

REPORT NUMBER: SPNCAP-CAL-20-005

**NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST**

**Hyundai Motor Company
2021 Genesis GV80
5-Door SUV**

NHTSA No: O20214216

**PREPARED BY:
CALSPAN CORPORATION
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June 24, 2021

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NRM-110
1200 NEW JERSEY AVE SE, ROOM W43-410
WASHINGTON, D.C. 20590**

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Date: June 24, 2021

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Date: June 24, 2021

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: _____

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16. Abstract A 32.20 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2021 Genesis GV80 SUV in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 10, 2021. The impact velocity of the vehicle was 32.32 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle was 21°C. The target vehicle's maximum post-test static crush was 364 mm located at level 3. The test vehicle's occupant performance data is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD (SID-IIs) (Serial No. DG8012)</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td></td> <td>1000</td> <td>289.503</td> </tr> <tr> <td>Resultant Lower Spine Acceleration</td> <td>G</td> <td>82</td> <td>40.560</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td>N</td> <td>5525</td> <td>2845.286</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td>mm</td> <td>38</td> <td>19.376</td> </tr> <tr> <td>Maximum Abdomen Rib Deflection</td> <td>mm</td> <td>45</td> <td>22.169</td> </tr> </tbody> </table> The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.						Measurement Description	Driver ATD (SID-IIs) (Serial No. DG8012)			Units	Threshold	Result	Head Injury Criteria (HIC ₃₆)		1000	289.503	Resultant Lower Spine Acceleration	G	82	40.560	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2845.286	Maximum Thoracic Rib Deflection	mm	38	19.376	Maximum Abdomen Rib Deflection	mm	45	22.169
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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 2021 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00352. The purpose of this test is to generate comparative side impact performance in a 2021 Genesis GV80 SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated March 2020.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2021 Genesis GV80 SUV. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.32 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on February 10, 2021. Pre-test and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS Side NCAP Pole Laboratory Test Procedure, dated March 2020. The side impact event was documented by 11 cameras. Camera locations and other pertinent camera information are included on page 3-11 in this report.

The Part 572V (SID-IIs) dummy was instrumented accordingly:

Head CG tri-axial accelerometers

Thorax upper, middle, and lower rib displacement potentiometers

Abdomen upper and lower rib displacement potentiometers

Lower spine tri-axial accelerometers

Iliac load cell

Acetabulum load cell

Appendix B contains the dummy response data. Dummy configuration and performance verification data can be found in Appendix C of this report. Appendix D identifies all serial numbers, manufacturers, and calibration dates for test equipment, dummy sensors, potentiometers, and load cells used to collect data during the test.

Injury readings for the SID-IIs dummy were recorded as follows:

INJURY READINGS

Measurement Description	Driver ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)		1000	289.503
Resultant Lower Spine Acceleration	g	82	40.560
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2845.286
Maximum Thoracic Rib Deflection	mm	38*	19.376
Maximum Abdominal Rib Deflection	mm	45*	22.169

*Proposed IARV

Supplemental restraint information was recorded as follows:

SUPPLEMENTAL RESTRAINT INFORMATION

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 – Torso/Pelvis	Yes	Yes	No	N/A
Side Airbag 3 – Torso	No	N/A	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other – Driver Inboard Seat Airbag	Yes	Yes	No	N/A

GENERAL COMMENTS:

1. P1 serial number – DG8012

Data Anomalies:

- No Questionable Data

SECTION 3

OCCUPANT AND VEHICLE INFORMATION

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, Seat Belt, Steering Wheel Adjustment and Fuel Systems Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Camera and instrumentation Data

Data Sheet No. 6 – Vehicle Accelerometer Data

Data Sheet No. 7 – Rigid Pole Load Cell Data

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – Test Vehicle Profile Measurements

Data Sheet No. 10 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 11 – Vehicle Damage Profile Distances

Data Sheet No. 12 – FMVSS No. 301 Static Rollover Results

Data Sheet No. 13 – Dummy / Vehicle Temperature and Humidity Stabilization Data

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2021 Genesis GV80 SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
Test Date: 2/10/2021

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20214216
Model Year	2021
Make	Genesis
Model	GV80
Body Style	SUV
VIN	KMUHB4SB0MU038696
Body Color	Blue
Odometer Reading (km/mi)	41 miles
Engine Displacement (L)	2.5
Type / No. Cylinders	I4
Engine Placement	Inline
Transmission Type	Automatic
Transmission Speeds	8-Speed
Overdrive	Yes
Final Drive	Rear Wheel Drive
Roof Rack	No
Sunroof / T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	No
Other Optional Feature	-
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso / Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head / Torso Airbag	No
Rear Pass. Torso Airbag	Yes
Rear Pass. Torso / Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Driver Inboard Seatback Airbag	Yes

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company
Date of Manufacture	NOV / 2020
Vehicle Type	MPV

GVWR (kg)	2620
GAWR Front (kg)	1390
GAWR Rear (kg)	1485

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	N/A	5
Capacity Weight (VCW) (kg)				410
DSC X 68.04 kg				340.2
Cargo Weight (RCLW) (kg)				69.8

(A)

(B)

(A-B)

VEHICLE SEAT TYPE

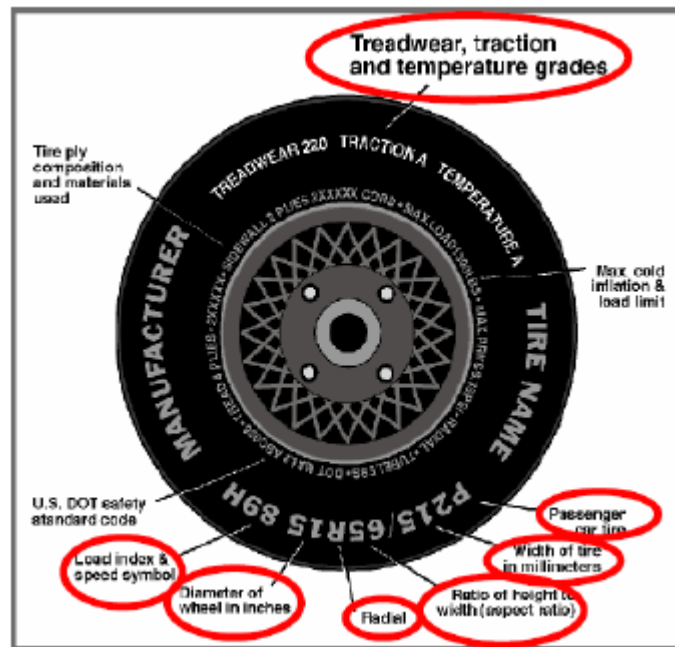
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable	
						W/ Lever	W/ Knob
Front Seat	X						X
Rear or Second Row Seat			X			X	
Third Row Seat							

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

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021

Collected for year, make, model, & VIN, all 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)	230	250
Recommended Tire Size	265/55R19	265/55R19
Tire Size on Vehicle	265/55R19	265/55R19
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Scorpion Zero	Scorpion Zero
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 Rayon	1 Rayon
Tire Plies Body	1 Rayon, 2 Steel, 1 Polyamide	1 Rayon, 2 Steel, 1 Polyamide
Load Index/Speed Symbol	109W	109W
Tire Material	Rubber	Rubber
DOT Safety Code Left	1UN9E735D0620	1UN9E735D0620
DOT Safety Code Right	1UN9E735D0620	1UN9E735D0620

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

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	230	230	250	250
Tire Placard	kPa	230	230	250	250
Owner's Manual	kPa	230	230	250	250
As Tested	kPa	230	230	250	250

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	522	535		556	566		542	585	
Right	kg	517	529		514	579		524	570	
Ratio	%	49.4	50.6		48.3	51.7		48.0	52.0	
Totals	kg	1039	1064	2103	1070	1145	2215	1066	1155	2221

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	2103	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50.0	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	69.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	2222.8	(A+B+C)

Does the measured As Test Vehicle Weight lie within the required weight range
 (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to – 9 kg)? ☒ Yes ☐ No

TEST VEHICLE ATTITUDES AND CG

Measurement Description	Units	As Delivered	As Tested	Fully Loaded	Meets Rqmt***
Driver Door Sill Angle (front-to-rear)*	Deg	-0.05	-0.50	-0.05	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	-0.40	-0.30	-0.20	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	-0.25	-0.20	-0.15	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	-0.10	-0.10	-0.10	Yes
Vehicle CG (Aft of Front Axle)	mm	1497	1529	1538	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	5	11	13	

* ND = Nose Down (-), NU = Nose Up (+)

** LD = Left Down (-), LU = Left Up (+)

*** The "As Tested" vehicle attitude measurements must be equal to or between the "As Delivered" and "Fully Loaded" vehicle attitude measurements. Indicate "Yes" or "No" for Meets Requirement

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

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	18
Spare Tire	18
Jack	4
Tail Light	2
Right Rear Passenger Window	3
Ballast / Equipment Added	61.5

Test Height – Adjustable Suspension Setting, if Applicable	N/A
--	-----

Test Surface Markings

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	1052
Aft 25 mm target	1053

DATA SHEET NO. 2
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021

SEAT POSITIONING

The driver's seat, front center seat (if applicable), and right front passenger's seat should be set to the forward-most, mid-height, mid-angle position. The struck-side rear passenger's seat, rear center seat, and non-struck side rear passenger's seats should be set to the rear-most, lowest, mid-angle position.

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	18.7	10.0	14.4
Front Passenger Seat	19.6	11.4	15.5
Front Center Seat	N/A	N/A	N/A
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	14.4	51	Max	66	74	84
			Mid	34	41	51
			Min	1	8	17
Front Passenger Seat	15.5	45	Max	60	68	75
			Mid	30	38	45
			Min	0	7	14
Front Center Seat	N/A	N/A	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Non-Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Rear Center Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-

DATA SHEET NO. 2 ... (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

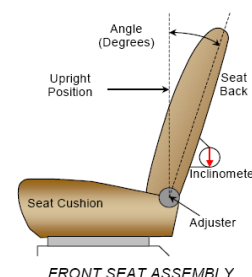
NHTSA No.: O20214216
 Test Date: 2/10/2021

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	257	N/A	0	N/A
Front Passenger Seat	248	N/A	0	N/A
Front Center Seat	N/A	N/A	N/A	N/A
Struck Side Rear Seat	80	9 (0-8)	80	8
Non-Struck Side Rear Seat	80	9 (0-8)	80	8
Rear Center Seat	80	9 (0-8)	80	8

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned such that the dummy's head is level. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck-side rear passenger seat back is positioned in accordance with the information provided by the manufacturer on Form No. 1 for the 5th percentile female dummy in a Side NCAP MDB test. The rear center and non-struck side rear passenger's seat back are set to match the struck-side rear seat back.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/Seated Dummy	41.0	Power	7.3	Power
Front Passenger Seat	41.1	Power	7.3	Power
Front Center Seat	N/A	N/A	N/A	N/A
Struck Side Rear Seat	27.0	14 (0-13)	1.4	0
Non-Struck Side Rear Seat	27.0	14 (0-13)	1.4	0
Rear Center Seat	27.0	14 (0-13)	1.4	0

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. Zero is defined as the uppermost detent

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

HEAD RESTRAINT ADJUSTMENT

The driver's head restraint is adjusted to the lowest and most full forward in-use position.

Seat	Total # of Positions	Placed in Position #
Driver Seat	6 (0-5)	5 (Lowermost & Full Forward)

DATA SHEET NO. 2 ... (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

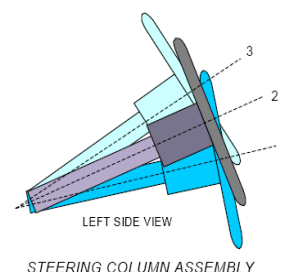
Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.

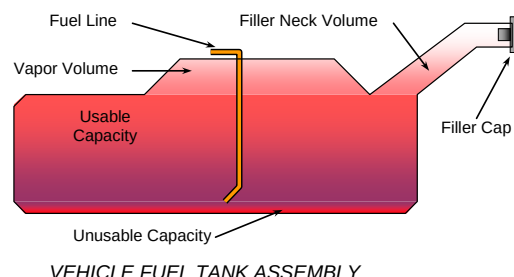
	Degrees	Fore / Aft Position (mm)
Lowermost – Position 1	22.4	
Geometric Center – Position 2	24.5	
Uppermost – Position 3	26.5	
Telescoping Steering Wheel Travel		50
Test Position	24.5	25



FUEL PUMP

Describe the fuel pump type, details about how it operates, and the location of the fuel filler neck.

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.



FUEL TANK CAPACITY DATA

Description	Liters
Usable Capacity of "Standard Tank" - see Form No. 1	80.0
Usable Capacity of "Optional Tank" - see Form No. 1	N/A
Usable Capacity of "Standard Tank" - see Owner's Manual	80.0
Usable Capacity of "Optional Tank" - see Owner's Manual	N/A
93% of Usable Capacity	74.4
Actual Amount of Solvent Used in Test	74.4
1/3 of Usable Capacity	26.7

Is the Actual Amount of Solvent Used in the test equal to 93% $\pm$ 1% of the Usable Capacity stated in Form No. 1?



Yes

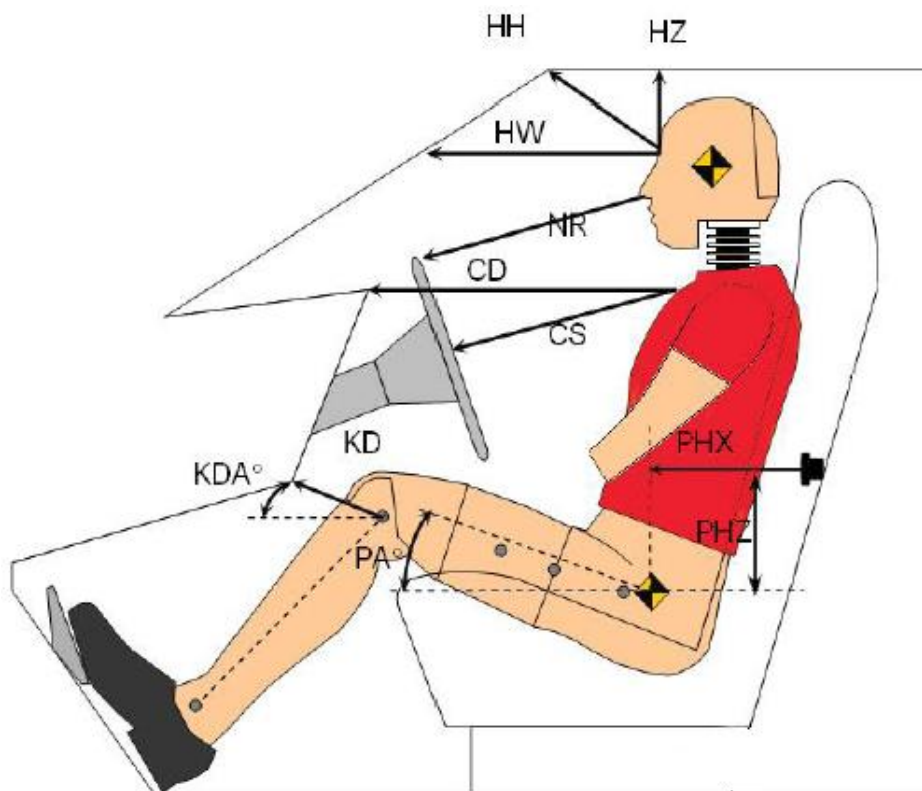


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DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021



Left Side View

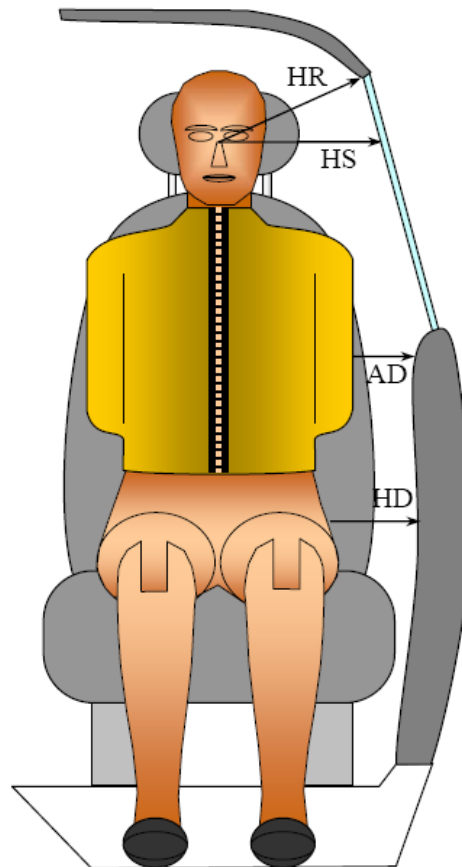
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. DG8012)	
		Length (mm)	Angle (°)
HH	Head to Header	240	
HW	Head to Windshield	501	
HZ	Head to Roof Liner	170	
NR	Nose to Rim	234	
CD	Chest to Dash	400	
CS	Chest to Steering Wheel	162	
KD(L) / KDA(L)°	Left Knee to Dash	101	29.0
KD(R) / KDA(R)°	Right Knee to Dash	90	8.8
PAX°	Pelvic Tilt Angle (X-Axis)		20.1
PAY°	Pelvic Tilt Angle (Y-Axis)		0.3
PHX	Hip Point to Striker (X-Axis)	333	
PHZ	Hip Point to Striker (Z-Axis)	128	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2021 Genesis GV80 SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
Test Date: 2/10/2021



FRONT VIEW OF DUMMY

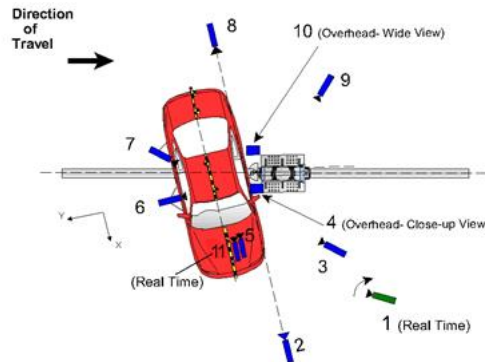
DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. DG8012)
HR	Head To Side Header	mm	249
HS	Head to Side Window	mm	371
AD	Arm to Door	mm	152
HD	Hip Point to Door	mm	165

DATA SHEET NO. 5 CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2021 Genesis GV80 SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
Test Date: 2/10/2021



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Real-time (24 - 30 fps) pan view of impact				Zoom	60
2	Front ground level - impact view	7066	0	-1530	28	1000
3	Impact side 45° - forward pole view	4956	-1303	-1580	24	1000
4	Overhead Close-up view of impact	0	0	-9375	28	1000
5	Onboard - dummy front view				25	1000
6	Onboard - dummy side view				12.5	1000
7	Onboard - dummy rear oblique view				12.5	1000
8	Rear ground level - impact view	-8013	0	-1608	28	1000
9	Impact side 45° - rearward pole view	-4988	-3865	-1591	24	1000
10	Overhead wide - view of impact	0	0	-9375	12.5	1000
11	Real-time (24 - 30 fps) - dummy front view				Zoom	60

Notes: Reference - From Point of Impact for X and Y; from Ground for Z
+X = Forward of vehicle, +Y = Right of vehicle, +Z = Down
* All measurements accurate to ± 6 mm. Vehicle is at a 75° angle to the rigid pole.

Comments: All cameras operated as intended.

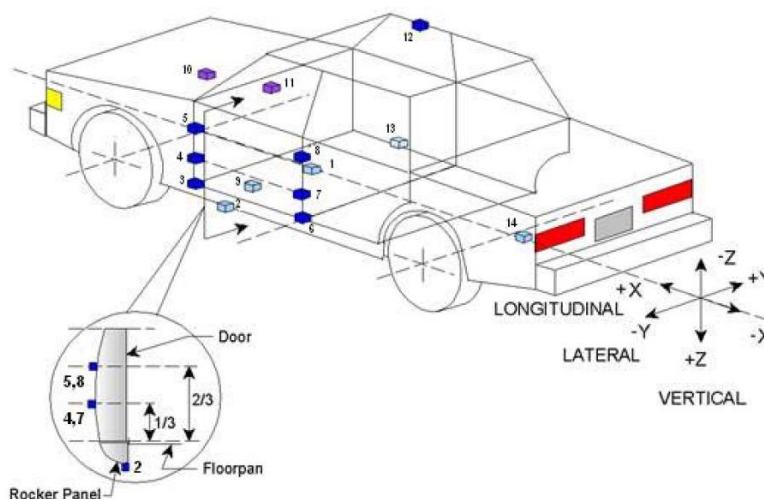
INSTRUMENTATION

Description	Number of Channels
Driver Dummy Channels	16
Vehicle Structure Accelerometers	18
Pole Load Cells	8
Total	42

DATA SHEET NO. 6 VEHICLE ACCELEROMETER DATA

Test Vehicle: 2021 Genesis GV80 SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
Test Date: 2/10/2021



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2812	2	-243
2	Left Floor Sill	2915	-707	-9
3	A-Pillar Sill	3311	-674	-30
4	A-Pillar Low	3407	-656	-285
5	A-Pillar Mid	3286	-694	-753
6	B-Pillar Sill	2357	-709	-55
7	B-Pillar Low	2328	-712	-276
8	B-Pillar Mid	2291	-713	-514
9	Driver Seat Track	2565	-607	-56
10	Engine Top	4131	42	-506
11	Firewall	3679	168	-539
12	Right Roof	2361	621	-1223
13	Right Floor Sill	2920	710	-10
14	Rear Floorpan	1241	-6	-78

Reference: X – Rear surface of vehicle (+ forward)
Y – Vehicle centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle: 2021 Genesis GV80 SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
Test Date: 2/10/2021

POLE BARRIER



RIGID POLE LOAD CELL LOCATIONS

ID	Units	Height From Ground
1	mm	200
2	mm	590
3	mm	750
4	mm	1075
5	mm	1260
6	mm	1740
7	mm	1920
8	mm	2300

**DATA SHEET NO. 8
POST-TEST OBSERVATIONS**

Test Vehicle: 2021 Genesis GV80 SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
Test Date: 2/10/2021

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver Seat Dummy (SID-IIs)
Face	Curtain Airbag, Inboard Seat Airbag
Top of Head	Curtain Airbag
Left Side of Head	Curtain Airbag
Back of Head	Curtain Airbag, Head Rest
Left Shoulder	Torso/Pelvis Airbag, Seat Back
Upper Torso	Torso/Pelvis Airbag, Seat Back
Lower Torso	Torso/Pelvis Airbag, Seat Back
Left Hip	Torso/Pelvis Airbag, Seatpan
Left Knee	None

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch/ Other
	Front	Rear	Front	Rear	
Remained Closed and Operational	No	No	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	No	No	No	No
Latch or Hinge Systems Pulled Out of Their Anchorages	No	No	No	No	No
Disengaged from Latched Position	No	No	No	No	No
Latch Separated from Striker	No	No	No	No	No
Jammed Shut	Yes	Yes	No	No	No
If Door Opened at Striker, Width of Opening at Striker (mm)	0	0	0	0	0

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	No	No	No
Seat Disengagement from Floor Pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

DATA SHEET NO. 8 ... (CONTINUED)
POST-TEST OBSERVATIONS

Test Vehicle: 2021 Genesis GV80 SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
Test Date: 2/10/2021

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar and C-Pillar Bucked
Sill Separation	200 mm length below left rear passenger door
Windshield Damage	Cracks throughout with separation along Driver A-Pillar and roof
Side Window Damage	Cracks Throughout
Other Notable Effects	None

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 – Torso/Pelvis	Yes	Yes	No	N/A
Side Airbag 3 – Torso	No	N/A	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other – Driver Inboard Seat Airbag	Yes	Yes	No	N/A

VEHICLE SPEED, VEHICLE ANGLE AT IMPACT AND IMPACT POINT LOCATION DATA

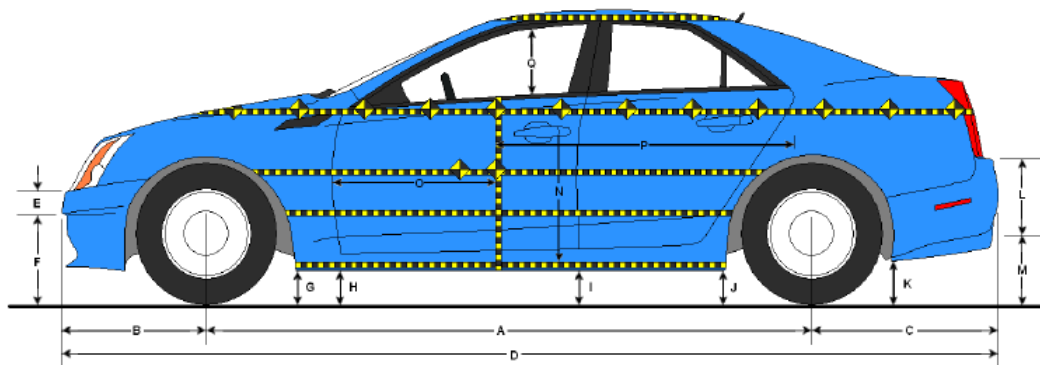
Measured Parameter	Units	Tolerance	Value
Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt	mm		1312
Actual Impact Point - Aft of Front Axle	mm		1315
Horizontal Offset (+ forward / - rearward)	mm	+/- 38 *	3
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	deg	75 +/- 3	75
Trap No. 1 Velocity - Primary	kph	31.4 to 33.0	32.32
Trap No. 2 Velocity - Redundant	kph	31.4 to 33.0	32.28

* Of Intended Impact Point

DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2021 Genesis GV80 SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
Test Date: 2/10/2021



LEFT SIDE VIEW

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

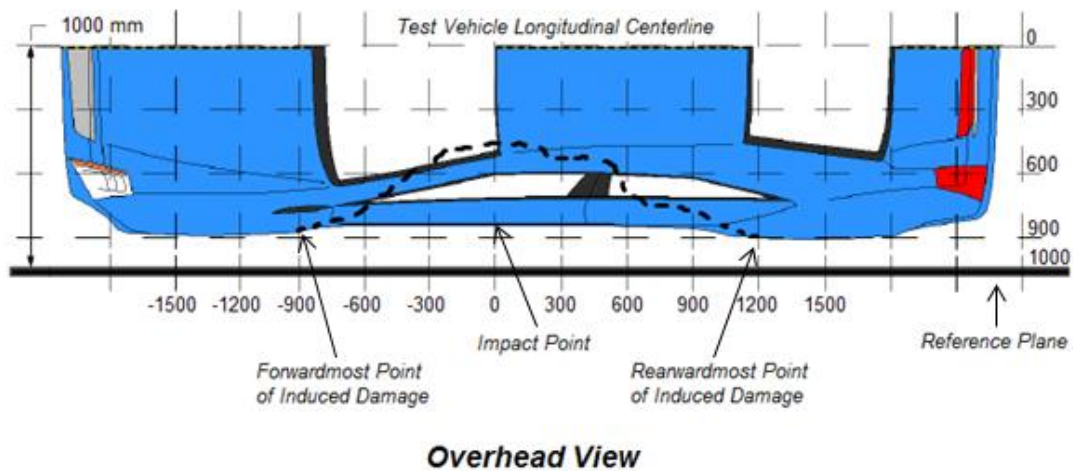
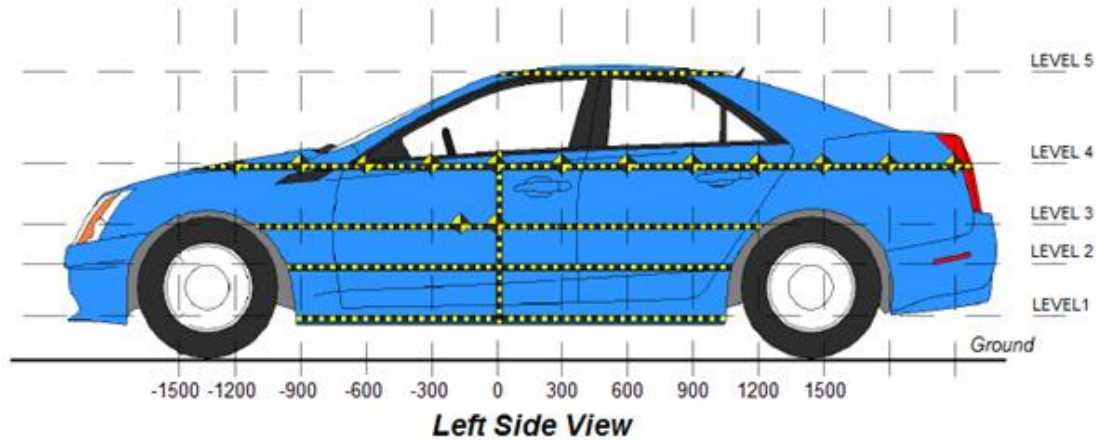
Code	Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2958	2906	52
B	Front Axle to FSOV	877	901	-24
C	Rear Axle to RSOV	1109	1112	-3
D	Total Length at Centerline	4943	4919	24
E	Front Bumper Thickness	193	193	0
F	Front Bumper Bottom to Ground	360	395	-35
G	Sill Height at Front Wheel Well	253	245	8
H	Sill Height at Front Door Leading Edge	256	242	14
I	Sill Height at B-Pillar	269	280	-11
J1	Sill Height at Rear Wheel Well	264	291	-27
J2	Pinch Weld Height at Rear Wheel Well	258	284	-26
K	Sill Height Aft of Rear Wheel Well	293	303	-10
L	Rear Bumper Thickness	275	275	0
M	Rear Bumper Bottom to Ground	450	446	4
N	Sill Height to Bottom of Front Window Sill	912	934	-22
O	Front Door Leading Edge to Impact CL	589	542	47
P	Rear Door Trailing Edge to Impact CL	1589	1508	81
Q	Front Window Opening	392	378	14
R	Right Side Length	4868	4860	8
S	Left Side Length	4867	4817	50
T	Vehicle Width at B-Pillars	1933	1811	122
U	Front Wheel Track Width	1672	1663	9
V	Rear Wheel Track Width	1685	1682	3

* All measurements in mm with tolerance of ± 3 mm

DATA SHEET NO. 10
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021



MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	285	212	300
2	Occupant Hip Point	mm	780	353	150
3	Mid - Door	mm	856	364	150
4	Window Sill	mm	1166	250	150
5	Window Top	mm	1638	94	150

NOTE: The above measurements should be taken along the vertical impact reference line. Vehicle measurements forward of the vertical impact reference line are negative.

DATA SHEET NO. 10 ... (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

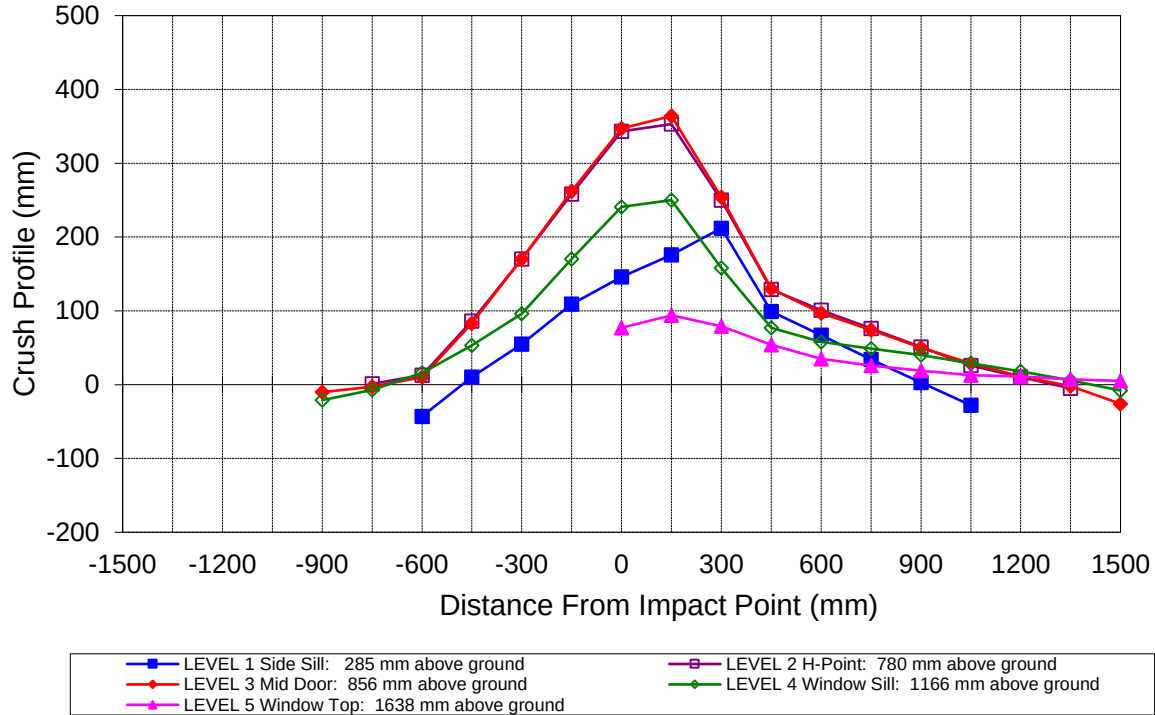
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050															
-900			970	809				980	830				-10	-21	
-750		966	960	823			965	963	830			1	-3	-7	
-600	881	957	956	835		924	944	946	819		-43	13	10	16	
-450	884	956	956	846		874	870	873	793		10	86	83	53	
-300	886	957	959	847		831	787	789	751		55	170	170	96	
-150	887	960	962	854		778	702	700	684		109	258	262	170	
0	887	961	964	859	624	741	618	617	618	547	146	343	347	241	77
150	888	962	966	862	657	712	609	602	612	563	176	353	364	250	94
300	889	963	966	864	662	677	713	712	706	583	212	250	254	158	79
450	884	963	966	866	661	785	834	836	789	607	99	129	130	77	54
600	882	961	964	865	660	815	860	867	807	625	67	101	97	58	35
750	880	961	964	864	660	846	885	890	815	634	34	76	74	49	26
900	879	962	963	863	657	876	911	913	823	638	3	51	50	40	19
1050	875	964	964	858	651	903	938	935	829	638	-28	26	29	29	13
1200		971	968	857	644		961	957	839	633		10	11	18	11
1350		976	977	849	632		981	979	843	625		-5	-2	6	7
1500			978	844	612			1004	852	607			-26	-8	5

NOTE: Pre-test measurements are taken when the vehicle is in the “As Tested” weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point. The final distance from impact is determined after the final dummy positioning and the pole is aligned with the center of gravity of the dummy’s head.

