REPORT NUMBER: SPNCAP-CAL-20-011

NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST

Nissan Motor Co. LTD.
2020 Nissan LEAF PLUS (62 kWh Battery)
Five Door Hatchback

NHTSA No: O20205200

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

October 13, 2020

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NRM-110
1200 NEW JERSEY AVE SE, ROOM W43-410
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Prepared by: Matthew Pronko Date: October 13, 2020
Matthew Pronko, Test Engineer

Approved by: Vanessa Hansen Date: October 13, 2020
Vanessa Hansen, Operations Manager

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. SPNCAP-CAL-20-011	***2. Government Accession No.***	***3. Recipient's Catalog No.***
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact Pole 305 Indicant Testing of a 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200		***5. Report Date*** October 13, 2020 ***6. Performing Organization Code*** CAL
7. Author(s) Matthew Pronko, Test Engineer Vanessa Hansen, Operations Manager		***8. Performing Organization Report No.*** CAL-DOT-2020-011
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, May 18, 2020 – October 13, 2020 ***14. Sponsoring Agency Code*** NRM-110
15. *Supplementary Notes*		

16. Abstract

A 32.21 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2020 Nissan LEAF PLUS Five Door Hatchback 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 May 18, 2020.

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 312 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	145.704
Resultant Lower Spine Acceleration	G	82	40.553
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3173.210
Maximum Thoracic Rib Deflection	mm	38	17.225
Maximum Abdomen Rib Deflection	mm	45	16.370

The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.

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

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Form DOT F1700.7 (8-72)

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SECTION 1

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY 2020 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00352. The purpose of this test is to generate comparative side impact performance in a 2020 Nissan LEAF PLUS Five Door Hatchback. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated October 2015.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2020 Nissan LEAF PLUS five door hatchback. 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 May 18, 2020. Pre-test and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS Side NCAP Pole Laboratory Test Procedure, dated October 2015. Camera locations and other pertinent camera information are included on page 3-11 in this report.

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

Head CG tri-axial accelerometers
Thorax upper, middle, and lower rib displacement potentiometers
Abdomen upper and lower rib displacement potentiometers
Lower spine tri-axial accelerometers
Iliac load cell
Acetabulum load cell

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

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

INJURY READINGS

Measurement Description	Driver ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})		1000	145.704
Resultant Lower Spine Acceleration	g	82	40.553
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3173.210
Maximum Thoracic Rib Deflection	mm	38*	17.225
Maximum Abdominal Rib Deflection	mm	45*	16.370

*****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	Yes		
Knee Airbag	Yes	Yes		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 – Torso/Pelvis	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

GENERAL COMMENTS:

1. P1 serial number – DG8012

Data Anomalies:

- Left Sill A-Pillar Y Acceleration, Exceeded calibration range at 46 ms
- Left Front Sill Y Acceleration, Exceeded calibration range and saturated at 26.2 ms
- Left Middle B-Pillar Y Acceleration, Exceeded calibration range at 11.6 ms
- Load Cell Pole Barrier #1 Fy, Channel saturated 38.7ms to 65.1ms

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. 305-1 – General Test and Parameter Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-2 – Pre-Impact Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-3 – Pre-Impact Electrical Isolation Measurements and Calculations for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-4 – Post-Impact Data for Indicant FMVSS No. 305 Testing

Data Sheet No. 305-5 –Static Rollover Test Data for Indicant FMVSS No. 305 Testing

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback
NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test
Test Date: 5/18/2020

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20205200
Model Year	2020
Make	Nissan
Model	LEAF PLUS
Body Style	5 Door Hatchback
VIN	1N4BZ1CP7LC304111
Body Color	Blue
Odometer Reading (km/mi)	91 miles
Engine Displacement (L)	EV
Type / No. Cylinders	EV
Engine Placement	N/A
Transmission Type	Automatic
Transmission Speeds	Direct Drive
Overdrive	Yes
Final Drive	Front Wheel Drive
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

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

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Nissan Motor Co. LTD
Date of Manufacture	02/20
Vehicle Type	Passenger Car

GVWR (kg)	2200
GAWR Front (kg)	1140
GAWR Rear (kg)	1080

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	0	5	
Capacity Weight (VCW) (kg)				390	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				49.8	(A-B)

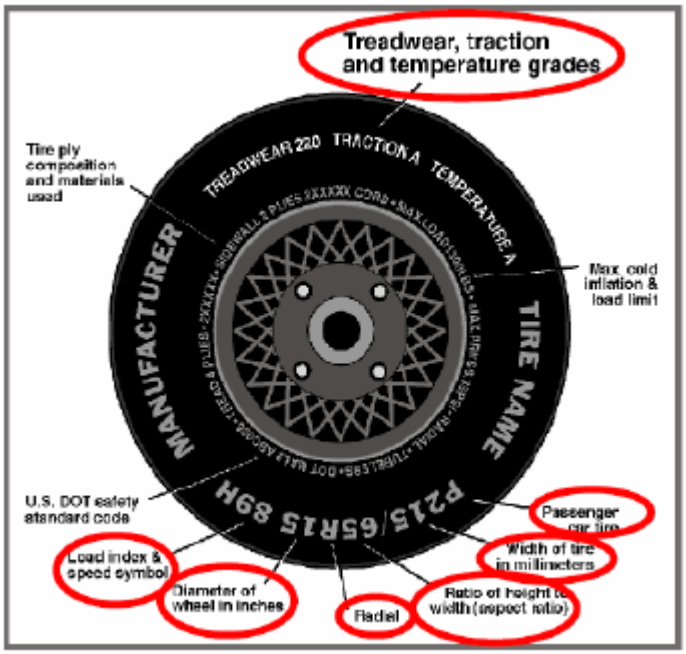
VEHICLE SEAT TYPE

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

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

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

Collected for year, make, model, & VIN, all items circled in red, tire manufacturer and tire name.



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	250	250
Recommended Tire Size	P215/50R17	P215/50R17
Tire Size on Vehicle	P215/50R17	P215/50R17
Tire Manufacturer	Michelin	Michelin
Tire Model	Energy Saver	Energy Saver
Treadwear	480	480
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 1 Polyamide, 2 Steel	1 Polyester, 1 Polyamide, 2 Steel
Load Index/Speed Symbol	90V	90V
Tire Material	Rubber	Rubber
DOT Safety Code Left	B33800KX5019	B33800KX5019
DOT Safety Code Right	B33800KX5019	B33800KX5019

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

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test Test Date: 5/18/2020

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	248	250	252	248
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa	250	250	250	250
As Tested	kPa	250	250	250	250

TEST VEHICLE AXLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	517	375		534	402		539	413	
Right	kg	495	383		525	402		508	411	
Ratio	%	57	43		56.8	43.2		56	44	
Totals	kg	1012	758	1770	1059	804	1863	1047	824	1871

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1770	(A)
Actual Weight of 1 P572V (SID-IIs) ATD Used	kg	50	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	49.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1869.8	(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	-0.75	-0.80	-0.90	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg	-0.75	-0.75	-0.70	Yes
Front Bumper-Line Angle (left-to-right)**	Deg	-0.15	-0.20	-0.30	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg	-0.05	-0.20	-0.20	Yes
Vehicle CG (Aft of Front Axle)	mm	1157	1166	1190	
Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline)	mm	6	4	14	

* ND = Nose Down (-), NU = Nose Up (+)
** LD = Left Down (-), LU = Left Up (+)
*** The "As Tested" vehicle attitude measurements must be equal to or between the "As Delivered" and "Fully Loaded" vehicle attitude measurements. Indicate "Yes" or "No" for Meets Requirement"

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

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	7.5
Passenger Rear Window	5
Ballast / Equipment Added	6.5

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

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

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL (º)		
	Max	Min	Mid
Driver Seat	21.3	14.3	17.8
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	17.8	39	Max	38	47	56
			Mid	19	30	39
			Min	5	14	22
Front Passenger Seat	Not Adjustable		Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Front Center Seat	N/A	N/A	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Non-Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Rear Center Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-

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

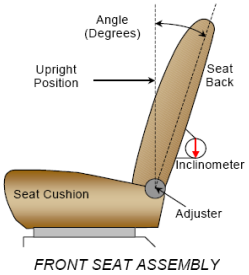
Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback
NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test
Test Date: 5/18/2020

SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detents*
Driver Seat	240	N/A	0	N/A
Front Passenger Seat	210	22 (0-21)	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	57.3	N/A	+2.6	N/A
Front Passenger Seat	56.1	-	+1.7	1
Front Center Seat	N/A	N/A	N/A	N/A
Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed	Fixed
Rear Center Seat	Fixed	Fixed	Fixed	Fixed

SEAT BELT ANCHORAGE ADJUSTMENT

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

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

HEAD RESTRAINT ADJUSTMENT

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

Seat	Total # of Positions	Placed in Position #
Driver Seat	5 (0-4)	Lowermost

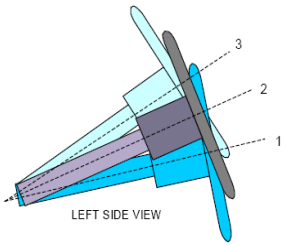
DATA SHEET NO. 2 … (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

STEERING COLUMN ADJUSTMENT

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

	Degrees	Fore / Aft Position (mm)
Lowermost – Position 1	22.4	
Geometric Center – Position 2	25.0	
Uppermost – Position 3	28.0	
Telescoping Steering Wheel Travel		30
Test Position	25.0	15

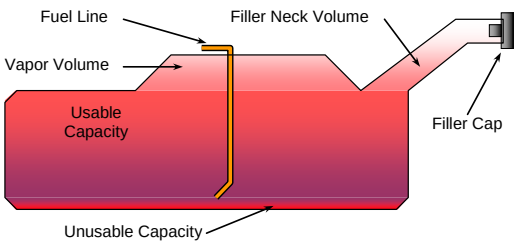


STEERING COLUMN ASSEMBLY

FUEL PUMP

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

Electric Vehicle



VEHICLE FUEL TANK ASSEMBLY

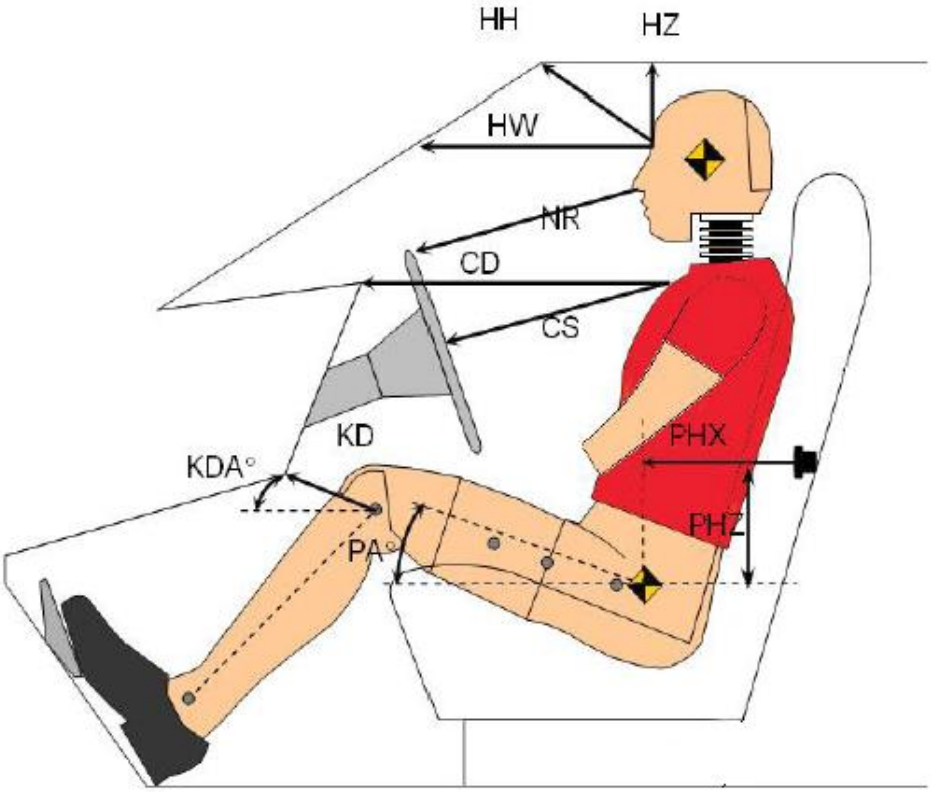
FUEL TANK CAPACITY DATA

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

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020



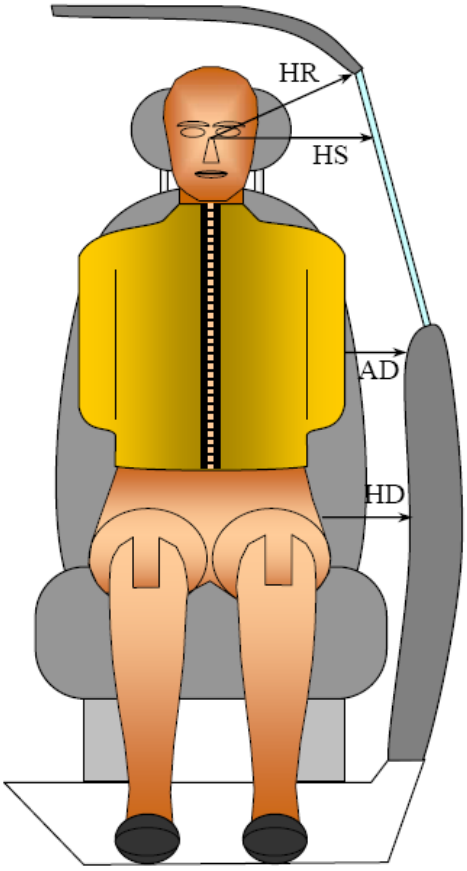
Left Side View

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Description	Driver (Serial No. DG8012)	
		Length (mm)	Angle (◦)
HH	Head to Header	323	
HW	Head to Windshield	707	
HZ	Head to Roof Liner	210	
NR	Nose to Rim	219	
CD	Chest to Dash	395	
CS	Chest to Steering Wheel	166	
KD(L) / KDA(L)◦	Left Knee to Dash	72	28.8
KD(R) / KDA(R)◦	Right Knee to Dash	78	26.5
PAX◦	Pelvic Tilt Angle (X-Axis)		20.8
PAY◦	Pelvic Tilt Angle (Y-Axis)		0.3
PHX	Hip Point to Striker (X-Axis)	412	
PHZ	Hip Point to Striker (Z-Axis)	137	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020



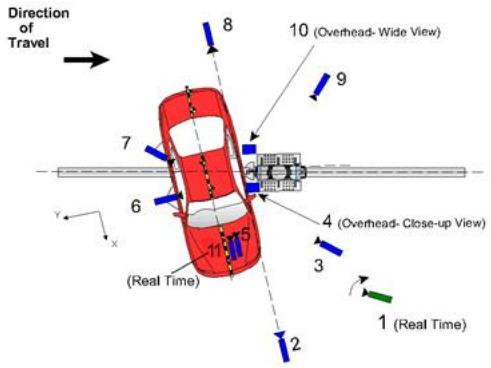
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver - Length (Serial No. DG8012)
HR	Head To Side Header	mm	250
HS	Head to Side Window	mm	364
AD	Arm to Door	mm	134
HD	Hip Point to Door	mm	142

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test Test Date: 5/18/2020



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Real-time (24 - 30 fps) pan view of impact				Zoom	30
2	Front ground level - impact view	0	7119	-1540	28	1000
3	Impact side 45º - forward pole view	1932	4575	-1579	24	1000
4	Overhead Close-up view of impact	0	0	-9375	50	1000
5	Onboard - dummy front view				25	1000
6	Onboard - dummy side view				12.5	1000
7	Onboard - dummy rear oblique view				12.5	1000
8	Rear ground level - impact view	0	-8190	-1625	28	1000
9	Impact side 45º - rearward pole view	4381	-5255	-1455	24	1000
10	Overhead wide - view of impact	0	0	-9375	12.5	1000
11	Real-time (24 - 30 fps) - dummy front view				Zoom	30

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

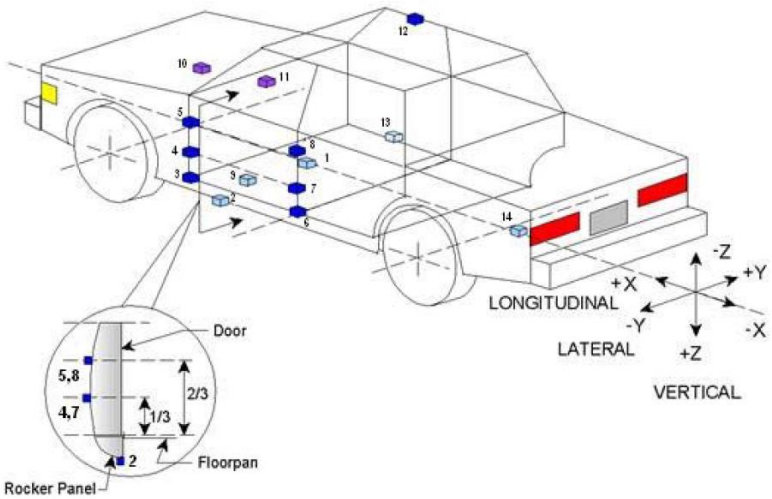
Comments: All cameras operated as intended.

INSTRUMENTATION

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

DATA SHEET NO. 6
VEHICLE ACCELEROMETER DATA

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020



TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2323	21	-27
2	Left Floor Sill	2488	-663	185
3	A-Pillar Sill	3001	-581	173
4	A-Pillar Low	3021	-581	-12
5	A-Pillar Mid	3172	-619	-506
6	B-Pillar Sill	1996	-646	114
7	B-Pillar Low	1987	-637	-112
8	B-Pillar Mid	1923	-638	-409
9	Driver Seat Track	2170	-540	132
10	Engine Top	3608	168	-285
11	Firewall	3286	-100	-160
12	Right Roof	2272	604	-950
13	Right Floor Sill	2527	664	186
14	Rear Floorpan	1890	366	224

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

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

POLE BARRIER

RIGID POLE LOAD CELL LOCATIONS

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

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test Test Date: 5/18/2020

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver Seat Dummy (SID-IIs)
Face	Front Airbag
Top of Head	Curtain Airbag
Left Side of Head	Curtain Airbag
Back of Head	Curtain Airbag & Headrest
Left Shoulder	Seatback & Torso/Pelvis Airbag
Upper Torso	Seatback
Lower Torso	Seatback
Left Hip	Seatpan & Torso/Pelvis Airbag
Left Knee	Knee Airbag

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

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

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

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test Test Date: 5/18/2020

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-Pillar Buckled
Sill Separation	None
Windshield Damage	Cracks Throughout
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	Yes		
Knee Airbag	Yes	Yes		
Side Airbag 1 - Curtain	Yes	Yes	Yes	Yes
Side Airbag 2 – Torso/Pelvis	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Other				

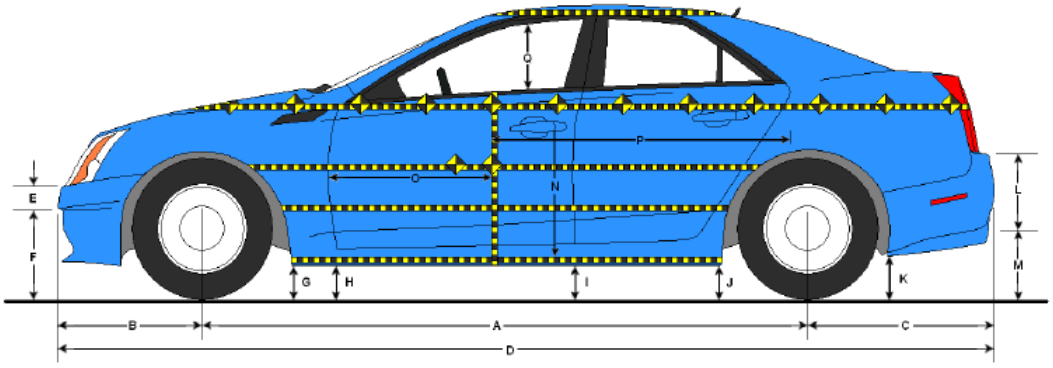
VEHICLE SPEED, VEHICLE ANGLE AT IMPACT AND IMPACT POINT LOCATION DATA

Measured Parameter		Units	Tolerance	Value
Vertical Impact Ref Line	- Aft of Front Axle, Intended Impact Pt	mm		1011
Actual Impact Point	- Aft of Front Axle	mm		1011
Horizontal Offset (+ forward / - rearward)		mm	+/- 38 *	0
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion		deg	75 +/- 3	75
Trap No. 1 Velocity	- Primary	kph	31.4 to 33.0	32.22
Trap No. 2 Velocity	- Redundant	kph	31.4 to 33.0	32.25

* Of Intended Impact Point

DATA SHEET NO. 9
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback
NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test
Test Date: 5/18/2020



LEFT SIDE VIEW

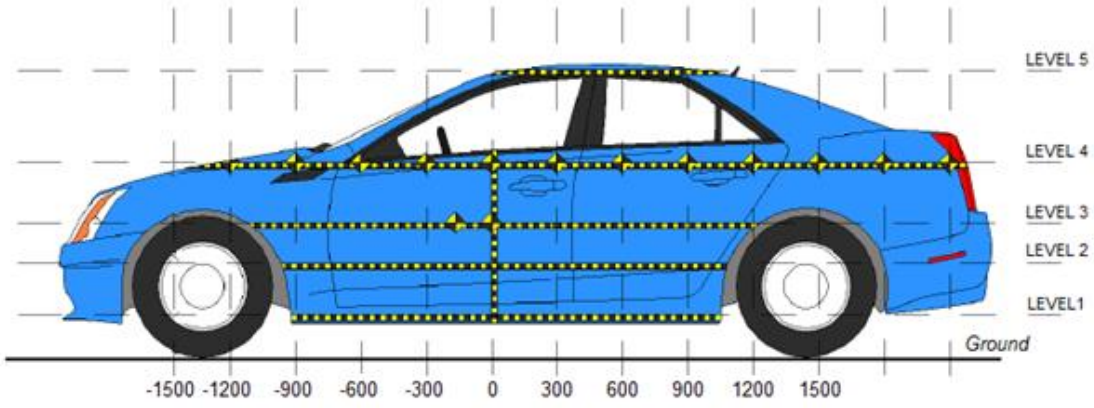
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Vehicle Wheelbase	2701	2670	31
B	Front Axle to FSOV	996	1004	-8
C	Rear Axle to RSOV	784	783	1
D	Total Length at Centerline	4480	4457	23
E	Front Bumper Thickness	210	210	0
F	Front Bumper Bottom to Ground	266	302	-36
G	Sill Height at Front Wheel Well	175	178	-3
H	Sill Height at Front Door Leading Edge	174	178	-4
I	Sill Height at B-Pillar	187	189	-2
J1	Sill Height at Rear Wheel Well	205	209	-4
J2	Pinch Weld Height at Rear Wheel Well	193	193	0
K	Sill Height Aft of Rear Wheel Well	286	286	0
L	Rear Bumper Thickness	235	235	0
M	Rear Bumper Bottom to Ground	438	436	2
N	Sill Height to Bottom of Front Window Sill	867	870	-3
O	Front Door Leading Edge to Impact CL	577	512	65
P	Rear Door Trailing Edge to Impact CL	1498	1435	63
Q	Front Window Opening	441	431	10
R	Right Side Length	4370	4375	-5
S	Left Side Length	4367	4325	42
T	Vehicle Width at B-Pillars	1773	1713	60

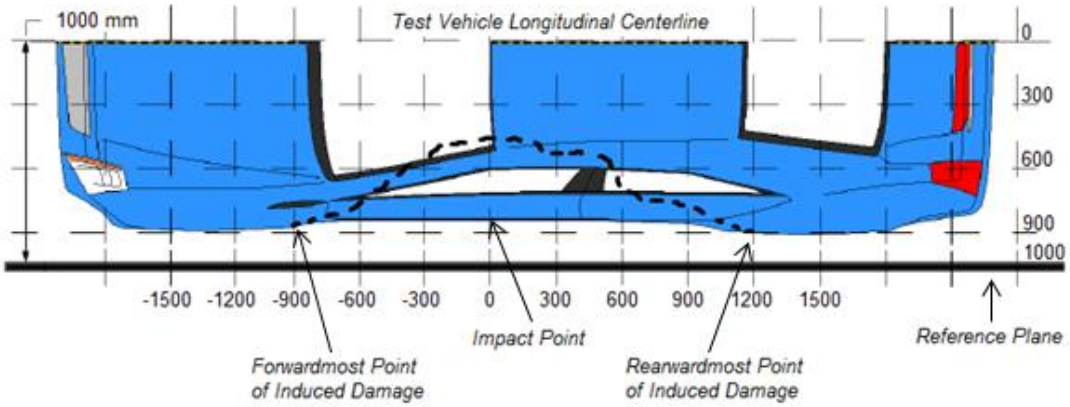
* All measurements in mm with tolerance of ± 3mm

DATA SHEET NO. 10
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020



Left Side View



Overhead View

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	282	206	0
2	Occupant Hip Point	mm	622	299	150
3	Mid - Door	mm	687	312	150
4	Window Sill	mm	966	287	150
5	Window Top	mm	1485	110	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: 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test Test Date: 5/18/2020

