

REPORT NUMBER: SideNCAPMDB-KAR-23-002

**NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST**

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

NHTSA No: M20230301

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



FEBRUARY 23, 2023

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NRM-100
1200 NEW JERSEY AVE, SE
WASHINGTON, D.C. 20590**

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Approval Date: February 23, 2023

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

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		6. Performing Organization Code KAR																												
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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 Jeep Grand Cherokee 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 February 09, 2023. The impact velocity of the Moving Deformable Barrier was 62.04 km/h and the outside ambient temperature at the struck (driver's) side of the vehicle was 21.4°C. The target vehicle's maximum post-test static crush was 116 mm located at level 2. The test vehicle's occupant performance data is as follows:																														
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*Proposed IARV

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SECTION 1
TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2023 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number 693JJ920D000015. The purpose of this test is to generate comparative side impact performance in a 2023 Jeep Grand Cherokee Altitude 5-Door SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated March 2020.

SECTION 2

SUMMARY OF TEST RESULTS

A 2023 Jeep Grand Cherokee Altitude 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 61.95 km/h (38.49 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 February 09, 2023. Pre- and post-test photographs of the test vehicle, the MDB and the dummies (ES-2re and SID-IIs) are included in Appendix A of this report.

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

Head Triaxial Angular Rate Sensors

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	87.035
Maximum Thoracic Rib Deflection	mm	44	21.468
Combined Abdominal Force	N	2500	855.887
Pubic Symphysis Force	N	6000	1045.390

**Proposed IARV*

Measurement Description	Units	Passenger ATD (SID-IIs)	
		Threshold	Result
Head Injury Criteria (HIC ₃₆)		1000	163.732
Lower Spine (T12) Resultant Acceleration	g	82	38.739
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2343.462
Maximum Thoracic Rib Deflection	mm	38*	15.403
Maximum Abdominal Rib Deflection	mm	45*	28.488

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

GENERAL COMMENTS:

- PASSENGER HEAD AZR, CHANNEL FAILED AT 93.0 MS
- RIGHT FRONT SILL AX, CHANNEL FAILED, NO DATA
- LEFT REAR SILL AY, CHANNEL FAILED AT 3.1 MS
- LEFT LOWER A-POST AY, CHANNEL FAILED AT 23.2 MS

SECTION 3

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

CONVERSION FACTORS

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

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20230301
Model Year	2023
Make	Jeep
Model	Grand Cherokee Altitude
Body Style	5-Door SUV
VIN	1C4RJGAG9PC514088
Body Color	White
Odometer Reading (km / mi)	42 / 26
Engine Displacement (L)	3.6
Type / No. of Cylinders	V6
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	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	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other Safety Restraint	No

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

No

DATA FROM CERTIFICATION LABEL

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

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

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				476.0	A
DSC x 68 (kg)				340	B
Cargo Weight (RCLW) (kg)				136	A-B*

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

VEHICLE SEAT TYPE

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

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

TIRE PRESSURES

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

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	511.5	450.0		539.0	601.0		551.5	588.5	
Right	kg	519.5	465.0		505.0	556.0		497.5	575.0	
Ratio	%	53.0%	47.0%		47.4%	52.6%		47.4%	52.6%	
Total	kg	1031.0	915.0	1946.0	1044.0	1157.0	2201.0	1049.0	1163.5	2212.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1946.0	A
Sum of Actual Weight of 2 P572 ATD Used	kg	125.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	135.8	C
Calculated Target Vehicle Test Weight (TVT _W)	kg	2206.8	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	940	937	Yes
RF	mm	940	937	Yes
LR	mm	940	938	Yes
RR	mm	945	942	Yes
Vehicle CG (Aft of Front Axle)	mm	1524	1556	
Vehicle CG (Left (+)/Right (-) from Longitudinal Centerline)	mm	51	34	

***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 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

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

Component Description	Weight (kg)
None	

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 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

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	9.0	0.0	4.5
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid Fore/Aft	Forwardmost
Driver Seat	4.5	808	Max	822	824	833
			Mid	807	808	816
			Min	789	791	799
Front Passenger Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Front Center Seat			Max			
			Mid			
			Min			
Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Max	Fixed	Fixed	Fixed
			Mid	Fixed	Fixed	Fixed
			Min	Fixed	Fixed	Fixed

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

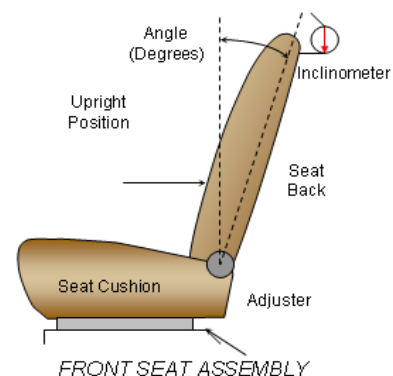
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position From Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	250		125	
Front Passenger Seat	255		128	
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 at the head rest post.



SEAT BACK POSITION

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degree	Detent*
Driver Seat w/ Seated Dummy	70.8		11.0	
Front Passenger Seat	69.8		11.0	
Front Center Seat				
Struck Side Rear Seat w/Seated Dummy	36.6	9	10.7	0
Non-Struck Side Rear Seat	36.6	9	10.7	0
Rear Center Seat	36.6	9	10.7	0

*Detent zero (0) is the forward most detent

DATA SHEET NO. 2 ... (CONTINUED)

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

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

SEAT BELT ANCHORAGE ADJUSTMENT

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

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

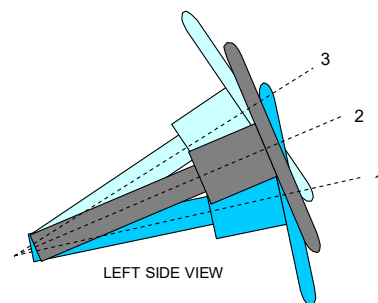
HEAD RESTRAINT ADJUSTMENT

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	7	H
Rear Seat	Fixed	Fixed

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.



LEFT SIDE VIEW
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	22.4	135
Geometric Center Position, No. 2	25.7	178
Uppermost Position, No. 3	28.9	220
Telescoping Steering Wheel Travel		85
Test Position	25.7	178

DATA SHEET NO. 2 ... (CONTINUED)

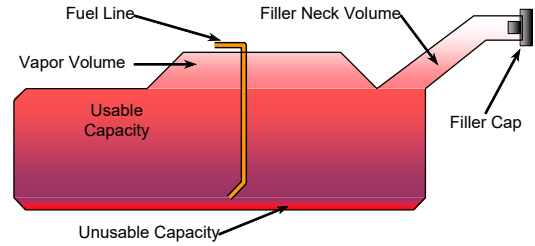
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

FUEL PUMP

The vehicle is equipped with an electric fuel pump. The fuel pump is activated when the ignition is turned to "ON" position.



VEHICLE FUEL TANK ASSEMBLY

FUEL TANK CAPACITY

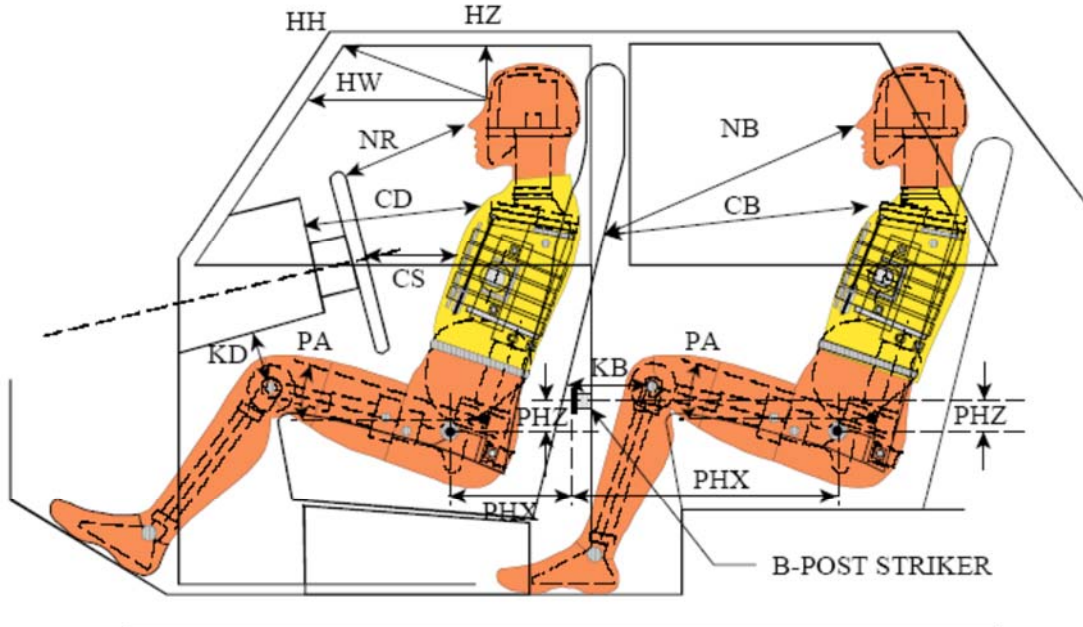
Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	87.06
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	87.06
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	80.97
Actual amount of Solvent Used in Test	80.97
1/3 of Usable Capacity	29.02

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

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



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

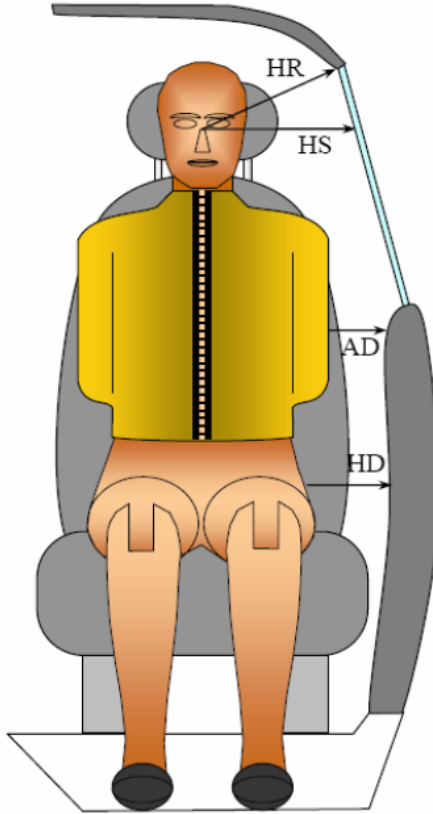
Driver Code	Pass. Code	Description	Driver		Passenger	
			Length (mm)	Angle (°)	Length (mm)	Angle (°)
HH		Head to Header	505			
HW		Head to Windshield	892			
HZ	HZ	Head to Roof	248		322	
NR	NB	Nose to Rim/Seat Back	500		465	
CD	CB	Chest to Dash/Seat Back	659		467	
CS		Chest to Steering Wheel	422			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	231	23.6	258	16.0
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	217	21.1	259	16.3
PAX°	PAX°	Pelvic Tilt Angle X		5.0		22.0
	PAY°	Pelvic Tilt Angle Y		0.0		0.0
PHX	PHX	Hip Point to Striker (x-axis)	125		178	
PHZ	PHZ	Hip Point to Striker (z-axis)	69		139	

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

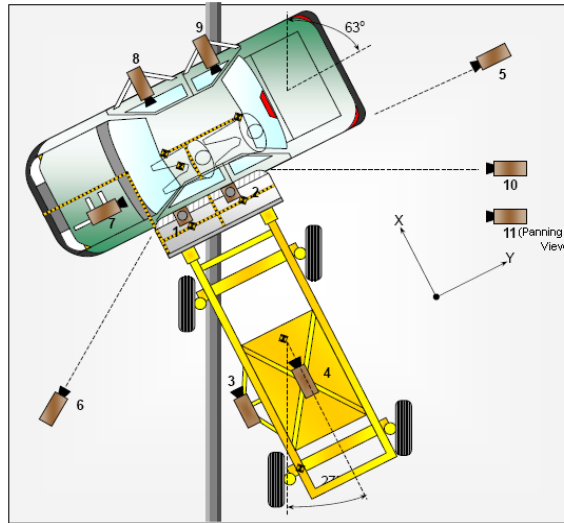
Code	Measurement Description	Units	Driver	Passenger
HR	Head to Side Header	mm	294	282
HS	Head to Side Window	mm	417	363
AD	Arm to Door	mm	100	150
HD	H-Point to Door	mm	159	167

DATA SHEET NO. 5

CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



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

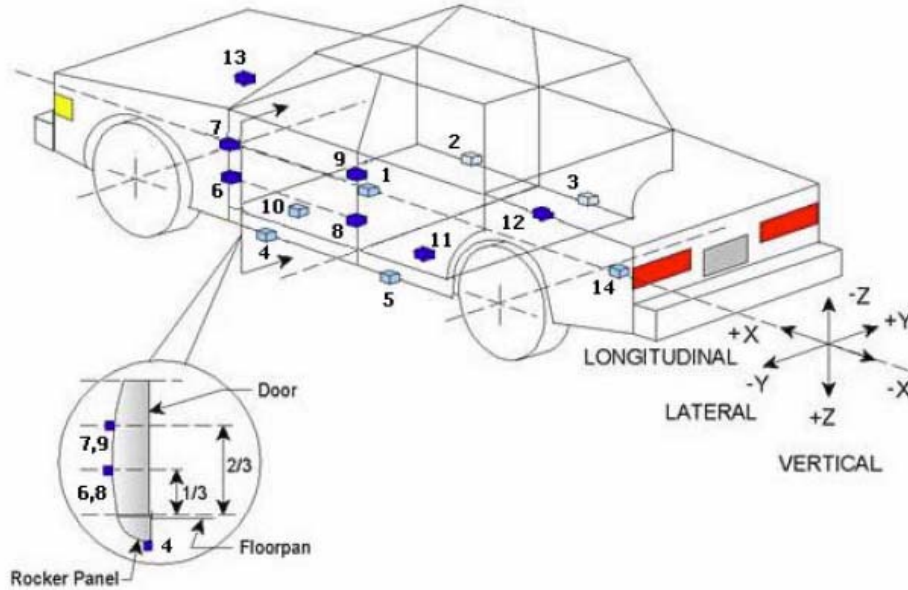
INSTRUMENTATION

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 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

Loc. No.	Sensor Description	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	1910	0	823
2	Right Sill at Front Seat	2790	725	537
3	Right Sill at Rear Seat	1923	720	720
4	Left Sill at Front Door	2715	-830	450
5	Left Sill at Rear Door	1710	-823	480
6	A-Pillar Lower	3233	-825	870
7	A-Pillar Middle	3233	-825	1046
8	B-Pillar Lower	2154	-742	830
9	B-Pillar Middle	2154	-742	1226
10	Front Seat Track	2335	-219	520
11	Rear Seat Structure	1727	-383	520
12	Right Rear Occupant Compartment	1910	400	543
13	Engine Block	3767	130	1132
14	Rear Floorpan Above Axle	1212	0	727

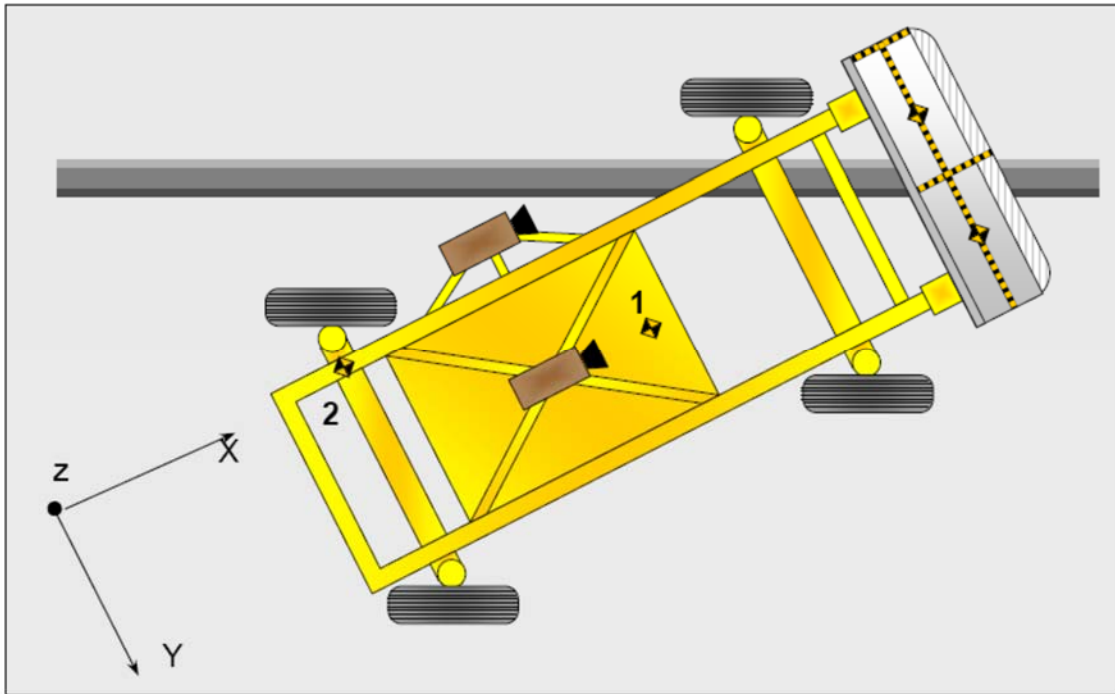
Reference: X – Rear surface of vehicle (+ forward)
 Y – Vehicle centerline (+ to right)
 Z – Ground plane (+ down)

DATA SHEET NO. 7

MDB ACCELEROMETER LOCATIONS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



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 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

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	Curtain Airbag
Left Side of Head	Curtain Airbag	Curtain Airbag
Back of Head	Headrest	Curtain Airbag, Head Rest
Left Shoulder	Curtain Airbag, T/P Airbag	Door Panel
Upper Torso	Side Airbag	Door Panel
Lower Torso	Side Airbag	Door Panel
Left Hip	Side Airbag	Door Panel
Left Knee	Door Panel	Door Panel

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	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge System Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Record Width of Opening at Striker (mm)	N/A	N/A	N/A	N/A	N/A

DATA SHEET NO. 8 ... (CONTINUED)

POST-TEST OBSERVATIONS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

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 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheelbase	mm		2960
Vertical Impact Reference Line (Aft of Front Axle)(Intended Impact Point)	mm		507
Actual Impact Point (Aft of Front Axle)	mm		507
Horizontal Offset (+ forward / - rearward)	mm	± 50 of Intended Impact Point	0
Vertical Offset (+ down / - up)	mm	± 20 of Intended Impact Point	19

DATA SHEET NO. 9

MDB SUMMARY OF RESULTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

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	61.95
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.11
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	89.9
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	62.7
MDB Crabbed Angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.2

MAXIMUM STATIC CRUSH OF HONEYCOMB FACE

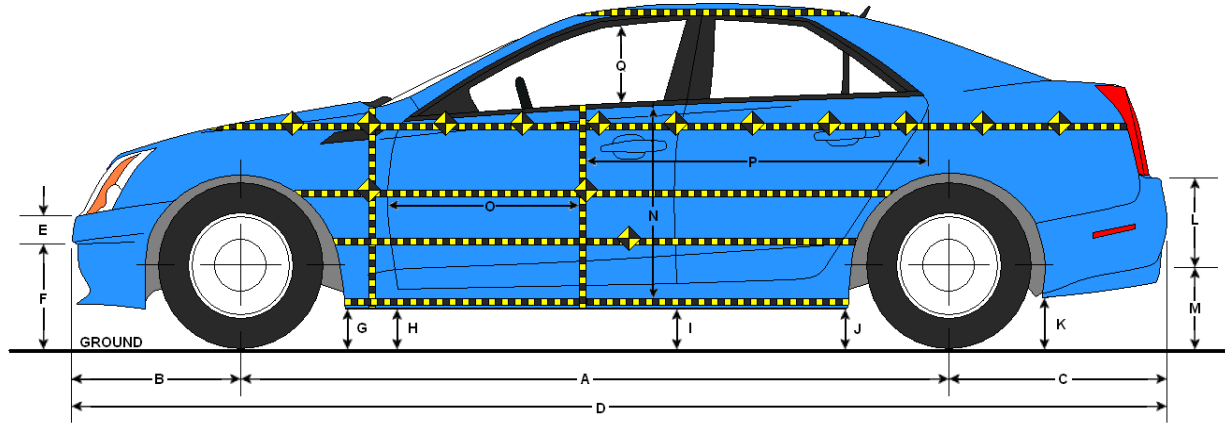
Vertical Location			From Centerline		Max. Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Right	255
B	Top of Bumper	533	700	Left	170
C	Mid Level	686	800	Left	181
D	Top of Stack	813	800	Left	186

DATA SHEET NO. 10

TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Change
A	Wheelbase	2960	2951	-9
B	Front Axle to FSOV	902	896	-6
C	Rear Axle to RSOV	1036	1051	15
D	Total Length at Centerline	4898	4899	1
E	Front Bumper Thickness	386	386	0
F	Front Bumper Bottom to Ground	25	23	-2
G	Sill Height at Front Wheel Well	276	323	47
H	Sill Height at Front Door Leading Edge	80	99	19
I	Sill Height at B-Pillar	230	229	-1
J1	Sill Height at Rear Wheel Well	278	318	40
J2	Pinch Weld Height at Rear Wheel Well	-52	-41	11
K	Sill Height Aft of Rear Wheel Well	456	477	21
L	Rear Bumper Thickness	236	256	20
M	Rear Bumper Bottom to Ground	100	99	-1
N	Sill Height to Bottom of Front Window Sill	584	579	-5
O	Front Door Leading Edge to Impact CL	710	706	-4
P	Rear Door Trailing Edge to Impact CL	1413	1391	-22
Q	Front Window Opening	443	469	26
R	Right Side Length	4266	4268	2
S	Left Side Length	4237	4231	-6
T	Vehicle Width at B-Pillar	1896	1808	-88

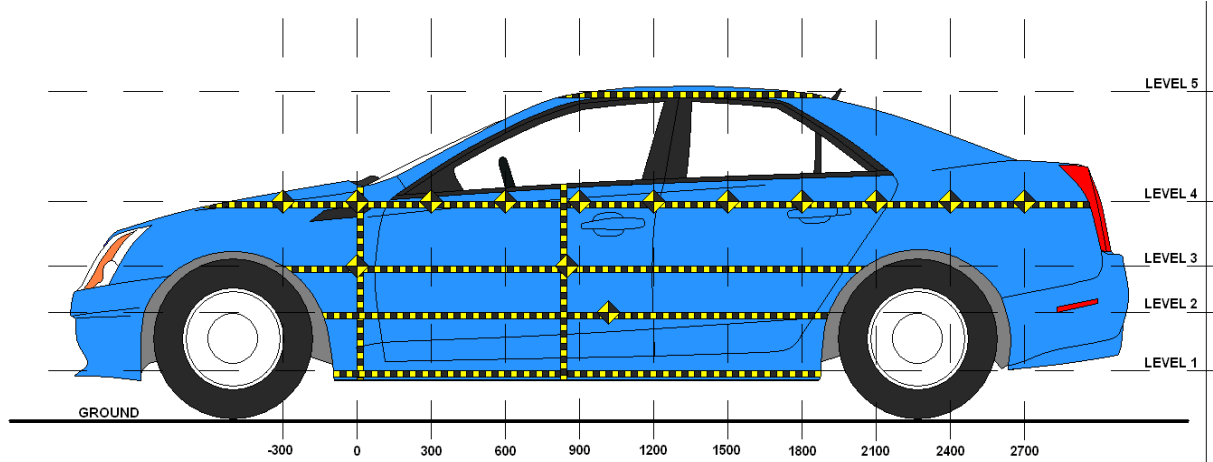
All measurements in mm with tolerance of ± 3mm

DATA SHEET NO. 11

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



LEFT SIDE VIEW

Level	Description	Height Above Ground (mm)	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	423	400	1500
2	Occupant H-Point	855	229	1500
3	Mid-Door	1125	104	1950
4	Window Sill	1289	54	1350
5	Window Top	1776	0	900

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

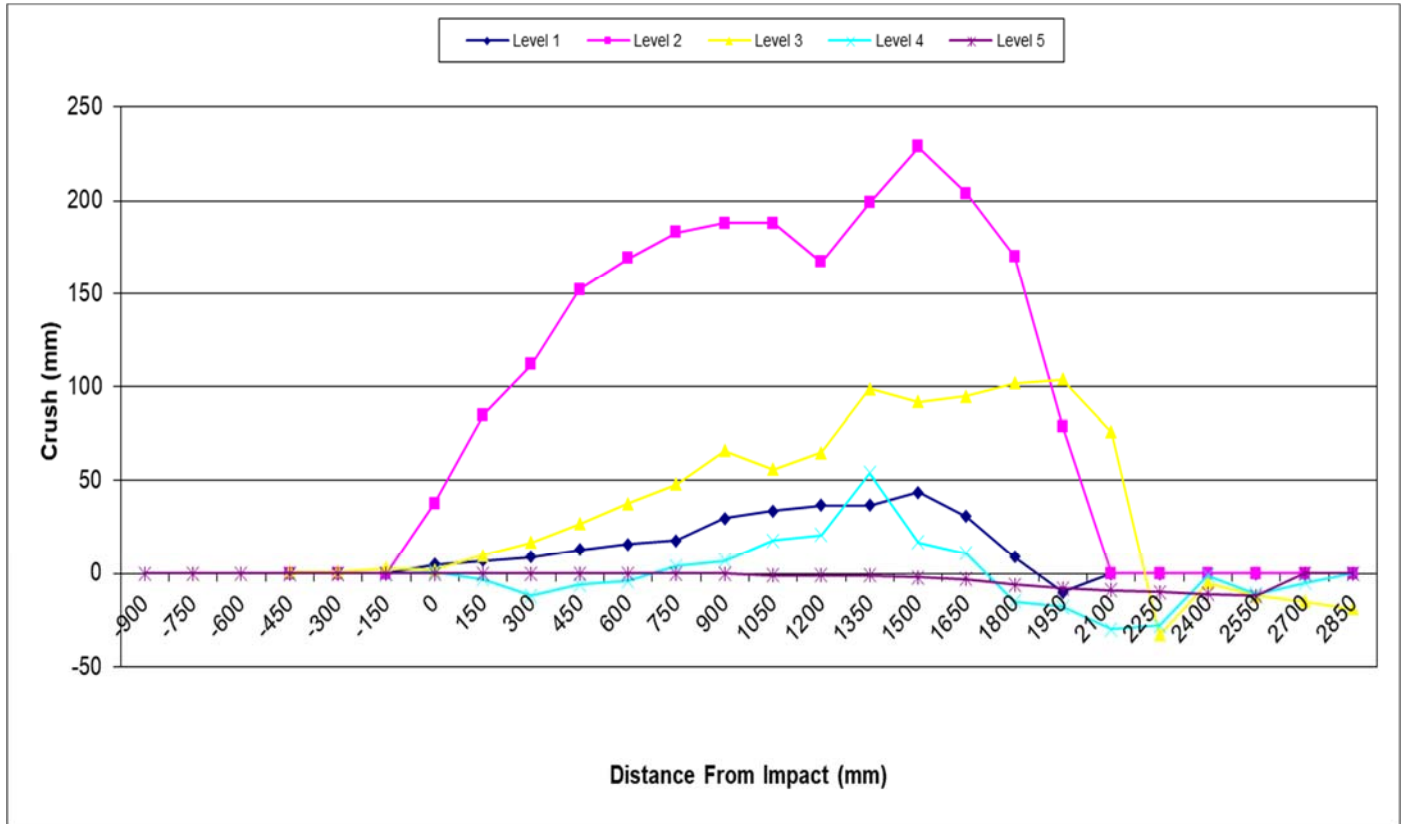
	Pre-Test (mm)					Post-Test (mm)					Crush (mm)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450			594					595					1		
-300			585					586					1		
-150			576					579					3		
0	590	538	570	649		595	576	572	650		5	38	2	1	
150	608	550	567	630		615	635	577	627		7	85	10	-3	
300	618	553	563	625		627	665	580	613		9	112	17	-12	
450	617	552	560	619		630	704	587	613		13	152	27	-6	
600	617	551	557	630		633	720	595	626		16	169	38	-4	
750	619	550	555	615		637	733	603	619		18	183	48	4	
900	618	550	553	629	824	648	738	619	636	824	30	188	66	7	0
1050	619	549	551	613	828	653	737	607	631	827	34	188	56	18	-1
1200	618	549	551	630	829	655	716	616	651	828	37	167	65	21	-1
1350	618	549	549	610	830	655	748	648	664	829	37	199	99	54	-1
1500	618	550	551	633	832	662	779	643	650	830	44	229	92	17	-2
1650	611	549	552	620	834	642	753	647	631	831	31	204	95	11	-3
1800	593	545	551	642	836	602	715	653	627	830	9	170	102	-15	-6
1950	566	530	550	627	837	556	609	654	609	829	-10	79	104	-18	-8
2100			546	648	837			622	618	828			76	-30	-9
2250			540	633	837			507	605	827			-33	-28	-10
2400			539	645	838			534	644	827			-5	-1	-11
2550			543	648	836			531	637	824			-12	-11	-12
2700			552	660				537	655				-15	-5	
2850			575	671				556	671				-19	0	

DATA SHEET NO. 11 ... (CONTINUED)

TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

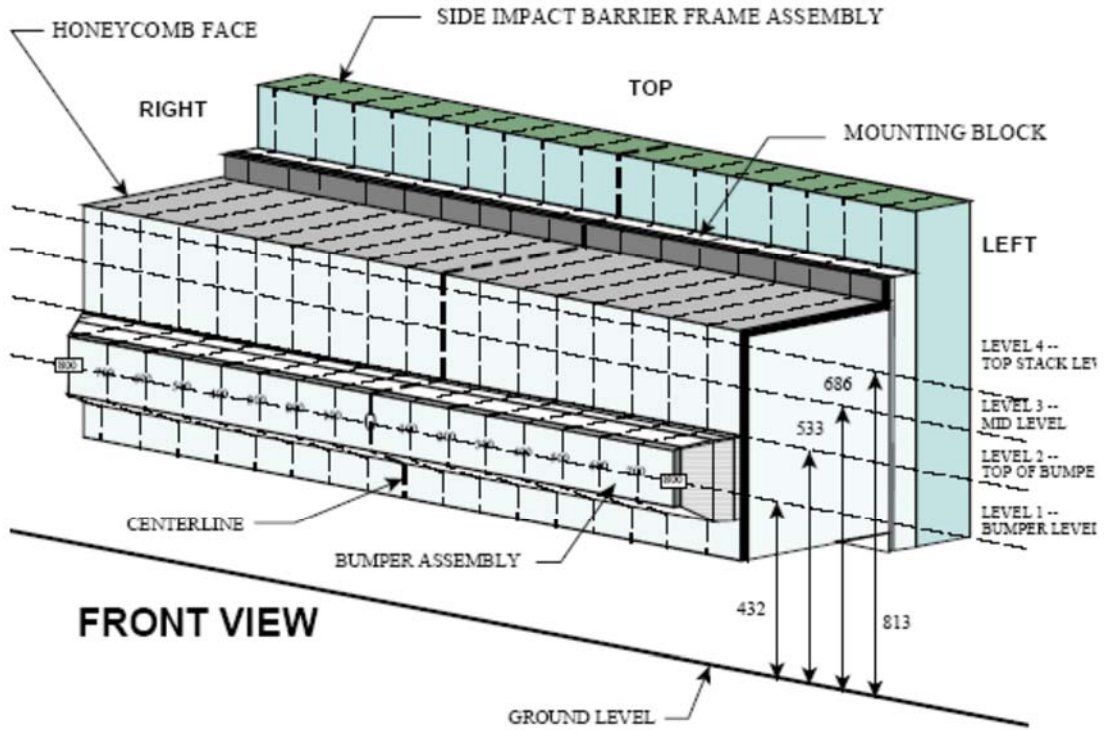


DATA SHEET NO. 12

MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



NOTE: Dimensions are shown in millimeters, mm

DEFORMABLE BARRIER STATIC CRUSH

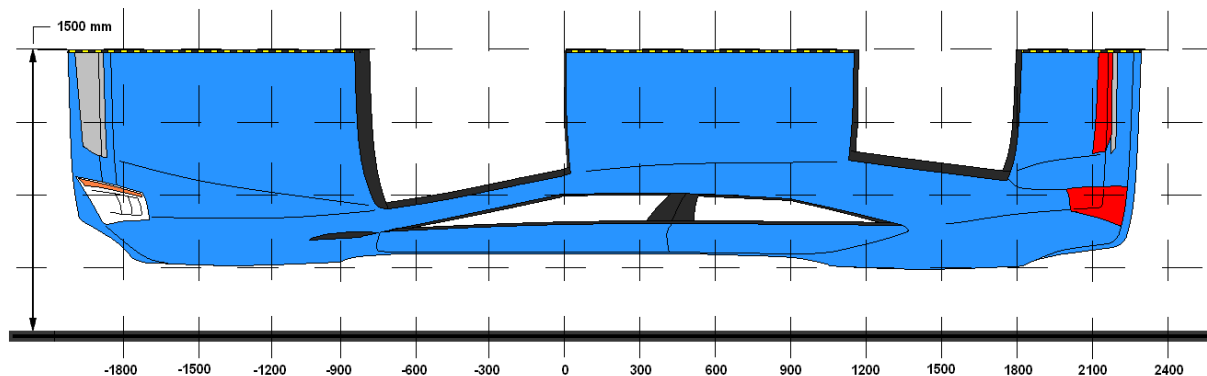
Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100		0	100	200	300	400	500	600	700
1	255	250	236	233	240	236	235	230	235	236	232	231	230	224	228	223	241
2	142	146	141	146	144	145	149	160	151	161	157	155	155	157	159	170	160
3	136	88	72	75	115	135	95	91	95	87	81	78	82	92	115	168	181
4	138	94	71	69	93	92	94	79	68	51	76	87	102	112	139	176	186

All dimensions in millimeters.

