REPORT NUMBER: SPNCAP-CAL-19-001

NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST

Ford Motor Co.
2019 Ford Edge
SUV

NHTSA No: M20190201

PREPARED BY:
CALSPAN CORPORATION
P.O. BOX 400
BUFFALO, NEW YORK 14225

March 22, 2019

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Prepared by: Amila Perera Date: March 22, 2019

Amila Perera, Test Engineer

Approved by: Vanessa Hansen Date: March 22, 2019

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 2019 Ford Edge SUV NHTSA No.: M20190201		***5. Report Date*** March 22, 2019 ***6. Performing Organization Code*** CAL
7. Author(s) Amila Perera, Senior Test Engineer Vanessa Hansen, Operations Manager		***8. Performing Organization Report No.*** CAL-DOT-2019-001
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, January 10, 2019 - March 22, 2019 ***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 2019 Ford Edge 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 January 10, 2019.

The impact velocity of the vehicle was 32.22 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 403 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	256.908
Resultant Lower Spine Acceleration	G	82	37.728
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1892.551
Maximum Thoracic Rib Deflection	mm	38	18.775
Maximum Abdomen Rib Deflection	mm	45	17.215

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, NPO-411 1200 New Jersey Ave. SE Washington, D.C. 20590 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833

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Form DOT F1700.7 (8-72)

TABLE OF CONTENTS

SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 2019 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 2019 Ford Edge 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 2019 Ford Edge SUV. The subject vehicle was towed into the rigid pole at an angle of 75^{o} and a velocity of 32.22 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on January 10, 2019. 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	256.908
Resultant Lower Spine Acceleration	g	82	37.728
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1892.551
Maximum Thoracic Rib Deflection	mm	38*	18.775
Maximum Abdominal Rib Deflection	mm	45*	17.215

*****Proposed IARV

Supplemental restraint information was recorded as follows:

SUPPLEMENTAL RESTRAINT INFORMATION

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 – Torso/Pelvis	Yes	Yes	No	No
Seat Belt Pretensioner	Yes	Yes	Yes	No
Seat Belt Load Limiter	Yes	Yes	Yes	No
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: 2019 Ford Edge SUV
NHTSA No.: M20190201
Test Program: NCAP Side Pole Impact Test
Test Date: 1/10/2019

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20190201
Model Year	2019
Make	Ford
Model	Edge
Body Style	SUV
VIN	2FMPK3G99KBB30953
Body Color	Grey
Odometer Reading (mi)	17
Engine Displacement (L)	2.0
Type / No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	8-Speed
Overdrive	Yes
Final Drive	FWD
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	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Rear Pass. Load Limiter	Yes
Other Safety Restraint	No

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Co,
Date of Manufacture	11/18
Vehicle Type	MPV

GVWR (kg)	2390
GAWR Front (kg)	1247
GAWR Rear (kg)	1145

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	-	5	
Capacity Weight (VCW) (kg)				430	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				89.8	(A-B)

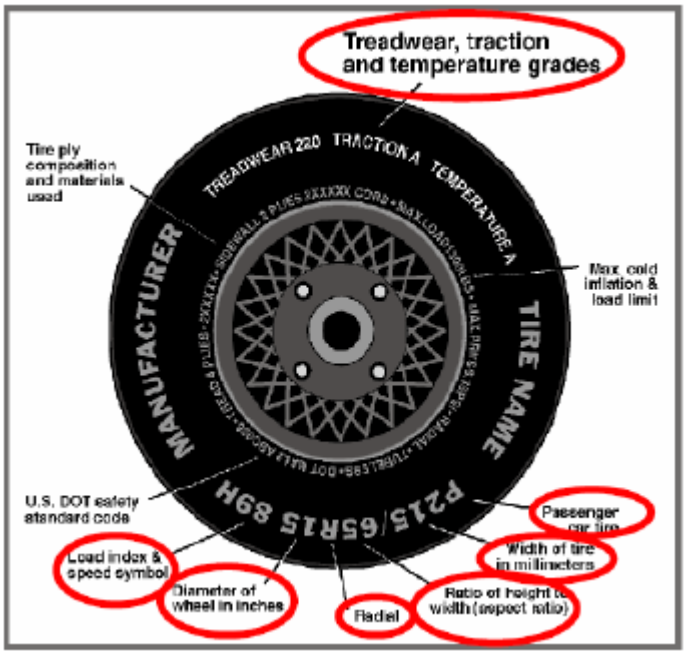
VEHICLE SEAT TYPE

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:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019

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)	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	245/60R18	245/60R18
Tire Size on Vehicle	245/60R18	245/60R18
Tire Manufacturer	Michelin	Michelin
Tire Model	Latitude Tour	Latitude Tour
Treadwear	440	440
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 1 Polyamide, 2 Steel	2 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	105V	105V
Tire Material	Rubber	Rubber
DOT Safety Code Left	M34A 015X 3918	M34A 015X 3918
DOT Safety Code Right	M34A 015X 3918	M34A 015X 3918

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

Test Vehicle: 2019 Ford Edge SUV NHTSA No.: M20190201
Test Program: NCAP Side Pole Impact Test Test Date: 1/10/2019

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	250	255	250	250
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	535	377		556	435.5		553	439	
Right	kg	542	345		535.5	404		551	396	
Ratio	%	60	40		57	43		57	43	
Totals	kg	1077	722	1799	1091.5	839.5	1931	1104	835	1939

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1799	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	89.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1938.8	(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	-0.65	-0.20	-0.10	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	-0.60	-0.70	-0.70	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	-0.05	-0.10	-0.20	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	0.05	0.0	0.0	Yes
Vehicle CG (Aft of Front Axle)	mm	1441	1236	1224	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	12	22	19	

* 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:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	10
Spare Tire	15.5
Jack	3
Tail Light	1
Passenger side windows	9
Ballast / Equipment Added	63.3

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:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019

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	16.1	11.1	13.6
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	13.6	6	Max	-	-	-
			Mid	0	3	6
			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

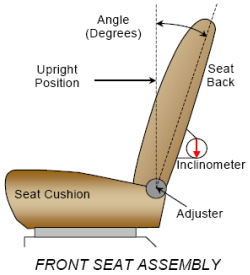
Test Vehicle: 2019 Ford Edge SUV NHTSA No.: M20190201
Test Program: NCAP Side Pole Impact Test Test Date: 1/10/2019

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	255	38 (0-37)	0	0
Front Passenger Seat	240	36 (0-35)	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	50.2	0-24	-8.2	2
Front Passenger Seat	49.8	0-24	-8.8	2
Front Center Seat	N/A	N/A	N/A	N/A
Struck Side Rear Seat	17.1	0-9	5.1	1
Non-Struck Side Rear Seat	17.0	0-9	5.2	1
Rear Center Seat	17.0	0-9	5.2	1

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 – Uppermost

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	3	Lowest

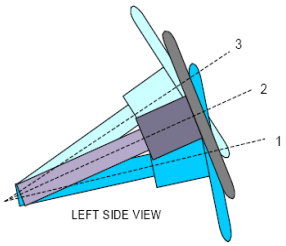
DATA SHEET NO. 2 … (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019

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	25.8	
Geometric Center – Position 2	28.8	
Uppermost – Position 3	31.8	
Telescoping Steering Wheel Travel		44
Test Position	28.8	22

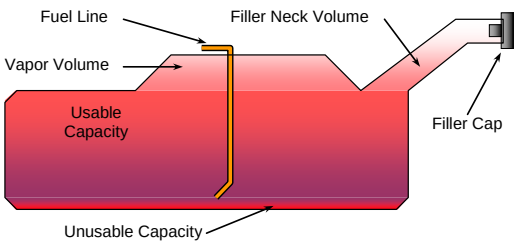


STEERING COLUMN ASSEMBLY

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

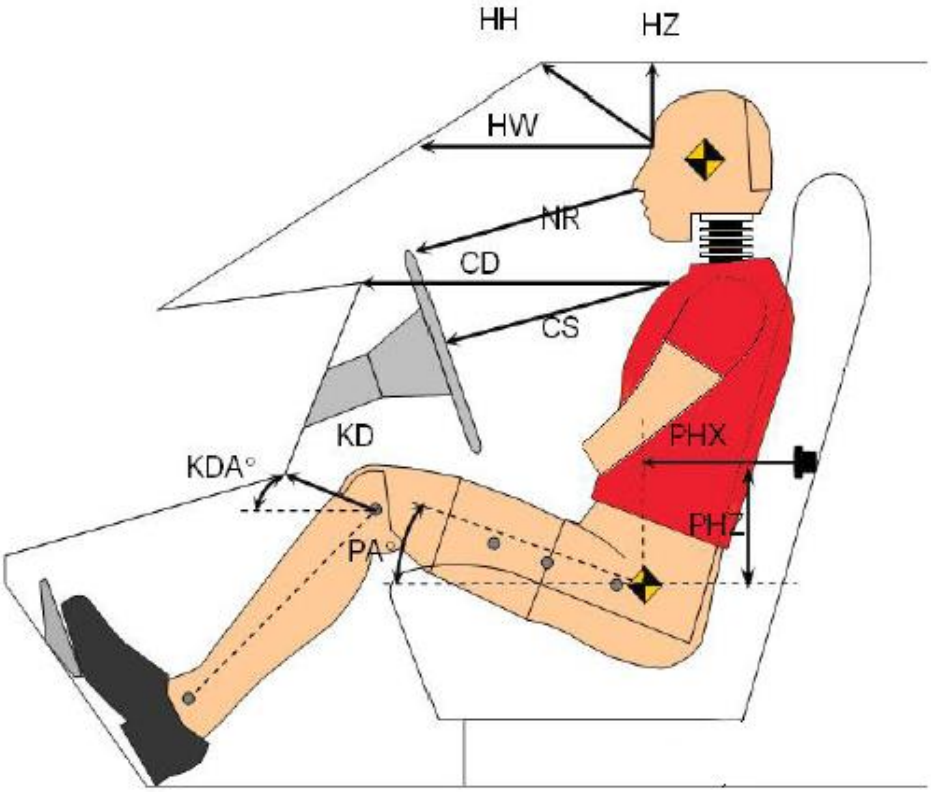
Description			Liters
Usable Capacity of “Standard Tank”	-	see Form No. 1	69.5
Usable Capacity of “Optional Tank”	-	see Form No. 1	N/A
Usable Capacity of “Standard Tank”	-	see Owner’s Manual	69.5
Usable Capacity of “Optional Tank”	-	see Owner’s Manual	N/A
93% of Usable Capacity			64.6
Actual Amount of Solvent Used in Test			64.6
1/3 of Usable Capacity			23.1

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:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019



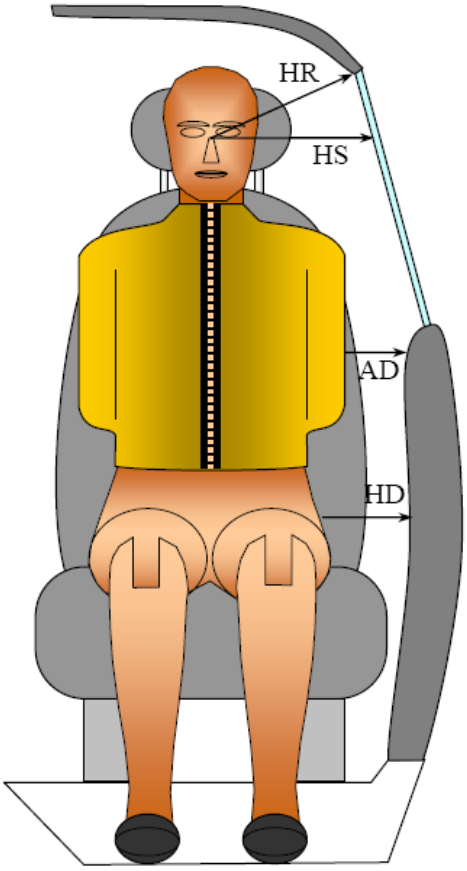
Left Side View

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. DG8012)	
		Length (mm)	Angle (◦)
HH	Head to Header	300	
HW	Head to Windshield	718	
HZ	Head to Roof Liner	218	
NR	Nose to Rim	208	
CD	Chest to Dash	388	
CS	Chest to Steering Wheel	165	
KD(L) / KDA(L)◦	Left Knee to Dash	128	27.1
KD(R) / KDA(R)◦	Right Knee to Dash	138	24.6
PAX◦	Pelvic Tilt Angle (X-Axis)		22.3
PAY◦	Pelvic Tilt Angle (Y-Axis)		0.3
PHX	Hip Point to Striker (X-Axis)	362	
PHZ	Hip Point to Striker (Z-Axis)	159	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019



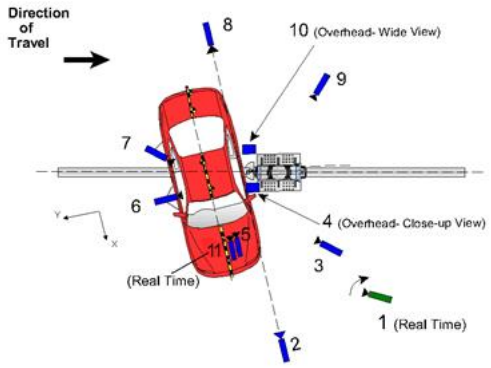
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver - Length (Serial No. DG8012)
HR	Head To Side Header	mm	277
HS	Head to Side Window	mm	405
AD	Arm to Door	mm	192
HD	Hip Point to Door	mm	168

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2019 Ford Edge SUV NHTSA No.: M20190201
Test Program: NCAP Side Pole Impact Test Test Date: 1/10/2019



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	7366	0	-1437	28	1000
3	Impact side 45º - forward pole view	5047	-1484	-1461	24	1000
4	Overhead Close-up view of impact	0	0	-9370	28	1000
5	Onboard - dummy front view				25	1000
6	Onboard - dummy side view				12.5	1000
7	Onboard - dummy rear oblique view				8	1000
8	Rear ground level - impact view	-8371	0	-1459	28	1000
9	Impact side 45º - rearward pole view	-3351	-3802	-1448	24	1000
10	Overhead wide - view of impact	0	0	-9370	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.*

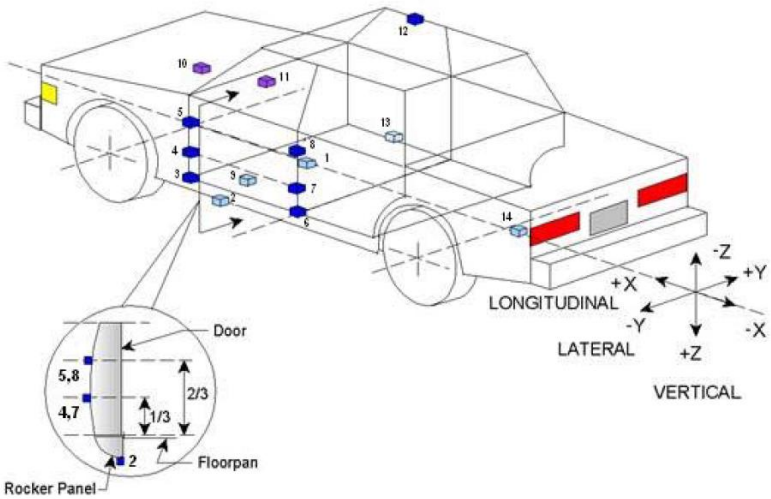
Comments: All cameras operated as intended.

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: 2019 Ford Edge SUV NHTSA No.: M20190201
Test Program: NCAP Side Pole Impact Test Test Date: 1/10/2019



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2578	-13	-205
2	Left Floor Sill	2994	-677	229
3	A-Pillar Sill	3244	-628	169
4	A-Pillar Low	3247	-637	-22
5	A-Pillar Mid	3314	-674	-532
6	B-Pillar Sill	2196	-687	219
7	B-Pillar Low	2298	-690	-10
8	B-Pillar Mid	2253	-698	-248
9	Driver Seat Track	2417	-549	128
10	Engine Top	4027	236	-252
11	Firewall	3596	326	-143
12	Right Roof	2194	562	-1051
13	Right Floor Sill	2975	683	223
14	Rear Floorpan	940	20	32

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:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019

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: 2019 Ford Edge SUV NHTSA No.: M20190201
Test Program: NCAP Side Pole Impact Test Test Date: 1/10/2019

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver Seat Dummy (SID-IIs)
Face	None
Top of Head	Curtain Airbag
Left Side of Head	None
Back of Head	Headrest, Curtain Airbag & Seatback
Left Shoulder	Torso/Pelvis Airbag
Upper Torso	Seatback
Lower Torso	Seatback
Left Hip	Torso/Pelvis Airbag & Seat Pan
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: 2019 Ford Edge SUV NHTSA No.: M20190201
Test Program: NCAP Side Pole Impact Test Test Date: 1/10/2019

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-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	No	N/A
Seat Belt Pretensioner	Yes	Yes	Yes	No
Seat Belt Load Limiter	Yes	Yes	Yes	No
Other				

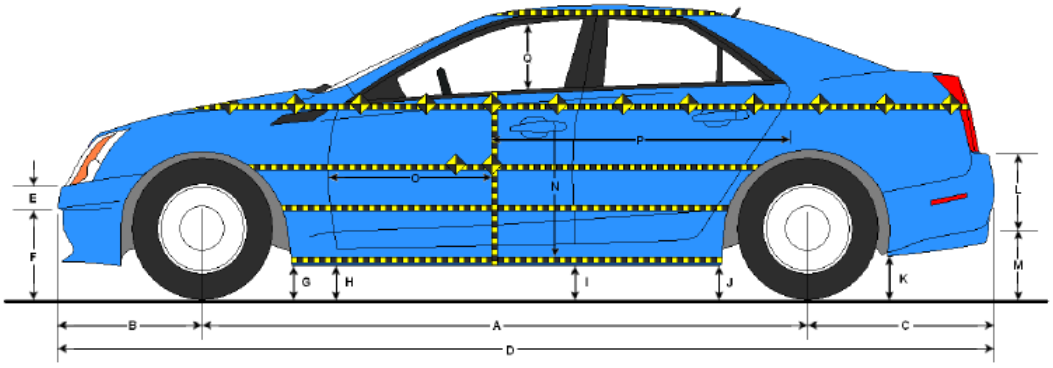
VEHICLE SPEED, VEHICLE ANGLE AT IMPACT AND IMPACT POINT LOCATION DATA

Measured Parameter		Units	Tolerance	Value
Vertical Impact Ref Line	- Aft of Front Axle, Intended Impact Pt	mm		1023
Actual Impact Point	- Aft of Front Axle	mm		1028
Horizontal Offset (+ forward / - rearward)		mm	+/- 38 *	-5
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	32.22
Trap No. 2 Velocity	- Redundant	kph	31.4 to 33.0	32.19

* Of Intended Impact Point

DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019



LEFT SIDE VIEW

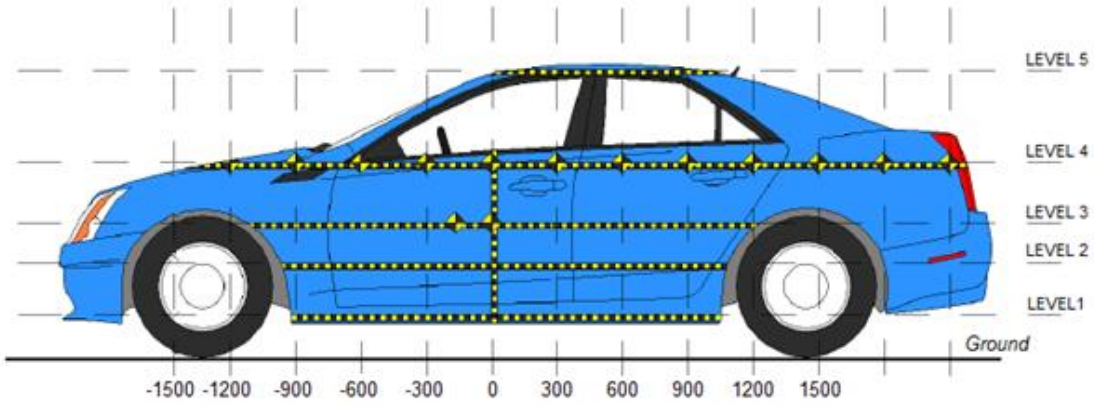
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2842	2749	93
B	Front Axle to FSOV	966	1012	-46
C	Rear Axle to RSOV	989	985	4
D	Total Length at Centerline	4796	4746	50
E	Front Bumper Thickness	130	130	0
F	Front Bumper Bottom to Ground	507	537	-30
G	Sill Height at Front Wheel Well	270	230	40
H	Sill Height at Front Door Leading Edge	232	265	-33
I	Sill Height at B-Pillar	242	258	-16
J1	Sill Height at Rear Wheel Well	256	277	-21
J2	Pinch Weld Height at Rear Wheel Well	242	263	-21
K	Sill Height Aft of Rear Wheel Well	292	303	-11
L	Rear Bumper Thickness	160	160	0
M	Rear Bumper Bottom to Ground	429	435	-6
N	Sill Height to Bottom of Front Window Sill	894	902	-8
O	Front Door Leading Edge to Impact CL	522	396	126
P	Rear Door Trailing Edge to Impact CL	1663	1548	115
Q	Front Window Opening	432	425	7
R	Right Side Length	4694	4684	10
S	Left Side Length	4698	4618	80
T	Vehicle Width at B-Pillars	1917	1770	147

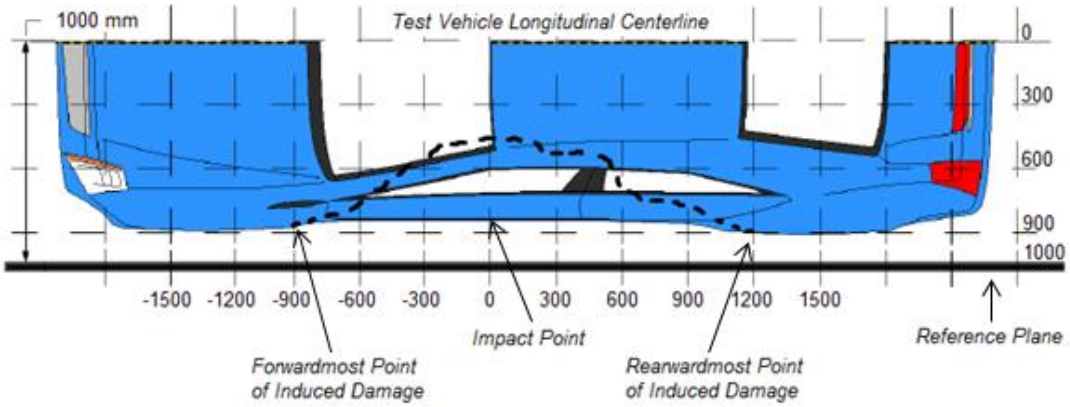
* All measurements in mm with tolerance of ± 3mm

DATA SHEET NO. 10
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019



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	490	386	150
2	Occupant Hip Point	mm	735	394	150
3	Mid - Door	mm	814	403	150
4	Window Sill	mm	1086	367	150
5	Window Top	mm	1626	136	150

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

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

Test Vehicle: 2019 Ford Edge SUV NHTSA No.: M20190201
Test Program: NCAP Side Pole Impact Test Test Date: 1/10/2019

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

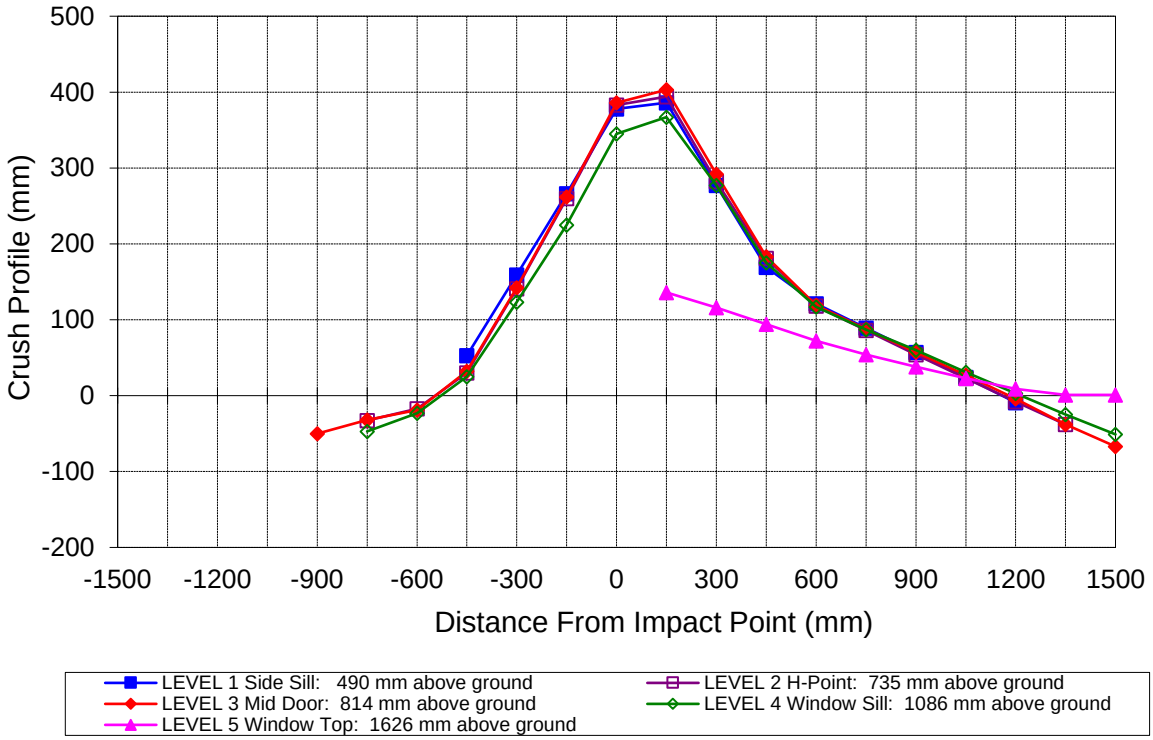
	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050															
-900			958					1008					-50		
-750		957	953	856			990	985	903			-33	-32	-47	
-600		950	944	867			967	963	890			-17	-19	-23	
-450	941	942	942	878		888	912	910	853		53	30	32	25	
-300	943	943	946	890		784	802	804	767		159	141	142	123	
-150	944	945	949	899		678	685	687	674		266	260	262	225	
0	944	946	951	908		566	563	565	563		378	383	386	345	
150	942	946	952	915	622	556	552	549	548	486	386	394	403	367	136
300	940	947	953	923	647	663	665	661	646	531	277	282	292	277	116
450	938	947	953	927	654	769	766	770	752	560	169	181	183	175	94
600	934	946	953	929	658	813	828	834	812	586	121	118	119	117	72
750	931	944	951	931	661	842	858	863	844	607	89	86	88	87	54
900	924	941	948	933	663	867	887	891	873	625	57	54	57	60	38
1050	932	939	945	933	663	908	916	918	902	640	24	23	27	31	23
1200	934	941	944	934	662	943	949	948	931	653	-9	-8	-4	3	9
1350		948	946	945	658		986	984	970	657		-38	-38	-25	1
1500			955	947	651			1022	998	650			-67	-51	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:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019

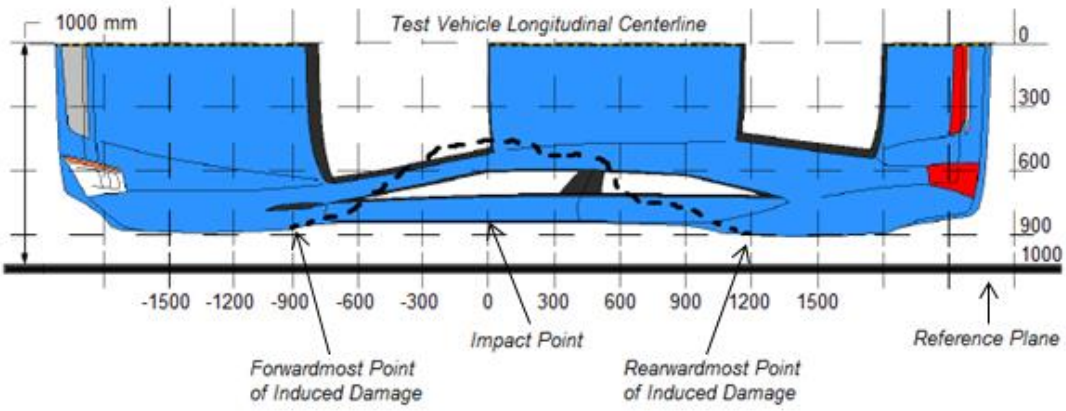
Vehicle Exterior Crush Measurements - Visual Representation



DATA SHEET NO. 11
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019

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	-900	3	-8	42	-50
2	-420	3	111	57	54
3	60	3	441	49	392
4	540	3	192	47	145
5	1020	3	87	54	33
6	1500	3	-22	45	-67

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

Test Vehicle:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side MDB Impact Test	Test Date:	1/10/2019
Test Time:	10:20 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°	73	300	373
90° to 180°	60	300	360
180° to 270°	62	300	362
270° to 360°	75	300	375

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

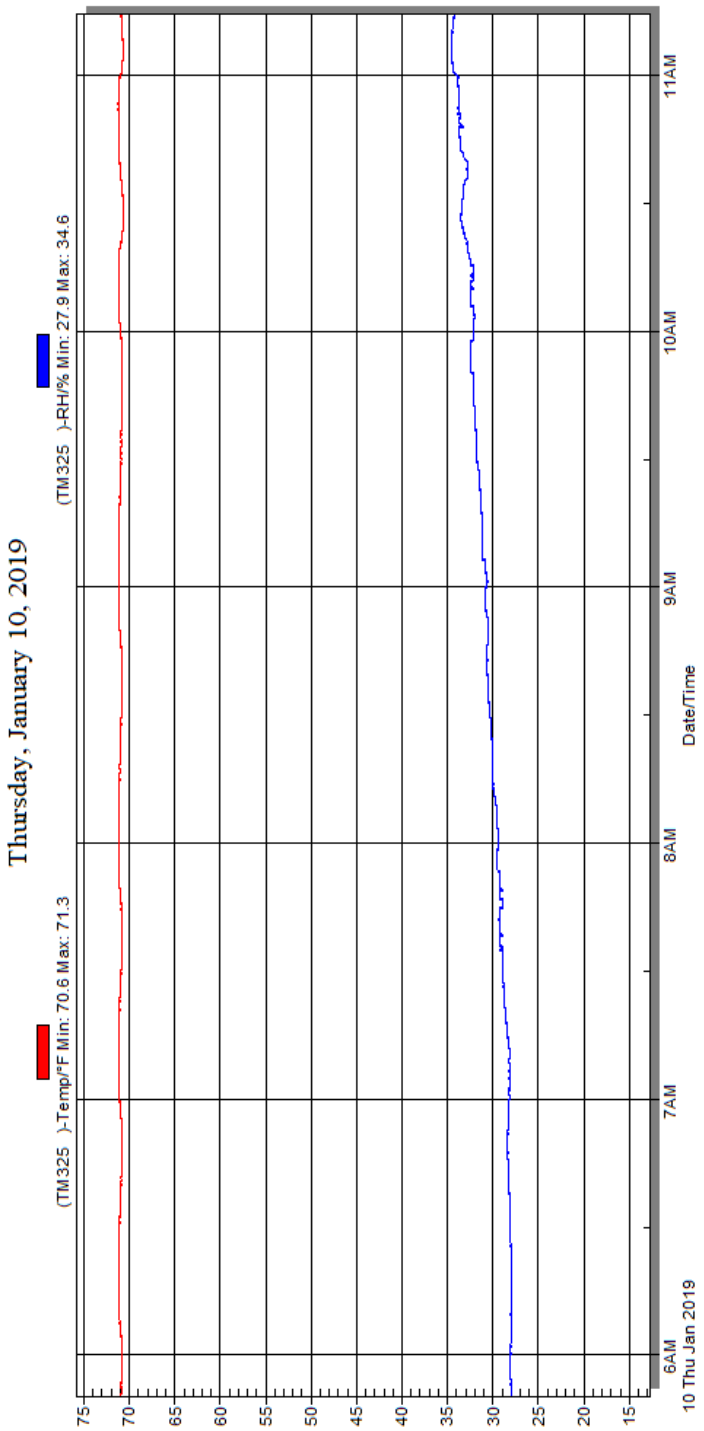
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

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:	2019 Ford Edge SUV	NHTSA No.:	M20190201
Test Program:	NCAP Side Pole Impact Test	Test Date:	1/10/2019



