

**REPORT NUMBER: NCAP-CAL-20-012**

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

**GM Korea Company  
2020 Buick Encore GX  
Four Door SUV**

**NHTSA No: M20200100**

**PREPARED BY:  
CALSPAN CORPORATION  
P.O. BOX 400  
BUFFALO, NEW YORK 104625**



**June 12, 2020**

**FINAL REPORT**

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

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Date: June 12, 2020

**FINAL REPORT ACCEPTANCE BY OCWS:**

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

Date: \_\_\_\_\_

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

Date: \_\_\_\_\_

**TECHNICAL REPORT DOCUMENTATION PAGE**

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				<b>14. Sponsoring Agency Code</b> NRM-110																																																					
<b>15. Supplementary Notes</b>																																																									
<b>16. Abstract</b> A 56.30 km/h (35 mph), NCAP frontal rigid barrier impact test was conducted on a 2020 Buick Encore GX SUV in accordance with the specifications of the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. This test was conducted to obtain data related to FMVSS Nos. 208, 212, 219 (partial), 301, and 305 performance. The test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on April 8, 2020.  The impact velocity of the vehicle was 56.30 km/h, and the ambient temperature at the barrier face at the time of impact was 21°C. The target vehicle post-test maximum crush was 459 mm at the center of the front bumper. The test vehicle's occupant performance data is as follows:																																																									
<table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD (Serial No. 142)</th> <th colspan="2">Passenger ATD (Serial No. 140)</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC<sub>15</sub>)</td> <td></td> <td>700</td> <td>231.957</td> <td>700</td> <td>582.541</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-21.786</td> <td>52</td> <td>-14.057</td> </tr> <tr> <td>Nij</td> <td></td> <td>1</td> <td>0.270</td> <td>1</td> <td>0.275</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4,170</td> <td>800.290</td> <td>2,620</td> <td>530.791</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4,000</td> <td>-141.667</td> <td>2,520</td> <td>-466.157</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10,008</td> <td>-369.483</td> <td>6,805</td> <td>-1604.037</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10,008</td> <td>-929.737</td> <td>6,805</td> <td>-2847.257</td> </tr> </tbody> </table>						Measurement Description	Units	Driver ATD (Serial No. 142)		Passenger ATD (Serial No. 140)		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC <sub>15</sub> )		700	231.957	700	582.541	Maximum Chest Compression	mm	63	-21.786	52	-14.057	Nij		1	0.270	1	0.275	Neck Tension	N	4,170	800.290	2,620	530.791	Neck Compression	N	4,000	-141.667	2,520	-466.157	Left Femur Force	N	10,008	-369.483	6,805	-1604.037	Right Femur Force	N	10,008	-929.737	6,805	-2847.257
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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 No. 693JJ919D000005. 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 128 load cells was impacted by a 2020 Buick Encore GX SUV at a velocity of 56.30 km/h. The test was performed at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on April 8, 2020. Pre- and post-test photographs of the vehicle and dummies to document the test can be found in Appendix A. One real-time camera and 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, 50<sup>th</sup> percentile male anthropomorphic test device (ATD), was placed in the driver seating position and one Part 572O 5<sup>th</sup> percentile female ATD was placed in the right-front passenger seating position according to dummy placement instructions specified in the Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, 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. 142) and the right-front passenger (position 2) ATD (Serial No. 140) were qualified prior to this test. Certification details, along with instrumentation calibration data, can be found in Appendix C of this report.

The 486 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and 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 a total of 0.0 grams of stoddard solvent leakage after the event or during any phase of the static rollover. The maximum static crush of the vehicle was 459 mm and both driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: The driver's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee air bag.

The passenger's visible contact points were as follows: The passenger's head contacted the frontal airbag and then the head restraint. The upper torso contacted the frontal airbag. Both knees contacted the knee airbag

The occupant data is summarized below.

ATD Position	HIC <sub>15</sub>	Nij	Neck Tension (N)	Neck Comp. (N)	3ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50 <sup>th</sup> )	231.957	0.270	800.290	-141.667	50.420	-21.786	-369.483	-929.737
Passenger (5 <sup>th</sup> )	582.541	0.275	530.791	-466.157	48.850	-14.057	-1604.037	-2847.257

**GENERAL COMMENTS:**

1. P1 (Driver) serial number - 142
2. P2 (Passenger) serial number - 140

**Data Anomalies:**

- Left Rear Seat Cross Member X Acceleration, Exceeded calibration range at 23.1 ms 36.9 ms
- Left Rear Seat Cross Member X Redundant Acceleration, Exceeded calibration range at 36.6 ms
- Right Rear Seat Cross Member X Redundant Acceleration, Exceeded calibration range at 38.3 ms
- Engine Bottom X Acceleration, Questionable data after 30.2 ms
- Passenger Pelvic Z Acceleration, Questionable data throughout
- Barrier K-12 FX, Questionable Data throughout

## **SECTION 2**

### **OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS**

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat Adjustment, Fuel System, and Steering Wheel Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Seat Belt Positioning Data

Data Sheet No. 6 – High-Speed Camera Locations and Data

Data Sheet No. 7 – Vehicle Accelerometer Locations

Data Sheet No. 8 – Photographic Reference Target Locations

Data Sheet No. 9 – Load Cell Locations on Fixed Barrier

Data Sheet No. 10 – Test Vehicle Summary of Results

Data Sheet No. 11 – Post-Test Observations

Data Sheet No. 12 – Vehicle Profile Measurements

Data Sheet No. 13 – Accident Investigation Division Data

Data Sheet No. 14 – Vehicle Intrusion Measurements

Data Sheet No. 15 – Summary of Indicant FMVSS No. 212 and FMVSS No. 219 (Partial)

Data Sheet No. 16 – FMVSS 301 Barrier Impact and Static Rollover Results

Data Sheet No. 17 – Dummy/Vehicle Temperature Stabilization Chart

**DATA SHEET NO. 1  
GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	M20200100	Traction Control System (TCS)	Yes
Model Year	2020	Power Steering	Yes
Make	Buick	Power Window Auto-Reverse	No
Model	Encore GX	Driver Frontal Airbag	Yes
Body Style	SUV	Driver Curtain Airbag	Yes
VIN	KL4MMESL3LB085252	Driver Head/Torso Airbag	No
Body Color	Gray	Driver Torso Airbag	No
Odometer Reading (km /mi)	76 mi	Driver Torso/Pelvis Airbag	Yes
Engine Displacement (L)	1.3	Driver Pelvis Airbag	No
Type / No. Cylinders	I3	Driver Knee Airbag	Yes
Engine Placement	Transverse	Front Pass. Frontal Airbag	Yes
Transmission Type	Automatic	Front Pass. Curtain Airbag	Yes
Transmission Speeds	9-Speed	Front Pass. Head/Torso Airbag	No
Overdrive	Yes	Front Pass. Torso Airbag	No
Final Drive	All Wheel Drive	Front Pass. Torso/Pelvis Airbag	Yes
Roof Rack	No	Front Pass. Pelvis Airbag	No
Sunroof / T-Top	No	Front Pass. Knee Airbag	Yes
Running Boards	No	Driver Pretensioner	Yes
Tilt Steering Wheel	Yes	Driver Load Limiter	Yes
Power Seats	Yes	Front Pass. Pretensioner	Yes
Anti-Lock Brakes (ABS)	Yes	Front Pass. Load Limiter	Yes
Automatic Door Locks (ADLs)	Yes	Other –	-

Does owner's manual provide instructions to turn off automatic door locks?

No

**DATA FROM CERTIFICATION LABEL**

Manufactured By	GM Korea Company	GVWR (kg)	2000
Date of Manufacture	12/19	GAWR Front (kg)	1060
		GAWR Rear (kg)	1060

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

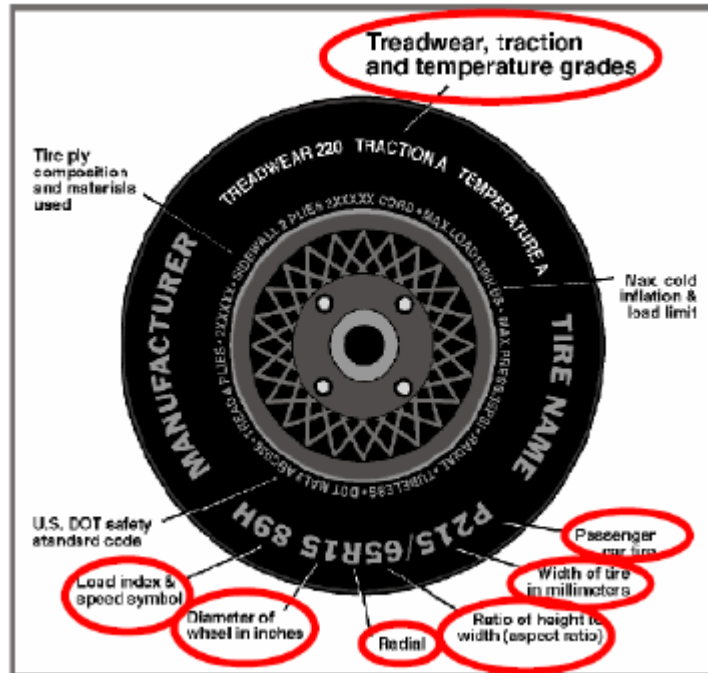
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				428
Cargo Wt. (RCLW) (kg)				87.8

**DATA SHEET NO. 1 ... (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

Collect items circled in red, tire manufacturer, and tire name.



**VEHICLE TIRE INFORMATION**

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	225/55R18	225/55R18
Tire Size on Vehicle	225/55R18	225/55R18
Tire Manufacturer	Hankook	Hankook
Tire Model	Kinergy	Kinergy
Treadwear	700	700
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 2 Polyester, 1 Nylon	2 Steel, 2 Polyester, 1 Nylon
Load Index / Speed Symbol	98H	98H
Tire Material	Rubber	Rubber
DOT Safety Code Left	1T7001BH04819	1T7001BH04819
DOT Safety Code Right	1T7001BH04819	1T7001BH04819

**DATA SHEET NO. 1 ... (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

**TEST VEHICLE WEIGHTS**

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	460	299		504	376	
Right	kg	442	291		465	370	
Ratio	%	60.5	39.5		56.5	43.5	
Totals	kg	902	590	1492	969	746	1715

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1492	(A)
Weight of 1 P572E ATD & 1 P572O ATD	kg	142	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	87.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1721.8	(A+B+C)

**TEST VEHICLE ATTITUDES AND CG**

Condition	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	865	867	884	885	1026
As Tested	mm	854	856	848	848	1129
Post-Test	mm	911	916	837	846	

**GENERAL TEST VEHICLE DATA**

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2595
Total Vehicle Length at Left Side	mm	4188
Total Vehicle Length at Centerline	mm	4345
Total Vehicle Length at Right Side	mm	4188
Weight of Ballast in Cargo Area	kg	50
Weight of Vehicle Components Removed	kg	26
Amount of Stoddard Solvent in Fuel Tank	L	46.5

**LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:**

Trunk carpeting, spare tire, and jack

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**DATA SHEET NO.1 ... (CONTINUED)**  
**GENERAL TEST AND VEHICLE PARAMETER DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

**TARGET VEHICLE STRUCTURAL MEASUREMENT**

No.	Description	Pre-Test
1	Total Length	4345
2	Total Width	1772
3*	Bumper Top Height	606
4*	Bumper Bottom Height	512
5*	Longitudinal Member Top Height	608
6	Distance Between Longitudinal Members	1036
7	Longitudinal Member Width	32
8*	Engine Top Height	880
9*	Engine Bottom Height	236
10	Engine and Gearbox Width	407
11	Front Bumper-Engine Distance	614
12*	Front Shock Absorber Fixing Height	941
13*	Bonnet Leading Edge Height	966
14	Front Shock Absorber Fixing Width	1164
15	Front Bumper – Front Axle Distance	913
16	Front Axle – A Pillar Distance	513
17	A-Pillar – B-Pillar Distance	1050
18	B-Pillar – Rear Axle Distance	1034
19	B-Pillar – C-Pillar Distance	989
20*	Roof Sill Bottom Height	1526
21*	Roof Sill Top Height	1604
22*	Floor Sill Bottom Height	350
23*	Floor Sill Top Height	444

\*Height Measurements are taken from the ground  
 Note: All measurements are in millimeters

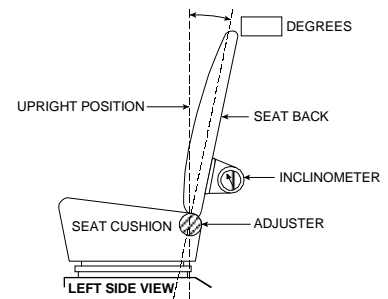
**DATA SHEET NO. 2**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

**NOMINAL DESIGN RIDING POSITION**

The driver's seat back was set to the manufacturer's designated angle. The passenger's seat back was positioned in a similar manner as the driver's seat back. Seat back angles are measured at the headrest post bezel using a digital inclinometer.



**FRONT SEAT ASSEMBLY**

Seating Position	Degrees
Driver Seat Back Angle	-7.4
Passenger Seat Back Angle	-7.6

**SEAT FORE / AFT POSITIONS**

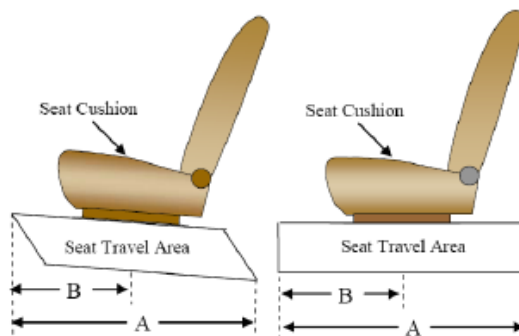
The driver's seat was positioned at the mid-point of fore/aft travel at its lowest position. The passenger's seat was positioned at the most forward position of fore/aft travel. Zero is defined as the forward most position.

Seating Position	Total Fore / Aft Travel	Placed in Position #
Driver Seat	335	168
Passenger Seat	260 (0-26)	0

**SEAT BELT UPPER ANCHORAGE**

The driver's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 50<sup>th</sup> percentile adult male ATD. The passenger's seat belt anchorage was positioned according to the manufacturer's designated positioning for a 5<sup>th</sup> percentile adult female ATD. For this test zero is defined as the uppermost position.

Seating Position	Total # of Positions	Placed in Position #
Driver Seat	4 (0-3)	0
Passenger Seat	4 (0-3)	0





**DATA SHEET NO. 2 ... (CONTINUED)**  
**SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

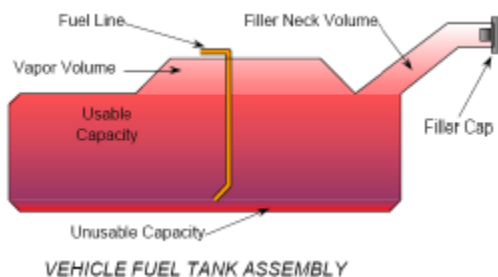
NHTSA No.: M20200100  
 Test Date: 4/8/2020

**FUEL TANK CAPACITY**

Description	Liters
Usable Capacity of "Standard Tank"	50
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	46 – 47
Actual Amount of Solvent Used	46.5
1/3 of Usable Capacity	16.7

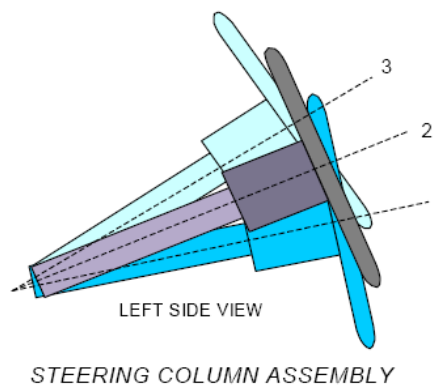
**FUEL PUMP**

The vehicle is equipped with an electric fuel pump. The fuel filler neck is on the left side of the vehicle. The pump creates positive pressure in the fuel lines, pushing the gasoline to the engine. See form 1 for more information.



**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. For angular measurements, a digital inclinometer was used to measure a plate which was placed across the steering wheel rim. A tape measure was used to measure the telescoping steering wheel travel.



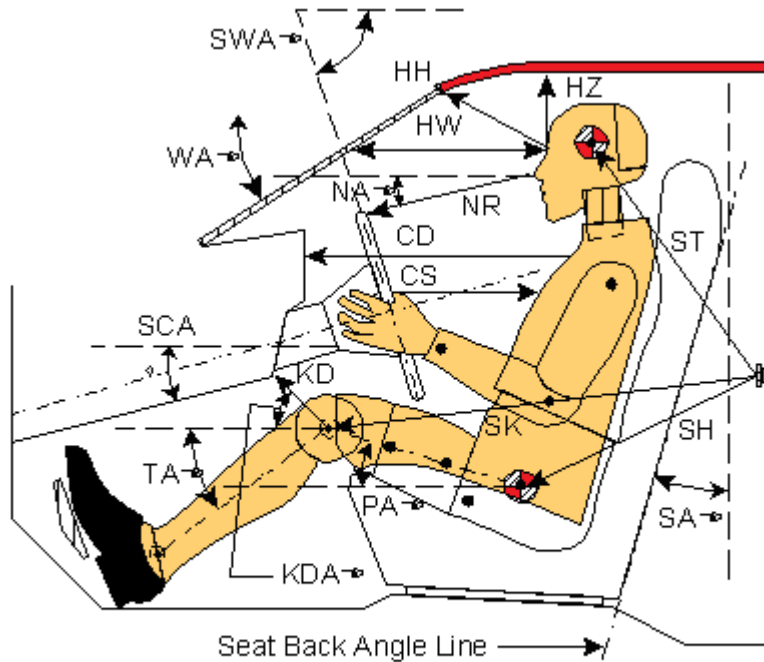
**STEERING COLUMN POSITIONS**

Description	Degrees	Fore / Aft Position (mm)
Lowermost position No. 1	21.4	
Geometric center position No. 2	23.5	
Uppermost position No. 3	25.7	
Telescoping Steering Wheel Travel		50
Test Position	23.5	25

**DATA SHEET NO. 3**  
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2020 Buick Encore GX SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
Test Date: 4/8/2020



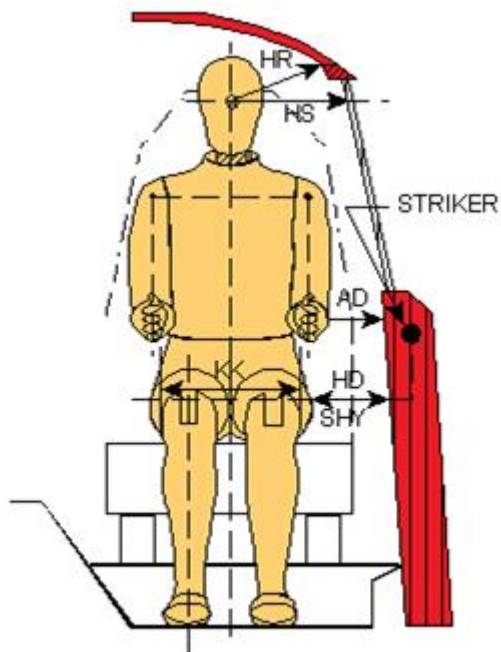
**Left Side View**

Code	Measurement Description	Driver (SN: 142)		Passenger (SN: 140)	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
<b>WA</b> <sup>o</sup>	Windshield Angle		28.2		
<b>SWA</b> <sup>o</sup>	Steering Wheel Angle		22.8		
<b>SCA</b> <sup>o</sup>	Steering Column Angle		67.2		
<b>SA</b> <sup>o</sup>	Seat Back Angle (on headrest post)		-7.4		-7.6
<b>HZ</b>	Head to Roof (Z)	248	90	261	90
<b>HH</b>	Head to Header	426	24.7	360	44.3
<b>HW</b>	Head to Windshield	746	0	712	0
<b>NR</b>	Nose to Rim / Dash	421	9.1	454	23.6
<b>CD</b>	Chest to Dash	540		410	
<b>CS</b>	Chest to Steering Hub	343	2.3		
<b>RA</b>	Rim to Abdomen	219	0		
<b>KDL</b>	Left Knee to Dash	212	24.8	124	28.7
<b>KDR</b>	Right Knee to Dash	212	17.8	125	27.2
<b>PA</b> <sup>o</sup>	Pelvic Angle		24.2		19.2
<b>TA</b> <sup>o</sup>	Tibia Angle		34.2		50.7
<b>SK</b>	Striker to Knee	526	1.3	641	4.6
<b>ST</b>	Striker to Head	547	82.5	512	66.8
<b>SH</b>	Striker to H-Point	192	45.6	351	22.4

**DATA SHEET NO. 4**  
**DUMMY LATERAL CLEARANCE DIMENSIONS**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020



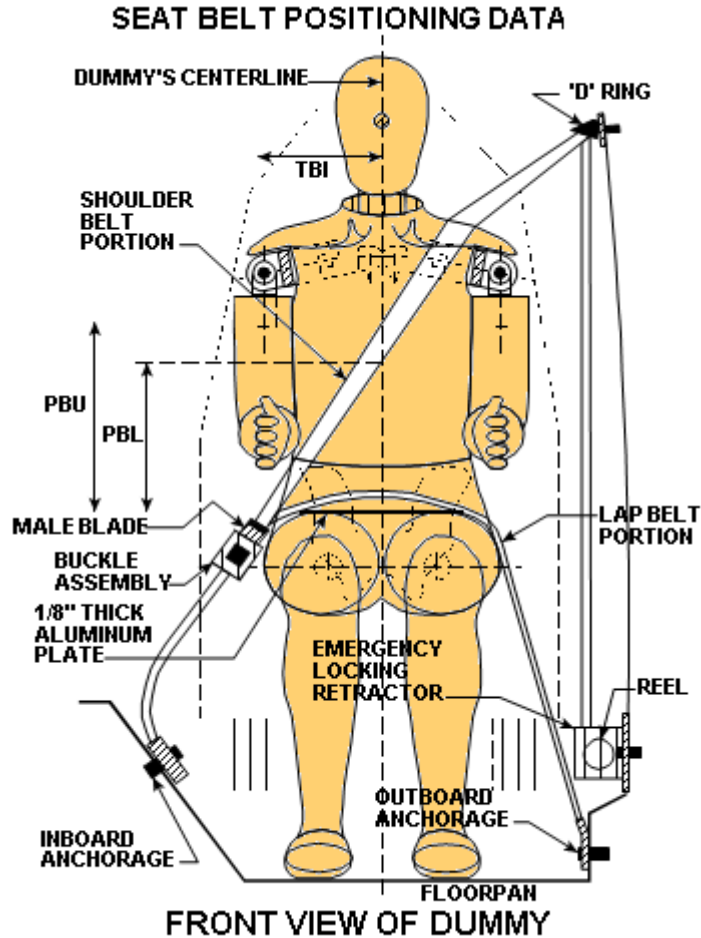
Front View

Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	131	95
HD	H-Point to Door	155	171
HR	Head to Side Header	230	288
HS	Head to Side Window	353	395
KK	Knee to Knee	345	210
SHY	Striker to H-Point (Y Direction)	255	275
AA	Ankle to Ankle	350	165

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

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020



**SEAT BELT POSITIONING MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
<b>PBU</b> — Top surface of reference to belt upper edge	mm	355	280
<b>PBL</b> — Top surface of reference to belt lower edge	mm	280	195

**BELT LENGTH DATA**

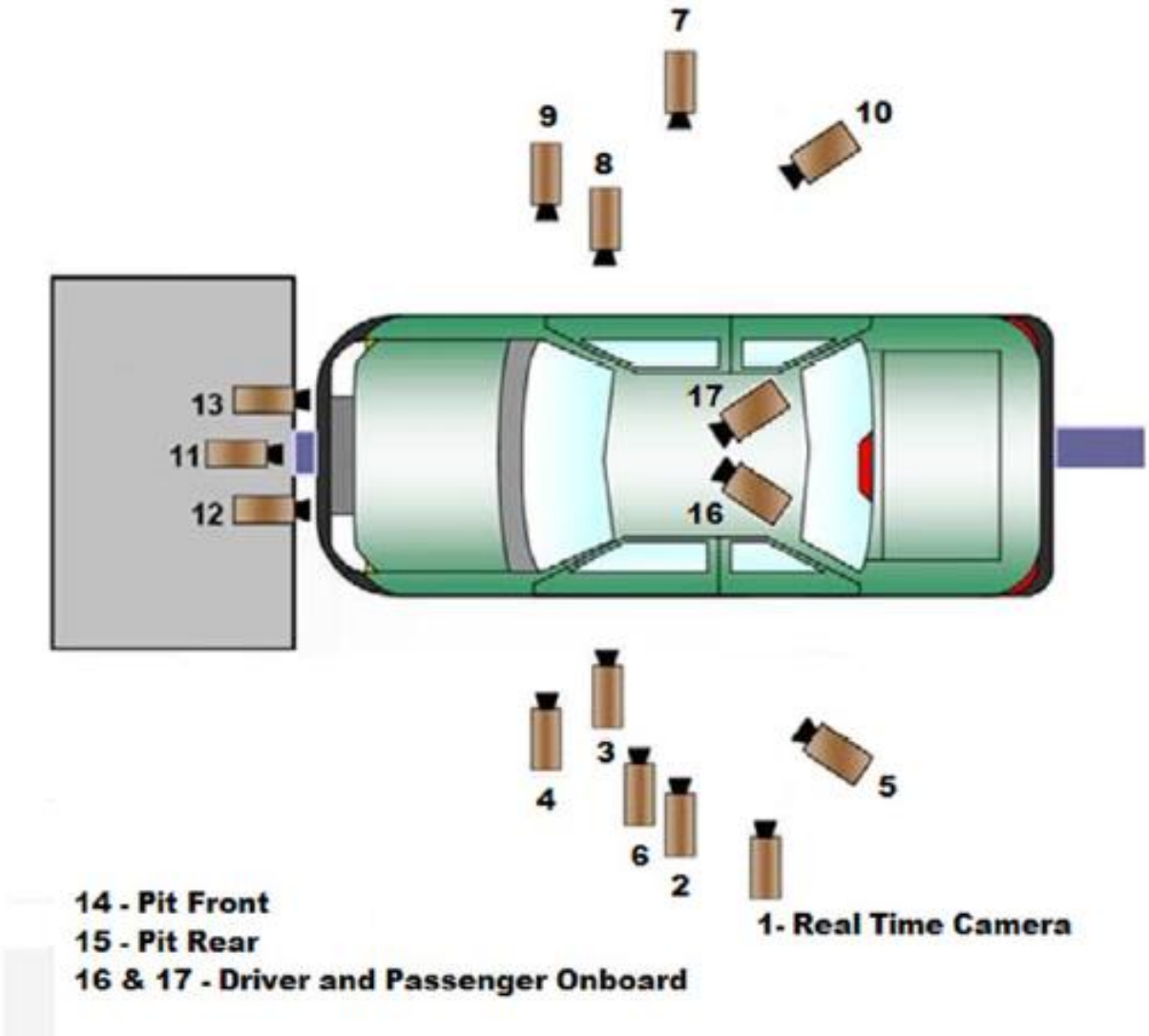
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	810	925
Lap Belt Length as measured on ATD	mm	605	700
Remainder of belt on reel	mm	1085	875
Total belt length for continuous webbing systems	mm	2500	2500

**DATA SHEET NO. 6  
HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
Test Date: 4/8/2020

**CAMERA POSITIONS FOR FRONTAL IMPACTS**



**DATA SHEET NO. 6 ... (CONTINUED)**  
**HIGH-SPEED CAMERA LOCATIONS AND DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

**CAMERA LOCATIONS**

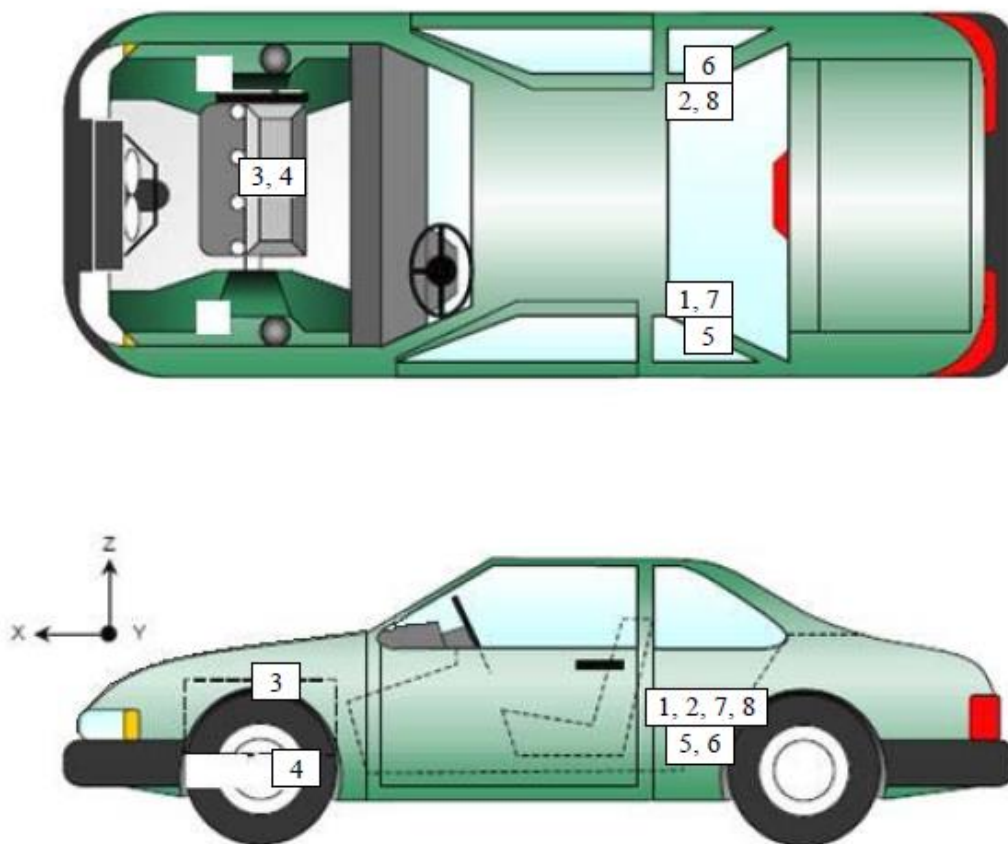
No.	Camera View	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-	-	-		60
2	Left Overall	-2068	-5631	-1435	24	1000
3	Driver Close-Up	-1431	-7451	-1407	50	1000
4	Left Front Half	-758	-5641	-1380	28	1000
5	Left Angle	-4487	-5275	-2569	50	1000
6	Steering Column	-1431	-7995	-1752	50	1000
7	Right Overall	-1804	7331	-1351	24	1000
8	Passenger Close-Up	-1318	6328	-1465	50	1000
9	Right Front Half	-868	6128	-1271	28	1000
10	Right Angle	-4561	4834	-2548	50	1000
11	Windshield	1280	0	-3475	25	1000
12	Driver Windshield	750	-400	-2415	25	1000
13	Passenger Windshield	750	400	-2415	25	1000
14	Pit Front	-860	0	2327	12.5	1000
15	Pit Rear	-2152	0	2237	12.5	1000
16	Onboard Driver Airbag (Optional)				8	1000
17	Onboard Passenger Airbag (Optional)				8	1000

\* COORDINATES:      +X = forward of impact plane  
                              +Y = right of monorail center  
                              +Z = into ground

**DATA SHEET NO. 7**  
**VEHICLE ACCELEROMETER LOCATIONS**

Test Vehicle: 2020 Buick Encore GX SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
Test Date: 4/8/2020



**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1635	-319	63
2	Right Rear Accelerometer – X Direction	1636	272	60
3	Engine Top X	3608	122	-381
4	Engine Bottom X	3607	155	250
5	Left Rear Accelerometer – Z Direction	1635	-319	63
6	Right Rear Accelerometer – Z Direction	1636	272	60
7	Left Rear Accelerometer – X Direction Redundant	1636	-294	64
8	Right Rear Accelerometer – X Direction Redundant	1635	295	58

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

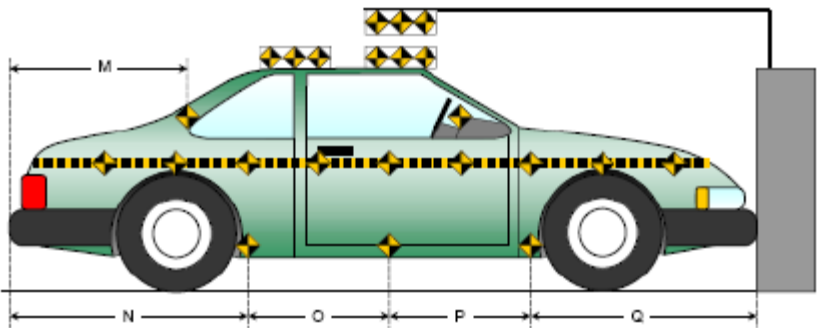
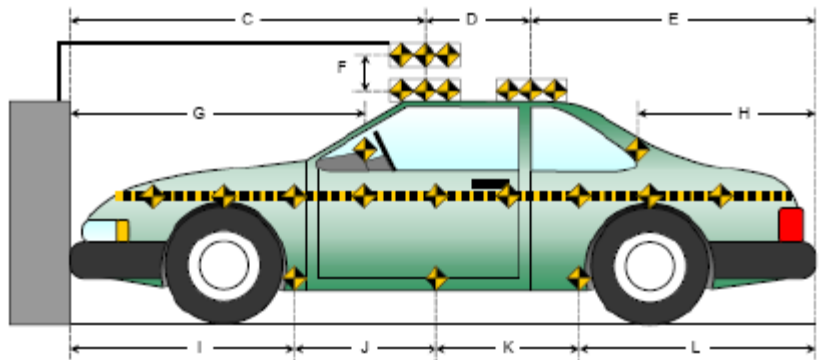
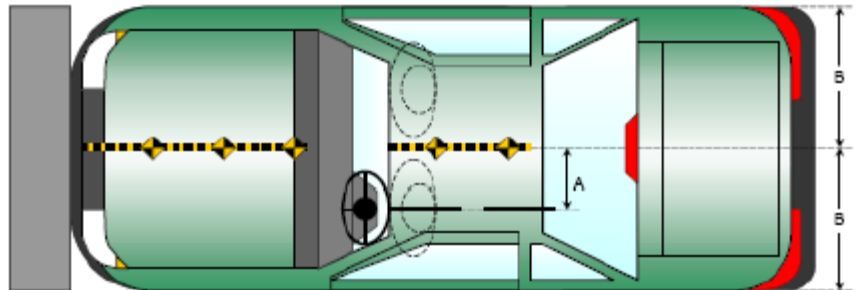
**DATA SHEET NO. 8**  
**PHOTOGRAPHIC REFERENCE TARGET LOCATIONS**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

Item	Value
A	356
B	886
C	1668
D	742
E	1934
F	195
G	3021
H	878
I	1389
J	825
K	827
L	1304
M	877
N	1303
O	831
P	823
Q	1389

All units in millimeters





**DATA SHEET NO. 9**  
**LOAD CELL LOCATIONS ON FIXED BARRIER**

Test Vehicle: 2020 Buick Encore GX SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
Test Date: 4/8/2020

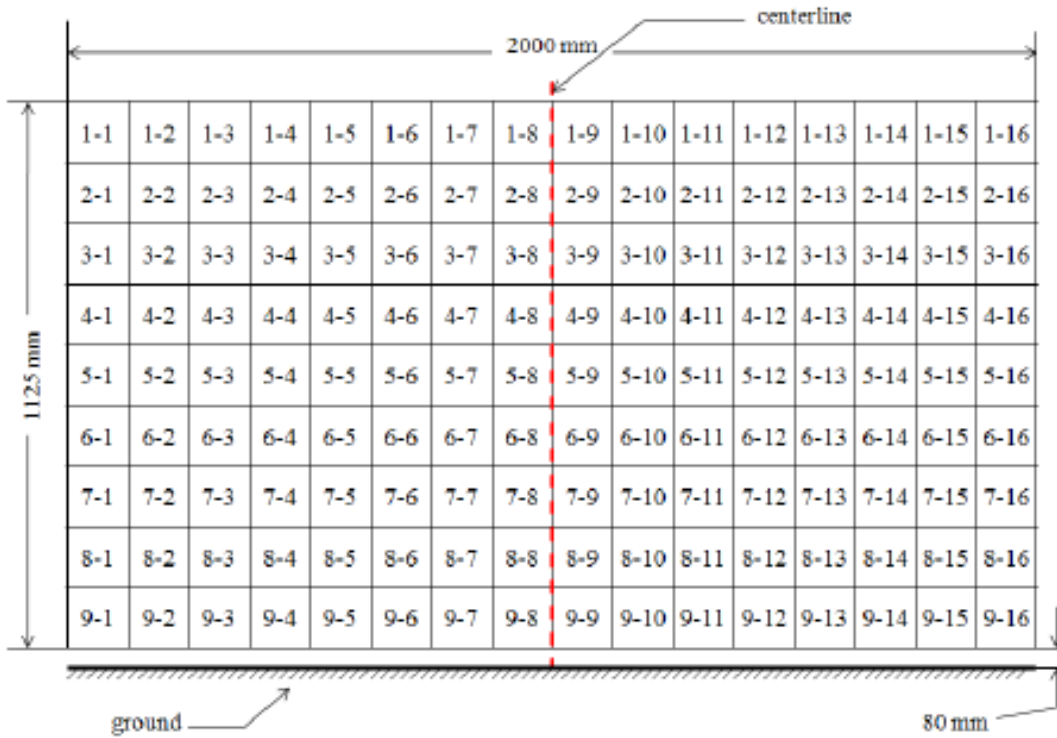


Figure 1 - Load Cell Locations on a 128-Load Cell Barrier with Plywood Height Extension\*  
Please note above diagram is not actual representation of load cell barrier used.

**DATA SHEET NO. 10**  
**TEST VEHICLE SUMMARY OF RESULTS**

Test Vehicle: 2020 Buick Encore GX SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
Test Date: 4/8/2020

**INSTRUMENTATION**

<b>Instrumentation</b>	<b>Number of Channels Collected</b>
Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	8
Load Cell Barrier	384
<b>Total</b>	<b>486</b>

**CAMERA COVERAGE**

<b>Type of Camera</b>	<b>Number Used in this Test</b>
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time Panning	1
<b>Total</b>	<b>17</b>

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

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

Description	Driver	Passenger
Dummy Type / Serial No.	P572E 50 <sup>th</sup> Male / 142	P5720 5 <sup>th</sup> Female / 140
Head Contact	Front Airbag & Headrest	Front Airbag & Headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

**DOOR OPENING AND SEAT TRACK INFORMATION**

Description	Driver	Passenger	Other
Locked / Unlocked Doors	Unlocked	Unlocked	
Front Door Opening	Closed & Operational	Closed & Operational	
Rear Door Opening	Closed & Operational	Closed & Operational	
Trunk/Hatch/Tailgate Opening			Operational
Seat Track Shift (mm)	0	0	
Seat Back Movement from Initial Position	No	No	

**POST-TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	Minor cracks along driver side
Window Damage	None
Other	None

**VEHICLE REBOUND FROM BARRIER**

Measured Parameter	Units	Value
Left Side	mm	1261
Center	mm	1193
Right Side	mm	1231
Average	mm	1228

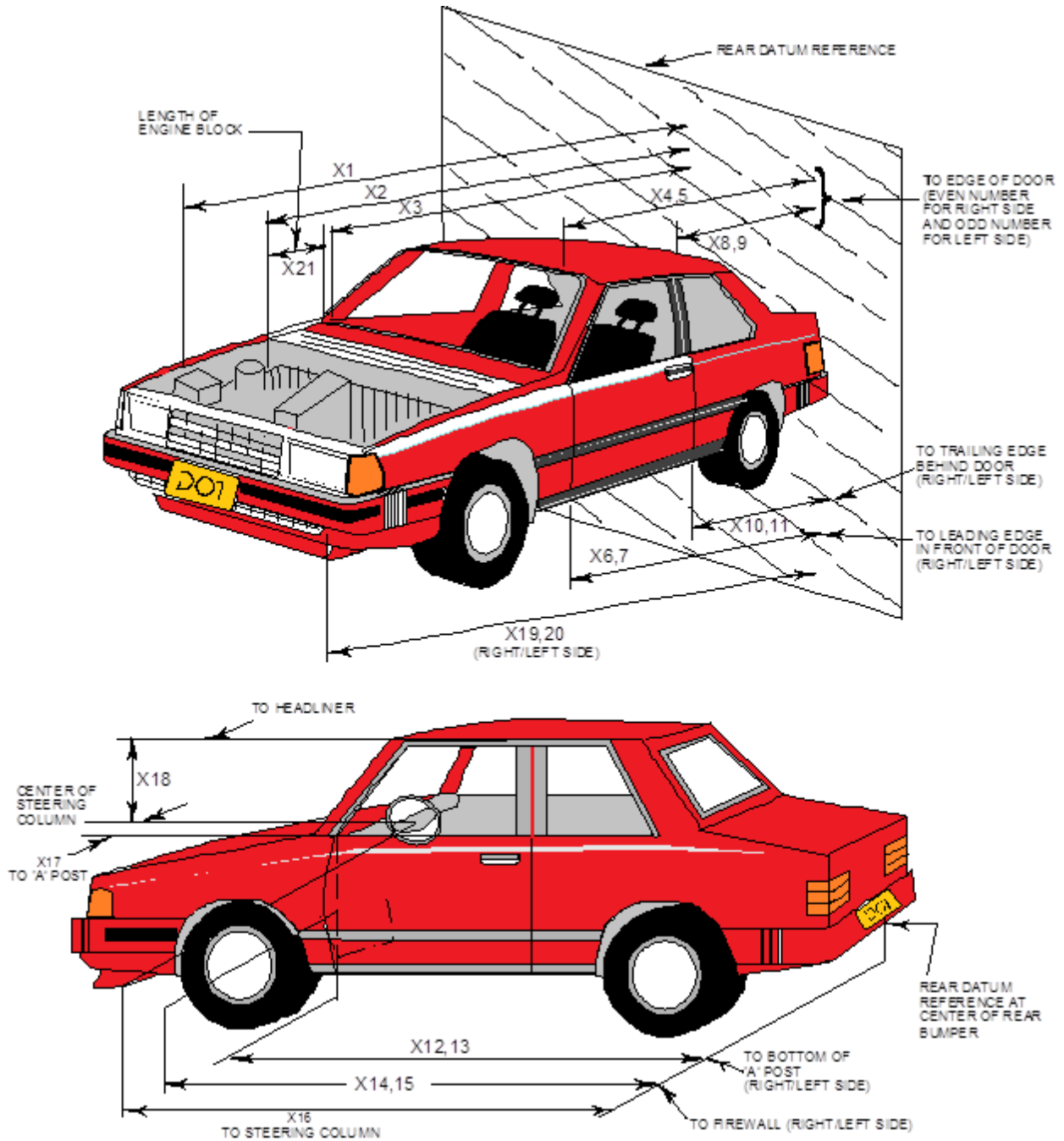
**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

Restraint Type	Driver		Passenger	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 - Torso/Pelvis Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

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

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020



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

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4345	3886	-459
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3731	3545	-186
3	RSOV to Firewall	3353	3331	-22
4	RSOV to Upper Leading Edge of Right Door	2923	2922	-1
5	RSOV to Upper Leading Edge of Left Door	2921	2920	-1
6	RSOV to Lower Leading Edge of Right Door	2898	2897	-1
7	RSOV to Lower Leading Edge of Left Door	2900	2896	-4
8	RSOV to Upper Trailing Edge of Right Door	1883	1887	4
9	RSOV to Upper Trailing Edge of Left Door	1881	1885	4
10	RSOV to Lower Trailing Edge of Right Door	1928	1931	3
11	RSOV to Lower Trailing Edge of Left Door	1927	1928	1
12	RSOV to Bottom of "A" Post of Right Side	2942	2942	0
13	RSOV to Bottom of "A" Post of Left Side	2940	2940	0
14	RSOV to Firewall, Right Side	3306	3293	-13
15	RSOV to Firewall, Left Side	3307	3294	-13
16	RSOV to Steering Column	2492	2559	67
17	Center of Steering Column to "A" Post	292	280	-12
18	Center of Steering Column to Headliner	445	478	33
19	RSOV to Right Side of Front Bumper	4242	3916	-326
20	RSOV to Left Side of Front Bumper	4240	3763	-477
21	Length of Engine Block	204	204	0
RD	RSOV to Right Side of Dash Panel	2676	2676	0
CD	RSOV to Center of Dash Panel	2639	2635	-4
LD	RSOV to Left Side of Dash Panel	2675	2674	-1

All Dimensions in mm

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

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

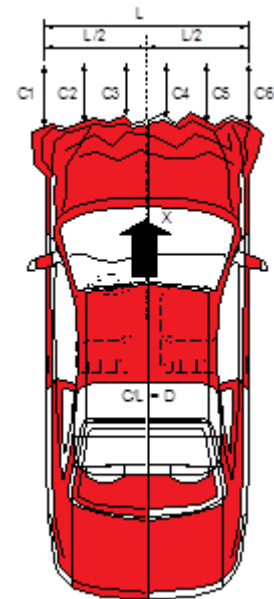
**VEHICLE INFORMATION**

VIN: KL4MMESL3LB085252  
 Vehicle Size Category: MPV

Wheelbase (mm): 2595  
 Test Weight (kg): 1715

**ACCELEROMETER DATA**

Accelerometer Locations: Please See Data Sheet No. 7  
 Cal. Procedure / Interval: Calspan Procedure / 6 month  
 Integration Algorithm: Trapezoidal  
 Linearity: > 99%  
 Impact Velocity (km/h): 56.3  
 Velocity Change (km/h): 68.86  
 Time of Separation (ms): 142



**CRUSH PROFILE**

Collision Deformation Classification: 12FDEW2  
 Midpoint of Damage: C3  
 Damage Region Length (mm): 1292  
 Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	4093	3781	312
C2	Crush Zone 2 at Left Side	mm	4250	3831	419
C3	Crush Zone 3 at Left Side	mm	4325	3869	456
C4	Crush Zone 4 at Right Side	mm	4325	3891	434
C5	Crush Zone 5 at Right Side	mm	4250	3871	379
C6	Crush Zone 6 at Right Side	mm	4093	3878	215
L	C1 to C6	mm	1292	1382	-90

**DATA SHEET NO. 14**  
**VEHICLE INTRUSION MEASUREMENTS**

Test Vehicle: 2020 Buick Encore GX SUV  
Test Program: NCAP Frontal Barrier Impact Test

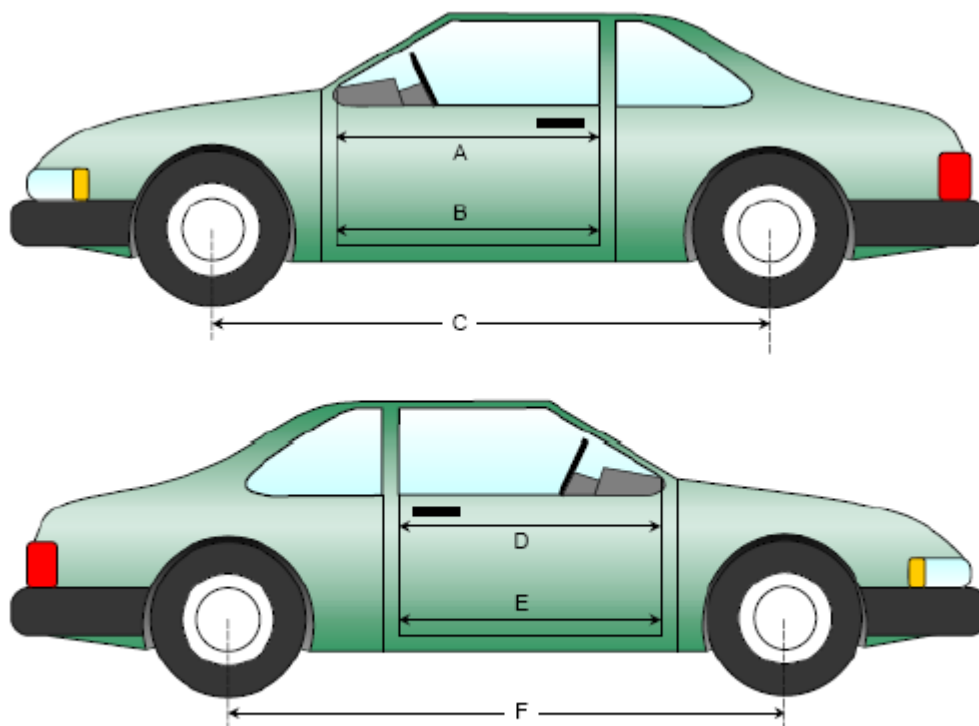
NHTSA No.: M20200100  
Test Date: 4/8/2020

**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	929	929	0
B	Left Side Lower	mm	849	849	0
D	Right Side Upper	mm	930	930	0
E	Right Side Lower	mm	846	847	1

**WHEELBASE MEASUREMENTS**

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2595	2506	-89
F	Right Side Wheelbase	mm	2595	2532	-63



**Left & Right Side Views**

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

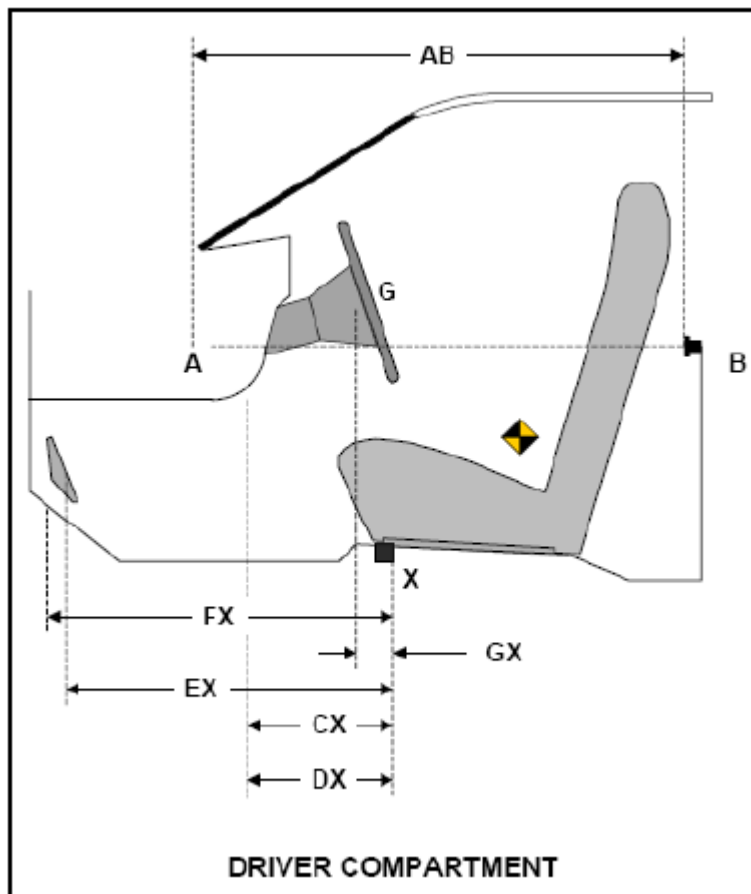
Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

**DRIVER COMPARTMENT INTRUSION**

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	773	772	-1
CX	Left Knee Bolster to X	mm	363	362	-1
DX	Right Knee Bolster to X	mm	361	354	-7
EX	Brake Pedal to X	mm	552	473	-79
FX	Foot Rest to X	mm	590	583	-7
GX	Center of Steering Column Wheel Hub to X	mm	97	167	70

*X = Front of Seat Track (Stationary)*





**DATA SHEET NO. 15**  
**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020

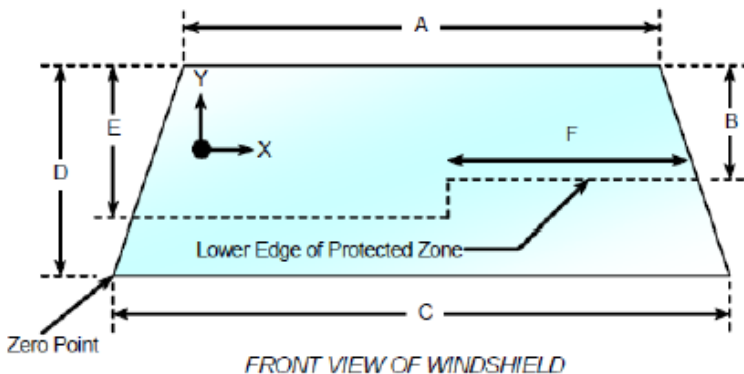
**Windshield Mounting Details:** A 0.8 mm trim surrounds the top and side of windshield while a plastic shroud is on the bottom.