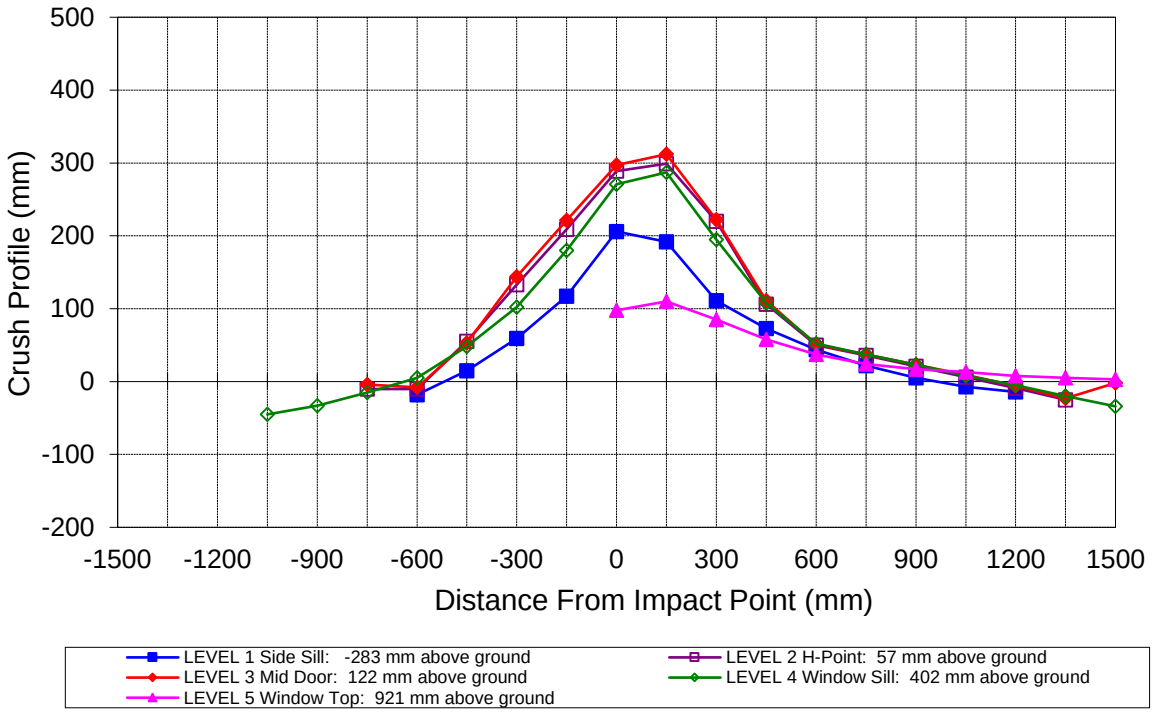
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1500															
-1350															
-1200															
-1050				782					827					-45	
-900				799					832					-33	
-750		887	888	784			897	892	799			-10	-4	-15	
-600	863	884	881	794		881	894	889	789		-18	-10	-8	5	
-450	836	879	879	803		821	824	826	755		15	55	53	48	
-300	833	881	882	815		774	748	738	713		59	133	144	102	
-150	832	883	884	825		715	674	663	645		117	209	221	180	
0	832	885	886	837	583	626	596	589	566	485	206	289	297	271	98
150	832	885	887	841	609	640	586	575	554	499	192	299	312	287	110
300	833	886	888	847	614	722	666	666	652	529	111	220	222	195	85
450	834	885	888	850	614	761	779	777	742	556	73	106	111	108	58
600	834	883	886	853	615	790	833	835	801	578	44	50	51	52	37
750	834	881	884	852	613	812	845	847	815	589	22	36	37	37	24
900	834	881	884	853	608	829	860	861	830	591	5	21	23	23	17
1050	835	884	886	851	599	842	878	877	843	586	-7	6	9	8	13
1200	841	889	890	850	584	855	898	896	855	576	-14	-9	-6	-5	8
1350		892	893	865	561		917	916	885	556		-25	-23	-20	5
1500			894	842	528			896	876	525			-2	-34	3

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

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

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

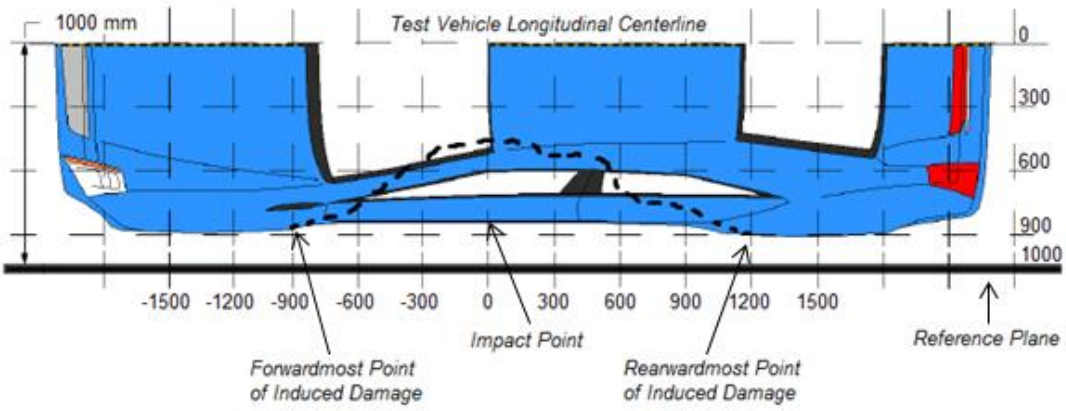


Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 11
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

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



Overhead View

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-750	3	108	112	-4
2	-300	3	262	118	144
3	150	3	425	113	312
4	600	3	165	114	51
5	1050	3	123	114	9
6	1500	3	104	106	-2

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

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side MDB Impact Test	Test Date:	5/18/2020
Test Time:	9:11 AM	Temperature:	21º 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°	65	300	365
90° to 180°	68	300	368
180° to 270°	62	300	362
270° to 360°	66	300	366

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

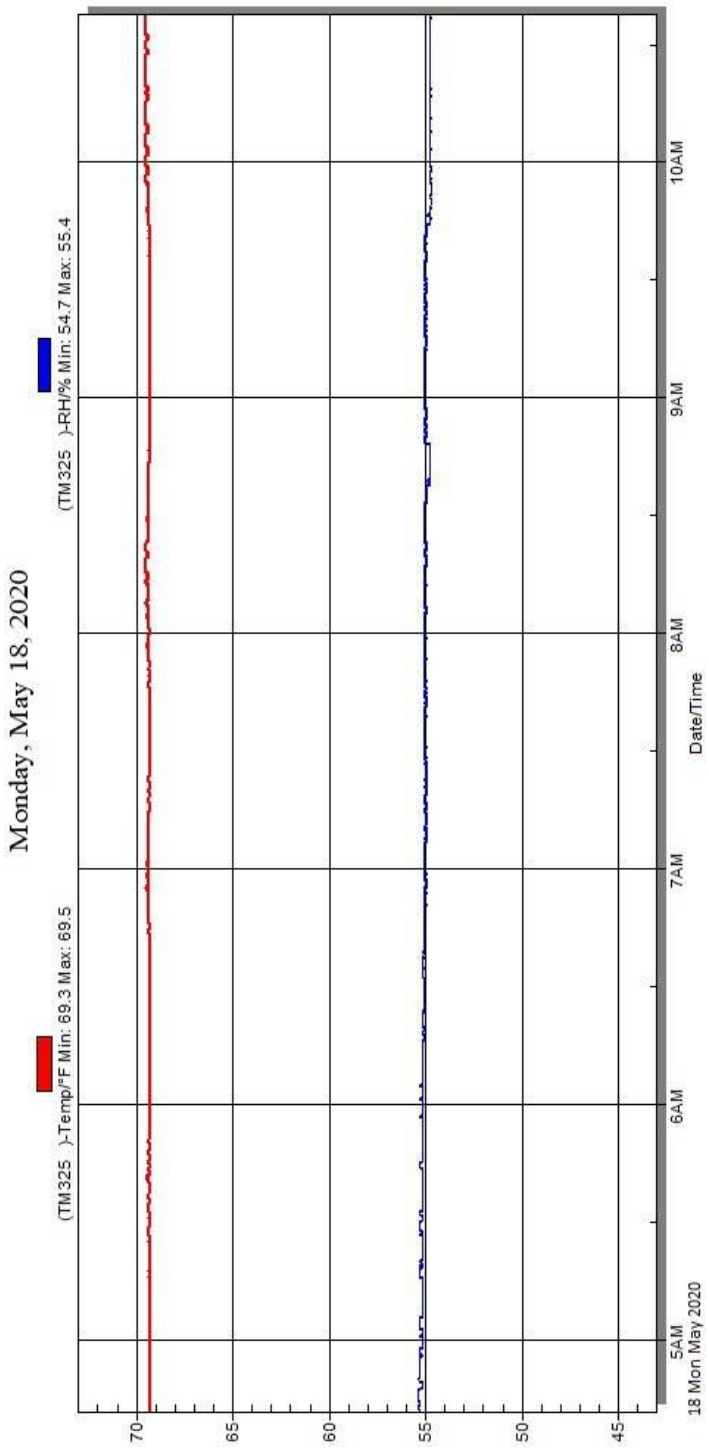
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	0
90° to 180°	0	0	0	0
180° to 270°	0	0	0	0
270° to 360°	0	0	0	0

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

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

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020



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

DATA SHEET NO. 305-1
GENERAL TEST AND VEHICLE PARAMETER DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test Test Date: 5/18/2020

ELECTRIC VEHICLE PROPULSION SYSTEM

Measured Parameter	Value
Type of Electric Vehicle (Electric/Gas-Electric Hybrid/Fuel Cell-Electric Hybrid)	Electric
Propulsion Battery Type	Laminated Lithium-Ion
Nominal Voltage (Volts)	360
Is this Vehicle equipped with an Automatic Propulsion Battery Disconnect?	Yes
Physical Location of Automatic Propulsion Battery Disconnect, if applicable	Inside Battery Pack
Auxiliary Battery Type	12V Lead Acid

PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED)

Measured Parameter	Value
Electrolyte Fluid Type	Organic Electrolyte
Electrolyte Fluid Specific Gravity	1.206 g/cc
Electrolyte Fluid Kinematic Viscosity (centistokes)	4.6 cP
Electrolyte Fluid Color	Clear
Propulsion Battery Coolant Type, Color and Specific Gravity (if applicable)	Air
Location of Battery Modules (Inside or Outside of Passenger Compartment?)	Outside

PROPULSION BATTERY STATE OF CHARGE

Measured Parameter	Units	Value
For all battery types: Voltage Range corresponding to **useable energy** of the battery:		
Minimum State of Charge	V	0
Maximum State of Charge	V	403
95% of Maximum	V	382.85
Test Voltage *	V	403.4
For batteries that are rechargeable ONLY by an energy source on the vehicle: Voltage range corresponding to **useable energy** of the battery :		
Minimum State of Charge	V	
Maximum State of Charge	V	
95% of Maximum	V	
Test Voltage *	V	

* *For all battery types-No less than 95% of Maximum Operating Voltage; for batteries that are rechargeable ONLY by an energy source on the vehicle-maximum practicable state of charge within normal operating range*.

DATA SHEET NO. 305-2
PRE-IMPACT DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

VEHICLE CHASSIS GROUND PT(S) LOCATION(S) & PROPULSION BATTERY SYSTEM

Measured Parameter	Value
Details of Vehicle Chassis Ground Points & Locations	Ground wire attached to rear vehicle chassis
Details of Propulsion Battery Components	Components are all internal to the battery pack system.

DATA SHEET NO. 305-3
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test Test Date: 5/18/2020

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Resolution	V	0.001
Last Calibration Date		7/10/2019

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

PROPULSION BATTERY VOLTAGE, RESISTANCE & ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Measured Parameter	Symbol	Units	Value
Normal operating voltage range specified by the manufacturer	V_b	V	403
Propulsion Battery Voltage : (ready to drive position)	V_b	V	403.4
Propulsion Battery to Vehicle Chassis	V_1	V	162
Propulsion Battery to Vehicle Chassis	V_2	V	176
Propulsion Battery to Vehicle Chassis Across Known Resistor	R_o	Ω	203300
Propulsion Battery to Vehicle Chassis with R_o installed	V_1'	V	8.2
Propulsion Battery to Vehicle Chassis with R_o installed	V_2'	V	9.3
$R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1']$	R_{i1}	Ω	7956000
$R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2']$	R_{i2}	Ω	6998000
Lesser value of R_{i1} and R_{i2}	R_i	Ω	6998000
Electrical Isolation Value (Minimum E.I. Value is 500 Ω/V)	R_i/V_b	Ω/V	17348

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? [X] Yes [ ] No (Fail)

NOTES:

- *The measurement shall be made with the propulsion battery connected to the vehicle propulsion system, and the vehicle in the "ready-to-drive" (propulsion motor(s) activated) position.*
- *If the voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.*
- *The known resistance Ro (in Ohms) should be approximately 500 times the nominal operating voltage of the vehicle (in volts) per SAE J1766*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*

DATA SHEET NO. 305-4
POST-IMPACT DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle:	2020 Nissan LEAF PLUS Five Door Hatchback	NHTSA No.:	O20205200
Test Program:	NCAP Side Pole Impact Test	Test Date:	5/18/2020

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V_b)	V	4.79

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

ELECTRICAL ISOLATION MEASUREMENTS & IMPACT CALCULATIONS

Parameter	Value	Units		Value		Value	
V_1 =	1.68	V	Time:	3	Minutes	14	Seconds
V_2 =	1.66	V	Time:	3	Minutes	32	Seconds
$R_{o\,=}$	203300	Ω	Time:		Minutes		Seconds
V_1' =	0.105	V	Time:	3	Minutes	44	Seconds
V_2' =	0.092	V	Time:	3	Minutes	57	Seconds
R_{i1} =	6063000	Ω	Time:	3	Minutes	46	Seconds
R_{i2} =	6972000	Ω	Time:	3	Minutes	57	Seconds
R_i =	6063000	Ω	Time:	3	Minutes	57	Seconds
R_i/V_b =	1265699	Ω/V	Time:	3	Minutes	57	Seconds

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)?	X	Yes		No (Fail)

NOTES:

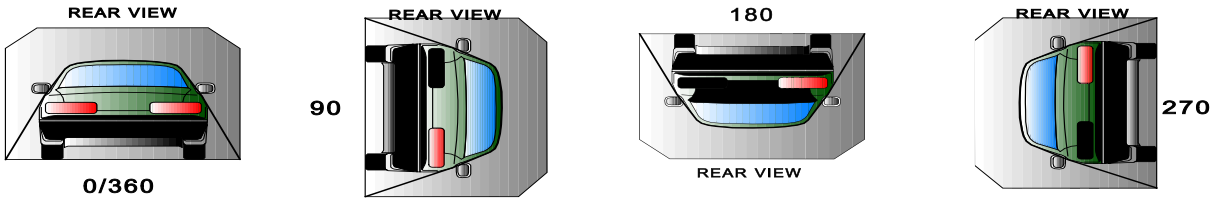
- *R_{i1}= R_o*(1+V_2/V_1)*[(V_1-V_1')/V_1'], R_{i2}= R_o*(1+V_1/V_2)*[(V_2-V_2')/V_2'], R_i = Lesser value of R_{i1} and R_{i2}*
- *If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant*
- *Minimum Electrical Isolation Value is 500 Ω/V*

. **PROPULSION BATTERY SYSTEM COMPONENTS**

Measured Parameter	Comments	Passed	Failed
Propulsion Battery Module movement within the passenger compartment	No Movement	X	
Intrusion of an outside Propulsion Battery Component into the passenger compartment	No Intrusion	X	
Is propulsion battery electrolyte spillage visible in the passenger compartment?		X	

DATA SHEET NO. 305-5
STATIC ROLLOVER TEST DATA FOR INDICANT FMVSS NO. 305 TESTING

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback
Test Program: NCAP Side Pole Impact Test
NHTSA No.: O20205200
Test Date: 5/18/2020



Rear View

DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Rollover Stage	Rotation Time (spec. 1 -3 min)		FMVSS 301 Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	5	5	6	5	7
90° to 180°	1	8	5	6	8	7
180° to 270°	1	2	5	6	2	7
270° to 360°	1	6	5	6	6	7

ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

Rollover Stage	Propulsion Battery Electrolyte Spillage	Units	Spillage Location
0° to 90°	0.0	Liters	None
90° to 180°	0.0	Liters	None
180° to 270°	0.0	Liters	None
270° to 360°	0.0	Liters	None
Total Spillage	0.0	Liters	None

** FMVSS 305 Requirements: Maximum allowable propulsion battery electrolyte spillage is **5.0 Liters***

Is the total spillage of propulsion battery electrolyte greater than 5.0 Liters? [ ] Yes (Fail) [X] No
Is propulsion battery electrolyte spillage visible in the passenger compartment? [ ] Yes (Fail) [X] No

VOLTMETER INFORMATION

Measured Parameter	Units	Value
Make & Model		Fluke 87
Serial No.		65280327
Internal Impedance Value	MΩ	10
Nominal Propulsion Battery Voltage (V_b)	V	4.79

NOTES:

- *The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10 M Ω*
- *An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.*

DATA SHEET NO. 305-5
STATIC ROLLOVER TEST DATA FOR INDICANT FMVSS NO. 305 TESTING (CONT'D)

Test Vehicle: 2020 Nissan LEAF PLUS Five Door Hatchback NHTSA No.: O20205200
Test Program: NCAP Side Pole Impact Test Test Date: 5/18/2020

ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS

Parameter	Rollover Stage	Value	Units		Minutes	Seconds
V_1 =	90°	1.64	V	Time:	2	04
	180°	1.65	V		8	20
	270°	1.65	V		14	16
	360°	1.64	V		20	43
V_2 =	90°	1.65	V	Time:	2	24
	180°	1.66	V		8	37
	270°	1.66	V		14	36
	360°	1.66	V		20	58
V_1' =	90°	0.098	V	Time:	3	27
	180°	0.096	V		8	48
	270°	0.097	V		14	47
	360°	0.096	V		21	08
V_2' =	90°	0.097	V	Time:	3	35
	180°	0.09	V		9	0
	270°	0.098	V		14	56
	360°	0.096	V		21	18
R_{i1} =	90°	6417000	Ω	Time:	3	28
	180°	6602000	Ω		8	50
	270°	6530000	Ω		14	48
	360°	6579000	Ω		21	10
R_{i2} =	90°	6490000	Ω	Time:	3	36
	180°	7072000	Ω		8	61
	270°	6461000	Ω		14	57
	360°	6584000	Ω		21	20
R_i =	90°	6417000	Ω	Time:	3	36
	180°	6602000	Ω		9	02
	270°	6461000	Ω		14	57
	360°	6579000	Ω		21	21
R_i/V_b =	90°	1339714	Ω/V	Time:	3	37
	180°	1378243	Ω/V		9	02
	270°	1348891	Ω/V		15	01
	360°	1373561	Ω/V		21	22

Is the Electrical Isolation Value ≥ 500 Ω/V (Yes/No)? [X] Yes [ ] No (Fail)

