REPORT NUMBER: NCAP-KAR-20-026

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

VOLKSWAGEN GROUP OF AMERICA
2020 VOLKSWAGEN ATLAS CROSS SPORT 5 DOOR MPV

NHTSA NUMBER: M20205800

PREPARED BY:
APPLUS IDIADA KARCO ENGINEERING, LLC.
9270 HOLLY ROAD
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SEPTEMBER 15, 2020

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVE, SE
ROOM W43-410
WASHINGTON, DC 20590

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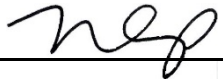
Reviewed By: 

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Approval Date: September 15, 2020

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date:

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

Date:

TECHNICAL REPORT DOCUMENTATION PAGE

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Final Report of New Car Assessment Program Testing of a 2020 Volksw agen Atlas Cross Sport 5-Door MPV NHTSA No. M20205800	September 15, 2020
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9. Performing Organization Name and Address Applus IDIADA KARCO Engineering, LLC. 9270 Holly Rd. Adelanto, CA 92301	**10. Work Unit No.**
	11. Contract or Grant No. 693JJ919D000004
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highw ay Traffic Safety Administration Office of Crashw orthiness Standards 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C. 20590	**13. Type of Report and Period Covered** Final Test Report, September 1 - Septemeber 15, 2020
	14. Sponsoring Agency Code NRM-110

15. Supplementary Notes Placards for this vehicle should be named "Atlas Cross Sport".

16. Abstract

A 56.3 km/h NCAP Frontal Impact Test w as conducted on a 2020 Volksw agen Atlas Cross Sport 5-Door MPV in accordance w ith the specifications of the Office of Crashw orthiness Standards Frontal NCAP Laboratory Test Procedure. This test w as conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and footw ell intrusion performance. The test w as conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on February September 1, 2020.

The impact velocity of the vehicle w as 56.01 km/h and the ambient temperature at the barrier face at the time of impact w as 38.3°C. The target vehicle's post-test maximum crush w as 435 mm at DPD4 to the right side of the vehicle centerline. The test vehicle's performance is as follow s:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})	N/A	700	306.8	700	276.6
Maximum Chest Compression	mm	63	-27	52	-18
Nij	N/A	1	0.30	1	0.39
Neck Tension	N	4170	1832.4	2620	574.9
Neck Compression	N	4000	-263.5	2520	-518.7
Left Femur Force	N	10000	-298.9	6805	-1319.1
Right Femur Force	N	10000	-1020.2	6805	-430.8

17. Key Words	18. Distribution Statement
56.3 km/h (35 mph) Full Frontal Rigid Barrier Impact Test New Car Assessment Program (NCAP)	Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave., SE Washington, DC 20590

19. Security Classification of this report	20. Security Classification of this page	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	142	

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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 for NCAP Full Frontal Rigid Barrier Impact Testing.

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2020 Volkswagen Atlas Cross Sport 5-Door MPV at a velocity of 56.01 km/h. The test was performed at Applus IDIADA KARCO Engineering, LLC. on September 1, 2020. 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 572E 50th percentile male anthropomorphic test device (ATD) was placed in the driver seating position and one Part 572O 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 102 channels of dummy and vehicle response data were recorded on an on-board data acquisition system. Appendix B contains the dummy response data traces.

There was 100 percent windshield retention and no 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 was 435 mm at DPD 4 to the right of vehicle centerline and 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 torso contacted the frontal airbag. Both left and right knees contacted the knee bolster.

The passenger's visible contact points were as follows: the passenger ATD's head contacted the frontal airbag and headrest. The upper 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 (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50th Male)	306.8	0.30	1832.4	-263.5	39	-27	-298.9	-1020.2
Passenger (5th Female)	276.6	0.39	574.9	-518.7	50	-18	-1319.1	-430.8

GENERAL COMMENTS

- Driver and passenger lap belt force was not installed
- Passenger chest AXR – channel failed at 64 ms.
- Load cell 103 barrier MZ channel failed resulting in no data
- Load cell 803 barrier FX channel failed resulting in no data
- Barrier load cell 109-116, DAQ module shut down due to overheating (CURNOs 611-634)

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

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: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20205800
Model Year	2020
Make	Volkswagen
Model	Atlas Cross Sport
Body Style	5-Door MPV
VIN	1V2GC2CAXLC202660
Body Color	Tourmaline Blue Metallic
Odometer Reading (km / mi)	15 / 9
Engine Displacement (L)	2.0
Type / No. of Cylinders	4 Cylinder
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	Yes
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

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

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Volkswagen Group of America
Date of Manufacture	Nov-19

GVWR (kg)	2570
GAWR Front (kg)	1300
GAWR Rear (kg)	1320

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Bench			
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				495.0	*A*
DSC x 68.04 (kg)				340.2	*B*
Cargo Weight (RCLW) (kg)				154.8	*A-B**

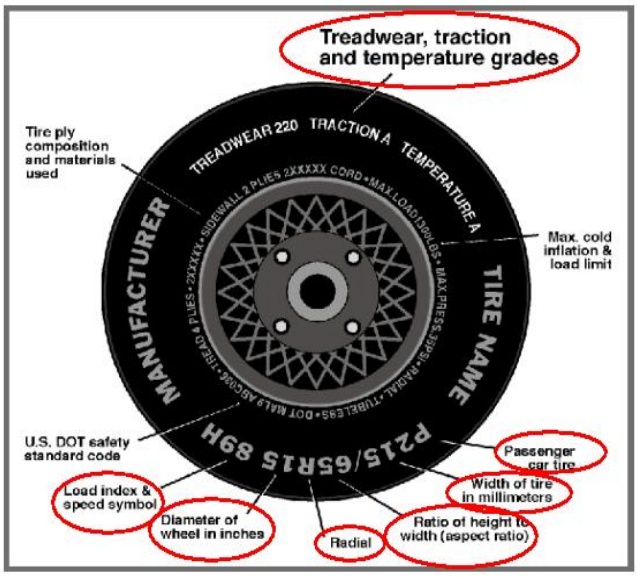
*For trucks or MPVs, if A-B>136, RCLW=136 kg

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	P245/60 R18	P245/60 R18
Tire Size on Vehicle	P245/60 R18	P245/60 R18
Tire Manufacturer	Goodyear	Goodyear
Tire Model	Assurance Finesse	Assurance Finesse
Treadwear	540	540
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 1 Polyamide	2 Polyester, 2 Steel, 1 Polyamide
Load Index / Speed Symbol	105 T	105T
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Nylon
DOT Safety Code Left	M683 KPIR 4119	M683 KPIR 4119
DOT Safety Code Right	M683 KPIR 4119	M683 KPIR 4119

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	558.0	418.0		590.0	541.5	
Right	kg	561.5	418.0		584.0	509.0	
Ratio	%	57.2%	42.8%	100.0%	52.8%	47.2%	100.0%
Total	kg	1119.5	836.0	1955.5	1174.0	1050.5	2224.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1955.5	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	136.0	C
Calculated Vehicle Target Weight (TVTW)	kg	2232.5	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	915	912	926	934	1274
As Tested	mm	912	915	913	923	1407
Post-Test	mm	900	910	903	902	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheelbase	mm	2980
Total Vehicle Length at Left Side	mm	4360
Total Vehicle Length at Centerline	mm	4960
Total Vehicle Length at Right Side	mm	4360
Weight of Ballast in Cargo Area	kg	25.5
Weight of Vehicle Components Removed	kg	28.0
Amount of Stoddard Solvent in Fuel Tank	L	38.00

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk Trim (6.5 kg), Spare Tire and Tools (21.5 kg)

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test
1	Total Length	4960
2	Total Width	1985
3	Bumper Top Height	687
4	Bumper Bottom Height	515
5	Longitudinal Member Top Height	625
6	Distance Between Longitudinal Members	860
7	Longitudinal Member Width	85
8	Engine Top Height	915
9	Engine Bottom Height	250
10	Engine and Gearbox Width	560
11	Front Bumper to Engine Distance	510
12	Front Shock Absorber Fixing Height	1000
13	Bonnet Leading Edge Height	995
14	Front Shock Absorber Fixing Width	1260
15	Front Bumper to Front Axle Distance	960
16	Front Axle to A-Pillar Distance	550
17	A-Pillar to B-Pillar Distance	960
18	B-Pillar to Rear Axle Distance	1375
19	B-Pillar to C-Pillar Distance	965
20	Roof Sill Bottom Height	1535
21	Roof Sill Top Height	1675
22	Floor Sill Bottom Height	307
23	Floor Sill Top Height	460

All measurements in millimeters.

DATA SHEET NO. 2

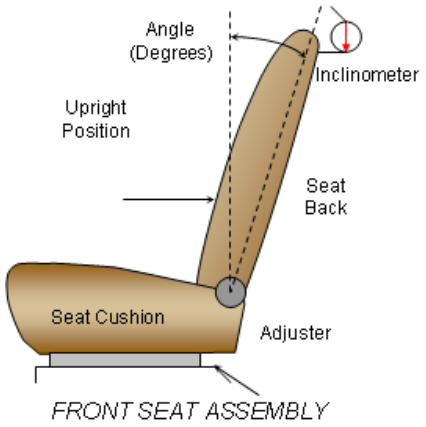
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

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 at the headrest post.

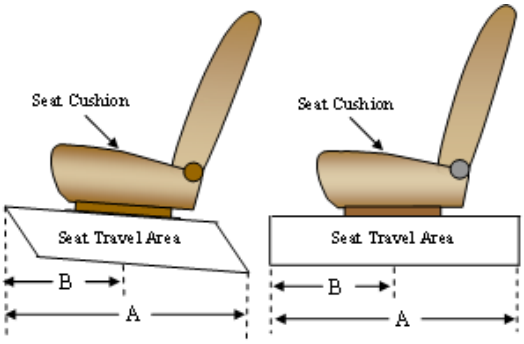


SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	14.0
Passenger Seat Back Angle	15.0

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	325 mm	163 mm
Passenger Seat	255 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 "H" is the uppermost position, followed by position "M2", followed by position "M1", and Position "L" is the lowermost position.

SEAT BELT UPPER ANCHORAGES

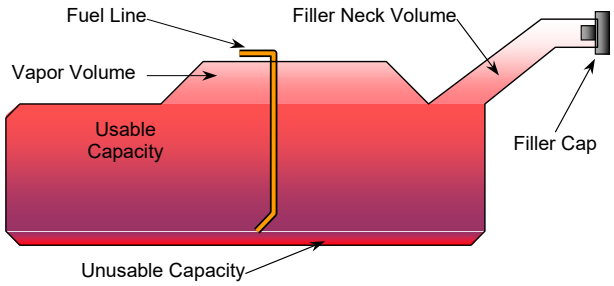
Seating Position	Total No. of Positions	Placed in Position
Driver Seat	4	H
Passenger Seat	4	H

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	70.40
Usable Capacity of "Optional Tank"	
92 - 94% of Usable Capacity	64.77 to 66.18
Actual Amount of Stoddard Solvent Used	65.49
1/3 of Usable Capacity	23.47

FUEL PUMP

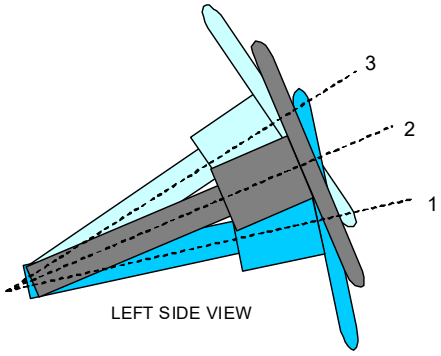
The vehicle is equipped with an electronic fuel pump. The fuel pump normally operates when the vehicle's electrical system is activated. The fuel pump operates approximately 1 second after the ignition is switched to "ON", while the engine is running, and approximately for 1.5 seconds after the engine stops running.



VEHICLE FUEL TANK ASSEMBLY

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

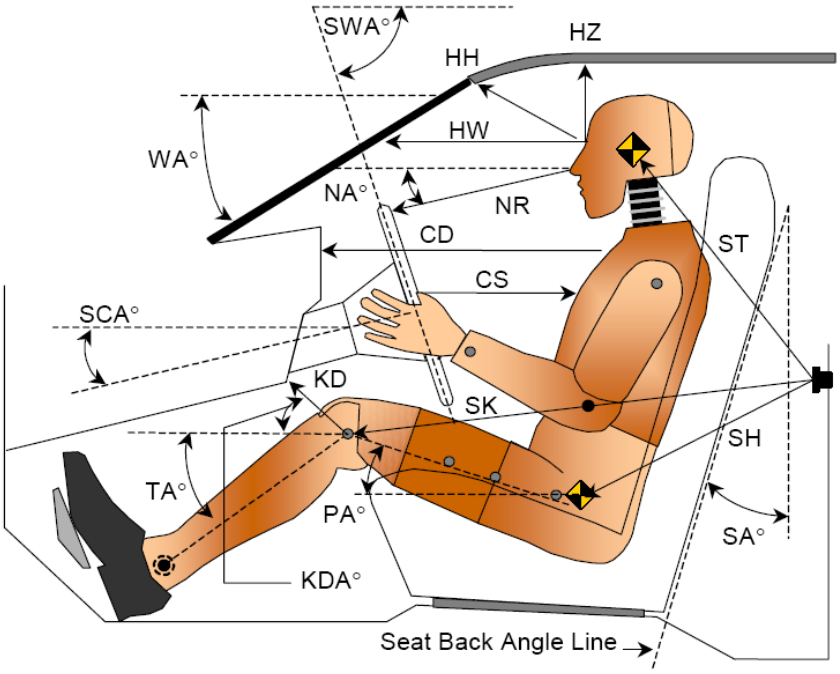
	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	22.9	78
Geometric Center Position, No. 2	25.5	105
Uppermost Position, No. 3	28.0	131
Telescoping Steering Wheel Travel		53
Test Position	25.5	105

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20



LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		31.4		
SWA°	Steering Wheel Angle		63.3		
SCA°	Steering Column Angle		26.7		
SA°	Seat Back Angle (On Headrest Post)		14.0		15.0
HZ	Head to Roof	210	90.0	228	90.0
HH	Head to Header	395	27.2	365	21.1
HW	Head to Windshield	658	0.0	650	0.0
NR	Nose to Rim	376	8.8	448	22.2
CD	Chest to Dash	521	17.6	399	1.8
CS	Chest to Steering Hub	312	0.0		
RA	Rim to Abdomen	201	0.0		
KDL	Left Knee to Dash	190	28.6	108	44.3
KDR	Right Knee to Dash	184	27.3	125	36.5
PA°	Pelvic Angle		20.6		19.8
TA°	Tibia Angle		46.1		55.3
SK	Striker to Knee	620	13.3	709	12.9
ST	Striker to Head	425	70.0	403	59.1
SH	Striker to H-Point	335	49.6	423	32.0

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

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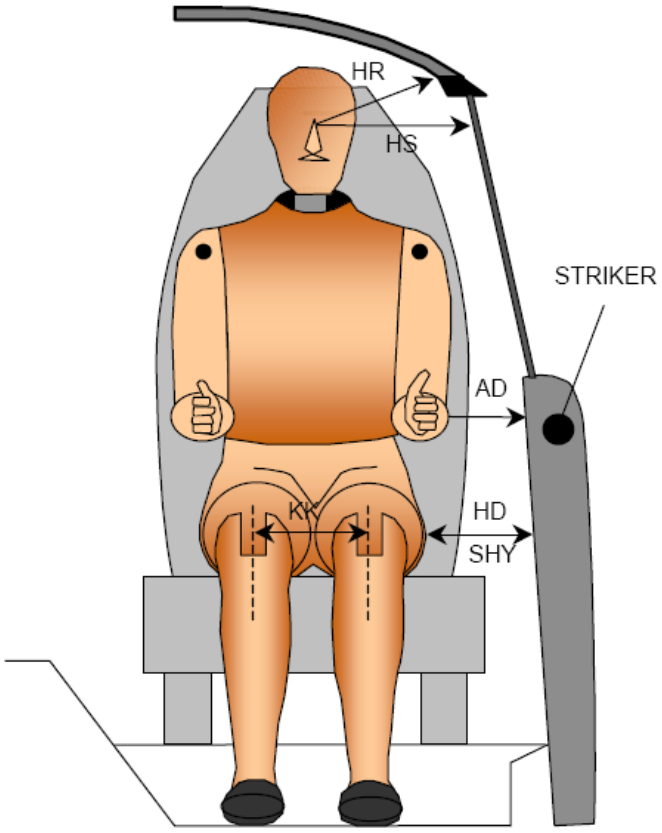

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	151	113
HD	H-Point to Door	158	190
HR	Head to Side Header	252	273
HS	Head to Side Window	390	420
KK	Knee to Knee	315	215
SHY	Striker to H-Point (Y-Direction)	265	298
AA	Ankle to Ankle	310	180

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

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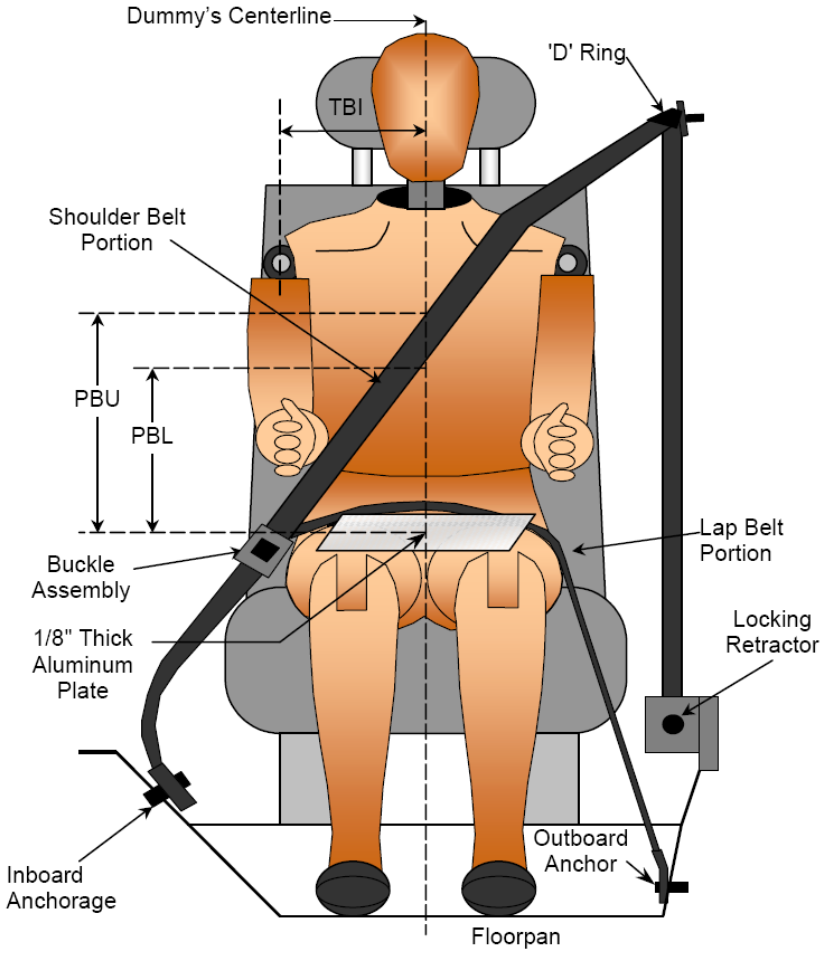


FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Code	Measurement Description	Units	Driver	Passenger
PBU	Top Surface of Aluminum Plate to Belt Upper Edge	mm	330	260
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	255	185

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	925	975
Lap Belt Length as Measured on ATD	mm	909	909
Remainder of Belt on Reel	mm	860	765
Total Belt Length for Continuous Webbing Systems	mm	2694	2649

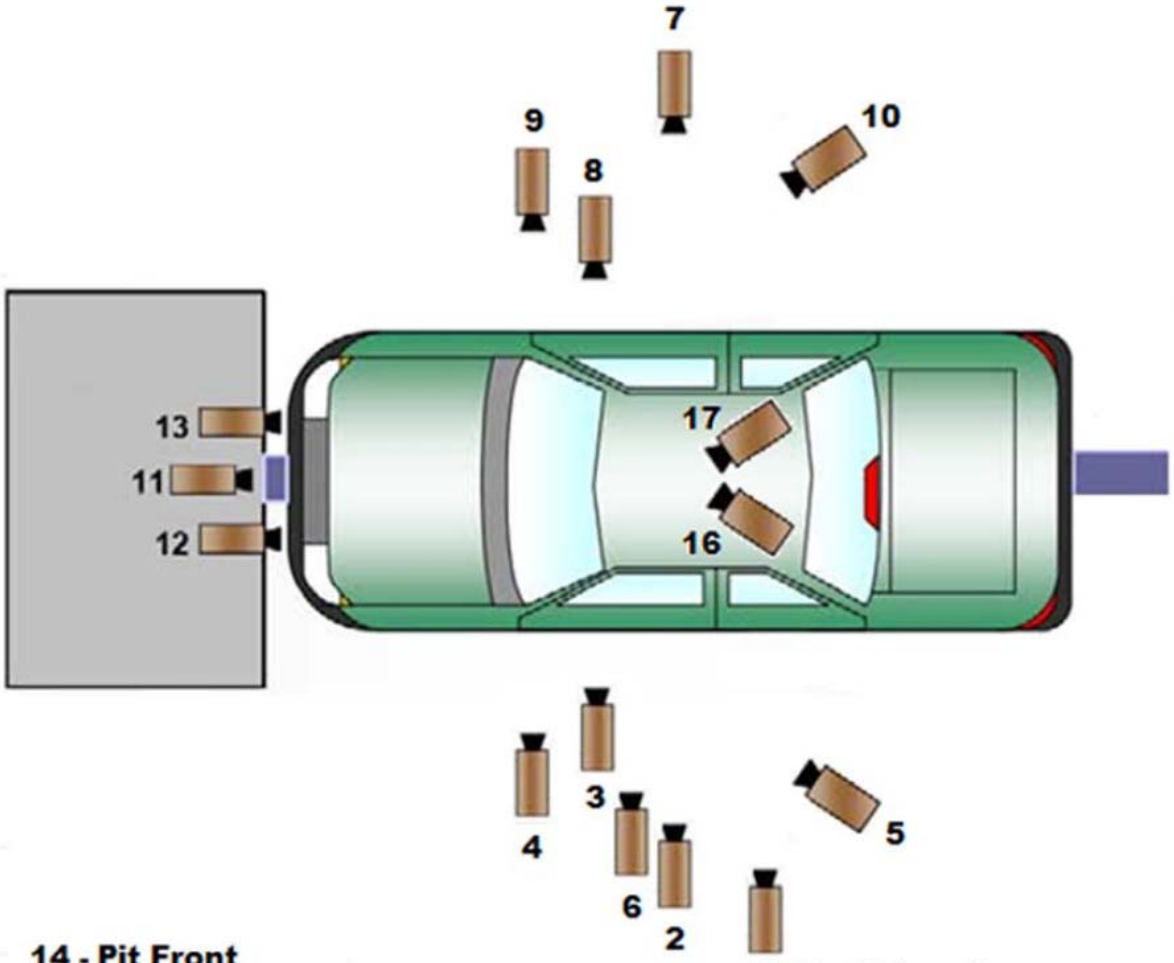
DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

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: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

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	20	1000
15	Pit Rear	-3398	0	1495	20	1000
16	Driver Onboard	1200	-380	-1580	6	1000
17	Passenger Onboard	1200	380	-1580	6	1000

Coordinates: +X = forward impact plane

+Y = right of monorail center

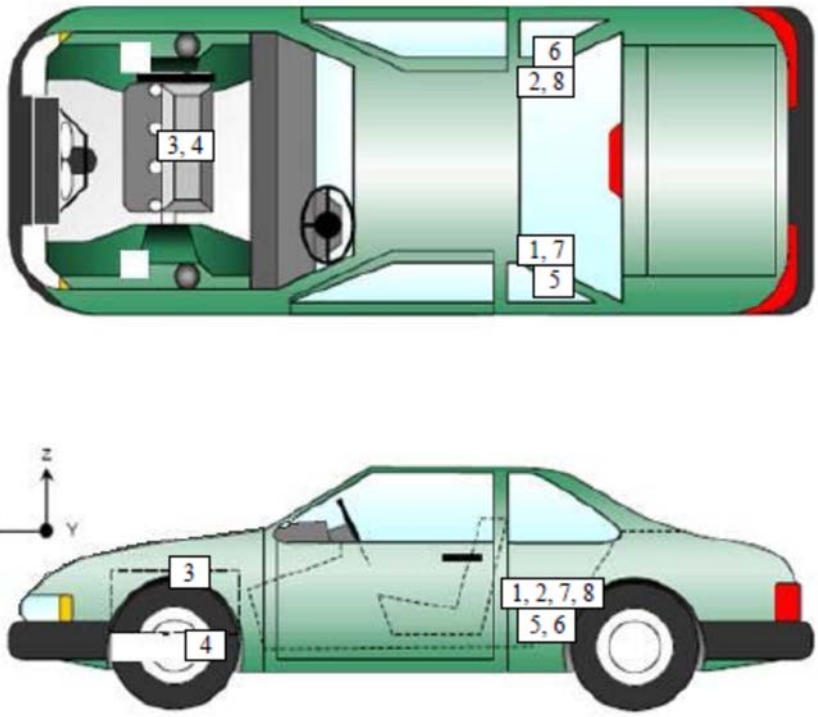
+Z = into ground

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Accelerometer X-Direction	3110	-820	-310
2	Right Rear Accelerometer X-Direction	3110	820	-310
3	Engine Top X	610	250	-800
4	Engine Bottom X	630	110	-410
5	Left Rear Accelerometer Z-Direction	3110	-820	-310
6	Right Rear Accelerometer Z-Direction	3110	820	-310
7	Left Rear Accelerometer X-Direction Redundant	3110	-820	-310
8	Right Rear Accelerometer X-Direction Redundant	3110	820	-310

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

Y – Vehicle Centerline (+ to right)

Z – Ground Plane (+ down)

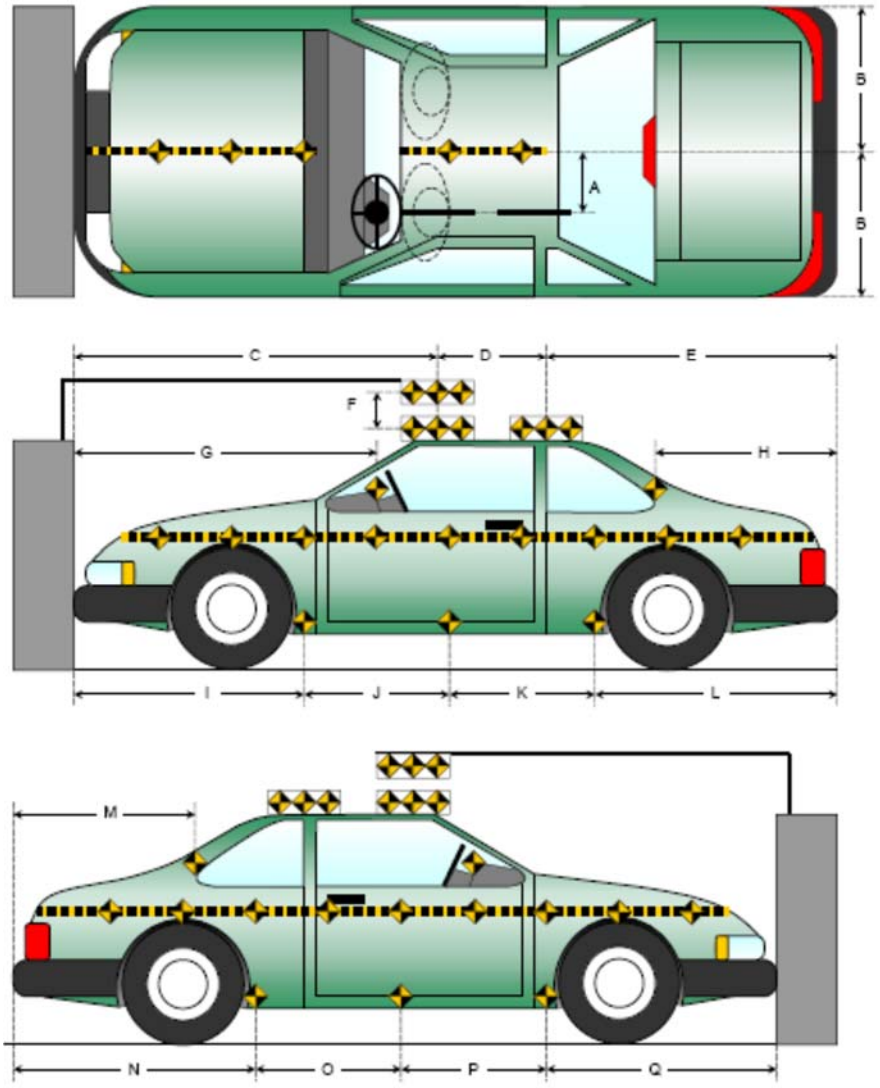
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

Item	Value
A	430
B	993
C	2130
D	610
E	2193
F	305
G	1815
H	800
I	1462
J	995
K	995
L	1498
M	800
N	1498
O	995
P	995
Q	1462



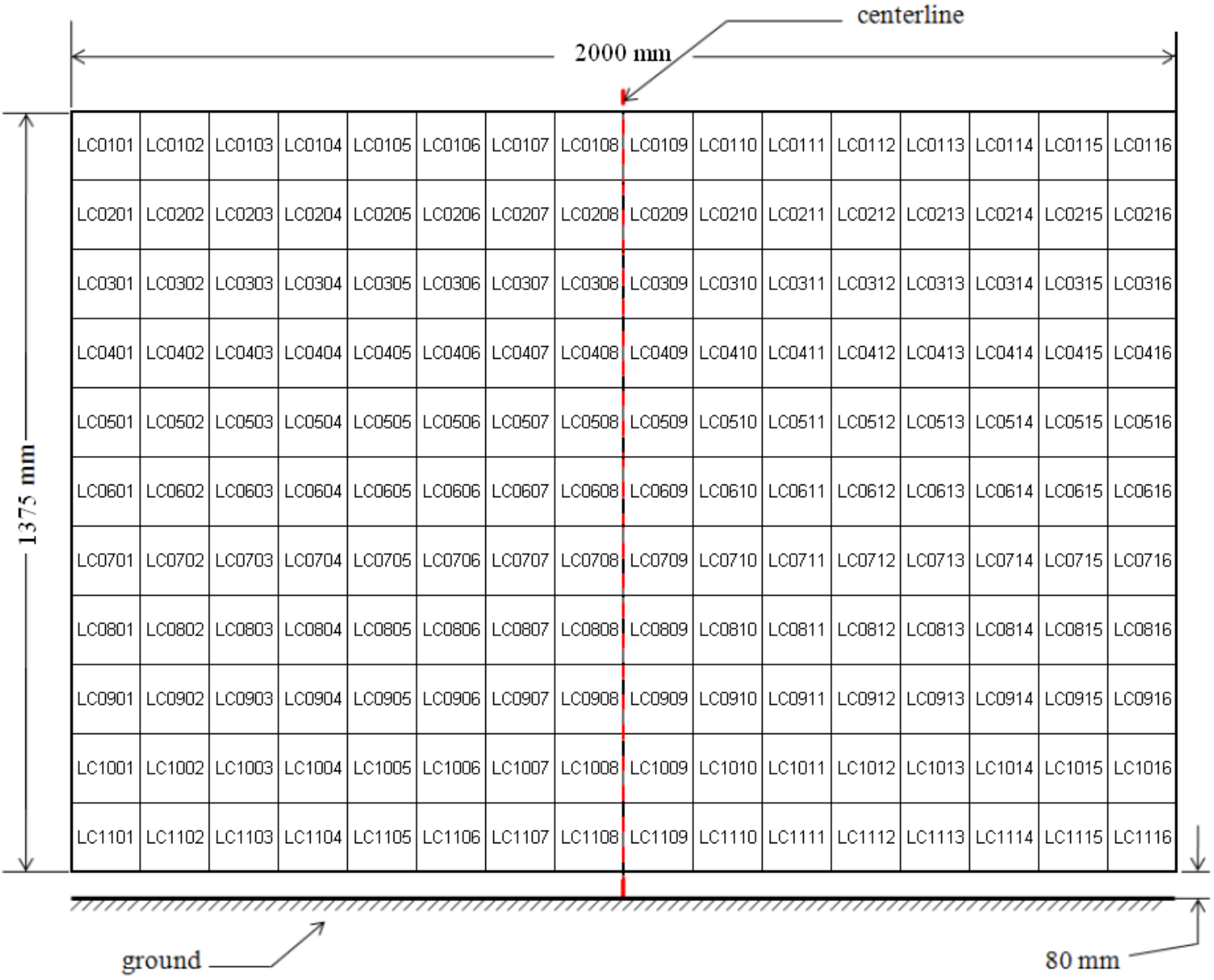
All measurements in millimeters.

DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20



DATA SHEET NO. 10

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

INSTRUMENTATION

Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	8
Load Cell Barrier	528
Total	630

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: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type/Serial No.	P572E 50th Percentile Male ATD / 360	P572O 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 Airbag
Left Knee Contact	Knee Bolster	Knee Bolster
Right Knee Contact	Knee Bolster	Knee Bolster

DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION

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

OTHER VEHICLE POST-TEST OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	2200
Center	mm	2063
Right Side	mm	2215
Average	mm	2159

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

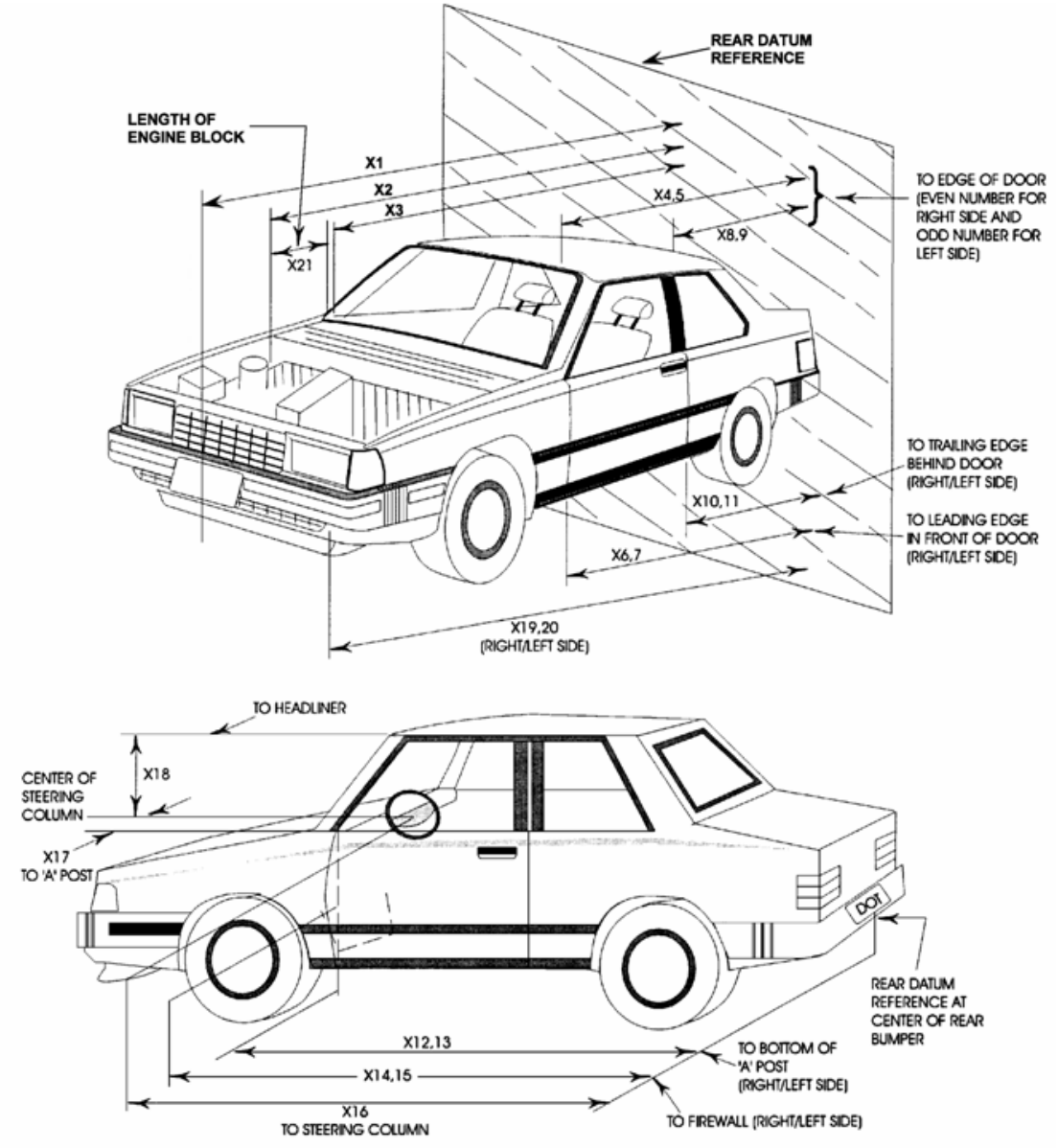
Restraint Type	Driver		Passenger	
	Installed	Operated	Installed	Operated
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 (Curtain)	Yes	Yes	Yes	Yes
Side Airbag 2 (Torso/Pelvis)	Yes	No	Yes	No
Knee Airbag	No		No	
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes

DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20



DATA SHEET NO. 12 … (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4960	4650	-310
2	Rear Surface of Vehicle to Front of Engine	4450	4410	-40
3	RSOV to Firewall	3825	3800	-25
4	RSOV to Upper Leading Edge of Right Door	3450	3448	-2
5	RSOV to Upper Leading Edge of Left Door	3450	3450	0
6	RSOV to Lower Leading Edge of Right Door	3437	3436	-1
7	RSOV to Lower Leading Edge of Left Door	3437	3436	-1
8	RSOV to Upper Trailing Edge of Right Door	2300	2300	0
9	RSOV to Upper Trailing Edge of Left Door	2300	2301	1
10	RSOV to Lower Trailing Edge of Right Door	2383	2381	-2
11	RSOV to Lower Trailing Edge of Left Door	2383	2383	0
12	RSOV to Bottom of A-Pillar, Right Side	3372	3372	0
13	RSOV to Bottom of A-Pillar, Left Side	3370	3369	-1
14	RSOV to Firewall, Right Side	3800	3780	-20
15	RSOV to Firewall, Left Side	3800	3790	-10
16	RSOV to Steering Column	2980	3010	30
17	Center of Steering Column to A-Pillar	450	448	-2
18	Center of Steering Column to Headliner	423	420	-3
19	RSOV to Right Side of Front Bumper	4360	4260	-100
20	RSOV to Left Side of Front Bumper	4360	4250	-110
21	Length of Engine Block	520	520	0
RD	RSOV to Right Side of Dash Panel	3185	3183	-2
CD	RSOV to Center of Dash Panel	3080	3080	0
LD	RSOV to Left Side of Dash Panel	3185	3185	0

All measurements in millimeters.

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

VEHICLE INFORMATION

VIN: 1V2GC2CAXLC202660 Wheelbase (mm): 2980

Vehicle Size Category: MPV Test Weight (kg): 2224.5

ACCELEROMETER DATA

Accelerometer Locations: Left Rear Crossmember

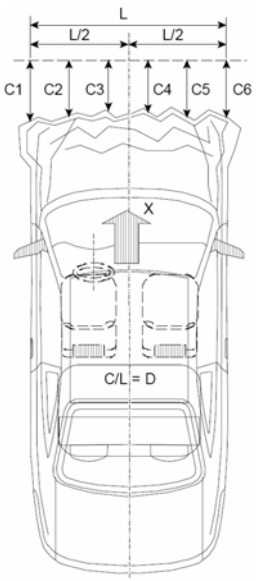
Cal. Procedure/Interval: Vibration Test / 6 months

Integration Algorithm: NHTSA Standard Linearity: Good

Impact Velocity (km/h): 56.01

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): 1485

Impact Mode: Full Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	180	325	145
C2	Crush Zone 2 at Left Side	mm	30	405	375
C3	Crush Zone 3 at Left Side	mm	10	420	410
C4	Crush Zone 4 at Right Side	mm	10	445	435
C5	Crush Zone 5 at Right Side	mm	30	450	420
C6	Crush Zone 6 at Right Side	mm	180	495	315
L	C1 to C6	mm	1485		

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

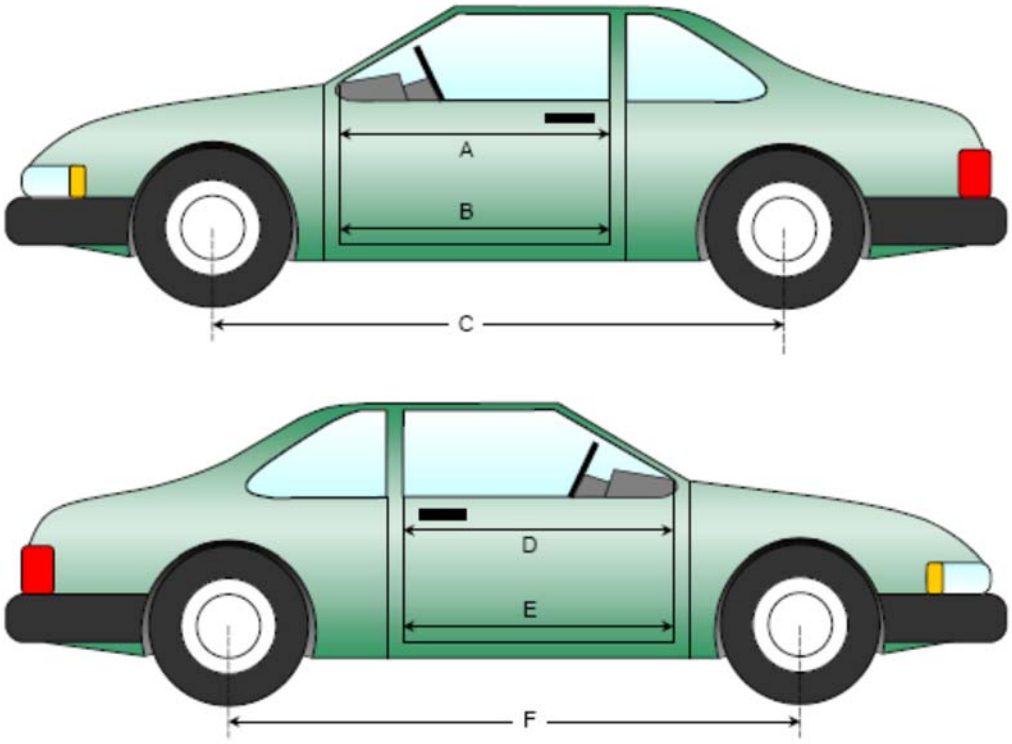
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	960	961	-1
B	Left Side Lower	mm	852	850	2
D	Right Side Upper	mm	965	963	2
E	Right Side Lower	mm	850	848	2

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2980	2960	20
F	Right Side Wheelbase	mm	2980	2970	10



DATA SHEET NO. 14 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

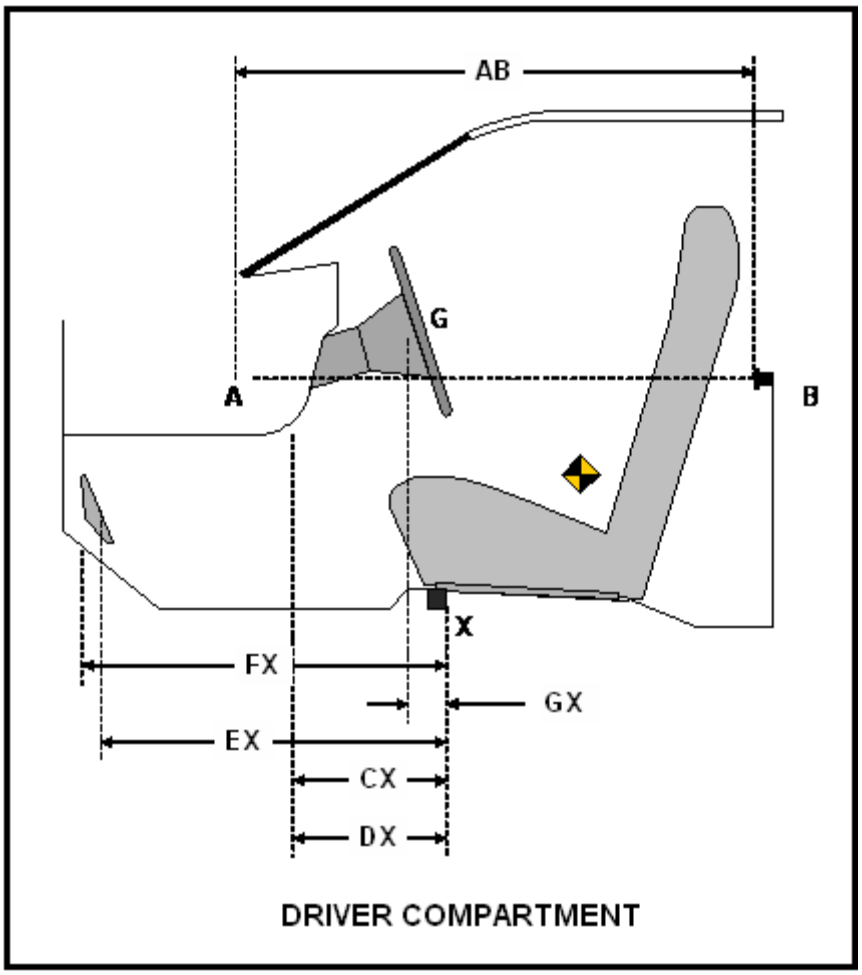
Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	837	840	-3
CX	Left Knee Bolster to X	mm	290	281	9
DX	Right Knee Bolster to X	mm	280	282	-2
EX	Brake Pedal to X	mm	520	520	0
FX	Foot Rest to X	mm	595	595	0
GX	Center of Steering Wheel Hub to X	mm	110	120	-10

X = Front of Seat Track (Stationary)



DRIVER COMPARTMENT

DATA SHEET NO. 15

SUMMARY OF INDICANT FMVSS 212 AND 219 (PARTIAL) DATA

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

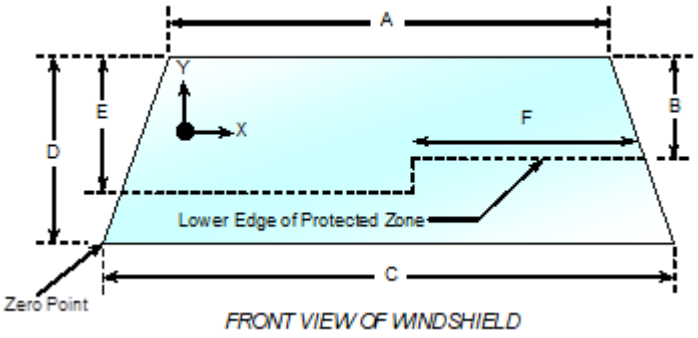
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber molding and rubber cement.