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

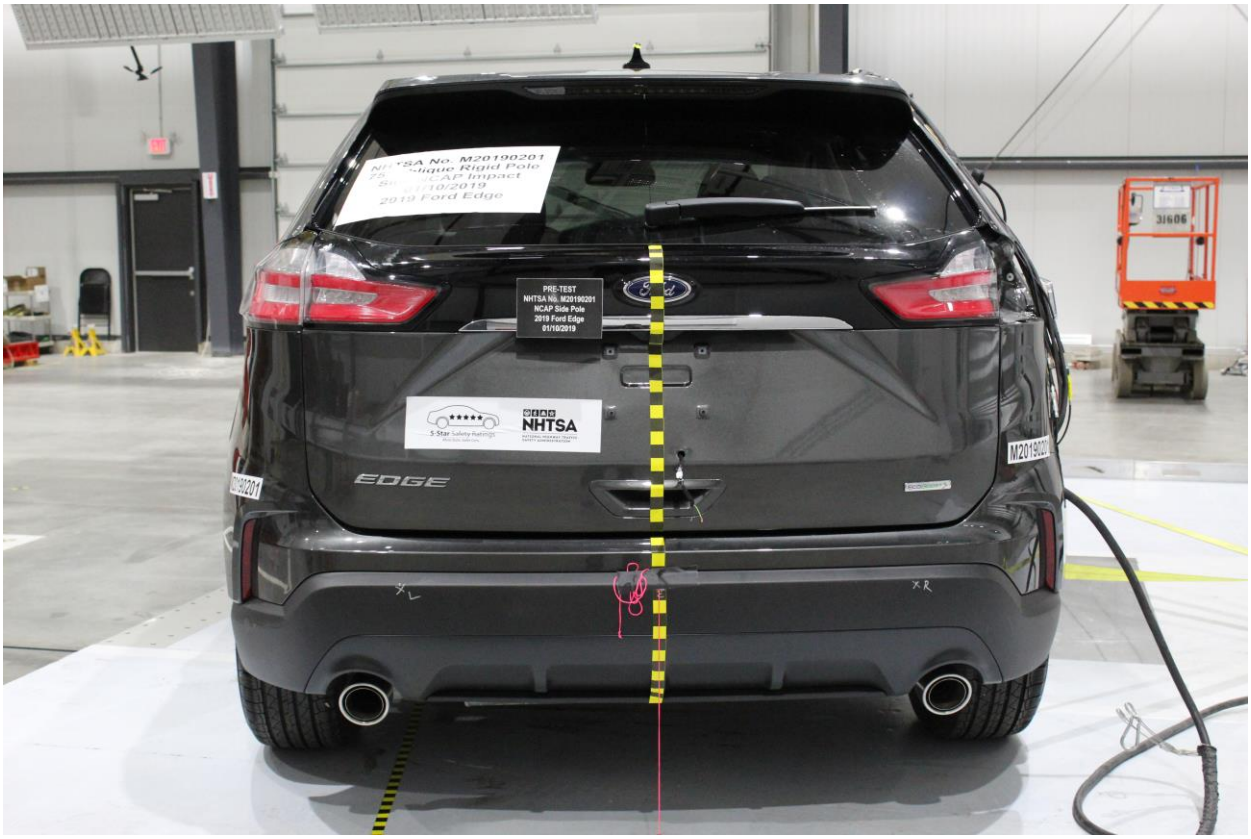


Figure A-11: Pre-Test Rear View of Test Vehicle

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

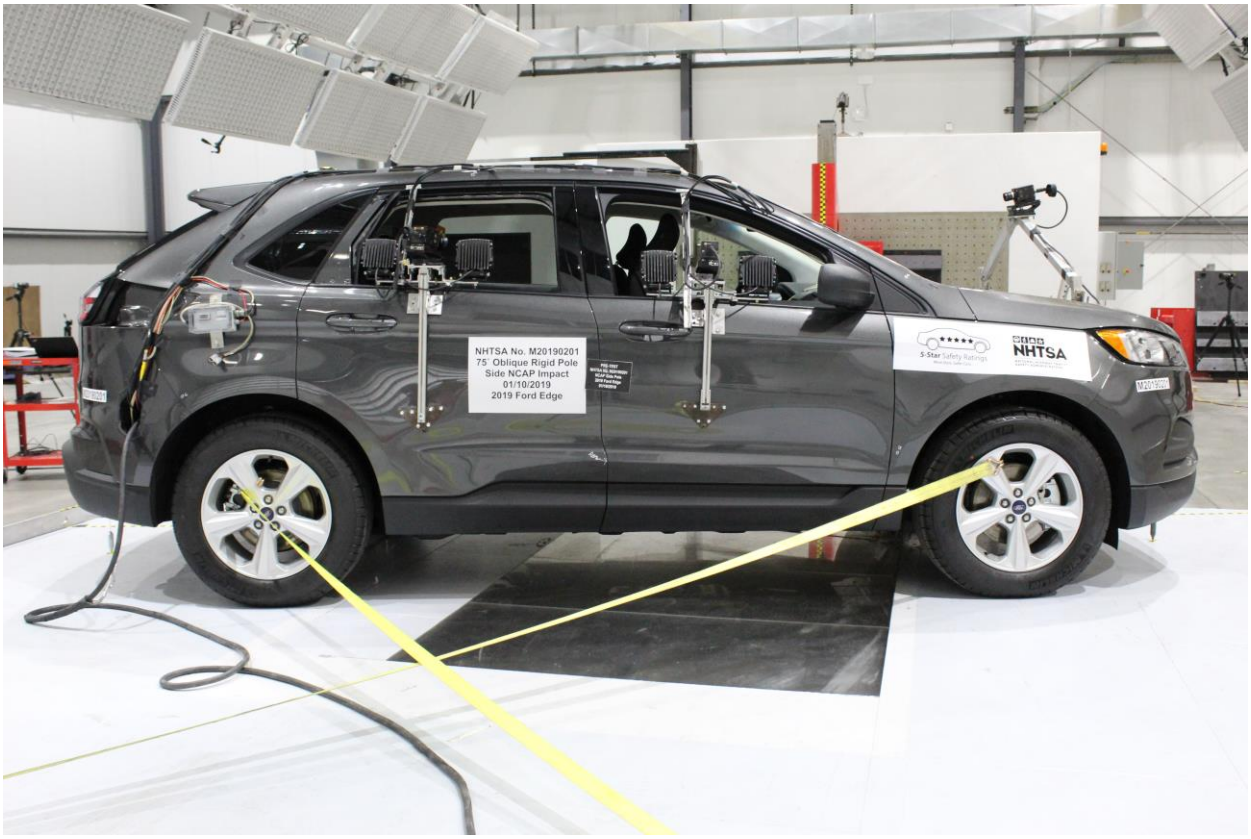


Figure A-13: Pre-Test Right Side View of Test Vehicle

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

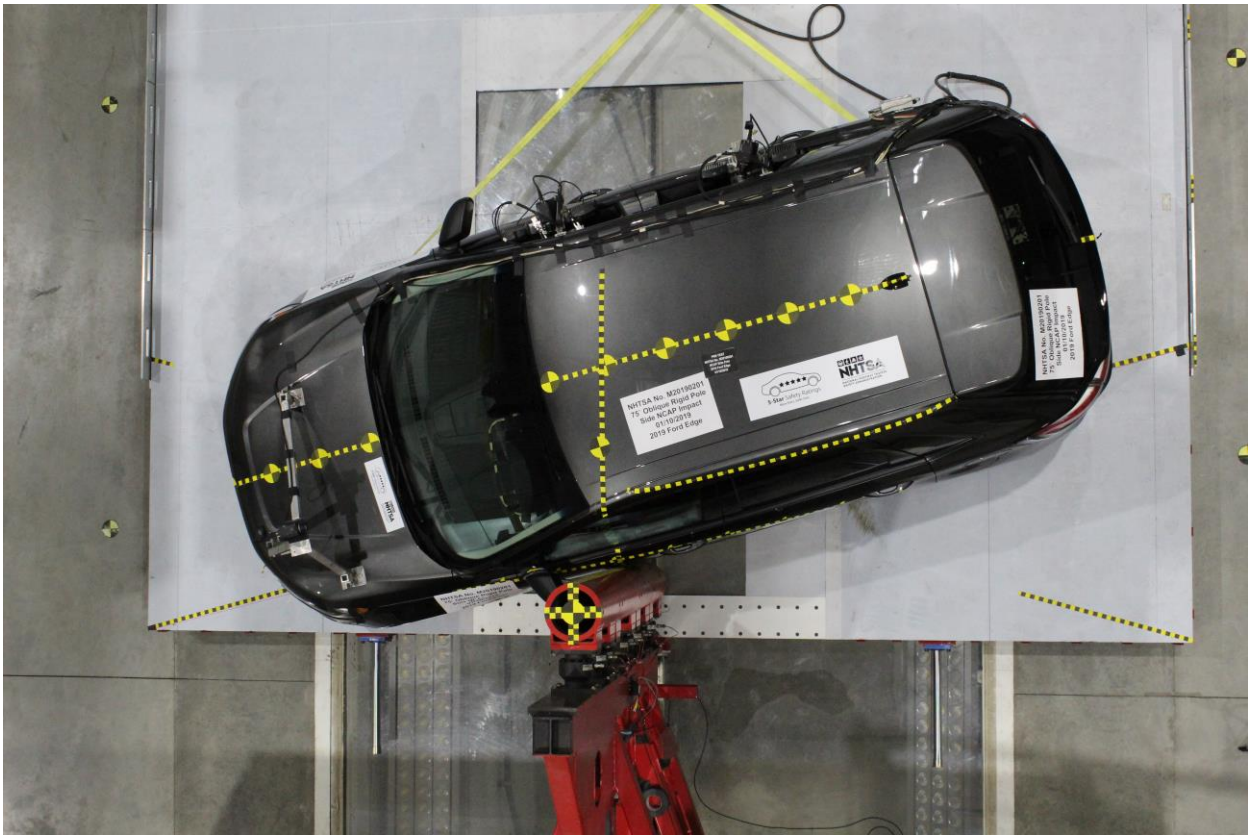


Figure A-15: Pre-Test Overhead View of Test Area

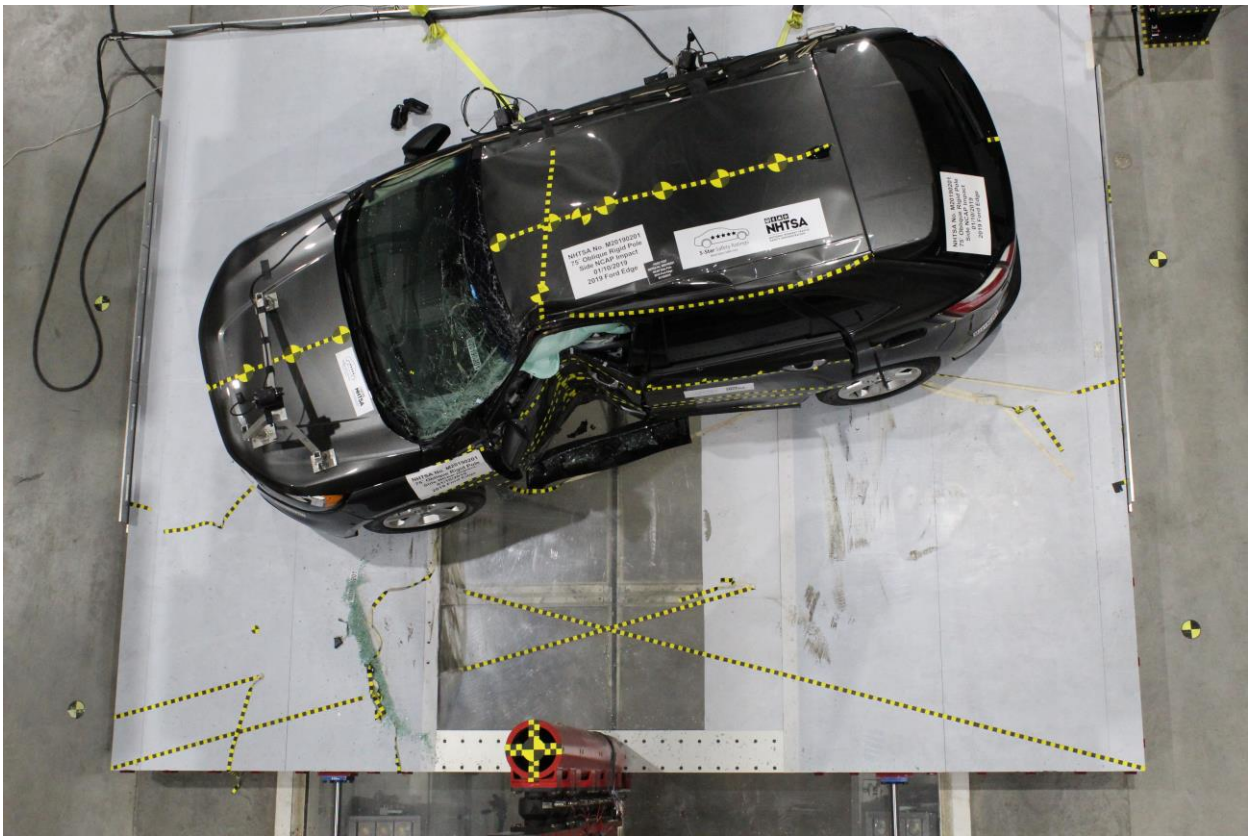


Figure A-16: Post-Test Overhead View of Test Area

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

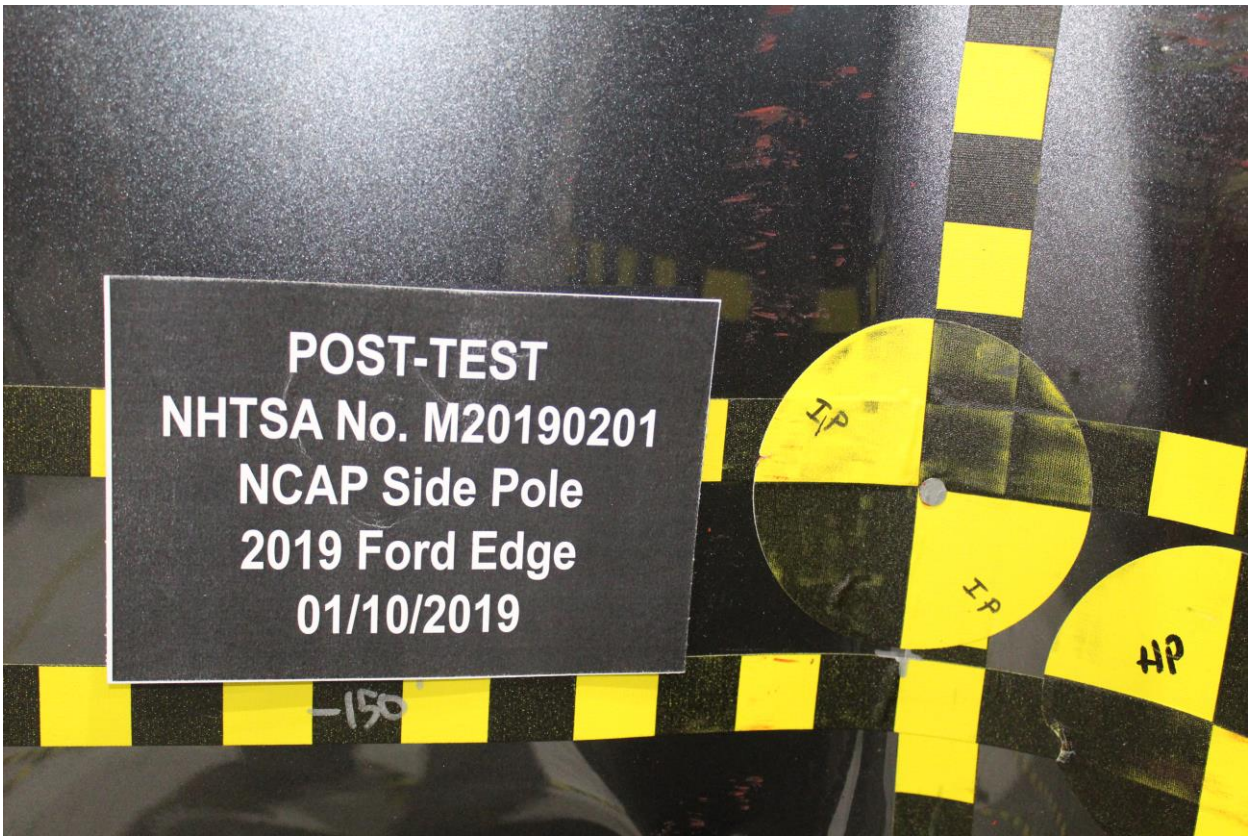


Figure A-20: Post-Test Close-Up View of Impact Point Target Showing Impact Location

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

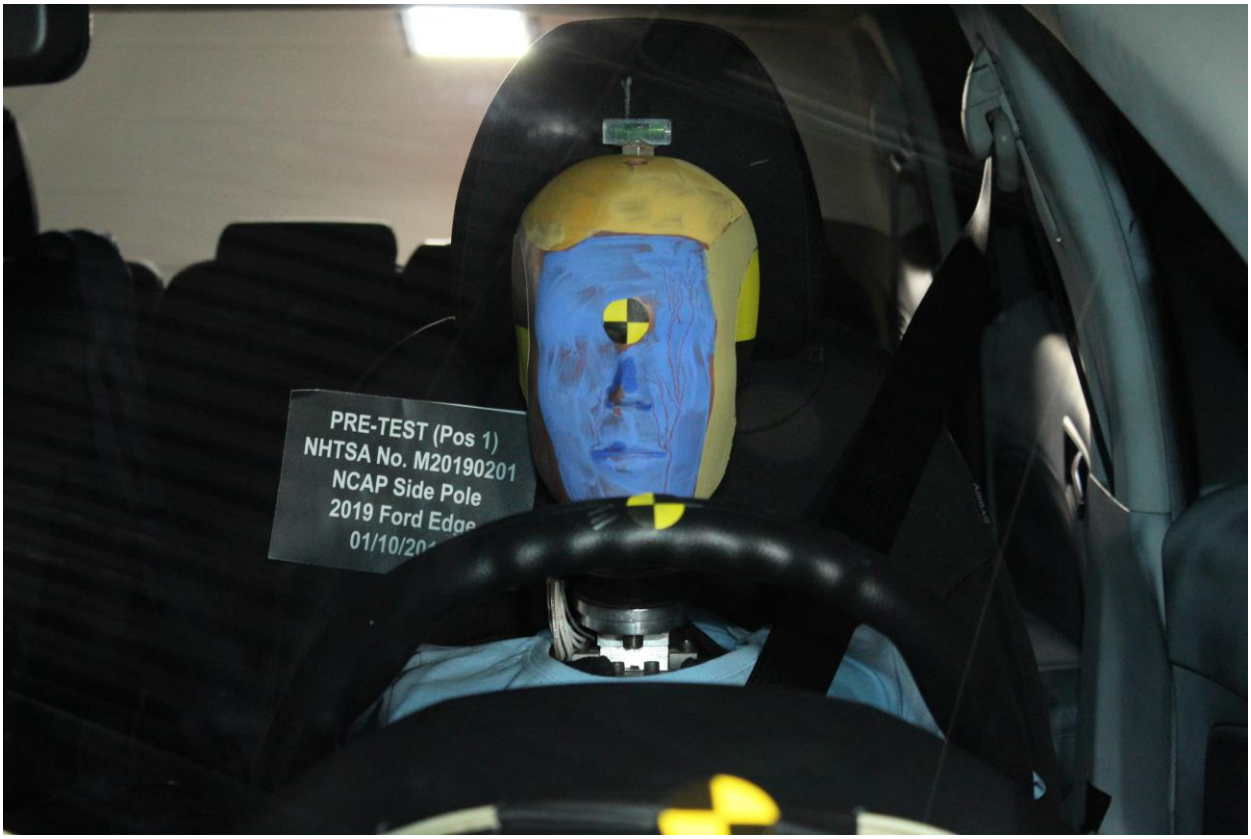


Figure A-27: Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint

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

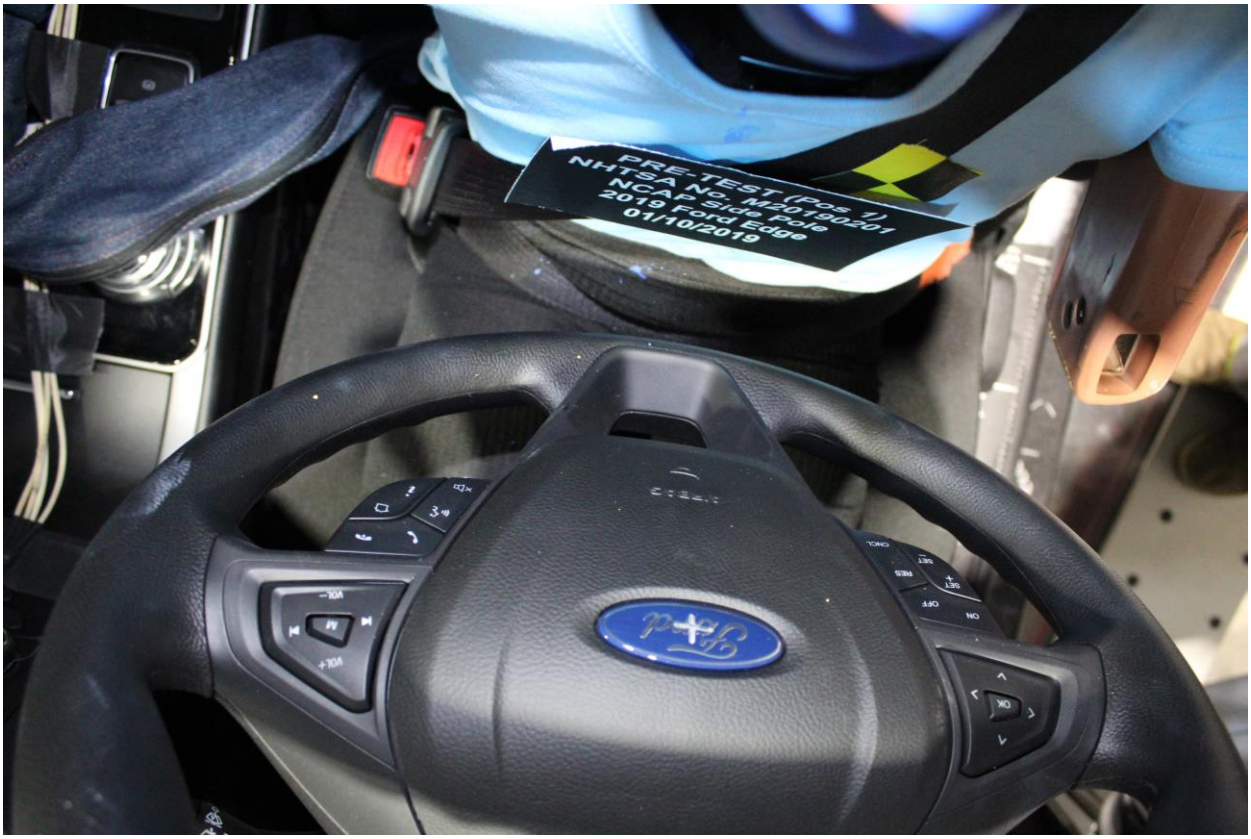


Figure A-29: Pre-Test Overhead View of Dummy Thighs on Seat Pan

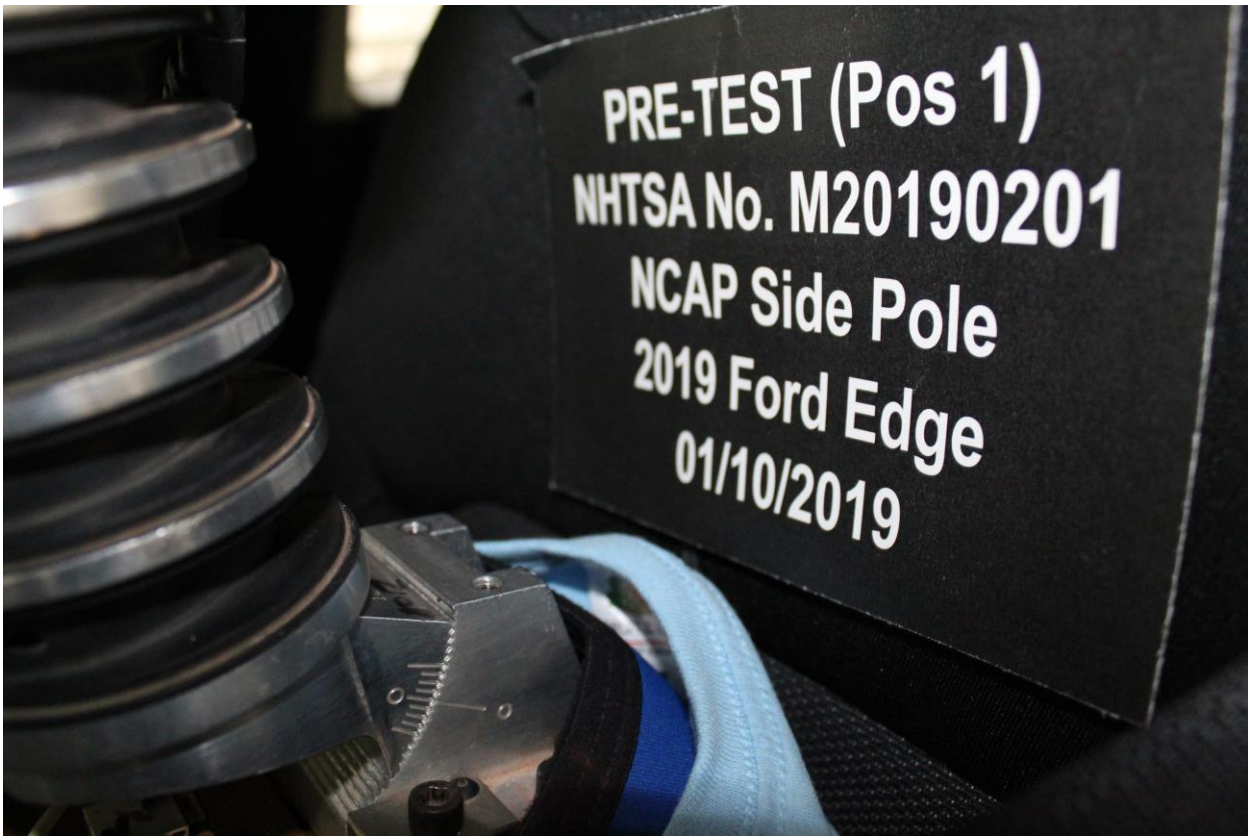


Figure A-30: Pre-Test Left Side View of Dummy's Neck Showing Position of Adjustable Neck Bracket

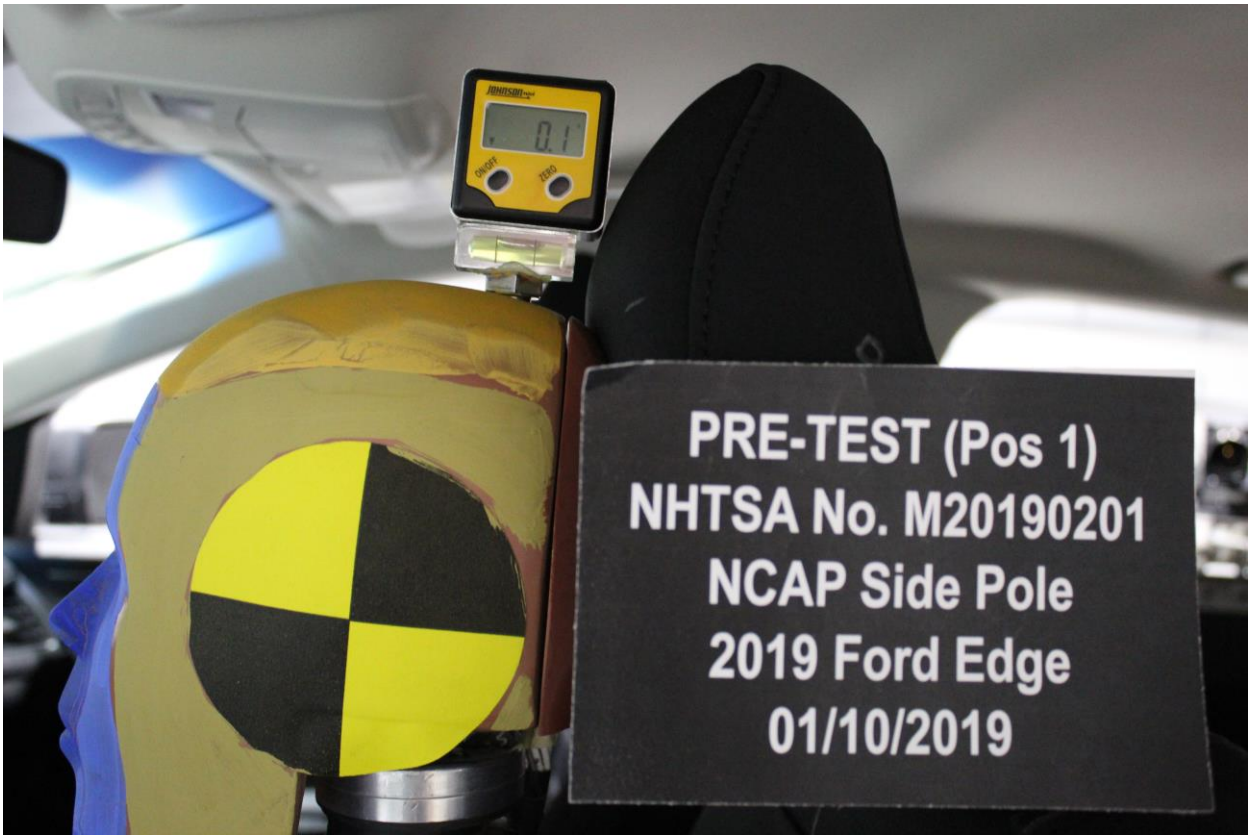


Figure A-31: Pre-Test Left Side View of Dummy's Head Showing Dummy's Head is Level