DATA SHEET NO. 10 ... (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021



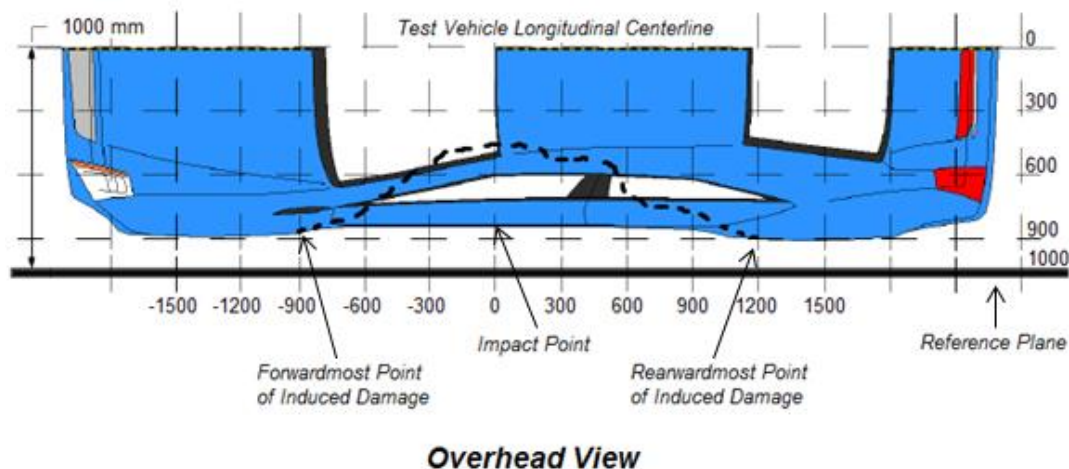
Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 11 **VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021

For guidance regarding damage profile distance measurements, please refer to the latest version of the *NHTSA Test Reference Guide, Volume 1: Vehicle Tests*.



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-900	3	20	30	-10
2	-420	3	144	43	101
3	60	3	389	35	354
4	540	3	145	35	110
5	1020	3	69	36	33
6	1500	3	-4	22	-26

DATA SHEET NO. 12
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle: <u>2021 Genesis GV80 SUV</u>	NHTSA No.: <u>O20214216</u>
Test Program: <u>NCAP Side Pole Impact Test</u>	Test Date: <u>2/10/2021</u>
Test Time: <u>10:18 AM</u>	Temperature: <u>21° C</u>

- 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 Details: No Spillage Occurred

FMVSS NO. 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	71	300	371
90° to 180°	68	300	368
180° to 270°	70	300	370
270° to 360°	67	300	367

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

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

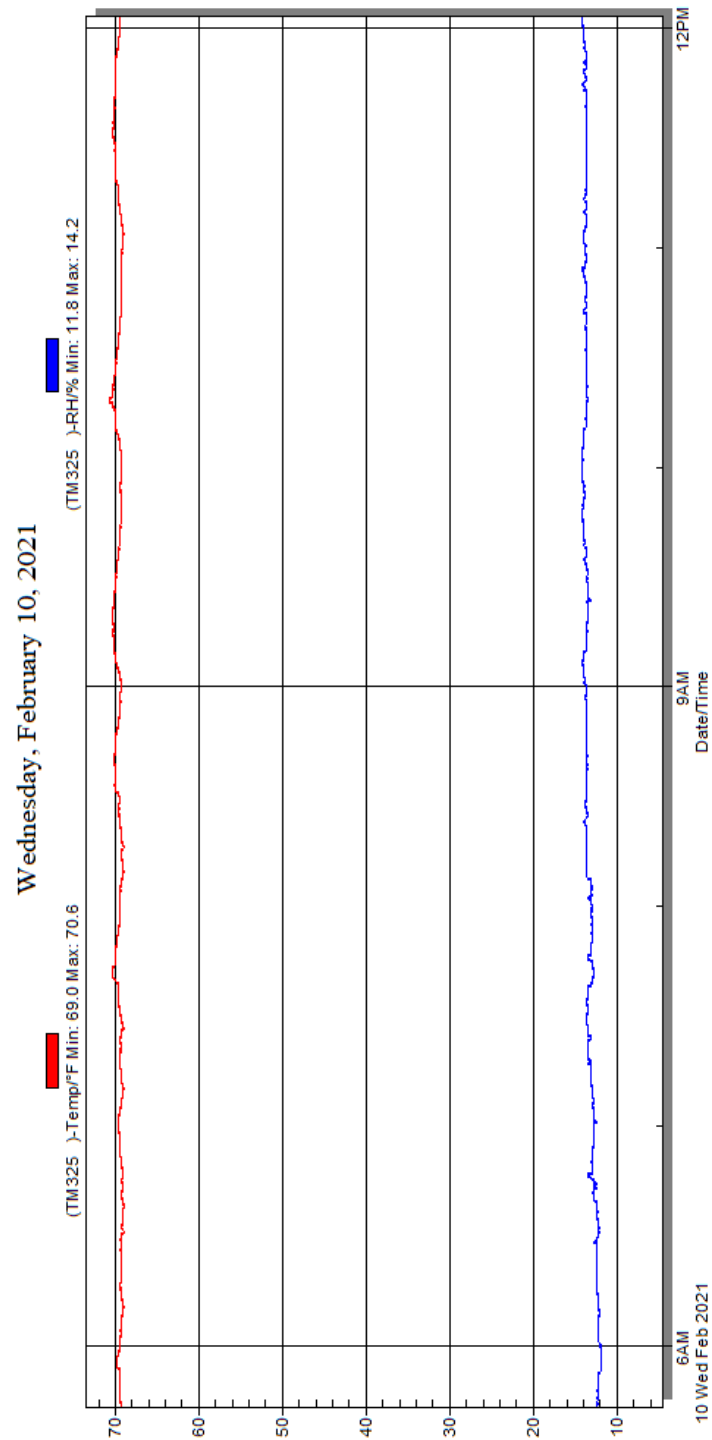
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	No Spillage Occurred
90° to 180°	No Spillage Occurred
180° to 270°	No Spillage Occurred
270° to 360°	No Spillage Occurred

DATA SHEET NO. 13
DUMMY / VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle: 2021 Genesis GV80 SUV
 Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20214216
 Test Date: 2/10/2021



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

APPENDIX A
PHOTOGRAPHS

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Figure A-1: As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



Figure A-2: As Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



Figure A-3: Pre-Test Frontal View of Test Vehicle

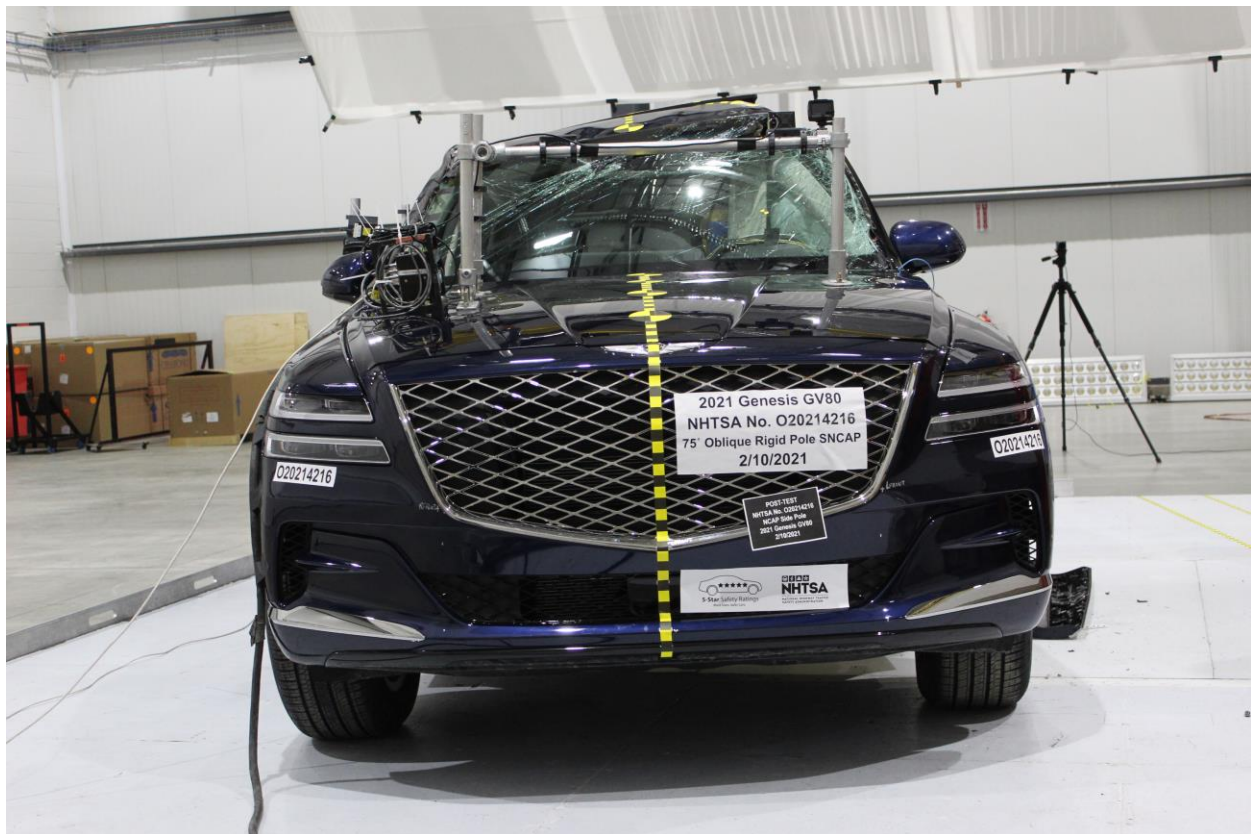


Figure A-4: Post-Test Frontal View of Test Vehicle



Figure A-5: Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Figure A-6: Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



Figure A-7: Pre-Test Left Side View of Test Vehicle



Figure A-8: Post-Test Left Side View of Test Vehicle



Figure A-9: Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



Figure A-10: Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



Figure A-11: Pre-Test Rear View of Test Vehicle



Figure A-12: Post-Test Rear View of Test Vehicle



Figure A-13: Pre-Test Right Side View of Test Vehicle



Figure A-14: Post-Test Right Side View of Test Vehicle

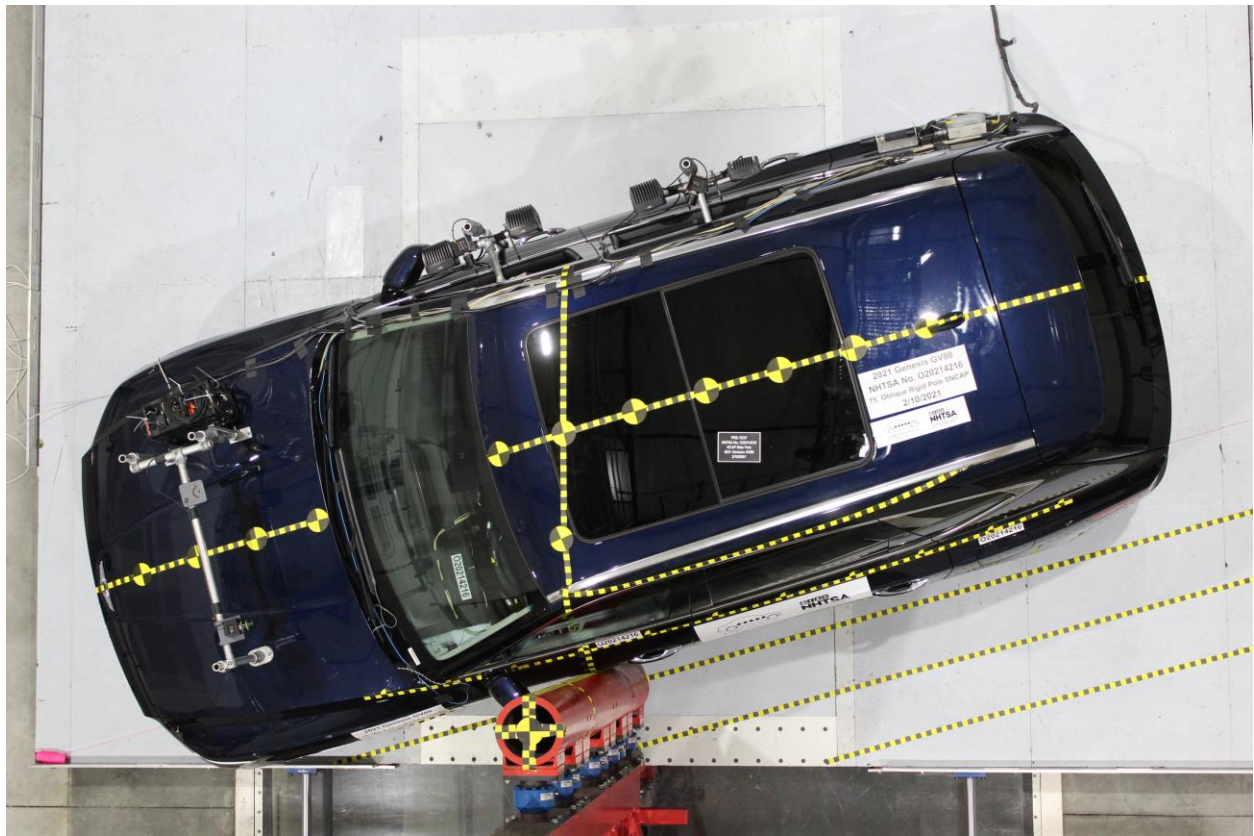


Figure A-15: Pre-Test Overhead View of Test Area

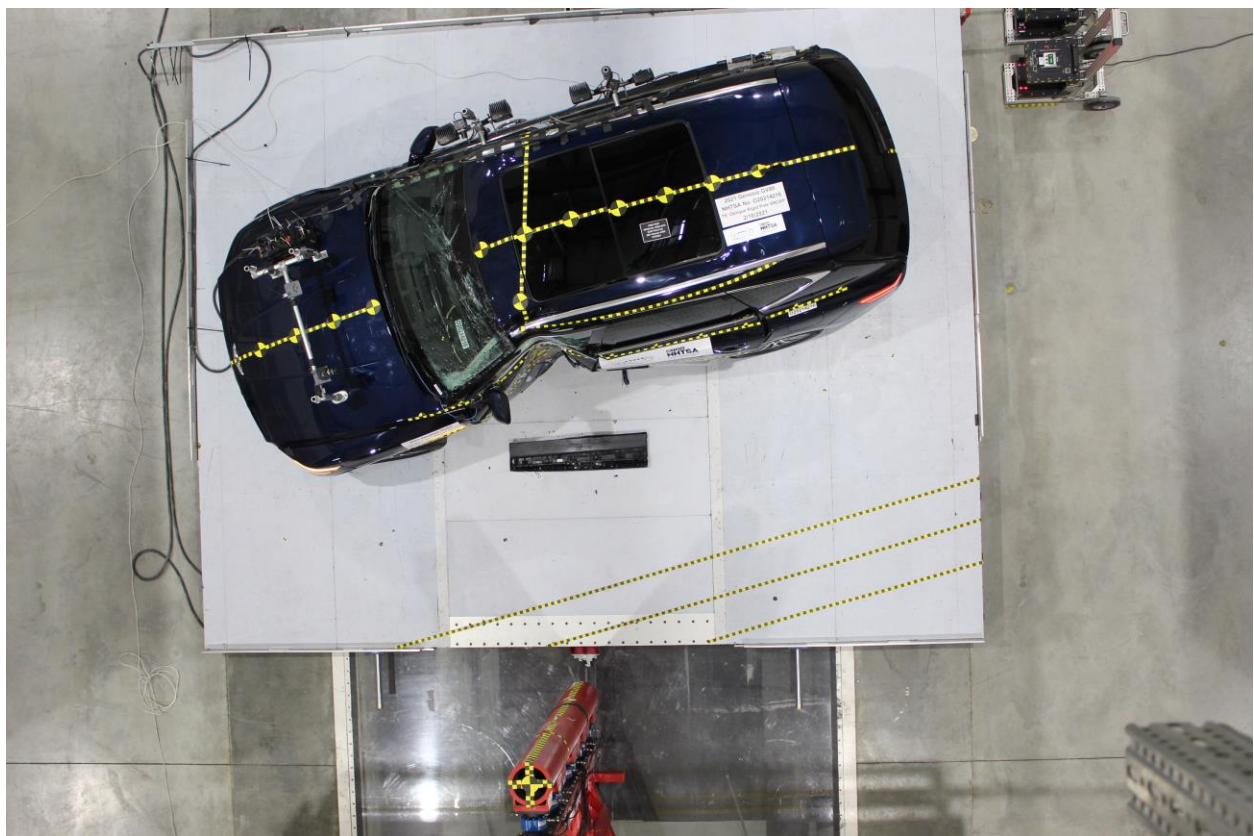


Figure A-16: Post-Test Overhead View of Test Area



Figure A-17: Pre-Test Left Side View of Pole Positioned Against Side of Vehicle



Figure A-18: Pre-Test Right Side View of Pole Positioned Against Side of Vehicle



Figure A-19: Pre-Test Close-Up View of Impact Point Target



Figure A-20: Post-Test Close-Up View of Impact Point Target Showing Impact Location



Figure A-21: Pre-Test Front Close-Up View of Dummy Head and Chest

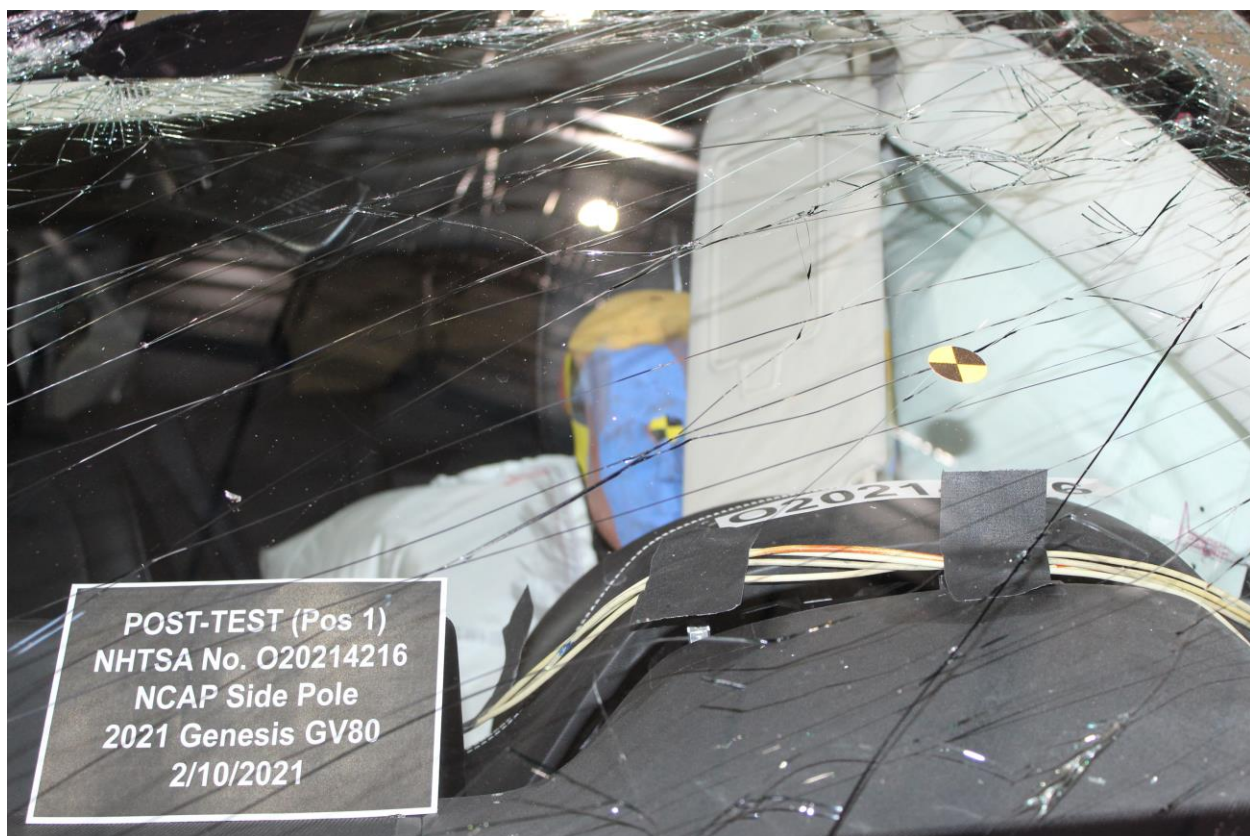


Figure A-22: Post-Test Front Close-Up View of Dummy



Figure A-23: Pre-Test Left Side View of Dummy Showing Belt and Chalking



Figure A-24: Pre-Test Left Side View of Dummy Shoulder and Door Top View



Figure A-25: Post-Test Left Side View of Dummy Shoulder and Door Top View



Figure A-26: Pre-Test Frontal View of Seat Back Prior to Dummy Positioning



Figure A-27: Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint



Figure A-28: Pre-Test Frontal View of Seat Pan Prior to Dummy Positioning



Figure A-29: Pre-Test Overhead View of Dummy Thighs on Seat Pan



Figure A-30: Pre-Test Left Side View of Dummy's Neck Showing Position of Adjustable Neck Bracket



Figure A-31: Pre-Test Left Side View of Dummy's Head Showing Dummy's Head is Level



Figure A-32: Pre-Test Placement of Dummy's Feet



Figure A-33: Pre-Test View of Belt Anchorage for Dummy



Figure A-34: Pre-Test Left Side View of Steering Wheel



Figure A-35: Pre-Test View of Disengaged Parking Brake



Figure A-36: Pre-Test View of Parking Brake

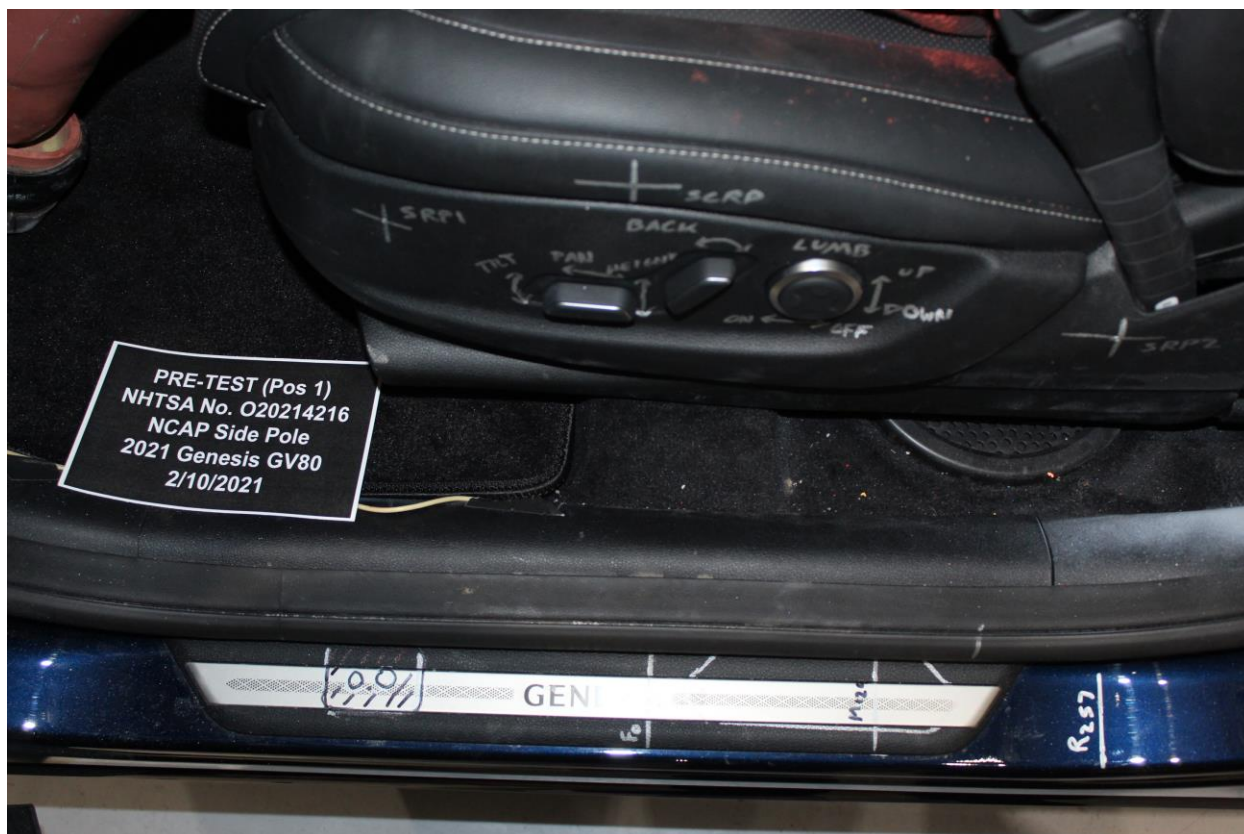


Figure A-37: Pre-Test Close-Up Left Side View of Driver Seat Track



Figure A-38: Pre-Test Close-Up Left Side View of Driver Seat Back



Figure A-39: Pre-Test Close-Up View of Driver Seat Back or Head Restraint



Figure A-40: Pre-Test Dummy and Door Clearance View



Figure A-41: Post-Test Dummy and Door Clearance View



Figure A-42: Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment



Figure A-43: Post-Test Right Side View of Dummy and Front Seat of Occupant Compartment



Figure A-44: Pre-Test Inner Door Panel View



Figure A-45: Post-Test Inner Door Panel View Showing Dummy Contact Location

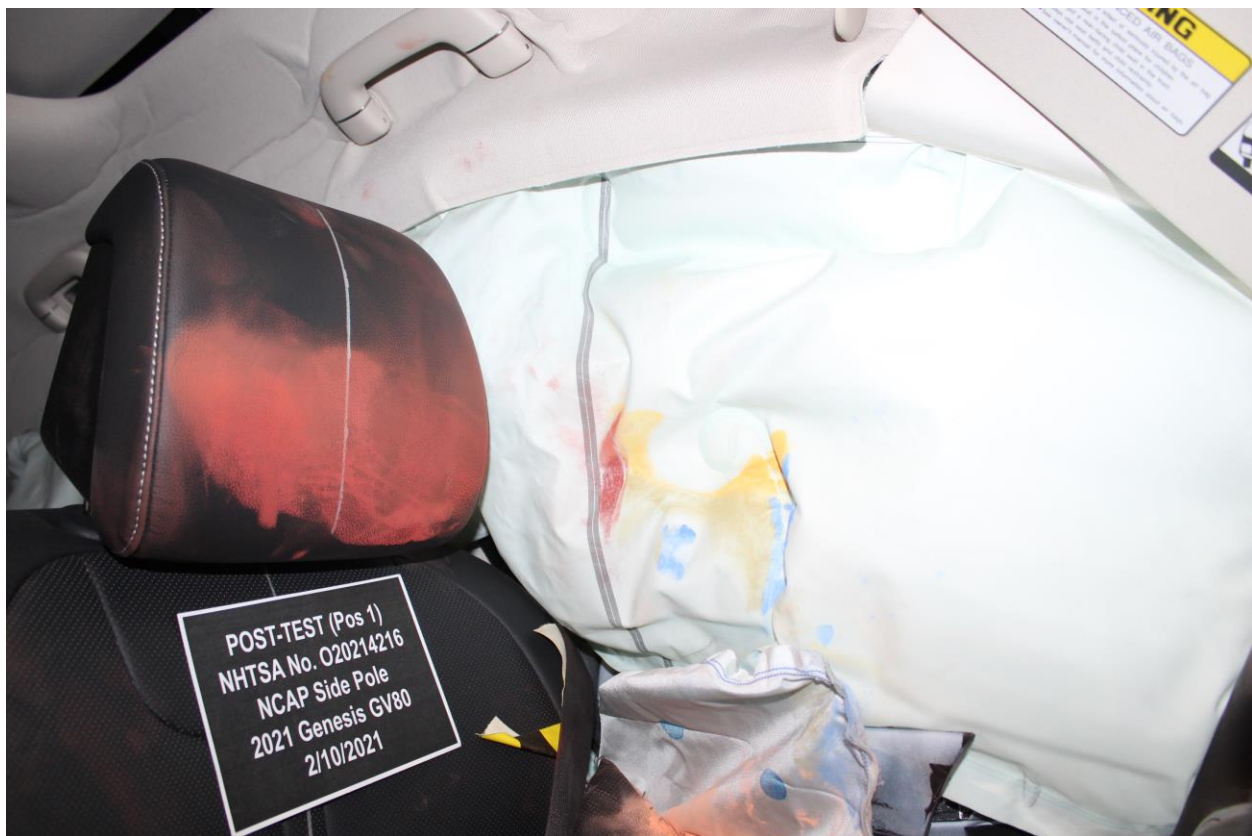


Figure A-46: Post-Test Dummy Close-Up Head Contact with Vehicle Interior View



Figure A-47: Post-Test Dummy Close-Up Head Contact with Side Airbag View



Figure A-48: Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View



Figure A-49: Post-Test Dummy Close-Up Torso Contact with Side Airbag View



Figure A-50: Post-Test Dummy Close-Up Pelvis Contact with Vehicle Interior View



Figure A-51: Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View

Photo Not Applicable

Figure A-52: Post-Test Dummy Close-Up Knee Contact with Vehicle Interior View



Figure A-53: Pre-Test Right Side View of Dummy and Rear Seat of Occupant Compartment



Figure A-54: Post-Test Inner Rear Passenger Torso Air Bag Deployment View



Figure A-55: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck



Figure A-56: Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Figure A-57: Close-Up View of Vehicle's Certification Label

