REPORT NUMBER: SPNCAP-CAL-20-008

NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST

GM Korea Company
2020 Buick Encore GX
SUV

NHTSA No: M20200101

PREPARED BY:
CALSPAN CORPORATION
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June 11, 2020

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Prepared by: Matthew Pronko Date: June 11, 2020
Matthew Pronko, Test Engineer

Approved by: Vanessa Hansen Date: June 11, 2020
Vanessa Hansen, Operations Manager

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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4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Pole Testing of a 2020 Buick Encore GX SUV NHTSA No.: M20200101		***5. Report Date*** June 11, 2020 ***6. Performing Organization Code*** CAL
7. Author(s) Matthew Pronko, Test Engineer Vanessa Hansen, Operations Manager		***8. Performing Organization Report No.*** CAL-DOT-2020-008
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operation P.O. Box 400 Buffalo, New York 14225		***10. Work Unit No.*** ***11. Contract or Grant No.*** DTNH22-14-D-00352
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Crashworthiness Standards (NRM-110) 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C. 20590		***13. Type of Report and Period Covered:*** Final Test Report, April 6, 2020 - June 11, 2020 ***14. Sponsoring Agency Code*** NRM-110
15. *Supplementary Notes*		

16. Abstract

A 32.20 km/h (20 mph), 75˚ oblique impact Side NCAP Test was conducted on the subject 2020 Buick Encore GX 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 April 6, 2020.

The impact velocity of the vehicle was 32.33 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 334 mm located at level 3. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (SID-IIs) (Serial No. DG8012)		
	Units	Threshold	Result
Head Injury Criteria (HIC_{36})		1000	336.514
Resultant Lower Spine Acceleration	G	82	37.764
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2630.681
Maximum Thoracic Rib Deflection	mm	38	16.572
Maximum Abdomen Rib Deflection	mm	45	18.177

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.

17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs	***18. Distribution Statement*** Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, 1200 New Jersey Ave. SE Washington, D.C. 20590

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UNCLASSIFIED	UNCLASSIFIED	123	

Form DOT F1700.7 (8-72)

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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 2020 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 2020 Buick Encore GX SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated October 2015.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2020 Buick Encore GX SUV. The subject vehicle was towed into the rigid pole at an angle of 75^{o} and a velocity of 32.33 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on April 6, 2020. 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 October 2015. 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	336.514
Resultant Lower Spine Acceleration	g	82	37.764
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2630.681
Maximum Thoracic Rib Deflection	mm	38*	16.572
Maximum Abdominal Rib Deflection	mm	45*	18.177

*****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	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other				

GENERAL COMMENTS:

1. P1 serial number – DG8012

Data Anomalies:

- None

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: 2020 Buick Encore GX SUV
NHTSA No.: M20200101
Test Program: NCAP Side Pole Impact Test
Test Date: 4/6/2020

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20200101
Model Year	2020
Make	Buick
Model	Encore GX
Body Style	SUV
VIN	KL4MMBS20LB070343
Body Color	Gray
Odometer Reading (km/mi)	165 miles
Engine Displacement (L)	1.2
Type / No. Cylinders	I3 Turbo
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	CVT
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
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	No
Rear Pass. Torso / Pelvis Airbag	Yes
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
Other Safety Restraint	-

Does owner's manual provide instructions to turn off automatic door locks? No

DATA FROM CERTIFICATION LABEL

Manufactured By	GM Korea Company
Date of Manufacture	11/19
Vehicle Type	MPV

GVWR (kg)	1910
GAWR Front (kg)	1060
GAWR Rear (kg)	1060

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)				428	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				87.8	(A-B)

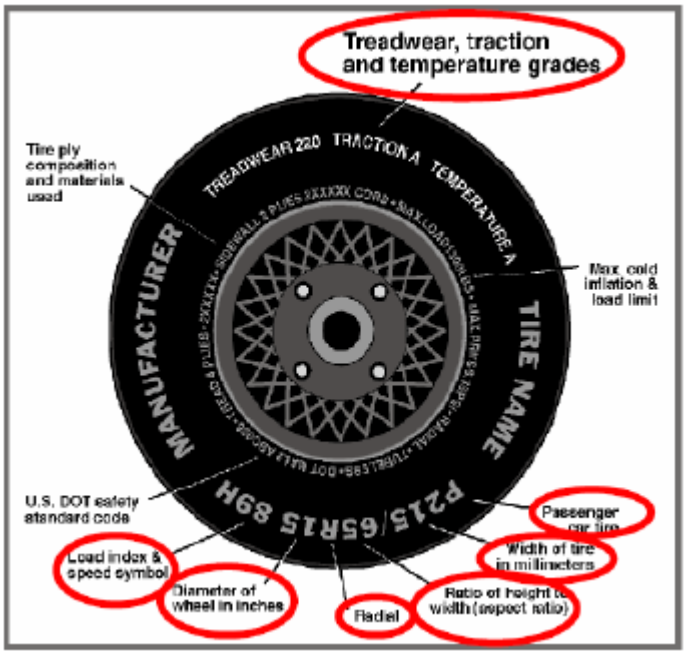
VEHICLE SEAT TYPE

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:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020

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)	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 Polyester, 2 Steel, 1 Nylon	2 Polyester, 2 Steel, 1 Nylon
Load Index/Speed Symbol	98H	98H
Tire Material	Rubber	Rubber
DOT Safety Code Left	1T7001BH04519	1T7001BH04519
DOT Safety Code Right	1T7001BH04419	1T7001BH04519

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

Test Vehicle: 2020 Buick Encore GX SUV NHTSA No.: M20200101
Test Program: NCAP Side Pole Impact Test Test Date: 4/6/2020

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	312	310	318	315
Tire Placard	kPa	240	240	240	240
Owner's Manual	kPa	240	240	240	240
As Tested	kPa	240	240	240	240

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	438	270		456	317		456	333	
Right	kg	415	263		435	309		419	318	
Ratio	%	61.5	38.5		58.7	41.3		57.3	42.7	
Totals	kg	853	533	1386	891	626	1517	875	651	1526

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1386	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	87.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1523.8	(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)? [X] **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	-0.70	-0.10	-0.05	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	-0.55	-0.20	-0.15	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	+0.15	-0.10	-0.20	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	-0.15	-0.10	-0.05	Yes
Vehicle CG (Aft of Front Axle)	mm	997	1070	1106	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	17	15	27	

* 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:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	11
Spare Tire	12
Jack	3
Ballast / Equipment Added	60

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

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

Test Vehicle:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020

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 (º)		
	Max	Min	Mid
Driver Seat	18.0	13.7	15.9
Front Passenger Seat	Not Adjustable		
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) (º)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore / Aft	Forward-Most
Driver Seat	15.9	8	Max	-	-	-
			Mid	14	11	8
			Min	-	-	-
Front Passenger Seat	Not Adjustable		Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
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

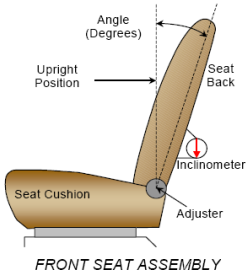
Test Vehicle: 2020 Buick Encore GX SUV | NHTSA No.: M20200101
Test Program: NCAP Side Pole Impact Test | Test Date: 4/6/2020

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	260	27(0-26)	0	0
Front Passenger Seat	260	27(0-26)	0	0
Front Center Seat	N/A	N/A	N/A	N/A
Struck Side Rear Seat	FIXED	FIXED	FIXED	FIXED
Non-Struck Side Rear Seat	FIXED	FIXED	FIXED	FIXED
Rear Center Seat	FIXED	FIXED	FIXED	FIXED

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.



FRONT SEAT ASSEMBLY

Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detents*
Driver Seat w/Seated Dummy	66.2	N/A	-14.6	6
Front Passenger Seat	41.1	N/A	-9.6	6
Front Center Seat	N/A	N/A	N/A	N/A
Struck Side Rear Seat	FIXED	FIXED	FIXED	FIXED
Non-Struck Side Rear Seat	FIXED	FIXED	FIXED	FIXED
Rear Center Seat	FIXED	FIXED	FIXED	FIXED

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	5 (0-4)	Lowermost

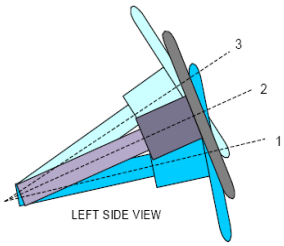
DATA SHEET NO. 2 … (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020

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	21.7	
Geometric Center – Position 2	23.5	
Uppermost – Position 3	25.9	
Telescoping Steering Wheel Travel		50
Test Position	23.5	25

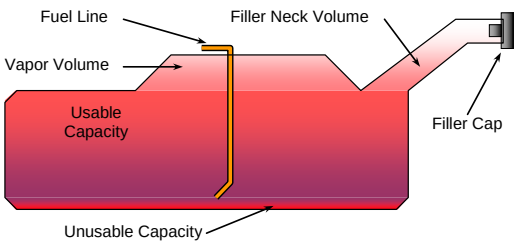


STEERING COLUMN ASSEMBLY

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.



VEHICLE FUEL TANK ASSEMBLY

FUEL TANK CAPACITY DATA

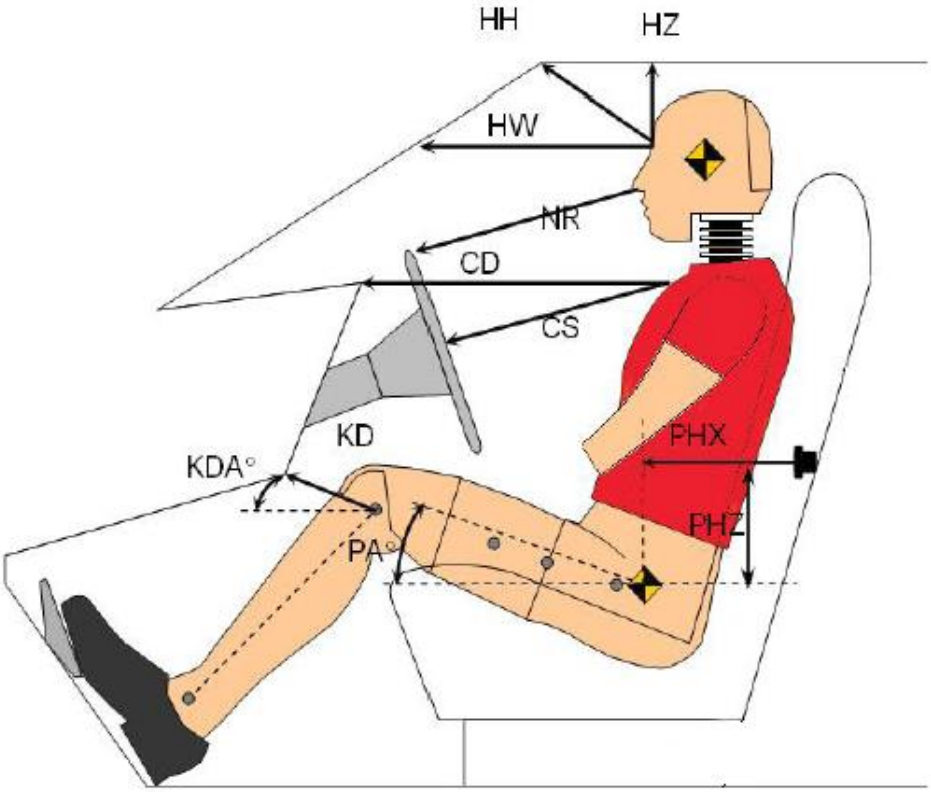
Description			Liters
Usable Capacity of “Standard Tank”	-	see Form No. 1	50
Usable Capacity of “Optional Tank”	-	see Form No. 1	N/A
Usable Capacity of “Standard Tank”	-	see Owner’s Manual	50
Usable Capacity of “Optional Tank”	-	see Owner’s Manual	N/A
93% of Usable Capacity			46.5
Actual Amount of Solvent Used in Test			46.5
1/3 of Usable Capacity			16.7

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

[X] Yes [ ] No

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020



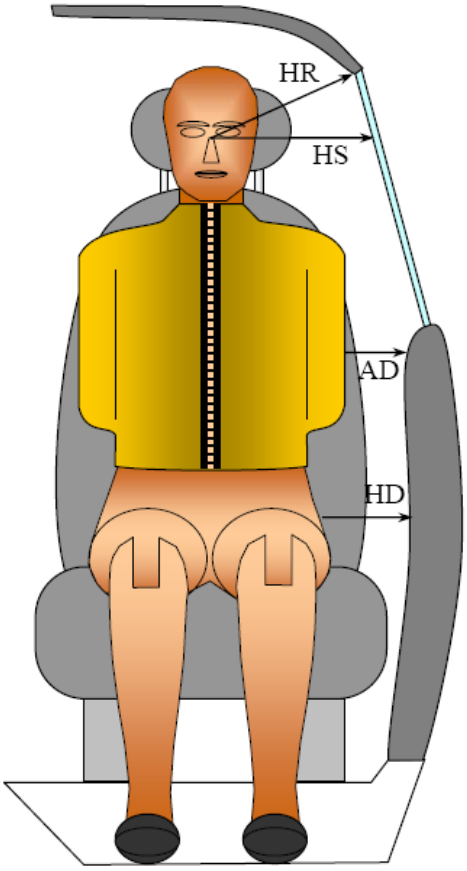
Left Side View

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. DG8012)	
		Length (mm)	Angle (◦)
HH	Head to Header	341	
HW	Head to Windshield	716	
HZ	Head to Roof Liner	244	
NR	Nose to Rim	270	
CD	Chest to Dash	434	
CS	Chest to Steering Wheel	236	
KD(L) / KDA(L)◦	Left Knee to Dash	157	22.7
KD(R) / KDA(R)◦	Right Knee to Dash	156	21.8
PAX◦	Pelvic Tilt Angle (X-Axis)		20.0
PAY◦	Pelvic Tilt Angle (Y-Axis)		0.3
PHX	Hip Point to Striker (X-Axis)	268	
PHZ	Hip Point to Striker (Z-Axis)	77	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020



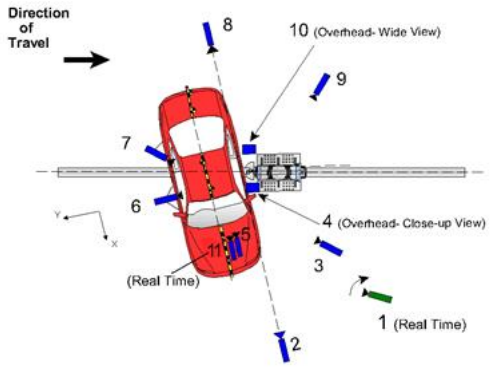
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver - Length (Serial No. DG8012)
HR	Head To Side Header	mm	235
HS	Head to Side Window	mm	383
AD	Arm to Door	mm	167
HD	Hip Point to Door	mm	157

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2020 Buick Encore GX SUV NHTSA No.: M20200101
Test Program: NCAP Side Pole Impact Test Test Date: 4/6/2020



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	8064	0	-1290	28	1000
3	Impact side 45º - forward pole view	5472	-1554	-1404	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	-8748	0	-1210	28	1000
9	Impact side 45º - rearward pole view	-3128	-3718	-1300	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 75º angle to the rigid pole.*

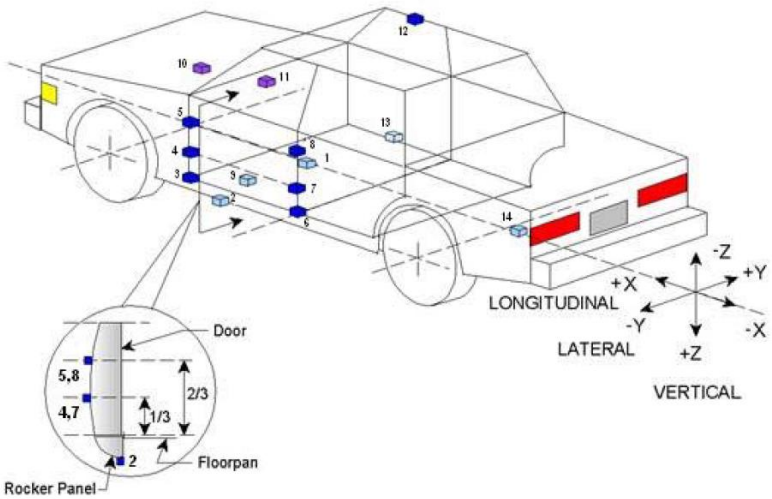
Comments: All cameras operated as intended.

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: 2020 Buick Encore GX SUV NHTSA No.: M20200101
Test Program: NCAP Side Pole Impact Test Test Date: 4/6/2020



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2353	11	-211
2	Left Floor Sill	2600	-630	125
3	A-Pillar Sill	2878	-610	142
4	A-Pillar Low	2999	-597	-114
5	A-Pillar Mid	2936	-615	-640
6	B-Pillar Sill	1917	-586	118
7	B-Pillar Low	1935	-650	-208
8	B-Pillar Mid	1894	-635	-525
9	Driver Seat Track	2115	-516	65
10	Engine Top	3652	287	-339
11	Firewall	3212	169	-281
12	Right Roof	1978	555	-1108
13	Right Floor Sill	2594	633	121
14	Rear Floorpan	829	6	38

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:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020

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: 2020 Buick Encore GX SUV NHTSA No.: M20200101
Test Program: NCAP Side Pole Impact Test Test Date: 4/6/2020

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver Seat Dummy (SID-IIs)
Face	Curtain Airbag
Top of Head	Curtain Airbag
Left Side of Head	Curtain Airbag
Back of Head	Headrest & Seatback
Left Shoulder	Seatback
Upper Torso	Seatback
Lower Torso	Seatback
Left Hip	Torso/Pelvis Airbag
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: 2020 Buick Encore GX SUV NHTSA No.: M20200101
Test Program: NCAP Side Pole Impact Test Test Date: 4/6/2020

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar & C-Pillar buckled
Sill Separation	None
Windshield Damage	Cracks throughout with separation along Driver A-Pillar
Side Window Damage	Driver window shattered
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	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Yes	No	N/A
Other				

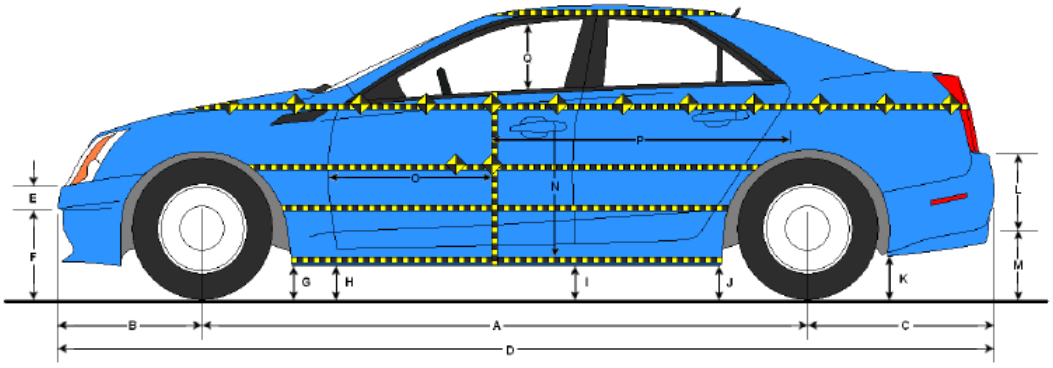
VEHICLE SPEED, VEHICLE ANGLE AT IMPACT AND IMPACT POINT LOCATION DATA

Measured Parameter		Units	Tolerance	Value
Vertical Impact Ref Line	- Aft of Front Axle, Intended Impact Pt	mm		1079
Actual Impact Point	- Aft of Front Axle	mm		1079
Horizontal Offset (+ forward / - rearward)		mm	+/- 38 *	0
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion		deg	75 +/- 3	75.0
Trap No. 1 Velocity	- Primary	kph	31.4 to 33.0	32.33
Trap No. 2 Velocity	- Redundant	kph	31.4 to 33.0	32.31

* Of Intended Impact Point

DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Buick Encore GX SUV
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20200101
Test Date: 4/6/2020



LEFT SIDE VIEW

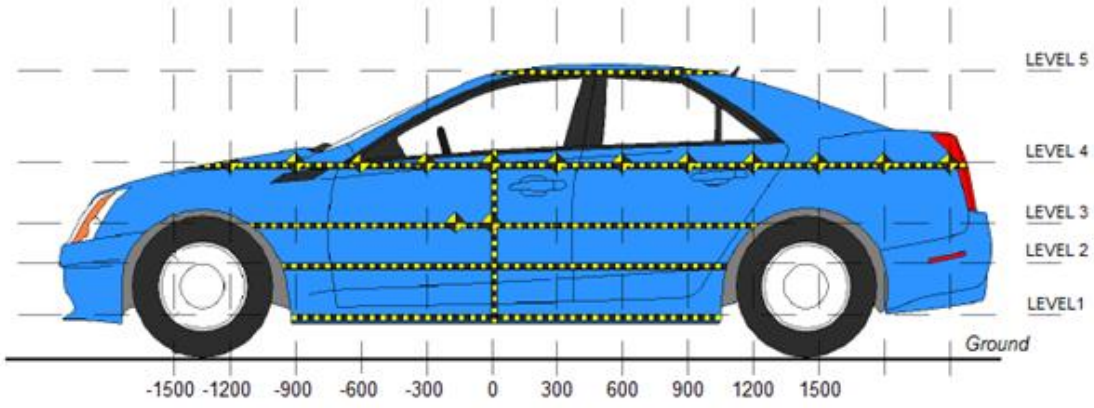
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2593	2525	68
B	Front Axle to FSOV	917	955	-38
C	Rear Axle to RSOV	835	832	3
D	Total Length at Centerline	4345	4311	34
E	Front Bumper Thickness	230	230	0
F	Front Bumper Bottom to Ground	358	373	-15
G	Sill Height at Front Wheel Well	226	225	1
H	Sill Height at Front Door Leading Edge	223	208	15
I	Sill Height at B-Pillar	230	220	10
J1	Sill Height at Rear Wheel Well	230	251	-21
J2	Pinch Weld Height at Rear Wheel Well	240	258	-18
K	Sill Height Aft of Rear Wheel Well	277	287	-10
L	Rear Bumper Thickness	175	175	0
M	Rear Bumper Bottom to Ground	337	334	3
N	Sill Height to Bottom of Front Window Sill	910	920	-10
O	Front Door Leading Edge to Impact CL	631	528	103
P	Rear Door Trailing Edge to Impact CL	1397	1319	78
Q	Front Window Opening	415	396	19
R	Right Side Length	4195	4187	8
S	Left Side Length	4195	4140	55
T	Vehicle Width at B-Pillars	1773	1701	72

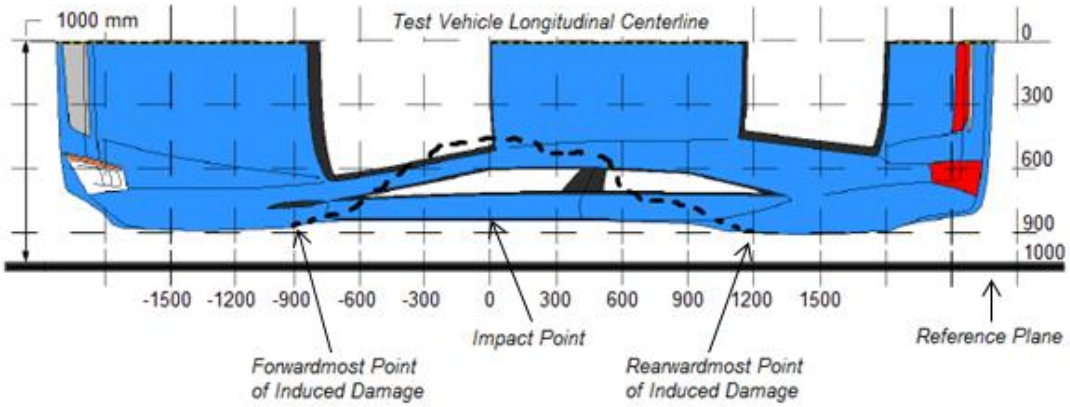
* All measurements in mm with tolerance of ± 3mm

DATA SHEET NO. 10
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020



Left Side View



Overhead View

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	307	277	0
2	Occupant Hip Point	mm	689	331	0
3	Mid - Door	mm	733	334	0
4	Window Sill	mm	1094	271	0
5	Window Top	mm	1574	98	0

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: 2020 Buick Encore GX SUV NHTSA No.: M20200101
Test Program: NCAP Side Pole Impact Test Test Date: 4/6/2020

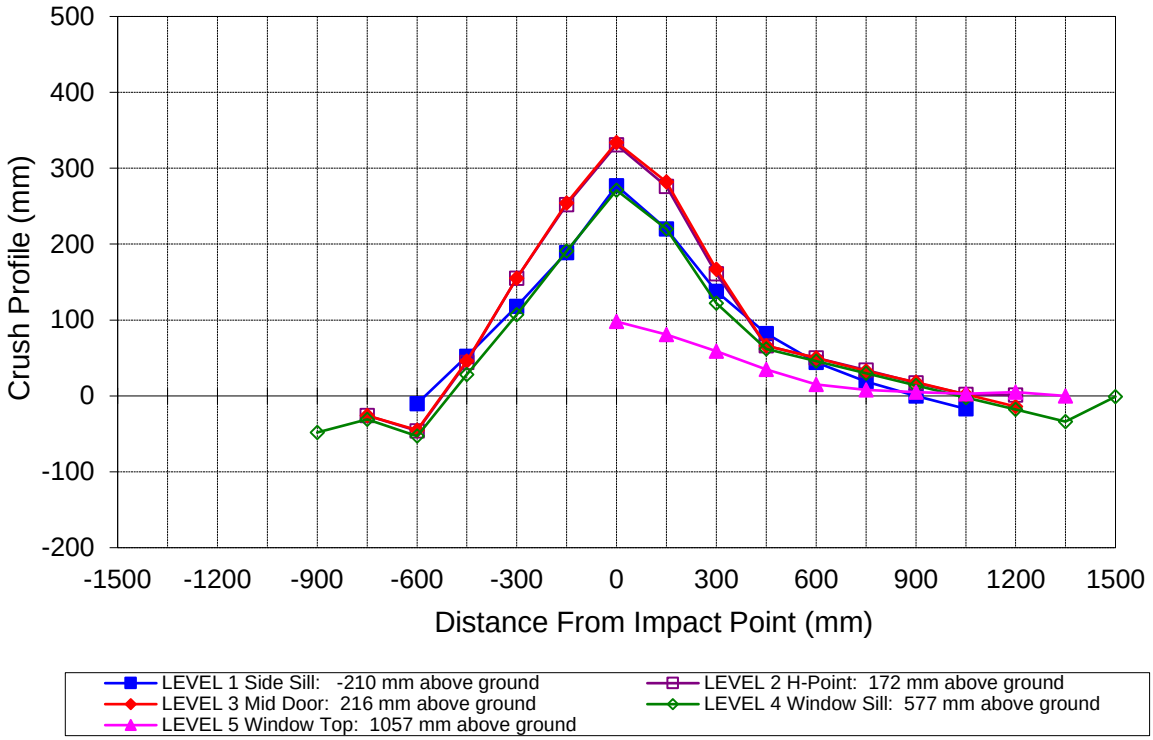
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	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				760					808					-48	
-750		905	902	777			931	928	808			-26	-26	-31	
-600	841	893	892	785		851	939	937	838		-10	-46	-45	-53	
-450	839	878	883	788		787	834	837	760		52	44	46	28	
-300	838	878	881	794		720	723	726	687		118	155	155	107	
-150	837	877	880	801		648	625	626	610		189	252	254	191	
0	836	877	880	809	594	559	546	546	538	496	277	331	334	271	98
150	835	876	880	813	608	615	600	598	593	527	220	276	282	220	81
300	834	875	879	816	610	696	714	712	694	551	138	161	167	122	59
450	834	872	876	816	608	752	806	810	754	573	82	66	66	62	35
600	833	871	875	815	605	789	821	825	769	590	44	50	50	46	15
750	832	872	875	815	601	813	838	842	785	593	19	34	33	30	8
900	830	879	882	828	594	830	862	864	814	589	0	17	18	14	5
1050	831	897	896	829	583	848	895	894	831	580	-17	2	2	-2	3
1200		901	903	829	566		900	917	847	561		1	-14	-18	5
1350				828	529				862	529				-34	0
1500				825					826					-1	

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:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020

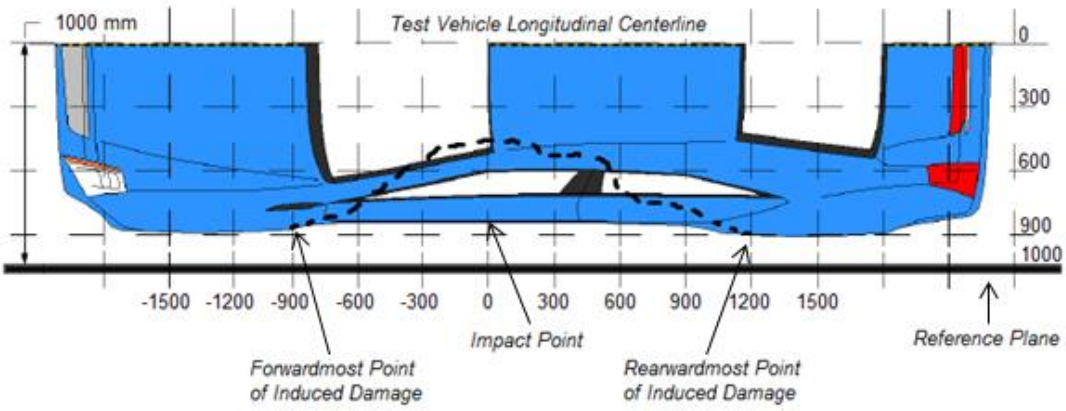


Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 11
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020

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



Overhead View

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-750	3	72	98	-26
2	-360	3	230	118	112
3	30	3	444	120	324
4	420	3	210	123	87
5	810	3	149	122	27
6	1200	3	83	97	-14

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

Test Vehicle:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side MDB Impact Test	Test Date:	4/6/2020
Test Time:	9:55 AM	Temperature:	21° C

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

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

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

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°	70	300	370
180° to 270°	71	300	371
270° to 360°	70	300	370

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

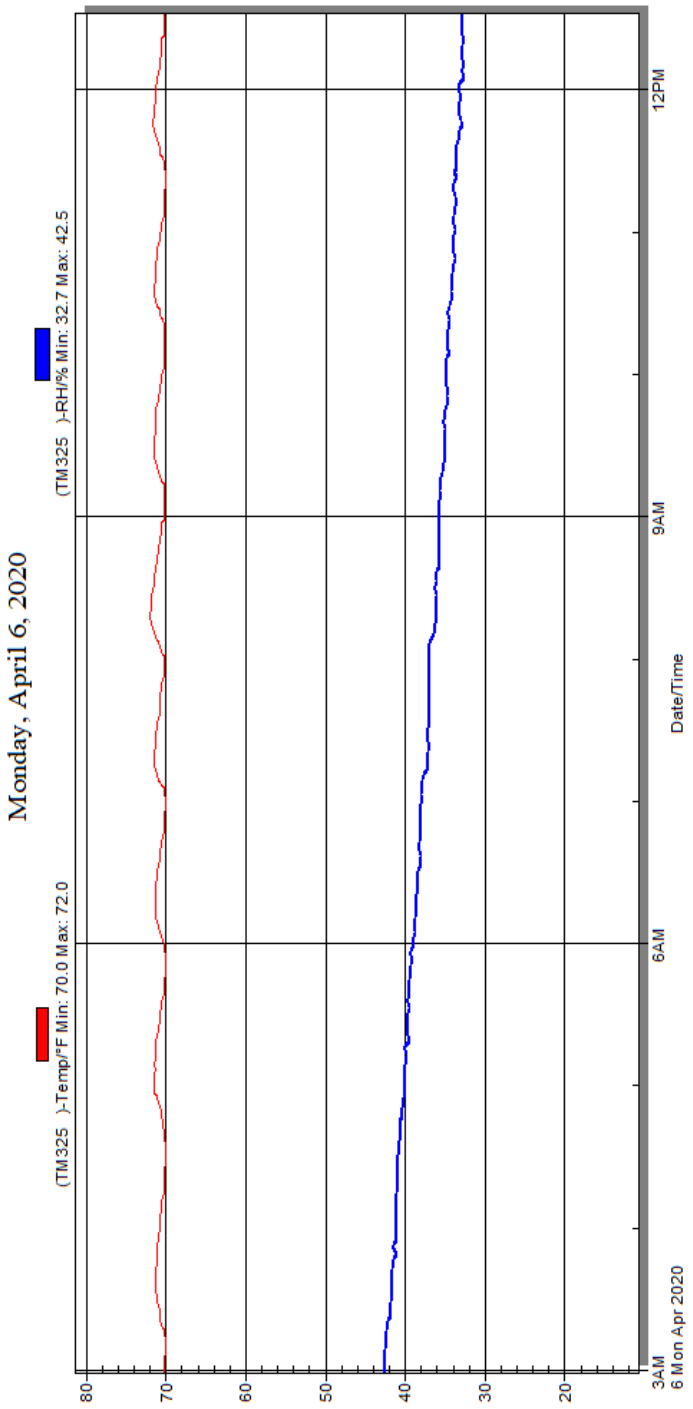
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

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:	2020 Buick Encore GX SUV	NHTSA No.:	M20200101
Test Program:	NCAP Side Pole Impact Test	Test Date:	4/6/2020



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

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure A-1: As Delivered Right Front ¾ View of Test Vehicle

Figure A-2: As Delivered Left Rear ¾ 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 ¾ View of Test Vehicle

Figure A-6: Post-Test Left Front ¾ 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 ¾ View of Test Vehicle

Figure A-10: Post-Test Left Rear ¾ 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