DATA SHEET NO. 13

VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301
 Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Pre-Test (mm)	Post-Test (mm)	Crush (mm)
1	2850	4	671	671	0
2	2100	3	546	622	76
3	1500	2	550	779	229
4	900	2	550	738	188
5	300	2	553	665	112
6	-450	3	594	595	1

MDB DAMAGE PROFILE DISTANCES

DPD	From MDB Centerline		Level	Crush (mm)
	Distance (mm)	Direction		
1	800	Left	1	255
2	500	Left	1	233
3	200	Left	1	235
4	200	Right	1	232
5	500	Right	1	224
6	800	Right	1	241

DATA SHEET NO. 14

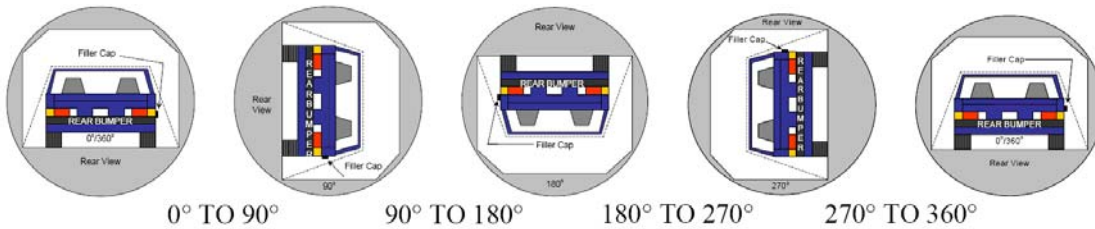
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23

Temperature at Time of Impact: 16.1°C Test Time: 4:11 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°	83	300	383
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

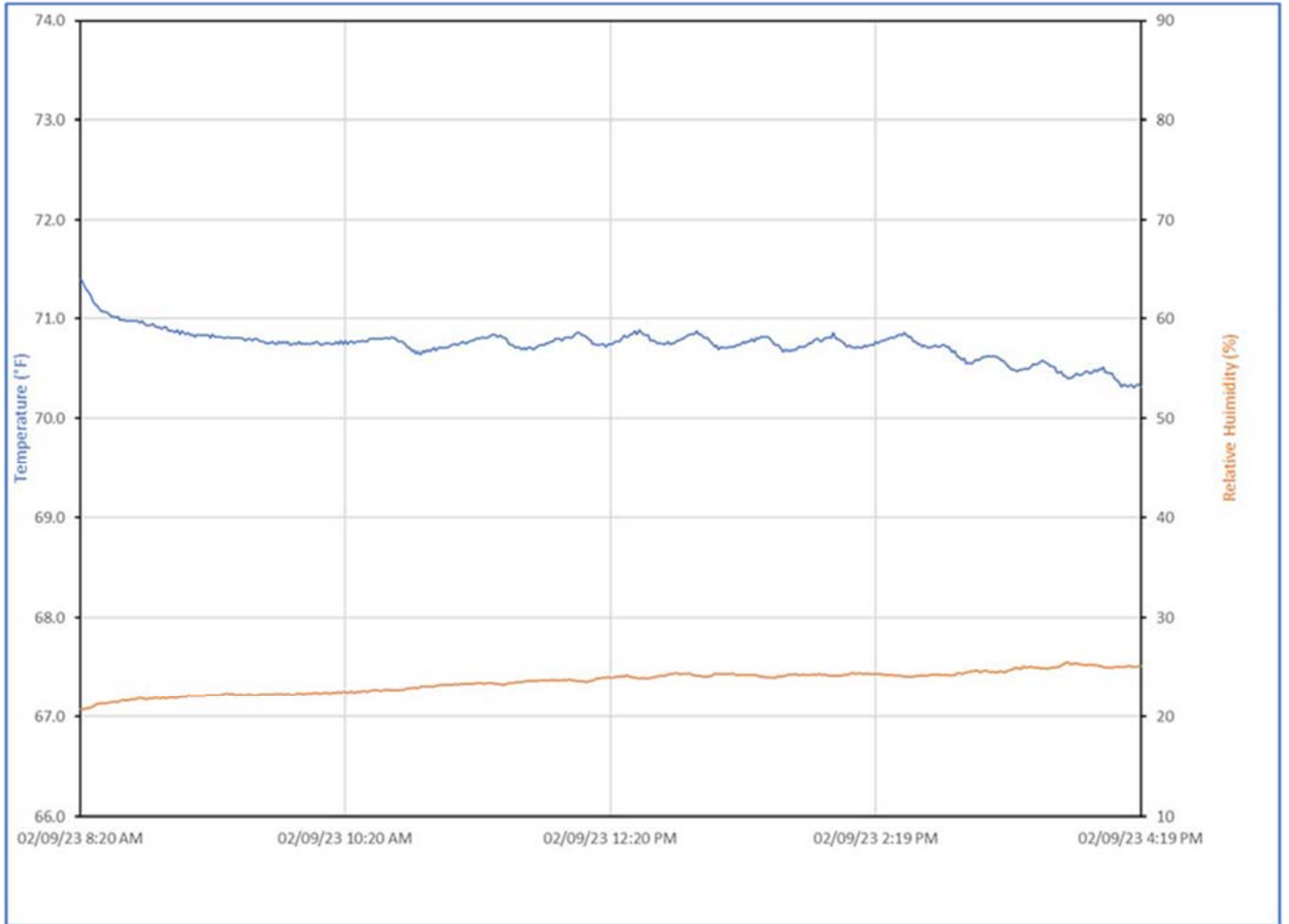
Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 15

DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION

Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV NHTSA No. M20230301

Test Program: NCAP MDB Side Impact Test Test Date: 02/09/23



**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

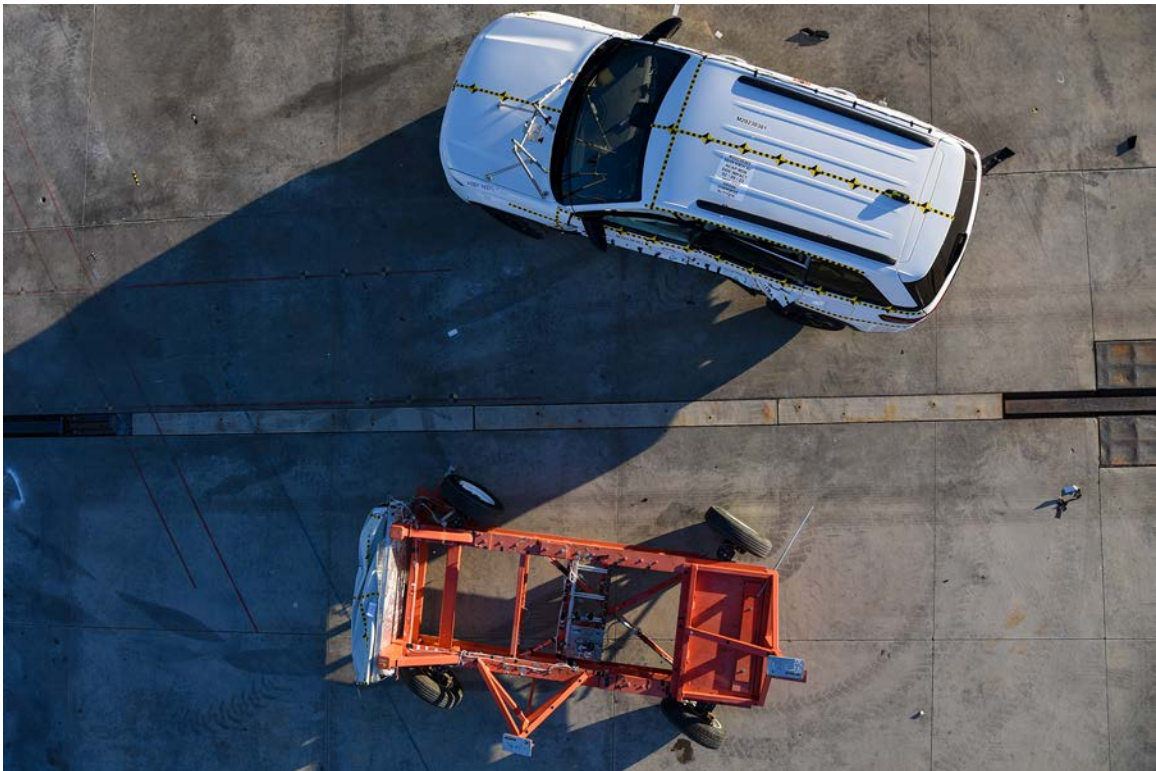


FIGURE 16. Post-Test Overhead View of Test Area



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



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

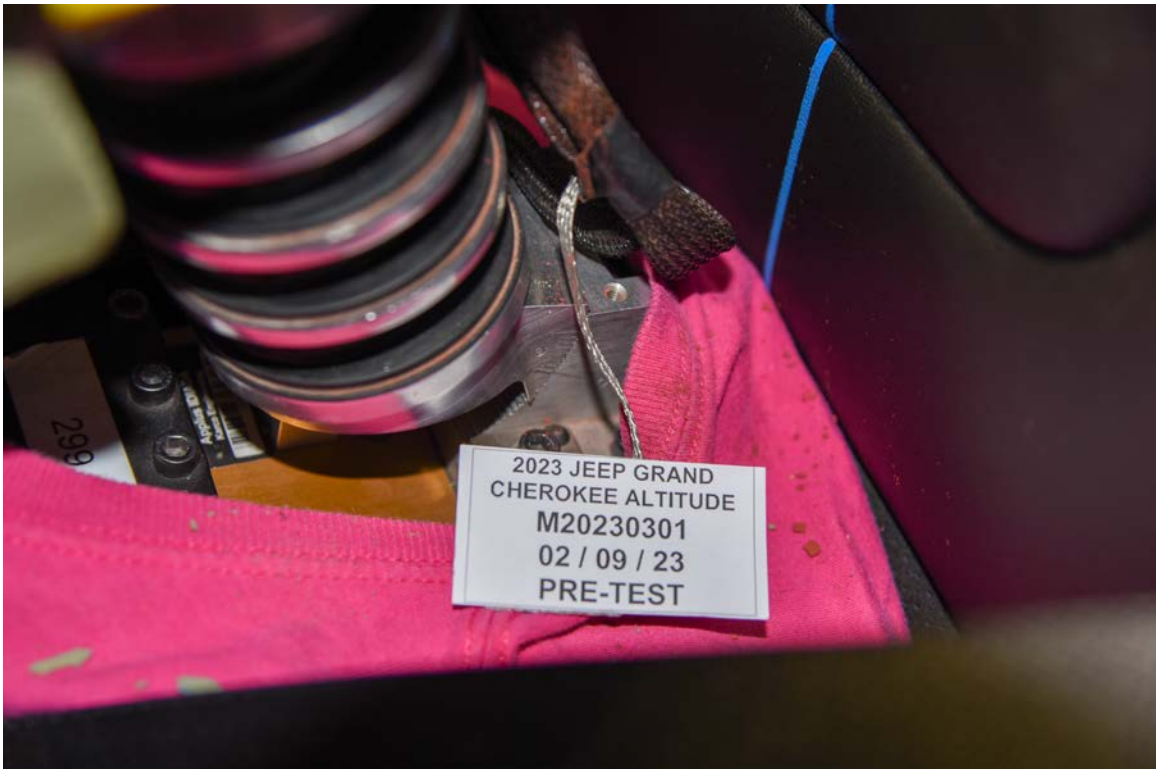


FIGURE 62. Pre-Test View of Rear Passenger Dummy's Neck
Showing Position of Adjustable Neck Bracket



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

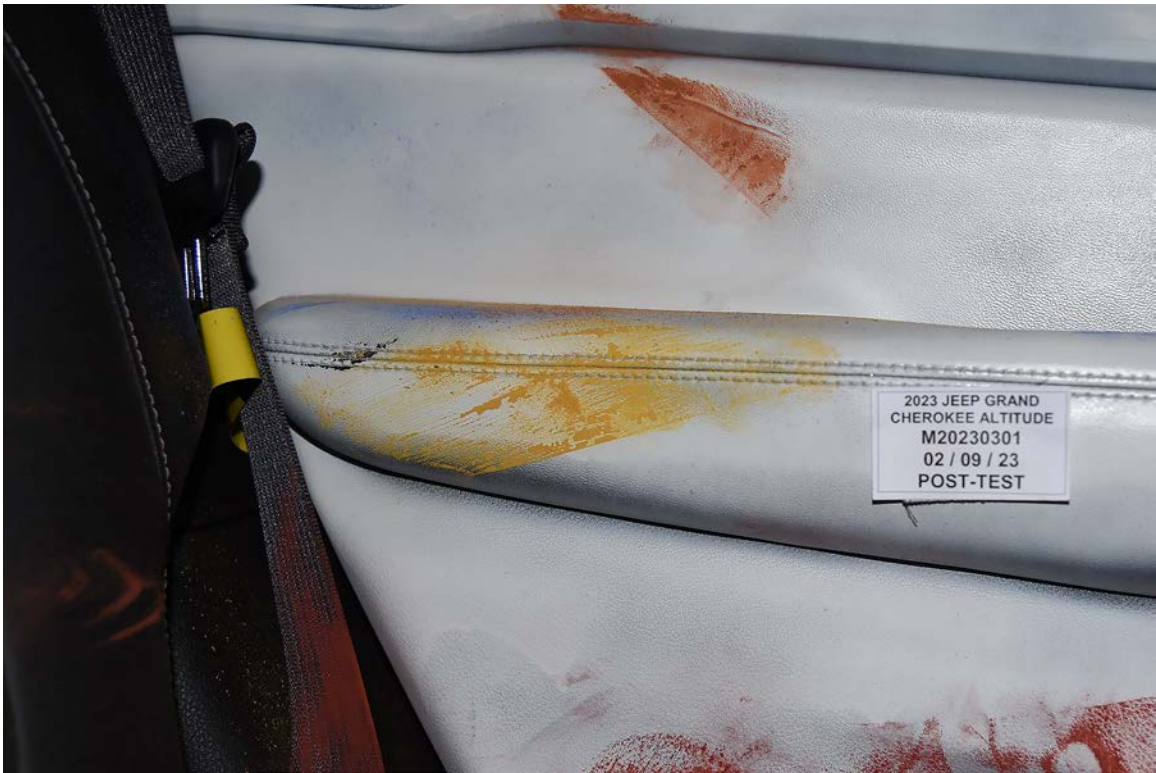


FIGURE 77. Post-Test Rear Passenger Dummy Close-Up
Torso Contact with Vehicle Interior View

Photograph Not Applicable
Vehicle not equipped with rear passenger side airbag.

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

Photograph Not Applicable
Vehicle not equipped with rear passenger side airbag.

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



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

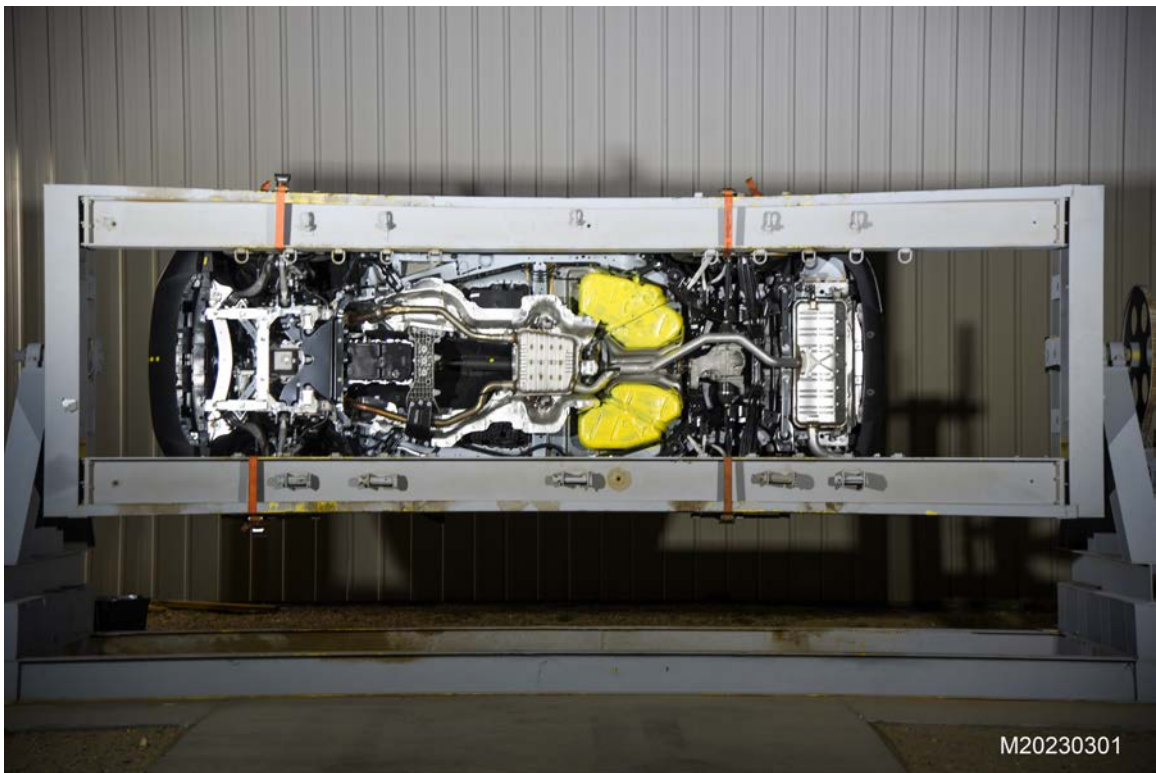


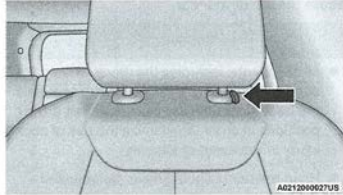
FIGURE 99. FMVSS No. 301 Static Rollover 270 Degrees



FIGURE 100. FMVSS No. 301 Static Rollover 360 Degrees

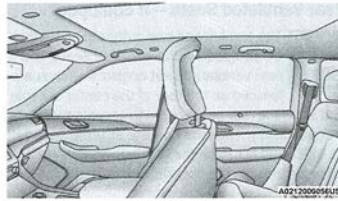
NOTE:

The head restraints should only be removed by qualified technicians, for service purposes only. If either of the head restraints require removal, see an authorized dealer.

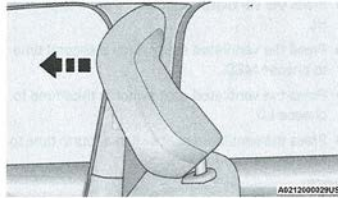


Head Restraint Adjustment Button

To adjust the head restraint forward, pull the top of the head restraint toward the front of the vehicle as desired and release. To adjust the head restraint rearward, pull the top of the head restraint to the forward most position and release. The head restraint will return to the rear most position.



Upright Position



Forward Adjustment

WARNING!

- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

Head Restraints – Second Row Captain's Chairs (If Equipped)

If the second row is equipped with captain's chairs, the head restraints are not adjustable or removable. They automatically fold forward when the seatback is folded, and do not return to their normal position when the seatback is raised. After returning the seatback to its upright position after a folding operation, raise the head restraint until it locks in place.

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

WARNING!

- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

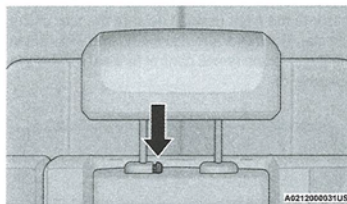
Head Restraints – Second Row Bench (If Equipped)

If the second row is equipped with a bench seat, the head restraints on the outboard seats are not adjustable or removable. They automatically fold forward when the seatback is folded, and do not return to their normal position when the seatback is raised. After returning the seatback to its upright position after a folding operation, raise the head restraint until it locks in place.

The center head restraint has one adjustment position, and can be adjusted up or down when the seat is occupied. Pull up on the head restraint to raise it. To lower the head restraint, push the adjustment button located on the base of the head restraint, and push downward on the head restraint until it locks into place.

NOTE:

The center head restraint is not removable.



Center Seat Head Restraint Adjustment Button

NOTE:

For information on child restraint tethering, see > page 272.

WARNING!

- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

Third Row Head Restraints – If Equipped

The third row head restraints are not adjustable or removable, but can be folded for improved visibility when the vehicle is in REVERSE, and there are no occupants in the seats.



Press the "Headrest Fold" button within the Controls menu of the Uconnect system to power fold the third row head restraints.

The head restraints will also automatically fold when the seatbacks are folded forward using the release handles on the backs of the seats from the cargo area.

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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3	Driver Head Acceleration (Z) Primary vs. Time	B-1
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22	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-7
23	Passenger Iliac Force on Impact Side (Y) vs. Time	B-7
24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-7

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)

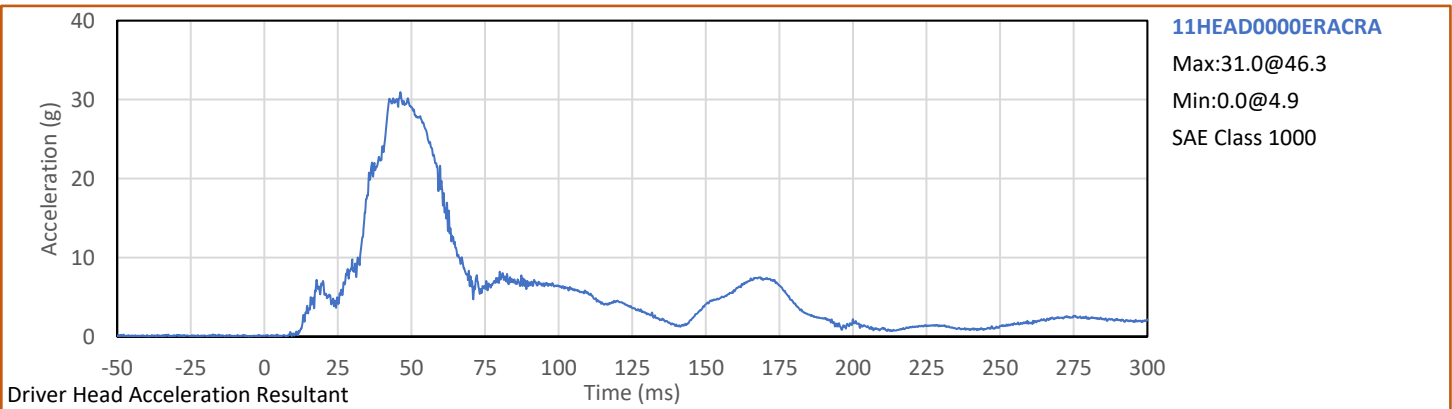
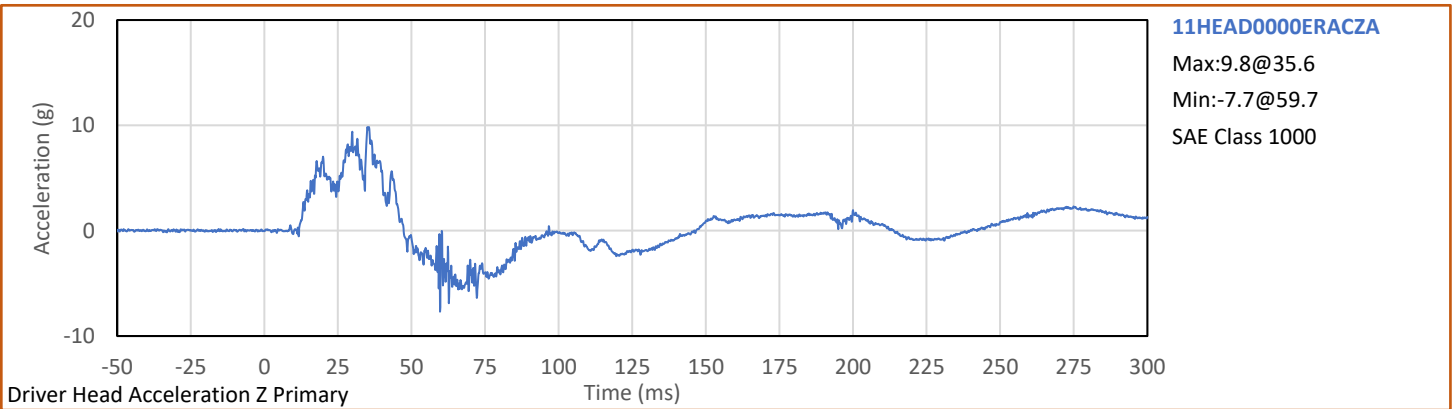
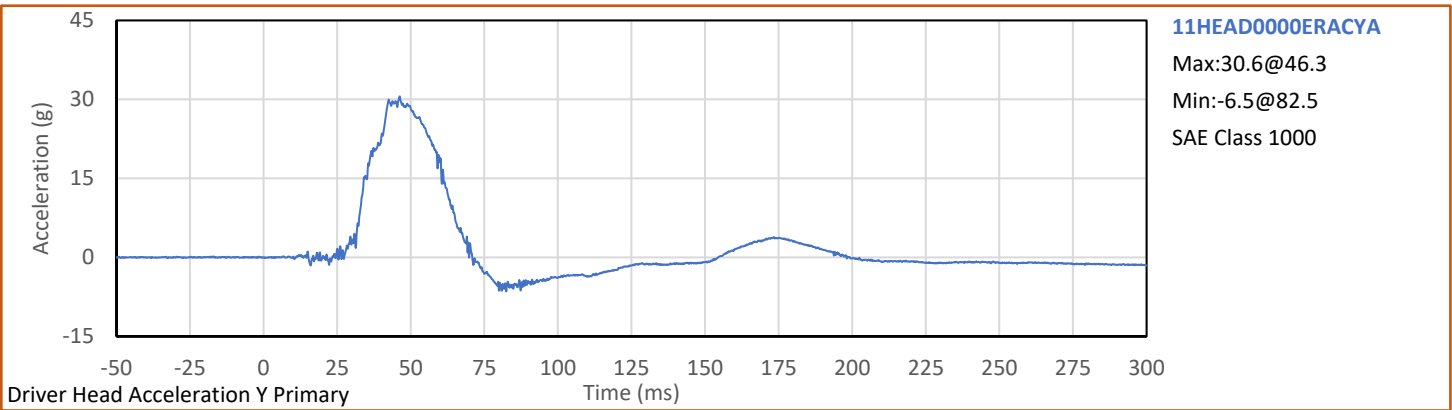
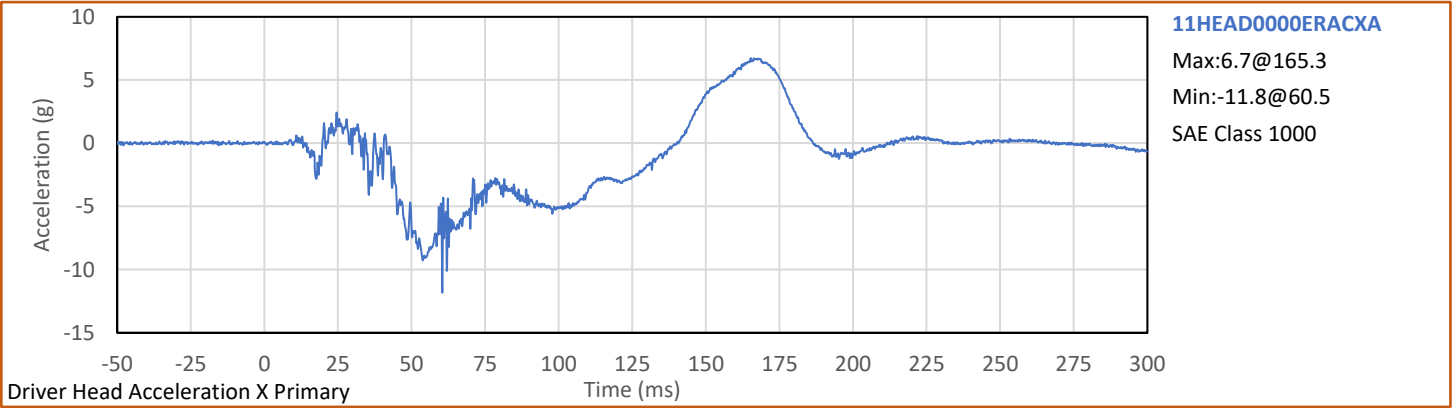
MDB Center of Gravity Acceleration (Z)

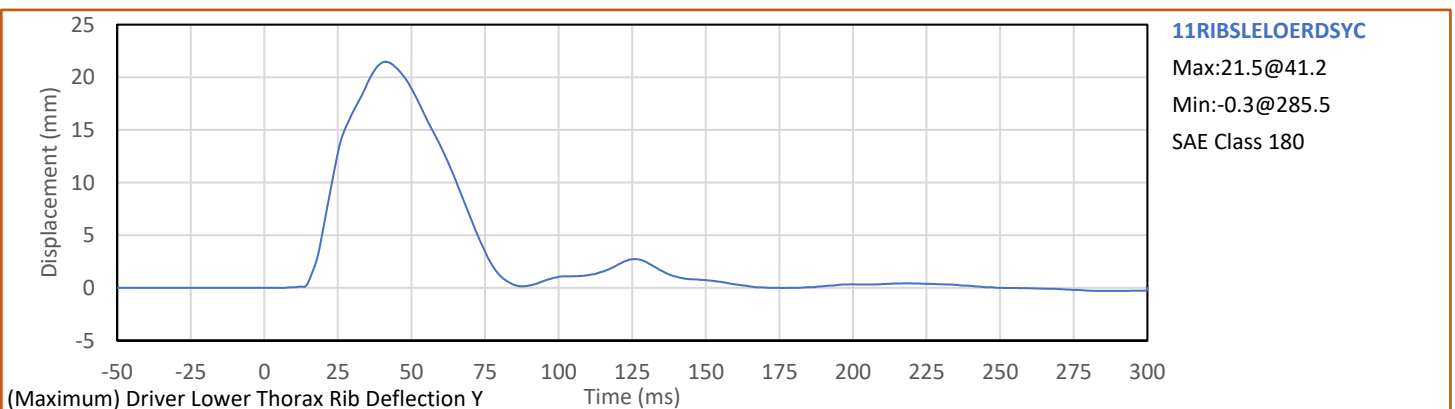
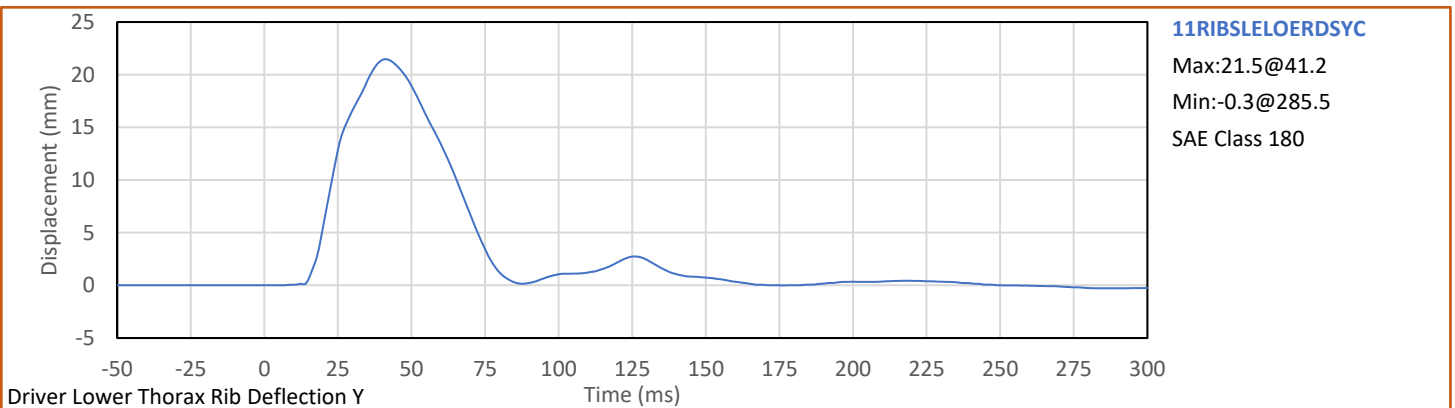
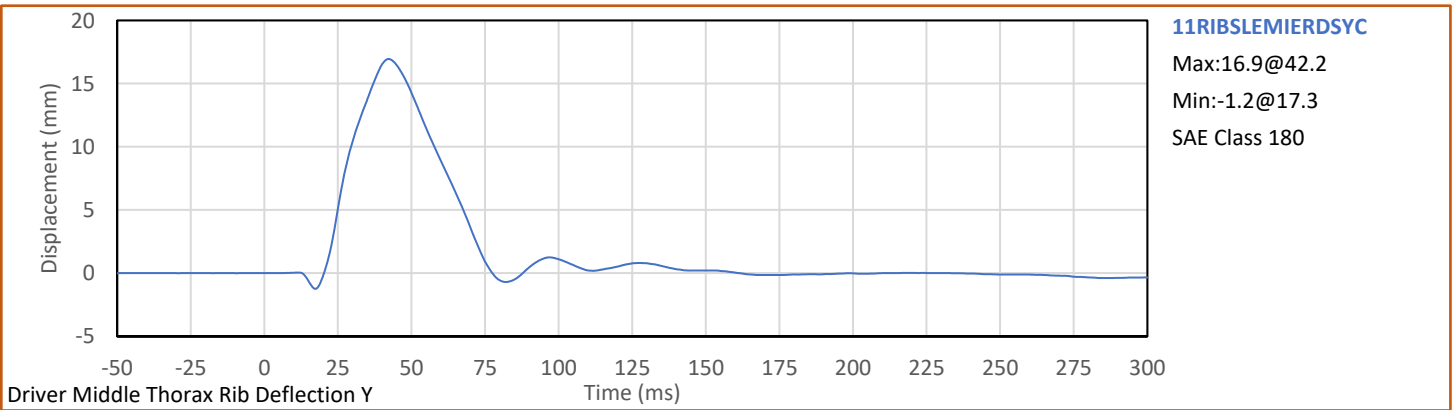
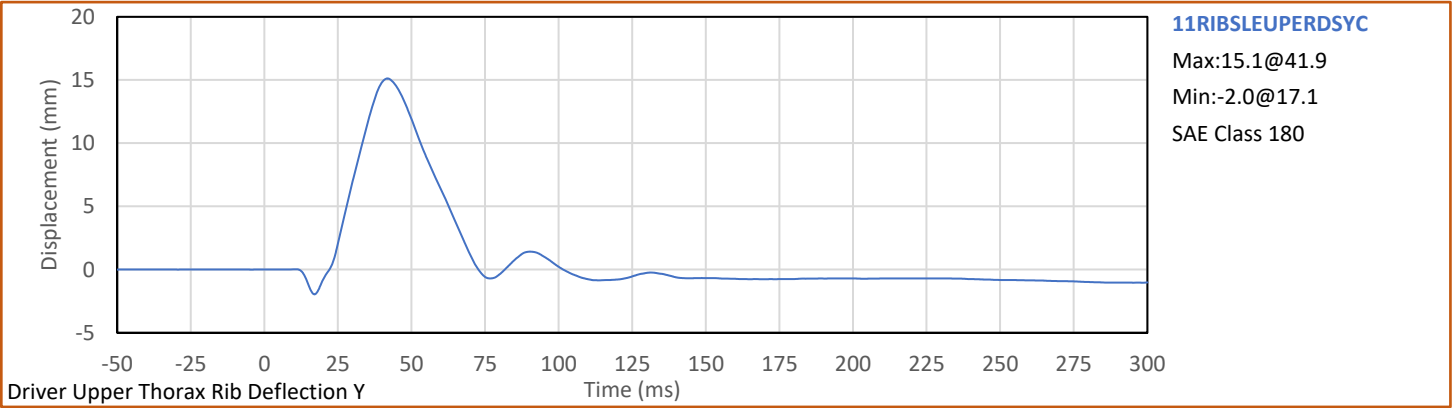
MDB Rear Acceleration (X)