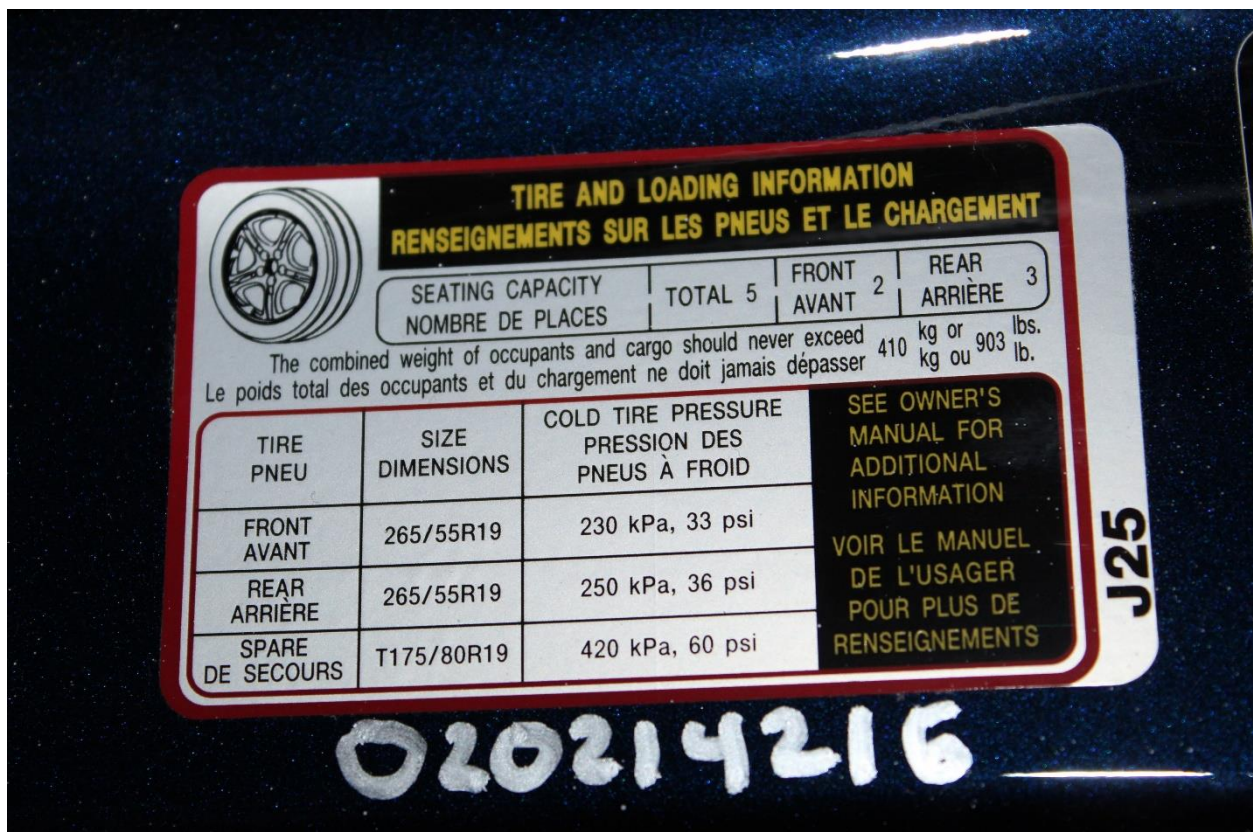


Figure A-58: Close-Up View of Vehicle's Tire Information Placard or Label

Photo Not Applicable

Figure A-58a: Close-Up View of Reduced Load Capacity Label

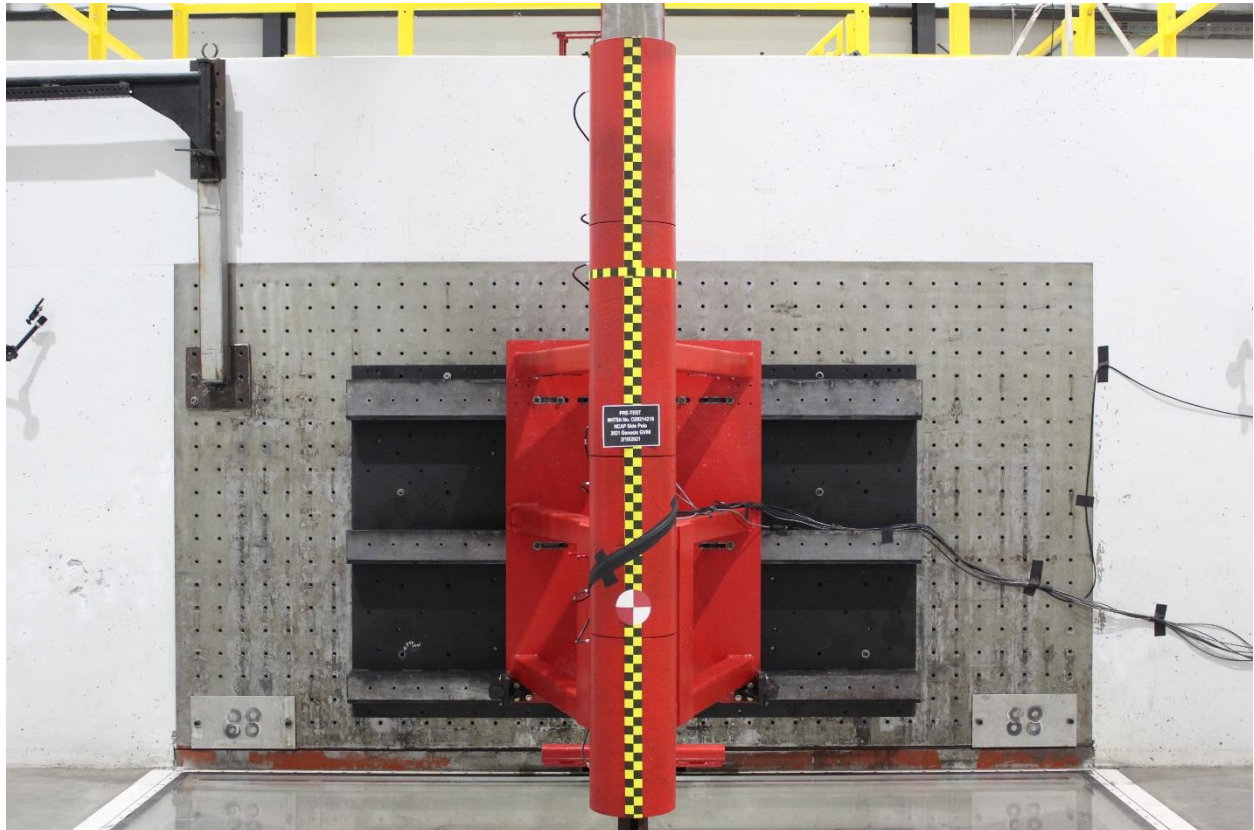


Figure A-59: Pre-Test Pole Barrier Front View

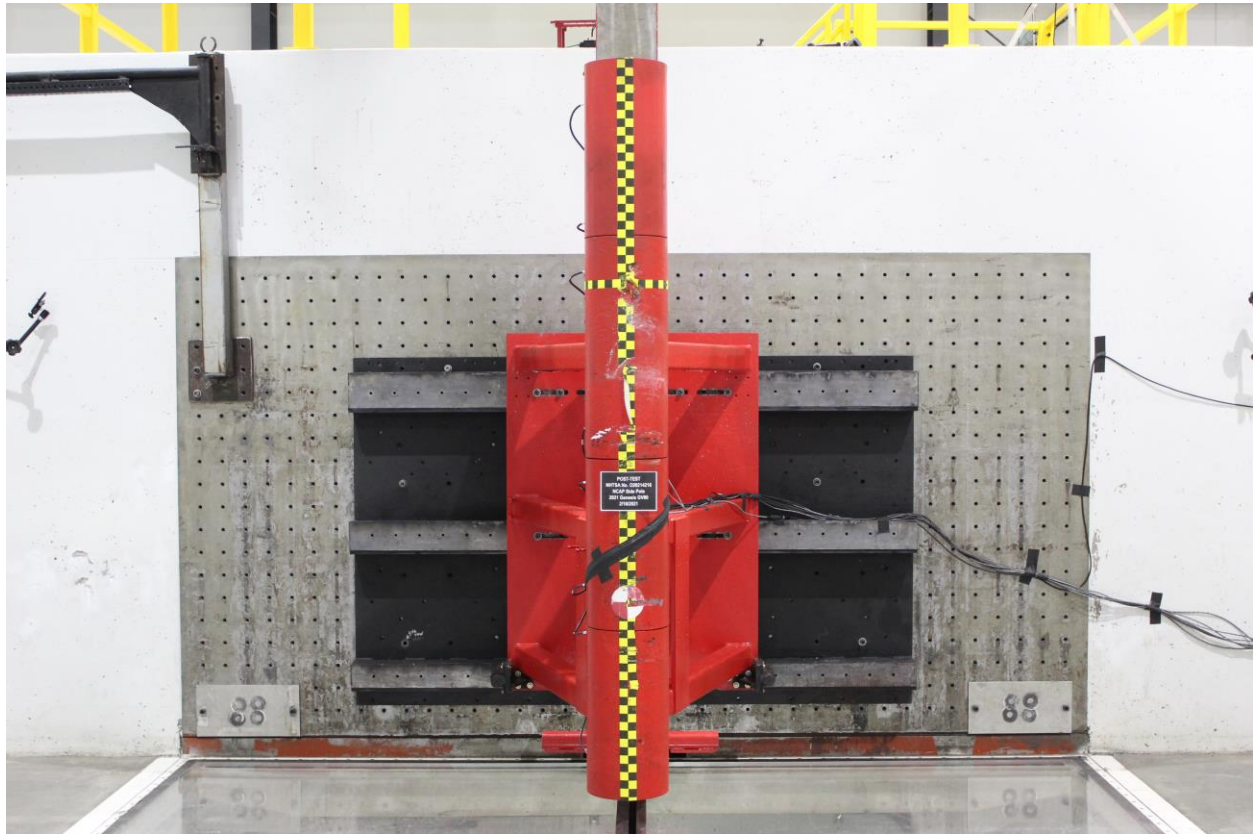


Figure A-60: Post-Test Pole Barrier Front View

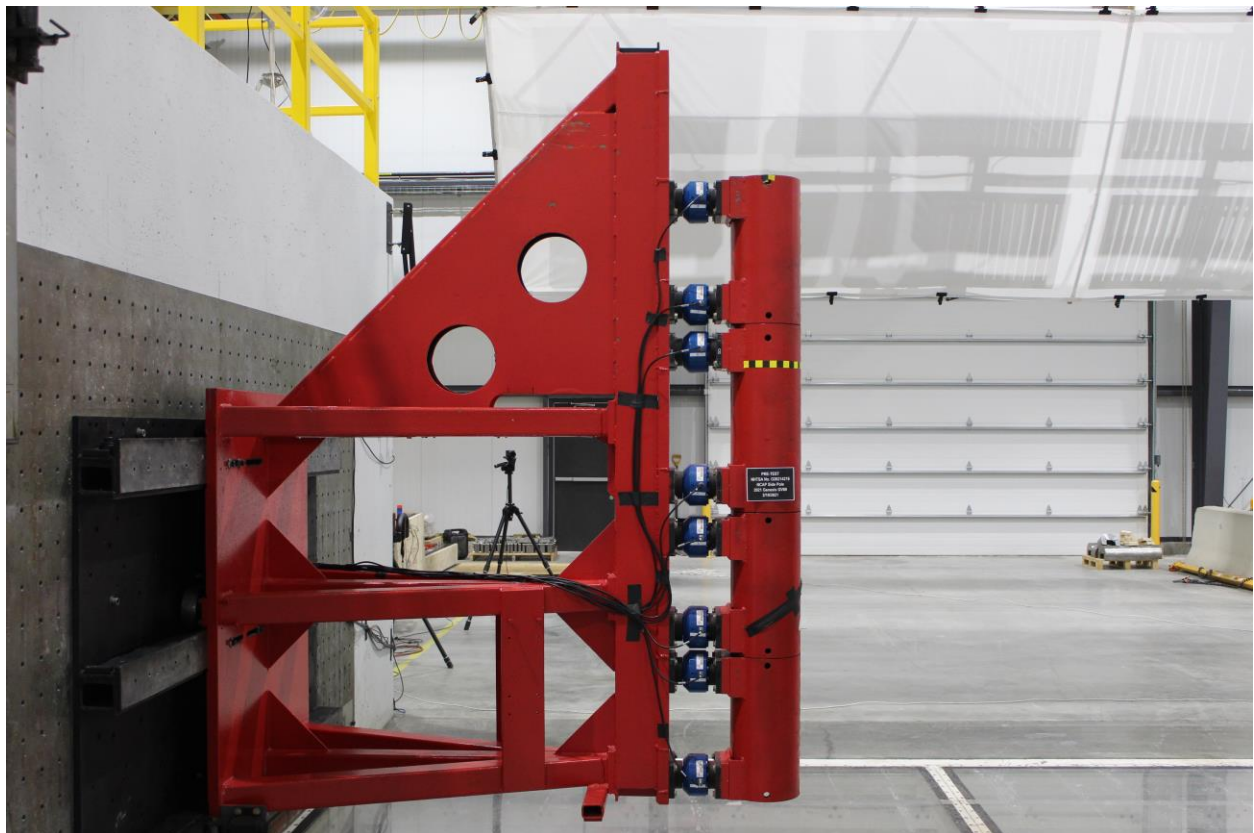


Figure A-61: Pre-Test Pole Barrier Side View

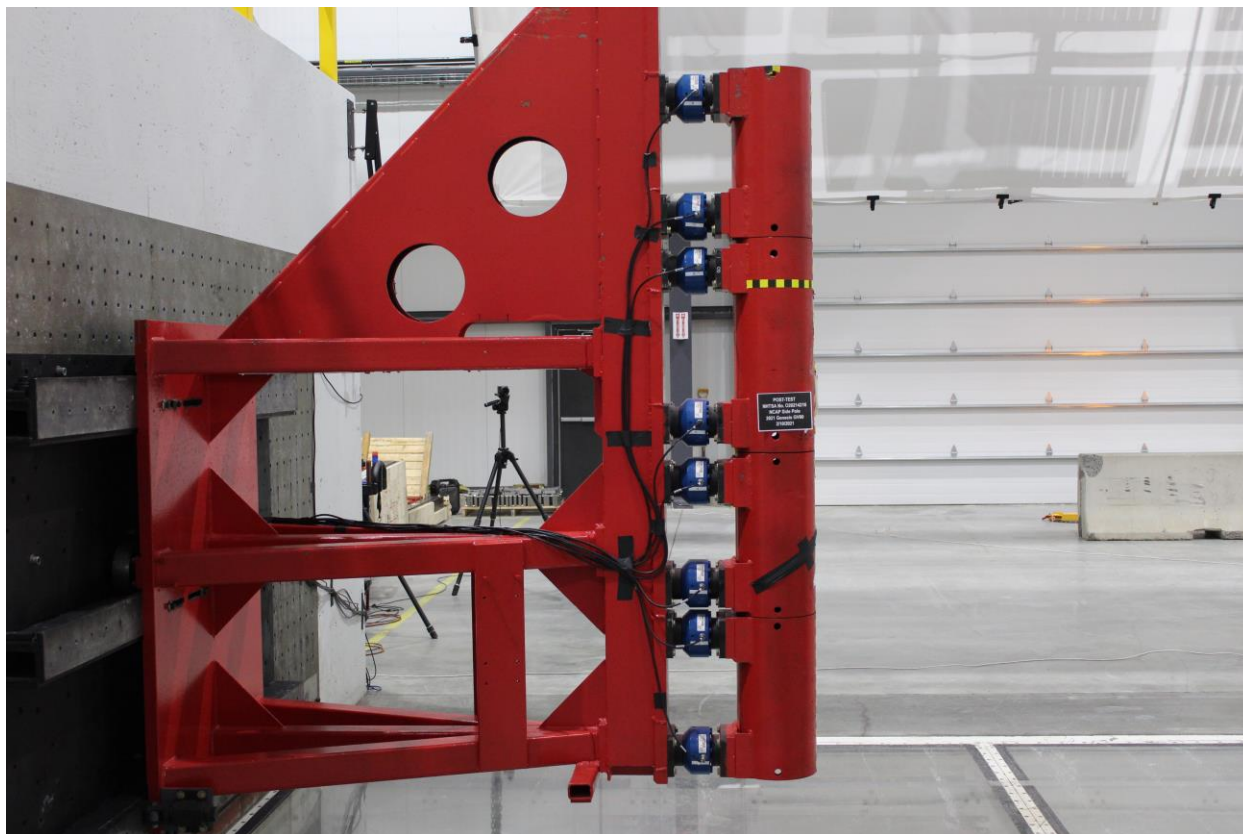


Figure A-62: Post-Test Pole Barrier Side View

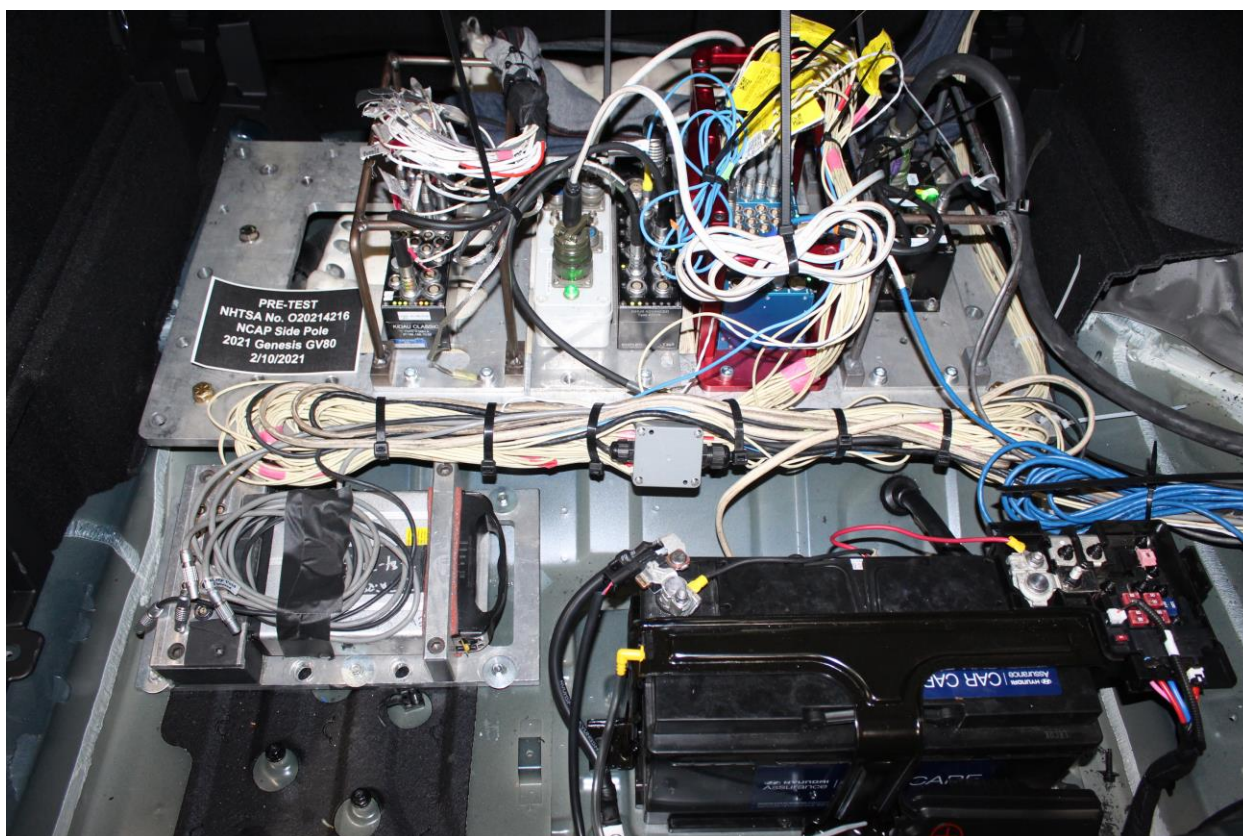


Figure A-63: Pre-Test Ballast View



Figure A-64: Post-Test Primary and Redundant Speed Trap Read-Out



Figure A-65: FMVSS No. 301 Static Rollover 0 Degrees

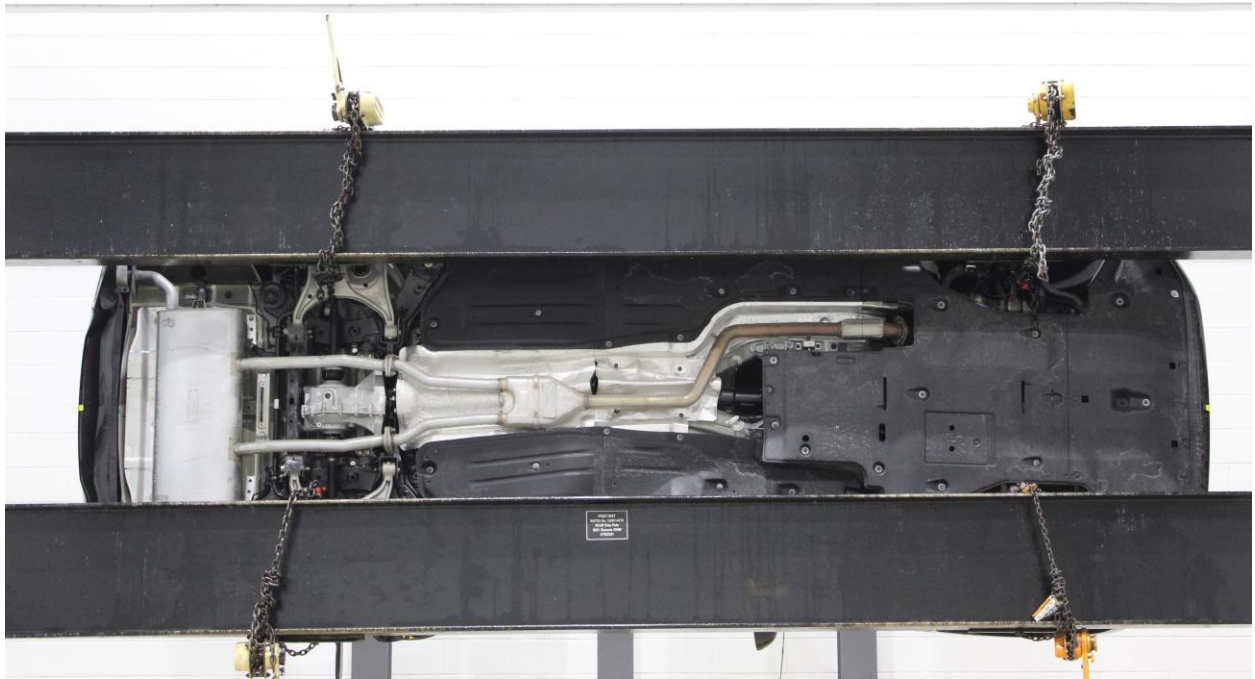


Figure A-66: FMVSS No. 301 Static Rollover 90 Degrees

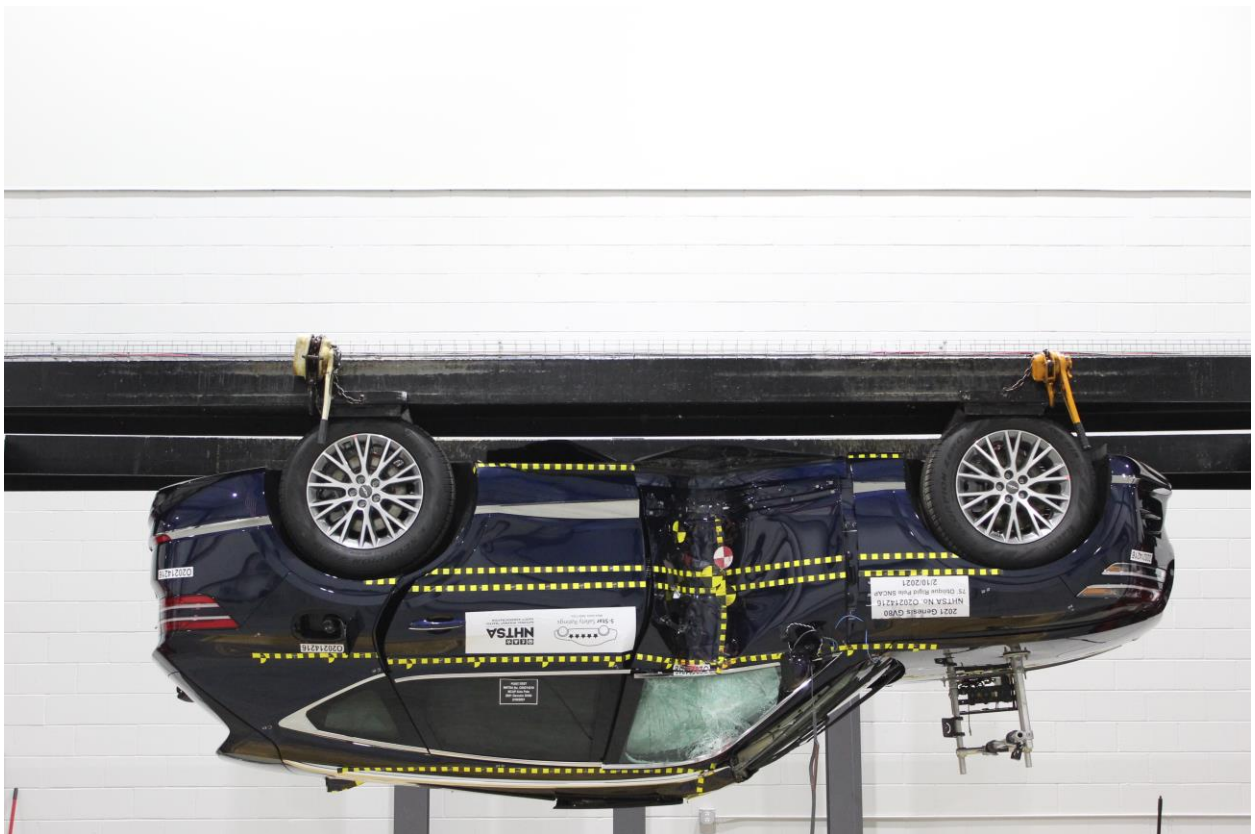


Figure A-67: FMVSS No. 301 Static Rollover 180 Degrees



Figure A-68: FMVSS No. 301 Static Rollover 270 Degrees



Figure A-69: FMVSS No. 301 Static Rollover 360 Degrees



Figure A-70: Impact Event

2021 GV80 RWD 2.5T ADVANCED

THE GENESIS EXPERIENCE

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

STANDARD FEATURES:

ADVANCED SAFETY TECHNOLOGY

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

POWERTRAIN TECHNOLOGY

- 2.5L I4 T-GDI (300 HP / 311 lb-ft)
- 8-speed Automatic Transmission
- Self-Leveling Rear Suspension
- Drive Mode Select

COMFORT & CONVENIENCE

- 19-inch Alloy Wheels
- LED Quad Headlights
- LED Rear Combination Lamps
- High Beam Assist
- Power-Folding Outside Mirrors
- Leatherette Seating Surfaces
- 12-way Power Front Seats
- Heated Front Seats
- Piano Black Gloss Trim
- Leatherette wrapped/stitched Upper Inst. Panel
- Adjustable Interior Ambient Lighting

COMFORT & CONVENIENCE(cont.):

- Power Hands-free Liftgate w/ Auto Open
- Power Tilt & Telescopic Steering Wheel
- Rearview Camera w/ Dynamic Guidelines
- EC Inside Mirror with HomeLink®
- Dual Front & Dual Rear USB Ports
- Towing Wiring
- Premium Navigation with 14.5" HD Screen
- Apple CarPlay(TM) & Android Auto(TM)
- AM/FM/XM Radio®/HD Radio® with 12 speakers

GENESIS WARRANTY

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

Full Tank of Gas

Additional Standard Features

- Carpeted Floor Mats
- Cargo Cover
- Cargo Mat
- Cargo Net

Manufacturer's Suggested Retail Price: \$48,900.00

ADDED FEATURES:

- * ADRIATIC BLUE(RYS) Paint \$400.00
- * Advanced Package: \$3,900.00

Additional Standard Features

- Panoramic Roof
- Ventilated Front Seats
- Heated Steering Wheel
- Matte Finish Wood Trim
- Manual Rear Side Shades
- Lexicon® 21-Speaker Audio System
- Genesis Digital Key
- Wireless Device Charger
- Rear Occupant Alert

SOLD TO: NY710

GENESIS OF ITHACA
320 ELMIRA ROAD
ITHACA NY 14850

SHIPPED TO: NY710

Inland Freight & Handling: \$1,025.00

TOTAL PRICE: \$54,225.00

7 A 3541HMORNI 3

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

Fuel Economy and Environment

Fuel Economy

23 MPG
combined city/hwy

4.3 gallons per 100 miles

21 city
25 highway

Small SUVs range from 16 to 120 MPG. The best vehicle rates 141 MPG.

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

Annual fuel cost \$2,100

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

5 (Best)

Smog Rating (tailpipe only)

5 (Best)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.70 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles

GOVERNMENT 5-STAR SAFETY RATINGS

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

Source: National Highway Traffic Safety Administration (NHTSA).
www.safercar.gov or 1-888-327-4236

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CARLINE: U.S./CANADIAN PARTS CONTENT: 5 %

MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 90 %

FOR THIS VEHICLE: FINAL ASSEMBLY POINT: ULSAN, KOREA

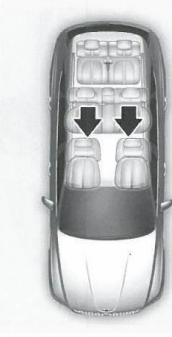
COUNTRY OF ORIGIN: TRANSMISSION: KOREA

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

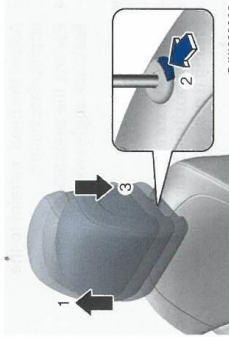
Figure A-71: Monroney Label

NOTICE

If you recline the seatback towards the front with the head restraint and seat cushion raised, the head restraint may come in contact with the sunvisor or other parts of the vehicle.

Front seat head restraints

The driver's and front passenger's seats are equipped with adjustable head restraints for the passengers safety and comfort.



Adjusting the height up and down

To raise the head restraint:

1. Pull it up to the desired position (1).

To lower the head restraint:

1. Push and hold the release button (2) on the head restraint support.
2. Lower the head restraint to the desired position (3).

Figure A-72: Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Figure A-73: Post-Test View of Shattered Vehicle Inner Door Panel

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver Dummy Instrumentation Plots

Fig.	Description	Page
1	Driver Head Acceleration (X) Primary vs. Time	B-4
2	Driver Head Acceleration (Y) Primary vs. Time	B-4
3	Driver Head Acceleration (Z) Primary vs. Time	B-4
4	Driver Head Resultant Acceleration Primary vs. Time	B-4
5	Driver Lower Spine T12 Acceleration (X) vs. Time	B-5
6	Driver Lower Spine T12 Acceleration (Y) vs. Time	B-5
7	Driver Lower Spine T12 Acceleration (Z) vs. Time	B-5
8	Driver Lower Spine T12 Resultant Acceleration vs. Time	B-5
9	Driver Iliac Wing Force on Impact Side (Y) vs. Time	B-6
10	Driver Acetabulum Force on Impact Side (Y) vs. Time	B-6
11	Driver Total Pelvis Force on Impact Side (Y) vs. Time	B-6

The following additional data for this test can be obtained from the Research and Development section of the NHTSA website. The website can be found at www.NHTSA.gov.

Additional Driver Dummy Instrumentation Data

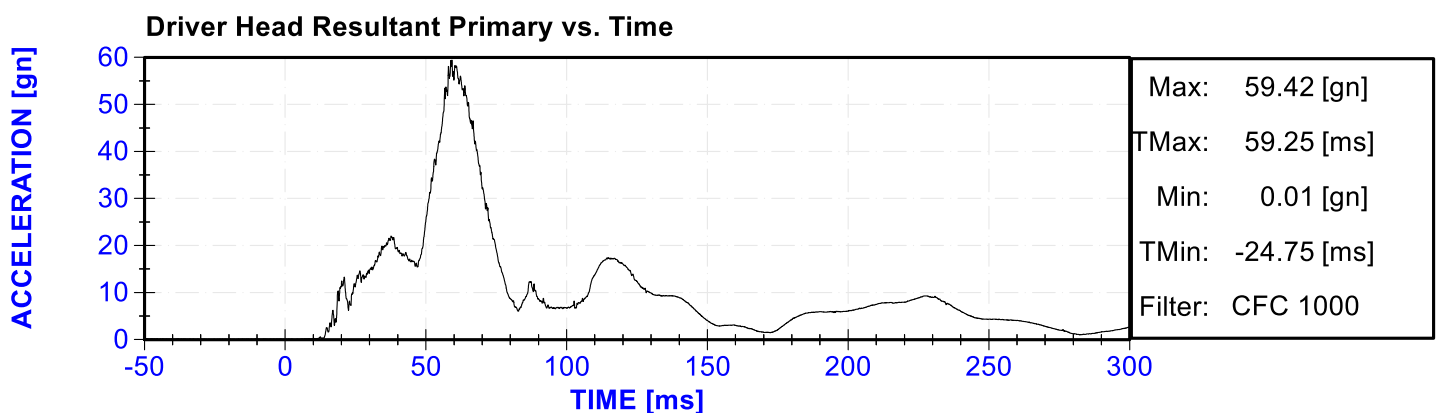
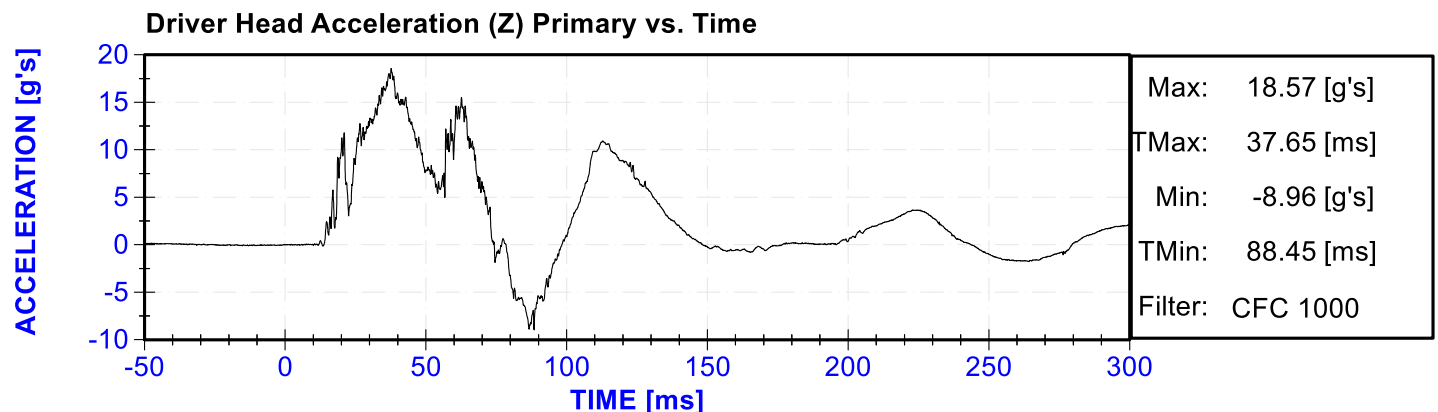
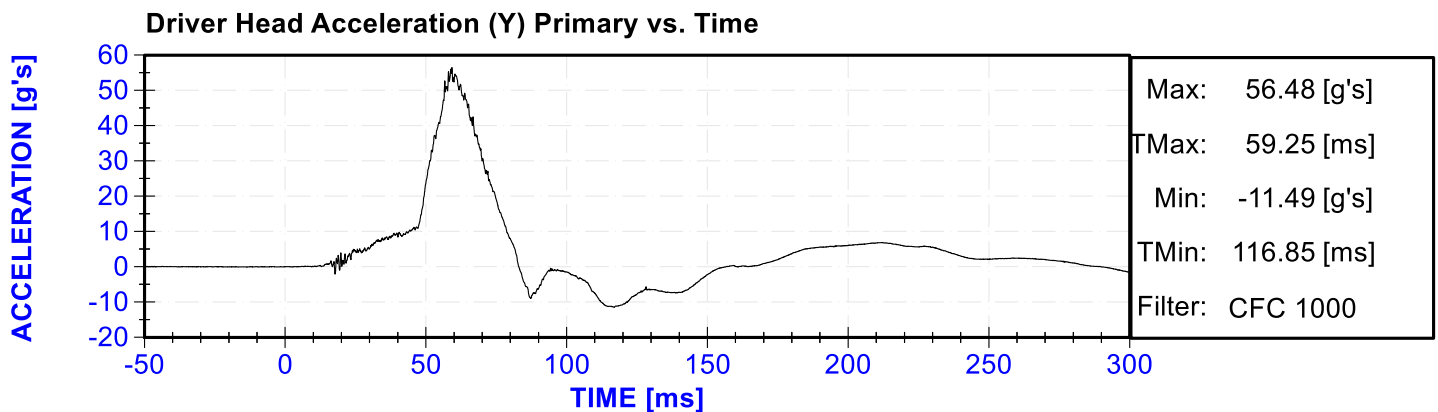
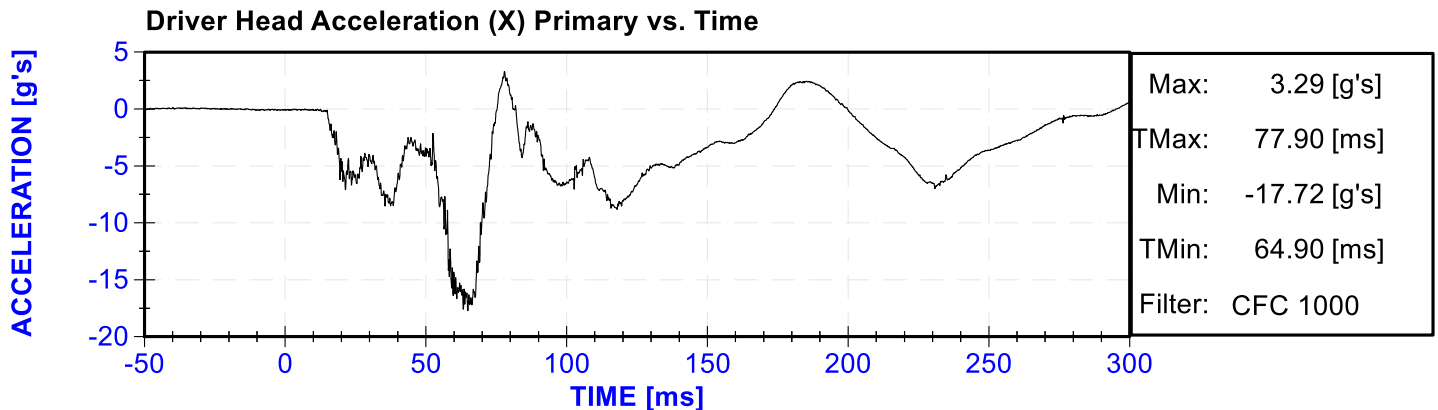
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection (Y)

