

REPORT NUMBER: NCAP-KAR-20-012

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

**VOLVO CAR CORPORATION
2020 VOLVO XC60 T5 AWD 5-DOOR MPV**

NHTSA NUMBER: M20205903

**PREPARED BY:
APPLUS IDIADA KARCO ENGINEERING, LLC.
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FEBRUARY 4, 2020

FINAL REPORT

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

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Date: _____

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

Date: _____

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2020 Volvo XC60 T5 AWD 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 January 21, 2020. The impact velocity of the vehicle was 56.71 km/h and the ambient temperature at the barrier face at the time of impact was 6.7°C. The target vehicle's post-test maximum crush was 560 mm at the vehicle's centerline. The test vehicle's performance is as follows: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>125.3</td> <td>700</td> <td>177.6</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-18</td> <td>52</td> <td>-12</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.22</td> <td>1</td> <td>0.28</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>879.3</td> <td>2620</td> <td>795.5</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>-68.2</td> <td>2520</td> <td>-242.9</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10000</td> <td>-2175.7</td> <td>6805</td> <td>-1461.4</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10000</td> <td>-2092.5</td> <td>6805</td> <td>-1562.2</td> </tr> </tbody> </table>				Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	125.3	700	177.6	Maximum Chest Compression	mm	63	-18	52	-12	Nij	N/A	1	0.22	1	0.28	Neck Tension	N	4170	879.3	2620	795.5	Neck Compression	N	4000	-68.2	2520	-242.9	Left Femur Force	N	10000	-2175.7	6805	-1461.4	Right Femur Force	N	10000	-2092.5	6805	-1562.2
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

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

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

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2020 Volvo XC60 T5 AWD 5-door MPV at a velocity of 56.71 km/h. The test was performed at Applus IDIADA KARCO Engineering, LLC. on January 21, 2020. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report.

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

One Part 572E 50th percentile male anthropomorphic test device (ATD) was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck force transducers, right / left femur load cells, and lower leg instrumentation. Seat belt load cells were installed on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 360) and the right-front passenger (position 2) ATD (Serial No. 630) were qualified prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 106 channels of dummy and vehicle response data were recorded on an on-board data acquisition system. Appendix B contains the dummy response data traces.

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

The maximum static crush was 560 mm at the vehicle's centerline and both the driver and passenger side doors remained closed during the impact event and were operable after the impact. The Right Rear Sill Acceleration X channel failed at 27.6 milliseconds, the Engine Bottom Acceleration X channel failed at 26.1 milliseconds, the Right Rear Sill Acceleration Z channel failed at 27.6 milliseconds, and the Redundant Right Rear Sill Acceleration Z channel failed at 27.6 milliseconds. The Barrier Load Cell 1103 Moment Z channel failed and no data was collected.

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. Both left and right knees contacted the knee bolster.

The occupant data is summarized below:

ATD Position	HIC ₁₅	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50th Male)	125.3	0.22	879.3	-68.2	31	-18	-2175.7	-2092.5
Passenger (5th Female)	177.6	0.28	795.5	-242.9	30	-12	-1461.4	-1562.2

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

CONVERSION FACTORS

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

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20205903
Model Year	2020
Make	Volvo
Model	XC60 T5 AWD
Body Style	5-Door MPV
VIN	YV4102RK4L1488417
Body Color	Osmium Grey Metallic
Odometer Reading (km / mi)	18 / 11
Engine Displacement (L)	2.0
Type / No. of Cylinders	4 Cylinders
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	Yes
Sunroof / T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System	Yes
Power Steering	Yes
Power Window Auto-Reverse	Yes
Driver Frontal Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	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	N/A

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	Volvo Car Corporation
Date of Manufacture	Oct-19

GVWR (kg)	2431
GAWR Front (kg)	1211
GAWR Rear (kg)	1261

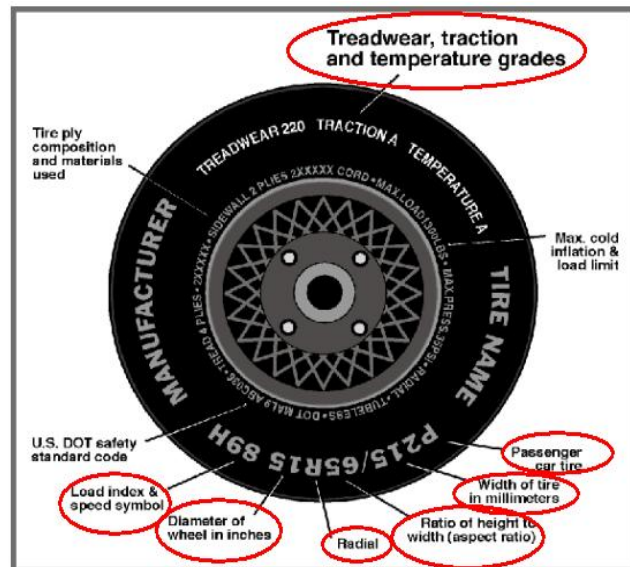
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket	Bench			
Designated Seating Capacity	2	3		5	
Capacity Weight (VCW) (kg)				430.0	A
DSC x 68.04 (kg)				340.2	B
Cargo Weight (RCLW) (kg)				89.8	A-B

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
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VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	235/60 R18	235/60 R18
Tire Size on Vehicle	235/60 R18	235/60 R18
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Scorpion Zero	Scorpion Zero
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Rayon	2 Rayon
Tire Plies Body	2 Rayon, 2 Steel, 1 Polyamide	2 Rayon, 2 Steel, 1 Polyamide
Load Index / Speed Symbol	103V	103V
Tire Material	Rayon, Steel, Polyamide	Rayon, Steel, Polyamide
DOT Safety Code Left	XB K3 V825	XB K3 V825
DOT Safety Code Right	XB K3 V825	XB K3 V825

DATA SHEET NO. 1 ... (CONTINUED)**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20**TEST VEHICLE WEIGHTS**

	Units	As Delivered Weights (UWV)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	516.5	426.0		549.0	523.5	
Right	kg	510.0	429.0		521.5	512.5	
Ratio	%	54.6%	45.4%	100.0%	50.8%	49.2%	100.0%
Total	kg	1026.5	855.0	1881.5	1070.5	1036.0	2106.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UWV)	kg	1881.5	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	89.8	C
Calculated Vehicle Target Weight (TVTW)	kg	2112.3	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	837	835	838	843	1300
As Tested	mm	815	813	813	816	1407
Post-Test	mm	810	845	799	823	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheelbase	mm	2860
Total Vehicle Length at Left Side	mm	3983
Total Vehicle Length at Centerline	mm	4693
Total Vehicle Length at Right Side	mm	3980
Weight of Ballast in Cargo Area	kg	102.0
Weight of Vehicle Components Removed	kg	18.0
Amount of Stoddard Solvent in Fuel Tank	L	65.10

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Trunk Trim, Spare Tire, and Tools (18.0 kg)

DATA SHEET NO. 1 ... (CONTINUED)**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20**TARGET VEHICLE STRUCTURAL MEASUREMENTS**

No.	Description	Pre-Test
1	Total Length	4693
2	Total Width	1905
3	Bumper Top Height	750
4	Bumper Bottom Height	285
5	Longitudinal Member Top Height	700
6	Distance Between Longitudinal Members	660
7	Longitudinal Member Width	65
8	Engine Top Height	927
9	Engine Bottom Height	275
10	Engine and Gearbox Width	570
11	Front Bumper to Engine Distance	535
12	Front Shock Absorber Fixing Height	975
13	Bonnet Leading Edge Height	887
14	Front Shock Absorber Fixing Width	1005
15	Front Bumper to Front Axle Distance	880
16	Front Axle to A-Pillar Distance	615
17	A-Pillar to B-Pillar Distance	989
18	B-Pillar to Rear Axle Distance	1180
19	B-Pillar to C-Pillar Distance	816
20	Roof Sill Bottom Height	1488
21	Roof Sill Top Height	1630
22	Floor Sill Bottom Height	340
23	Floor Sill Top Height	430

All measurements in millimeters.

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV

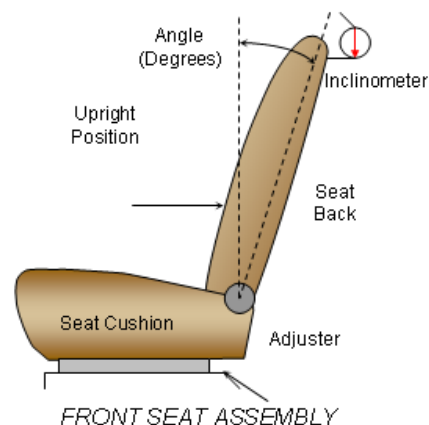
NHTSA No.: M20205903

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/21/20

NOMINAL DESIGN RIDING POSITION

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

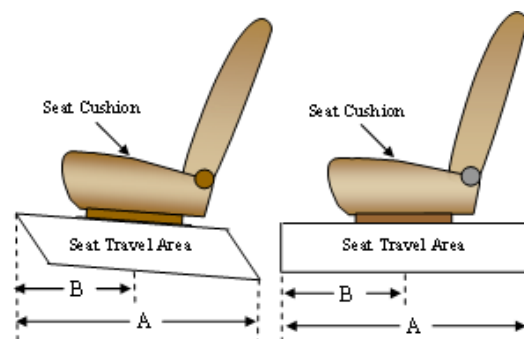


SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	22.5
Passenger Seat Back Angle	20.0

SEAT FORE / AFT POSITIONING

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



SEAT FORE/AFT POSITIONS

Seating Position	Total Fore-Aft Travel	Placed in Position
Driver Seat	319 mm	160 mm
Passenger Seat	265 mm	0 mm

SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the manufacturer's design position for a 50th percentile adult male ATD for the driver, and a 5th percentile adult female ATD for the passenger. Position "H" is the uppermost position, followed by position "M2", followed by position "M1", and Position "L" is the lowermost position.

SEAT BELT UPPER ANCHORAGES

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

DATA SHEET NO. 2 ... (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903

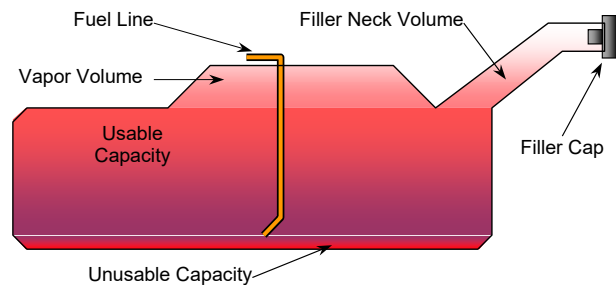
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	70.00
Usable Capacity of "Optional Tank"	
92 - 94% of Usable Capacity	64.4 to 65.8
Actual Amount of Stoddard Solvent Used	65.10
1/3 of Usable Capacity	23.33

FUEL PUMP

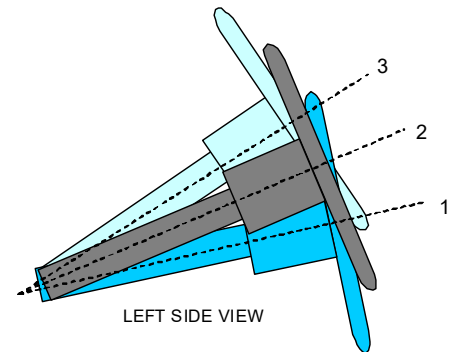
The vehicle is equipped with an electric fuel pump. The fuel pump operates after the ignition switch is turned ON and while the engine is running.



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

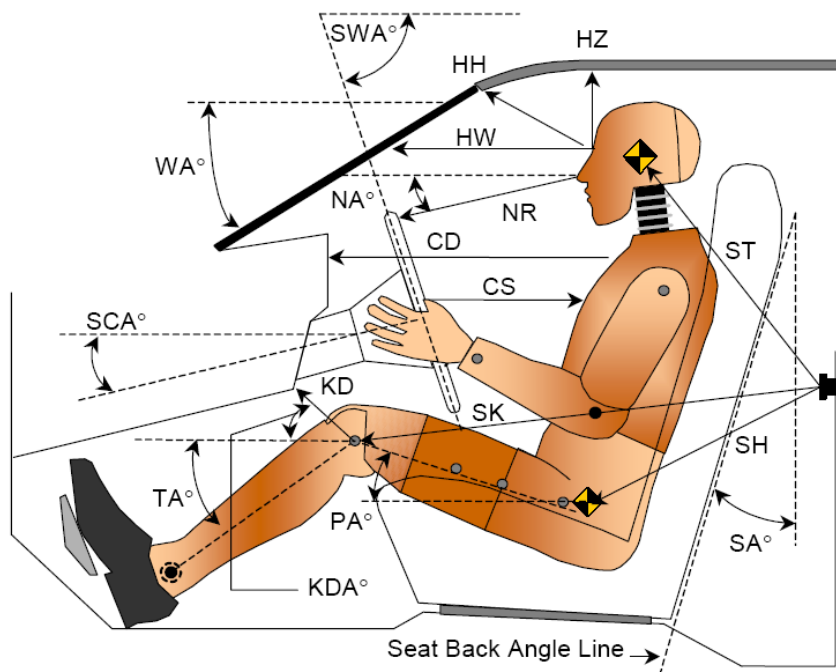
STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	20.2	85
Geometric Center Position, No. 2	23.3	110
Uppermost Position, No. 3	26.4	135
Telescoping Steering Wheel Travel		50
Test Position	23.3	110

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20



LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		25.4		
SWA°	Steering Wheel Angle		66.2		
SCA°	Steering Column Angle		23.8		
SA°	Seat Back Angle (On Headrest Post)		22.5		20.0
HZ	Head to Roof	210	90.0	205	90.0
HH	Head to Header	380	30.5	294	45.5
HW	Head to Windshield	695	0.0	629	0.0
NR	Nose to Rim	422	4.6	424	12.4
CD	Chest to Dash	535	14.6	358	0.4
CS	Chest to Steering Hub	322	1.3		
RA	Rim to Abdomen	215	0.0		
KDL	Left Knee to Dash	164	53.6	54	50.0
KDR	Right Knee to Dash	156	38.0	72	49.9
PA°	Pelvic Angle		23.7		20.8
TA°	Tibia Angle		40.4		55.2
SK	Striker to Knee	534	2.1	641	2.9
ST	Striker to Head	500	86.3	476	72.0
SH	Striker to H-Point	212	43.2	312	18.2

DATA SHEET NO. 4

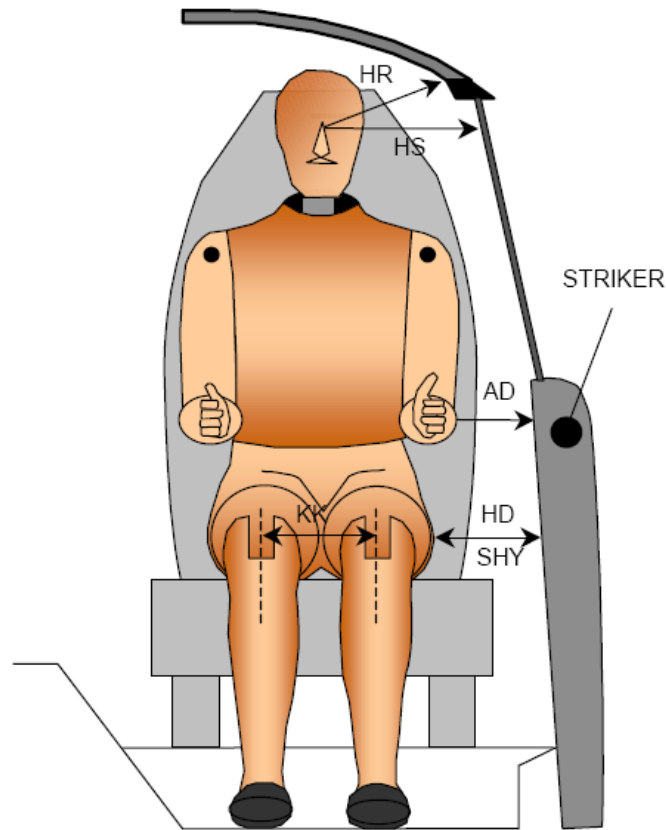
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV

NHTSA No.: M20205903

Test Program: 56.3 km/h Frontal Impact NCAP Test

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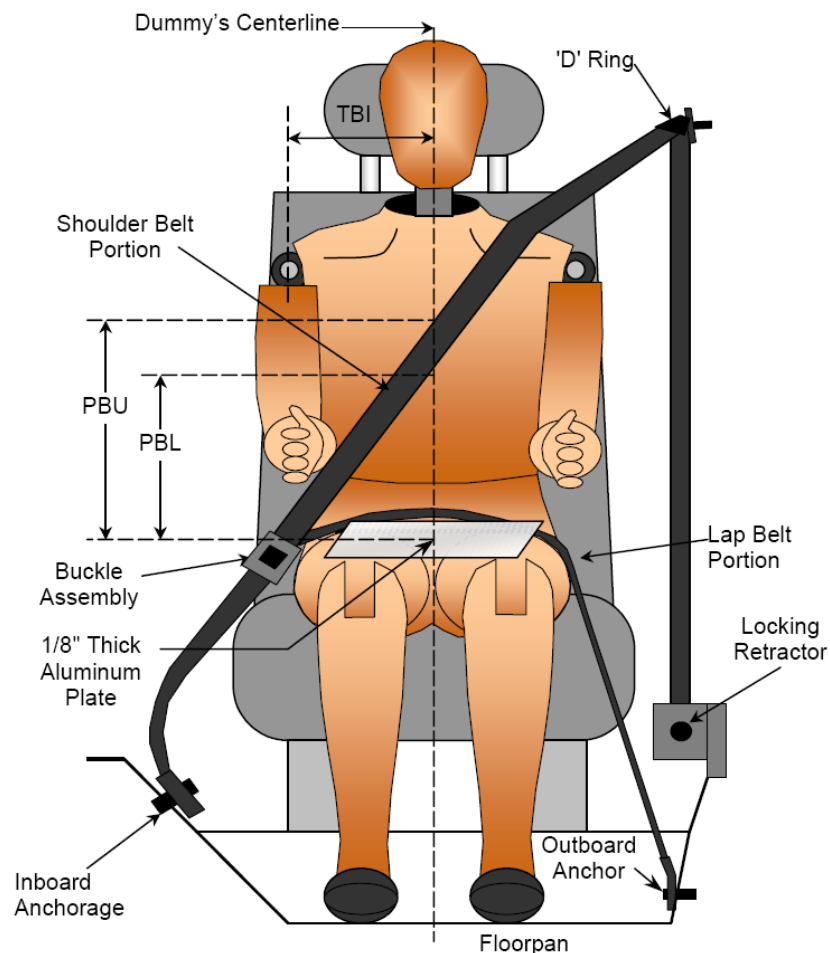


Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	110	89
HD	H-Point to Door	208	250
HR	Head to Side Header	206	229
HS	Head to Side Window	345	425
KK	Knee to Knee	300	165
SHY	Striker to H-Point (Y-Direction)	255	281
AA	Ankle to Ankle	290	170

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20



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	320	280
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	215	180

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	910	957
Lap Belt Length as Measured on ATD	mm	590	545
Remainder of Belt on Reel	mm	992	935
Total Belt Length for Continuous Webbing Systems	mm	2492	2437

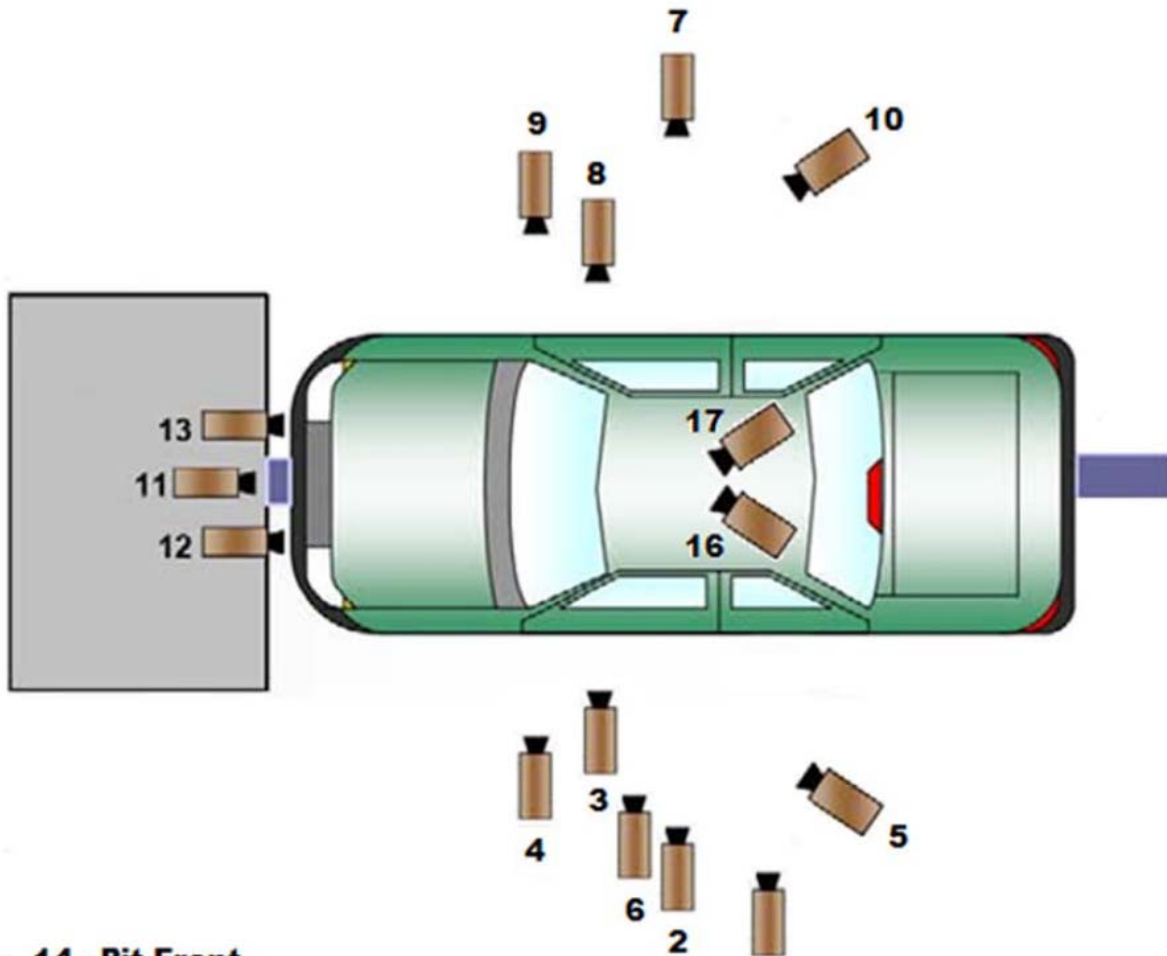
DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

CAMERA POSITIONS FOR FRONTAL IMPACTS



14 - Pit Front

15 - Pit Rear

16 & 17 - Driver and Passenger Onboard

1- Real Time Camera

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

DATA SHEET NO. 6 ... (CONTINUED)**HIGH-SPEED CAMERA LOCATIONS AND DATA**Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20**CAMERA LOCATIONS**

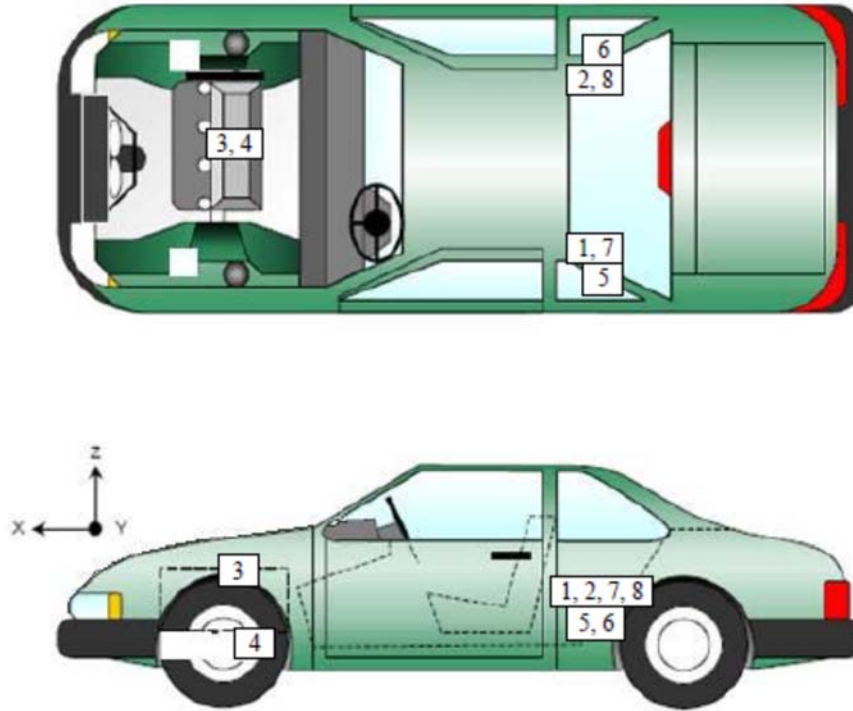
No.	Description	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-11412	-8150	-1484		30
2	Left Overall	-2456	-7975	-1025	20	1000
3	Driver Close-Up	-2590	-7950	-1371	50	1000
4	Left Front Half	-1701	-6197	-1701	35	1000
5	Left Angle	-6696	-10308	-3211	105	1000
6	Steering Column	-1966	-10412	-3688	35	1000
7	Right Overall	-2336	7569	-1012	20	1000
8	Passenger Close-Up	-1733	7581	-1408	50	1000
9	Right Front Half	-1600	8214	-1811	35	1000
10	Right Angle	-6217	9516	-4830	85	1000
11	Windshield	-354	0	-5749	28	1000
12	Driver Windshield	297	-366	-2460	24	1000
13	Passenger Windshield	297	366	-2460	24	1000
14	Pit Front	-756	0	1495	20	1000
15	Pit Rear	-3398	0	1495	20	1000
16	Driver Onboard	-1100	-370	-1520	8	1000
17	Passenger Onboard	-1100	370	-1520	8	1000

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

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Accelerometer X-Direction	1460	-665	-435
2	Right Rear Accelerometer X-Direction	1465	665	-435
3	Engine Top X	3770	320	-915
4	Engine Bottom X	3820	15	-530
5	Left Rear Accelerometer Z-Direction	1460	-665	-435
6	Right Rear Accelerometer Z-Direction	1465	665	-435
7	Left Rear Accelerometer X-Direction Redundant	1460	-665	-435
8	Right Rear Accelerometer X-Direction Redundant	1465	665	-435

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

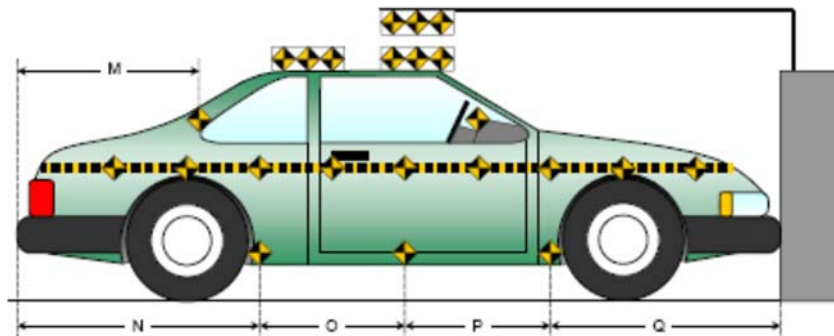
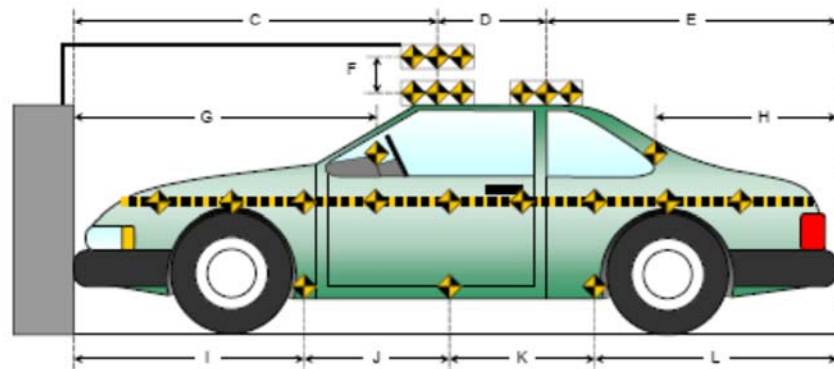
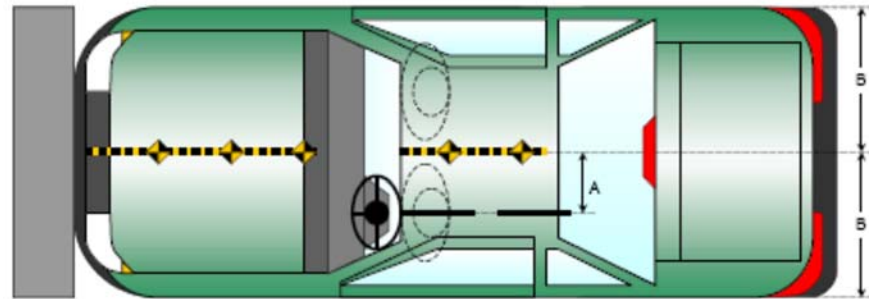
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

Item	Value
A	N/A
B	953
C	N/A
D	610
E	1770
F	N/A
G	1885
H	525
I	1375
J	928
K	928
L	1458
M	525
N	1458
O	928
P	928
Q	1375



All measurements in millimeters.

DATA SHEET NO. 9

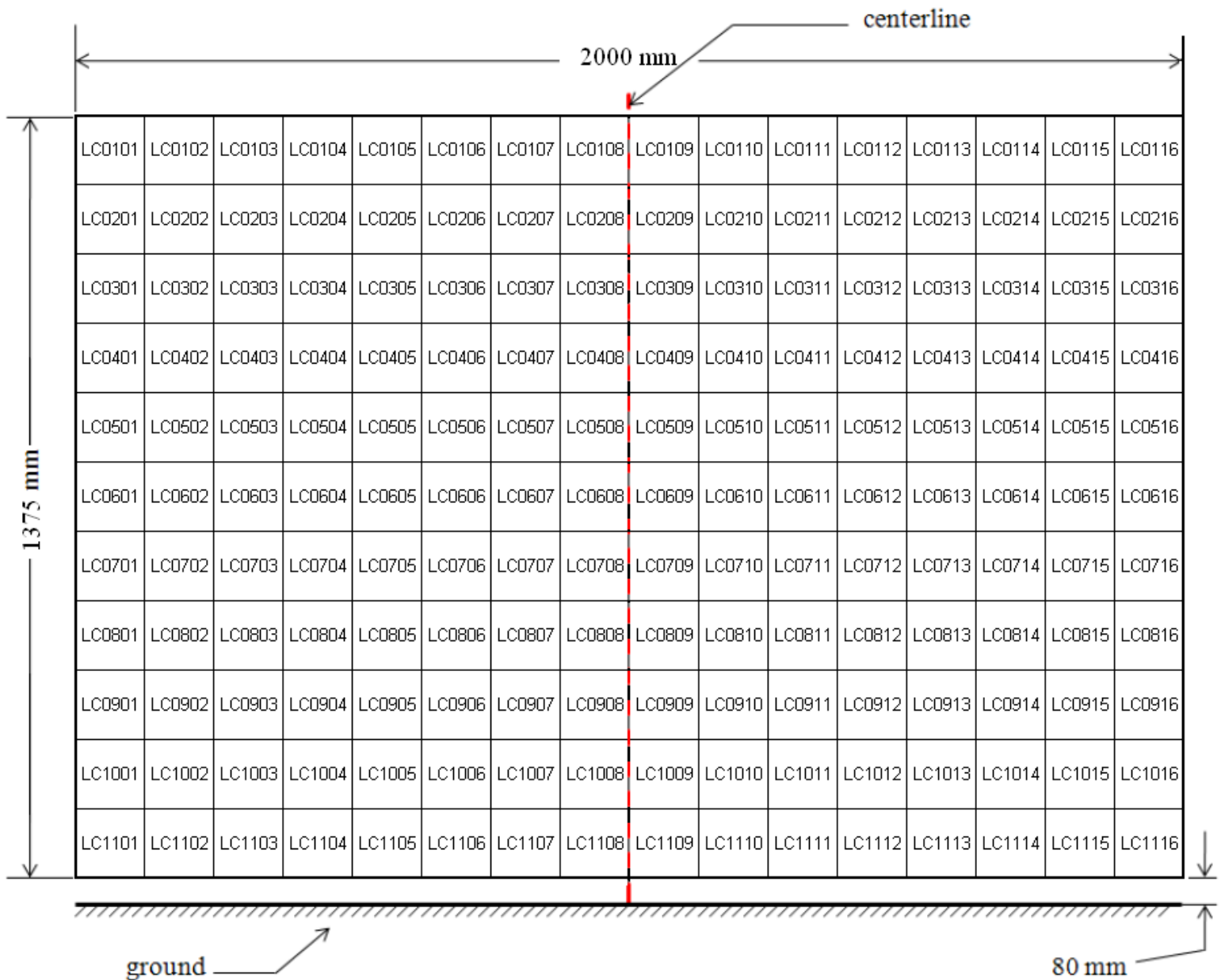
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV

NHTSA No.: M20205903

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/21/20



DATA SHEET NO. 10**TEST VEHICLE SUMMARY OF RESULTS**Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20**INSTRUMENTATION**

Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	8
Seat Belt Load Cells	4
Load Cell Barrier	528
Total	634

CAMERA COVERAGE

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

DATA SHEET NO. 11

POST-TEST OBSERVATIONS

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type/Serial No.	P572E 50th Percentile Male ATD / 360	P572O 5th Percentile Female ATD / 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	Knee Bolster

DOOR OPENING, TRUNK 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
Trunk/Hatch/Tailgate Opening	None	None
Seat Track Shift (mm)	0	5
Seat Back Movement from Initial Position	None	None

OTHER VEHICLE POST-TEST OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

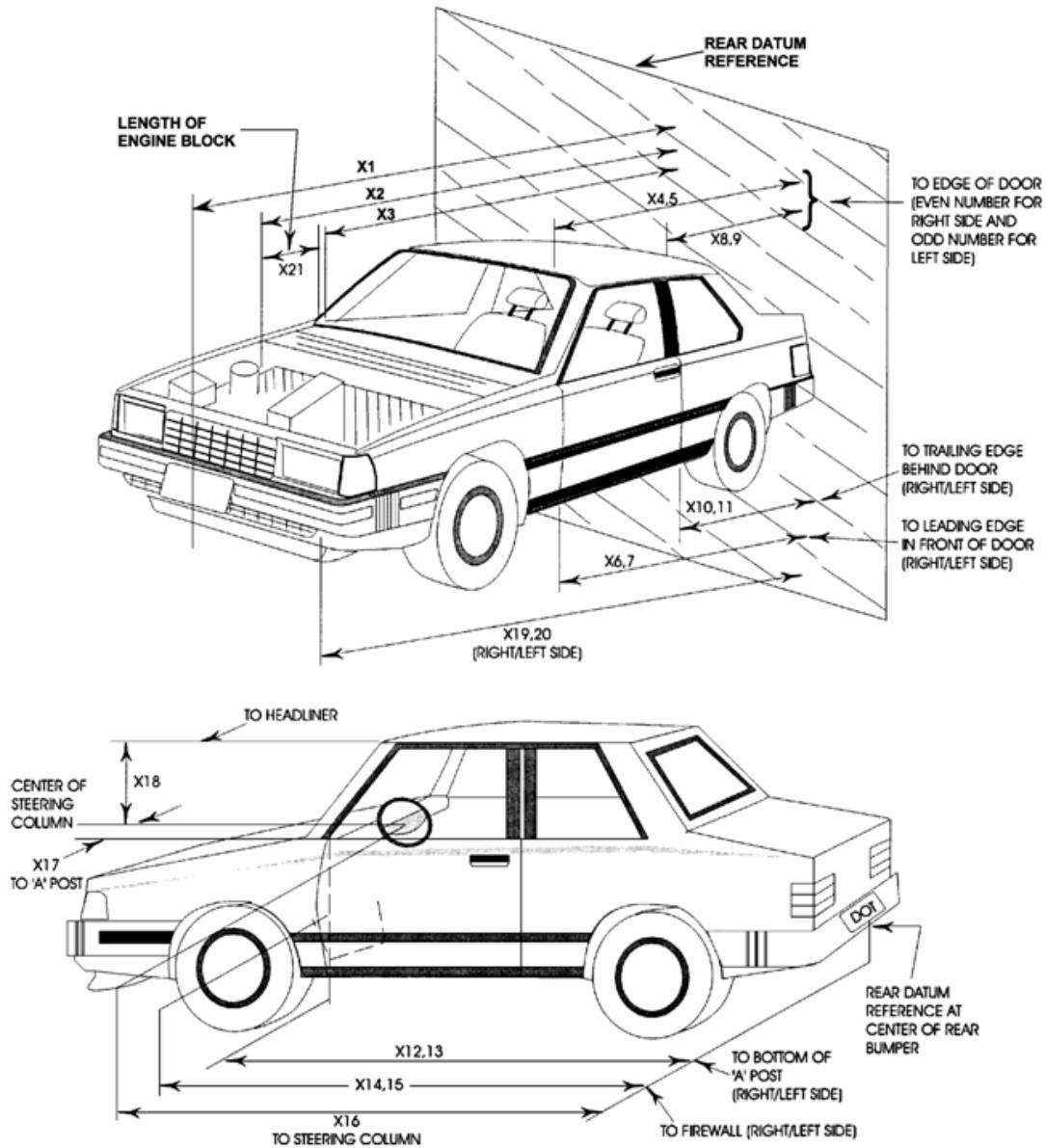
Measured Parameter	Units	Value
Left Side	mm	2071
Center	mm	2051
Right Side	mm	2081
Average	mm	2068

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20



DATA SHEET NO. 12 ... (CONTINUED)**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4693	4133	-560
2	Rear Surface of Vehicle to Front of Engine	4158	3930	-228
3	RSOV to Firewall	3698	3687	-11
4	RSOV to Upper Leading Edge of Right Door	3205	3205	0
5	RSOV to Upper Leading Edge of Left Door	3205	3185	-20
6	RSOV to Lower Leading Edge of Right Door	3195	3200	5
7	RSOV to Lower Leading Edge of Left Door	3193	3180	-13
8	RSOV to Upper Trailing Edge of Right Door	2060	2080	20
9	RSOV to Upper Trailing Edge of Left Door	2040	2060	20
10	RSOV to Lower Trailing Edge of Right Door	2130	2150	20
11	RSOV to Lower Trailing Edge of Left Door	2127	2120	-7
12	RSOV to Bottom of A-Pillar, Right Side	3119	3130	11
13	RSOV to Bottom of A-Pillar, Left Side	3116	3105	-11
14	RSOV to Firewall, Right Side	3683	3615	-68
15	RSOV to Firewall, Left Side	3683	3597	-86
16	RSOV to Steering Column	2860	2730	-130
17	Center of Steering Column to A-Pillar	450	410	-40
18	Center of Steering Column to Headliner	455	520	65
19	RSOV to Right Side of Front Bumper	3980	3910	-70
20	RSOV to Left Side of Front Bumper	3983	3930	-53
21	Length of Engine Block	600	600	0
RD	RSOV to Right Side of Dash Panel	2770	2820	50
CD	RSOV to Center of Dash Panel	2660	2720	60
LD	RSOV to Left Side of Dash Panel	2785	2790	5

All measurements in millimeters.