*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° C

**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2109	2109	100
Right Side	2109	2109	100
Total	4218	4218	100



Item	Units	Value
A	mm	1200
B	mm	490
C	mm	1438
D	mm	790
E	mm	500
F	mm	580

**AREAS OF PROTECTED ZONE FAILURES**

- A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.
- No Penetration

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.
- No Penetration

X	Y

**DATA SHEET NO. 15 ... (CONTINUED)**  
**SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA**

Test Vehicle: 2020 Buick Encore GX SUV  
Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
Test Date: 4/8/2020

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

Temperature at Time of Impact: 21 ° C

Test Time: 12:43 PM

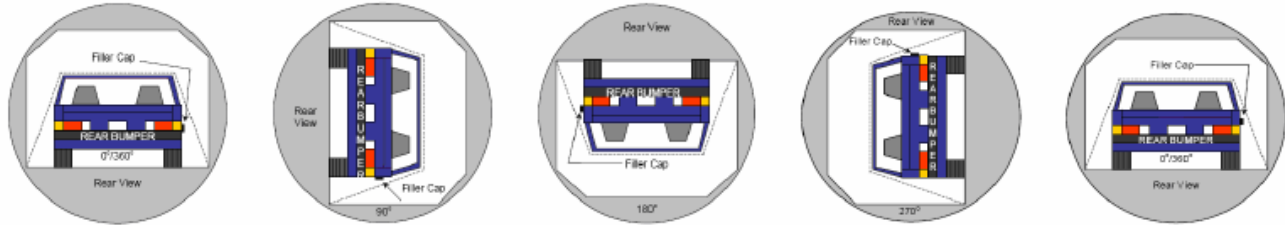
**STODDARD SOLVENT SPILLAGE MEASUREMENTS**

- A. From impact until vehicle motion ceases: 0 oz.  
(Maximum allowable is 1 oz.)
- B. For the 5-minute period after motion ceases: 0 oz.  
(Maximum allowable is 5 oz.)
- C. For the following 25 minutes: 0 oz.  
(Maximum allowable is 1 oz./minute)
- D. Spillage: No Spillage Occurred

**DATA SHEET NO. 16  
FMVSS 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020



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

1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent Spillage: No Spillage Occurred

**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	70	300	370
90° to 180°	69	300	369
180° to 270°	69	300	369
270° to 360°	70	300	370

**FMVSS 301 SPILLAGE TABLE**

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

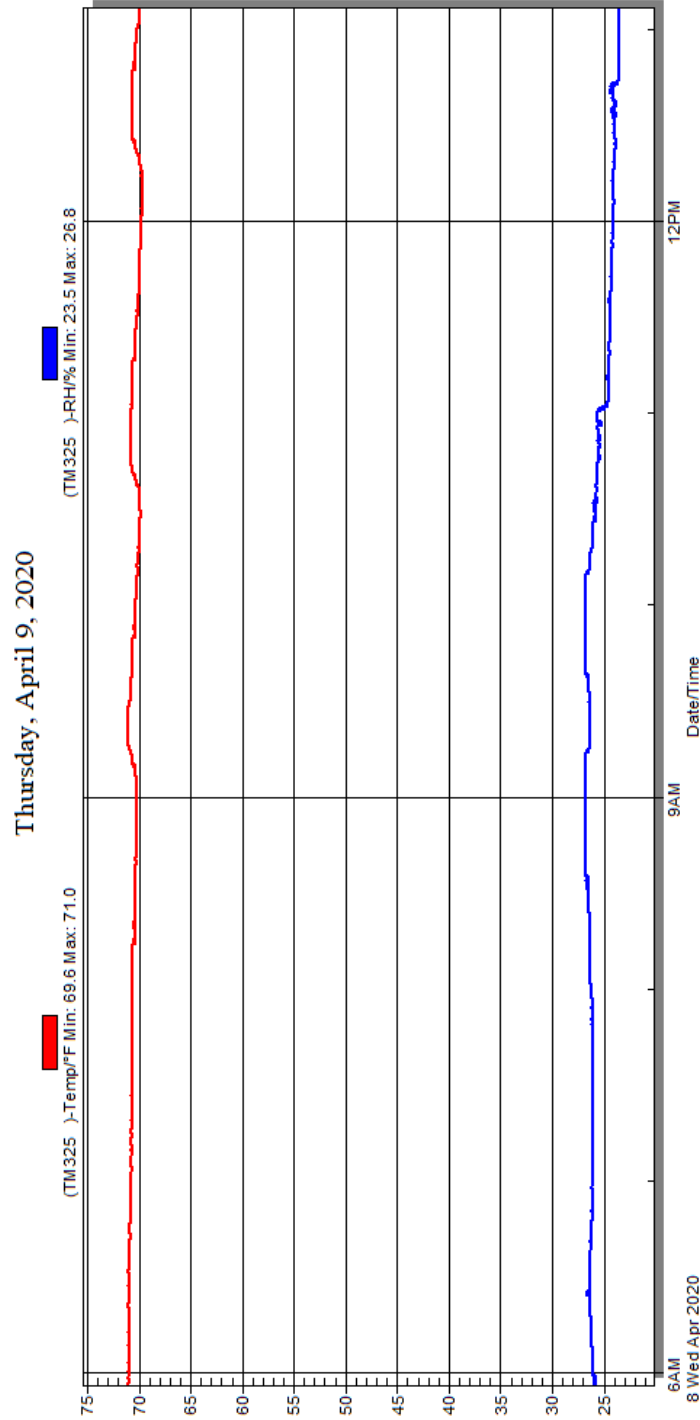
**SOLVENT SPILLAGE LOCATION TABLE**

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

**DATA SHEET NO. 17**  
**DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART**

Test Vehicle: 2020 Buick Encore GX SUV  
 Test Program: NCAP Frontal Barrier Impact Test

NHTSA No.: M20200100  
 Test Date: 4/8/2020



**Temperature and Humidity Stabilization Chart/Data for Dummies and Test Vehicle**

**APPENDIX A**  
**PHOTOGRAPHS**

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<b>Fig.</b>	<b>Description</b>	<b>Page</b>
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<b>Fig.</b>	<b>Description</b>	<b>Page</b>
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82	2020 Buick Encore GX Frontal Impact Event	A-45
83	Monroney Label Photograph	A-46

**<sup>1</sup>NOTE:** *The underbody views should include the following vehicle components: fuel pump, fuel lines, sender unit, fuel tank filler pipe and any other visible system components.*





**Figure A-1: Load Cell Location**



**Figure A-2: Pre-Test Load Cell Wall**





Figure A-3: Post-Test Load Cell Wall

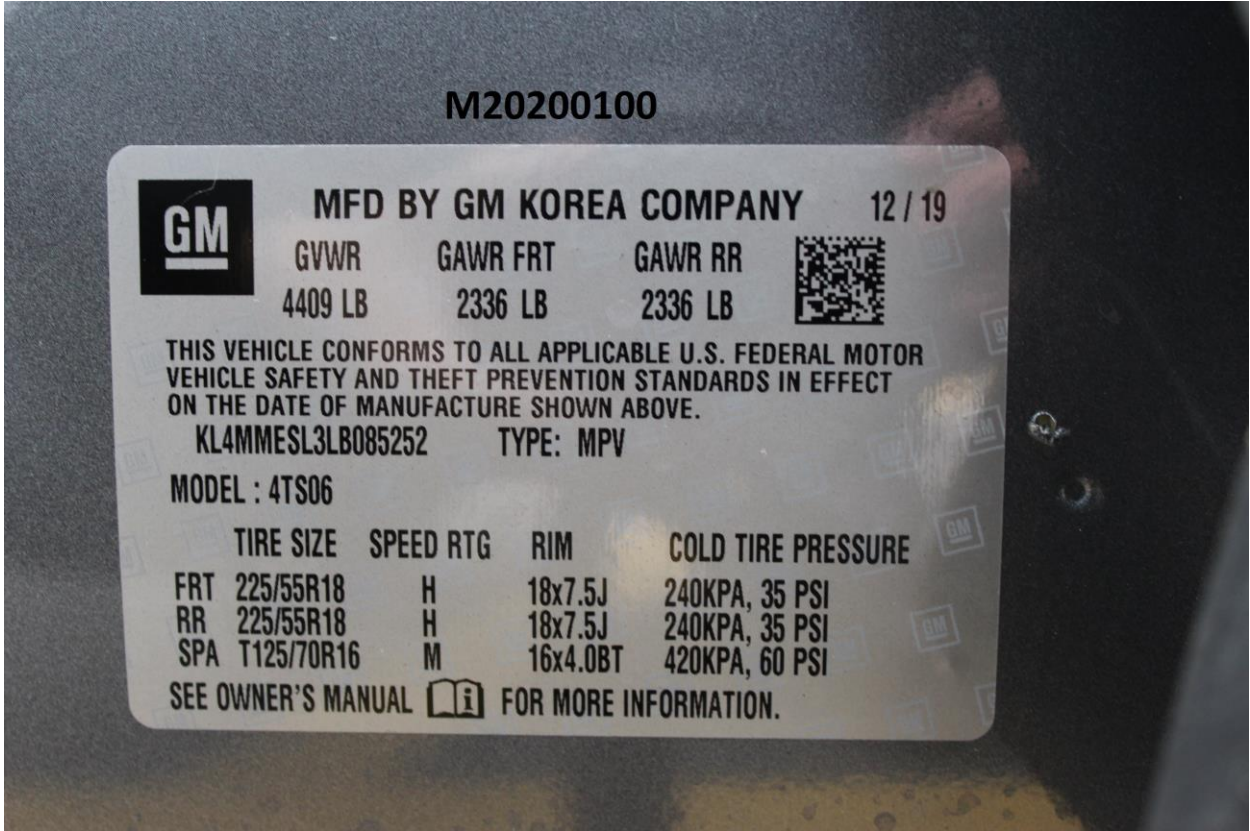
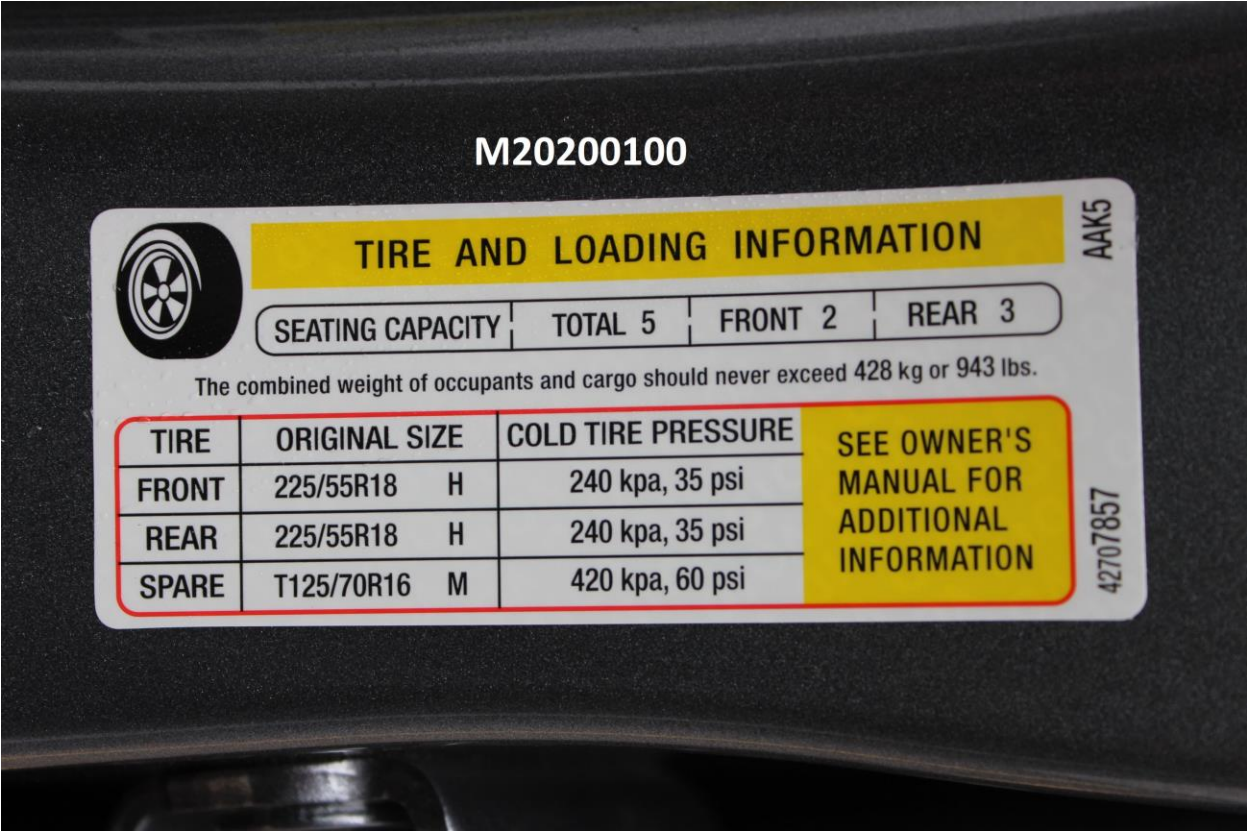


Figure A-4: Manufacturer's Label



**Figure A-5: Tire Placard**



**Figure A-6: 2020 Buick Encore GX Frontal As Delivered**



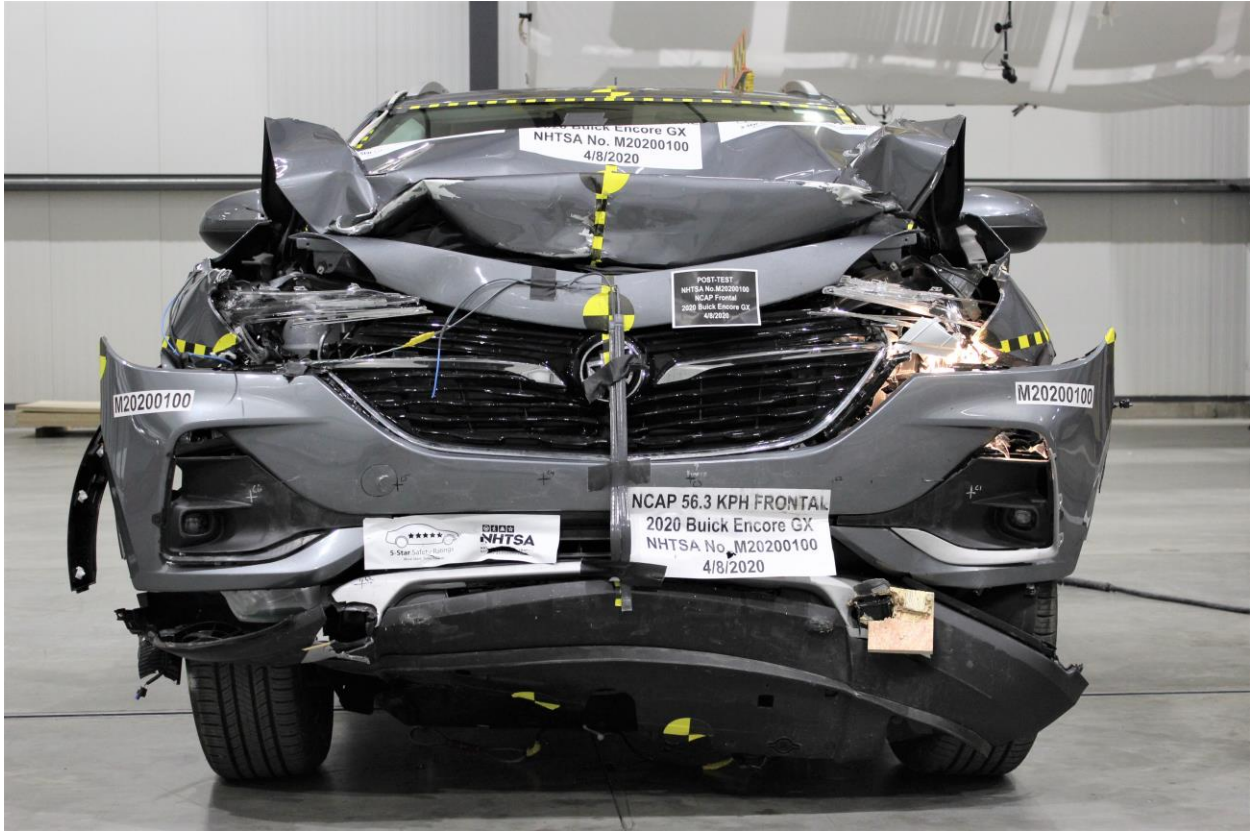


M20200100

Figure A-7: Left Rear 3-4 View, As Received



Figure A-8: Pre-Test Front View of Test Vehicle



**Figure A-9: Post-Test Front View of Test Vehicle**



**Figure A-10: Pre-Test Left View of Test Vehicle**





**Figure A-11: Post-Test Left View of Test Vehicle**



**Figure A-12: Pre-Test Right View of Test Vehicle**



**Figure A-13: Post-Test Right View of Test Vehicle**



**Figure A-14: Pre-Test Right Front 3-4 View**





**Figure A-15: Post-Test Right Front 3-4 View**



**Figure A-16: Pre-Test Left Rear 3-4 View**





Figure A-17: Post-Test Left Rear 3-4 View

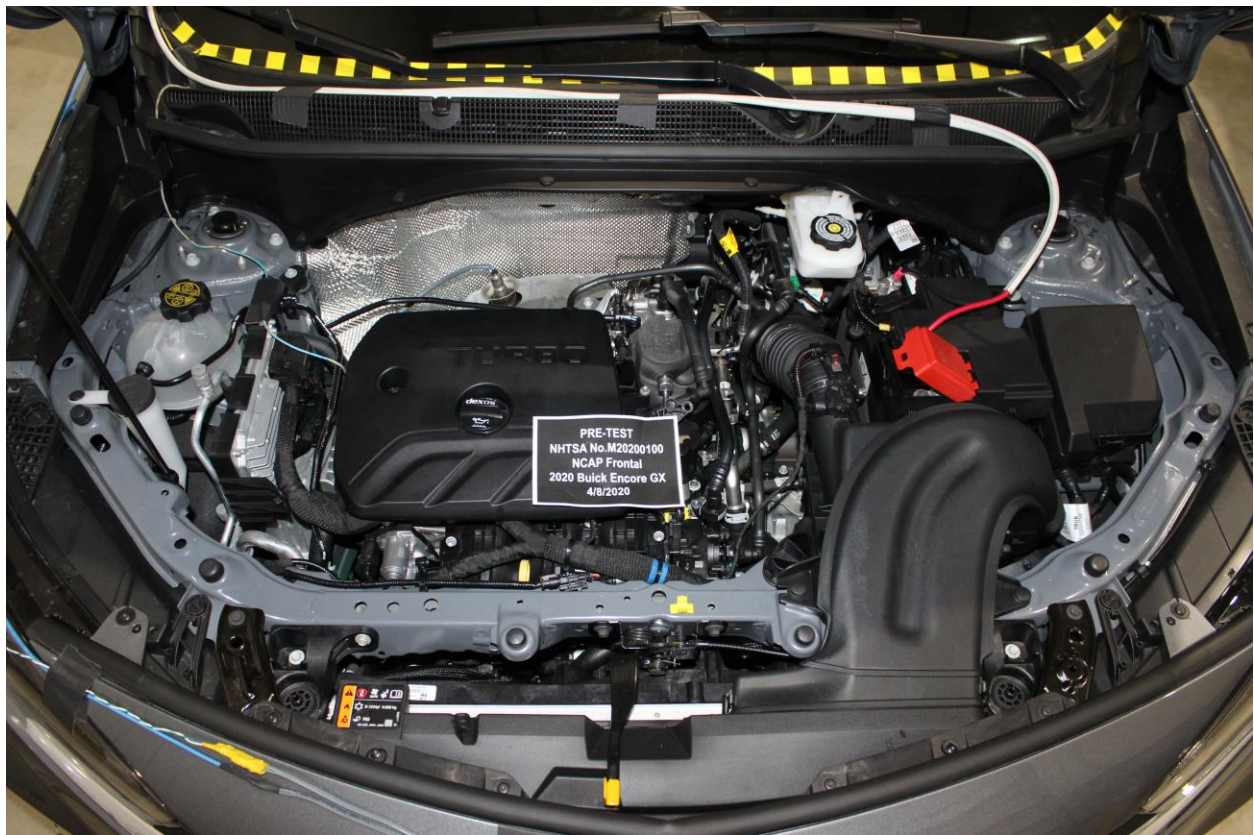


Figure A-18: Pre-Test Windshield View



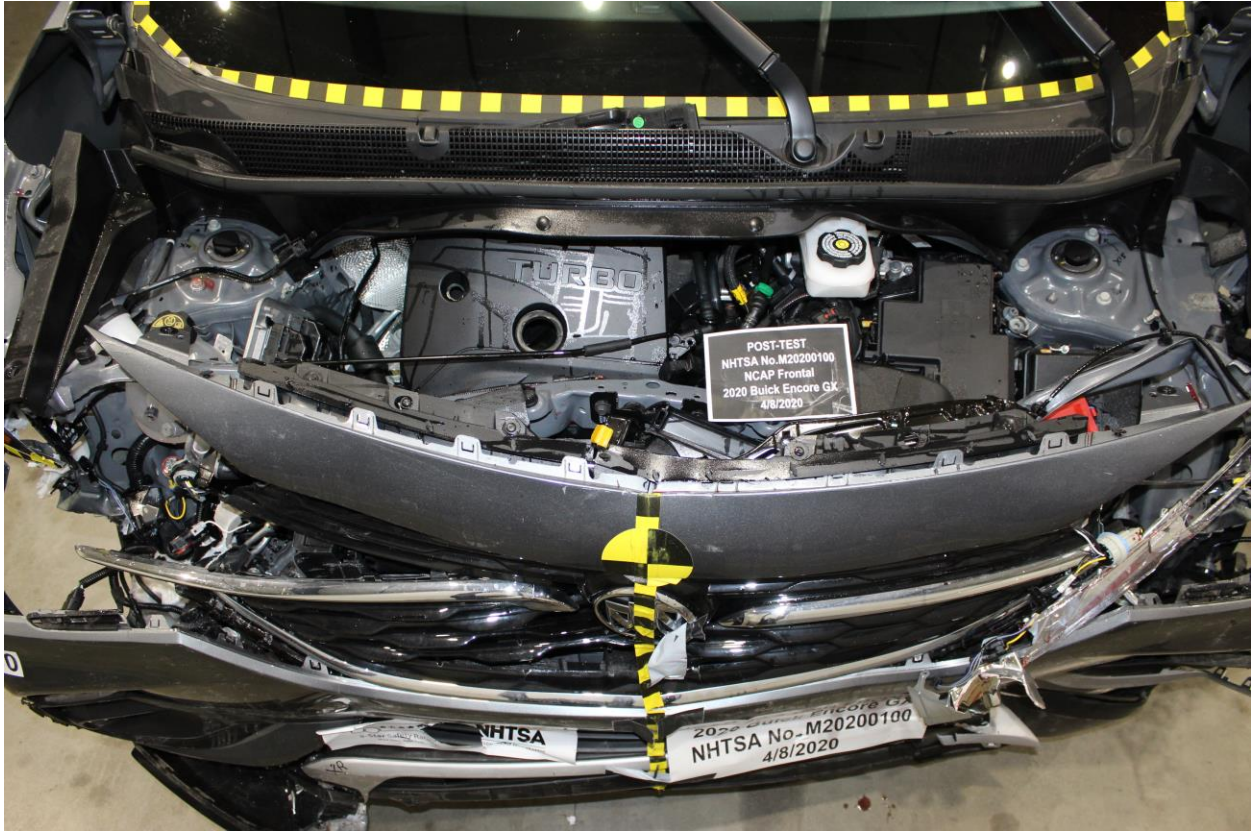


**Figure A-19: Post-Test Windshield View**



**Figure A-20: Pre-Test Engine Compartment View**





**Figure A-21: Post-Test Engine Compartment View**



**Figure A-22: Pre-Test Fuel Filler Cap View**



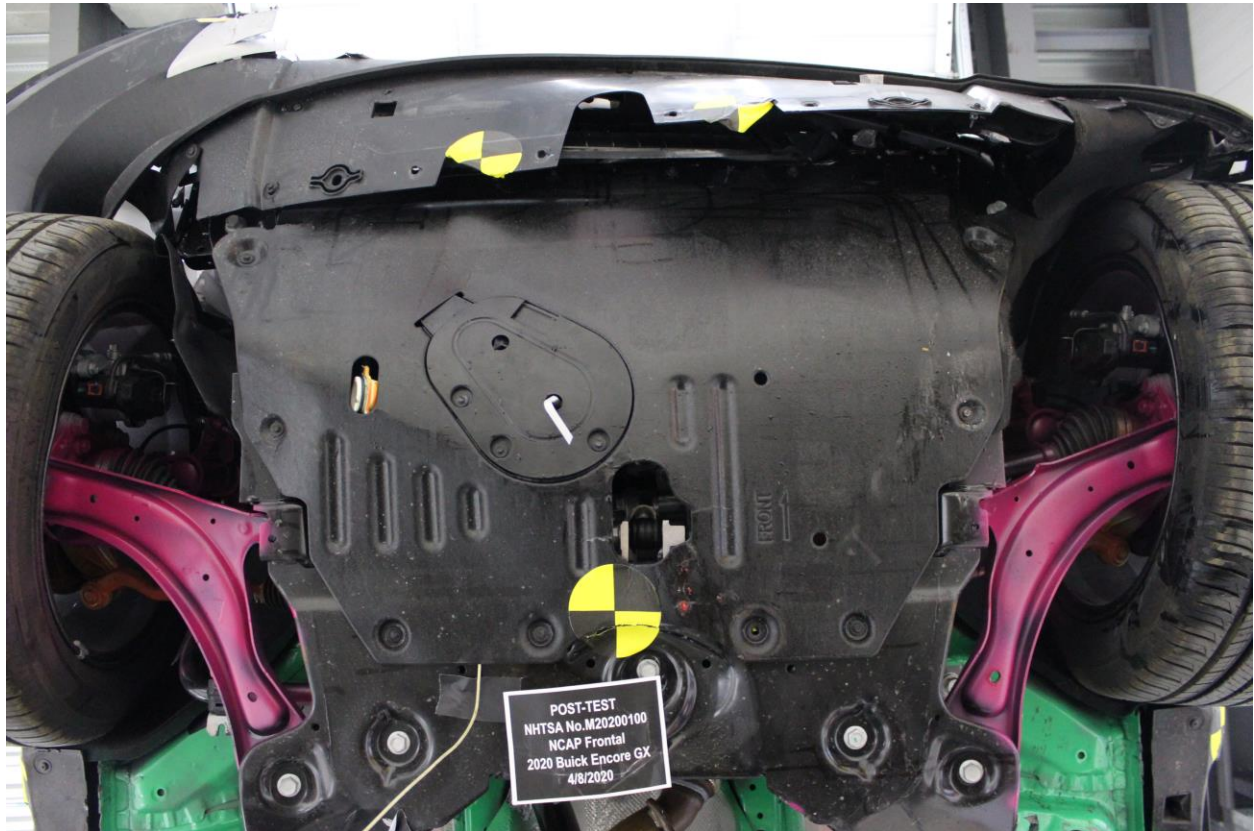


**Figure A-23: Post-Test Fuel Filler Cap View**

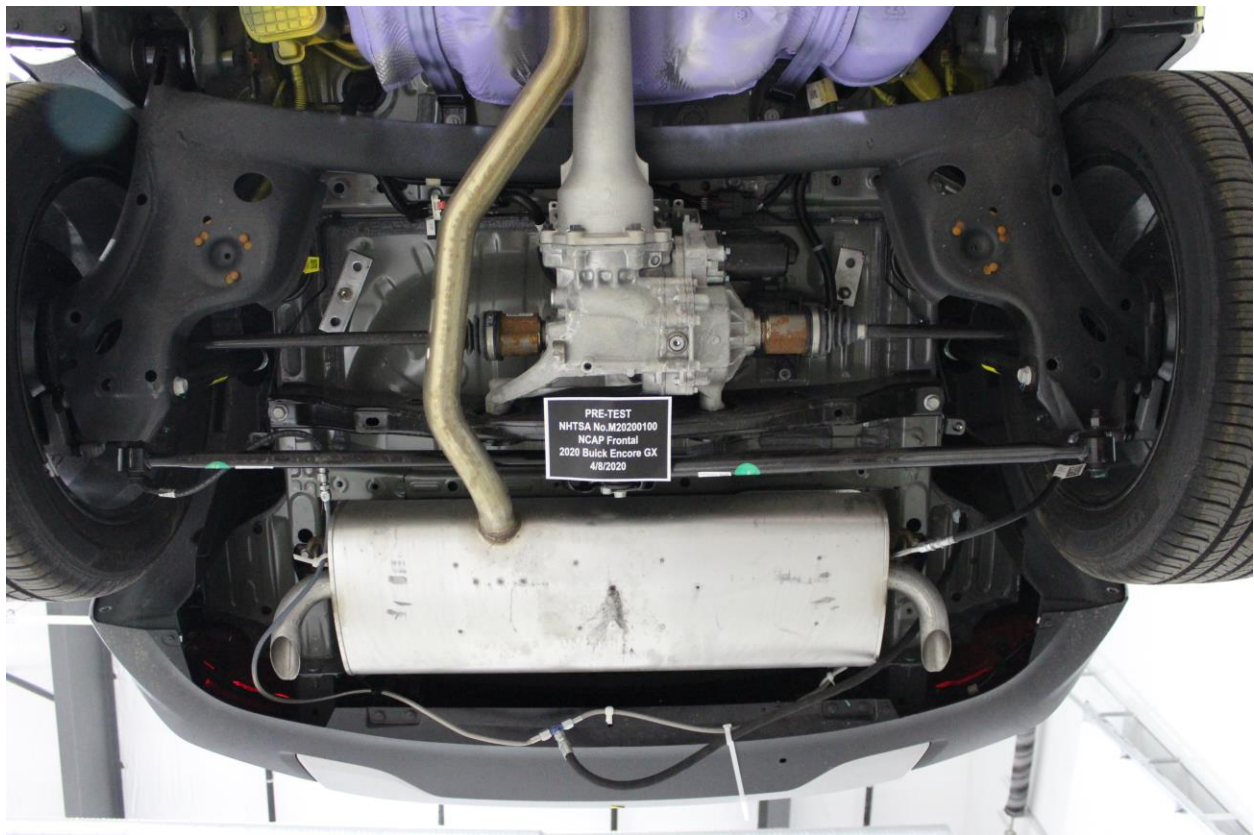


**Figure A-24: Pre-Test Front Underbody View**



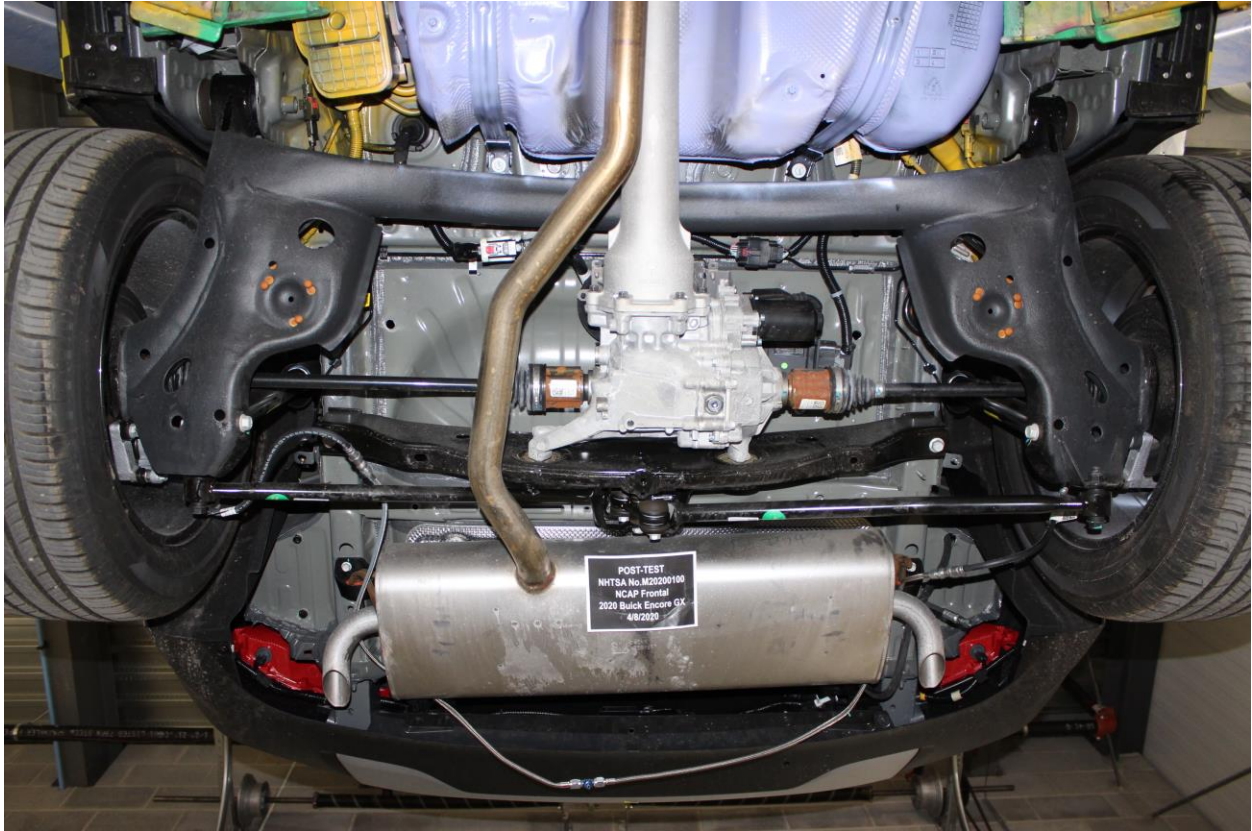


**Figure A-25: Post-Test Front Underbody View**



**Figure A-26: Pre-Test Rear Underbody View**





**Figure A-27: Post-Test Rear Underbody View**



**Figure A-28: Pre-Test Dummy Cable Routing**





**Figure A-29: Post-Test Dummy Cable Routing**



**Figure A-30: Pre-Test Driver Dummy Front View**





Figure A-31: Post-Test Driver Dummy Front View



Figure A-32: Pre-Test Driver Dummy Window View





Figure A-33: Post-Test Driver Dummy Window View



Figure A-34: Pre-Test Driver Dummy and Vehicle Interior View





Figure A-35: Post-Test Driver Dummy and Vehicle Interior View



Figure A-36: Pre-Test Driver's Seat Fore-Aft Markings





Figure A-37: Post-Test Driver's Seat Fore-Aft Markings



Figure A-38: Pre-Test View of Belt Anchorage for Driver Dummy



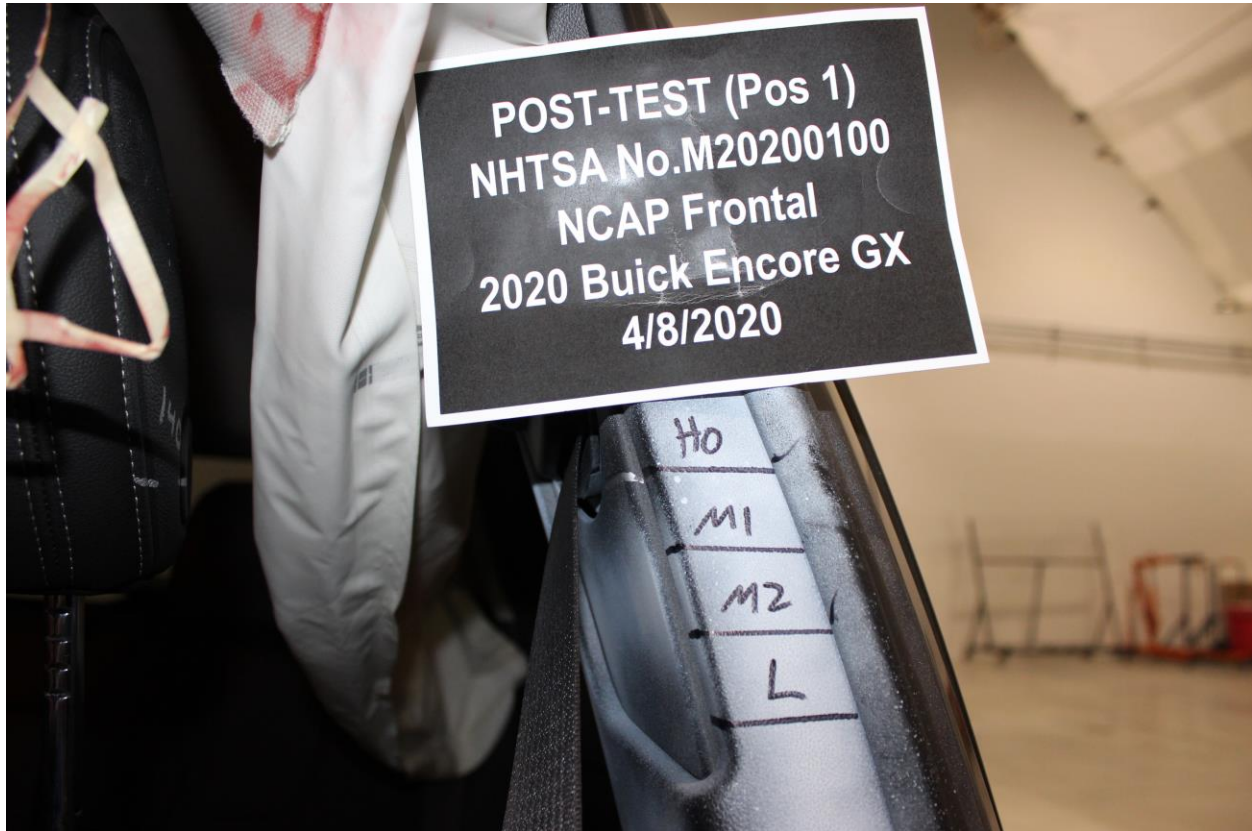


Figure A-39: Post-Test View of Belt Anchorage for Driver Dummy

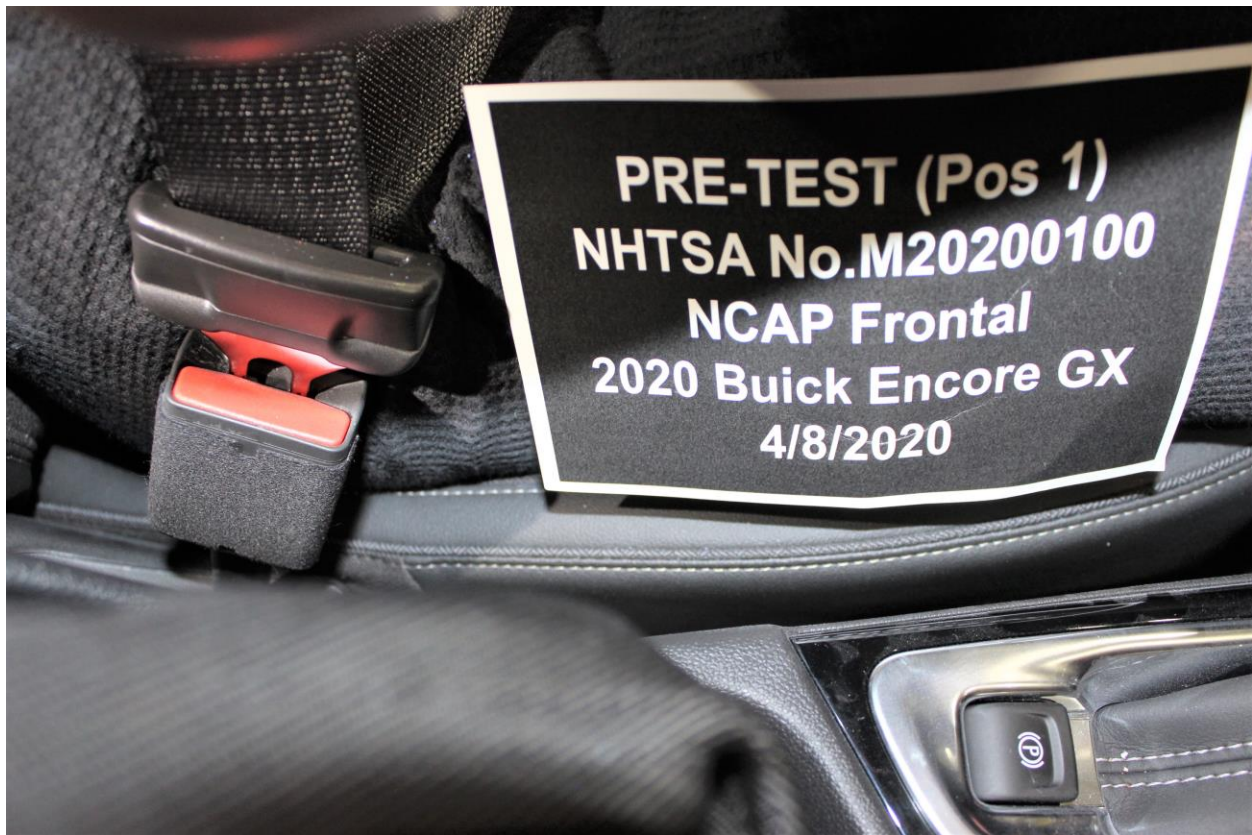


Figure A-40: Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy





**Figure A-41: Post-Test View of Belt Buckle and Latch Plate for Driver Dummy**



**Figure A-42: Pre-Test Driver Dummy Feet**





**Figure A-43: Post-Test Driver Dummy Feet**



**Figure A-44: Pre-Test Driver's Side Knee Bolster**





**Figure A-45: Post-Test Driver's Side Knee Bolster**



**Figure A-46: Pre-Test Driver's Side Floorpan**



**Figure A-47: Post-Test Driver's Side Floorpan**



**Figure A-48: Post-Test Driver Dummy Face**





**Figure A-49: Post-Test Driver Dummy Contact With Airbag**



**Figure A-50: Post-Test Driver Dummy Contact With Headrest**





**Figure A-51: Pre-Test View of the Steering Wheel**



**Figure A-52: Post-Test View of the Steering Wheel**



Figure A-53: Pre-Test Passenger Dummy Front View



Figure A-54: Post-Test Passenger Dummy Front View





**Figure A-55: Pre-Test Passenger Dummy Window View**



**Figure A-56: Post-Test Passenger Dummy Window View**



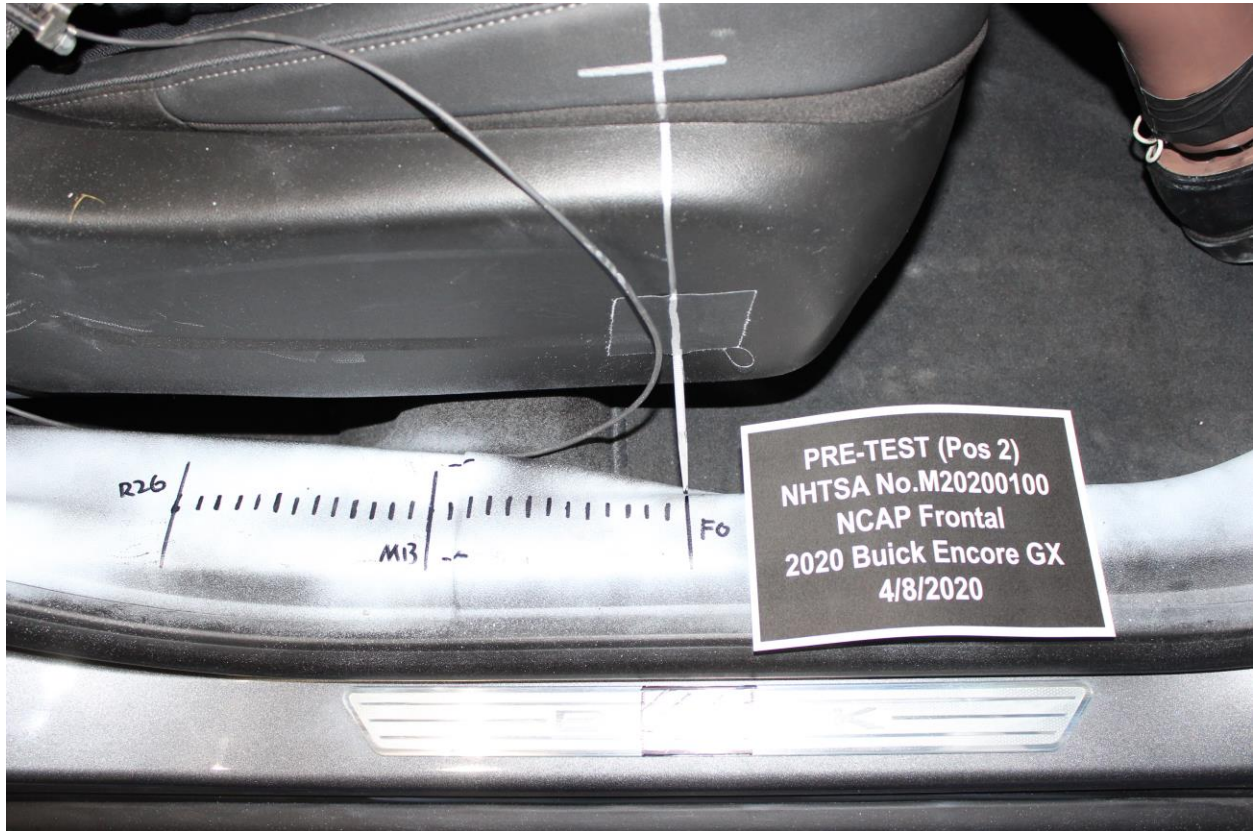


**Figure A-57: Pre-Test Passenger Dummy and Vehicle Interior View**

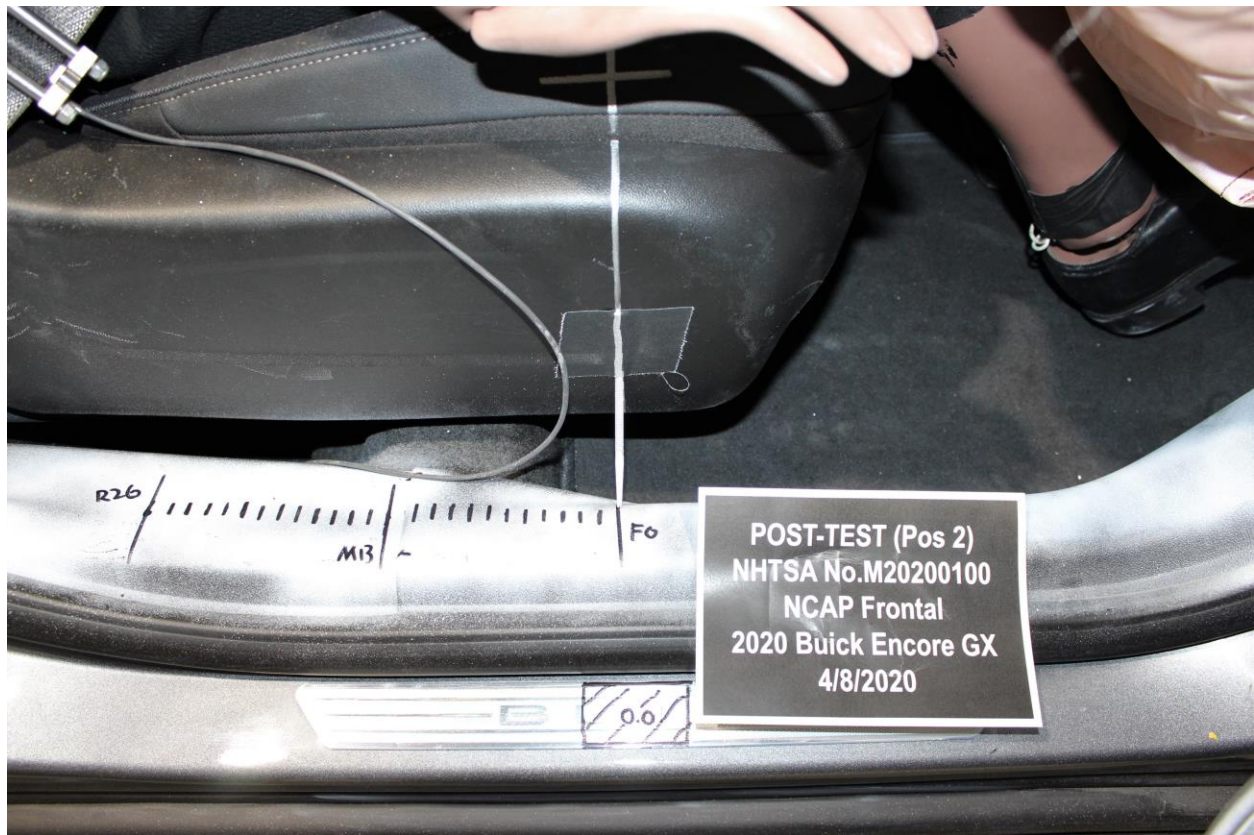


**Figure A-58: Post-Test Passenger Dummy and Vehicle Interior View**



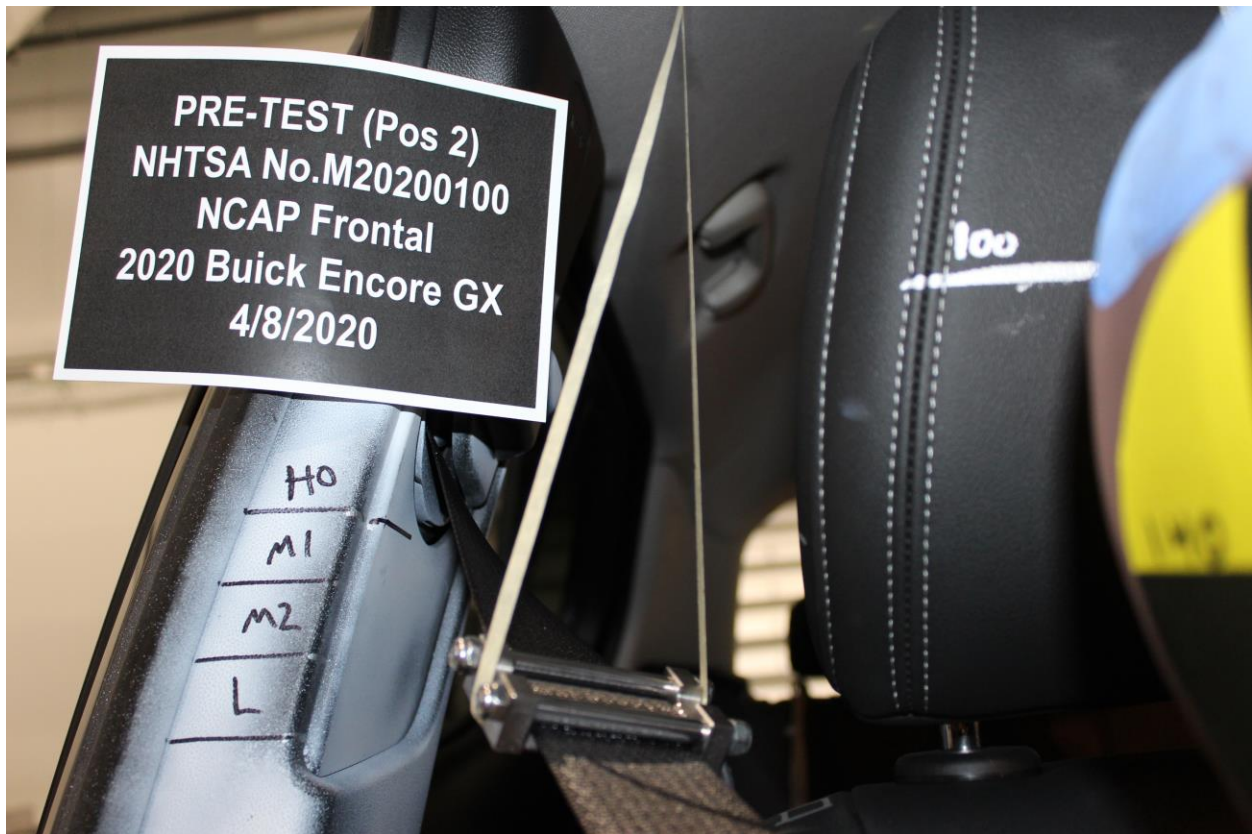


**Figure A-59: Pre-Test Passenger's Seat Fore-Aft Markings**



**Figure A-60: Post-Test Passenger's Seat Fore-Aft Markings**





**Figure A-61: Pre-Test View of Belt Anchorage for Passenger Dummy**



**Figure A-62: Post-Test View of Belt Anchorage for Passenger Dummy**





**Figure A-63: Pre-Test View of Belt Buckle and Latch Plate for Passenger Dummy**



**Figure A-64: Post-Test View of Belt Buckle and Latch Plate for Passenger Dummy**

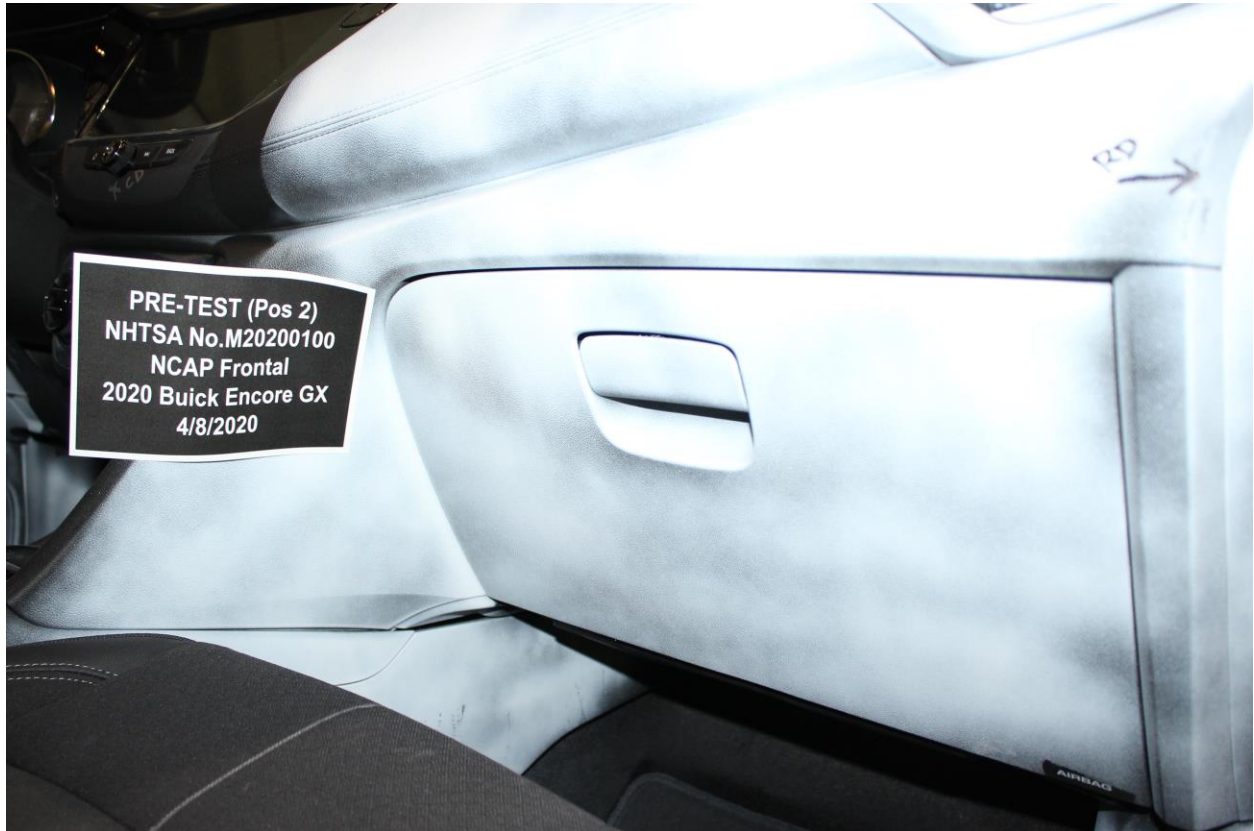




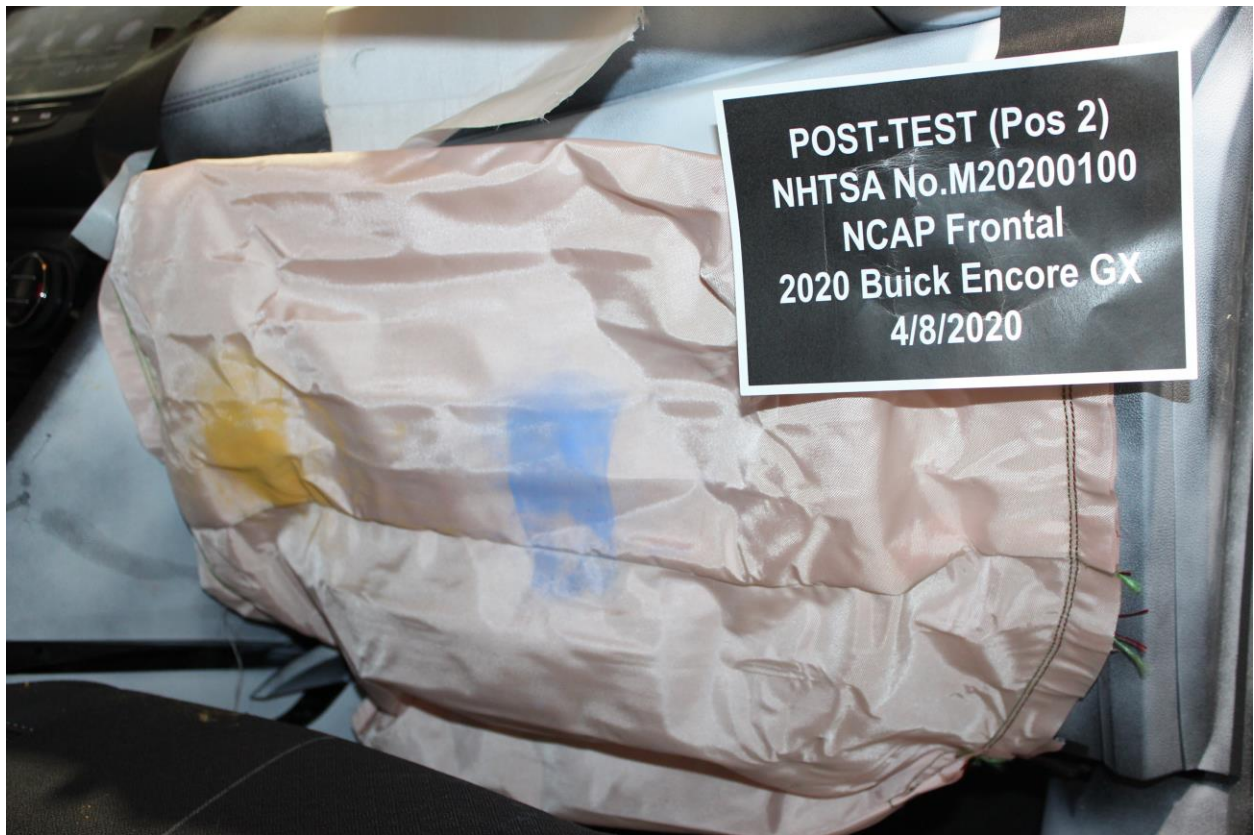
**Figure A-65: Pre-Test Passenger Dummy Feet**