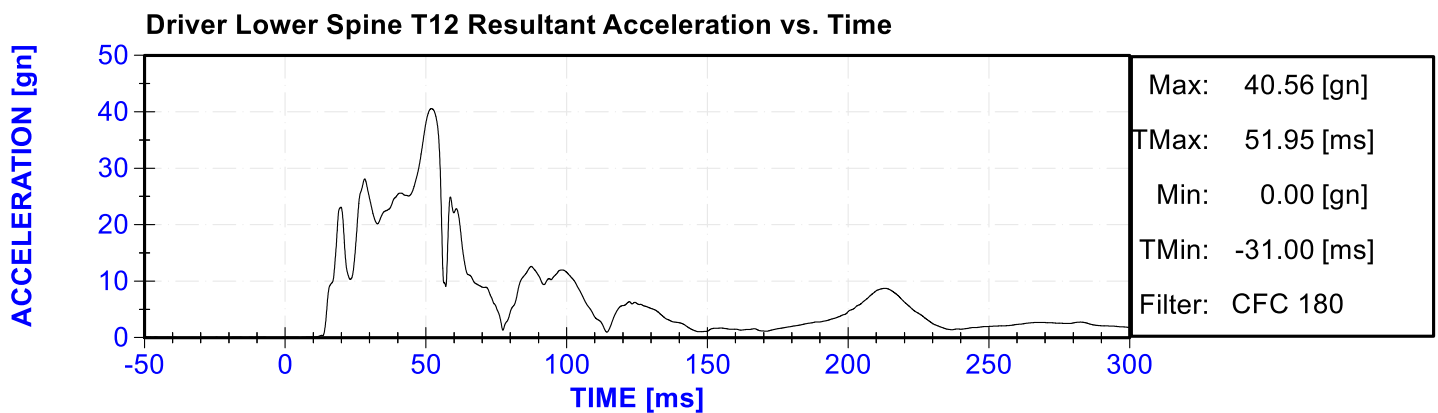
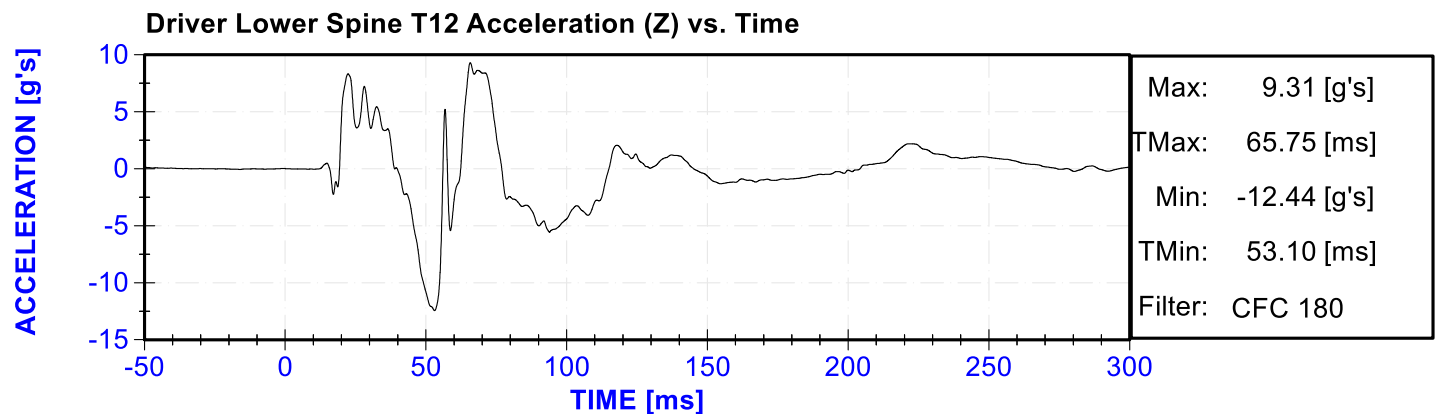
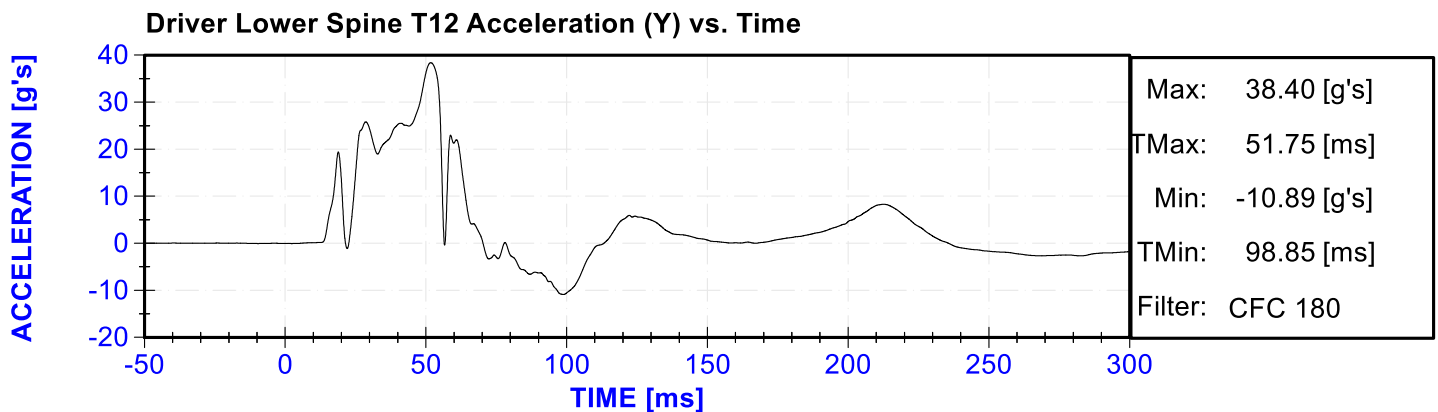
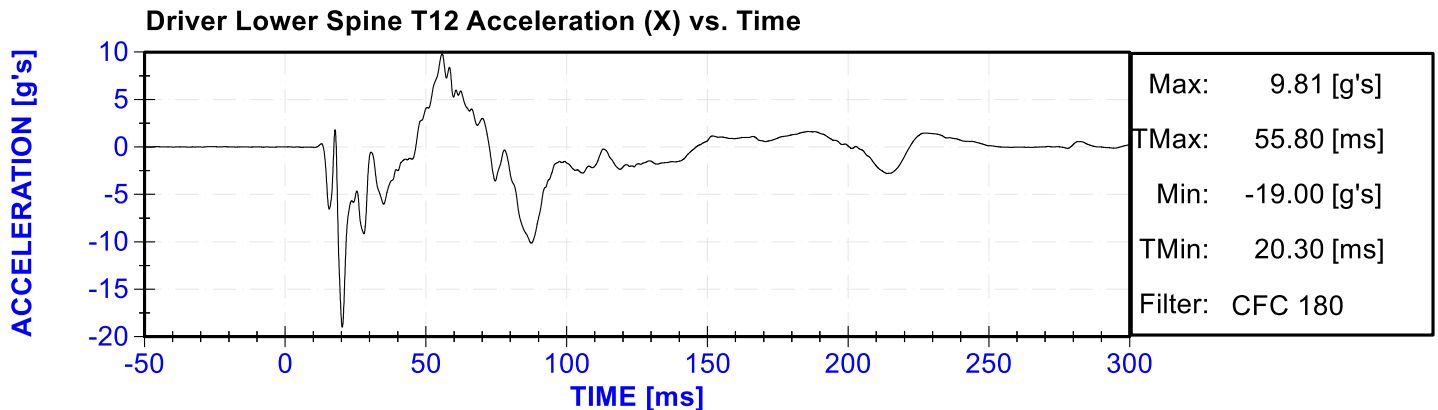
Vehicle Instrumentation Data

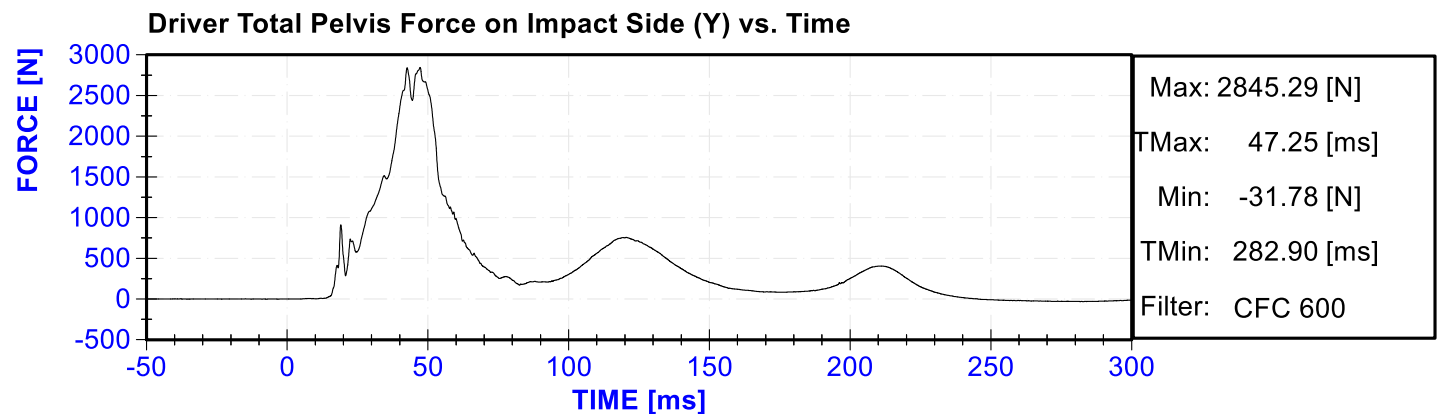
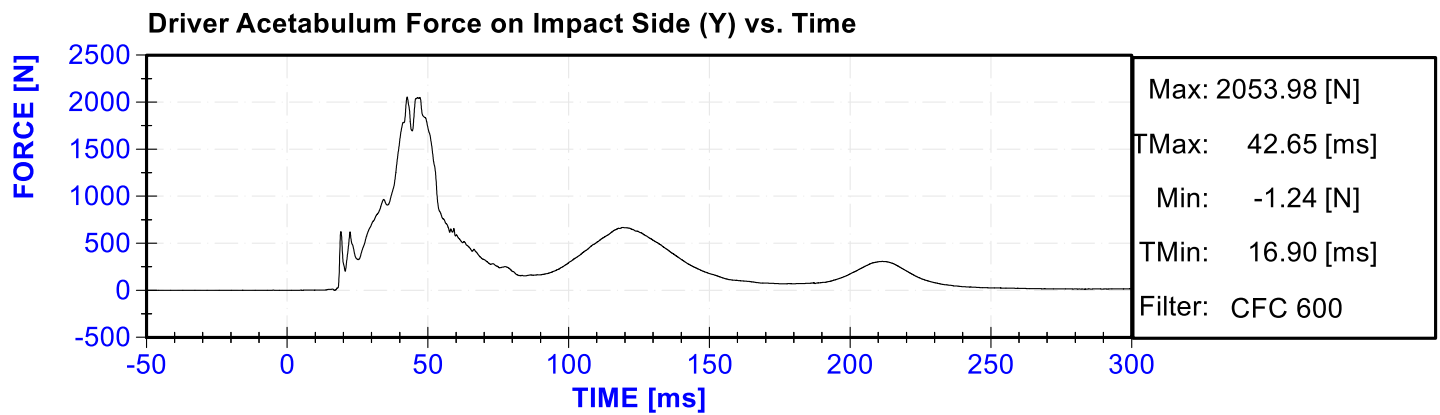
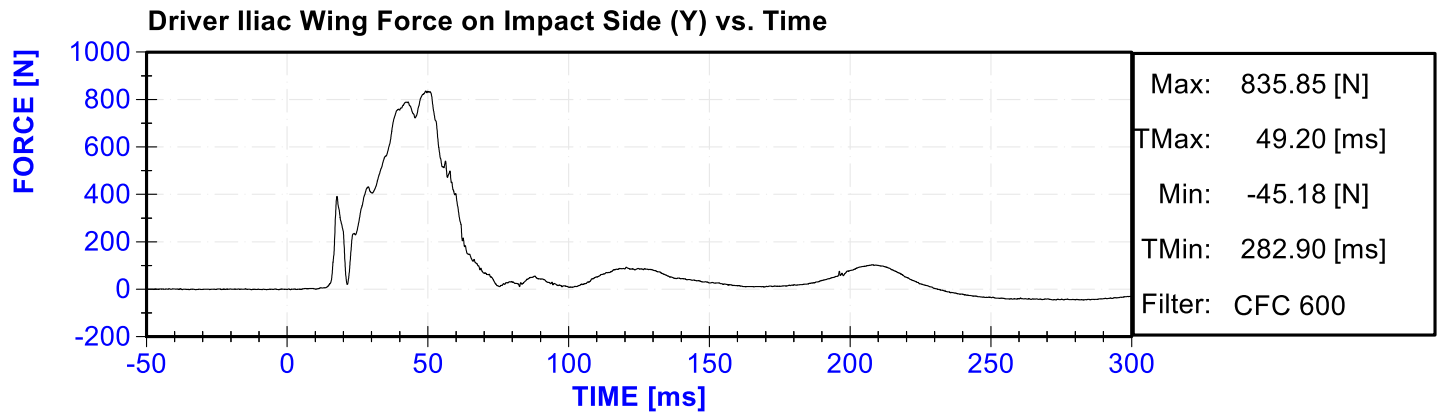
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration (Y)
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy Hip Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)

Pole Instrumentation Data

Load Cell Pole Barrier #1 Force (Y)
Load Cell Pole Barrier #2 Force (Y)
Load Cell Pole Barrier #3 Force (Y)
Load Cell Pole Barrier #4 Force (Y)
Load Cell Pole Barrier #5 Force (Y)
Load Cell Pole Barrier #6 Force (Y)
Load Cell Pole Barrier #7 Force (Y)
Load Cell Pole Barrier #8 Force (Y)







APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO: DG8012

(CONFIGURED FOR LEFT SIDE IMPACT)

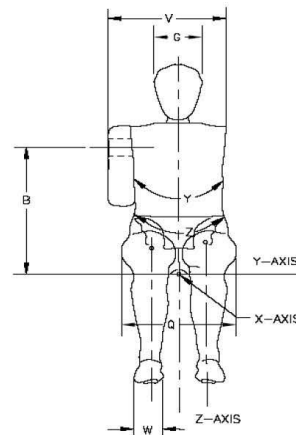
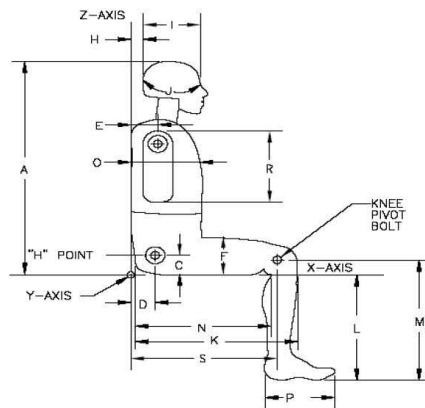


External Measurements - SID-IIs

Technician: J.Pericak

Date: 2/5/2021

Dummy Serial Number: DG8012



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	Pass
B	Shoulder Pivot Height	437	453	446	Pass
C	H-point Height	79	89	84	Pass
D	H-point from seatback	141	151	144	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	130	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	184	Pass
J	Head Circumference	541	551	548	Pass
K	Buttock to Knee Length	514	540	536	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	435	Pass
O	Chest Depth w/o jacket	195	211	207	Pass
P	Foot Length	216	232	225	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	320	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	348	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	870	Pass
Z	Waist Circumference	761	791	784	Pass

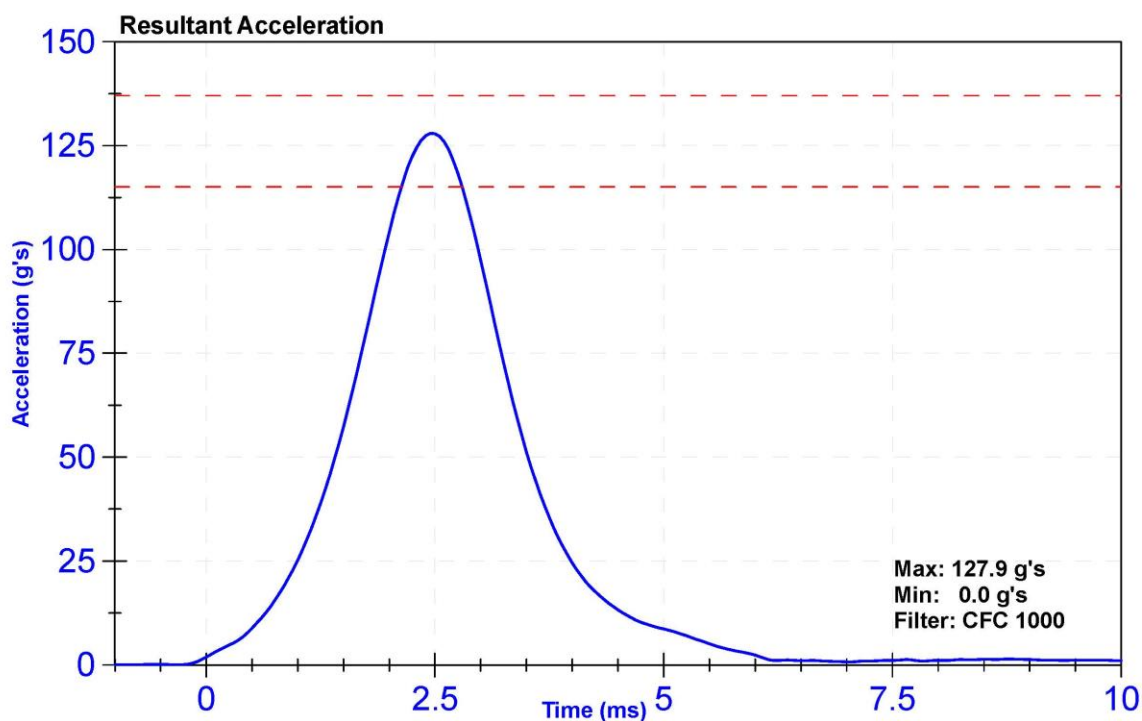
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

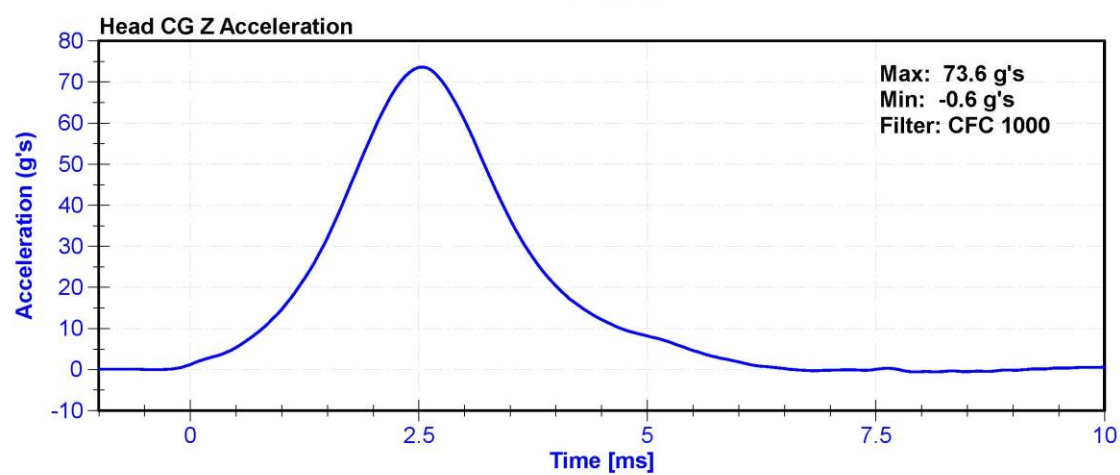
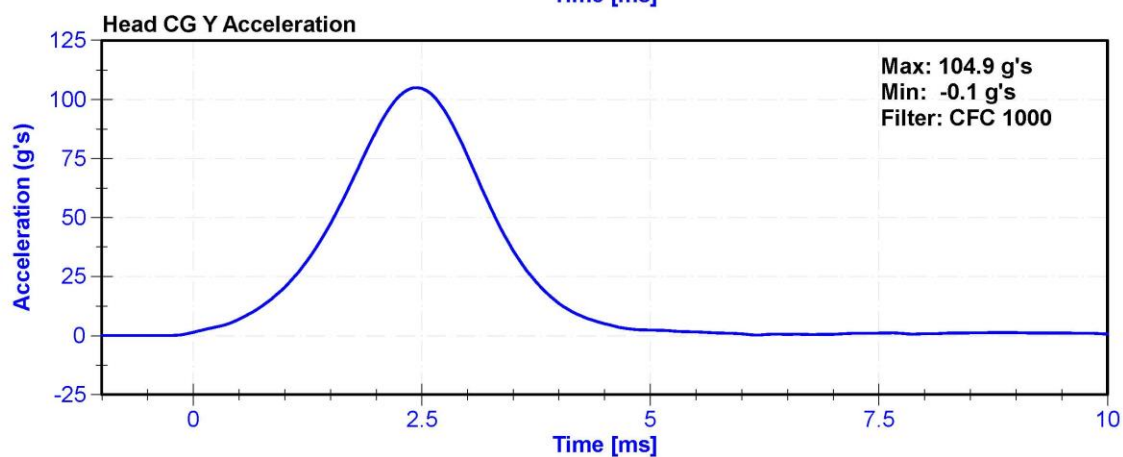
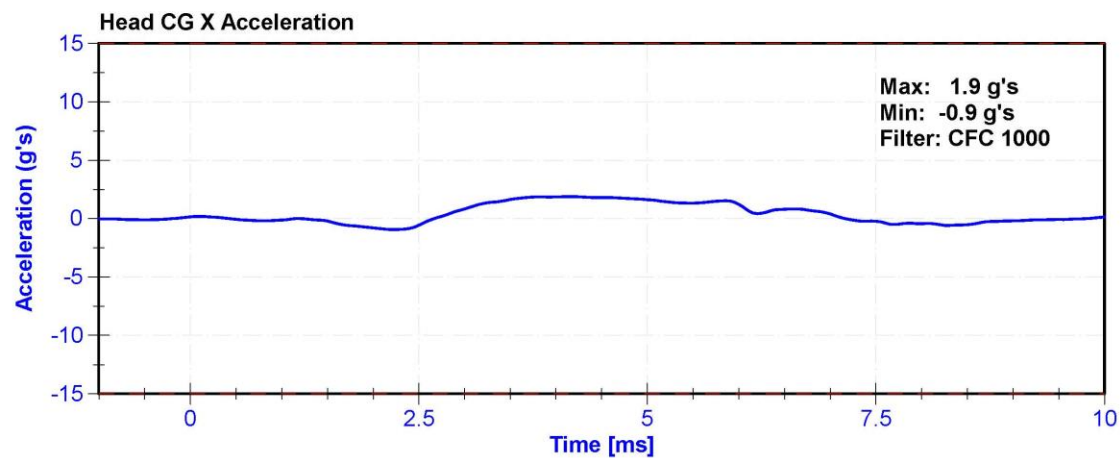
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	19.8	Pass
Resultant Acceleration	115	137	g's	127.9	Pass
Oscillation	0	15	%	1.1	Pass
Fore-Aft Acceleration	-15	15	g's	1.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P74788	11/5/2020	5/6/2021
Y Accelerometer	ENDEVCO 7264	AC-P83432	11/5/2020	5/6/2021
Z Accelerometer	ENDEVCO 7264	AC-P83319	11/5/2020	5/6/2021





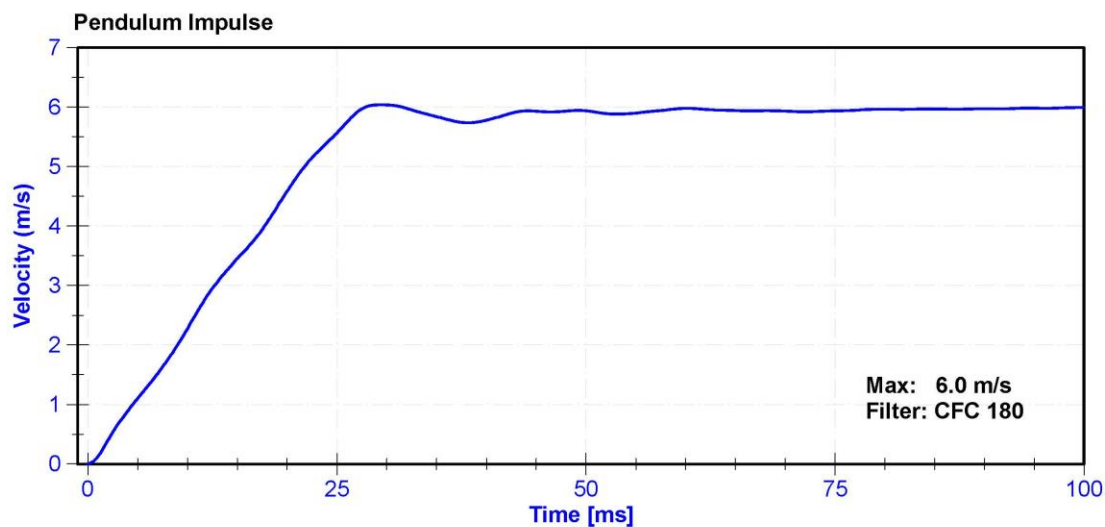
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

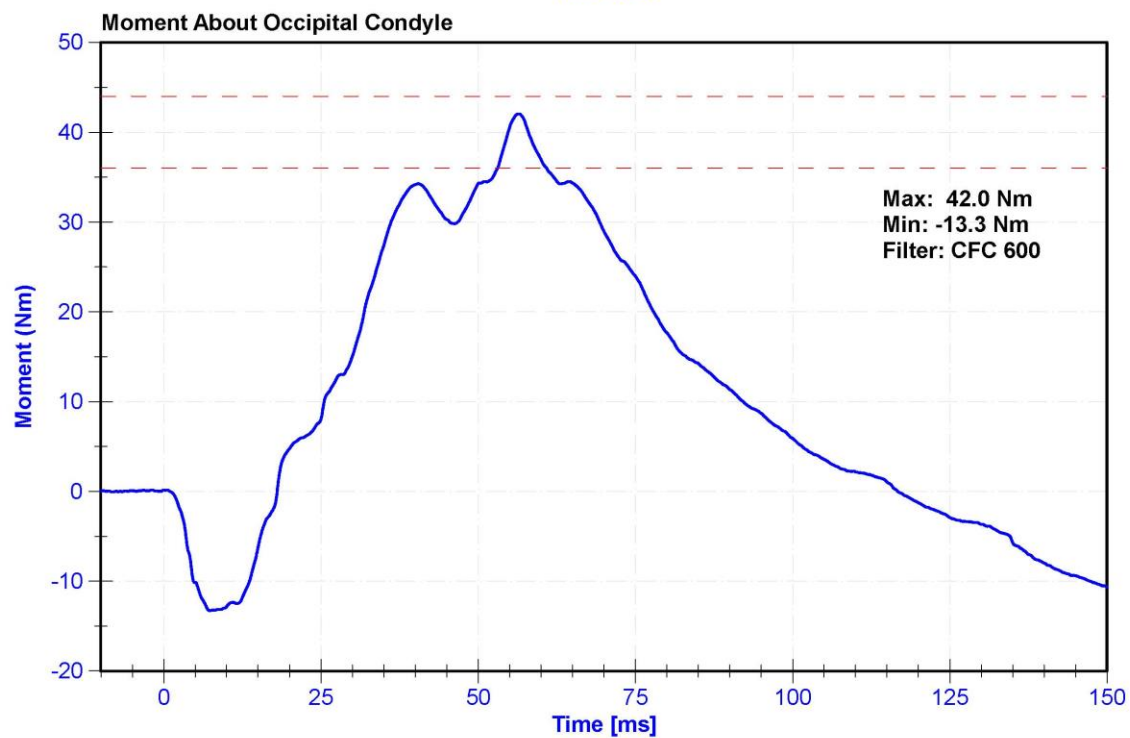
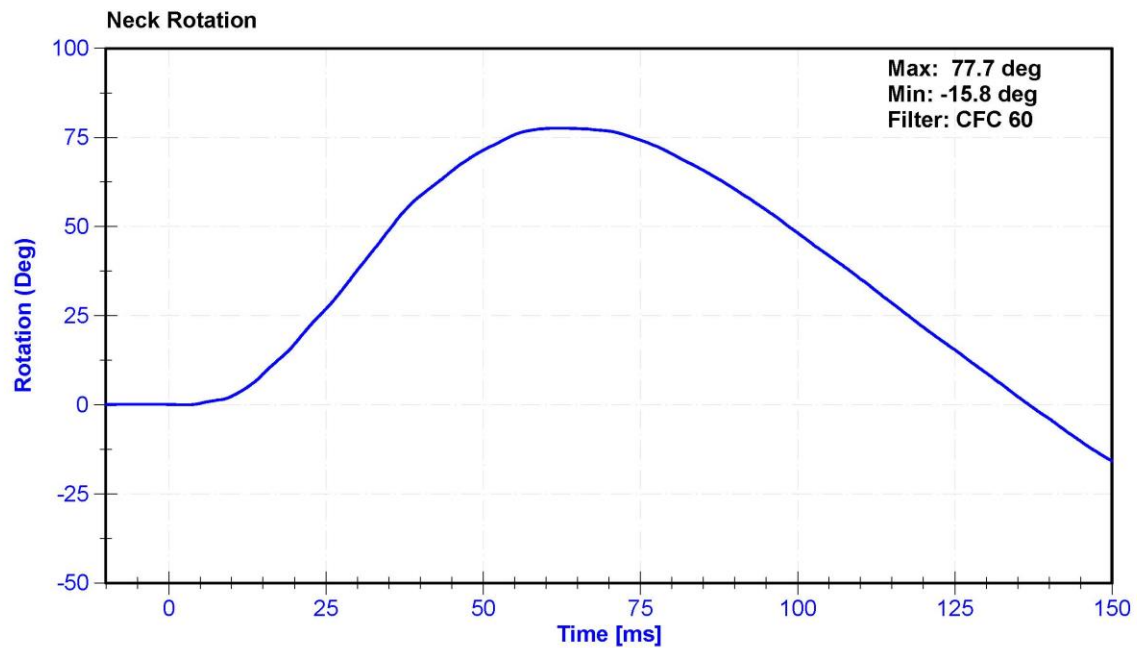
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.5	Pass
Humidity	10	70	%	22.5	Pass
Velocity	5.51	5.63	m/s	5.549	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.27	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.45	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.58	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.56	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	6.04	Pass
Neck Rotation	71	81	deg	77.7	Pass
Time at Maximum Rotation	50	70	ms	61.9	Pass
Moment about the OC	36	44	Nm	42.0	Pass
Moment Decay to 0 Nm	102	126	ms	116.8	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	Denton 78051-342	DS-184Pend	11/6/2020	11/6/2021
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/6/2020	11/6/2021
Upper Neck Load Cell	Denton 1716	17162019 FY	3/18/2020	3/18/2021





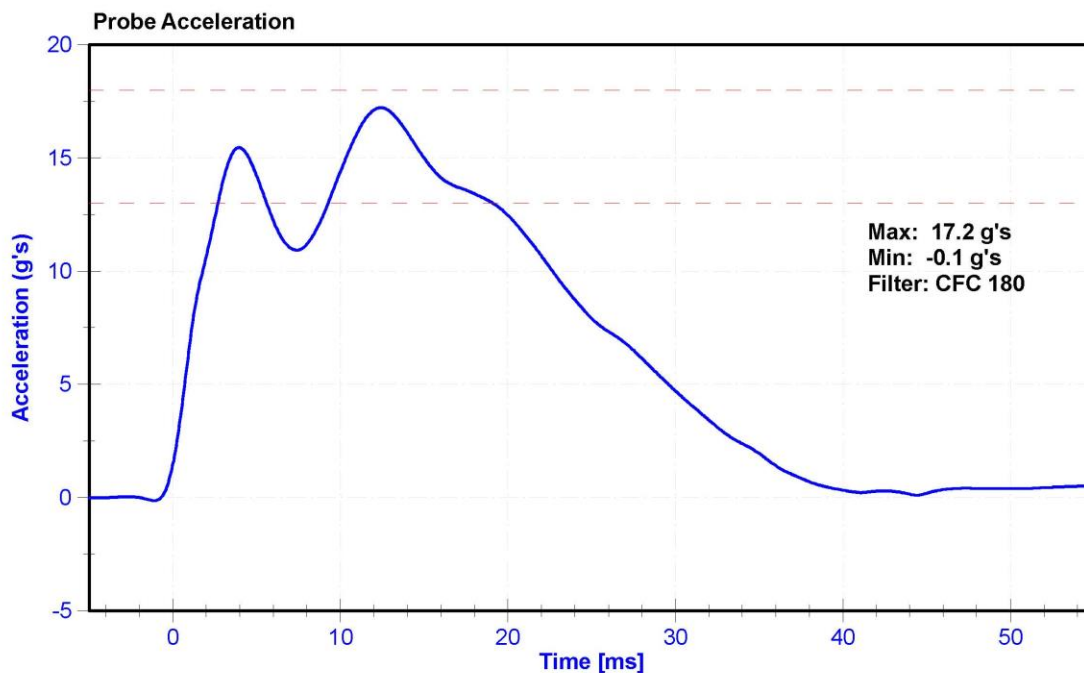
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

