

**REPORT NUMBER: NCAP-KAR-23-003**

**NEW CAR ASSESSMENT PROGRAM (NCAP)  
FRONTAL BARRIER IMPACT TEST**

**HYUNDAI MOTOR MANUFACTURING ALABAMA LLC  
2023 HYUNDAI SANTA CRUZ SEL AWD 4-DOOR TRUCK**

**NHTSA NUMBER: M20234200**

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



**MARCH 08, 2023**

**FINAL REPORT**

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

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Approval Date: March 08, 2023

FINAL REPORT ACCEPTANCE BY OCWS:

\_\_\_\_\_  
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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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		<b>14. Sponsoring Agency Code</b> NRM-100																																																					
<b>15. Supplementary Notes</b>																																																							
<b>16. Abstract</b> A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. The test was conducted at the Applus+ IDIADA KARCO Engineering, LLC. facility in Adelanto, California on February 21, 2023.  The impact velocity of the vehicle was 56.53 km/h and the ambient temperature at the barrier face at the time of impact was 16.7°C. The target vehicle's post-test maximum crush was 794 mm at DPD4 to the right of the vehicle's centerline. The test vehicle's performance is as follows:																																																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>15</sub>)</td> <td>N/A</td> <td>700</td> <td>217.296</td> <td>700</td> <td>230.017</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-22.430</td> <td>52</td> <td>-14.277</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.228</td> <td>1</td> <td>0.423</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>870.107</td> <td>2620</td> <td>557.985</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>-324.339</td> <td>2520</td> <td>-379.057</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10008</td> <td>-162.139</td> <td>6800</td> <td>-272.311</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10008</td> <td>-727.386</td> <td>6800</td> <td>-212.275</td> </tr> </tbody> </table>				Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC <sub>15</sub> )	N/A	700	217.296	700	230.017	Maximum Chest Compression	mm	63	-22.430	52	-14.277	Nij	N/A	1	0.228	1	0.423	Neck Tension	N	4170	870.107	2620	557.985	Neck Compression	N	4000	-324.339	2520	-379.057	Left Femur Force	N	10008	-162.139	6800	-272.311	Right Femur Force	N	10008	-727.386	6800	-212.275
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<b>17. Key Words</b> 56.3 km/h (35 mph) Full Frontal Rigid Barrier Impact Test New Car Assessment Program (NCAP)		<b>18. Distribution Statement</b> National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave, SE Washington, DC 20590																																																					
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## **SECTION 1**

### **PURPOSE AND SUMMARY OF TEST**

#### **PURPOSE**

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program, sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number 693JJ919D000004. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Procedure dated May 2018 for NCAP Full Frontal Rigid Barrier Impact Testing.

#### **SUMMARY**

A load cell barrier consisting of 176 load cells was impacted by a 2023 Hyundai Santa Cruz SEL AWD 4-door Truck at a velocity of 56.53 km/h. The test was performed at Applus+ IDIADA KARCO Engineering, LLC. on February 21, 2023. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report.

One (1) real-time cameras and sixteen (16) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of this report.

One Part HIII 50<sup>th</sup> percentile male anthropomorphic test device (ATD) was placed in the driver seating position and one Part HIII 5<sup>th</sup> percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck force transducers, right / left femur load cells, and lower leg instrumentation.

The driver (position 1) ATD (Serial No. 360) and the right-front passenger (position 2) ATD (Serial No. DH1644) were qualified prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 105 channels of dummy and vehicle response data were recorded on an on-board data acquisition system. Appendix B contains the dummy response data traces. Appendix D contains a complete list of instrumentation used for dummies and the vehicle.

There was 100 percent windshield retention and intrusion into the protected zone of the windshield during the event. There was no Stoddard solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the test vehicle was 796 mm at DPD4 to the right of the vehicle's centerline. Both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: the driver ATD's head contacted the frontal airbag and headrest. The upper and lower torso contacted the frontal airbag. Both left and right knees contacted the knee bolster.

The passenger's visible contact points were as follows: the passenger ATD's head contacted the frontal airbag and headrest. The upper and lower torso contacted the frontal airbag. Both left and right knees contacted the knee bolster.

The occupant data is summarized below:

ATD Position	HIC <sub>15</sub>	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50th Male)	217.296	0.228	870.107	-324.339	45.222	-22.430	-162.139	-727.386
Passenger (5th Female)	230.017	0.423	557.985	-379.057	40.845	-14.277	-272.311	-212.275

**GENERAL COMMENTS:**

None

## SECTION 2

### OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

### 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 <sup>2</sup>	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 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA Number	M20234200
Model Year	2023
Make	Hyundai
Model	Santa Cruz
Body Style	4-Door Truck
VIN	5NTJCDAE1PH057304
Body Color	Blue Stone
Odometer Reading (km / mi)	201 / 125
Engine Displacement (L)	2.5
Type / No. of Cylinders	Inline 4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	No
Sunroof / T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System	Yes
Power Steering	Yes
Power Window Auto-Reverse	Yes
Driver Frontal 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	No
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	No
Driver Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Seat Belt Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other Safety Restraint	Yes

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

**DATA FROM CERTIFICATION LABEL**

Manufactured By	Hyundai Motor Manufacturing Alabama LLC
Date of Manufacture	Dec-22

GVWR (kg)	2544
GAWR Front (kg)	1200
GAWR Rear (kg)	1450

**VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION**

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Split Bench			
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				640.0	A
DSC x 68.04 (kg)				340.2	B
Cargo Weight (RCLW) (kg)				136.0	A-B



**DATA SHEET NO. 1 ... (CONTINUED)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

**TEST VEHICLE WEIGHTS**

	Units	As Delivered Weights (UWV)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	495.5	412.5		538.0	511.5	
Right	kg	497.5	385.0		499.0	512.5	
Ratio	%	55.5%	44.5%	100.0%	50.3%	49.7%	100.0%
Total	kg	993.0	797.5	1790.5	1037.0	1024.0	2061.0

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total Delivered Weight (UWV)	kg	1790.5	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	136.0	C
Calculated Vehicle Target Weight (TVTWT)	kg	2067.5	A+B+C

**TEST VEHICLE ATTITUDES**

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	827	827	850	855	1336
As Tested	mm	835	842	825	835	1490
Post-Test	mm	820	837	819	816	

**GENERAL TEST VEHICLE DATA**

Measurement Description	Units	Value
Total Vehicle Wheelbase	mm	2999
Total Vehicle Length at Left Side	mm	4450
Total Vehicle Length at Centerline	mm	4985
Total Vehicle Length at Right Side	mm	4432
Weight of Ballast in Cargo Area	kg	154.5
Weight of Vehicle Components Removed	kg	18.5
Amount of Stoddard Solvent in Fuel Tank	L	62.31

**VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:**

Bed Liner (18.5 kg)

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**DATA SHEET NO. 1 ... (CONTINUED)**

**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

**TARGET VEHICLE STRUCTURAL MEASUREMENTS**

No.	Description	Pre-Test
1	Total Length	4985
2	Total Width	1874
3	Bumper Top Height	700
4	Bumper Bottom Height	435
5	Longitudinal Member Top Height	747
6	Distance Between Longitudinal Members	1033
7	Longitudinal Member Width	104
8	Engine Top Height	1020
9	Engine Bottom Height	352
10	Engine and Gearbox Width	473
11	Front Bumper to Engine Distance	560
12	Front Shock Absorber Fixing Height	1115
13	Bonnet Leading Edge Height	970
14	Front Shock Absorber Fixing Width	1203
15	Front Bumper to Front Axle Distance	907
16	Front Axle to A-Pillar Distance	684
17	A-Pillar to B-Pillar Distance	932
18	B-Pillar to Rear Axle Distance	1383
19	B-Pillar to C-Pillar Distance	810
20	Roof Sill Bottom Height	1622
21	Roof Sill Top Height	1744
22	Floor Sill Bottom Height	345
23	Floor Sill Top Height	484

All measurements in millimeters.

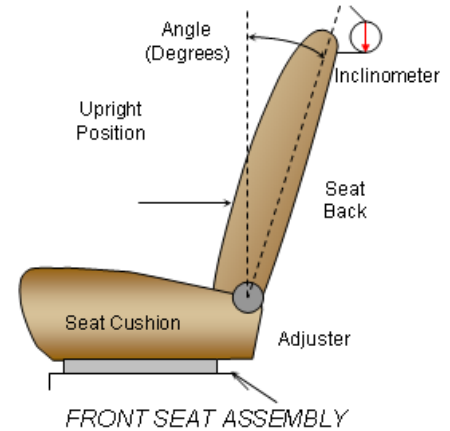
## DATA SHEET NO. 2

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

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023

#### NOMINAL DESIGN RIDING POSITION

The procedure for the driver is as follows: the seat back is set to the manufacturer’s designated angle. The procedure for the passenger is as follows: the seat back is set to position the transverse instrumentation platform of the dummy’s head at  $0^\circ \pm 0.5^\circ$ . Seat back angle is measured with a flat edge along the seat back.

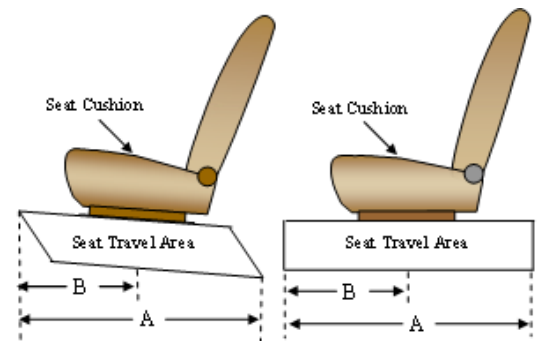


#### SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	0.5
Passenger Seat Back Angle	-1.4

#### SEAT FORE / AFT POSITIONING

The total seat travel is measured from the forward most possible position to the rear most possible position. The driver’s seat is set to the middle of the fore-aft travel. The passenger’s seat is set to the forward most position where the ATD will not contact any interior panels.



#### SEAT FORE/AFT POSITIONS

Seating Position	Total Fore-Aft Travel	Placed in Position
Driver Seat	304 mm	152 mm
Passenger Seat	238 mm	0 mm

#### SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the manufacturer’s design position for a 50<sup>th</sup> percentile adult male ATD for the driver, and a 5<sup>th</sup> percentile adult female ATD for the passenger. Position “L” is the lowermost position, followed by position “M1”. Position “H” is the uppermost position.

#### SEAT BELT UPPER ANCHORAGES

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

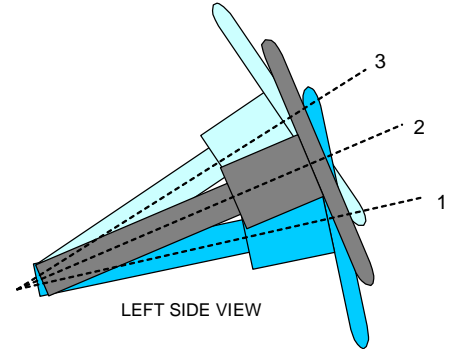
**DATA SHEET NO. 2 ... (CONTINUED)**

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

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

**STEERING COLUMN ADJUSTMENT**

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. A digital inclinometer is used to measure a plate which is placed across the rim of the steering wheel for angular measurements.



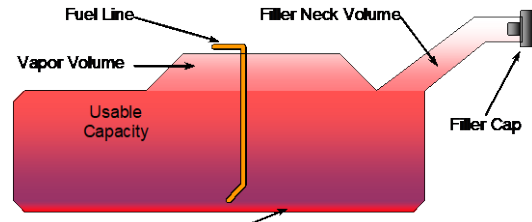
LEFT SIDE VIEW  
STEERING COLUMN ASSEMBLY

**STEERING COLUMN POSITIONING**

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	66.1	206
Geometric Center Position, No. 2	63.6	232
Uppermost Position, No. 3	61.0	257
Telescoping Steering Wheel Travel		51
Test Position	63.6	232

**FUEL PUMP**

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



VEHICLE FUEL TANK ASSEMBLY

**FUEL TANK CAPACITY**

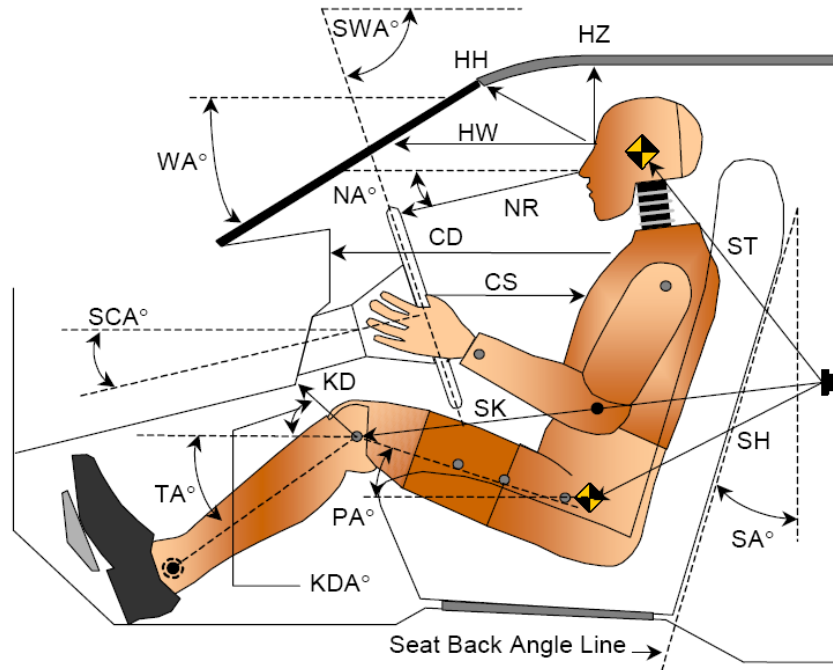
Description	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	67.00
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	67.00
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	62.31
Actual amount of Solvent Used in Test	62.31
1/3 of Usable Capacity	22.33

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 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023



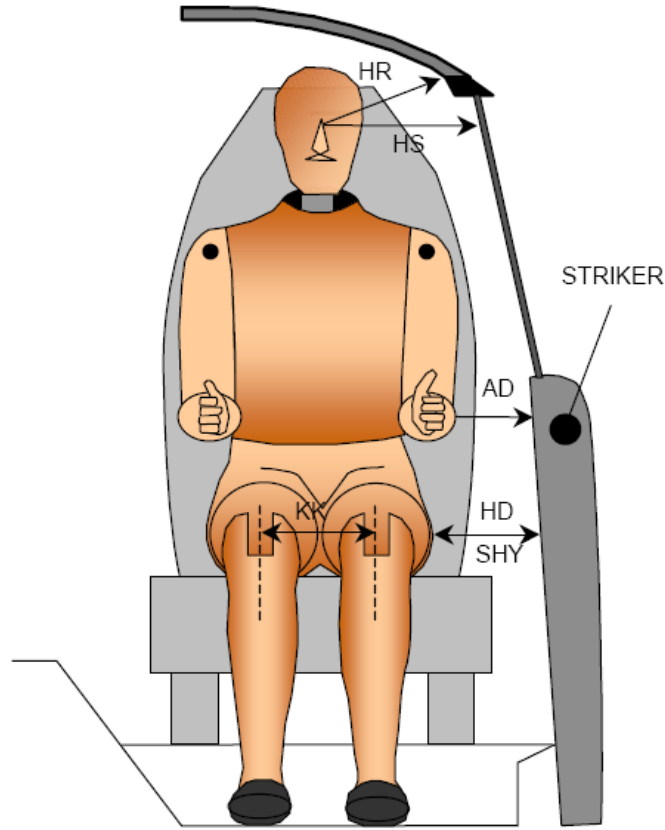
**LEFT SIDE VIEW**

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		61.2		
SWA°	Steering Wheel Angle		63.6		
SCA°	Steering Column Angle		26.4		
SA°	Seat Back Angle (On Seatback Post)		0.5		-1.4
HZ	Head to Roof	202	90.0	239	90.0
HH	Head to Header	360	29.3	329	50.1
HW	Head to Windshield	691	0.0	738	0.0
NR	Nose to Rim	390	5.1	488	29.3
CD	Chest to Dash	637	5.9	429	3.2
CS	Chest to Steering Hub	300	1.4		
RA	Rim to Abdomen	203	17.2		
KDL	Left Knee to Dash	189	22.5	138	32.2
KDR	Right Knee to Dash	179	22.5	136	24.0
PA°	Pelvic Angle		23.1		20.1
TA°	Tibia Angle		47.6		51.4
SK	Striker to Knee	626		728	
ST	Striker to Head	558		539	
SH	Striker to H-Point	326		389	

## DATA SHEET NO. 4

### DUMMY LATERAL CLEARANCE DIMENSIONS

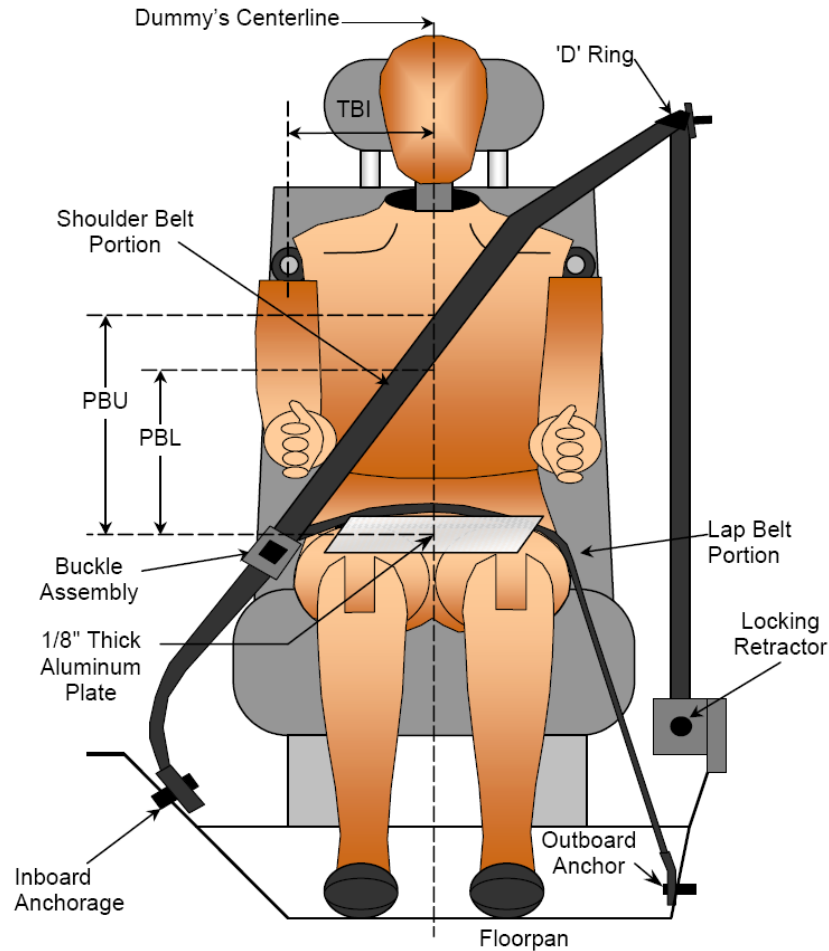
Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023



Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	116	81
HD	H-Point to Door	164	195
HR	Head to Side Header	226	267
HS	Head to Side Window	365	385
KK	Knee to Knee	352	170
SHY	Striker to H-Point (Y-Direction)	153	169
AA	Ankle to Ankle	365	190

**DATA SHEET NO. 5**  
**SEAT BELT POSITIONING DATA**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023



**FRONT VIEW OF DUMMY**

**SEAT BELT POSITIONING MEASUREMENTS**

Code	Measurement Description	Units	Driver	Passenger
PBU	Top Surface of Aluminum Plate to Belt Upper Edge	mm	294	276
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	247	129

**BELT LENGTH DATA**

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	898	927
Lap Belt Length as Measured on ATD	mm	605	695
Remainder of Belt on Reel	mm	783	615
Total Belt Length for Continuous Webbing Systems	mm	2286	2237

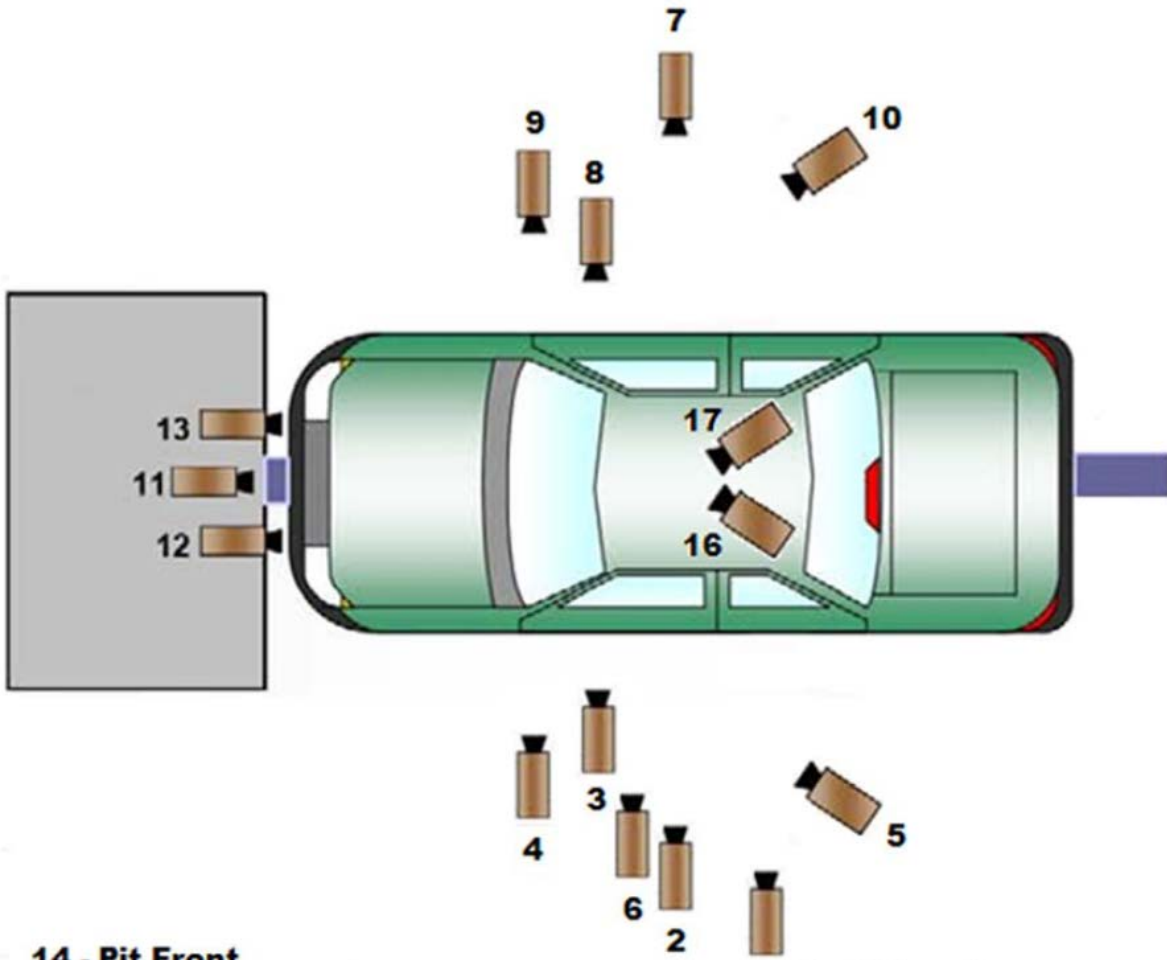
**DATA SHEET NO. 6**

**HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

**CAMERA POSITIONS FOR FRONTAL IMPACTS**



**14 - Pit Front**

**15 - Pit Rear**

**16 & 17 - Driver and Passenger Onboard**

**1- Real Time Camera**

*\*\*Camera locations are approximate and not to scale*

**DATA SHEET NO. 6 ... (CONTINUED)**

**HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023

**CAMERA LOCATIONS**

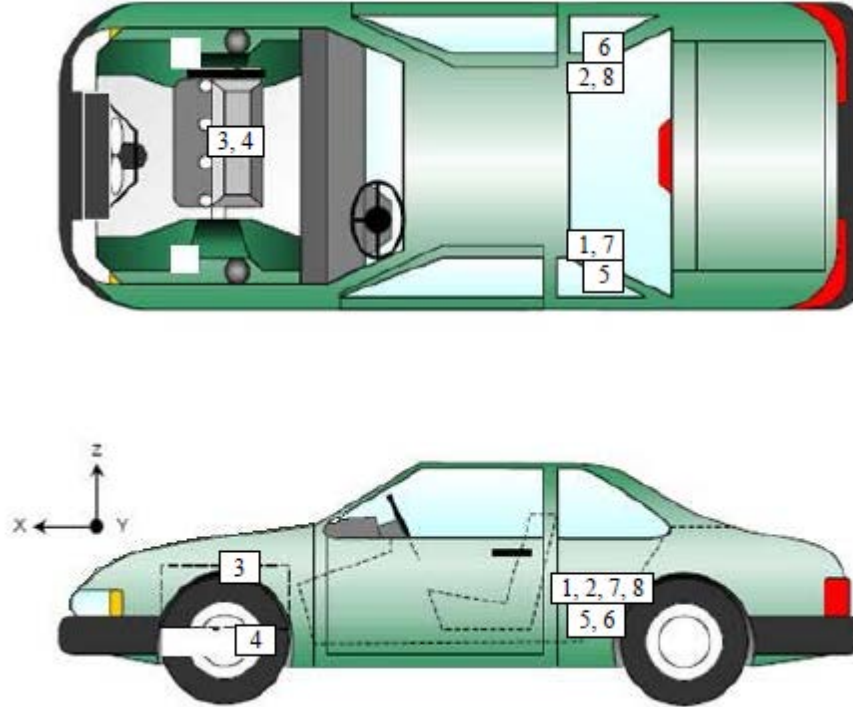
No.	Description	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-11412	-8150	-1484		30
2	Left Overall	-2456	-7975	-1025	20	1000
3	Driver Close-Up	-2590	-7950	-1371	50	1000
4	Left Front Half	-1701	-6197	-1701	35	1000
5	Left Angle	-6696	-10308	-3211	105	1000
6	Steering Column	-1966	-10412	-3688	35	1000
7	Right Overall	-2336	7569	-1012	20	1000
8	Passenger Close-Up	-1733	7581	-1408	50	1000
9	Right Front Half	-1600	8214	-1811	35	1000
10	Right Angle	-6217	9516	-4830	85	1000
11	Windshield	-354	0	-5749	28	1000
12	Driver Windshield	297	-366	-2460	24	1000
13	Passenger Windshield	297	366	-2460	24	1000
14	Pit Front	-756	0	1495	21	1000
15	Pit Rear	-3398	0	1495	15	1000
16	Driver Onboard	-2796	-247	-1721	8	1000
17	Passenger Onboard	-2796	247	-1721	8	1000

Coordinates:      +X = forward impact plane  
                          +Y = right of monorail center  
                          +Z = into ground

## DATA SHEET NO. 7

### VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023



### VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Accelerometer X-Direction	2995	-850	470
2	Right Rear Accelerometer X-Direction	2995	850	470
3	Engine Top X	650	-35	1080
4	Engine Bottom X	675	25	350
5	Left Rear Accelerometer Z-Direction	2995	-850	470
6	Right Rear Accelerometer Z-Direction	2995	850	470
7	Left Rear Accelerometer X-Direction Redundant	2995	-850	470
8	Right Rear Accelerometer X-Direction Redundant	2995	850	470

Reference Points:    X – Rear Surface of Vehicle (+ forward)  
                           Y – Vehicle Centerline (+ to right)  
                           Z – Ground Plane (+ down)

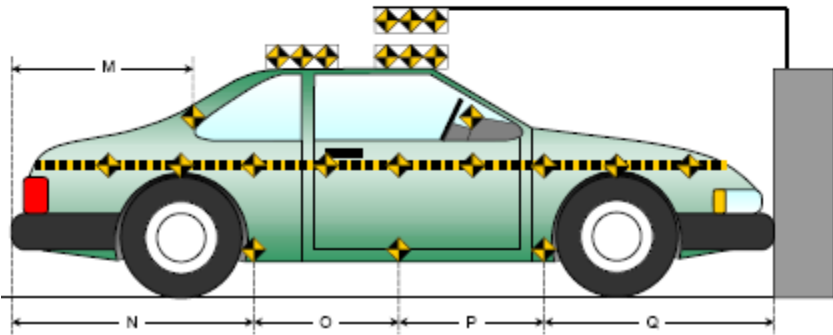
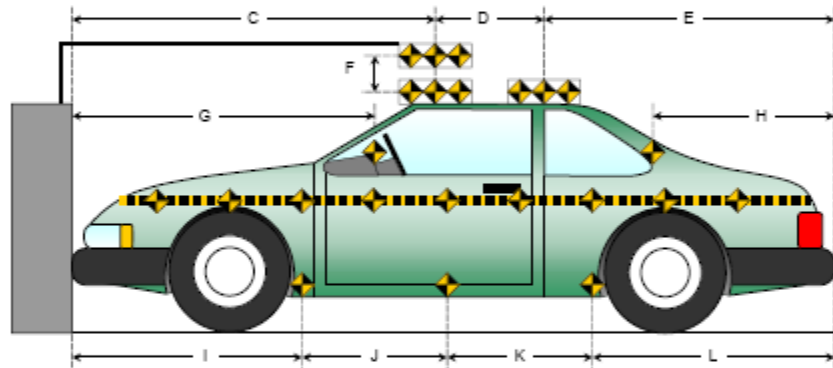
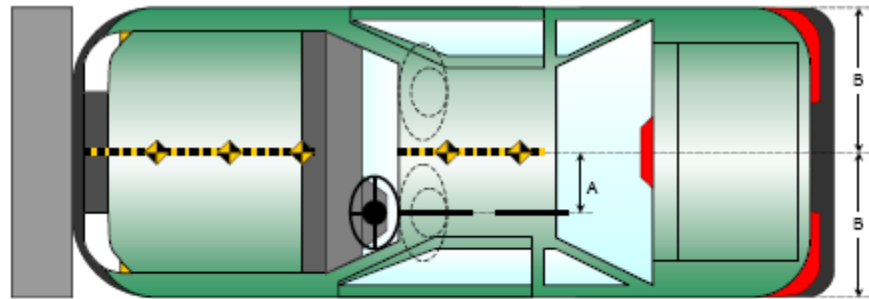
**DATA SHEET NO. 8**

**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

Item	Value
A	N/A
B	891
C	N/A
D	N/A
E	N/A
F	N/A
G	1850
H	1528
I	1506
J	891
K	888
L	1700
M	1523
N	1707
O	885
P	888
Q	1505



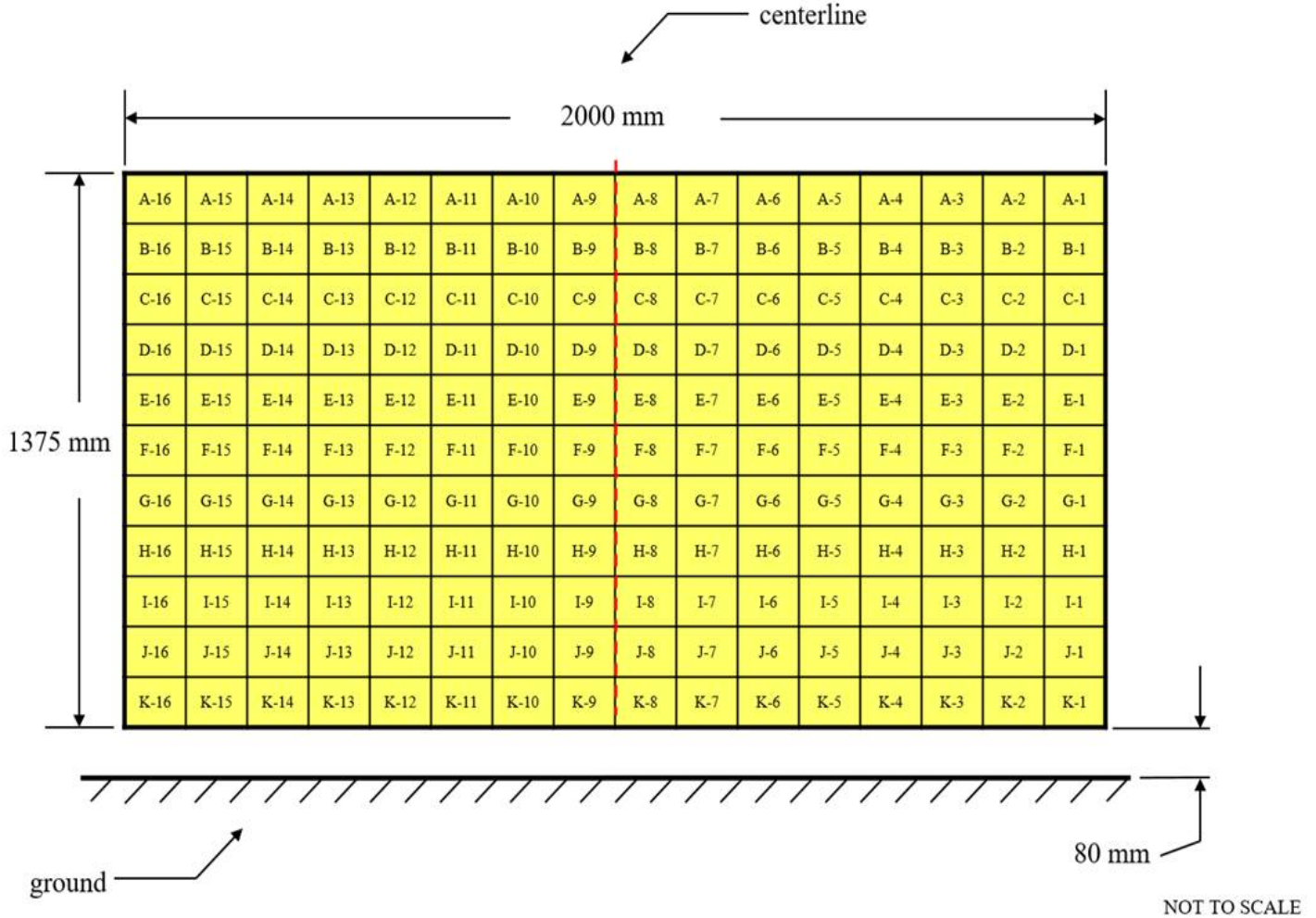
All measurements in millimeters.

**DATA SHEET NO. 9**

**LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023



**DATA SHEET NO. 10**

**TEST VEHICLE SUMMARY OF RESULTS**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

**INSTRUMENTATION**

Driver Dummy Sensors	47
Passenger Dummy Sensors	47
Vehicle Structure Accelerometers	8
Seat Belt Load Cells	3
Load Cell Barrier	528
Total	633

**CAMERA COVERAGE**

High-Speed Vehicle On Board	2
High-Speed Off Board	14
Real Time	1
Total	17

**DATA SHEET NO. 11**  
**POST-TEST OBSERVATIONS**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

Description	Driver	Passenger
Dummy Type/Serial No.	HIII 50th Percentile Male ATD / 360	HIII 5th Percentile Female ATD / DH1644
Head Contact	Frontal Airbag, Headrest	Frontal Airbag, Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	Frontal Airbag	Frontal Airbag
Left Knee Contact	Knee Bolster	Knee Bolster
Right Knee Contact	Knee Bolster	Knee Bolster

**DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION**

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Jammed Shut	Remained closed, latched, and operational
Rear Door Opening	Remained closed, latched, and operational	Remained closed, latched, and operational
Trunk/Hatch/Tailgate Opening	None	
Seat Track Shift (mm)	0	0
Seat Back Movement from Initial Position	None	None

**OTHER VEHICLE POST-TEST OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Broken
Window Damage	None
Other Notable Effects	None

**VEHICLE REBOUND FROM BARRIER**

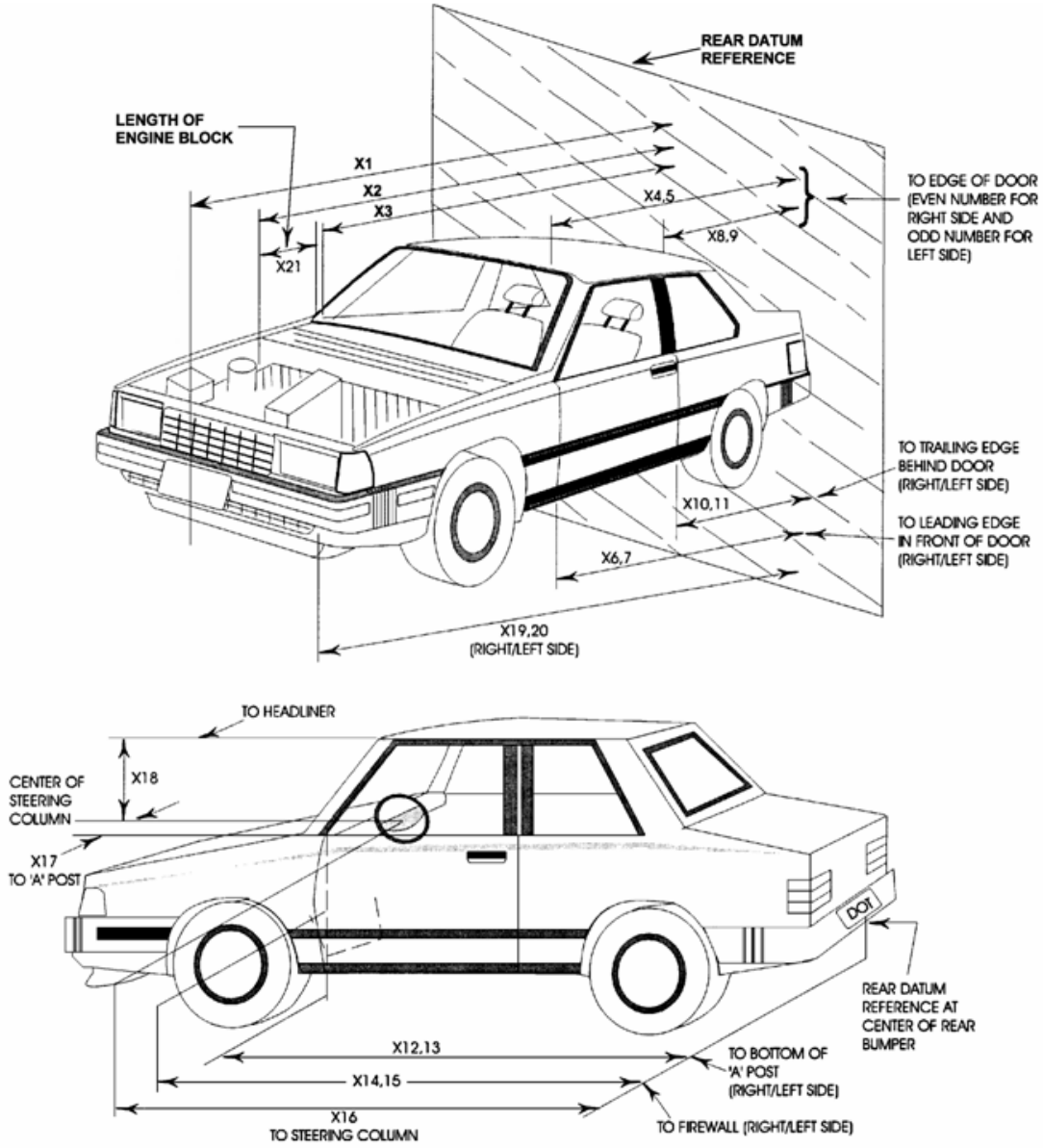
Measured Parameter	Units	Value
Left Side	mm	3065
Center	mm	3013
Right Side	mm	3258
Average	mm	3112

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

Restraint Type	Driver		Passenger	
	Installed	Operated	Installed	Operated
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 (Curtain)	Yes	No	Yes	No
Side Airbag 2 (Torso/Pelvis)	Yes	No	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes

**DATA SHEET NO. 12**  
**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023



**DATA SHEET NO. 12 ... (CONTINUED)****VEHICLE PROFILE MEASUREMENTS**Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

No.	Description	Pre-Test	Post-Test	Change
1	Total Length of Vehicle at Centerline	4985	4472	-513
2	Rear Surface of Vehicle to Front of Engine	4378	4140	-238
3	RSOV to Firewall	3981	3970	-11
4	RSOV to Upper Leading Edge of Right Door	3520	3522	2
5	RSOV to Upper Leading Edge of Left Door	3576	3573	-3
6	RSOV to Lower Leading Edge of Right Door	3509	3507	-2
7	RSOV to Lower Leading Edge of Left Door	3553	3549	-4
8	RSOV to Upper Trailing Edge of Right Door	2492	2490	-2
9	RSOV to Upper Trailing Edge of Left Door	2508	2505	-3
10	RSOV to Lower Trailing Edge of Right Door	2528	2523	-5
11	RSOV to Lower Trailing Edge of Left Door	2535	2529	-6
12	RSOV to Bottom of A-Pillar, Right Side	3376	3369	-7
13	RSOV to Bottom of A-Pillar, Left Side	3394	3390	-4
14	RSOV to Firewall, Right Side	3993	3970	-23
15	RSOV to Firewall, Left Side	3981	3983	2
16	RSOV to Steering Column	3082	3127	45
17	Center of Steering Column to A-Pillar	293	263	-30
18	Center of Steering Column to Headliner	470	538	68
19	RSOV to Right Side of Front Bumper	4432	4252	180
20	RSOV to Left Side of Front Bumper	4450	4234	-216
21	Length of Engine Block			
RD	RSOV to Right Side of Dash Panel	3431	3432	1
CD	RSOV to Center of Dash Panel	3391	3389	-2
LD	RSOV to Left Side of Dash Panel	3411	3406	-5

All measurements in millimeters.