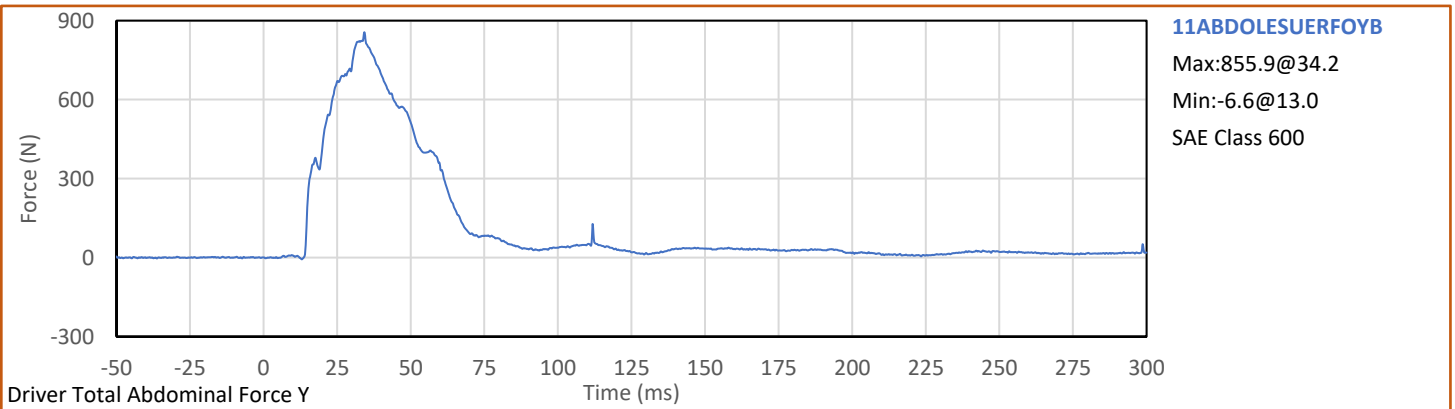
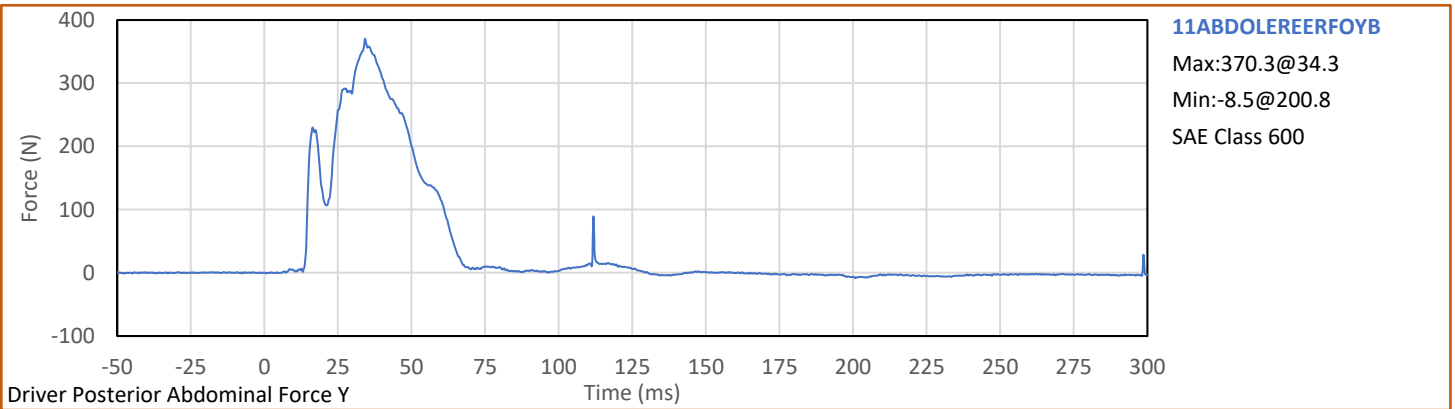
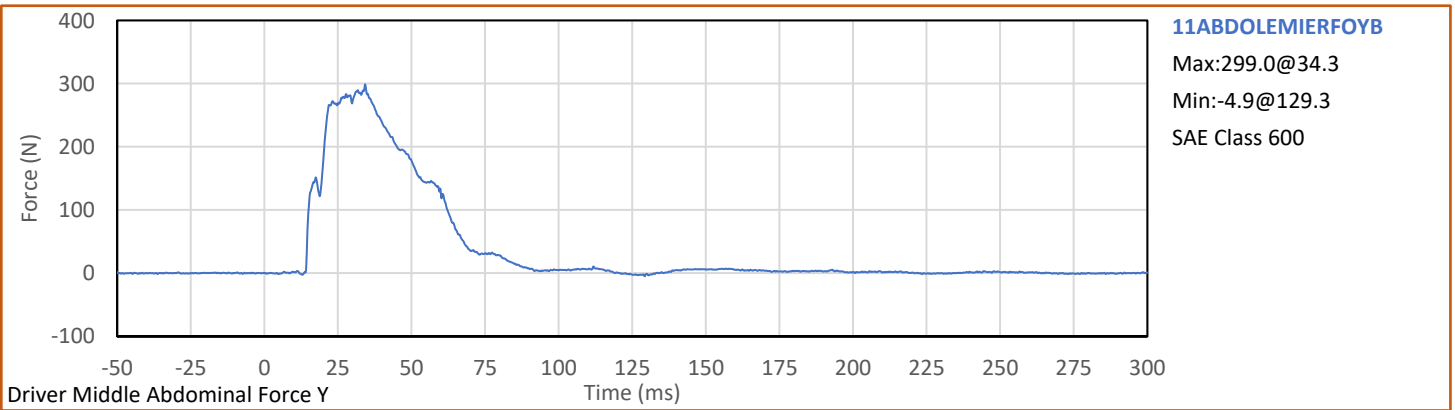
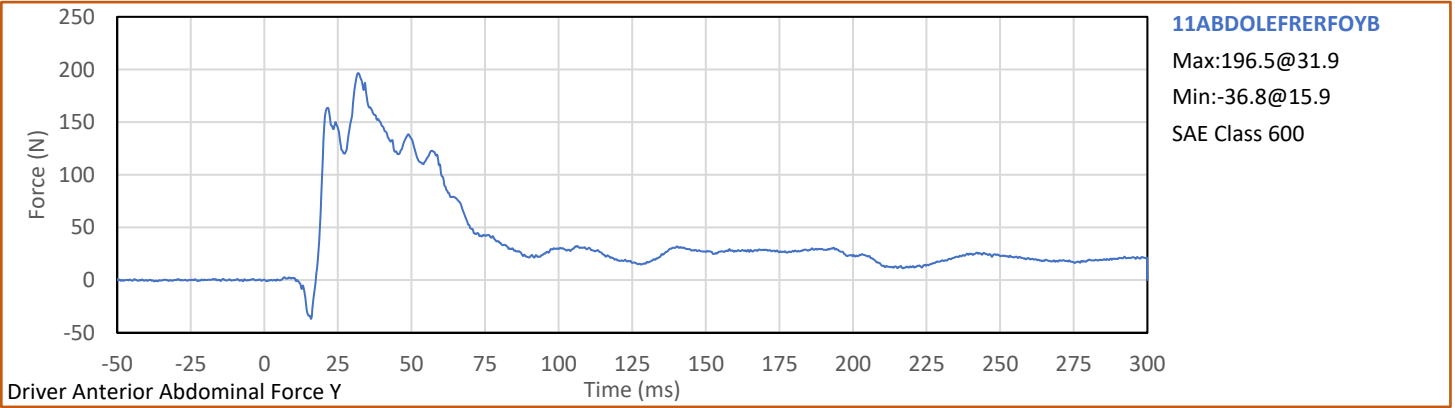
MDB Rear Acceleration (Y)

Left MDB Contact Switch

Right MDB Contact Switch

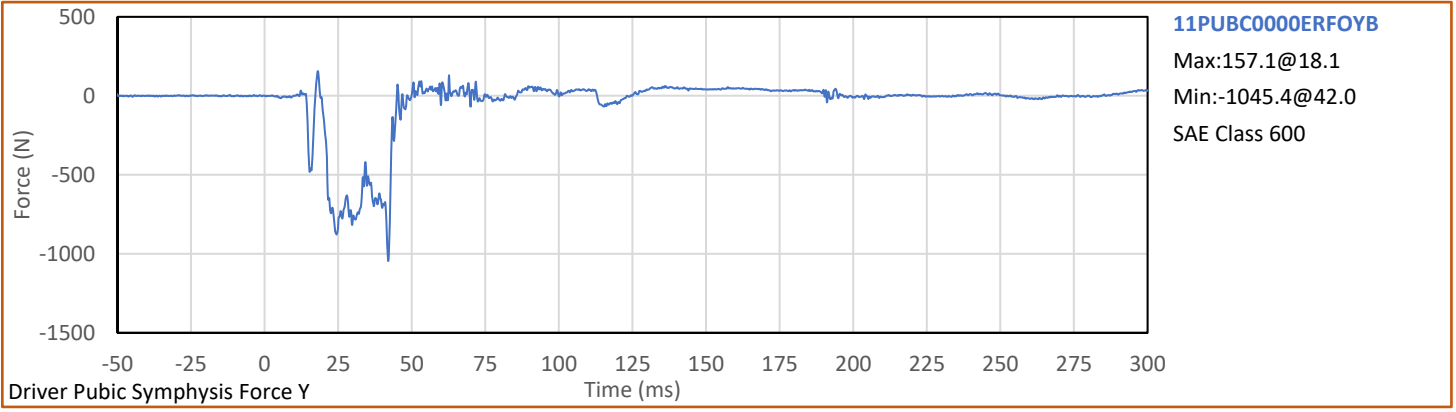


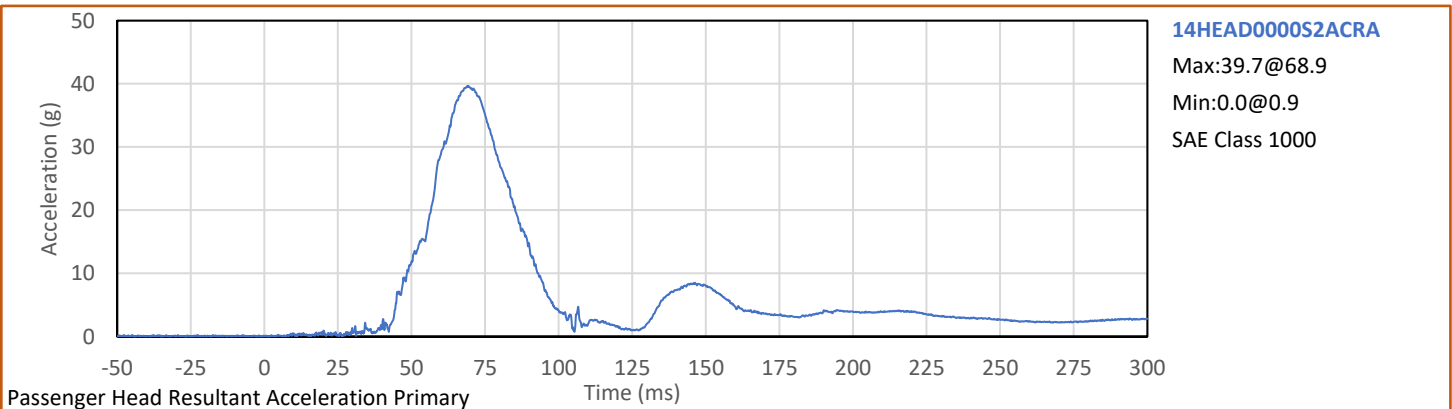
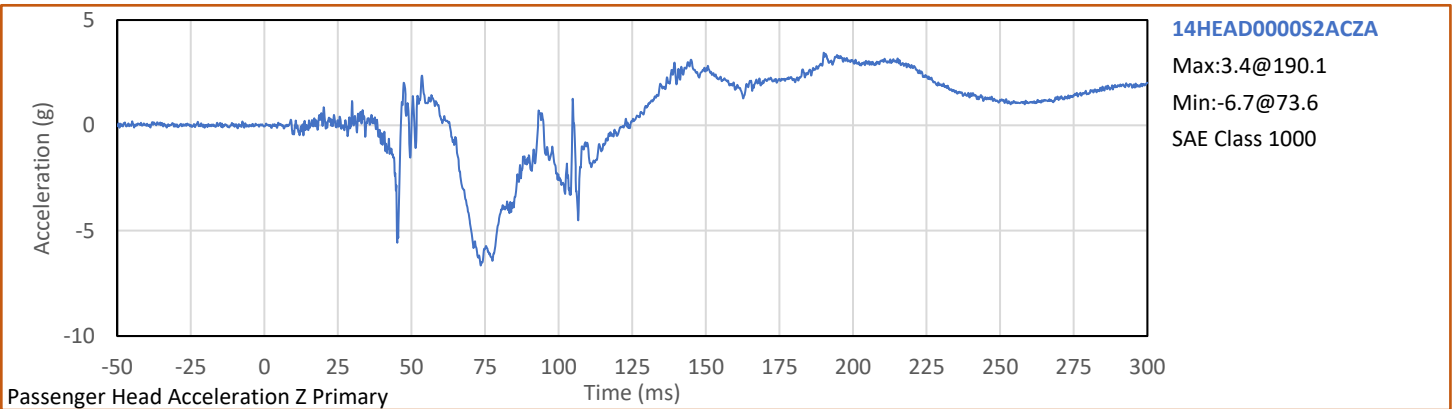
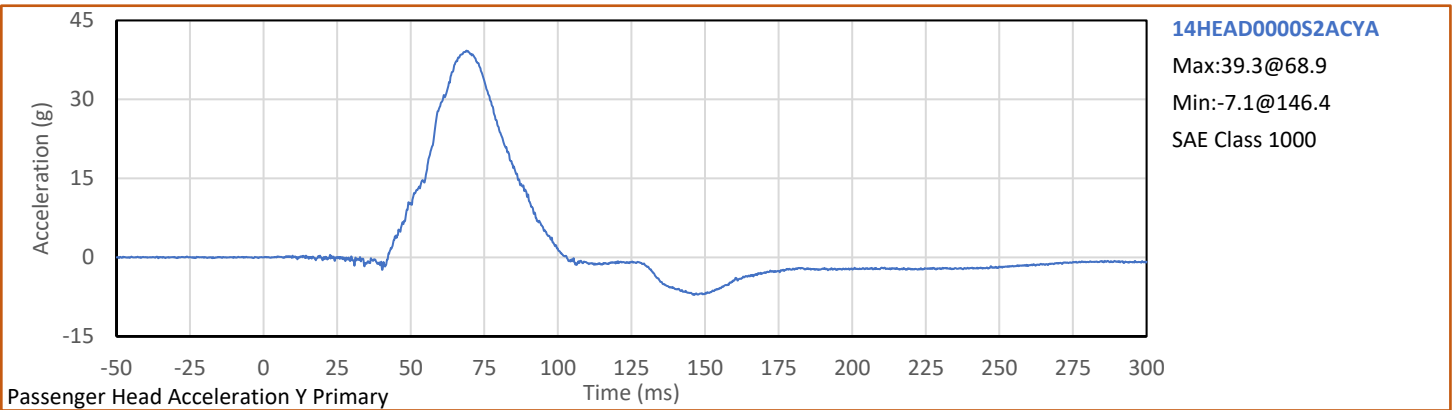
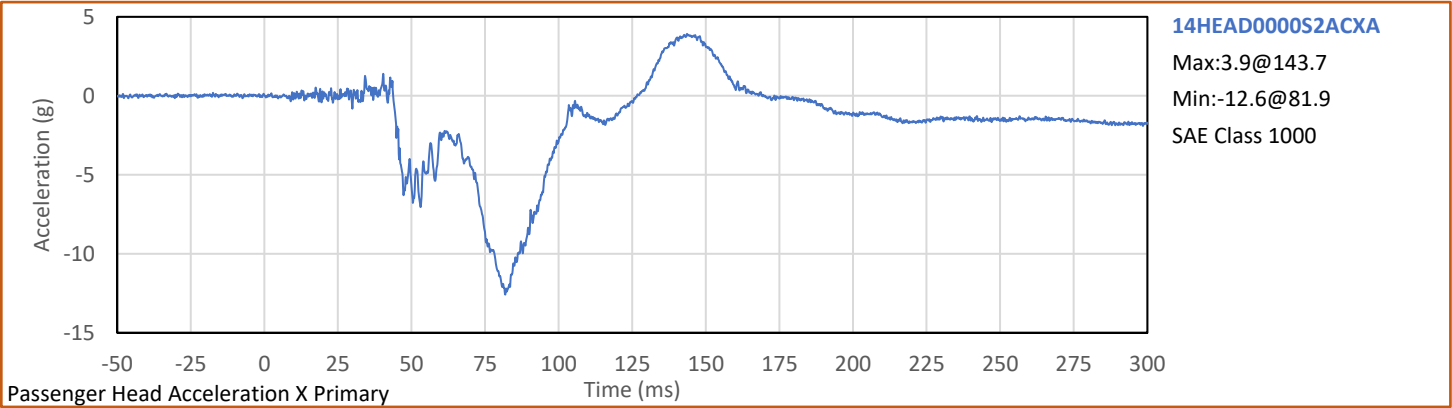


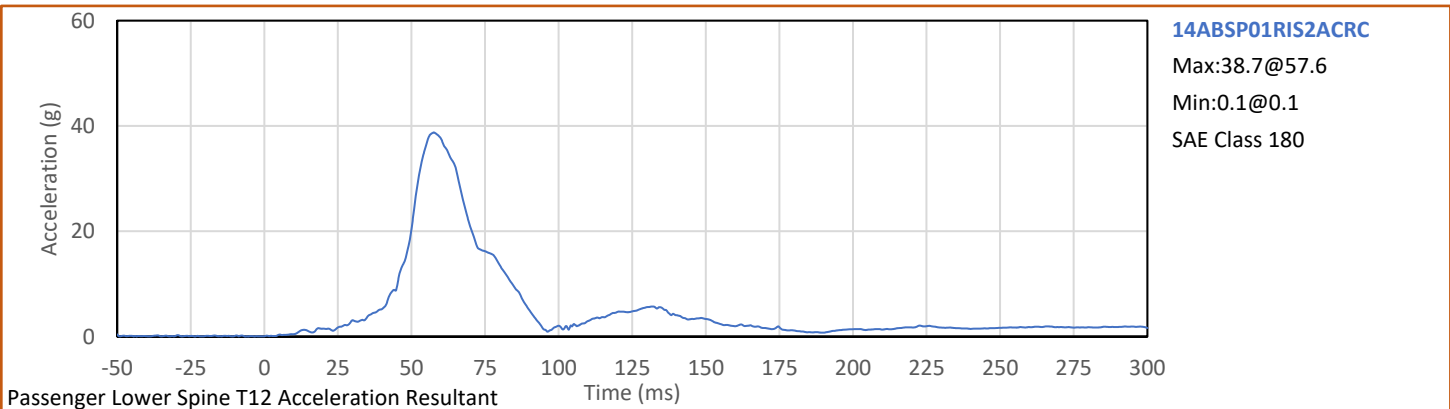
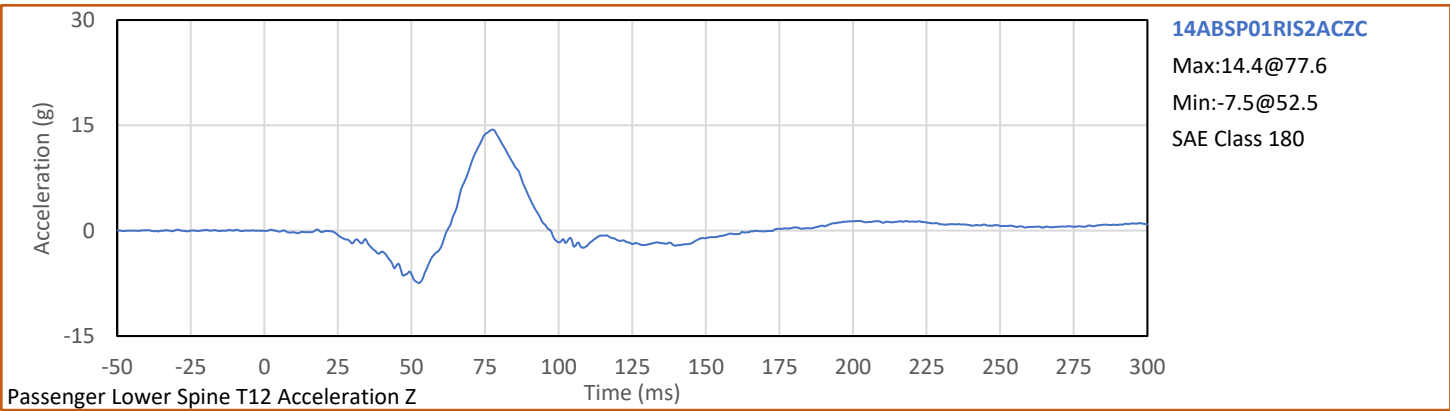
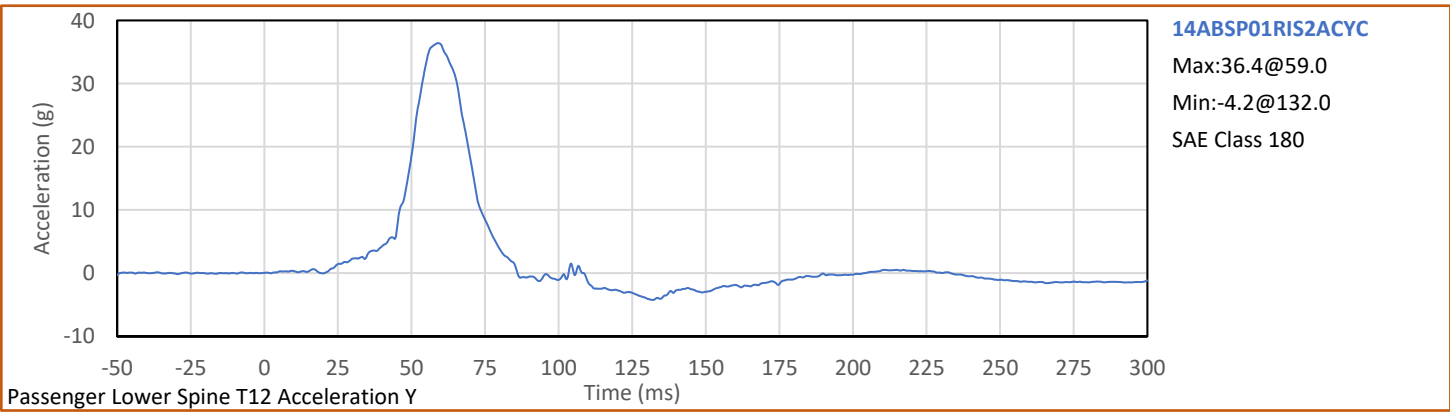
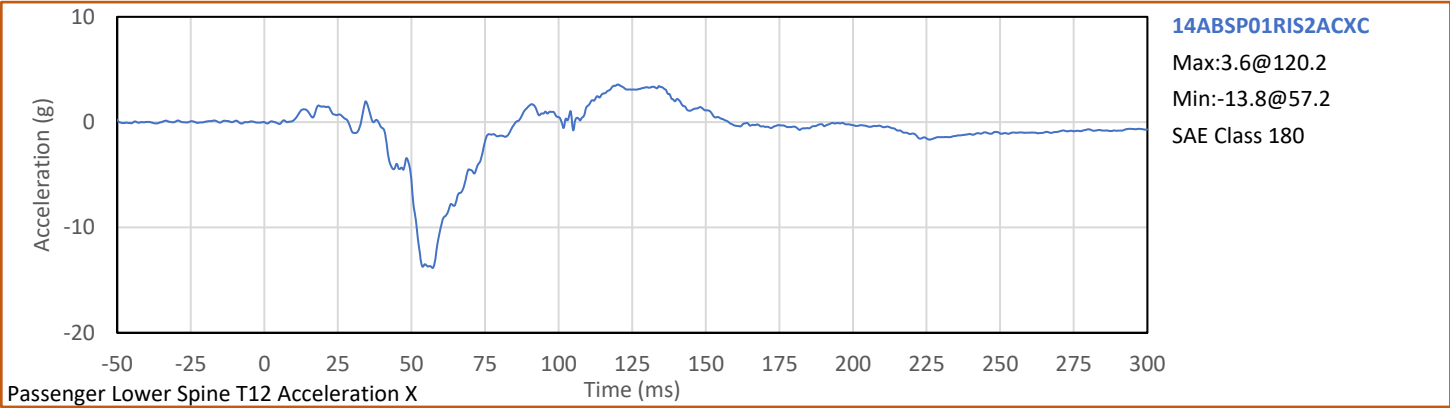


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Test Program: NCAP MDB Side Impact Test

NHTSA No.: M20230301
Test Date: 2/9/2023







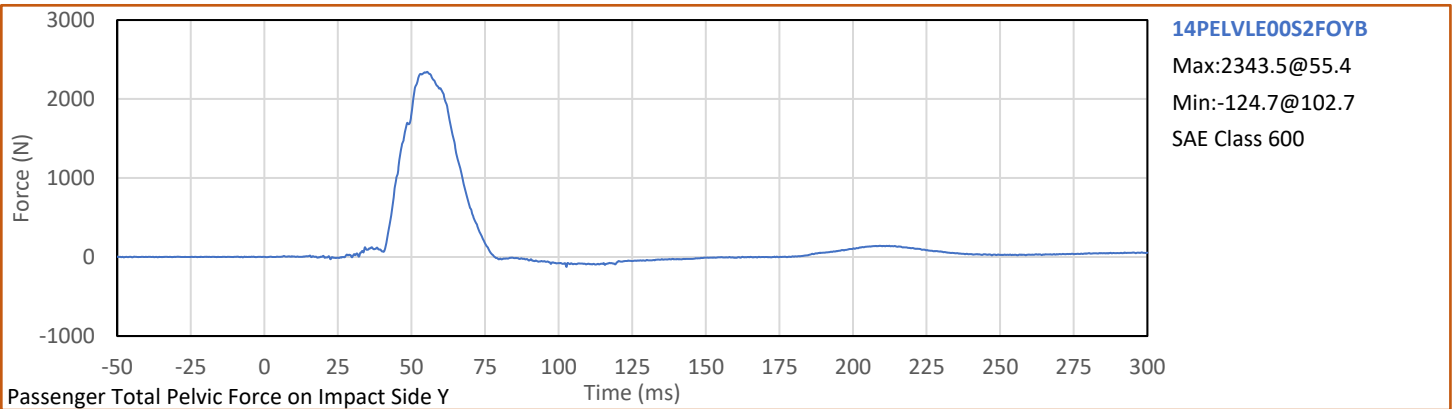
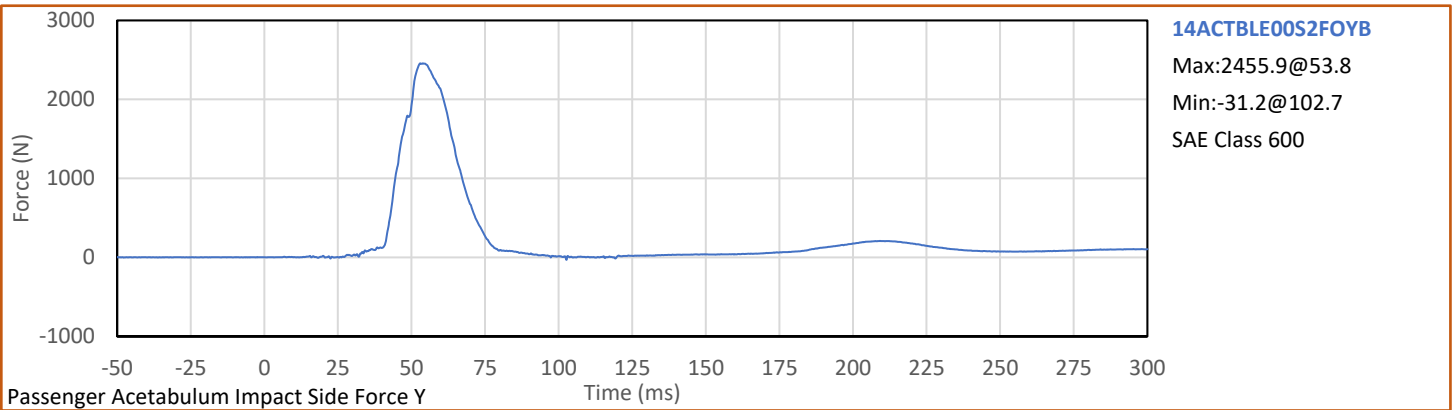
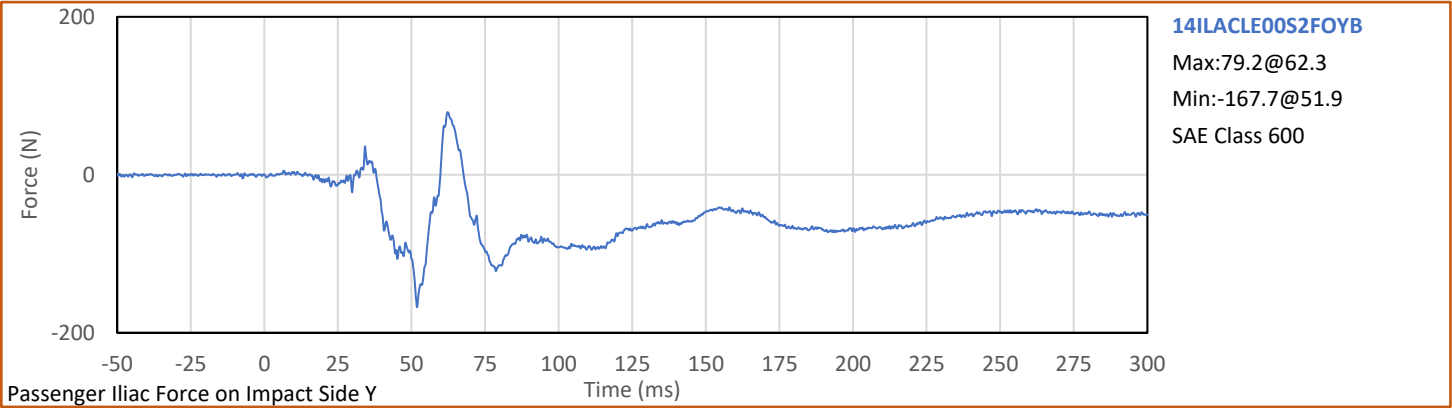
Test Vehicle: 2023 Jeep Grand Cherokee Altitude 5-Door SUV

NHTSA No.: M20230301



Test Program: NCAP MDB Side Impact Test

Test Date: 2/9/2023



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

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.0	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
1 - Sitting Height	mm	900	918	909	Pass
2 - Seat to Shoulder Joint	mm	558	572	563	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	349	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	101	Pass
5 - Sole to Seat, Sitting	mm	433	451	439	Pass
6 - Head Width	mm	152	158	155	Pass
7 - Shoulder/Arm Width	mm	461	479	469	Pass
8 - Thorax Width	mm	322	332	326	Pass
9 - Abdomen Width	mm	273	287	280	Pass
10 - Pelvis Lap Width	mm	359	373	368	Pass
11 - Head Depth	mm	196	206	200	Pass
12 - Thorax Depth	mm	262	272	269	Pass
13 - Abdomen Depth	mm	194	204	201	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	604	Pass
Overall Test Results					Pass

Technician: _____



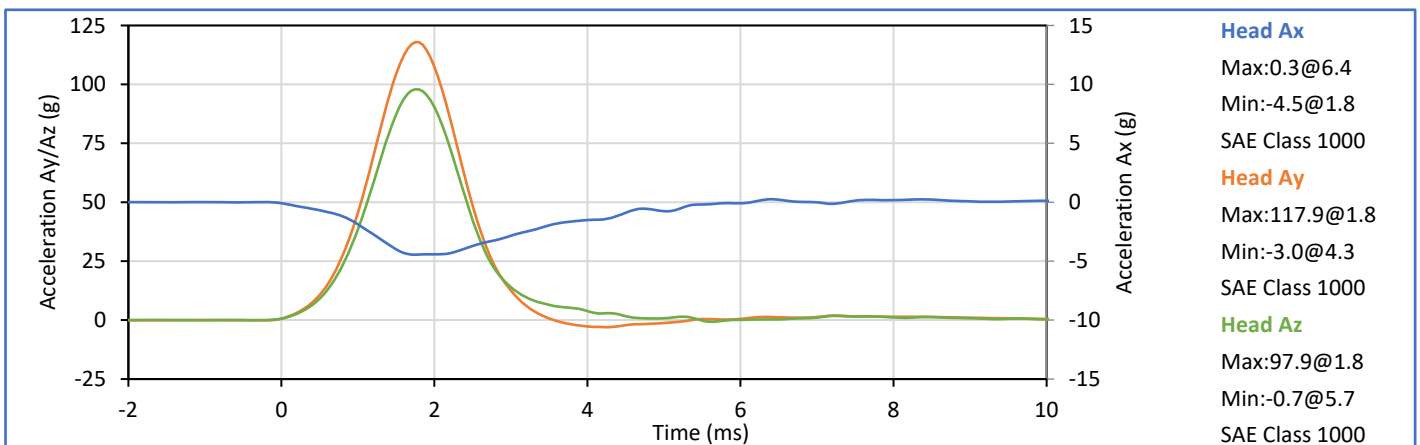
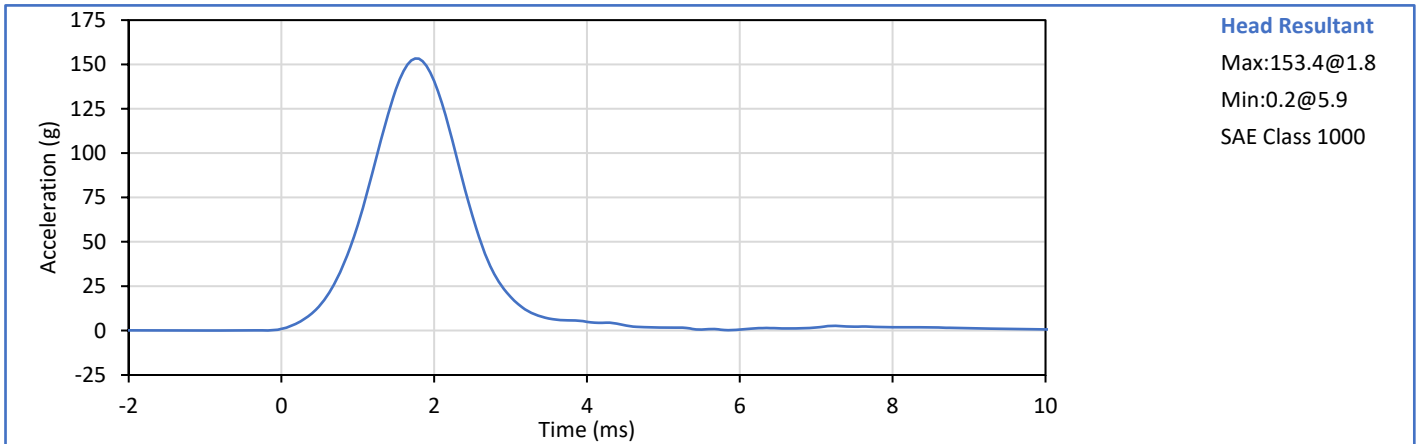
G. Fuentes