**Figure A-66: Post-Test Passenger Dummy Feet**



**Figure A-67: Pre-Test Passenger's Side Knee Bolster**



**Figure A-68: Post-Test Passenger's Side Knee Bolster**





**Figure A-69: Pre-Test Passenger's Side Floorpan**



**Figure A-70: Post-Test Passenger's Side Floorpan**





**Figure A-71: Post-Test Passenger Dummy Face**



**Figure A-72: Post-Test Passenger Dummy Contact With Airbag**





**Figure A-73: Post-Test Passenger Dummy Contact With Headrest**



**Figure A-74: Photograph of Ballast Installed in Vehicle**

# Photo Not Applicable

Figure A-75: Post-Test Stoddard Solvent Spillage Location View, If Required

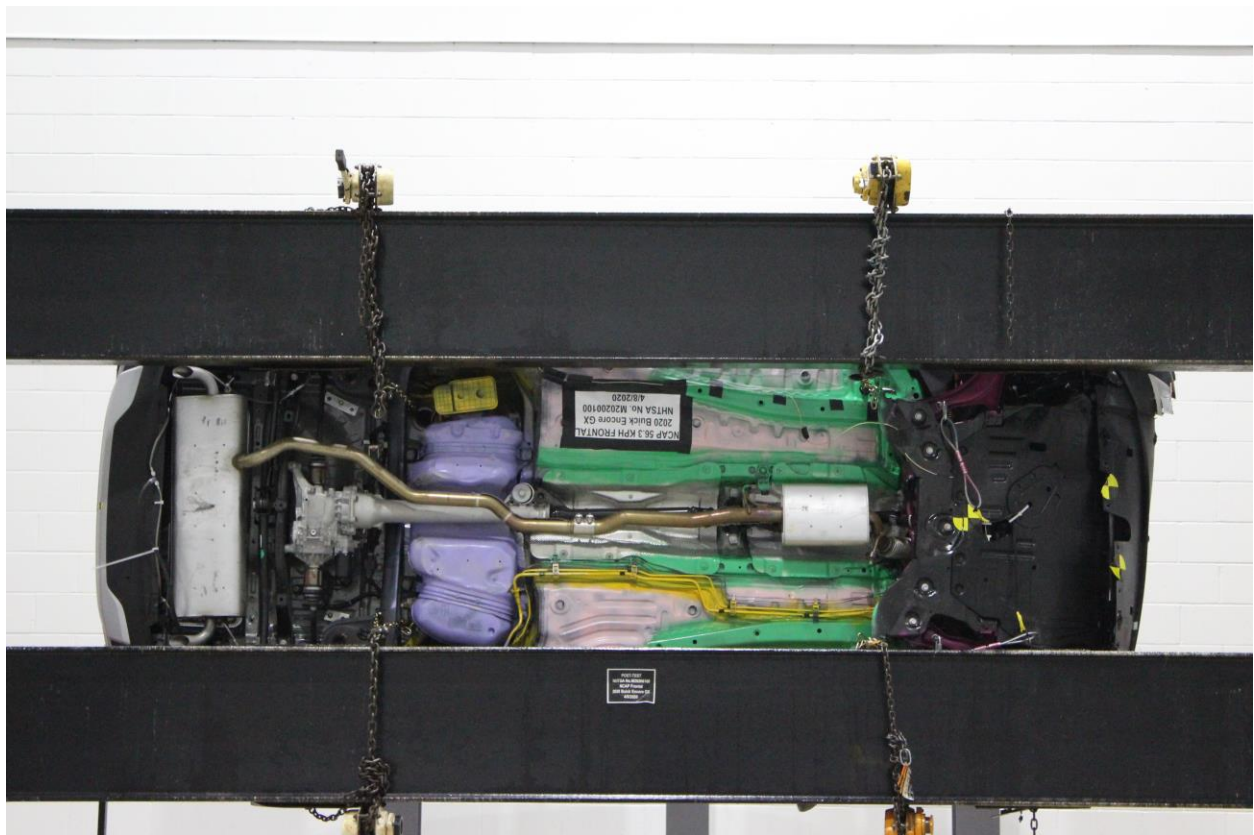


Figure A-76: Post-Test Speed Trap Read-Out





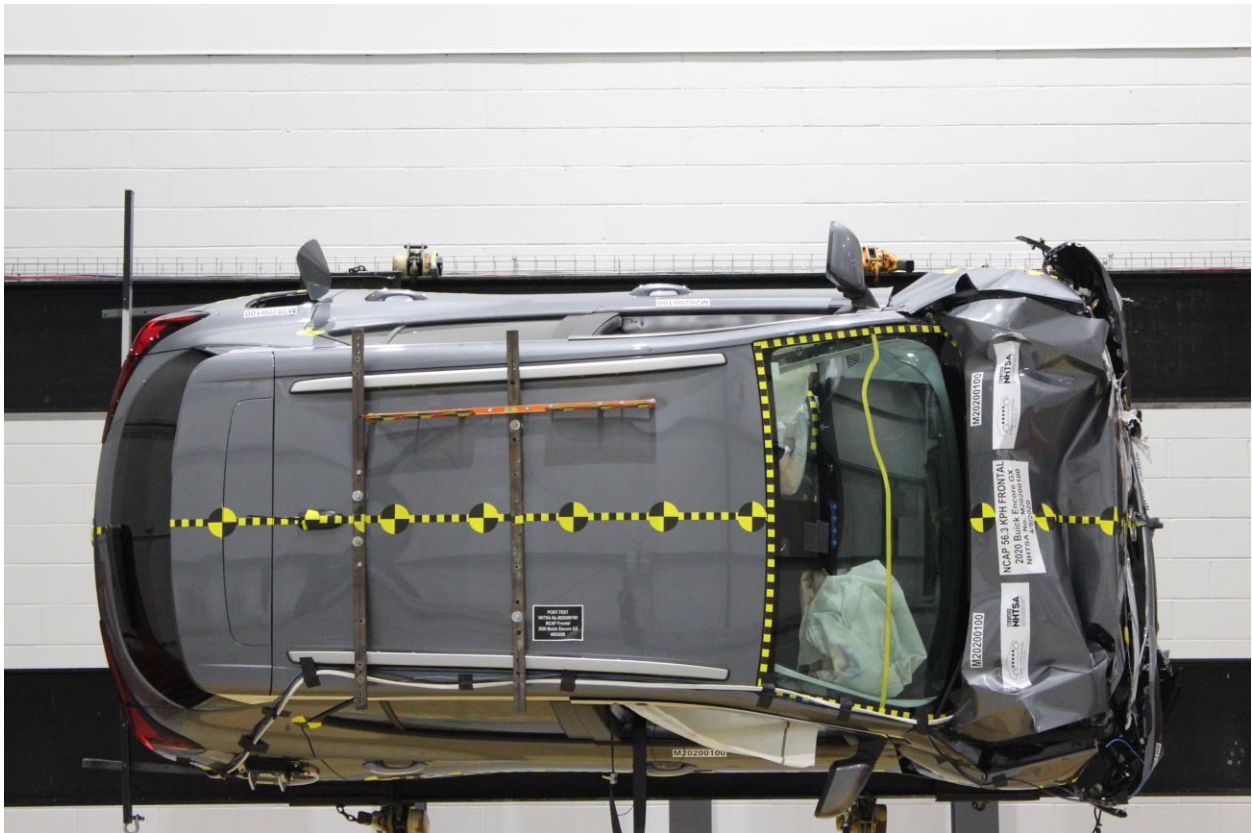
**Figure A-77: Vehicle at 0° on Static Rollover Device**



**Figure A-78: Vehicle at 90° on Static Rollover Device**



**Figure A-79: Vehicle at 180° on Static Rollover Device**



**Figure A-80: Vehicle at 270° on Static Rollover Device**





**Figure A-81: Vehicle at 360° on Static Rollover Device**



**Figure A-82: 2020 Buick Encore GX Frontal Impact Event**





**2020 ENCORE GX SELECT - AWD**

**EXTERIOR: SATIN STEEL GRAY METALLIC  
INTERIOR: EBONY / EBONY ACCENTS**

**ECOTEC 1.3L TURBO TRANSMISSION, 9-SPD AUTOMATIC**

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**STANDARD EQUIPMENT**

ITEMS LISTED BELOW ARE INCLUDED AT NO EXTRA CHARGE IN THE STANDARD VEHICLE PRICE EXCEPT:

• 3 YEAR / 36,000 MILE\* BUMPER-TO-BUMPER LIMITED WARRANTY

• 5 YEAR / 60,000 MILE\* POWERTRAIN LIMITED WARRANTY, ROADSIDE ASSISTANCE & COURTESY TRANSPORTATION

• FIRST MAINTENANCE VISIT

• \*WHICHEVER COMES FIRST SEE BUICK.COM OR DEALER FOR TERMS, DETAILS & LIMITS

**PERFORMANCE & MECHANICAL**

• ENGINE CONTROL, STOP-START SYSTEM W/ OVERRIDE

• BRAKES, ABS W/ AUTO DRY

• BRAKE LINING WEAR INDICATOR

• STABILITRAK STABILITY CONTROL

• CABIN AIR FILTRATION MONITOR

**CONNECTIVITY & TECHNOLOGY**

• KEYLESS OPEN / KEYLESS START

• BUICK CONNECTED ACCESS

• BUICK INFOTAINMENT SYSTEM W/ 8" DIAG COLOR TOUCHSCREEN

ADDITIONAL FEATURES FOR COMPATIBLE PHONES INCLUDE:

• BLUETOOTH AUDIO STREAMING, VOICE COMMAND PASSTHROUGH TO PHONE, ANDROID AUTO & APPLE CARPLAY CAPABLE

• SIRIUSXM RADIO CAPABLE, ALL ACCESS TRIAL W/ SUBSCRIPTION SOLD SEPARATELY

• 4.2" DIAG. COLOR DISPLAY DRIVER INFORMATION CENTER

• ONSTAR (R) SERVICES & 4G LTE W/FI (R) AVAILABLE. SEE ONSTAR.COM FOR TERMS

• REAR USB A & C CHARGING ONLY PORTS

• FRONT USB A & C PORTS & AUX INPUT

**INTERIOR**

• SEAT ADJUSTER, DRIVER 10-WAY POWER INCLUDING LUMBAR CONTROL

• SEAT, REAR 40/60 SPLIT-BENCH, FOLDING

• SEAT ADJUSTER, FRONT PASSENGER 4-WAY MANUAL

• POWER WINDOWS, FRONT PASS & REAR EXPRESS DOWN

• POWER WINDOW DRIVER W/ EXPRESS UP/DOWN

• CARGO SECURITY COVER, REAR

• SEATS, CLOTH & LEATHERETTE

• CARGO LOAD FLOOR, TWO LEVELS

• BUICK QUIETTUNING W/ ACTIVE NOISE CANCELLATION

• LEATHER WRAP STEERING WHEEL

**EXTERIOR**

• GLASS, DEEP TINTED

• MIRRORS, OUTSIDE HEATED, POWER-ADJUSTABLE, BODY-COLOR

**MANUAL FOLDING**

• CAPLESS FUEL FILL

• WHEELS, 18" MACHINED ALUMINUM W/ PAINTED POCKETS

• FRONT FOG LAMPS, LED

• DAYTIME RUNNING LAMPS, SIGNATURE LED

• ROOF RACK, SIDE RAILS

**SAFETY & SECURITY**

• BUICK DRIVER CONFIDENCE: AUTO EMERGENCY BRAKING, FRONT PEDESTRIAN BRAKING, FORWARD COLLISION ALERT, FOLLOWING DISTANCE INDICATOR

• LANE KEEP ASSIST WITH LANE DEPARTURE WARNING & INTELLIGENT HEADLAMPS

• TEEN DRIVER

• TIRE PRESSURE MONITOR SYSTEM (EXCL. SPARE TIRE)

• TIRE FILL ALERT (EXCL. SPARE)

• REAR VISION CAMERA

**MANUFACTURER'S SUGGESTED RETAIL PRICE**

**STANDARD VEHICLE PRICE \$27,700.00**

**OPTIONS & PRICING**

OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT DRIVEN)

LIFTGATE PACKAGE: 520.00

POWER, HANDS FREE SATIN STEEL GRAY METALLIC 495.00

TOTAL OPTIONS \$1,015.00

TOTAL VEHICLE & OPTIONS \$28,715.00

DESTINATION CHARGE 995.00

**TOTAL VEHICLE PRICE\* \$29,710.00**

**EPA DOT Fuel Economy and Environment**

**Fuel Economy**

**28** MPG combined city/hwy

26 city 29 highway

3.6 gallons per 100 miles

Small SUVs range from 18 to 120 MPG. The best vehicle rates 136 MPGe.

**You save \$250** in fuel costs over 5 years compared to the average new vehicle.

**Annual fuel cost \$1,450**

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

6

**Smog Rating** (tailpipe only)

7

This vehicle emits 520 grams CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions, learn more at [fuelconomy.gov](http://fuelconomy.gov).

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 \$7,900 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.70 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

[fuelconomy.gov](http://fuelconomy.gov)

Calculate personalized estimates and compare vehicles

**Gasoline Vehicle**

**GOVERNMENT 5-STAR SAFETY RATINGS**

**Overall Vehicle Score To Be Rated**

Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash	Driver	To Be Rated
	Passenger	To Be Rated
Side Crash	Front seat	To Be Rated
	Rear seat	To Be Rated
Rollover		To Be Rated

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

**PARTS CONTENT INFORMATION**

**FOR VEHICLES IN THIS CARLINE:**  
U.S./CANADIAN PARTS CONTENT: 3%  
MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA 45%  
MEXICO 26%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

**FOR THIS VEHICLE:**  
FINAL ASSEMBLY POINT: BUPYEONG GU, IN KOREA  
COUNTRY OF ORIGIN: ENGINE: MEXICO  
TRANSMISSION: MEXICO

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RUPPEYONG GULN KOREA R19120975  
VIN KLAMMESL3LB085252  
DEALER TO WHOM DELIVERED:  
GARY LANG AUTO GROUP  
1107 S STATE ROUTE 31  
MCHENRY, IL 60050-8200

**WO**

Figure A-83: Monroney Label Photograph

**APPENDIX B**  
**VEHICLE & DUMMY RESPONSE DATA TRACES**

**Table of Data Plots**

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Plot 3	Driver Head Z Acceleration vs. Time Primary	B-5
Plot 4	Driver Head Resultant Acceleration vs. Time Primary	B-5
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Plot 13	Driver Nij vs. Time Primary	B-8
Plot 14	Driver Left Femur Force vs. Time	B-8
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Plot 30	Passenger Right Femur Force vs. Time	B-12

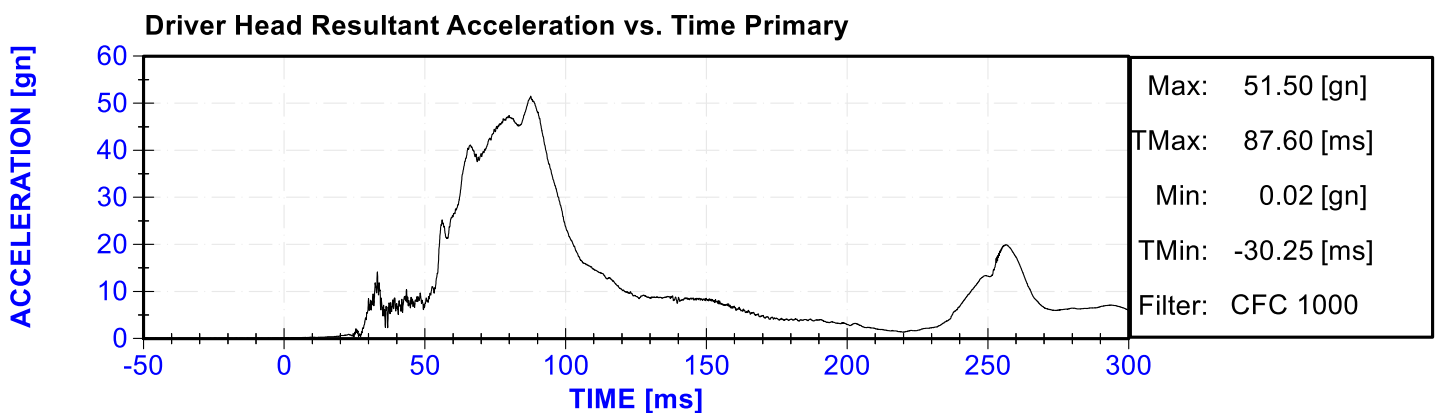
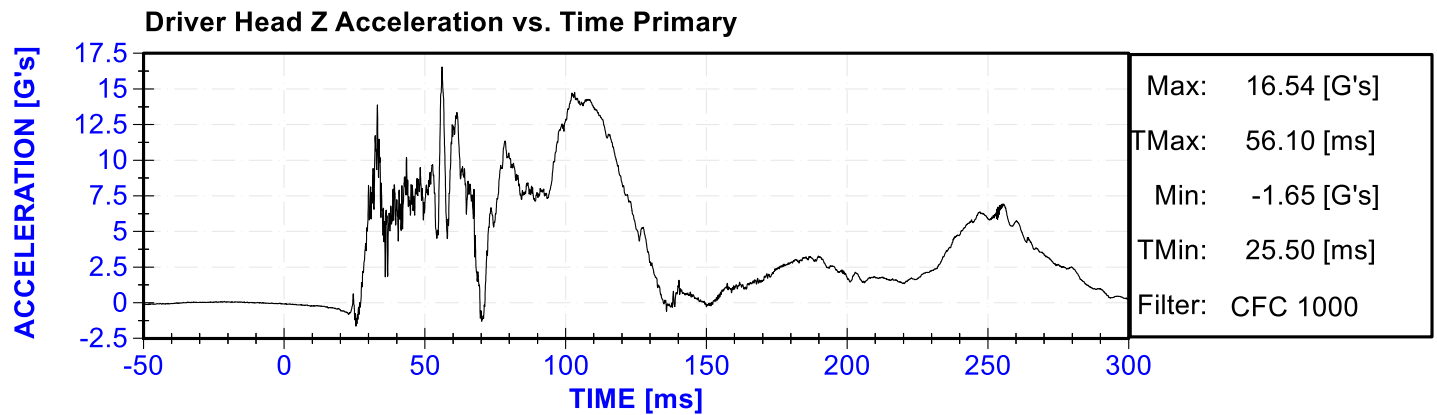
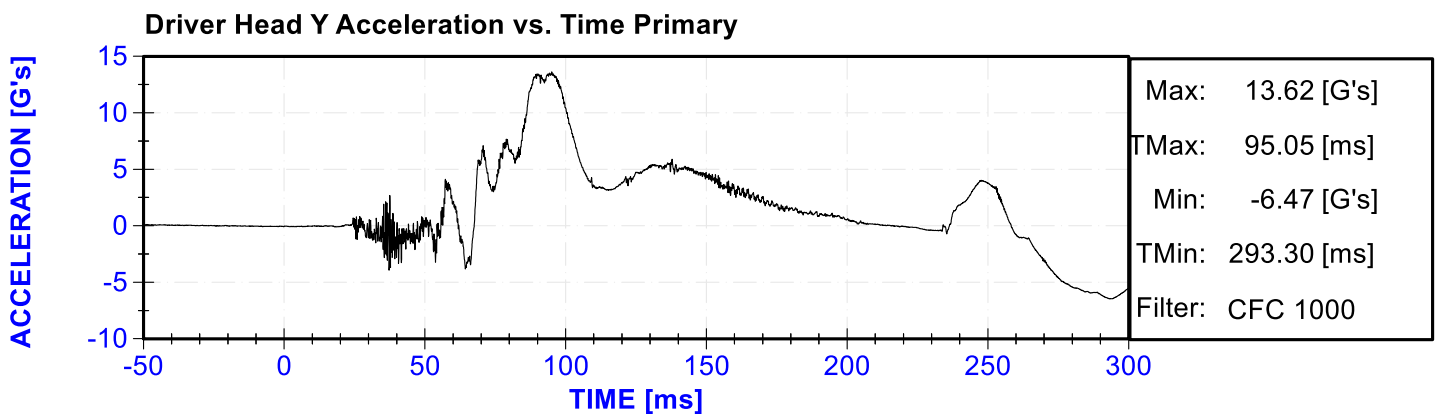
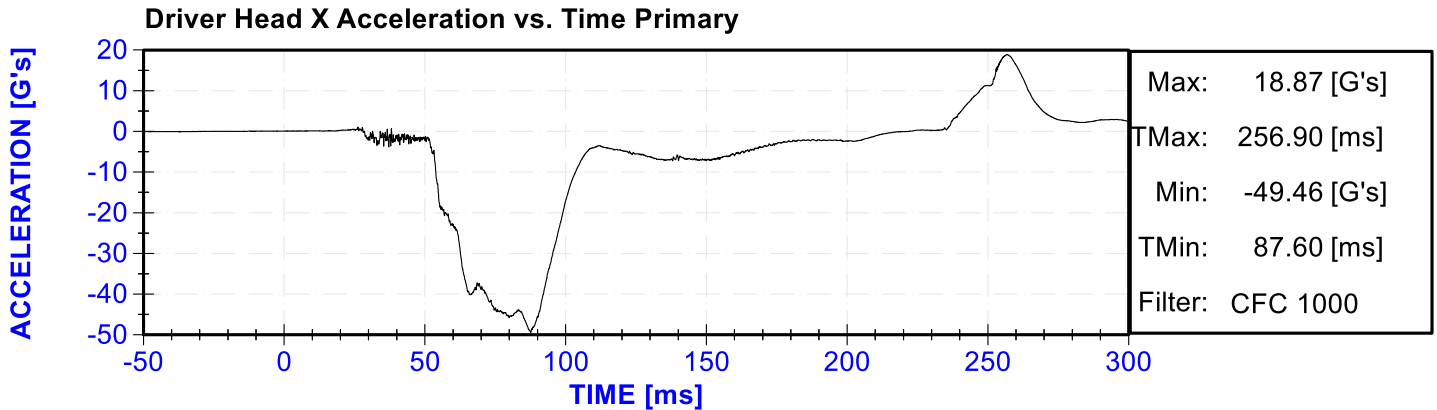
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at [www.NHTSA.gov](http://www.NHTSA.gov)

Driver Head X Acceleration Redundant  
 Driver Head Y Acceleration Redundant  
 Driver Head Z Acceleration Redundant  
 Driver Upper Neck Force Y  
 Driver Upper Neck Moment X  
 Driver Upper Neck Moment Z  
 Driver Chest X Acceleration Redundant  
 Driver Chest Y Acceleration Redundant  
 Driver Chest Z Acceleration Redundant  
 Driver Pelvis X  
 Driver Pelvis Y  
 Driver Pelvis Z  
 Driver Left Femur Redundant  
 Driver Right Femur Redundant  
 Driver Left Upper Tibia Moment X  
 Driver Left Upper Tibia Moment Y

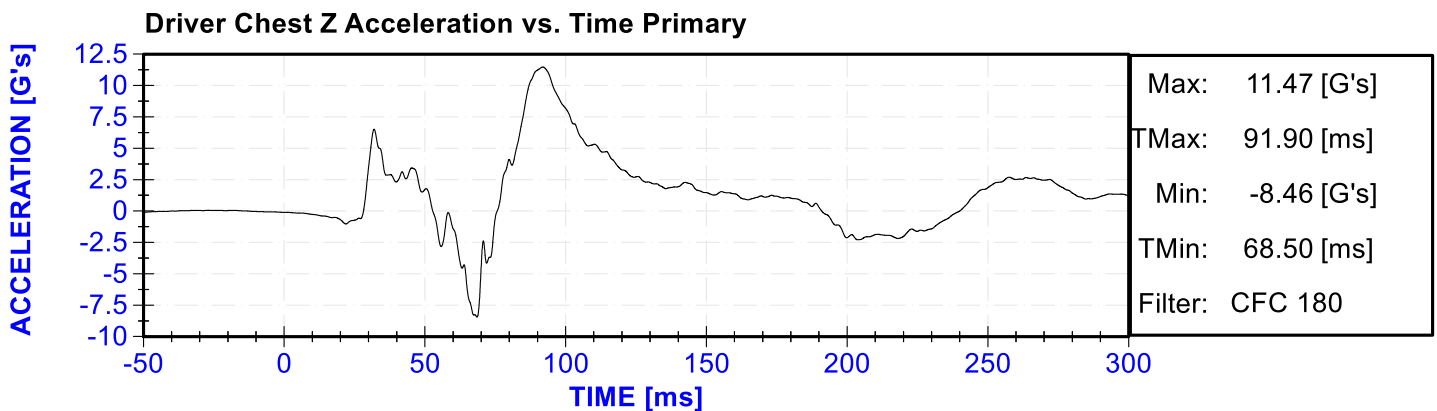
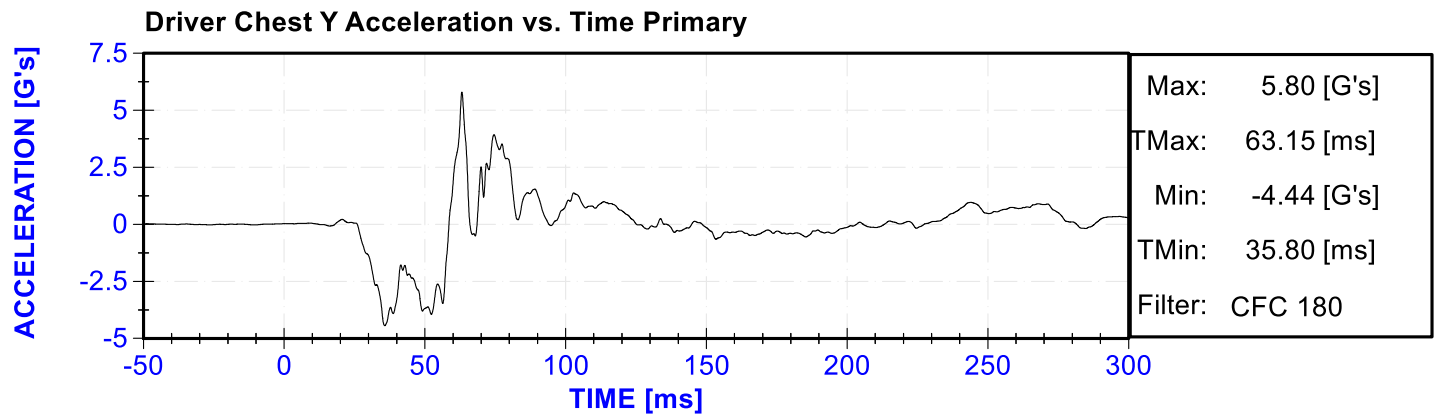
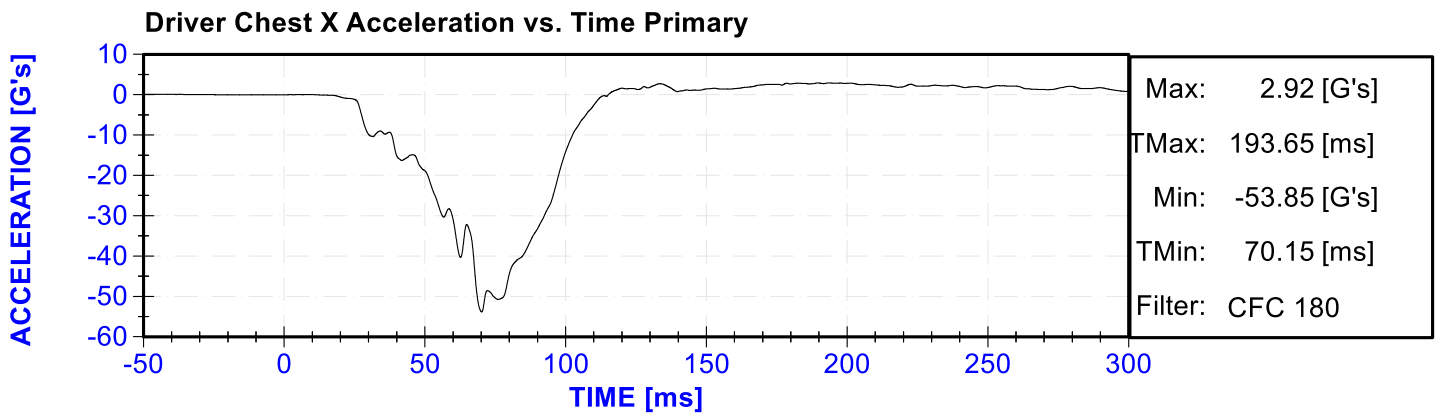
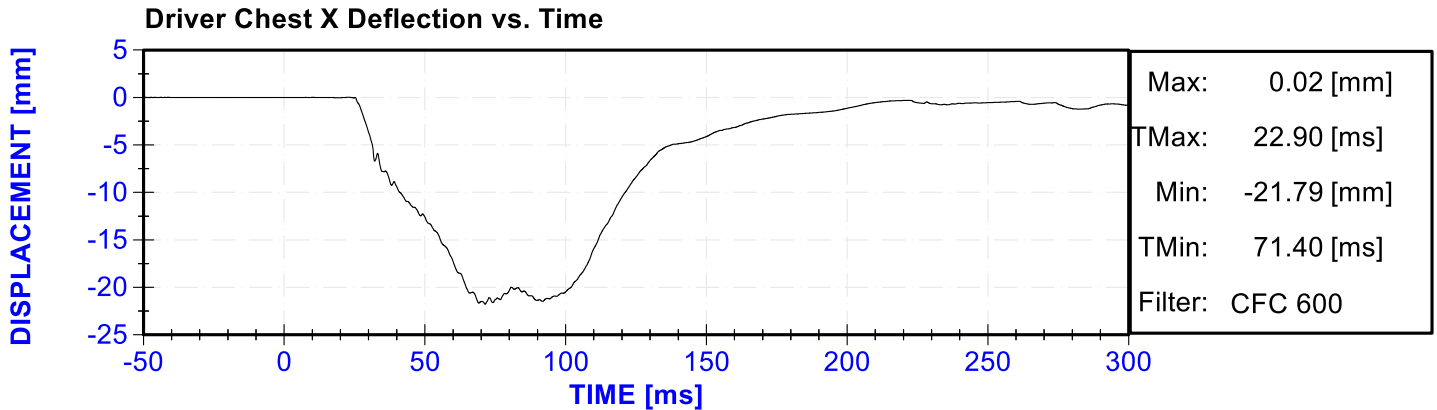


Driver Left Upper Tibia Force Z  
Driver Left Lower Tibia Moment X  
Driver Left Lower Tibia Moment Y  
Driver Left Lower Tibia Force Z  
Driver Right Upper Tibia Moment X  
Driver Right Upper Tibia Moment Y  
Driver Right Upper Tibia Force Z  
Driver Right Lower Tibia Moment X  
Driver Right Lower Tibia 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 Redundant  
Passenger Right Femur 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  
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Passenger Left Foot Fore Z  
Passenger Left Foot Aft X  
Passenger Left Foot Aft Z

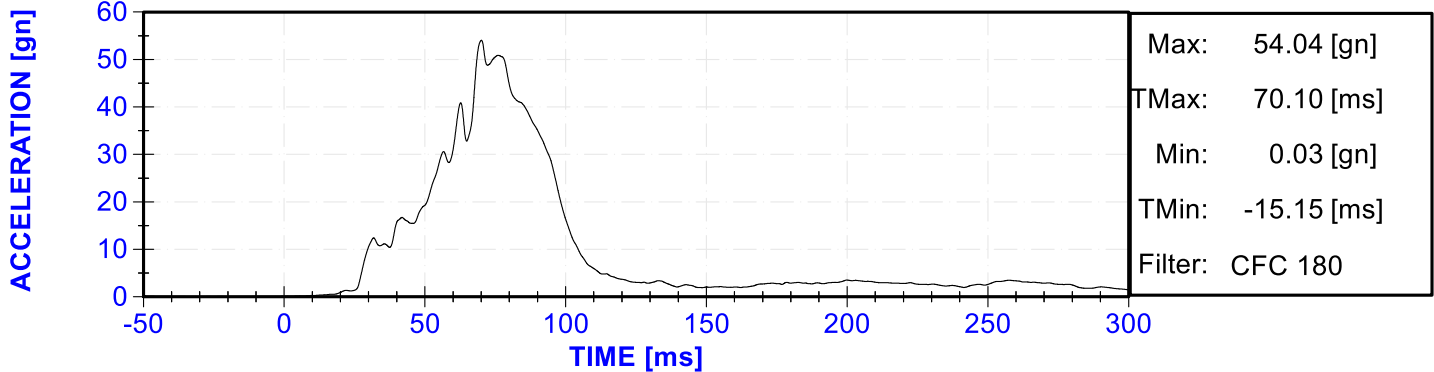
Passenger Right Foot Fore Z  
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Passenger Right Foot Aft Z  
Passenger Shoulder Belt Force  
Passenger Lap Belt Force  
Passenger Head Angular Velocity X  
Passenger Head Angular Velocity Y  
Passenger Head Angular Velocity Z  
Left Rear Seat Crossmember X  
Left Rear Seat Crossmember Z  
Right Rear Seat Crossmember X  
Right Rear Seat Crossmember Z  
Left Rear Seat Crossmember X Redundant  
Right Rear Seat Crossmember X Redundant  
Vehicle Engine Top X  
Vehicle Engine Bottom X  
Load Cell Barrier Forces and Moments



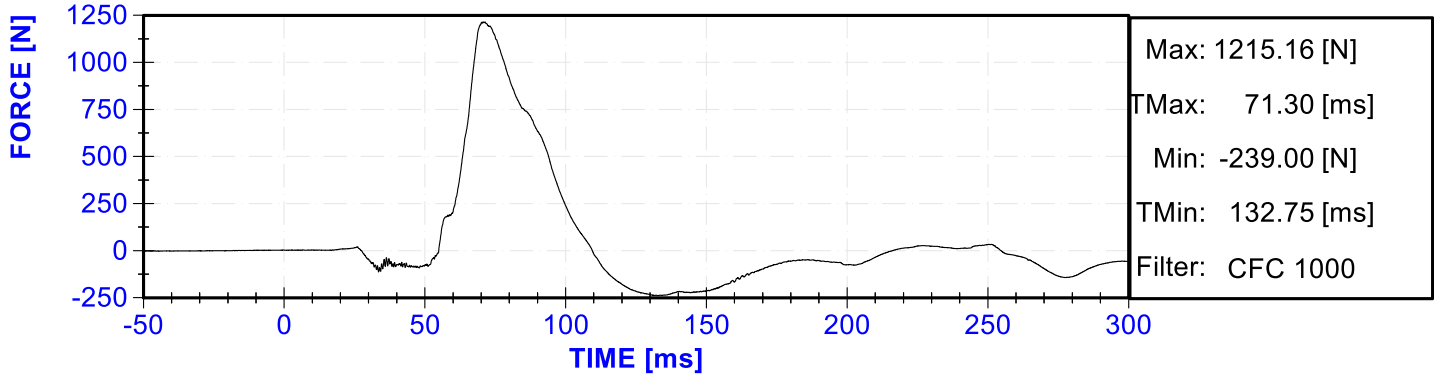




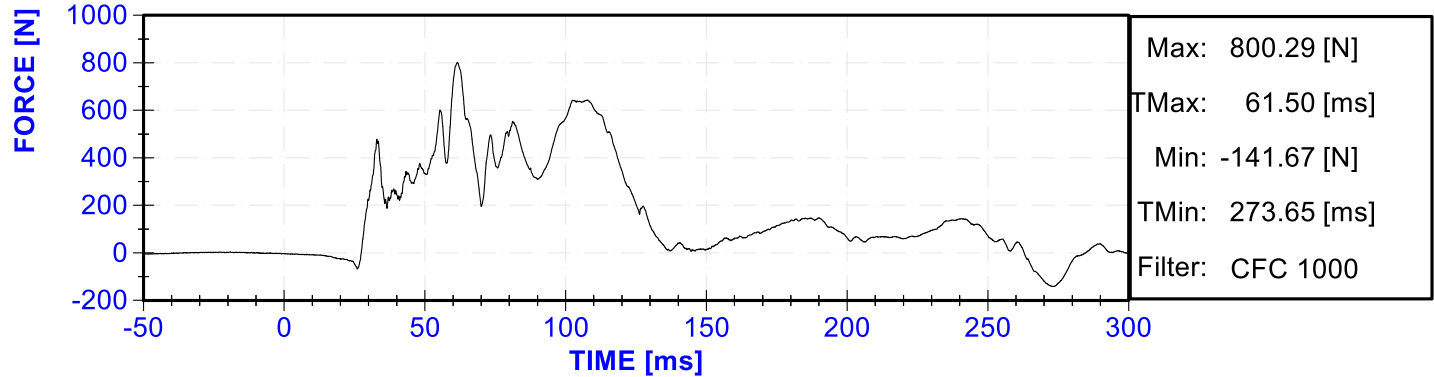
Driver Chest Resultant Acceleration vs. Time Primary



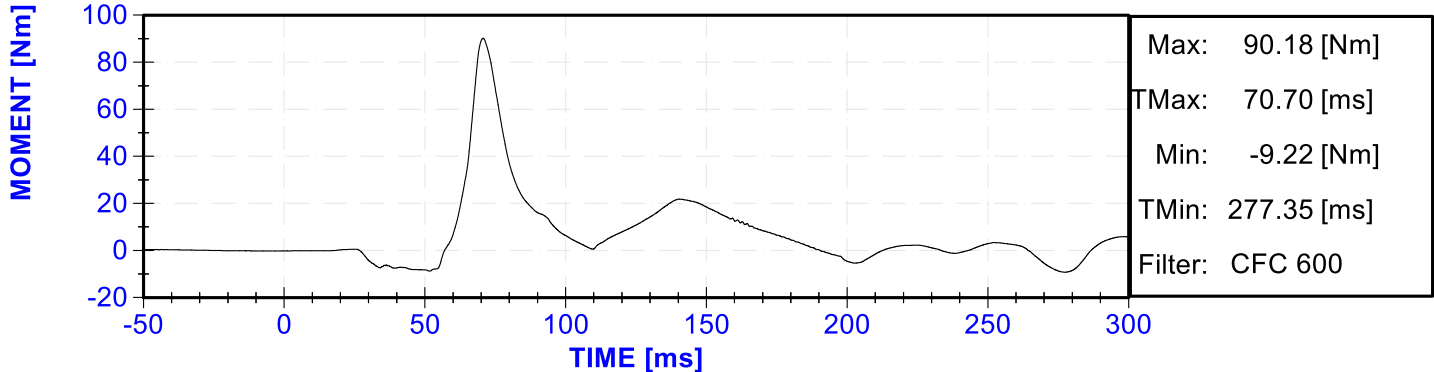
Driver Upper Neck Force X vs. Time Primary

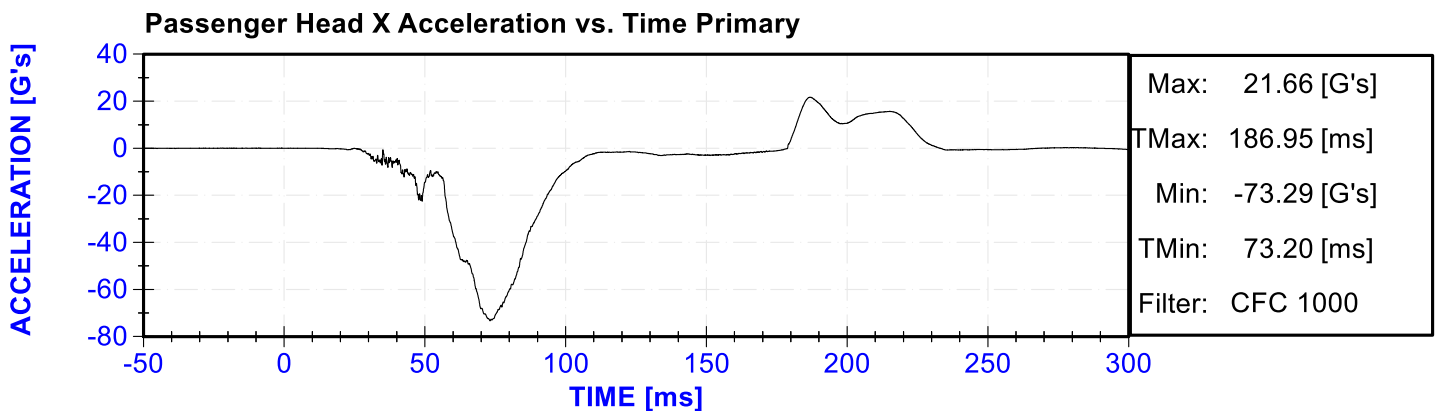
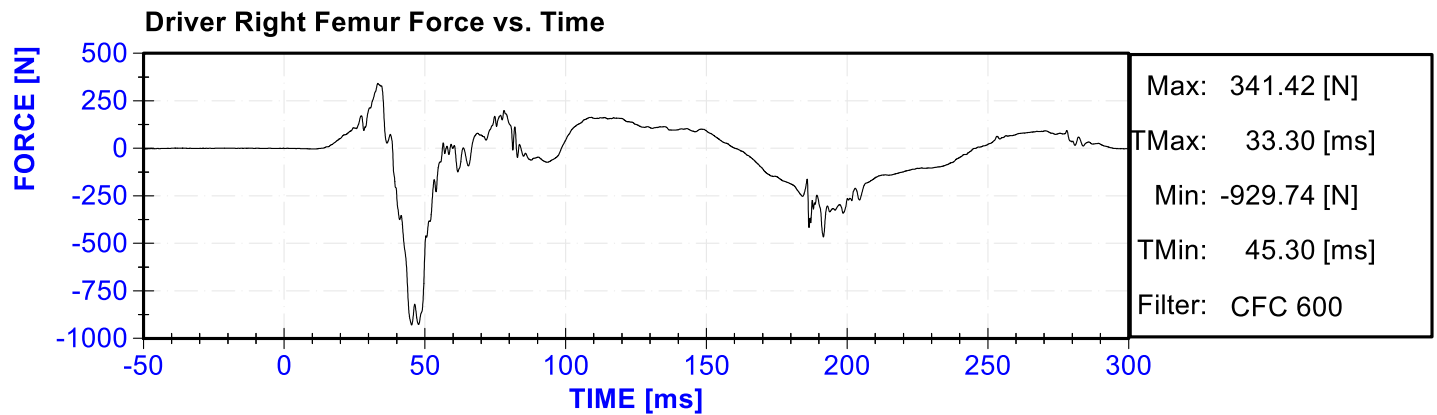
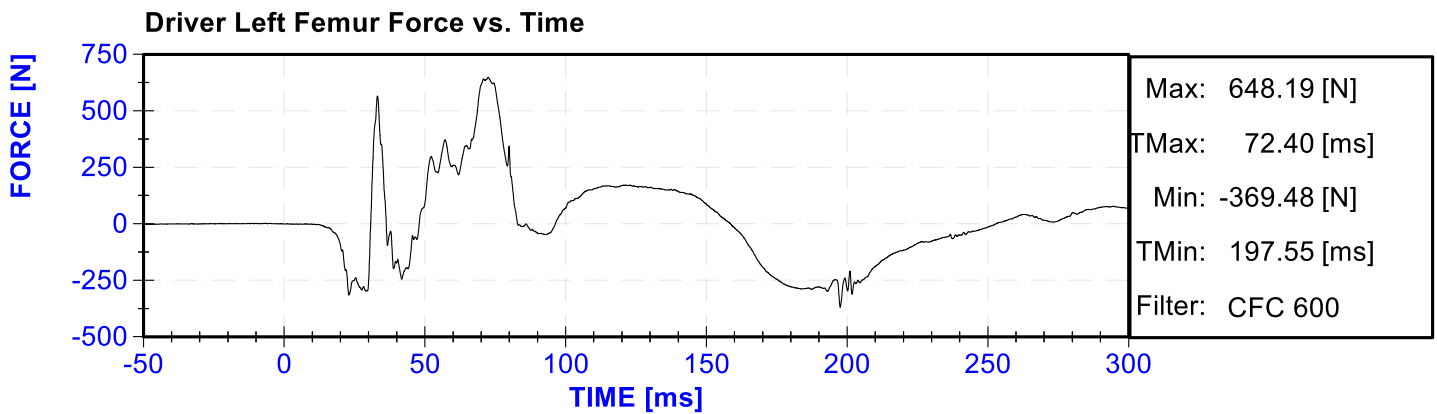
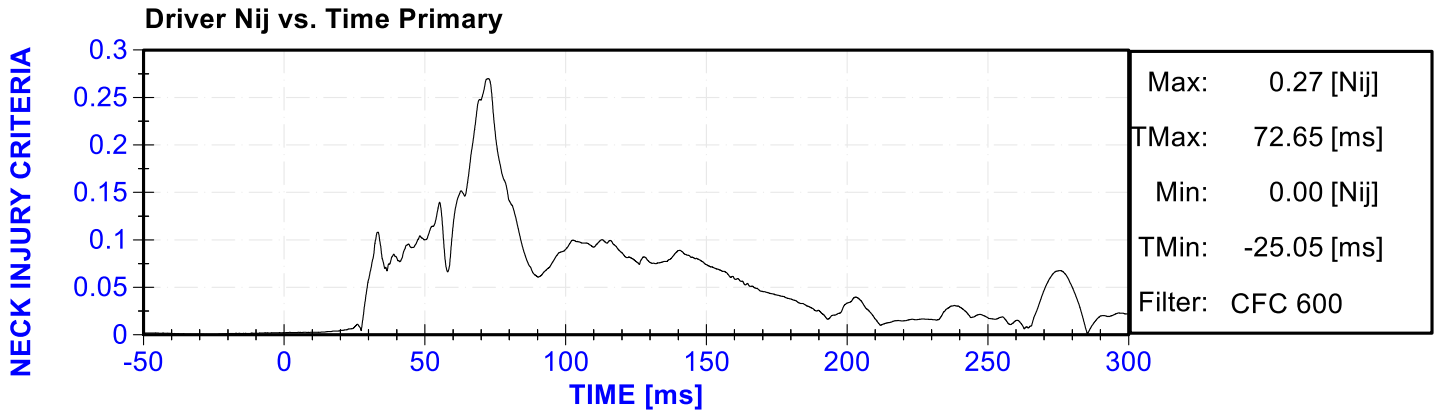


Driver Upper Neck Force Z vs. Time Primary

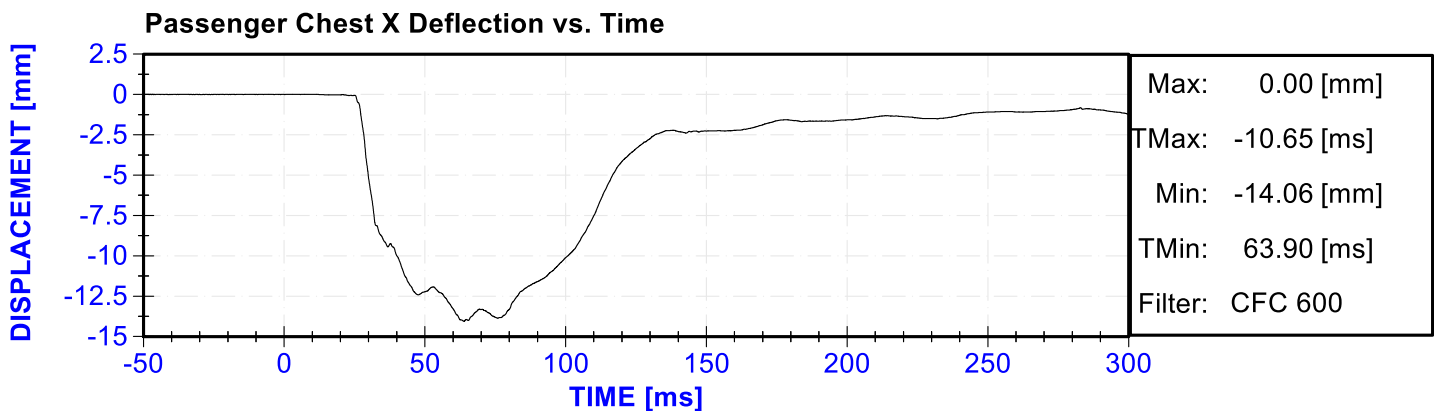
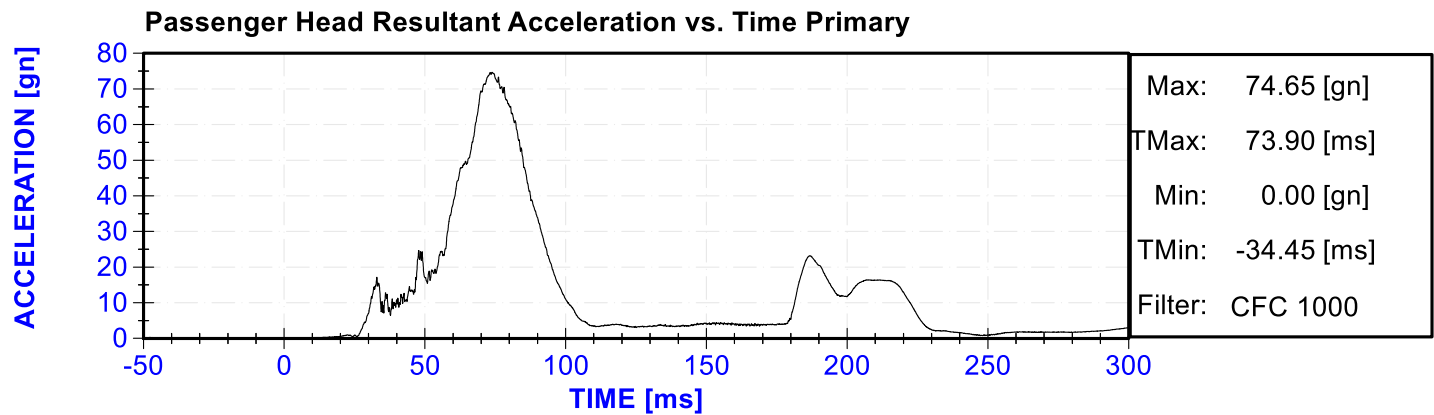
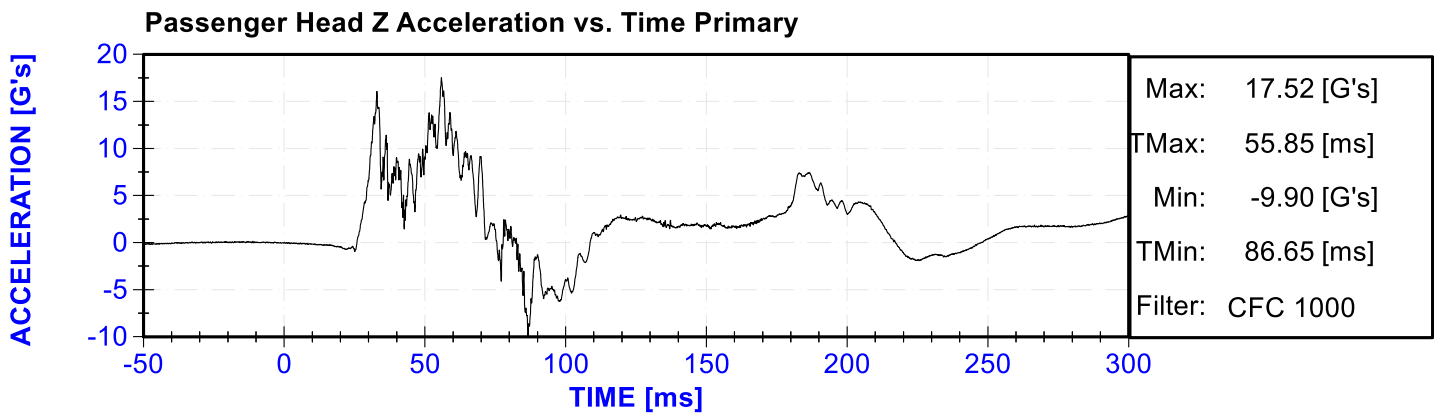
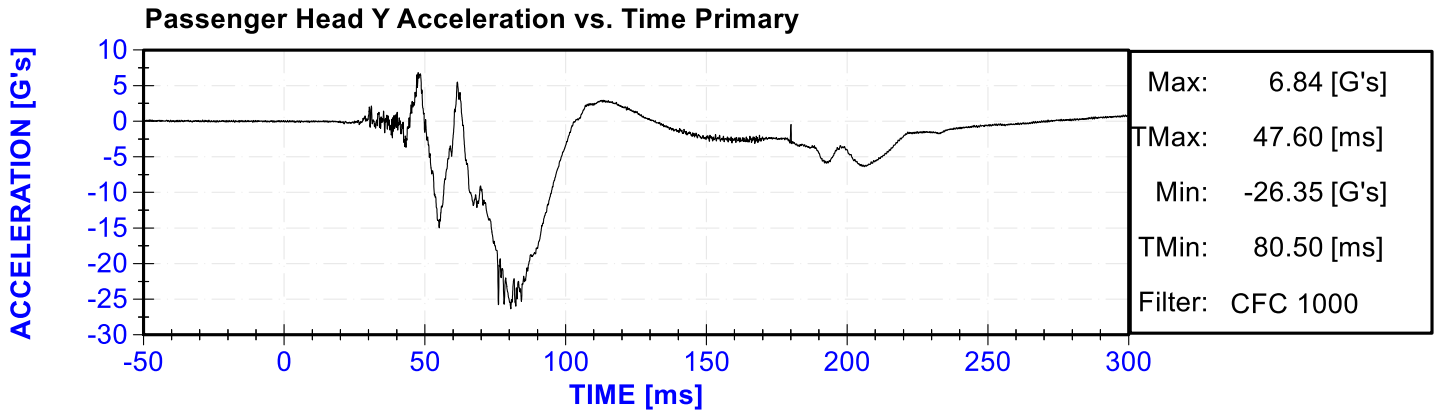


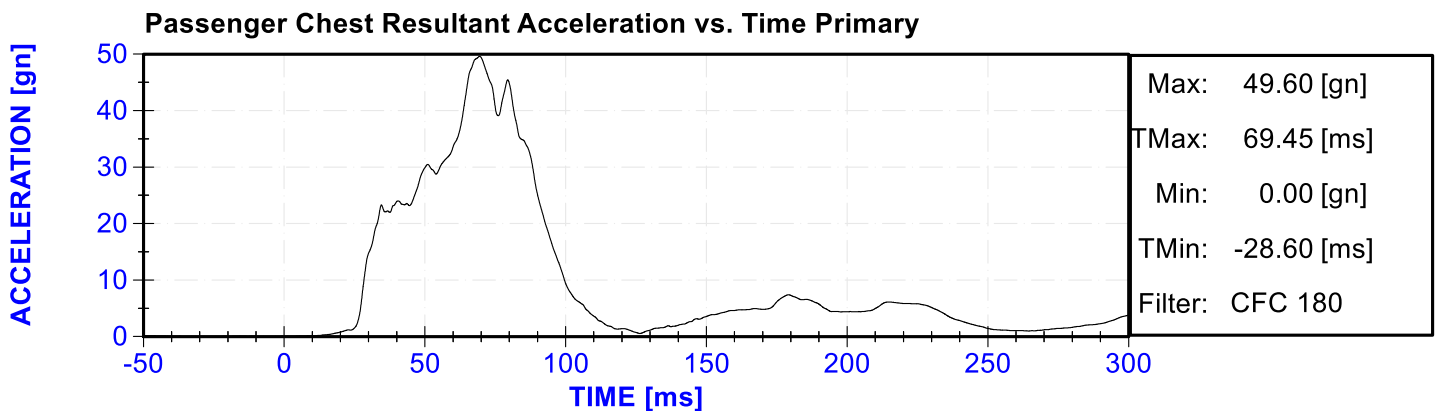
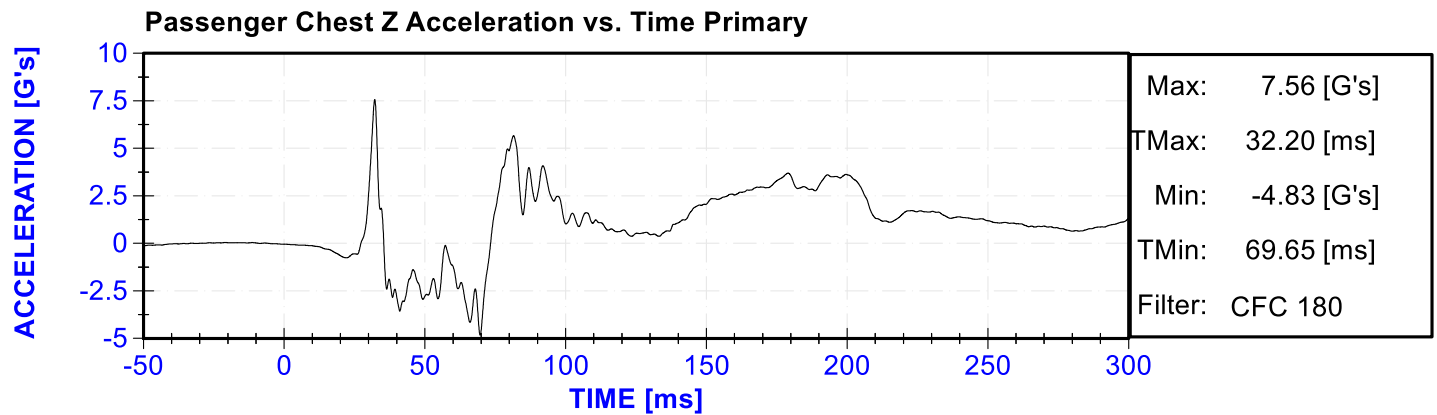
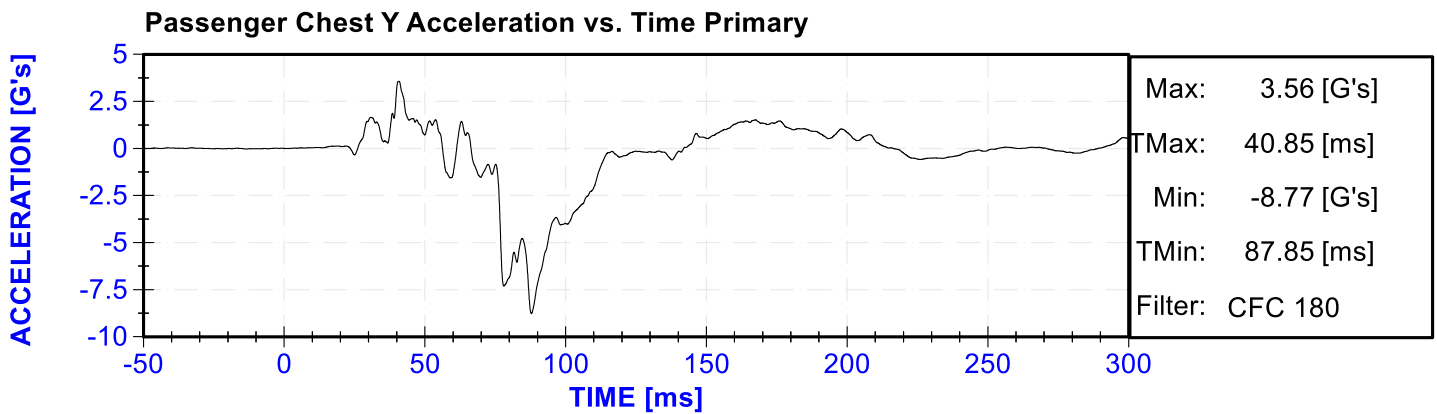
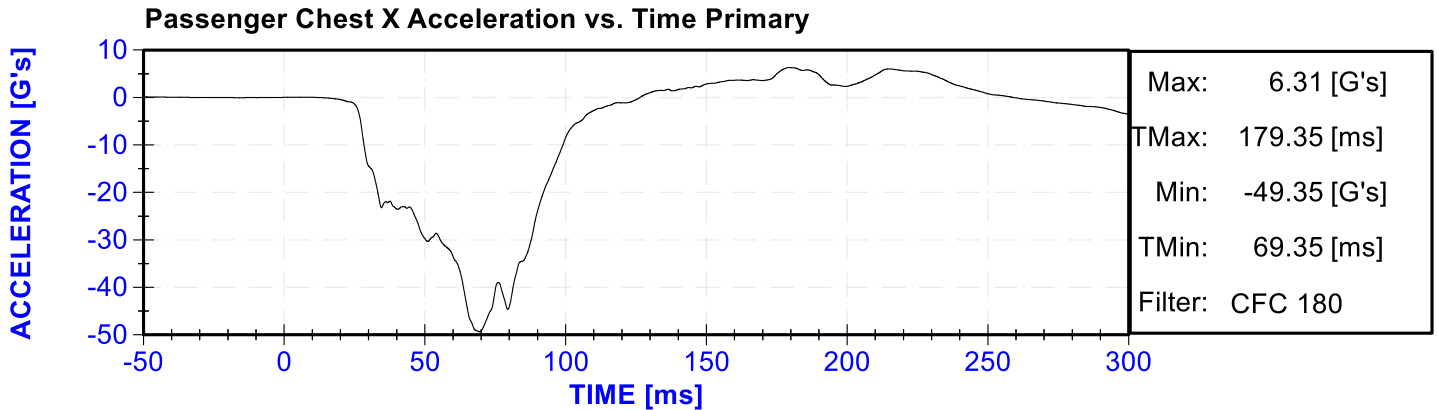
Driver Upper Neck Moment Y vs. Time Primary