DATA SHEET NO. 13**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

VEHICLE INFORMATION

VIN: YV4102RK4L1488417 Wheelbase (mm): 2860
Vehicle Size Category: MPV Test Weight (kg): 2106.5

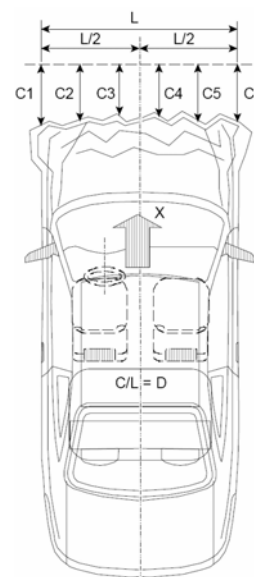
ACCELEROMETER DATA

Accelerometer Locations: Left Rear Crossmember
Cal. Procedure/Interval: Vibration Test / 6 months
Integration Algorithm: NHTSA Standard
Impact Velocity (km/h): 56.71
Velocity Change (km/h): 65.0
Time of Separation (msec): 78.1

Linearity: Good

CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1463
Impact Mode: Full Frontal



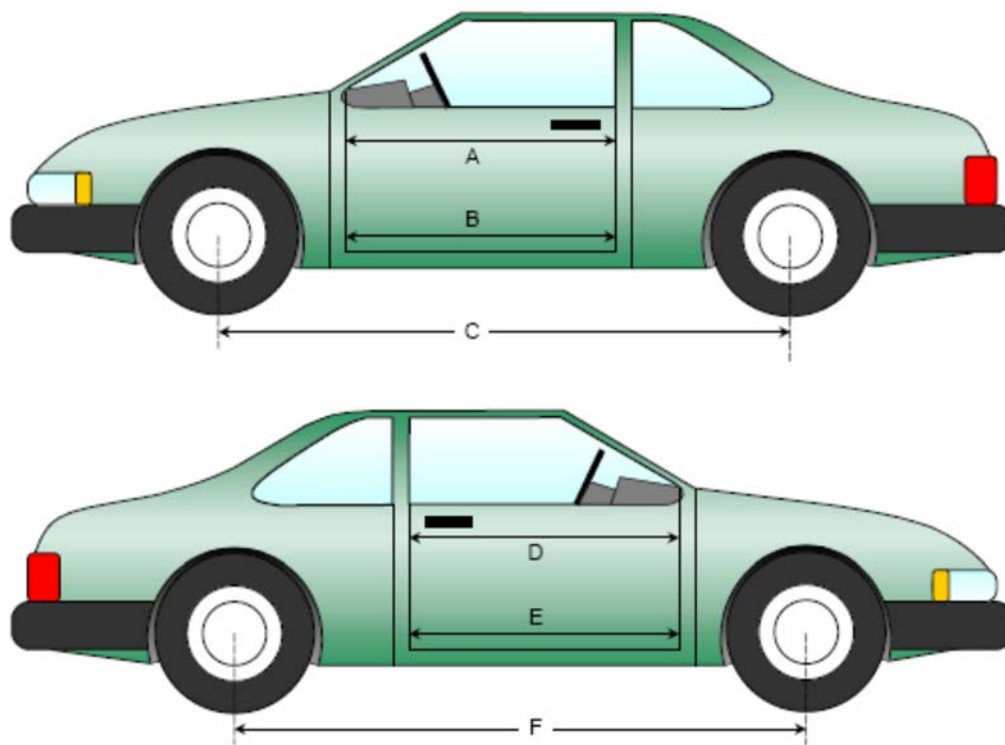
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	200	660	460
C2	Crush Zone 2 at Left Side	mm	40	590	550
C3	Crush Zone 3 at Left Side	mm	30	530	500
C4	Crush Zone 4 at Right Side	mm	30	565	535
C5	Crush Zone 5 at Right Side	mm	40	580	540
C6	Crush Zone 6 at Right Side	mm	200	640	440
L	C1 to C6	mm	1463		

DATA SHEET NO. 14**VEHICLE INTRUSION MEASUREMENTS**Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPVNHTSA No.: M20205903Test Program: 56.3 km/h Frontal Impact NCAP TestTest Date: 01/21/20**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	990	985	5
B	Left Side Lower	mm	943	940	3
D	Right Side Upper	mm	988	990	-2
E	Right Side Lower	mm	907	925	-18

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2860	2780	80
F	Right Side Wheelbase	mm	2860	2780	80



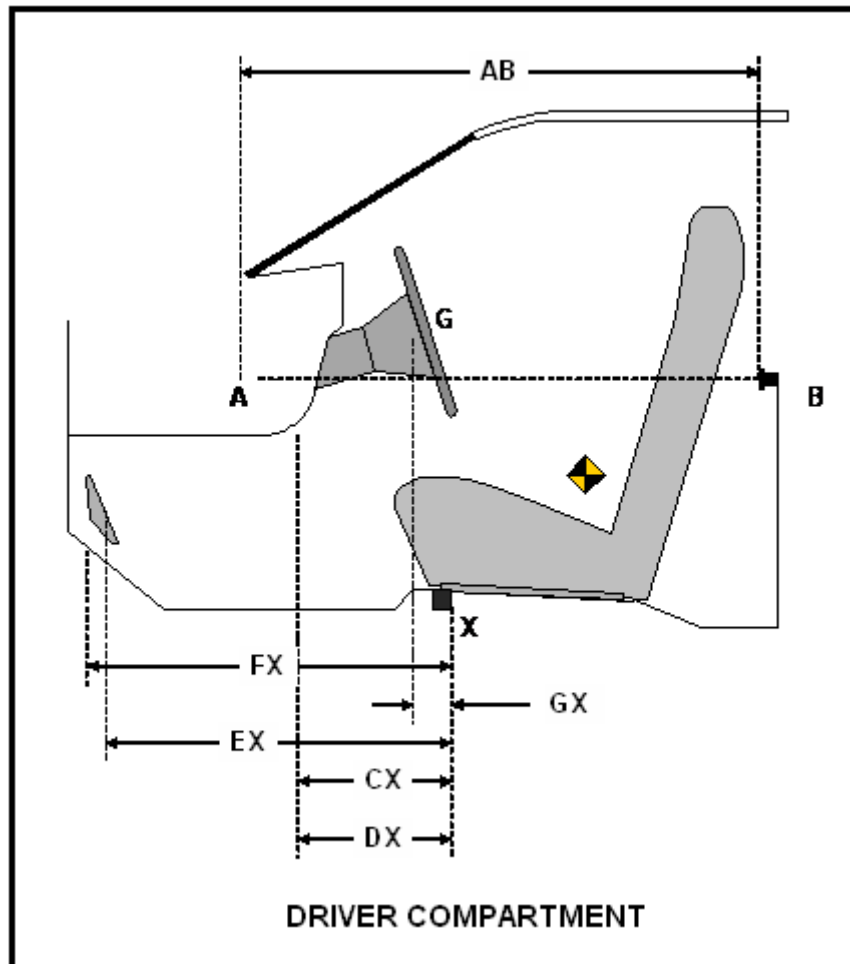
DATA SHEET NO. 14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	845	845	0
CX	Left Knee Bolster to X	mm	395	350	45
DX	Right Knee Bolster to X	mm	365	340	25
EX	Brake Pedal to X	mm	560	590	-30
FX	Foot Rest to X	mm	610	580	30
GX	Center of Steering Wheel Hub to X	mm	140	140	0

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

SUMMARY OF INDICANT FMVSS 212 AND 219 (PARTIAL) DATA

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

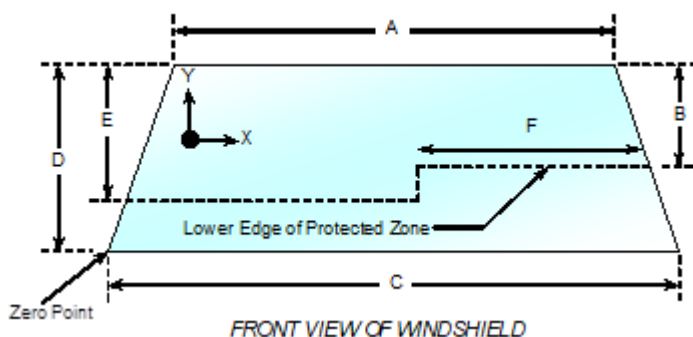
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber molding and rubber cement.

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

Temperature of windshield molding during test: 21.3° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2315	2315	100.0%
Right Side	2315	2315	100.0%
Total	4630	4630	100.0%



Item	Units	Value
A	mm	1250
B	mm	380
C	mm	1450
D	mm	965
E	mm	490
F	mm	595

AREAS OF PROTECTED ZONE FAILURES

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

X	Y

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

X	Y

DATA SHEET NO. 16

FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS

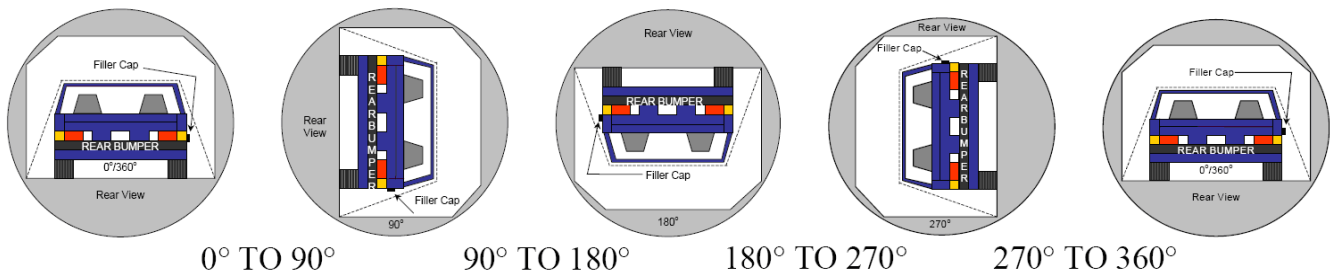
Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 6.7° C Test Time: 2:08 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.



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard solvent spillage: There was no Stoddard solvent spillage.

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	82	300	382
90° To 180°	81	300	381
180° To 270°	82	300	382
270° To 360°	77	300	377

DATA SHEET NO. 16 ... (CONTINUED)**FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS**Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20**FMVSS 301 SPILLAGE TABLE**

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

SOLVENT SPILLAGE LOCATION TABLE

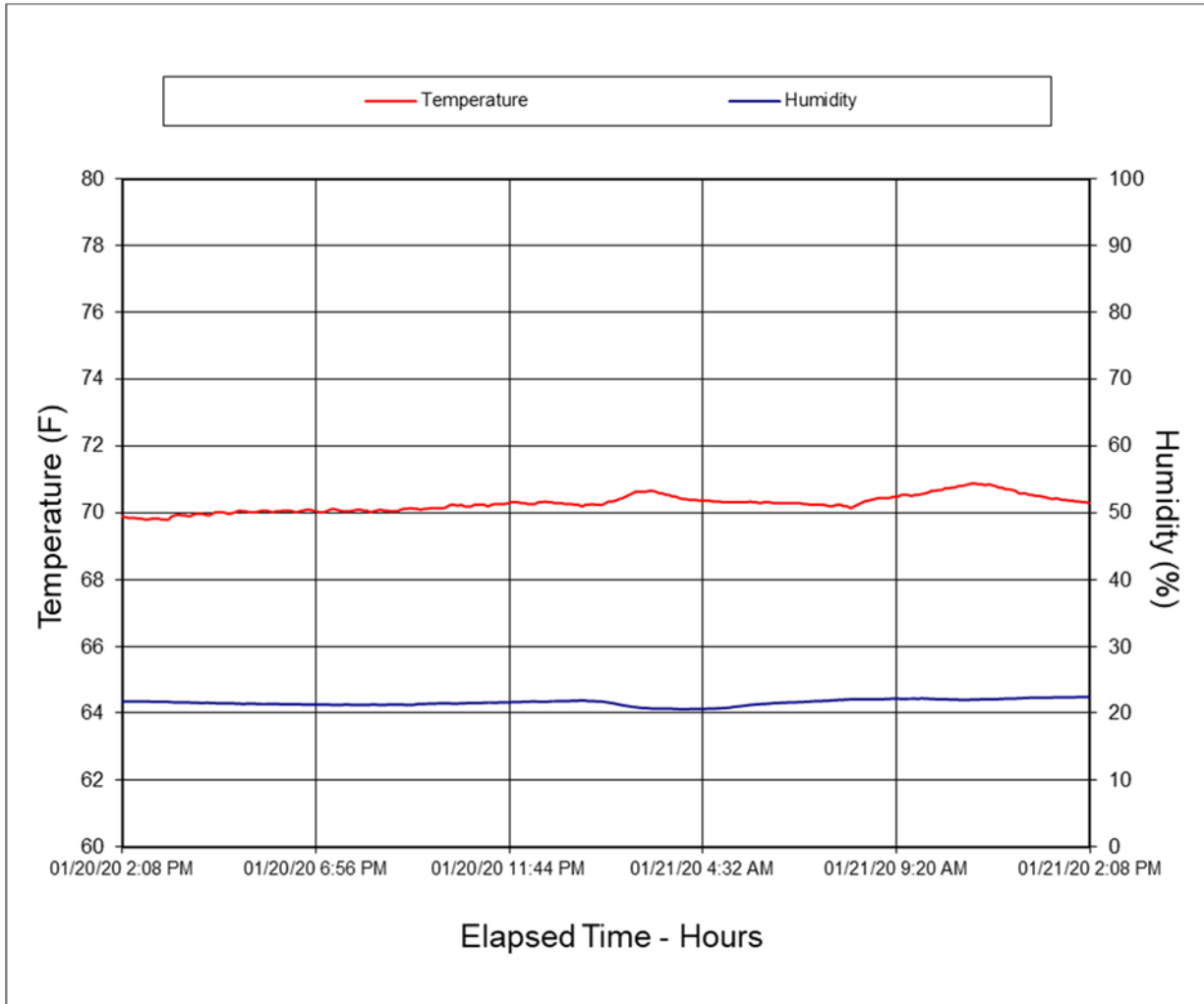
Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 17

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV NHTSA No.: M20205903

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/21/20



APPENDIX A
PHOTOGRAPHIC DOCUMENTATION

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FIGURE 1. Load Cell Location