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

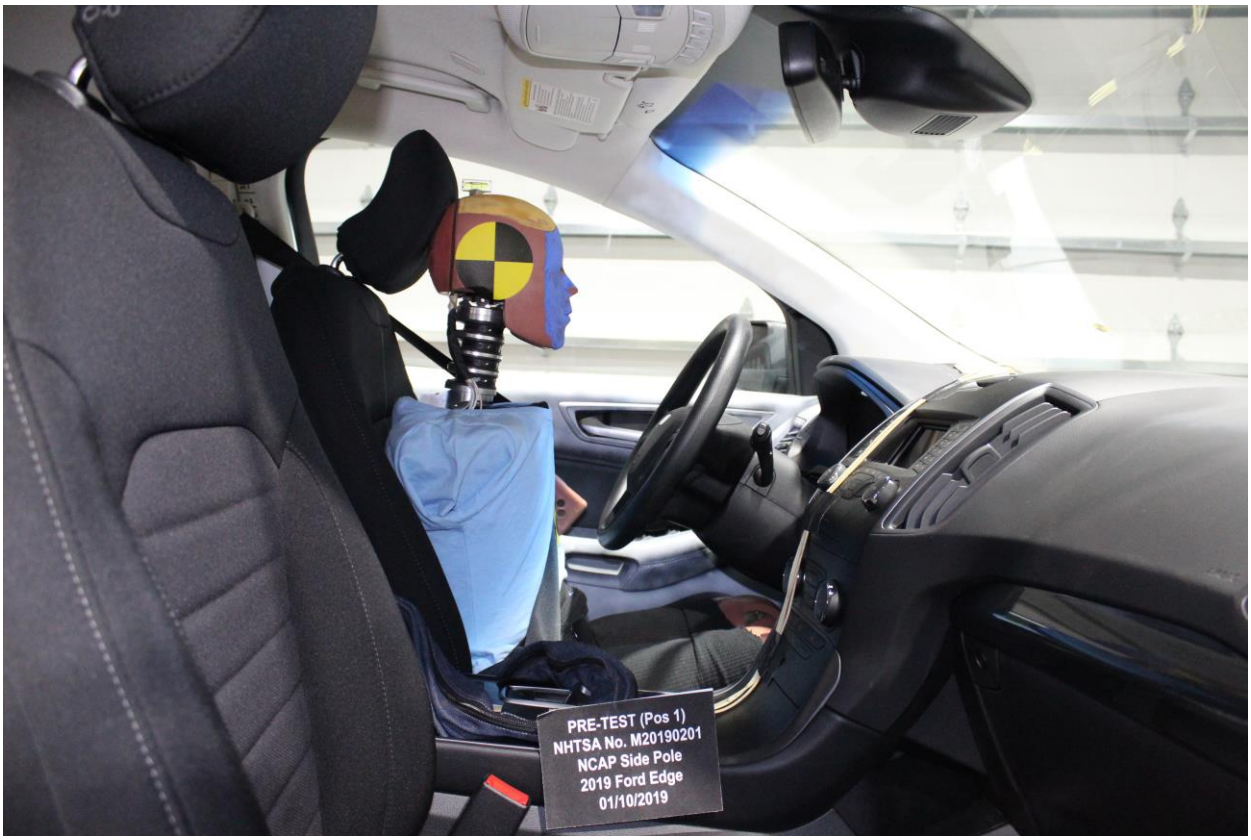


Figure A-42: Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment

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

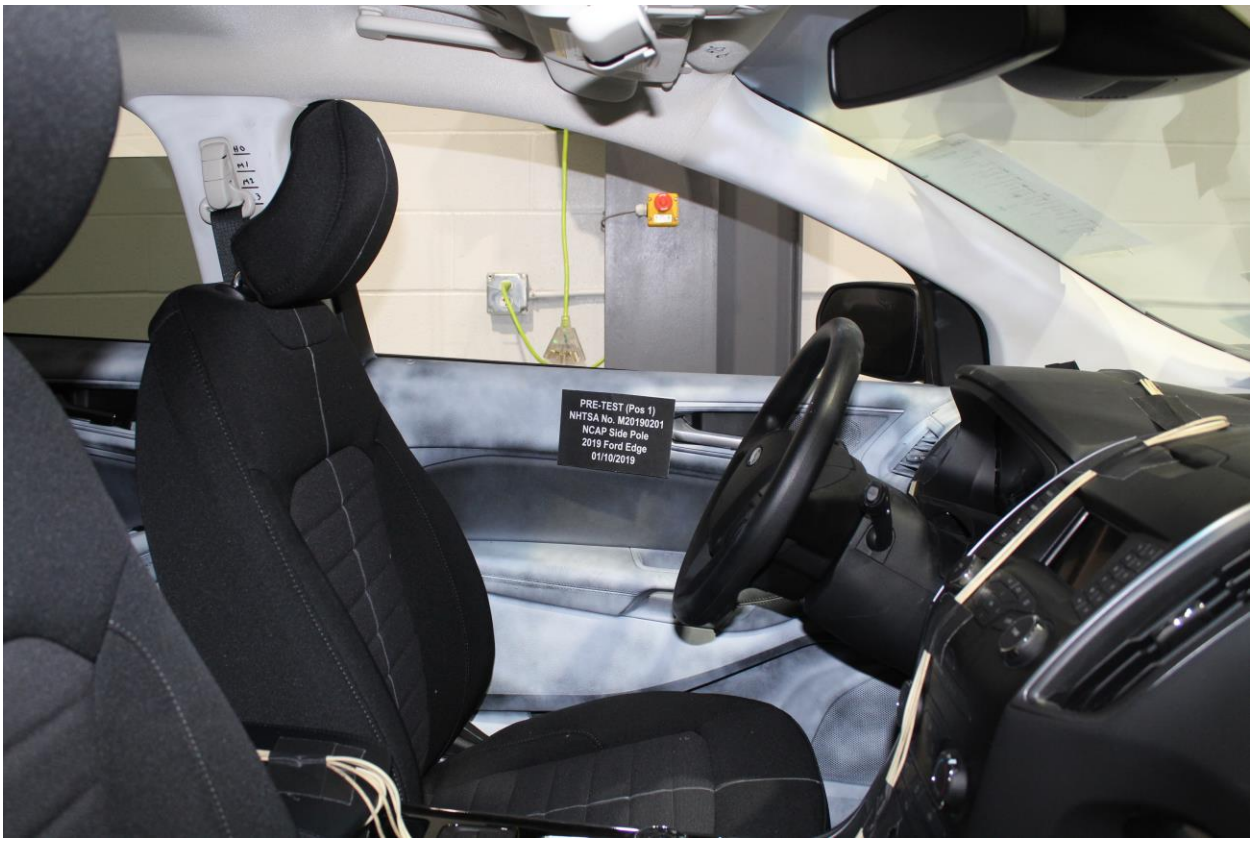


Figure A-44: Pre-Test Inner Door Panel View

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

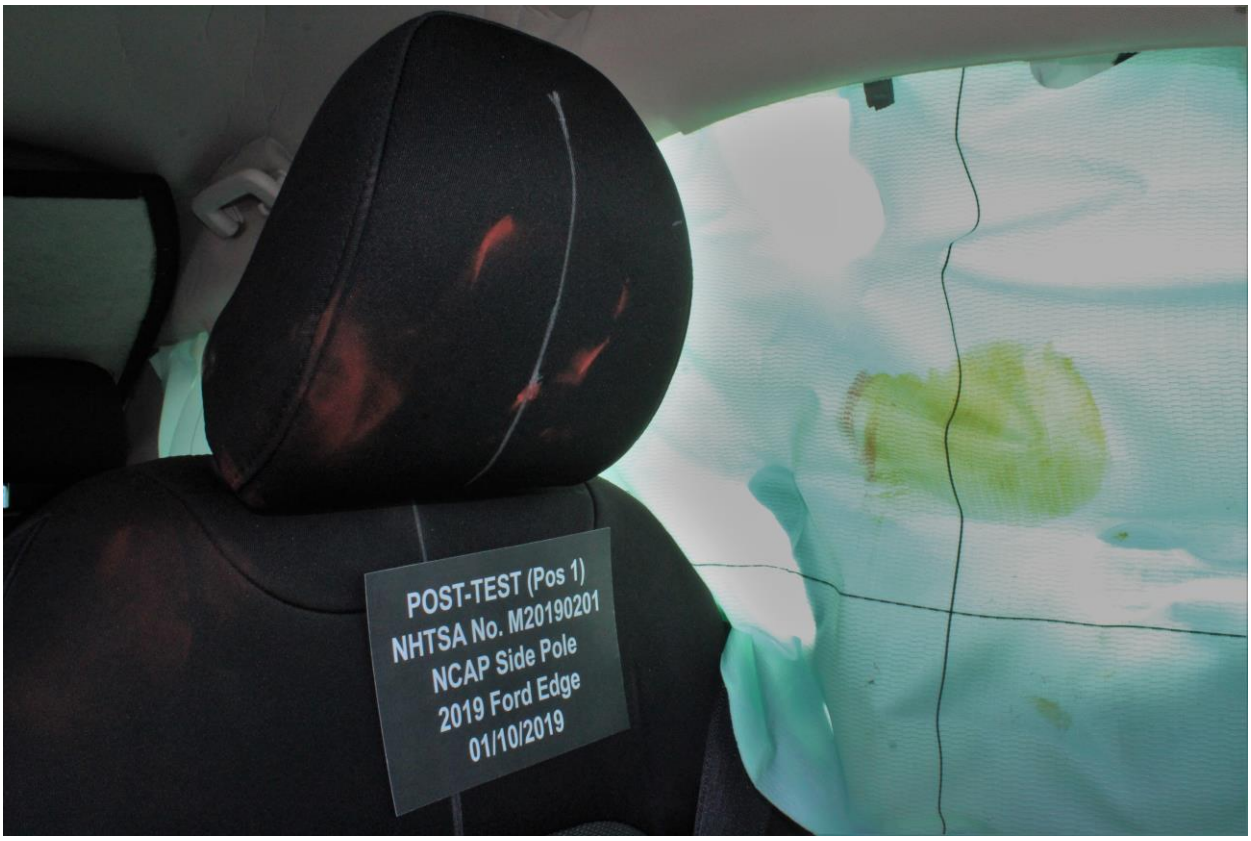


Figure A-46: Post-Test Dummy Close-Up Head Contact with Vehicle Interior View

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

Photo Not Applicable

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

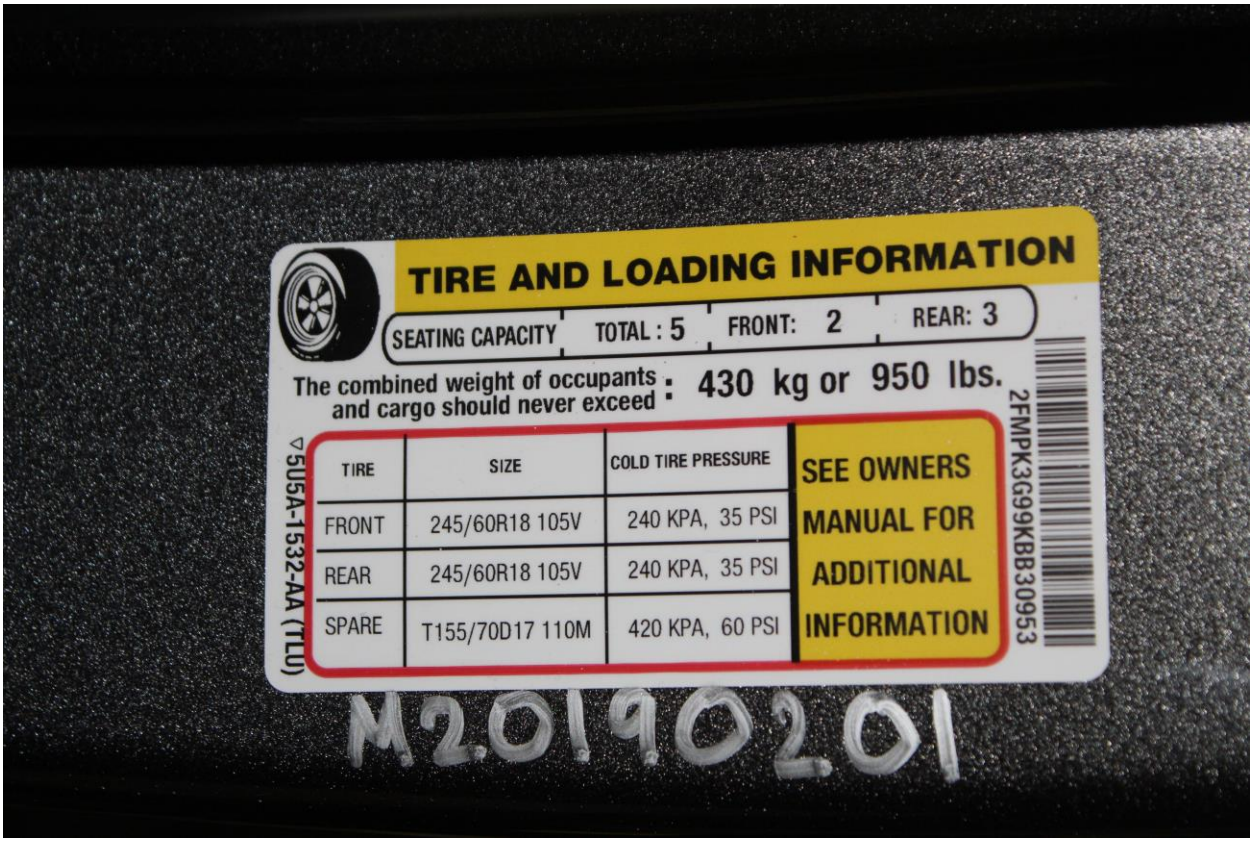


Figure A-56: Close-Up View of Vehicle's Tire Information Placard or Label

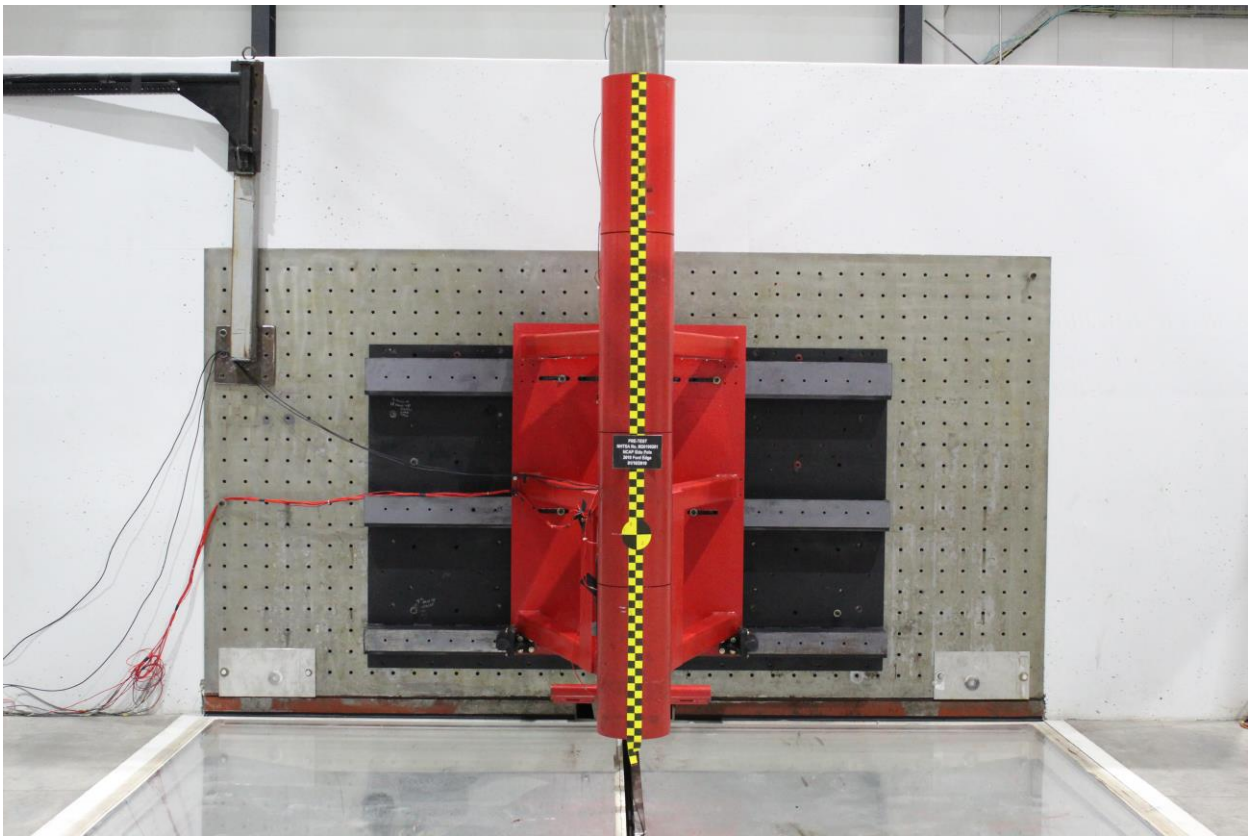


Figure A-57: Pre-Test Pole Barrier Front View

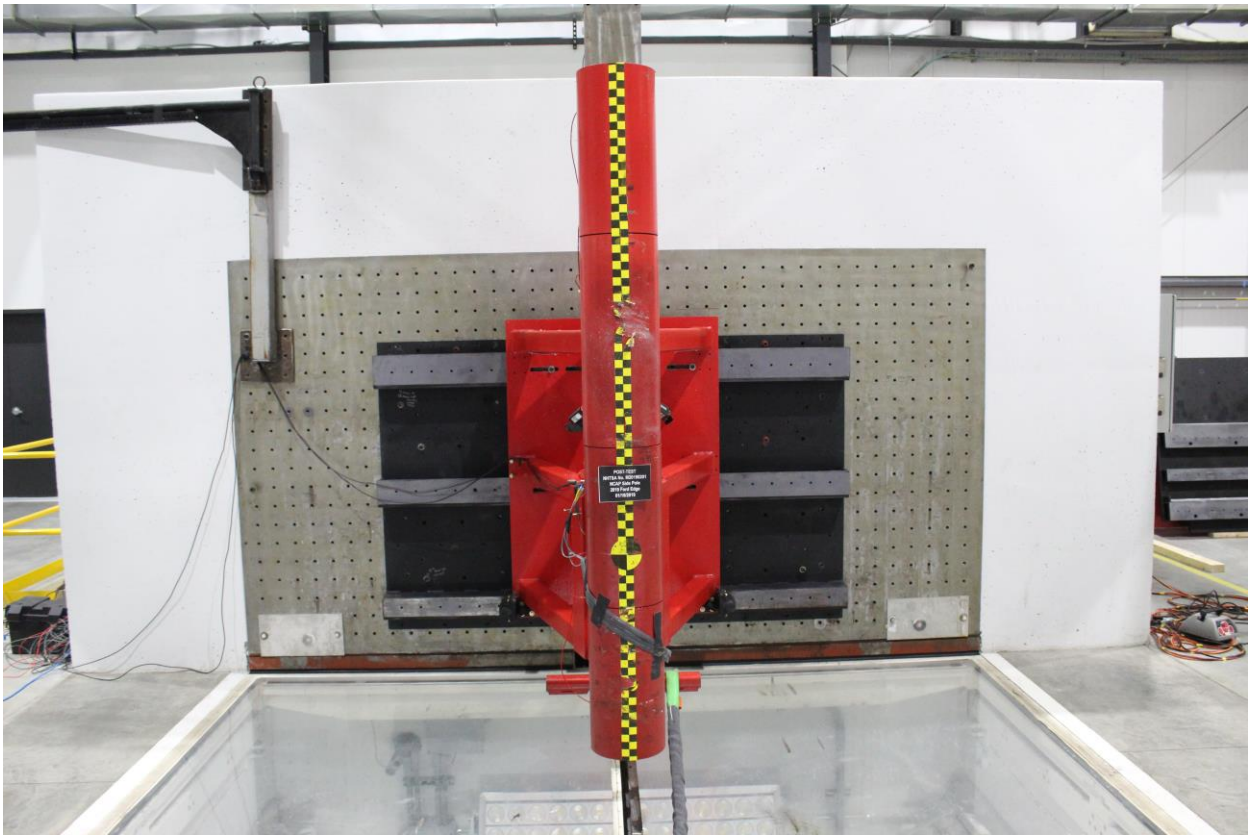


Figure A-58: Post-Test Pole Barrier Front View

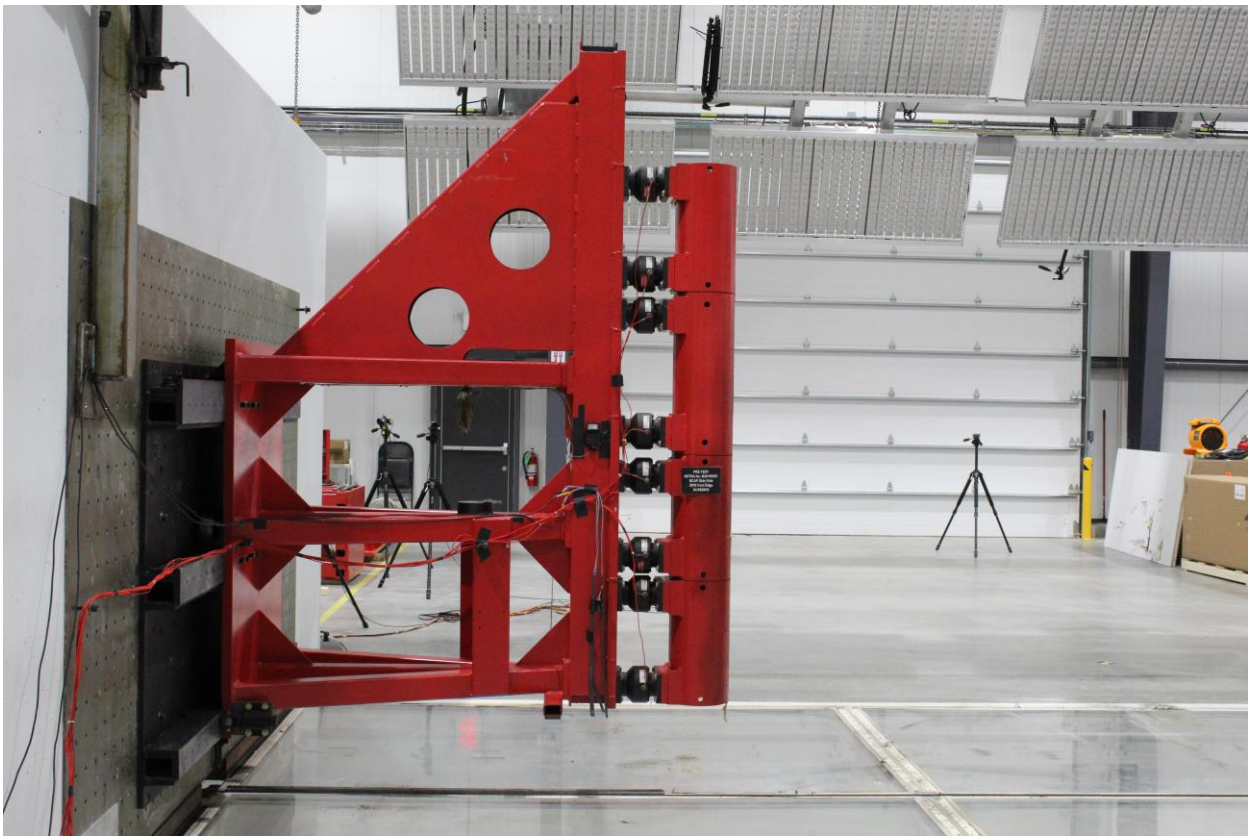


Figure A-59: Pre-Test Pole Barrier Side View

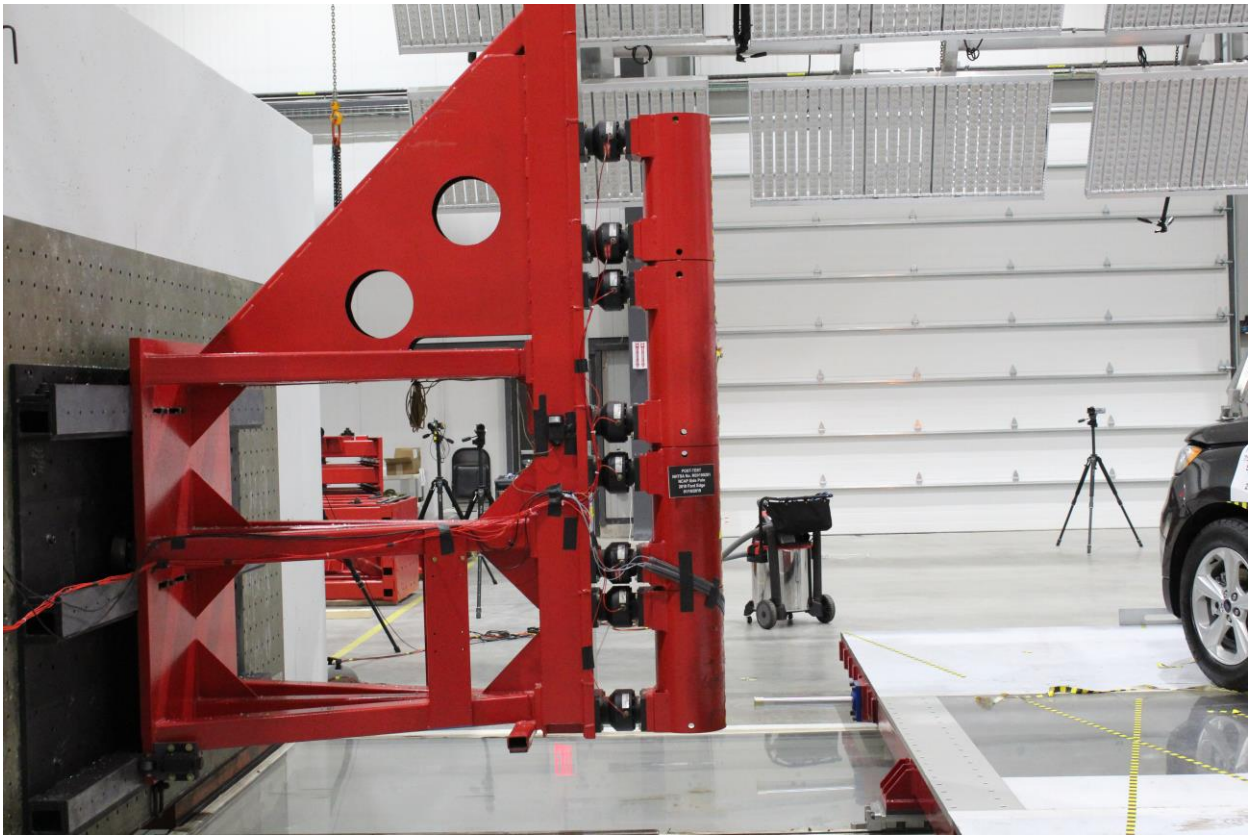


Figure A-60: Post-Test Pole Barrier Side View

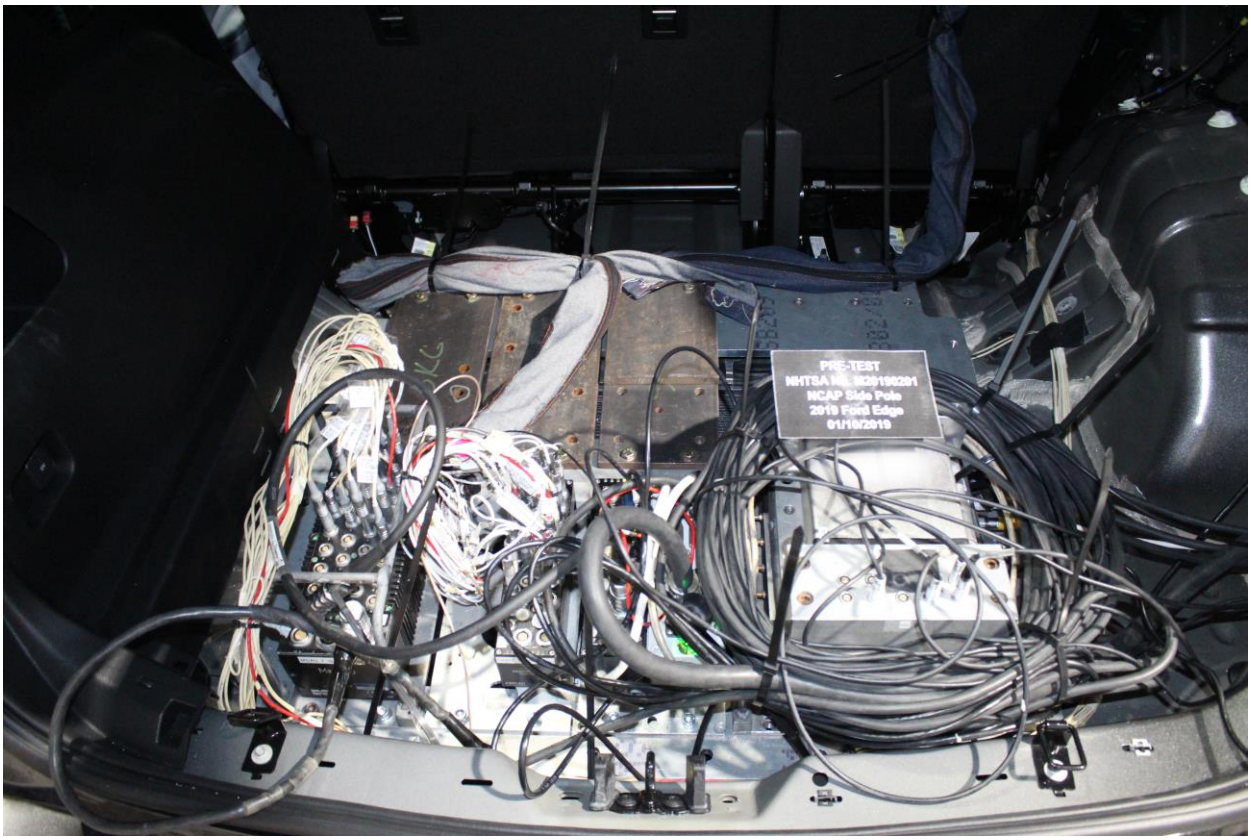


Figure A-61: Pre-Test Ballast View

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

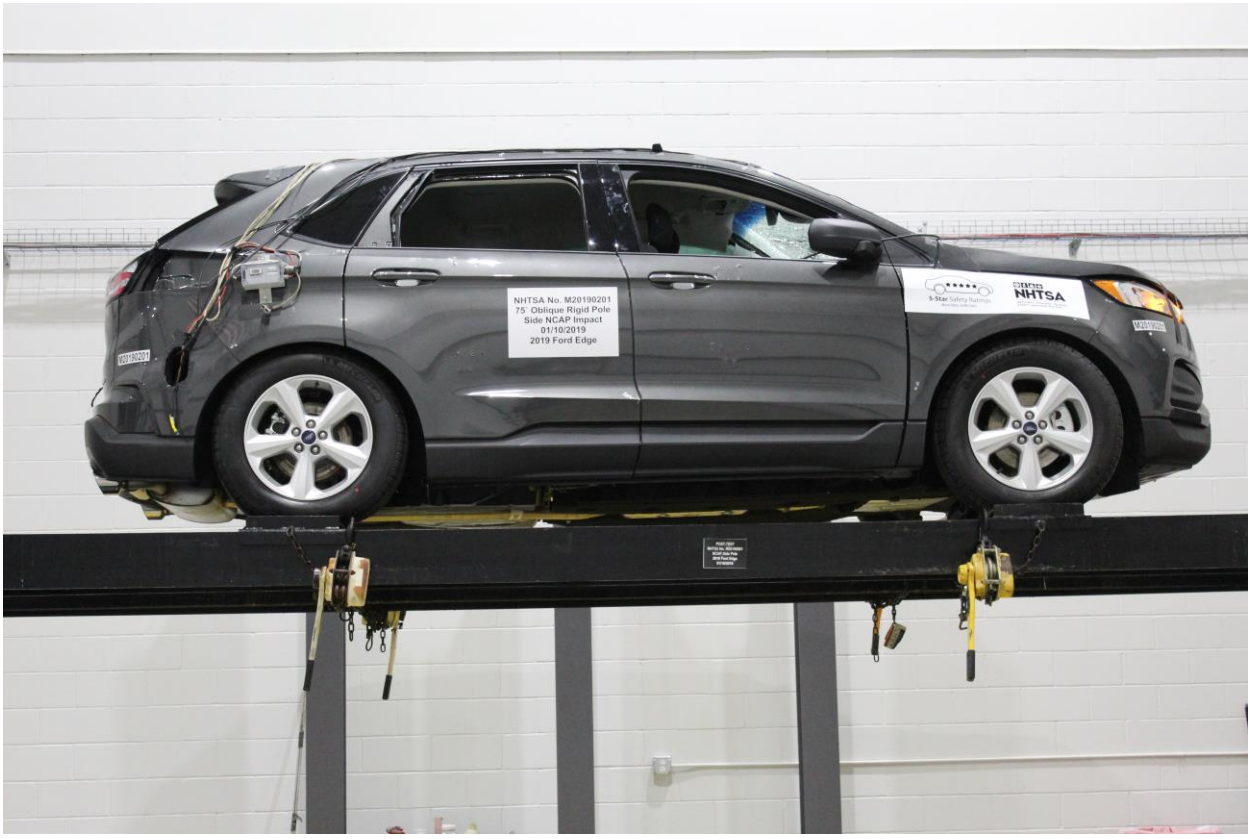


Figure A-63: FMVSS No. 301 Static Rollover 0 Degrees

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

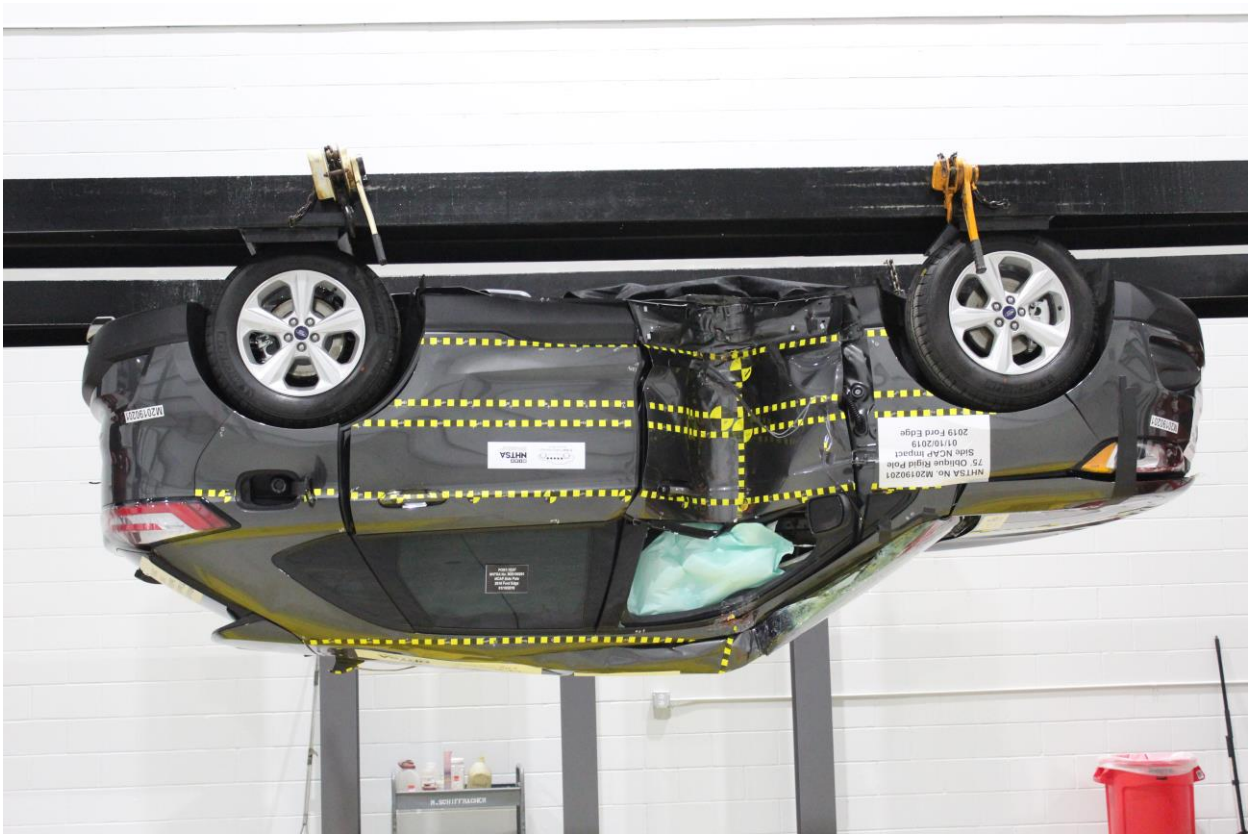


Figure A-65: FMVSS No. 301 Static Rollover 180 Degrees

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

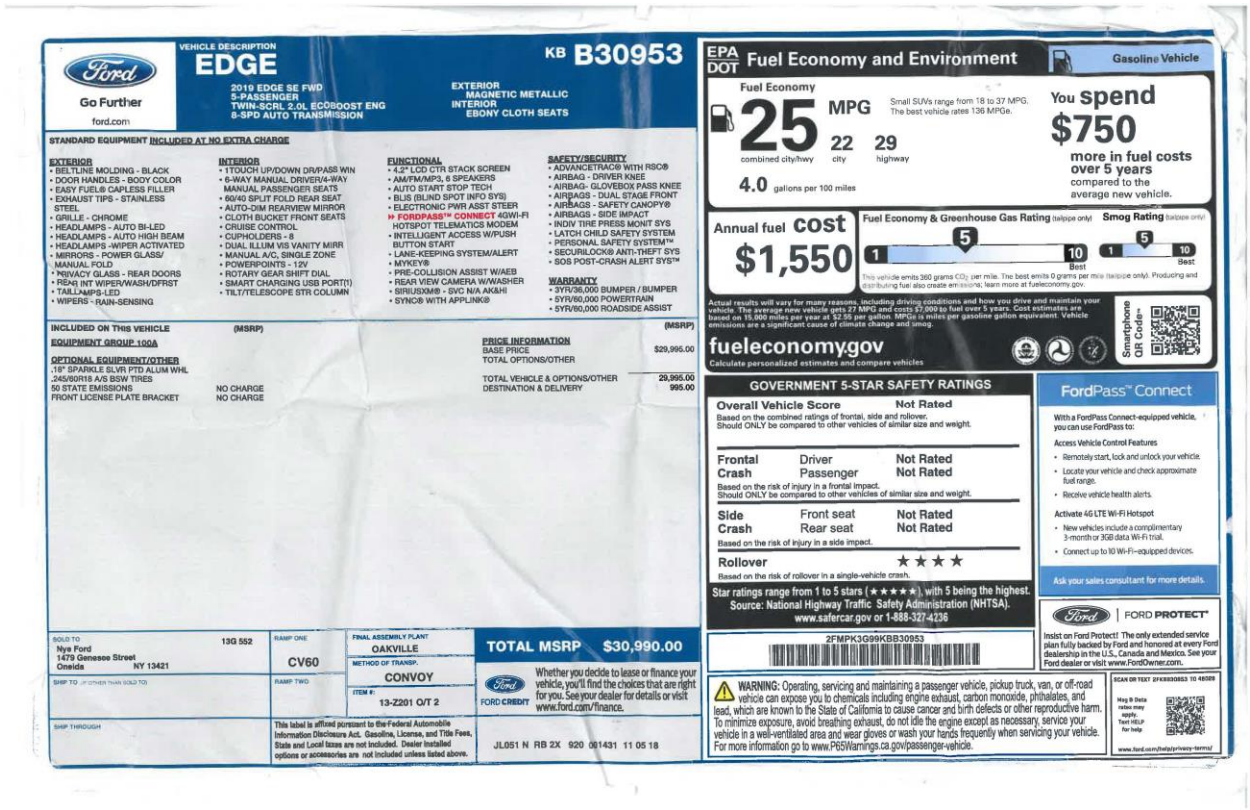
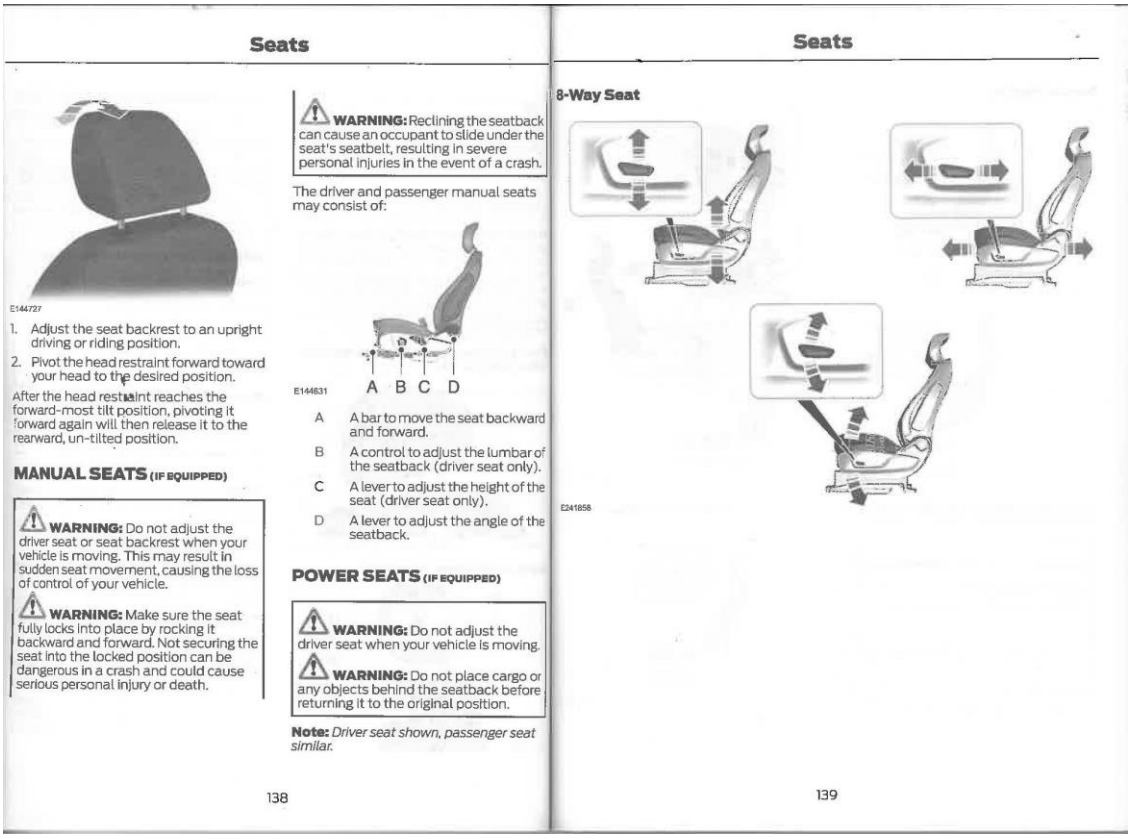


Figure A-69: Monroney Label



Seats

E144727

1. Adjust the seat backrest to an upright driving or riding position.
2. Pivot the head restraint forward toward your head to the desired position.

After the head restraint reaches the forward-most tilt position, pivoting it forward again will then release it to the rearward, un-tilted position.

MANUAL SEATS (IF EQUIPPED)

WARNING: Do not adjust the driver seat or seat backrest when your vehicle is moving. This may result in sudden seat movement, causing the loss of control of your vehicle.

WARNING: Make sure the seat fully locks into place by rocking it backward and forward. Not securing the seat into the locked position can be dangerous in a crash and could cause serious personal injury or death.

WARNING: Reclining the seatback can cause an occupant to slide under the seat's seatbelt, resulting in severe personal injuries in the event of a crash.

The driver and passenger manual seats may consist of:

E144631 A B C D

A — A bar to move the seat backward and forward.

B — A control to adjust the lumbar of the seatback (driver seat only).

C — A lever to adjust the height of the seat (driver seat only).

D — A lever to adjust the angle of the seatback.

POWER SEATS (IF EQUIPPED)

WARNING: Do not adjust the driver seat when your vehicle is moving.

WARNING: Do not place cargo or any objects behind the seatback before returning it to the original position.

Note: *Driver seat shown, passenger seat similar.*

138

Seats

8-Way Seat

E241858

139

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

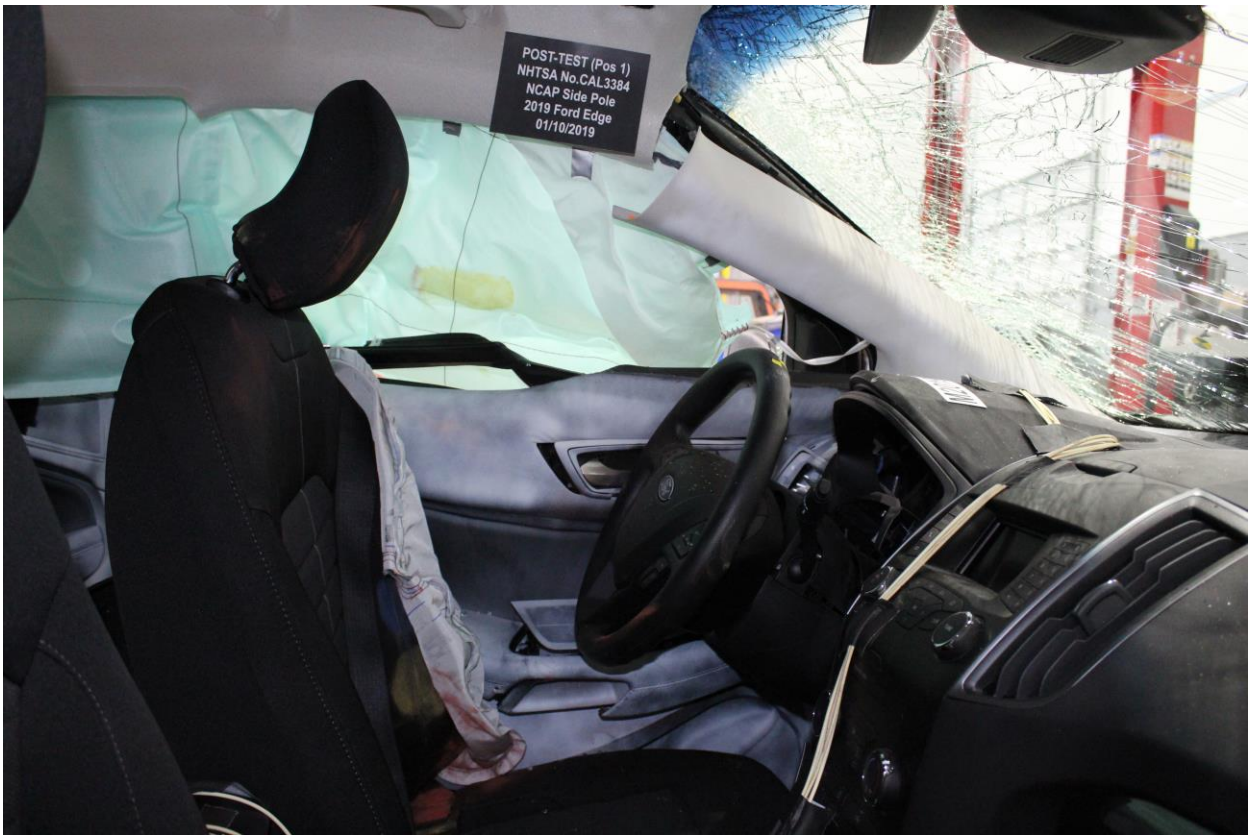


Figure A-71: Post-Test View of Shattered Vehicle Inner Door Panel (if applicable)

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.dot.gov.