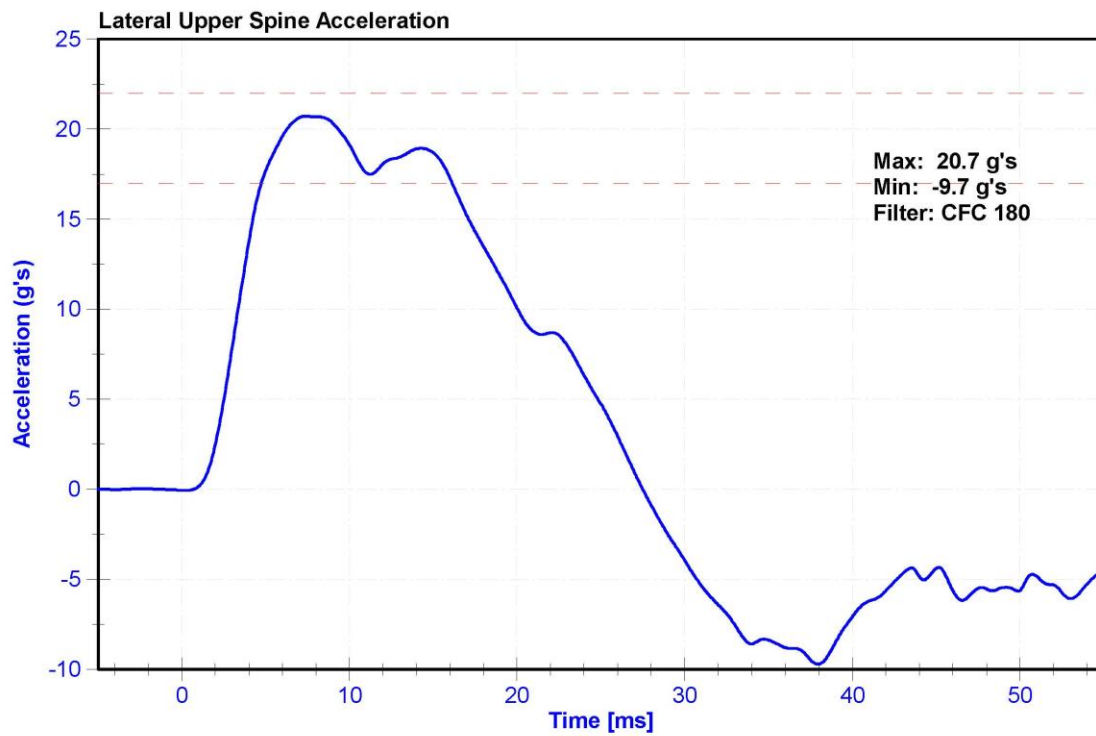
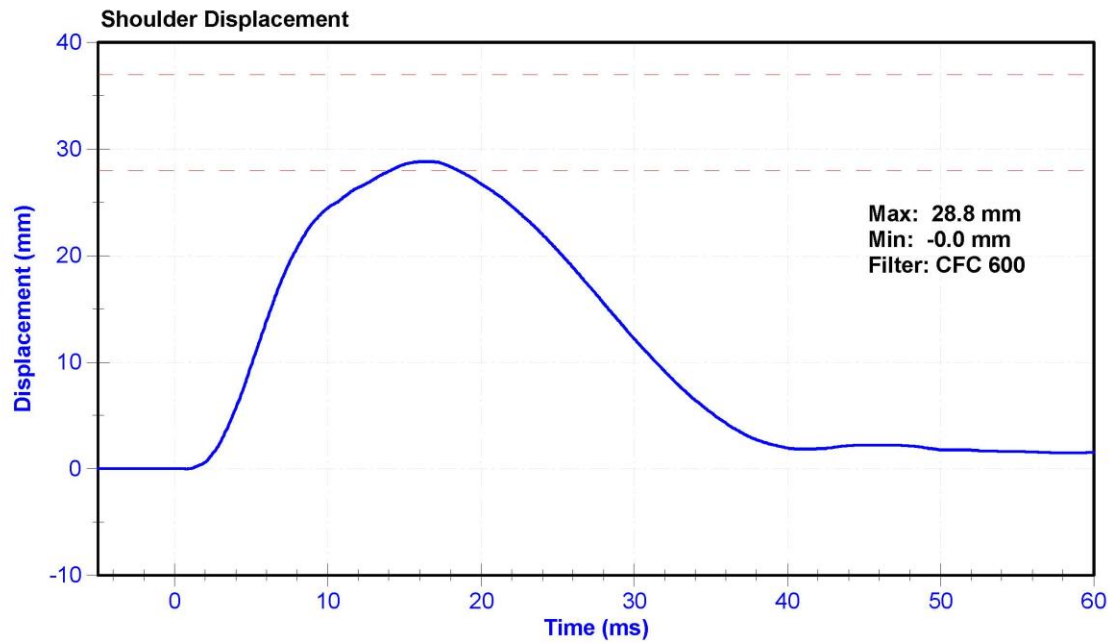
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	34.2	Pass
Velocity	4.2	4.4	m/s	4.33	Pass
Probe Acceleration	13	18	g's	17.2	Pass
Shoulder Deflection	28	37	mm	28.8	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A278994	12/3/2020	12/3/2021
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	12/2/2020	6/2/2021
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	11/5/2020	5/6/2021





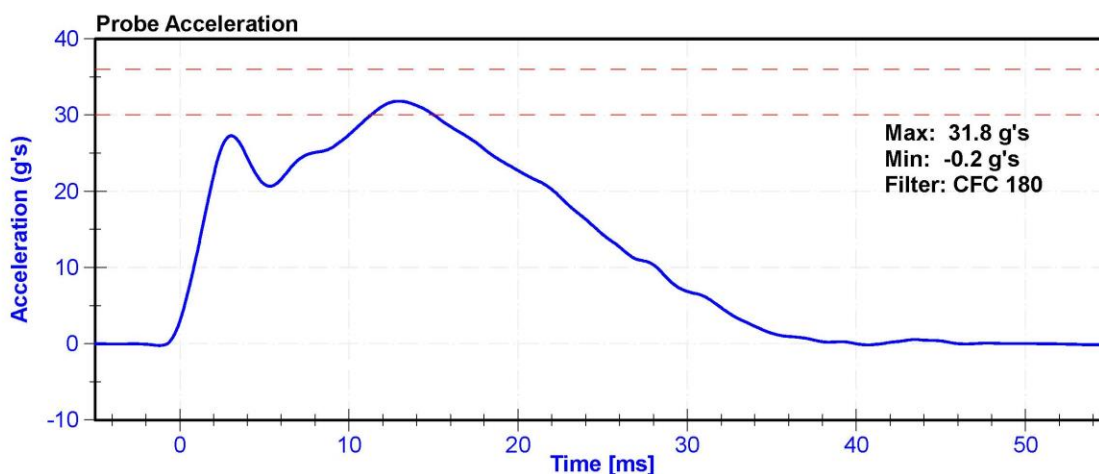
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ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

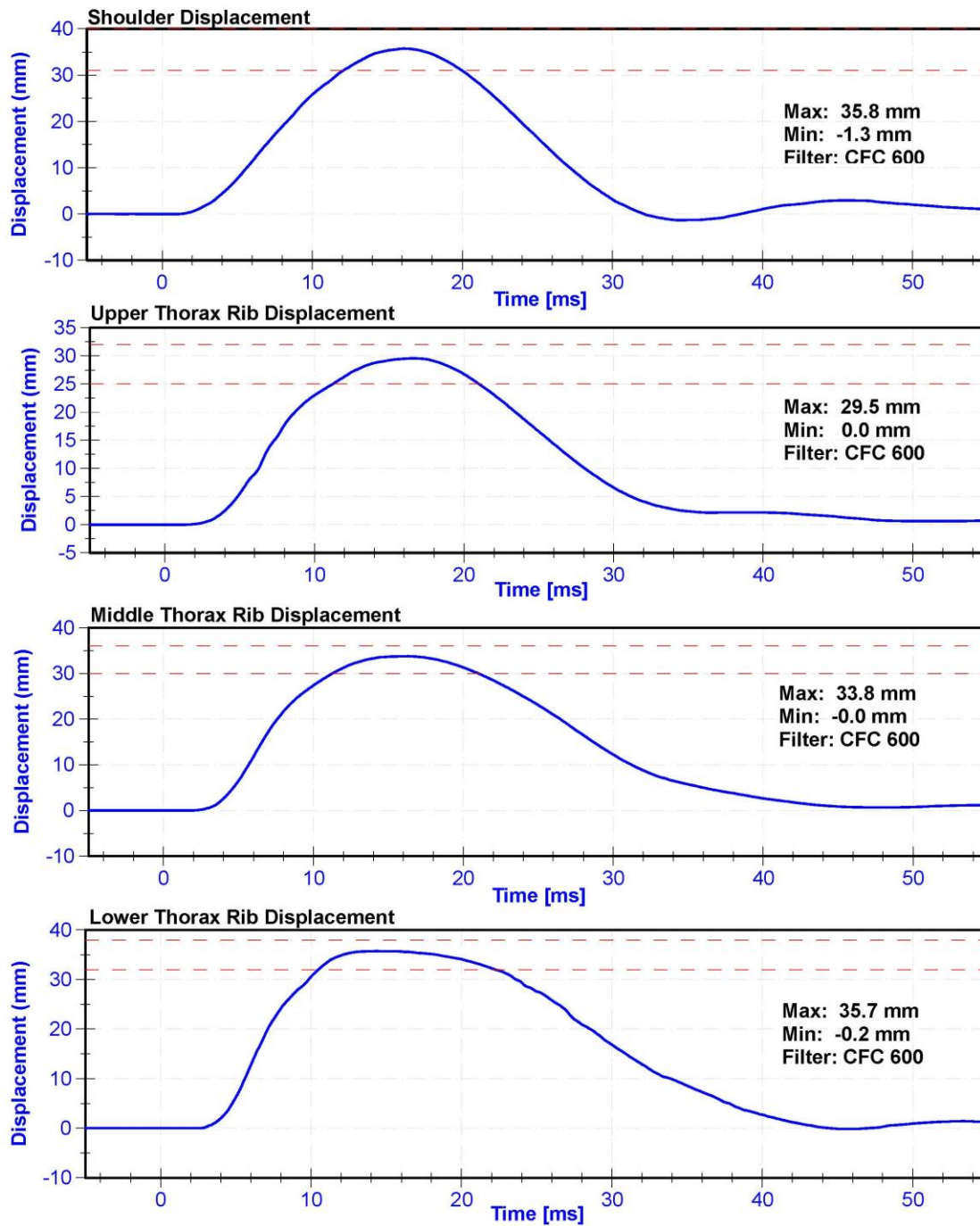
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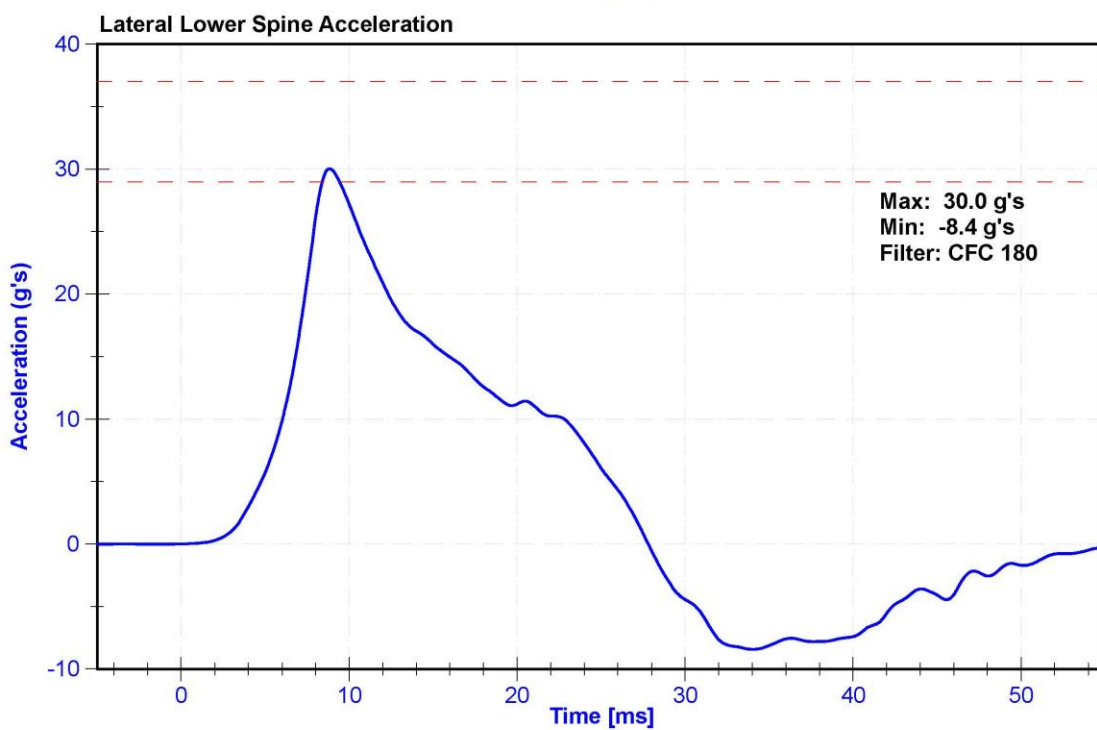
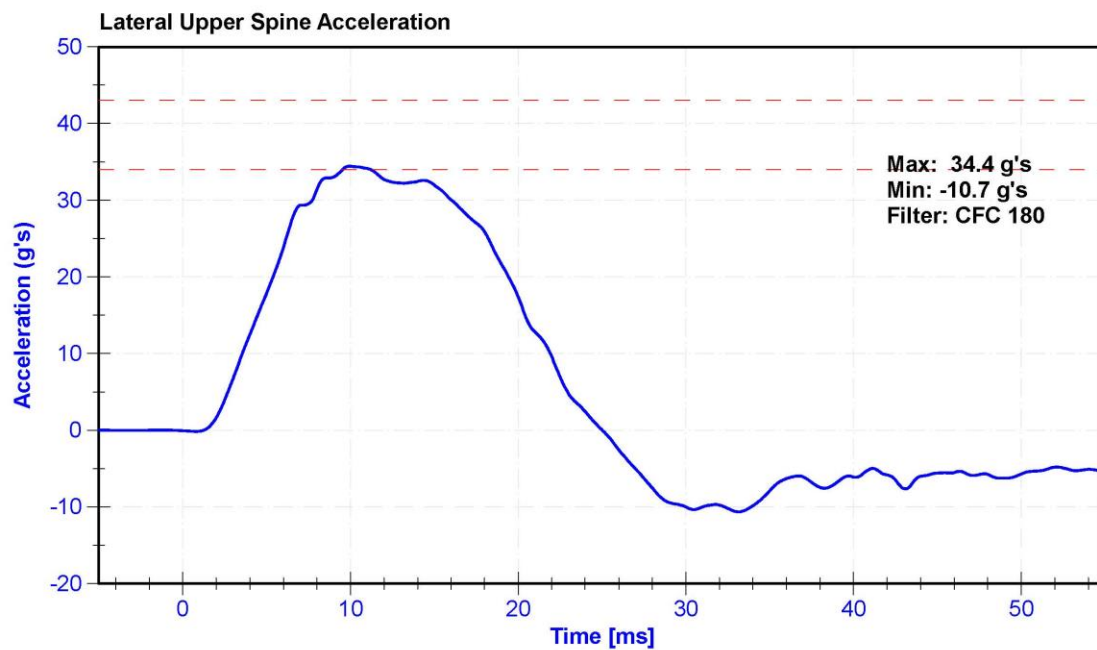
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	6.6	6.8	m/s	6.67	Pass
Probe Acceleration after 5 ms	30	36	g's	31.8	Pass
Lateral Upper Spine Acceleration	34	43	g's	34.4	Pass
Lateral Lower Spine Acceleration	29	37	g's	30.0	Pass
Shoulder Deflection	31	40	mm	35.8	Pass
Upper Thorax Rib Deflection	25	32	mm	29.5	Pass
Mid Thorax Rib Deflection	30	36	mm	33.8	Pass
Lower Thorax Rib Deflection	32	38	mm	35.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A278994	12/3/2020	12/3/2021
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P64148	11/5/2020	5/6/2021
Upper Spine T12 Y Accelerometer	ENDEVCO 7264C	AC-P51327	11/5/2020	5/6/2021
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	12/2/2020	6/2/2021
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	11/6/2020	5/7/2021
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	11/6/2020	5/7/2021
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	11/6/2020	5/7/2021







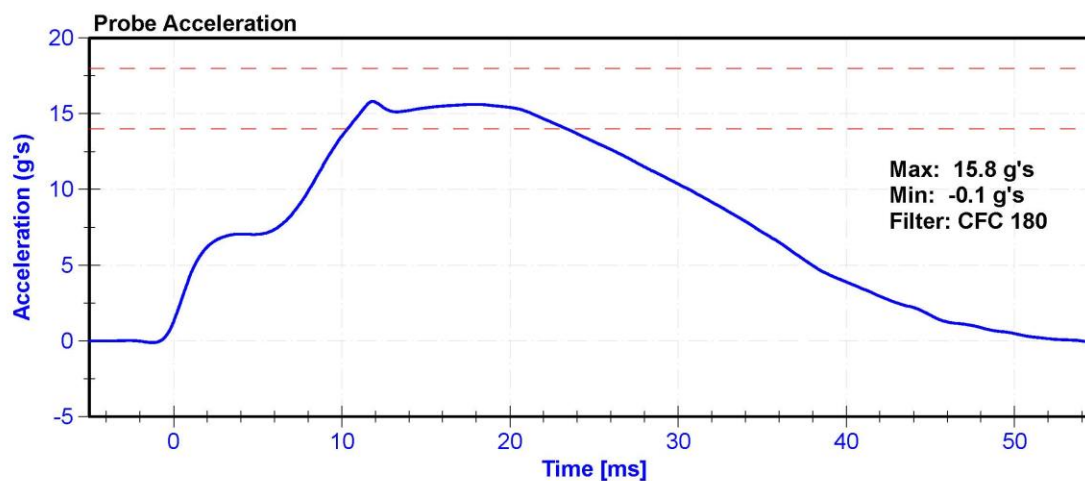
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

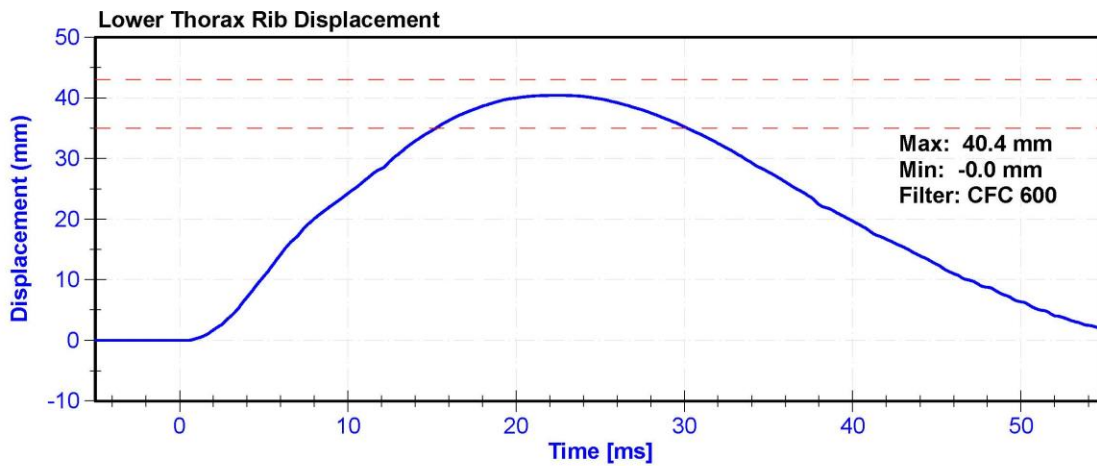
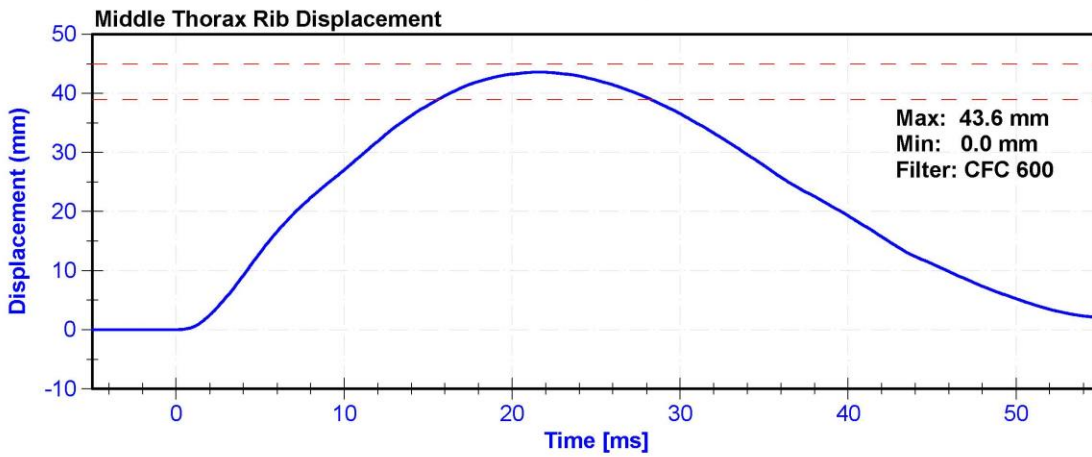
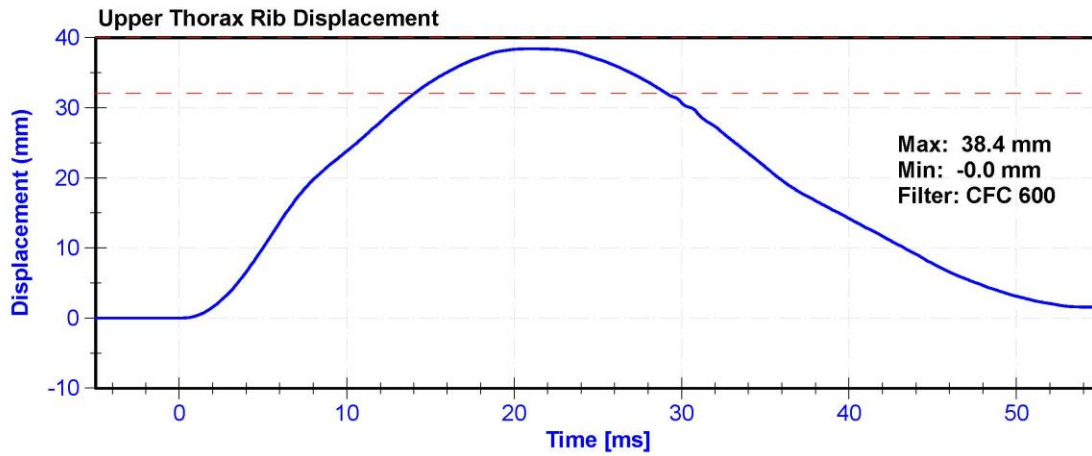
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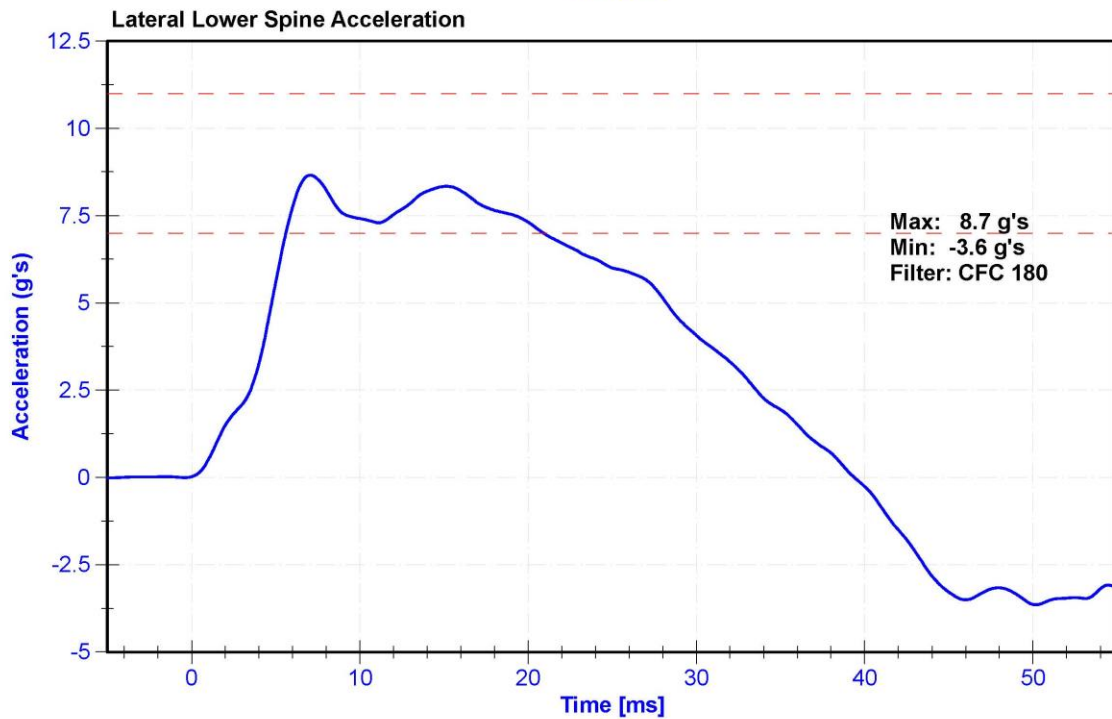
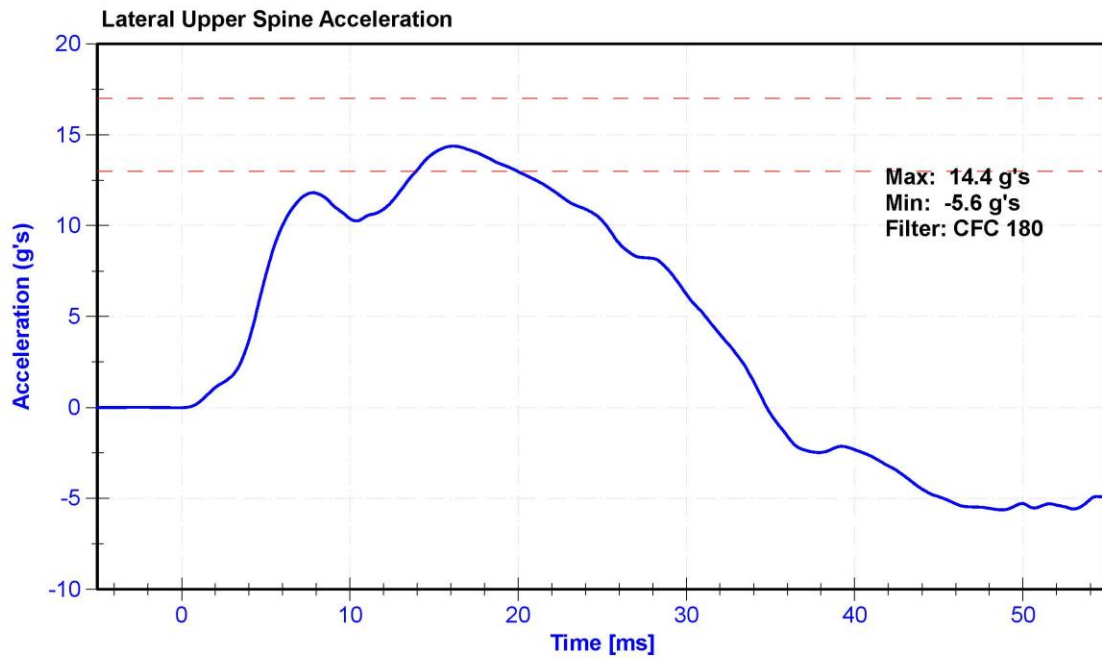
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	14	18	g's	15.8	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.4	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.7	Pass
Upper Thorax Rib Deflection	32	40	mm	38.4	Pass
Middle Thorax Rib Deflection	39	45	mm	43.6	Pass
Lower Thorax Rib Deflection	35	43	mm	40.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A278994	12/3/2020	12/3/2021
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	11/5/2020	5/6/2021
Lower Spine Y Accelerometer	ENDEVCO 7264C	AC-P51327	11/5/2020	5/6/2021
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	11/6/2020	5/7/2021
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	11/6/2020	5/7/2021
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	11/6/2020	5/7/2021







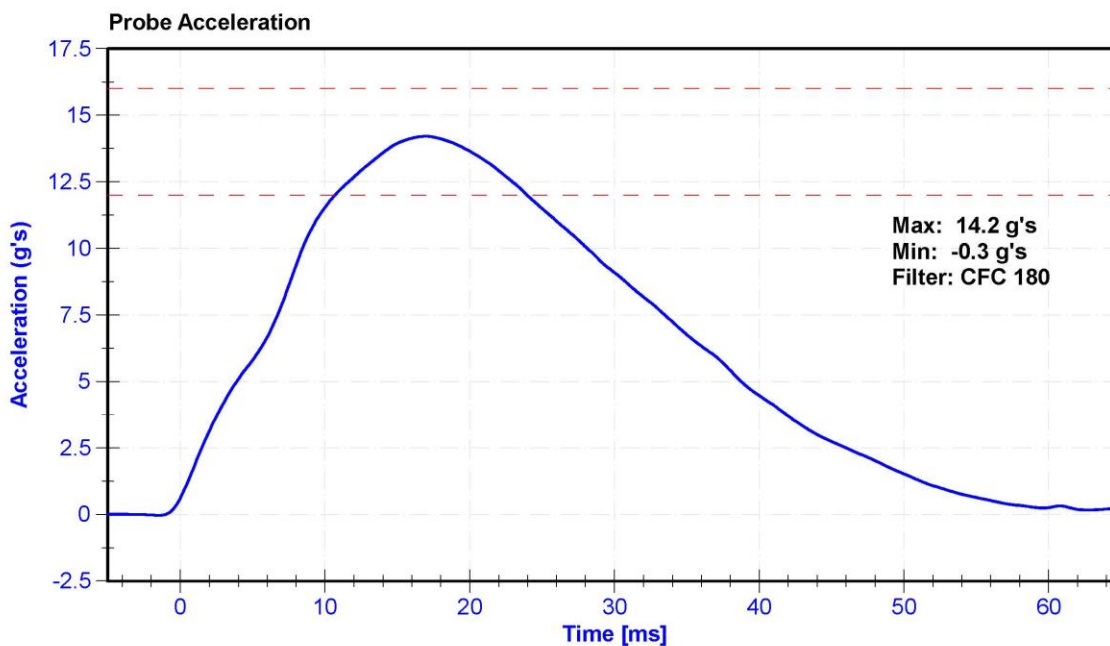
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

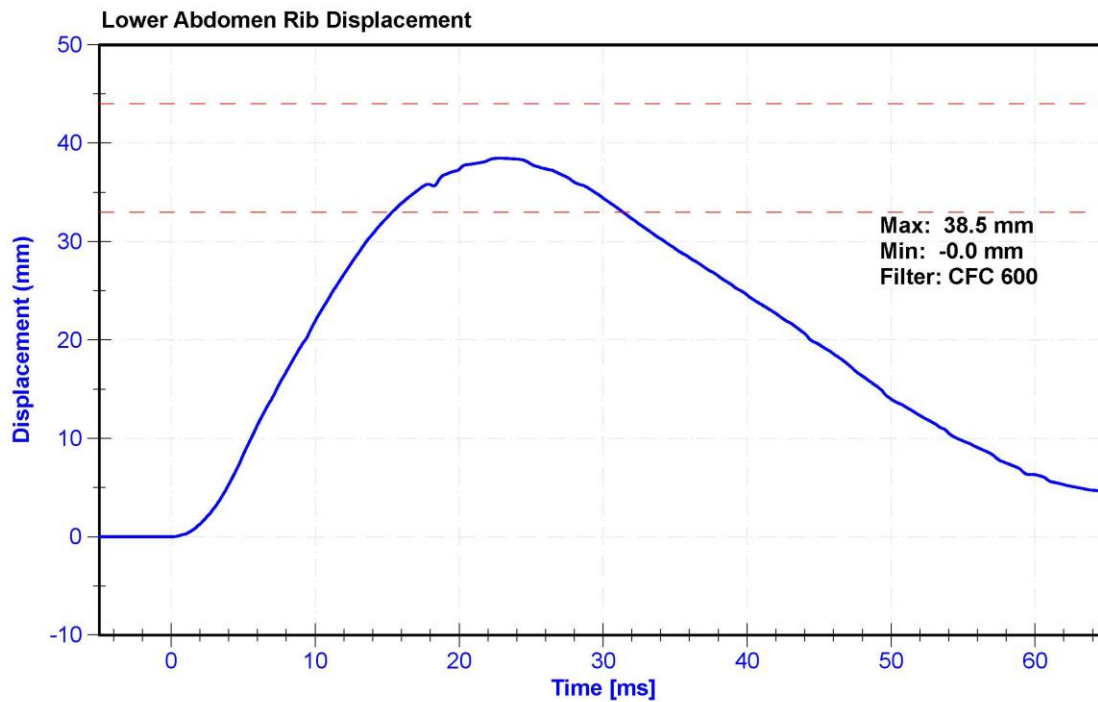
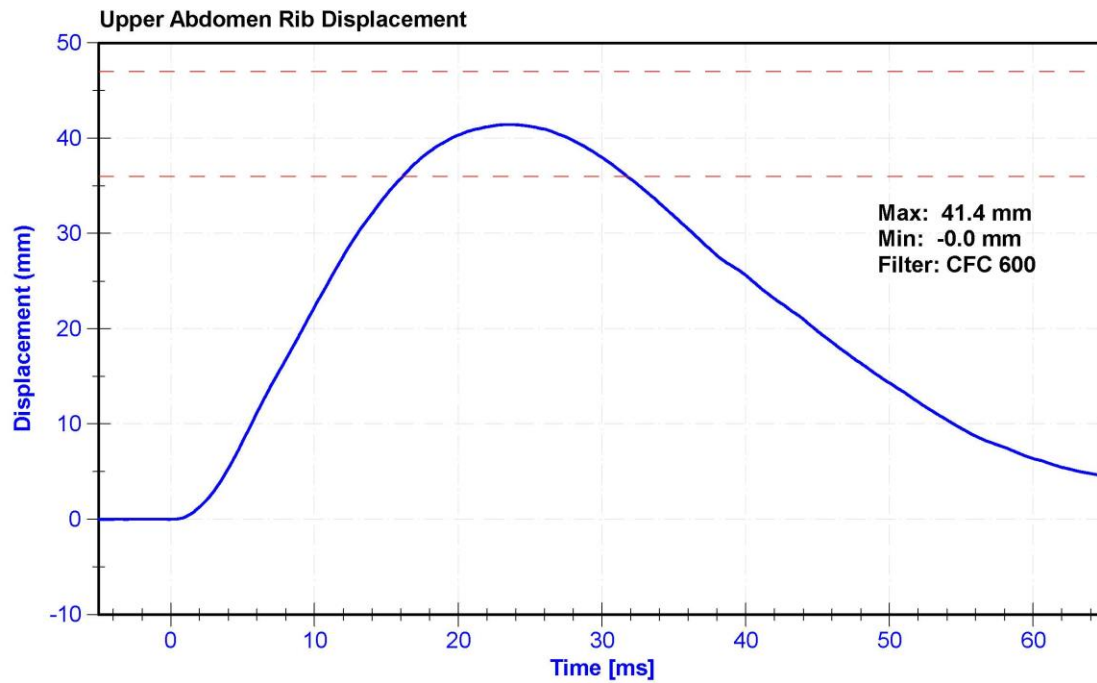
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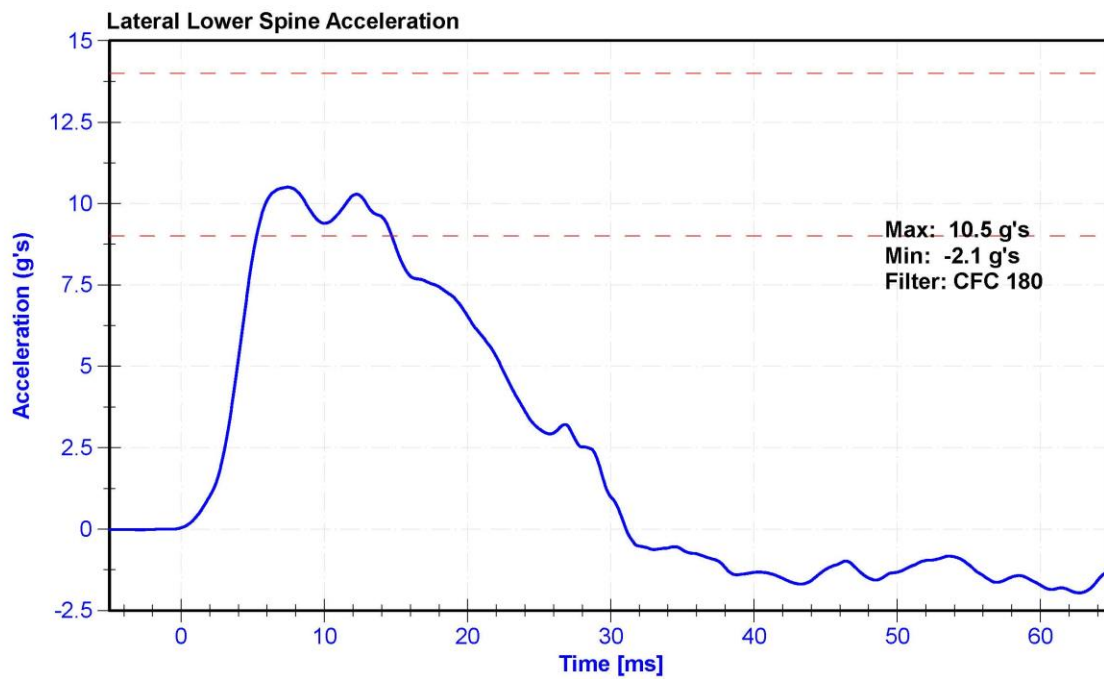
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	12	16	g's	14.2	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.5	Pass
Upper Abdomen Rib Deflection	36	47	mm	41.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	38.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	MSI 64C-2000	A278994	12/3/2020	12/3/2021
Lower Spine Y Accelerometer	ENDEVCO 7264C	AC-P51327	11/5/2020	5/6/2021
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	11/6/2020	5/7/2021
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	11/6/2020	5/7/2021