**DATA SHEET NO. 13**

**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

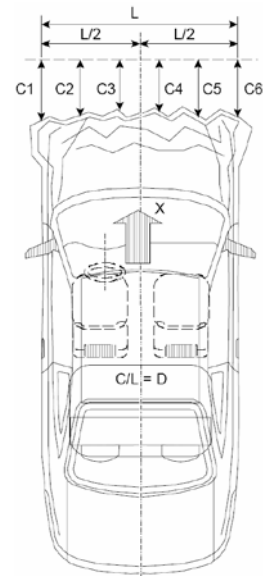
**VEHICLE INFORMATION**

VIN: 5NTJCDAE1PH057304 Wheelbase (mm): 2999  
 Vehicle Size Category: Truck Test Weight (kg): 2061.0

**ACCELEROMETER DATA**

Accelerometer Locations: Left Rear Crossmember  
 Cal. Procedure/Interval: Vibration Test / 6 months  
 Integration Algorithm: NHTSA Standard  
 Impact Velocity (km/h): 56.53  
 Velocity Change (km/h): 68.3  
 Time of Separation (msec): 73.5

Linearity: Good



**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW3  
 Midpoint of Damage: Vehicle Centerline  
 Damage Region Length (mm): 1677  
 Impact Mode: Full Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Crush
C1	Crush Zone 1 at Left Side	mm	252	819	567
C2	Crush Zone 2 at Left Side	mm	101	800	699
C3	Crush Zone 3 at Left Side	mm	21	813	792
C4	Crush Zone 4 at Right Side	mm	21	817	796
C5	Crush Zone 5 at Right Side	mm	101	805	704
C6	Crush Zone 6 at Right Side	mm	249	826	577
L	C1 to C6	mm	1677		

## DATA SHEET NO. 14

### VEHICLE INTRUSION MEASUREMENTS

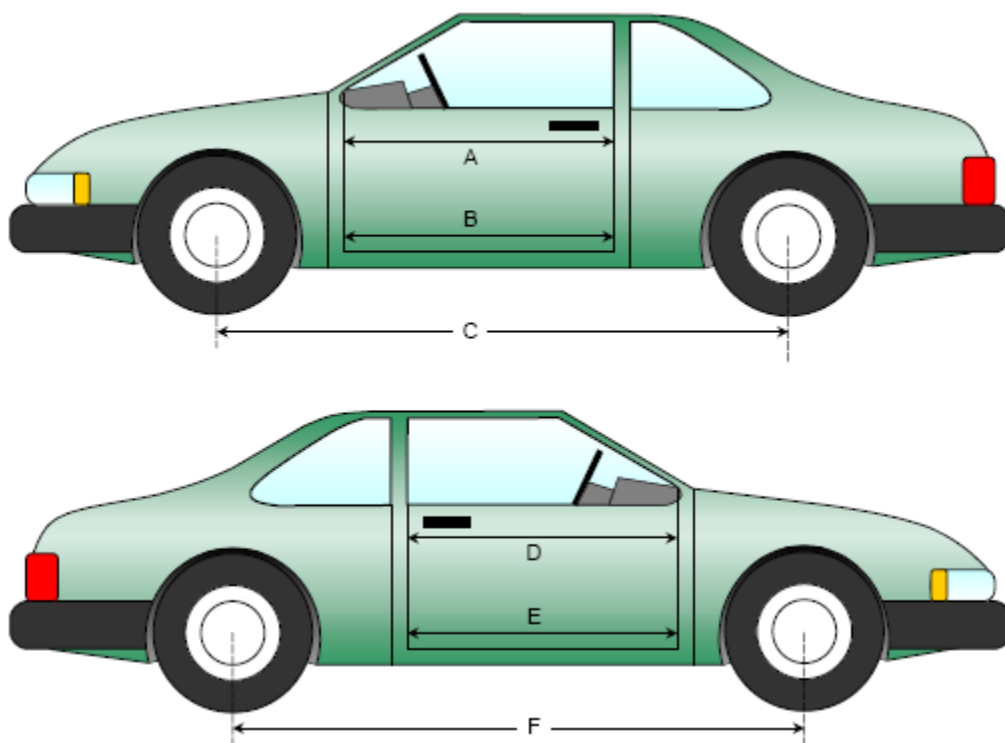
Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023

#### DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Change
A	Left Side Upper	mm	1068	1068	0
B	Left Side Lower	mm	1018	1020	2
D	Right Side Upper	mm	1028	1033	5
E	Right Side Lower	mm	981	984	3

#### WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Change
C	Left Side Wheelbase	mm	2999	2900	-99
F	Right Side Wheelbase	mm	2999	2928	-71



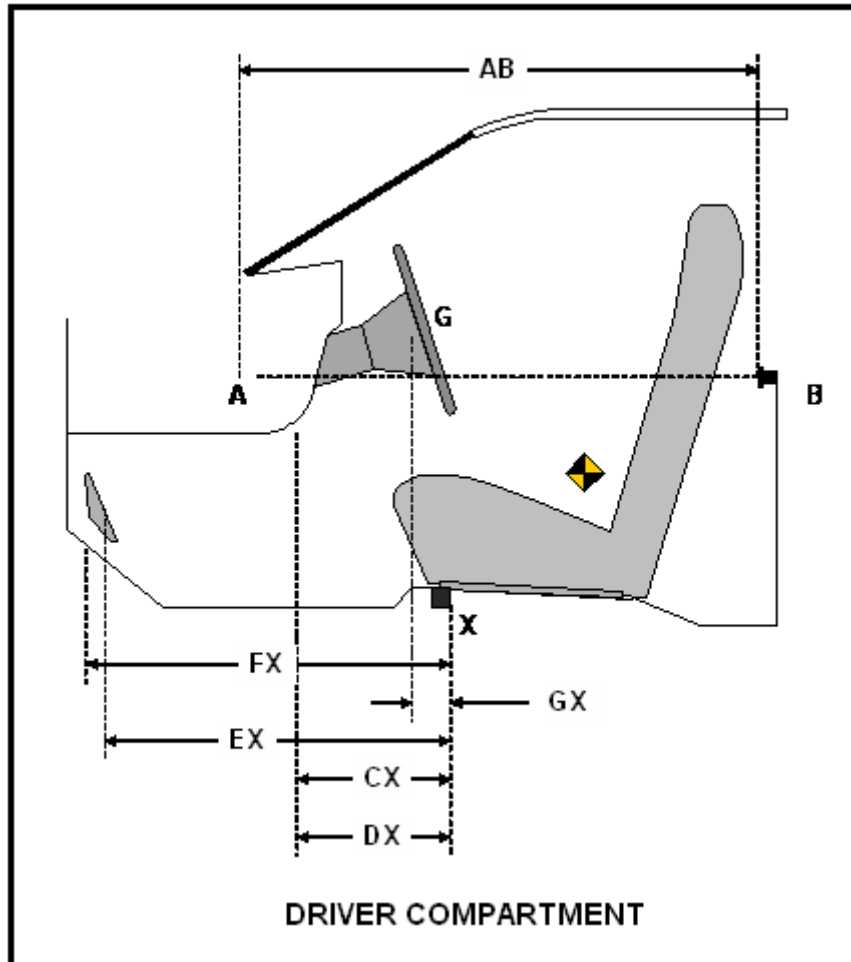
**DATA SHEET NO. 14 ... (CONTINUED)**  
**VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Change
AB	Door Opening (Inside Window Jam)	mm	977	979	2
CX	Left Knee Bolster to X	mm	275	305	30
DX	Right Knee Bolster to X	mm	304	336	32
EX	Brake Pedal to X	mm	576	516	-60
FX	Foot Rest to X	mm	571	559	-12
GX	Center of Steering Wheel Hub to X	mm	62	106	44

X = Front of Seat Track (Stationary)



**DATA SHEET NO. 15**

**SUMMARY OF INDICANT FMVSS 212 AND 219 (PARTIAL) DATA**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

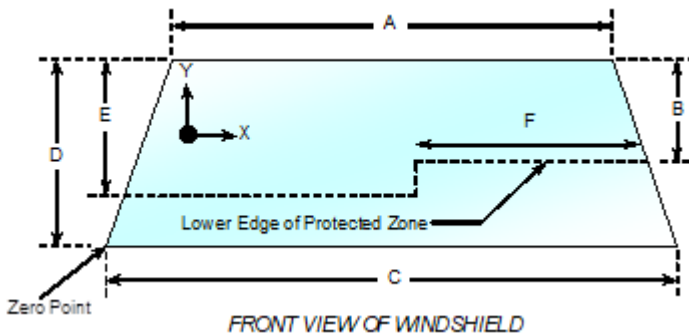
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber molding and rubber cement.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicles not equipped with occupant passive restraints and 50% for each side of the windshield for vehicles which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.5°C

**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2294	2294	100.0%
Right Side	2294	2294	100.0%
Total	4588	4588	100.0%



Item	Units	Value
A	mm	1246
B	mm	505
C	mm	1502
D	mm	920
E	mm	527
F	mm	590

**AREAS OF PROTECTED ZONE FAILURES**

**A.** Provide Coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield.

X	Y

**B.** Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

X	Y

**DATA SHEET NO. 16**

**FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS**

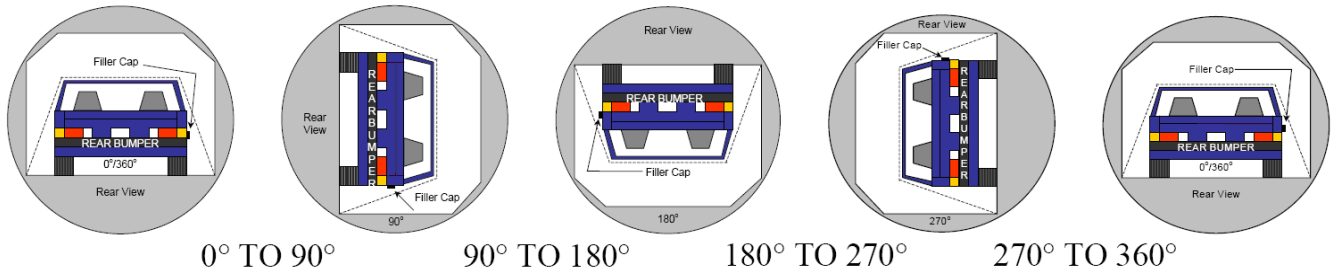
Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck      NHTSA No.: M20234200  
 Test Program: 56.3 km/h Frontal Impact NCAP Test      Test Date: 02/21/2023

**FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA**

Temperature at Time of Impact: 16.7°C      Test Time: 3:32 PM

**Stoddard Solvent Spillage Measurements**

- 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: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard solvent spillage: N/A

**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	84	300	384
90° To 180°	82	300	382
180° To 270°	81	300	381
270° To 360°	79	300	379

**DATA SHEET NO. 16 ... (CONTINUED)**

**FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023

**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**

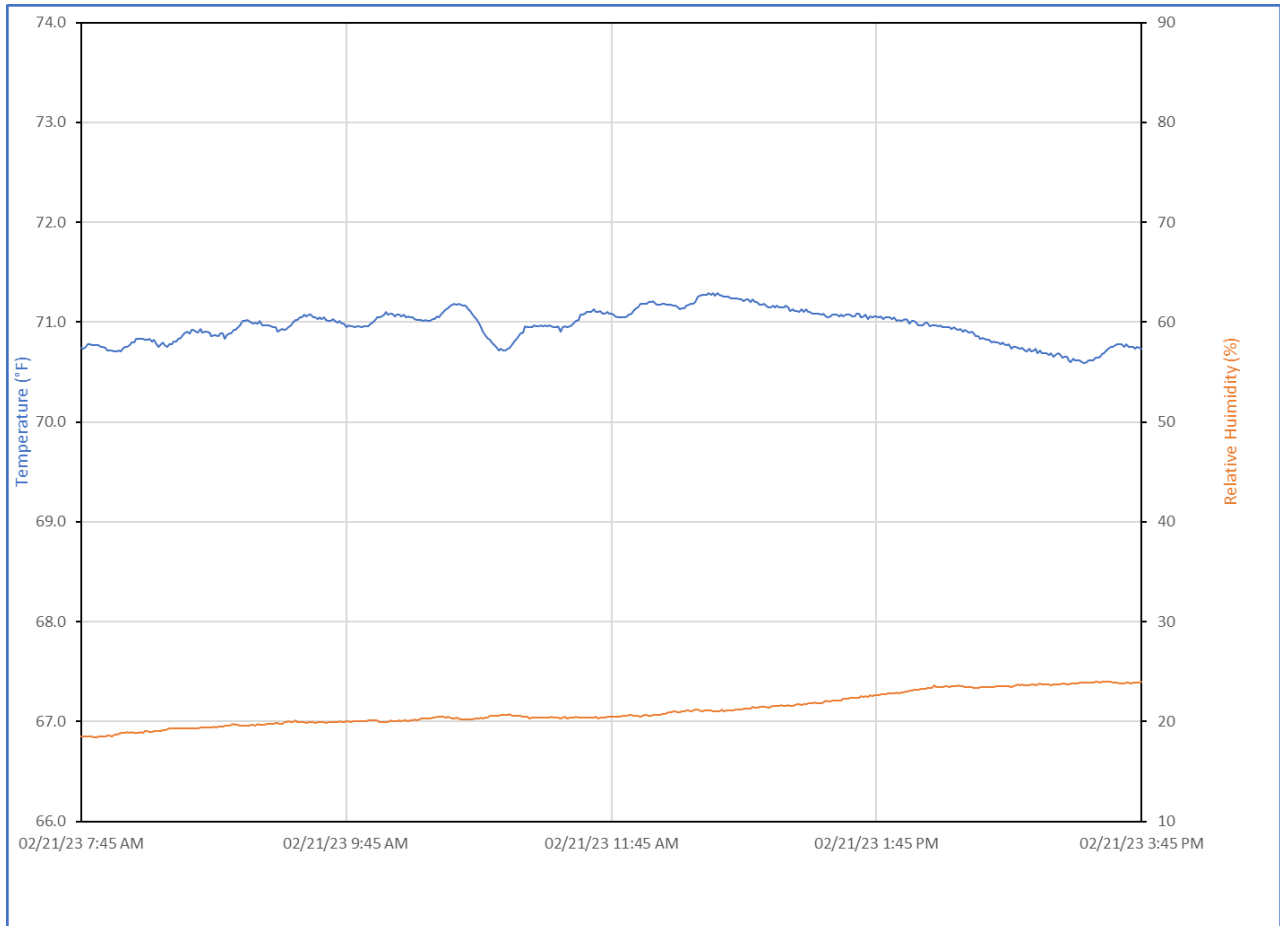
Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

**DATA SHEET NO. 17**

**DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART**

Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck NHTSA No.: M20234200

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 02/21/2023



**APPENDIX A**  
**PHOTOGRAPHIC DOCUMENTATION**

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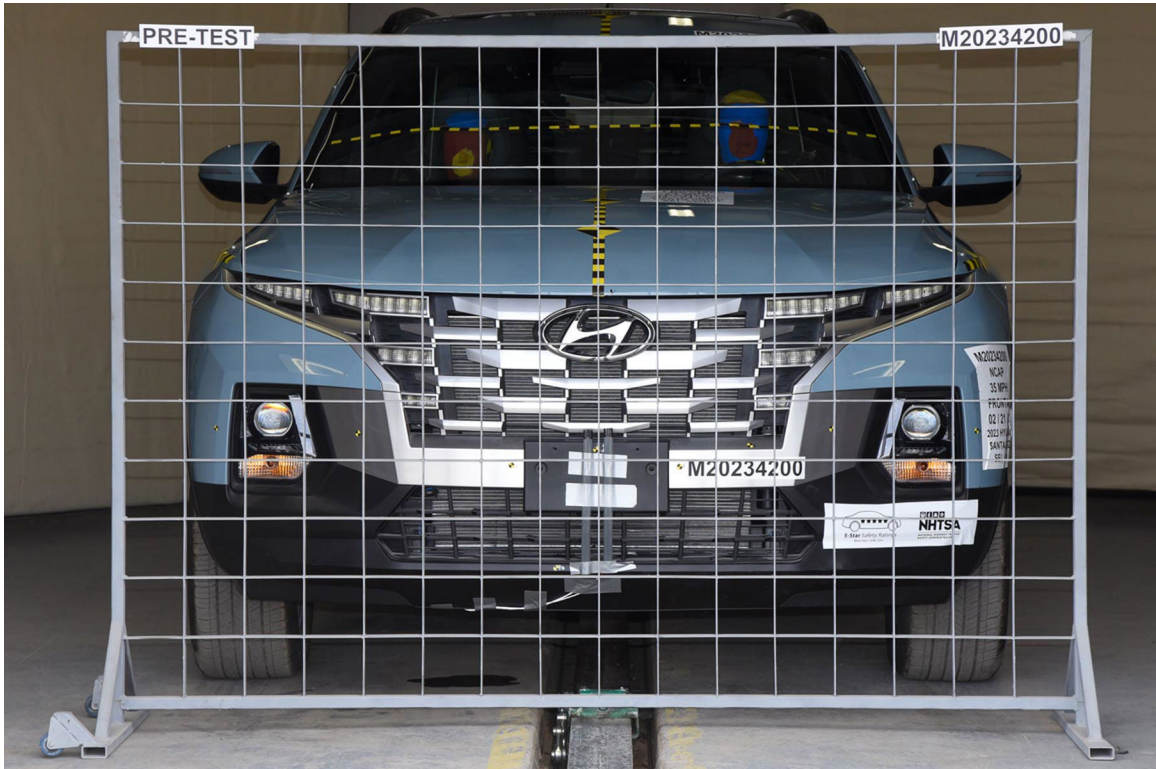


FIGURE 1. Load Cell Location

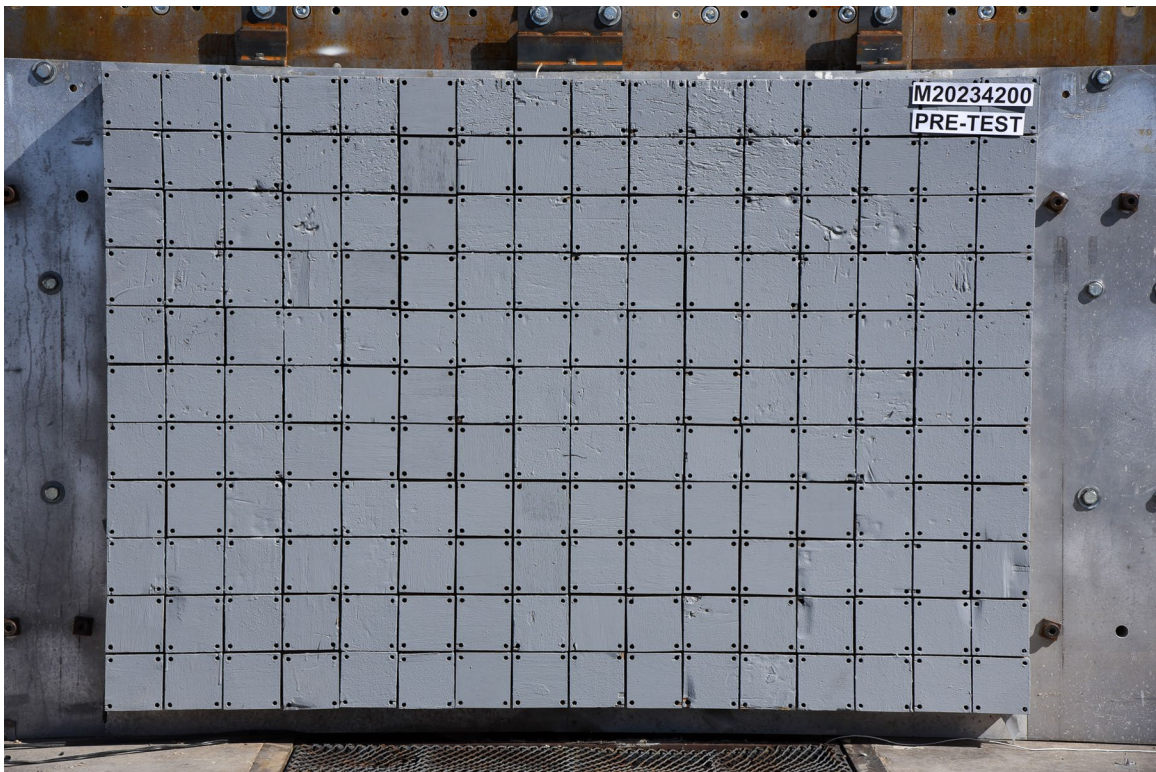


FIGURE 2. Pre-Test Load Cell Wall

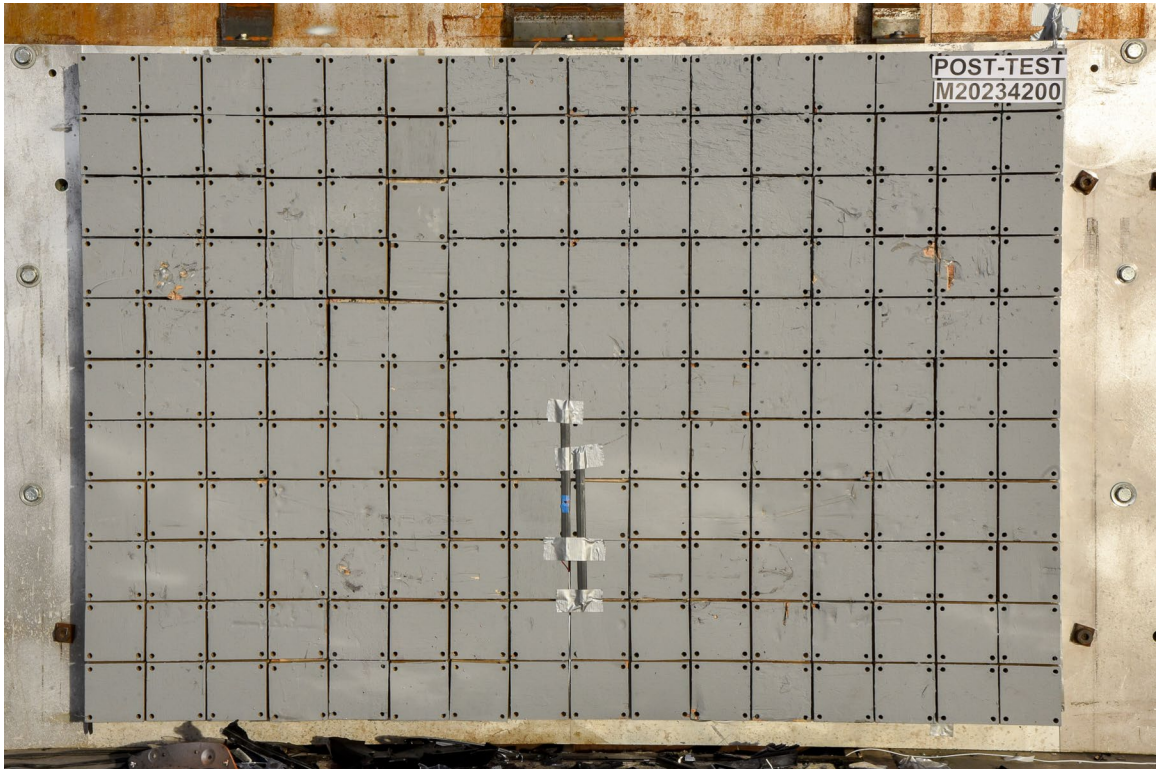


FIGURE 3. Post-Test Load Cell Wall

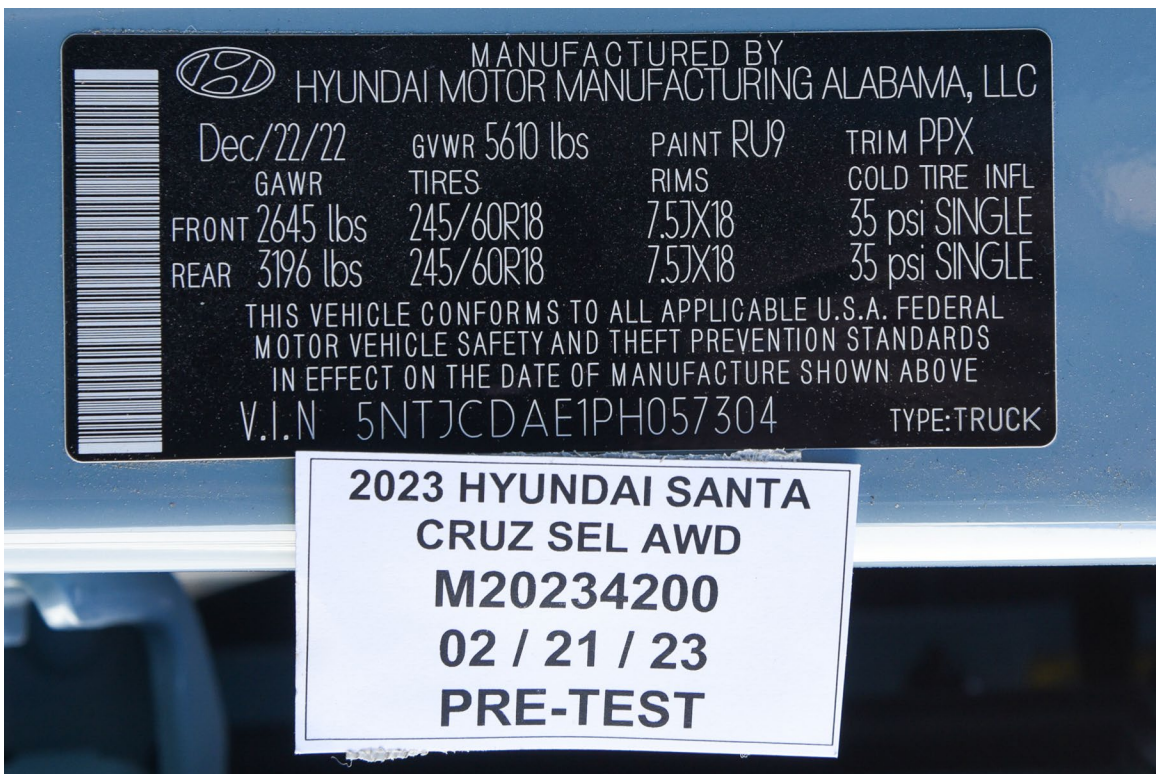


FIGURE 4. Manufacturer's Label



FIGURE 5. Tire Placard



FIGURE 6. 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck Frontal as Delivered