Additional Driver Dummy Instrumentation Data

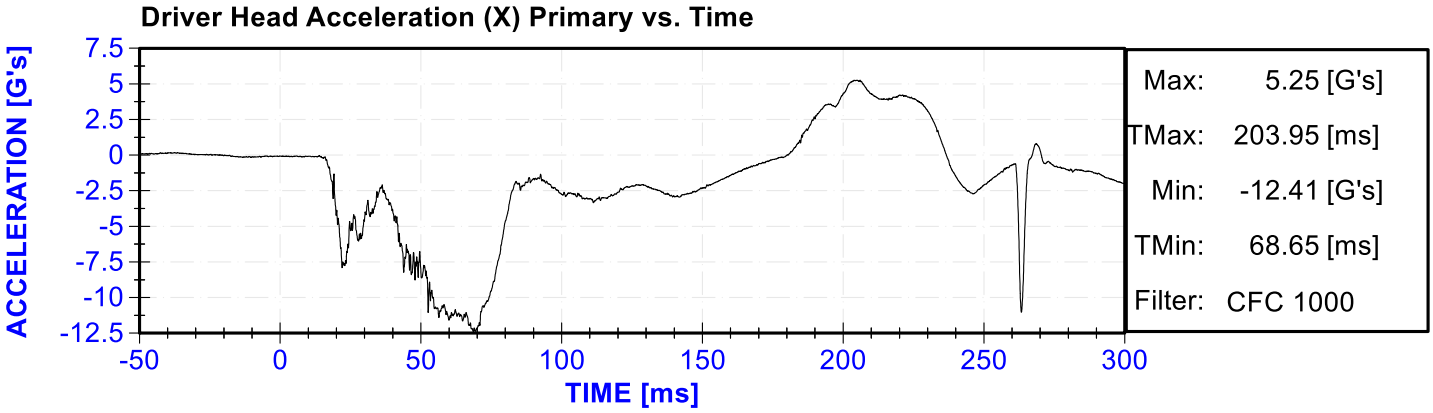
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection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

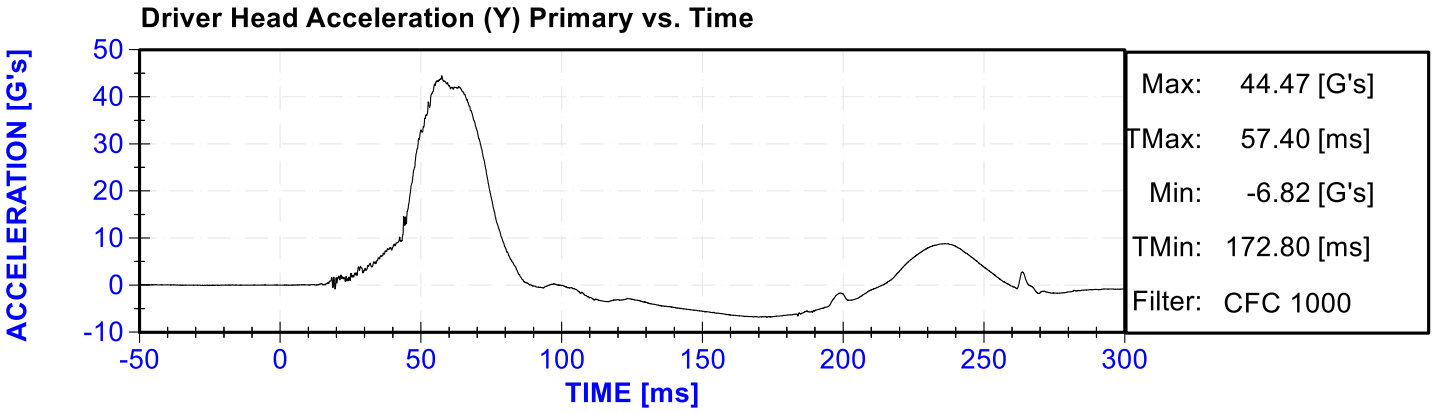
Vehicle Instrumentation Data

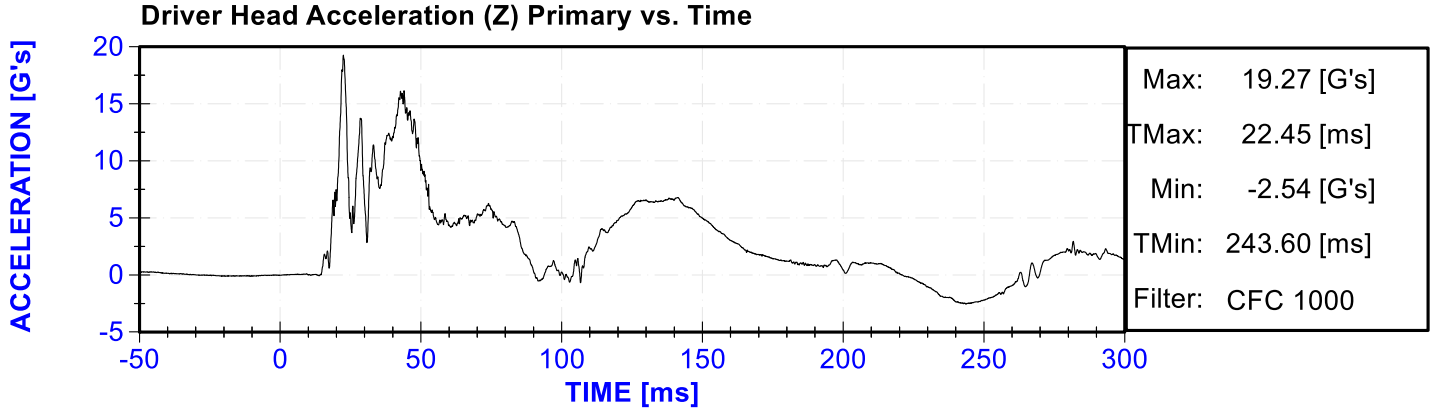
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration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

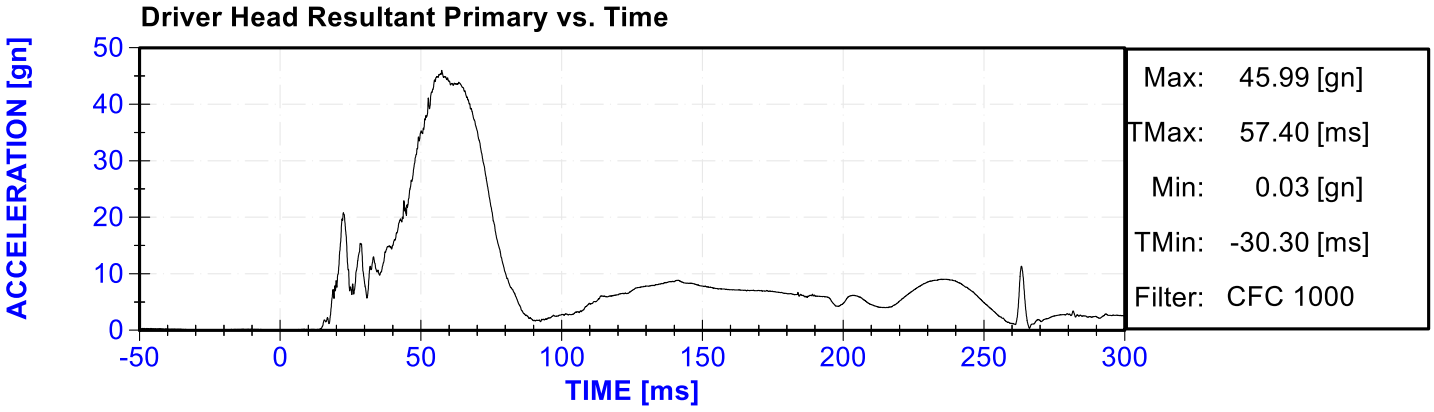
Pole Instrumentation Data

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)

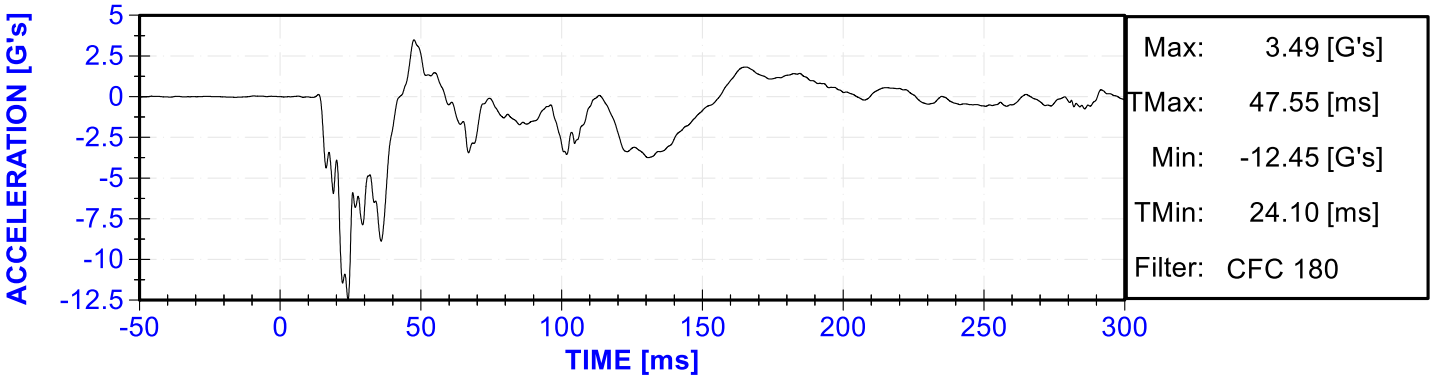

Driver Head Acceleration (X) Primary vs. Time
ACCELERATION [G's]
TIME [ms]
Max: 5.25 [G's]
TMax: 203.95 [ms]
Min: -12.41 [G's]
TMin: 68.65 [ms]
Filter: CFC 1000


Driver Head Acceleration (Y) Primary vs. Time
ACCELERATION [G's]
TIME [ms]
Max: 44.47 [G's]
TMax: 57.40 [ms]
Min: -6.82 [G's]
TMin: 172.80 [ms]
Filter: CFC 1000

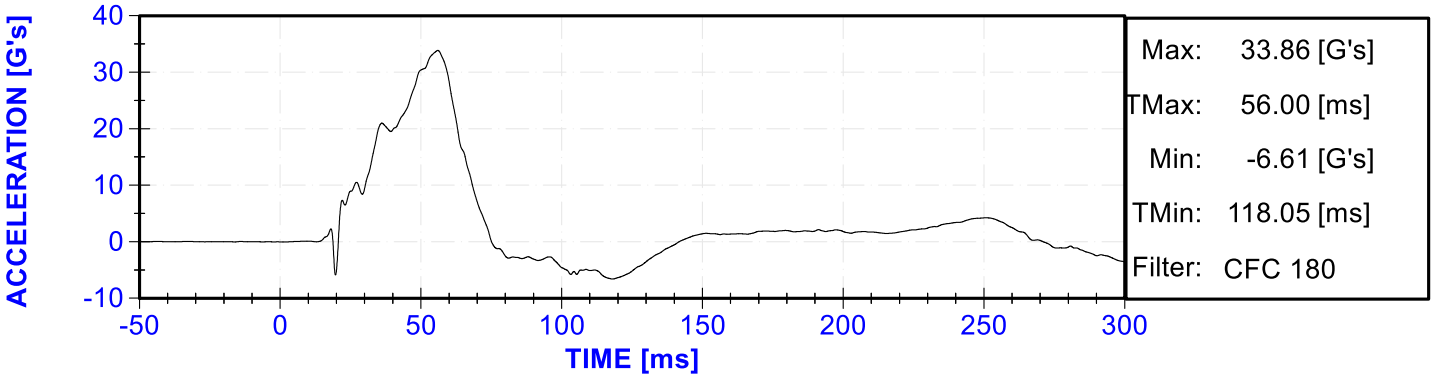

Driver Head Acceleration (Z) Primary vs. Time
ACCELERATION [G's]
TIME [ms]
Max: 19.27 [G's]
TMax: 22.45 [ms]
Min: -2.54 [G's]
TMin: 243.60 [ms]
Filter: CFC 1000


Driver Head Resultant Primary vs. Time
ACCELERATION [gn]
TIME [ms]
Max: 45.99 [gn]
TMax: 57.40 [ms]
Min: 0.03 [gn]
TMin: -30.30 [ms]
Filter: CFC 1000

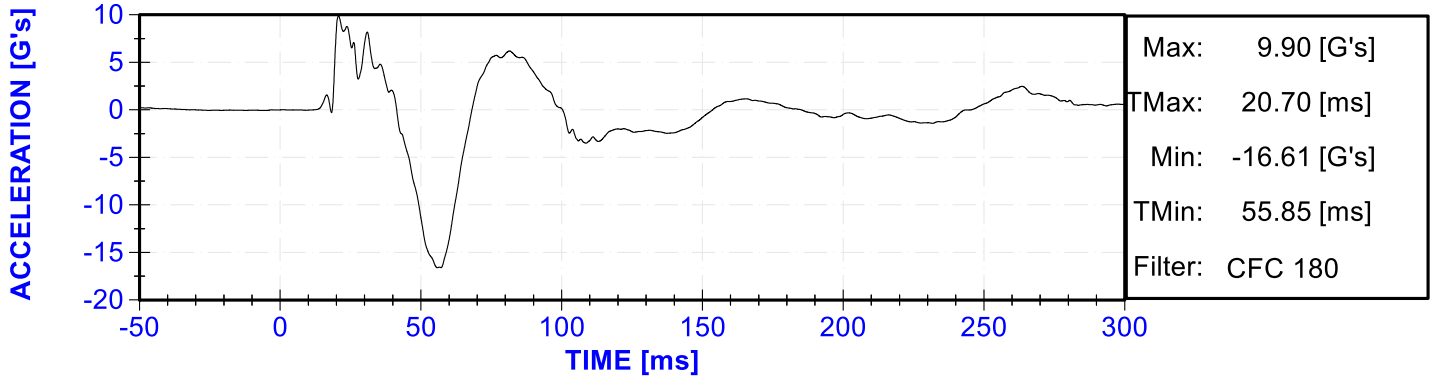
Driver Lower Spine T12 Acceleration (X) vs. Time



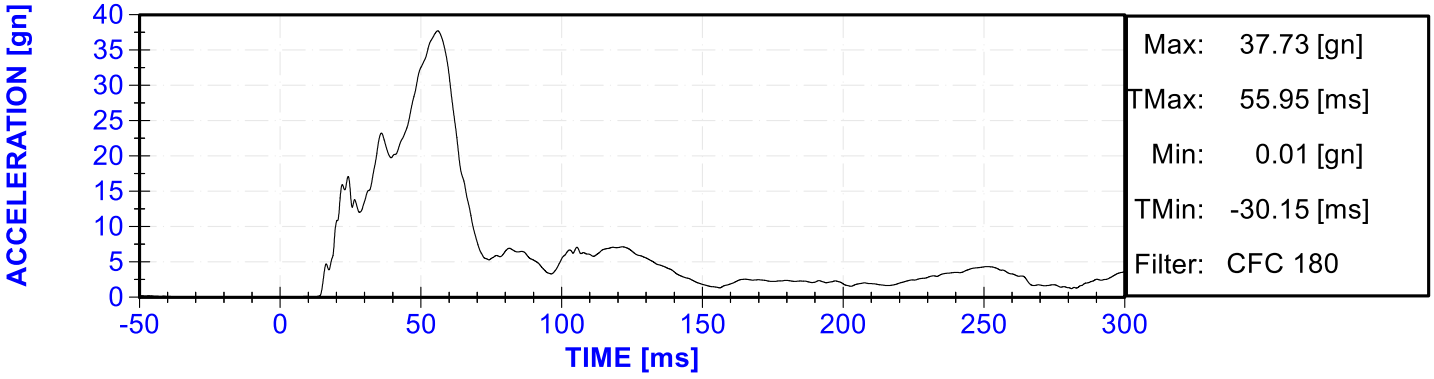
Driver Lower Spine T12 Acceleration (Y) vs. Time



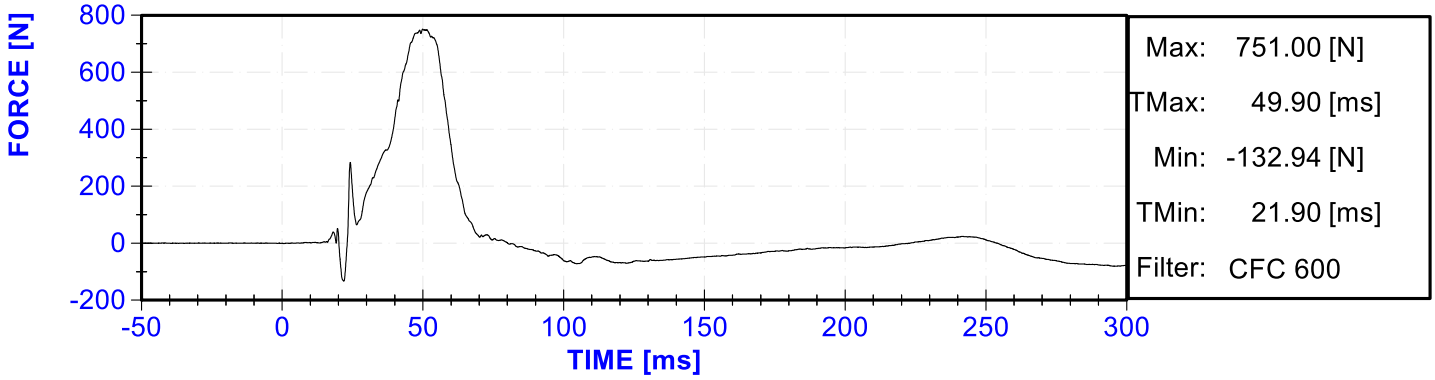
Driver Lower Spine T12 Acceleration (Z) vs. Time



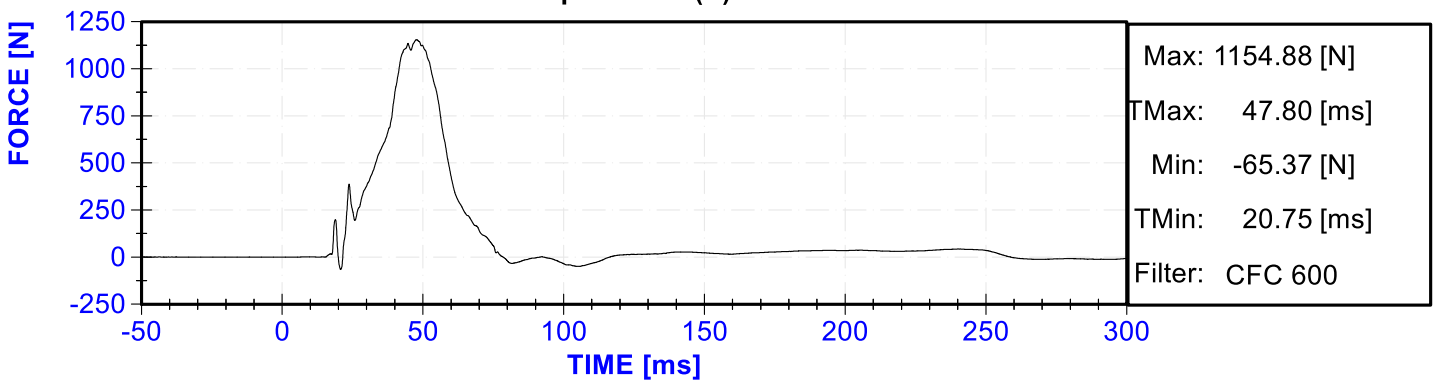
Driver Lower Spine T12 Resultant Acceleration vs. Time



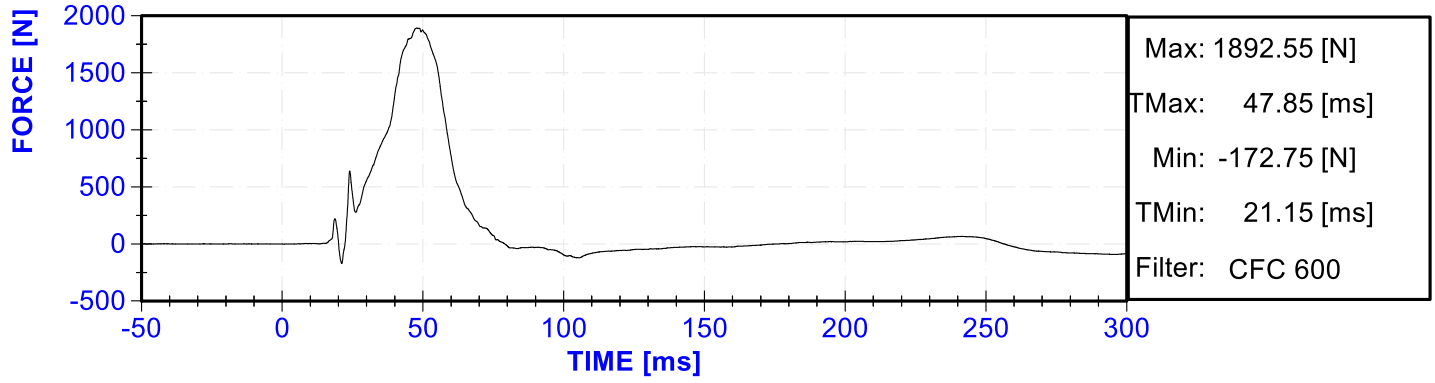
Driver Iliac Wing Force on Impact Side (Y) vs. Time



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

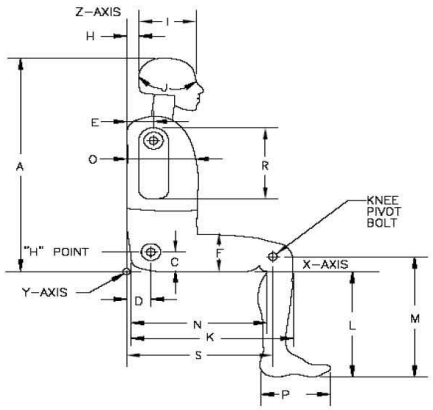
SERIAL NO: DG8012

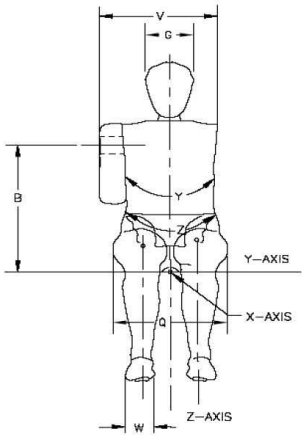
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Dutton Date: 12/21/2018

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	780	Pass
B	Shoulder Pivot Height	437	453	447	Pass
C	H-point Height	79	89	86	Pass
D	H-point from seatback	141	151	147	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	128	Pass
G	Head Breadth	140	148	143	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	185	Pass
J	Head Circumference	541	551	546	Pass
K	Buttock to Knee Length	514	540	531	Pass
L	Popliteal Height	343	369	356	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	429	Pass
O	Chest Depth w/o jacket	195	211	206	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	484	Pass
V	Shoulder Width	341	357	344	Pass
W	Foot Width	78	94	83	Pass
Y	Chest Circumference w/jacket	851	881	867	Pass
Z	Waist Circumference	761	791	778	Pass

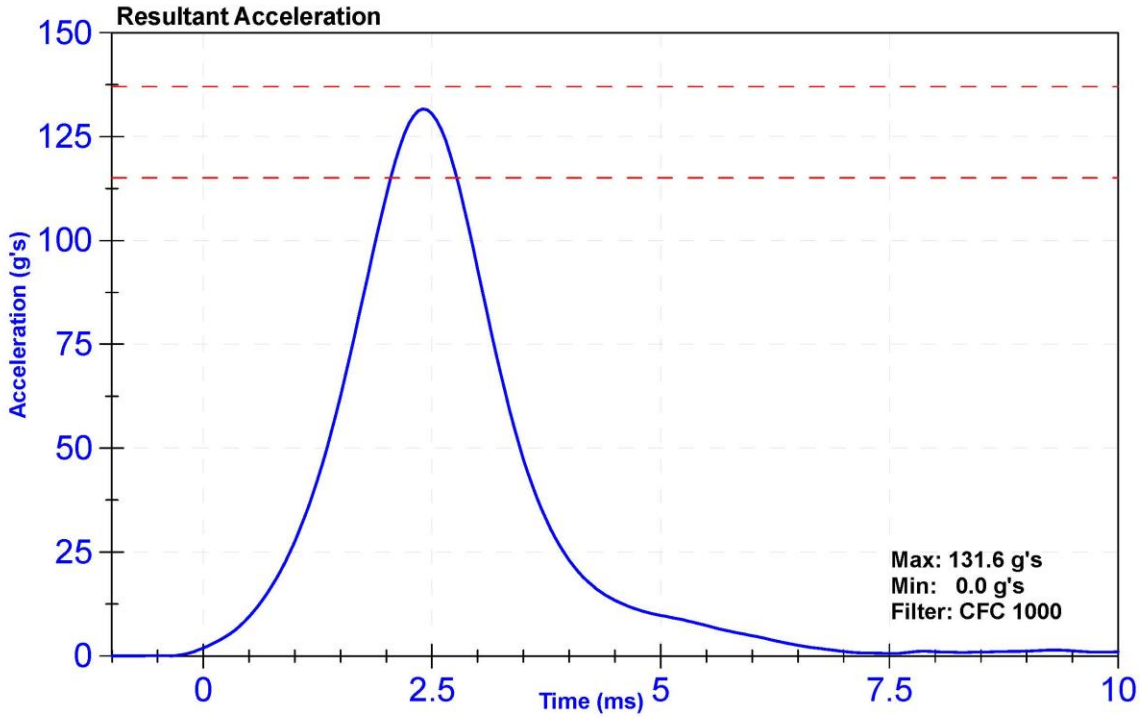
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

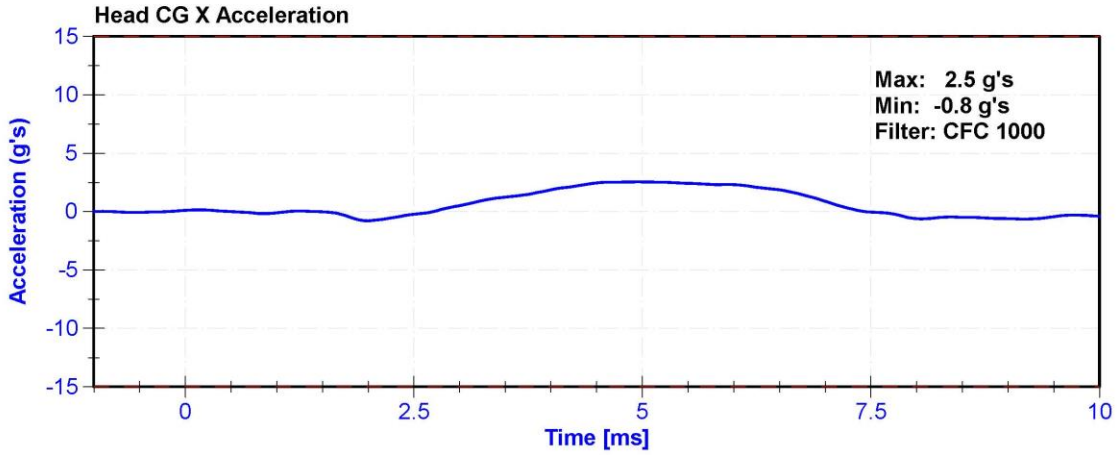
Results

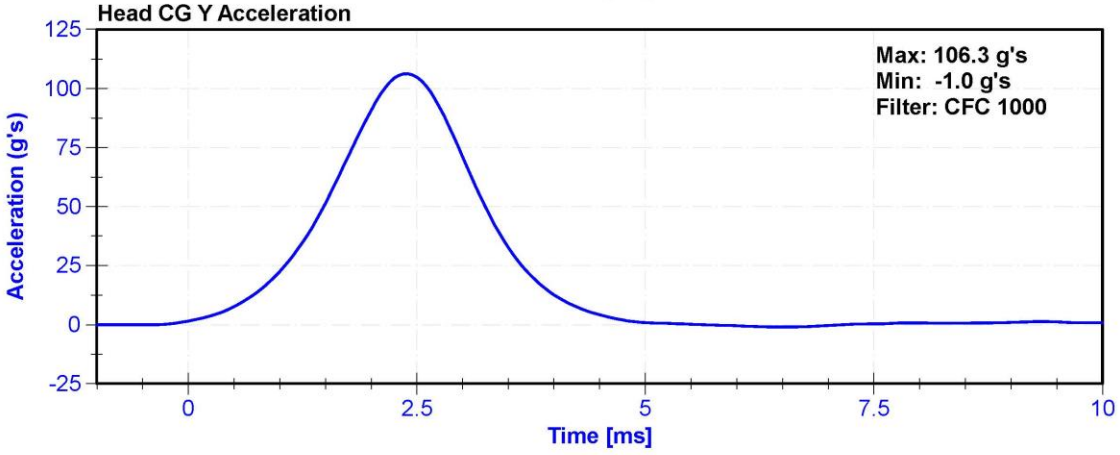
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	20.6	Pass
Resultant Acceleration	115	137	g's	131.6	Pass
Oscillation	0	15	%	1.0	Pass
Fore-Aft Acceleration	-15	15	g's	2.5	Pass

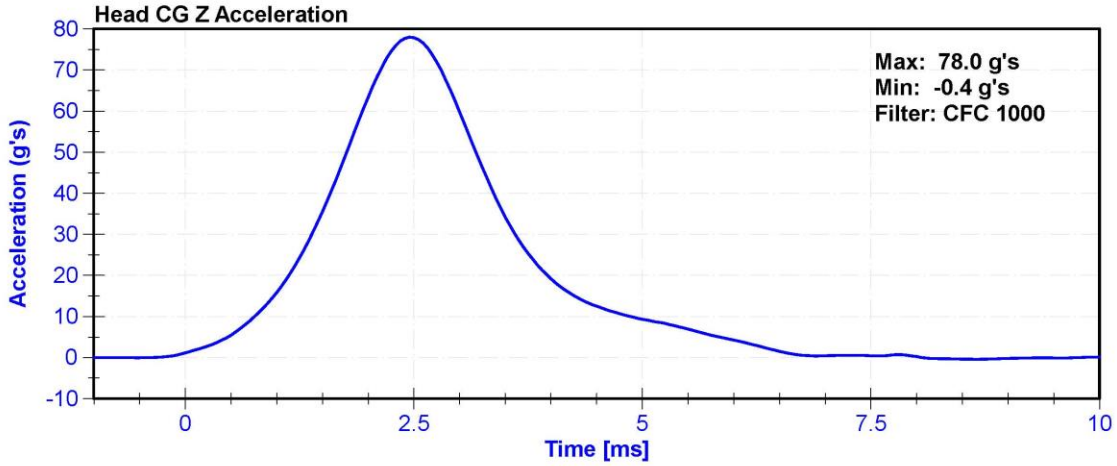
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P74788	10/18/2018	4/18/2019
Y Accelerometer	ENDEVCO 7264CT	AC-P83432	10/18/2018	4/18/2019
Z Accelerometer	ENDEVCO 7264	AC-P83319	10/18/2018	4/18/2019




Head CG X Acceleration
Max: 2.5 g's
Min: -0.8 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 106.3 g's
Min: -1.0 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 78.0 g's
Min: -0.4 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

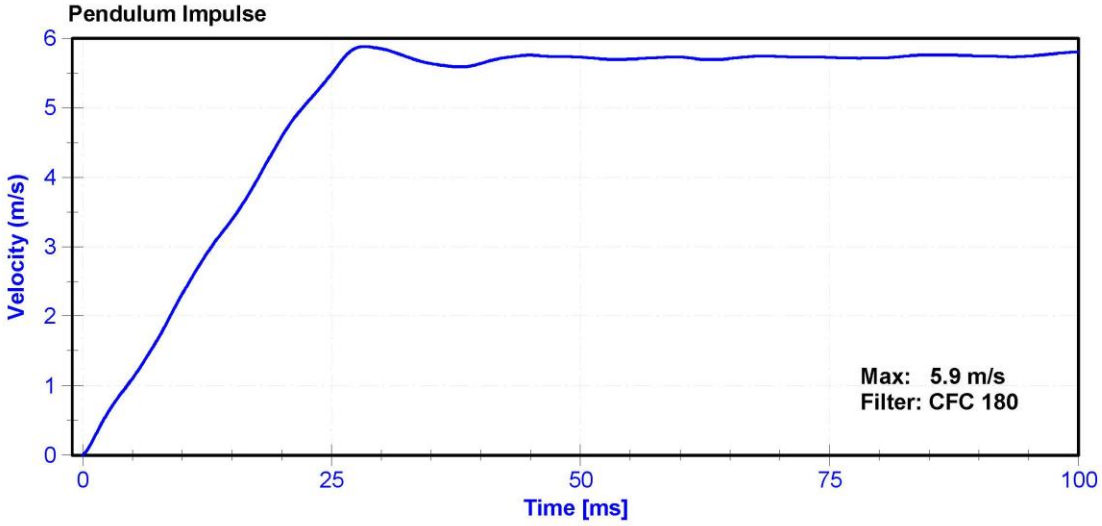
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

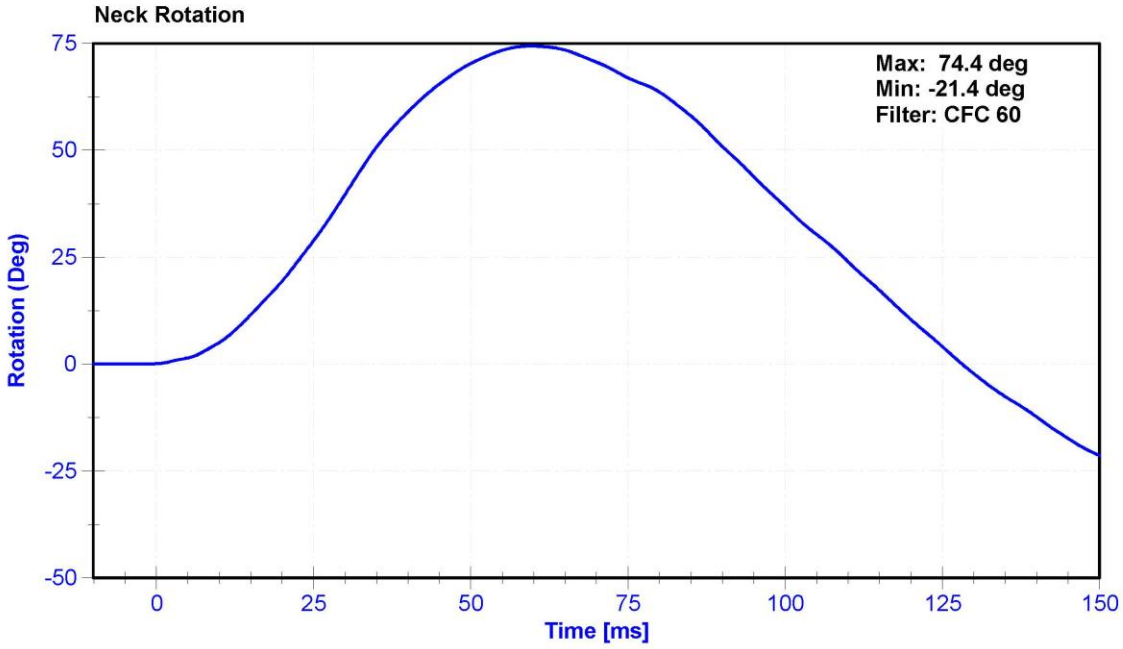
Results

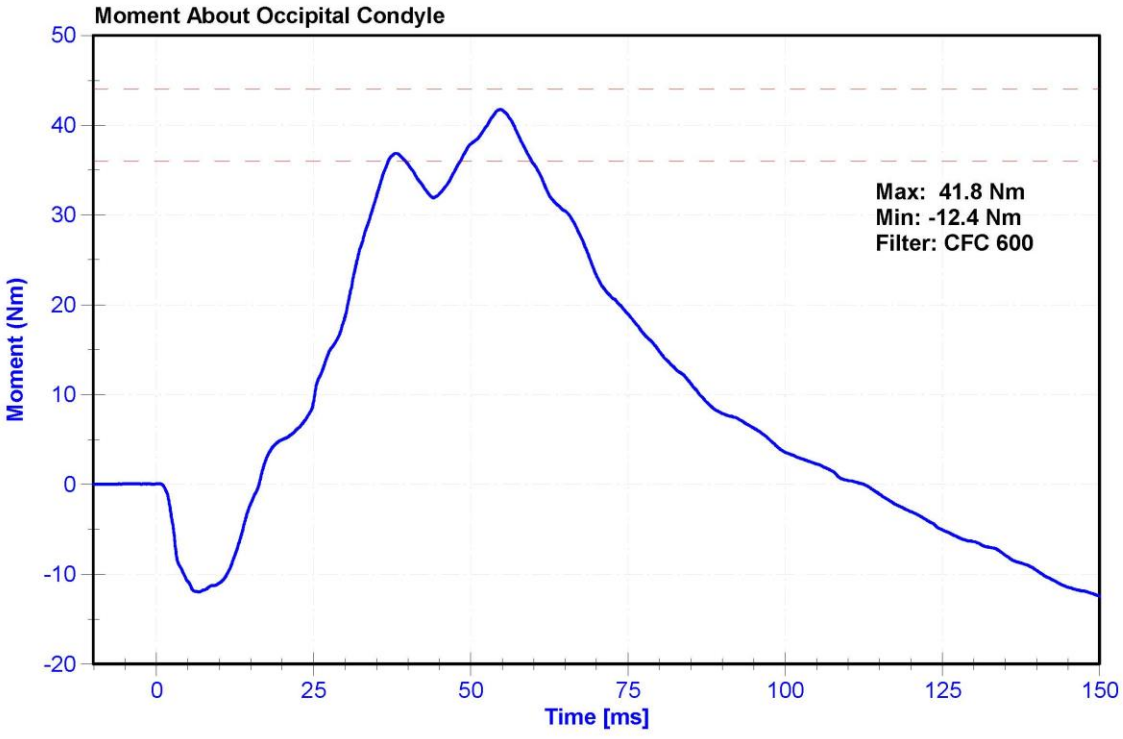
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	39.2	Pass
Velocity	5.51	5.63	m/s	5.546	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.32	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.39	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.59	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.49	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.88	Pass
Neck Rotation	71	81	deg	74.4	Pass
Time at Maximum Rotation	50	70	ms	59.6	Pass
Moment about the OC	36	44	Nm	41.8	Pass
Moment Decay to 0 Nm	102	126	ms	112.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	11/1/2018	11/1/2019
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/1/2018	11/1/2019
Upper Neck Load Cell	Denton 1716	LC-2018 FY	9/28/2018	9/28/2019




