REPORT NUMBER: NCAP-KAR-21-011

NEW CAR ASSESSMENT PROGRAM (NCAP)

FRONTAL BARRIER IMPACT TEST

HYUNDAI MOTOR COMPANY

2021 GENESIS G80 4-DOOR SEDAN

NHTSA NUMBER: O20214212

PREPARED BY:

APPLUS+ IDIADA KARCO ENGINEERING, LLC.

9270 HOLLY ROAD

ADELANTO, CA 92301

SEPTEMBER 22, 2021

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF CRASHWORTHINESS STANDARDS

MAIL CODE: NRM-100

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Date: _____

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16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2021 Genesis G80 4-Door Sedan 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 June 29, 2021.

The impact velocity of the vehicle was 56.19 km/h and the ambient temperature at the barrier face at the time of impact was 36.7°C. The target vehicle's post-test maximum crush was 320 mm at the vehicle's centerline. The test vehicle's performance is as follows:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})	N/A	700	202.6	700	136.5
Maximum Chest Compression	mm	63	-23	52	-18
Nij	N/A	1	0.28	1	0.34
Neck Tension	N	4170	1007.7	2620	1060.0
Neck Compression	N	4000	-138.5	2520	-190.0
Left Femur Force	N	10000	-1315.5	6800	-123.0
Right Femur Force	N	10000	-3435.7	6800	-104.0

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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 2021 Genesis G80 4-Door Sedan at a velocity of 56.19 km/h. The test was performed at Applus+ IDIADA KARCO Engineering, LLC. on June 29, 2021. 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 50th percentile male anthropomorphic test device (ATD) was placed in the driver seating position and one Part HIII 5th 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. 141) were qualified prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 106 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 320 mm at 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 the left knee and the right contacted the knee airbag.

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_{15}	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (g)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50th Male)	202.6	0.28	1007.7	-138.5	40	-23	-1315.5	-3435.7
Passenger (5th Female)	136.5	0.34	1060.0	-190.0	43	-18	-123.0	-104.0

GENERAL COMMENTS:

- Driver Lap Belt Force, Not Installed
- Passenger Lap Belt Force, Not Installed
- Passenger Head AZR, CF at 78.6 ms
- Passenger Upper Neck Fx, Questionable Data between 205-225 ms
- Barrier K-14 Mz, Questionable Data
- Barrier D-01 Fx – Questionable Data
- Due to a testing delay, the incorrect test date is displayed on the vehicle information placard in some pre-test videos and photographs. The actual test date was 6/29/2021 as indicated in red text.

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in^2	kPa	6.895
Temperature	General Use	^oF	^oC	=(Tf -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: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	O20214212	Traction Control System	Yes
Model Year	2021	Power Steering	Yes
Make	Genesis	Power Window Auto-Reverse	Yes
Model	G80	Driver Frontal Airbag	Yes
Body Style	4-Door Sedan	Driver Curtain Airbag	Yes
VIN	KMTGB4SC6MU073249	Driver Head/Torso Airbag	No
Body Color	Savile Silver	Driver Torso Airbag	No
Odometer Reading (km / mi)	48 / 30	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	2.5	Driver Pelvis Airbag	No
Type / No. of Cylinders	Inline 4-Cylinder	Driver Knee Airbag	Yes
Engine Placement	Longitudinal	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	8	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	AWD	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	Yes	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Seat Belt Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other Safety Restraint	Yes

Does Owner's Manual provide instructions to turn off automatic door locks? No

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company	GVWR (kg)	2385
		GAWR Front (kg)	1300
Date of Manufacture	Mar-21	GAWR Rear (kg)	1405

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

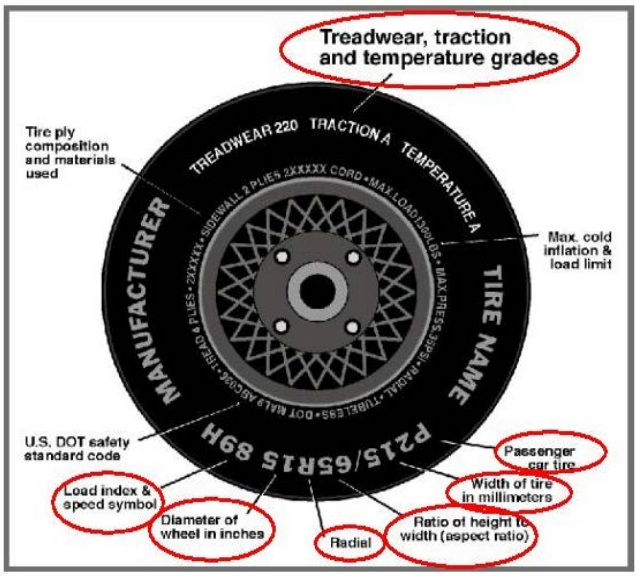
Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Split Bench			
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				400.0	*A*
DSC x 68.04 (kg)				340.2	*B*
Cargo Weight (RCLW) (kg)				59.8	*A-B*

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	250	250
Cold Pressure (kPa)	250	250
Recommended Tire Size	P245/45 R19	P275/40 R19
Tire Size on Vehicle	P245/45 R19	P275/40 R19
Tire Manufacturer	Michellin	Michellin
Tire Model	Primacy Tour	Primacy Tour
Treadwear	500	500
Traction	AA	AA
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Polyamide	1 Polyester, 2 Steel, 1 Polyamide
Load Index / Speed Symbol	105W	105W
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	F344 01KX 2120	F344 01KX 2120
DOT Safety Code Right	F344 01KX 2120	F344 01KX 2120

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	490.5	444.5		541.0	518.0	
Right	kg	504.0	466.0		516.0	524.0	
Ratio	%	52.2%	47.8%	100.0%	50.4%	49.6%	100.0%
Total	kg	994.5	910.5	1905.0	1057.0	1042.0	2099.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1905.0	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	59.8	C
Calculated Vehicle Target Weight (TVTW)	kg	2105.8	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	747	744	737	738	1353
As Tested	mm	737	735	727	735	1441
Post-Test	mm	776	798	712	752	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheelbase	mm	3009
Total Vehicle Length at Left Side	mm	4329
Total Vehicle Length at Centerline	mm	4987
Total Vehicle Length at Right Side	mm	4329
Weight of Ballast in Cargo Area	kg	92.3
Weight of Vehicle Components Removed	kg	33.0
Amount of Stoddard Solvent in Fuel Tank	L	60.57

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Rear Fascia (8.0 kg), Rear Bumper Beam (5.5 kg), Outboard Mirrors (3.5 kg), Rear Headrest (1.5 kg) Taillights (3.0 kg), Rear Side Panels (2.0 kg), Tweeter (0.5 kg), Seat Cushion (9.0kg)

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test
1	Total Length	4987
2	Total Width	1896
3	Bumper Top Height	692
4	Bumper Bottom Height	454
5	Longitudinal Member Top Height	561
6	Distance Between Longitudinal Members	851
7	Longitudinal Member Width	100
8	Engine Top Height	871
9	Engine Bottom Height	221
10	Engine and Gearbox Width	500
11	Front Bumper to Engine Distance	557
12	Front Shock Absorber Fixing Height	868
13	Bonnet Leading Edge Height	753
14	Front Shock Absorber Fixing Width	887
15	Front Bumper to Front Axle Distance	197
16	Front Axle to A-Pillar Distance	688
17	A-Pillar to B-Pillar Distance	965
18	B-Pillar to Rear Axle Distance	1147
19	B-Pillar to C-Pillar Distance	800
20	Roof Sill Bottom Height	1390
21	Roof Sill Top Height	1445
22	Floor Sill Bottom Height	225
23	Floor Sill Top Height	330

All measurements in millimeters.

DATA SHEET NO. 2

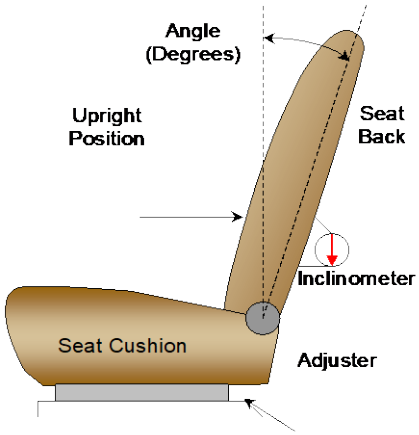
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

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° ± 0.5°. Seat back angle is measured with a flat edge along the seat back.



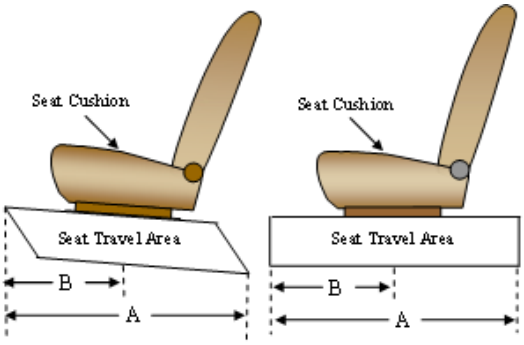
FRONT SEAT ASSEMBLY

SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	0.5
Passenger Seat Back Angle	2.5

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	315 mm	157 mm
Passenger Seat	250 mm	0 mm

SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the manufacturer's design position for a 50th percentile adult male ATD for the driver, and a 5th 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	High
Passenger Seat	4	High

DATA SHEET NO. 2 … (CONTINUED)

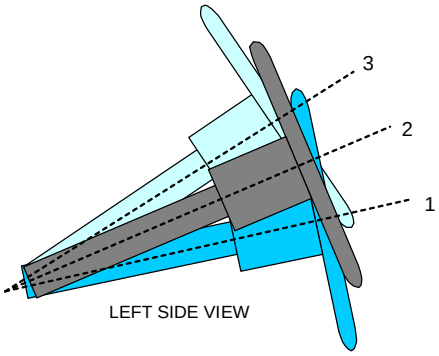
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

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.



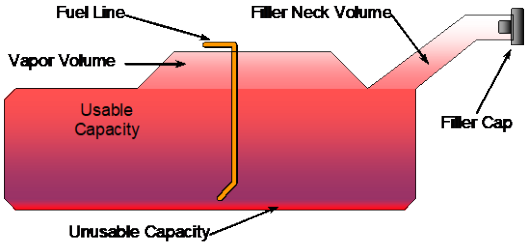
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	17.9	95
Geometric Center Position, No. 2	20.0	120
Uppermost Position, No. 3	22.1	145
Telescoping Steering Wheel Travel		50
Test Position	20.0	120

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)	60.57
Usable Capacity of "Optional Tank" (see Form No. 1)	
Usable Capacity of "Standard Tank" (see Owner's Manual)	60.57
Usable Capacity of "Optional Tank" (see Owner's Manual)	
93% of Usable Capacity	56.33
Actual amount of Solvent Used in Test	56.33
1/3 of Usable Capacity	20.19

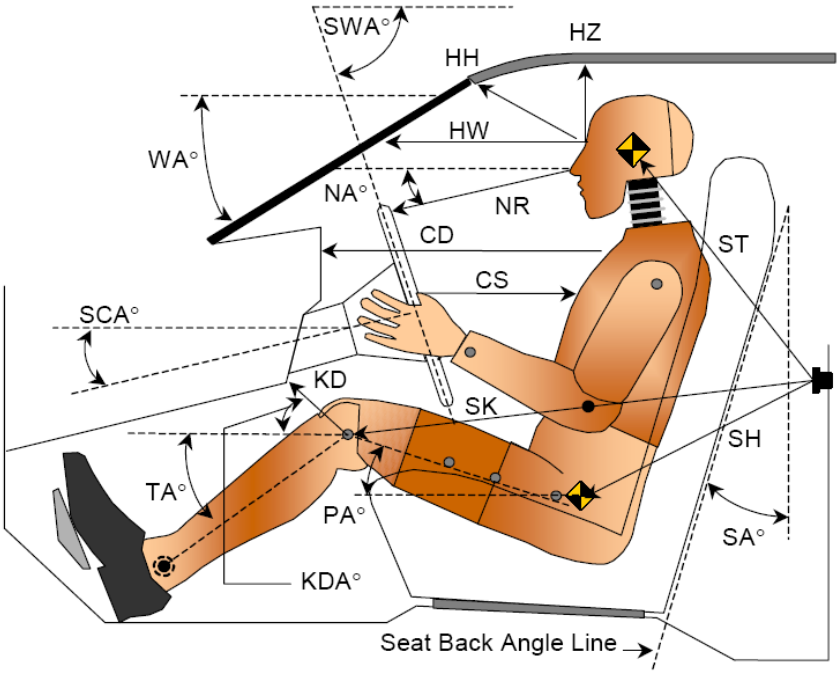
Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in the Form No. 1? ☒ **Yes** ☐ **No**

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21



LEFT SIDE VIEW

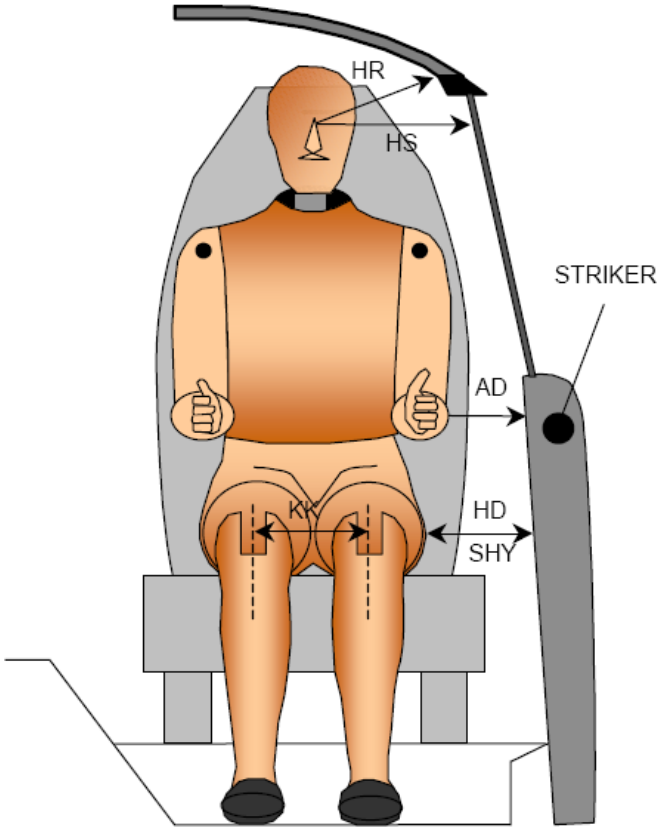
Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		22.4		
SWA°	Steering Wheel Angle		68.9		
SCA°	Steering Column Angle		19.0		
SA°	Seat Back Angle (On Headrest Post)		0.5		2.6
HZ	Head to Roof	183	90.0	196	90.0
HH	Head to Header	304	31.5	263	46.8
HW	Head to Windshield	639	0.0	612	0.0
NR	Nose to Rim	374	4.4	435	27.0
CD	Chest to Dash	531	15.2	386	11.9
CS	Chest to Steering Hub	309	3.2		
RA	Rim to Abdomen	210	0.0		
KDL	Left Knee to Dash	212	31.9	95	48.9
KDR	Right Knee to Dash	168	33.8	135	35.2
PA°	Pelvic Angle		24.3		21.6
TA°	Tibia Angle		38.8		42.2
SK	Striker to Knee	524	9.2	598	10.0
ST	Striker to Head	413	82.3	405	72.7
SH	Striker to H-Point	290	58.4	331	34.3

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21



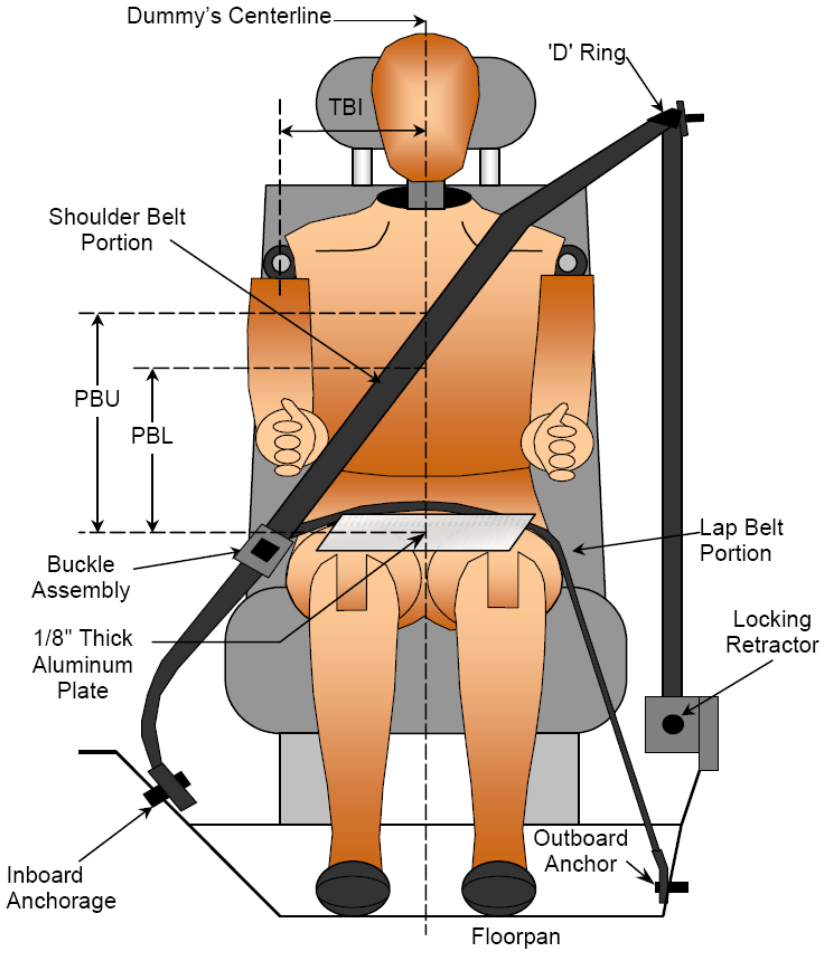
Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	115	95
HD	H-Point to Door	184	201
HR	Head to Side Header	215	247
HS	Head to Side Window	375	380
KK	Knee to Knee	322	160
SHY	Striker to H-Point (Y-Direction)	253	298
AA	Ankle to Ankle	328	165

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21



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	344	295
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	265	200

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	344	295
Lap Belt Length as Measured on ATD	mm	265	200
Remainder of Belt on Reel	mm	1032	1123
Total Belt Length for Continuous Webbing Systems	mm	1641	1618

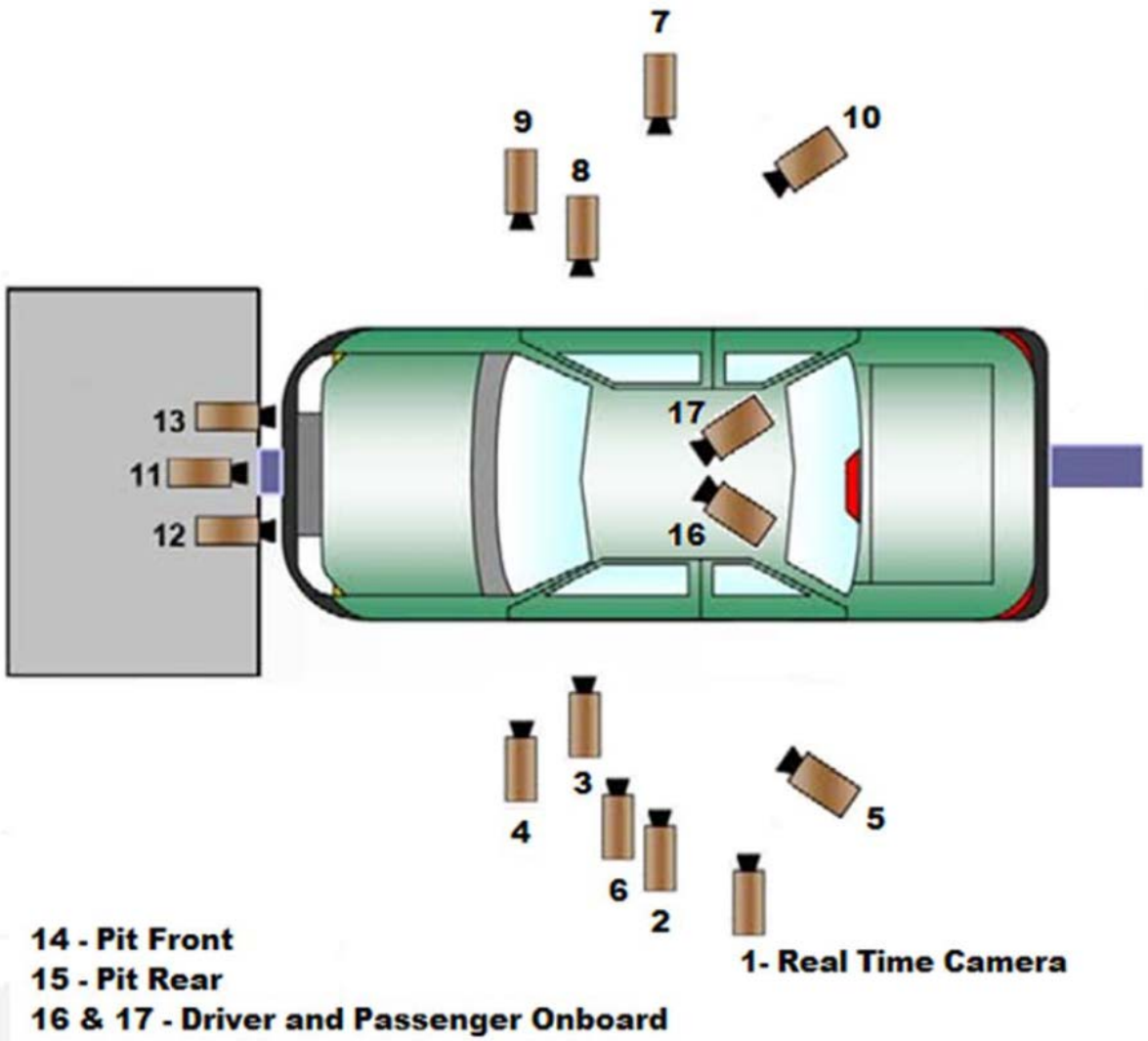
DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

DATA SHEET NO. 6 … (CONTINUED)

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

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	14	1000
16	Driver Onboard	-1660	-265	-1340	6	1000
17	Passenger Onboard	-1660	265	-1340	6	1000

Coordinates: +X = forward impact plane

+Y = right of monorail center

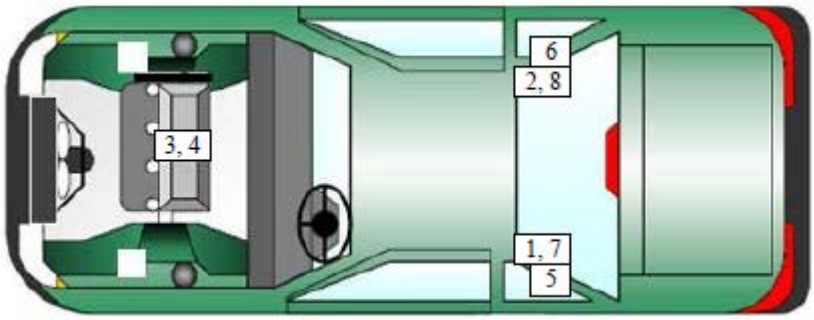
+Z = into ground

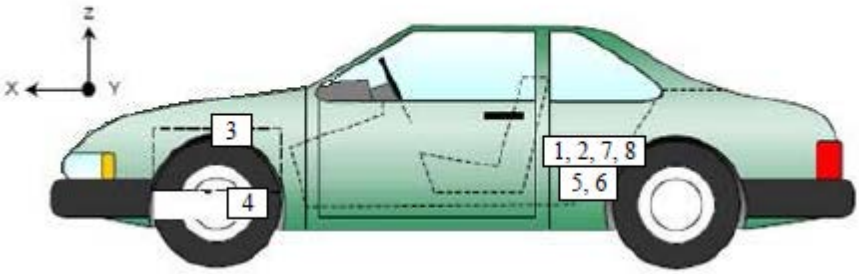
DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Accelerometer X-Direction	1905	-722	312
2	Right Rear Accelerometer X-Direction	1905	722	312
3	Engine Top X	4096	60	871
4	Engine Bottom X	4321	0	198
5	Left Rear Accelerometer Z-Direction	1905	-722	312
6	Right Rear Accelerometer Z-Direction	1905	722	312
7	Left Rear Accelerometer X-Direction Redundant	1905	-722	312
8	Right Rear Accelerometer X-Direction Redundant	1905	722	312

Reference Points: X – Rear Surface of Vehicle (+ forward)

Y – Vehicle Centerline (+ to right)

Z – Ground Plane (+ down)

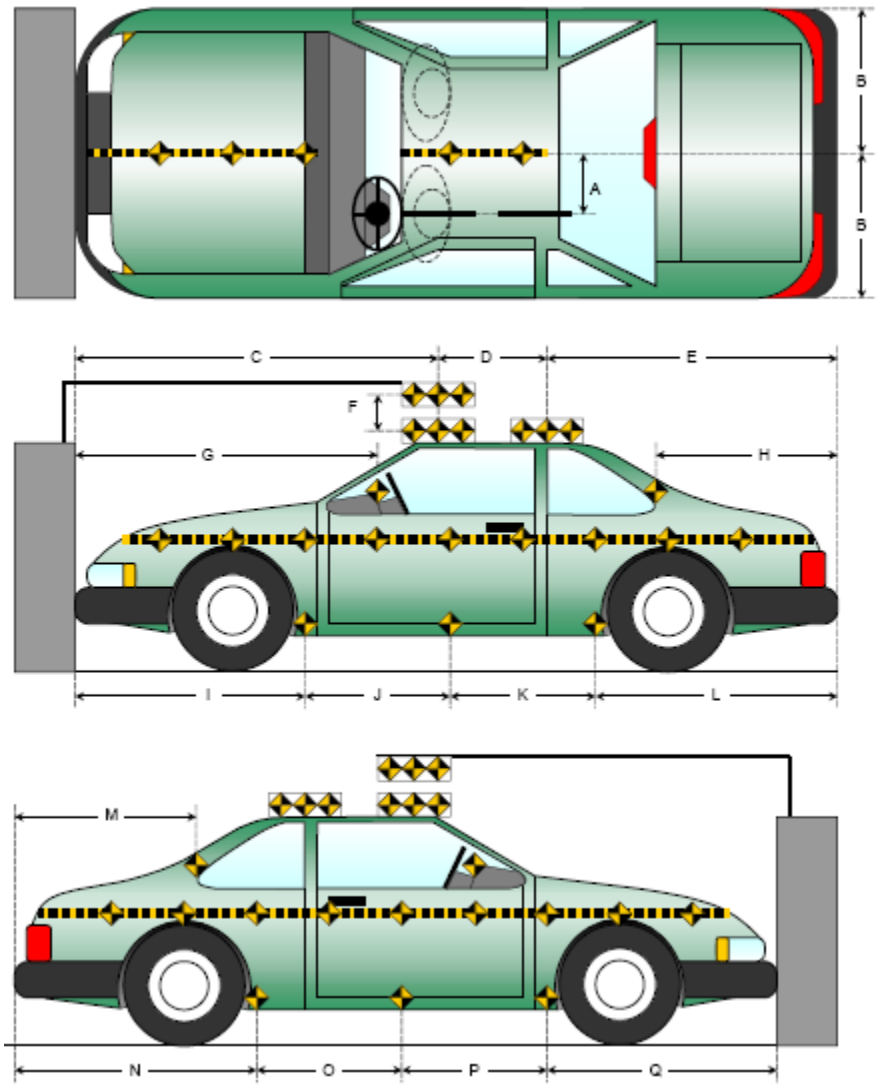
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

Item	Value
A	444
B	954
C	N/A
D	N/A
E	N/A
F	N/A
G	1589
H	830
I	1313
J	1046
K	1050
L	1578
M	830
N	1578
O	1050
P	1046
Q	1313



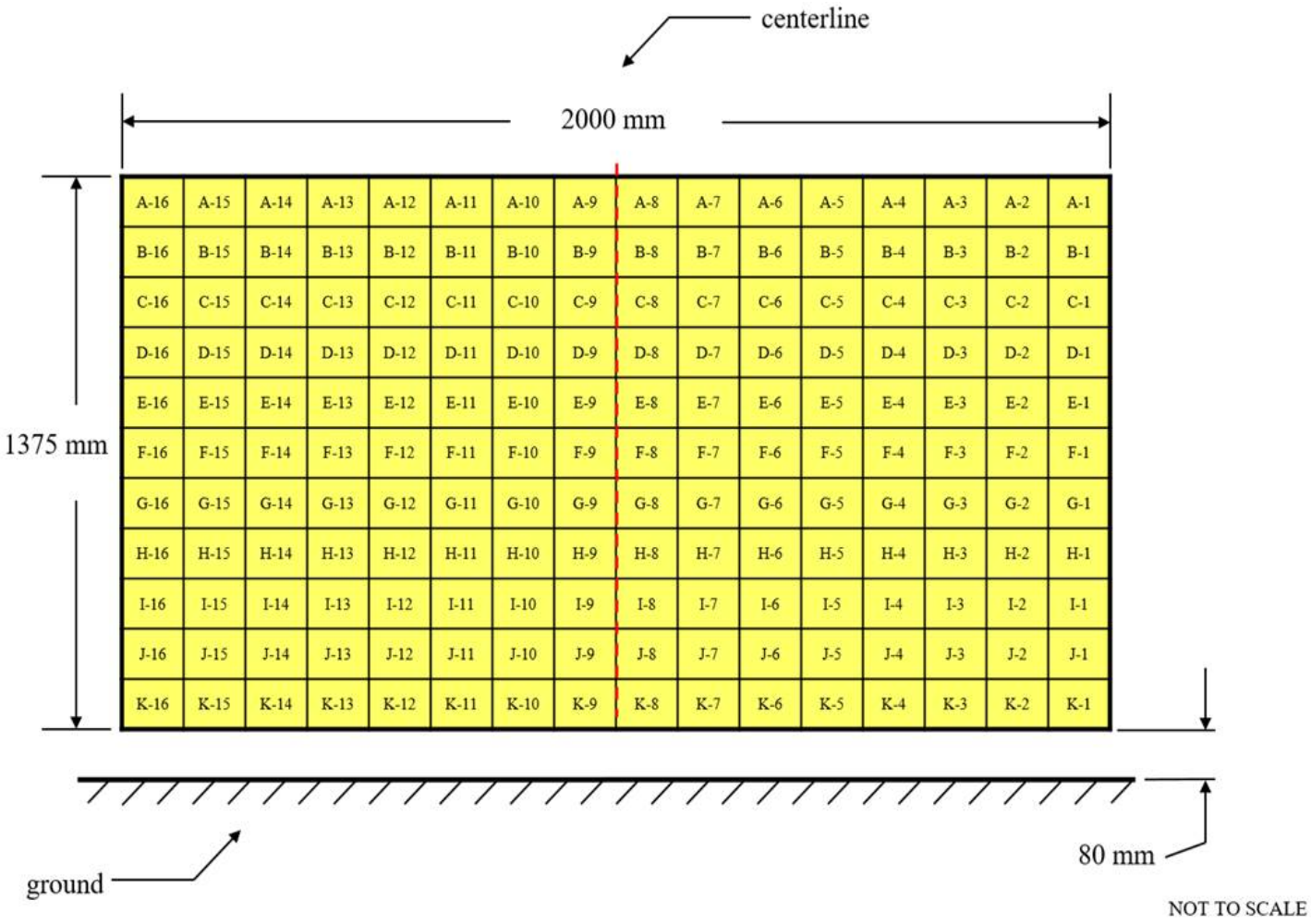
All measurements in millimeters.

DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21



DATA SHEET NO. 10

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

INSTRUMENTATION

Driver Dummy Accelerometers	49
Passenger Dummy Accelerometers	49
Vehicle Structure Accelerometers	8
Load Cell Barrier	176
Total	282

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: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type/Serial No.	HIII 50th Percentile Male ATD / 360	HIII 5th Percentile Female ATD / 141
Head Contact	Frontal Airbag, Headrest	Frontal Airbag, Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	Frontal Airbag	Frontal Aibag
Left Knee Contact	Knee Airbag	Knee Bolster
Right Knee Contact	Knee Airbag, Steering Wheel Rim	Knee Bolster

DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Remained closed, latched, and operational	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	None
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1309
Center	mm	1236
Right Side	mm	1365
Average	mm	1303

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

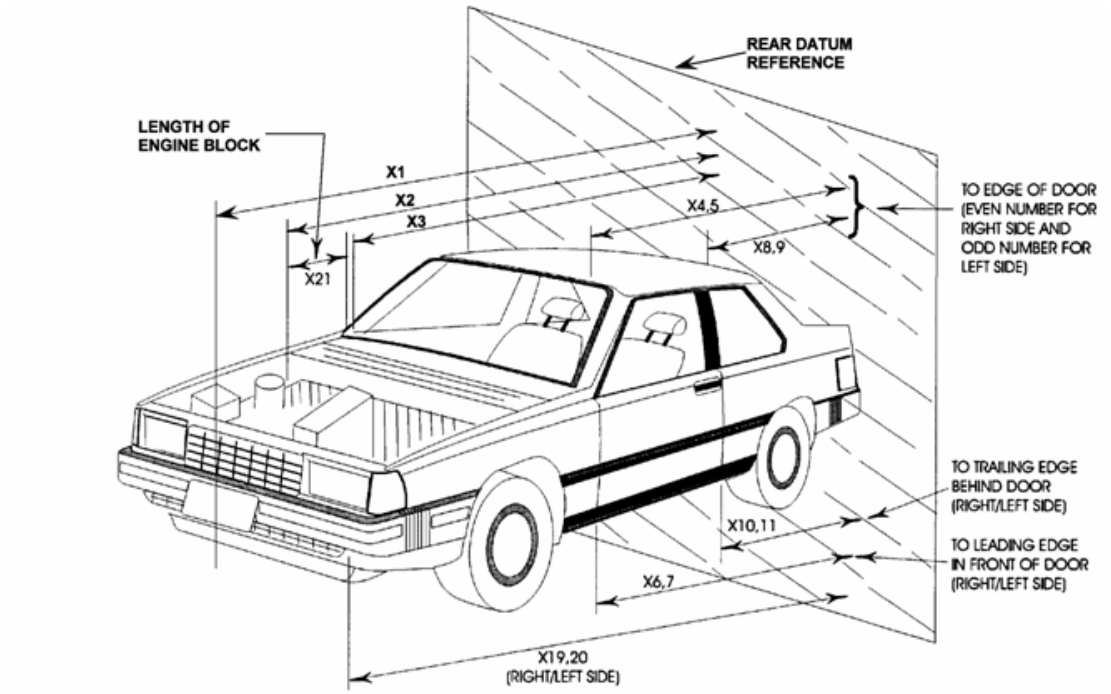
Restraint Type	Driver		Passenger	
	Installed	Operated	Installed	Operated
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 (Curtain)	Yes	No	Yes	No
Side Airbag 2 (Torso/Pelvis)	Yes	No	Yes	No
Knee Airbag	Yes	Yes	No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes

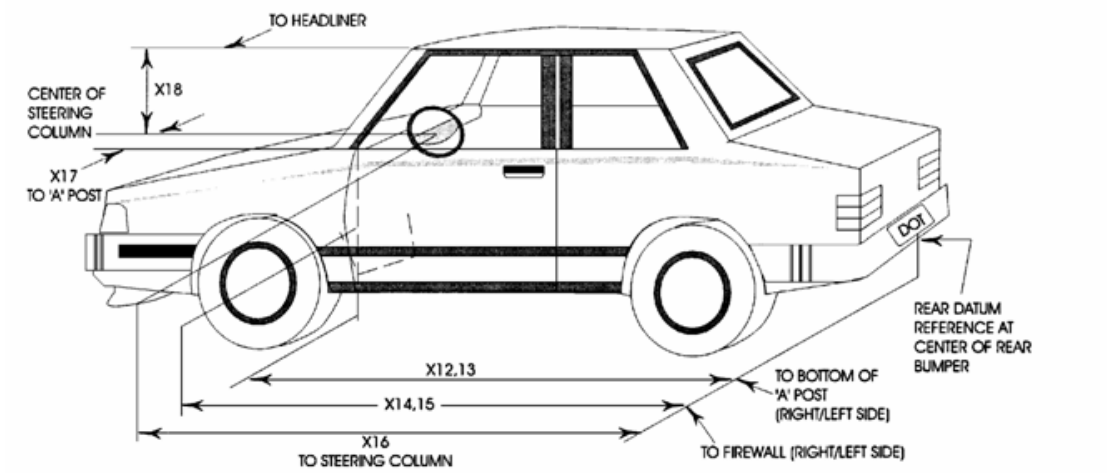
DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21





DATA SHEET NO. 12 … (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4987	4667	320
2	Rear Surface of Vehicle to Front of Engine	4288	4231	57
3	RSOV to Firewall	4244	4244	0
4	RSOV to Upper Leading Edge of Right Door	3486	3488	-2
5	RSOV to Upper Leading Edge of Left Door	3453	3453	0
6	RSOV to Lower Leading Edge of Right Door	3488	3487	1
7	RSOV to Lower Leading Edge of Left Door	3452	3452	0
8	RSOV to Upper Trailing Edge of Right Door	2334	2334	0
9	RSOV to Upper Trailing Edge of Left Door	2301	2301	0
10	RSOV to Lower Trailing Edge of Right Door	2380	2381	-1
11	RSOV to Lower Trailing Edge of Left Door	2345	2345	0
12	RSOV to Bottom of A-Pillar, Right Side	3417	3416	1
13	RSOV to Bottom of A-Pillar, Left Side	3386	3385	1
14	RSOV to Firewall, Right Side	4244	4244	0
15	RSOV to Firewall, Left Side	4128	4128	0
16	RSOV to Steering Column	2907	2958	-51
17	Center of Steering Column to A-Pillar	307	427	-120
18	Center of Steering Column to Headliner	439	450	-11
19	RSOV to Right Side of Front Bumper	4365	4277	88
20	RSOV to Left Side of Front Bumper	4329	4296	33
21	Length of Engine Block	466	466	0
RD	RSOV to Right Side of Dash Panel	3130	3131	-1
CD	RSOV to Center of Dash Panel	3061	3064	-3
LD	RSOV to Left Side of Dash Panel	3102	3104	-2

All measurements in millimeters.

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

VEHICLE INFORMATION

VIN: KMTGB4SC6MU073249 Wheelbase (mm): 3009

Vehicle Size Category: Passenger Car Test Weight (kg): 2099.0

ACCELEROMETER DATA

Accelerometer Locations: Left Rear Crossmember

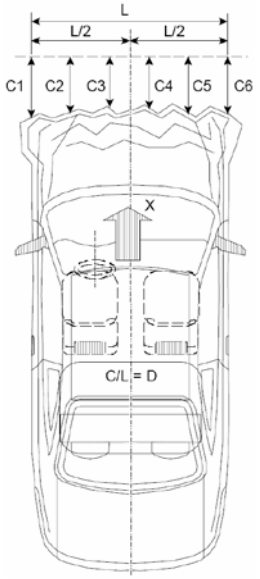
Cal. Procedure/Interval: Vibration Test / 6 months

Integration Algorithm: NHTSA Standard Linearity: Good

Impact Velocity (km/h): 56.19

Velocity Change (km/h): 69.4

Time of Separation (msec): 65.1



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2

Midpoint of Damage: Vehicle Centerline

Damage Region Length (mm): 1617

Impact Mode: Full Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	256	431	175
C2	Crush Zone 2 at Left Side	mm	97	376	279
C3	Crush Zone 3 at Left Side	mm	41	339	298
C4	Crush Zone 4 at Right Side	mm	26	325	299
C5	Crush Zone 5 at Right Side	mm	56	347	291
C6	Crush Zone 6 at Right Side	mm	209	377	168
L	C1 to C6	mm	1617		

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

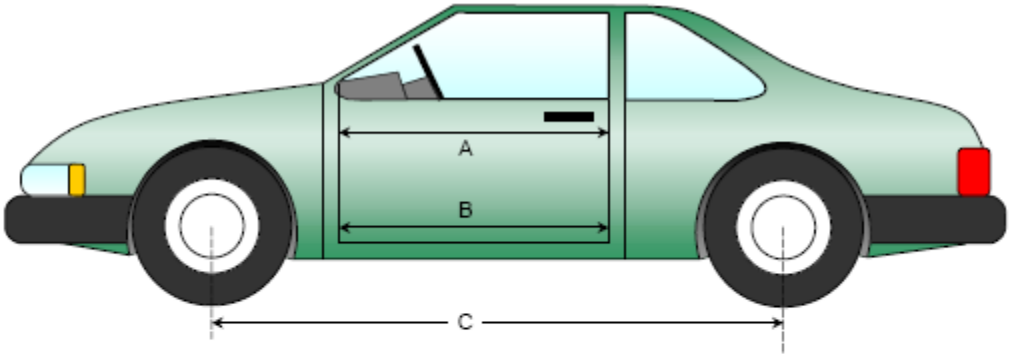
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

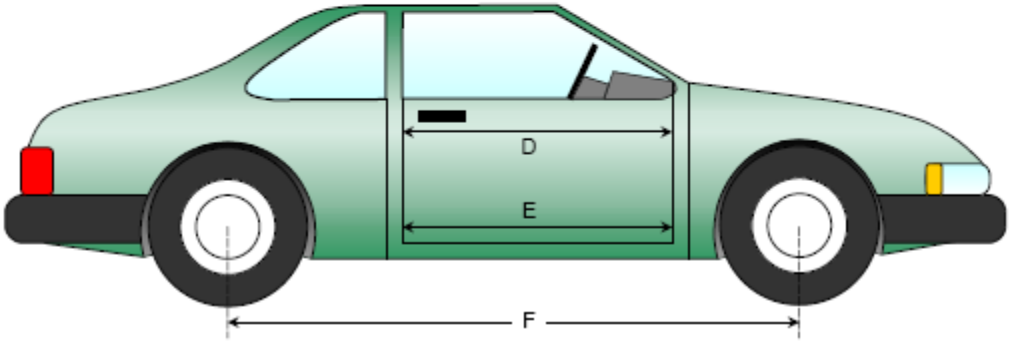
DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1152	1151	1
B	Left Side Lower	mm	1107	1106	1
D	Right Side Upper	mm	1152	1154	-2
E	Right Side Lower	mm	1108	1106	2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	3009	2935	74
F	Right Side Wheelbase	mm	3009	2956	53





DATA SHEET NO. 14 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

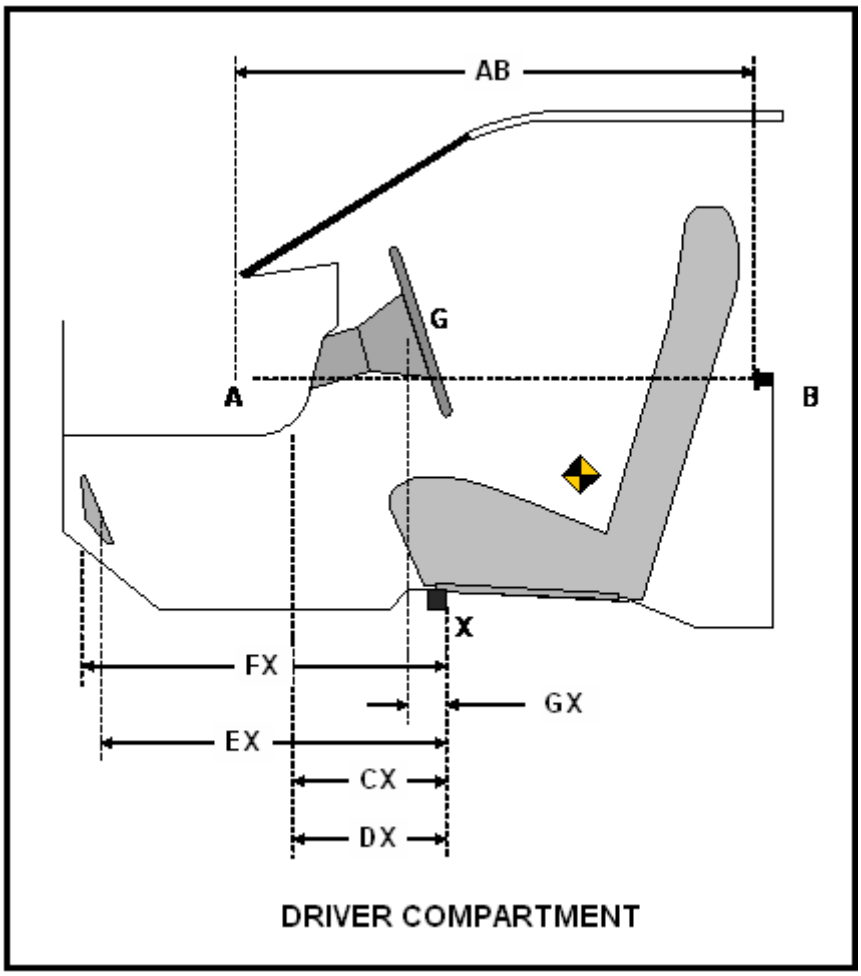
Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	987	984	2
CX	Left Knee Bolster to X	mm	261	253	8
DX	Right Knee Bolster to X	mm	262	255	7
EX	Brake Pedal to X	mm	573	646	-73
FX	Foot Rest to X	mm	578	567	11
GX	Center of Steering Wheel Hub to X	mm	33	73	-40

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

SUMMARY OF INDICANT FMVSS 212 AND 219 (PARTIAL) DATA

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

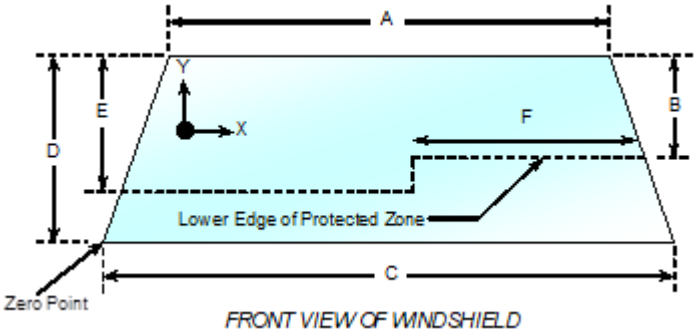
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber molding and rubber cement.