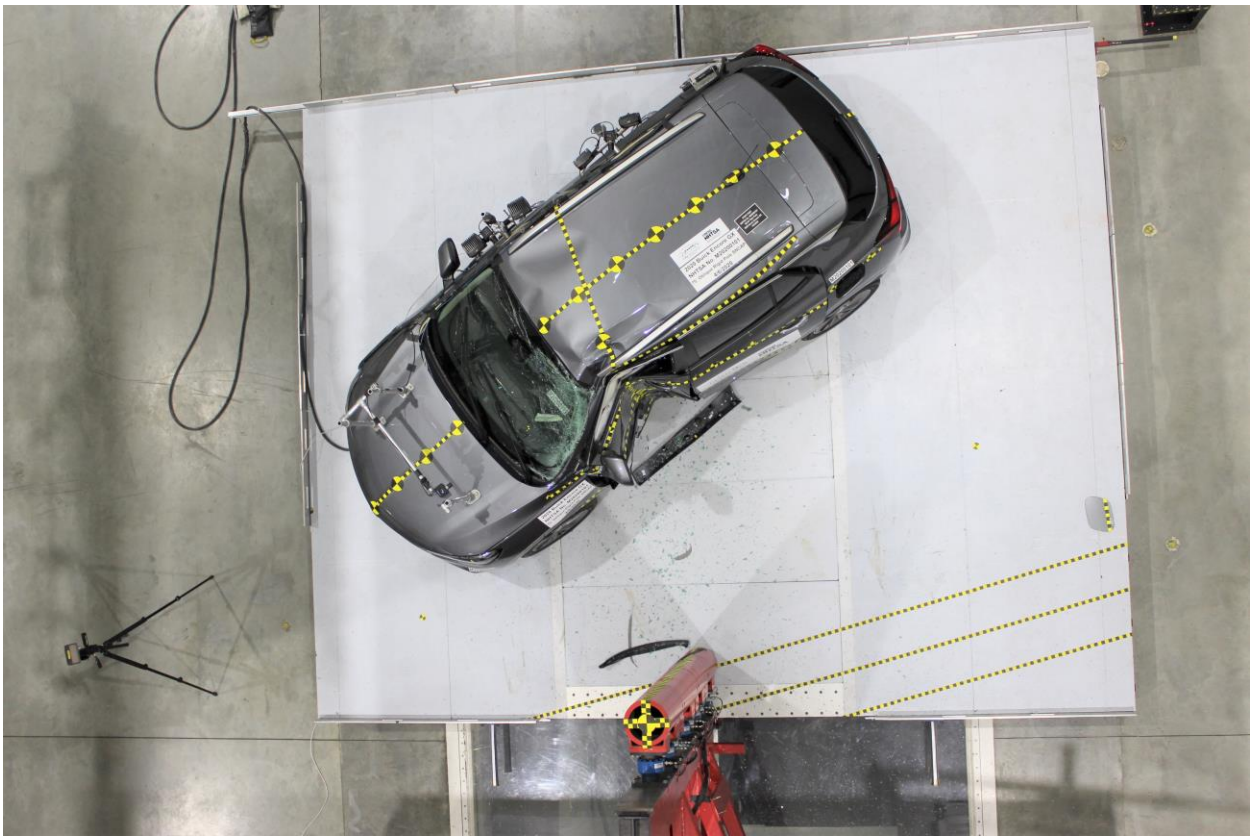


Figure A-16: Post-Test Overhead View of Test Area

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

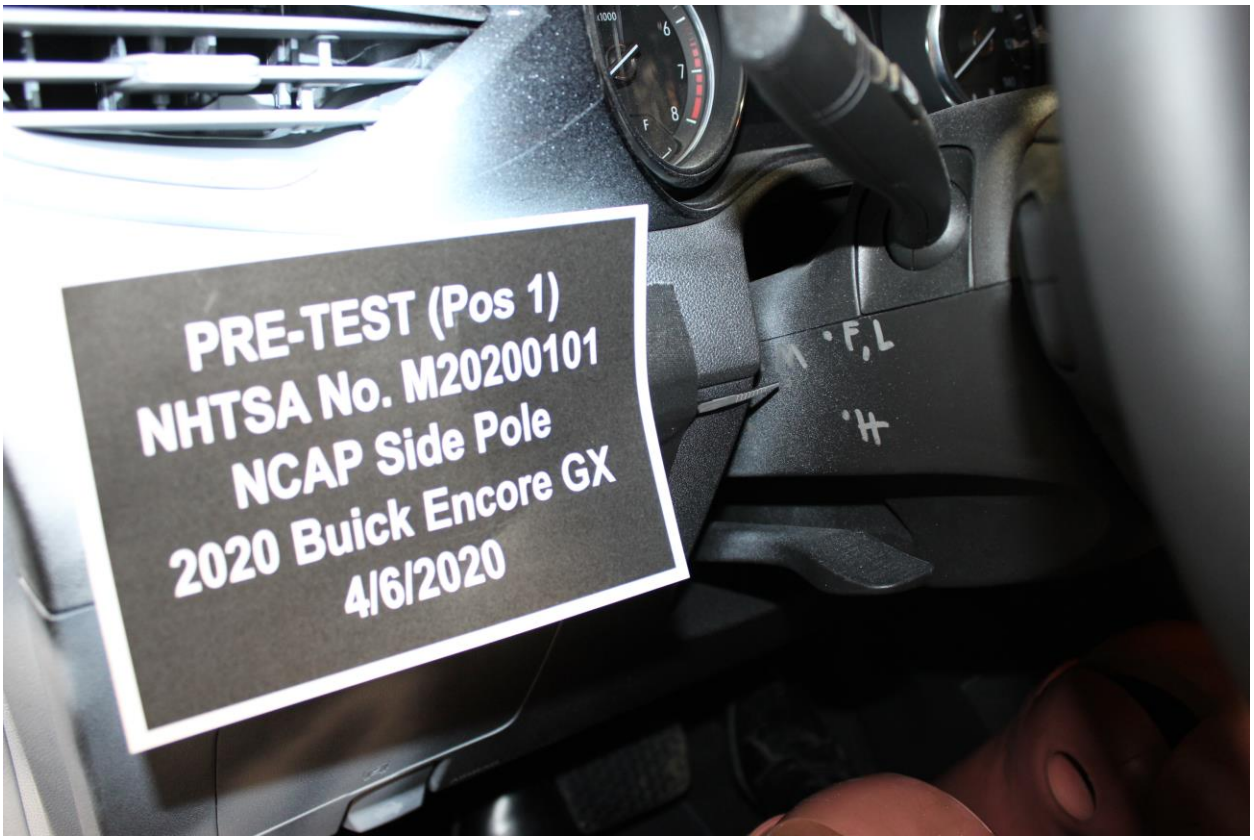


Figure A-34: Pre-Test Left Side View of Steering Wheel

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

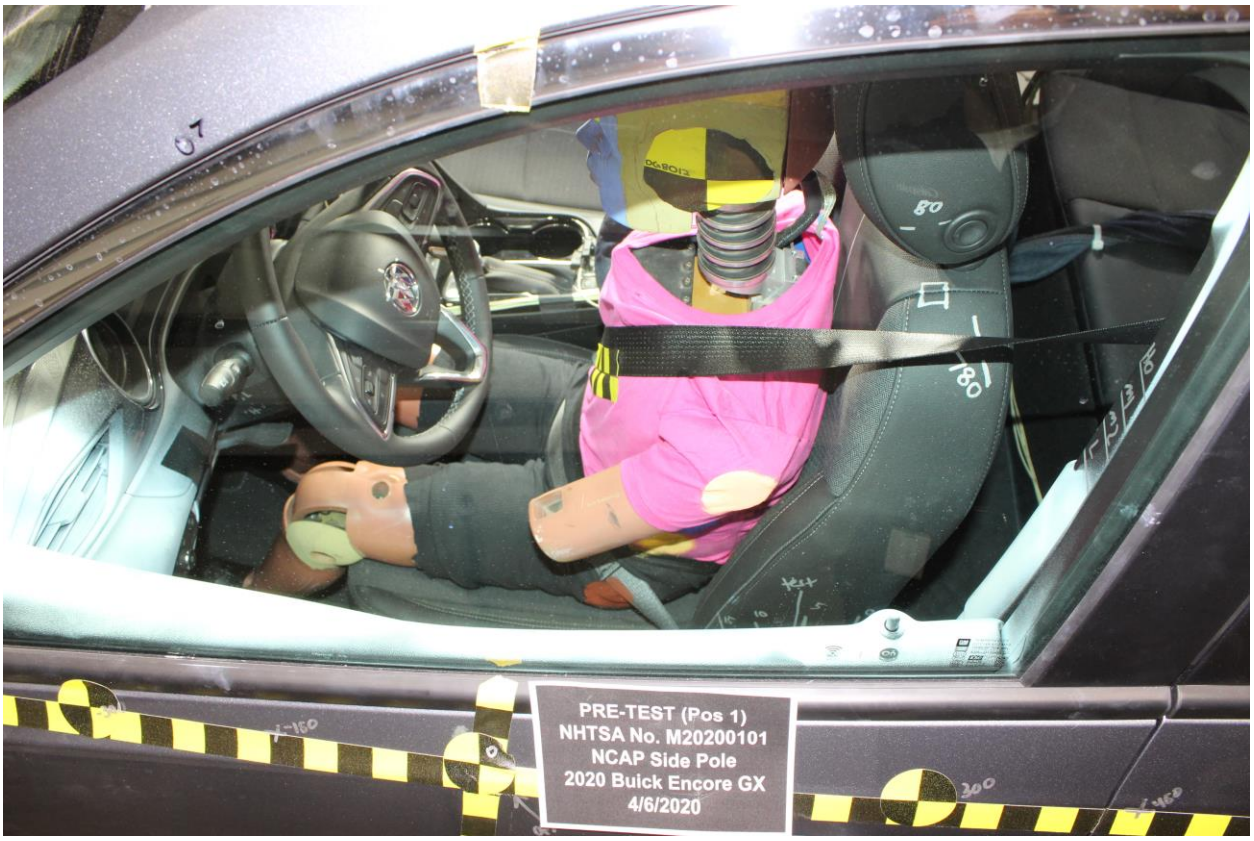


Figure A-40: Pre-Test Dummy and Door Clearance View

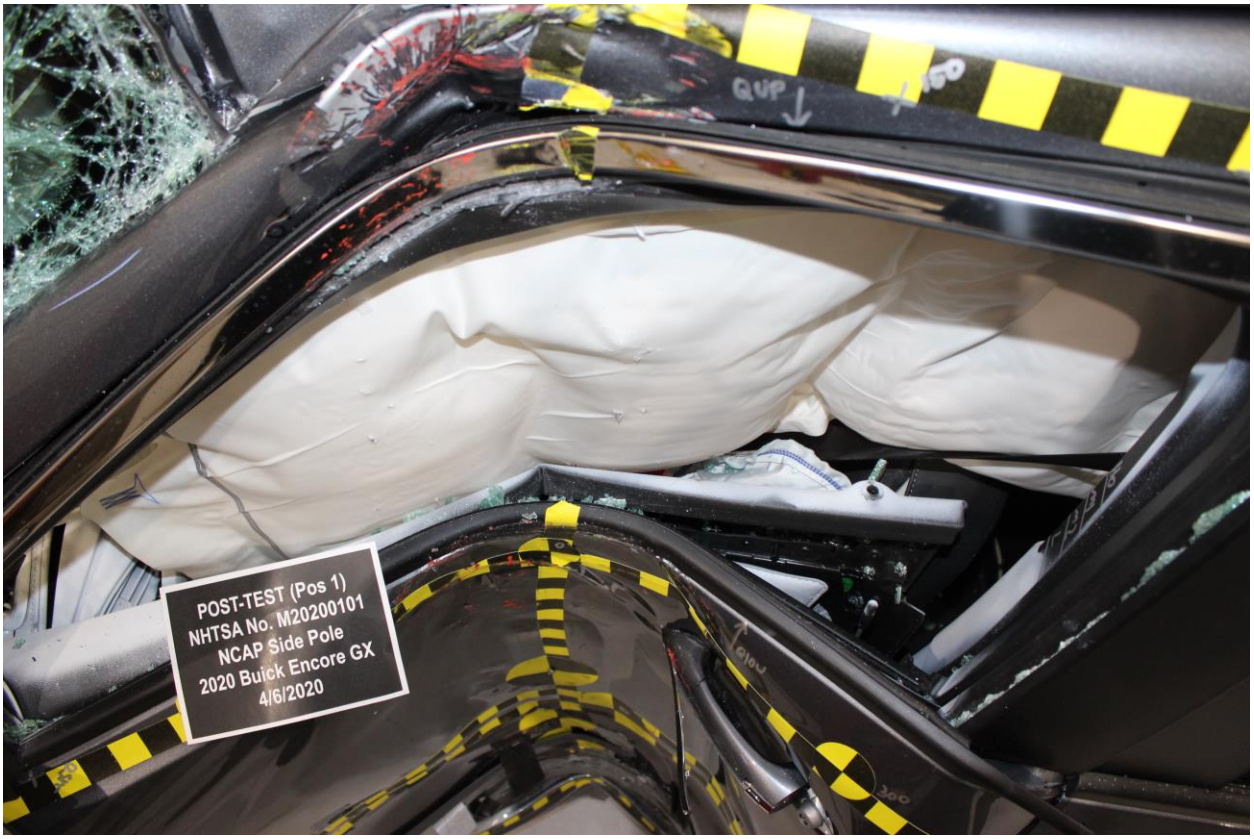


Figure A-41: Post-Test Dummy and Door Clearance View

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

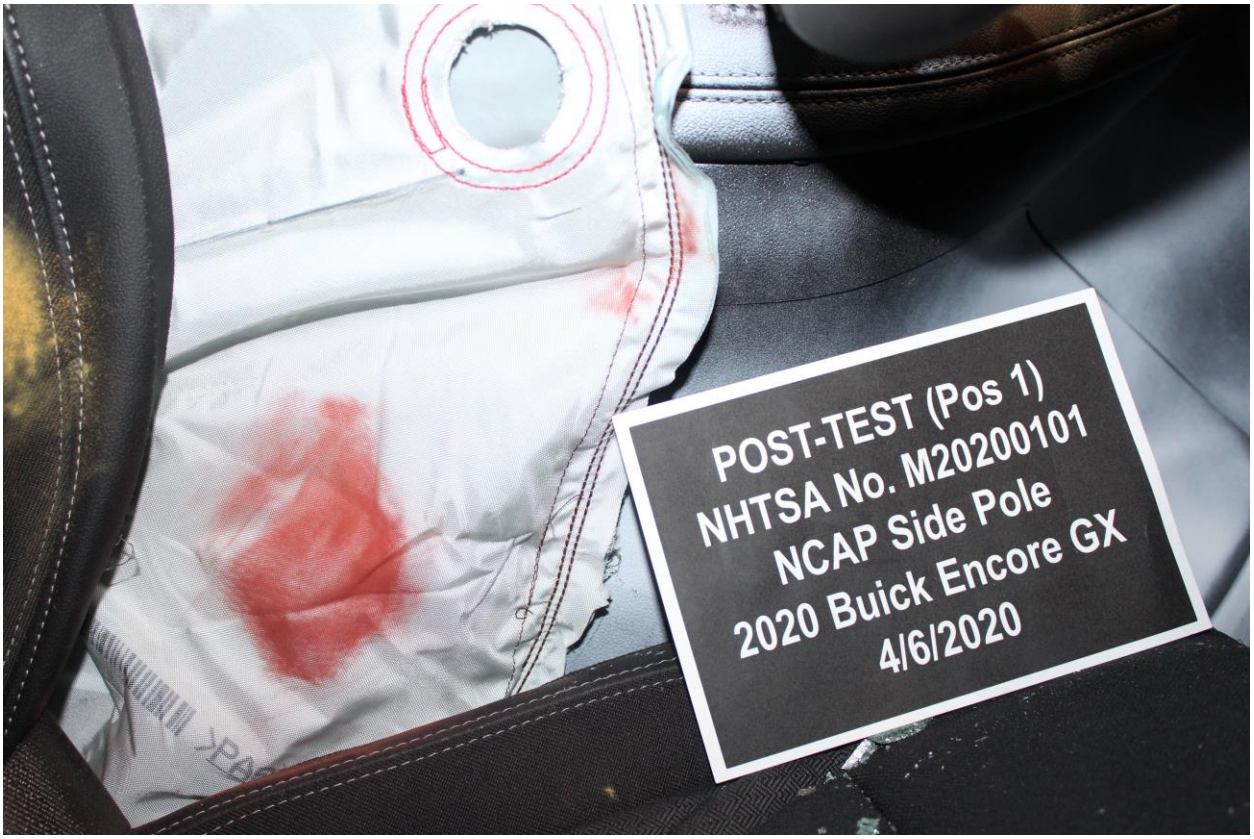


Figure A-51: Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View

Photo Not Applicable

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

Figure A-53: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

Figure A-54: Post-Test View of Fuel Filler Cap or Fuel Filler Neck

Figure A-55: Close-Up View of Vehicle's Certification Label

Photo Not Applicable

Figure A-55a: Close-Up View of Reduced Load Capacity Label

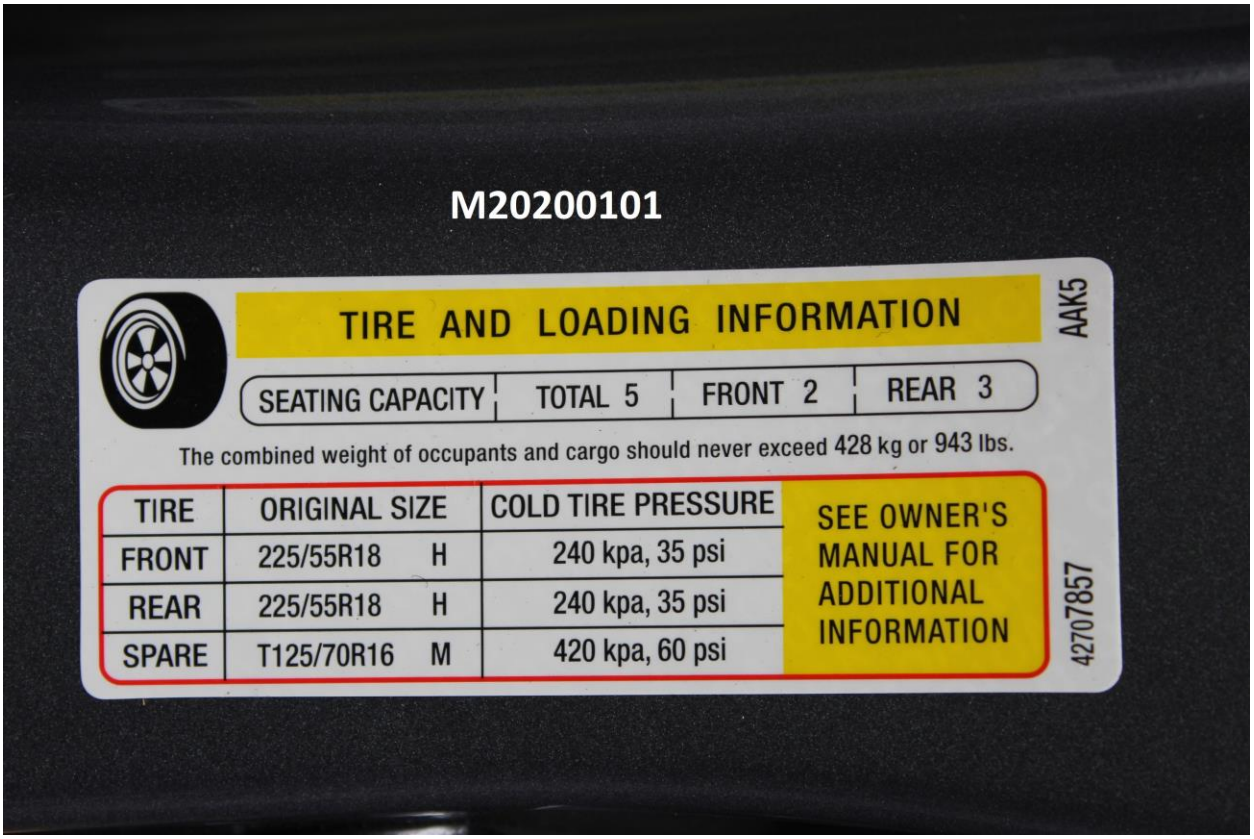


Figure A-56: Close-Up View of Vehicle's Tire Information Placard or Label

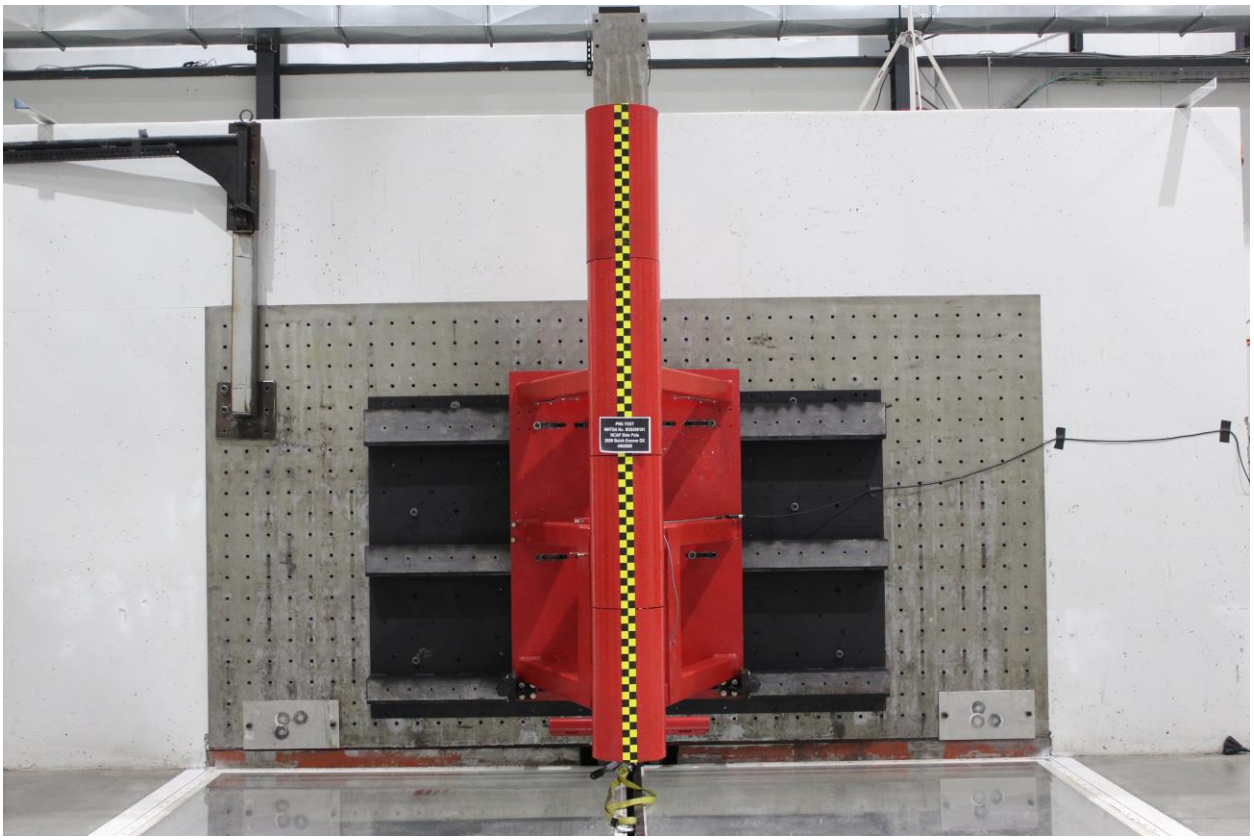


Figure A-57: Pre-Test Pole Barrier Front View

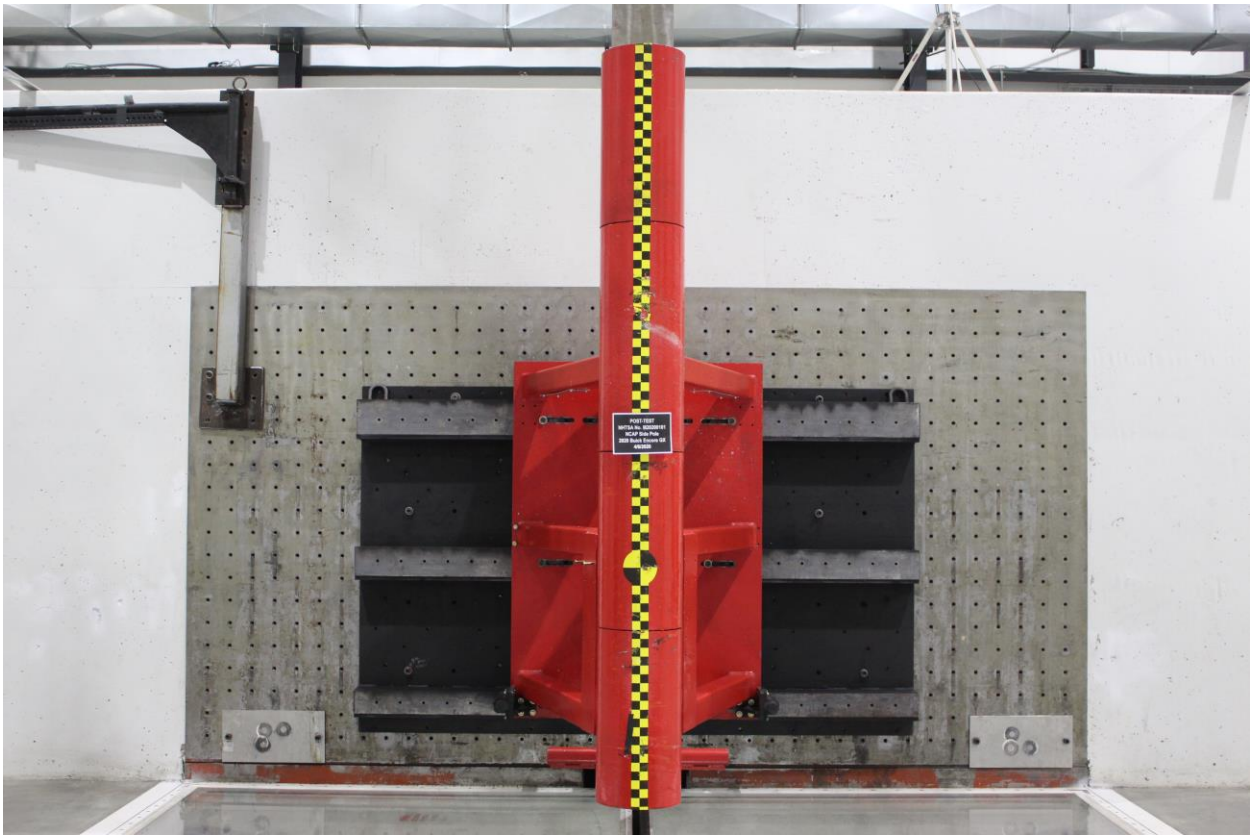


Figure A-58: Post-Test Pole Barrier Front View

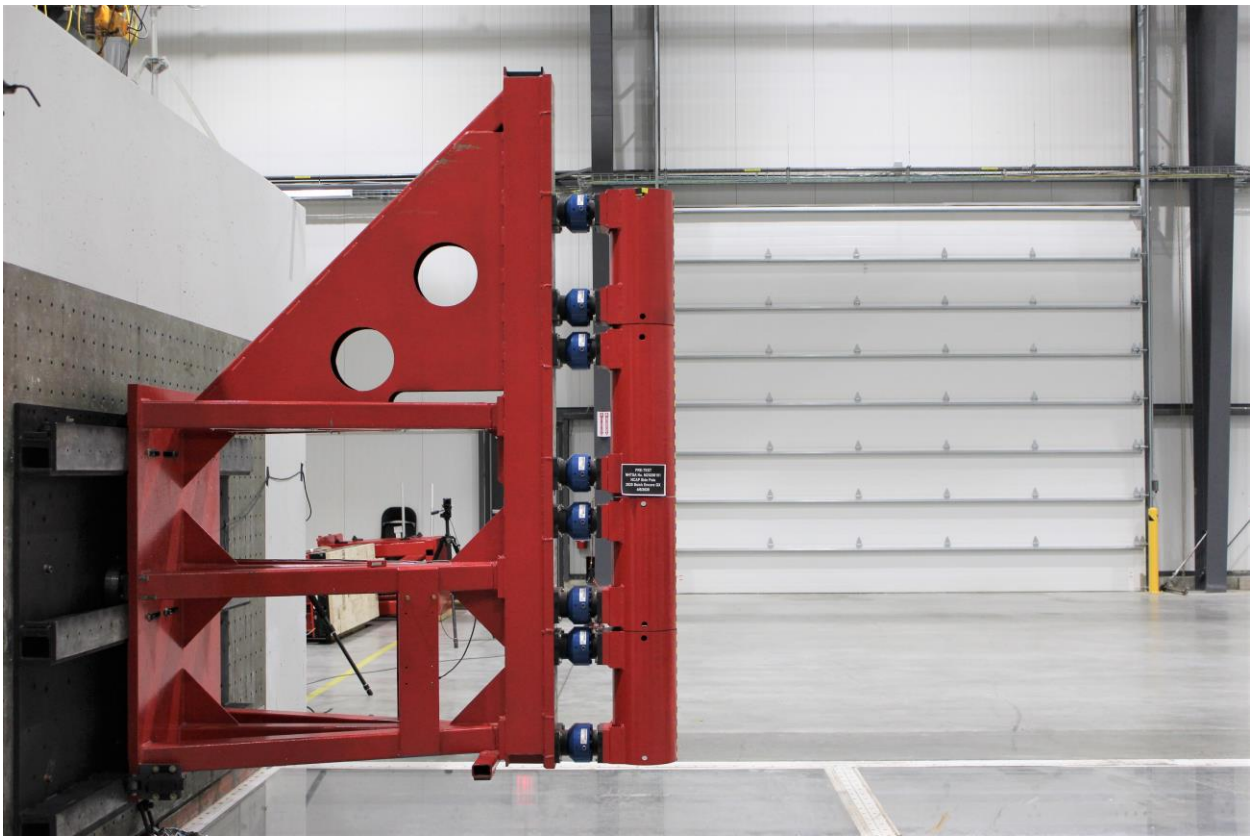


Figure A-59: Pre-Test Pole Barrier Side View

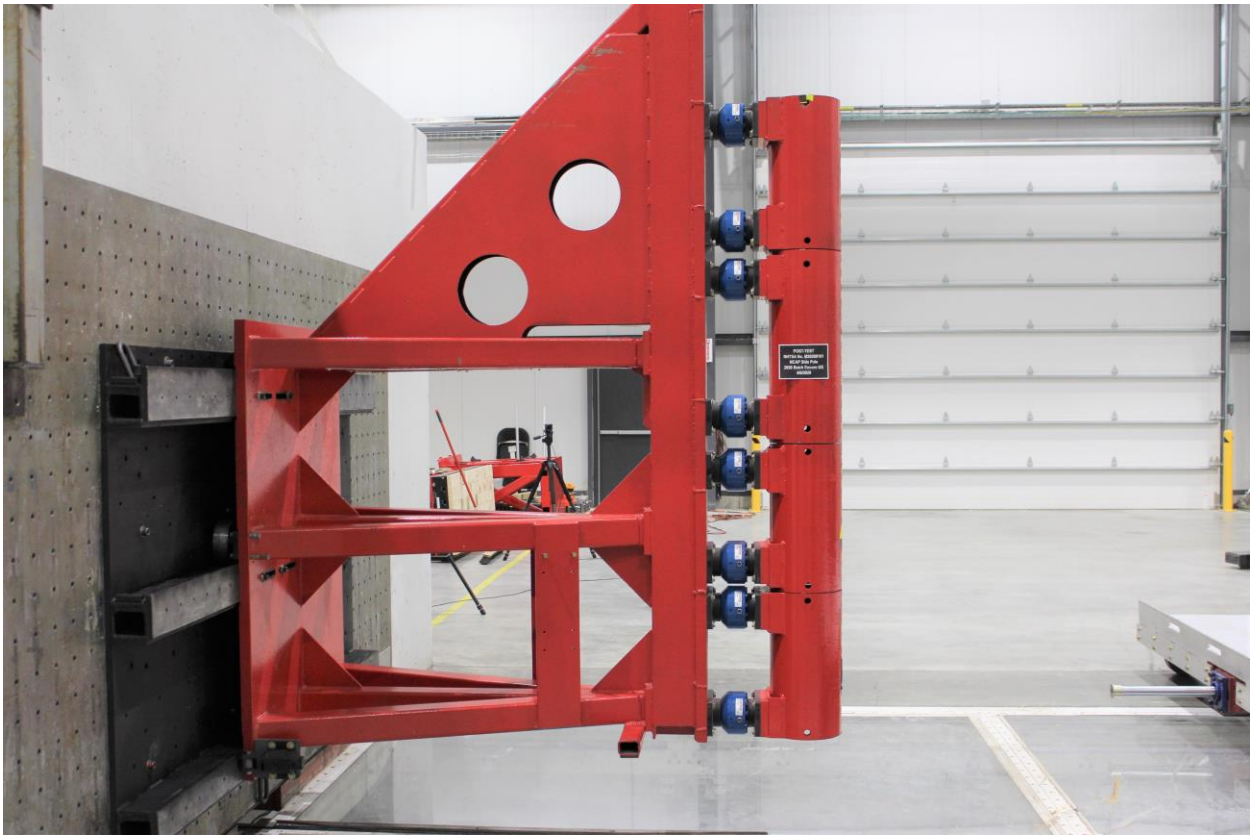


Figure A-60: Post-Test Pole Barrier Side View

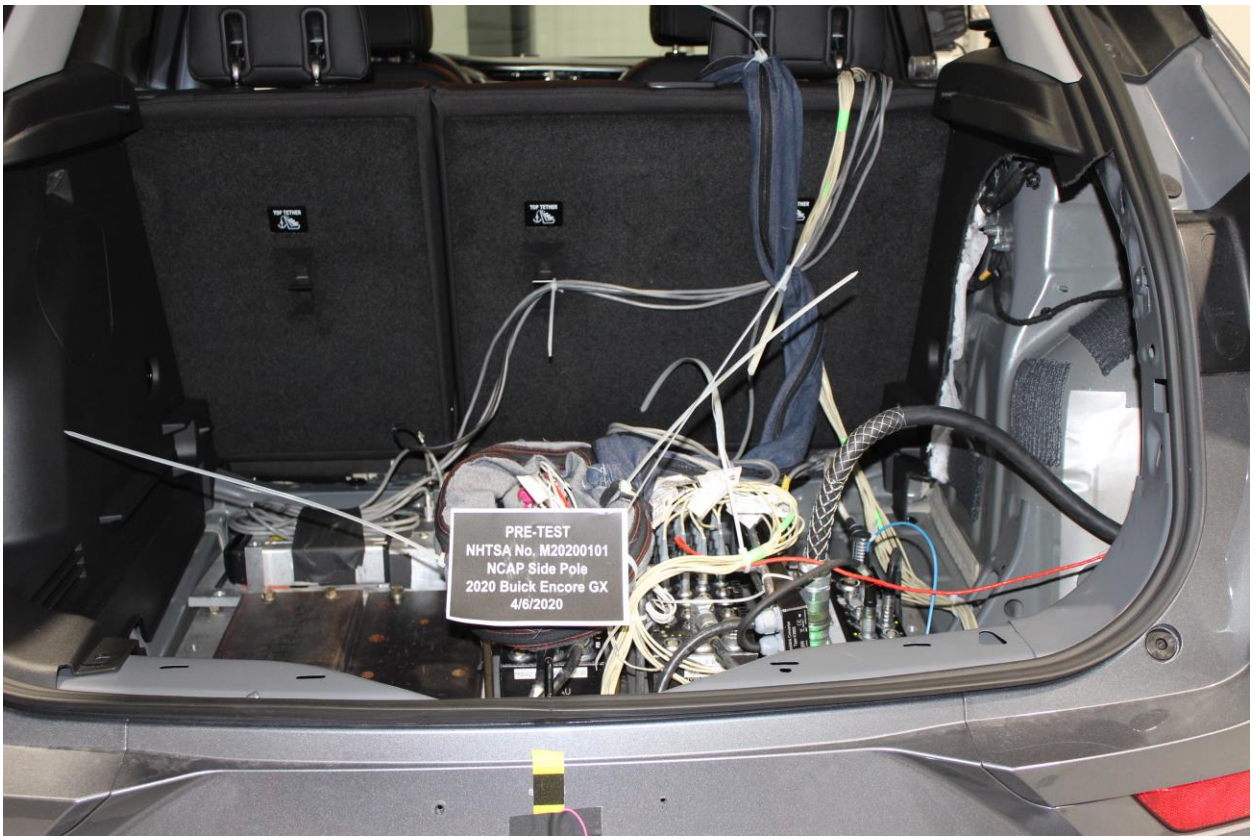


Figure A-61: Pre-Test Ballast View

Figure A-62: Post-Test Primary and Redundant Speed Trap Read-Out

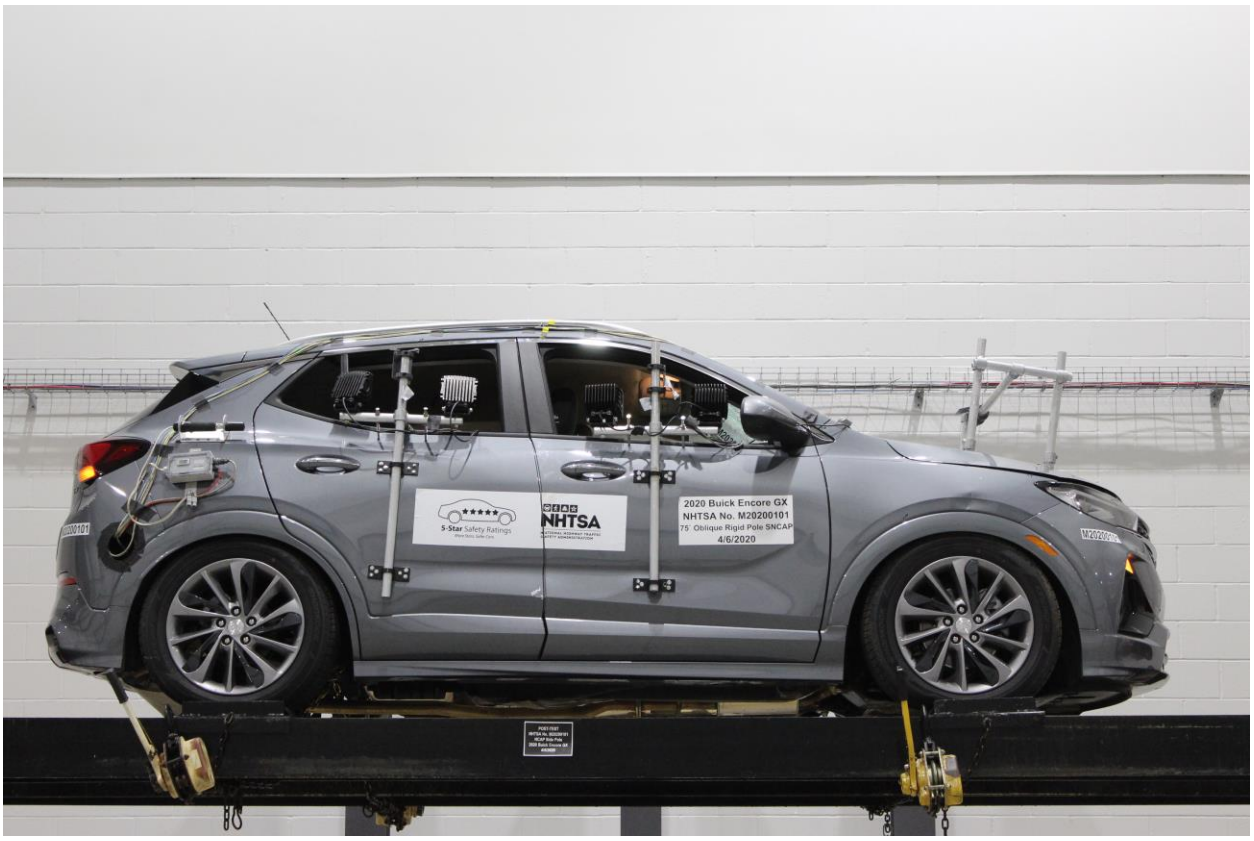


Figure A-63: FMVSS No. 301 Static Rollover 0 Degrees

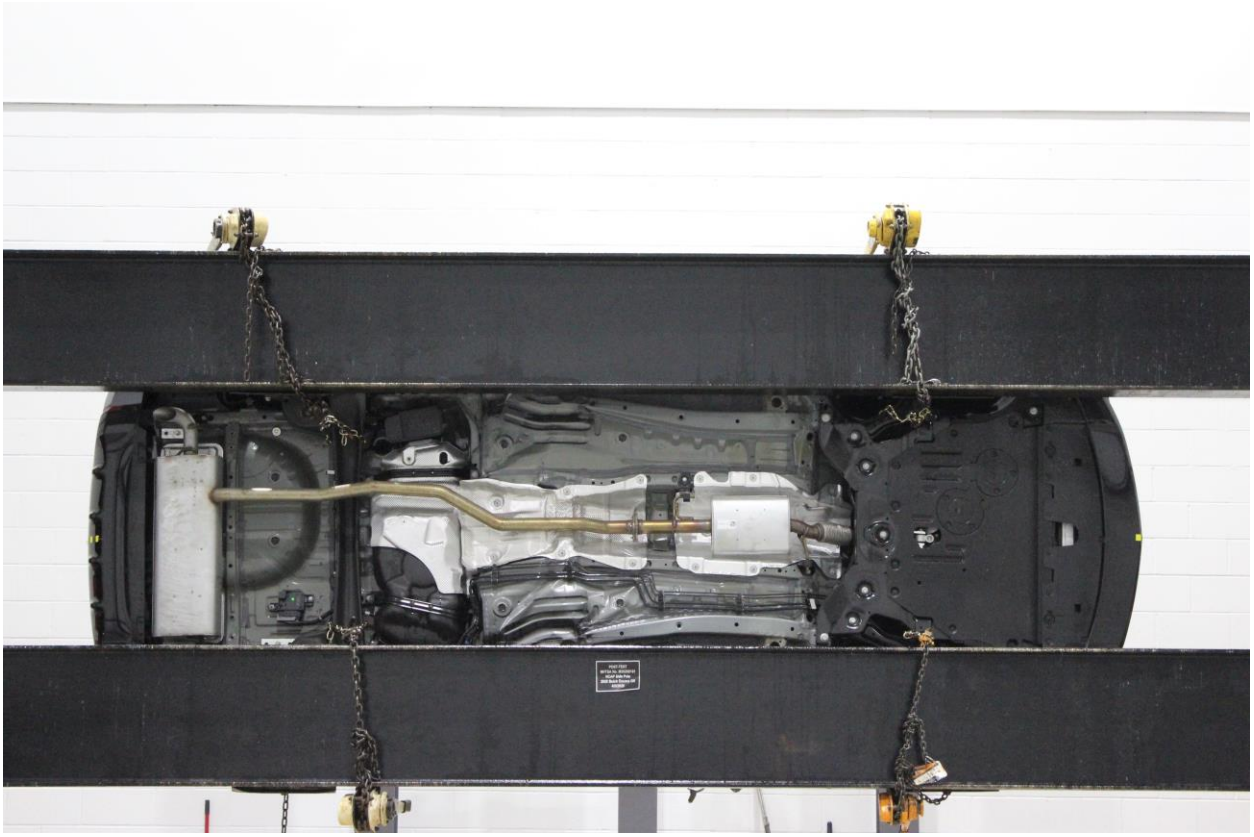


Figure A-64: FMVSS No. 301 Static Rollover 90 Degrees

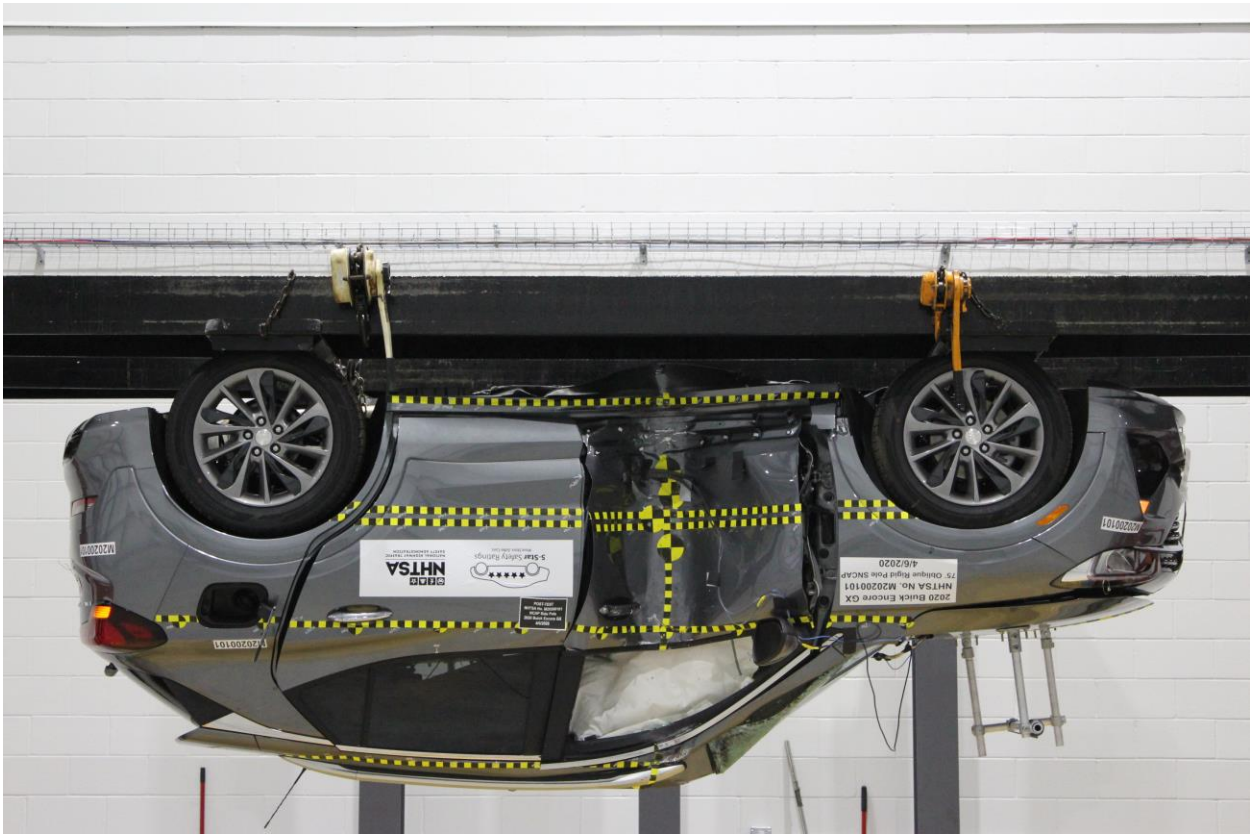


Figure A-65: FMVSS No. 301 Static Rollover 180 Degrees

Figure A-66: FMVSS No. 301 Static Rollover 270 Degrees

Figure A-67: FMVSS No. 301 Static Rollover 360 Degrees

Figure A-68: Impact Event

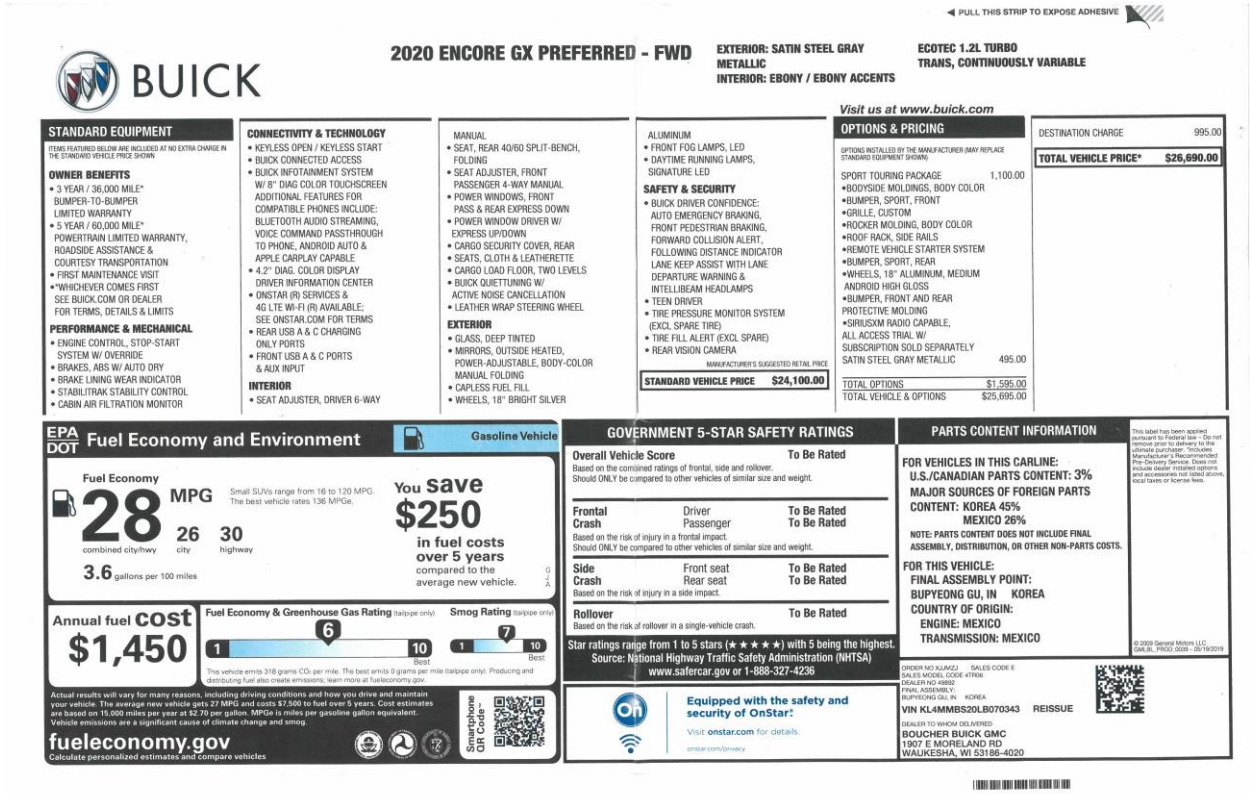
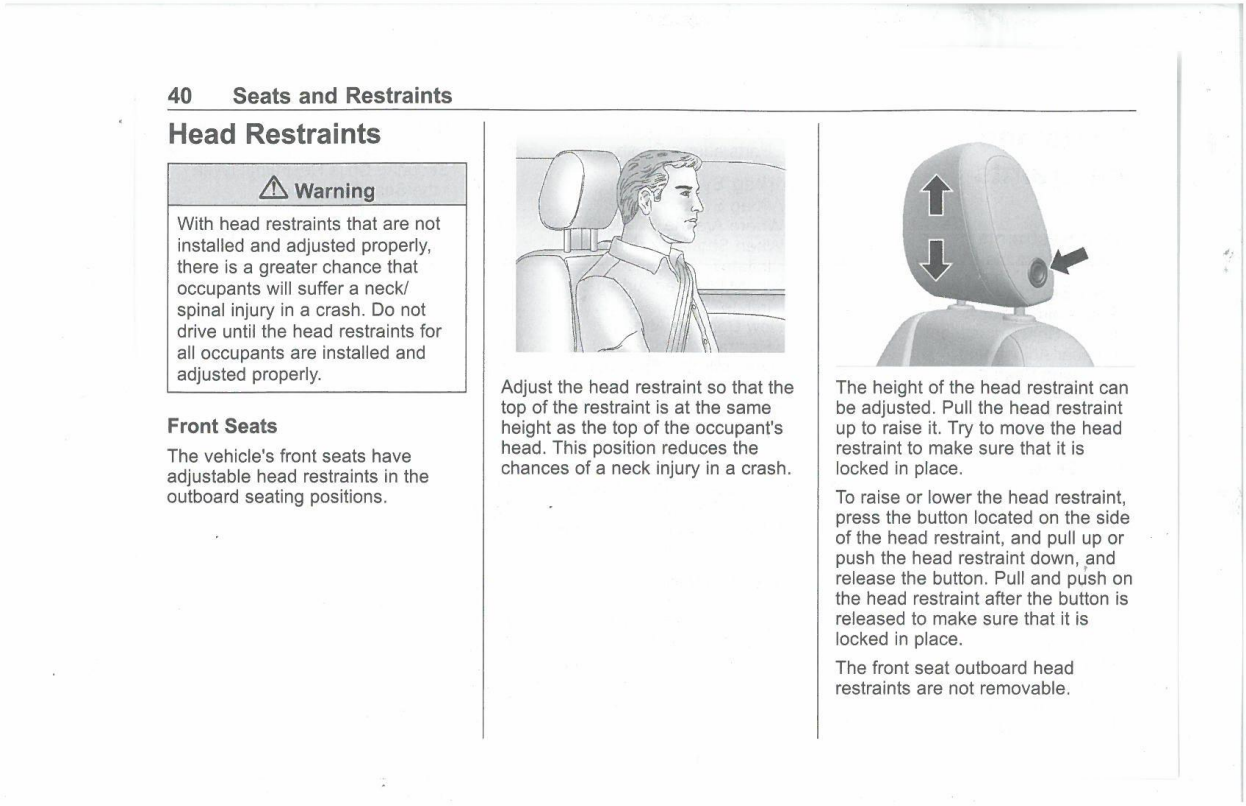


Figure A-69: Monroney Label



40 Seats and Restraints

Head Restraints

⚠ Warning

With head restraints that are not installed and adjusted properly, there is a greater chance that occupants will suffer a neck/ spinal injury in a crash. Do not drive until the head restraints for all occupants are installed and adjusted properly.