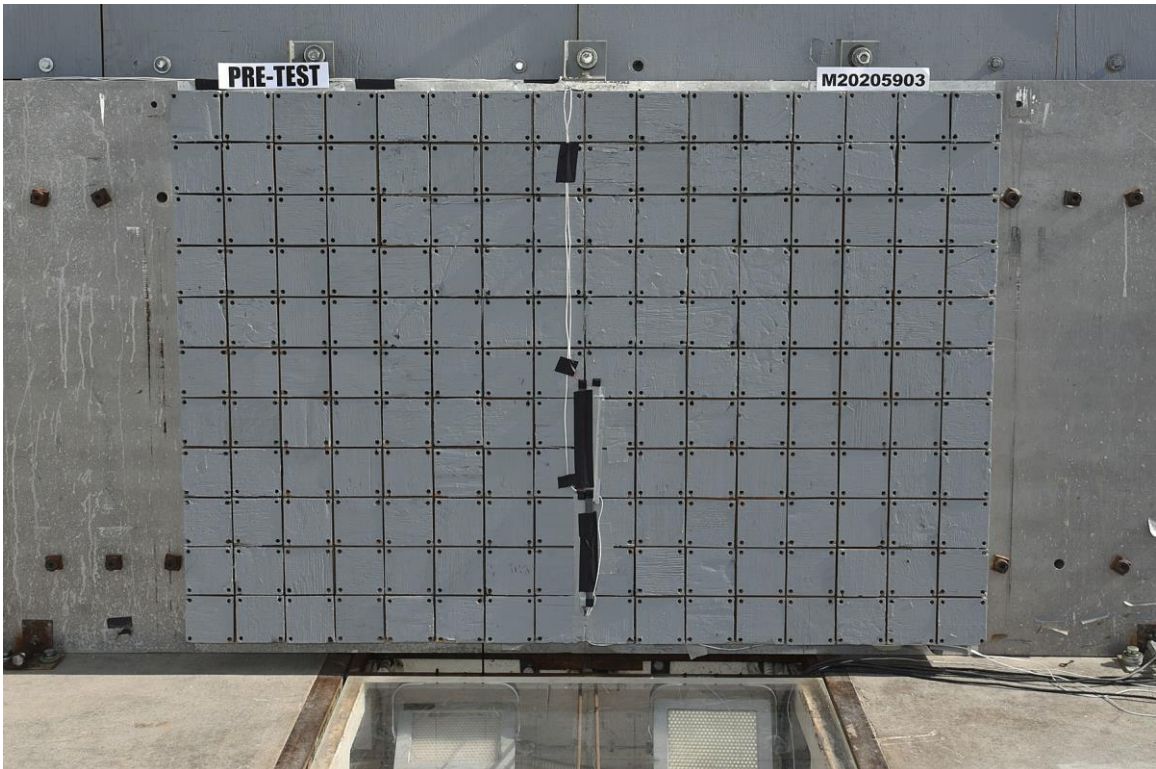


FIGURE 2. Pre-Test Load Cell Wall



FIGURE 3. Post-Test Load Cell Wall

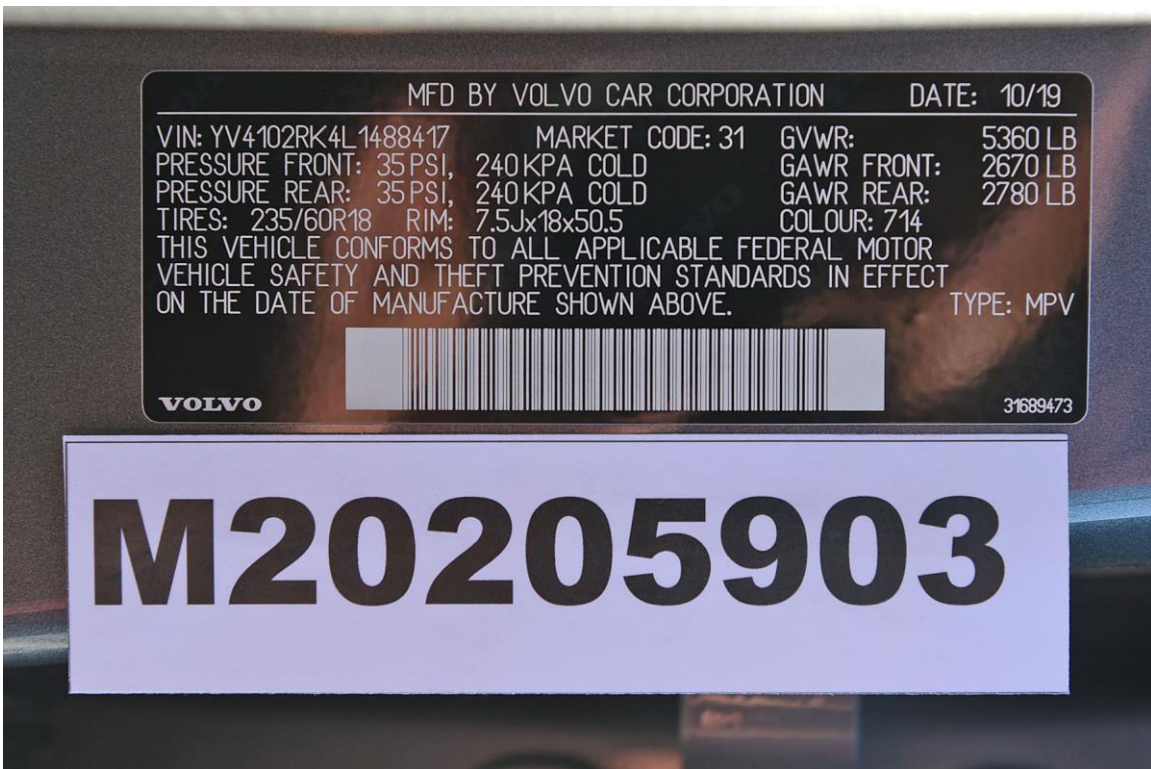


FIGURE 4. Manufacturer's Label

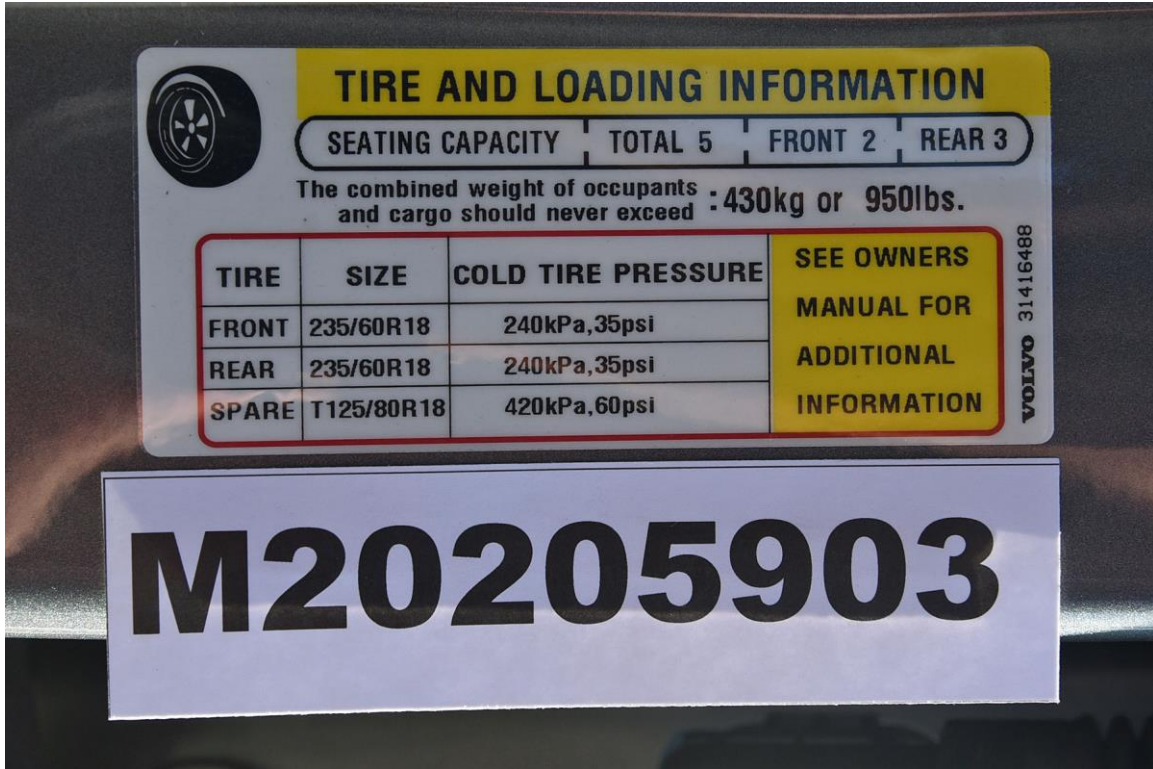


FIGURE 5. Tire Placard



FIGURE 6. 2020 Volvo XC60 T5 AWD Frontal as Delivered



FIGURE 7. Left Rear $\frac{3}{4}$ View, as Received



FIGURE 8. Pre-Test Front View of Test Vehicle



FIGURE 9. Post-Test Front View of Test Vehicle



FIGURE 10. Pre-Test Left View of Test Vehicle



FIGURE 11. Post-Test Left View of Test Vehicle



FIGURE 12. Pre-Test Right View of Test Vehicle



FIGURE 13. Post-Test Right View of Test Vehicle



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



FIGURE 15. Post-Test Right Front $\frac{3}{4}$ View



FIGURE 16. Pre-Test Left Rear $\frac{3}{4}$ View



FIGURE 17. Post-Test Left Rear $\frac{3}{4}$ View



FIGURE 18. Pre-Test Windshield View



FIGURE 19. Post-Test Windshield View



FIGURE 20. Pre-Test Engine Compartment View



FIGURE 21. Post-Test Engine Compartment View



FIGURE 22. Pre-Test Fuel Filler Cap View



FIGURE 23. Post-Test Fuel Filler Cap View

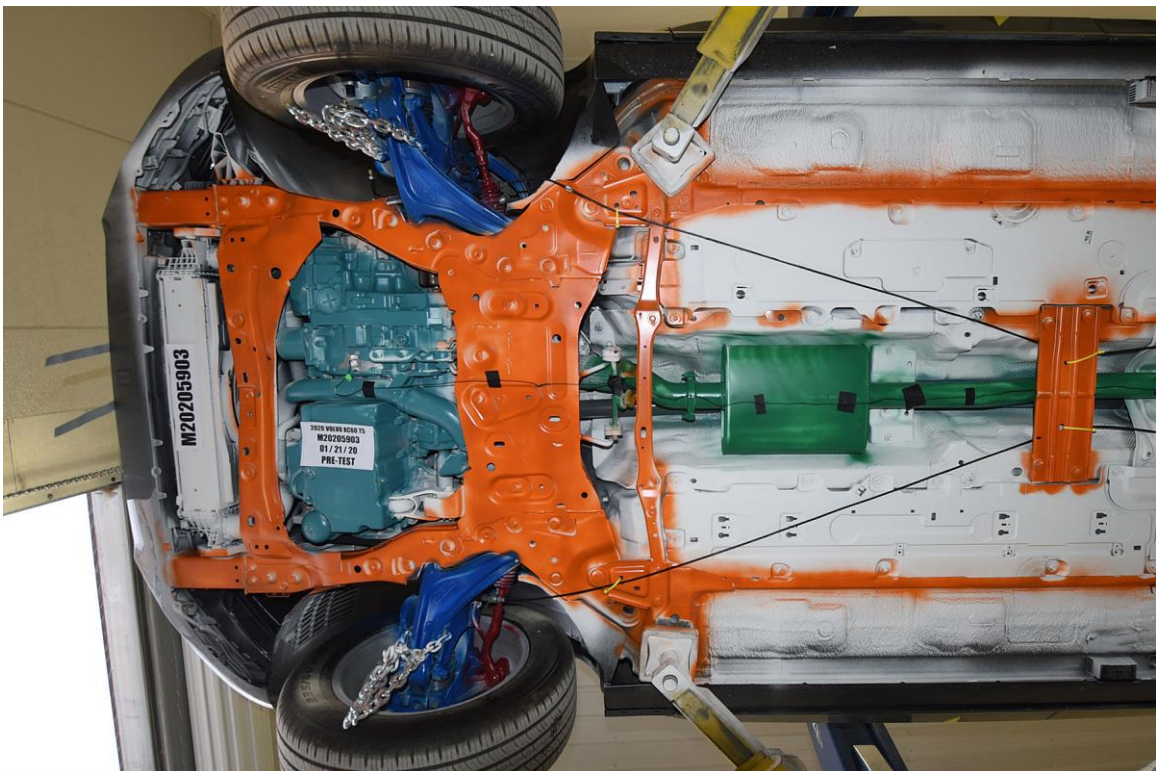


FIGURE 24. Pre-Test Front Underbody View

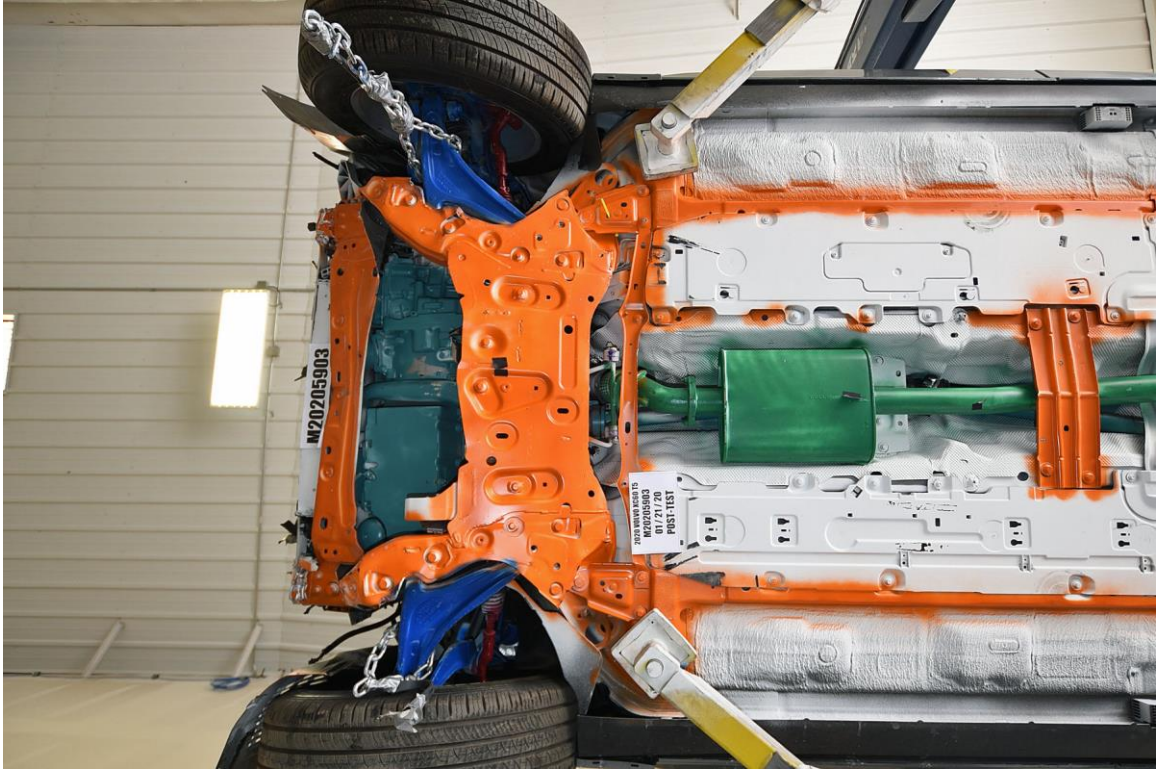


FIGURE 25. Post-Test Front Underbody View

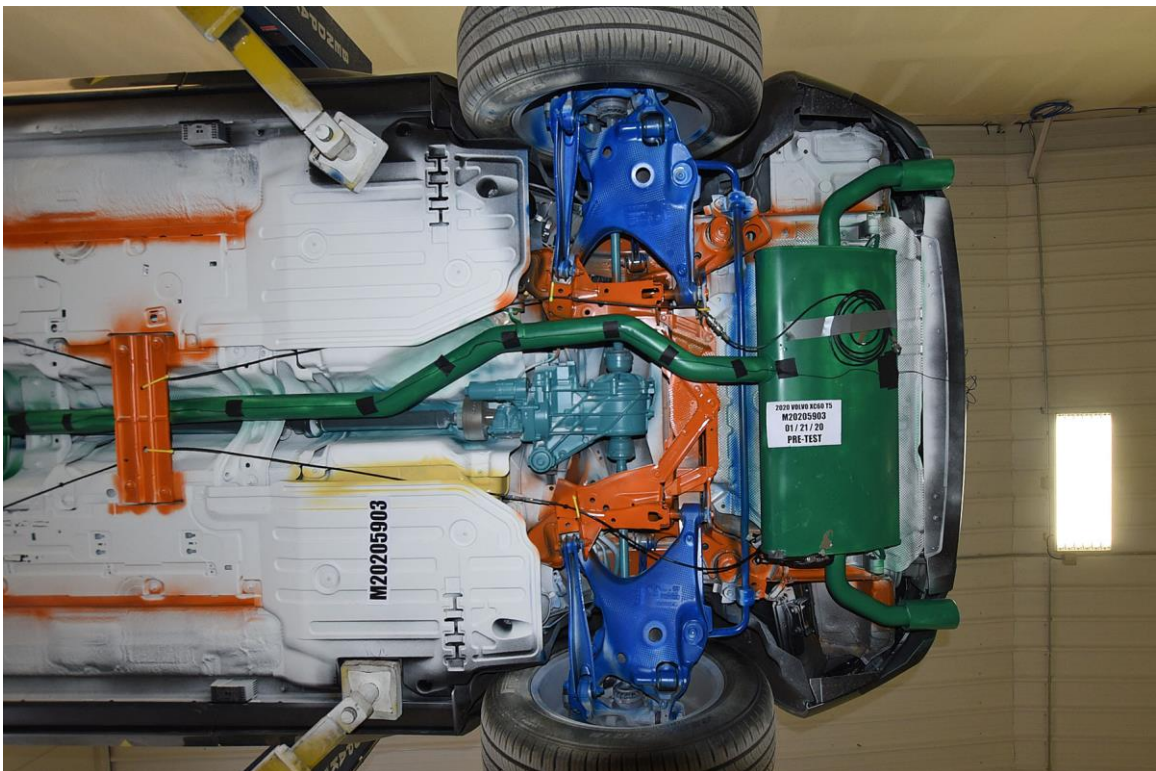


FIGURE 26. Pre-Test Rear Underbody View

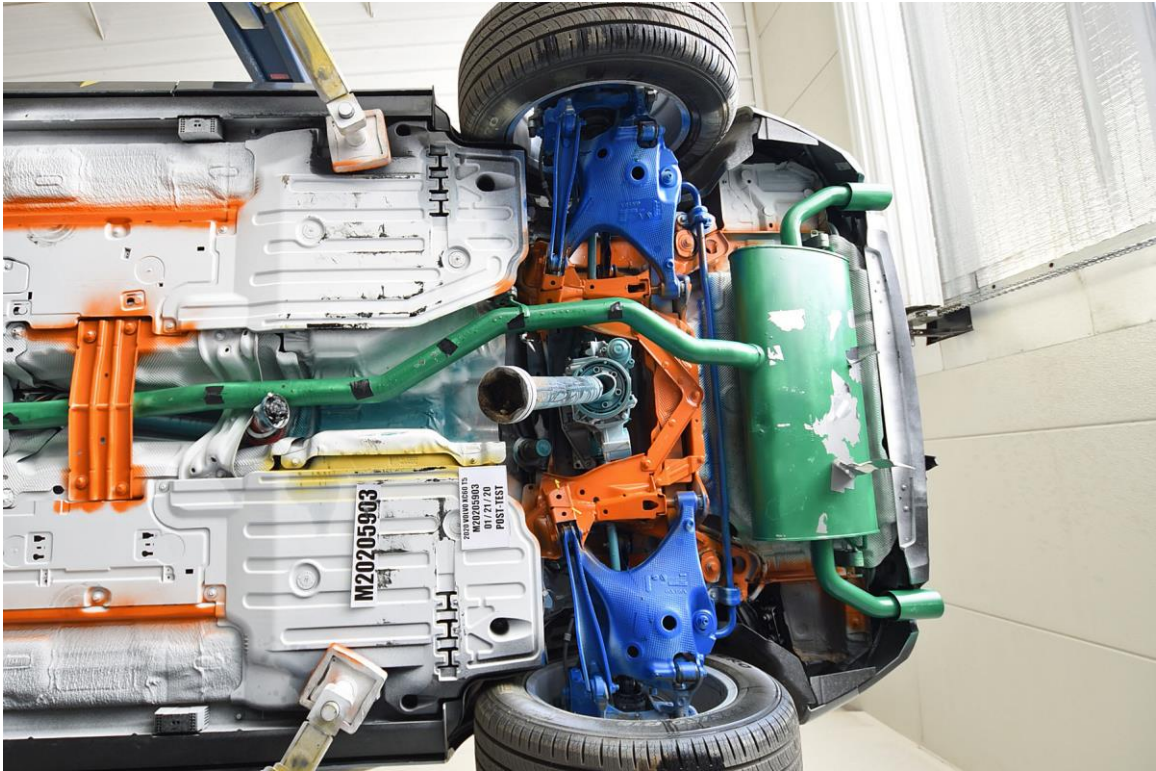


FIGURE 27. Post-Test Rear Underbody View



FIGURE 28. Pre-Test Dummy Cable Routing



FIGURE 29. Post-Test Dummy Cable Routing



FIGURE 30. Pre-Test Driver Dummy Front View



FIGURE 31. Post-Test Driver Dummy Front View



FIGURE 32. Pre-Test Driver Dummy Window View



FIGURE 33. Post-Test Driver Dummy Window View



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



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



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



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



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



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



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



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



FIGURE 42. Pre-Test Driver Dummy Feet



FIGURE 43. Post-Test Driver Dummy Feet

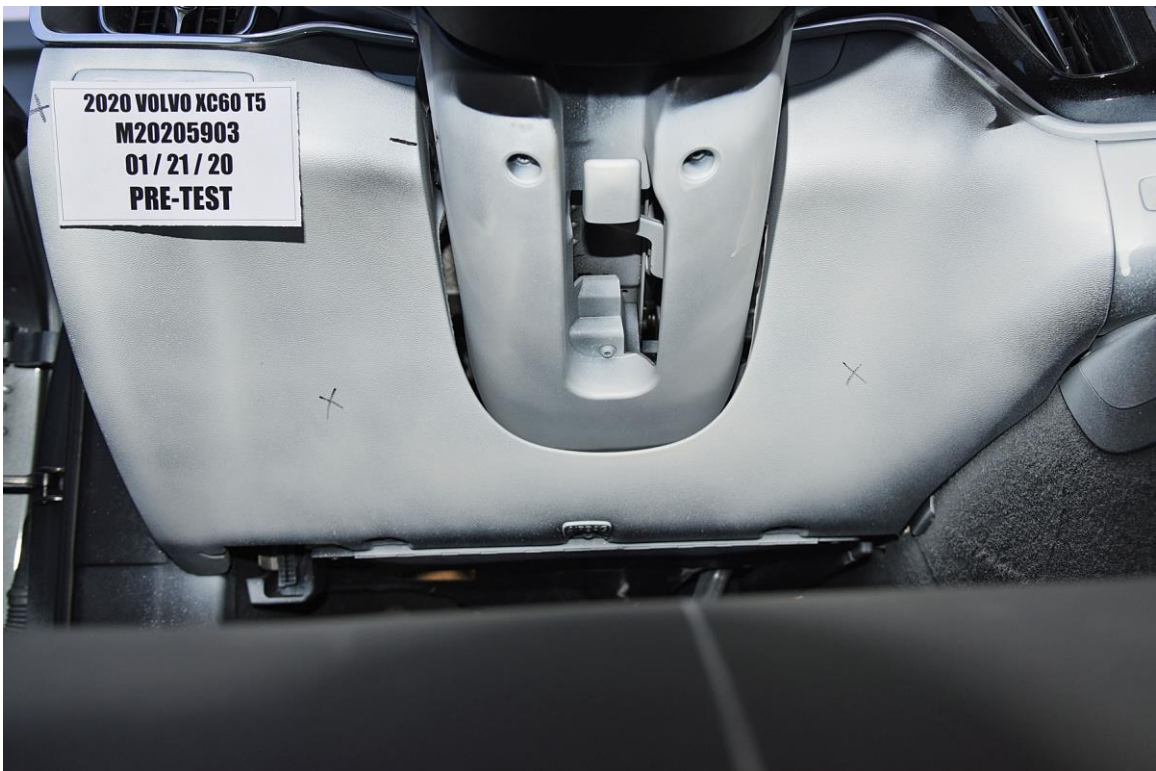


FIGURE 44. Pre-Test Driver's Side Knee Bolster



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



FIGURE 46. Pre-Test Driver's Side Floorpan



FIGURE 47. Post-Test Driver's Side Floorpan



FIGURE 48. Post-Test Driver Dummy Face



FIGURE 49. Post-Test Driver Dummy Contact with Airbag



FIGURE 50. Post-Test Driver Dummy Contact with Headrest



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



FIGURE 51. Pre-Test View of the Steering Wheel



FIGURE 52. Post-Test View of the Steering Wheel



FIGURE 53. Pre-Test Passenger Dummy Front View



FIGURE 54. Post-Test Passenger Dummy Front View



FIGURE 55. Pre-Test Passenger Dummy Window View



FIGURE 56. Post-Test Passenger Dummy Window View



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



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



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



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



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



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



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



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

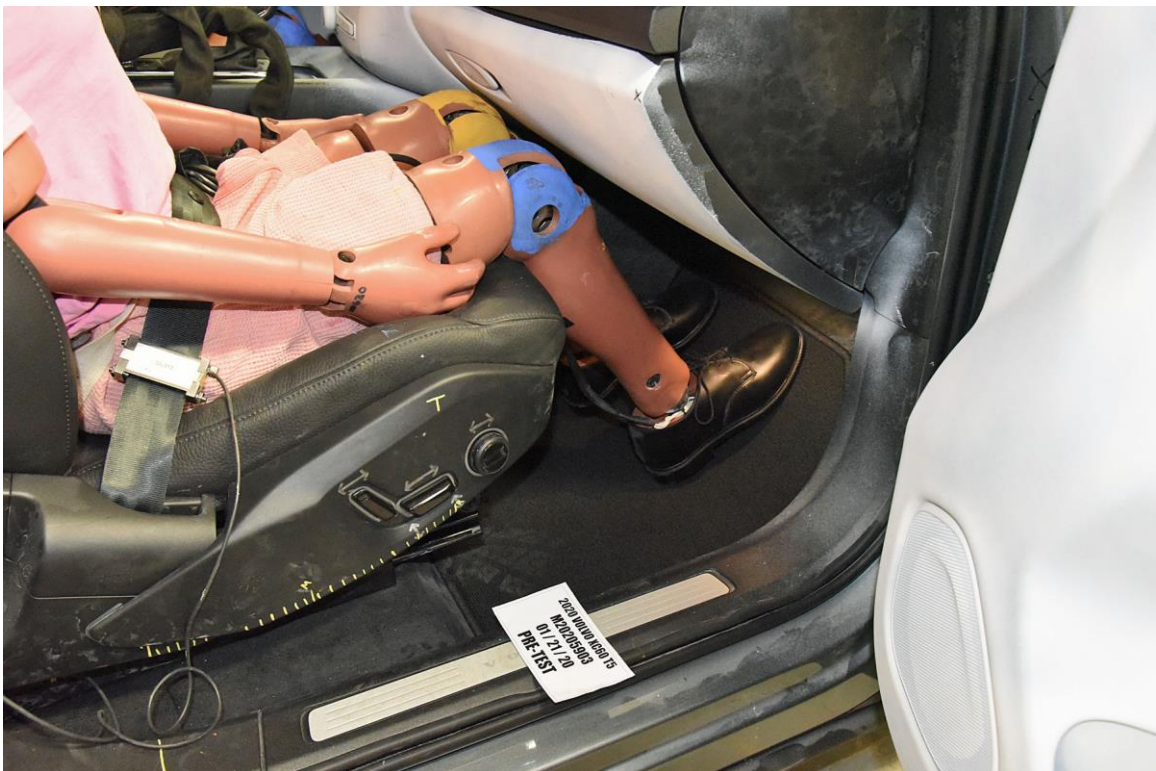


FIGURE 65. Pre-Test Passenger Dummy Feet



FIGURE 66. Post-Test Passenger Dummy Feet



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



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



FIGURE 69. Pre-Test Passenger's Side Floorpan



FIGURE 70. Post-Test Passenger's Side Floorpan



FIGURE 71. Post-Test Passenger Dummy Face



FIGURE 72. Post-Test Passenger Dummy Contact with Airbag



FIGURE 73. Post-Test Passenger Dummy Contact with Headrest



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

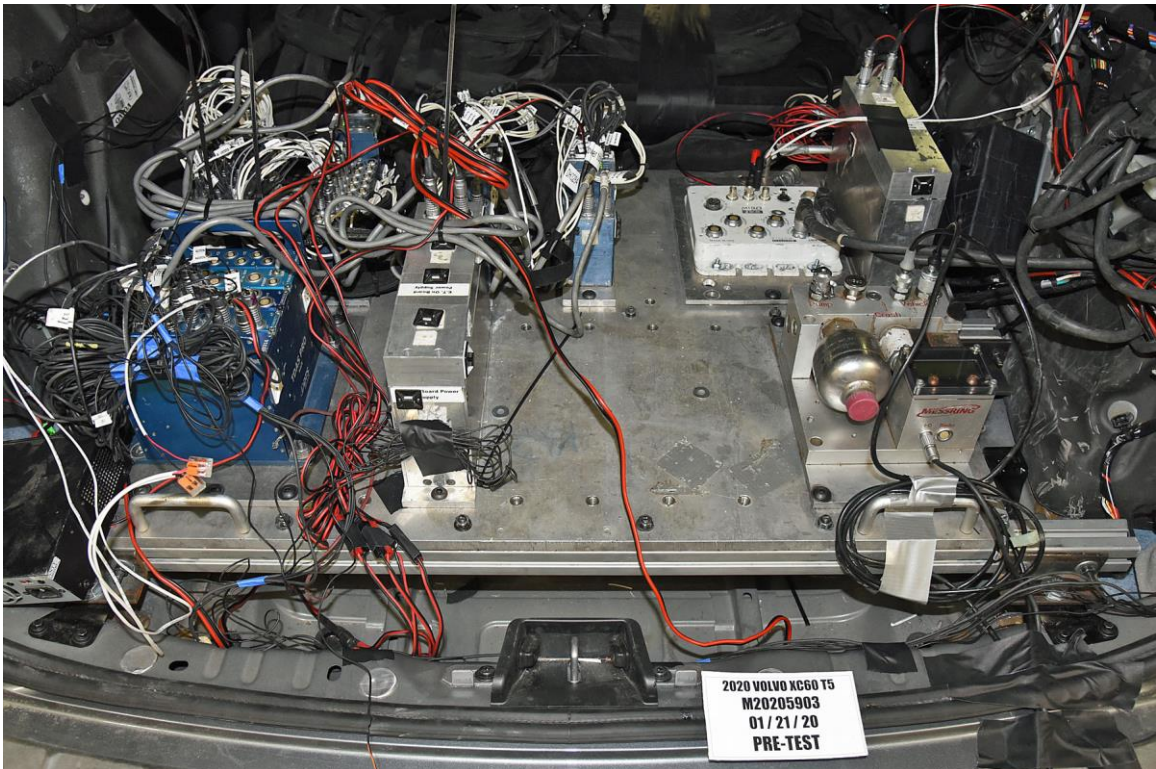


FIGURE 74. Photograph of Ballast Installed in Vehicle

Photograph Not Applicable

No Stoddard Solvent Spillage

FIGURE 75. Post-Test Stoddard Solvent Spillage Location View



FIGURE 76. Post-Test Speed Trap Read-Out



FIGURE 77. Vehicle at 0° on Static Rollover Device

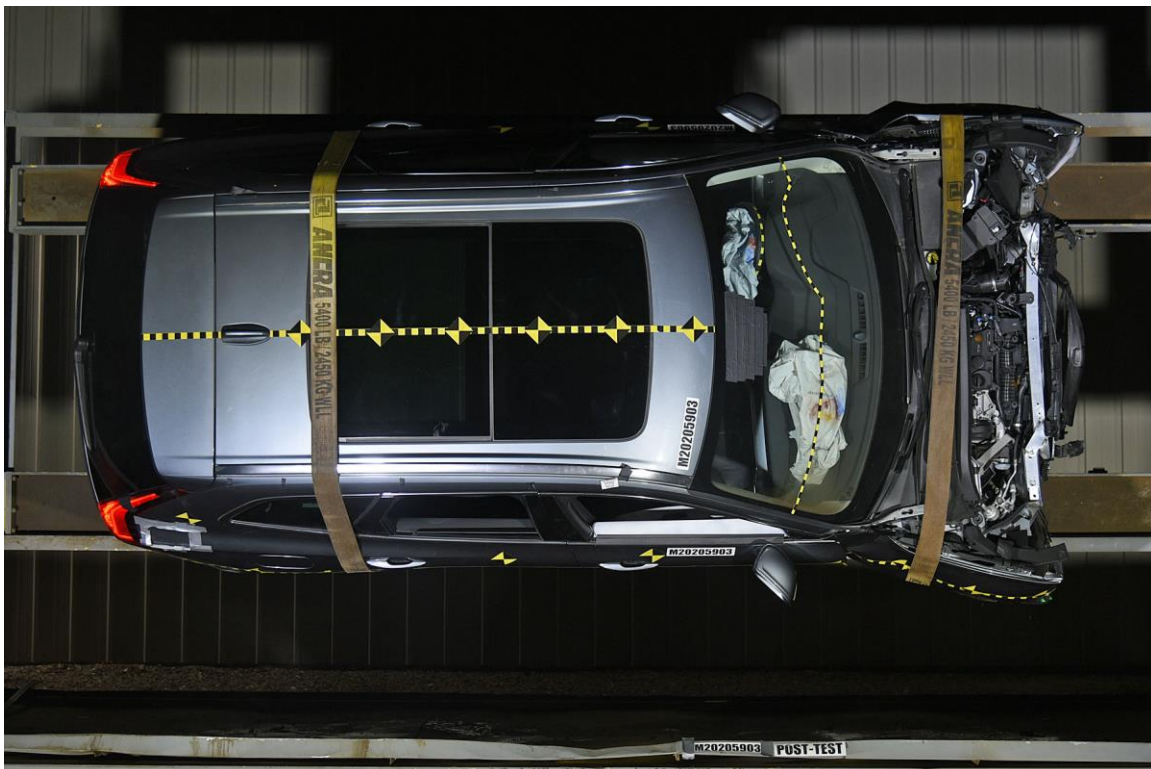


FIGURE 78. Vehicle at 90° on Static Rollover Device

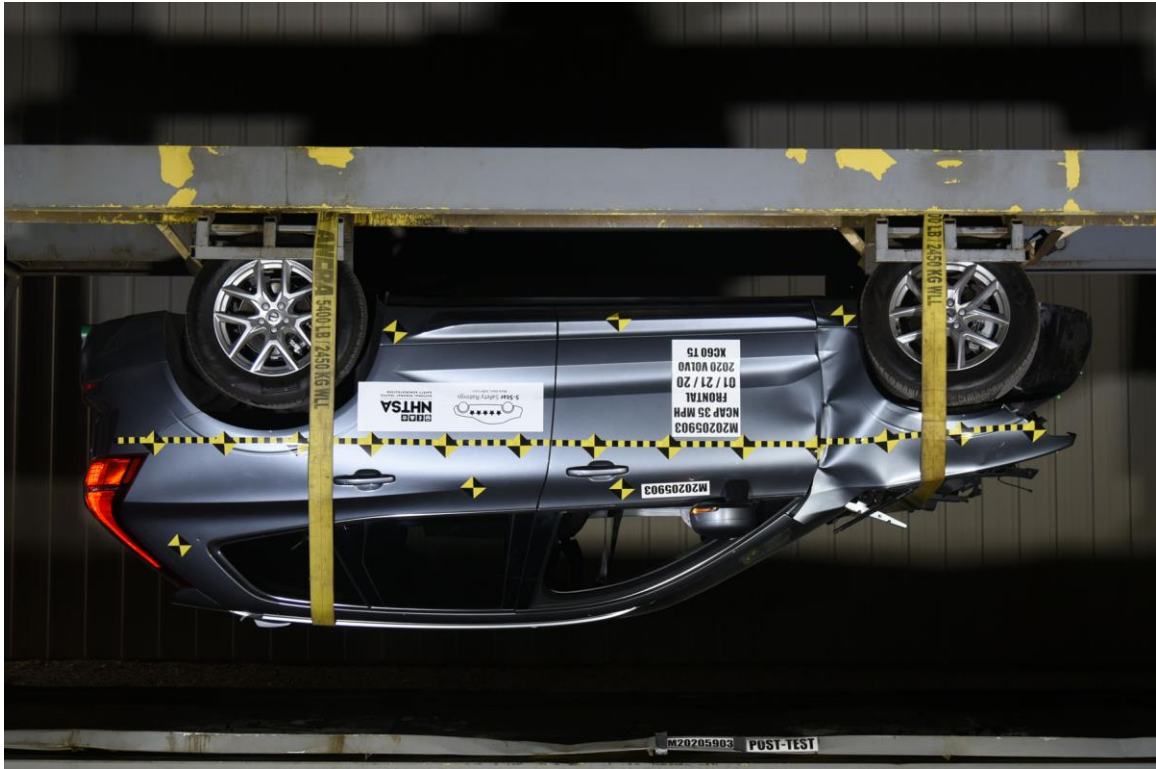


FIGURE 79. Vehicle at 180° on Static Rollover Device

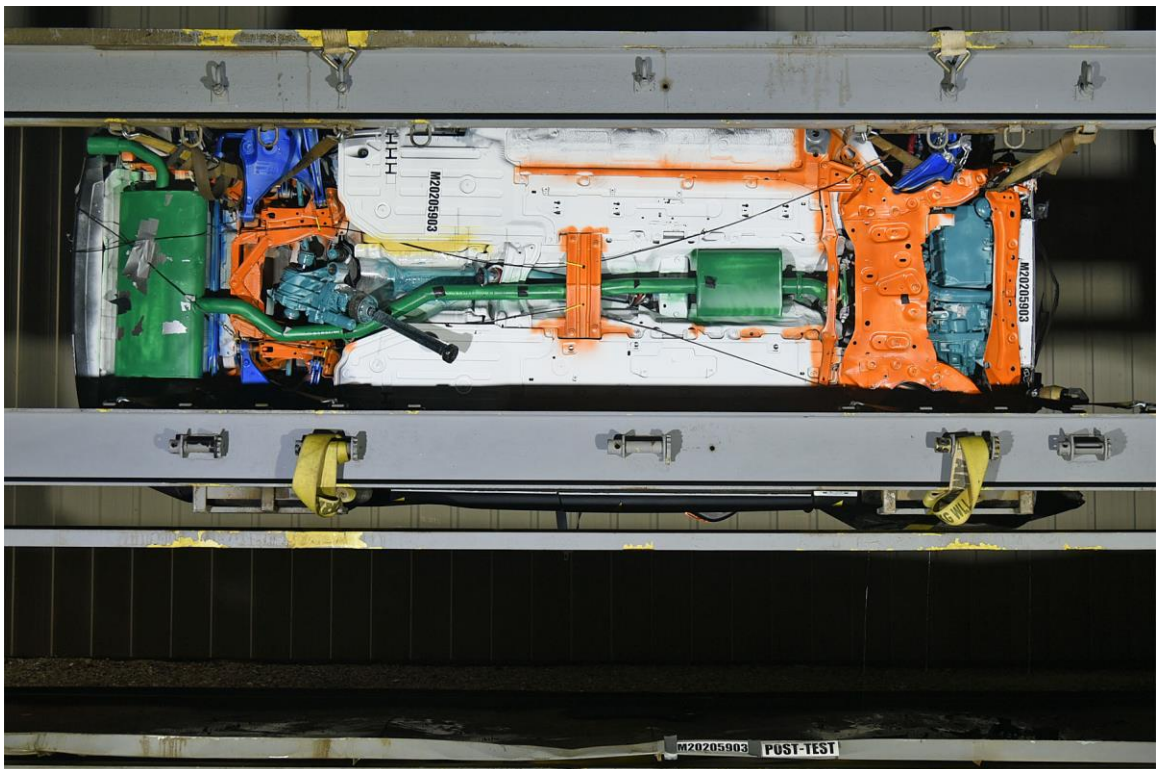


FIGURE 80. Vehicle at 270° on Static Rollover Device



FIGURE 81. Vehicle at 360° on Static Rollover Device



FIGURE 82. 2020 Volvo XC60 T5 AWD Frontal Impact Event

XC60 T5 AWD MOMENTUM

PERFORMANCE

2.0L Turbo-Charged, Direct Inject Engine
250 HP @ 5500 RPM and 258 lb-ft Torque @ 1500 RPM
3-Speed Overdrive Automatic Transmission w/ Start/Stop
All Wheel Drive with Instant Traction
Pneumatic Windows Front & Integrated 18" Rear Spoiler
Anti-Lock Braking System (ABS) w/ Hill Start Assist
Advanced Electronic Stability Control (ESC)
Electric Power Assisted Steering
18" Alloy Wheels with 48 Season Tires
Dynamic Chassis & Adjustable Drive Mode Settings

AUDIO & TECHNOLOGY

9" Integrated Sensus Connect Touchscreen Infot.
WiFi Internet and Complimentary Test Subscription
Smartphone Integration (Apple CarPlay/Android Auto)
12.3" Digital Driver Display
Volvo On Call with 4-Ti Complimentary Subscription
incl. Mobile App w/ Remote Start
220W High Performance Audio System w/ 10 Speakers
HD Radio / 2 LCD Tunes
Bluetooth Handsfree w/ Audio Streaming
SensusM Studio w/ 3 month Test Subscription

SAFETY & SECURITY

Collision Avoidance by City Safety
Detects Vehicle/Pedestrian/Cyclist/Large Animal
Run-off Road Protection & Run-off Road Mitigation
Lane Keeping Aid & Occupant Lane Mitigation
Rear Park Assist & Rear Park Assist Camera
360° Sign Information
Supplemental Restraint System (Airbags)
Driver Adaptive & Front Pass Dual Stage, Driver
Knee, Side/Inflatable Head Curtain (Side Impact),
Inflatable Curtain Head Side-Inflatable (Side, Head)
Sole Impact Protection System (SIPS)
Whiplash Protection System (WHIPS) in Front Seats
Unibody High Strength Steel Safety Cage
Five, 3-Point Safety Belts w/ Pretensioners
Lower Anchors and Tethers for Child Seats
Child Safety Locks in Rear Doors
Hill Descent Control
LED Headlights w/ Thor's Hammer OR, & Auto Highbeam

LUXURY & CONVENIENCE

Laminated Panoramic Moonroof w/ Power Sunshade
Leather Upholstery Seating Surface
8-way Power Front Seats & Driver Seat Memory
Heated Front Seats
Split Folding Backrest with Load Through Hatch
Power Tailgate with Programmable Height
2-Zone Automatic Climate Control + ClimateZone
Tinted Windows, Rear & Cargo Bay
Dual Integrated Round Tailpipes
Volvo Aluminum 5-Ti Hubs
Leather Wrapped 78" & Telescopic Steering Wheel
Ivy On Aluminum Disc Brakes
Hidson Storage under Rear Seats
Aluminum Cargo Shelf Plate
Wipe-Downs with Integrated Washers
17V Power Outlet in Rear

AUTHORIZED RETAILER

NORTH TOWN VOLVO 3710
6185 MAIN ST
WILLIAMSVILLE, NY 14221

WARRANTY

48 Month/50,000 Mile Limited Warranty Coverage
144 Month Corrosion Protection "Unlimited Mileage"
Refer to Warranty Info Book for Specific Limitations
VOLVO On Call Roadside Assistance
Volvo Increased Protection: Ask Your Volvo Retailer
About an Extended Service Contract

MAINTENANCE

Complimentary Factory Scheduled Maintenance for the
First 3 Years or 36,000 Miles

PRICING

IMPORTER'S SUGGESTED LIST PRICE P.T.E.: \$45,450.00

Premium Package
Keyless Entry w/ Handsfree Tailgate Opening
Blind Spot Information System (BLIS) w/
Steer Assist & Cross Traffic Alert w/ Auto Brake
Front Park Assist
Automatically Dimmed Mirror & Color for Mirror
Power Retractable Rearview Mirror
HomeLink & Compass Integrated in Rearview Mirror
Power Folding Rear Headrests
Heated Rear Seats & Heated Steering Wheel 750.00
Metallic Paint 645.00
Bumper Cover* 135.00
Navigation System* 1,200.00
Protection Package* 315.00
Destination Charge 995.00
Total Suggested Retail Price: \$48,640.00

Fuel Economy and Environment

Fuel Economy
23 MPG
Combined city/hwy 20 city 27 highway
4.3 gallons per 100 miles

You spend \$3,000 more in fuel costs over 5 years compared to the average new vehicle.

Annual Fuel Cost \$2,100

Fuel Economy & Greenhouse Gas Rating (tailpipe only) Smog Rating (tailpipe only)
1 5 10 15 20
This vehicle emits 387 grams CO2 per mile. The best emits 3 grams per mile (tailpipe only). Producing and distributing fuel also create emissions, less than 1% of tailpipe-only gas.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$ 7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at 13.25 per gallon. MPGe is miles per gallon gasoline equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles.

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE: VOLVO SERIES
U.S./CANADIAN PARTS CONTENT: 1%
MAJOR SOURCES OF FOREIGN PARTS CONTENT:
SWEDEN: 25%
BELGIUM: 15%
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT:
GOTHENBURG, SWEDEN
COUNTRY OF ORIGIN:
ENGINE PARTS:
SWEDEN
TRANSMISSION PARTS:
JAPAN

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

GOVERNMENT 5-STAR SAFETY RATINGS

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

13

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest
Source: National Highway Traffic Safety Administration (NHTSA)
www.safercar.gov or 1-888-327-4236

VEHICLE IDENTIFICATION
Type & Chassis: 246 488417
Model Year: 2020
Color: Denim Grey Metallic
VIN: YV4102RK4L1488417

Port of Importation: Newark, NJ
Delivered by: Truck
DELIVERY ADDRESS
NORTH TOWN VOLVO 3710
6185 MAIN ST
WILLIAMSVILLE, NY 14221

YV4102RK4L1488417

FIGURE 83. Monroney Label Photograph

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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

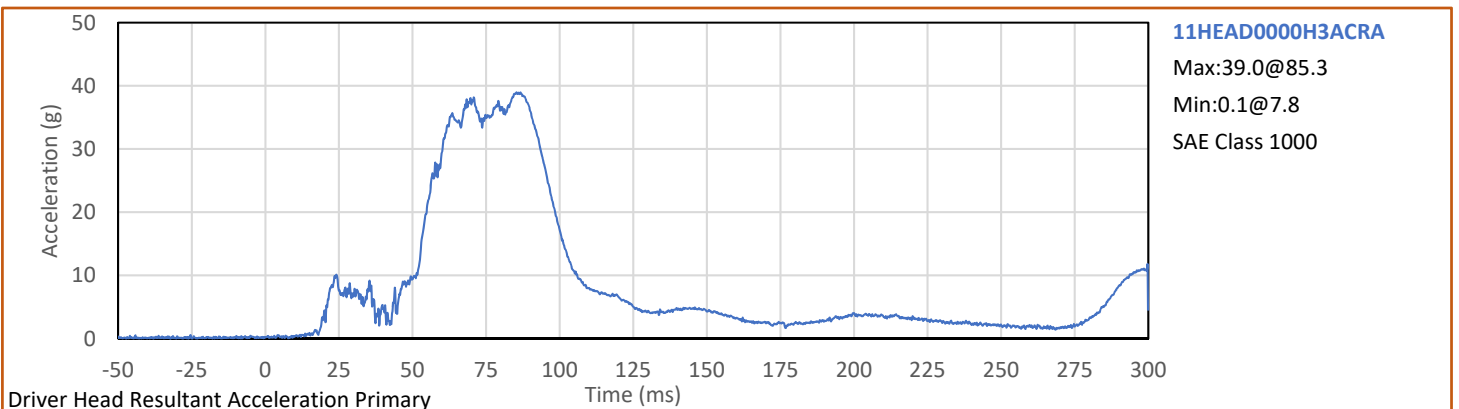
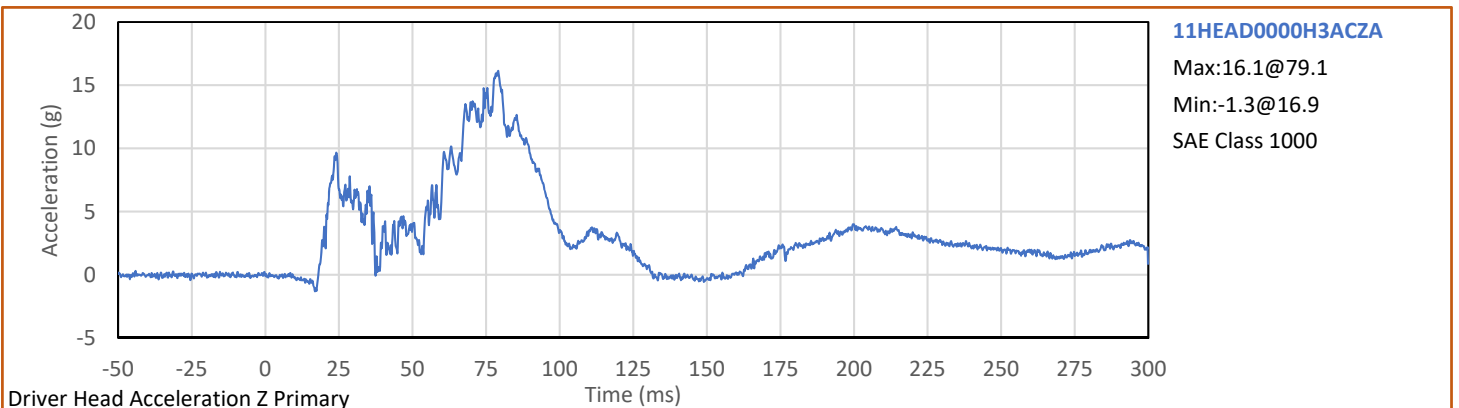
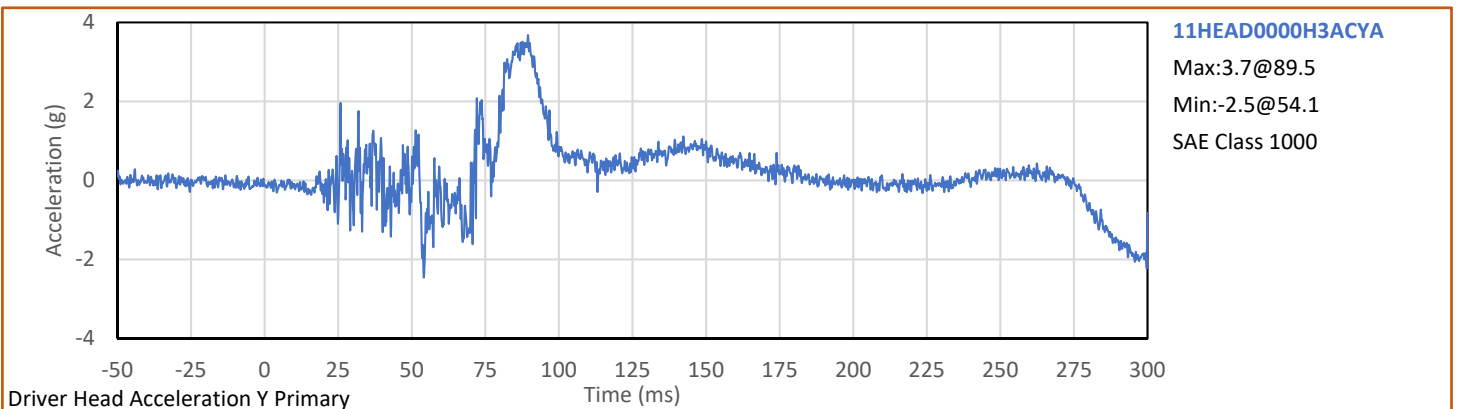
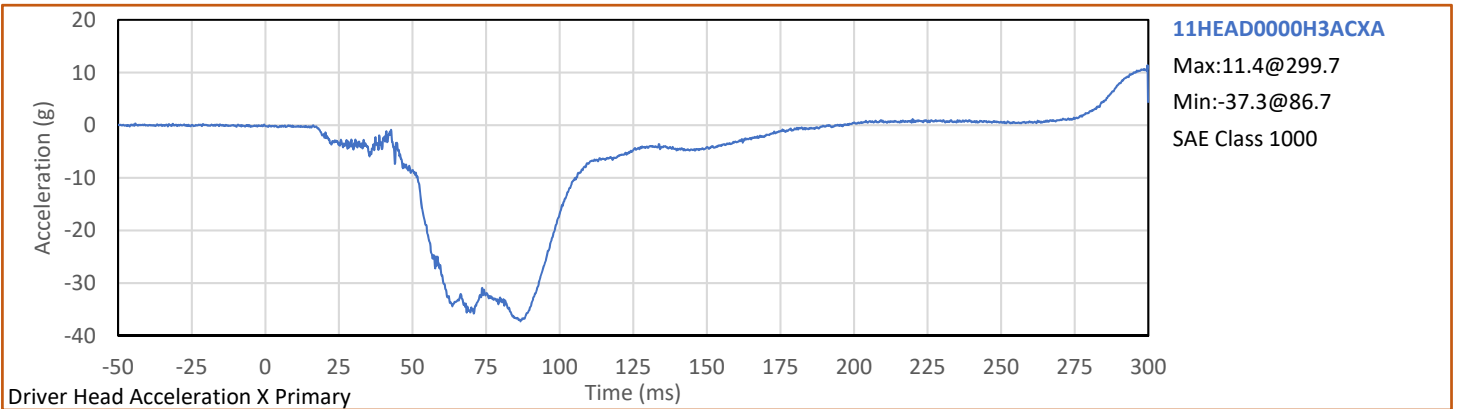
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.gov

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

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

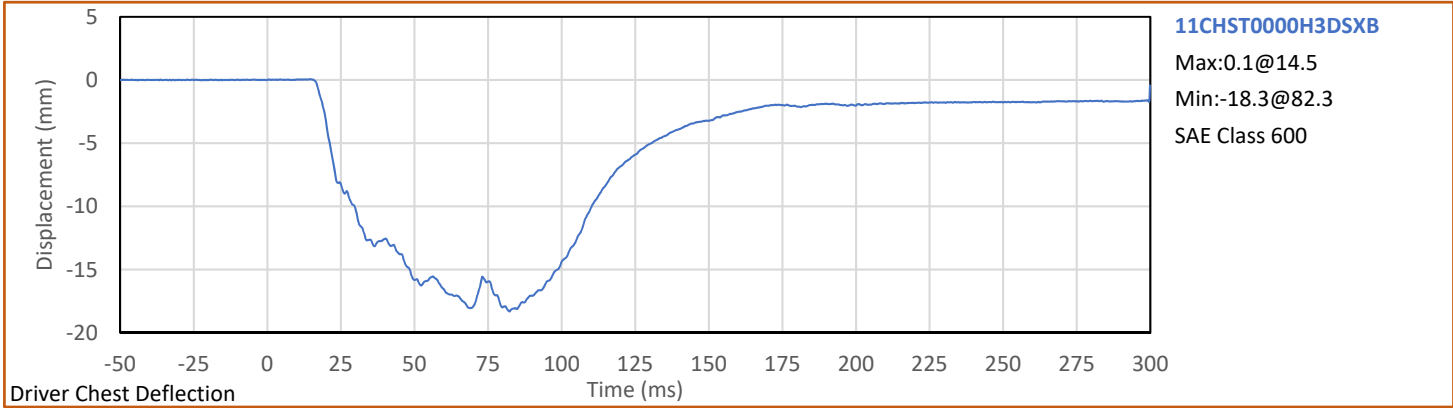
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Test Program: 56.3 km/h Frontal Impact NCAP Test

NHTSA No.: M20205903
Test Date: 1/21/2020



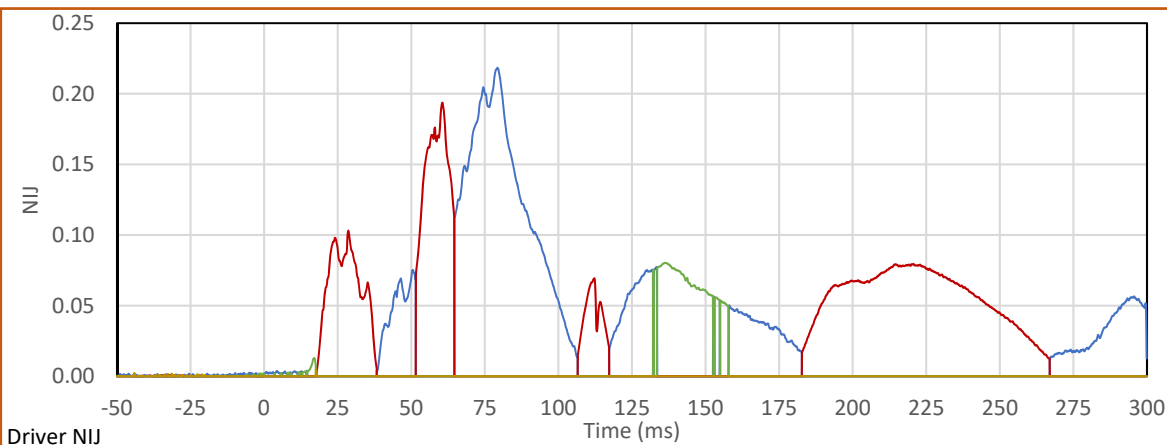
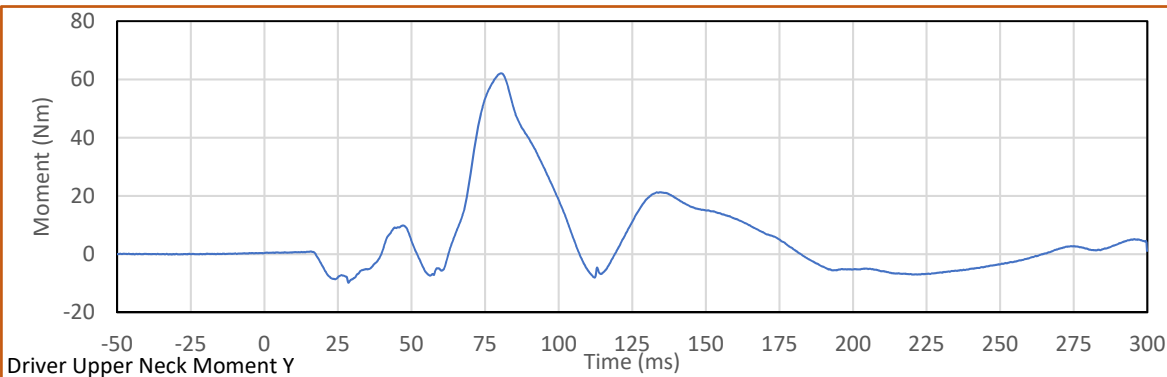
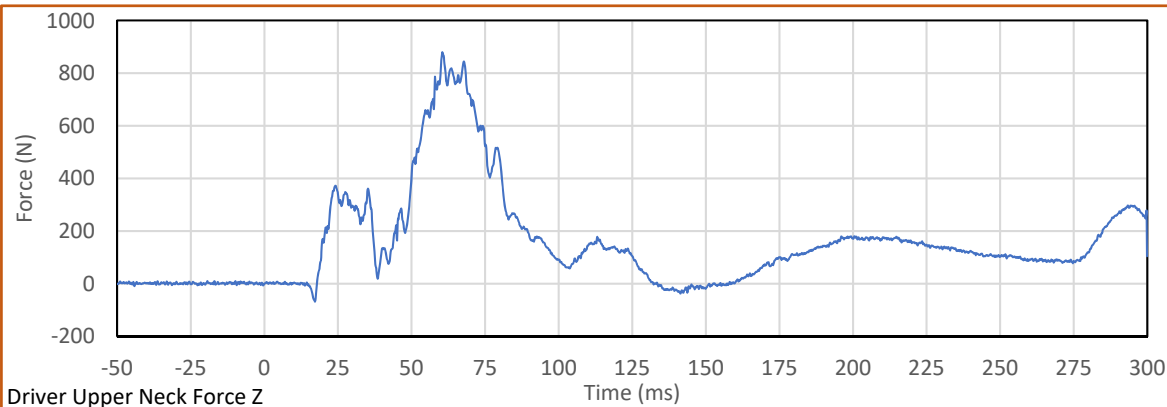
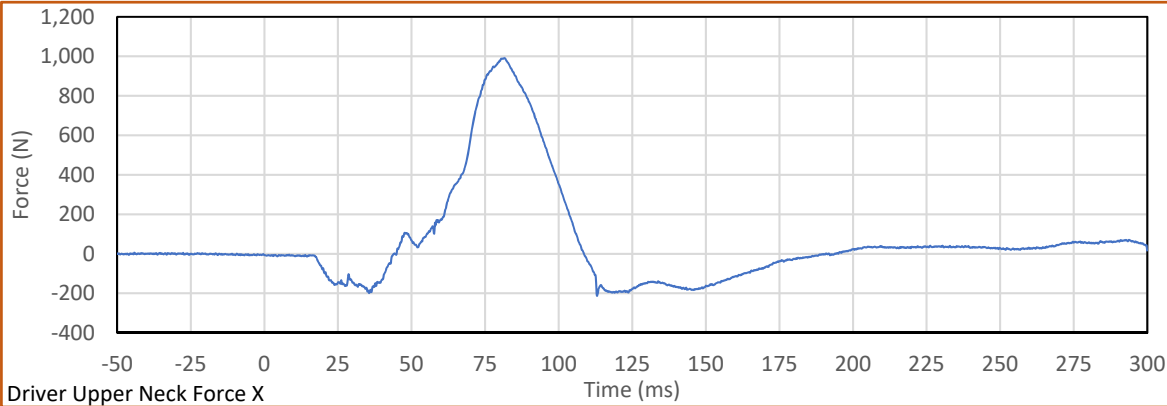
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Test Program: 56.3 km/h Frontal Impact NCAP Test

NHTSA No.: M20205903
Test Date: 1/21/2020



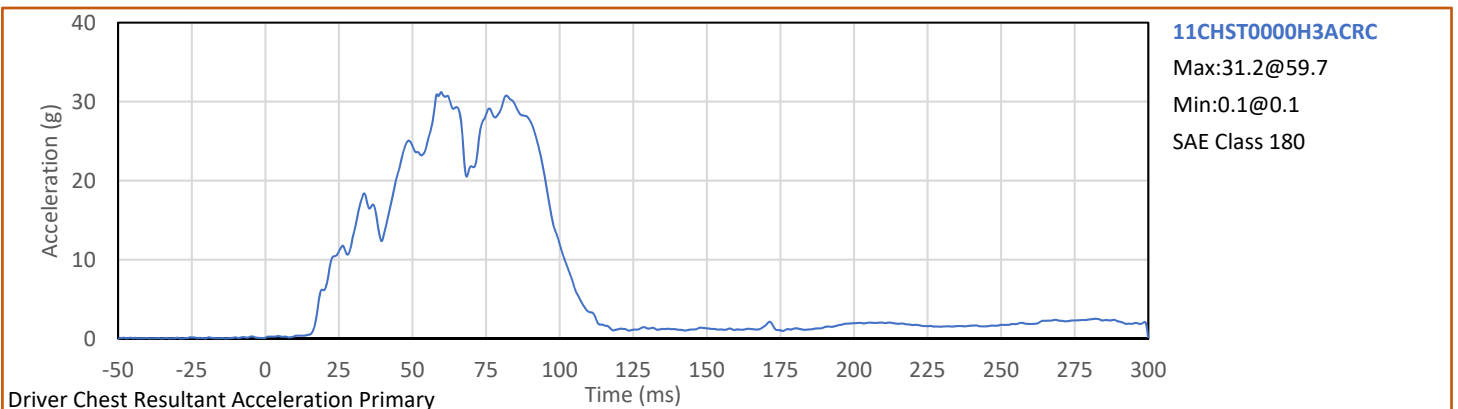
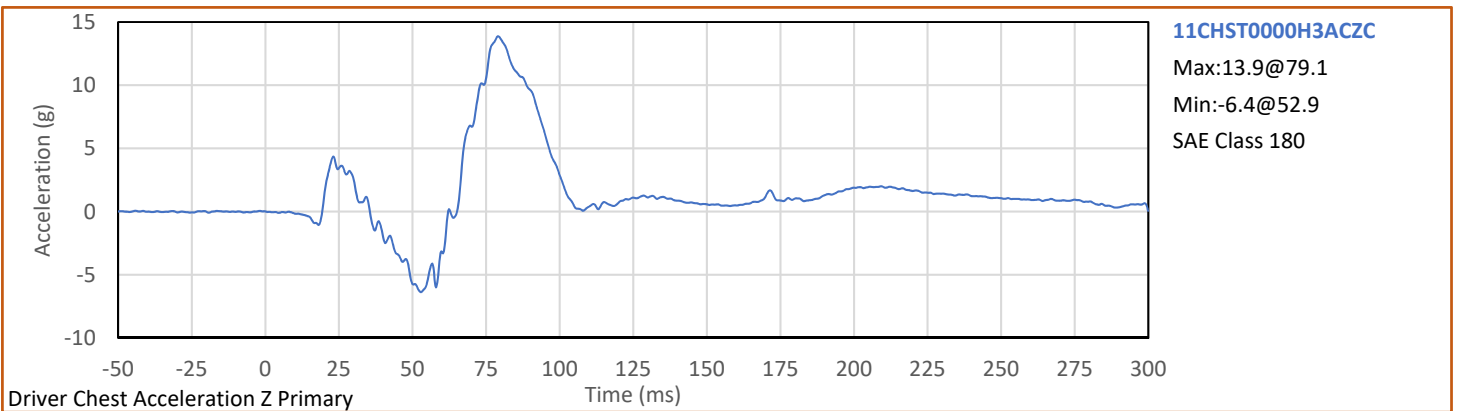
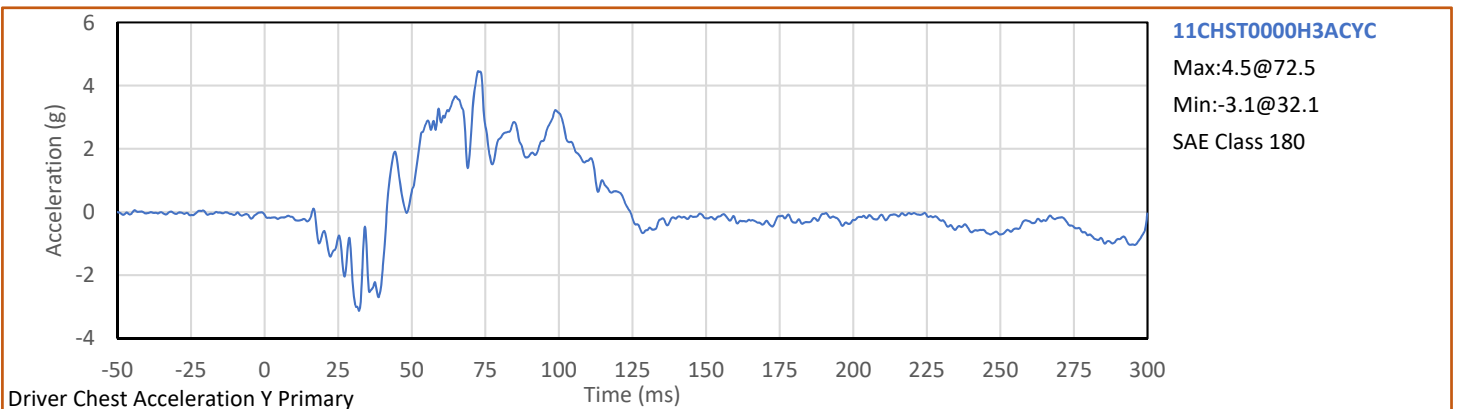
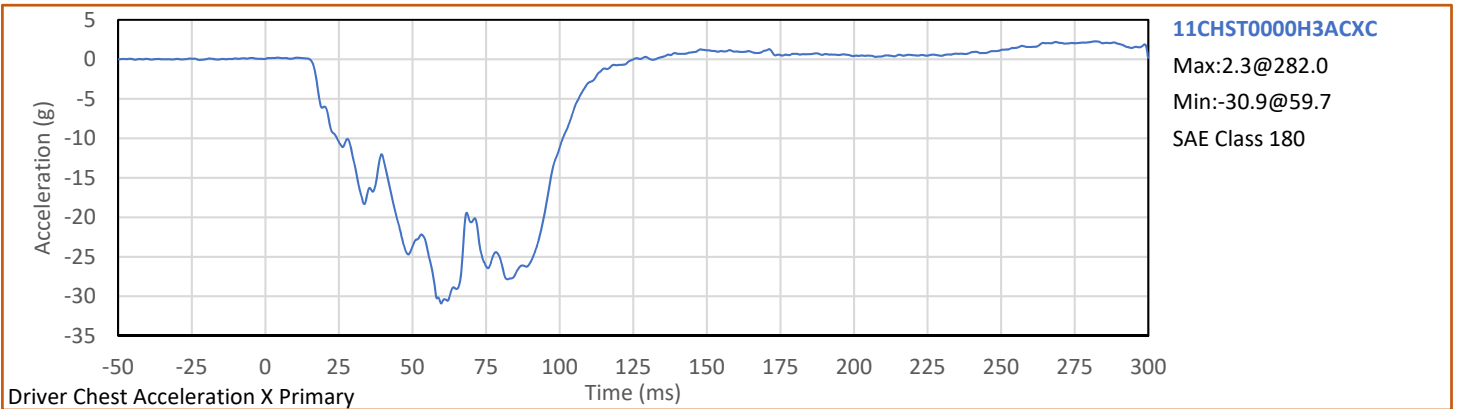
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Test Program: 56.3 km/h Frontal Impact NCAP Test