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: 21.7° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2298	2298	100.0%
Right Side	2298	2298	100.0%
Total	4596	4596	100.0%



Item	Units	Value
A	mm	1260
B	mm	325
C	mm	1530
D	mm	903
E	mm	495
F	mm	480

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: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 36.7°C Test Time: 2:45 PM

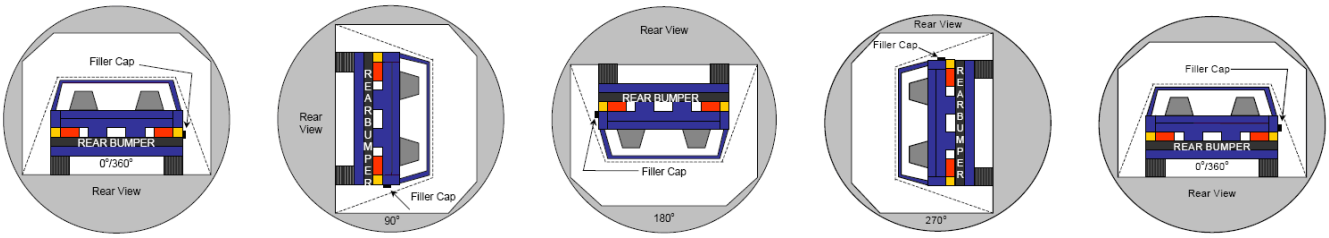
Stoddard Solvent Spillage Measurements

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: _____



0° TO 90° 90° TO 180° 180° TO 270° 270° TO 360°

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°	81	300	381
90° To 180°	84	300	384
180° To 270°	83	300	383
270° To 360°	81	300	381

DATA SHEET NO. 16 … (CONTINUED)

FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21

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

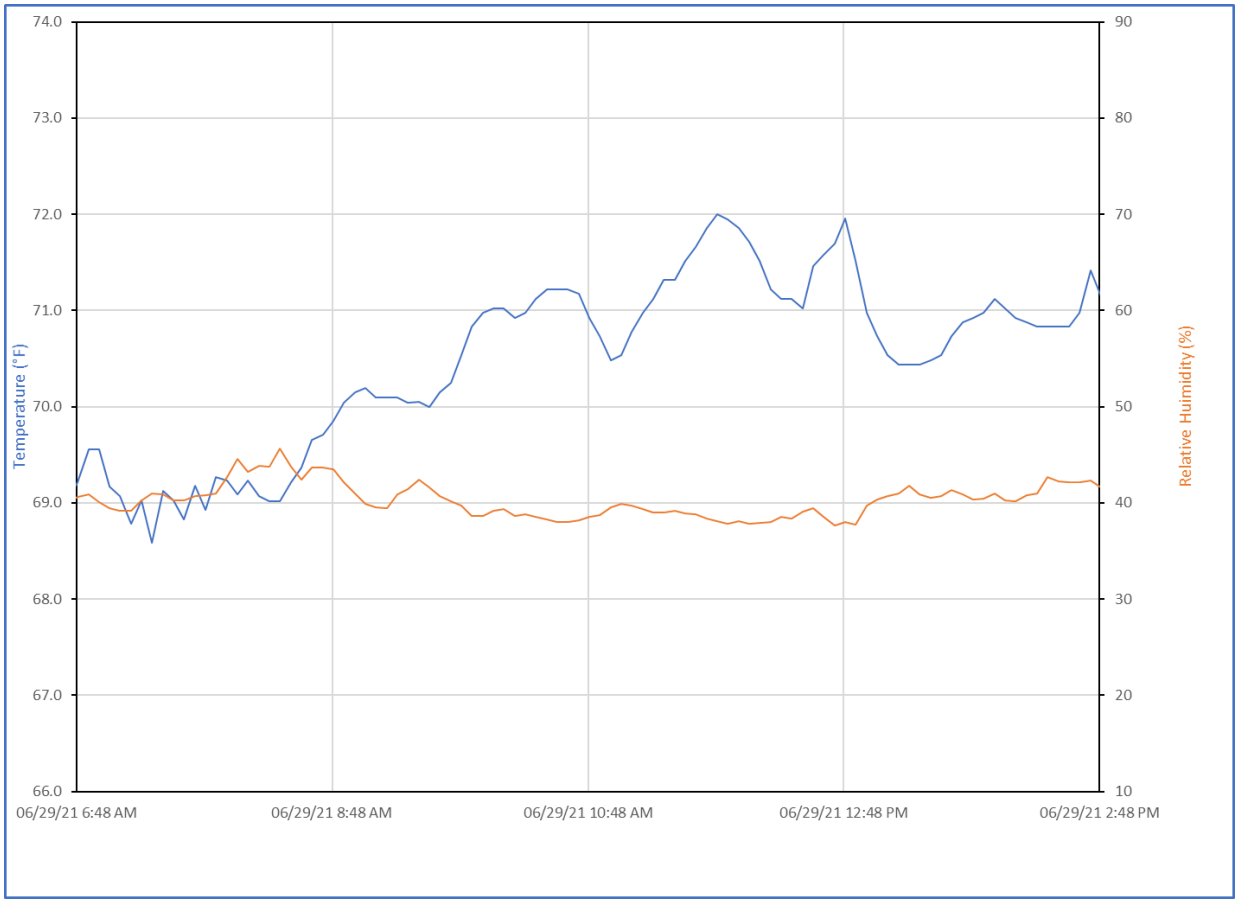
Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 17

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2021 Genesis G80 4-Door Sedan NHTSA No.: O20214212

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 06/29/21



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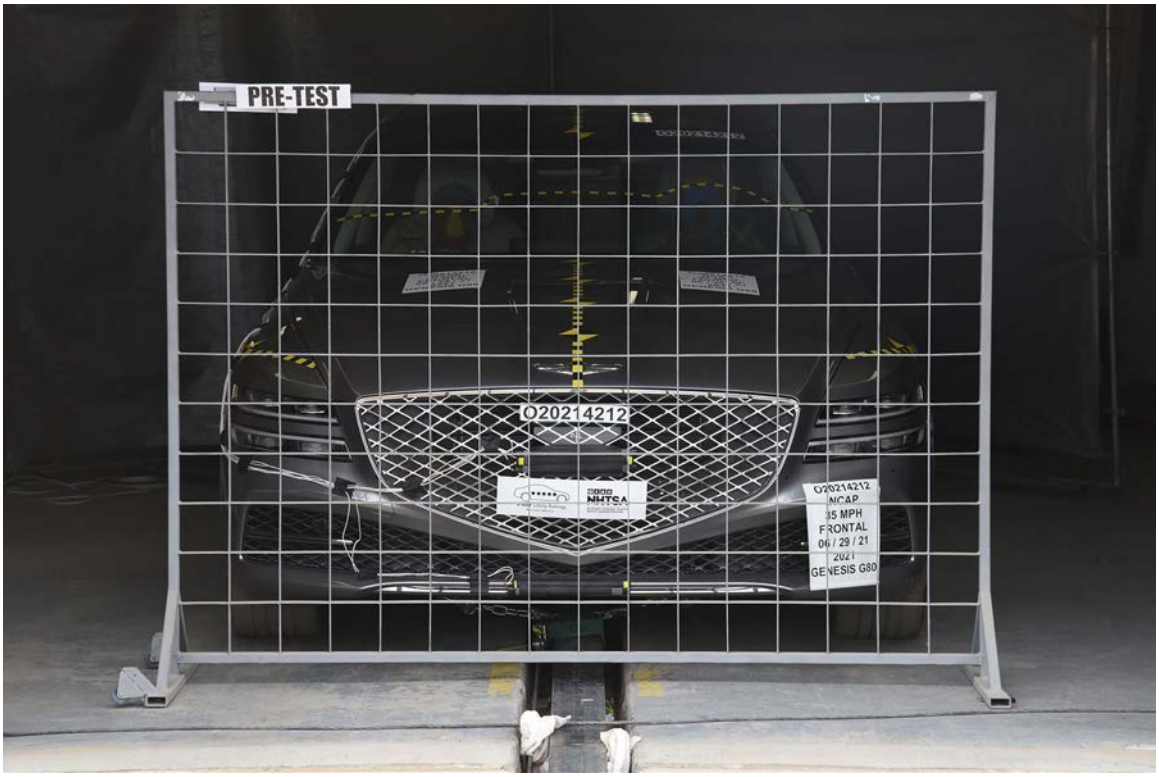