FIGURE 7. Left Rear 3/4 View, As Received



FIGURE 8. Pre-Test Front View of Test Vehicle



FIGURE 9. Post-Test Front View of Test Vehicle



FIGURE 10. Pre-Test Left View of Test Vehicle



FIGURE 11. Post-Test Left View of Test Vehicle



FIGURE 12. Pre-Test Right View of Test Vehicle



FIGURE 13. Post-Test Right Vehicle of Test Vehicle



FIGURE 14. Pre-Test Right Front 3/4 View



FIGURE 15. Post-Test Right Front 3/4 View



FIGURE 16. Pre-Test Left Rear 3/4 View



FIGURE 17. Post-Test Left Rear 3/4 View

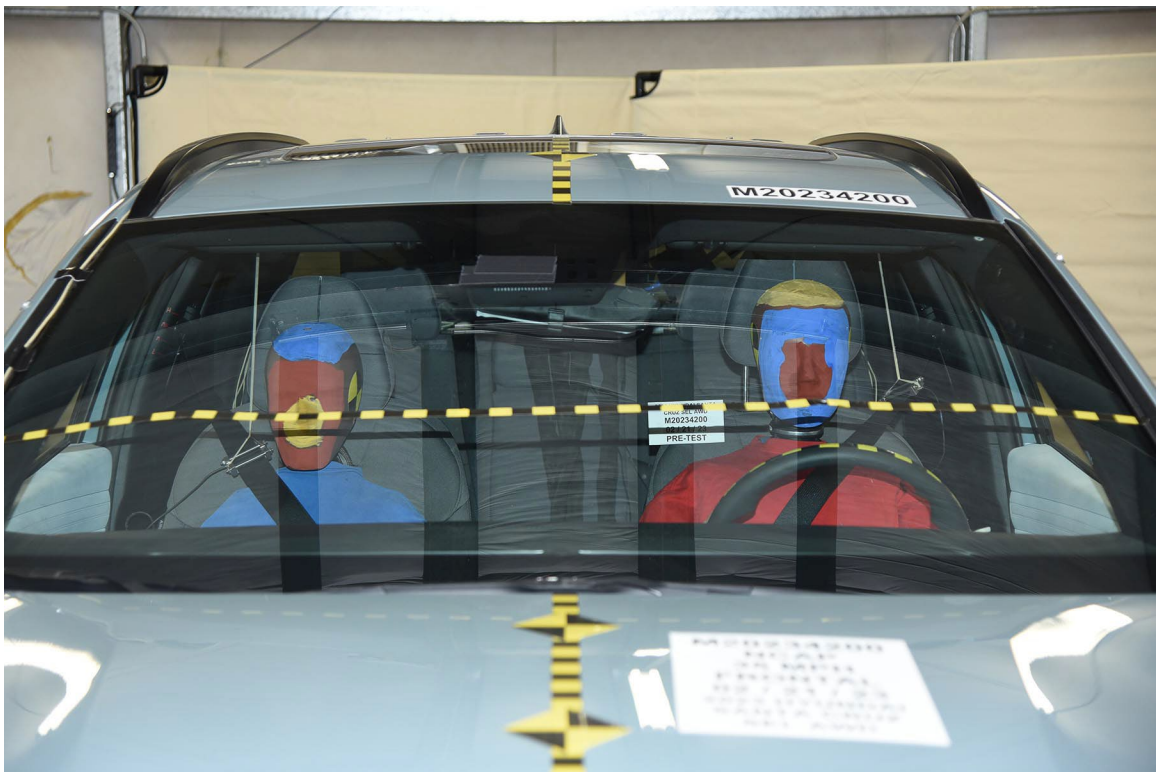


FIGURE 18. Pre-Test Windshield View





FIGURE 21. Post-Test Engine Compartment View



FIGURE 22. Pre-Test Fuel Filler Cap View



FIGURE 23. Post-Test Fuel Filler Cap View

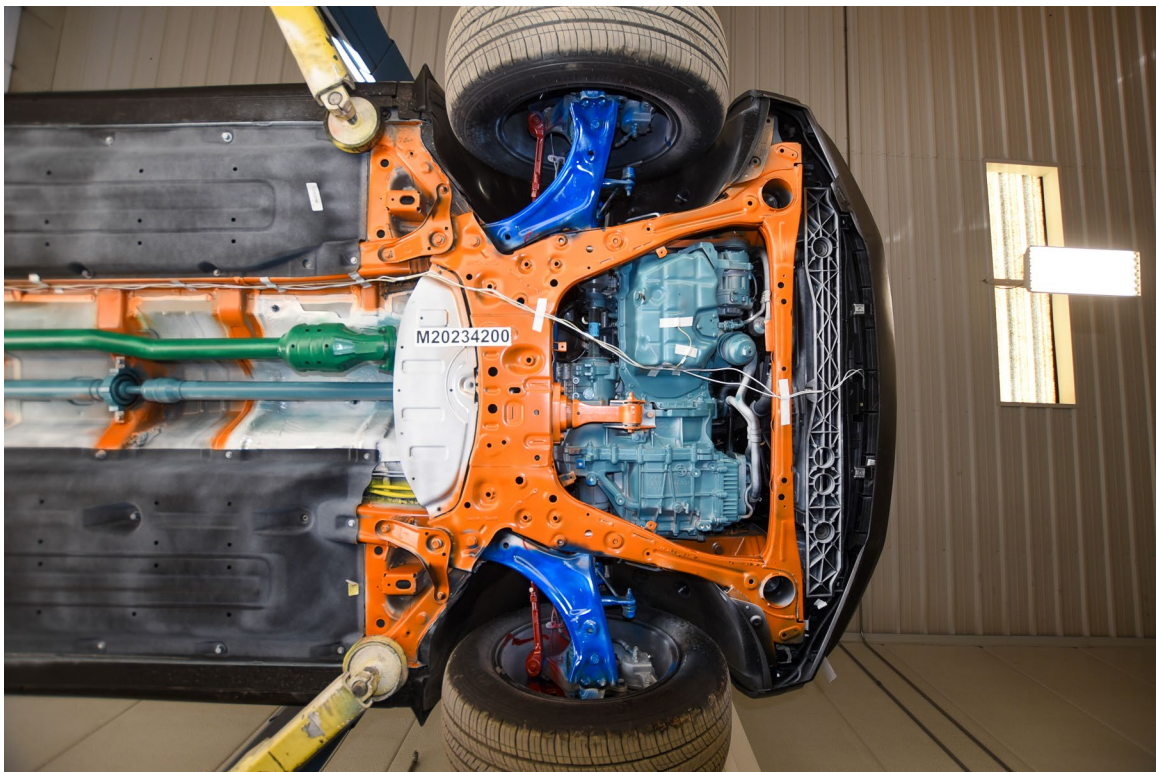


FIGURE 24. Pre-Test Front Underbody View

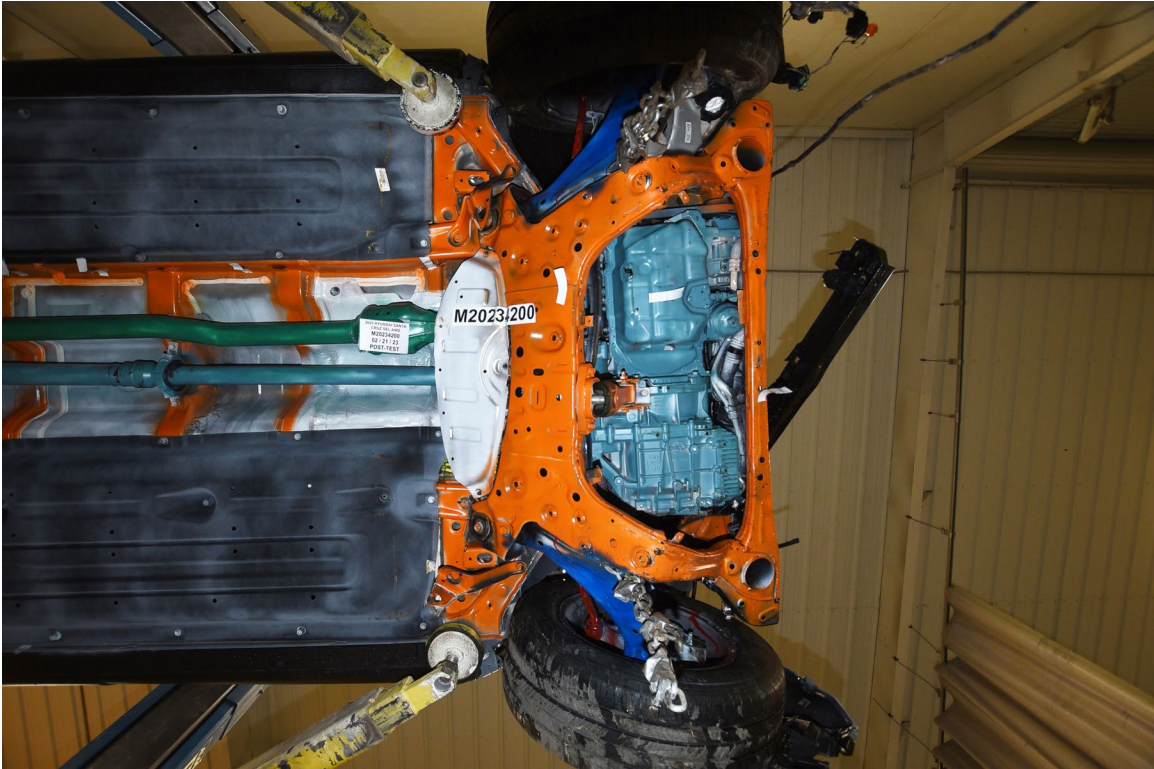


FIGURE 25. Post-Test Front Underbody View

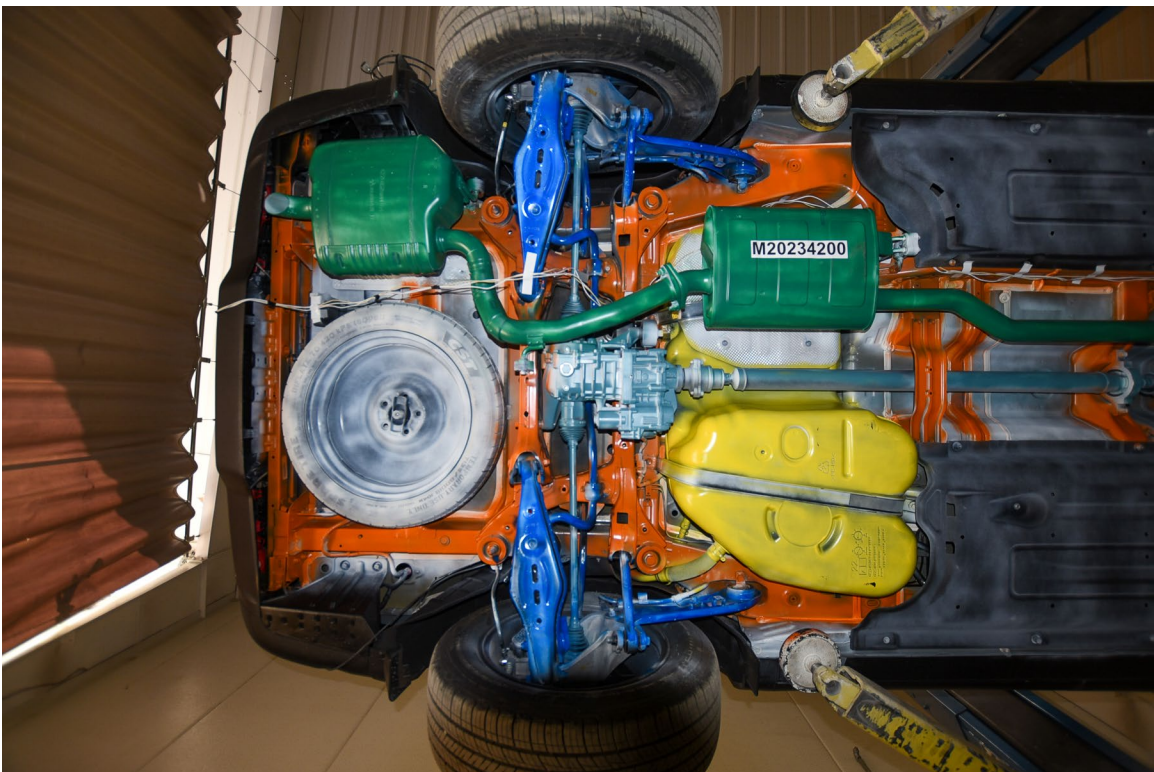


FIGURE 26. Pre-Test Rear Underbody View



FIGURE 27. Post-Test Rear Underbody View



FIGURE 28. Pre-Test Dummy Cable Routing



FIGURE 29. Post-Test Dummy Cable Routing



FIGURE 30. Pre-Test Driver Dummy Front View



FIGURE 31. Post-Test Driver Dummy Front View



FIGURE 32. Pre-Test Driver Dummy Window View



FIGURE 33. Post-Test Driver Dummy Window View



FIGURE 34. Pre-Test Driver Dummy and Vehicle Interior View



FIGURE 35. Post-Test Driver Dummy and Vehicle Interior View



FIGURE 36. Pre-Test Driver's Seat Fore-Aft Markings



FIGURE 37. Post-Test Driver's Seat Fore-Aft Markings



FIGURE 38. Pre-Test View of Belt Anchorage for Driver Dummy



FIGURE 39. Post-Test View of Belt Anchorage for Driver Dummy



FIGURE 40. Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy



FIGURE 41. Post-Test View of Belt Buckle and Latch Plate for Driver Dummy



FIGURE 42. Pre-Test Driver Dummy Feet



FIGURE 43. Post-Test Driver Dummy Feet



FIGURE 44. Pre-Test Driver's Side Knee Bolster



FIGURE 45. Post-Test Driver's Side Knee Bolster



FIGURE 46. Pre-Test Driver's Side Floorpan



FIGURE 47. Post-Test Driver's Side Floorpan



FIGURE 48. Post-Test Driver Dummy Face



FIGURE 49. Post-Test Driver Dummy Contact with Airbag



FIGURE 50. Post-Test Driver Dummy Contact with Headrest



FIGURE 51. Pre-Test View of the Steering Wheel



FIGURE 52. Post-Test View of the Steering Wheel



FIGURE 53. Pre-Test Passenger Dummy Front View



FIGURE 54. Post-Test Passenger Dummy Front View



FIGURE 55. Pre-Test Passenger Dummy Window View



FIGURE 56. Post-Test Passenger Dummy Window View



FIGURE 57. Pre-Test Passenger Dummy and Vehicle Interior View



FIGURE 58. Post-Test Passenger Dummy and Vehicle Interior View



FIGURE 59. Pre-Test Passenger's Seat Fore-Aft Markings



FIGURE 60. Post-Test Passenger's Seat Fore-Aft Markings



FIGURE 61. Pre-Test View of Belt Anchorage for Passenger Dummy



FIGURE 62. Post-Test View of Belt Anchorage for Passenger Dummy



FIGURE 63. Pre-Test View of Belt Buckle and Latch Plate for Passenger Dummy



FIGURE 64. Post-Test View of Belt Buckle and Latch Plate for Passenger Dummy

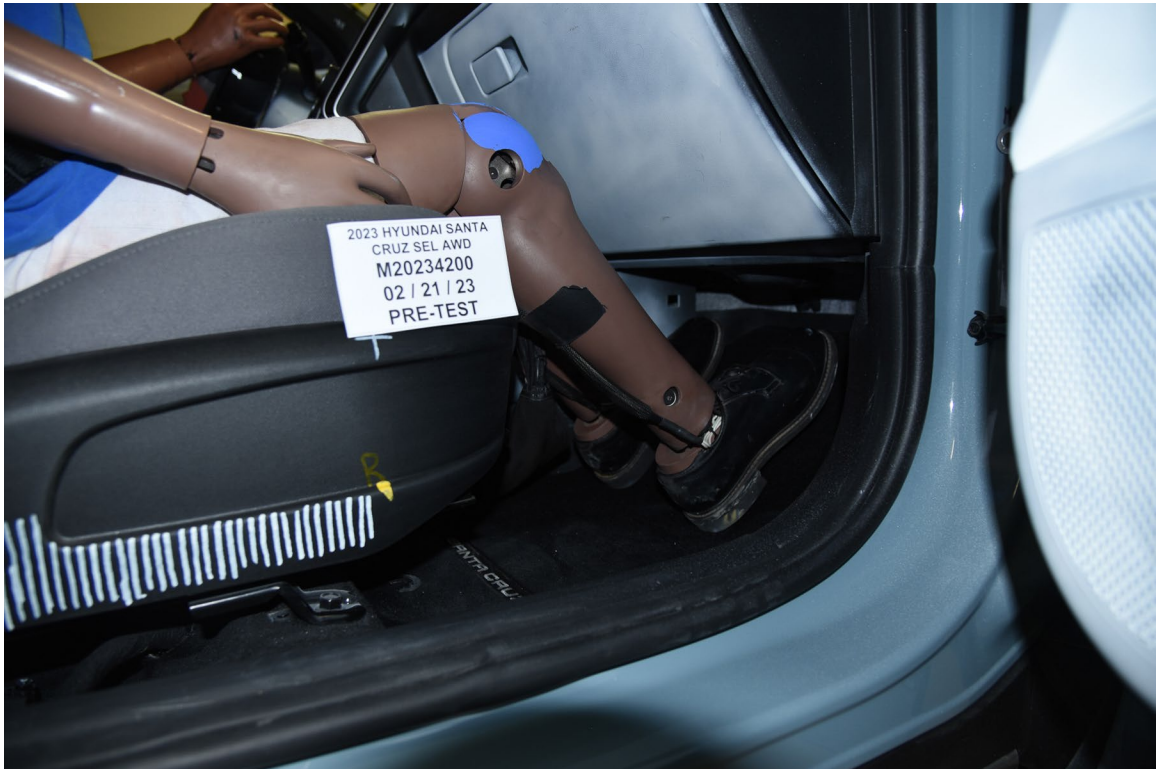


FIGURE 65. Pre-Test Passenger Dummy Feet



FIGURE 66. Post-Test Passenger Dummy Feet



FIGURE 67. Pre-Test Passenger's Side Knee Bolster



FIGURE 68. Post-Test Passenger's Side Knee Bolster



FIGURE 69. Pre-Test Passenger's Side Floorpan



FIGURE 70. Post-Test Passenger's Side Floorpan



FIGURE 71. Post-Test Passenger Dummy Face



FIGURE 72. Post-Test Passenger Dummy Contact with Airbag



FIGURE 73. Post-Test Passenger Dummy Contact with Headrest

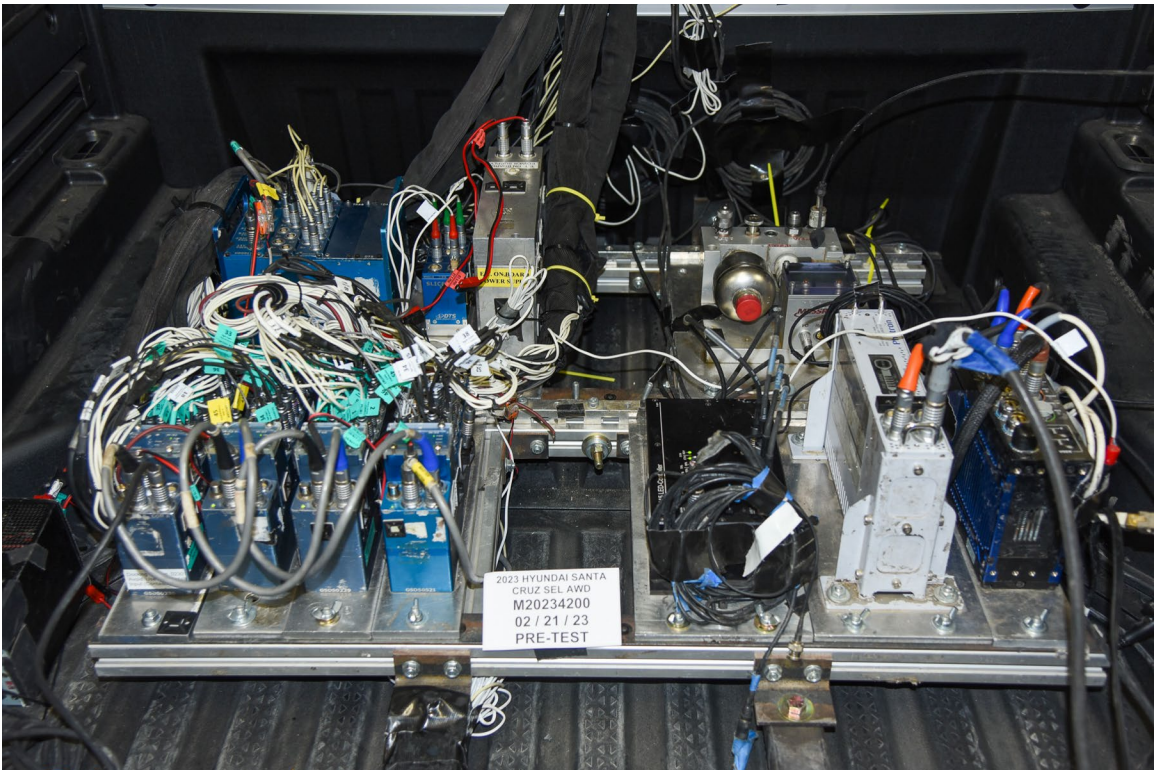


FIGURE 74. Photograph of Ballast Installed in Vehicle

# Photograph Not Applicable No Stoddard Solvent Spillage

FIGURE 75. Post-Test Stoddard Solvent Spillage Location View



FIGURE 76. Post-Test Speed Trap Read-Out



FIGURE 77. Vehicle at 0° on Static Rollover Device



FIGURE 78. Vehicle at 90° on Static Rollover Device

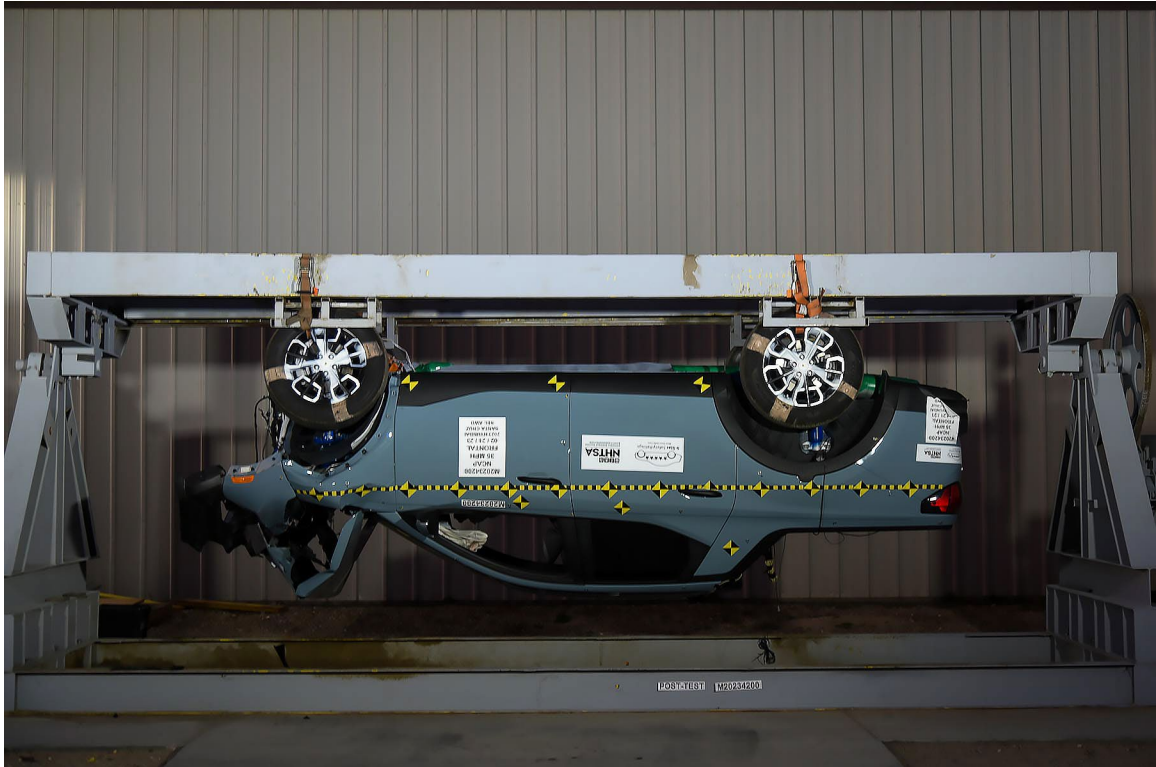


FIGURE 79. Vehicle at 180° on Static Rollover Device



FIGURE 80. Vehicle at 270° on Static Rollover Device



FIGURE 81. Vehicle at 360° on Static Rollover Device



FIGURE 82. 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck Frontal Impact Event

VIN: SNTJCDAE1PH057304

VIN: SNTJCDAE1PH057304



2023 SANTA CRUZ SEL AWD

**SOLD TO: TX187**  
 HYUNDAI OF LUFKIN  
 3101 S. MEDFORD DRIVE  
 LUFKIN TX 75901

**SHIPPED TO: TX187**

VIN: SNTJCDAE1PH057304  
 MODEL: S0432445  
 ENGINE: G4KNNC365797  
 PORT OF ENTRY: MA  
 EXTERIOR COLOR: BLUE STONE  
 INTERIOR/SEAT COLOR: GRAY/GRAY  
 TRANSPORT: TRUCK  
 ACCESSORY WEIGHT: 21 lbs/ 110 lbs.  
 EMISSIONS: This vehicle is certified to meet emission requirements in all 50 states

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.

Source: National Highway Traffic Safety Administration (NHTSA).  
www.safercar.gov or 1-888-327-4236

**STANDARD FEATURES:**  
**SECURITY BEST WARRANTY**  
 5-year/100,000-mile New Vehicle Warranty\*  
 10-year/100,000-mile Powertrain Warranty\*  
 7-year/Unlimited-mile Anti-rust/Perforation Warranty\*  
 5-year/50,000-mile Complimentary Maintenance\*\*  
 \*Limited restrictions, see dealer for details  
**ADVANCED SAFETY TECHNOLOGY**  
 Forward Collision-avoidance Assist  
 Blind-spot Collision-avoidance Assist  
 Rear Cross-traffic Collision-avoidance Assist  
 Lane Keeping Assist, Lane Following Assist  
 Driver Attention Warning  
 Safe Exit Warning  
 Front, Side & Side-curtain Airbags  
**POWERTRAIN TECHNOLOGY**  
 Smartstream 2.5L 4-cylinder Engine  
 8-speed Automatic Transmission w/ SHIFTSERVO  
 HTRAC All Wheel Drive  
**EXTERIOR**  
 18-inch Alloy Wheels  
 Automatic Headlights  
 LED Daytime Running Lights  
 LED Tailgate  
 Sheet Metal Composite Bed  
 Under Bed & Sideval Storage Compartments  
 Rear Bumper Corner Steps  
 Temporary Compact Spare Tire  
**COMFORT & CONVENIENCE**  
 Proximity Key w/ Push Button Start  
 Remote Engine Start  
 Power Driver's Seat w/ Lumbar Support  
 Heated Front Seats  
 8-speaker Bose® Premium Audio System  
 Air Conditioning w/ Cabin Air Filter  
 LCD Multi-information Display  
 8-inch Display Audio w/ Android Auto™ & Apple CarPlay®  
 AMP®/FM® Radio™/Tuner  
 Rear View Monitor  
 Dual Front USB Ports  
 SiriusXM® Radio w/ 90-day Platinum trial subscription;  
 Not Available in AK & HI

**COMFORT & CONVENIENCE (cont.)**  
 SiriusXM Connected Services 3-year Standard (enrollment req.)  
 Bluetooth Remote Start (3-year Complimentary Service)  
 Full Tank of Fuel  
**Manufacturer's Suggested Retail Price:** \$29,290.00

**ADDED FEATURES:**  
 ActiveX Package  
 Power Sunroof  
 Integrated Convenience Cover  
 Adjustable Cervical Crest Rail System  
 Power Windows  
 110V/AC Power Window in Bed  
 10.25-inch Digital Instrument Cluster  
 Wireless Device Charging  
 LED Interior Lights & Bed Lighting  
 Rear Sliding Glass  
 Cargo Package  
 Bed Mat, Cargo Net, Envelope, & Electric Jack  
 \*Crate Port Mats  
 \*\*Mol Guards  
**Manufacturer's Suggested Retail Price:** \$3,270.00

**Interior Freight & Handling:** \$1,295.00  
**Total Price:** \$34,425.00

NOT OFFICIAL  
SUBJECT TO CHANGE

The 2023 Hyundai SANTA CRUZ. Our one-of-a-kind Sport Adventure Vehicle.



**Fuel Economy and Environment**

**Fuel Economy**  
 23 MPG combined city/hwy  
 21 city  
 25 highway  
 4.3 gallons per 100 miles

**You spend \$1,500 more in fuel costs over 5 years** compared to the average new vehicle.

**Annual fuel COST \$1,900**

**Fuel Economy & Greenhouse Gas Rating** (tailpipe only)  
 5 (Best)

**Smog Rating** (tailpipe only)  
 5 (Best)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 28 MPG and costs \$2,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.99 per gallon, which is more per gallon than required. Vehicle emissions are a significant cause of climate change and smog.

**fuel economy.gov**  
 Calculate personalized estimates, and compare vehicles.

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline license and title fees, state and local taxes and dealer-installed options and accessories are not included in the manufacturer's suggested retail price. This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1231 et seq. which prohibits its removal or alteration prior to delivery to the ultimate purchaser.

**PARTS CONTENT INFORMATION FOR VEHICLE IN THIS CARLINE:**  
 U.S./CANADIAN PARTS CONTENT: 55 %  
 MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 35 %

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

**FOR THIS VEHICLE:**  
 FINAL ASSEMBLY POINT: MONTGOMERY, ALABAMA, U.S.A.  
 COUNTRY OF ORIGIN:  
 ENGINE: U.S.A.  
 TRANSMISSION: U.S.A./KOREA

2 A

VIN: SNTJCDAE1PH057304

FIGURE 83. Monroney Label Photograph

**APPENDIX B**  
**DUMMY RESPONSE DATA TRACES**

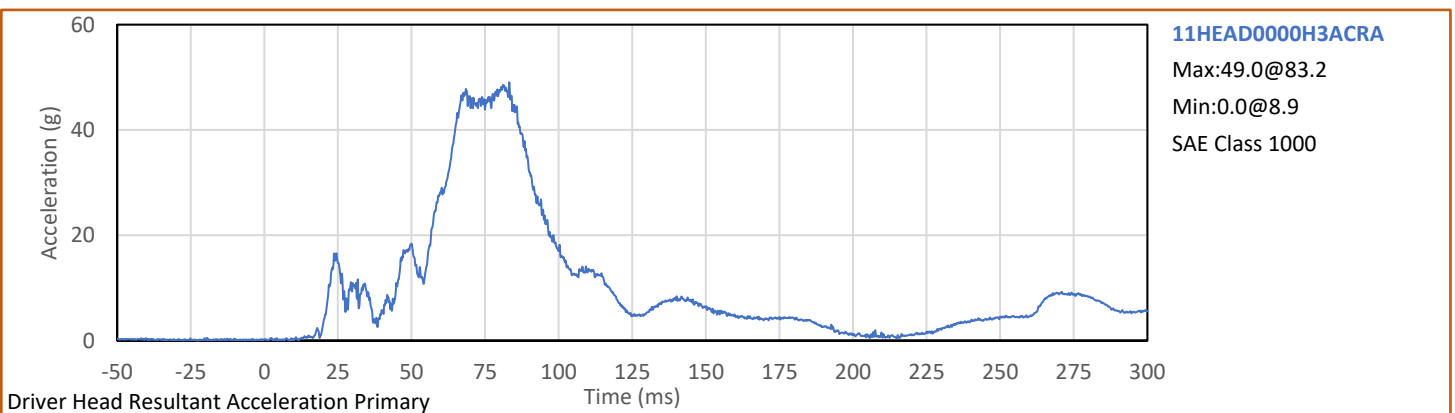
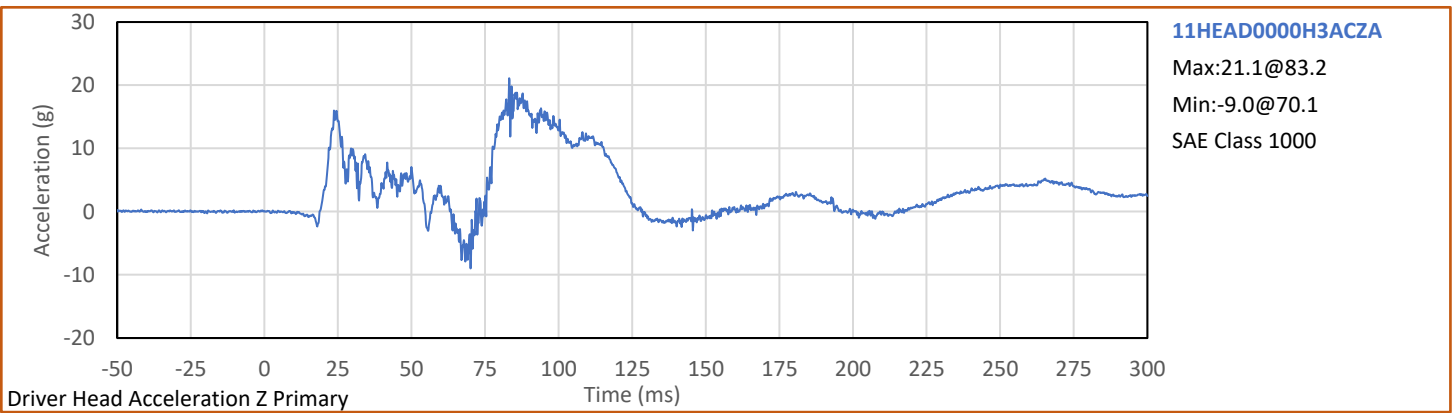
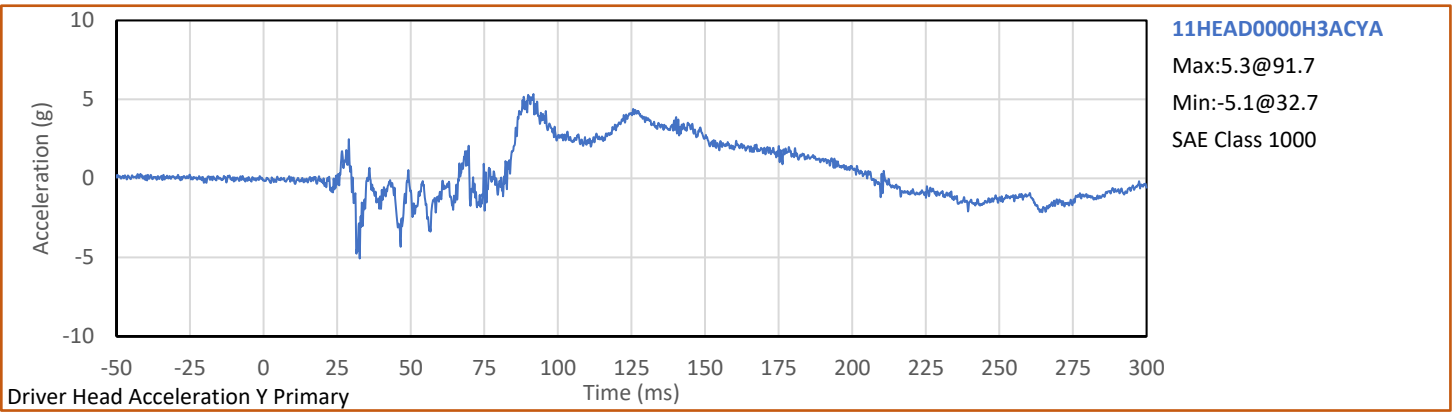
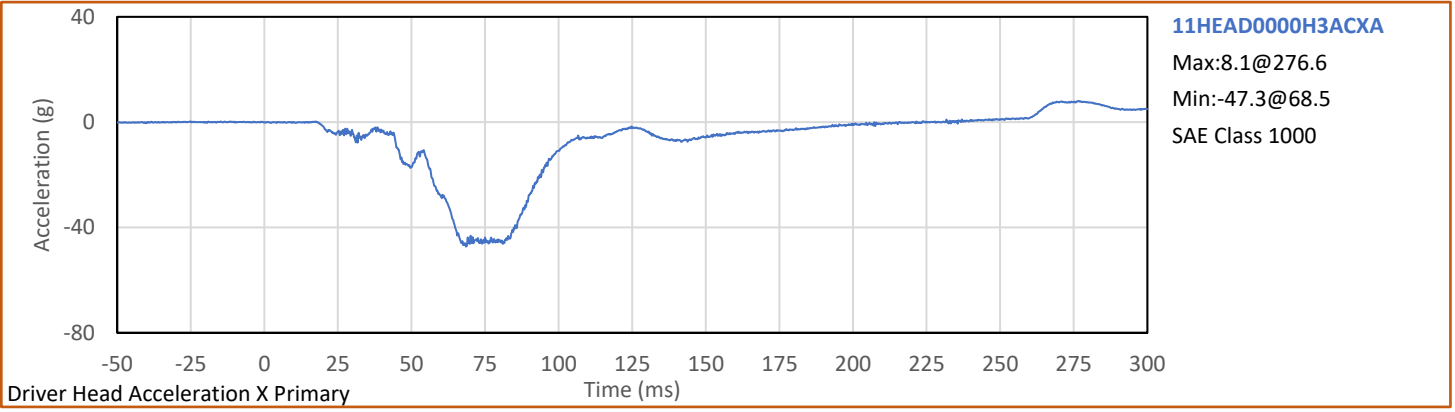
## TABLE OF DATA PLOTS

Plot		Page
1	Driver Head Acceleration X Primary	B-1
2	Driver Head Acceleration Y Primary	B-1
3	Driver Head Acceleration Z Primary	B-1
4	Driver Head Resultant Acceleration Primary	B-1
5	Driver Chest X Deflection	B-2
6	Driver Upper Neck Force X	B-3
7	Driver Upper Neck Force Z	B-3
8	Driver Upper Neck Moment Y	B-3
9	Driver Nij	B-3
10	Driver Chest Acceleration X Primary	B-4
11	Driver Chest Acceleration Y Primary	B-4
12	Driver Chest Acceleration Z Primary	B-4
13	Driver Chest Resultant Acceleration Primary	B-4
14	Driver Left Femur Force Z	B-5
15	Driver Right Femur Force Z	B-5
16	Passenger Head Acceleration X Primary	B-6
17	Passenger Head Acceleration Y Primary	B-6
18	Passenger Head Acceleration Z Primary	B-6
19	Passenger Head Resultant Acceleration Primary	B-6
20	Passenger Chest X Deflection	B-7
21	Passenger Upper Neck Force X	B-8
22	Passenger Upper Neck Force Z	B-8
23	Passenger Upper Neck Moment Y	B-8
24	Passenger Nij	B-8
25	Passenger Chest Acceleration X Primary	B-9
26	Passenger Chest Acceleration Y Primary	B-9
27	Passenger Chest Acceleration Z Primary	B-9
28	Passenger Chest Resultant Acceleration Primary	B-9
29	Passenger Left Femur Force Z	B-10
30	Passenger Right Femur Force Z	B-10

The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at [www.nhtsa.gov](http://www.nhtsa.gov)

Driver Head X Acceleration Redundant  
Driver Head Y Acceleration Redundant  
Driver Head Z Acceleration Redundant  
Driver Upper Neck Force Y  
Driver Upper Neck Moment X  
Driver Upper Neck Moment Z  
Driver Chest X Acceleration Redundant  
Driver Chest Y Acceleration Redundant  
Driver Chest Z Acceleration Redundant  
Driver Pelvis X  
Driver Pelvis Y  
Driver Pelvis Z  
Driver Left Femur Force Z Redundant  
Driver Right Femur Force Z Redundant  
Driver Left Upper Tibia Moment X  
Driver Left Upper Tibia Moment Y  
Driver Left Upper Tibia Force Z  
Driver Left Lower Tibia Moment X  
Driver Left Lower Tibia Moment Y  
Driver Left Lower Tibia Force Z  
Driver Right Upper Tibia Moment X  
Driver Right Upper Tibia Moment Y  
Driver Right Upper Tibia Force Z  
Driver Right Lower Tibia Moment X  
Driver Right Lower Tibia Moment Y  
Driver Right Lower Tibia Force Z  
Driver Left Foot Fore Z  
Driver Left Foot Aft X  
Driver Left Foot Aft Z  
Driver Right Foot Fore Z  
Driver Right Foot Aft X  
Driver Right Foot Aft Z  
Driver Shoulder Belt Force  
Driver Lap Belt Force  
Driver Head Angular Velocity X  
Driver Head Angular Velocity Y  
Driver Head Angular Velocity Z  
Passenger Head X Acceleration Redundant  
Passenger Head Y Acceleration Redundant  
Passenger Head Z Acceleration Redundant  
Passenger Upper Neck Force X  
Passenger Upper Neck Force Z  
Passenger Upper Neck Moment Y

Passenger Chest X Acceleration Redundant  
Passenger Chest Y Acceleration Redundant  
Passenger Chest Z Acceleration Redundant  
Passenger Pelvis X  
Passenger Pelvis Y  
Passenger Pelvis Z  
Passenger Left Femur Force Redundant  
Passenger Right Femur Force Redundant  
Passenger Left Upper Tibia Moment X  
Passenger Left Upper Tibia Moment Y  
Passenger Left Upper Tibia Force Z  
Passenger Left Lower Tibia Moment X  
Passenger Left Lower Tibia Moment Y  
Passenger Left Lower Tibia Force Z  
Passenger Right Upper Tibia Moment X  
Passenger Right Upper Tibia Moment Y  
Passenger Right Upper Tibia Force Z  
Passenger Right Lower Tibia Moment X  
Passenger Right Lower Tibia Moment Y  
Passenger Right Lower Tibia Force Z  
Passenger Left Foot Fore Z  
Passenger Left Foot Aft X  
Passenger Left Foot Aft Z  
Passenger Right Foot Fore Z  
Passenger Right Foot Aft X  
Passenger Right Foot Aft Z  
Passenger Shoulder Belt Force  
Passenger Lap Belt Force  
Passenger Head Angular Velocity X  
Passenger Head Angular Velocity Y  
Passenger Head Angular Velocity Z  
Left Rear Seat Crossmember X  
Left Rear Seat Crossmember Z  
Right Rear Seat Crossmember X  
Right Rear Seat Crossmember Z  
Left Rear Seat Crossmember X Redundant  
Right Rear Seat Crossmember X Redundant  
Vehicle Engine Top X  
Vehicle Engine Bottom X  
Load Cell Barrier Forces and Moments



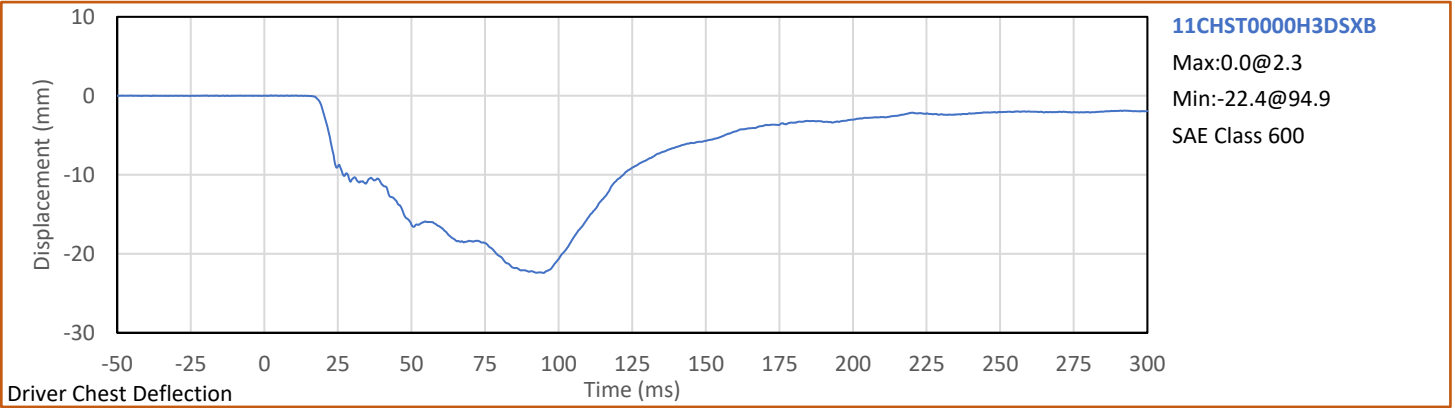
Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck

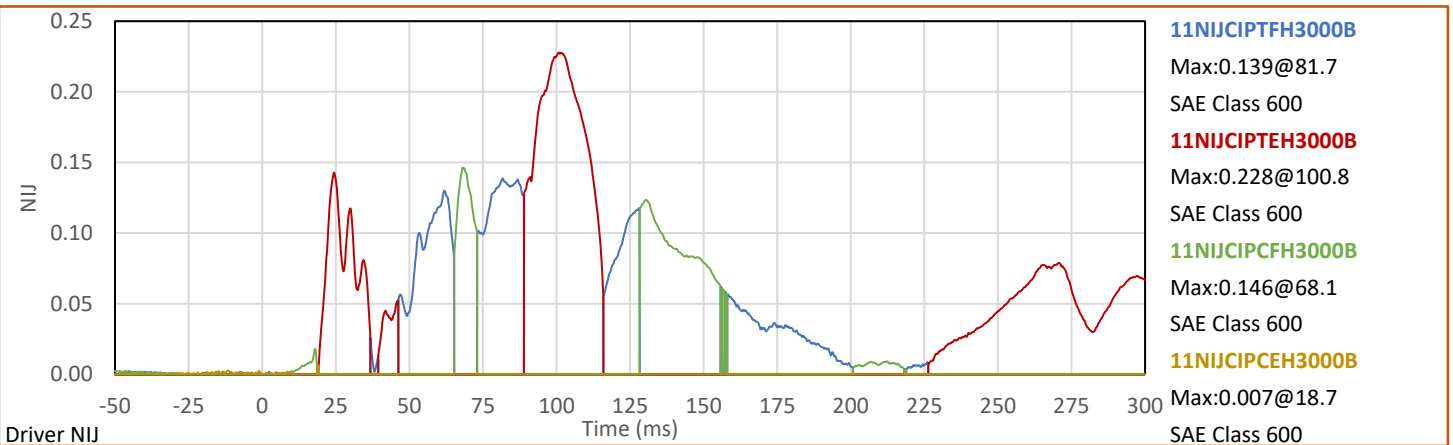
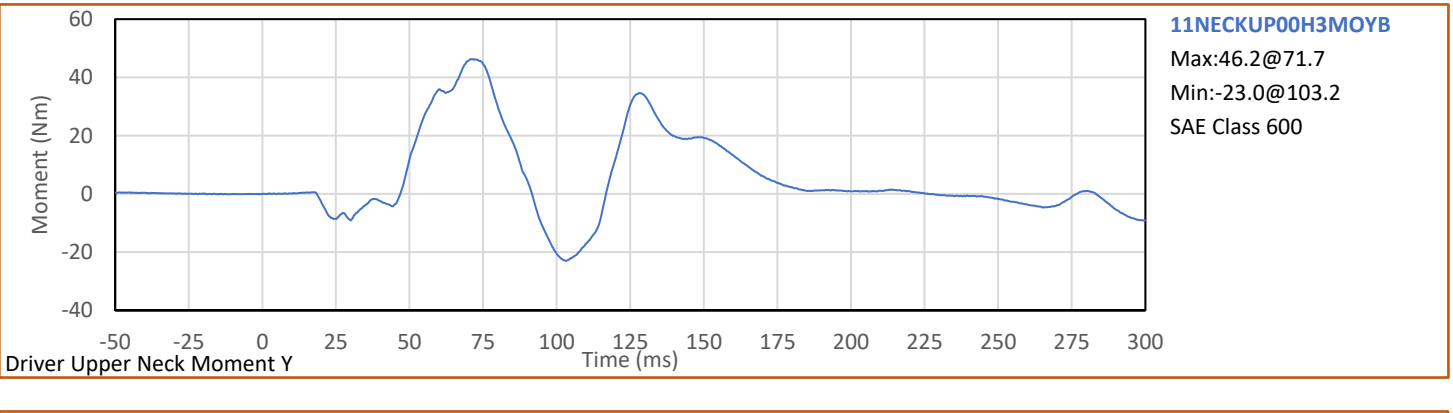
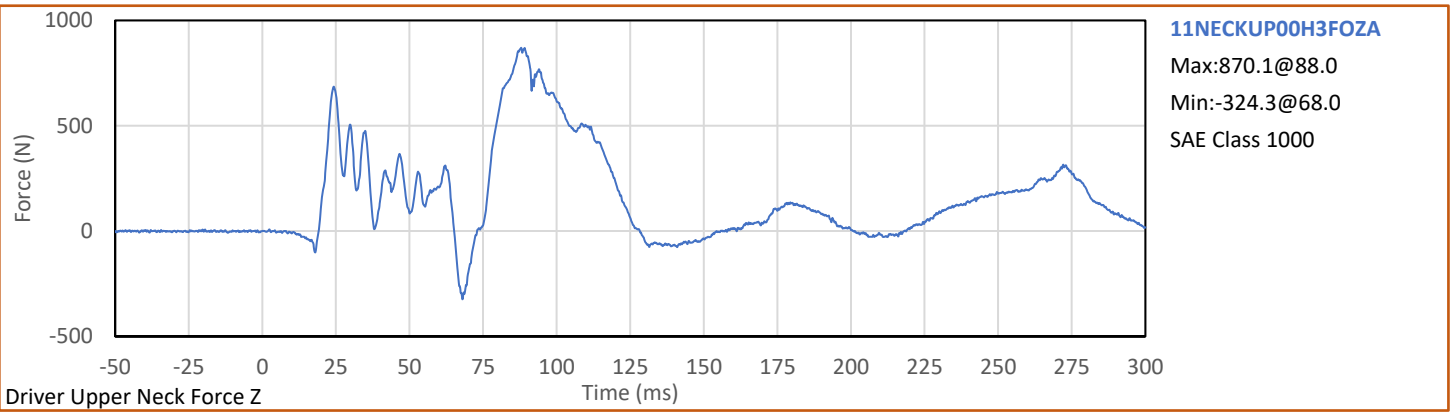
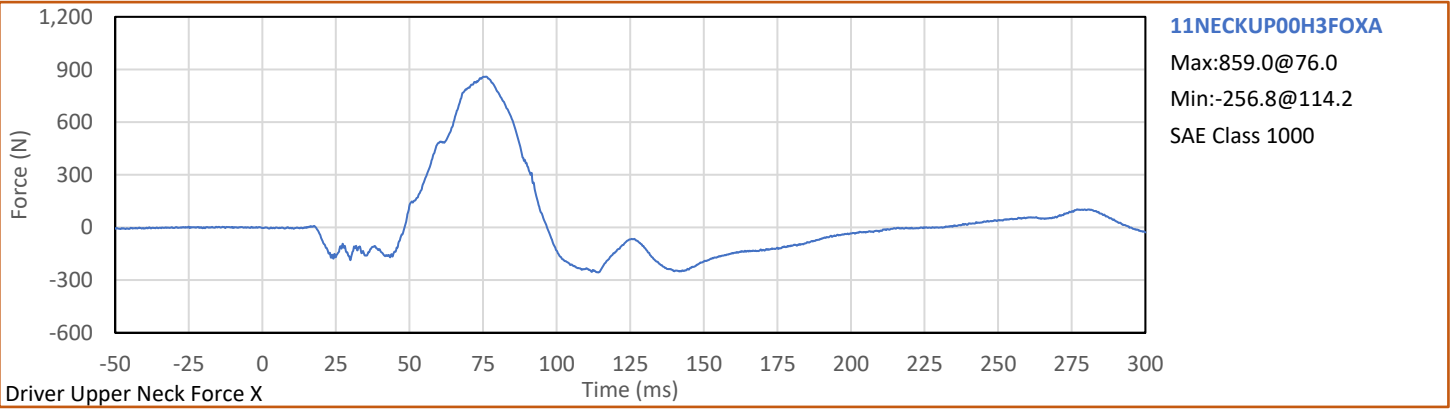
NHTSA No.: M20234200

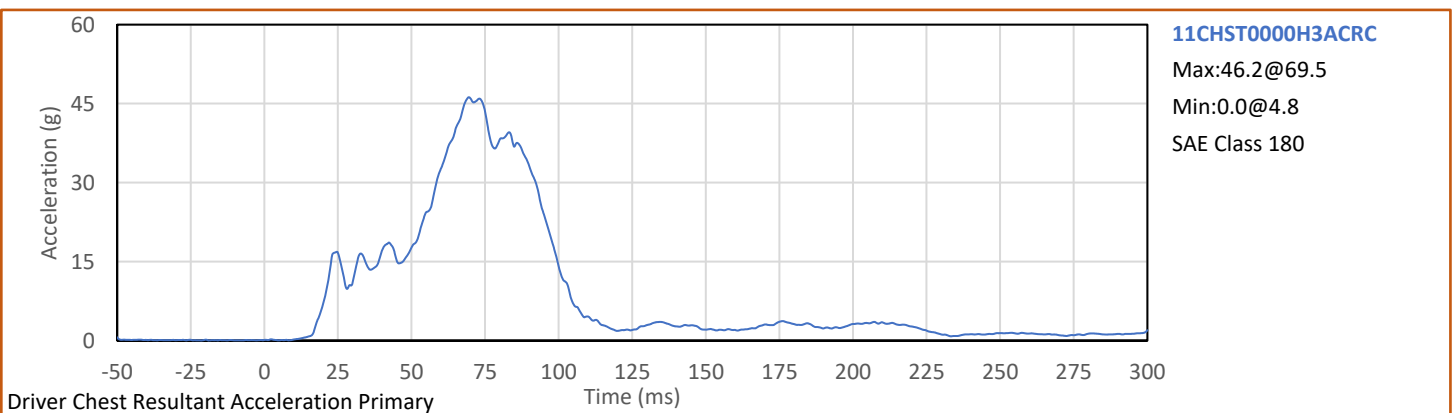
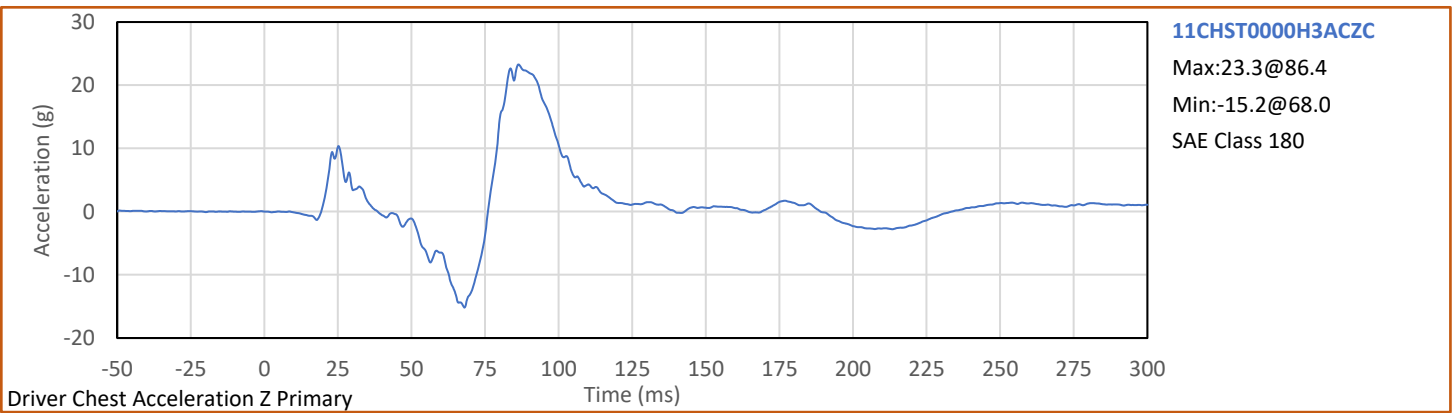
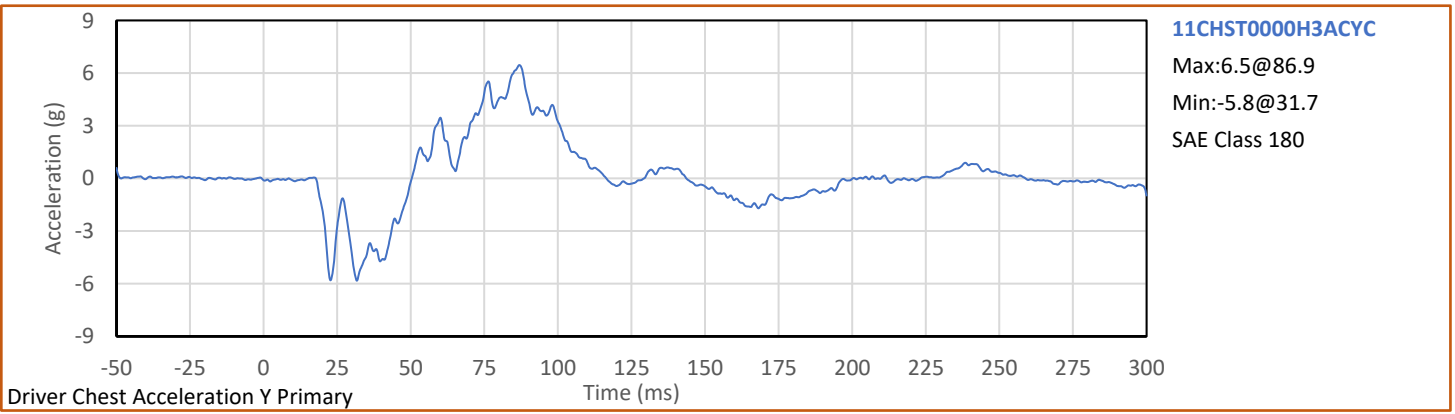
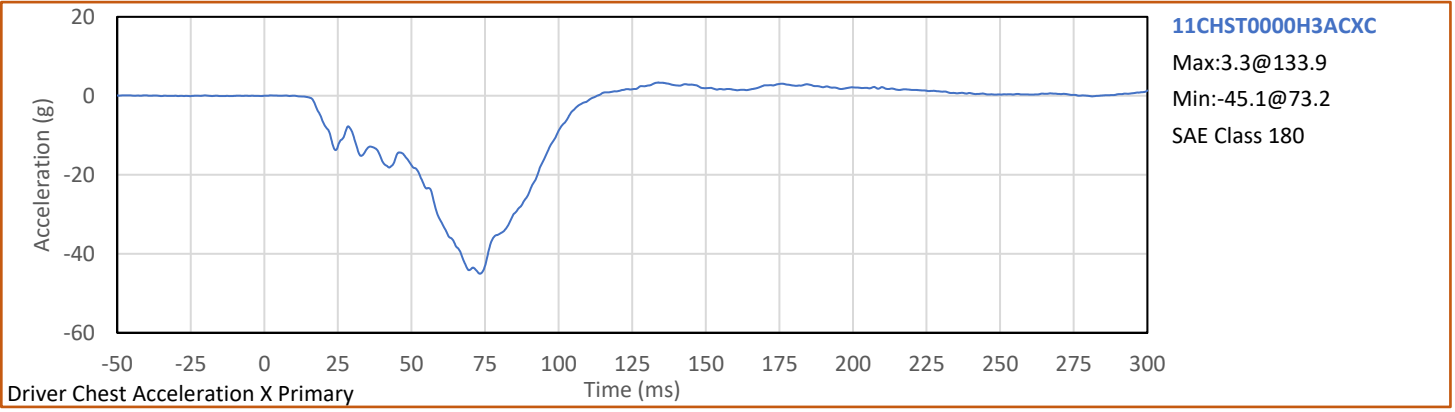


Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 2/21/2023

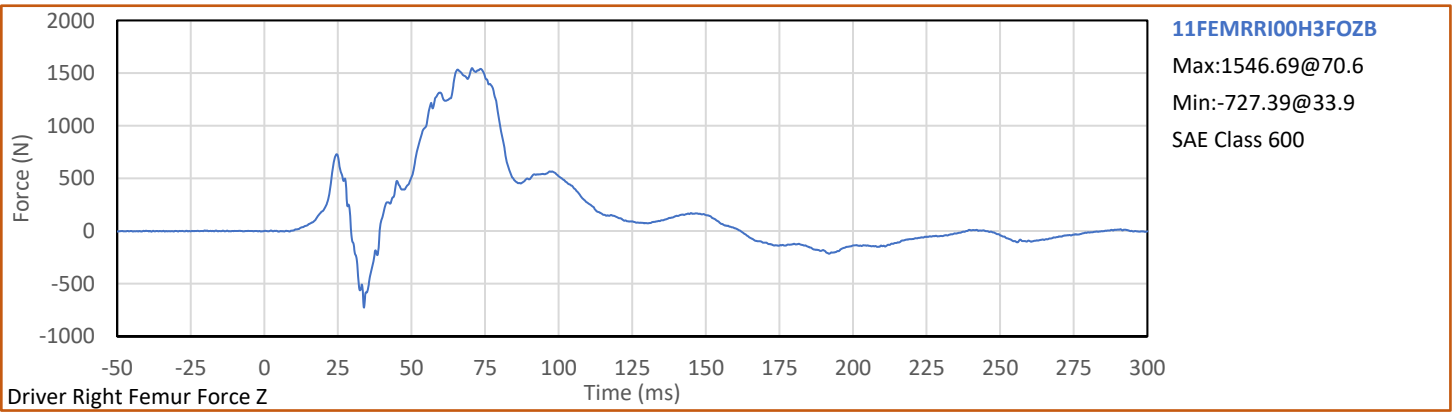
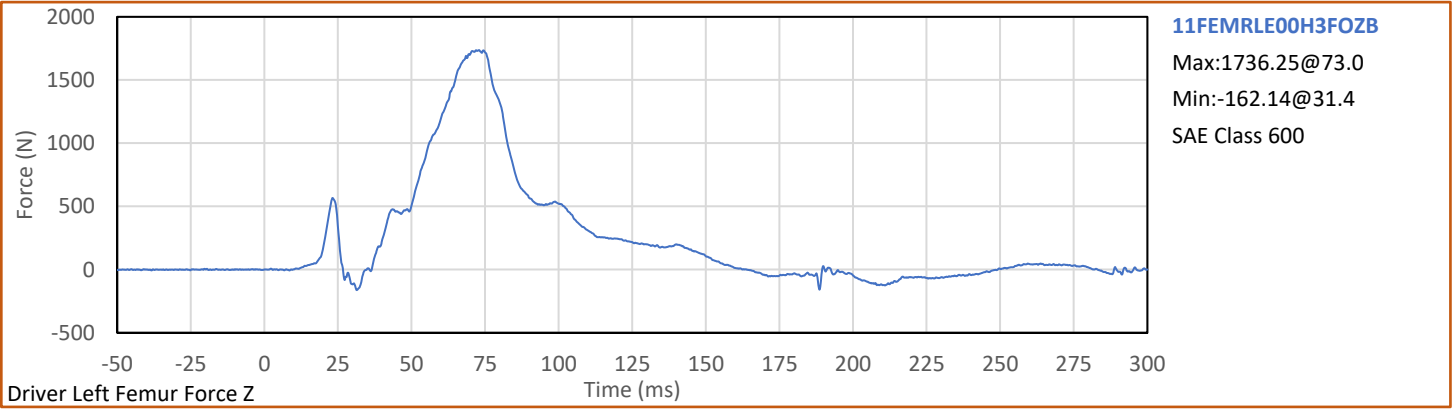


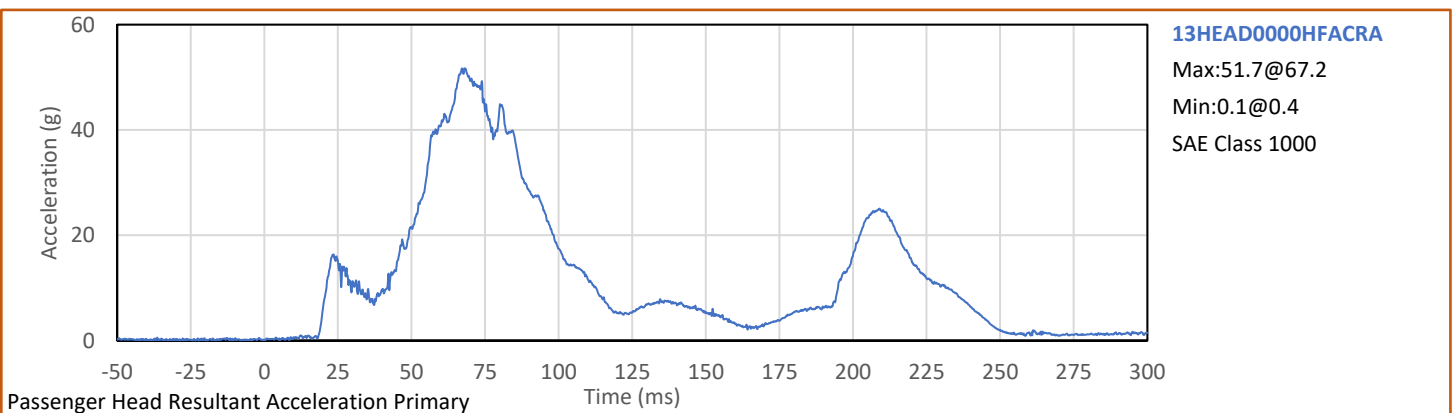
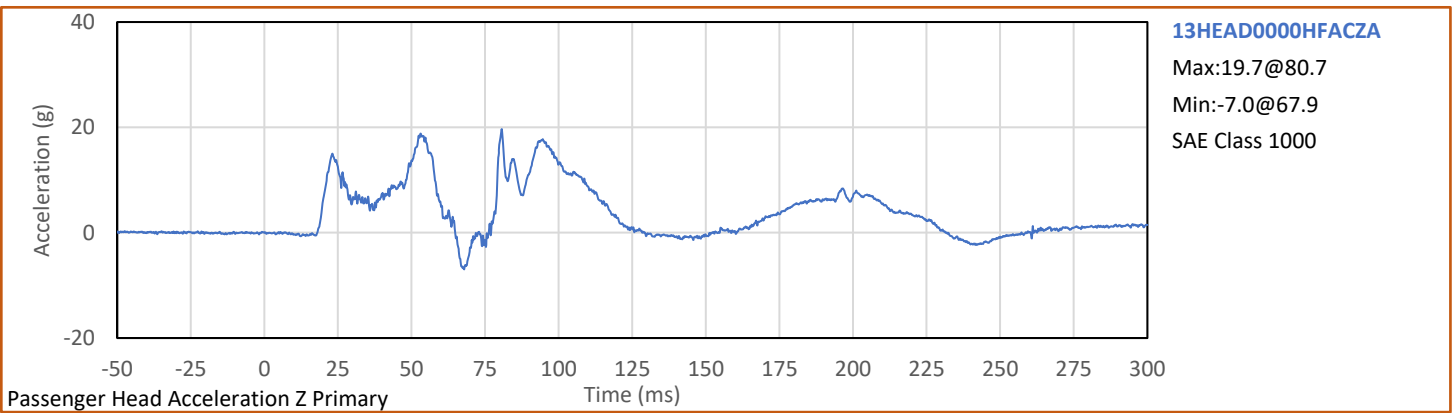
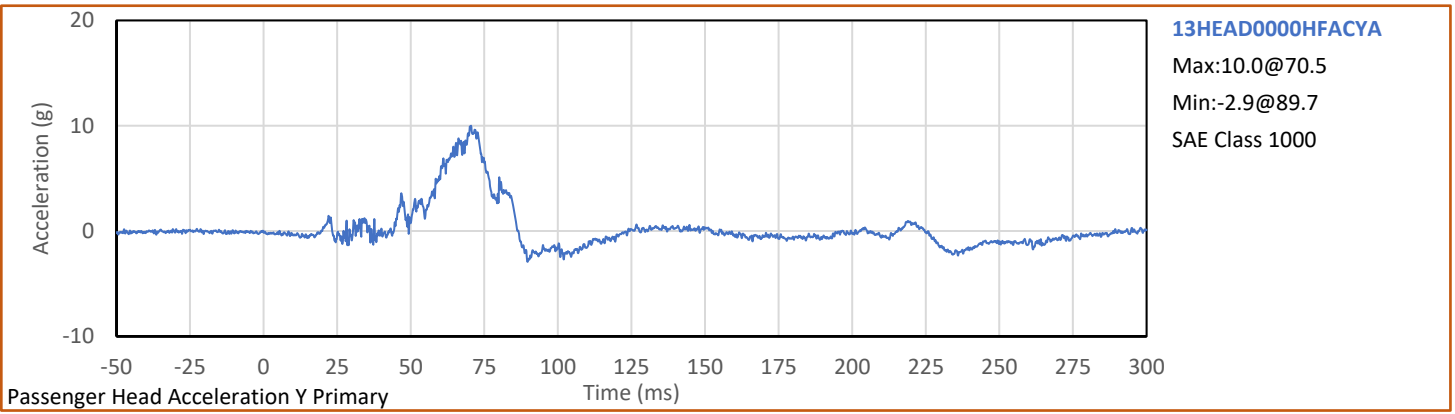
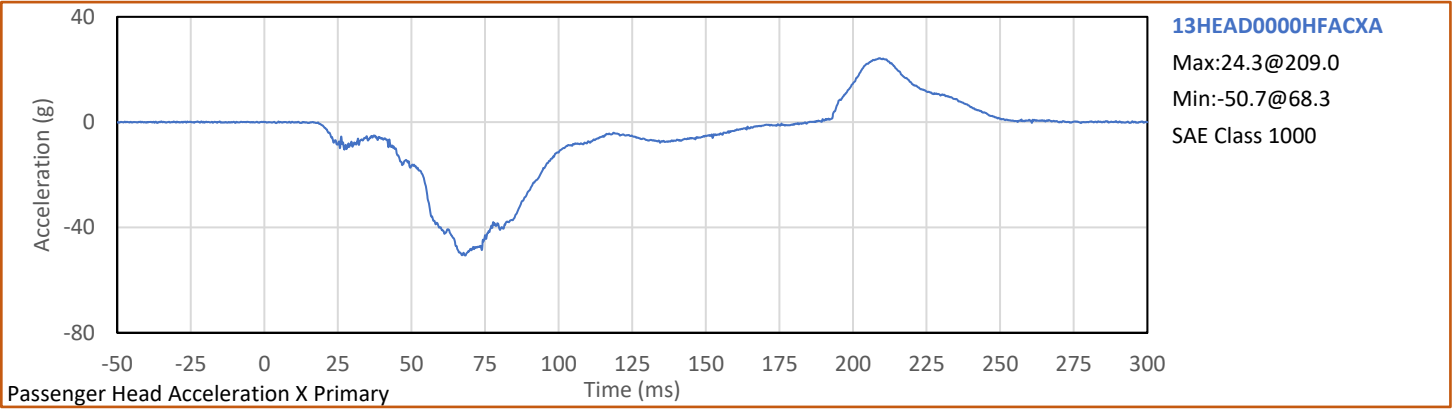




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Test Program: 56.3 km/h Frontal Impact NCAP Test

NHTSA No.: M20234200  
Test Date: 2/21/2023





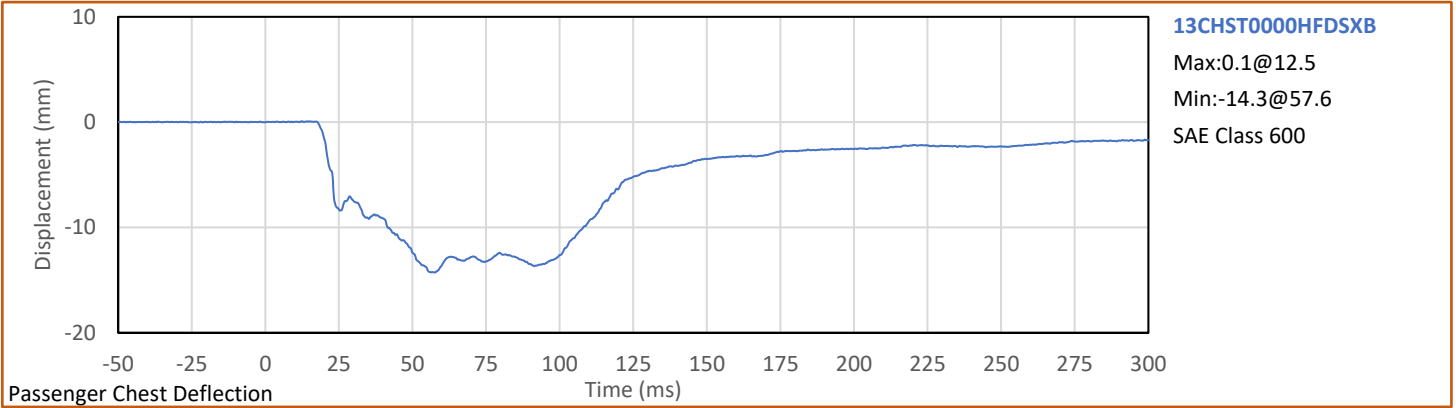
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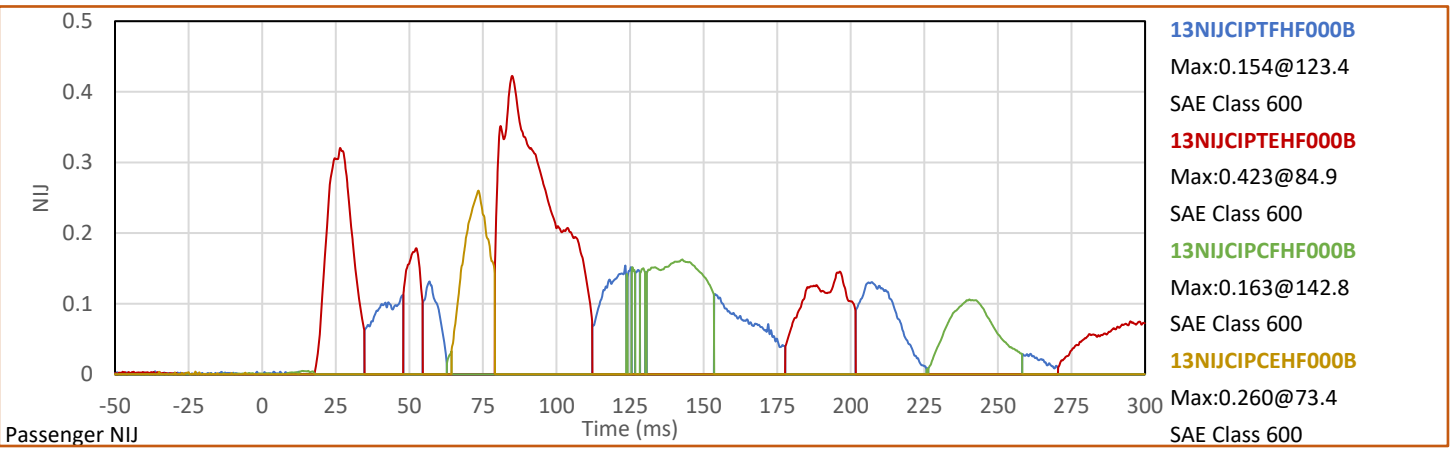
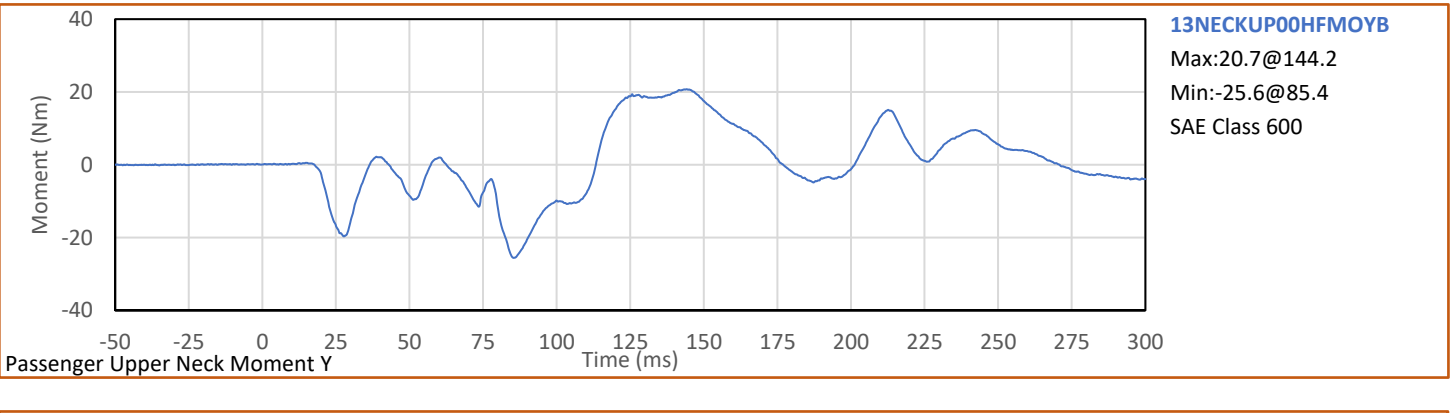
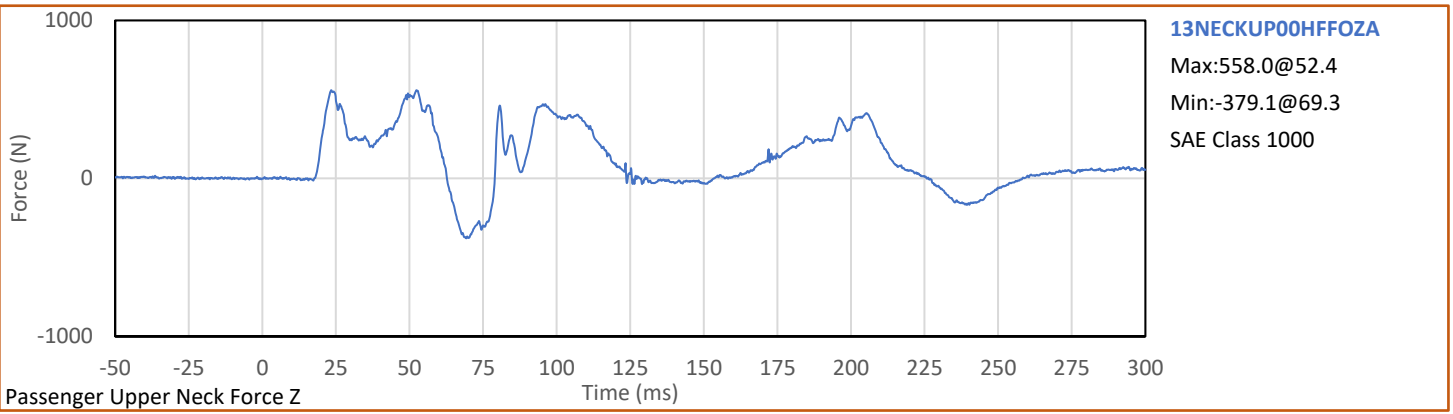
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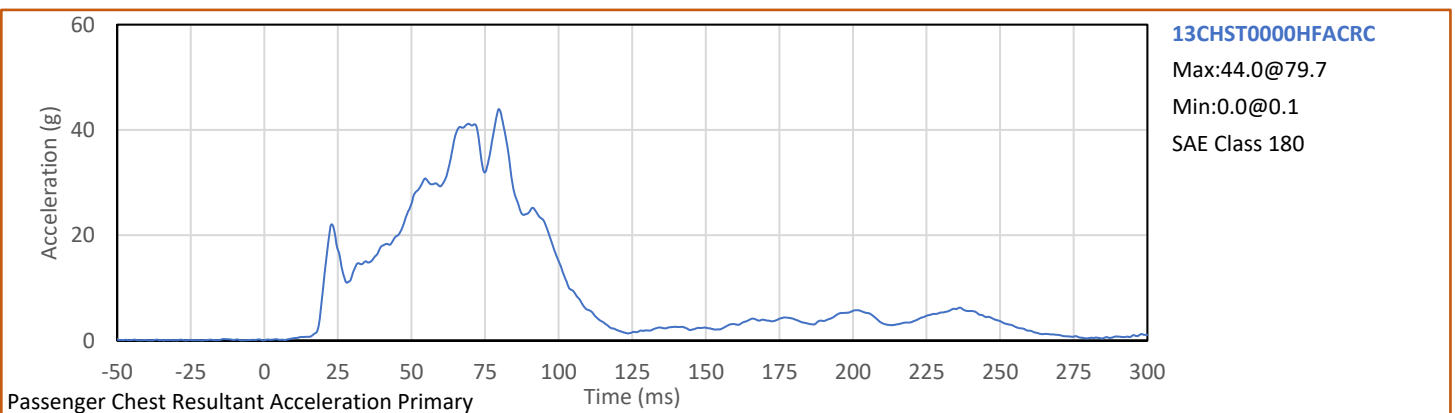
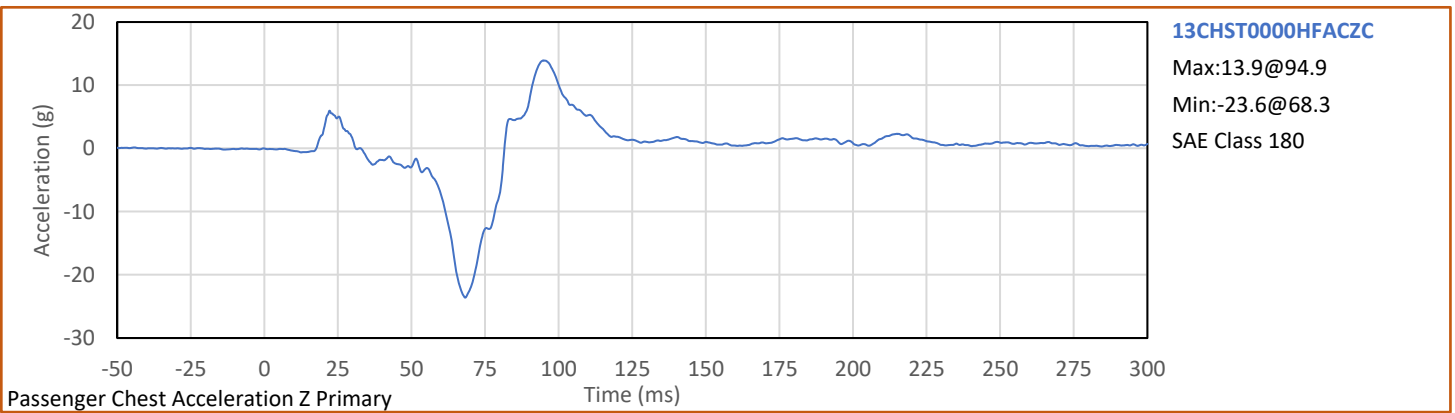
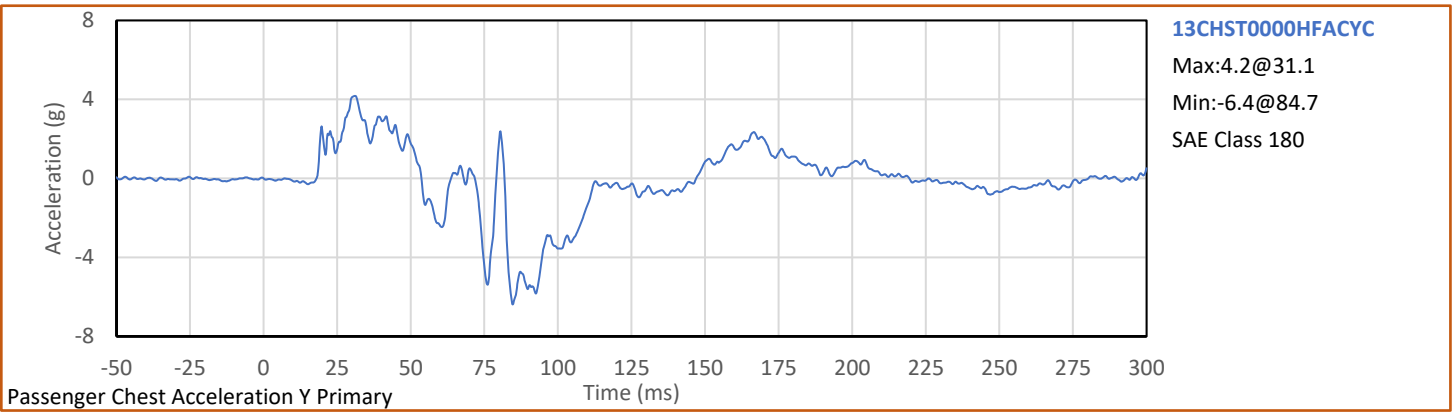
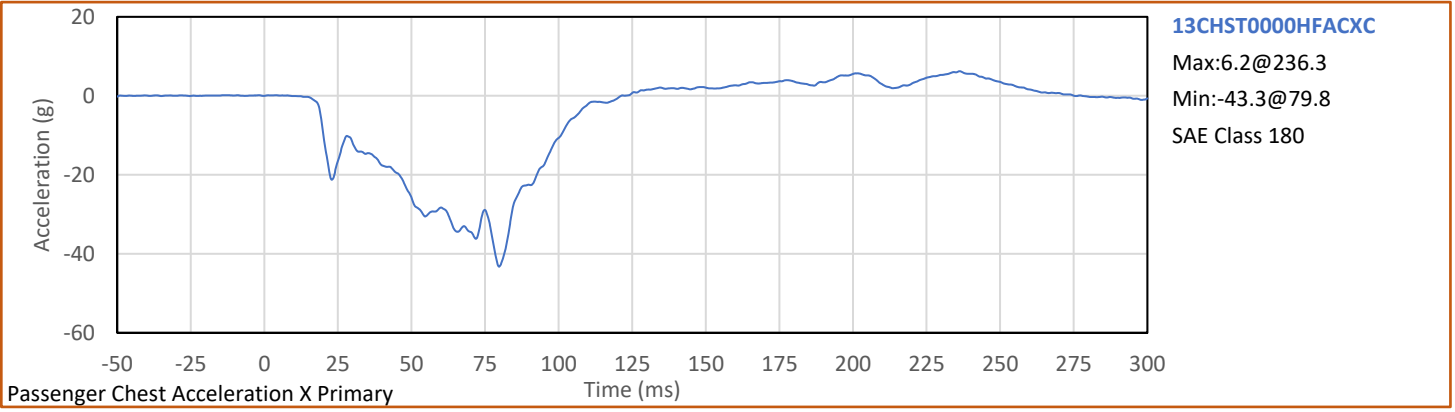


Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 2/21/2023







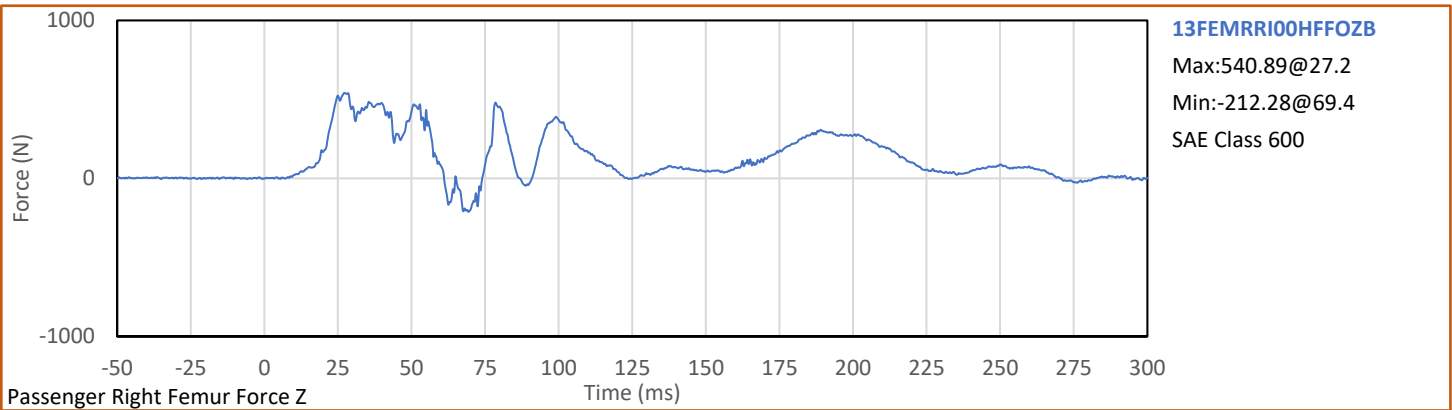
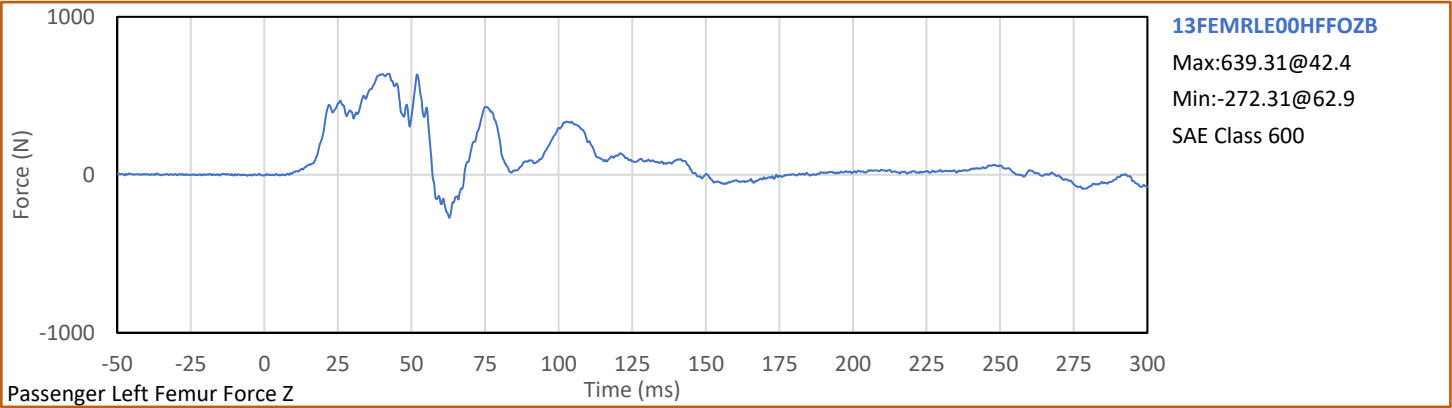
Test Vehicle: 2023 Hyundai Santa Cruz SEL AWD 4-Door Truck

NHTSA No.: M20234200



Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 2/21/2023



**APPENDIX C**  
**DUMMY QUALIFICATION AND PERFORMANCE VERIFICATION DATA**

**APPENDIX C**  
**Pre-Test ATD Qualification and Performance Verification**  
**Hybrid III 50th Percentile Male ATD**  
**S/N: 360**

ATD Serial No.: 360


Test Date: 2023-02-06

Dummy Item	Inspect for	Comments	Damage	OK
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ. Assembly	Bent shaft			✓
	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer Mounting	Head mounting secure			✓
	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:


No Problems Found

Technician:   
G. Fuentes

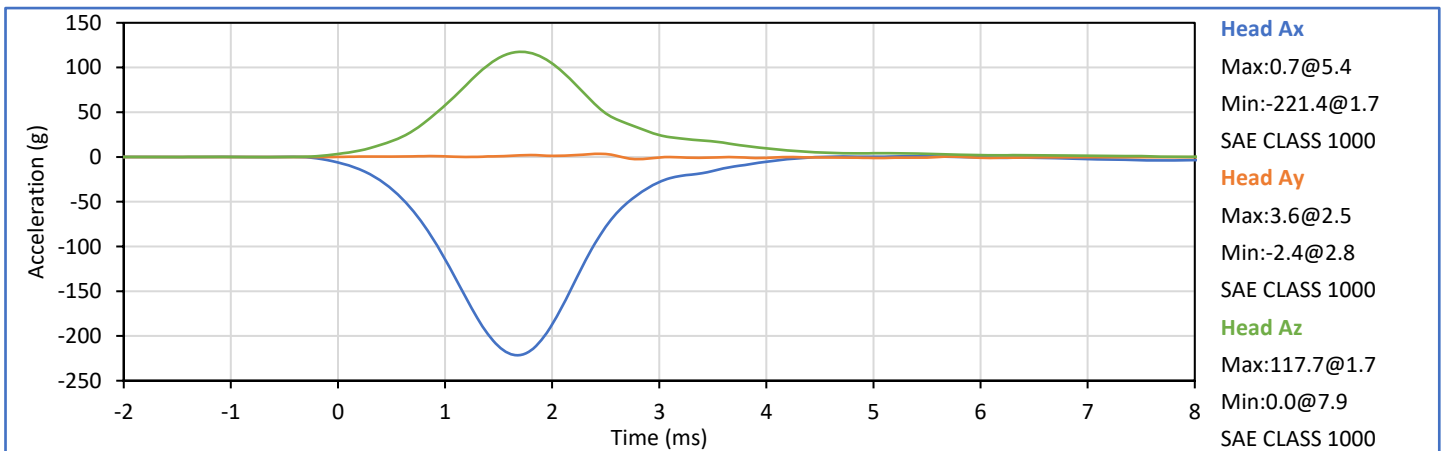
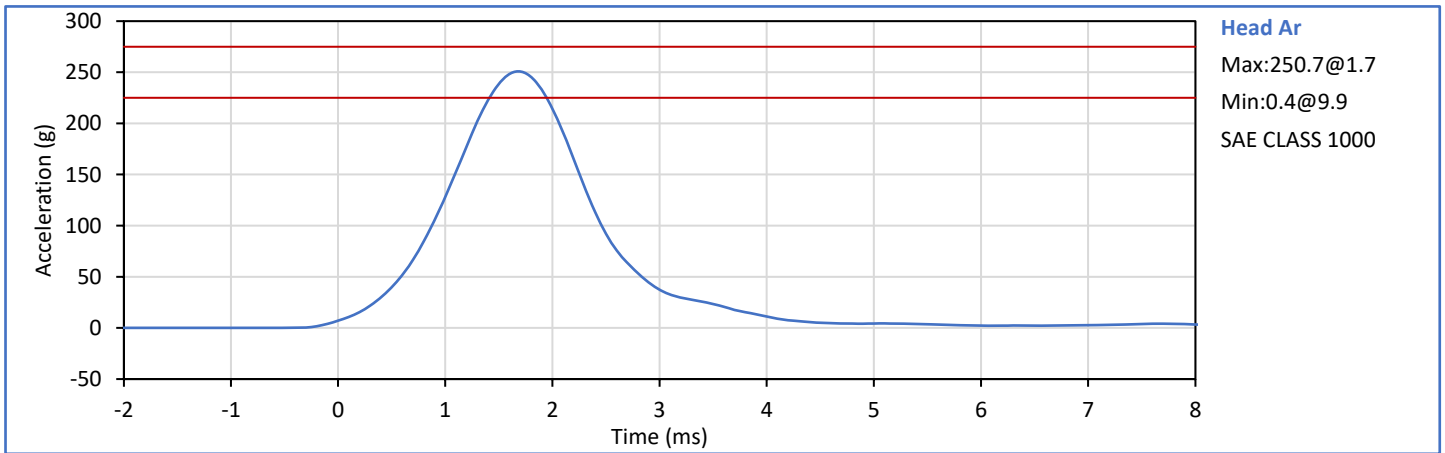
Approved By:   
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
A - Total sitting height	mm	879	889	885	Pass
B - Shoulder pivot height	mm	505	521	510	Pass
C - 'H' point height	mm	84	89	89	Pass
D - 'H' point location from backline	mm	135	140	140	Pass
E - Shoulder pivot from backline	mm	84	94	90	Pass
F - Thigh clearance	mm	140	155	148	Pass
G - Back of elbow to wrist pivot	mm	290	305	296	Pass
H - Head back to backline	mm	41	46	45	Pass
I - Shoulder to elbow length	mm	330	345	335	Pass
J - Elbow rest height	mm	190	211	204	Pass
K - Buttock to knee length	mm	579	604	598	Pass
L - Popliteal length	mm	429	455	442	Pass
M - Knee pivot height	mm	485	500	491	Pass
N - Buttock popliteal length	mm	452	477	460	Pass
O - Chest depth without jacket	mm	213	229	221	Pass
P - Foot length	mm	251	267	259	Pass
V - Shoulder breadth	mm	422	437	428	Pass
W - Foot breadth	mm	91	107	105	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	975	Pass
Z - Waist circum.	mm	836	866	862	Pass
AA - Location for chest circum.	mm	429	434	432	Pass
BB - Location for waist circum.	mm	226	231	228	Pass
Overall Test Results					Pass

Technician:   
G. Fuentes

Approved By:   
J. Hernandez

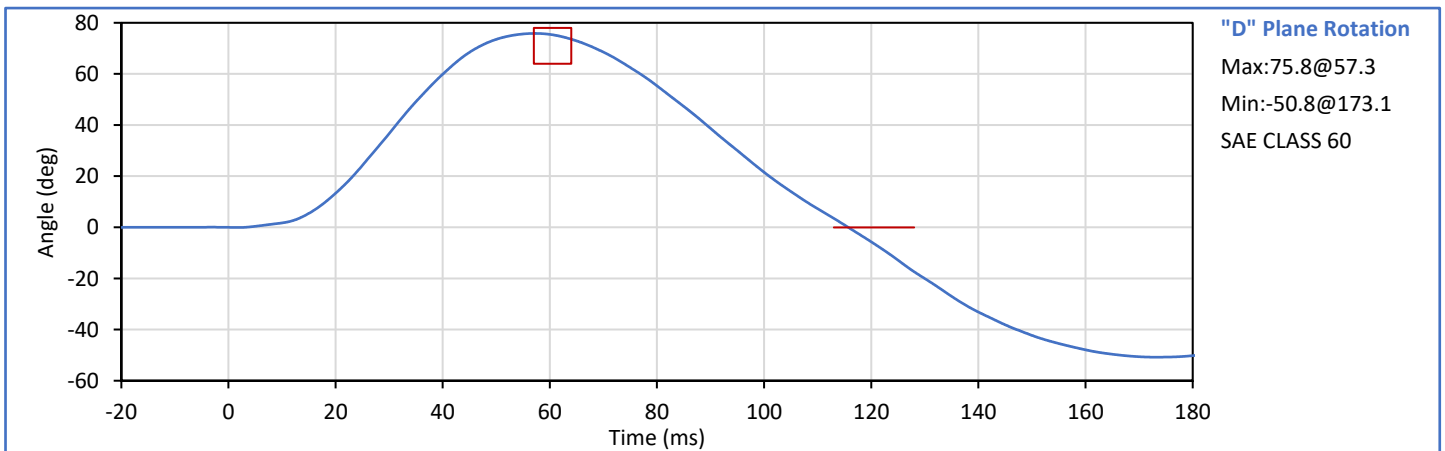
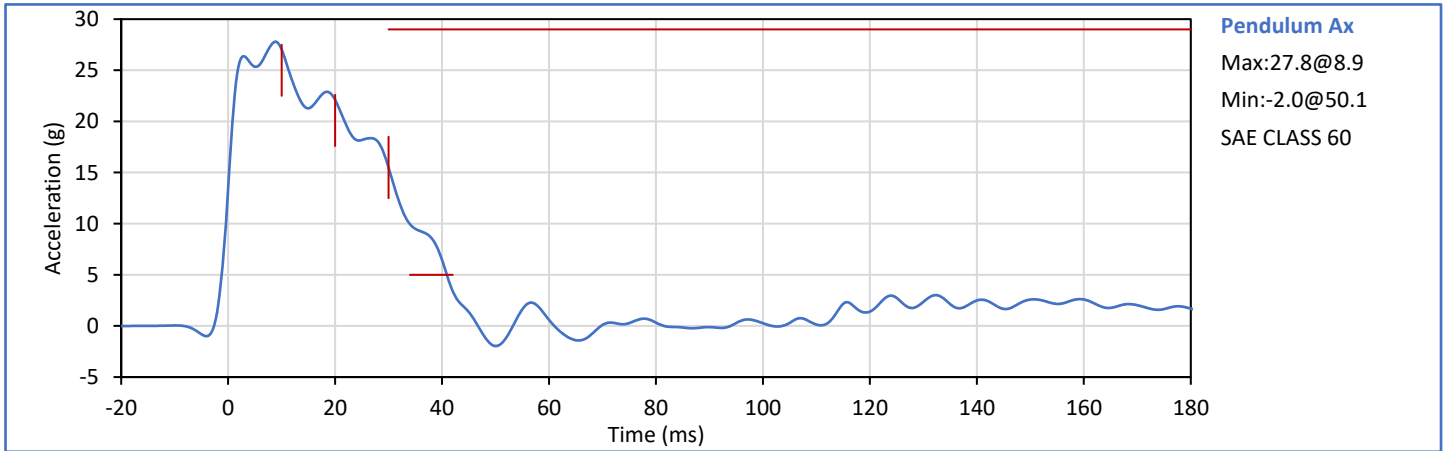
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Peak Resultant Acceleration	g	225.0	275.0	250.7	Pass
Peak Lateral Acceleration	g	-15.0	15.0	3.6	Pass
Oscillations After Main Pulse	%	0.0	10.0	0.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *G. Fuentes*  
G. Fuentes

