REPORT NUMBER: NCAP-KAR-19-003

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

SUBARU CORPORATION
2019 SUBARU ASCENT 5-DOOR MPV

NHTSA NUMBER: O20195503

PREPARED BY:
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OCTOBER 4, 2018

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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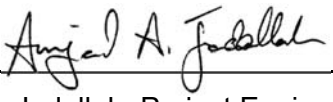
Prepared By: 

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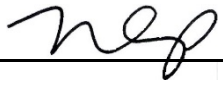
Reviewed By: 

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Approval Date: October 4, 2018

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date:

COTR, New Car Assessment Program
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16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2019 Subaru Ascent 5-door MPV in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and footwell intrusion performance. The test was conducted at the Applus IDIADA KARCO Engineering, LLC. facility in Adelanto, California on September 20, 2018.

The impact velocity of the vehicle was 56.32 km/h and the ambient temperature at the barrier face at the time of impact was 34.4°C. The target vehicle's post-test maximum crush was 430 mm at the vehicle's centerline. The test vehicle's performance is as follows:

Measurement Description	Units	Driver ATD		Passenger ATD	
		Threshold	Result	Threshold	Result
Head Injury Criteria (HIC_{15})	N/A	700	190.1	700	209.9
Maximum Chest Compression	mm	63	-20	52	-17
Nij	N/A	1	0.21	1	0.33
Neck Tension	N	4170	1017.7	2620	877.2
Neck Compression	N	4000	-36.1	2520	-691.9
Left Femur Force	N	10000	-707.9	6800	-154.7
Right Femur Force	N	10000	-1298.7	6800	-131.4

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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 DTNH22-12-D-00259. 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 Frontal NCAP Laboratory Test Procedure, dated October 2015.

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2019 Subaru Ascent 5-door MPV at a velocity of 56.32 km/h. The test was performed at Applus IDIADA KARCO Engineering, LLC. on September 20, 2018. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report.

Three (3) 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 Frontal NCAP Laboratory Test Procedure.

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. 630) were calibrated prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 100 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% windshield retention and no intrusion into the protected zone of the windshield during the event.

The maximum static crush was 430 mm at the vehicle's centerline. Both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

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

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

The occupant data is summarized below:

ATD Position	HIC_{15}	T^1 (ms)	T^2 (ms)	Chest Disp. (mm)	Nij	Neck Tension (N)	Neck Comp. (N)	Left Femur (N)	Right Femur (N)
Driver (50th)	190.1	76.5	91.5	-20	0.21	1017.7	-36.1	-707.9	-1298.7
Passenger (5th)	209.9	64.2	79.2	-17	0.33	877.2	-691.9	-154.7	-131.4

The NHTSA number in the placards used in Appendix A of this report are listed incorrectly with the first character as the numeral "0" instead of the letter "O".

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

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: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	O20195503
Model Year	2019
Make	Subaru
Model	Ascent
Body Style	5-Door MPV
VIN	4S4WMAADXK3401011
Body Color	Ice Silver Metallic
Odometer Reading (km / mi)	183/114
Engine Displacement (L)	2.4
Type / No. of Cylinders	Boxer 4-Cylinder
Engine Placement	Longitudinal
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	Yes
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	No

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Subaru Corp.
Date of Manufacture	May-18

GVWR (kg)	2721
GAWR Front (kg)	1370
GAWR Rear (kg)	1495

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

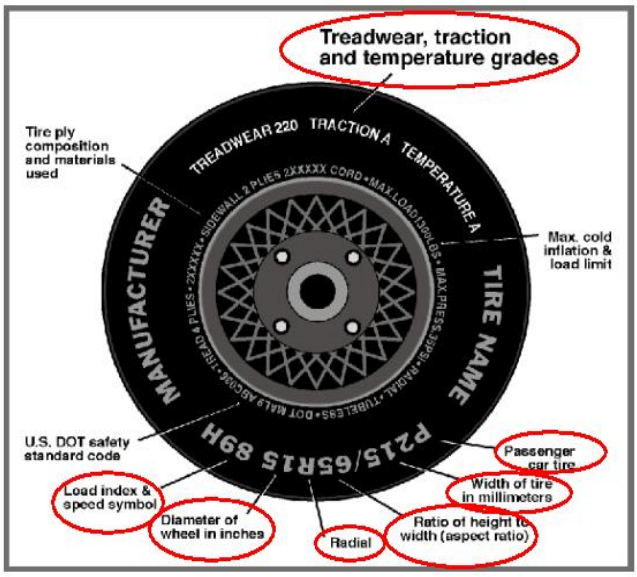
Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Bench	Bench		
Designated Seating Capacity	2	3	3	8	
Capacity Weight (VCW) (kg)				600.0	*A*
DSC x 68.04 (kg)				544.3	*B*
Cargo Weight (RCLW) (kg)				55.7	*A-B*

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	P245/60R18	P245/60R18
Tire Size on Vehicle	P245/60R18	P245/60R18
Tire Manufacturer	Falken	Falken
Tire Model	Ziex ZE001E A/S	Ziex ZE001E A/S
Treadwear	360	360
Traction	B	B
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	105H	105H
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	R8L2 DM2R 0418	R8L2 DM2R 0418
DOT Safety Code Right	R8L2 DM2R 0418	R8L2 DM2R 0418

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	553.0	470.0		589.0	533.0	
Right	kg	542.0	445.0		573.0	504.0	
Ratio	%	54.5%	45.5%	100.0%	52.8%	47.2%	100.0%
Total	kg	1095.0	915.0	2010.0	1162.0	1037.0	2199.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	2010.0	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	55.7	C
Calculated Vehicle Target Weight (TVTW)	kg	2206.7	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	902	909	931	931	1316
As Tested	mm	879	888	904	905	1363
Post-Test	mm	952	988	910	907	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheelbase	mm	2890
Total Vehicle Length at Left Side	mm	4300
Total Vehicle Length at Centerline	mm	4995
Total Vehicle Length at Right Side	mm	4300
Weight of Ballast in Cargo Area	kg	77.7
Weight of Vehicle Components Removed	kg	51.0
Amount of Stoddard Solvent in Fuel Tank	L	67.94

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Rear Trim (6.0 kg), 3rd Row Seat (45.0 kg)

DATA SHEET NO. 1 … (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test
1	Total Length	4995
2	Total Width	1935
3	Bumper Top Height	717
4	Bumper Bottom Height	370
5	Longitudinal Member Top Height	600
6	Distance Between Longitudinal Members	840
7	Longitudinal Member Width	70
8	Engine Top Height	835
9	Engine Bottom Height	256
10	Engine and Gearbox Width	700
11	Front Bumper to Engine Distance	520
12	Front Shock Absorber Fixing Height	1000
13	Bonnet Leading Edge Height	990
14	Front Shock Absorber Fixing Width	1240
15	Front Bumper to Front Axle Distance	1025
16	Front Axle to A-Pillar Distance	530
17	A-Pillar to B-Pillar Distance	976
18	B-Pillar to Rear Axle Distance	1365
19	B-Pillar to C-Pillar Distance	1003
20	Roof Sill Bottom Height	1540
21	Roof Sill Top Height	1695
22	Floor Sill Bottom Height	290
23	Floor Sill Top Height	445

All measurements in millimeters.

DATA SHEET NO. 2

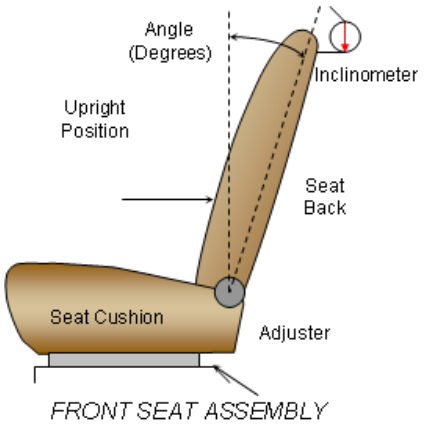
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

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.

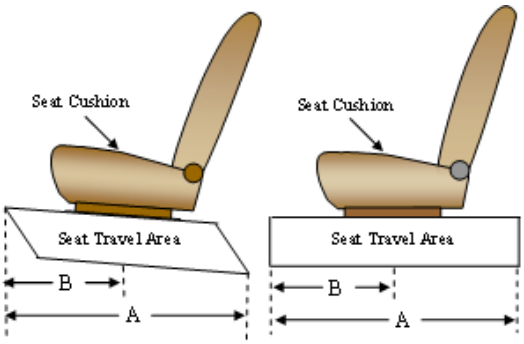


SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	7.5
Passenger Seat Back Angle	6.3

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	301 mm	158 mm
Passenger Seat	262 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," and position "M1." Position "L" is the lowermost position.

SEAT BELT UPPER ANCHORAGES

Seating Position	Total No. of Positions	Placed in Position
Driver Seat	4	M2
Passenger Seat	4	M2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

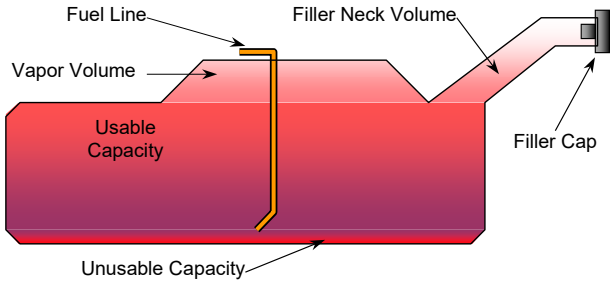
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	73.05
Usable Capacity of "Optional Tank"	
92 - 94% of Usable Capacity	67.21 to 68.67
Actual Amount of Stoddard Solvent Used	67.94
1/3 of Usable Capacity	24.35

FUEL PUMP

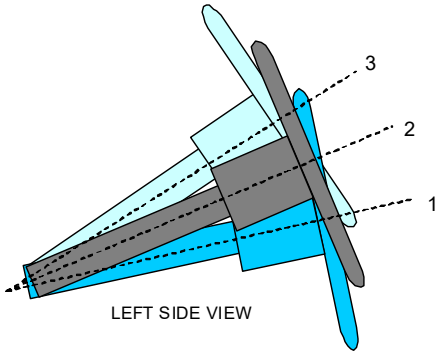
The vehicle is equipped with an electric fuel pump. The fuel pump operates when the engine is running.



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

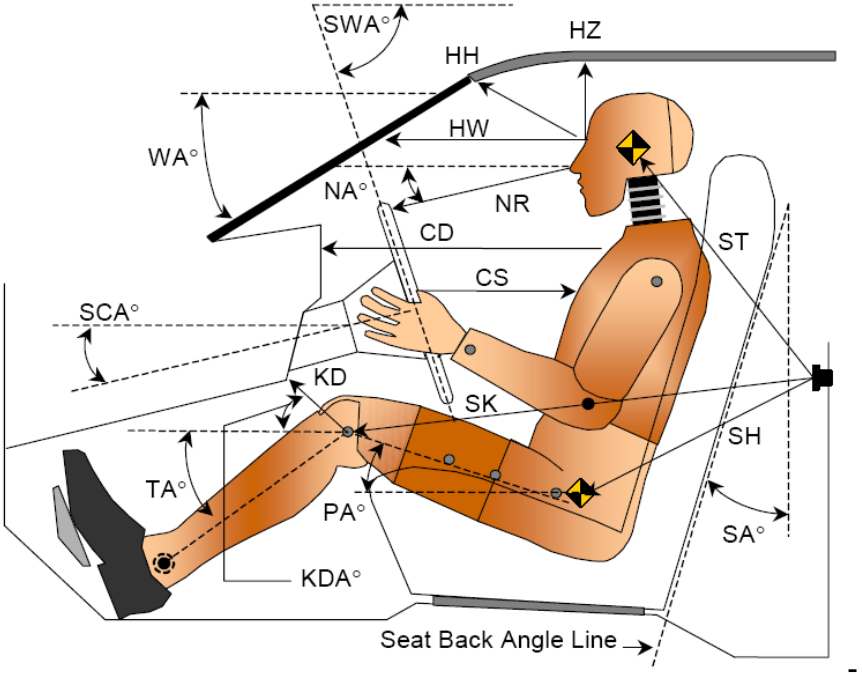
	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	24.7	78
Geometric Center Position, No. 2	26.5	105
Uppermost Position, No. 3	28.3	131
Telescoping Steering Wheel Travel		53
Test Position	28.3	131

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



LEFT SIDE VIEW

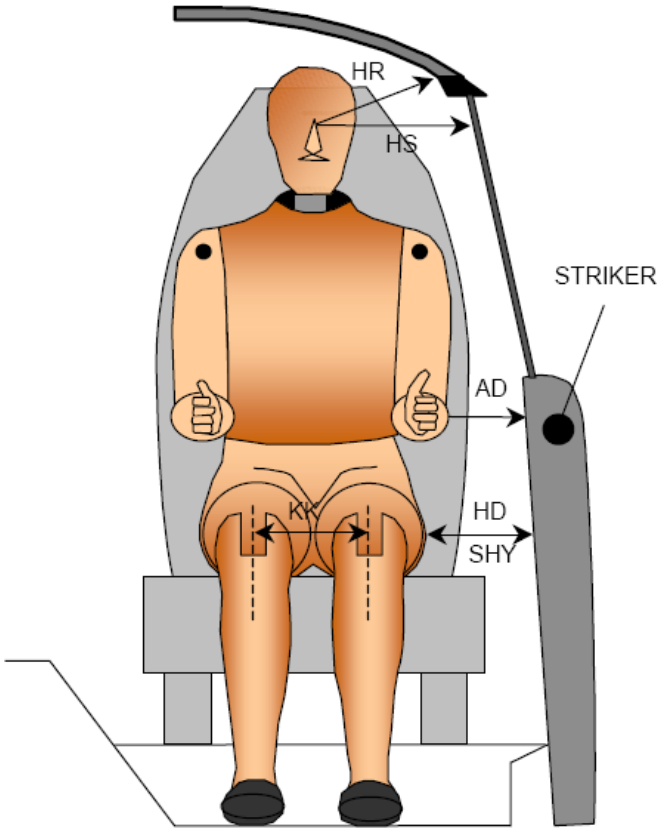
Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		29.9		
SWA°	Steering Wheel Angle		63.5		
SCA°	Steering Column Angle		26.5		
SA°	Seat Back Angle (On Headrest Post)		7.5		6.3
HZ	Head to Roof	267	90.0	278	90.0
HH	Head to Header	451	22.2	381	42.8
HW	Head to Windshield	744	0.0	697	0.0
NR	Nose to Rim	449	11.6	481	28.7
CD	Chest to Dash	574	9.6	432	3.5
CS	Chest to Steering Hub	345	3.7		
RA	Rim to Abdomen	231	0.0		
KDL	Left Knee to Dash	144	12.1	87	30.1
KDR	Right Knee to Dash	155	18.6	101	29.6
PA°	Pelvic Angle		24.3		20.4
TA°	Tibia Angle		41.4		55.9
SK	Striker to Knee	574	9.2	663	11.7
ST	Striker to Head	459	85.1	414	65.7
SH	Striker to H-Point	259	46.4	362	29.0

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



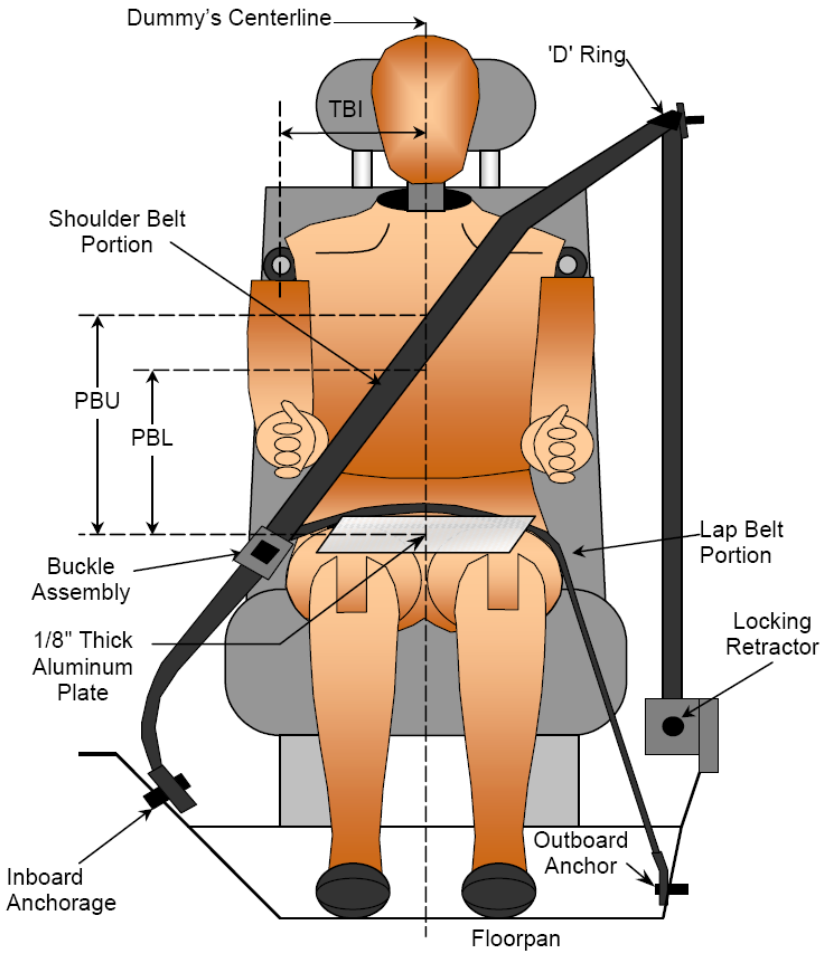
Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	155	119
HD	H-Point to Door	163	212
HR	Head to Side Header	277	308
HS	Head to Side Window	385	428
KK	Knee to Knee	300	160
SHY	Striker to H-Point (Y-Direction)	273	321
AA	Ankle to Ankle	318	190

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



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	335	255
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	255	175

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	860	947
Lap Belt Length as Measured on ATD	mm	625	745
Remainder of Belt on Reel	mm	930	667
Total Belt Length for Continuous Webbing Systems	mm	2415	2359

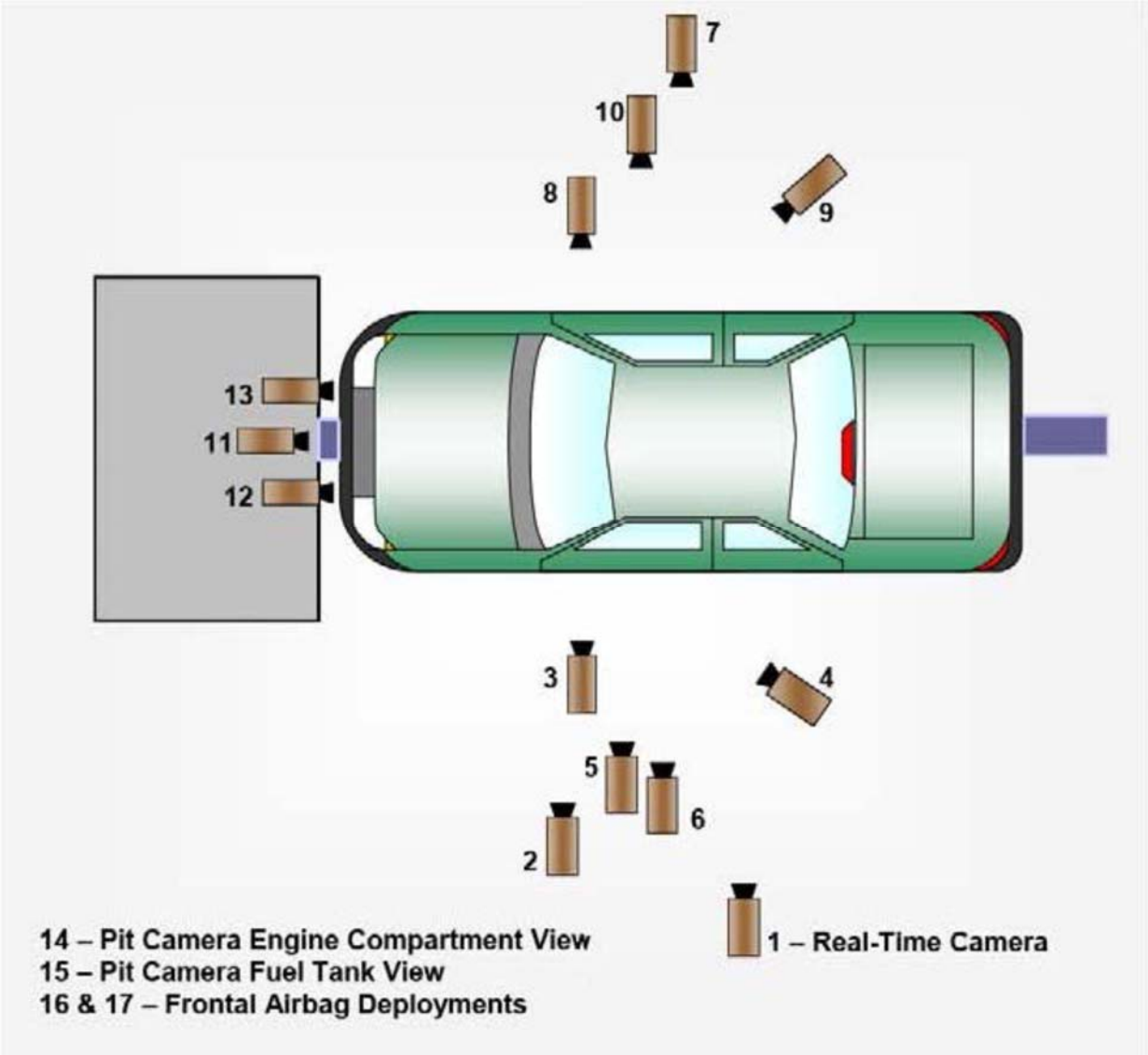
DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 … (CONTINUED)

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

CAMERA LOCATIONS

No.	Description	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-11412	-8150	-1484		30
2	Driver Close-Up	-2590	-7950	-1371	50	1000
3	Left Front Half	-1701	-6197	-1701	35	1000
4	Left Angle	-6696	-10308	-3211	105	1000
5	Steering Column - Top	-1966	-10412	-3688	35	1000
6	Steering Column - Bottom	-1972	-10412	-3379	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	Onboard Driver Airbag (Optional)	-1600	-300	-1600	8	1000
17	Onboard Passenger Airbag (Optional)	-1600	300	-1600	8	1000
18	Real-Time Left View of Impact					
19	Real-Time Right View of Impact					

Coordinates: +X = forward impact plane

+Y = right of monorail center

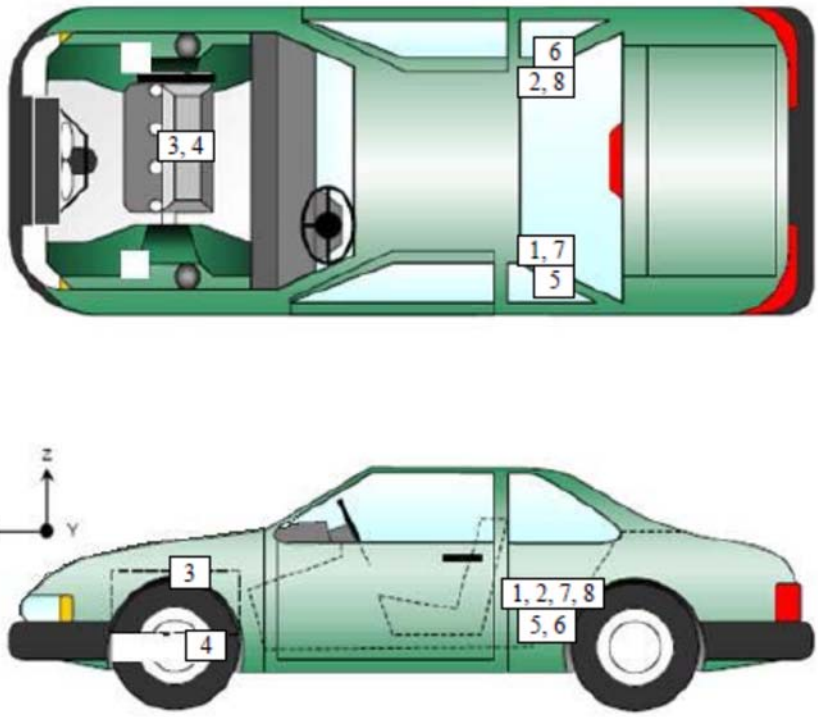
+Z = into ground

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Accelerometer X-Direction	2000	-1000	-380
2	Right Rear Accelerometer X-Direction	2000	1000	-380
3	Engine Top X	4300	100	-800
4	Engine Bottom X	4320	120	-300
5	Left Rear Accelerometer Z-Direction	3850	-900	-400
6	Right Rear Accelerometer Z-Direction	3850	900	-400
7	Left Rear Accelerometer X-Direction Redundant	2000	-1000	-380
8	Right Rear Accelerometer X-Direction Redundant	2000	1000	-380

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

Y – Vehicle Centerline (+ to right)

Z – Ground Plane (+ down)

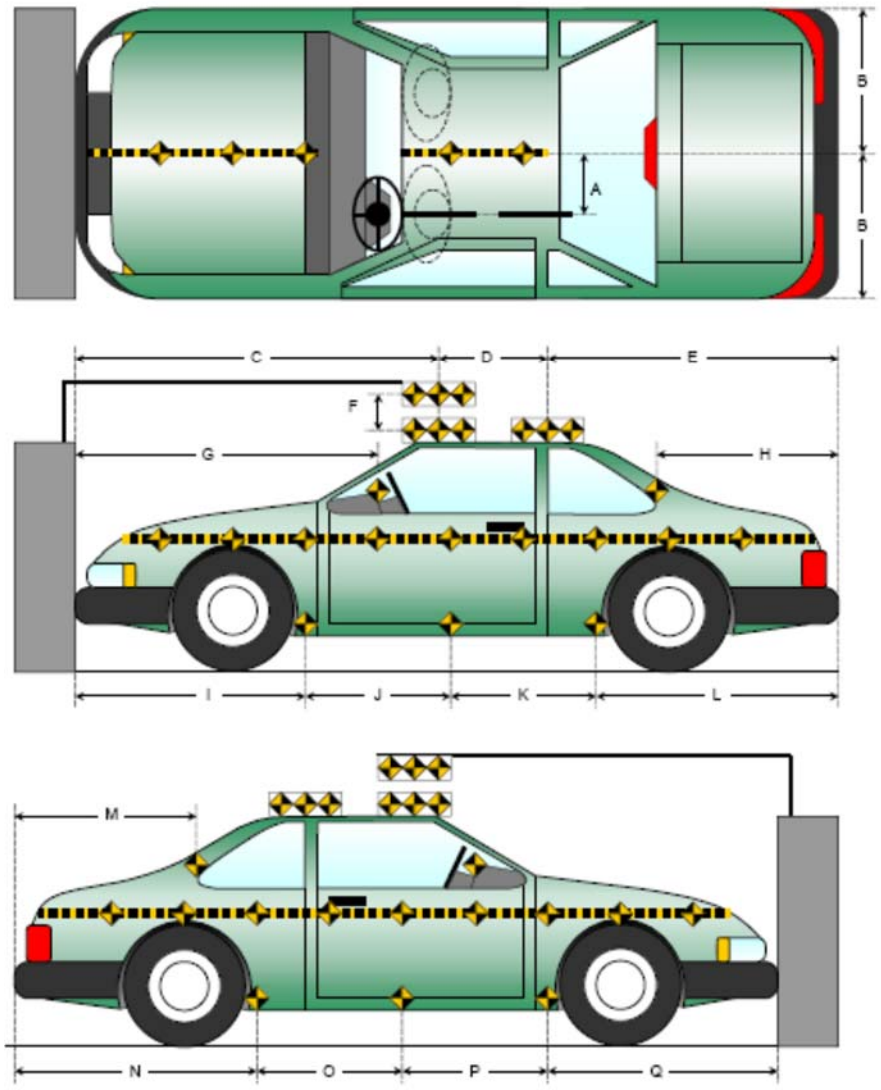
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

Item	Value
A	430
B	968
C	2380
D	610
E	2000
F	305
G	1810
H	470
I	1515
J	950
K	950
L	1575
M	470
N	1573
O	950
P	950
Q	1514



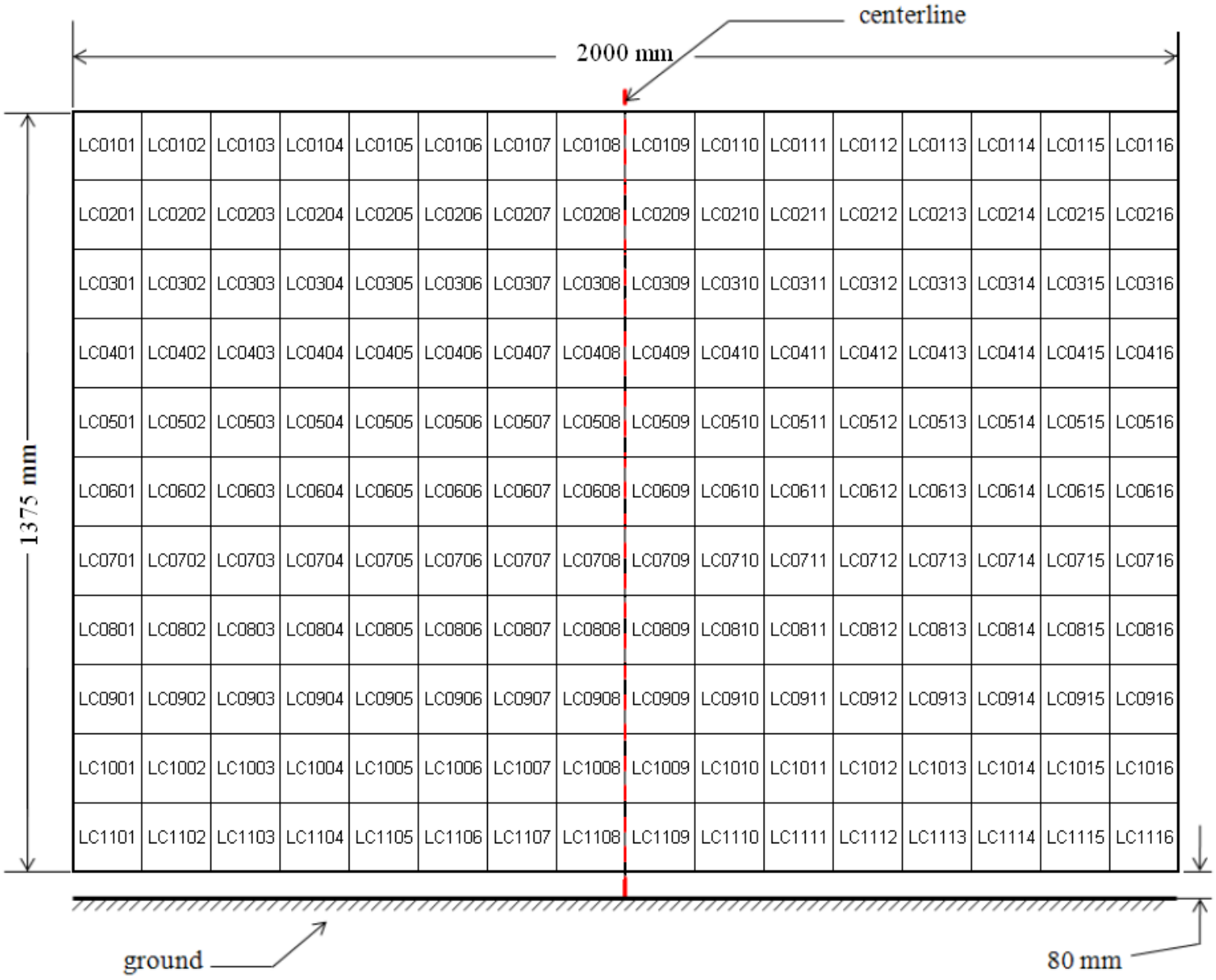
All measurements in millimeters.

DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



DATA SHEET NO. 10

TEST VEHICLE CAMERA AND INSTRUMENTATION SUMMARY

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

INSTRUMENTATION

Driver Dummy Accelerometers	44
Passenger Dummy Accelerometers	44
Vehicle Structure Accelerometers	8
Seat Belt Load Cells	4
Load Cell Barrier	528
Total	628

CAMERA COVERAGE

High-Speed Vehicle On Board	2
High-Speed Off Board	14
Real Time	3
Total	19

DATA SHEET NO. 11

POST-TEST OBSERVATIONS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type/Serial No.	P572E 50th Percentile Male ATD / 360	P572O 5th Percentile Female ATD / 630
Head Contact	Frontal Airbag, Headrest	Frontal Airbag, Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Bolster
Right Knee Contact	Knee Airbag	None

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
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
Seat Track Shift (mm)	8	2
Seat Back Failure	None	None
Glazing Damage	None	None

POST-TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1829
Center	mm	1822
Right Side	mm	1855
Average	mm	1835

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

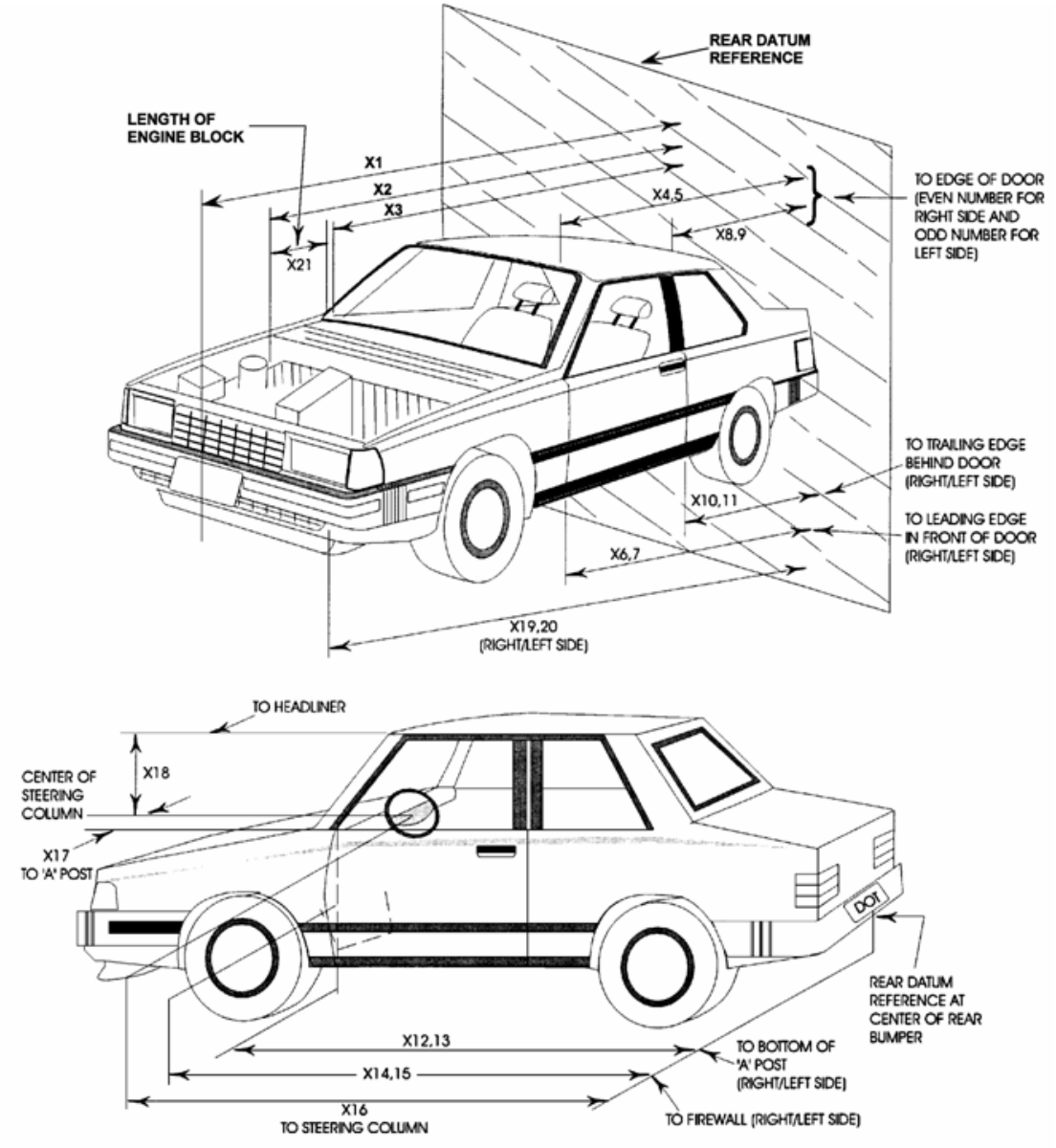
P

DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



DATA SHEET NO. 12 … (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4995	4565	-430
2	Rear Surface of Vehicle to Front of Engine	4370	4090	-280
3	RSOV to Firewall	3760	3768	8
4	RSOV to Upper Leading Edge of Right Door	3455	3433	-22
5	RSOV to Upper Leading Edge of Left Door	3460	3438	-22
6	RSOV to Lower Leading Edge of Right Door	3425	3416	-9
7	RSOV to Lower Leading Edge of Left Door	3423	3410	-13
8	RSOV to Upper Trailing Edge of Right Door	2385	2373	-12
9	RSOV to Upper Trailing Edge of Left Door	2383	2370	-13
10	RSOV to Lower Trailing Edge of Right Door	2443	2435	-8
11	RSOV to Lower Trailing Edge of Left Door	2440	2432	-8
12	RSOV to Bottom of A-Pillar, Right Side	3441	3426	-15
13	RSOV to Bottom of A-Pillar, Left Side	3436	3424	-12
14	RSOV to Firewall, Right Side	3755	3760	5
15	RSOV to Firewall, Left Side	3815	3821	6
16	RSOV to Steering Column	2985	3125	140
17	Center of Steering Column to A-Pillar	470	470	0
18	Center of Steering Column to Headliner	470	465	-5
19	RSOV to Right Side of Front Bumper	4300	4075	-225
20	RSOV to Left Side of Front Bumper	4300	4095	-205
21	Length of Engine Block	590	590	0
RD	RSOV to Right Side of Dash Panel	3200	3185	-15
CD	RSOV to Center of Dash Panel	3140	3135	-5
LD	RSOV to Left Side of Dash Panel	3200	3175	-25

All measurements in millimeters.