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: 21.1° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2414	2414	100.0%
Right Side	2414	2414	100.0%
Total	4828	4828	100.0%



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1386
B	mm	322
C	mm	1760
D	mm	820
E	mm	1650
F	mm	585

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: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 38.3° C Test Time: 3:53 PM

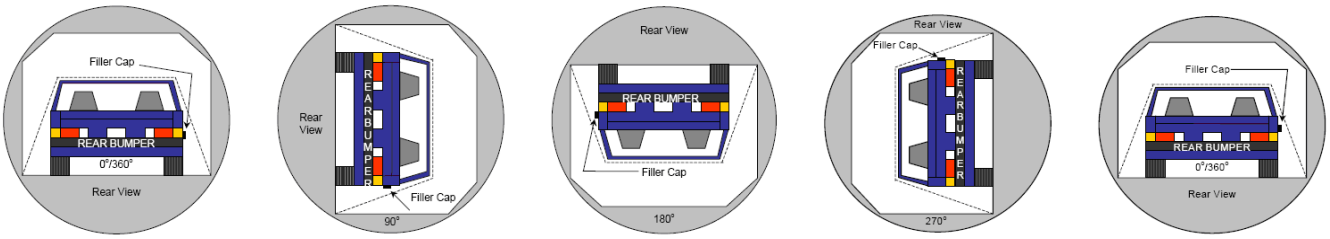
Stoddard Solvent Spillage Measurements

A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable = 1 oz.)

B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable = 5 oz.)

C. For the following 25 minutes: 0 oz.
(Maximum allowable = 1 oz./minute)

D. Spillage: There was no Stoddard solvent 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: There was no Stoddard solvent spillage.

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	82	300	382
90° To 180°	83	300	383
180° To 270°	86	300	386
270° To 360°	82	300	382

DATA SHEET NO. 16 … (CONTINUED)

FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20

FMVSS 301 SPILLAGE TABLE

Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° To 90°	0			
90° To 180°	0			
180° To 270°	0			
270° To 360°	0			

SOLVENT SPILLAGE LOCATION TABLE

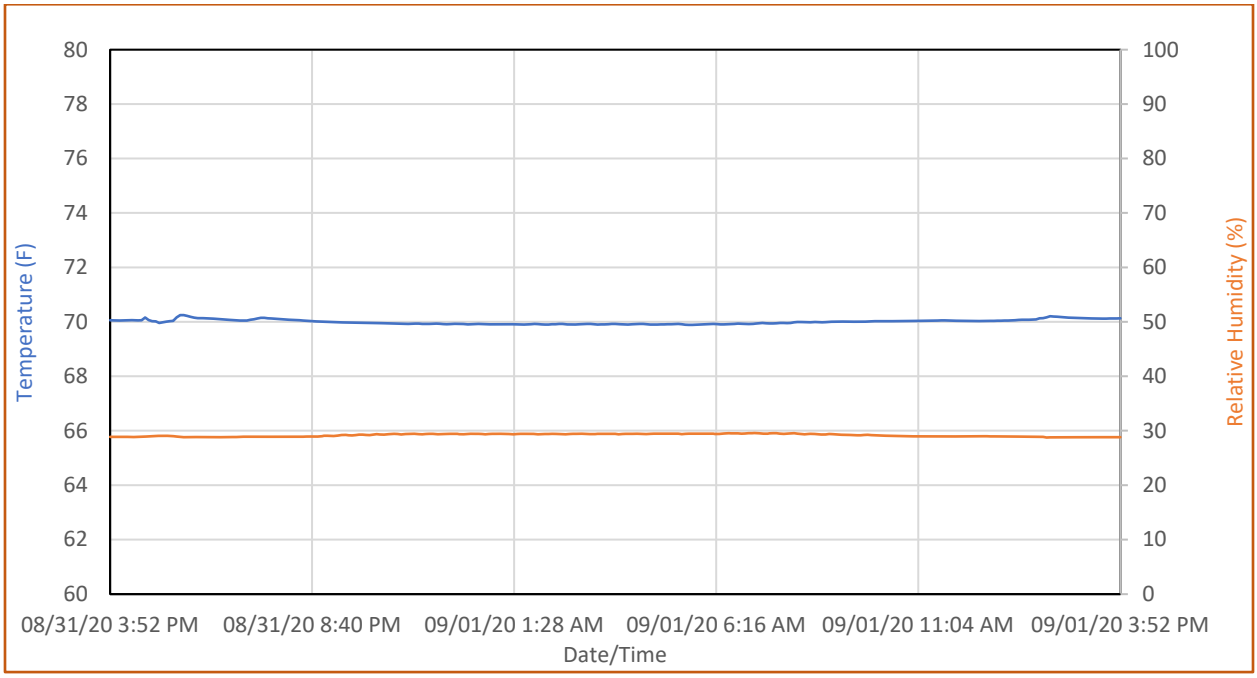
Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 17

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2020 Volkswagen Atlas Cross Sport 5-Door MPV NHTSA No.: M20205800

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/01/20



APPENDIX A
PHOTOGRAPHIC DOCUMENTATION

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS … (CONTINUED)

TABLE OF PHOTOGRAPHS … (CONTINUED)