Front Seats

The vehicle's front seats have adjustable head restraints in the outboard seating positions.

Adjust the head restraint so that the top of the restraint is at the same height as the top of the occupant's head. This position reduces the chances of a neck injury in a crash.

The height of the head restraint can be adjusted. Pull the head restraint up to raise it. Try to move the head restraint to make sure that it is locked in place.

To raise or lower the head restraint, press the button located on the side of the head restraint, and pull up or push the head restraint down, and release the button. Pull and push on the head restraint after the button is released to make sure that it is locked in place.

The front seat outboard head restraints are not removable.

Figure A-70: Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

Photo Not Applicable

Figure A-71: Post-Test View of Shattered Vehicle Inner Door Panel (if applicable)

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver Dummy Instrumentation Plots

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

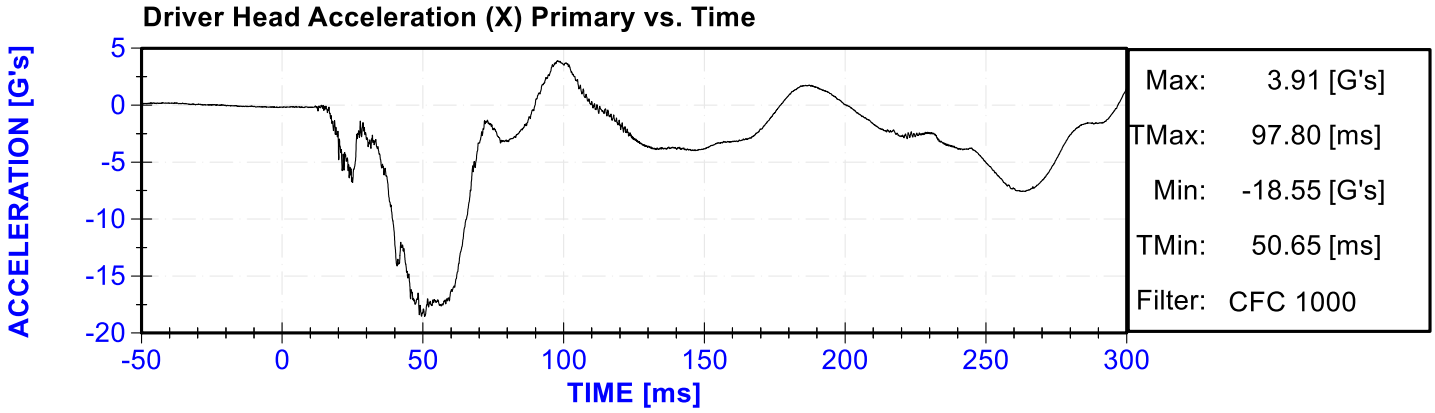
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection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

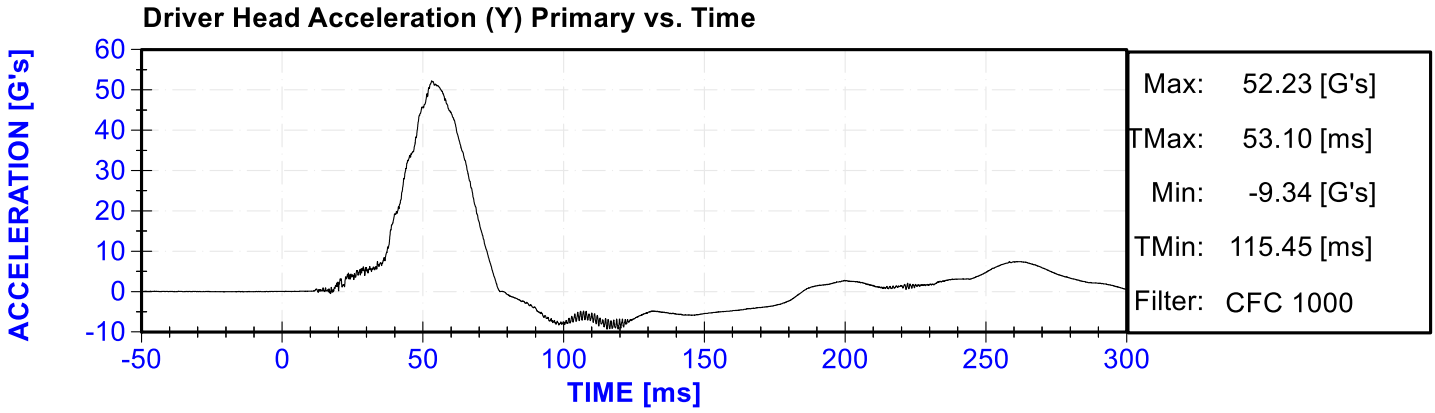
Vehicle Instrumentation Data

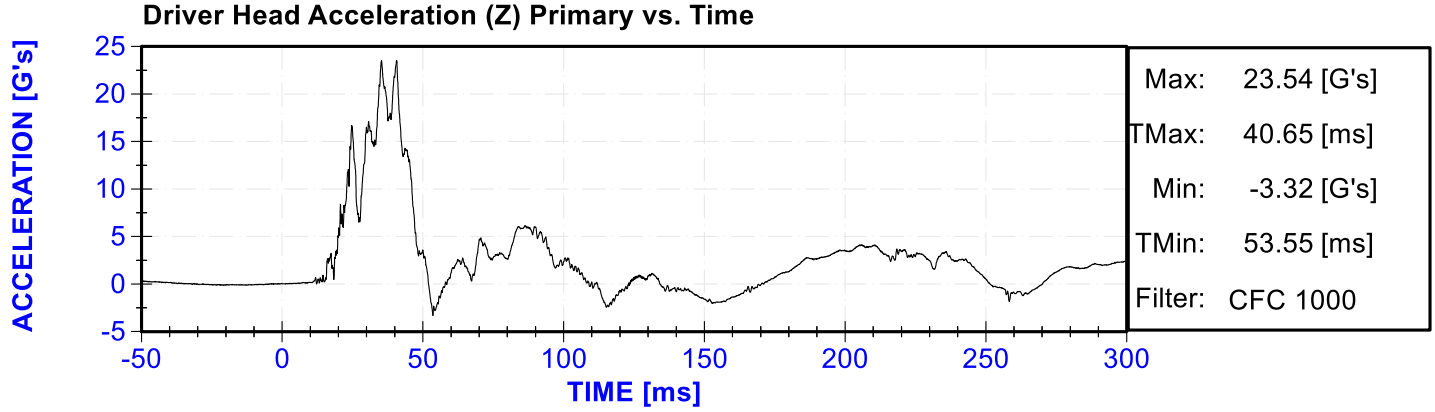
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration (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)

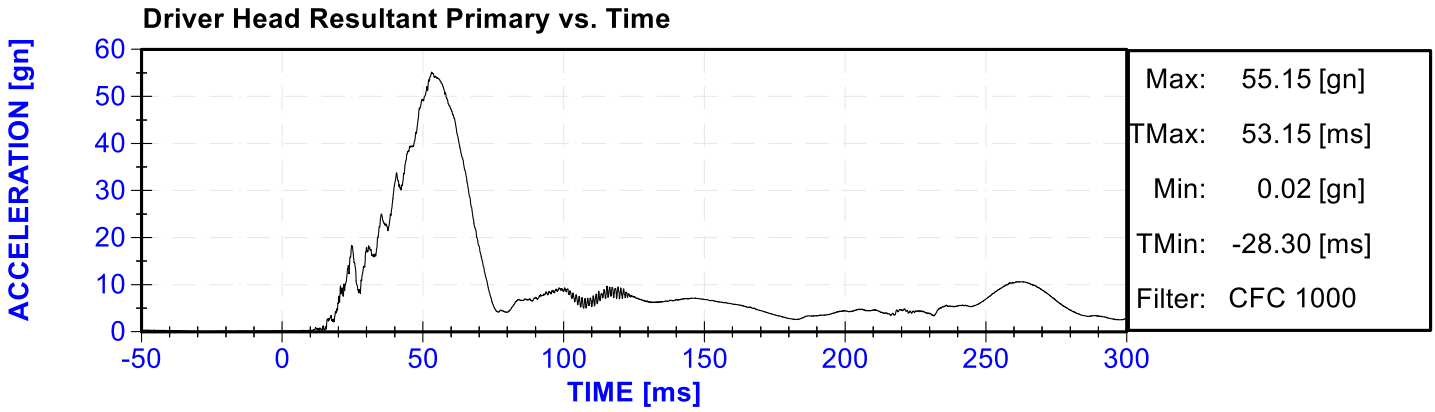
Pole Instrumentation Data

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)

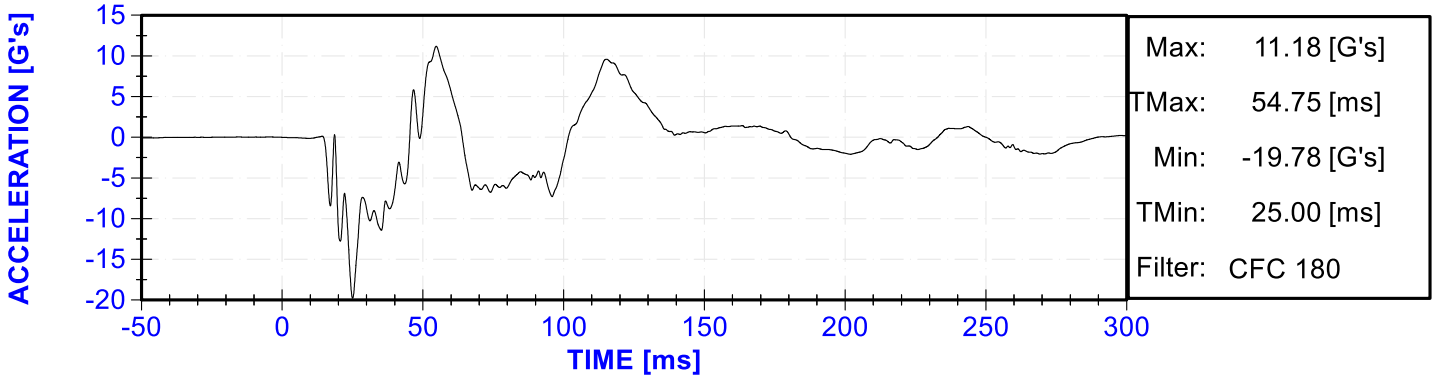

Driver Head Acceleration (X) Primary vs. Time
ACCELERATION [G's]
TIME [ms]
Max: 3.91 [G's]
TMax: 97.80 [ms]
Min: -18.55 [G's]
TMin: 50.65 [ms]
Filter: CFC 1000


Driver Head Acceleration (Y) Primary vs. Time
ACCELERATION [G's]
TIME [ms]
Max: 52.23 [G's]
TMax: 53.10 [ms]
Min: -9.34 [G's]
TMin: 115.45 [ms]
Filter: CFC 1000

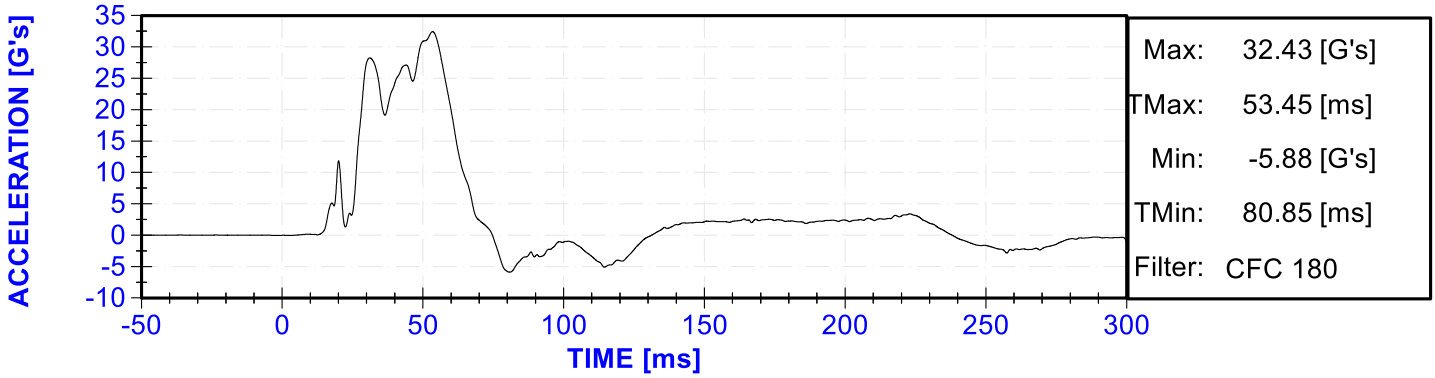

Driver Head Acceleration (Z) Primary vs. Time
ACCELERATION [G's]
TIME [ms]
Max: 23.54 [G's]
TMax: 40.65 [ms]
Min: -3.32 [G's]
TMin: 53.55 [ms]
Filter: CFC 1000


Driver Head Resultant Primary vs. Time
ACCELERATION [gn]
TIME [ms]
Max: 55.15 [gn]
TMax: 53.15 [ms]
Min: 0.02 [gn]
TMin: -28.30 [ms]
Filter: CFC 1000

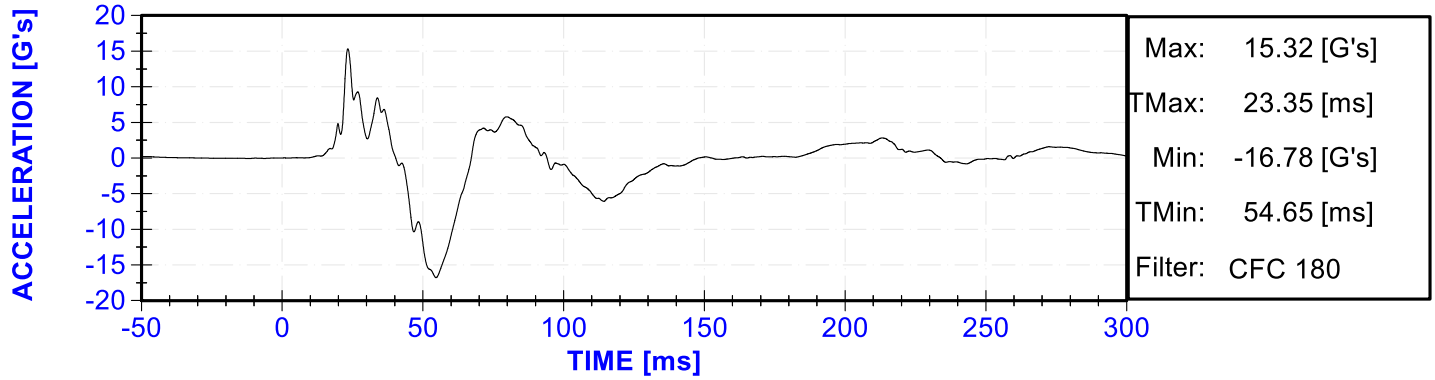
Driver Lower Spine T12 Acceleration (X) vs. Time