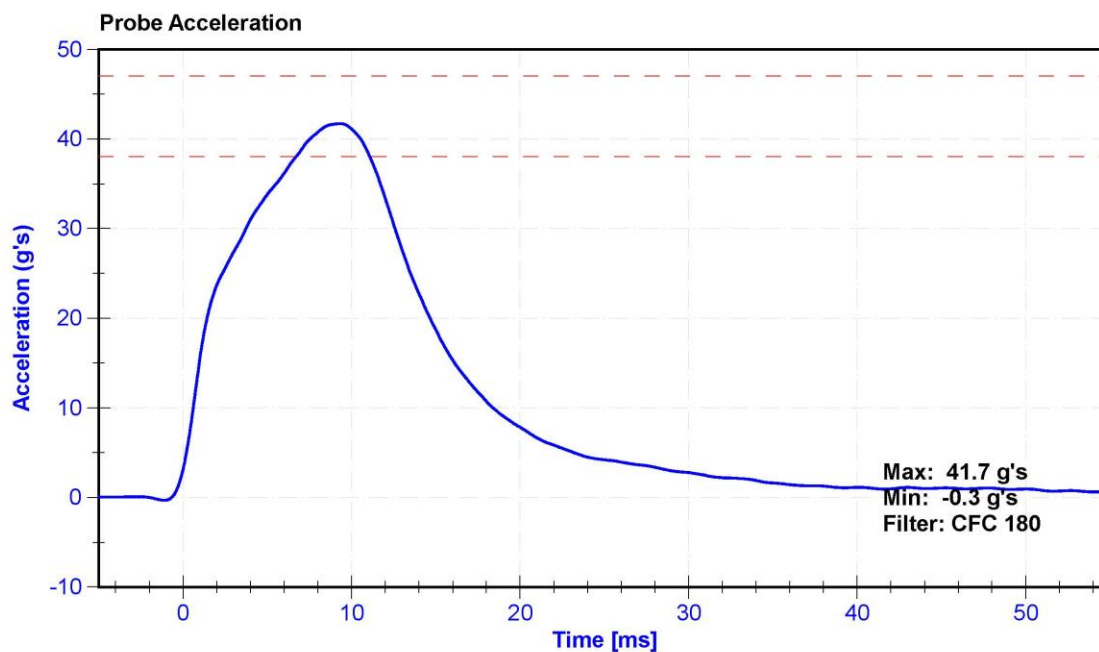
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

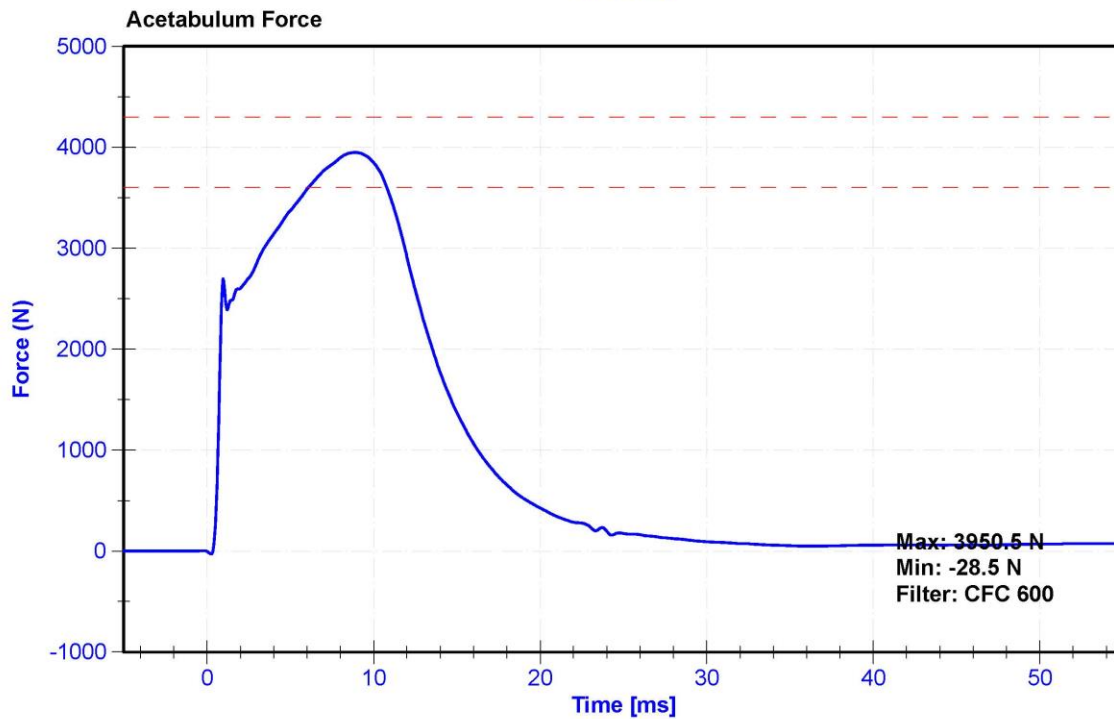
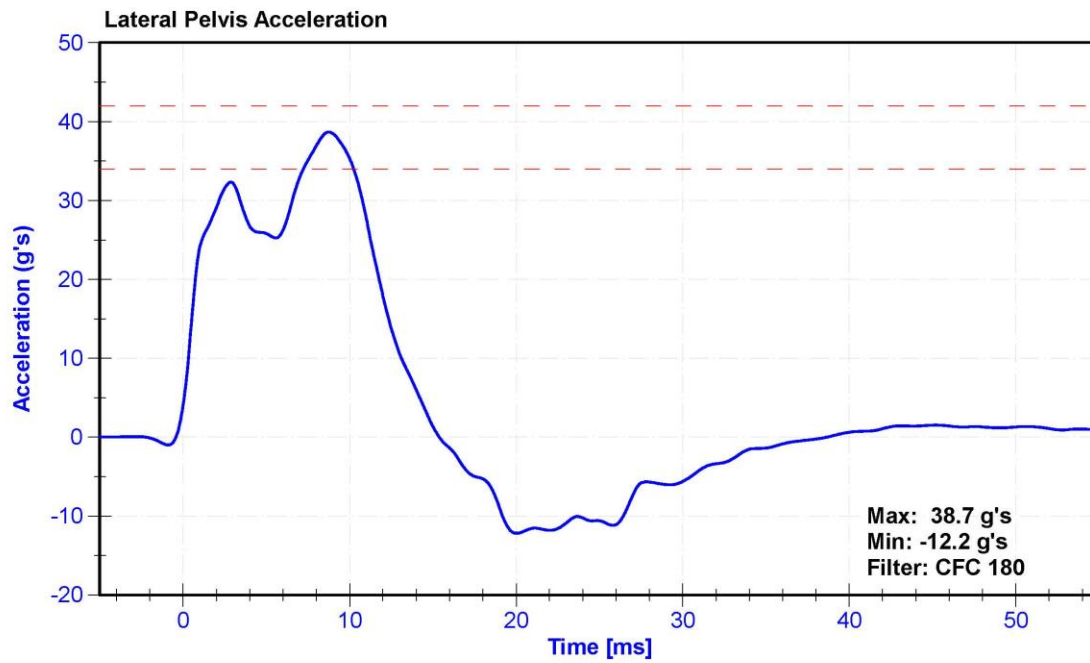
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	6.6	6.8	m/s	6.68	Pass
Probe Acceleration	38	47	g's	41.7	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	38.7	Pass
Acetabulum Force	3600	4300	N	3950.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A278994	12/3/2020	12/3/2021
Pelvis Y Accelerometer	ENDEVCO 7264C	AC-P51875	11/5/2020	5/6/2021
Acetabulum Load Cell	Denton 3249J	LC-267Fy	3/19/2020	3/19/2021
Certification Plug	SACO	13894	5/20/2020	N/A
Crash Test Plug	SACO	13085	7/30/2020	N/A







068012

CLASH
2/5/25
SV

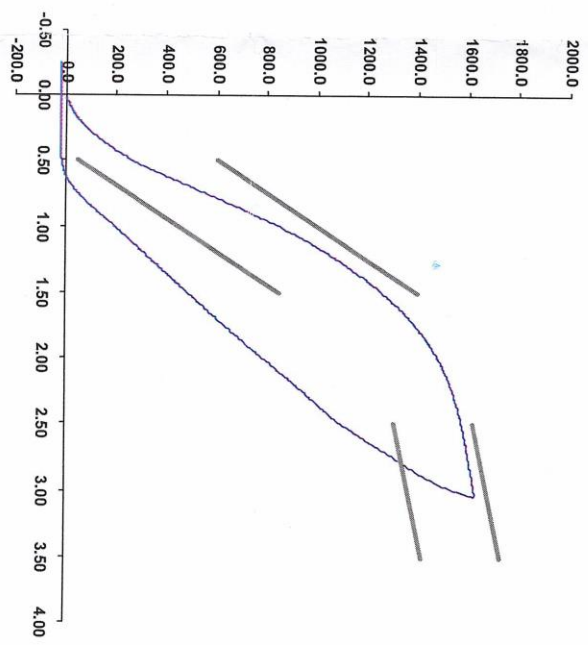
SID-lls Pelvis Plug Certification Test

Plug S/N 13085
Test Number 10405
Report Number 10440
Test Date 7/30/2019 4:30:16 PM

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	267.09	50.00
Force @ 1.5 mm (N)	1,266.72	850.00
Force @ 2.5 mm (N)	1,577.82	1,306.00
Force @ 3.0 mm (N)	1,627.74	1,361.00

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm/min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Template No 107	30-Jul-19
SACO Research	
By: <u>DC</u> Date: <u>7/30/2019</u>	
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX	
Operator	
Part Number 180-4450	



06-8002
NON-IMPACT CRASH
2/5/21
S

SID-IIS Pelvis Plug Certification Test

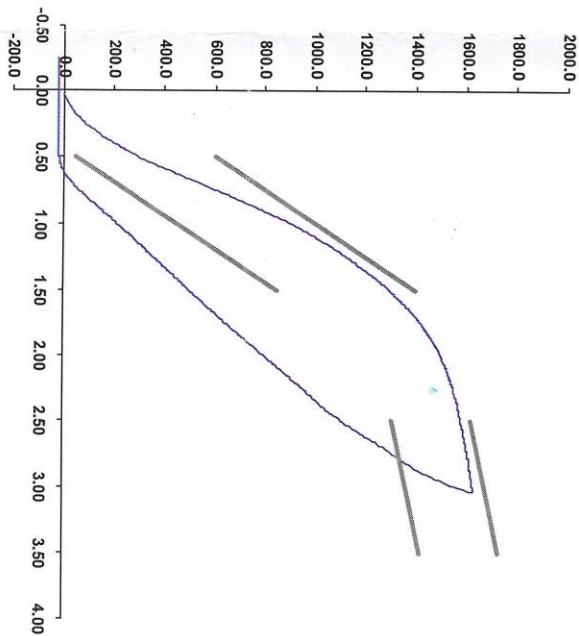
Plug S/N 13092
Test Number 10412
Report Number 10447
Test Date 7/30/2019 4:41:57 PM

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	303.70	50.00
Force @ 1.5 mm (N)	1,296.38	600.00
Force @ 2.5 mm (N)	1,581.33	1,400.00
Force @ 3.0 mm (N)	1,628.33	1,618.00

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm/min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 30-Jul-19
SACO Research

By: DC Date: 7/30/2019
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



968012
Cot #15 Pass
2/15/21
SV

SID-11s Pelvis Plug Certification Test

Plug S/N 13894

Test Number 13368

Report Number 13413

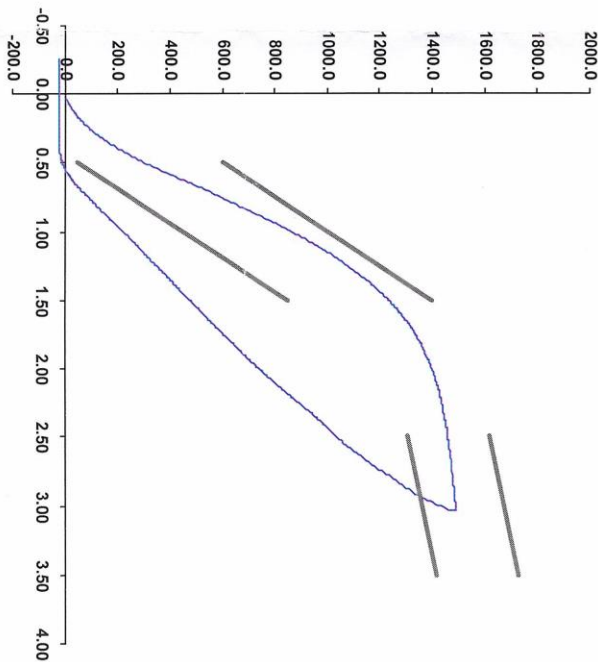
Test Date 5/20/2020 8:17:51 PM

Force (-N) vs Extension (-mm)

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50.00	600.00
Force @ 1.5 mm (N)	850.00	1,400.00
Force @ 2.5 mm (N)	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS) 1000
Preload Value (-N) 22.24
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator

Part Number 180-4450

Template No 107 20-May-20

SACO Research

By: *DC*

Date: *5/20/2020*

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

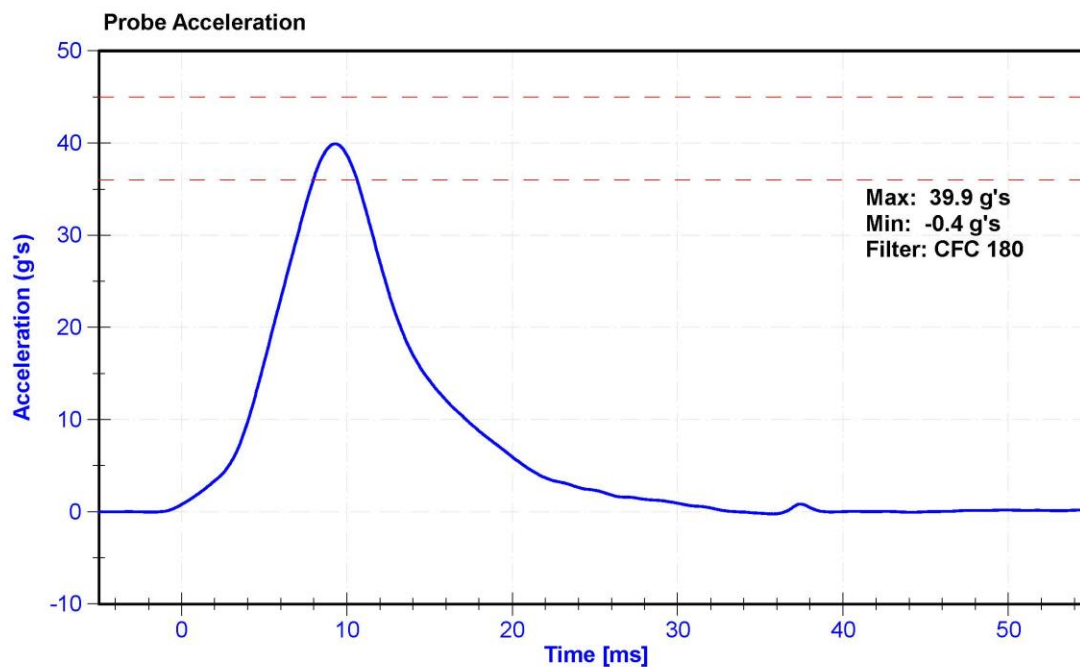
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

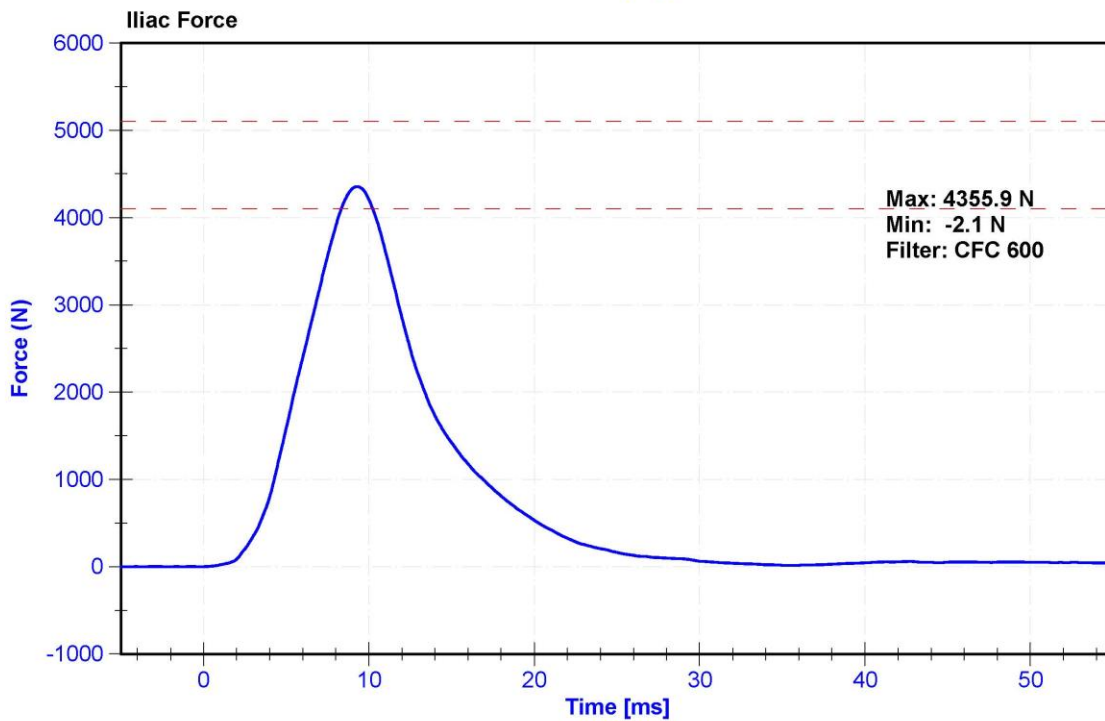
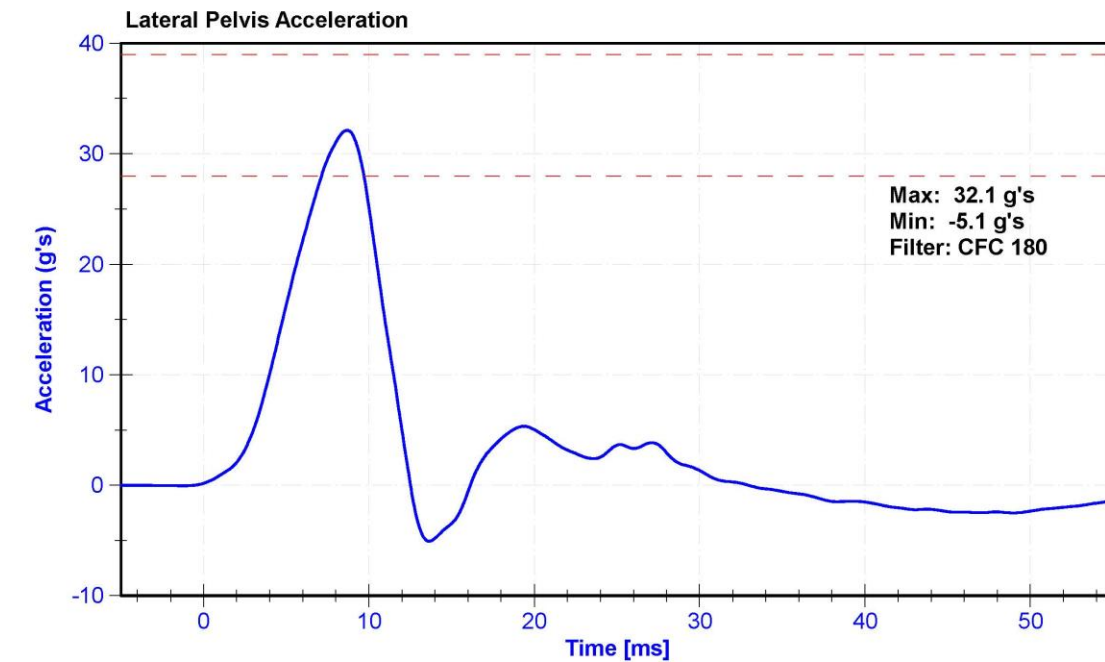
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	36	45	g's	39.9	Pass
Lateral Pelvis Acceleration	28	39	g's	32.1	Pass
Iliac Force	4100	5100	N	4355.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A278994	12/3/2020	12/3/2021
Pelvis Y Accelerometer	ENDEVCO 7264C	AC-P51875	11/5/2020	5/6/2021
Iliac Load Cell	DENTON 3228J	LC-290Fy	11/16/2020	11/16/2021





CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

SERIAL NO: DG8012

(CONFIGURED FOR LEFT SIDE IMPACT)

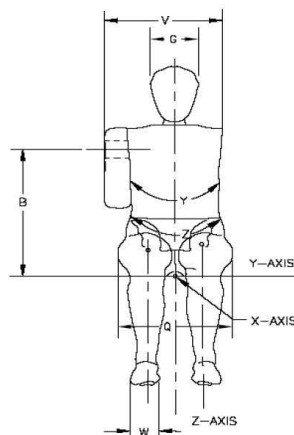
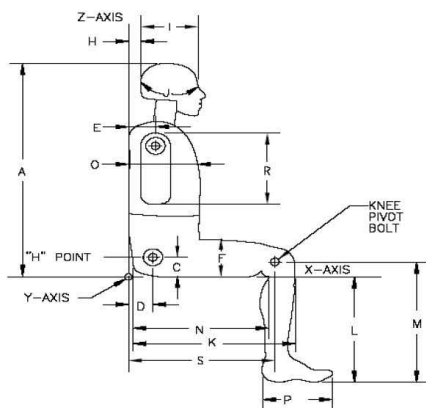


External Measurements - SID-IIs

Technician: J.Pericak

Date: 2/10/2021

Dummy Serial Number: DG8012



Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	Pass
B	Shoulder Pivot Height	437	453	446	Pass
C	H-point Height	79	89	84	Pass
D	H-point from seatback	141	151	144	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	130	Pass
G	Head Breadth	140	148	142	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	185	Pass
J	Head Circumference	541	551	548	Pass
K	Buttock to Knee Length	514	540	536	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	435	Pass
O	Chest Depth w/o jacket	195	211	208	Pass
P	Foot Length	216	232	225	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	320	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	348	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	870	Pass
Z	Waist Circumference	761	791	784	Pass

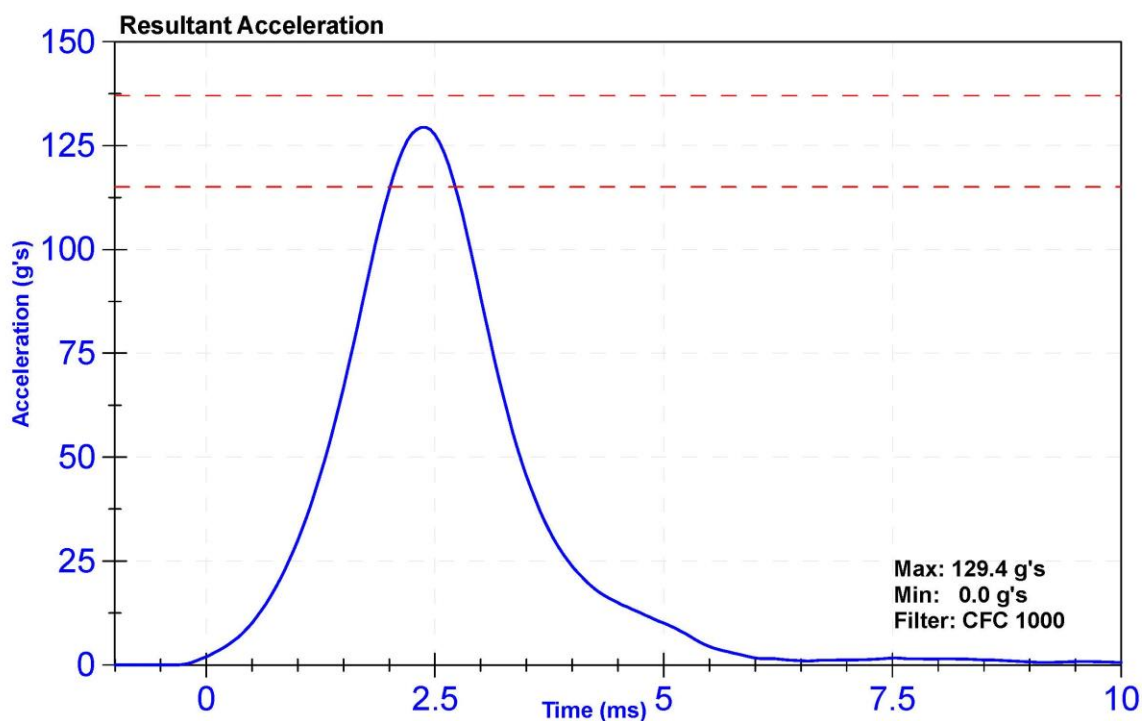
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

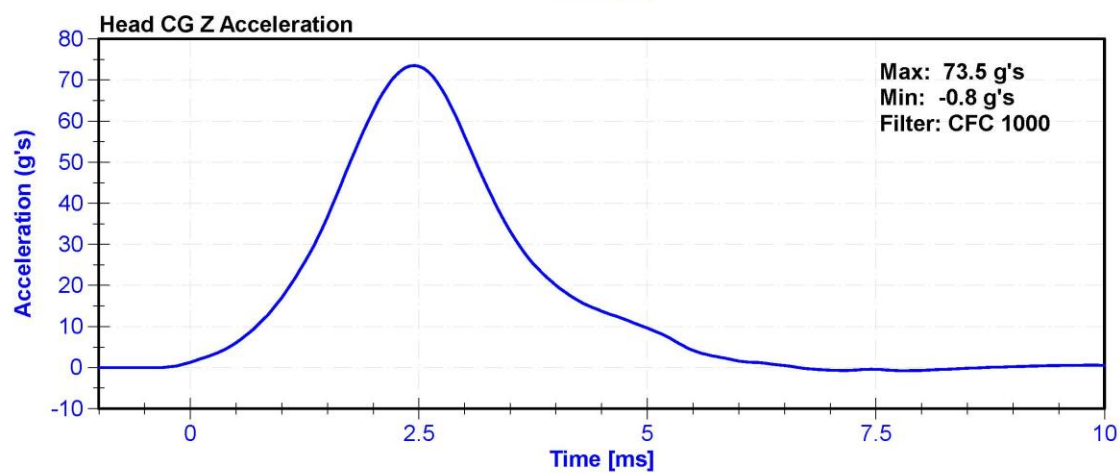
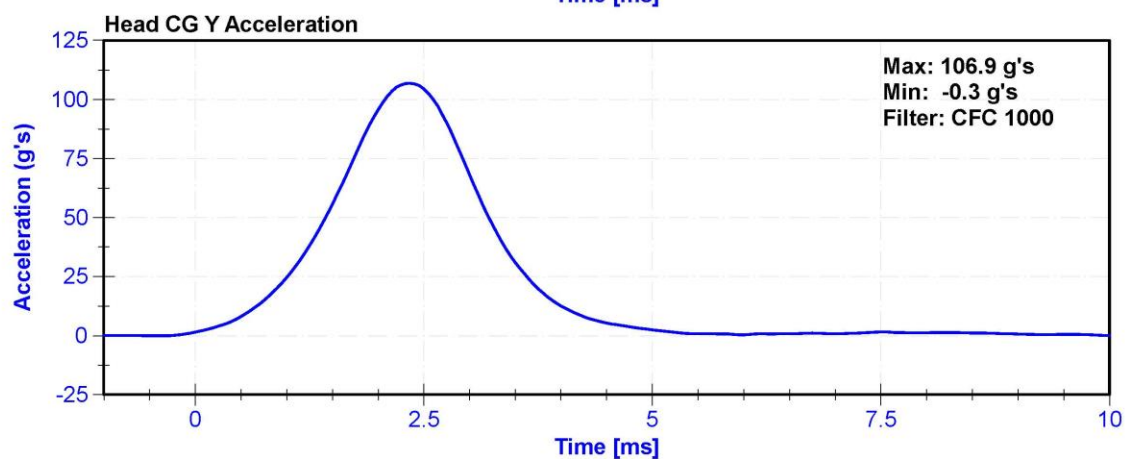
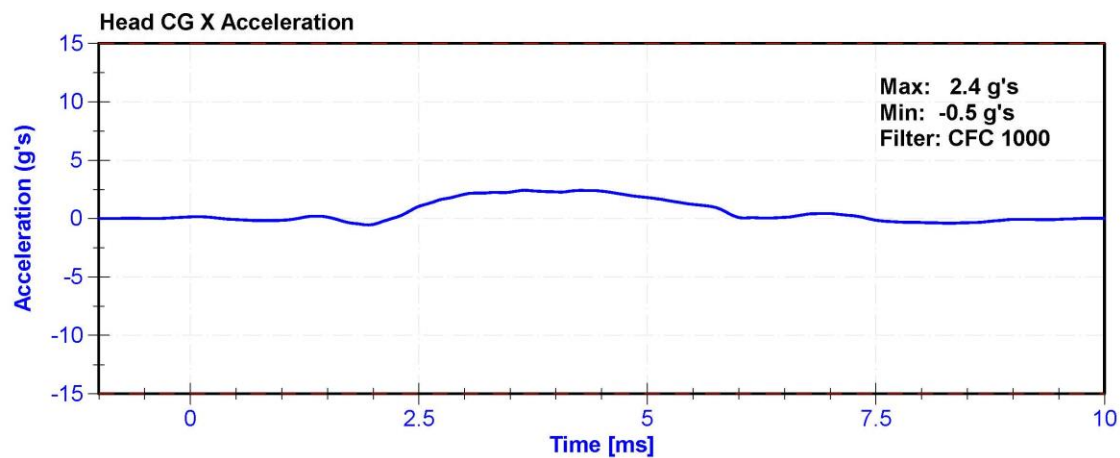
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.8	Pass
Humidity	10	70	%	29	Pass
Resultant Acceleration	115	137	g's	129.4	Pass
Oscillation	0	15	%	1.2	Pass
Fore-Aft Acceleration	-15	15	g's	2.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P74788	11/5/2020	5/6/2021
Y Accelerometer	ENDEVCO 7264CT	AC-P83432	11/5/2020	5/6/2021
Z Accelerometer	ENDEVCO 7264	AC-P83319	11/5/2020	5/6/2021





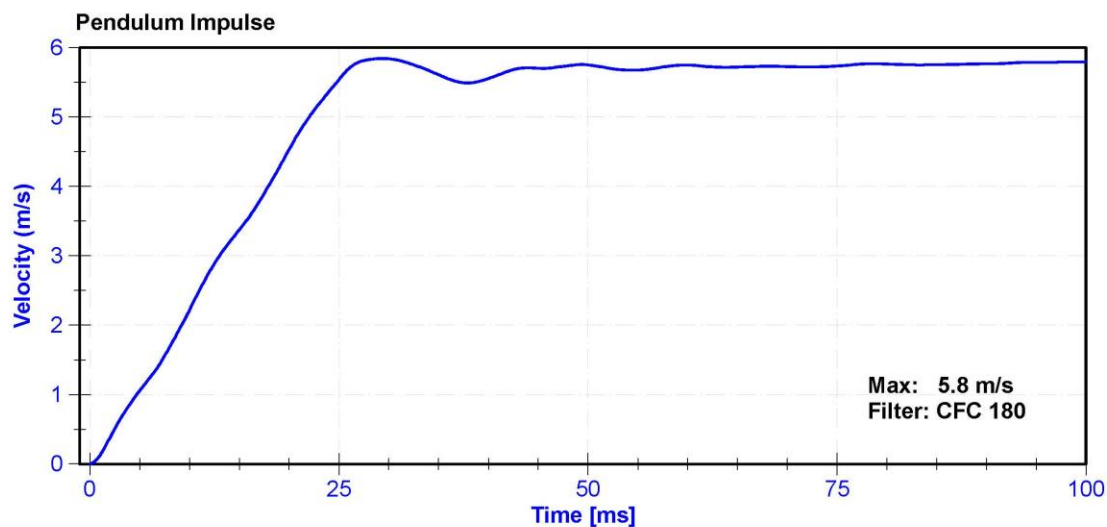
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