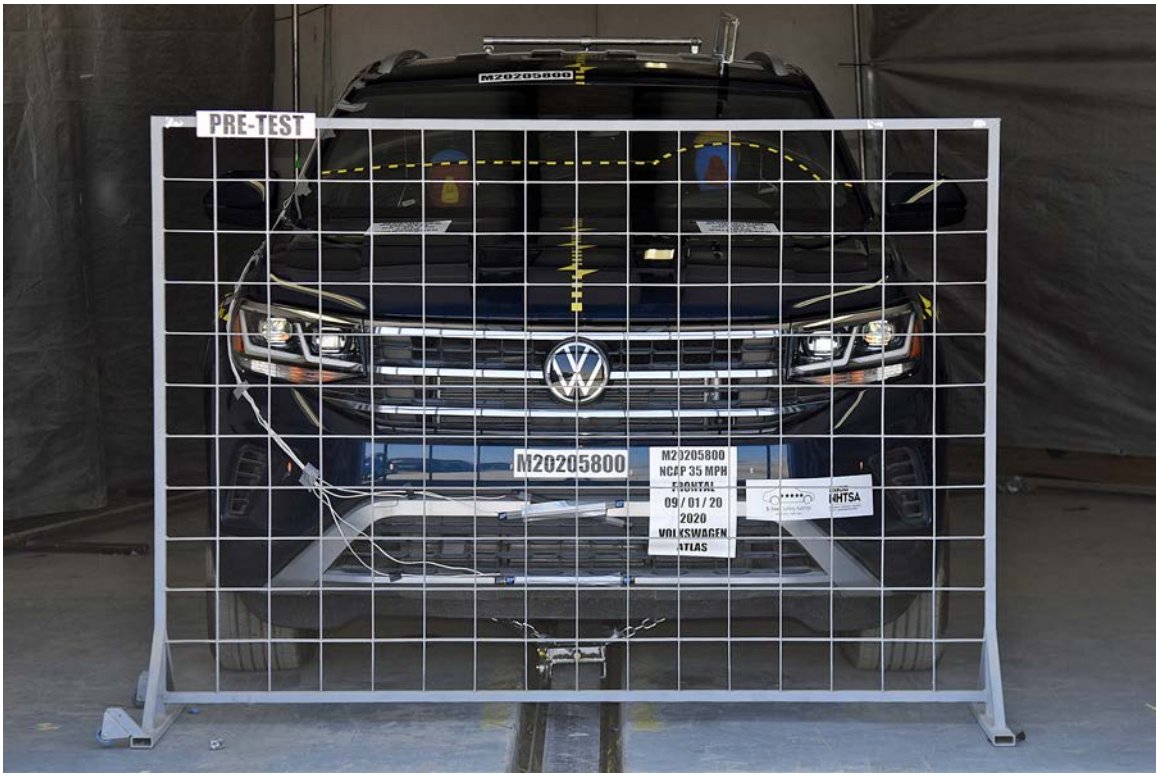


FIGURE 1. Load Cell Location

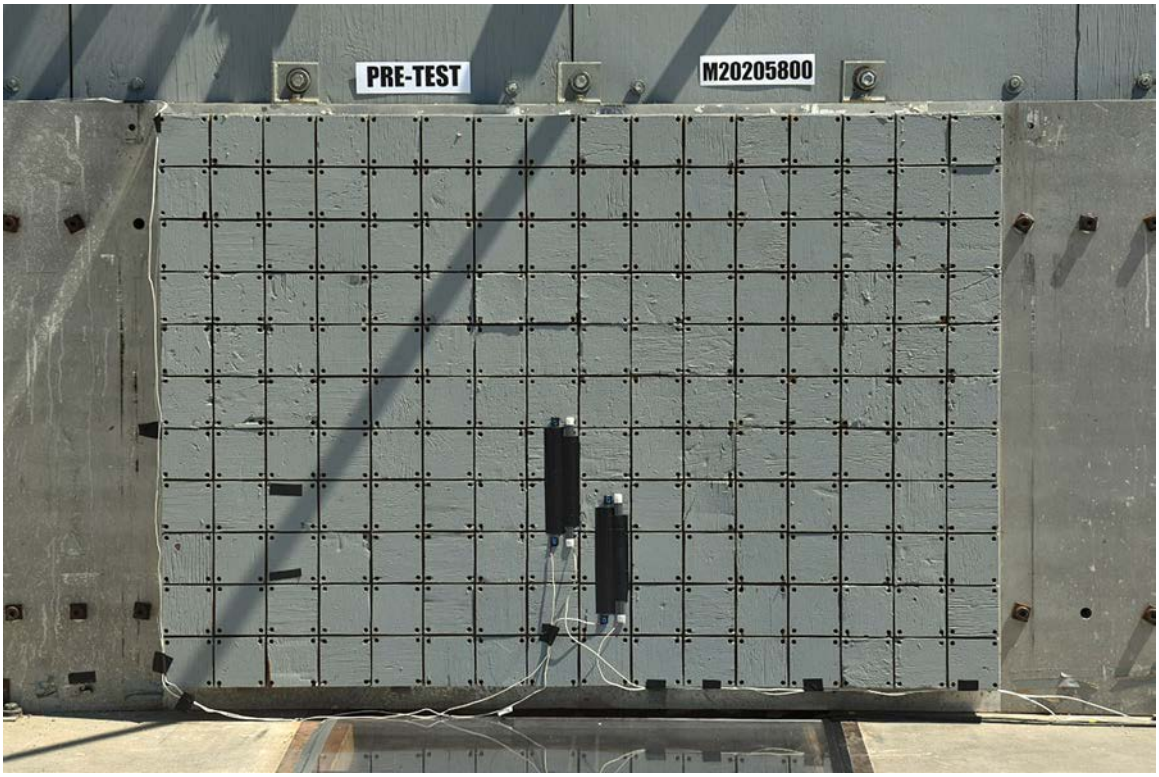


FIGURE 2. Pre-Test Load Cell Wall

FIGURE 3. Post-Test Load Cell Wall

FIGURE 4. Manufacturer's Label

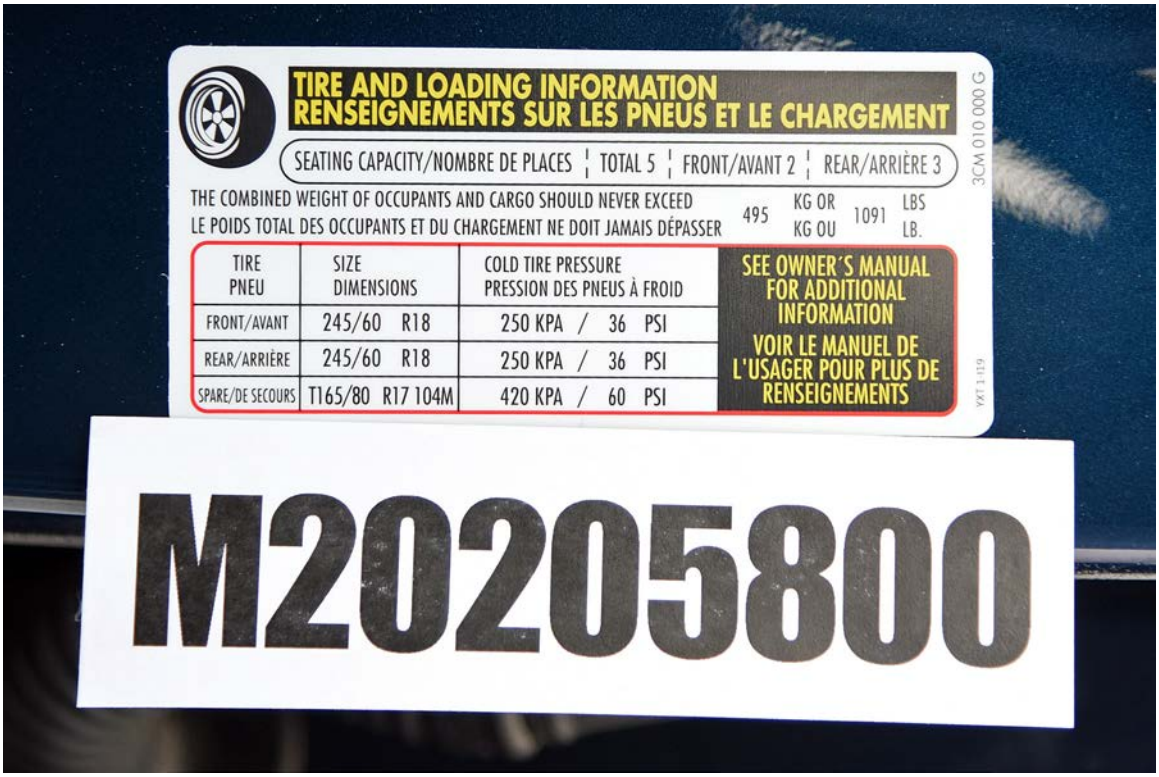


FIGURE 5. Tire Placard

FIGURE 6. 2020 Nissan Sentra Frontal as Delivered

FIGURE 7. Left Rear ¾ View, as Received

FIGURE 8. Pre-Test Front View of Test Vehicle

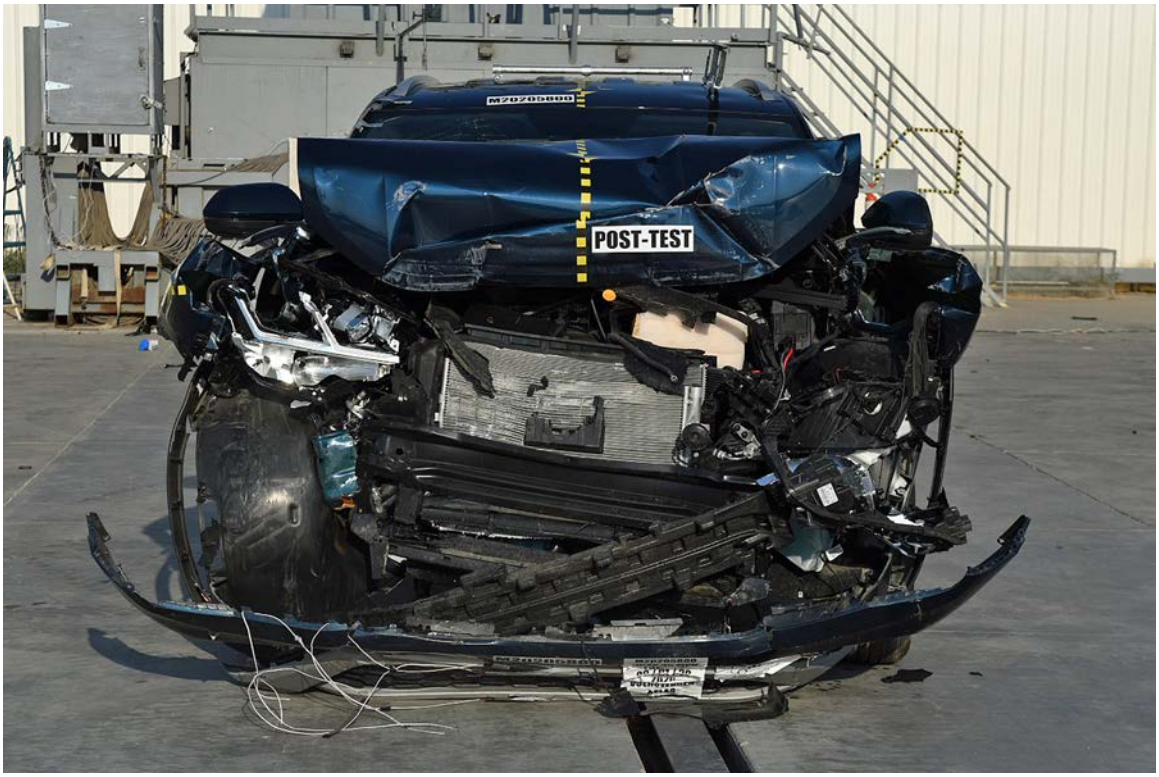


FIGURE 9. Post-Test Front View of Test Vehicle

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

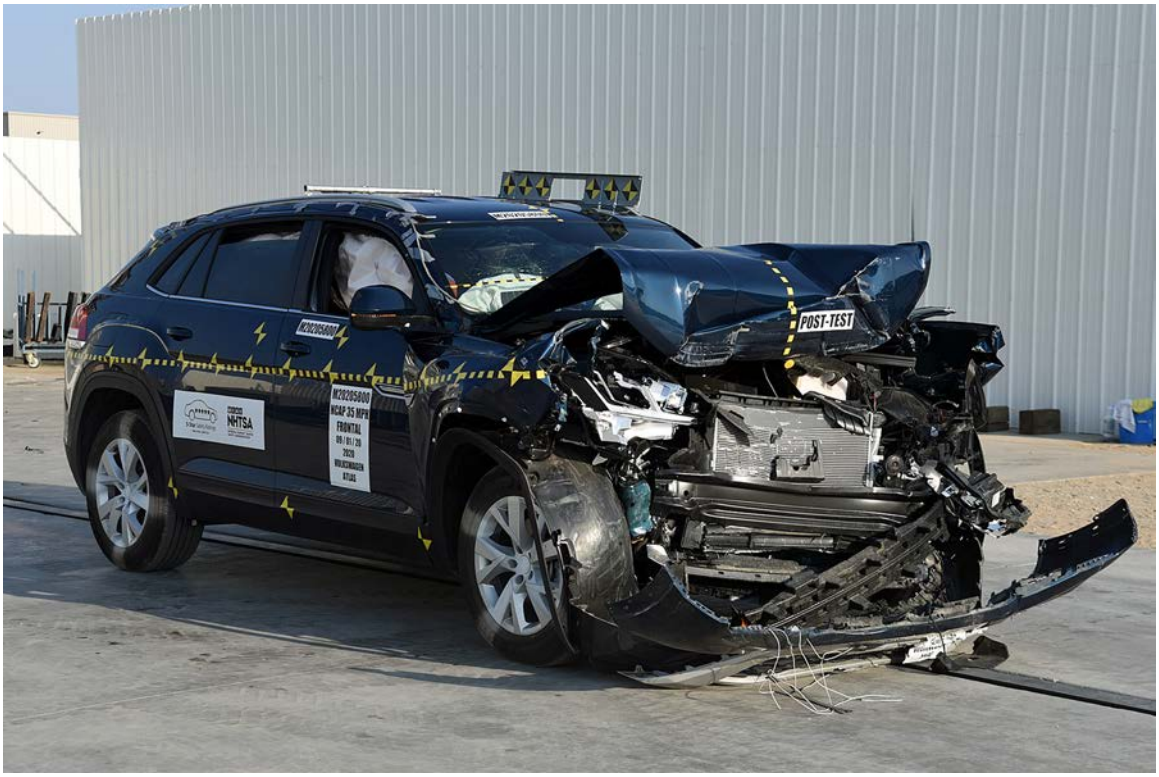


FIGURE 15. Post-Test Right Front ¾ View

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

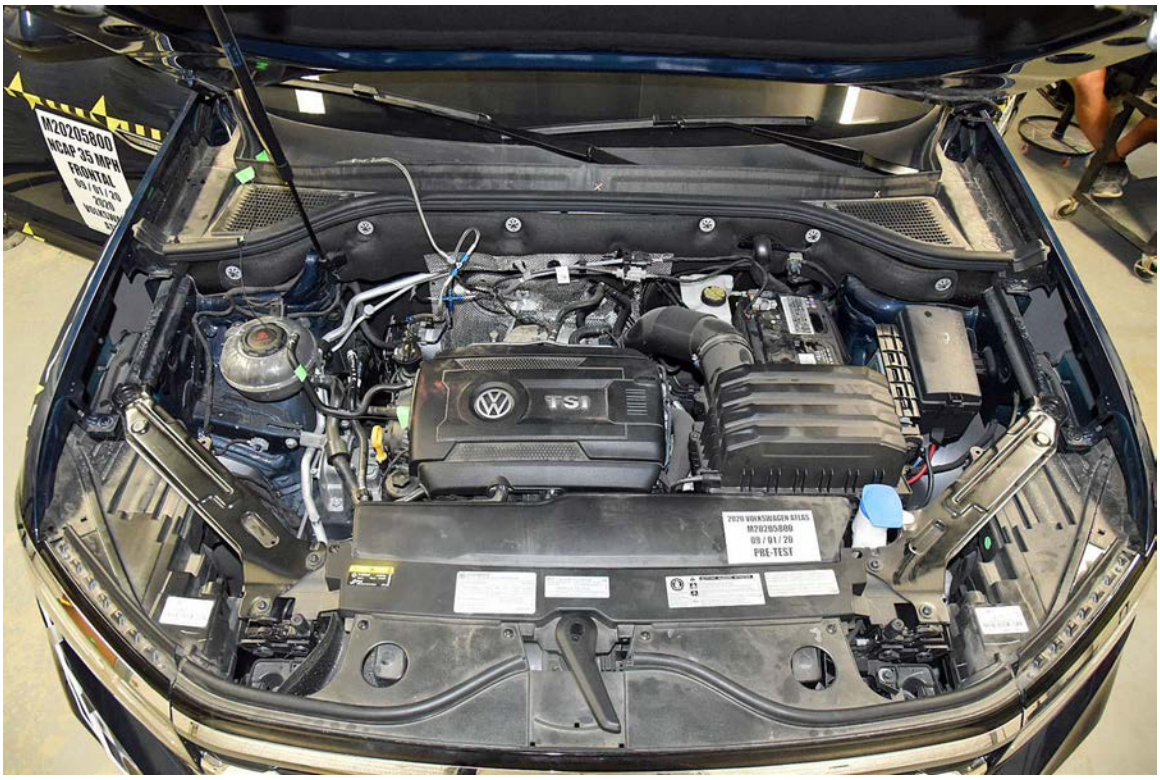


FIGURE 20. Pre-Test Engine Compartment View

FIGURE 21. Post-Test Engine Compartment View

FIGURE 22. Pre-Test Fuel Filler Cap View

FIGURE 23. Post-Test Fuel Filler Cap View

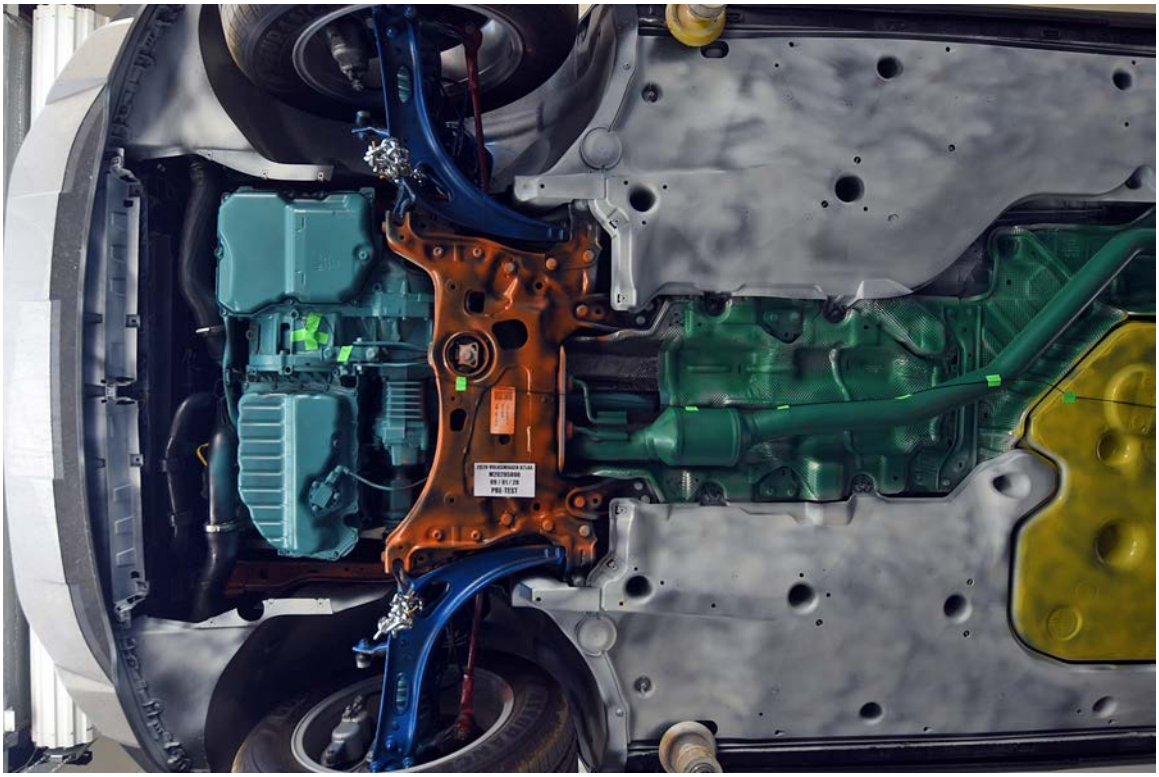


FIGURE 24. Pre-Test Front Underbody View

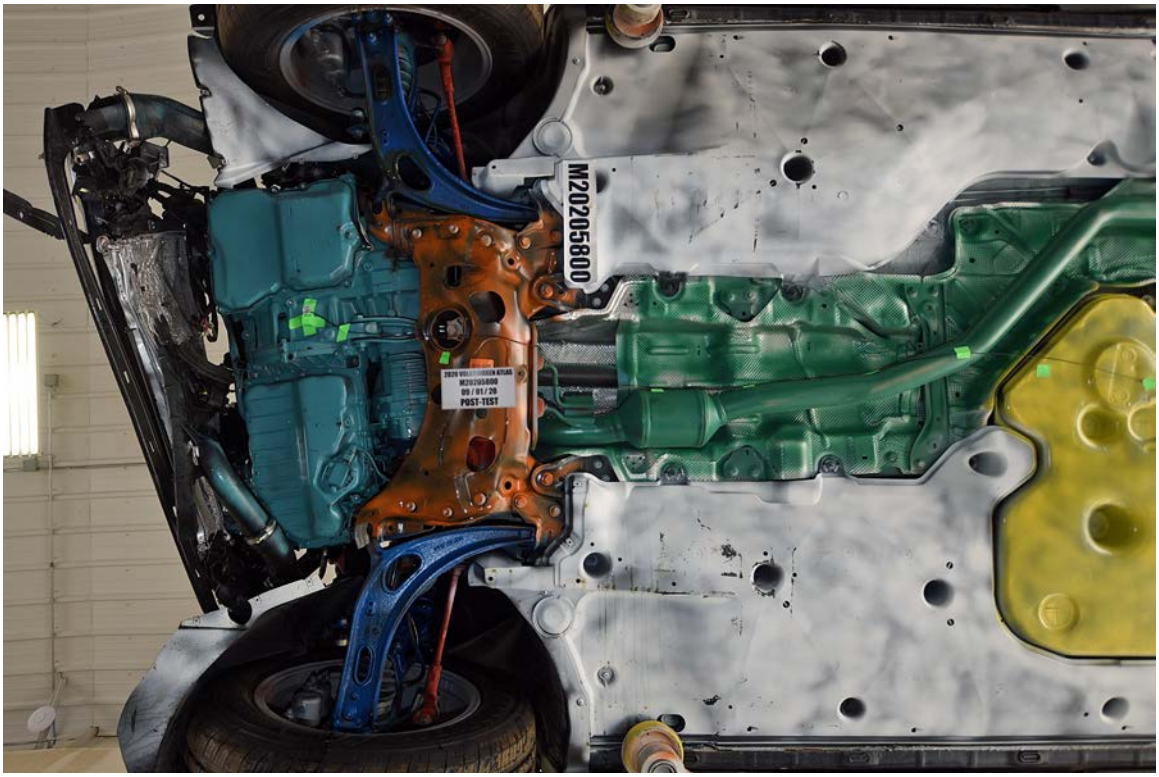


FIGURE 25. Post-Test Front Underbody View

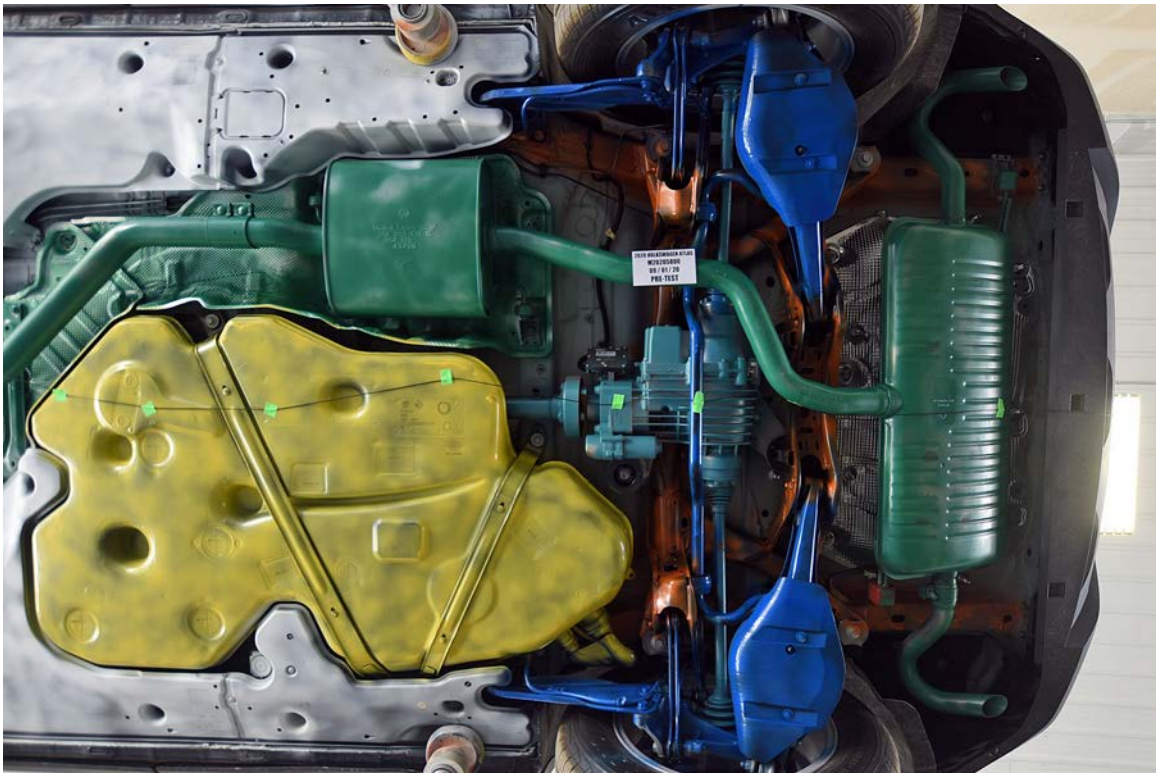


FIGURE 26. Pre-Test Rear Underbody View

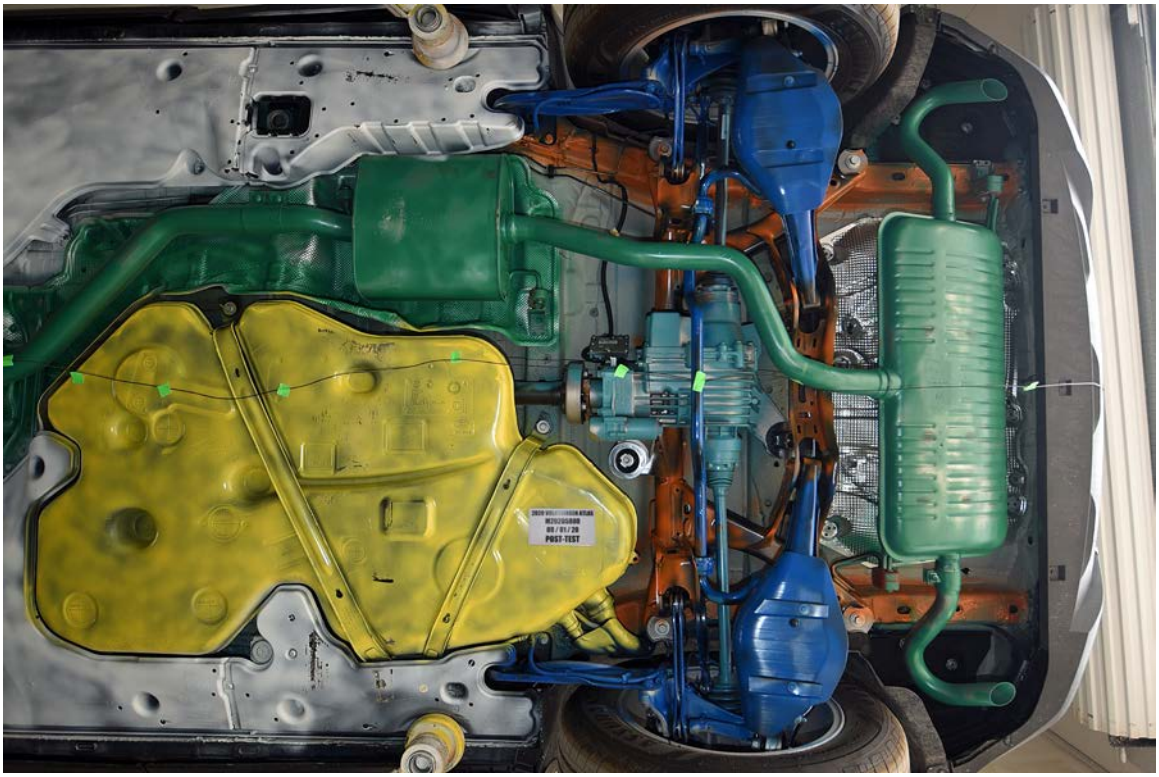


FIGURE 27. Post-Test Rear Underbody View

FIGURE 28. Pre-Test Dummy Cable Routing

FIGURE 29. Post-Test Dummy Cable Routing

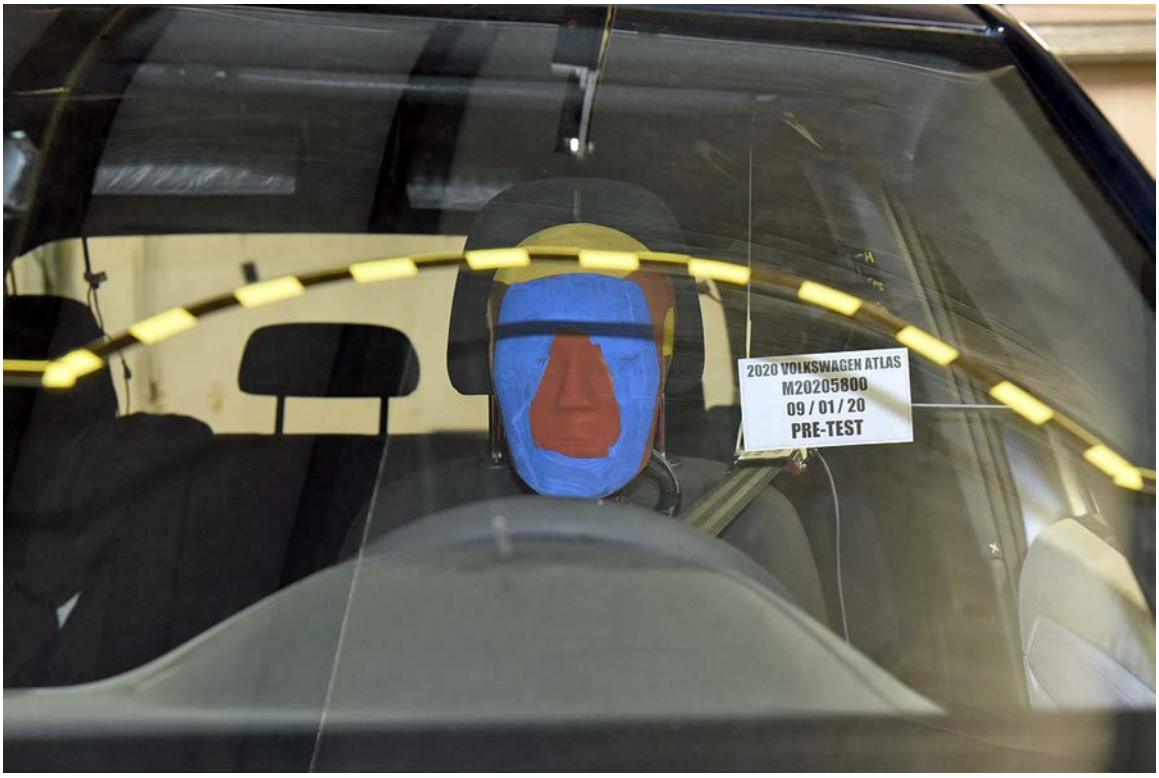


FIGURE 30. Pre-Test Driver Dummy Front View

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

Photograph Not Available

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 Bolster

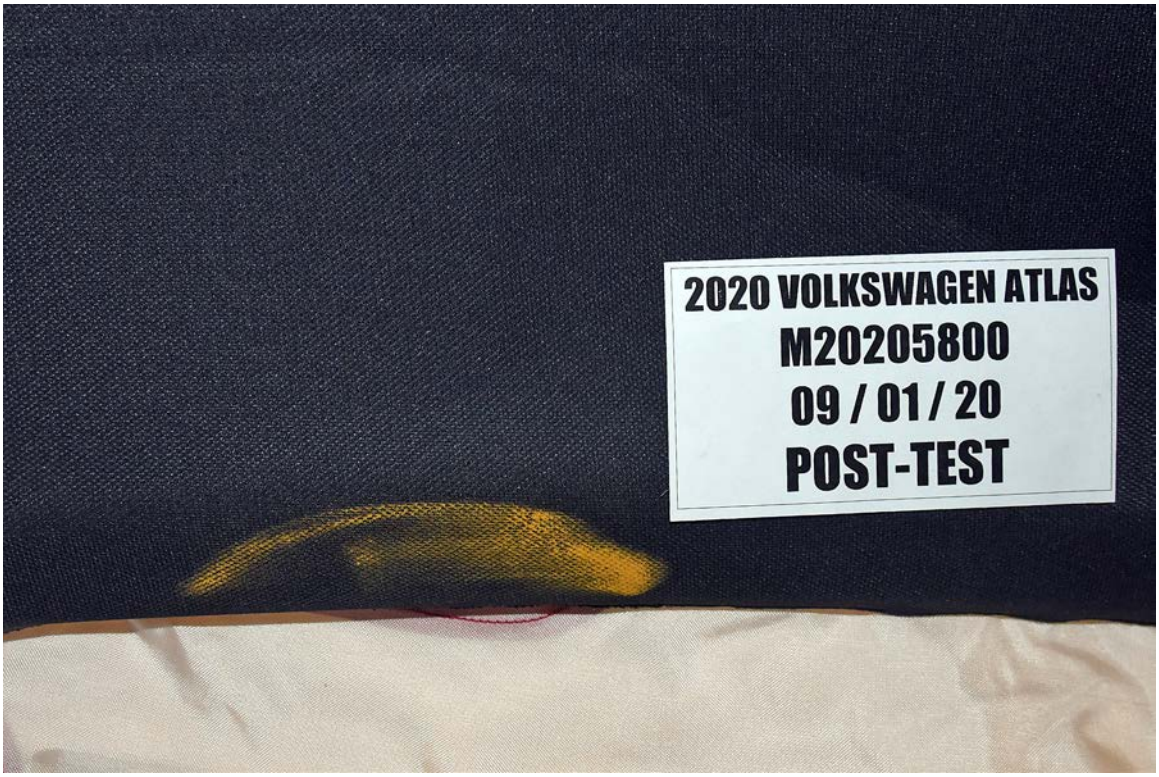


FIGURE 50b. Post-Test Driver Dummy Contact with Headliner

FIGURE 51. Pre-Test View of the Steering Wheel

FIGURE 52. Post-Test View of the Steering Wheel

FIGURE 53. Pre-Test Passenger Dummy Front View

FIGURE 54. Post-Test Passenger Dummy Front View

FIGURE 55. Pre-Test Passenger Dummy Window View

FIGURE 56. Post-Test Passenger Dummy Window View

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

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

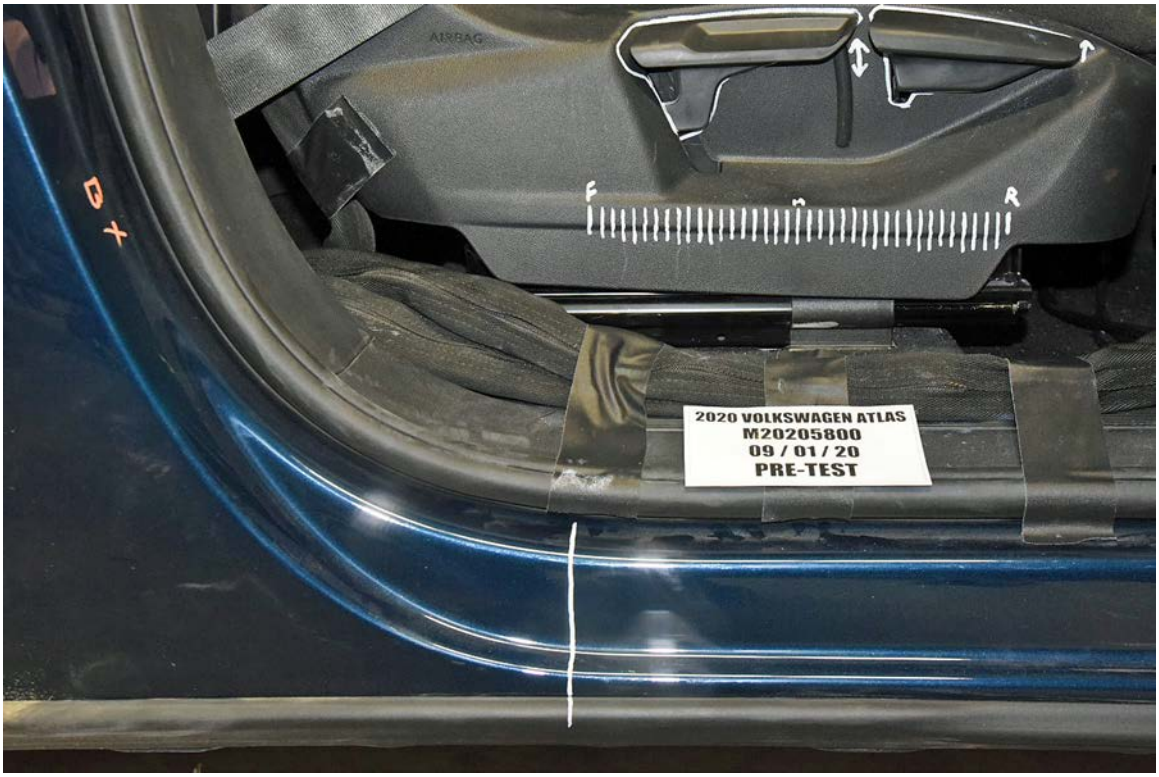


FIGURE 59. Pre-Test Passenger's Seat Fore-Aft Markings

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

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

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

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

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

FIGURE 65. Pre-Test Passenger Dummy Feet

FIGURE 66. Post-Test Passenger Dummy Feet

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

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

FIGURE 69. Pre-Test Passenger's Side Floorpan

FIGURE 70. Post-Test Passenger's Side Floorpan

FIGURE 71. Post-Test Passenger Dummy Face

FIGURE 72. Post-Test Passenger Dummy Contact with Airbag

FIGURE 73. Post-Test Passenger Dummy Contact with Headrest

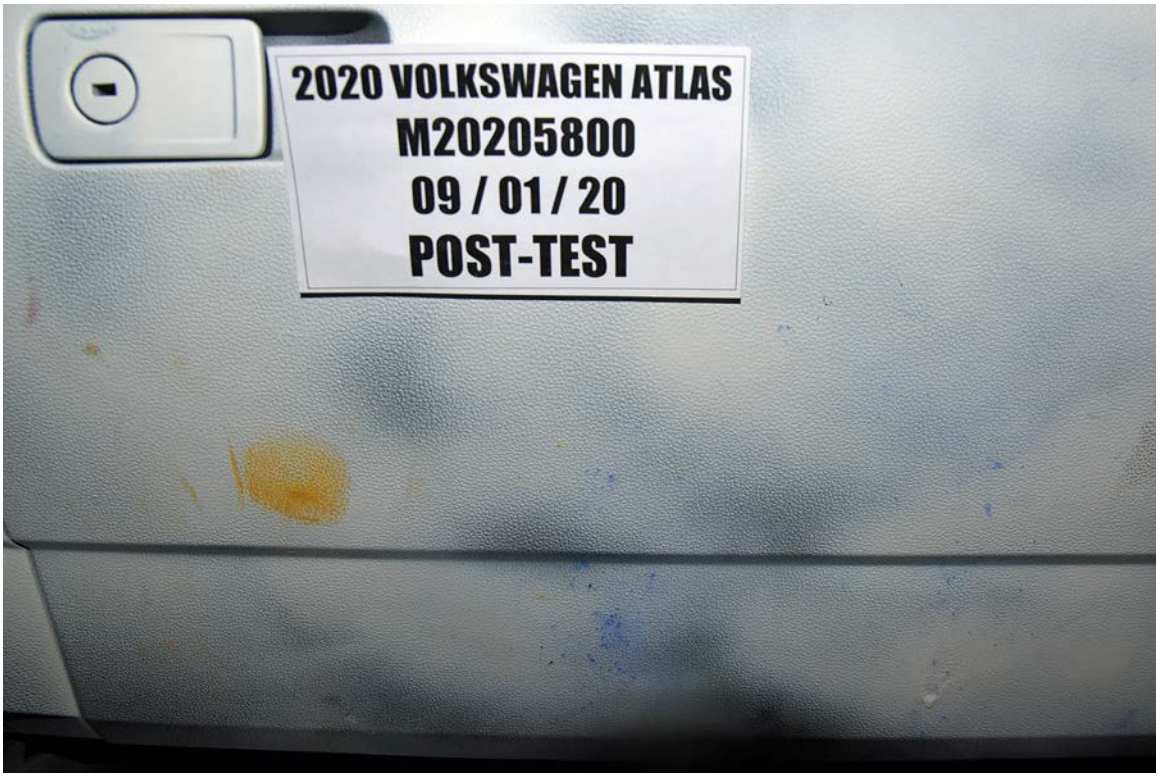


FIGURE 73a. Post-Test Passenger Dummy Contact with Knee Bolster

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

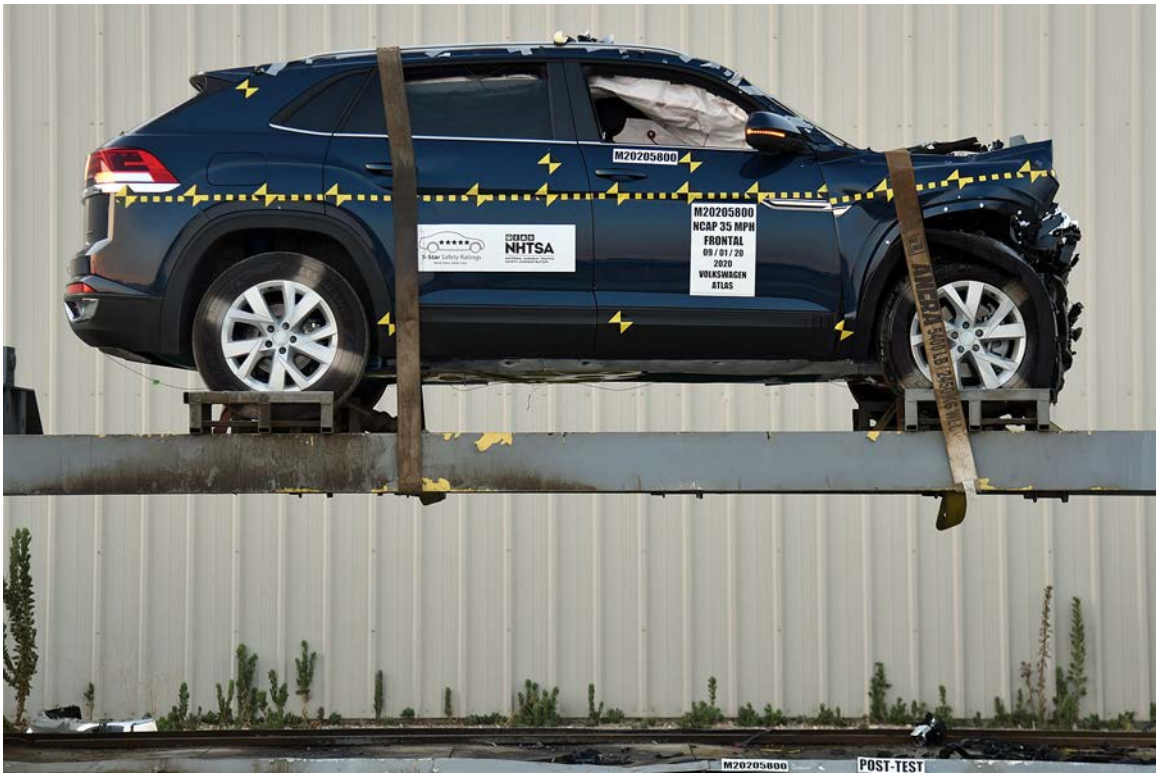


FIGURE 77. Vehicle at 0° on Static Rollover Device

FIGURE 78. Vehicle at 90° on Static Rollover Device

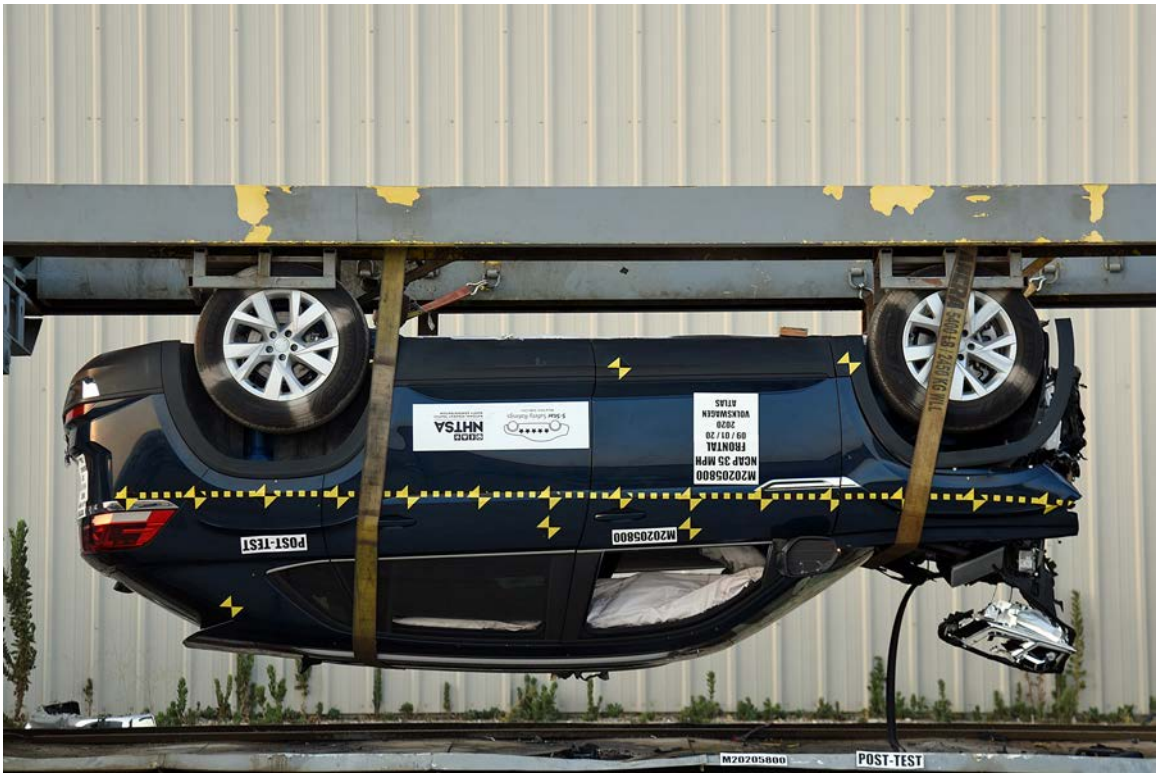


FIGURE 79. Vehicle at 180° on Static Rollover Device

FIGURE 80. Vehicle at 270° on Static Rollover Device

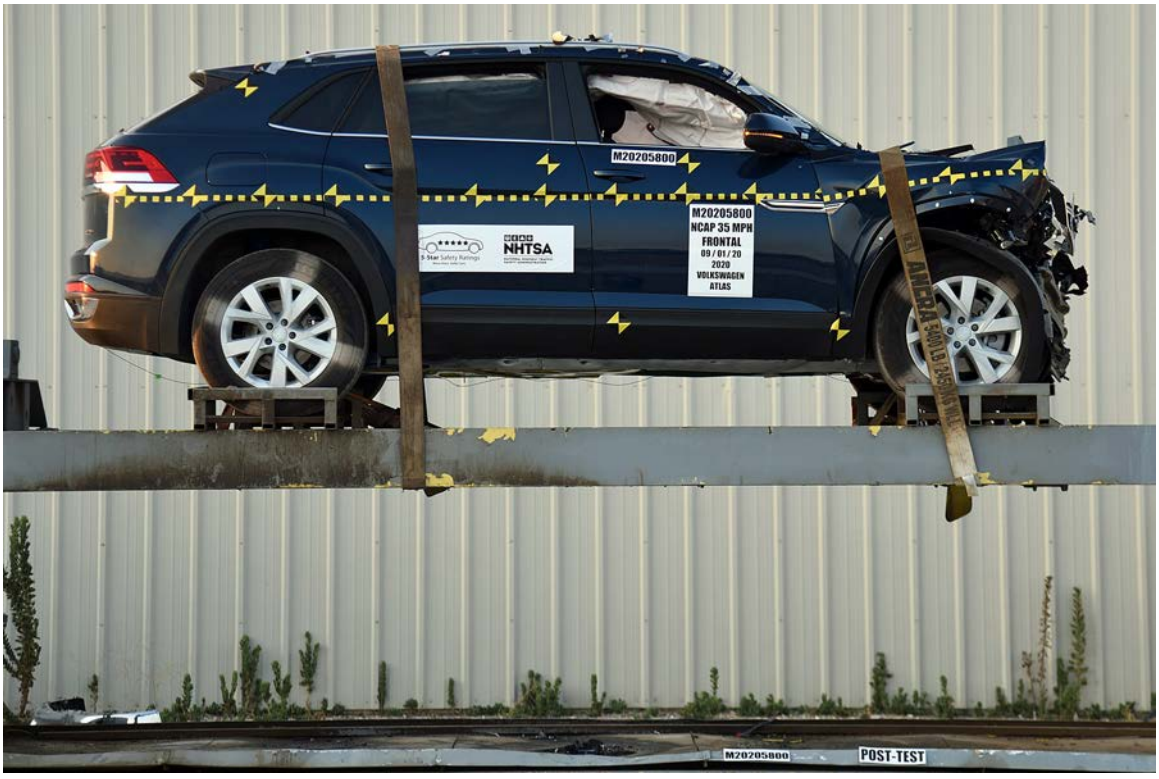


FIGURE 81. Vehicle at 360° on Static Rollover Device

FIGURE 82. 2020 Nissan Sentra Frontal Impact Event

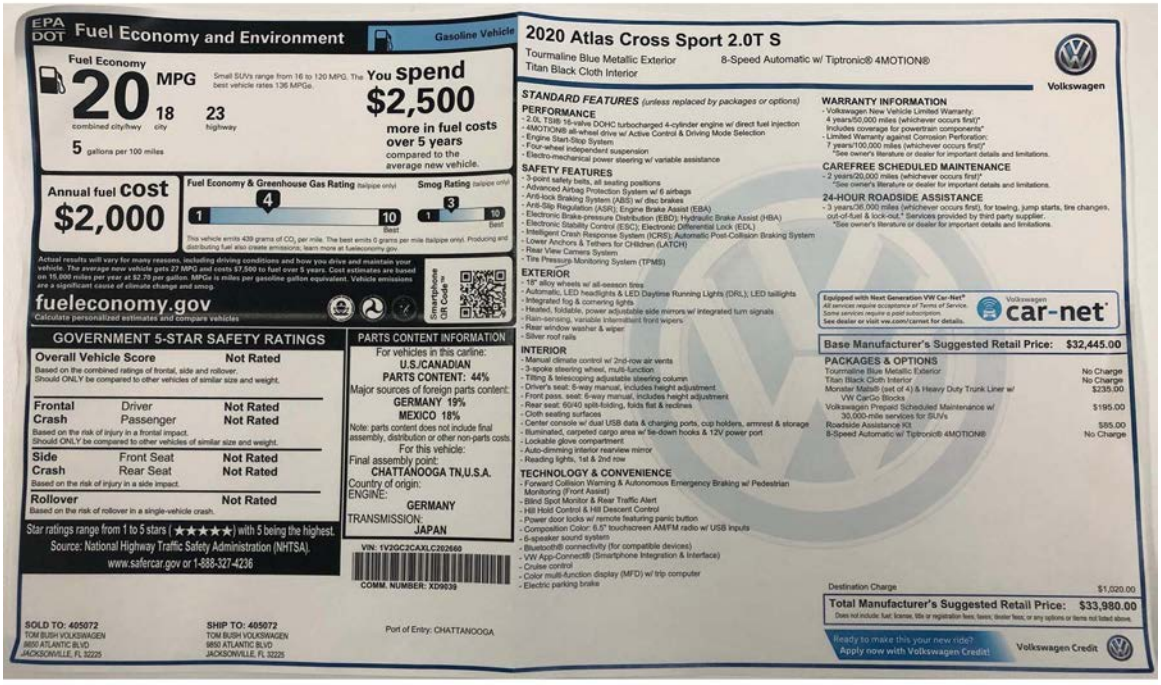


FIGURE 83. Monroney Label Photograph

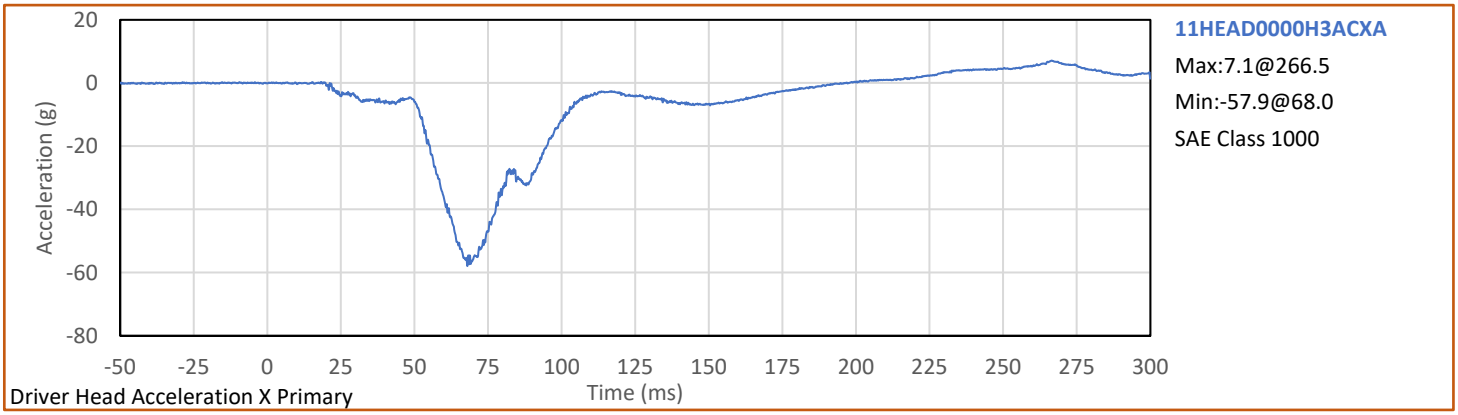
APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

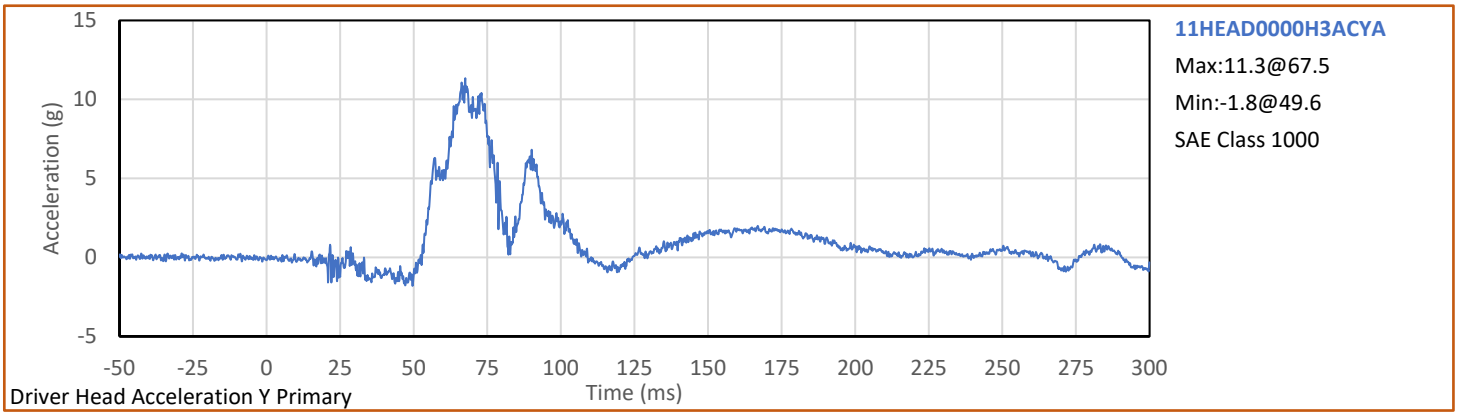
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.gov

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

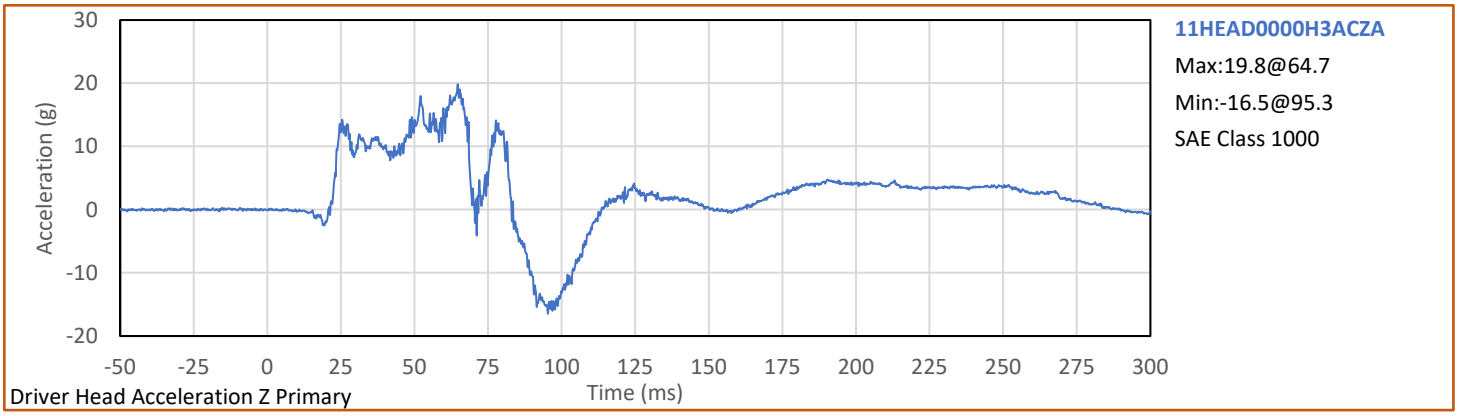
Passenger Chest X Acceleration Redundant
Passenger Chest Y Acceleration Redundant
Passenger Chest Z Acceleration Redundant
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Left Femur Force Redundant
Passenger Right Femur Force Redundant
Passenger Left Upper Tibia Moment X
Passenger 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



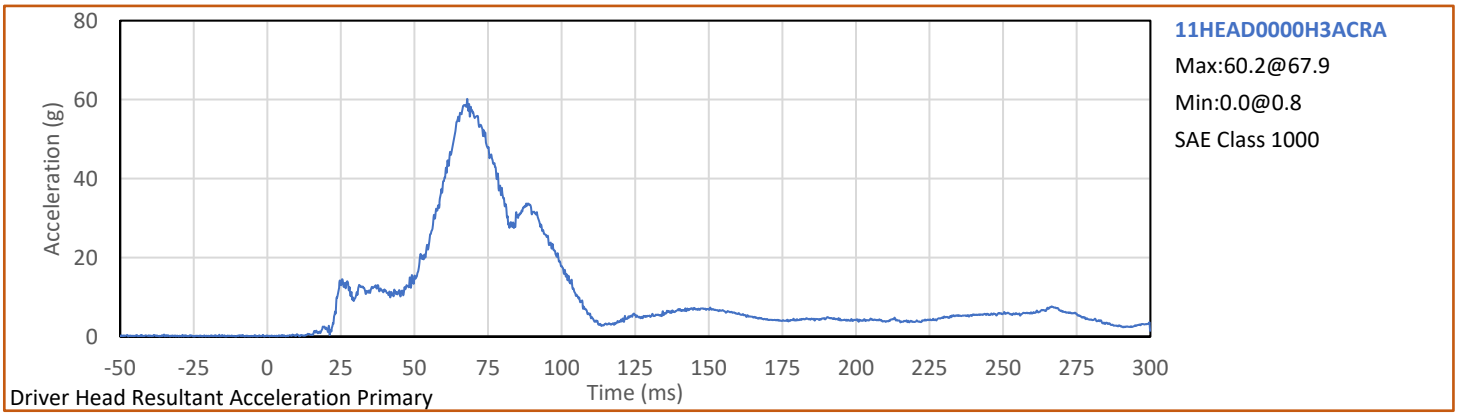
Driver Head Acceleration X Primary



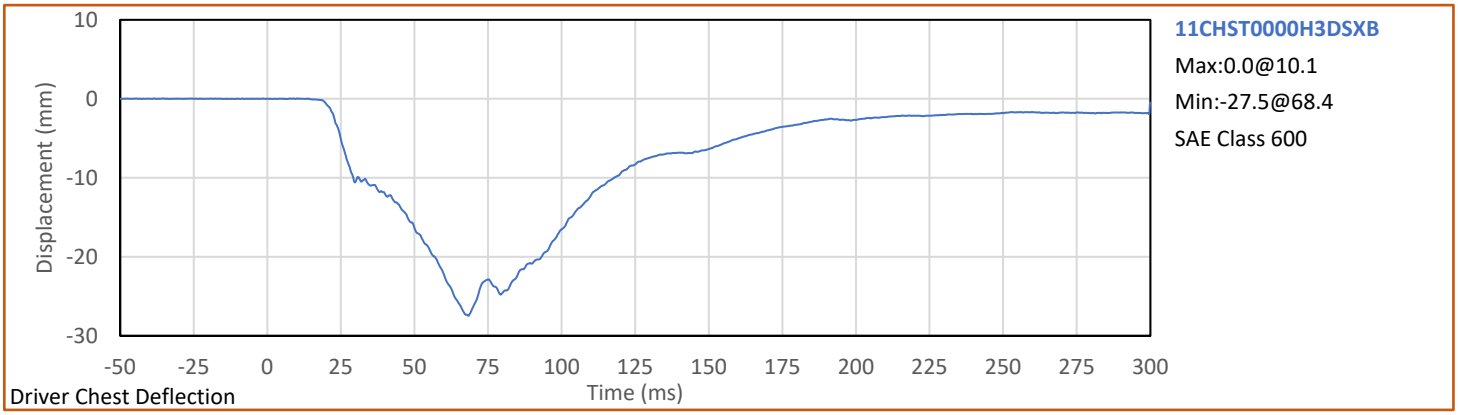
Driver Head Acceleration Y Primary



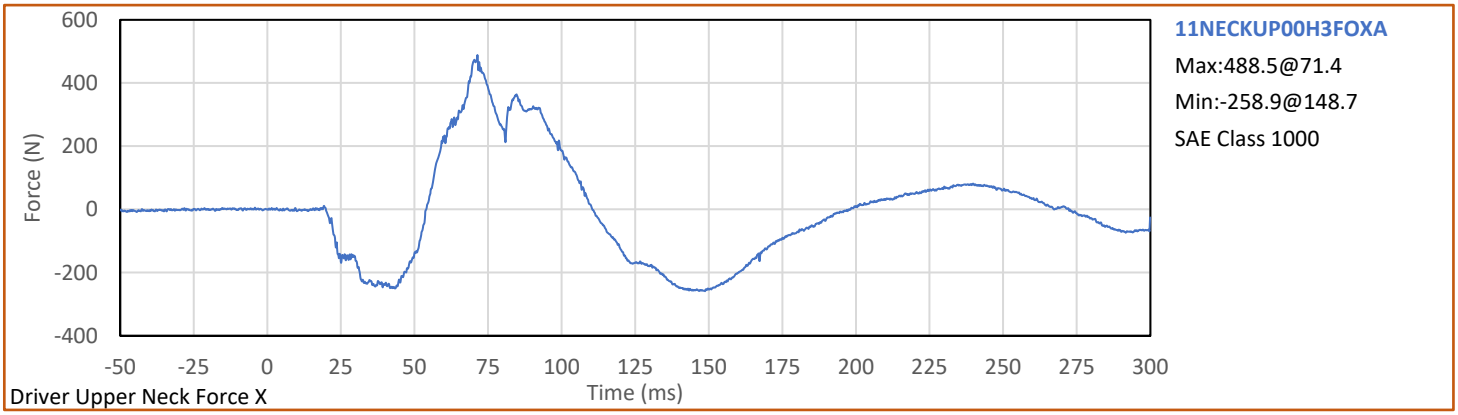
Driver Head Acceleration Z Primary

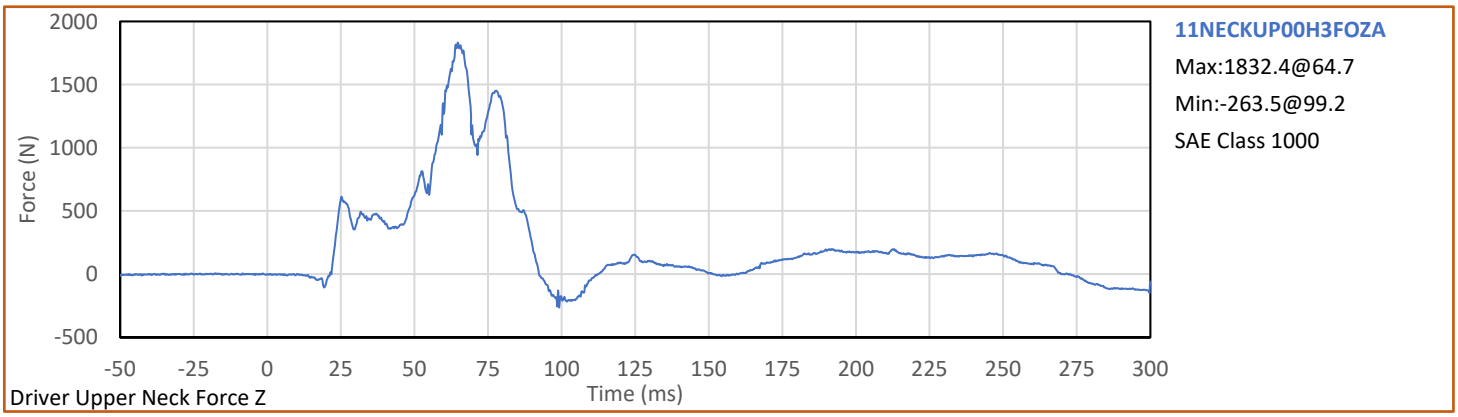


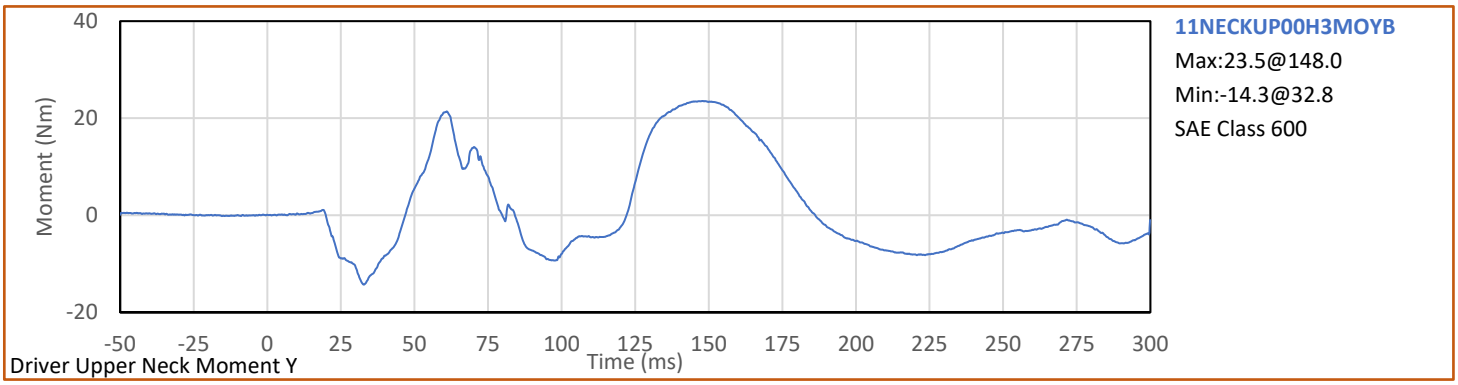
Driver Head Resultant Acceleration Primary

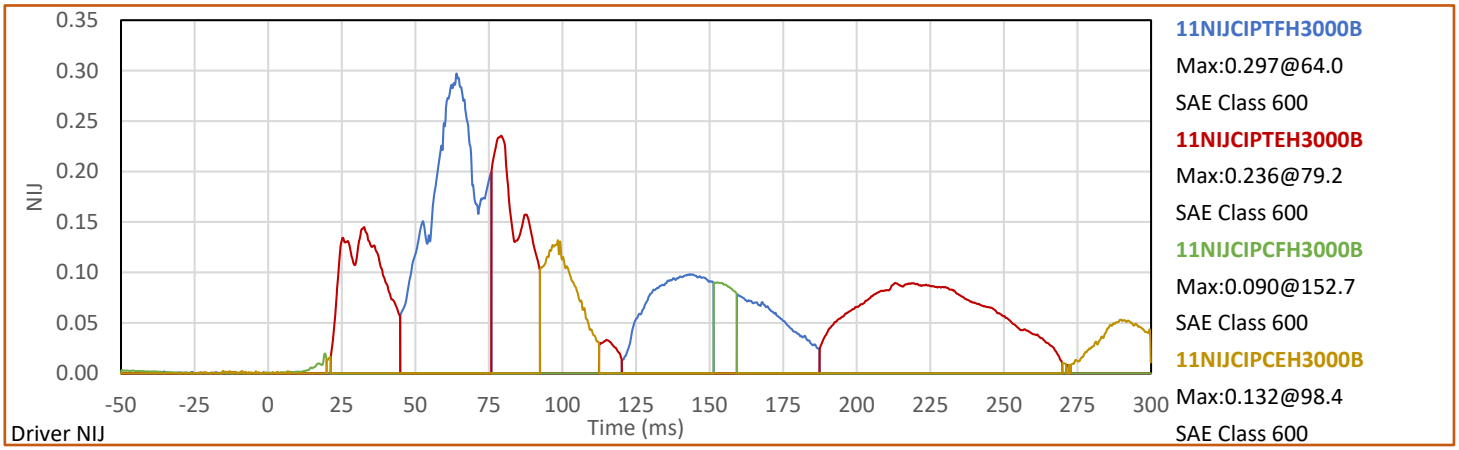


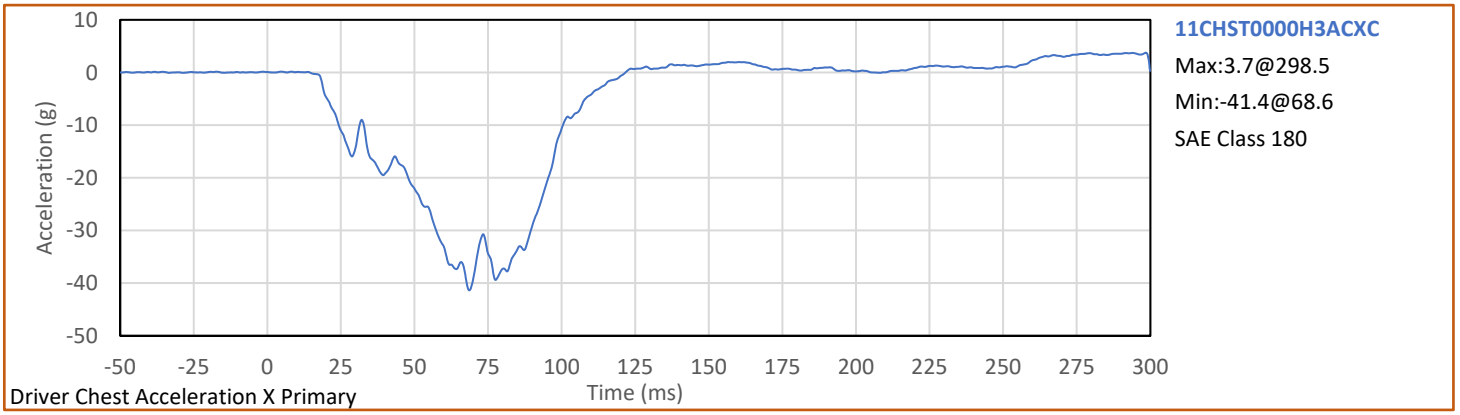
Driver Chest Deflection


Force (N)
Time (ms)
Driver Upper Neck Force X
11NECKUP00H3FOXA
Max:488.5@71.4
Min:-258.9@148.7
SAE Class 1000

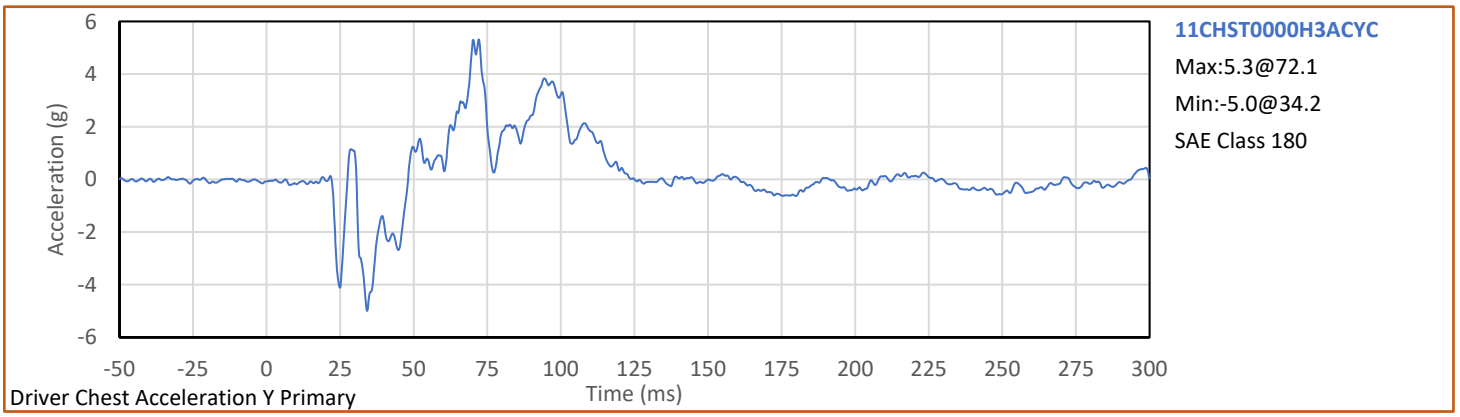

Force (N)
Time (ms)
Driver Upper Neck Force Z
11NECKUP00H3FOZA
Max:1832.4@64.7
Min:-263.5@99.2
SAE Class 1000


Moment (Nm)
Time (ms)
Driver Upper Neck Moment Y
11NECKUP00H3MOYB
Max:23.5@148.0
Min:-14.3@32.8
SAE Class 600

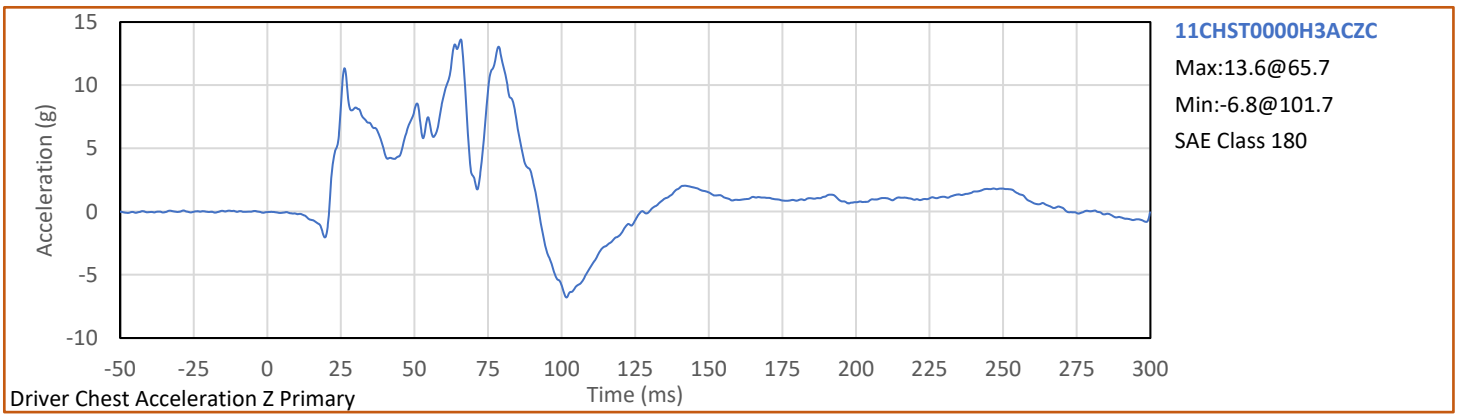

NIJ
Time (ms)
Driver NIJ
11NIJCIPTFH3000B
Max:0.297@64.0
SAE Class 600
11NIJCIPTEH3000B
Max:0.236@79.2
SAE Class 600
11NIJCIPCFH3000B
Max:0.090@152.7
SAE Class 600
11NIJCIPCEH3000B
Max:0.132@98.4
SAE Class 600