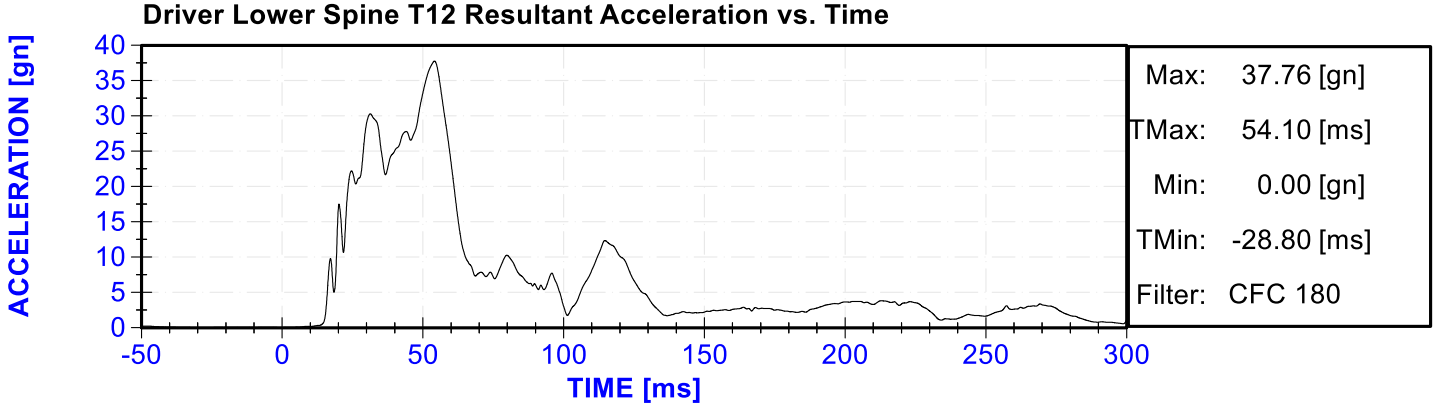
Driver Lower Spine T12 Acceleration (Y) vs. Time



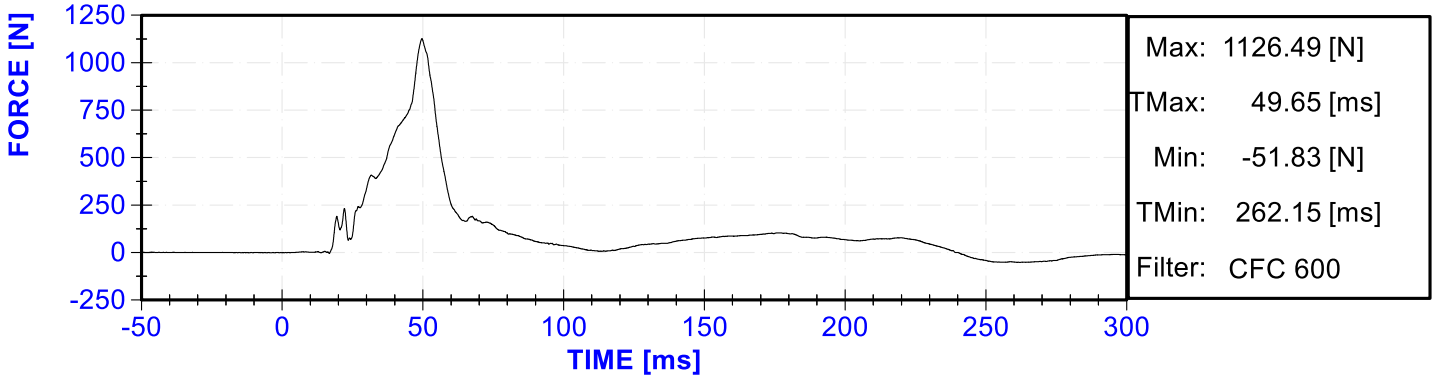
Driver Lower Spine T12 Acceleration (Z) vs. Time



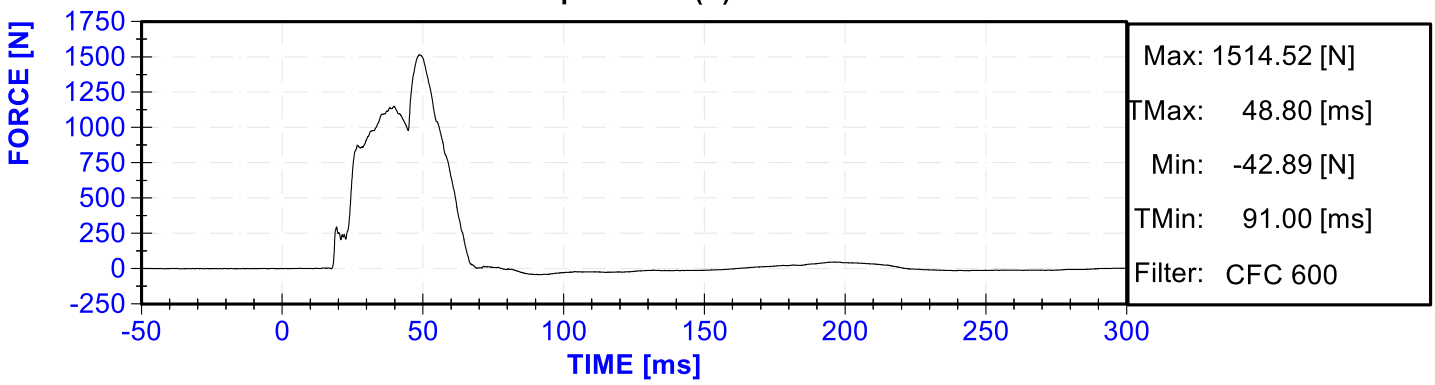
Driver Lower Spine T12 Resultant Acceleration vs. Time



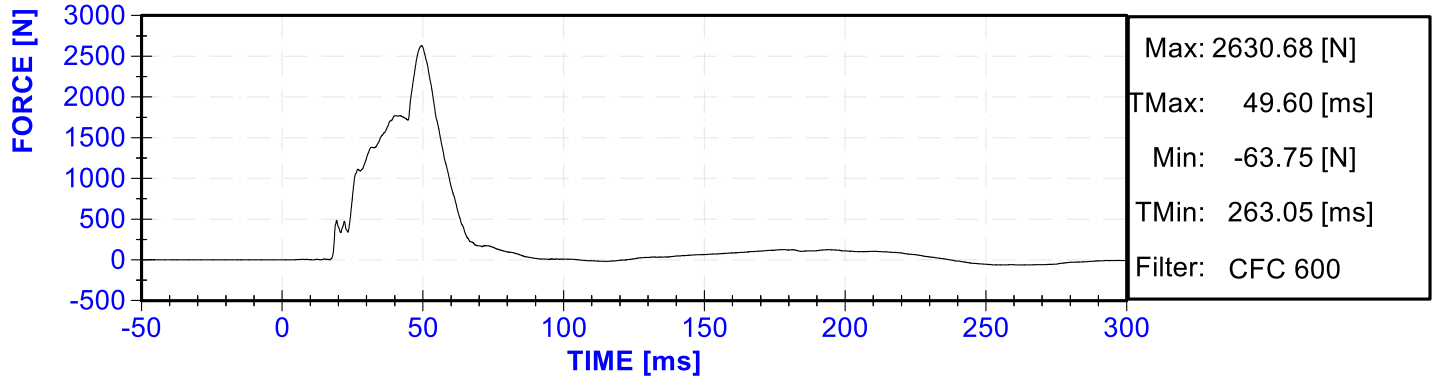
Driver Iliac Wing Force on Impact Side (Y) vs. Time



Driver Acetabulum Force on Impact Side (Y) vs. Time



Driver Total Pelvis Force on Impact Side (Y) vs. Time



APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

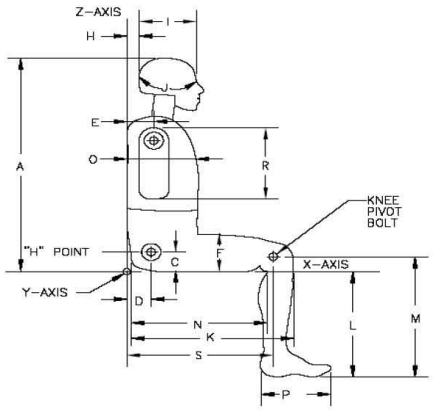
SERIAL NO: DG8012

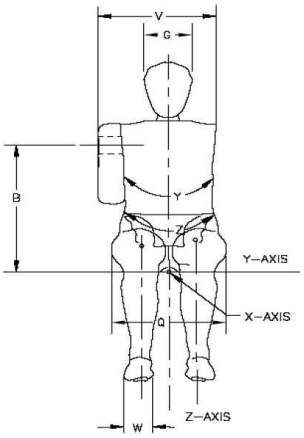
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Dutton Date: 03/25/2020

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	779	Pass
B	Shoulder Pivot Height	437	453	446	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	126	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	185	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	533	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	405	Pass
N	Buttock Popliteal Length	416	442	433	Pass
O	Chest Depth w/o jacket	195	211	205	Pass
P	Foot Length	216	232	222	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	486	Pass
V	Shoulder Width	341	357	345	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	867	Pass
Z	Waist Circumference	761	791	781	Pass

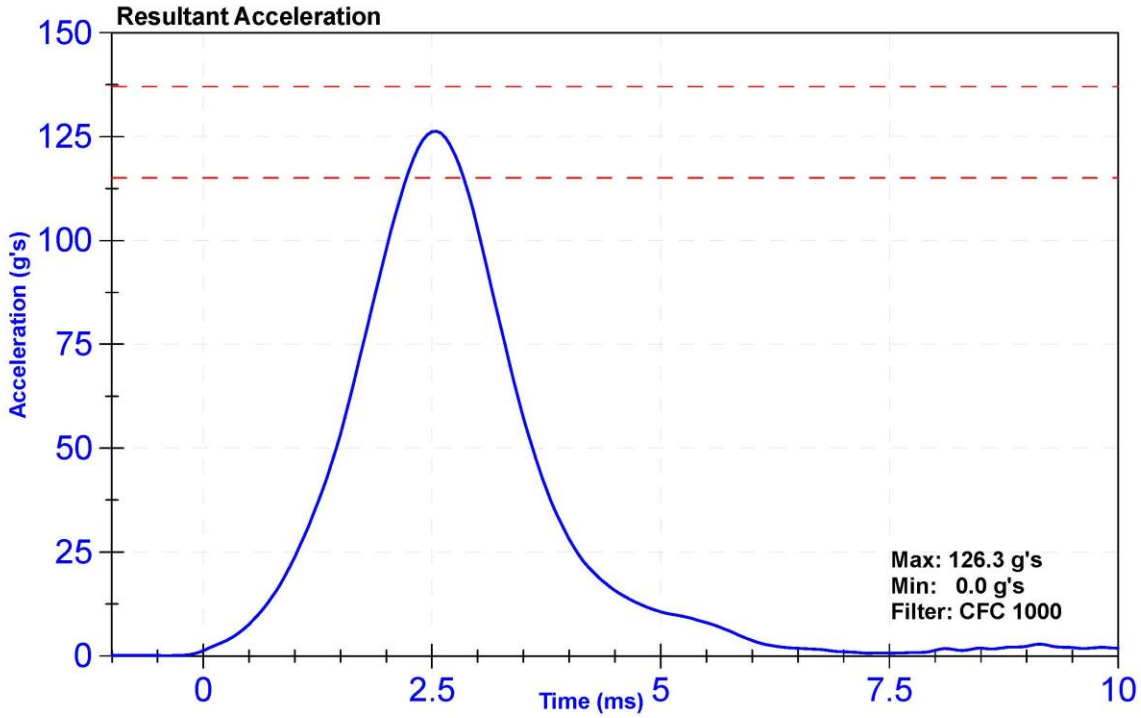
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

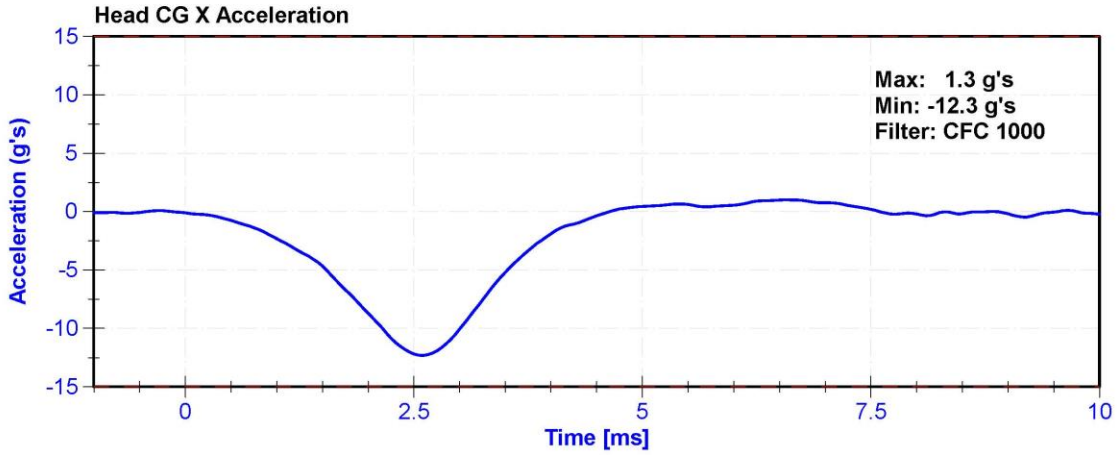
Results

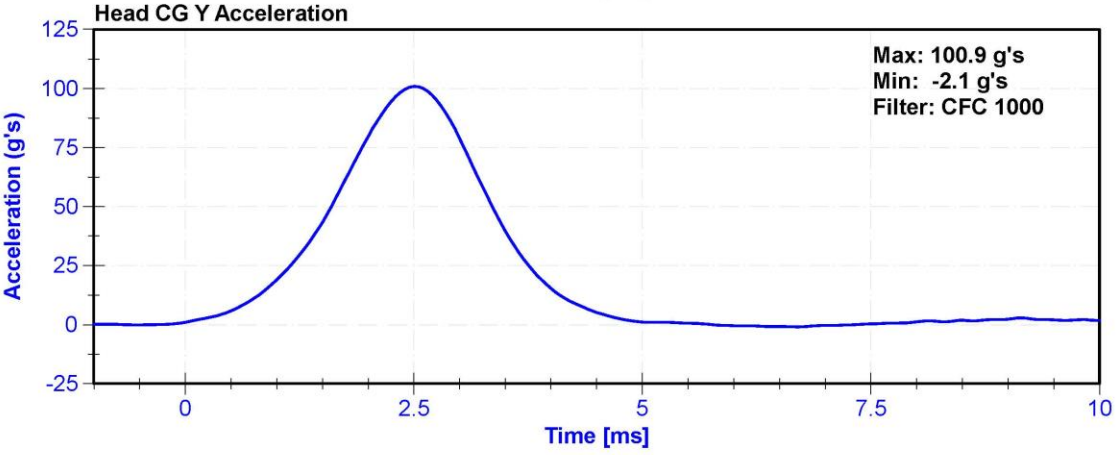
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	37.6	Pass
Resultant Acceleration	115	137	g's	126.3	Pass
Oscillation	0	15	%	2.4	Pass
Fore-Aft Acceleration	-15	15	g's	-12.3	Pass

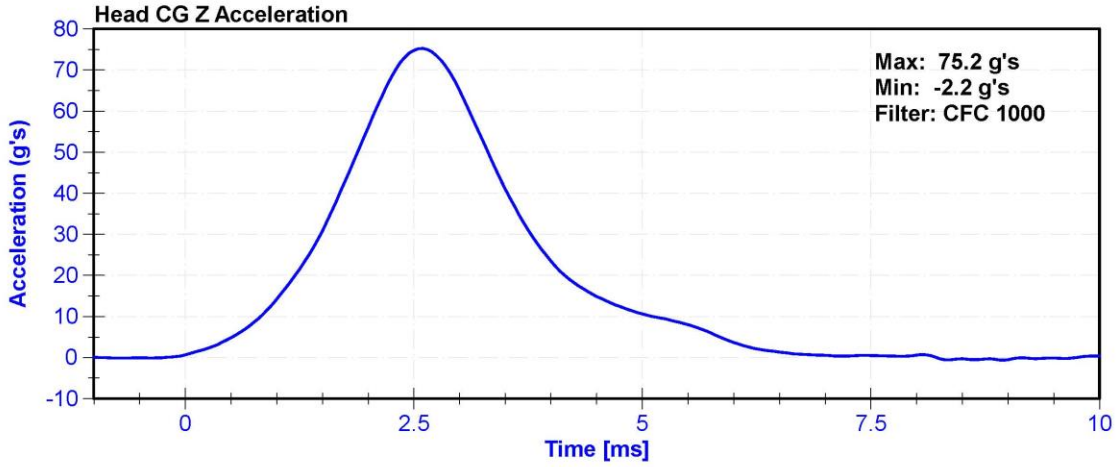
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264-X	P74788	4/11/2019	4/10/2020
Y Accelerometer	ENDEVCO 7264CT-Z	P83432	4/11/2019	4/10/2020
Z Accelerometer	ENDEVCO 7264-Y	P83319	4/11/2019	4/10/2020




Head CG X Acceleration
Max: 1.3 g's
Min: -12.3 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 100.9 g's
Min: -2.1 g's
Filter: CFC 1000
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 75.2 g's
Min: -2.2 g's
Filter: CFC 1000
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]

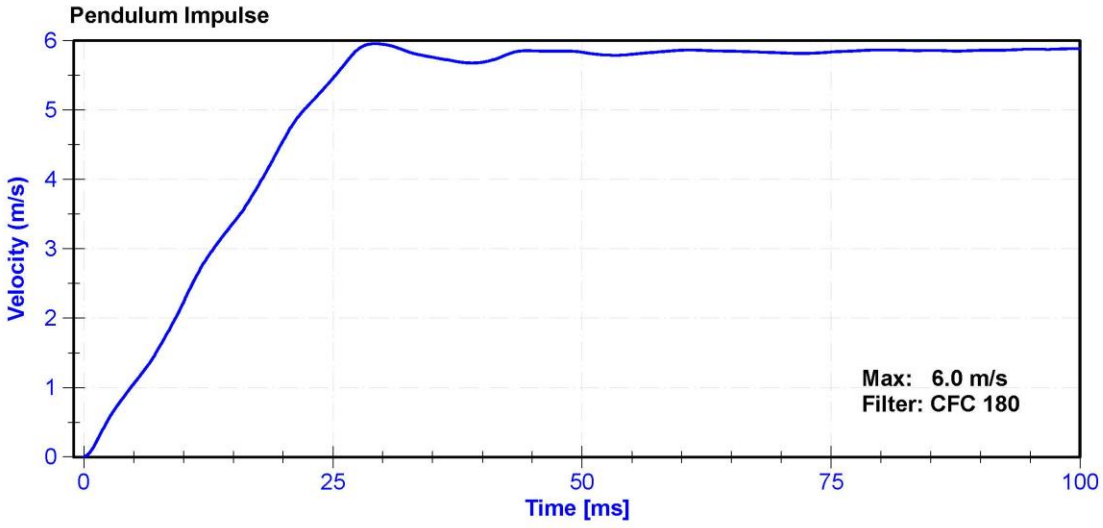
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

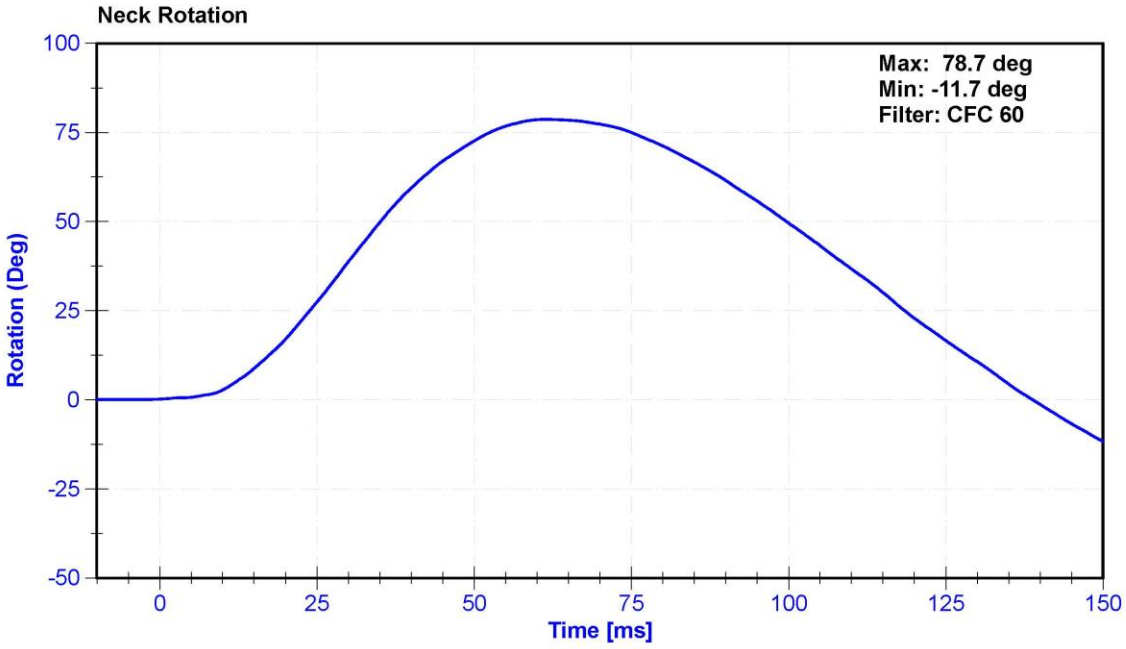
Results

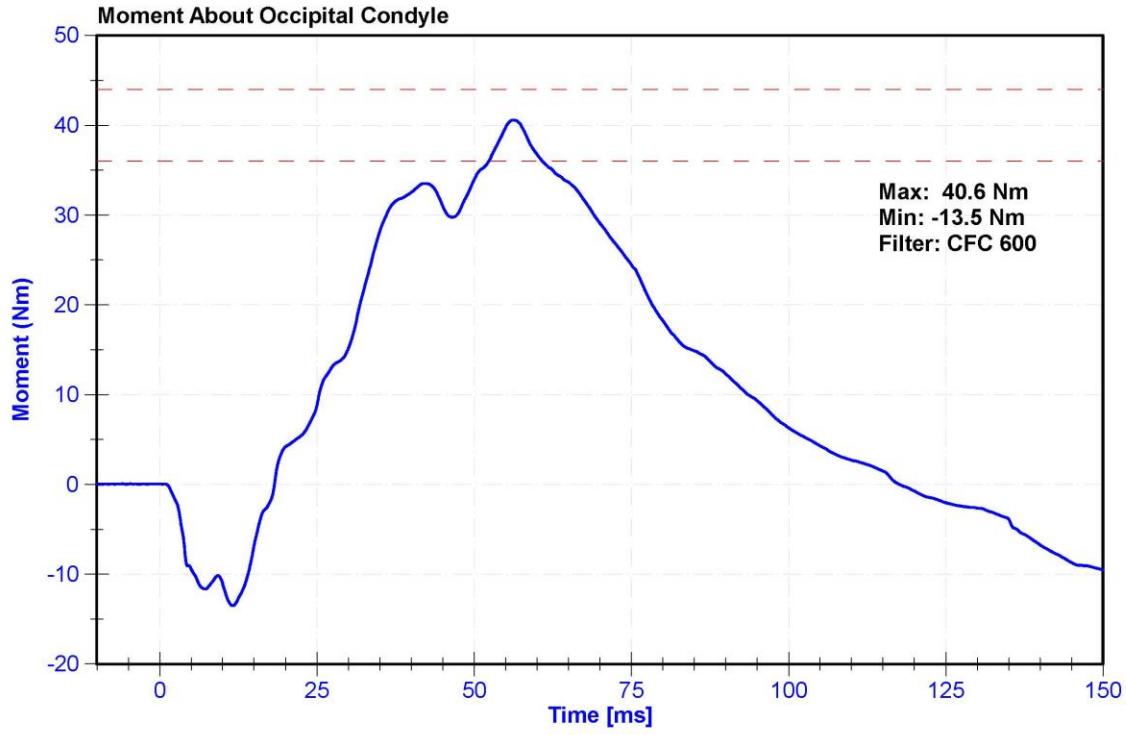
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	32.1	Pass
Velocity	5.51	5.63	m/s	5.549	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.23	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.37	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.55	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.45	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.95	Pass
Neck Rotation	71	81	deg	78.7	Pass
Time at Maximum Rotation	50	70	ms	61.3	Pass
Moment about the OC	36	44	Nm	40.6	Pass
Moment Decay to 0 Nm	102	126	ms	117.6	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	Denton 78051-342	DS-184Pend	11/4/2019	11/3/2020
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/4/2019	11/3/2020
Upper Neck Load Cell	Denton 1716A	LC-2192Fy	6/20/2019	6/19/2020




Neck Rotation
Max: 78.7 deg
Min: -11.7 deg
Filter: CFC 60
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 40.6 Nm
Min: -13.5 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

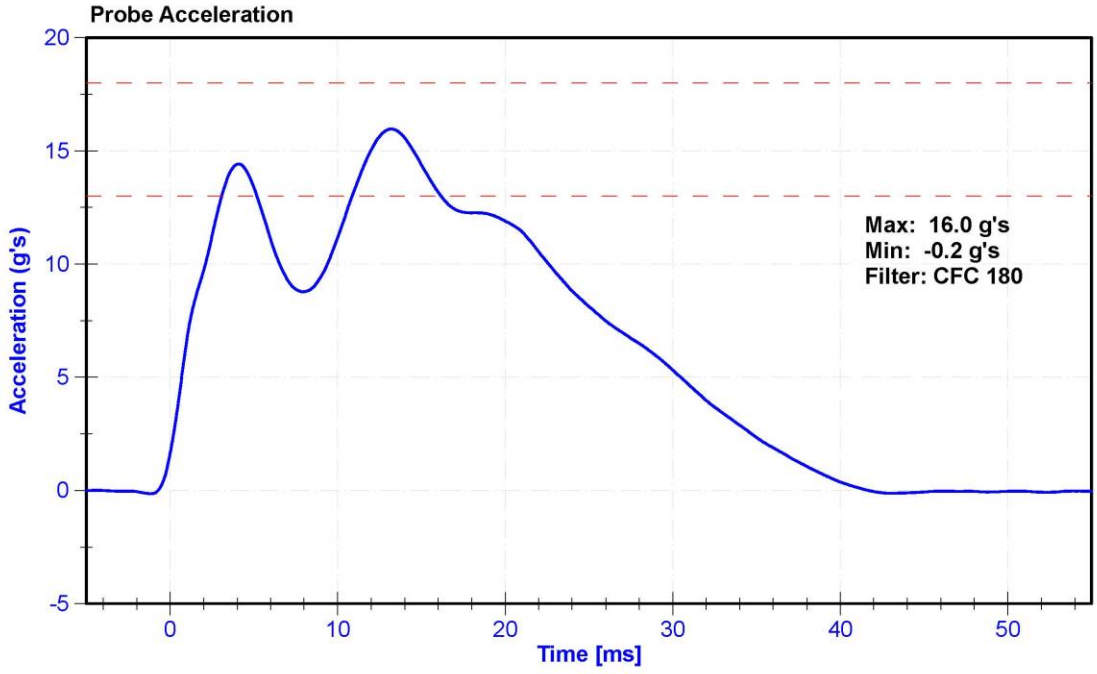
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

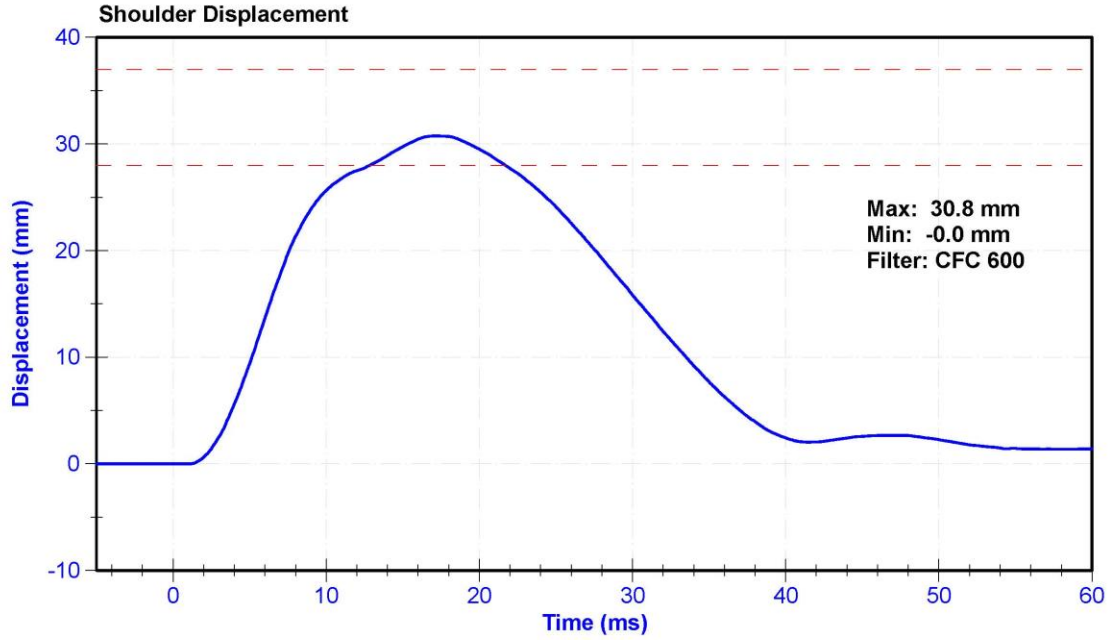
Results

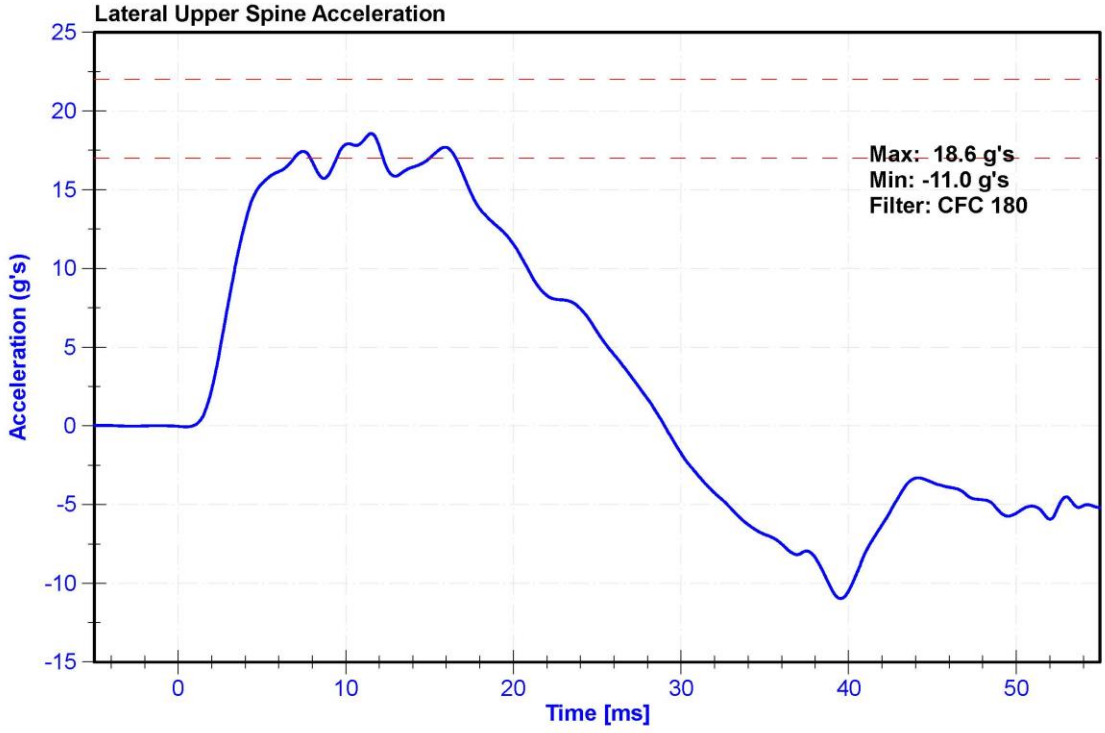
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	33	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	13	18	g's	16.0	Pass
Shoulder Deflection	28	37	mm	30.8	Pass
Lateral Upper Spine Acceleration	17	22	g's	18.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	10/28/2019	4/27/2020
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/28/2019	4/27/2020




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 30.8 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 18.6 g's
Min: -11.0 g's
Filter: CFC 180

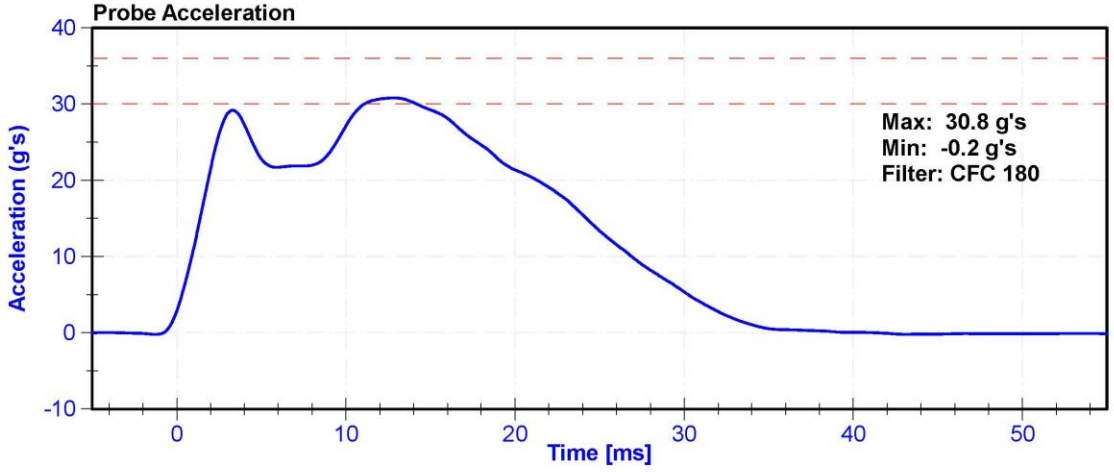
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