Neck Rotation
Max: 74.4 deg
Min: -21.4 deg
Filter: CFC 60
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 41.8 Nm
Min: -12.4 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

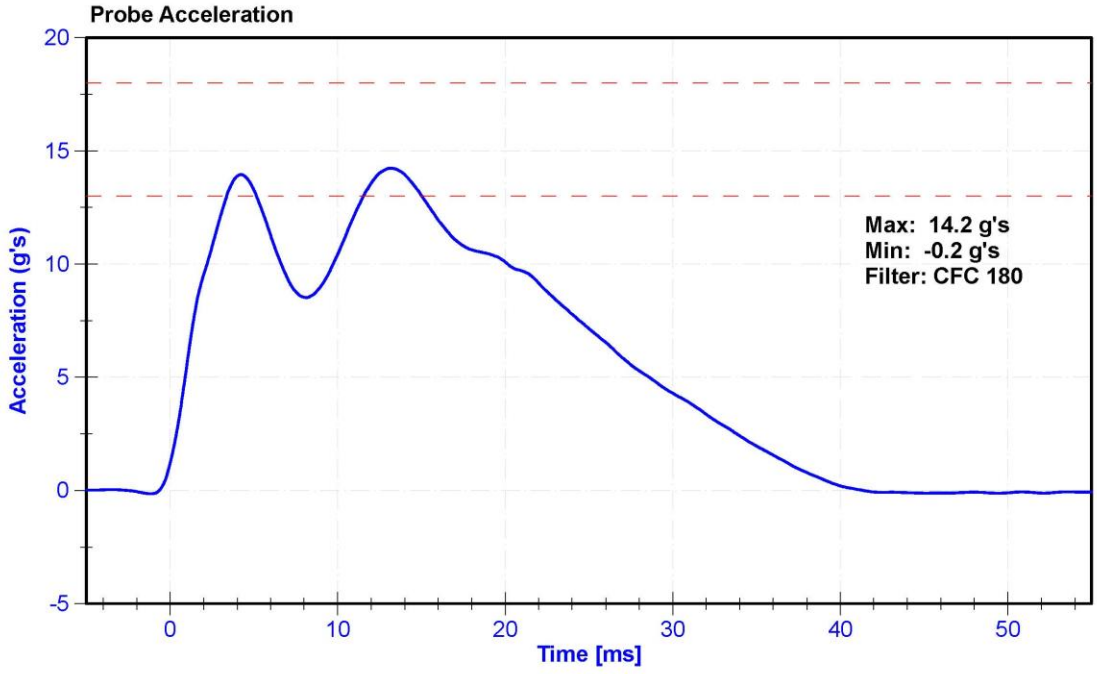
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

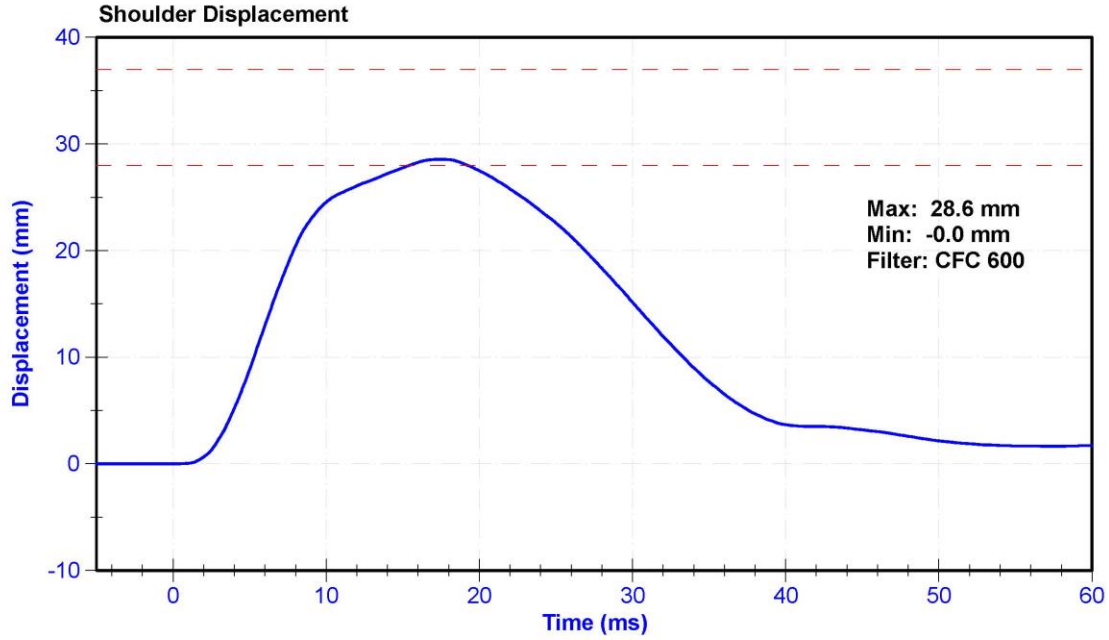
Results

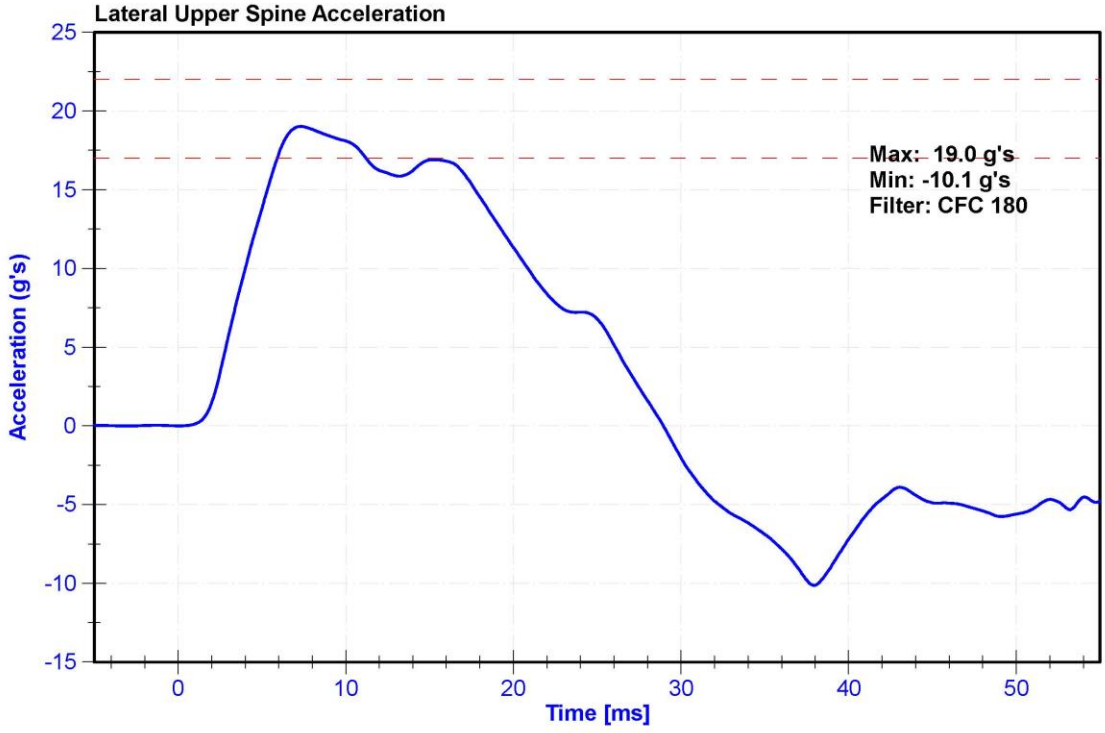
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.7	Pass
Humidity	10	70	%	27.1	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	13	18	g's	14.2	Pass
Shoulder Deflection	28	37	mm	28.6	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	10/11/2018	10/11/2019
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/23/2018	4/23/2019




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: 19.0 g's
Min: -10.1 g's
Filter: CFC 180

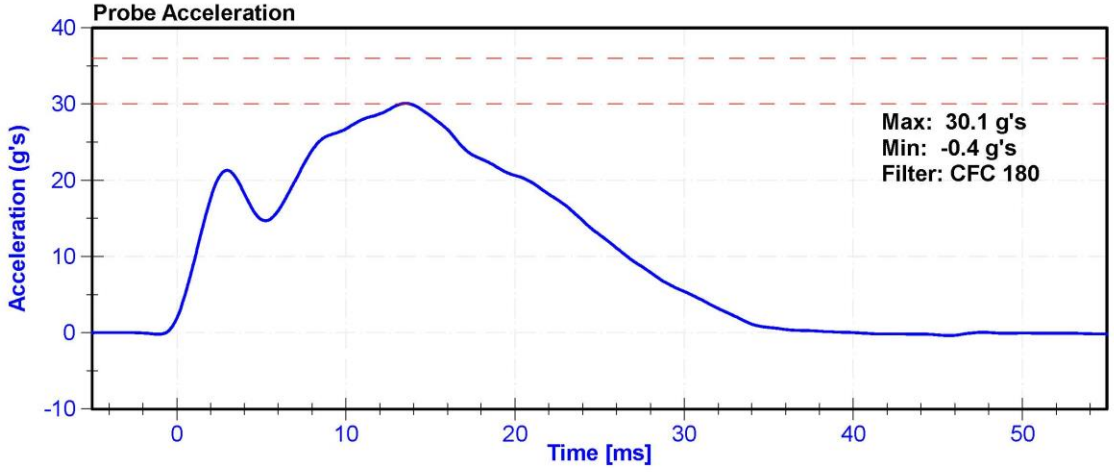
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

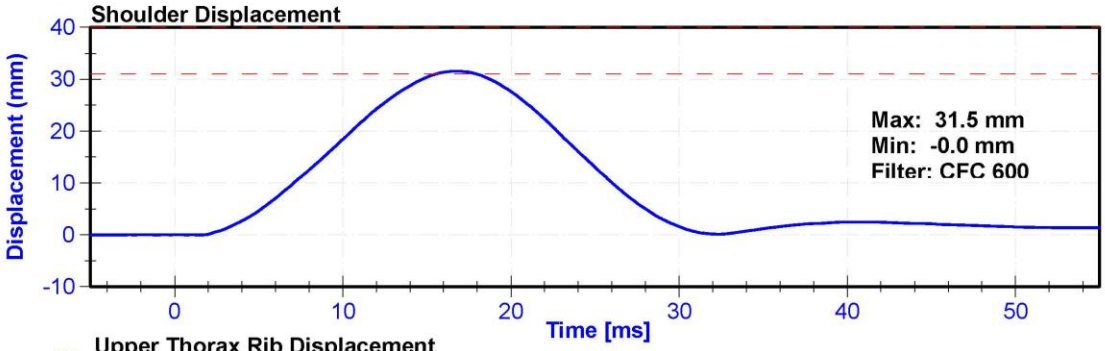
Results

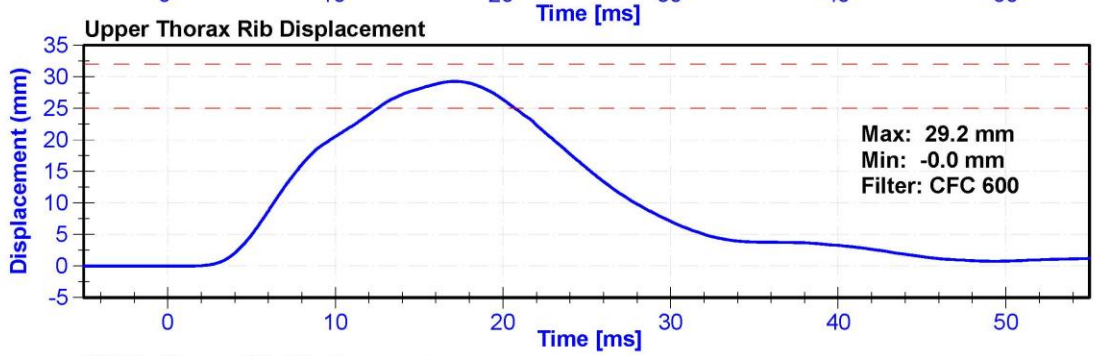
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.0	Pass
Humidity	10	70	%	26.1	Pass
Velocity	6.6	6.8	m/s	6.74	Pass
Probe Acceleration after 5 ms	30	36	g's	30.1	Pass
Lateral Upper Spine Acceleration	34	43	g's	36.3	Pass
Lateral Lower Spine Acceleration	29	37	g's	31.8	Pass
Shoulder Deflection	31	40	mm	31.5	Pass
Upper Thorax Rib Deflection	25	32	mm	29.2	Pass
Mid Thorax Rib Deflection	30	36	mm	34.5	Pass
Lower Thorax Rib Deflection	32	38	mm	37.0	Pass

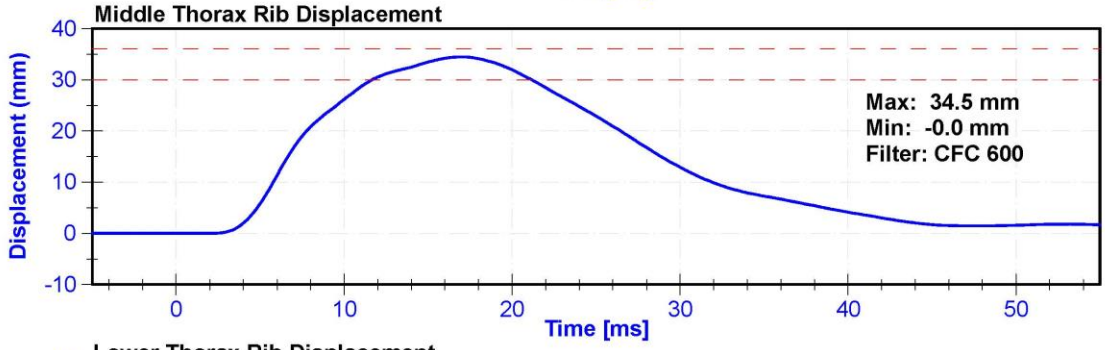
Transducer Calibrations

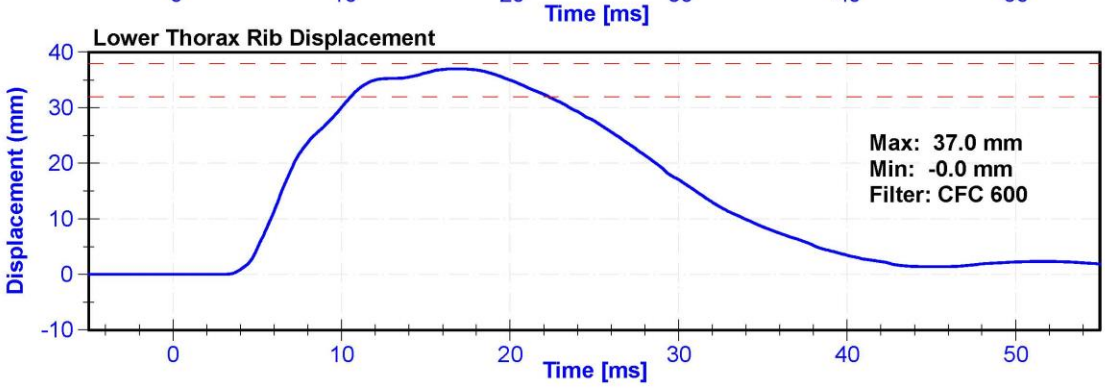
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/23/2018	4/23/2019
Upper Spine T12 Y Accelerometer	ENDEVCO 7264CT	AC-P51699	10/16/2018	4/16/2019
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	10/11/2018	10/11/2019
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/15/2018	5/15/2019
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	10/12/2018	10/12/2019
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	10/12/2018	10/12/2019

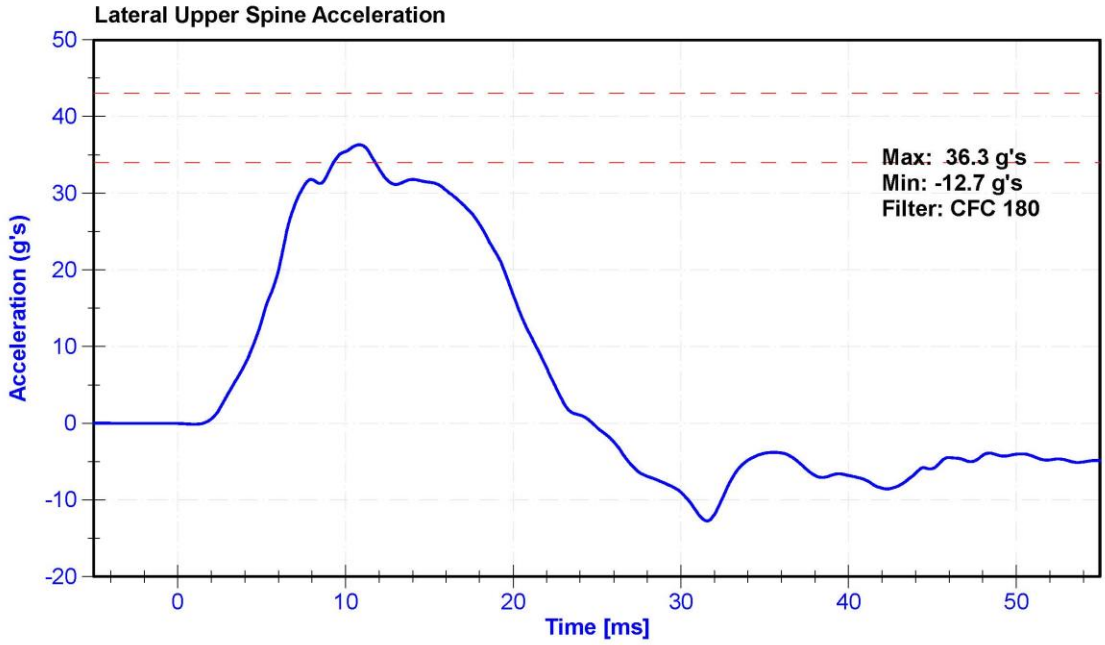


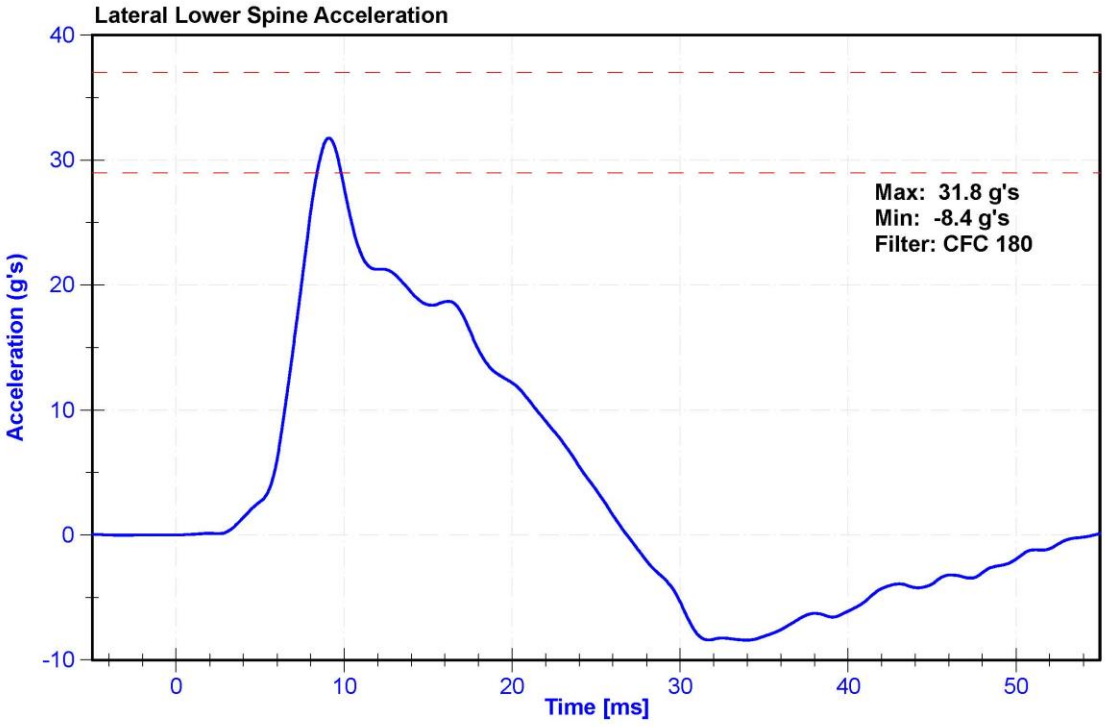

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 31.5 mm
Min: -0.0 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 29.2 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.5 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.0 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 36.3 g's
Min: -12.7 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: 31.8 g's
Min: -8.4 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

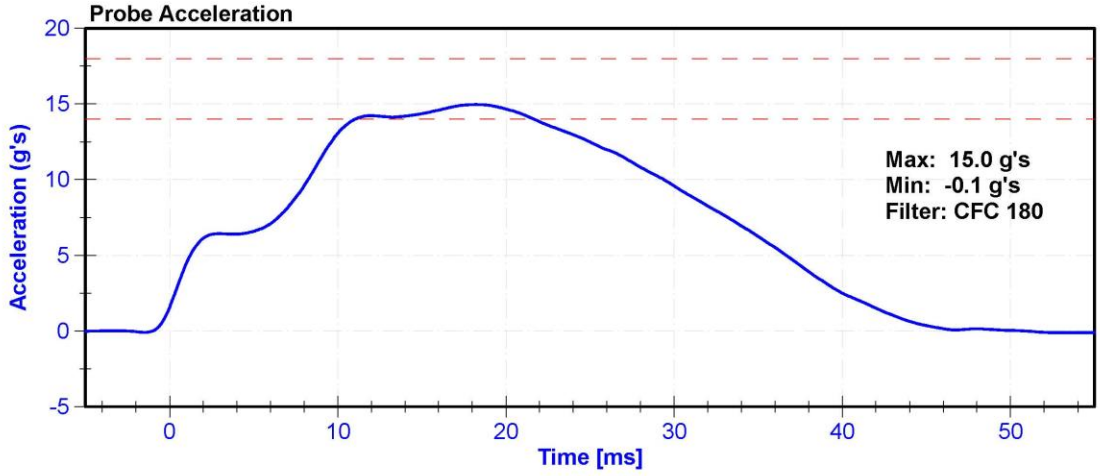
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

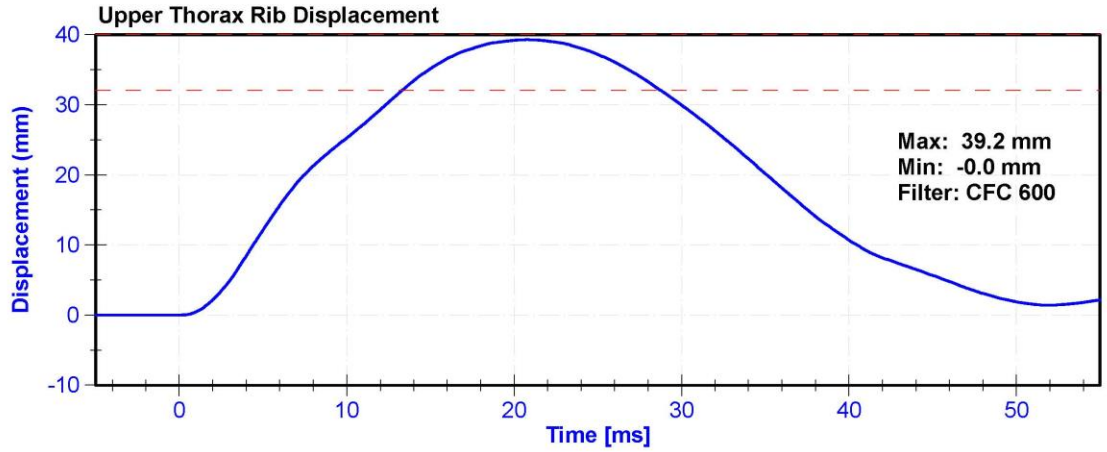
Results

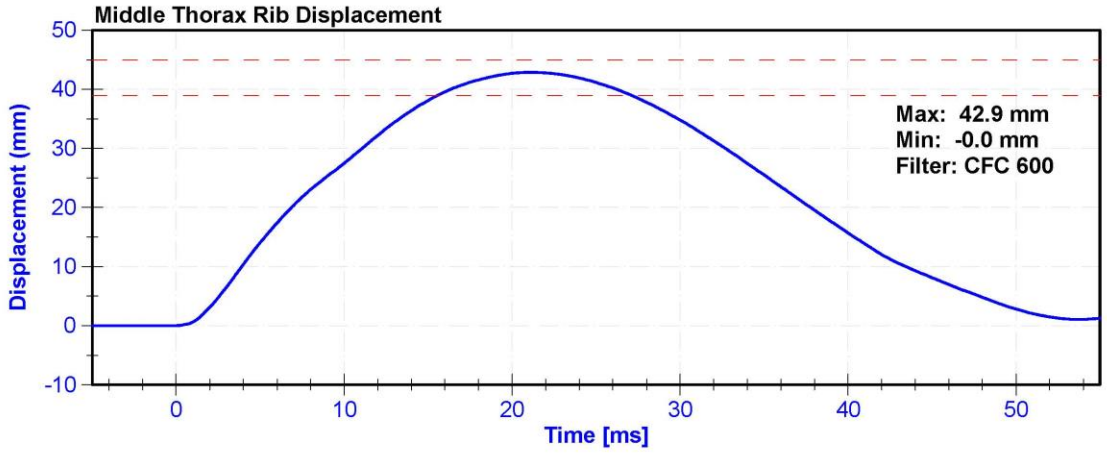
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	27.7	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	14	18	g's	15.0	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.2	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.7	Pass
Upper Thorax Rib Deflection	32	40	mm	39.2	Pass
Middle Thorax Rib Deflection	39	45	mm	42.9	Pass
Lower Thorax Rib Deflection	35	43	mm	38.1	Pass

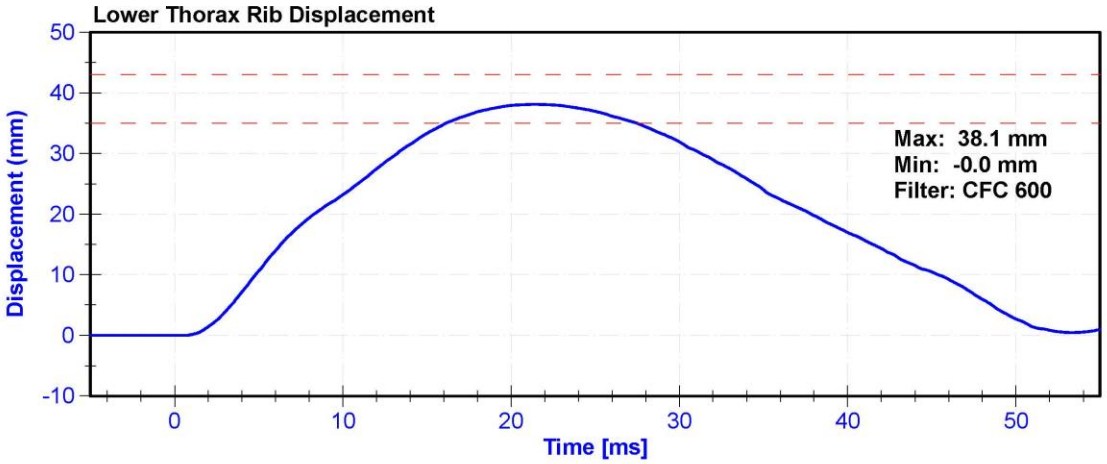
Transducer Calibrations

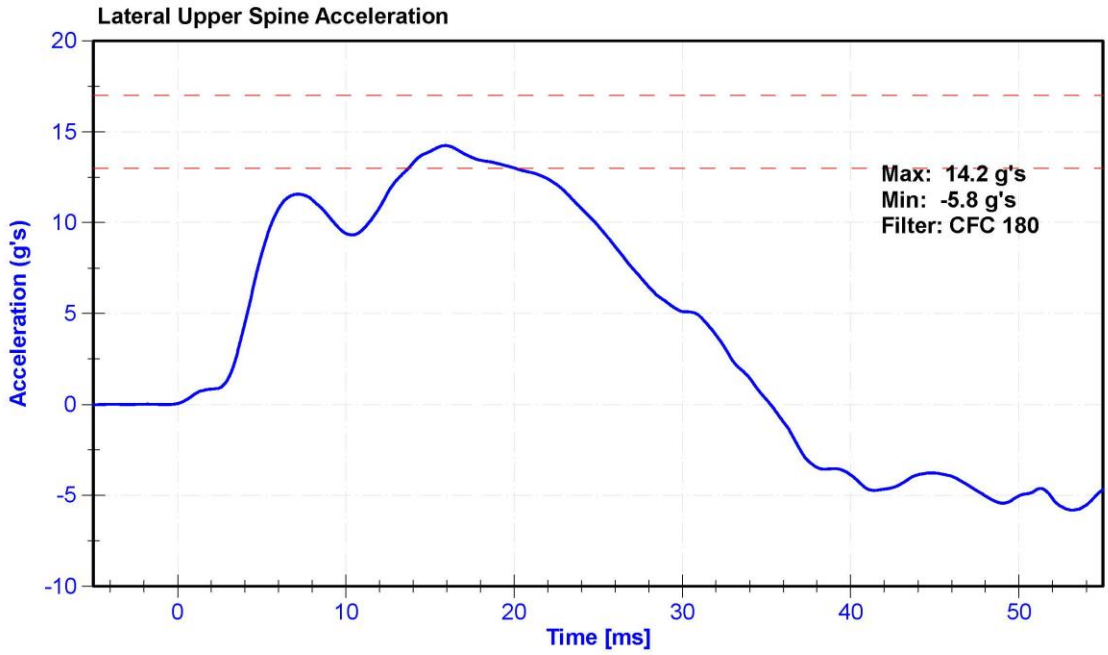
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/23/2018	4/23/2019
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51699	10/16/2018	4/16/2019
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/15/2018	5/15/2019
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	10/12/2018	10/12/2019
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	10/12/2018	10/12/2019

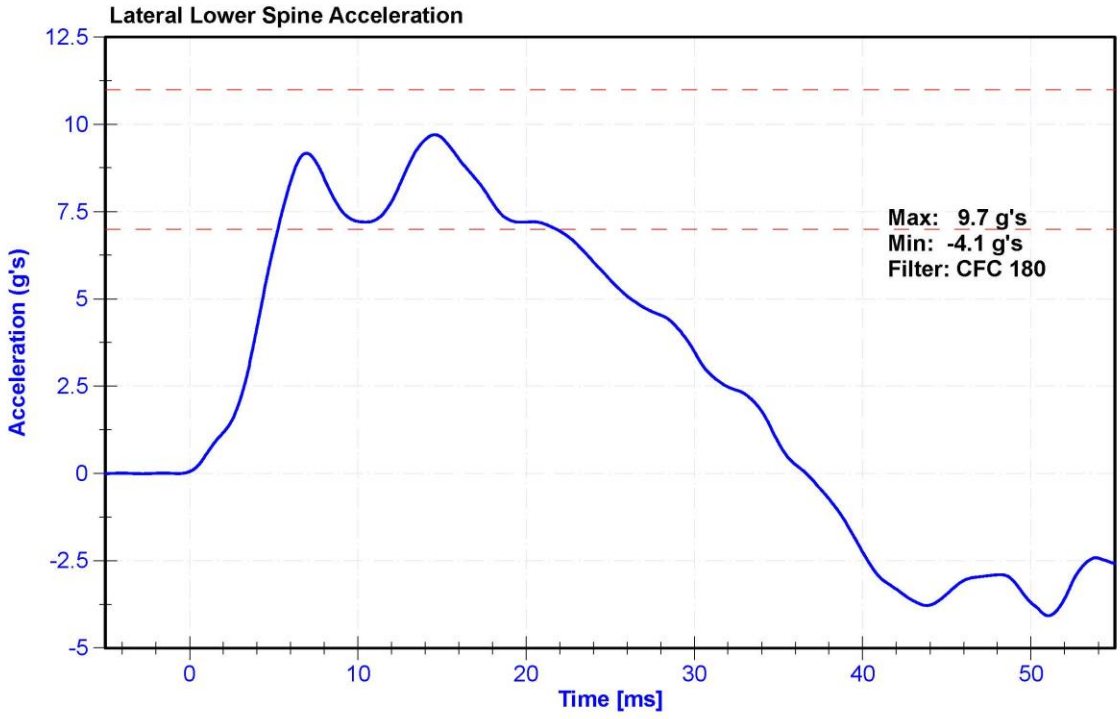



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 39.2 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.9 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.1 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 14.2 g's
Min: -5.8 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: 9.7 g's
Min: -4.1 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

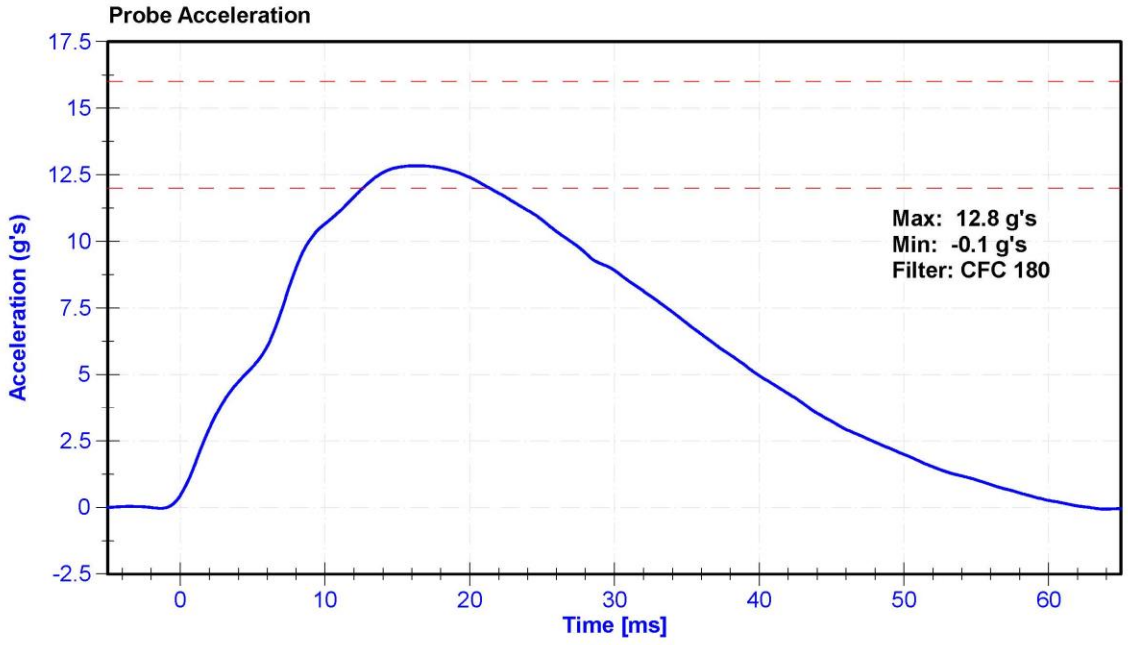
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