FIGURE 1. Load Cell Location

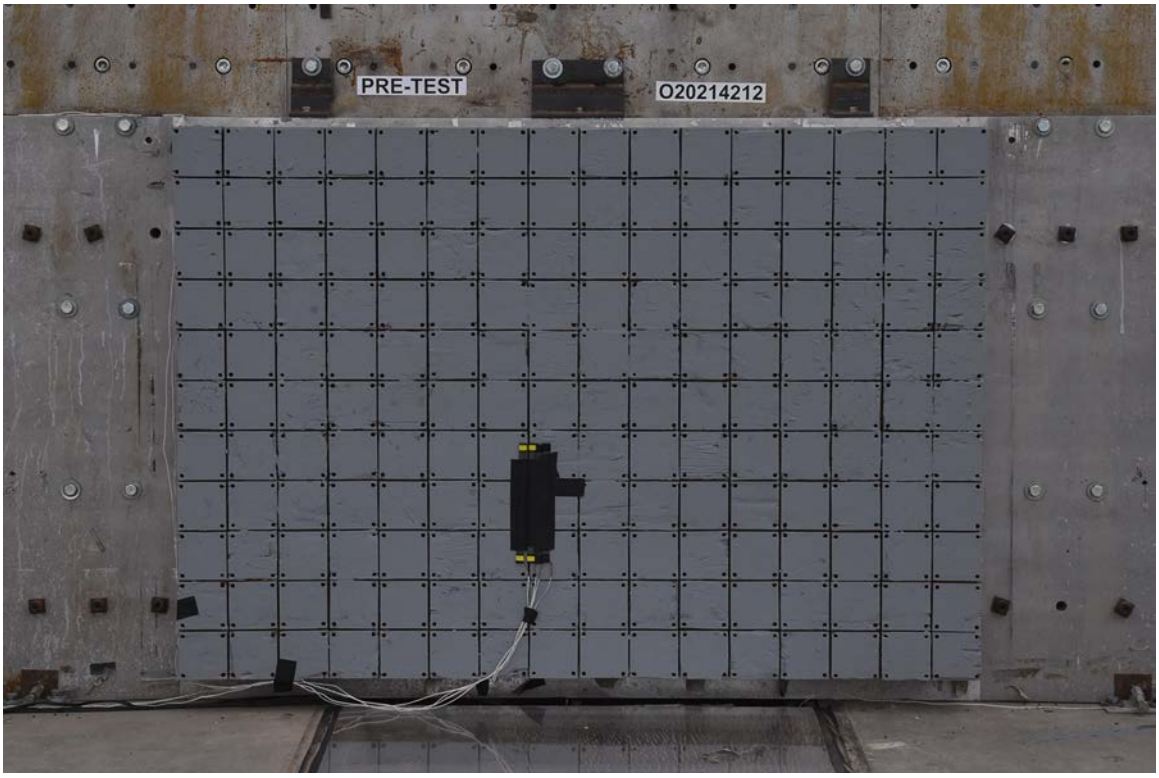


FIGURE 2. Pre-Test Load Cell Wall

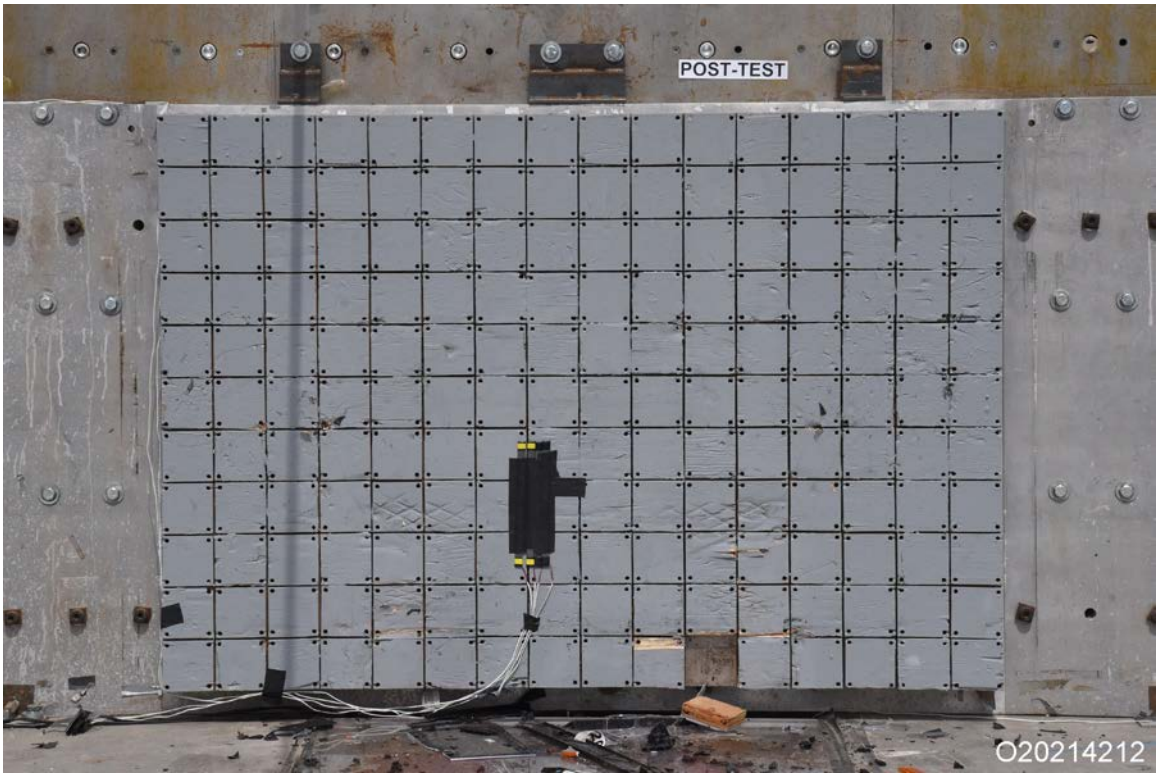


FIGURE 3. Post-Test Load Cell Wall

FIGURE 4. Manufacturer's Label

FIGURE 5. Tire Placard

FIGURE 6. 2021 Genesis G80 Frontal as Delivered

FIGURE 7. Left Rear ¾ View, as Received

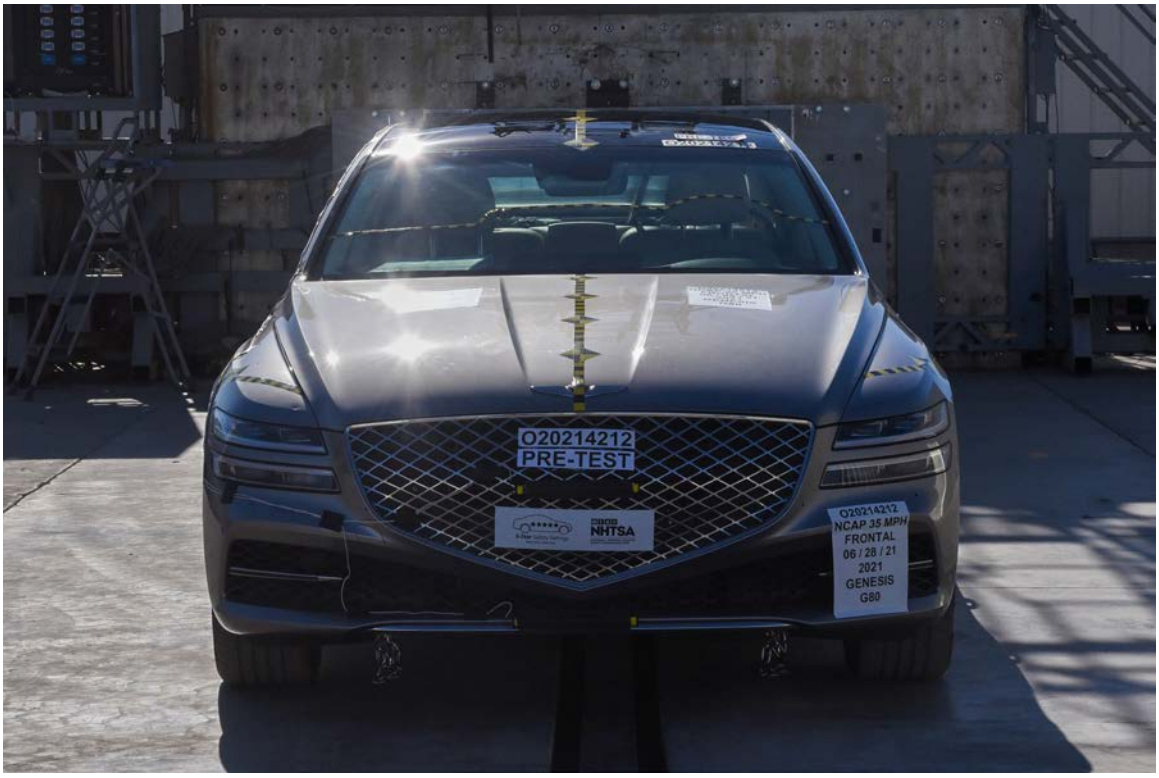


FIGURE 8. Pre-Test Front View of Test Vehicle

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 View of Test Vehicle

FIGURE 14. Pre-Test Right Front ¾ View

FIGURE 15. Post-Test Right Front ¾ View

FIGURE 16. Pre-Test Left Rear ¾ View

FIGURE 17. Post-Test Left Rear ¾ View

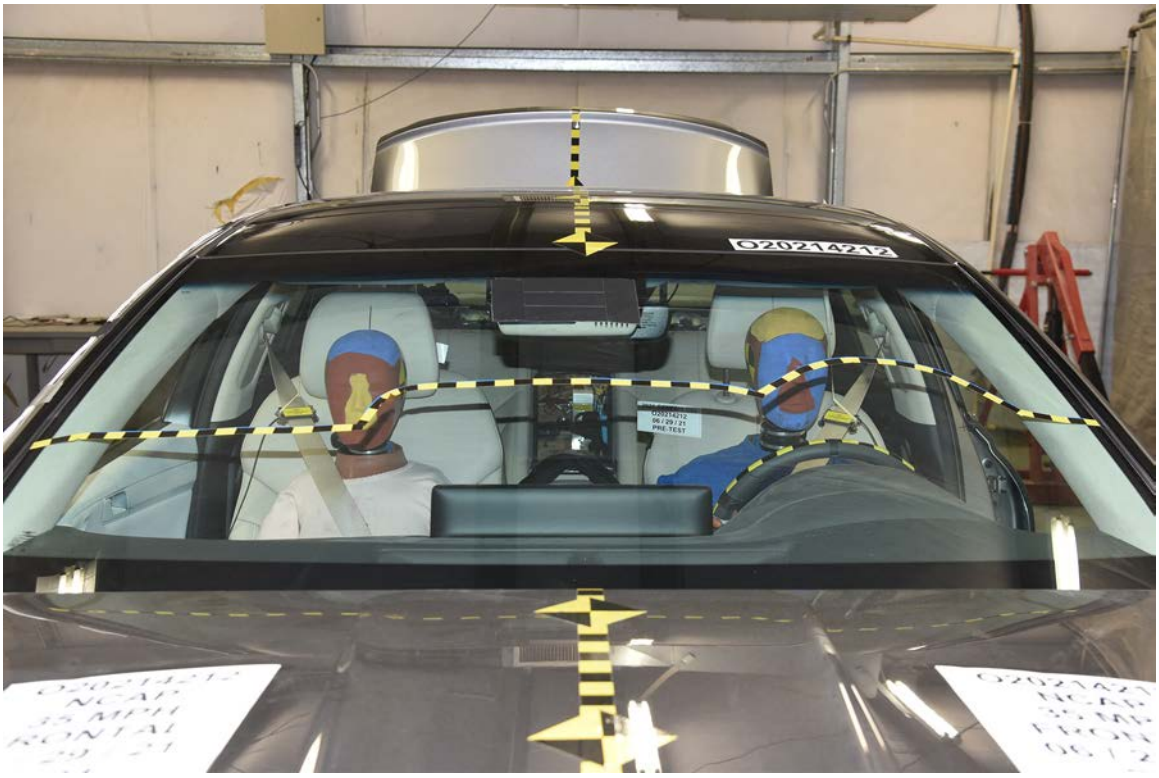


FIGURE 18. Pre-Test Windshield View

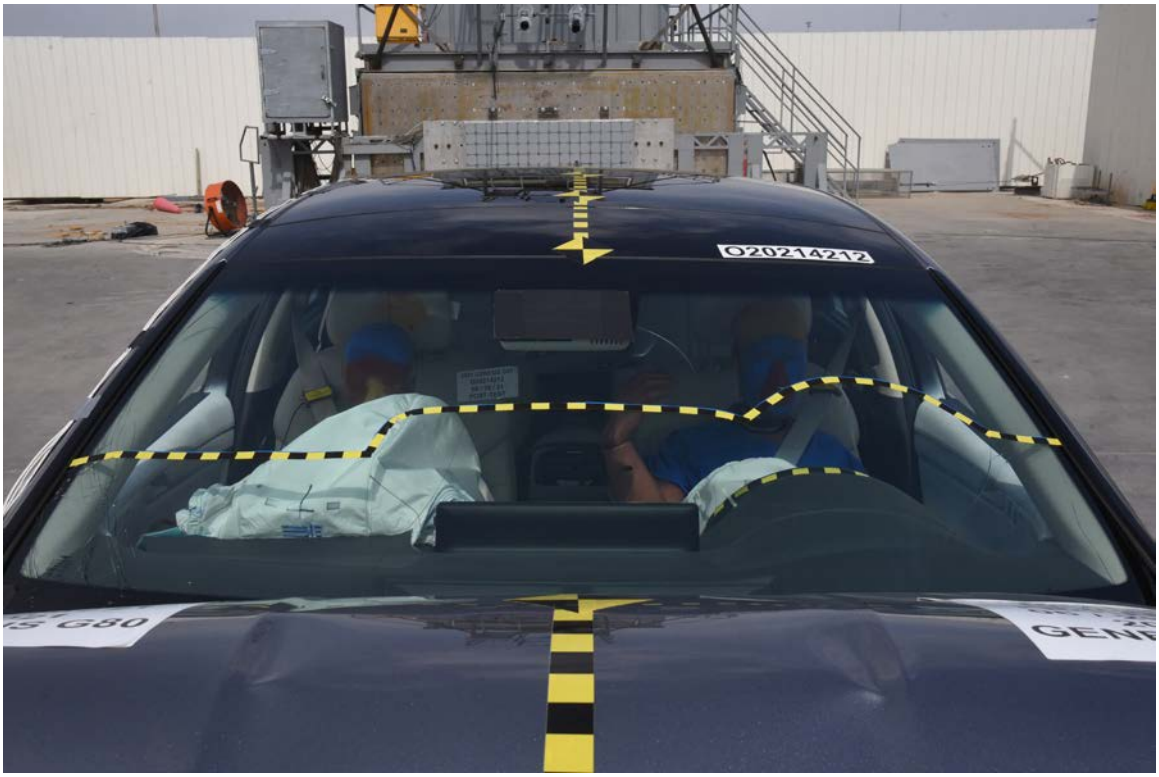


FIGURE 19. Post-Test Windshield View

Photograph Not Available

FIGURE 20. Pre-Test Engine Compartment View

FIGURE 21. Post-Test Engine Compartment View

FIGURE 22. Pre-Test Fuel Filler Cap View

FIGURE 23. Post-Test Fuel Filler Cap View

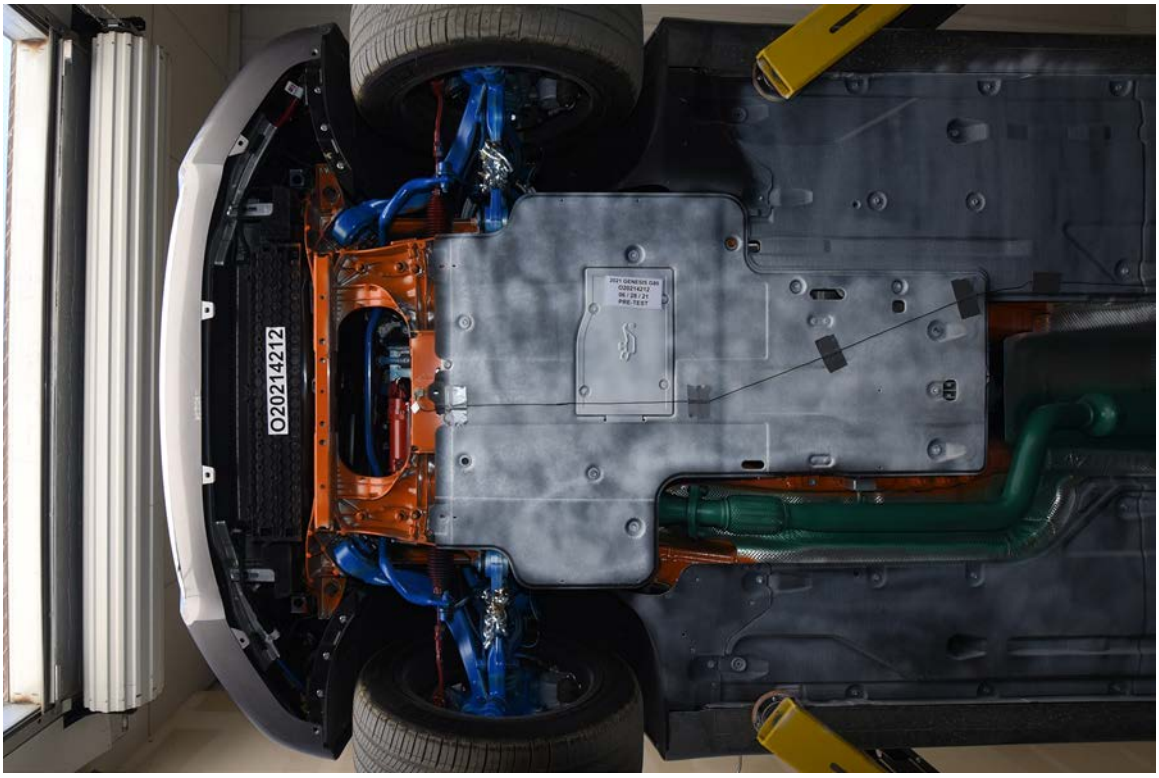


FIGURE 24. Pre-Test Front Underbody View

FIGURE 25. Post-Test Front Underbody View

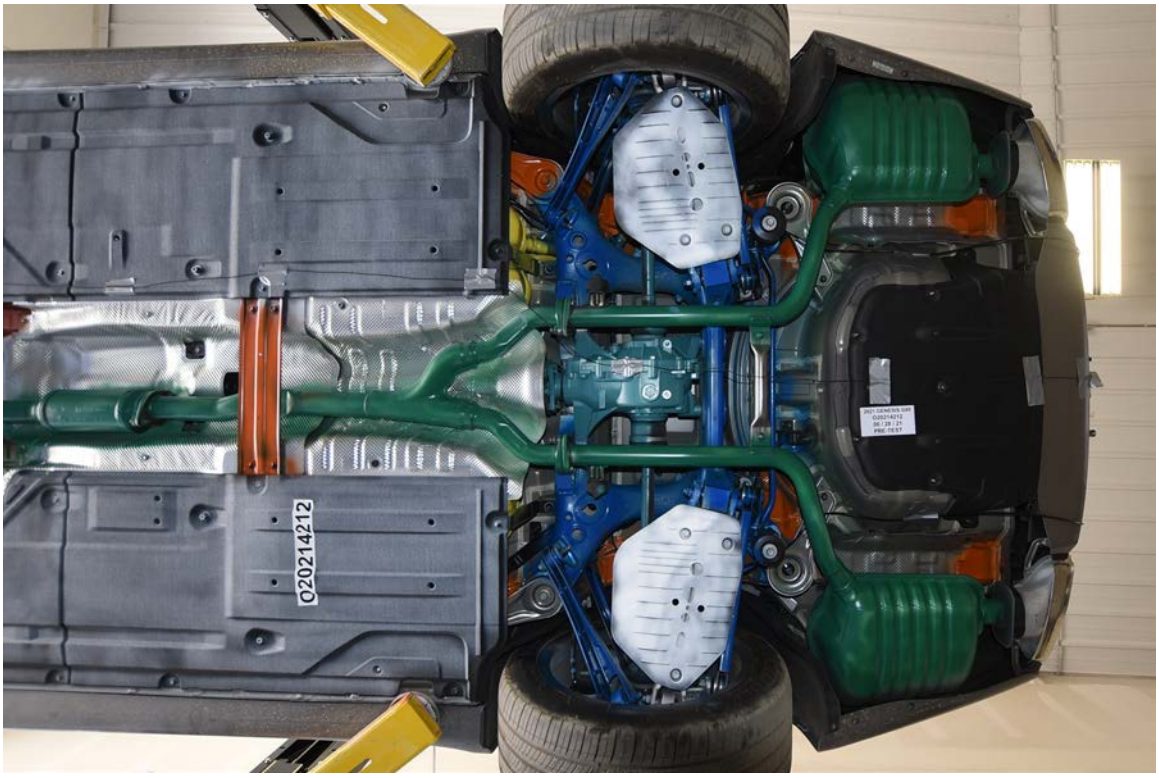


FIGURE 26. Pre-Test Rear Underbody View

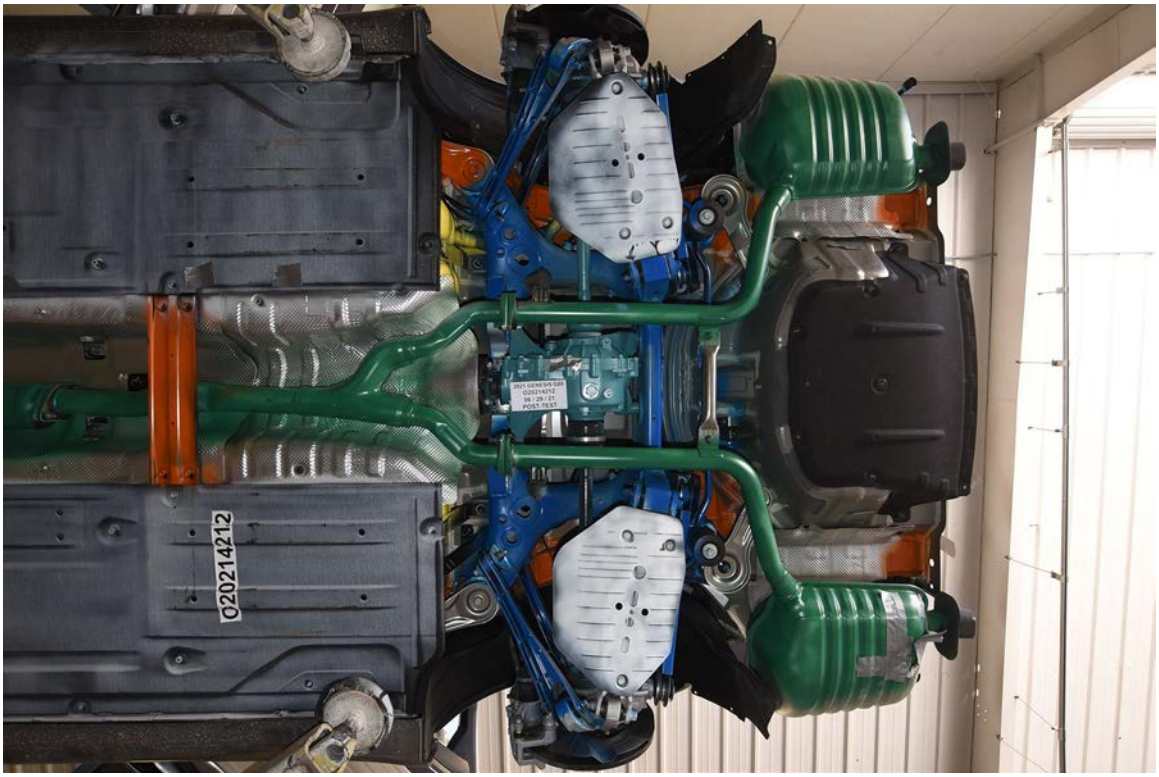


FIGURE 27. Post-Test Rear Underbody View

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

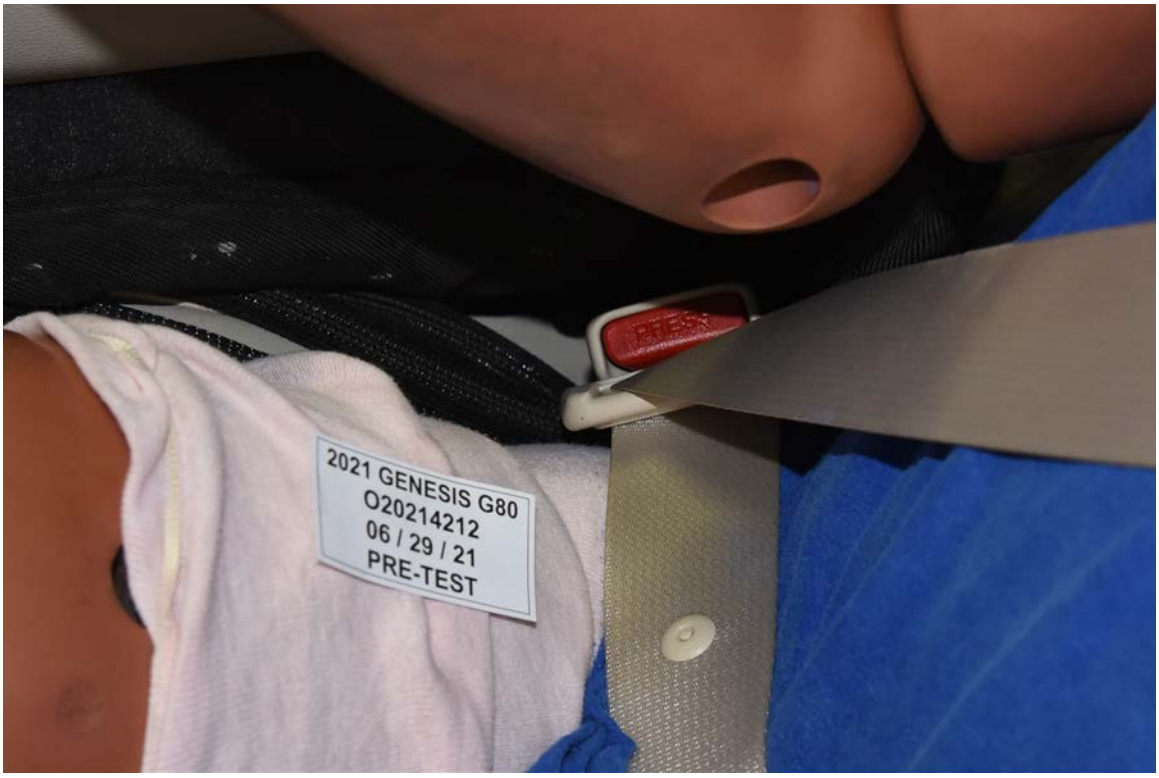


FIGURE 40. Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy

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

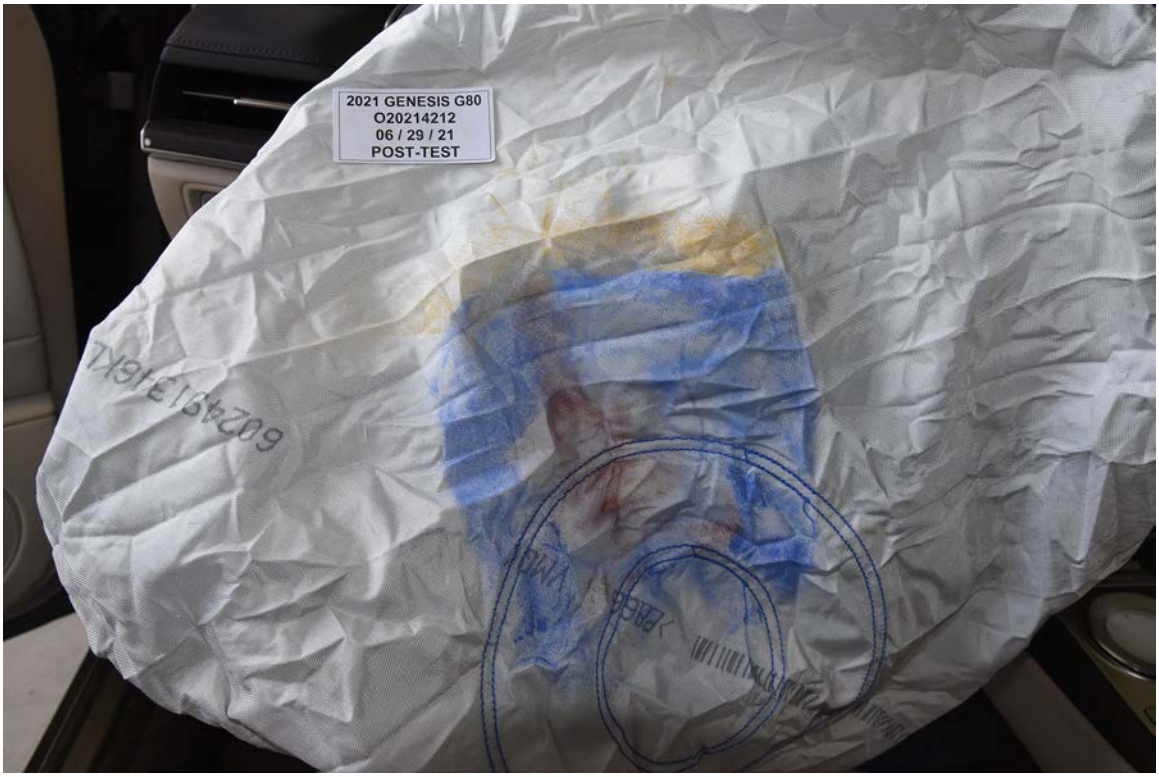


FIGURE 49. Post-Test Driver Dummy Contact with Airbag

FIGURE 50. Post-Test Driver Dummy Contact with Headrest

FIGURE 50a. Post-Test Driver Dummy Contact with Knee Airbag

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

Photograph Not Available

FIGURE 69. Pre-Test Passenger's Side Floorpan

FIGURE 70. Post-Test Passenger's Side Floorpan

FIGURE 71. Post-Test Passenger Dummy Face

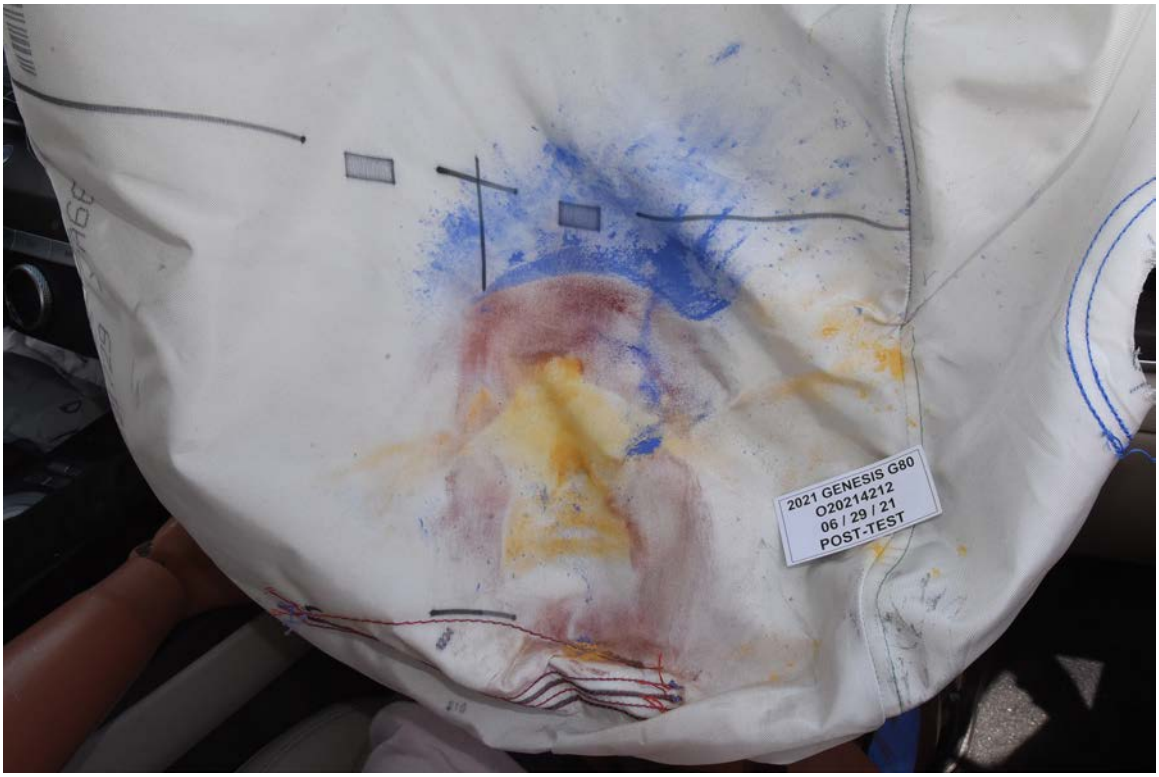


FIGURE 72. Post-Test Passenger Dummy Contact with Airbag

FIGURE 73. Post-Test Passenger Dummy Contact with Headrest

FIGURE 73a. Post-Test Passenger Dummy Contact with Knee Bolster

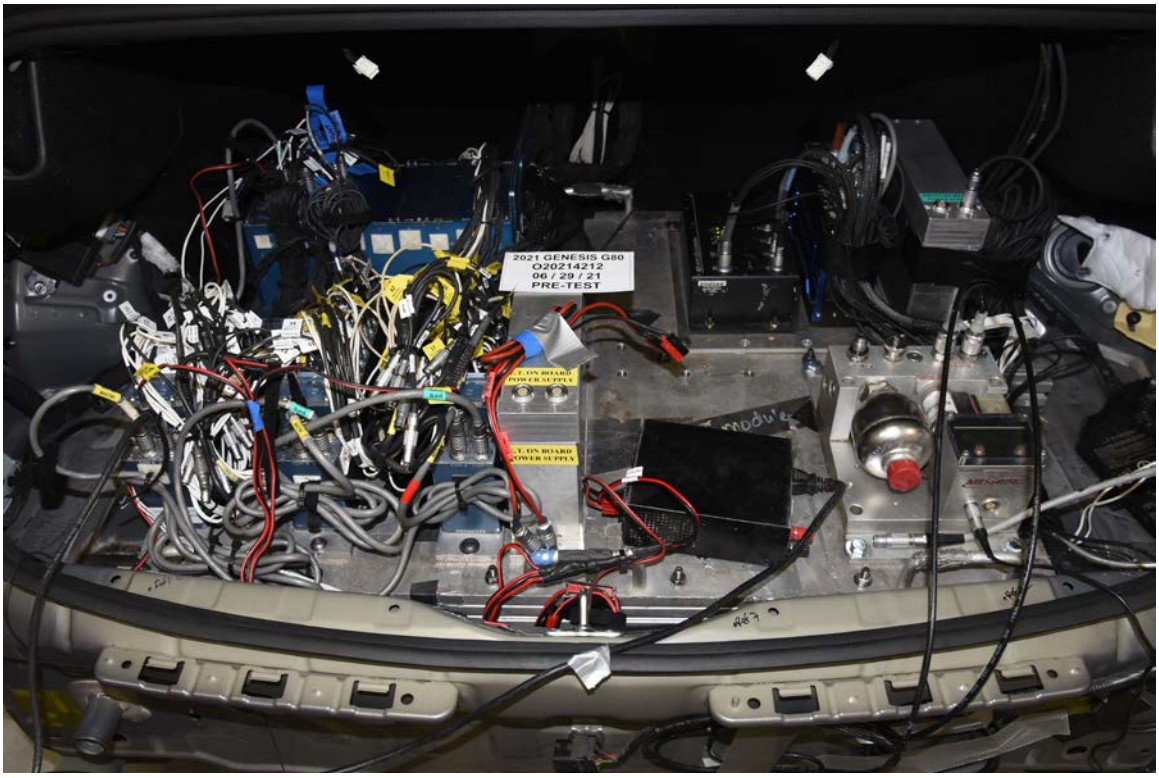


FIGURE 74. Photograph of Ballast Installed in Vehicle

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

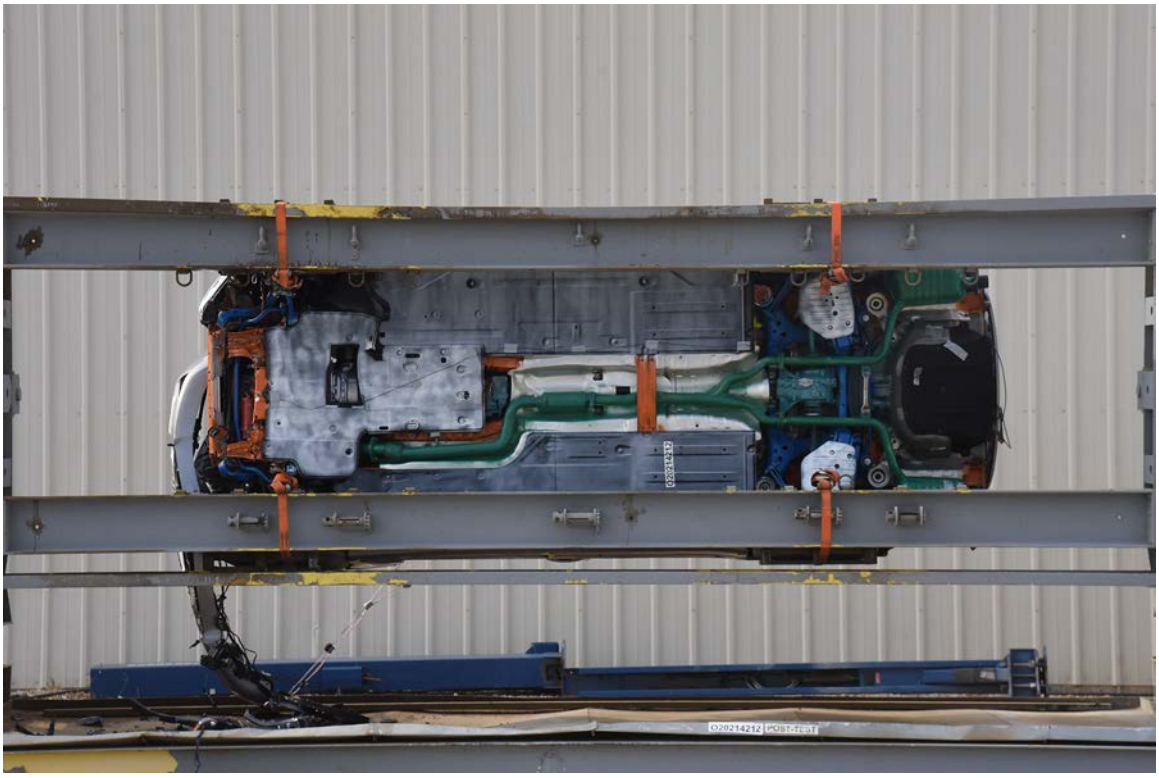
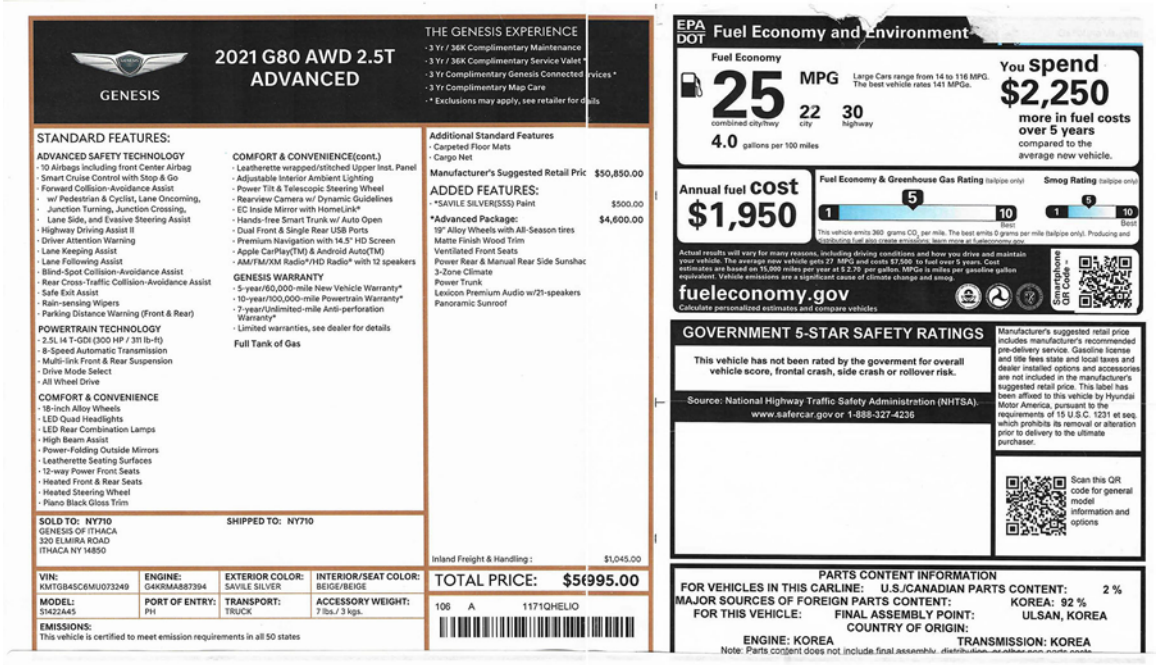


FIGURE 80. Vehicle at 270° on Static Rollover Device

FIGURE 81. Vehicle at 360° on Static Rollover Device

FIGURE 82. 2021 Genesis G80 Frontal Impact Event



GENESIS

2021 G80 AWD 2.5T
ADVANCED

THE GENESIS EXPERIENCE
- 3 Yr / 36K Complimentary Maintenance
- 3 Yr / 36K Complimentary Service Valet*
- 3 Yr Complimentary Genesis Connected Services*
- 3 Yr Complimentary Map Care
- * Exclusions may apply, see retailer for details

STANDARD FEATURES:

ADVANCED SAFETY TECHNOLOGY
- 10 Airbags including front Center Airbag
- Smart Cruise Control with Stop & Go
- Forward Collision-Avoidance Assist w/ Pedestrian & Cyclist, Lane Oncoming, Junction Turning, Junction Crossing, Lane Side, and Evasive Steering Assist
- Highway Driving Assist II
- Driver Attention Warning
- Lane Keeping Assist
- Lane Following Assist
- Blind-Spot Collision-Avoidance Assist
- Rear Cross-Traffic Collision-Avoidance Assist
- Safe Exit Assist
- Rain-sensing Wipers
- Parking Distance Warning (Front & Rear)

POWERTRAIN TECHNOLOGY
- 2.5L I4 T-GDI (300 HP / 311 lb-ft)
- 8-Speed Automatic Transmission
- Multi-link Front & Rear Suspension
- Drive Mode Select
- All Wheel Drive

COMFORT & CONVENIENCE
- 18-inch Alloy Wheels
- LED Quad Headlights
- LED Rear Combination Lamps
- High Beam Assist
- Power-Folding Outside Mirrors
- Leatherette Seating Surfaces
- 12-way Power Front Seats
- Heated Front & Rear Seats
- Heated Steering Wheel
- Piano Black Gloss Trim

COMFORT & CONVENIENCE(cont.)
- Leatherette wrapped/stitched Upper Inst. Panel
- Adjustable Interior Ambient Lighting
- Power Tilt & Telescopic Steering Wheel
- Rearview Camera w/ Dynamic Guidelines
- EC Inside Mirror with HomeLink®
- Hands-free Smart Trunk w/ Auto Open
- Dual Front & Single Rear USB Ports
- Premium Navigation with 14.5" HD Screen
- Apple CarPlay(TM) & Android Auto(TM)
- AM/FM/XM Radio®/HD Radio® with 12 speakers

GENESIS WARRANTY
- 5-year/60,000-mile New Vehicle Warranty*
- 10-year/100,000-mile Powertrain Warranty*
- 7-year/Unlimited-mile Anti-perforation Warranty*
- Limited warranties, see dealer for details

Full Tank of Gas

Additional Standard Features
- Carpeted Floor Mats
- Cargo Net

Manufacturer's Suggested Retail Pric $50,850.00

ADDED FEATURES:
- *SAVILE SILVER(SSS) Paint $500.00

*Advanced Package: $4,600.00
19" Alloy Wheels with All-Season tires
Matte Finish Wood Trim
Ventilated Front Seats
Power Rear & Manual Rear Side Sunshac
3-Zone Climate
Power Trunk
Lexicon Premium Audio w/21-speakers
Panoramic Sunroof

SOLD TO: NY710
GENESIS OF ITHACA
320 ELMIRA ROAD
ITHACA NY 14850

SHIPPED TO: NY710

Inland Freight & Handling : $1,045.00

TOTAL PRICE: $50995.00

VIN:	ENGINE:	EXTERIOR COLOR:	INTERIOR/SEAT COLOR:
KMTGB4SC6MU073249	G4KRMA887394	SAVILE SILVER	BEIGE/BEIGE
MODEL:	PORT OF ENTRY:	TRANSPORT:	ACCESSORY WEIGHT:
51422A45	PH	TRUCK	7 lbs./ 3 kgs.

EMISSIONS:
This vehicle is certified to meet emission requirements in all 50 states

106 A 1171QHELIO

EPA DOT Fuel Economy and Environment

Fuel Economy
25 MPG
22 city
30 highway
4.0 gallons per 100 miles
Large Cars range from 14 to 116 MPG. The best vehicle rates 141 MPGe.

You spend $2,250 more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $1,950

Fuel Economy & Greenhouse Gas Rating (tailpipe only) 5 (1–10, Best)

Smog Rating (tailpipe only) 5 (1–10, Best)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs $7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $2.75 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the goverment 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

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.

Scan this QR code for general model information and options

PARTS CONTENT INFORMATION
FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 2 %
MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 92 %
FOR THIS VEHICLE: FINAL ASSEMBLY POINT: ULSAN, KOREA
COUNTRY OF ORIGIN:
ENGINE: KOREA TRANSMISSION: KOREA
Note: Parts content does not include final assembly, distribution, or other non-parts costs

FIGURE 83. Monroney Label Photograph

Due to a testing delay, the incorrect test date is displayed on the vehicle Information placard in some pre-test videos and photographs. The actual test date was 6/29/2021.

APPENDIX B

DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

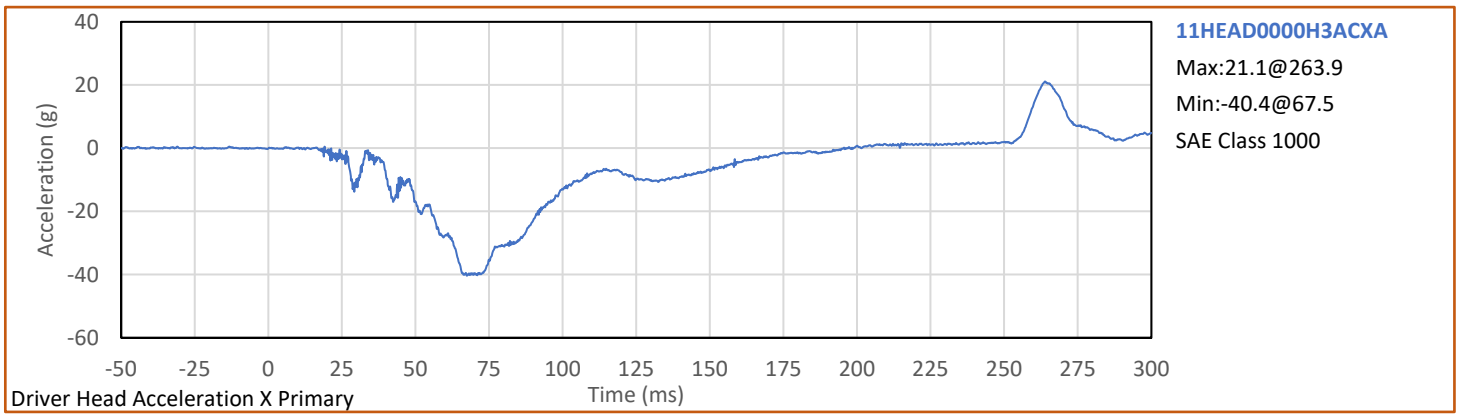
Plot		Page
1	Driver Head Acceleration X Primary	B-1
2	Driver Head Acceleration Y Primary	B-1
3	Driver Head Acceleration Z Primary	B-1
4	Driver Head Resultant Acceleration Primary	B-1
5	Driver Chest X Deflection	B-2
6	Driver Upper Neck Force X	B-3
7	Driver Upper Neck Force Z	B-3
8	Driver Upper Neck Moment 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

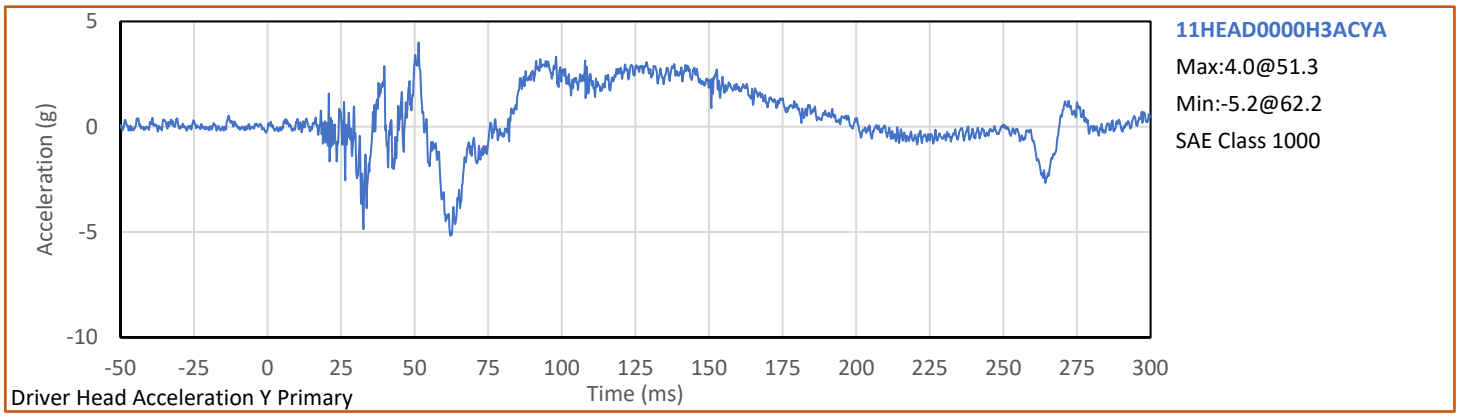
Driver Head X Acceleration Redundant
Driver Head Y Acceleration Redundant
Driver Head Z Acceleration Redundant
Driver Upper Neck Force Y
Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration Redundant
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

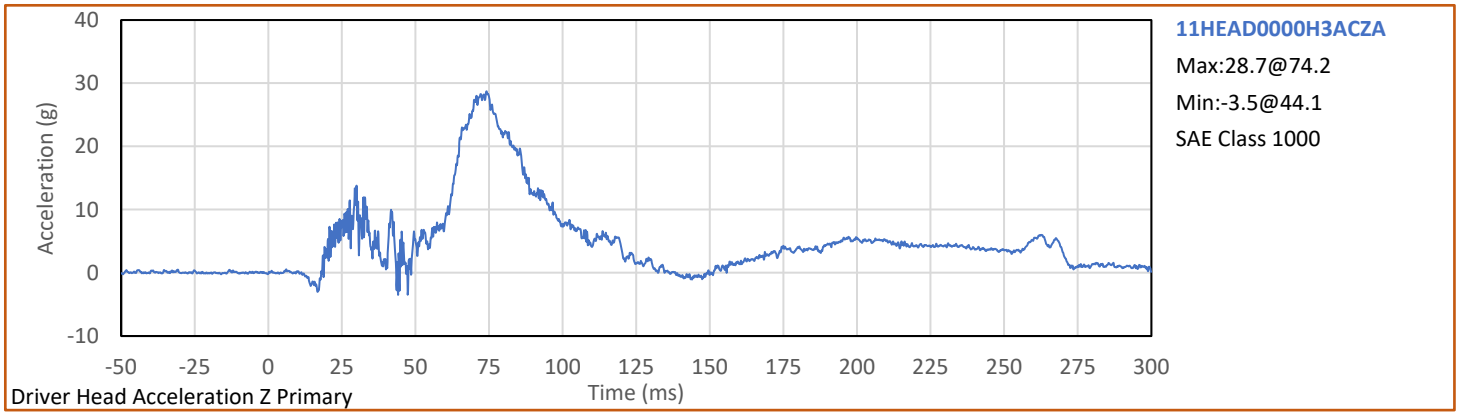
Test Vehicle:	2021 Genesis G80 4-Door Sedan	NHTSA No.:	O20214212
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	6/29/2021



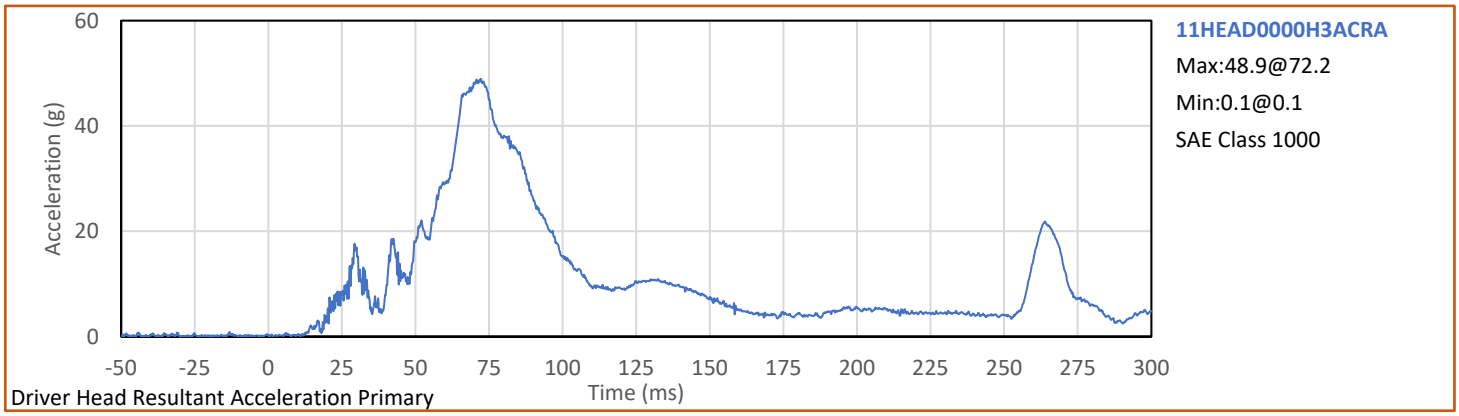
Driver Head Acceleration X Primary



Driver Head Acceleration Y Primary

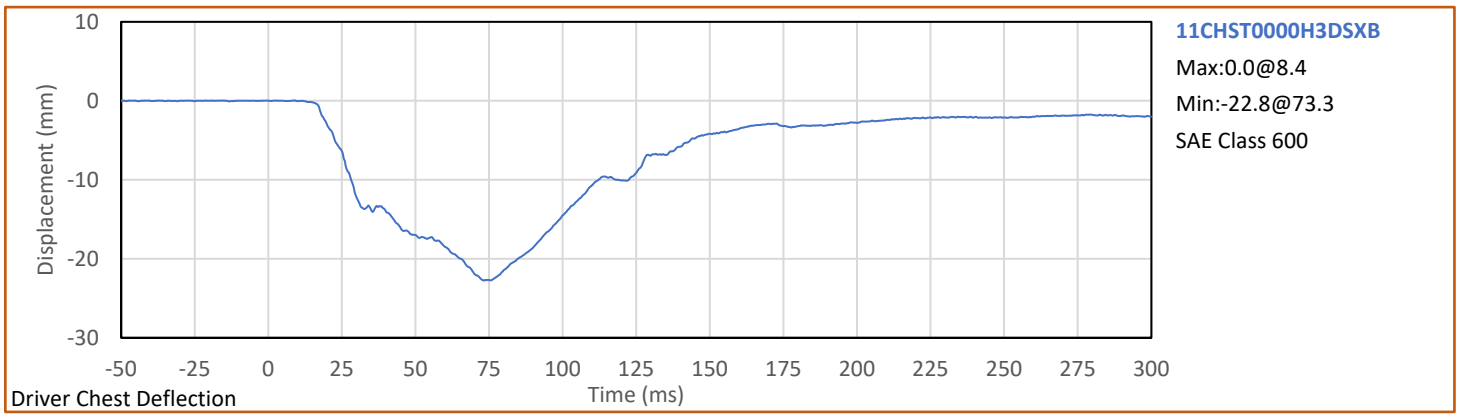


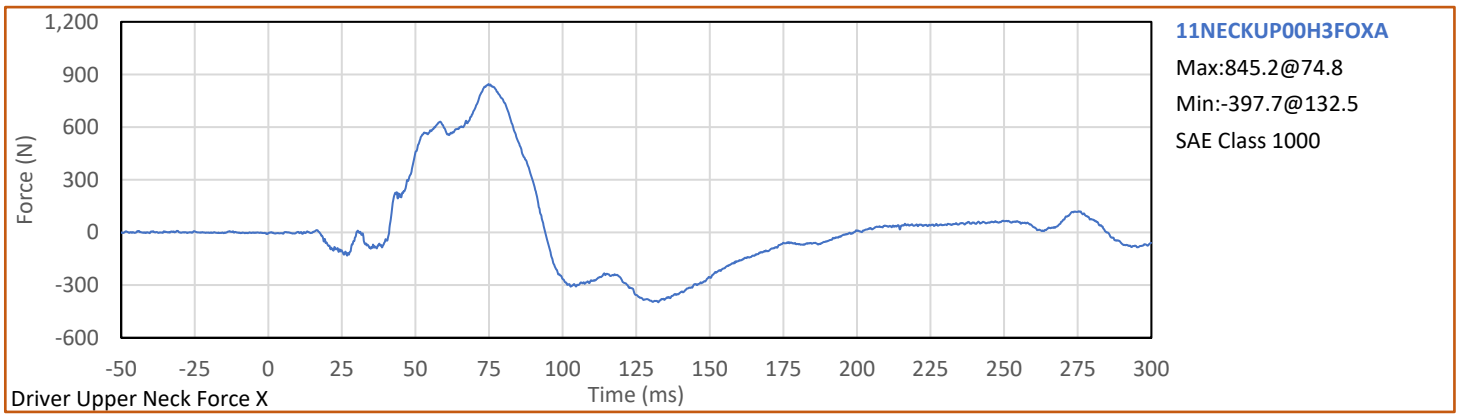
Driver Head Acceleration Z Primary



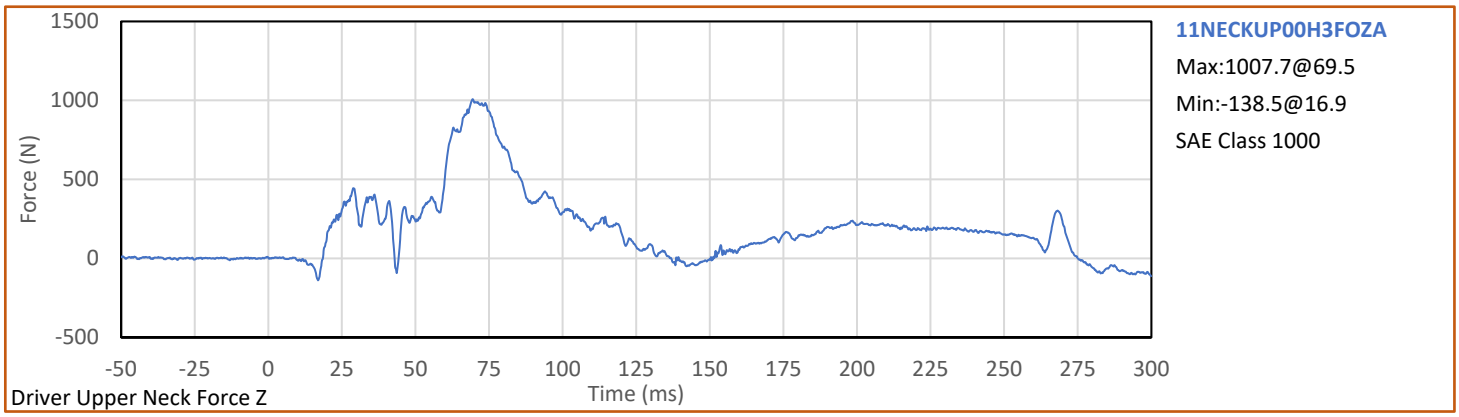
Driver Head Resultant Acceleration Primary

Test Vehicle:	2021 Genesis G80 4-Door Sedan	NHTSA No.:	O20214212
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	6/29/2021

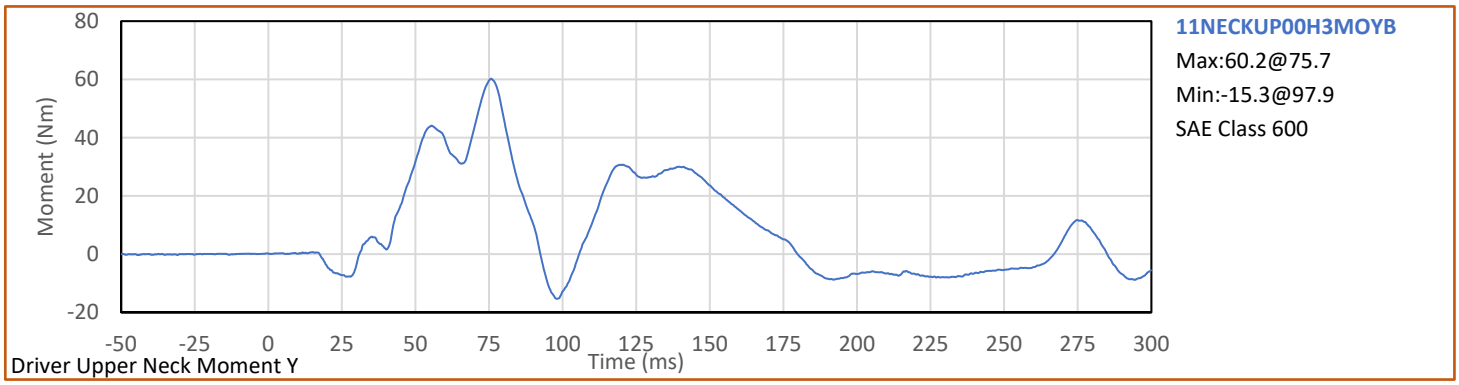




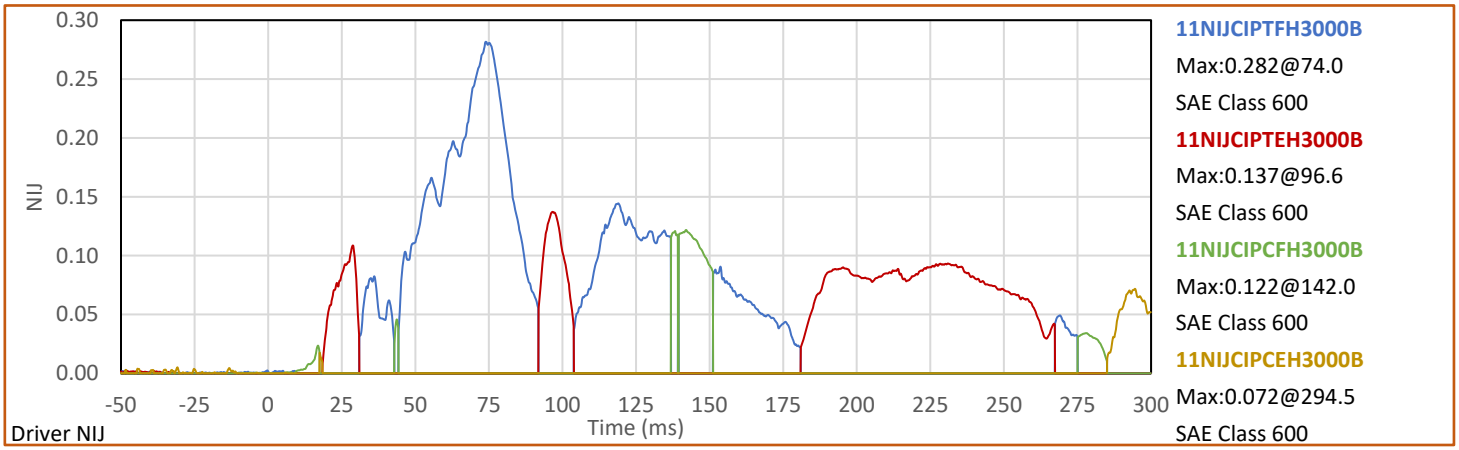
Driver Upper Neck Force X



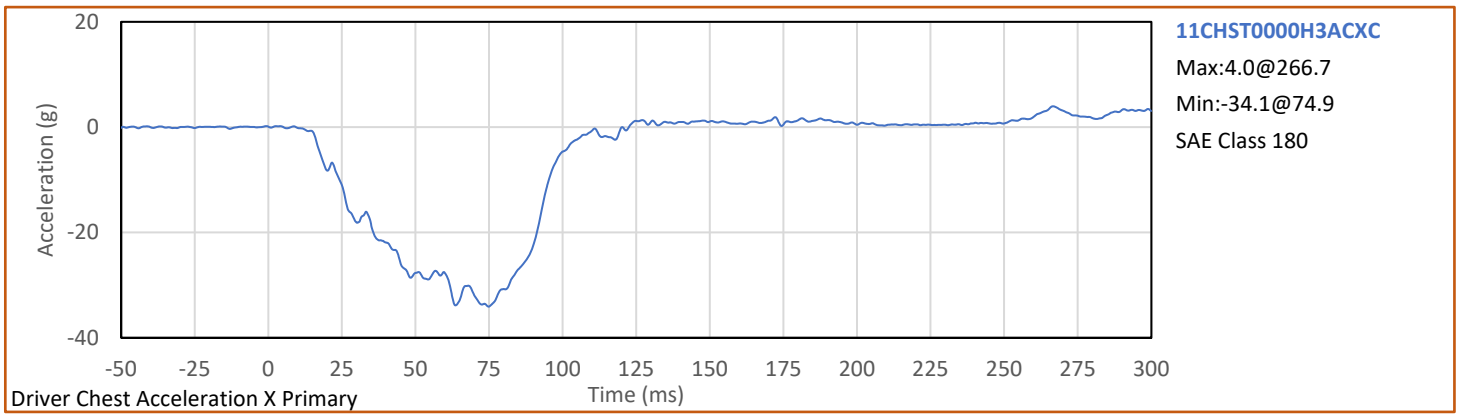
Driver Upper Neck Force Z

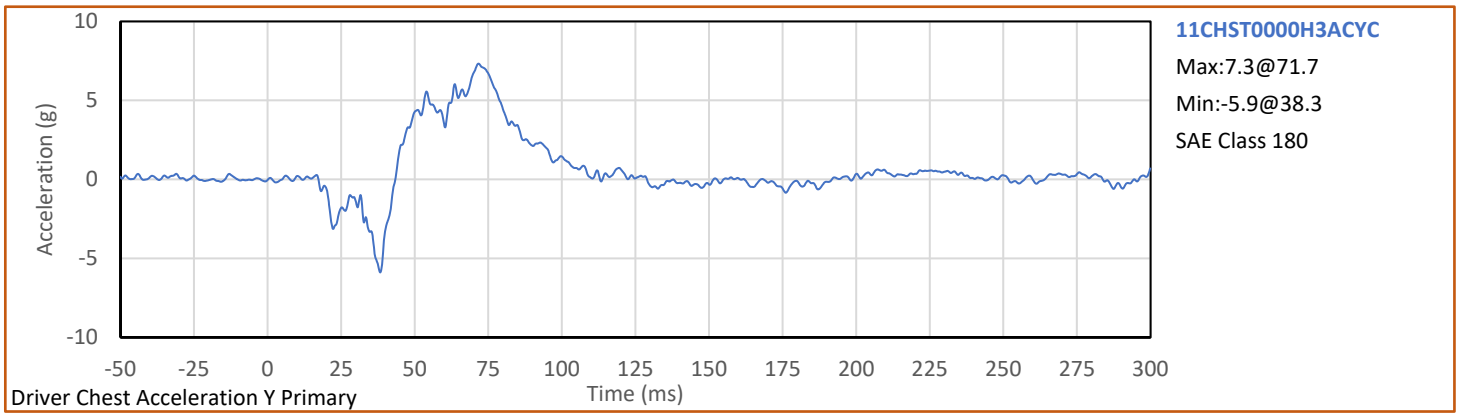


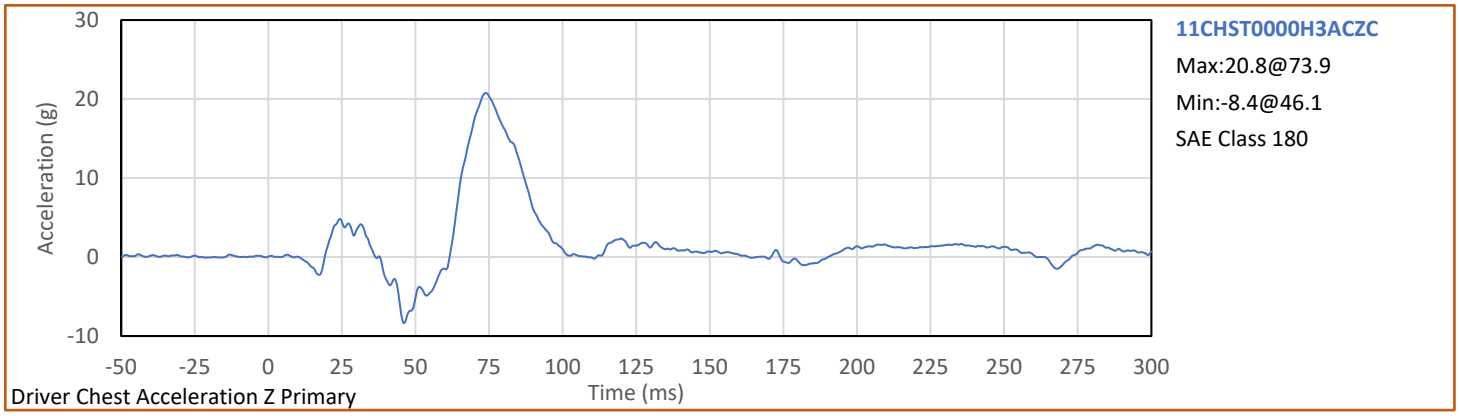
Driver Upper Neck Moment Y

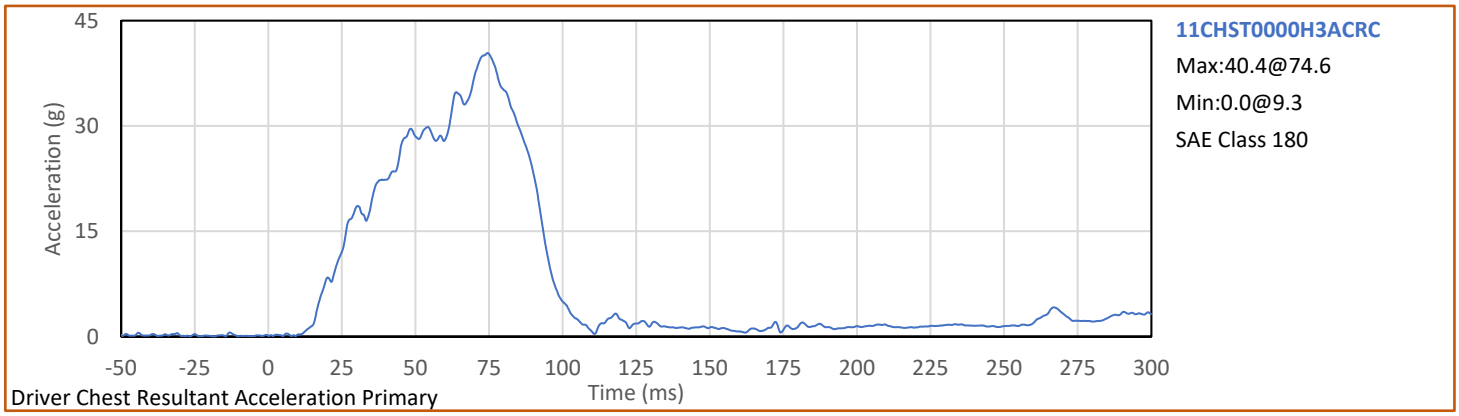


Driver NIJ


11CHST0000H3ACXC
Max:4.0@266.7
Min:-34.1@74.9
SAE Class 180
Acceleration (g)
Time (ms)
Driver Chest Acceleration X Primary


11CHST0000H3ACYC
Max:7.3@71.7
Min:-5.9@38.3
SAE Class 180
Acceleration (g)
Time (ms)
Driver Chest Acceleration Y Primary


11CHST0000H3ACZC
Max:20.8@73.9
Min:-8.4@46.1
SAE Class 180
Acceleration (g)
Time (ms)
Driver Chest Acceleration Z Primary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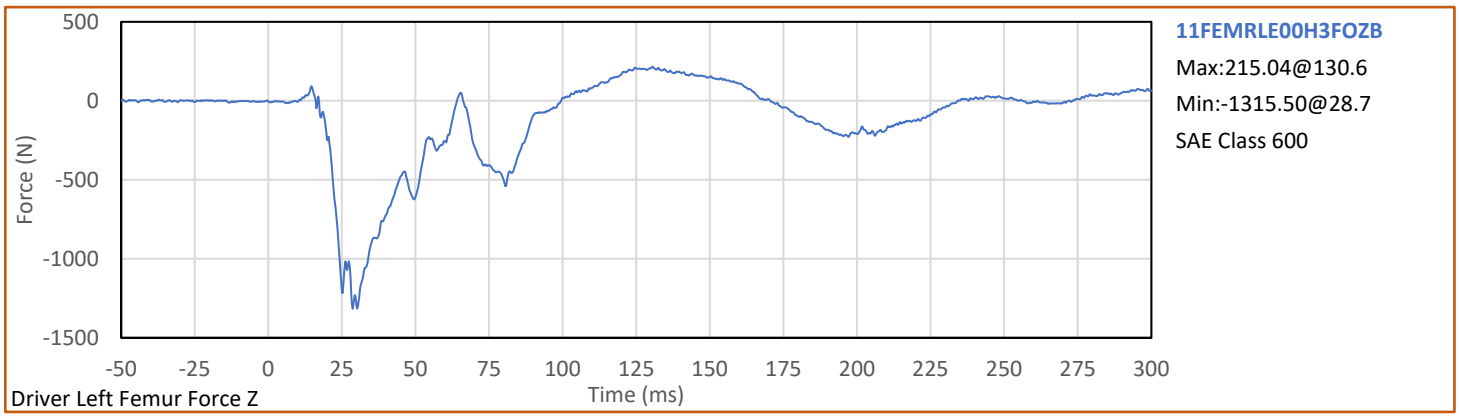
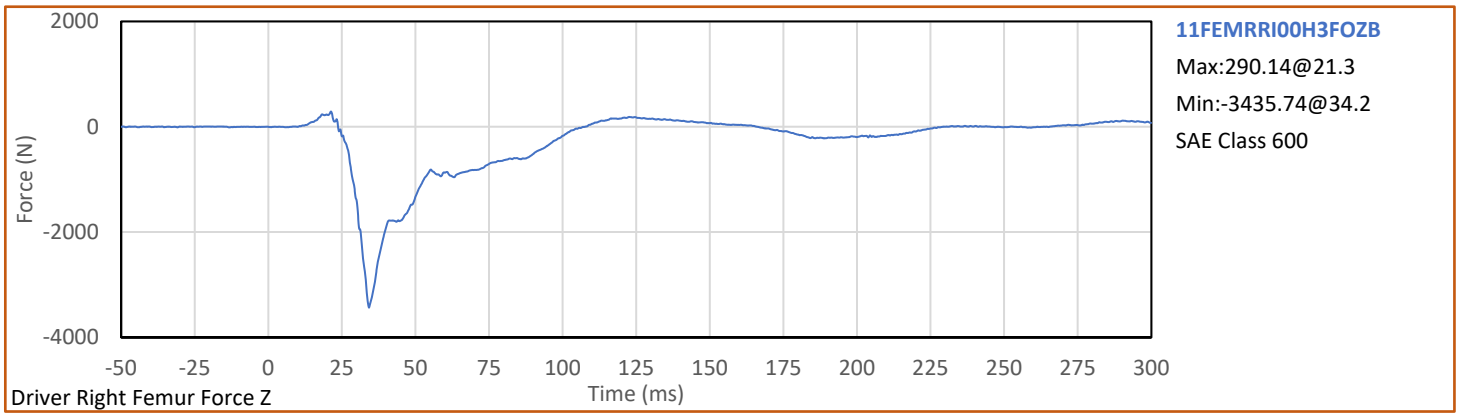
Max:40.4@74.6
Min:0.0@9.3
SAE Class 180
Acceleration (g)
Time (ms)
Driver Chest Resultant Acceleration Primary