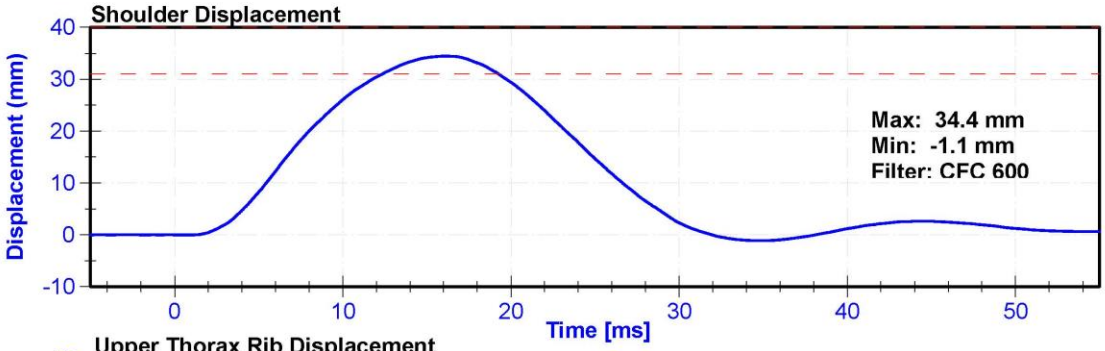
Results

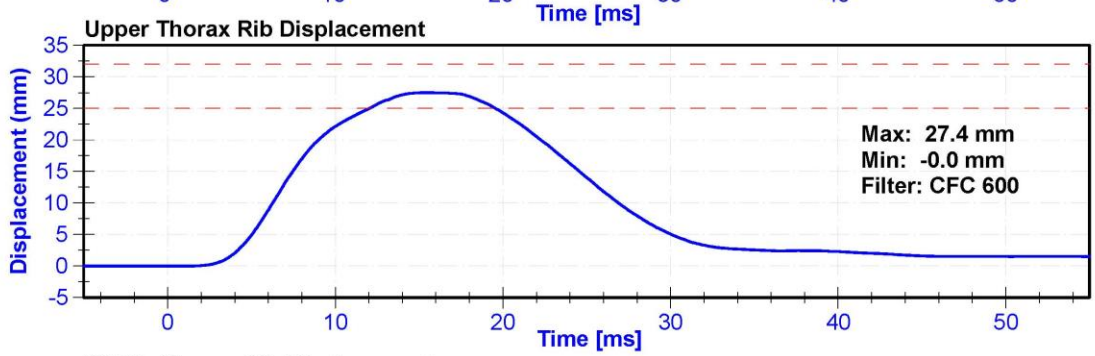
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.79	Pass
Probe Acceleration after 5 ms	30	36	g's	30.8	Pass
Lateral Upper Spine Acceleration	34	43	g's	34.7	Pass
Lateral Lower Spine Acceleration	29	37	g's	29.1	Pass
Shoulder Deflection	31	40	mm	34.4	Pass
Upper Thorax Rib Deflection	25	32	mm	27.4	Pass
Mid Thorax Rib Deflection	30	36	mm	33.0	Pass
Lower Thorax Rib Deflection	32	38	mm	38.0	Pass

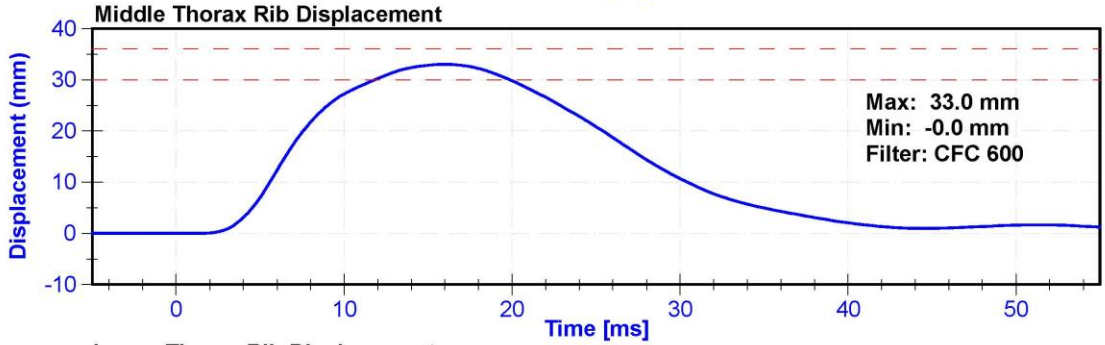
Transducer Calibrations

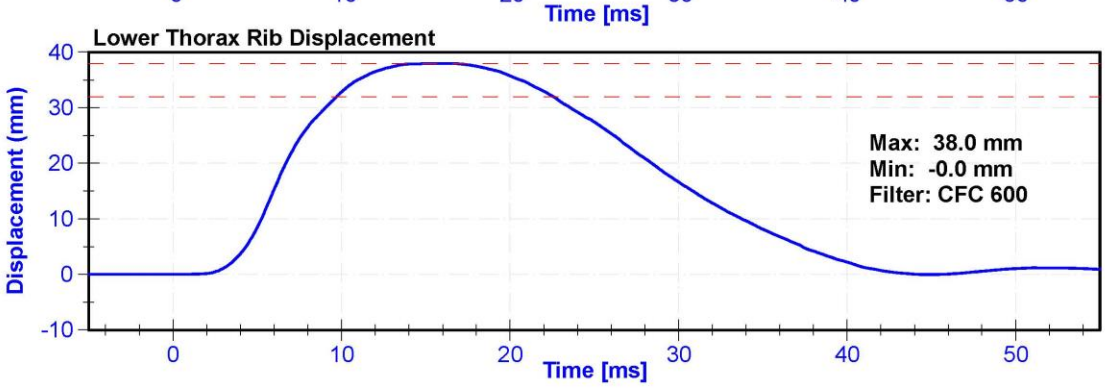
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/28/2019	4/27/2020
Upper Spine T12 Y Accelerometer	ENDEVCO 7264CT	AC-P51327	9/30/2019	3/31/2020
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	10/28/2019	4/27/2020
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	10/28/2019	4/27/2020
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	10/28/2019	4/27/2020
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	10/28/2019	4/27/2020

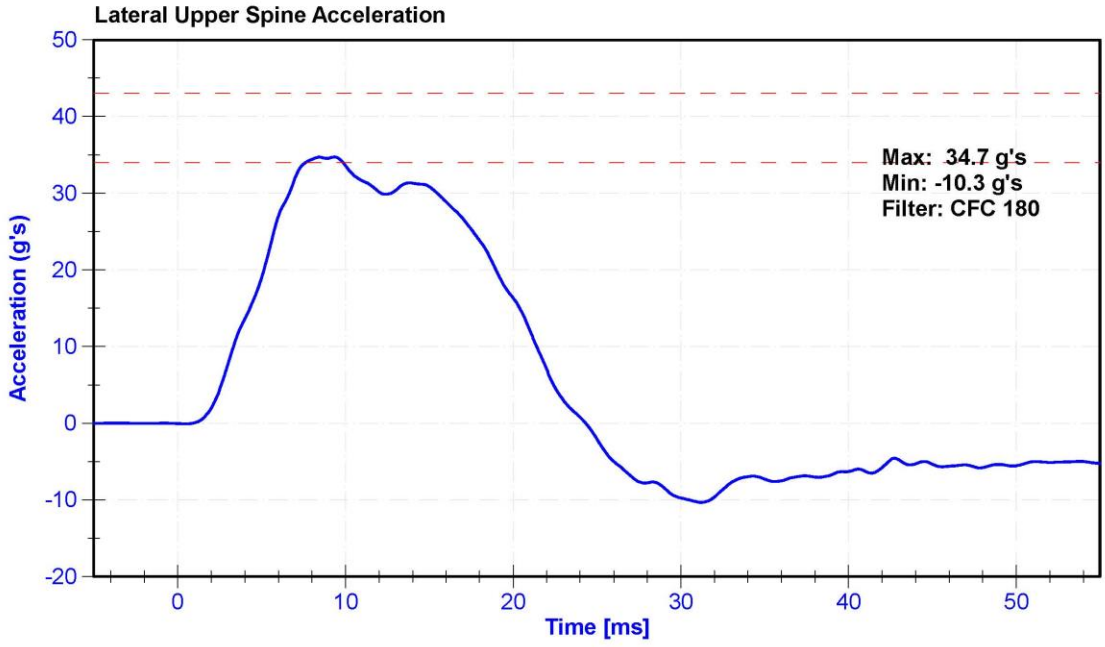


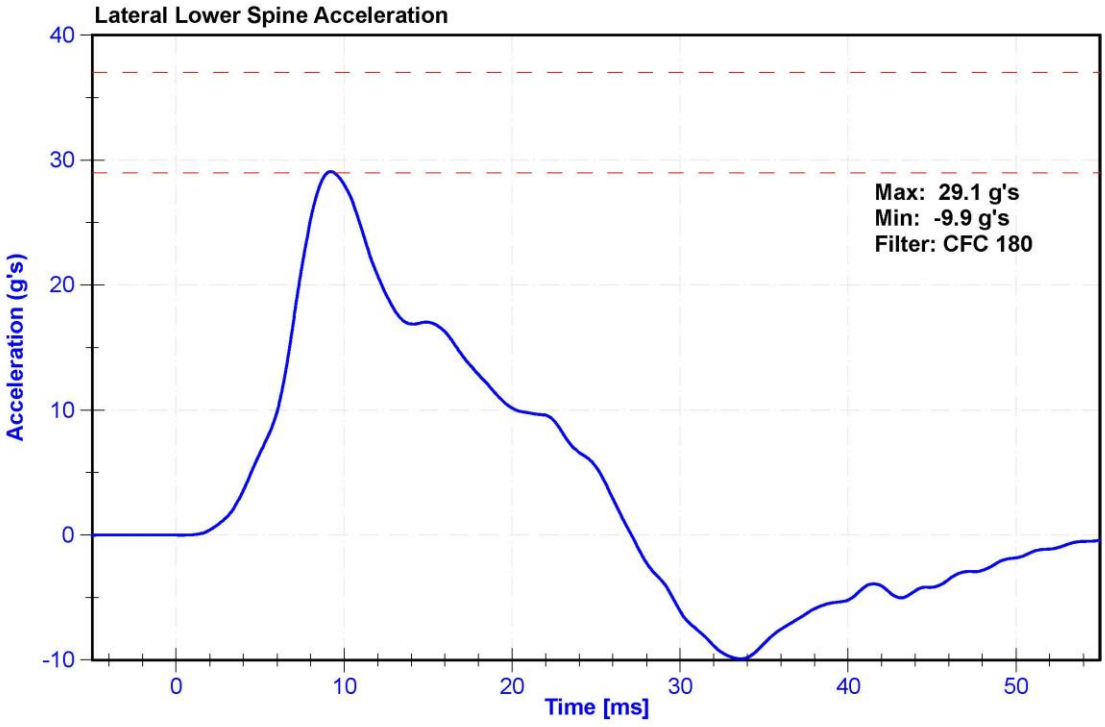

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 34.4 mm
Min: -1.1 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 27.4 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.0 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.0 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 34.7 g's
Min: -10.3 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 29.1 g's
Min: -9.9 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

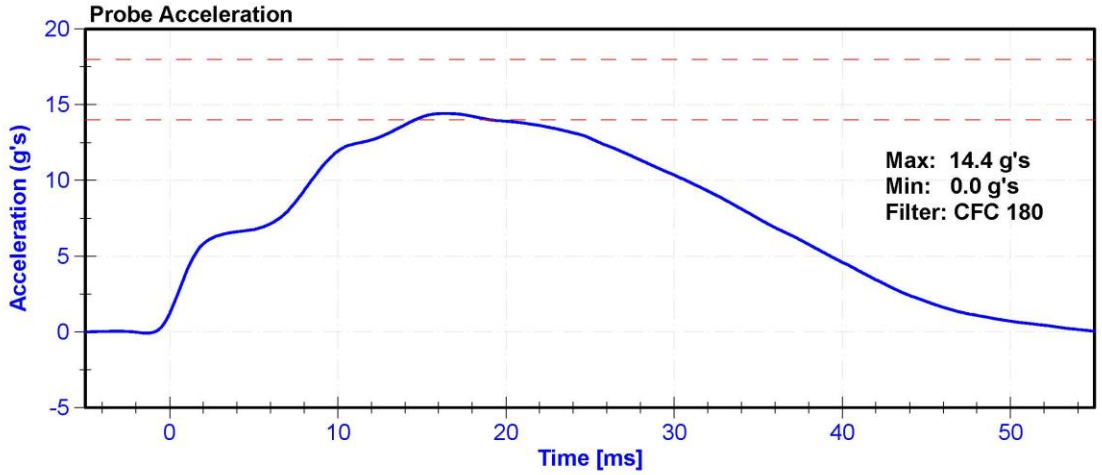
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

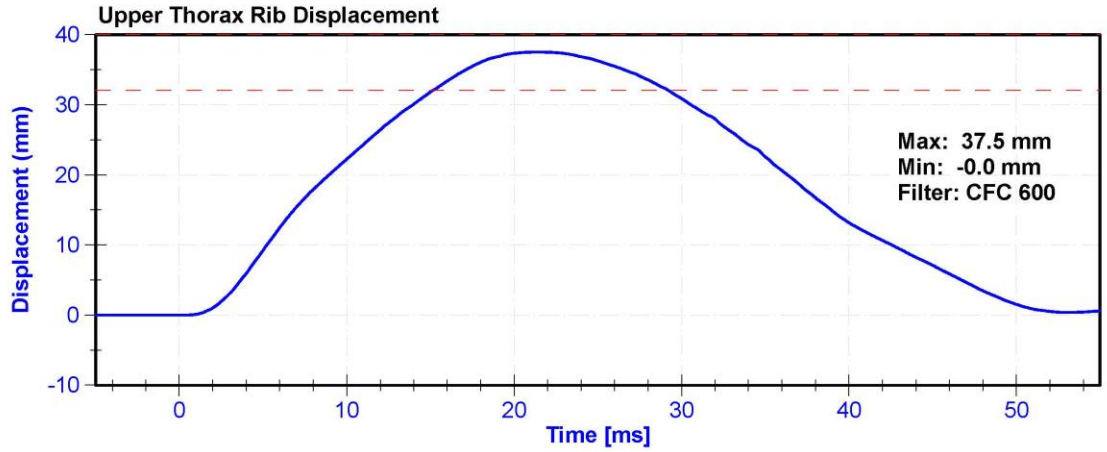
Results

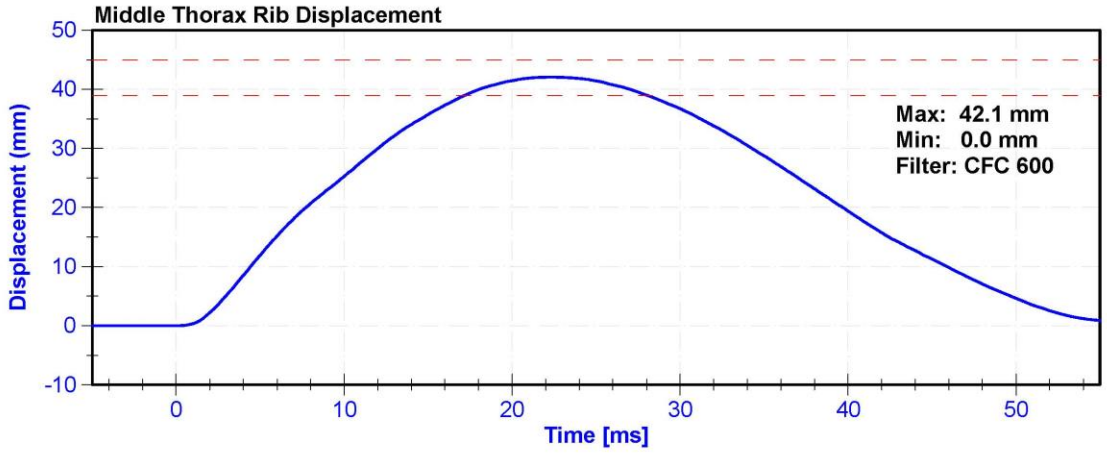
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.23	Pass
Probe Acceleration	14	18	g's	14.4	Pass
Lateral Upper Spine Acceleration	13	17	g's	13.3	Pass
Lateral Lower Spine Acceleration	7	11	g's	7.6	Pass
Upper Thorax Rib Deflection	32	40	mm	37.5	Pass
Middle Thorax Rib Deflection	39	45	mm	42.1	Pass
Lower Thorax Rib Deflection	35	43	mm	41.5	Pass

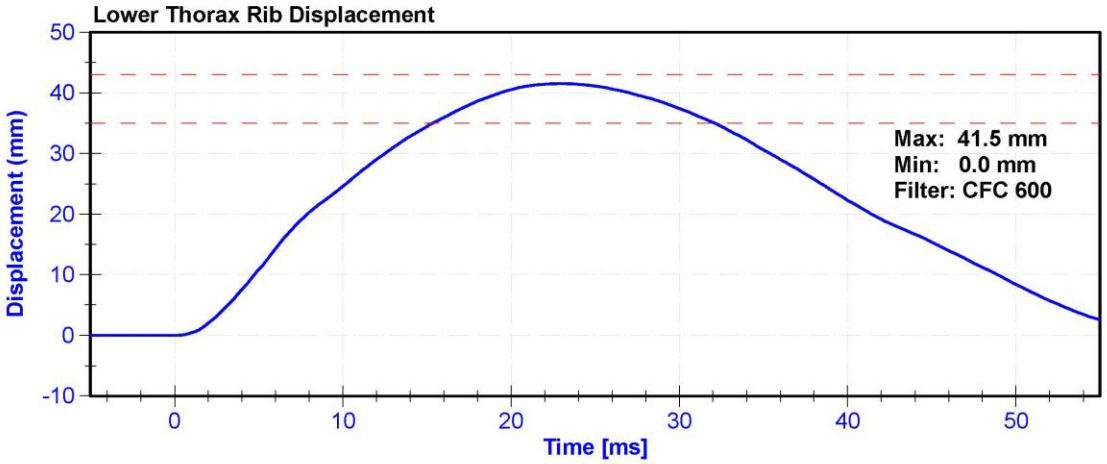
Transducer Calibrations

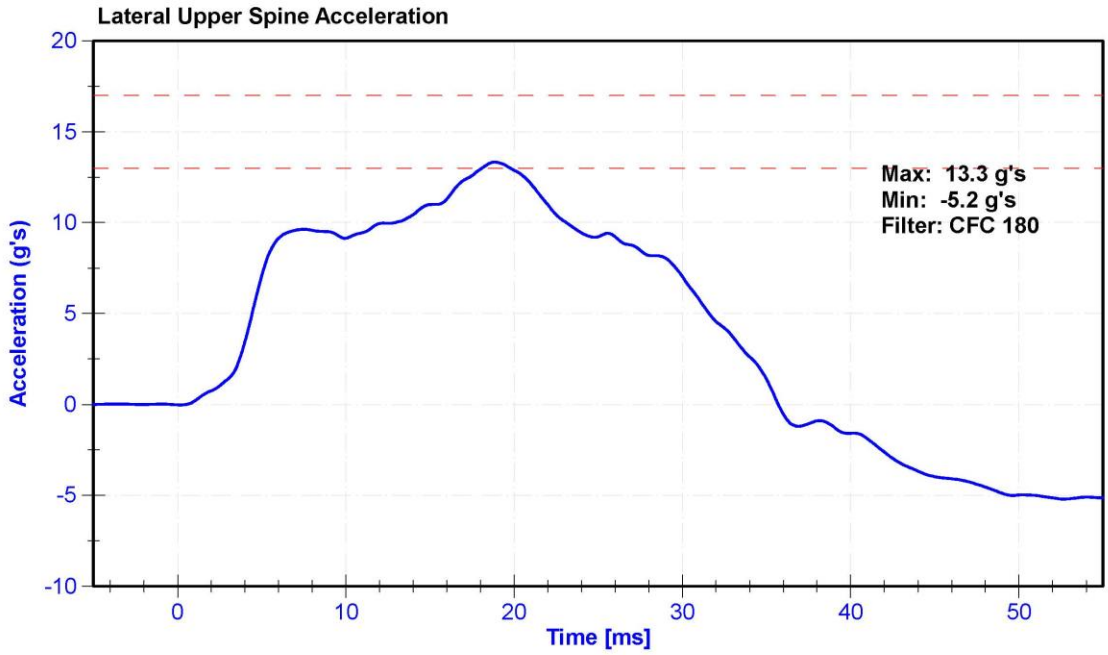
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/28/2019	4/27/2020
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51327	9/30/2019	3/31/2020
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	10/28/2019	4/27/2020
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	10/28/2019	4/27/2020
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	10/28/2019	4/27/2020

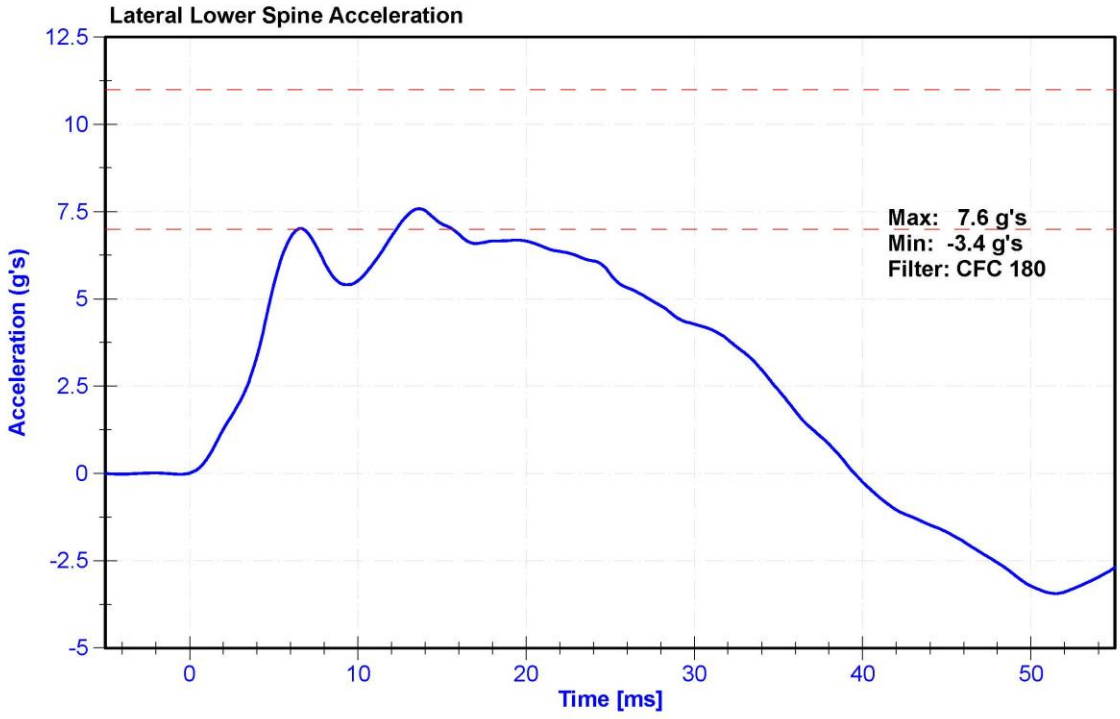



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.5 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.1 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.5 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 13.3 g's
Min: -5.2 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
20
15
10
5
0
-5
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 7.6 g's
Min: -3.4 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50

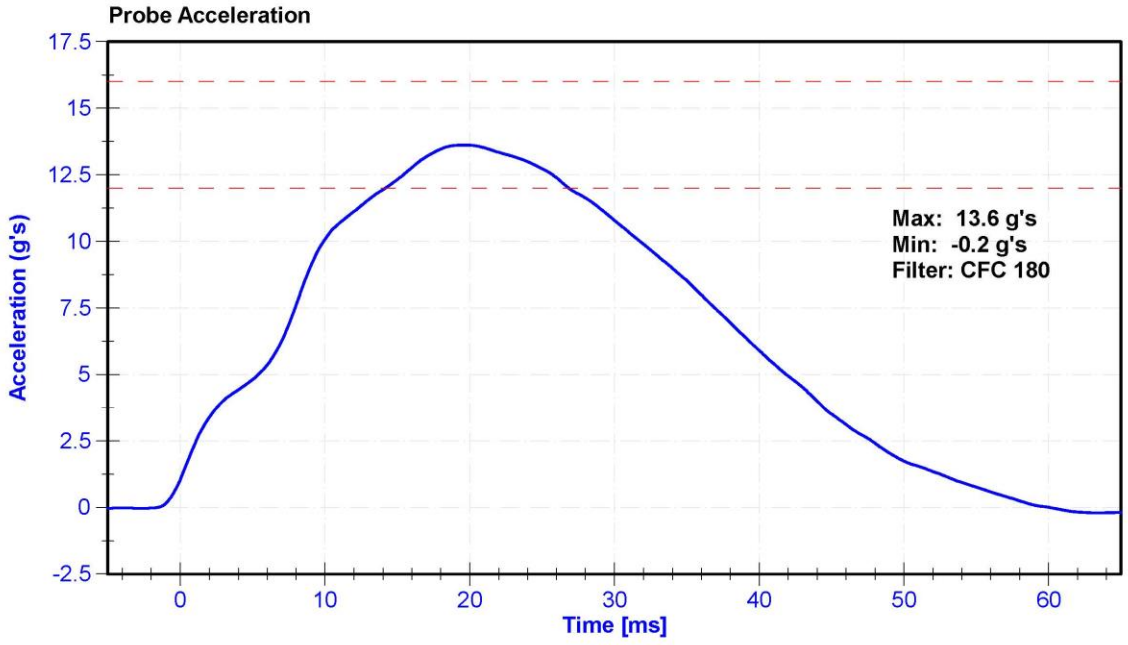
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

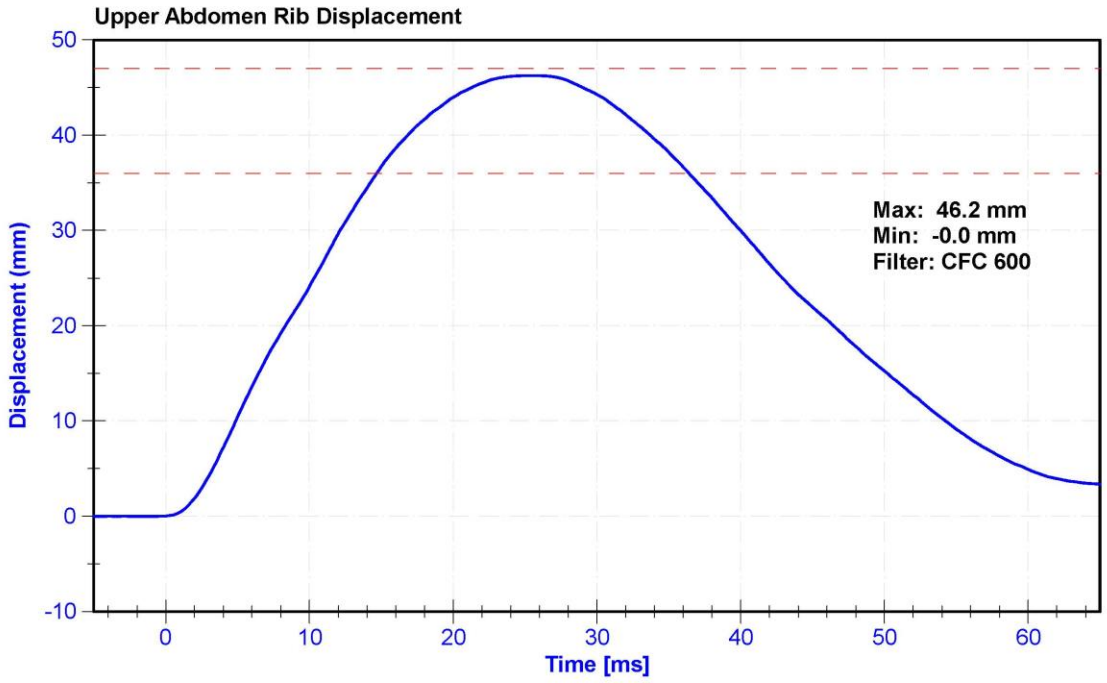
Results

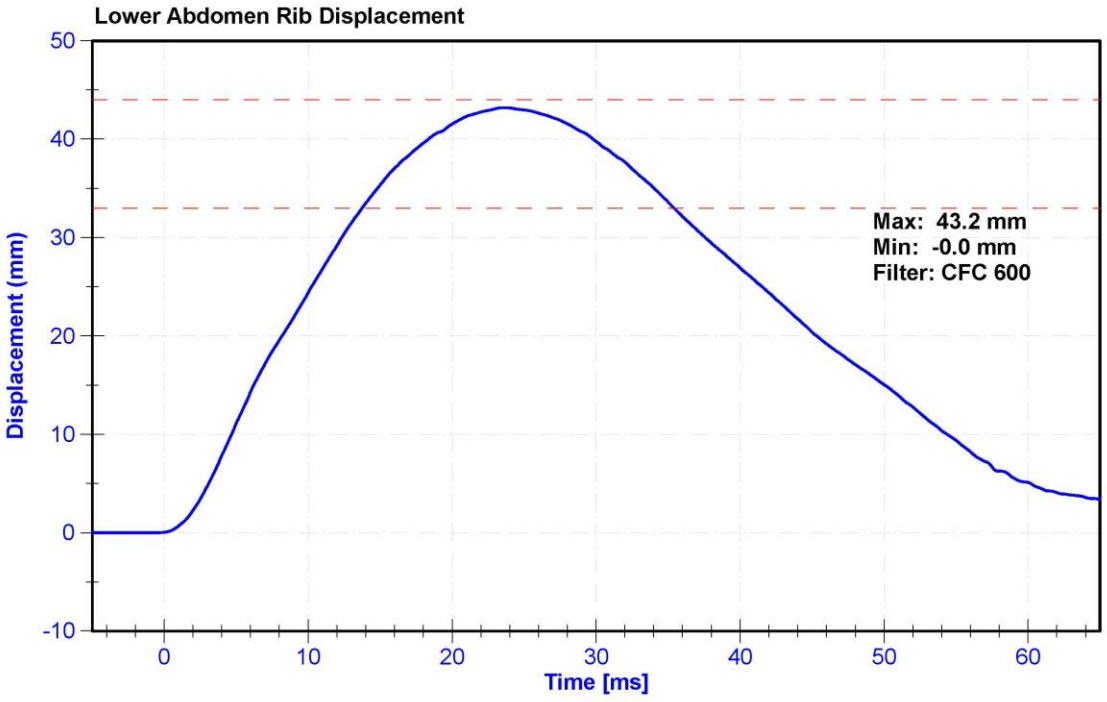
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.0	Pass
Humidity	10	70	%	30.0	Pass
Velocity	4.2	4.4	m/s	4.22	Pass
Probe Acceleration	12	16	g's	13.6	Pass
Lateral Lower Spine Acceleration	9	14	g's	9.2	Pass
Upper Abdomen Rib Deflection	36	47	mm	46.2	Pass
Lower Abdomen Rib Deflection	33	44	mm	43.2	Pass

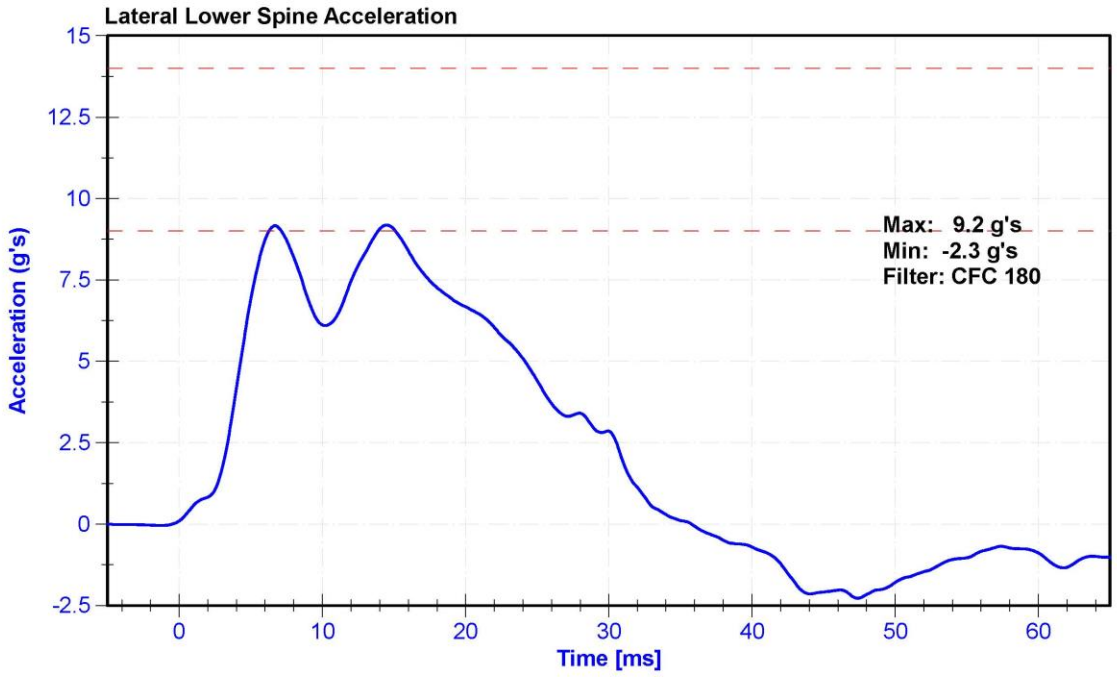
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51327	9/30/2019	3/31/2020
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	10/28/2019	4/27/2020
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	10/28/2019	4/27/2020