Approved By: _____



J. Hernandez

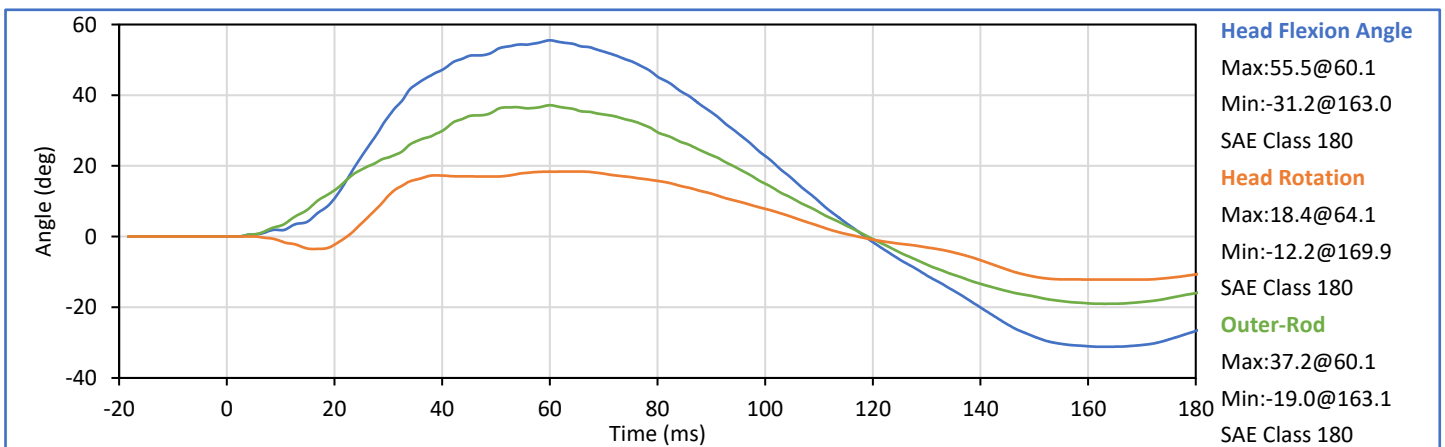
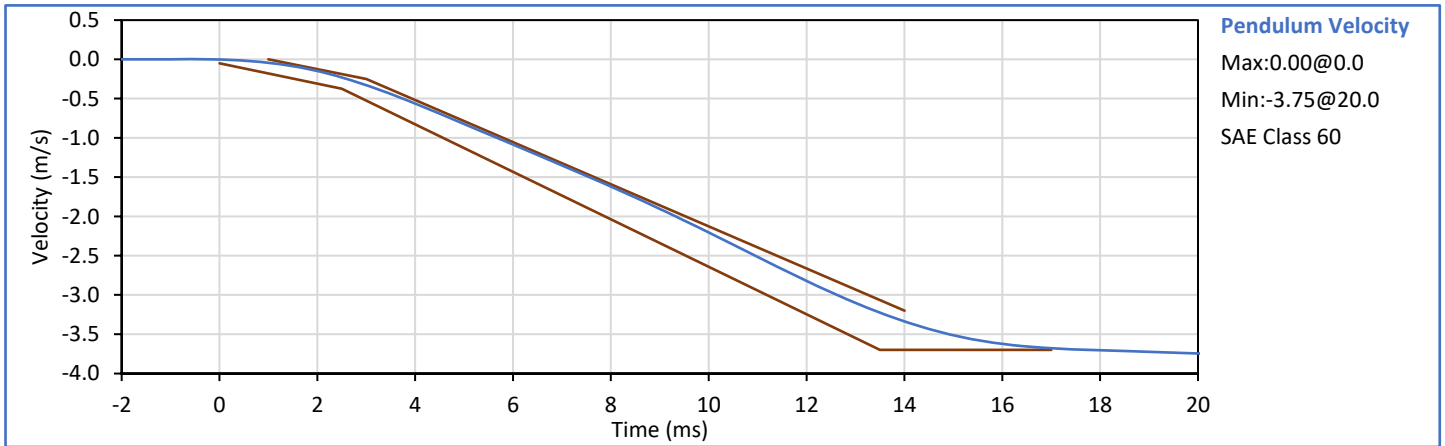
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Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	125.0	155.0	153.4	Pass
Peak Head Ax	g	-15.0	15.0	0.3	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	3.30	3.50	3.50	Pass
Peak Headform Flexion	deg	49.0	59.0	55.5	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	60.1	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	58.5	Pass
Overall Test Results					Pass



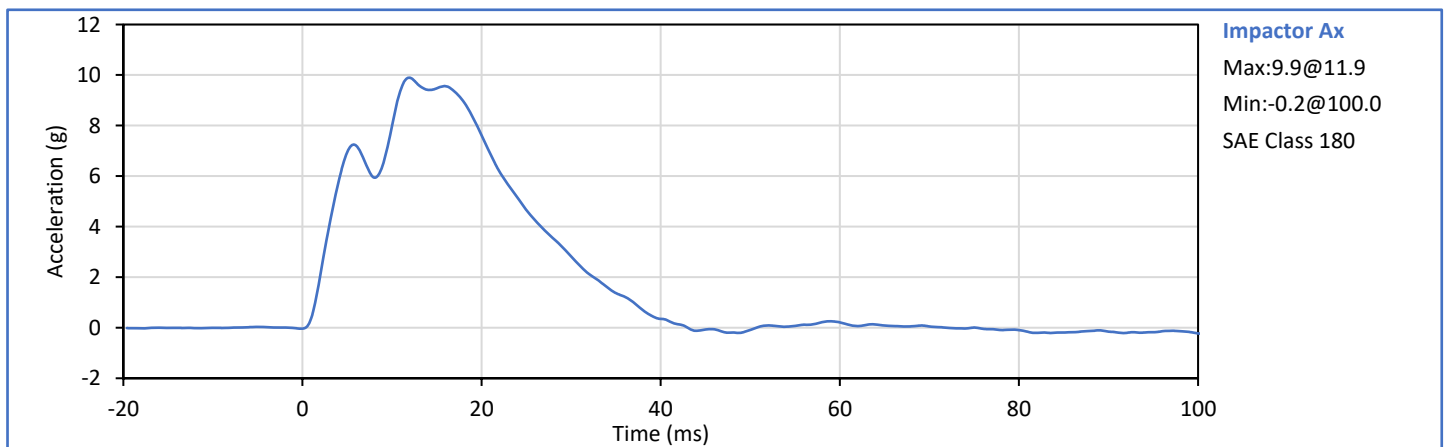
Technician: *Mill LGS III*
G. Fuentes

Approved By: *J. Hernandez*
J. Hernandez

ATD Serial No.: F037

Test Date: 2023-02-01

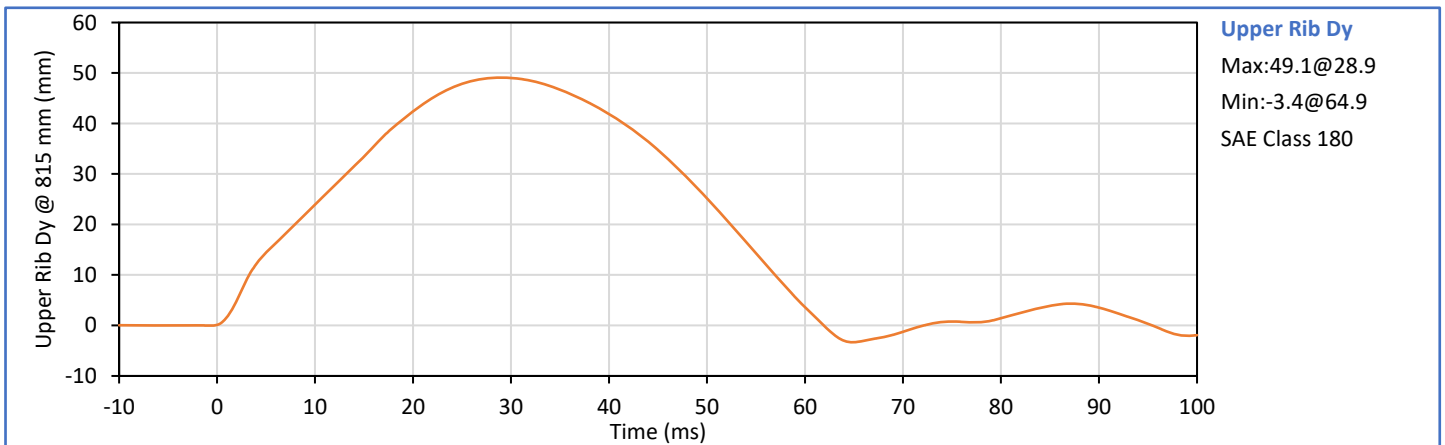
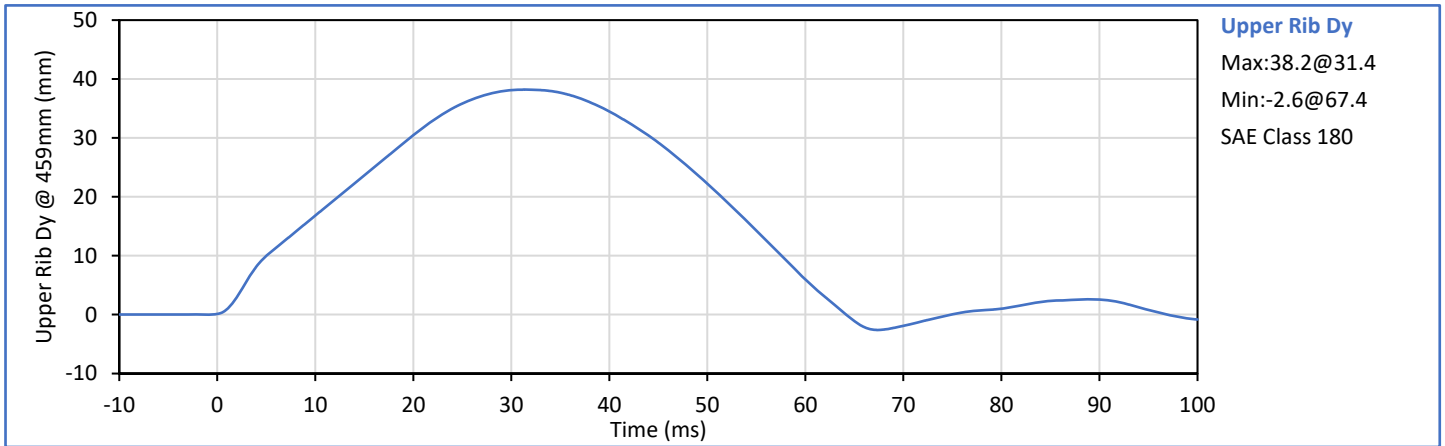
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Impactor Ax	g	7.5	10.5	9.9	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

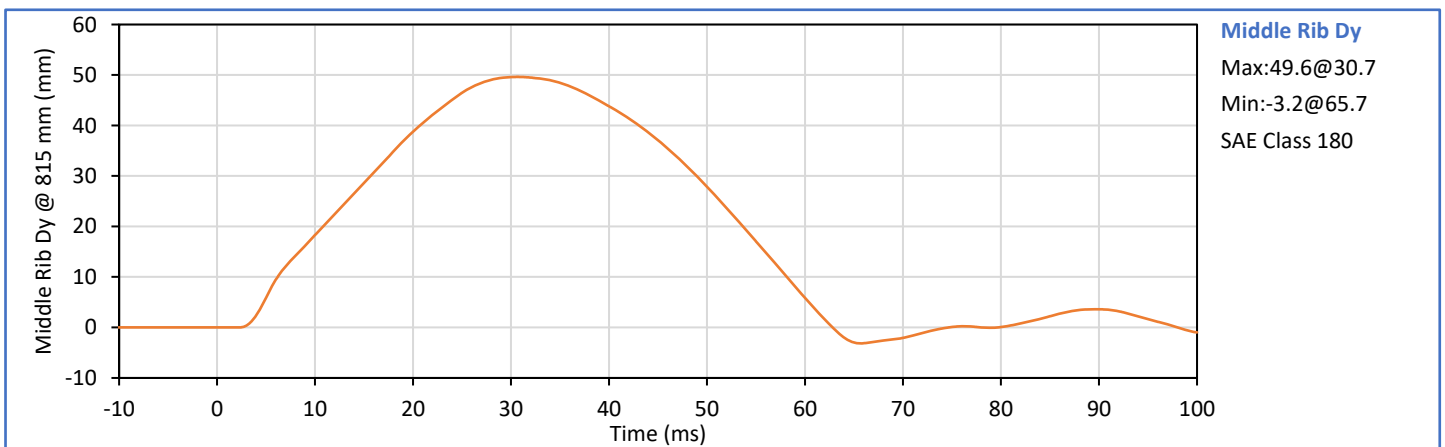
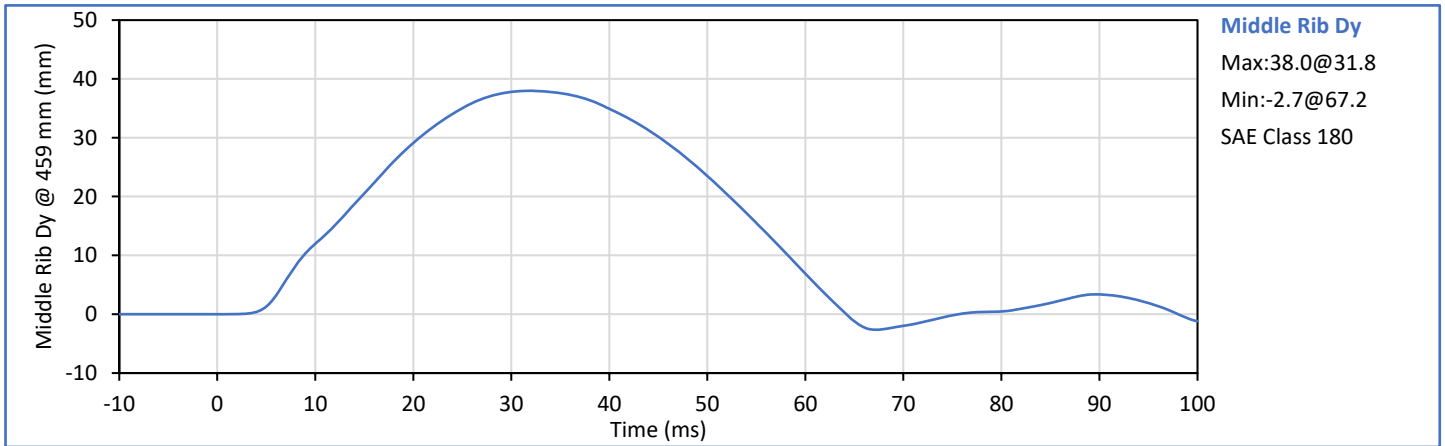
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Upper Rib Dy @ 459mm	mm	36.0	40.0	38.2	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	49.1	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

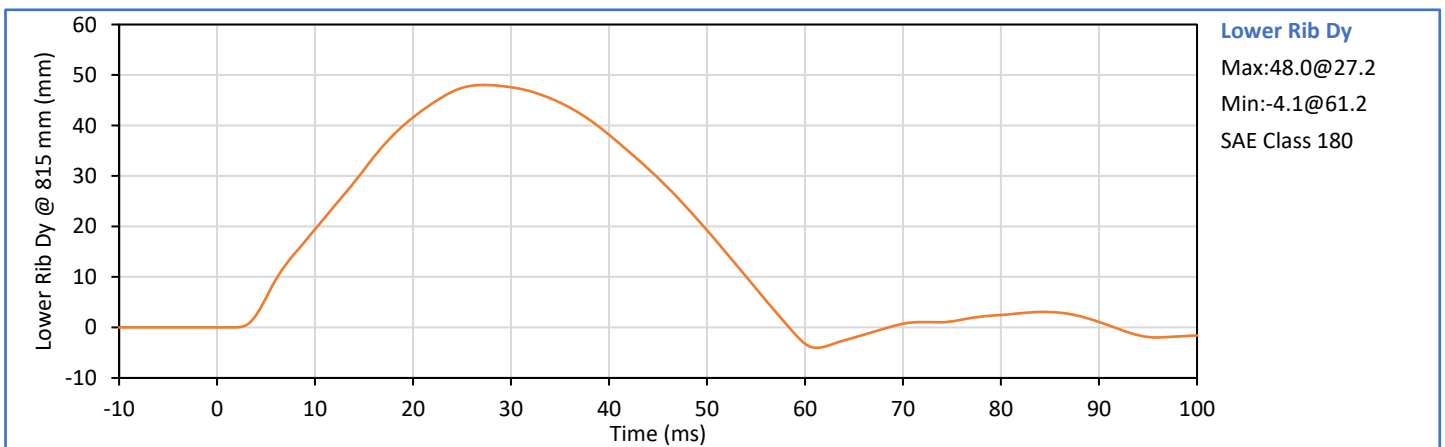
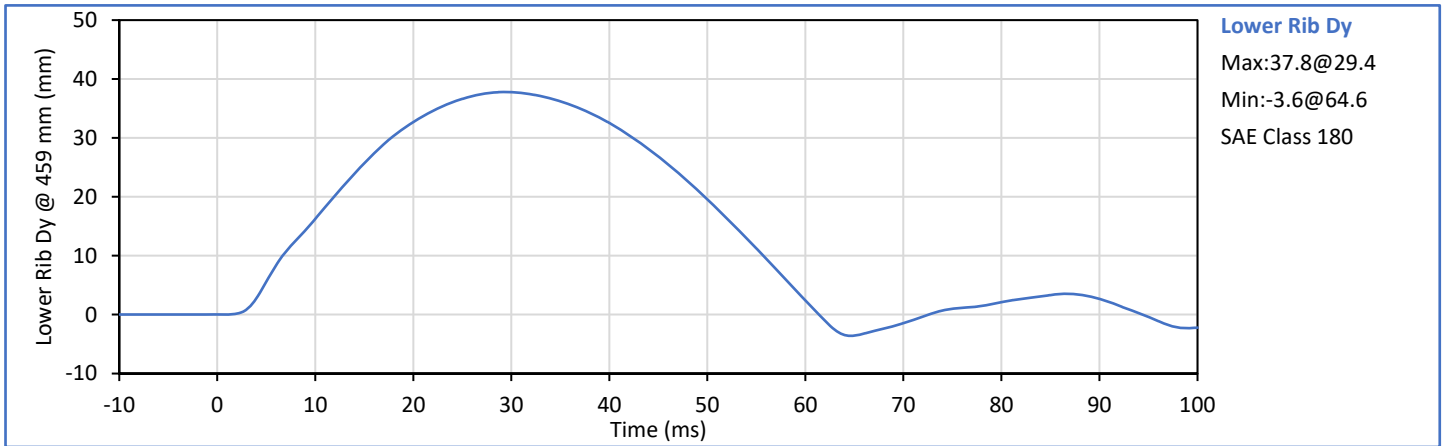
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	38.0	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	49.6	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

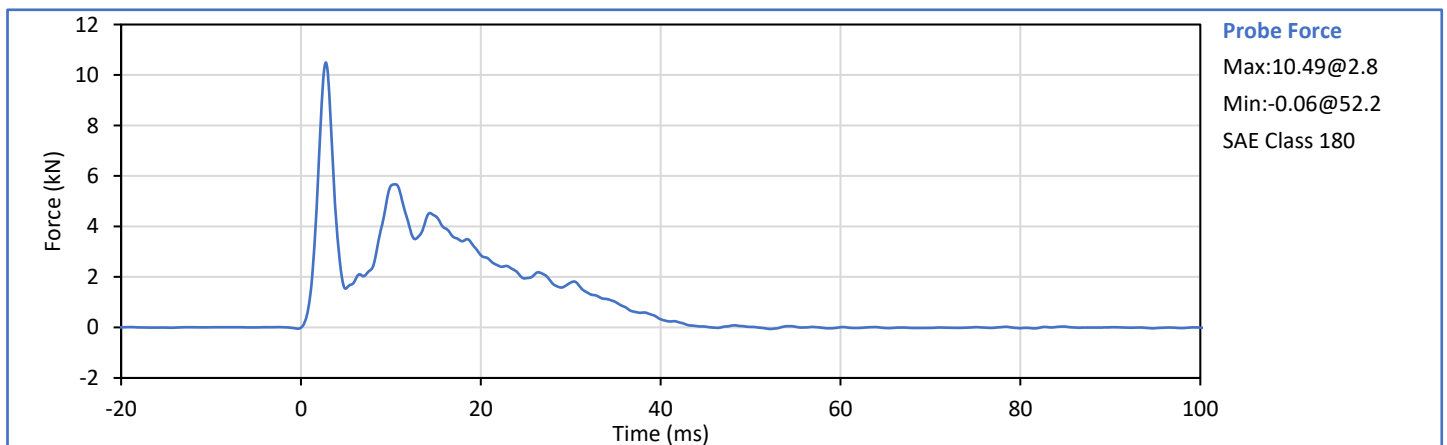
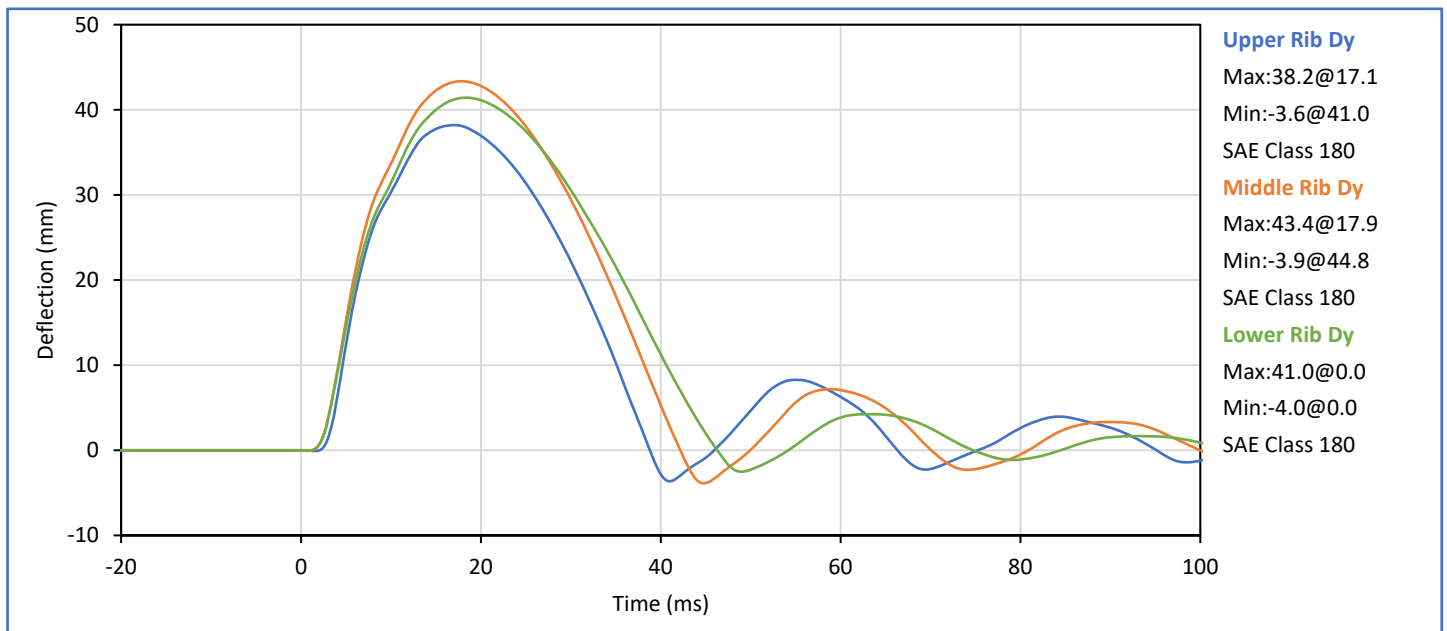
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	37.8	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	48.0	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

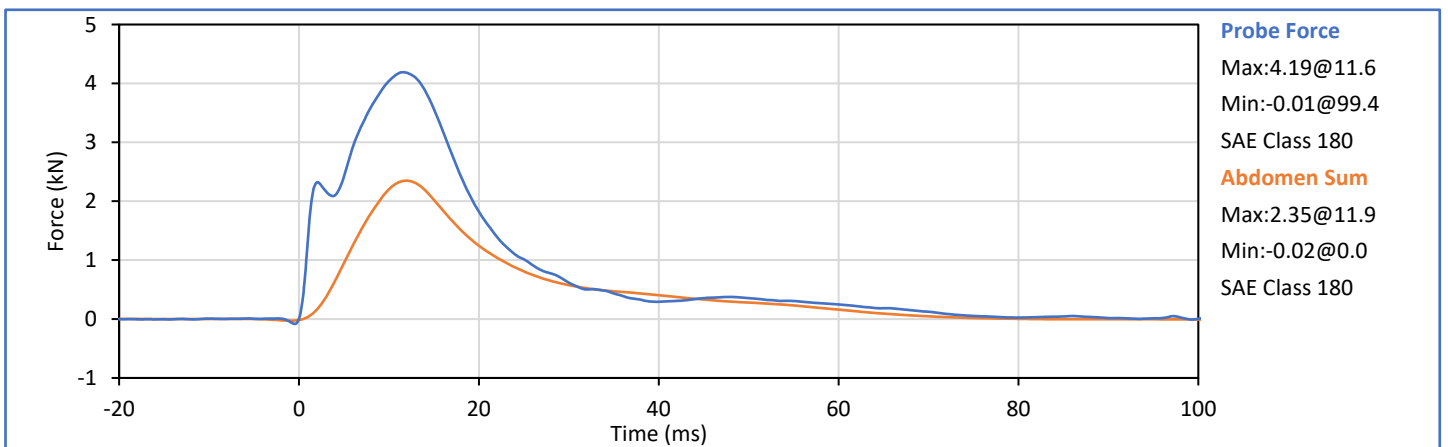
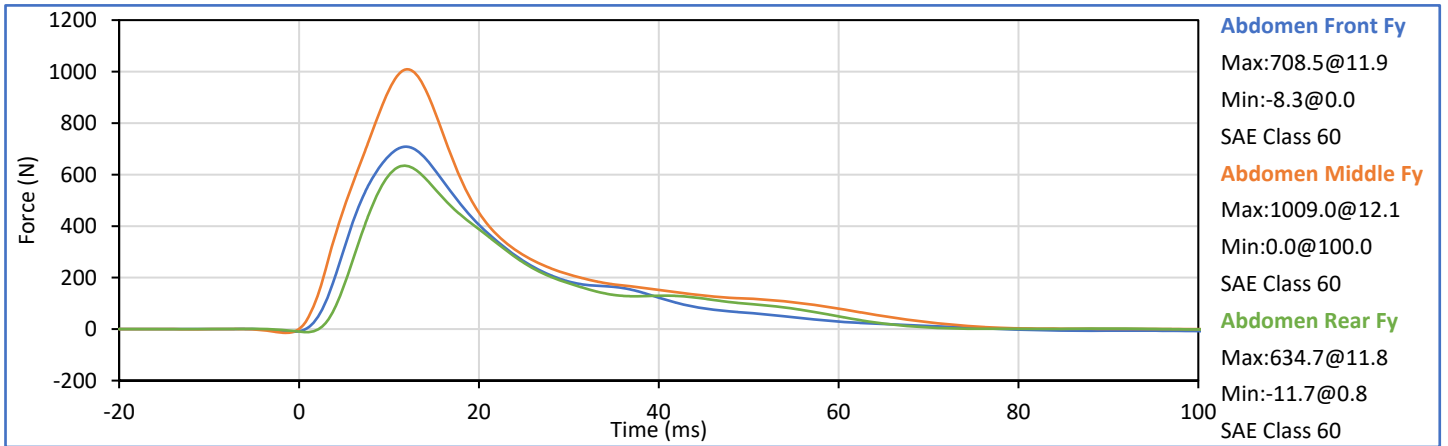
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	5.40	5.60	5.51	Pass
Peak Upper Rib Dy	mm	34.0	41.0	38.2	Pass
Peak Middle Rib Dy	mm	37.0	45.0	43.4	Pass
Peak Lower Rib Dy	mm	37.0	44.0	41.4	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	5.67	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

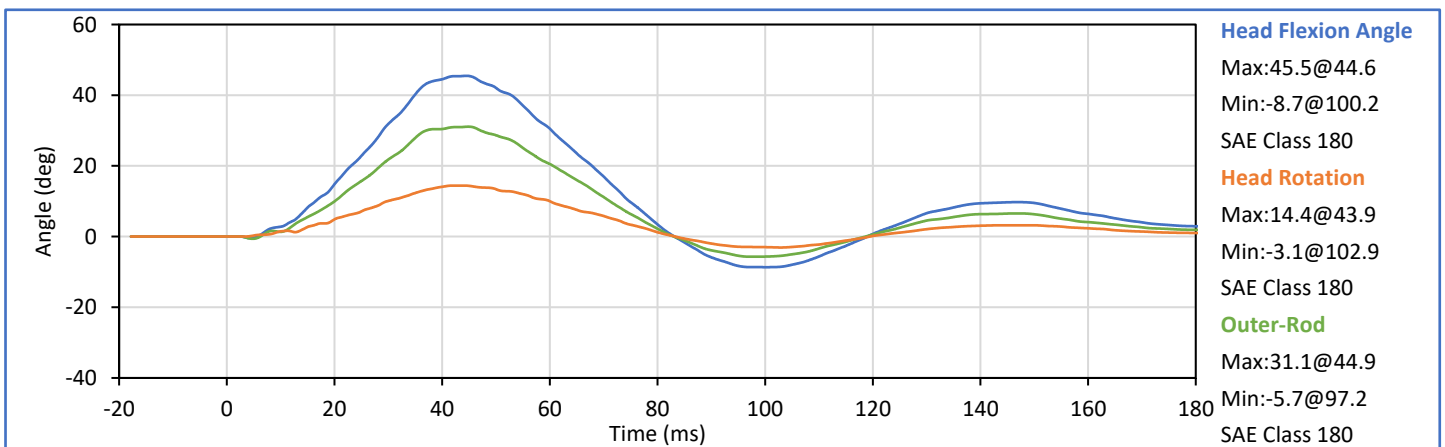
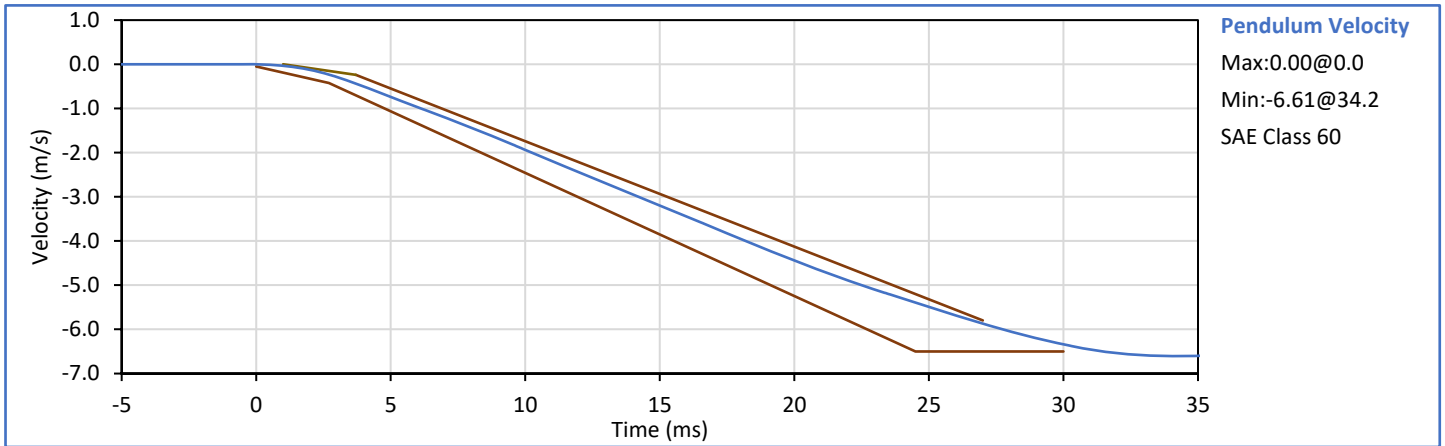
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	20.8	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	3.90	4.10	4.03	Pass
Peak Impactor Force	kN	4.00	4.80	4.19	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.6	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.35	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	11.9	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