11FEMRLE00H3FOZB
Max:215.04@130.6
Min:-1315.50@28.7
SAE Class 600
Force (N)
500
0
-500
-1000
-1500
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
Time (ms)
Driver Left Femur Force Z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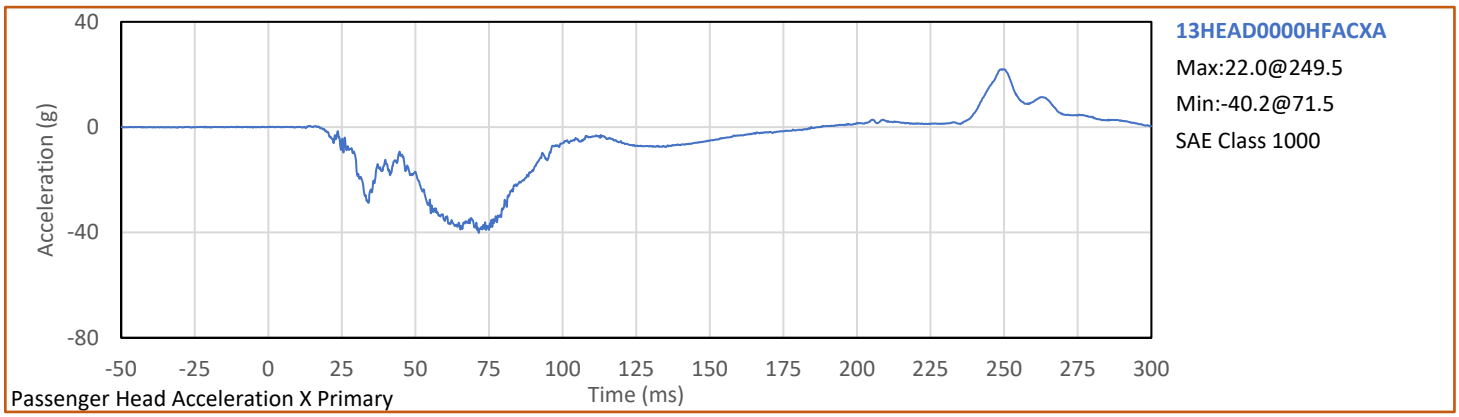
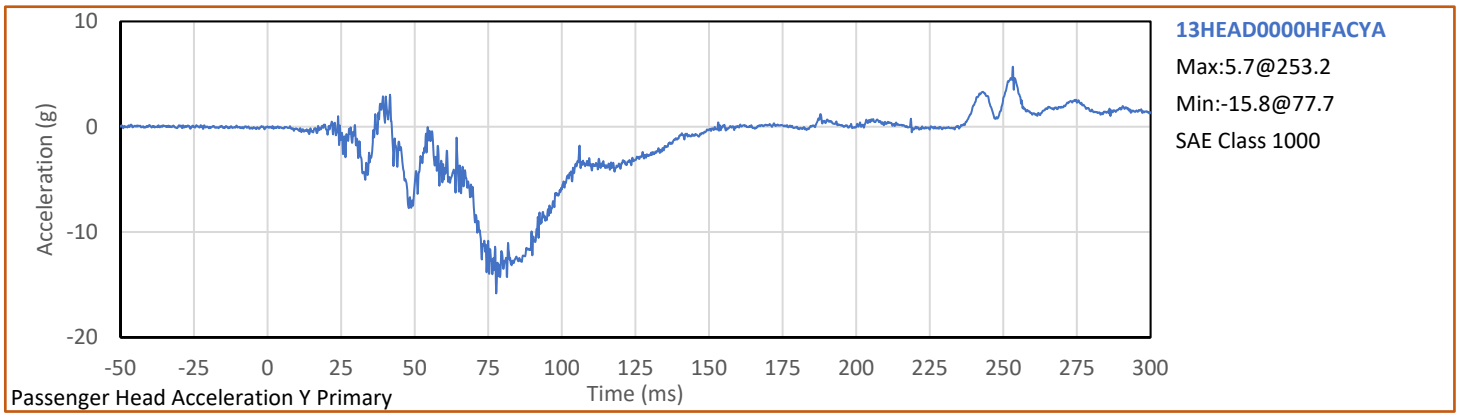
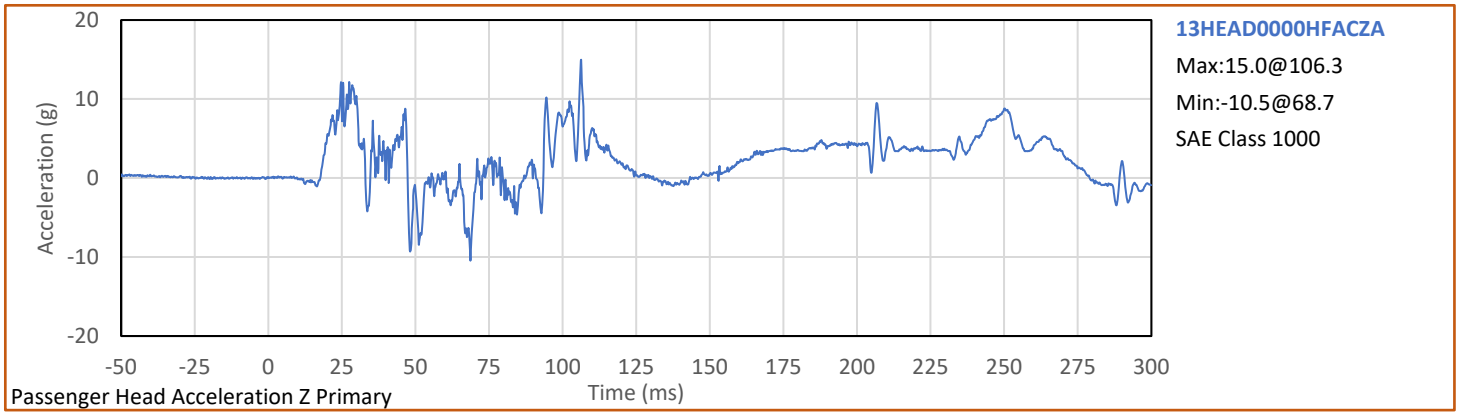
Max:290.14@21.3
Min:-3435.74@34.2
SAE Class 600
Force (N)
2000
0
-2000
-4000
-50
-25
0
25
50
75
100
125
150
175
200
225
250
275
300
Time (ms)
Driver Right Femur Force Z



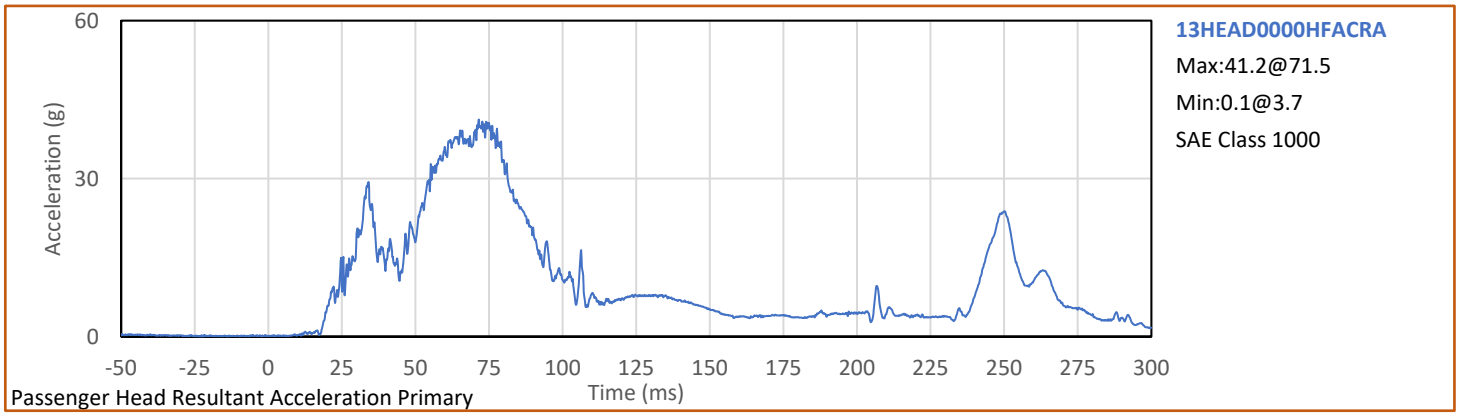
Passenger Head Acceleration X Primary



Passenger Head Acceleration Y Primary

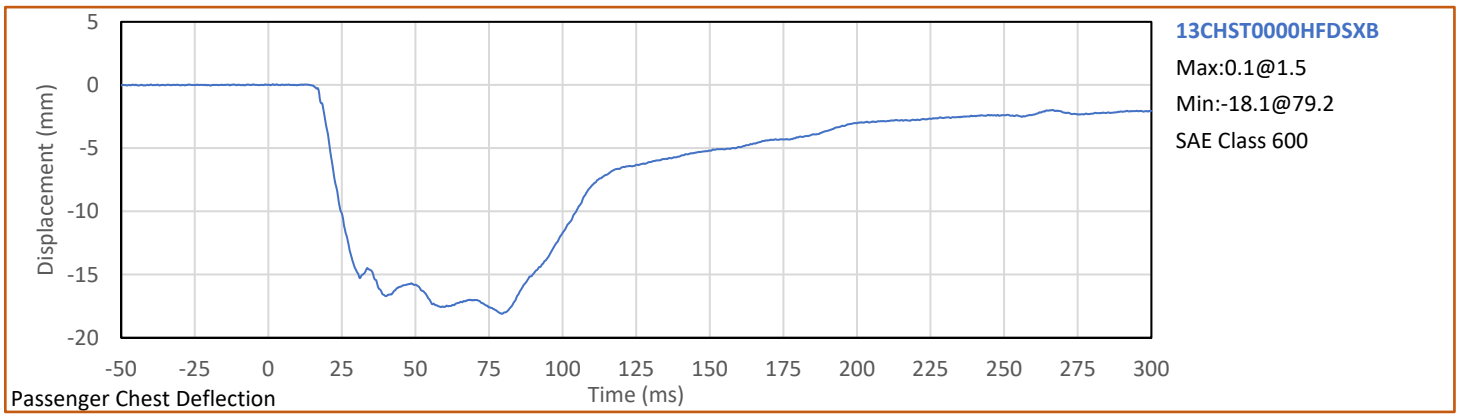


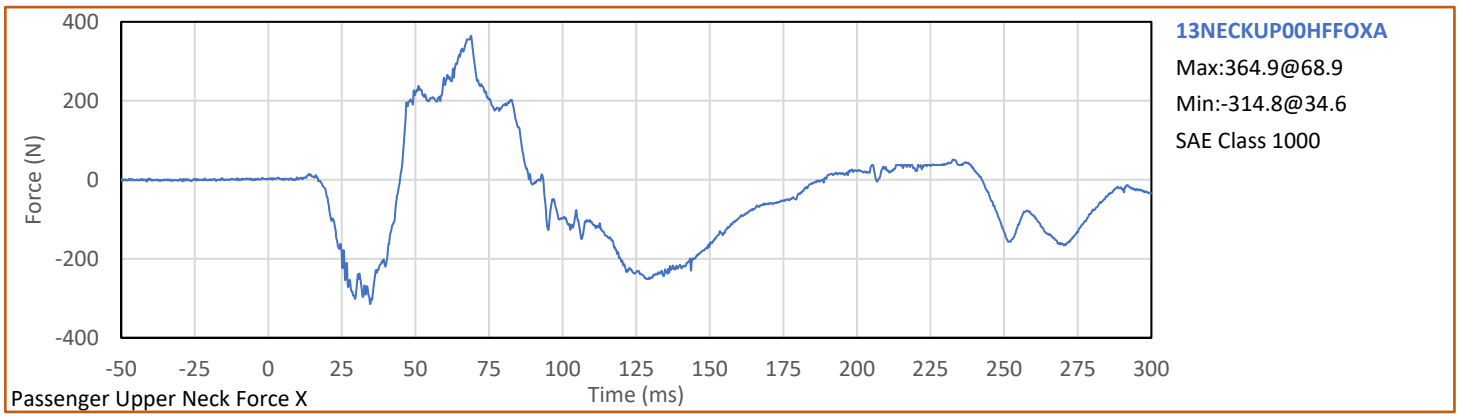
Passenger Head Acceleration Z Primary



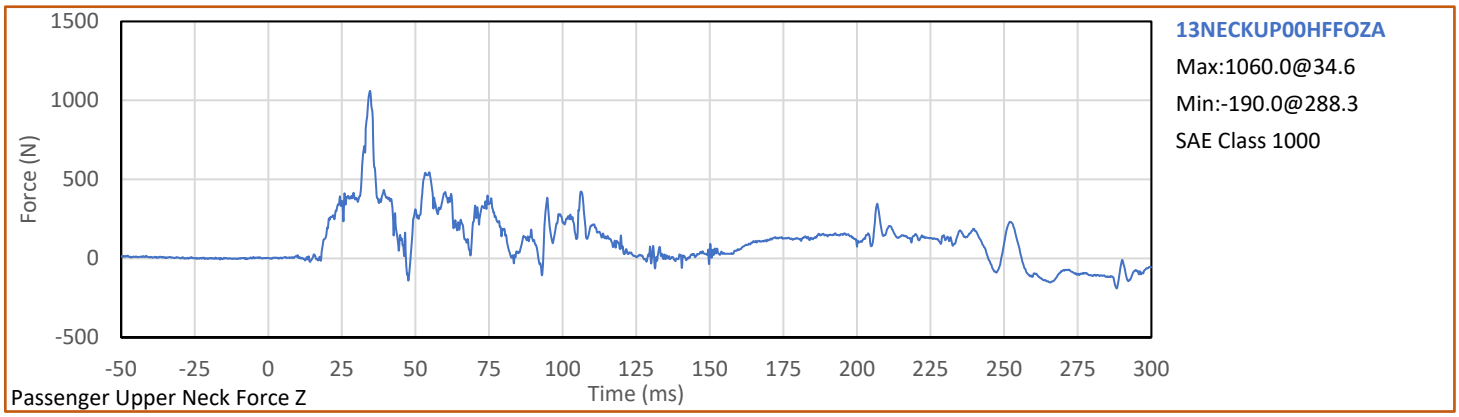
Passenger Head Resultant Acceleration Primary

Test Vehicle:	2021 Genesis G80 4-Door Sedan	NHTSA No.:	O20214212
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	6/29/2021

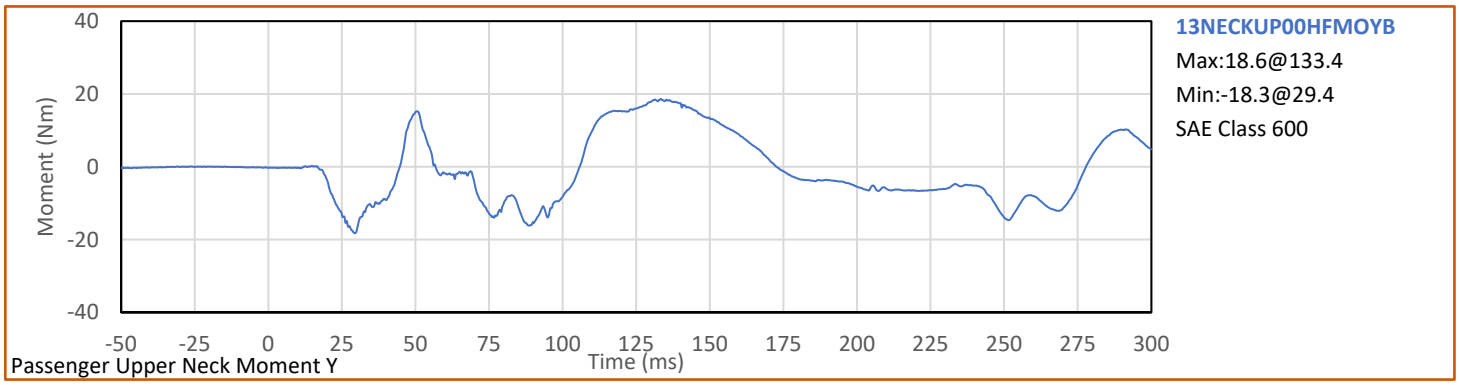




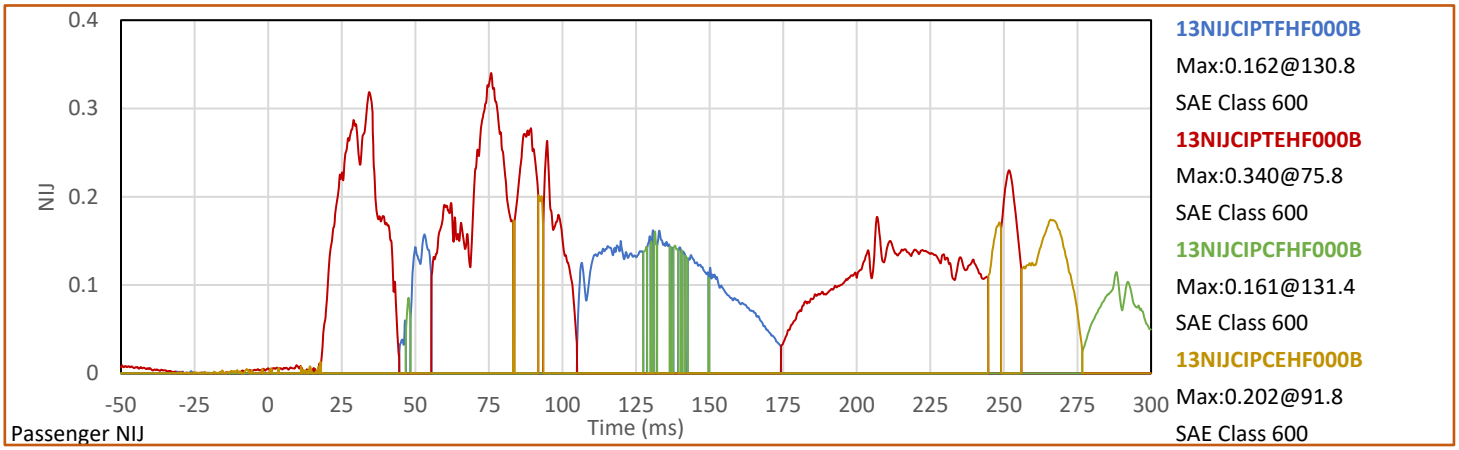
Passenger Upper Neck Force X



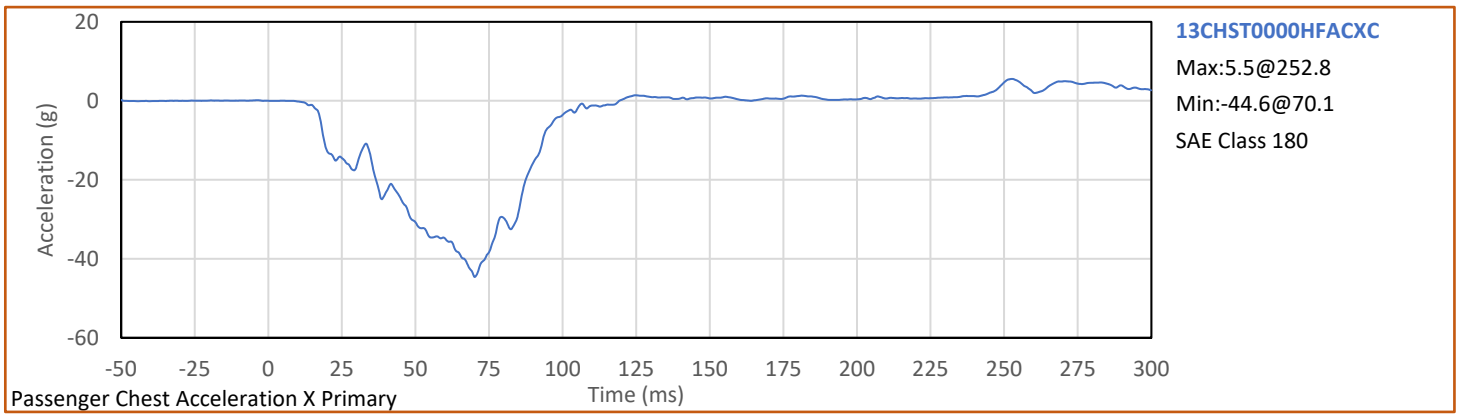
Passenger Upper Neck Force Z



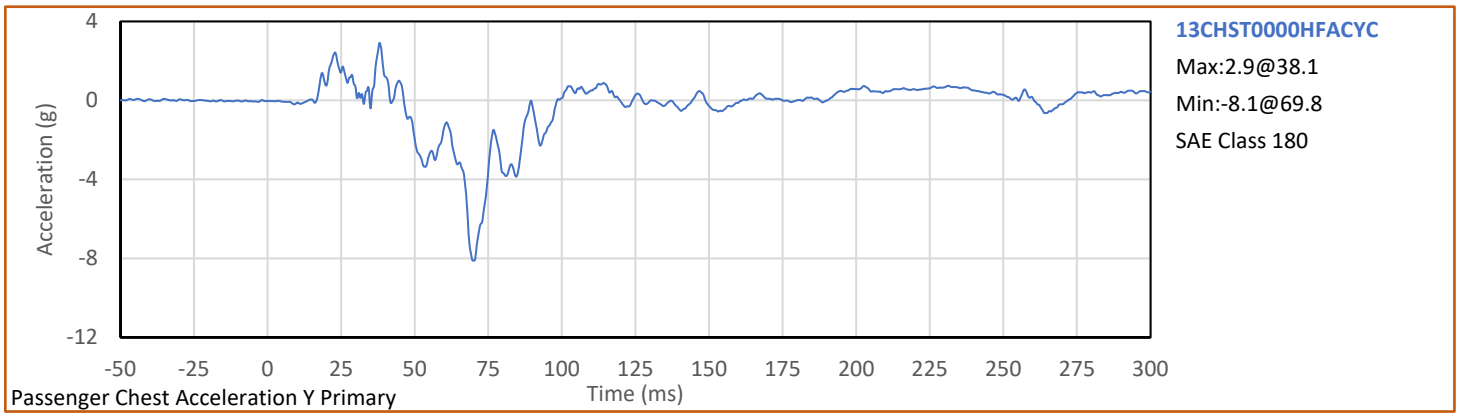
Passenger Upper Neck Moment Y



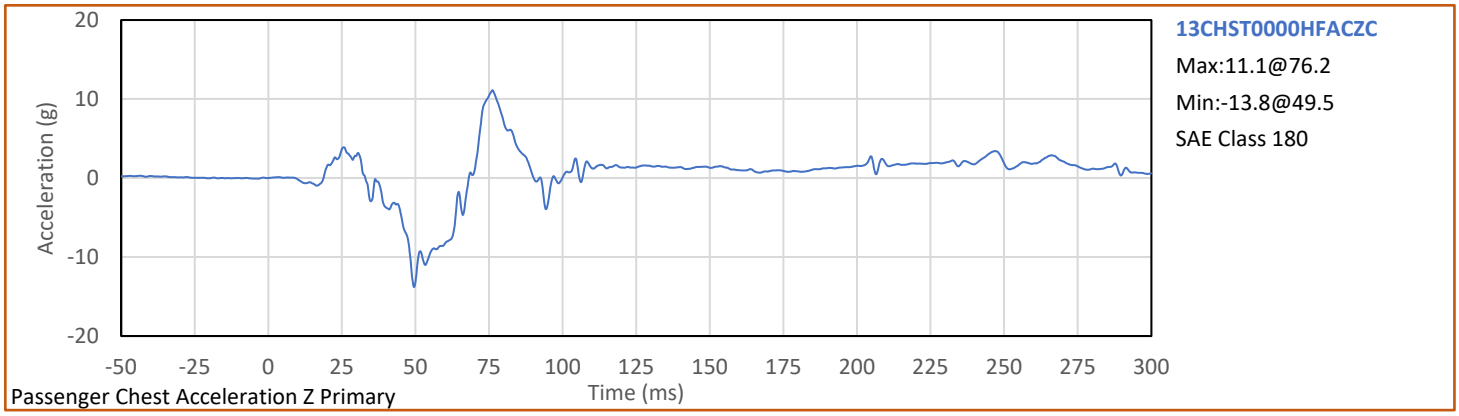
Passenger NIJ



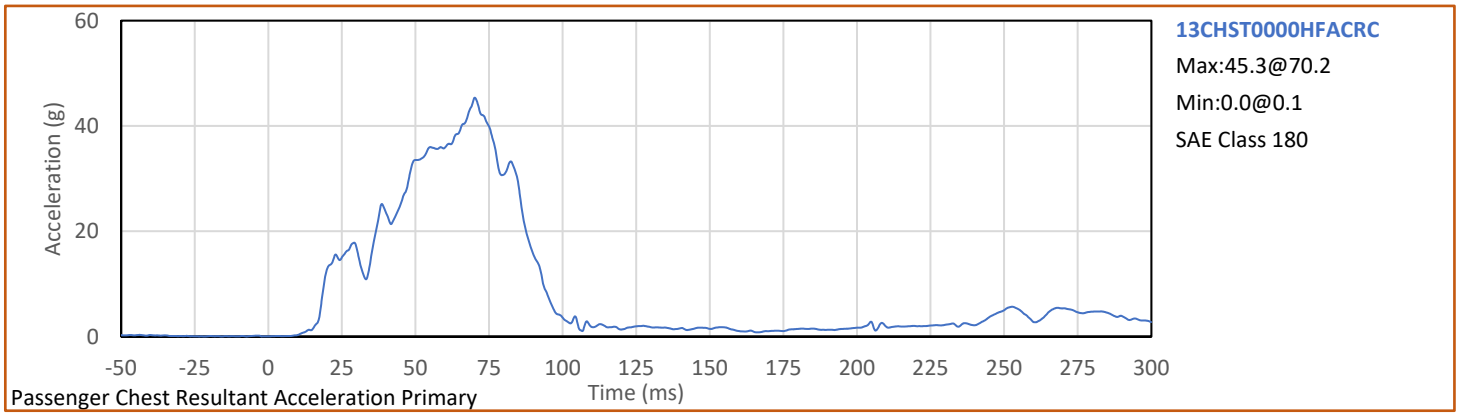
Passenger Chest Acceleration X Primary



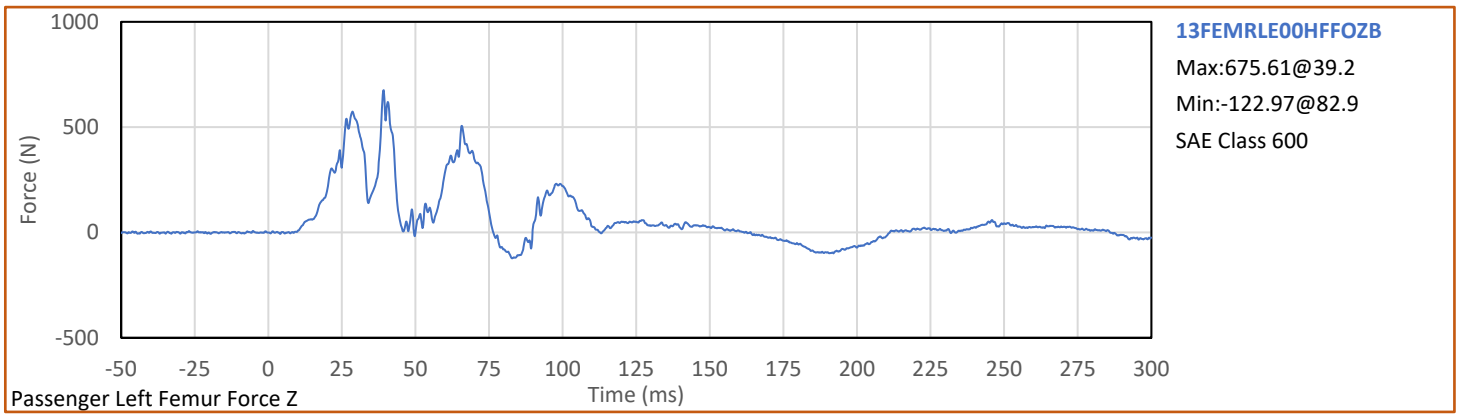
Passenger Chest Acceleration Y Primary



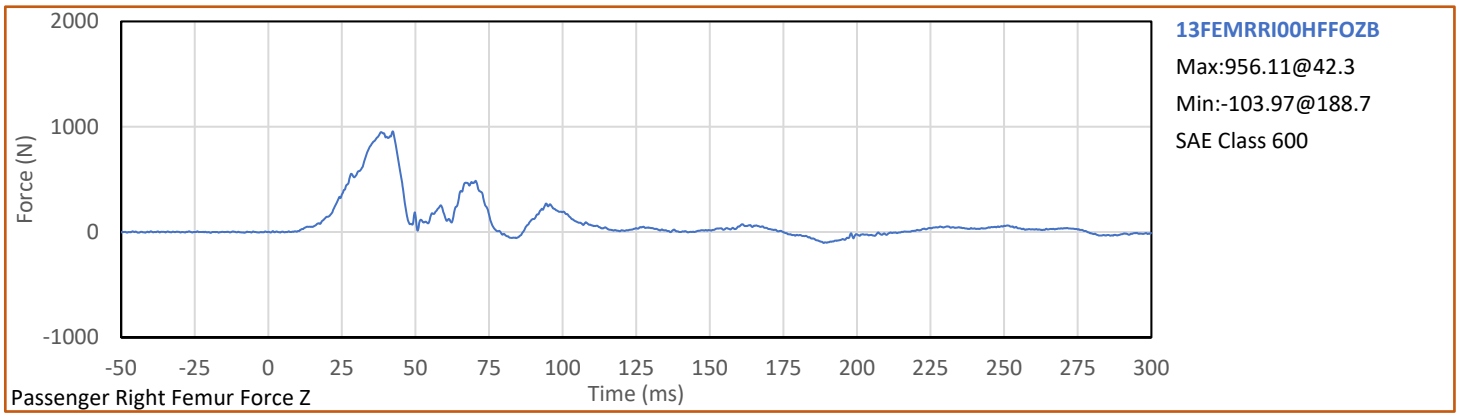
Passenger Chest Acceleration Z Primary



Passenger Chest Resultant Acceleration Primary



Passenger Left Femur Force Z



Passenger Right Femur Force Z

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

Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
ATD Damage Checklist

ATD Serial No.: 360 Test Date: 2021-06-23

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: J. Hernandez

Approved By: P. Puzzuto

Applus IDIADA
KARCO

Hybrid III 50th Percentile Male ATD
External Measurements

ATD Serial No.: 360

Test Date: 2021-06-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	26	Pass
A - Total sitting height	mm	879	889	886	Pass
B - Shoulder pivot height	mm	505	521	515	Pass
C - 'H' point height	mm	84	89	87	Pass
D - 'H' point location from backline	mm	135	140	137	Pass
E - Shoulder pivot from backline	mm	84	94	91	Pass
F - Thigh clearance	mm	140	155	153	Pass
G - Back of elbow to wrist pivot	mm	290	305	295	Pass
H - Head back to backline	mm	41	46	46	Pass
I - Shoulder to elbow length	mm	330	345	338	Pass
J - Elbow rest height	mm	190	211	208	Pass
K - Buttock to knee length	mm	579	604	592	Pass
L - Popliteal length	mm	429	455	442	Pass
M - Knee pivot height	mm	485	500	490	Pass
N - Buttock popliteal length	mm	452	477	465	Pass
O - Chest depth without jacket	mm	213	229	221	Pass
P - Foot length	mm	251	267	256	Pass
V - Shoulder breadth	mm	422	437	426	Pass
W - Foot breadth	mm	91	107	96	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	997	Pass
Z - Waist circum.	mm	836	866	854	Pass
AA - Location for chest circum.	mm	429	434	432	Pass
BB - Location for waist circum.	mm	226	231	229	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

Approved By: P. Puzzuto

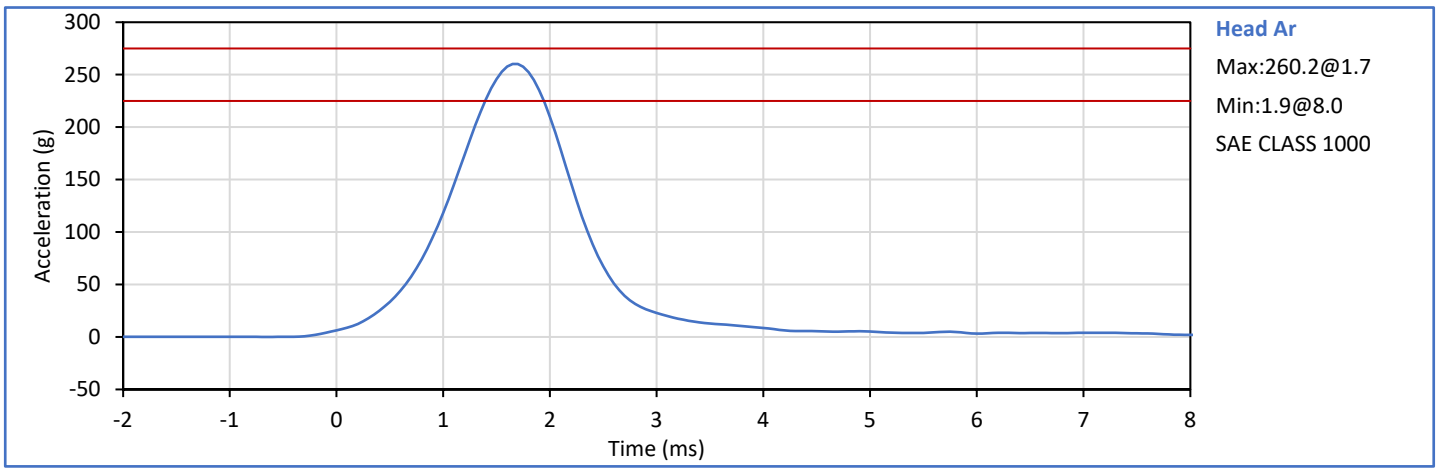
Applus IDIADA KARCO

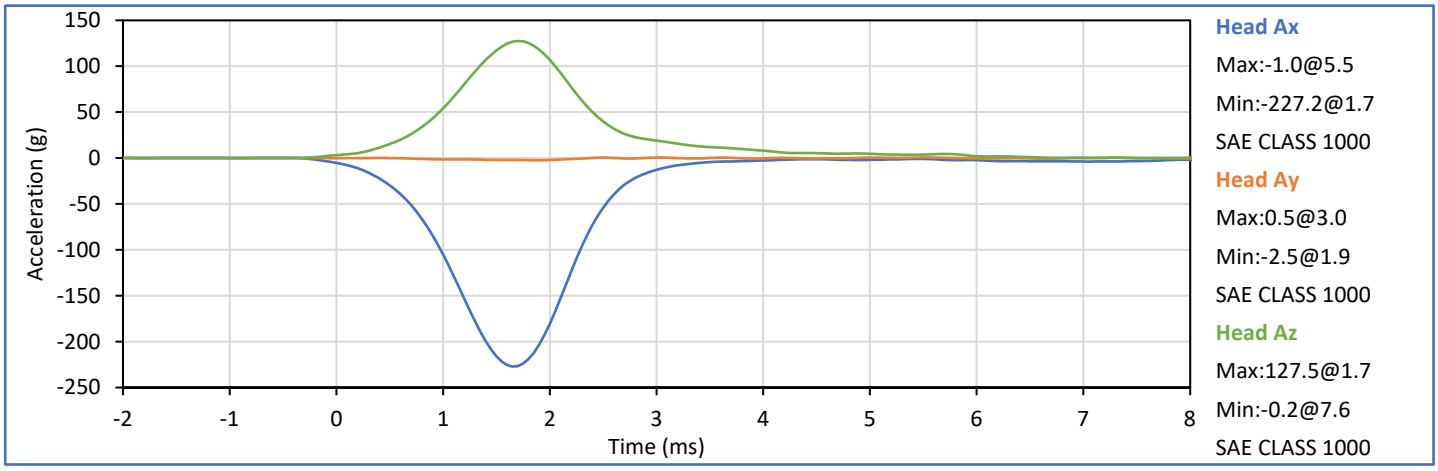
Hybrid III 50th Percentile Male ATD
Head Drop

ATD Serial No.: 360

Test Date: 2021-06-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.8	Pass
Laboratory Relative Humidity	%	10	70	50	Pass
Peak Resultant Acceleration	g	225.0	275.0	260.2	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-2.5	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

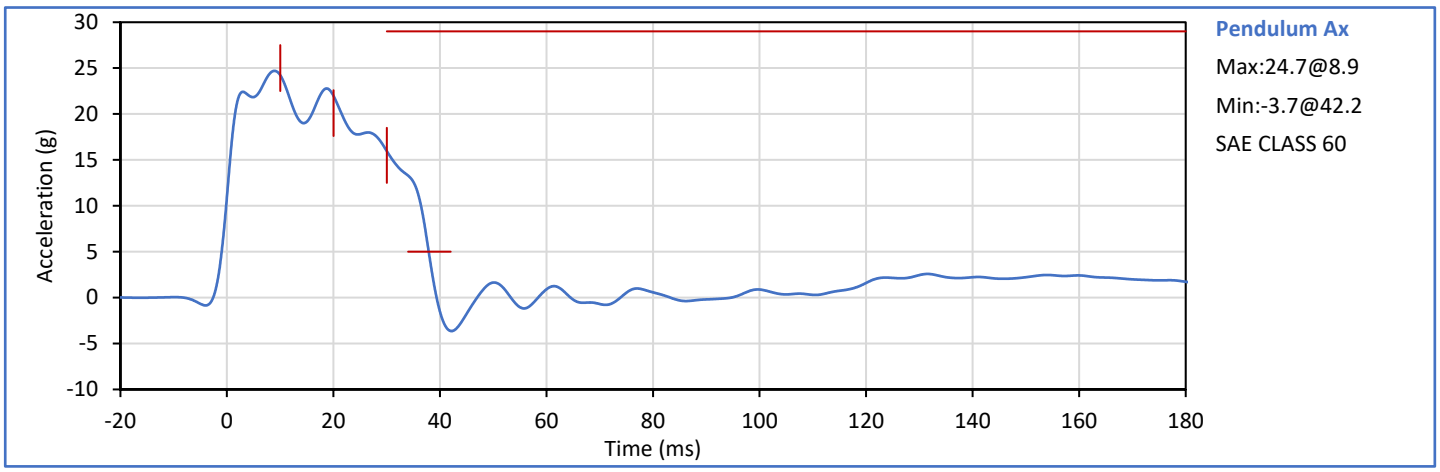
Applus IDIADA KARCO

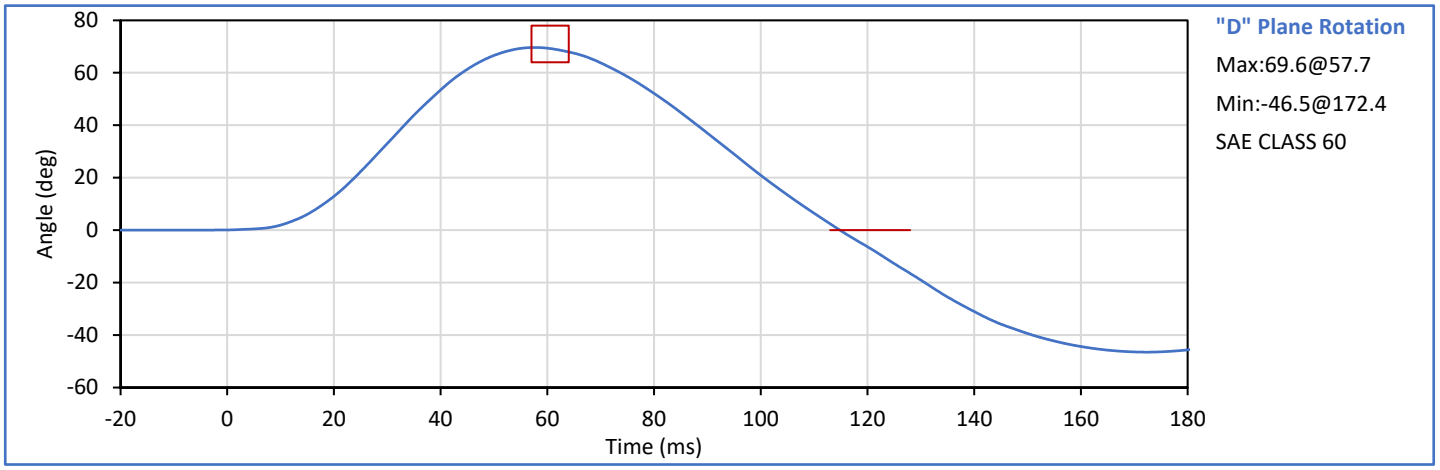
Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 360

Test Date: 2021-06-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	6.89	7.13	6.96	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	24.2	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	22.0	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	16.0	Pass
Peak Pendulum Decel After 30 ms	g	0.0	29.0	16.0	Pass
Deceleration Decay to Cross 5g	ms	34.0	42.0	37.9	Pass
"D" Plane Rotation peak	deg	64.0	78.0	69.6	Pass
	ms	57.0	64.0	57.7	Pass
"D" Plane Rotation Decay to Zero	ms	113.0	128.0	114.9	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	97.1	Pass
	ms	47.0	58.0	50.6	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	97.6	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

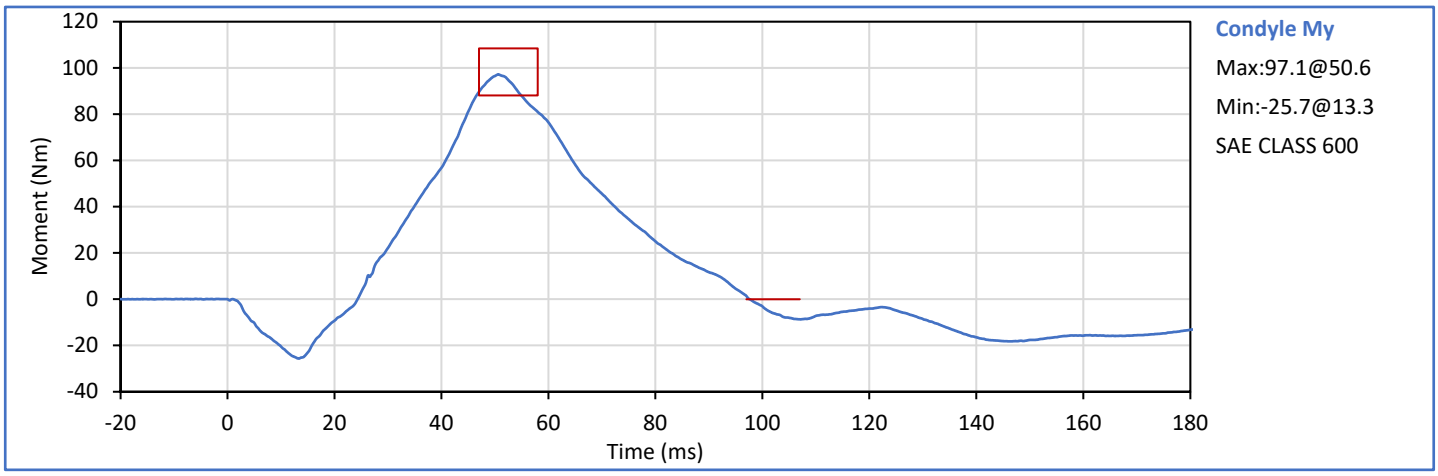
Approved By: P. Puzzuto

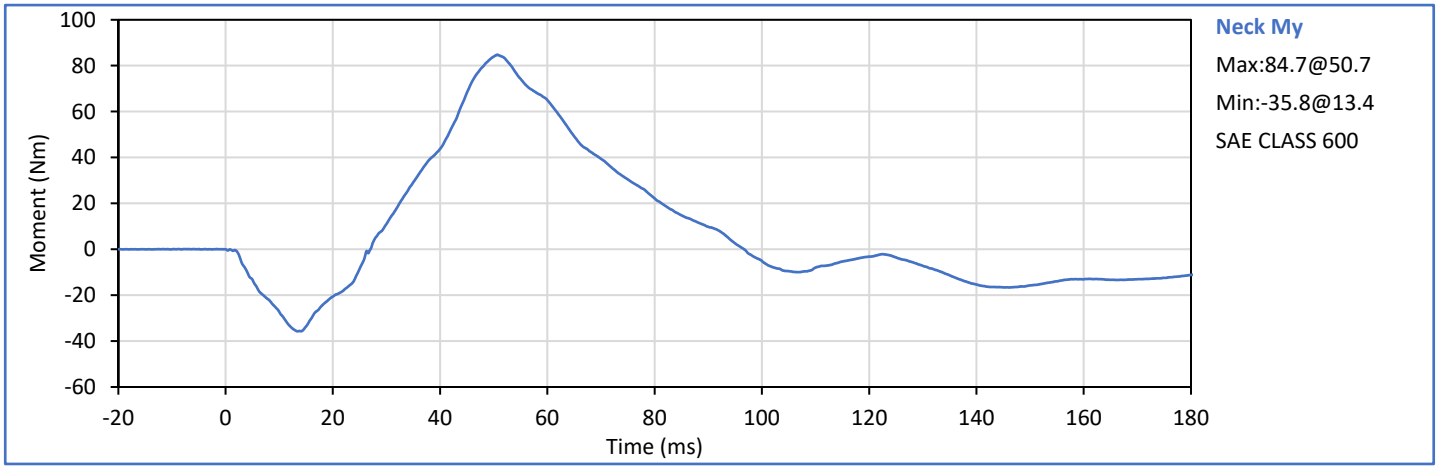
Applus IDIADA
KARCO

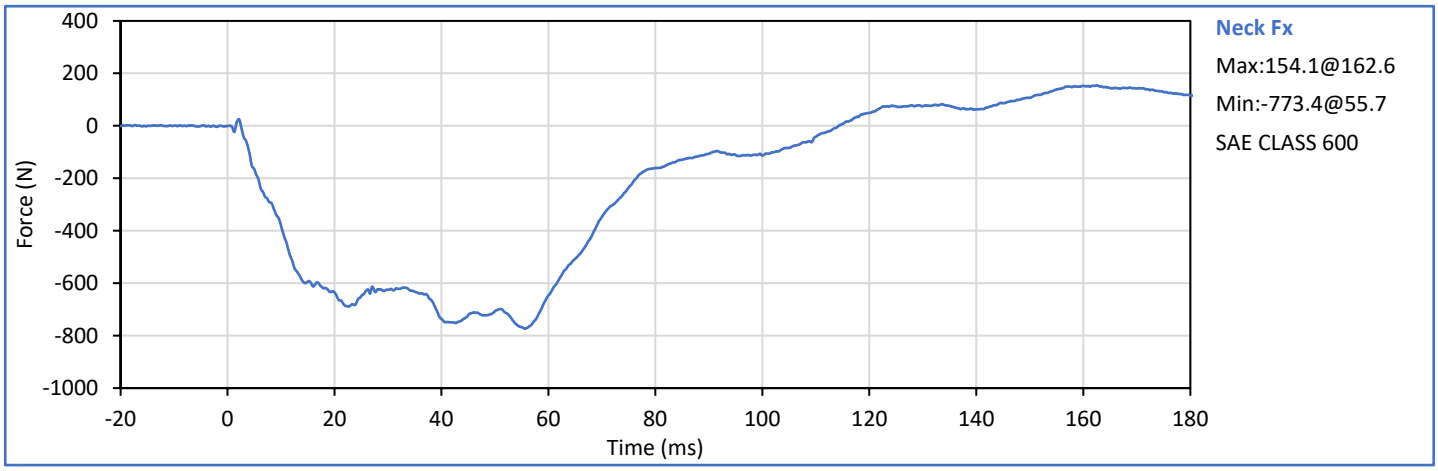
Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 360