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

VEHICLE INFORMATION

VIN: 4S4WMAADXK3401011 Wheelbase (mm): 2890

Vehicle Size Category: MPV Test Weight (kg): 2199.0

ACCELEROMETER DATA

Accelerometer Locations: Left Rear Crossmember

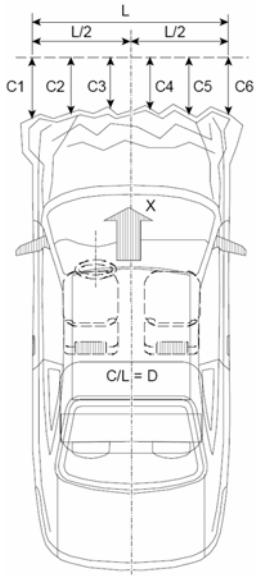
Cal. Procedure/Interval: Vibration Test / 6 months

Integration Algorithm: NHTSA Standard Linearity: Good

Impact Velocity (km/h): 56.32

Velocity Change (km/h): 65.1

Time of Separation (msec): 74.0



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2

Midpoint of Damage: Vehicle Centerline

Damage Region Length (mm): 1641

Impact Mode: Full Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	240	502	262
C2	Crush Zone 2 at Left Side	mm	35	410	375
C3	Crush Zone 3 at Left Side	mm	2	365	363
C4	Crush Zone 4 at Right Side	mm	2	340	338
C5	Crush Zone 5 at Right Side	mm	35	343	308
C6	Crush Zone 6 at Right Side	mm	240	388	148
L	C1 to C6	mm	1641		

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

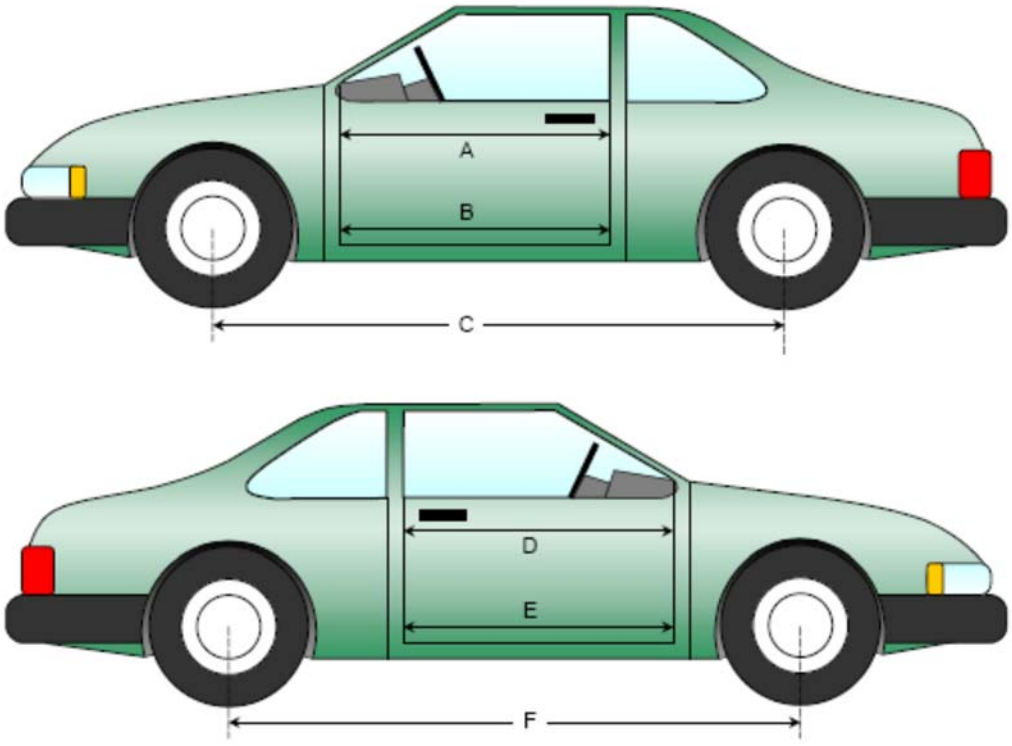
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	976	976	0
B	Left Side Lower	mm	861	864	-3
D	Right Side Upper	mm	978	978	0
E	Right Side Lower	mm	806	803	3

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2890	2870	20
F	Right Side Wheelbase	mm	2890	2870	20



DATA SHEET NO. 14 … (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

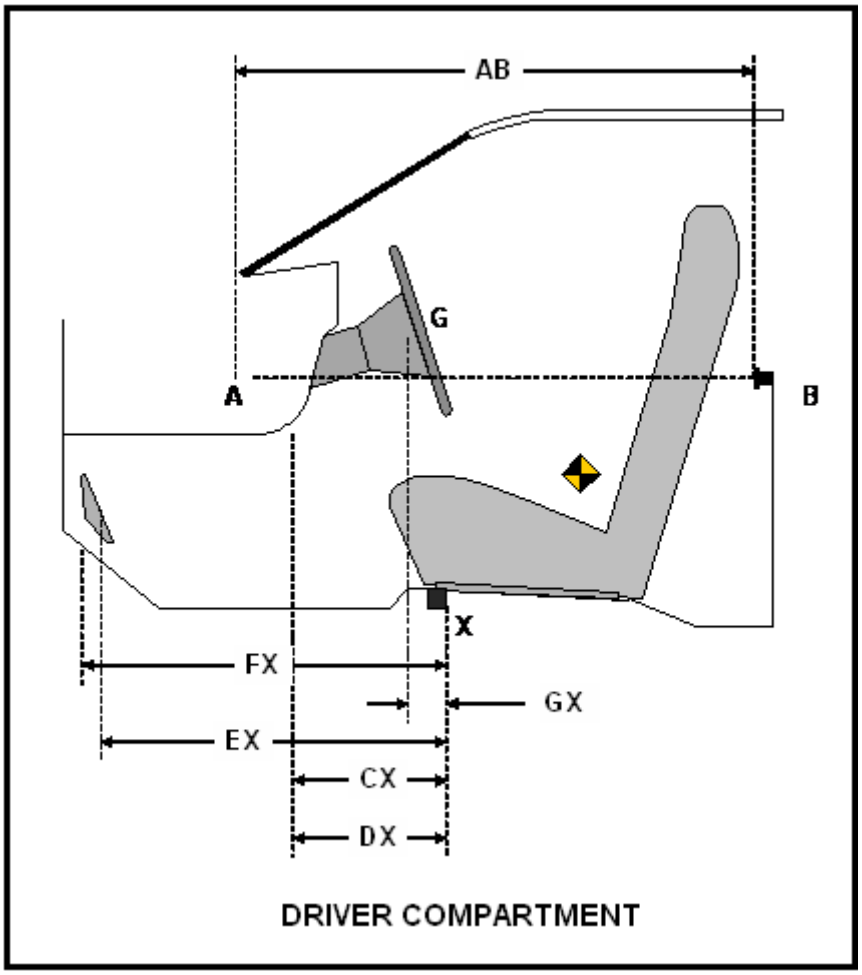
Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	916	916	0
CX	Left Knee Bolster to X	mm	280	280	0
DX	Right Knee Bolster to X	mm	280	283	-3
EX	Brake Pedal to X	mm	555	550	5
FX	Foot Rest to X	mm	540	530	10
GX	Center of Steering Wheel Hub to X	mm	40	110	-70

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

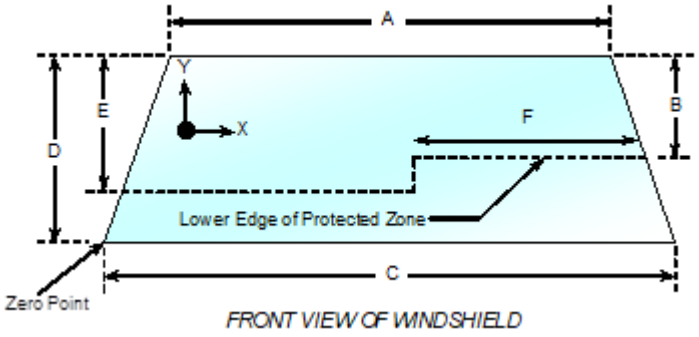
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber molding and rubber cement.

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: 21.2° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2302	2302	100.0%
Right Side	2302	2302	100.0%
Total	4562	4562	100.0%



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1330
B	mm	510
C	mm	1510
D	mm	882
E	mm	562
F	mm	540

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. 15 … (CONTINUED)

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 34.4° C Test Time: 2:19 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)

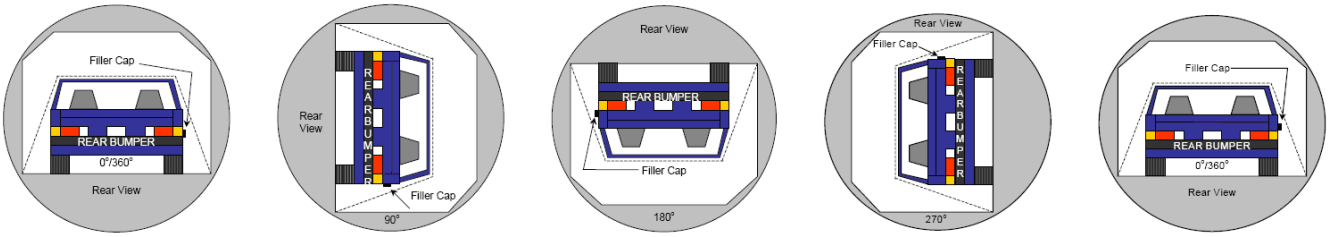
D. Spillage: There was no Stoddard solvent spillage.

DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



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°	74	300	374
90° To 180°	84	300	384
180° To 270°	83	300	383
270° To 360°	79	300	379

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

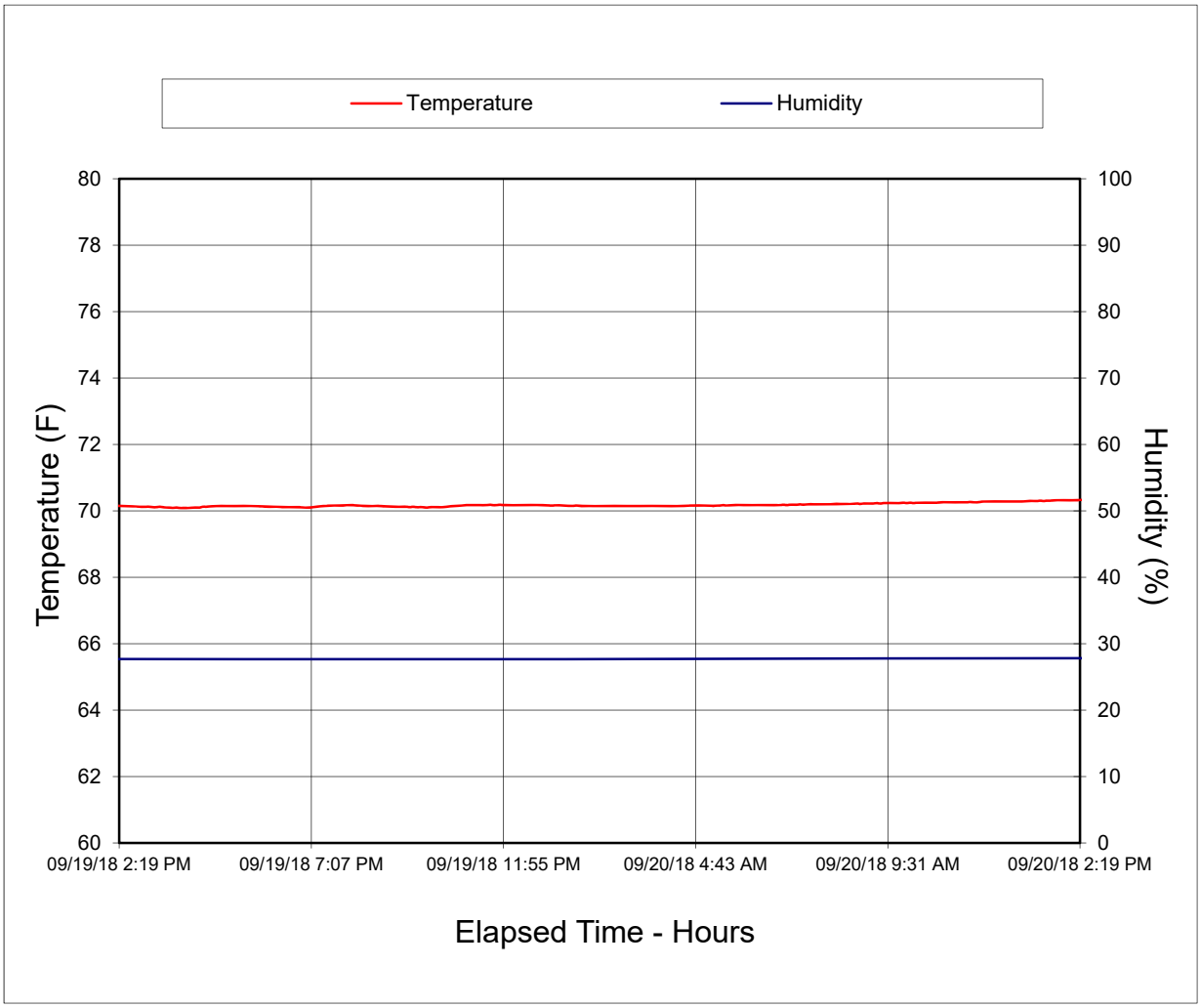
Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 17

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2019 Subaru Ascent 5-Door MPV NHTSA No.: O20195503

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 09/20/18



APPENDIX A

PHOTOGRAPHS

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FIGURE 1. Load Cell Location