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

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

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

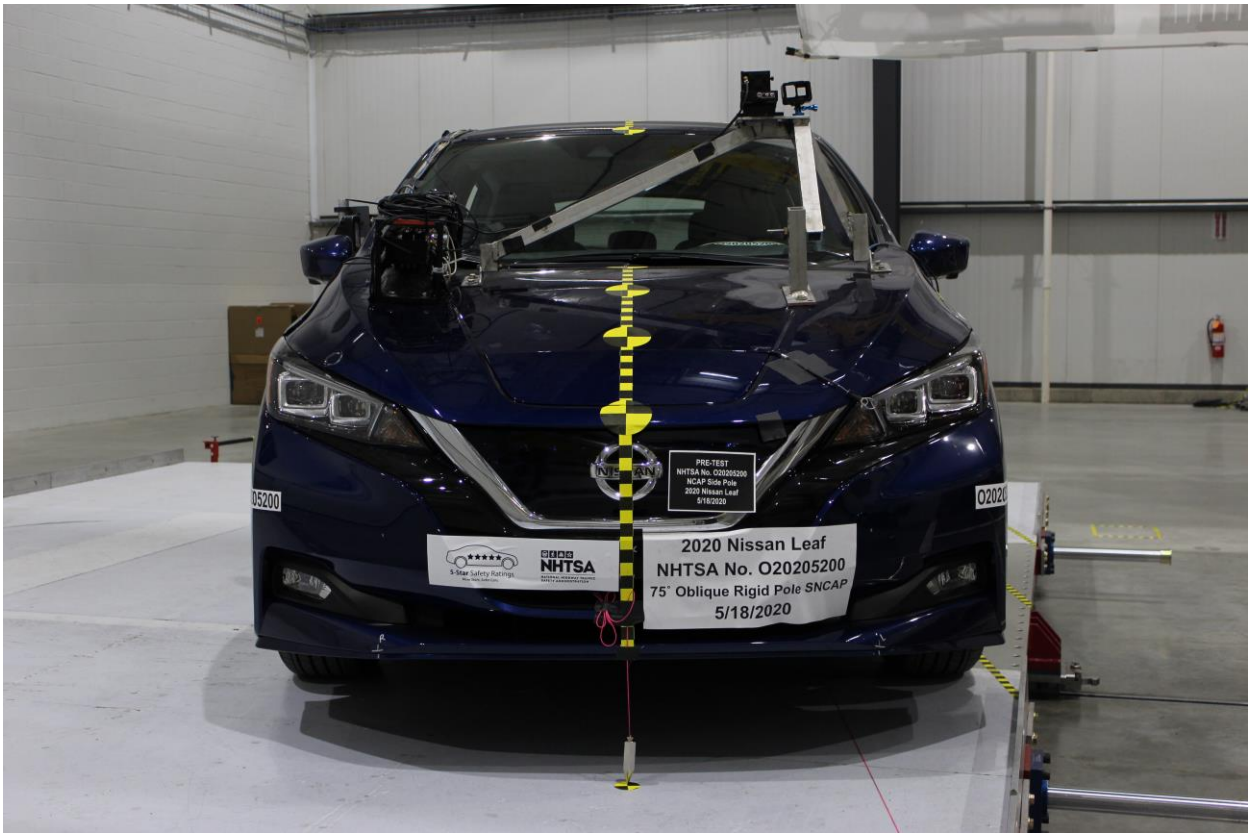


Figure A-3: Pre-Test Frontal View of Test Vehicle

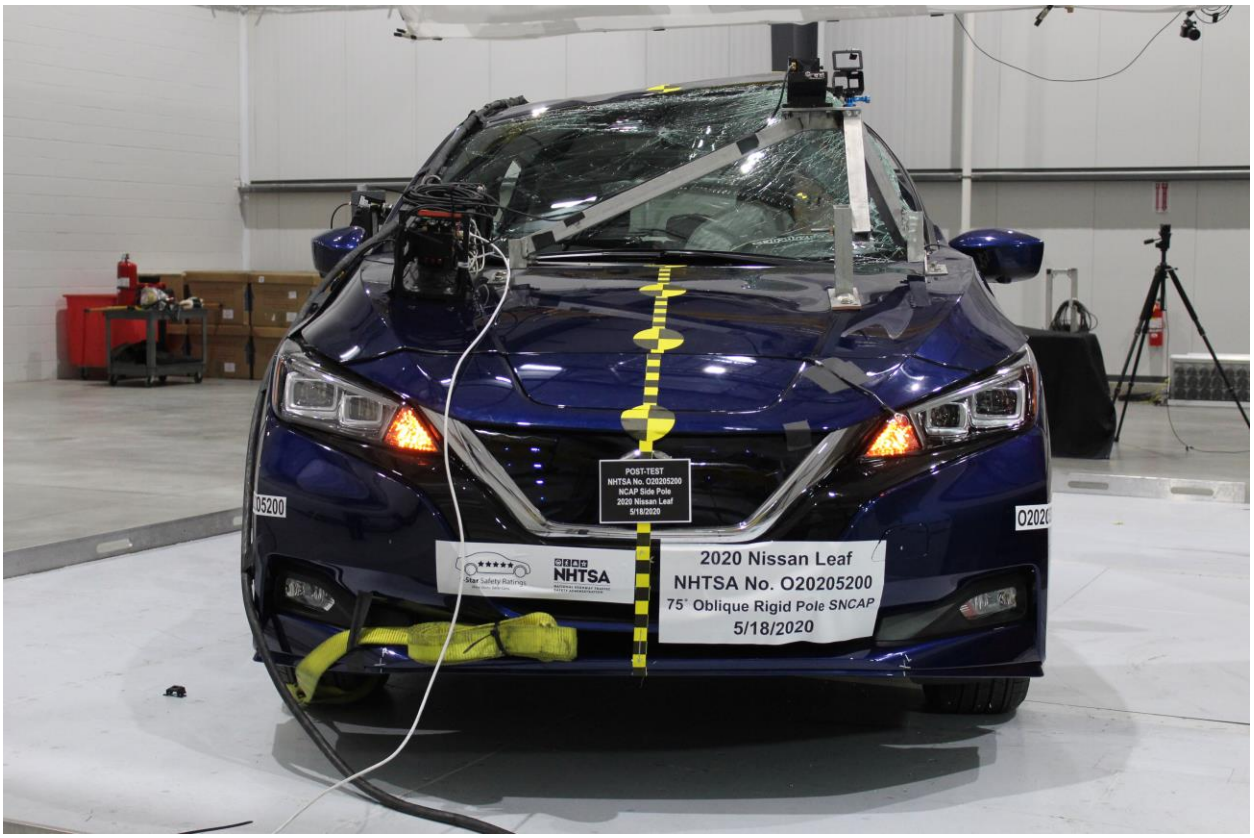


Figure A-4: Post-Test Frontal View of Test Vehicle

Figure A-5: Pre-Test Left Front ¾ View of Test Vehicle

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

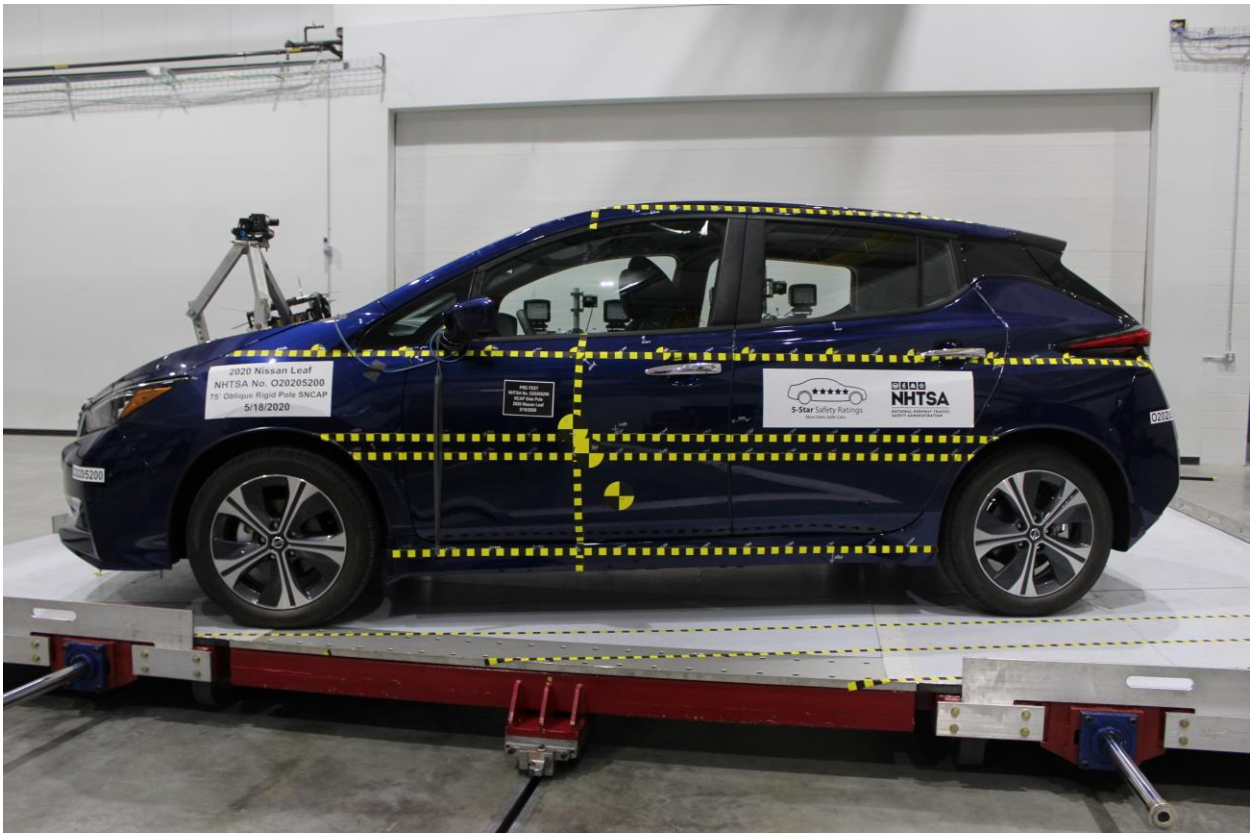


Figure A-7: Pre-Test Left Side View of Test Vehicle

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

Figure A-9: Pre-Test Left Rear ¾ View of Test Vehicle

Figure A-10: Post-Test Left Rear ¾ View of Test Vehicle

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

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

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

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

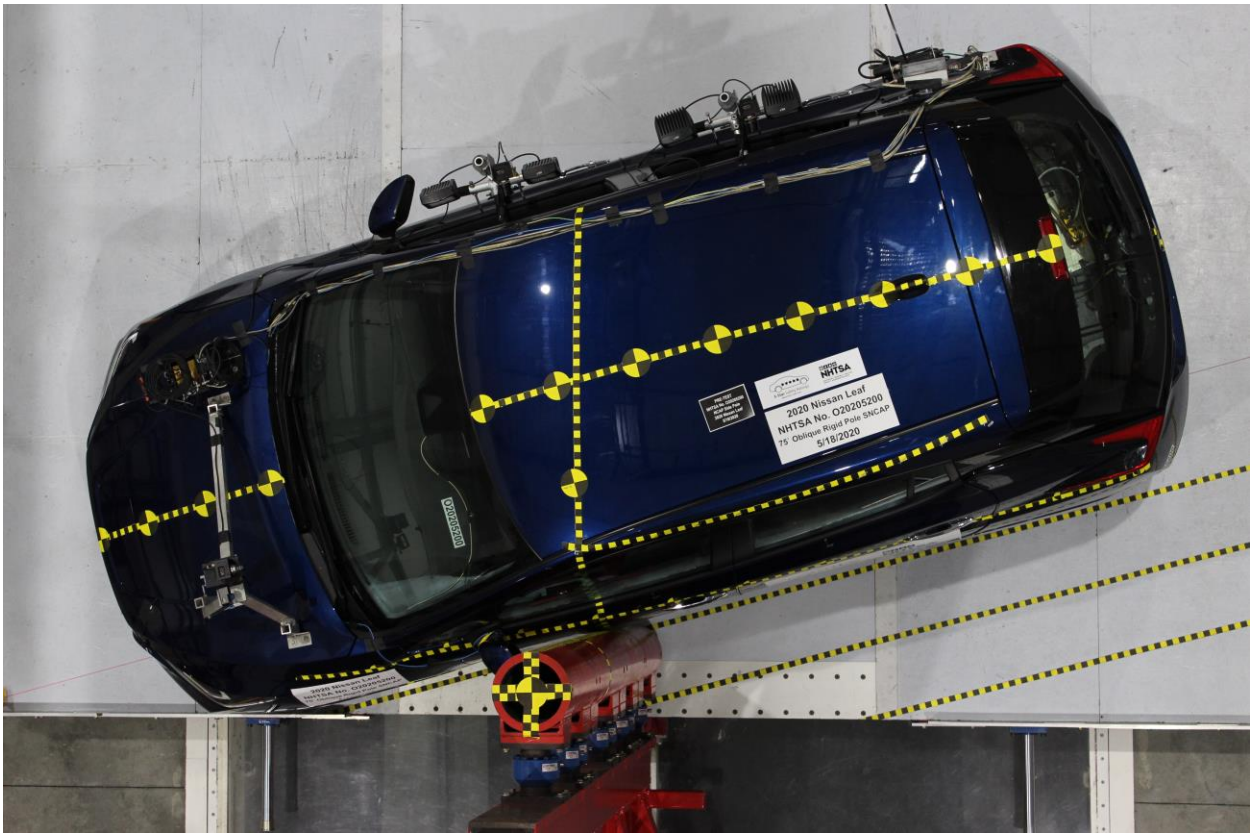


Figure A-15: Pre-Test Overhead View of Test Area

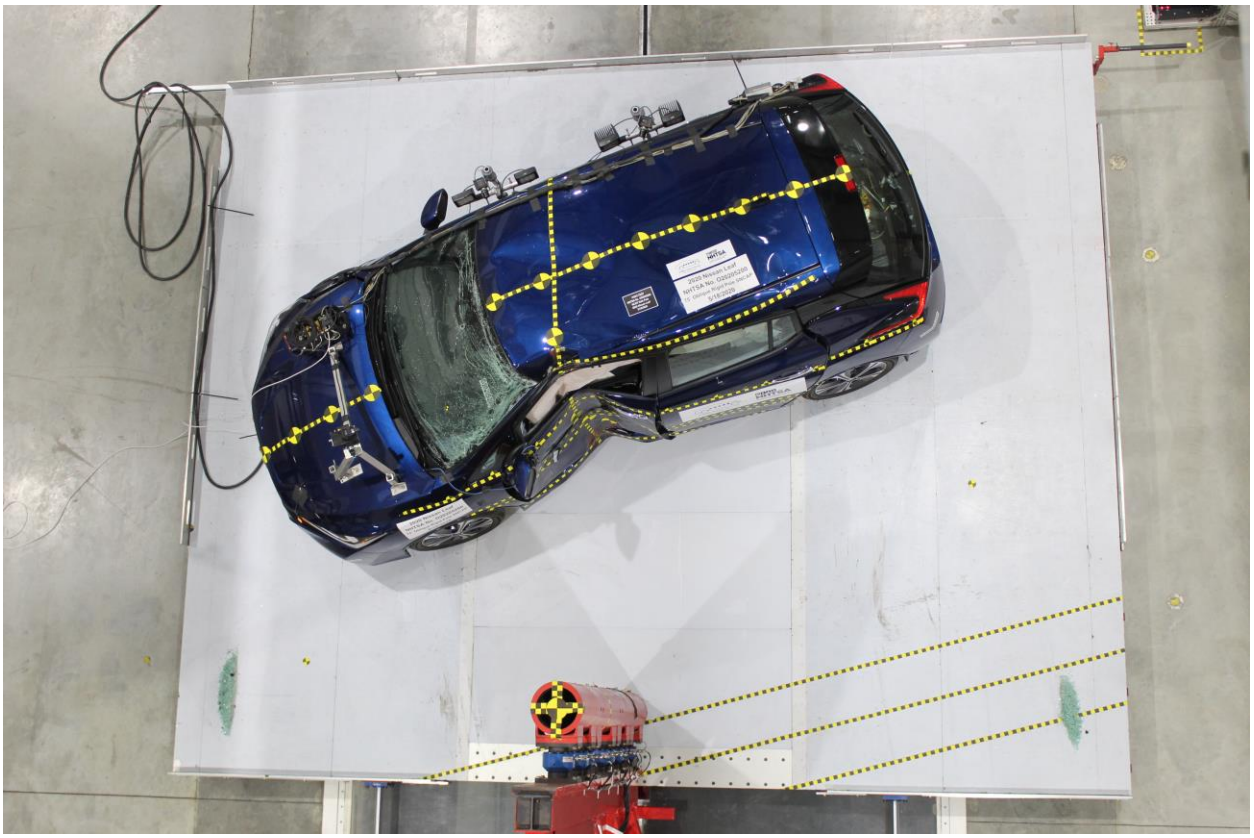


Figure A-16: Post-Test Overhead View of Test Area