NHTSA No.: M20205903
Test Date: 1/21/2020



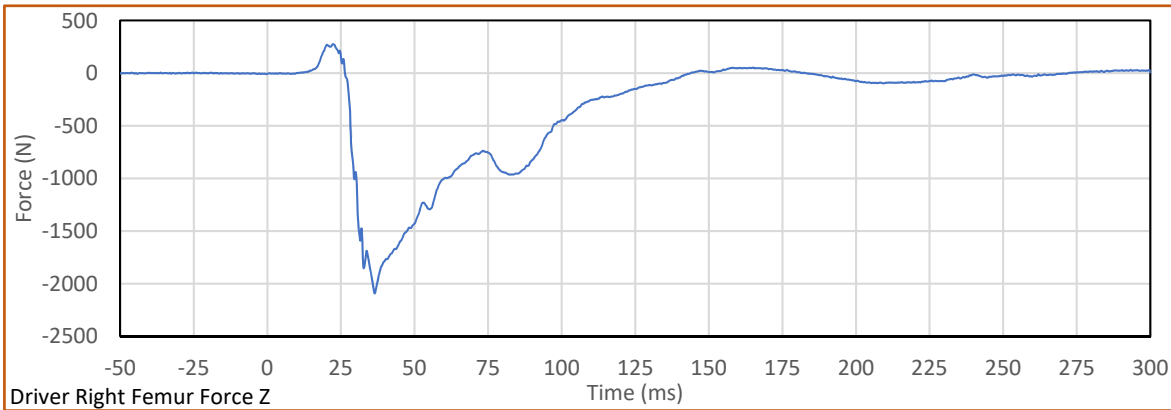
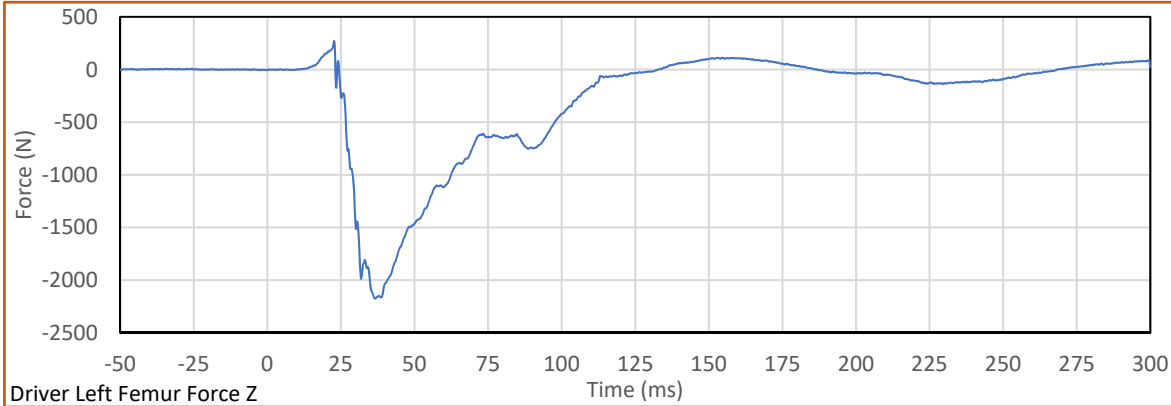
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NHTSA No.: M20205903
Test Date: 1/21/2020



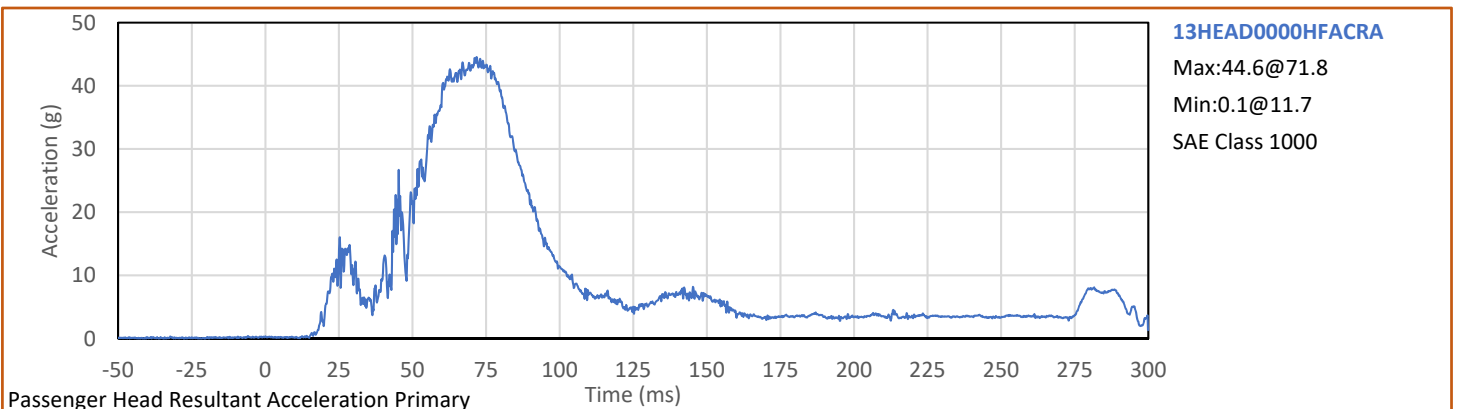
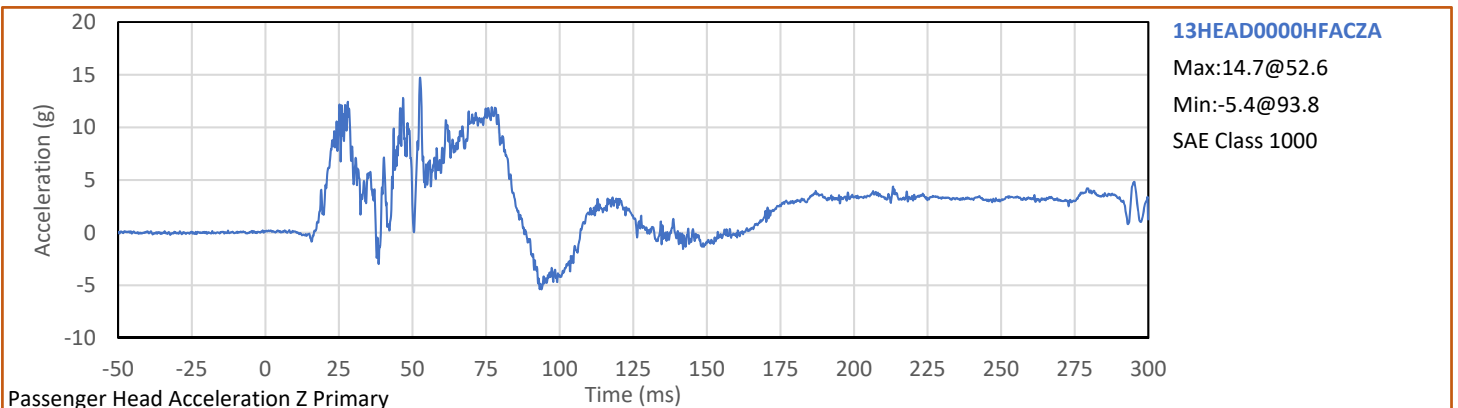
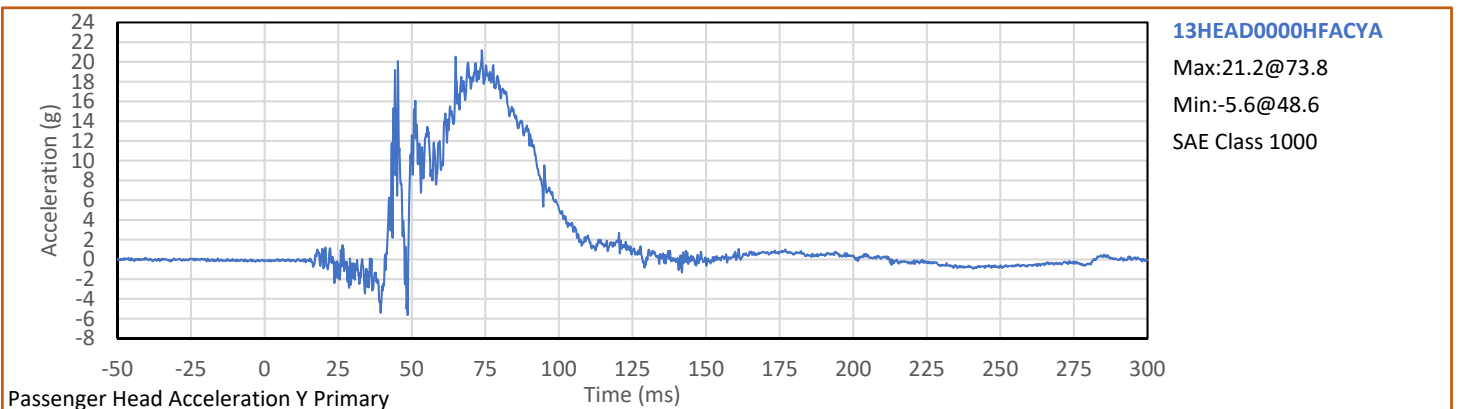
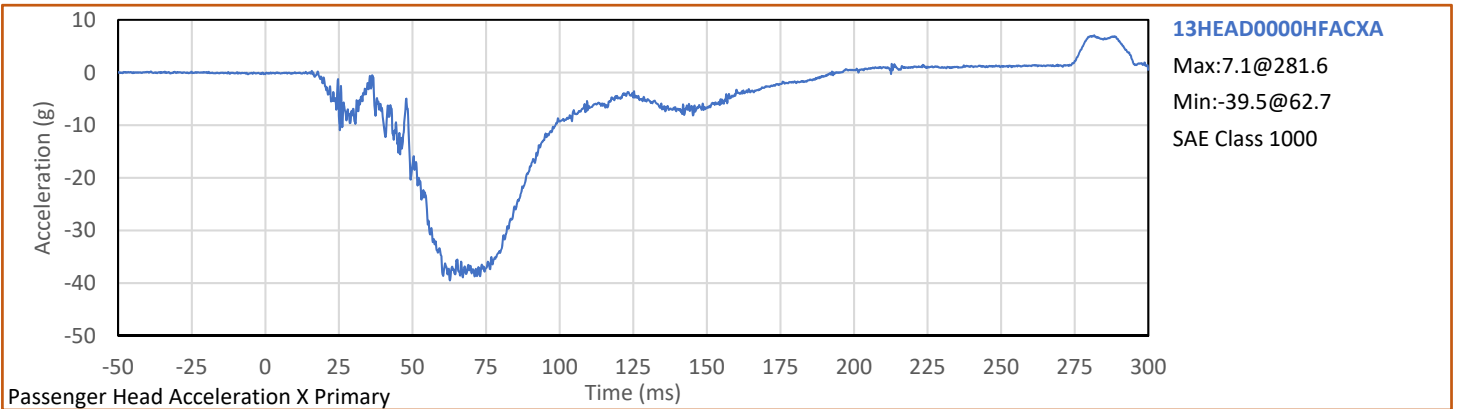
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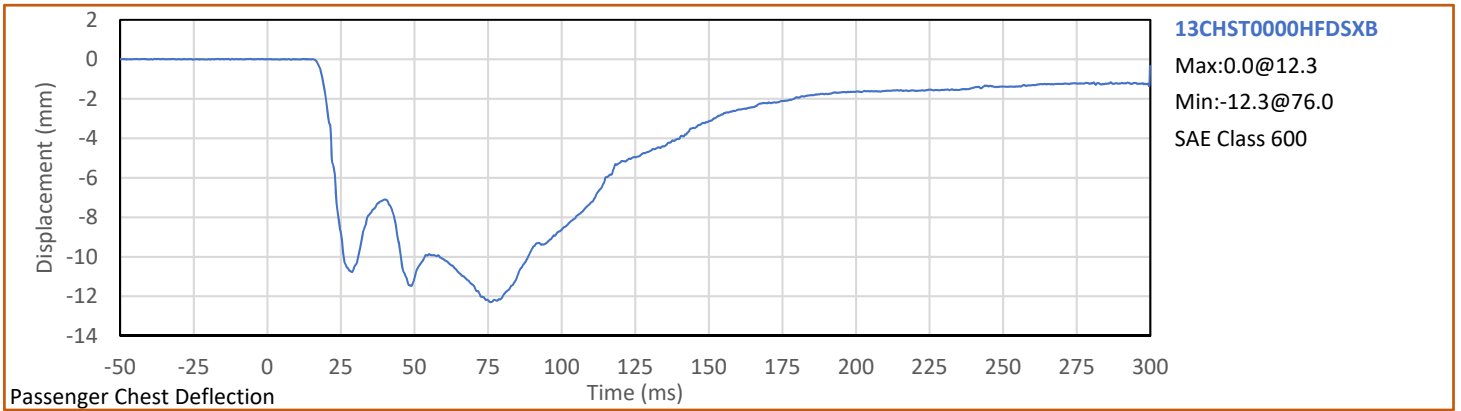
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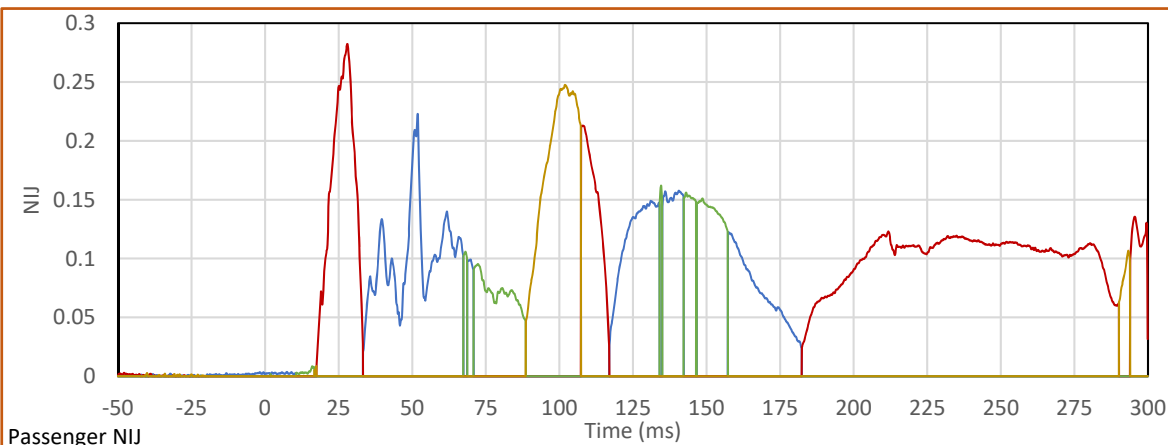
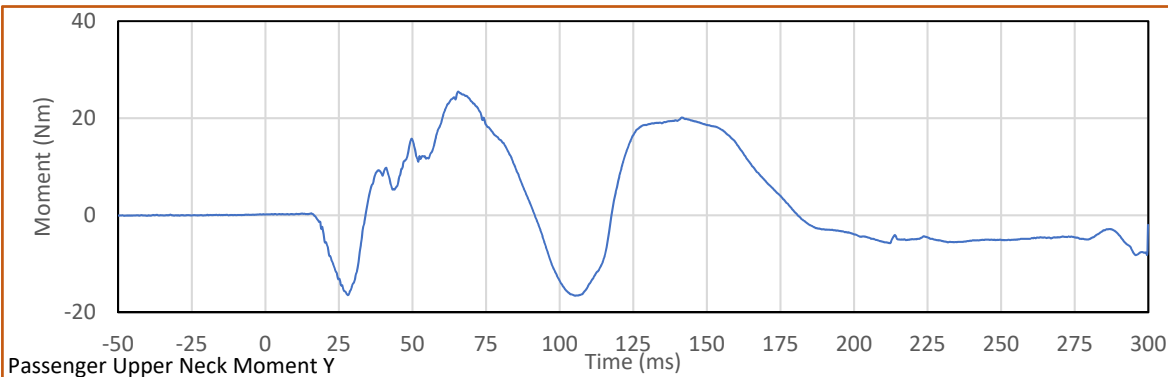
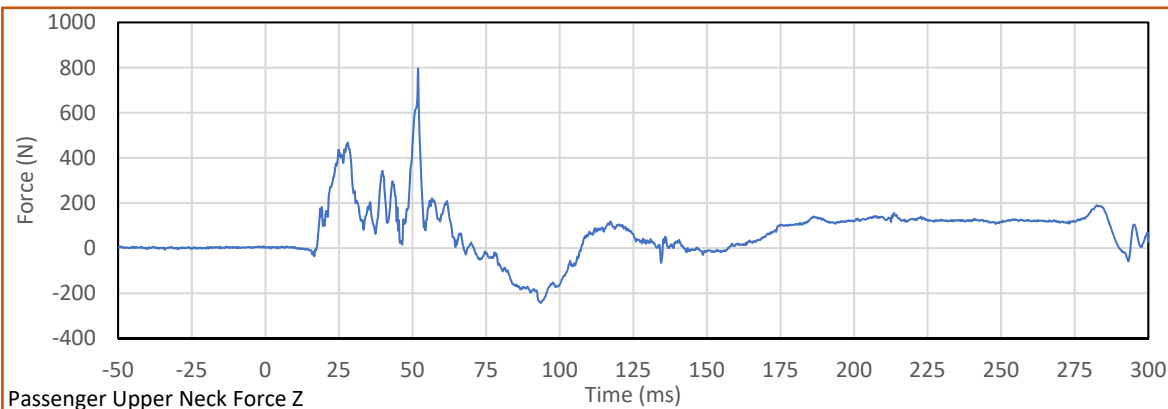
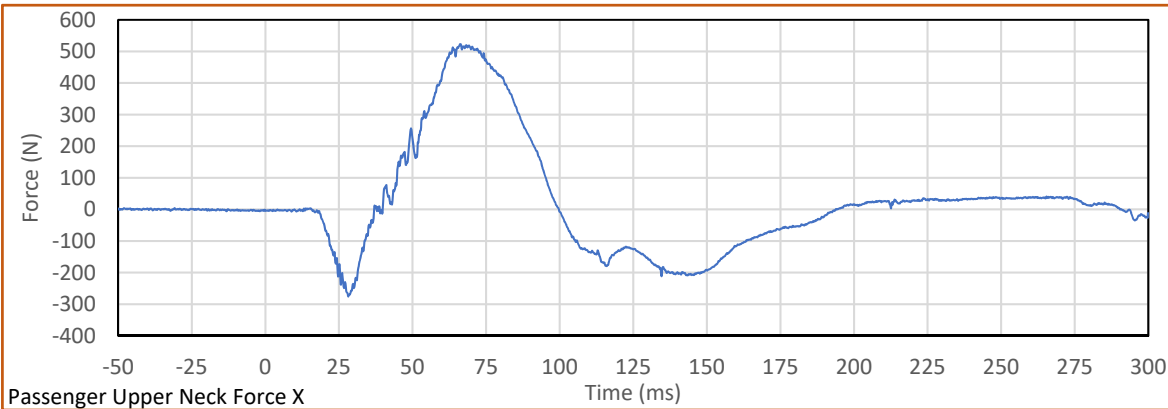
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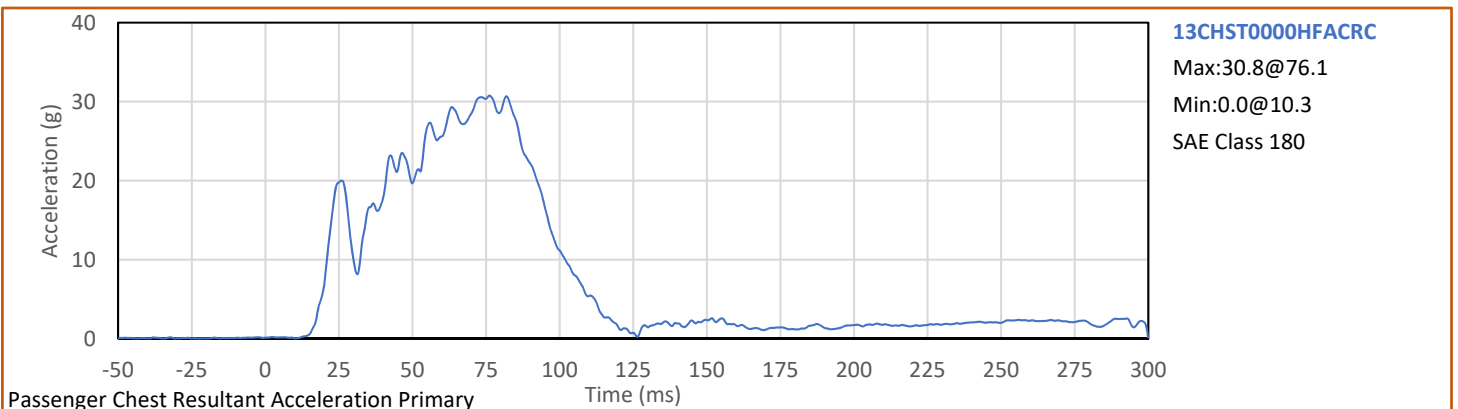
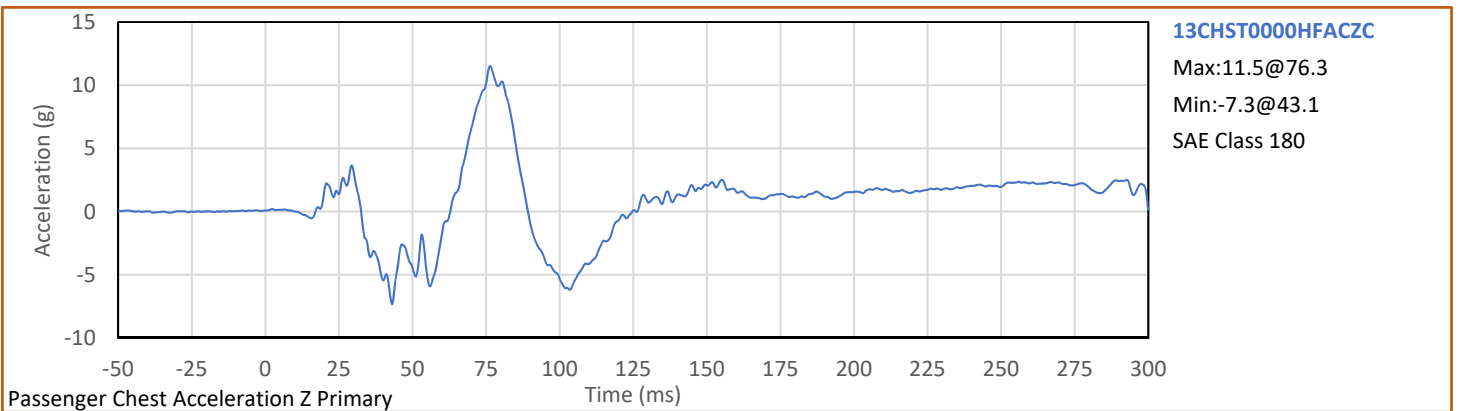
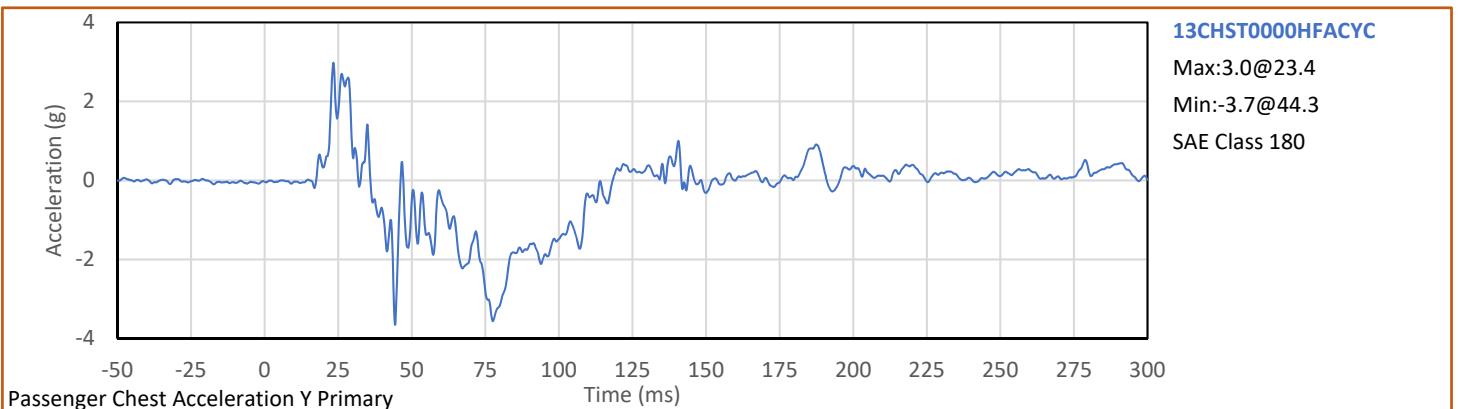
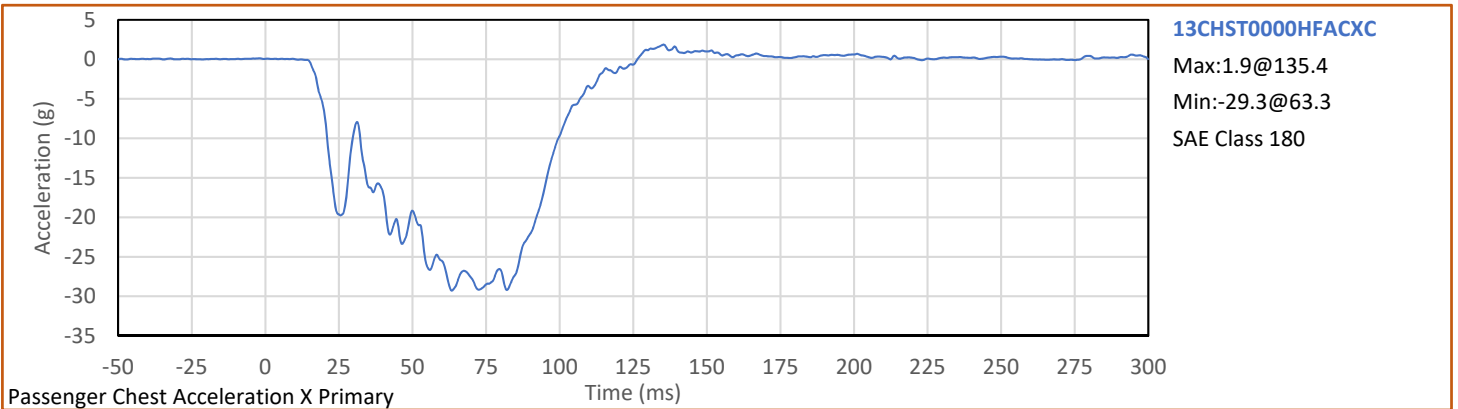
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NHTSA No.: M20205903
Test Date: 1/21/2020



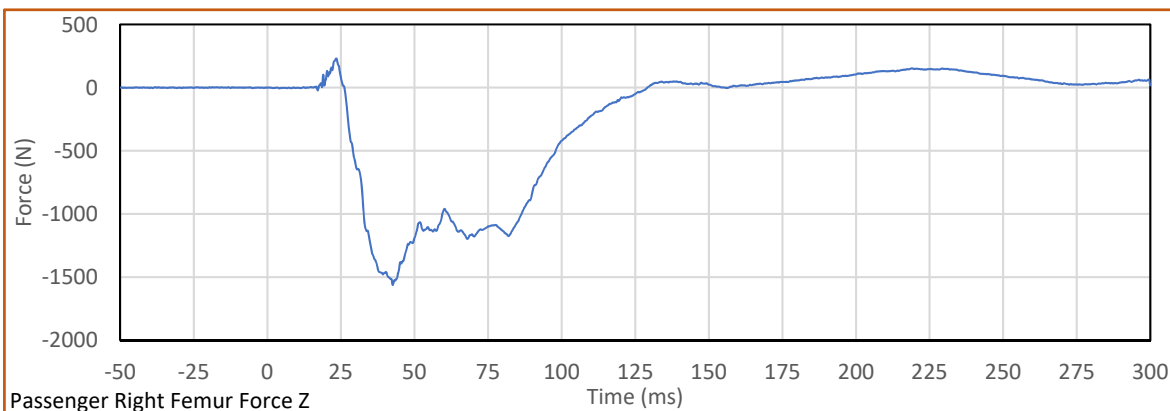
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Test Program: 56.3 km/h Frontal Impact NCAP Test

NHTSA No.: M20205903
Test Date: 1/21/2020



Test Vehicle: 2020 Volvo XC60 T5 AWD 5-Door MPV
Test Program: 56.3 km/h Frontal Impact NCAP Test

NHTSA No.: M20205903
Test Date: 1/21/2020



APPENDIX C
DUMMY QUALIFICATION AND PERFORMANCE VERIFICATION

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

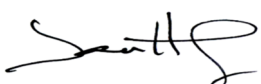
ATD Serial No.: 360

Test Date: 2020-01-09

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

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician: 
J. Hernandez

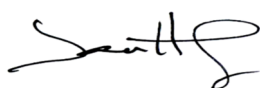
Approved By: 
P. Puzzuto

ATD Serial No.: 360

Test Date: 2020-01-09

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	885	Pass
B - Shoulder pivot height	mm	505	521	518	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	148	Pass
G - Back of elbow to wrist pivot	mm	290	305	296	Pass
H - Head back to backline	mm	41	46	45	Pass
I - Shoulder to elbow length	mm	330	345	343	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	491	Pass
N - Buttock popliteal length	mm	452	477	468	Pass
O - Chest depth without jacket	mm	213	229	219	Pass
P - Foot length	mm	251	267	261	Pass
V - Shoulder breadth	mm	422	437	431	Pass
W - Foot breadth	mm	91	107	102	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	976	Pass
Z - Waist circum.	mm	836	866	851	Pass
AA - Location for chest circum.	mm	429	434	433	Pass
BB - Location for waist circum.	mm	226	231	229	Pass
			Overall Test Results		Pass

Technician:



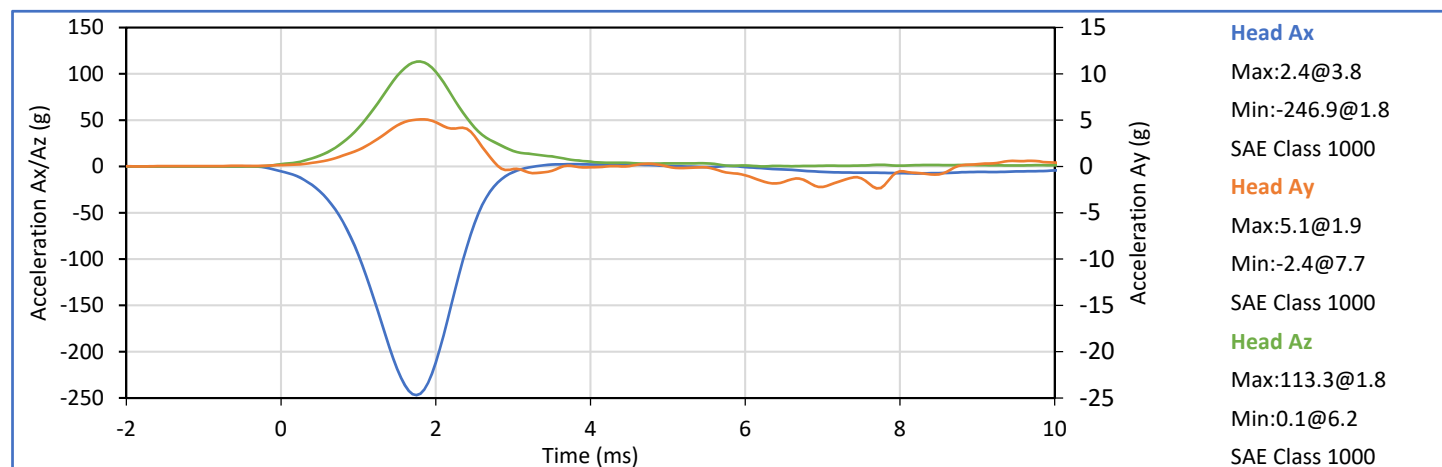
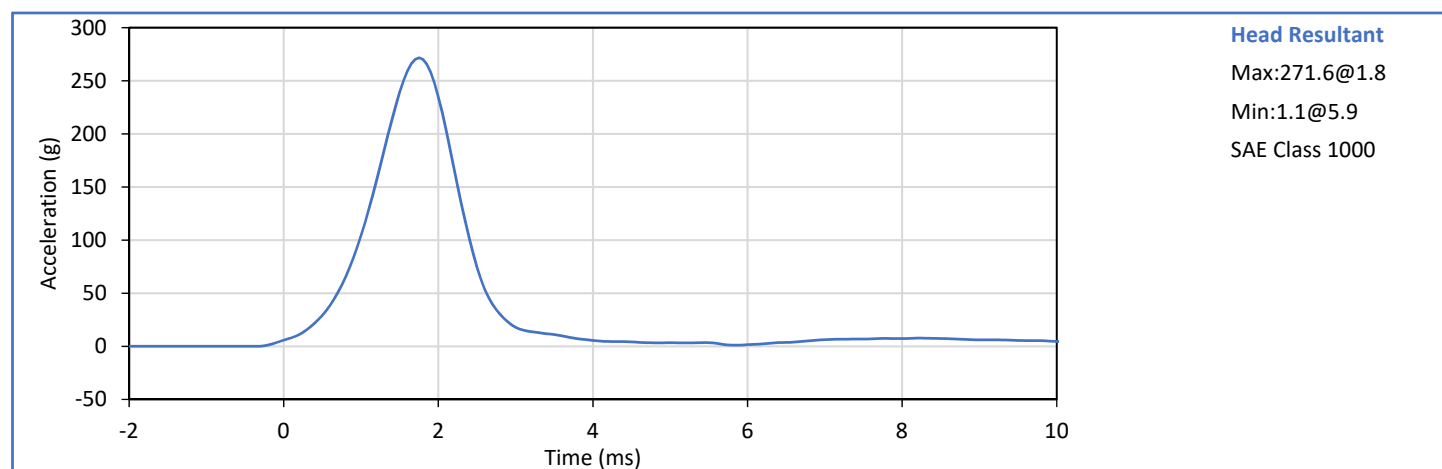
J. Hernandez

Approved By:



P. Puzzuto

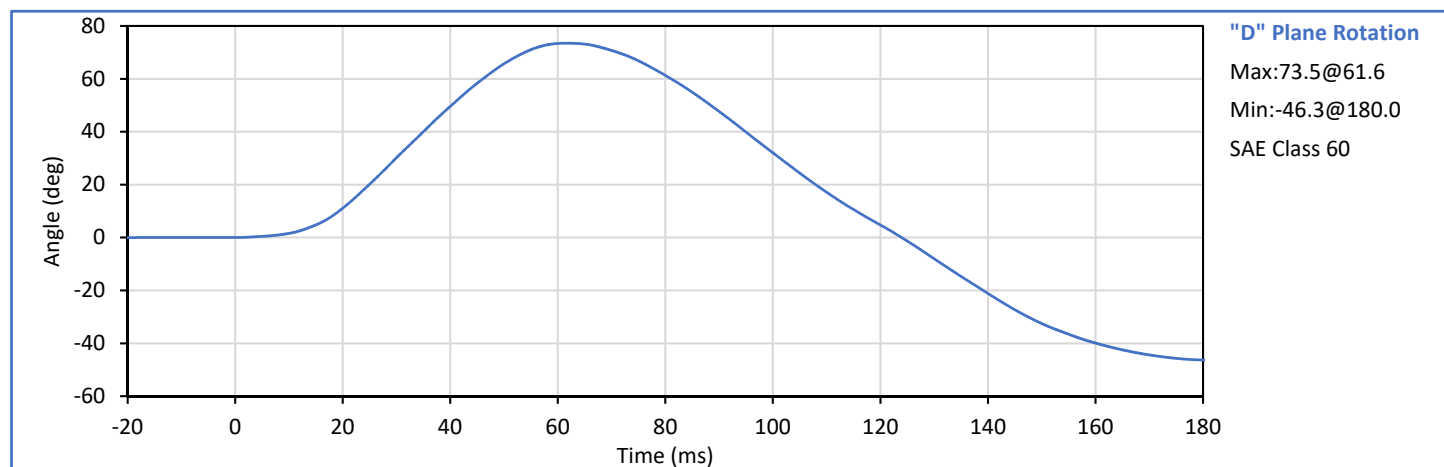
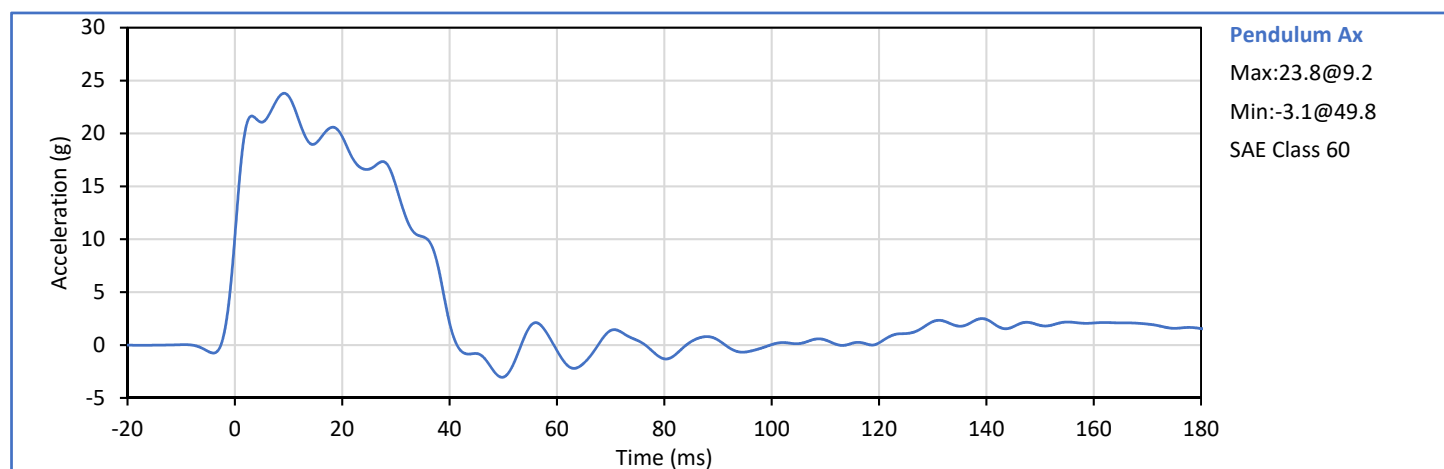
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Relative Humidity	%	10	70	28	Pass
Peak Resultant Acceleration	g	225.0	275.0	271.6	Pass
Peak Lateral Acceleration	g	-15.0	15.0	5.1	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.9	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass