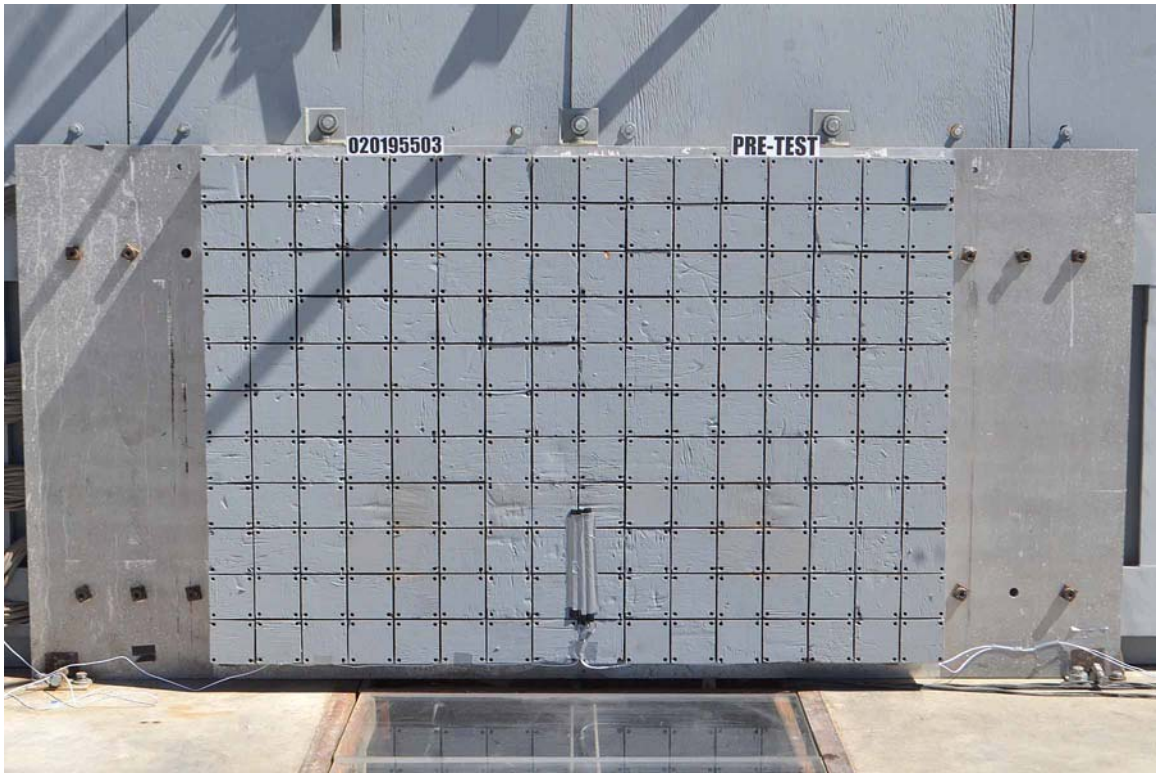

FIGURE 2. Pre-Test Load Cell Wall

FIGURE 3. Post-Test Load Cell Wall

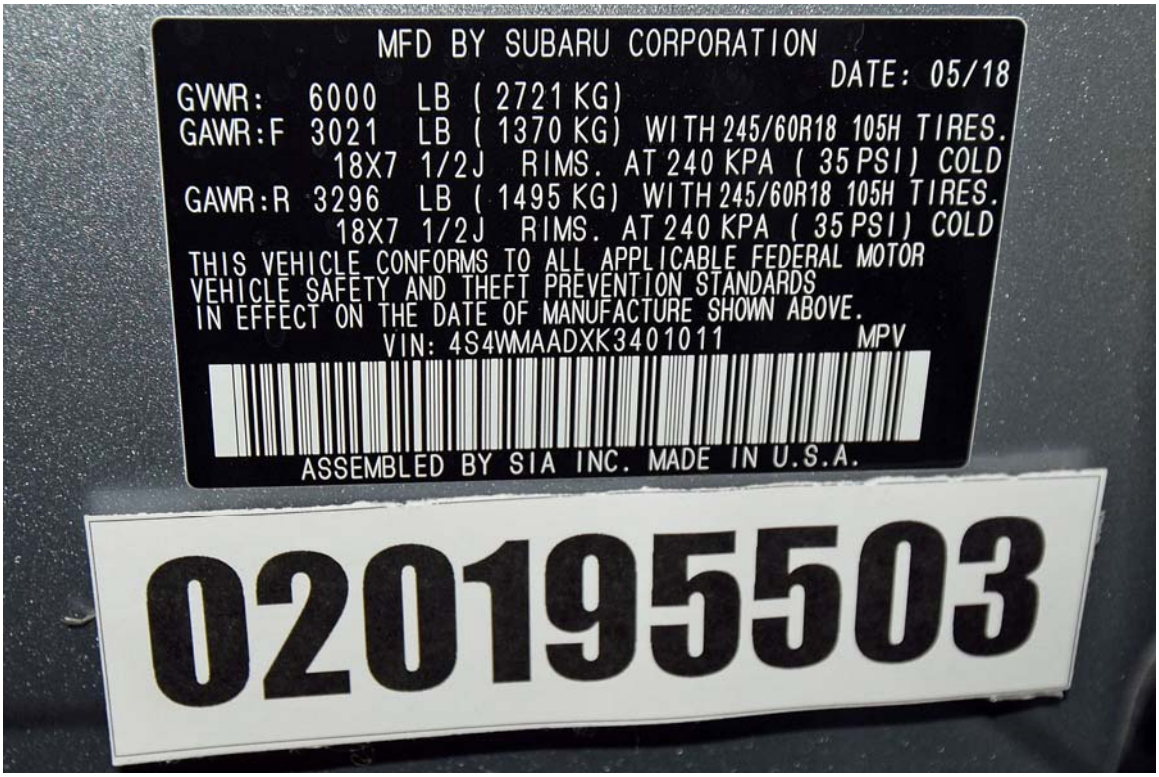

FIGURE 4. Manufacturer's Label

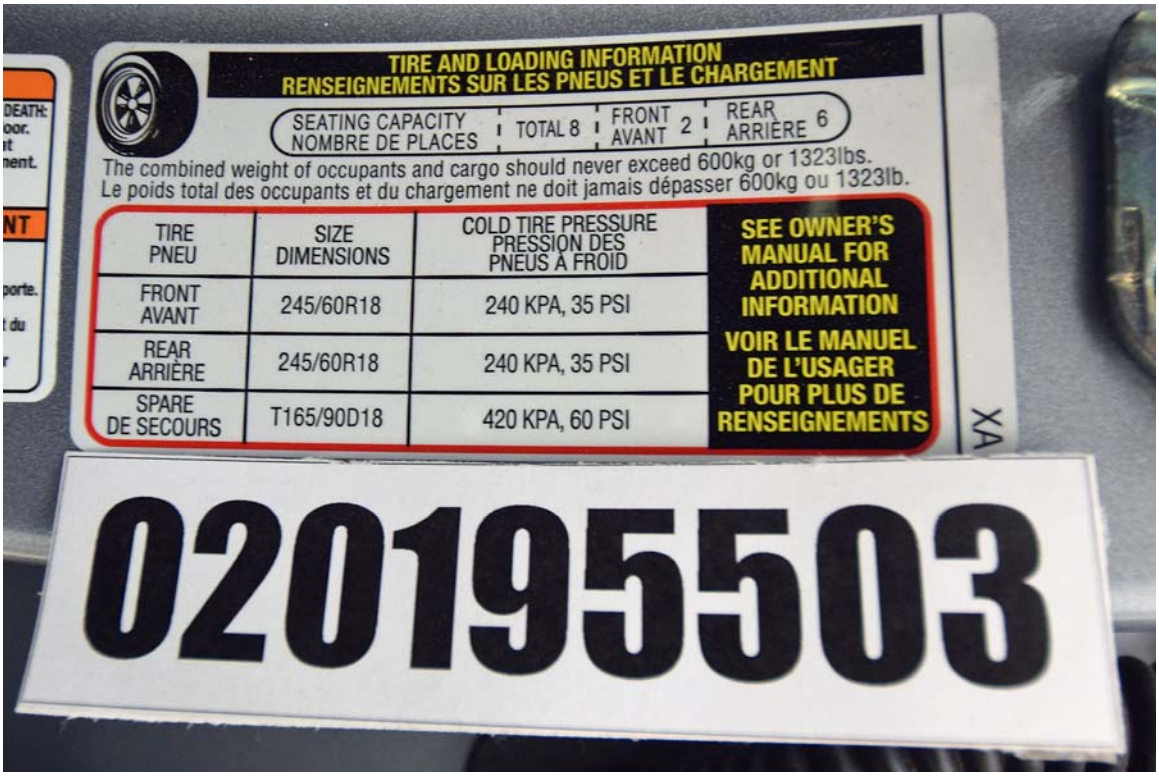

FIGURE 5. Tire Placard

FIGURE 6. 2019 Subaru Ascent Frontal as Delivered

FIGURE 7. Left Rear ¾ View, as Received

FIGURE 8. Pre-Test Front View of Test Vehicle

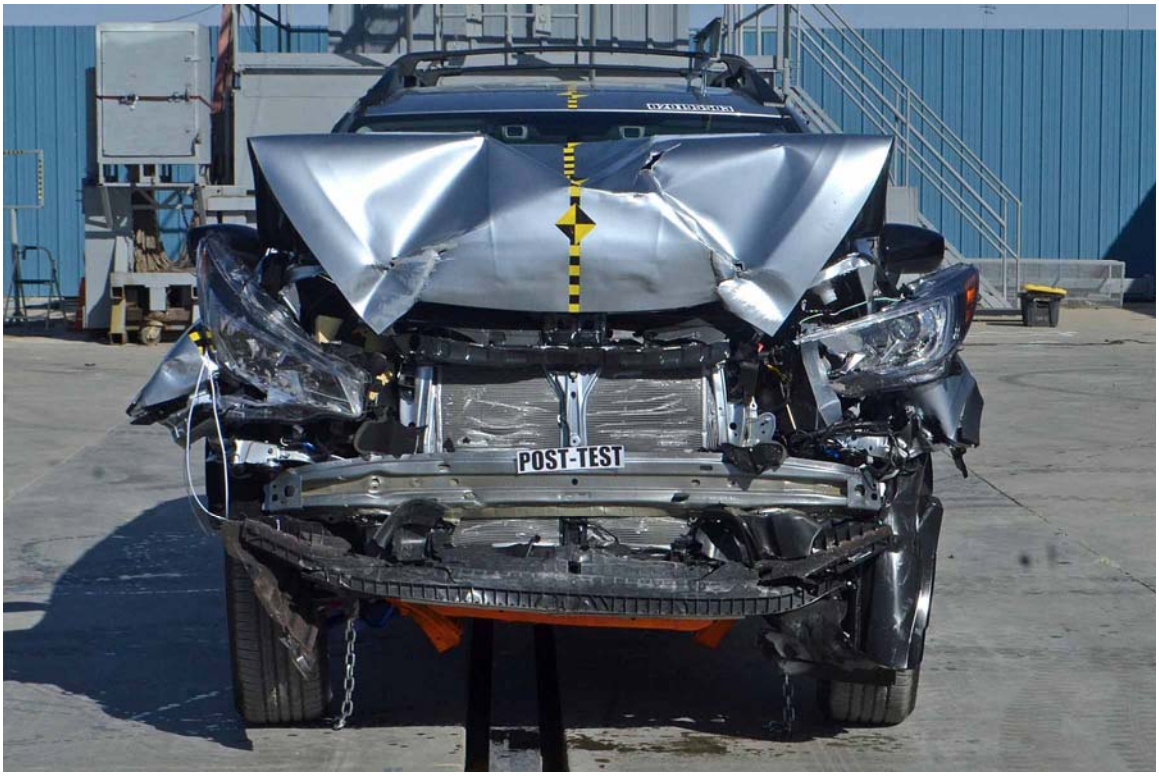

FIGURE 9. Post-Test Front View of Test Vehicle

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

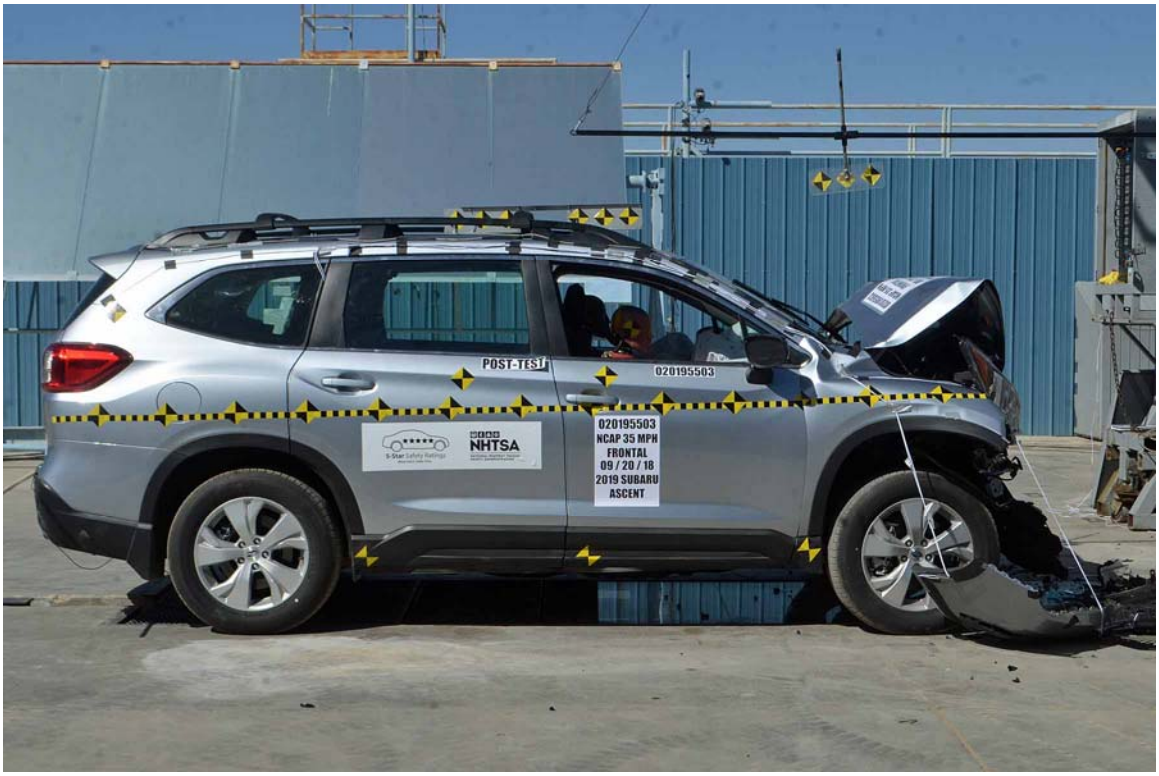

FIGURE 13. Post-Test Right View of Test Vehicle

FIGURE 14. Pre-Test Right Front ¾ View

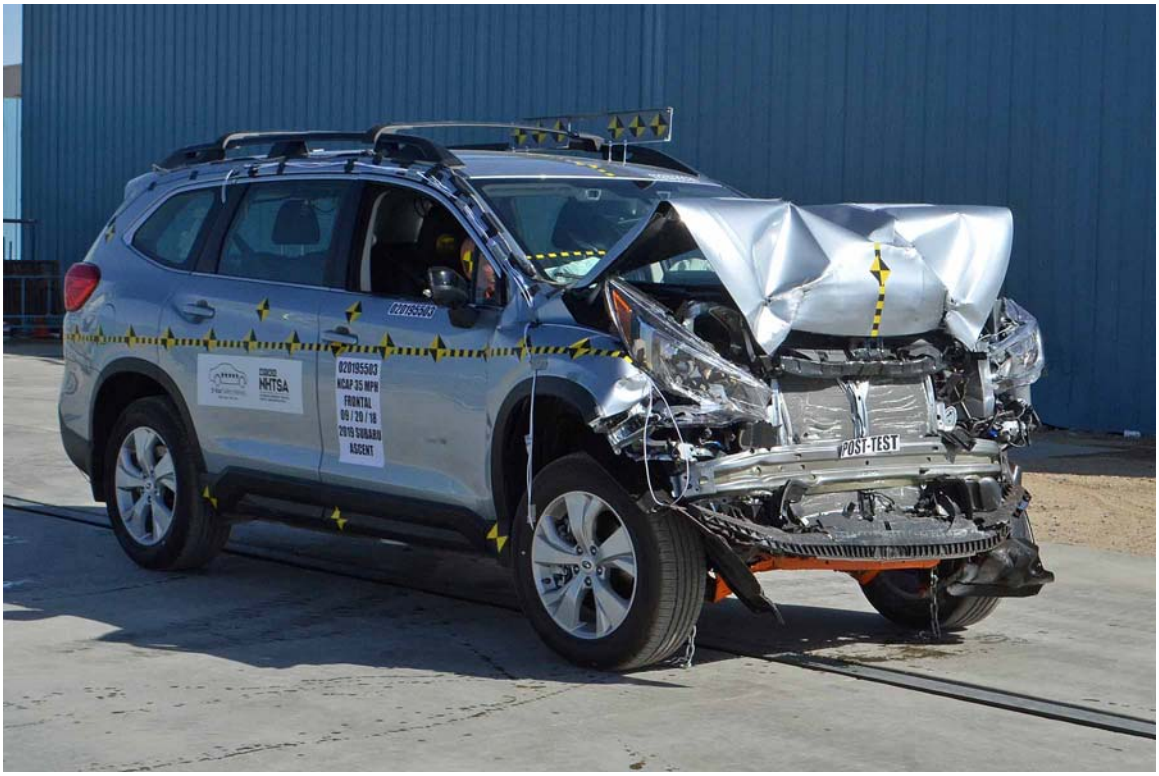

FIGURE 15. Post-Test Right Front ¾ View

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

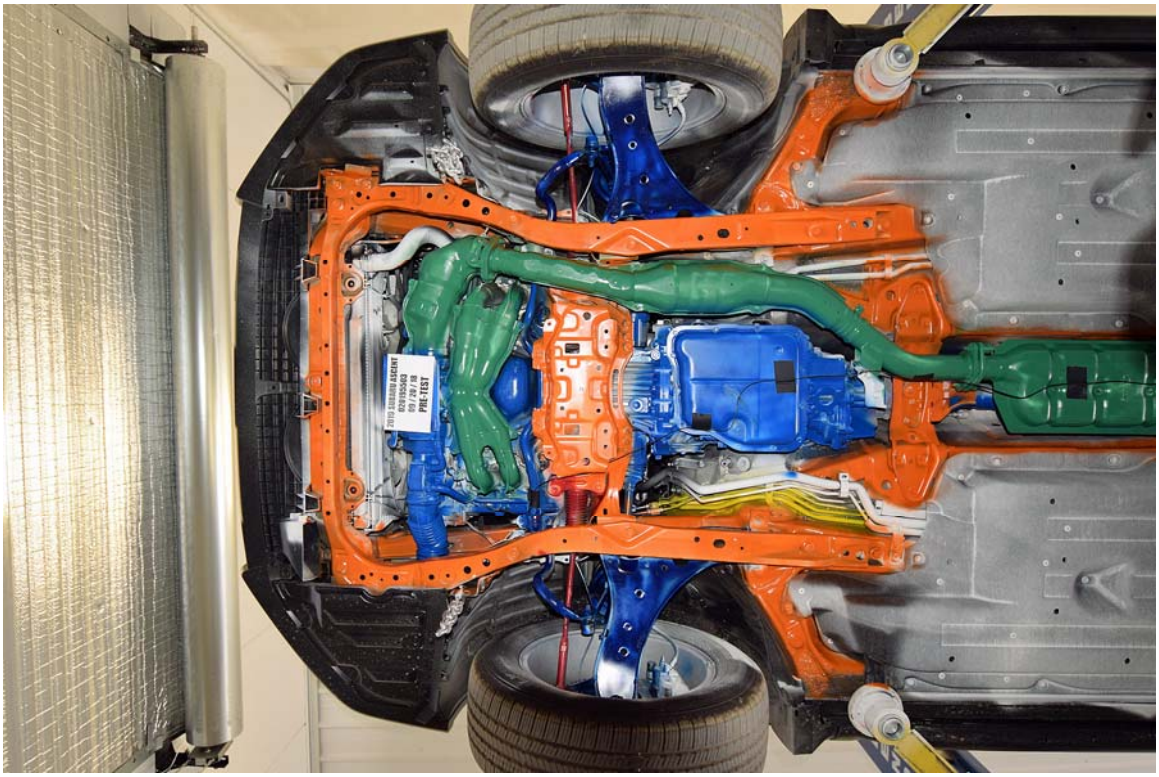

FIGURE 24. Pre-Test Front Underbody View

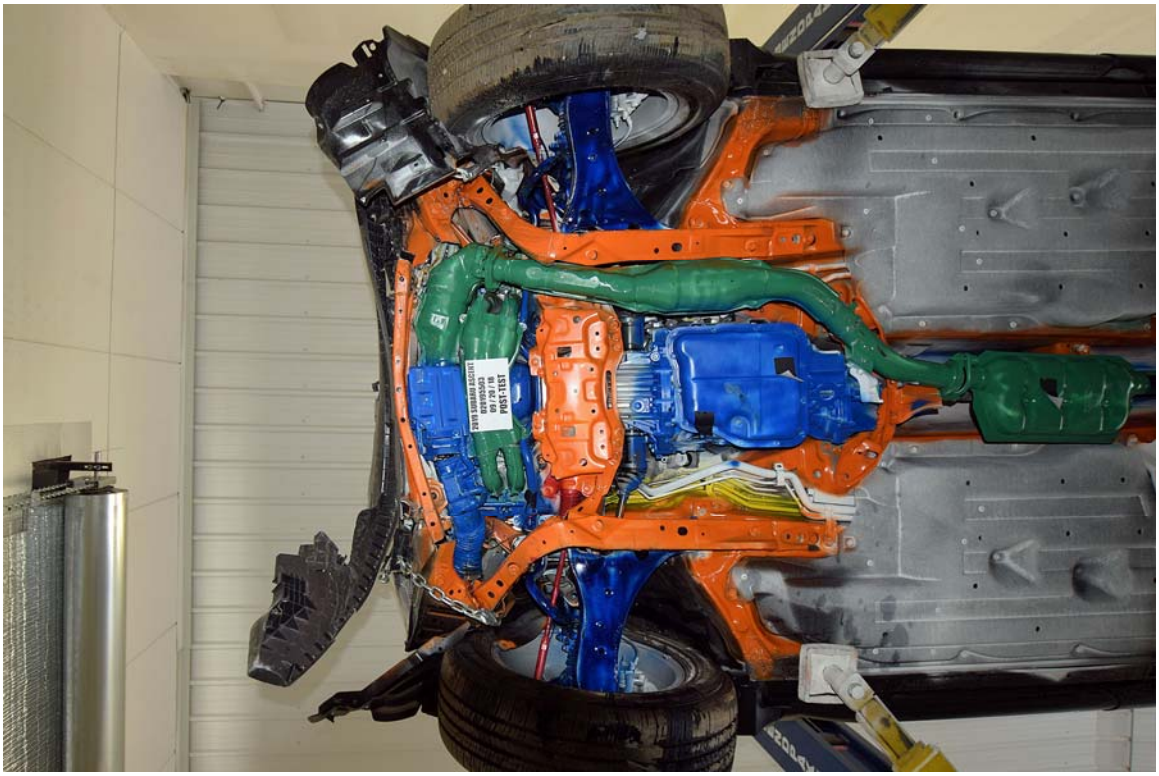

FIGURE 25. Post-Test Front Underbody View

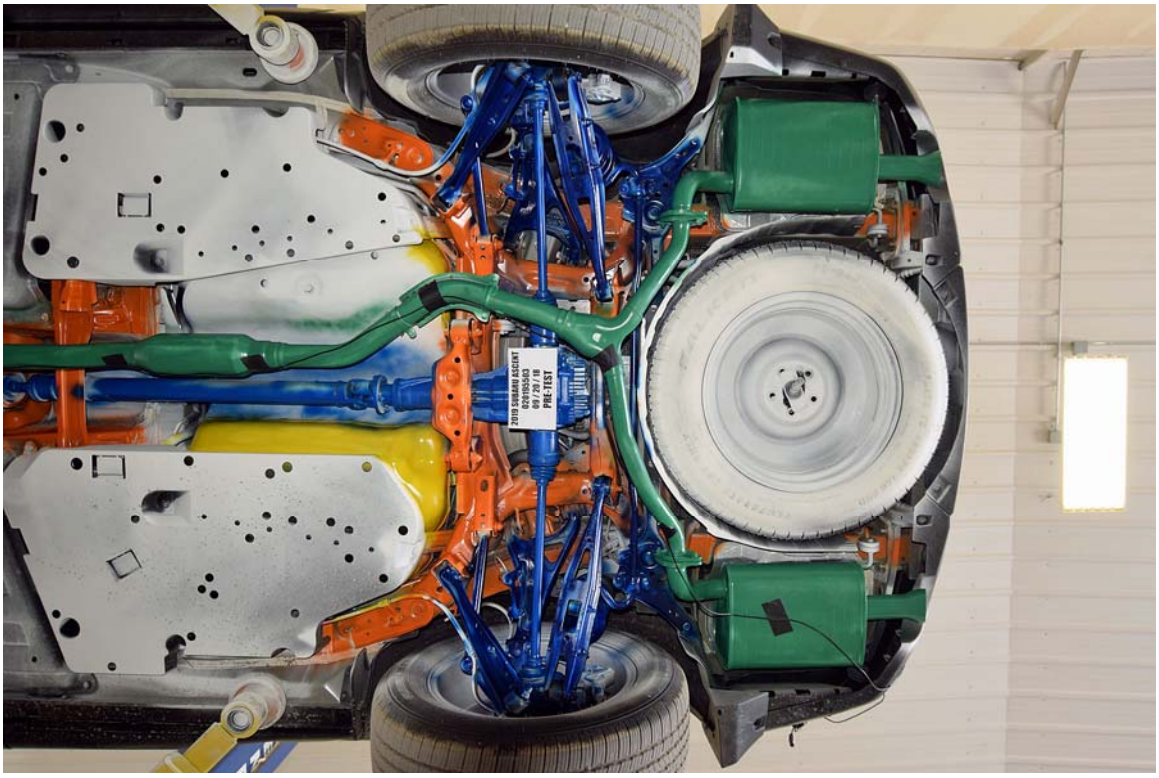

FIGURE 26. Pre-Test Rear Underbody View

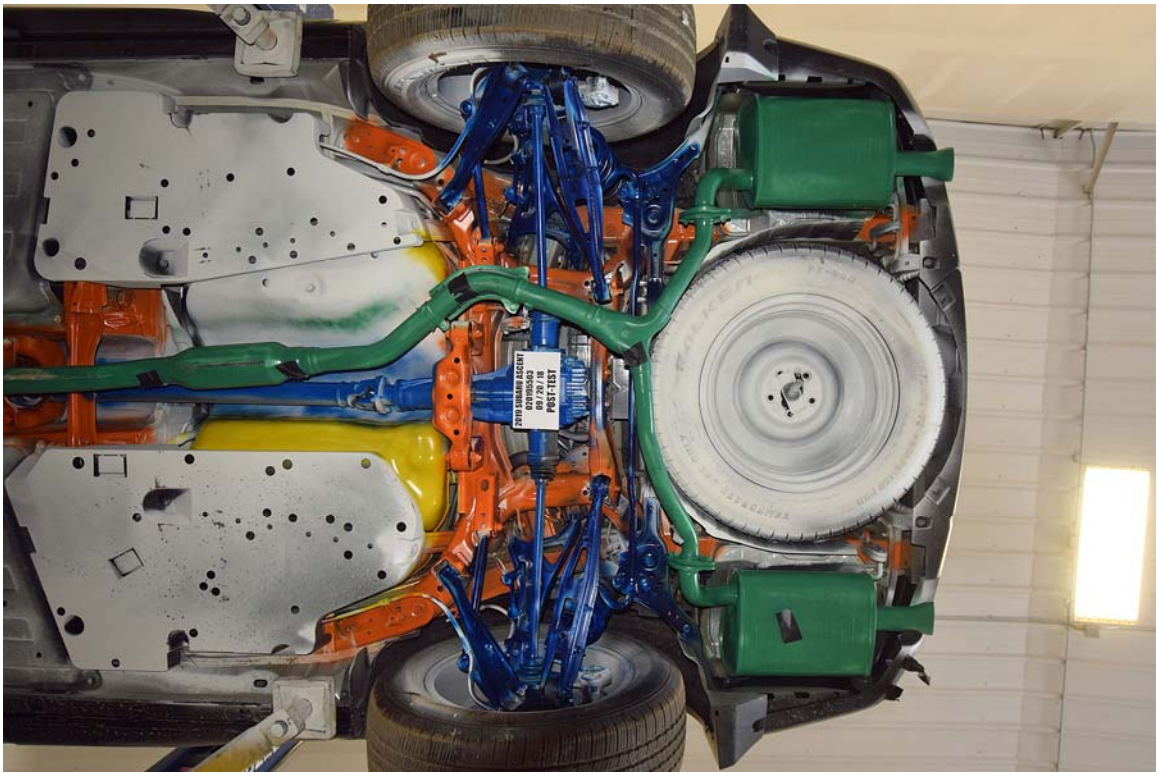

FIGURE 27. Post-Test Rear Underbody View

FIGURE 28. Pre-Test Dummy Cable Routing

FIGURE 29. Post-Test Dummy Cable Routing

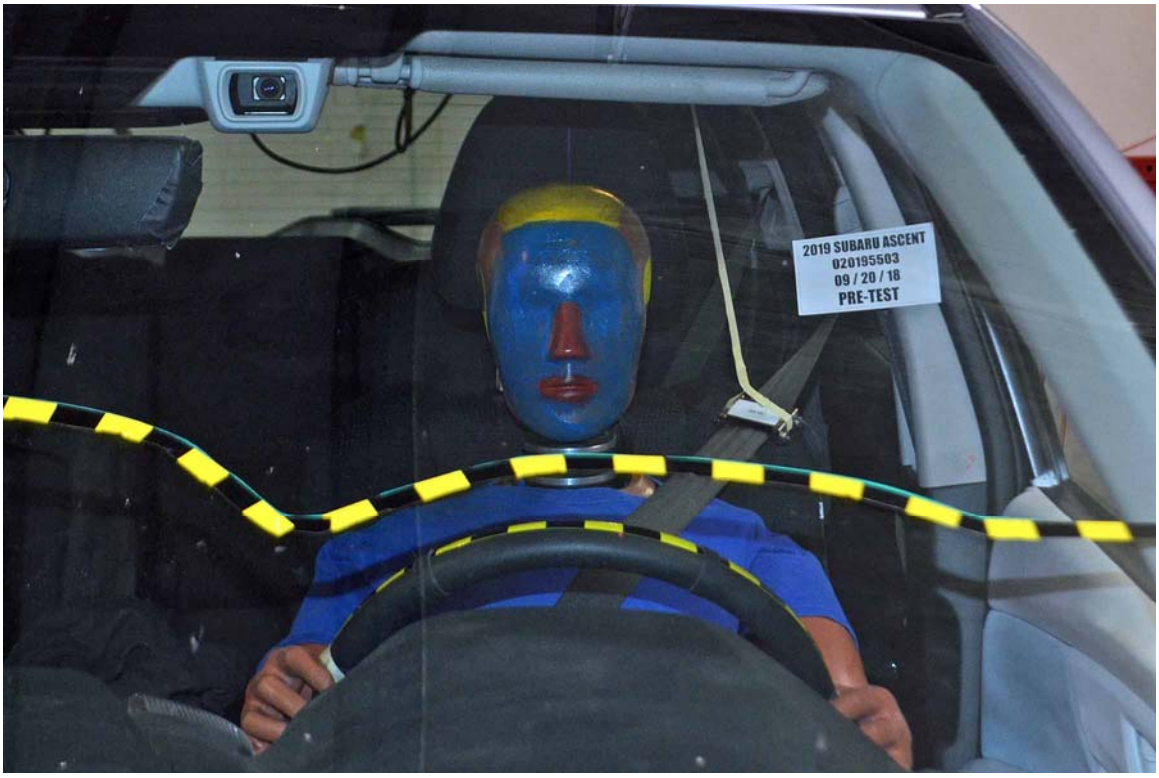

FIGURE 30. Pre-Test Driver Dummy Front View

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 Driver Dummy Feet

FIGURE 41. Post-Test Driver Dummy Feet

FIGURE 42. Pre-Test Driver's Side Knee Bolster

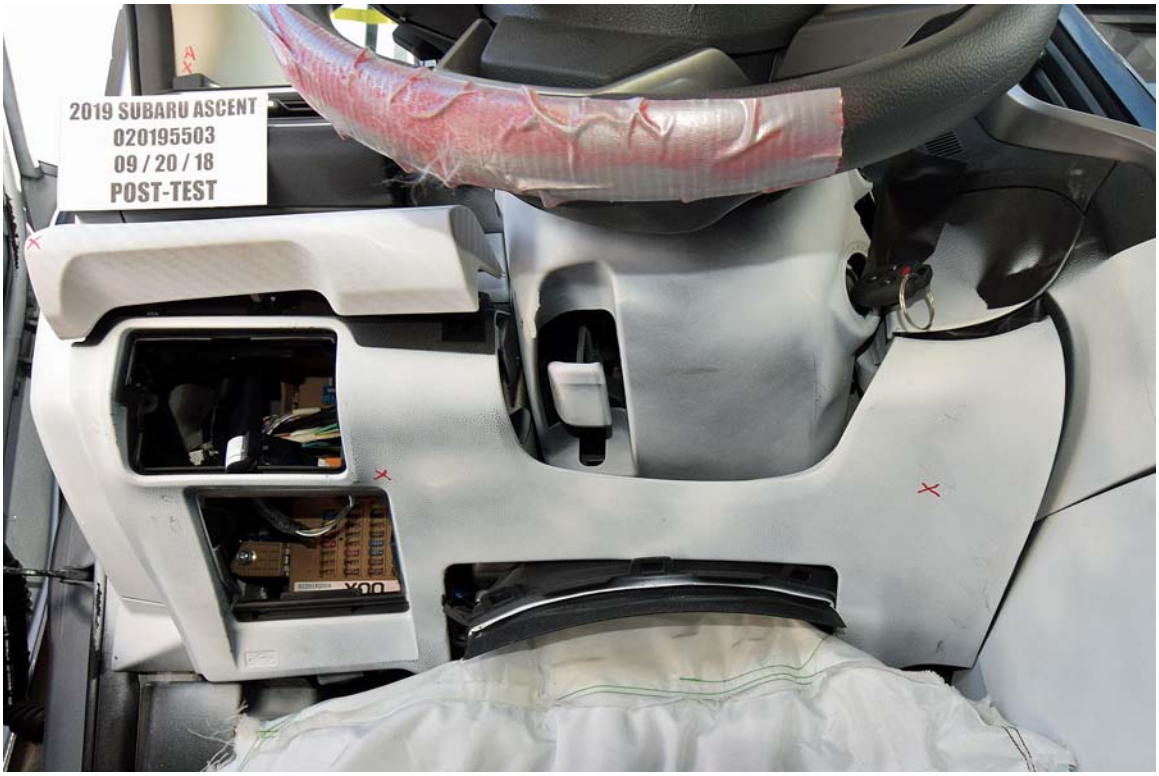

FIGURE 43. Post-Test Driver's Side Knee Bolster

FIGURE 44. Pre-Test Driver's Side Floorpan

FIGURE 45. Post-Test Driver's Side Floorpan

FIGURE 46. Post-Test Driver Dummy Face

FIGURE 47. Post-Test Driver Dummy Contact with Airbag

FIGURE 48. Post-Test Driver Dummy Contact with Headrest

FIGURE 48a. Post-Test Driver Dummy Contact with Knee Airbag

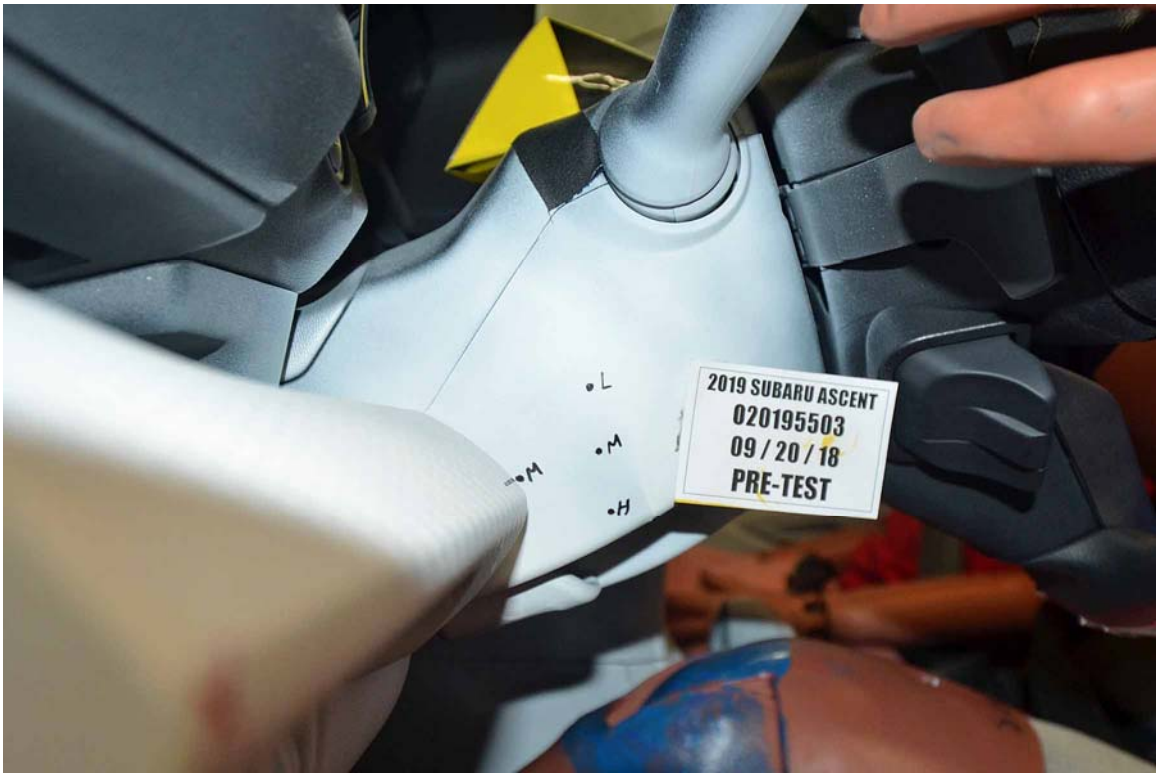

FIGURE 49. Pre-Test View of the Steering Wheel

FIGURE 50. Post-Test View of the Steering Wheel

FIGURE 51. Pre-Test Passenger Dummy Front View

FIGURE 52. Post-Test Passenger Dummy Front View

FIGURE 53. Pre-Test Passenger Dummy Window View

FIGURE 54. Post-Test Passenger Dummy Window View

FIGURE 55. Pre-Test Passenger Dummy and Vehicle Interior View

FIGURE 56. Post-Test Passenger Dummy and Vehicle Interior View

FIGURE 57. Pre-Test Passenger's Seat Fore-Aft Markings

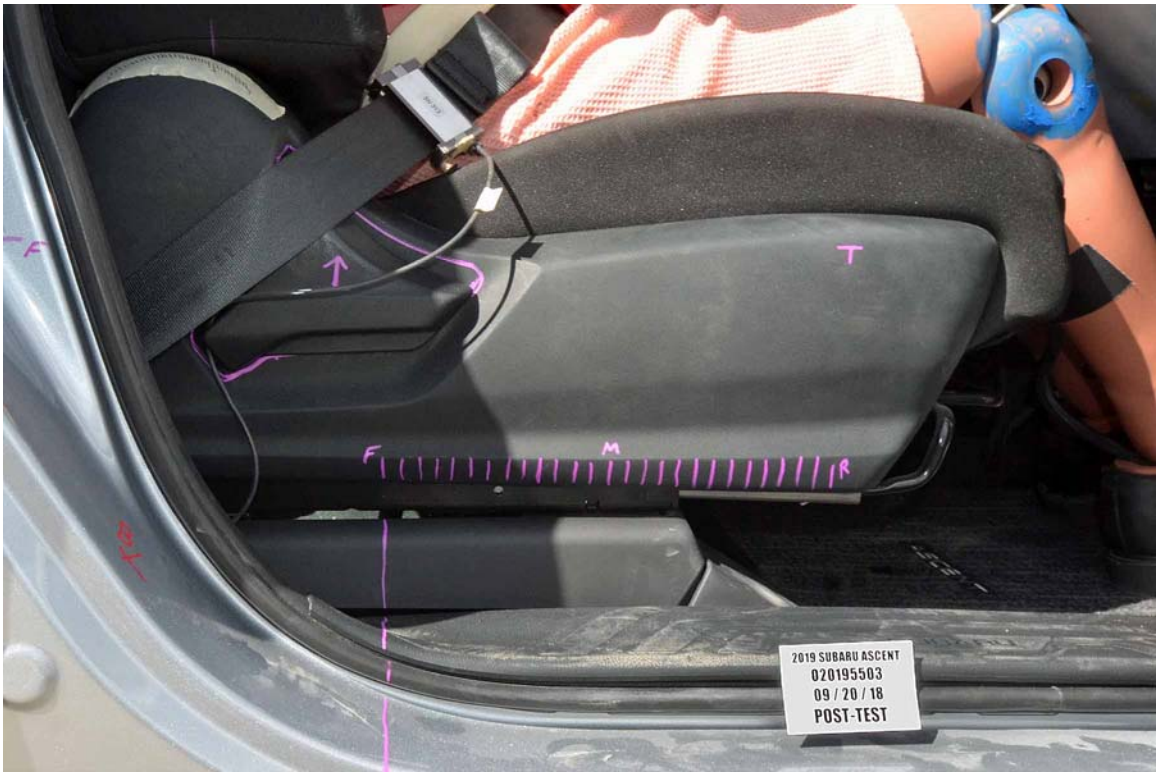

FIGURE 58. Post-Test Passenger's Seat Fore-Aft Markings

FIGURE 59. Pre-Test View of Belt Anchorage for Passenger Dummy

FIGURE 60. Post-Test View of Belt Anchorage for Passenger Dummy

FIGURE 61. Pre-Test Passenger Dummy Feet

FIGURE 62. Post-Test Passenger Dummy Feet

FIGURE 63. Pre-Test Passenger's Side Knee Bolster

FIGURE 64. Post-Test Passenger's Side Knee Bolster

FIGURE 65. Pre-Test Passenger's Side Floorpan

FIGURE 66. Post-Test Passenger's Side Floorpan

FIGURE 67. Post-Test Passenger Dummy Face

FIGURE 68. Post-Test Passenger Dummy Contact with Airbag

FIGURE 69. Post-Test Passenger Dummy Contact with Headrest

FIGURE 69a. Post-Test Passenger Dummy Contact with Knee Bolster

FIGURE 70. Photograph of Ballast Installed in Vehicle

Photograph Not Applicable

No Stoddard
Solvent Spillage

FIGURE 71. Post-Test Stoddard Solvent Spillage Location View

FIGURE 72. Post-Test Speed Trap Read-Out

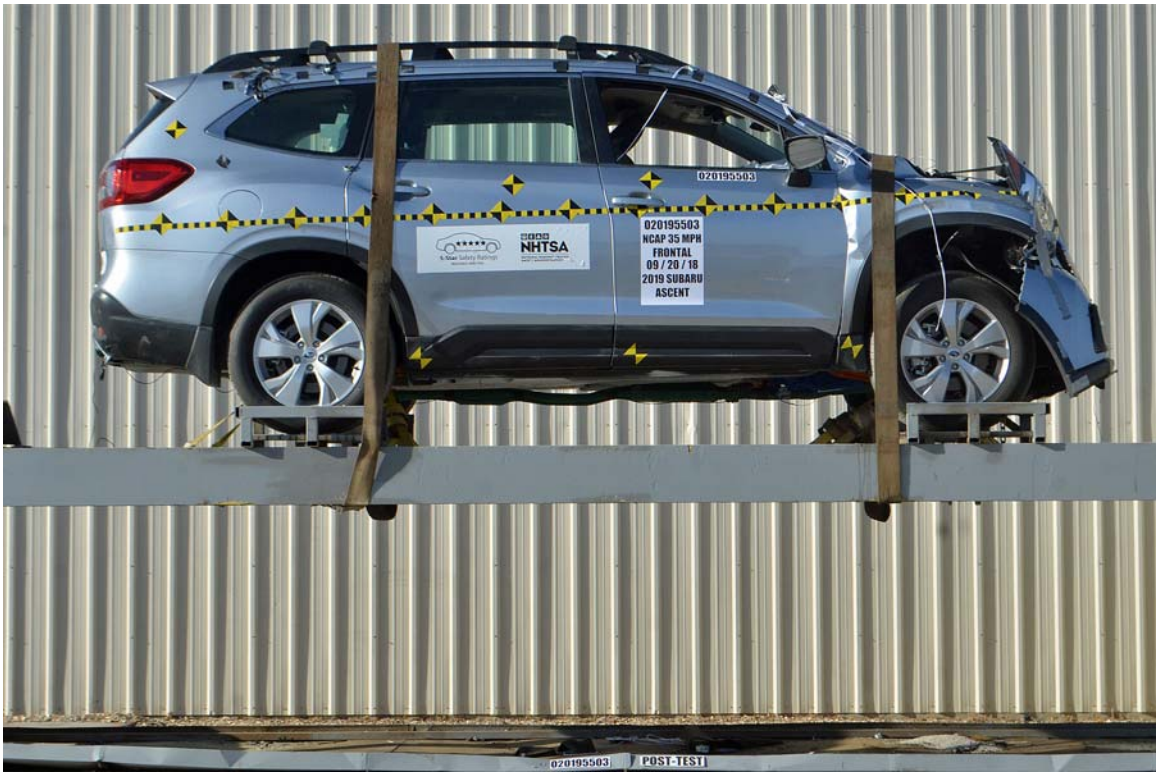

FIGURE 73. Vehicle at 0° on Static Rollover Device

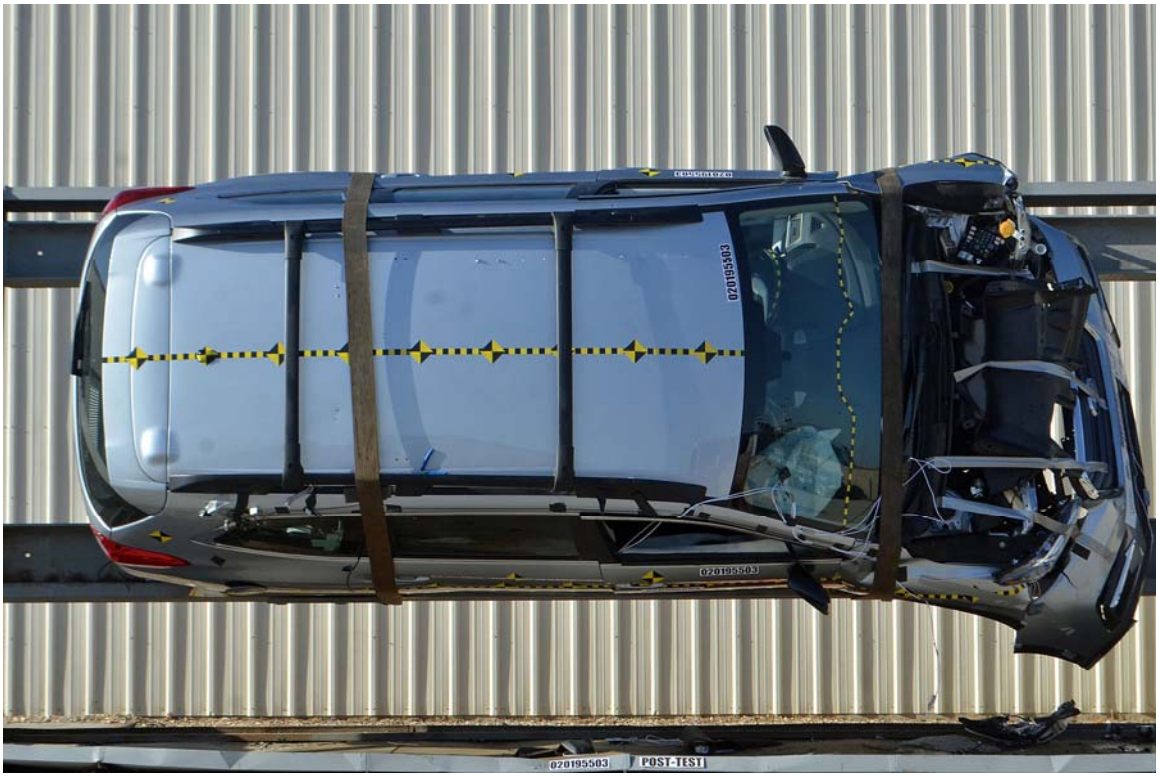

FIGURE 74. Vehicle at 90° on Static Rollover Device

FIGURE 75. Vehicle at 180° on Static Rollover Device

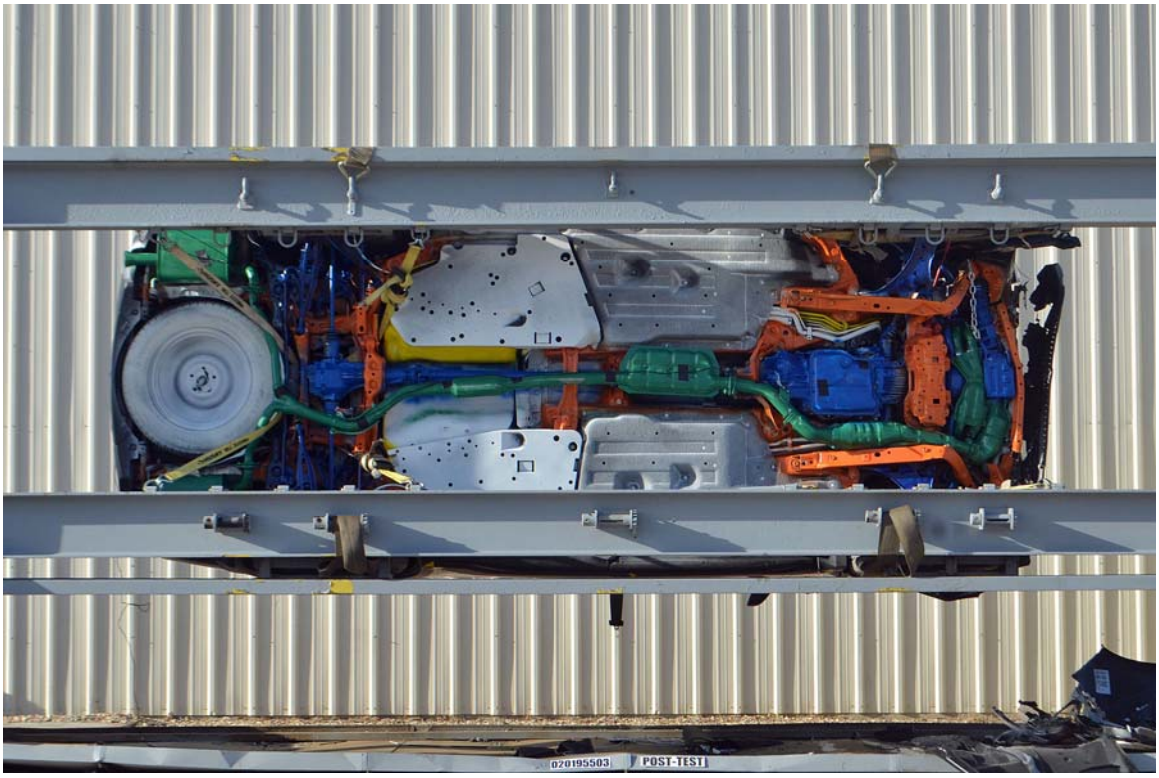

FIGURE 76. Vehicle at 270° on Static Rollover Device

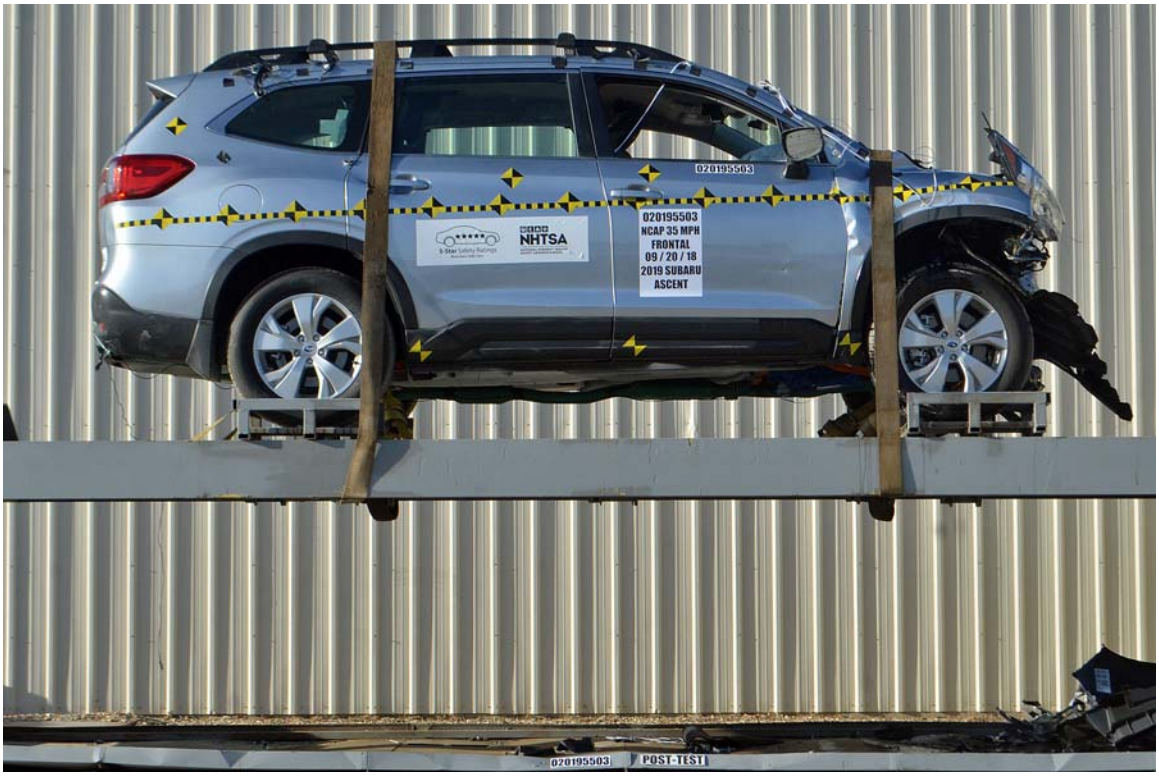

FIGURE 77. Vehicle at 360° on Static Rollover Device

FIGURE 78. 2019 Subaru Ascent Frontal Impact Event

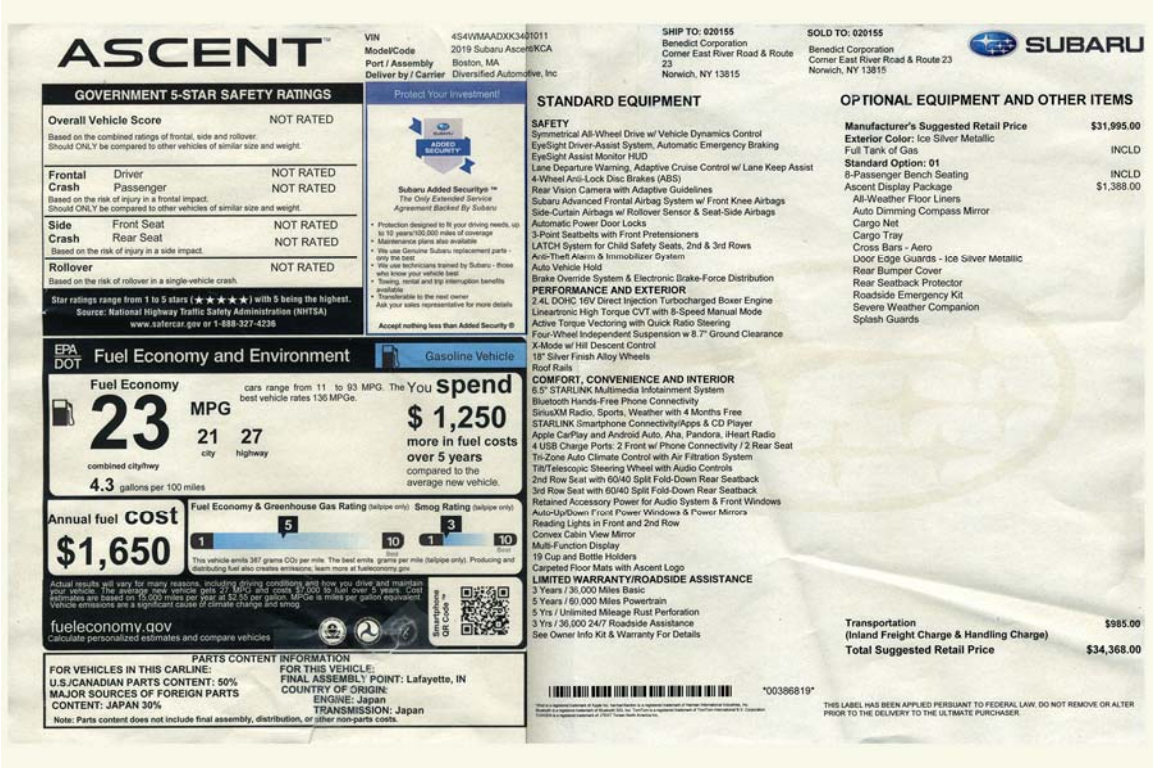

FIGURE 79. Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

Plot		Page
1	Driver Head Acceleration X Primary	B-1
2	Driver Head Acceleration Y Primary	B-1
3	Driver Head Acceleration Z Primary	B-1
4	Driver Head Resultant Acceleration Primary	B-1
5	Driver Chest X Deflection	B-2
6	Driver Chest Acceleration X Primary	B-3
7	Driver Chest Acceleration Y Primary	B-3
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10	Driver Upper Neck Force X	B-4
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13	Driver Nij	B-4
14	Driver Left Femur Force Z	B-5
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16	Passenger Head Acceleration X Primary	B-6
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29	Passenger Left Femur Force Z	B-10
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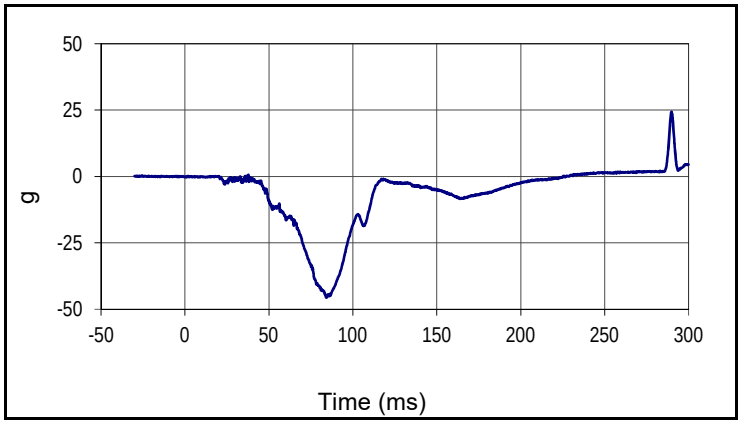
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

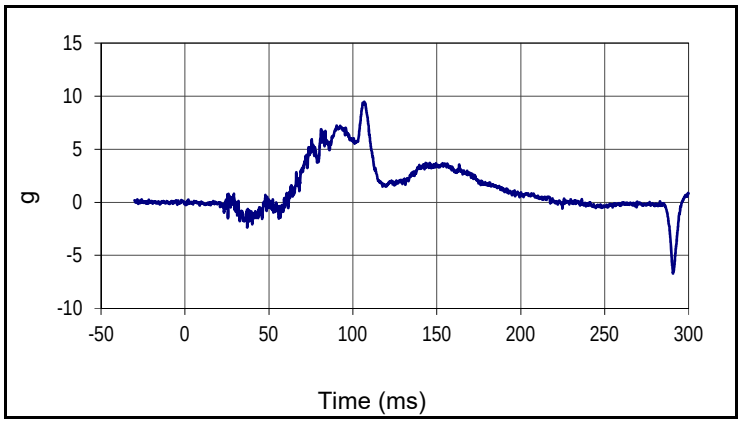
Driver Head X Acceleration Redundant
Driver Head Y Acceleration Redundant
Driver Head Z Acceleration Redundant
Driver Upper Neck Force Y
Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration Redundant
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
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
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember X Redundant
Right Rear Seat Crossmember X Redundant
Vehicle Engine Top X
Vehicle Engine Bottom X
Load Cell Barrier Forces and Moments

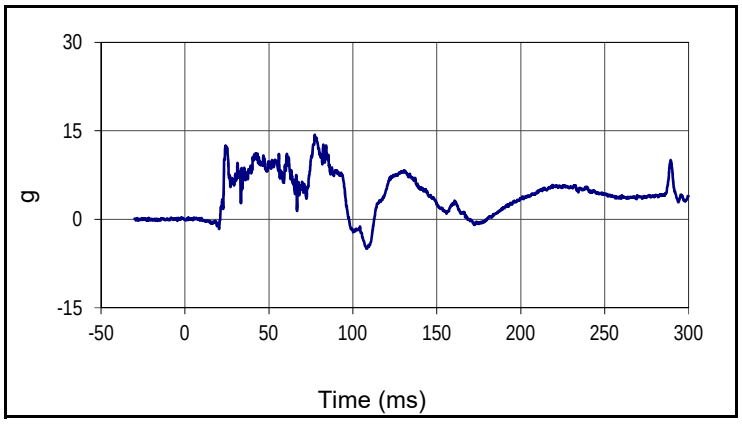
Test Vehicle:	2019 Subaru Ascent 5-Door MPV	NHTSA No.:	O20195503
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	09/20/18



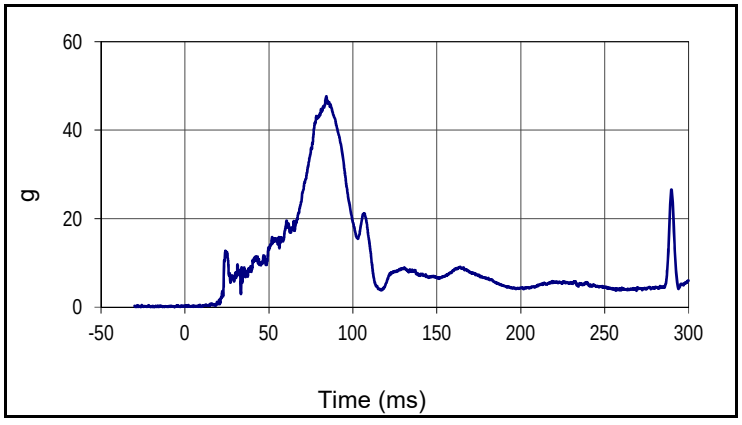
Curve Description			
Driver Head Acceleration X Primary			
Plot No.		SAE Class	Units
001		1000	g
Max	Time	Min	Time
24.4	289.8	-45.7	84.2



Curve Description			
Driver Head Acceleration Y Primary			
Plot No.		SAE Class	Units
002		1000	g
Max	Time	Min	Time
9.5	106.8	-6.7	290.7

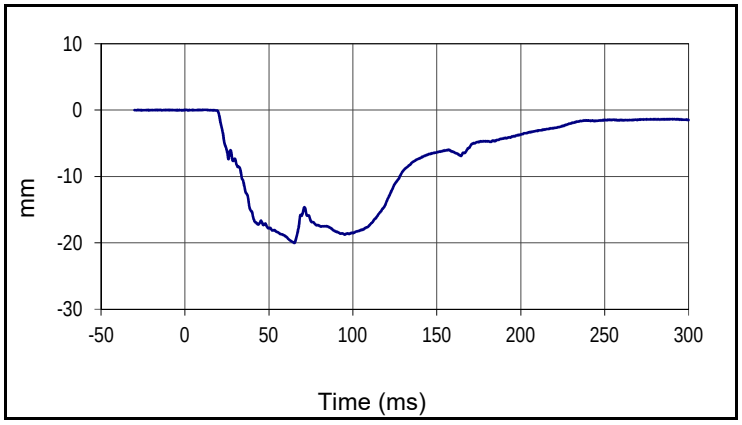


Curve Description			
Driver Head Acceleration Z Primary			
Plot No.		SAE Class	Units
003		1000	g
Max	Time	Min	Time
14.3	77.3	-5.0	108.2



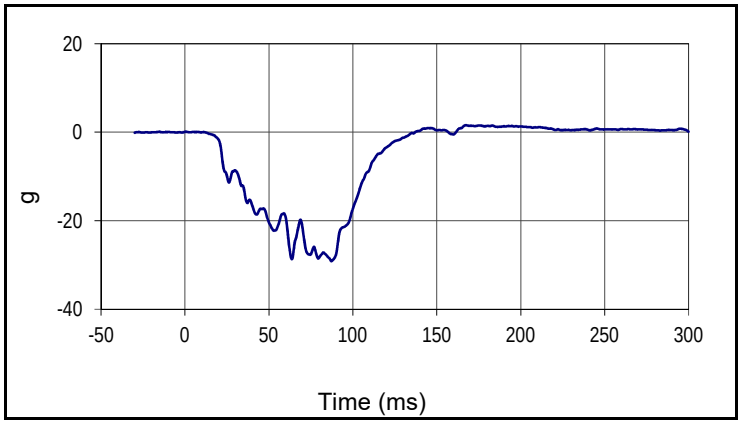
Curve Description			
Driver Head Resultant Acceleration Primary			
Plot No.		SAE Class	Units
004		1000	g
Max	Time	Min	Time
47.6	84.2	0.1	10.0

Test Vehicle:	2019 Subaru Ascent 5-Door MPV	NHTSA No.:	O20195503
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	09/20/18

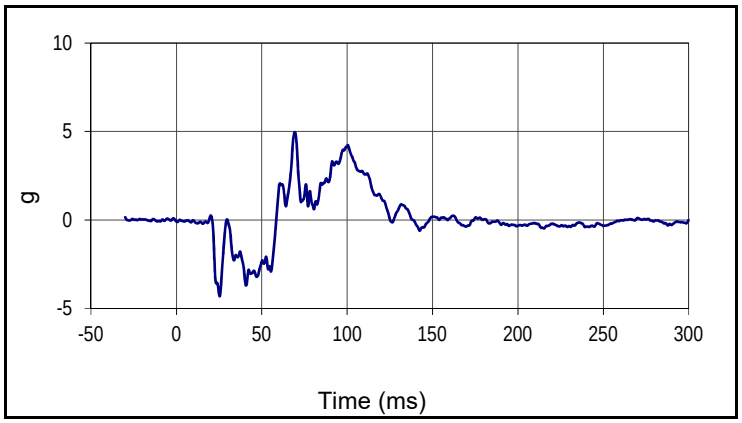


Curve Description			
Driver Chest Deflection			
Plot No.		SAE Class	Units
005		600	mm
Max	Time	Min	Time
0.0	12.7	-20.0	65.1

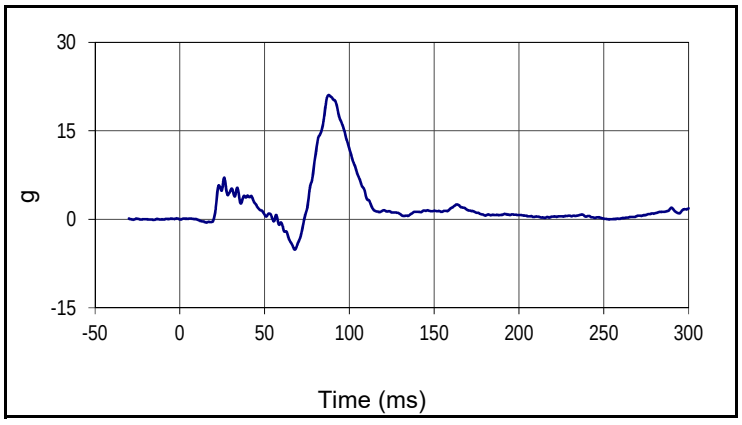
Test Vehicle:	2019 Subaru Ascent 5-Door MPV	NHTSA No.:	O20195503
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	09/20/18