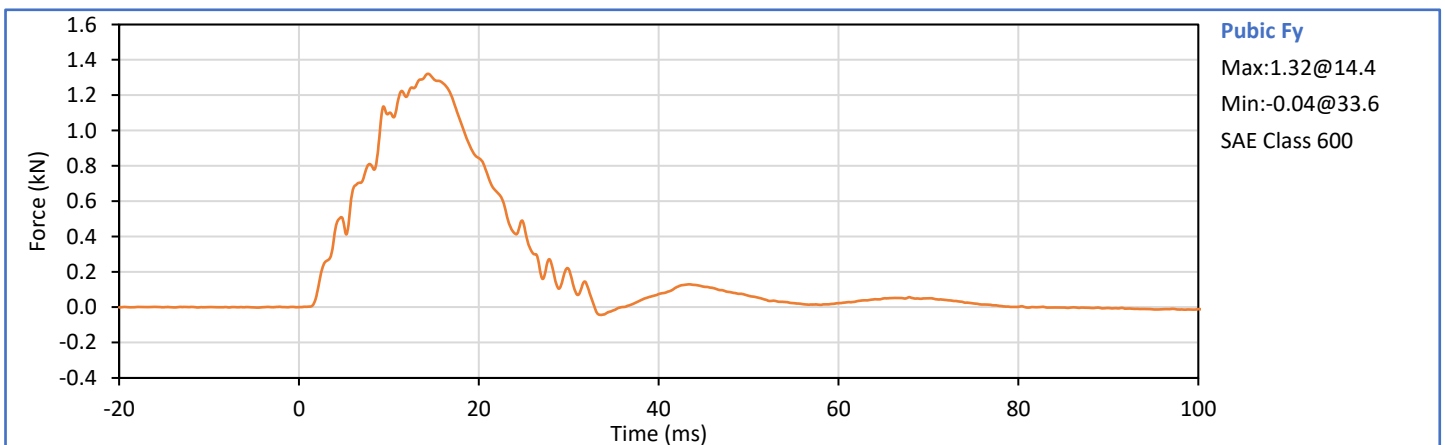
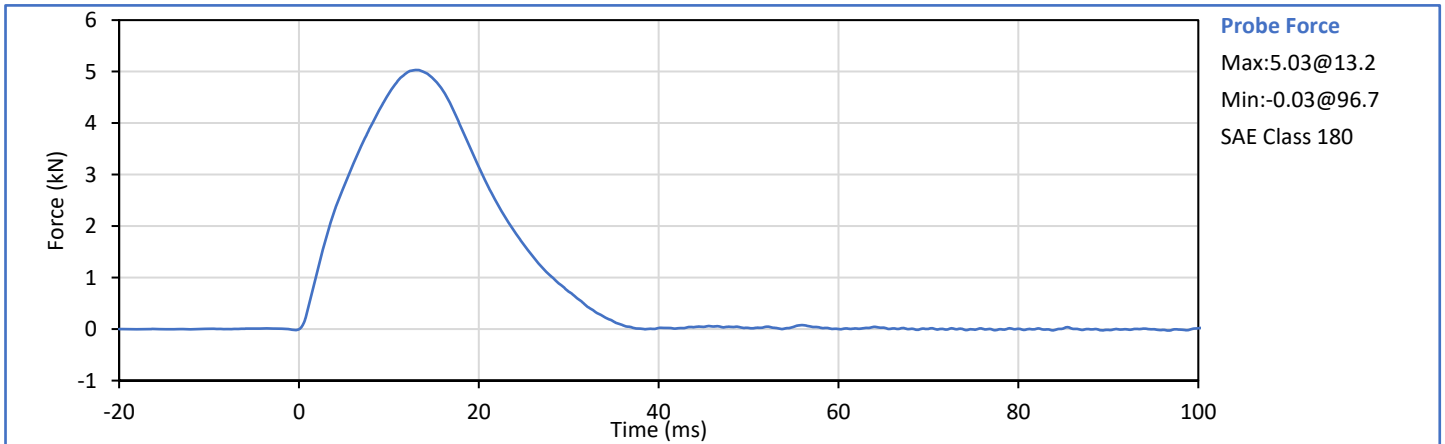
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.95	6.15	6.13	Pass
Peak Headform Flexion	deg	45.0	55.0	45.5	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	44.6	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	38.6	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
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	4.33	Pass
Peak Impactor Force	kN	4.70	5.40	5.03	Pass
Time of Peak Impactor Force	ms	11.8	16.1	13.2	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.32	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	14.4	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

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

ATD Serial No.: 299

Test Date: 2023-01-31

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	780	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	100	Pass
F - Thigh Clearance	mm	119	135	133	Pass
G - Head Breadth	mm	140	148	144	Pass
H - Head Back From Backline	mm	40	46	42	Pass
I - Head Depth	mm	178	188	183	Pass
J - Head Circumference	mm	541	551	544	Pass
K - Buttock To Knee Length	mm	514	540	525	Pass
L - Popliteal Height	mm	343	369	359	Pass
K - Knee Pivot To Floor Height	mm	392	409	401	Pass
N - Buttock Popliteal Length	mm	416	442	423	Pass
O - Chest Depth W/O Jacket	mm	195	211	209	Pass
P - Foot Length	mm	216	232	225	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	316	Pass
R - Arm Length	mm	249	259	257	Pass
S - Knee Joint To Seatback	mm	477	493	484	Pass
V - Shoulder Width	mm	341	357	351	Pass
W - Foot Width	mm	78	94	85	Pass
Y - Chest Circumference W/Jacket	mm	851	881	873	Pass
Z - Waist Circumference	mm	761	791	786	Pass
				Overall Test Results	Pass

Technician:



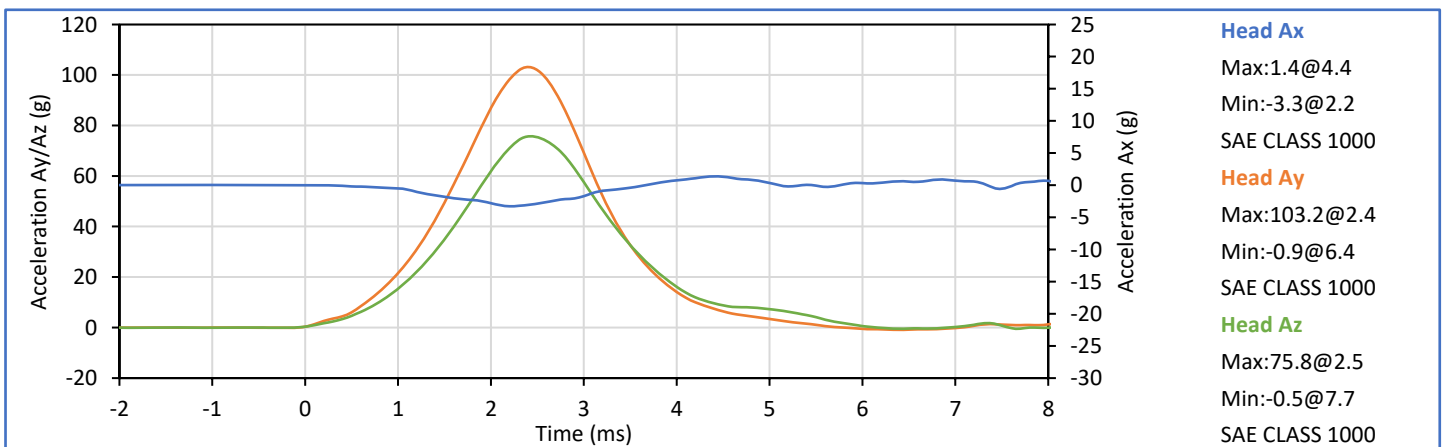
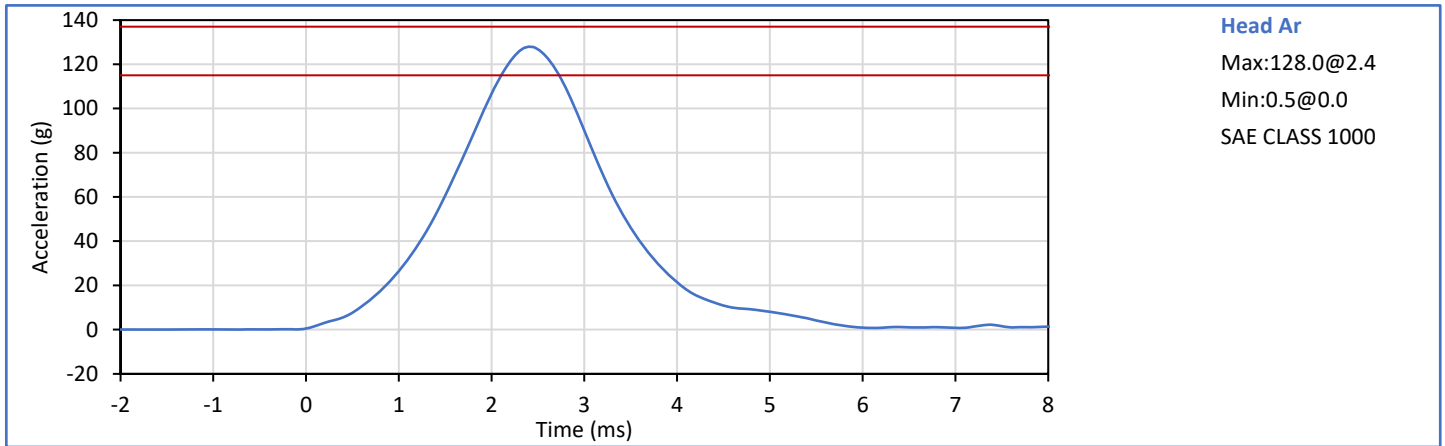
G. Fuentes

Approved By:



J. Hernandez

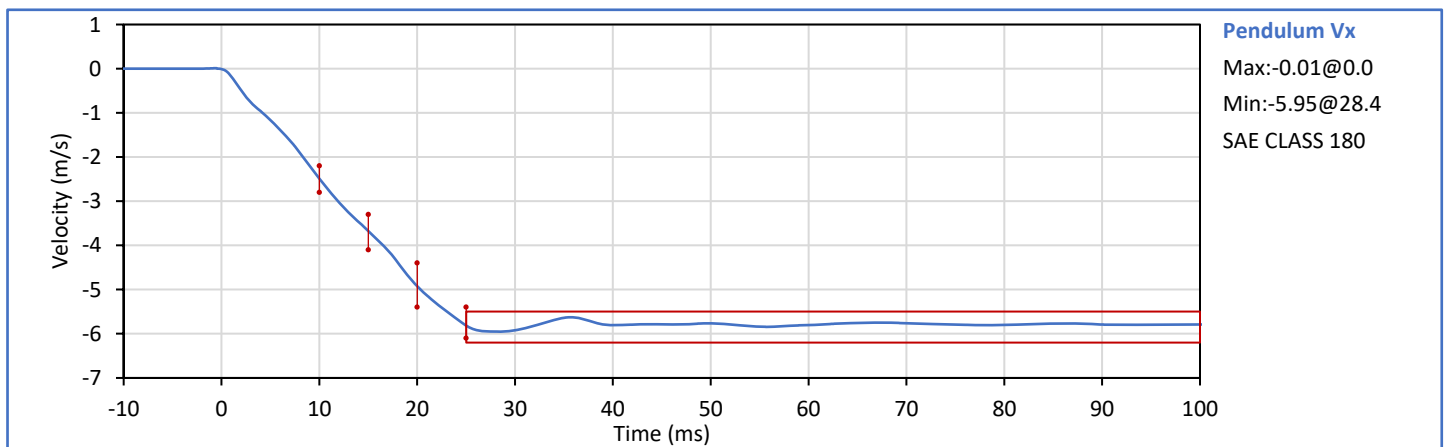
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	115.0	137.0	128.0	Pass
Peak Head Ax	g	-15.0	15.0	-3.3	Pass
Oscillations After Main Pulse	%	0.0	15.0	1.7	Pass
Is Acceleration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



Technician: *Mill LGS III*
G. Fuentes

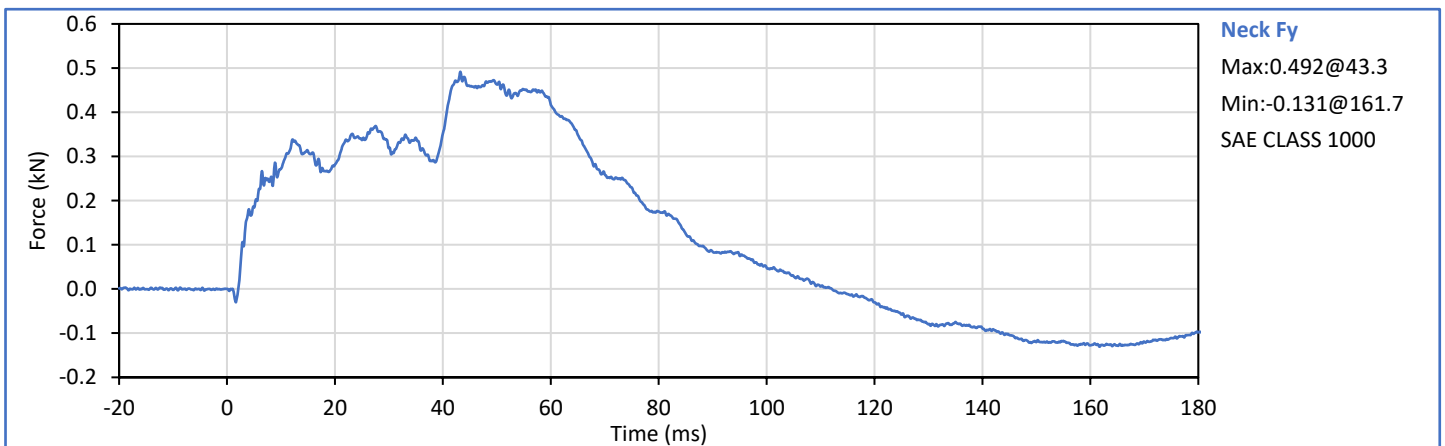
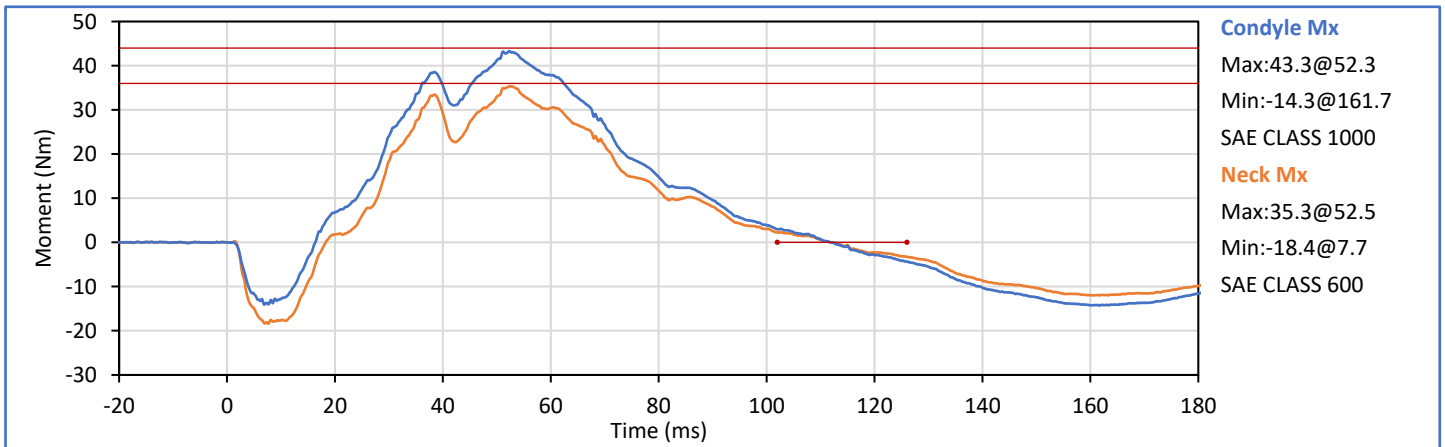
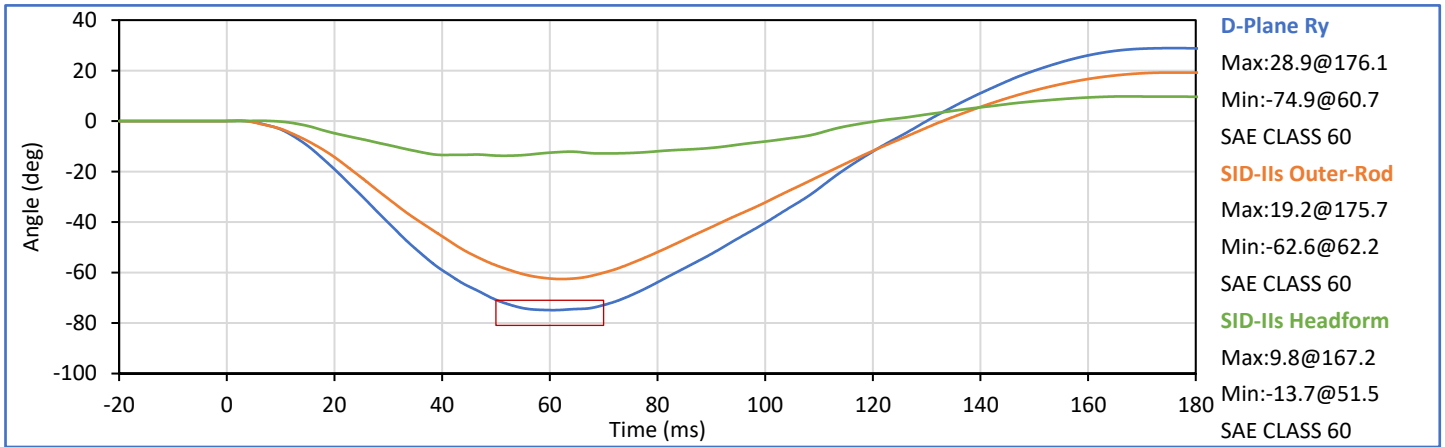
Approved By: *Smith*
J. Hernandez

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	5.51	5.63	5.58	Pass
Pendulum Decel at 10 ms	m/s	-2.80	-2.20	-2.49	Pass
Pendulum Decel at 15 ms	m/s	-4.10	-3.30	-3.68	Pass
Pendulum Decel at 20 ms	m/s	-5.40	-4.40	-4.93	Pass
Pendulum Decel at 25 ms	m/s	-6.10	-5.40	-5.82	Pass
Pendulum Decel from 25-100 ms	m/s	-6.20	-5.50	-5.95/-5.63	Pass
Peak "D" Plane Rotation	deg	-81.0	-71.0	-74.9	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	60.7	Pass
Peak Occ. Condyle Moment	Nm	36.0	44.0	43.3	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	111.9	Pass
Overall Test Results					Pass

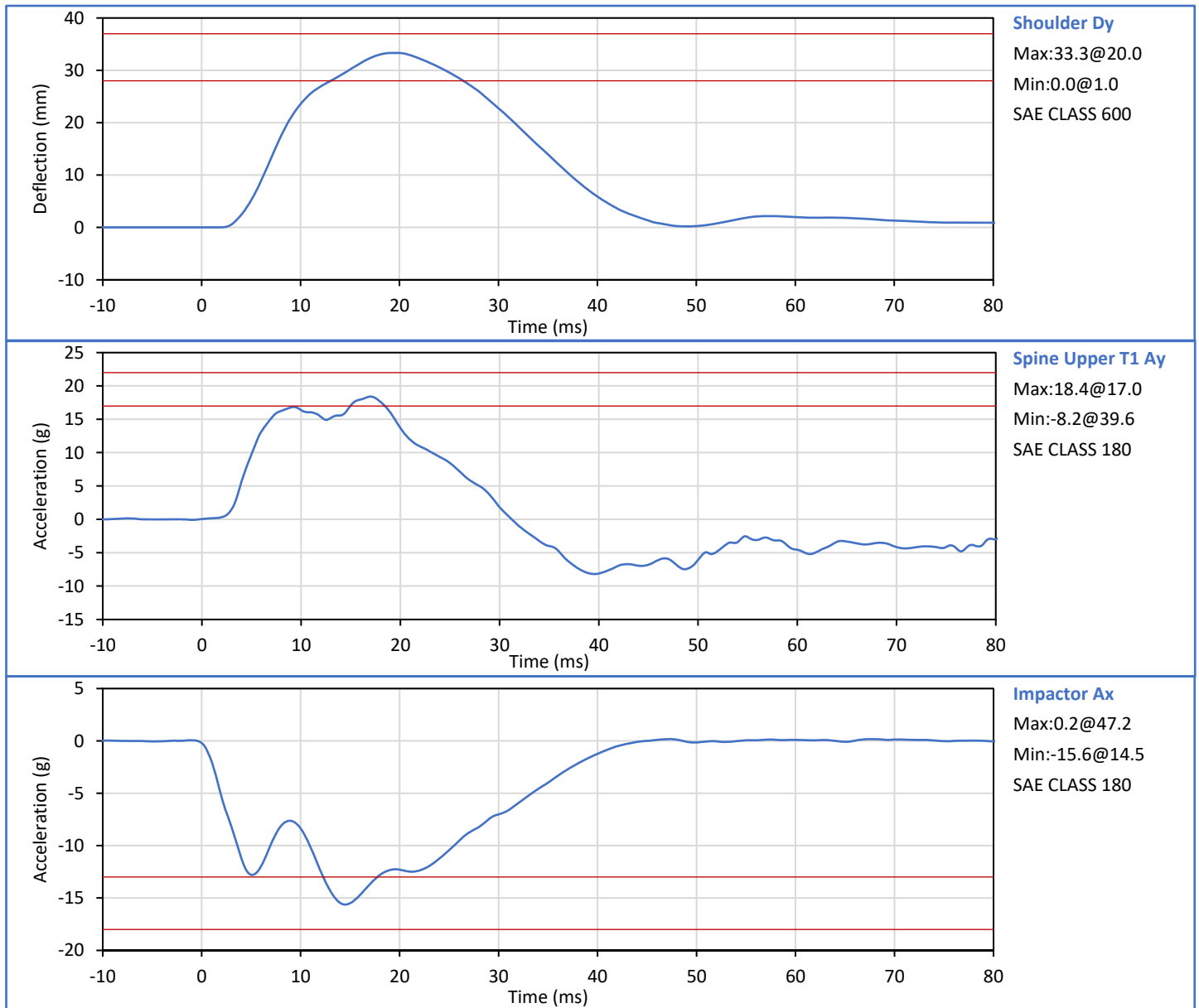


Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez



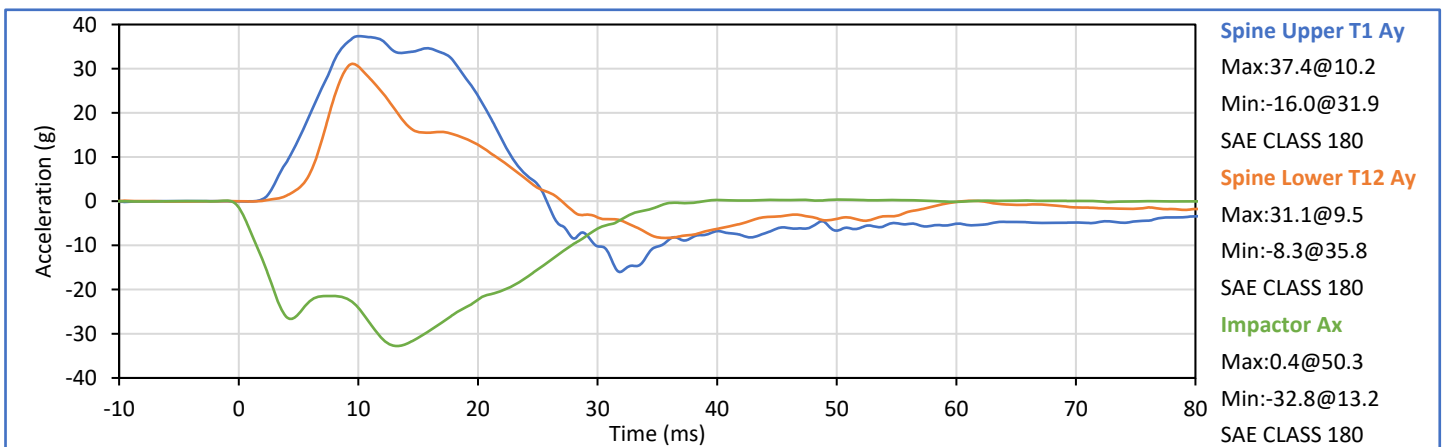
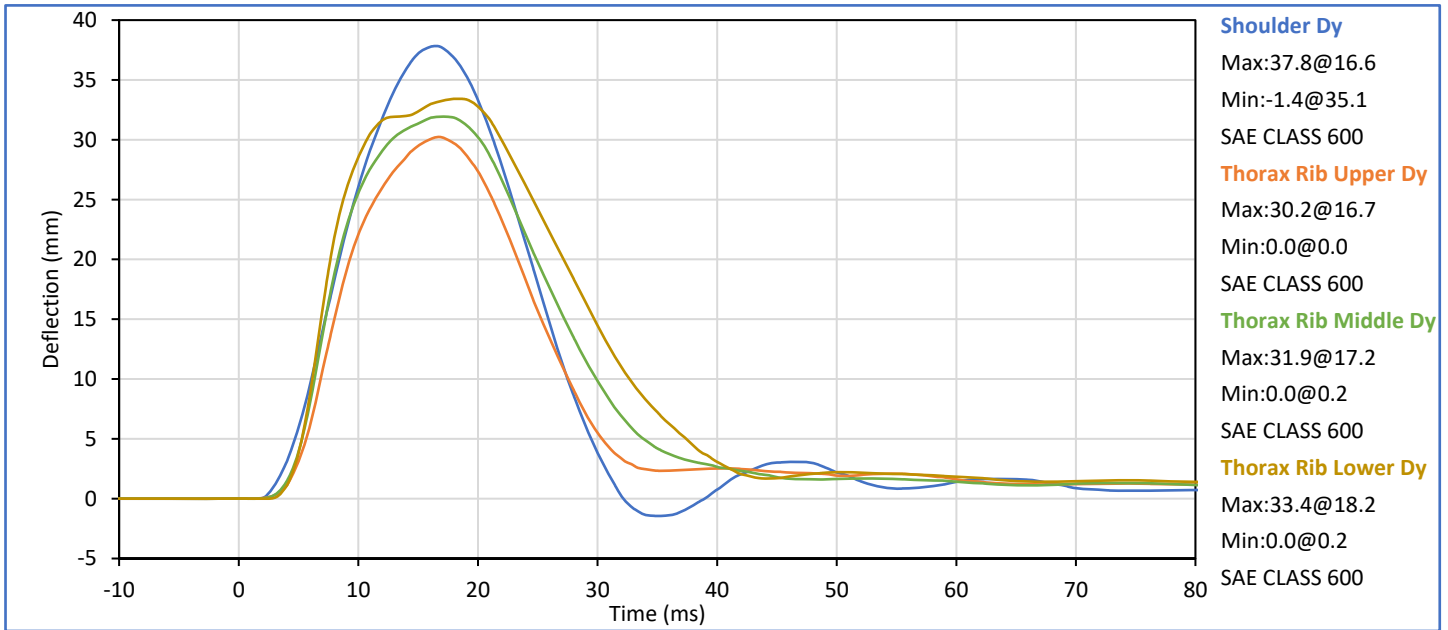
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory Relative Humidity	%	10	70	16	Pass
Impactor Velocity	m/s	4.20	4.40	4.33	Pass
Peak Shoulder Dy	mm	28.0	37.0	33.3	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.4	Pass
Peak Impactor Ax	g	-18.0	-13.0	-15.6	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

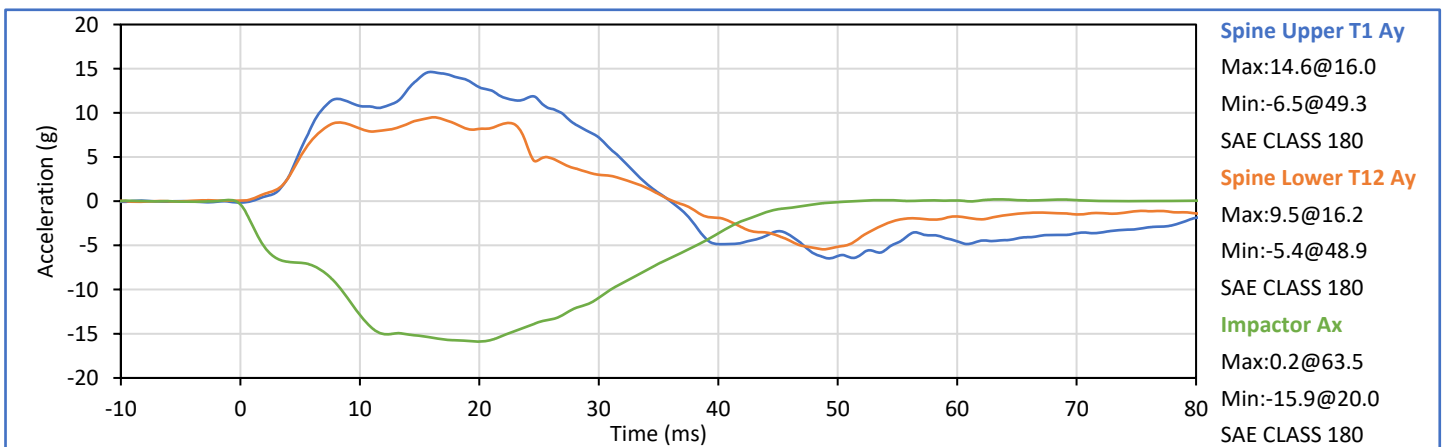
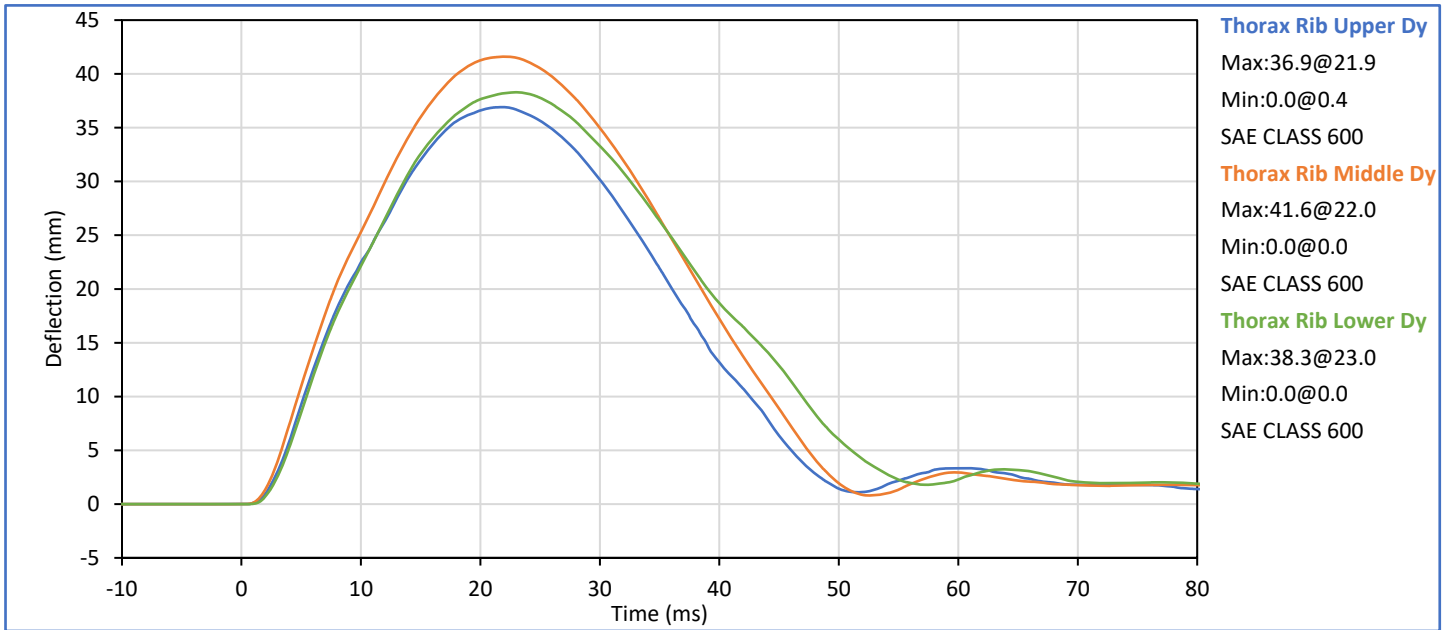
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Impactor Velocity	m/s	6.60	6.80	6.73	Pass
Peak Shoulder Dy	mm	31.0	40.0	37.8	Pass
Peak Upper Rib Dy	mm	25.0	32.0	30.2	Pass
Peak Middle Rib Dy	mm	30.0	36.0	31.9	Pass
Peak Lower Rib Dy	mm	32.0	38.0	33.4	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	37.4	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	31.1	Pass
Peak Impactor Ax	g	-36.0	-30.0	-32.8	Pass
Overall Test Results					Pass



Technician: Mill LGS III
G. Fuentes

Approved By: J. Hernandez
J. Hernandez

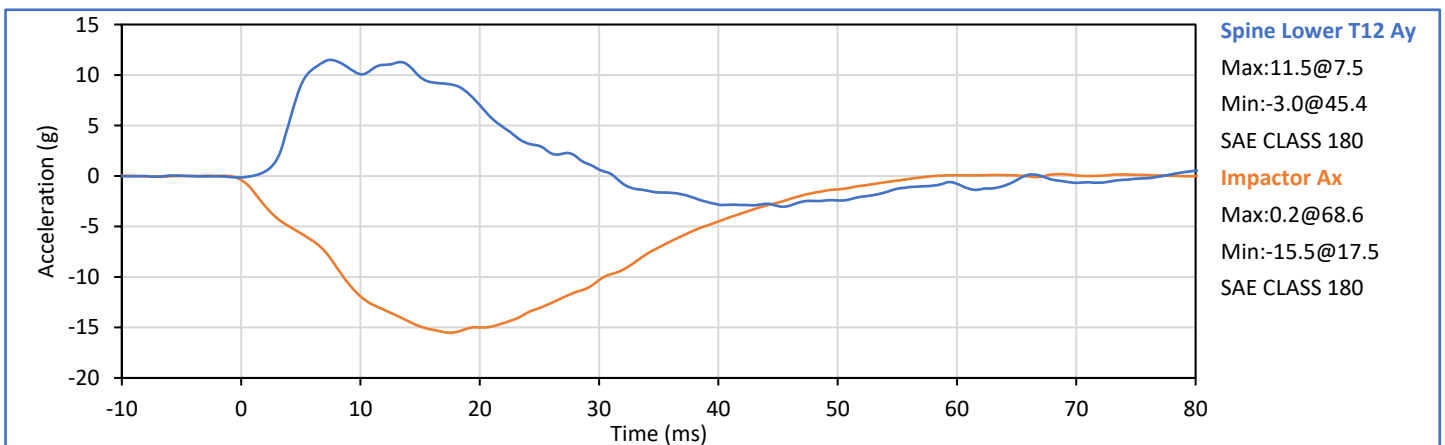
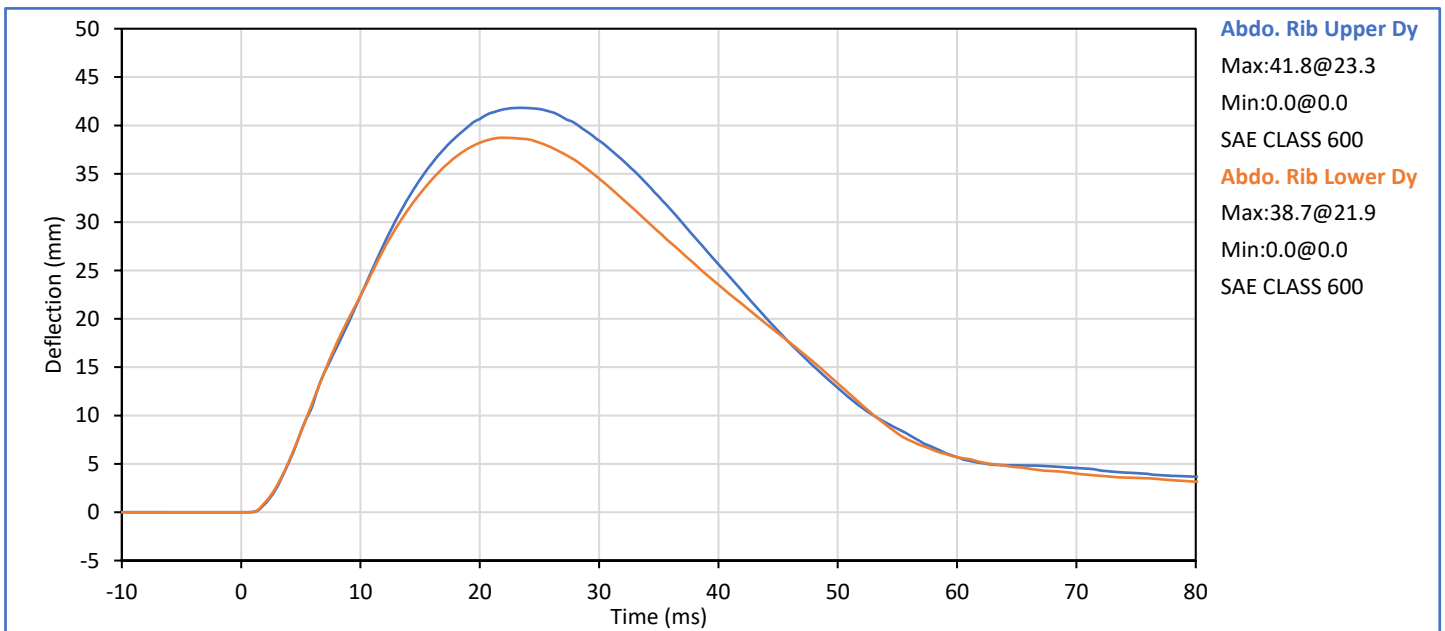
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.29	Pass
Peak Thorax Rib Upper Dy	mm	32.0	40.0	36.9	Pass
Peak Thorax Rib Middle Dy	mm	39.0	45.0	41.6	Pass
Peak Thorax Rib Lower Dy	mm	35.0	43.0	38.3	Pass
Peak Spine Upper T1 Ay	g	13.0	17.0	14.6	Pass
Peak Spine Lower T12 Ay	g	7.0	11.0	9.5	Pass
Peak Impactor Ax	g	-18.0	-14.0	-15.9	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *J. Hernandez*
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Upper Abdomen Rib Dy	mm	36.0	47.0	41.8	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	38.7	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	11.5	Pass
Peak Impactor Ax	g	-16.0	-12.0	-15.5	Pass
Overall Test Results					Pass