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 46.2 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.2 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
0
10
20
30
40
50
60
Time [ms]
Max: 9.2 g's
Min: -2.3 g's
Filter: CFC 180

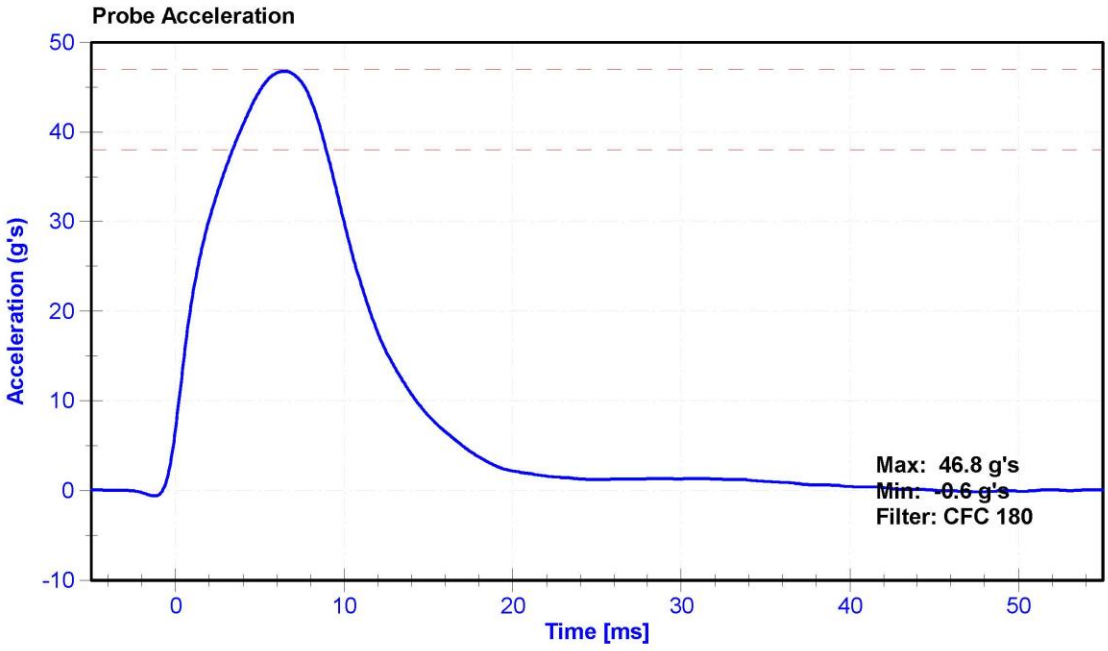
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

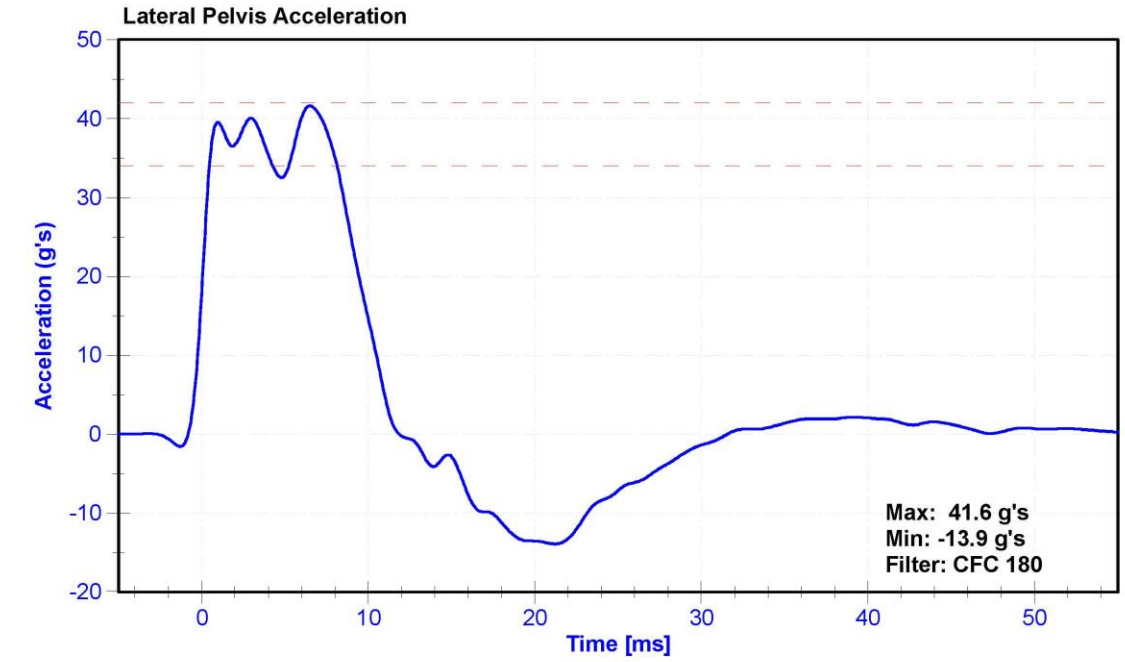
Results

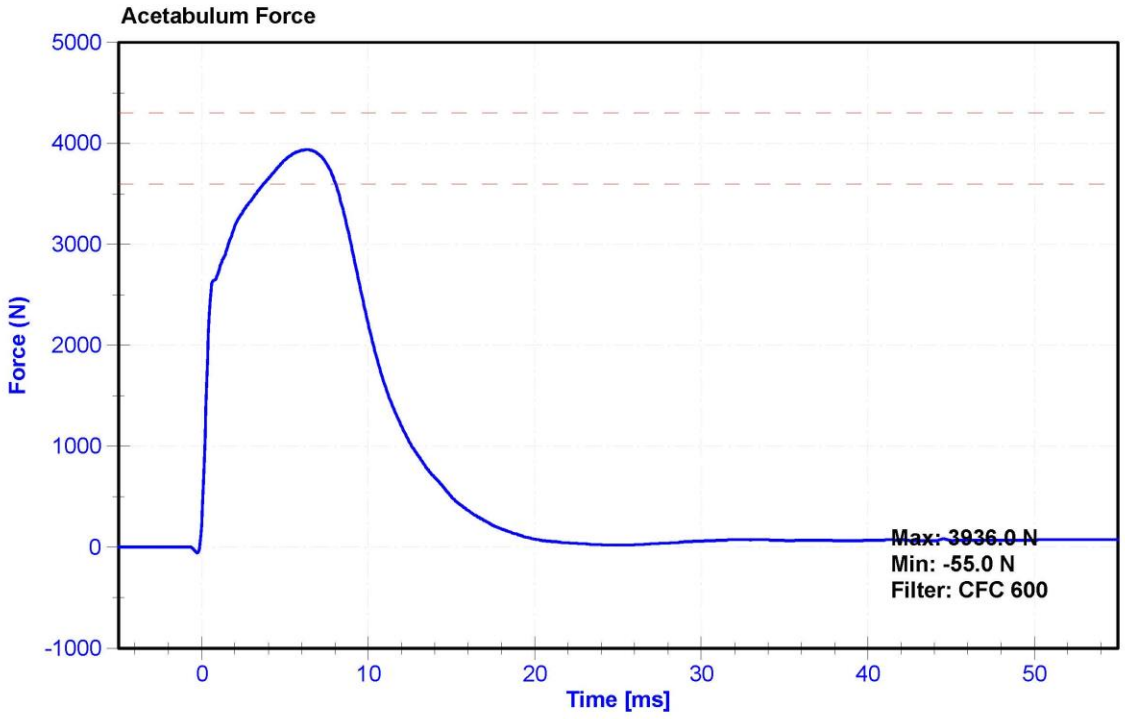
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.9	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.63	Pass
Probe Acceleration	38	47	g's	46.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.6	Pass
Acetabulum Force	3600	4300	N	3936.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	10/28/2019	4/27/2020
Acetabulum Load Cell	Denton 3249J	LC-4986Fy	6/14/2019	6/13/2020
Certification Plug	SACO	13603	9/25/2019	N/A
Crash Test Plug	SACO	13446	9/20/2019	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 41.6 g's
Min: -13.9 g's
Filter: CFC 180


Acetabulum Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 3936.0 N
Min: -55.0 N
Filter: CFC 600

8012
Crash Plug 3/26/20

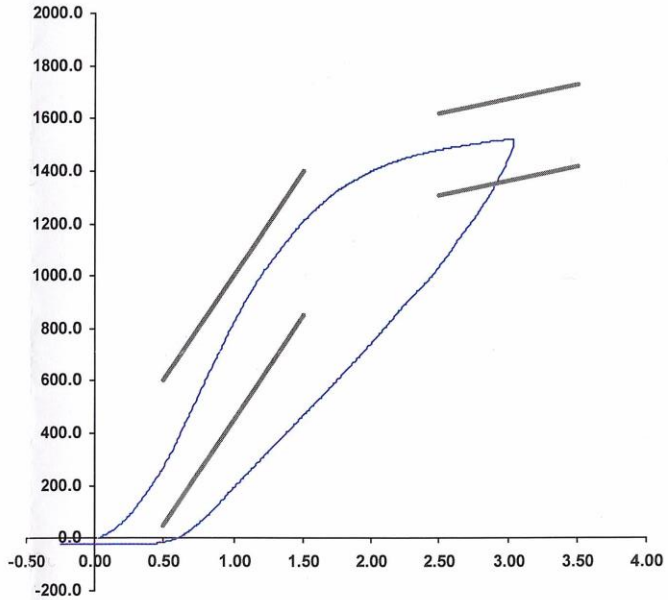
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13446
Test Number 11089
Report Number 11127
Test Date 9/20/2019 8:46:48 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	277.93	50.00	600.00
Force @ 1.5 mm (N)	1,211.85	850.00	1,400.00
Force @ 2.5 mm (N)	1,481.40	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,521.56	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS 1000

Crosshead Speed (mm / min) or Rat 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Operator

Part Number 180-4450

Template No 107 20-Sep-19
SACO Research

By : DC Date : 9/20/2019

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

SACO RESEARCH

DG8012
Cert 2 3/25/20

SID-IIs Pelvis Plug Certification Test

Plug S/N 13603
Test Number 11247
Report Number 11285
Test Date 9/25/2019 1:00:11 PM

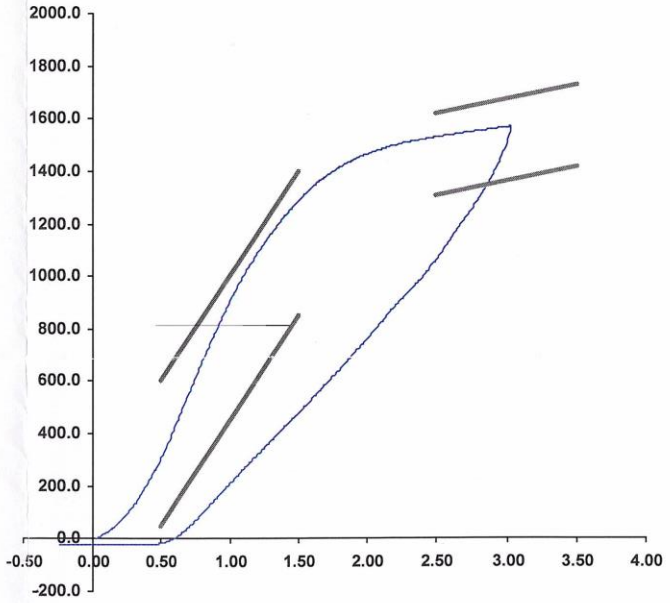
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	314.81	50.00	600.00
Force @ 1.5 mm (N)	1,293.86	850.00	1,400.00
Force @ 2.5 mm (N)	1,531.55	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,568.67	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS 1000

Crosshead Speed (mm / min) or Rat 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 25-Sep-19
SACO Research

By : DC. Date : 9/25/2019

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

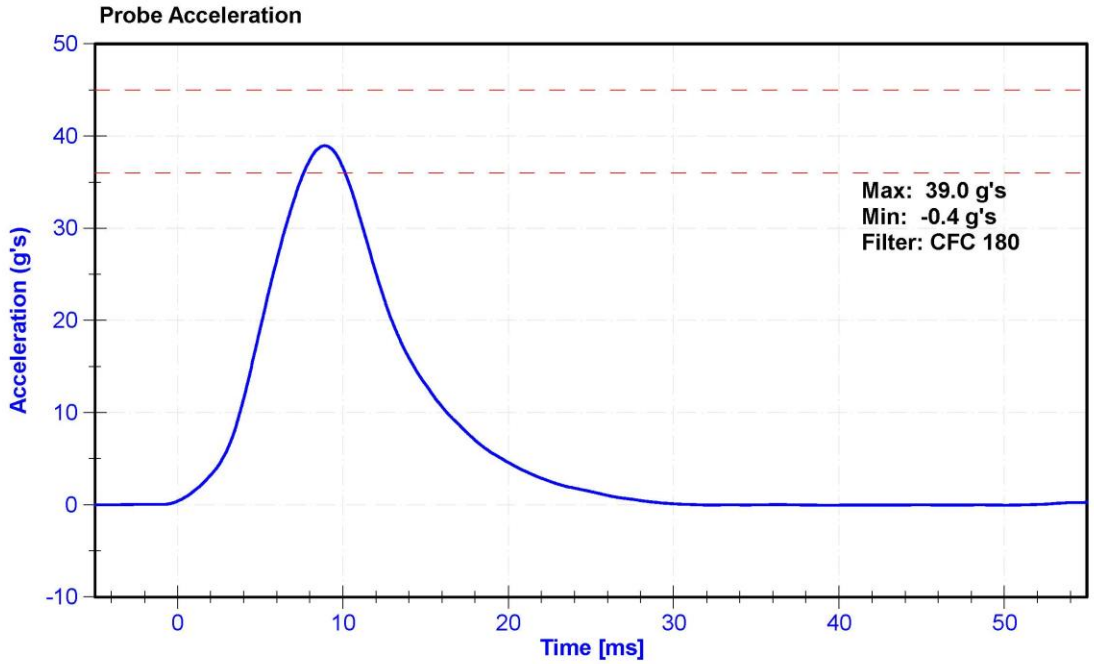
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

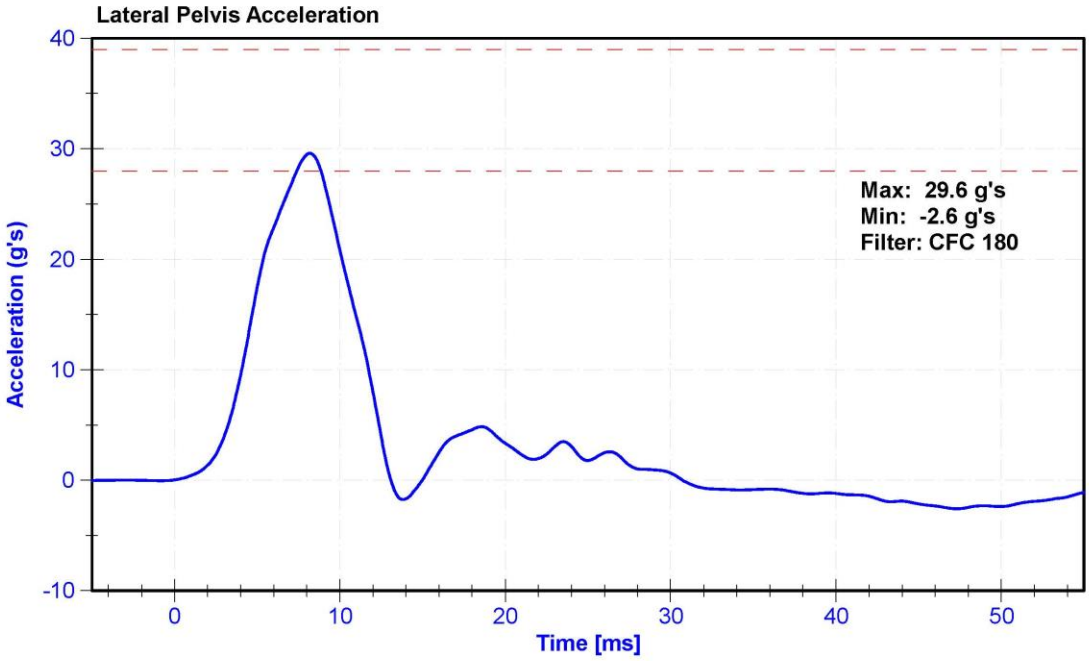
Results

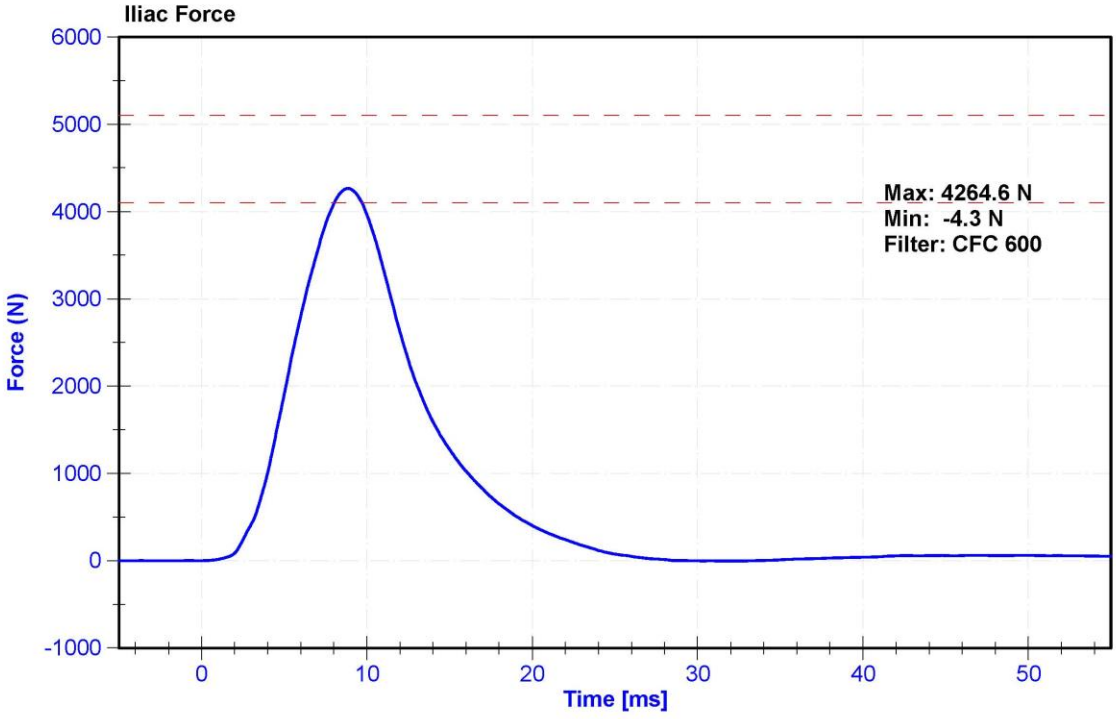
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	32.0	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	39.0	Pass
Lateral Pelvis Acceleration	28	39	g's	29.6	Pass
Iliac Force	4100	5100	N	4264.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	10/28/2019	4/27/2020
Iliac Load Cell	DENTON 3228J	LC-290Fy	9/25/2019	9/24/2020




Lateral Pelvis Acceleration
Max: 29.6 g's
Min: -2.6 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50


Iliac Force
Max: 4264.6 N
Min: -4.3 N
Filter: CFC 600
Force (N)
Time [ms]
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50

CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

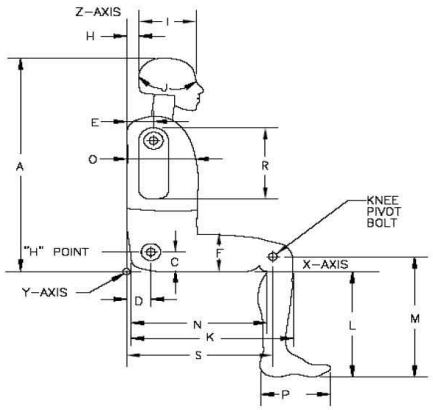
SERIAL NO: DG8012

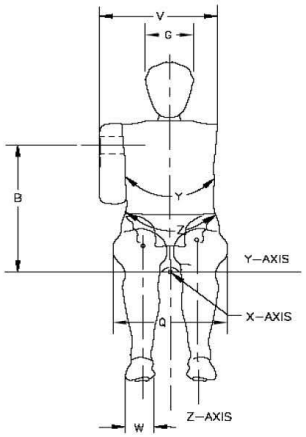
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Dutton Date: 04/06/2020

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	779	Pass
B	Shoulder Pivot Height	437	453	446	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	126	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	533	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	404	Pass
N	Buttock Popliteal Length	416	442	433	Pass
O	Chest Depth w/o jacket	195	211	205	Pass
P	Foot Length	216	232	222	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	486	Pass
V	Shoulder Width	341	357	345	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	867	Pass
Z	Waist Circumference	761	791	781	Pass

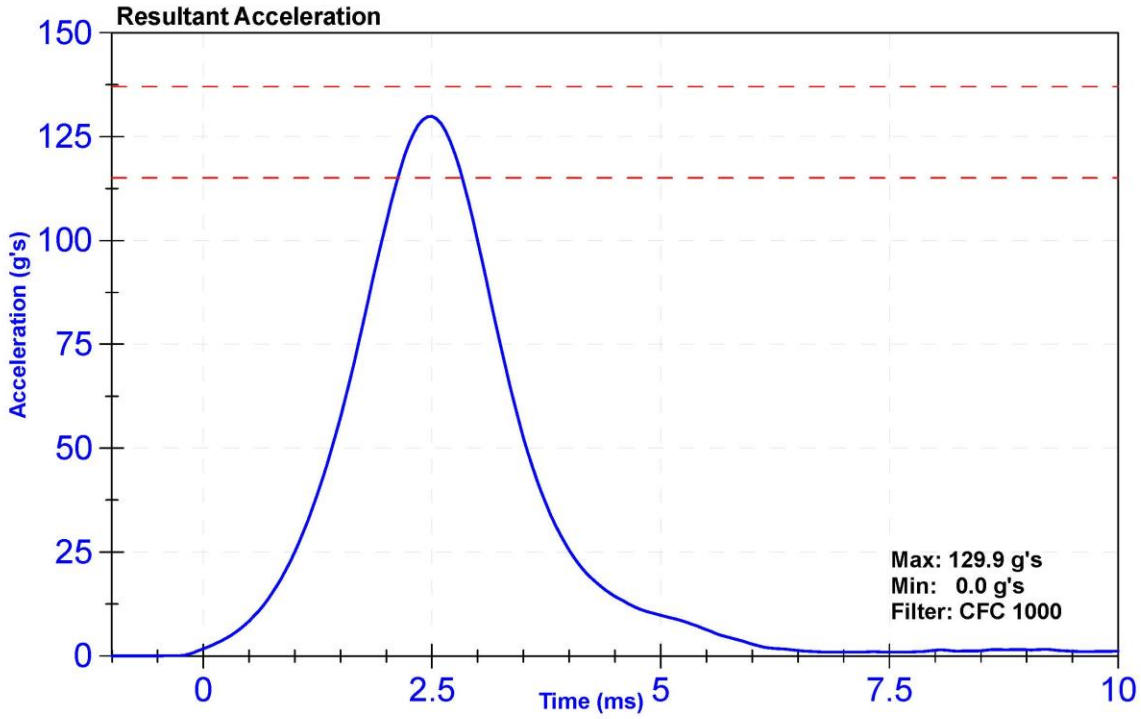
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

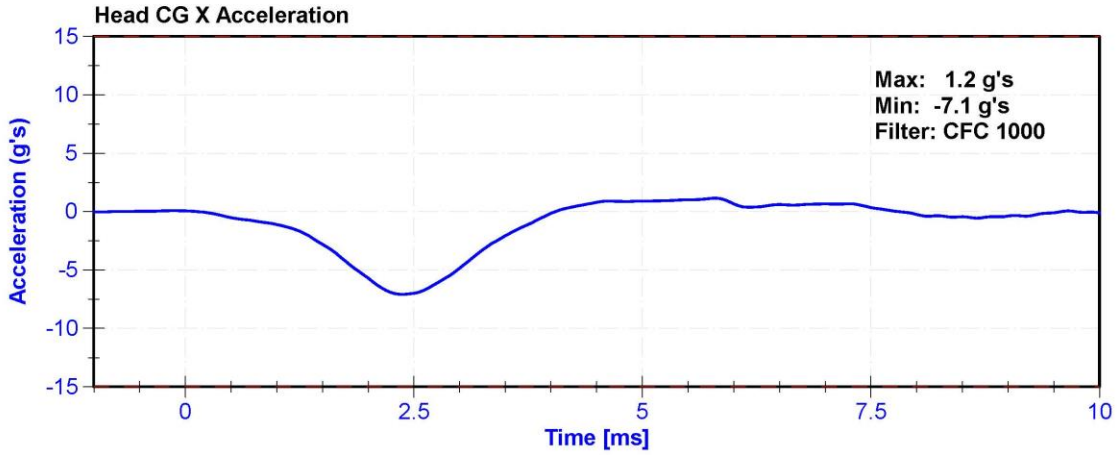
Results

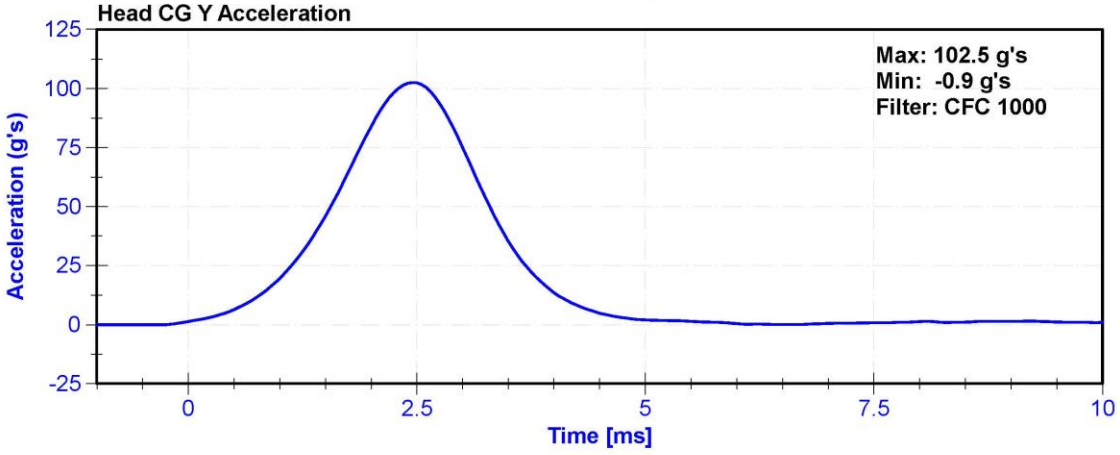
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	33.8	Pass
Resultant Acceleration	115	137	g's	129.9	Pass
Oscillation	0	15	%	1.2	Pass
Fore-Aft Acceleration	-15	15	g's	-7.1	Pass

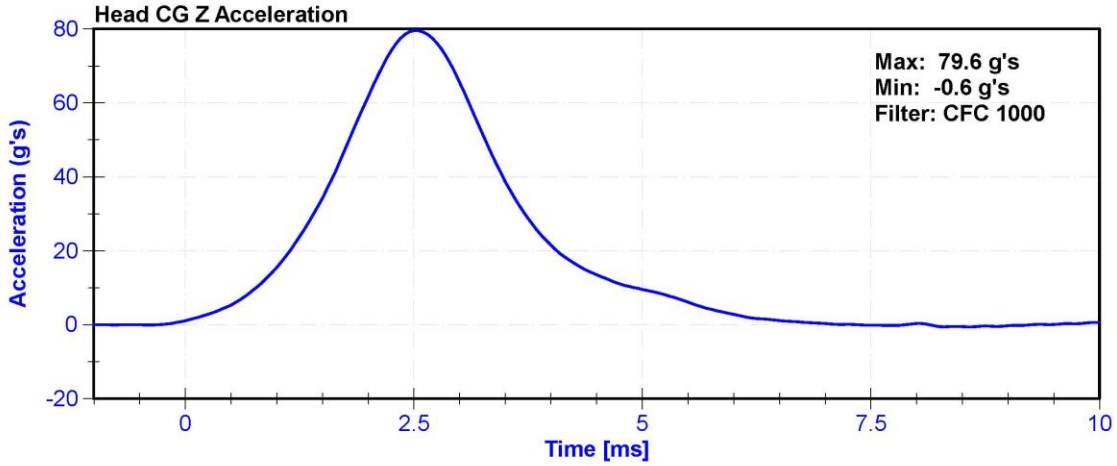
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P74788	10/28/2019	4/27/2020
Y Accelerometer	ENDEVCO 7264CT	AC-P83432	10/28/2019	4/27/2020
Z Accelerometer	ENDEVCO 7264	AC-P83319	10/28/2019	4/27/2020




Head CG X Acceleration
Max: 1.2 g's
Min: -7.1 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 102.5 g's
Min: -0.9 g's
Filter: CFC 1000
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 79.6 g's
Min: -0.6 g's
Filter: CFC 1000
Acceleration (g's)
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]

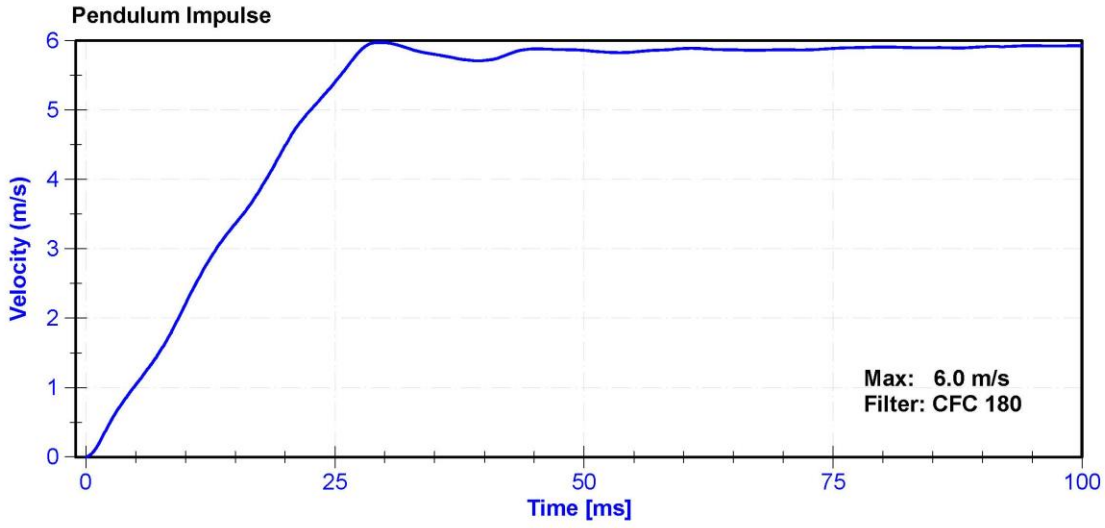
ATD Manufacturer	FTSS	Test Technician	E. Helenbrook
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

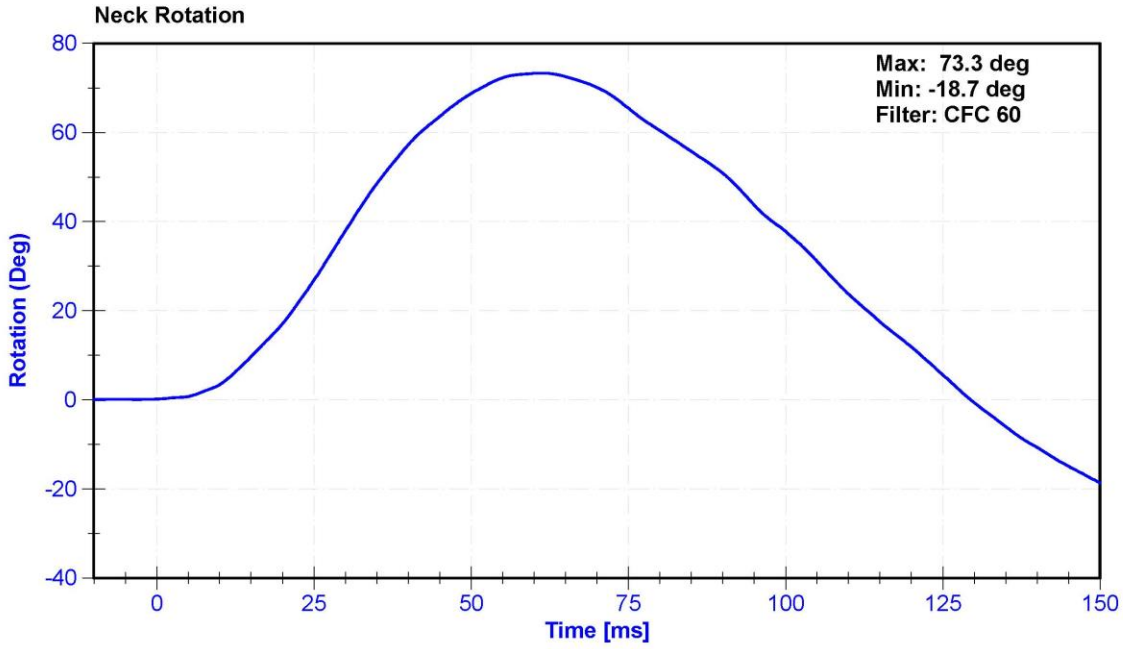
Results

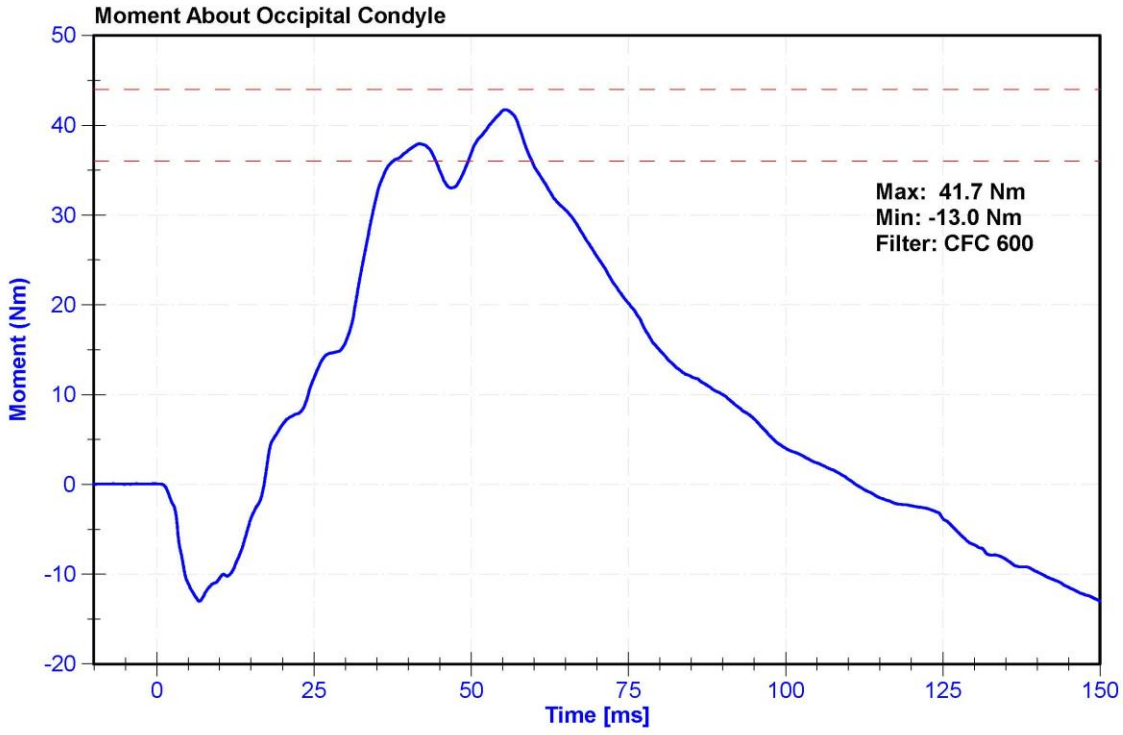
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	32.1	Pass
Velocity	5.51	5.63	m/s	5.584	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.21	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.36	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.48	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.40	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.97	Pass
Neck Rotation	71	81	deg	73.3	Pass
Time at Maximum Rotation	50	70	ms	61.3	Pass
Moment about the OC	36	44	Nm	41.7	Pass
Moment Decay to 0 Nm	102	126	ms	111.2	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	Denton 78051-342	DS-184Pend	11/4/2019	11/3/2020
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/4/2019	11/3/2020
Upper Neck Load Cell	Denton 1716A	LC-2192Fy	6/20/2019	6/19/2020