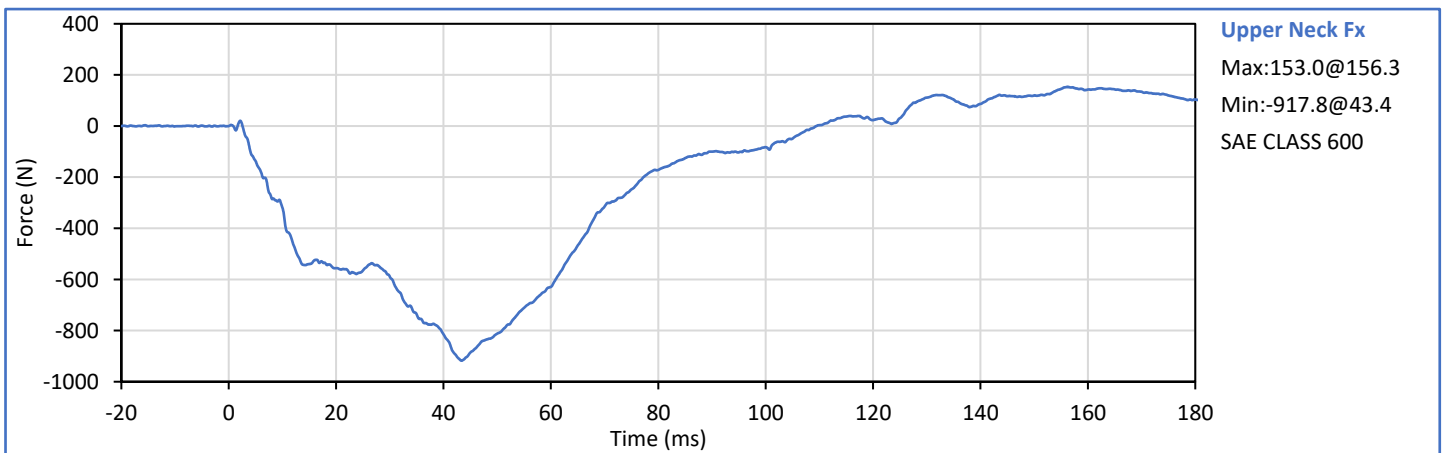
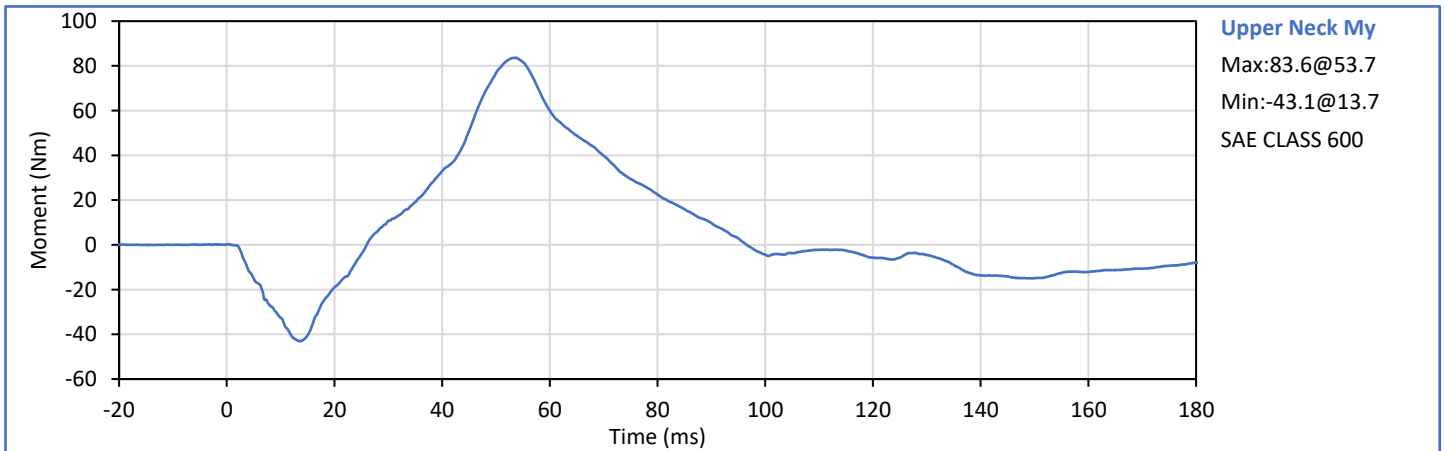
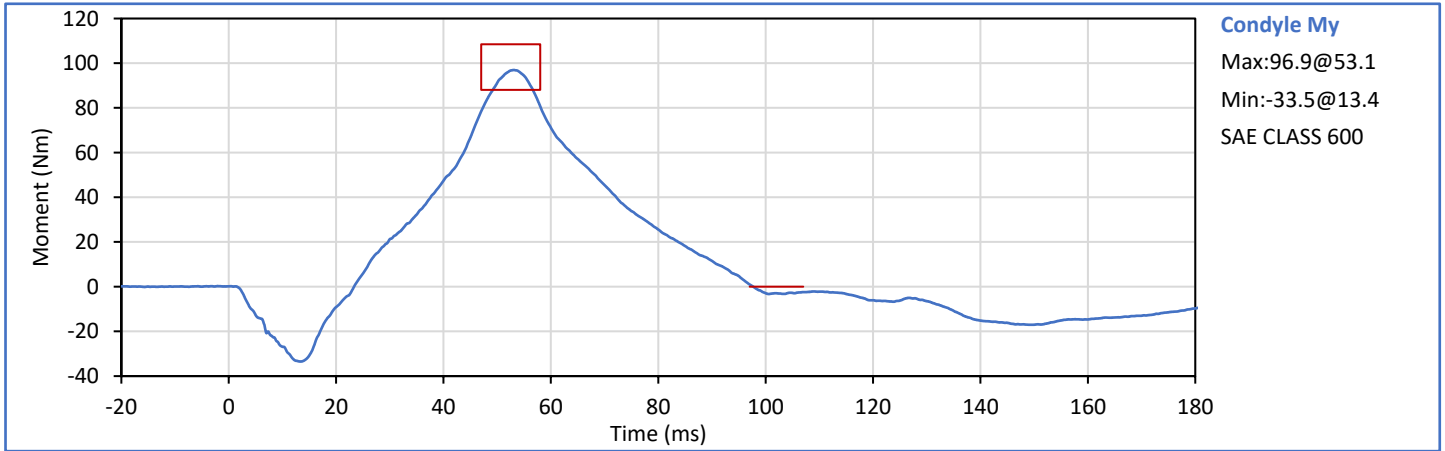
Approved By: *J. Hernandez*  
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	6.89	7.13	6.99	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	27.0	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	22.1	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	15.5	Pass
Peak Pendulum Decel After 30 ms	g	0.0	29.0	15.5	Pass
Deceleration Decay to Cross 5g	ms	34.0	42.0	40.9	Pass
"D" Plane Rotation peak	deg	64.0	78.0	75.8	Pass
	ms	57.0	64.0	57.3	Pass
"D" Plane Rotation Decay to Zero	ms	113.0	128.0	115.8	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	96.9	Pass
	ms	47.0	58.0	53.1	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	97.7	Pass
Overall Test Results					Pass

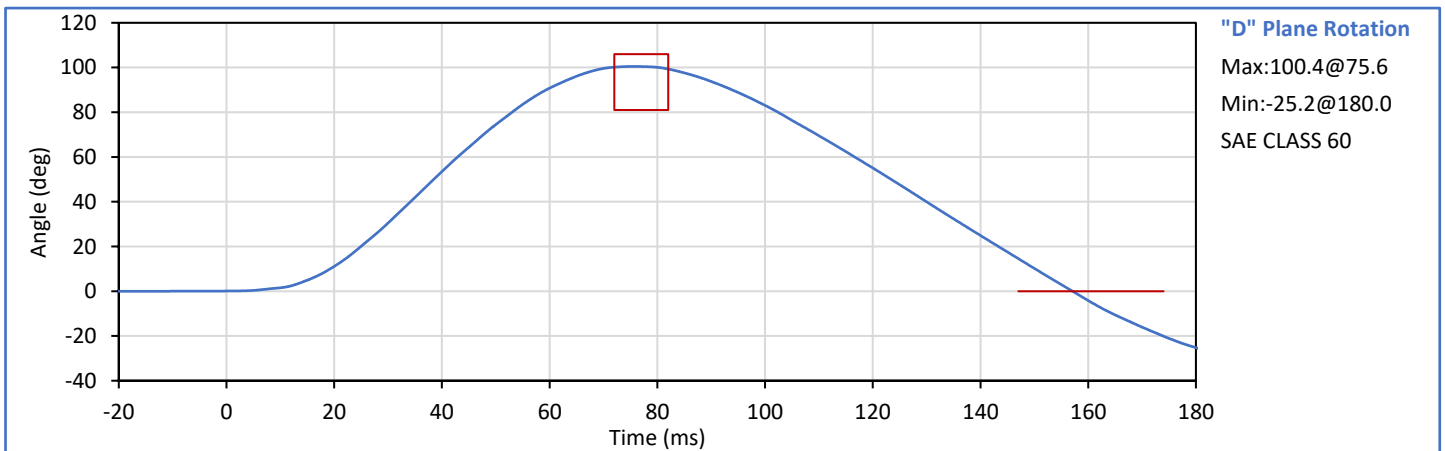
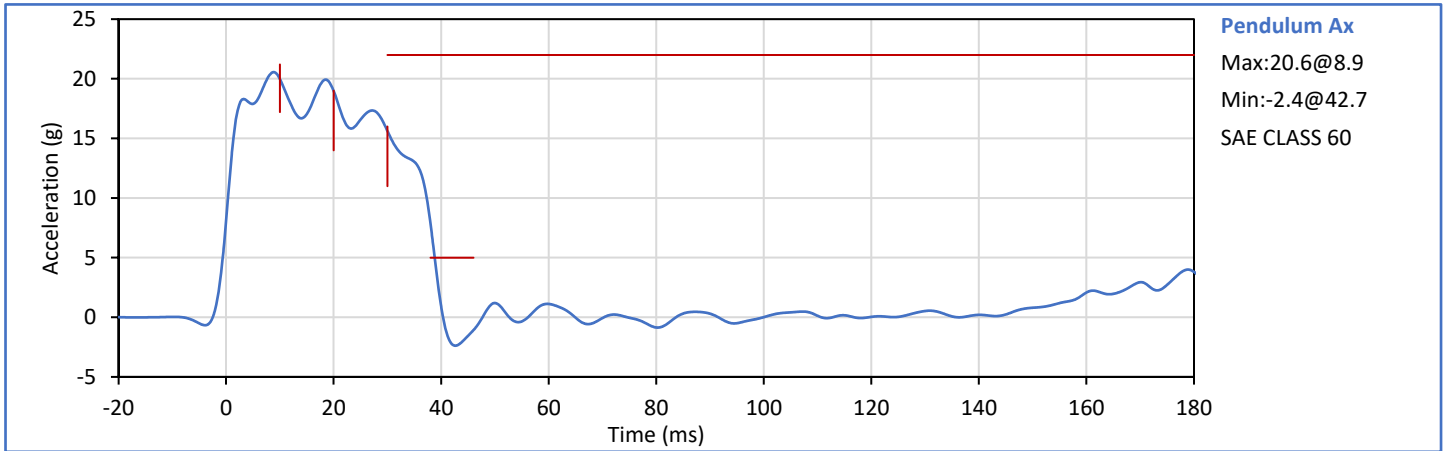


Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

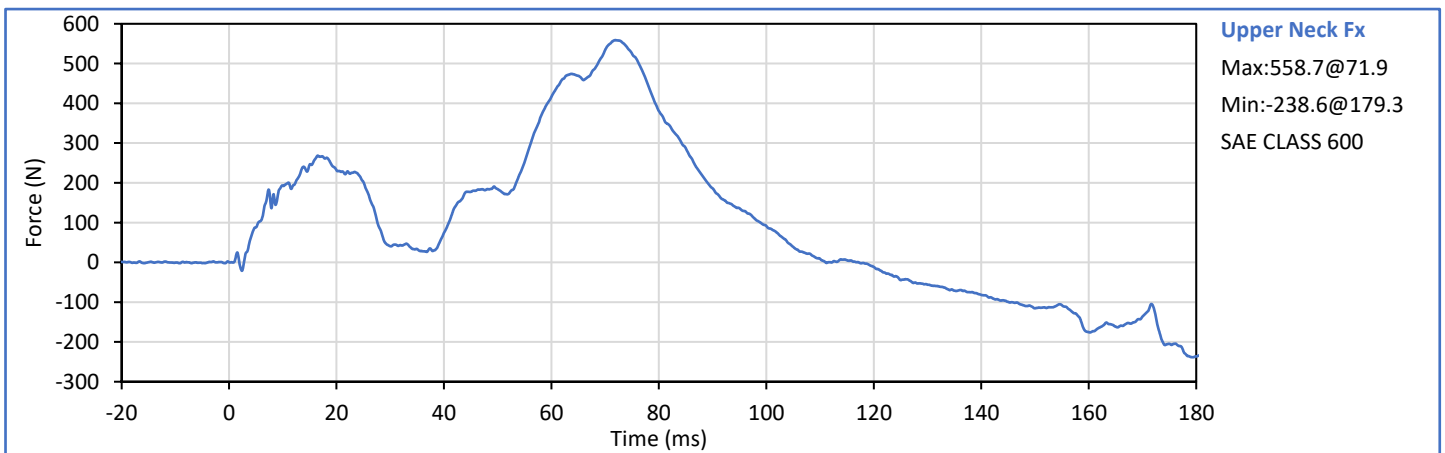
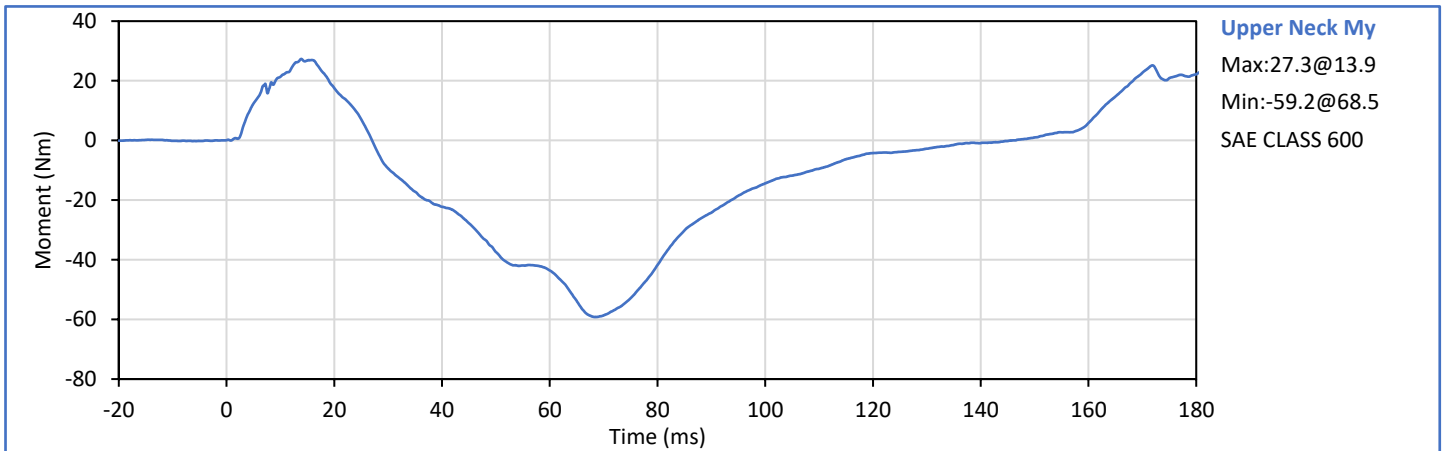
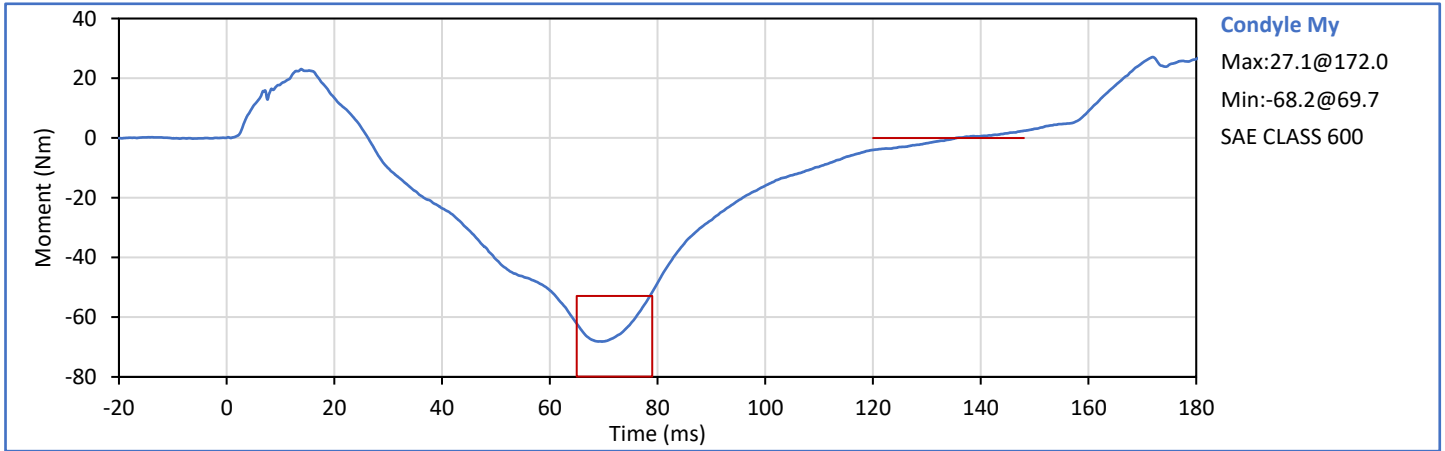


Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.94	6.19	6.07	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.0	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	19.0	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	15.6	Pass
Peak Pendulum Decel After 30 ms	g	0.0	22.0	15.6	Pass
Deceleration Decay to Cross 5g	ms	38.0	46.0	38.8	Pass
"D" Plane Rotation peak	deg	81.0	106.0	100.4	Pass
	ms	72.0	82.0	75.6	Pass
"D" Plane Rotation Decay to Zero	ms	147.0	174.0	157.1	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-68.2	Pass
	ms	65.0	79.0	69.7	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	135.5	Pass
Overall Test Results					Pass

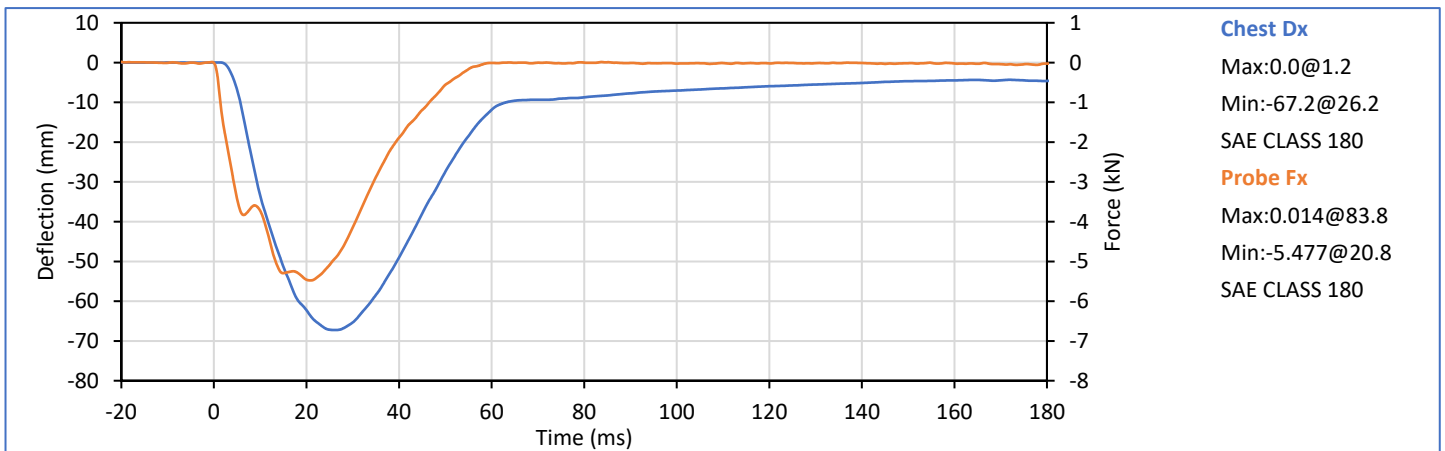
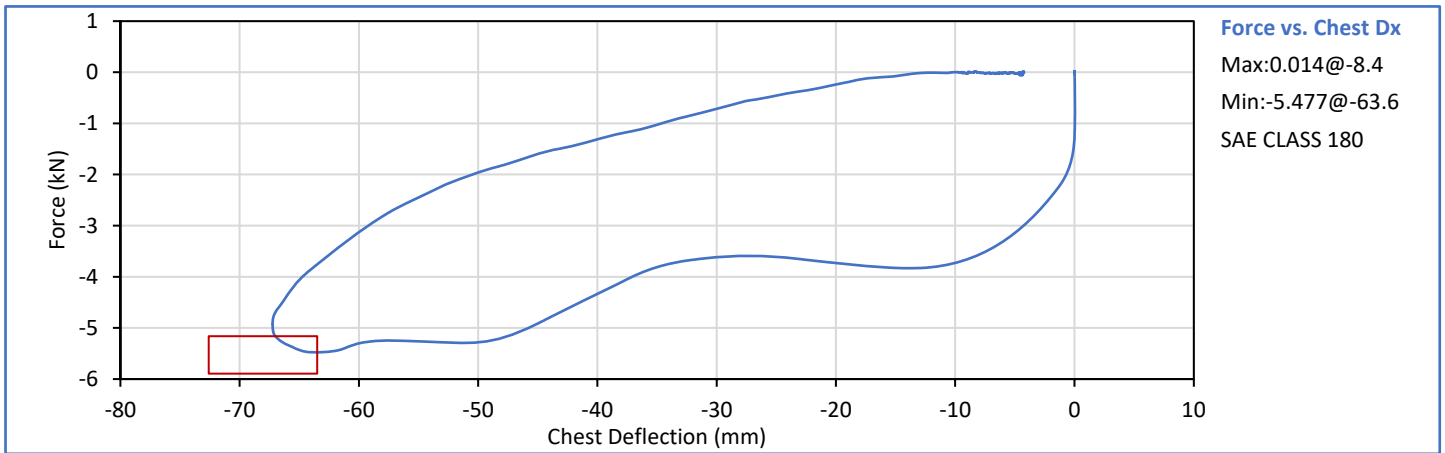


Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez



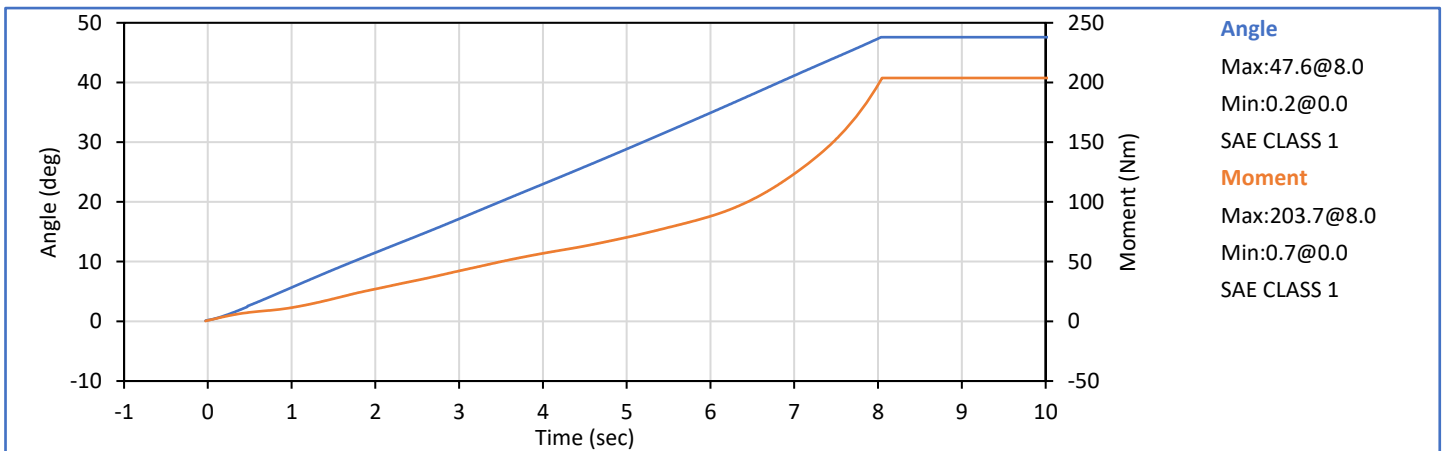
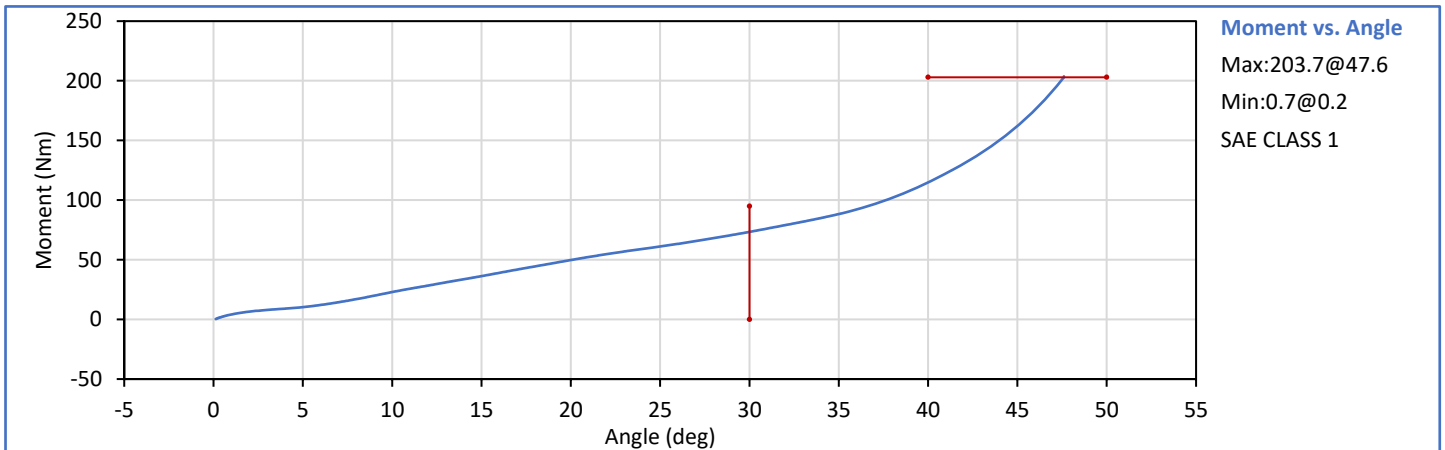
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.2	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Probe Velocity	m/s	6.58	6.82	6.68	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-67.2	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.477	Pass
Internal Hysteresis	%	69.0	85.0	70.2	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *G. Fuentes*  
 G. Fuentes

Approved By: *J. Hernandez*  
 J. Hernandez

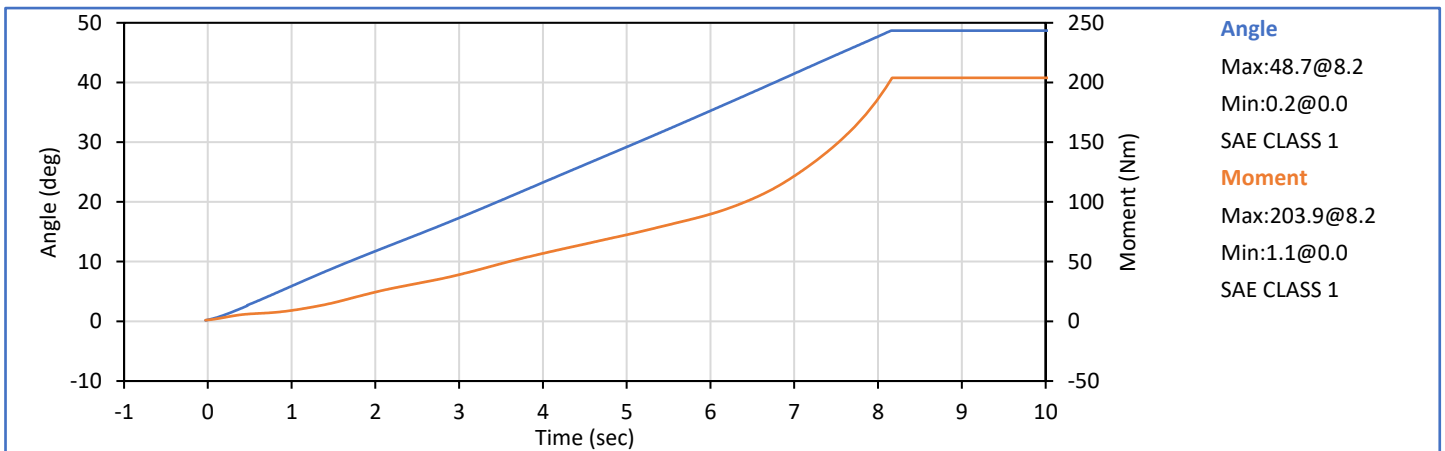
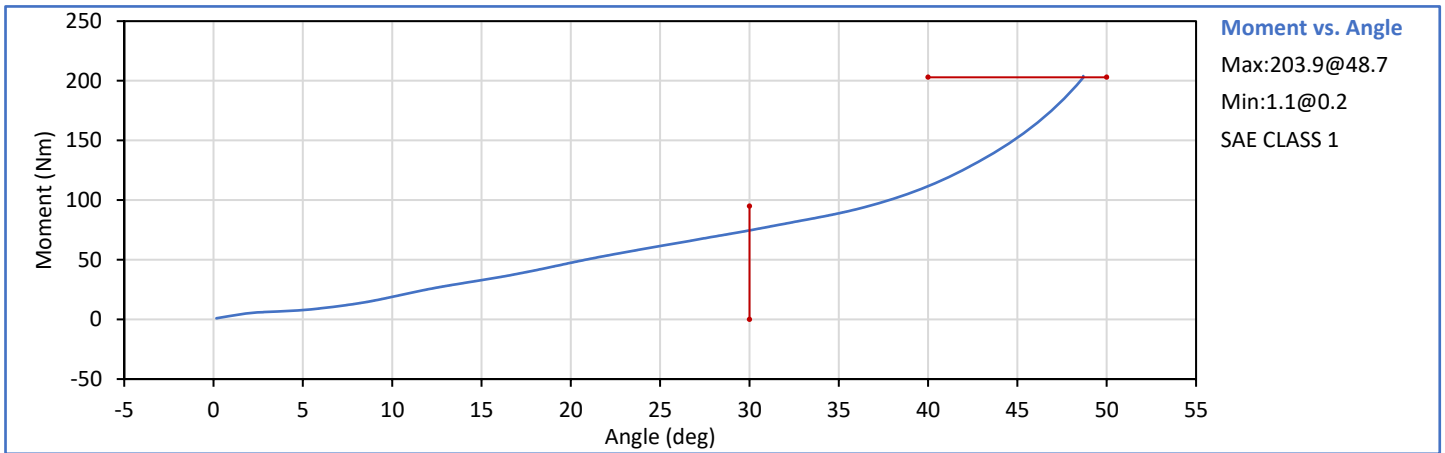
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.3	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Left Hip Rotation Rate	deg/s	5.0	10.0	5.9	Pass
Left Femur Torque at 30°	Nm	0.0	95.0	73.3	Pass
Left Hip Rotation at 203 Nm	deg	40.0	50.0	47.6	Pass
Overall Test Results					Pass



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

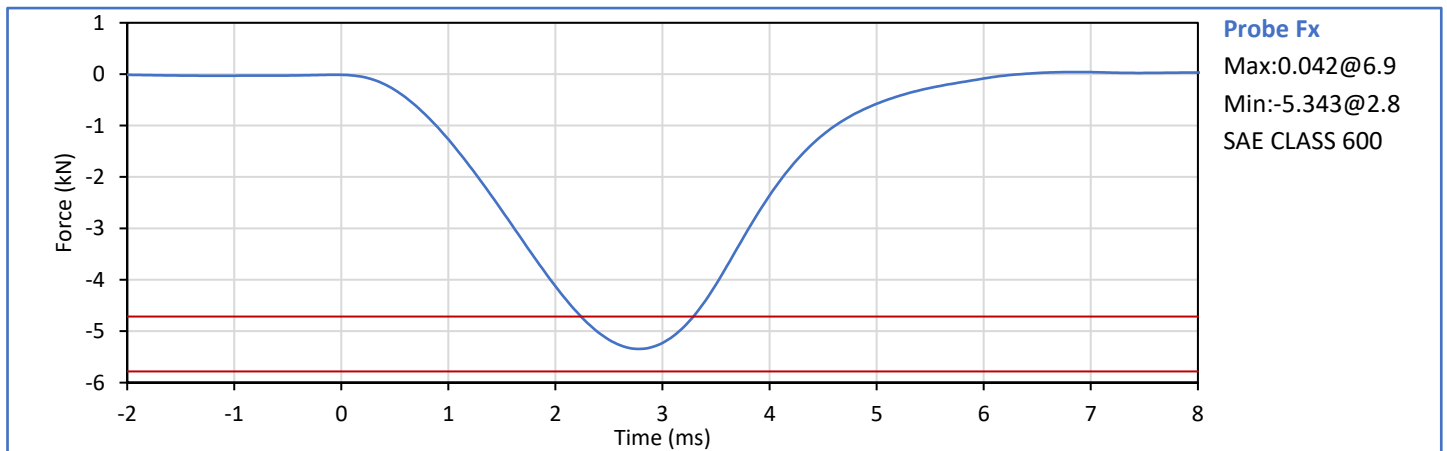
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.3	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Right Hip Rotation Rate	deg/s	5.0	10.0	5.9	Pass
Right Femur Torque at 30°	Nm	0.0	95.0	74.5	Pass
Right Hip Rotation at 203 Nm	deg	40.0	50.0	48.7	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

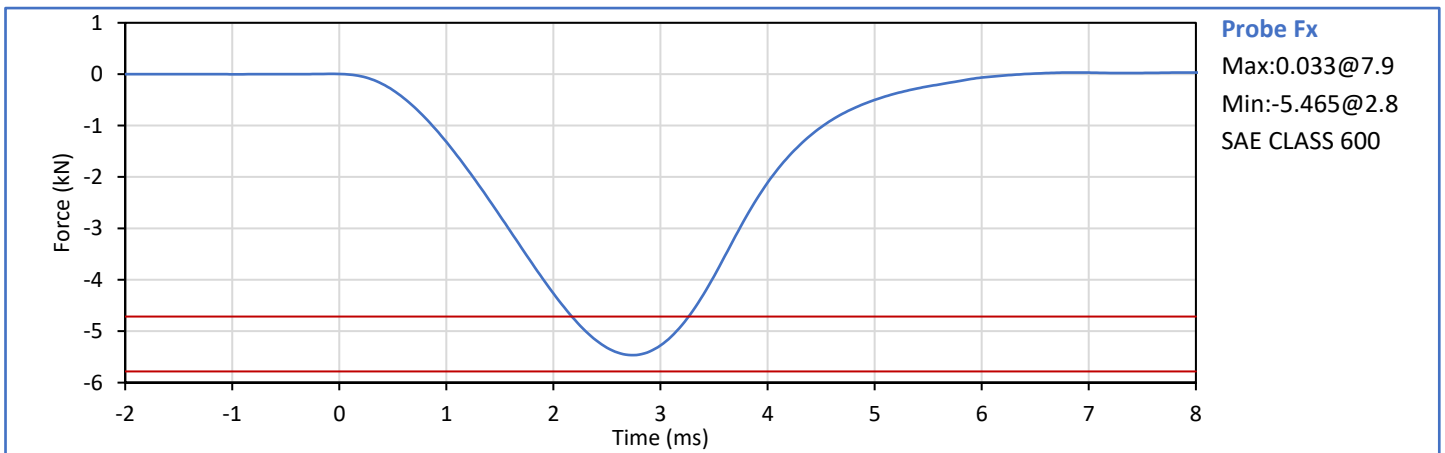
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Probe Velocity	m/s	2.070	2.130	2.103	Pass
Peak Resistive Force	kN	-5.782	-4.715	-5.343	Pass
Overall Test Results					Pass



Technician: *G. Fuentes*  
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Approved By: *J. Hernandez*  
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.3	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Probe Velocity	m/s	2.070	2.130	2.103	Pass
Peak Resistive Force	kN	-5.782	-4.715	-5.465	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

**APPENDIX C**  
**Pre-Test ATD Qualification and Performance Verification**  
**Hybrid III 5th Percentile Female ATD**  
**S/N: DH1644**

Dummy Item	Inspect for	Comments	Damage	Okay
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ. Assembly	Bent shaft			✓
	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer Mounting	Head mounting secure			✓
	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician: \_\_\_\_\_



G. Fuentes

Approved By: \_\_\_\_\_



J. Hernandez

ATD Serial No.: DH1644

Test Date: 2023-02-06

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	35	Pass
A - Total sitting height	mm	775	800	784	Pass
B - Shoulder pivot height	mm	432	457	441	Pass
C - 'H' point height	mm	81	86	85	Pass
D - 'H' point location from backline	mm	145	150	149	Pass
E - Shoulder pivot from backline	mm	69	84	76	Pass
F - Thigh clearance	mm	119	135	128	Pass
G - Back of elbow to wrist pivot	mm	244	259	254	Pass
H - Head back to backline	mm	41	46	43	Pass
I - Shoulder to elbow length	mm	277	297	283	Pass
J - Elbow rest height	mm	183	203	192	Pass
K - Buttock to knee length	mm	521	546	536	Pass
L - Popliteal length	mm	356	376	374	Pass
M - Knee pivot height	mm	394	419	402	Pass
N - Buttock popliteal length	mm	414	439	429	Pass
O - Chest depth without jacket	mm	175	191	181	Pass
P - Foot length	mm	219	234	229	Pass
R - Buttock to Knee Pivot Length	mm	457	483	468	Pass
S - Head Breadth	mm	137	147	142	Pass
T - Head Depth	mm	178	188	186	Pass
U - Hip Breadth	mm	300	315	306	Pass
V - Shoulder breadth	mm	351	366	361	Pass
W - Foot breadth	mm	79	94	90	Pass
X - Head circum.	mm	528	549	536	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	864	Pass
Z - Waist circum.	mm	760	790	767	Pass
AA - Location for chest circum.	mm	333	358	344	Pass
BB - Location for waist circum.	mm	160	170	168	Pass
Overall Test Results					Pass

Technician:



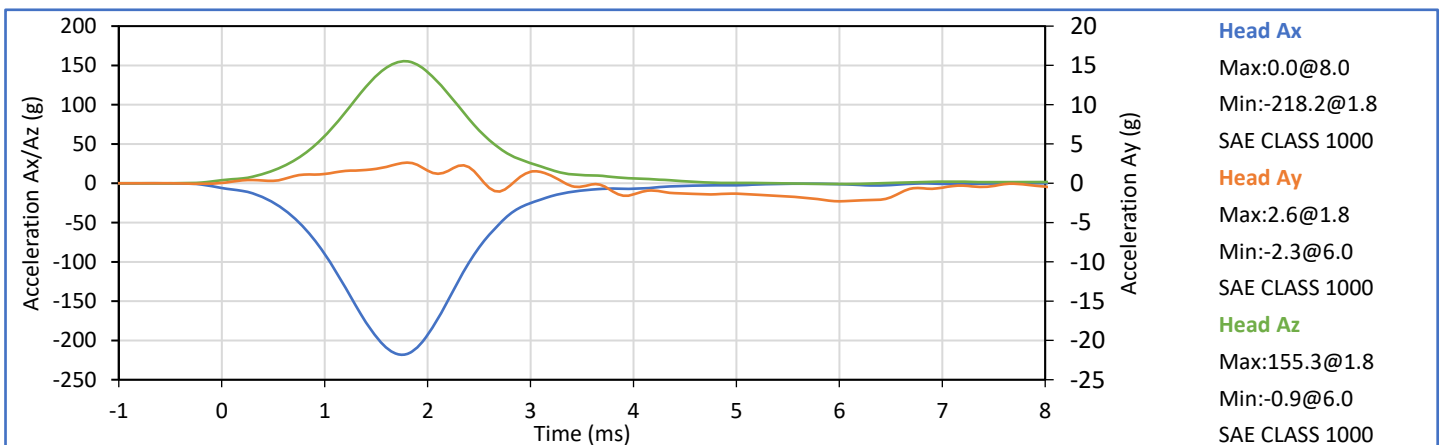
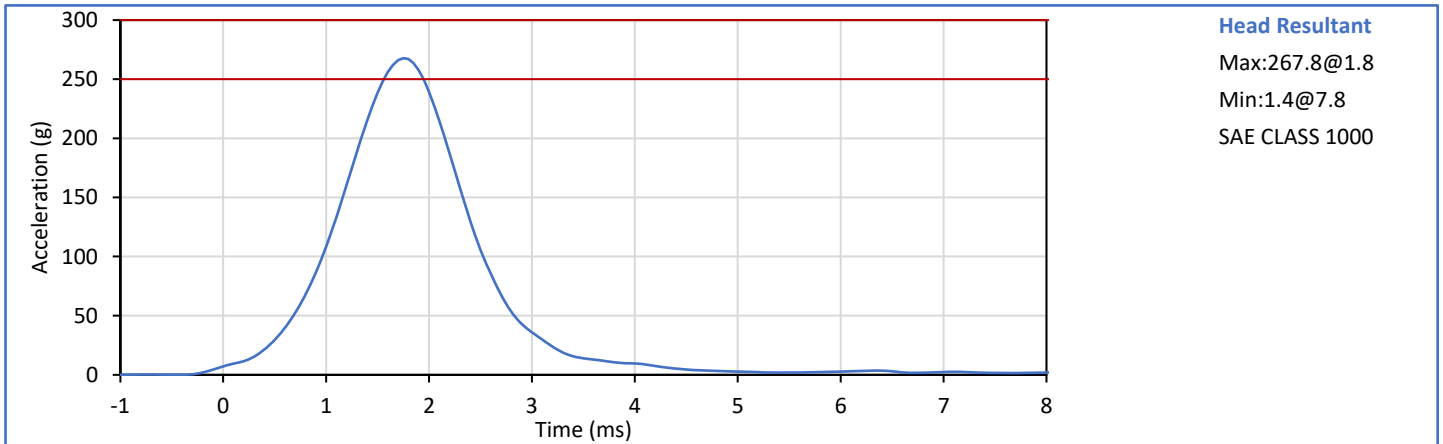
G. Fuentes