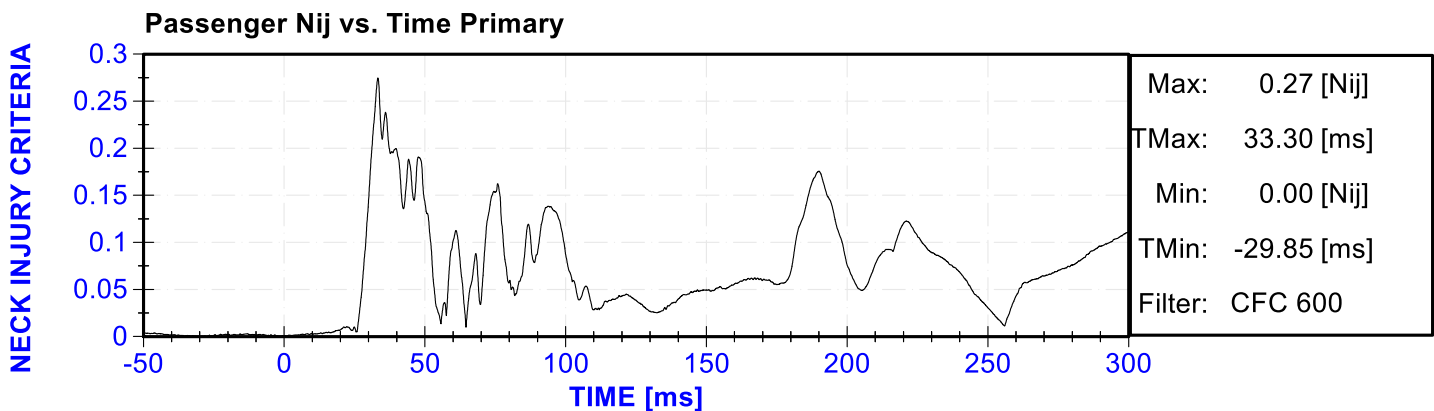
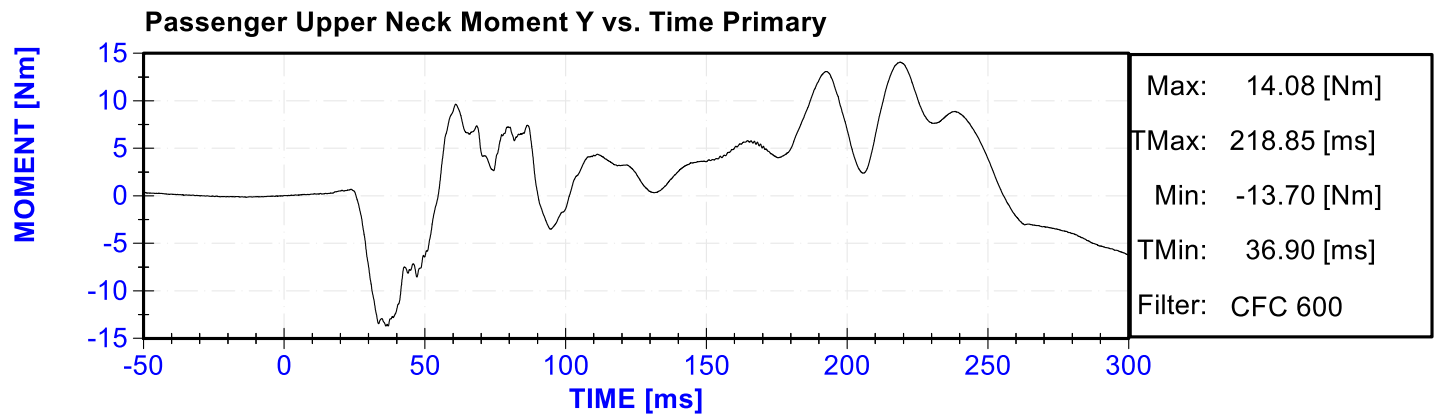
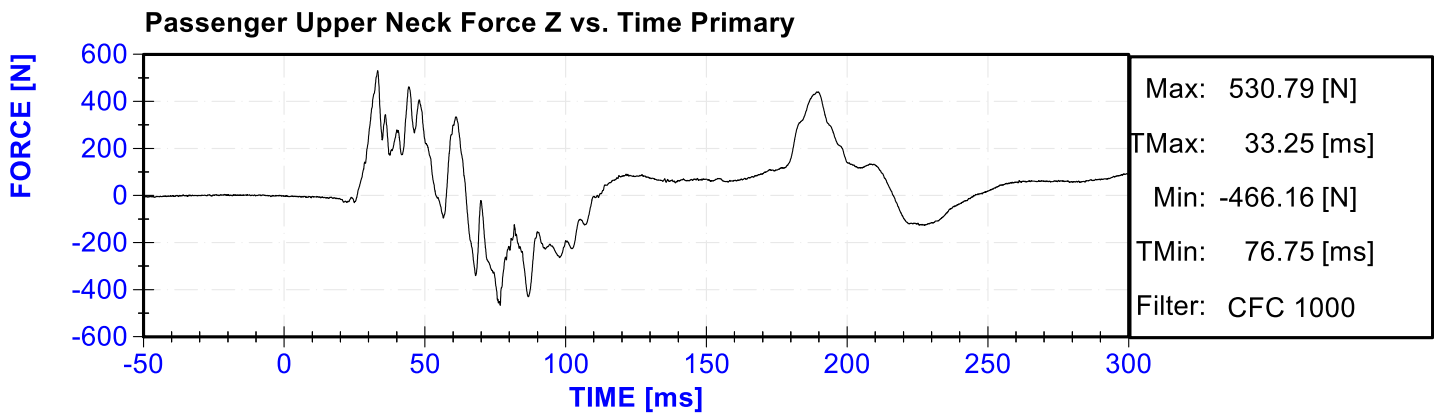
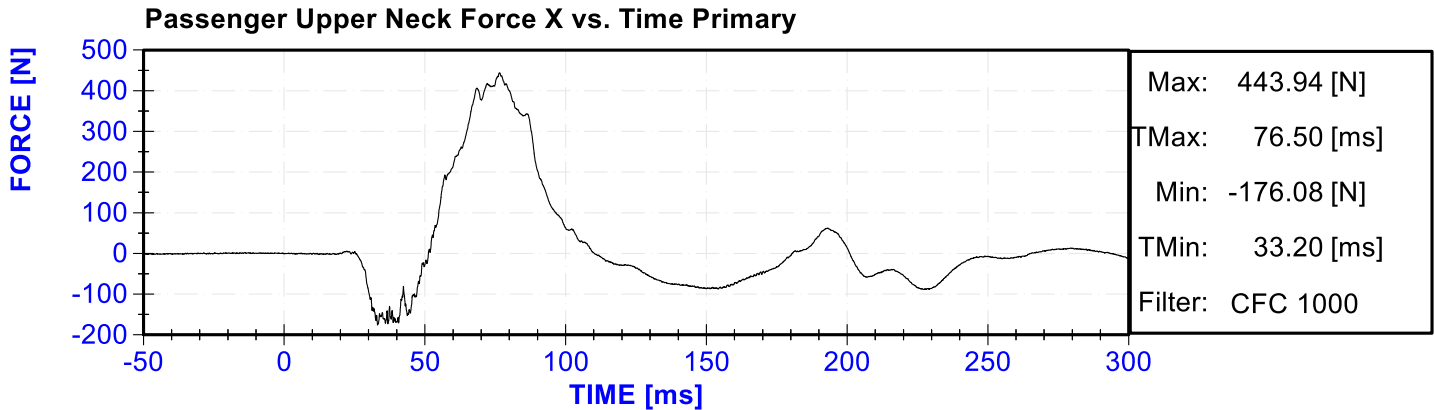




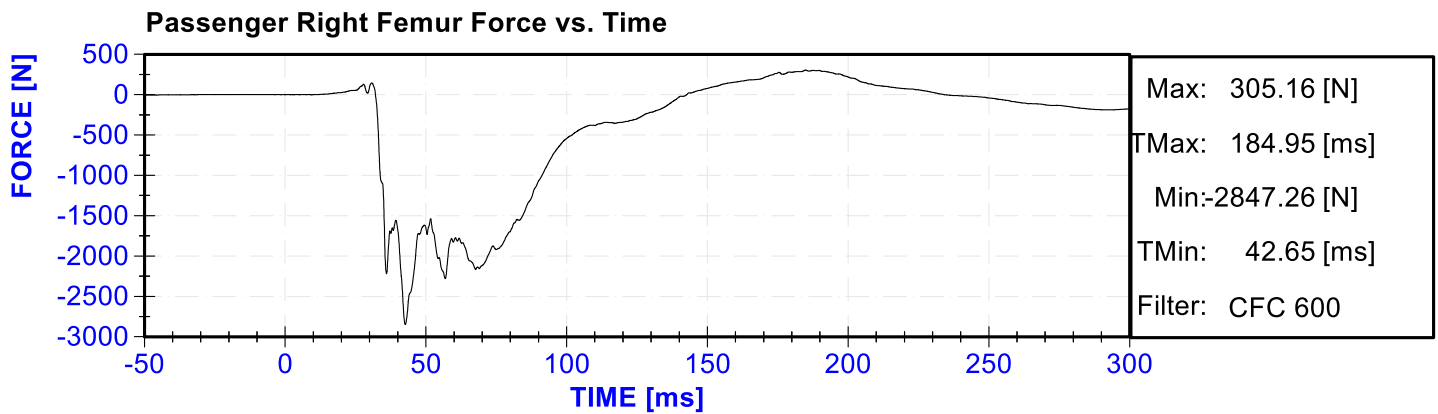
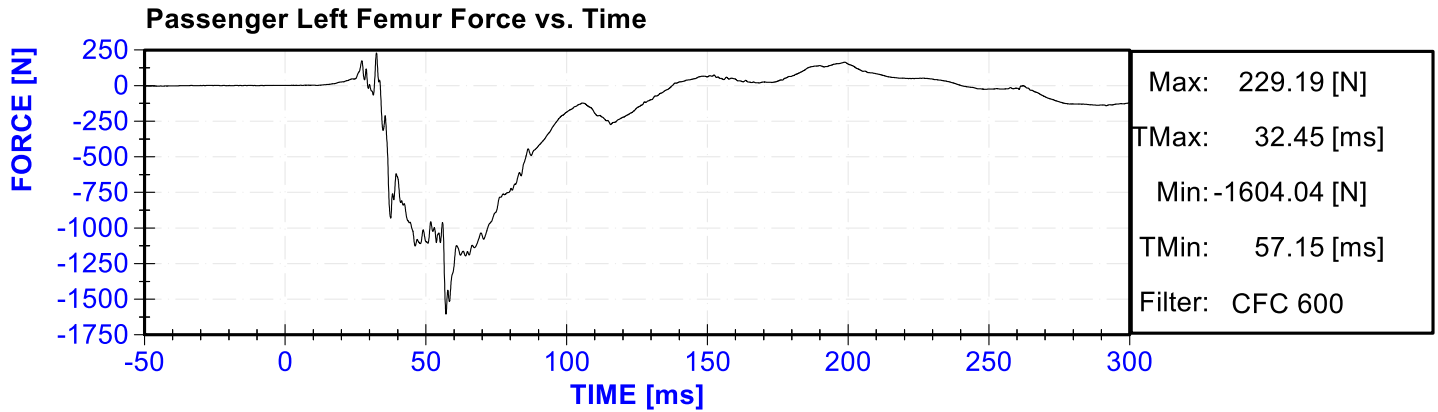












## APPENDIX C

### DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

**CALIBRATION TEST RESULTS**

**PRE-TEST**

**HYBRID III 50<sup>TH</sup> PERCENTILE MALE - DRIVER ATD**

**SERIAL NO: 142**



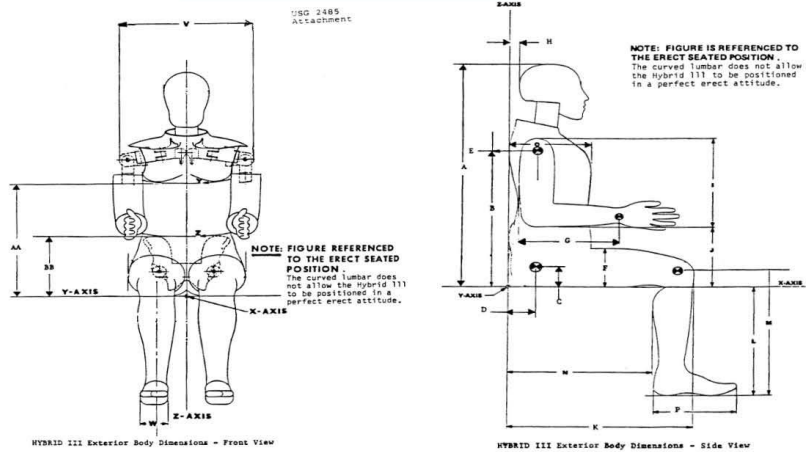


External Measurements - Hybrid 3 - 50th Male

Technician: K. Dutton

Date: 03/27/2020

Dummy Serial Number: 142



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.6	Pass
F	Thigh Clearance	5.5	6.1	5.9	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.4	Pass
J	Elbow Rest Height	7.5	8.3	8.0	Pass
K	Buttock to Knee Length	22.8	23.8	23.5	Pass
L	Popliteal Height	16.9	17.9	17.4	Pass
M	Knee Pivot Height	19.1	19.7	19.6	Pass
N	Buttock Popliteal Length	17.8	18.8	18.4	Pass
O	Chest Depth without Jacket	8.4	9.0	8.7	Pass
P	Foot Length (right)	9.9	10.5	10.3	Pass
V	Shoulder Breadth	16.3	17.2	16.9	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.7	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass

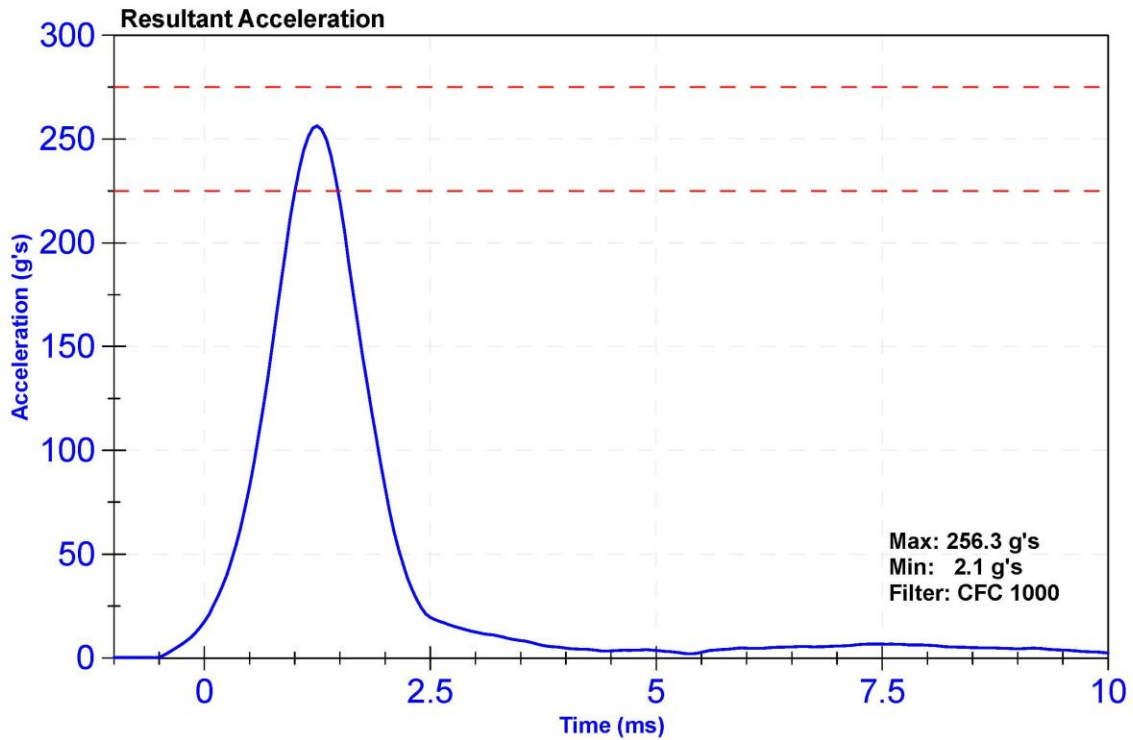
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

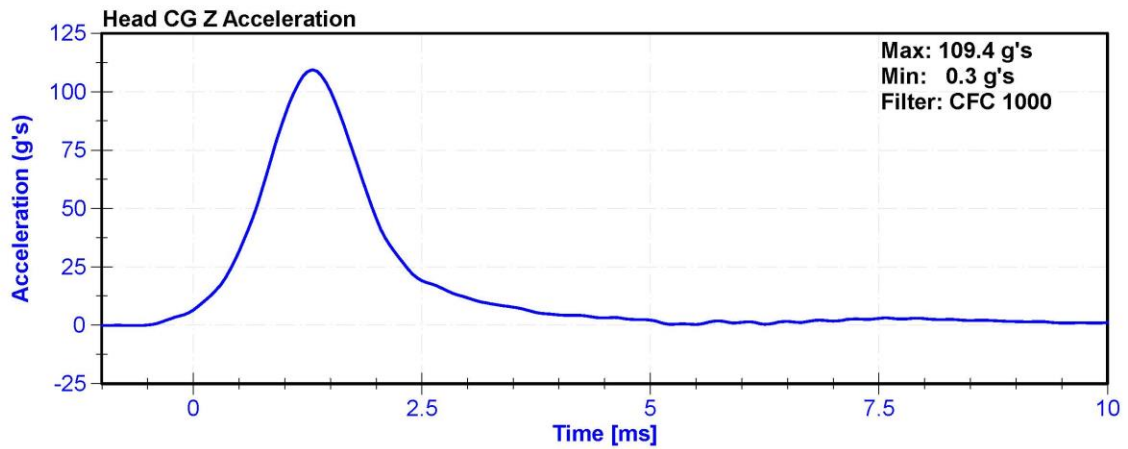
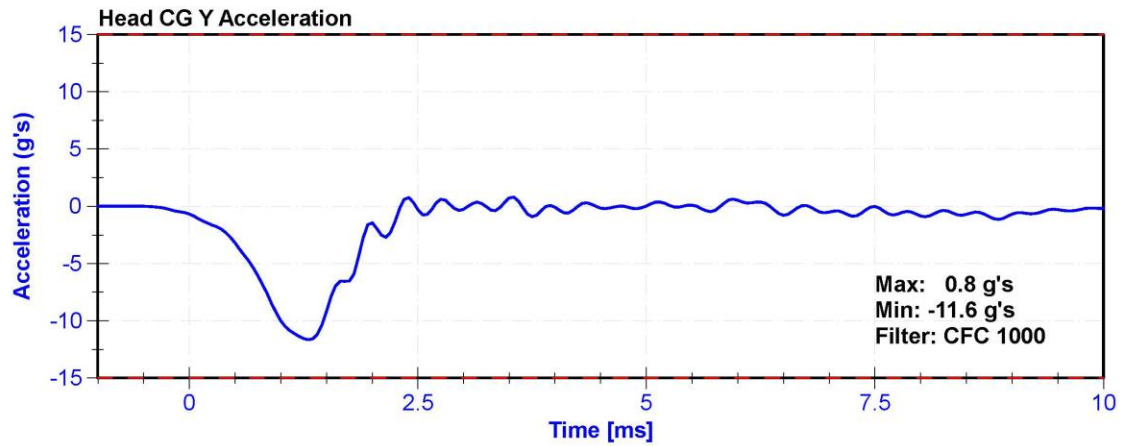
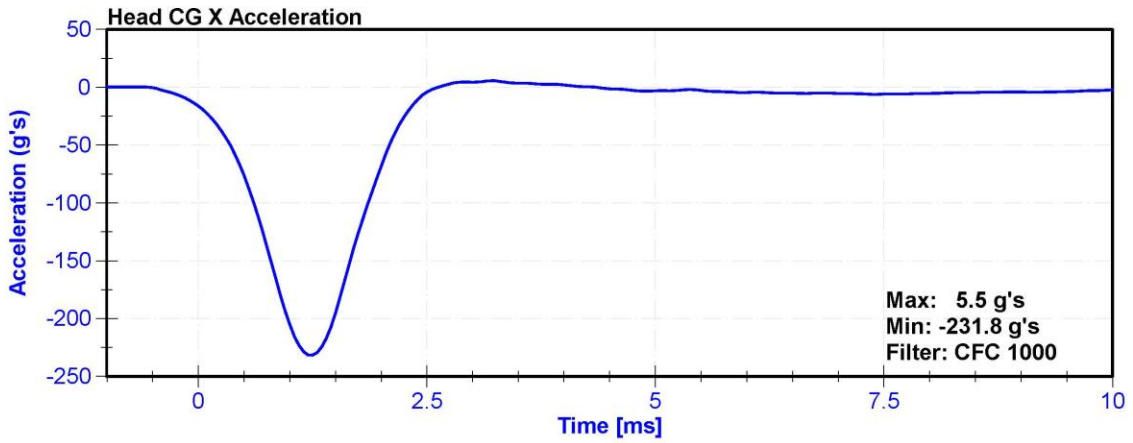
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	33.5	Pass
Resultant Acceleration	225	275	g's	256.3	Pass
Oscillation	0	10	%	2.6	Pass
Lateral Acceleration	-15	15	g's	-11.6	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	P51681	2/10/2020	8/10/2020
Y Accelerometer	ENDEVCO 7264	P64151	2/10/2020	8/10/2020
Z Accelerometer	ENDEVCO 7264	P52114	2/10/2020	8/10/2020







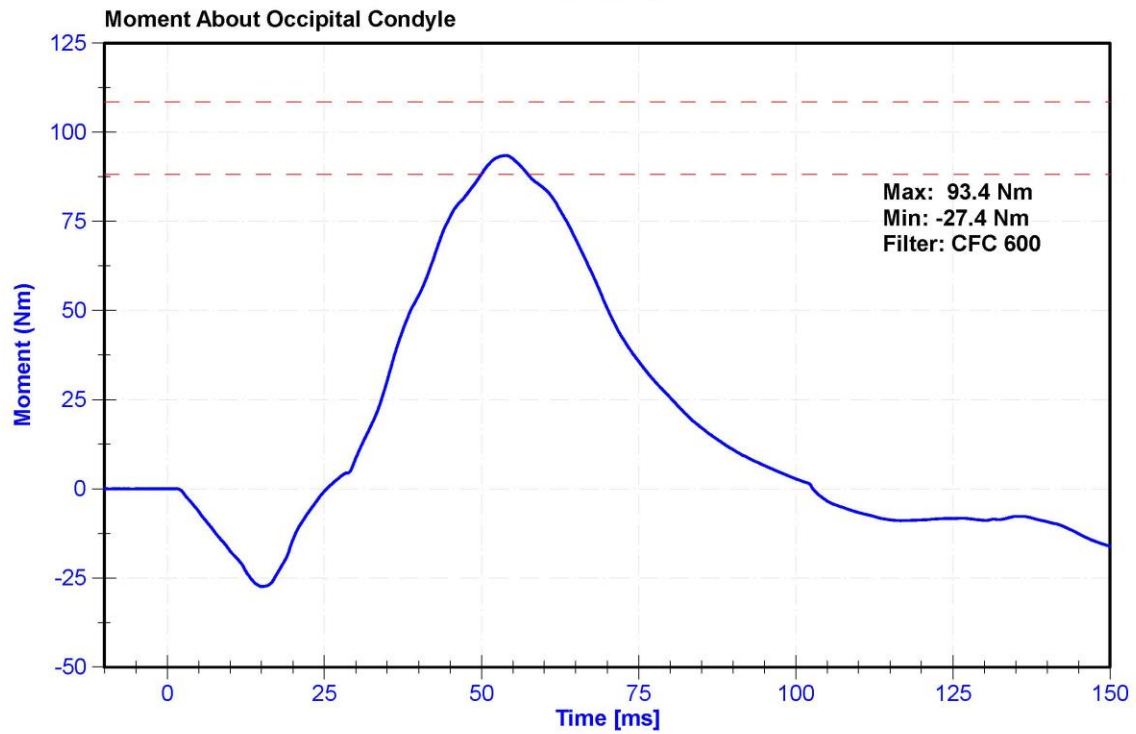
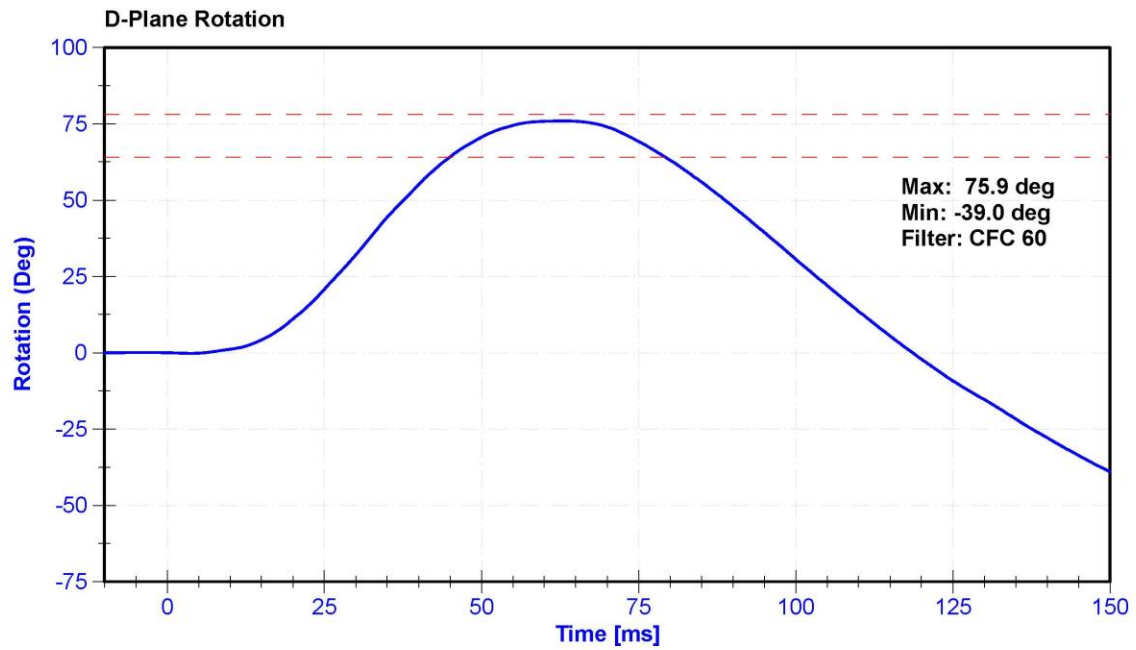
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

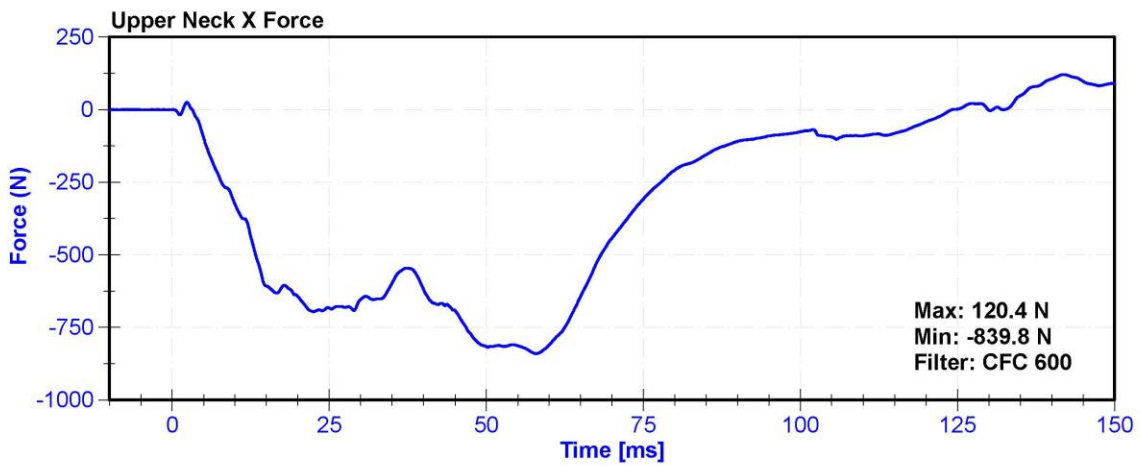
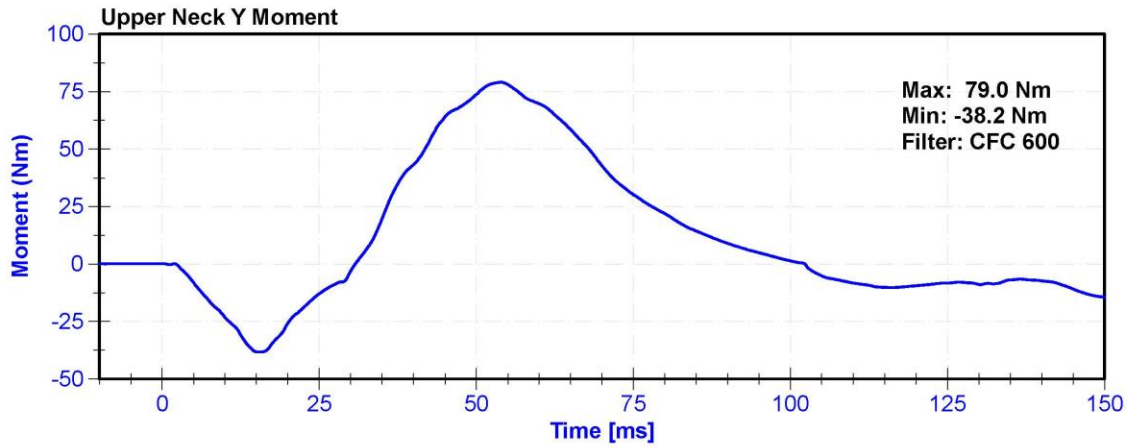
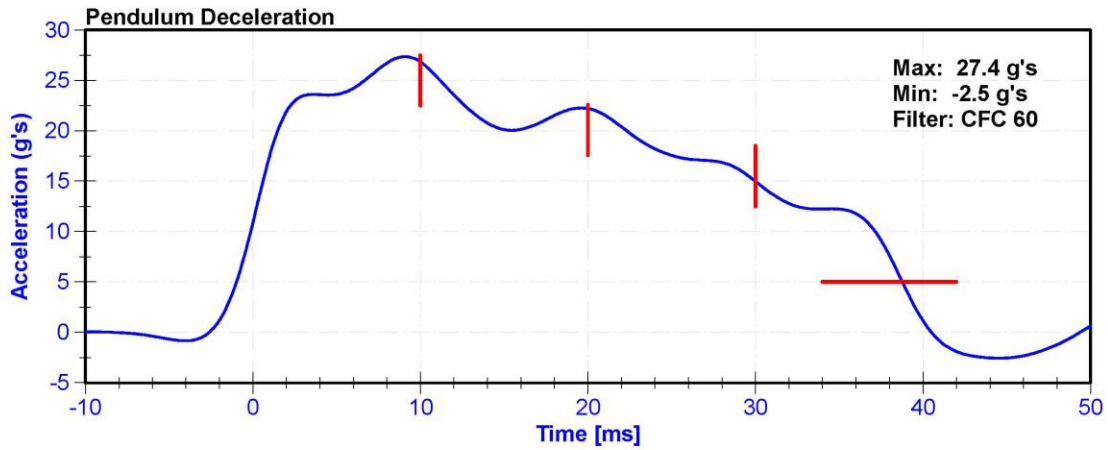
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	32.3	Pass
Velocity	6.89	7.13	m/s	6.903	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	26.85	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	22.21	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	14.98	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	27.4	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	38.8	Pass
Maximum D Plane Rotation	64	78	deg	75.9	Pass
Time to Maximum Rotation	57	64	ms	63.1	Pass
Rotation Decay to Zero	113	127	ms	118.6	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	93.45	Pass
Time to Maximum Moment	47	58	ms	53.9	Pass
Moment Decay to Zero	97	107	ms	102.8	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5M9 Pend	1/30/2020	1/29/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton IF-205	LC-280FxGFE	10/3/2019	10/2/2020







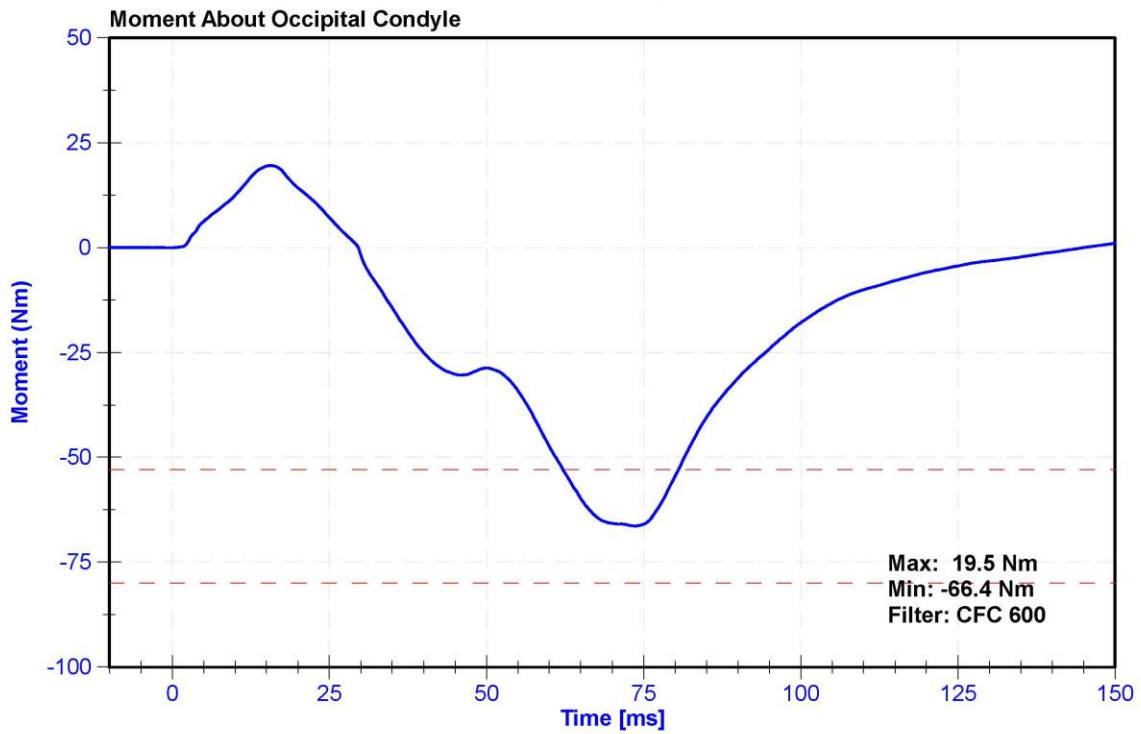
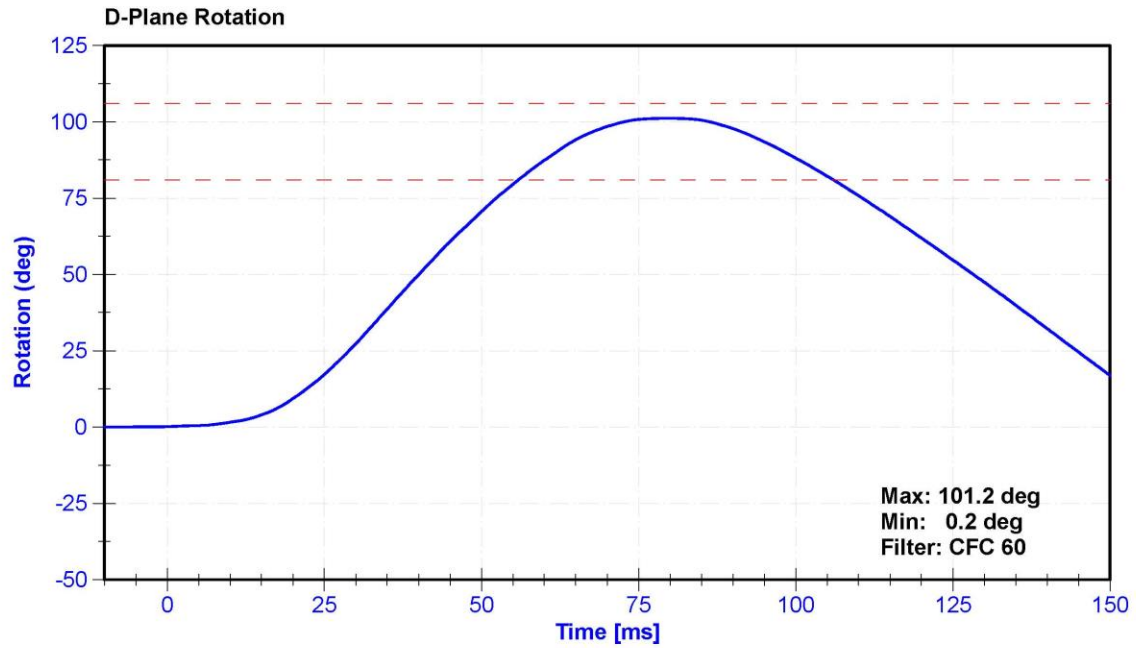
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

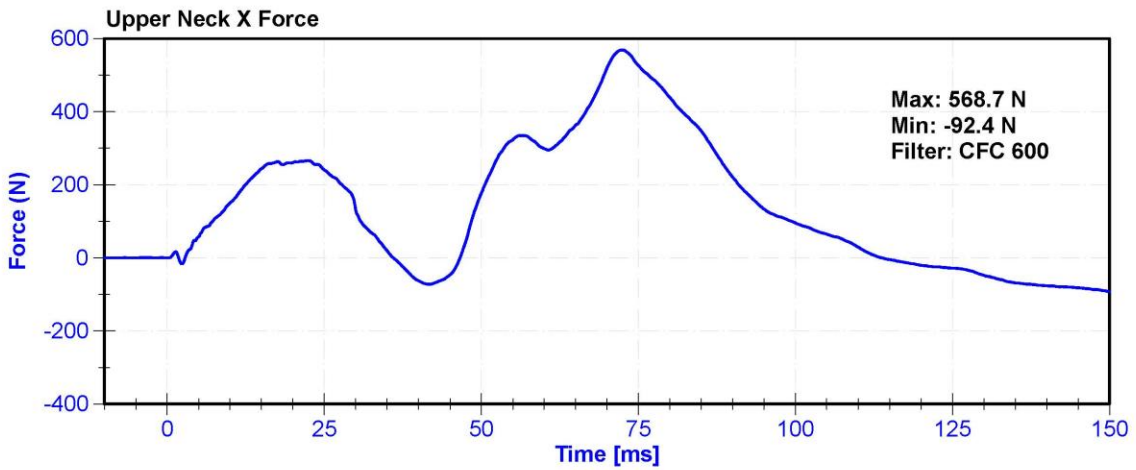
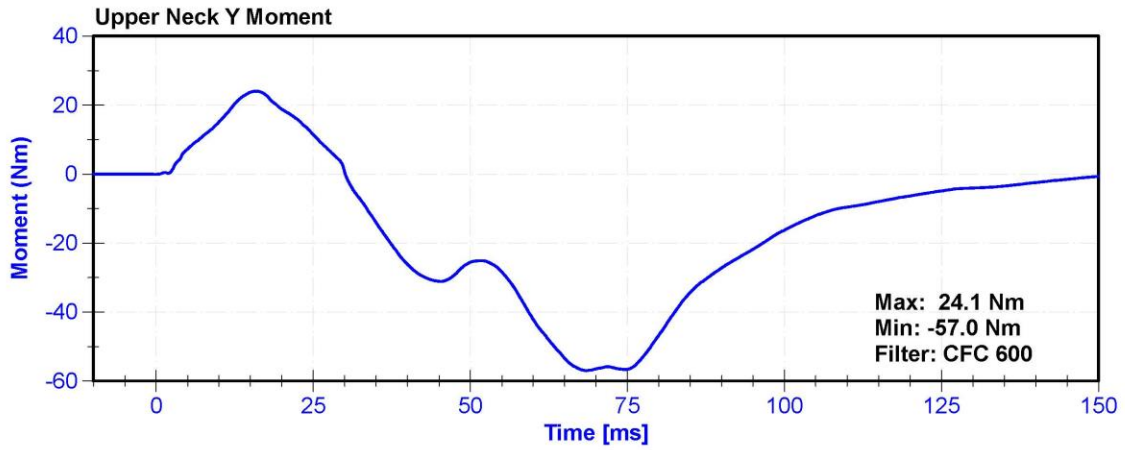
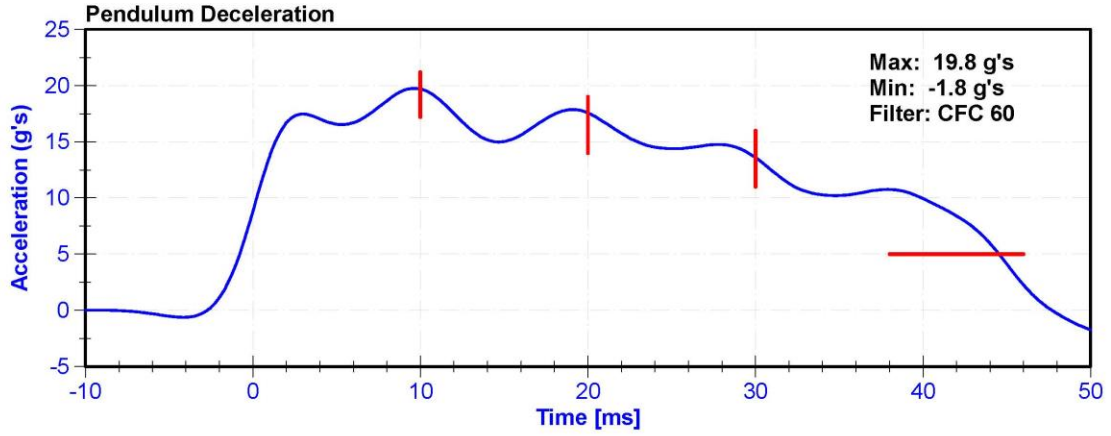
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	33.7	Pass
Velocity	5.94	6.19	m/s	5.964	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	19.70	Pass
Pendulum Deceleration at 20ms	14	19	g's	17.6	Pass
Pendulum Deceleration at 30ms	11	16	g's	13.6	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	19.8	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	44.5	Pass
Maximum D Plane Rotation	81	106	deg	101.2	Pass
Time to Maximum Rotation	72	82	ms	79.6	Pass
Rotation Decay to Zero	147	174	ms	161.3	Pass
Minimum Moment About OC	-80	-52.9	Nm	-66.40	Pass
Time to Minimum Moment	65	79	ms	73.6	Pass
Moment Decay to Zero	120	148	ms	145.1	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5M9 Pend	1/30/2020	1/29/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton IF-205	LC-280FxGFE	10/3/2019	10/2/2020







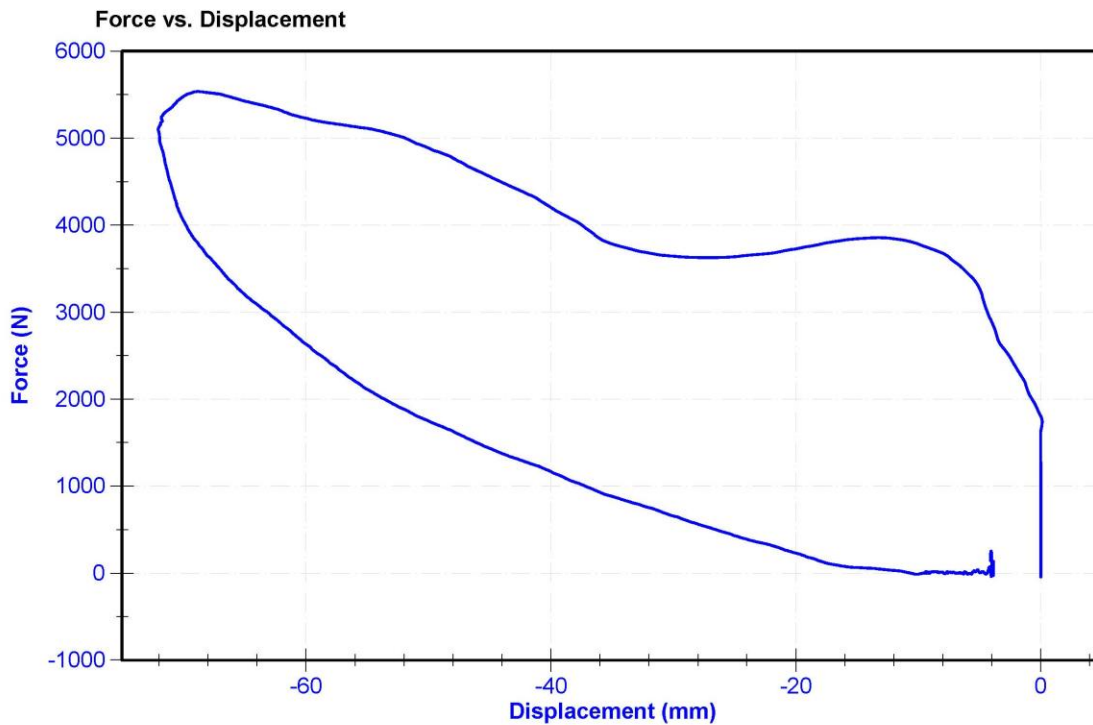
ATD Manufacturer	Humanetics	Test Technician	E. Helenbrook
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

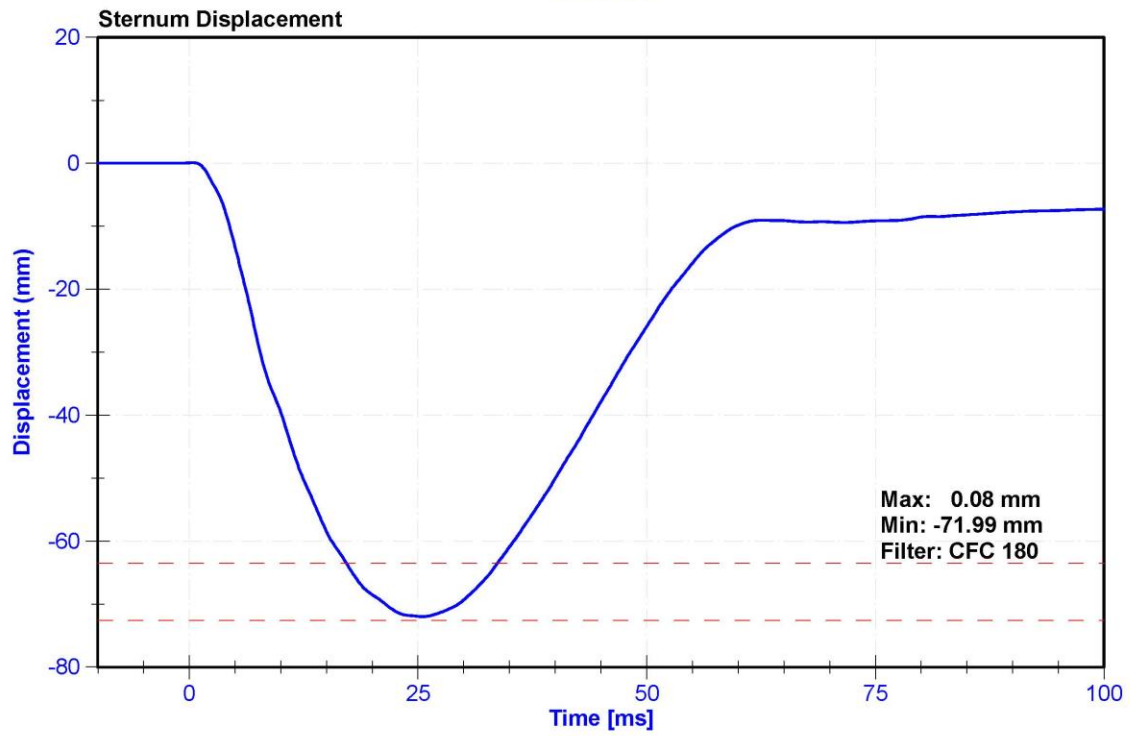
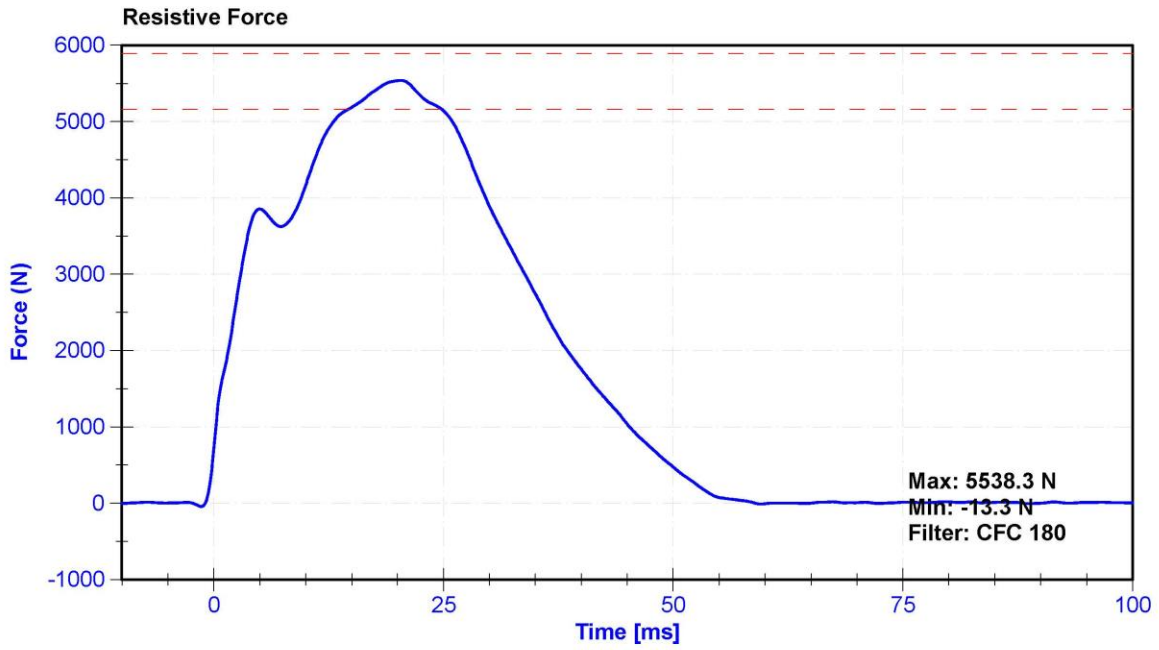
**Results**

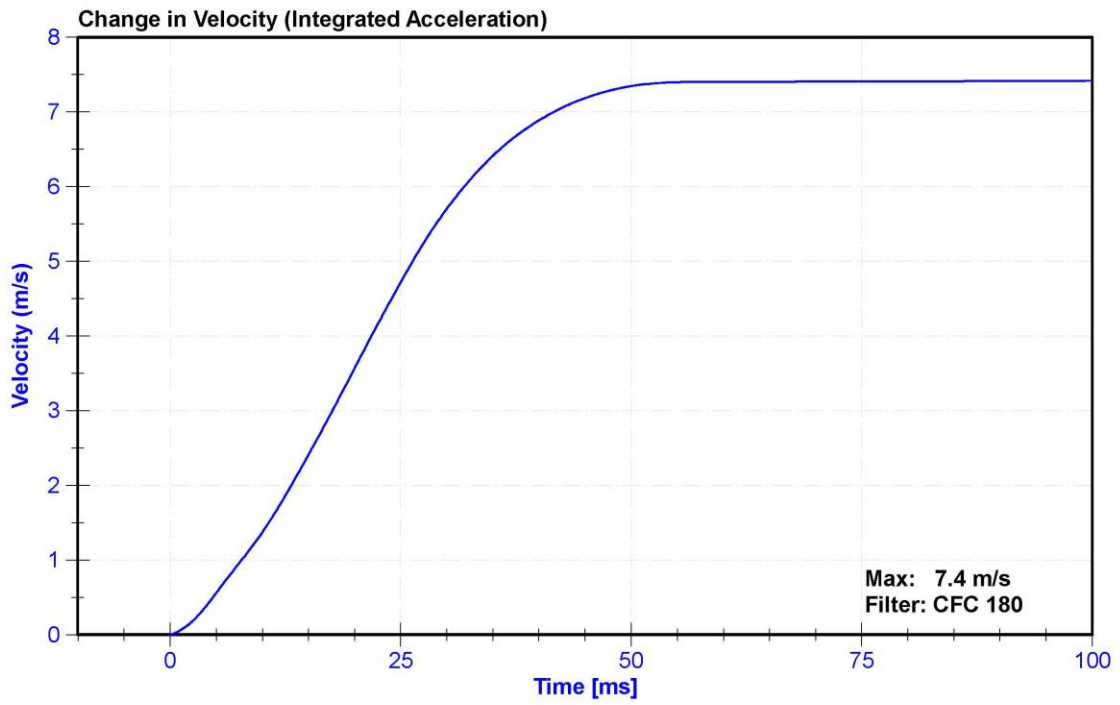
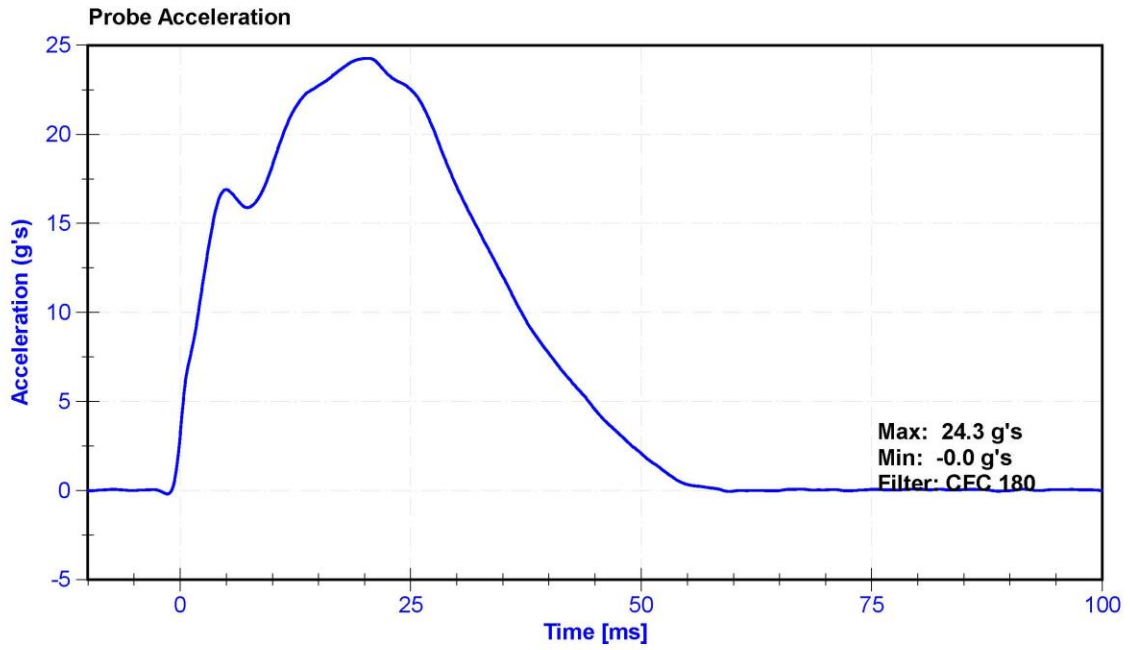
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	39.2	Pass
Velocity	6.59	6.83	m/s	6.728	Pass
Chest Displacement	-72.6	-63.5	mm	-71.99	Pass
Resistive Force	5160	5894	N	5538.3	Pass
Hysteresis	65	85	%	70.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Chest Potentiometer	Servo 6209-2038	DS-142	3/27/2020	9/25/2020









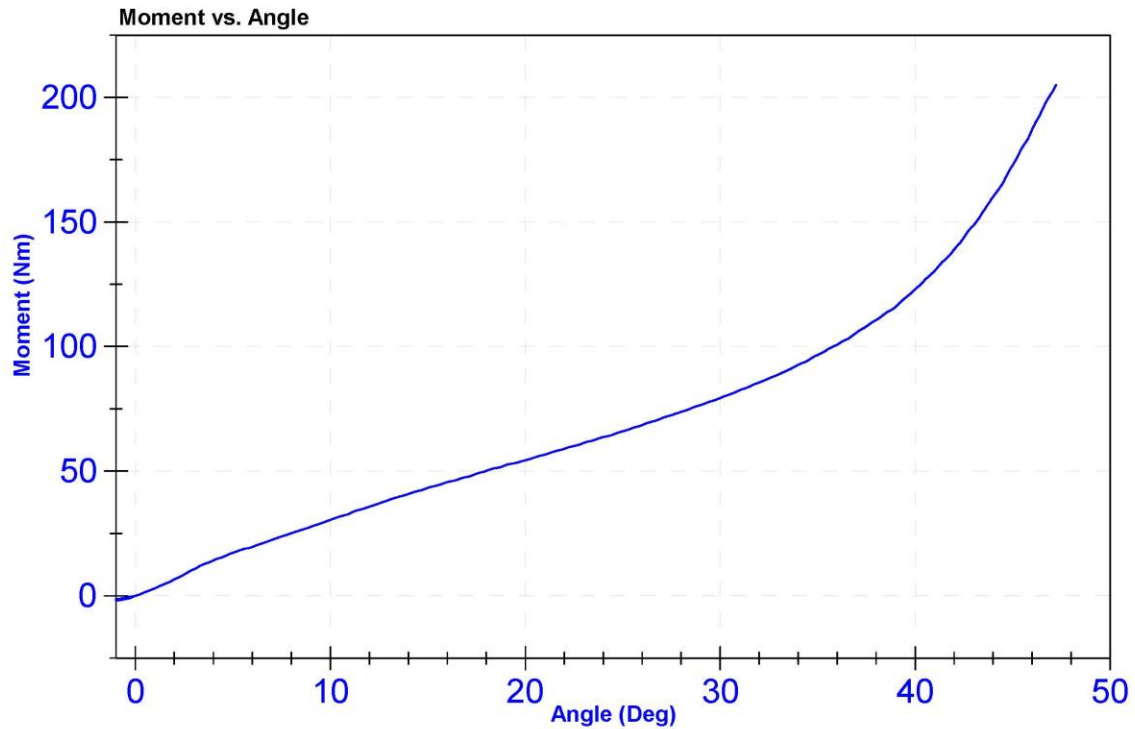
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.3	Pass
Humidity	10	70	%	34.5	Pass
Average Velocity	5	10	deg/s	7.1	Pass
Angle at 203Nm	40	50	deg	47.1	Pass
Moment at 30 degrees	0	94.9	Nm	79.3	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/18/2019	9/17/2020
Load Cell	Key Trans 2301-02	LC-115 My	9/12/2019	9/11/2020