Neck Rotation
Max: 73.3 deg
Min: -18.7 deg
Filter: CFC 60
Rotation (Deg)
80
60
40
20
0
-20
-40
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 41.7 Nm
Min: -13.0 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

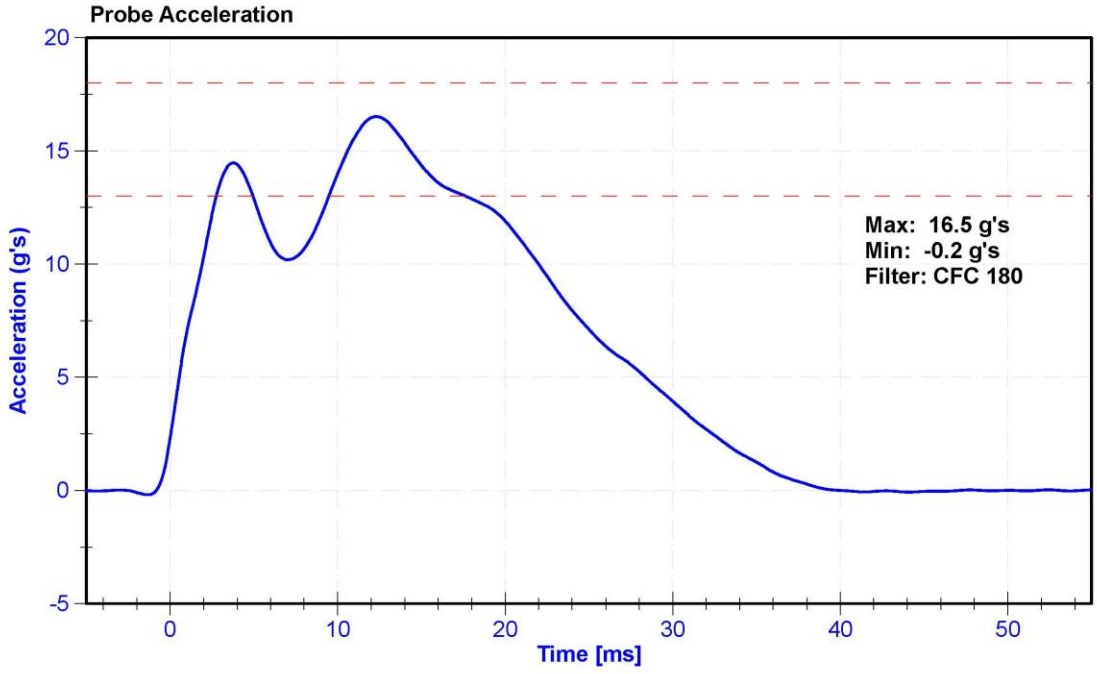
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

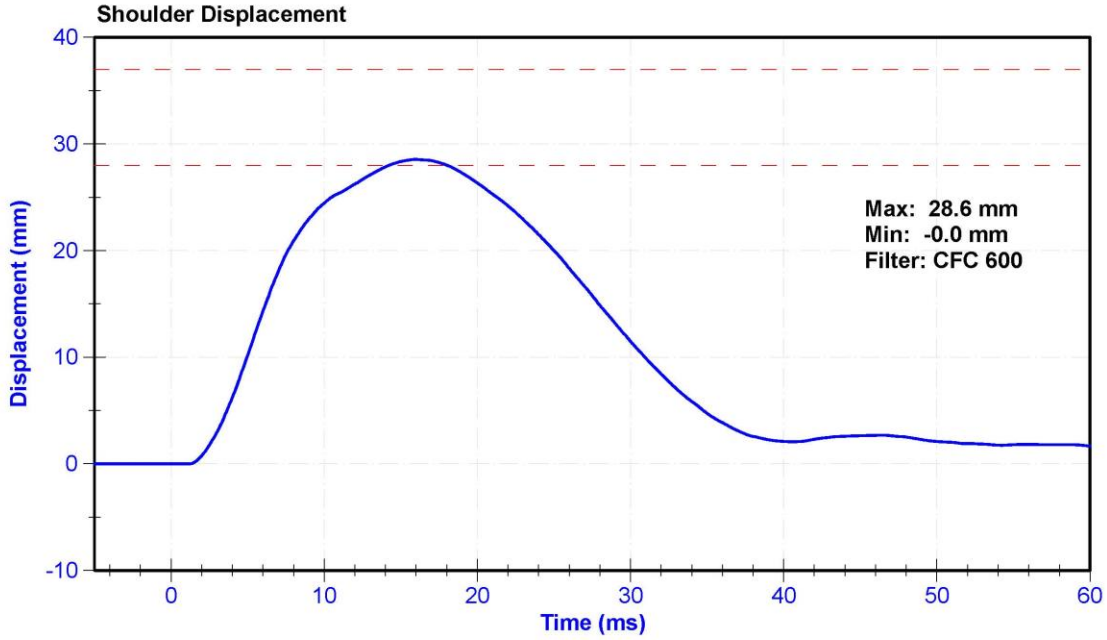
Results

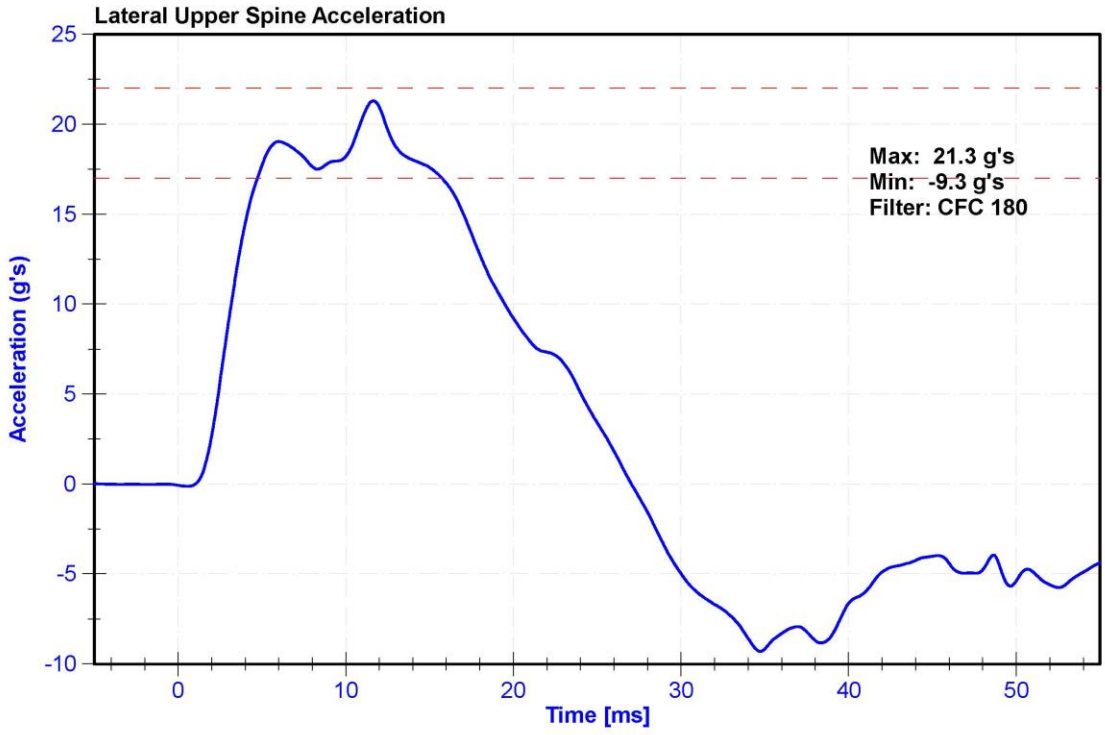
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	37.7	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	13	18	g's	16.5	Pass
Shoulder Deflection	28	37	mm	28.6	Pass
Lateral Upper Spine Acceleration	17	22	g's	21.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	10/28/2019	4/27/2020
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/28/2019	4/27/2020




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 28.6 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 21.3 g's
Min: -9.3 g's
Filter: CFC 180

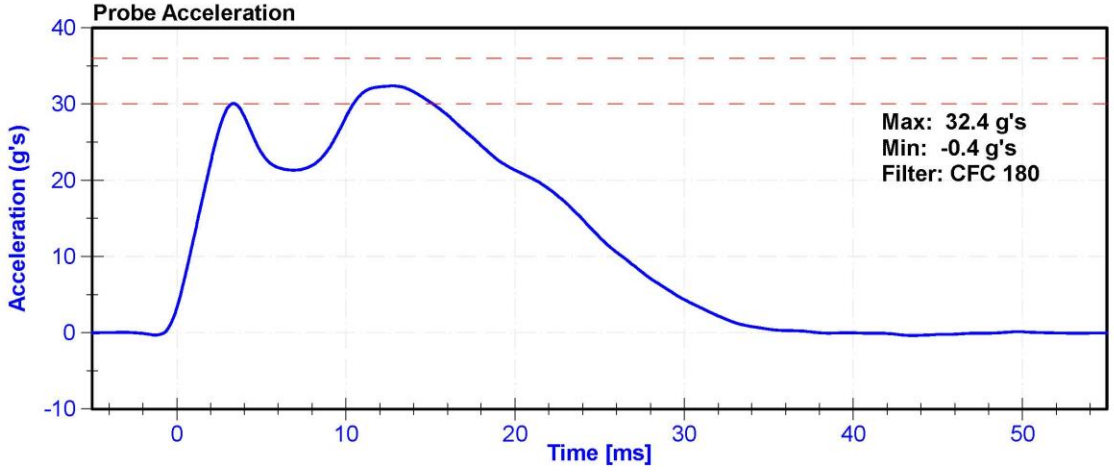
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

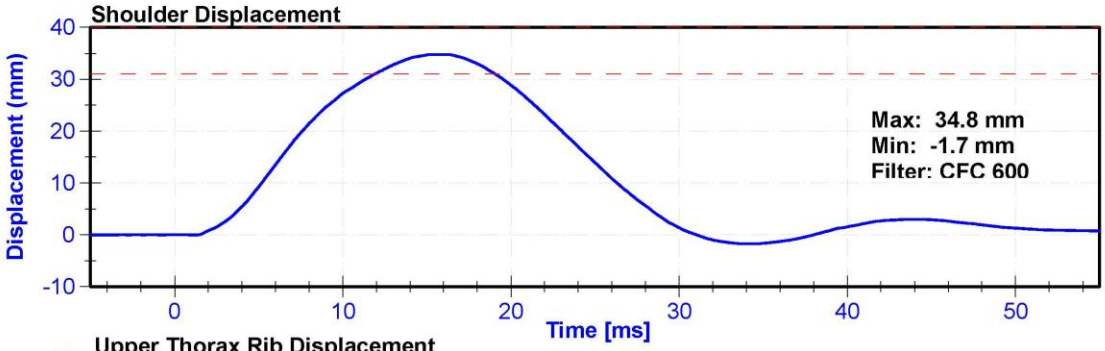
Results

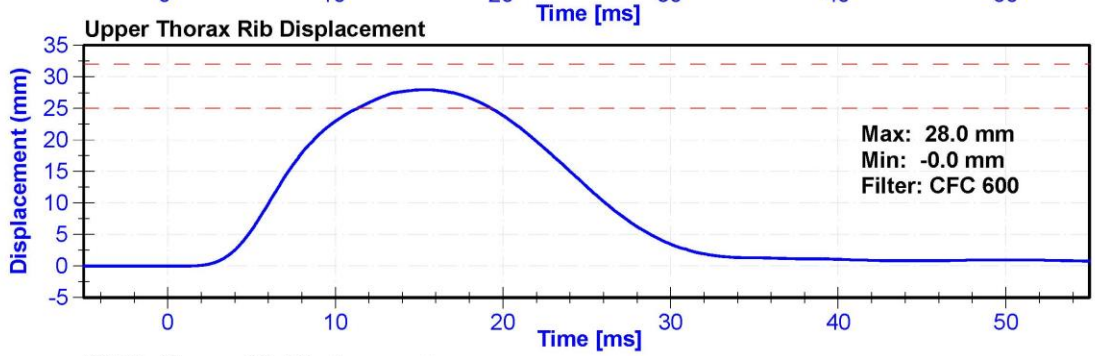
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	37.2	Pass
Velocity	6.6	6.8	m/s	6.79	Pass
Probe Acceleration after 5 ms	30	36	g's	32.4	Pass
Lateral Upper Spine Acceleration	34	43	g's	36.1	Pass
Lateral Lower Spine Acceleration	29	37	g's	29.3	Pass
Shoulder Deflection	31	40	mm	34.8	Pass
Upper Thorax Rib Deflection	25	32	mm	28.0	Pass
Mid Thorax Rib Deflection	30	36	mm	32.3	Pass
Lower Thorax Rib Deflection	32	38	mm	36.3	Pass

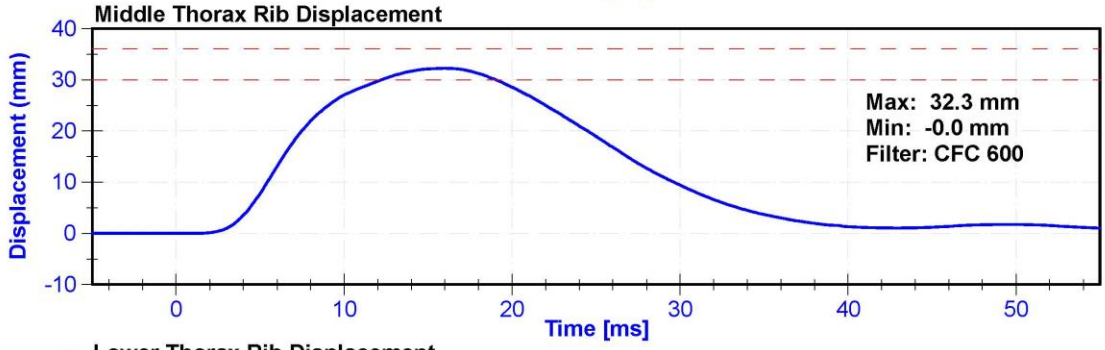
Transducer Calibrations

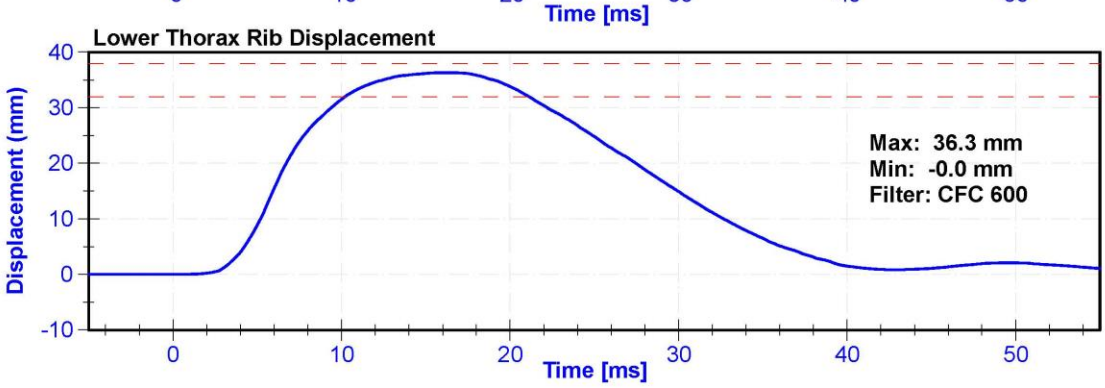
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/28/2019	4/27/2020
Upper Spine T12 Y Accelerometer	ENDEVCO 7264CT	AC-P51327	3/30/2020	9/28/2020
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	10/28/2019	4/27/2020
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	10/28/2019	4/27/2020
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	10/28/2019	4/27/2020
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	10/28/2019	4/27/2020




Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 34.8 mm
Min: -1.7 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 28.0 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.3 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 36.3 mm
Min: -0.0 mm
Filter: CFC 600

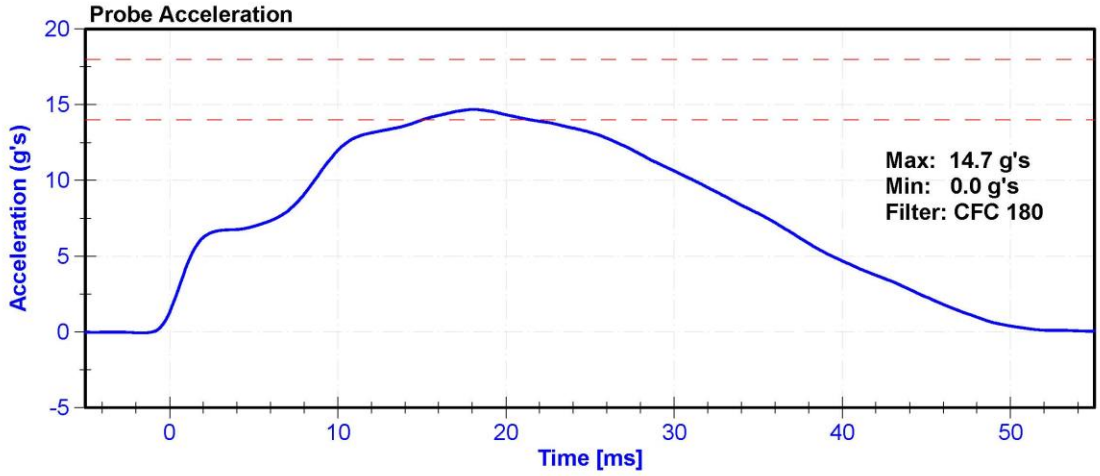
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

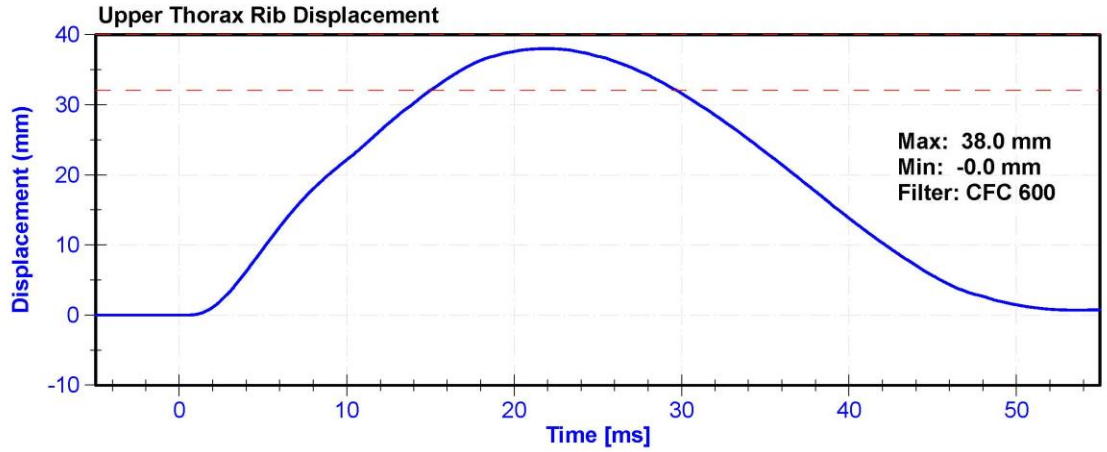
Results

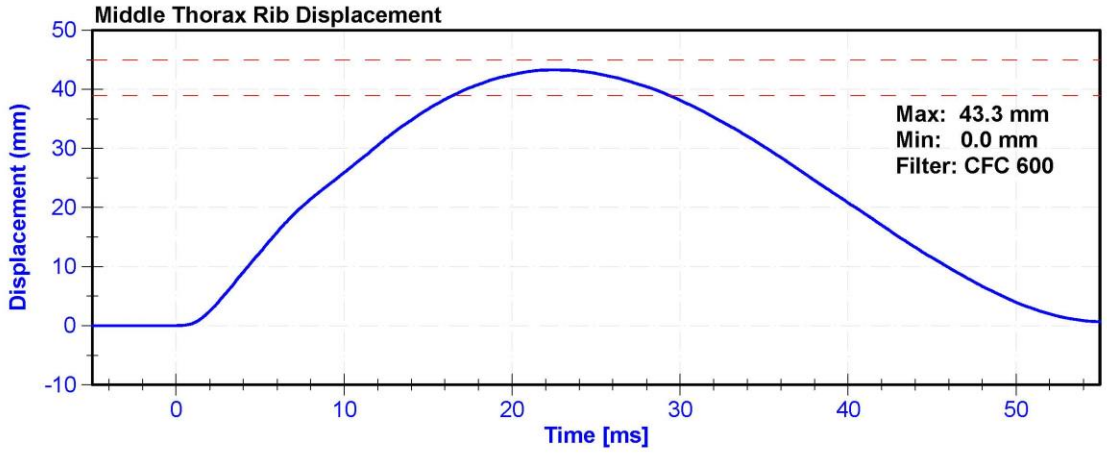
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	36.1	Pass
Velocity	4.2	4.4	m/s	4.22	Pass
Probe Acceleration	14	18	g's	14.7	Pass
Lateral Upper Spine Acceleration	13	17	g's	13.2	Pass
Lateral Lower Spine Acceleration	7	11	g's	7.5	Pass
Upper Thorax Rib Deflection	32	40	mm	38.0	Pass
Middle Thorax Rib Deflection	39	45	mm	43.3	Pass
Lower Thorax Rib Deflection	35	43	mm	42.8	Pass

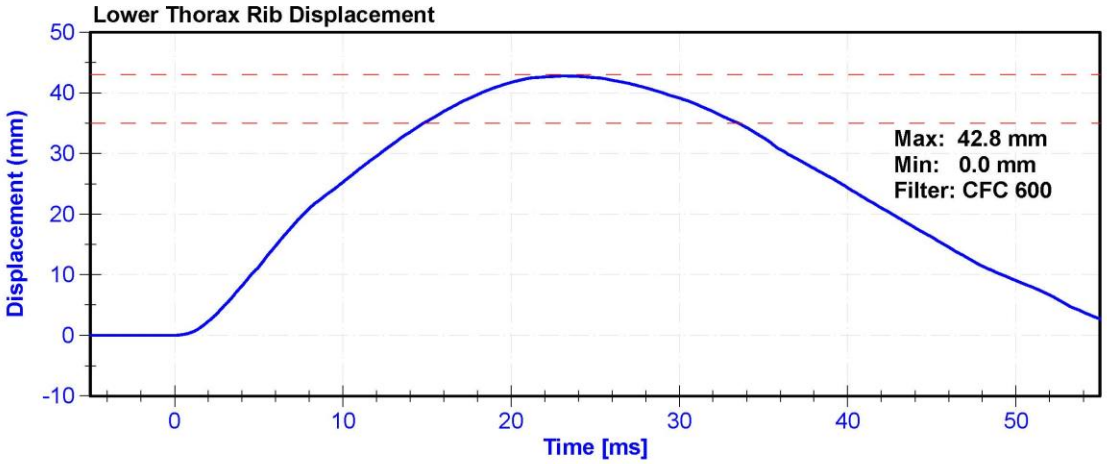
Transducer Calibrations

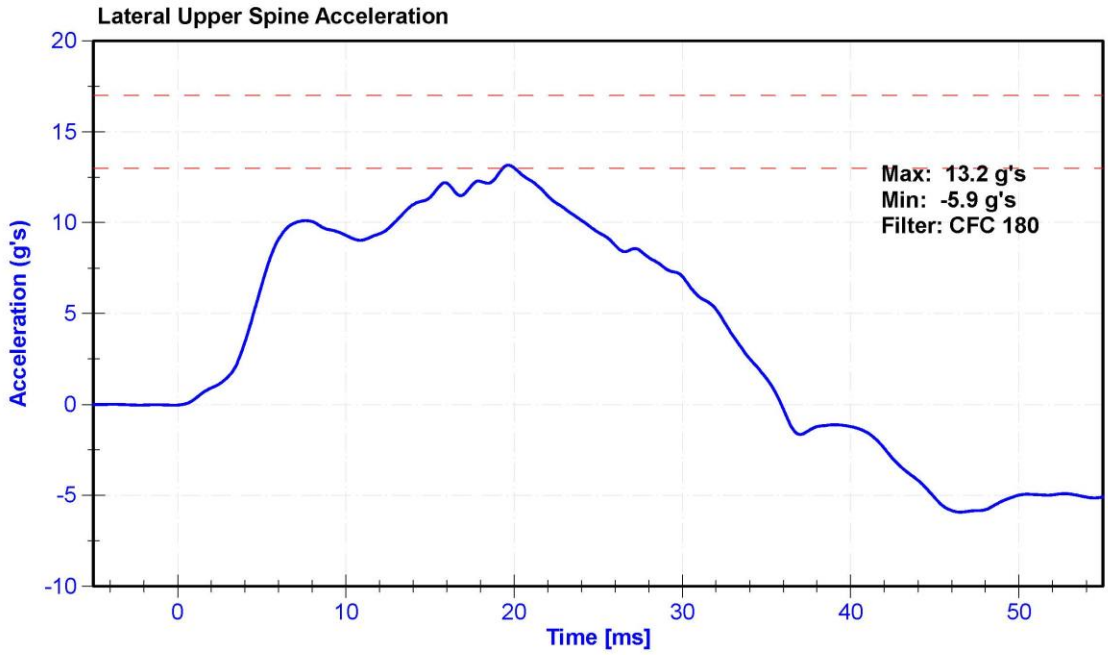
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/28/2019	4/27/2020
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51327	3/30/2020	9/28/2020
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	10/28/2019	4/27/2020
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	10/28/2019	4/27/2020
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	10/28/2019	4/27/2020

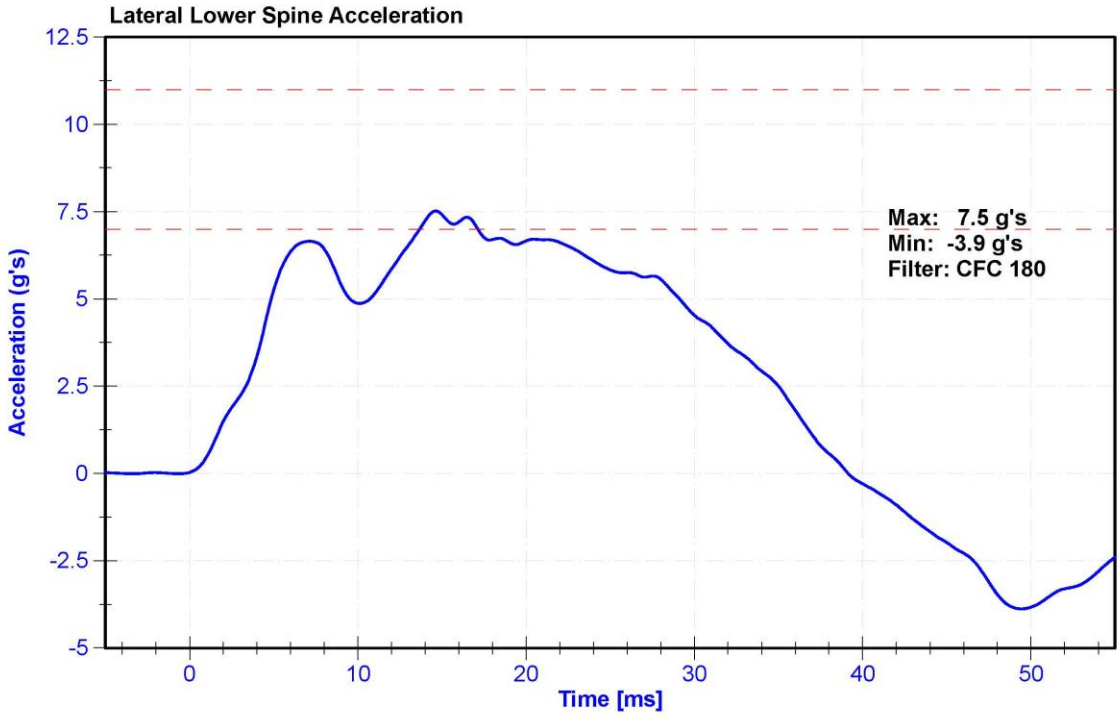



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.0 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.3 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.8 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 13.2 g's
Min: -5.9 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
20
15
10
5
0
-5
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 7.5 g's
Min: -3.9 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50

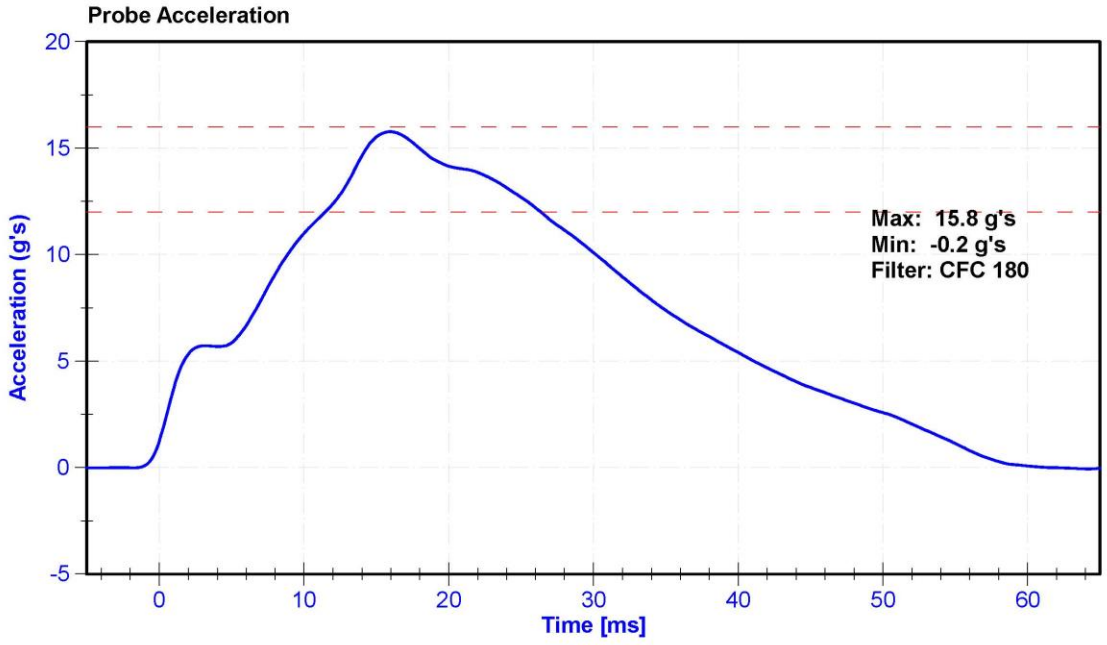
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