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

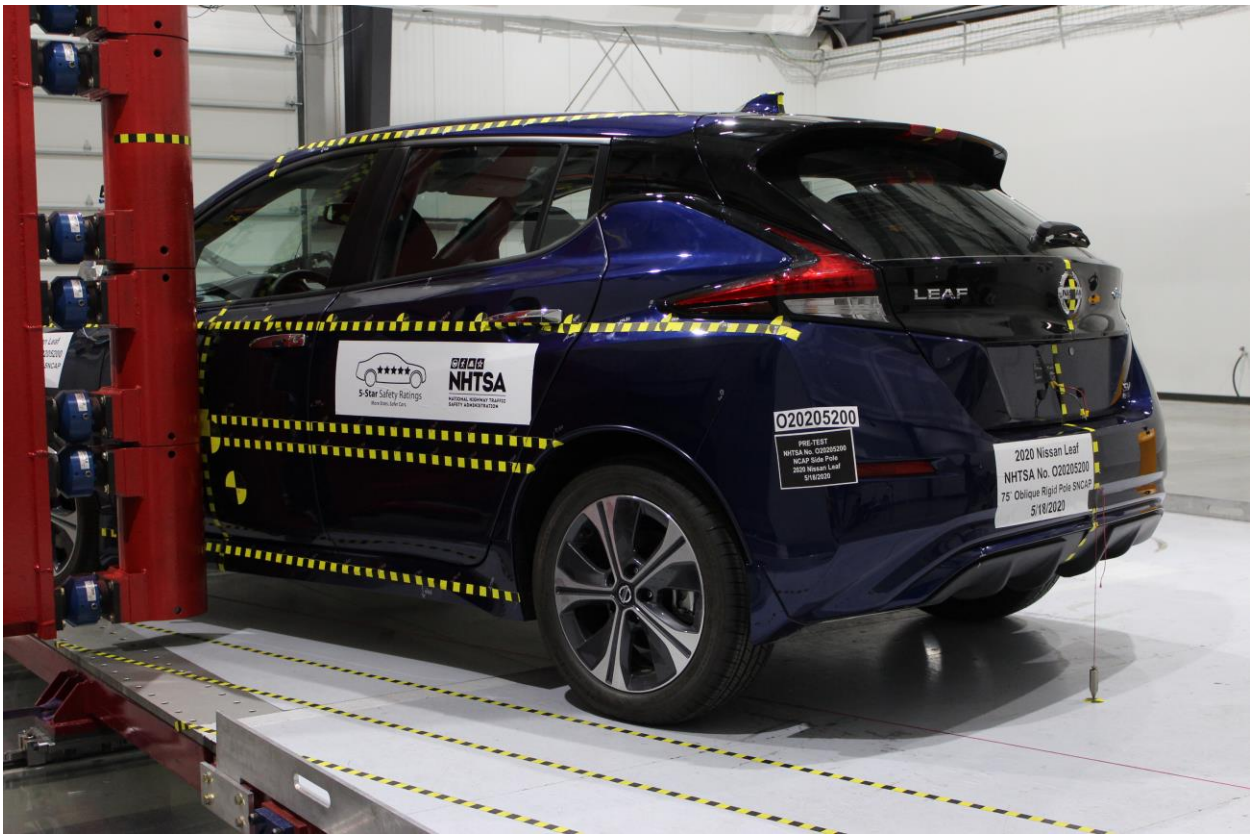


Figure A-18: Pre-Test Right Side View of Pole Positioned Against Side of Vehicle

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

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

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

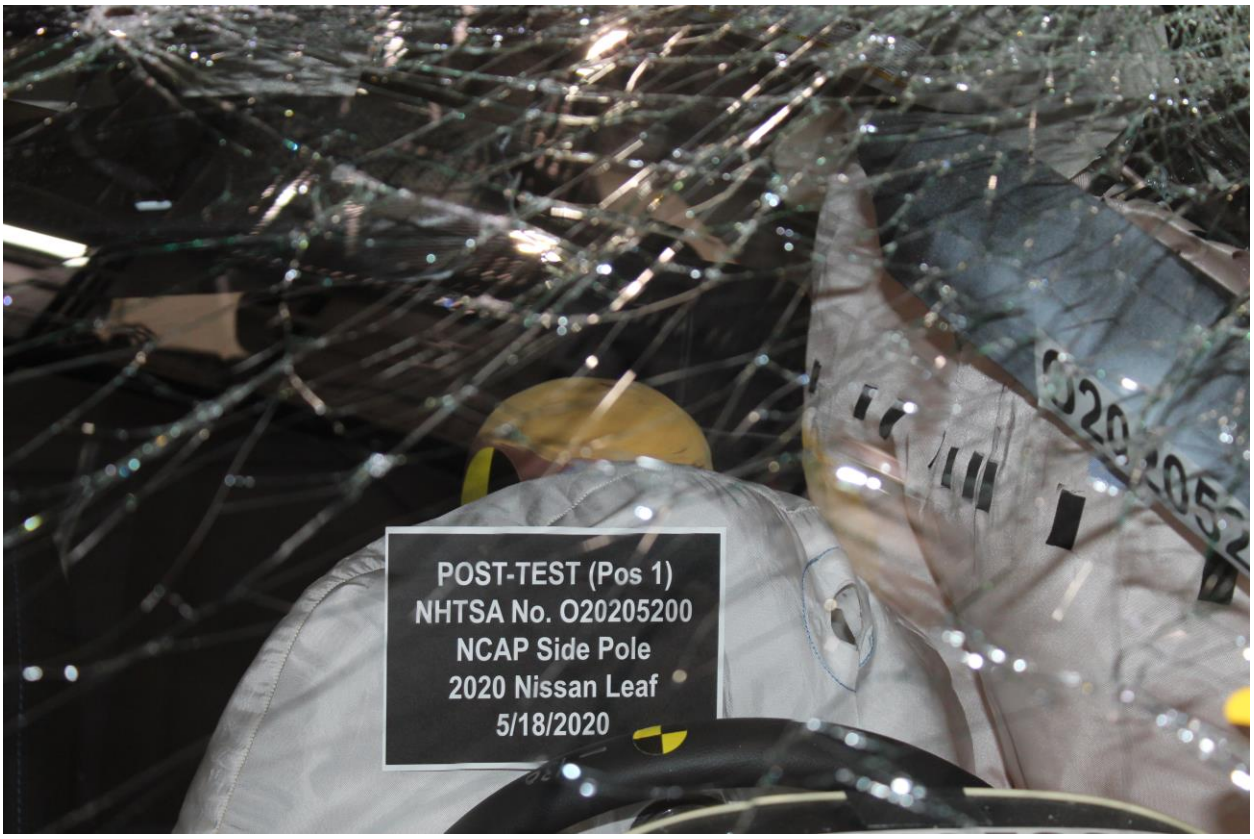


Figure A-22: Post-Test Front Close-Up View of Dummy

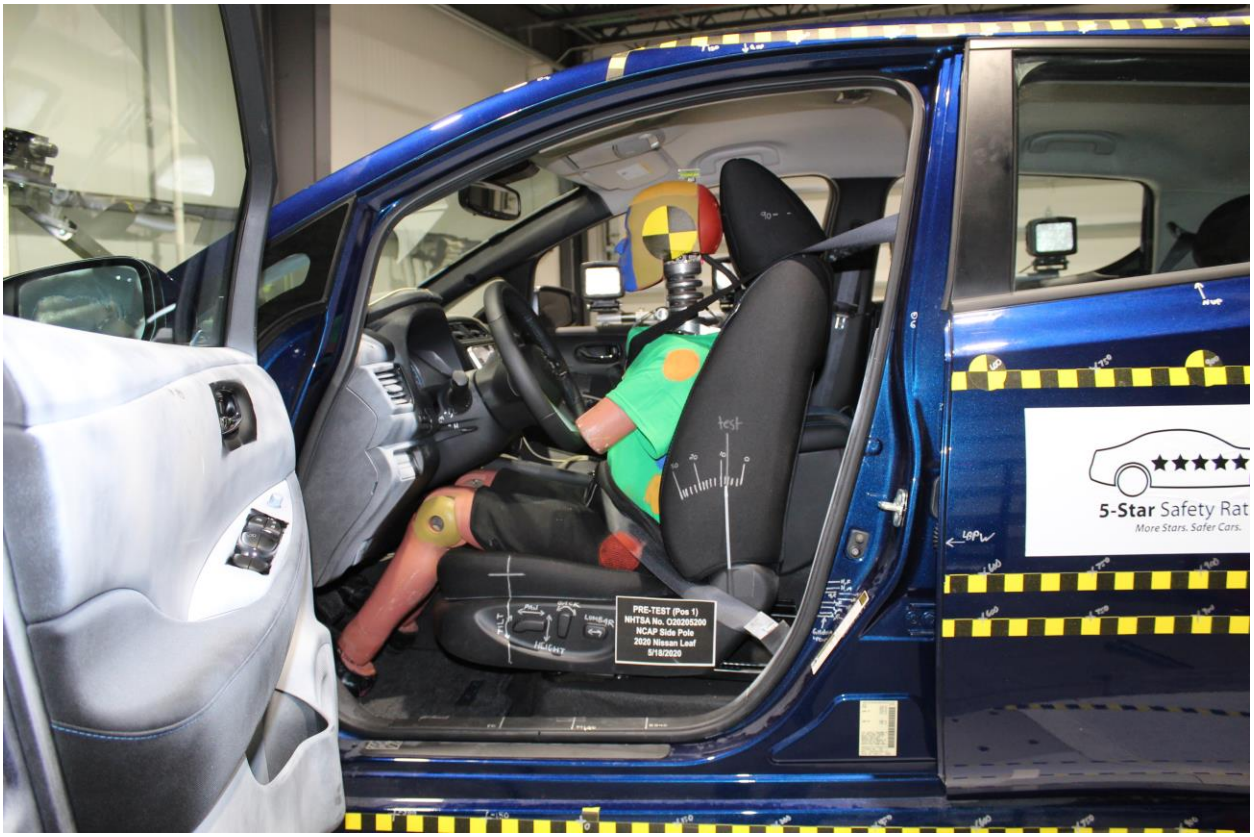


Figure A-23: Pre-Test Left Side View of Dummy Showing Belt and Chalking

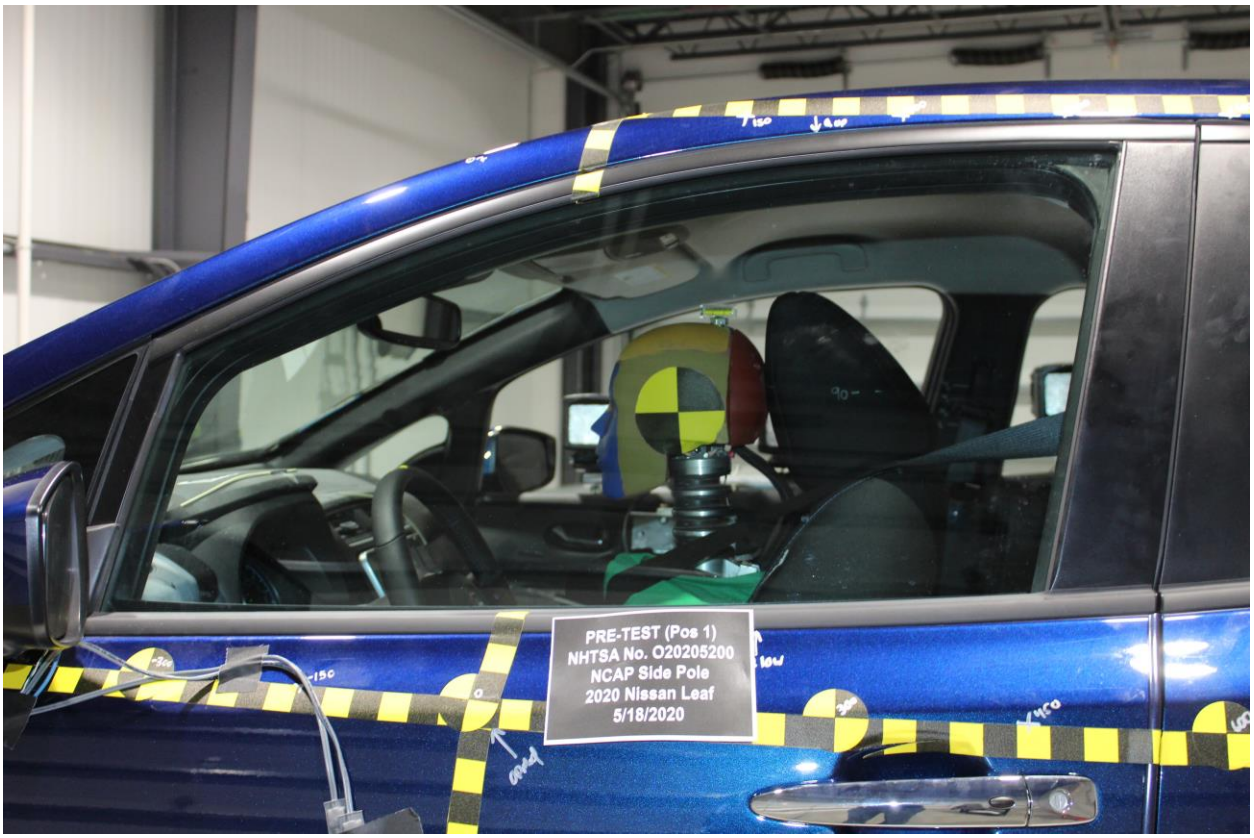


Figure A-24: Pre-Test Left Side View of Dummy Shoulder and Door Top View

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

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

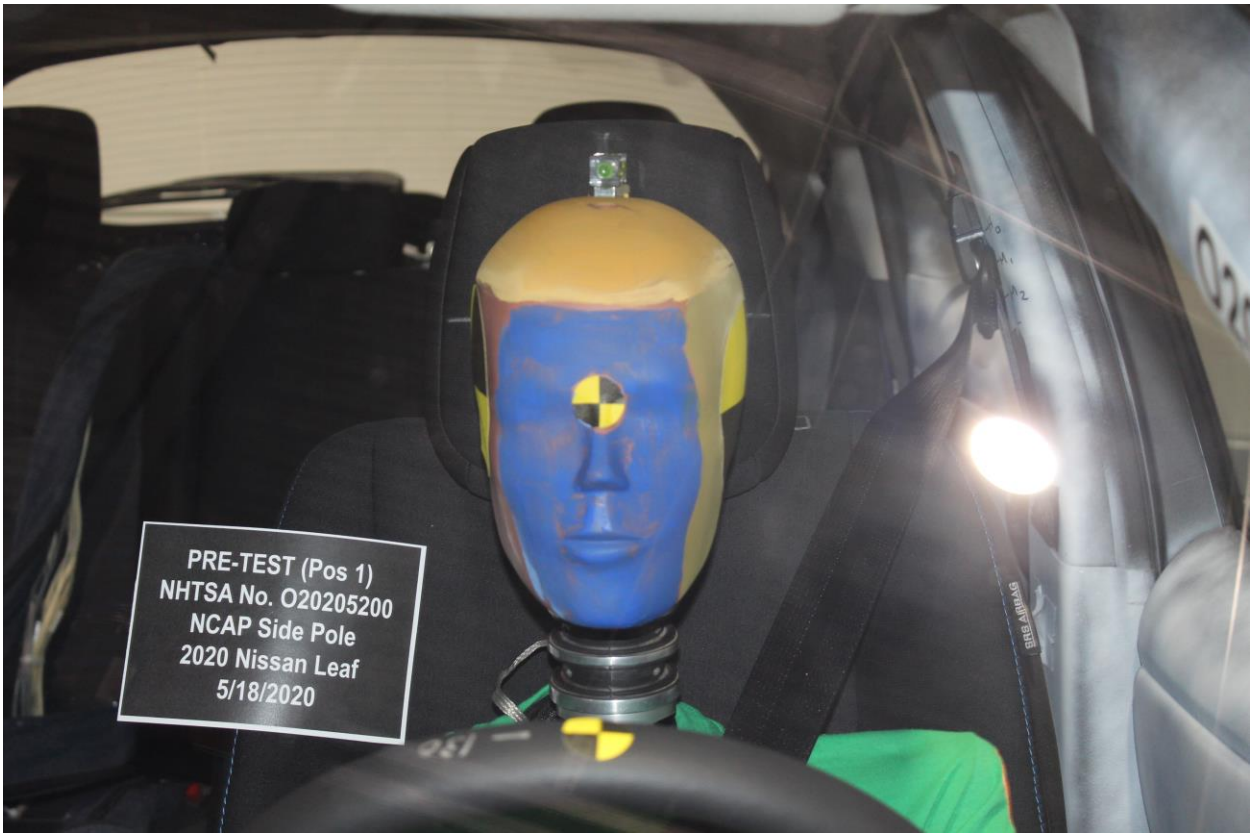


Figure A-27: Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint

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

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

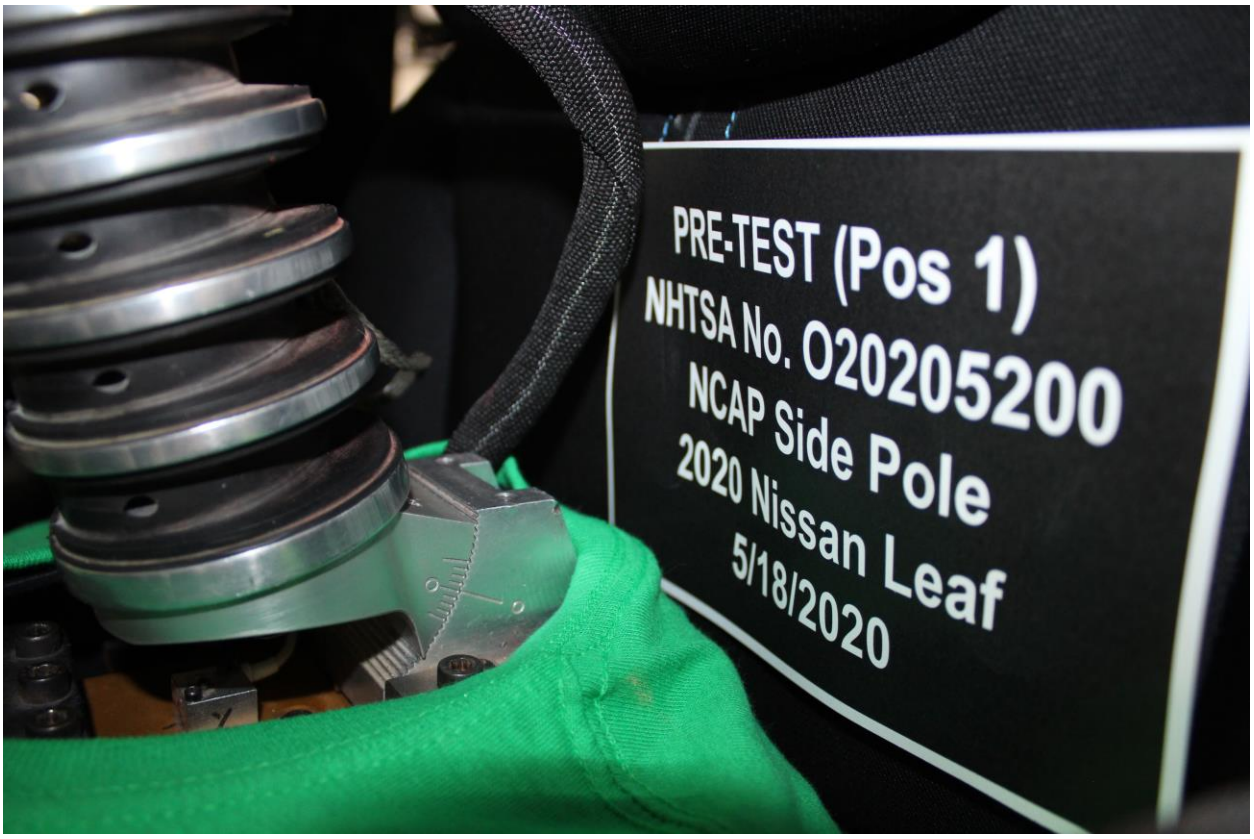


Figure A-30: Pre-Test Left Side View of Dummy's Neck Showing Position of Adjustable Neck Bracket