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 Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	250.0	300.0	267.8	Pass
Peak Lateral Acceleration	g	-15.0	15.0	2.6	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
<b>Overall Test Results</b>					<b>Pass</b>



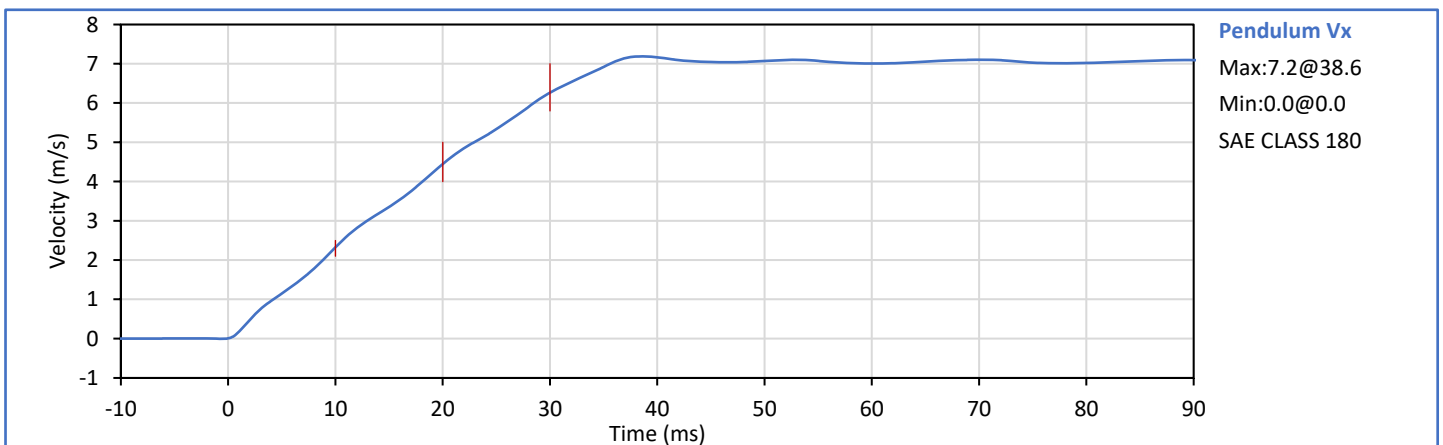
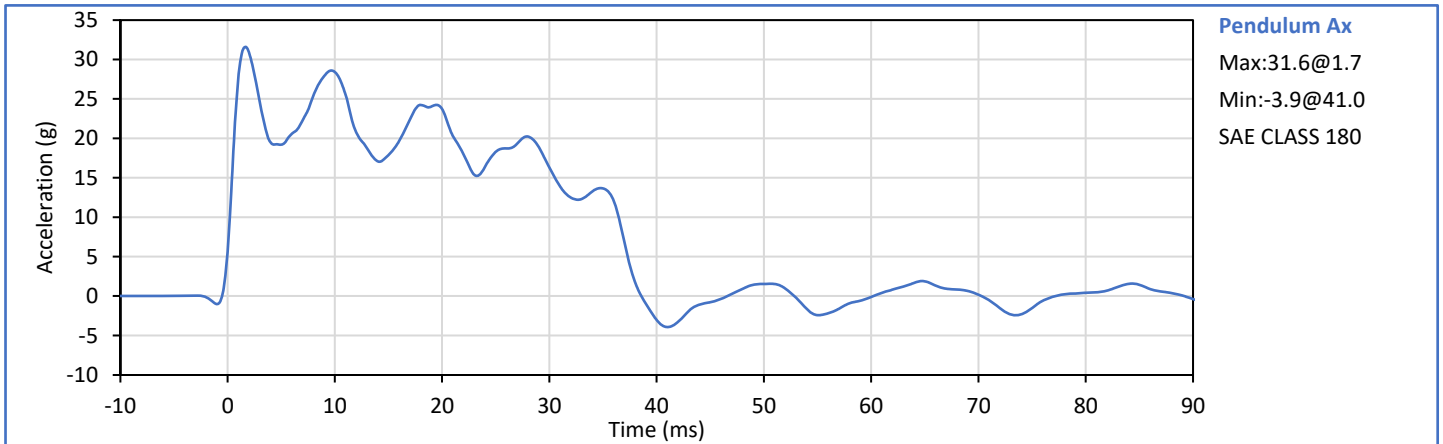
Technician: \_\_\_\_\_

G. Fuentes

Approved By: \_\_\_\_\_

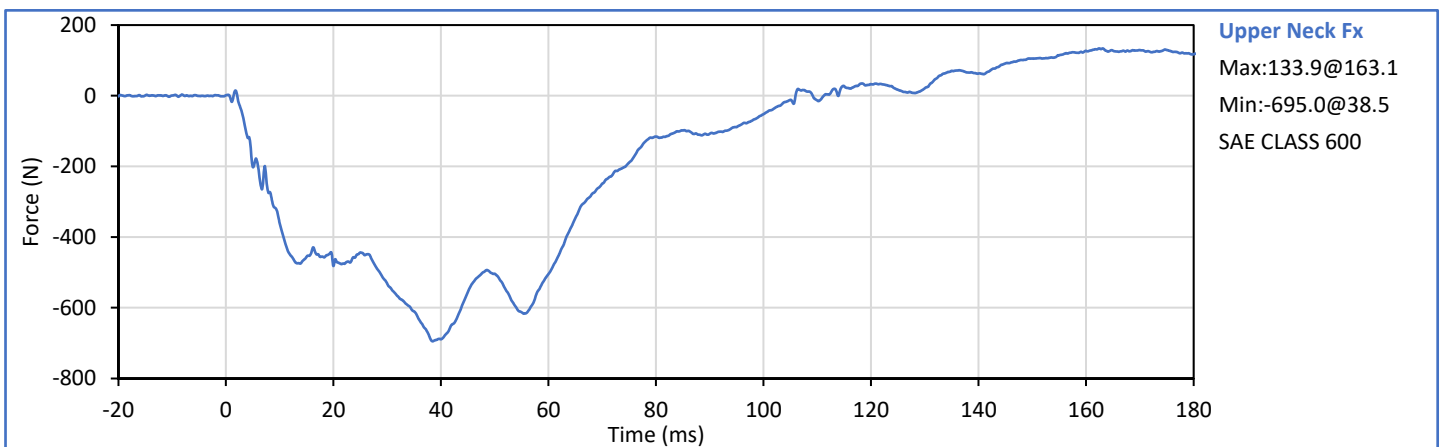
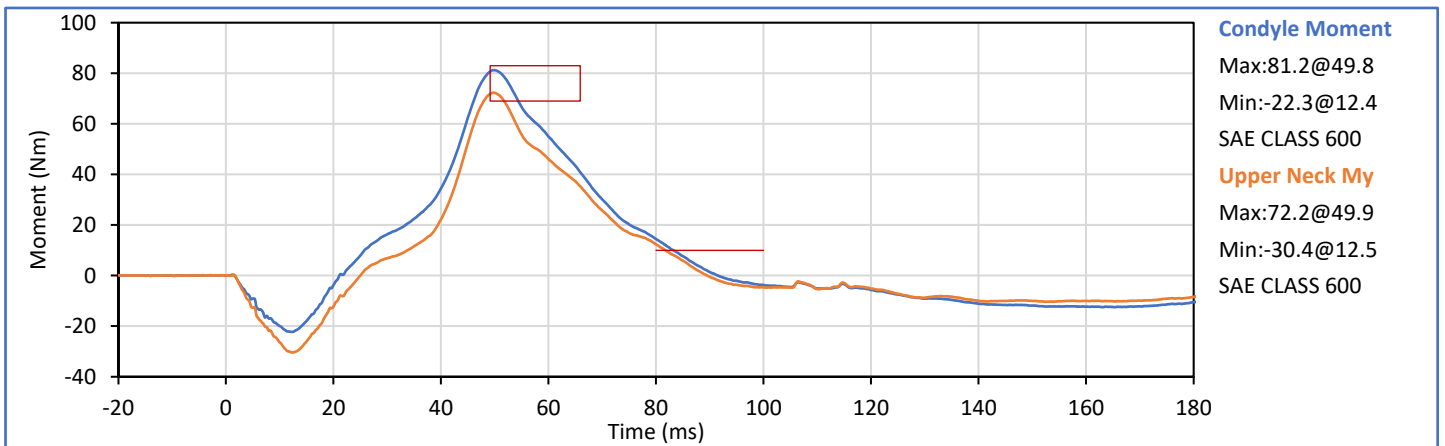
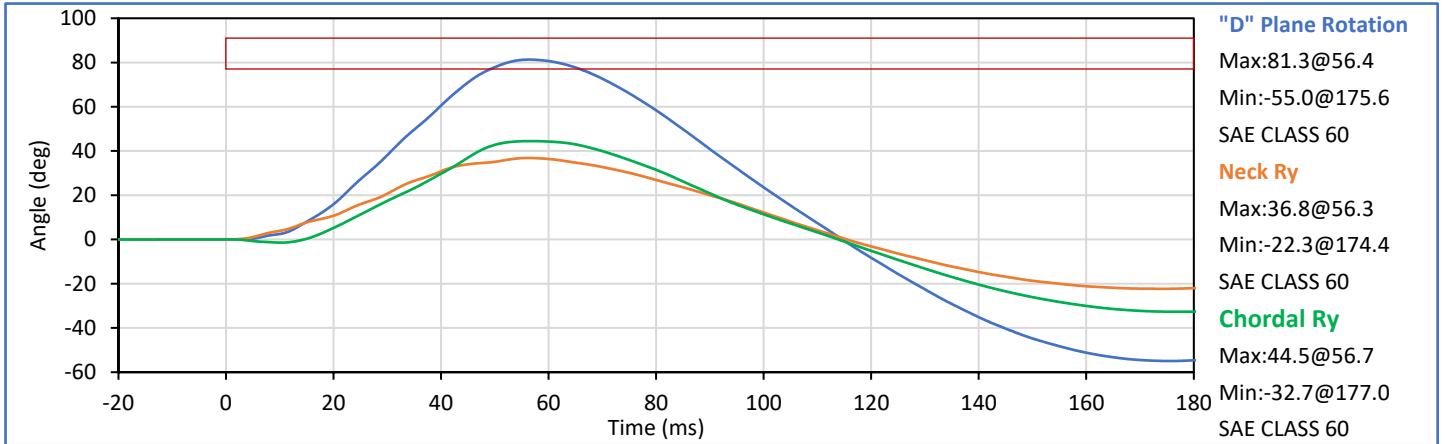
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	6.89	7.13	7.02	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.32	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.44	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.26	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	81.3	Pass
Peak Moment in Rotation	Nm	69.0	83.0	81.2	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	83.2	Pass
Overall Test Results					Pass

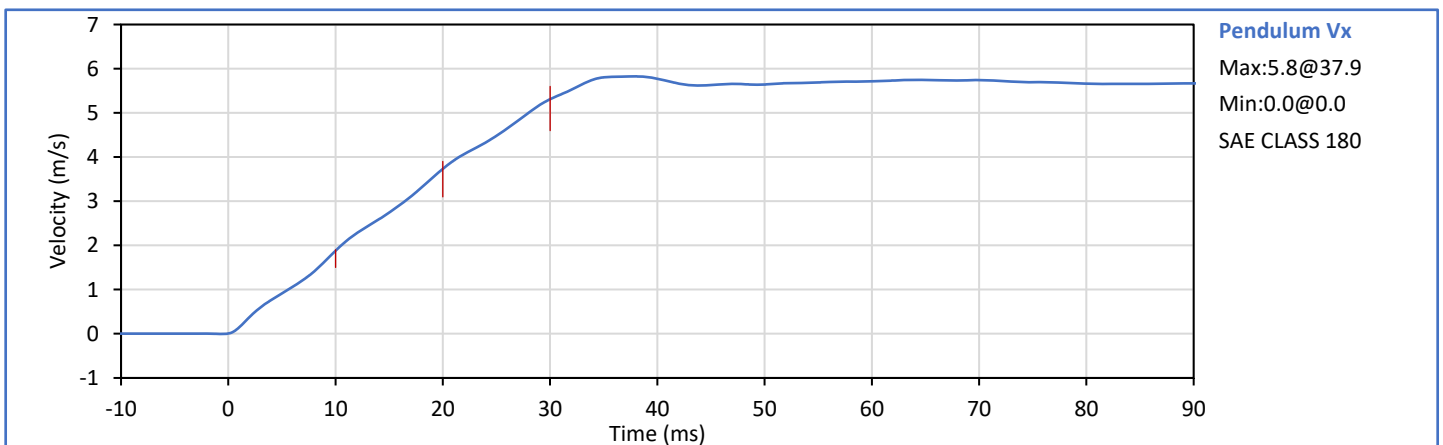
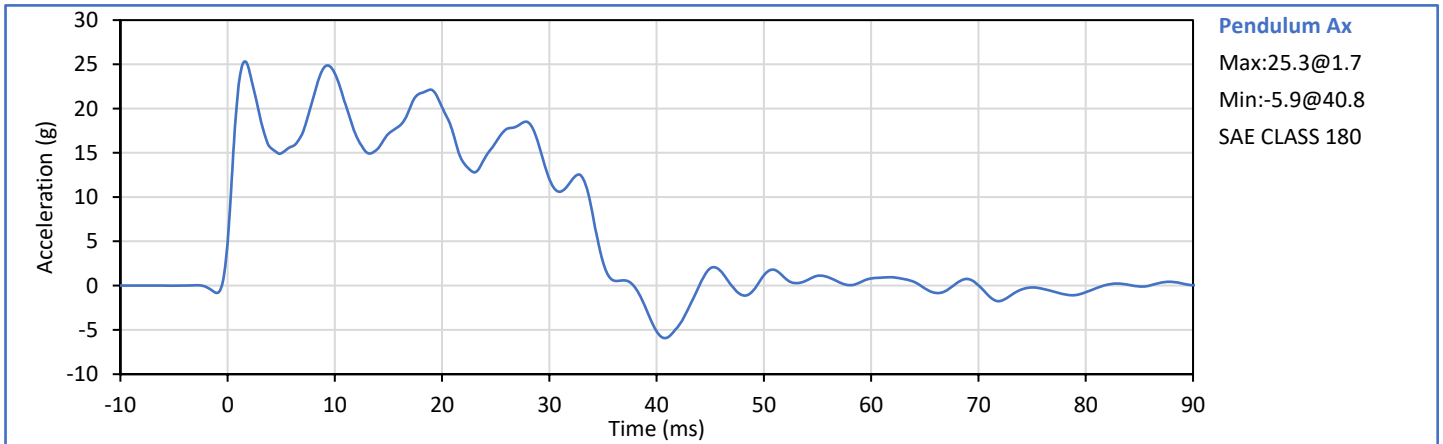


Technician: *Millie L. III*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

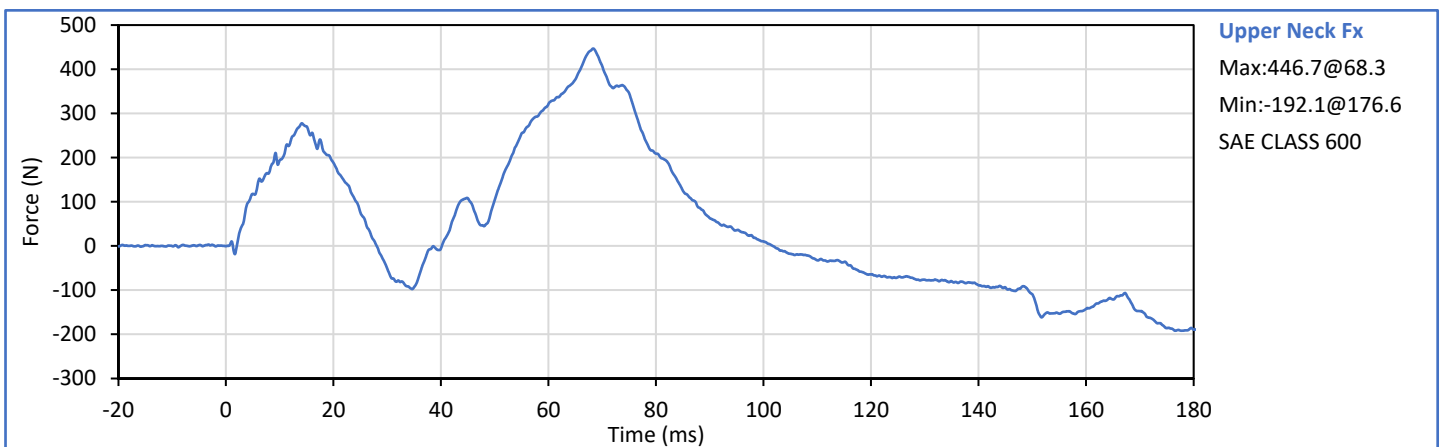
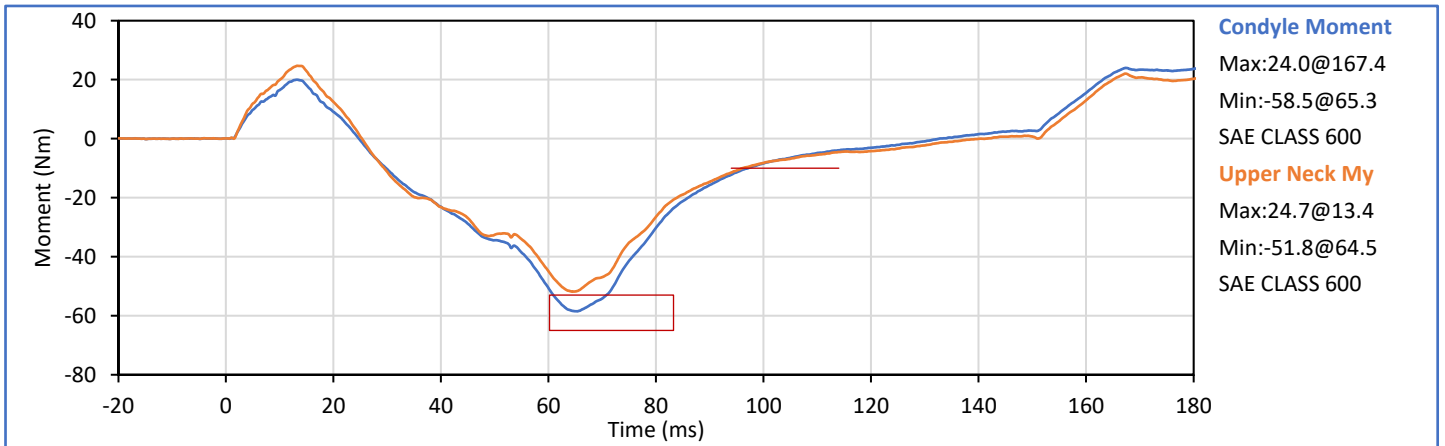
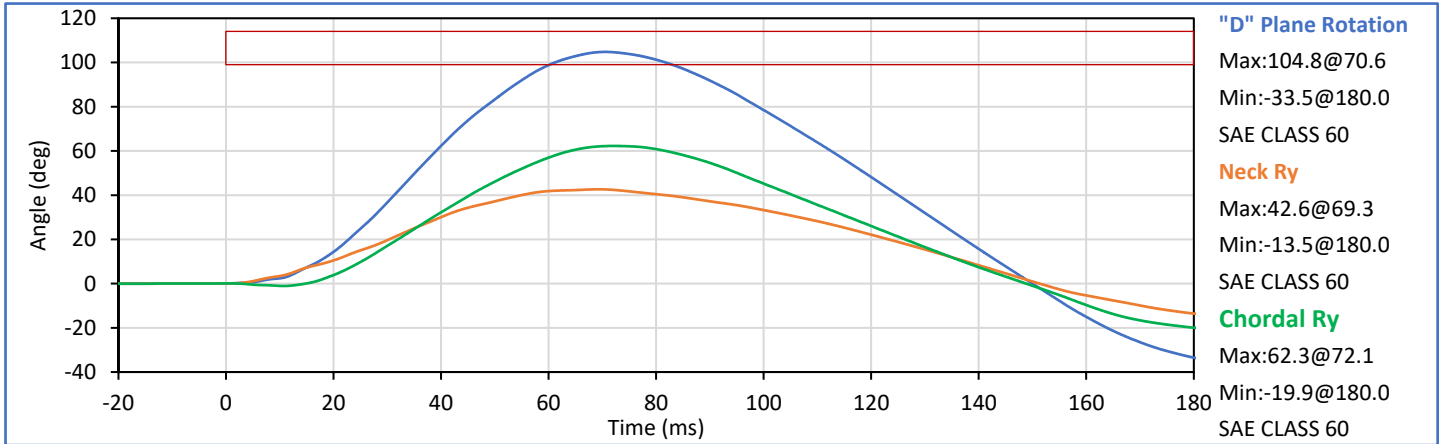


Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.95	6.19	6.08	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.88	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.73	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.31	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	104.8	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-58.5	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	97.2	Pass
Overall Test Results					Pass

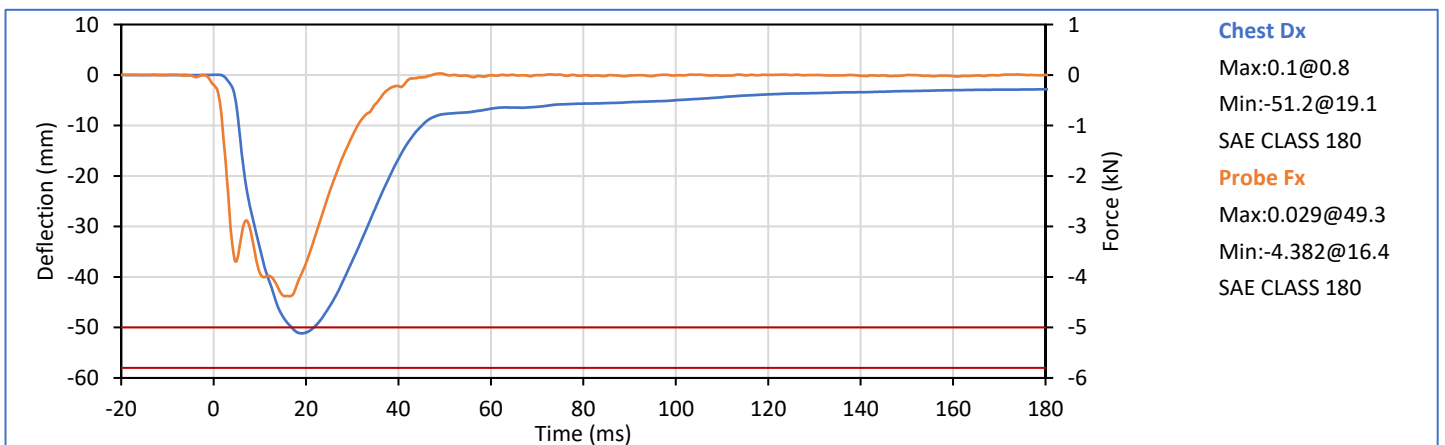
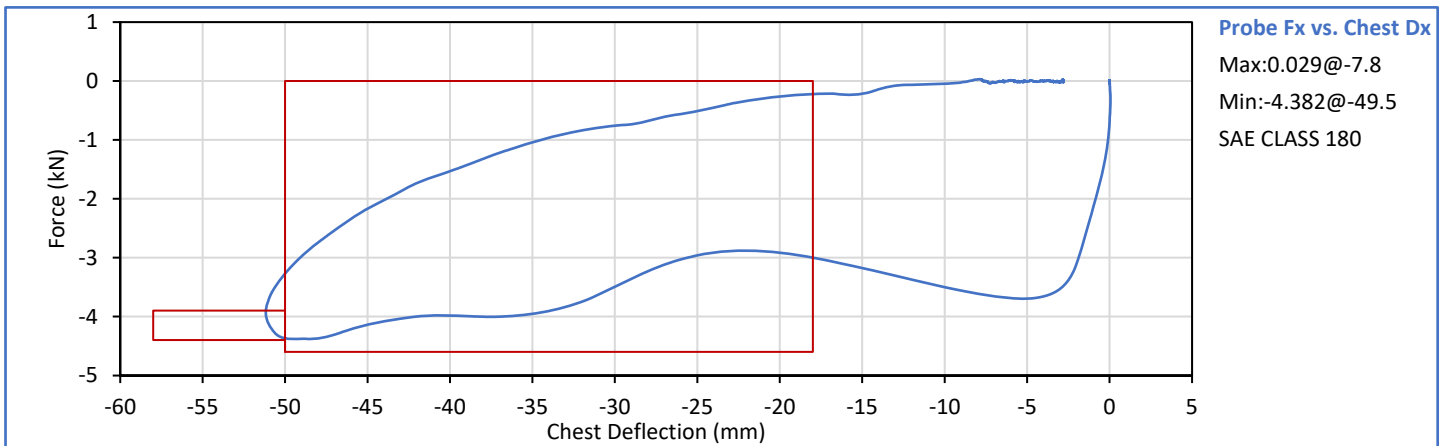


Technician: *Millie LGS III*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez



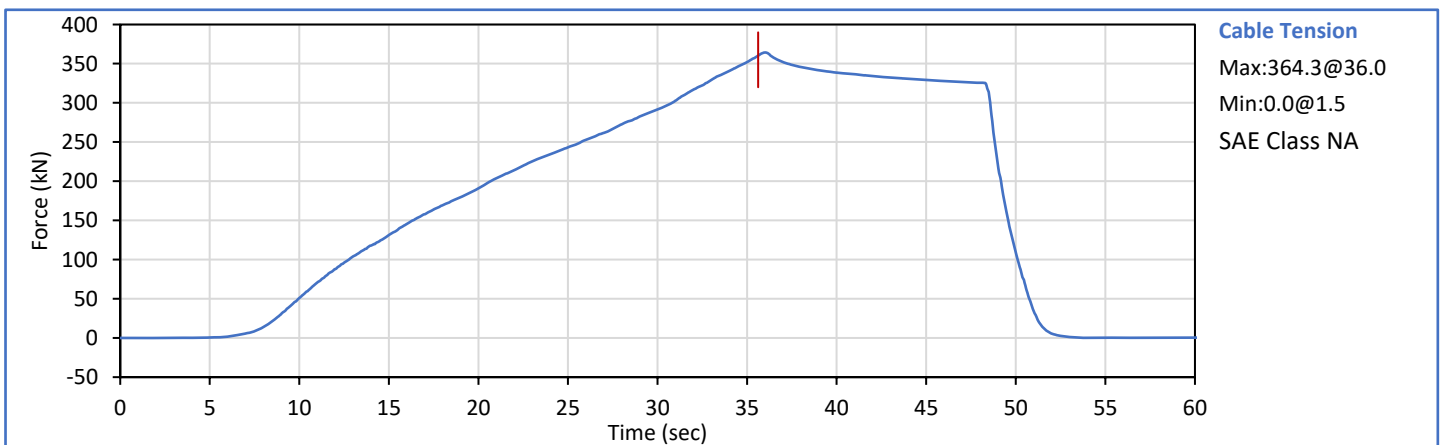
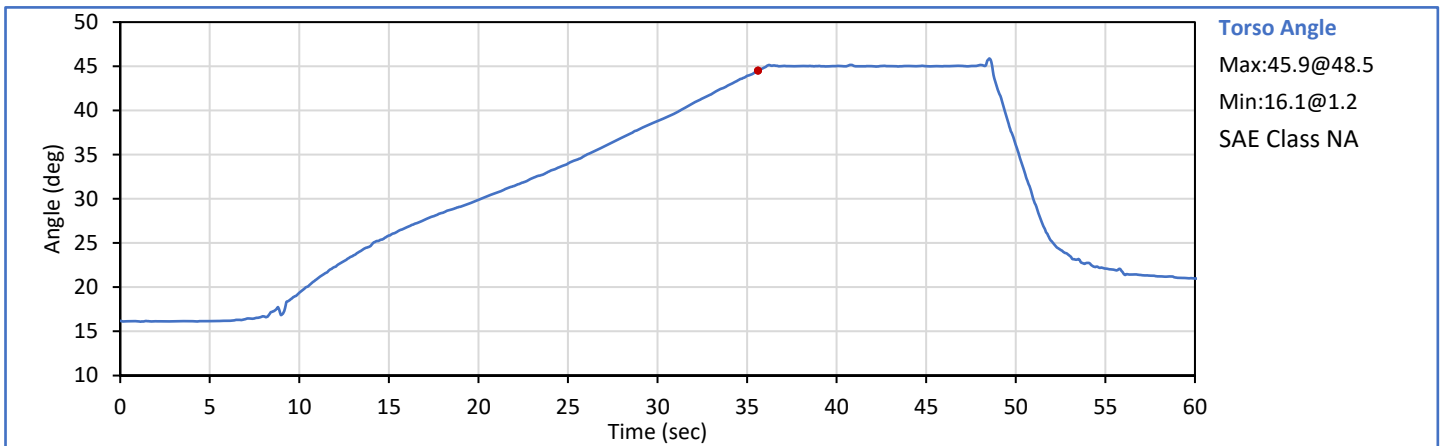
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory RelativeHumidity	%	10	70	33	Pass
Probe Velocity	m/s	6.59	6.83	6.75	Pass
Peak Chest Deflection	mm	-58.0	-50.0	-51.2	Pass
Peak Probe Force, 50 and 58 mm	kN	-4.400	-3.900	-4.370	Pass
Peak Probe Force, 18 and 50 mm	kN	-4.600	0.000	-4.382	Pass
Internal Hysteresis	%	69.0	85.0	75.6	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *Millie LGS III*  
 G. Fuentes

Approved By: *J. Hernandez*  
 J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Humidity	%	10	70	30	Pass
Orientation Angle	deg	0.0	20.0	16.2	Pass
Test Initial Angle	deg	11.0	19.0	16.1	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	360.2	Pass
Torso Flexion Rate	deg/s	0.50	1.50	1.04	Pass
Final Reference Plane Angle	deg	-8.0	8.0	3.8	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician:           *Millie LGS III*            
G. Fuentes

Approved By:           *J. Hernandez*            
J. Hernandez





**APPENDIX C**  
**Post-Test ATD Qualification and Performance Verification**  
**Hybrid III 50th Percentile Male ATD**  
**S/N: 360**


ATD Serial No.: 360


Test Date: 2023-02-23

Dummy Item	Inspect for	Comments	Damage	OK
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ. Assembly	Bent shaft			✓
	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer Mounting	Head mounting secure			✓
	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician:   
G. Fuentes

Approved By:   
J. Hernandez

ATD Serial No.: 360

Test Date: 2023-02-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
A - Total sitting height	mm	879	889	880	Pass
B - Shoulder pivot height	mm	505	521	514	Pass
C - 'H' point height	mm	84	89	88	Pass
D - 'H' point location from backline	mm	135	140	140	Pass
E - Shoulder pivot from backline	mm	84	94	92	Pass
F - Thigh clearance	mm	140	155	148	Pass
G - Back of elbow to wrist pivot	mm	290	305	300	Pass
H - Head back to backline	mm	41	46	45	Pass
I - Shoulder to elbow length	mm	330	345	334	Pass
J - Elbow rest height	mm	190	211	203	Pass
K - Buttock to knee length	mm	579	604	588	Pass
L - Popliteal length	mm	429	455	438	Pass
M - Knee pivot height	mm	485	500	496	Pass
N - Buttock popliteal length	mm	452	477	458	Pass
O - Chest depth without jacket	mm	213	229	217	Pass
P - Foot length	mm	251	267	258	Pass
V - Shoulder breadth	mm	422	437	432	Pass
W - Foot breadth	mm	91	107	102	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	983	Pass
Z - Waist circum.	mm	836	866	861	Pass
AA - Location for chest circum.	mm	429	434	431	Pass
BB - Location for waist circum.	mm	226	231	228	Pass
Overall Test Results					Pass

Technician:



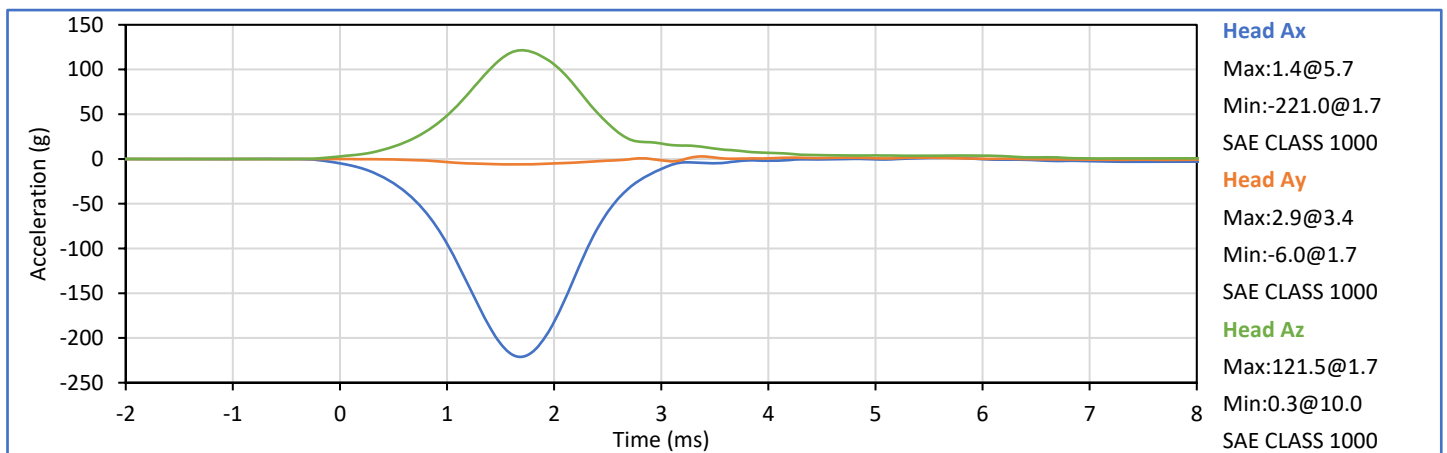
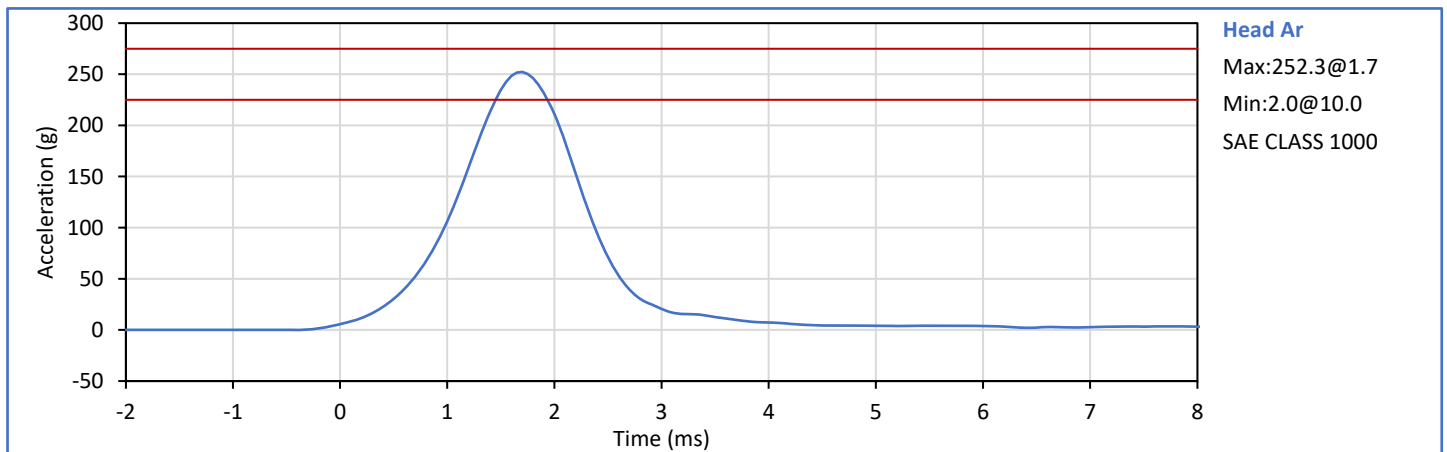
G. Fuentes

Approved By:



J. Hernandez

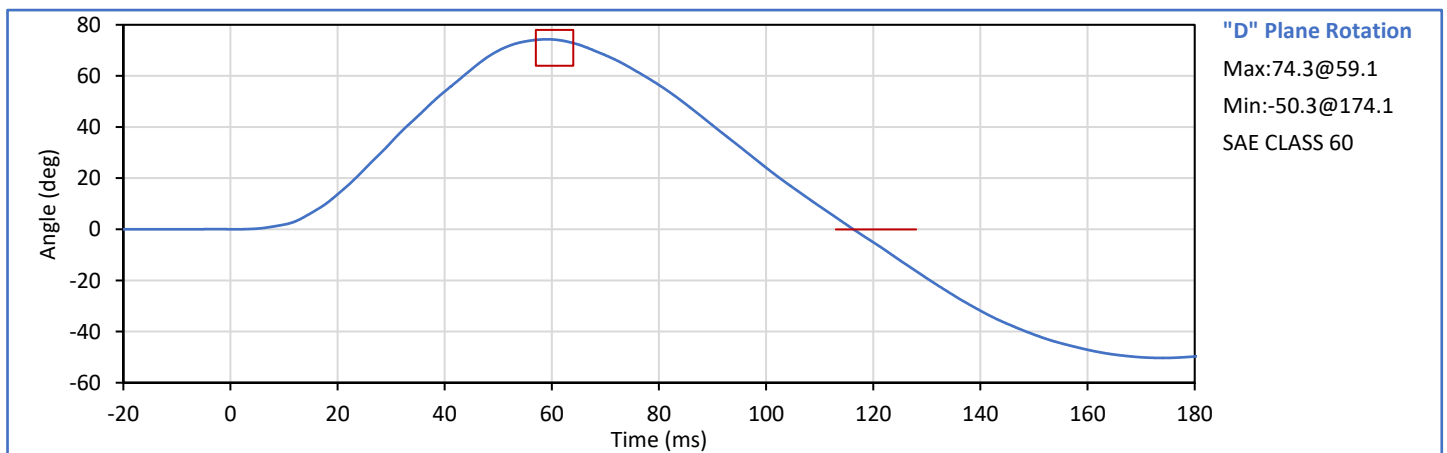
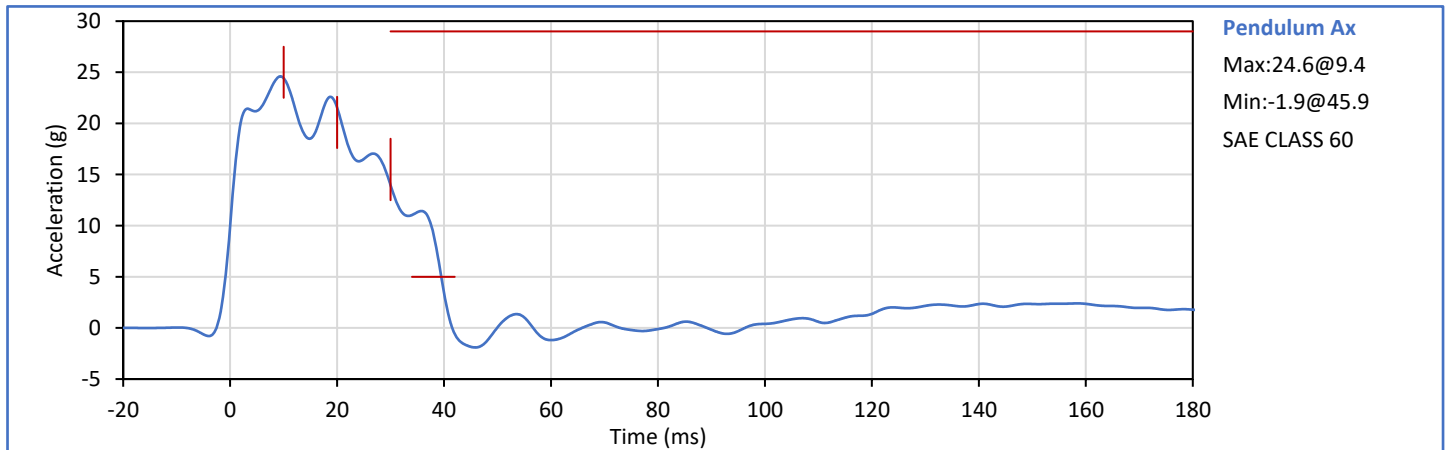
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	32	Pass
Peak Resultant Acceleration	g	225.0	275.0	252.3	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-6.0	Pass
Oscillations After Main Pulse	%	0.0	10.0	0.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *G. Fuentes*  
G. Fuentes