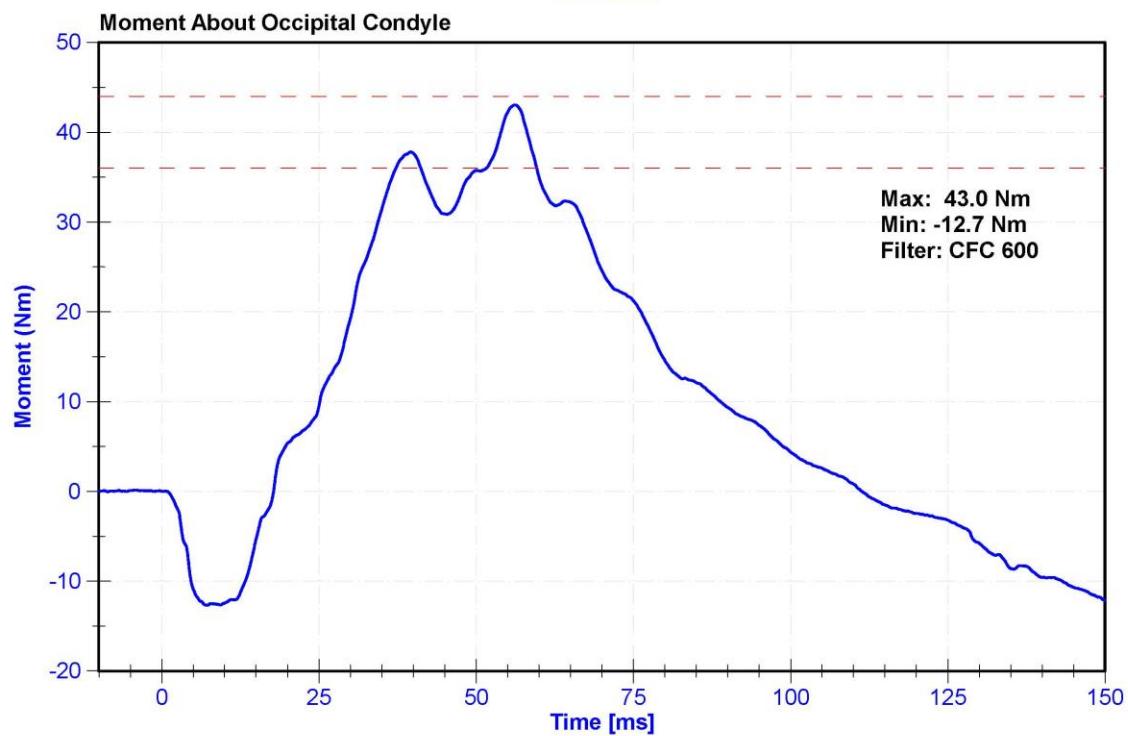
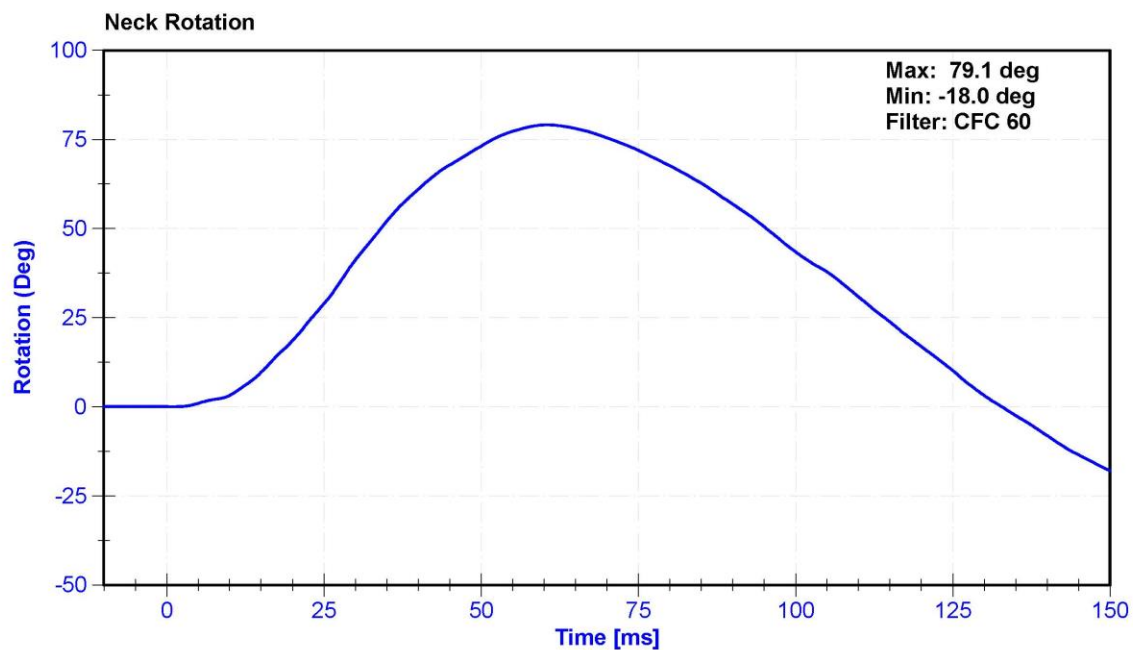
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	5.51	5.63	m/s	5.584	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.22	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.37	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.53	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.54	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.84	Pass
Neck Rotation	71	81	deg	79.1	Pass
Time at Maximum Rotation	50	70	ms	60.4	Pass
Moment about the OC	36	44	Nm	43.0	Pass
Moment Decay to 0 Nm	102	126	ms	111.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-C16503 Striker	2/5/2021	2/5/2022
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	11/6/2020	11/6/2021
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/6/2020	11/6/2021
Upper Neck Load Cell	Denton 1716	17162019 FY	3/18/2020	3/18/2021





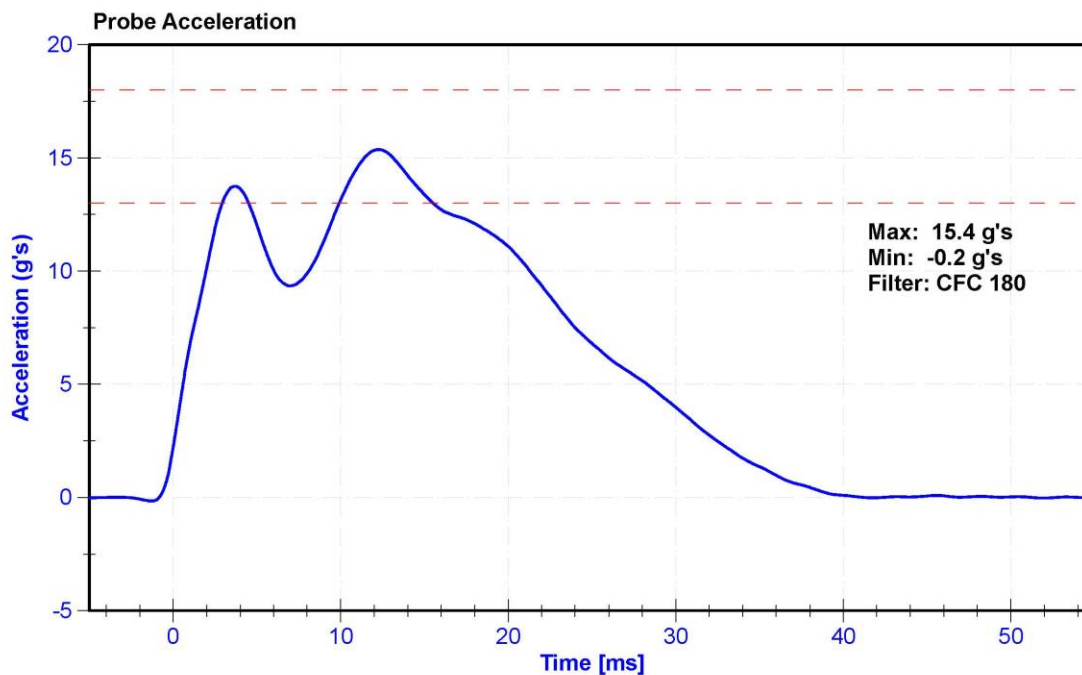
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

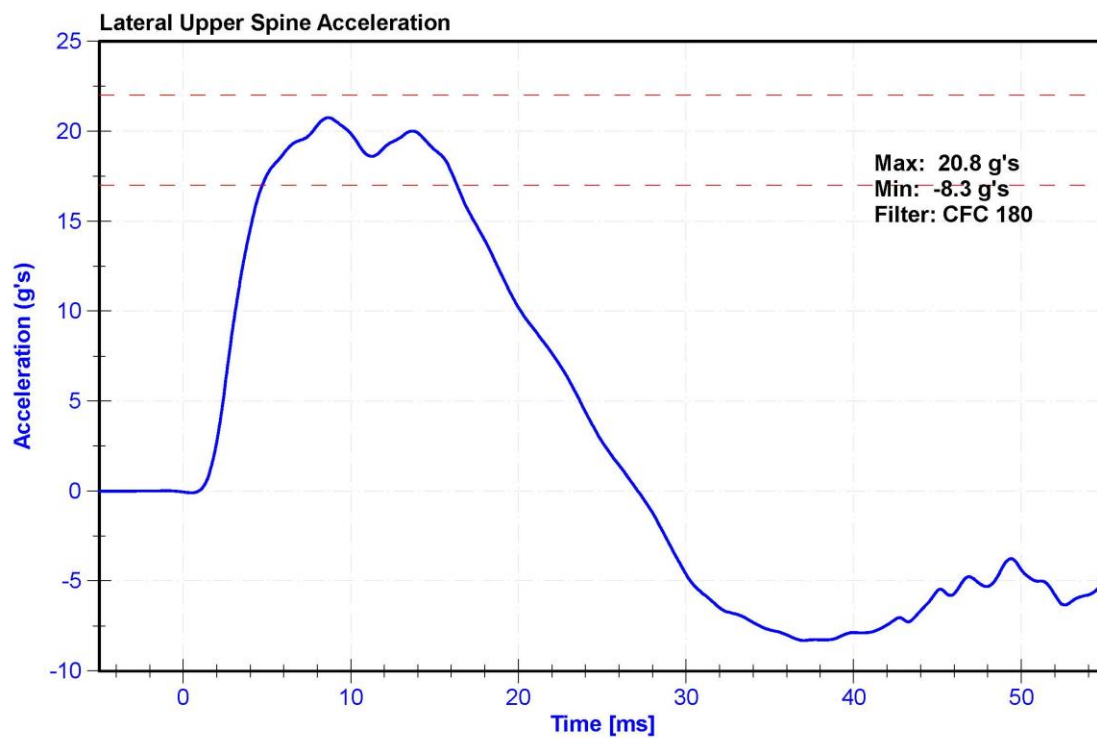
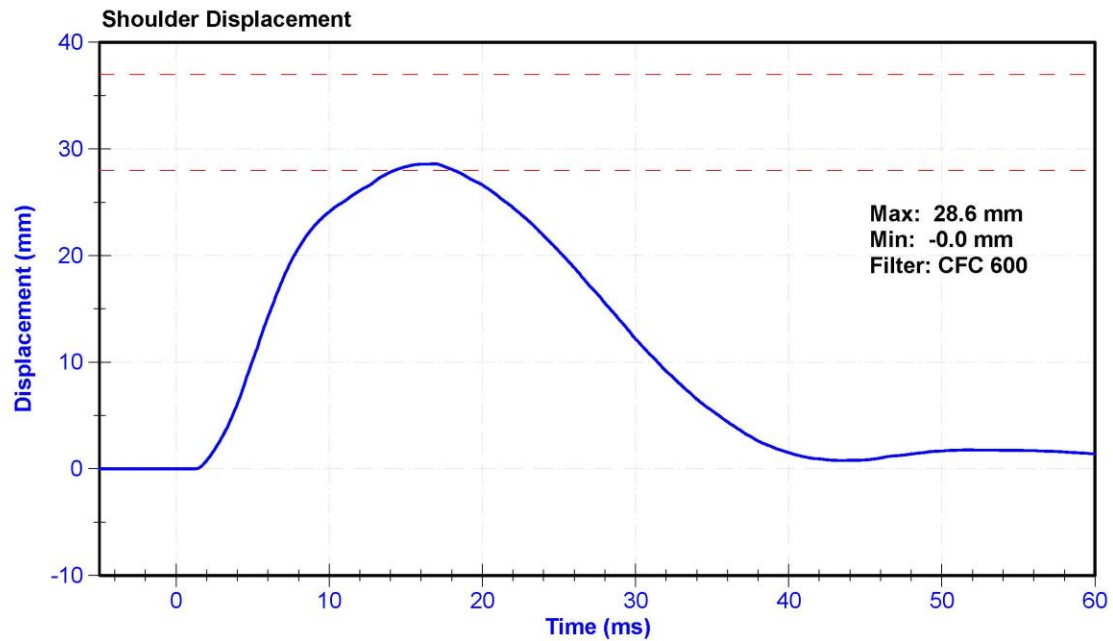
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	26	Pass
Velocity	4.2	4.4	m/s	4.32	Pass
Probe Acceleration	13	18	g's	15.4	Pass
Shoulder Deflection	28	37	mm	28.6	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	12/2/2020	6/2/2021
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	11/5/2020	5/6/2021





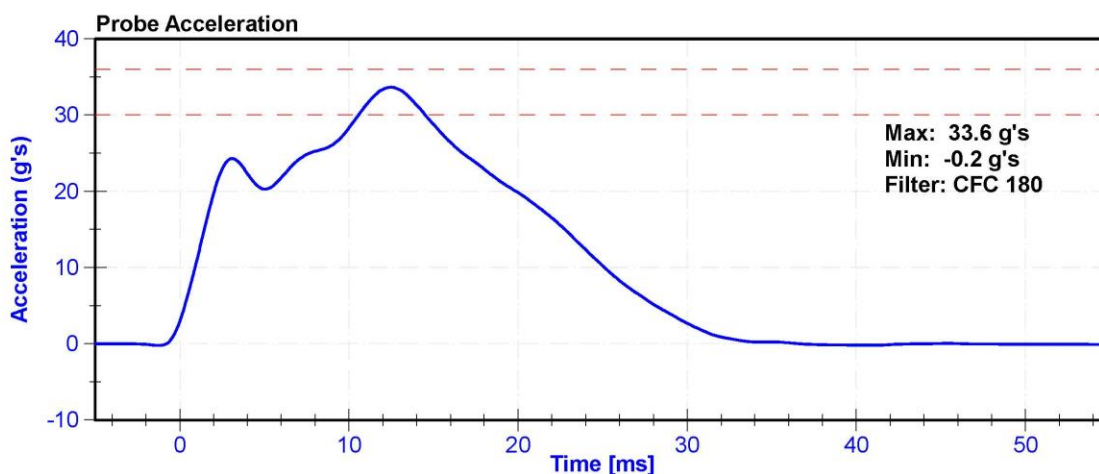
ATD Manufacturer	FTSS	Test Technician	S. Vacanti
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

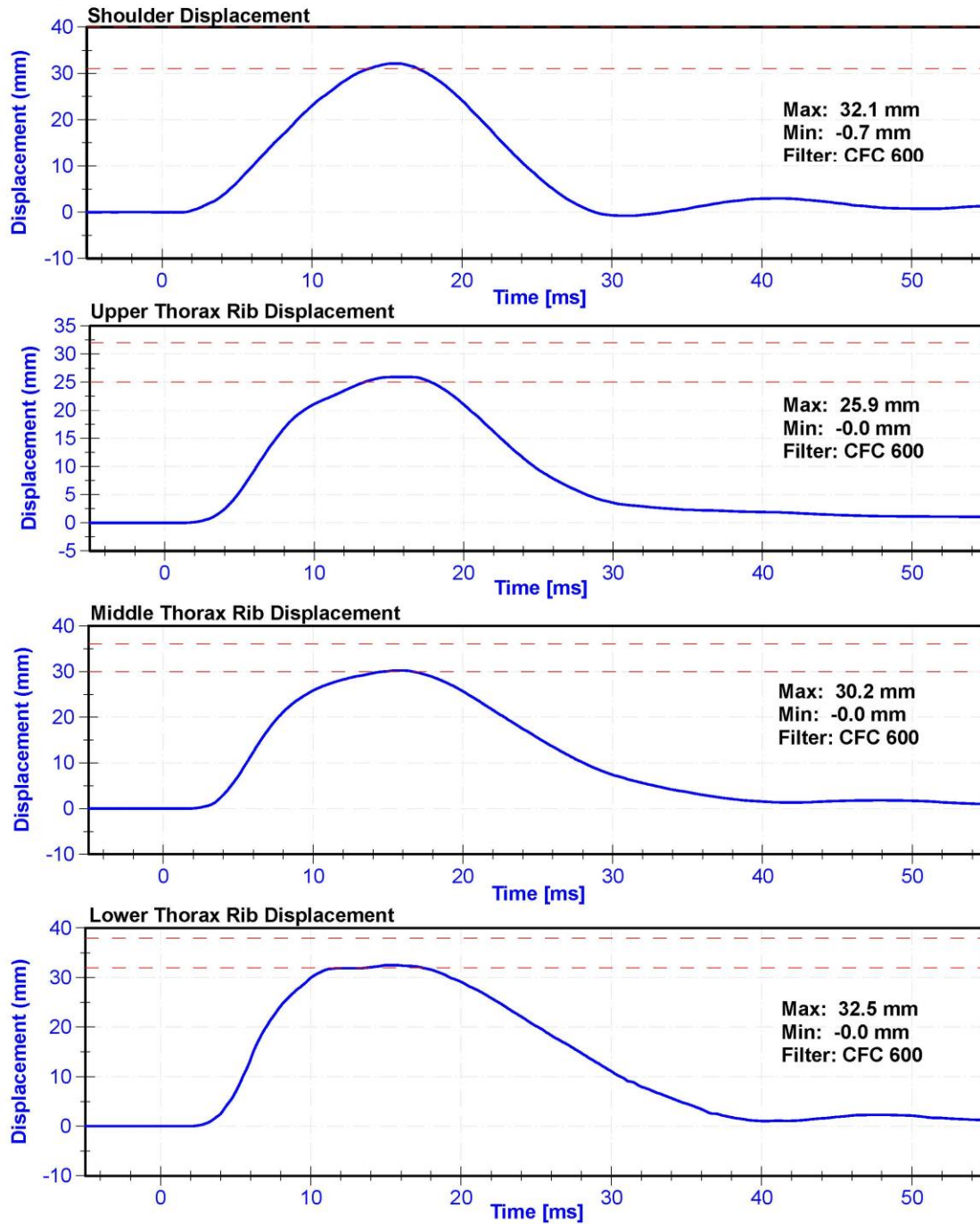
Results

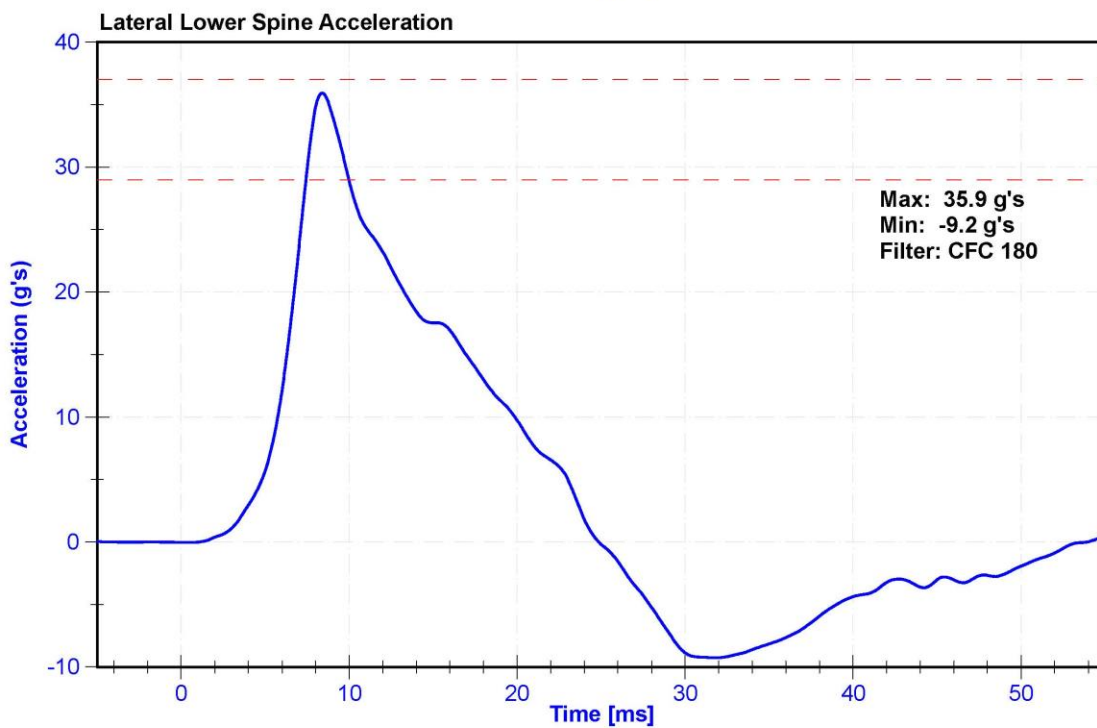
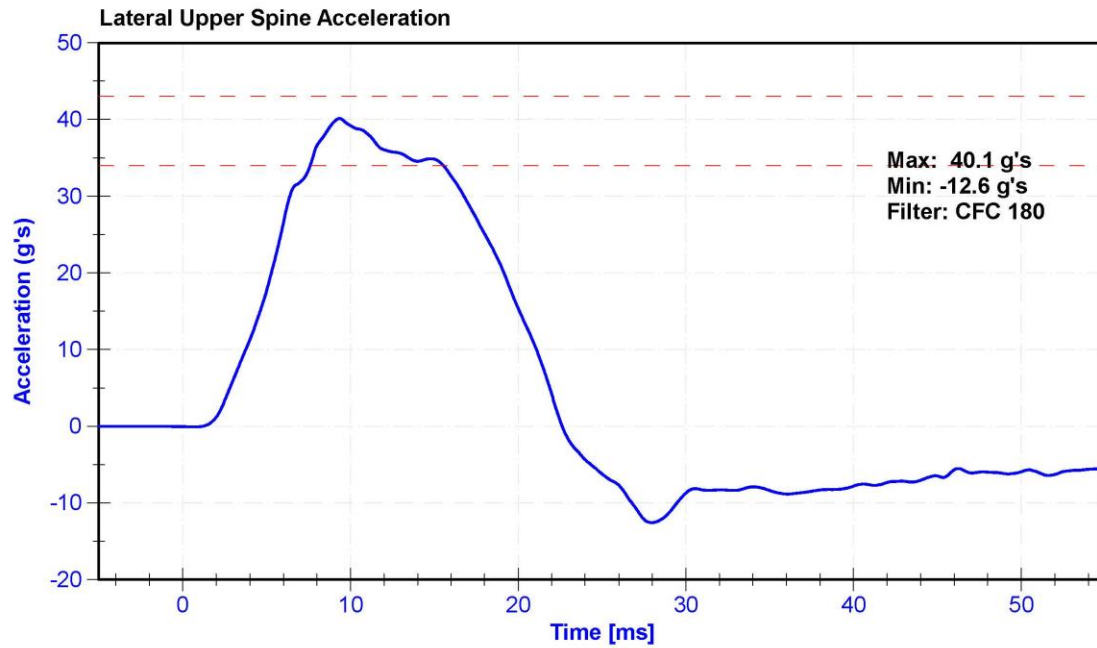
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	23	Pass
Velocity	6.6	6.8	m/s	6.71	Pass
Probe Acceleration after 5 ms	30	36	g's	33.6	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.1	Pass
Lateral Lower Spine Acceleration	29	37	g's	35.9	Pass
Shoulder Deflection	31	40	mm	32.1	Pass
Upper Thorax Rib Deflection	25	32	mm	25.9	Pass
Mid Thorax Rib Deflection	30	36	mm	30.2	Pass
Lower Thorax Rib Deflection	32	38	mm	32.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P64148	11/5/2020	5/6/2021
Upper Spine T12 Y Accelerometer	ENDEVCO 7264C	AC-P51327	11/5/2020	5/6/2021
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	12/2/2020	6/2/2021
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	11/6/2020	5/7/2021
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	11/6/2020	5/7/2021
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	11/6/2020	5/7/2021







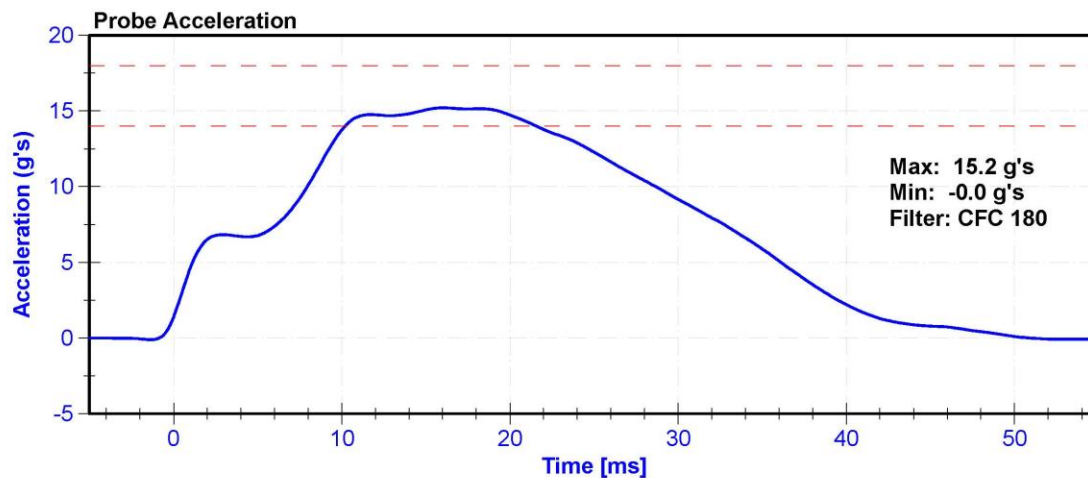
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

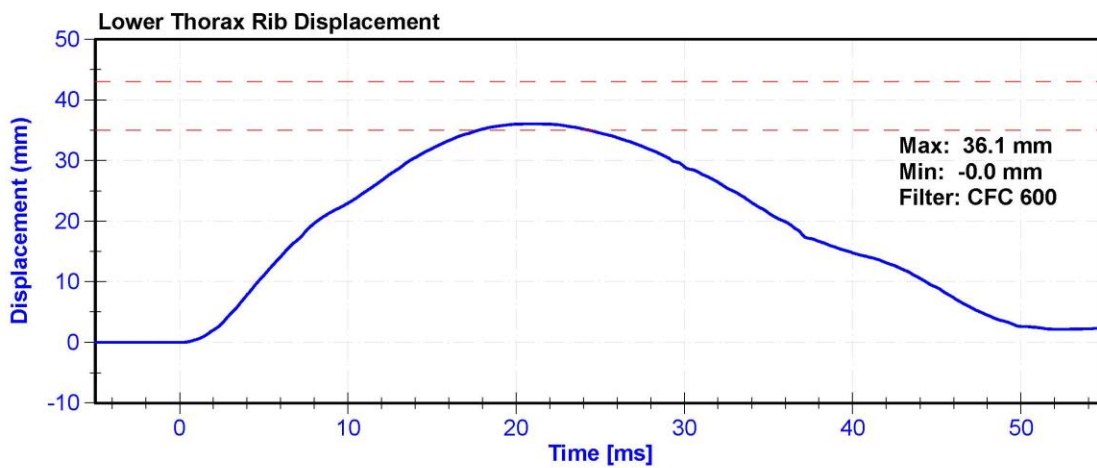
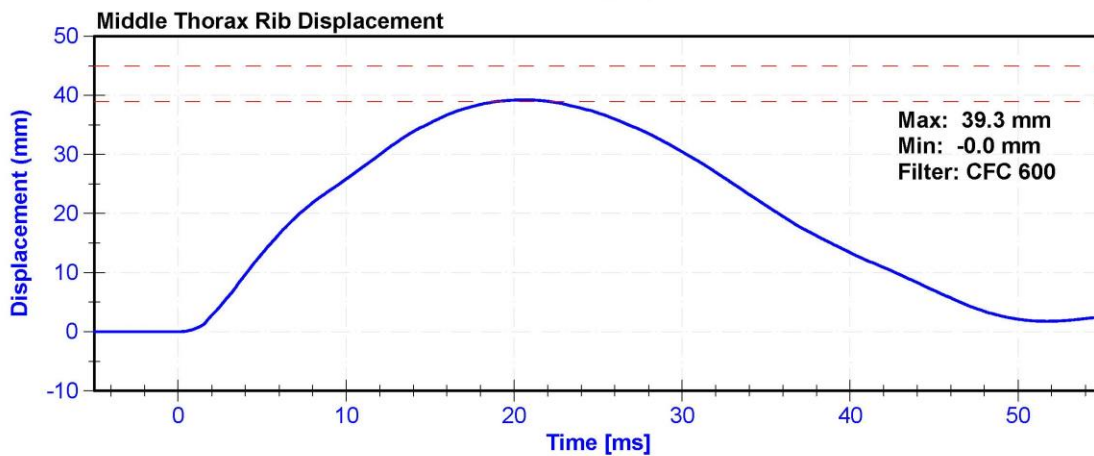
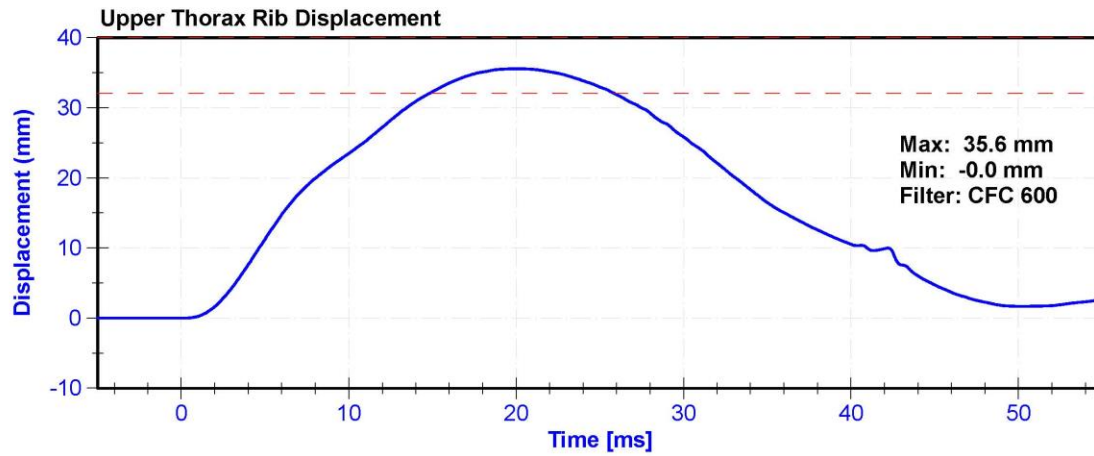
Results

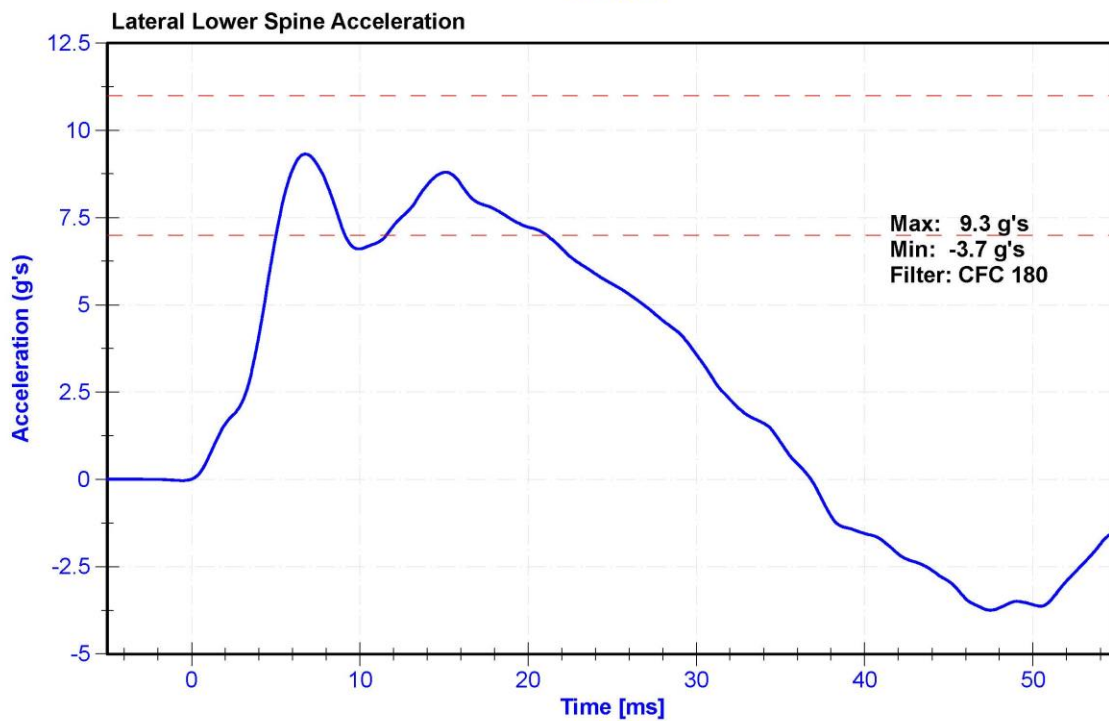
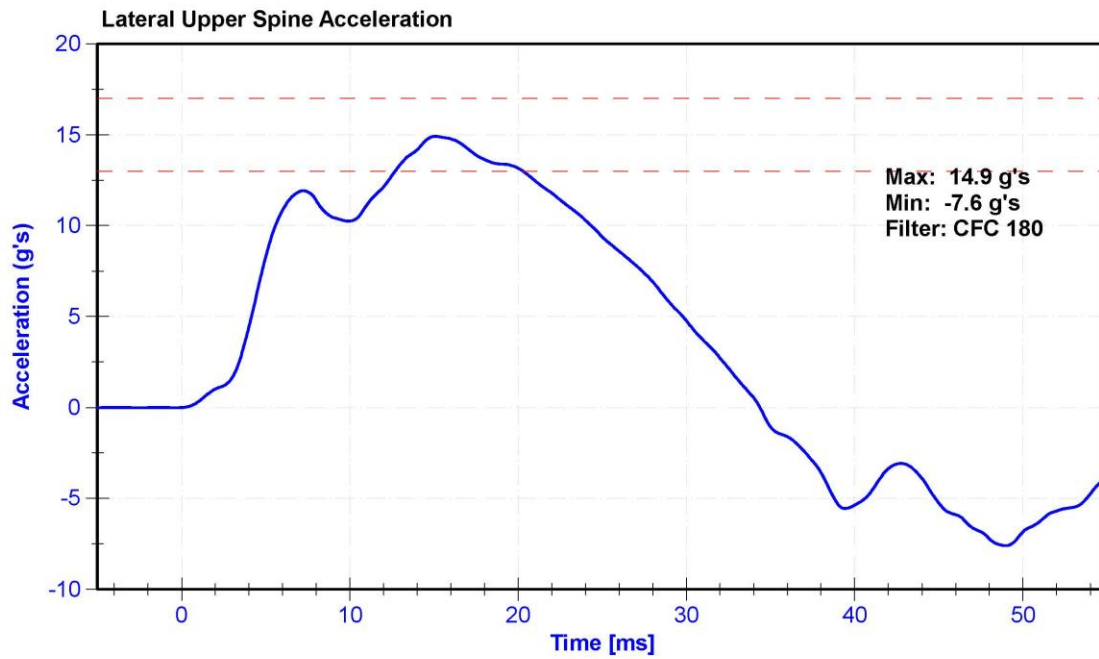
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	26	Pass
Velocity	4.2	4.4	m/s	4.26	Pass
Probe Acceleration	14	18	g's	15.2	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.9	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.3	Pass
Upper Thorax Rib Deflection	32	40	mm	35.6	Pass
Middle Thorax Rib Deflection	39	45	mm	39.3	Pass
Lower Thorax Rib Deflection	35	43	mm	36.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	11/5/2020	5/6/2021
Lower Spine Y Accelerometer	ENDEVCO 7264C	AC-P51327	11/5/2020	5/6/2021
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	11/6/2020	5/7/2021
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	11/6/2020	5/7/2021
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	11/6/2020	5/7/2021