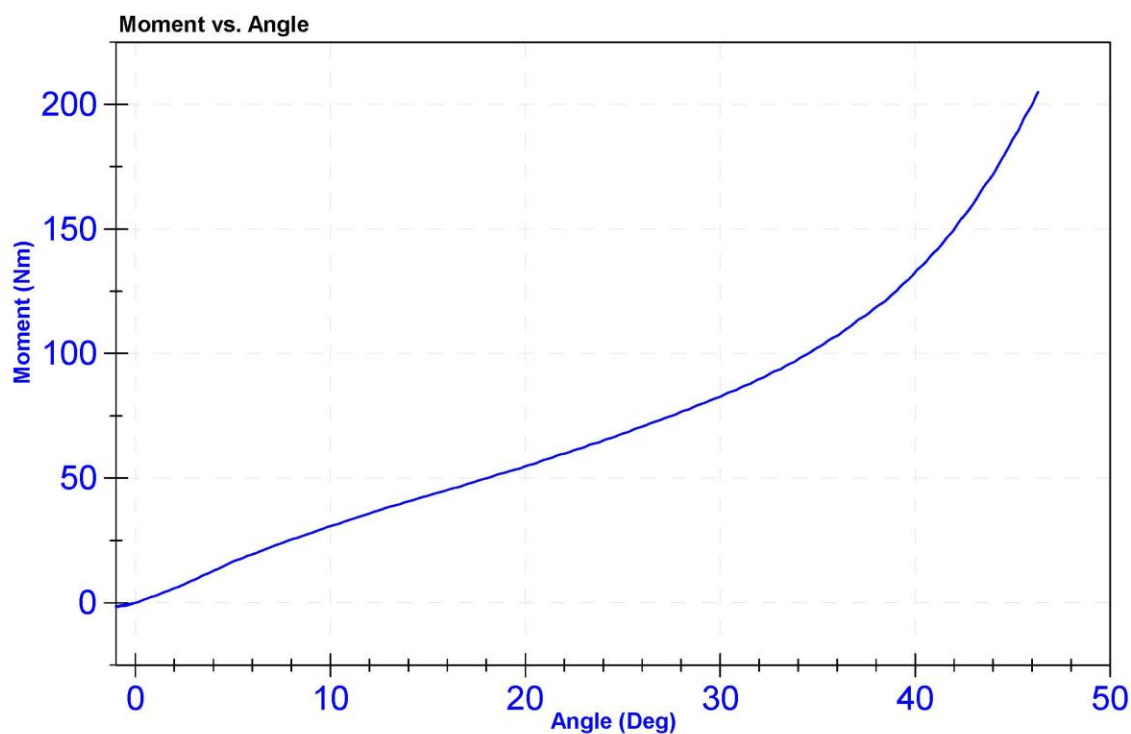
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.5	Pass
Humidity	10	70	%	34.6	Pass
Average Velocity	5	10	deg/s	7.0	Pass
Angle at 203Nm	40	50	deg	46.2	Pass
Moment at 30 degrees	0	94.9	Nm	82.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/18/2019	9/17/2020
Load Cell	Key Trans 2301-02	LC-115 My	9/12/2019	9/11/2020



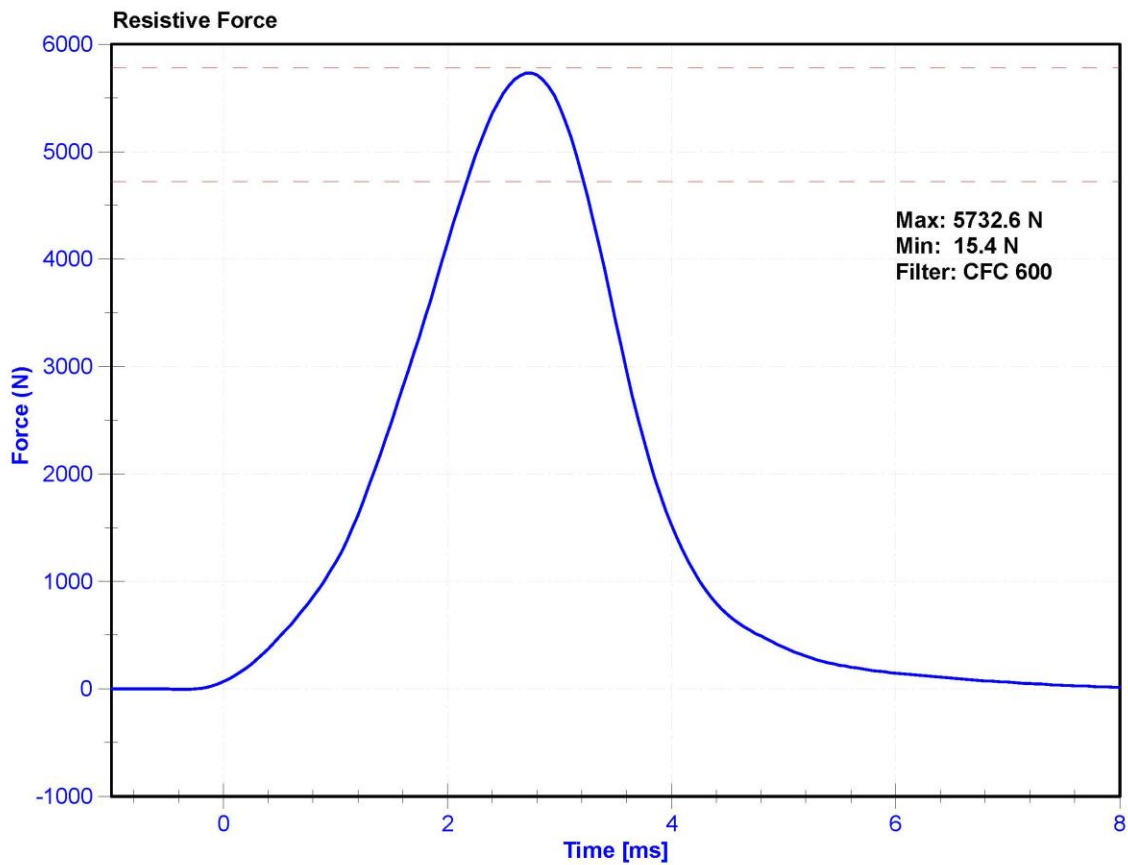
ATD Manufacturer	Humanetics	Test Technician	K. Dutton
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

**Results**

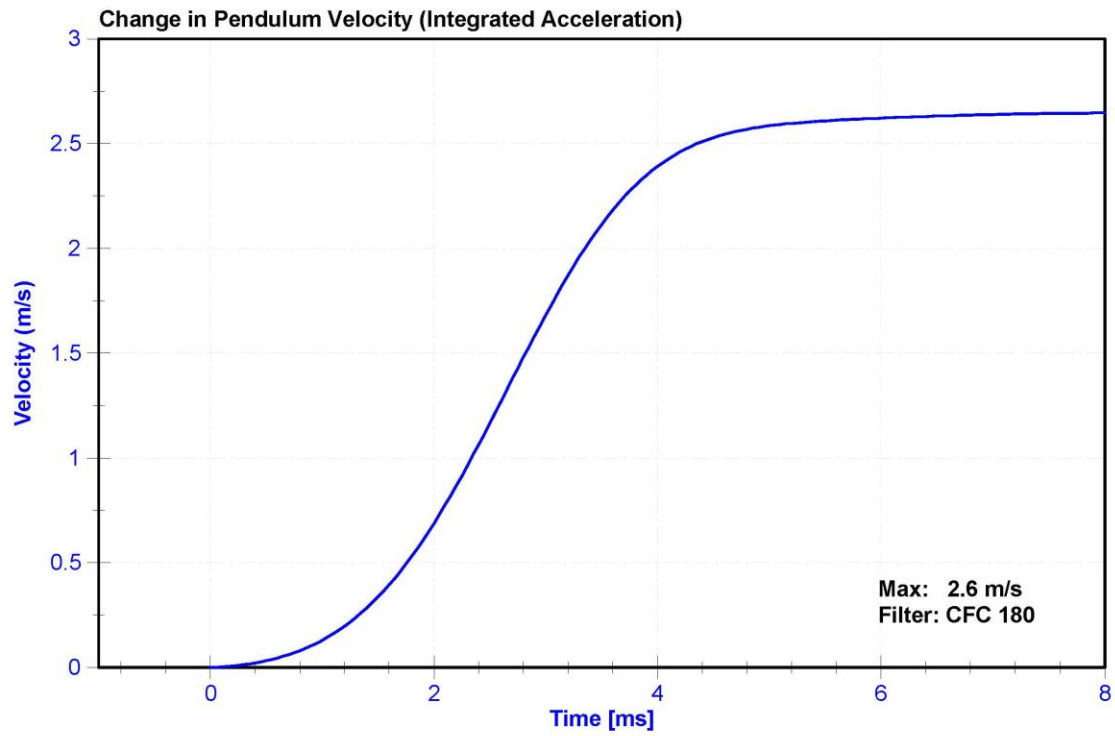
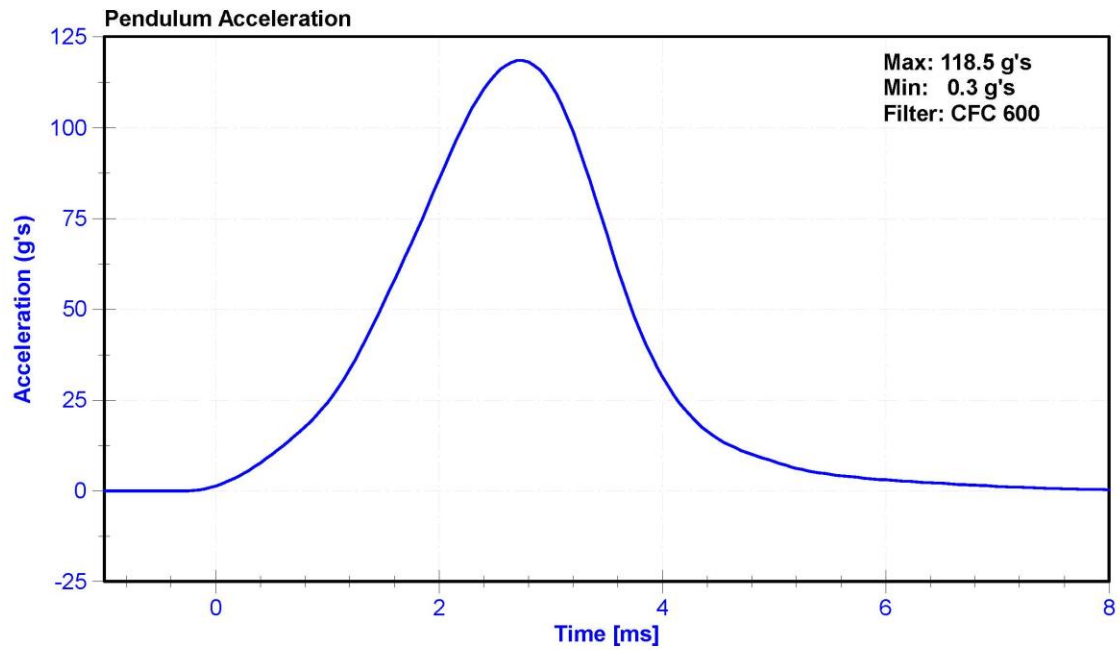
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21	Pass
Humidity	10	70	%	19.6	Pass
Velocity	2.07	2.13	m/s	2.112	Pass
Maximum Resistive Force	4720	5780	N	5732.6	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020







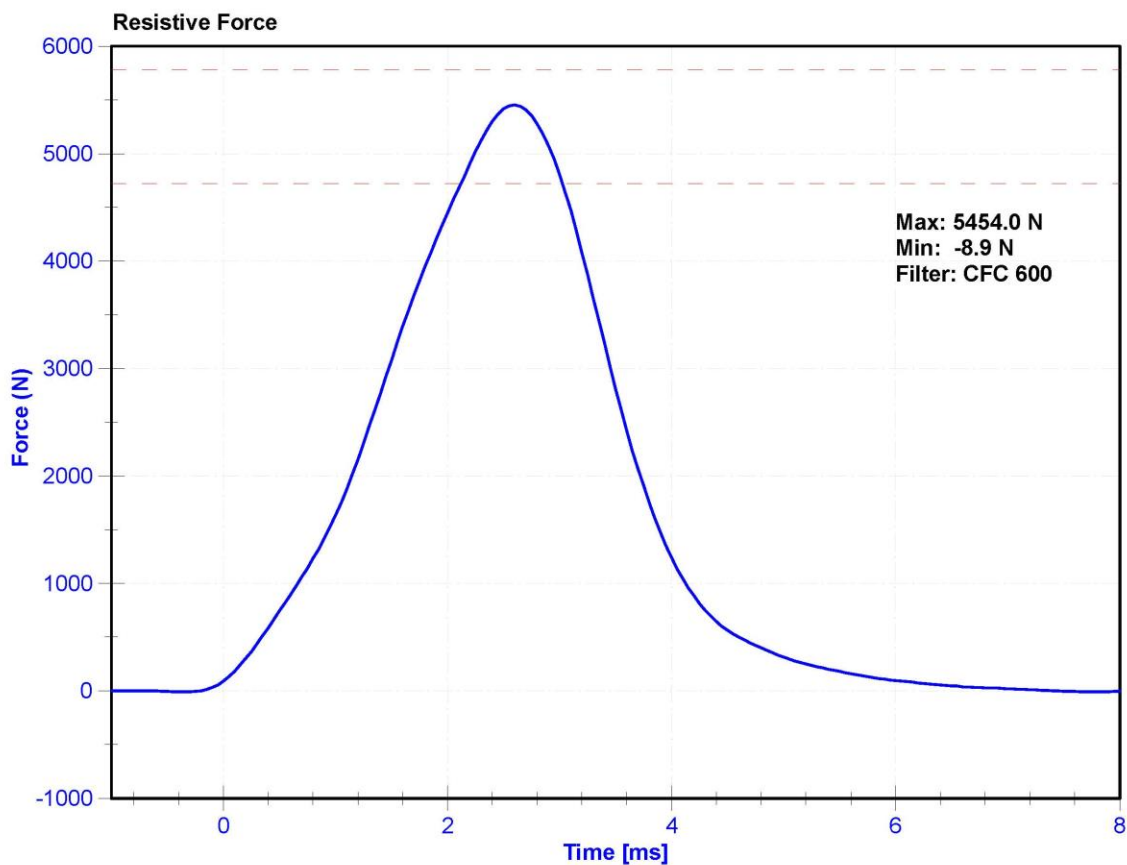
ATD Manufacturer	Humanetics	Test Technician	K. Dutton
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

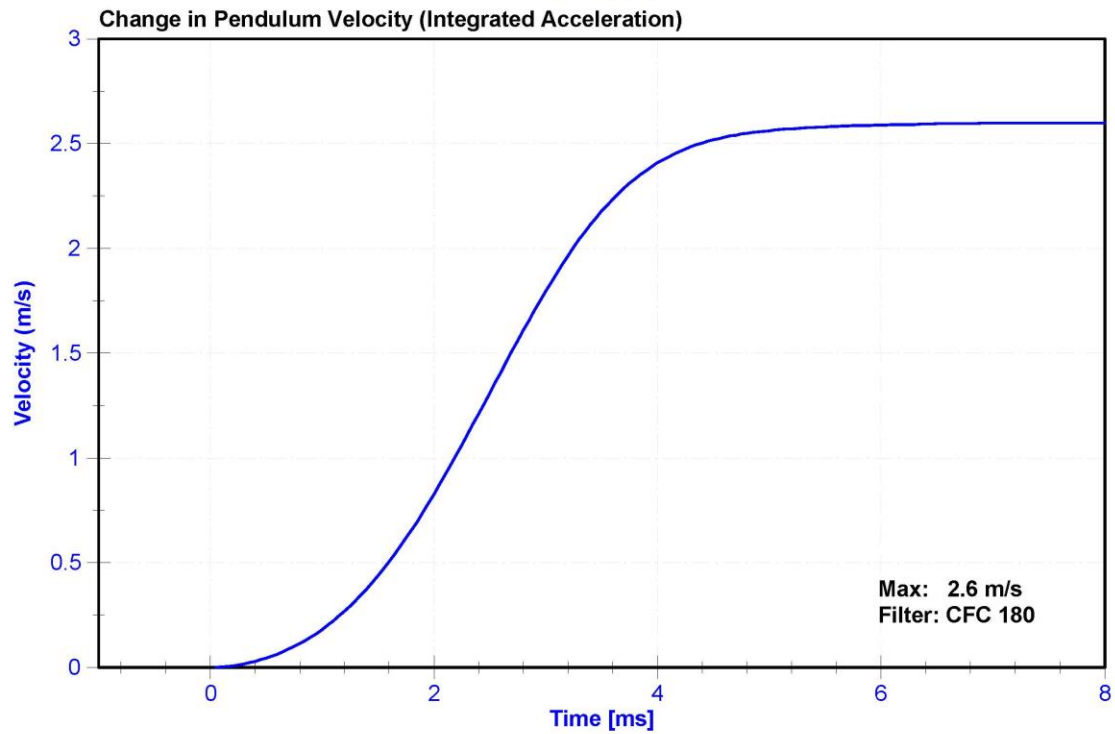
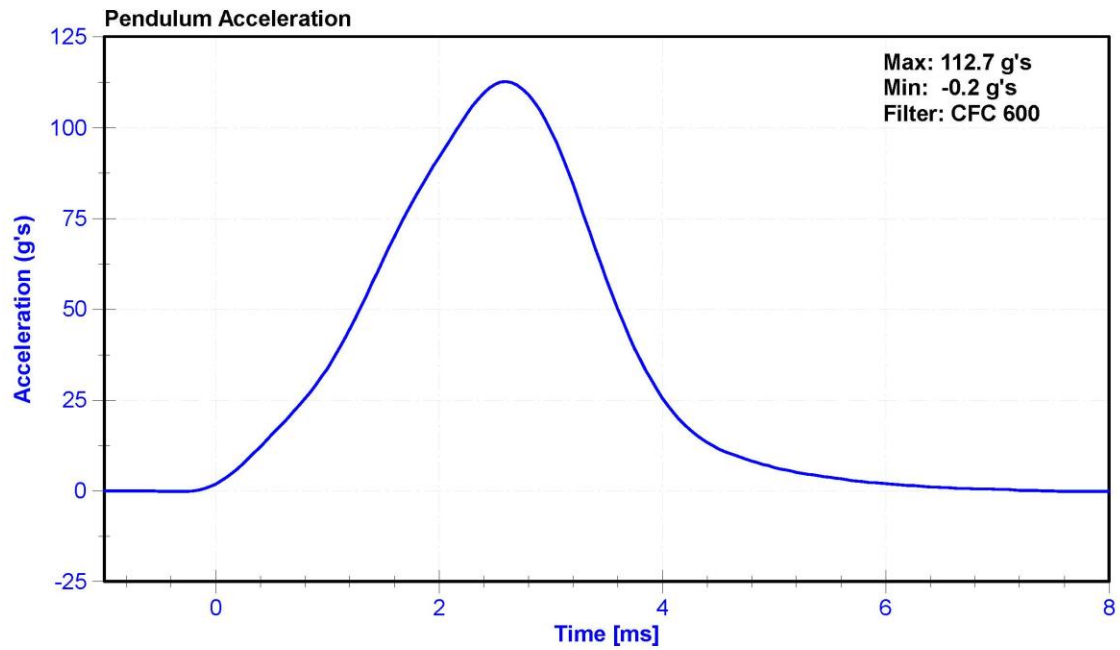
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21	Pass
Humidity	10	70	%	19.6	Pass
Velocity	2.07	2.13	m/s	2.112	Pass
Maximum Resistive Force	4720	5780	N	5454.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020







**CALIBRATION TEST RESULTS**

**PRE-TEST**

**HYBRID III 5<sup>TH</sup> PERCENTILE - PASSENGER ATD**

**SERIAL NO: 140**

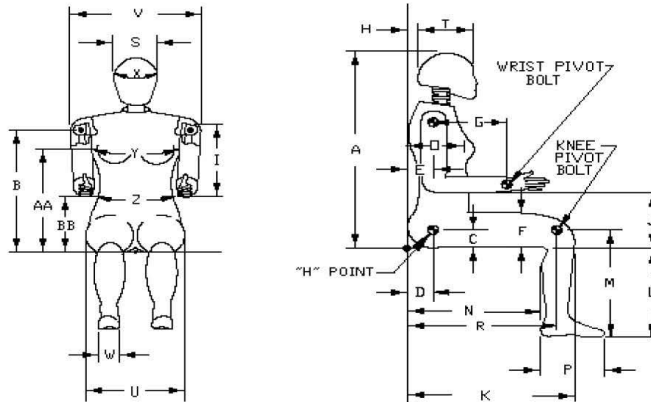


External Measurements - Hybrid 3 - 5th Female

Technician: K. Brogan

Date: 03/27/2020

Dummy Serial Number: 140



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	791	Pass
B	Shoulder Pivot Height	432	457	442	Pass
C	H-Point Height	81	86	83	Pass
D	H-Point from Backline	145	150	146	Pass
E	Shoulder Pivot from Backline	69	84	77	Pass
F	Thigh Clearance	119	135	126	Pass
G	Back of Elbow to Wrist Pivot	244	259	252	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	291	Pass
J	Elbow Rest Height	183	203	197	Pass
K	Buttock to Knee Length	521	546	537	Pass
L	Popliteal Height	356	376	366	Pass
M	Knee Pivot Height	394	419	409	Pass
N	Buttock Popliteal Length	414	439	428	Pass
O	Chest Depth without Jacket	175	191	182	Pass
P	Foot Length (right)	219	234	229	Pass
R	Buttock To Knee Pivot Length	457	483	465	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	180	Pass
U	Hip Breadth	300	315	313	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	83	Pass
X	Head Circumference	528	549	540	Pass
Y	Chest Circumference with Jacket	851	881	874	Pass
Z	Waist Circumference	460	790	624	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass

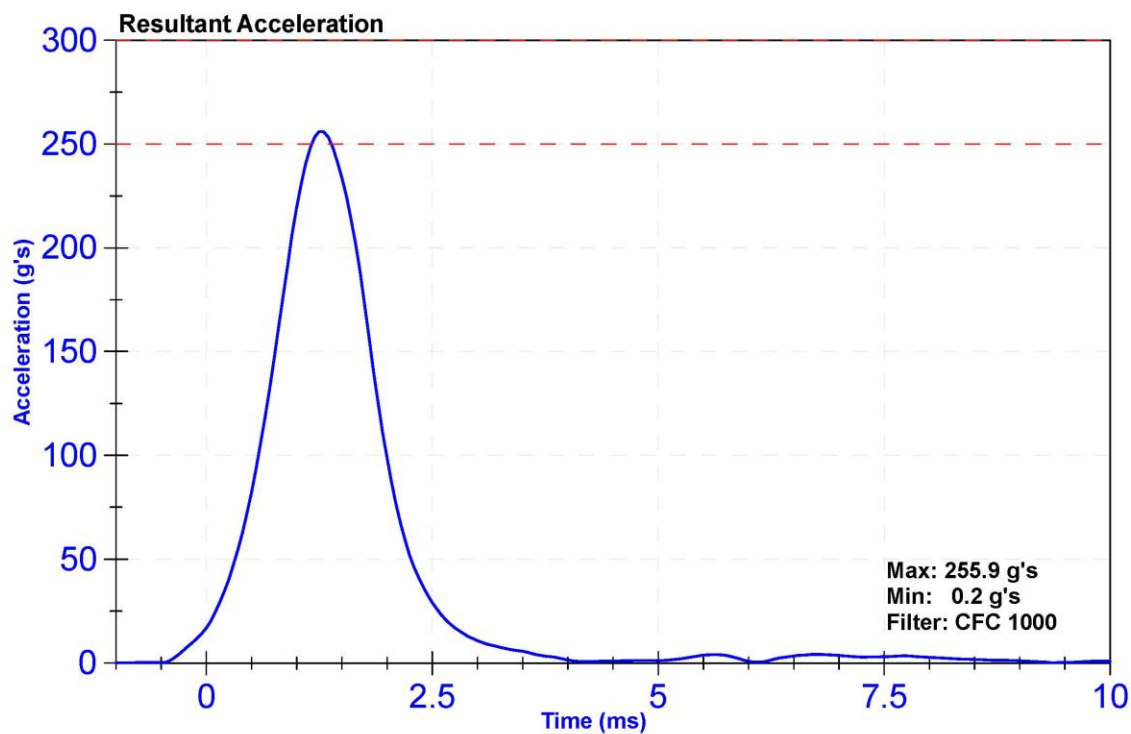
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

**Results**

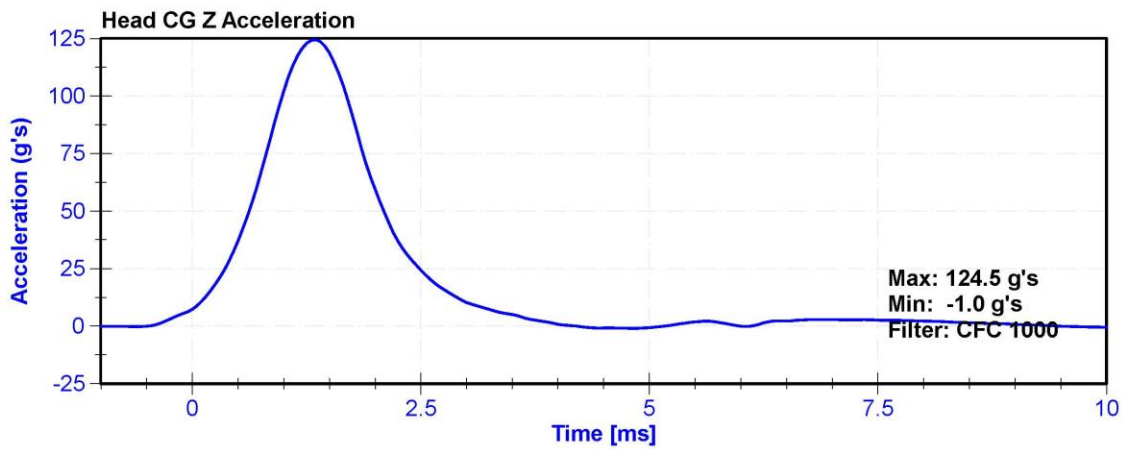
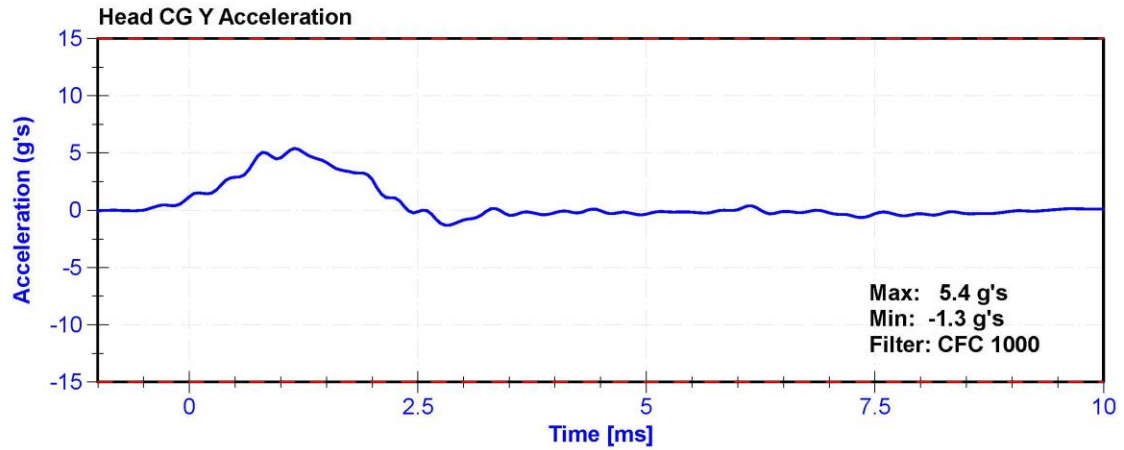
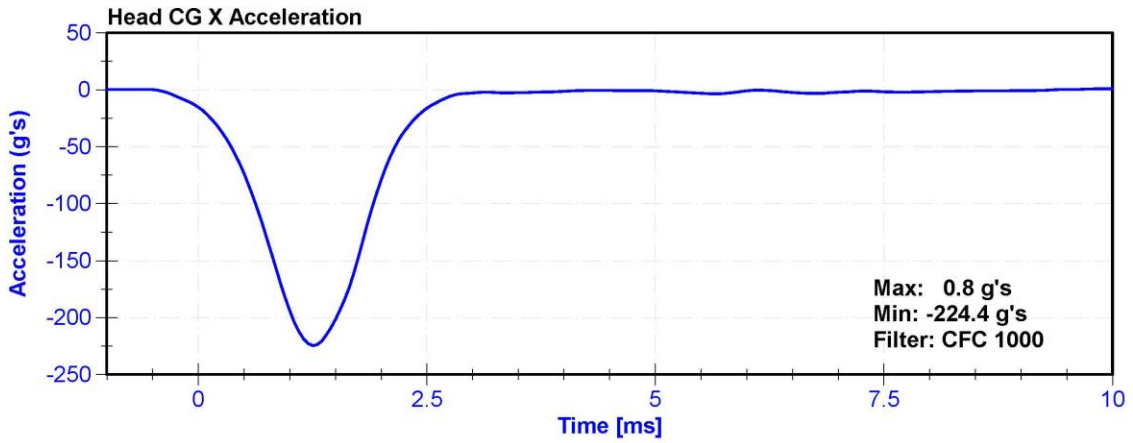
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.2	Pass
Humidity	10	70	%	34.2	Pass
Resultant Acceleration	250	300	g's	255.9	Pass
Oscillation	0	10	%	1.6	Pass
Lateral Acceleration	-15	15	g's	5.4	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P51945	10/21/2019	4/20/2020
Y Accelerometer	ENDEVCO 7264CT	AC-P51974	10/21/2019	4/20/2020
Z Accelerometer	ENDEVCO 7264CT	AC-P51946	10/21/2019	4/20/2020







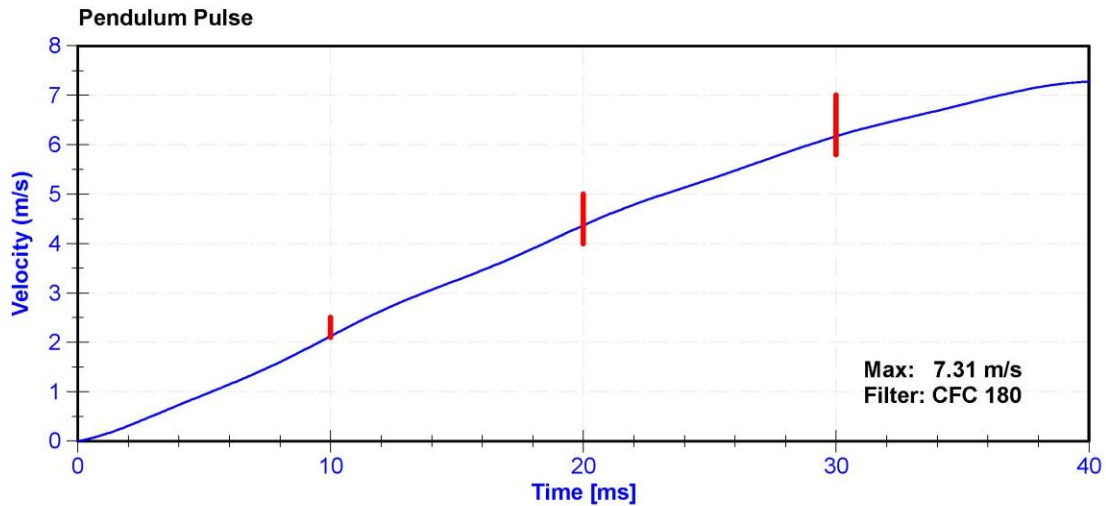
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

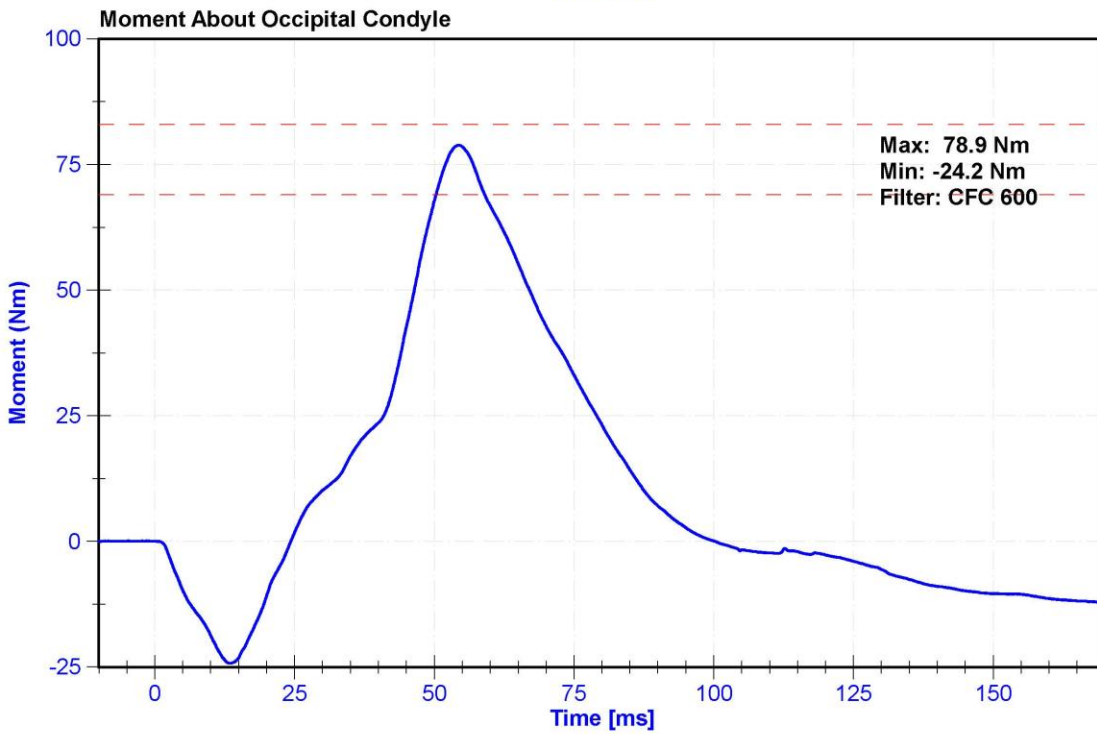
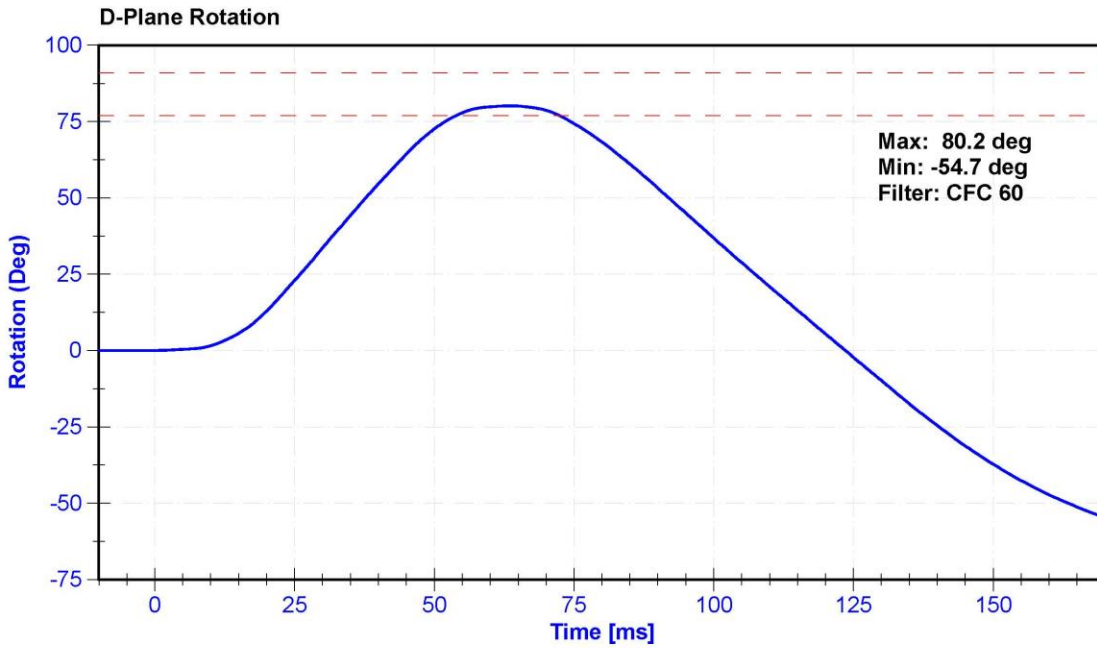
**Results**

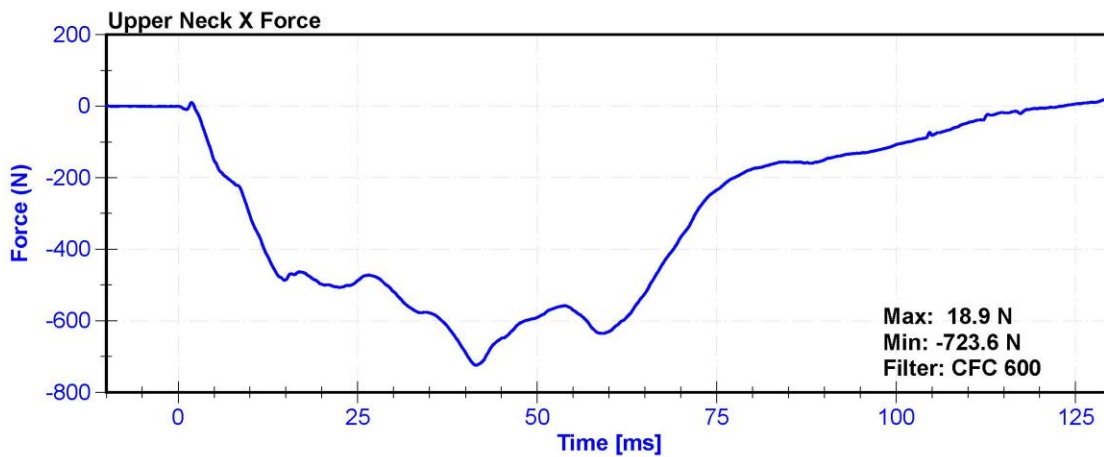
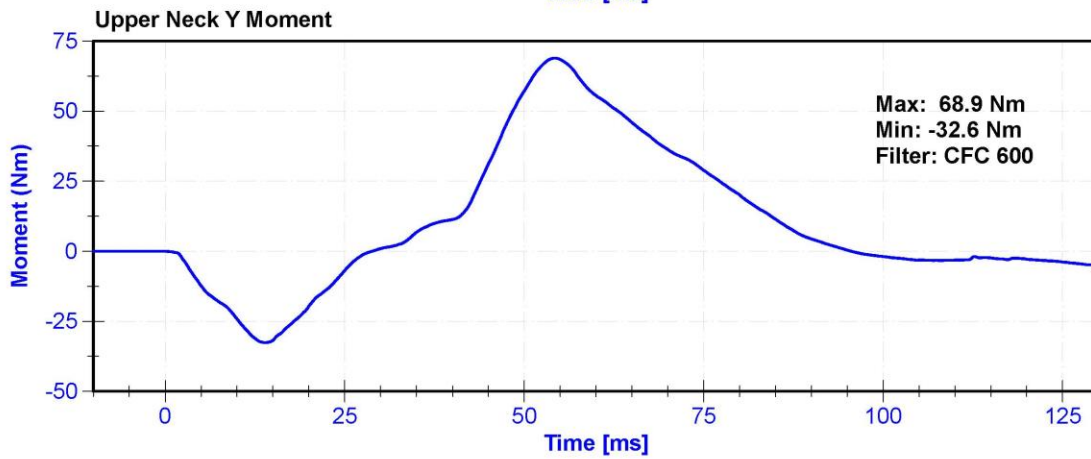
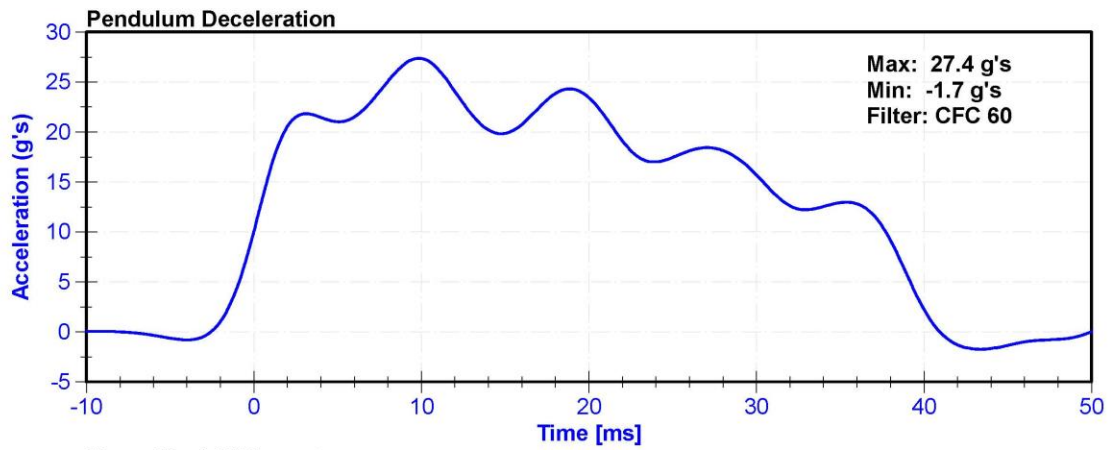
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	34.4	Pass
Velocity	6.89	7.13	m/s	7.013	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.12	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.37	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.17	Pass
Max D Plane Rotation	77	91	deg	80.2	Pass
Max Moment During Rotation Interval	69	83	Nm	78.9	Pass
Moment Decay to 10.0 Nm	80	100	ms	87.6	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5M9 Pend	1/30/2020	1/29/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton 1716	LC-1872 FX	10/5/2019	10/4/2020









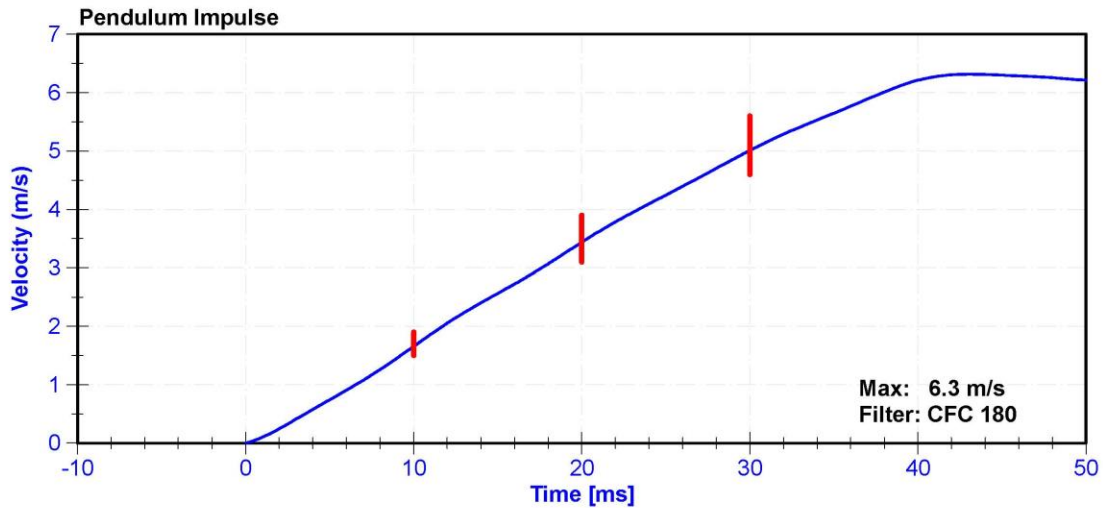
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

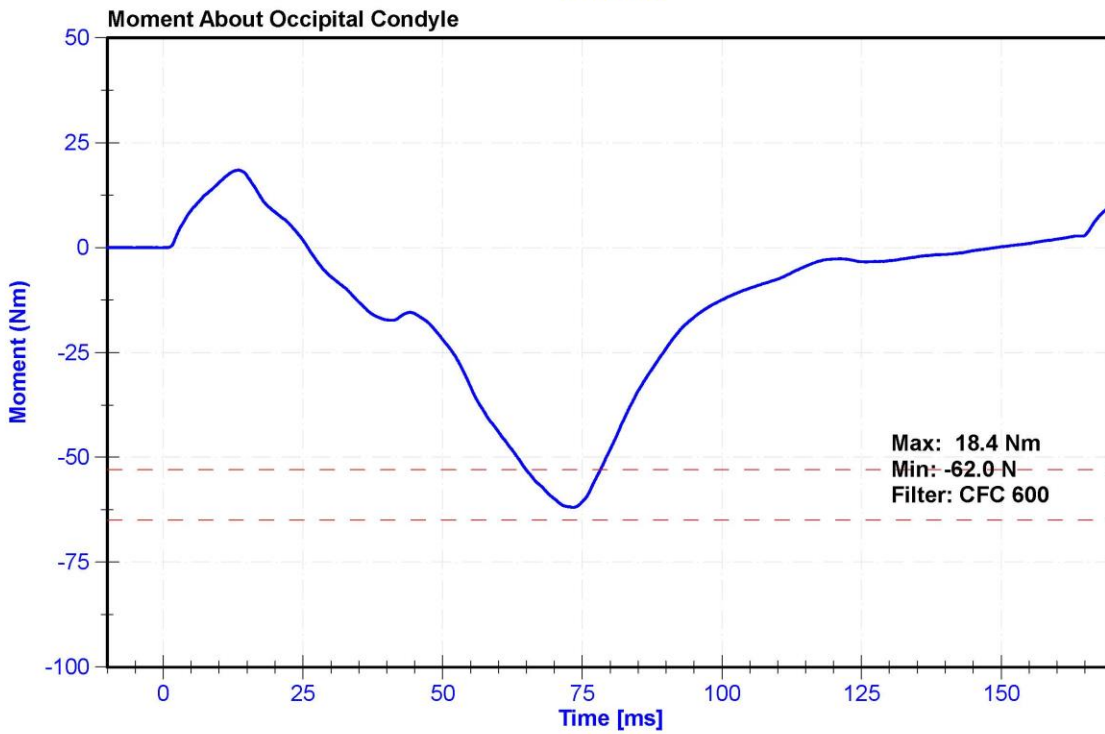
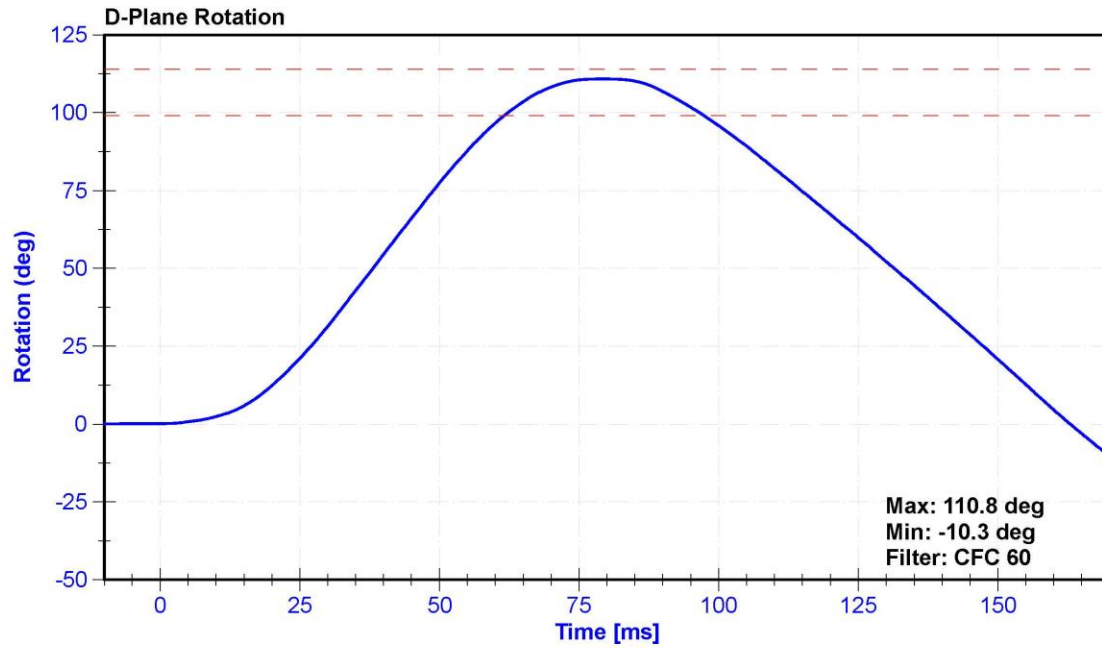
**Results**

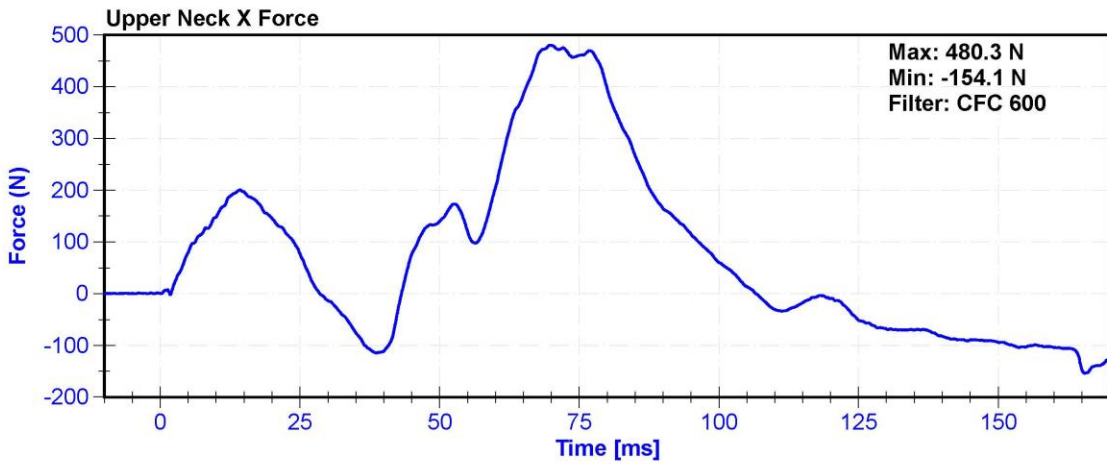
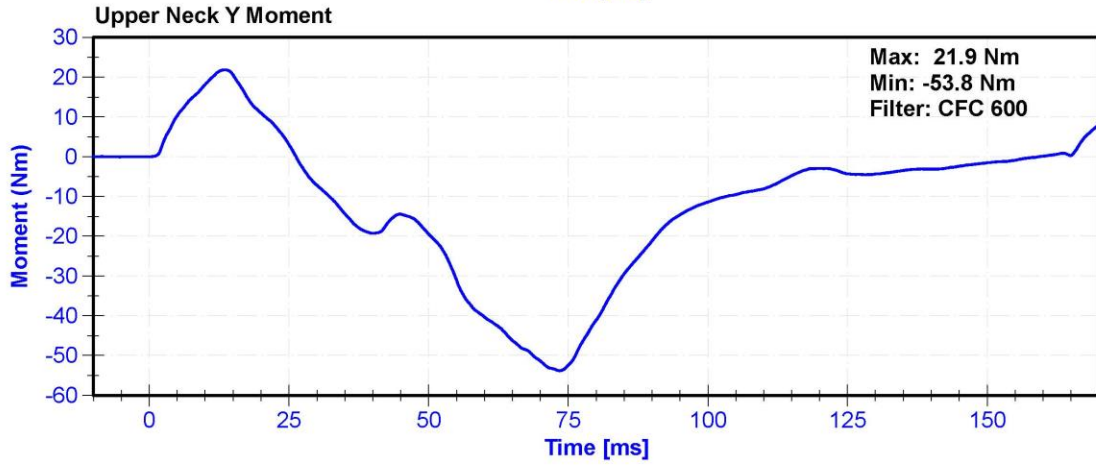
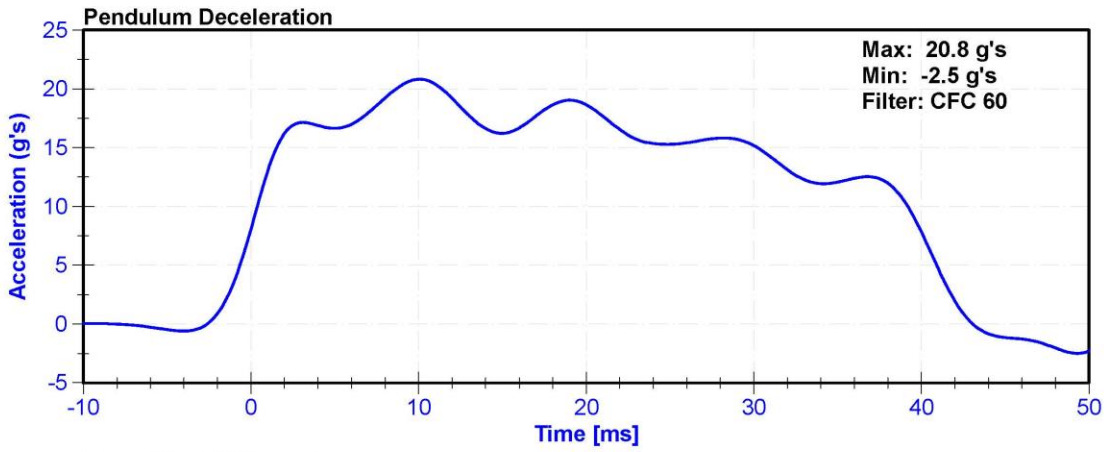
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.2	Pass
Humidity	10	70	%	34.3	Pass
Velocity	5.95	6.19	m/s	6.088	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.66	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.44	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.01	Pass
D Plane Rotation	99	114	deg	110.8	Pass
Moment During Rotation Interval	-65	-53	Nm	-62.0	Pass
Moment Decay to -10Nm	94	114	ms	104.5	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5M9 Pend	1/30/2020	1/29/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton 1716	LC-1872 FX	10/5/2019	10/4/2020







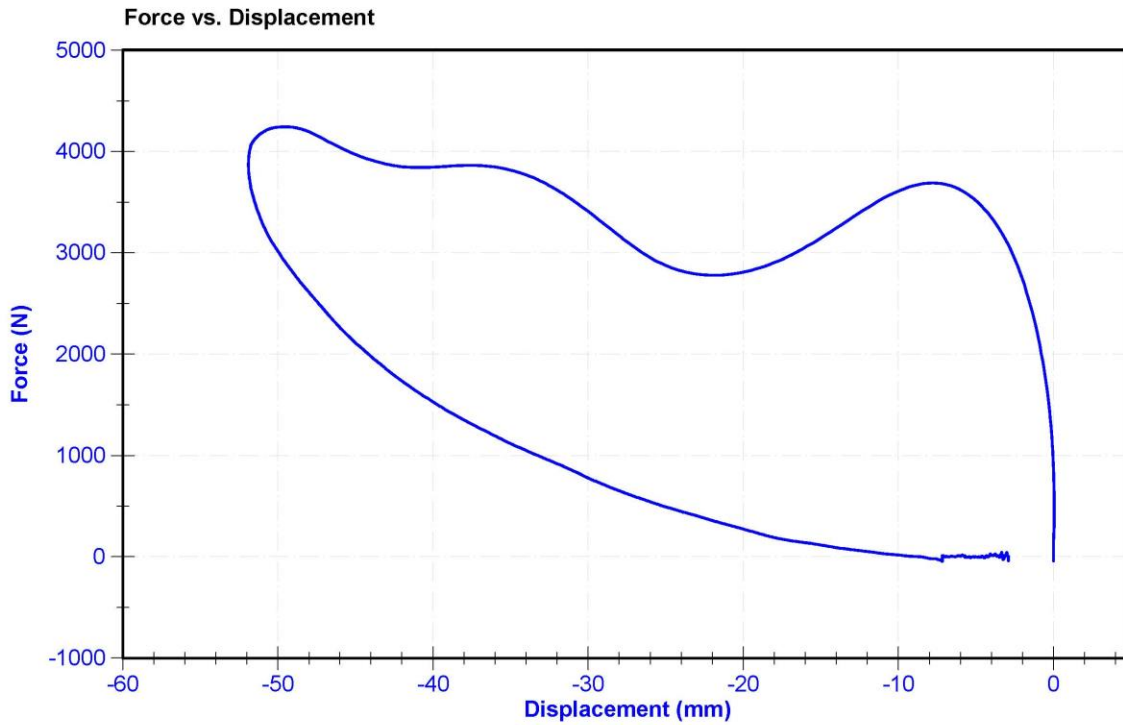
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