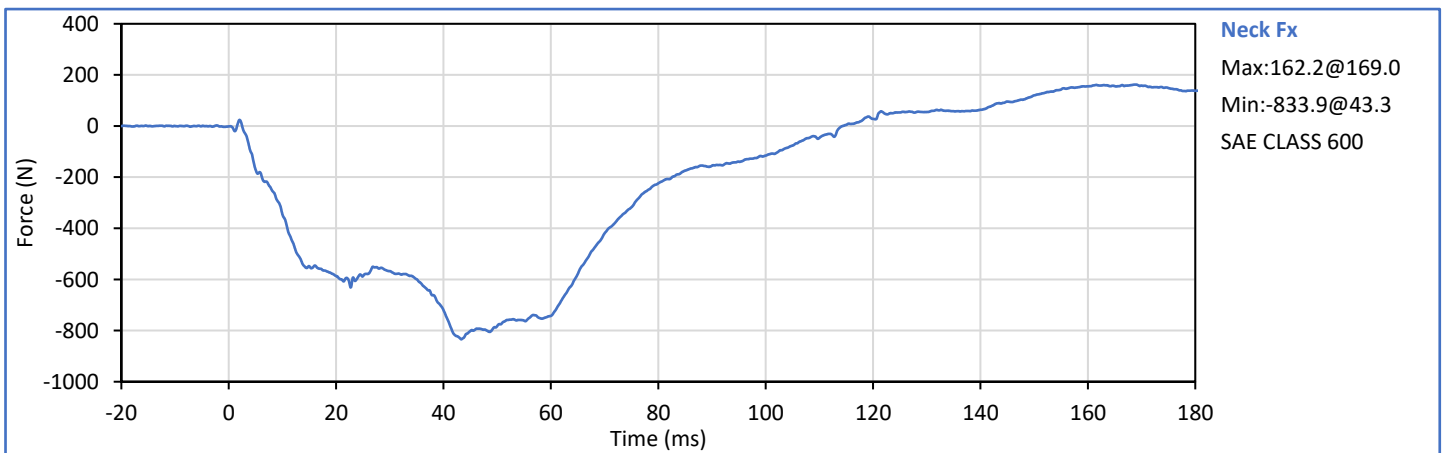
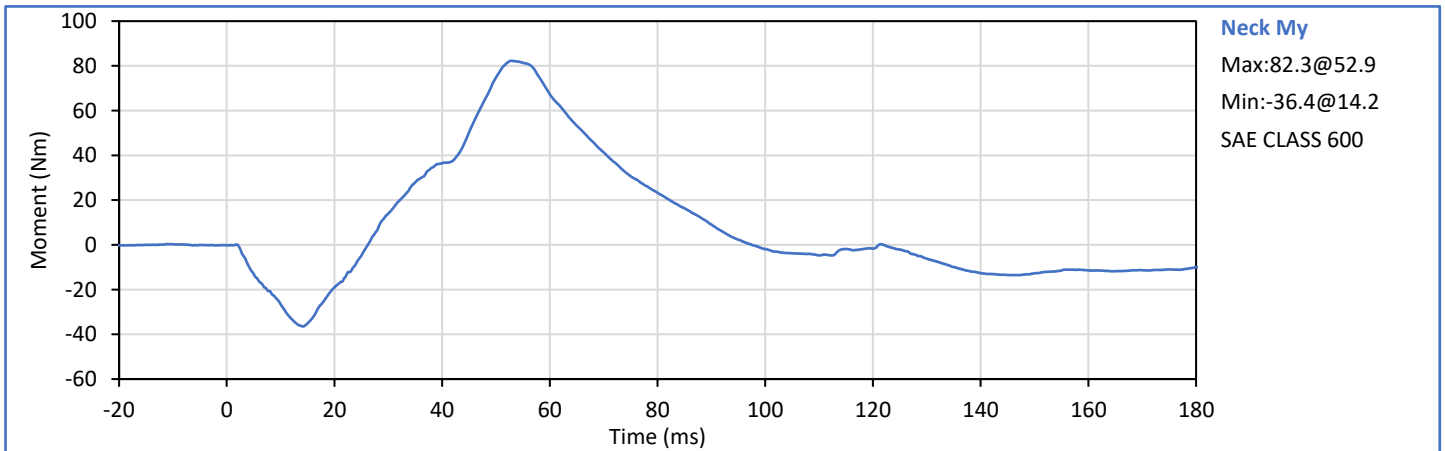
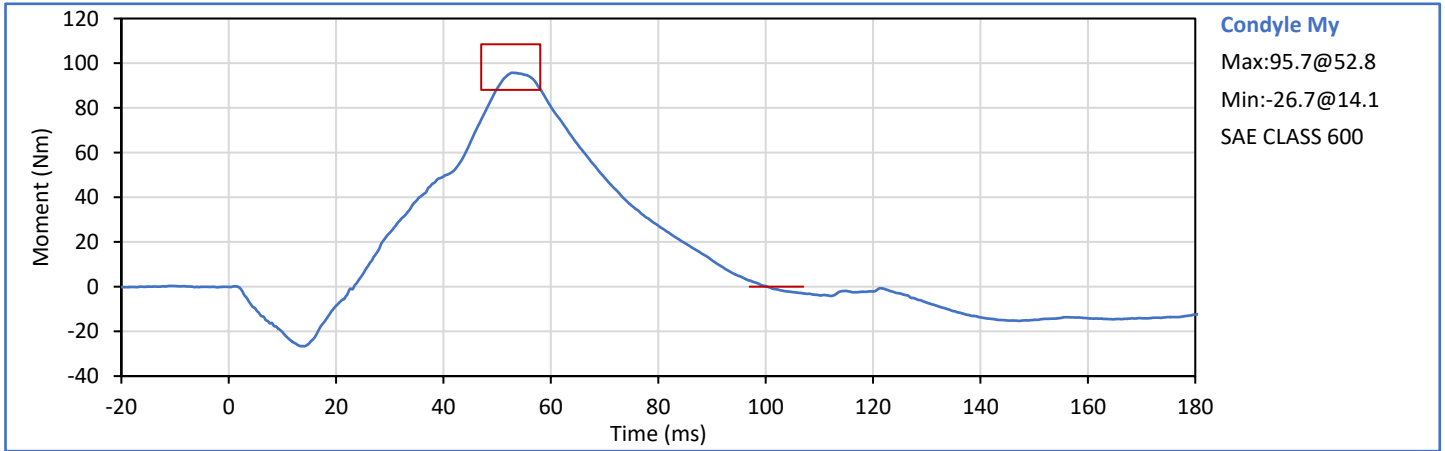
Approved By: *J. Hernandez*  
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	40	Pass
Pendulum Velocity	m/s	6.89	7.13	6.98	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	24.4	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	21.6	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	14.0	Pass
Peak Pendulum Decel After 30 ms	g	0.0	29.0	14.0	Pass
Deceleration Decay to Cross 5g	ms	34.0	42.0	39.5	Pass
"D" Plane Rotation peak	deg	64.0	78.0	74.3	Pass
	ms	57.0	64.0	59.1	Pass
"D" Plane Rotation Decay to Zero	ms	113.0	128.0	116.4	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	95.7	Pass
	ms	47.0	58.0	52.8	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	100.3	Pass
Overall Test Results					Pass

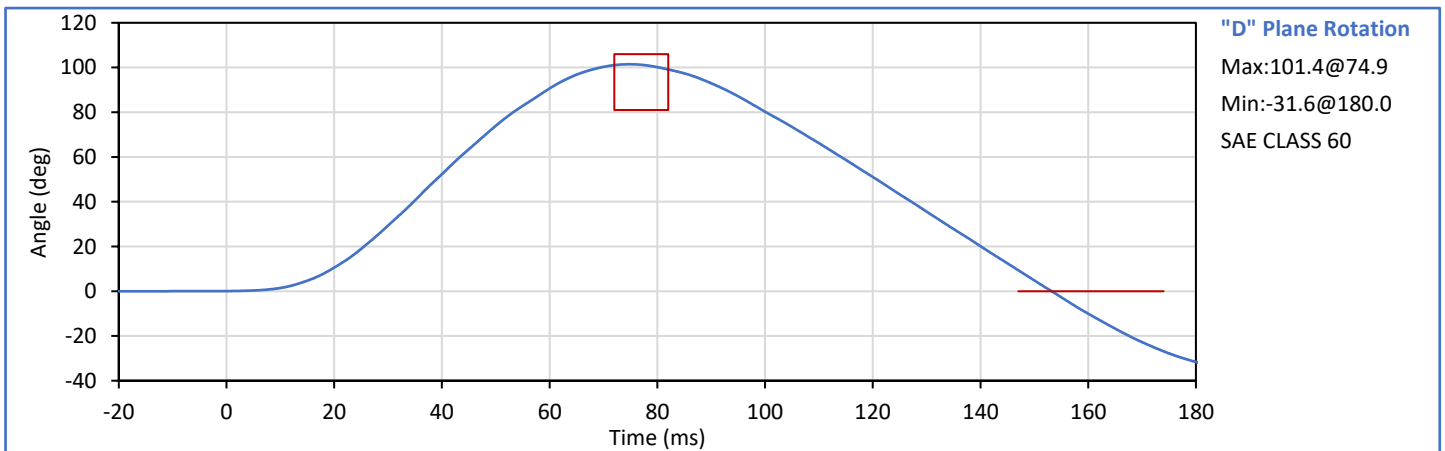
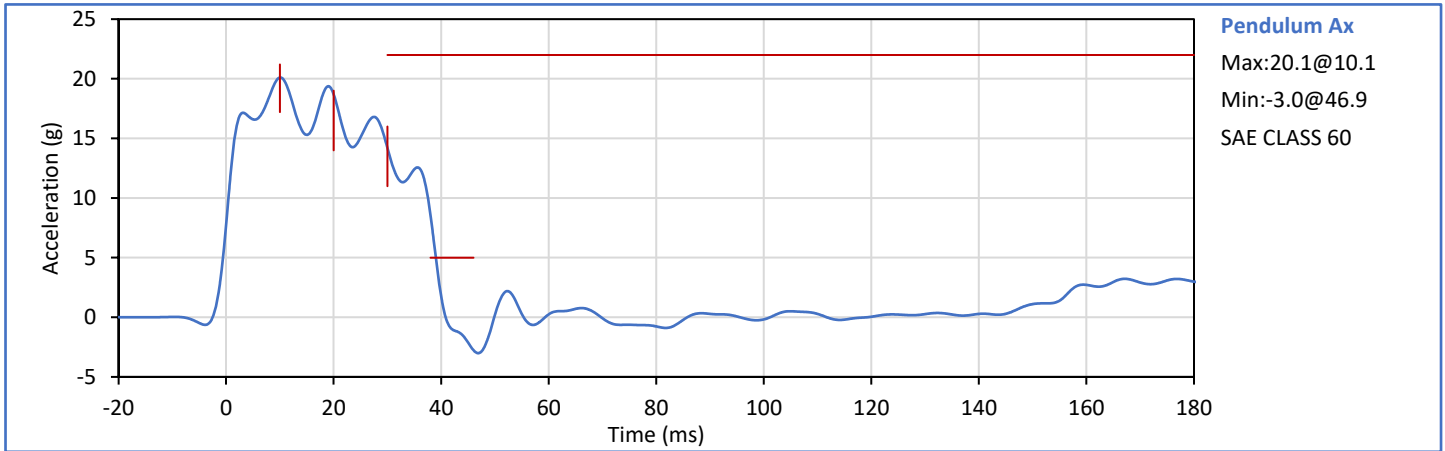


Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

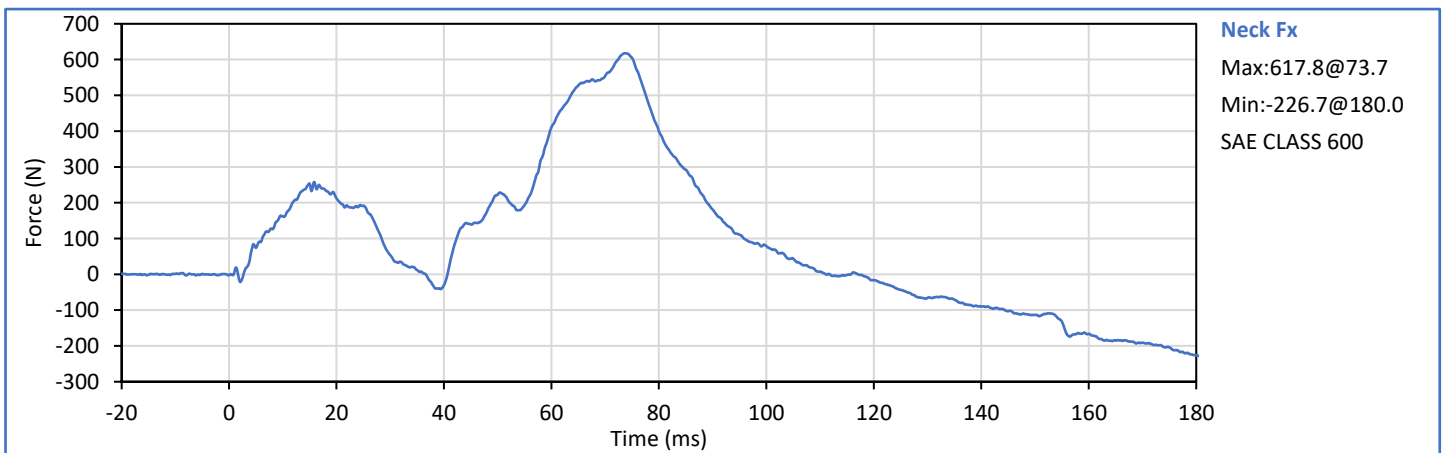
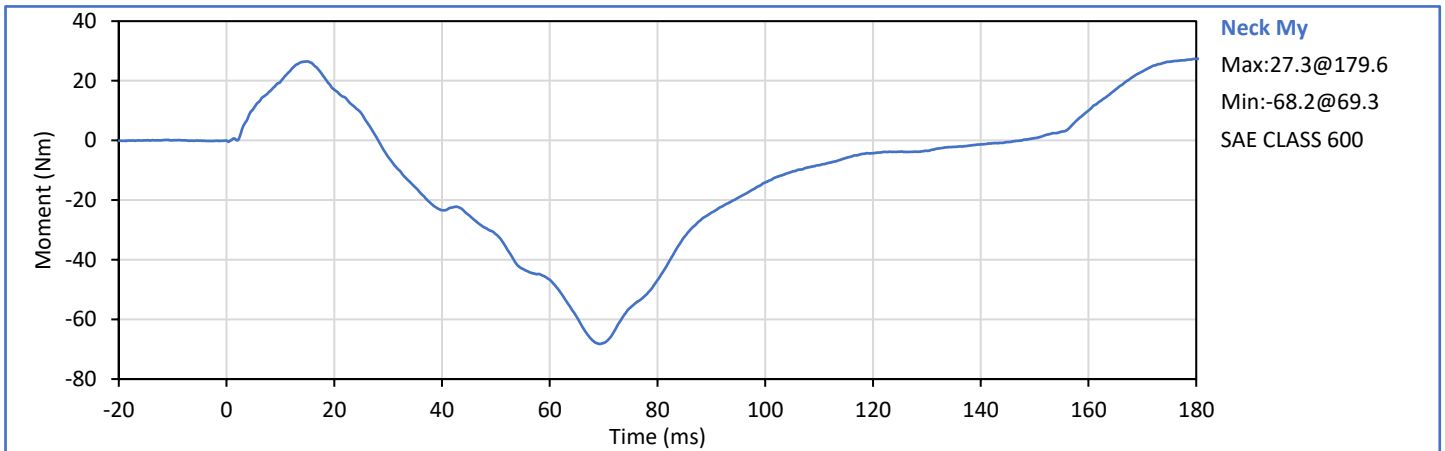
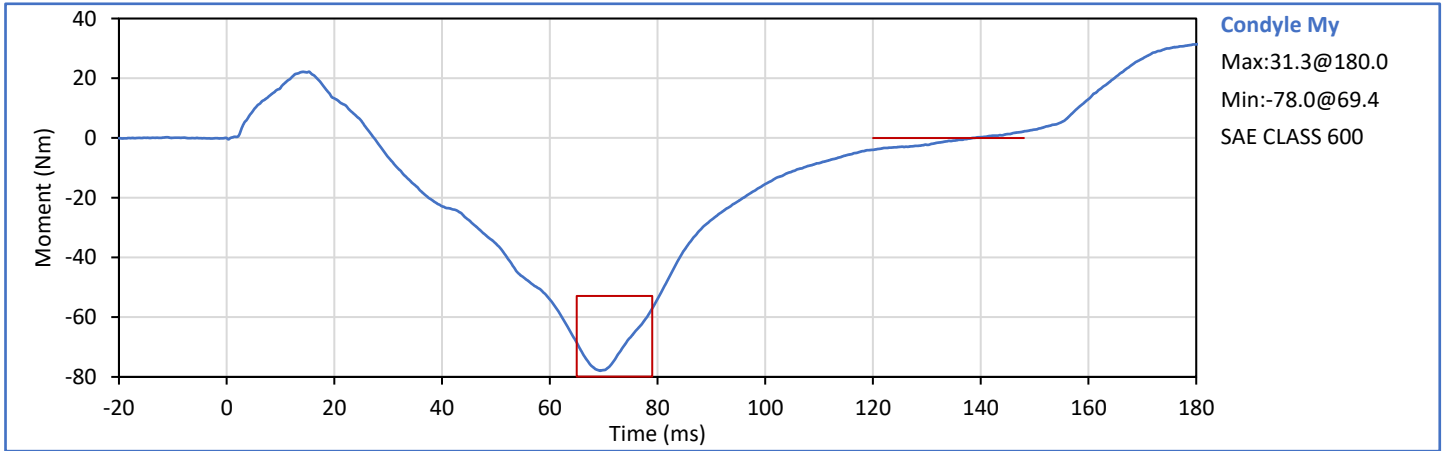


Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	40	Pass
Pendulum Velocity	m/s	5.94	6.19	6.04	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.1	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.7	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	14.2	Pass
Peak Pendulum Decel After 30 ms	g	0.0	22.0	14.2	Pass
Deceleration Decay to Cross 5g	ms	38.0	46.0	39.0	Pass
"D" Plane Rotation peak	deg	81.0	106.0	101.4	Pass
	ms	72.0	82.0	74.9	Pass
"D" Plane Rotation Decay to Zero	ms	147.0	174.0	153.3	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-78.0	Pass
	ms	65.0	79.0	69.4	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	138.6	Pass
Overall Test Results					Pass

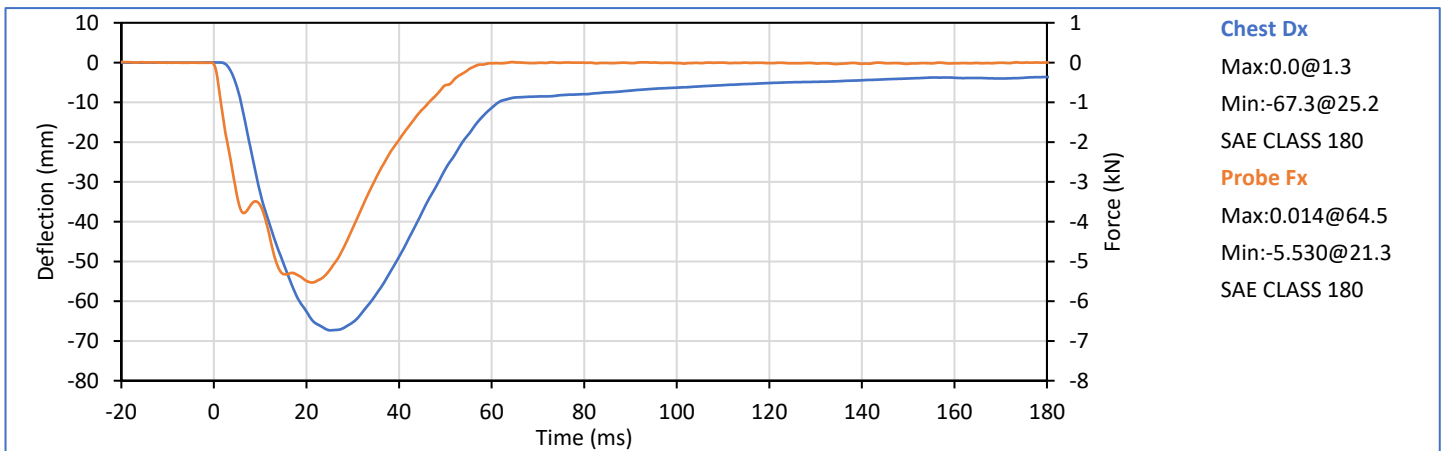
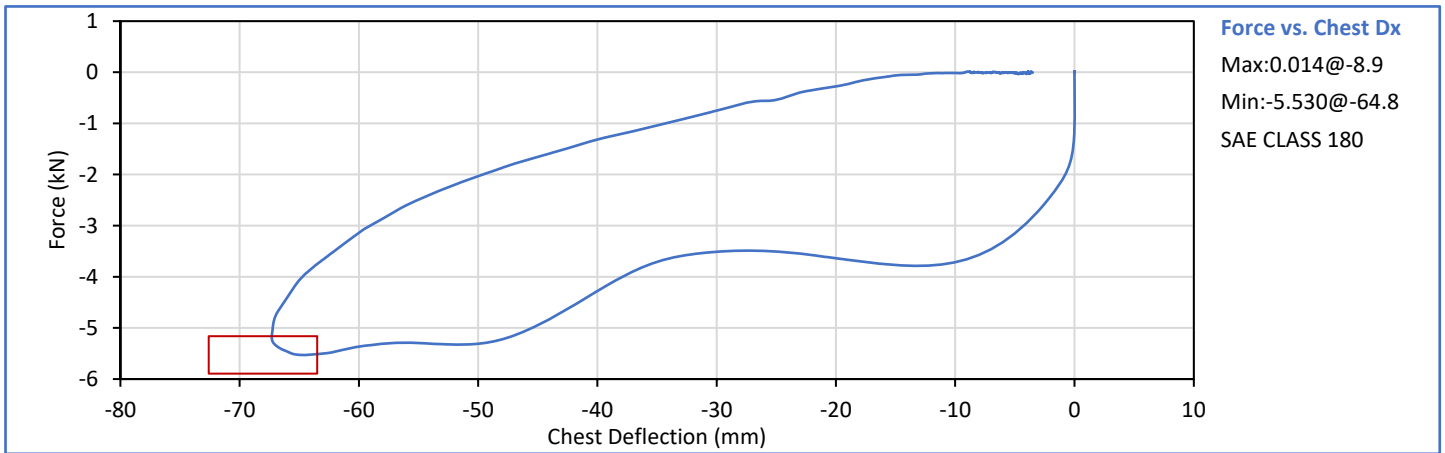


Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez



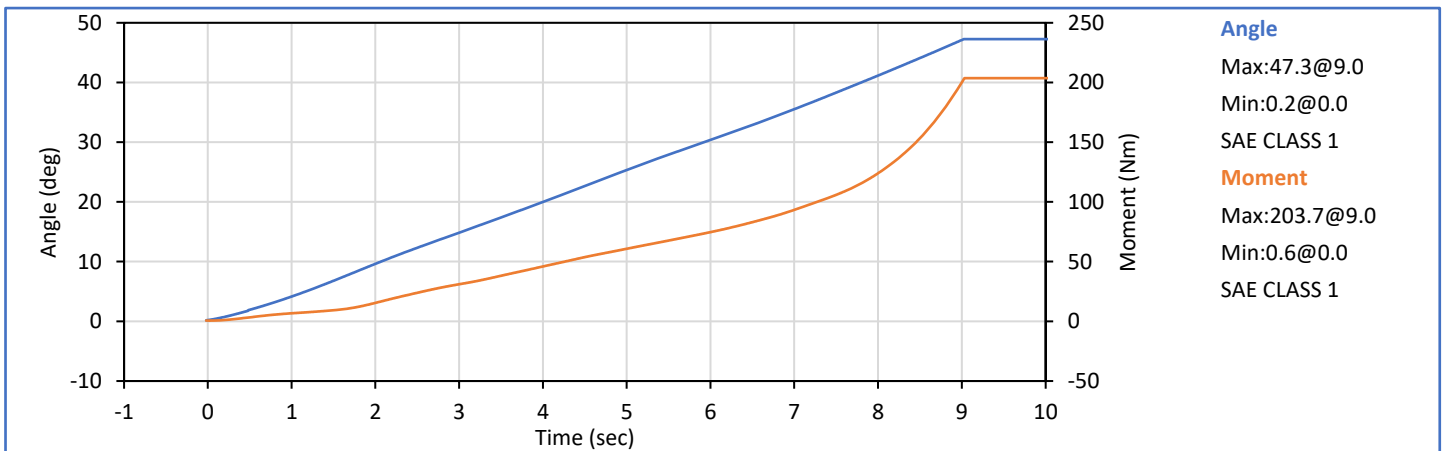
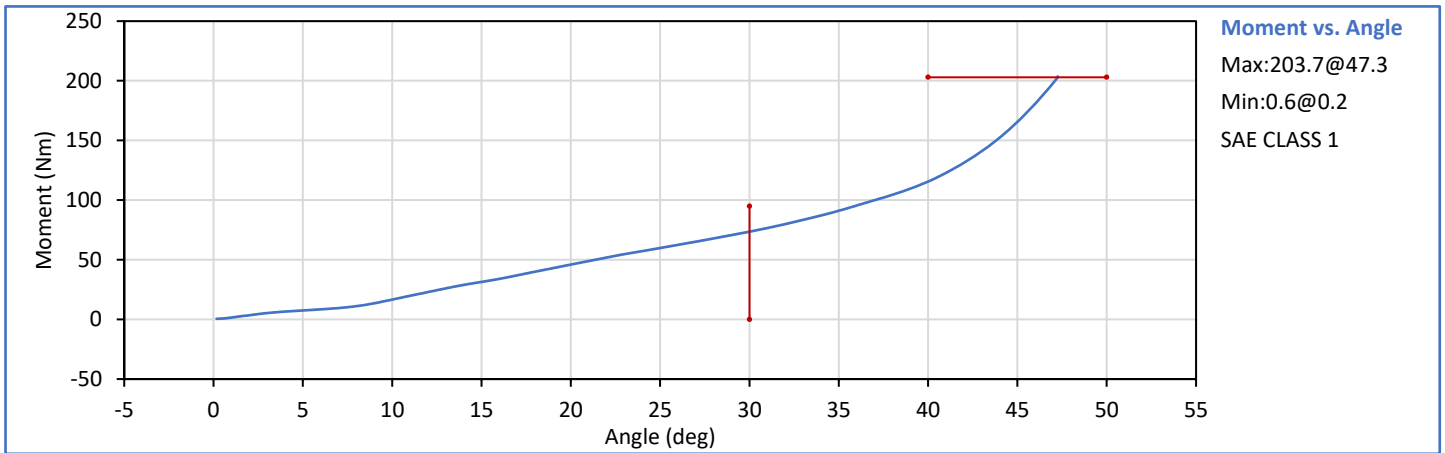
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.9	Pass
Laboratory Relative Humidity	%	10	70	33	Pass
Probe Velocity	m/s	6.58	6.82	6.67	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-67.3	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.530	Pass
Internal Hysterisis	%	69.0	85.0	69.4	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

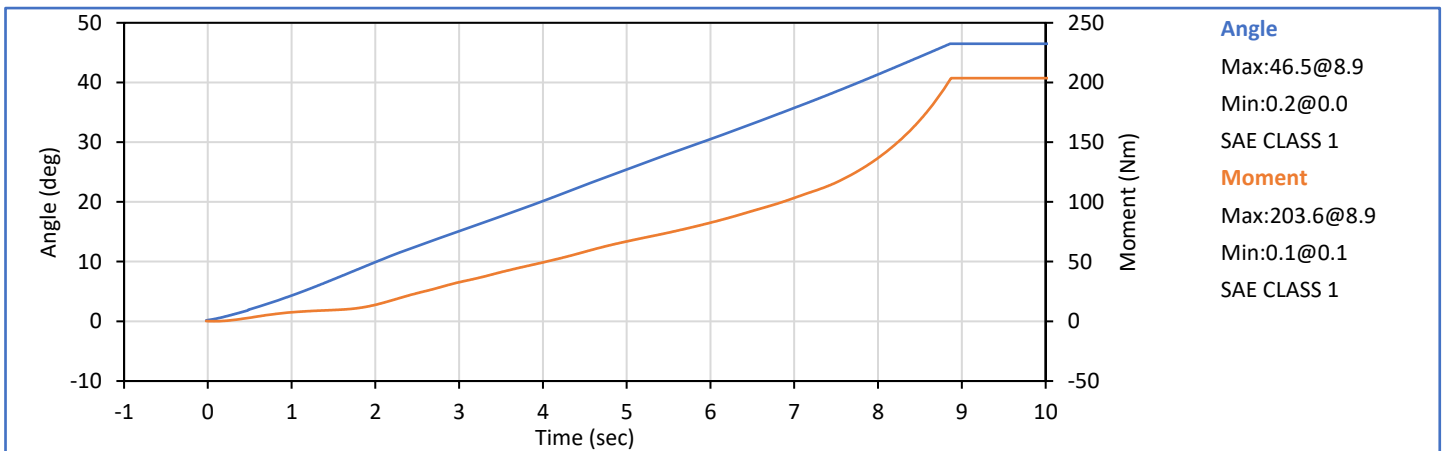
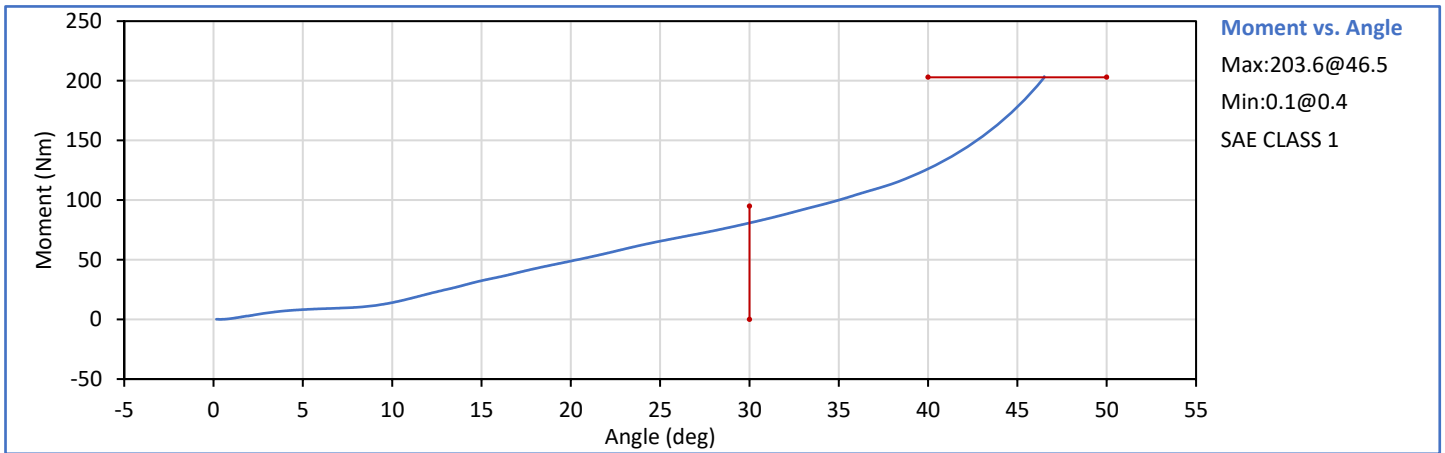
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.3	Pass
Laboratory Relative Humidity	%	10	70	32	Pass
Left Hip Rotation Rate	deg/s	5.0	10.0	5.2	Pass
Left Femur Torque at 30°	Nm	0.0	95.0	73.5	Pass
Left Hip Rotation at 203 Nm	deg	40.0	50.0	47.3	Pass
Overall Test Results					Pass



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

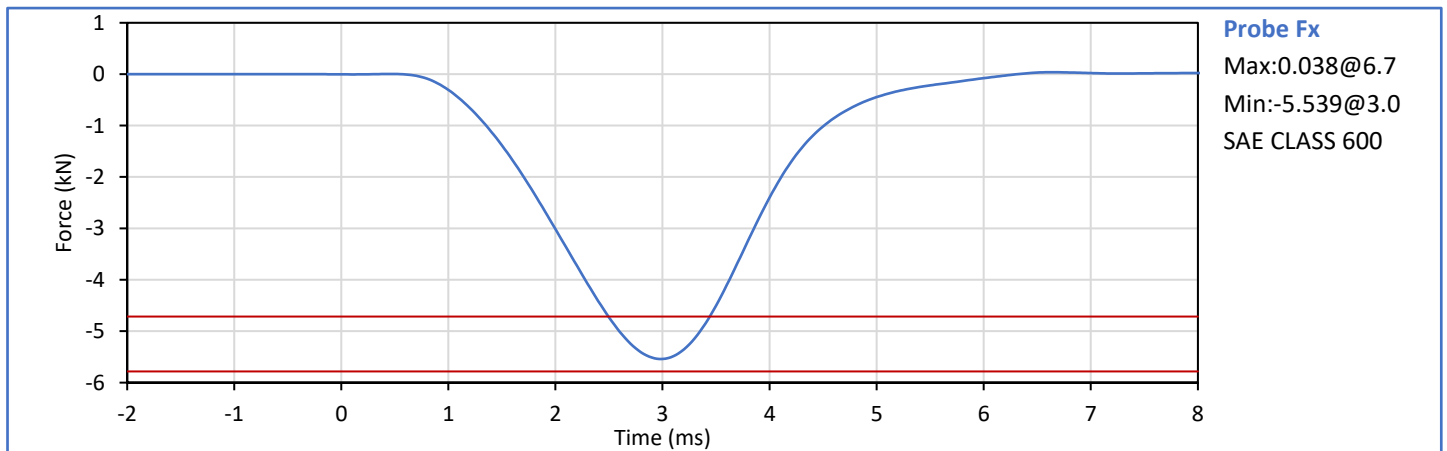
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.3	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Right Hip Rotation Rate	deg/s	5.0	10.0	5.2	Pass
Right Femur Torque at 30°	Nm	0.0	95.0	80.8	Pass
Right Hip Rotation at 203 Nm	deg	40.0	50.0	46.5	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

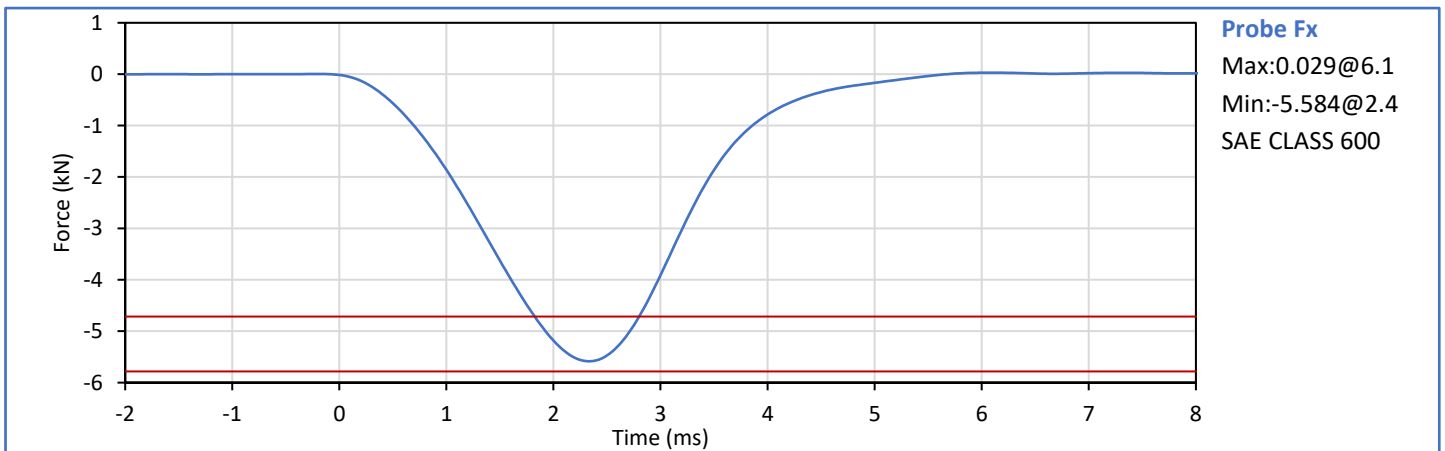
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.4	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Probe Velocity	m/s	2.070	2.130	2.105	Pass
Peak Resistive Force	kN	-5.782	-4.715	-5.539	Pass
Overall Test Results					Pass



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.5	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Probe Velocity	m/s	2.070	2.130	2.103	Pass
Peak Resistive Force	kN	-5.782	-4.715	-5.584	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

**APPENDIX C**  
**Post-Test ATD Qualification and Performance Verification**  
**Hybrid III 5th Percentile Female ATD**  
**S/N: DH1644**

Dummy Item	Inspect for	Comments	Damage	Okay
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ. Assembly	Bent shaft			✓
	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer Mounting	Head mounting secure			✓
	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician:           *Bill G III*            
G. Fuentes

Approved By:           *Scott*            
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	35	Pass
A - Total sitting height	mm	775	800	785	Pass
B - Shoulder pivot height	mm	432	457	439	Pass
C - 'H' point height	mm	81	86	86	Pass
D - 'H' point location from backline	mm	145	150	149	Pass
E - Shoulder pivot from backline	mm	69	84	78	Pass
F - Thigh clearance	mm	119	135	127	Pass
G - Back of elbow to wrist pivot	mm	244	259	251	Pass
H - Head back to backline	mm	41	46	43	Pass
I - Shoulder to elbow length	mm	277	297	290	Pass
J - Elbow rest height	mm	183	203	195	Pass
K - Buttock to knee length	mm	521	546	538	Pass
L - Popliteal length	mm	356	376	365	Pass
M - Knee pivot height	mm	394	419	402	Pass
N - Buttock popliteal length	mm	414	439	421	Pass
O - Chest depth without jacket	mm	175	191	184	Pass
P - Foot length	mm	219	234	231	Pass
R - Buttock to Knee Pivot Length	mm	457	483	467	Pass
S - Head Breadth	mm	137	147	141	Pass
T - Head Depth	mm	178	188	186	Pass
U - Hip Breadth	mm	300	315	308	Pass
V - Shoulder breadth	mm	351	366	355	Pass
W - Foot breadth	mm	79	94	90	Pass
X - Head circum.	mm	528	549	536	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	866	Pass
Z - Waist circum.	mm	760	790	768	Pass
AA - Location for chest circum.	mm	333	358	350	Pass
BB - Location for waist circum.	mm	160	170	167	Pass
Overall Test Results					Pass

Technician: \_\_\_\_\_



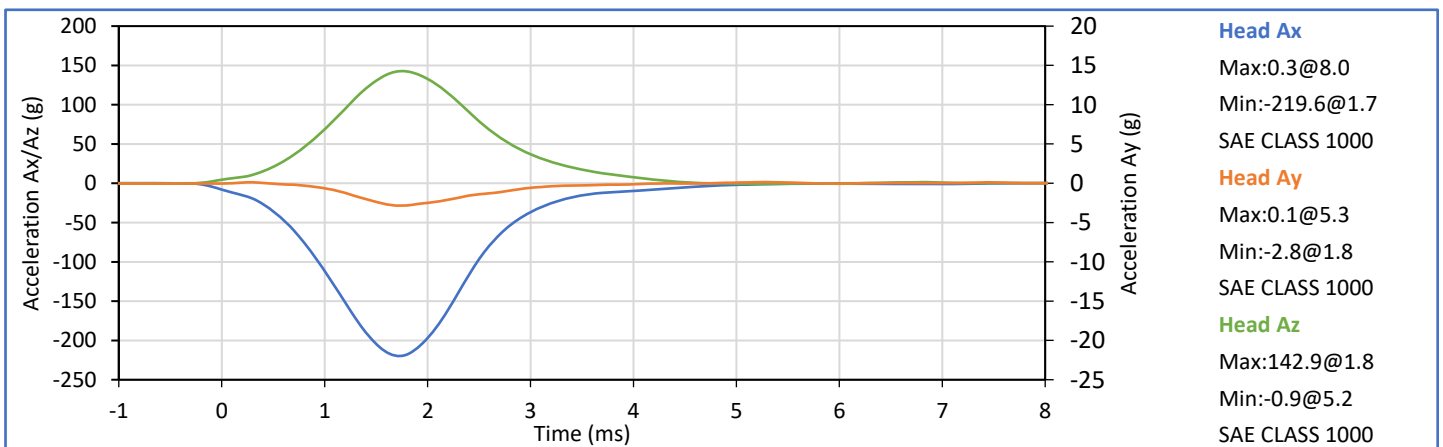
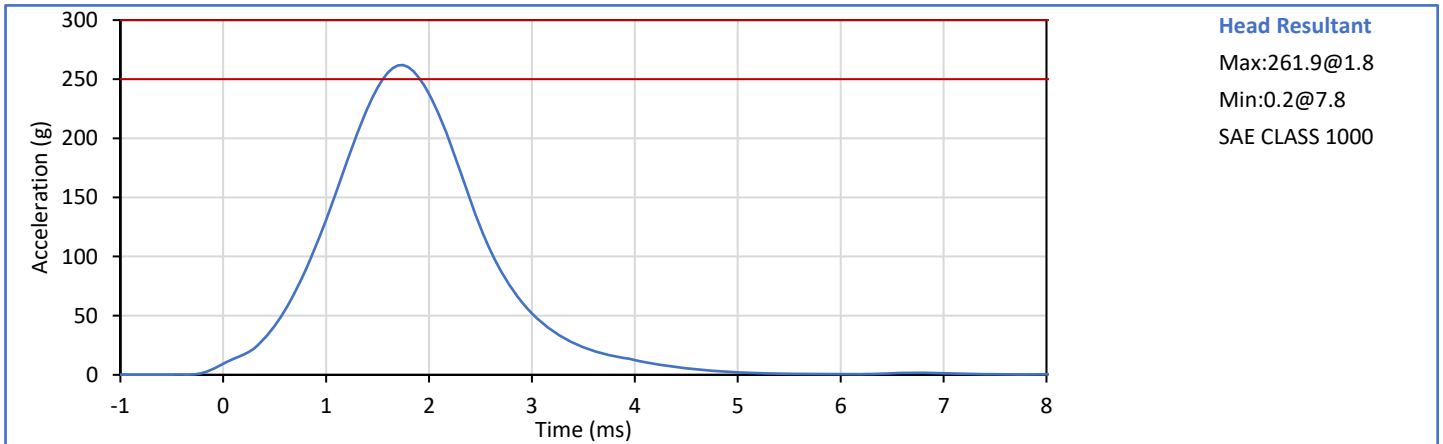
G. Fuentes