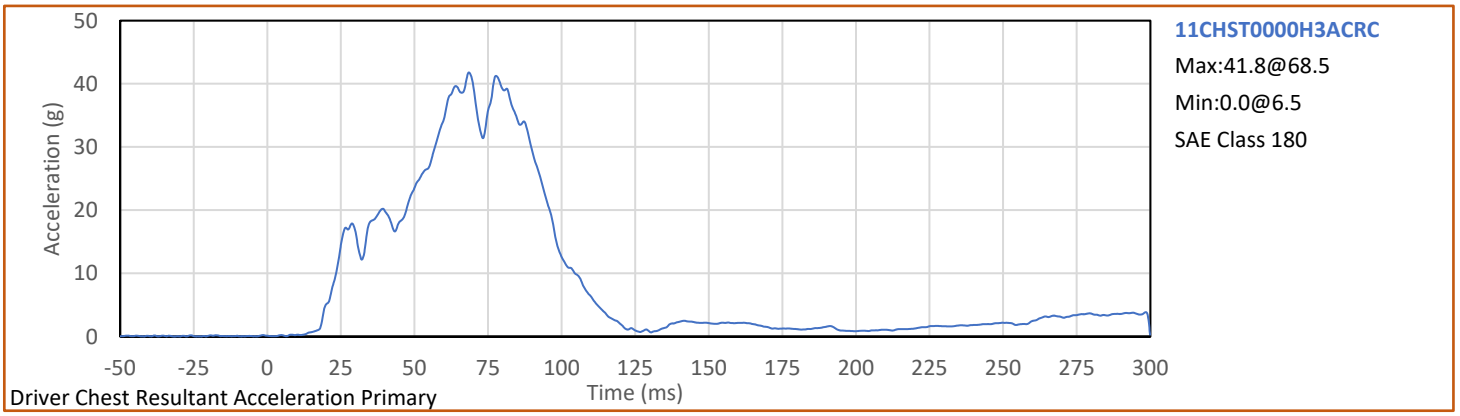
Driver Chest Acceleration X Primary



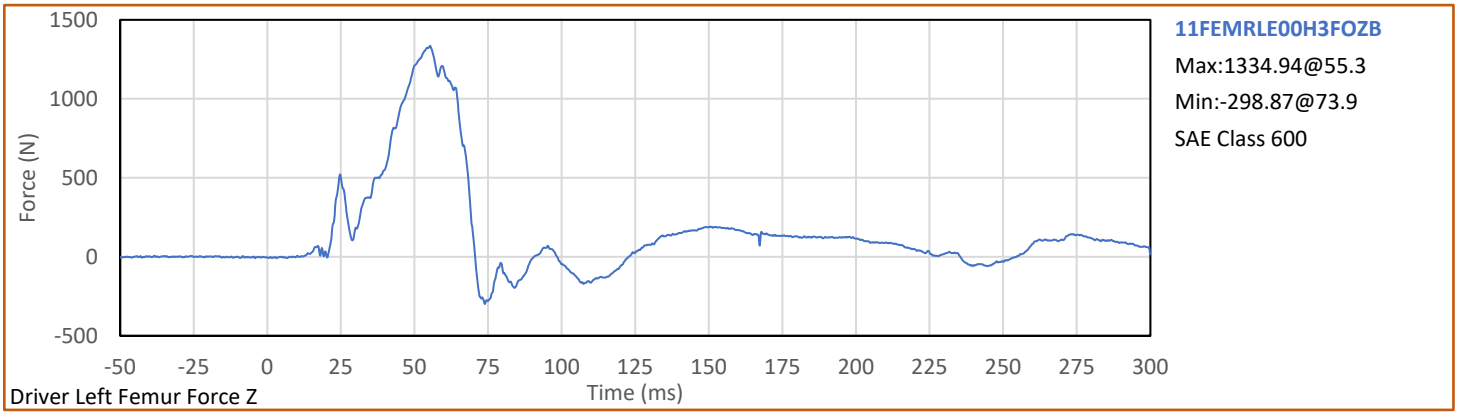
Driver Chest Acceleration Y Primary

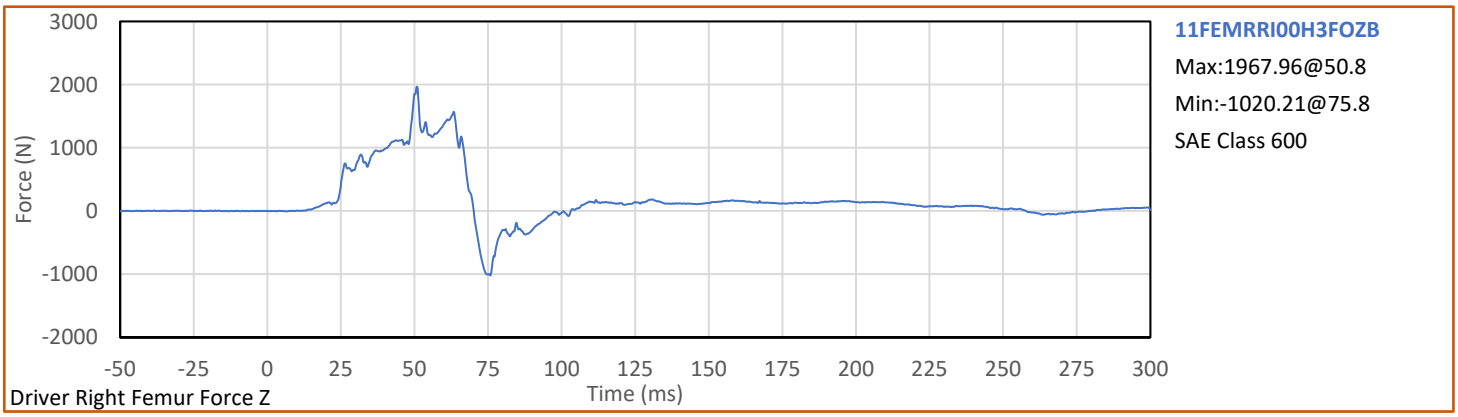


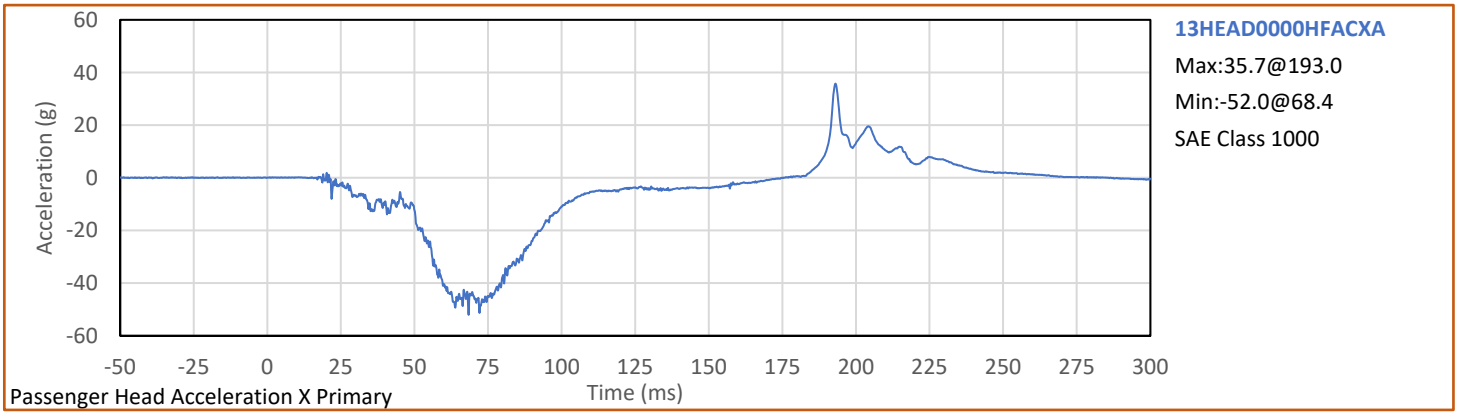
Driver Chest Acceleration Z Primary

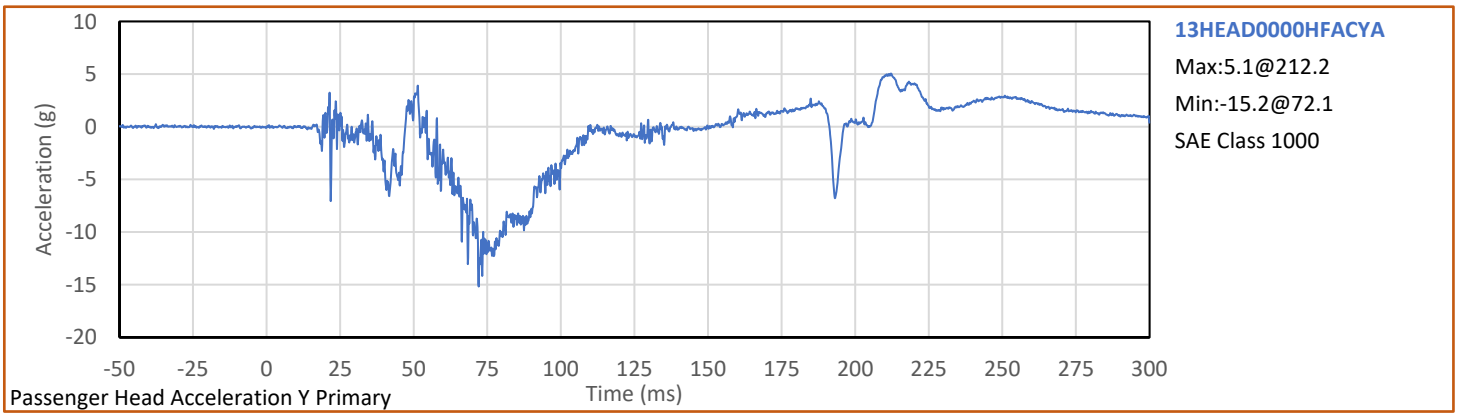


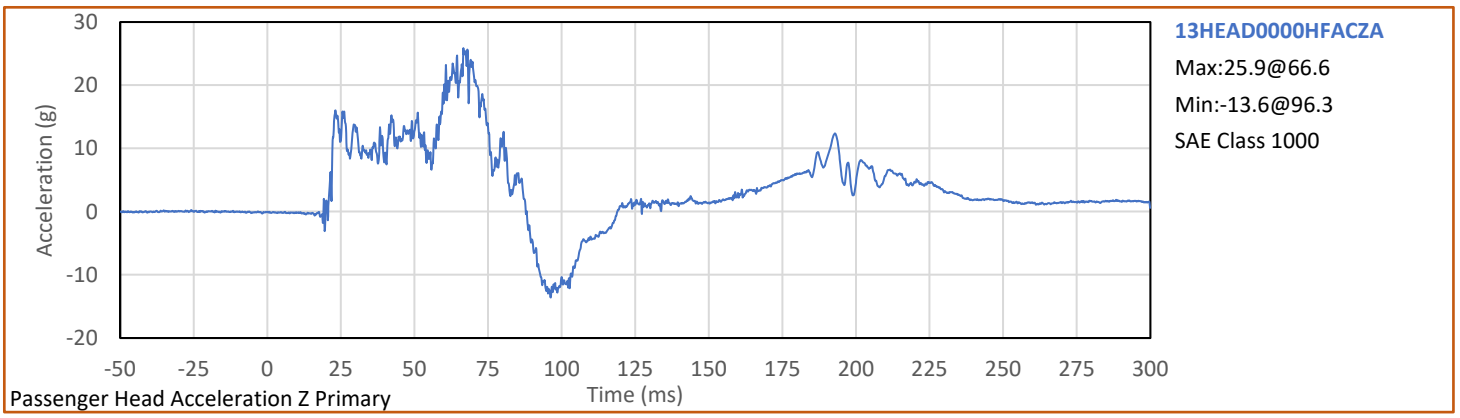
Driver Chest Resultant Acceleration Primary

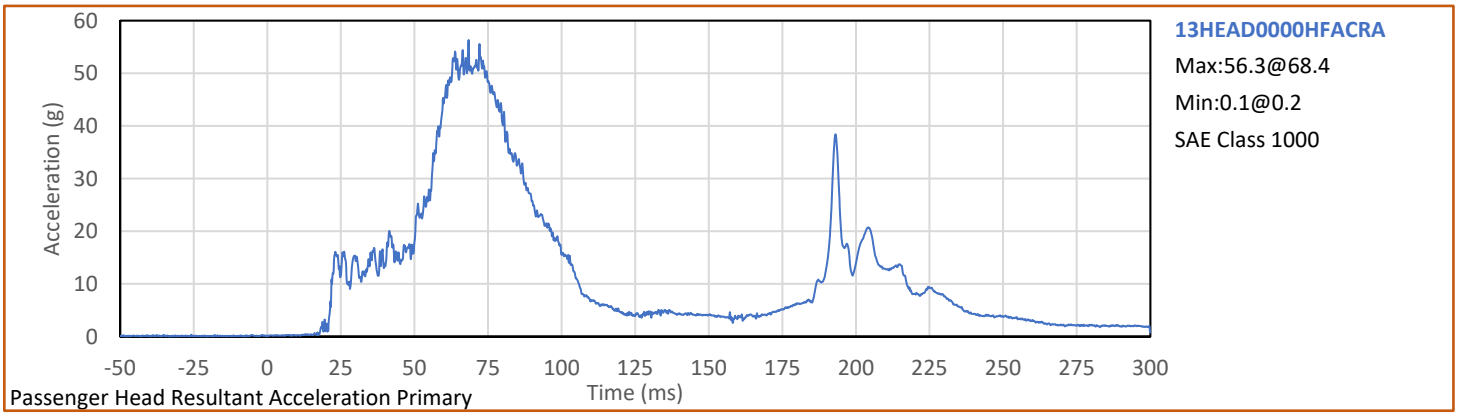

1500
1000
500
0
-500
Force (N)
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Time (ms)
11FEMRLE00H3FOZB
Max:1334.94@55.3
Min:-298.87@73.9
SAE Class 600
Driver Left Femur Force Z

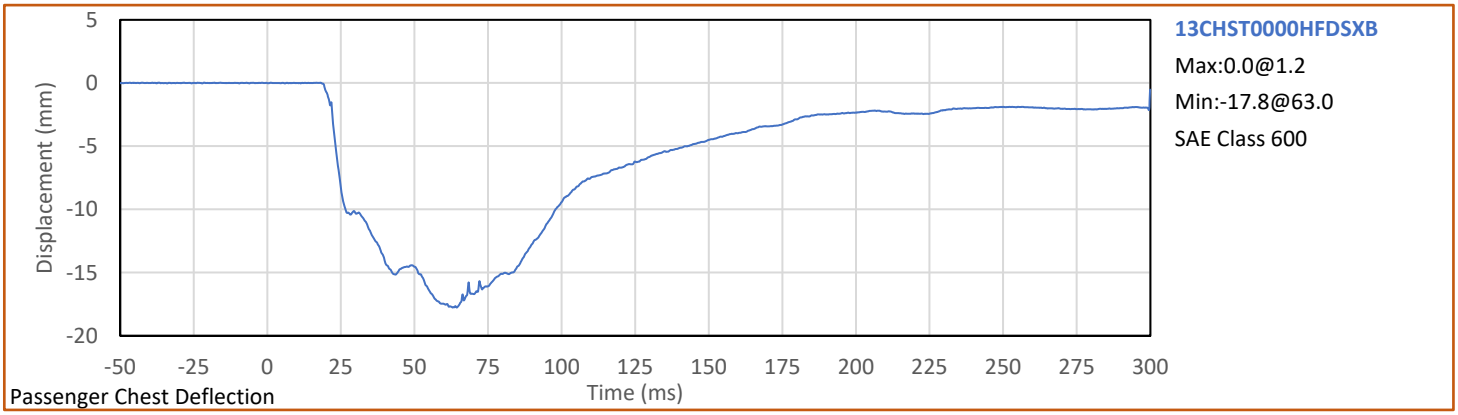

3000
2000
1000
0
-1000
-2000
Force (N)
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Time (ms)
11FEMRRI00H3FOZB
Max:1967.96@50.8
Min:-1020.21@75.8
SAE Class 600
Driver Right Femur Force Z


Acceleration (g)
Time (ms)
Passenger Head Acceleration X Primary
13HEAD0000HFACXA
Max:35.7@193.0
Min:-52.0@68.4
SAE Class 1000

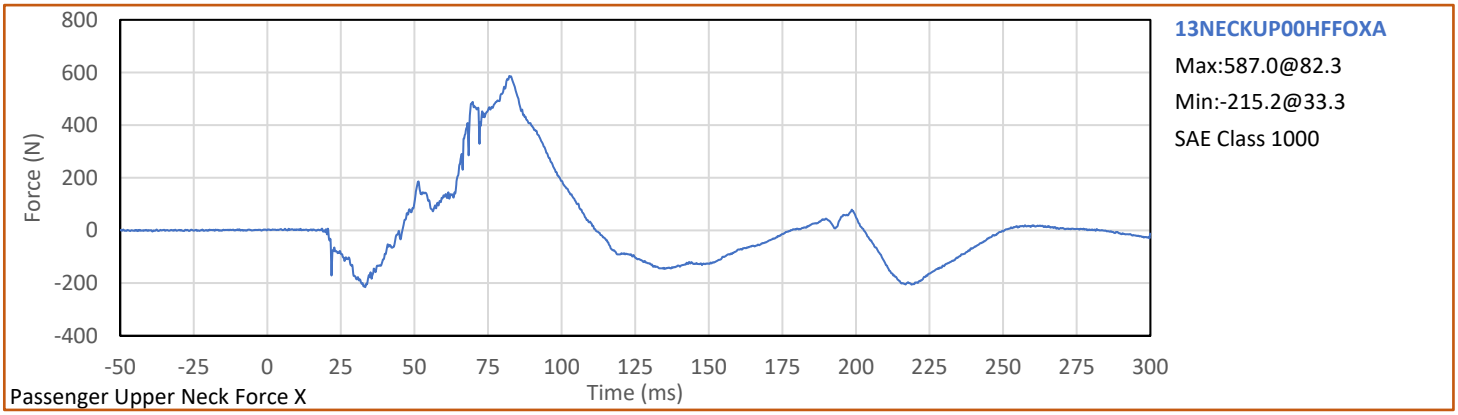

Acceleration (g)
Time (ms)
Passenger Head Acceleration Y Primary
13HEAD0000HFACYA
Max:5.1@212.2
Min:-15.2@72.1
SAE Class 1000

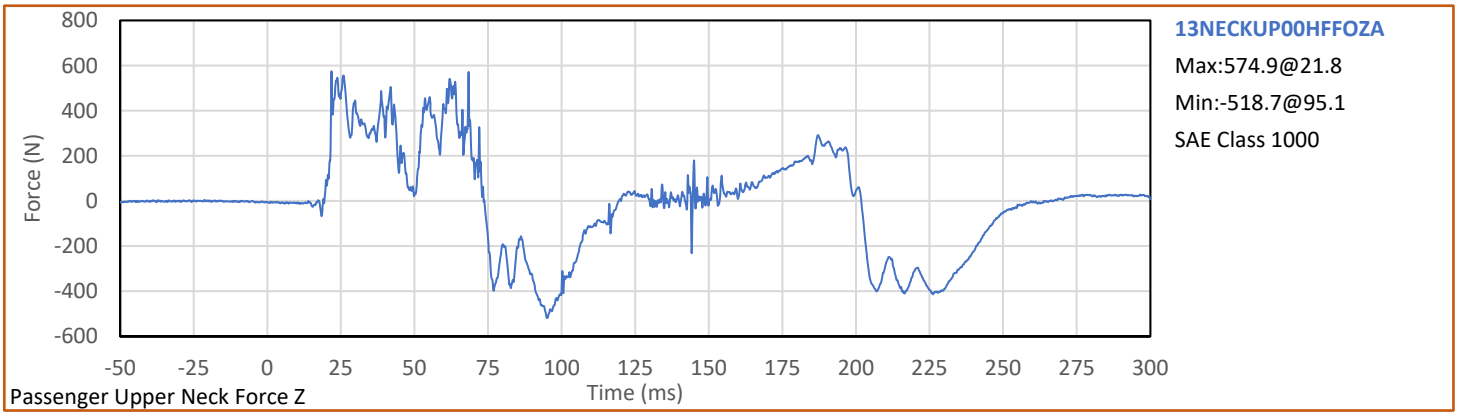

Acceleration (g)
Time (ms)
Passenger Head Acceleration Z Primary
13HEAD0000HFACZA
Max:25.9@66.6
Min:-13.6@96.3
SAE Class 1000

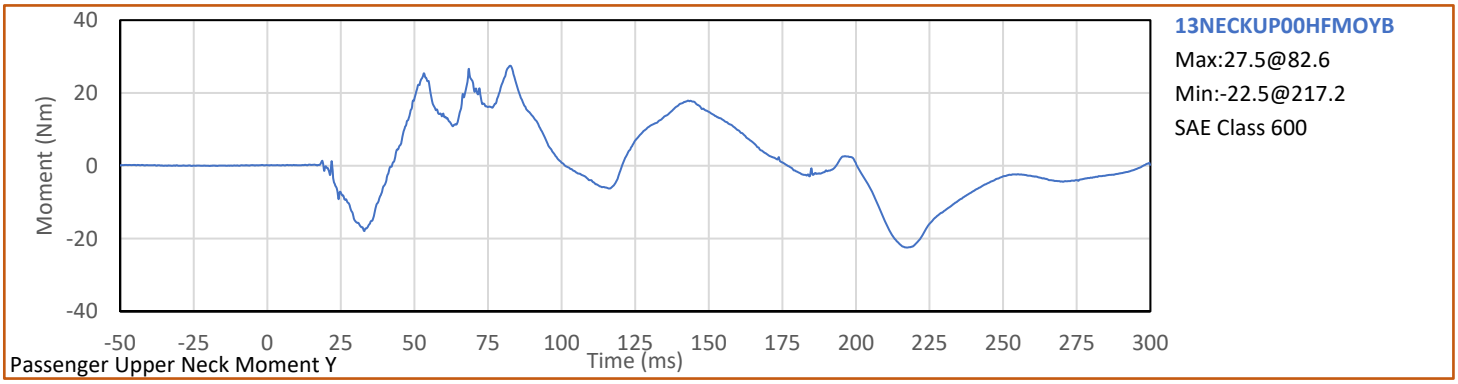

Acceleration (g)
Time (ms)
Passenger Head Resultant Acceleration Primary
13HEAD0000HFACRA
Max:56.3@68.4
Min:0.1@0.2
SAE Class 1000

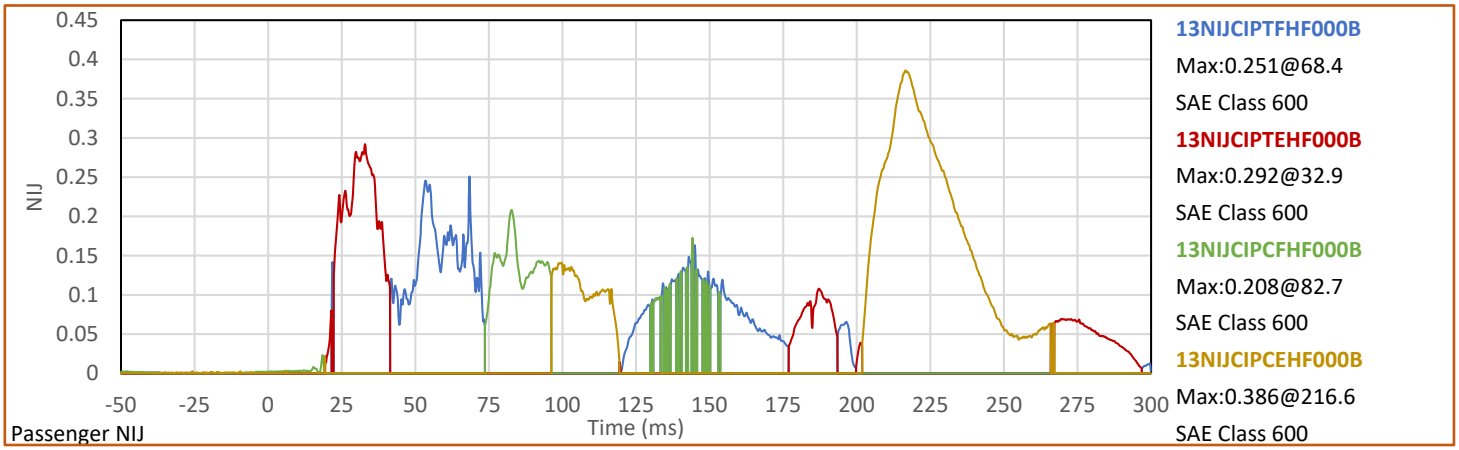


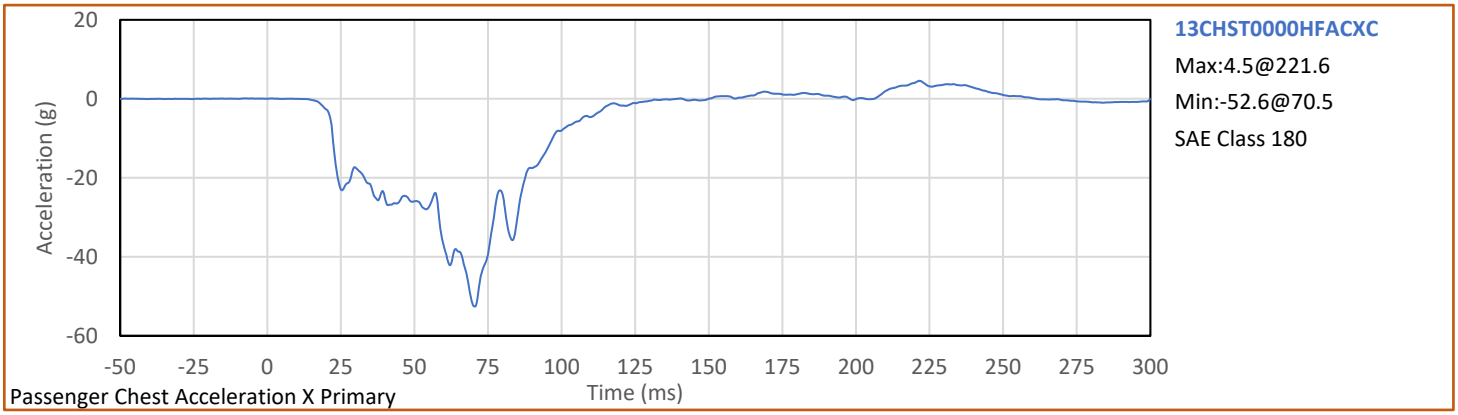
Passenger Chest Deflection

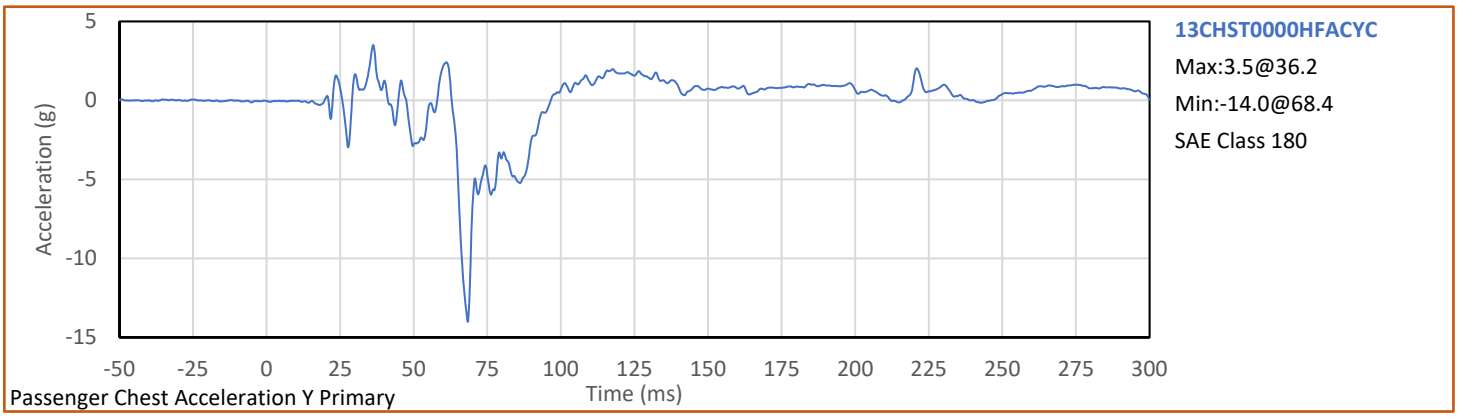

Force (N)
Time (ms)
Passenger Upper Neck Force X
13NECKUP00HFFOXA
Max:587.0@82.3
Min:-215.2@33.3
SAE Class 1000

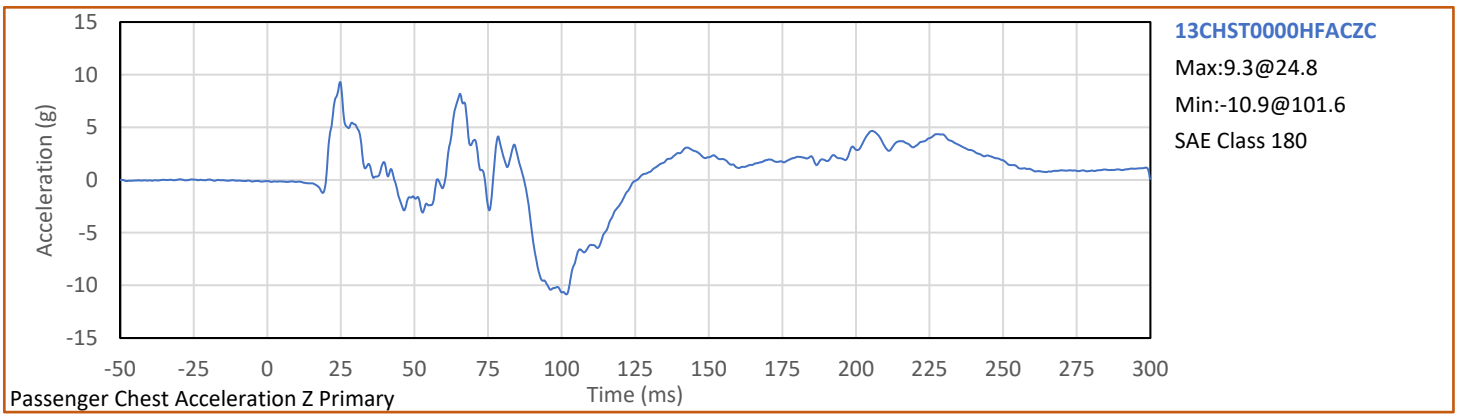

Force (N)
Time (ms)
Passenger Upper Neck Force Z
13NECKUP00HFFOZA
Max:574.9@21.8
Min:-518.7@95.1
SAE Class 1000


Moment (Nm)
Time (ms)
Passenger Upper Neck Moment Y
13NECKUP00HFMOYB
Max:27.5@82.6
Min:-22.5@217.2
SAE Class 600

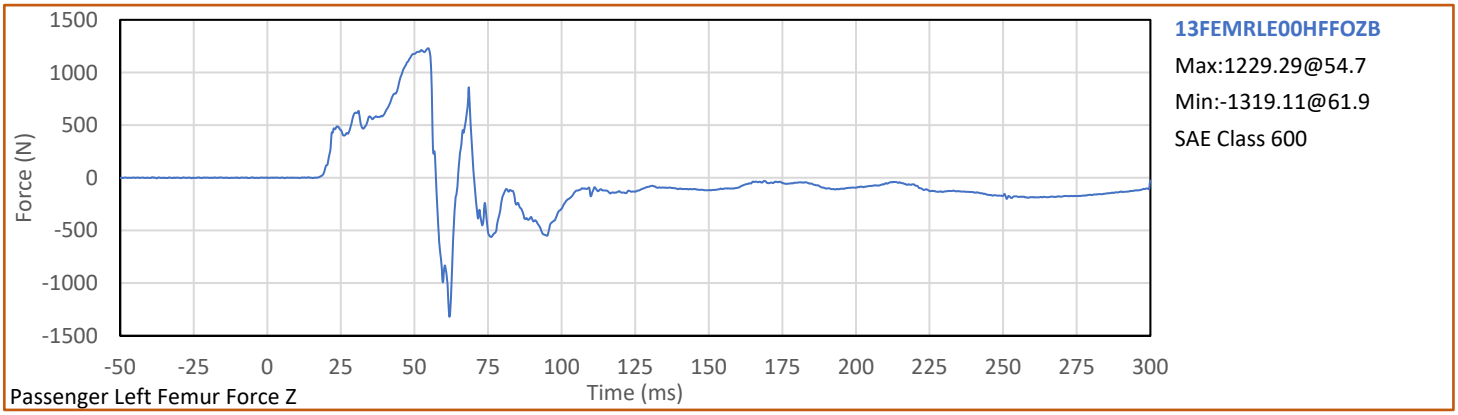

NIJ
Time (ms)
Passenger NIJ
13NIJCIPTFHF000B
Max:0.251@68.4
SAE Class 600
13NIJCIPTEHF000B
Max:0.292@32.9
SAE Class 600
13NIJCIPCFHF000B
Max:0.208@82.7
SAE Class 600
13NIJCIPCEHF000B
Max:0.386@216.6
SAE Class 600

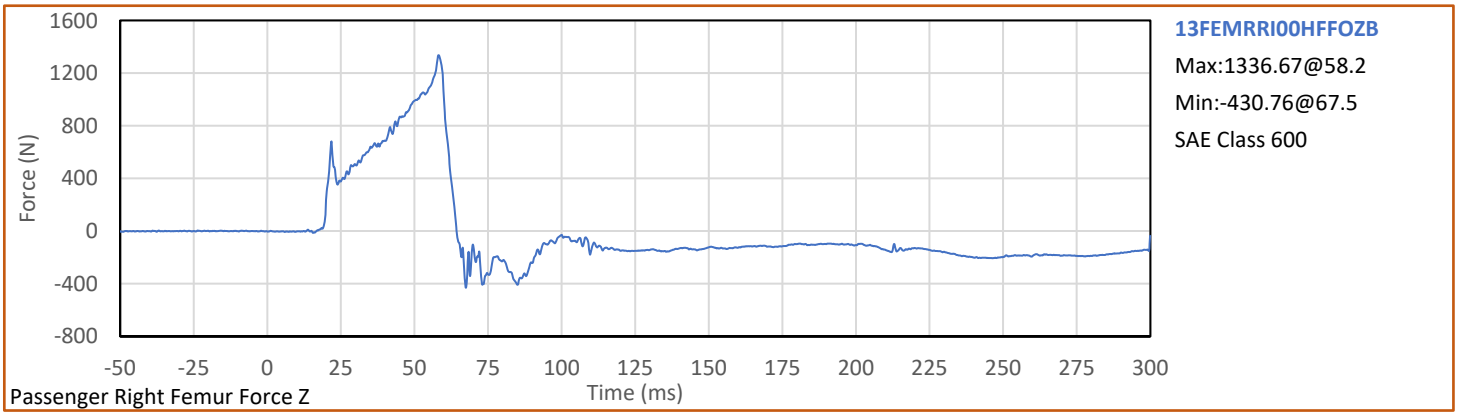

Acceleration (g)
Time (ms)
Passenger Chest Acceleration X Primary
13CHST0000HFACXC
Max:4.5@221.6
Min:-52.6@70.5
SAE Class 180


Acceleration (g)
Time (ms)
Passenger Chest Acceleration Y Primary
13CHST0000HFACYC
Max:3.5@36.2
Min:-14.0@68.4
SAE Class 180


Acceleration (g)
Time (ms)
Passenger Chest Acceleration Z Primary
13CHST0000HFACZC
Max:9.3@24.8
Min:-10.9@101.6
SAE Class 180


Acceleration (g)
Time (ms)
Passenger Chest Resultant Acceleration Primary
13CHST0000HFACRC
Max:53.0@70.3
Min:0.1@0.1
SAE Class 180


1500
1000
500
0
-500
-1000
-1500
Force (N)
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Time (ms)
Passenger Left Femur Force Z
13FEMRLE00HFFOZB
Max:1229.29@54.7
Min:-1319.11@61.9
SAE Class 600


1600
1200
800
400
0
-400
-800
Force (N)
-50 -25 0 25 50 75 100 125 150 175 200 225 250 275 300
Time (ms)
Passenger Right Femur Force Z
13FEMRRI00HFFOZB
Max:1336.67@58.2
Min:-430.76@67.5
SAE Class 600

APPENDIX C
DUMMY QUALIFICATION AND PERFORMANCE VERIFICATION

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: 2020-08-18

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.	Bent shaft			✓
Assembly	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer	Head mounting secure			✓
Mounting	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: 2020-08-18

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	518	Pass
C - 'H' point height	mm	84	89	87	Pass
D - 'H' point location from backline	mm	135	140	140	Pass
E - Shoulder pivot from backline	mm	84	94	89	Pass
F - Thigh clearance	mm	140	155	146	Pass
G - Back of elbow to wrist pivot	mm	290	305	294	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	203	Pass
K - Buttock to knee length	mm	579	604	591	Pass
L - Popliteal length	mm	429	455	436	Pass
M - Knee pivot height	mm	485	500	492	Pass
N - Buttock popliteal length	mm	452	477	464	Pass
O - Chest depth without jacket	mm	213	229	222	Pass
P - Foot length	mm	251	267	257	Pass
V - Shoulder breadth	mm	422	437	430	Pass
W - Foot breadth	mm	91	107	101	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	981	Pass
Z - Waist circum.	mm	836	866	845	Pass
AA - Location for chest circum.	mm	429	434	433	Pass
BB - Location for waist circum.	mm	226	231	227	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

Approved By: P. Puzzuto

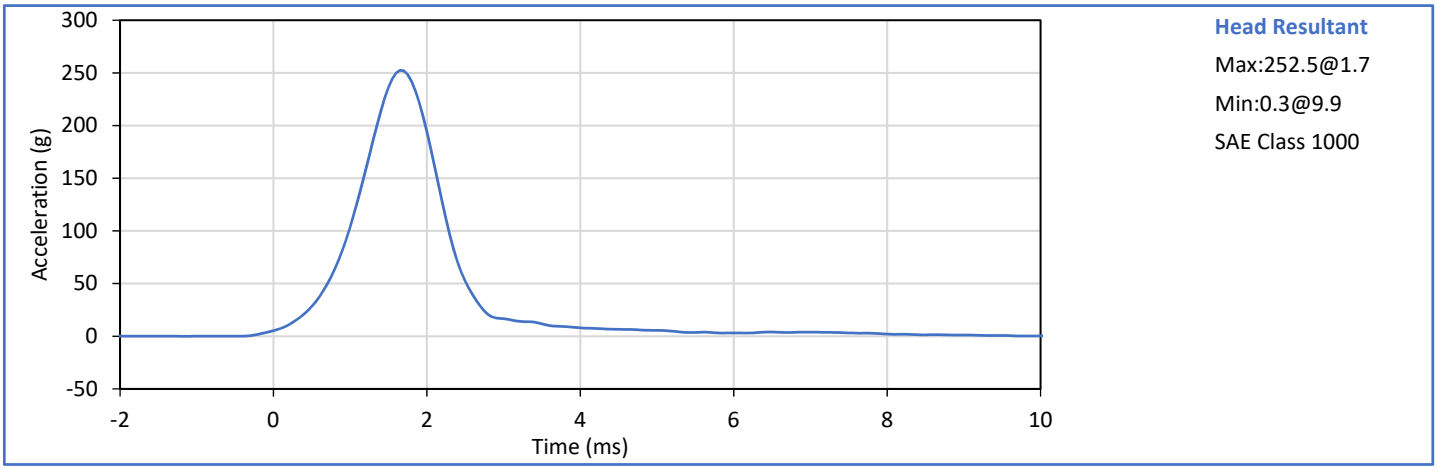
Applus IDIADA KARCO

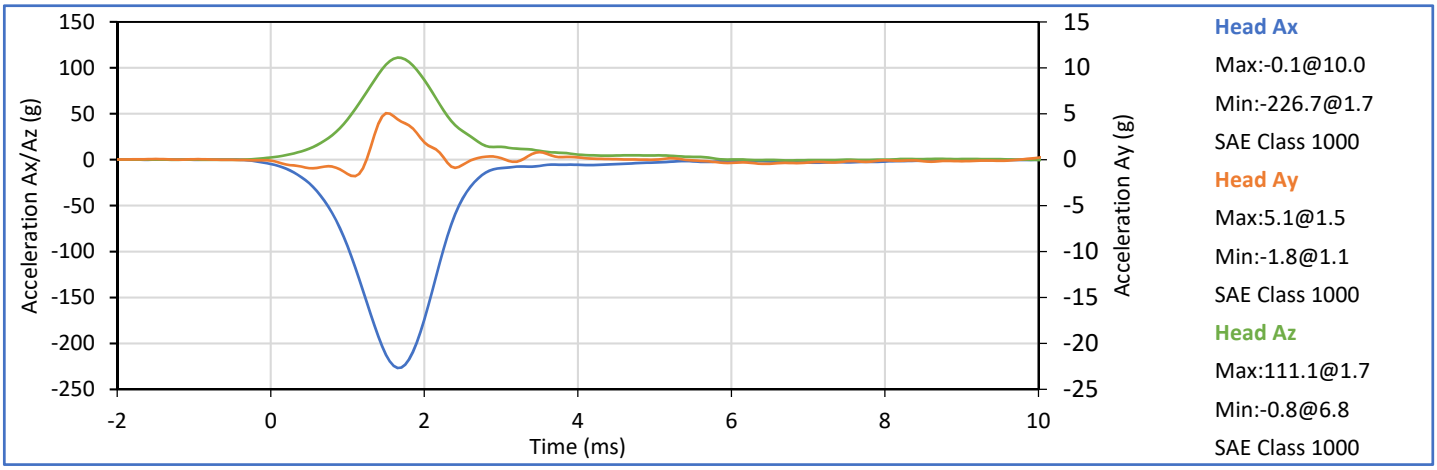
Hybrid III 50th Percentile Male ATD
Head Drop

ATD Serial No.: 360

Test Date: 2020-08-18

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	30	Pass
Peak Resultant Acceleration	g	225.0	275.0	252.5	Pass
Peak Lateral Acceleration	g	-15.0	15.0	5.1	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