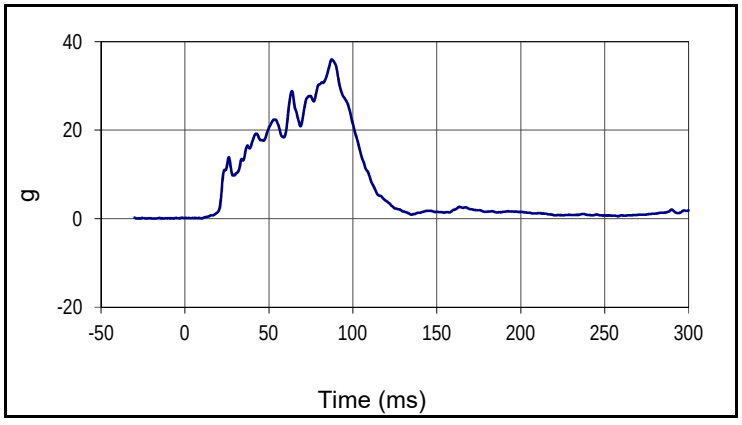
Curve Description			
Driver Chest Acceleration X Primary			
Plot No.		SAE Class	Units
006		180	g
Max	Time	Min	Time
1.6	167.2	-29.2	87.2



Curve Description			
Driver Chest Acceleration Y Primary			
Plot No.		SAE Class	Units
007		180	g
Max	Time	Min	Time
5.0	69.3	-4.3	25.3

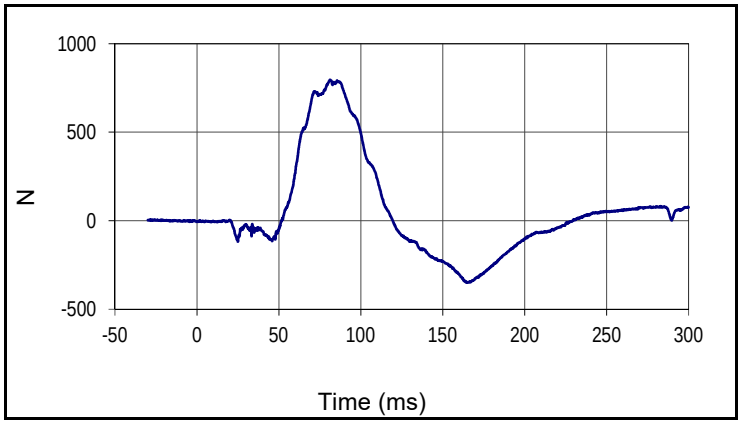


Curve Description			
Driver Chest Acceleration Z Primary			
Plot No.		SAE Class	Units
008		180	g
Max	Time	Min	Time
21.1	87.8	-5.1	67.8

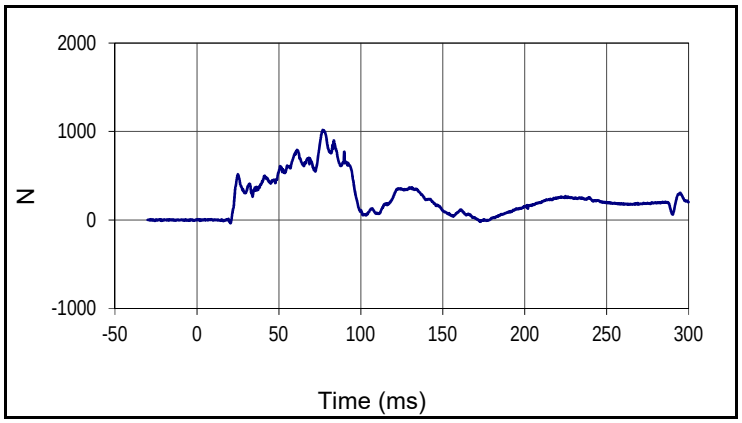


Curve Description			
Driver Chest Resultant Acceleration Primary			
Plot No.		SAE Class	Units
009		180	g
Max	Time	Min	Time
36.0	87.4	0.0	10.0

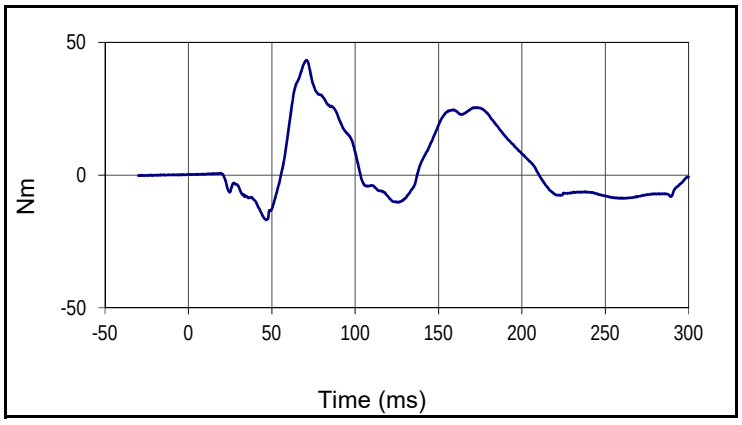
Test Vehicle:	2019 Subaru Ascent 5-Door MPV	NHTSA No.:	O20195503
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	09/20/18



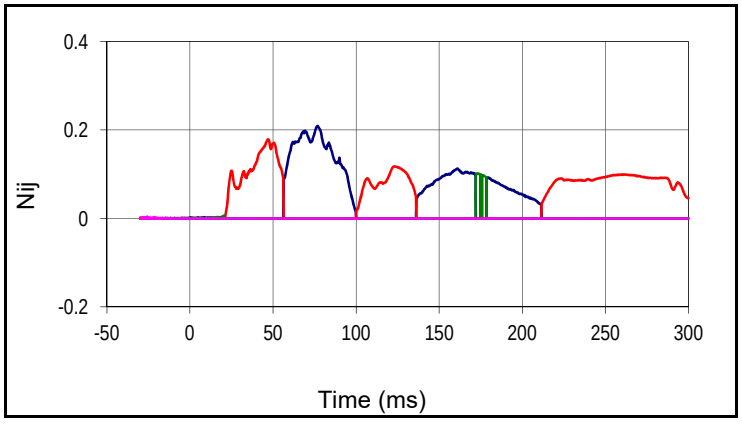
Curve Description			
Driver Upper Neck Force X			
Plot No.		SAE Class	Units
010		1000	N
Max	Time	Min	Time
795.9	81.1	-350.0	164.7



Curve Description			
Driver Upper Neck Force Z			
Plot No.		SAE Class	Units
011		1000	N
Max	Time	Min	Time
1017.7	76.8	-36.1	20.5

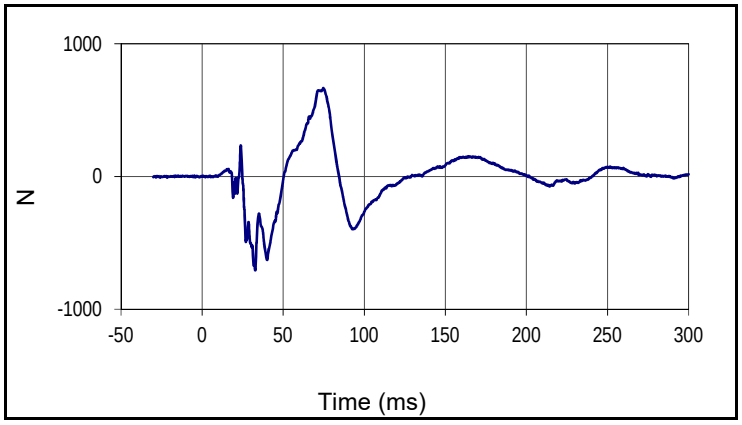


Curve Description			
Driver Upper Neck Moment Y			
Plot No.		SAE Class	Units
012		600	Nm
Max	Time	Min	Time
43.3	70.9	-16.9	46.6

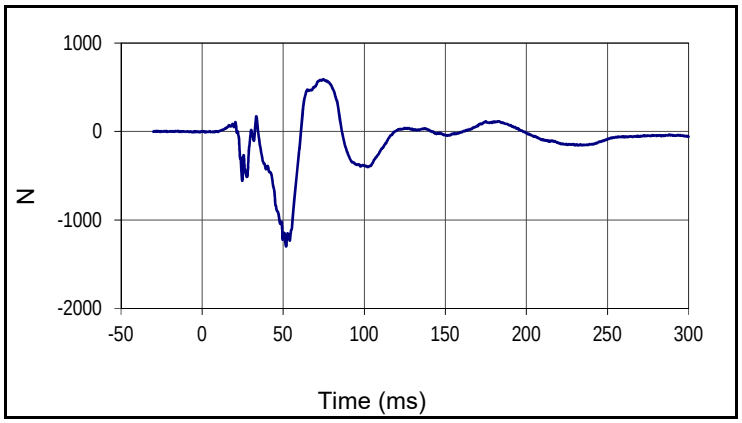


Curve Description		
Driver Nij		
Units	Max	Time
Ntf	0.21	76.9
Units	Max	Time
Nte	0.18	46.9
Units	Max	Time
Ncf	0.10	173.2
Units	Max	Time
Nce	0.00	-25.7

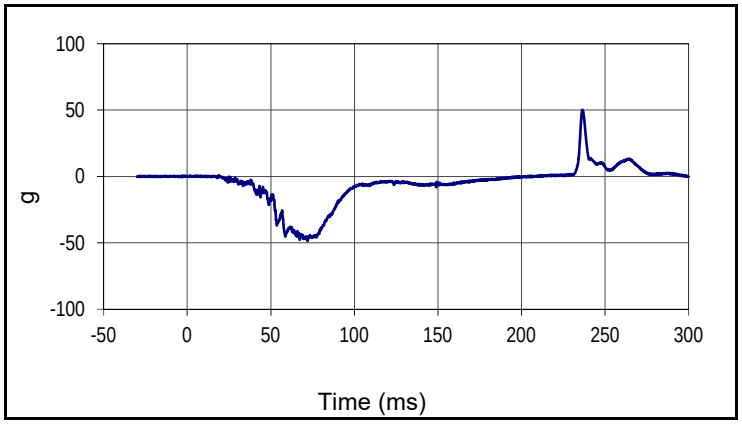
Test Vehicle:	2019 Subaru Ascent 5-Door MPV	NHTSA No.:	O20195503
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	09/20/18



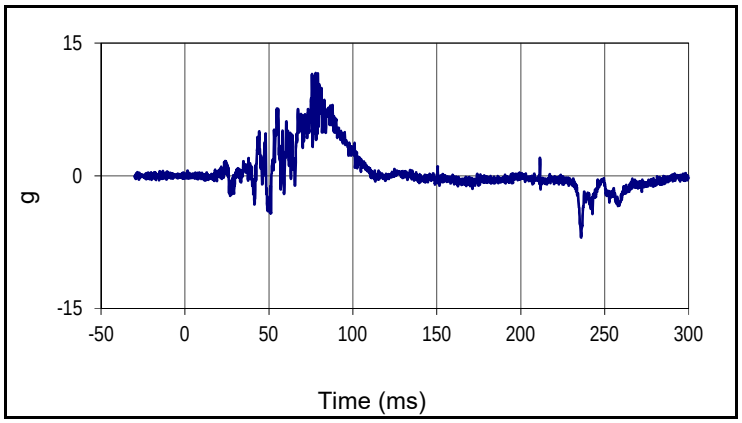
Curve Description			
Driver Left Femur Force Z			
Plot No.		SAE Class	Units
014		600	N
Max	Time	Min	Time
666.2	74.7	-707.9	32.8



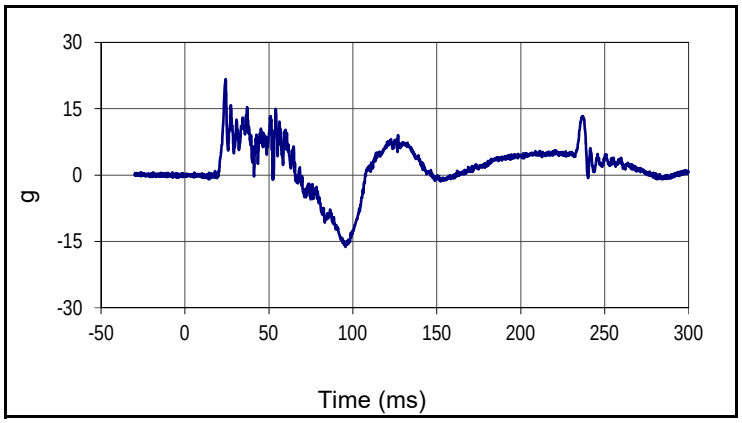
Curve Description			
Driver Right Femur Force Z			
Plot No.		SAE Class	Units
015		600	N
Max	Time	Min	Time
590.8	74.7	-1298.7	51.8



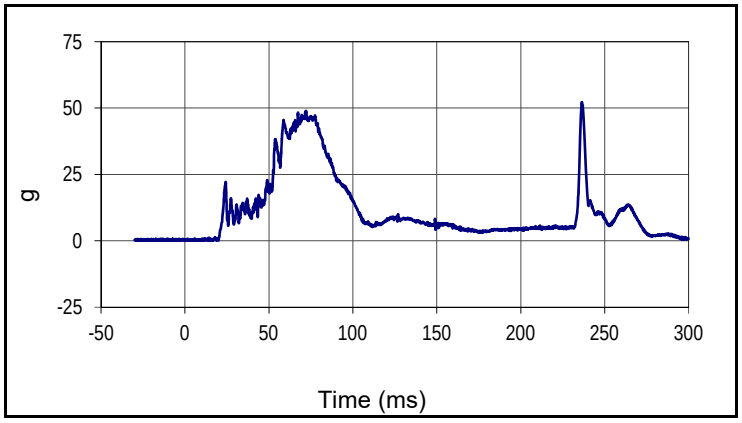
Curve Description			
Passenger Head Acceleration X Primary			
Plot No.		SAE Class	Units
016		1000	g
Max	Time	Min	Time
50.2	236.4	-48.3	72.1



Curve Description			
Passenger Head Acceleration Y Primary			
Plot No.		SAE Class	Units
017		1000	g
Max	Time	Min	Time
11.6	77.8	-7.0	236.0

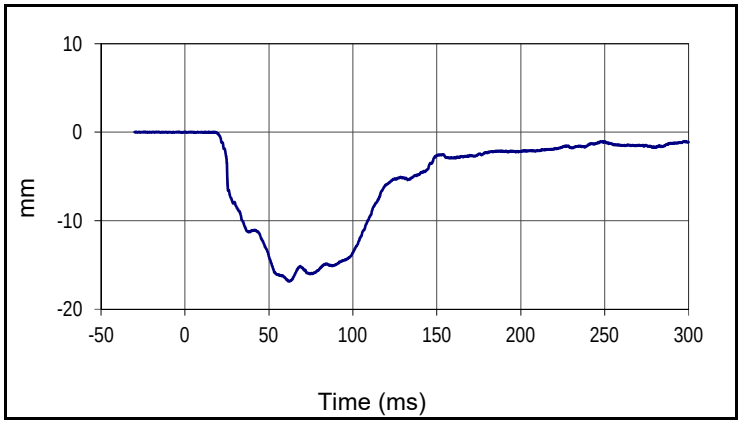


Curve Description			
Passenger Head Acceleration Z Primary			
Plot No.		SAE Class	Units
018		1000	g
Max	Time	Min	Time
21.7	24.2	-16.2	95.6

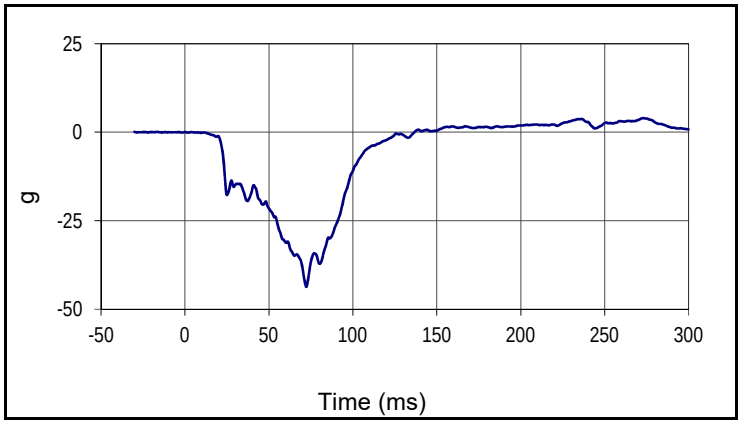


Curve Description			
Passenger Head Resultant Acceleration Primary			
Plot No.		SAE Class	Units
019		1000	g
Max	Time	Min	Time
52.2	236.4	0.1	14.2

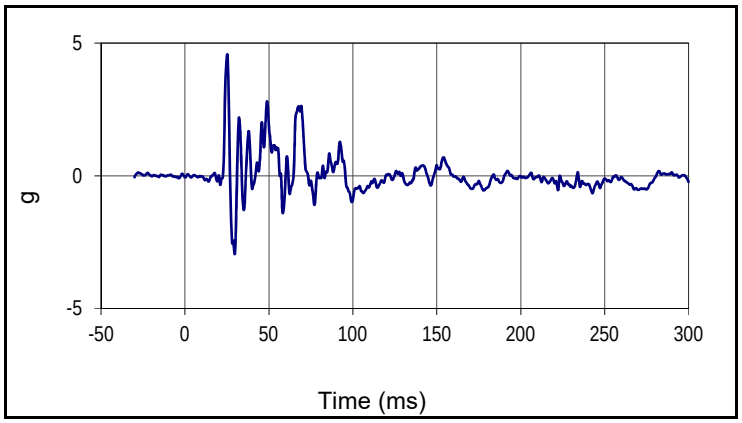
Test Vehicle:	2019 Subaru Ascent 5-Door MPV	NHTSA No.:	O20195503
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	09/20/18



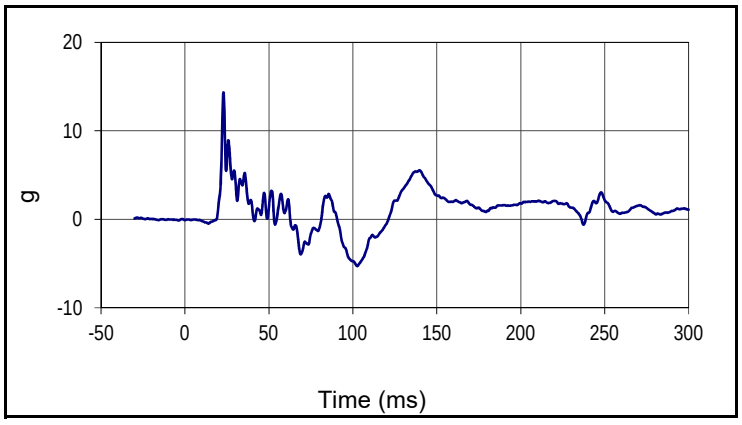
Curve Description			
Passenger Chest Deflection			
Plot No.		SAE Class	Units
020		600	mm
Max	Time	Min	Time
0.0	13.9	-16.9	62.0



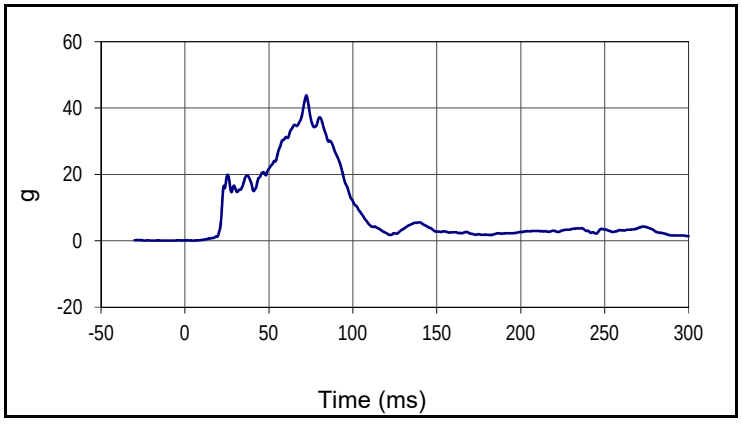
Curve Description			
Passenger Chest Acceleration X Primary			
Plot No.		SAE Class	Units
021		180	g
Max	Time	Min	Time
4.0	272.8	-43.7	72.3



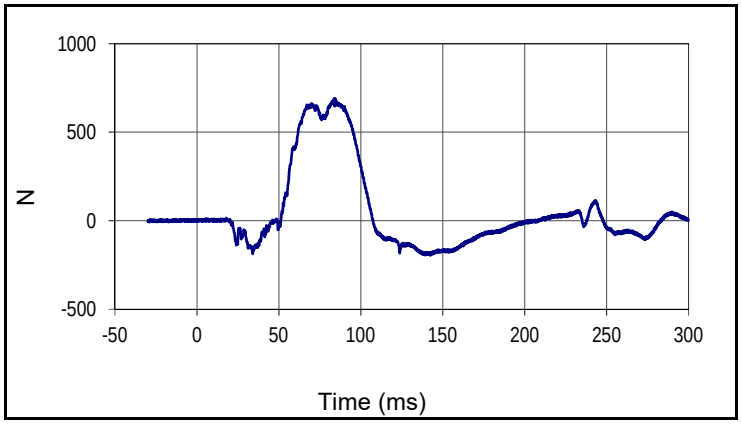
Curve Description			
Passenger Chest Acceleration Y Primary			
Plot No.		SAE Class	Units
022		180	g
Max	Time	Min	Time
4.6	25.2	-3.0	29.6



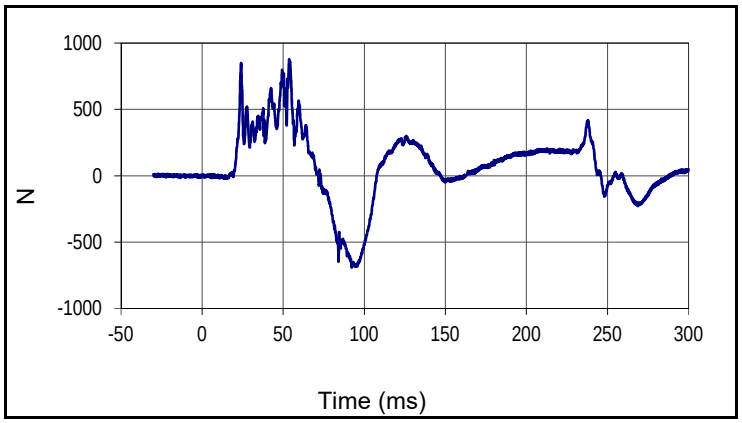
Curve Description			
Passenger Chest Acceleration Z Primary			
Plot No.		SAE Class	Units
023		180	g
Max	Time	Min	Time
14.3	22.9	-5.3	102.6



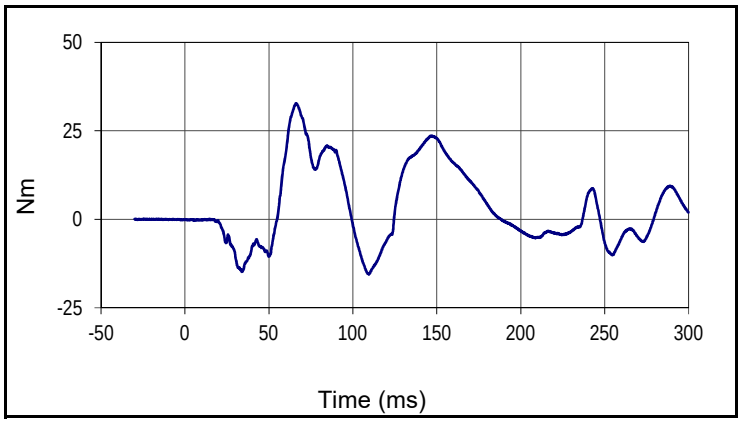
Curve Description			
Passenger Chest Resultant Acceleration Primary			
Plot No.		SAE Class	Units
024		180	g
Max	Time	Min	Time
43.8	72.3	0.0	4.6



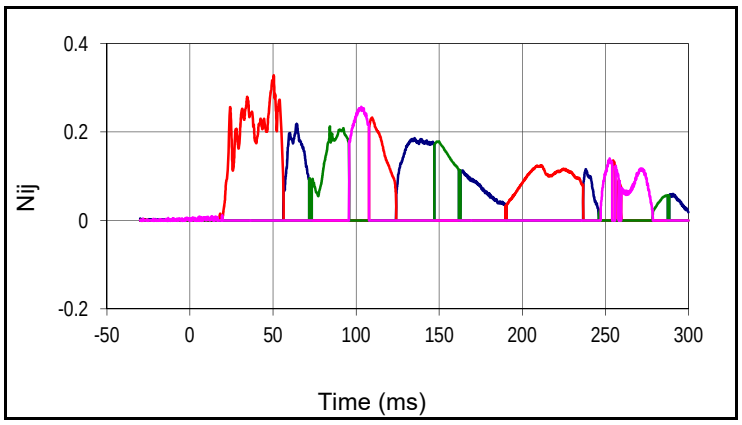
Curve Description			
Passenger Upper Neck Force X			
Plot No.		SAE Class	Units
025		1000	N
Max	Time	Min	Time
690.7	84.3	-195.7	142.4



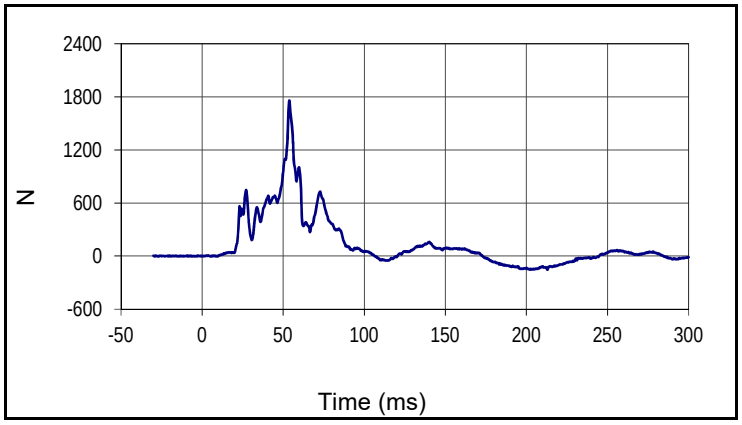
Curve Description			
Passenger Upper Neck Force Z			
Plot No.		SAE Class	Units
026		1000	N
Max	Time	Min	Time
877.2	53.7	-691.9	92.3



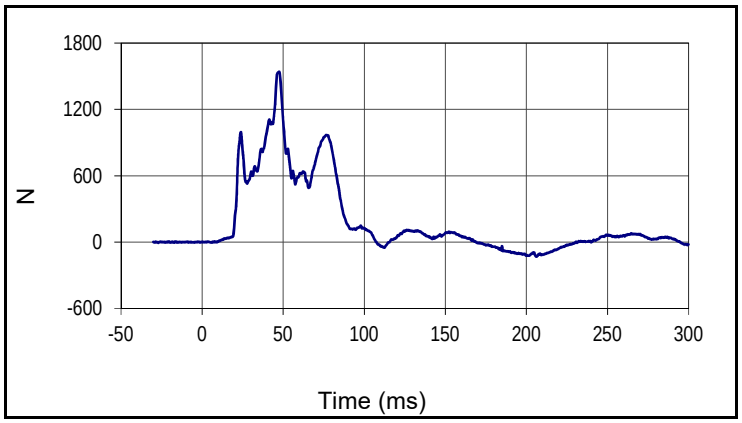
Curve Description			
Passenger Upper Neck Moment Y			
Plot No.		SAE Class	Units
027		600	Nm
Max	Time	Min	Time
32.7	66.0	-15.6	109.5



Curve Description		
Passenger Nij		
Units	Max	Time
Ntf	0.22	64.0
Units	Max	Time
Nte	0.33	50.4
Units	Max	Time
Ncf	0.21	84.2
Units	Max	Time
Nce	0.26	103.1



Curve Description			
Passenger Left Femur Force Z			
Plot No.		SAE Class	Units
029		600	N
Max	Time	Min	Time
1757.6	53.8	-154.7	212.9



Curve Description			
Passenger Right Femur Force Z			
Plot No.		SAE Class	Units
030		600	N
Max	Time	Min	Time
1540.6	47.6	-131.4	206.1

APPENDIX C
ATD CALIBRATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
PRE-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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Hybrid III 50th Percentile Male
ATD Damage Checklist

ATD Serial No.: 360 Test Date: 2018-08-22

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:

Technician: J. Hernandez

Approved By: P. Puzzuto

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Hybrid III 50th Percentile Male
External Measurements

ATD Serial No.: 360 Test Date: 2018-08-22

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	517	Pass
C - 'H' point height	mm	84	89	86	Pass
D - 'H' point location from backline	mm	135	140	138	Pass
E - Shoulder pivot from backline	mm	84	94	88	Pass
F - Thigh clearance	mm	140	155	153	Pass
G - Back of elbow to wrist pivot	mm	290	305	301	Pass
H - Head back to backline	mm	41	46	45	Pass
I - Shoulder to elbow length	mm	330	345	342	Pass
J - Elbow rest height	mm	190	211	204	Pass
K - Buttock to knee length	mm	579	604	585	Pass
L - Popliteal length	mm	429	455	443	Pass
M - Knee pivot height	mm	485	500	496	Pass
N - Buttock popliteal length	mm	452	477	460	Pass
O - Chest depth without jacket	mm	213	229	223	Pass
P - Foot length	mm	251	267	255	Pass
V - Shoulder breadth	mm	422	437	428	Pass
W - Foot breadth	mm	91	107	98	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	984	Pass
Z - Waist circum.	mm	836	866	846	Pass
AA - Location for chest circum.	mm	429	434	432	Pass
BB - Location for waist circum.	mm	226	231	227	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

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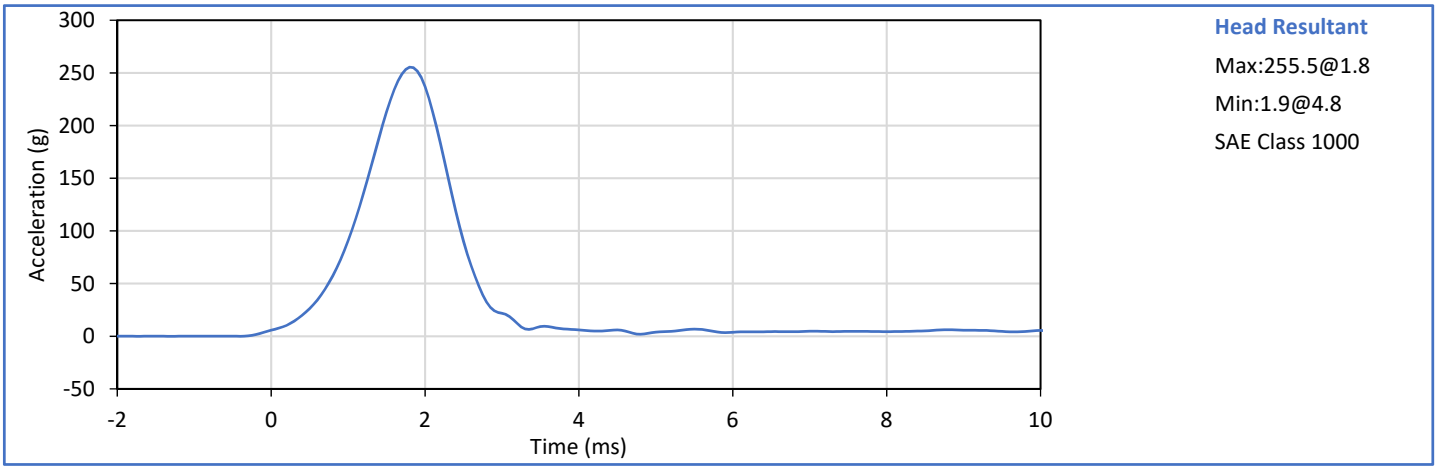
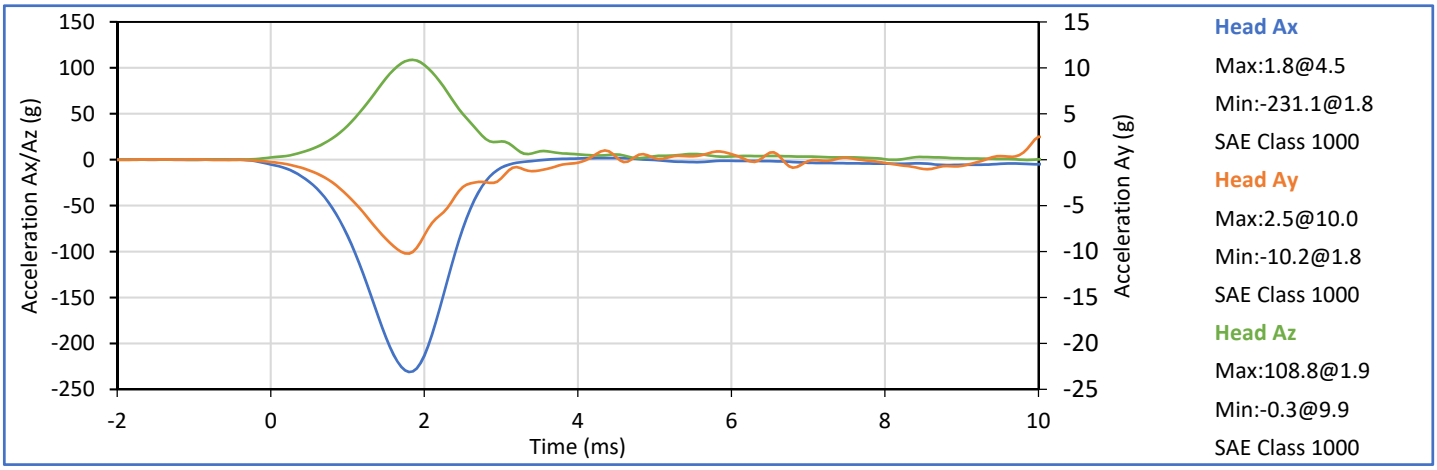
Hybrid III 50th Percentile Male
Head Drop

ATD Serial No.: 360 Test Date: 2018-08-22

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.2	Pass
Laboratory Humidity	%	10	70	44	Pass
Peak Resultant Acceleration	g	225.0	275.0	255.5	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-10.2	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: T. Lowman

Approved By: P. Puzzuto

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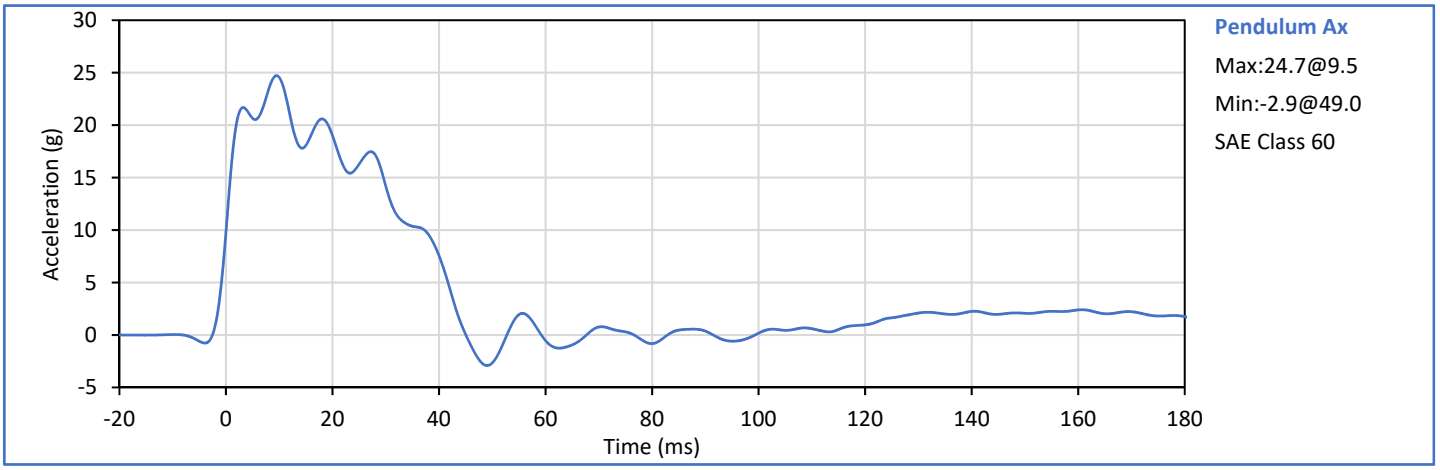
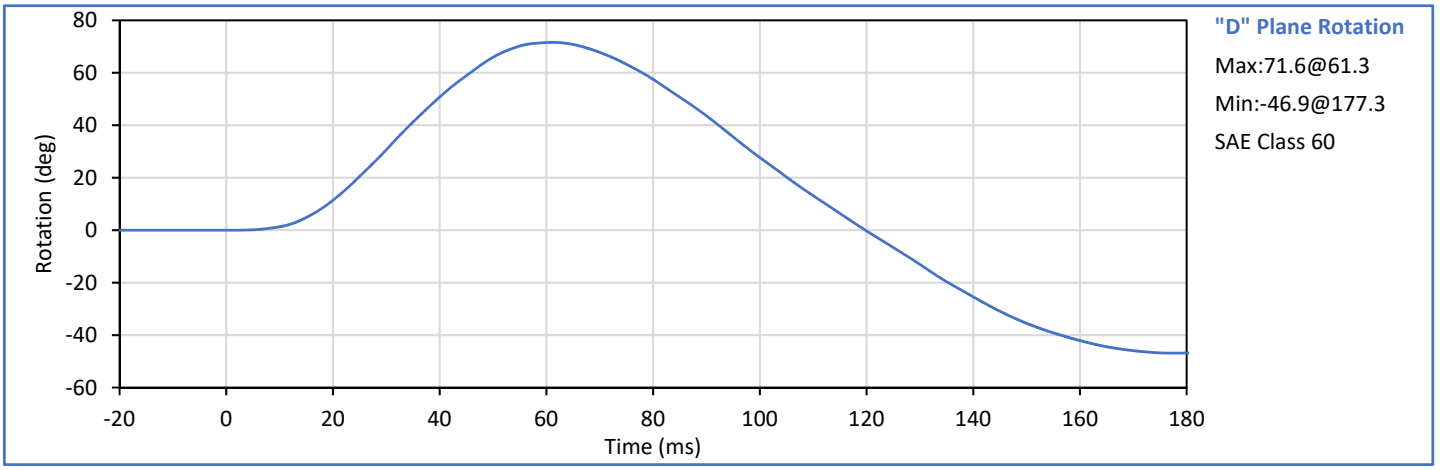
Hybrid III 50th Percentile Male
Neck Flexion Test

ATD Serial No.: 360 Test Date: 2018-08-22

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	44	Pass
Pendulum Velocity	m/s	6.89	7.13	6.89	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	24.5	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	19.0	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	14.2	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	14.2	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	41.7	Pass
"D" Plane Rotation peak	deg	64.0	78.0	71.6	Pass
	ms	57.0	64.0	61.3	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	119.8	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	95.5	Pass
	ms	47.0	58.0	55.6	Pass
Moment Decay, Peak to Zero	deg	97.0	107.0	99.4	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