Test Date: 2021-06-24







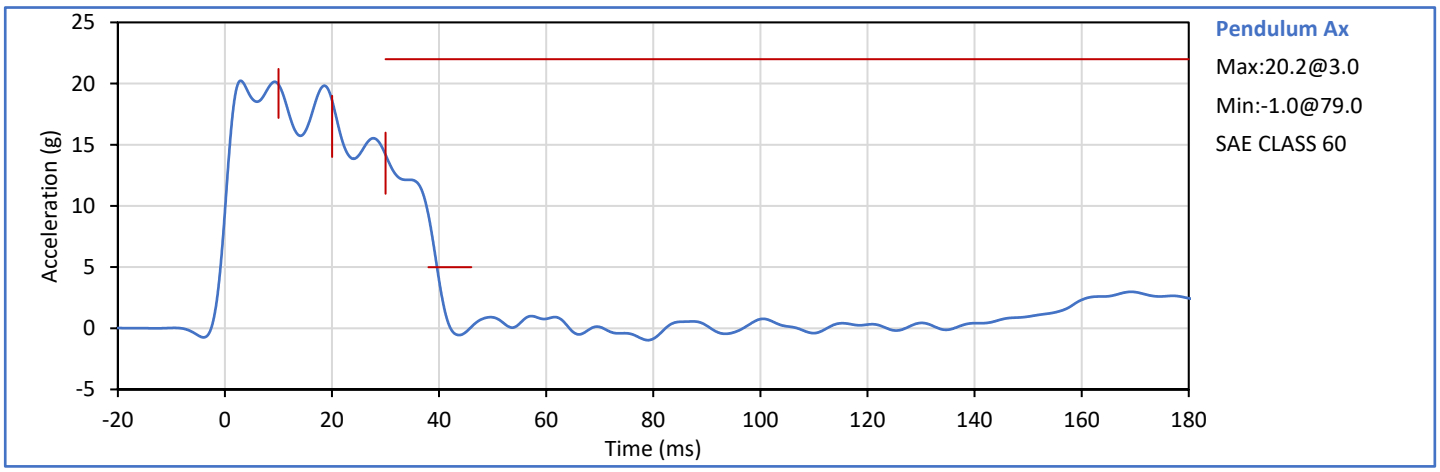
Applus IDIADA KARCO

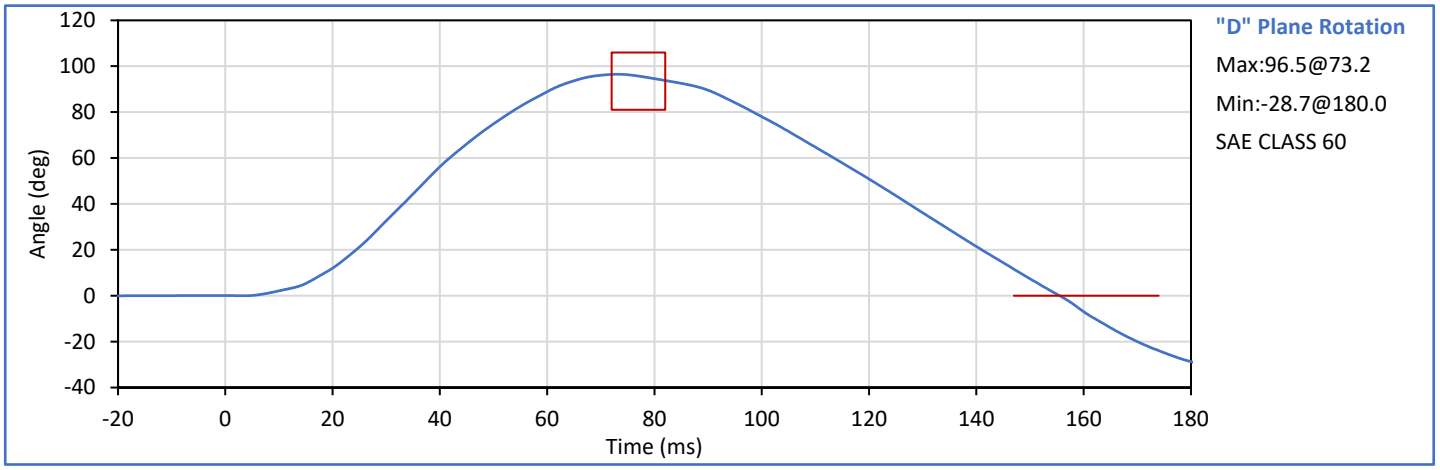
Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 360

Test Date: 2021-06-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.94	6.19	6.11	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	19.9	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	39.6	Pass
"D" Plane Rotation peak	deg	81.0	106.0	96.5	Pass
	ms	72.0	82.0	73.2	Pass
"D" Plane Rotation Decay to Zero	ms	147.0	174.0	155.6	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-70.9	Pass
	ms	65.0	79.0	68.3	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	133.4	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

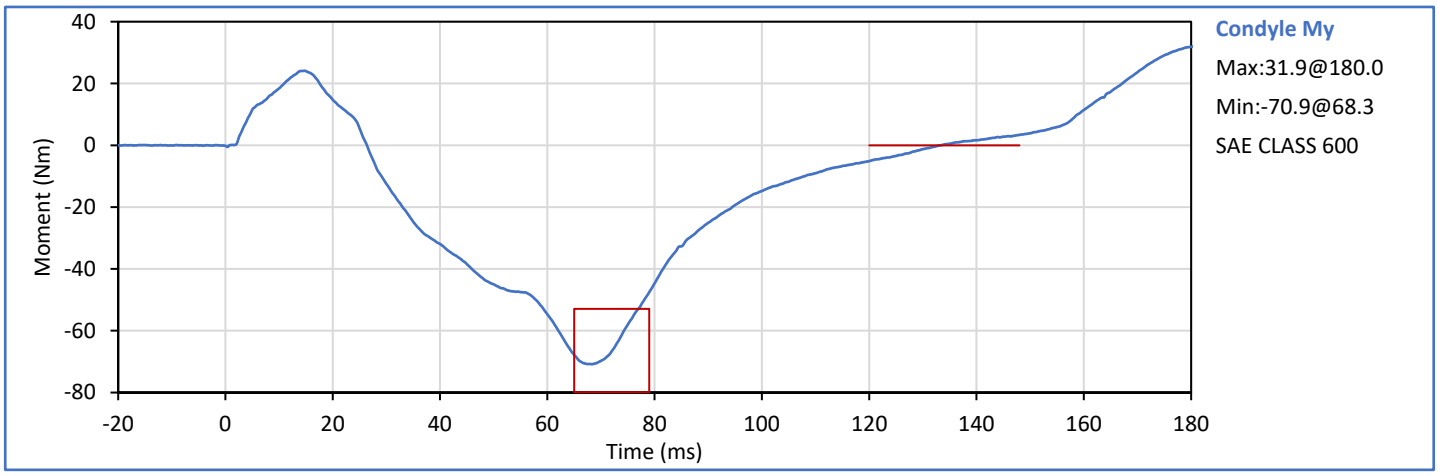
Approved By: P. Puzzuto

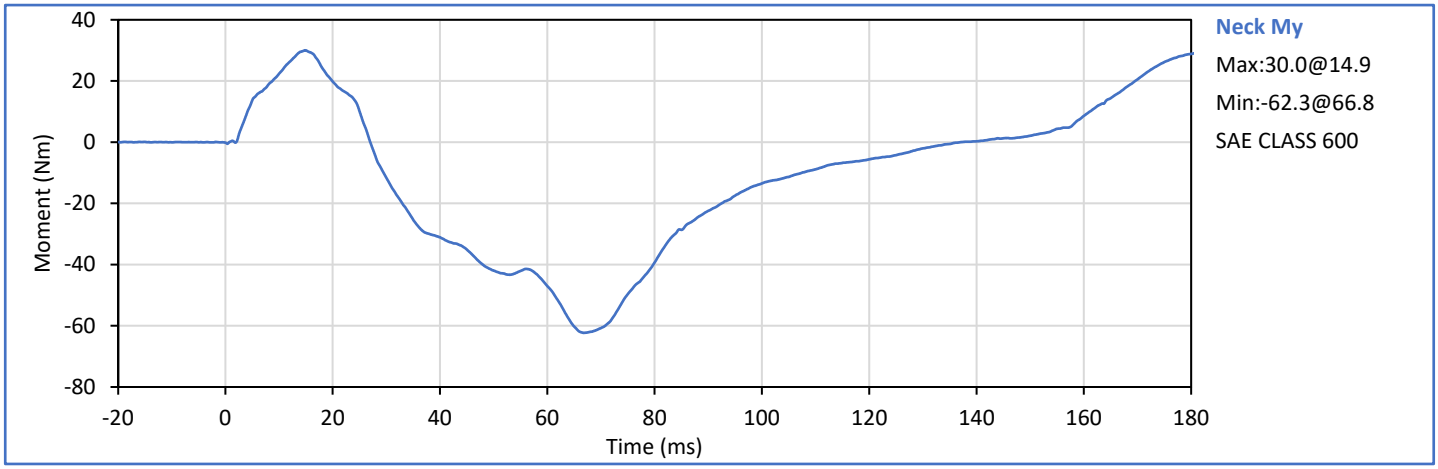
Applus IDIADA
KARCO

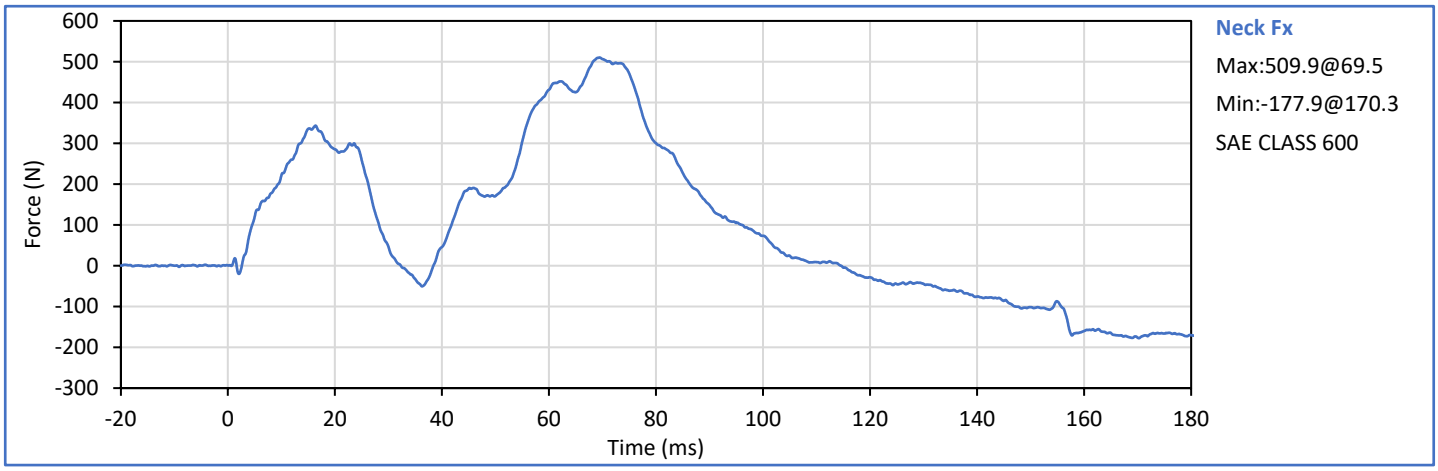
Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 360

Test Date: 2021-06-24







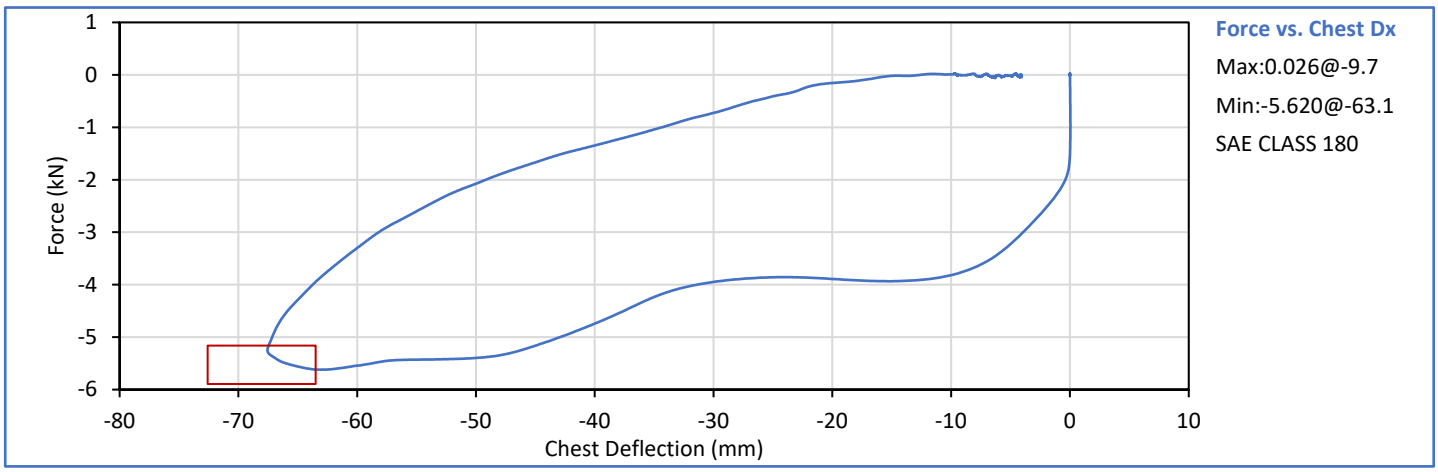
Applus IDIADA KARCO

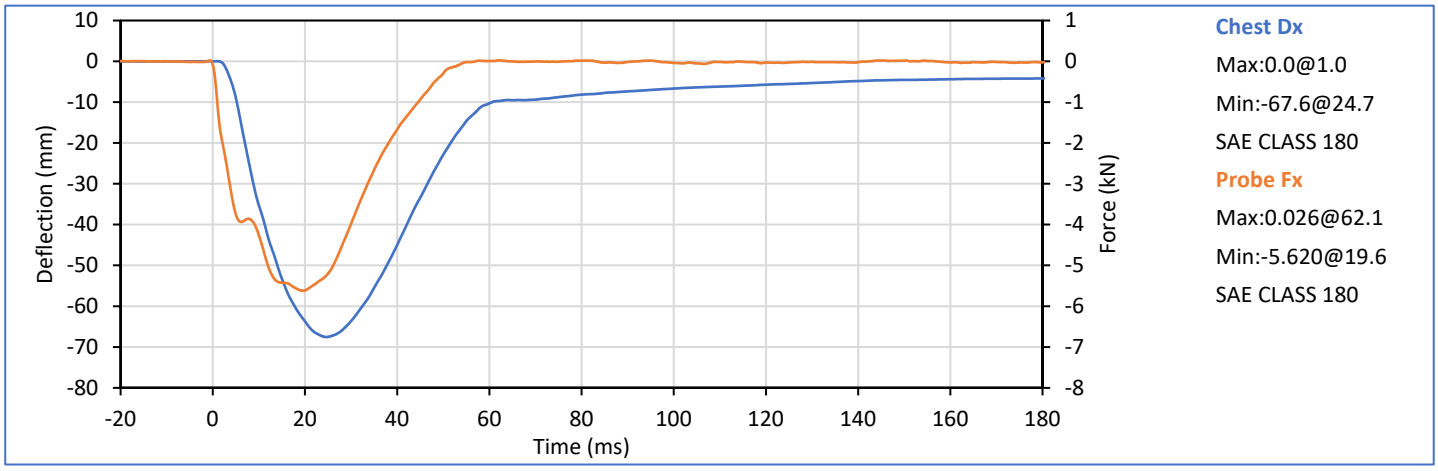
Hybrid III 50th Percentile Male ATD
Thorax Impact

ATD Serial No.: 360

Test Date: 2021-06-24

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	34	Pass
Probe Velocity	m/s	6.58	6.82	6.79	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-67.6	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.620	Pass
Internal Hysterisis	%	69.0	85.0	70.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

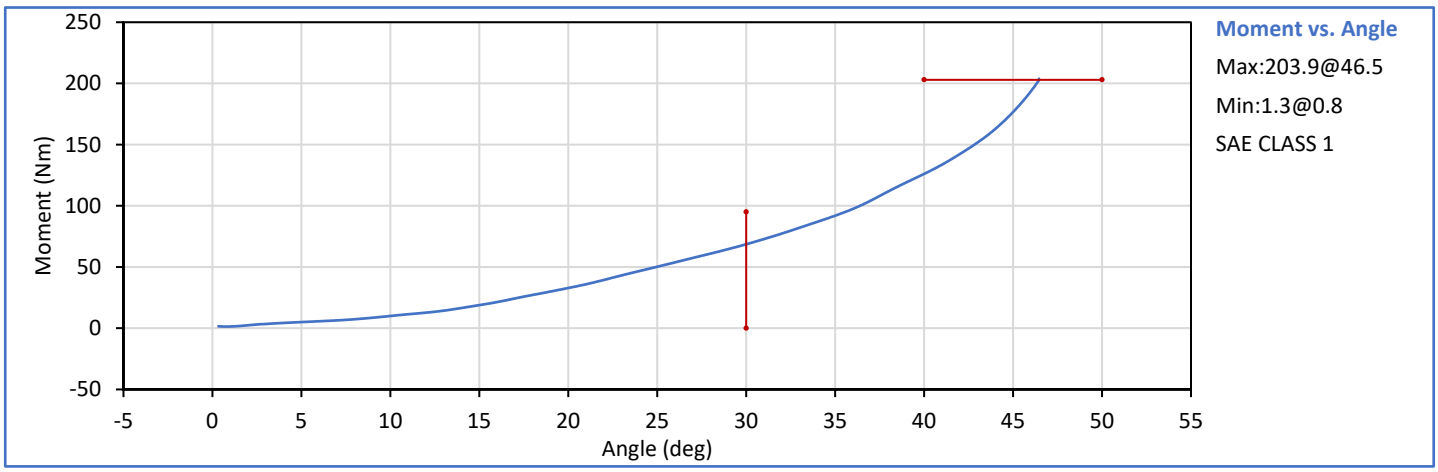
Applus IDIADA KARCO

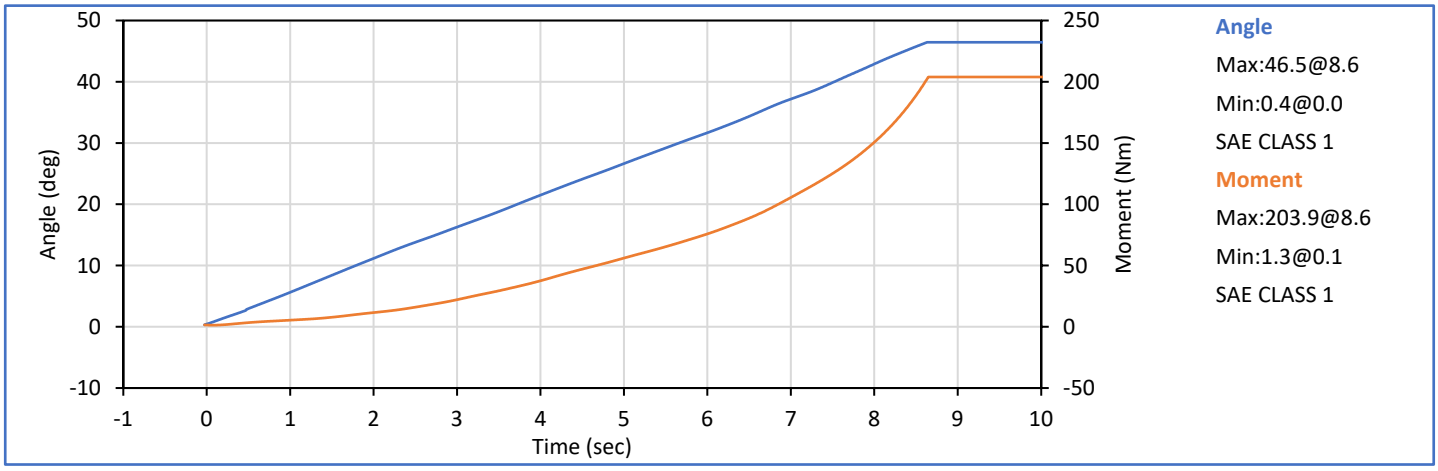
Hybrid III 50th Percentile Male ATD
Hip Range of Motion (Left)

ATD Serial No.: 360

Test Date: 2021-06-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Relative Humidity	%	10	70	35	Pass
Left Hip Rotation Rate	deg/s	5.0	10.0	5.3	Pass
Left Femur Torque at 30°	Nm	0.0	95.0	68.5	Pass
Left Hip Rotation at 203 Nm	deg	40.0	50.0	46.5	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

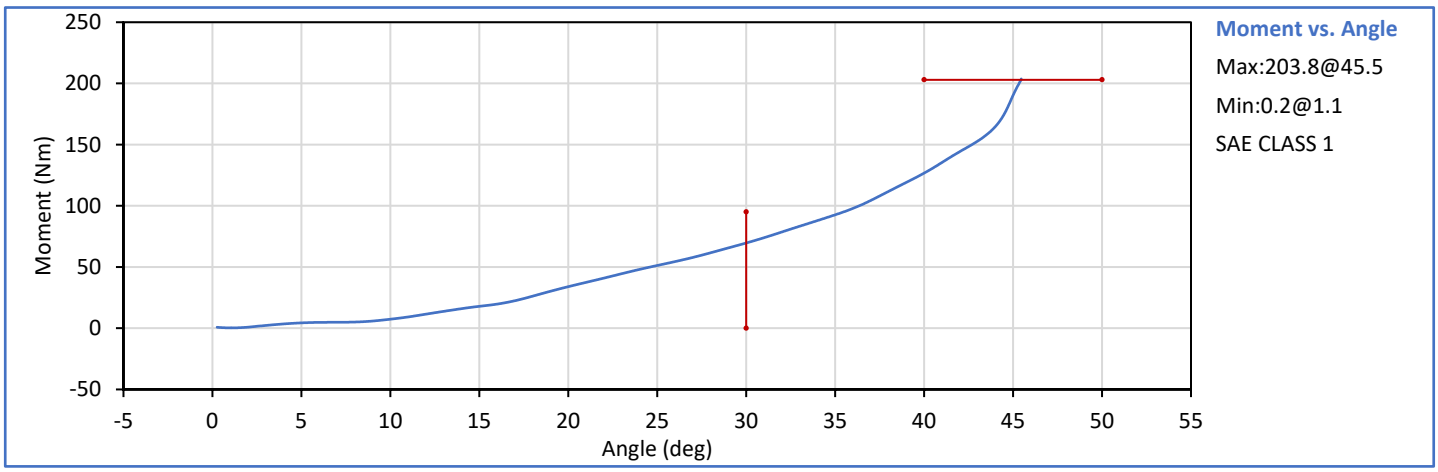
Applus IDIADA KARCO

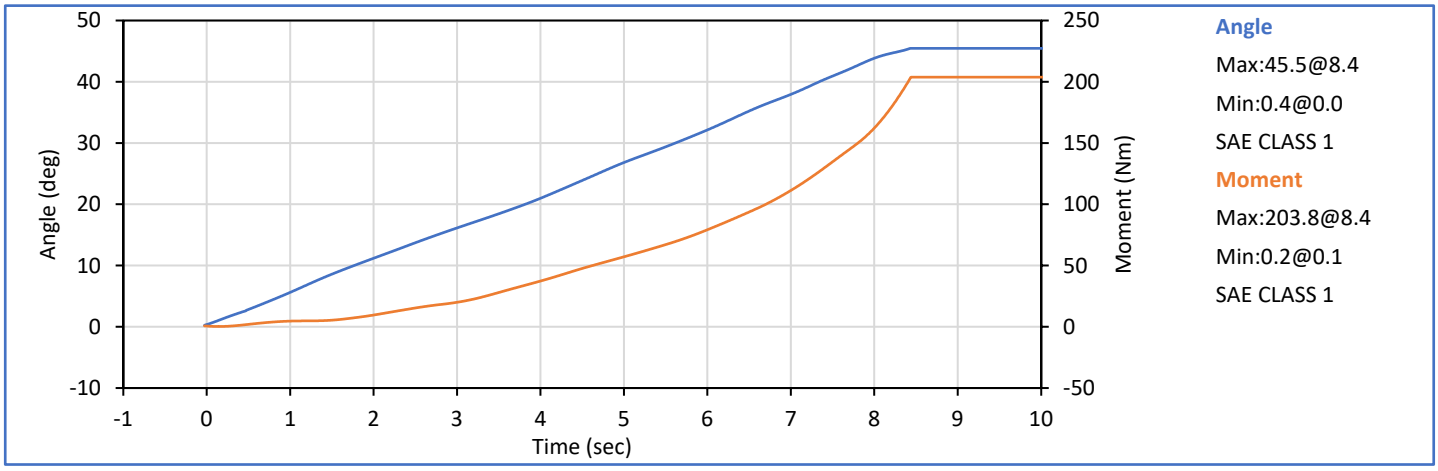
Hybrid III 50th Percentile Male ATD
Hip Range of Motion (Right)

ATD Serial No.: 360

Test Date: 2021-06-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Relative Humidity	%	10	70	35	Pass
Right Hip Rotation Rate	deg/s	5.0	10.0	5.4	Pass
Right Femur Torque at 30°	Nm	0.0	95.0	69.6	Pass
Right Hip Rotation at 203 Nm	deg	40.0	50.0	45.5	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

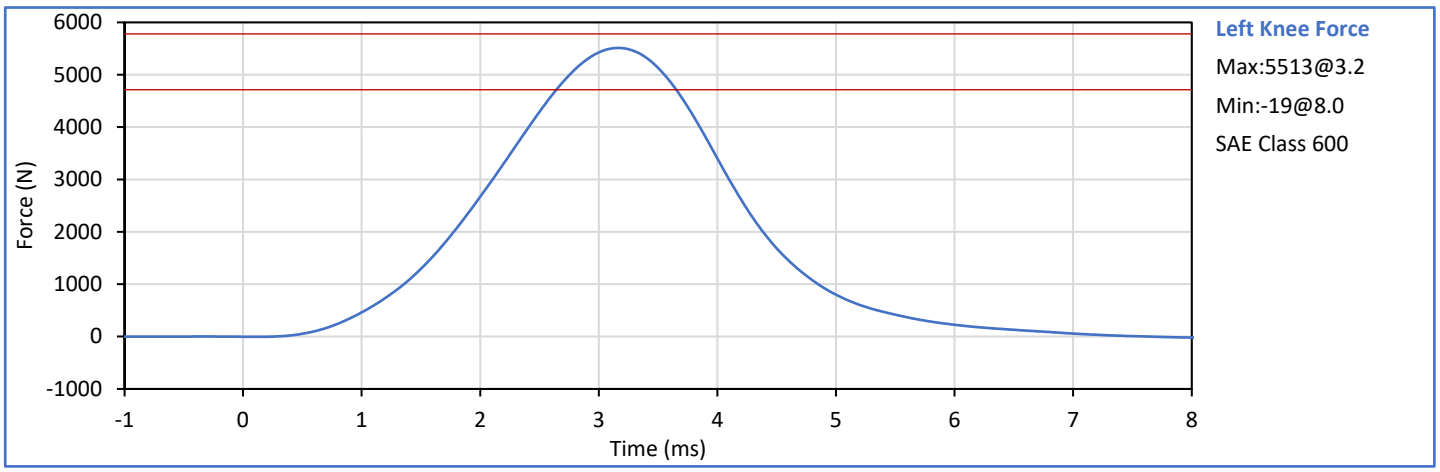
Applus IDIADA KARCO

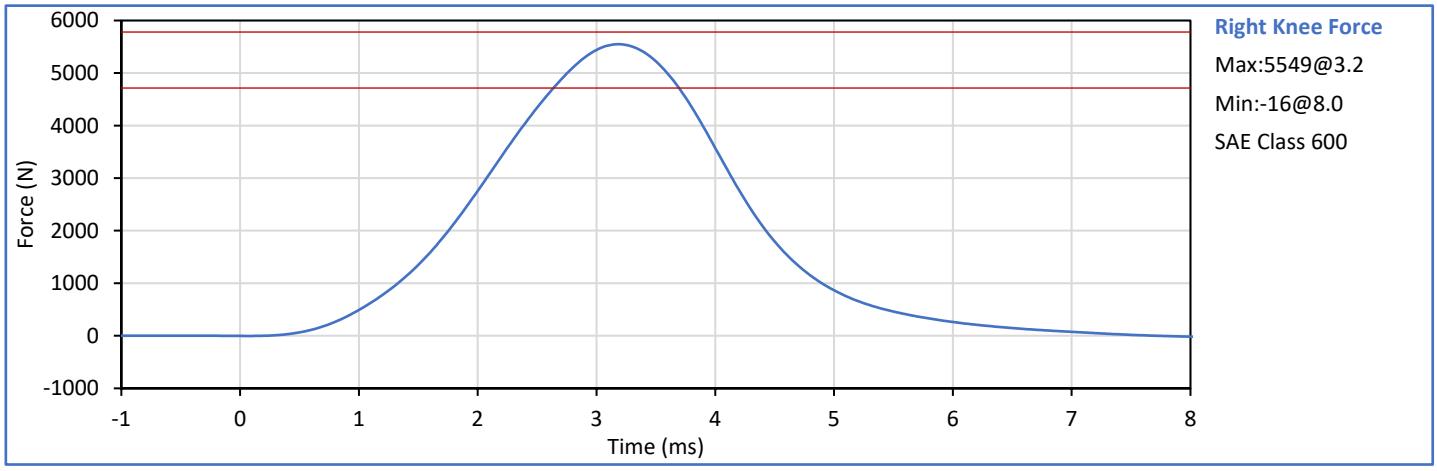
Hybrid III 50th Percentile Male ATD
Knee Impact (Left/Right)

ATD Serial No.: 360

Test Date: 2021-06-25

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	20.6	Pass
	Laboratory Relative Humidity	%	10	70	30	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.100	Pass
	Peak Resistive Force	N	4715	5782	5513	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.102	Pass
	Peak Resistive Force	N	4715	5782	5549	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Pre-Test ATD Qualification and Performance Verification
Hybrid III 5th Percentile Female ATD
S/N: 141

Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Damage Checklist

ATD Serial No.: 141

Test Date: 2021-06-15

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: J. Hernandez

Approved By: P. Puzzuto

Applus IDIADA
KARCO

Hybrid III 5th Percentile Female ATD
External Measurements

ATD Serial No.: 141

Test Date: 2021-06-15

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	775	800	794	Pass
B - Shoulder pivot height	mm	432	457	446	Pass
C - 'H' point height	mm	81	86	85	Pass
D - 'H' point location from backline	mm	145	150	147	Pass
E - Shoulder pivot from backline	mm	69	84	75	Pass
F - Thigh clearance	mm	119	135	127	Pass
G - Back of elbow to wrist pivot	mm	244	259	256	Pass
H - Head back to backline	mm	41	46	43	Pass
I - Shoulder to elbow length	mm	277	297	282	Pass
J - Elbow rest height	mm	183	203	194	Pass
K - Buttock to knee length	mm	521	546	534	Pass
L - Popliteal length	mm	356	376	365	Pass
M - Knee pivot height	mm	394	419	410	Pass
N - Buttock popliteal length	mm	414	439	429	Pass
O - Chest depth without jacket	mm	175	191	180	Pass
P - Foot length	mm	219	234	226	Pass
R - Buttock to Knee Pivot Length	mm	457	483	466	Pass
S - Head Breadth	mm	137	147	145	Pass
T - Head Depth	mm	178	188	184	Pass
U - Hip Breadth	mm	300	315	305	Pass
V - Shoulder breadth	mm	351	366	361	Pass
W - Foot breadth	mm	79	94	88	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	781	Pass
AA - Location for chest circum.	mm	333	358	339	Pass
BB - Location for waist circum.	mm	160	170	166	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

Approved By: P. Puzzuto

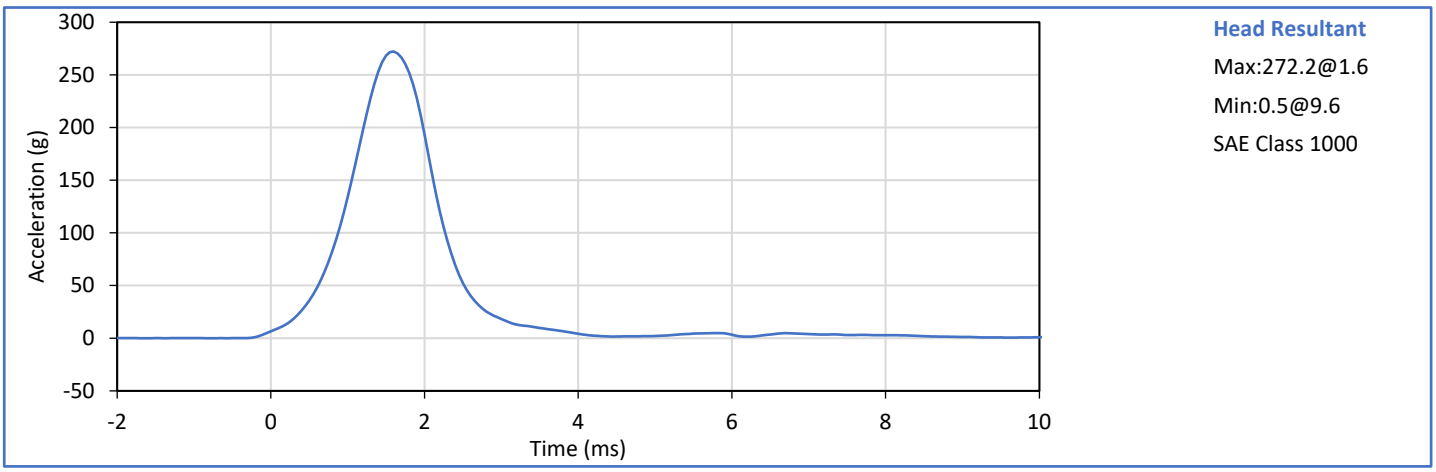
Applus IDIADA
KARCO

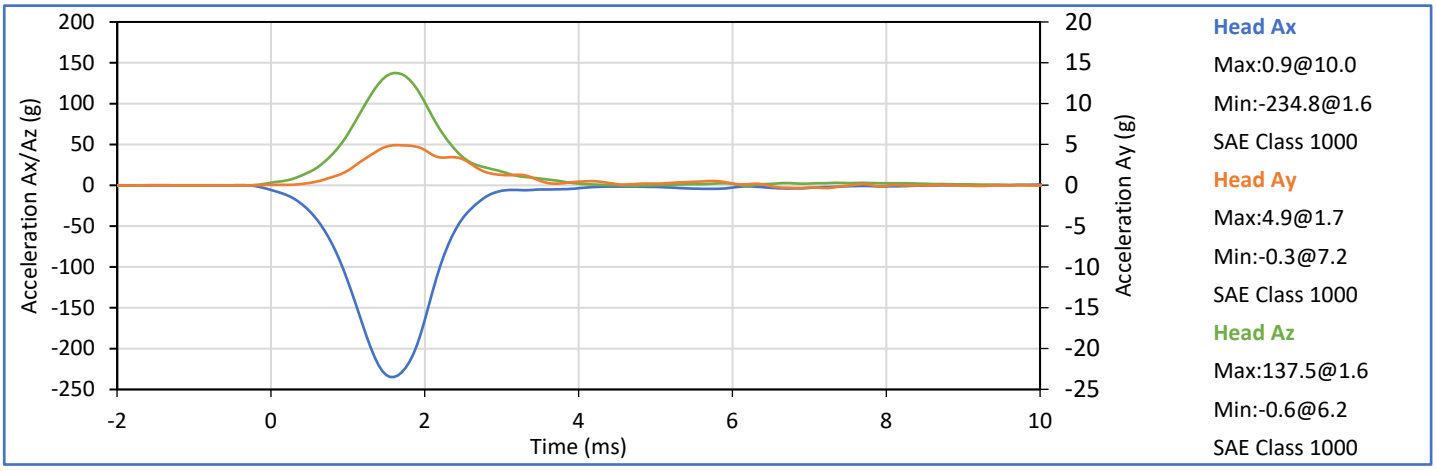
Hybrid III 5th Percentile Female ATD
Head Drop Test

ATD Serial No.: 141

Test Date: 2021-06-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	22.2	Pass
Laboratory Humidity	%	10	70	32	Pass
Peak Resultant Acceleration	g	250.0	300.0	272.2	Pass
Peak Lateral Acceleration	g	-15.0	15.0	4.9	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.8	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

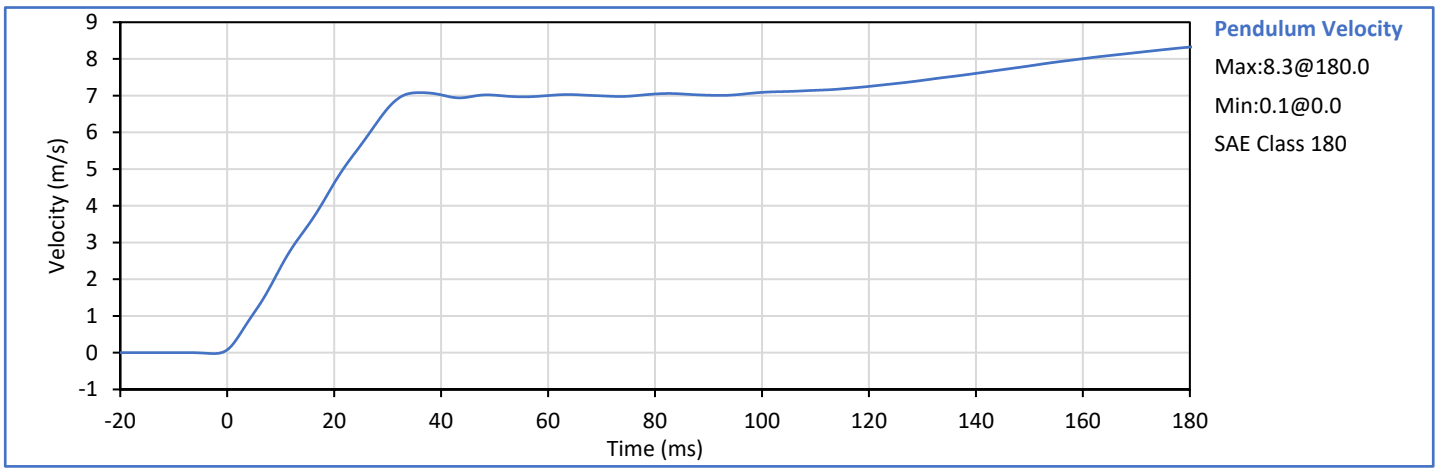
Applus IDIADA
KARCO

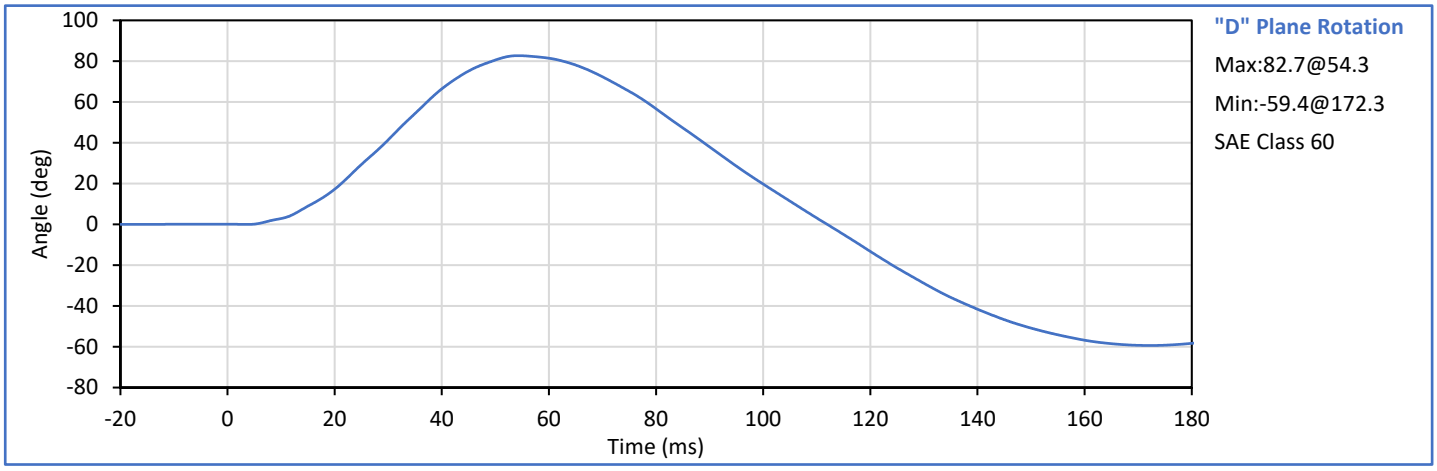
Hybrid III 5th Percentile Female ATD
Neck Flexion Test

ATD Serial No.: 141

Test Date: 2021-06-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.9	Pass
Laboratory Humidity	%	10	70	47	Pass
Pendulum Velocity	m/s	6.89	7.13	7.08	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.33	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.61	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.65	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	82.7	Pass
Peak Moment in Rotation	Nm	69.0	83.0	80.5	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	82.0	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