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

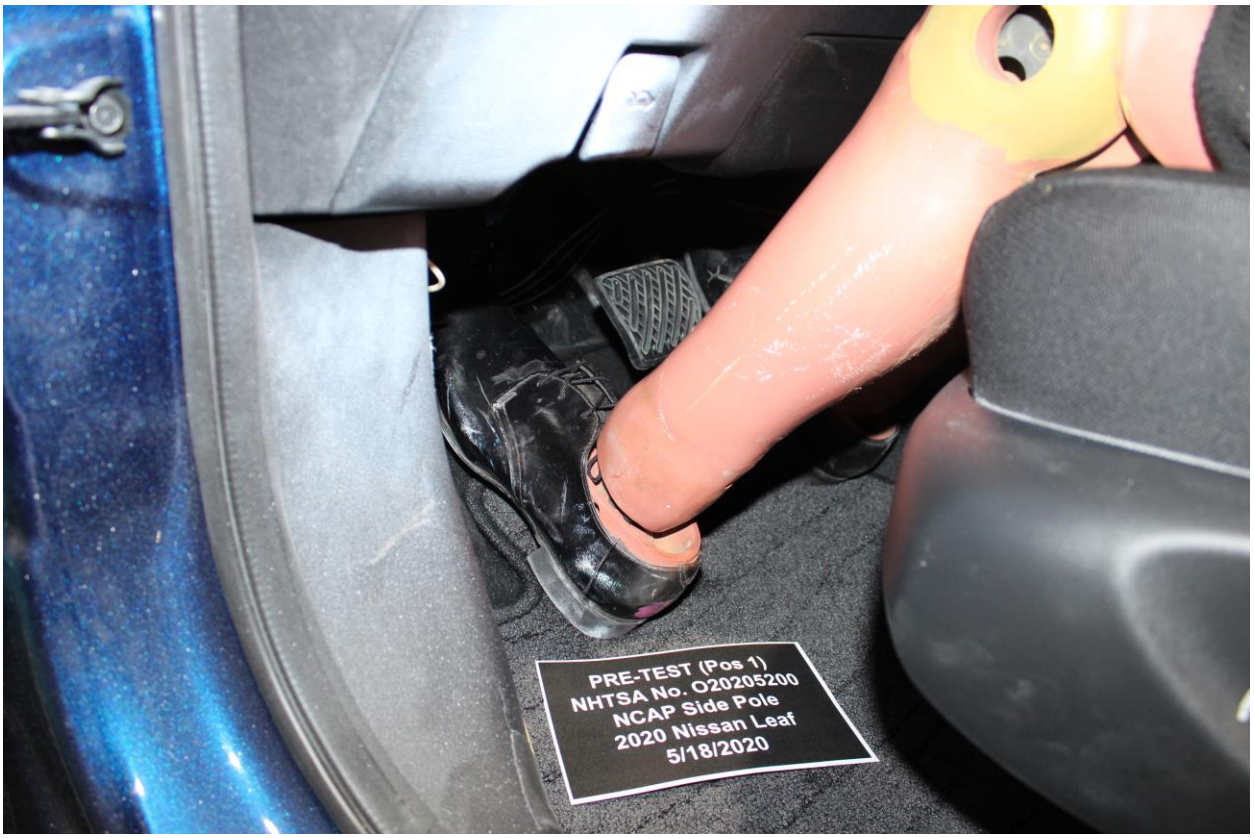


Figure A-32: Pre-Test Placement of Dummy's Feet

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

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

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

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

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

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

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

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

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

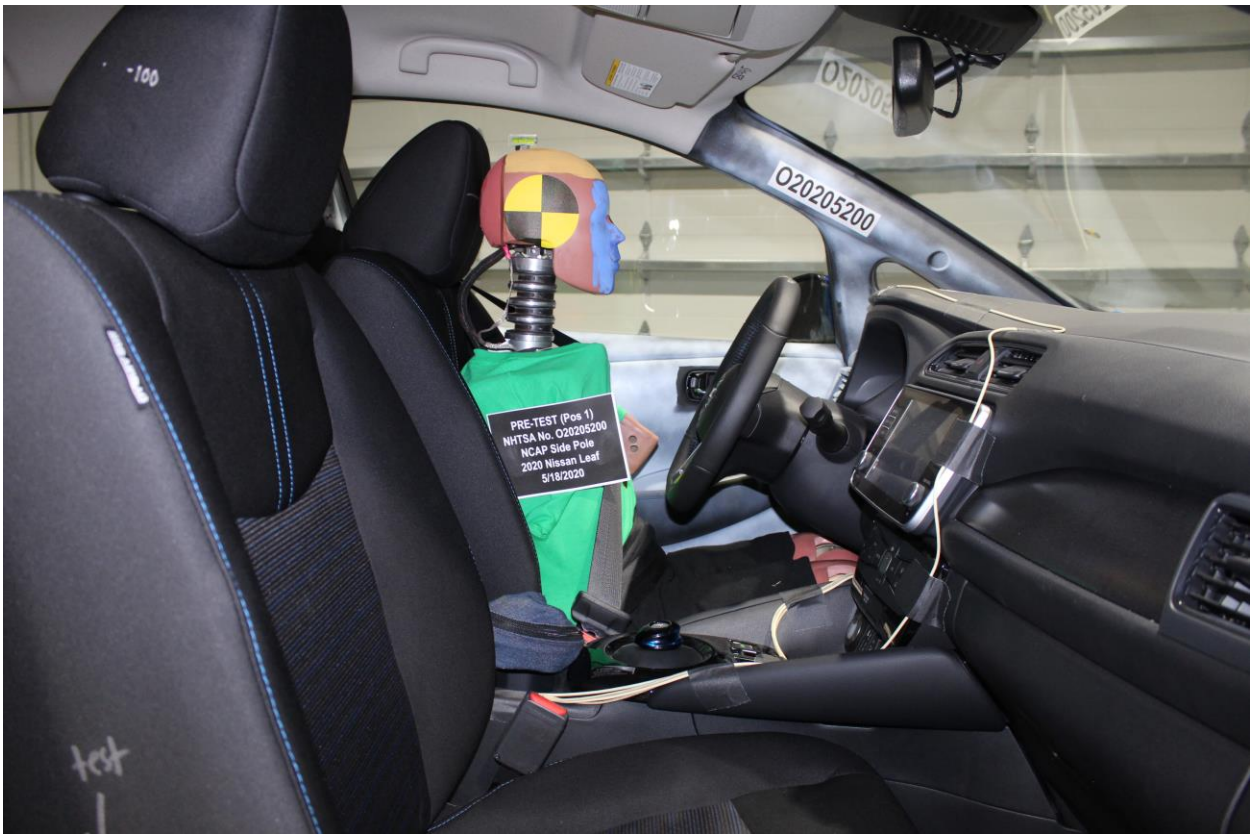


Figure A-42: Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment

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

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

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

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

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

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

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

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

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

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

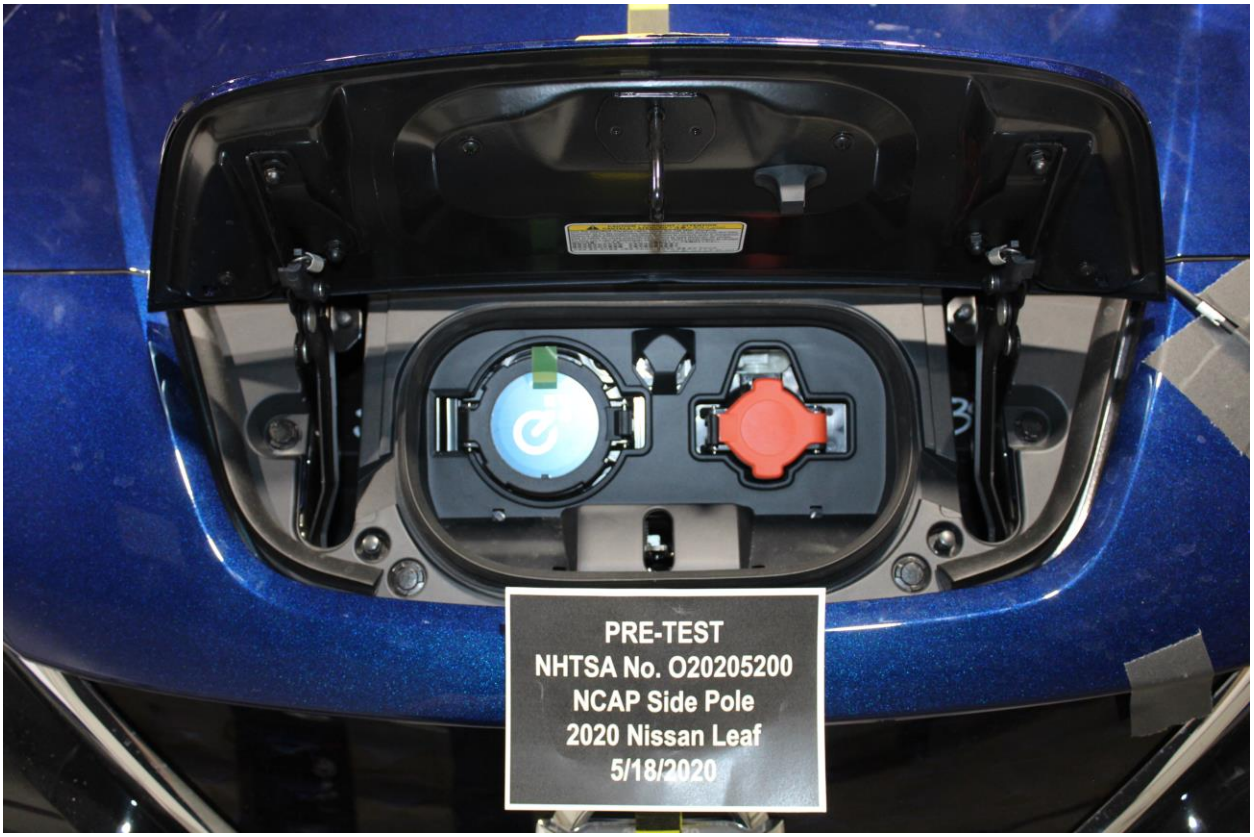


Figure A-53: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

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

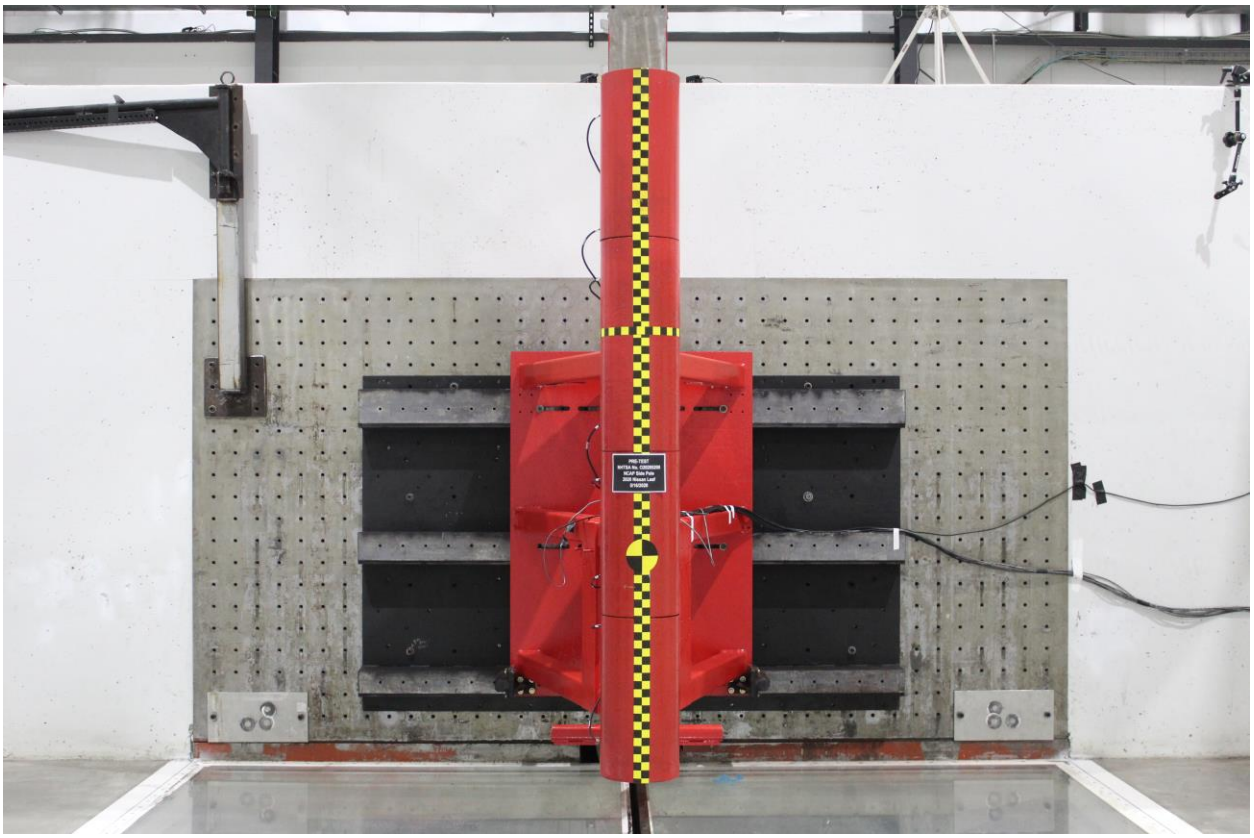


Figure A-57: Pre-Test Pole Barrier Front View

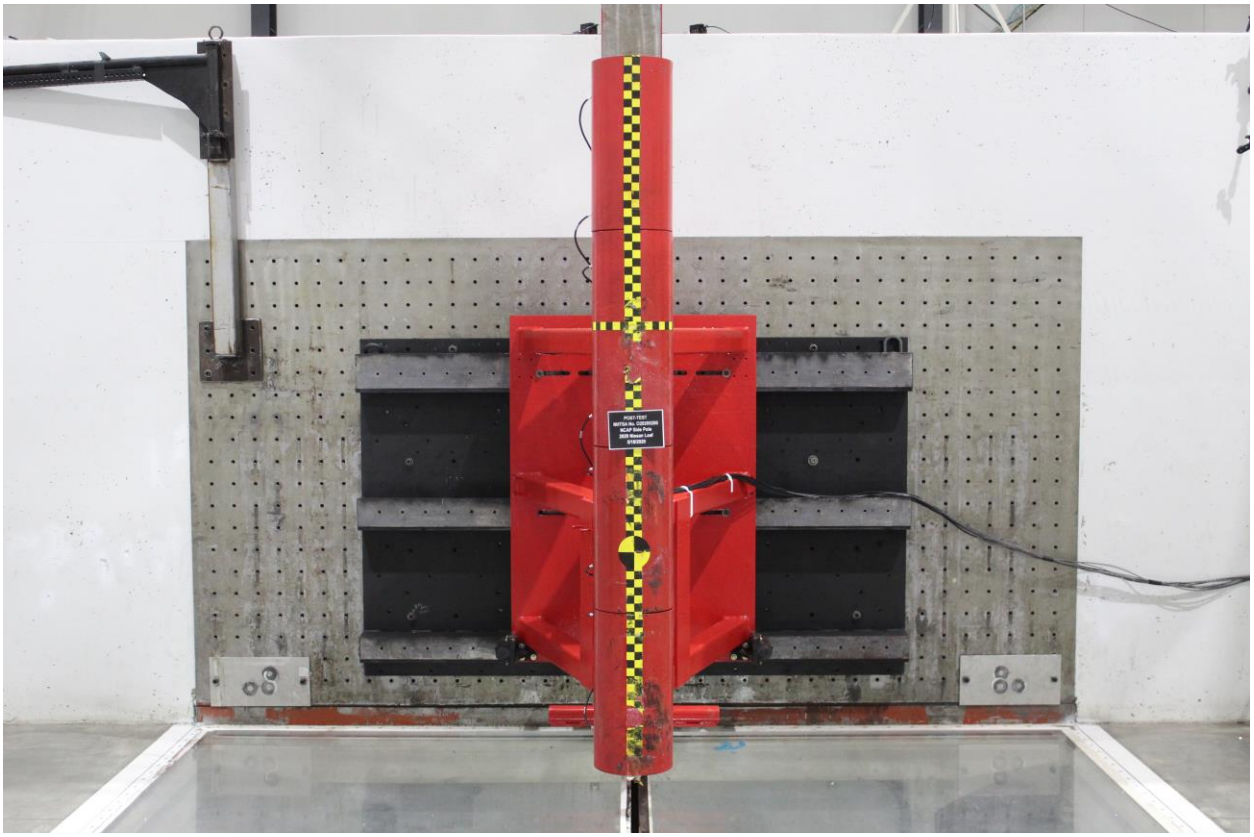


Figure A-58: Post-Test Pole Barrier Front View

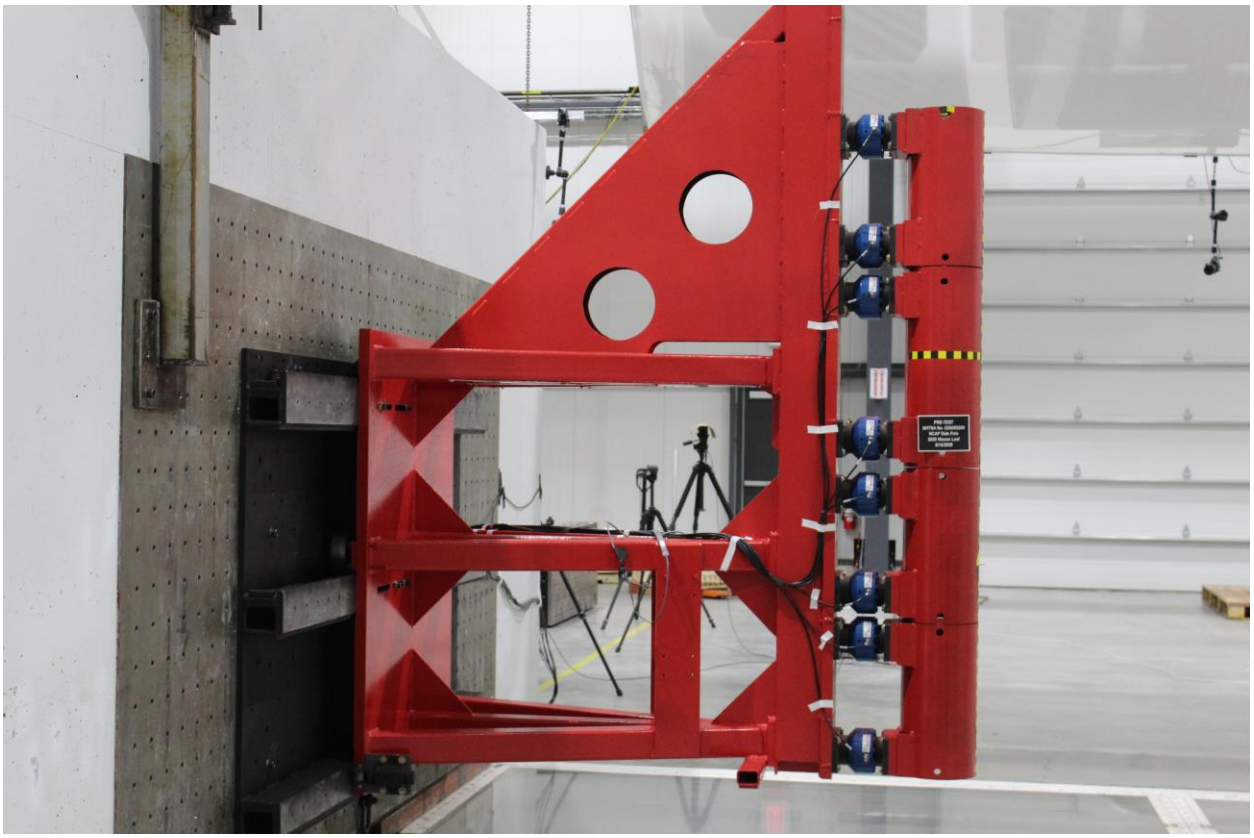


Figure A-59: Pre-Test Pole Barrier Side View

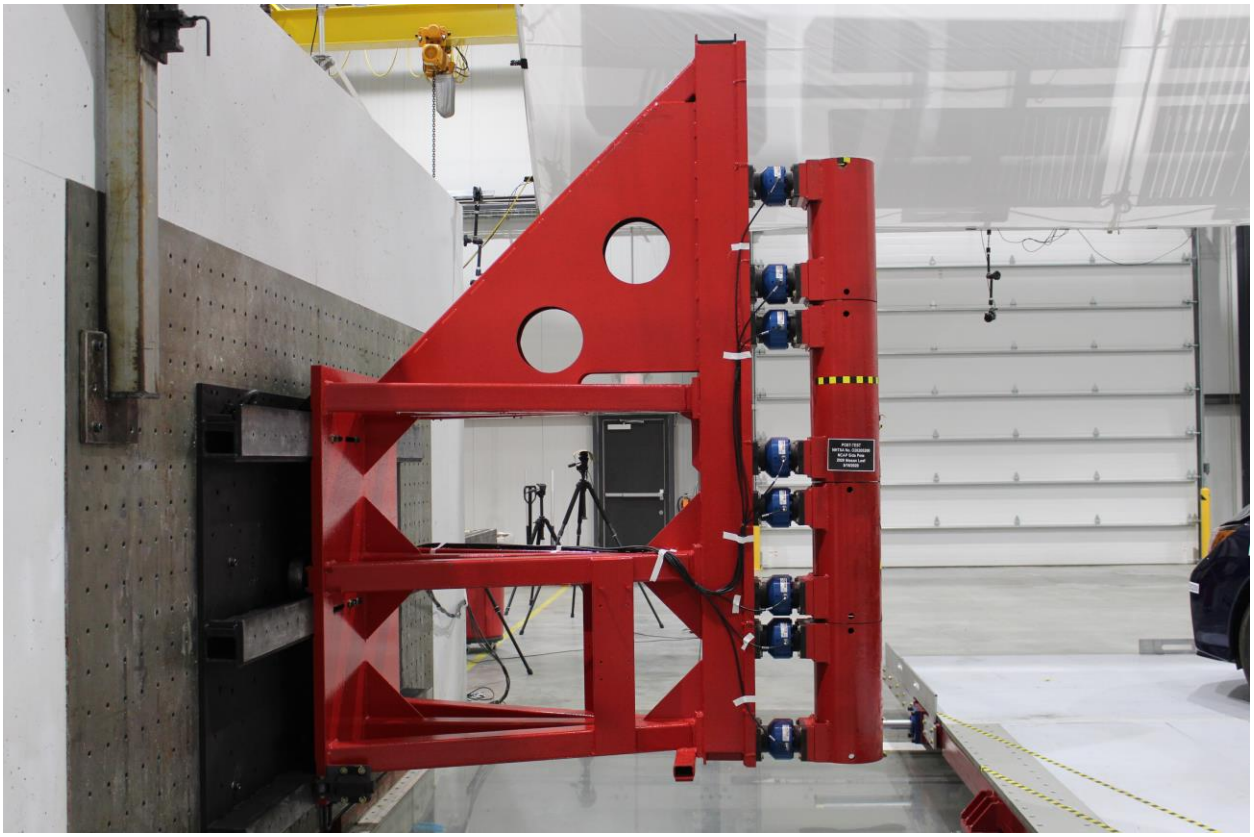


Figure A-60: Post-Test Pole Barrier Side View

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

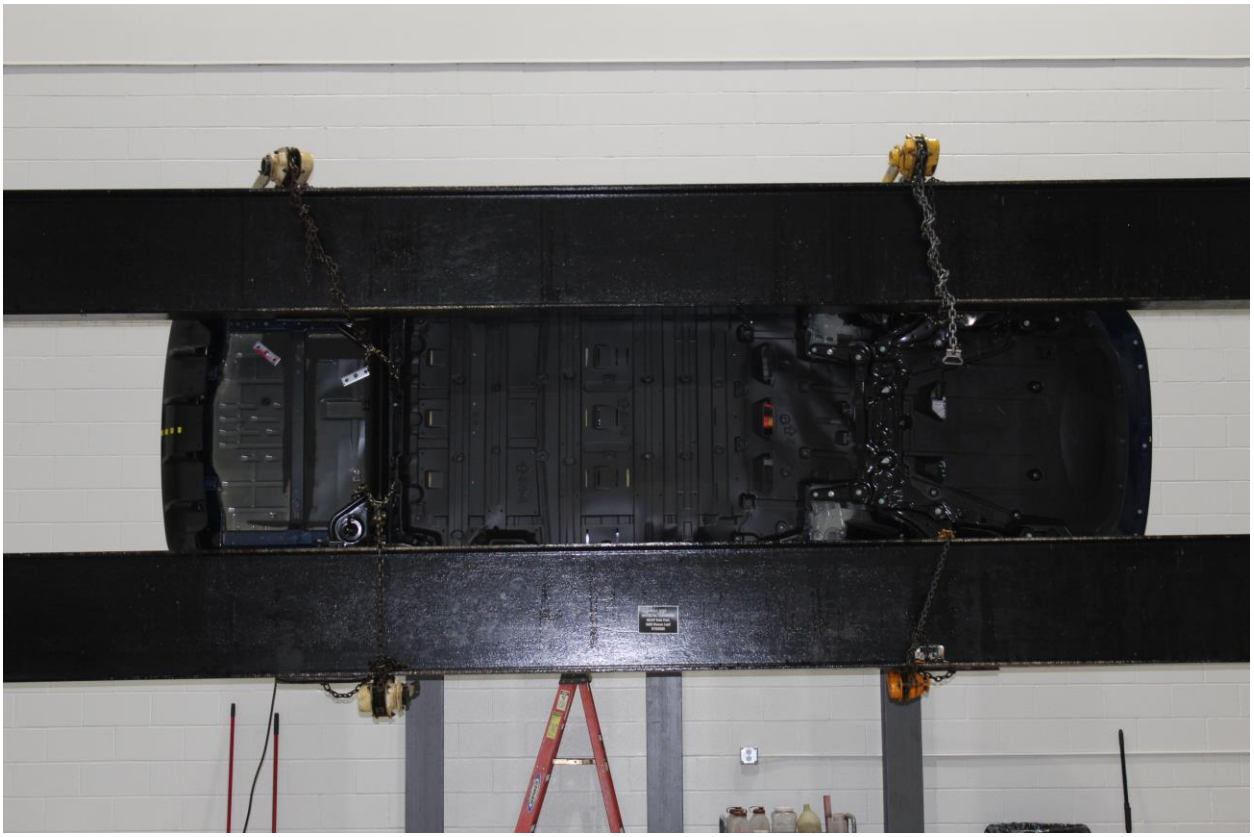


Figure A-66: FMVSS No. 301 Static Rollover 270 Degrees

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

Figure A-68: Impact Event

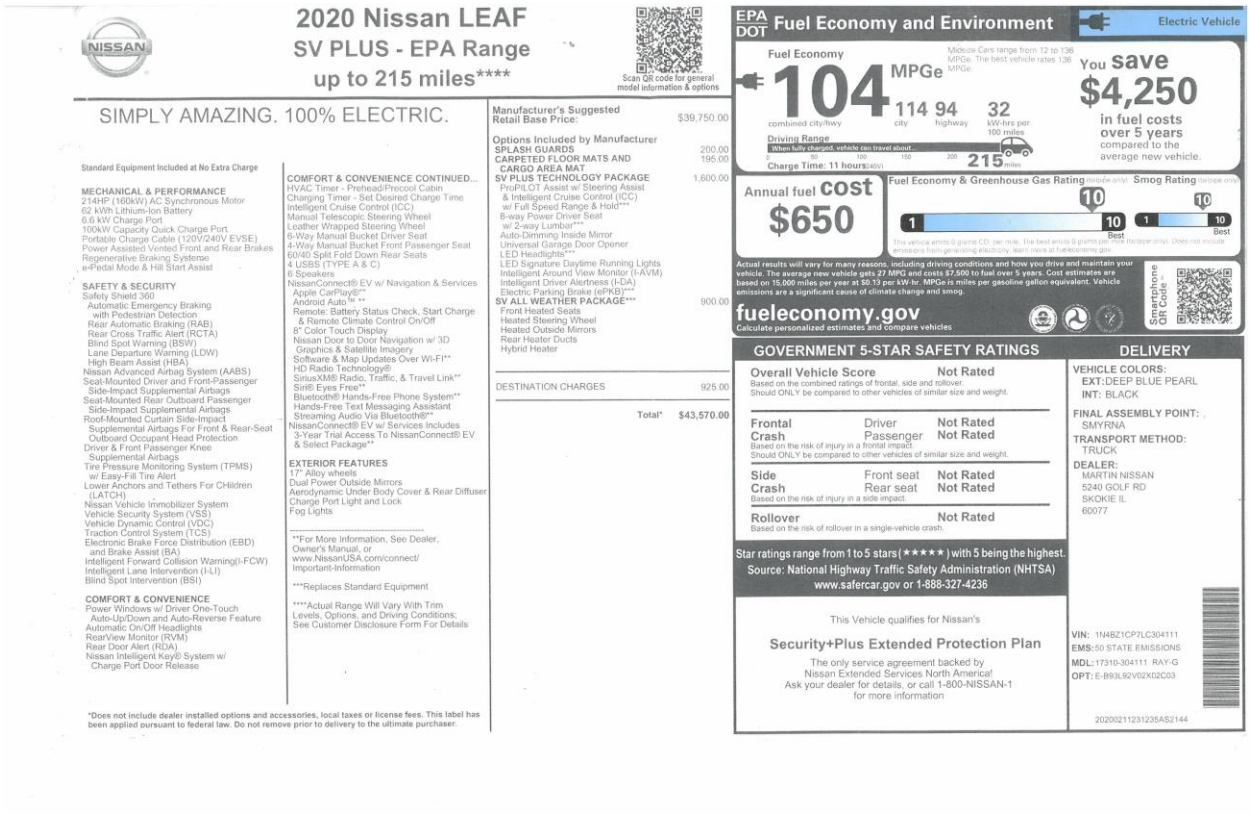


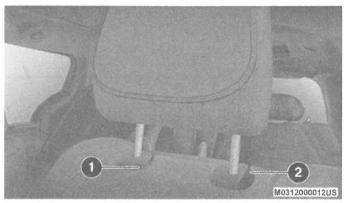
Figure A-69: Monroney Label

Head Restraints — Front Seats

The front driver and passenger seats are equipped with four-way head restraints.

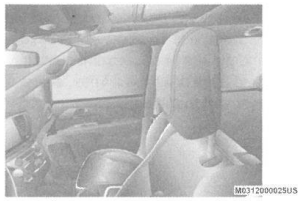
To raise the head restraint, pull upward on the head restraint. To lower the head restraint, push the adjustment button, located at the base of the head restraint, and push downward. The front head restraints are also adjustable forward and rearward. To tilt forward, pull the top of the head restraint toward the front of the vehicle to the desired position. To adjust the head restraint rearward, continue pulling forward on the top of the head restraint to the furthest forward position and the head restraint will return to the upright position.

NOTE:
To remove the head restraint, raise it as far as it can go. Then, push the release button and the adjustment button at the base of each post while pulling the head restraint up. Seatback angle may need to be adjusted to fully remove the head restraint. To reinstall the head restraint, put the head restraint posts into the holes and push downward. Then, adjust the head restraint to the appropriate height.



Front Head Restraint

1 — Release Button
2 — Adjustment Button



Normal Position

Forward Adjustment

2

WARNING!

- A loose head restraint thrown forward in a collision or hard stop could cause serious injury or death to occupants of the vehicle. Always securely stow removed head restraints in a location outside the occupant compartment.
- ALL the head restraints MUST be reinstalled in the vehicle to properly protect the occupants. Follow the re-installation instructions above prior to operating the vehicle or occupying a seat.

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)

Figure 305-1: Auxiliary Power Module Warning Label

Figure 305-2: Power Inverter Warning Label

Photo Not Applicable

Figure 305-3 First Responder Warning Label

Photo Not Applicable

Figure 305-4: First Responder Warning Label Location

Figure 305-5: Other Vehicle Label Related to Electric Propulsion System

Figure 305-6: Manual High Voltage Service Disconnect in Place

Figure 305-7: Manual High Voltage Service Disconnect Removed (Show Plug)

Figure 305-8: Manual High Voltage Service Disconnect Removed Location

Figure 305-9: Pre-Impact View of Propulsion Battery

Figure 305-10: Post-Impact Front View of Propulsion Battery

Photo Not Applicable

Figure 305-11: Post-Impact Rear View of Propulsion Battery (if any part of it is visible)

Figure 305-12: Pre-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

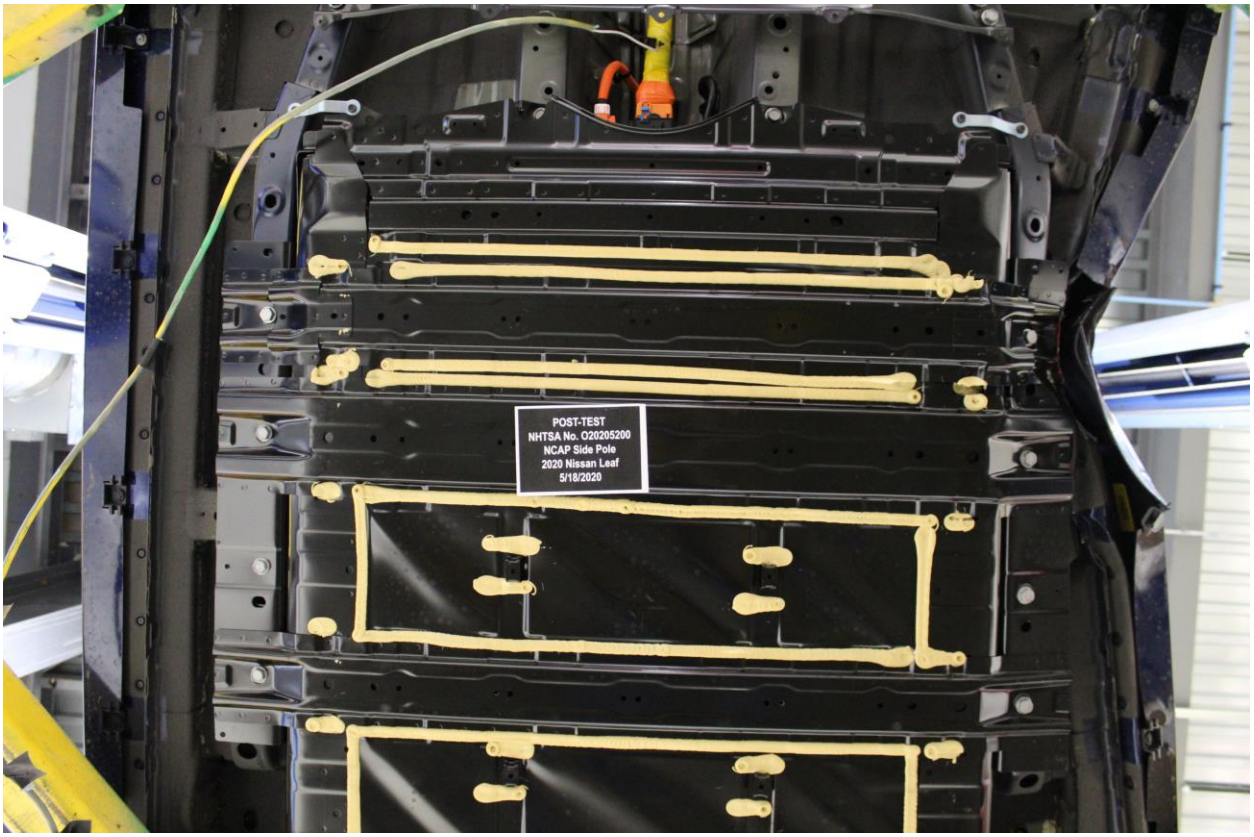


Figure 305-13: Post-Impact View of Battery Box(s) or Container(s) Which Holds Individual Battery Modules

Photo Not Applicable

Figure 305-14: Pre-Impact View of Propulsion Battery Module(s)

Photo Not Applicable

Figure 305-15: Post-Impact View of Propulsion Battery Module(s)