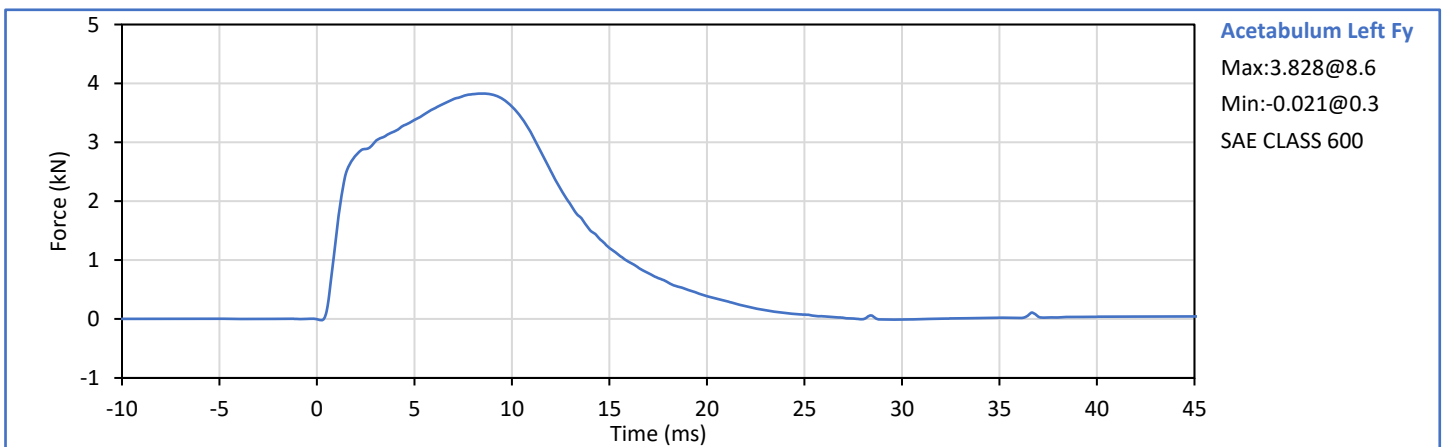
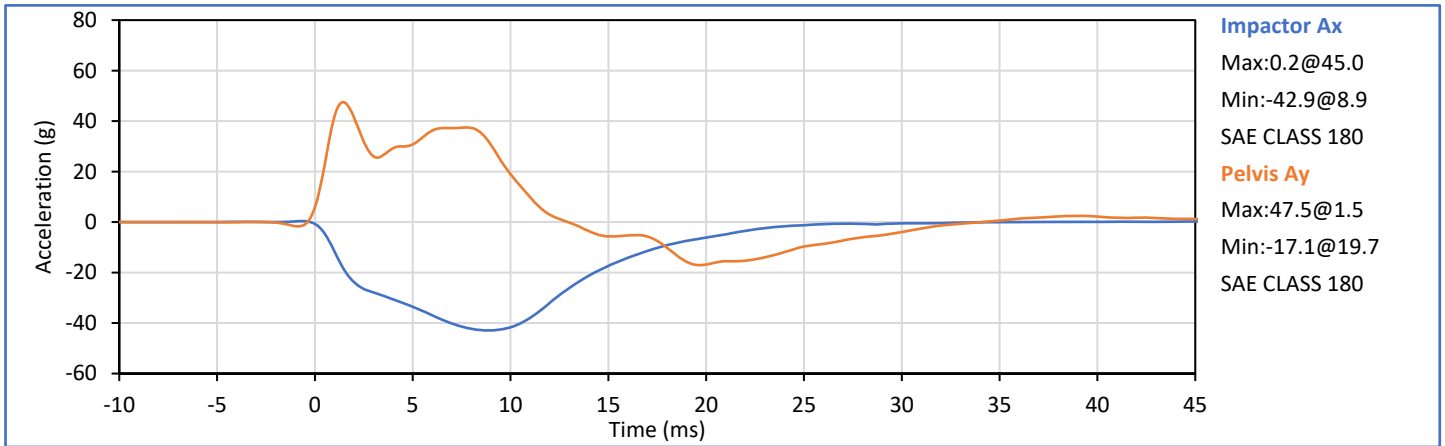


Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
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	6.60	6.80	6.69	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.83	Pass
Pelvis Ay after 6ms	g	34.0	42.0	37.5	Pass
Peak Impactor Ax	g	-47.0	-38.0	-42.9	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 14788



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

ATD Serial No.: 299

Test Date: 2023-02-01

Pelvis Plug S/N: 14788



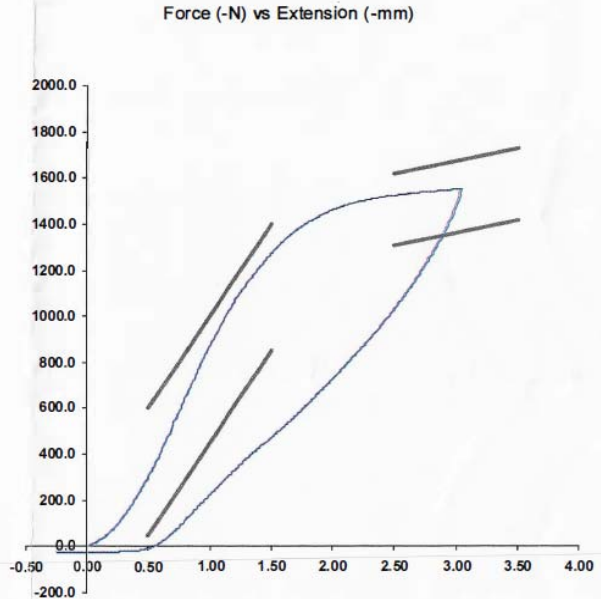
SID-IIs Pelvis Plug Certification Test

Plug S/N 14788
Test Number 16761
Report Number 16807
Test Date 12/29/2020 11:29:20 AM

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Force @ 0.5 mm (N)	311.45	50.00	600.00
Force @ 1.5 mm (N)	1,271.12	850.00	1,400.00
Force @ 2.5 mm (N)	1,522.46	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,549.04	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:



Operator _____
Part Number 180-4450

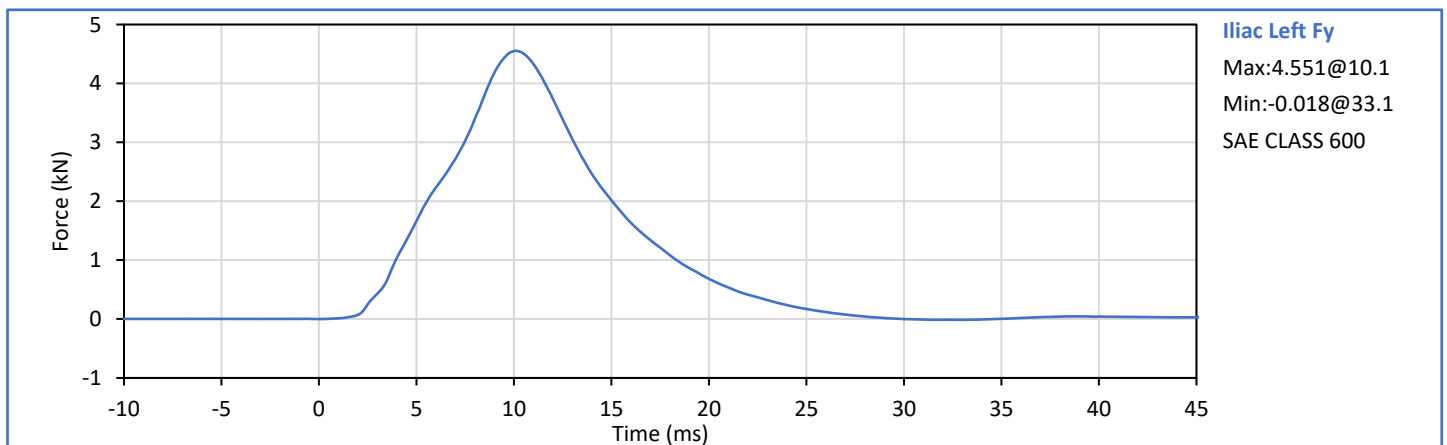
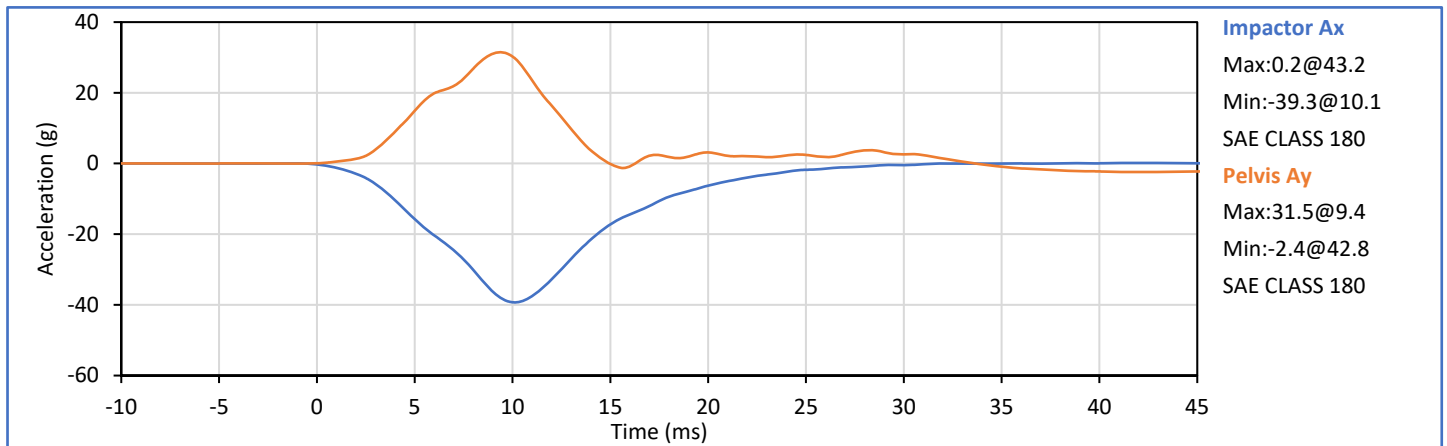
Template No 107 29-Dec-20
SACO Research

By: DC Date: 12/29/20
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

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	4.32	Pass
Peak Iliac Fy	kN	4.10	5.10	4.55	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: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

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

Tested Parameter	Units	Spec Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.0	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
1 - Sitting Height	mm	900	918	909	Pass
2 - Seat to Shoulder Joint	mm	558	572	563	Pass
3 - Seat to Lower Face of Thoracic Spine Box	mm	346	356	349	Pass
4 - Seat to Hip Joint (bolt center)	mm	97	103	101	Pass
5 - Sole to Seat, Sitting	mm	433	451	439	Pass
6 - Head Width	mm	152	158	155	Pass
7 - Shoulder/Arm Width	mm	461	479	469	Pass
8 - Thorax Width	mm	322	332	326	Pass
9 - Abdomen Width	mm	273	287	280	Pass
10 - Pelvis Lap Width	mm	359	373	368	Pass
11 - Head Depth	mm	196	206	200	Pass
12 - Thorax Depth	mm	262	272	269	Pass
13 - Abdomen Depth	mm	194	204	201	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	604	Pass
Overall Test Results					Pass

Technician:



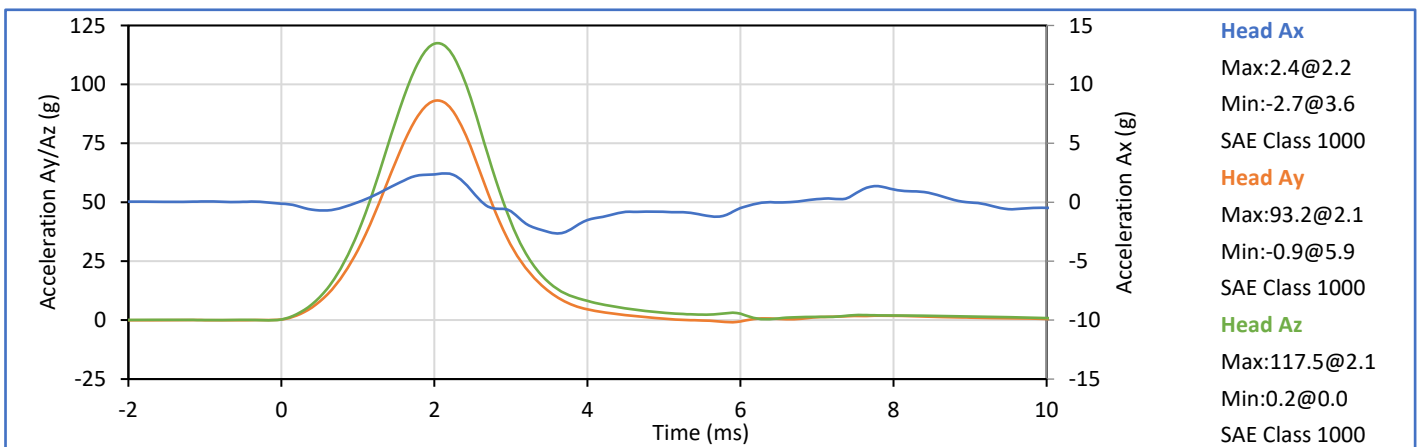
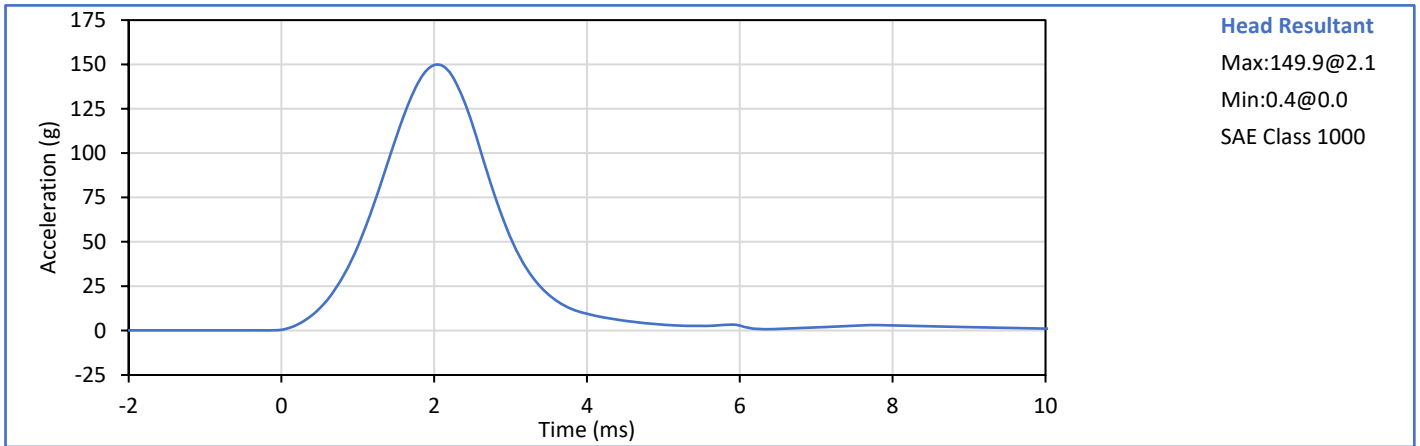
G. Fuentes

Approved By:



J. Hernandez

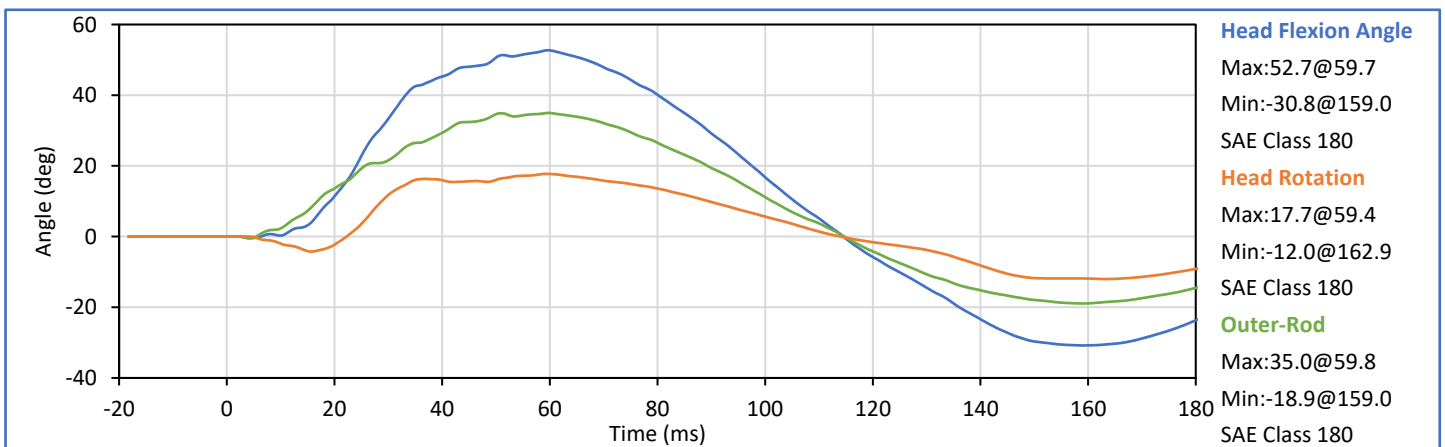
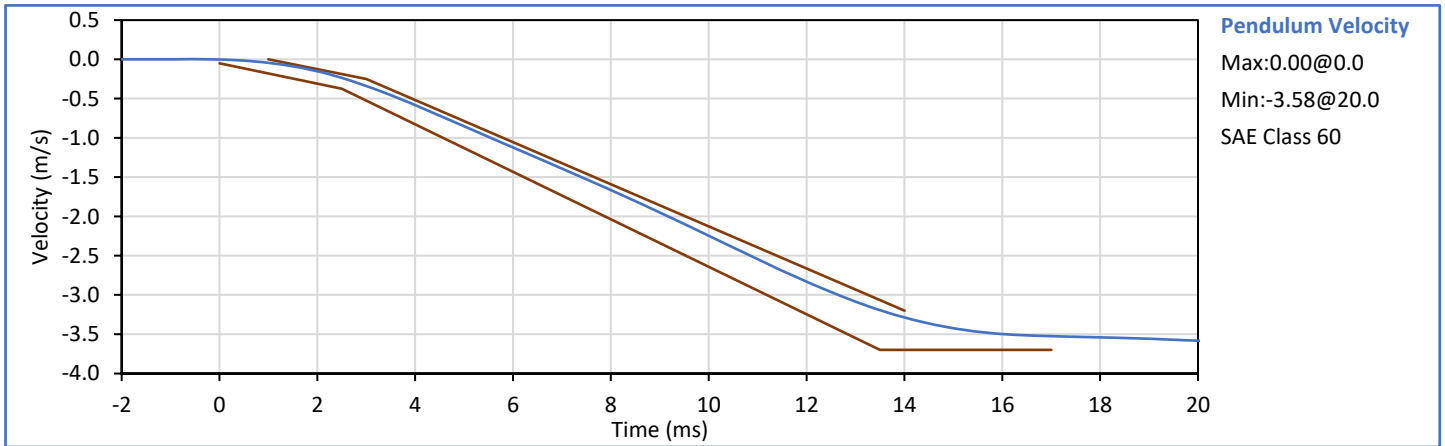
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.4	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Peak Resultant Acceleration	g	125.0	155.0	149.9	Pass
Peak Head Ax	g	-15.0	15.0	2.4	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
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	52.7	Pass
Time of Peak Headform Flexion	ms	54.0	66.0	59.7	Pass
Flexion Decay (Peak to zero)	ms	53.0	88.0	54.9	Pass
Overall Test Results					Pass



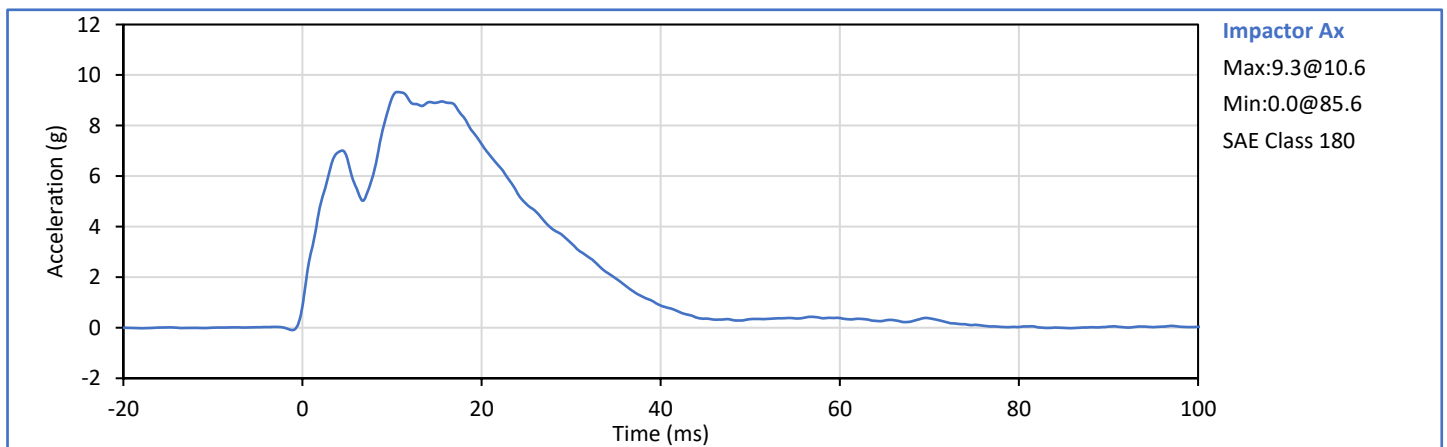
Technician: *Mill LGS III*
G. Fuentes

Approved By: *J. Hernandez*
J. Hernandez

ATD Serial No.: F037

Test Date: 2023-02-14

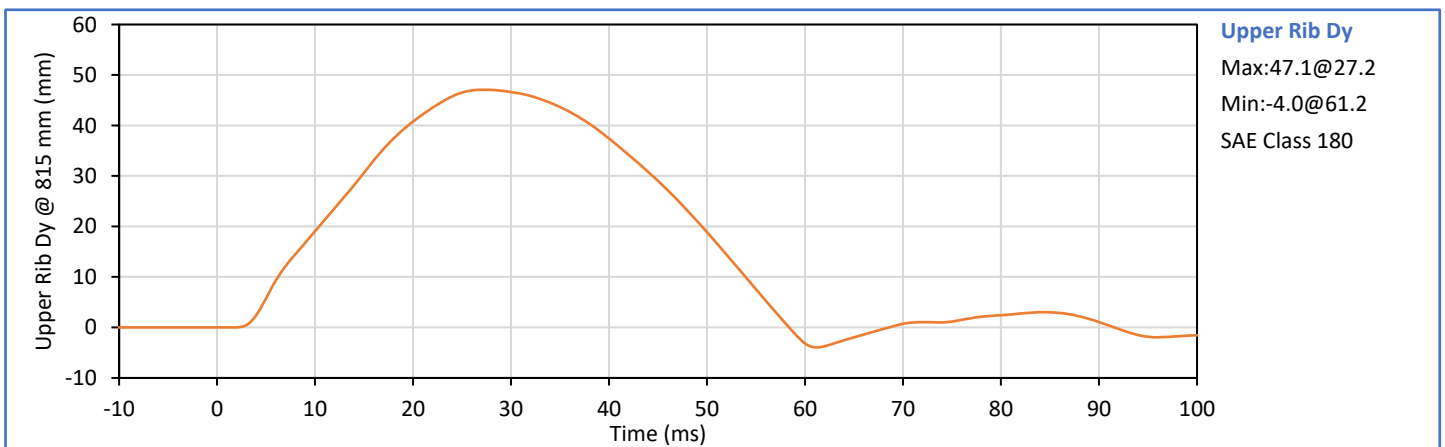
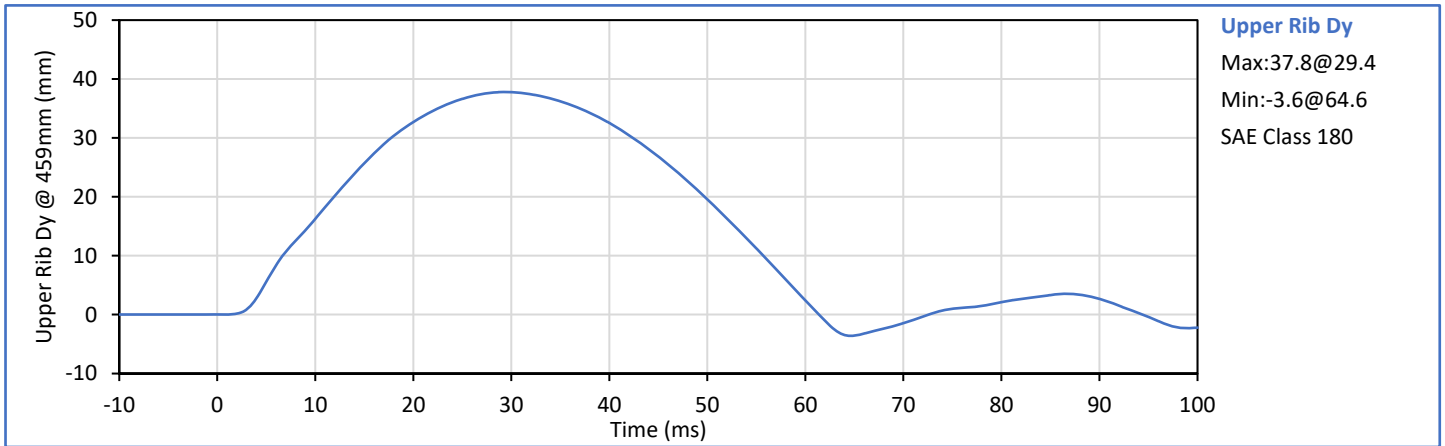
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Impactor Ax	g	7.5	10.5	9.3	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seuth*
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
Upper Rib Dy @ 459mm	mm	36.0	40.0	37.8	Pass
Upper Rib Dy @ 815mm	mm	46.0	51.0	47.1	Pass
Overall Test Results					Pass



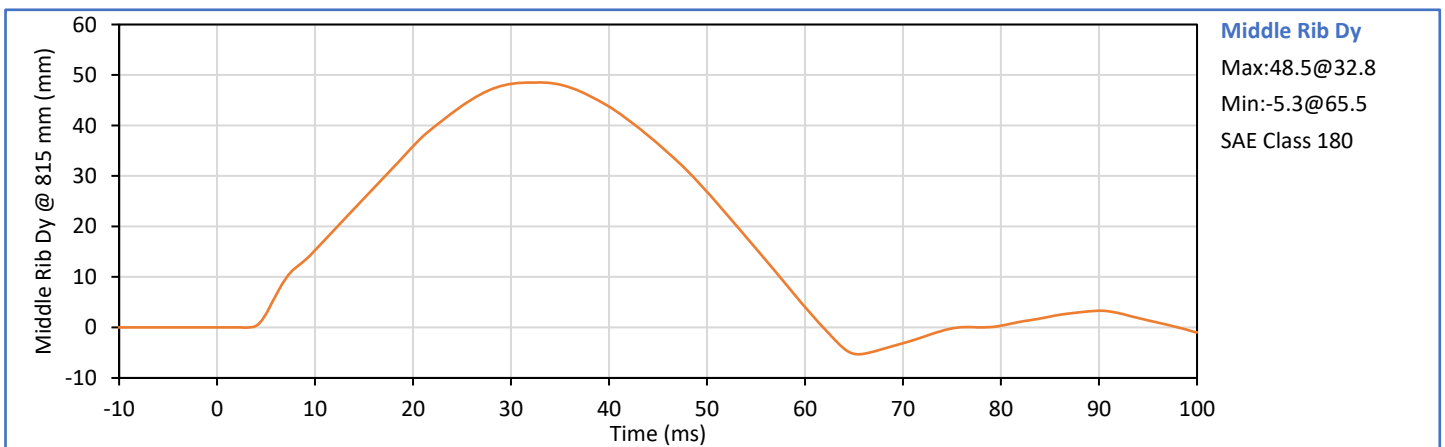
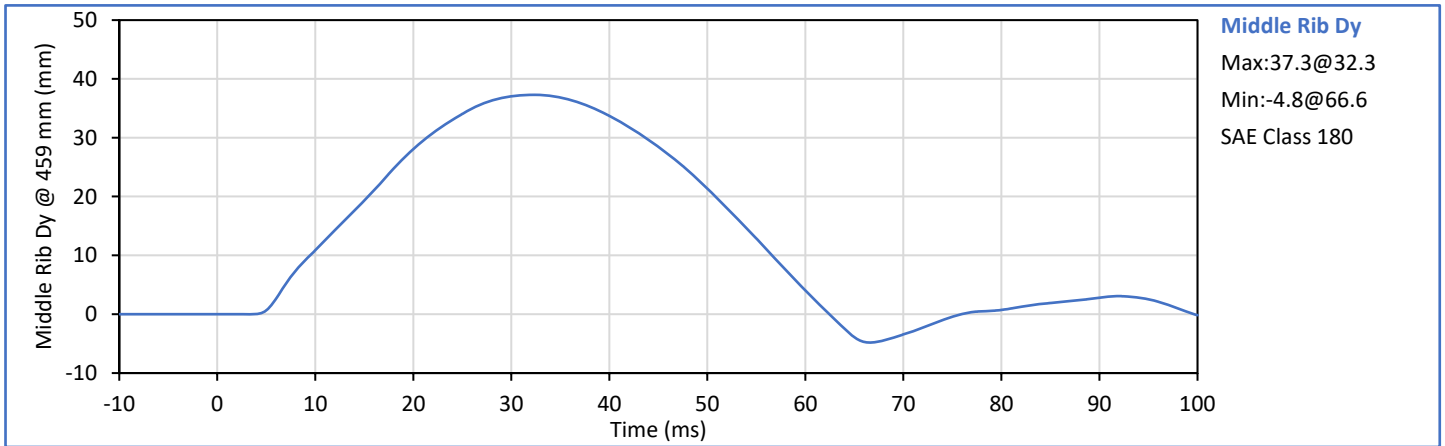
Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

ATD Serial No.: F037

Test Date: 2023-02-14

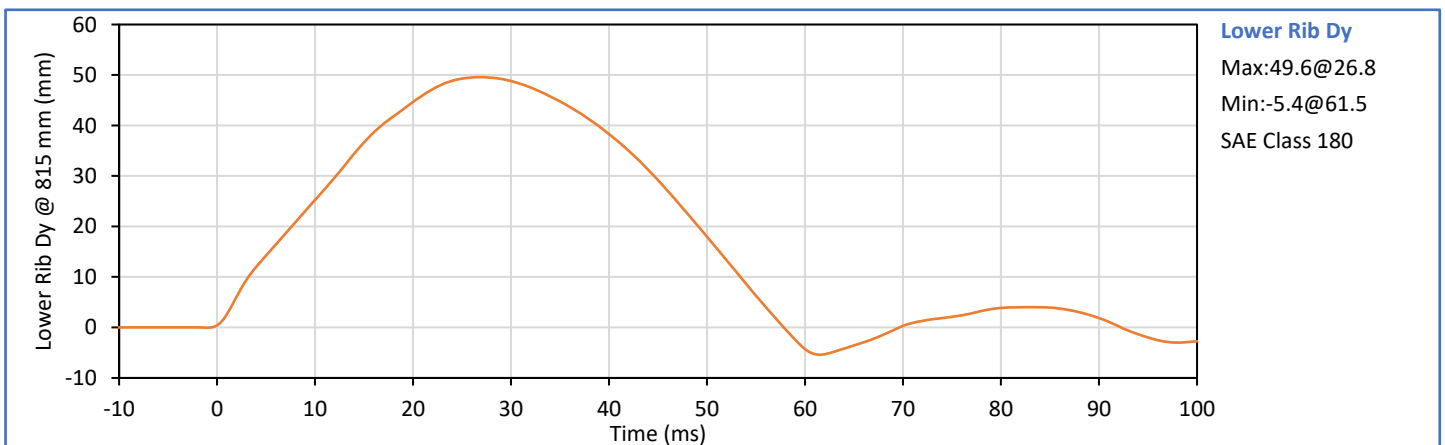
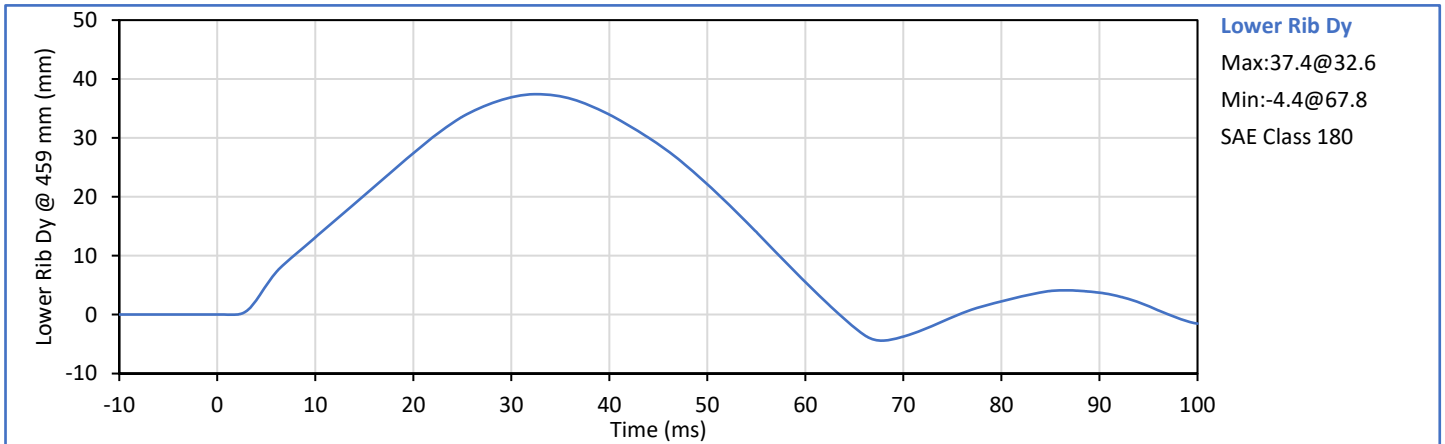
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Middle Rib Dy @ 459mm	mm	36.0	40.0	37.3	Pass
Middle Rib Dy @ 815mm	mm	46.0	51.0	48.5	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