Technician: J. Hernandez

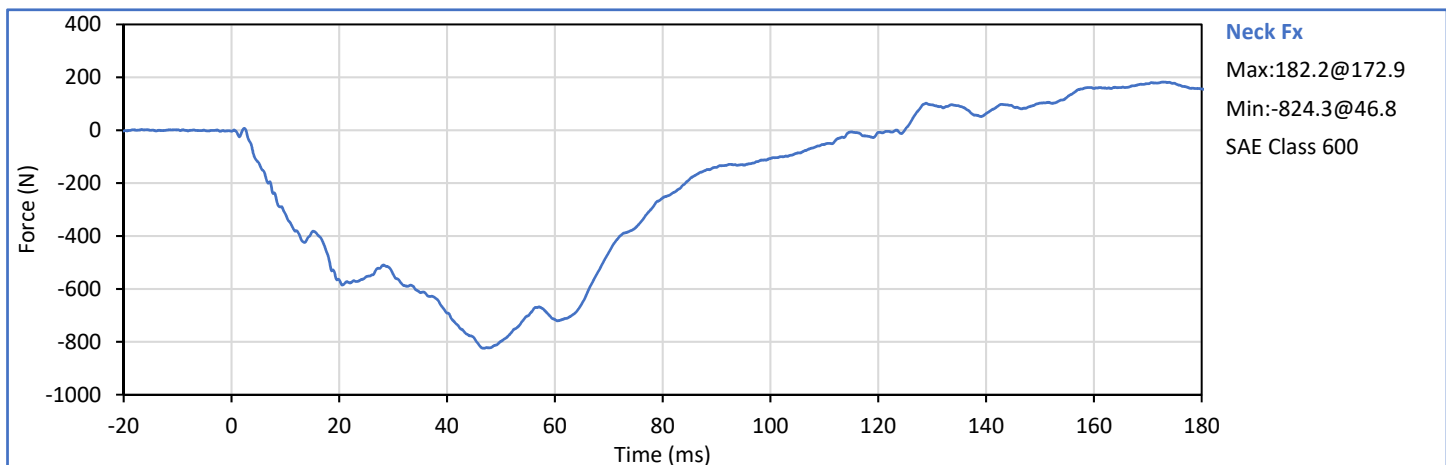
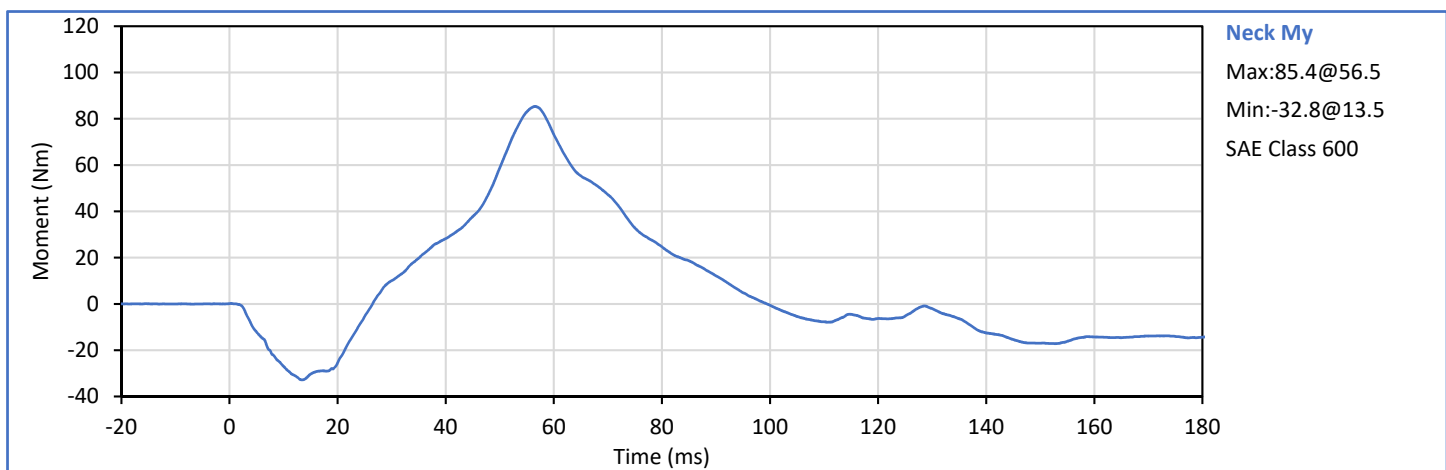
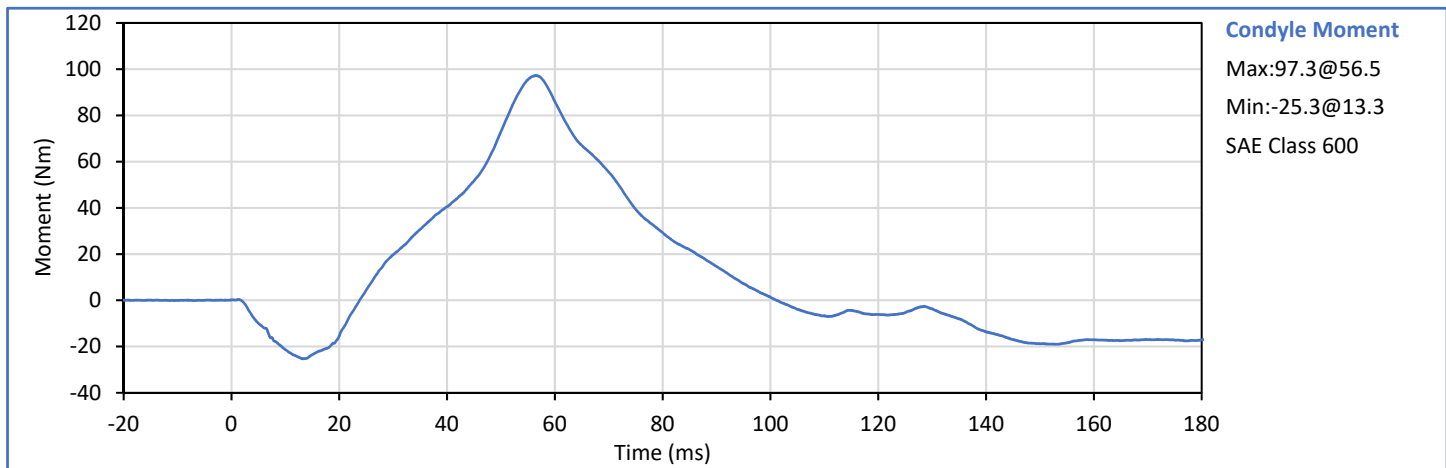
Approved By: P. Puzzuto
C-3

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	6.89	7.13	6.92	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	23.5	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	19.7	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	15.0	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	15.0	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	38.8	Pass
"D" Plane Rotation peak	deg	64.0	78.0	73.5	Pass
	ms	57.0	64.0	61.6	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	124.0	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	97.3	Pass
	ms	47.0	58.0	56.5	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	101.1	Pass
Overall Test Results				Pass	

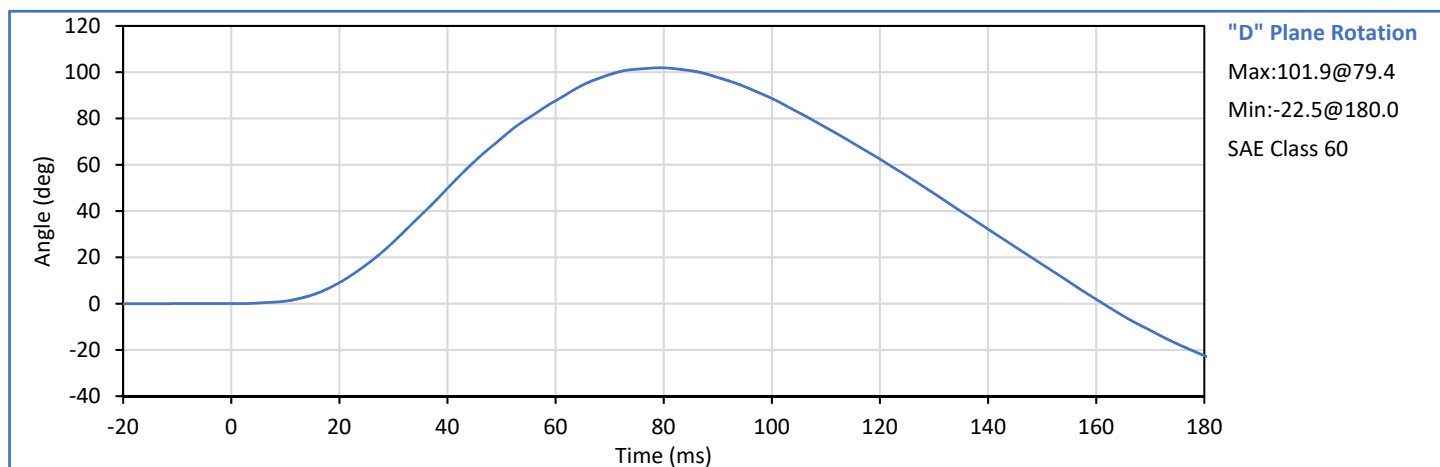
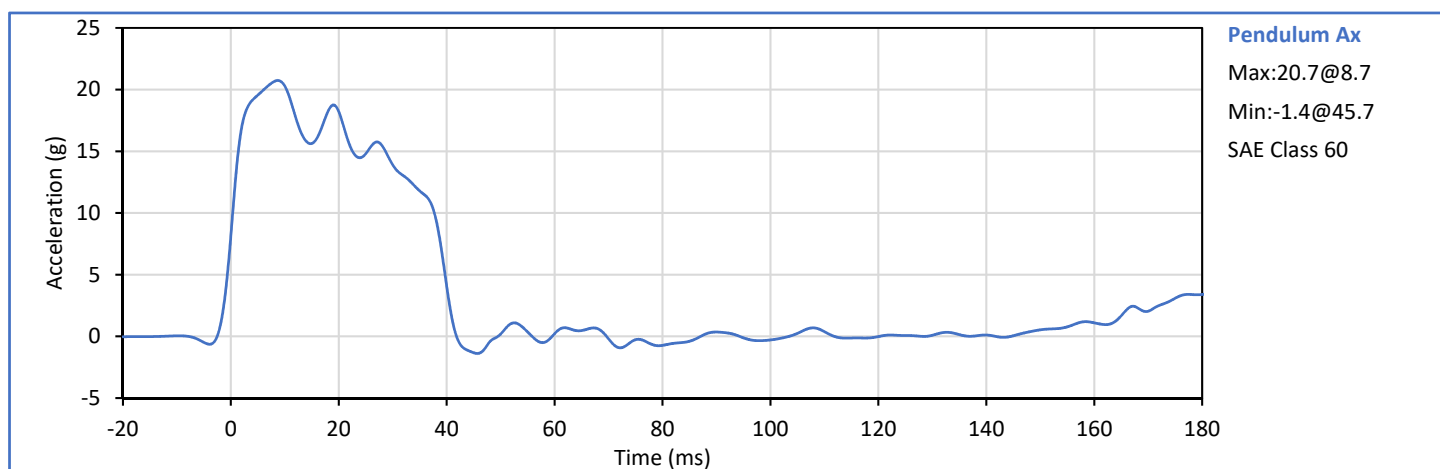


Technician: J. Hernandez

Approved By: P. Puzzuto
C-4

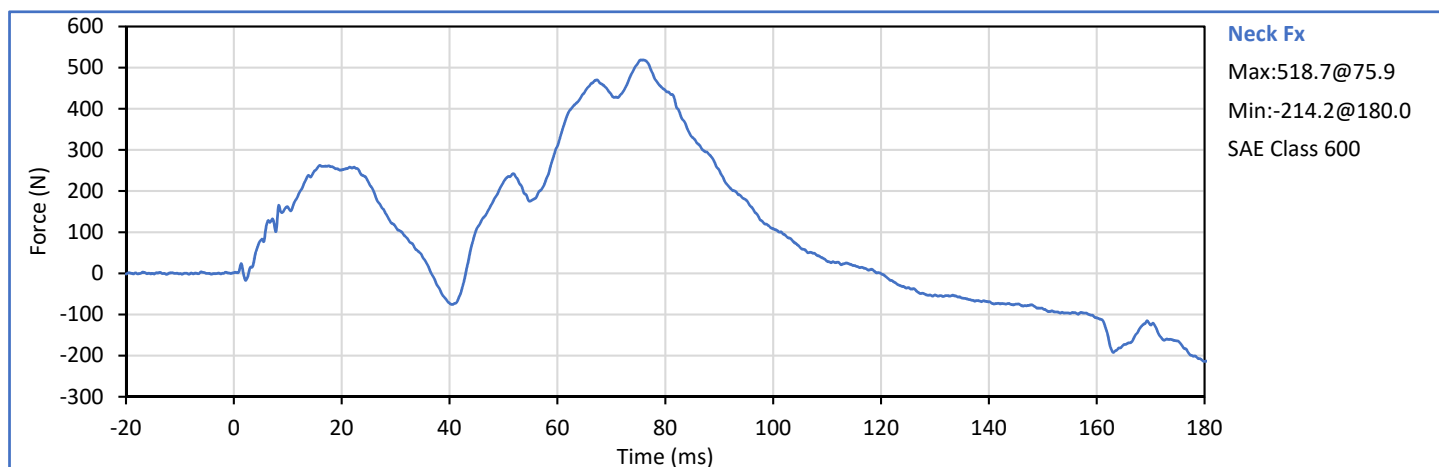
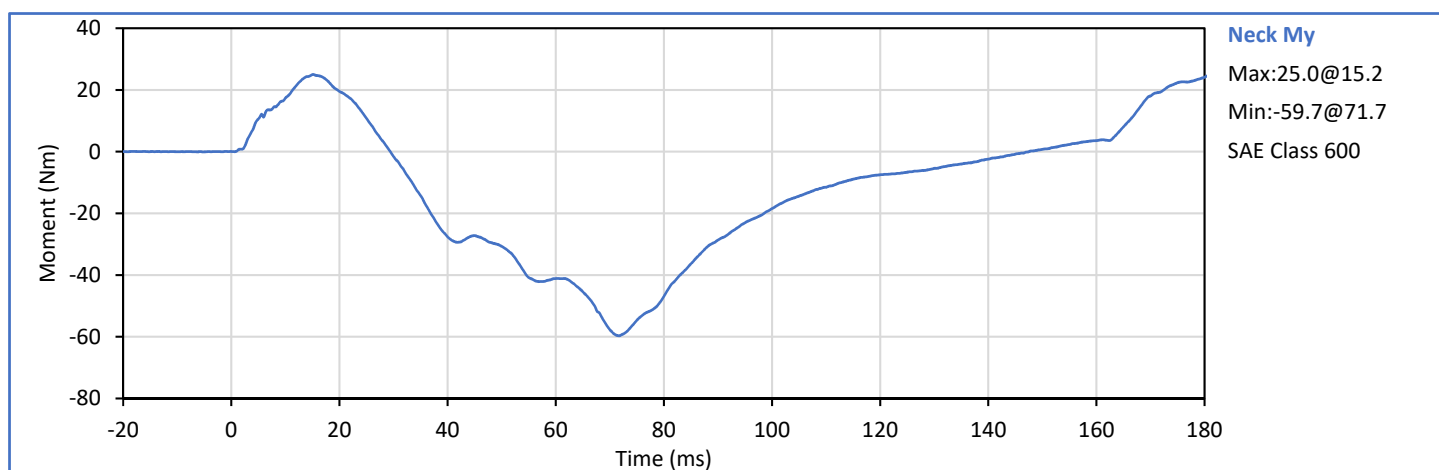
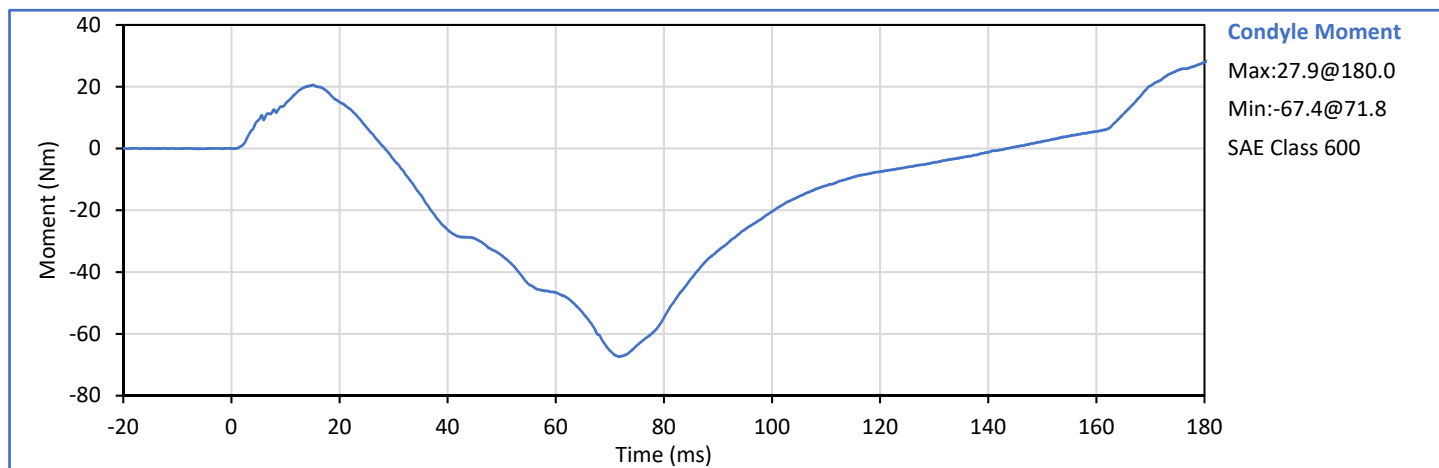


Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	5.94	6.19	6.01	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.3	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.2	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	13.9	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	13.9	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	39.7	Pass
"D" Plane Rotation peak	deg	81.0	106.0	101.9	Pass
	ms	72.0	82.0	79.4	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	161.4	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-67.4	Pass
	ms	65.0	79.0	71.8	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	143.4	Pass
Overall Test Results				Pass	

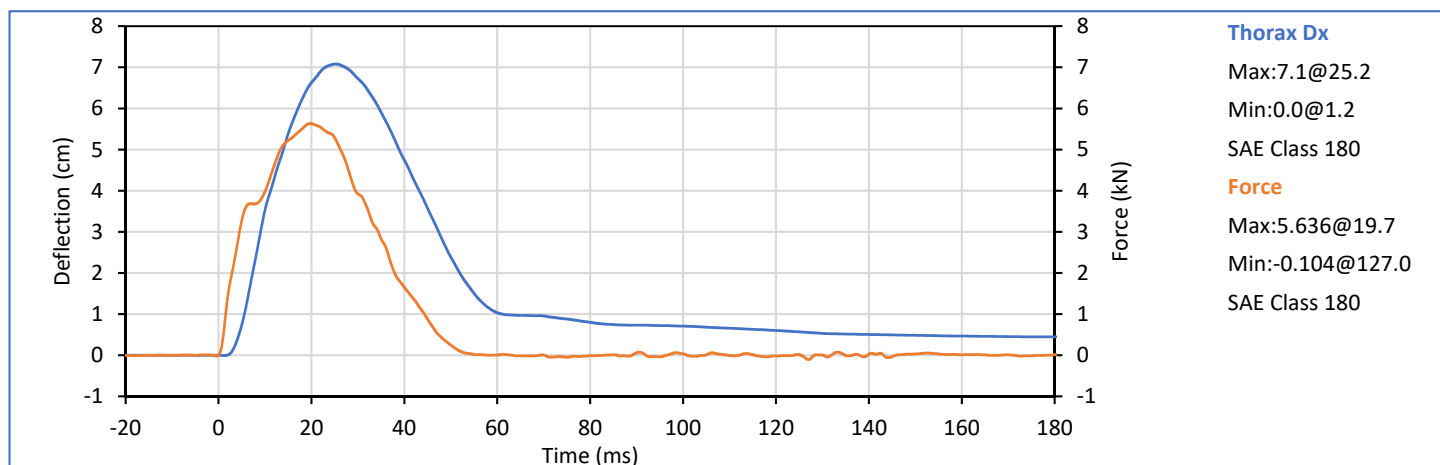
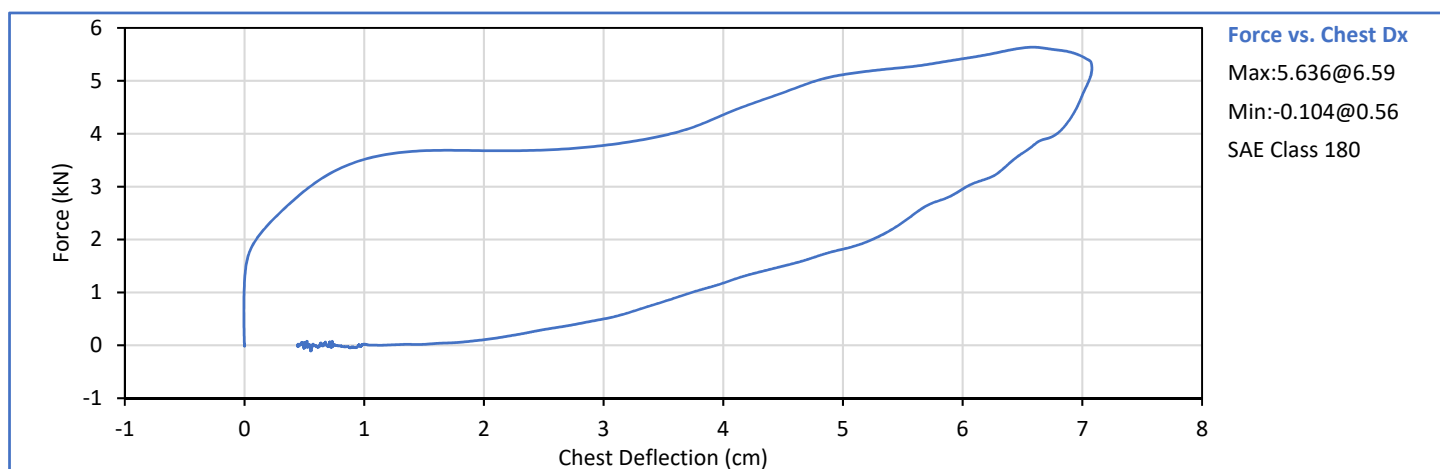


Technician: J. Hernandez

Approved By: P. Puzzuto
C-6



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	27	Pass
Probe Velocity	m/s	6.58	6.82	6.76	Pass
Peak Chest Deflection	cm	6.35	7.26	7.08	Pass
Peak Probe Force	kN	5.159	5.893	5.636	Pass
Internal Hysteresis	%	69.0	85.0	70.1	Pass
Overall Test Results				Pass	



Technician:

J. Hernandez

J. Hernandez

Approved By:

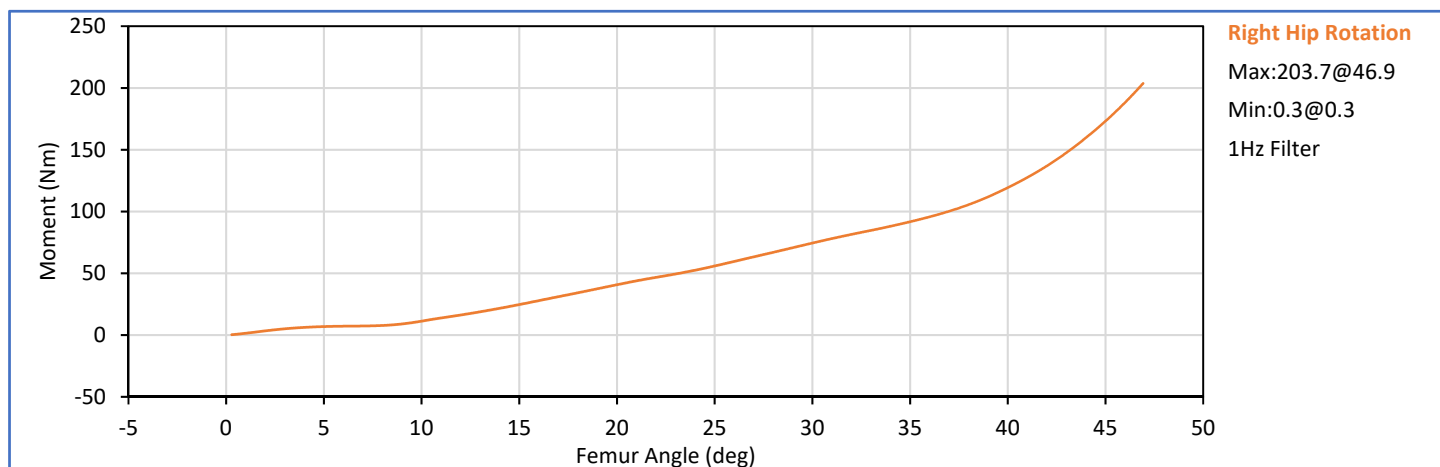
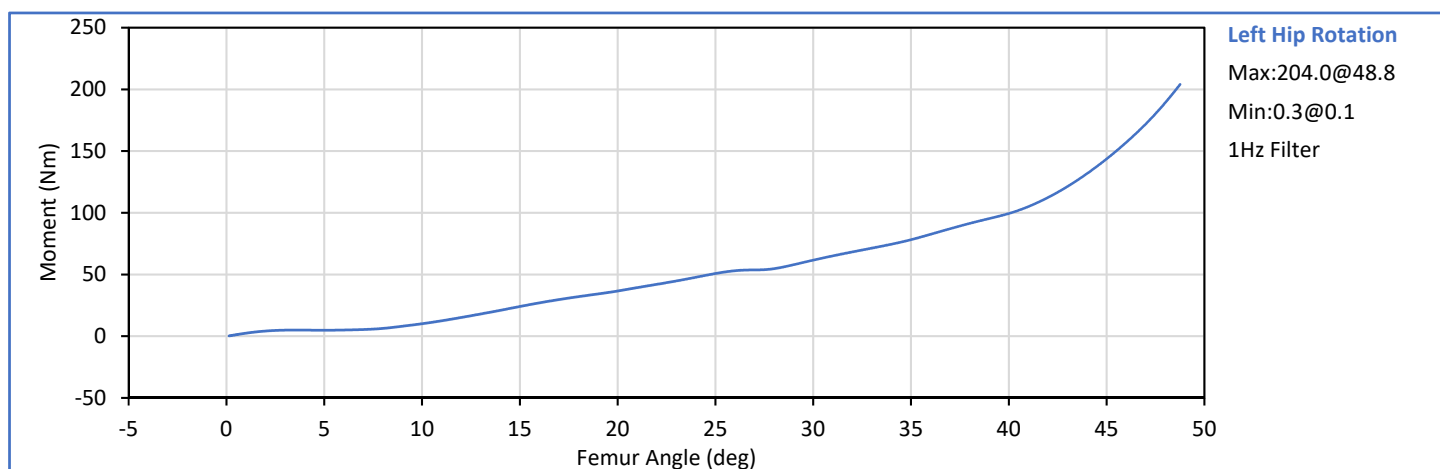
P. Puzzuto

P. Puzzuto

C-8

TR-P40001-01-NC

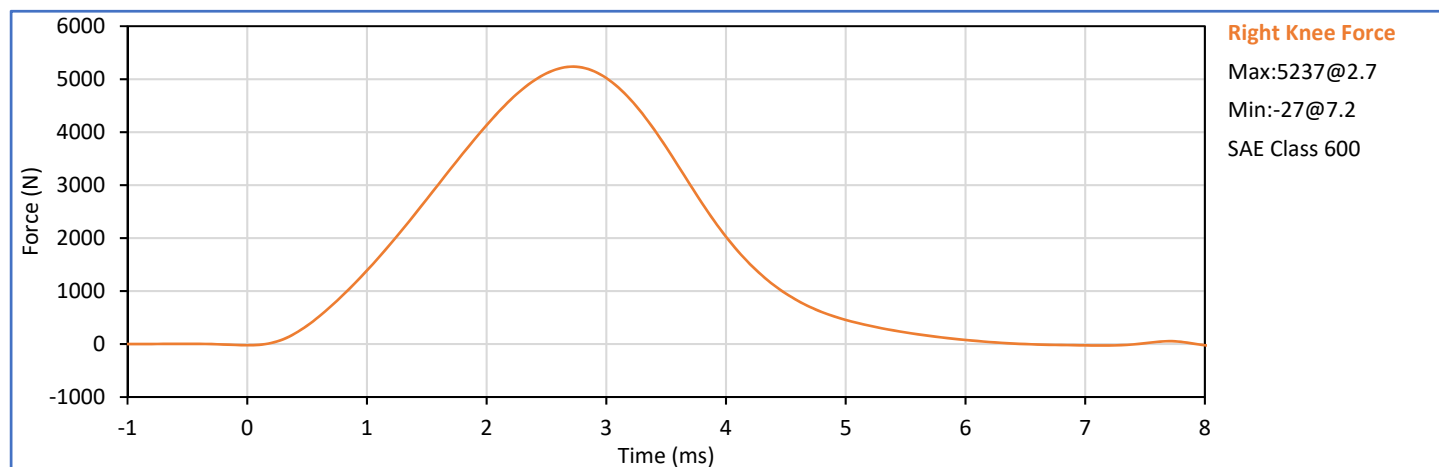
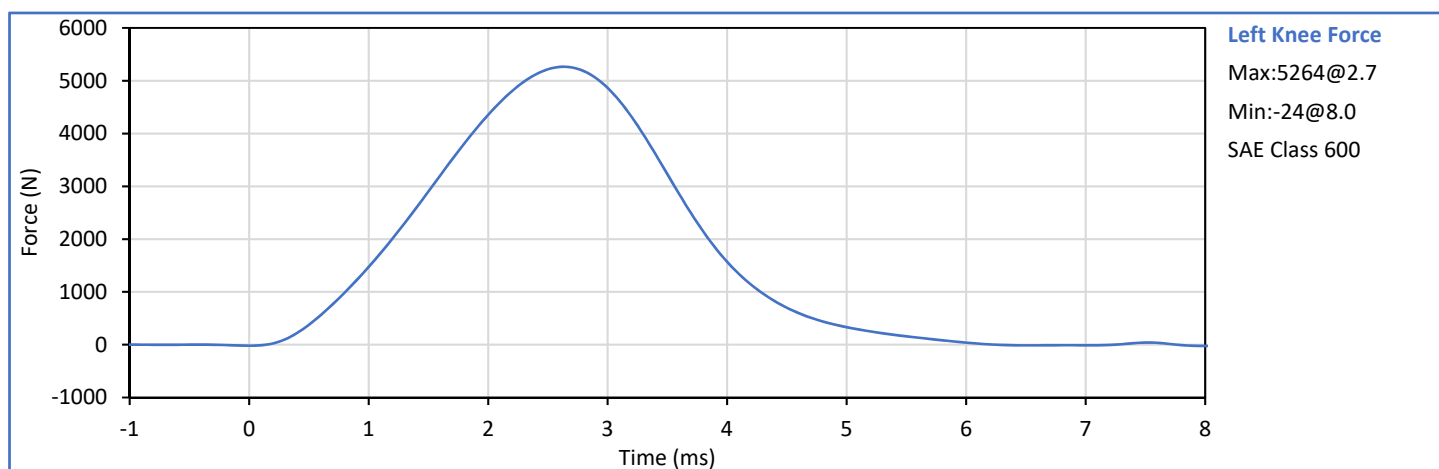
Tested Parameter		Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature		°C	18.9	25.6	21.2	Pass
Laboratory Relative Humidity		%	10	70	21	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	5.8	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	61.7	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	48.7	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	74.5	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	46.9	Pass
Overall Test Results						Pass



Technician: J. Hernandez

Approved By: P. Puzzuto
C-9

Tested Parameter		Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature		°C	18.9	25.6	21.1	Pass
Laboratory Relative Humidity		%	10	70	26	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.095	Pass
	Peak Resistive Force	N	4715	5782	5264	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.091	Pass
	Peak Resistive Force	N	4715	5782	5237	Pass
Overall Test Results					Pass	



Technician: J. Hernandez

Approved By: P. Puzzuto
C-10

APPENDIX C
Pre-Test ATD Qualification and Performance Verification
Hybrid III 5th Percentile Female ATD
S/N: 630

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

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician:



J. Hernandez

Approved By:



P. Puzzuto

ATD Serial No.: 630

Test Date: 2020-01-14

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

Technician:



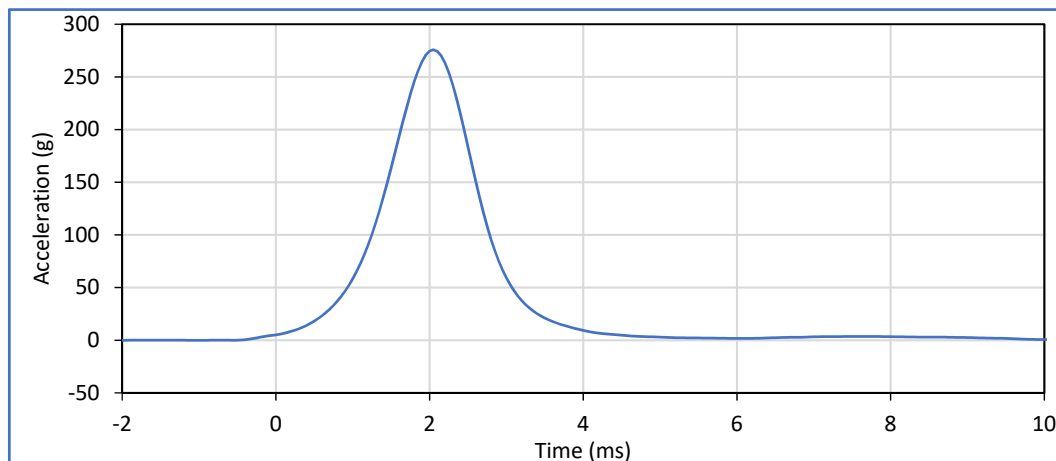
J. Hernandez

Approved By:



P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	20.6	Pass
Laboratory Humidity	%	10	70	27	Pass
Peak Resultant Acceleration	g	250.0	300.0	275.8	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-2.1	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	

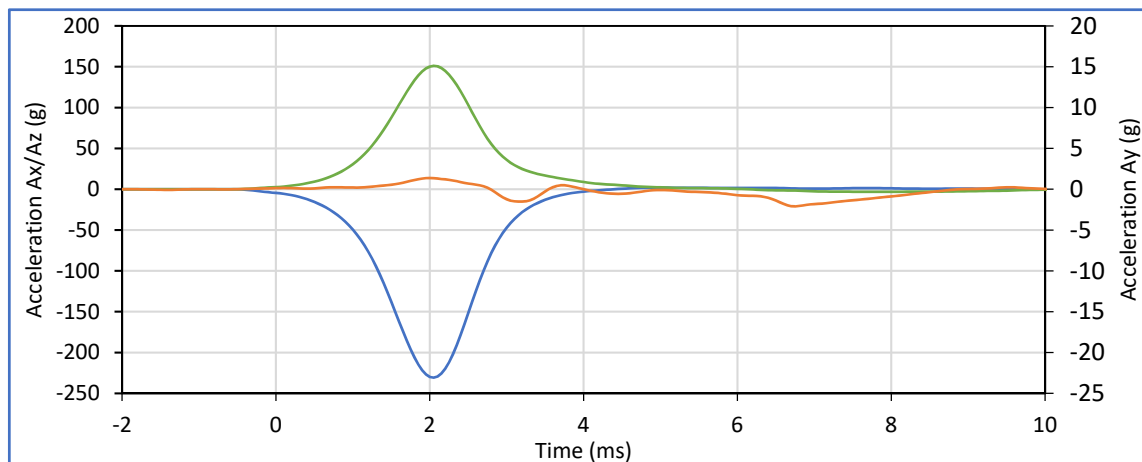


Head Resultant

Max:275.8@2.1

Min:0.7@10.0

SAE Class 1000



Head Ax

Max:2.0@5.0

Min:-230.7@2.1

SAE Class 1000

Head Ay

Max:1.4@2.0

Min:-2.1@6.8

SAE Class 1000

Head Az

Max:151.2@2.1

Min:-3.2@7.8

SAE Class 1000

Technician:

J. Hernandez

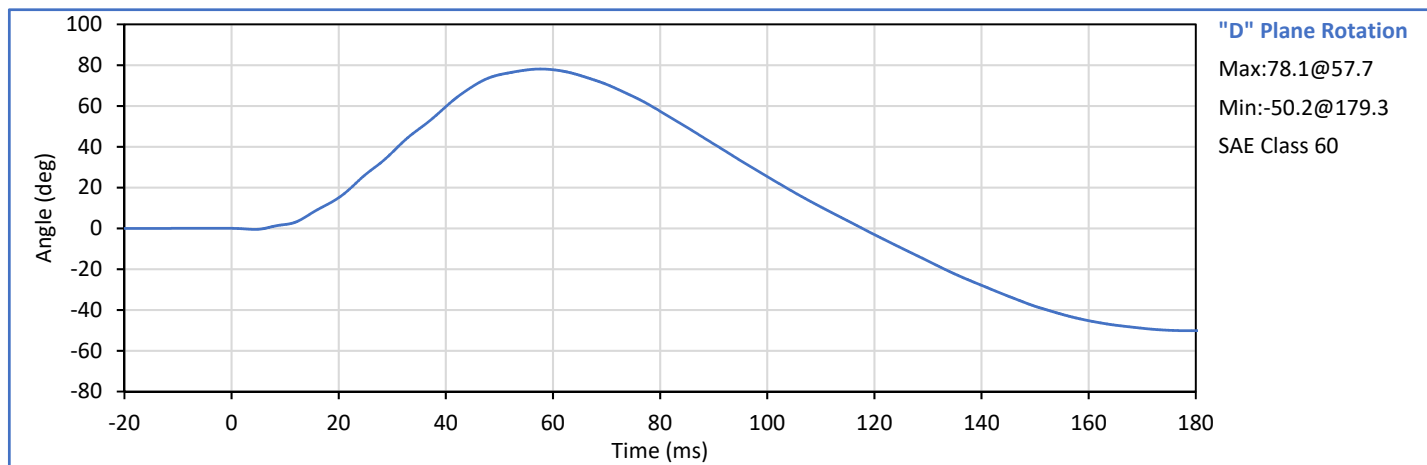
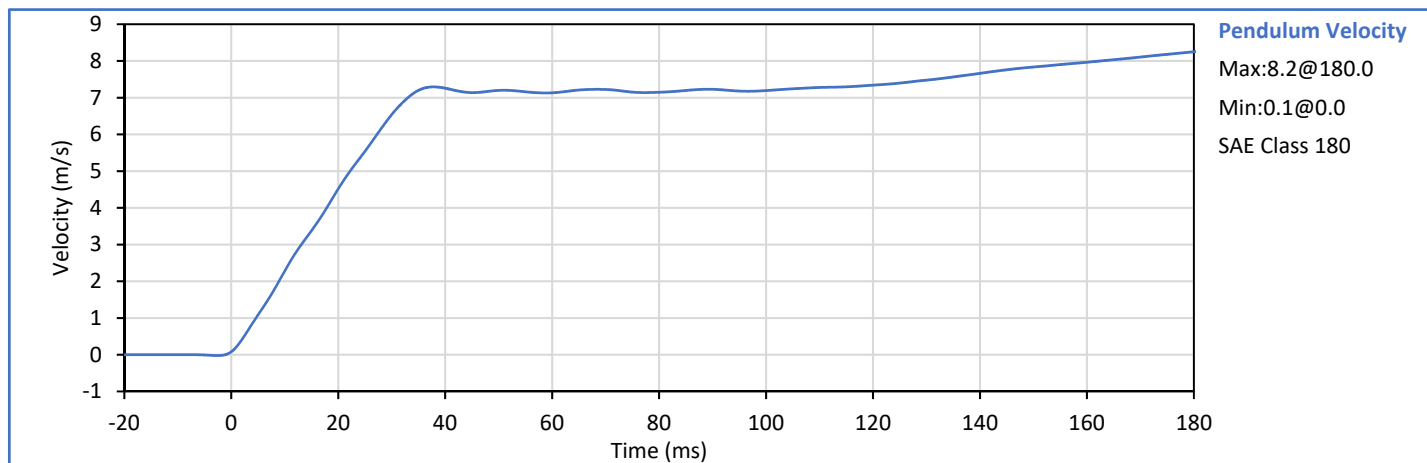
J. Hernandez