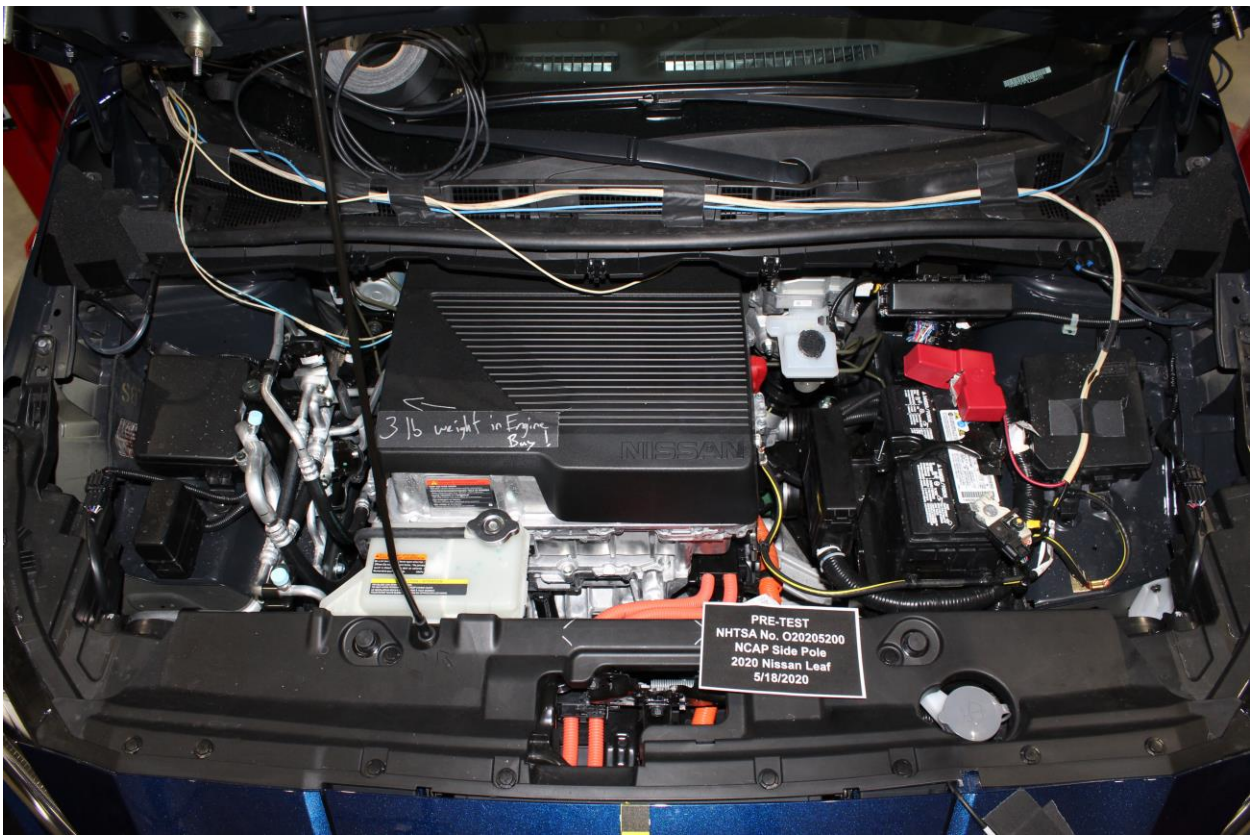


Figure 305-16: Pre-Impact View of Electric Propulsion Drive

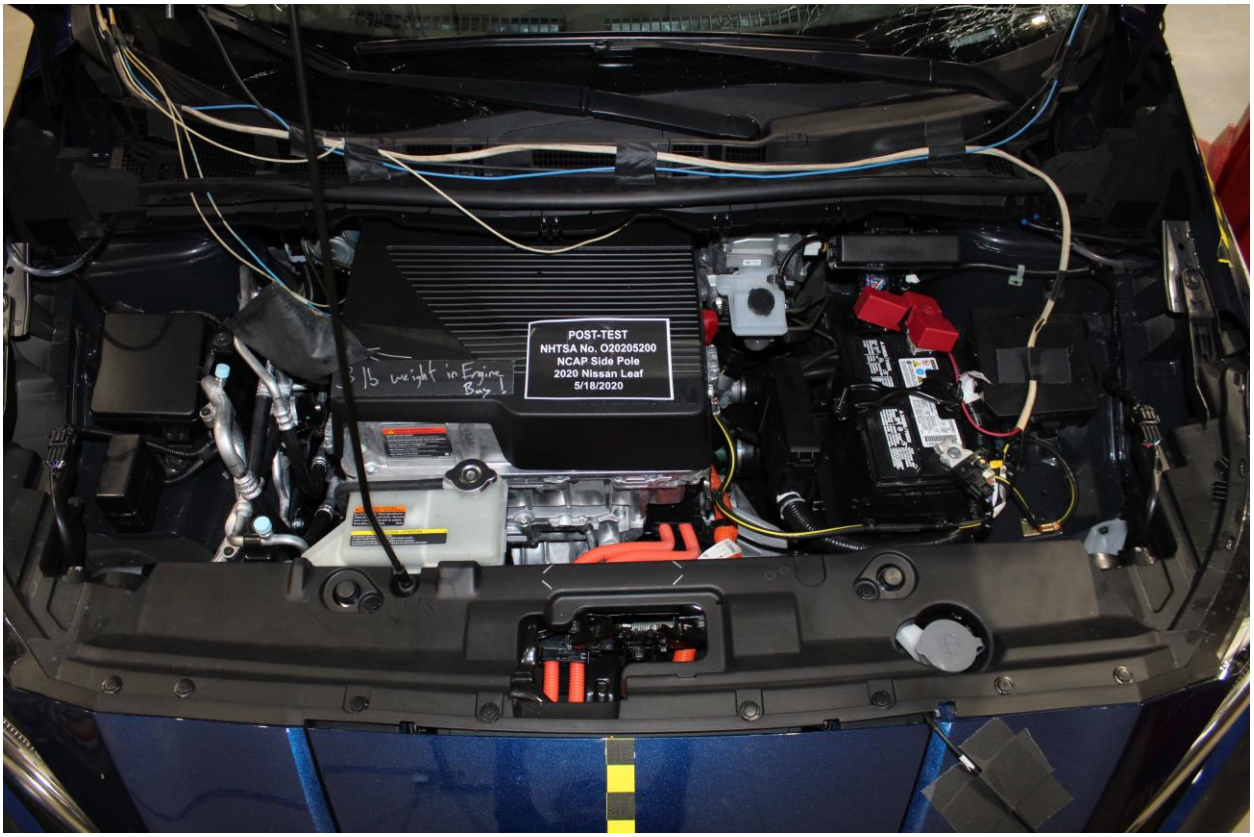


Figure 305-17: Post-Impact View of Electric Propulsion Drive

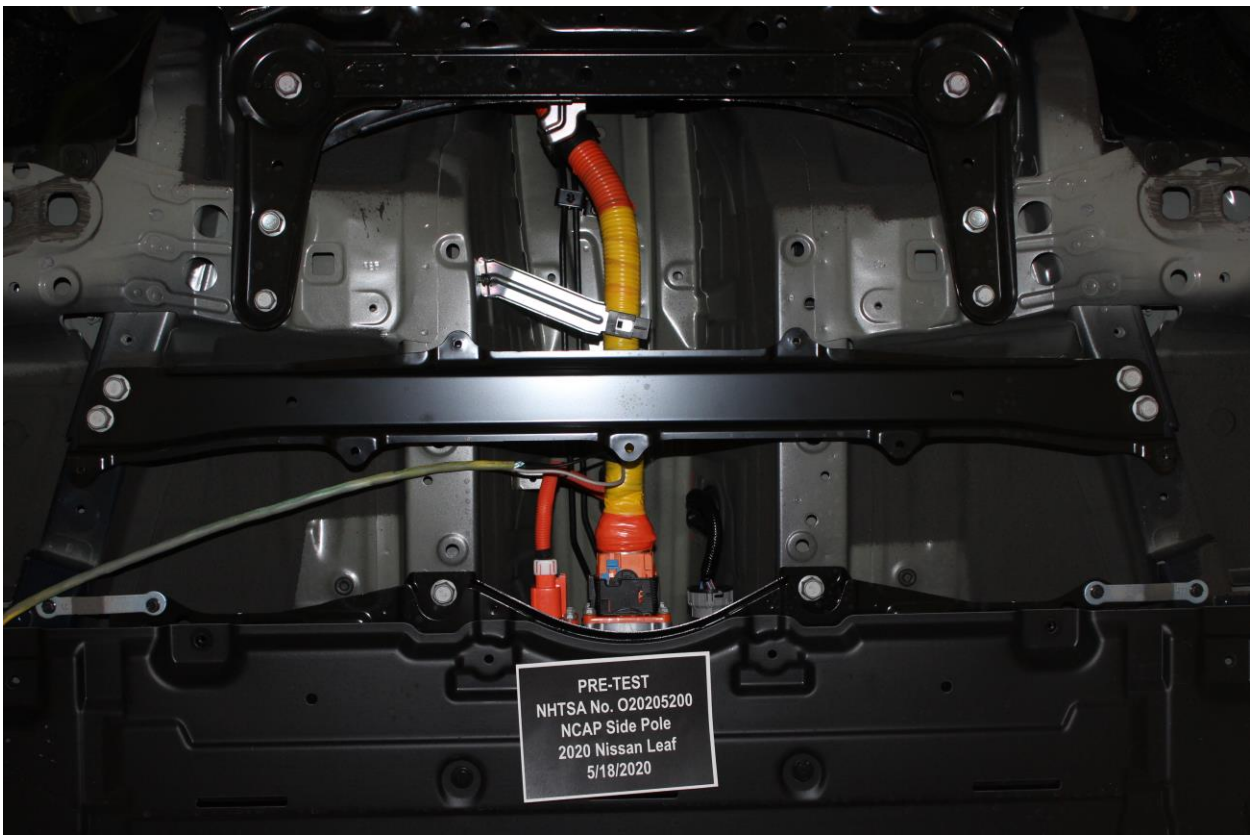


Figure 305-18: Pre-Impact View of High Voltage Interconnects

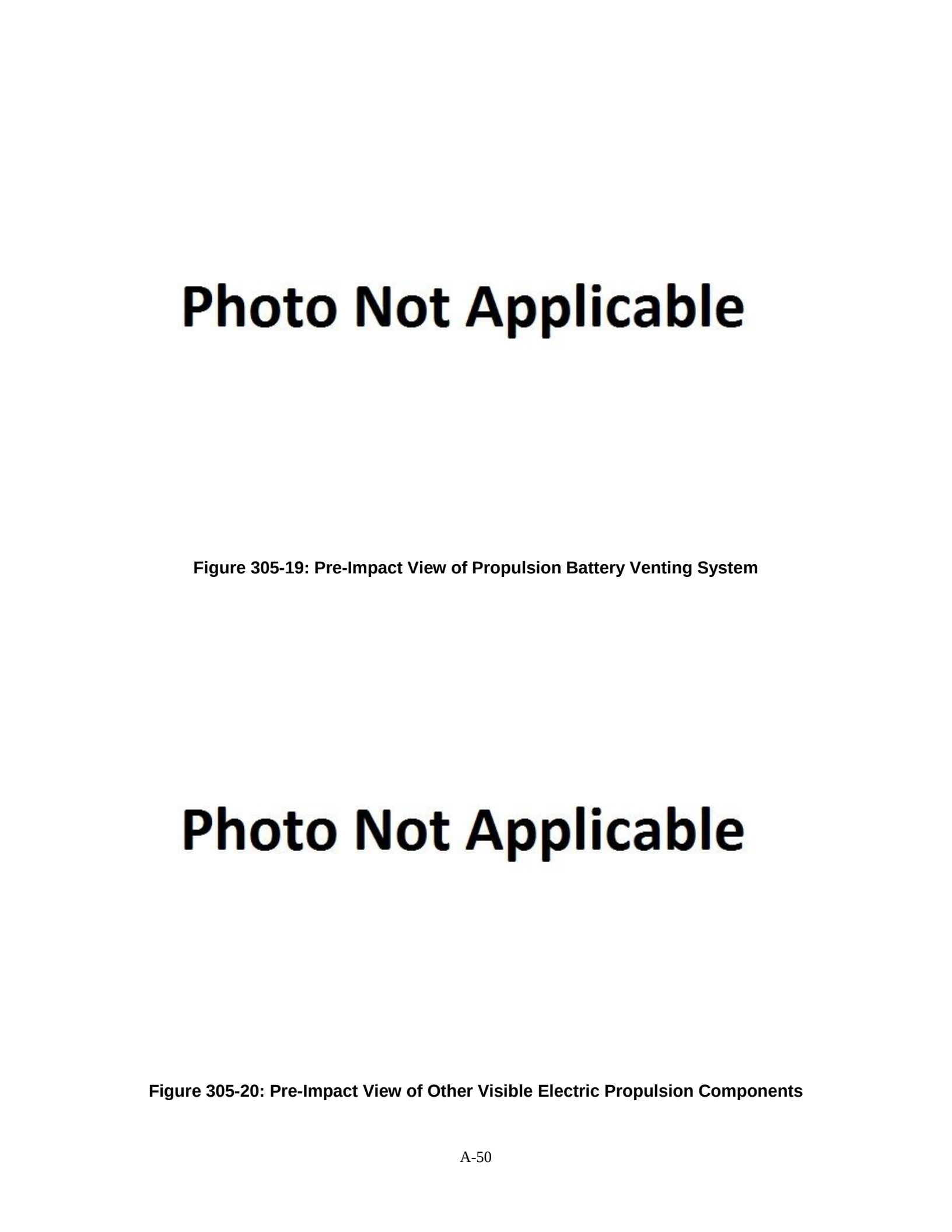


Figure 305-19: Pre-Impact View of Propulsion Battery Venting System

Figure 305-20: Pre-Impact View of Other Visible Electric Propulsion Components

Figure 305-21: Pre-Impact View of Ground Lead Attached

Figure 305-22: Pre-Impact View of High Voltage Leads Attached

Figure 305-23: Pre-Impact Close Up View of High Voltage Leads Attached

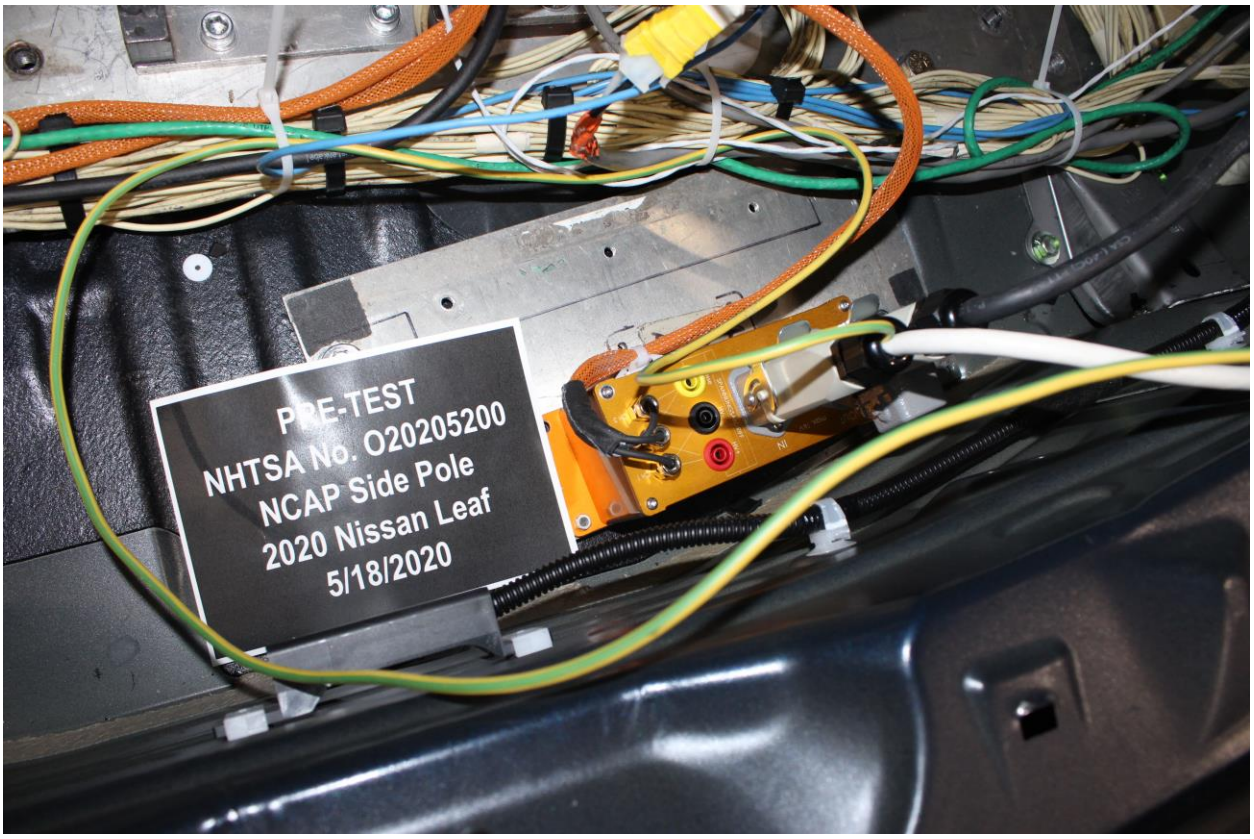


Figure 305-24: Pre-Impact View of Installed Test Interface Port

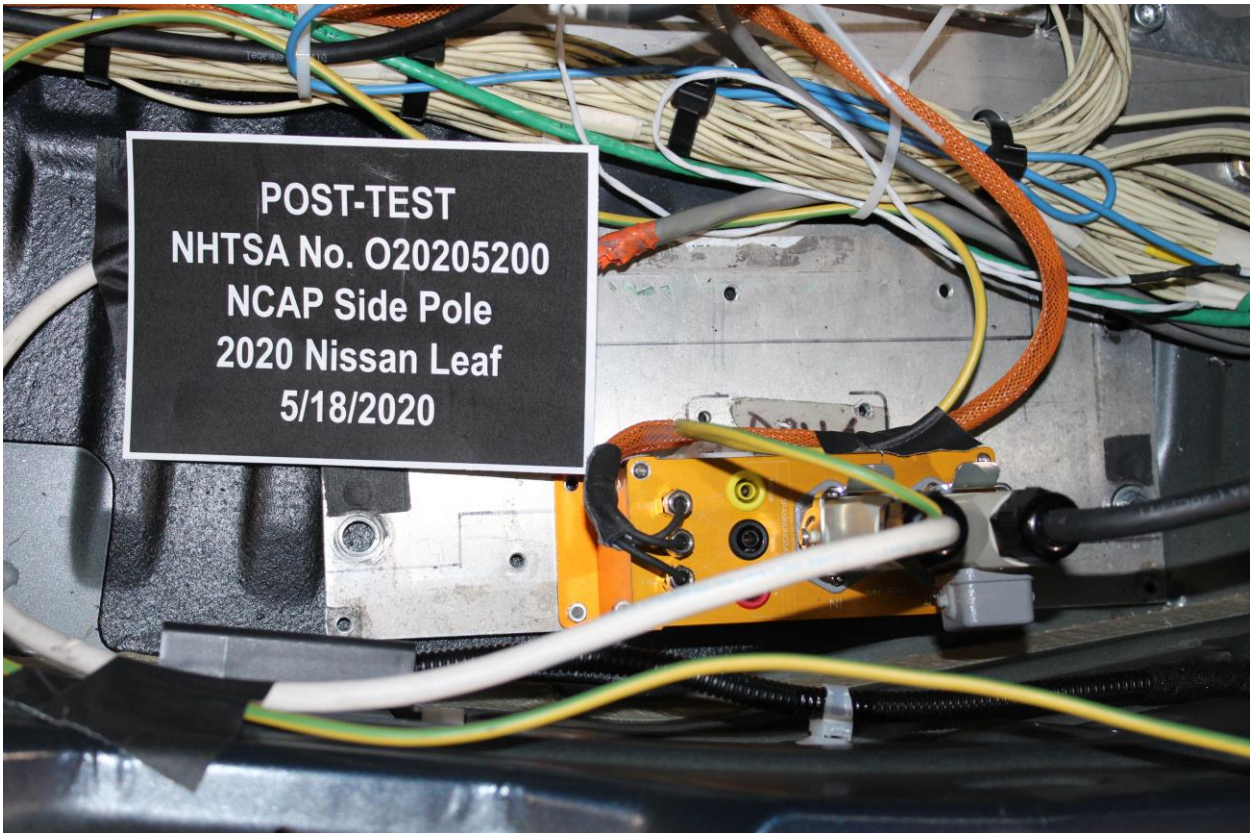


Figure 305-25: Post-Impact View of Installed Test Interface Port

Photo Not Applicable

Figure 305-26: Pre-Impact View of Other Test Devices

Photo Not Applicable

Figure 305-27: Post-Impact View of Other Test Devices

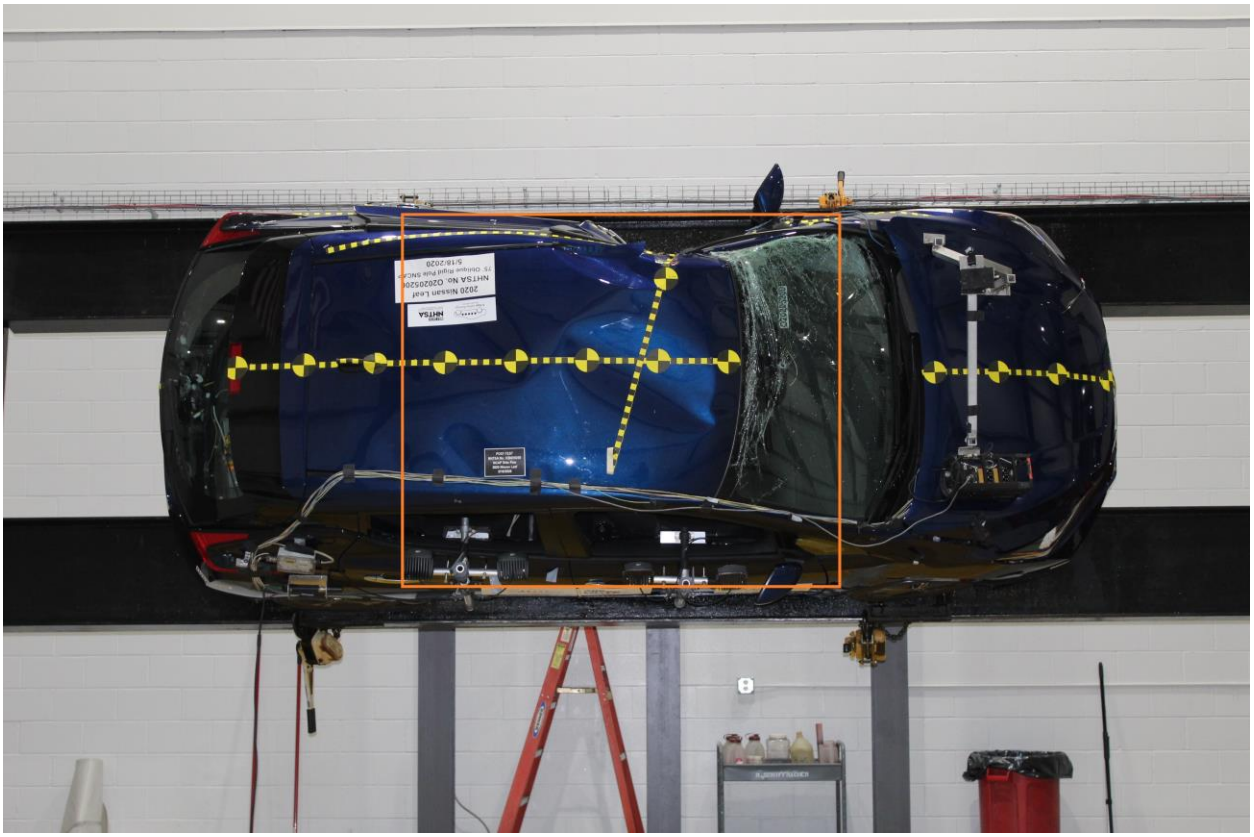


Figure 305-28: FMVSS No. 305 Static Rollover 90 Degrees

Figure 305-29: FMVSS No. 305 Static Rollover 180 Degrees

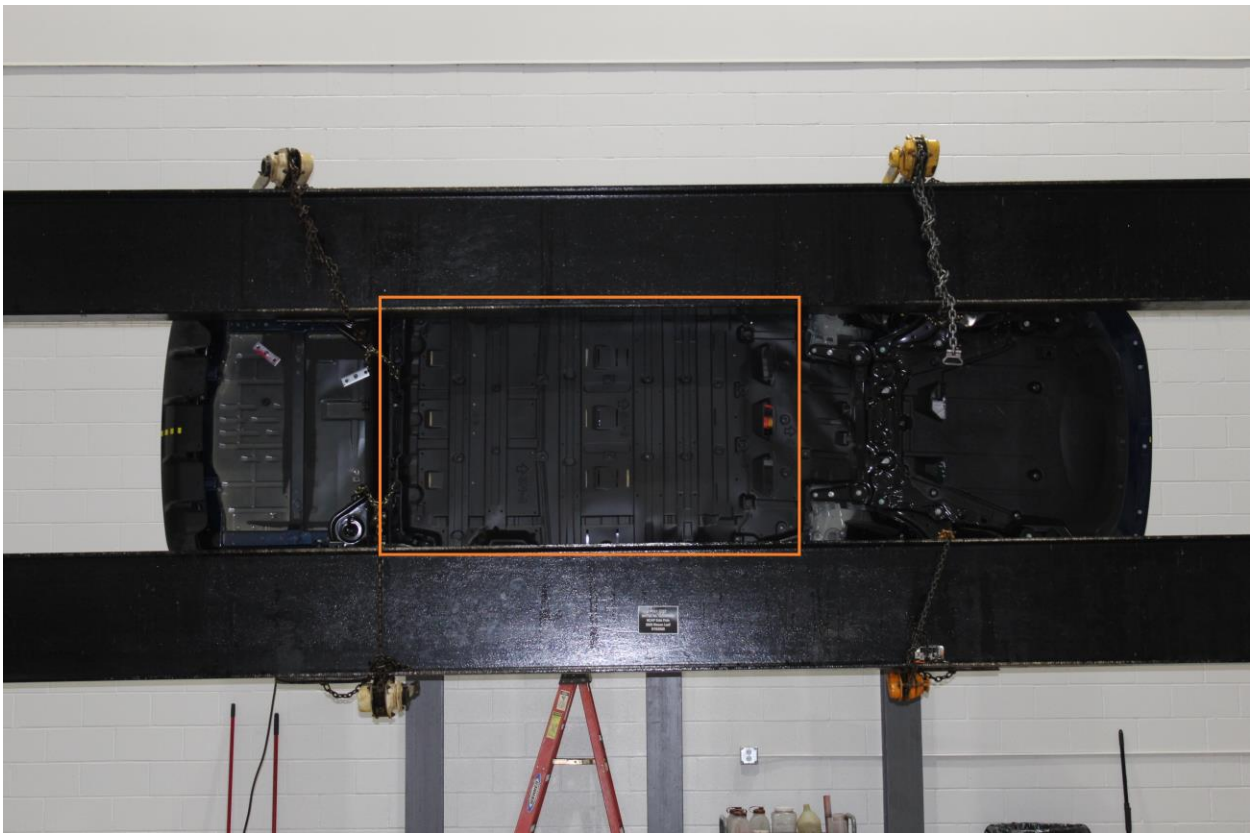


Figure 305-30: FMVSS No. 305 Static Rollover 270 Degrees

Figure 305-31: FMVSS No. 305 Static Rollover 360 Degrees

Figure 305-32: Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Figure 305-33: Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Photo Not Applicable

Figure 305-34: Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

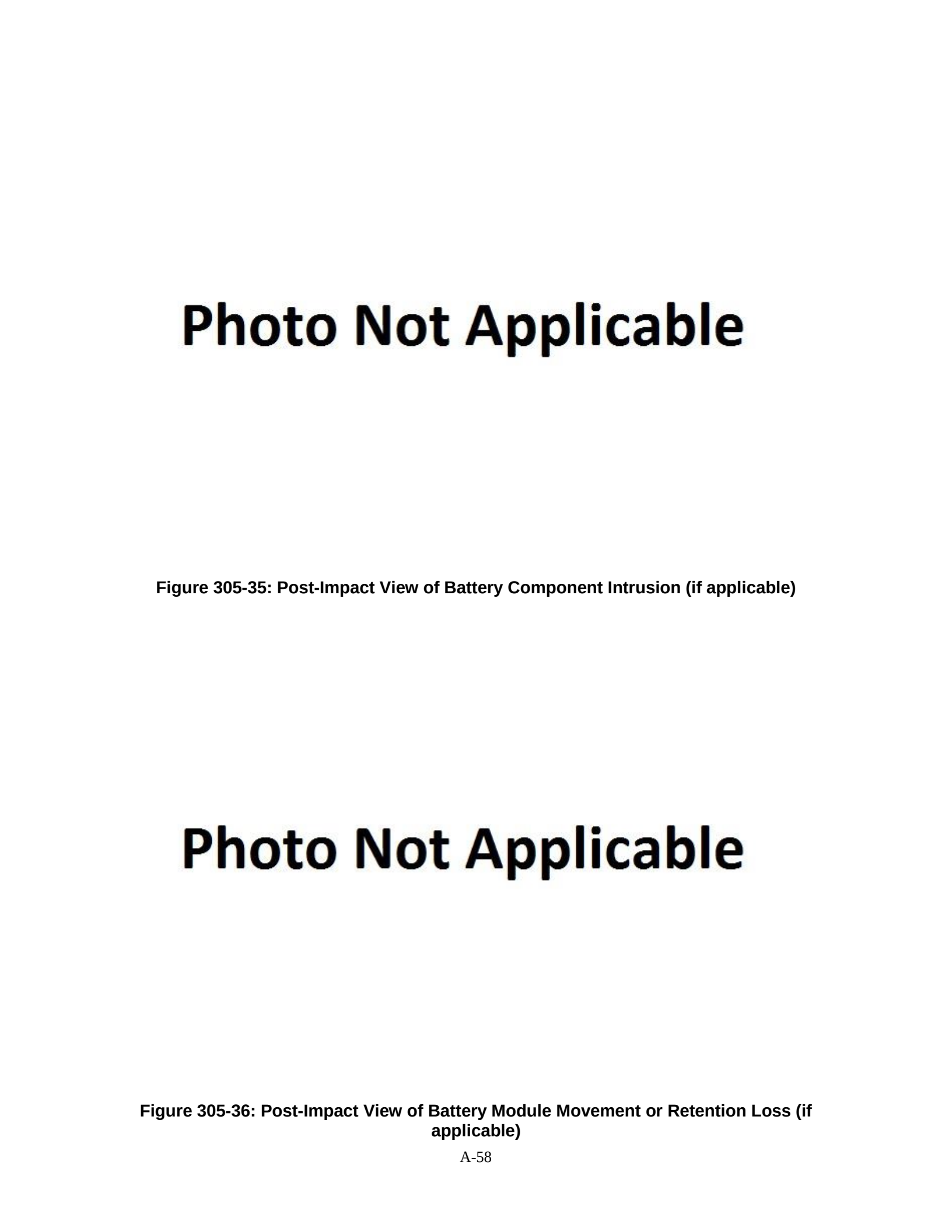


Figure 305-35: Post-Impact View of Battery Component Intrusion (if applicable)

Figure 305-36: Post-Impact View of Battery Module Movement or Retention Loss (if applicable)

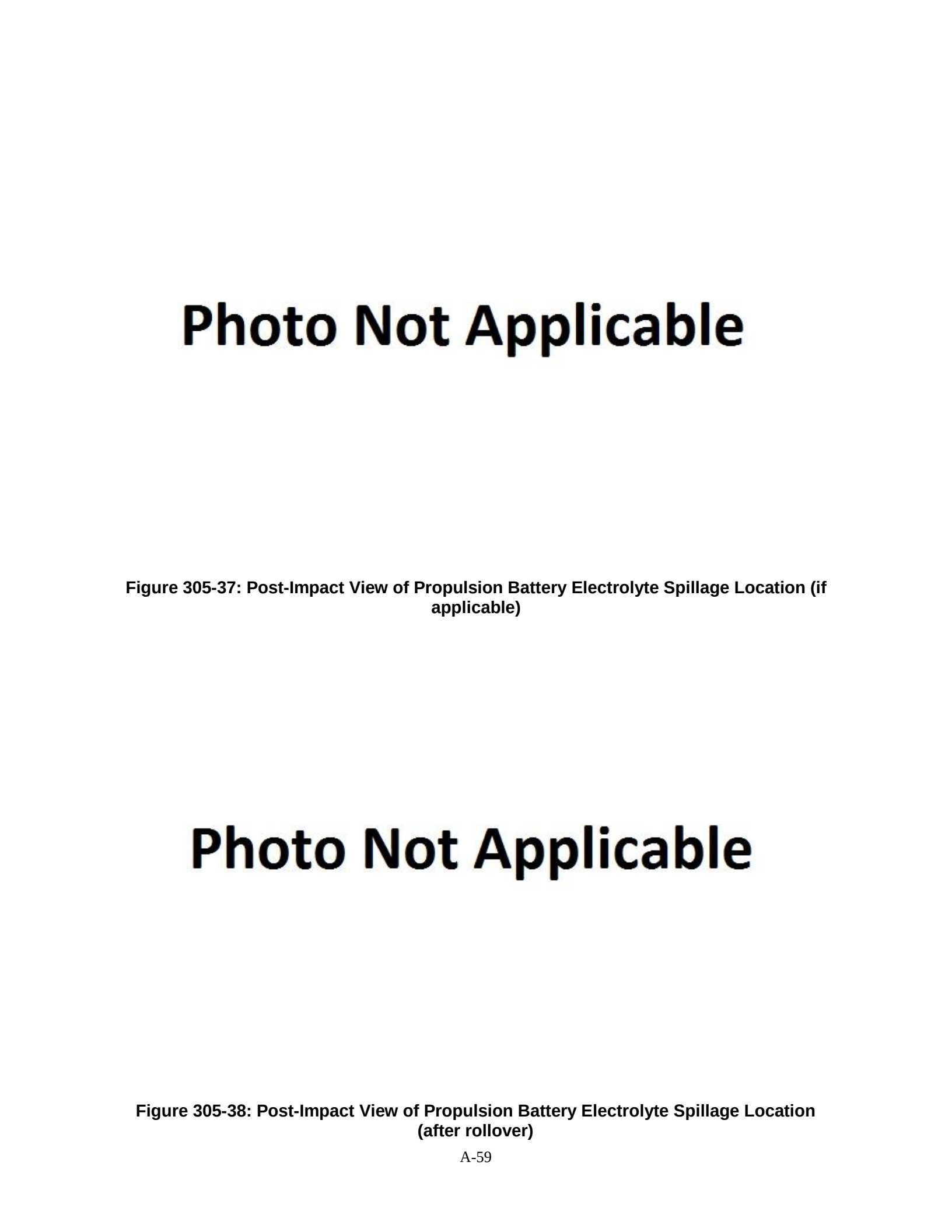


Figure 305-37: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (if applicable)

Figure 305-38: Post-Impact View of Propulsion Battery Electrolyte Spillage Location (after rollover)

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver Dummy Instrumentation Plots