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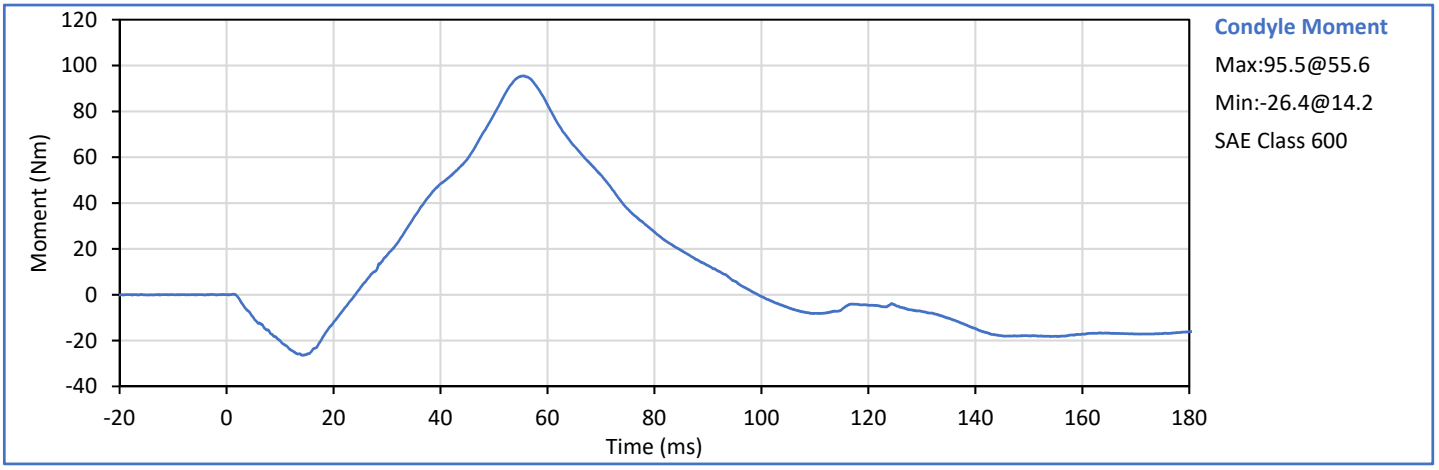
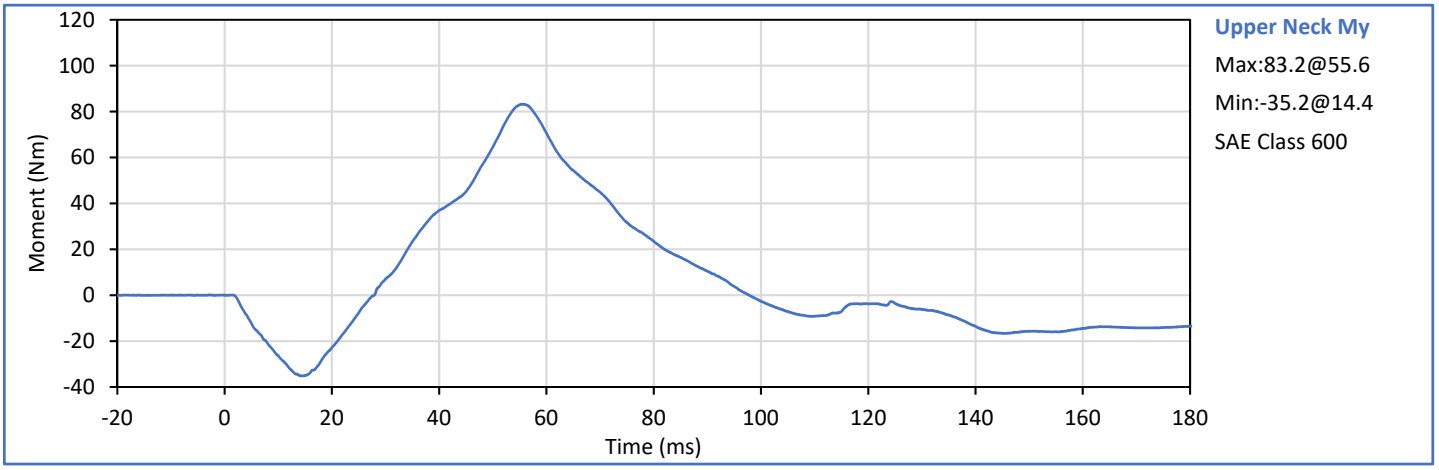
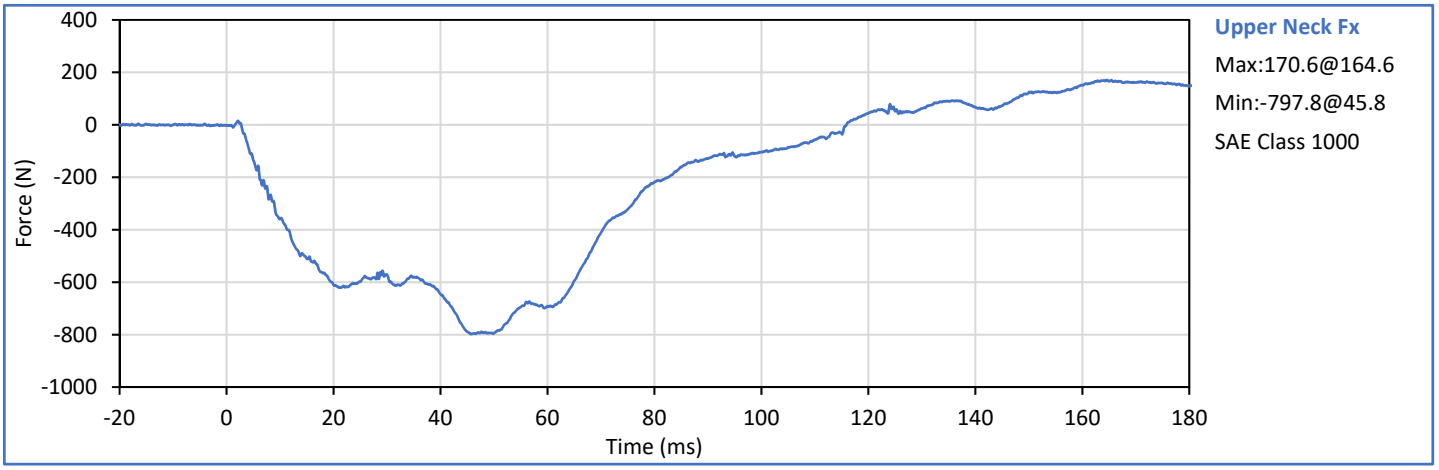
Hybrid III 50th Percentile Male
Neck Flexion Test

ATD Serial No.: 360 Test Date: 2018-08-22







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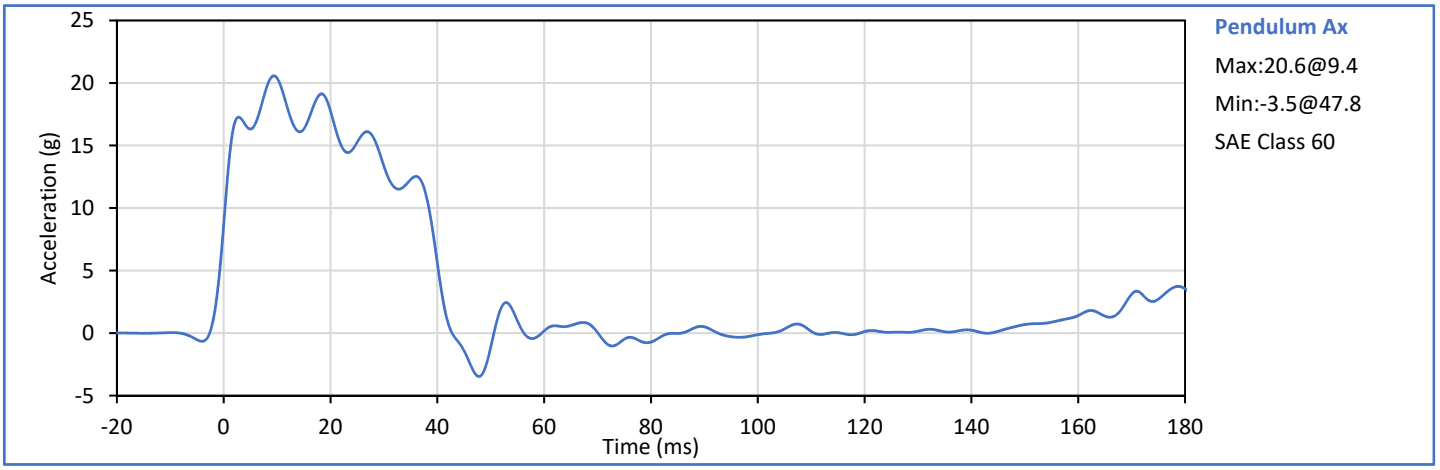
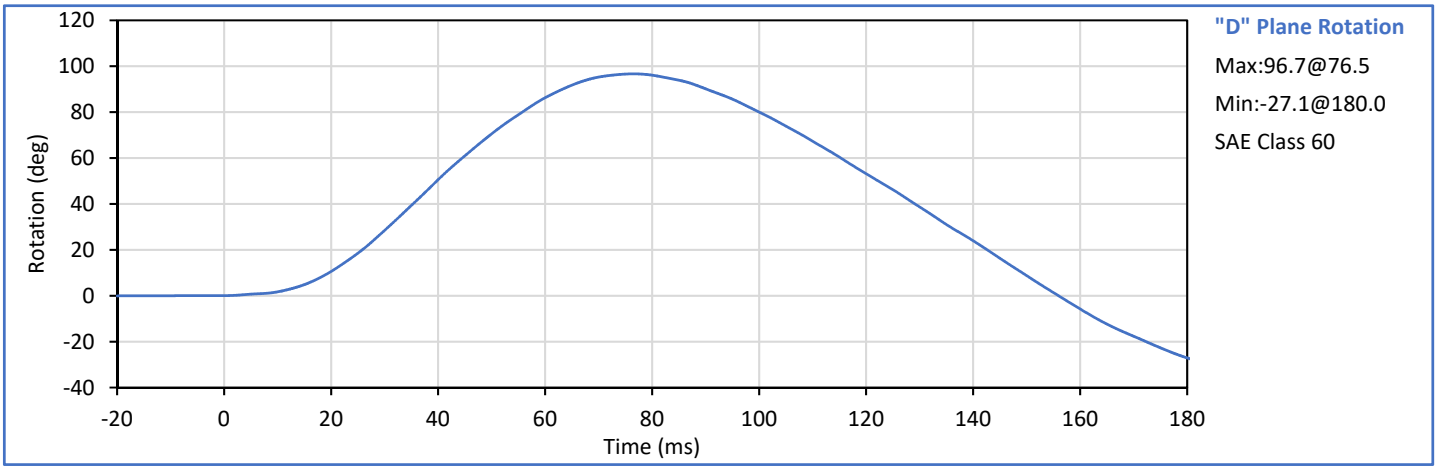
Hybrid III 50th Percentile Male
Neck Extension Test

ATD Serial No.: 360 Test Date: 2018-08-22

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	44	Pass
Pendulum Velocity	m/s	5.94	6.19	6.05	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.4	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	17.8	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	13.4	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	13.4	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	40.2	Pass
"D" Plane Rotation peak	deg	81.0	106.0	96.7	Pass
	ms	72.0	82.0	76.5	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	156.0	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-72.4	Pass
	ms	65.0	79.0	70.0	Pass
Moment Decay, Peak to Zero	deg	120.0	148.0	141.4	Pass
			Overall Test Results		Pass





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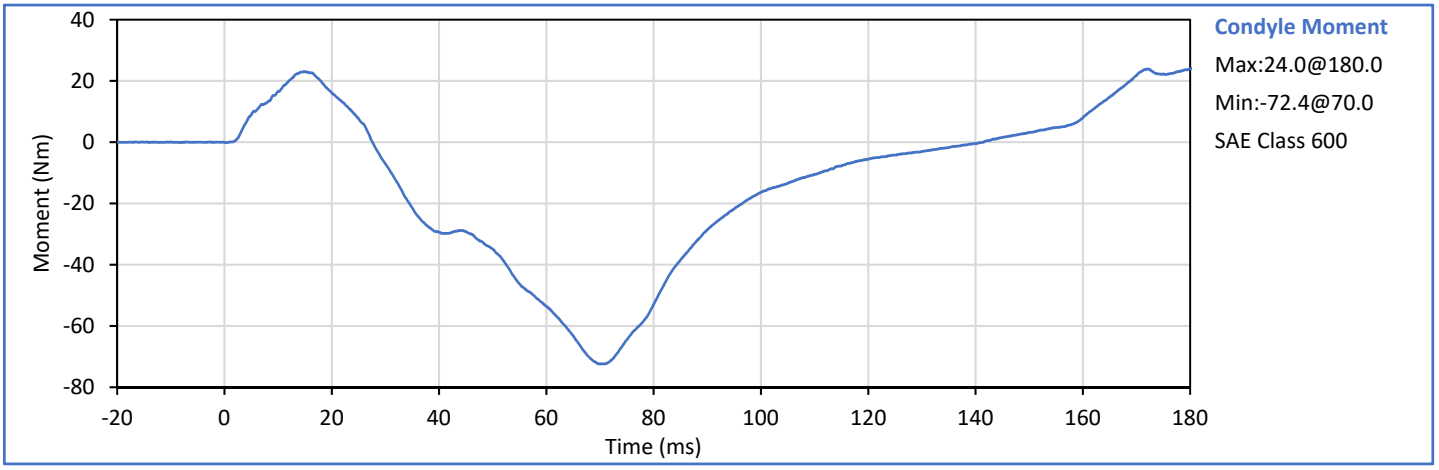
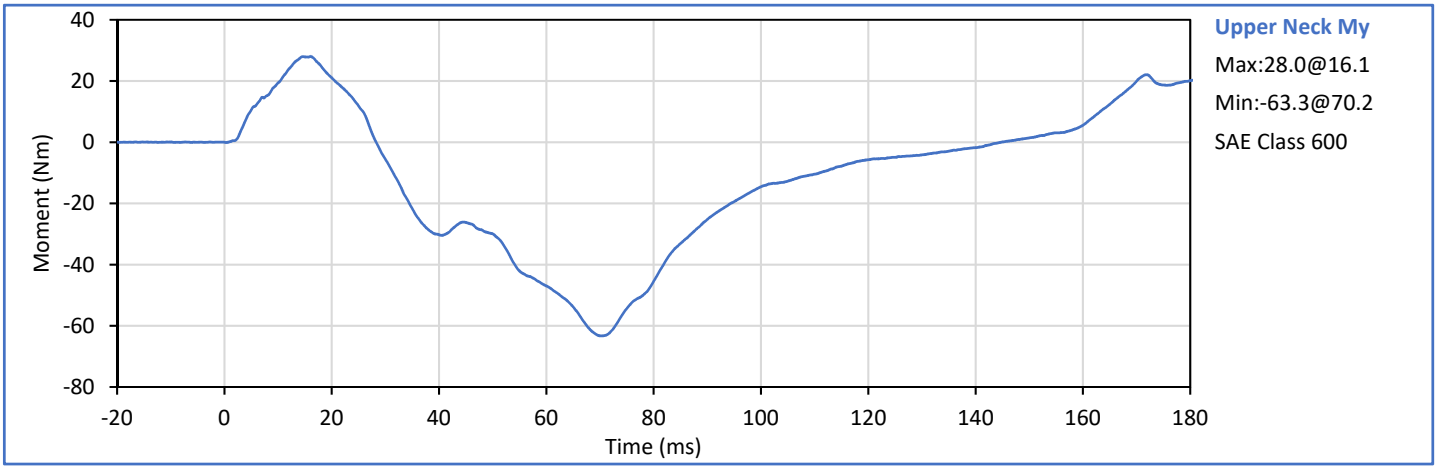
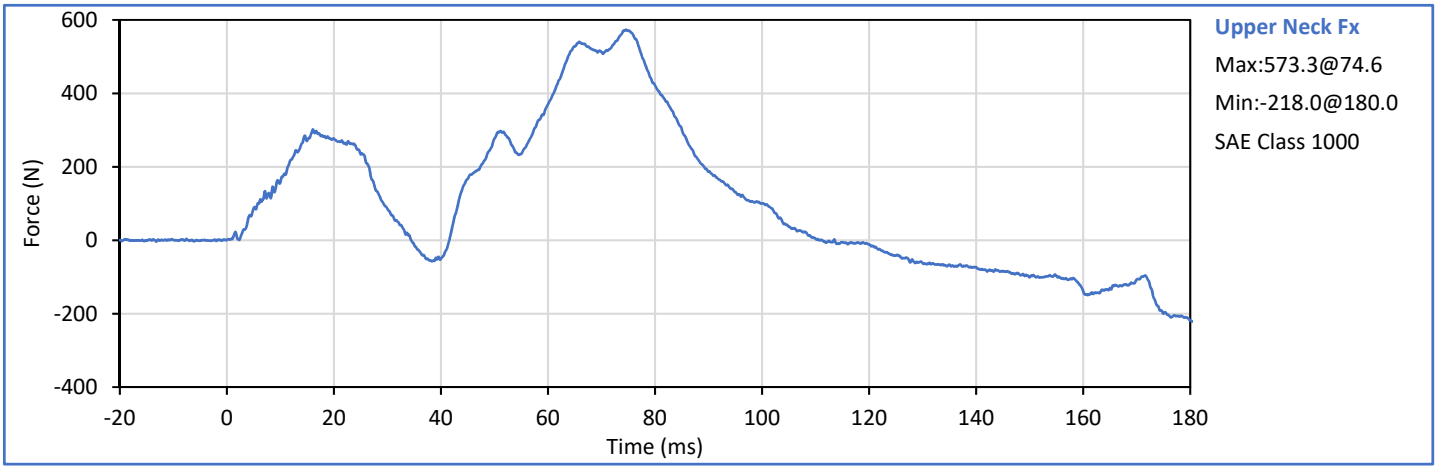
Hybrid III 50th Percentile Male
Neck Extension Test

ATD Serial No.: 360 Test Date: 2018-08-22







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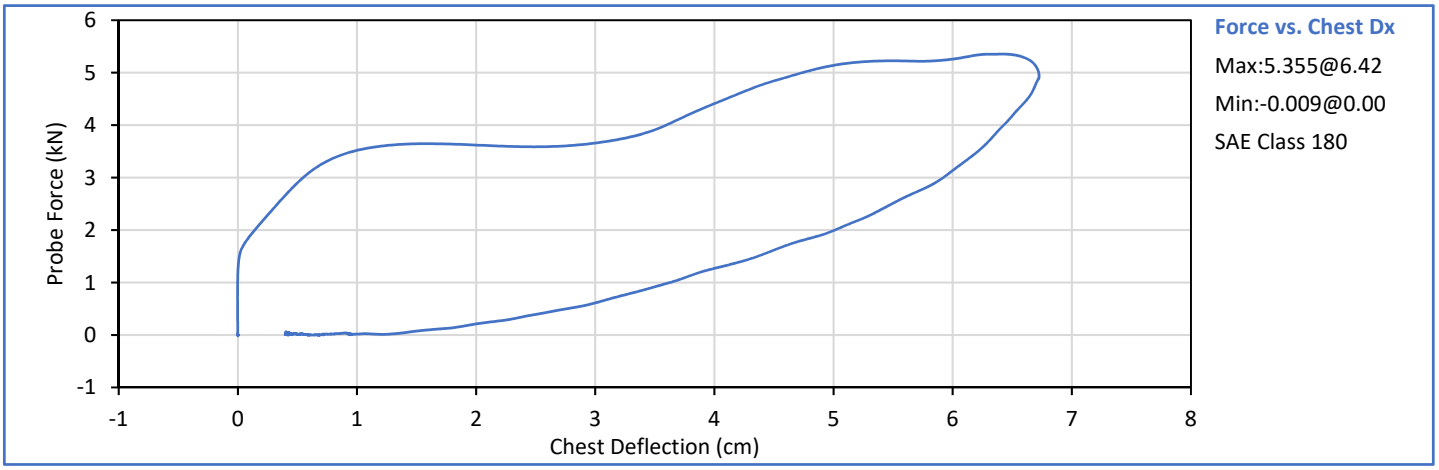
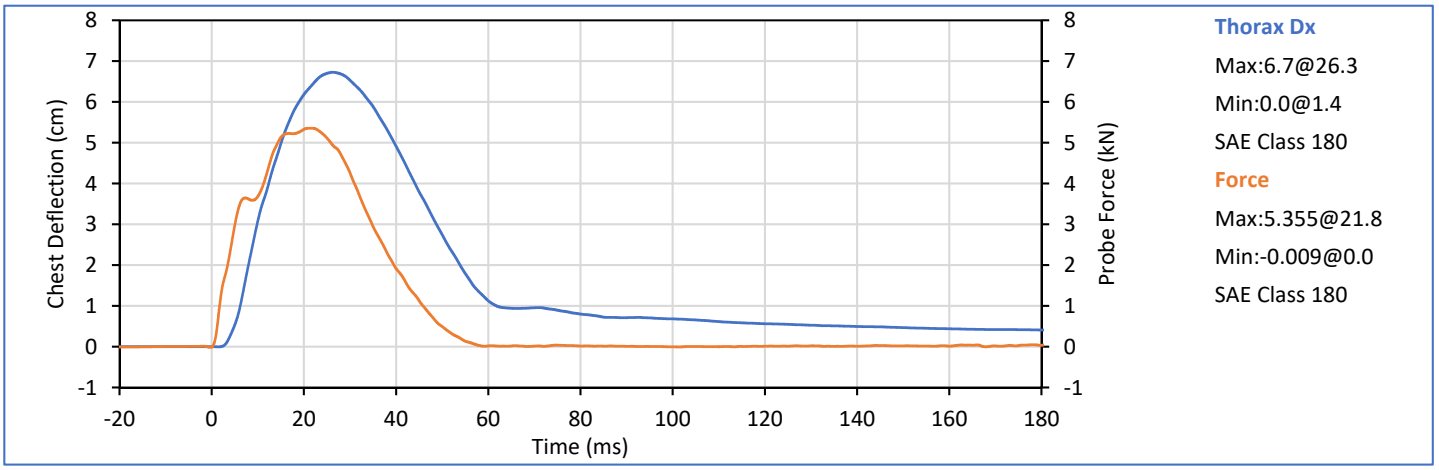
Hybrid III 50th Percentile Male
Thorax Impact

ATD Serial No.: 360 Test Date: 2018-08-22

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	44	Pass
Probe Velocity	m/s	6.58	6.82	6.65	Pass
Peak Chest Deflection	cm	6.35	7.26	6.73	Pass
Peak Probe Force	kN	5.159	5.893	5.355	Pass
Internal Hysterisis	%	69.0	85.0	70.0	Pass
			Overall Test Results		Pass





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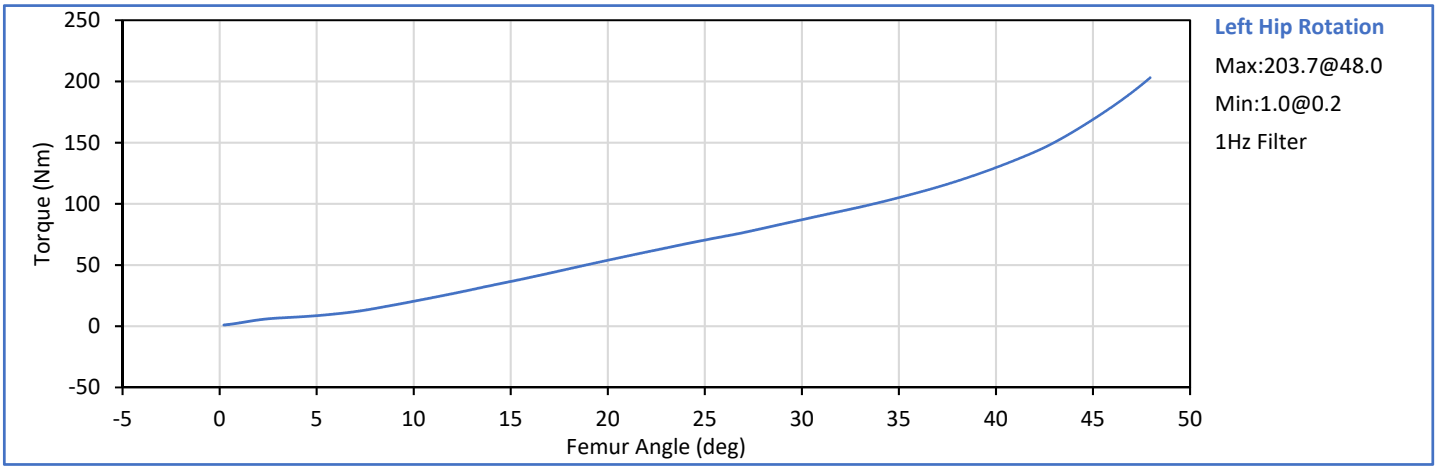
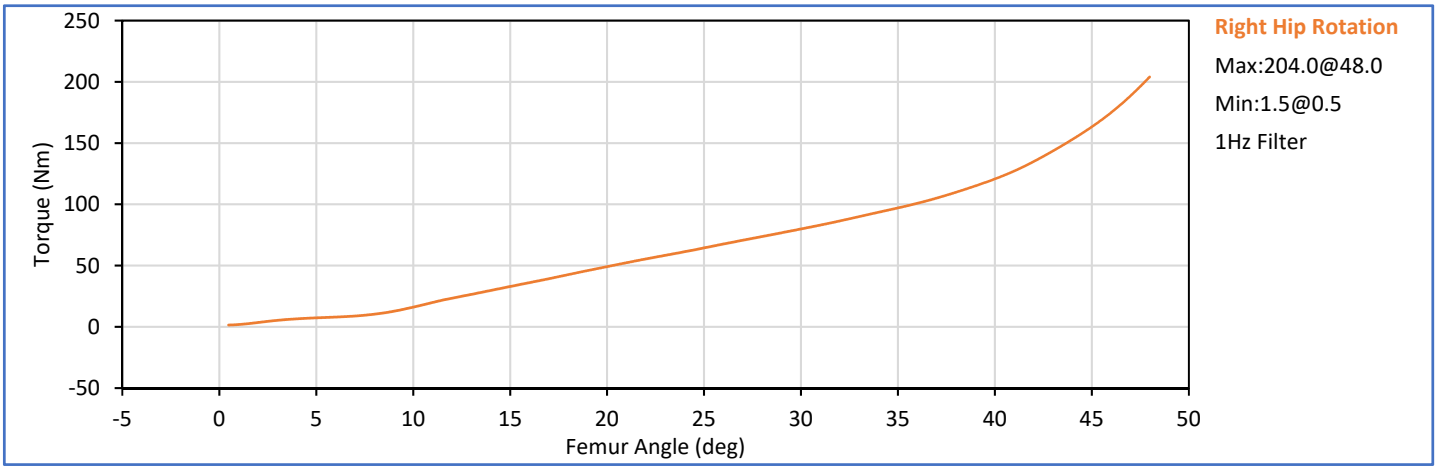
Hybrid III 50th Percentile Male
Hip Flexion (Left/Right)

ATD Serial No.: 360 Test Date: 2018-08-22

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.1	Pass
	Laboratory Humidity	%	10	70	40	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	5.8	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	87.1	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	47.9	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	80.0	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	47.9	Pass
				Overall Test Results		Pass





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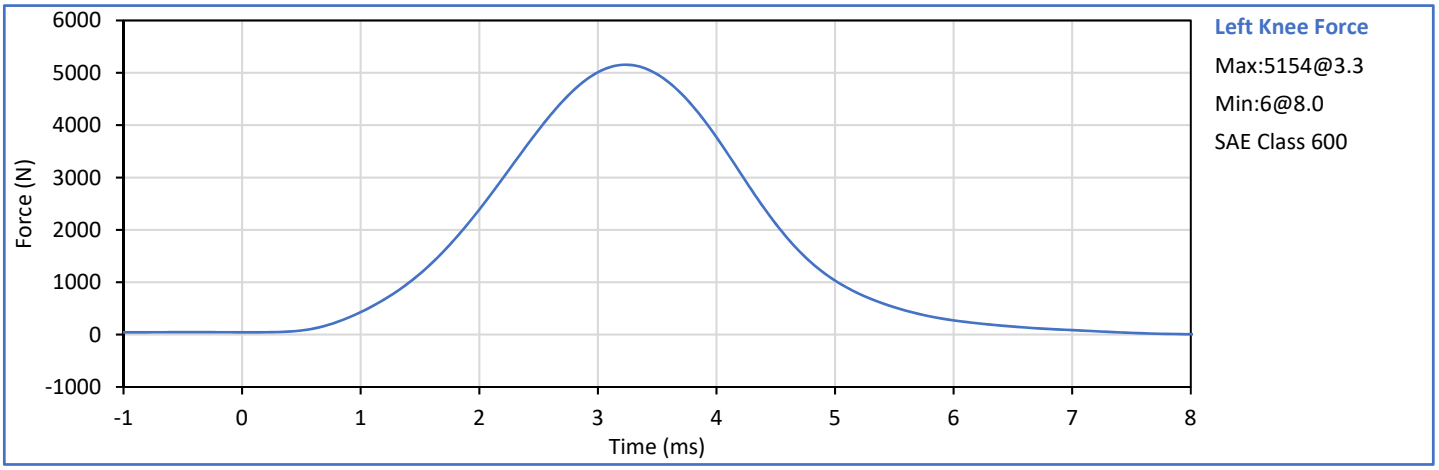
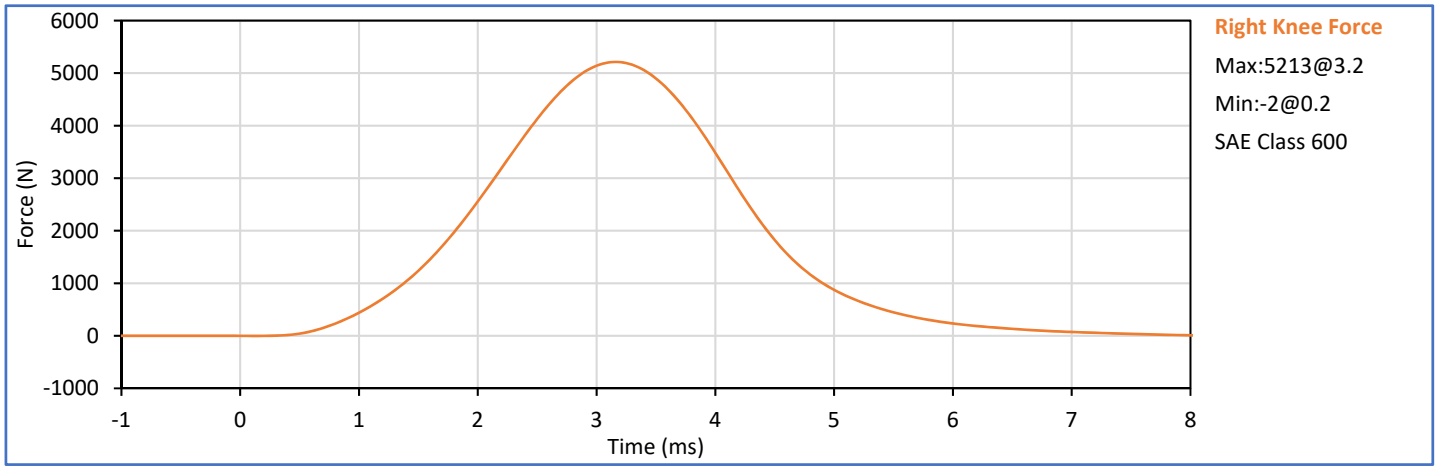
Hybrid III 50th Percentile Male
Knee Impact (Left/Right)

ATD Serial No.: 360 Test Date: 2018-08-22

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.2	Pass
	Laboratory Humidity	%	10	70	44	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.101	Pass
	Peak Resistive Force	N	4715	5782	5154	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.103	Pass
	Peak Resistive Force	N	4715	5782	5213	Pass
				Overall Test Results		Pass





Technician: T. Lowman

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Hybrid III 5th Percentile Female
Damage Checklist

ATD Serial No.: 630 Test Date: 2018-08-30

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:

Technician: J. Hernandez

Approved By: P. Puzzuto

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Hybrid III 5th Percentile Female
External Measurements

ATD Serial No.: 630 Test Date: 2018-08-30

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	22	Pass
A - Total sitting height	mm	775	800	788	Pass
B - Shoulder pivot height	mm	432	457	453	Pass
C - 'H' point height	mm	81	86	86	Pass
D - 'H' point location from backline	mm	145	150	148	Pass
E - Shoulder pivot from backline	mm	69	84	78	Pass
F - Thigh clearance	mm	119	135	128	Pass
G - Back of elbow to wrist pivot	mm	244	259	254	Pass
H - Head back to backline	mm	41	46	43	Pass
I - Shoulder to elbow length	mm	277	297	287	Pass
J - Elbow rest height	mm	183	203	197	Pass
K - Buttock to knee length	mm	521	546	531	Pass
L - Popliteal length	mm	356	376	367	Pass
M - Knee pivot height	mm	394	419	407	Pass
N - Buttock popliteal length	mm	414	439	428	Pass
O - Chest depth without jacket	mm	175	191	183	Pass
P - Foot length	mm	219	234	231	Pass
R - Buttock to Knee Pivot Length	mm	457	483	473	Pass
S - Head Breadth	mm	137	147	144	Pass
T - Head Depth	mm	178	188	184	Pass
U - Hip Breadth	mm	300	315	308	Pass
V - Shoulder breadth	mm	351	366	360	Pass
W - Foot breadth	mm	79	94	88	Pass
X - Head circum.	mm	528	549	535	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	868	Pass
Z - Waist circum.	mm	760	790	776	Pass
AA - Location for chest circum.	mm	333	358	339	Pass
BB - Location for waist circum.	mm	160	170	168	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

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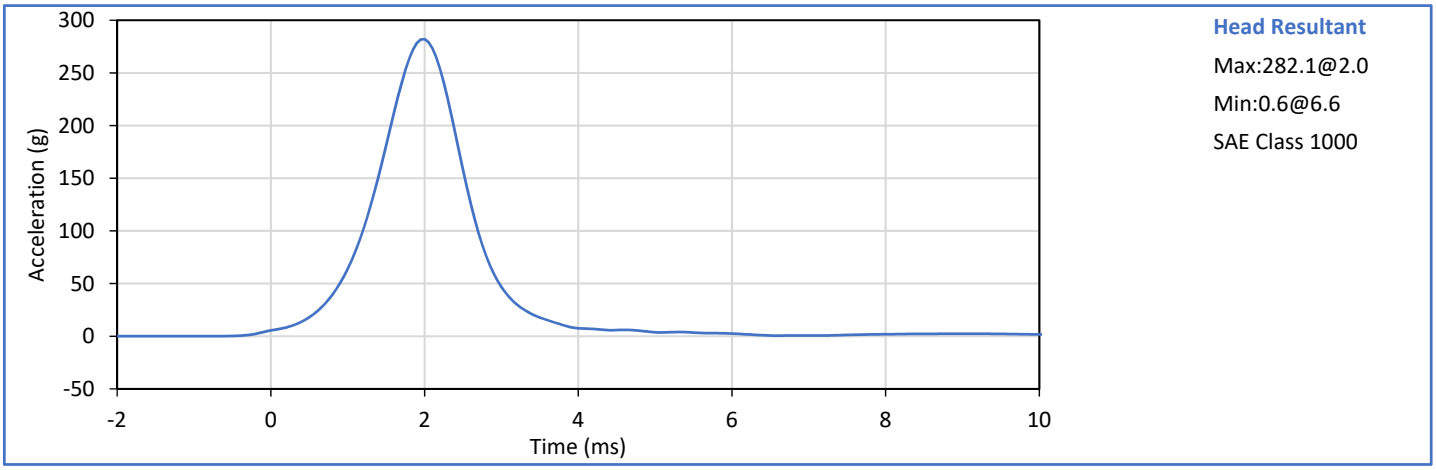
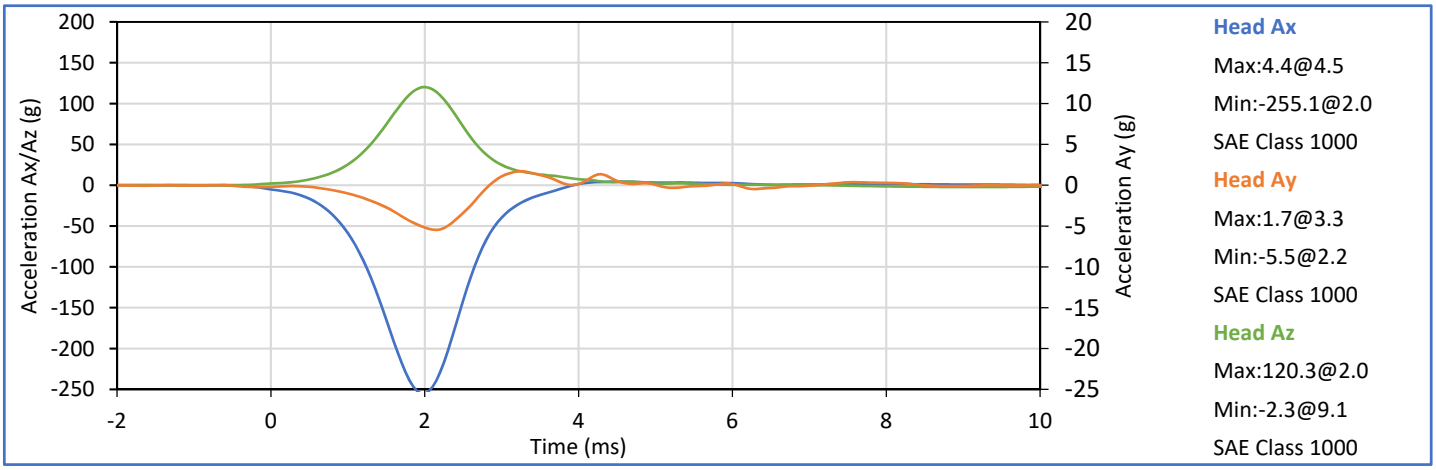
Hybrid III 5th Percentile Female
Head Drop

ATD Serial No.: 630 Test Date: 2018-09-01

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.8	Pass
Laboratory Humidity	%	10	70	32	Pass
Peak Resultant Acceleration	g	250.0	300.0	282.1	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-5.5	Pass
Oscillations After Main Pulse	%	0.0	10.0	0.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