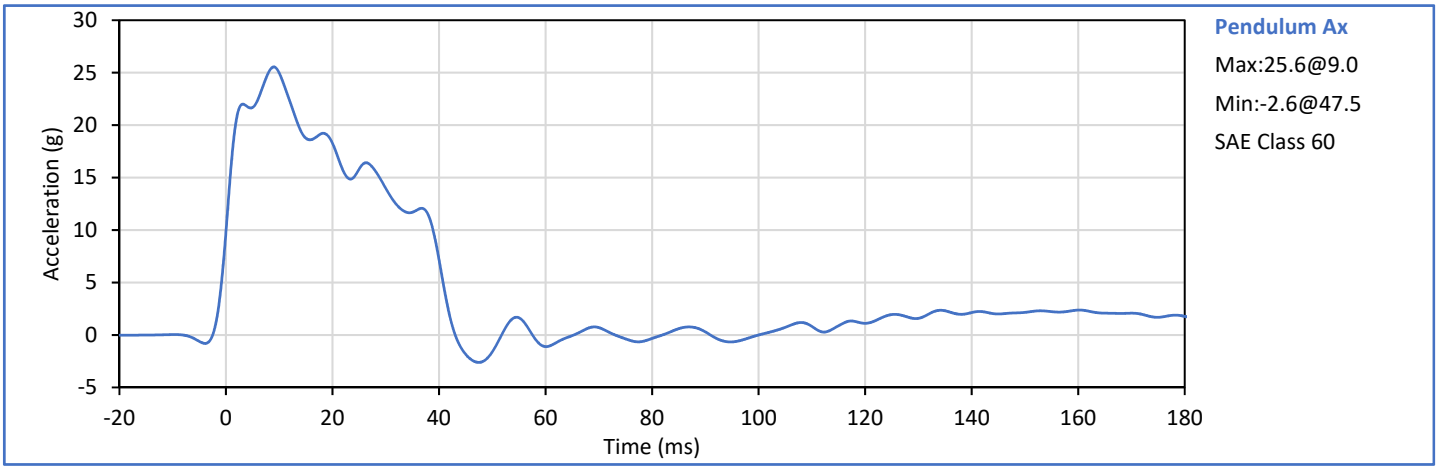
Approved By: P. Puzzuto

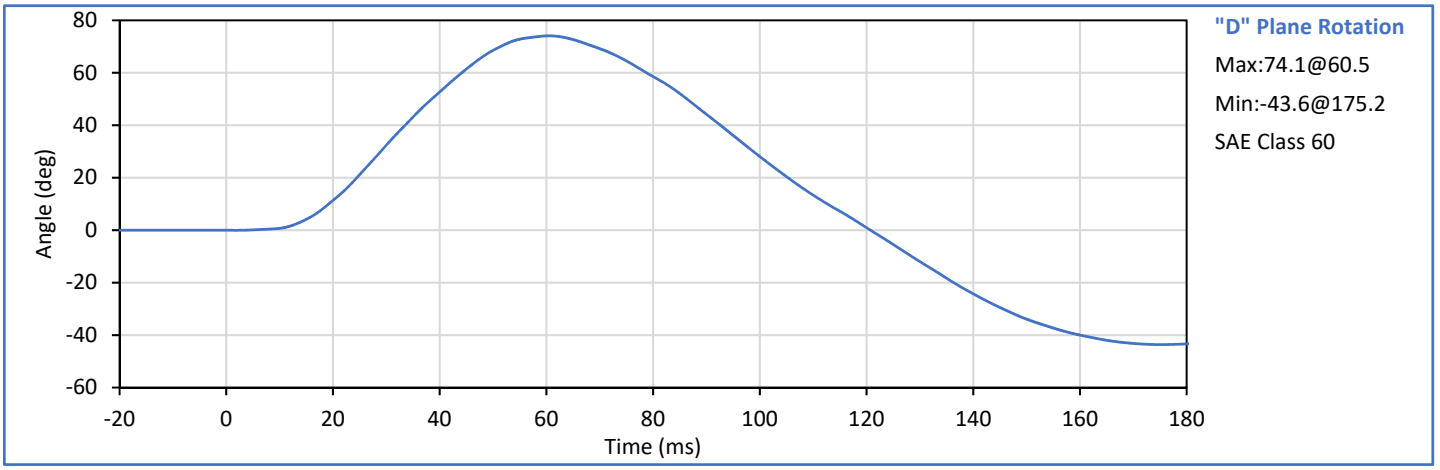
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 360 Test Date: 2020-08-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	20.8	Pass
Laboratory Relative Humidity	%	10	70	45	Pass
Pendulum Velocity	m/s	6.89	7.13	6.99	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	25.0	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	18.3	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	14.0	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	14.0	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	40.8	Pass
"D" Plane Rotation peak	deg	64.0	78.0	74.1	Pass
	ms	57.0	64.0	60.5	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	120.8	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	96.2	Pass
	ms	47.0	58.0	54.1	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	97.1	Pass
			Overall Test Results		Pass



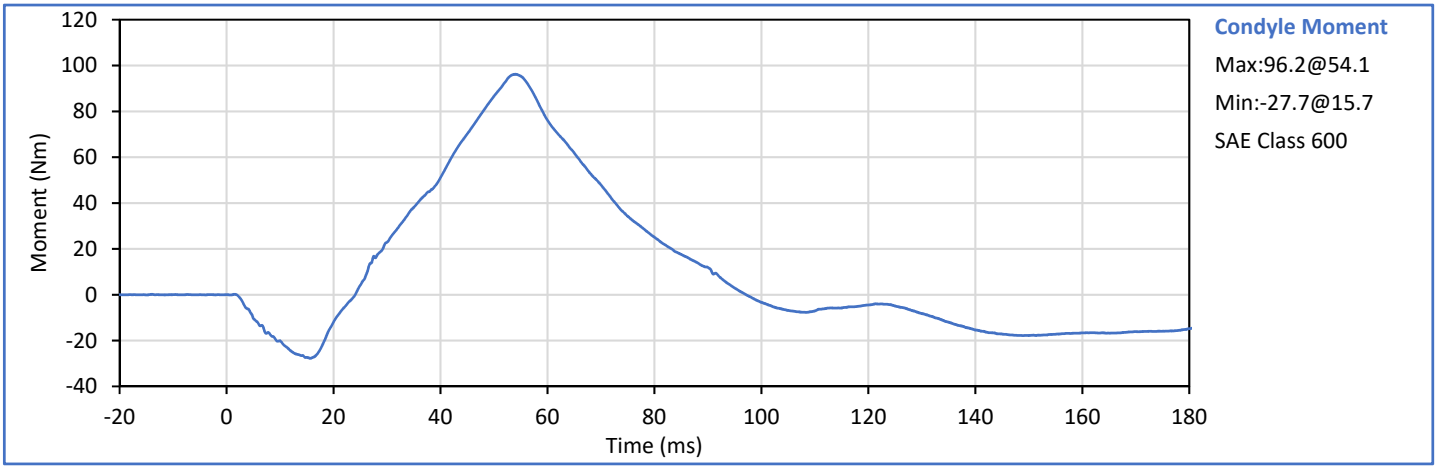


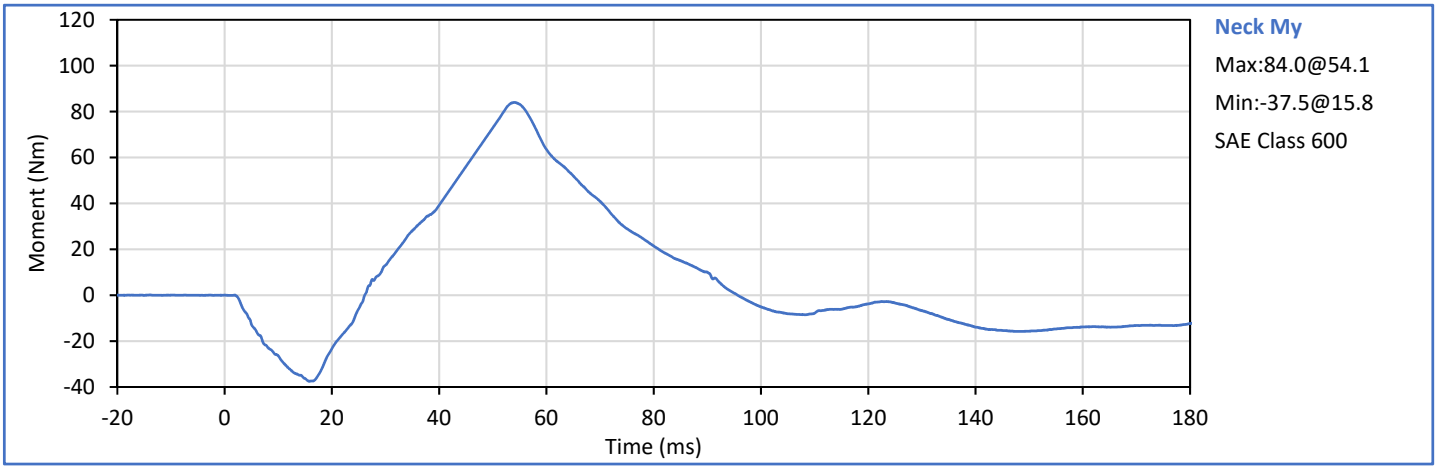
Technician: J. Hernandez

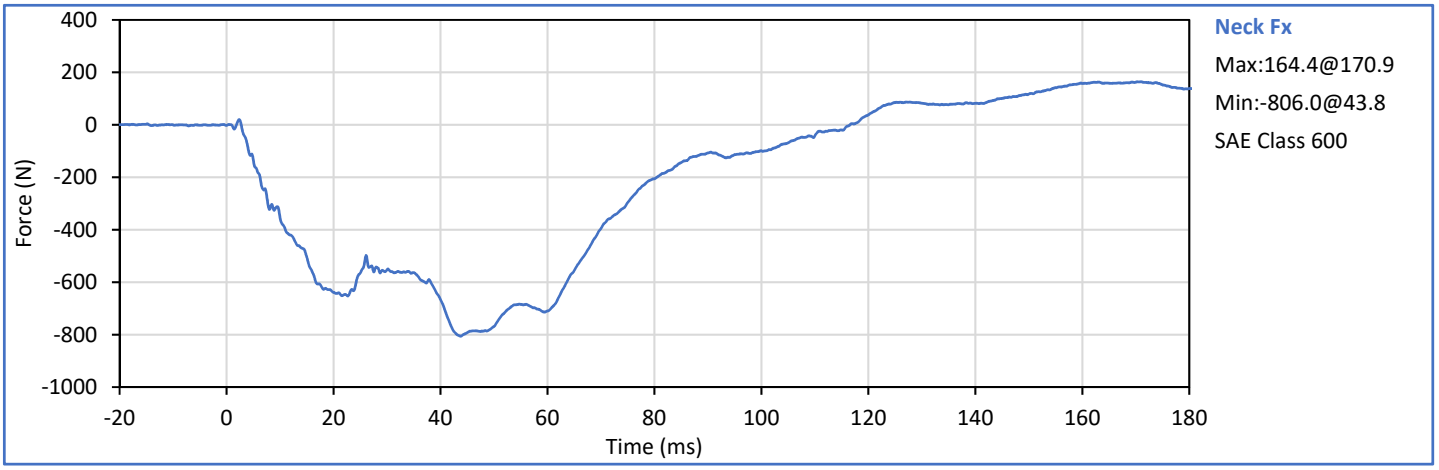
Approved By: P. Puzzuto

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 360 Test Date: 2020-08-24





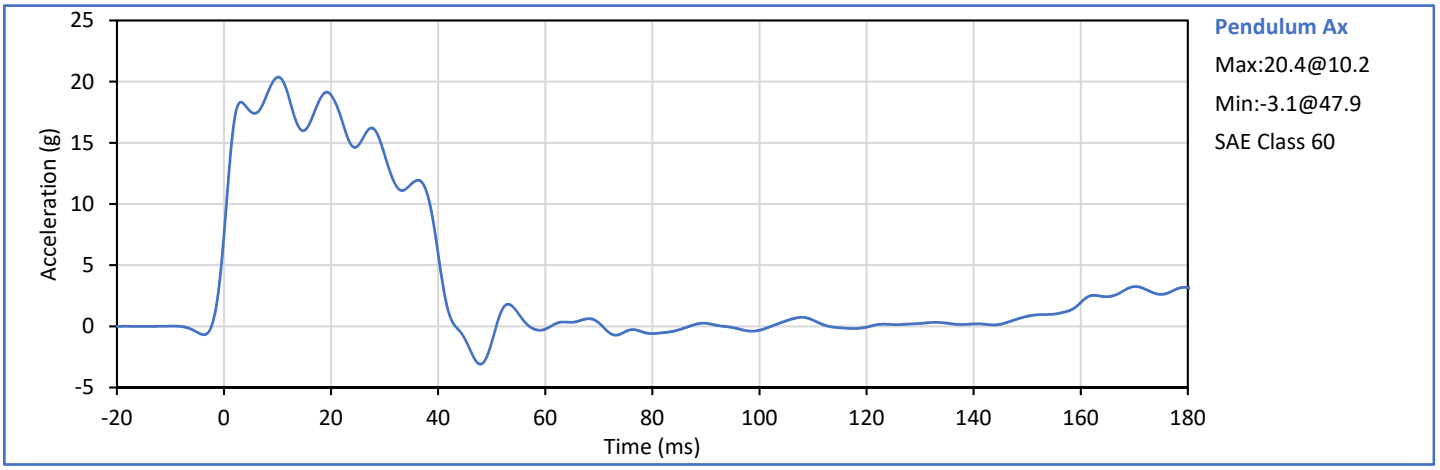


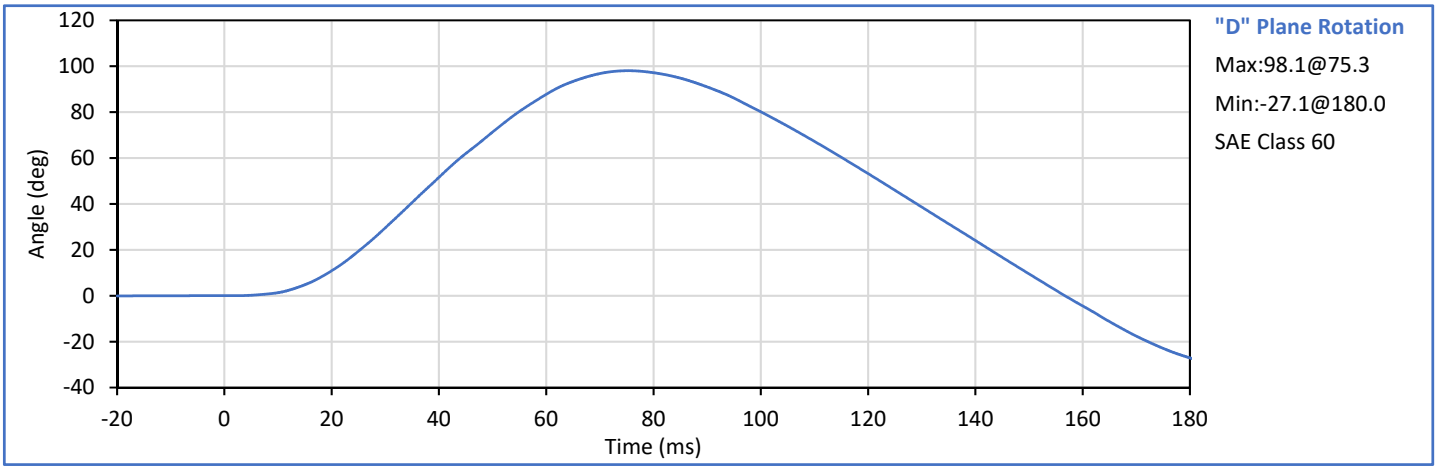
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 360 Test Date: 2020-08-24

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	6.09	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.4	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.9	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	14.0	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	14.0	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	40.3	Pass
"D" Plane Rotation peak	deg	81.0	106.0	98.1	Pass
	ms	72.0	82.0	75.3	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	156.8	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-72.4	Pass
	ms	65.0	79.0	70.9	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	140.2	Pass
			Overall Test Results		Pass





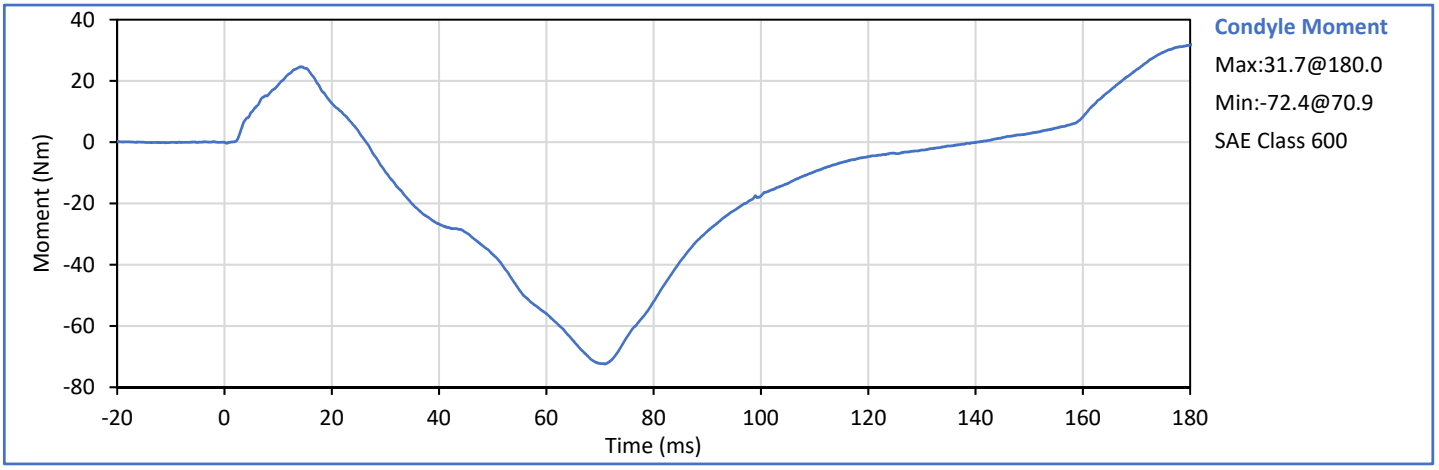
Technician: J. Hernandez

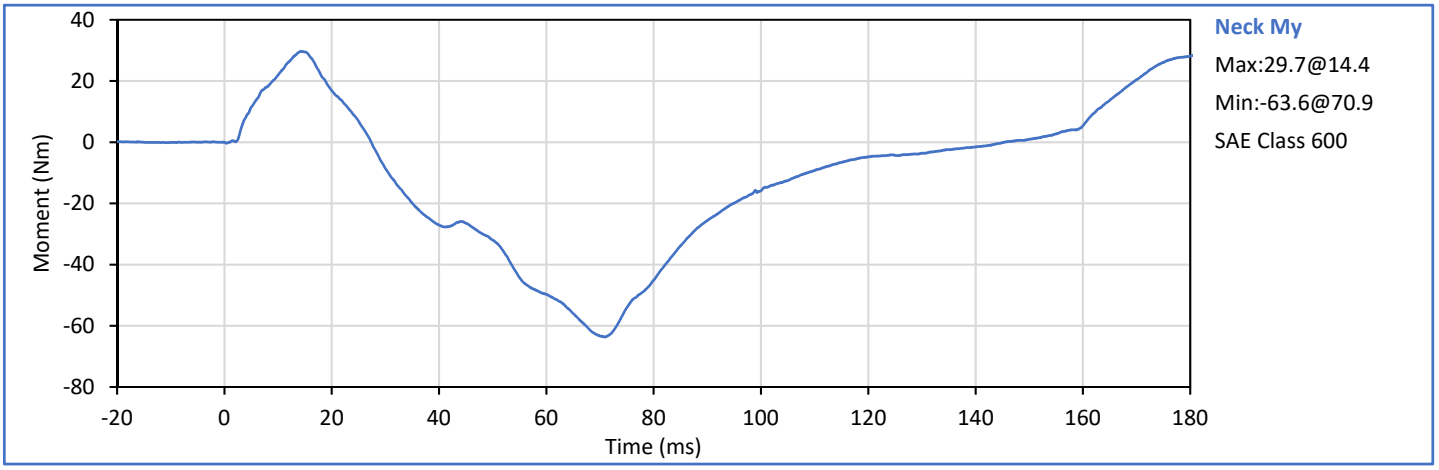
Approved By: P. Puzzuto

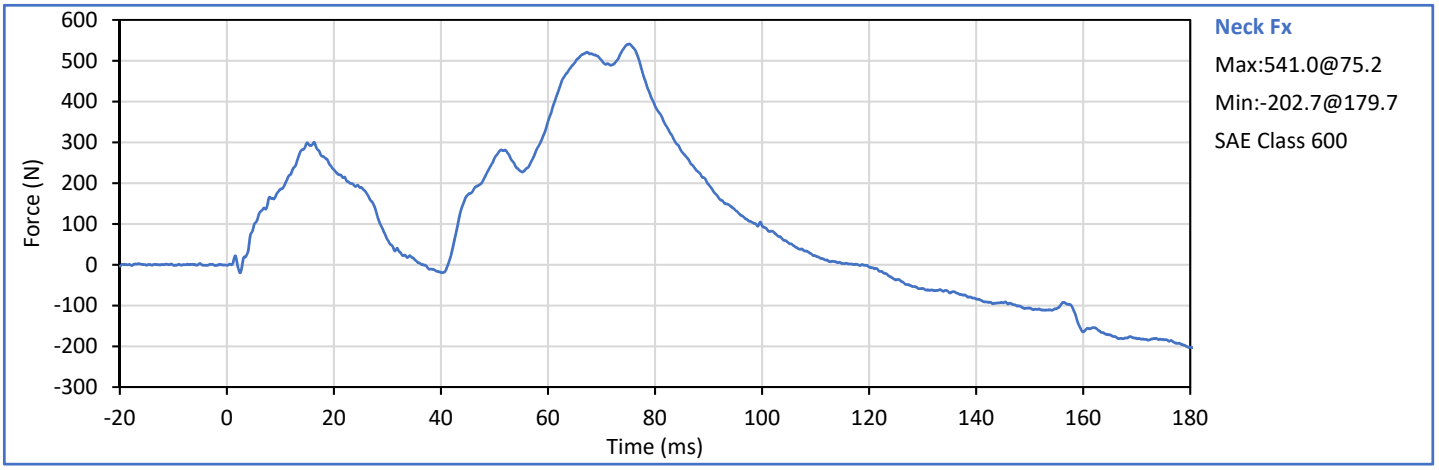
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 360 Test Date: 2020-08-24







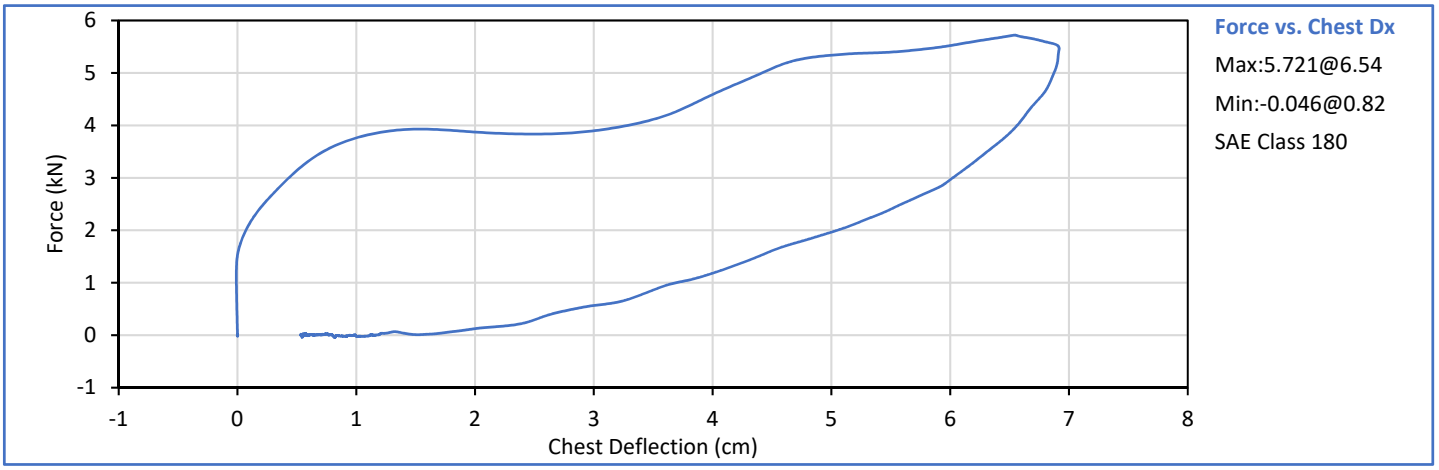
Applus IDIADA
KARCO

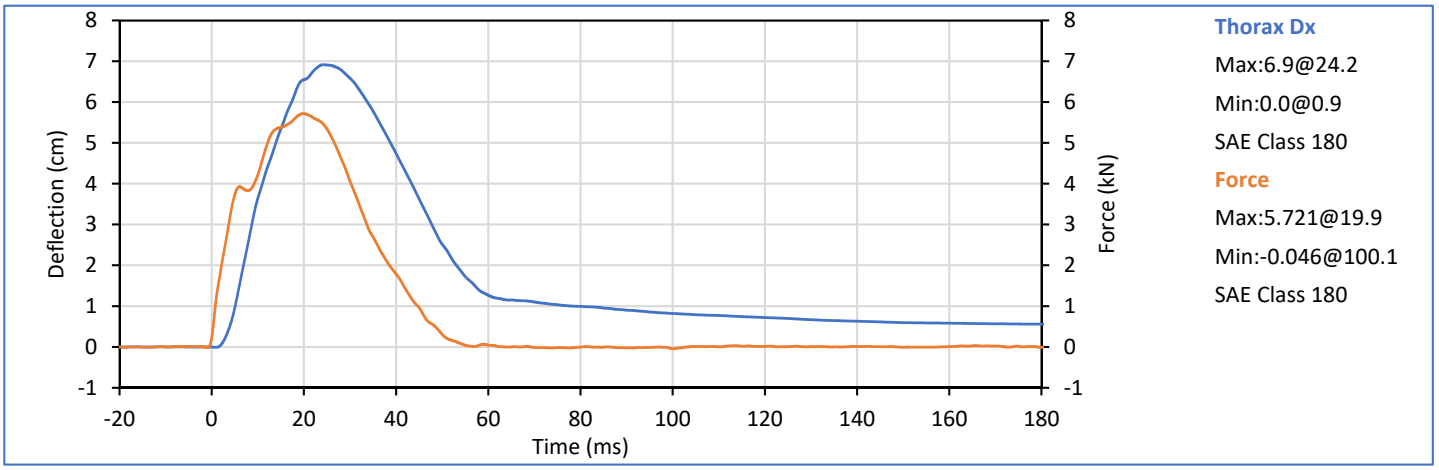
Hybrid III 50th Percentile Male ATD
Thorax Impact

ATD Serial No.: 360

Test Date: 2020-08-28

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
Probe Velocity	m/s	6.58	6.82	6.75	Pass
Peak Chest Deflection	cm	6.35	7.26	6.92	Pass
Peak Probe Force	kN	5.159	5.893	5.721	Pass
Internal Hysterisis	%	69.0	85.0	71.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

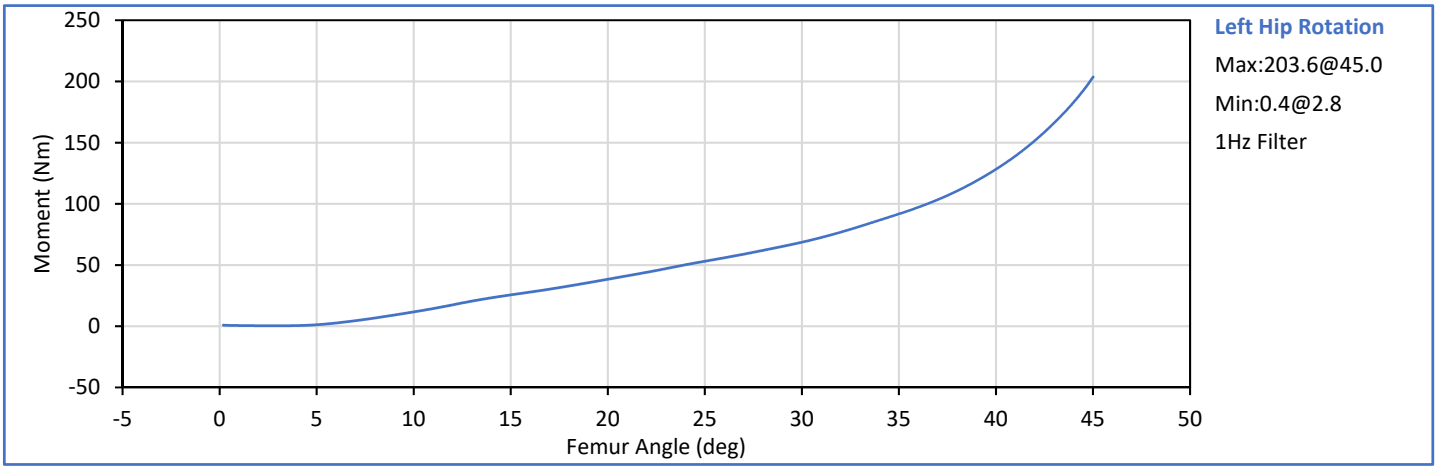
Approved By: P. Puzzuto

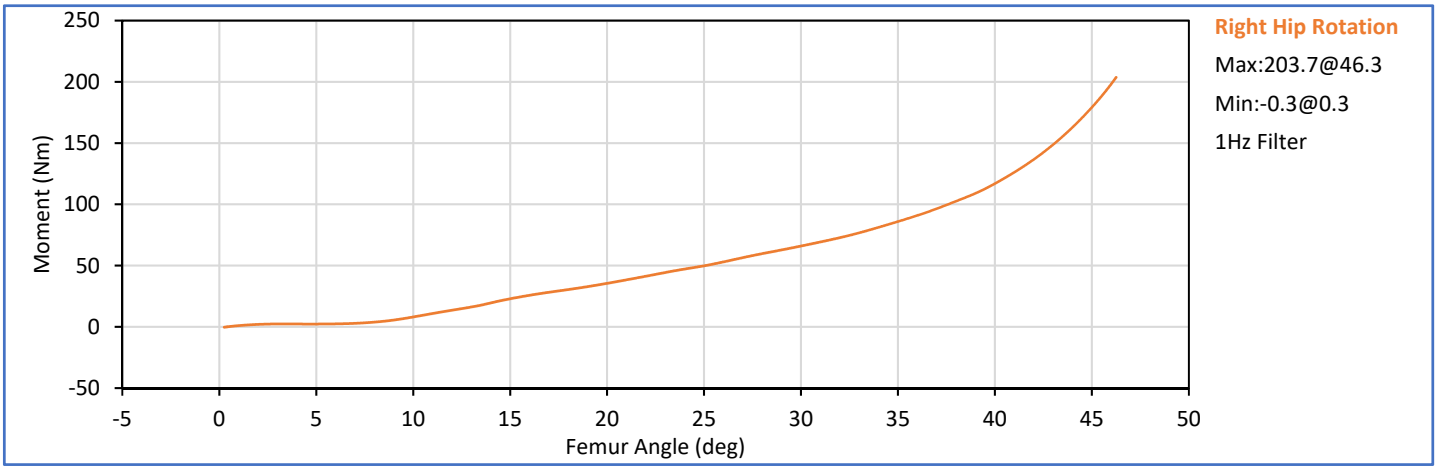
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Hip Flexion (Left/Right)

ATD Serial No.: 360 Test Date: 2020-08-28

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.2	Pass
	Laboratory Relative Humidity	%	10	70	21	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	5.7	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	68.7	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	45.0	Pass
Right Hip	Right Hip Rotation Rate	deg/s	5.0	10.0	5.7	Pass
	Right Femur Torque at 30°	Nm	0.0	95.0	66.0	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	46.2	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

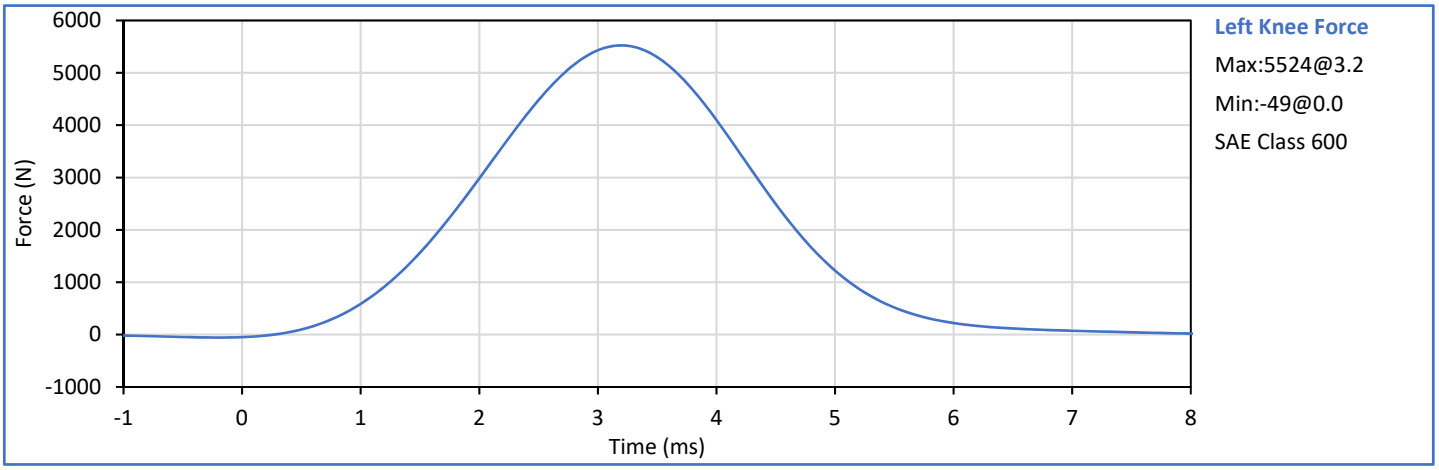
Applus IDIADA
KARCO

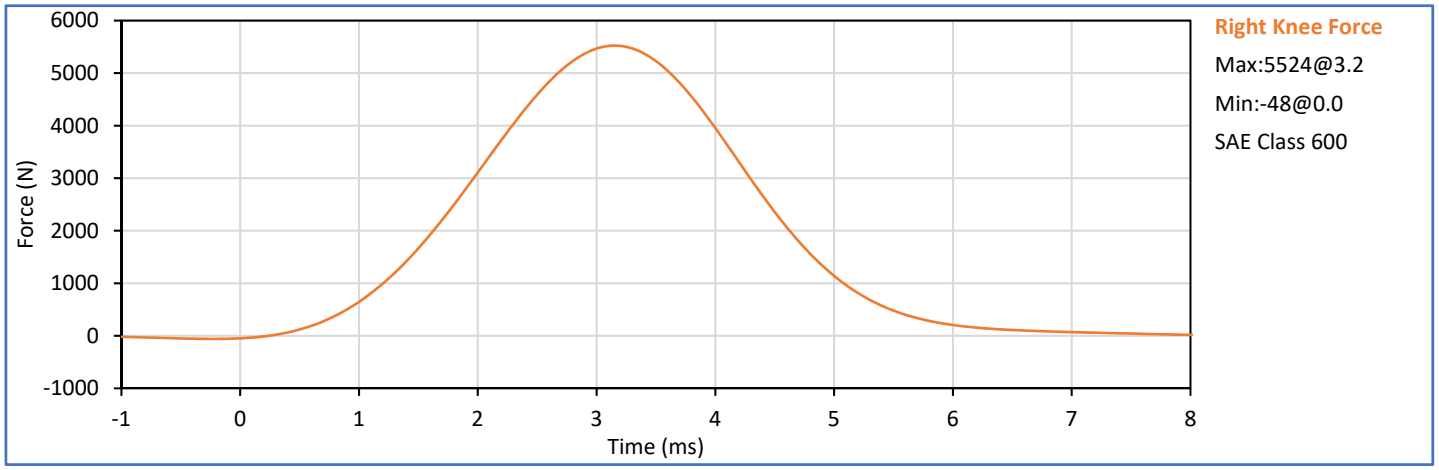
Hybrid III 50th Percentile Male ATD
Knee Impact (Left/Right)

ATD Serial No.: 360

Test Date: 2020-08-28

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	20.7	Pass
	Laboratory Relative Humidity	%	10	70	35	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.100	Pass
	Peak Resistive Force	N	4715	5782	5524	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.102	Pass
	Peak Resistive Force	N	4715	5782	5524	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: 2020-08-24

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.	Bent shaft			✓
Assembly	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer	Head mounting secure			✓
Mounting	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: 2020-08-24

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	22	Pass
A - Total sitting height	mm	775	800	789	Pass
B - Shoulder pivot height	mm	432	457	449	Pass
C - 'H' point height	mm	81	86	84	Pass
D - 'H' point location from backline	mm	145	150	148	Pass
E - Shoulder pivot from backline	mm	69	84	76	Pass
F - Thigh clearance	mm	119	135	129	Pass
G - Back of elbow to wrist pivot	mm	244	259	253	Pass
H - Head back to backline	mm	41	46	44	Pass
I - Shoulder to elbow length	mm	277	297	284	Pass
J - Elbow rest height	mm	183	203	195	Pass
K - Buttock to knee length	mm	521	546	538	Pass
L - Popliteal length	mm	356	376	369	Pass
M - Knee pivot height	mm	394	419	407	Pass
N - Buttock popliteal length	mm	414	439	430	Pass
O - Chest depth without jacket	mm	175	191	185	Pass
P - Foot length	mm	219	234	227	Pass
R - Buttock to Knee Pivot Length	mm	457	483	476	Pass
S - Head Breadth	mm	137	147	142	Pass
T - Head Depth	mm	178	188	180	Pass
U - Hip Breadth	mm	300	315	309	Pass
V - Shoulder breadth	mm	351	366	362	Pass
W - Foot breadth	mm	79	94	83	Pass
X - Head circum.	mm	528	549	540	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	873	Pass
Z - Waist circum.	mm	760	790	777	Pass
AA - Location for chest circum.	mm	333	358	342	Pass
BB - Location for waist circum.	mm	160	170	169	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

Approved By: P. Puzzuto

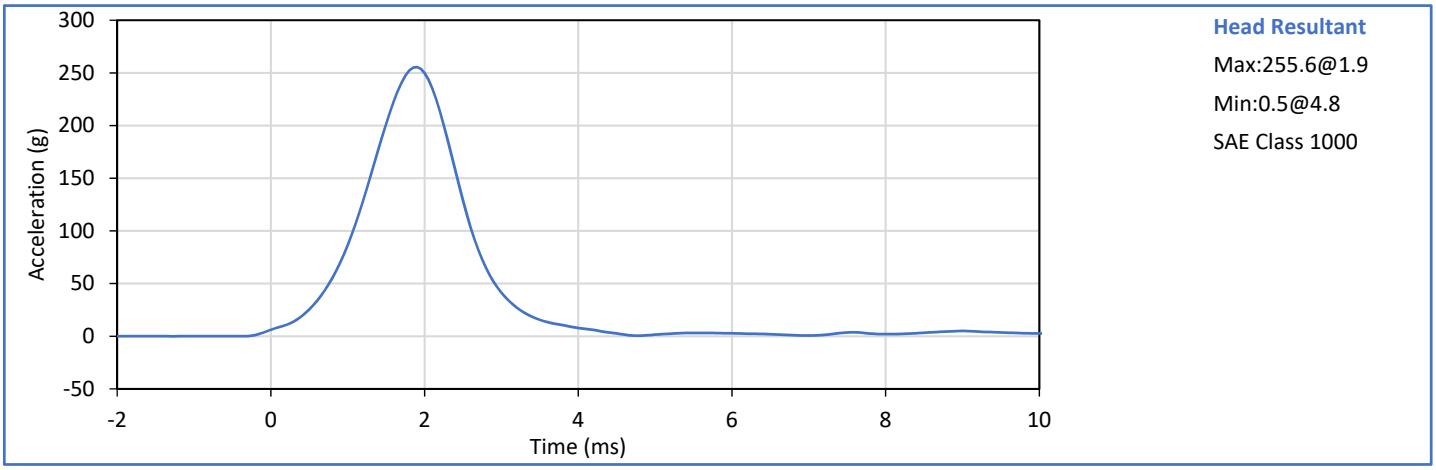
Applus IDIADA KARCO

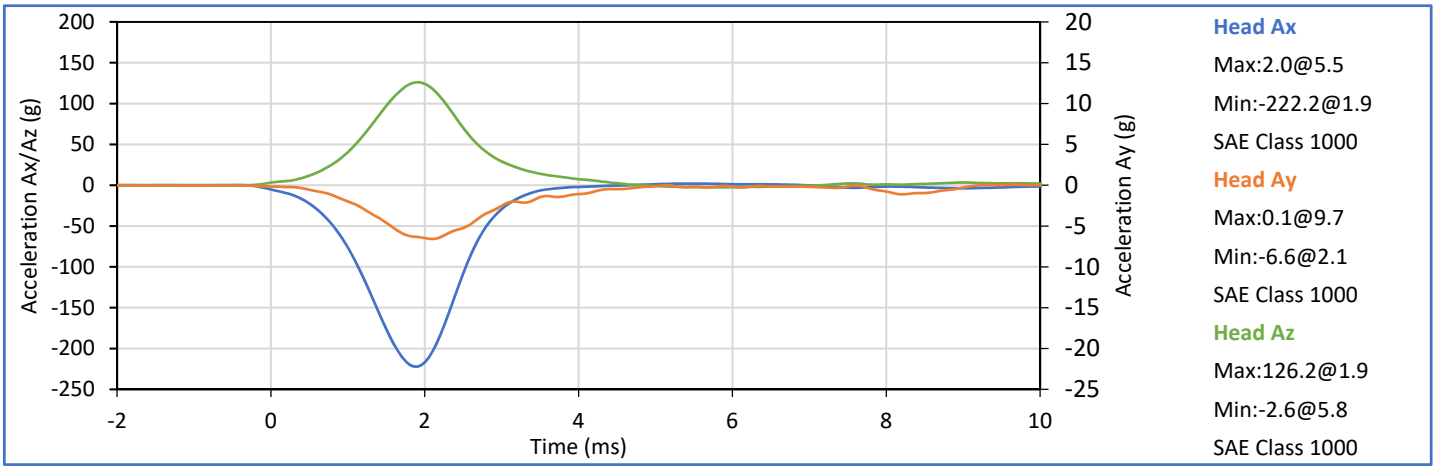
Hybrid III 5th Percentile Female ATD
Head Drop Test

ATD Serial No.: 141

Test Date: 2020-08-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.8	Pass
Laboratory Humidity	%	10	70	42	Pass
Peak Resultant Acceleration	g	250.0	300.0	255.6	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-6.6	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.0	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