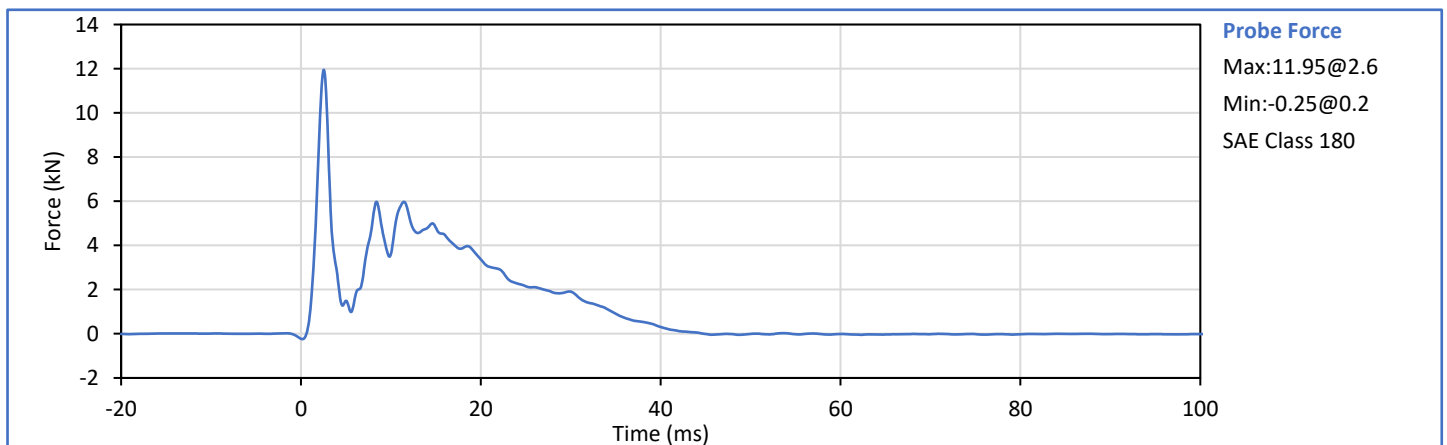
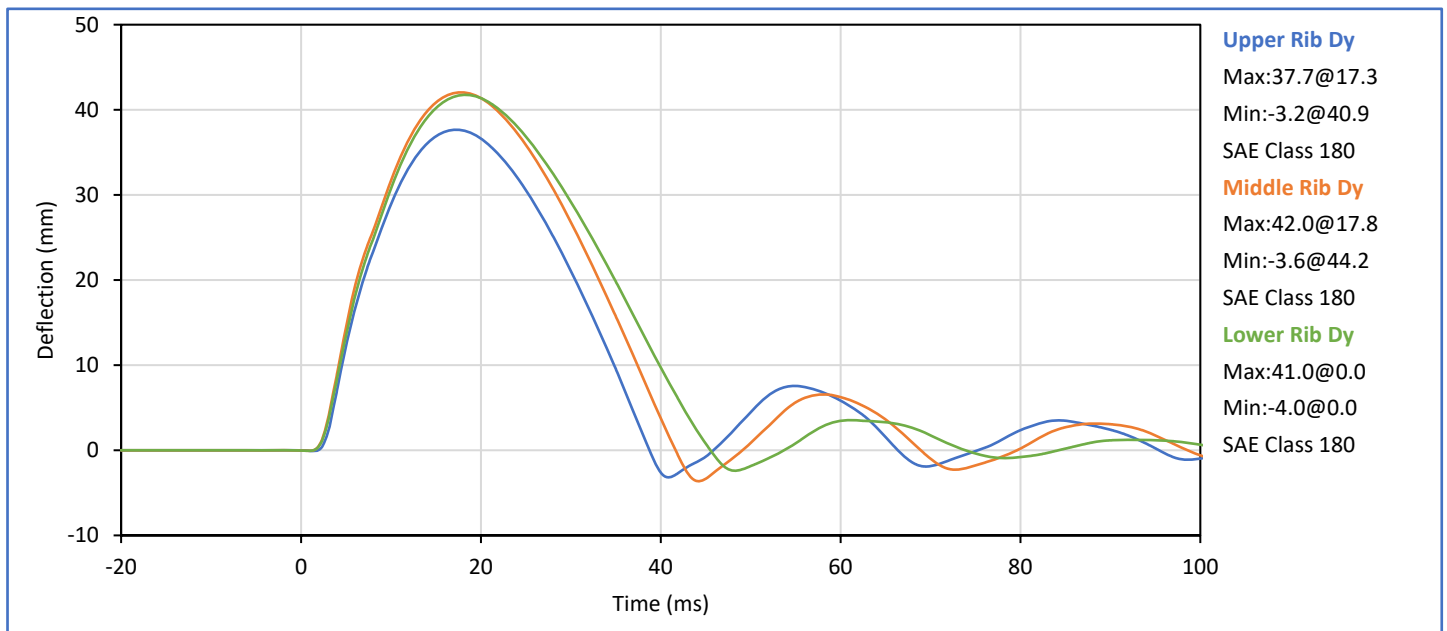
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Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Lower Rib Dy @ 459mm	mm	36.0	40.0	37.4	Pass
Lower Rib Dy @ 815mm	mm	46.0	51.0	49.6	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seuthy*
J. Hernandez

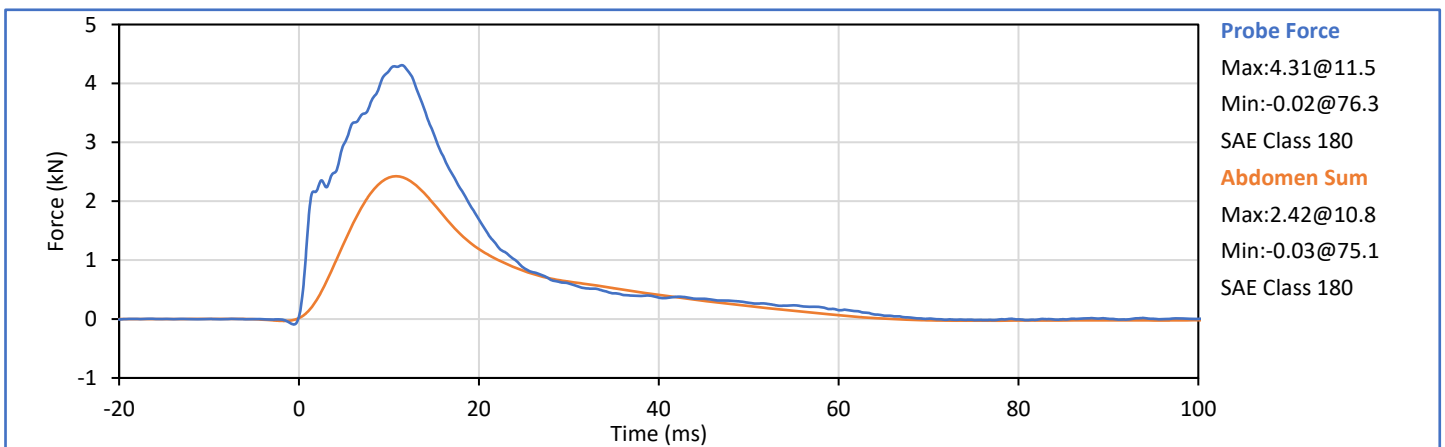
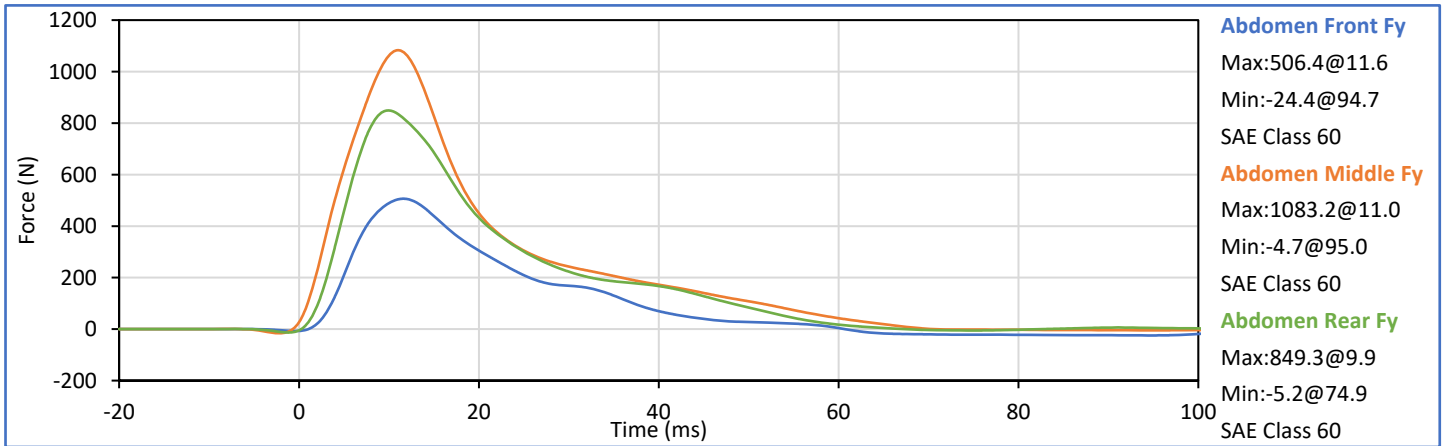
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	5.40	5.60	5.53	Pass
Peak Upper Rib Dy	mm	34.0	41.0	37.7	Pass
Peak Middle Rib Dy	mm	37.0	45.0	42.0	Pass
Peak Lower Rib Dy	mm	37.0	44.0	41.8	Pass
Peak Impactor Force After 6 ms	kN	5.10	6.20	5.97	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

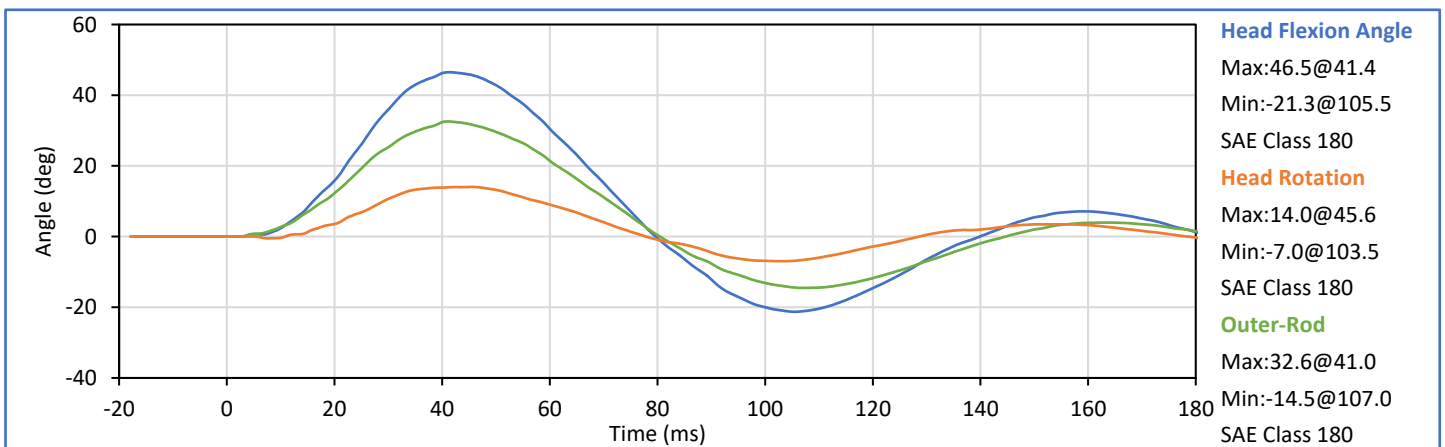
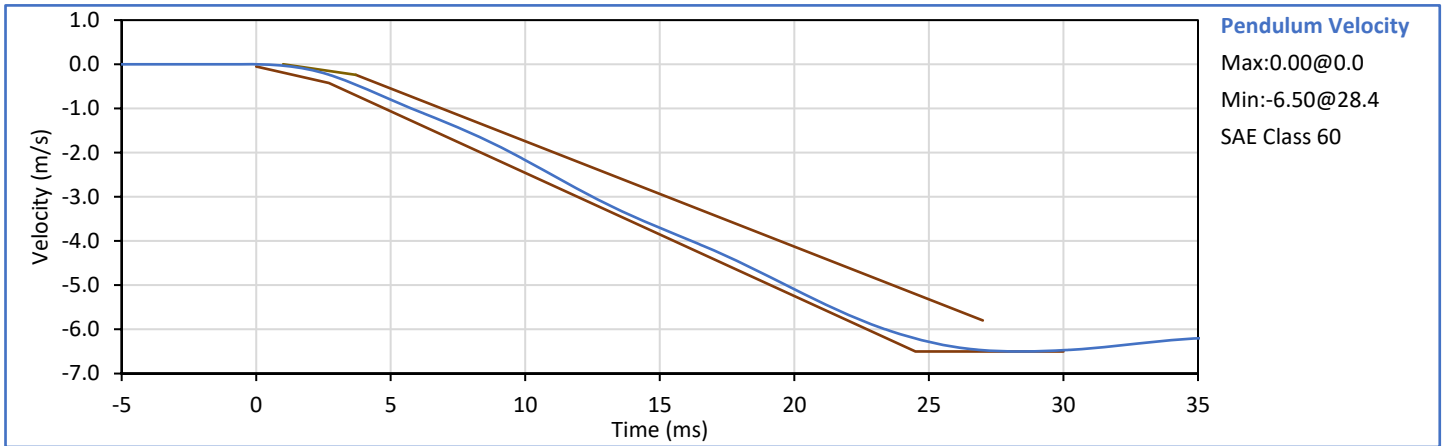
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Impactor Velocity	m/s	3.90	4.10	4.03	Pass
Peak Impactor Force	kN	4.00	4.80	4.31	Pass
Time of Peak Impactor Force	ms	10.6	13.0	11.5	Pass
Sum of Abdomen Forces	kN	2.20	2.70	2.42	Pass
Time of Peak Sum Abdomen Force	ms	10.0	12.3	10.8	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seuthy*
J. Hernandez

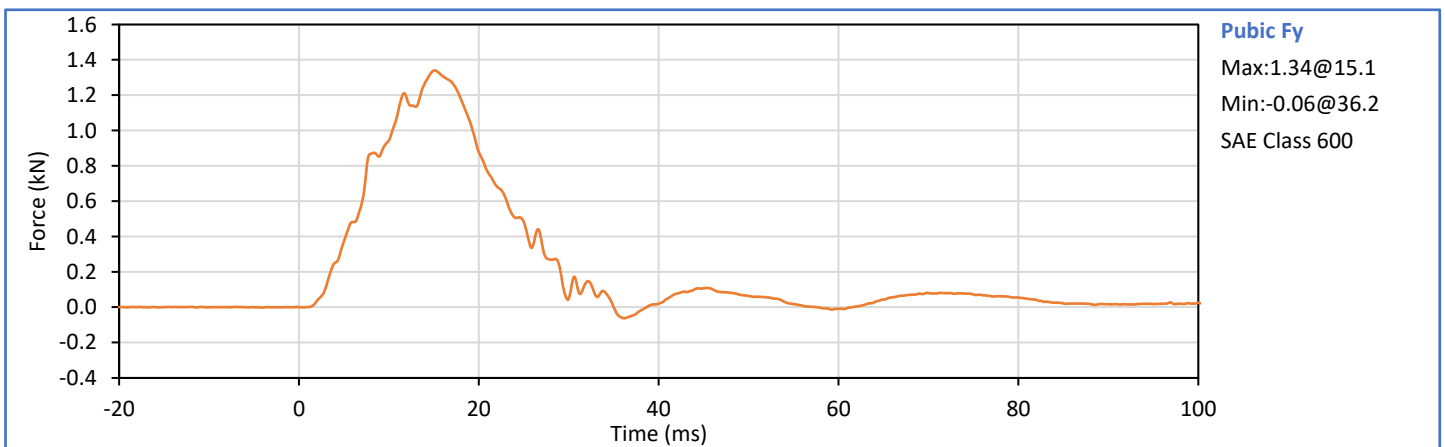
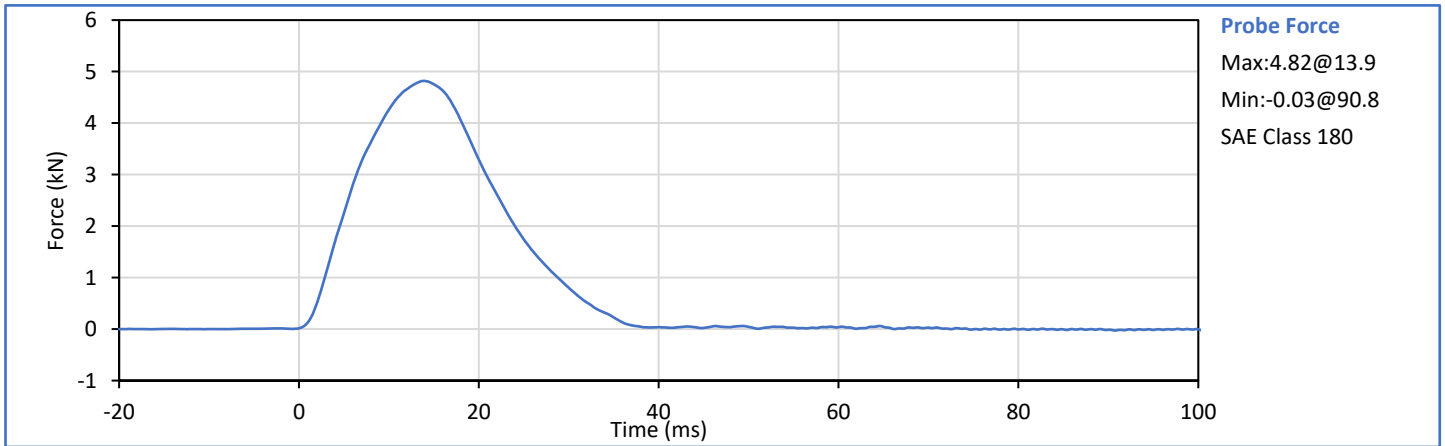
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.95	6.15	6.10	Pass
Peak Headform Flexion	deg	45.0	55.0	46.5	Pass
Time of Peak Headform Flexion	ms	39.0	53.0	41.4	Pass
Flexion Decay (Peak to zero)	ms	37.0	57.0	38.3	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Impactor Force	kN	4.70	5.40	4.82	Pass
Time of Peak Impactor Force	ms	11.8	16.1	13.9	Pass
Pubic Symphysis Fy	kN	1.23	1.59	1.34	Pass
Time of Peak Pubic Symphysis Fy	ms	12.2	17.0	15.1	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

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

ATD Serial No.: 299

Test Date: 2023-02-14

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	774	Pass
B - Shoulder Pivot Height	mm	437	453	450	Pass
C - Hpoint Height	mm	79	89	81	Pass
D - H Point From Seatback	mm	141	151	145	Pass
E - Shoulder Pivot From Backline	mm	97	107	105	Pass
F - Thigh Clearance	mm	119	135	134	Pass
G - Head Breadth	mm	140	148	146	Pass
H - Head Back From Backline	mm	40	46	43	Pass
I - Head Depth	mm	178	188	185	Pass
J - Head Circumference	mm	541	551	547	Pass
K - Buttock To Knee Length	mm	514	540	519	Pass
L - Popliteal Height	mm	343	369	356	Pass
K - Knee Pivot To Floor Height	mm	392	409	396	Pass
N - Buttock Popliteal Length	mm	416	442	432	Pass
O - Chest Depth W/O Jacket	mm	195	211	205	Pass
P - Foot Length	mm	216	232	223	Pass
Q - Hip Breadth (W/Pelvic Plugs)	mm	313	323	316	Pass
R - Arm Length	mm	249	259	257	Pass
S - Knee Joint To Seatback	mm	477	493	484	Pass
V - Shoulder Width	mm	341	357	351	Pass
W - Foot Width	mm	78	94	85	Pass
Y - Chest Circumference W/Jacket	mm	851	881	874	Pass
Z - Waist Circumference	mm	761	791	784	Pass
				Overall Test Results	Pass

Technician:



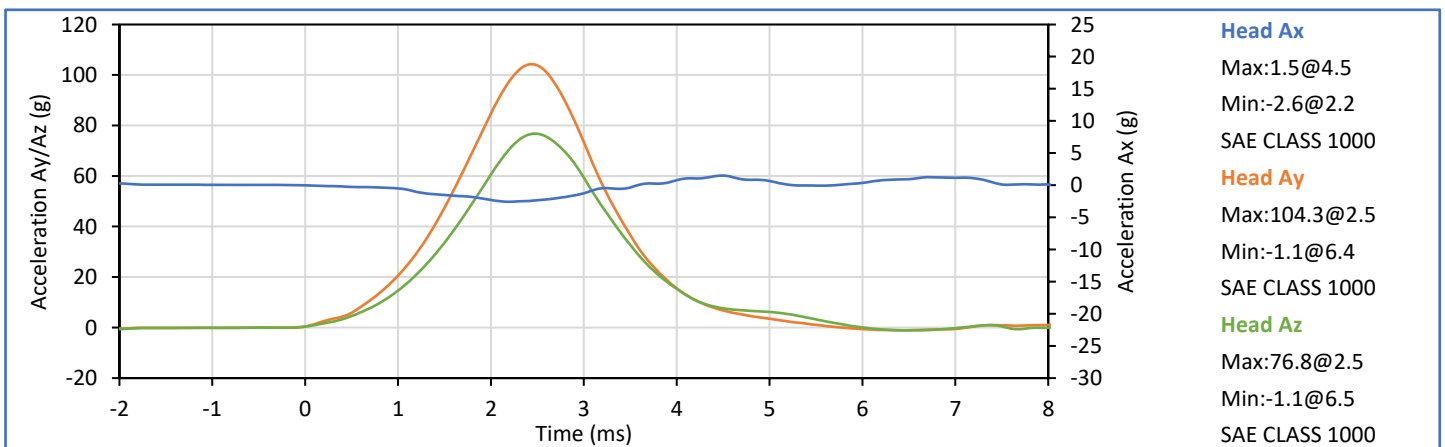
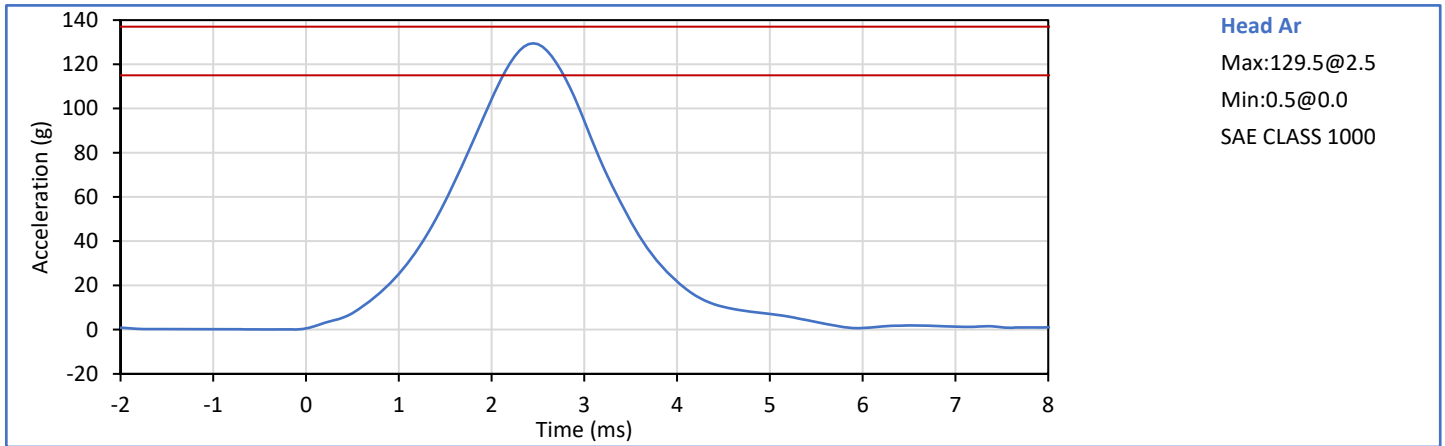
G. Fuentes

Approved By:



J. Hernandez

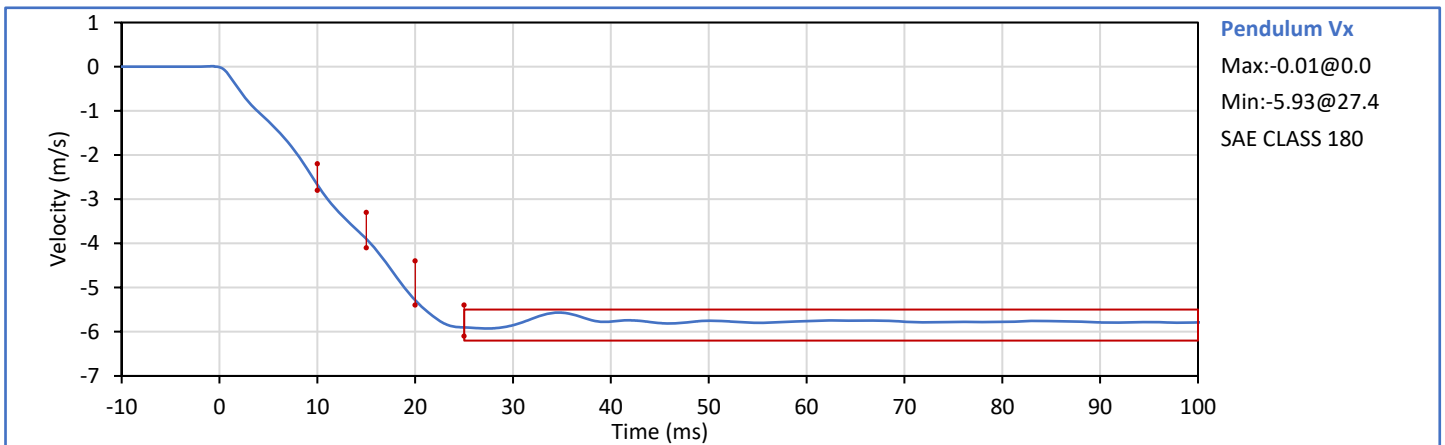
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Peak Resultant Acceleration	g	115.0	137.0	129.5	Pass
Peak Head Ax	g	-15.0	15.0	-2.6	Pass
Oscillations After Main Pulse	%	0.0	15.0	2.1	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

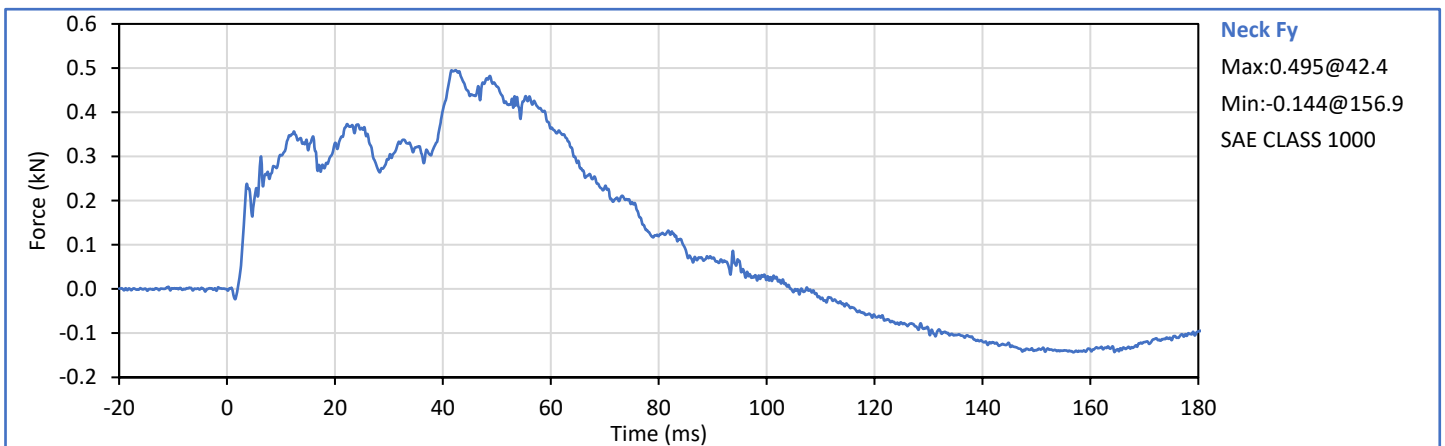
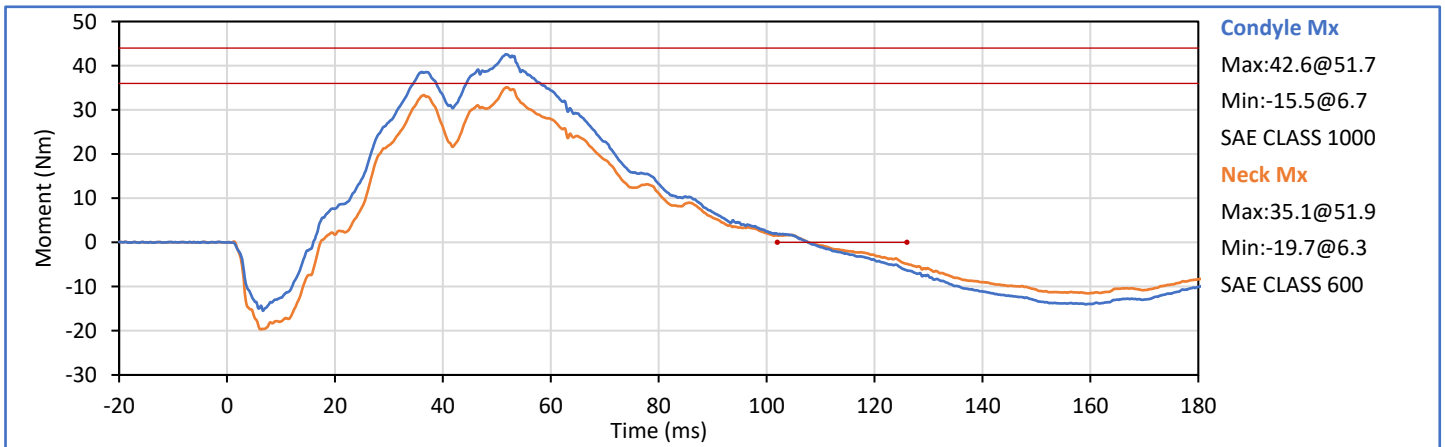
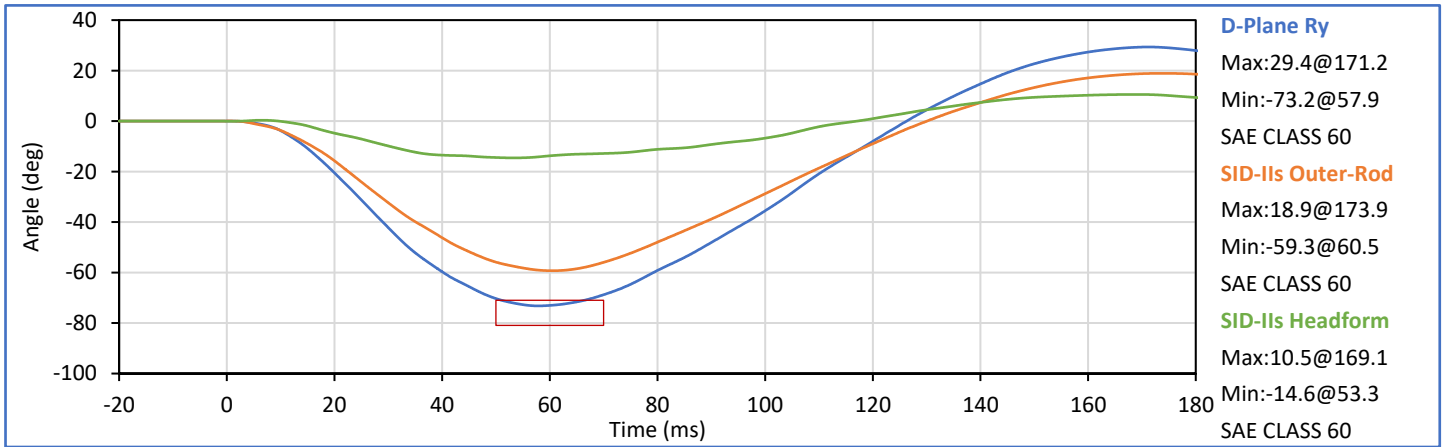
Approved By: *Smith*
J. Hernandez

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	5.58	Pass
Pendulum Decel at 10 ms	m/s	-2.80	-2.20	-2.67	Pass
Pendulum Decel at 15 ms	m/s	-4.10	-3.30	-3.90	Pass
Pendulum Decel at 20 ms	m/s	-5.40	-4.40	-5.29	Pass
Pendulum Decel at 25 ms	m/s	-6.10	-5.40	-5.90	Pass
Pendulum Decel from 25-100 ms	m/s	-6.20	-5.50	-5.93/-5.57	Pass
Peak "D" Plane Rotation	deg	-81.0	-71.0	-73.2	Pass
Time of Peak "D" Plane Rotation	ms	50.0	70.0	57.9	Pass
Peak Occ. Condyle Moment	Nm	36.0	44.0	42.6	Pass
Time of Moment Decay to 0 Nm	ms	102.0	126.0	107.7	Pass
Overall Test Results					Pass