Approved By: \_\_\_\_\_



J. Hernandez

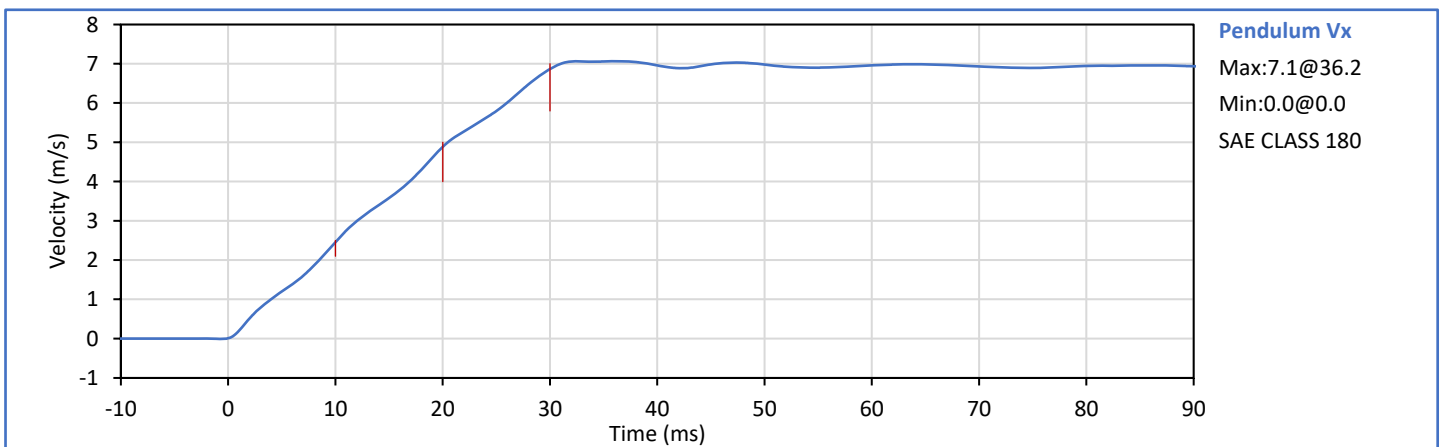
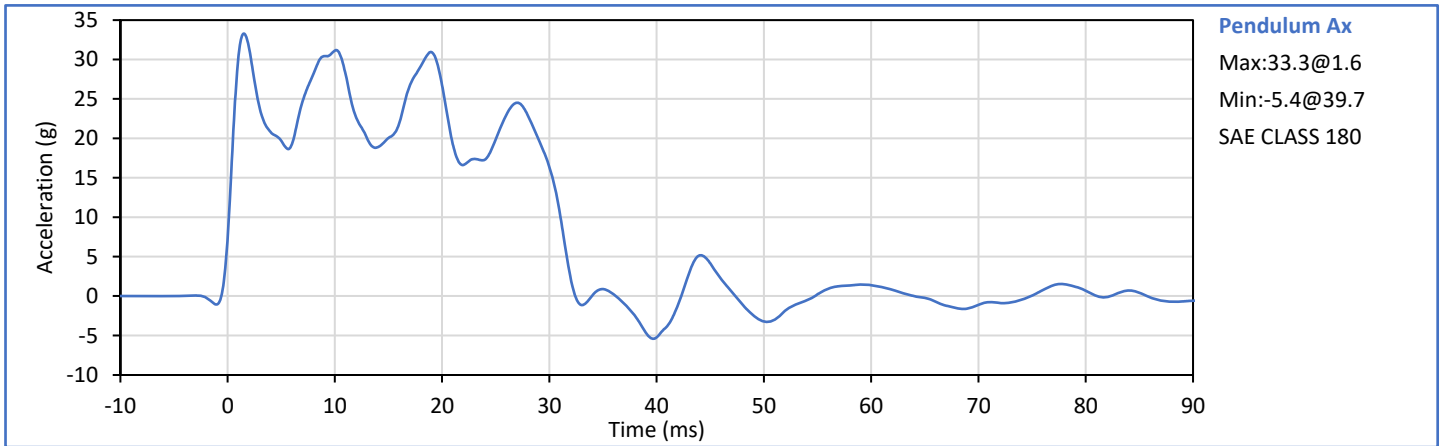
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	250.0	300.0	261.9	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-2.8	Pass
Oscillations After Main Pulse	%	0.0	10.0	0.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *Mill III*  
G. Fuentes

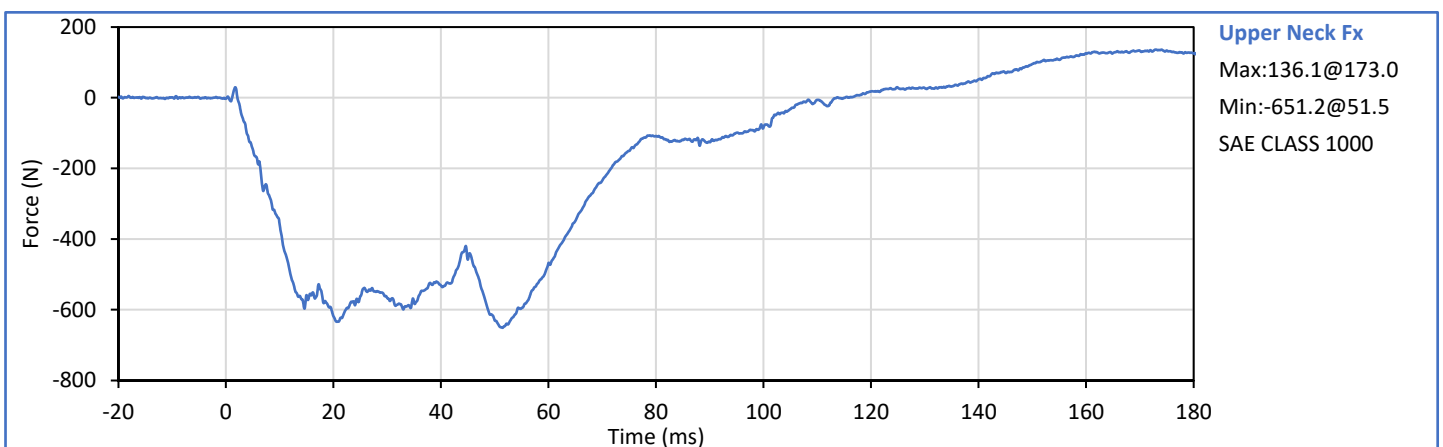
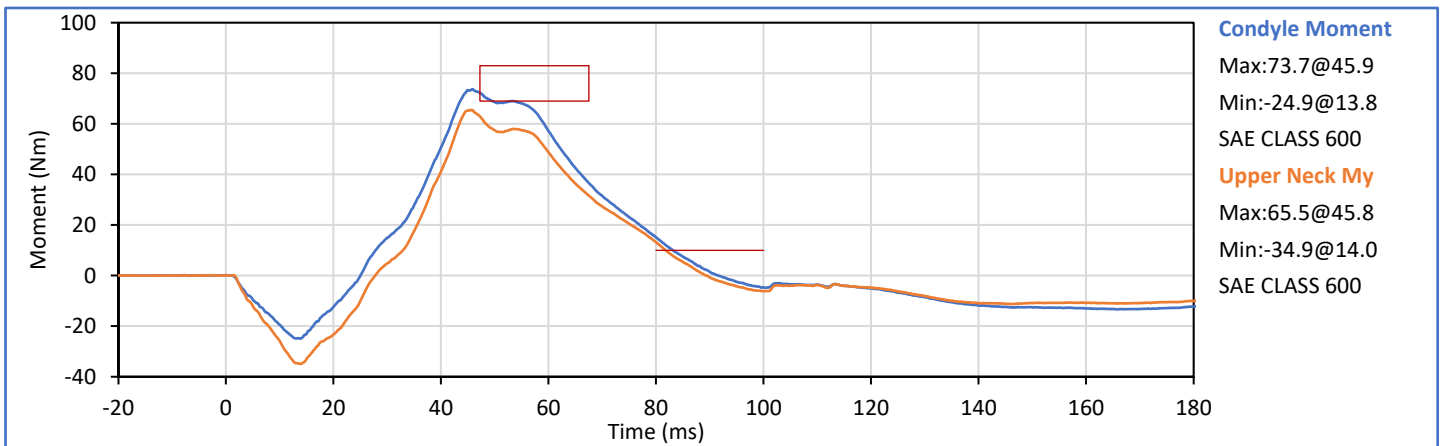
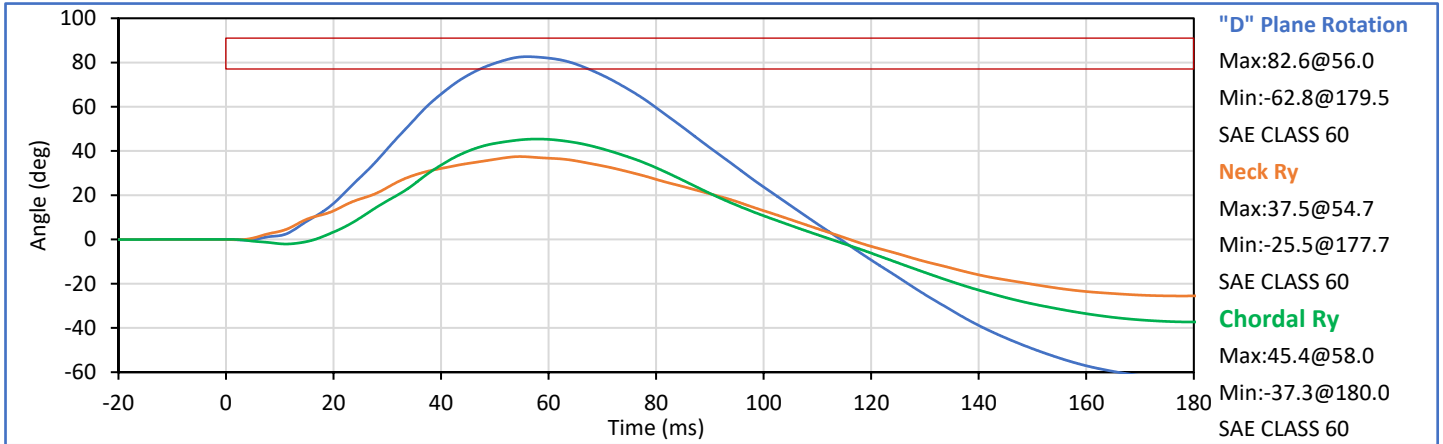
Approved By: *Smith*  
J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	6.89	7.13	7.00	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.45	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.88	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.86	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	82.6	Pass
Peak Moment in Rotation	Nm	69.0	83.0	72.2	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	83.2	Pass
Overall Test Results					Pass

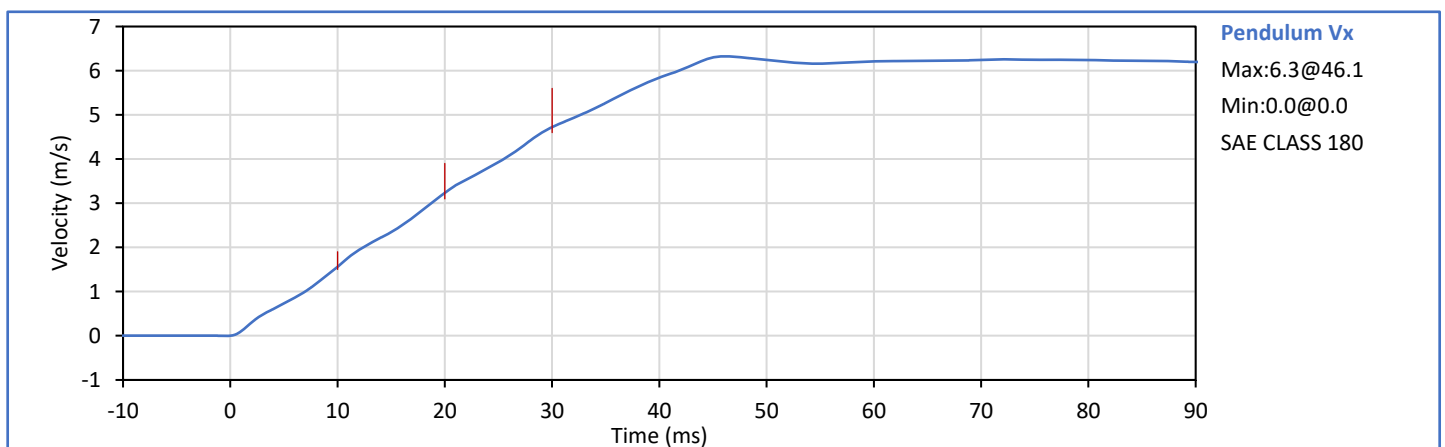
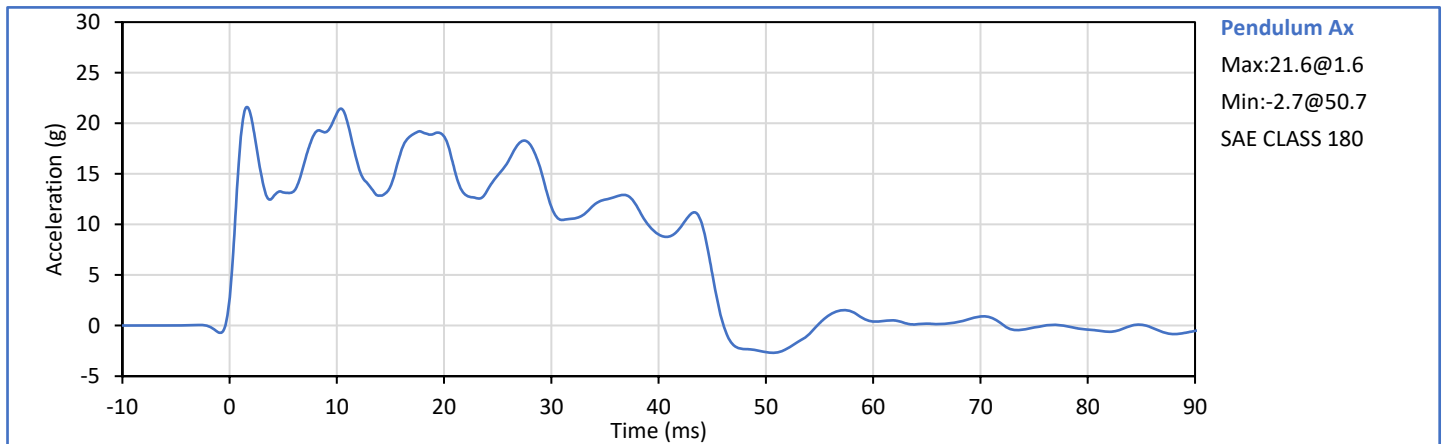


Technician: *Millie L. III*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

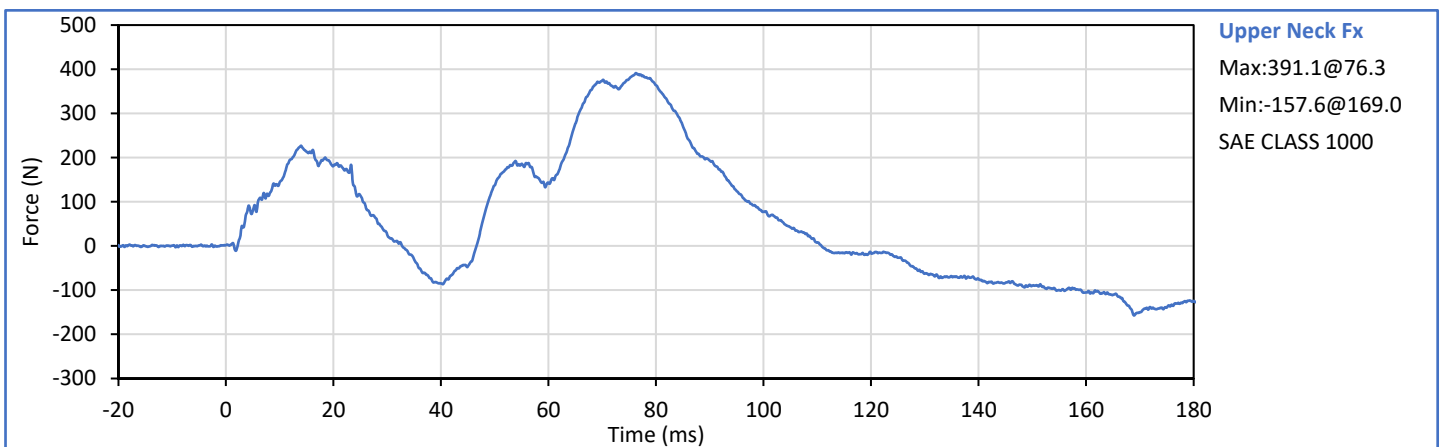
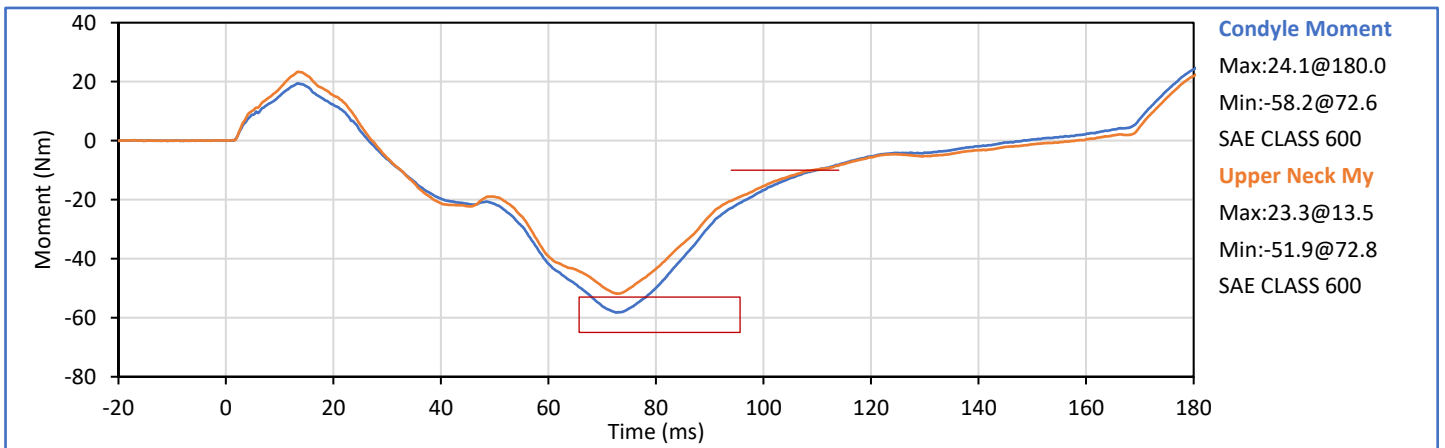
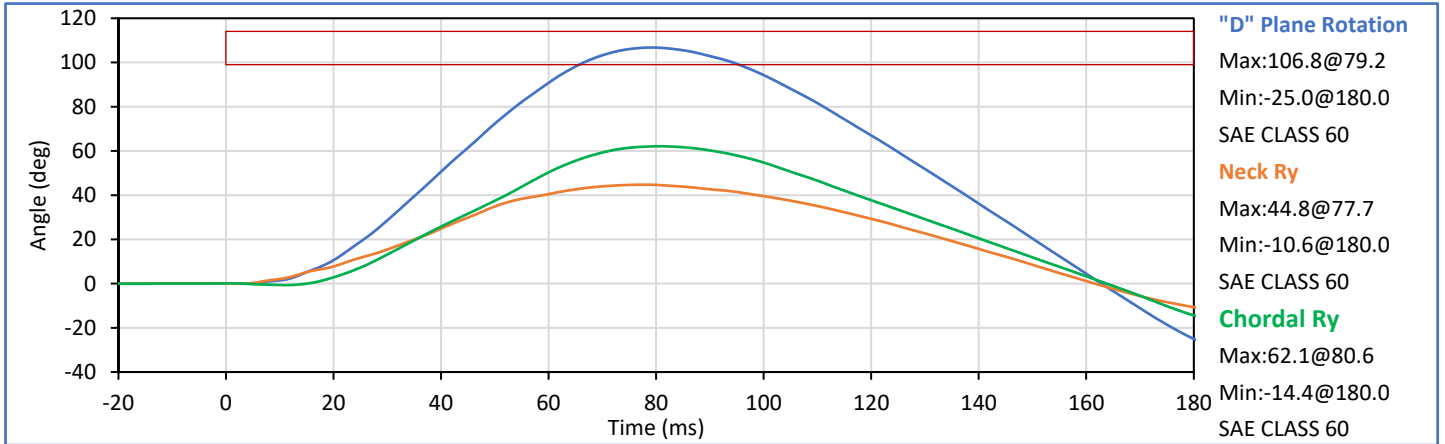


Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.0	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	5.95	6.19	6.06	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.56	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.23	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	4.72	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	106.8	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-58.2	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	109.8	Pass
Overall Test Results					Pass

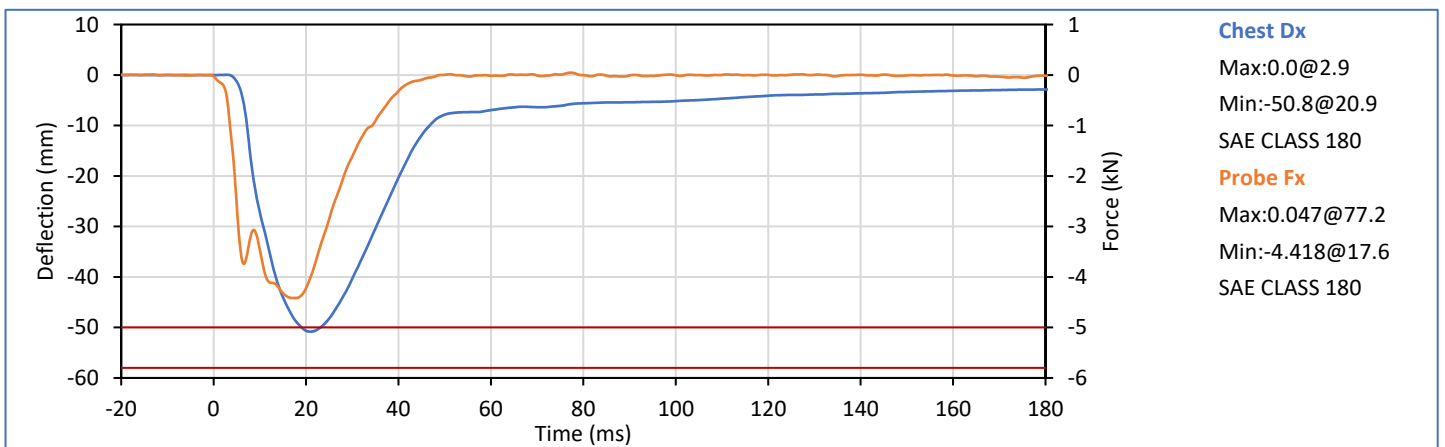
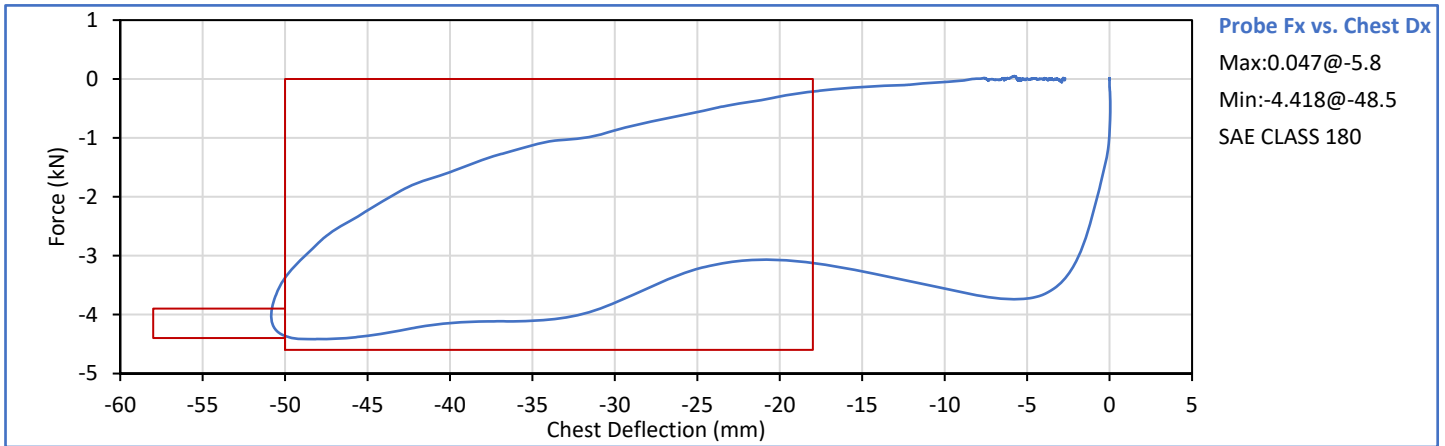


Technician: *Millie L. III*  
G. Fuentes

Approved By: *Scott J.*  
J. Hernandez



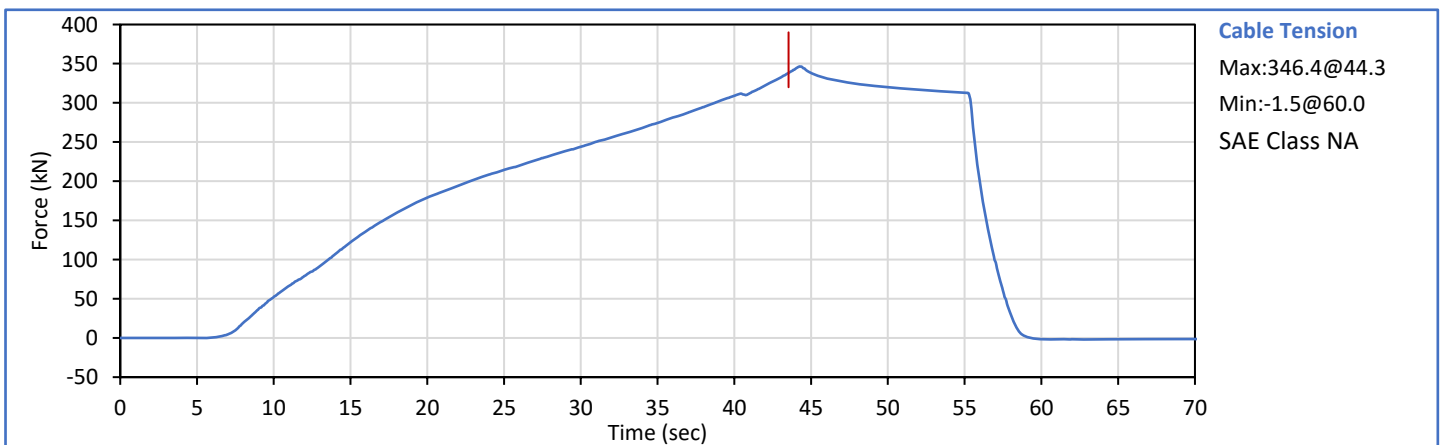
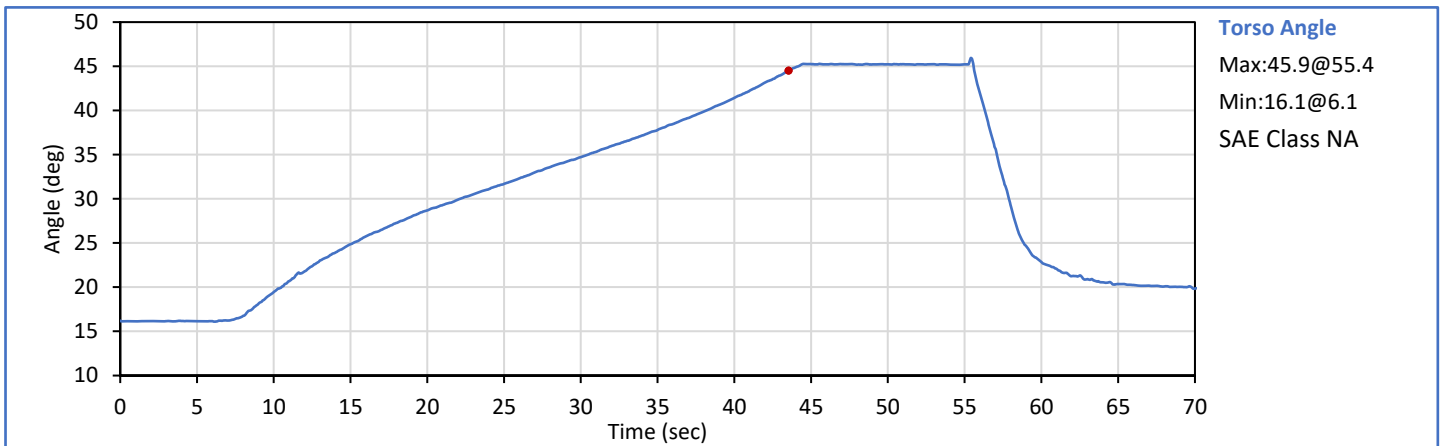
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.8	Pass
Laboratory RelativeHumidity	%	10	70	29	Pass
Probe Velocity	m/s	6.59	6.83	6.75	Pass
Peak Chest Deflection	mm	-58.0	-50.0	-50.8	Pass
Peak Probe Force, 50 and 58 mm	kN	-4.400	-3.900	-4.361	Pass
Peak Probe Force, 18 and 50 mm	kN	-4.600	0.000	-4.418	Pass
Internal Hysteresis	%	69.0	85.0	75.9	Pass
<b>Overall Test Results</b>					<b>Pass</b>



Technician: *Millie L. III*  
 G. Fuentes

Approved By: *J. Hernandez*  
 J. Hernandez

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.3	Pass
Laboratory Humidity	%	10	70	30	Pass
Orientation Angle	deg	0.0	20.0	15.2	Pass
Test Initial Angle	deg	11.0	19.0	16.1	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	338.1	Pass
Torso Flexion Rate	deg/s	0.50	1.50	0.77	Pass
Final Reference Plane Angle	deg	-8.0	8.0	2.9	Pass
<b>Overall Test Results</b>					<b>Pass</b>

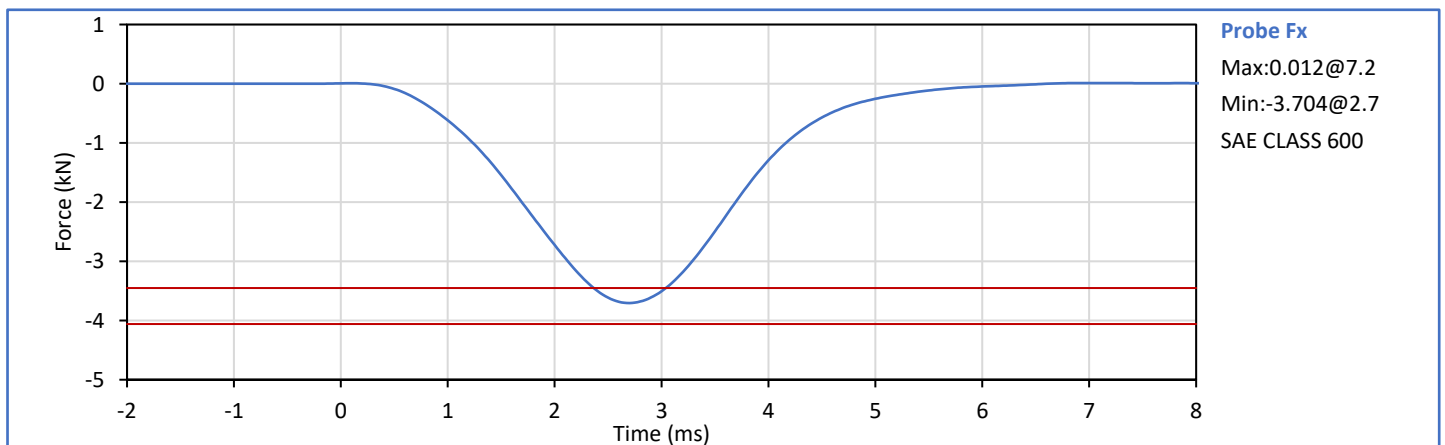


Technician:           *Millie LGS III*            
G. Fuentes

Approved By:           *J. Hernandez*            
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
Probe Velocity	m/s	2.070	2.130	2.102	Pass
Peak Resistive Force	kN	-4.060	-3.450	-3.704	Pass
Overall Test Results					Pass



Technician: *G. Fuentes*  
G. Fuentes

Approved By: *J. Hernandez*  
J. Hernandez

**APPENDIX D**  
**TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION**

**Table 1 - Driver ATD Instrumentation**

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P49209	Endevco	7264C-2k	2022-11-17
Head Acceleration Y Primary	P49228	Endevco	7264C-2k	2022-11-17
Head Acceleration Z Primary	P50101	Endevco	7264C-2k	2022-11-17
Head Acceleration X Redundant	P50103	Endevco	7264C-2k	2022-11-17
Head Acceleration Y Redundant	P49210	Endevco	7264C-2k	2022-11-17
Head Acceleration Z Redundant	P58713	Endevco	7264C-2k	2022-11-17
Head Rotation Rate X	ARS7587	DTS	ARS PRO-8k (2kHz)	2022-03-15
Head Rotation Rate Y	ARS7426	DTS	ARS PRO-8k (2kHz)	2022-03-15
Head Rotation Rate Z	ARS7480	DTS	ARS PRO-8k (2kHz)	2022-03-15
Upper Neck Force X	782 Fx	R.A. Denton	1716A	2022-03-30
Upper Neck Force Y	782 Fy	R.A. Denton	1716A	2022-03-30
Upper Neck Force Z	782 Fz	R.A. Denton	1716A	2022-03-30
Upper Neck Moment X	782 Mx	R.A. Denton	1716A	2022-03-30
Upper Neck Moment Y	782 My	R.A. Denton	1716A	2022-03-30
Upper Neck Moment Z	782 Mz	R.A. Denton	1716A	2022-03-30
Chest Acceleration X Primary	P52112	Endevco	7264C-2k	2022-11-18
Chest Acceleration Y Primary	P49208	Endevco	7264C-2k	2022-11-18
Chest Acceleration Z Primary	P51264	Endevco	7264C-2k	2022-11-18
Chest Acceleration X Redundant	P49461	Endevco	7264C-2k	2022-11-18
Chest Acceleration Y Redundant	P58774	Endevco	7264C-2k	2022-11-18
Chest Acceleration Z Redundant	P49168	Endevco	7264C-2k	2022-11-18
Chest Deflection	0606 (H3)	Servo	14CBI-3615	2022-11-21
Pelvis Acceleration X	P49238	Endevco	7264C-2k	2022-11-21
Pelvis Acceleration Y	P58877	Endevco	7264C-2k	2022-11-21
Pelvis Acceleration Z	P50087	Endevco	7264C-2k	2022-11-21
Left Femur Force Z	107 (pri)	R.A. Denton	3821JTF	2022-03-29
Right Femur Force Z	DS4139 (pri)	Humanetics	3821JLN2	2022-04-29
Left Femur Force Z Redundant	107 (red)	R.A. Denton	3821JTF	2022-03-29
Right Femur Force Z Redundant	DS4139 (red)	Humanetics	3821JLN2	2022-04-29
Left Upper Tibia Moment X	DH3054 Mx	R.A. Denton	IF-857	2022-03-28
Left Upper Tibia Moment Y	DH3054 My	R.A. Denton	IF-857	2022-03-28
Left Upper Tibia Force Z	DH3054 Fz	R.A. Denton	IF-857	2022-03-28
Left Lower Tibia Moment X	497 Mx	R.A. Denton	3644	2022-03-29
Left Lower Tibia Moment Y	497 My	R.A. Denton	3644	2022-03-29
Left Lower Tibia Force Z	497 Fz	R.A. Denton	3644	2022-03-29
Right Upper Tibia Moment X	DH3302 Mx	FTSS	IF-857	2022-03-29
Right Upper Tibia Moment Y	DH3302 My	FTSS	IF-857	2022-03-29
Right Upper Tibia Force Z	DH3302 Fz	FTSS	IF-857	2022-03-29
Right Lower Tibia Moment X	494 Mx	R.A. Denton	3644	2022-03-29
Right Lower Tibia Moment Y	494 My	R.A. Denton	3644	2022-03-29
Right Lower Tibia Force Z	494 Fz	R.A. Denton	3644	2022-03-29
Left Ankle Acceleration X	03E20-N09	Entran	EGEB6Q-2k	2022-11-22
Left Ankle Acceleration Z	P68074	Endevco	7264C-2k	2022-12-08
Left Toe Acceleration Z	03H07-Z10	Entran	EGEB6Q-2k	2022-11-23
Right Ankle Acceleration X	03E29-N20	Entran	EGEB6Q-2k	2022-11-23
Right Ankle Acceleration Z	P68602	Endevco	7264C-2k	2022-11-23
Right Toe Acceleration Z	03D09-N01	Entran	EGEB6Q-2k	2022-11-21
Seat Belt Outside Lap Force	263	FTSS	IF-964	2022-12-09
Seat Belt Upper Diagonal Force	177	FTSS	IF-964	2022-12-06

**Table 2 - Right Front Passenger ATD Instrumentation**

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P51889	Endevco	7264C-2k	2022-11-17
Head Acceleration Y Primary	P51861	Endevco	7264C-2k	2022-11-17
Head Acceleration Z Primary	P52077	Endevco	7264C-2k	2022-11-17
Head Acceleration X Redundant	P58835	Endevco	7264C-2k	2022-11-17
Head Acceleration Y Redundant	P51703	Endevco	7264C-2k	2022-11-17
Head Acceleration Z Redundant	P52096	Endevco	7264C-2k	2022-11-17
Head Rotation Rate X	ARS7367	DTS	ARS PRO-8k (2kHz)	2022-03-15
Head Rotation Rate Y	ARS7377	DTS	ARS PRO-8k (2kHz)	2022-03-15
Head Rotation Rate Z	ARS7498	DTS	ARS PRO-8k (2kHz)	2022-03-15
Upper Neck Force X	452 Fx	R.A. Denton	1716A	2022-03-30
Upper Neck Force Y	452 Fy	R.A. Denton	1716A	2022-03-30
Upper Neck Force Z	452 Fz	R.A. Denton	1716A	2022-03-30
Upper Neck Moment X	452 Mx	R.A. Denton	1716A	2022-03-30
Upper Neck Moment Y	452 My	R.A. Denton	1716A	2022-03-30
Upper Neck Moment Z	452 Mz	R.A. Denton	1716A	2022-03-30
Chest Acceleration X Primary	P58860	Endevco	7264C-2k	2022-11-16
Chest Acceleration Y Primary	P51876	Endevco	7264C-2k	2022-11-16
Chest Acceleration Z Primary	P58711	Endevco	7264C-2k	2022-11-16
Chest Acceleration X Redundant	P52049	Endevco	7264C-2k	2022-11-16
Chest Acceleration Y Redundant	P51862	Endevco	7264C-2k	2022-11-16
Chest Acceleration Z Redundant	P52048	Endevco	7264C-2k	2022-11-16
Chest Deflection	0724 (HF)	Servo	14CBI-3615	2022-11-21
Pelvis Acceleration X	P52090	Endevco	7264C-2k	2022-11-28
Pelvis Acceleration Y	P58849	Endevco	7264C-2k	2022-11-28
Pelvis Acceleration Z	P58756	Endevco	7264C-2k	2022-11-28
Left Femur Force Z	110 (pri)	R.A. Denton	3821JTF	2022-03-29
Right Femur Force Z	113 (pri)	R.A. Denton	3821JTF	2022-03-29
Left Femur Force Z Redundant	110 (red)	R.A. Denton	3821JTF	2022-03-29
Right Femur Force Z Redundant	113 (red)	R.A. Denton	3821JTF	2022-03-29
Left Upper Tibia Moment X	468 Mx	R.A. Denton	3643	2022-03-29
Left Upper Tibia Moment Y	468 My	R.A. Denton	3643	2022-03-29
Left Upper Tibia Force Z	468 Fz	R.A. Denton	3643	2022-03-29
Left Lower Tibia Moment X	399 Mx	R.A. Denton	3644	2022-03-29
Left Lower Tibia Moment Y	399 My	R.A. Denton	3644	2022-03-29
Left Lower Tibia Force Z	399 Fz	R.A. Denton	3644	2022-03-29
Right Upper Tibia Moment X	482 Mx	R.A. Denton	3643	2022-03-29
Right Upper Tibia Moment Y	482 My	R.A. Denton	3643	2022-03-29
Right Upper Tibia Force Z	482 Fz	R.A. Denton	3643	2022-03-29
Right Lower Tibia Moment X	499 Mx	R.A. Denton	3644	2022-03-29
Right Lower Tibia Moment Y	499 My	R.A. Denton	3644	2022-03-29
Right Lower Tibia Force Z	499 Fz	R.A. Denton	3644	2022-03-29
Left Ankle Acceleration X	P52057	Endevco	7264C-2k	2022-11-28
Left Ankle Acceleration Z	03E18-F07	Entran	EGEB6Q-2k	2022-11-28
Left Toe Acceleration Z	P49224	Endevco	7264C-2k	2022-11-28
Right Ankle Acceleration X	P52019	Endevco	7264C-2k	2022-11-28
Right Ankle Acceleration Z	P58755	Endevco	7264C-2k	2022-11-28
Right Toe Acceleration Z	P52076	Endevco	7264C-2k	2022-11-28
Seat Belt Outside Lap Force	313	FTSS	IF-964	2022-12-10
Seat Belt Upper Diagonal Force	315	FTSS	IF-964	2022-12-10

**Table 3 - Vehicle Instrumentation**

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Left Rear Primary Ax	M11120	Endevco	758H-2k	2022-12-03
Right Rear Primary Ax	M11216	Endevco	758H-2k	2022-12-09
Engine Top Ax	M11202	Endevco	758H-2k	2022-10-07
Engine Bottom Ax	M11118	Endevco	758H-2k	2022-12-09
Left Rear Az	M11104	Endevco	758H-2k	2022-10-11
Right Rear Az	M11040	Endevco	758H-2k	2022-10-07
Left Rear Redundant Ax	M11215	Endevco	758H-2k	2022-11-03
Right Rear Redundant Ax	M11233	Endevco	758H-2k	2022-11-08