**Results**

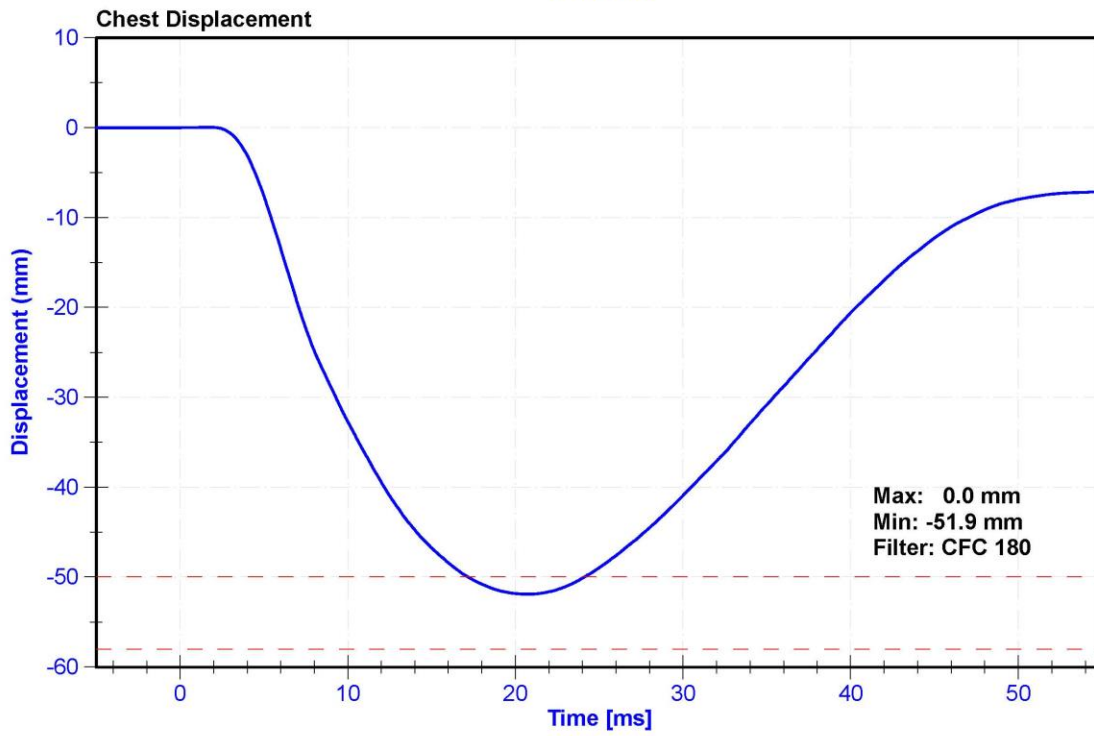
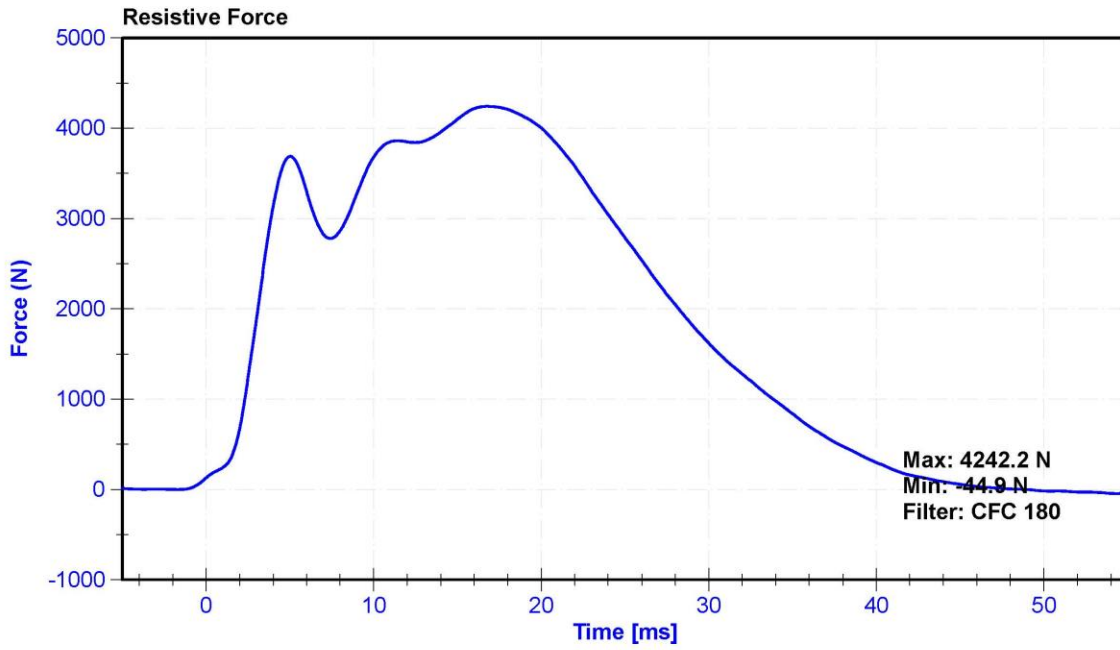
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22	Pass
Humidity	10	70	%	35.7	Pass
Velocity	6.59	6.83	m/s	6.612	Pass
Chest Deflection	-58	-50	mm	-51.9	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4239.5	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4242.2	Pass
Hysteresis	69	85	%	74.5	Pass

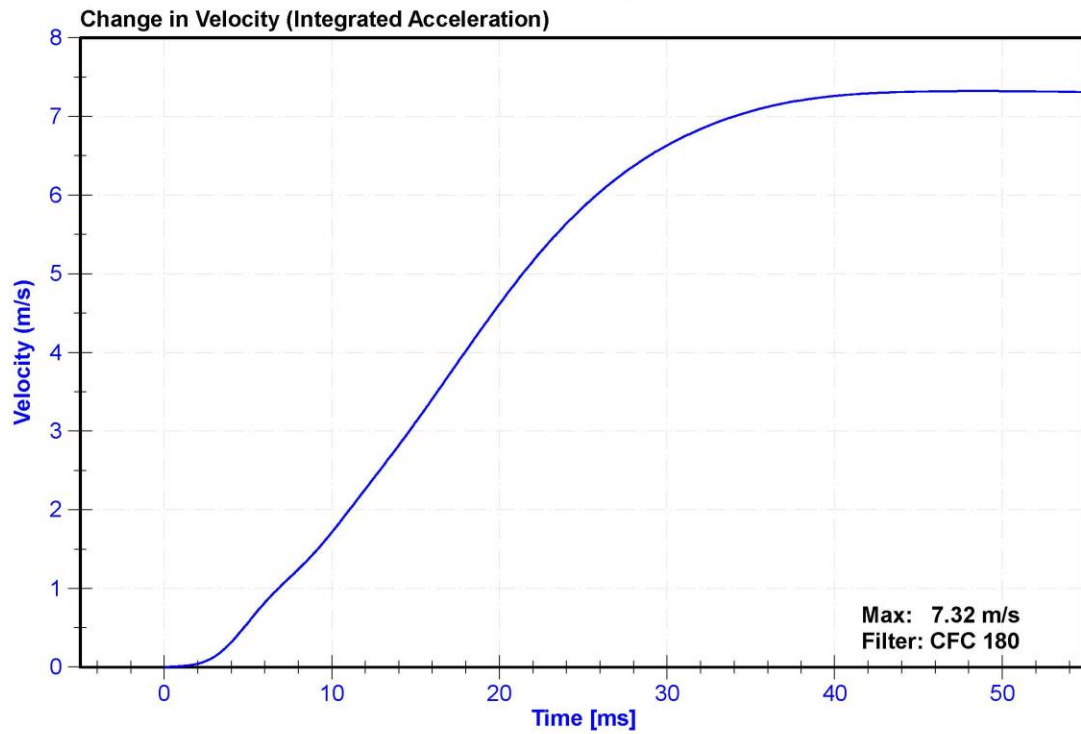
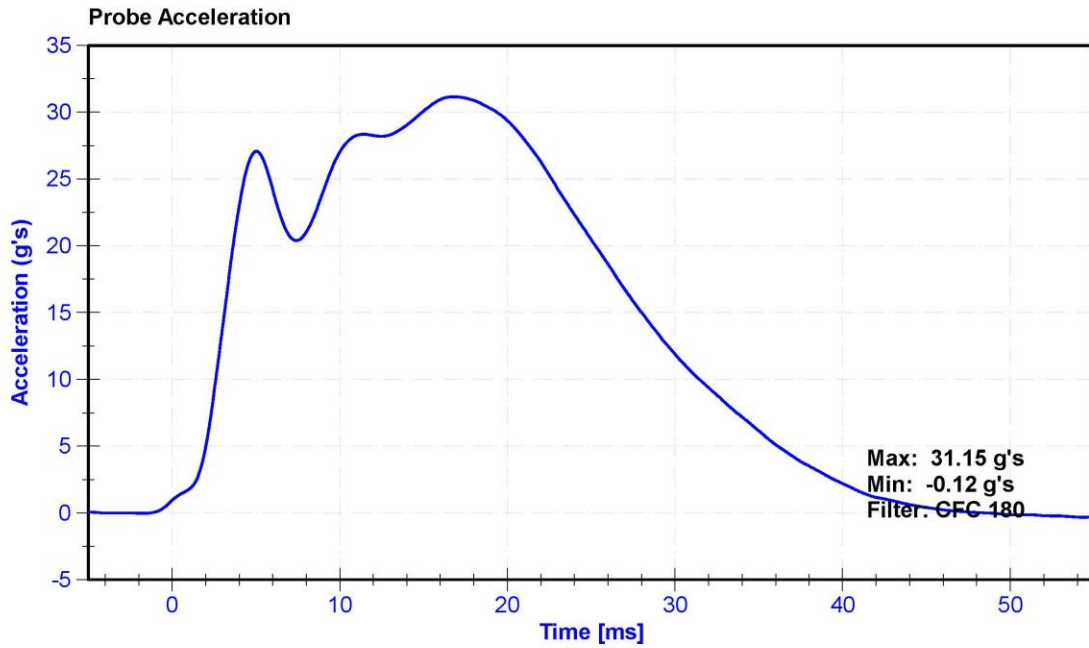
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Chest Potentiometer	SERVO 14CBI-3615	DS-140GFE	6/21/2019	6/20/2020









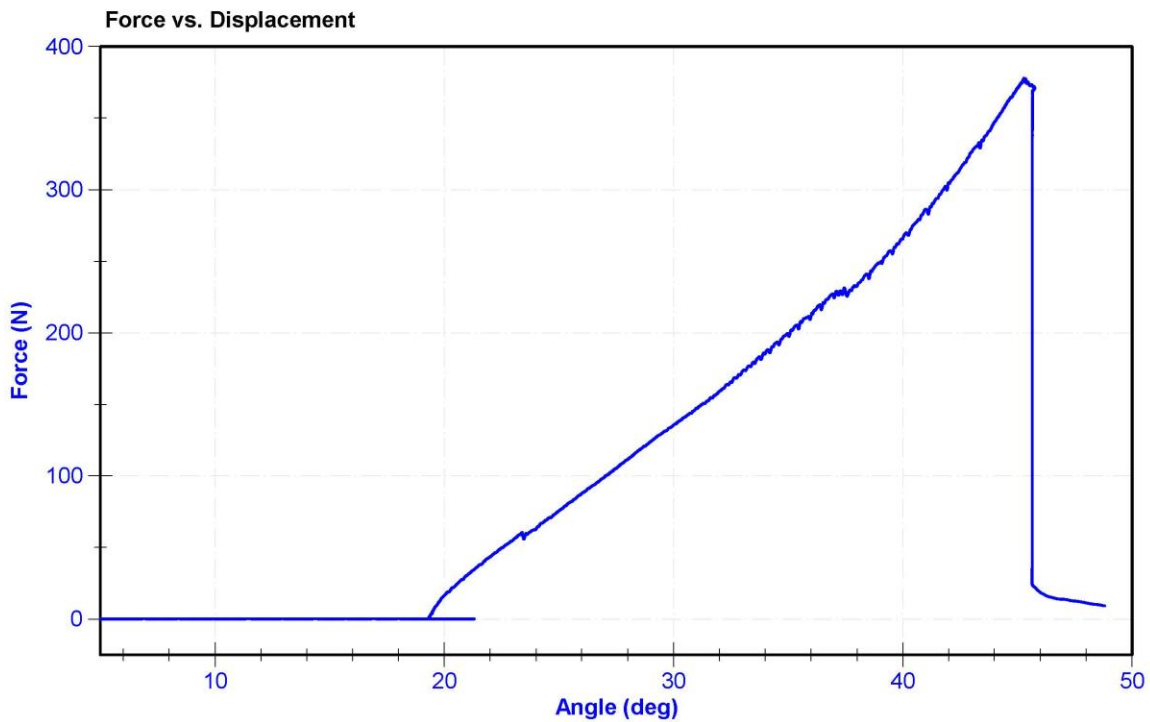
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	20.6	Pass
Humidity	10	70	%	38.6	Pass
Initial Angle	0	20	deg	19.3	Pass
Force at 45 Degrees	320	390	N	377.9	Pass
Return Angle Relative to Initial	0	8	deg	5.2	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	12/9/2019	12/8/2020
Load Cell	Interface SML-200	LC-493319	1/10/2020	1/9/2021



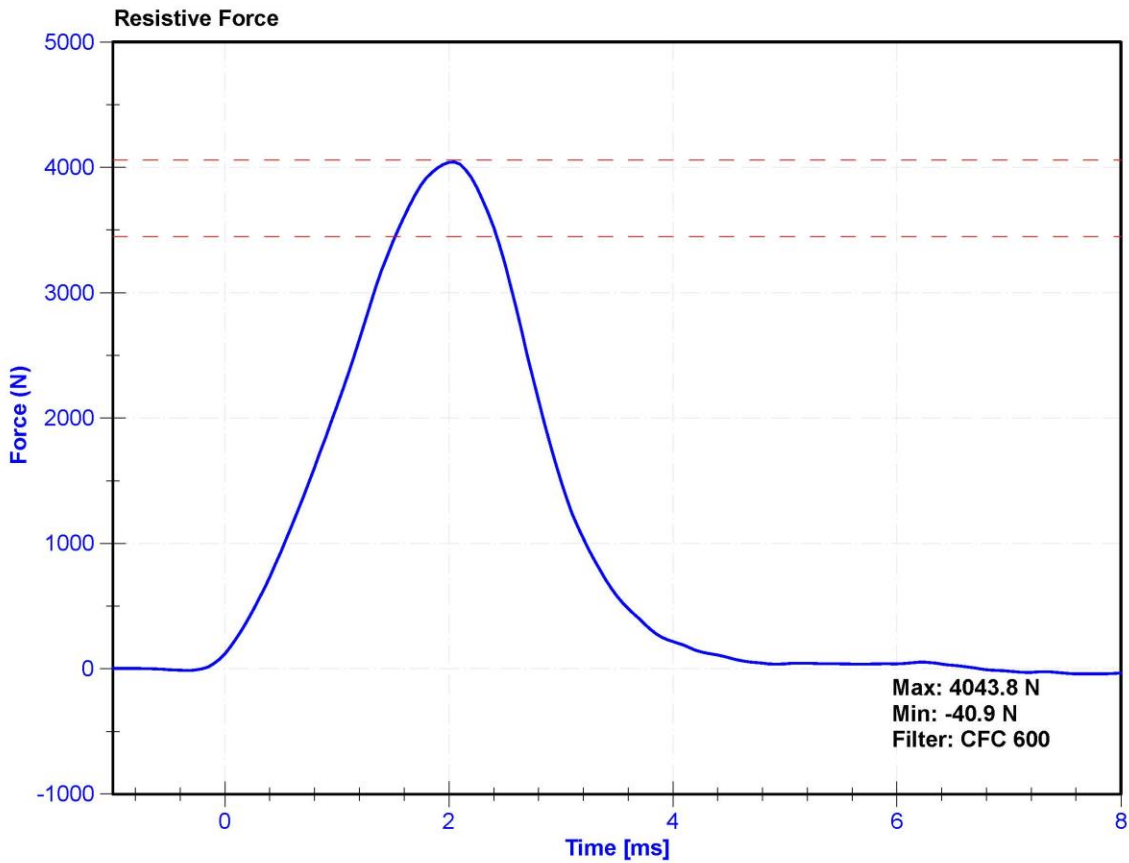
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

**Results**

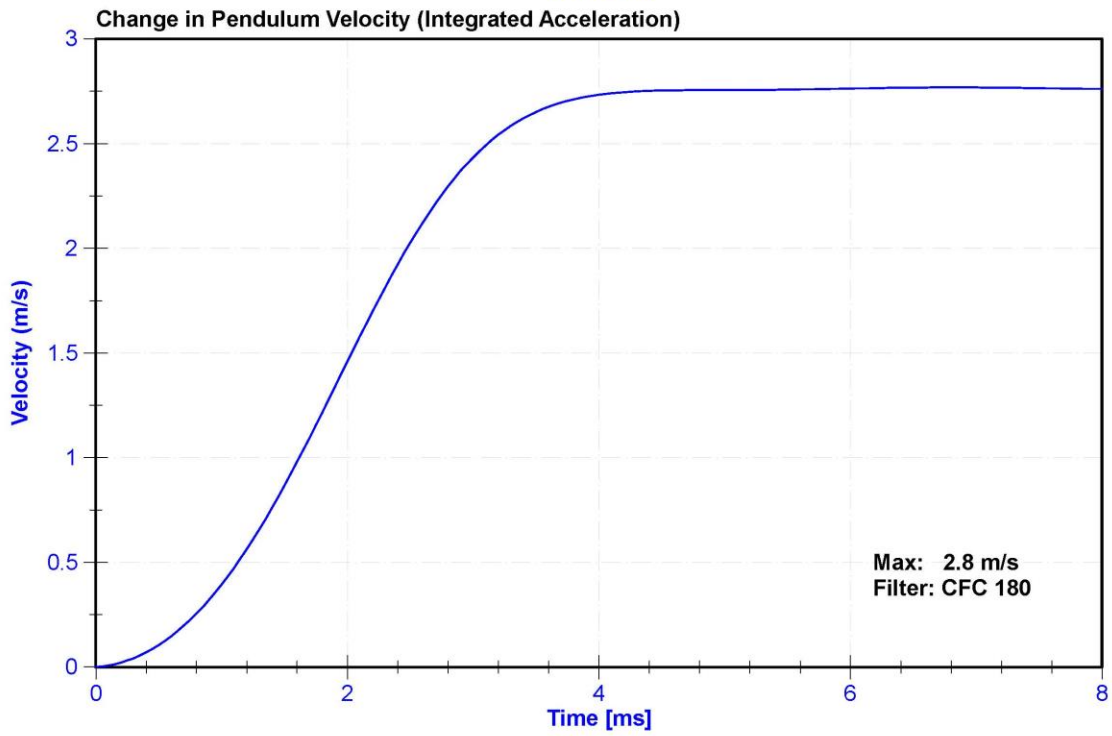
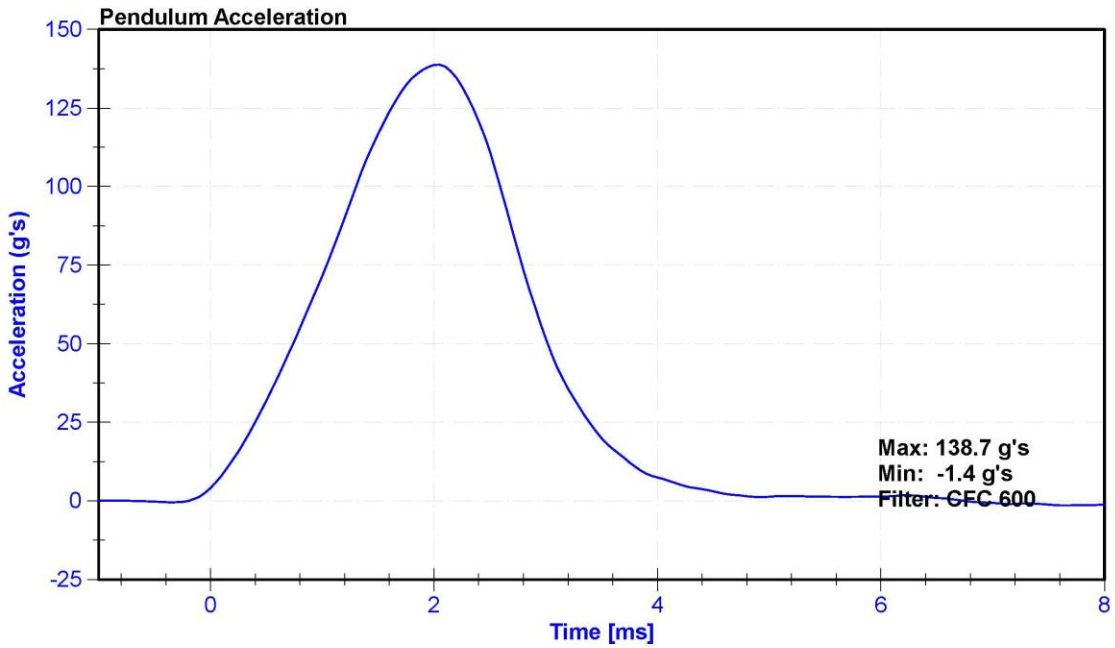
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.3	Pass
Humidity	10	70	%	39.1	Pass
Velocity	2.07	2.13	m/s	2.126	Pass
Resistive Force	3450	4060	N	4043.8	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020







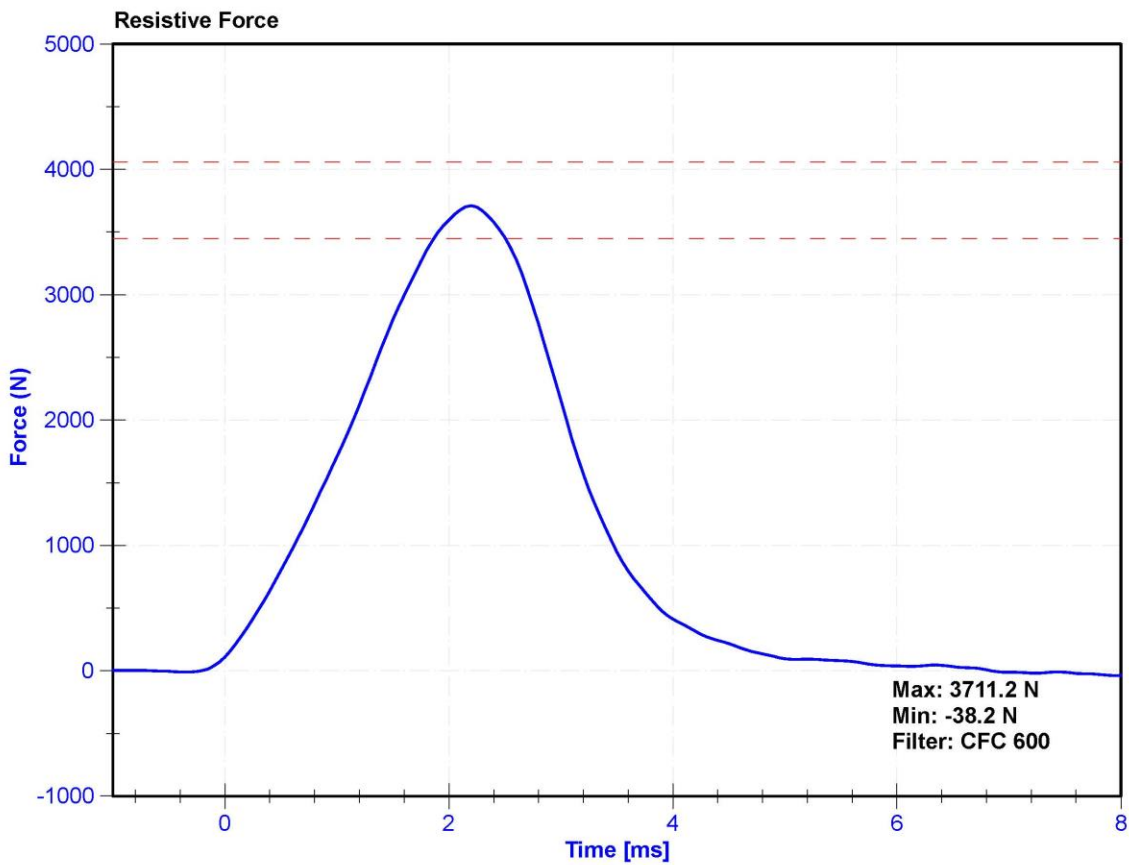
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

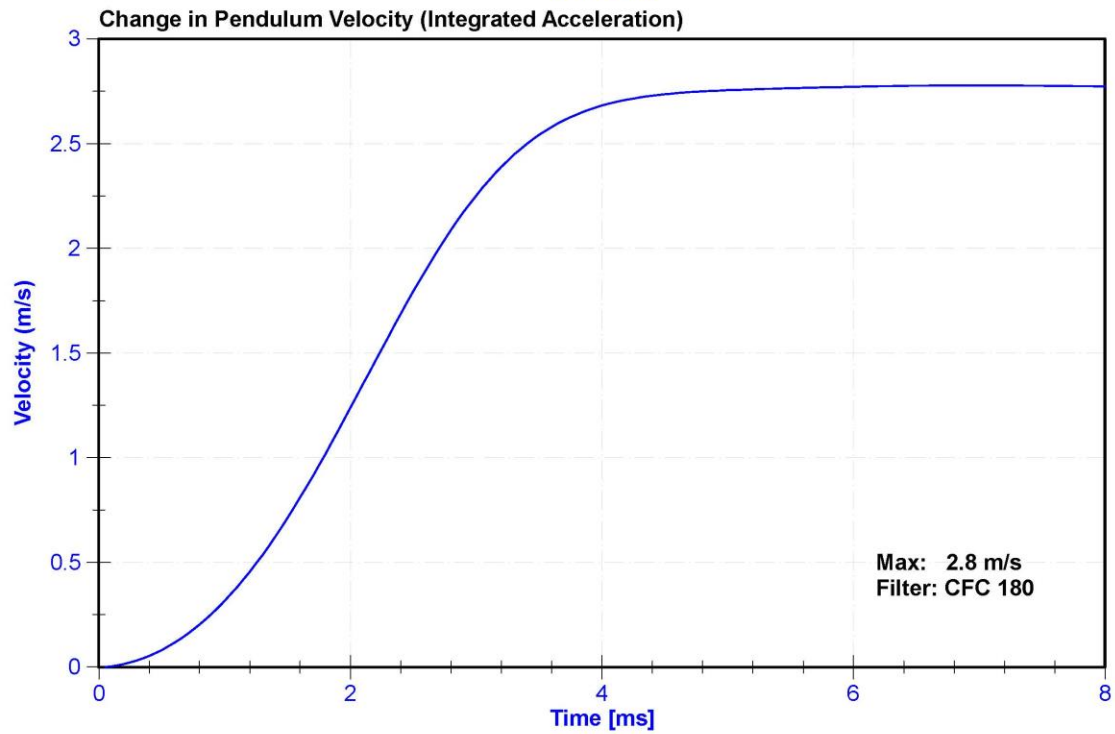
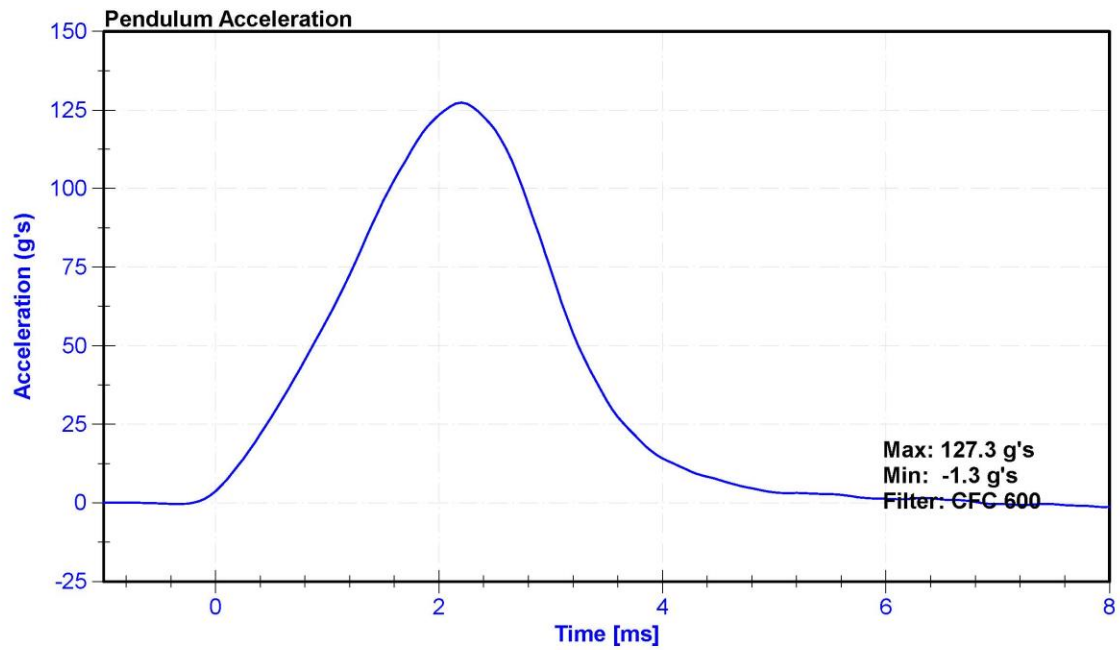
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.4	Pass
Humidity	10	70	%	39.1	Pass
Velocity	2.07	2.13	m/s	2.123	Pass
Resistive Force	3450	4060	N	3711.2	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020





**CALIBRATION TEST RESULTS**

**POST-TEST**

**HYBRID III 50<sup>TH</sup> PERCENTILE MALE - DRIVER ATD**

**SERIAL NO: 142**



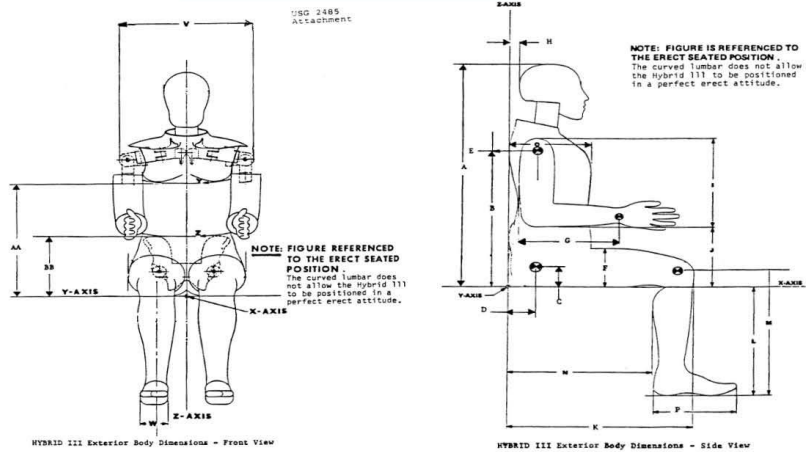


External Measurements - Hybrid 3 - 50th Male

Technician: K. Dutton

Date: 04/09/2020

Dummy Serial Number: 142



Symbol	Description	Specification (in)		Result (in)	Pass/Fail
A	Sitting Height	34.6	35.0	34.8	Pass
B	Shoulder Pivot Height	19.9	20.5	20.2	Pass
C	H-Point Height	3.3	3.5	3.4	Pass
D	H-Point from Backline	5.3	5.5	5.4	Pass
E	Shoulder Pivot from Backline	3.3	3.7	3.6	Pass
F	Thigh Clearance	5.5	6.1	5.9	Pass
G	Back of Elbow to Wrist Pivot	11.4	12.0	11.6	Pass
H	Head Back to Backline	1.6	1.8	1.7	Pass
I	Shoulder to Elbow Length	13.0	13.6	13.4	Pass
J	Elbow Rest Height	7.5	8.3	8.0	Pass
K	Buttock to Knee Length	22.8	23.8	23.5	Pass
L	Popliteal Height	16.9	17.9	17.4	Pass
M	Knee Pivot Height	19.1	19.7	19.6	Pass
N	Buttock Popliteal Length	17.8	18.8	18.5	Pass
O	Chest Depth without Jacket	8.4	9.0	8.7	Pass
P	Foot Length (right)	9.9	10.5	10.3	Pass
V	Shoulder Breadth	16.3	17.2	16.9	Pass
W	Foot Breadth	3.6	4.2	3.8	Pass
Y	Chest Circumference with Jacket	38.2	39.4	38.8	Pass
Z	Waist Circumference	32.9	34.1	33.7	Pass
AA	Reference Location (Chest Circumference)	16.9	17.1	17.0	Pass
BB	Reference Location (Waist Circumference)	8.9	9.1	9.0	Pass

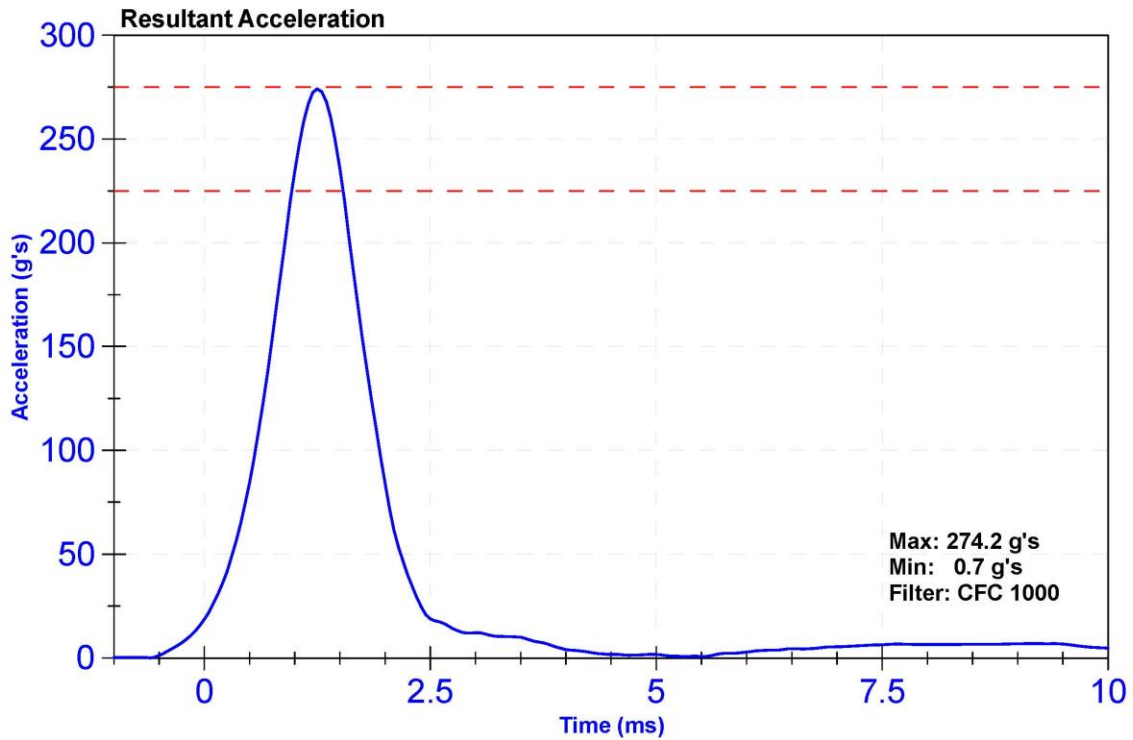
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

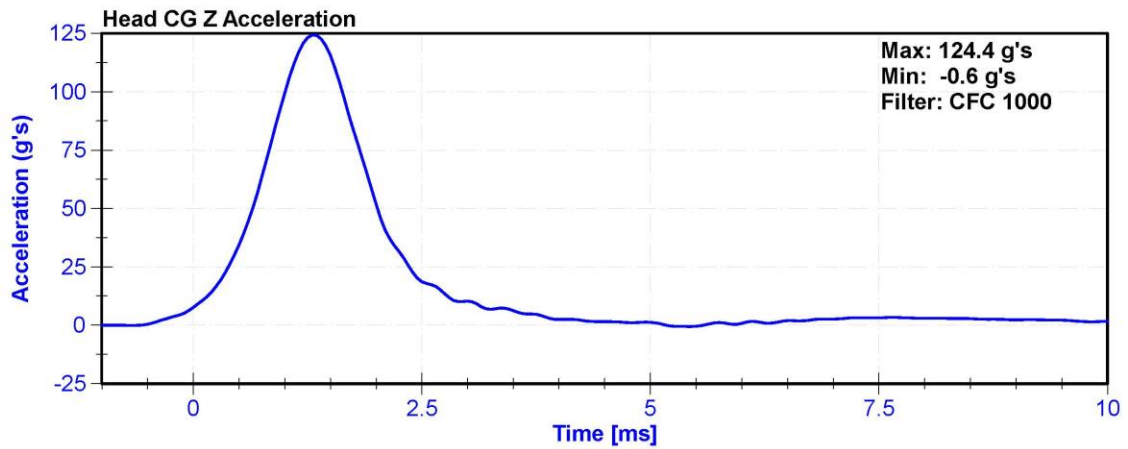
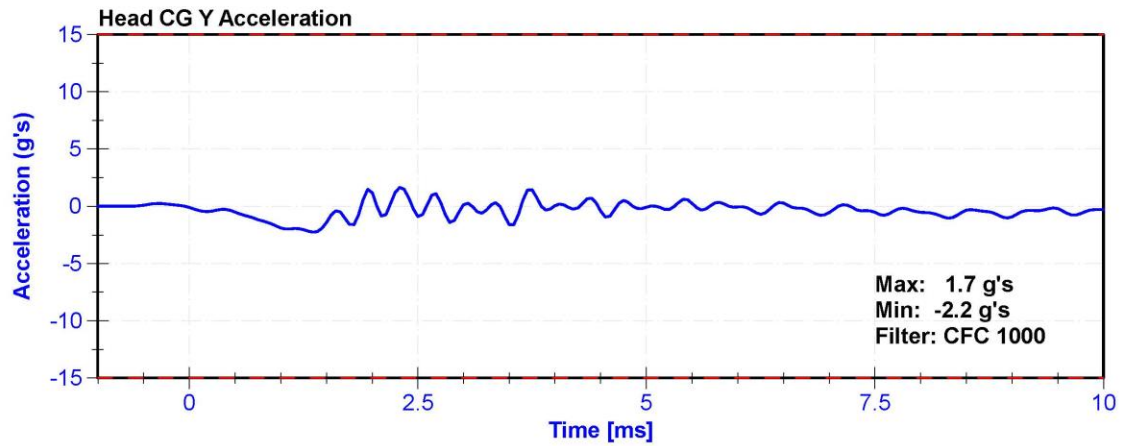
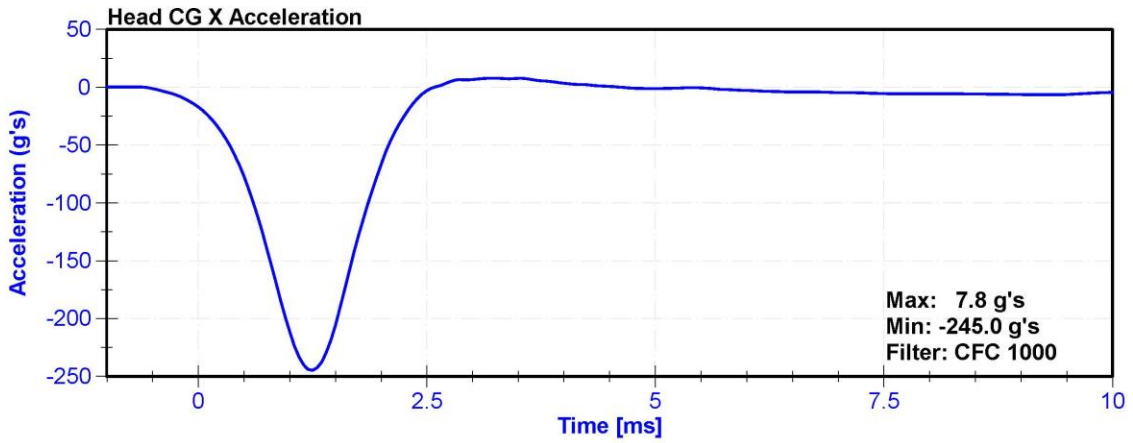
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.2	Pass
Humidity	10	70	%	29.2	Pass
Resultant Acceleration	225	275	g's	274.2	Pass
Oscillation	0	10	%	4.4	Pass
Lateral Acceleration	-15	15	g's	-2.2	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	P51681	2/10/2020	8/10/2020
Y Accelerometer	ENDEVCO 7264	P64151	2/10/2020	8/10/2020
Z Accelerometer	ENDEVCO 7264	P52114	2/10/2020	8/10/2020





ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

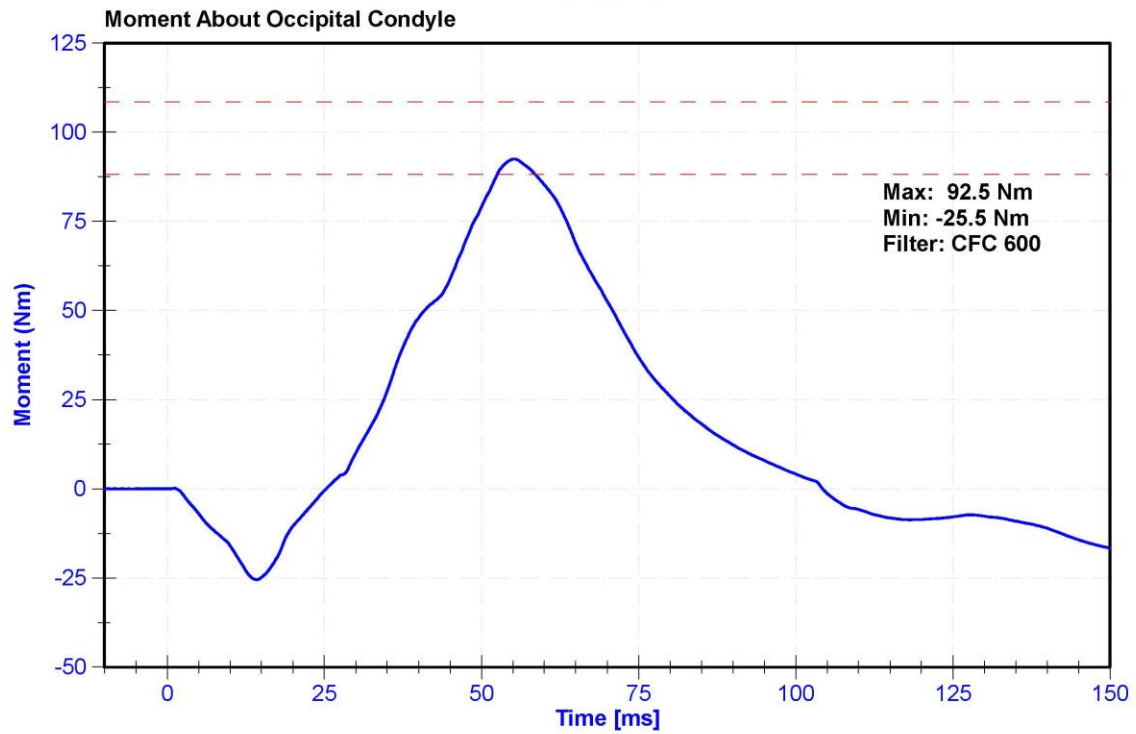
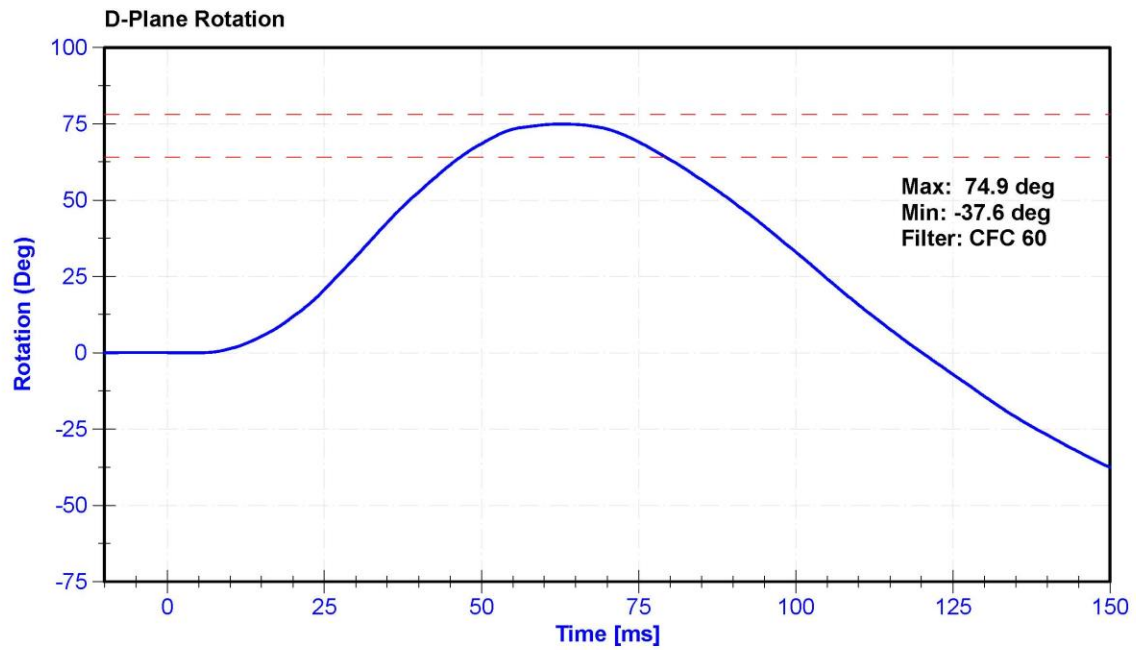
**Results**

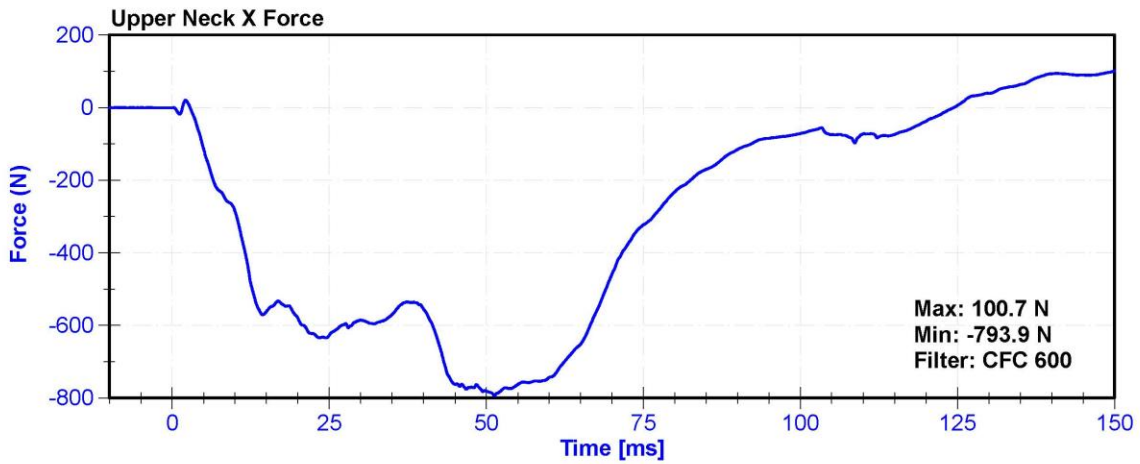
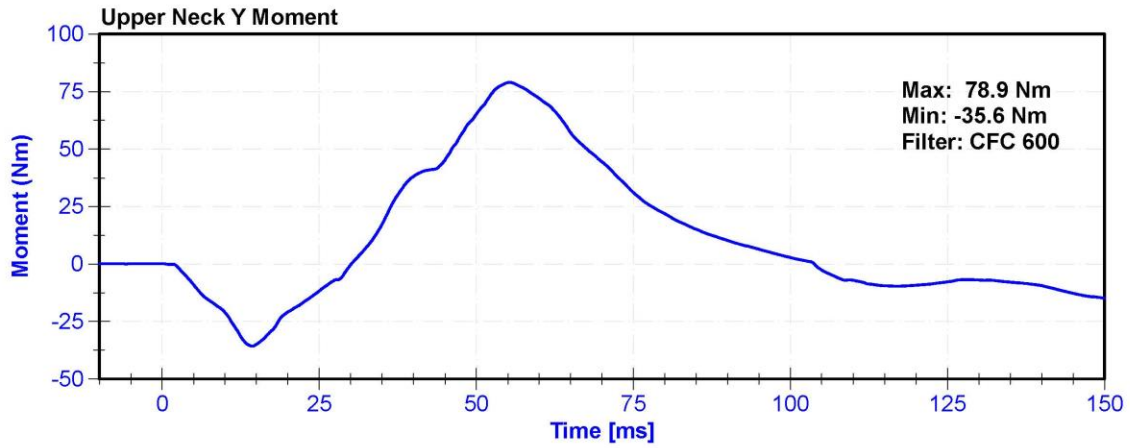
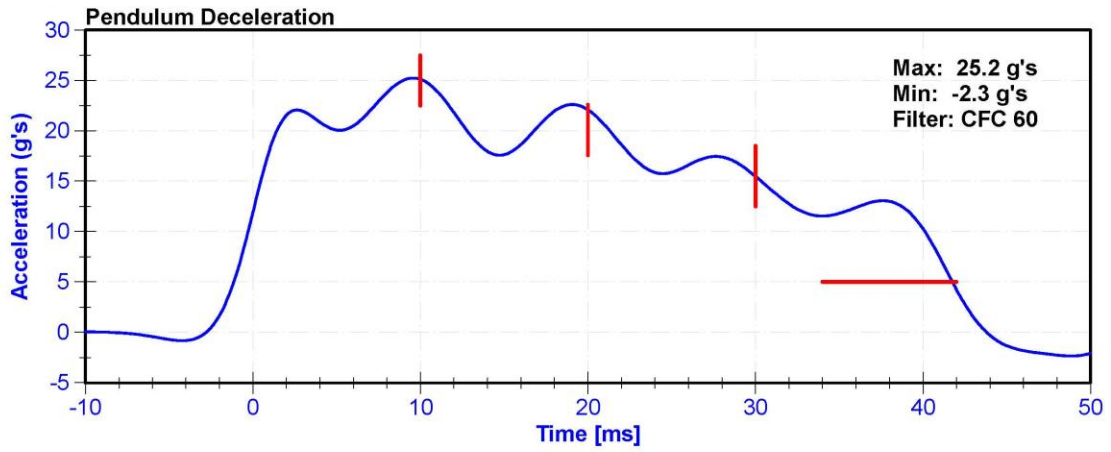
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	46.5	Pass
Velocity	6.89	7.13	m/s	6.958	Pass
Pendulum Deceleration at 10ms	22.5	27.5	g's	25.12	Pass
Pendulum Deceleration at 20ms	17.6	22.6	g's	22.09	Pass
Pendulum Deceleration at 30ms	12.5	18.5	g's	15.48	Pass
Max. Pendulum Deceleration After 30ms	0	29	g's	25.2	Pass
Pendulum Deceleration Time to 5 g's	34	42	ms	41.8	Pass
Maximum D Plane Rotation	64	78	deg	74.9	Pass
Time to Maximum Rotation	57	64	ms	62.7	Pass
Rotation Decay to Zero	113	127	ms	120.2	Pass
Moment About Occipital Condyle	88.1	108.4	Nm	92.46	Pass
Time to Maximum Moment	47	58	ms	55.2	Pass
Moment Decay to Zero	97	107	ms	104.3	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton IF-205	LC-280FxGFE	10/3/2019	10/2/2020







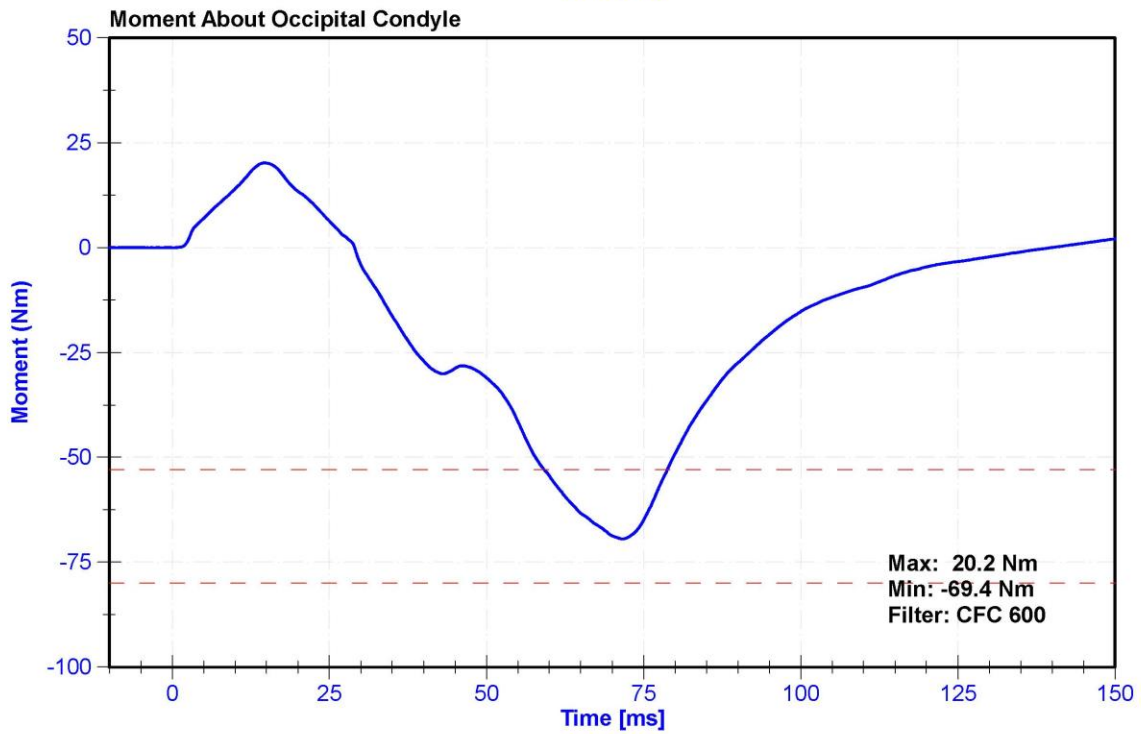
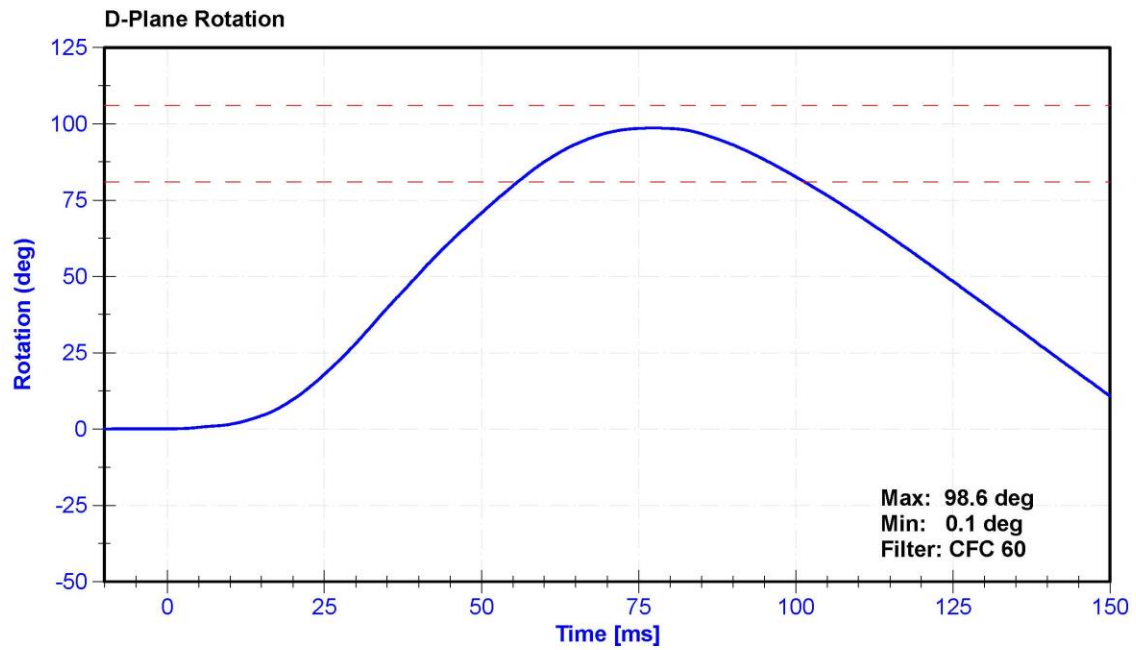
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