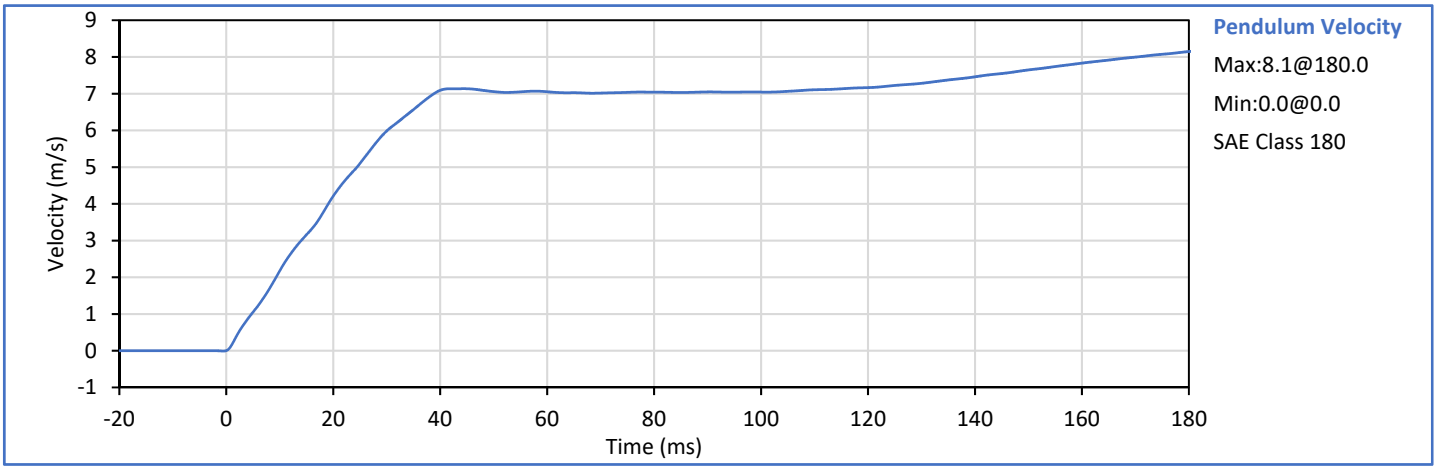
Approved By: P. Puzzuto

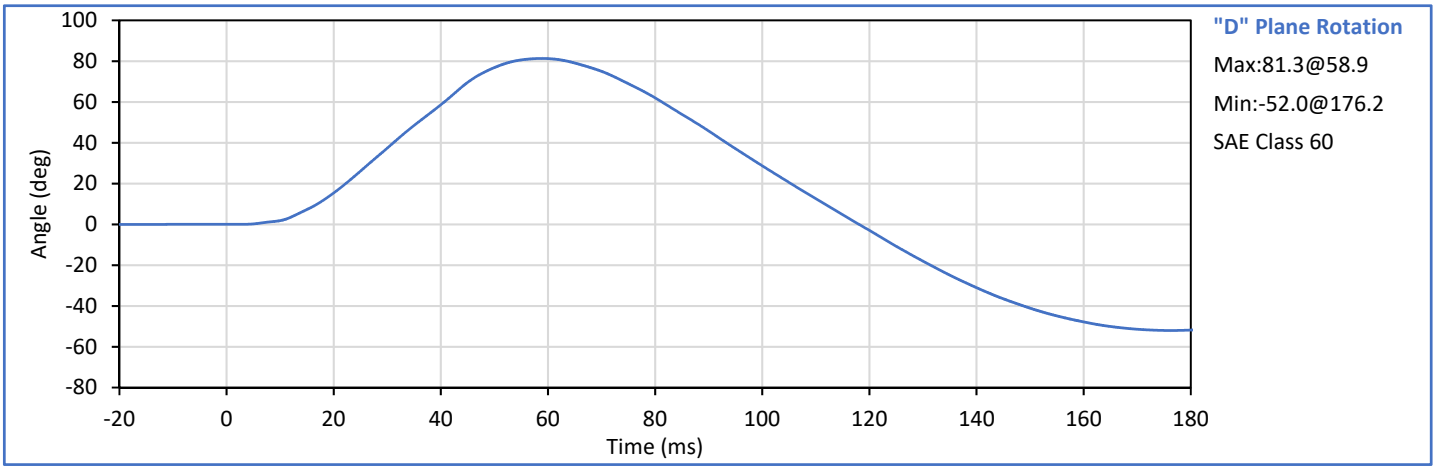
Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Neck Flexion Test

ATD Serial No.: 141 Test Date: 2020-08-27

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	6.89	7.13	7.00	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.18	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.21	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	5.99	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	81.3	Pass
Peak Moment in Rotation	Nm	69.0	83.0	74.9	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	85.3	Pass
			Overall Test Results		Pass





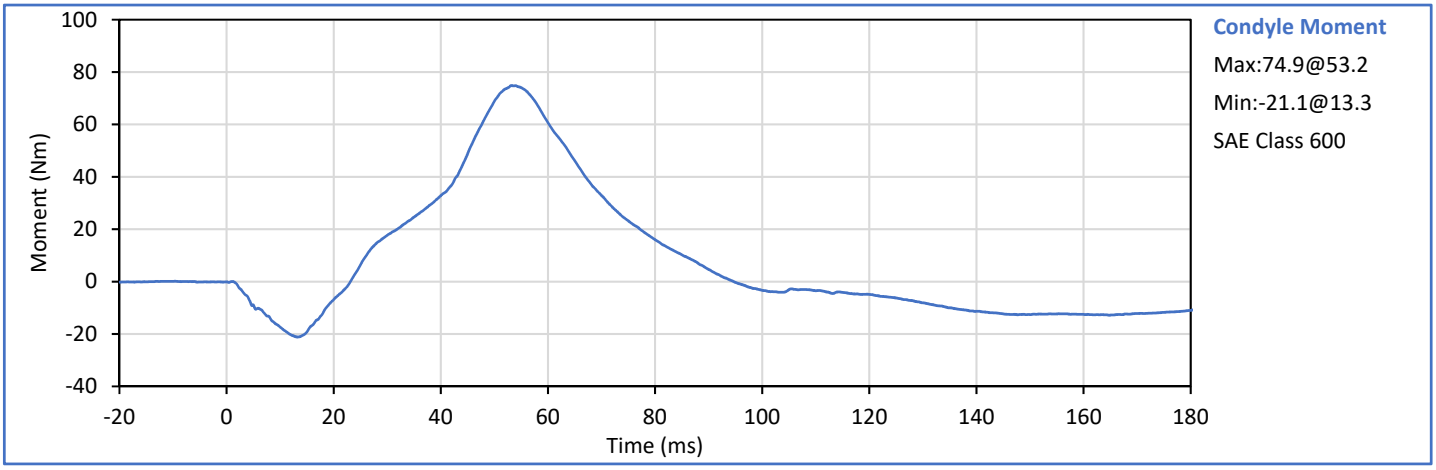
Technician: J. Hernandez

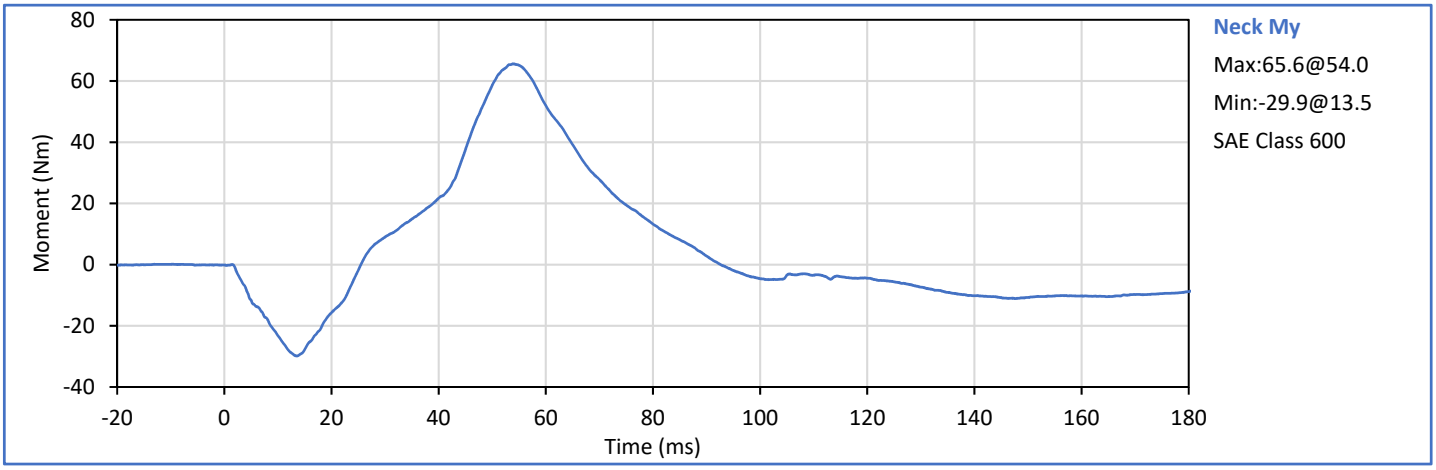
Approved By: P. Puzzuto

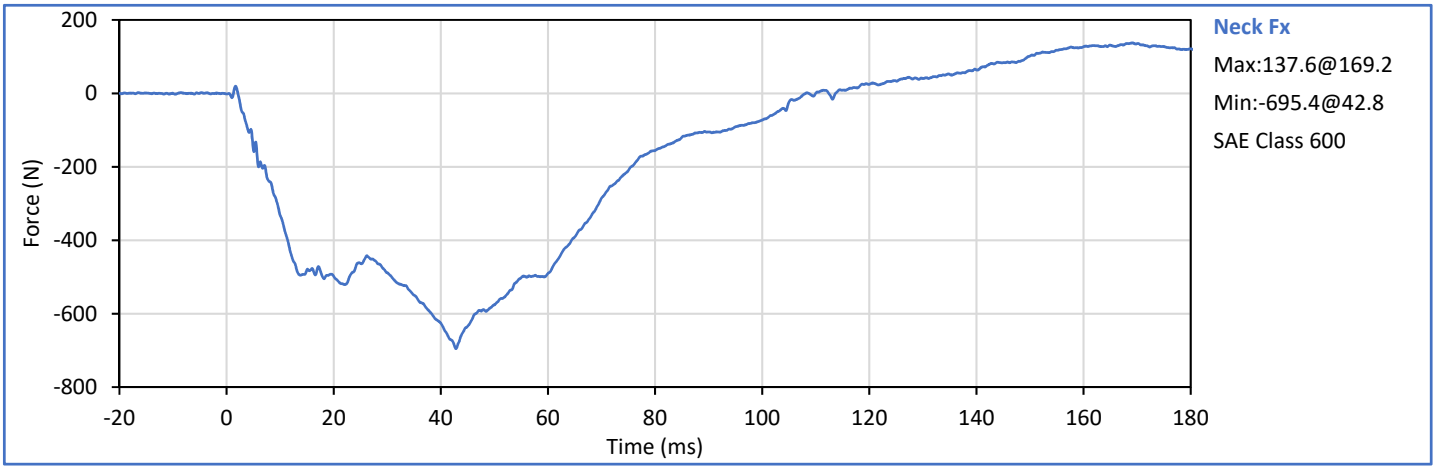
Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Neck Flexion Test

ATD Serial No.: 141 Test Date: 2020-08-27





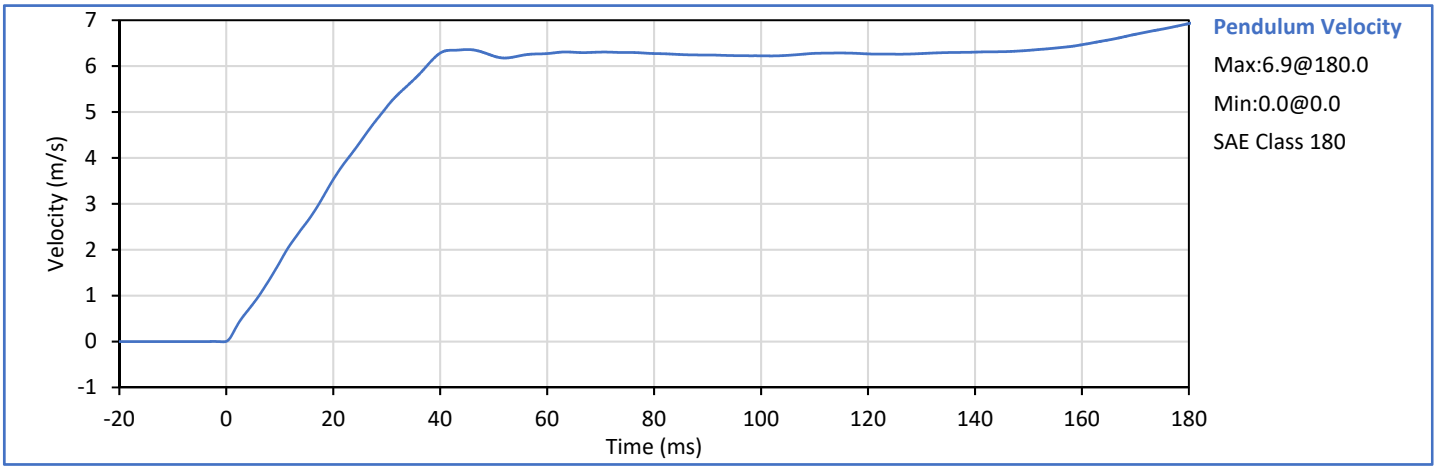


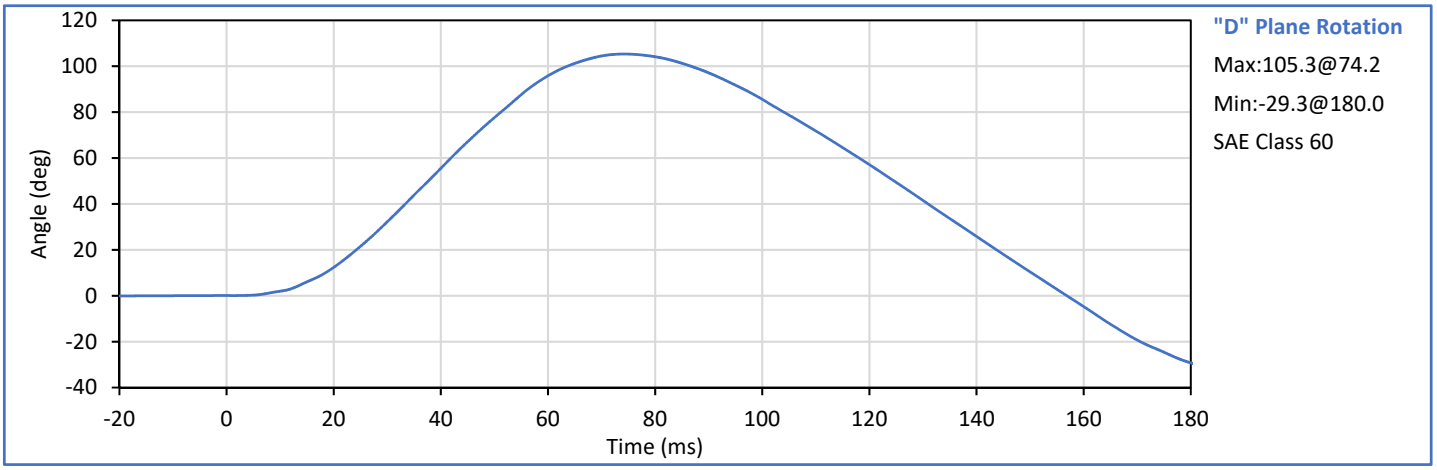
Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Neck Extension Test

ATD Serial No.: 141 Test Date: 2020-08-27

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	20.8	Pass
Laboratory Humidity	%	10	70	37	Pass
Pendulum Velocity	m/s	5.95	6.19	6.14	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.73	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.53	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.11	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	105.3	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-55.8	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	102.1	Pass
			Overall Test Results		Pass





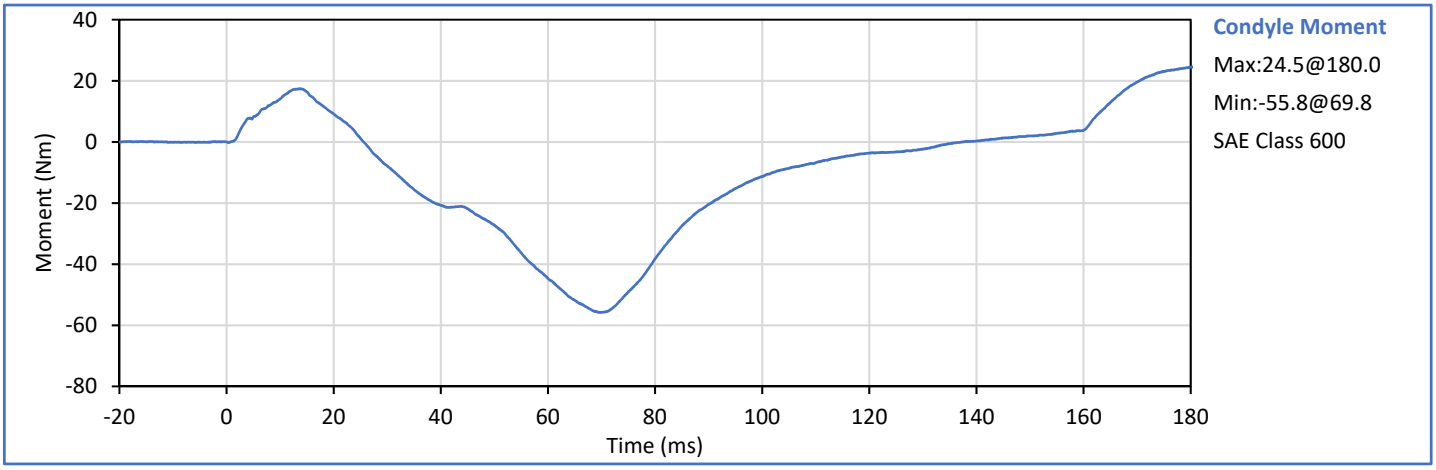
Technician: J. Hernandez

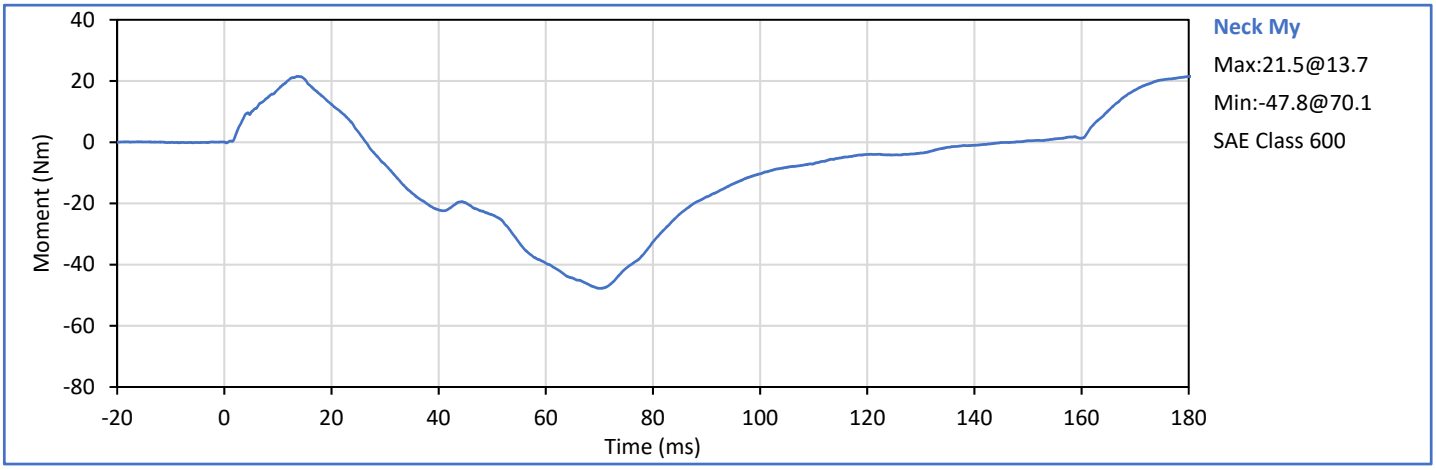
Approved By: P. Puzzuto

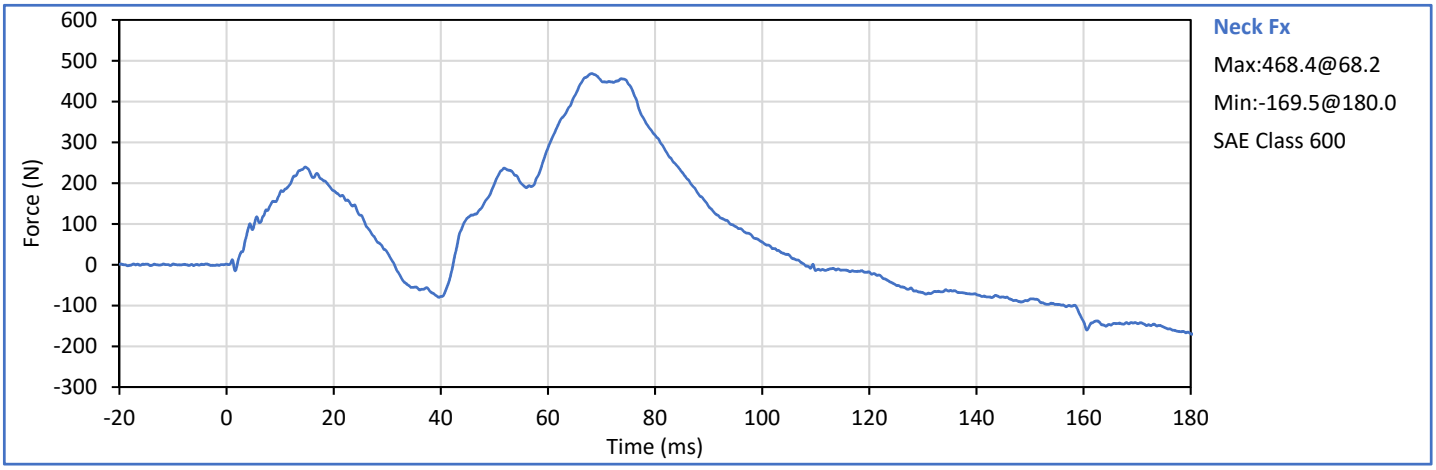
Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Neck Extension Test

ATD Serial No.: 141 Test Date: 2020-08-27







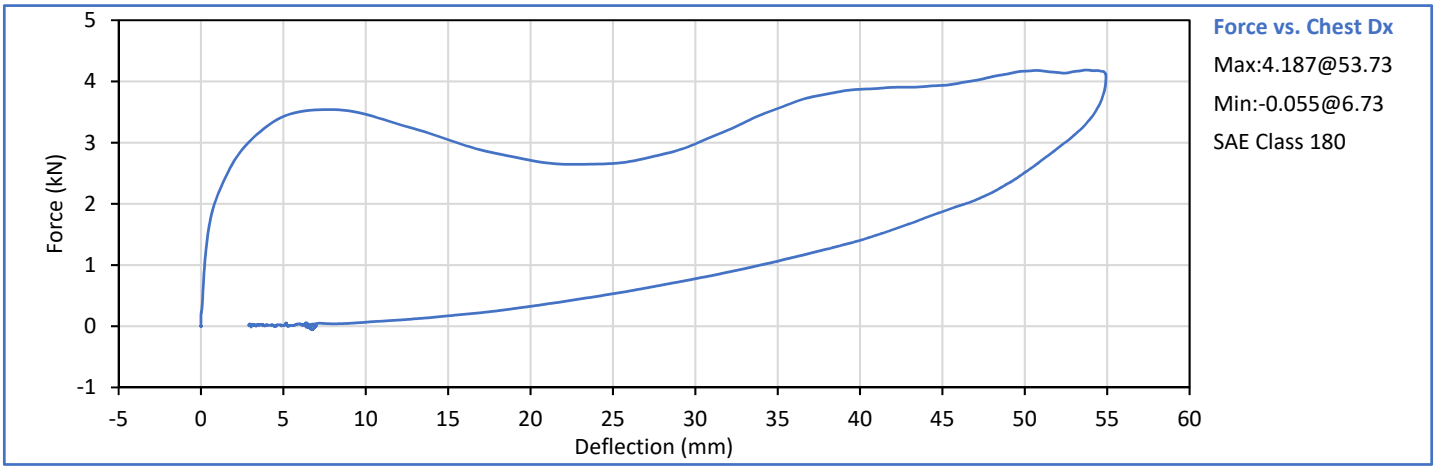
Applus IDIADA
KARCO

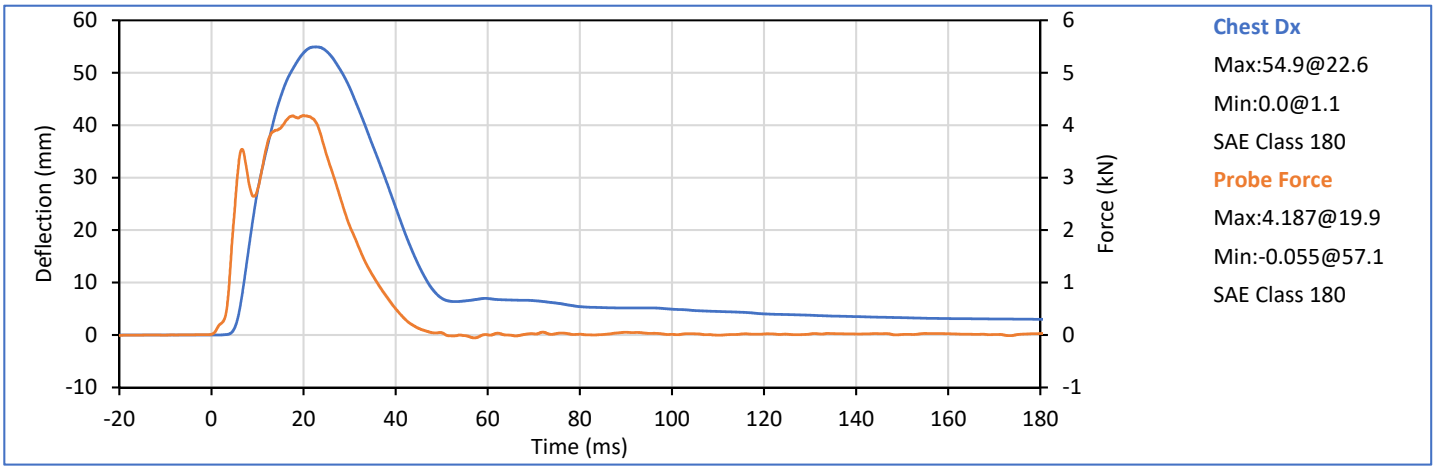
Hybrid III 5th Percentile Female ATD
Thorax Impact

ATD Serial No.: 141

Test Date: 2020-08-28

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	33	Pass
Probe Velocity	m/s	6.59	6.83	6.74	Pass
Peak Chest Deflection	mm	50.0	58.0	54.9	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.187	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	4.168	Pass
Internal Hysterisis	%	69.0	85.0	71.7	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

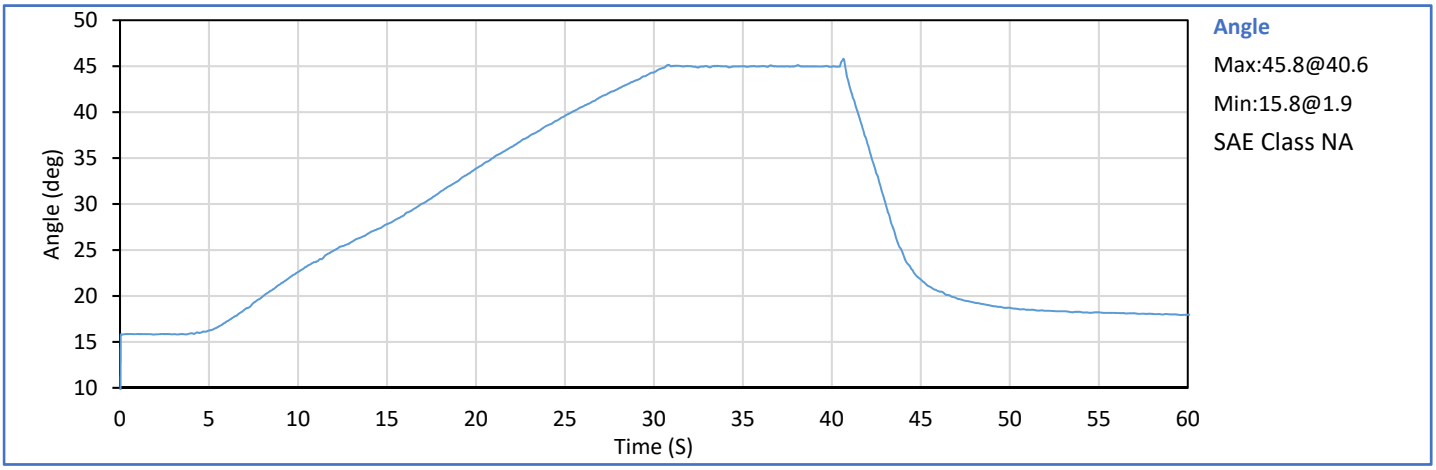
Applus IDIADA KARCO

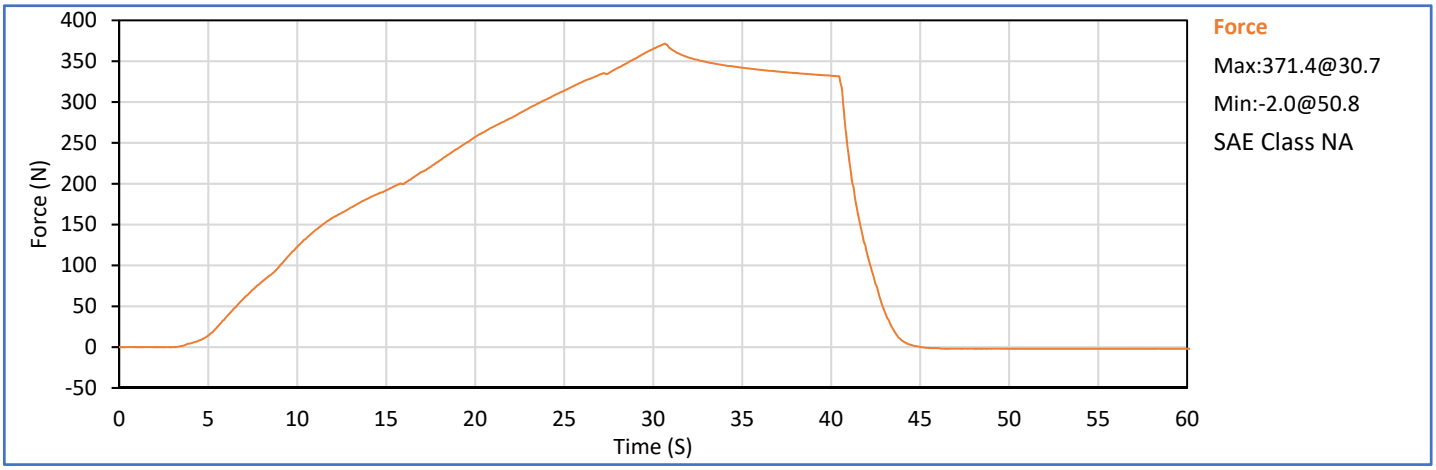
Hybrid III 5th Percentile Female ATD
Torso Flexion Test

ATD Serial No.: 141

Test Date: 2020-08-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	20.8	Pass
Laboratory Humidity	%	10	70	30	Pass
Orientation Angle	deg	0.0	20.0	15.1	Pass
Test Initial Angle	deg	11.0	19.0	15.8	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	335.6	Pass
Torso Flexion Rate	deg/s	0.50	1.50	1.13	Pass
Final Reference Plane Angle	deg	-8.0	8.0	4.1	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

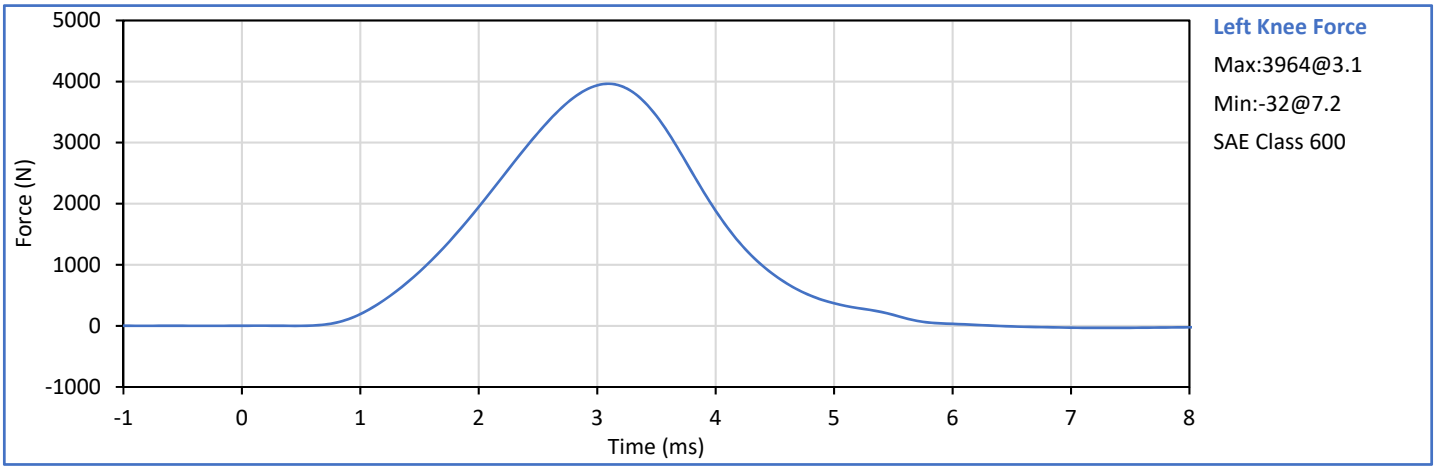
Applus IDIADA KARCO

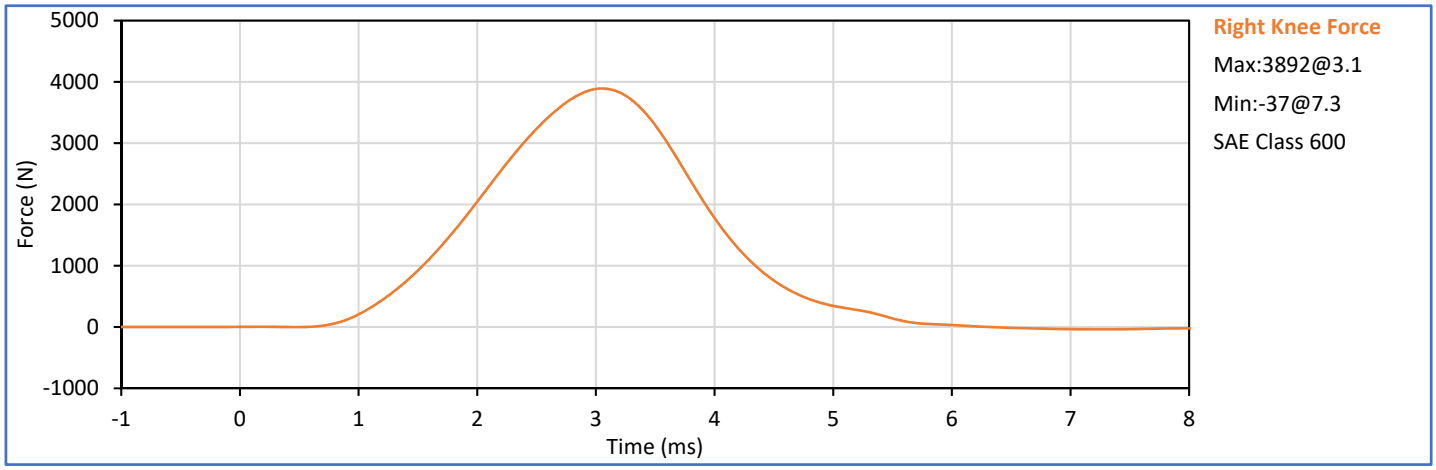
Hybrid III 5th Percentile Female ATD
Knee Impact (Left/Right)

ATD Serial No.: 141

Test Date: 2018-06-05

	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
Left Knee	Probe Velocity	m/s	2.070	2.130	2.084	Pass
	Peak Resistive Force	N	3450	4060	3964	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.087	Pass
	Peak Resistive Force	N	3450	4060	3892	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: 2020-09-10

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.	Bent shaft			✓
Assembly	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer	Head mounting secure			✓
Mounting	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: 2020-09-10

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	888	Pass
B - Shoulder pivot height	mm	505	521	516	Pass
C - 'H' point height	mm	84	89	87	Pass
D - 'H' point location from backline	mm	135	140	138	Pass
E - Shoulder pivot from backline	mm	84	94	91	Pass
F - Thigh clearance	mm	140	155	147	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	338	Pass
J - Elbow rest height	mm	190	211	200	Pass
K - Buttock to knee length	mm	579	604	588	Pass
L - Popliteal length	mm	429	455	444	Pass
M - Knee pivot height	mm	485	500	493	Pass
N - Buttock popliteal length	mm	452	477	458	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	105	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	980	Pass
Z - Waist circum.	mm	836	866	851	Pass
AA - Location for chest circum.	mm	429	434	433	Pass
BB - Location for waist circum.	mm	226	231	228	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

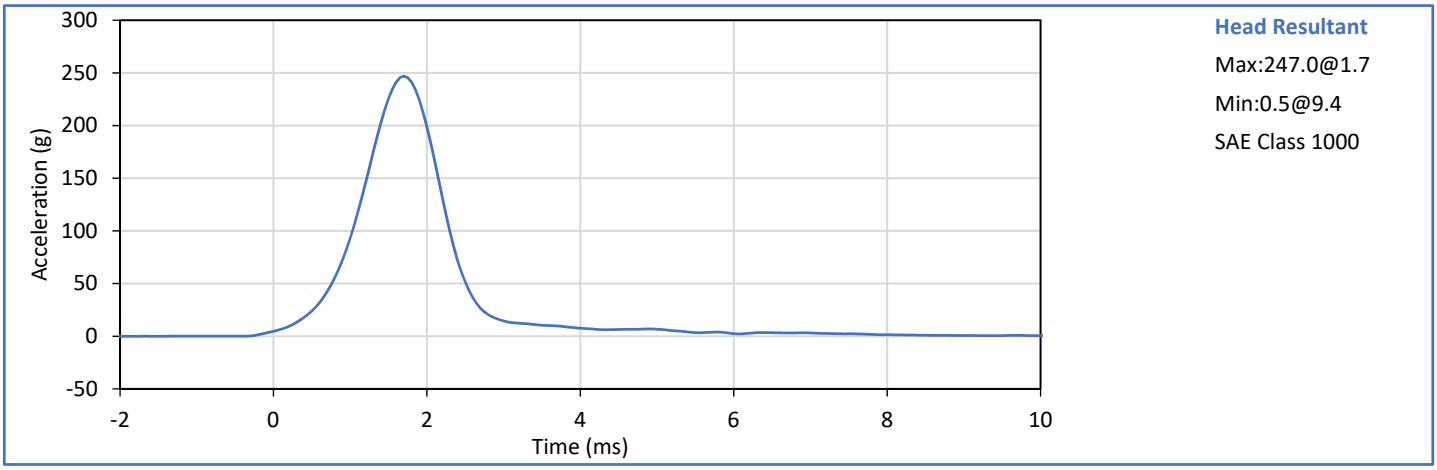
Approved By: P. Puzzuto

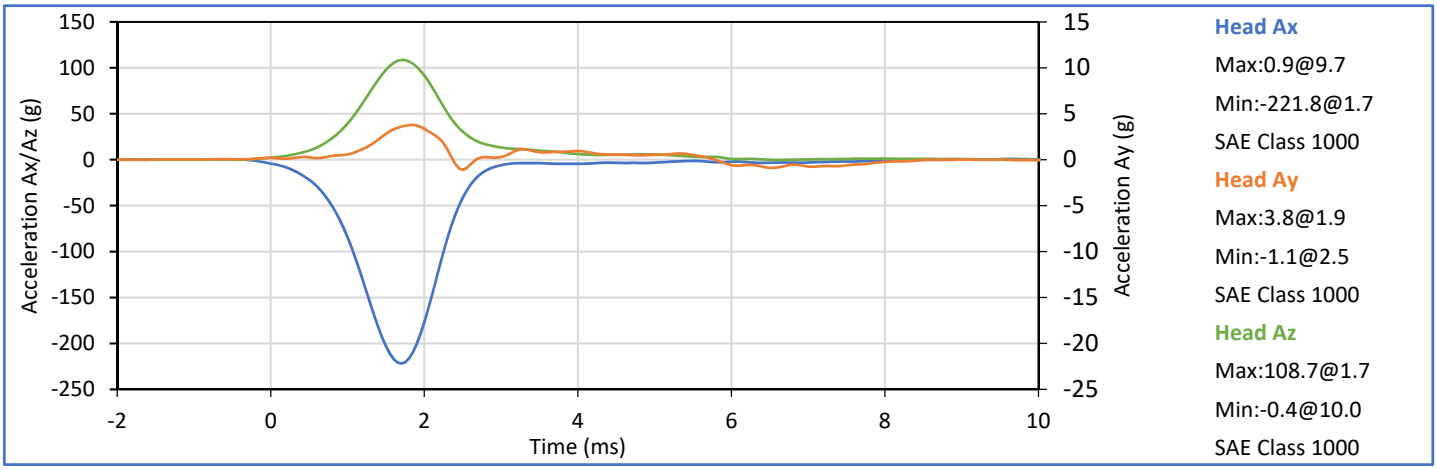
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Head Drop

ATD Serial No.: 360 Test Date: 2020-09-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity	%	10	70	21	Pass
Peak Resultant Acceleration	g	225.0	275.0	247.0	Pass
Peak Lateral Acceleration	g	-15.0	15.0	3.8	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