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

Additional Driver Dummy Instrumentation Data

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

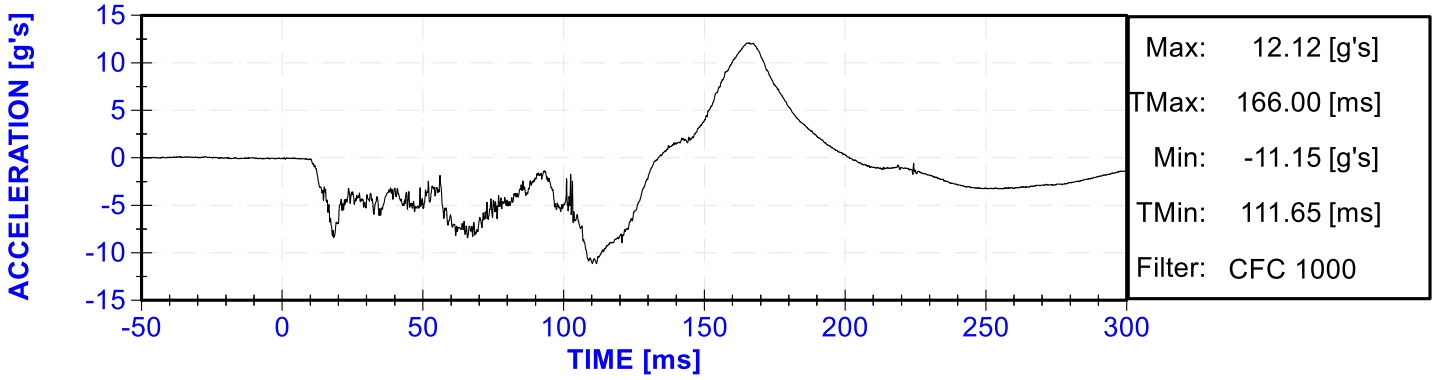
Vehicle Instrumentation Data

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

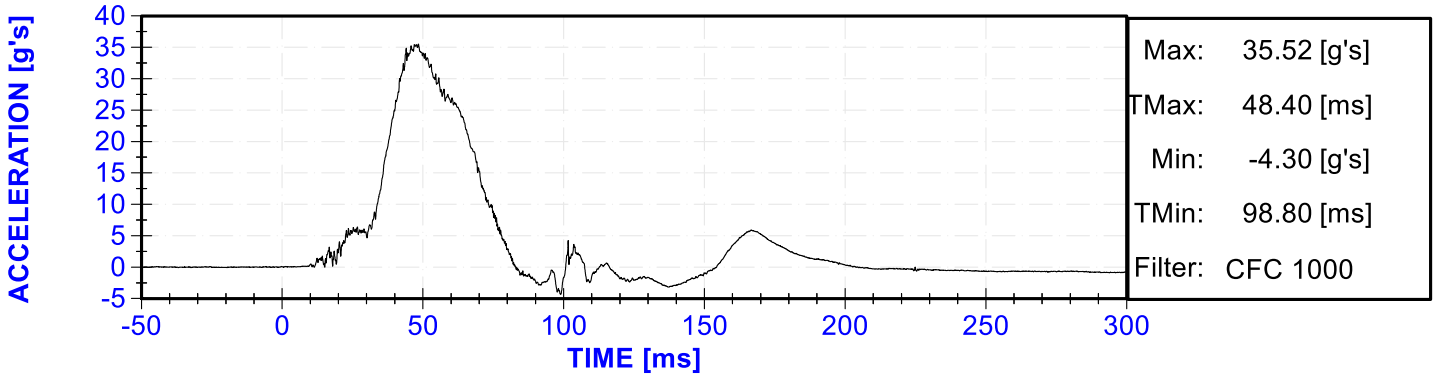
Pole Instrumentation Data

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

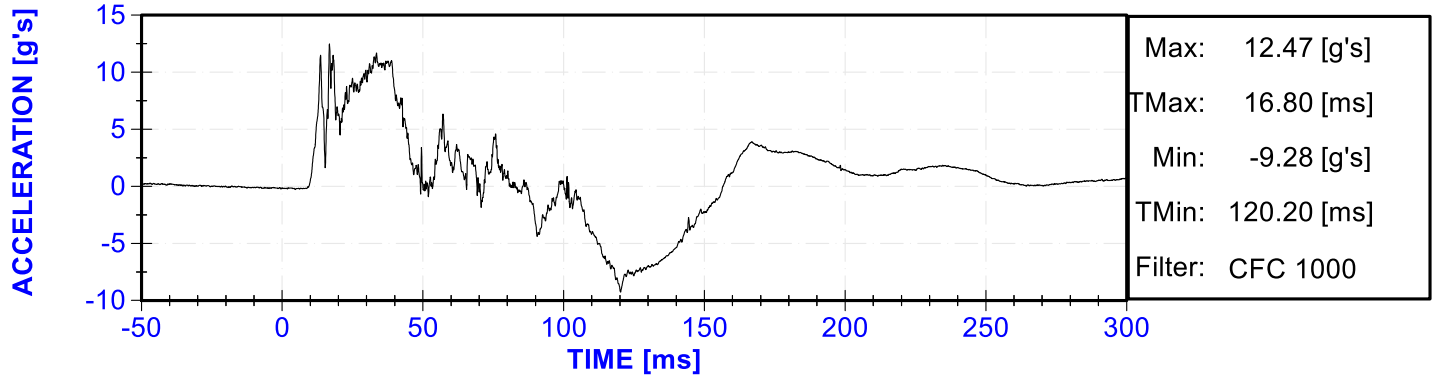
Driver Head Acceleration (X) Primary vs. Time



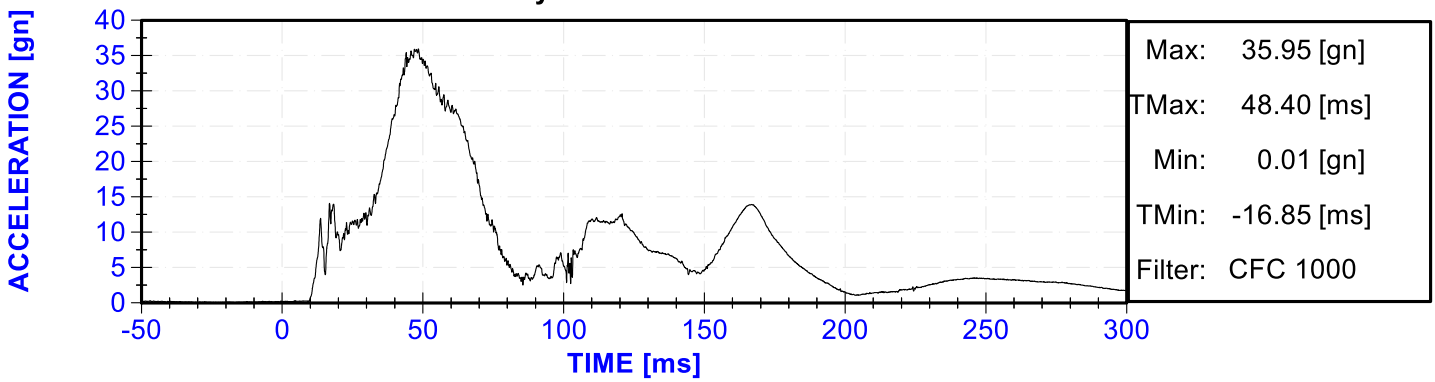
Driver Head Acceleration (Y) Primary vs. Time



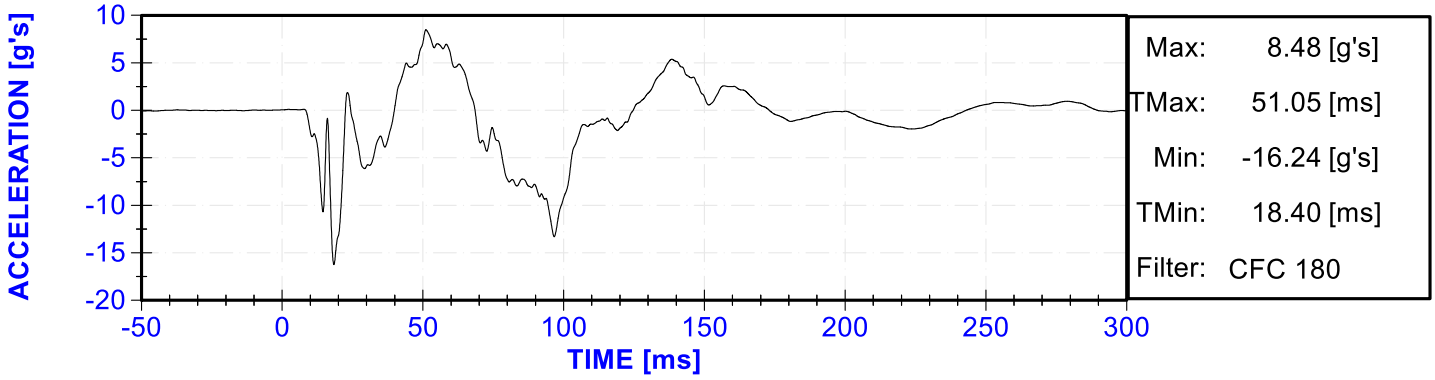
Driver Head Acceleration (Z) Primary vs. Time



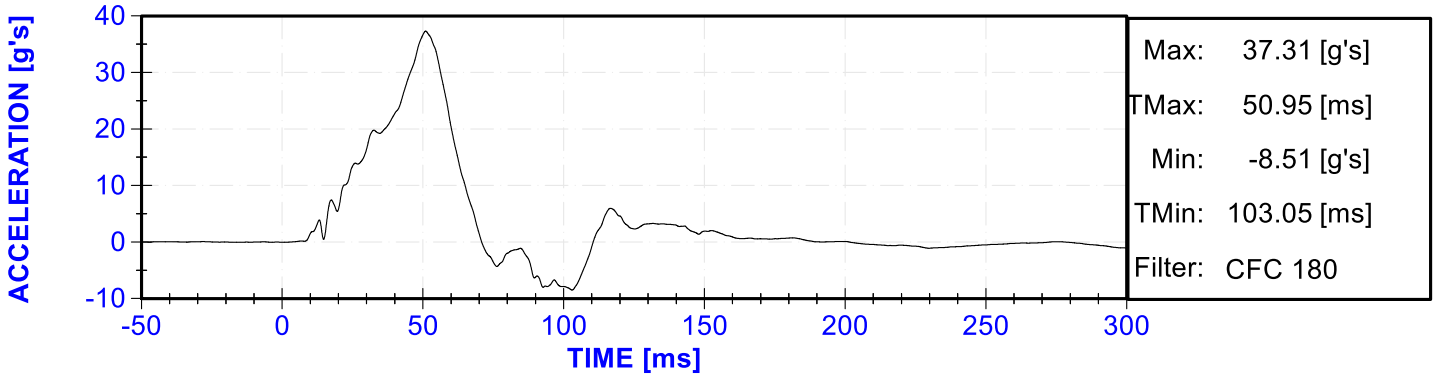
Driver Head Resultant Primary vs. Time



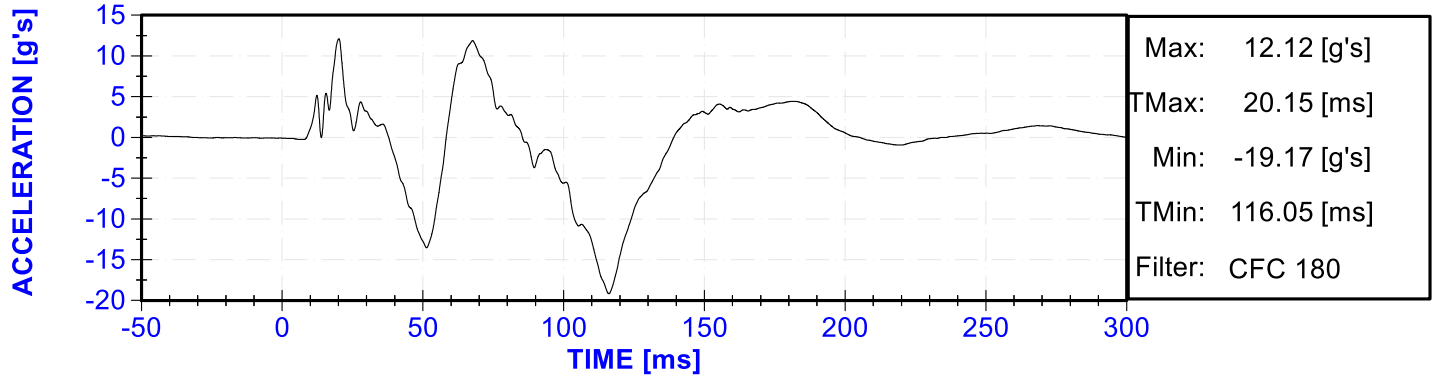
Driver Lower Spine T12 Acceleration (X) vs. Time



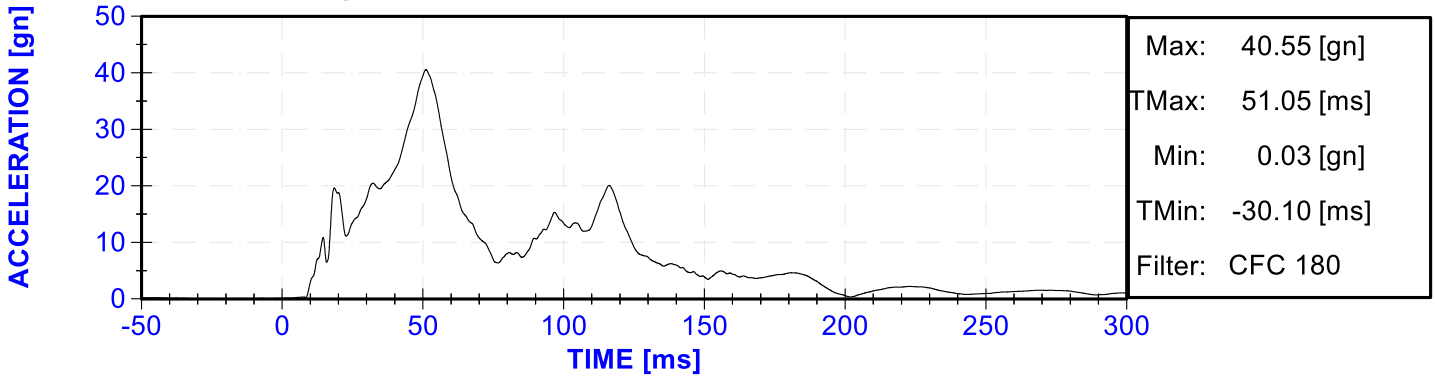
Driver Lower Spine T12 Acceleration (Y) vs. Time

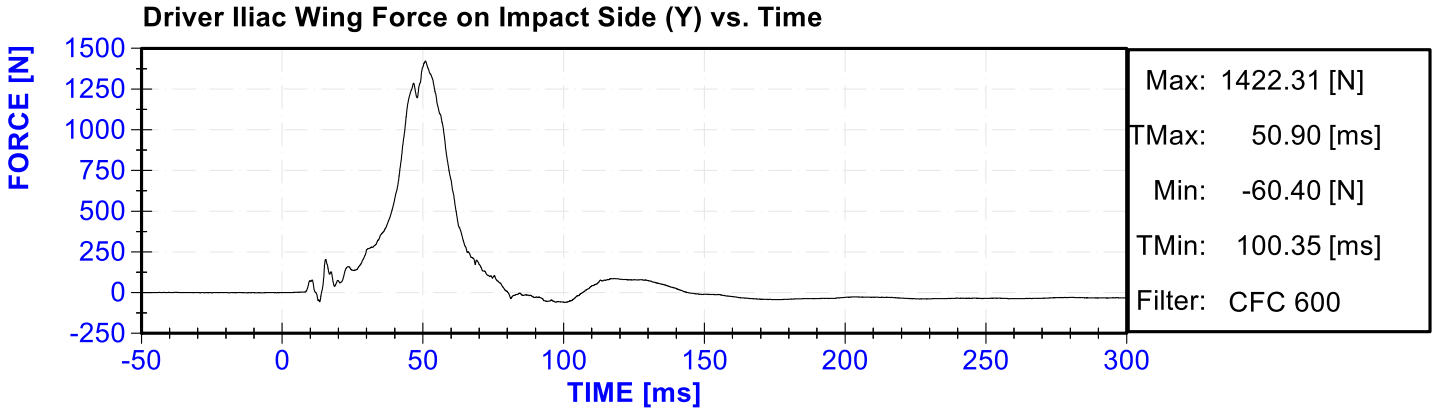


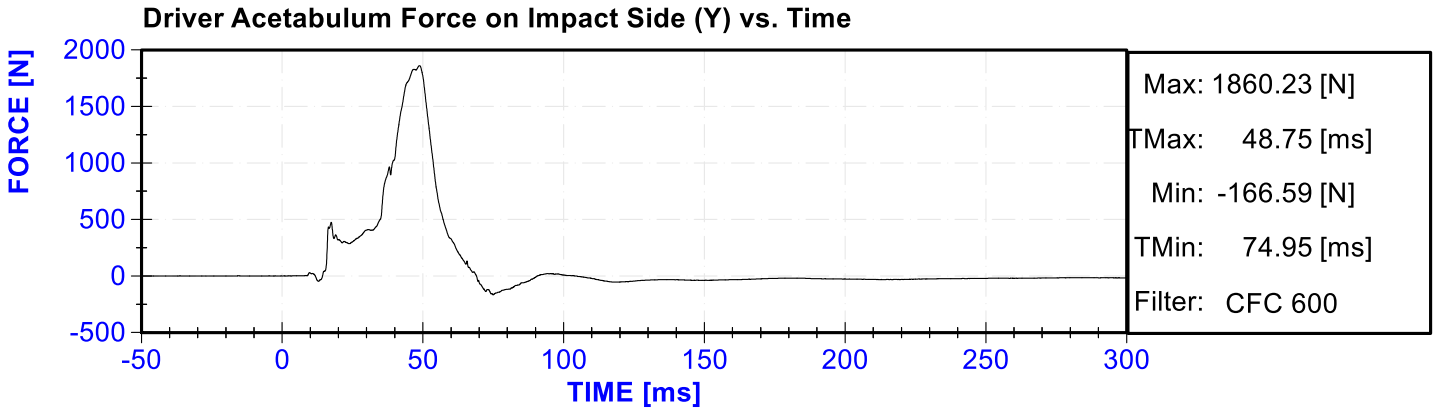
Driver Lower Spine T12 Acceleration (Z) vs. Time

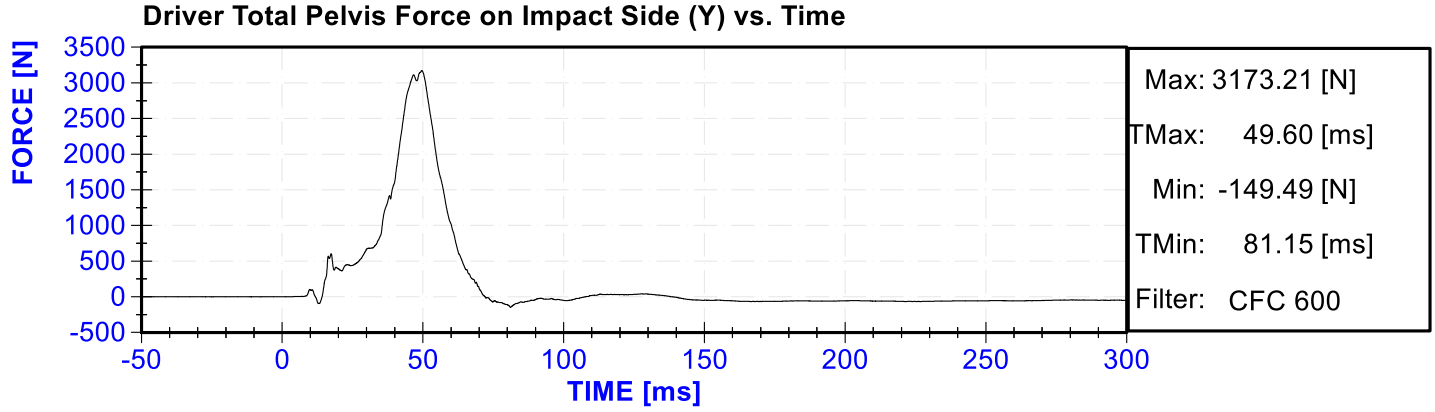


Driver Lower Spine T12 Resultant Acceleration vs. Time




Driver Iliac Wing Force on Impact Side (Y) vs. Time
FORCE [N]
1500
1250
1000
750
500
250
0
-250
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1422.31 [N]
TMax: 50.90 [ms]
Min: -60.40 [N]
TMin: 100.35 [ms]
Filter: CFC 600


Driver Acetabulum Force on Impact Side (Y) vs. Time
FORCE [N]
2000
1500
1000
500
0
-500
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 1860.23 [N]
TMax: 48.75 [ms]
Min: -166.59 [N]
TMin: 74.95 [ms]
Filter: CFC 600


Driver Total Pelvis Force on Impact Side (Y) vs. Time
FORCE [N]
3500
3000
2500
2000
1500
1000
500
0
-500
-50
0
50
100
150
200
250
300
TIME [ms]
Max: 3173.21 [N]
TMax: 49.60 [ms]
Min: -149.49 [N]
TMin: 81.15 [ms]
Filter: CFC 600

APPENDIX C

DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

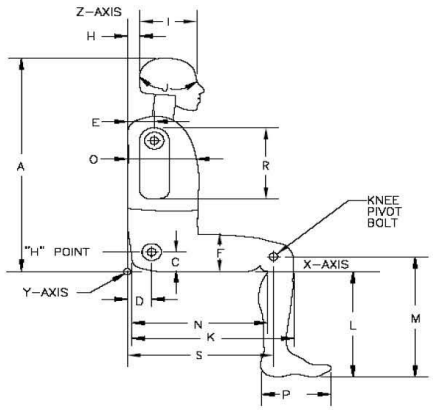
SERIAL NO: DG8012

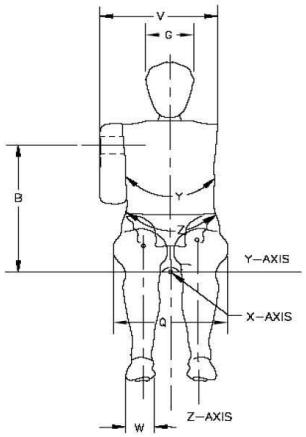
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Dutton Date: 05/12/2020

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	779	Pass
B	Shoulder Pivot Height	437	453	446	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	125	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	537	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	405	Pass
N	Buttock Popliteal Length	416	442	433	Pass
O	Chest Depth w/o jacket	195	211	205	Pass
P	Foot Length	216	232	224	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	318	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	345	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	867	Pass
Z	Waist Circumference	761	791	781	Pass

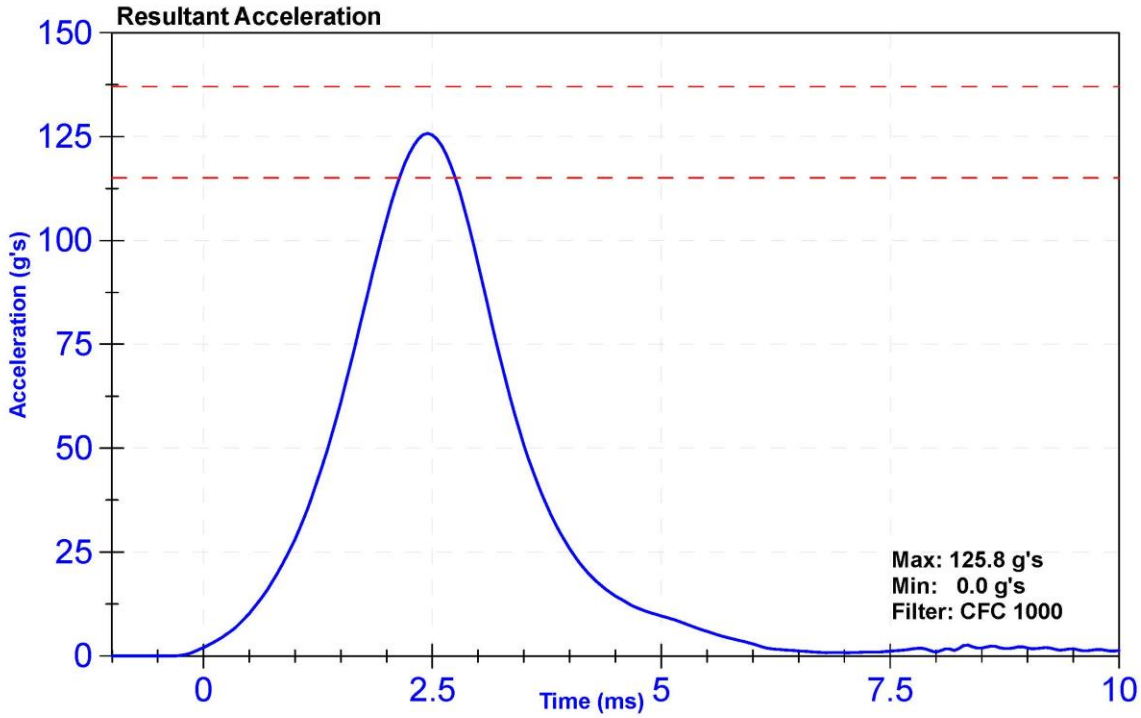
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

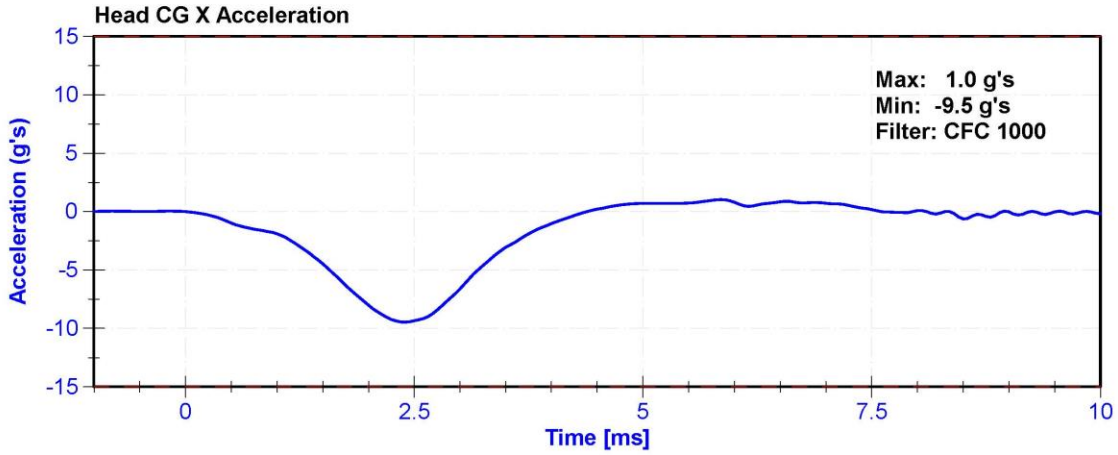
Results

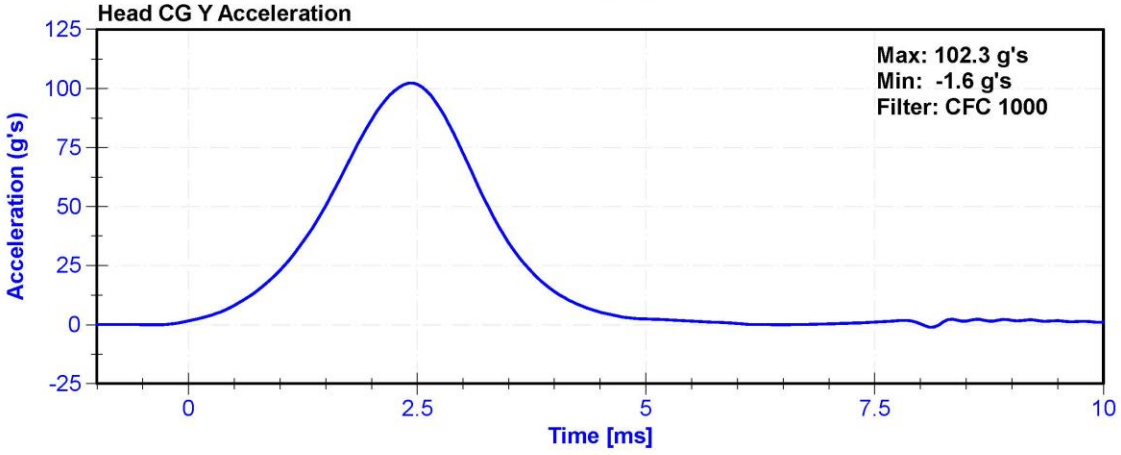
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	30	Pass
Resultant Acceleration	115	137	g's	125.8	Pass
Oscillation	0	15	%	2.9	Pass
Fore-Aft Acceleration	-15	15	g's	-9.5	Pass