**Results**

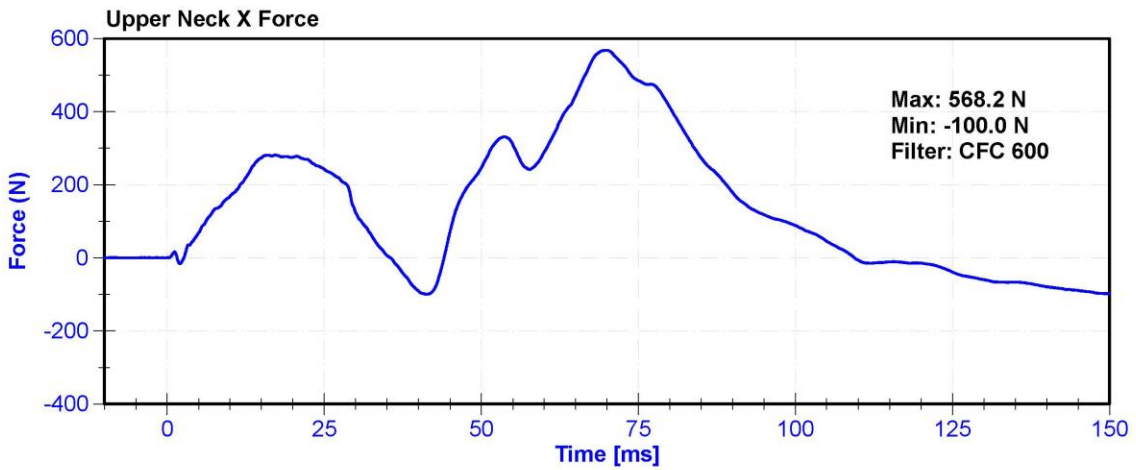
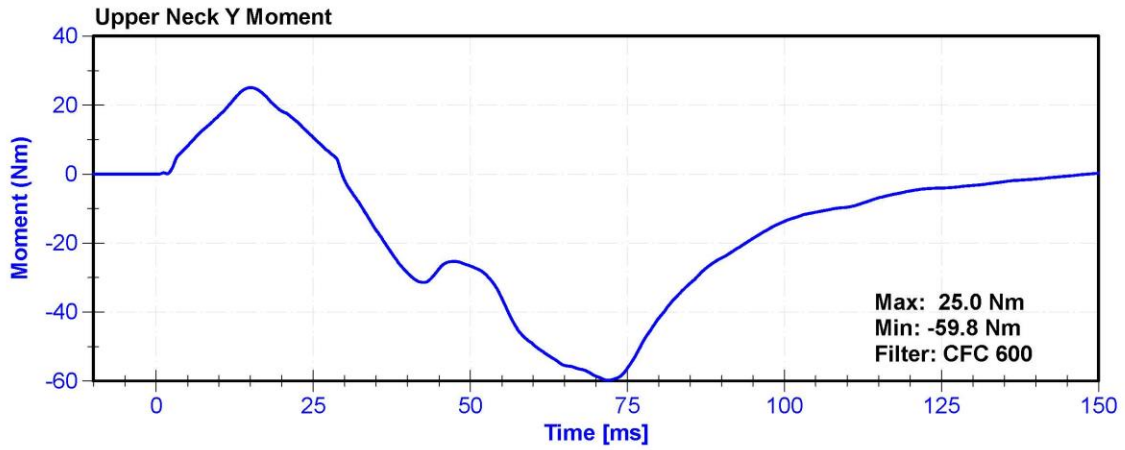
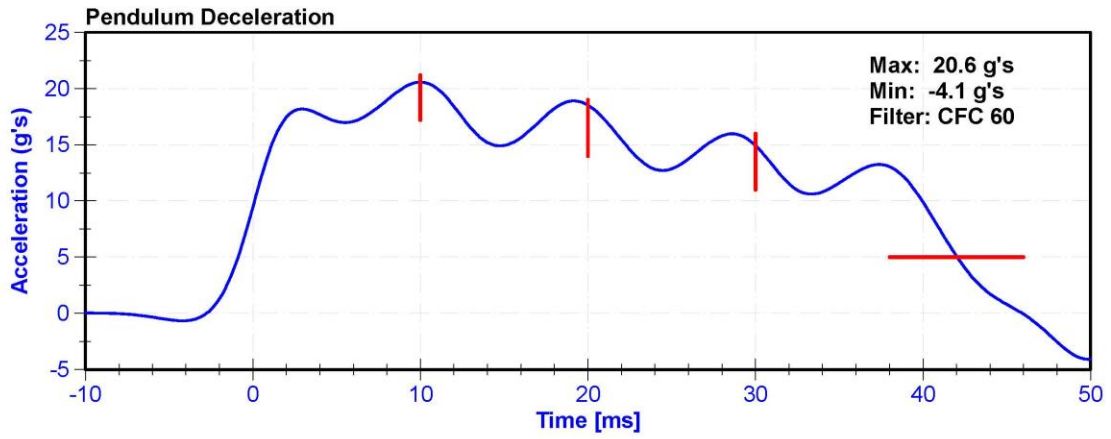
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	46.5	Pass
Velocity	5.94	6.19	m/s	6.005	Pass
Pendulum Deceleration at 10ms	17.2	21.2	g's	20.58	Pass
Pendulum Deceleration at 20ms	14	19	g's	18.5	Pass
Pendulum Deceleration at 30ms	11	16	g's	14.9	Pass
Max. Pendulum Deceleration After 30ms	0	22	g's	20.6	Pass
Pendulum Deceleration Time to 5 g's	38	46	ms	42.0	Pass
Maximum D Plane Rotation	81	106	deg	98.6	Pass
Time to Maximum Rotation	72	82	ms	77.2	Pass
Rotation Decay to Zero	147	174	ms	157.3	Pass
Minimum Moment About OC	-80	-52.9	Nm	-69.41	Pass
Time to Minimum Moment	65	79	ms	71.5	Pass
Moment Decay to Zero	120	148	ms	140.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton IF-205	LC-280FxGFE	10/3/2019	10/2/2020







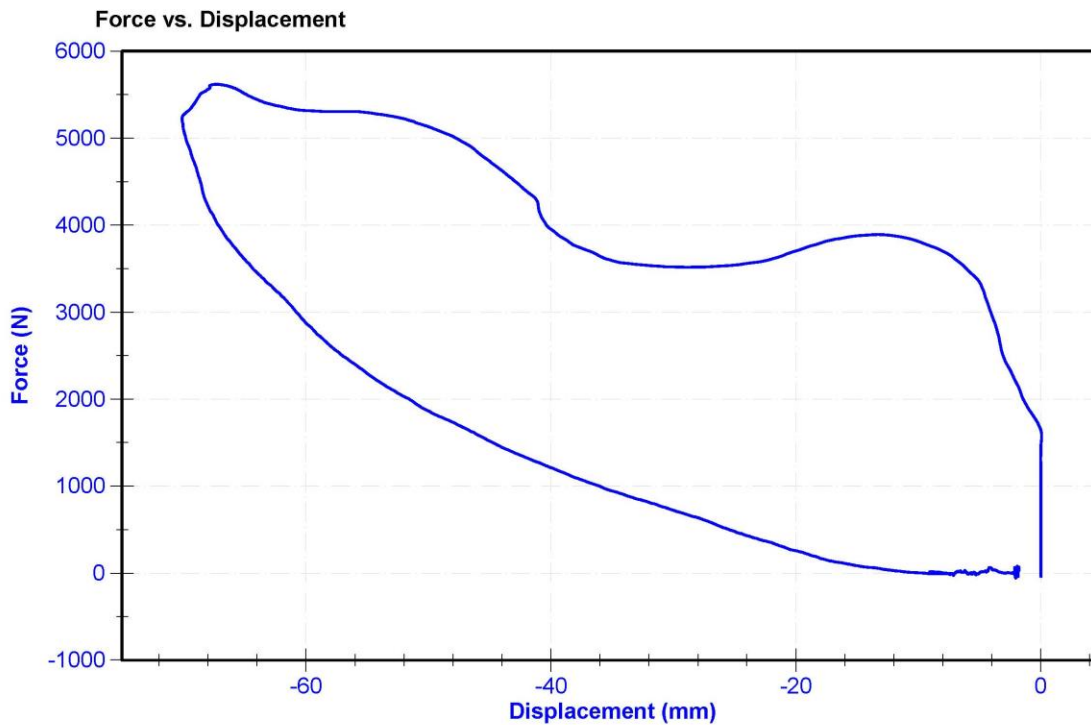
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

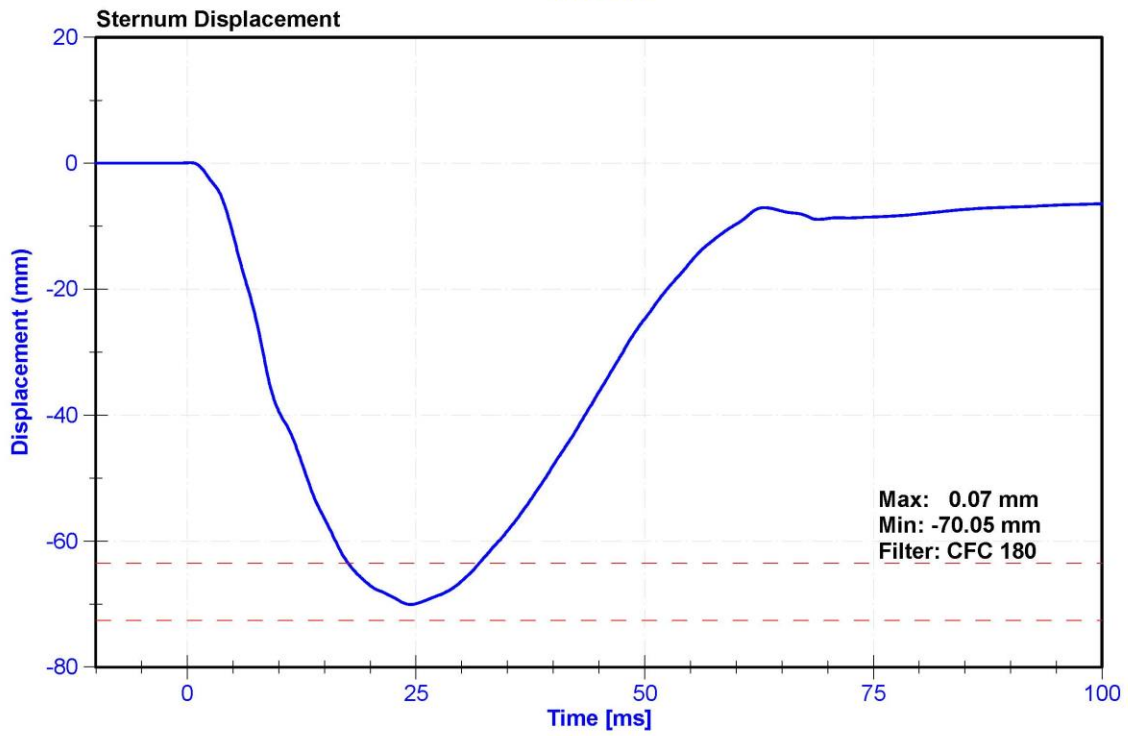
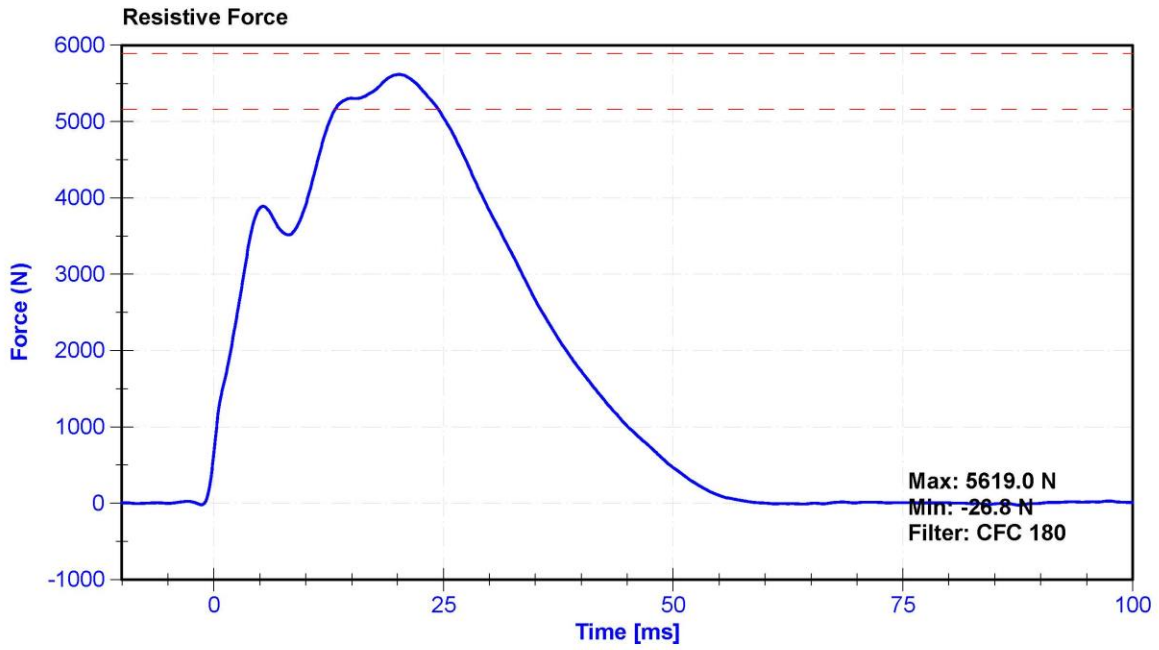
**Results**

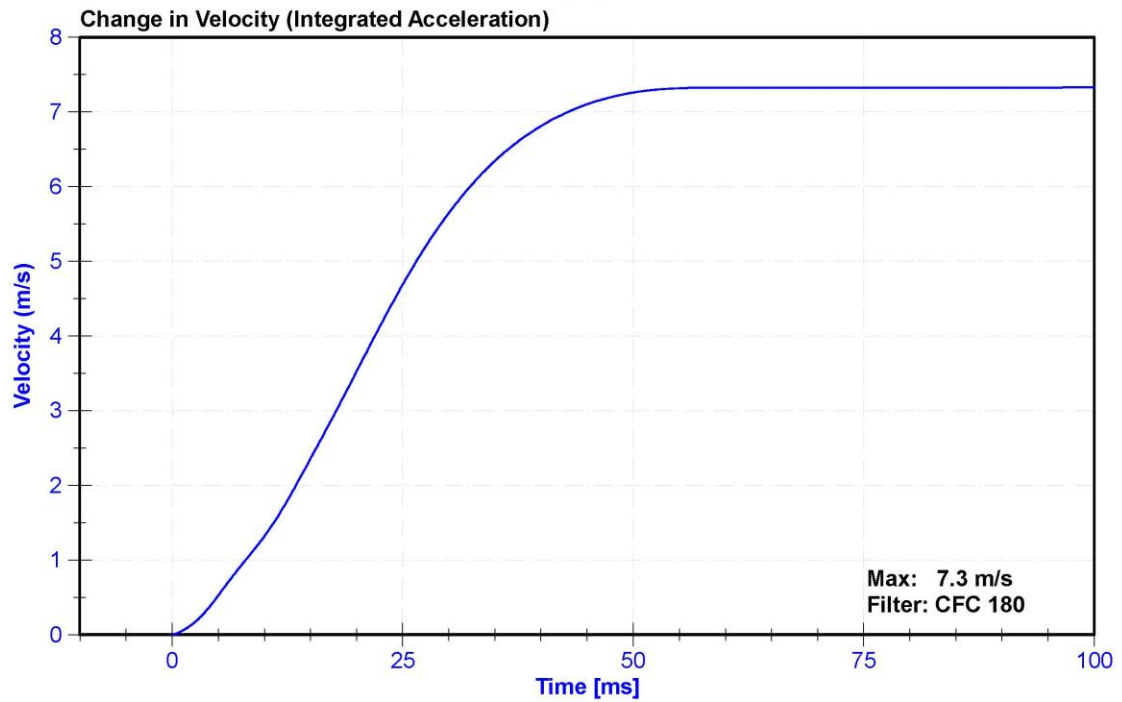
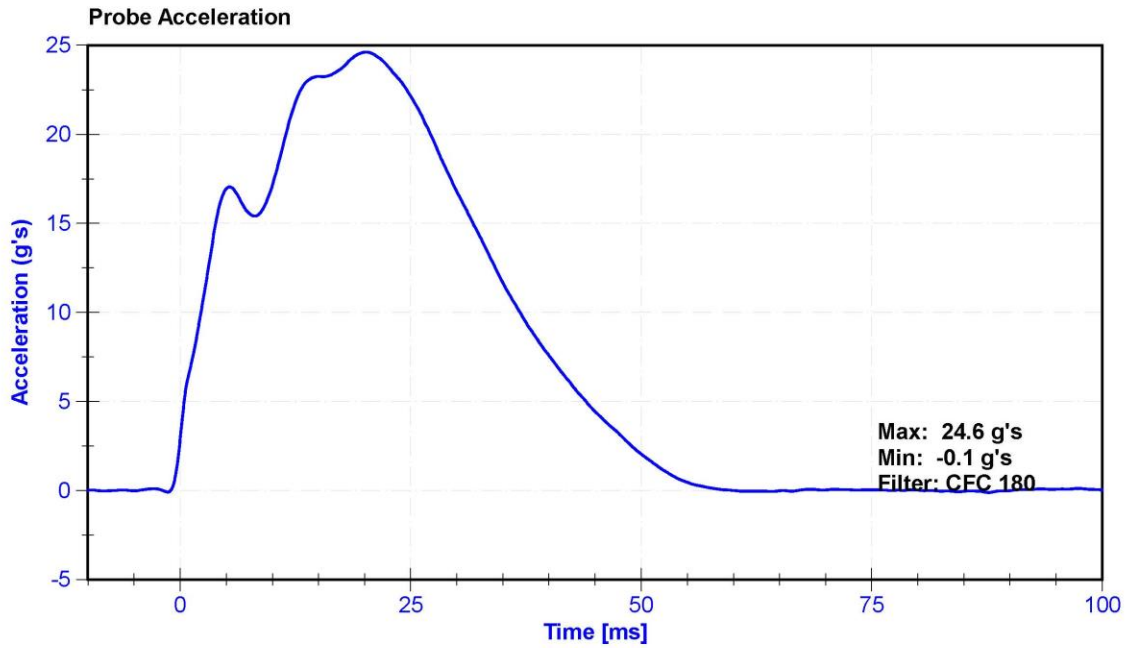
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	46.6	Pass
Velocity	6.59	6.83	m/s	6.597	Pass
Chest Displacement	-72.6	-63.5	mm	-70.05	Pass
Resistive Force	5160	5894	N	5619.0	Pass
Hysteresis	65	85	%	69.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020
Chest Potentiometer	Servo 6209-2038	DS-142	3/27/2020	9/25/2020









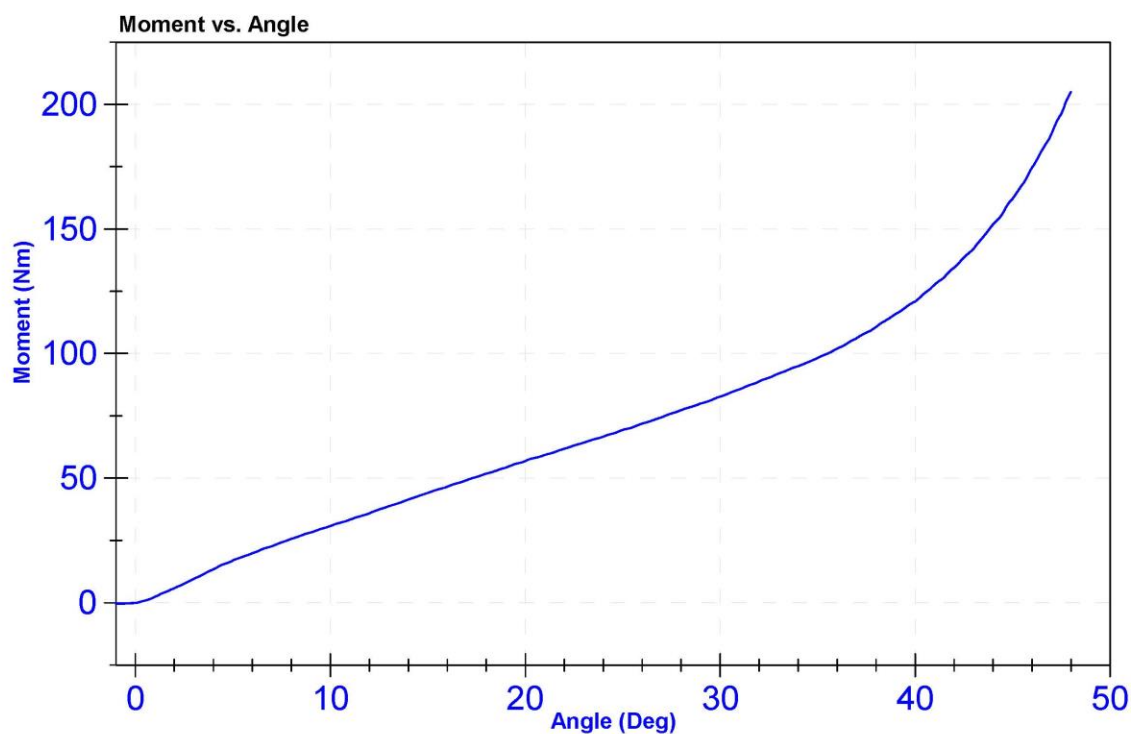
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.4	Pass
Humidity	10	70	%	29.2	Pass
Average Velocity	5	10	deg/s	7.0	Pass
Angle at 203Nm	40	50	deg	47.9	Pass
Moment at 30 degrees	0	94.9	Nm	82.8	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/18/2019	9/17/2020
Load Cell	Key Trans 2301-02	LC-115 My	9/12/2019	9/11/2020



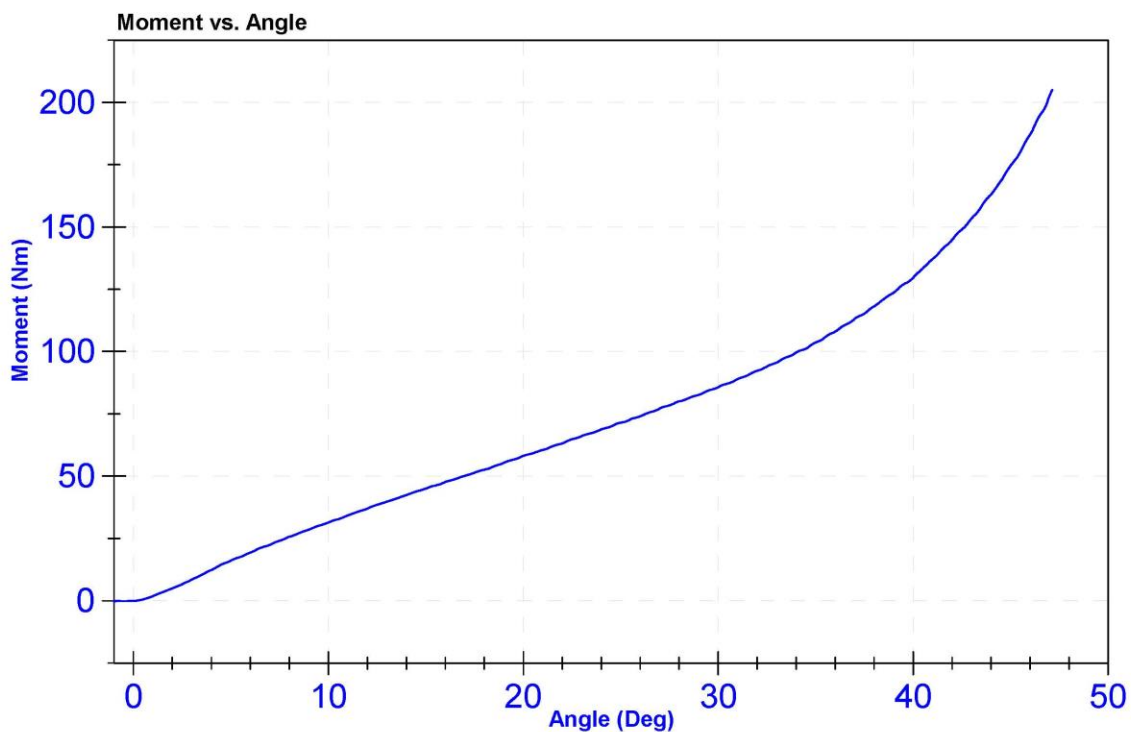
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.4	Pass
Humidity	10	70	%	29.2	Pass
Average Velocity	5	10	deg/s	7.0	Pass
Angle at 203Nm	40	50	deg	47.0	Pass
Moment at 30 degrees	0	94.9	Nm	85.7	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	ETI SP22	DS-0008	9/18/2019	9/17/2020
Load Cell	Key Trans 2301-02	LC-115 My	9/12/2019	9/11/2020



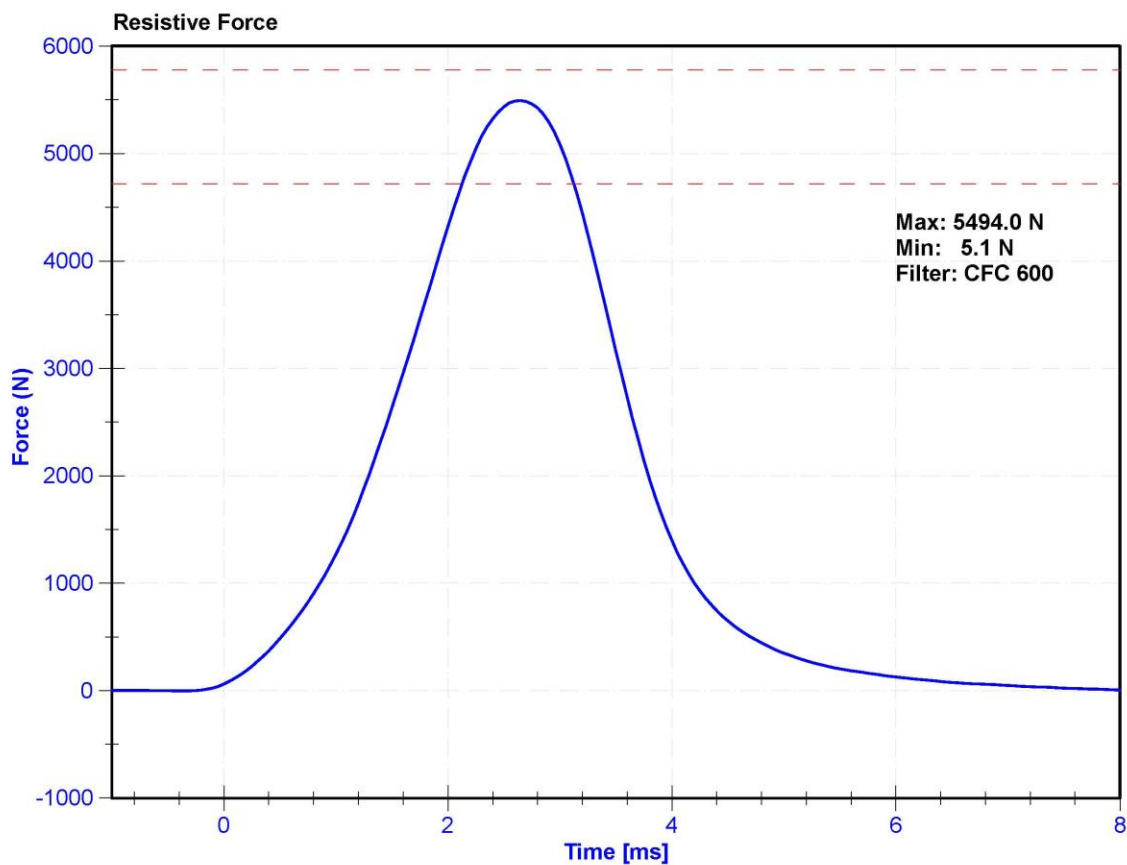
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

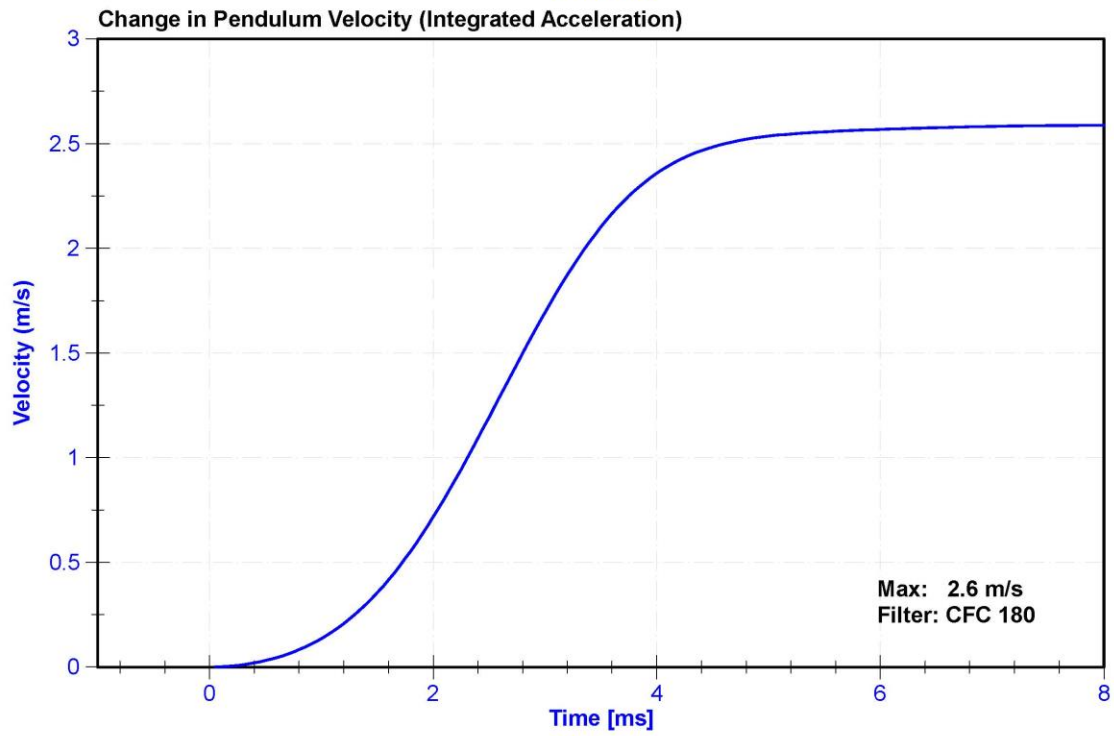
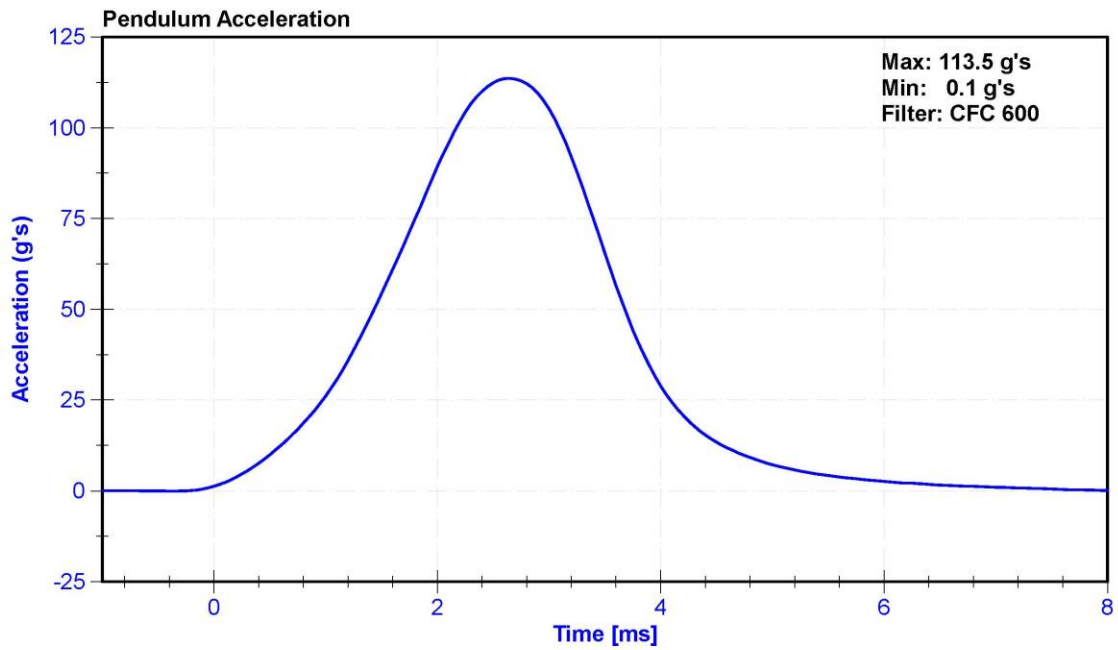
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.2	Pass
Humidity	10	70	%	31.3	Pass
Velocity	2.07	2.13	m/s	2.081	Pass
Maximum Resistive Force	4720	5780	N	5494.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020







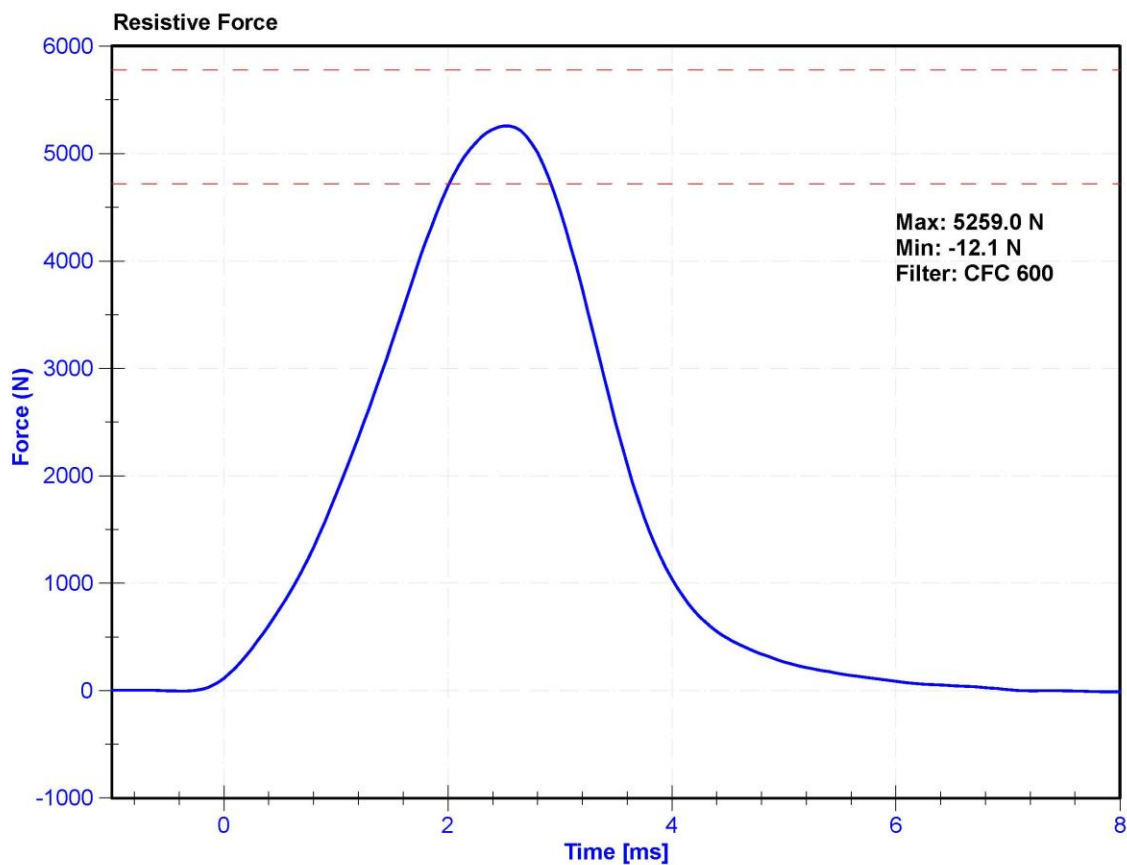
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	142	Laboratory Supervisor	K. Brogan

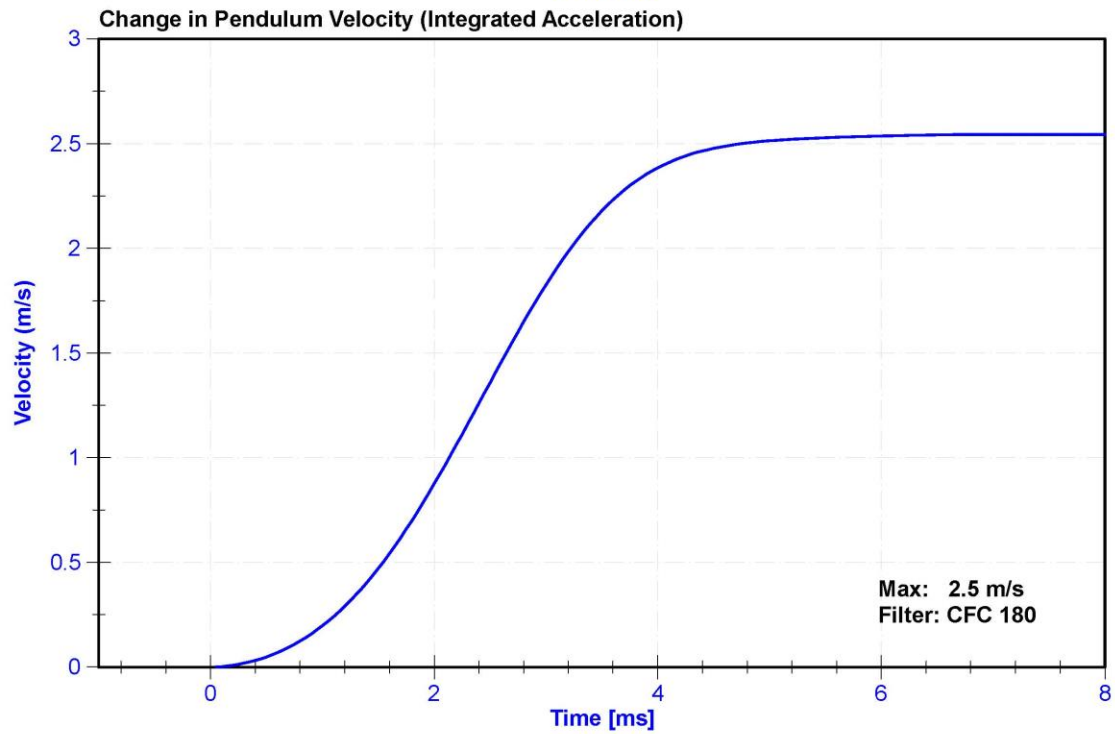
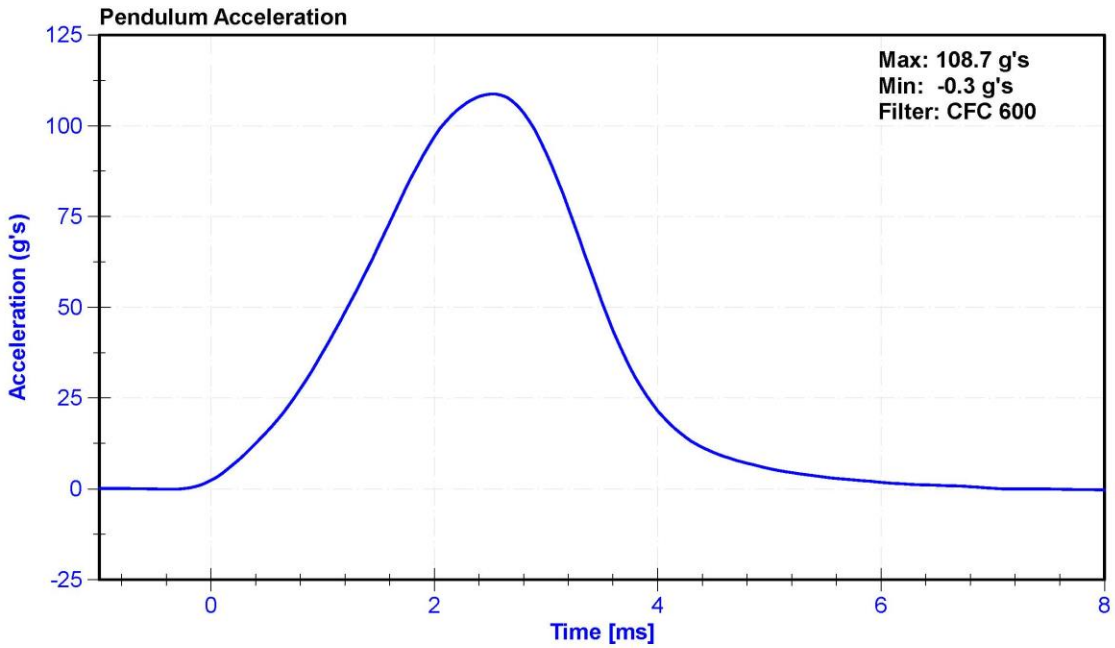
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.1	Pass
Humidity	10	70	%	31.3	Pass
Velocity	2.07	2.13	m/s	2.078	Pass
Maximum Resistive Force	4720	5780	N	5259.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020





**CALIBRATION TEST RESULTS**

**POST-TEST**

**HYBRID III 5<sup>TH</sup> PERCENTILE FEMALE - PASSENGER ATD**

**SERIAL NO: 140**

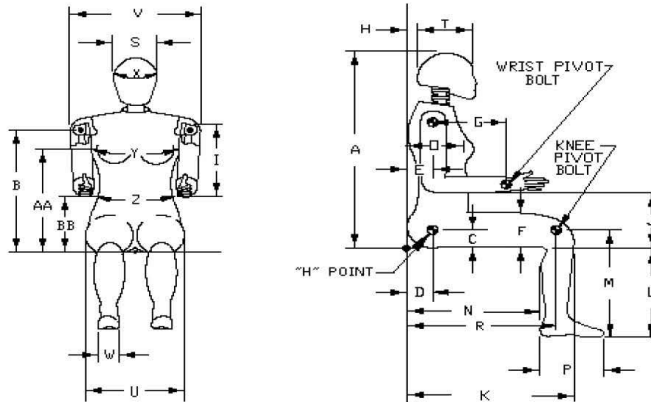


External Measurements - Hybrid 3 - 5th Female

Technician: K. Brogan

Date: 04/09/2020

Dummy Serial Number: 140



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	775	800	791	Pass
B	Shoulder Pivot Height	432	457	442	Pass
C	H-Point Height	81	86	83	Pass
D	H-Point from Backline	145	150	146	Pass
E	Shoulder Pivot from Backline	69	84	77	Pass
F	Thigh Clearance	119	135	126	Pass
G	Back of Elbow to Wrist Pivot	244	259	252	Pass
H	Head Back to Backline	43	48	45	Pass
I	Shoulder to Elbow Length	277	297	291	Pass
J	Elbow Rest Height	183	203	197	Pass
K	Buttock to Knee Length	521	546	539	Pass
L	Popliteal Height	356	376	366	Pass
M	Knee Pivot Height	394	419	409	Pass
N	Buttock Popliteal Length	414	439	428	Pass
O	Chest Depth without Jacket	175	191	182	Pass
P	Foot Length (right)	219	234	229	Pass
R	Buttock To Knee Pivot Length	457	483	465	Pass
S	Head Breadth	137	147	142	Pass
T	Head Depth	178	188	180	Pass
U	Hip Breadth	300	315	313	Pass
V	Shoulder Breadth	351	366	361	Pass
W	Foot Breadth	79	94	83	Pass
X	Head Circumference	528	549	540	Pass
Y	Chest Circumference with Jacket	851	881	874	Pass
Z	Waist Circumference	460	790	624	Pass
AA	Reference Location (Chest Circumference)	333	358	345	Pass
BB	Reference Location (Waist Circumference)	160	170	165	Pass



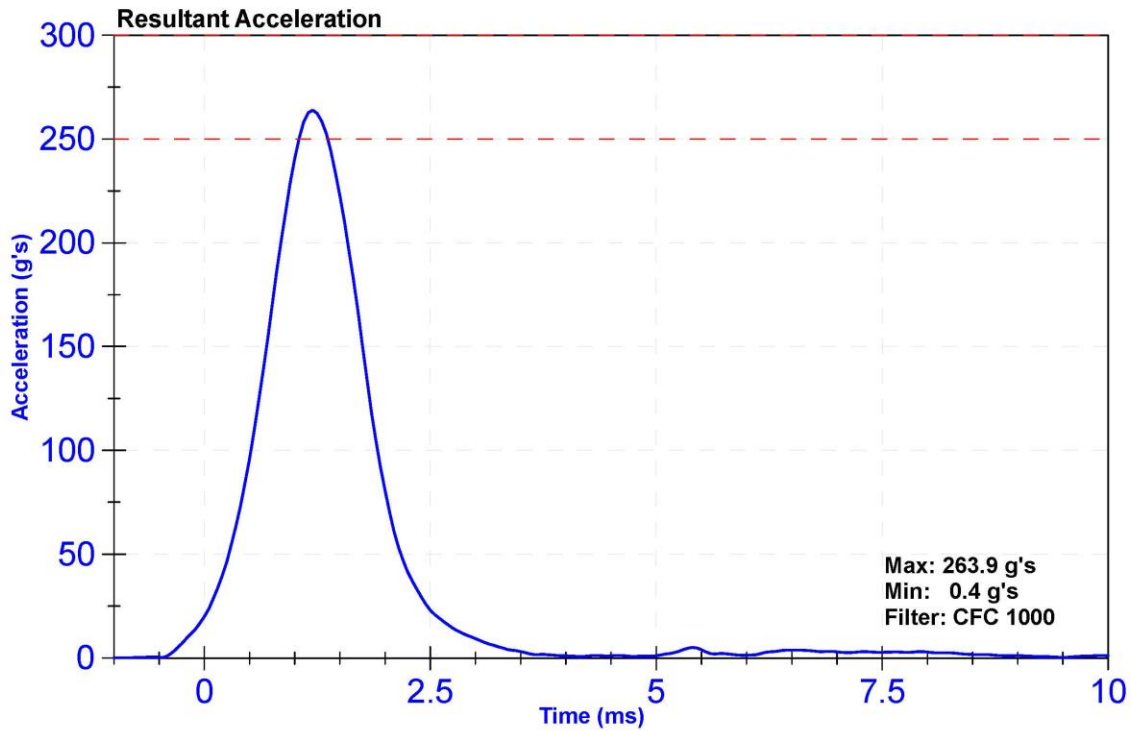
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

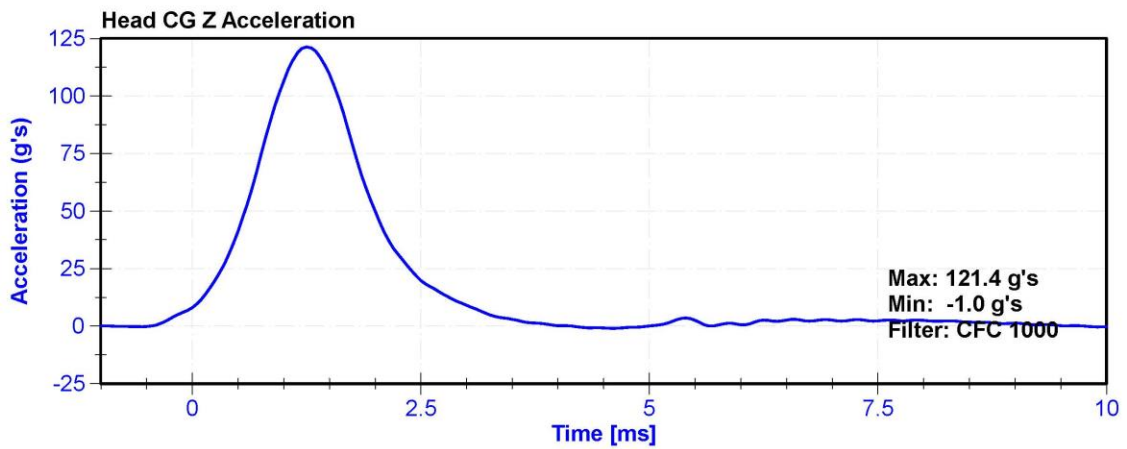
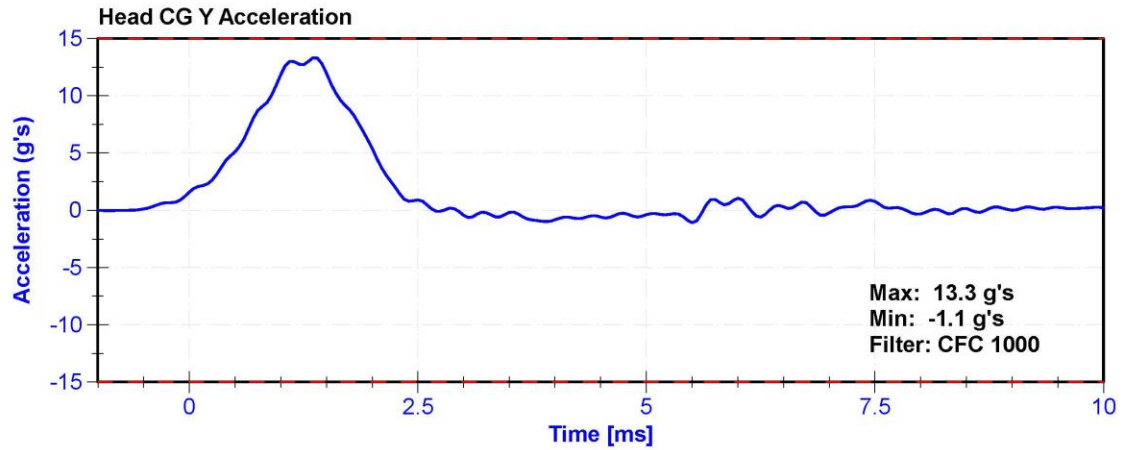
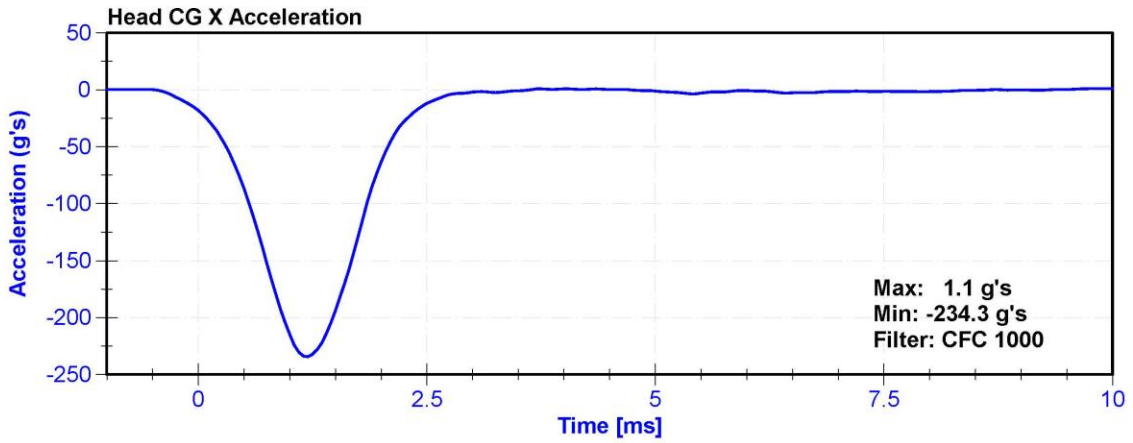
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	21.7	Pass
Humidity	10	70	%	37.9	Pass
Resultant Acceleration	250	300	g's	263.9	Pass
Oscillation	0	10	%	1.9	Pass
Lateral Acceleration	-15	15	g's	13.3	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P51945	10/21/2019	4/20/2020
Y Accelerometer	ENDEVCO 7264CT	AC-P51974	10/21/2019	4/20/2020
Z Accelerometer	ENDEVCO 7264CT	AC-P51946	10/21/2019	4/20/2020





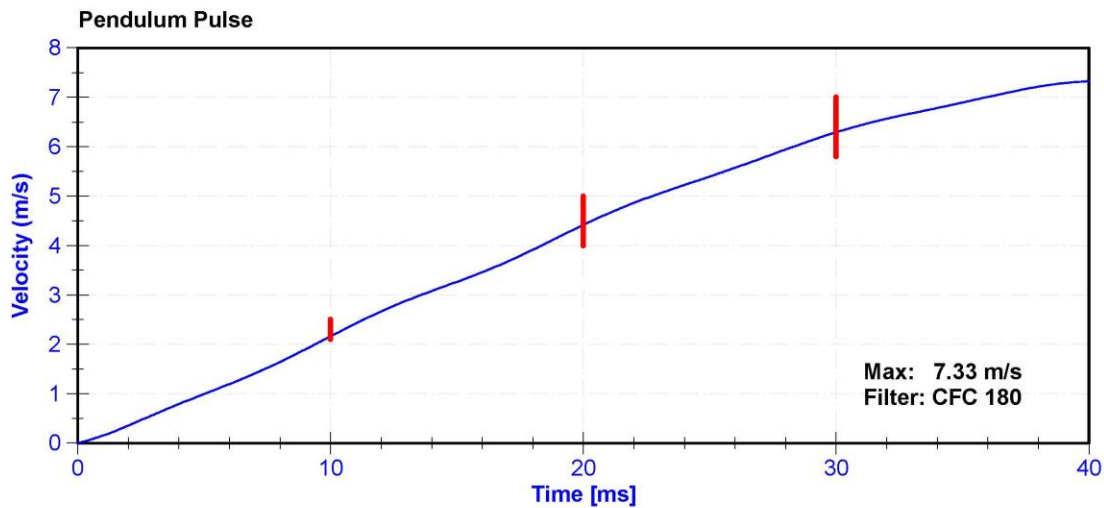
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

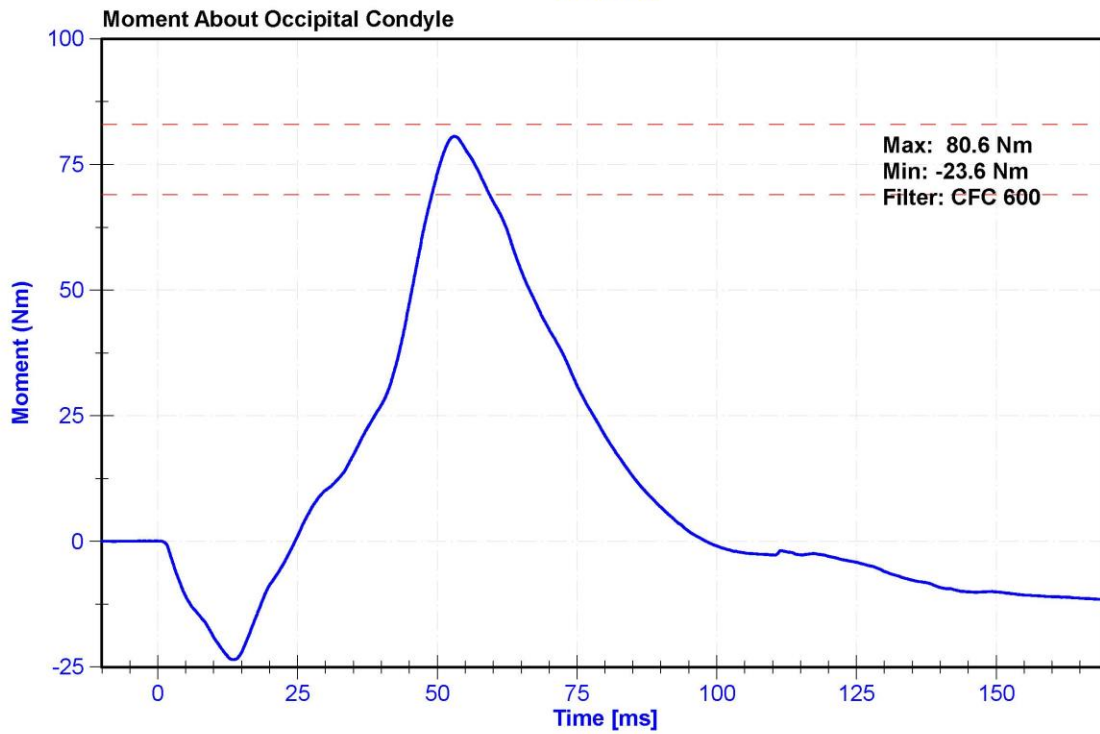
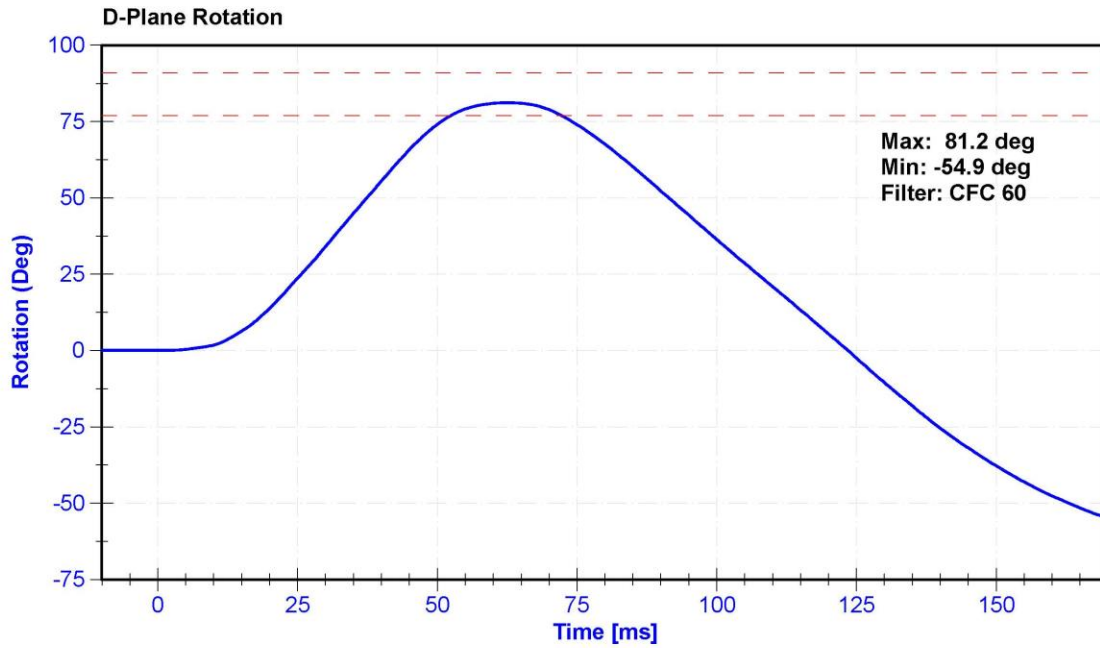
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	36.1	Pass
Velocity	6.89	7.13	m/s	7.013	Pass
Pendulum Impulse at 10ms	2.1	2.5	m/s	2.16	Pass
Pendulum Impulse at 20ms	4.0	5.0	m/s	4.42	Pass
Pendulum Impulse at 30ms	5.8	7.0	m/s	6.29	Pass
Max D Plane Rotation	77	91	deg	81.2	Pass
Max Moment During Rotation Interval	69	83	Nm	80.6	Pass
Moment Decay to 10.0 Nm	80	100	ms	87.2	Pass