Approved By:

P. Puzzuto

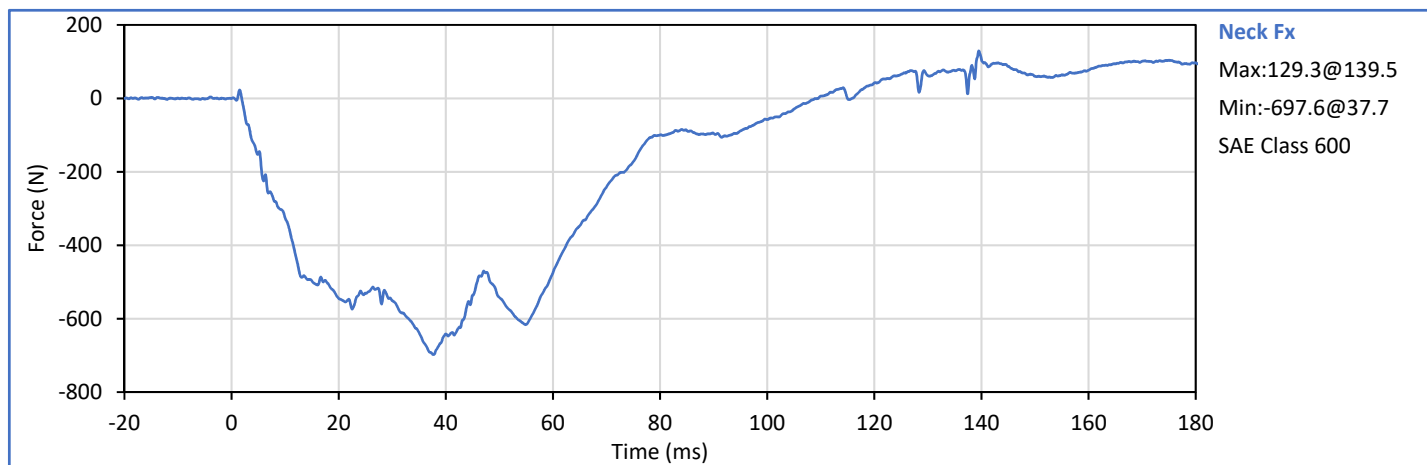
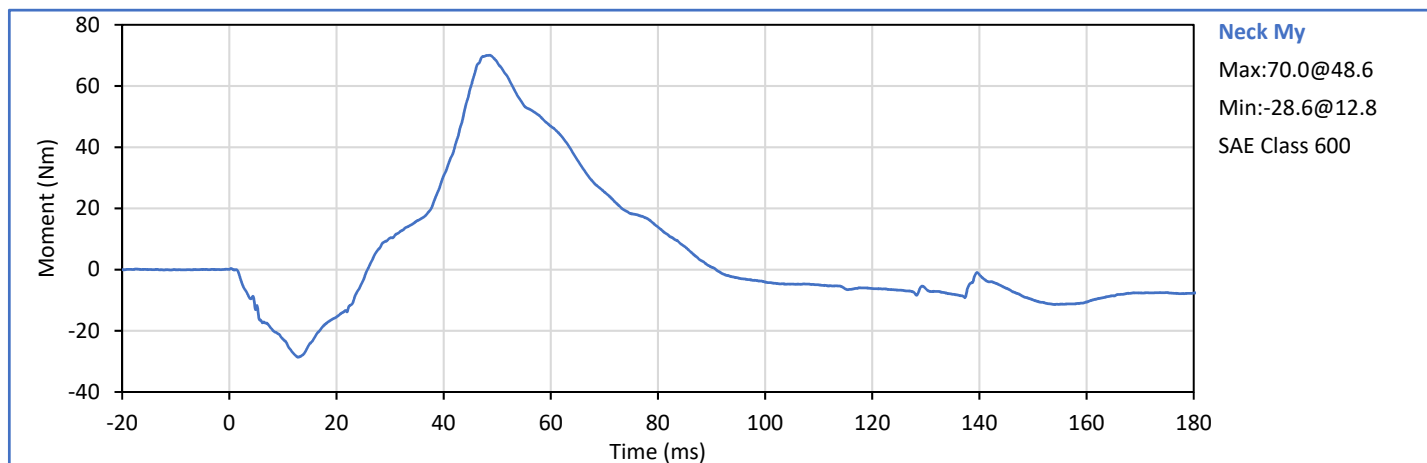
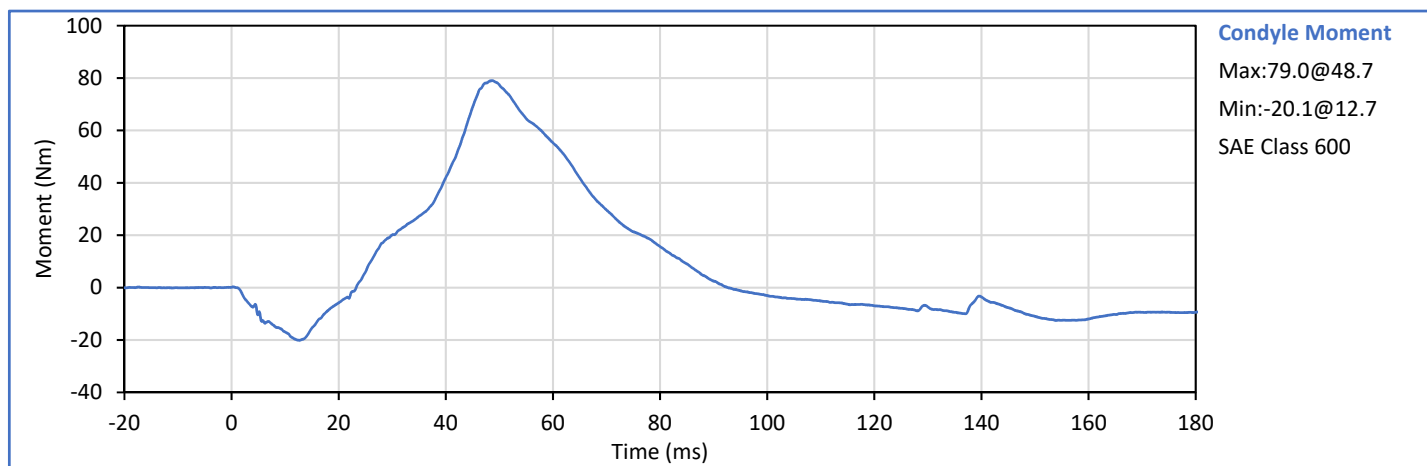
P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	27	Pass
Pendulum Velocity	m/s	6.89	7.13	7.08	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.28	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.52	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.54	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	78.1	Pass
Peak Moment in Rotation	Nm	69.0	83.0	79.0	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	84.3	Pass
Overall Test Results					Pass

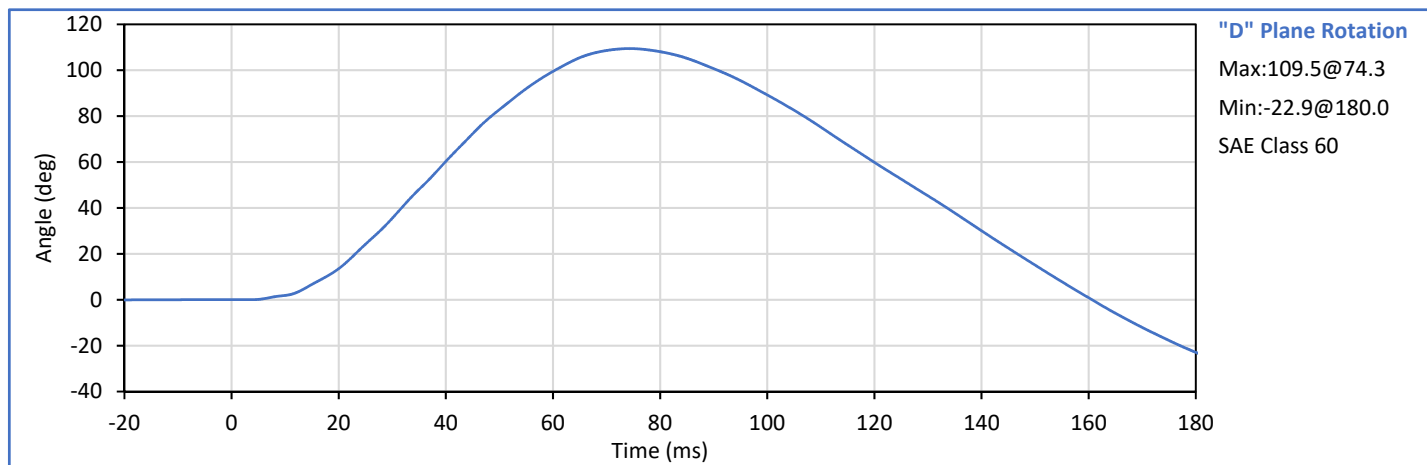
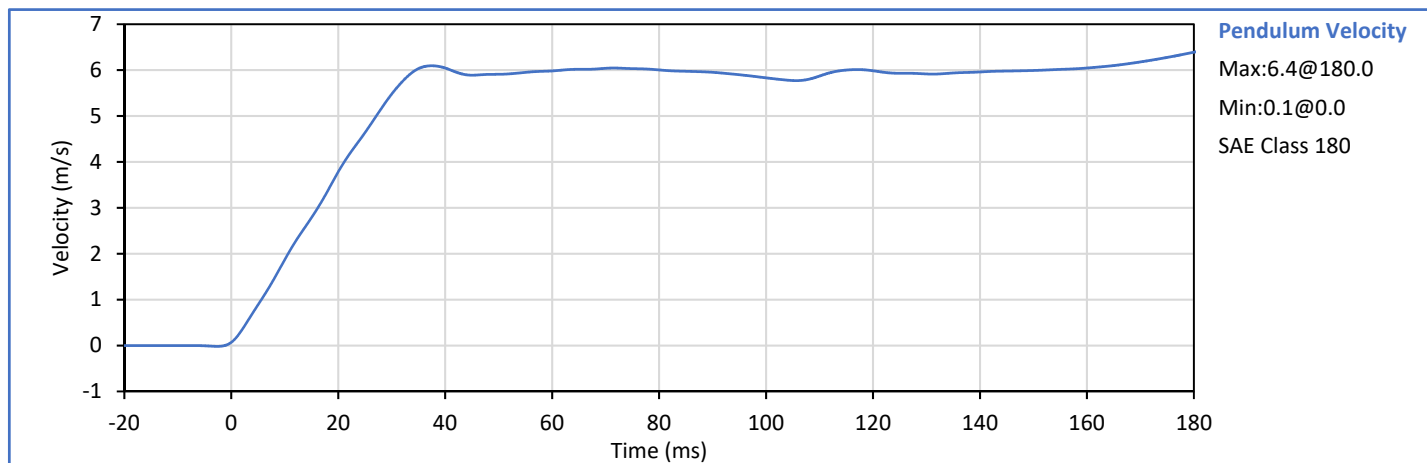


Technician: J. Hernandez

Approved By: P. Puzzuto



Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	5.95	6.19	6.01	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.87	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.78	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.48	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	109.5	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-58.3	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	99.8	Pass
Overall Test Results				Pass	Pass



Technician:

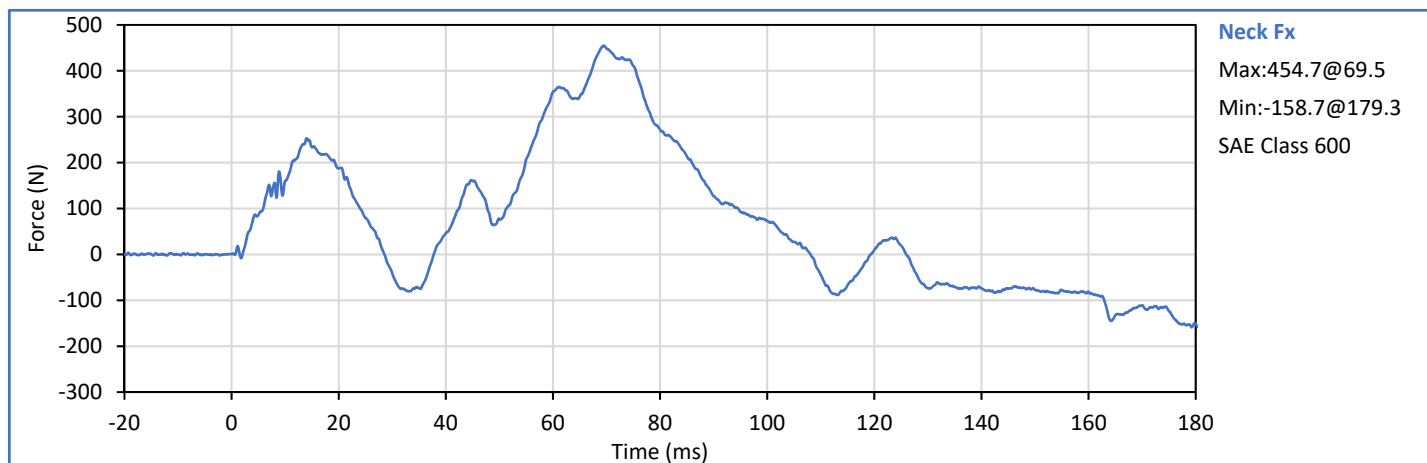
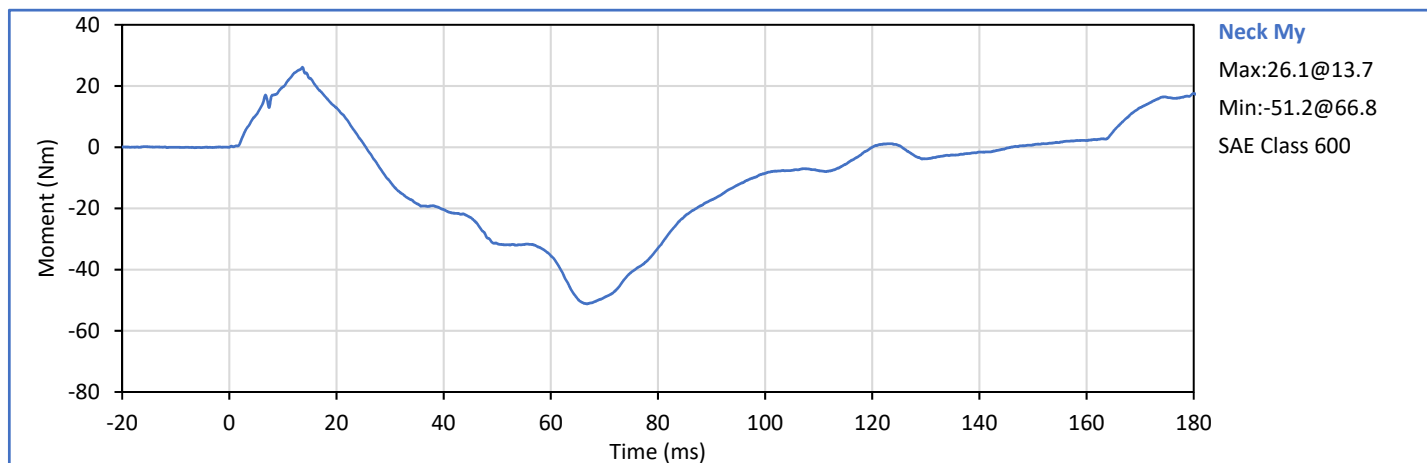
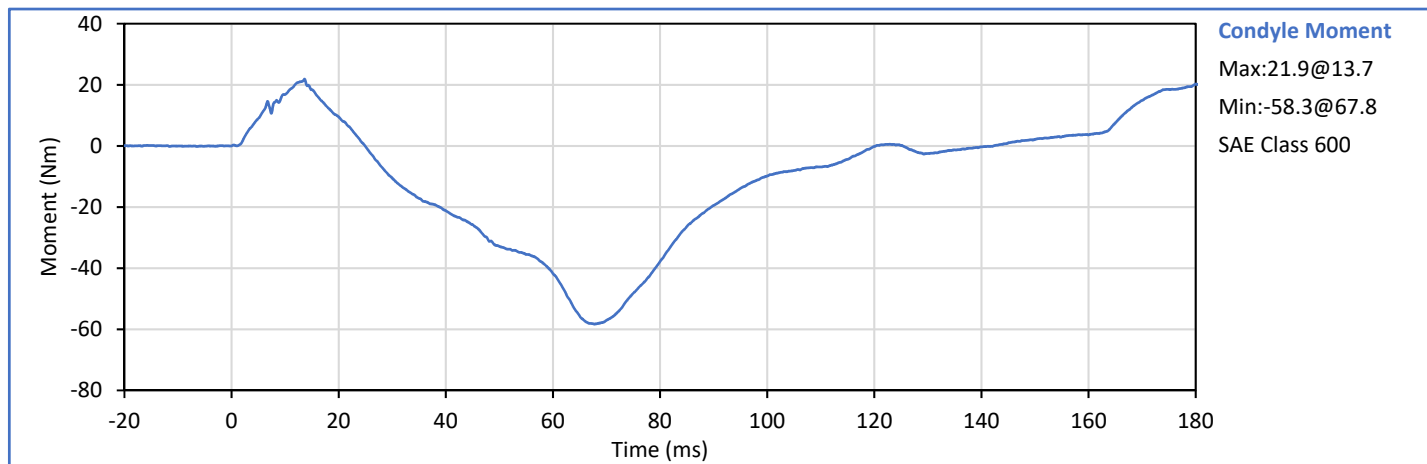
J. Hernandez

J. Hernandez

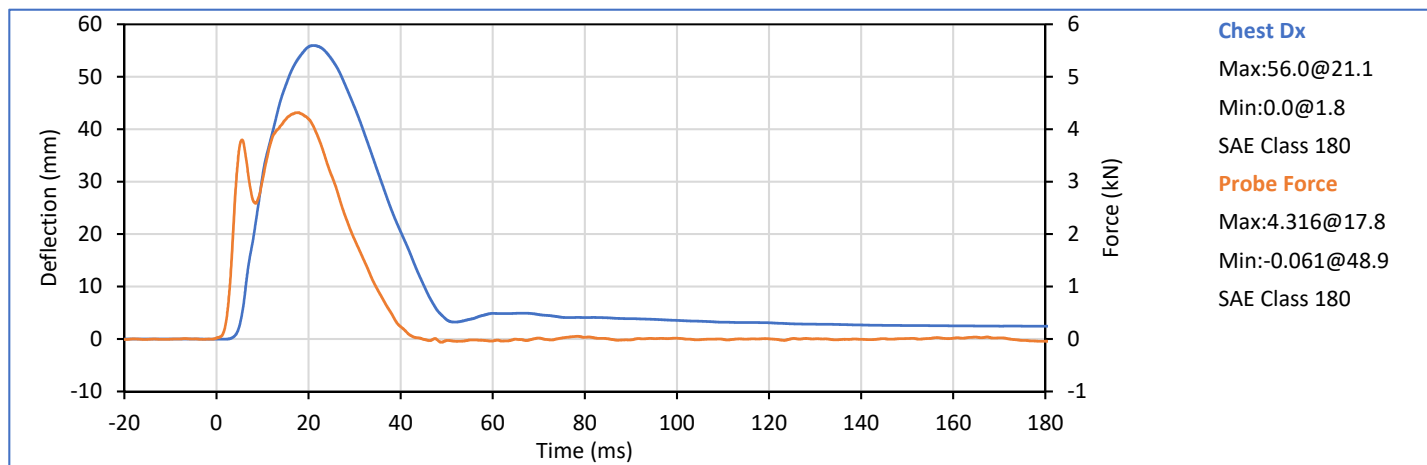
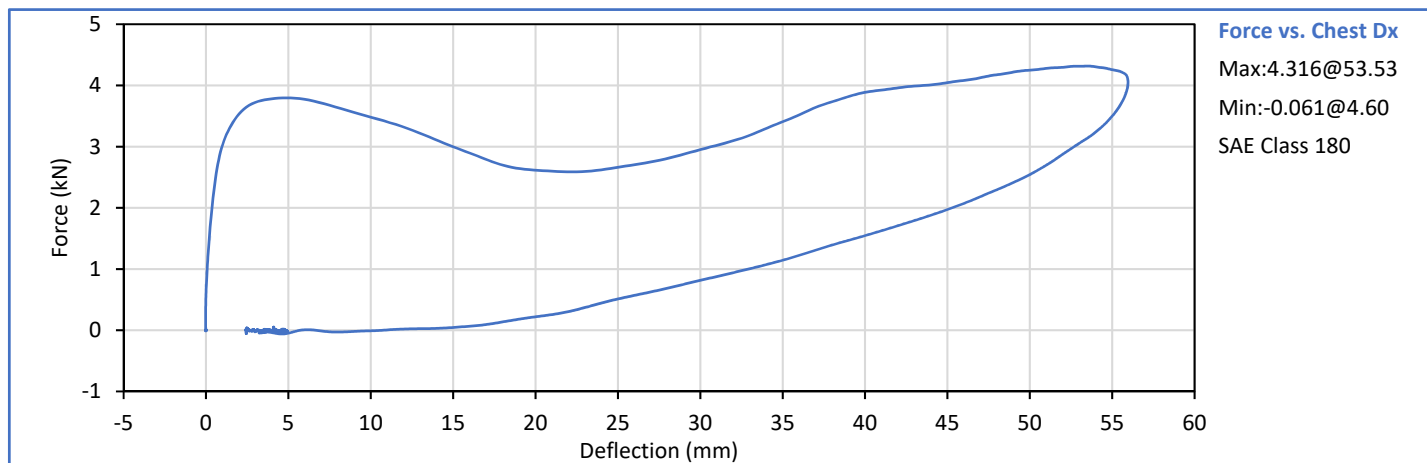
Approved By:

P. Puzzuto

P. Puzzuto



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
Probe Velocity	m/s	6.59	6.83	6.70	Pass
Peak Chest Deflection	mm	50.0	58.0	56.0	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.316	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	4.249	Pass
Internal Hysteresis	%	69.0	85.0	71.0	Pass
Overall Test Results				Pass	Pass



Technician:

J. Hernandez

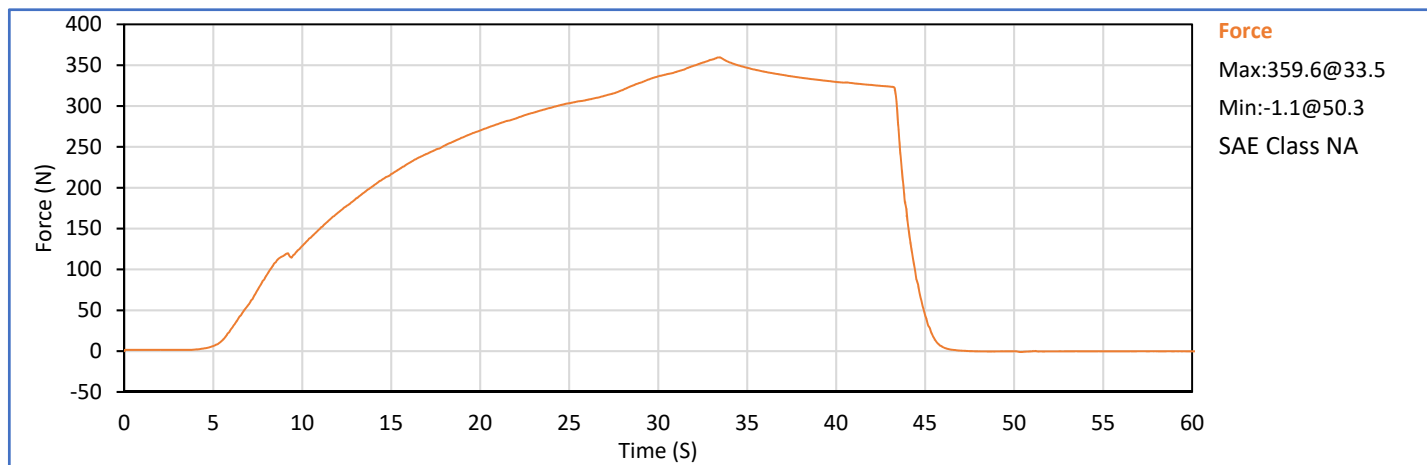
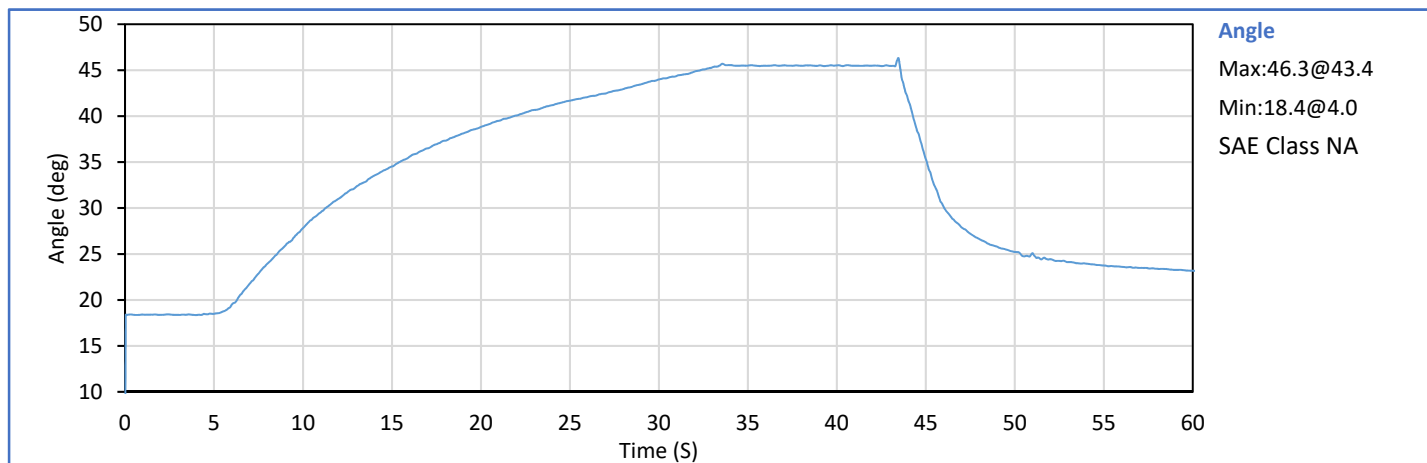
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

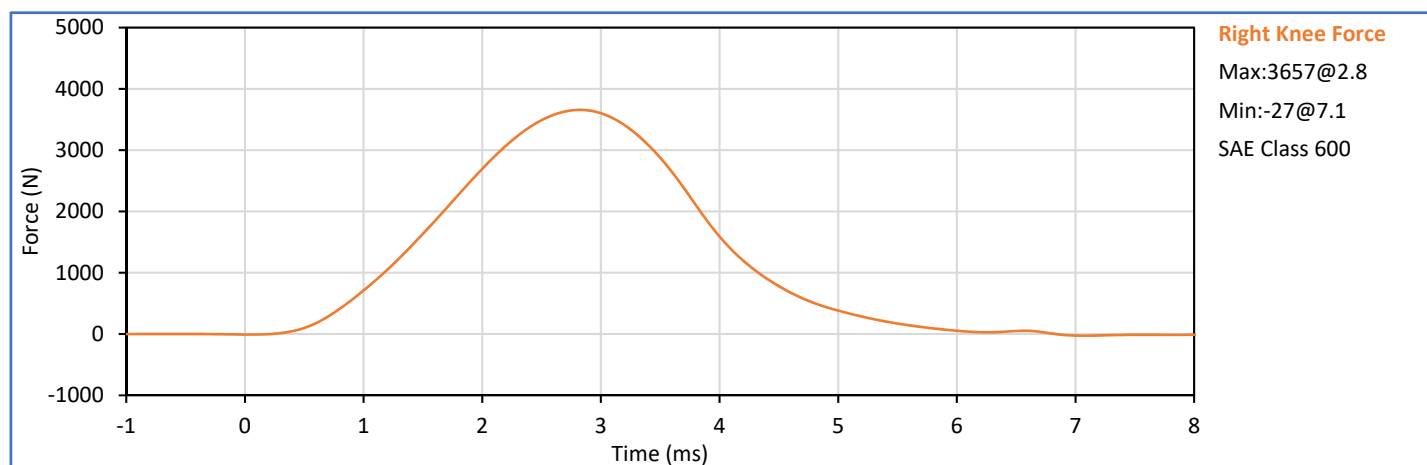
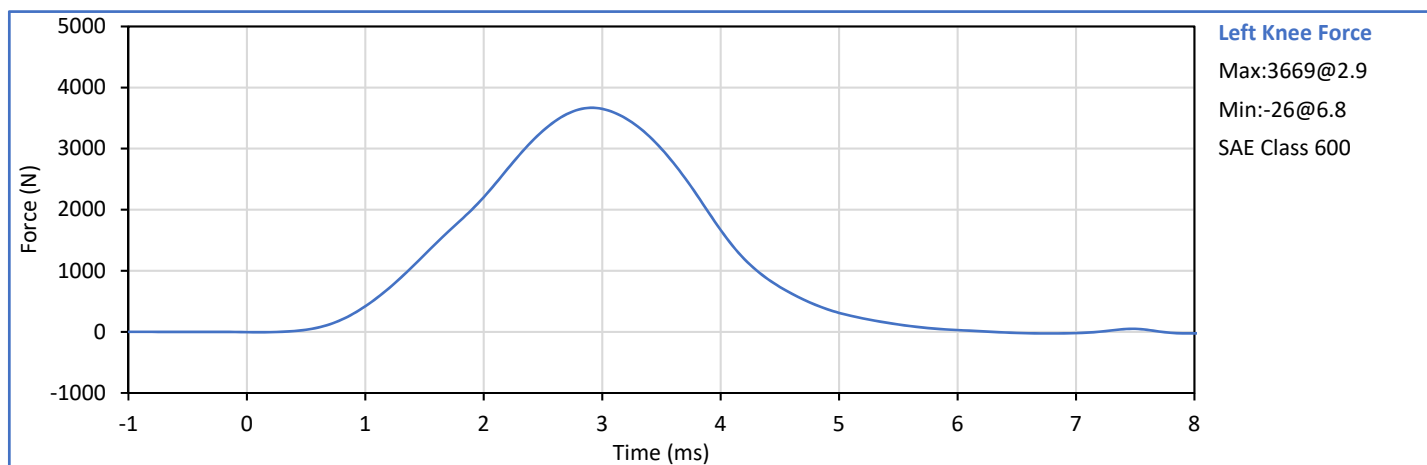
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Humidity	%	10	70	22	Pass
Orientation Angle	deg	0.0	20.0	17.5	Pass
Test Initial Angle	deg	11.0	19.0	18.4	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	353.5	Pass
Torso Flexion Rate	deg/s	0.50	1.50	0.96	Pass
Final Reference Plane Angle	deg	-8.0	8.0	3.2	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	22.2	Pass
	Laboratory Humidity	%	10	70	24	Pass
Left	Probe Velocity	m/s	2.070	2.130	2.094	Pass
Knee	Peak Resistive Force	N	3450	4060	3669	Pass
Right	Probe Velocity	m/s	2.070	2.130	2.098	Pass
Knee	Peak Resistive Force	N	3450	4060	3657	Pass
Overall Test Results					Pass	



Technician: J. Hernandez

Approved By: P. Puzzuto

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

ATD Serial No.: 360

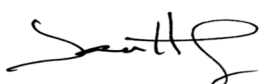
Test Date: 2020-01-22

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. Assembly	Bent shaft			✓
	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer Mounting	Head mounting secure			✓
	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician:



J. Hernandez

Approved By:



P. Puzzuto

ATD Serial No.: 360

Test Date: 2020-01-22

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	887	Pass
B - Shoulder pivot height	mm	505	521	517	Pass
C - 'H' point height	mm	84	89	87	Pass
D - 'H' point location from backline	mm	135	140	139	Pass
E - Shoulder pivot from backline	mm	84	94	91	Pass
F - Thigh clearance	mm	140	155	151	Pass
G - Back of elbow to wrist pivot	mm	290	305	297	Pass
H - Head back to backline	mm	41	46	46	Pass
I - Shoulder to elbow length	mm	330	345	343	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	440	Pass
M - Knee pivot height	mm	485	500	495	Pass
N - Buttock popliteal length	mm	452	477	464	Pass
O - Chest depth without jacket	mm	213	229	220	Pass
P - Foot length	mm	251	267	258	Pass
V - Shoulder breadth	mm	422	437	431	Pass
W - Foot breadth	mm	91	107	103	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	980	Pass
Z - Waist circum.	mm	836	866	851	Pass
AA - Location for chest circum.	mm	429	434	432	Pass
BB - Location for waist circum.	mm	226	231	228	Pass
			Overall Test Results		Pass

Technician: _____



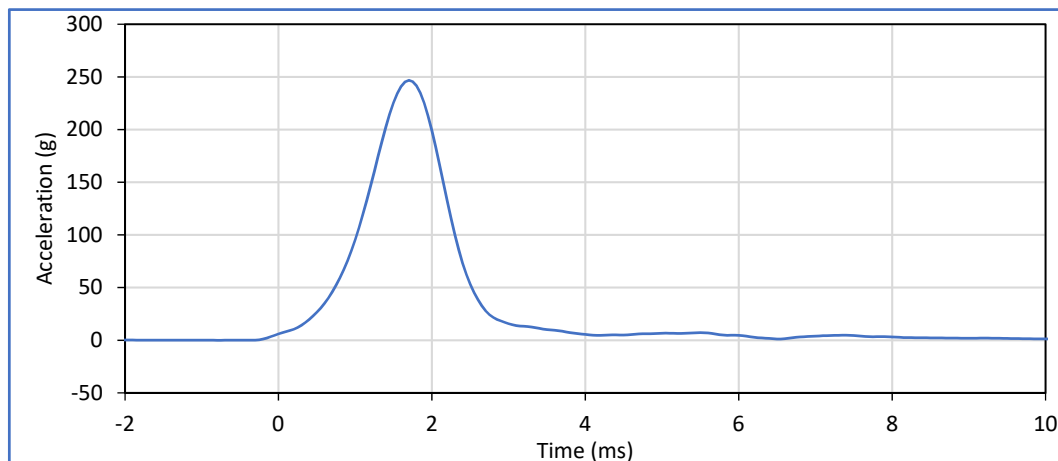
J. Hernandez

Approved By: _____



P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	225.0	275.0	246.8	Pass
Peak Lateral Acceleration	g	-15.0	15.0	2.9	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass

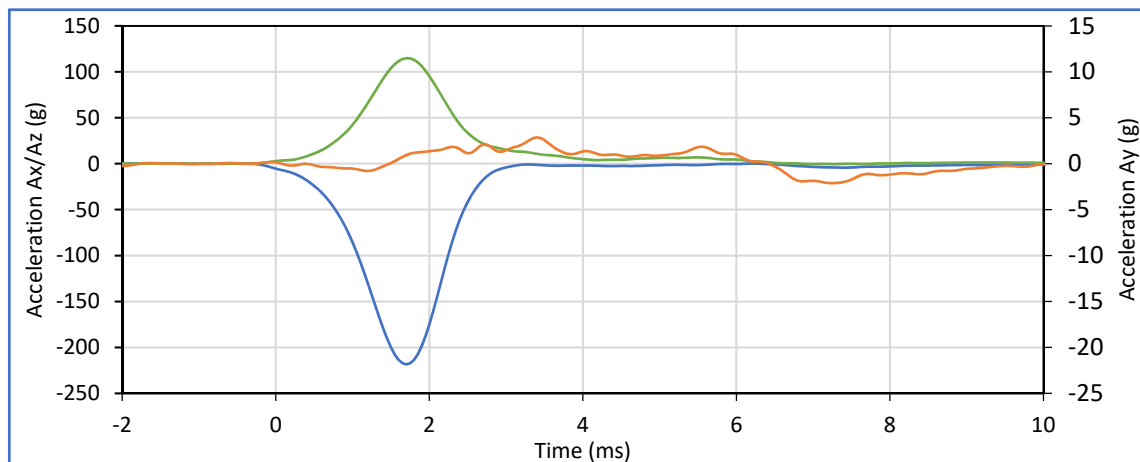


Head Resultant

Max:246.8@1.7

Min:1.2@6.5

SAE Class 1000



Head Ax

Max:0.2@6.2

Min:-218.4@1.7

SAE Class 1000

Head Ay

Max:2.9@3.4

Min:-2.1@7.3

SAE Class 1000

Head Az

Max:114.9@1.7

Min:-0.4@7.3

SAE Class 1000

Technician:

J. Hernandez

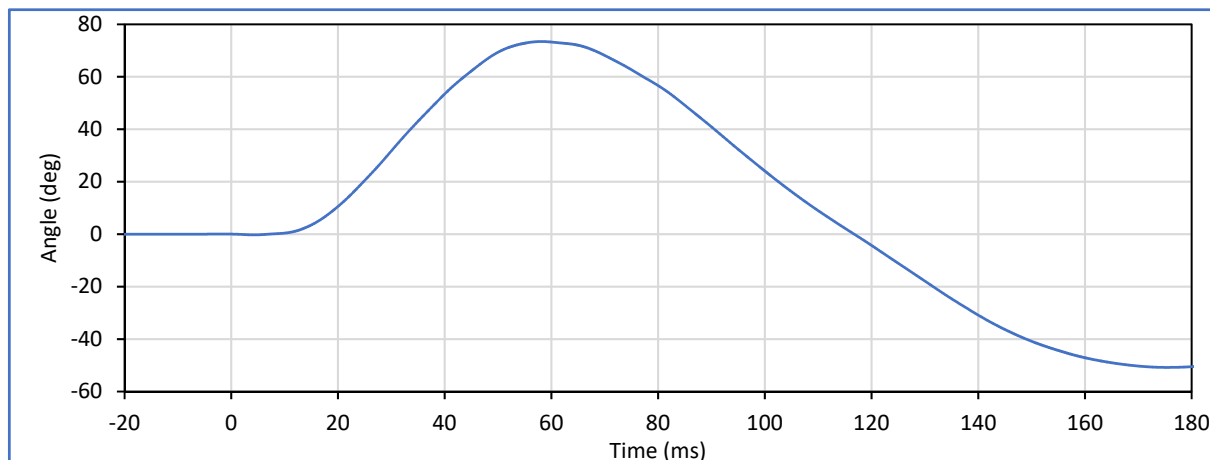
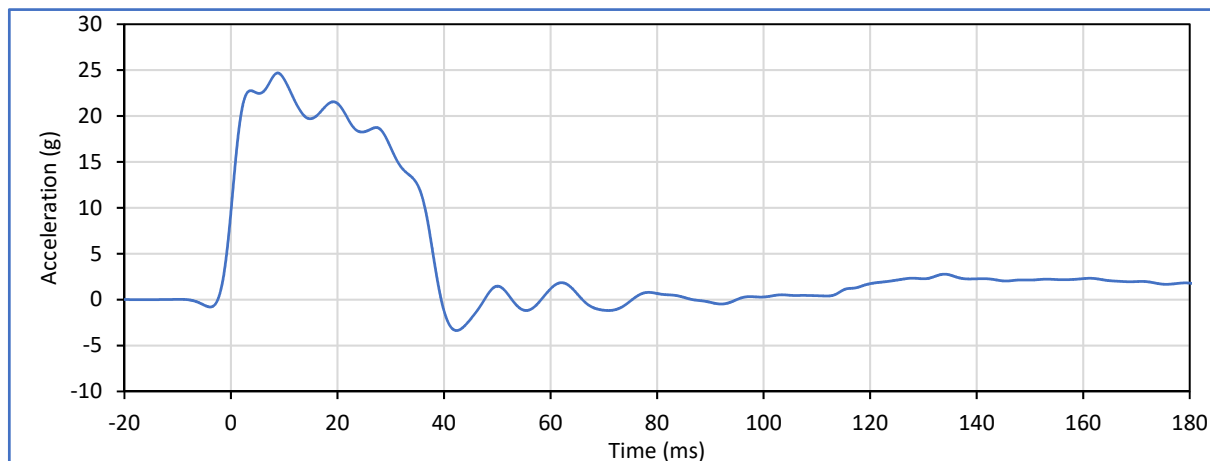
J. Hernandez

Approved By:

P. Puzzuto

P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.7	Pass
Laboratory Relative Humidity	%	10	70	30	Pass
Pendulum Velocity	m/s	6.89	7.13	7.08	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	24.0	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	21.4	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	16.6	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	16.6	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	37.9	Pass
"D" Plane Rotation peak	deg	64.0	78.0	73.5	Pass
	ms	57.0	64.0	58.1	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	116.8	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	99.8	Pass
	ms	47.0	58.0	51.0	Pass
Moment Decay, Peak to Zero	ms	97.0	107.0	98.4	Pass
Overall Test Results					Pass