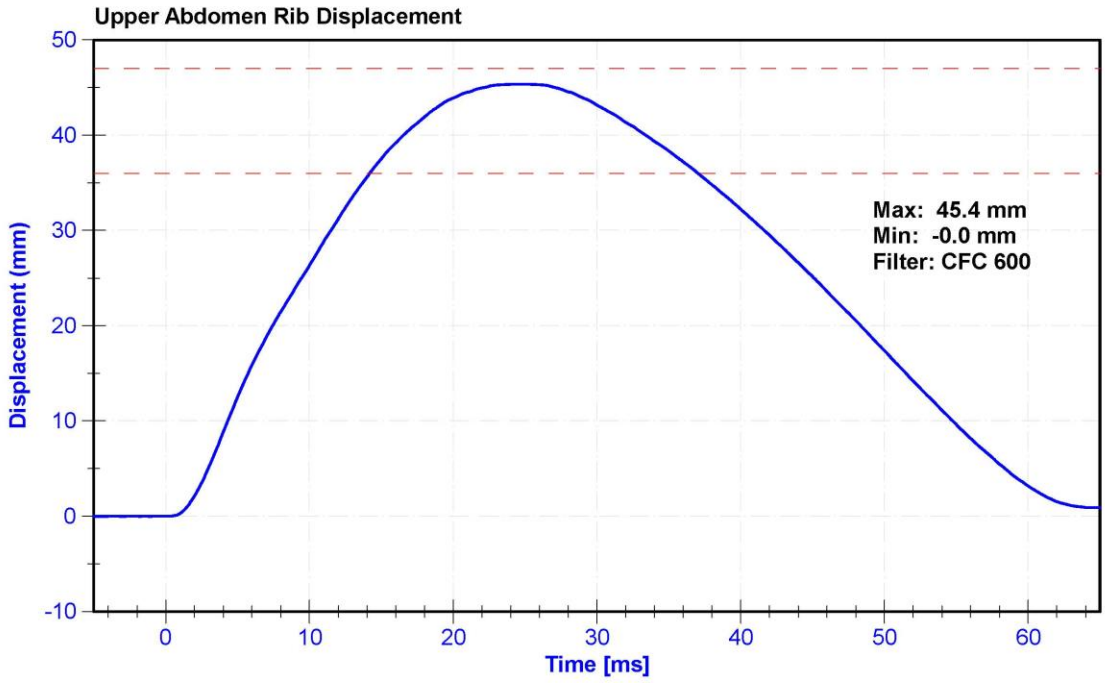
Results

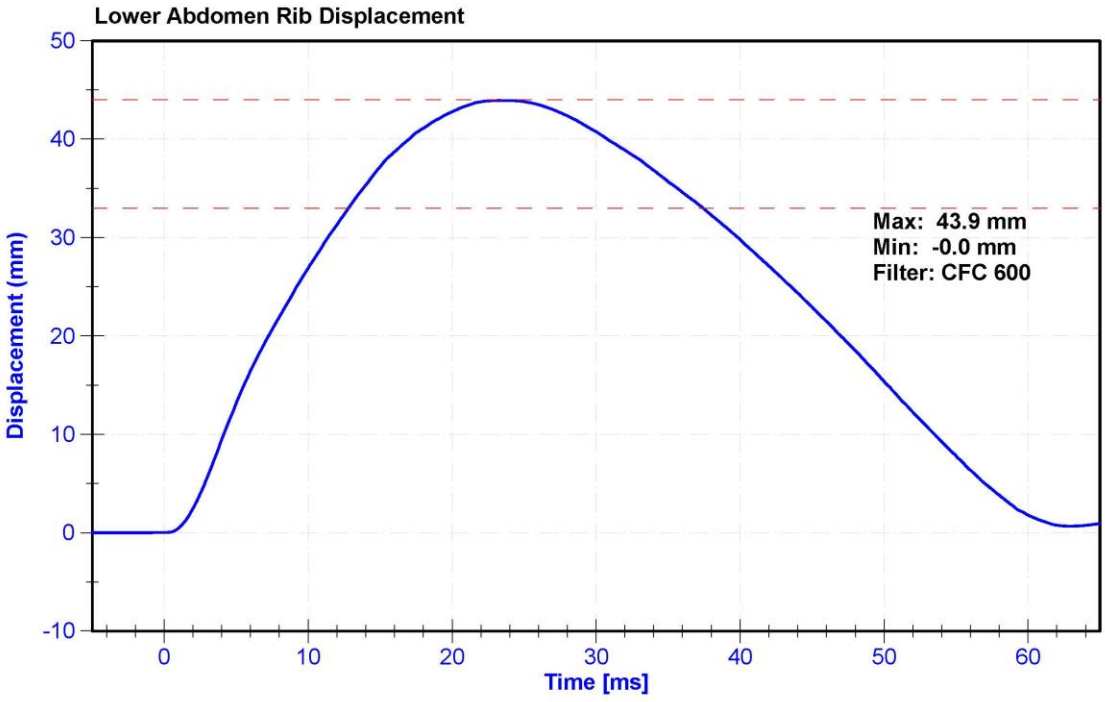
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	35.6	Pass
Velocity	4.2	4.4	m/s	4.22	Pass
Probe Acceleration	12	16	g's	15.8	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.7	Pass
Upper Abdomen Rib Deflection	36	47	mm	45.4	Pass
Lower Abdomen Rib Deflection	33	44	mm	43.9	Pass

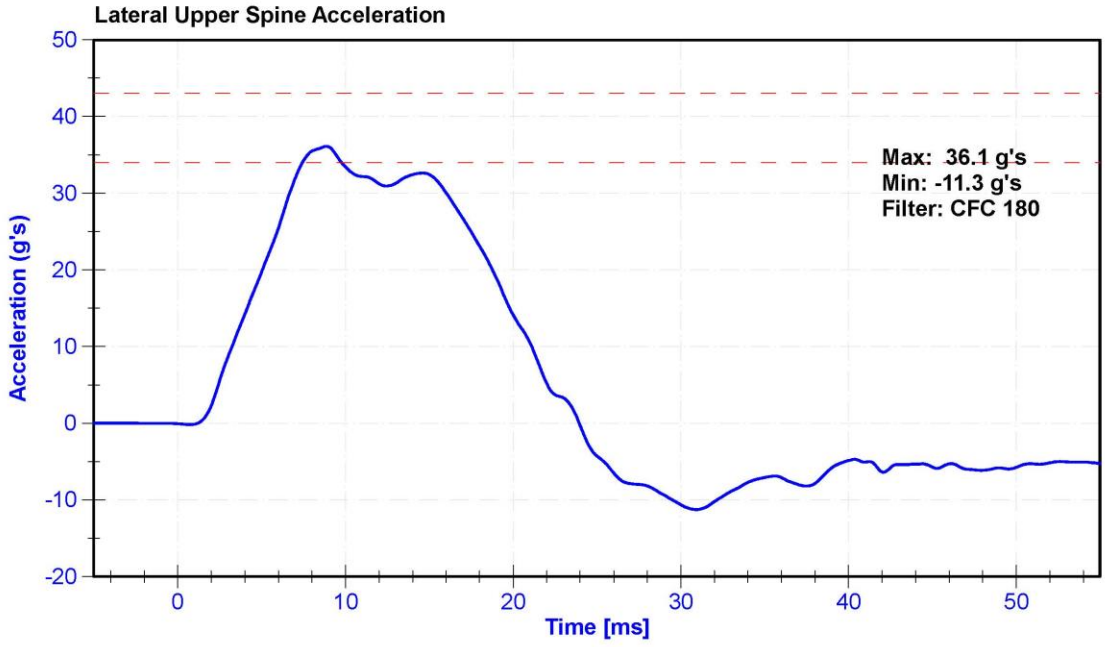
Transducer Calibrations

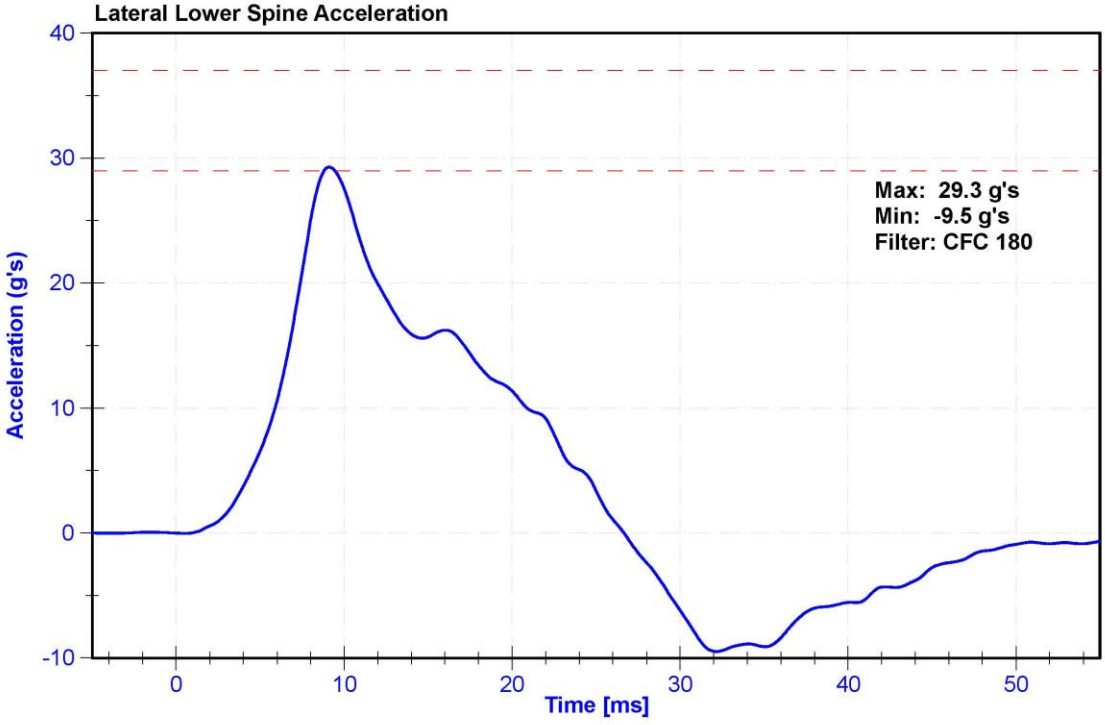
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51327	3/30/2020	9/28/2020
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	10/28/2019	4/27/2020
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	10/28/2019	4/27/2020

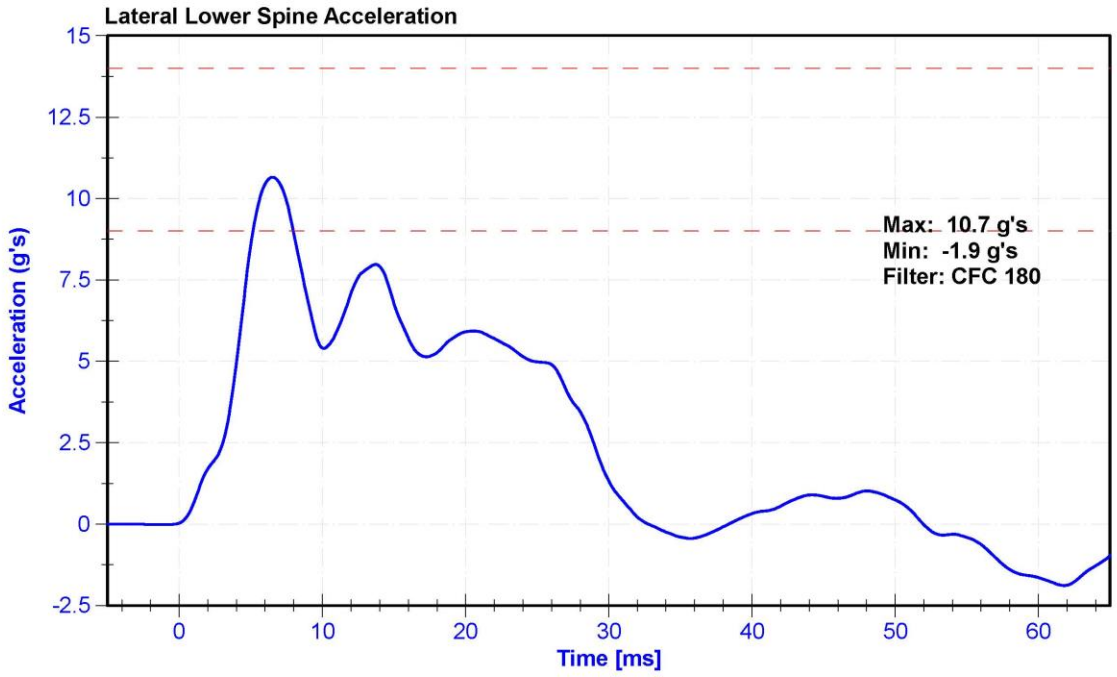



Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 45.4 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.9 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 36.1 g's
Min: -11.3 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]


Lateral Lower Spine Acceleration
Max: 29.3 g's
Min: -9.5 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
0
10
20
30
40
50
60
Time [ms]
Max: 10.7 g's
Min: -1.9 g's
Filter: CFC 180

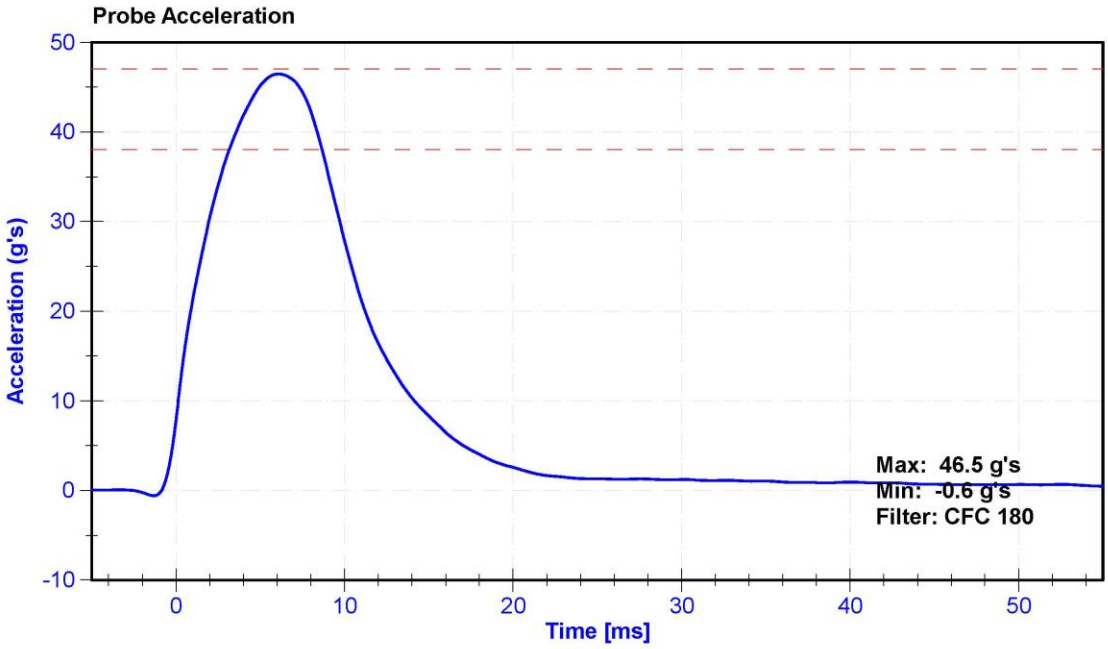
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

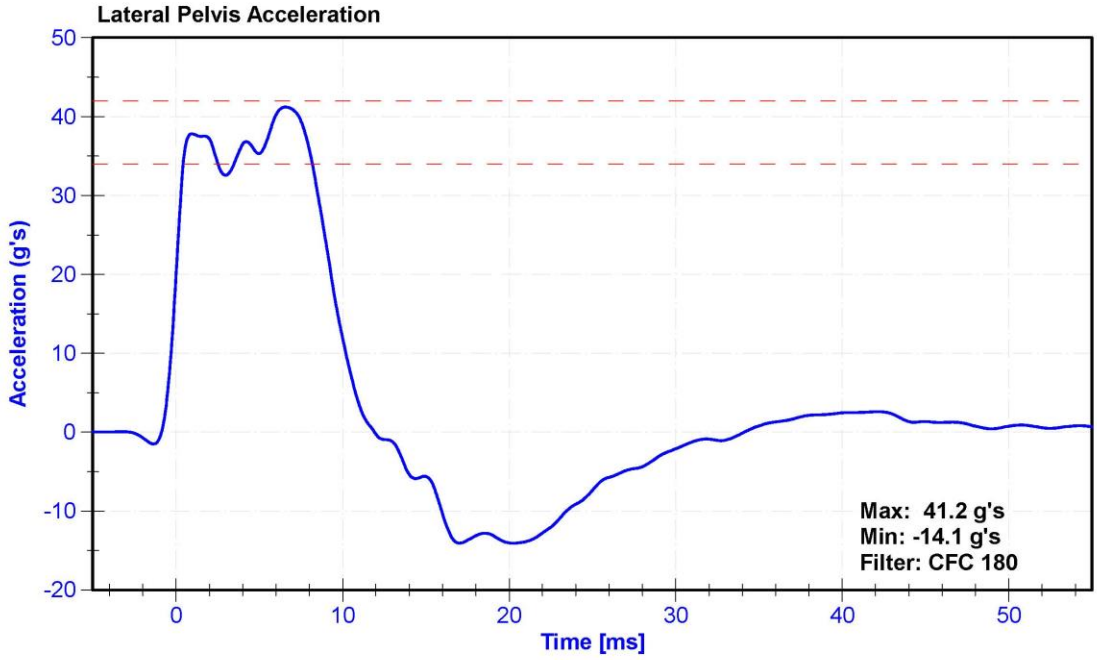
Results

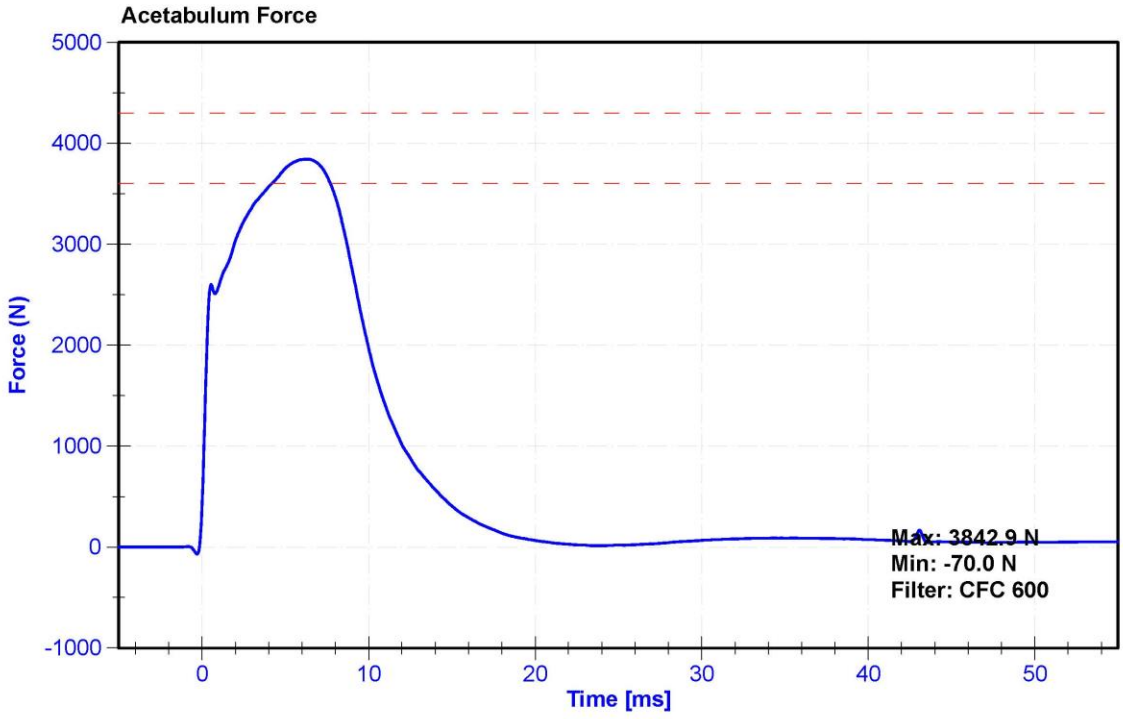
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	38.2	Pass
Velocity	6.6	6.8	m/s	6.63	Pass
Probe Acceleration	38	47	g's	46.5	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.2	Pass
Acetabulum Force	3600	4300	N	3842.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	10/28/2019	4/27/2020
Acetabulum Load Cell	Denton 3249J	LC-4986Fy	6/14/2019	6/13/2020
Certification Plug	SACO	13415	9/20/2019	N/A
Crash Test Plug	SACO	11917	1/31/2018	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 41.2 g's
Min: -14.1 g's
Filter: CFC 180


Acetabulum Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 3842.9 N
Min: -70.0 N
Filter: CFC 600

Crash DG8012 4/8/2020

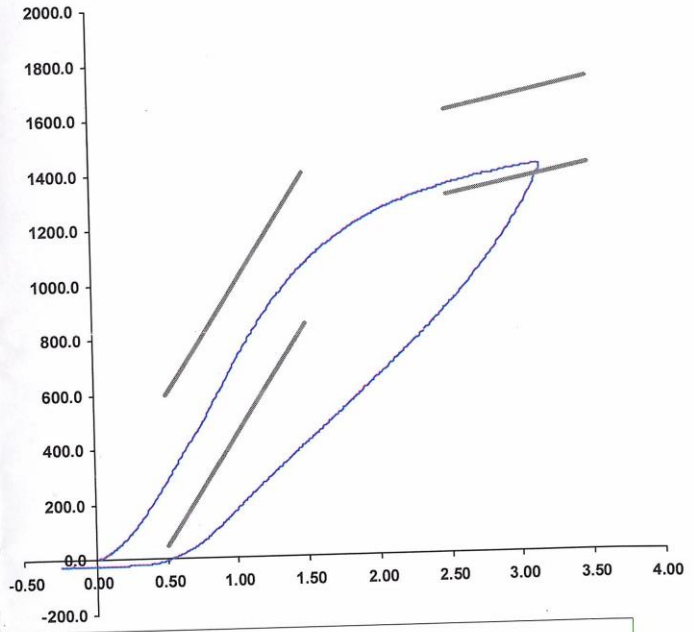
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 11917
Test Number 6079
Report Number 6095
Test Date 1/31/2018 1:55:06 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	278.33	50.00	600.00
Force @ 1.5 mm (N)	1,071.83	850.00	1,400.00
Force @ 2.5 mm (N)	1,346.87	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,402.61	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



Testing Machine STM-20 5965542
Load Cell S/N (FI360947), 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 31-Jan-18
SACO Research

By : DC Date : 1/31/18

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

Certy DG8(4/8/2020

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 13415
Test Number 11057
Report Number 11095
Test Date 9/20/2019 7:25:44 AM

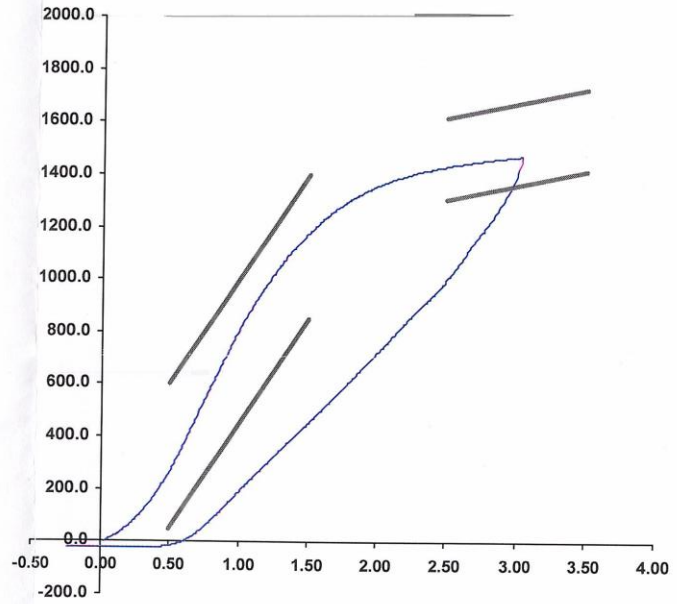
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	268.31	50.00	600.00
Force @ 1.5 mm (N)	1,175.29	850.00	1,400.00
Force @ 2.5 mm (N)	1,434.35	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,471.52	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (FI360947), Units (LBS 1000

Crosshead Speed (mm / min) or Rat 12.7
Extension or Position Measured by XHD_100 (XHD100)

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 20-Sep-19
SACO Research

By : DC Date : 9/20/2019

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

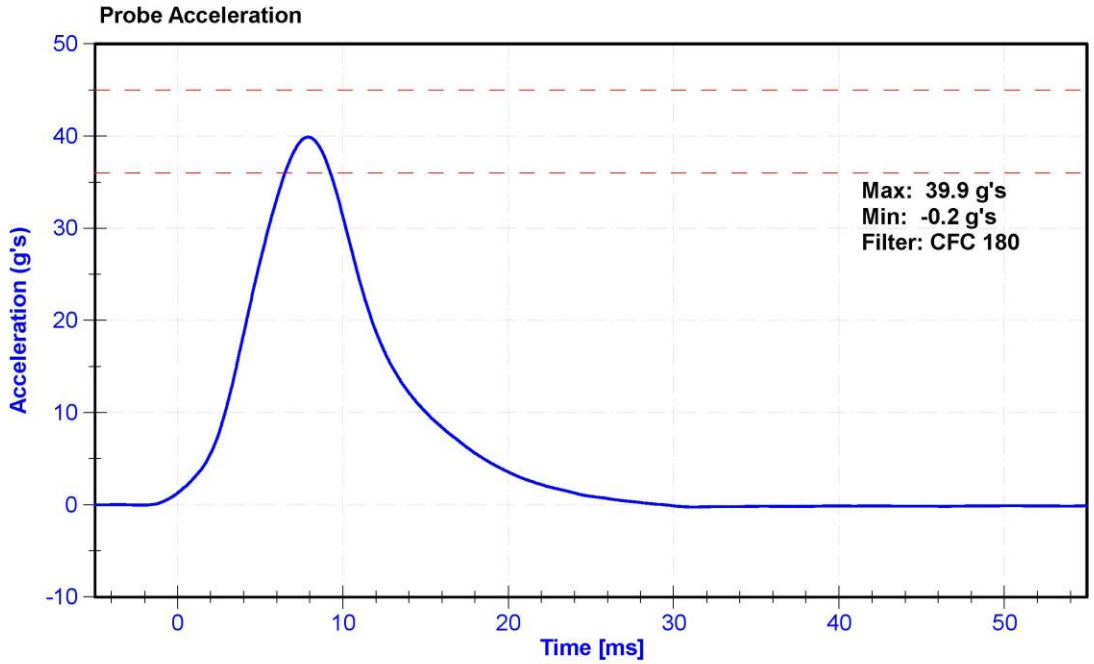
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

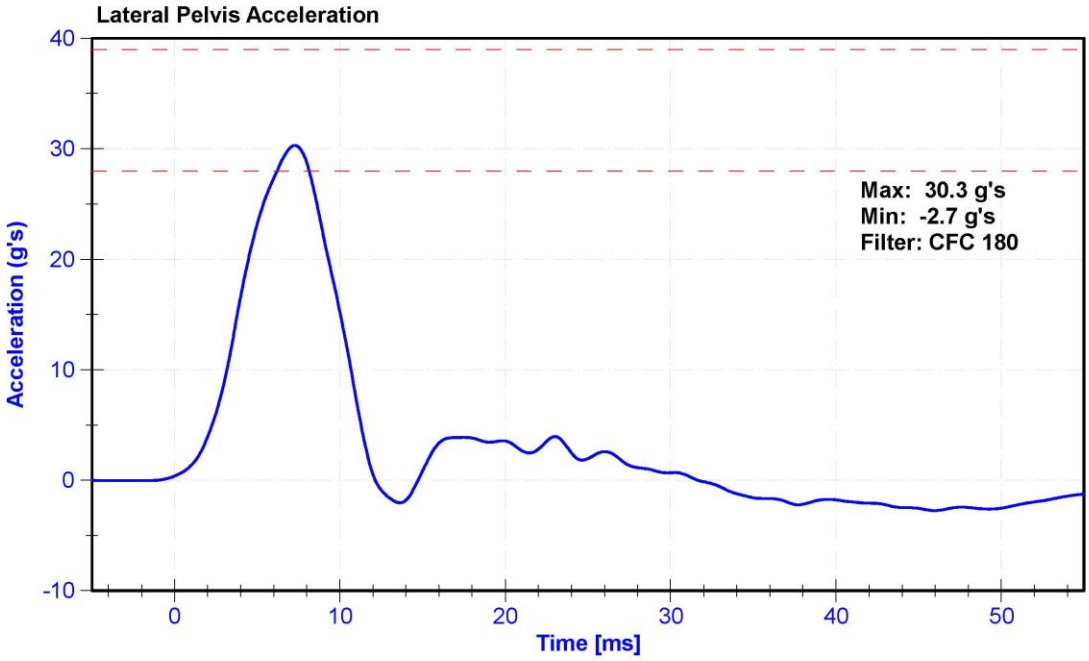
Results

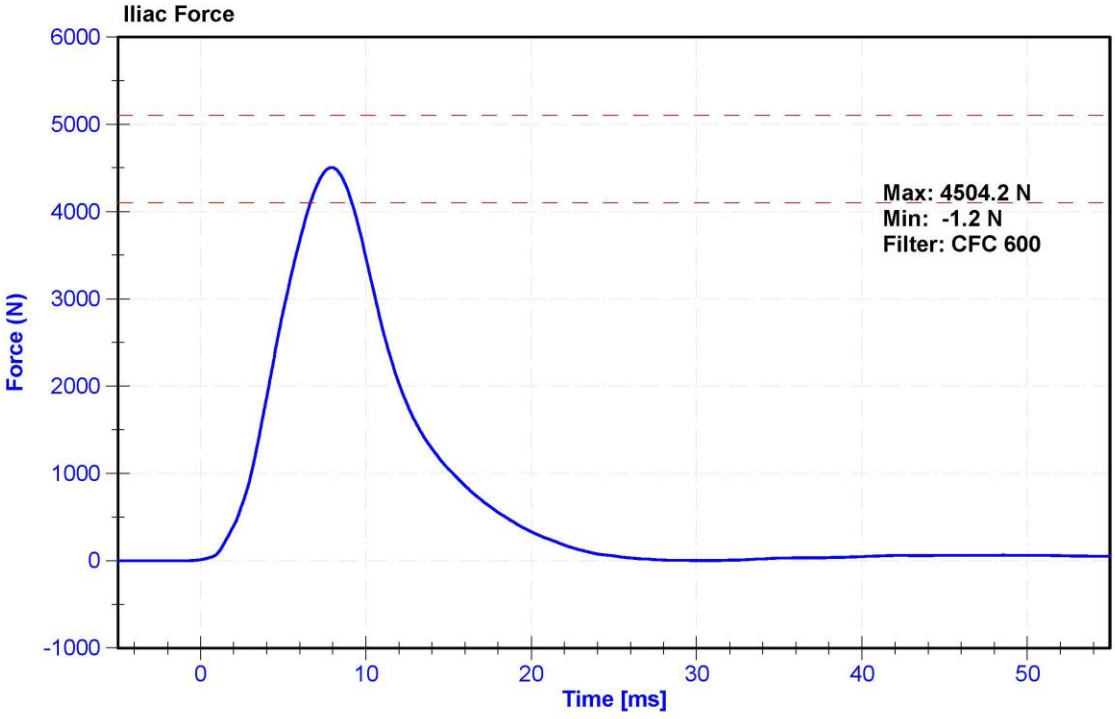
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	39.2	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	39.9	Pass
Lateral Pelvis Acceleration	28	39	g's	30.3	Pass
Iliac Force	4100	5100	N	4504.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	10/28/2019	4/27/2020
Iliac Load Cell	DENTON 3228J	LC-290Fy	9/25/2019	9/24/2020




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 30.3 g's
Min: -2.7 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4504.2 N
Min: -1.2 N
Filter: CFC 600

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	10/28/2019
			Y	AC-P83432	ENDEVCO	10/28/2019
			Z	AC-P83319	ENDEVCO	10/28/2019
Head Accelerometers - Redundant			X	AC-P80334	ENDEVCO	10/28/2019
			Y	AC-P63841	ENDEVCO	10/28/2019
			Z	AC-P83322	ENDEVCO	10/28/2019
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	DS-2165GFE	Servo	10/28/2019
		Middle	Y	DS-45 GFE	Servo	10/28/2019
		Lower	Y	DS-011GFE	Servo	10/28/2019
	Abdominal Rib	Upper	Y	DS-008GFE	Servo	10/28/2019
		Lower	Y	DS-1774GFE	Servo	10/28/2019
Lower Spine Accelerometers (T12)			X	AC-P52040	ENDEVCO	3/30/2020
			Y	AC-P51327	ENDEVCO	3/30/2020
			Z	AC-P52067	ENDEVCO	3/30/2020
Acetabulum Load Cell			Y	LC-4986Fy	Denton	6/14/2019
Lilac Wing Load Cell			Y	LC-290Fy	Denton	9/25/2019
Pelvis Plug (Struck Side)				13446	SACO	9/20/2019
Pelvis Plug (Non-Struck Side)						

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A315123	MSI 1201-1000	3/27/2020
Vehicle Center of Gravity	Y	A315796	MSI 1201-1000	3/11/2020
Vehicle Center of Gravity	Z	A315866	MSI 1201-1000	3/12/2020
Left Floor Sill	Y	A315116	MSI 1201-1000	3/11/2020
A-Pillar Sill	Y	A315837	MSI 1201-1000	3/11/2020
A-Pillar Low	Y	A315124	MSI 1201-1000	3/11/2020
A-Pillar Mid	Y	A315793	MSI 1201-1000	3/11/2020
B-Pillar Sill	Y	A284982	MSI 1201-1000	3/14/2020
B-Pillar Low	Y	A315801	MSI 1201-1000	3/11/2020
B-Pillar Mid	Y	AC-A280917	MSI 1201-1000	3/7/2020
Driver Seat	Y	AC-A279995	MSI 1201-1000	1/28/2020
Engine Top	X	A315190	MSI 1201-1000	3/30/2020
Engine Top	Y	A315867	MSI 1201-1000	3/30/2020
Firewall	Y	A315800	MSI 1201-1000	3/11/2020
Right Roof	Y	AC-A280329	MSI 1201-1000	10/30/2019
Right Floor Sill	Y	A315874	MSI 1201-1000	3/11/2020
Rear Floorpan	X	A315091	MSI 1201-1000	3/30/2020
Rear Floorpan	Y	A315920	MSI 1201-1000	3/30/2020

Table 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	LC_1117012	Interface	10/16/2019
Load Cell 2	LC_1117023	Interface	10/25/2019
Load Cell 3	LC_1117025	Interface	10/25/2019
Load Cell 4	LC_1117019	Interface	10/25/2019
Load Cell 5	LC_1117011	Interface	10/25/2019
Load Cell 6	LC_1117017	Interface	10/25/2019
Load Cell 7	LC_1117035	Interface	10/25/2019
Load Cell 8	LC_1117006	Interface	10/7/2019