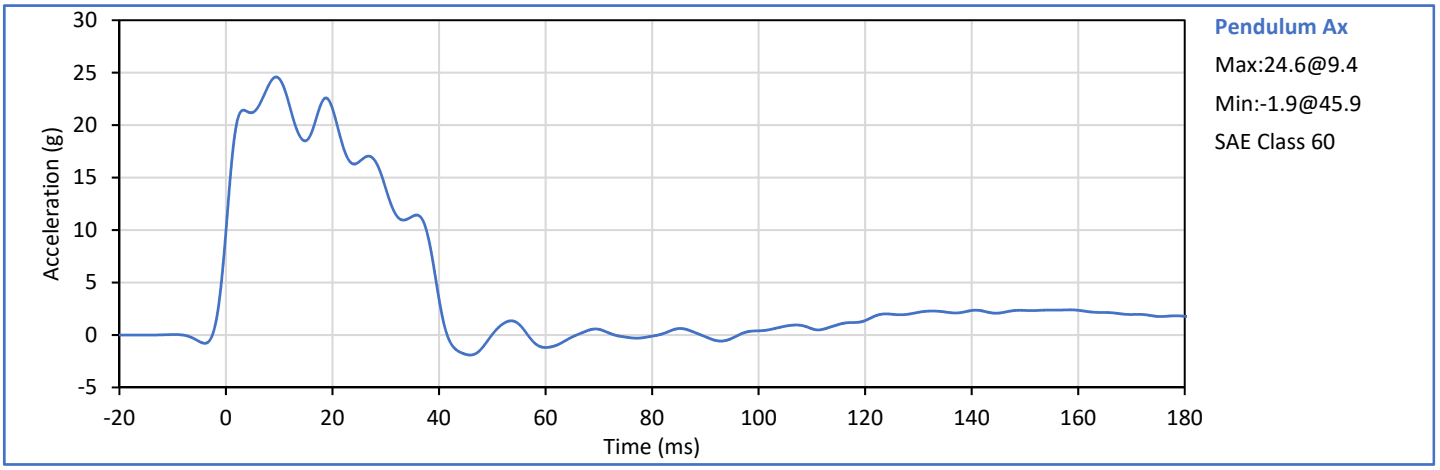
Approved By: P. Puzzuto

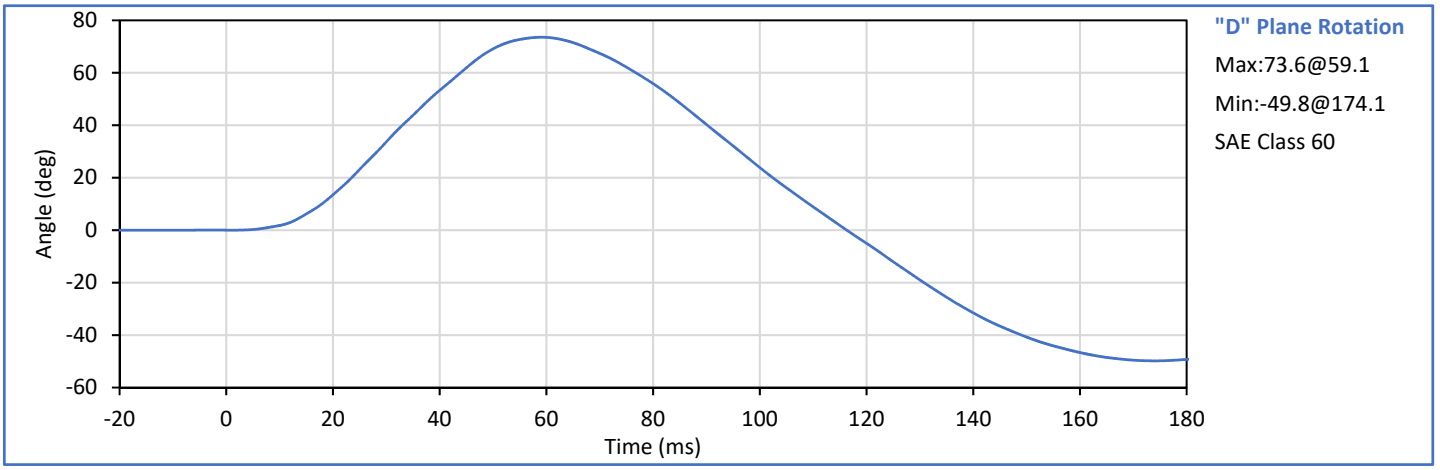
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 360 Test Date: 2020-09-10

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	6.92	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	24.4	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	21.6	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	14.0	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	14.0	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	39.5	Pass
"D" Plane Rotation peak	deg	64.0	78.0	73.6	Pass
	ms	57.0	64.0	59.1	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	116.4	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	96.7	Pass
	ms	47.0	58.0	52.8	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	100.3	Pass
			Overall Test Results		Pass



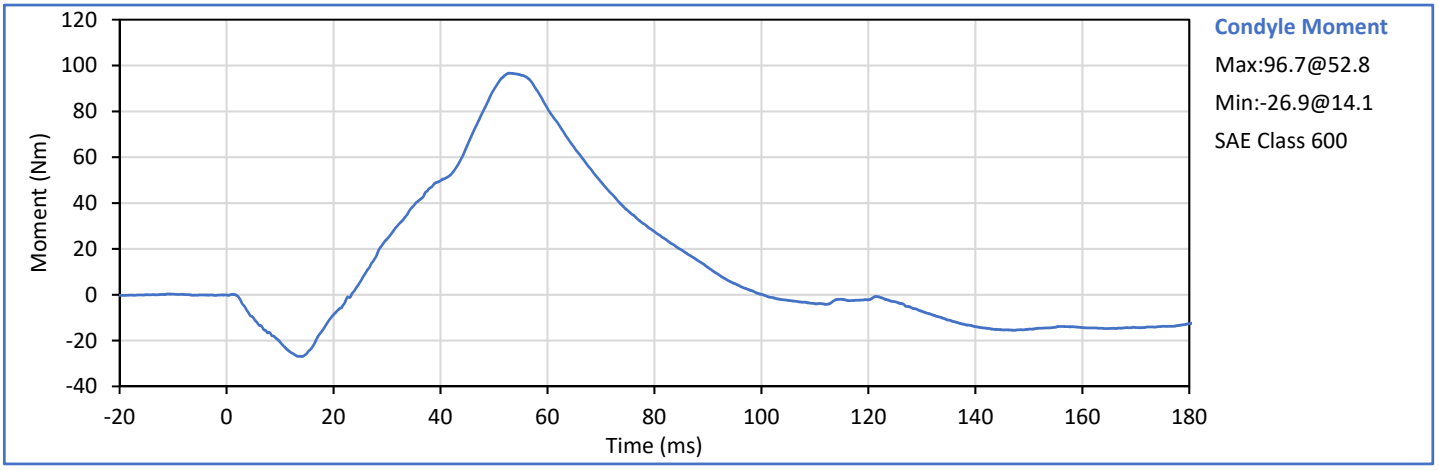


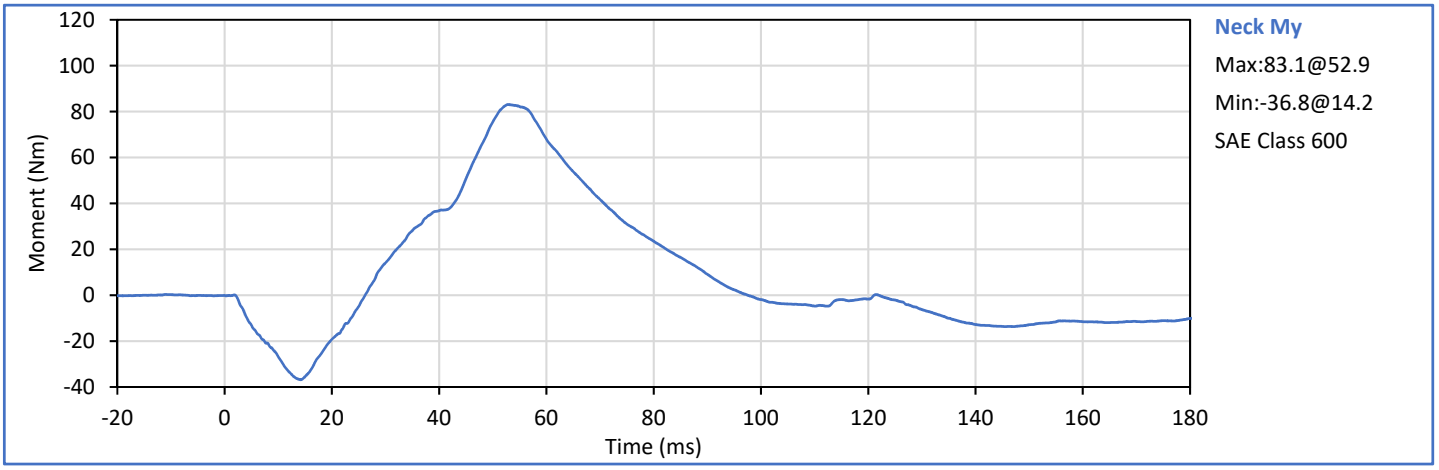
Technician: J. Hernandez

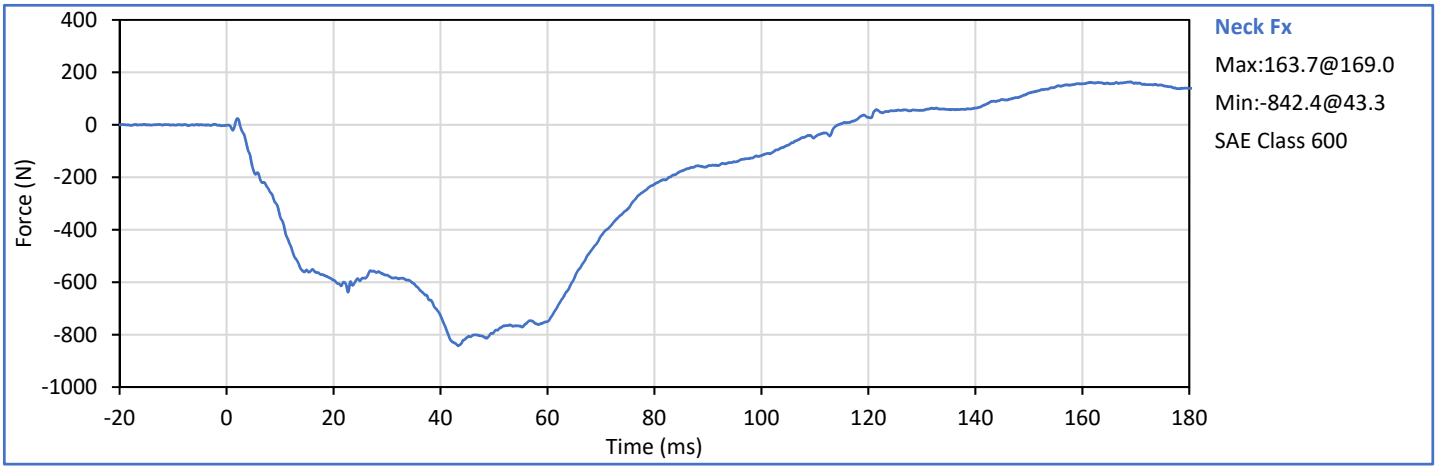
Approved By: P. Puzzuto

Hybrid III 50th Percentile Male ATD
Neck Flexion Test

ATD Serial No.: 360 Test Date: 2020-09-10





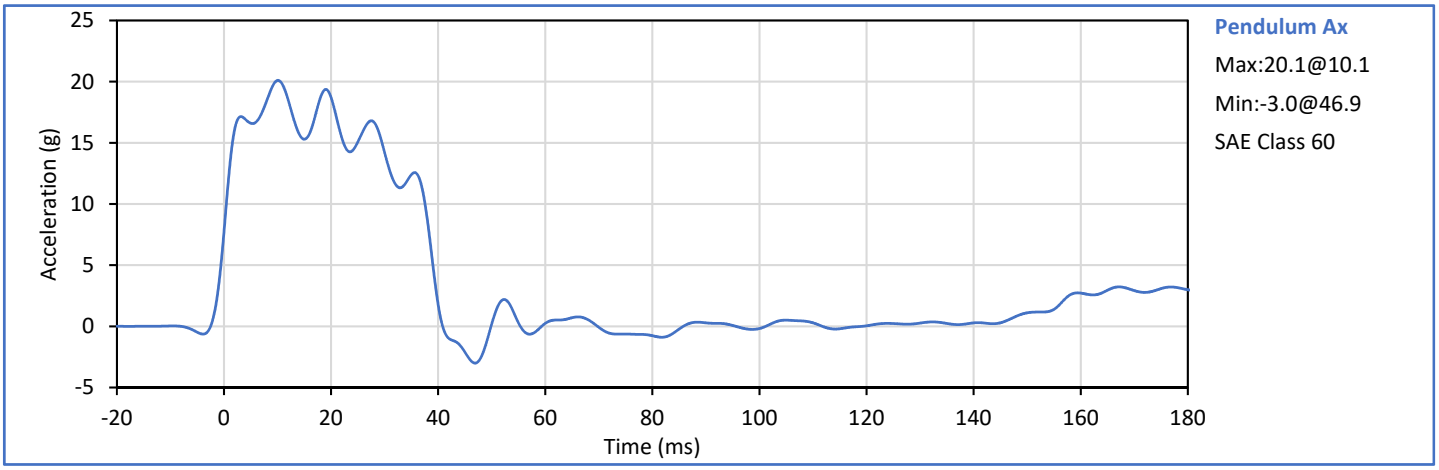


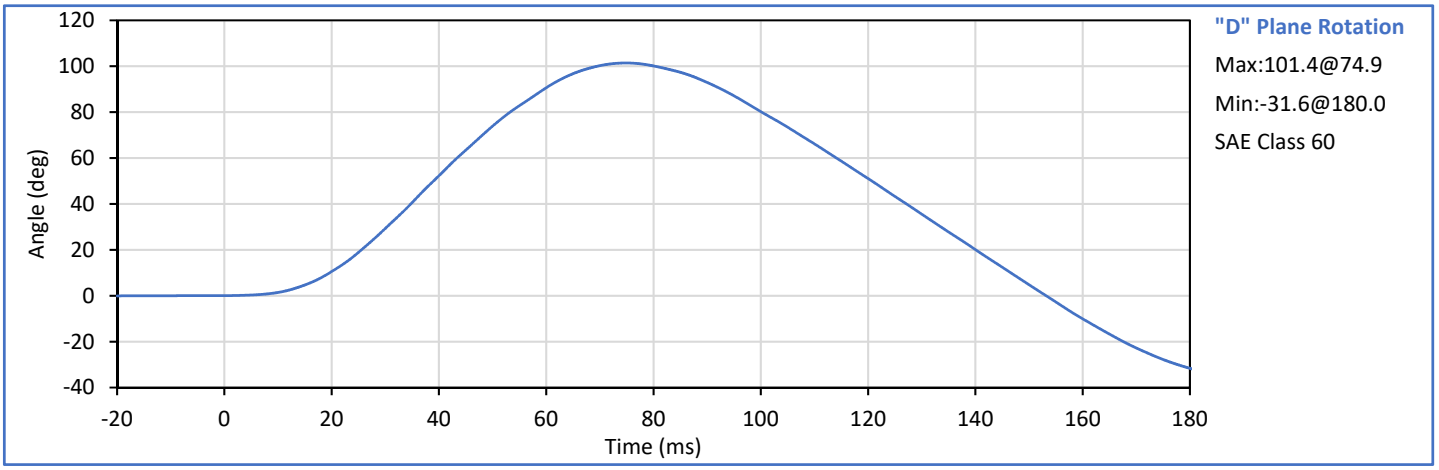
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 360 Test Date: 2020-09-10

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	6.14	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.1	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.7	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	14.2	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	14.2	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	39.0	Pass
"D" Plane Rotation peak	deg	81.0	106.0	101.4	Pass
	ms	72.0	82.0	74.9	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	153.3	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-78.0	Pass
	ms	65.0	79.0	69.4	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	138.6	Pass
			Overall Test Results		Pass





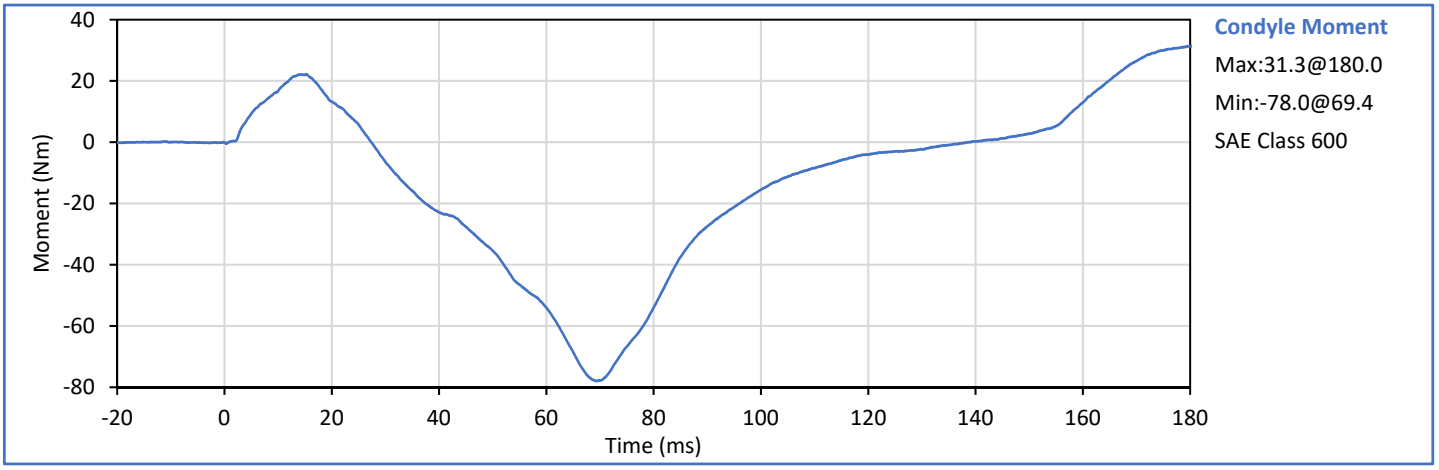
Technician: J. Hernandez

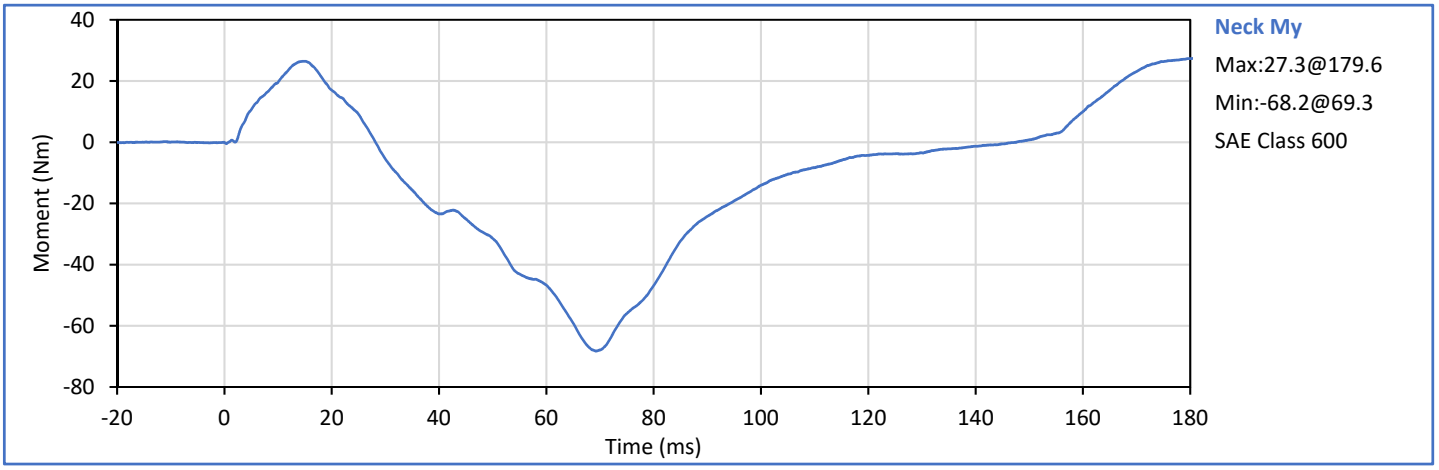
Approved By: P. Puzzuto

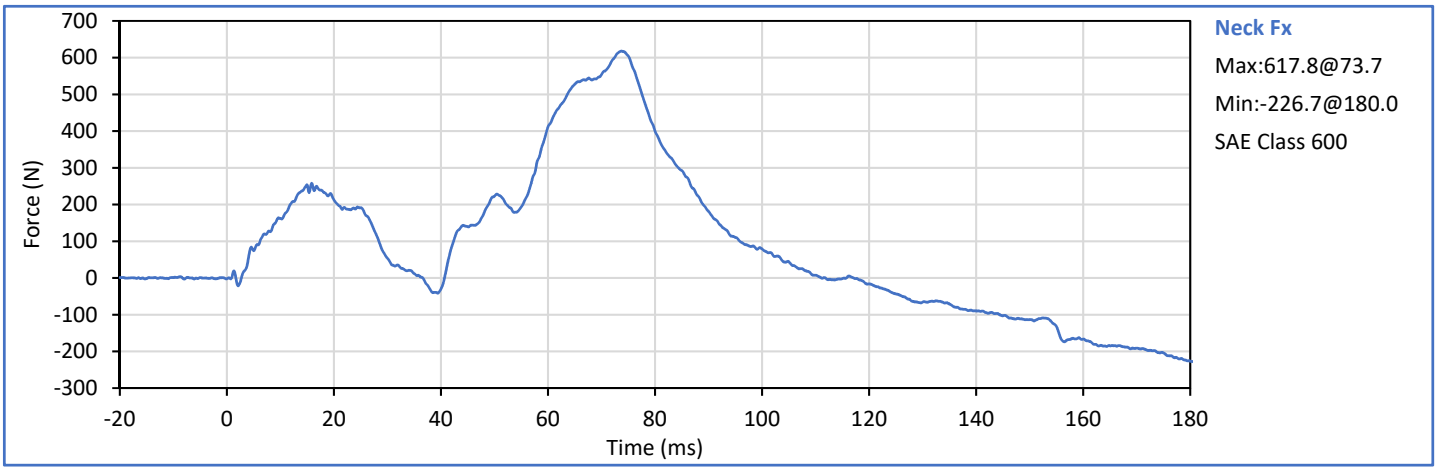
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Neck Extension Test

ATD Serial No.: 360 Test Date: 2020-09-10







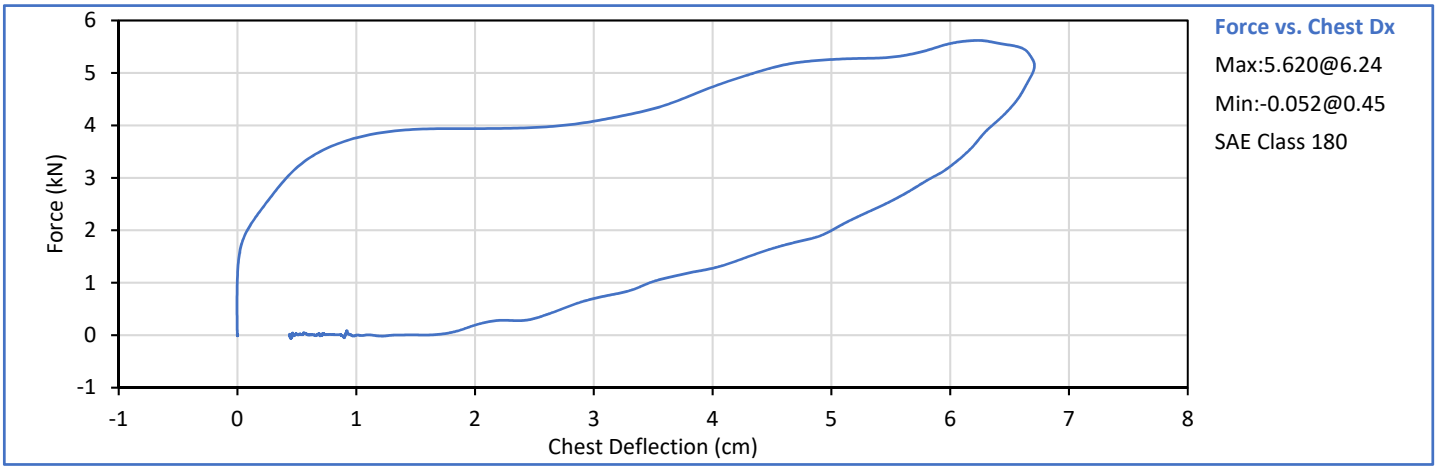
Applus IDIADA
KARCO

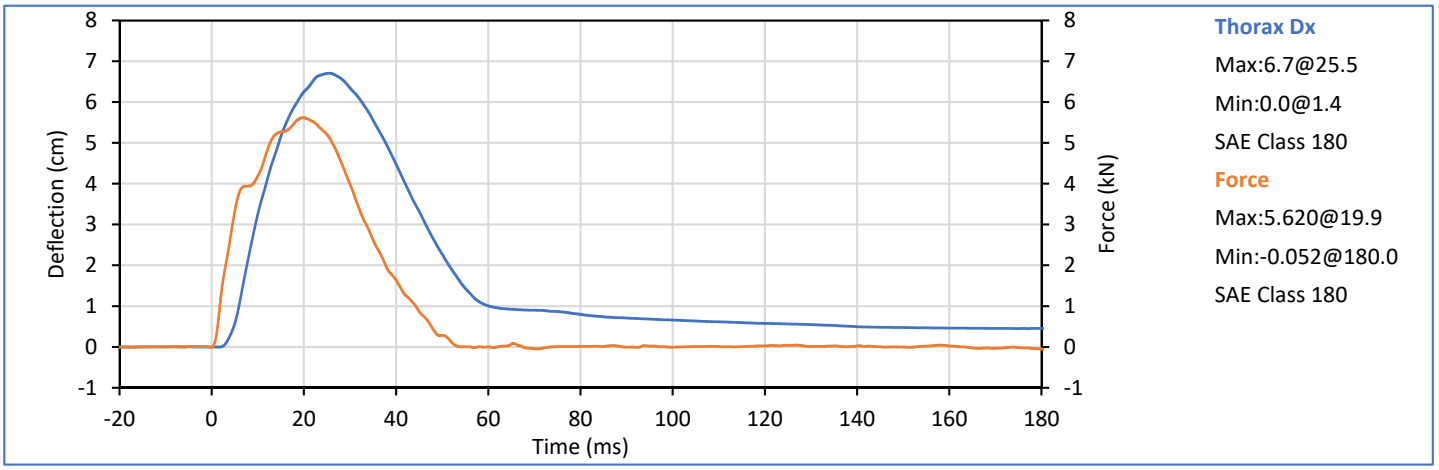
Hybrid III 50th Percentile Male ATD
Thorax Impact

ATD Serial No.: 360

Test Date: 2020-09-11

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	22	Pass
Probe Velocity	m/s	6.58	6.82	6.73	Pass
Peak Chest Deflection	cm	6.35	7.26	6.71	Pass
Peak Probe Force	kN	5.159	5.893	5.620	Pass
Internal Hysterisis	%	69.0	85.0	71.3	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

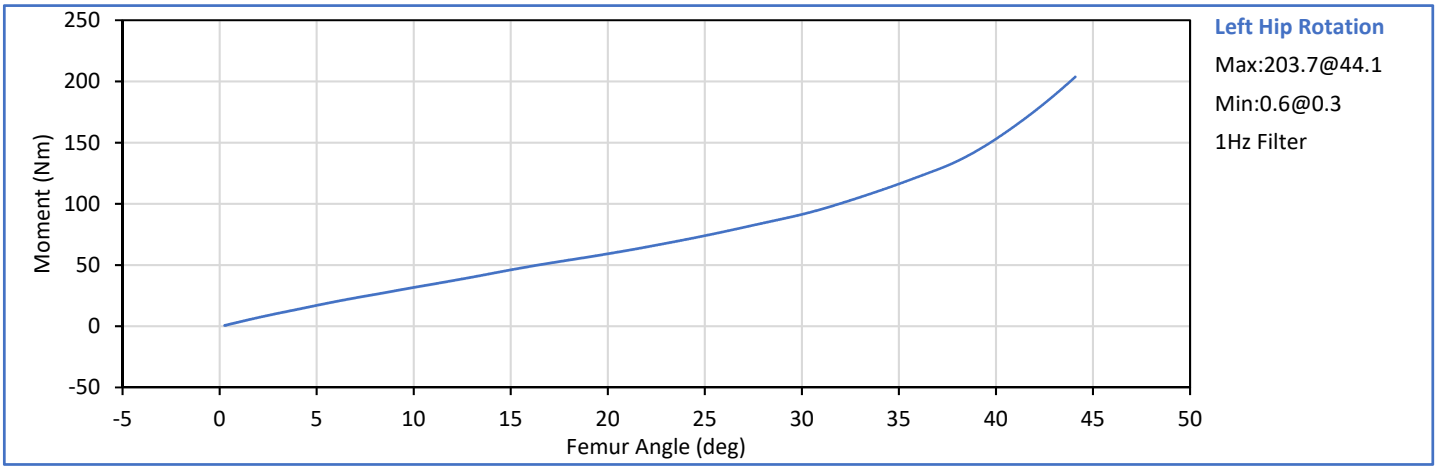
Approved By: P. Puzzuto

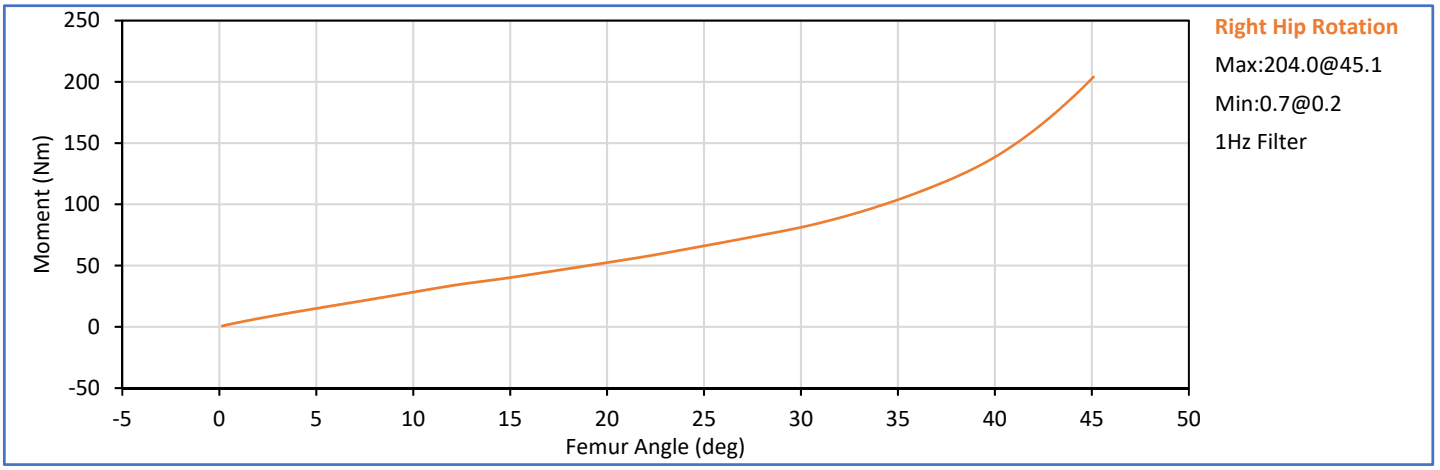
Applus IDIADA KARCO

Hybrid III 50th Percentile Male ATD
Hip Flexion (Left/Right)

ATD Serial No.: 360 Test Date: 2020-09-11

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.2	Pass
	Laboratory Relative Humidity	%	10	70	21	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	6.2	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	91.4	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	44.0	Pass
Right Hip	Right Hip Rotation Rate	deg/s	5.0	10.0	6.3	Pass
	Right Femur Torque at 30°	Nm	0.0	95.0	81.3	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	45.0	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

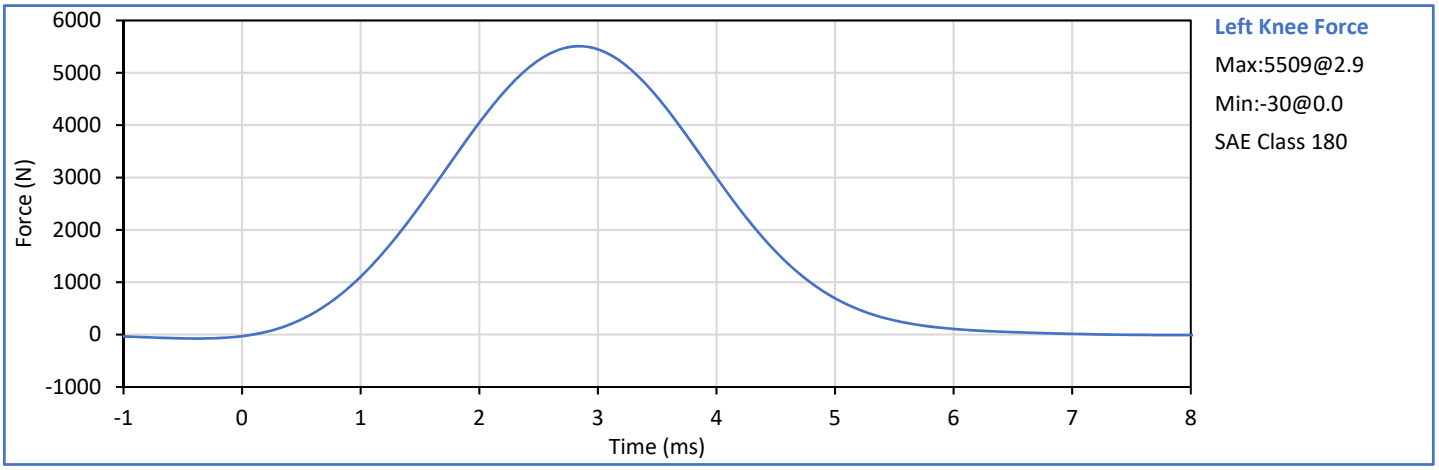
Applus IDIADA
KARCO

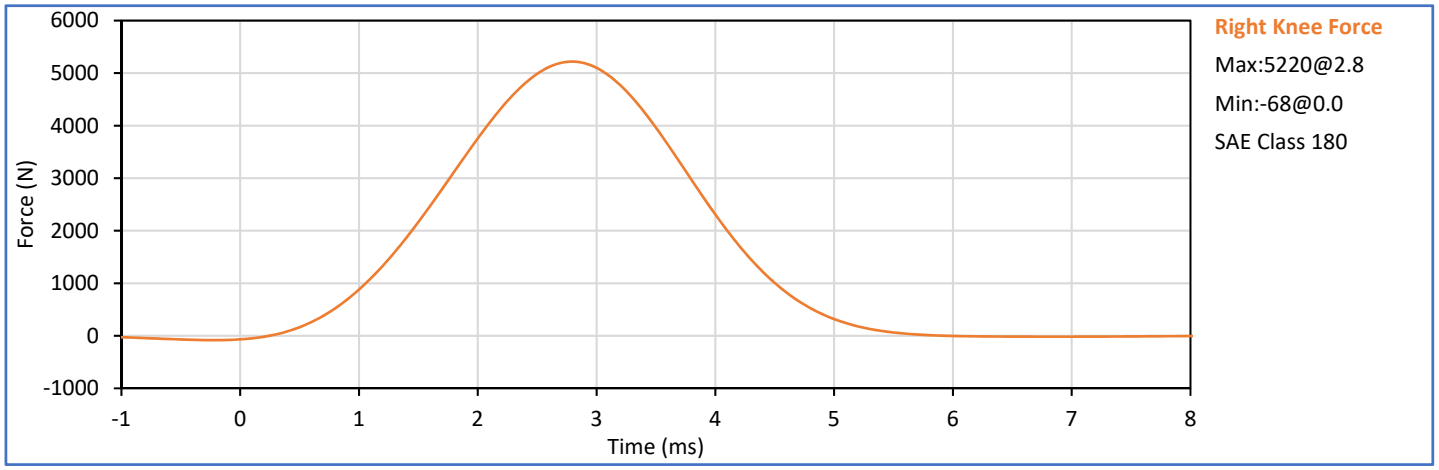
Hybrid III 50th Percentile Male ATD
Knee Impact (Left/Right)

ATD Serial No.: 360

Test Date: 2020-09-11

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.4	Pass
	Laboratory Relative Humidity	%	10	70	21	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.097	Pass
	Peak Resistive Force	N	4715	5782	5509	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.098	Pass
	Peak Resistive Force	N	4715	5782	5220	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: 2020-09-09

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.	Bent shaft			✓
Assembly	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer	Head mounting secure			✓
Mounting	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: 2020-09-09

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.0	Pass
Laboratory Relative Humidity	%	10	70	20	Pass
A - Total sitting height	mm	775	800	784	Pass
B - Shoulder pivot height	mm	432	457	444	Pass
C - 'H' point height	mm	81	86	86	Pass
D - 'H' point location from backline	mm	145	150	149	Pass
E - Shoulder pivot from backline	mm	69	84	81	Pass
F - Thigh clearance	mm	119	135	125	Pass
G - Back of elbow to wrist pivot	mm	244	259	253	Pass
H - Head back to backline	mm	41	46	42	Pass
I - Shoulder to elbow length	mm	277	297	287	Pass
J - Elbow rest height	mm	183	203	196	Pass
K - Buttock to knee length	mm	521	546	538	Pass
L - Popliteal length	mm	356	376	362	Pass
M - Knee pivot height	mm	394	419	410	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	478	Pass
S - Head Breadth	mm	137	147	143	Pass
T - Head Depth	mm	178	188	183	Pass
U - Hip Breadth	mm	300	315	311	Pass
V - Shoulder breadth	mm	351	366	363	Pass
W - Foot breadth	mm	79	94	87	Pass
X - Head circum.	mm	528	549	533	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	870	Pass
Z - Waist circum.	mm	760	790	768	Pass
AA - Location for chest circum.	mm	333	358	340	Pass
BB - Location for waist circum.	mm	160	170	166	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

Approved By: P. Puzzuto

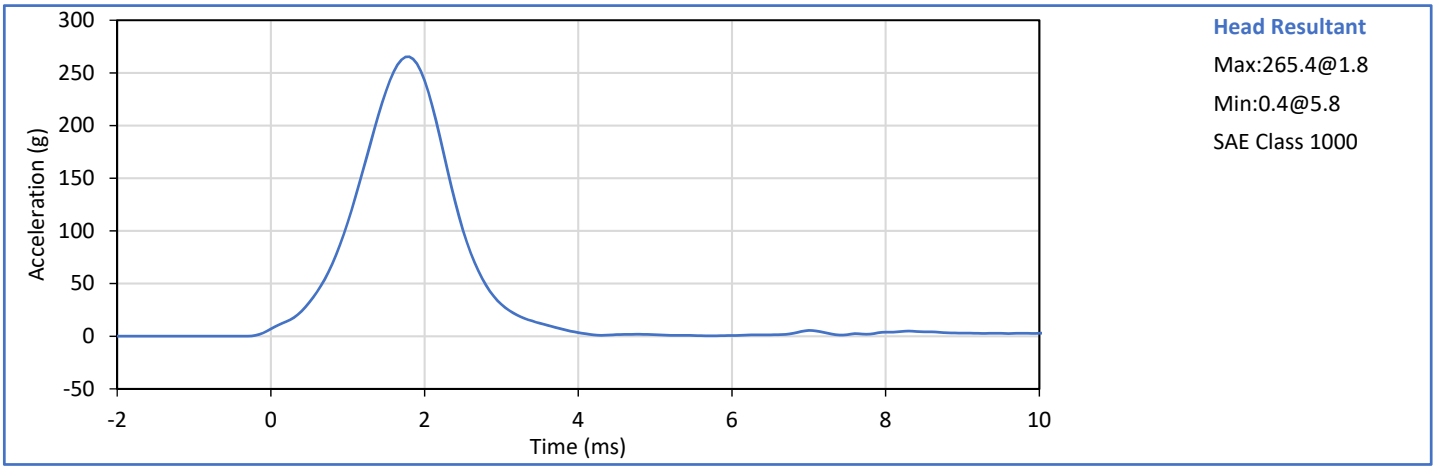
Applus IDIADA KARCO

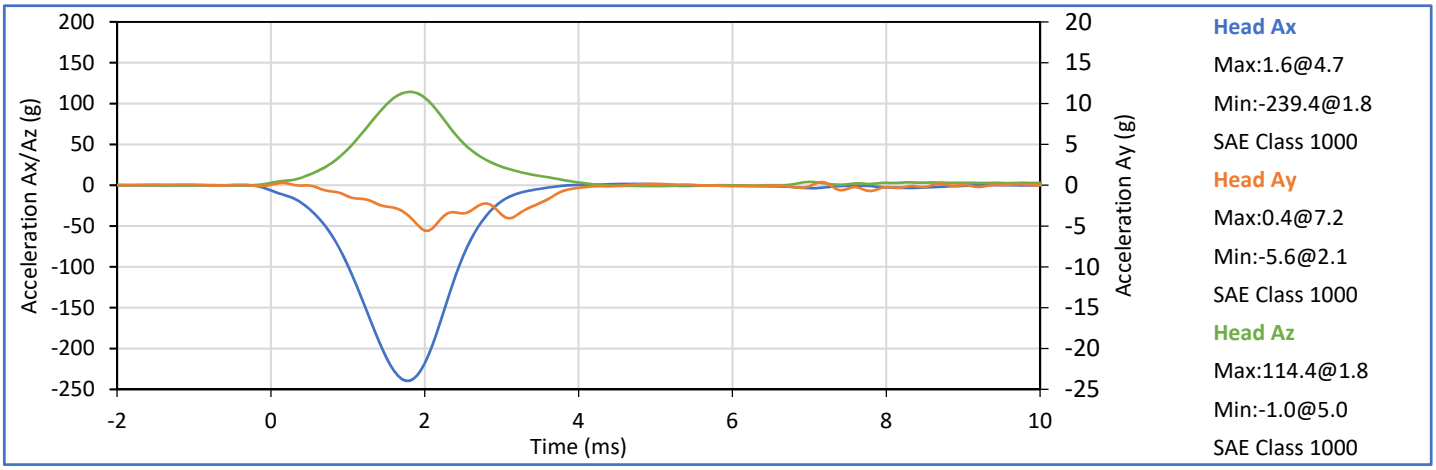
Hybrid III 5th Percentile Female ATD
Head Drop Test

ATD Serial No.: 141

Test Date: 2020-09-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.0	Pass
Laboratory Humidity	%	10	70	20	Pass
Peak Resultant Acceleration	g	250.0	300.0	265.4	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-5.6	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.1	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