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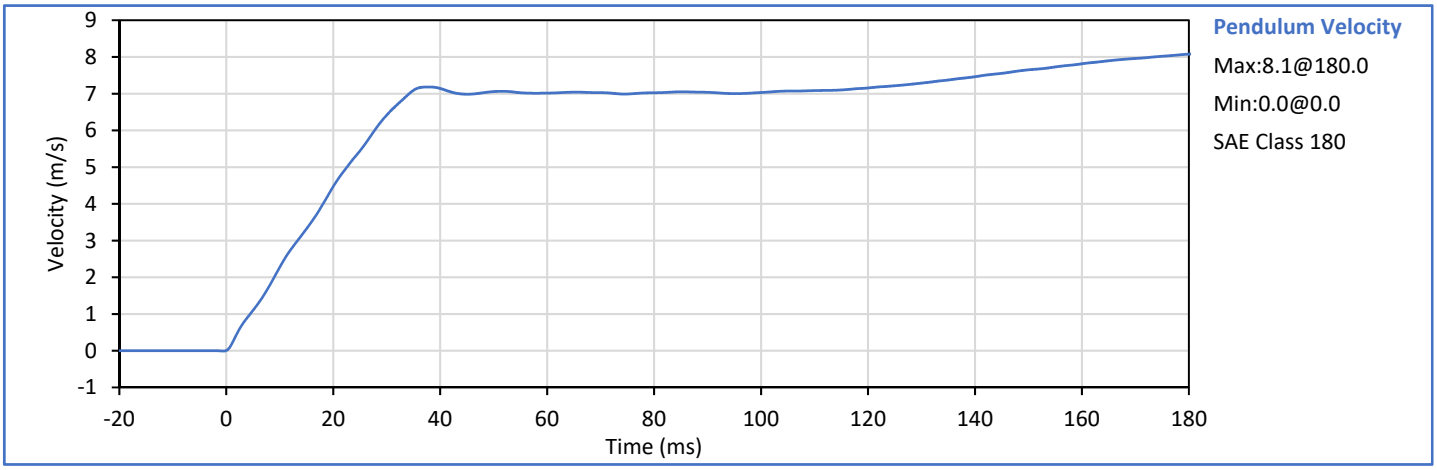
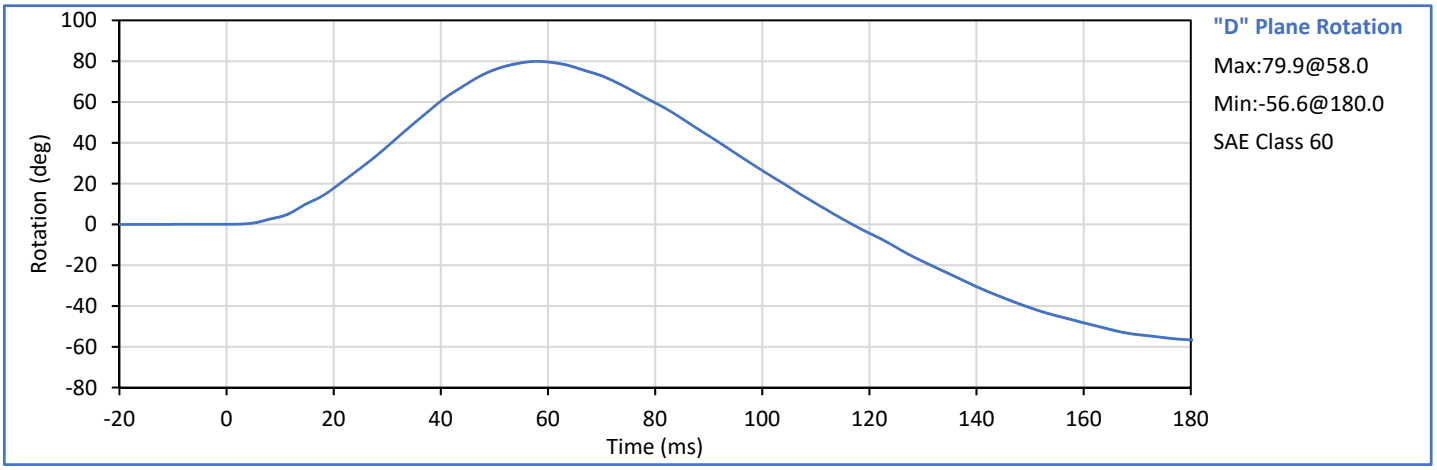
Hybrid III 5th Percentile Female
Neck Flexion Test

ATD Serial No.: 630 Test Date: 2018-09-01

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	6.89	7.13	7.00	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.27	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.47	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.42	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	79.9	Pass
Peak Moment in Rotation	Nm	69.0	83.0	80.2	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	85.0	Pass
			Overall Test Results		Pass





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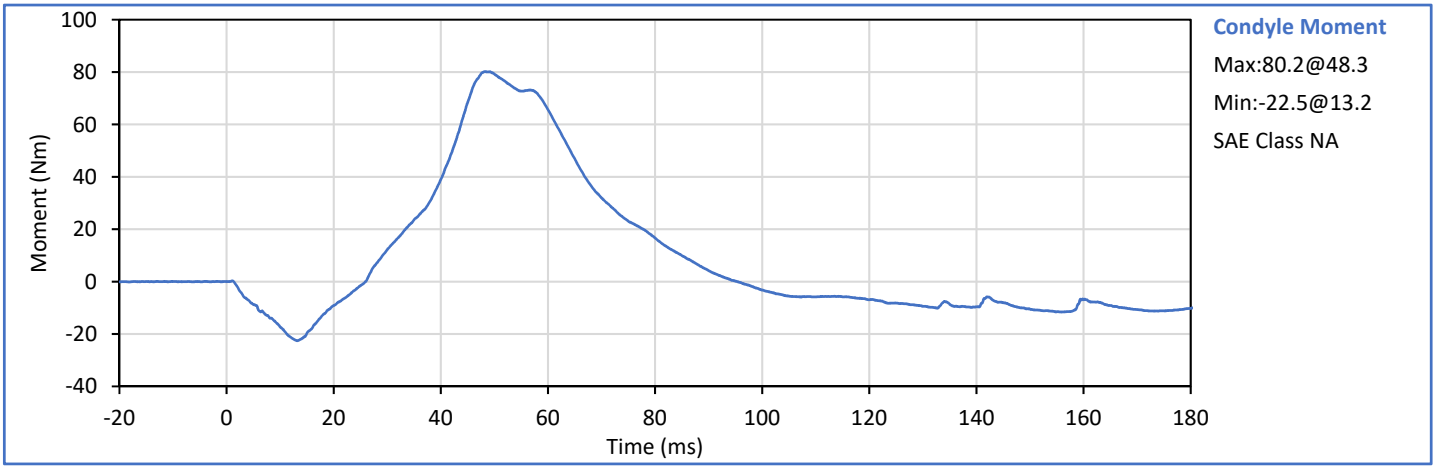
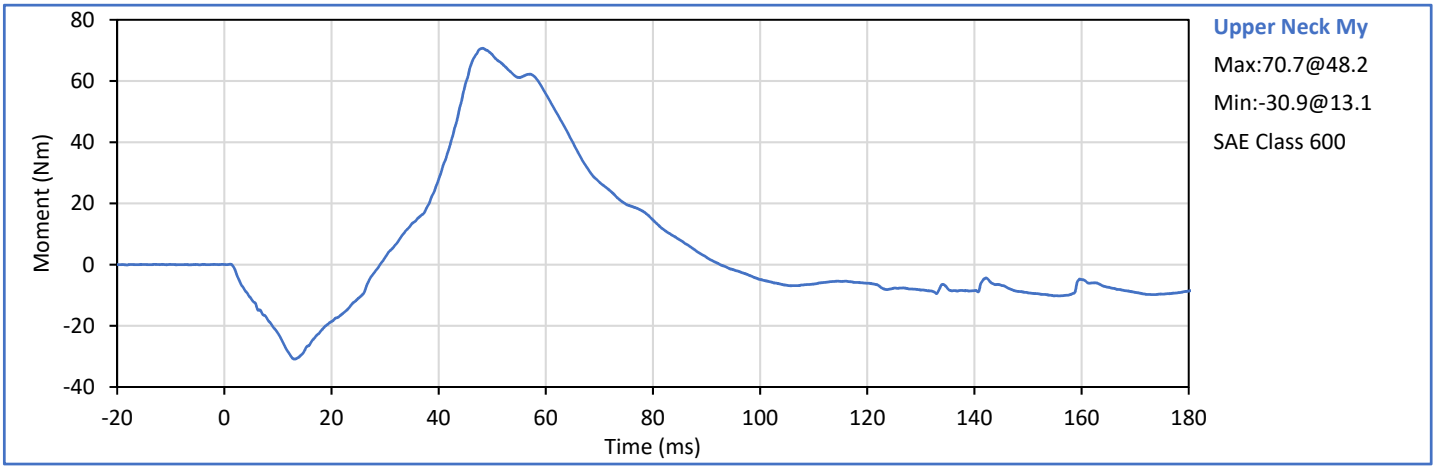
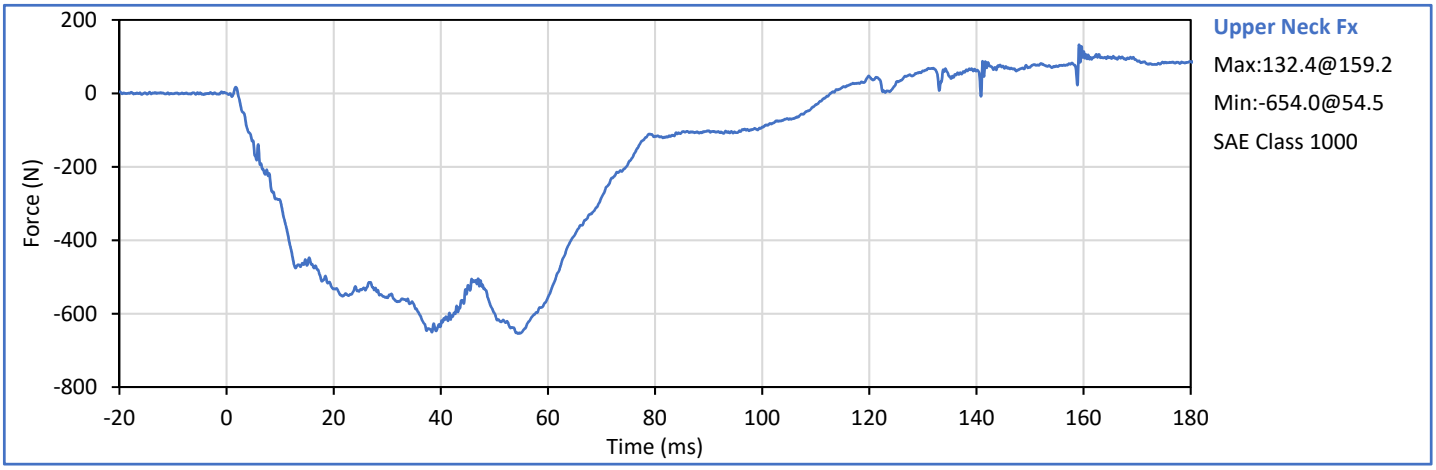
Hybrid III 5th Percentile Female
Neck Flexion Test

ATD Serial No.: 630 Test Date: 2018-09-01







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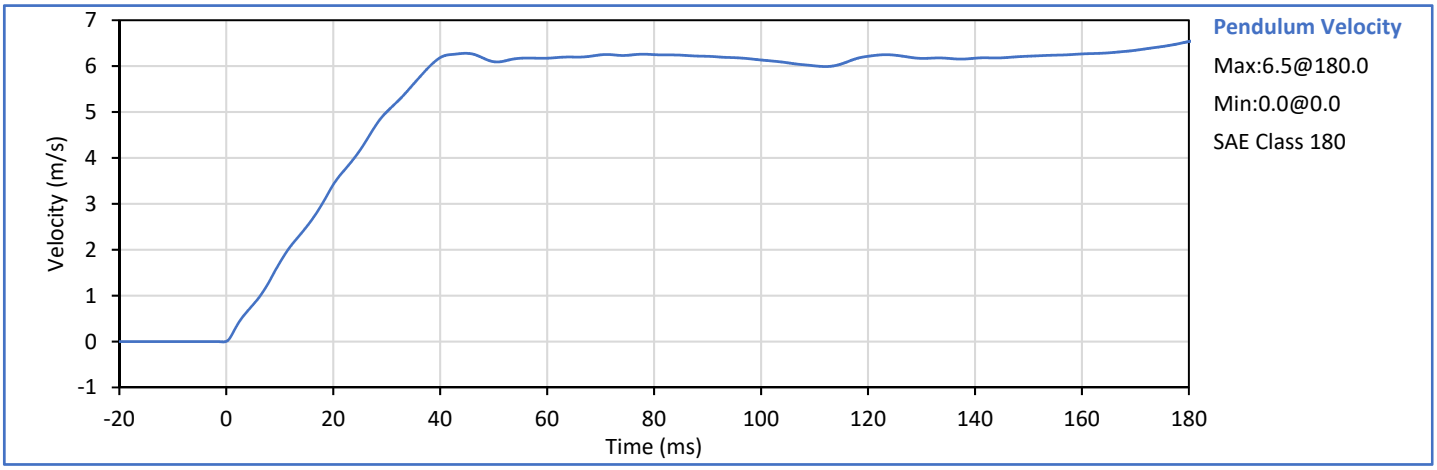
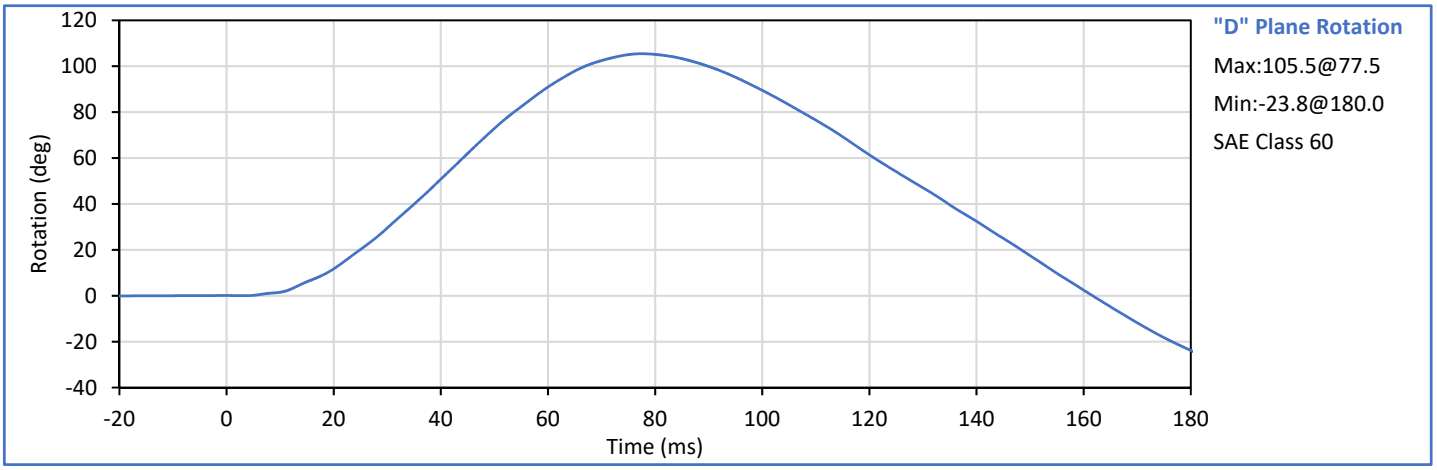
Hybrid III 5th Percentile Female
Neck Extension Test

ATD Serial No.: 630 Test Date: 2018-09-01

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	41	Pass
Pendulum Velocity	m/s	5.95	6.19	6.12	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.72	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.42	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.00	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	105.5	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-56.0	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	104.1	Pass
			Overall Test Results		Pass





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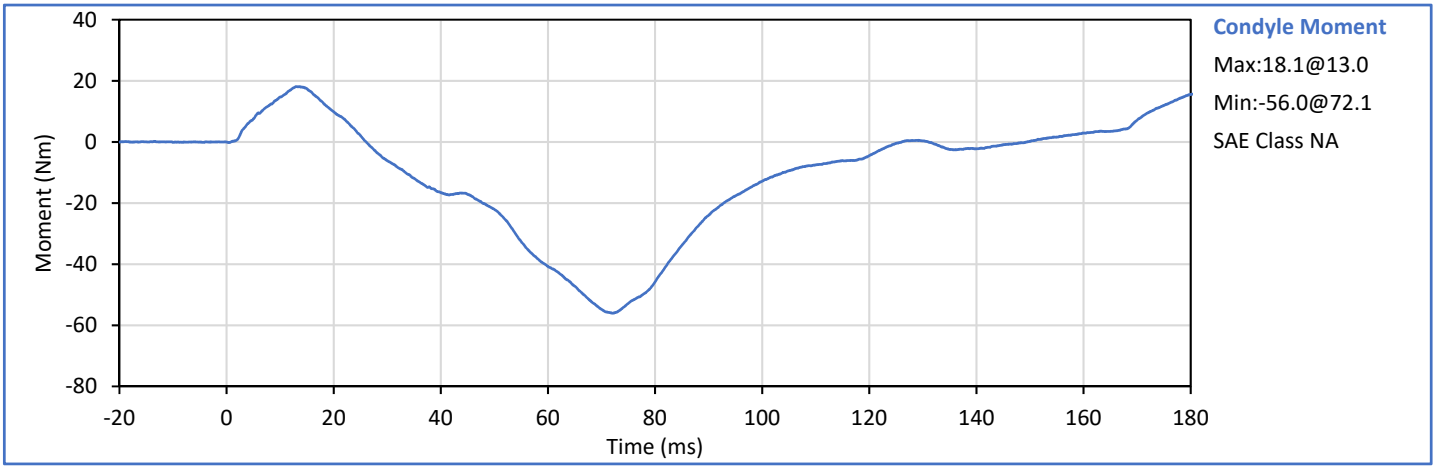
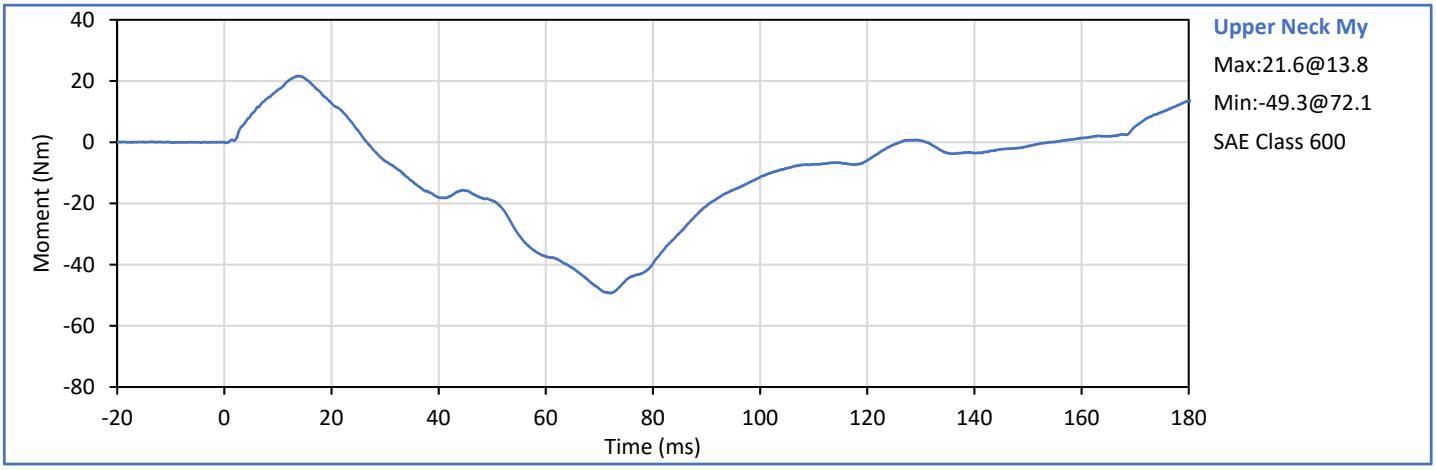
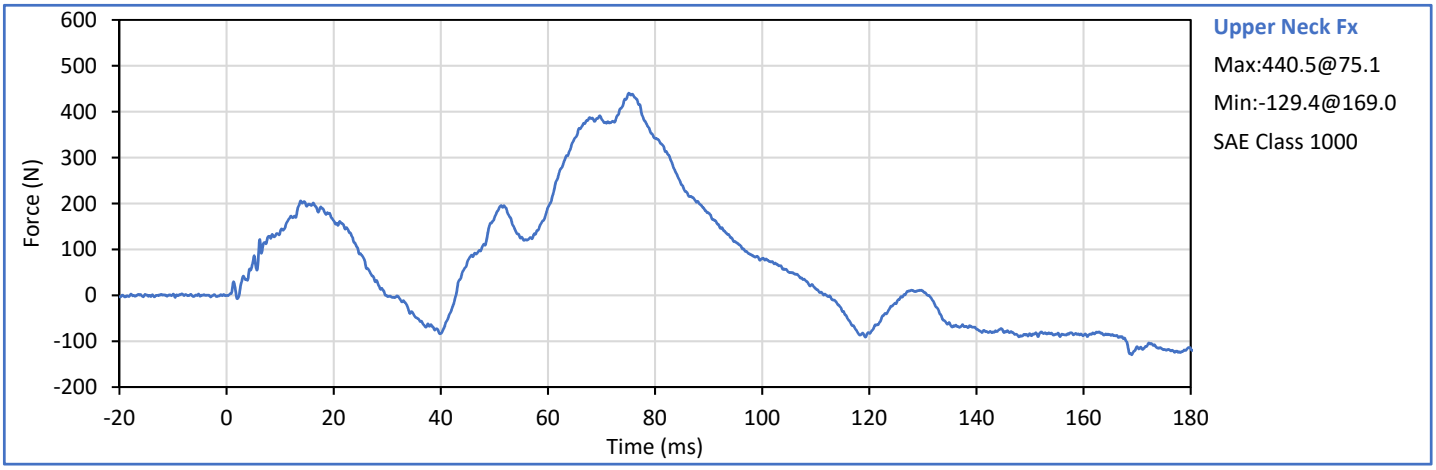
Hybrid III 5th Percentile Female
Neck Extension Test

ATD Serial No.: 630 Test Date: 2018-09-01







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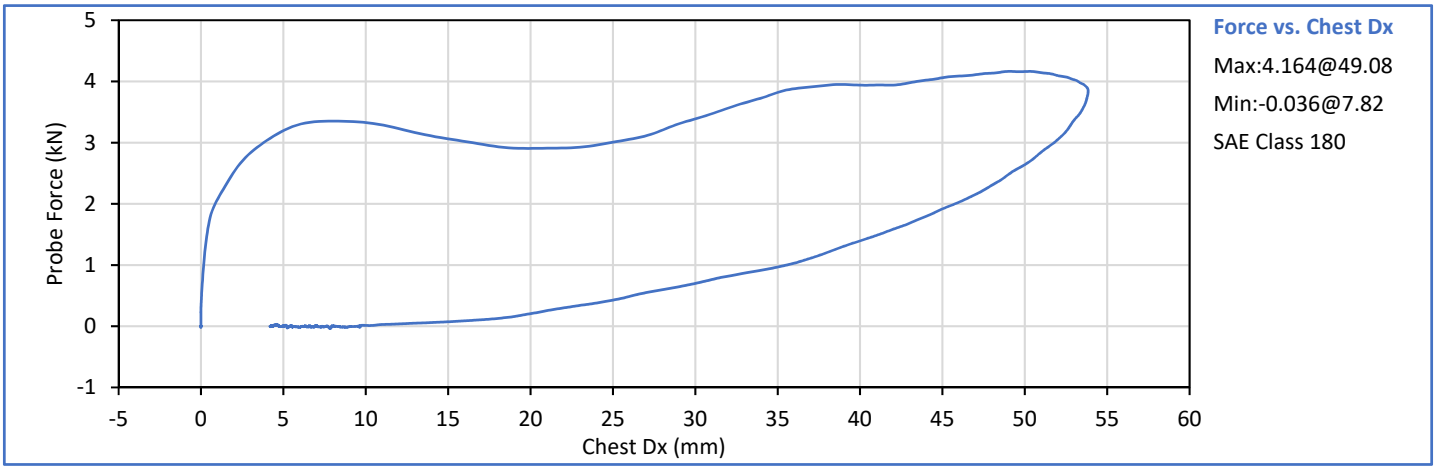
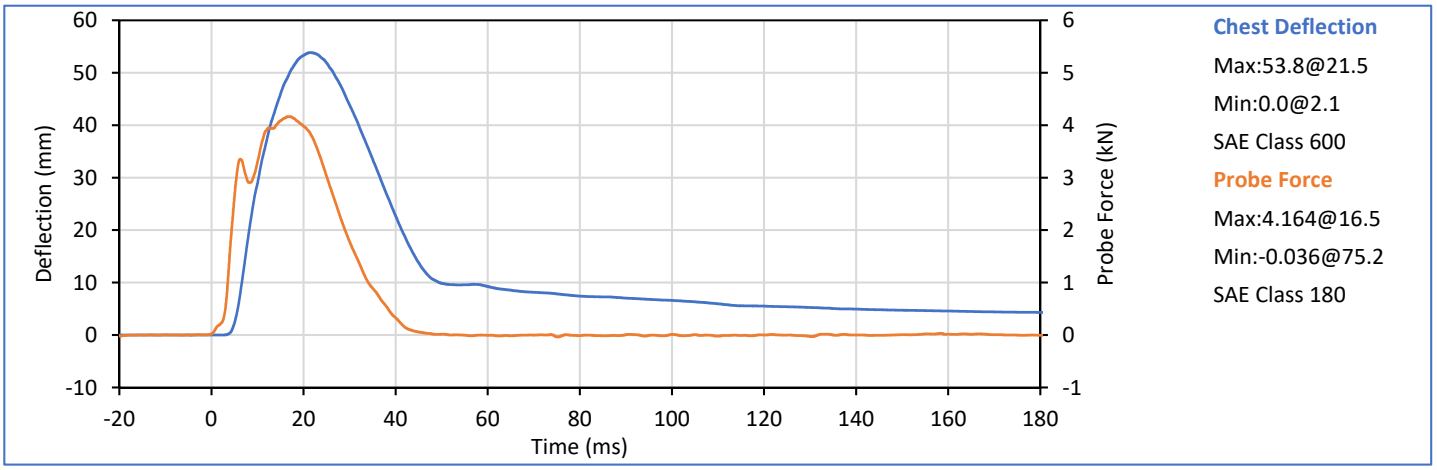
Hybrid III 5th Percentile Female
Thorax Impact

ATD Serial No.: 630

Test Date: 2018-01-10

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	6.70	Pass
Peak Chest Deflection	mm	50.0	58.0	53.8	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.164	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	4.164	Pass
Internal Hysterisis	%	69.0	85.0	74.7	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto

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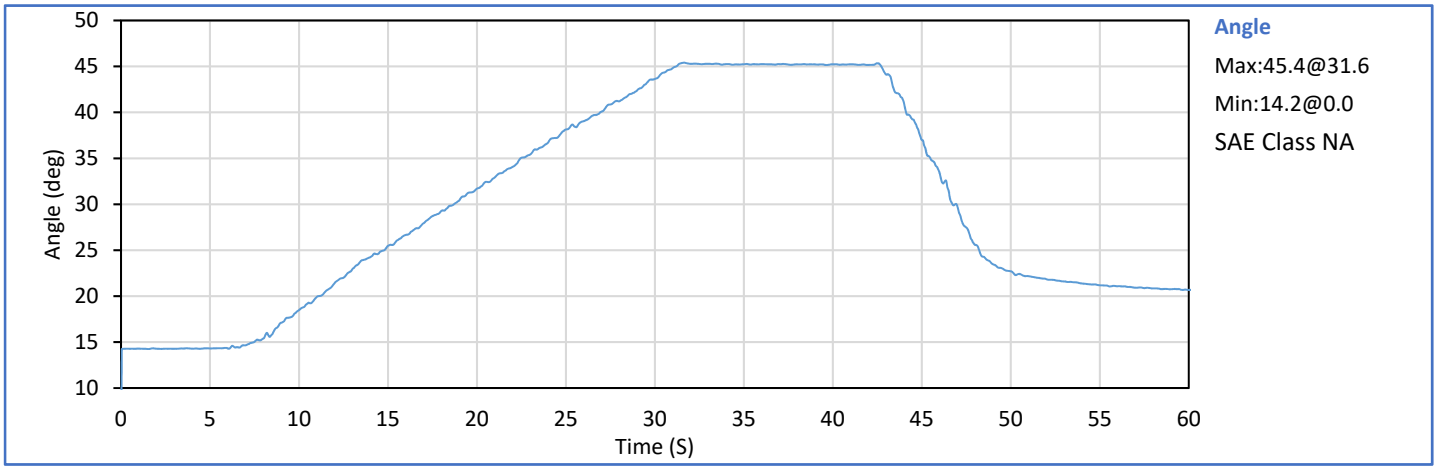
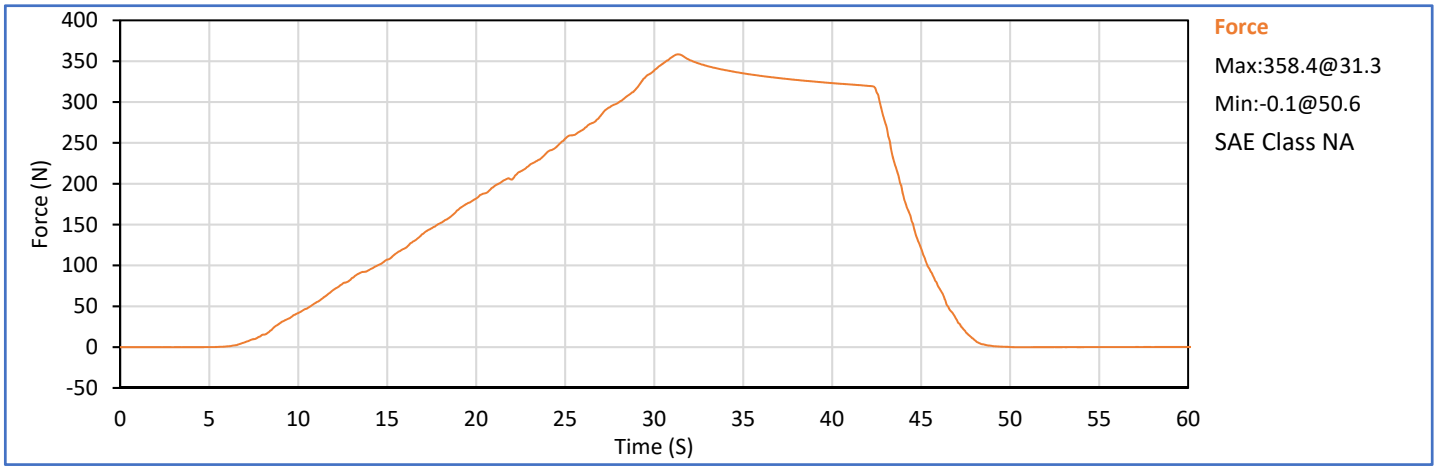
Hybrid III 5th Percentile Female
Torso Flexion Test

ATD Serial No.: 630 Test Date: 2018-08-30

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	11.2	Pass
Test Initial Angle	deg	11.0	19.0	14.3	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	357.4	Pass
Torso Flexion Rate	deg/s	0.50	1.50	1.28	Pass
Final Reference Plane Angle	deg	-8.0	8.0	5.4	Pass
			Overall Test Results		Pass





Technician: J. Hernandez

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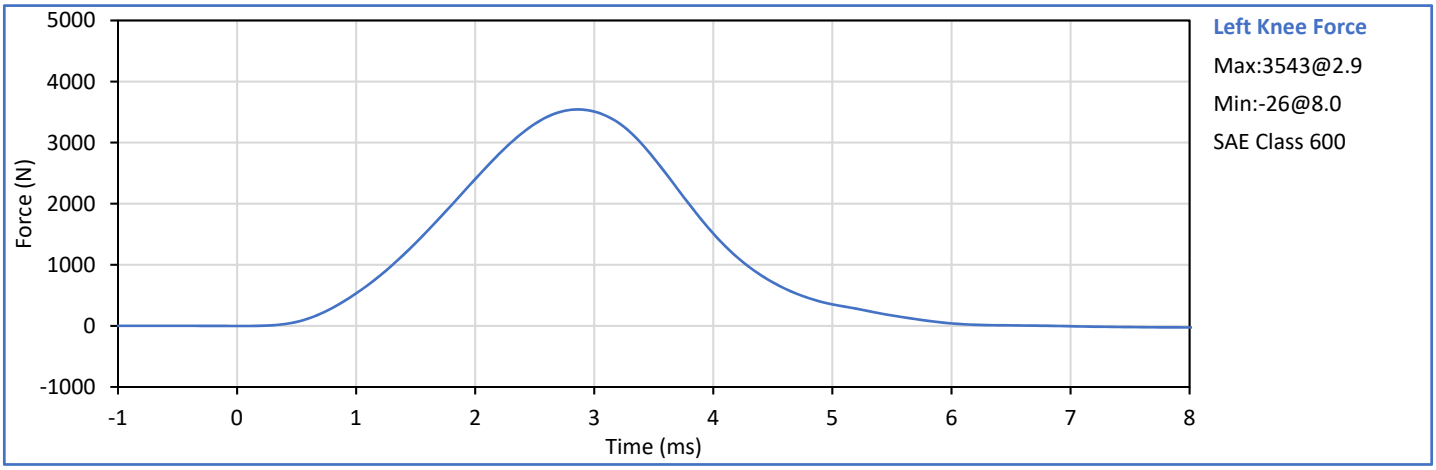
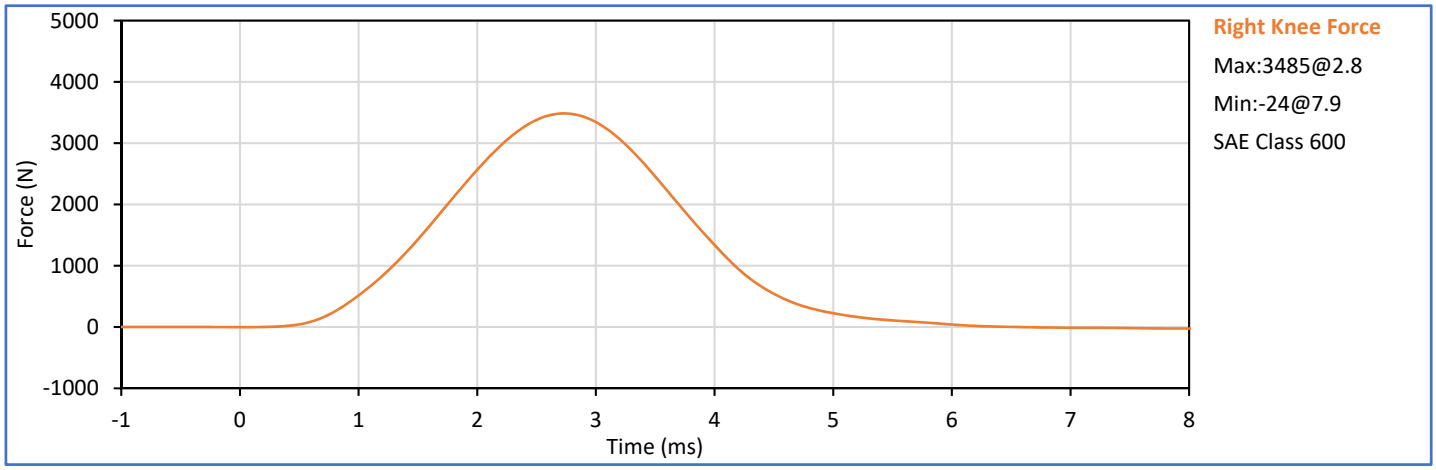
Hybrid III 5th Percentile Female
Knee Impact (Left/Right)

ATD Serial No.: 630

Test Date: 2018-08-30

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	23.3	Pass
	Laboratory Humidity	%	10	70	21	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.104	Pass
	Peak Resistive Force	N	3450	4060	3543	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.100	Pass
	Peak Resistive Force	N	3450	4060	3485	Pass
				Overall Test Results		Pass





Technician: Nicholas Garcia
N. Garcia

Approved By: P. Puzzuto
P. Puzzuto

APPENDIX C
POST-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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Hybrid III 50th Percentile Male
ATD Damage Checklist

ATD Serial No.: 360 Test Date: 2019-09-21

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:

Technician: J. Hernandez

Approved By: P. Puzzuto

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Hybrid III 50th Percentile Male
External Measurements

ATD Serial No.: 360 Test Date: 2019-09-21

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	514	Pass
C - 'H' point height	mm	84	89	86	Pass
D - 'H' point location from backline	mm	135	140	140	Pass
E - Shoulder pivot from backline	mm	84	94	92	Pass
F - Thigh clearance	mm	140	155	147	Pass
G - Back of elbow to wrist pivot	mm	290	305	296	Pass
H - Head back to backline	mm	41	46	45	Pass
I - Shoulder to elbow length	mm	330	345	338	Pass
J - Elbow rest height	mm	190	211	204	Pass
K - Buttock to knee length	mm	579	604	589	Pass
L - Popliteal length	mm	429	455	444	Pass
M - Knee pivot height	mm	485	500	491	Pass
N - Buttock popliteal length	mm	452	477	462	Pass
O - Chest depth without jacket	mm	213	229	221	Pass
P - Foot length	mm	251	267	260	Pass
V - Shoulder breadth	mm	422	437	433	Pass
W - Foot breadth	mm	91	107	104	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	983	Pass
Z - Waist circum.	mm	836	866	848	Pass
AA - Location for chest circum.	mm	429	434	431	Pass
BB - Location for waist circum.	mm	226	231	229	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

Approved By: P. Puzzuto

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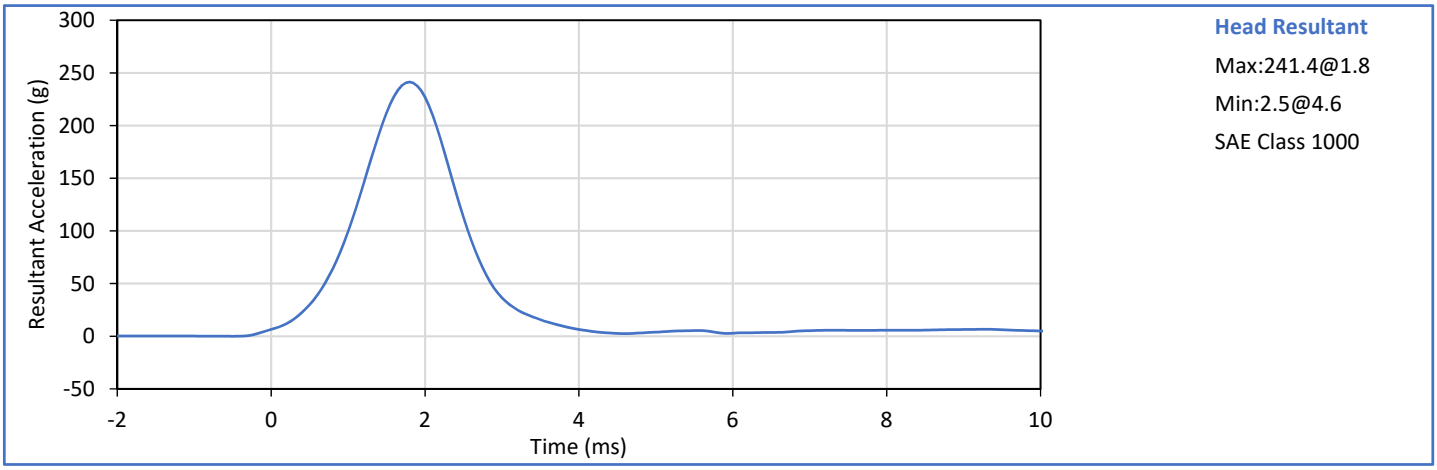
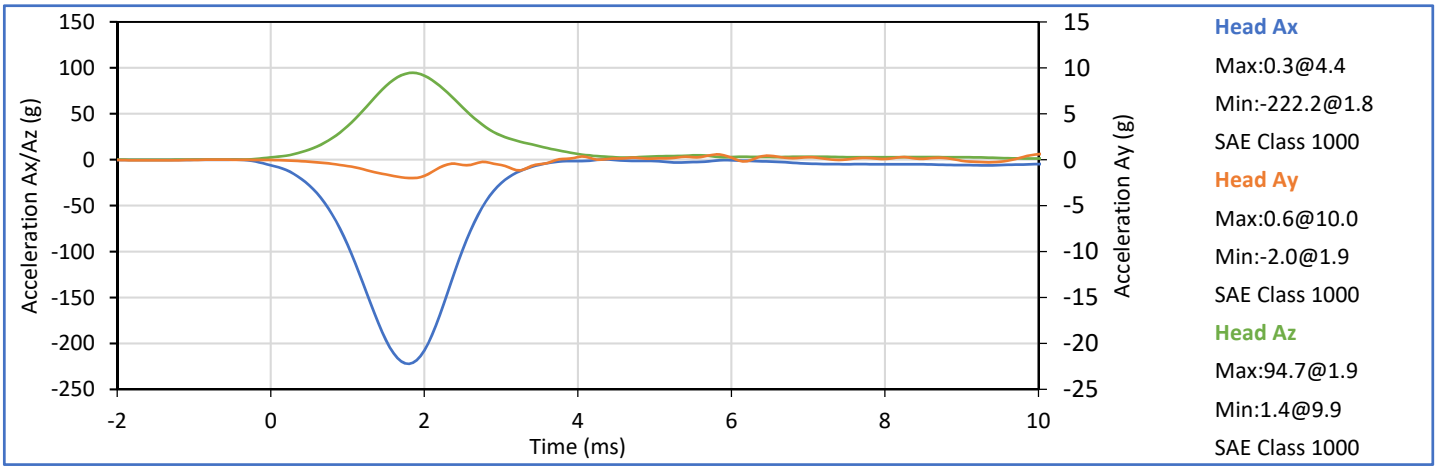
Hybrid III 50th Percentile Male
Head Drop