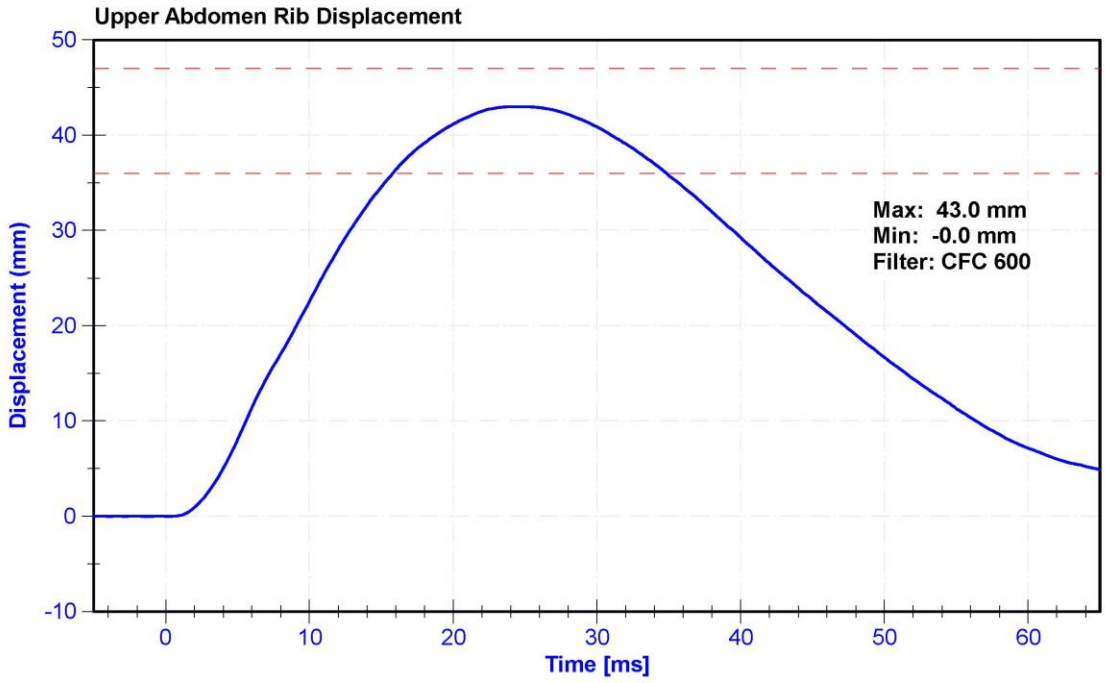
Results

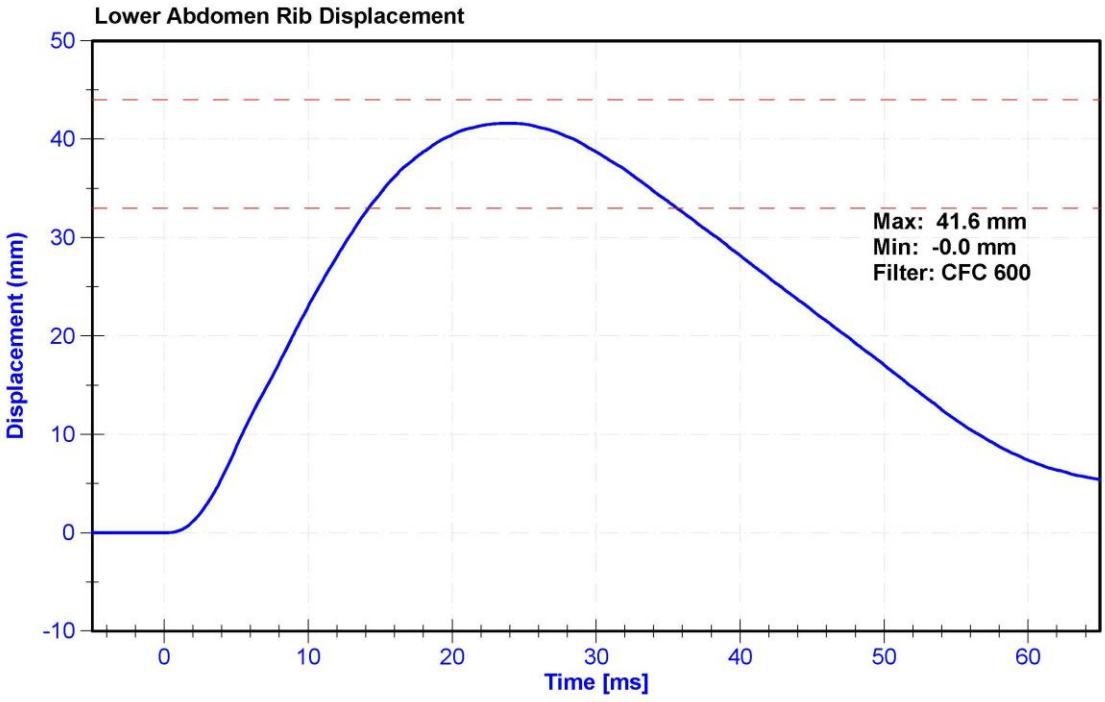
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.0	Pass
Humidity	10	70	%	27.2	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	12	16	g's	12.8	Pass
Lateral Lower Spine Acceleration	9	14	g's	9.7	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.0	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.6	Pass

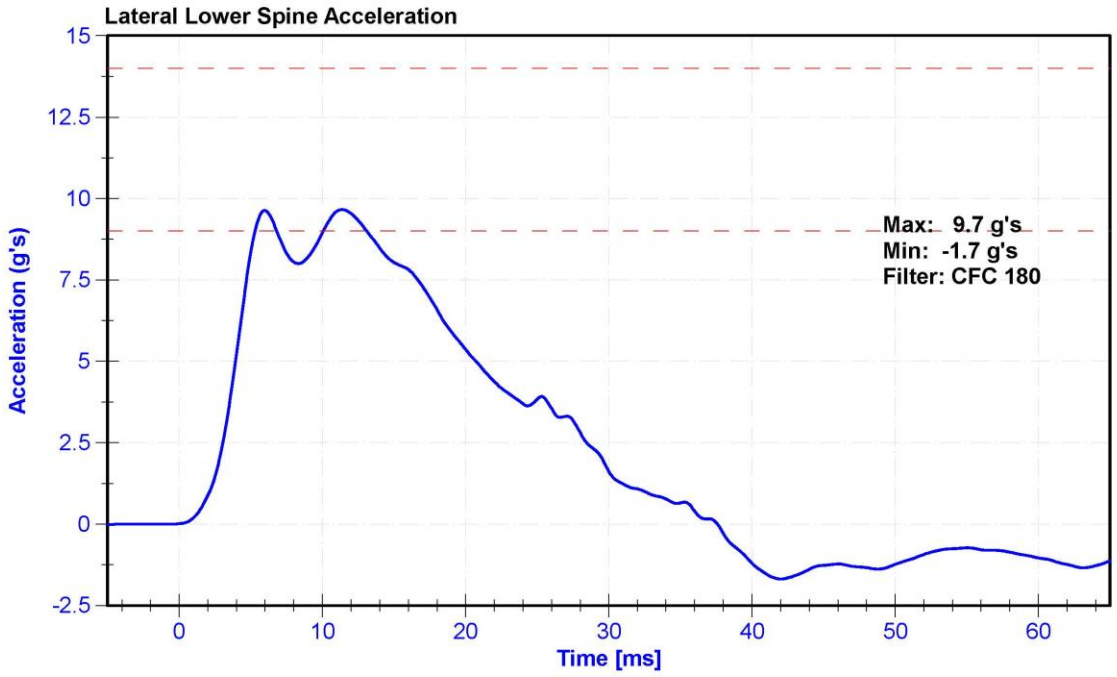
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51699	10/16/2018	4/16/2019
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	10/11/2018	10/11/2019
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	10/12/2018	10/12/2019




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.0 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.6 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: 9.7 g's
Min: -1.7 g's
Filter: CFC 180

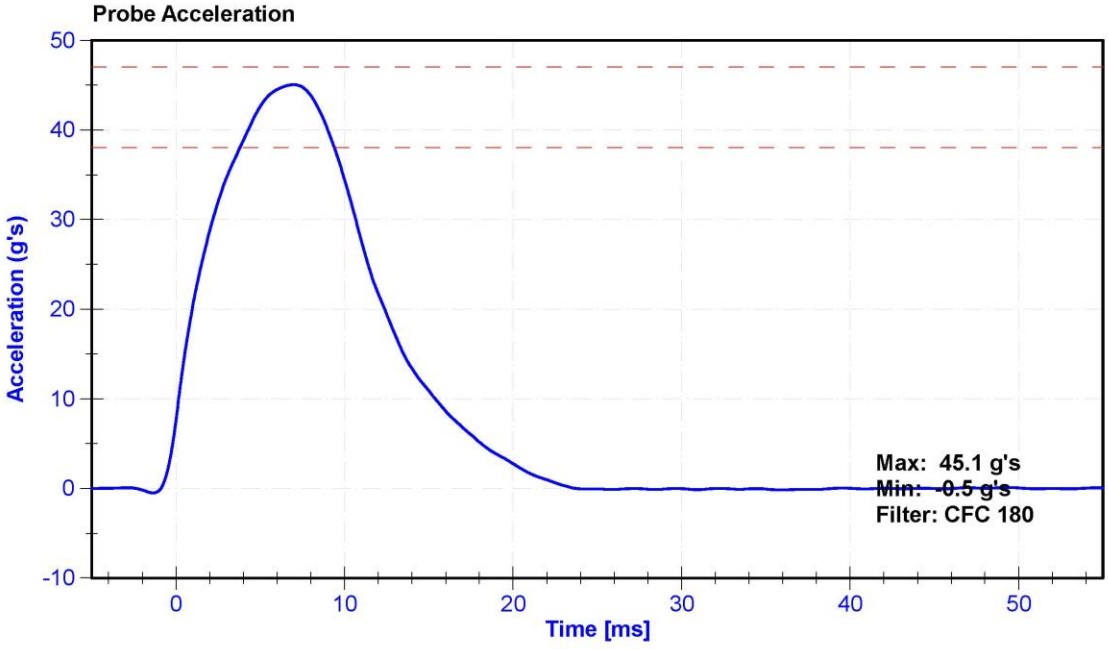
ATD Manufacturer	FTSS	Test Technician	K. Dutton
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

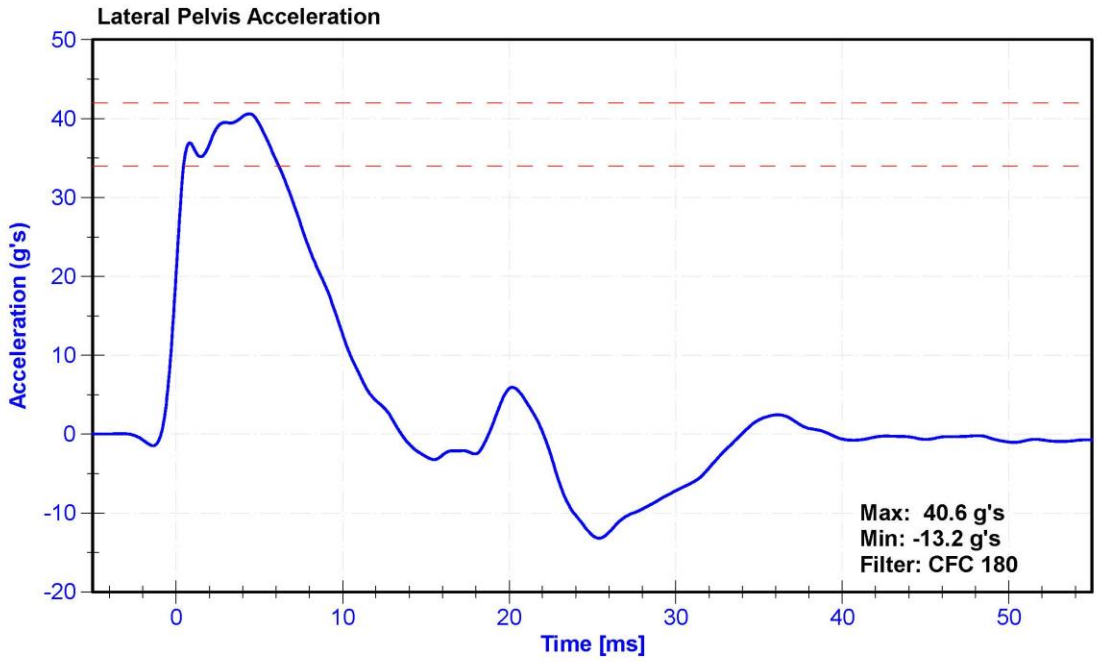
Results

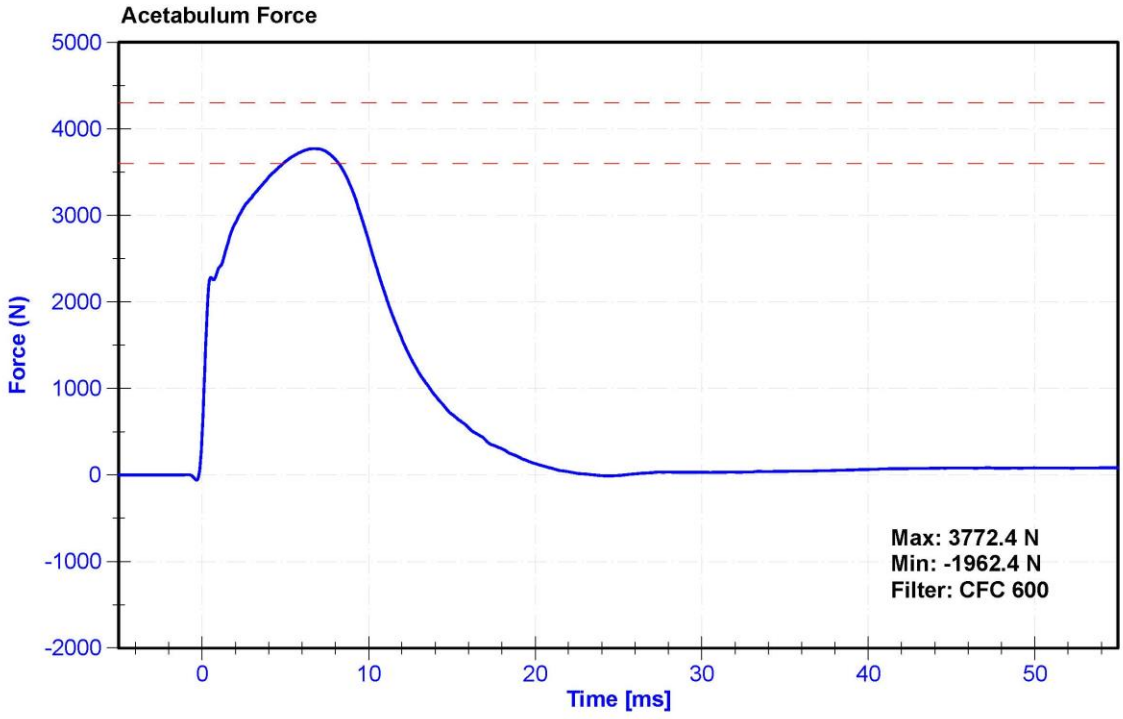
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	25	Pass
Velocity	6.6	6.8	m/s	6.70	Pass
Probe Acceleration	38	47	g's	45.1	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	34.7	Pass
Acetabulum Force	3600	4300	N	3772.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	10/17/2018	4/17/2019
Acetabulum Load Cell	Denton 3249J	LC-4986Fy	6/4/2018	6/4/2019
Certification Plug	SACO	11746	12/6/2017	N/A
Crash Test Plug	SACO	11797	1/22/2018	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: 40.6 g's
Min: -13.2 g's
Filter: CFC 180


Acetabulum Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
-2000
0
10
20
30
40
50
Time [ms]
Max: 3772.4 N
Min: -1962.4 N
Filter: CFC 600

#1

SID-IIs Pelvis Plug Certification Test

Plug S/N 11746
Test Number 5589
Report Number 5601
Test Date 12/6/2017 9:06:47 AM

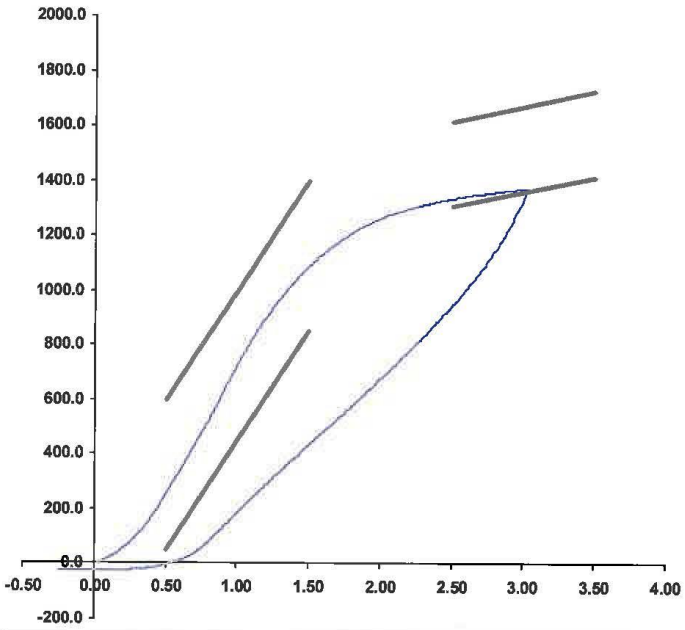
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	257.09	50.00	600.00
Force @ 1.5 mm (N)	1,088.60	850.00	1,400.00
Force @ 2.5 mm (N)	1,333.77	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,371.76	1,361.00	1,673.00

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:

Force (-N) vs Extension (-mm)



Operator DC

Part Number 180-4450

Template No 107 06-Dec-17
SACO Research

By : DC Date : 12/6/17

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

#2

SID-IIs Pelvis Plug Certification Test

Plug S/N 11797
Test Number 5904
Report Number 5920
Test Date 1/22/2018 12:35:34 PM

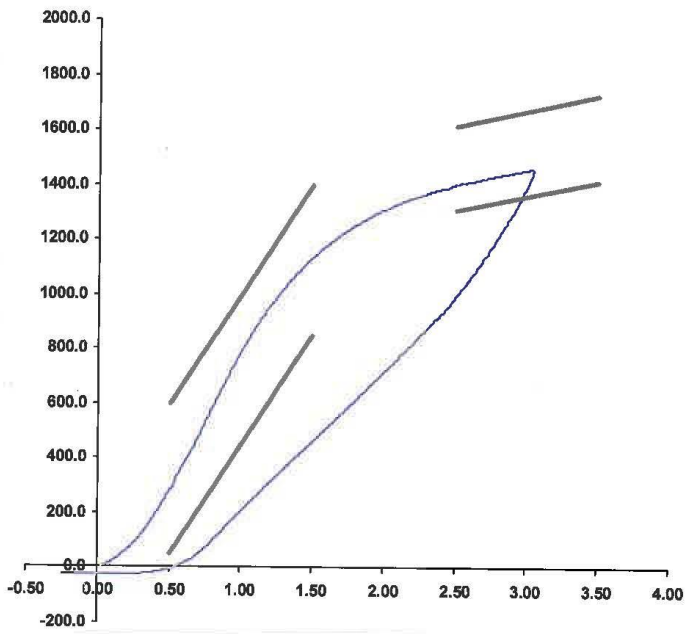
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	283.74	50.00	600.00
Force @ 1.5 mm (N)	1,138.84	850.00	1,400.00
Force @ 2.5 mm (N)	1,401.98	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,458.19	1,361.00	1,673.00

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:

Force (-N) vs Extension (-mm)



Operator DC

Part Number 180-4450

Template No 107 22-Jan-18
SACO Research

By : DC Date : 1/22/18

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

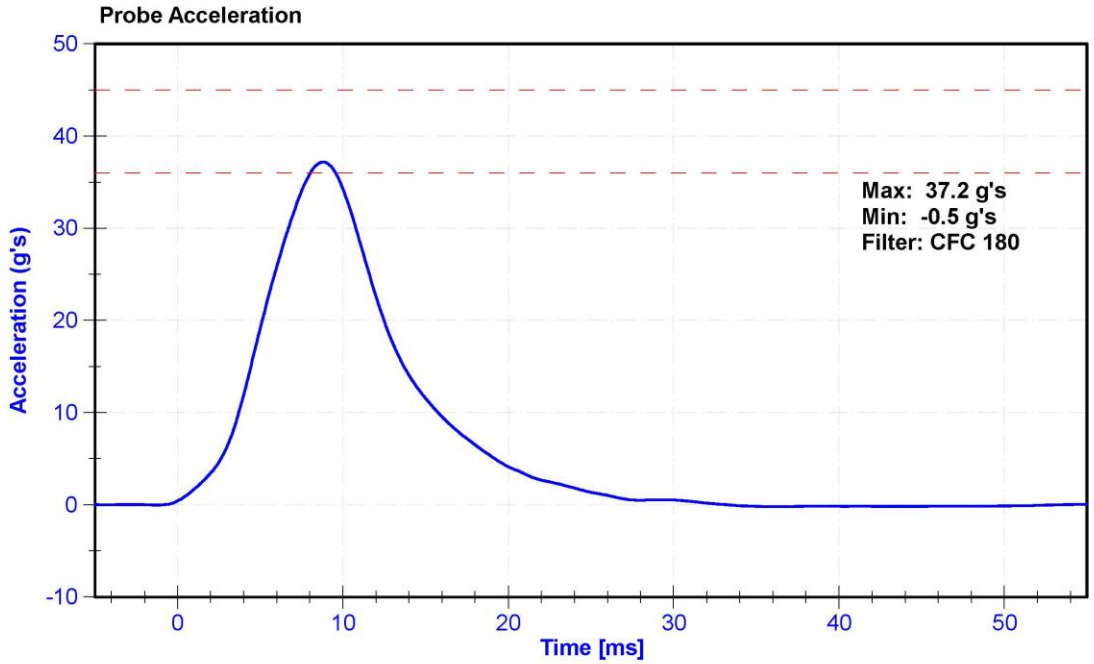
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K.Brogan

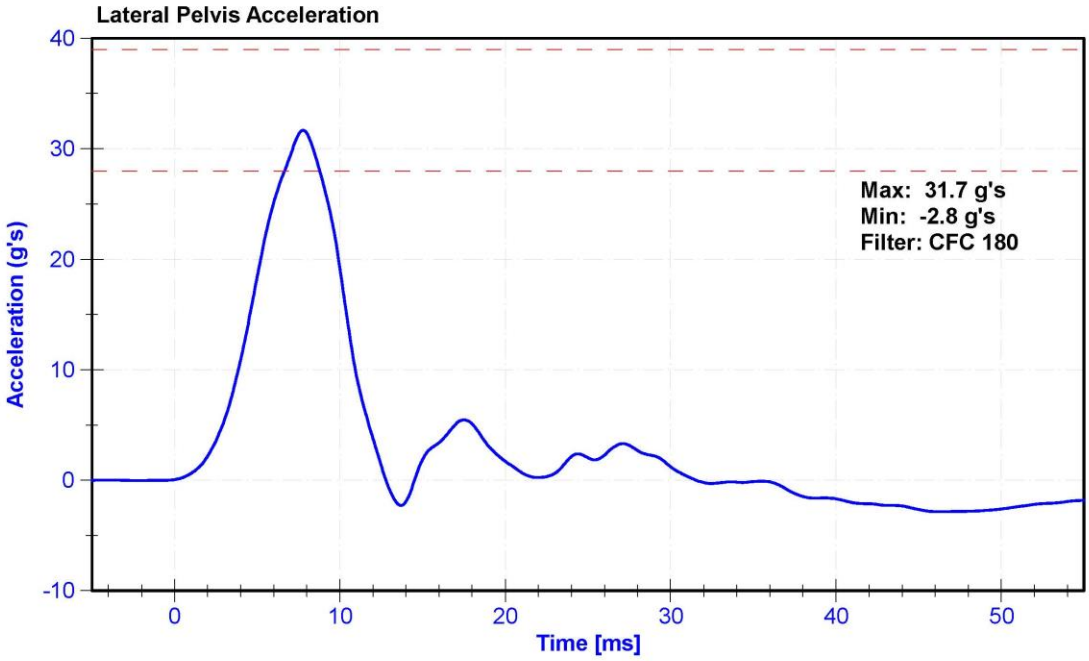
Results

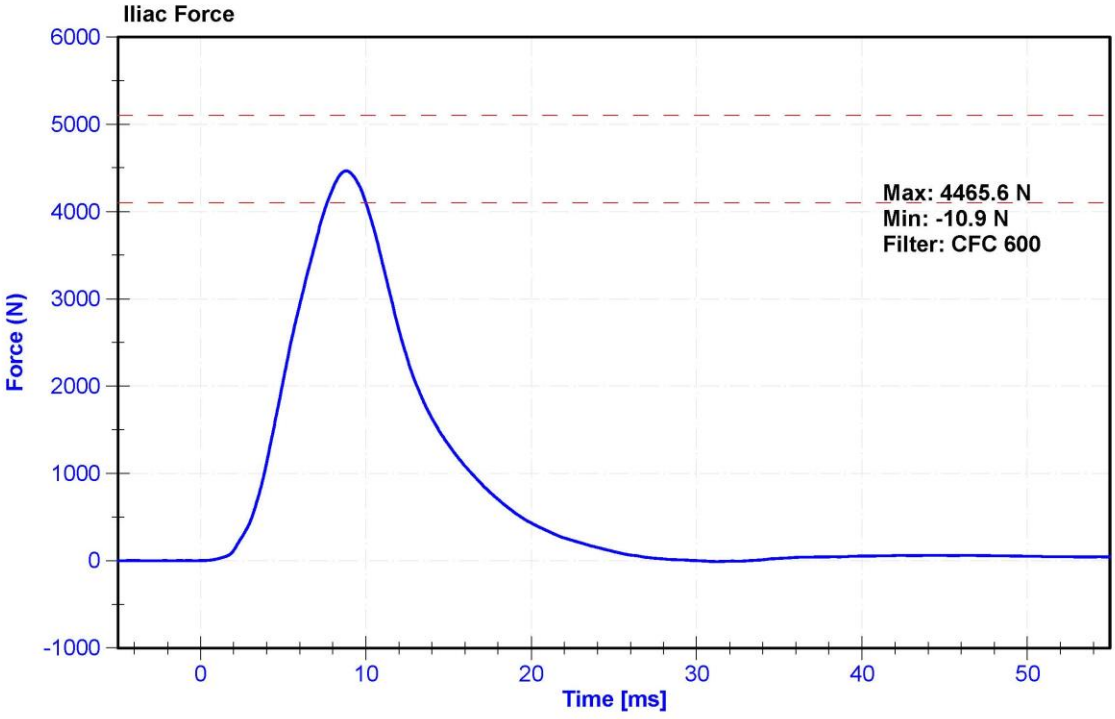
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	42.0	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	37.2	Pass
Lateral Pelvis Acceleration	28	39	g's	31.7	Pass
Iliac Force	4100	5100	N	4465.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P23904	11/1/2018	5/2/2019
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	10/17/2018	4/17/2019
Iliac Load Cell	DENTON 3228J	LC-113Fy	6/4/2018	6/4/2019




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 31.7 g's
Min: -2.8 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4465.6 N
Min: -10.9 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

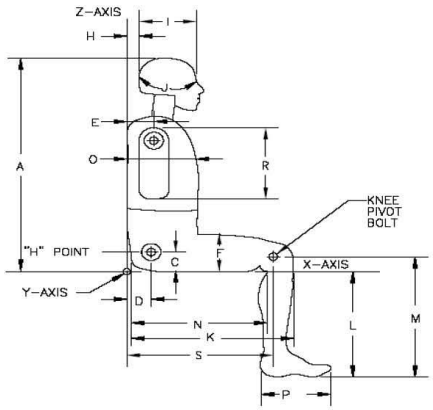
SERIAL NO: DG8012

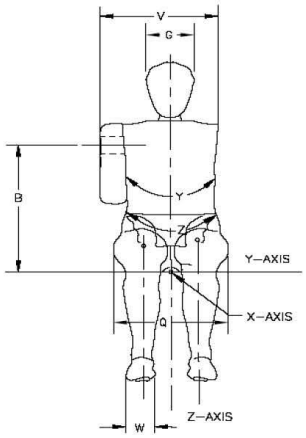
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Dutton Date: 01/11/2019

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	781	Pass
B	Shoulder Pivot Height	437	453	448	Pass
C	H-point Height	79	89	86	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	104	Pass
F	Thigh Clearance	119	135	128	Pass
G	Head Breadth	140	148	143	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	531	Pass
L	Popliteal Height	343	369	356	Pass
M	Knee Pivot to floor height	392	409	401	Pass
N	Buttock Popliteal Length	416	442	433	Pass
O	Chest Depth w/o jacket	195	211	206	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	344	Pass
W	Foot Width	78	94	83	Pass
Y	Chest Circumference w/jacket	851	881	867	Pass
Z	Waist Circumference	761	791	778	Pass

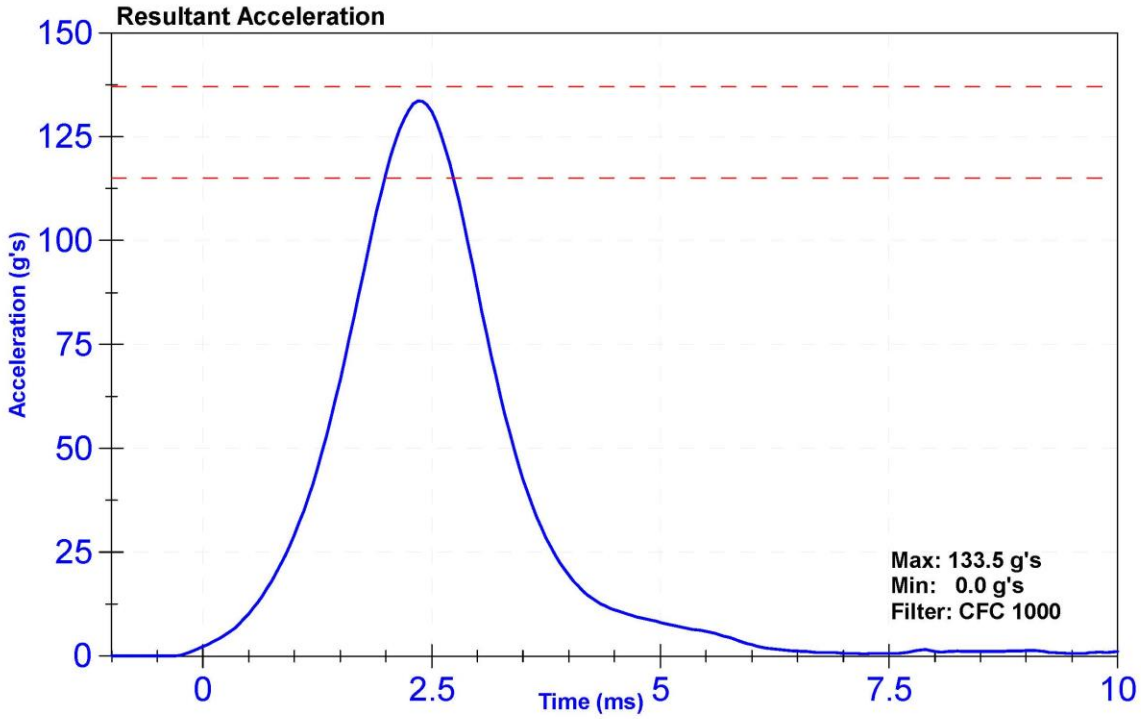
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

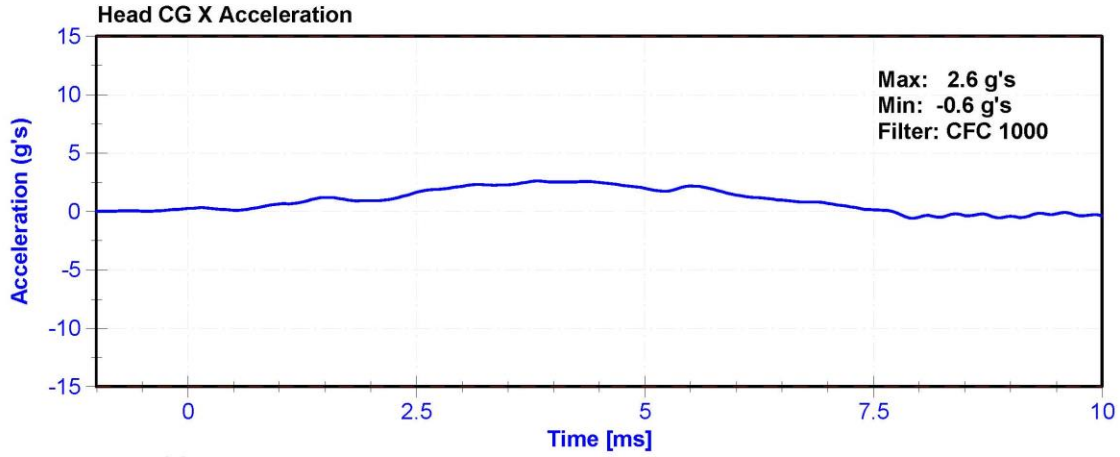
Results

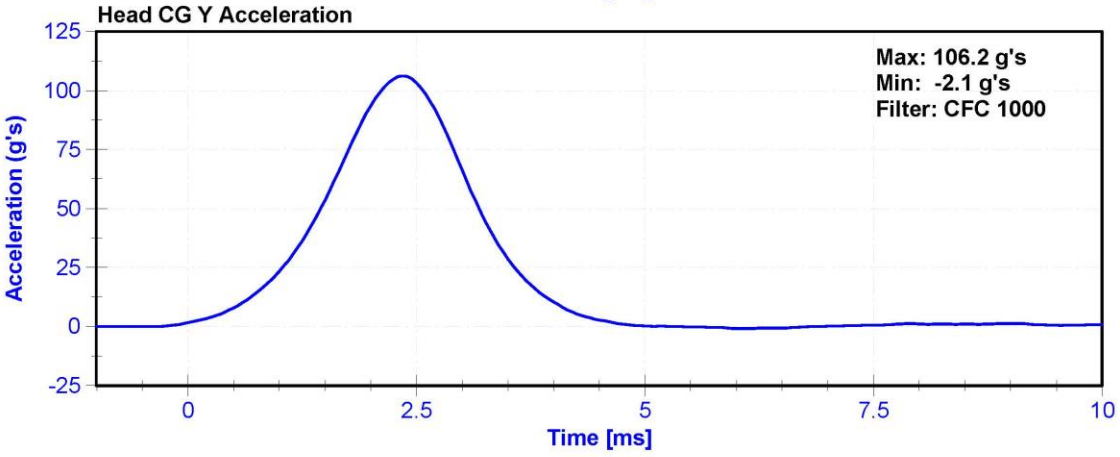
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	21.6	Pass
Resultant Acceleration	115	137	g's	133.5	Pass
Oscillation	0	15	%	2.0	Pass
Fore-Aft Acceleration	-15	15	g's	2.6	Pass

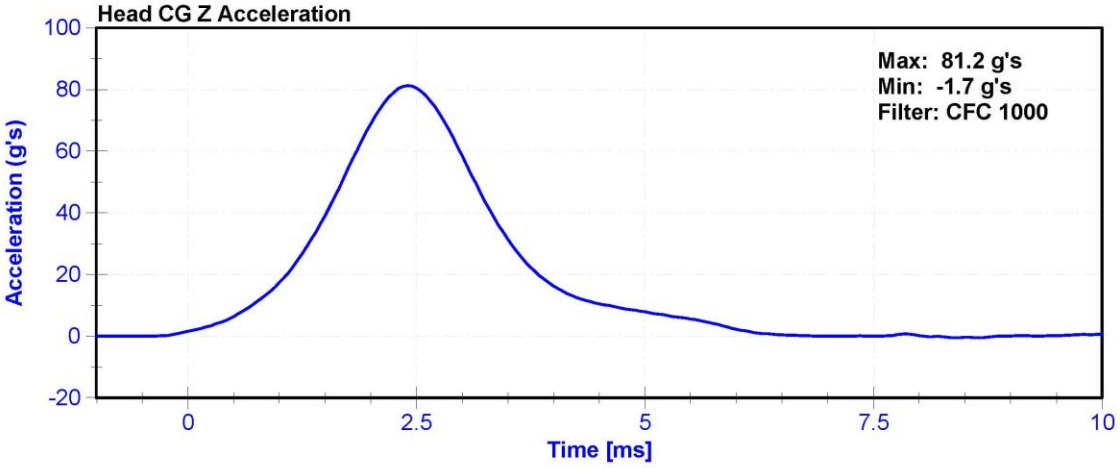
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P74788	10/18/2018	4/18/2019
Y Accelerometer	ENDEVCO 7264CT	AC-P83432	10/18/2018	4/18/2019
Z Accelerometer	ENDEVCO 7264	AC-P83319	10/18/2018	4/18/2019




Head CG X Acceleration
Max: 2.6 g's
Min: -0.6 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: 106.2 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: 81.2 g's
Min: -1.7 g's
Filter: CFC 1000
Acceleration (g's)
100
80
60
40
20
0
-20
0
2.5
5
7.5
10
Time [ms]