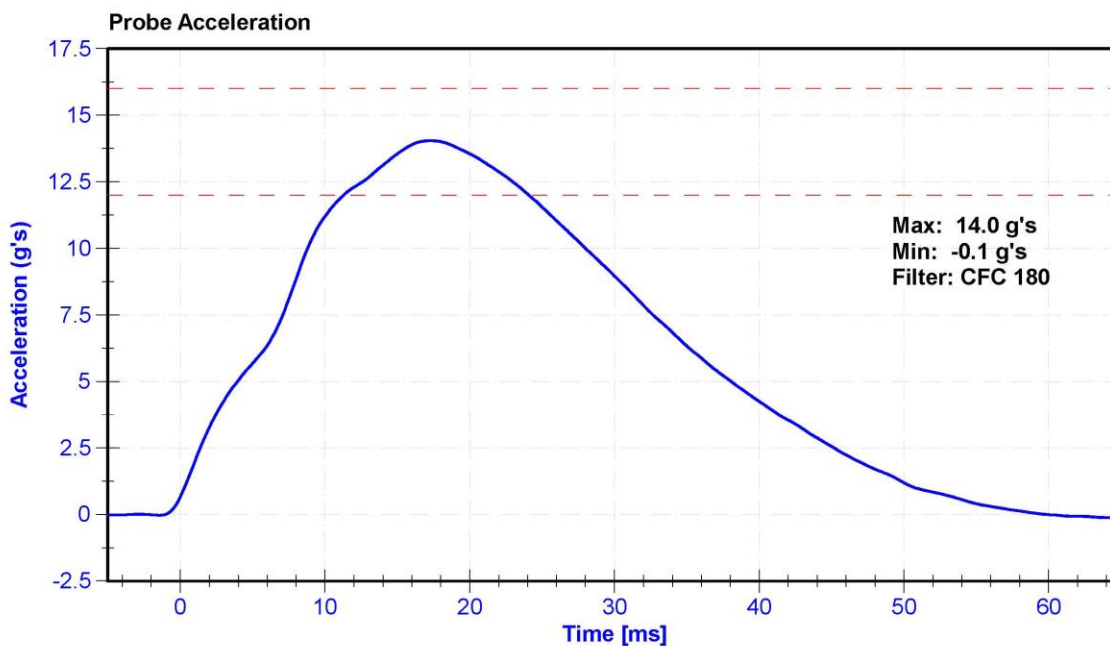
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

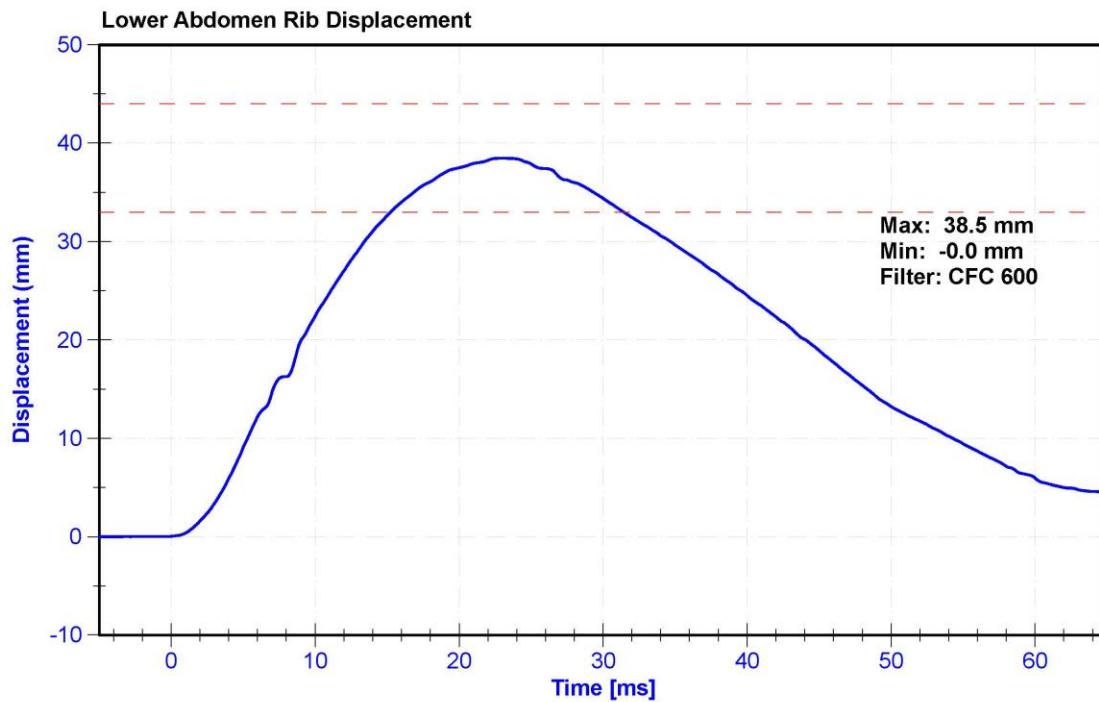
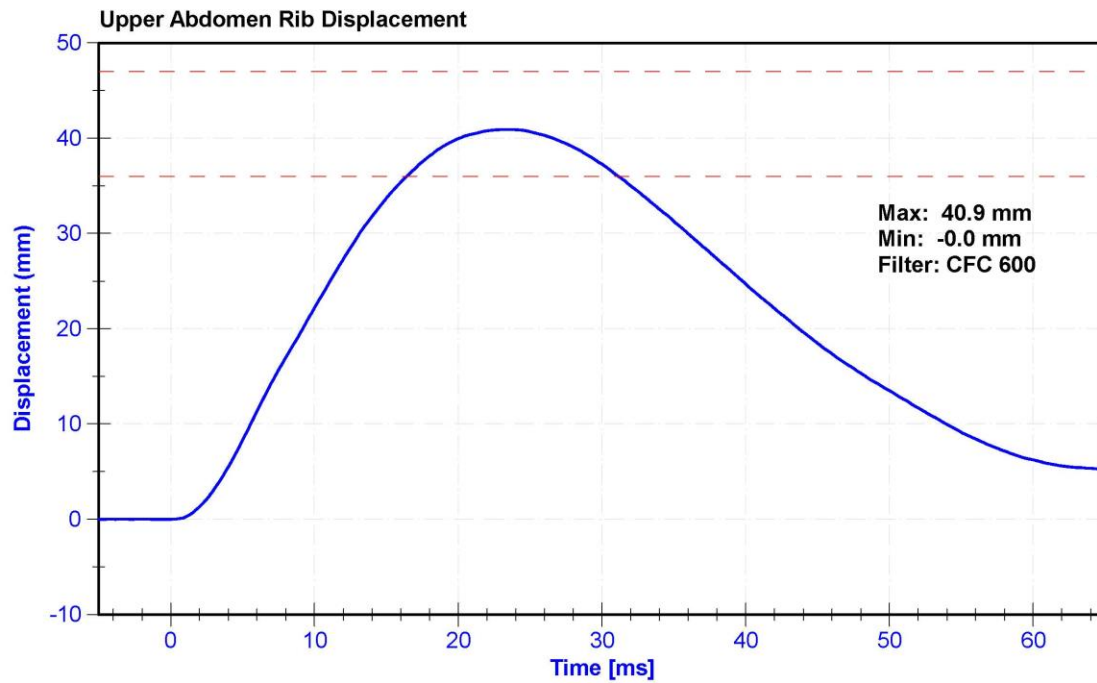
Results

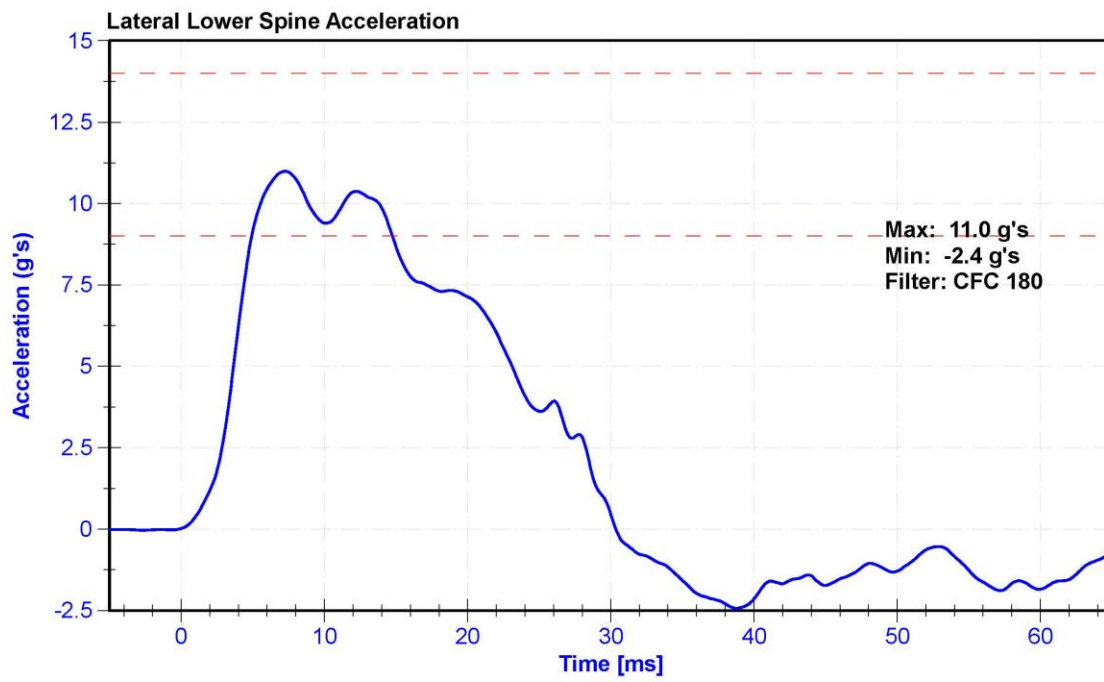
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	26.0	Pass
Velocity	4.2	4.4	m/s	4.27	Pass
Probe Acceleration	12	16	g's	14.0	Pass
Lateral Lower Spine Acceleration	9	14	g's	11.0	Pass
Upper Abdomen Rib Deflection	36	47	mm	40.9	Pass
Lower Abdomen Rib Deflection	33	44	mm	38.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Lower Spine Y Accelerometer	ENDEVCO 7264C	AC-P51327	11/5/2020	5/6/2021
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	11/6/2020	5/7/2021
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	11/6/2020	5/7/2021







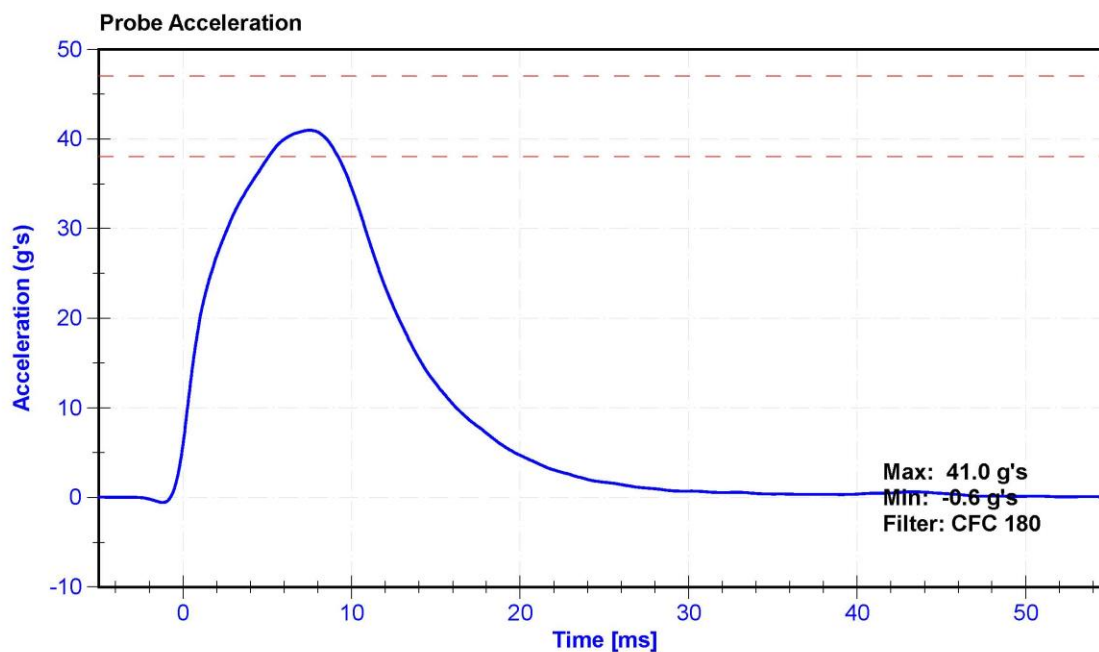
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

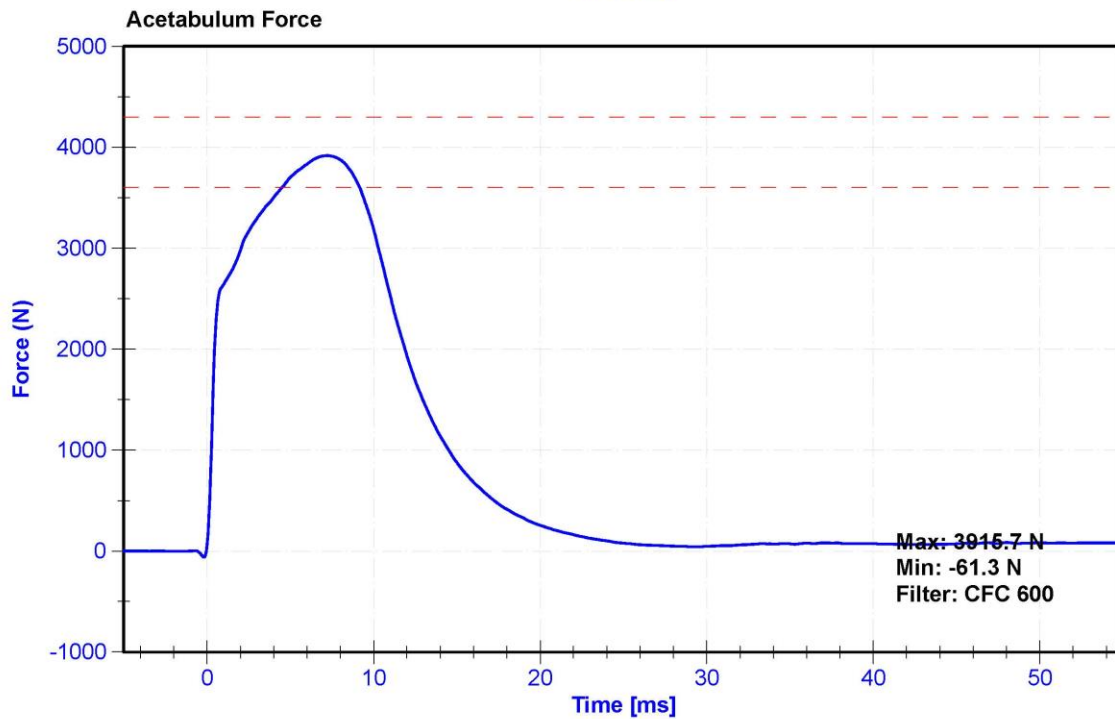
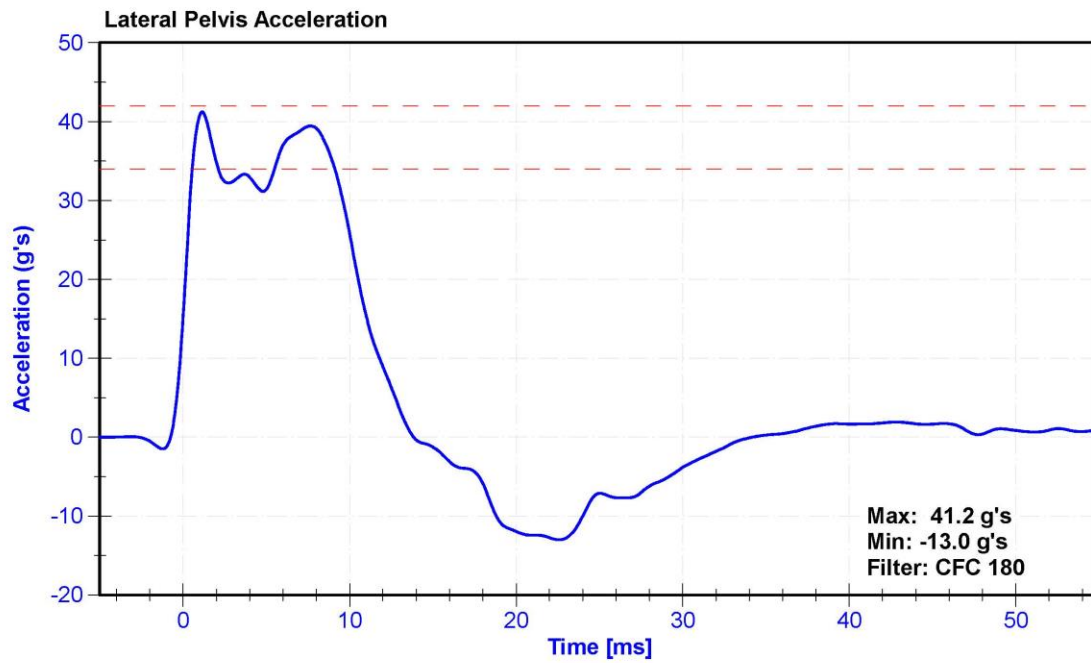
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	26	Pass
Velocity	6.6	6.8	m/s	6.67	Pass
Probe Acceleration	38	47	g's	41.0	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	39.5	Pass
Acetabulum Force	3600	4300	N	3915.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C2	T25885	2/2/2021	2/2/2022
Pelvis Y Accelerometer	ENDEVCO 7264C	AC-P51875	11/5/2020	5/6/2021
Acetabulum Load Cell	Denton 3249J	LC-267Fy	3/19/2020	3/19/2021
Certification Plug	SACO	14187	6/28/2020	N/A
Crash Test Plug	SACO	13032	7/30/2019	N/A







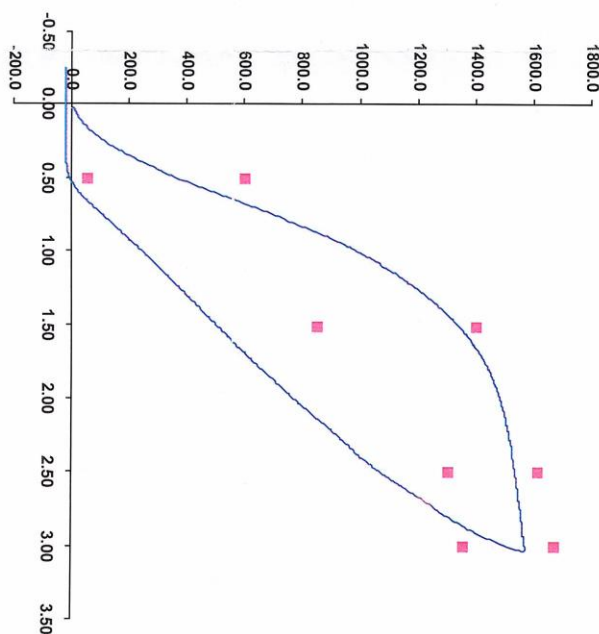
SID-11s Pelvis Plug Certification Test

Plug S/N 13710
Test Number 12338
Report Number 12381
Test Date 2/6/2020 12:46:47 PM

Test Results			
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	372.86	50.00	600.00
Force @ 1.5 mm (N)	1,342.30	850.00	1,400.00
Force @ 2.5 mm (N)	1,538.02	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,572.03	1,361.00	1,673.00

Testing Machine STM-20 5965542	
Load Cell S/N (T1240813), Units (LBS)	1000
Crosshead Speed (mm/min) or Rate	12.7
Extension or Position Measured by	XHD_100 (XHD100)

Notes:



Force (-N) vs Extension (-mm)

DE 8012
Non Impact
2/10/21

Operator	
Part Number 180-4450	
Template No 107 06-Feb-20	
SACO Research	

By: DC Date: 2/6/2020
SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX



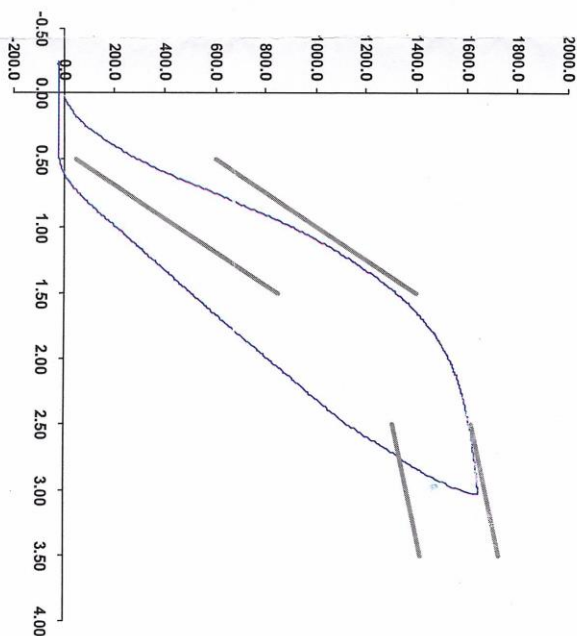
SID-11s Pelvis Plug Certification Test

Plug S/N 13032
Test Number 10352
Report Number 10387
Test Date 7/30/2019 1:04:00 PM

Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	50.00	600.00
Force @ 1.5 mm (N)	850.00	1,400.00
Force @ 2.5 mm (N)	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm/min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:



Operator

Part Number 180-4450

Template No 107 30-Jul-19
SACO Research

By: DC Date: 7/30/2019

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

New DR
CASH
2/11/2019



SID-11s Pelvis Plug Certification Test

Plug S/N 14187
Test Number 14225
Report Number 14270
Test Date 6/28/2020 1:15:29 PM

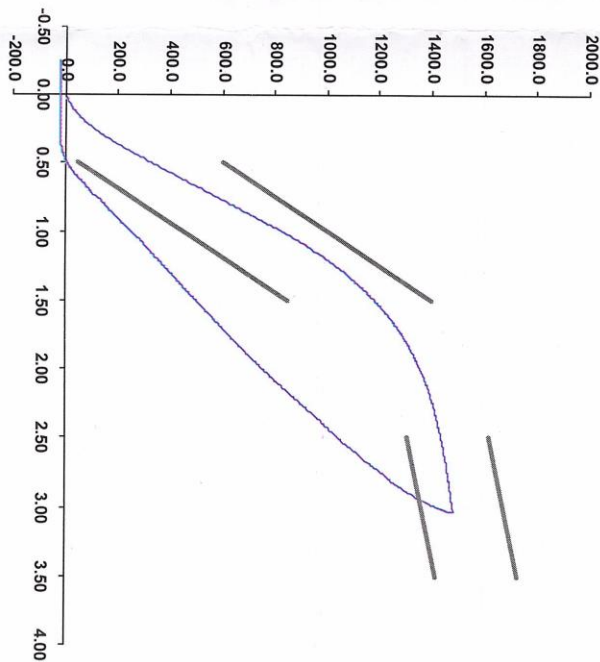
Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	331.86	50.00
Force @ 1.5 mm (N)	1,186.39	850.00
Force @ 2.5 mm (N)	1,436.14	1,306.00
Force @ 3.0 mm (N)	1,482.33	1,361.00

Testing Machine STM-20 5965542
Load Cell S/N (F1360947), Units (LBS) 1000
Crosshead Speed (mm / min) or Rate 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Despina
ceefy
2/10/21

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 28-Jun-20
SACO Research

By:

Date: 6-28-2020

SACO Research 41735 Elm St, #401 Murrieta, CA 92562 Tel 310-694-2082 FAX

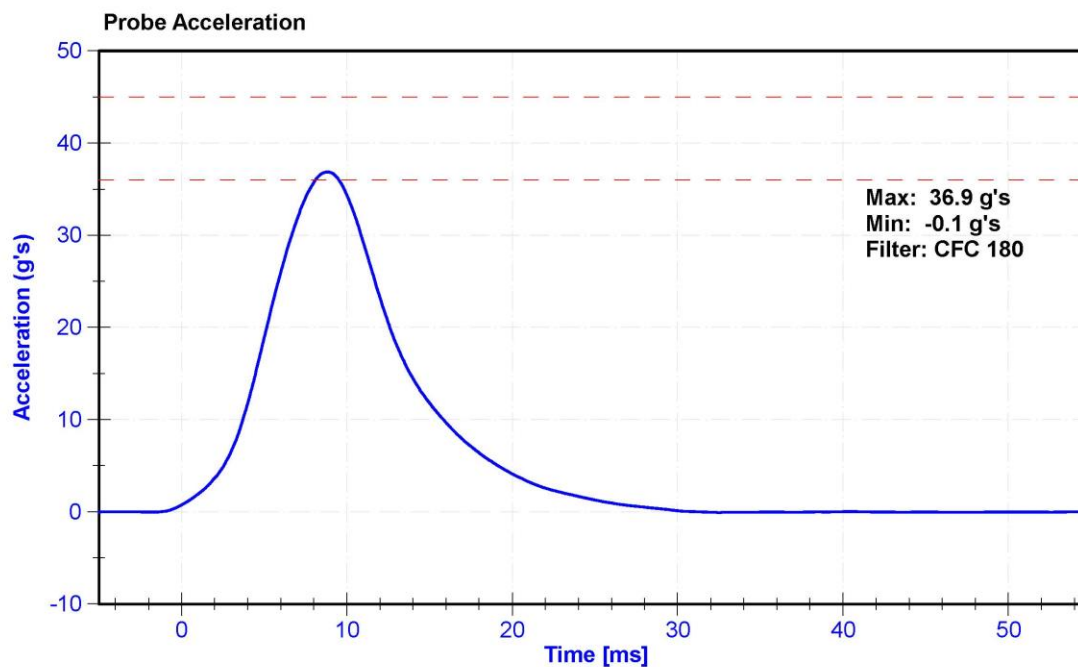
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

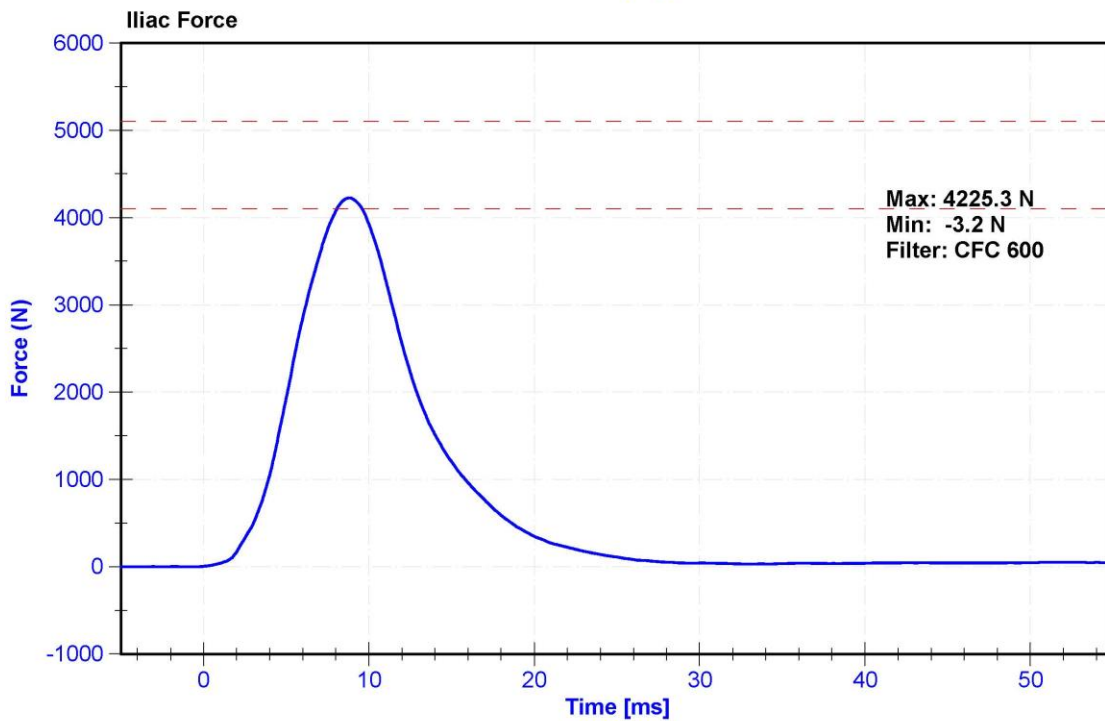
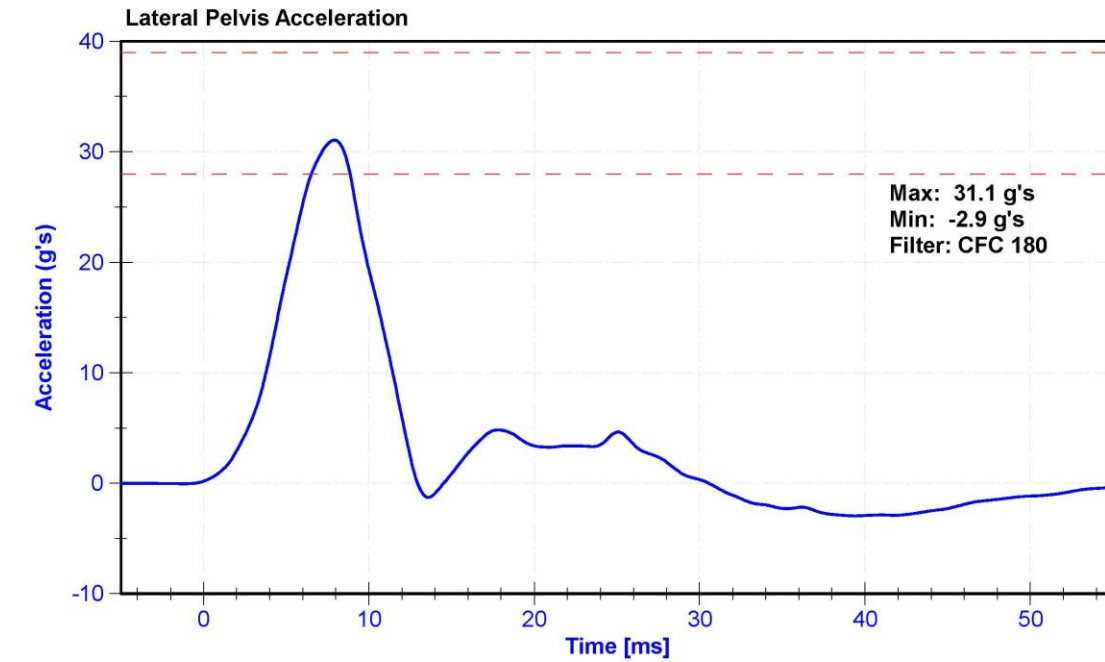
Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	26.0	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	36	45	g's	36.9	Pass
Lateral Pelvis Acceleration	28	39	g's	31.1	Pass
Iliac Force	4100	5100	N	4225.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264C	T25885	2/2/2021	2/2/2022
Pelvis Y Accelerometer	ENDEVCO 7264C	AC-P51875	11/5/2020	5/6/2021
Iliac Load Cell	DENTON 3228J	LC-290Fy	11/16/2020	11/16/2021





APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N: DG8012		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers			X	AC-P74788	Endevco	11/5/2020
			Y	AC-P83432	Endevco	11/5/2020
			Z	AC-P83319	Endevco	11/5/2020
Head Accelerometers - Redundant			X	AC-P80334	Endevco	11/5/2020
			Y	AC-P52155	Endevco	11/5/2020
			Z	AC-P83322	Endevco	11/5/2020
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	DS-2165GFE	Servo	11/6/2020
		Middle	Y	DS-45 GFE	Servo	11/6/2020
		Lower	Y	DS-011GFE	Servo	11/6/2020
	Abdominal Rib	Upper	Y	DS-008GFE	Servo	11/6/2020
		Lower	Y	DS-1774GFE	Servo	11/6/2020
Lower Spine Accelerometers (T12)			X	AC-P71272	Endevco	11/5/2020
			Y	AC-P51327	Endevco	11/5/2020
			Z	AC-P52067	Endevco	11/5/2020
Acetabulum Load Cell			Y	LC-267Fy	Denton	3/19/2020
Lilac Wing Load Cell			Y	LC-290Fy	Denton	11/16/2020
Pelvis Plug (Struck Side)				13085	SACO	7/30/2019
Pelvis Plug (Non-Struck Side)				13092	SACO	7/30/2019

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	1201-1000_A370885	Measurement Specialties	11/18/2020
Vehicle Center of Gravity	Y	1201-1000_A370898	Measurement Specialties	11/18/2020
Vehicle Center of Gravity	Z	1201-1000_A370899	Measurement Specialties	11/18/2020
Left Floor Sill	Y	1201-1000_A315796	Measurement Specialties	1/27/2021
A-Pillar Sill	Y	1201-1000_A315716	Measurement Specialties	10/10/2020
A-Pillar Low	Y	1201-1000_A280941	Measurement Specialties	1/27/2021
A-Pillar Mid	Y	1201-1000_A374232	Measurement Specialties	11/30/2020
B-Pillar Sill	Y	1201-1000_A280853	Measurement Specialties	1/27/2021
B-Pillar Low	Y	1201-1000_A280201	Measurement Specialties	1/27/2021
B-Pillar Mid	Y	1201-1000_A315123	Measurement Specialties	1/27/2021
Driver Seat	Y	1201-1000_A315866	Measurement Specialties	1/27/2021
Engine Top	X	1201-1000_A290920	Measurement Specialties	11/5/2020
Engine Top	Y	1201-1000_A290930	Measurement Specialties	11/5/2020
Firewall	Y	1201-1000_A350971	Measurement Specialties	9/23/2020
Right Roof	Y	1201-1000_A373171	Measurement Specialties	1/27/2021
Right Floor Sill	Y	1201-1000_A315766	Measurement Specialties	10/17/2020
Rear Floorpan	X	1201-1000_A372805	Measurement Specialties	11/19/2020
Rear Floorpan	Y	1201-1000_A372812	Measurement Specialties	11/19/2020

Table 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	1220AF-1057559-F0	Interface	9/2/2020
Load Cell 2	1220AF-1117006-F0	Interface	9/2/2020
Load Cell 3	1220AF-1117025-F0	Interface	9/2/2020
Load Cell 4	1220AF-1117019-F0	Interface	9/2/2020
Load Cell 5	1220AF-1117011-F0	Interface	9/2/2020
Load Cell 6	1220AF-1117017-F0	Interface	9/2/2020
Load Cell 7	1220AF-1117035-F0	Interface	9/2/2020
Load Cell 8	1220AF-1117023-F0	Interface	9/2/2020