ATD Serial No.: 360 Test Date: 2018-09-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.6	Pass
Laboratory Humidity	%	10	70	28	Pass
Peak Resultant Acceleration	g	225.0	275.0	241.4	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-2.0	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





Technician: T. Lowman

Approved By: P. Puzzuto

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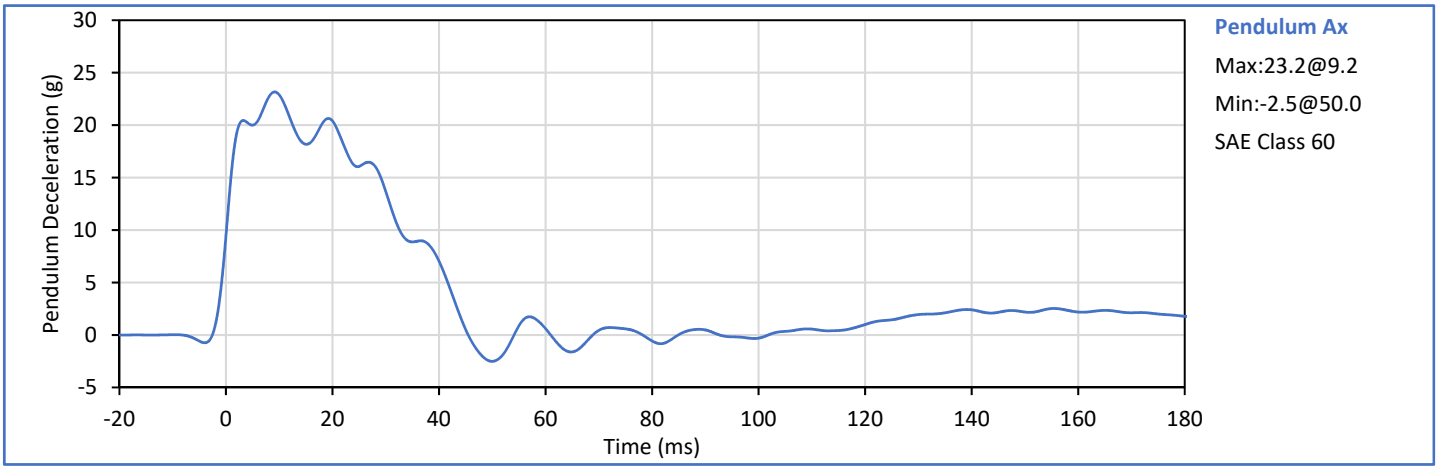
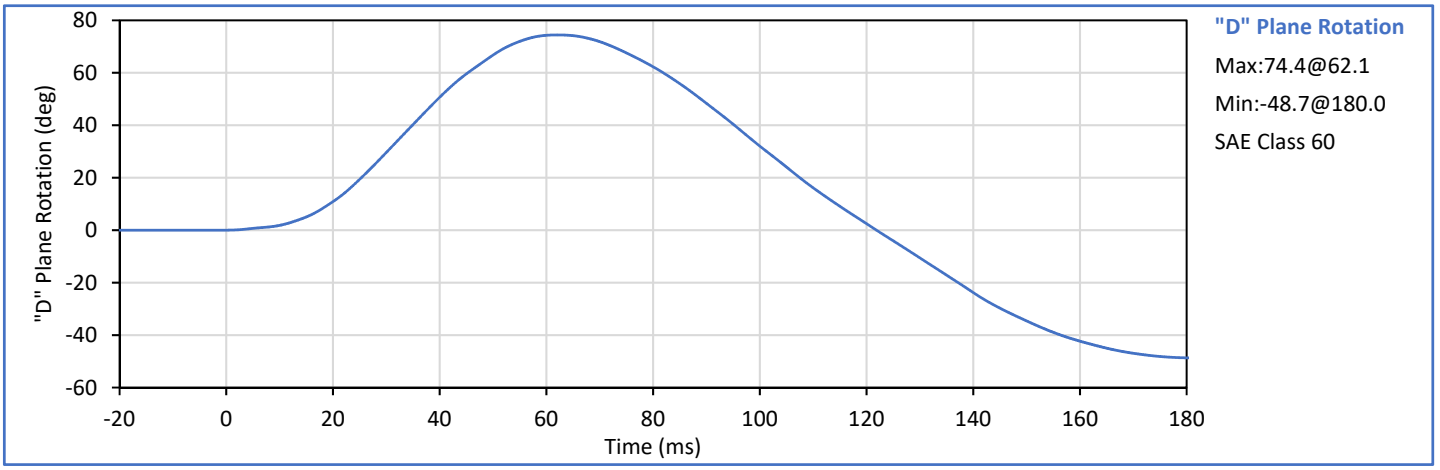
Hybrid III 50th Percentile Male
Neck Flexion Test

ATD Serial No.: 360 Test Date: 2018-09-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	6.89	7.13	6.89	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	22.9	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	20.4	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	13.7	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	13.7	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	41.6	Pass
"D" Plane Rotation peak	deg	64.0	78.0	74.4	Pass
	ms	57.0	64.0	62.1	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	121.9	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	92.7	Pass
	ms	47.0	58.0	57.6	Pass
Moment Decay, Peak to Zero	deg	97.0	107.0	101.6	Pass
			Overall Test Results		Pass





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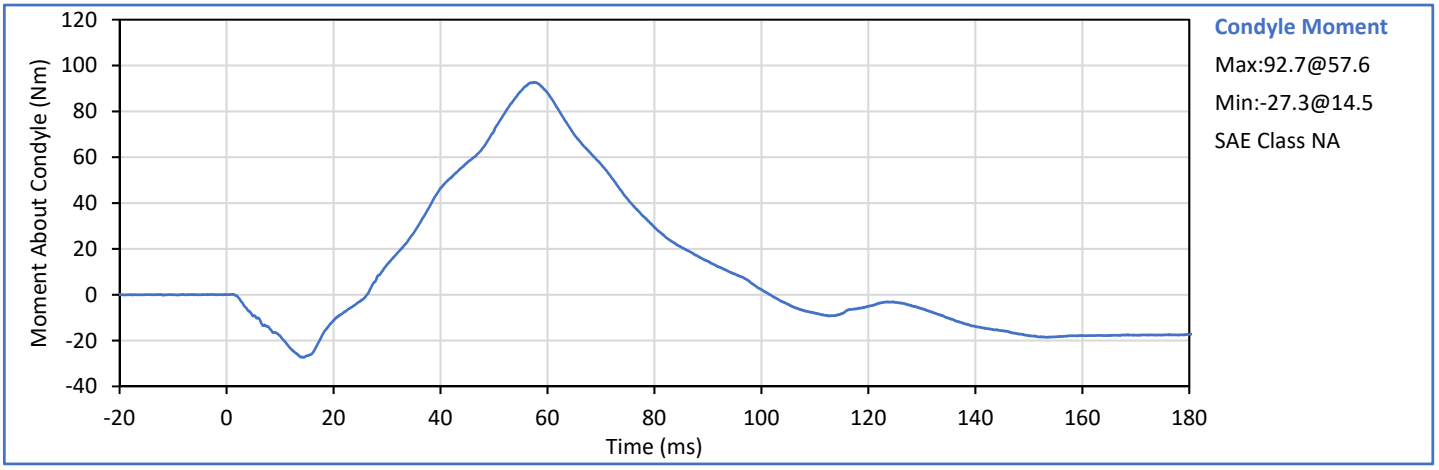
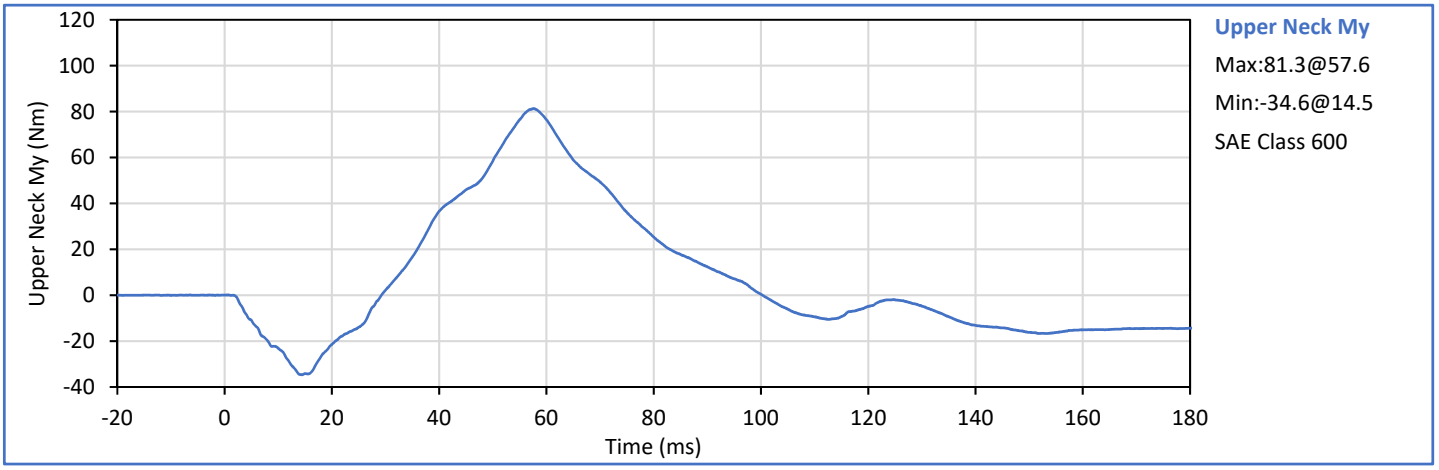
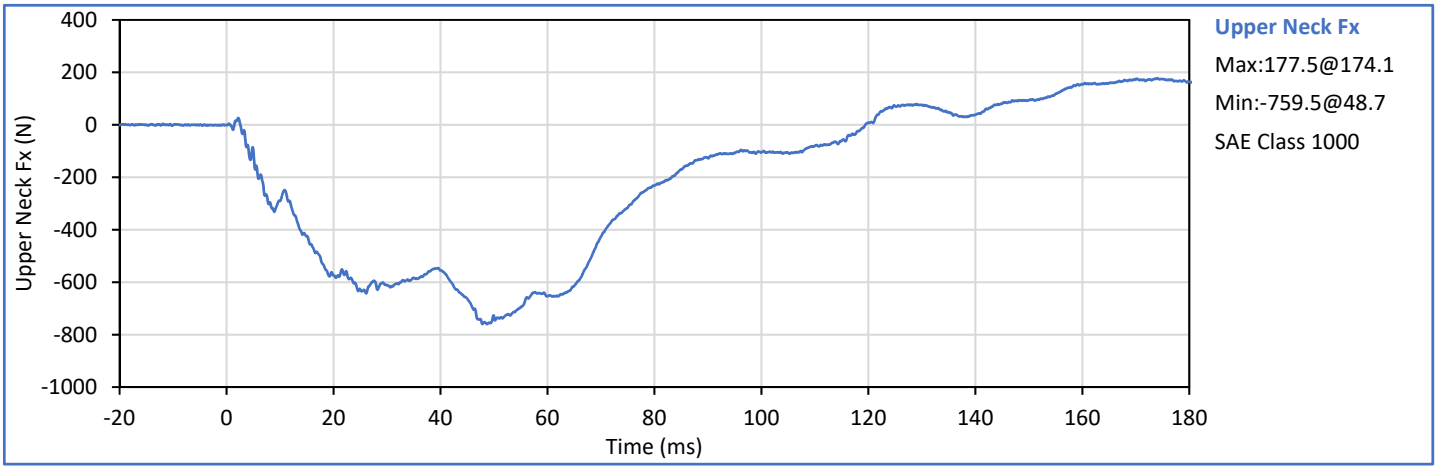
Hybrid III 50th Percentile Male
Neck Flexion Test

ATD Serial No.: 360 Test Date: 2018-09-25







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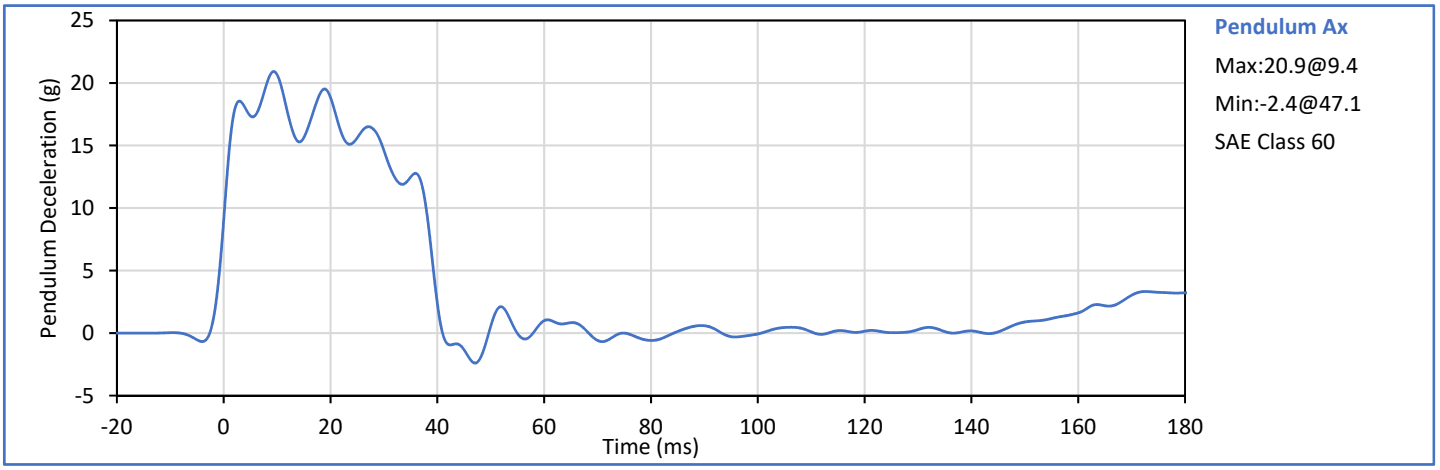
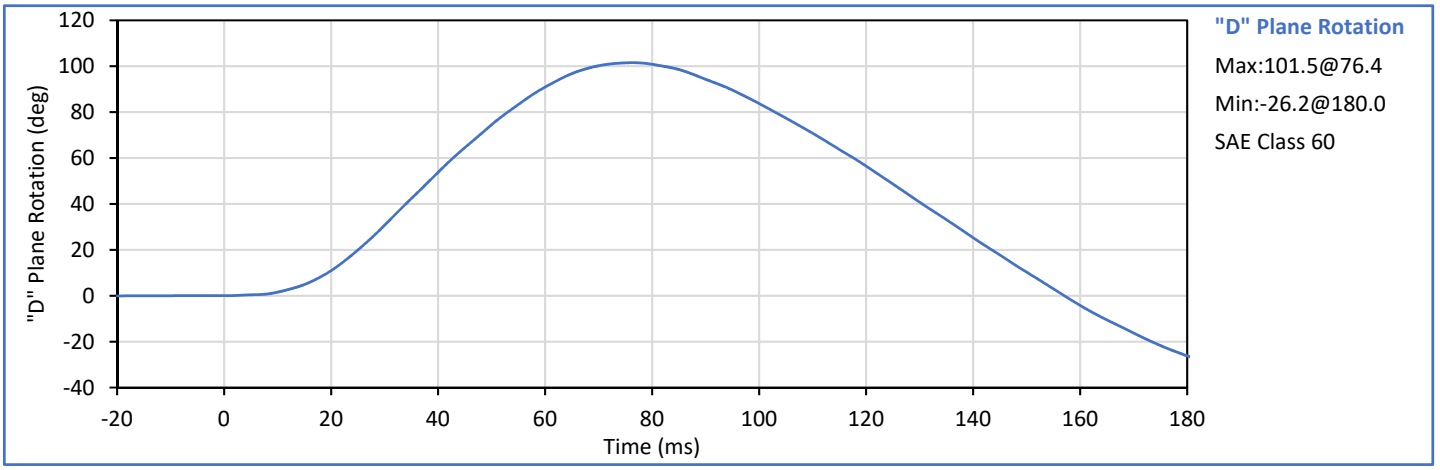
Hybrid III 50th Percentile Male
Neck Extension Test

ATD Serial No.: 360 Test Date: 2018-09-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	5.94	6.19	6.07	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.7	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.8	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	14.6	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	14.6	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	39.3	Pass
"D" Plane Rotation peak	deg	81.0	106.0	101.5	Pass
	ms	72.0	82.0	76.4	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	157.1	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-78.6	Pass
	ms	65.0	79.0	70.2	Pass
Moment Decay, Peak to Zero	deg	120.0	148.0	137.4	Pass
			Overall Test Results		Pass





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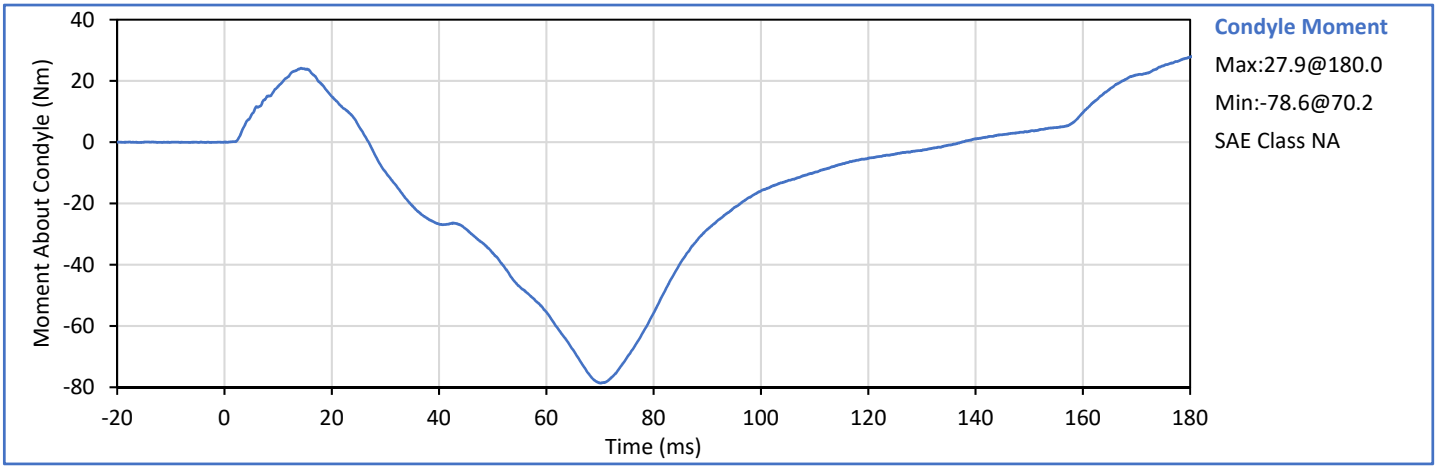
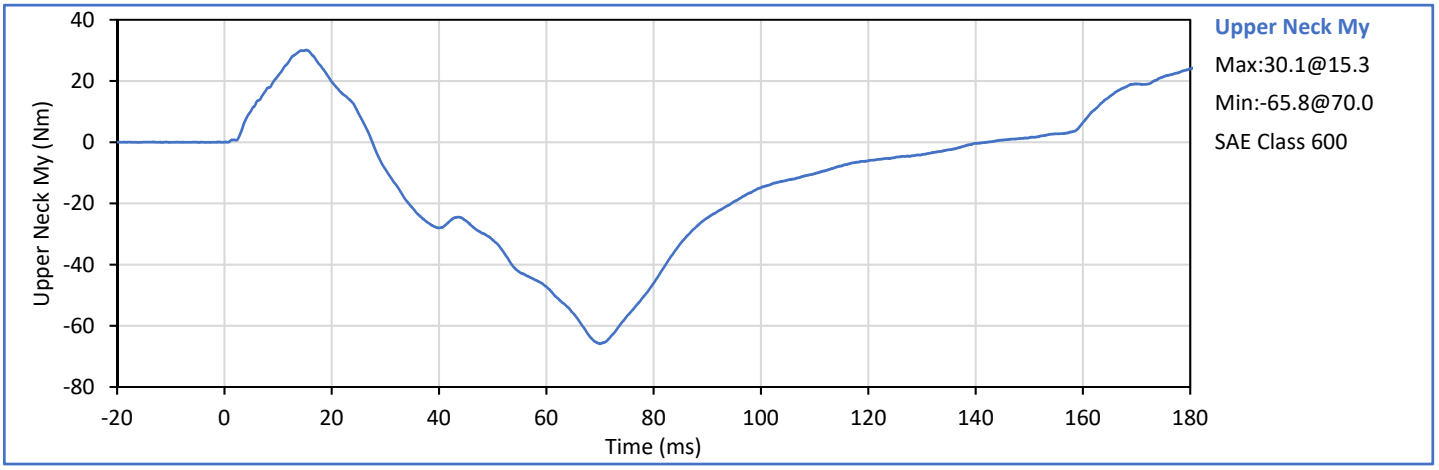
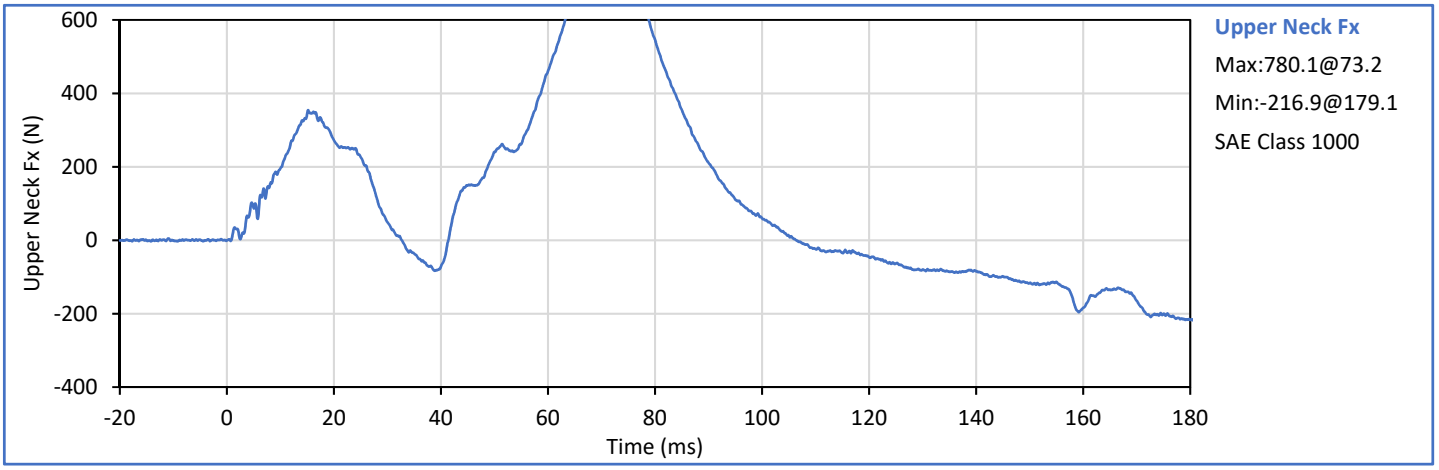
Hybrid III 50th Percentile Male
Neck Extension Test

ATD Serial No.: 360 Test Date: 2018-09-25







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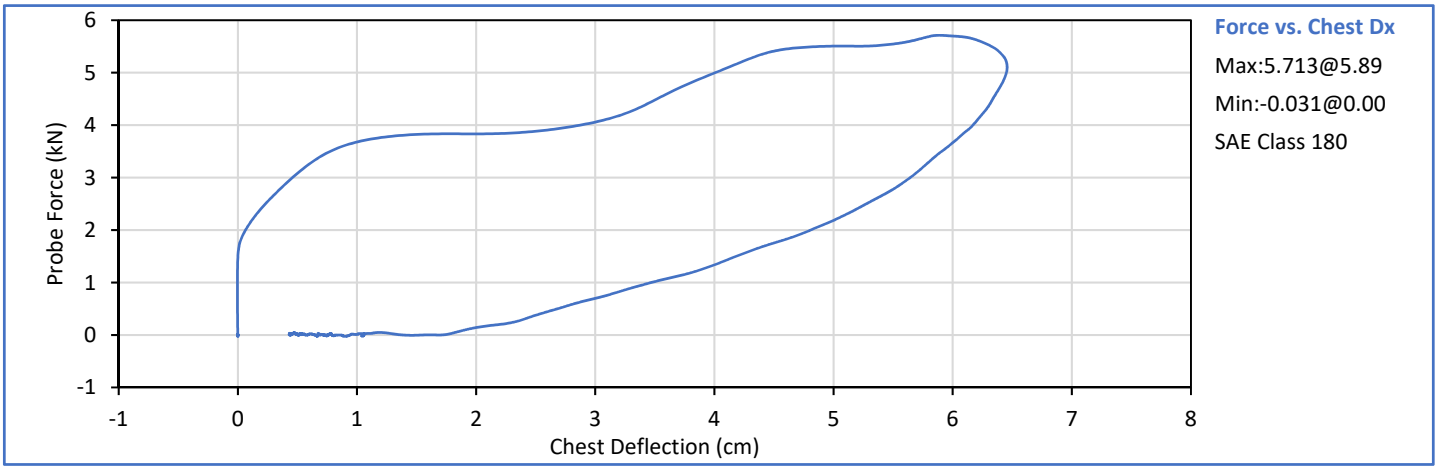
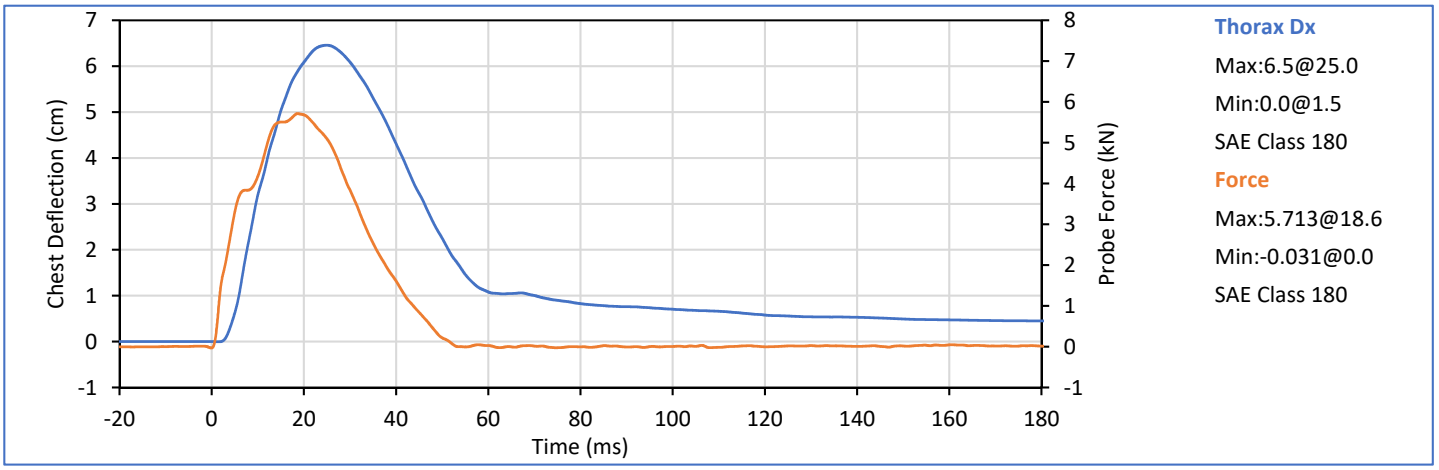
Hybrid III 50th Percentile Male
Thorax Impact

ATD Serial No.: 360 Test Date: 2018-09-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	36	Pass
Probe Velocity	m/s	6.58	6.82	6.60	Pass
Peak Chest Deflection	cm	6.35	7.26	6.46	Pass
Peak Probe Force	kN	5.159	5.893	5.713	Pass
Internal Hysterisis	%	69.0	85.0	72.2	Pass
			Overall Test Results		Pass





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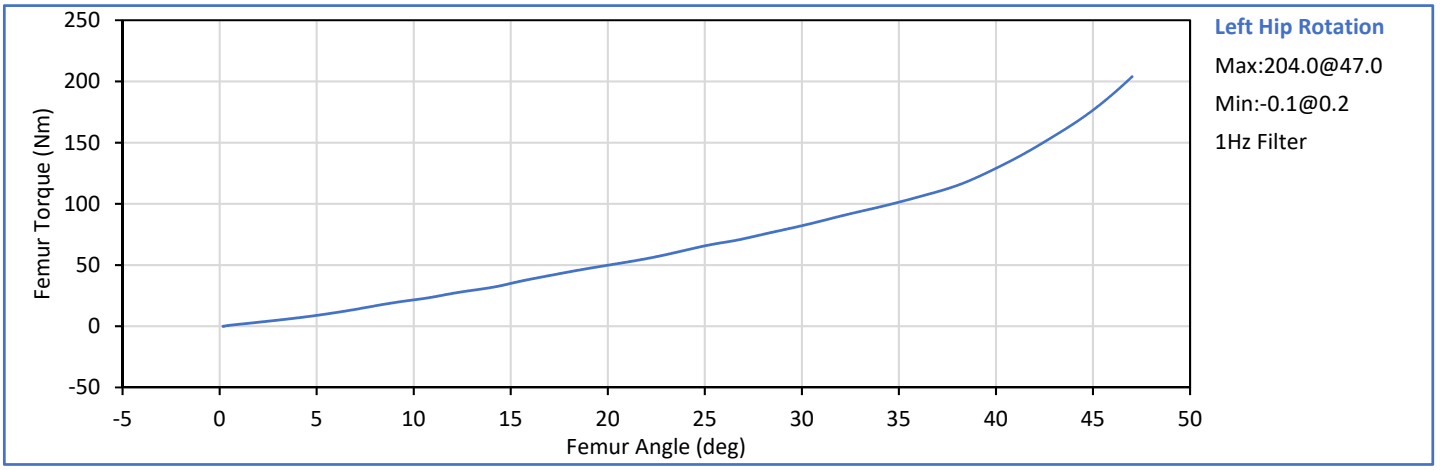
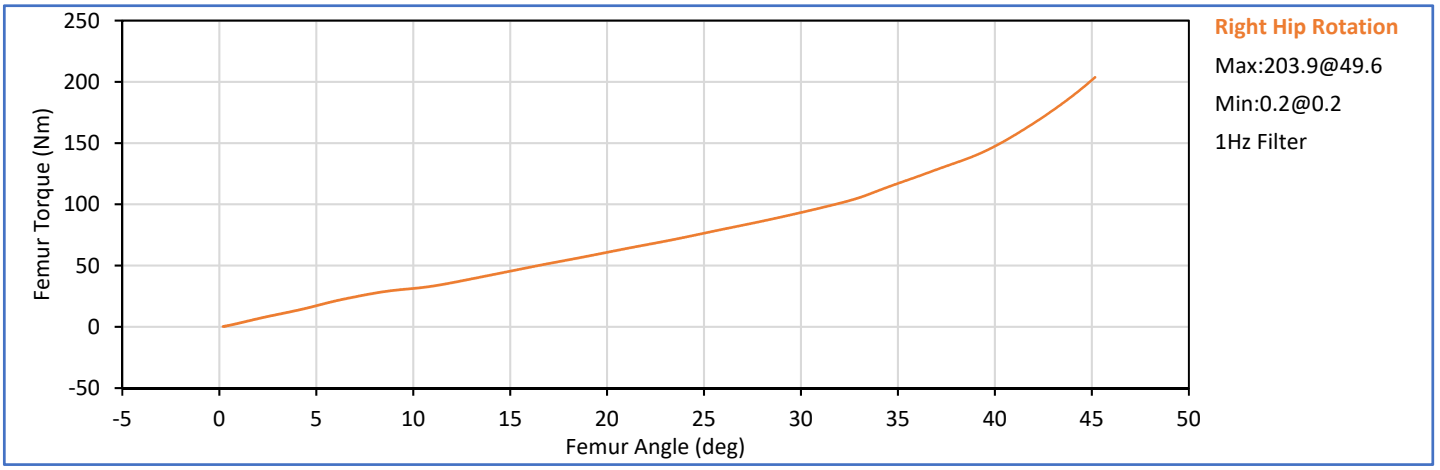
Hybrid III 50th Percentile Male
Hip Flexion (Left/Right)

ATD Serial No.: 360 Test Date: 2018-09-25

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.2	Pass
	Laboratory Humidity	%	10	70	21	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	5.8	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	82.2	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	46.9	Pass
Right Hip	Right Hip Rotation Rate	deg/s	5.0	10.0	5.8	Pass
	Right Femur Torque at 30°	Nm	0.0	95.0	93.3	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	45.1	Pass
				Overall Test Results		Pass





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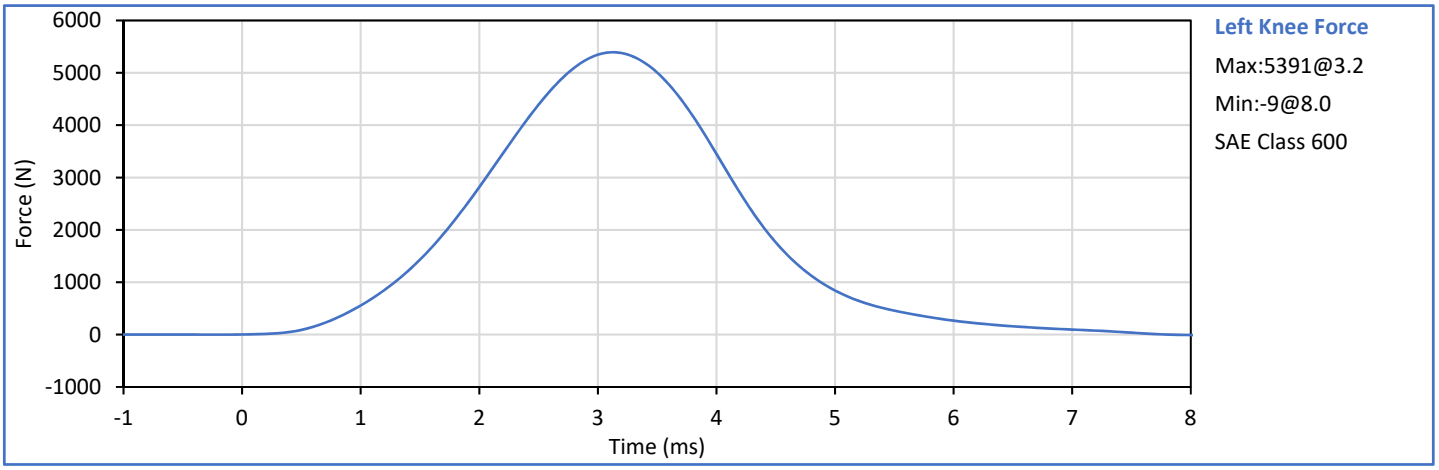
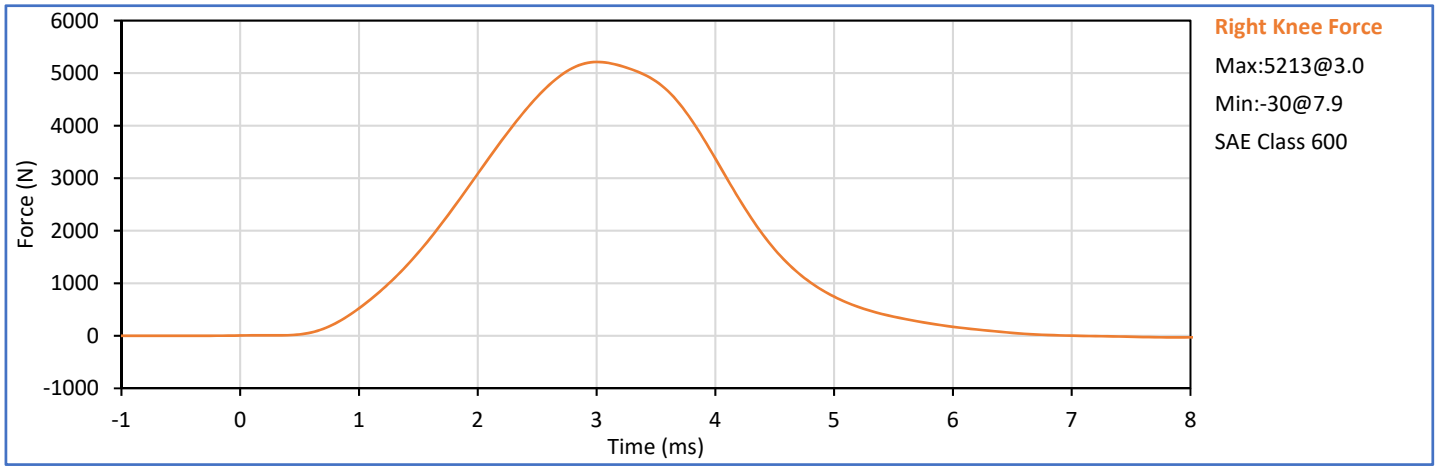
Hybrid III 50th Percentile Male
Knee Impact (Left/Right)

ATD Serial No.: 360 Test Date: 2018-09-22

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.7	Pass
	Laboratory Humidity	%	10	70	30	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.076	Pass
	Peak Resistive Force	N	4715	5782	5391	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.085	Pass
	Peak Resistive Force	N	4715	5782	5213	Pass
				Overall Test Results		Pass





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Hybrid III 5th Percentile Female
Damage Checklist

ATD Serial No.: 630 Test Date: 2018-09-21

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:

Broken wire on Neck Mx connector. Resoldered and checks good.