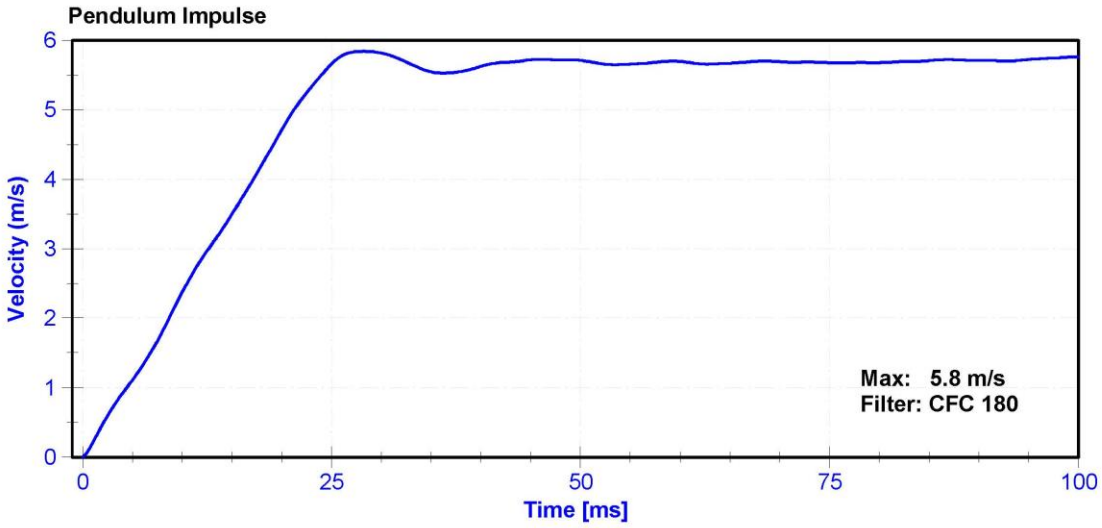
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

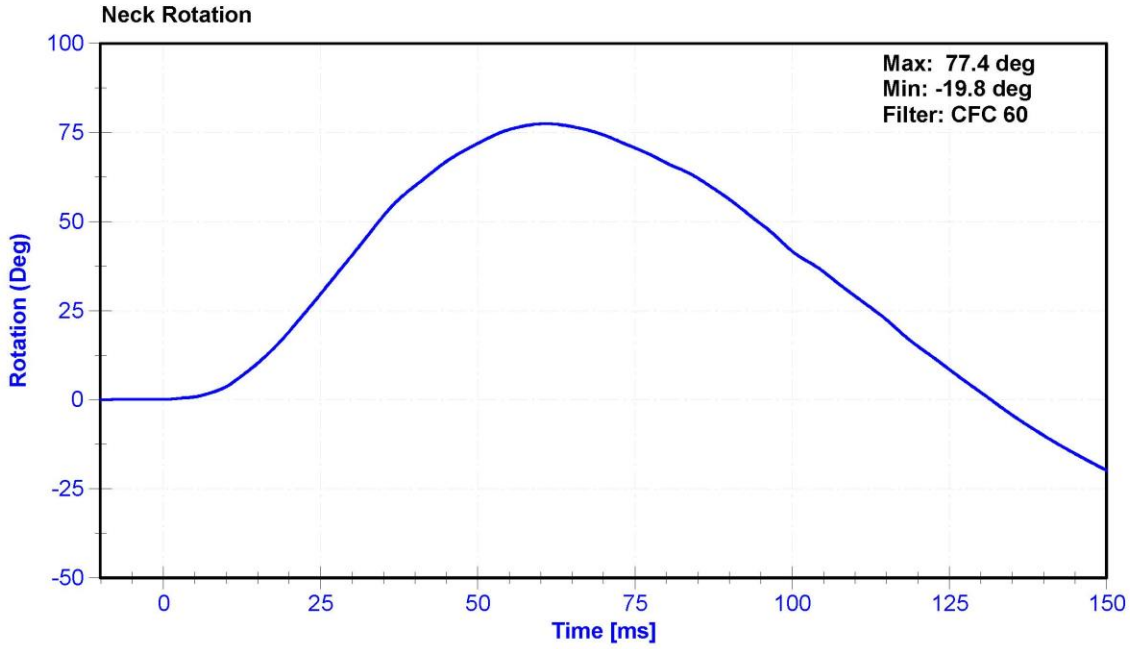
Results

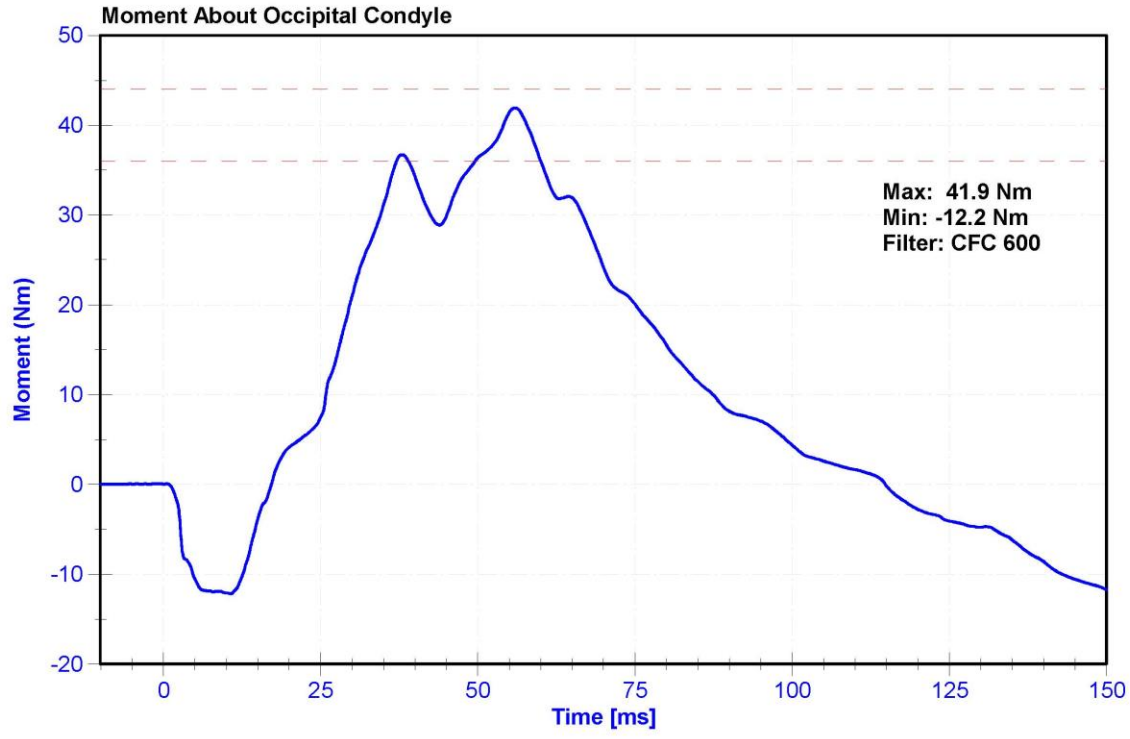
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.7	Pass
Humidity	10	70	%	20.6	Pass
Velocity	5.51	5.63	m/s	5.546	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.37	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.50	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.71	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.66	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.84	Pass
Neck Rotation	71	81	deg	77.4	Pass
Time at Maximum Rotation	50	70	ms	60.8	Pass
Moment about the OC	36	44	Nm	41.9	Pass
Moment Decay to 0 Nm	102	126	ms	114.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	11/1/2018	11/1/2019
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/1/2018	11/1/2019
Upper Neck Load Cell	Denton 1716	LC-2018 FY	9/28/2018	9/28/2019




Neck Rotation
Max: 77.4 deg
Min: -19.8 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: 41.9 Nm
Min: -12.2 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

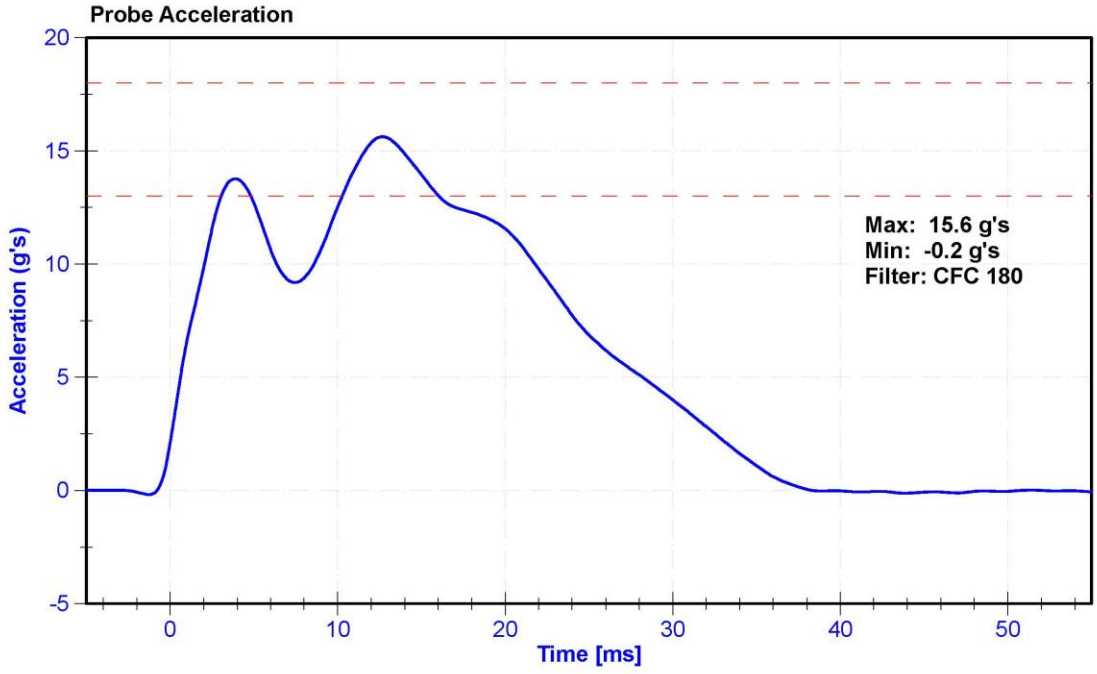
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

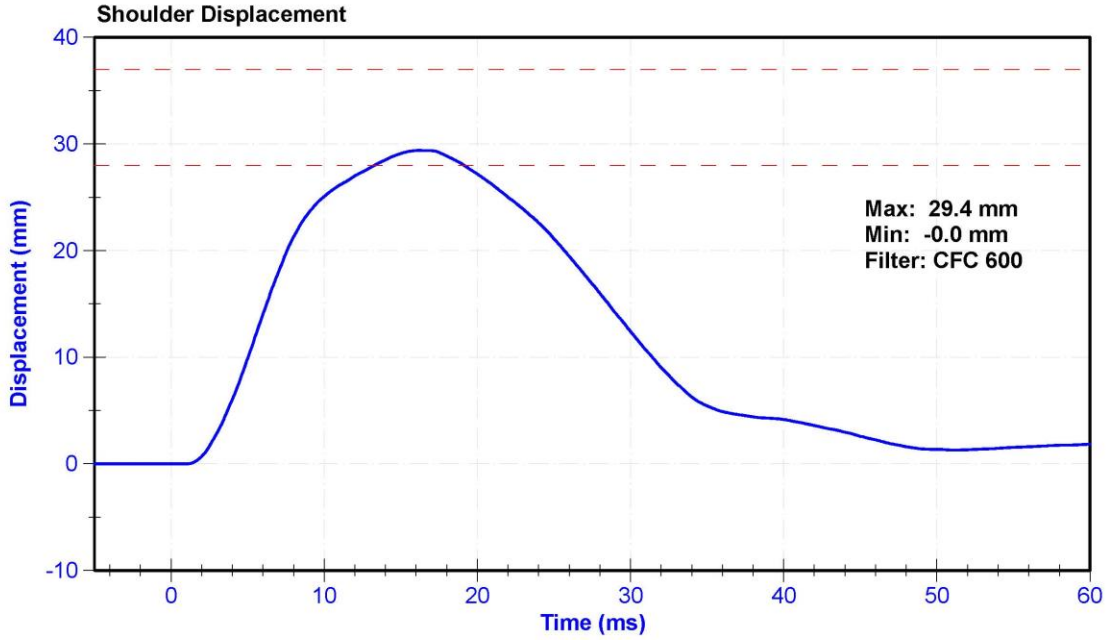
Results

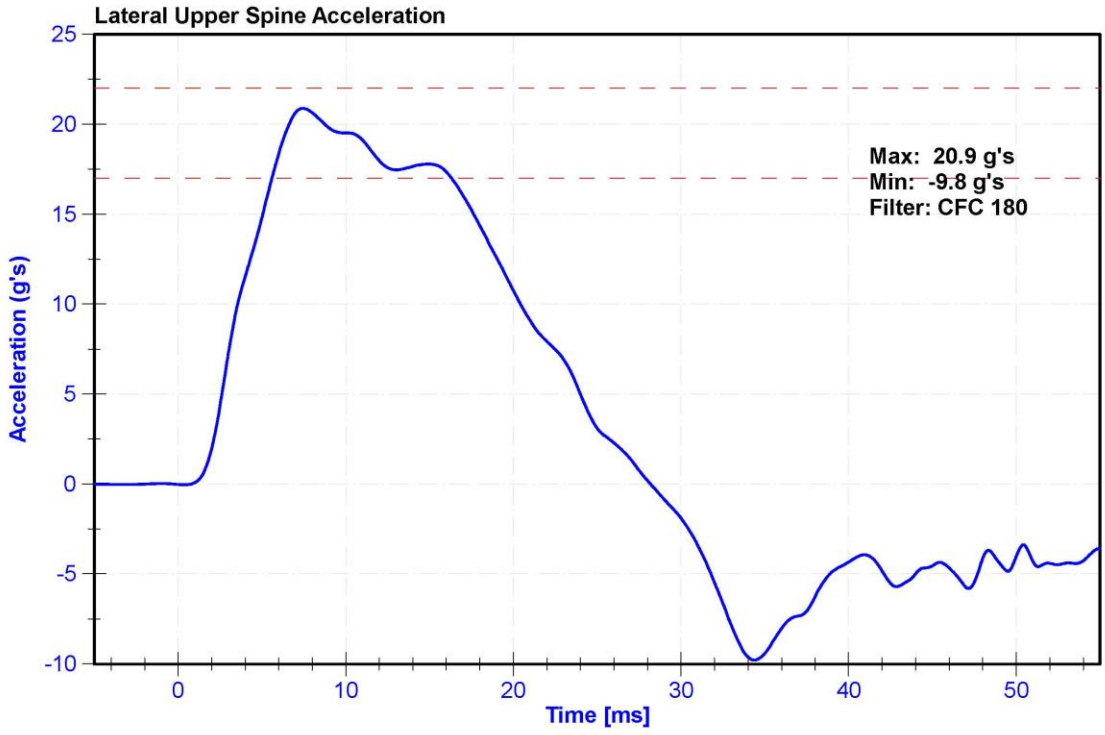
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	19.9	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	13	18	g's	15.6	Pass
Shoulder Deflection	28	37	mm	29.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco 7264C-2KTZ-2-360MAC7	AC-P94667	11/1/2018	11/1/2019
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	10/11/2018	10/11/2019
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/23/2018	4/23/2019




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 29.4 mm
Min: -0.0 mm
Filter: CFC 600
40
30
20
10
0
-10
0
10
20
30
40
50
60


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.9 g's
Min: -9.8 g's
Filter: CFC 180
25
20
15
10
5
0
-5
-10
0
10
20
30
40
50

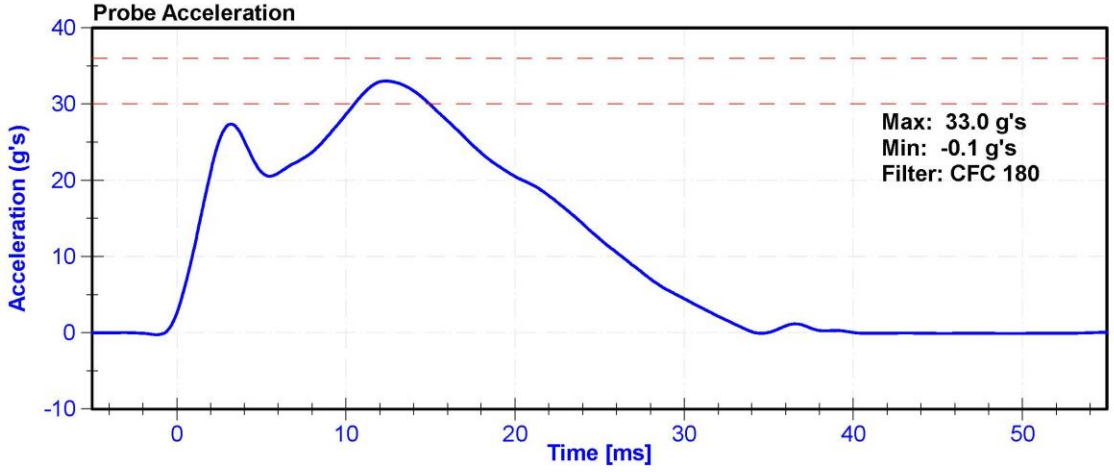
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

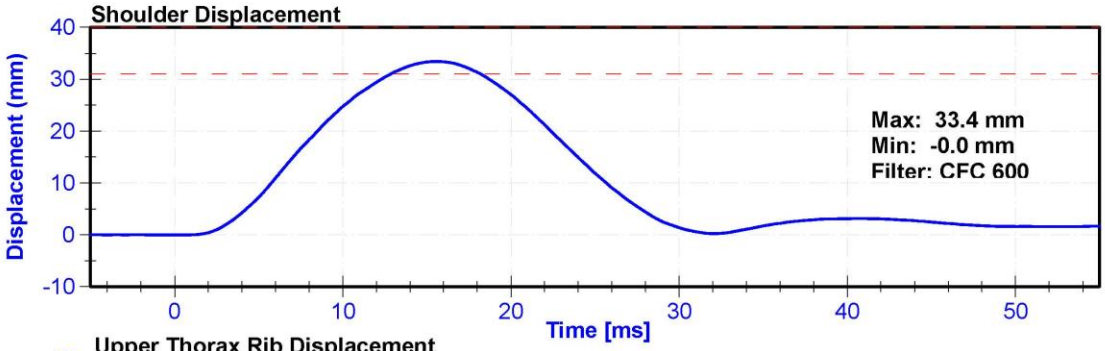
Results

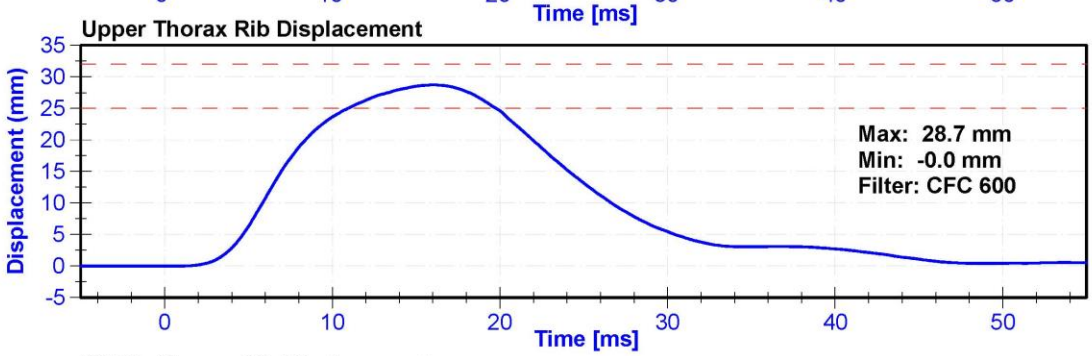
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.1	Pass
Humidity	10	70	%	17.9	Pass
Velocity	6.6	6.8	m/s	6.77	Pass
Probe Acceleration after 5 ms	30	36	g's	33.0	Pass
Lateral Upper Spine Acceleration	34	43	g's	40.1	Pass
Lateral Lower Spine Acceleration	29	37	g's	32.6	Pass
Shoulder Deflection	31	40	mm	33.4	Pass
Upper Thorax Rib Deflection	25	32	mm	28.7	Pass
Mid Thorax Rib Deflection	30	36	mm	33.0	Pass
Lower Thorax Rib Deflection	32	38	mm	34.7	Pass

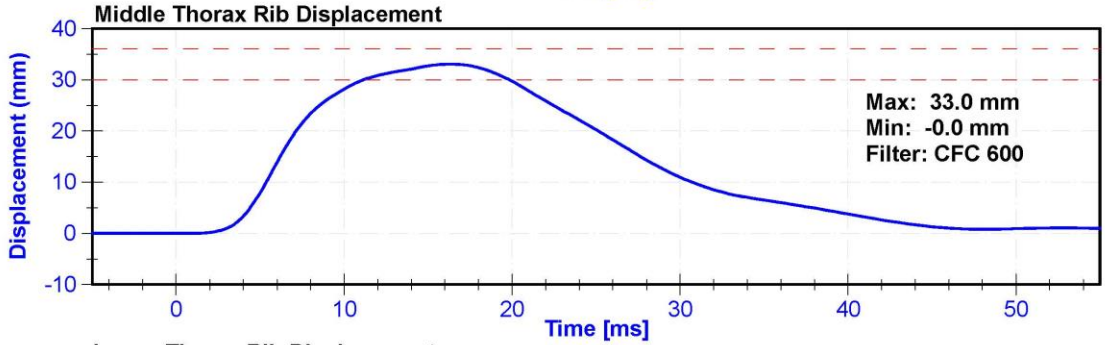
Transducer Calibrations

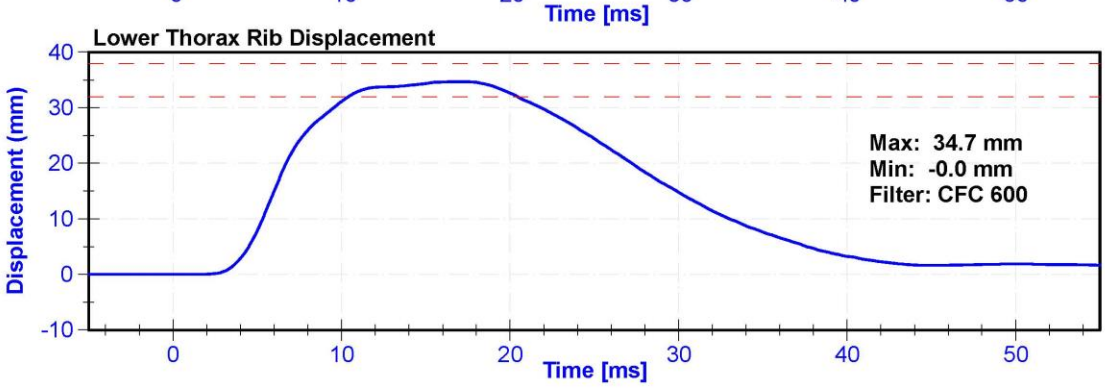
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco 7264C-2KTZ-2-360M AC	AC-P94667	11/1/2018	11/1/2019
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/23/2018	4/23/2019
Upper Spine T12 Y Accelerometer	ENDEVCO 7264CT	AC-P51699	10/16/2018	4/16/2019
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	10/11/2018	10/11/2019
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/15/2018	5/15/2019
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	10/12/2018	10/12/2019
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	10/12/2018	10/12/2019

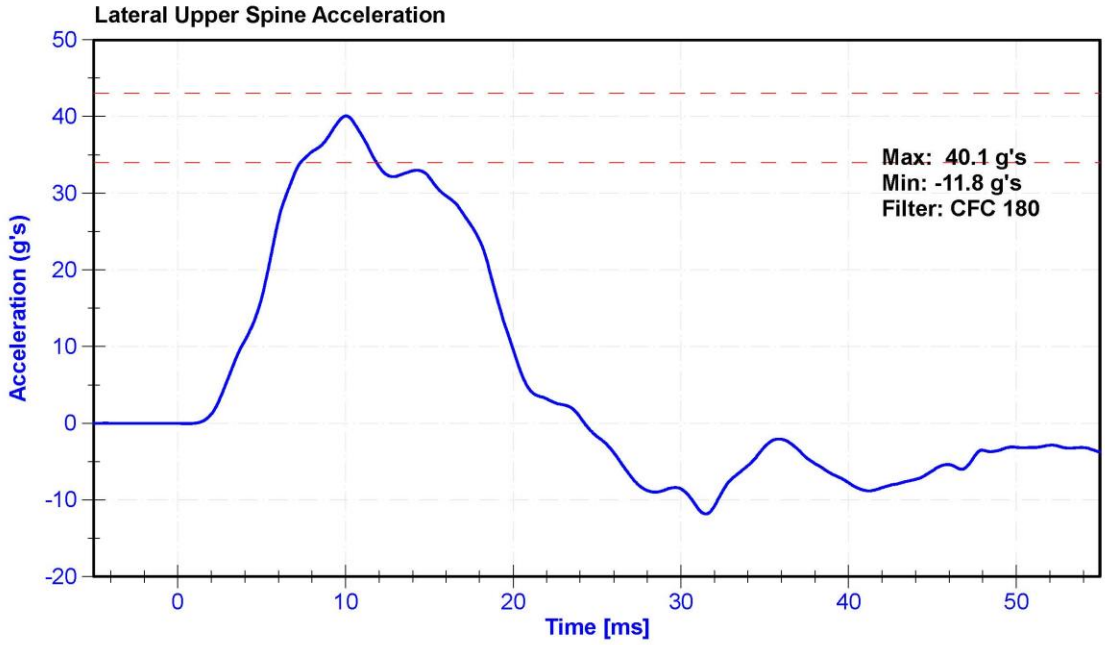


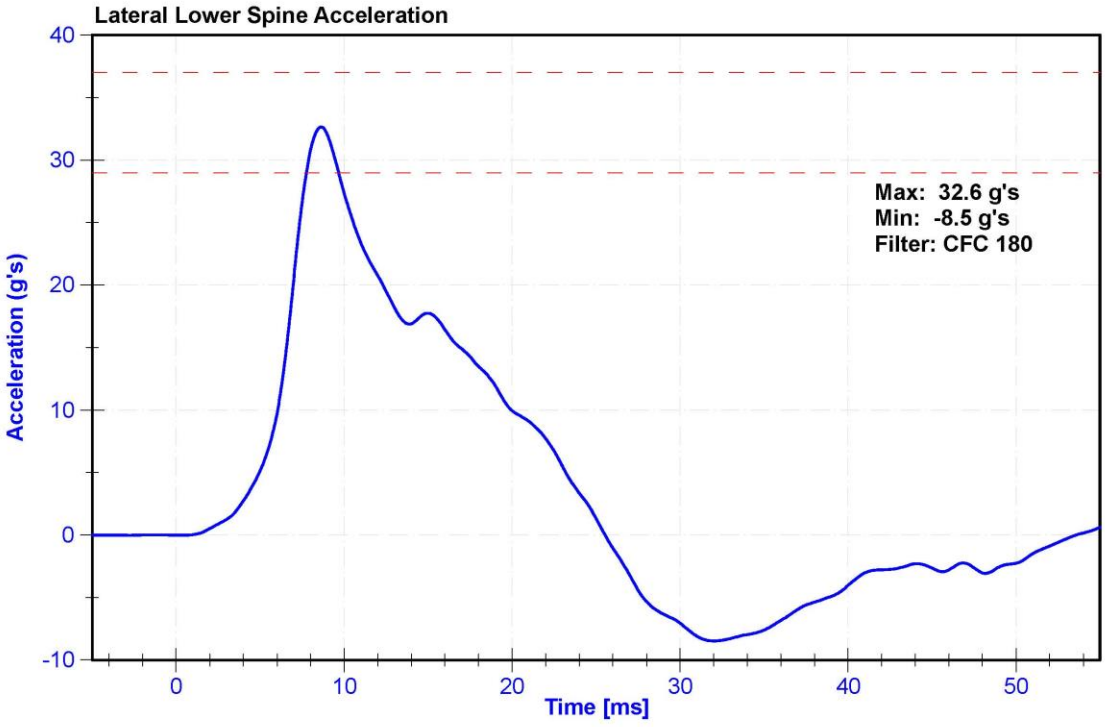

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 33.4 mm
Min: -0.0 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 28.7 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: 34.7 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 40.1 g's
Min: -11.8 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: 32.6 g's
Min: -8.5 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

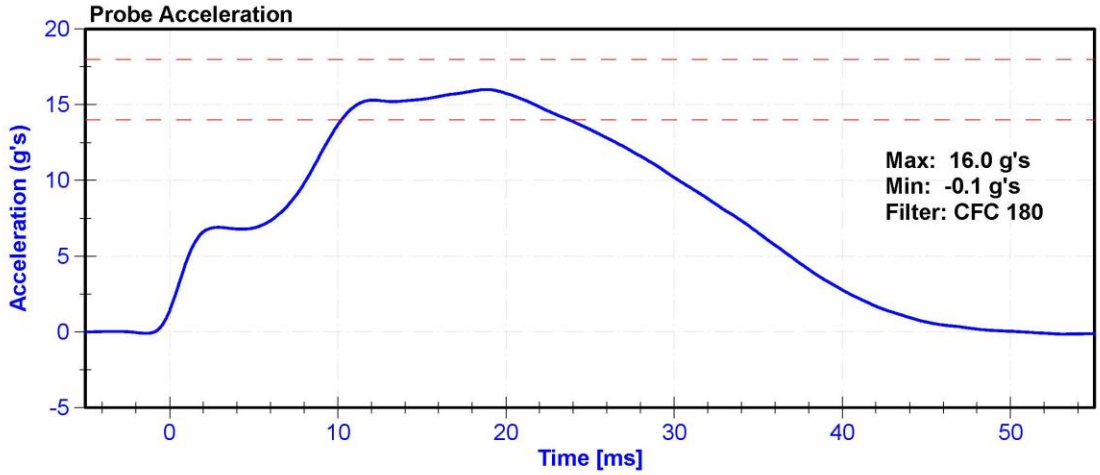
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

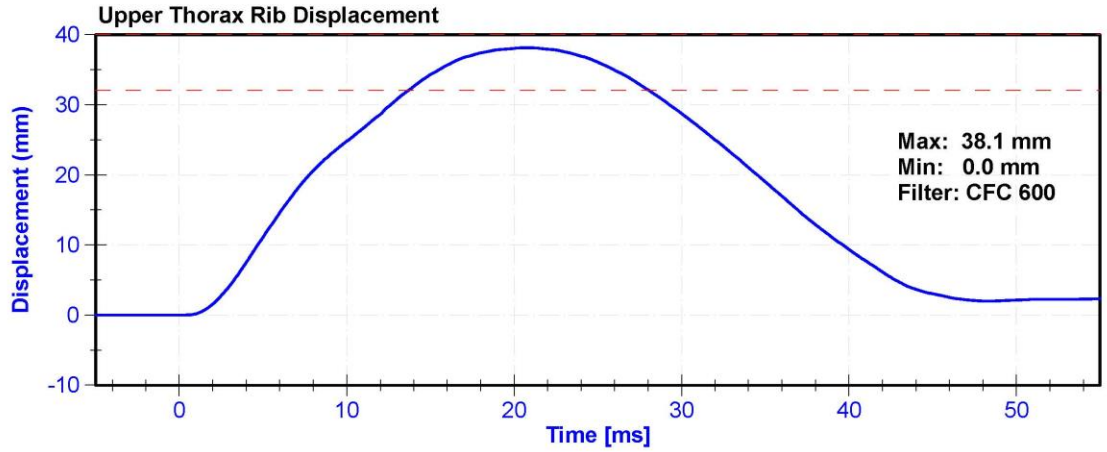
Results

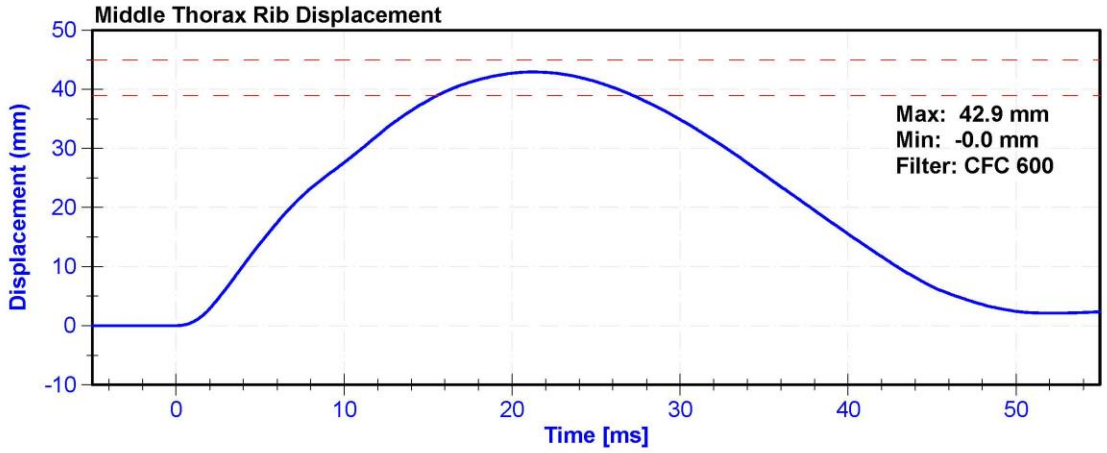
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22.2	Pass
Humidity	10	70	%	19.5	Pass
Velocity	4.2	4.4	m/s	4.35	Pass
Probe Acceleration	14	18	g's	16.0	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.3	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.7	Pass
Upper Thorax Rib Deflection	32	40	mm	38.1	Pass
Middle Thorax Rib Deflection	39	45	mm	42.9	Pass
Lower Thorax Rib Deflection	35	43	mm	39.0	Pass

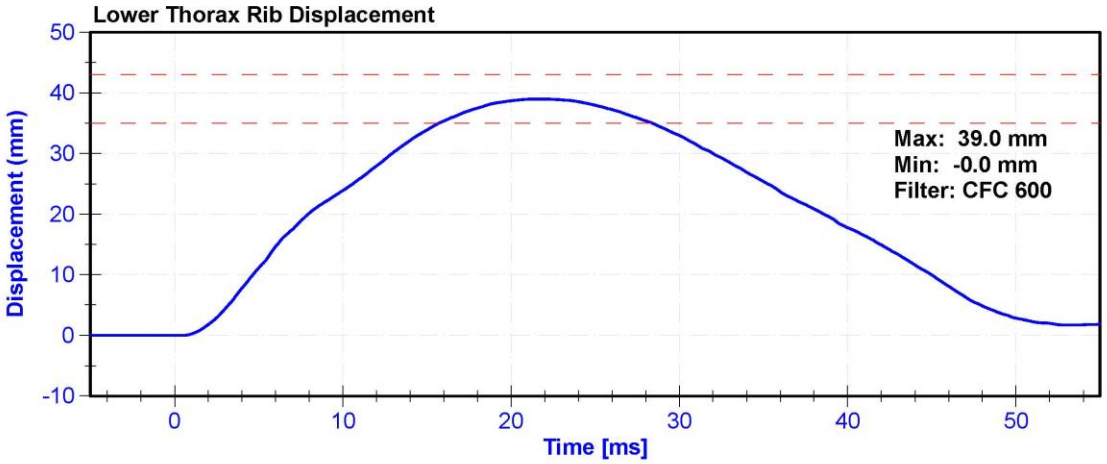
Transducer Calibrations

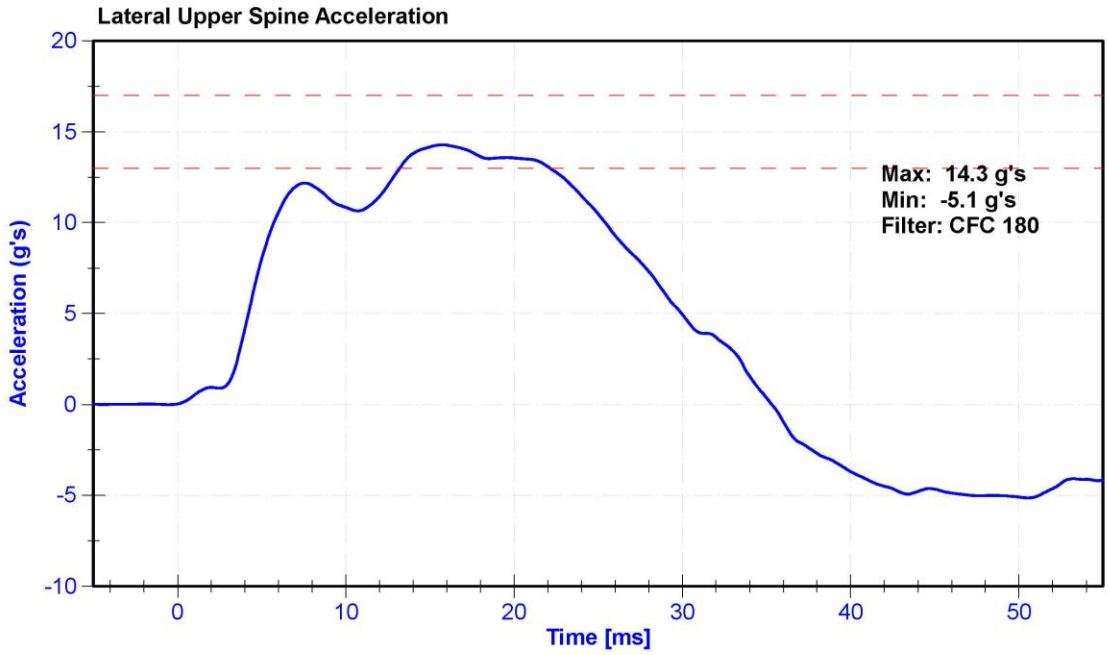
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco 7264C-2KTZ-2-360M	AC-P94667	11/1/2018	11/1/2019
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	10/23/2018	4/23/2019
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51699	10/16/2018	4/16/2019
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/15/2018	5/15/2019
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	10/12/2018	10/12/2019
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	10/12/2018	10/12/2019