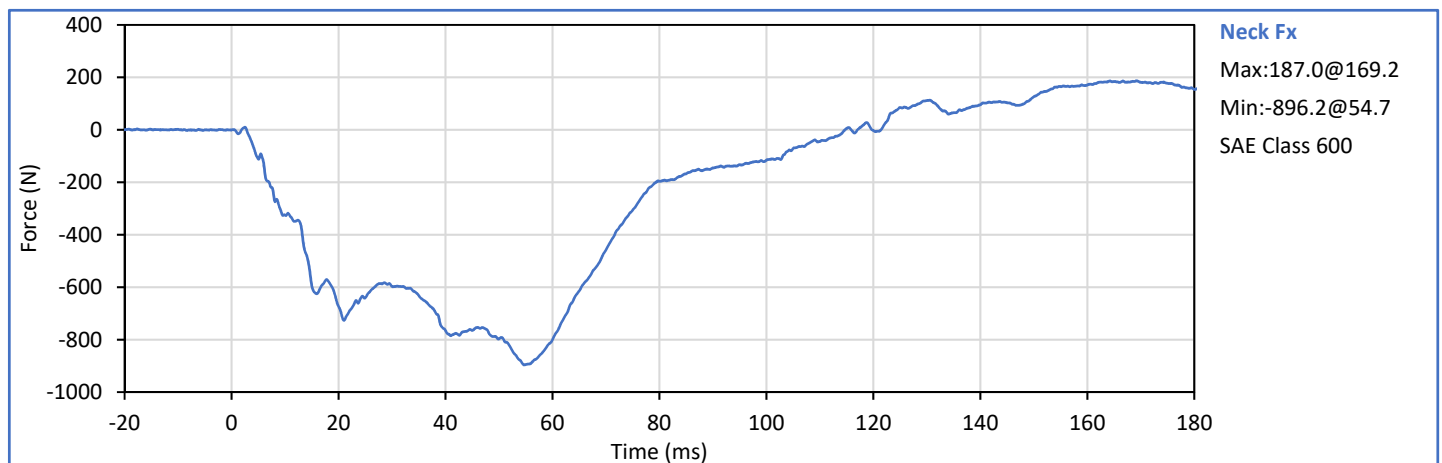
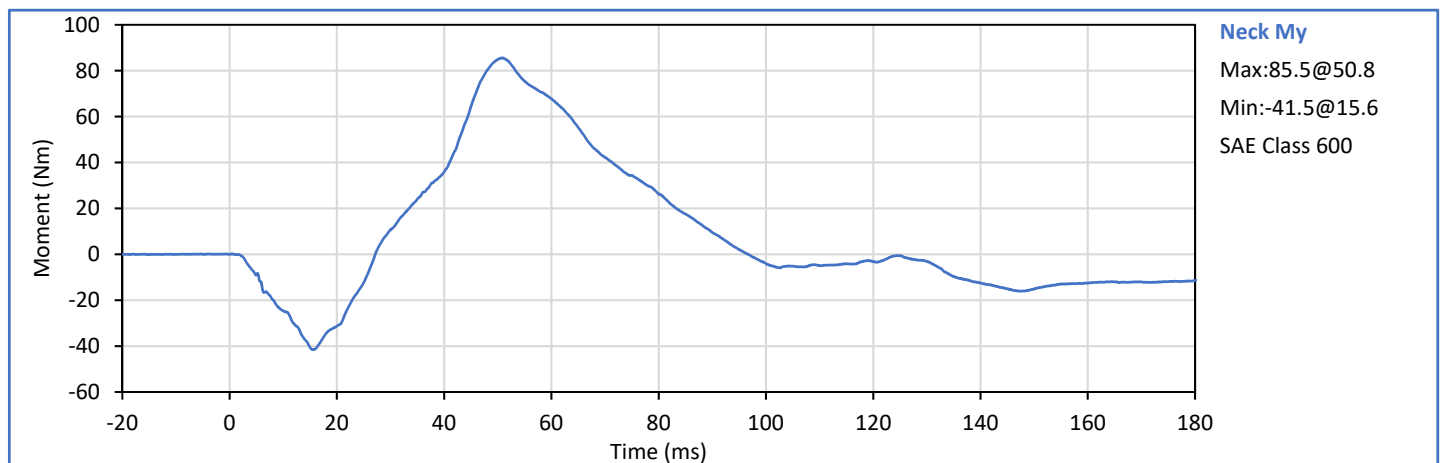
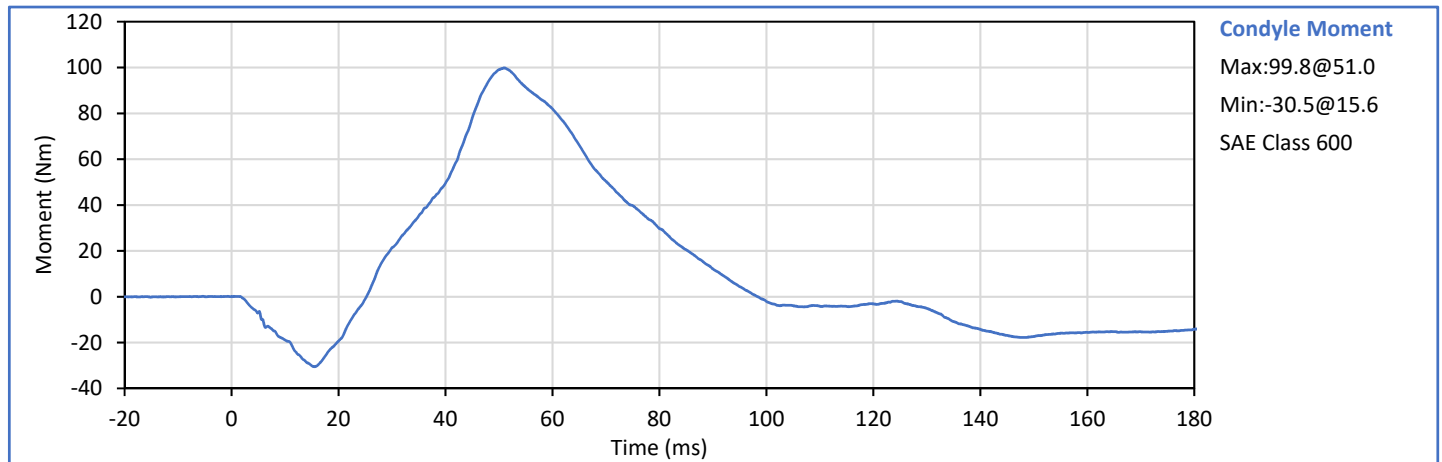


Technician: _____

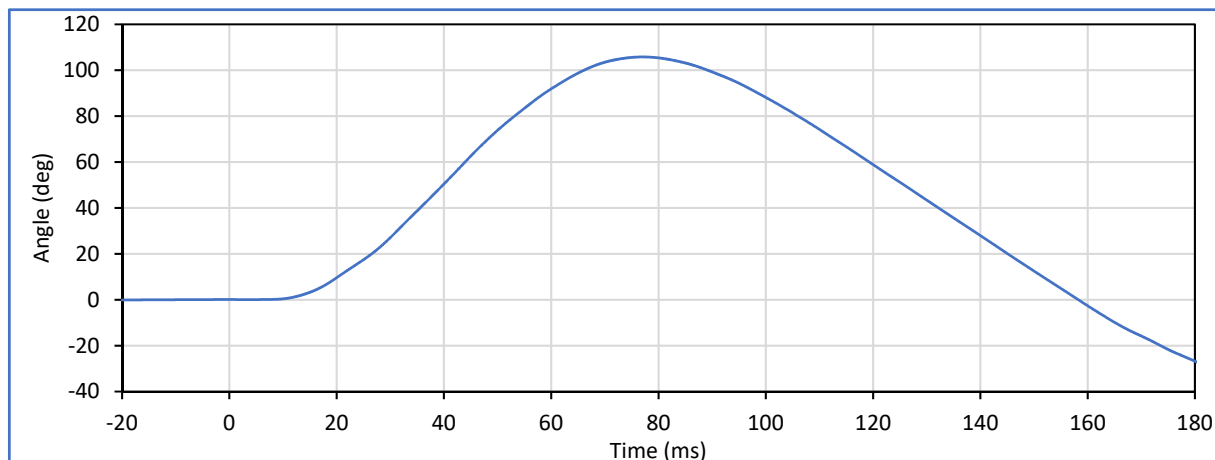
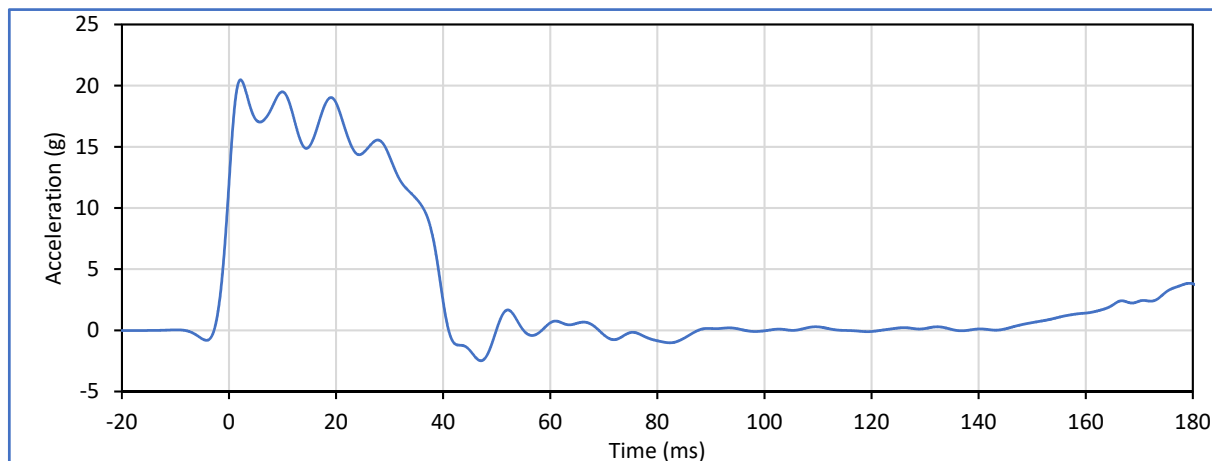
J. Hernandez

Approved By: _____

P. Puzzuto



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	32	Pass
Pendulum Velocity	m/s	5.94	6.19	6.10	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	19.5	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.6	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	14.2	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	14.2	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	39.1	Pass
"D" Plane Rotation peak	deg	81.0	106.0	105.8	Pass
	ms	72.0	82.0	77.1	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	158.3	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-78.7	Pass
	ms	65.0	79.0	70.9	Pass
Moment Decay, Peak to Zero	ms	120.0	148.0	144.0	Pass
Overall Test Results					Pass

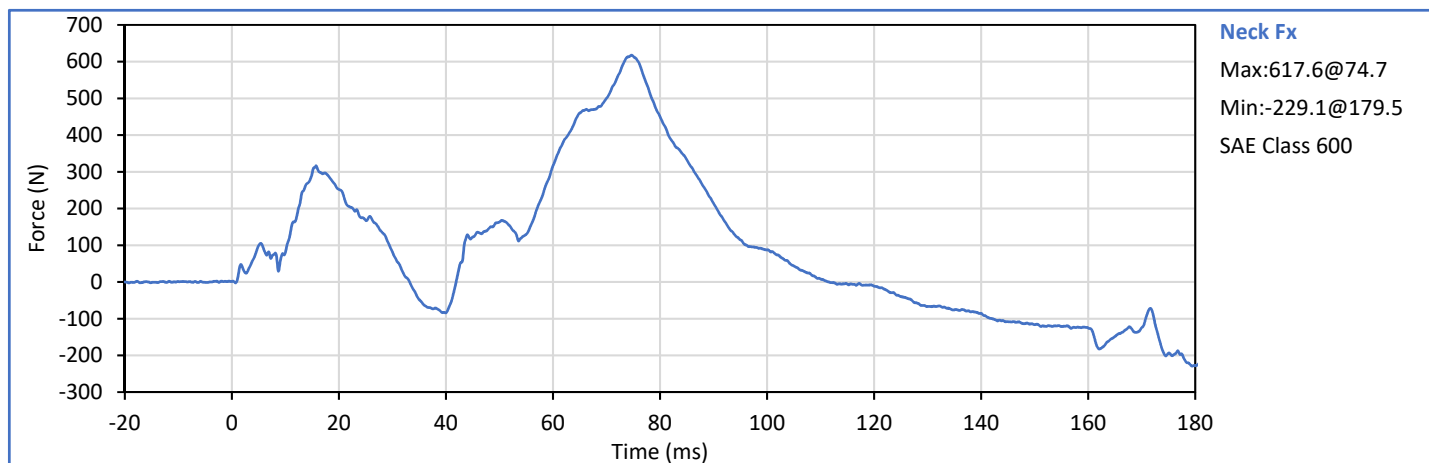
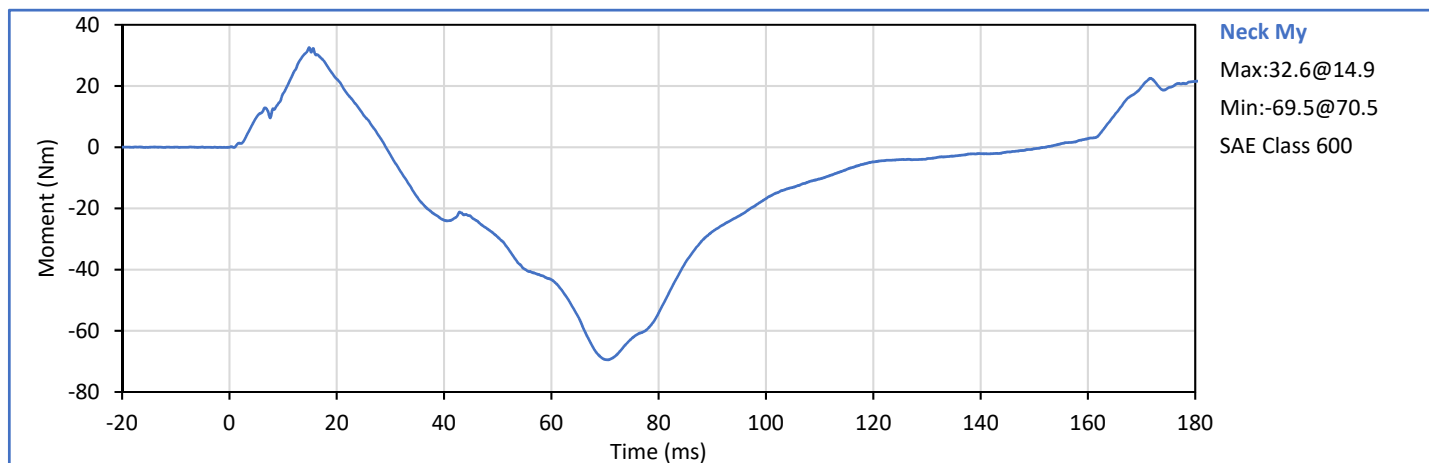
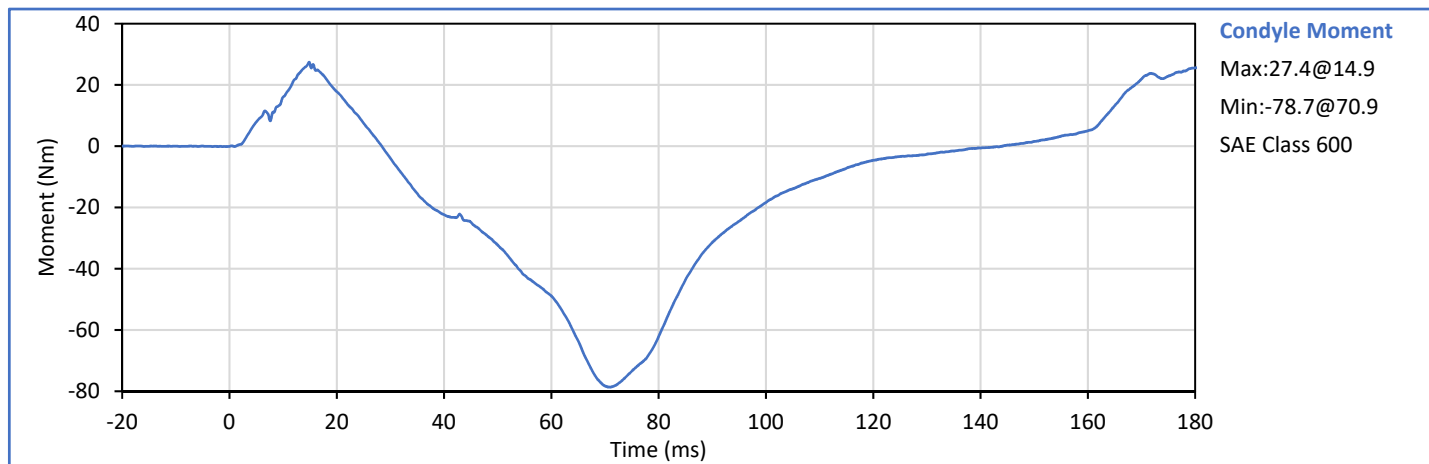


Technician: _____

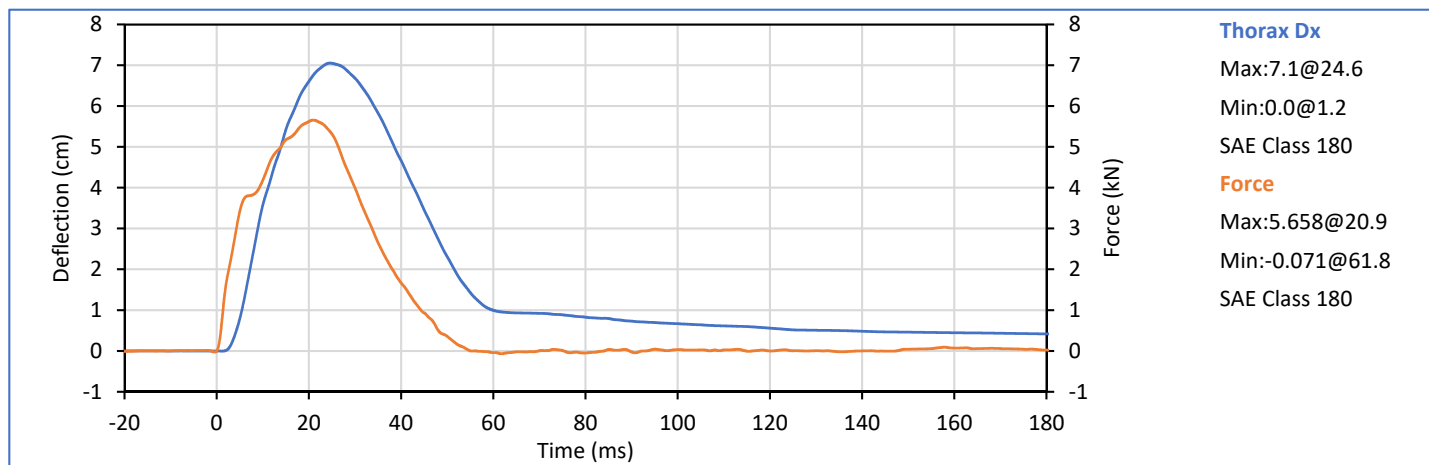
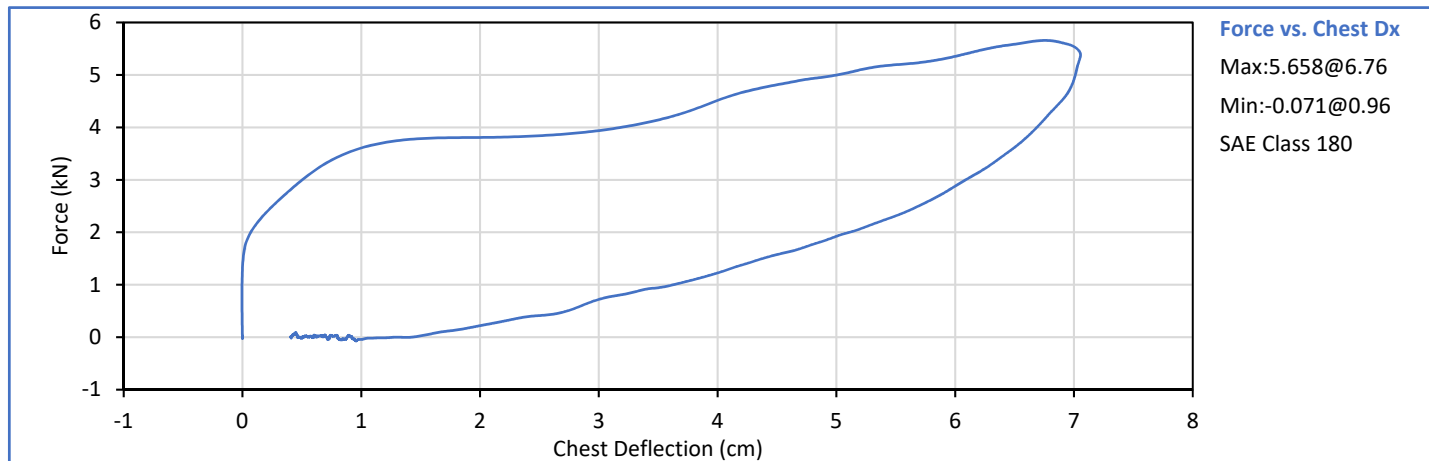
J. Hernandez

Approved By: _____

P. Puzzuto



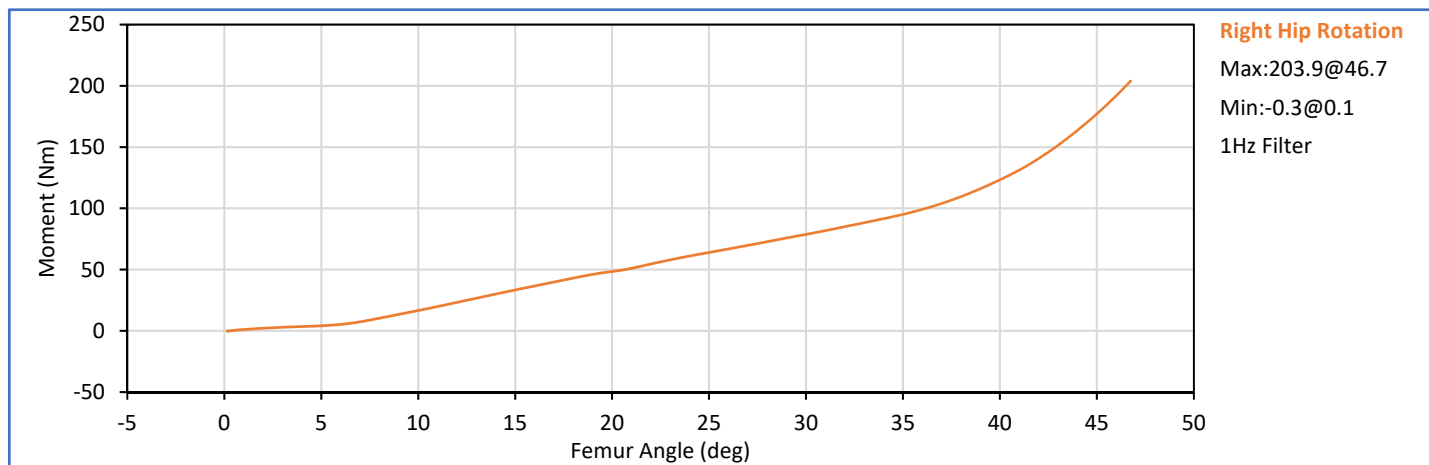
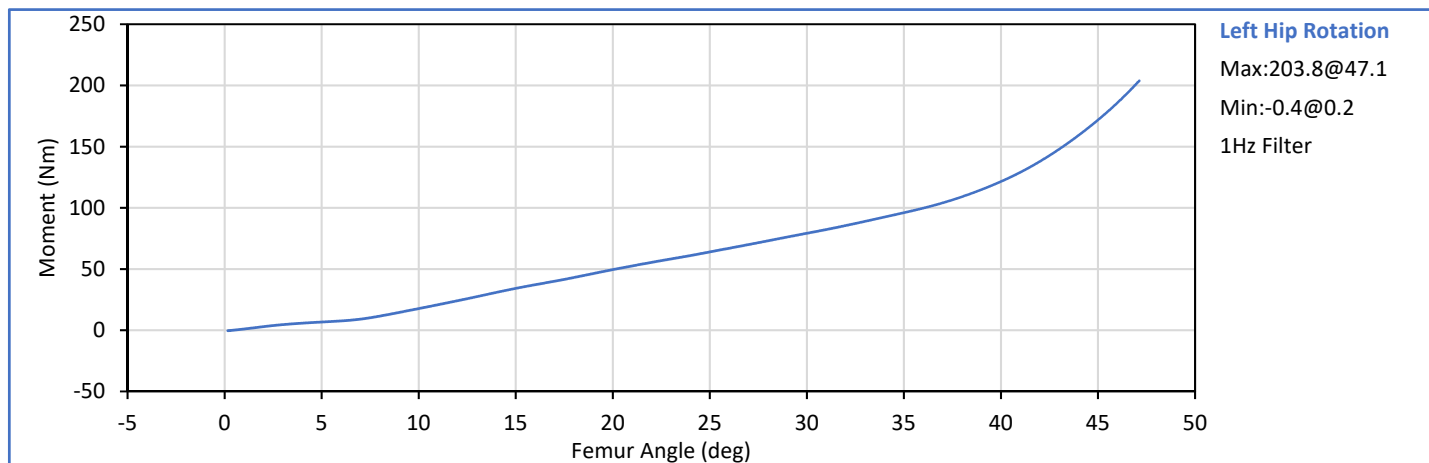
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	32	Pass
Probe Velocity	m/s	6.58	6.82	6.65	Pass
Peak Chest Deflection	cm	6.35	7.26	7.06	Pass
Peak Probe Force	kN	5.159	5.893	5.658	Pass
Internal Hysteresis	%	69.0	85.0	69.4	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

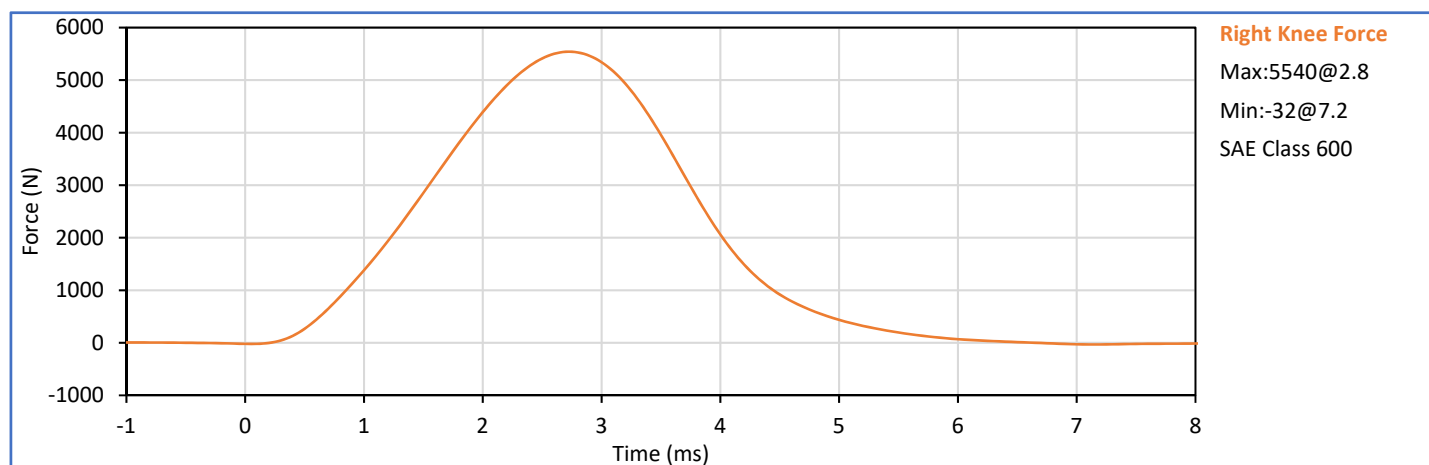
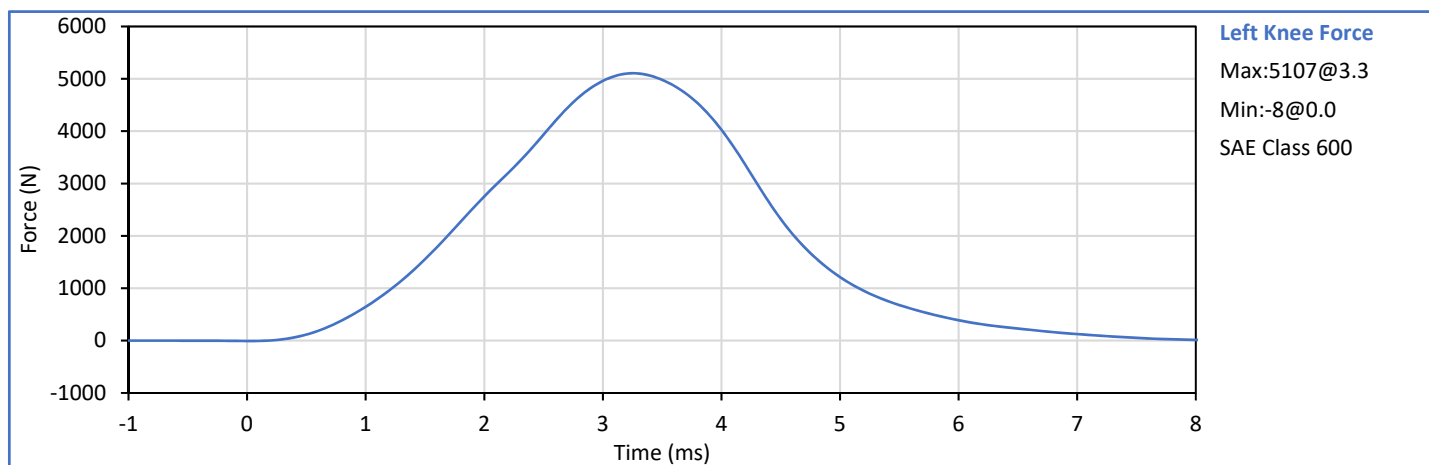
	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.1	Pass
	Laboratory Relative Humidity	%	10	70	30	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	5.8	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	79.3	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	47.1	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	78.8	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	46.7	Pass
Overall Test Results						Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.1	Pass
	Laboratory Relative Humidity	%	10	70	27	Pass
Left	Probe Velocity	m/s	2.070	2.130	2.093	Pass
Knee	Peak Resistive Force	N	4715	5782	5107	Pass
Right	Probe Velocity	m/s	2.070	2.130	2.081	Pass
Knee	Peak Resistive Force	N	4715	5782	5540	Pass
Overall Test Results						Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

APPENDIX C
Post-Test ATD Qualification and Performance Verification
Hybrid III 5th Percentile Female ATD
S/N: 630

ATD Serial No.: 630

Test Date: 2020-01-22

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

Describe any repairs or replacement of parts or other findings:

No Problems Found

Technician:



J. Hernandez

Approved By:



P. Puzzuto

ATD Serial No.: 630

Test Date: 2020-01-22

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	794	Pass
B - Shoulder pivot height	mm	432	457	448	Pass
C - 'H' point height	mm	81	86	86	Pass
D - 'H' point location from backline	mm	145	150	149	Pass
E - Shoulder pivot from backline	mm	69	84	80	Pass
F - Thigh clearance	mm	119	135	126	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	289	Pass
J - Elbow rest height	mm	183	203	198	Pass
K - Buttock to knee length	mm	521	546	538	Pass
L - Popliteal length	mm	356	376	365	Pass
M - Knee pivot height	mm	394	419	402	Pass
N - Buttock popliteal length	mm	414	439	430	Pass
O - Chest depth without jacket	mm	175	191	180	Pass
P - Foot length	mm	219	234	227	Pass
R - Buttock to Knee Pivot Length	mm	457	483	475	Pass
S - Head Breadth	mm	137	147	143	Pass
T - Head Depth	mm	178	188	186	Pass
U - Hip Breadth	mm	300	315	308	Pass
V - Shoulder breadth	mm	351	366	361	Pass
W - Foot breadth	mm	79	94	90	Pass
X - Head circum.	mm	528	549	542	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	867	Pass
Z - Waist circum.	mm	760	790	778	Pass
AA - Location for chest circum.	mm	333	358	346	Pass
BB - Location for waist circum.	mm	160	170	169	Pass
			Overall Test Results		Pass

Technician:



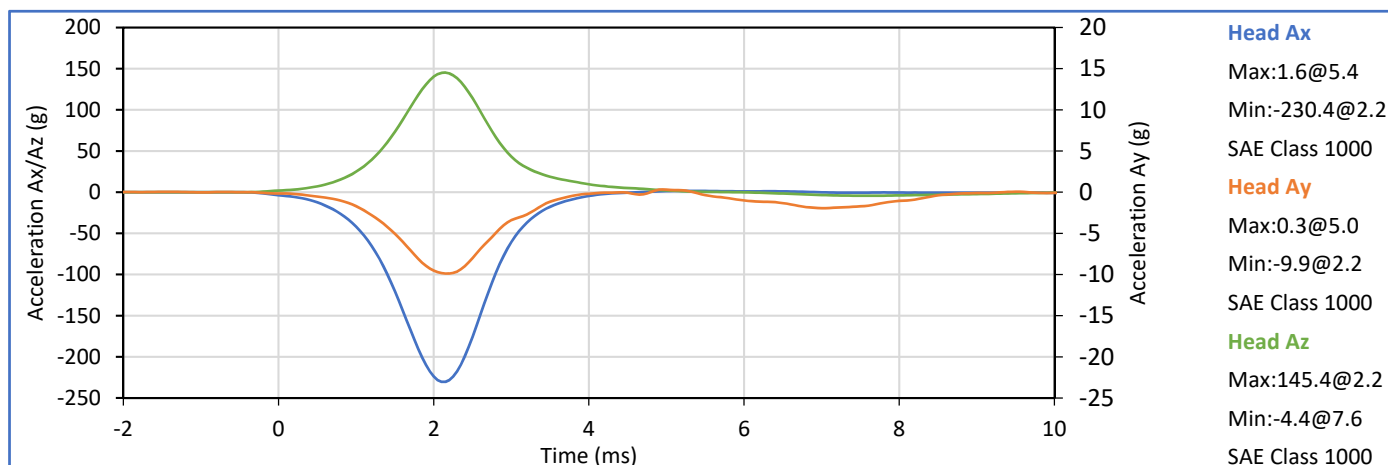
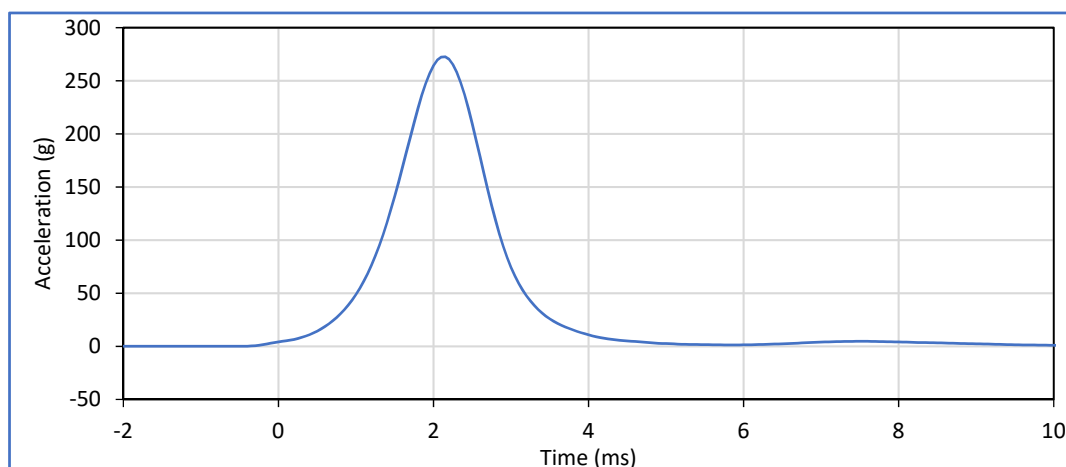
J. Hernandez

Approved By:



P. Puzzuto

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	30	Pass
Peak Resultant Acceleration	g	250.0	300.0	272.6	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-9.9	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass



Technician:

J. Hernandez

J. Hernandez

Approved By:

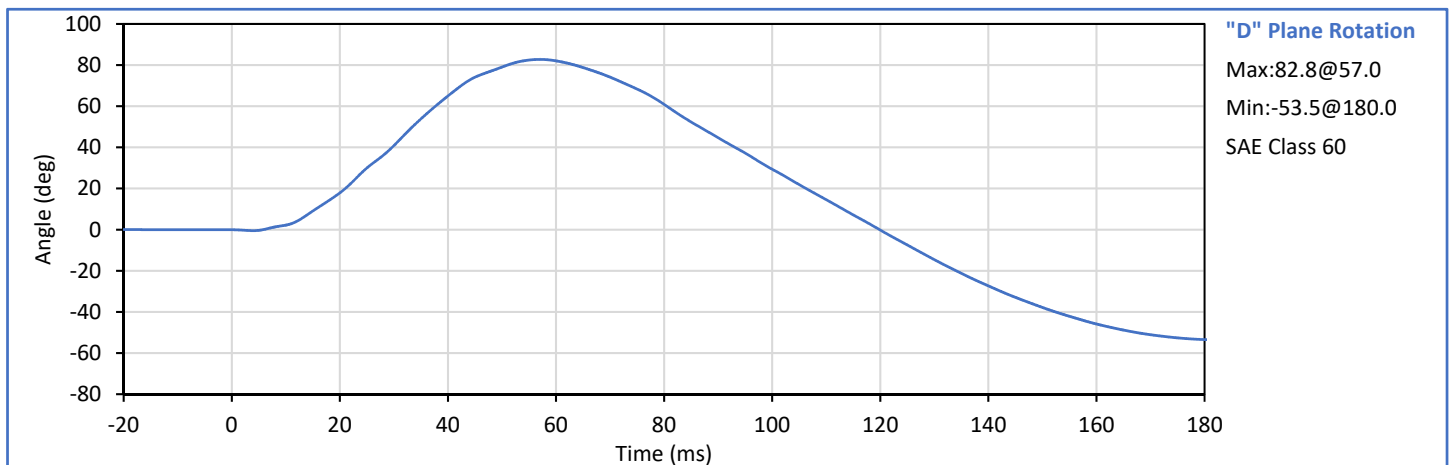
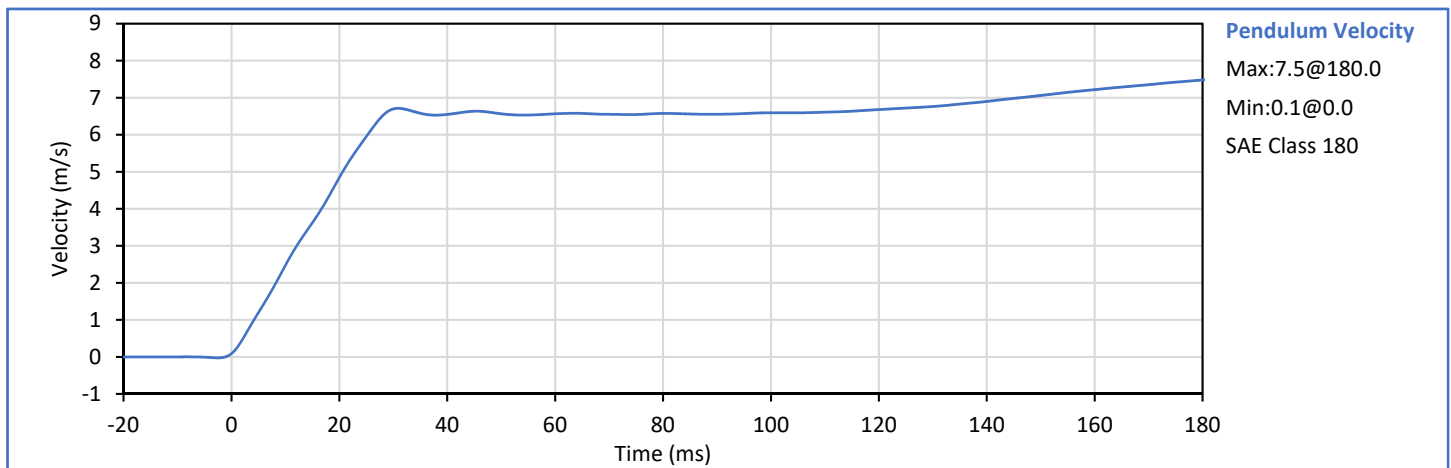
P. Puzzuto