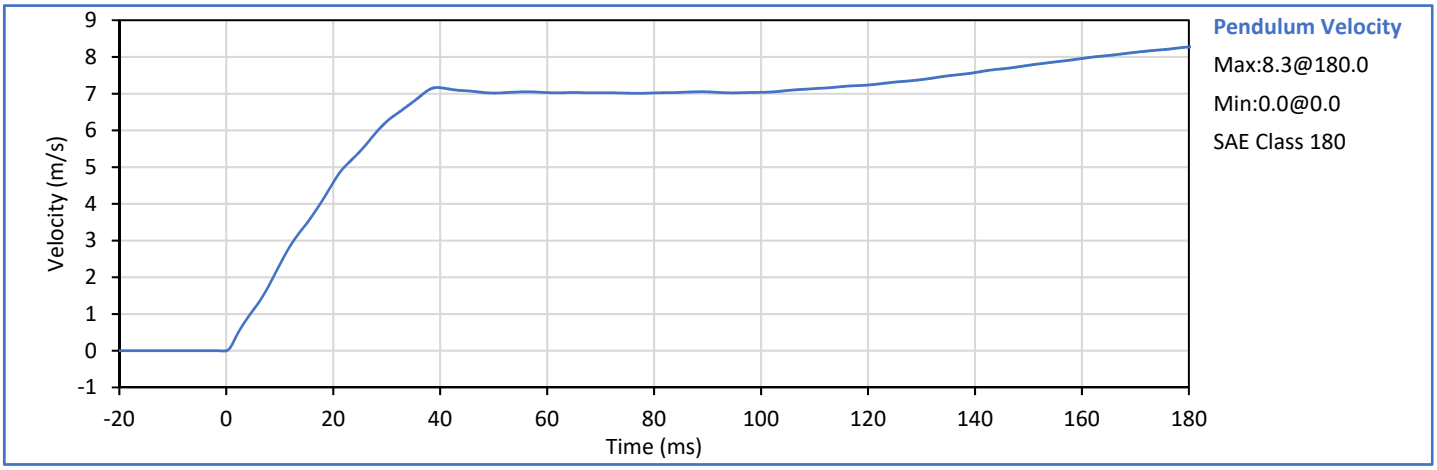
Approved By: P. Puzzuto

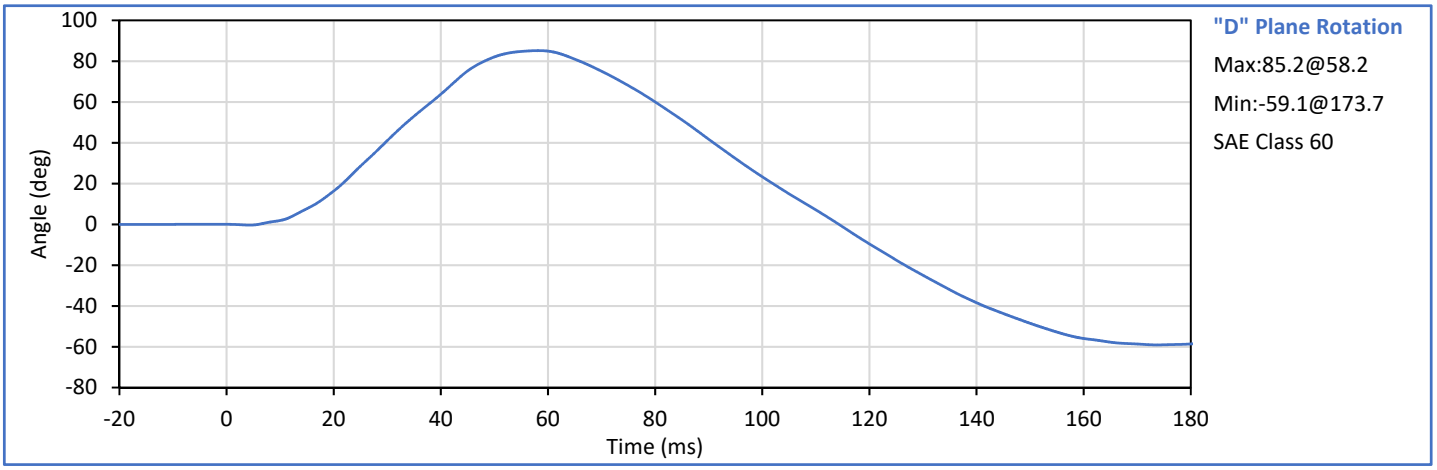
Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Neck Flexion Test

ATD Serial No.: 141 Test Date: 2020-09-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	6.89	7.13	6.90	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	4.58	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.24	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	85.2	Pass
Peak Moment in Rotation	Nm	69.0	83.0	75.4	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	82.9	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

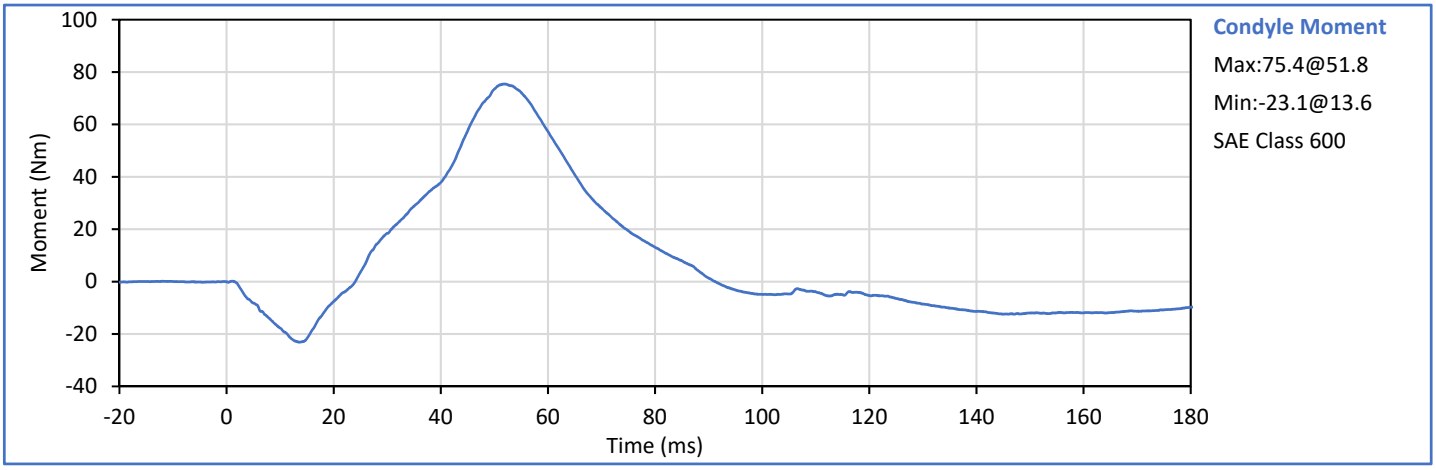
Approved By: P. Puzzuto

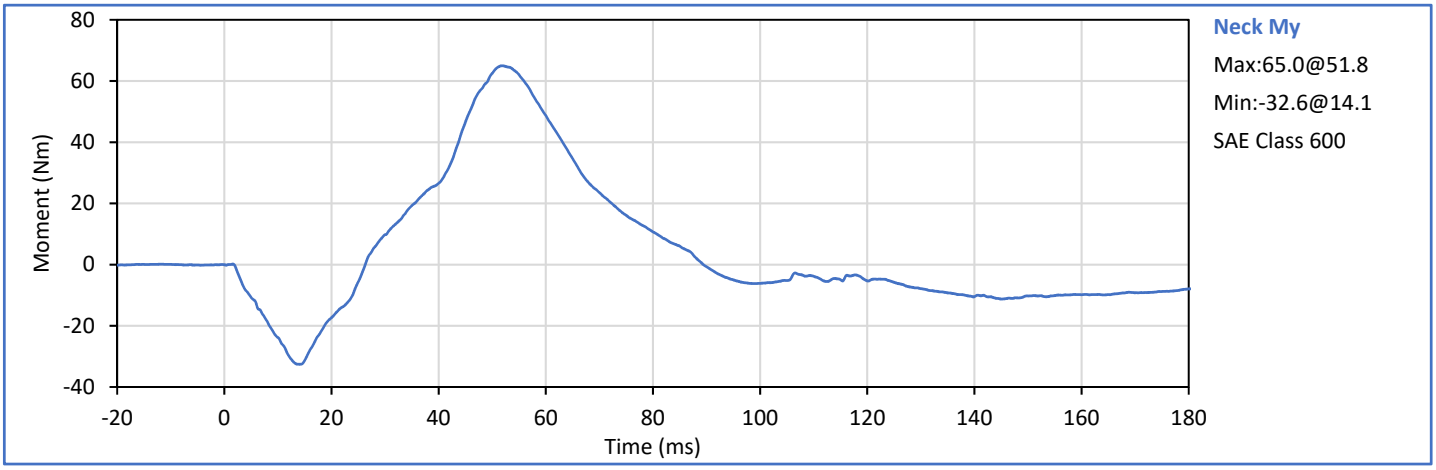
Applus IDIADA KARCO

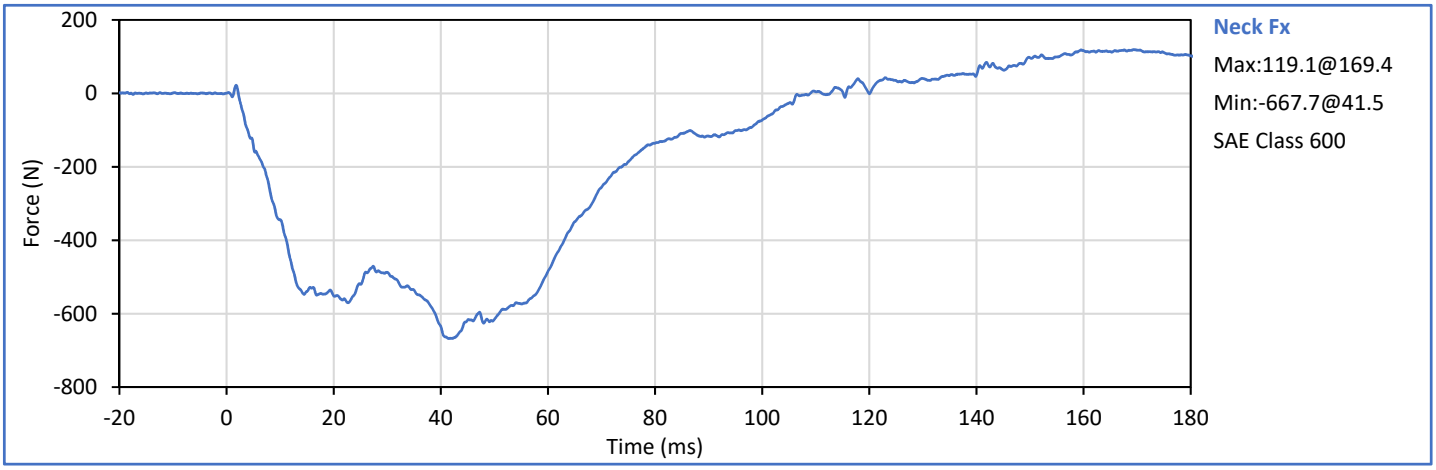
Hybrid III 5th Percentile Female ATD
Neck Flexion Test

ATD Serial No.: 141

Test Date: 2020-09-10





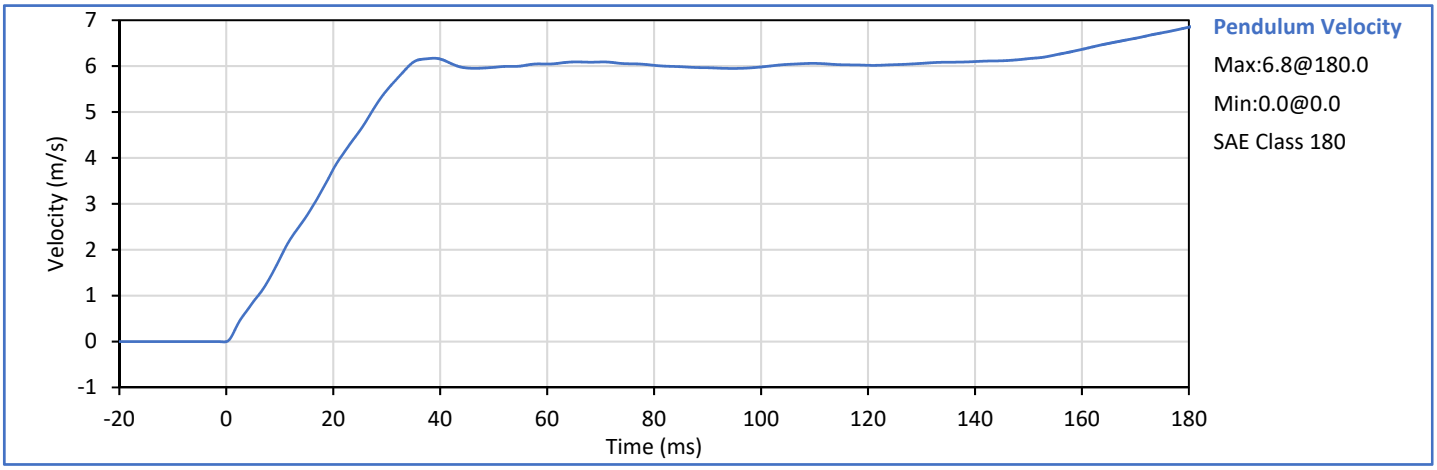


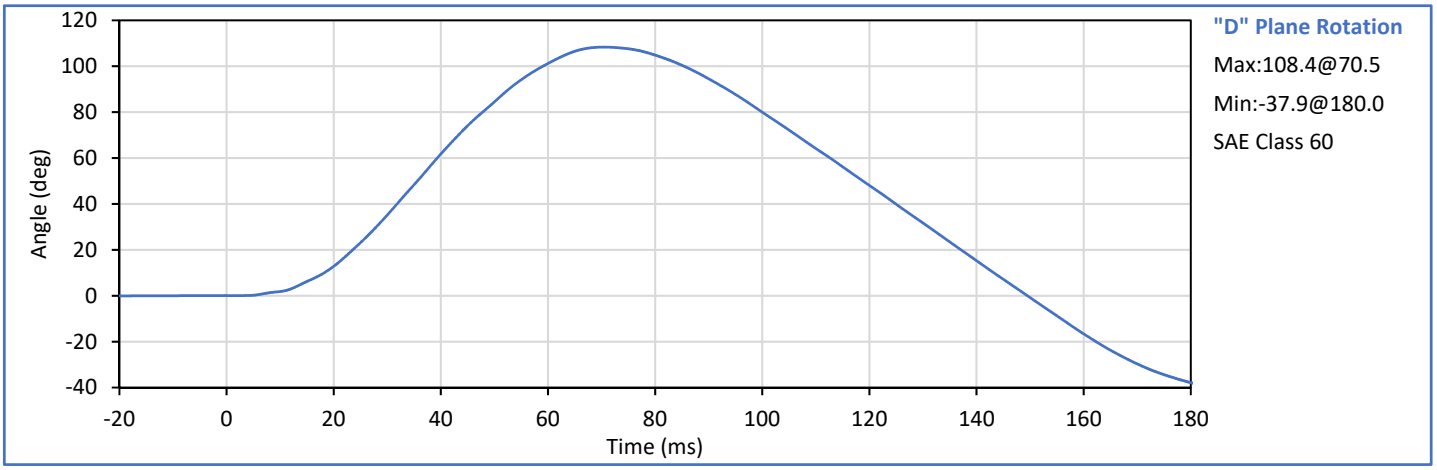
Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Neck Extension Test

ATD Serial No.: 141 Test Date: 2020-09-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	5.95	6.19	6.01	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.80	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.75	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.47	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	108.4	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-64.5	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	97.4	Pass
			Overall Test Results		Pass





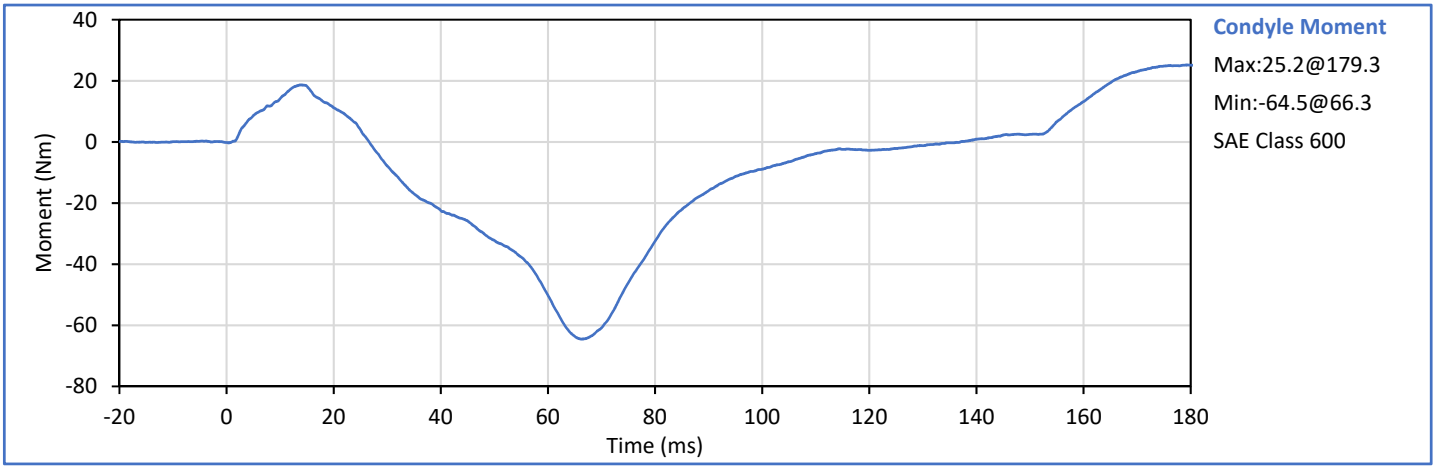
Technician: J. Hernandez

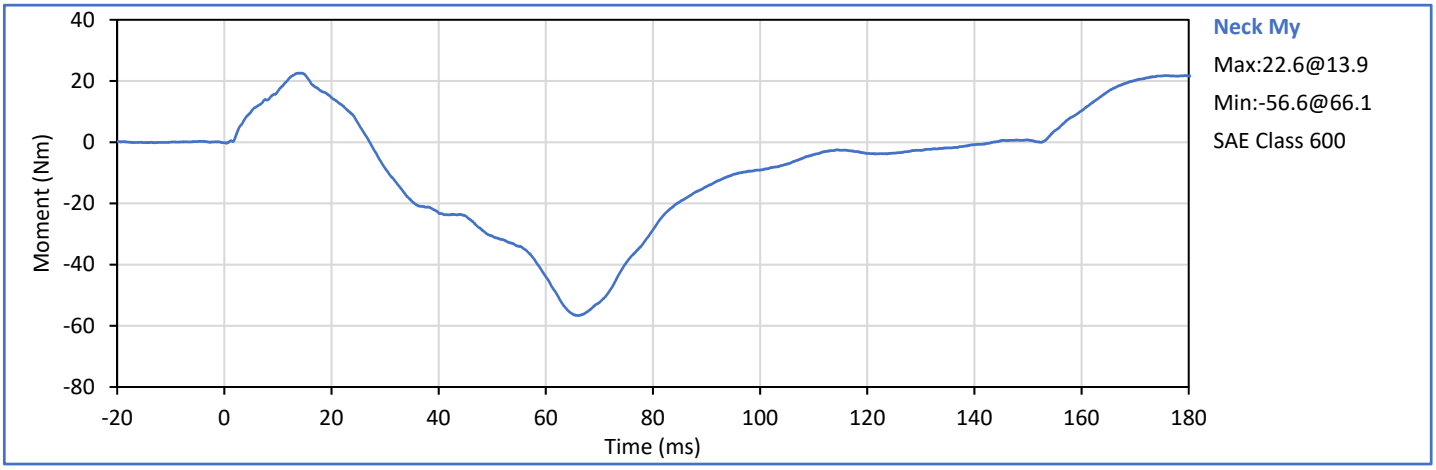
Approved By: P. Puzzuto

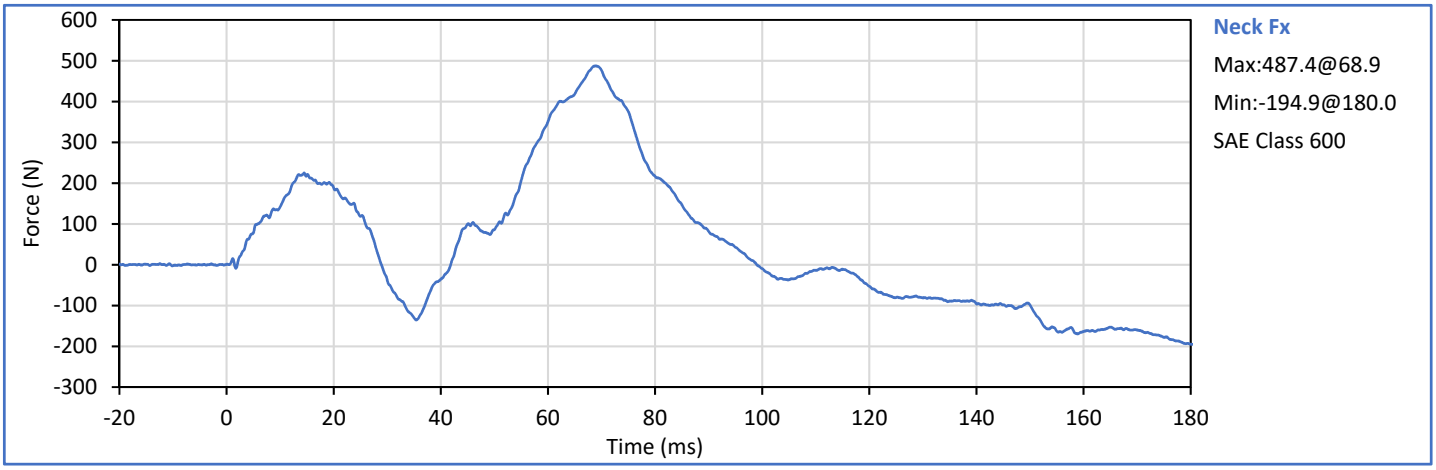
Applus IDIADA KARCO

Hybrid III 5th Percentile Female ATD
Neck Extension Test

ATD Serial No.: 141 Test Date: 2020-09-10







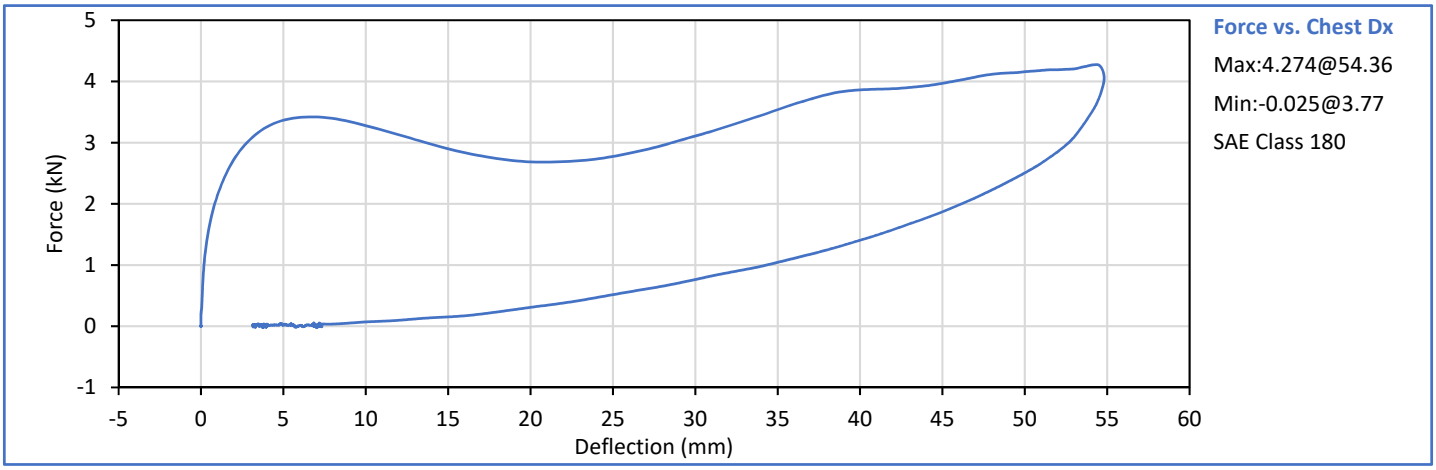
Applus IDIADA
KARCO

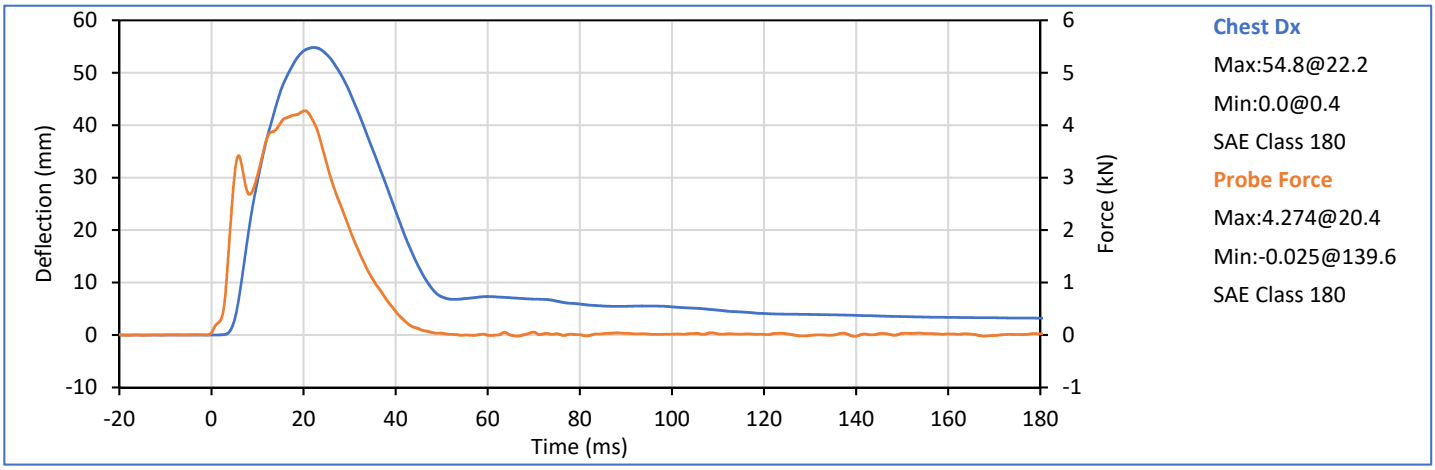
Hybrid III 5th Percentile Female ATD
Thorax Impact

ATD Serial No.: 141

Test Date: 2020-09-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	28	Pass
Probe Velocity	m/s	6.59	6.83	6.73	Pass
Peak Chest Deflection	mm	50.0	58.0	54.8	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.274	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	4.159	Pass
Internal Hysterisis	%	69.0	85.0	72.0	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

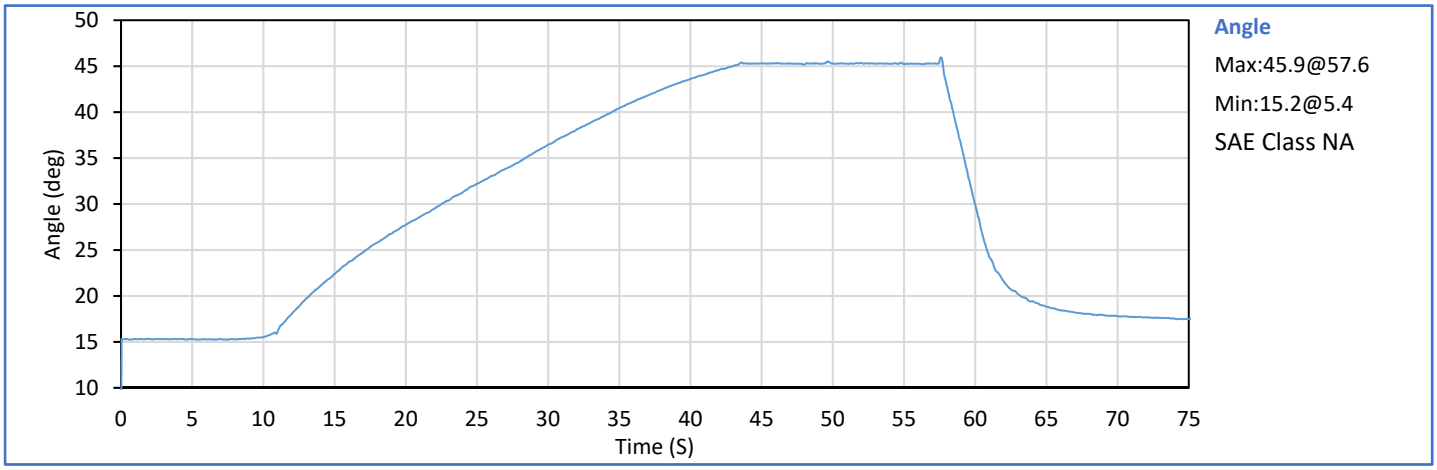
Applus IDIADA
KARCO

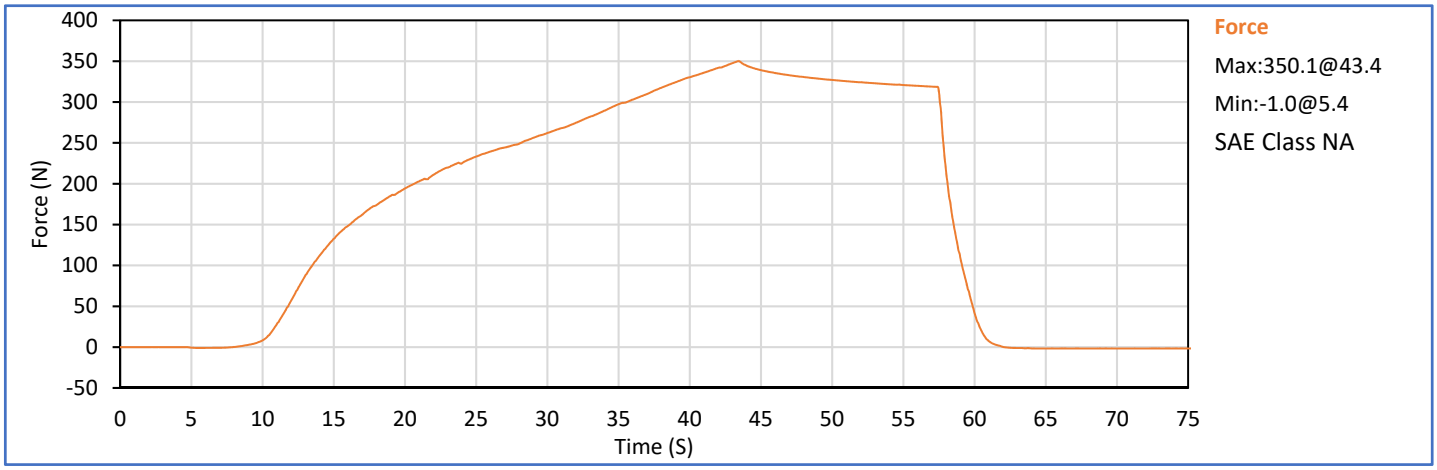
Hybrid III 5th Percentile Female ATD
Torso Flexion Test

ATD Serial No.: 141

Test Date: 2020-09-09

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	15.1	Pass
Test Initial Angle	deg	11.0	19.0	15.3	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	348.4	Pass
Torso Flexion Rate	deg/s	0.50	1.50	0.90	Pass
Final Reference Plane Angle	deg	-8.0	8.0	4.6	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

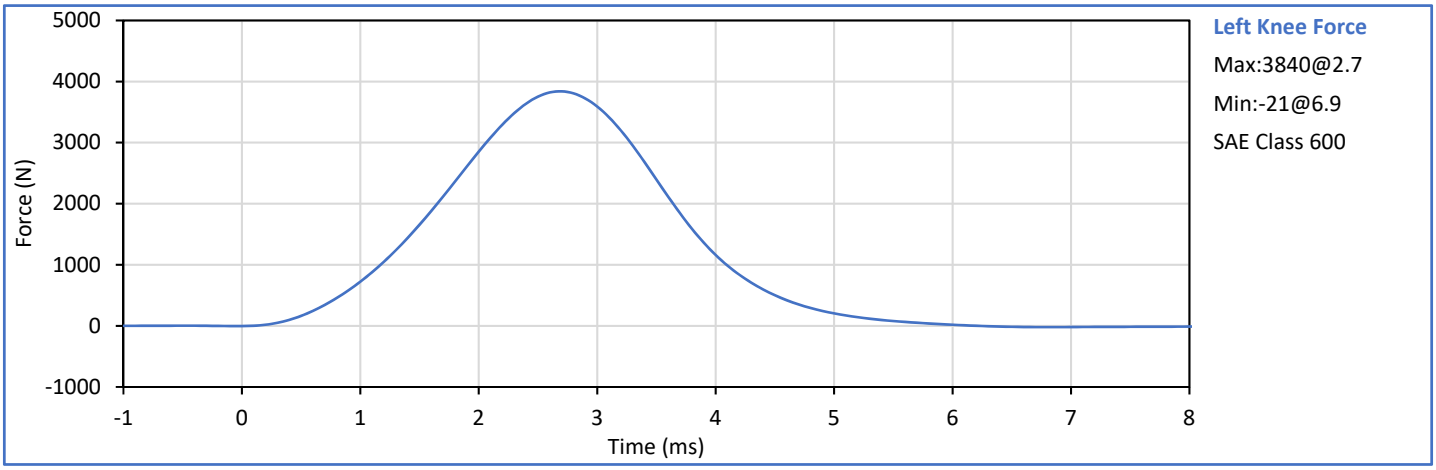
Applus IDIADA
KARCO

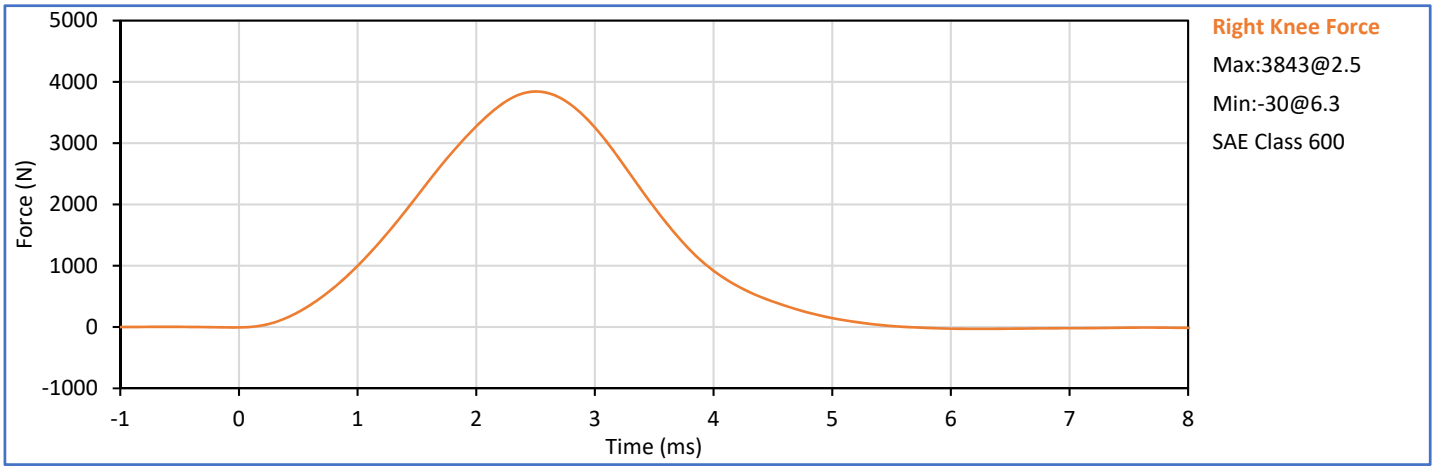
Hybrid III 5th Percentile Female ATD
Knee Impact (Left/Right)

ATD Serial No.: 141

Test Date: 2020-09-10

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.4	Pass
	Laboratory Humidity	%	10	70	21	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.109	Pass
	Peak Resistive Force	N	3450	4060	3840	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.107	Pass
	Peak Resistive Force	N	3450	4060	3843	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	2020-08-20
Head Acceleration Y Primary	P49228	Endevco	7264C-2k	2020-08-20
Head Acceleration Z Primary	P50101	Endevco	7264C-2k	2020-08-20
Head Acceleration X Redundant	P50103	Endevco	7264C-2k	2020-08-20
Head Acceleration Y Redundant	P49210	Endevco	7264C-2k	2020-08-20
Head Acceleration Z Redundant	P58713	Endevco	7264C-2k	2020-08-20
Head Rotation Rate X	ARS7587	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Y	ARS7426	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Z	ARS7480	DTS	ARS PRO-8k (2000Hz)	2019-07-08
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	2020-08-20
Chest Acceleration Y Primary	P49208	Endevco	7264C-2k	2020-08-20
Chest Acceleration Z Primary	P51264	Endevco	7264C-2k	2020-08-20
Chest Acceleration X Redundant	P49461	Endevco	7264C-2k	2020-08-20
Chest Acceleration Y Redundant	P58774	Endevco	7264C-2k	2020-08-20
Chest Acceleration Z Redundant	P49168	Endevco	7264C-2k	2020-08-20
Chest Deflection	0606 (H3)	Servo	14CBI-3615	2020-08-27
Pelvis Acceleration X	P49238	Endevco	7264C-2k	2020-08-20
Pelvis Acceleration Y	P58877	Endevco	7264C-2k	2020-08-20
Pelvis Acceleration Z	P50087	Endevco	7264C-2k	2020-08-20
Left Femur Force Z	DS9756 (pri)	Humanetics	3821JLN2	2019-09-03
Right Femur Force Z	DS4139 (pri)	Humanetics	3821JLN2	2019-09-03
Left Femur Force Z Redundant	DS9756 (red)	Humanetics	3821JLN2	2019-09-03
Right Femur Force Z Redundant	DS4139 (red)	Humanetics	3821JLN2	2019-09-03
Left Upper Tibia Moment X	DH3309 Mx	FTSS	IF-857	2019-09-09
Left Upper Tibia Moment Y	DH3309 My	FTSS	IF-857	2019-09-09
Left Upper Tibia Force Z	DH3309 Fz	FTSS	IF-857	2019-09-09
Left Lower Tibia Moment X	DI4186 Mx	FTSS	IF-853	2019-09-06
Left Lower Tibia Moment Y	DI4186 My	FTSS	IF-853	2019-09-06
Left Lower Tibia Force Z	DI4186 Fz	FTSS	IF-853	2019-09-06
Right Upper Tibia Moment X	DG6679 Mx	FTSS	IF-857	2019-09-09
Right Upper Tibia Moment Y	DG6679 My	FTSS	IF-857	2019-09-09
Right Upper Tibia Force Z	DG6679 Fz	FTSS	IF-857	2019-09-09
Right Lower Tibia Moment X	DI4188 Mx	FTSS	IF-853	2019-09-06
Right Lower Tibia Moment Y	DI4188 My	FTSS	IF-853	2019-09-06
Right Lower Tibia Force Z	DI4188 Fz	FTSS	IF-853	2019-09-06
Left Ankle Acceleration X	03E20-N09	Entran	EGEB6Q-2k	2020-08-24
Left Ankle Acceleration Z	03D30-N13	Entran	EGEB6Q-2k	2020-08-24
Left Toe Acceleration Z	03H07-Z10	Entran	EGEB6Q-2k	2020-08-24
Right Ankle Acceleration X	03E29-N20	Entran	EGEB6Q-2k	2020-08-24
Right Ankle Acceleration Z	03E18-F02	Entran	EGEB6Q-2k	2020-08-24
Right Toe Acceleration Z	05H31-Z04	Entran	EGEB6Q-2k	2020-08-24
Seat Belt Outside Lap Force	Not installed			
Seat Belt Upper Diagonal Force	315	FTSS	IF-964	2019-10-02

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	2020-08-25
Head Acceleration Y Primary	P58900	Endevco	7264C-2k	2020-08-25
Head Acceleration Z Primary	P58989	Endevco	7264C-2k	2020-08-25
Head Acceleration X Redundant	P58906	Endevco	7264C-2k	2020-08-25
Head Acceleration Y Redundant	P58983	Endevco	7264C-2k	2020-08-25
Head Acceleration Z Redundant	P58901	Endevco	7264C-2k	2020-08-25
Head Rotation Rate X	ARS7473	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Y	ARS7342	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Z	ARS7548	DTS	ARS PRO-8k (2000Hz)	2019-07-09
Upper Neck Force X	287 Fx	FTSS	IF-205	2019-10-21
Upper Neck Force Y	287 Fy	FTSS	IF-205	2019-10-21
Upper Neck Force Z	287 Fz	FTSS	IF-205	2019-10-21
Upper Neck Moment X	287 Mx	FTSS	IF-205	2019-10-21
Upper Neck Moment Y	287 My	FTSS	IF-205	2019-10-21
Upper Neck Moment Z	287 Mz	FTSS	IF-205	2019-10-21
Chest Acceleration X Primary	P58742	Endevco	7264C-2k	2020-08-26
Chest Acceleration Y Primary	P51640	Endevco	7264C-2k	2020-08-26
Chest Acceleration Z Primary	P58988	Endevco	7264C-2k	2020-08-26
Chest Acceleration X Redundant	P51632	Endevco	7264C-2k	2020-08-26
Chest Acceleration Y Redundant	P58793	Endevco	7264C-2k	2020-08-26
Chest Acceleration Z Redundant	P58790	Endevco	7264C-2k	2020-08-26
Chest Deflection	2527 (HF)	Servo	14CBI-3615	2020-08-27
Pelvis Acceleration X	P50076	Endevco	7264C-2k	2020-08-25
Pelvis Acceleration Y	P58897	Endevco	7264C-2k	2020-08-25
Pelvis Acceleration Z	P51724	Endevco	7264C-2k	2020-08-25
Left Femur Force Z	DS4137 (pri)	Humanetics	3821JLN2	2019-09-03
Right Femur Force Z	DS4141 (pri)	Humanetics	3821JLN2	2019-09-03
Left Femur Force Z Redundant	DS4137 (red)	Humanetics	3821JLN2	2019-09-03
Right Femur Force Z Redundant	DS4141 (red)	Humanetics	3821JLN2	2019-09-03
Left Upper Tibia Moment X	653 Mx	R.A. Denton	3643	2019-09-09
Left Upper Tibia Moment Y	653 My	R.A. Denton	3643	2019-09-09
Left Upper Tibia Force Z	653 Fz	R.A. Denton	3643	2019-09-09
Left Lower Tibia Moment X	498 Mx	R.A. Denton	3644	2019-09-06
Left Lower Tibia Moment Y	498 My	R.A. Denton	3644	2019-09-06
Left Lower Tibia Force Z	498 Fz	R.A. Denton	3644	2019-09-06
Right Upper Tibia Moment X	DH3302 Mx	FTSS	IF-857	2019-09-09
Right Upper Tibia Moment Y	DH3302 My	FTSS	IF-857	2019-09-09
Right Upper Tibia Force Z	DH3302 Fz	FTSS	IF-857	2019-09-09
Right Lower Tibia Moment X	501 Mx	R.A. Denton	3644	2019-09-06
Right Lower Tibia Moment Y	501 My	R.A. Denton	3644	2019-09-06
Right Lower Tibia Force Z	501 Fz	R.A. Denton	3644	2019-09-06
Left Ankle Acceleration X	A199899	MSI	64C-2k	2020-07-20
Left Ankle Acceleration Z	A199908	MSI	64C-2k	2020-07-20
Left Toe Acceleration Z	A199930	MSI	64C-2k	2020-07-20
Right Ankle Acceleration X	A202287	MSI	64C-2k	2020-07-20
Right Ankle Acceleration Z	A201195	MSI	64C-2k	2020-07-20
Right Toe Acceleration Z	A201202	MSI	64C-2k	2020-07-20
Seat Belt Outside Lap Force	Not installed			
Seat Belt Upper Diagonal Force	251	FTSS	IF-964	2019-10-02

Table 3 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Left Rear Primary Ax	A298314	MSI	52F-2k	2020-05-18
Right Rear Primary Ax	A298306	MSI	52F-2k	2020-05-18
Engine Top Ax	A298373	MSI	52F-2k	2020-05-18
Engine Bottom Ax	A298363	MSI	52F-2k	2020-06-13
Left Rear Az	A298328	MSI	52F-2k	2020-05-22
Right Rear Az	A298564	MSI	52F-2k	2020-05-18
Left Rear Redundant Ax	A298302	MSI	52F-2k	2020-05-18
Right Rear Redundant Ax	A298365	MSI	52F-2k	2020-05-22