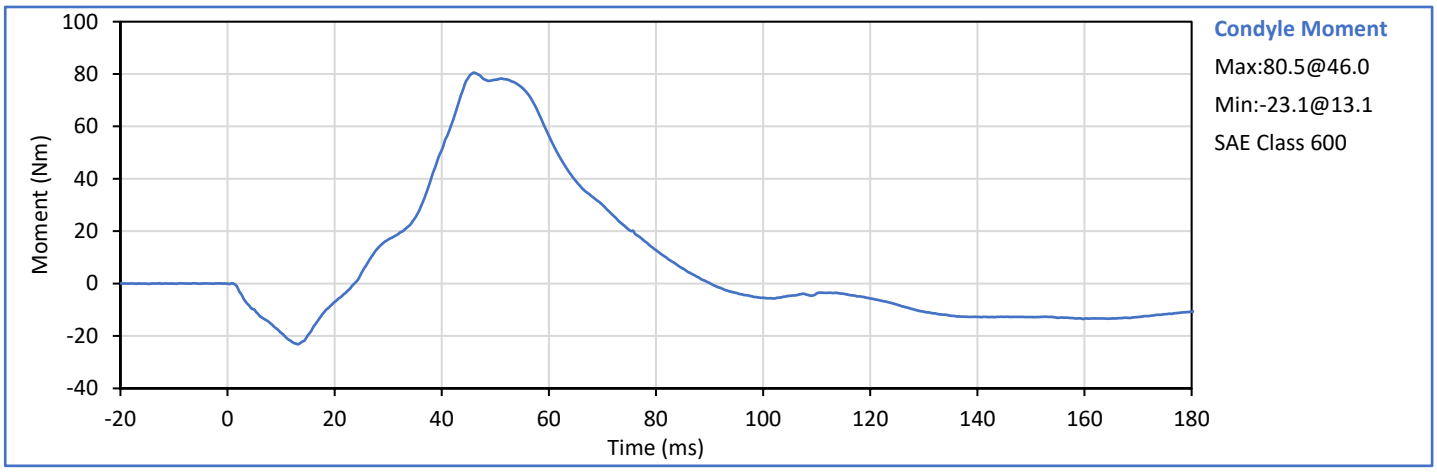
Approved By: P. Puzzuto

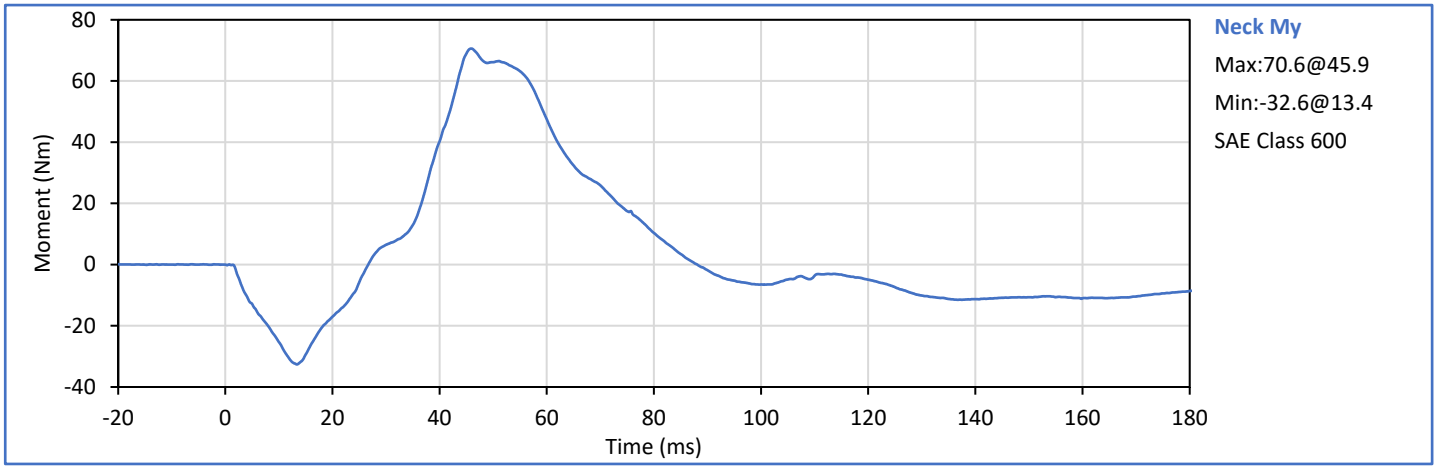
Applus IDIADA KARCO

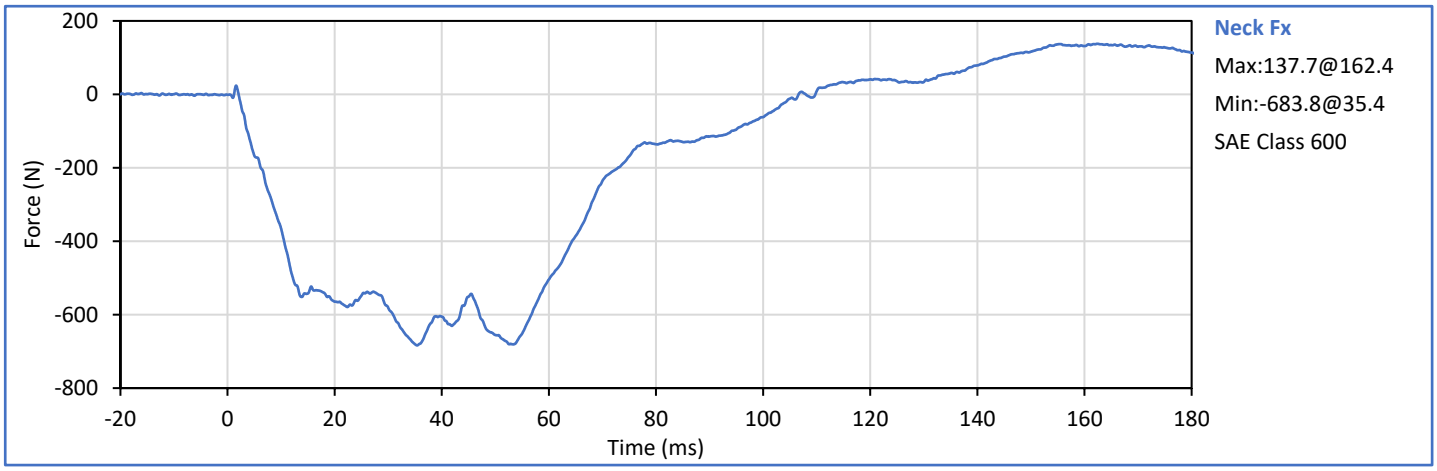
Hybrid III 5th Percentile Female ATD
Neck Flexion Test

ATD Serial No.: 141

Test Date: 2021-06-23







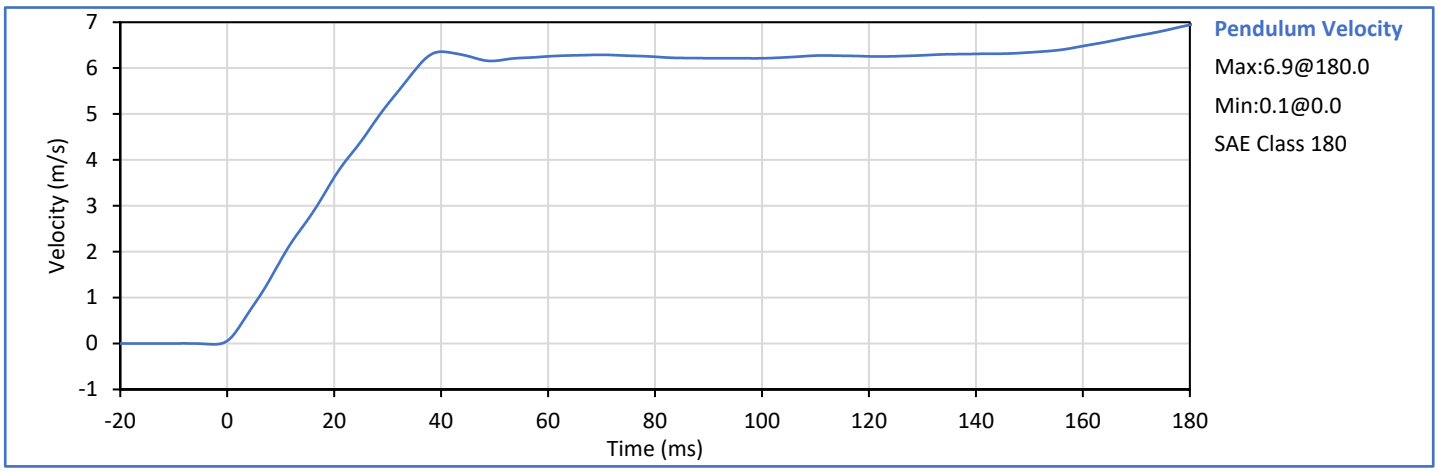
Applus IDIADA
KARCO

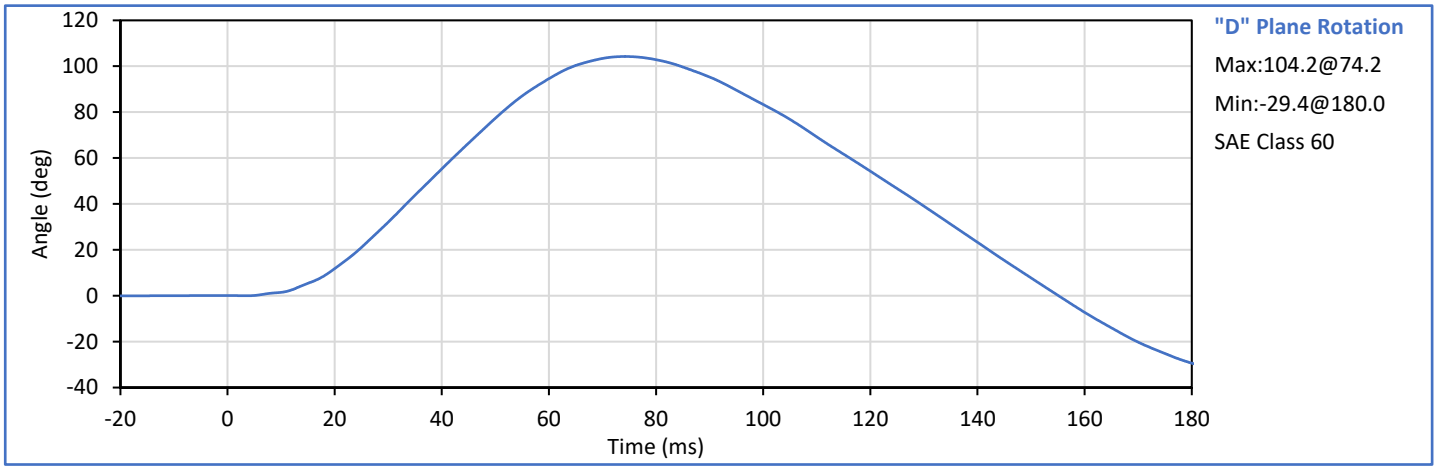
Hybrid III 5th Percentile Female ATD
Neck Extension Test

ATD Serial No.: 141

Test Date: 2021-06-23

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.9	Pass
Laboratory Humidity	%	10	70	47	Pass
Pendulum Velocity	m/s	5.95	6.19	6.05	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.81	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.62	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.21	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	104.2	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-56.1	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	100.8	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

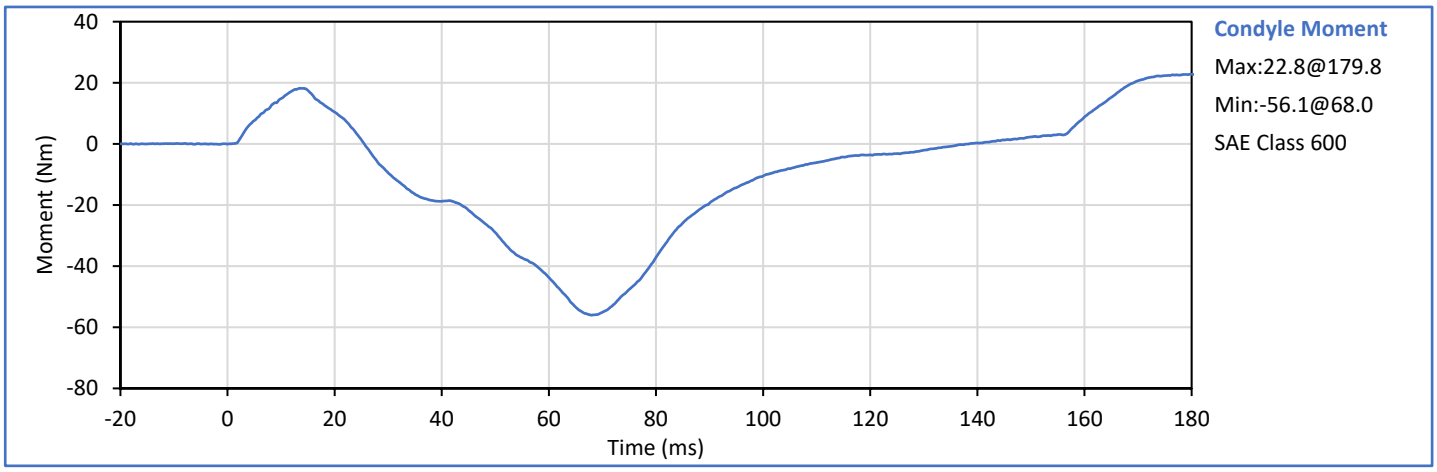
Approved By: P. Puzzuto

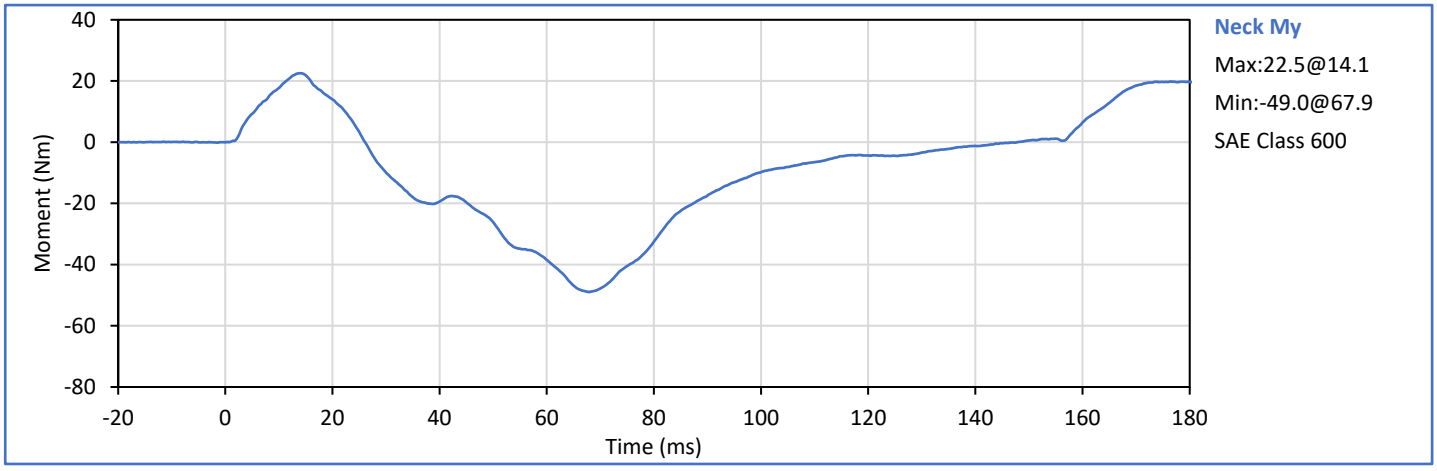
Applus IDIADA KARCO

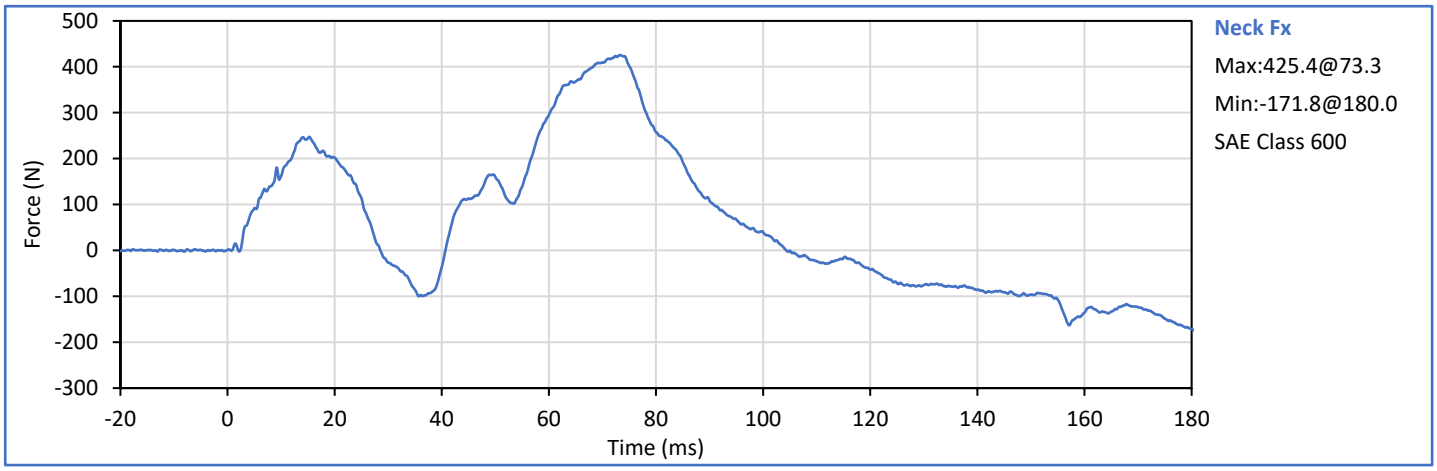
Hybrid III 5th Percentile Female ATD
Neck Extension Test

ATD Serial No.: 141

Test Date: 2021-06-23







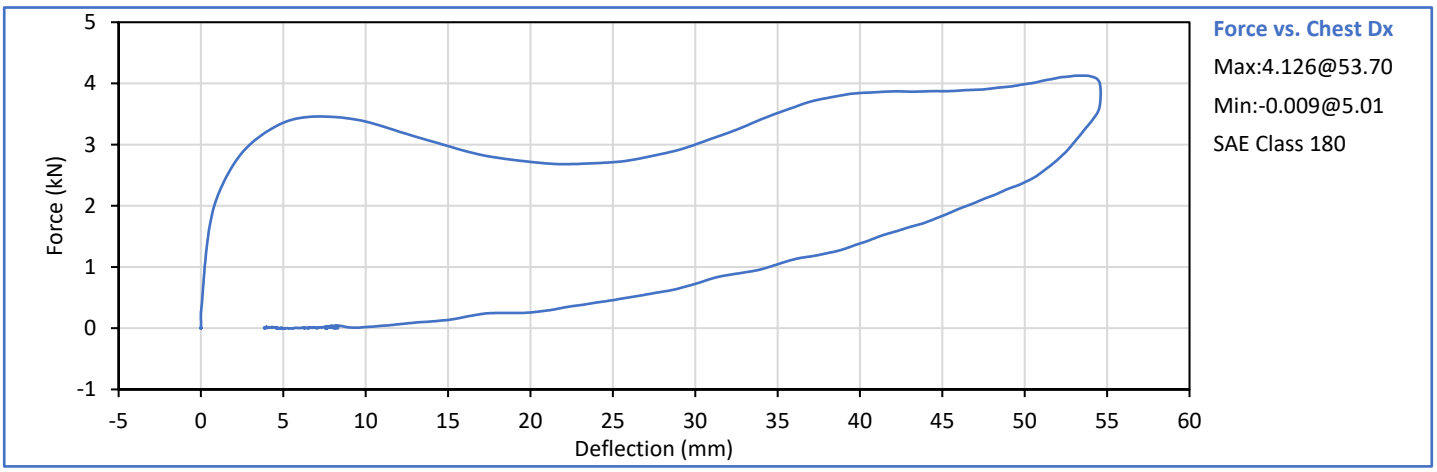
Applus IDIADA
KARCO

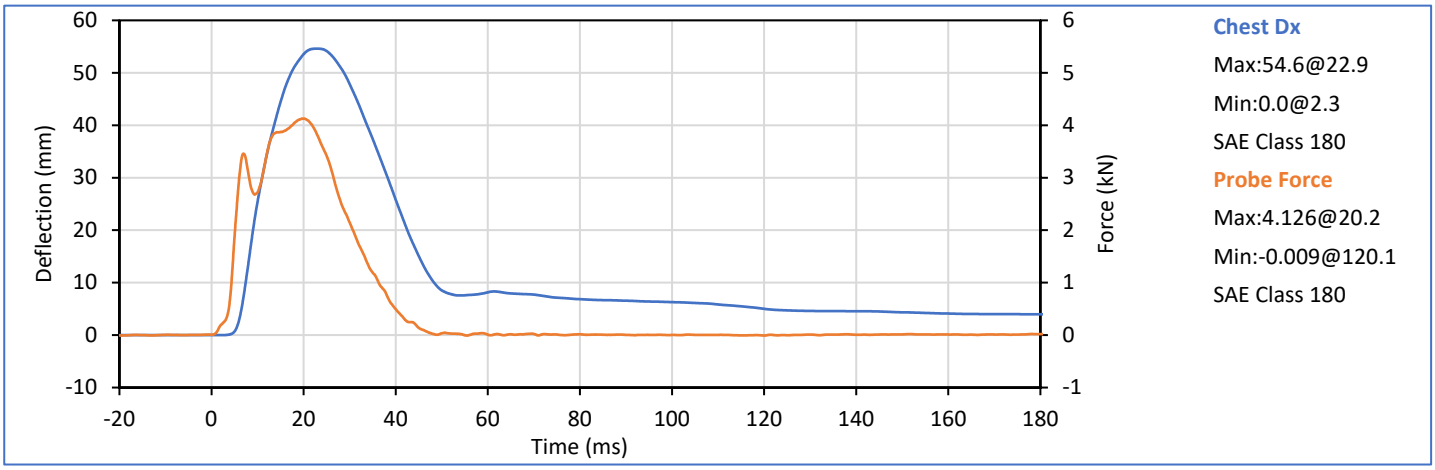
Hybrid III 5th Percentile Female ATD
Thorax Impact

ATD Serial No.: 141

Test Date: 2021-06-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.0	Pass
Laboratory Humidity	%	10	70	40	Pass
Probe Velocity	m/s	6.59	6.83	6.75	Pass
Peak Chest Deflection	mm	50.0	58.0	54.6	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.126	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	3.987	Pass
Internal Hysterisis	%	69.0	85.0	73.1	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

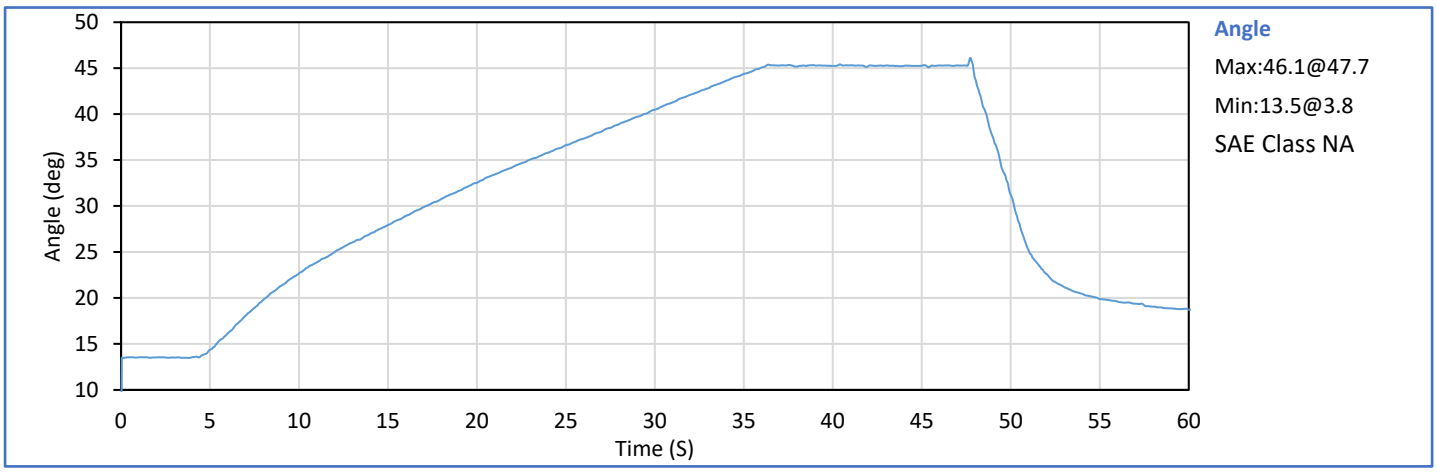
Applus IDIADA
KARCO

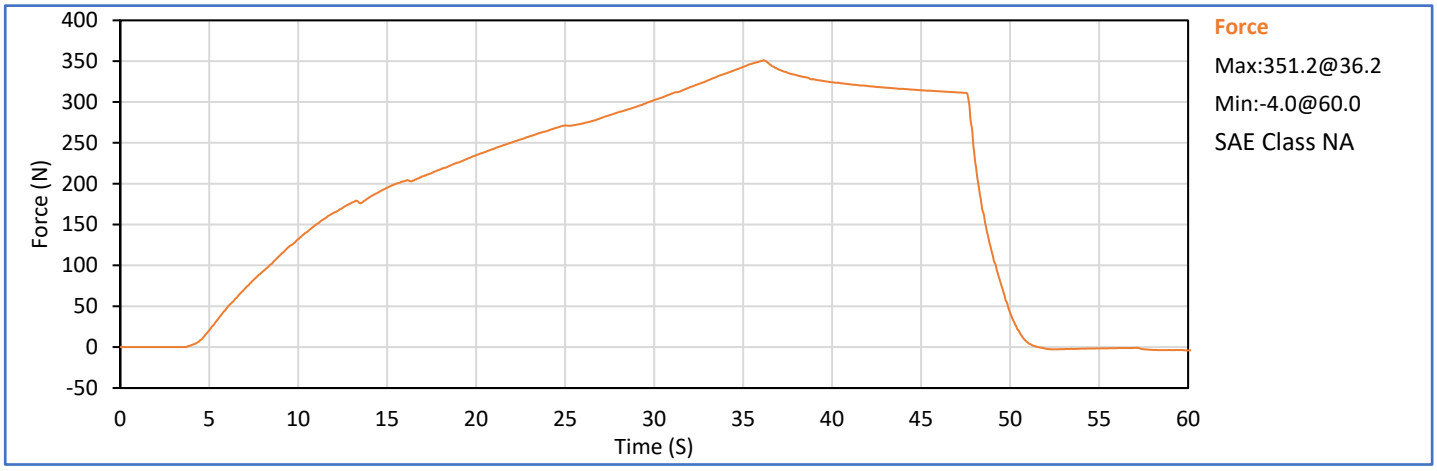
Hybrid III 5th Percentile Female ATD
Torso Flexion Test

ATD Serial No.: 141

Test Date: 2021-06-15

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	20.6	Pass
Laboratory Humidity	%	10	70	39	Pass
Orientation Angle	deg	0.0	20.0	13.1	Pass
Test Initial Angle	deg	11.0	19.0	13.5	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	350.1	Pass
Torso Flexion Rate	deg/s	0.50	1.50	0.99	Pass
Final Reference Plane Angle	deg	-8.0	8.0	6.5	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

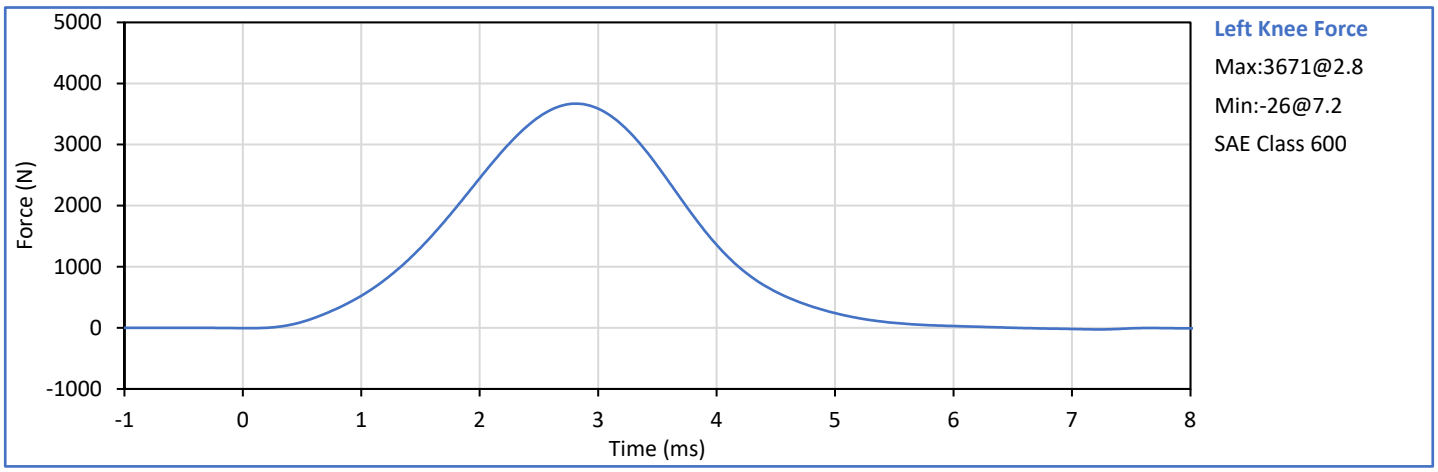
Applus IDIADA KARCO

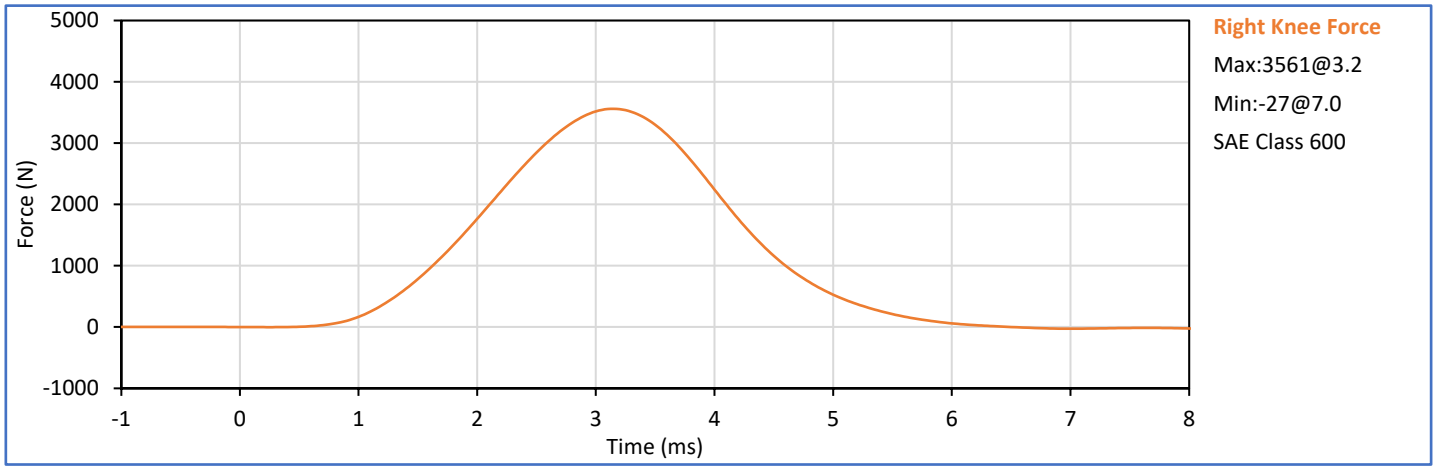
Hybrid III 5th Percentile Female ATD
Knee Impact (Left/Right)

ATD Serial No.: 141

Test Date: 2021-06-23

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.7	Pass
	Laboratory Humidity	%	10	70	35	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.106	Pass
	Peak Resistive Force	N	3450	4060	3671	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.097	Pass
	Peak Resistive Force	N	3450	4060	3561	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

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

Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
ATD Damage Checklist

ATD Serial No.: 360 Test Date: 2021-07-02

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: J. Hernandez

Approved By: P. Puzzuto

Applus IDIADA
KARCO

Hybrid III 50th Percentile Male ATD
External Measurements

ATD Serial No.: 360

Test Date: 2021-07-02

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	26	Pass
A - Total sitting height	mm	879	889	882	Pass
B - Shoulder pivot height	mm	505	521	515	Pass
C - 'H' point height	mm	84	89	86	Pass
D - 'H' point location from backline	mm	135	140	139	Pass
E - Shoulder pivot from backline	mm	84	94	89	Pass
F - Thigh clearance	mm	140	155	151	Pass
G - Back of elbow to wrist pivot	mm	290	305	295	Pass
H - Head back to backline	mm	41	46	45	Pass
I - Shoulder to elbow length	mm	330	345	337	Pass
J - Elbow rest height	mm	190	211	207	Pass
K - Buttock to knee length	mm	579	604	590	Pass
L - Popliteal length	mm	429	455	438	Pass
M - Knee pivot height	mm	485	500	493	Pass
N - Buttock popliteal length	mm	452	477	472	Pass
O - Chest depth without jacket	mm	213	229	220	Pass
P - Foot length	mm	251	267	256	Pass
V - Shoulder breadth	mm	422	437	429	Pass
W - Foot breadth	mm	91	107	101	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	992	Pass
Z - Waist circum.	mm	836	866	855	Pass
AA - Location for chest circum.	mm	429	434	430	Pass
BB - Location for waist circum.	mm	226	231	228	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

Approved By: P. Puzzuto

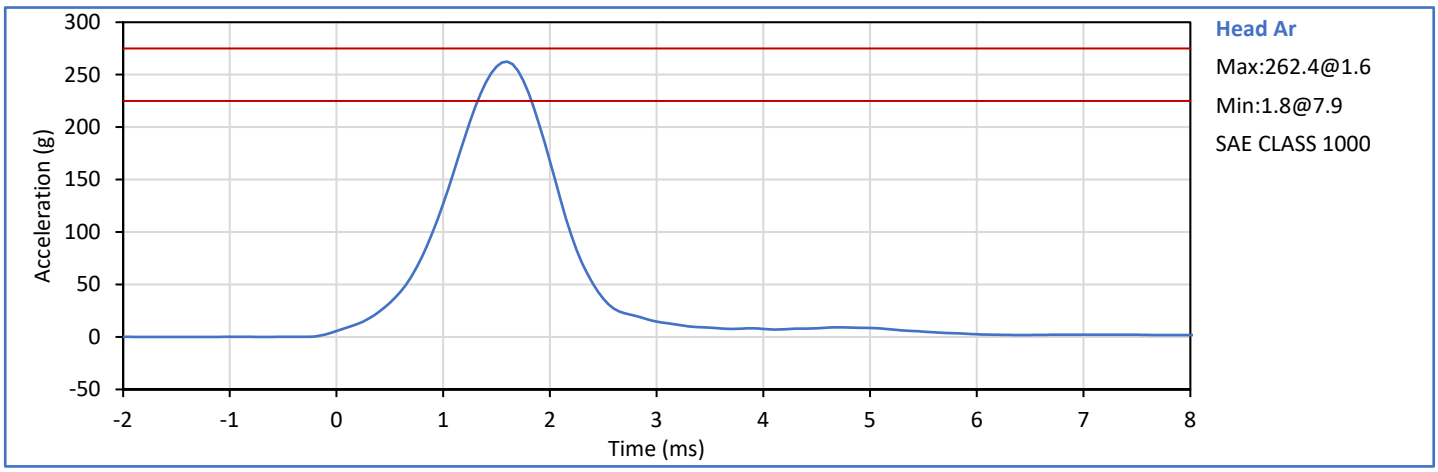
Applus IDIADA KARCO

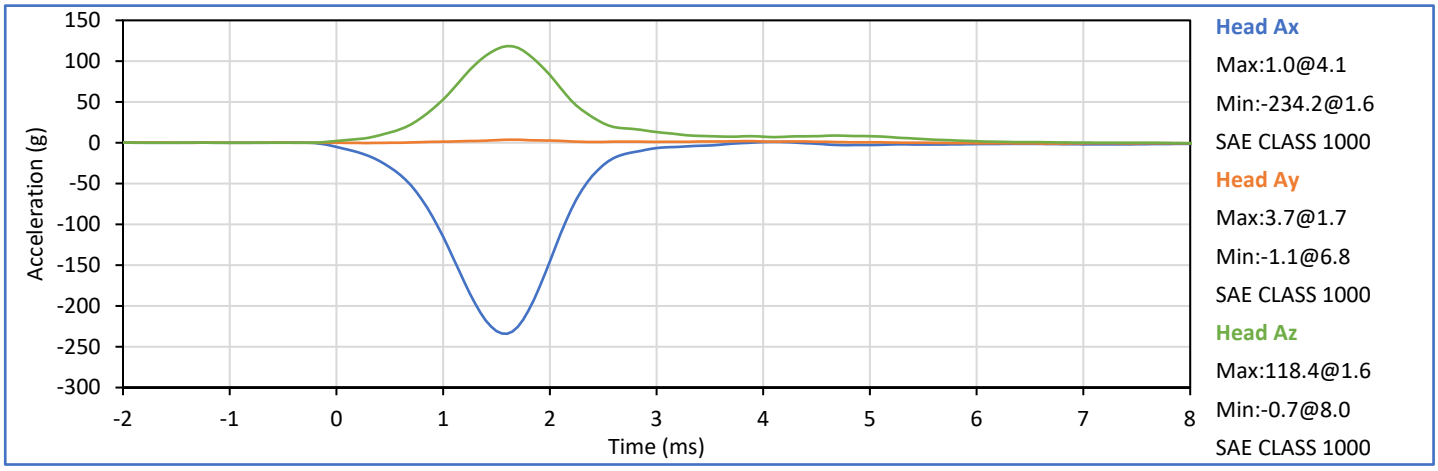
Hybrid III 50th Percentile Male ATD
Head Drop

ATD Serial No.: 360

Test Date: 2021-07-06

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Relative Humidity	%	10	70	31	Pass
Peak Resultant Acceleration	g	225.0	275.0	262.4	Pass
Peak Lateral Acceleration	g	-15.0	15.0	3.7	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

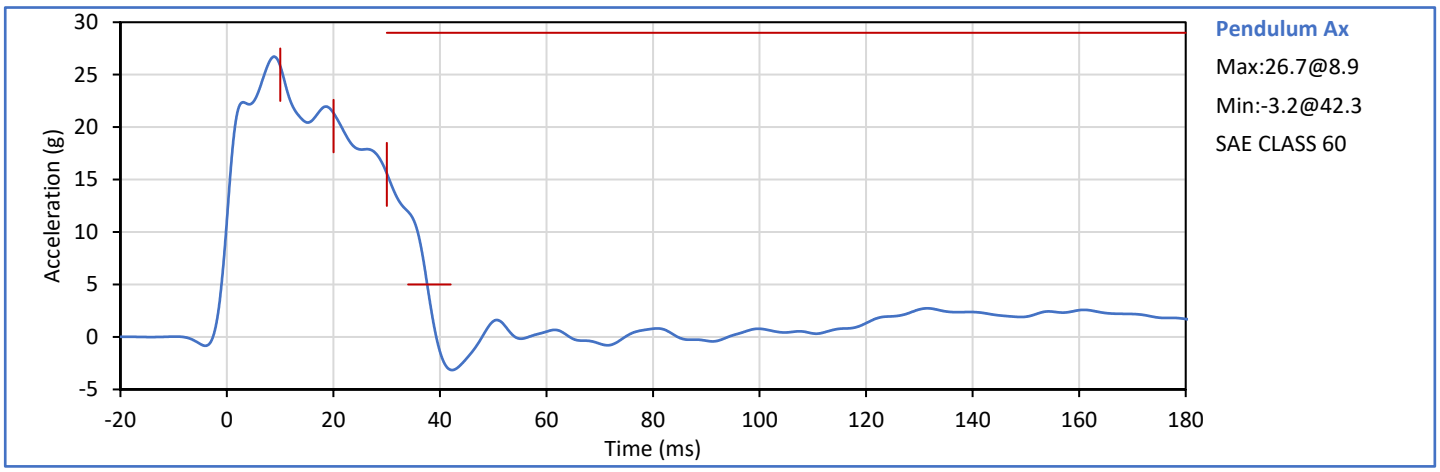
Applus IDIADA
KARCO

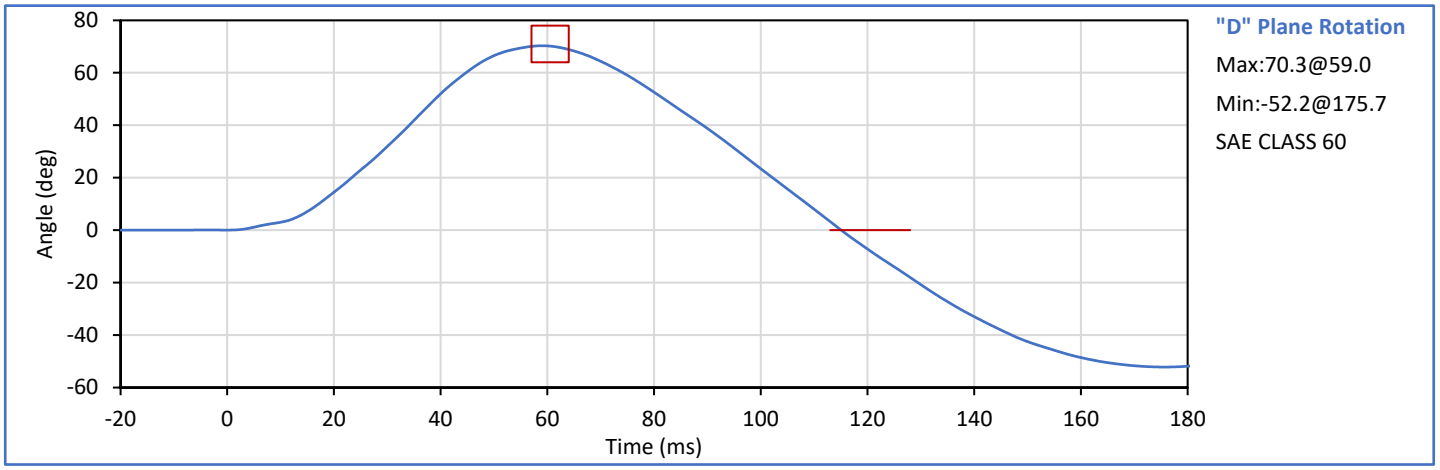
Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 360

Test Date: 2021-07-06

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.1	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	6.89	7.13	7.09	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	25.8	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	21.3	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	15.6	Pass
Peak Pendulum Decel After 30 ms	g	0.0	29.0	15.6	Pass
Deceleration Decay to Cross 5g	ms	34.0	42.0	37.6	Pass
"D" Plane Rotation peak	deg	64.0	78.0	70.3	Pass
	ms	57.0	64.0	59.0	Pass
"D" Plane Rotation Decay to Zero	ms	113.0	128.0	115.1	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	97.6	Pass
	ms	47.0	58.0	51.2	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	98.6	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