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Hybrid III 5th Percentile Female
External Measurements

ATD Serial No.: 630 Test Date: 2018-09-21

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	455	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	80	Pass
F - Thigh clearance	mm	119	135	126	Pass
G - Back of elbow to wrist pivot	mm	244	259	251	Pass
H - Head back to backline	mm	41	46	43	Pass
I - Shoulder to elbow length	mm	277	297	290	Pass
J - Elbow rest height	mm	183	203	199	Pass
K - Buttock to knee length	mm	521	546	532	Pass
L - Popliteal length	mm	356	376	364	Pass
M - Knee pivot height	mm	394	419	407	Pass
N - Buttock popliteal length	mm	414	439	425	Pass
O - Chest depth without jacket	mm	175	191	181	Pass
P - Foot length	mm	219	234	226	Pass
R - Buttock to Knee Pivot Length	mm	457	483	476	Pass
S - Head Breadth	mm	137	147	144	Pass
T - Head Depth	mm	178	188	186	Pass
U - Hip Breadth	mm	300	315	309	Pass
V - Shoulder breadth	mm	351	366	357	Pass
W - Foot breadth	mm	79	94	90	Pass
X - Head circum.	mm	528	549	537	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	860	Pass
Z - Waist circum.	mm	760	790	782	Pass
AA - Location for chest circum.	mm	333	358	348	Pass
BB - Location for waist circum.	mm	160	170	166	Pass
			Overall Test Results		Pass

Technician: J. Hernandez

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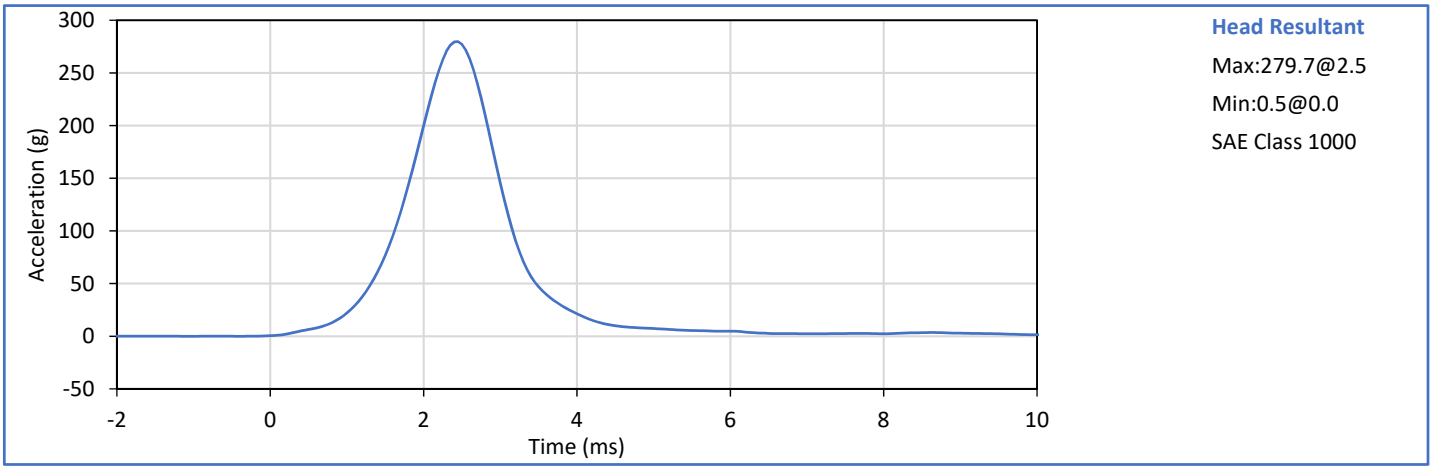
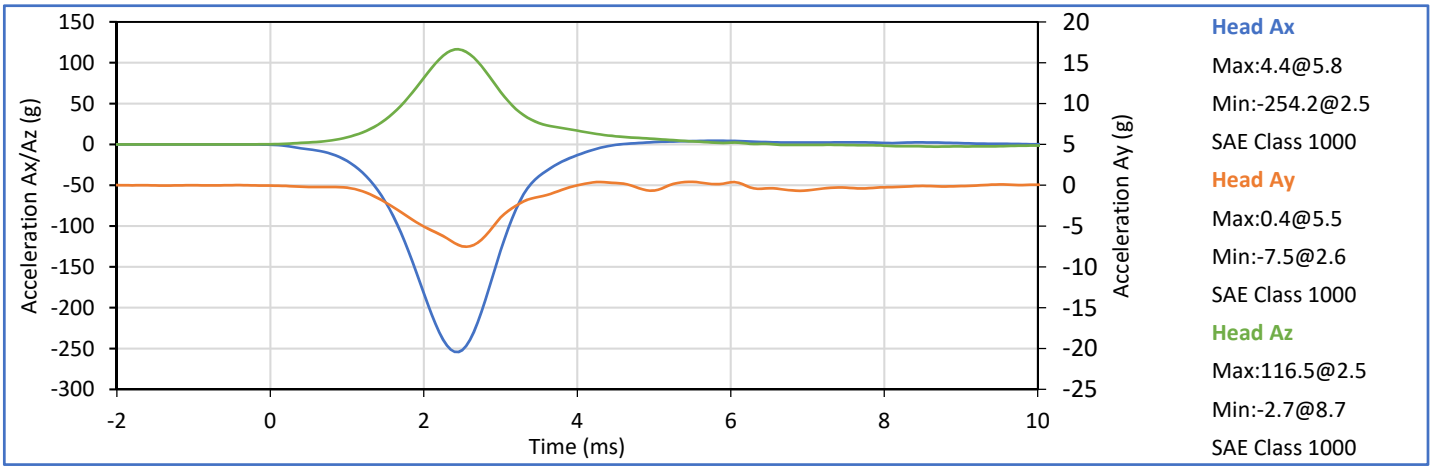
Hybrid III 5th Percentile Female
Head Drop

ATD Serial No.: 630

Test Date: 2018-09-21

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.4	Pass
Laboratory Humidity	%	10	70	28	Pass
Peak Resultant Acceleration	g	250.0	300.0	279.7	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-7.5	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass





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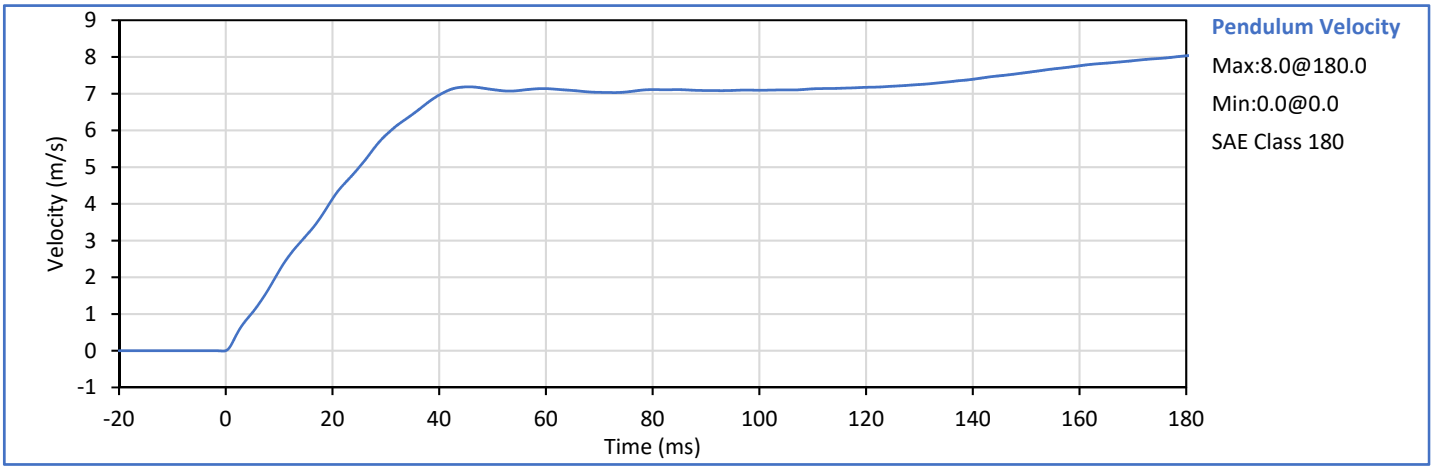
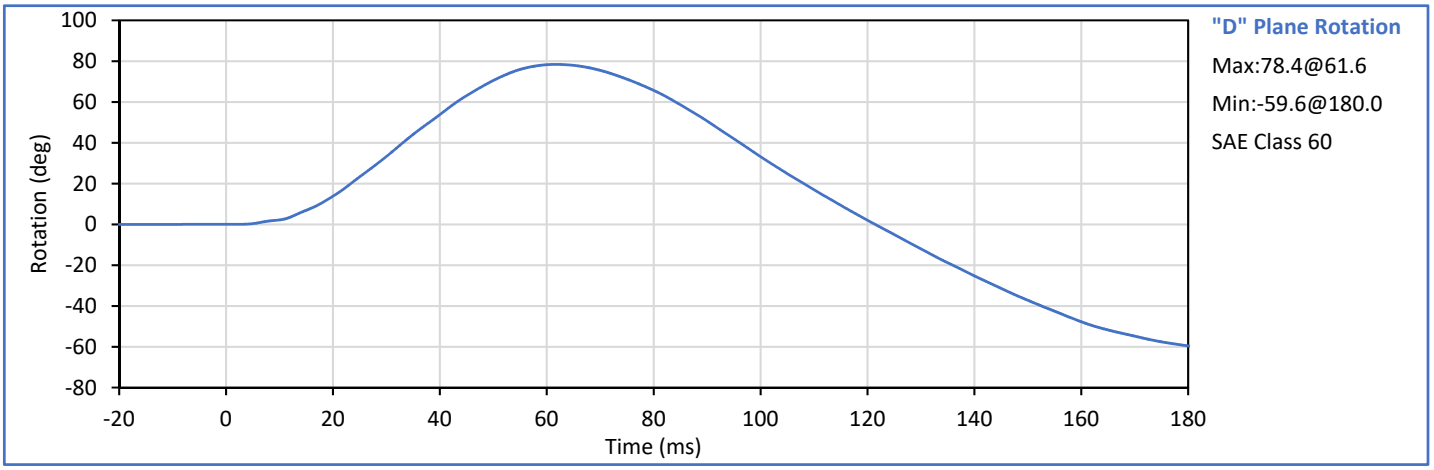
Hybrid III 5th Percentile Female
Neck Flexion Test

ATD Serial No.: 630

Test Date: 2018-09-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	32	Pass
Pendulum Velocity	m/s	6.89	7.13	7.01	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.17	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.14	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	5.87	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	78.4	Pass
Peak Moment in Rotation	Nm	69.0	83.0	78.5	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	90.2	Pass
			Overall Test Results		Pass





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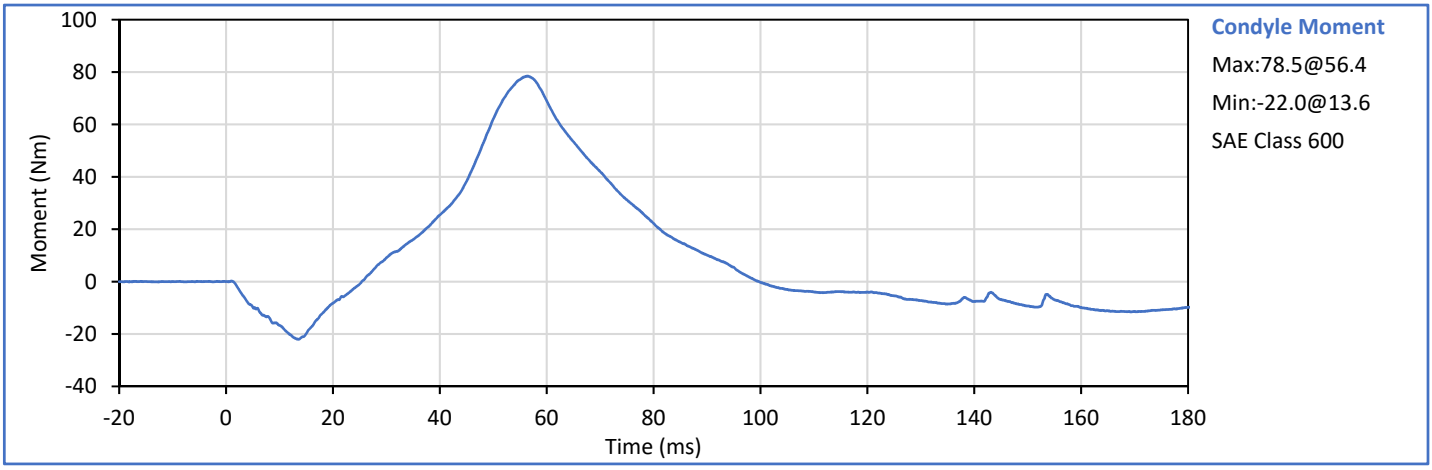
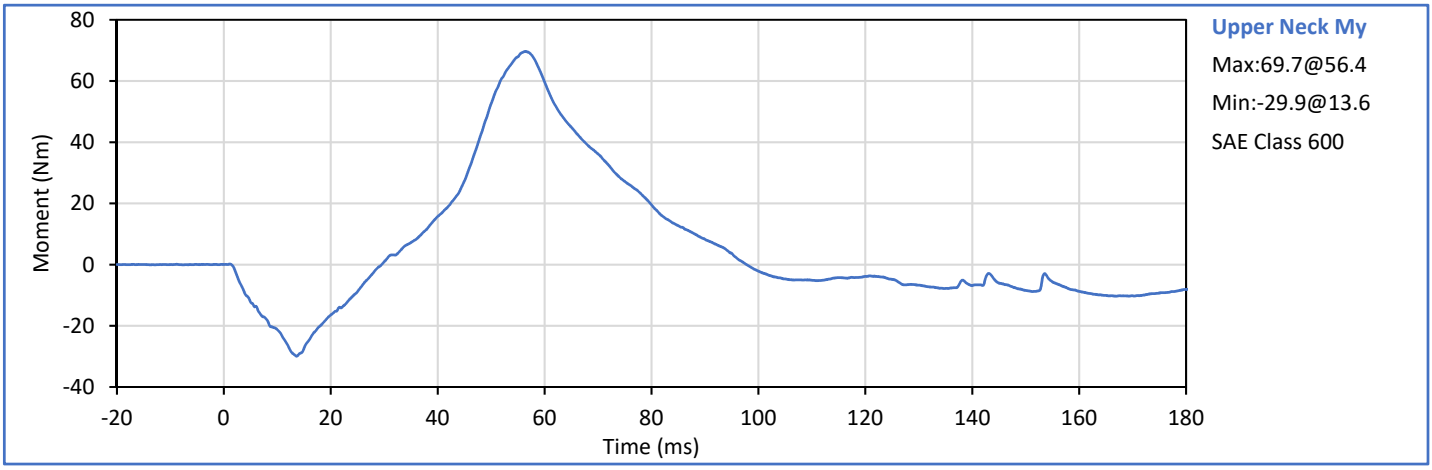
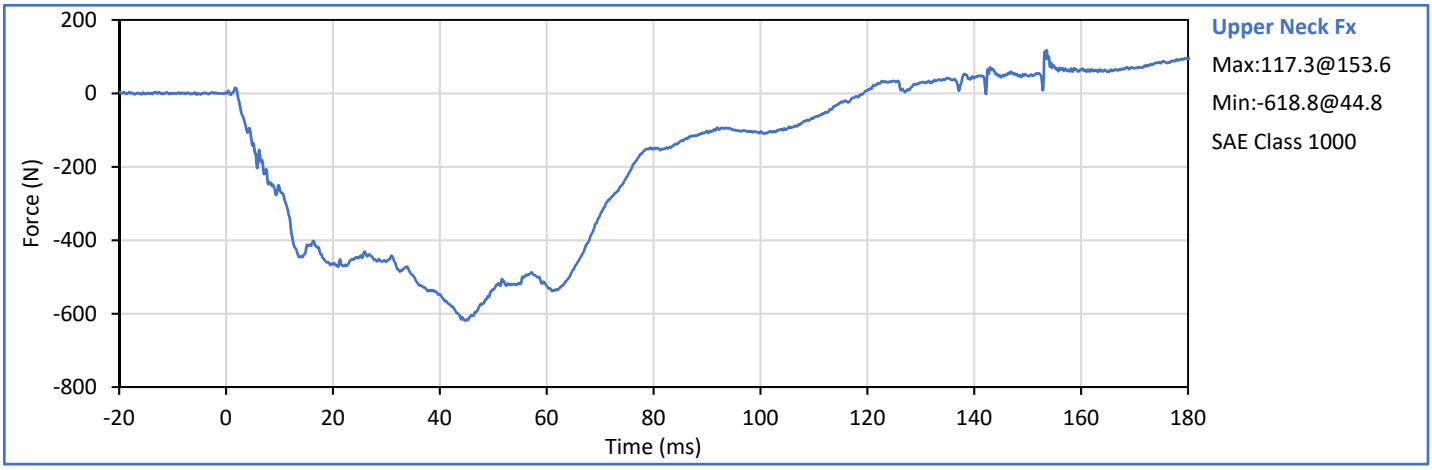
Hybrid III 5th Percentile Female
Neck Flexion Test

ATD Serial No.: 630

Test Date: 2018-09-25







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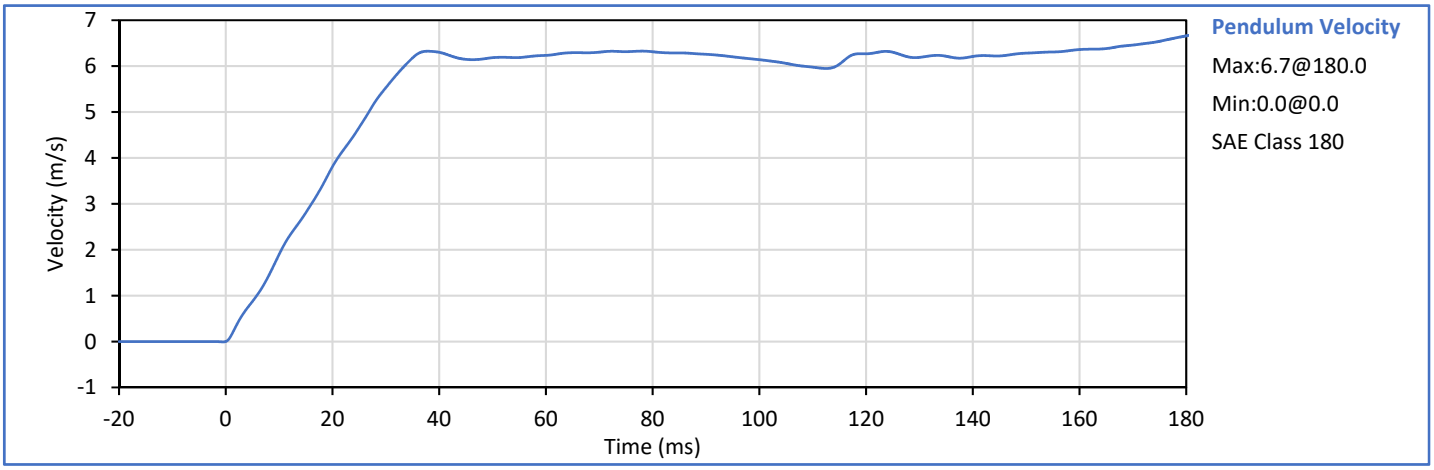
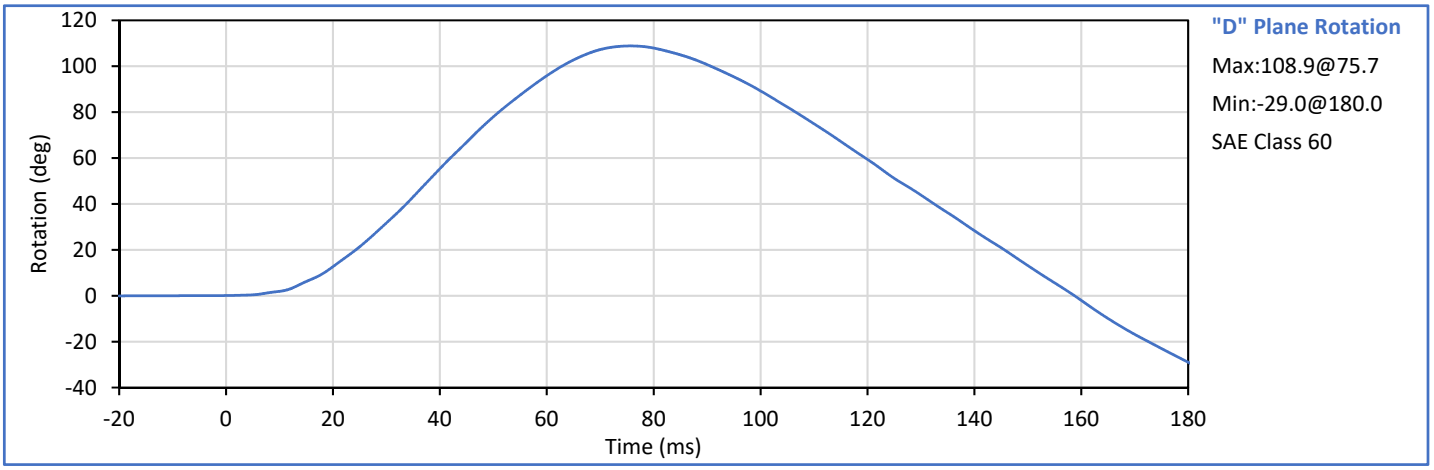
Hybrid III 5th Percentile Female
Neck Extension Test

ATD Serial No.: 630

Test Date: 2018-09-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	25	Pass
Pendulum Velocity	m/s	5.95	6.19	6.14	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.90	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.81	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.53	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	108.9	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-57.7	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	99.1	Pass
			Overall Test Results		Pass





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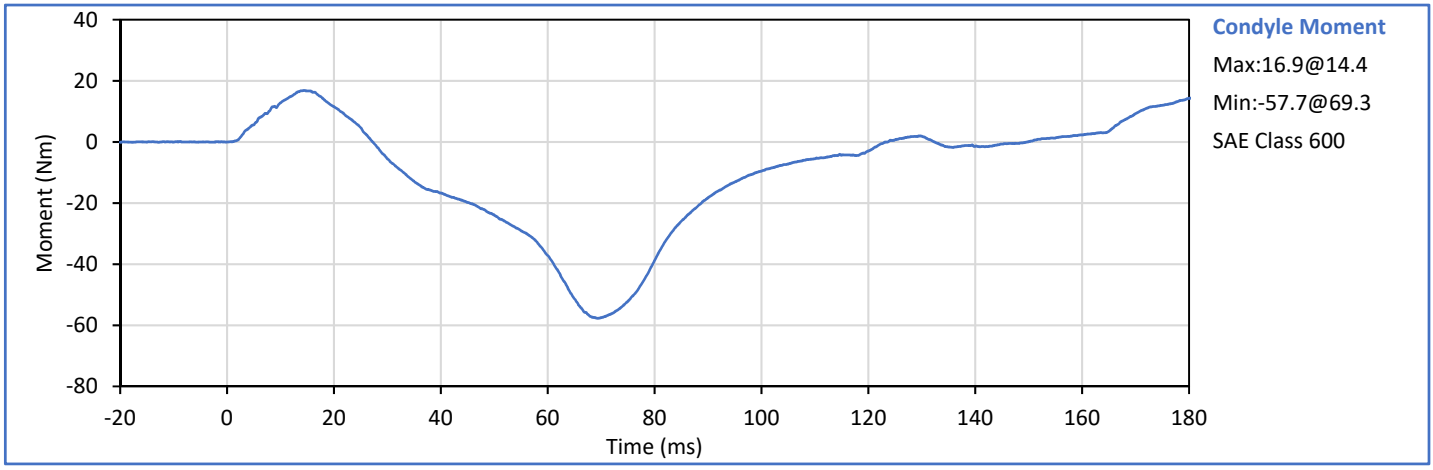
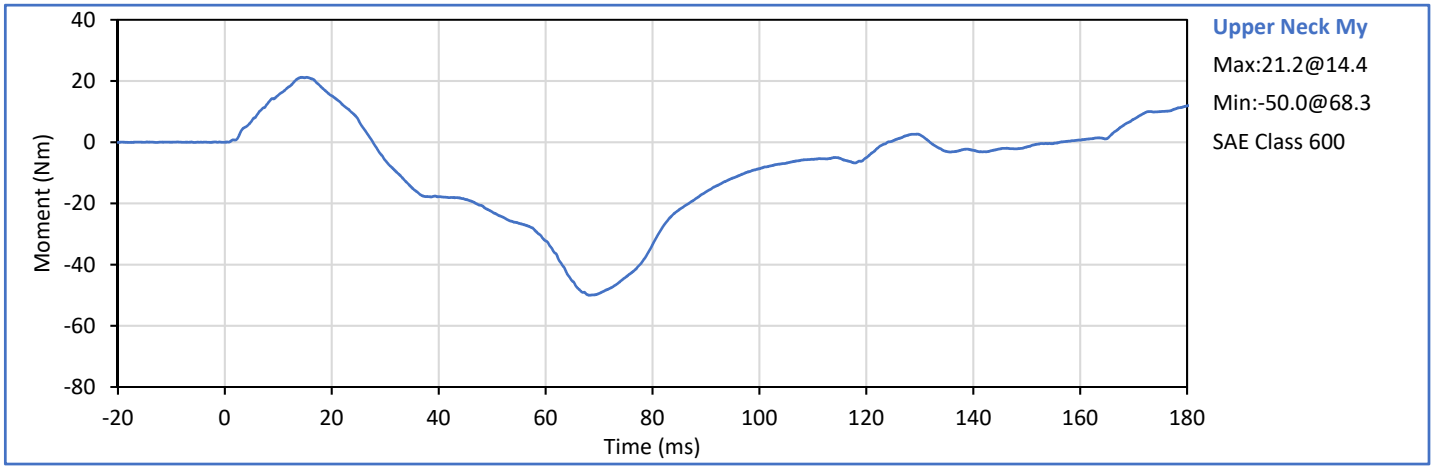
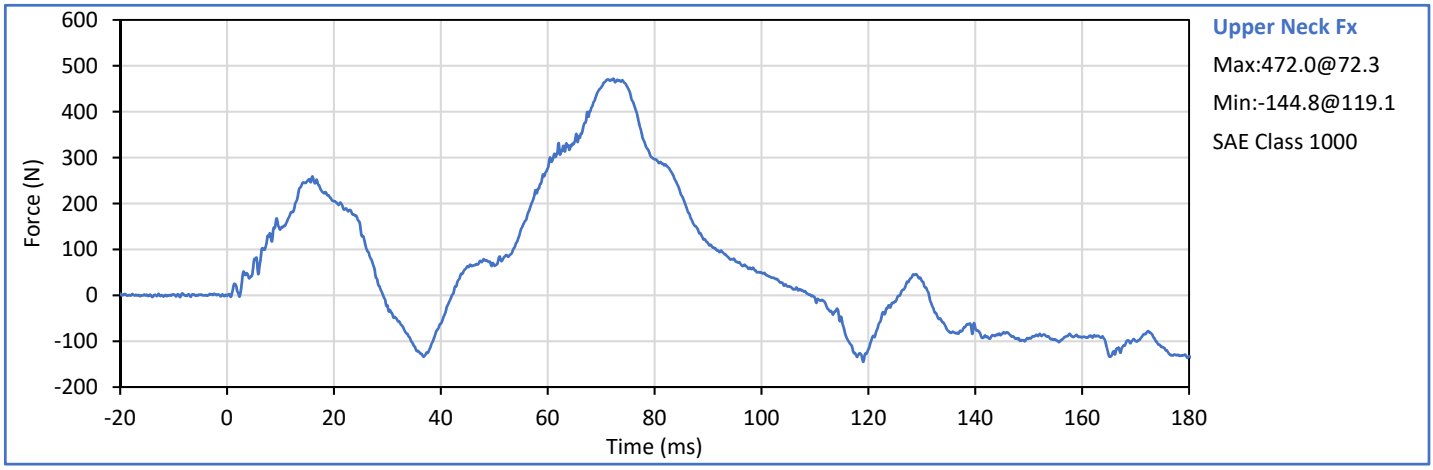
Hybrid III 5th Percentile Female
Neck Extension Test

ATD Serial No.: 630

Test Date: 2018-09-25







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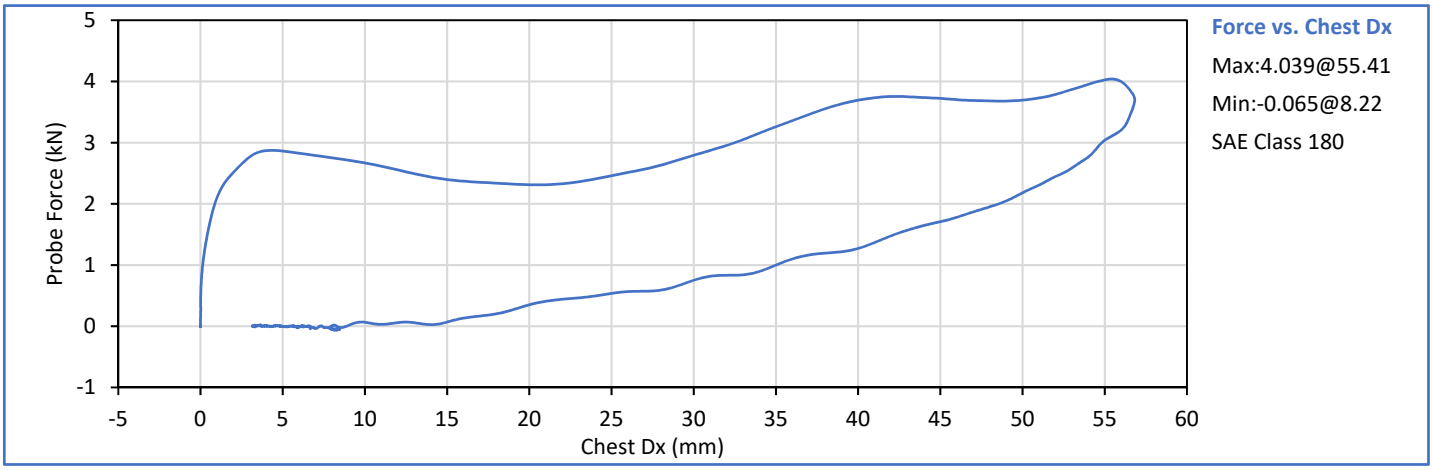
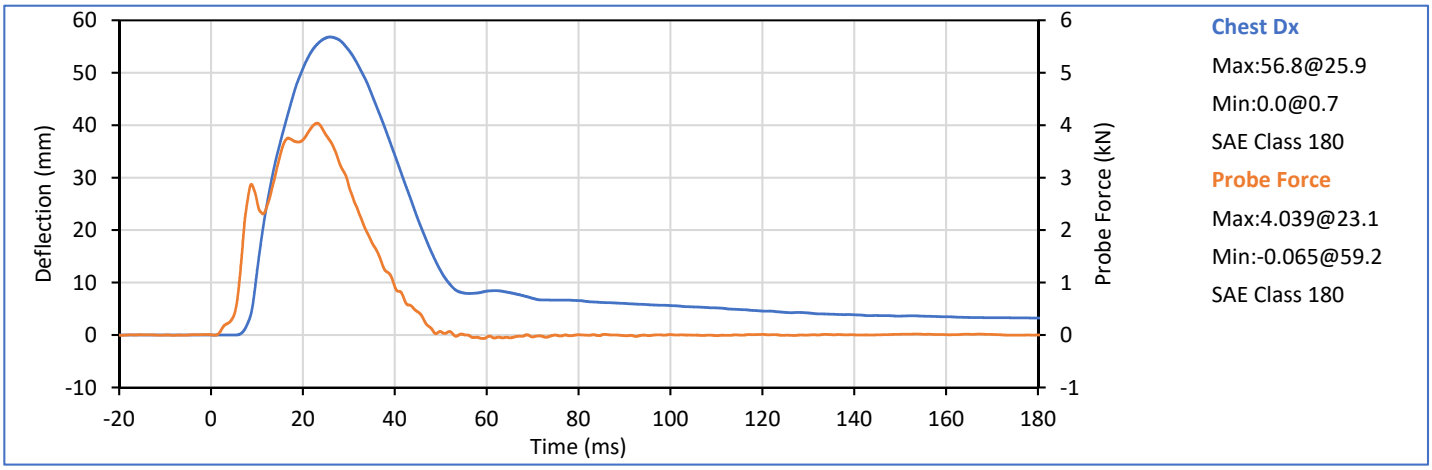
Hybrid III 5th Percentile Female Thorax Impact

ATD Serial No.: 630

Test Date: 2018-09-21

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	6.71	Pass
Peak Chest Deflection	mm	50.0	58.0	56.8	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.039	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	3.755	Pass
Internal Hysterisis	%	69.0	85.0	69.4	Pass
			Overall Test Results		Pass





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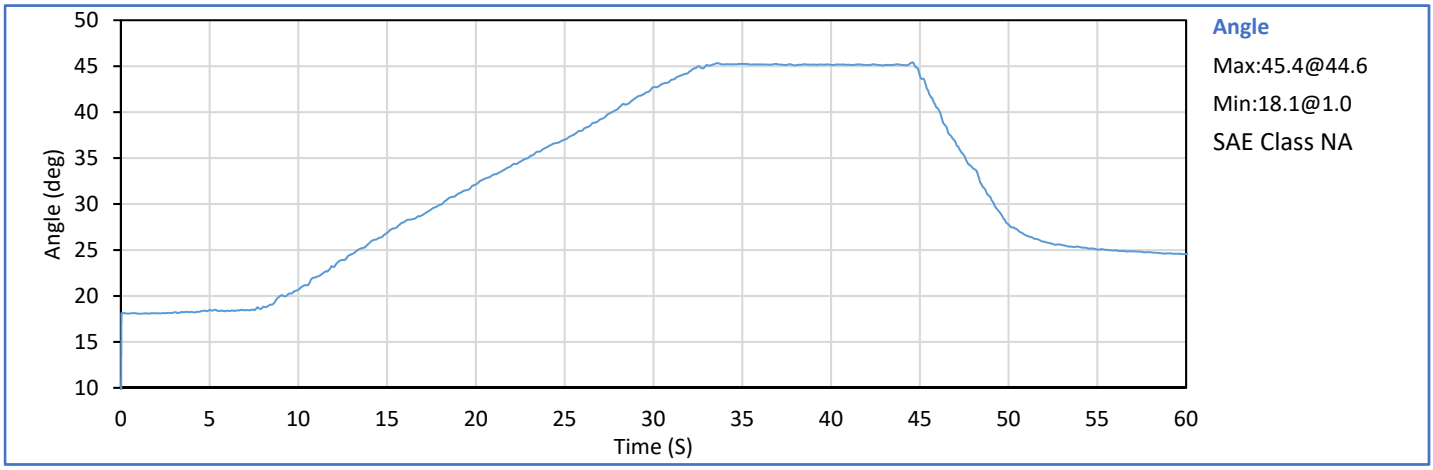
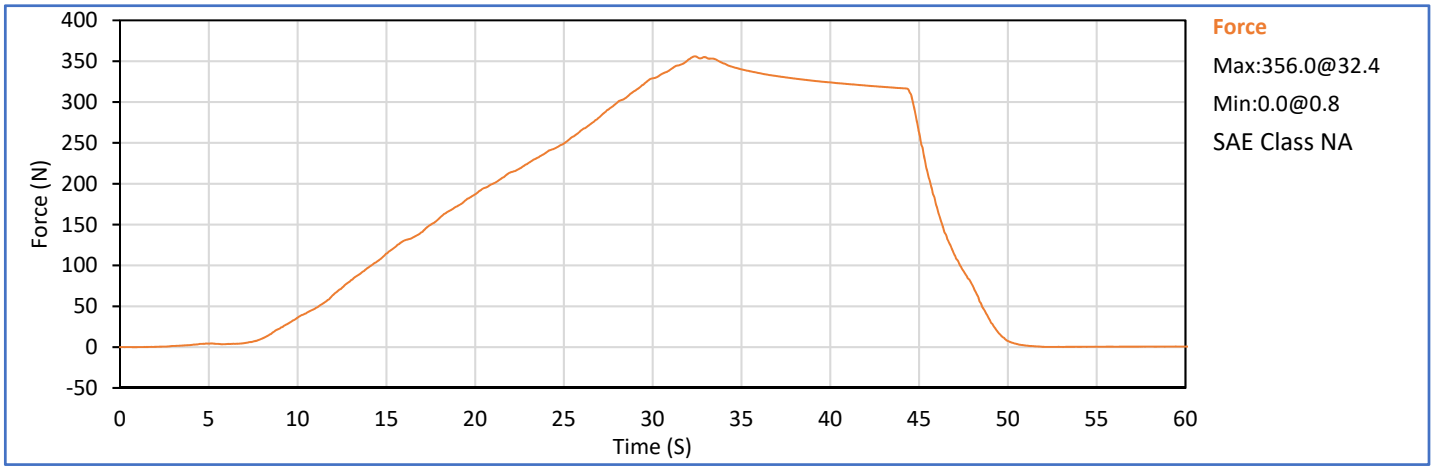
Hybrid III 5th Percentile Female
Torso Flexion Test

ATD Serial No.: 630

Test Date: 2018-09-25

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.4	Pass
Laboratory Humidity	%	10	70	25	Pass
Orientation Angle	deg	0.0	20.0	17.2	Pass
Test Initial Angle	deg	11.0	19.0	18.1	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	356.0	Pass
Torso Flexion Rate	deg/s	0.50	1.50	1.08	Pass
Final Reference Plane Angle	deg	-8.0	8.0	2.0	Pass
			Overall Test Results		Pass





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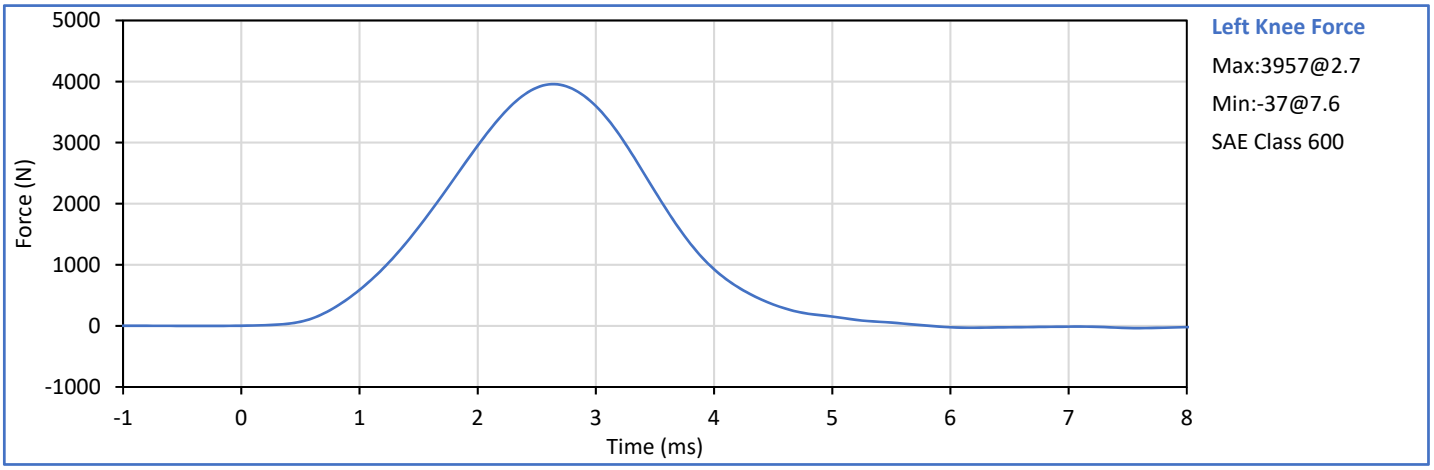
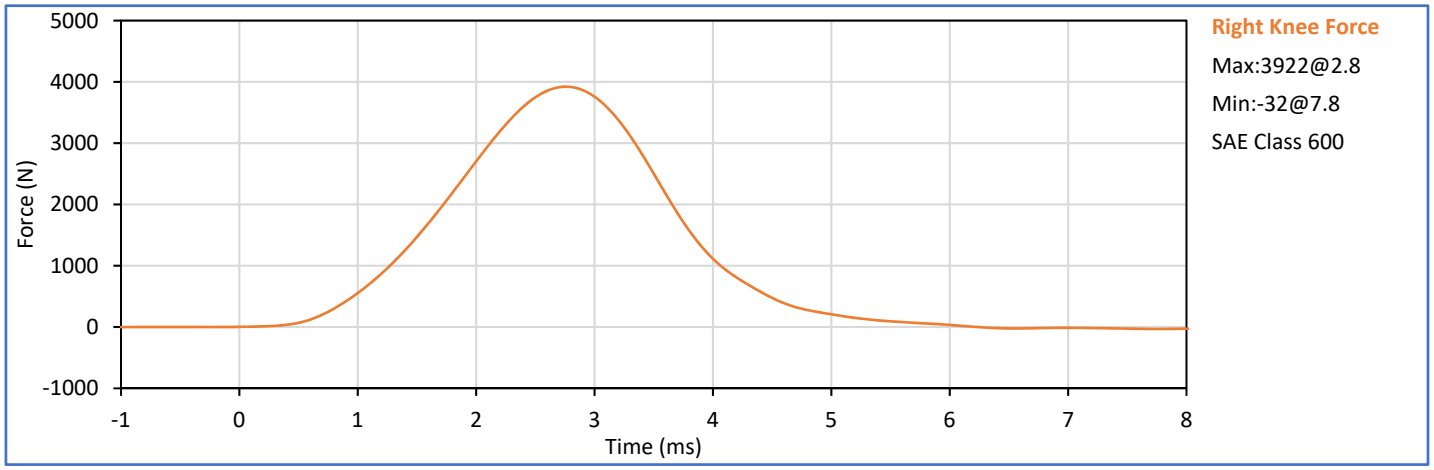
Hybrid III 5th Percentile Female Knee Impact (Left/Right)

ATD Serial No.: 630 Test Date: 2018-09-22

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.2	Pass
	Laboratory Humidity	%	10	70	25	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.104	Pass
	Peak Resistive Force	N	3450	4060	3957	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.103	Pass
	Peak Resistive Force	N	3450	4060	3922	Pass
				Overall Test Results		Pass





Technician: J. Hernandez

Approved By: P. Puzzuto