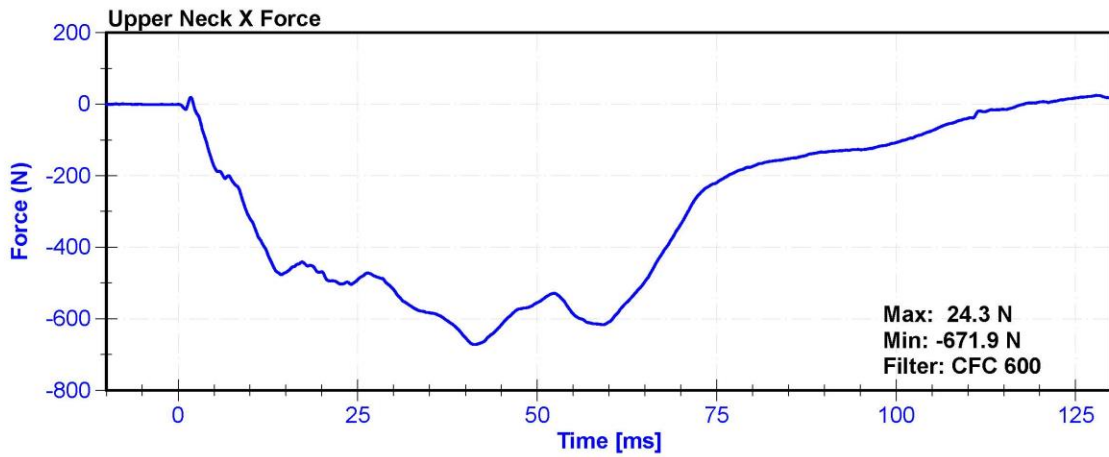
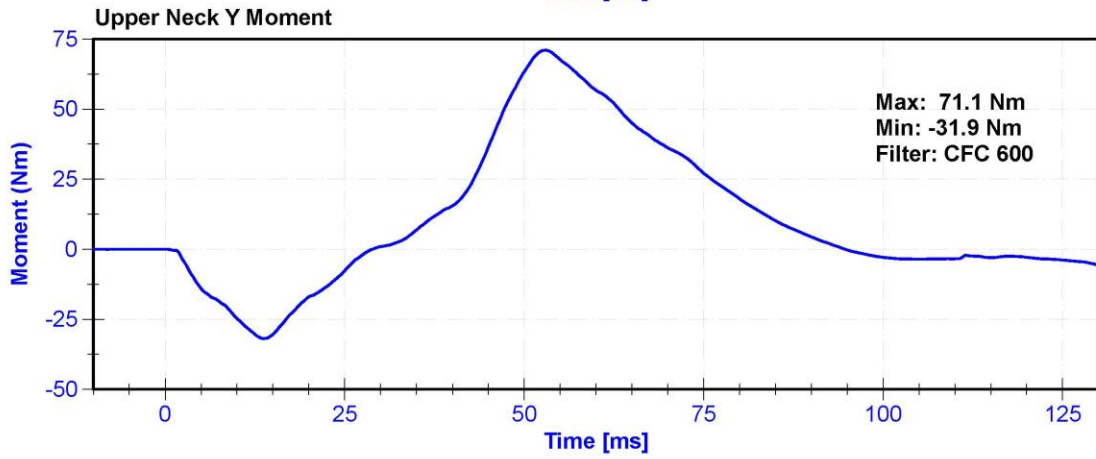
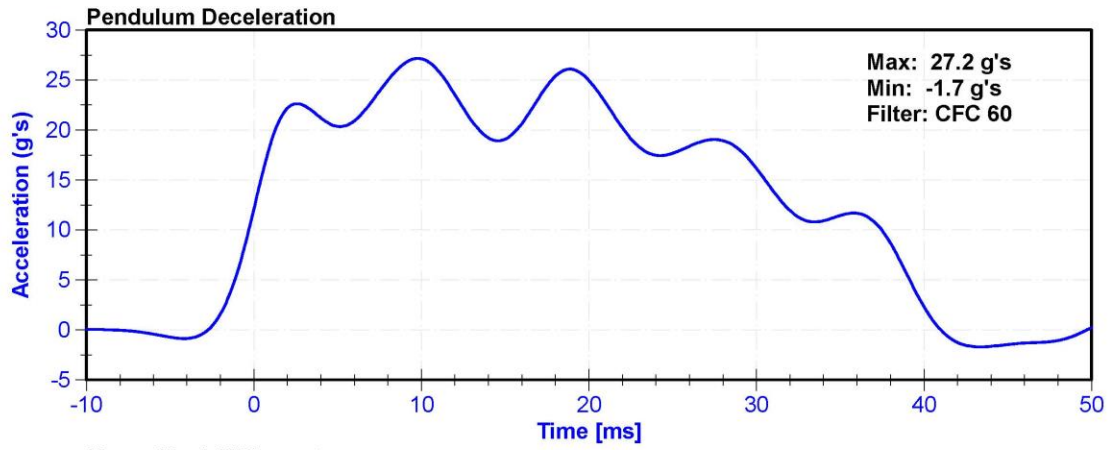
**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton 1716	LC-1872 FX	10/5/2019	10/4/2020









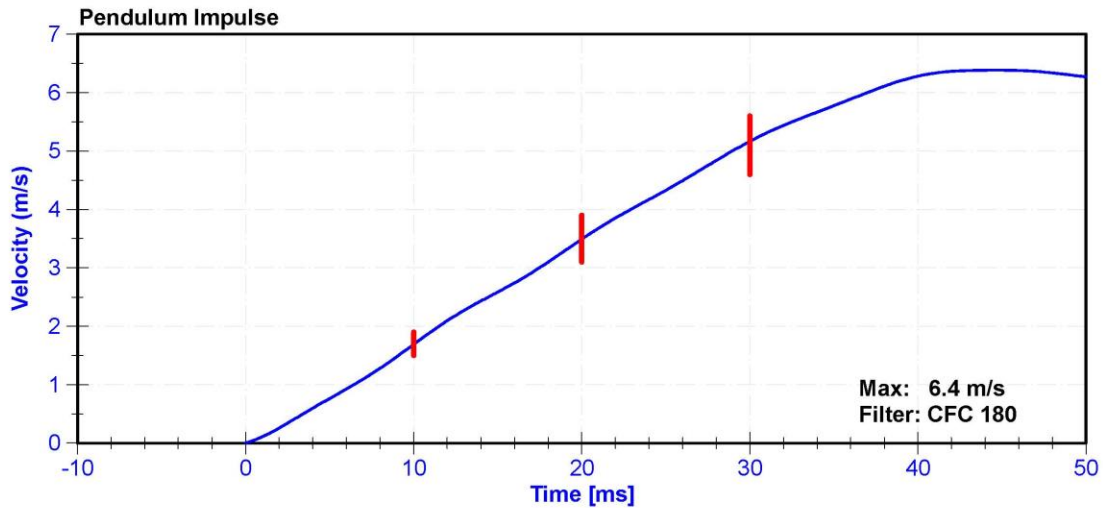
ATD Manufacturer	Humanetics	Test Technician	C. Mantell
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

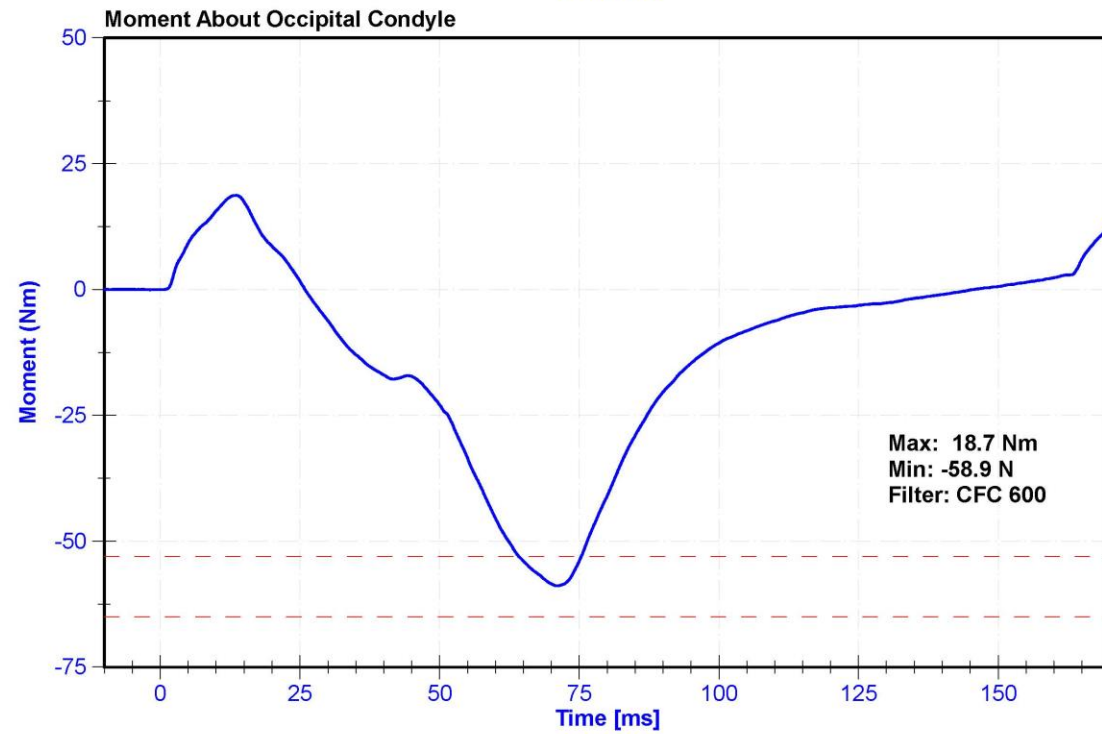
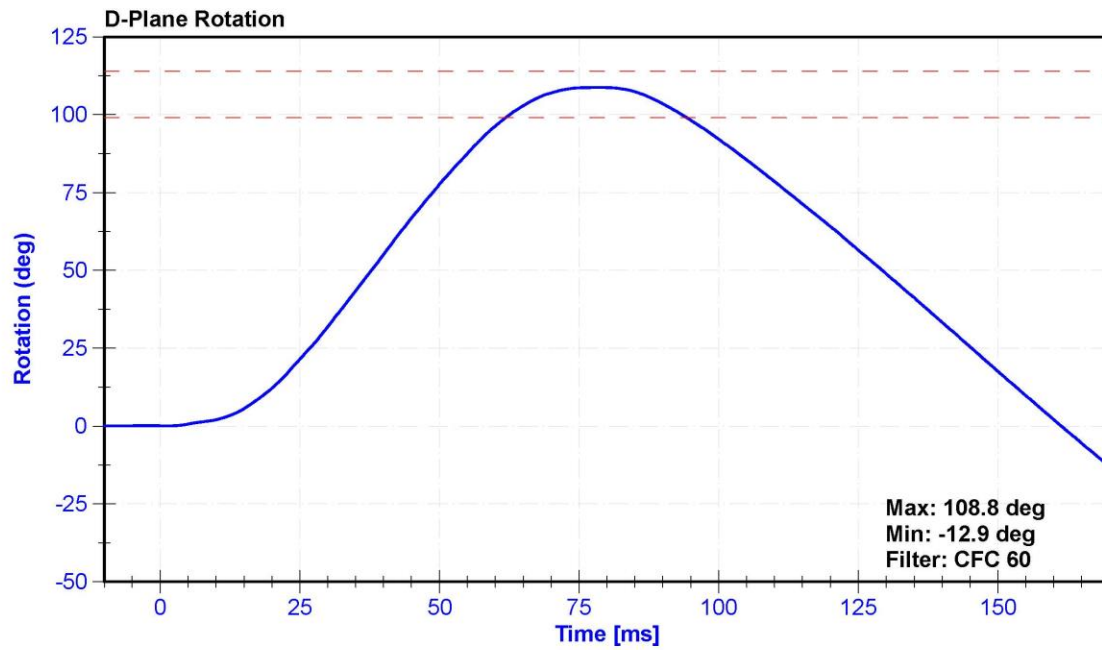
**Results**

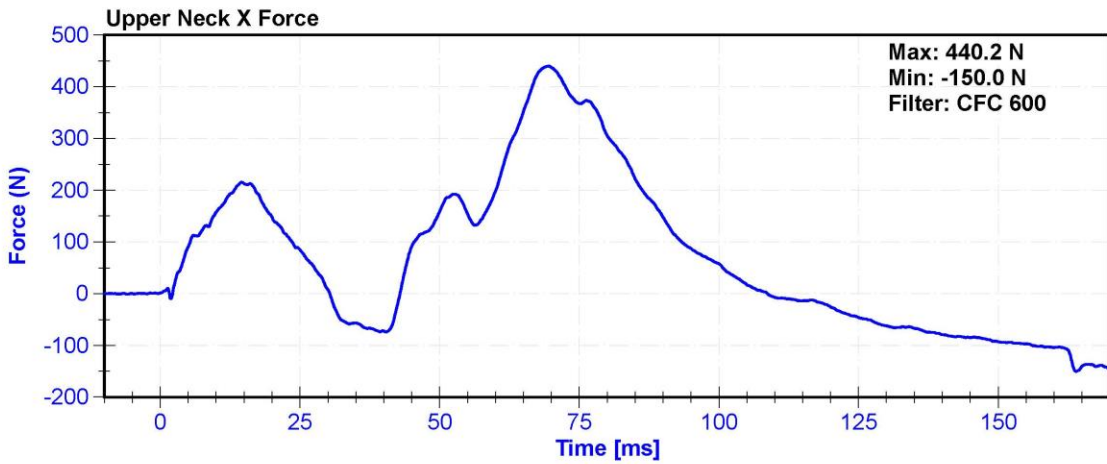
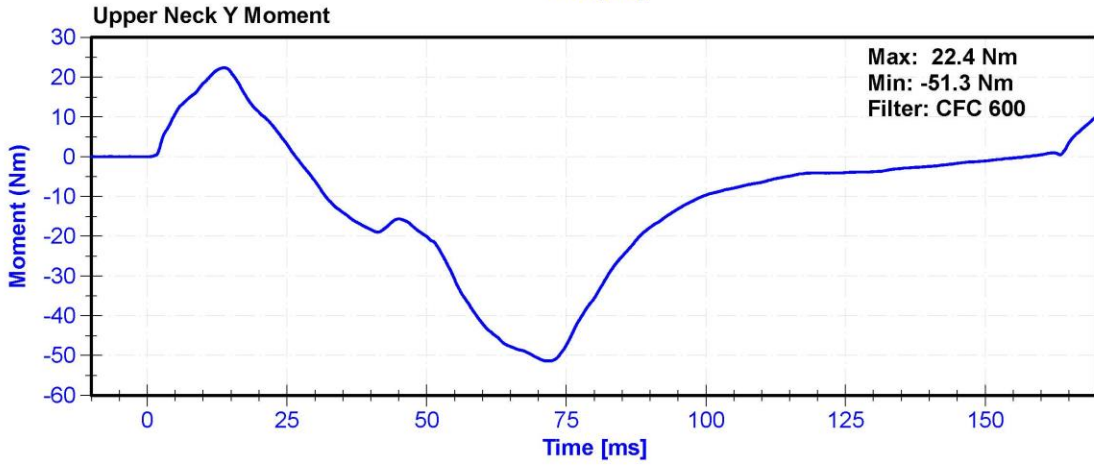
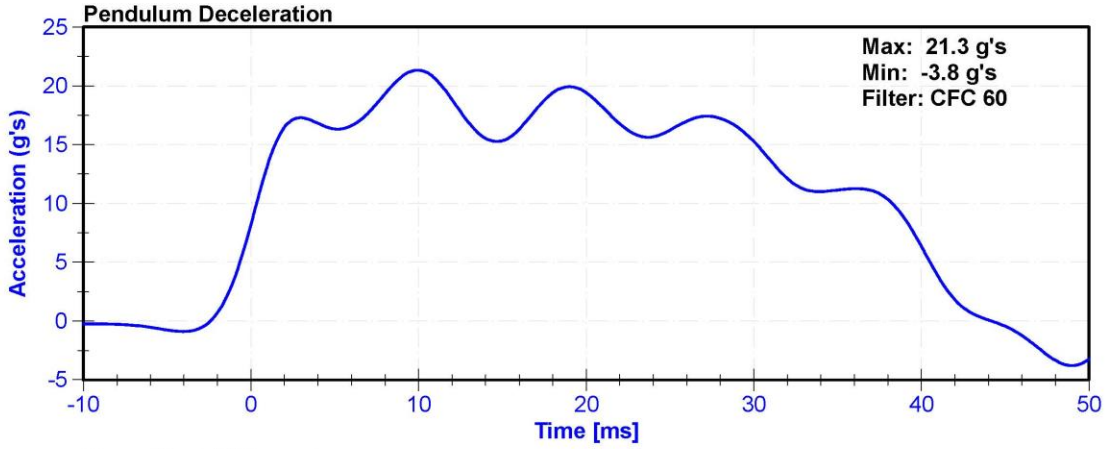
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	17.2	Pass
Velocity	5.95	6.19	m/s	6.088	Pass
Pendulum Impulse at 10ms	1.5	1.9	m/s	1.69	Pass
Pendulum Impulse at 20ms	3.1	3.9	m/s	3.49	Pass
Pendulum Impulse at 30ms	4.6	5.6	m/s	5.17	Pass
D Plane Rotation	99	114	deg	108.8	Pass
Moment During Rotation Interval	-65	-53	Nm	-58.9	Pass
Moment Decay to -10Nm	94	114	ms	101.1	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/6/2020	2/5/2021
Pendulum Potentiometer	ETI SP22G	DS-LABPOT1	9/13/2019	9/12/2020
Condyle Potentiometer	ETI SP22G	DS-LABPOT2	9/13/2019	9/12/2020
Upper Neck Load Cell	Denton 1716	LC-1872 FX	10/5/2019	10/4/2020









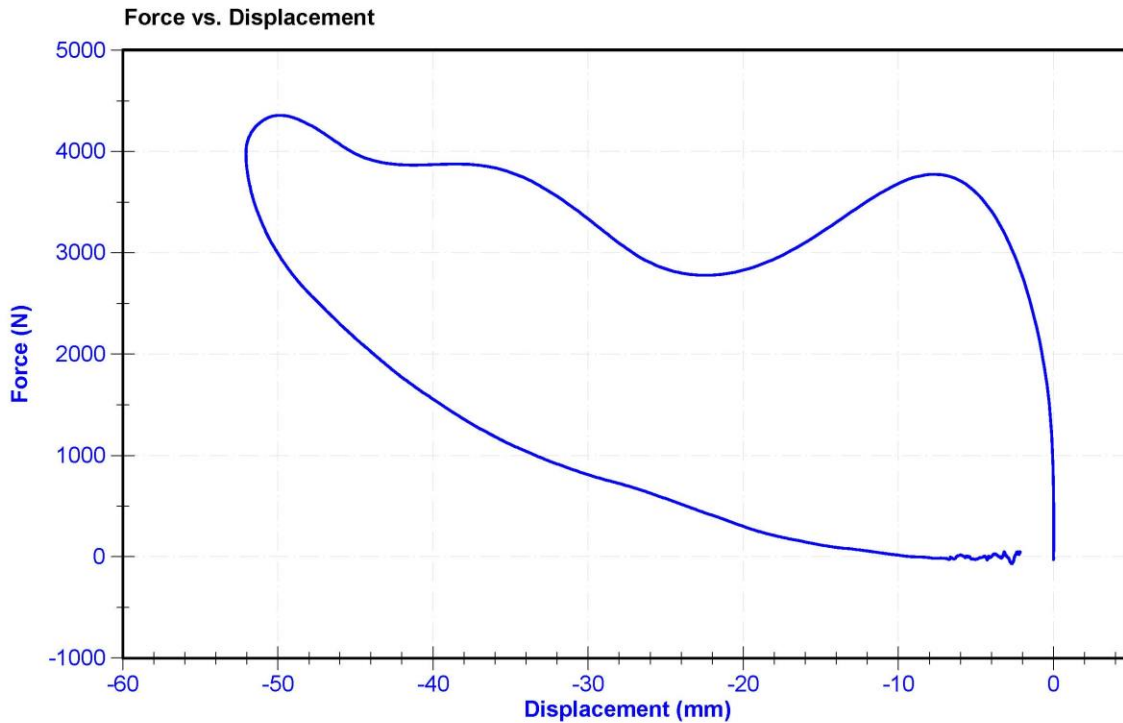
ATD Manufacturer	Humanetics	Test Technician	D.Reinhard
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

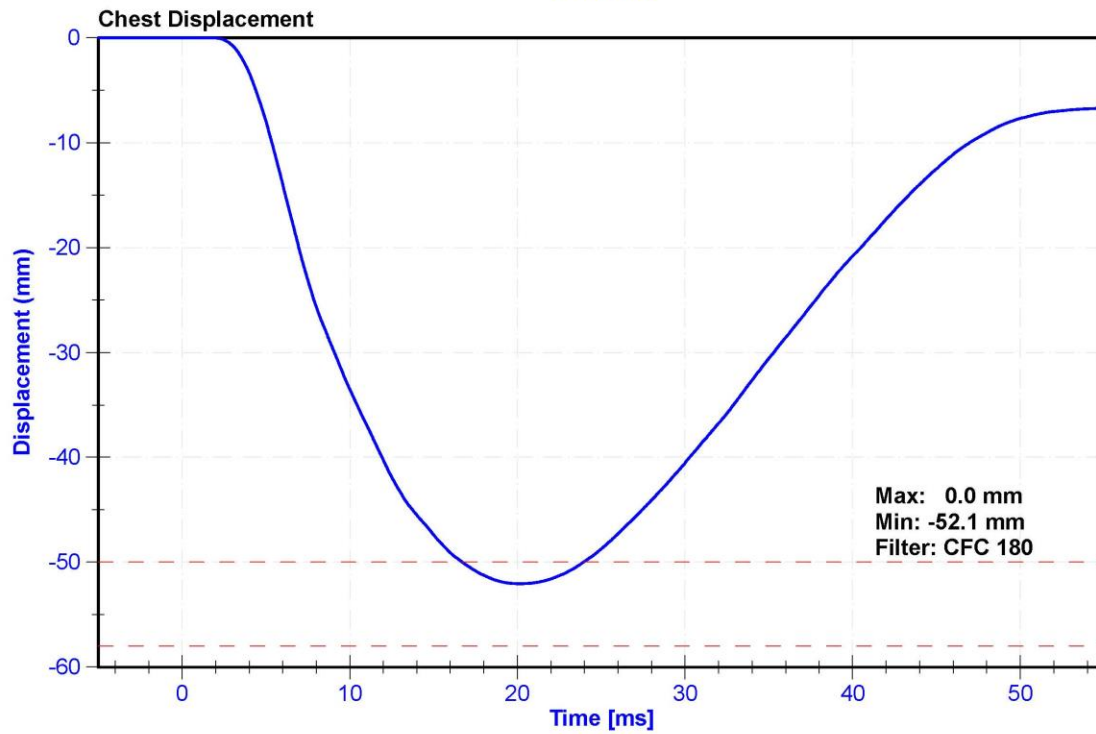
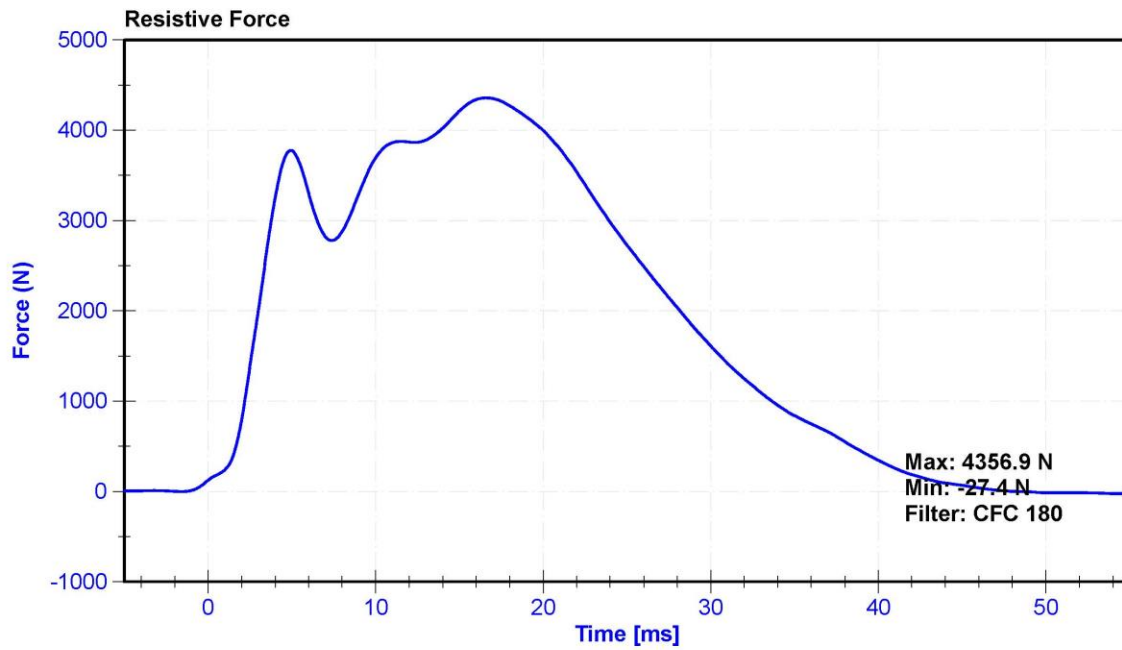
**Results**

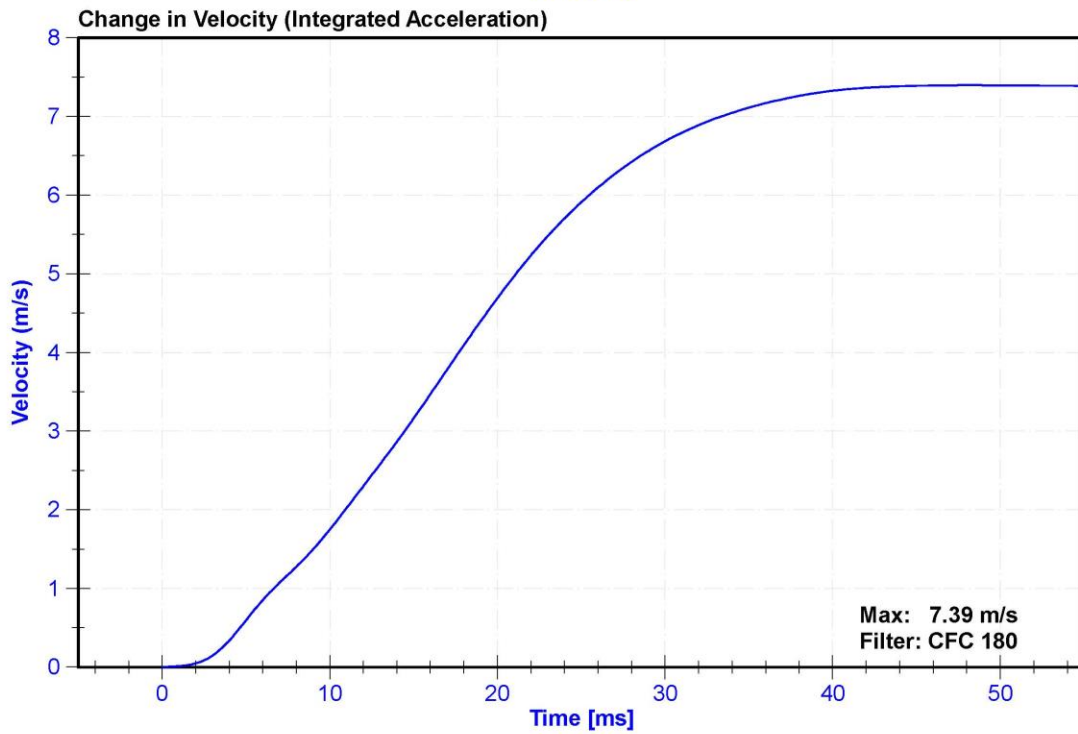
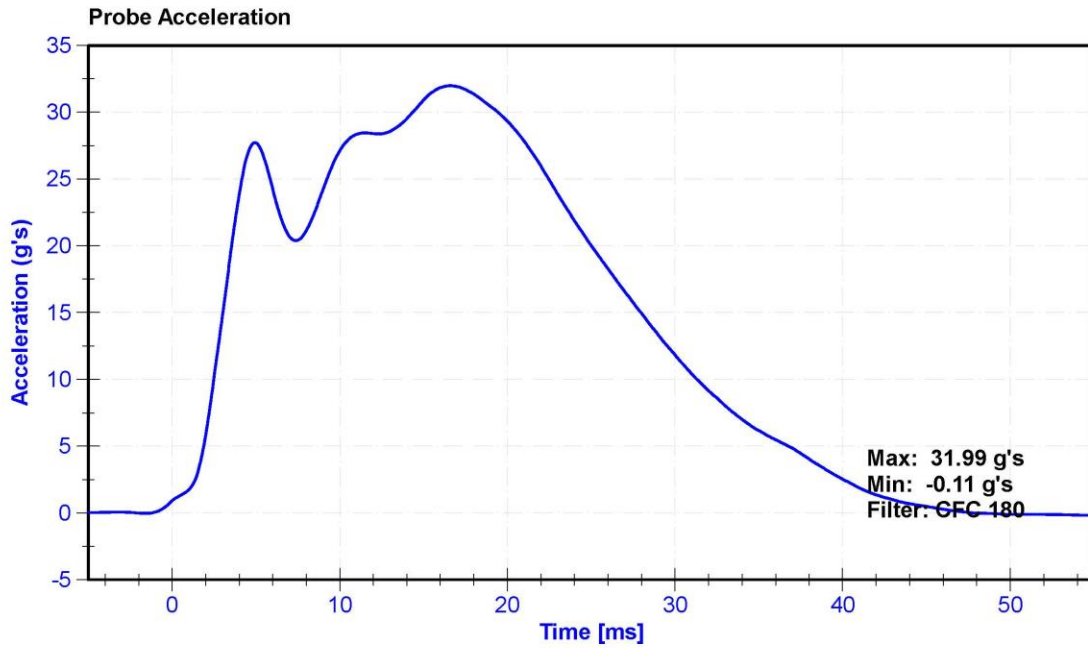
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22	Pass
Humidity	10	70	%	35.7	Pass
Velocity	6.59	6.83	m/s	6.626	Pass
Chest Deflection	-58	-50	mm	-52.1	Pass
Maximum Resistive Force (50 to 58mm)	3900	4400	N	4356.2	Pass
Maximum Resistive Force (18 to 50mm)	0	4600	N	4356.9	Pass
Hysteresis	69	85	%	73.9	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020
Chest Potentiometer	SERVO 14CBI-3615	DS-140GFE	6/21/2019	6/20/2020







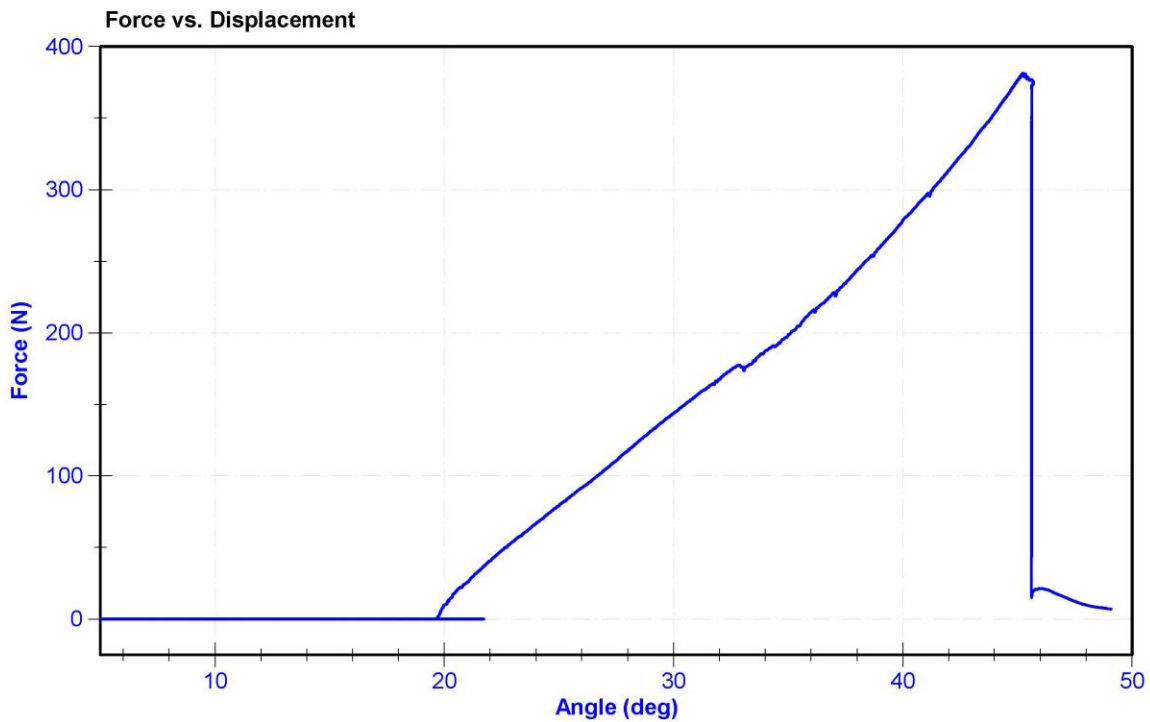
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.6	25.6	°C	20.2	Pass
Humidity	10	70	%	30.2	Pass
Initial Angle	0	20	deg	19.6	Pass
Force at 45 Degrees	320	390	N	381.5	Pass
Return Angle Relative to Initial	0	8	deg	1.0	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Potentiometer	Rieker N4C-1	DS-13051548	12/9/2019	12/8/2020
Load Cell	Interface SML-200	LC-493319	1/10/2020	1/9/2021





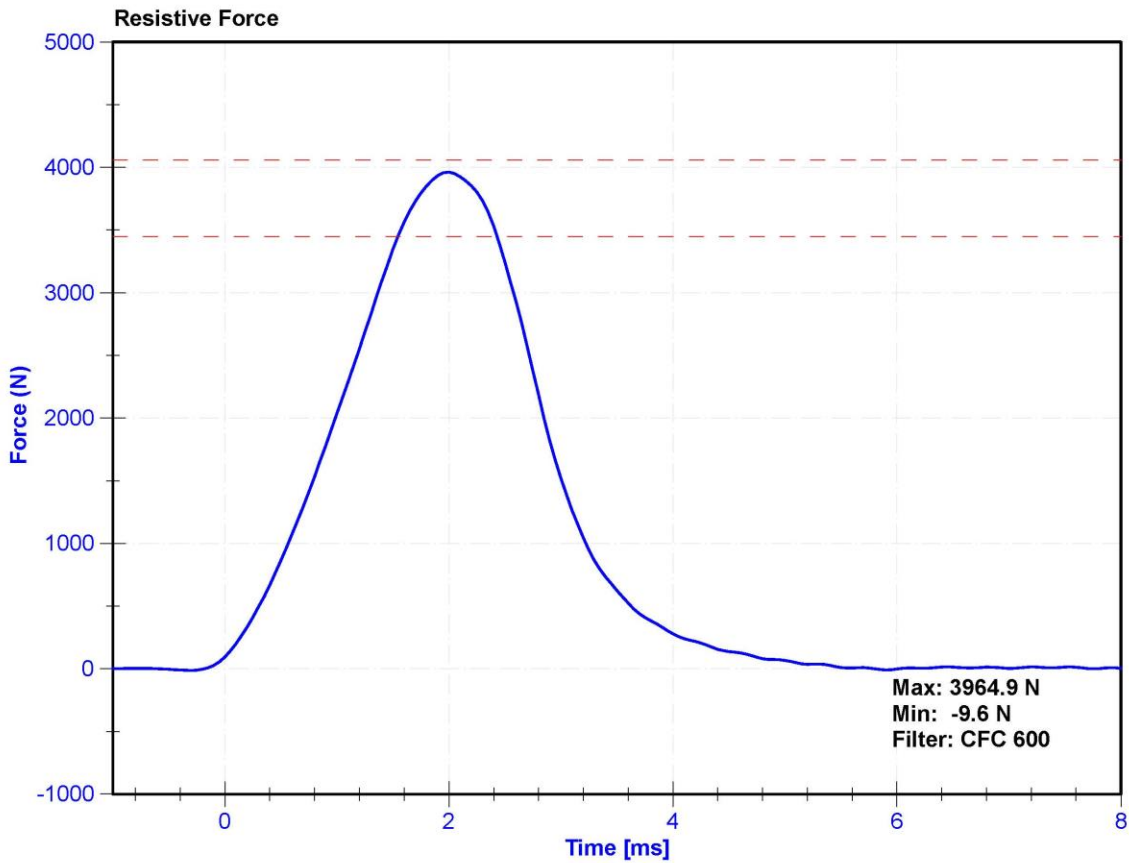
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

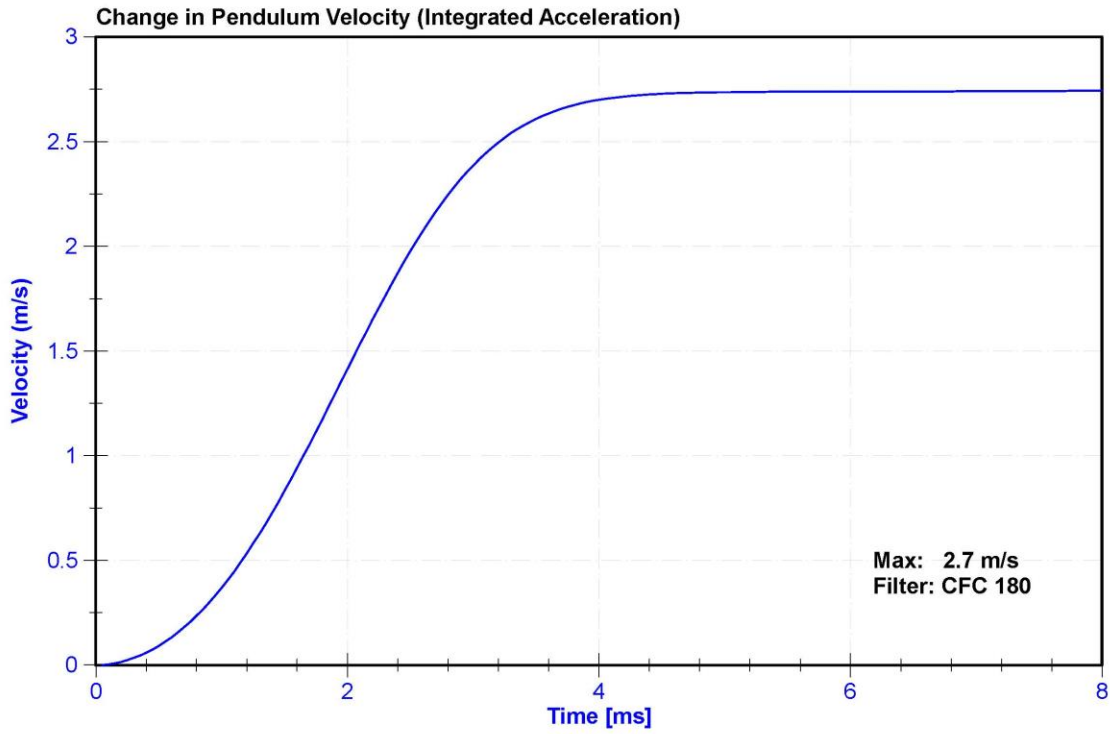
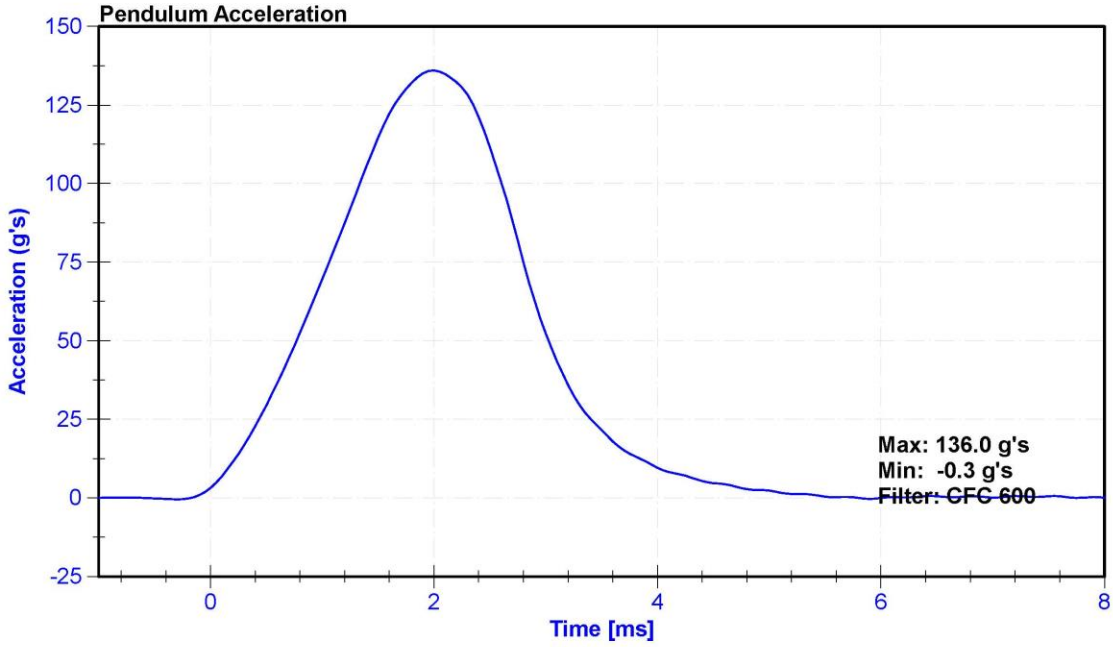
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.3	Pass
Humidity	10	70	%	37.6	Pass
Velocity	2.07	2.13	m/s	2.123	Pass
Resistive Force	3450	4060	N	3964.9	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020





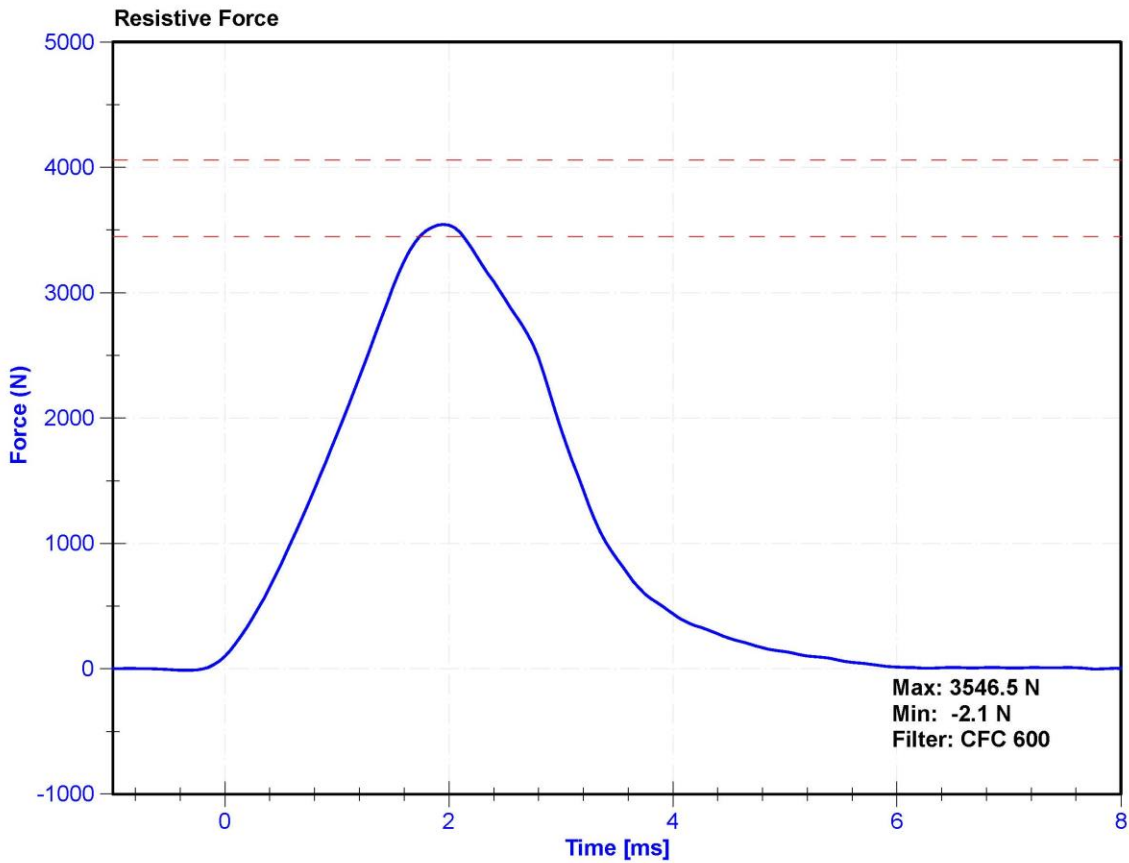
ATD Manufacturer	Humanetics	Test Technician	M. Dudek
ATD Serial Number	140	Laboratory Supervisor	K. Brogan

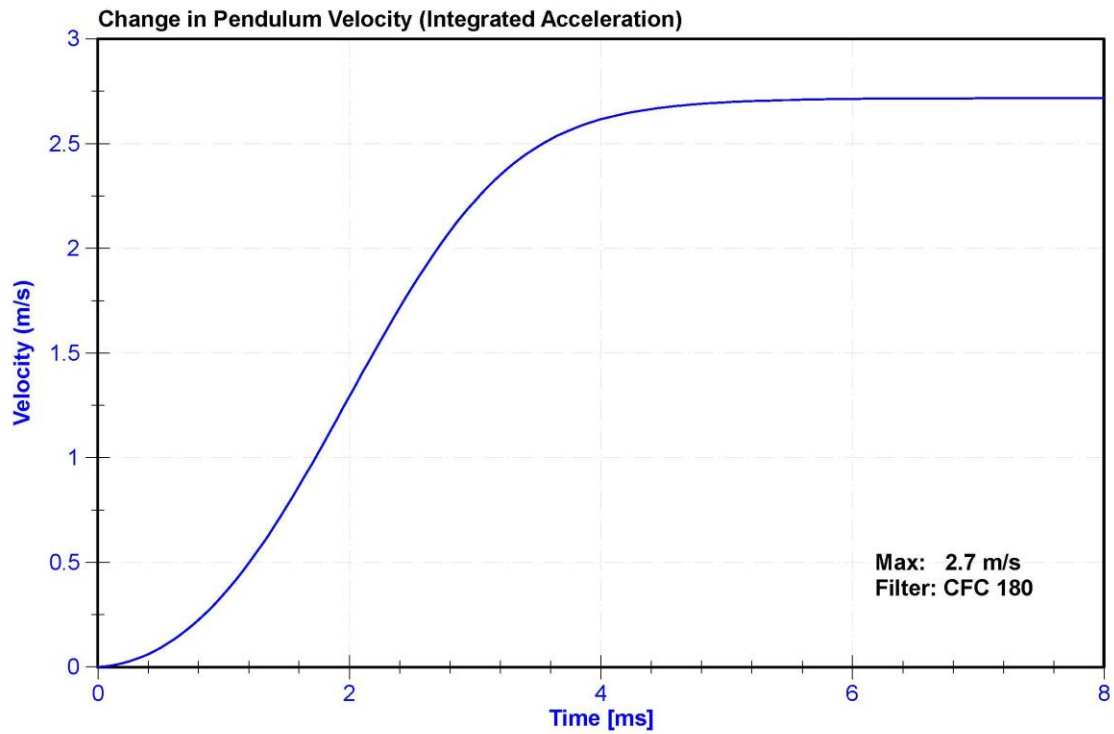
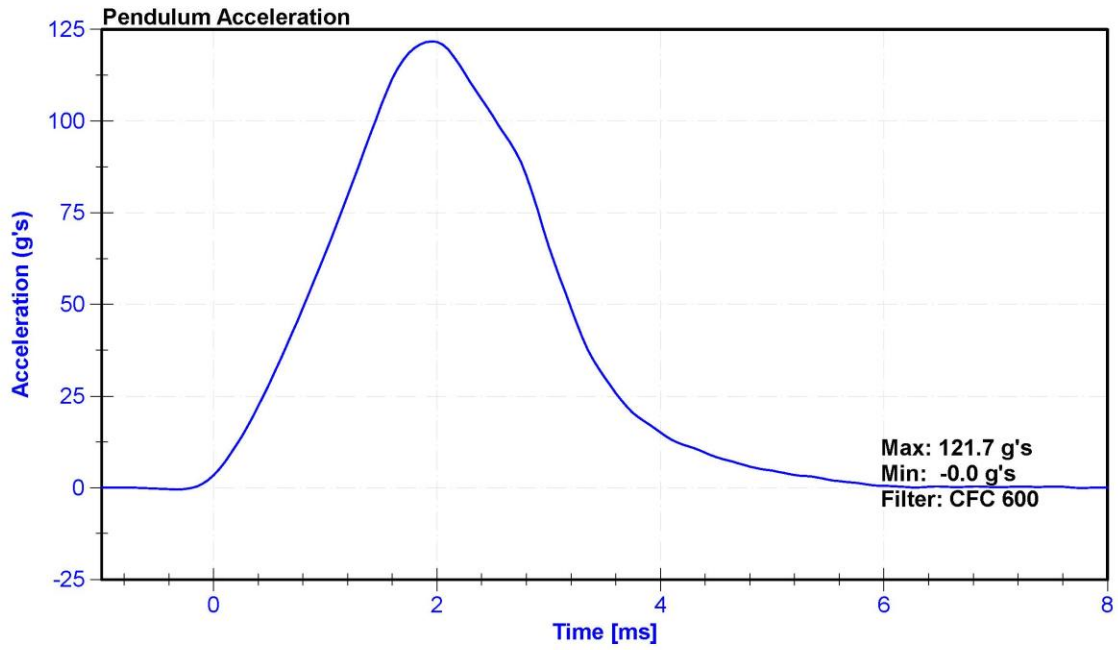
**Results**

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	18.9	25.6	°C	20.3	Pass
Humidity	10	70	%	37.6	Pass
Velocity	2.07	2.13	m/s	2.126	Pass
Resistive Force	3450	4060	N	3546.5	Pass

**Transducer Calibrations**

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A260568	1/29/2020	7/29/2020







## APPENDIX D

### DUMMY CALIBRATION AND PERFORMANCE VERIFICATION DATA

**Table 1 – Driver Dummy Instrumentation**

Instrumentation		Axis/Location	Hybrid III 50 <sup>th</sup> S/N: 142		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	P51681	ENDEVCO	2/10/2020
		Y	P64151	ENDEVCO	2/10/2020
		Z	P52114	ENDEVCO	2/10/2020
	Redundant	X	P58833	ENDEVCO	2/10/2020
		Y	P58905	ENDEVCO	2/10/2020
		Z	P63996	ENDEVCO	2/10/2020
Head Angular Rate Sensors		X	ARS-5941 GFE	DTS ARS	7/8/2019
		Y	ARS-6014 GFE	DTS ARS	7/8/2019
		Z	ARS-5990	DTS ARS	7/8/2019
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	LC-280FxGFE	Denton	10/3/2019
Chest Accelerometers	Primary	X	AC-P51994	ENDEVCO	2/17/2020
		Y	AC-P51991	ENDEVCO	2/17/2020
		Z	AC-P49185	ENDEVCO	2/17/2020
	Redundant	X	AC-P51713	ENDEVCO	2/17/2020
		Y	AC-P68059	ENDEVCO	2/17/2020
		Z	AC-P78824	ENDEVCO	2/17/2020
Chest Potentiometer		X	DS-142	Servo	3/27/2020
Pelvis Accelerometer		X	AC-P58800	ENDEVCO	2/17/2020
		Y	AC-P52157	ENDEVCO	2/17/2020
		Z	AC-P52156	ENDEVCO	2/17/2020
Femur Load Cells - Left	Primary	Z	LC-115-1 Fz	Denton	10/3/2019
	Redundant	Z	LC-115-2 Fz	Denton	10/3/2019
Femur Load Cells - Right	Primary	Z	LC-DI4210FZ1	Denton	10/3/2019
	Redundant	Z	LC-DI4210FZ2	Denton	10/3/2019
Tibia Load Cells - Left	Upper	MX, MY, FZ	LC-404Fx	Denton	9/25/2019
	Lower	MX, MY, FZ	LC-396Fz	Denton	9/25/2019
Tibia Load Cells – Right	Upper	MX, MY, FZ	LC-364Fz	Denton	10/3/2019
	Lower	MX, MY, FZ	36440364 FZ	Denton	9/25/2019
Foot Accelerometers - Left	Rear	X	AC-P50084	ENDEVCO	2/17/2020
	Front	Z	AC-P58779	ENDEVCO	2/17/2020
Foot Accelerometers - Right	Rear	X	AC-P51872	ENDEVCO	2/17/2020
	Front	Z	AC-P58893	ENDEVCO	2/17/2020
Seat belt Load Cells	Lap		LC-278	FTSS IF-964	11/2/2019
	Shoulder		LC-290	FTSS IF-964	11/2/2019

**Table 2 – Front Passenger Dummy Instrumentation**

Instrumentation		Axis/Location	Hybrid III 5 <sup>th</sup> S/N: 140		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	AC-P51945	ENDEVCO	10/21/2019
		Y	AC-P51974	ENDEVCO	10/21/2019
		Z	AC-P51946	ENDEVCO	10/21/2019
	Redundant	X	AC-P49200	ENDEVCO	10/21/2019
		Y	AC-P51950	ENDEVCO	10/21/2019
		Z	AC-P49440	ENDEVCO	10/21/2019
Head Angular Rate Sensors		X	ARS-6731	DTS ARS	7/8/2019
		Y	ARS-4718 GFE	DTS ARS	7/8/2019
		Z	ARS-7589	DTS ARS	7/8/2019
Upper Neck Load Cell		FX, Fy, Fz MX,MY, MZ	LC-1872 FX	Denton	10/5/2019
Chest Accelerometers	Primary	X	AC-P59019	ENDEVCO	3/3/2020
		Y	AC-P51965	ENDEVCO	3/3/2020
		Z	AC-P58981	ENDEVCO	3/3/2020
	Redundant	X	AC-P64000	ENDEVCO	3/3/2020
		Y	AC-P51970	ENDEVCO	3/3/2020
		Z	AC-P51689	ENDEVCO	3/3/2020
Chest Potentiometer		X	DS-140GFE	SERVO	6/21/2019
Pelvis Accelerometer		X	AC-P58912	ENDEVCO	10/21/2019
		Y	AC-P51220	ENDEVCO	10/21/2019
		Z	AC-P51989	ENDEVCO	10/21/2019
Femur Load Cells - Left	Primary	Z	LC-135Fz1	Denton	10/3/2019
	Redundant	Z	LC-135Fz2	Denton	10/3/2019
Femur Load Cells - Right	Primary	Z	LC-124Fz1	Denton	10/3/2019
	Redundant	Z	LC-124Fz2	Denton	10/3/2019
Tibia Load Cells - Left	Upper	MX, MY, FZ	3643-93 Fz	Denton	10/3/2019
	Lower	MX, MY, FZ	LC-490Fz	Denton	10/3/2019
Tibia Load Cells – Right	Upper	MX, MY, FZ	LC-91Fz	Denton	10/3/2019
	Lower	MX, MY, FZ	LC-398Fz	Denton	10/3/2019
Foot Accelerometers - Left	Rear	X	AC-P64005	ENDEVCO	10/21/2019
	Front	Z	AC-P64006	ENDEVCO	10/21/2019
Foot Accelerometers - Right	Rear	X	AC-P78669	ENDEVCO	10/21/2019
	Front	Z	AC-P52054	ENDEVCO	2/12/2020
Seat belt Load Cells	Lap		LC-174	FTSS IF-964	5/4/2019
	Shoulder		LC-DK1753	FTSS IF-964	5/4/2019

**Table 3 – Vehicle Instrumentation**

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	AC-A262062	MSI 1201-1000	1/13/2020
			Z	A284331	MSI 1201-1000	1/10/2020
		Redundant	X	AC-A280957	MSI 1201-1000	1/10/2020
	Right	Primary	X	A282714	MSI 1201-1000	1/10/2020
			Z	A284907	MSI 1201-1000	3/31/2020
		Redundant	X	A284228	MSI 1201-1000	3/31/2020
Engine Accelerometers	Top		X	AC-A255853	MSI 1201-1000	2/21/2020
	Bottom		X	AC-A255984	MSI 1201-1000	3/25/2020