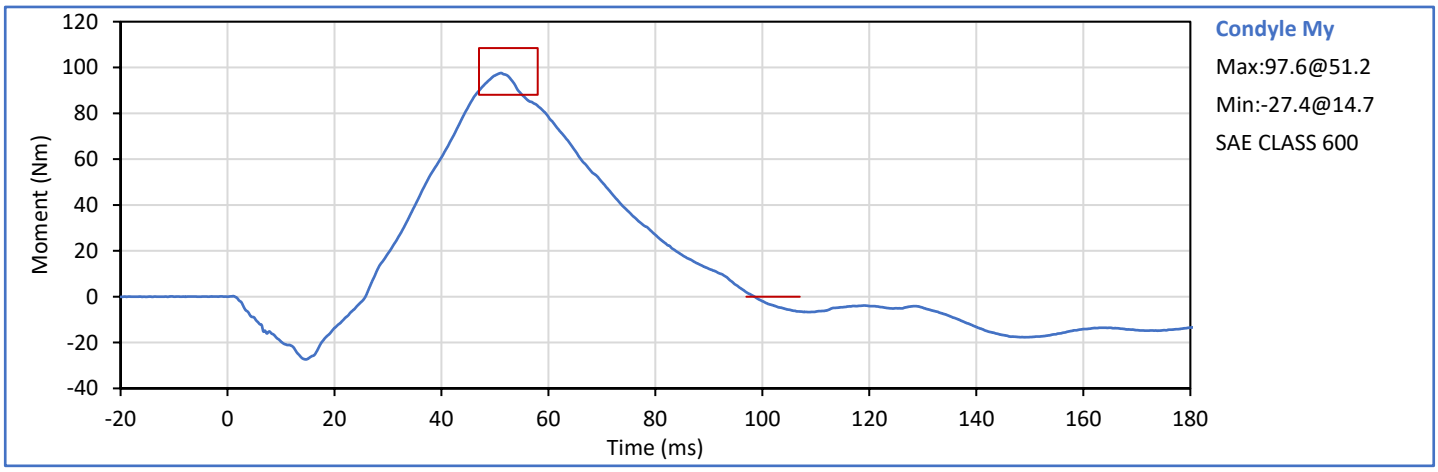
Approved By: P. Puzzuto

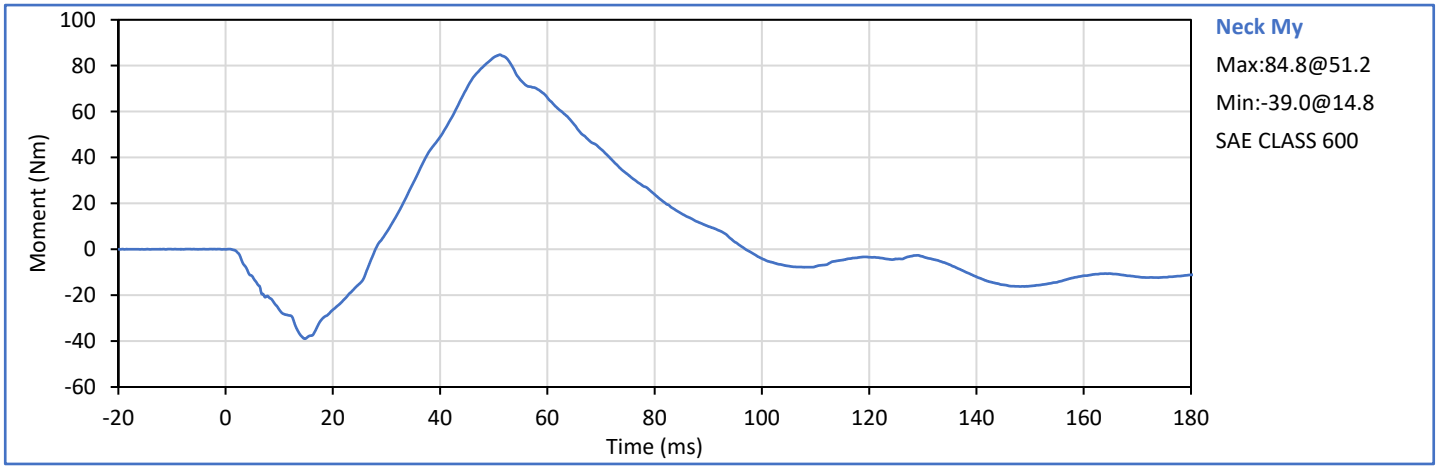
Applus IDIADA KARCO

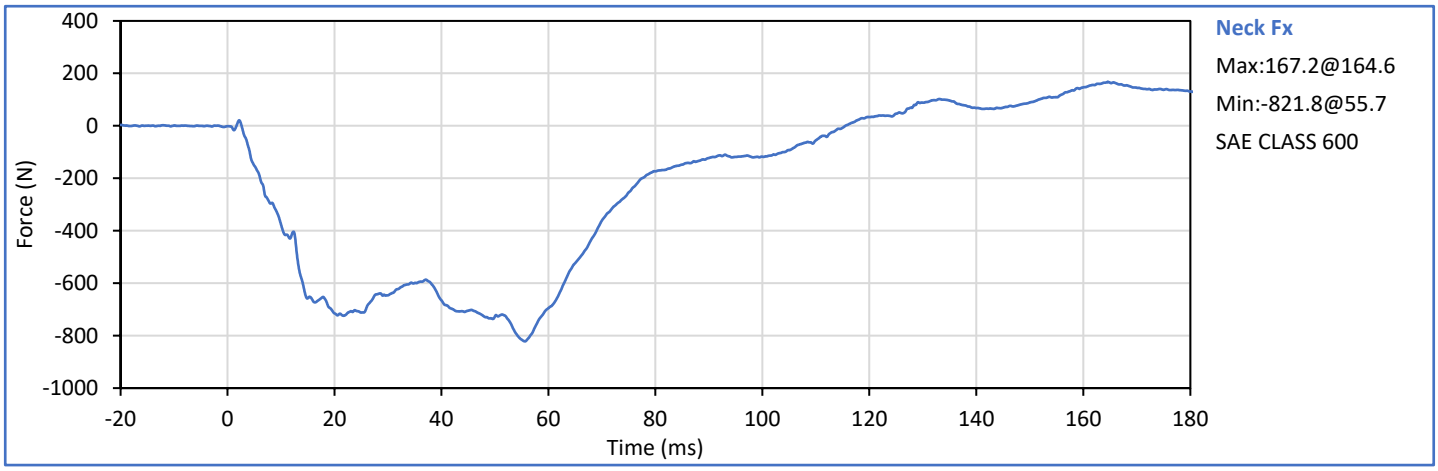
Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 360

Test Date: 2021-07-06







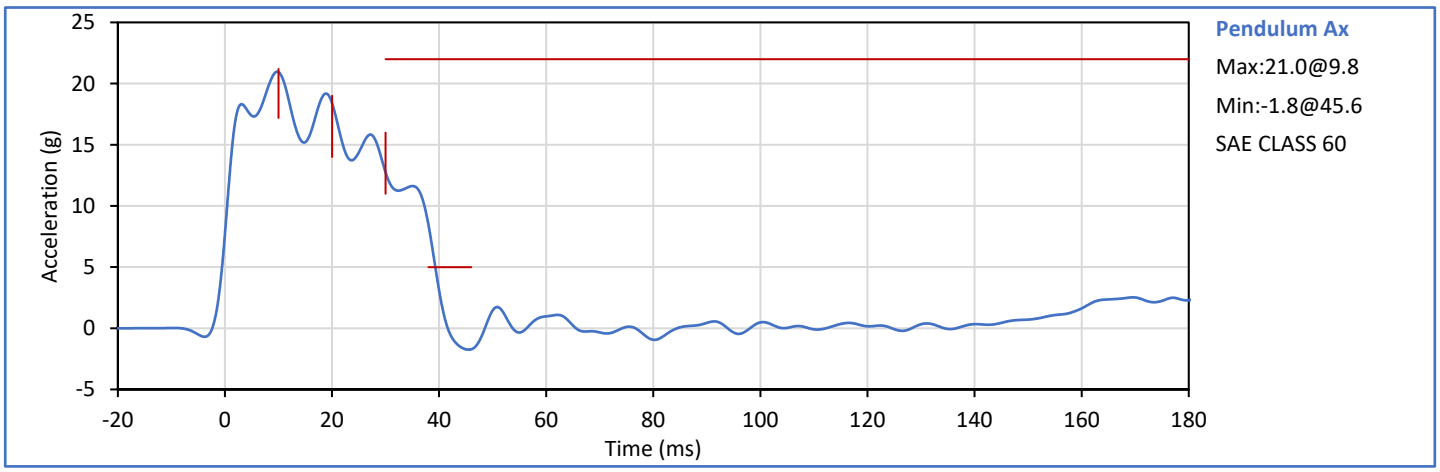
Applus IDIADA
KARCO

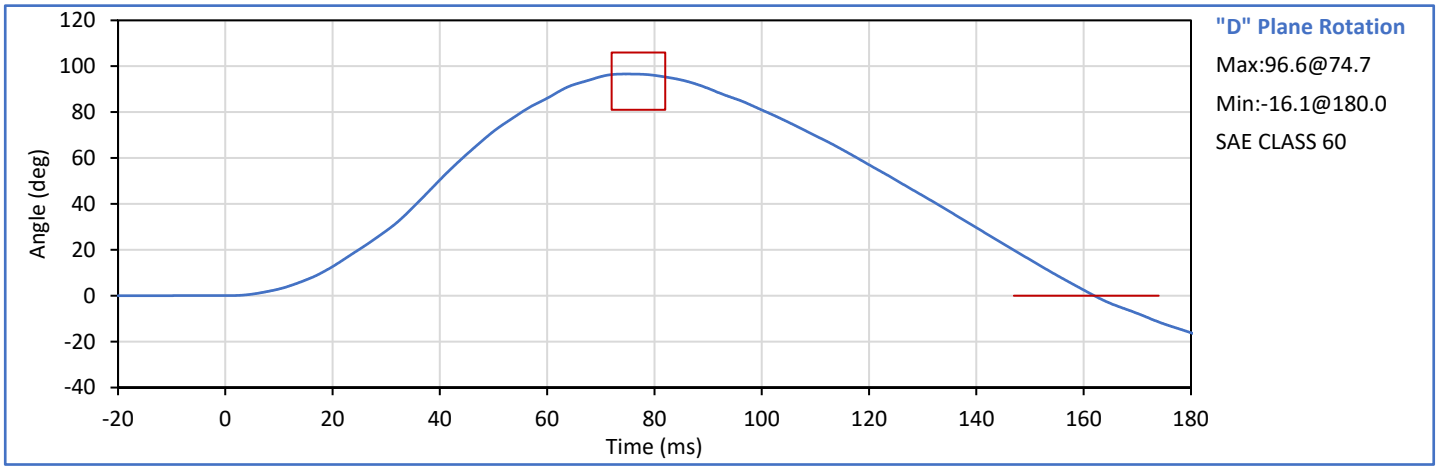
Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 360

Test Date: 2021-07-06

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	22.1	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Pendulum Velocity	m/s	5.94	6.19	6.16	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.9	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.4	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	12.8	Pass
Peak Pendulum Decel After 30 ms	g	0.0	22.0	12.8	Pass
Deceleration Decay to Cross 5g	ms	38.0	46.0	39.3	Pass
"D" Plane Rotation peak	deg	81.0	106.0	96.6	Pass
	ms	72.0	82.0	74.7	Pass
"D" Plane Rotation Decay to Zero	ms	147.0	174.0	162.1	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-70.4	Pass
	ms	65.0	79.0	70.4	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	136.4	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

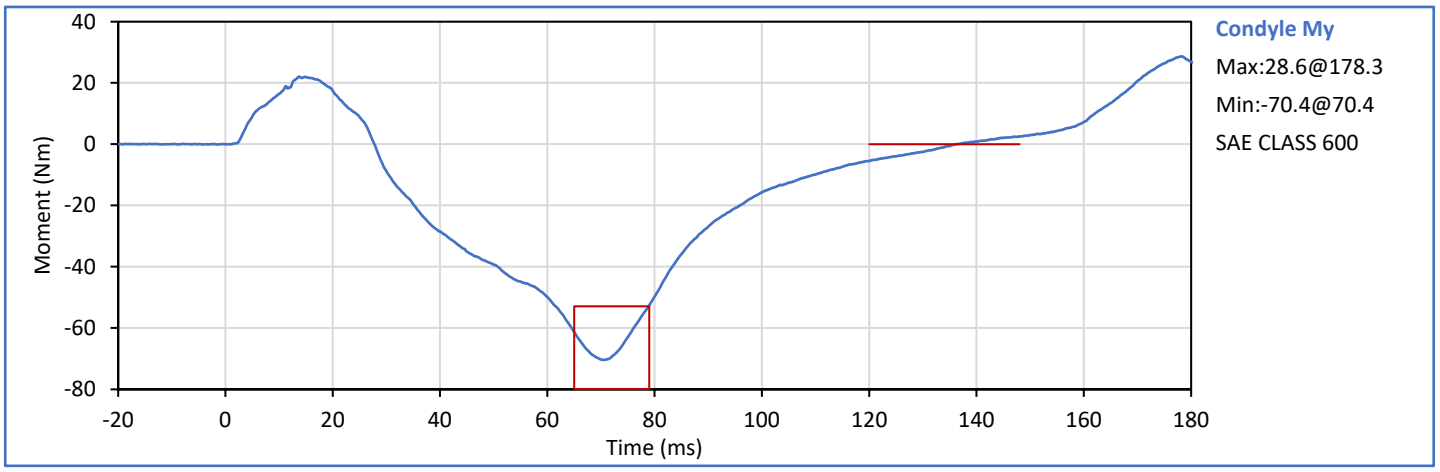
Approved By: P. Puzzuto

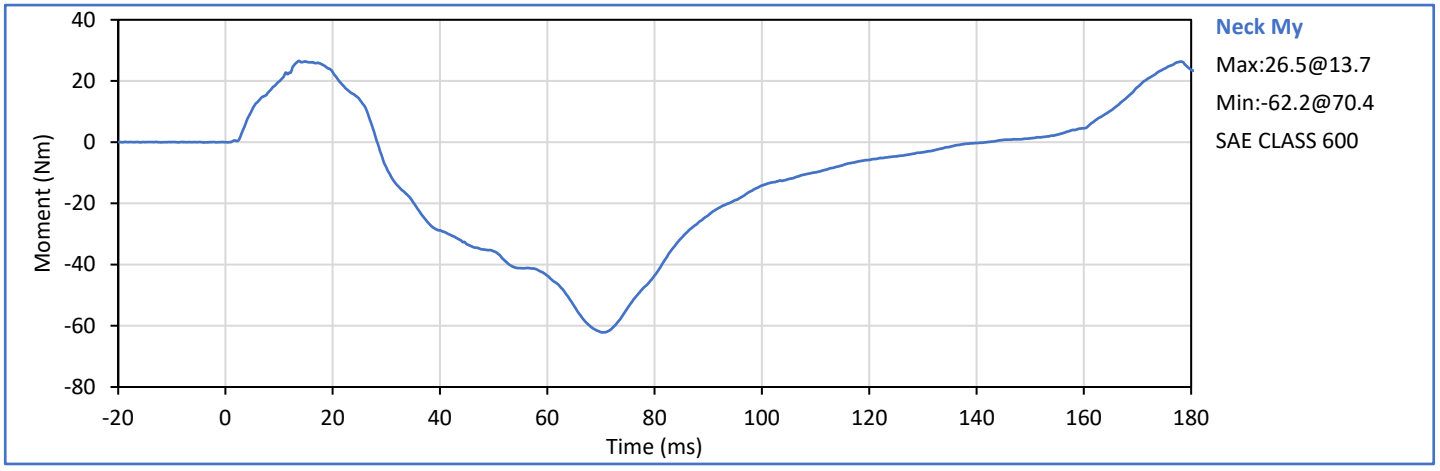
Applus IDIADA
KARCO

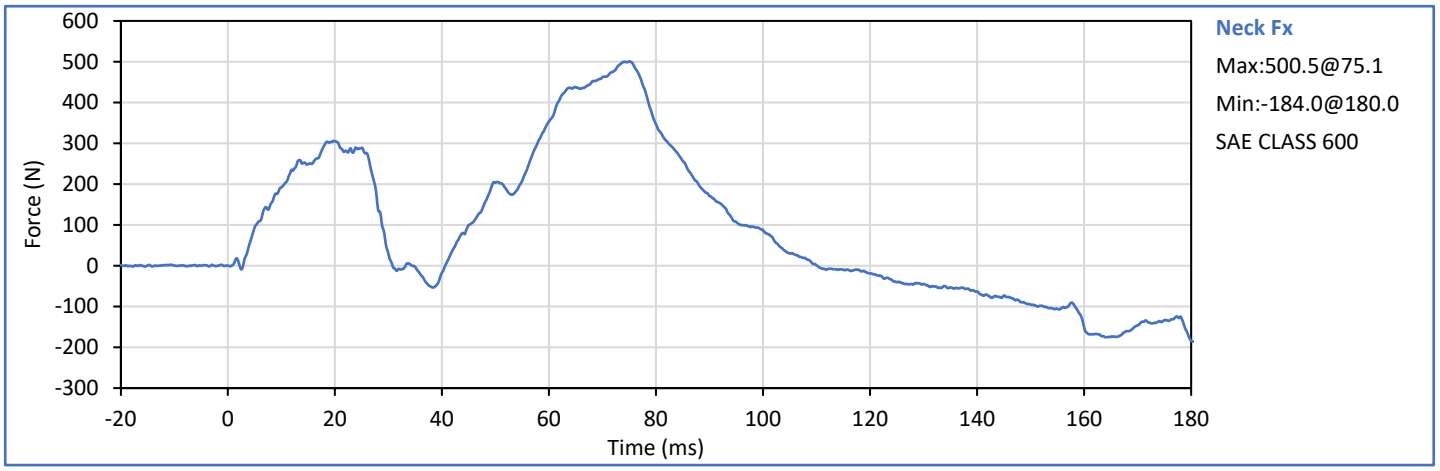
Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 360

Test Date: 2021-07-06







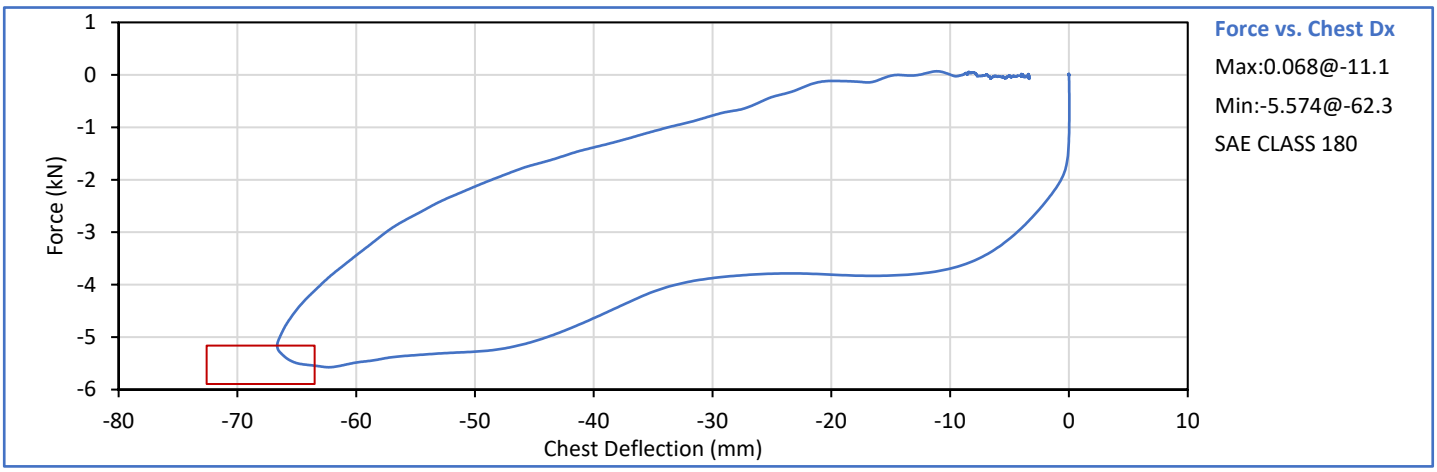
Applus IDIADA
KARCO

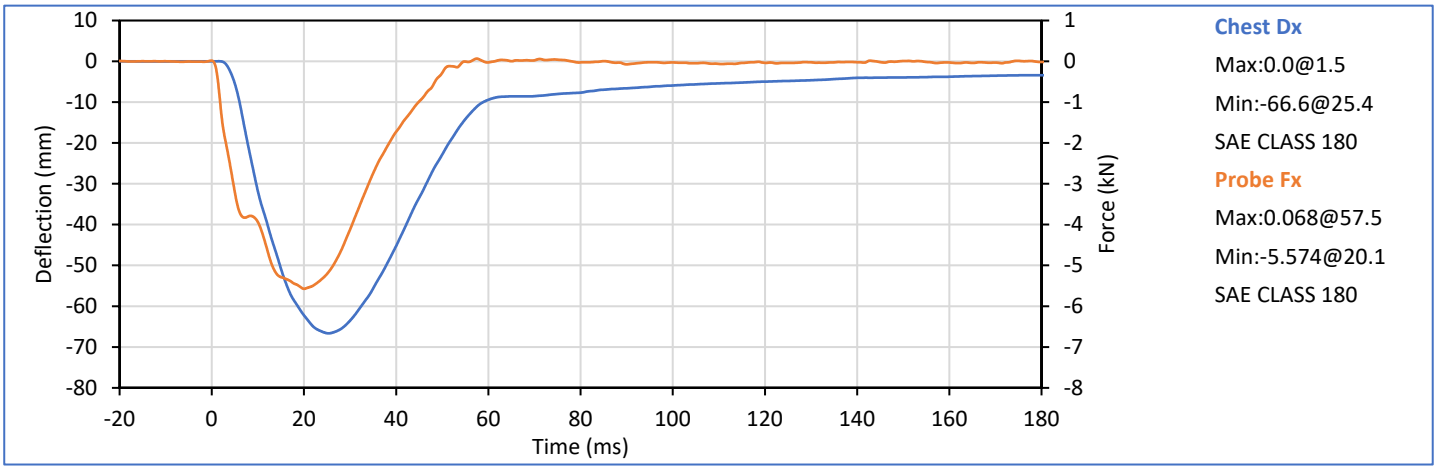
Hybrid III 50th Percentile Male ATD
Thorax Impact

ATD Serial No.: 360

Test Date: 2021-07-02

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
Probe Velocity	m/s	6.58	6.82	6.78	Pass
Peak Chest Deflection	mm	-72.6	-63.5	-66.6	Pass
Peak Probe Force	kN	-5.893	-5.159	-5.574	Pass
Internal Hysterisis	%	69.0	85.0	69.6	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

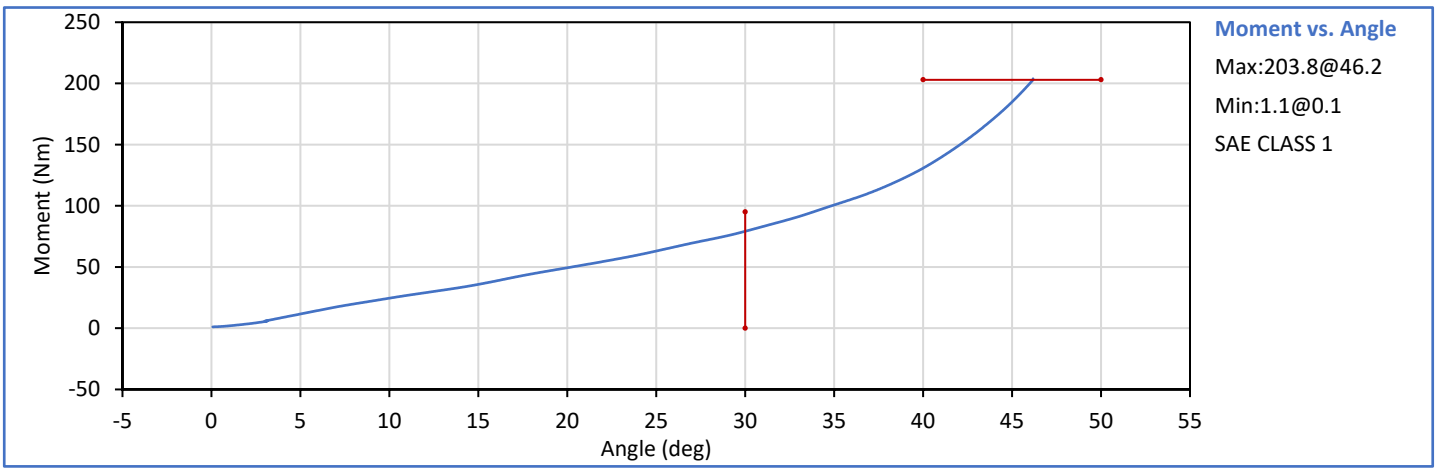
Applus IDIADA KARCO

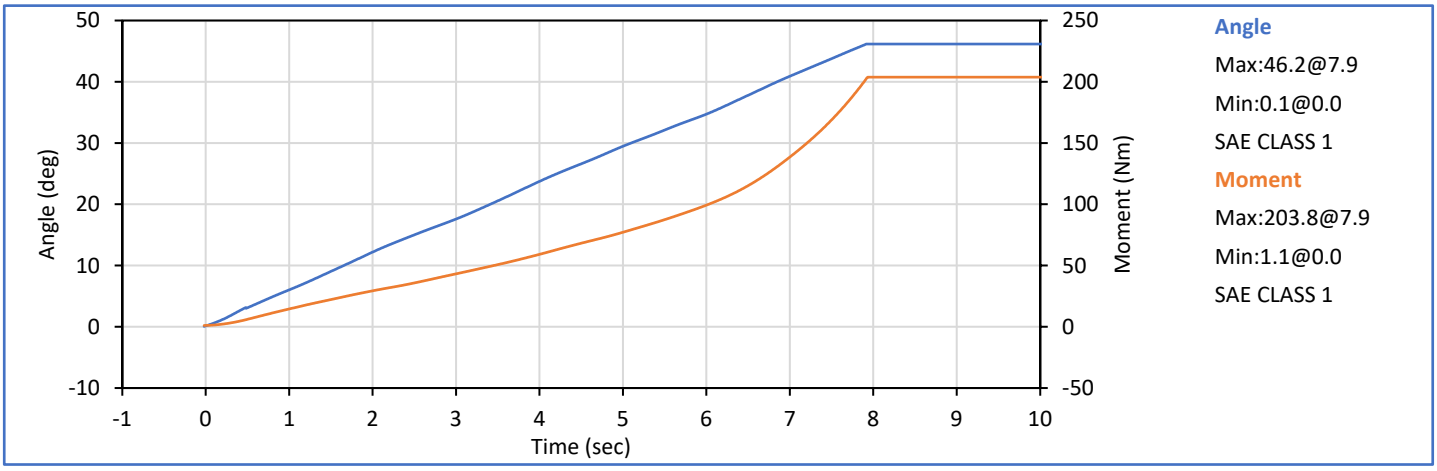
Hybrid III 50th Percentile Male ATD
Hip Range of Motion (Left)

ATD Serial No.: 360

Test Date: 2021-07-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Relative Humidity	%	10	70	33	Pass
Left Hip Rotation Rate	deg/s	5.0	10.0	5.8	Pass
Left Femur Torque at 30°	Nm	0.0	95.0	79.1	Pass
Left Hip Rotation at 203 Nm	deg	40.0	50.0	46.2	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

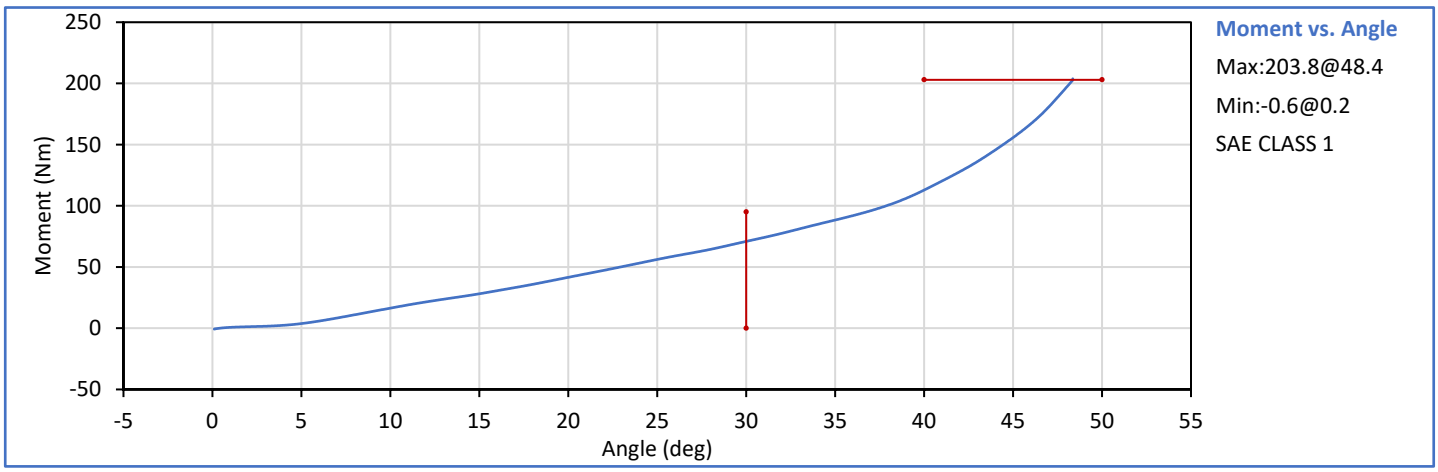
Applus IDIADA KARCO

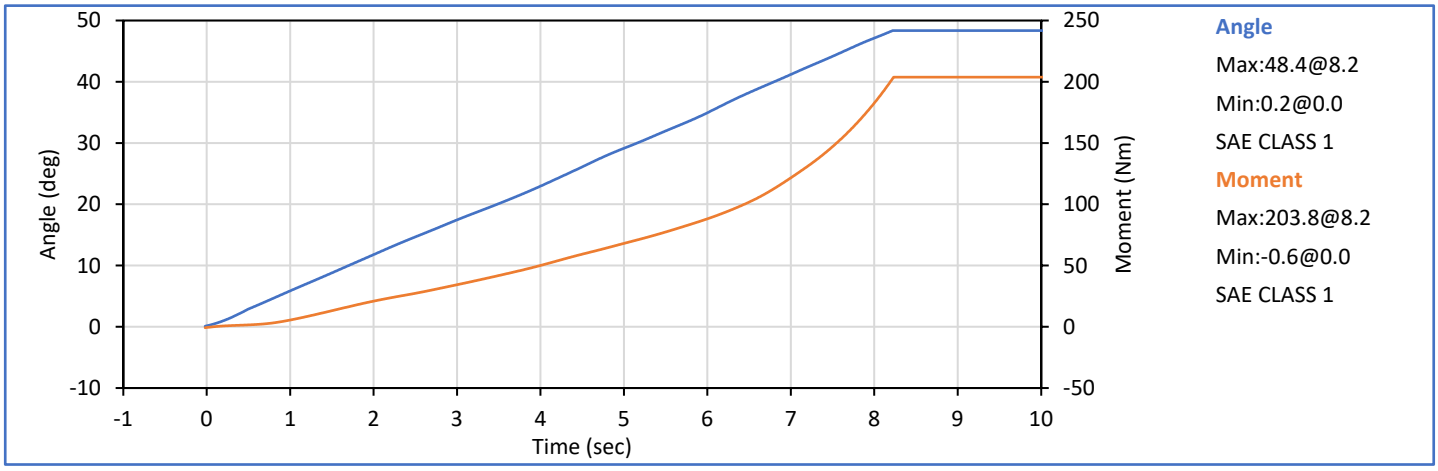
Hybrid III 50th Percentile Male ATD
Hip Range of Motion (Right)

ATD Serial No.: 360

Test Date: 2021-07-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Relative Humidity	%	10	70	33	Pass
Right Hip Rotation Rate	deg/s	5.0	10.0	5.9	Pass
Right Femur Torque at 30°	Nm	0.0	95.0	70.8	Pass
Right Hip Rotation at 203 Nm	deg	40.0	50.0	48.4	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

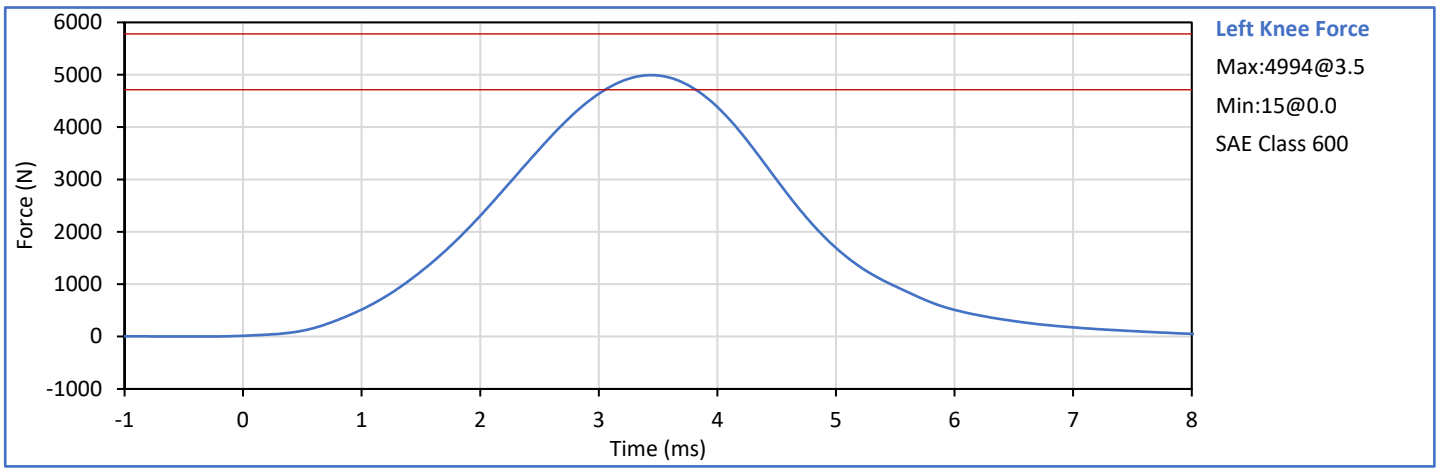
Applus IDIADA
KARCO

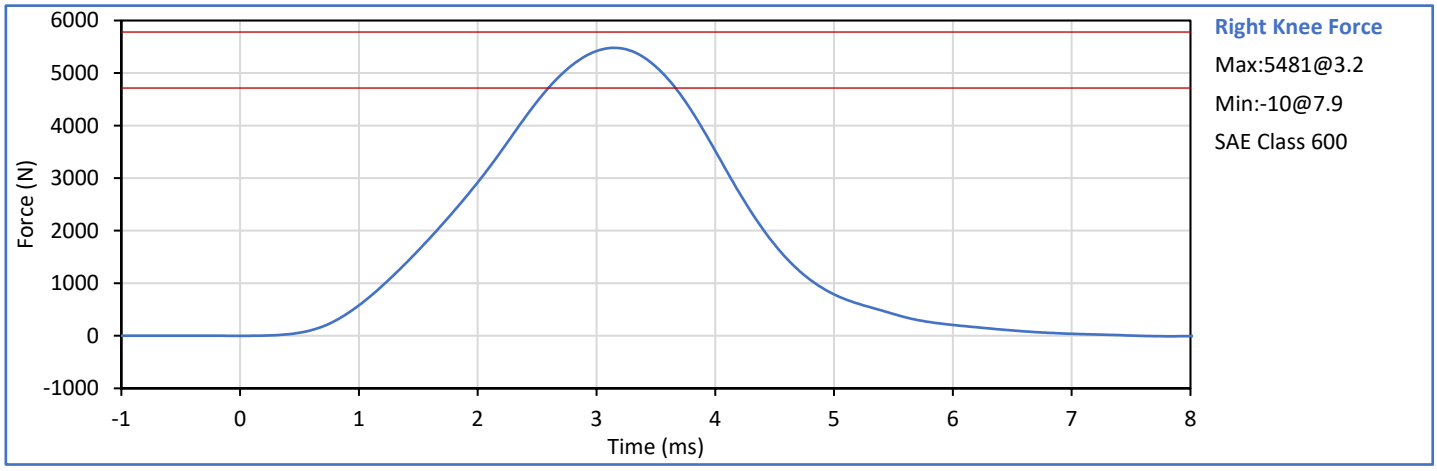
Hybrid III 50th Percentile Male ATD
Knee Impact (Left/Right)

ATD Serial No.: 360

Test Date: 2021-07-07

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.7	Pass
	Laboratory Relative Humidity	%	10	70	36	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.089	Pass
	Peak Resistive Force	N	4715	5782	4994	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.092	Pass
	Peak Resistive Force	N	4715	5782	5481	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Post-Test ATD Qualification and Performance Verification
Hybrid III 5th Percentile Female ATD
S/N: 141

Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Damage Checklist

ATD Serial No.: 141

Test Date: 2021-07-02

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: J. Hernandez

Approved By: P. Puzzuto

Applus IDIADA
KARCO

Hybrid III 5th Percentile Female ATD
External Measurements

ATD Serial No.: 141

Test Date: 2021-07-02

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	22	Pass
A - Total sitting height	mm	775	800	788	Pass
B - Shoulder pivot height	mm	432	457	453	Pass
C - 'H' point height	mm	81	86	86	Pass
D - 'H' point location from backline	mm	145	150	148	Pass
E - Shoulder pivot from backline	mm	69	84	78	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	287	Pass
J - Elbow rest height	mm	183	203	197	Pass
K - Buttock to knee length	mm	521	546	531	Pass
L - Popliteal length	mm	356	376	367	Pass
M - Knee pivot height	mm	394	419	407	Pass
N - Buttock popliteal length	mm	414	439	428	Pass
O - Chest depth without jacket	mm	175	191	183	Pass
P - Foot length	mm	219	234	231	Pass
R - Buttock to Knee Pivot Length	mm	457	483	473	Pass
S - Head Breadth	mm	137	147	144	Pass
T - Head Depth	mm	178	188	184	Pass
U - Hip Breadth	mm	300	315	308	Pass
V - Shoulder breadth	mm	351	366	360	Pass
W - Foot breadth	mm	79	94	88	Pass
X - Head circum.	mm	528	549	535	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	868	Pass
Z - Waist circum.	mm	760	790	776	Pass
AA - Location for chest circum.	mm	333	358	339	Pass
BB - Location for waist circum.	mm	160	170	168	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

Approved By: P. Puzzuto

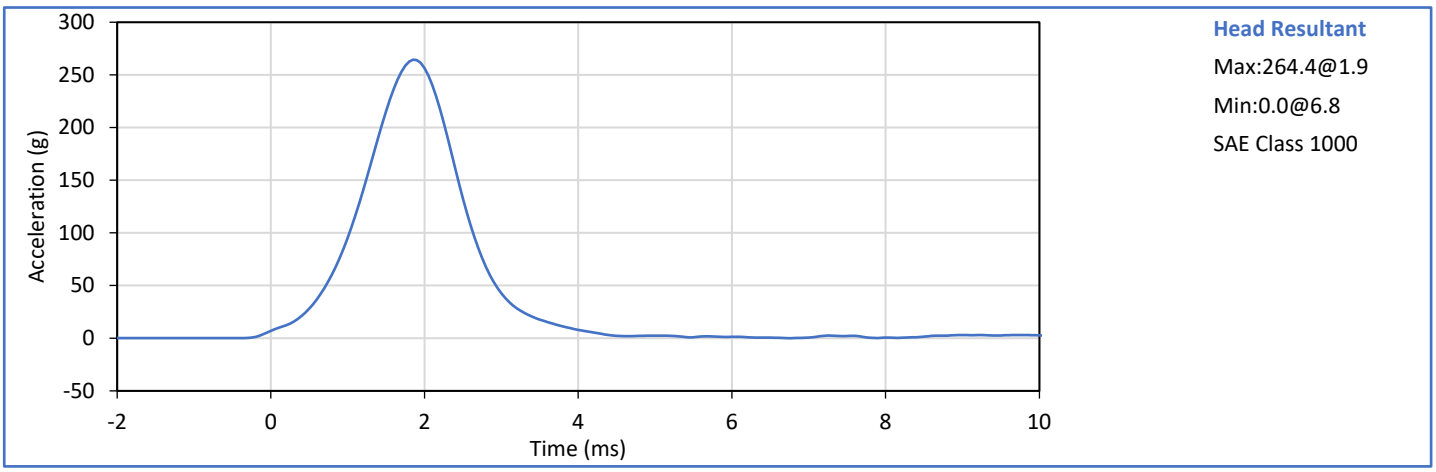
Applus IDIADA KARCO

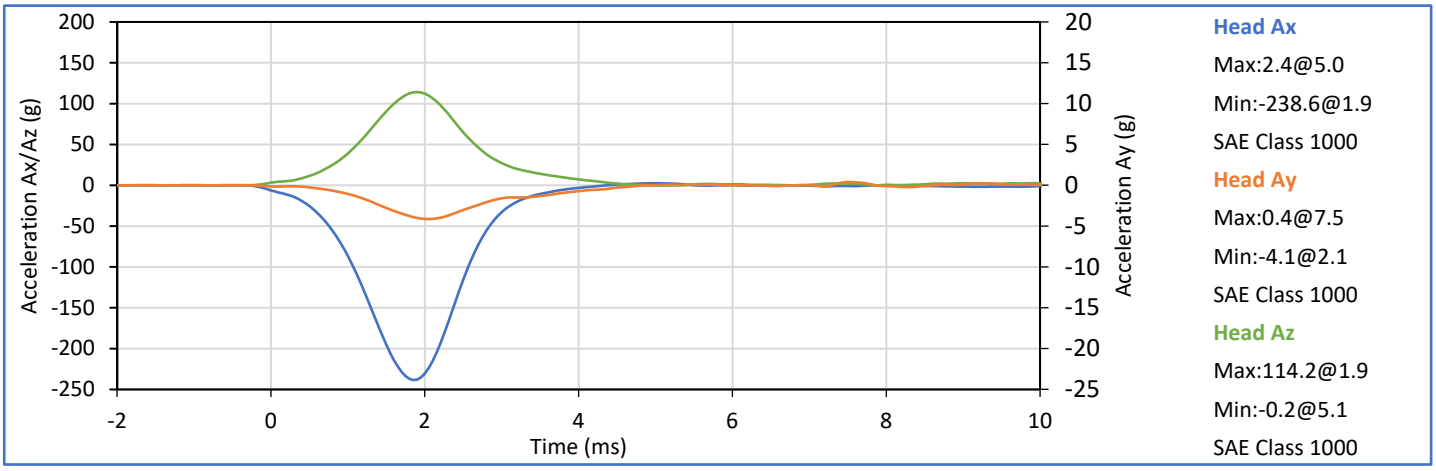
Hybrid III 5th Percentile Female ATD
Head Drop Test

ATD Serial No.: 141

Test Date: 2021-07-06

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	22.1	Pass
Laboratory Humidity	%	10	70	29	Pass
Peak Resultant Acceleration	g	250.0	300.0	264.4	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-4.1	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.2	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

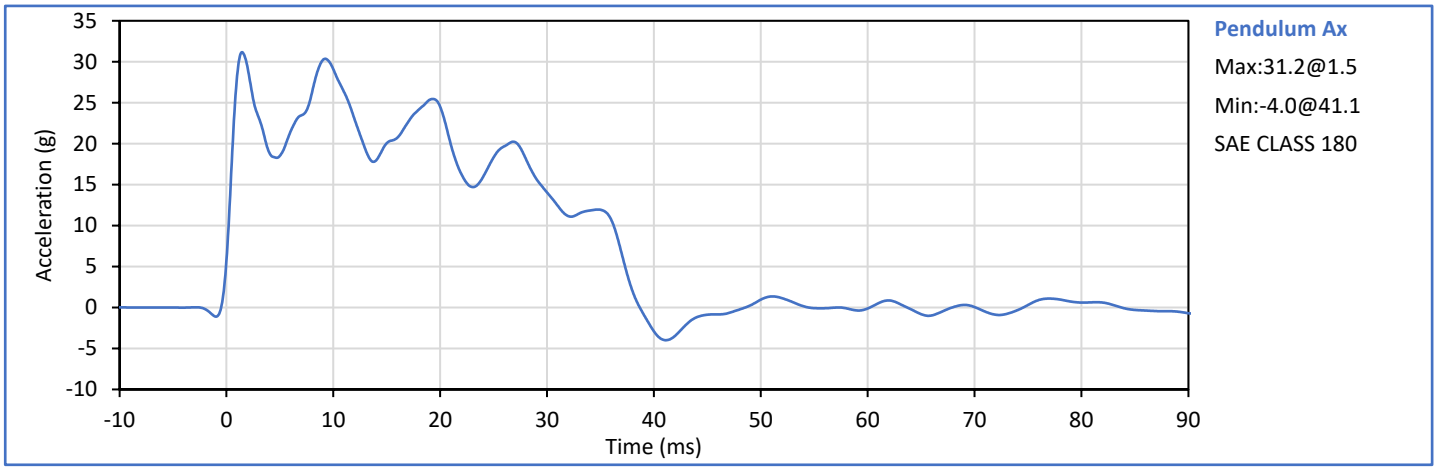
Applus IDIADA
KARCO

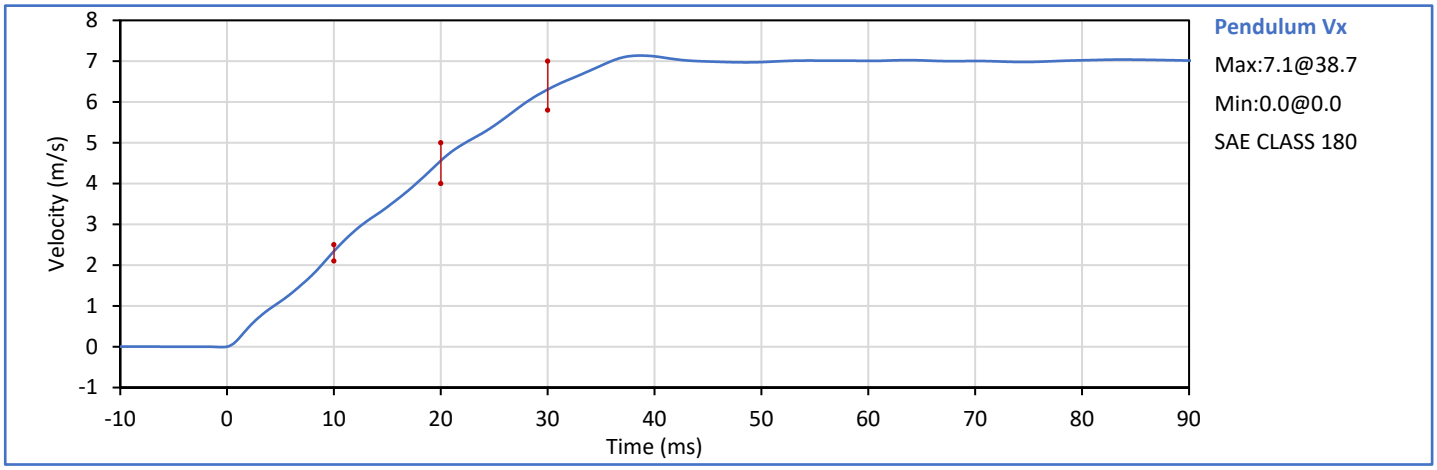
Hybrid III 5th Percentile Female ATD
Neck Flexion Test