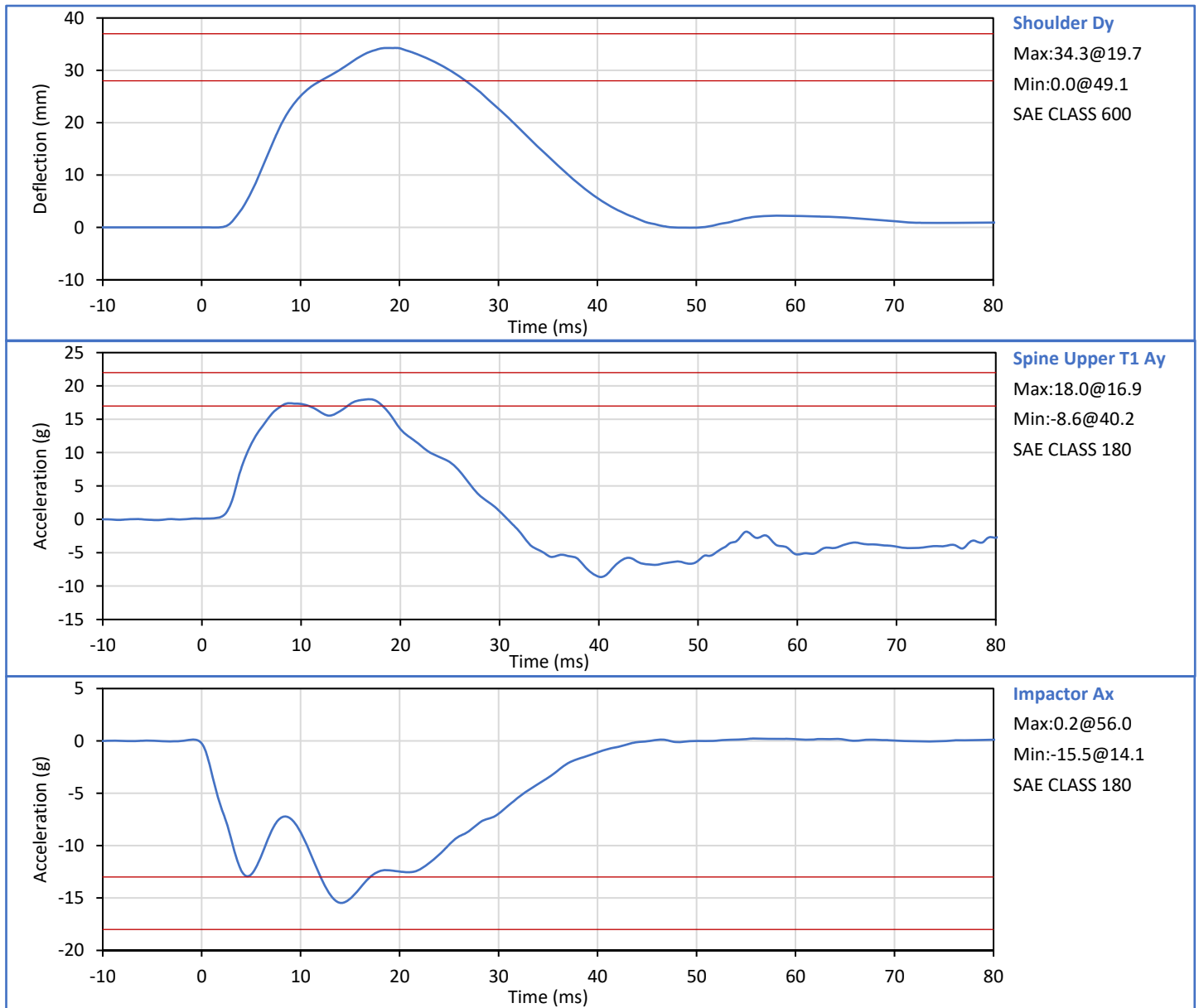


Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez



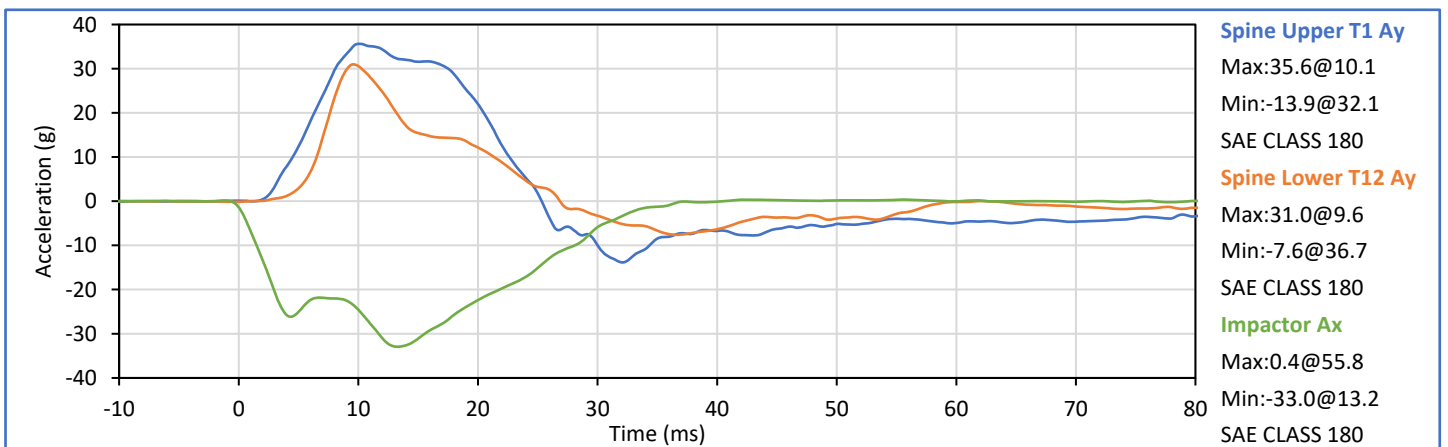
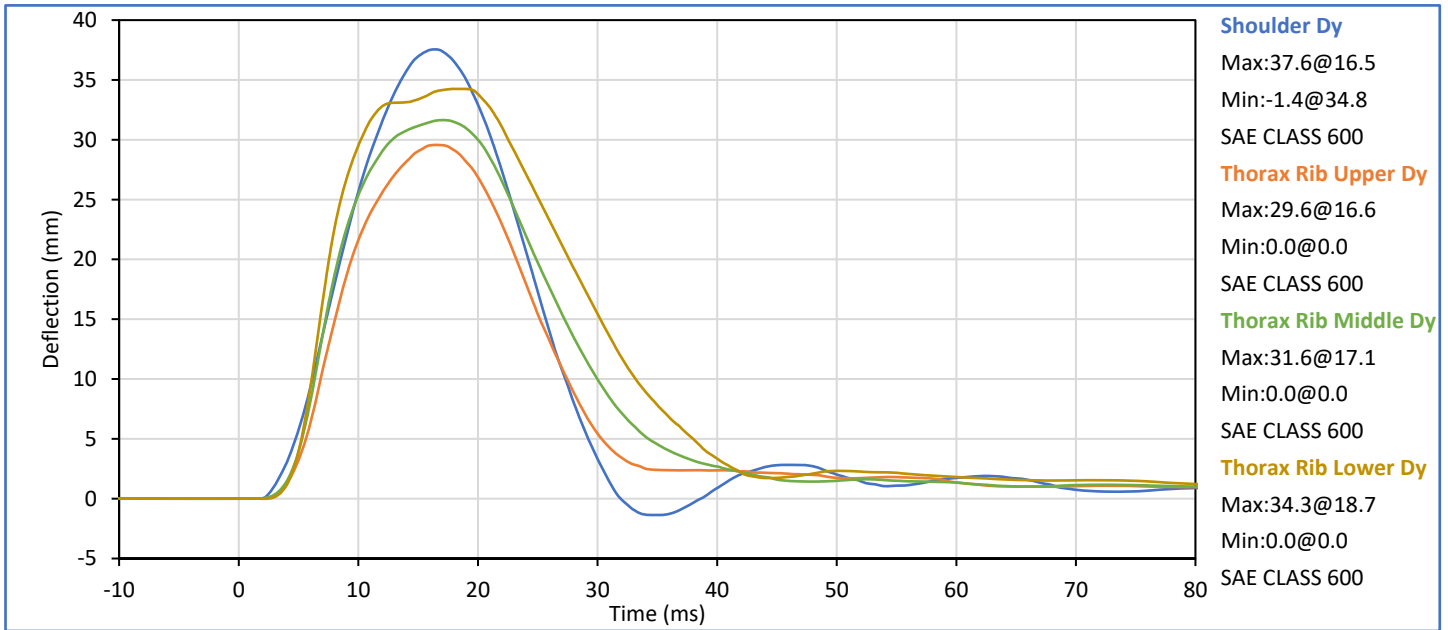
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.32	Pass
Peak Shoulder Dy	mm	28.0	37.0	34.3	Pass
Peak Upper Spine (T1) Ay	g	17.0	22.0	18.0	Pass
Peak Impactor Ax	g	-18.0	-13.0	-15.5	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

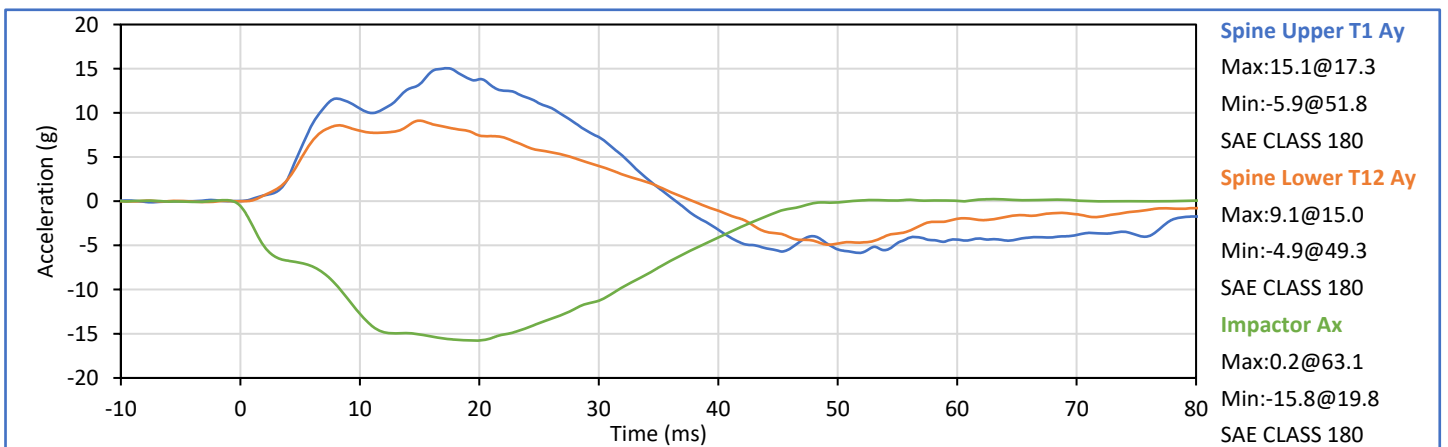
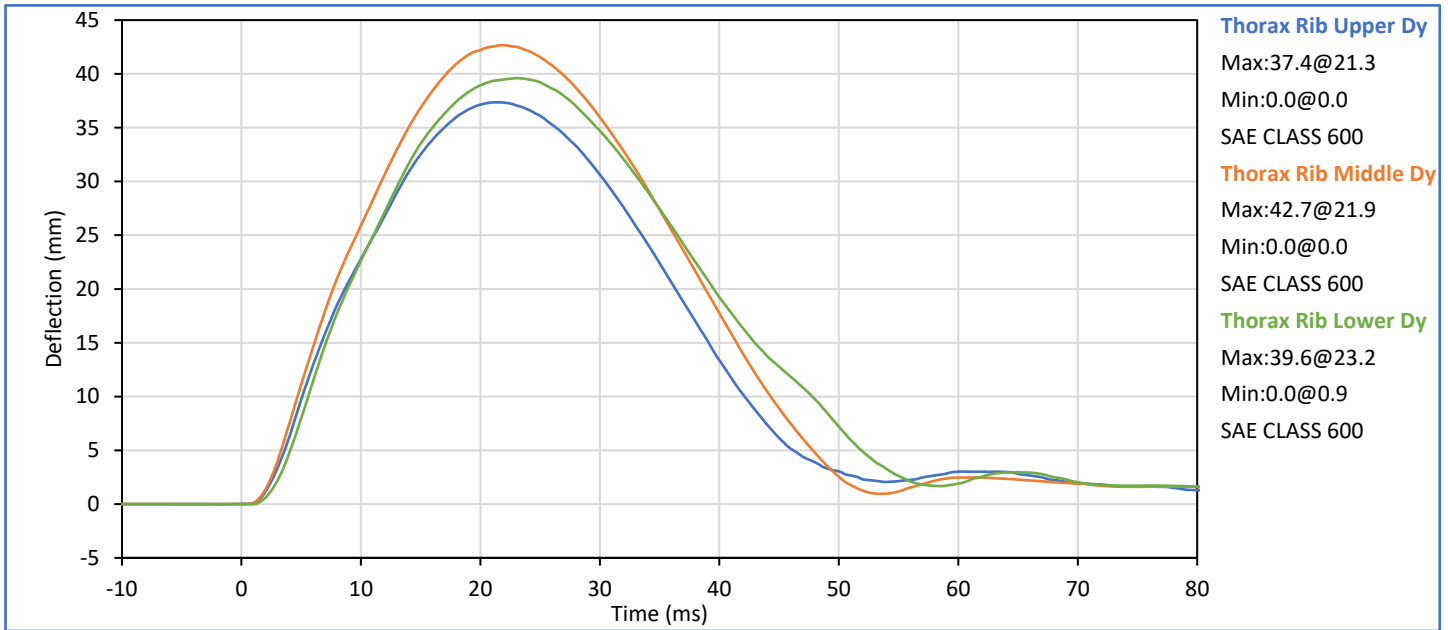
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.5	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Impactor Velocity	m/s	6.60	6.80	6.72	Pass
Peak Shoulder Dy	mm	31.0	40.0	37.6	Pass
Peak Upper Rib Dy	mm	25.0	32.0	29.6	Pass
Peak Middle Rib Dy	mm	30.0	36.0	31.6	Pass
Peak Lower Rib Dy	mm	32.0	38.0	34.3	Pass
Peak Upper Spine (T1) Ay	g	34.0	43.0	35.6	Pass
Peak Lower Spine (T12) Ay	g	29.0	37.0	31.0	Pass
Peak Impactor Ax	g	-36.0	-30.0	-33.0	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *J. Hernandez*
J. Hernandez

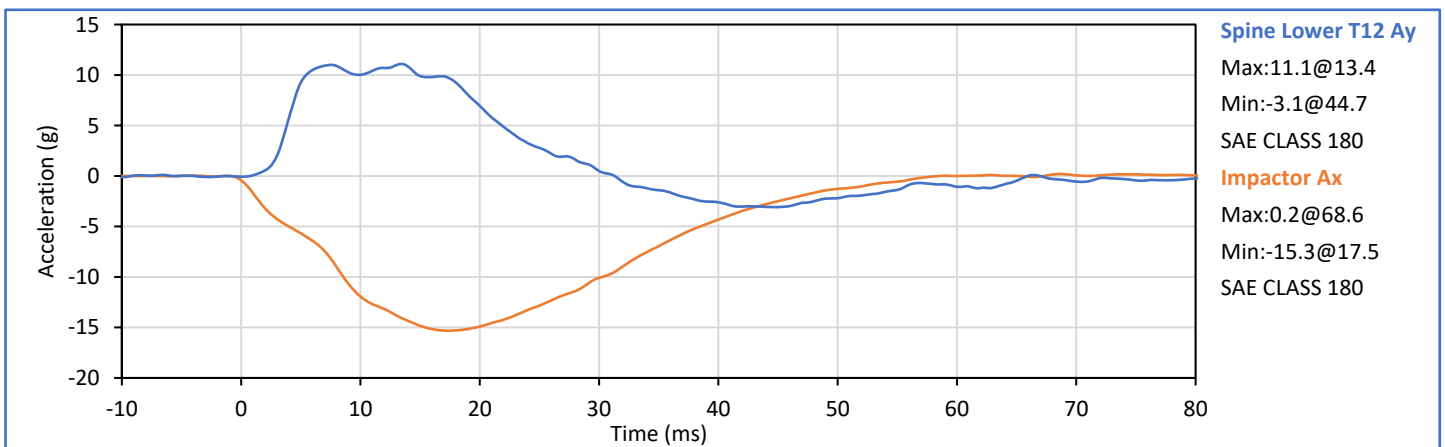
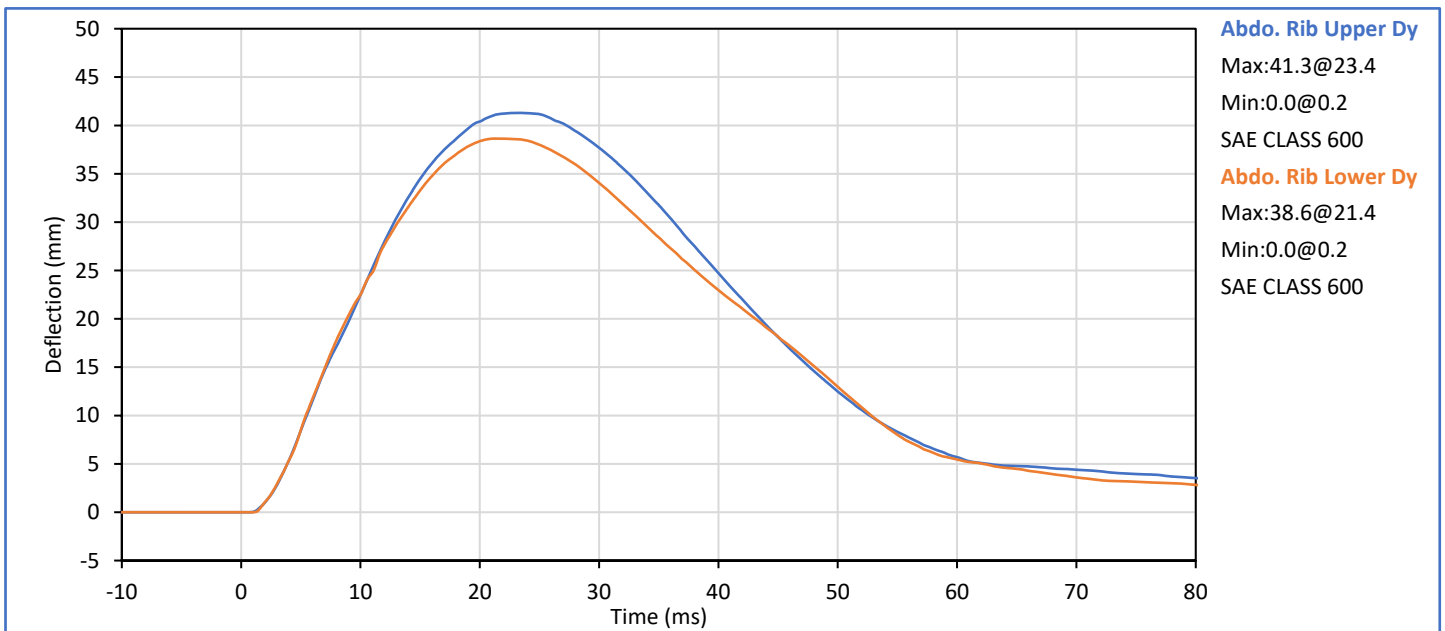
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.31	Pass
Peak Thorax Rib Upper Dy	mm	32.0	40.0	37.4	Pass
Peak Thorax Rib Middle Dy	mm	39.0	45.0	42.7	Pass
Peak Thorax Rib Lower Dy	mm	35.0	43.0	39.6	Pass
Peak Spine Upper T1 Ay	g	13.0	17.0	15.1	Pass
Peak Spine Lower T12 Ay	g	7.0	11.0	9.1	Pass
Peak Impactor Ax	g	-18.0	-14.0	-15.8	Pass
Overall Test Results					Pass



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Smith*
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.0	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	41.3	Pass
Peak Lower Abdomen Rib Dy	mm	33.0	44.0	38.6	Pass
Peak Lower Spine T12 Ay	mm	9.0	14.0	11.1	Pass
Peak Impactor Ax	g	-16.0	-12.0	-15.3	Pass
Overall Test Results					Pass

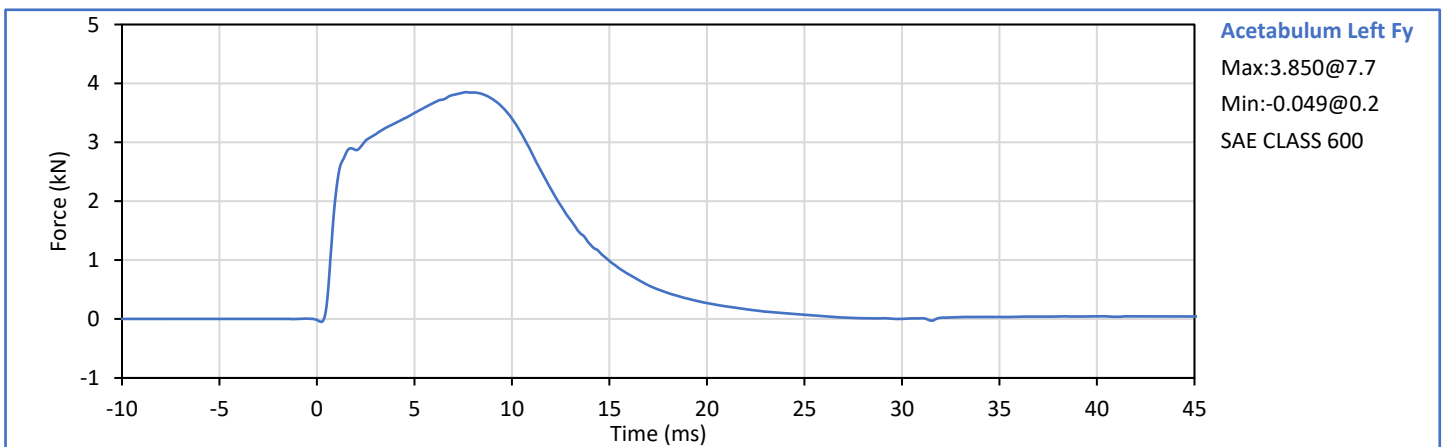
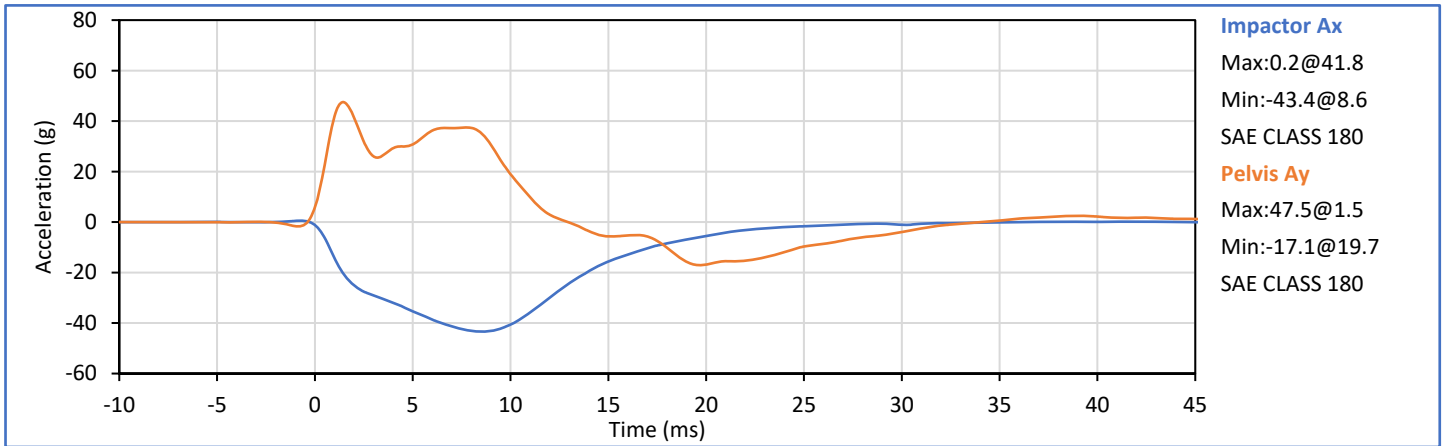


Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
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	6.60	6.80	6.70	Pass
Peak Acetabulum Fy	kN	3.60	4.30	3.85	Pass
Pelvis Ay after 6ms	g	34.0	42.0	37.5	Pass
Peak Impactor Ax	g	-47.0	-38.0	-43.4	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 14814



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seath*
J. Hernandez

ATD Serial No.: 299

Test Date: 2023-02-15

Pelvis Plug S/N: 14814



SID-IIs Pelvis Plug Certification Test

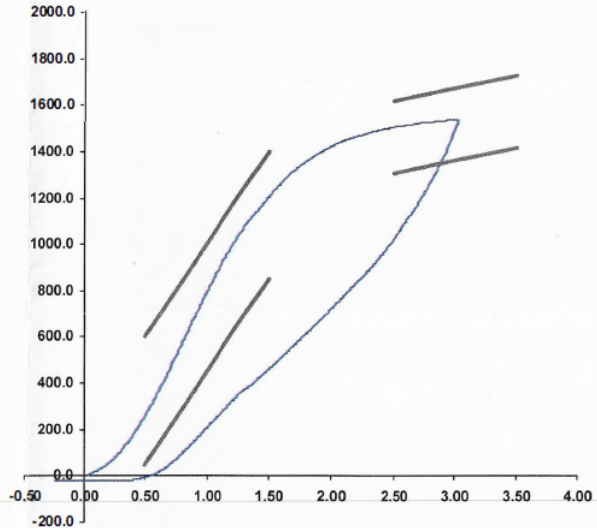
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Test Date 12/29/2020 1:08:49 PM

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Force @ 0.5 mm (N)	262.50	50.00	600.00
Force @ 1.5 mm (N)	1,209.68	850.00	1,400.00
Force @ 2.5 mm (N)	1,505.71	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,539.35	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

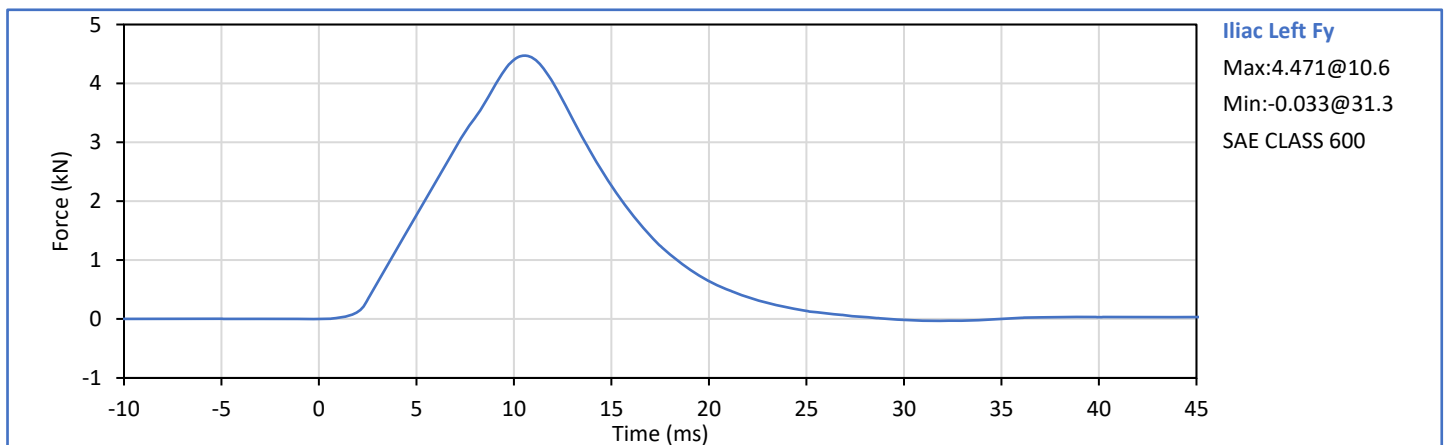
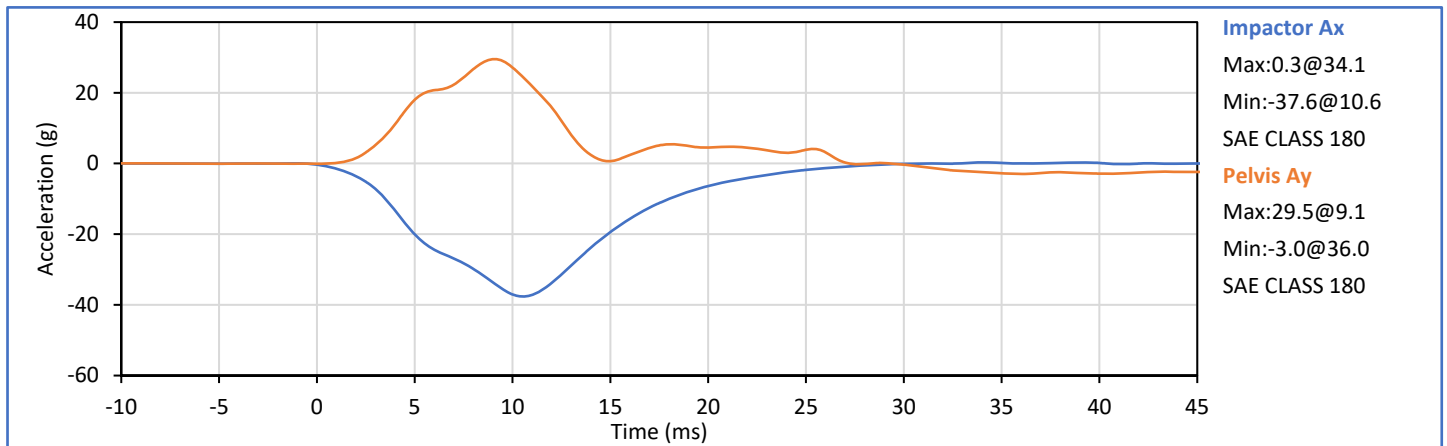
By: DC Date: 12/29/20

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

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.3	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Impactor Velocity	m/s	4.20	4.40	4.34	Pass
Peak Iliac Fy	kN	4.10	5.10	4.47	Pass
Peak Pelvis Ay	g	28.0	39.0	34.7	Pass
Peak Impactor Ax	g	-45.0	-36.0	-37.6	Pass
Overall Test Results					Pass

Pelvis Plug S/N: 12228 *

* Plug is not impacted and remains certified



Technician: *Mill LGS III*
G. Fuentes

Approved By: *Seuth*
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	2022-10-19
Head Acceleration Y Primary	P58865	Endevco	7264C-2k	2022-10-19
Head Acceleration Z Primary	P58867	Endevco	7264C-2k	2022-10-19
Head Acceleration X Redundant	P58859	Endevco	7264C-2k	2022-10-19
Head Acceleration Y Redundant	P58866	Endevco	7264C-2k	2022-10-19
Head Acceleration Z Redundant	P58873	Endevco	7264C-2k	2022-10-19
Upper Thorax Rib Deflection Y	209 (ES-2 Rib)	Honeywell	F38000203	2022-10-18
Middle Thorax Rib Deflection Y	210 (ES-2 Rib)	Honeywell	F38000203	2022-10-18
Lower Thorax Rib Deflection Y	207 (ES-2 Rib)	Honeywell	F38000203	2022-10-18
Anterior Abdominal Force Y	1514 Fy	R.A. Denton	2631J	2022-03-30
Middle Abdominal Force Y	1510 Fy	R.A. Denton	2631J	2022-03-30
Posterior Abdominal Force Y	1515 Fy	R.A. Denton	2631J	2022-03-30
Lower Spine T12 Acceleration X	P63856	Endevco	7264C-2k	2022-10-19
Lower Spine T12 Acceleration Y	P50063	Endevco	7264C-2k	2022-10-19
Lower Spine T12 Acceleration Z	P51880	Endevco	7264C-2k	2022-10-19
Pubic Symphysis Force Y	506 (Pubic)	R.A. Denton	3096JFL	2022-03-30

Table 2 - Left Rear Passenger ATD Instrumentation

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

Table 3 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Vehicle CG Ax	220347	BST	11CF-2k	2022-12-21
Vehicle CG Ay	220345	BST	11CF-2k	2022-12-22
Vehicle CG Az	220341	BST	11CF-2k	2022-12-19
Right Side Sill at Front Seat Ax	220286	BST	11CF-2k	2022-12-19
Right Side Sill at Front Seat Ay	220316	BST	11CF-2k	2022-12-20
Right Side Sill at Front Seat Az	220207	BST	11CF-2k	2022-12-20
Right Side Sill at Rear Seat Ax	220332	BST	11CF-2k	2022-12-11
Right Side Sill at Rear Seat Ay	220302	BST	11CF-2k	2022-12-11
Right Side Sill at Rear Seat Az	220334	BST	11CF-2k	2022-12-12
Left Side Sill at Front Seat Ay	220278	BST	11CF-2k	2022-12-19
Left Side Sill at Rear Seat Ay	220279	BST	11CF-2k	2022-12-18
Left Lower A-Pillar Ay	220173	BST	11CF-2k	2022-12-02
Left Middle A-Pillar Ay	220285	BST	11CF-2k	2022-12-12
Left Lower B-Pillar Ay	220280	BST	11CF-2k	2022-12-14
Left Middle B-Pillar Ay	220309	BST	11CF-2k	2022-12-09
Driver Seat Track at H-Point Ay	220258	BST	11CF-2k	2022-12-19
Rear Seat Structure Ay	220289	BST	11CF-2k	2022-12-12
Right Rear Occupant Comp. Ay	220239	BST	11CF-2k	2022-12-26
Engine Block Top Ax	220277	BST	11CF-2k	2022-12-12
Engine Block Top Ay	220265	BST	11CF-2k	2022-12-20
Rear Floopan Above Axle Ax	220343	BST	11CF-2k	2022-12-20
Rear Floopan Above Axle Ay	220344	BST	11CF-2k	2022-12-21
Rear Floopan Above Axle Az	220349	BST	11CF-2k	2022-12-21

Table 4 - Moving Deformable Barrier (MDB) Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
MDB CG Ax	220335	BST	11CF-2k	2022-12-12
MDB CG Ay	220307	BST	11CF-2k	2022-12-12
MDB CG Az	220273	BST	11CF-2k	2022-12-12
MDB Left Side at Rear Axle Ax	220330	BST	11CF-2k	2022-12-12
MDB Left Side at Rear Axle Ay	220308	BST	11CF-2k	2022-12-12