P. Puzzuto

ATD Serial No.: 630

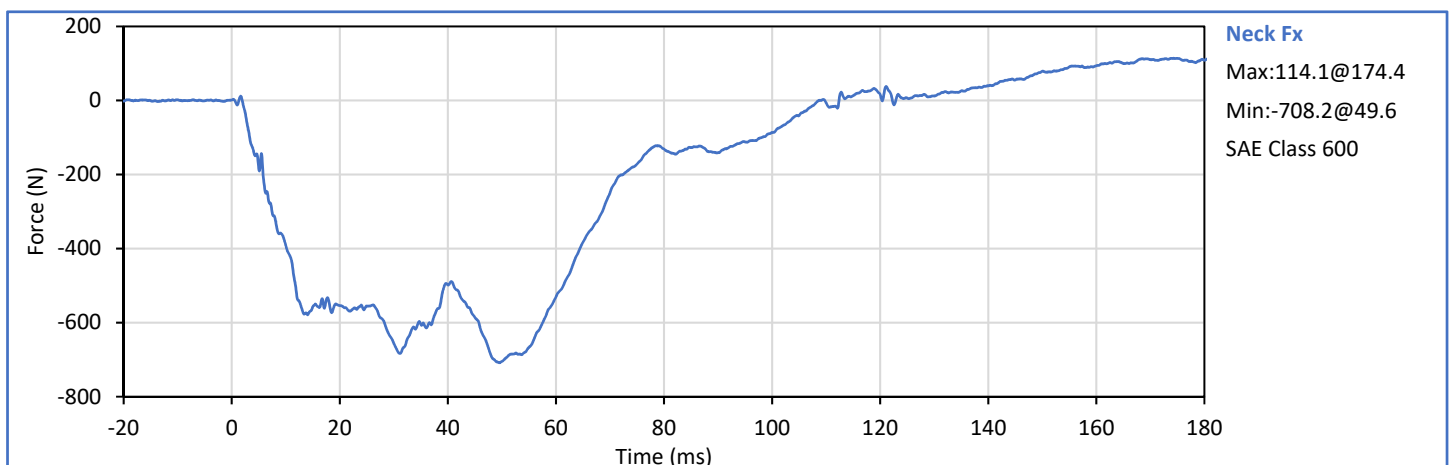
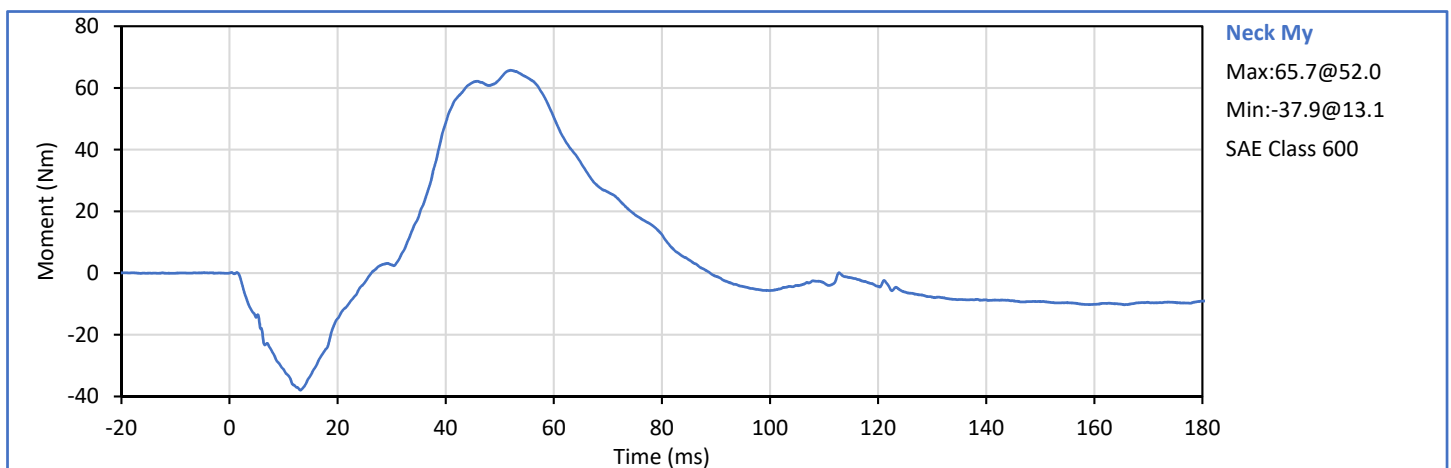
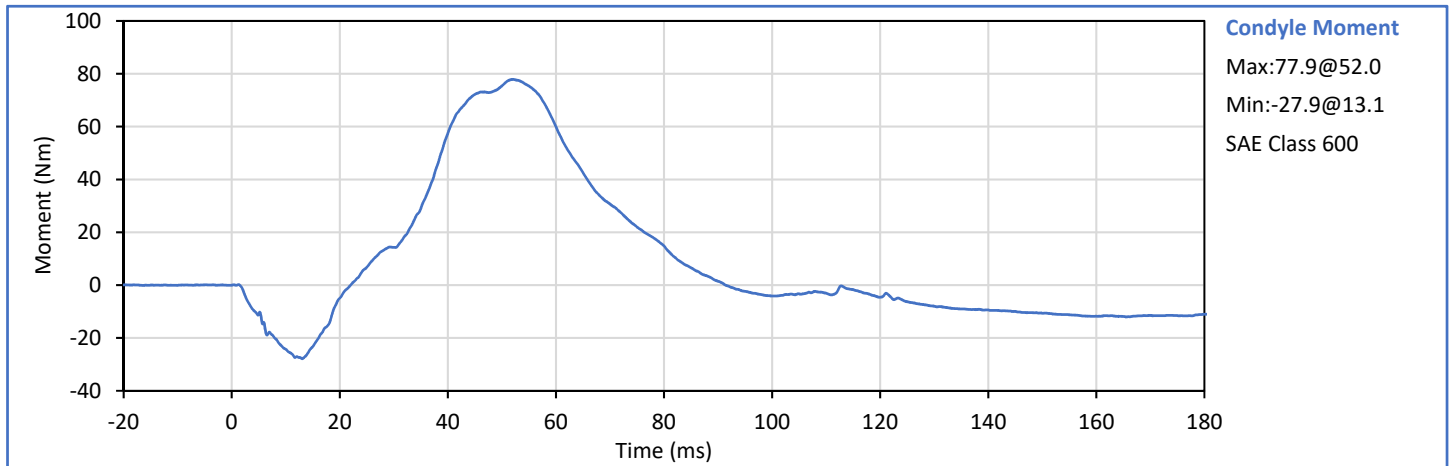
Test Date: 2020-01-24

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	27	Pass
Pendulum Velocity	m/s	6.89	7.13	6.93	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.47	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.85	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.70	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	82.8	Pass
Peak Moment in Rotation	Nm	69.0	83.0	77.9	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	82.4	Pass
Overall Test Results				Pass	Pass

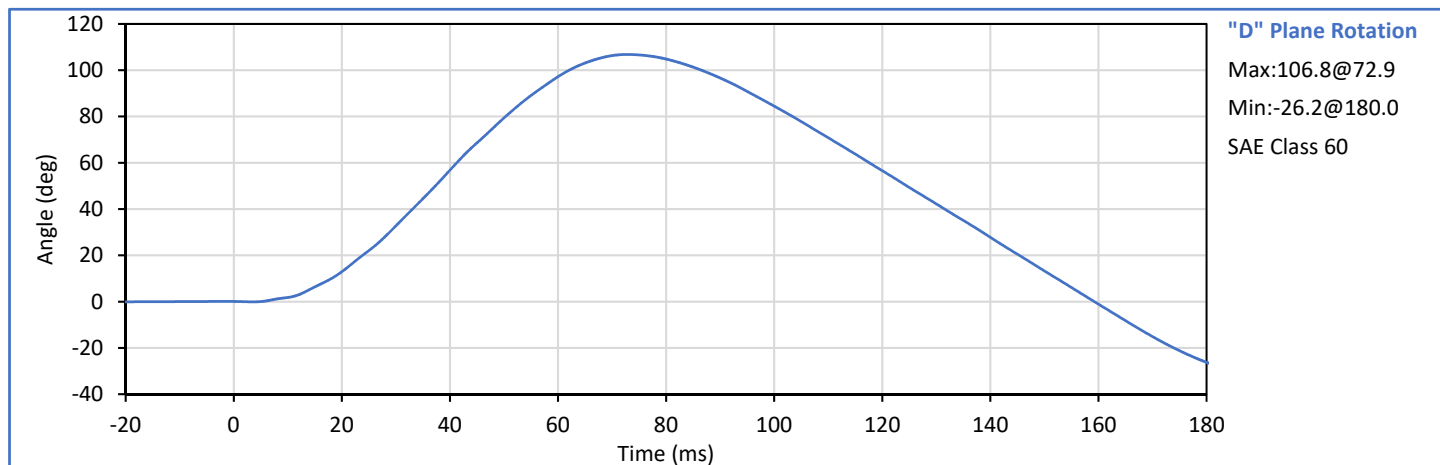
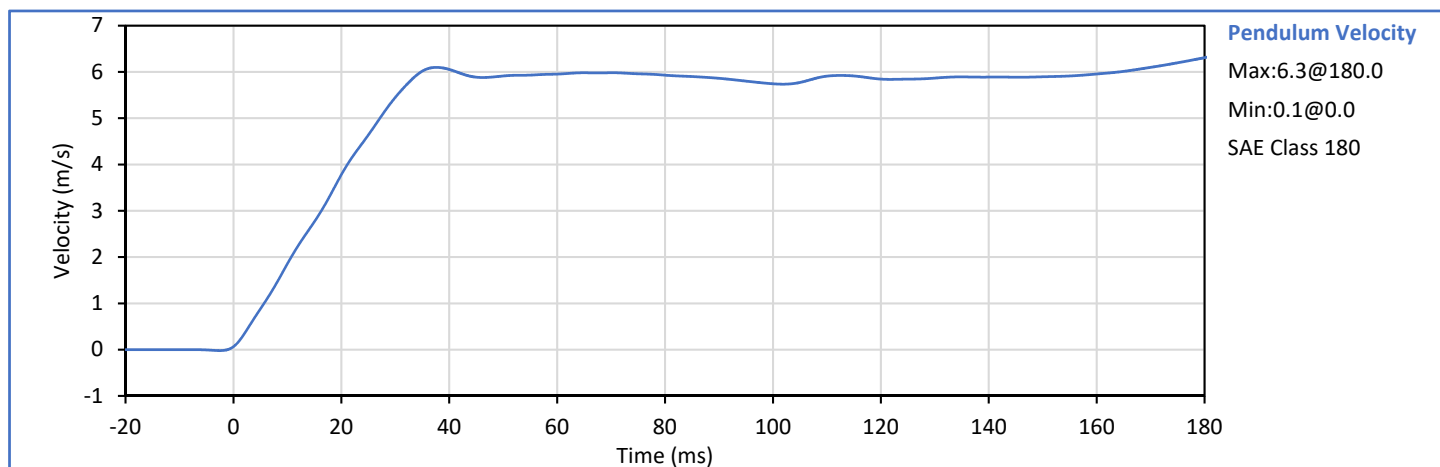


Technician: J. Hernandez

Approved By: P. Puzzuto
C-34

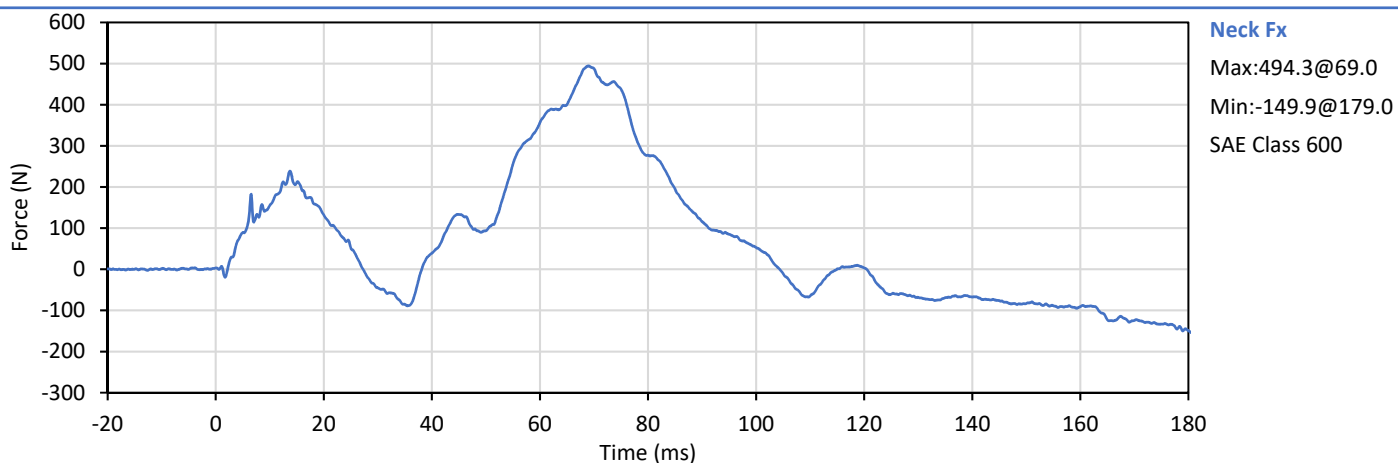
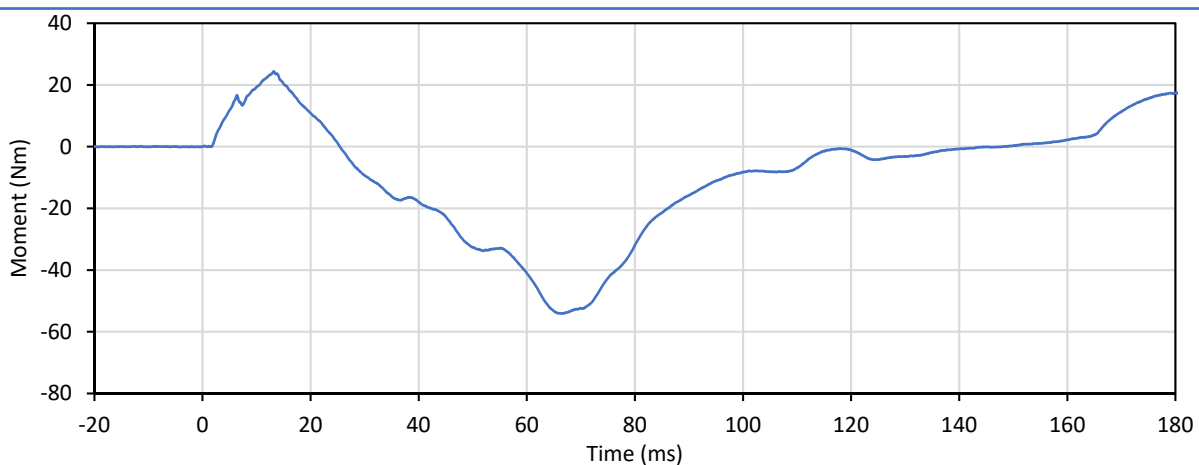
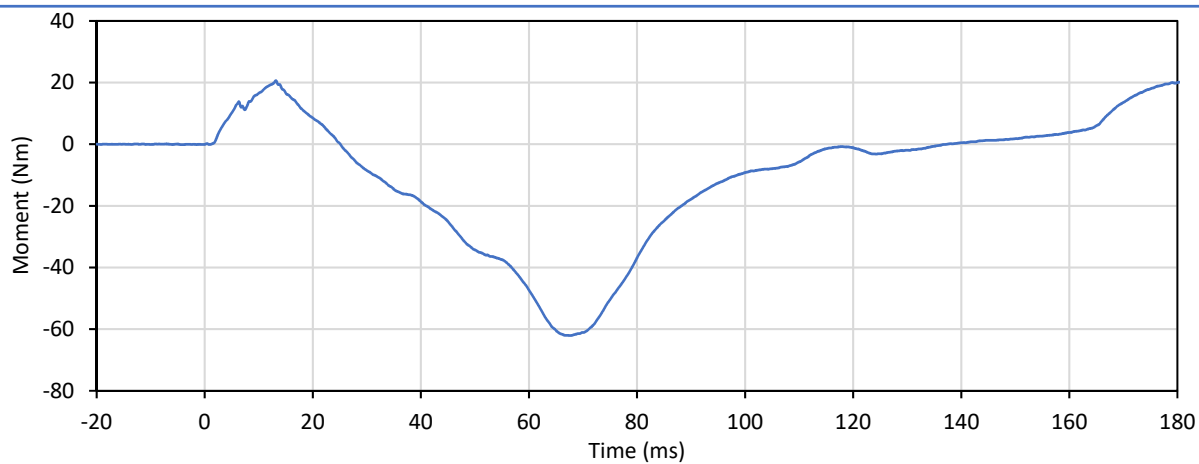


Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	28	Pass
Pendulum Velocity	m/s	5.95	6.19	6.01	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.86	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.78	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.45	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	106.8	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-62.1	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	98.7	Pass
Overall Test Results				Pass	Pass

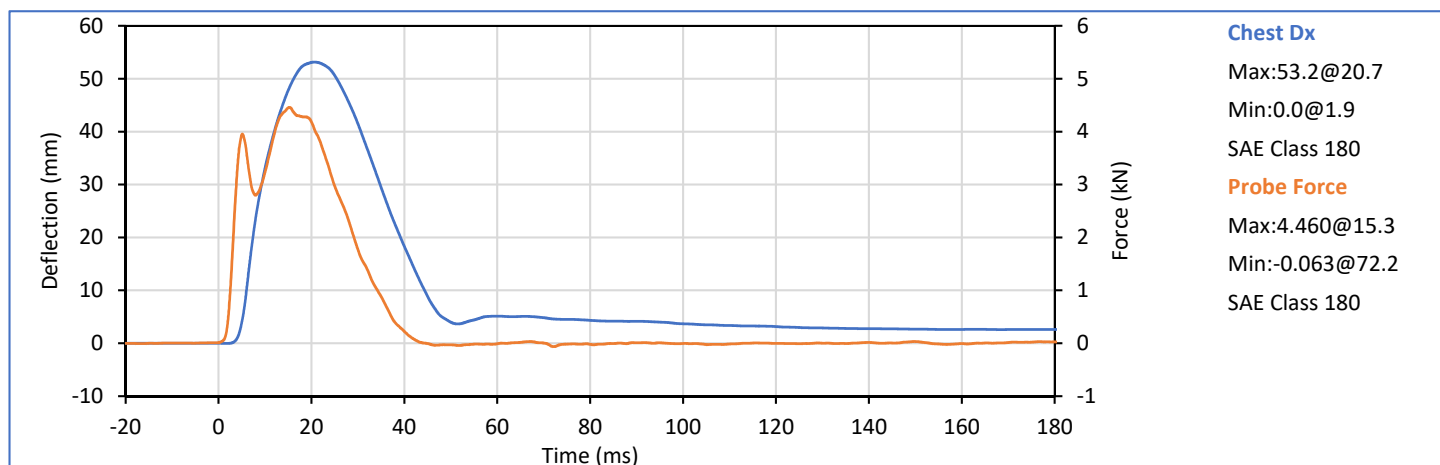
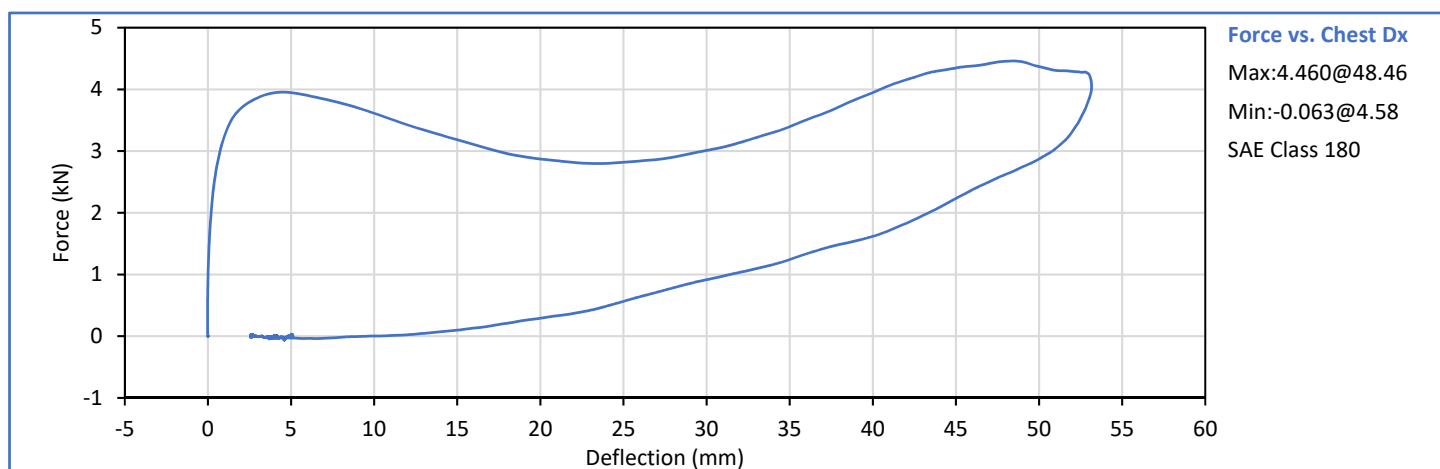


Technician: J. Hernandez

Approved By: P. Puzzuto
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Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	31	Pass
Probe Velocity	m/s	6.59	6.83	6.68	Pass
Peak Chest Deflection	mm	50.0	58.0	53.2	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.369	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	4.460	Pass
Internal Hysteresis	%	69.0	85.0	72.3	Pass
Overall Test Results				Pass	Pass



Technician:

J. Hernandez

J. Hernandez

Approved By:

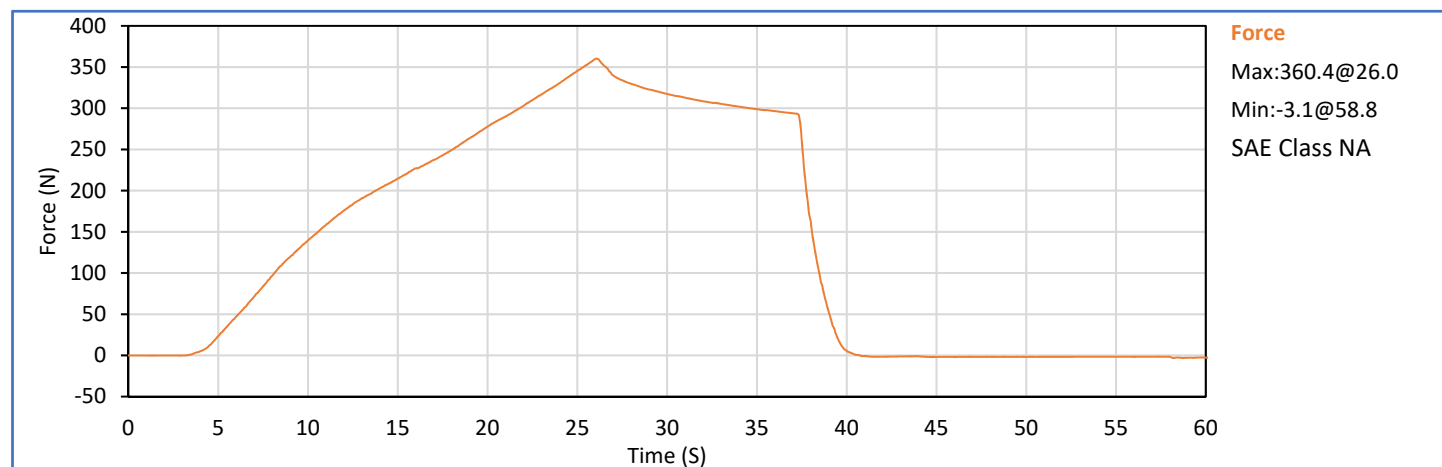
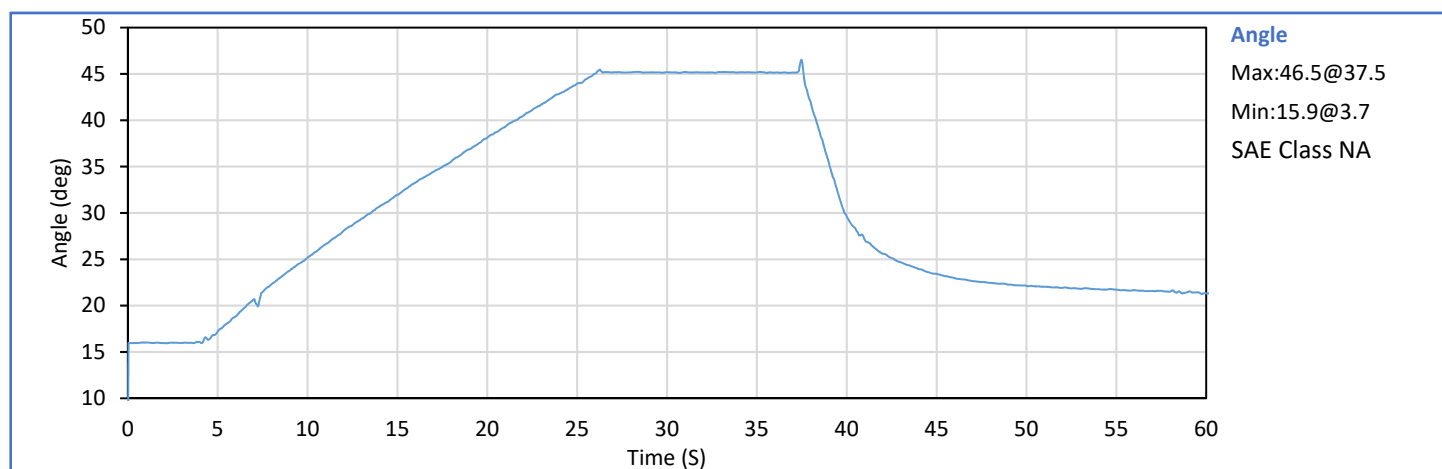
P. Puzzuto

P. Puzzuto

C-38

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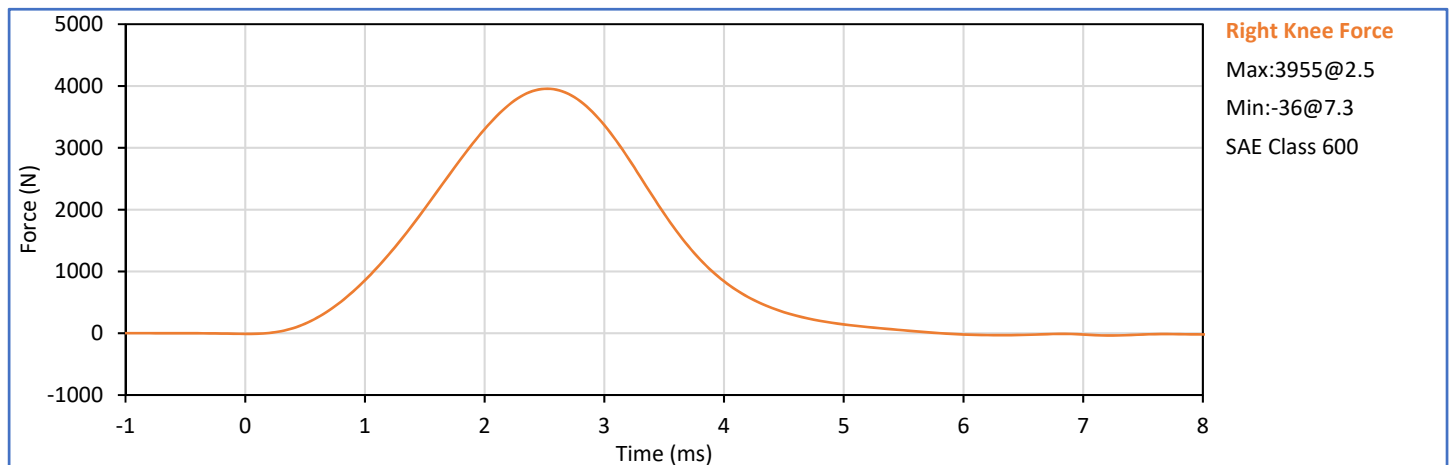
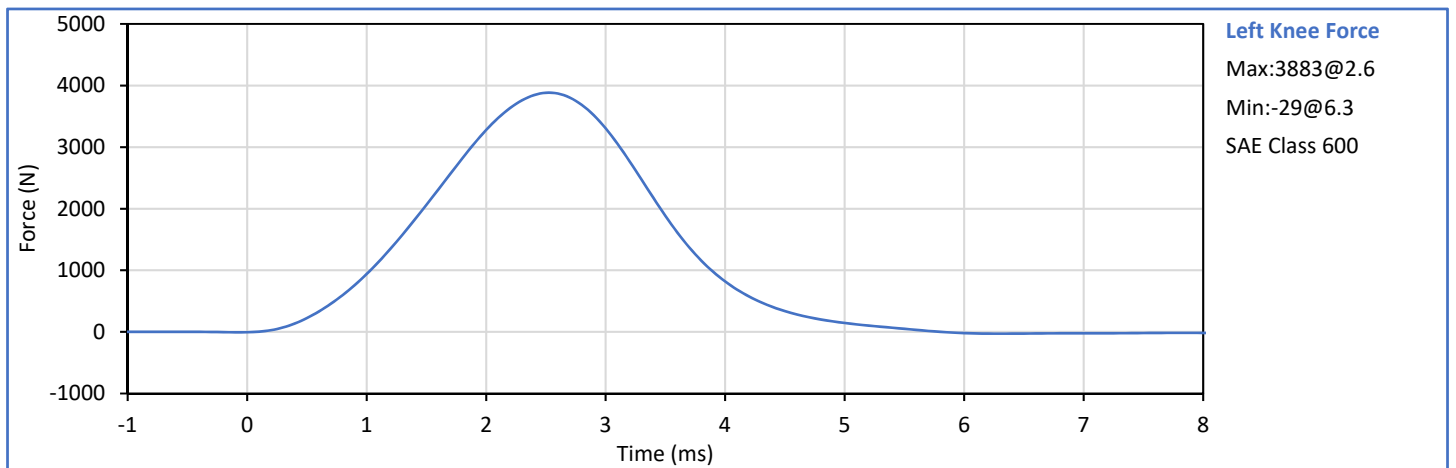
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	28	Pass
Orientation Angle	deg	0.0	20.0	15.1	Pass
Test Initial Angle	deg	11.0	19.0	16.0	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	360.4	Pass
Torso Flexion Rate	deg/s	0.50	1.50	1.33	Pass
Final Reference Plane Angle	deg	-8.0	8.0	3.9	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.1	Pass
	Laboratory Humidity	%	10	70	28	Pass
Left	Probe Velocity	m/s	2.070	2.130	2.095	Pass
Knee	Peak Resistive Force	N	3450	4060	3883	Pass
Right	Probe Velocity	m/s	2.070	2.130	2.078	Pass
Knee	Peak Resistive Force	N	3450	4060	3955	Pass
Overall Test Results					Pass	



Technician: J. Hernandez

Approved By: P. Puzzuto
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APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

Table 1 - Driver ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P49209	Endevco	7264C-2k	2020-01-06
Head Acceleration Y Primary	P49228	Endevco	7264C-2k	2020-01-06
Head Acceleration Z Primary	A199910	MSI	64C-2000	2020-01-06
Head Acceleration X Redundant	P50103	Endevco	7264C-2k	2020-01-06
Head Acceleration Y Redundant	P49210	Endevco	7264C-2k	2020-01-06
Head Acceleration Z Redundant	P58713	Endevco	7264C-2k	2020-01-06
Head Rotation Rate X	ARS7587	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Y	ARS7426	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Z	ARS7480	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Upper Neck Force X	2185 Fx	R.A. Denton	1716ATF	2019-09-03
Upper Neck Force Y	2185 Fy	R.A. Denton	1716ATF	2019-09-03
Upper Neck Force Z	2185 Fz	R.A. Denton	1716ATF	2019-09-03
Upper Neck Moment X	2185 Mx	R.A. Denton	1716ATF	2019-09-03
Upper Neck Moment Y	2185 My	R.A. Denton	1716ATF	2019-09-03
Upper Neck Moment Z	2185 Mz	R.A. Denton	1716ATF	2019-09-03
Chest Acceleration X Primary	P52112	Endevco	7264C-2k	2020-01-06
Chest Acceleration Y Primary	P49208	Endevco	7264C-2k	2020-01-06
Chest Acceleration Z Primary	P51264	Endevco	7264C-2k	2020-01-06
Chest Acceleration X Redundant	P49461	Endevco	7264C-2k	2020-01-06
Chest Acceleration Y Redundant	P58774	Endevco	7264C-2k	2020-01-06
Chest Acceleration Z Redundant	P49168	Endevco	7264C-2k	2020-01-06
Chest Deflection	0606	Servo	14CBI-3615	2020-01-06
Pelvis Acceleration X	P49238	Endevco	7264C-2k	2020-01-06
Pelvis Acceleration Y	P58877	Endevco	7264C-2k	2020-01-06
Pelvis Acceleration Z	P50087	Endevco	7264C-2k	2020-01-06
Left Femur Force Z	DS9756 (pri)	Humanetics	3821JLN2	2019-09-03
Right Femur Force Z	DS4139 (pri)	Humanetics	3821JLN2	2019-09-03
Left Femur Force Z Redundant	DS9756 (red)	Humanetics	3821JLN2	2019-09-03
Right Femur Force Z Redundant	DS4139 (red)	Humanetics	3821JLN2	2019-09-03
Left Upper Tibia Moment X	DH3309 Mx	FTSS	IF-857	2019-09-09
Left Upper Tibia Moment Y	DH3309 My	FTSS	IF-857	2019-09-09
Left Upper Tibia Force Z	DH3309 Fz	FTSS	IF-857	2019-09-09
Left Lower Tibia Moment X	DI4186 Mx	FTSS	IF-853	2019-09-06
Left Lower Tibia Moment Y	DI4186 My	FTSS	IF-853	2019-09-06
Left Lower Tibia Force Z	DI4186 Fz	FTSS	IF-853	2019-09-06
Right Upper Tibia Moment X	DG6679 Mx	FTSS	IF-857	2019-09-09
Right Upper Tibia Moment Y	DG6679 My	FTSS	IF-857	2019-09-09
Right Upper Tibia Force Z	DG6679 Fz	FTSS	IF-857	2019-09-09
Right Lower Tibia Moment X	DI4188 Mx	FTSS	IF-853	2019-09-06
Right Lower Tibia Moment Y	DI4188 My	FTSS	IF-853	2019-09-06
Right Lower Tibia Force Z	DI4188 Fz	FTSS	IF-853	2019-09-06
Left Ankle Acceleration X	03E20-N09	Entran	EGEB6Q-2k	2020-01-02
Left Ankle Acceleration Z	03D30-N13	Entran	EGEB6Q-2k	2020-01-02
Left Toe Acceleration Z	03H07-Z10	Entran	EGEB6Q-2k	2020-01-02
Right Ankle Acceleration X	03E29-N20	Entran	EGEB6Q-2k	2020-01-02
Right Ankle Acceleration Z	03E18-F02	Entran	EGEB6Q-2k	2020-01-02
Right Toe Acceleration Z	05H31-Z04	Entran	EGEB6Q-2k	2020-01-02
Seat Belt Outside Lap Force	300	FTSS	IF-964	2019-10-02
Seat Belt Upper Diagonal Force	315	FTSS	IF-964	2019-10-02

Table 2 - Right Front Passenger ATD Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Head Acceleration X Primary	P51889	Endevco	7264C-2k	2019-11-25
Head Acceleration Y Primary	P51861	Endevco	7264C-2k	2019-11-25
Head Acceleration Z Primary	P52077	Endevco	7264C-2k	2019-11-25
Head Acceleration X Redundant	P58835	Endevco	7264C-2k	2019-11-25
Head Acceleration Y Redundant	P51703	Endevco	7264C-2k	2019-11-25
Head Acceleration Z Redundant	P52096	Endevco	7264C-2k	2019-11-25
Head Rotation Rate X	ARS7455	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Y	ARS7537	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Head Rotation Rate Z	ARS7582	DTS	ARS PRO-8k (2000Hz)	2019-07-08
Upper Neck Force X	260 Fx	FTSS	IF-205	2019-04-10
Upper Neck Force Y	260 Fy	FTSS	IF-205	2019-04-10
Upper Neck Force Z	260 Fz	FTSS	IF-205	2019-04-10
Upper Neck Moment X	260 Mx	FTSS	IF-205	2019-04-10
Upper Neck Moment Y	260 My	FTSS	IF-205	2019-04-10
Upper Neck Moment Z	260 Mz	FTSS	IF-205	2019-04-10
Chest Acceleration X Primary	P58860	Endevco	7264C-2k	2019-11-25
Chest Acceleration Y Primary	P51876	Endevco	7264C-2k	2019-11-25
Chest Acceleration Z Primary	P58711	Endevco	7264C-2k	2019-11-25
Chest Acceleration X Redundant	P52049	Endevco	7264C-2k	2019-11-25
Chest Acceleration Y Redundant	P51862	Endevco	7264C-2k	2019-11-25
Chest Acceleration Z Redundant	P52048	Endevco	7264C-2k	2019-11-25
Chest Deflection	0724	Servo	14CBI-3615	2019-11-25
Pelvis Acceleration X	P52090	Endevco	7264C-2k	2019-11-25
Pelvis Acceleration Y	P58849	Endevco	7264C-2k	2019-11-25
Pelvis Acceleration Z	P58756	Endevco	7264C-2k	2019-11-25
Left Femur Force Z	106 (pri)	R.A. Denton	3821JTF	2019-02-22
Right Femur Force Z	112 (pri)	R.A. Denton	3821JTF	2019-02-22
Left Femur Force Z Redundant	106 (red)	R.A. Denton	3821JTF	2019-02-22
Right Femur Force Z Redundant	112 (red)	R.A. Denton	3821JTF	2019-02-22
Left Upper Tibia Moment X	414 Mx	R.A. Denton	3643	2019-03-06
Left Upper Tibia Moment Y	414 My	R.A. Denton	3643	2019-03-06
Left Upper Tibia Force Z	414 Fz	R.A. Denton	3643	2019-03-06
Left Lower Tibia Moment X	405 Mx	R.A. Denton	3644	2019-02-22
Left Lower Tibia Moment Y	405 My	R.A. Denton	3644	2019-02-22
Left Lower Tibia Force Z	405 Fz	R.A. Denton	3644	2019-02-22
Right Upper Tibia Moment X	DH3284 Mx	FTSS	IF-857	2019-02-22
Right Upper Tibia Moment Y	DH3284 My	FTSS	IF-857	2019-02-22
Right Upper Tibia Force Z	DH3284 Fz	FTSS	IF-857	2019-02-22
Right Lower Tibia Moment X	497 Mx	R.A. Denton	3644	2019-02-22
Right Lower Tibia Moment Y	497 My	R.A. Denton	3644	2019-02-22
Right Lower Tibia Force Z	497 Fz	R.A. Denton	3644	2019-02-22
Left Ankle Acceleration X	P52057	Endevco	7264C-2k	2019-11-26
Left Ankle Acceleration Z	03E18-F07	Entran	EGEB6Q-2k	2019-11-26
Left Toe Acceleration Z	P49224	Endevco	7264C-2k	2019-11-26
Right Ankle Acceleration X	P52019	Endevco	7264C-2k	2019-11-26
Right Ankle Acceleration Z	P58755	Endevco	7264C-2k	2019-11-26
Right Toe Acceleration Z	P52076	Endevco	7264C-2k	2019-11-26
Seat Belt Outside Lap Force	313	FTSS	IF-964	2019-10-02
Seat Belt Upper Diagonal Force	251	FTSS	IF-964	2019-10-02

Table 3 - Vehicle Instrumentation

Sensor Location	Sensor S\N	Mfr	Model	Cal Date
Left Rear Primary Ax	Accels\10250	Endevco	757F-2k	2019-12-13
Right Rear Primary Ax	Accels\10822	Endevco	757F-2k	2019-12-18
Engine Top Ax	Accels\A227276	MSI	52F-2000	2019-12-18
Engine Bottom Ax	Accels\A254909	MSI	52F-2000	2019-11-13
Left Rear Az	Accels\A145910	MSI	52F-2000	2019-12-18
Right Rear Az	Accels\A224566	MSI	52F-2000	2019-12-18
Left Rear Redundant Ax	Accels\10896	Endevco	757F-2k	2019-12-18
Right Rear Redundant Ax	Accels\11154	Endevco	757F-2k	2019-12-18