ATD Serial No.: 141

Test Date: 2021-07-06

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Humidity	%	10	70	31	Pass
Pendulum Velocity	m/s	6.89	7.13	7.00	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.34	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.56	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.30	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	79.7	Pass
Peak Moment in Rotation	Nm	69.0	83.0	73.8	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	83.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

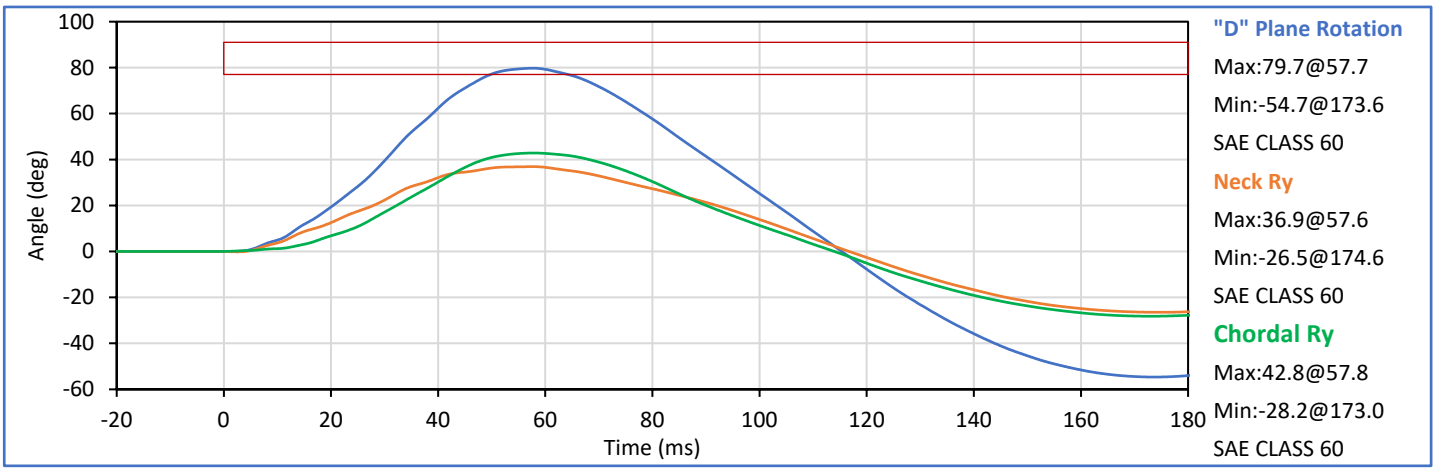
Approved By: P. Puzzuto

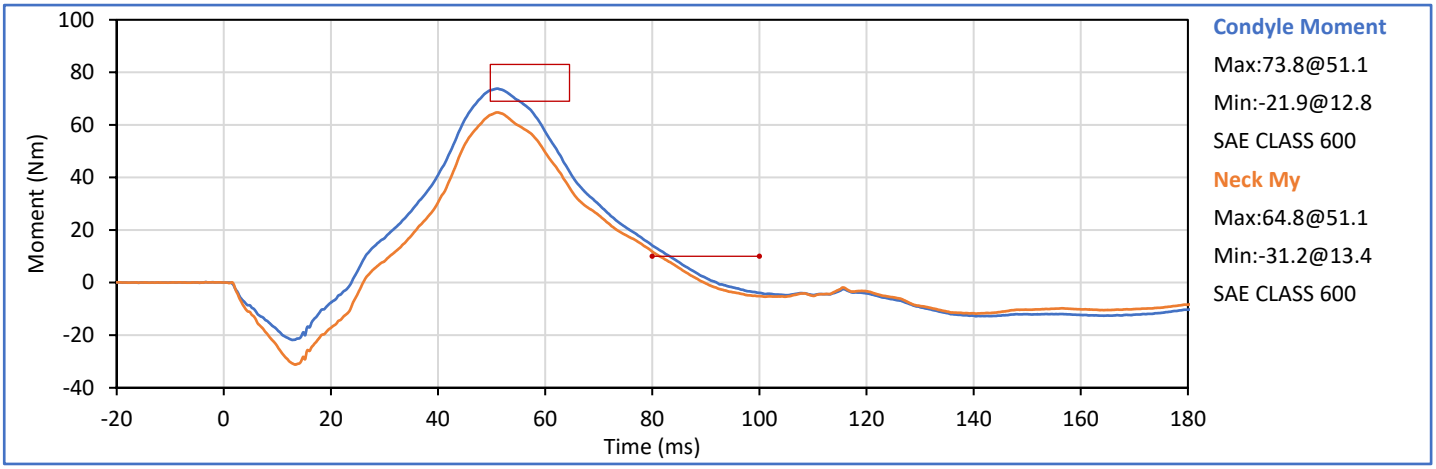
Applus IDIADA
KARCO

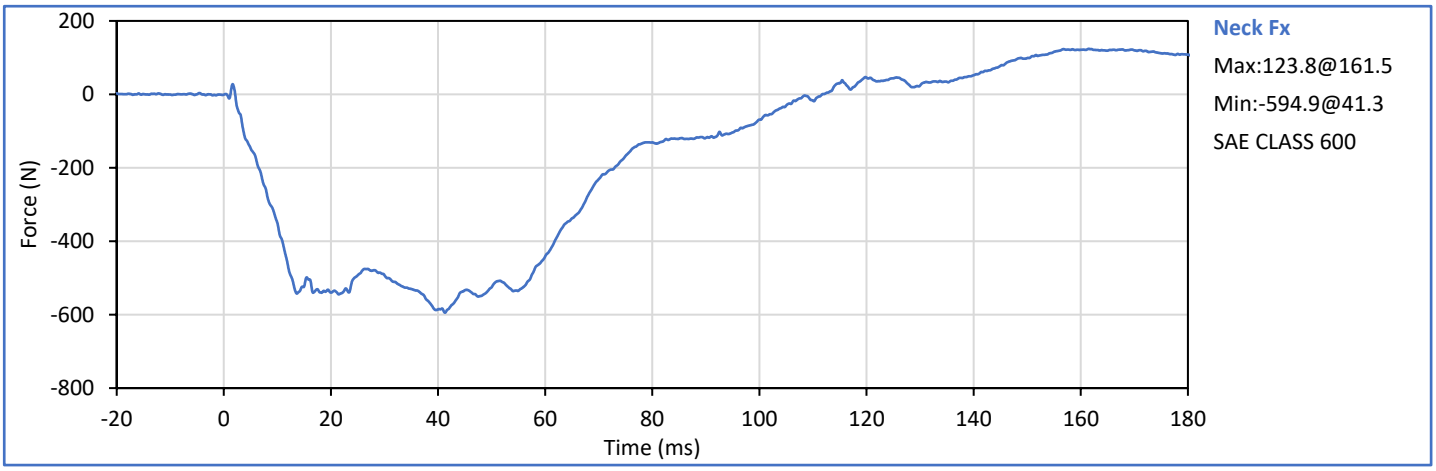
Hybrid III 5th Percentile Female ATD
Neck Flexion Test

ATD Serial No.: 141

Test Date: 2021-07-06







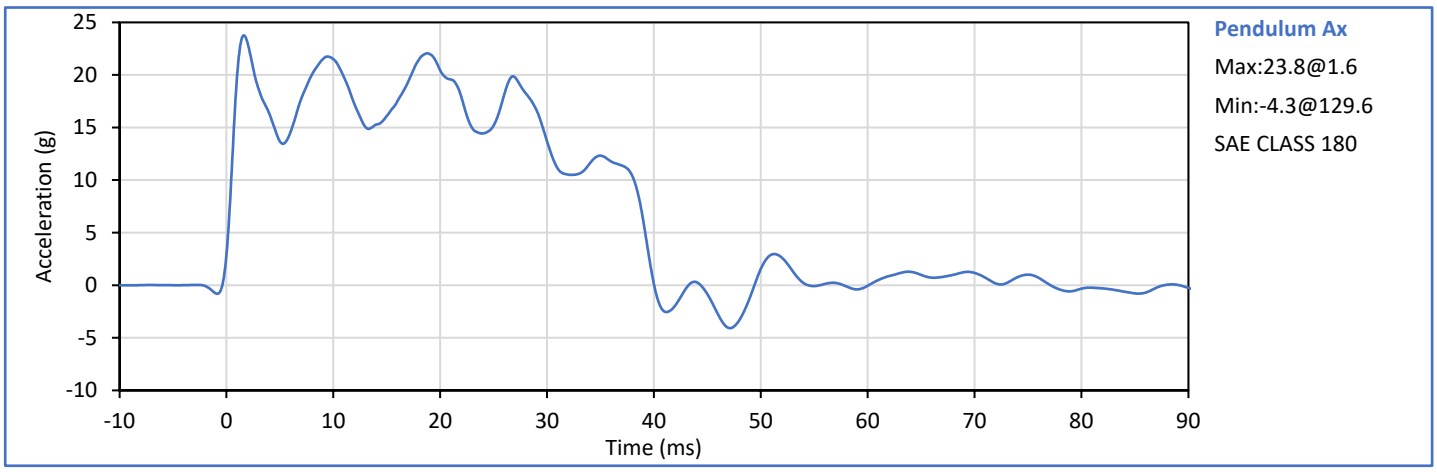
Applus IDIADA
KARCO

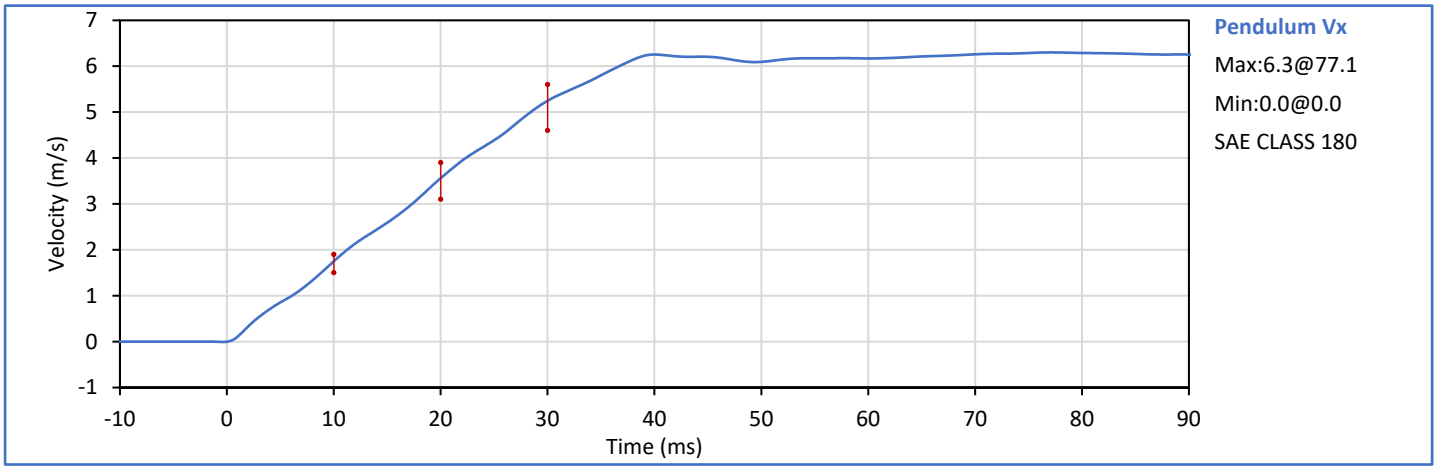
Hybrid III 5th Percentile Female ATD
Neck Extension Test

ATD Serial No.: 141

Test Date: 2021-07-06

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	33	Pass
Pendulum Velocity	m/s	5.95	6.19	6.05	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.75	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.56	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.25	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	105.8	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-58.8	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	98.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

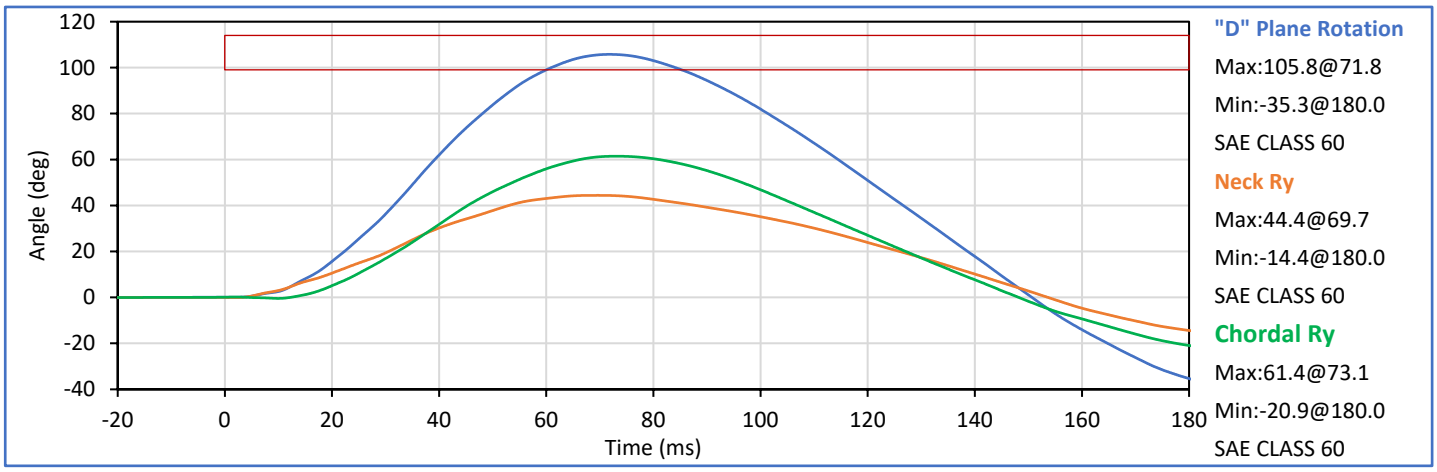
Approved By: P. Puzzuto

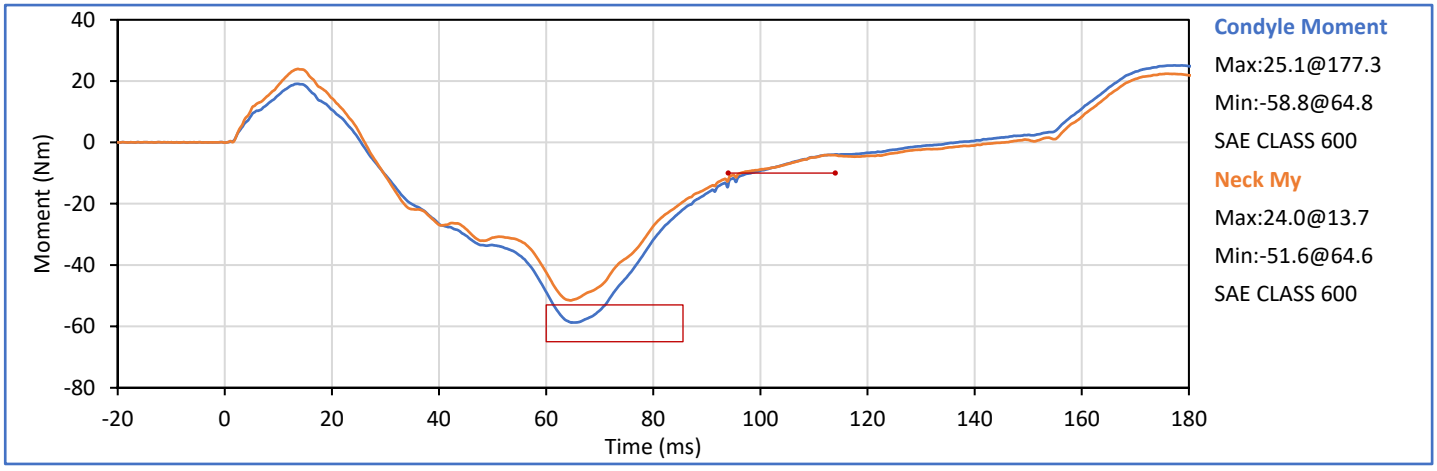
Applus IDIADA
KARCO

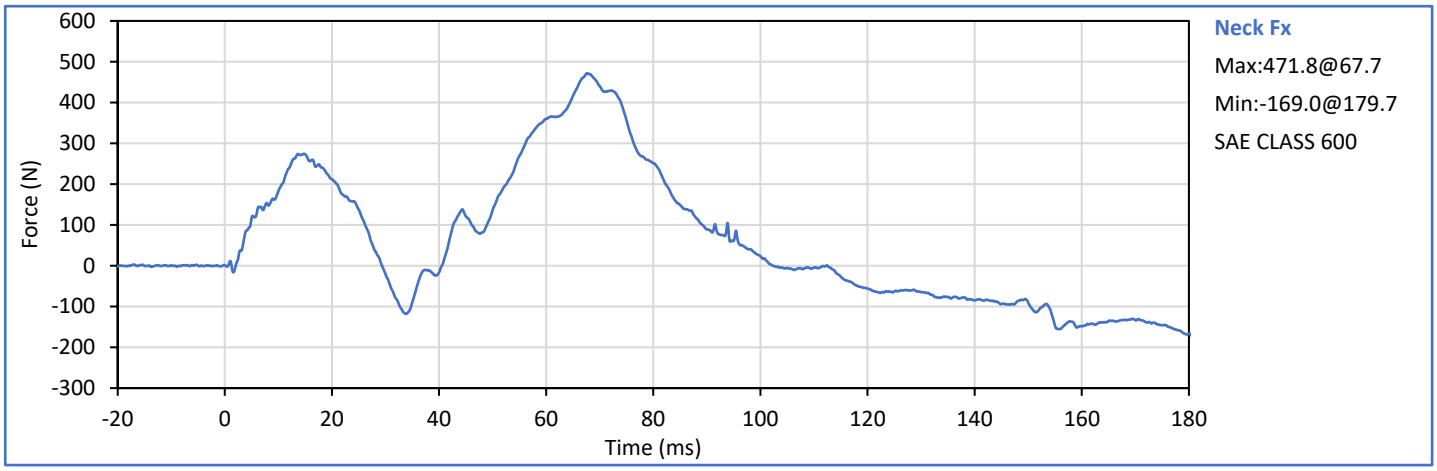
Hybrid III 5th Percentile Female ATD
Neck Extension Test

ATD Serial No.: 141

Test Date: 2021-07-06







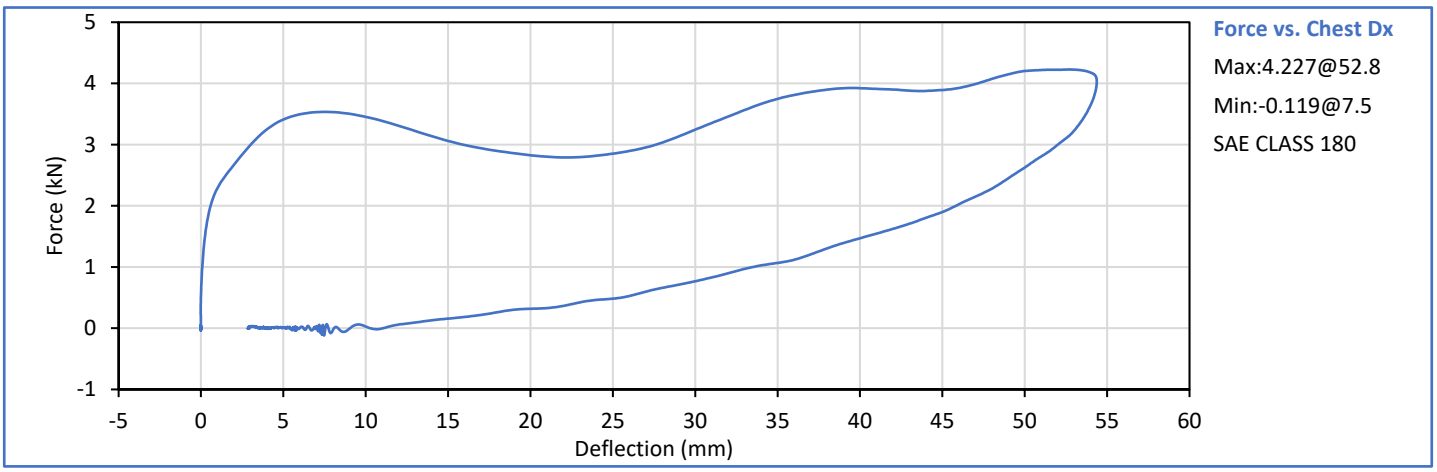
Applus IDIADA
KARCO

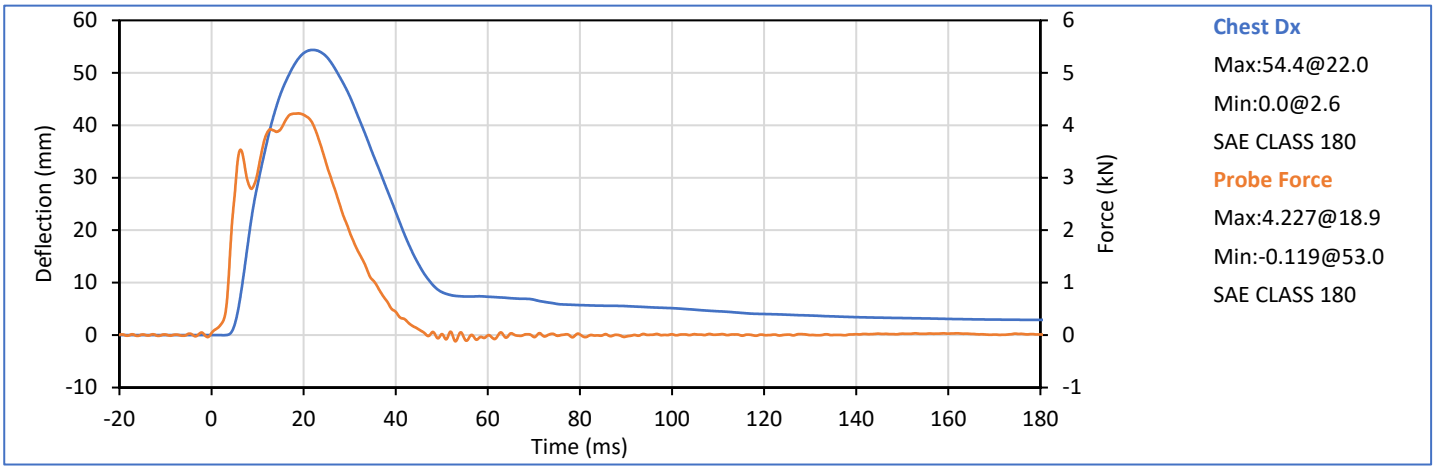
Hybrid III 5th Percentile Female ATD
Thorax Impact

ATD Serial No.: 141

Test Date: 2021-07-02

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	29	Pass
Probe Velocity	m/s	6.59	6.83	6.73	Pass
Peak Chest Deflection	mm	50.0	58.0	54.4	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.227	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	4.201	Pass
Internal Hysterisis	%	69.0	85.0	72.8	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

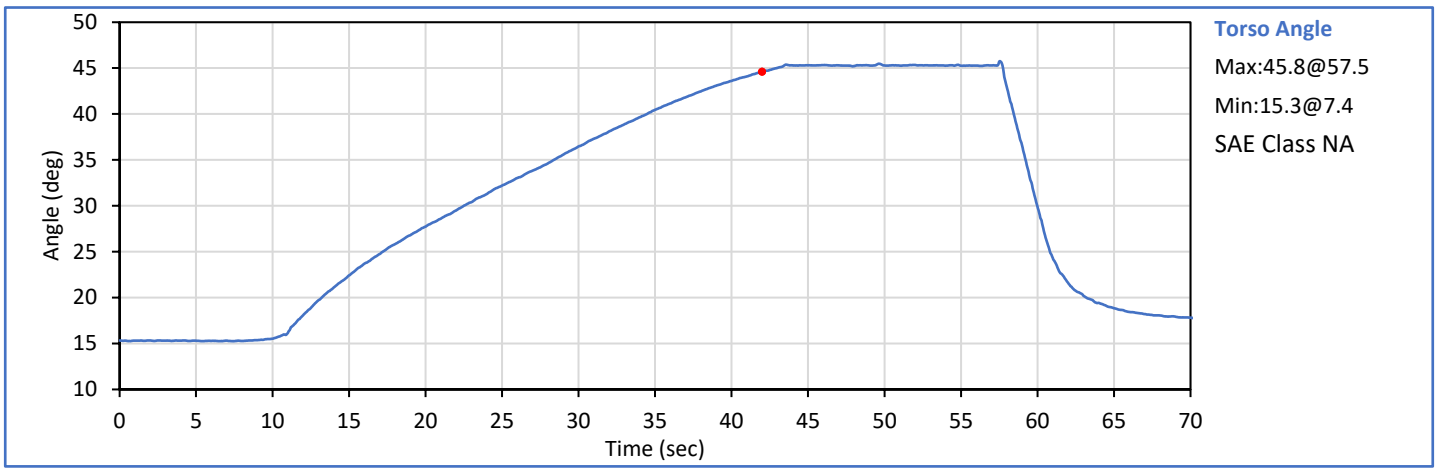
Applus IDIADA KARCO

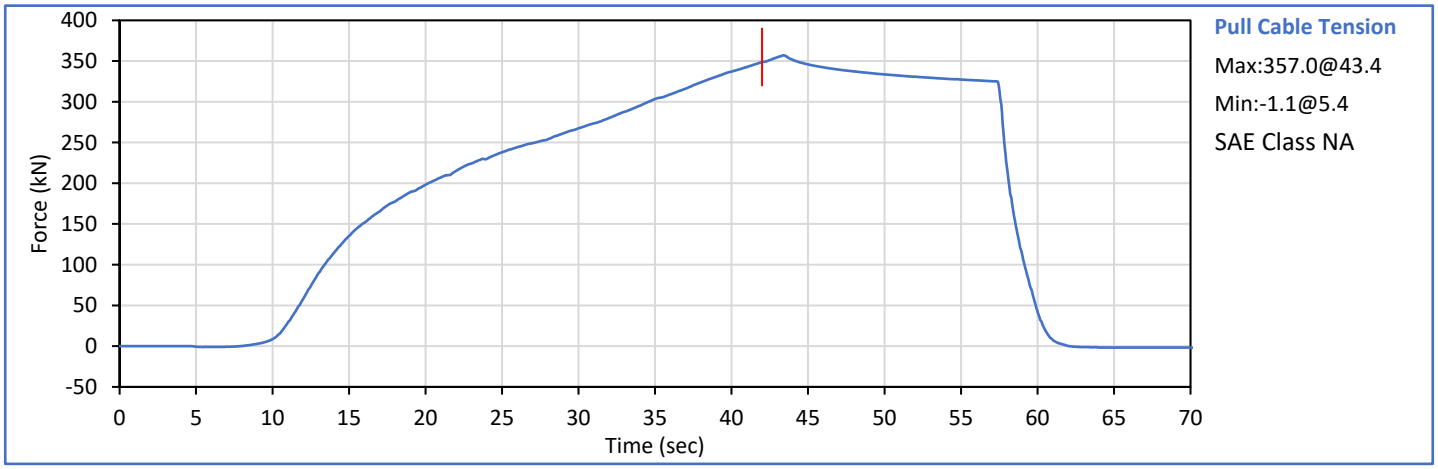
Hybrid III 5th Percentile Female ATD
Torso Flexion Test

ATD Serial No.: 141

Test Date: 2021-07-07

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.6	Pass
Laboratory Humidity	%	10	70	34	Pass
Orientation Angle	deg	0.0	20.0	15.2	Pass
Test Initial Angle	deg	11.0	19.0	15.3	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	348.7	Pass
Torso Flexion Rate	deg/s	0.50	1.50	0.94	Pass
Final Reference Plane Angle	deg	-8.0	8.0	1.2	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

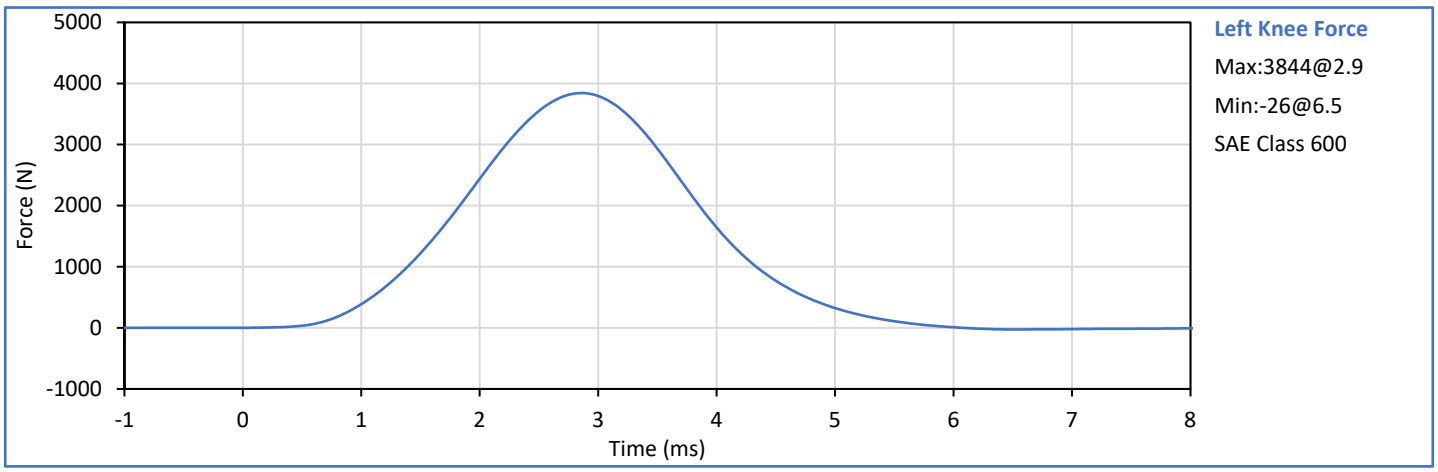
Applus IDIADA
KARCO

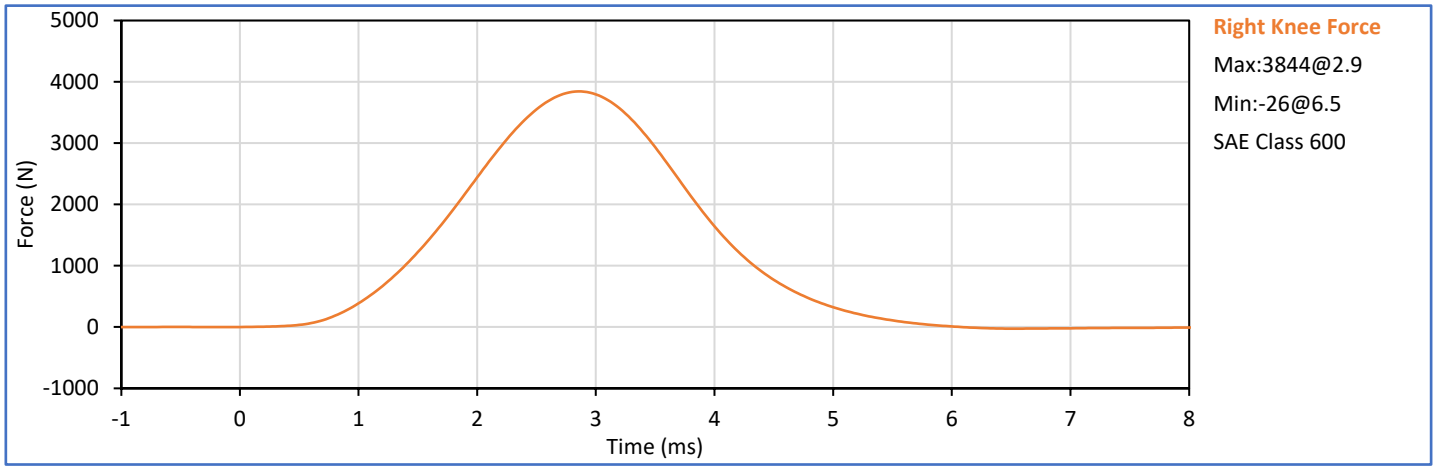
Hybrid III 5th Percentile Female ATD
Knee Impact (Left/Right)

ATD Serial No.: 141

Test Date: 2021-07-07

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.7	Pass
	Laboratory Humidity	%	10	70	38	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.087	Pass
	Peak Resistive Force	N	3450	4060	3844	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.096	Pass
	Peak Resistive Force	N	3450	4060	3844	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

H3-50M ATD S/N: 360

Table 1 - Driver ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P49209	Endevco	7264C-2k	2021-02-15
Head Acceleration Y Primary	P49228	Endevco	7264C-2k	2021-02-12
Head Acceleration Z Primary	P50101	Endevco	7264C-2k	2021-02-12
Head Acceleration X Redundant	P50103	Endevco	7264C-2k	2021-02-15
Head Acceleration Y Redundant	P49210	Endevco	7264C-2k	2021-02-12
Head Acceleration Z Redundant	P58713	Endevco	7264C-2k	2021-02-12
Head Rotation Rate X	ARS14943	DTS	ARS PRO-18k (2kHz)	2020-08-04
Head Rotation Rate Y	ARS14944	DTS	ARS PRO-18k (2kHz)	2020-08-04
Head Rotation Rate Z	ARS14954	DTS	ARS PRO-18k (2kHz)	2020-08-04
Upper Neck Force X	1633 Fx	R.A. Denton	1716A	2020-07-20
Upper Neck Force Y	1633 Fy	R.A. Denton	1716A	2020-07-20
Upper Neck Force Z	1633 Fz	R.A. Denton	1716A	2020-07-20
Upper Neck Moment X	1633 Mx	R.A. Denton	1716A	2020-07-20
Upper Neck Moment Y	1633 My	R.A. Denton	1716A	2020-07-20
Upper Neck Moment Z	1633 Mz	R.A. Denton	1716A	2020-07-20
Chest Acceleration X Primary	P52112	Endevco	7264C-2k	2021-02-11
Chest Acceleration Y Primary	P49208	Endevco	7264C-2k	2021-02-11
Chest Acceleration Z Primary	P51264	Endevco	7264C-2k	2021-02-12
Chest Acceleration X Redundant	P49461	Endevco	7264C-2k	2021-02-11
Chest Acceleration Y Redundant	P58774	Endevco	7264C-2k	2021-02-11
Chest Acceleration Z Redundant	P49168	Endevco	7264C-2k	2021-02-12
Chest Deflection	0606 (H3)	Servo	14CBI-3615	2021-02-15
Pelvis Acceleration X	P49238	Endevco	7264C-2k	2021-02-15
Pelvis Acceleration Y	P58877	Endevco	7264C-2k	2021-02-15
Pelvis Acceleration Z	P50087	Endevco	7264C-2k	2021-02-15
Left Femur Force Z	DS9756 (pri)	Humanetics	3821JLN2	2021-01-18
Right Femur Force Z	DS4141 (pri)	Humanetics	3821JLN2	2021-01-18
Left Femur Force Z Redundant	DS9756 (red)	Humanetics	3821JLN2	2021-01-18
Right Femur Force Z Redundant	DS4141 (red)	Humanetics	3821JLN2	2021-01-18
Left Upper Tibia Moment X	DH3309 Mx	FTSS	IF-857	2021-01-14
Left Upper Tibia Moment Y	DH3309 My	FTSS	IF-857	2021-01-14
Left Upper Tibia Force Z	DH3309 Fz	FTSS	IF-857	2021-01-14
Left Lower Tibia Moment X	DI4186 Mx	FTSS	IF-853	2021-01-14
Left Lower Tibia Moment Y	DI4186 My	FTSS	IF-853	2021-01-14
Left Lower Tibia Force Z	DI4186 Fz	FTSS	IF-853	2021-01-14
Right Upper Tibia Moment X	DG6679 Mx	FTSS	IF-857	2021-01-14
Right Upper Tibia Moment Y	DG6679 My	FTSS	IF-857	2021-01-14
Right Upper Tibia Force Z	DG6679 Fz	FTSS	IF-857	2021-01-14
Right Lower Tibia Moment X	405 Mx	R.A. Denton	3644	2021-01-14
Right Lower Tibia Moment Y	405 My	R.A. Denton	3644	2021-01-14
Right Lower Tibia Force Z	405 Fz	R.A. Denton	3644	2021-01-14
Left Ankle Acceleration X	03E20-N09	Entran	EGEB6Q-2k	2021-02-18
Left Ankle Acceleration Z	03D30-N13	Entran	EGEB6Q-2k	2021-02-18
Left Toe Acceleration Z	03H07-Z10	Entran	EGEB6Q-2k	2021-02-18
Right Ankle Acceleration X	03E29-N20	Entran	EGEB6Q-2k	2021-02-18
Right Ankle Acceleration Z	03E18-F02	Entran	EGEB6Q-2k	2021-02-18
Right Toe Acceleration Z	03D09-N01	Entran	EGEB6Q-2k	2021-02-18
Seat Belt Outside Lap Force	177	FTSS	IF-964	2020-10-02
Seat Belt Upper Diagonal Force	251	FTSS	IF-964	2020-10-02

H3-05F ATD S/N: 141

Table 2 - Right Front Passenger ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P58902	Endevco	7264C-2k	2021-06-21
Head Acceleration Y Primary	P58900	Endevco	7264C-2k	2021-06-21
Head Acceleration Z Primary	P58989	Endevco	7264C-2k	2021-06-21
Head Acceleration X Redundant	P58906	Endevco	7264C-2k	2021-06-21
Head Acceleration Y Redundant	P58983	Endevco	7264C-2k	2021-06-21
Head Acceleration Z Redundant	P58901	Endevco	7264C-2k	2021-06-21
Head Rotation Rate X	ARS7473	DTS	ARS PRO-8k (2kHz)	2021-03-02
Head Rotation Rate Y	ARS7342	DTS	ARS PRO-8k (2kHz)	2021-03-02
Head Rotation Rate Z	ARS7548	DTS	ARS PRO-8k (2kHz)	2021-03-02
Upper Neck Force X	452 Fx	R.A. Denton	1716A	2021-03-23
Upper Neck Force Y	452 Fy	R.A. Denton	1716A	2021-03-23
Upper Neck Force Z	452 Fz	R.A. Denton	1716A	2021-03-23
Upper Neck Moment X	452 Mx	R.A. Denton	1716A	2021-03-23
Upper Neck Moment Y	452 My	R.A. Denton	1716A	2021-03-23
Upper Neck Moment Z	452 Mz	R.A. Denton	1716A	2021-03-23
Chest Acceleration X Primary	P58742	Endevco	7264C-2k	2021-06-22
Chest Acceleration Y Primary	P51640	Endevco	7264C-2k	2021-06-22
Chest Acceleration Z Primary	P58988	Endevco	7264C-2k	2021-06-22
Chest Acceleration X Redundant	P51632	Endevco	7264C-2k	2021-06-22
Chest Acceleration Y Redundant	P58793	Endevco	7264C-2k	2021-06-22
Chest Acceleration Z Redundant	P58790	Endevco	7264C-2k	2021-06-22
Chest Deflection	2527 (HF)	Servo	14CBI-3615	2021-06-14
Pelvis Acceleration X	P50076	Endevco	7264C-2k	2021-06-22
Pelvis Acceleration Y	P58897	Endevco	7264C-2k	2021-06-22
Pelvis Acceleration Z	P51724	Endevco	7264C-2k	2021-06-22
Left Femur Force Z	DS4136 (pri)	Humanetics	3821JLN2	2021-03-23
Right Femur Force Z	DS4138 (pri)	Humanetics	3821JLN2	2021-03-23
Left Femur Force Z Redundant	DS4136 (red)	Humanetics	3821JLN2	2021-03-23
Right Femur Force Z Redundant	DS4138 (red)	Humanetics	3821JLN2	2021-03-23
Left Upper Tibia Moment X	481 Mx	R.A. Denton	3643	2021-04-09
Left Upper Tibia Moment Y	481 My	R.A. Denton	3643	2021-04-09
Left Upper Tibia Force Z	481 Fz	R.A. Denton	3643	2021-04-09
Left Lower Tibia Moment X	494 Mx	R.A. Denton	3644	2021-03-23
Left Lower Tibia Moment Y	494 My	R.A. Denton	3644	2021-03-23
Left Lower Tibia Force Z	494 Fz	R.A. Denton	3644	2021-03-23
Right Upper Tibia Moment X	DH3302 Mx	FTSS	IF-857	2021-01-14
Right Upper Tibia Moment Y	DH3302 My	FTSS	IF-857	2021-01-14
Right Upper Tibia Force Z	DH3302 Fz	FTSS	IF-857	2021-01-14
Right Lower Tibia Moment X	499 Mx	R.A. Denton	3644	2021-03-23
Right Lower Tibia Moment Y	499 My	R.A. Denton	3644	2021-03-23
Right Lower Tibia Force Z	499 Fz	R.A. Denton	3644	2021-03-23
Left Ankle Acceleration X	A199899	MSI	64C-2k	2021-06-21
Left Ankle Acceleration Z	A199908	MSI	64C-2k	2021-06-21
Left Toe Acceleration Z	A199930	MSI	64C-2k	2021-06-21
Right Ankle Acceleration X	A202287	MSI	64C-2k	2021-06-21
Right Ankle Acceleration Z	A201195	MSI	64C-2k	2021-06-21
Right Toe Acceleration Z	A201202	MSI	64C-2k	2021-06-21
Seat Belt Outside Lap Force	300	FTSS	IF-964	2020-10-02
Seat Belt Upper Diagonal Force	313	FTSS	IF-964	2020-10-02

Table 3 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Left Rear Primary Ax	A273415	MSI	52F-2k	2021-05-14
Right Rear Primary Ax	A298318	MSI	52F-2k	2021-03-22
Engine Top Ax	A265914	MSI	52F-2k	2021-03-22
Engine Bottom Ax	A331808	MSI	52F-2k	2021-02-25
Left Rear Az	A298373	MSI	52F-2k	2021-05-14
Right Rear Az	A336688	MSI	52F-2k	2021-03-22
Left Rear Redundant Ax	A331829	MSI	52F-2k	2021-05-14
Right Rear Redundant Ax	A298391	MSI	52F-2k	2021-03-22