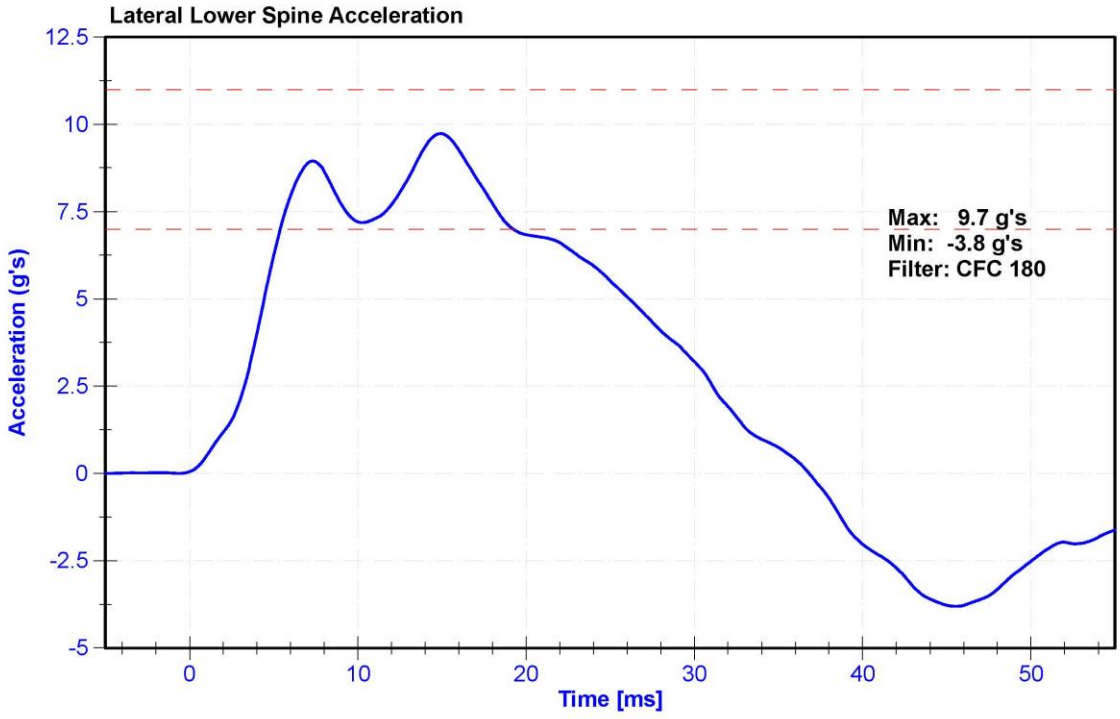



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.1 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.9 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 39.0 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 14.3 g's
Min: -5.1 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: 9.7 g's
Min: -3.8 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

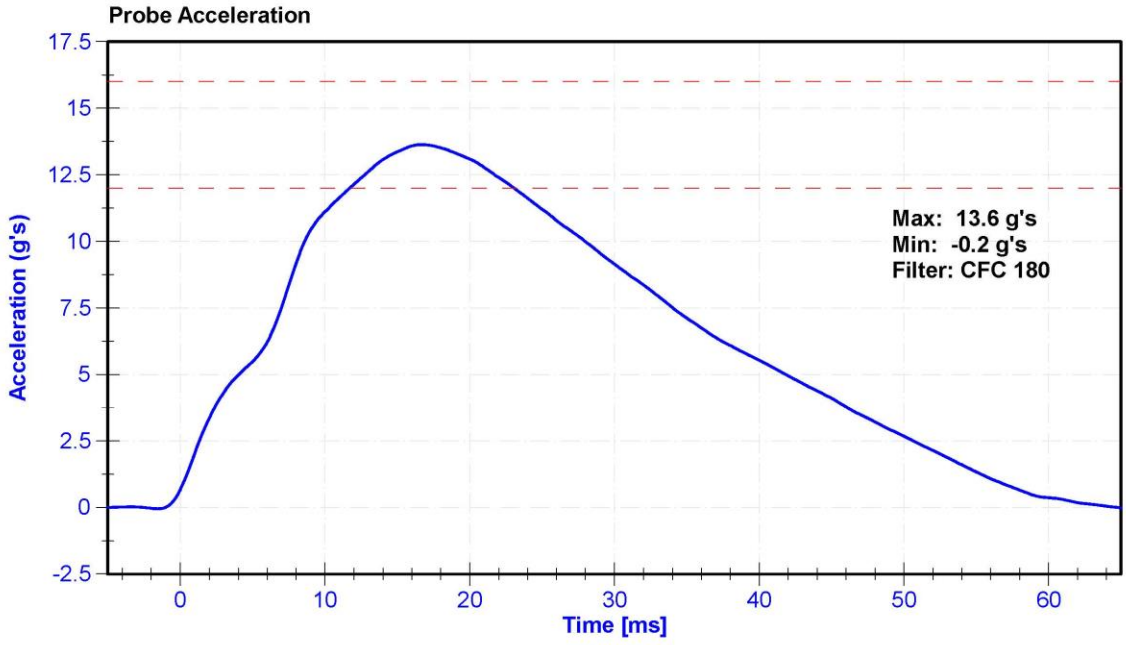
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

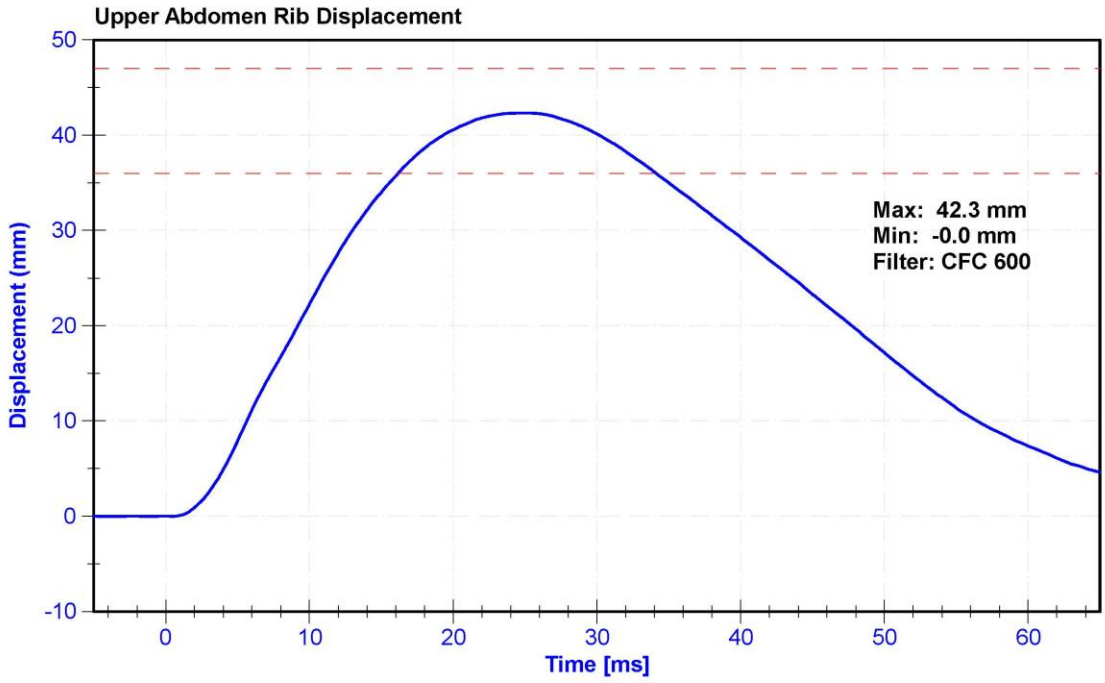
Results

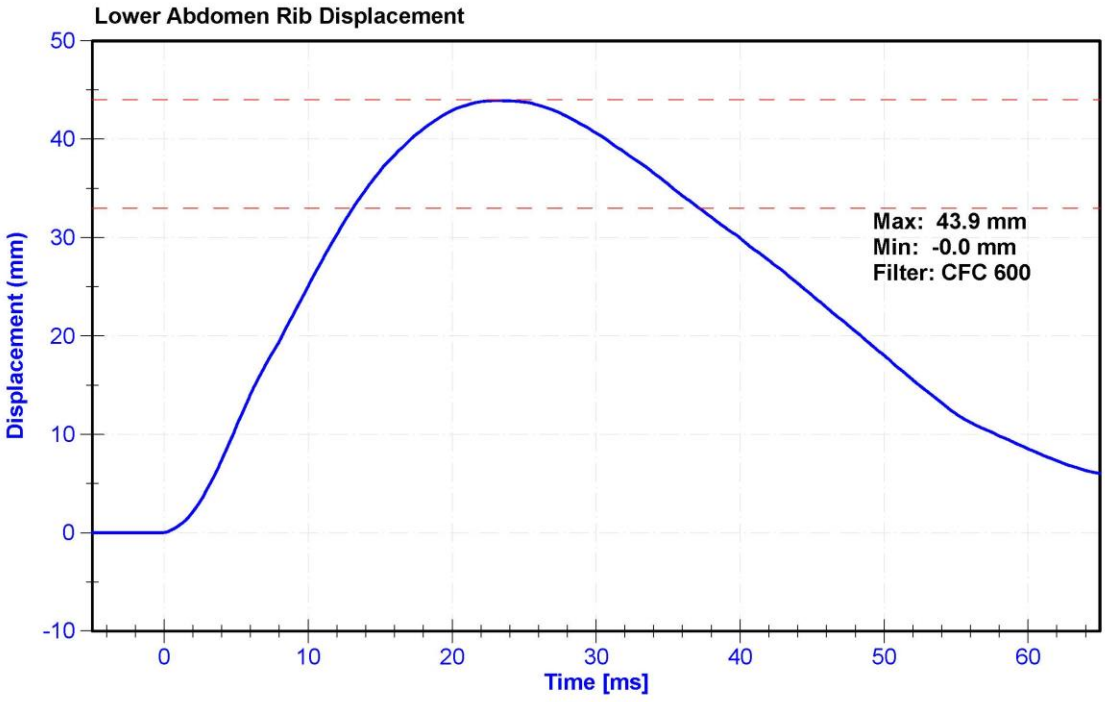
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.8	Pass
Humidity	10	70	%	25.1	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	12	16	g's	13.6	Pass
Lateral Lower Spine Acceleration	9	14	g's	9.7	Pass
Upper Abdomen Rib Deflection	36	47	mm	42.3	Pass
Lower Abdomen Rib Deflection	33	44	mm	43.9	Pass

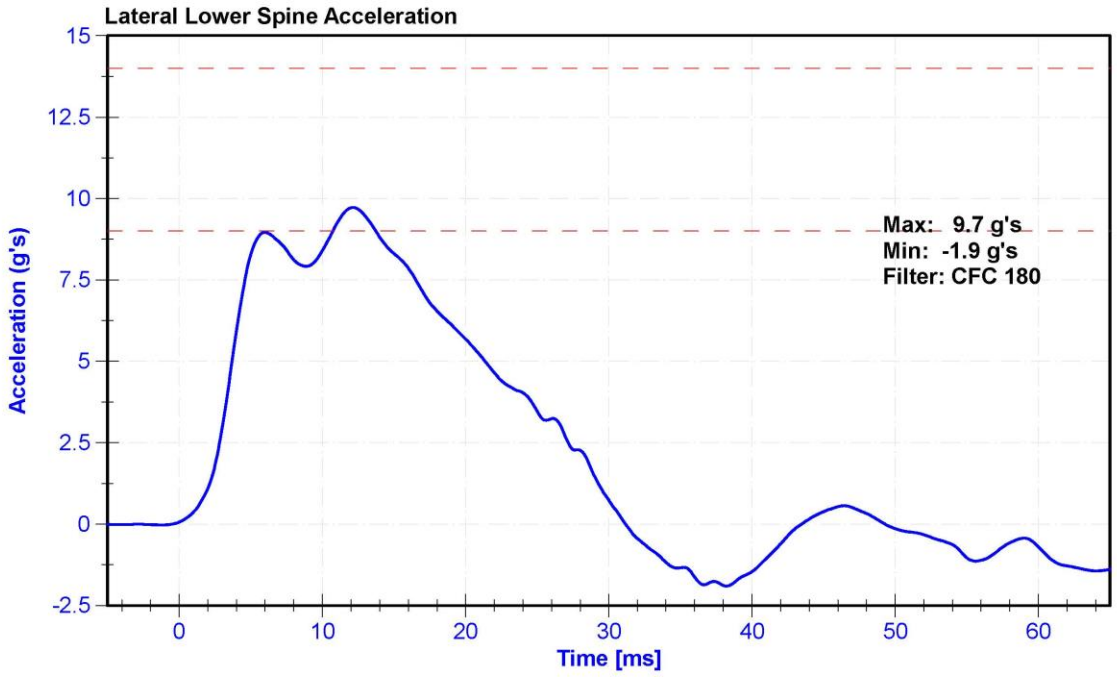
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	Endevco 7264C-2KTZ-2-360M	AC-P94667	11/1/2018	11/1/2019
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51699	10/16/2018	4/16/2019
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	10/11/2018	10/11/2019
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	10/12/2018	10/12/2019




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.3 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 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: 9.7 g's
Min: -1.9 g's
Filter: CFC 180

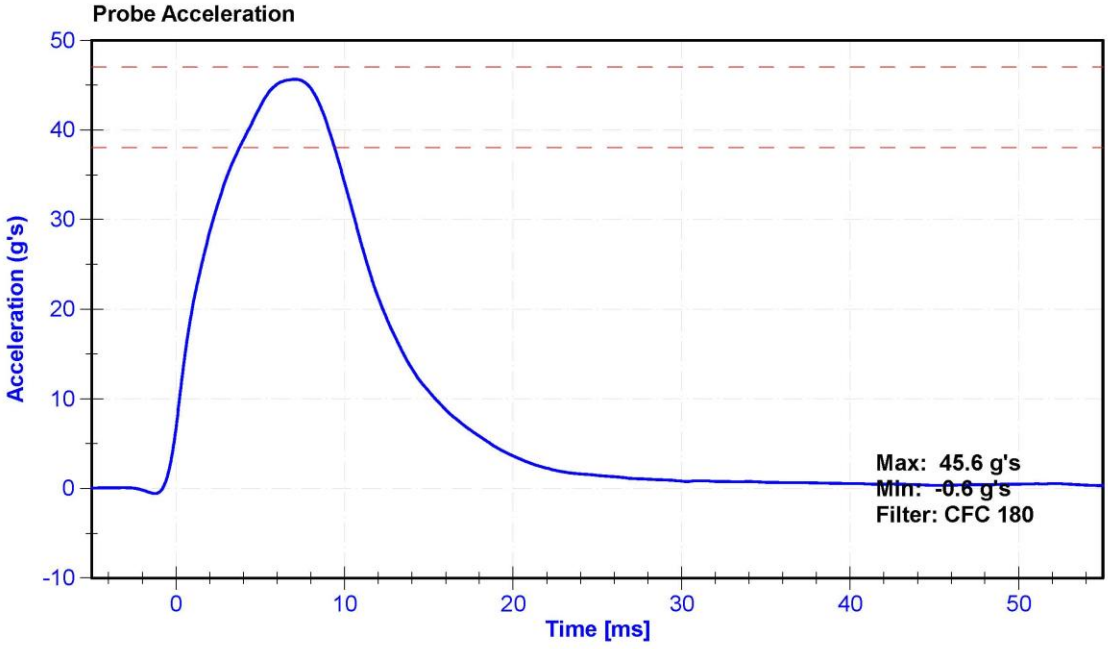
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

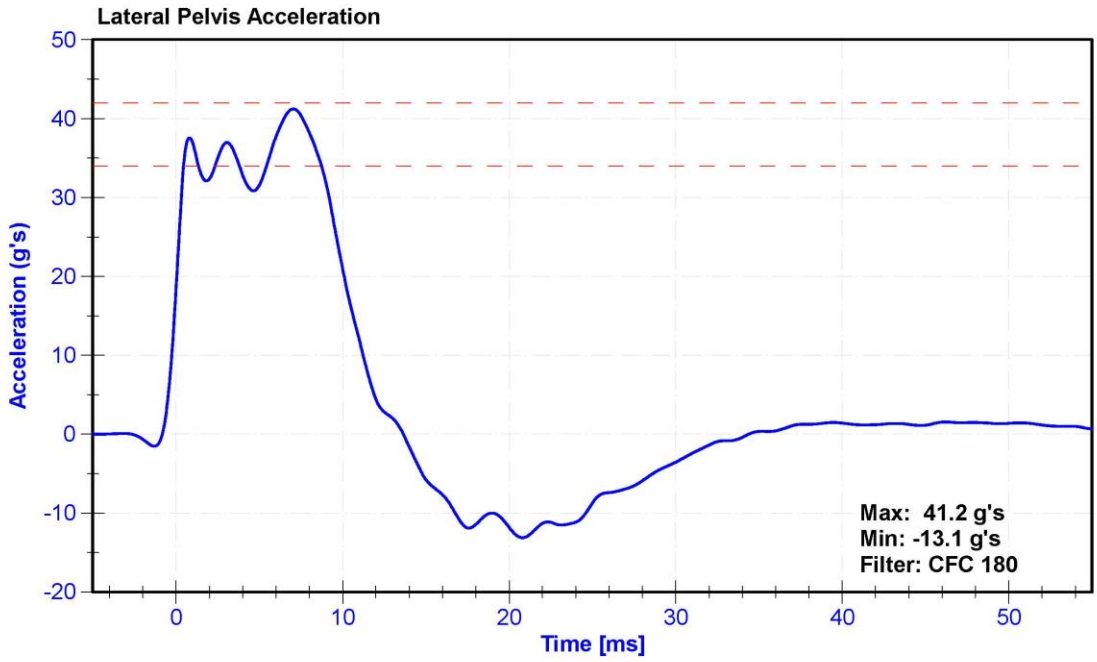
Results

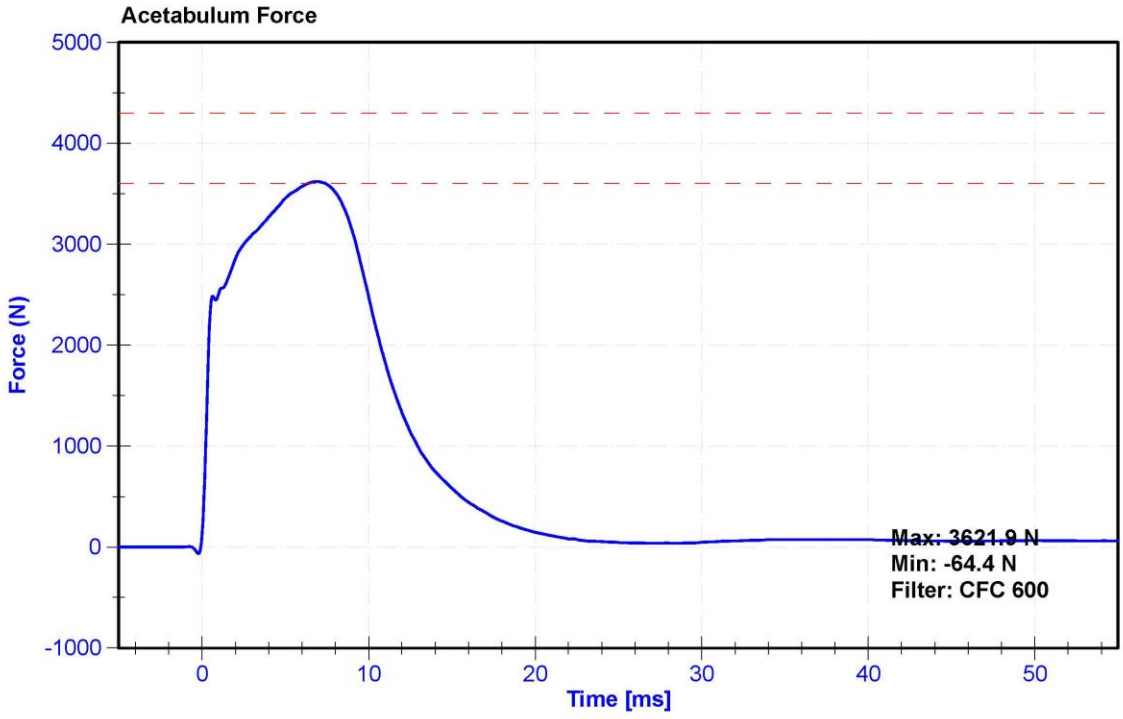
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	22	Pass
Humidity	10	70	%	25	Pass
Velocity	6.6	6.8	m/s	6.67	Pass
Probe Acceleration	38	47	g's	45.6	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.2	Pass
Acetabulum Force	3600	4300	N	3621.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco 7264C-2KTZ-2-360M	AC-P94667	11/1/2018	11/1/2019
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	10/17/2018	4/17/2019
Acetabulum Load Cell	Denton 3249J	LC-4986Fy	6/4/2018	6/4/2019
Certification Plug	Humanetics	11558	9/29/2016	N/A
Crash Test Plug	Humanetics	11587	10/4/2016	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: -13.1 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: 3621.9 N
Min: -64.4 N
Filter: CFC 600

Post Crash 1/14/2019

SID-IIs Pelvis Plug Certification Test

Plug S/N 11587
Test Number 3130
Report Number 3123
Test Date 10/4/2016 12:33:20 PM

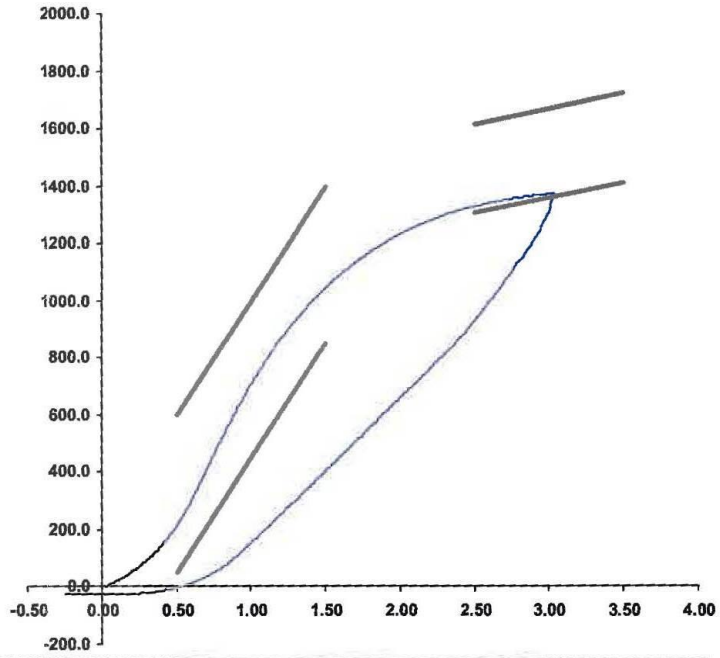
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	218.78	50.00	600.00
Force @ 1.5 mm (N)	1,049.43	850.00	1,400.00
Force @ 2.5 mm (N)	1,332.20	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,376.56	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (TI240813), Units (LBS) 1000

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

Notes:

Force (-N) vs Extension (-mm)



Operator DC

Part Number 180-4450

Template No 107 04-Oct-16
SACO Research

By : DC Date : 10/4/16

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

cert 3 Post 1/14/2019

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 11558
Test Number 3099
Report Number 3092
Test Date 9/29/2016 9:24:52 AM

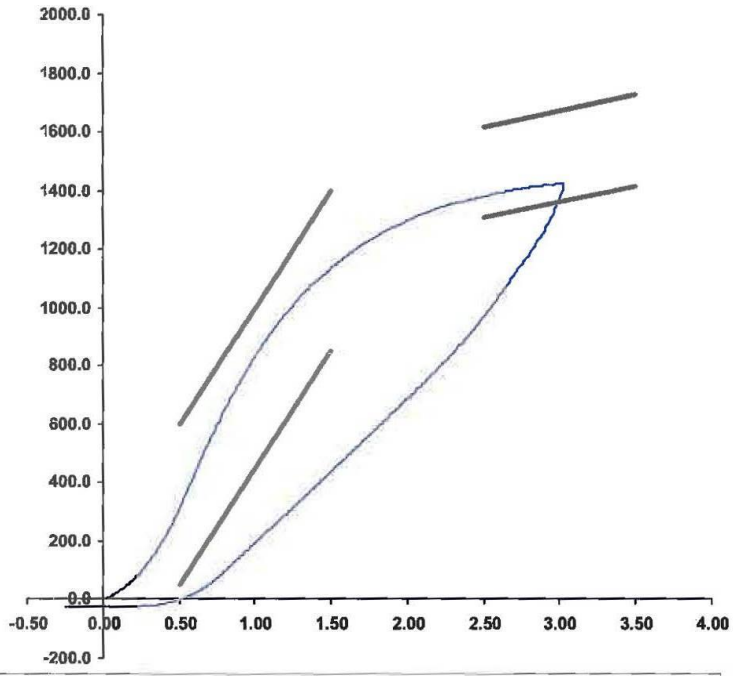
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	317.13	50.00	600.00
Force @ 1.5 mm (N)	1,140.39	850.00	1,400.00
Force @ 2.5 mm (N)	1,380.42	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,424.56	1,361.00	1,673.00

Testing Machine STM-20 5965542
Load Cell S/N (TI240813), Units (LBS) 1000

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

Notes:

Force (-N) vs Extension (-mm)



Operator DC

Part Number 180-4450

Template No 107 29-Sep-16
SACO Research

By : DC Date : 9/29/16

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

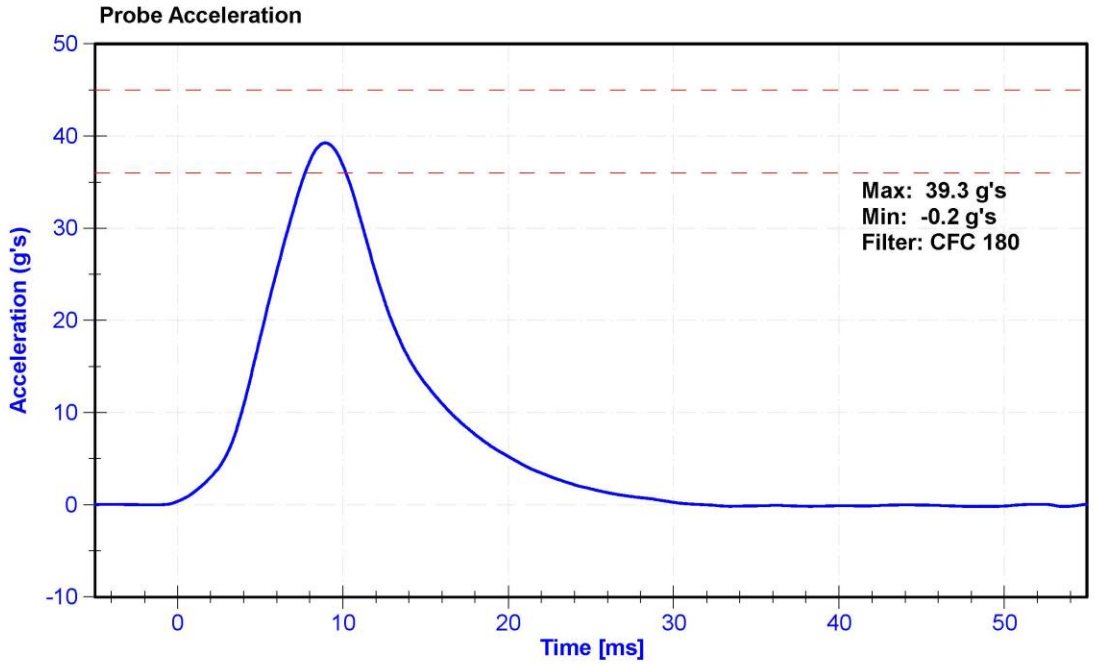
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K.Brogan

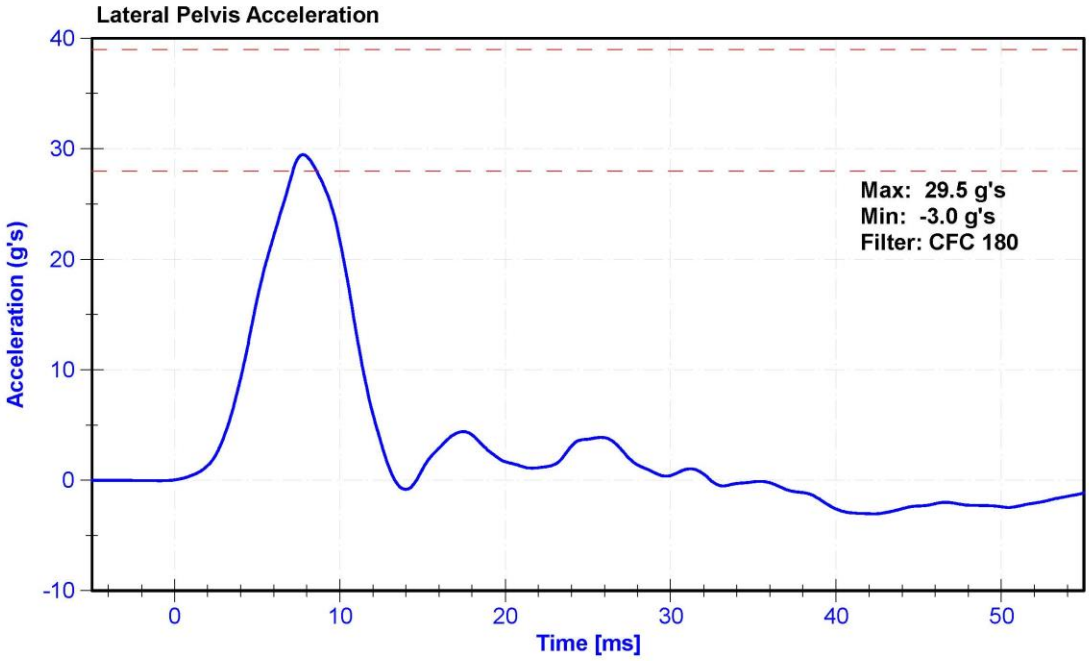
Results

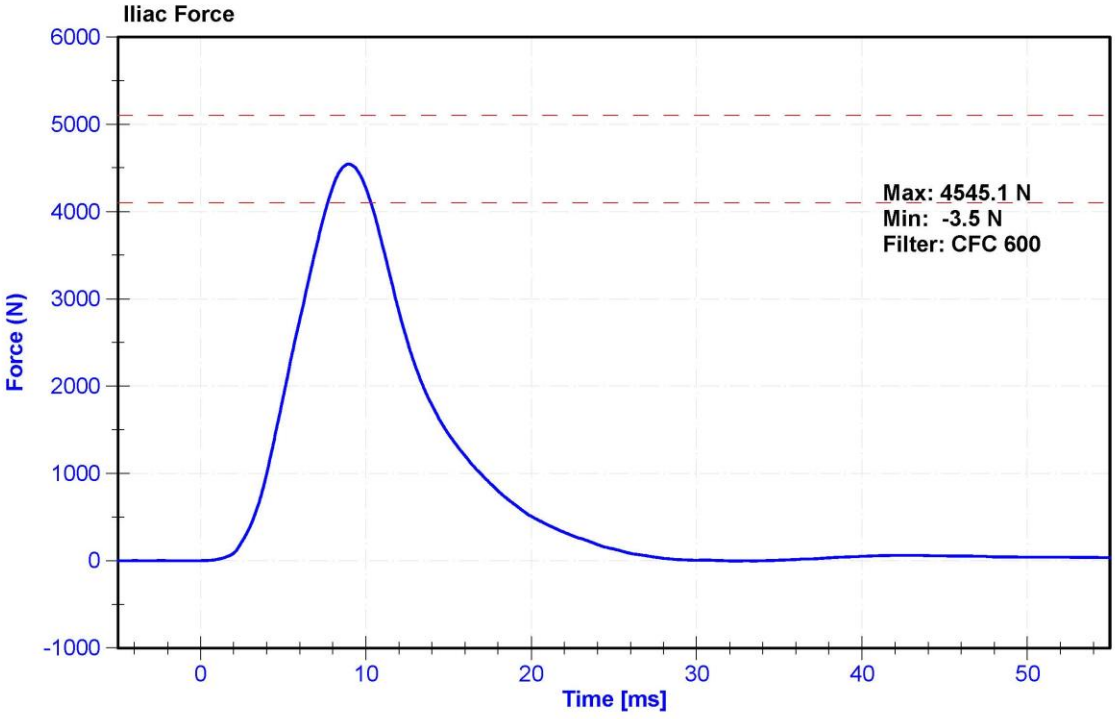
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	42.0	Pass
Velocity	4.2	4.4	m/s	4.40	Pass
Probe Acceleration	36	45	g's	39.3	Pass
Lateral Pelvis Acceleration	28	39	g's	29.5	Pass
Iliac Force	4100	5100	N	4545.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	Endevco 7264C-2KTZ-2-360M	AC-P94667	11/1/2018	11/1/2019
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	10/17/2018	4/17/2019
Iliac Load Cell	DENTON 3228J	LC-113Fy	6/4/2018	6/4/2019




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 29.5 g's
Min: -3.0 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4545.1 N
Min: -3.5 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	10/18/2018
			Y	AC-P83432	ENDEVCO	10/18/2018
			Z	AC-P83319	ENDEVCO	10/18/2018
Head Accelerometers - Redundant			X	AC-P80334	ENDEVCO	10/18/2018
			Y	AC-P84345	ENDEVCO	10/18/2018
			Z	AC-P83322	ENDEVCO	10/18/2018
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	DS-2165GFE	Servo	5/15/2018
		Middle	Y	DS-45 GFE	Servo	10/12/2018
		Lower	Y	DS-011GFE	Servo	10/12/2018
	Abdominal Rib	Upper	Y	DS-008GFE	Servo	10/11/2018
		Lower	Y	DS-1774GFE	Servo	10/12/2018
Lower Spine Accelerometers (T12)			X	AC-P45019	ENDEVCO	10/17/2018
			Y	AC-P51699	ENDEVCO	10/16/2018
			Z	AC-P51685	ENDEVCO	10/17/2018
Acetabulum Load Cell			Y	LC-4986Fy	Denton	6/4/2018
Lilac Wing Load Cell			Y	LC-113Fy	Denton	6/4/2018
Pelvis Plug (Struck Side)				11554	SACO	9/29/2016
Pelvis Plug (Non-Struck Side)						

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	AC-A250386	MSI 1201-1001	1/5/2019
Vehicle Center of Gravity	Y	AC-A255856	MSI 1201-1000	1/5/2019
Vehicle Center of Gravity	Z	AC-A262926	MSI 1201-1000	7/17/2018
Left Floor Sill	Y	AC-A192218	MSI 1201-1000	1/5/2019
A-Pillar Sill	Y	AC-A222645	MSI 1201-1000	1/5/2019
A-Pillar Low	Y	AC-A280907	MSI 1201-1000	11/21/2018
A-Pillar Mid	Y	AC-A255989	MSI 1201-1000	1/5/2019
B-Pillar Sill	Y	AC-A250352	MSI 1201-1000	1/5/2019
B-Pillar Low	Y	AC-A262923	MSI 1201-1000	1/5/2019
B-Pillar Mid	Y	AC-A217581	MSI 1201-1000	10/12/2018
Driver Seat	Y	AC-A255860	MSI 1201-1000	1/5/2019
Engine Top	X	AC-A250382	MSI 1201-1005	10/4/2018
Engine Top	Y	AC-A255878	MSI 1201-1000	1/5/2019
Firewall	Y	AC-A255887	MSI 1201-1000	1/5/2019
Right Roof	Y	AC-A229237	MSI 1201-1000	11/15/2018
Right Floor Sill	Y	AC-A196981	MSI 1201-1000	1/5/2019
Rear Floorpan	X	AC-A250369	MSI 1201-1003	1/5/2019
Rear Floorpan	Y	AC-A255867	MSI 1201-1000	1/5/2019

Table 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	LC-18879	Interface 1220-FS	8/3/2018
Load Cell 2	LC-18852	Interface 1220-FS	8/3/2018
Load Cell 3	LC-46955	Interface 1220-FS	8/3/2018
Load Cell 4	LC-18882	Interface 1220-FS	8/3/2018
Load Cell 5	LC-18864	Interface 1220-FS	8/3/2018
Load Cell 6	LC-18847	Interface 1220-FS	8/3/2018
Load Cell 7	LC-62086	Interface 1220-FS	8/3/2018
Load Cell 8	LC-46962	Interface 1220-FS	8/3/2018