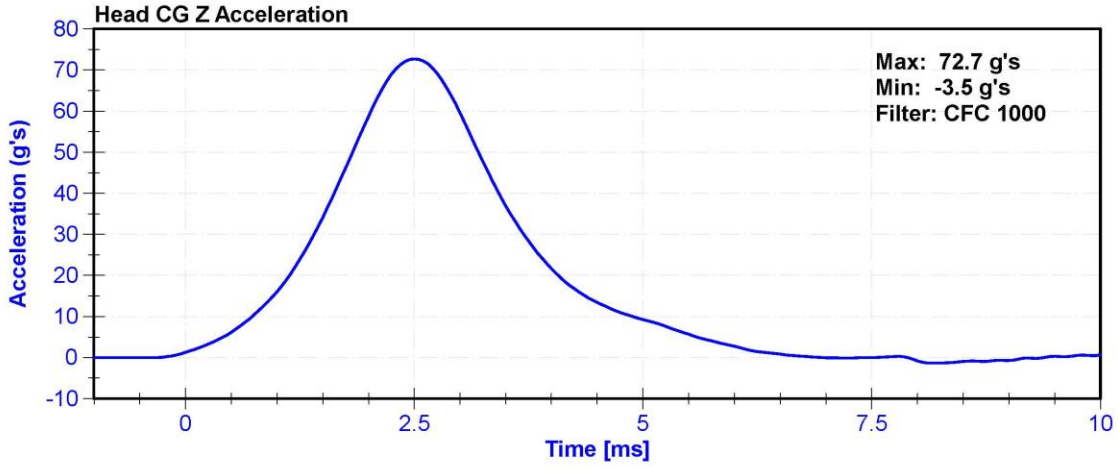
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P74788	4/16/2020	10/15/2020
Y Accelerometer	ENDEVCO 7264CT	AC-P83432	4/16/2020	10/15/2020
Z Accelerometer	ENDEVCO 7264	AC-P83319	4/16/2020	10/15/2020




Head CG X Acceleration
Max: 1.0 g's
Min: -9.5 g's
Filter: CFC 1000
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]


Head CG Y Acceleration
Max: 102.3 g's
Min: -1.6 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: 72.7 g's
Min: -3.5 g's
Filter: CFC 1000
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]

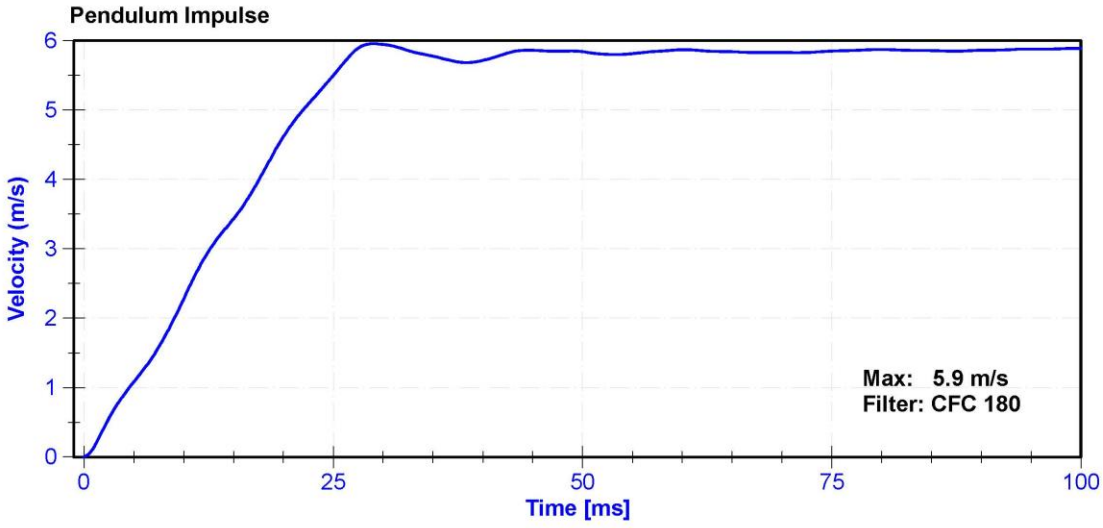
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

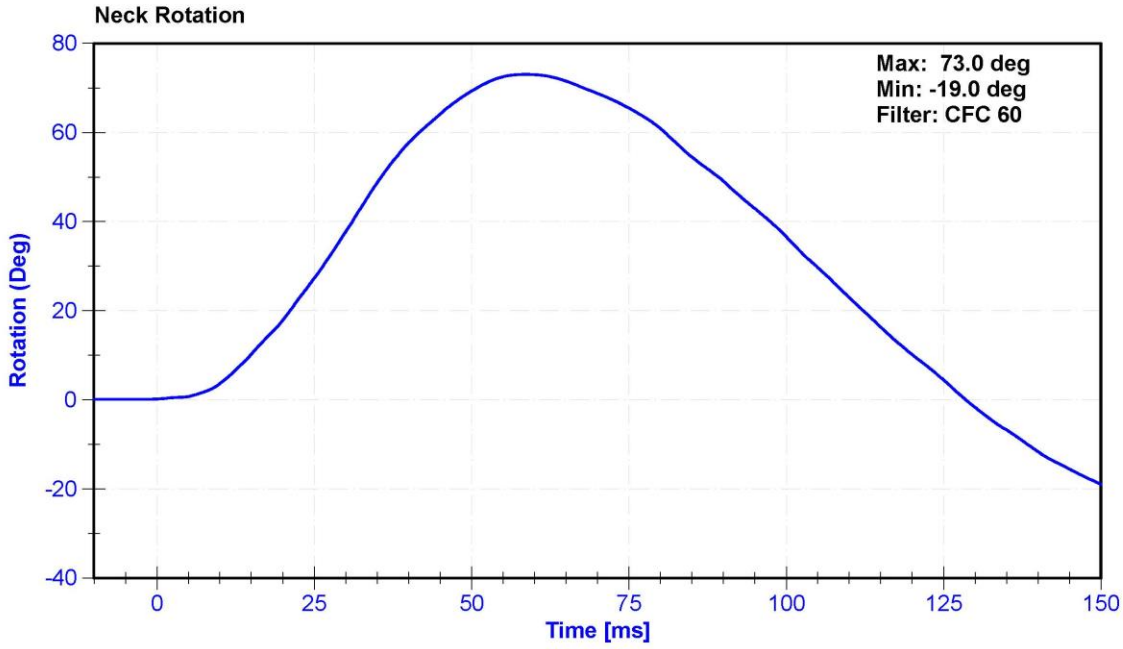
Results

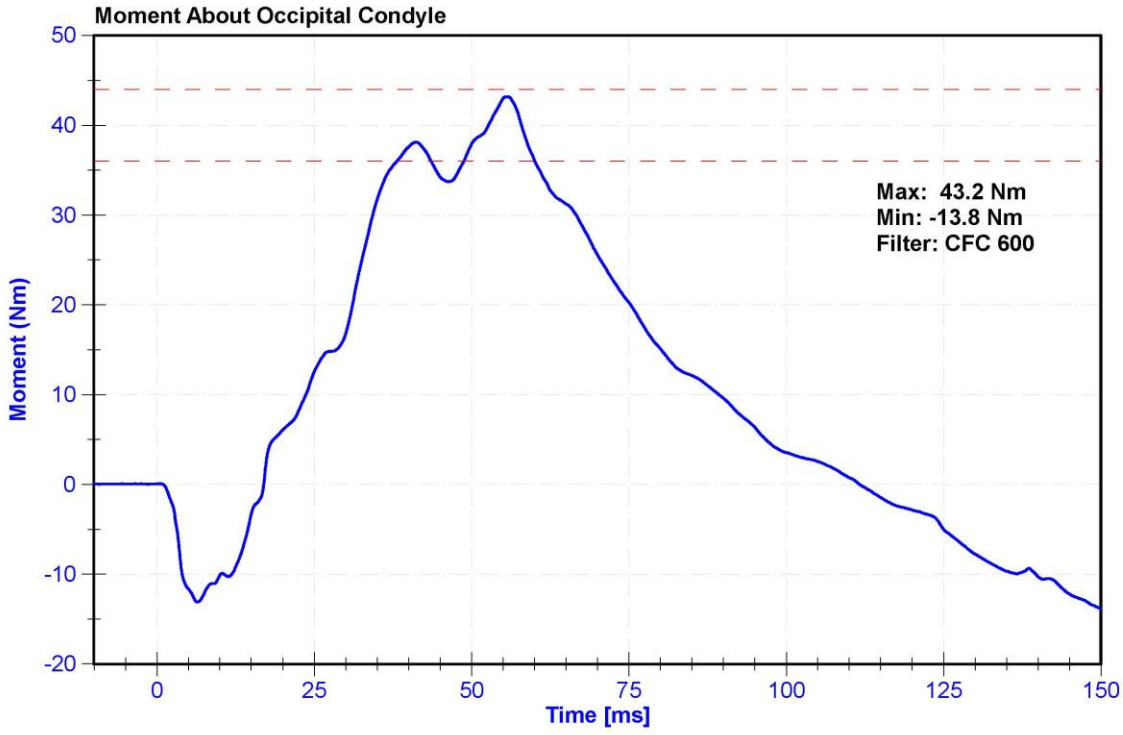
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	29	Pass
Velocity	5.51	5.63	m/s	5.549	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.28	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.43	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.61	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.50	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.95	Pass
Neck Rotation	71	81	deg	73.0	Pass
Time at Maximum Rotation	50	70	ms	58.6	Pass
Moment about the OC	36	44	Nm	43.2	Pass
Moment Decay to 0 Nm	102	126	ms	111.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5M9 Pend	1/30/2020	1/29/2021
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	11/4/2019	11/3/2020
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/4/2019	11/3/2020
Upper Neck Load Cell	Denton 1716A	LC-2192Fy	6/20/2019	6/19/2020




Neck Rotation
Max: 73.0 deg
Min: -19.0 deg
Filter: CFC 60
Rotation (Deg)
80
60
40
20
0
-20
-40
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.2 Nm
Min: -13.8 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

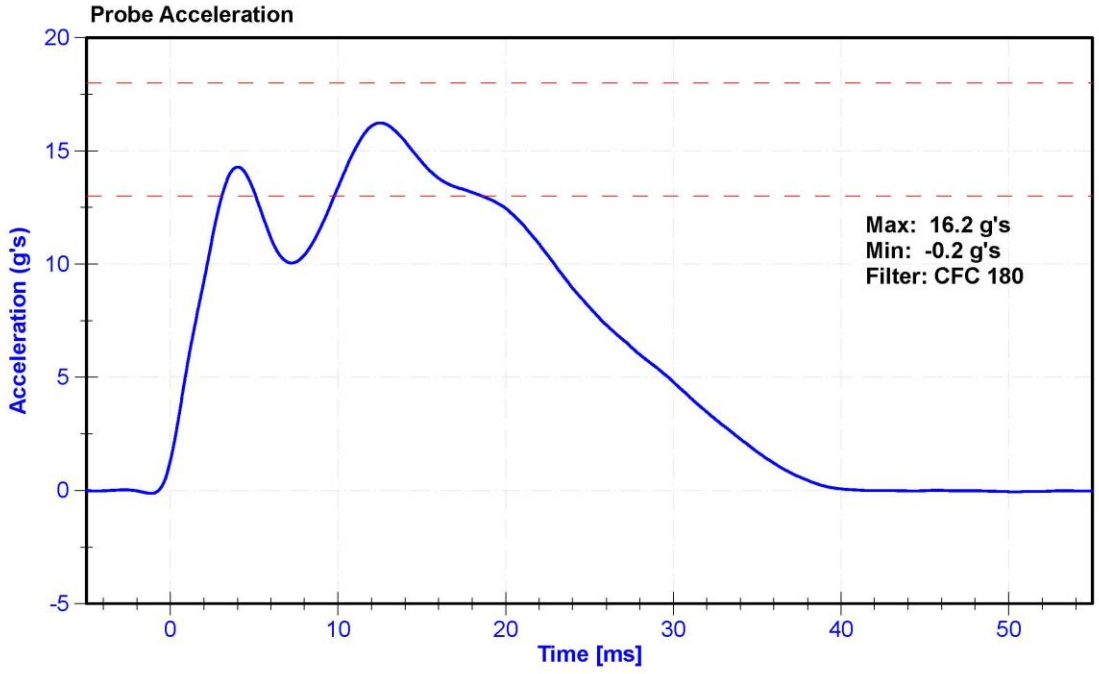
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

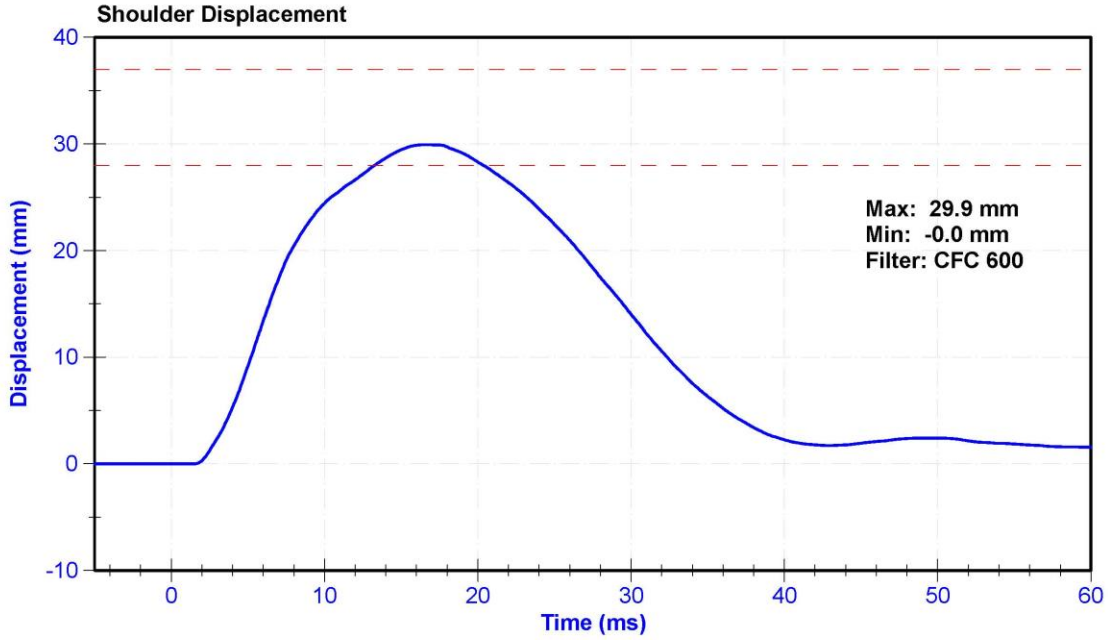
Results

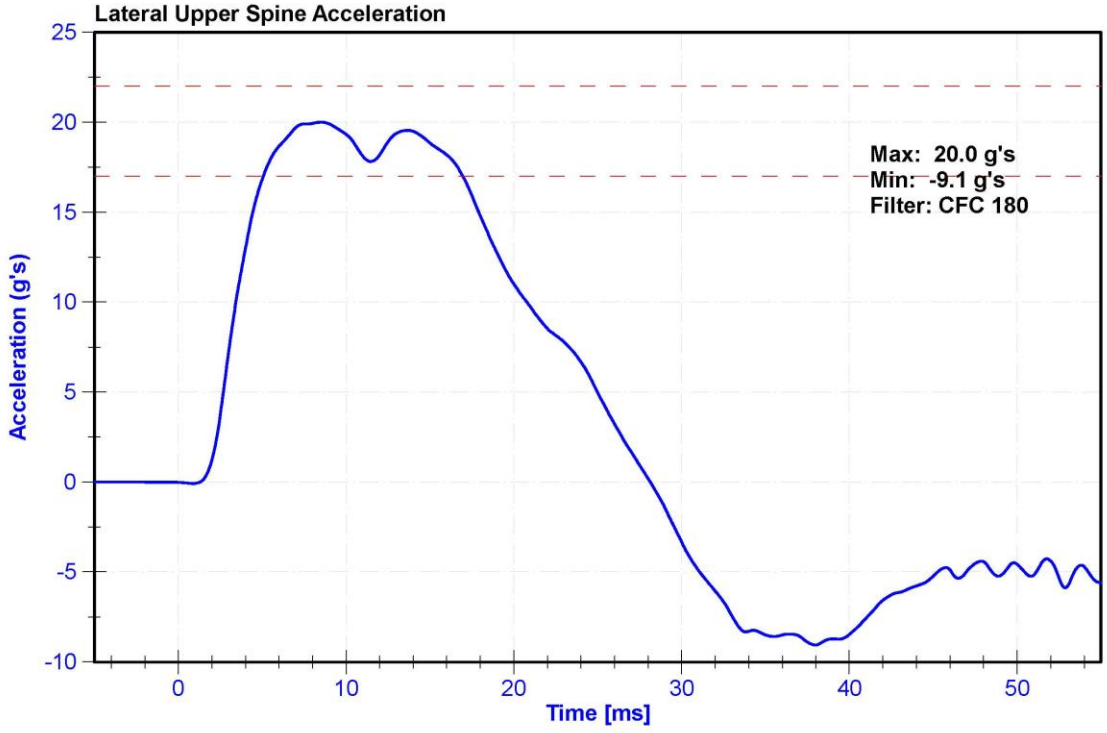
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21	Pass
Humidity	10	70	%	30	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	13	18	g's	16.2	Pass
Shoulder Deflection	28	37	mm	29.9	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	5/6/2020	11/4/2020
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	4/16/2020	10/15/2020




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 29.9 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.0 g's
Min: -9.1 g's
Filter: CFC 180

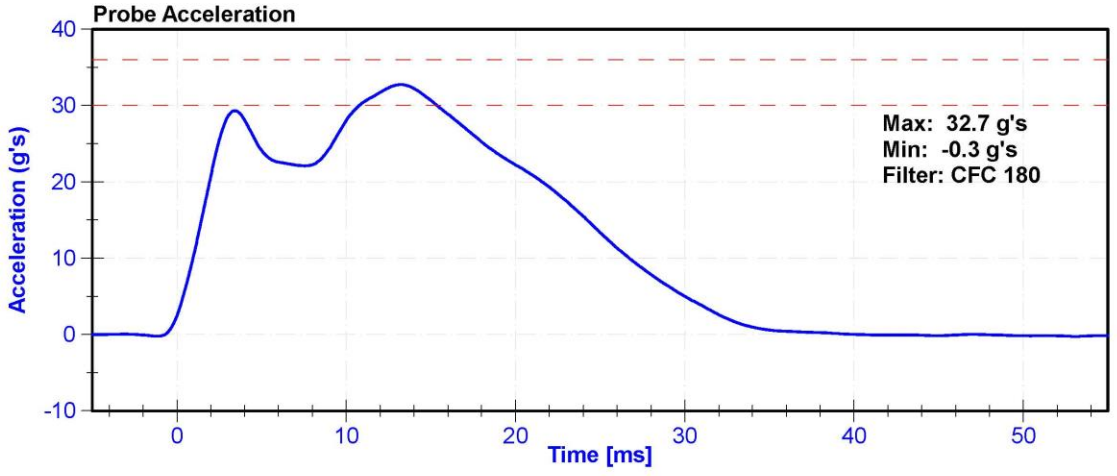
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

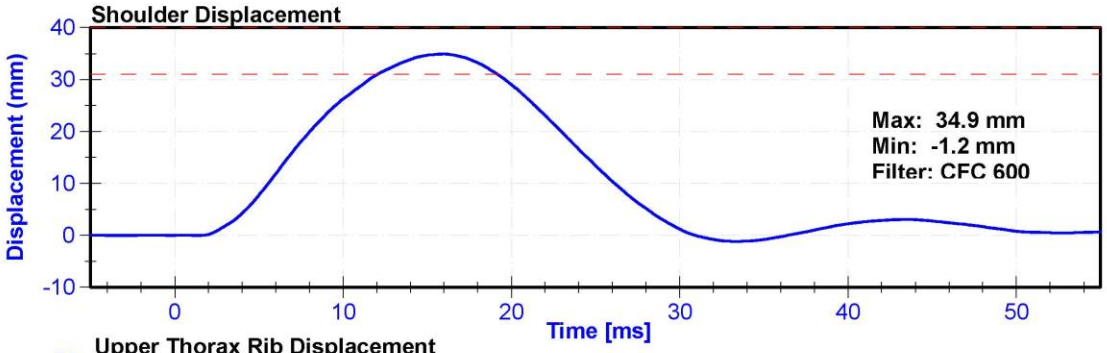
Results

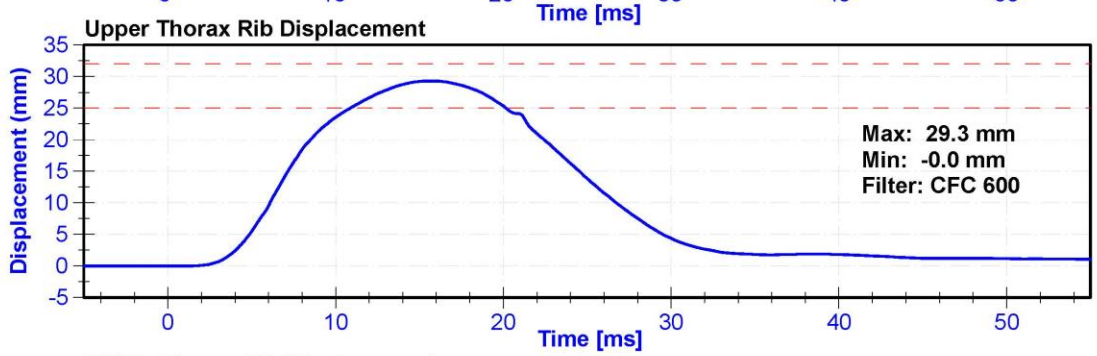
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	25.0	Pass
Velocity	6.6	6.8	m/s	6.80	Pass
Probe Acceleration after 5 ms	30	36	g's	32.7	Pass
Lateral Upper Spine Acceleration	34	43	g's	37.2	Pass
Lateral Lower Spine Acceleration	29	37	g's	31.8	Pass
Shoulder Deflection	31	40	mm	34.9	Pass
Upper Thorax Rib Deflection	25	32	mm	29.3	Pass
Mid Thorax Rib Deflection	30	36	mm	33.8	Pass
Lower Thorax Rib Deflection	32	38	mm	35.6	Pass

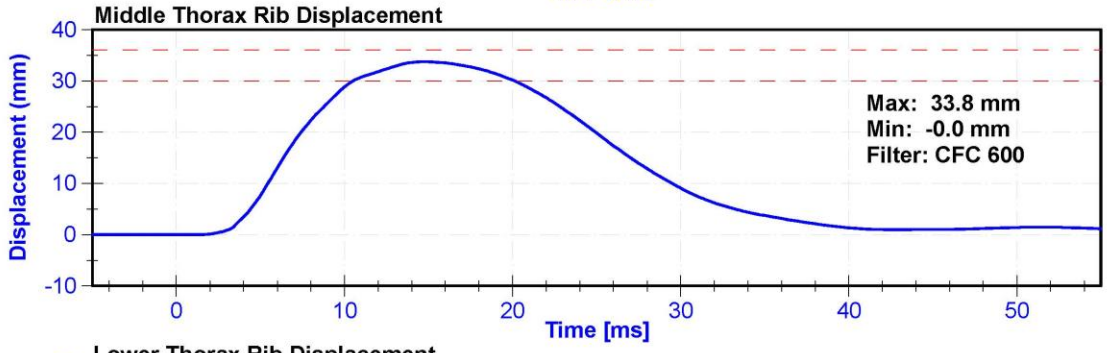
Transducer Calibrations

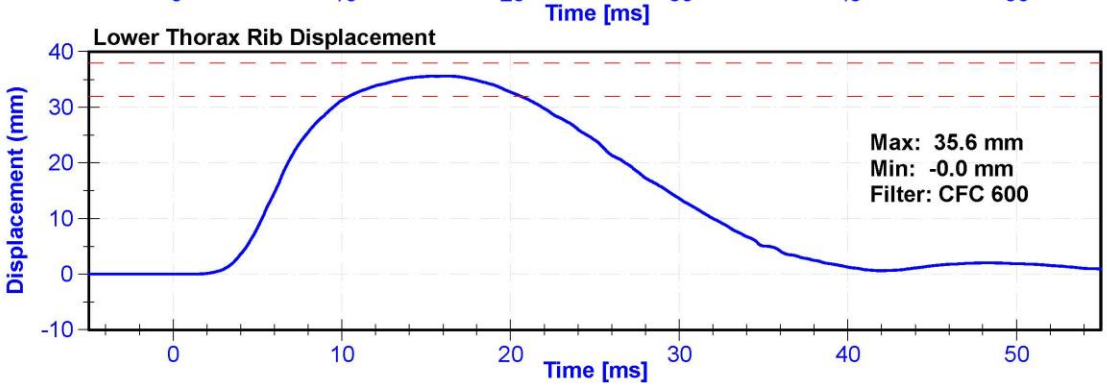
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P64148	4/16/2020	10/15/2020
Upper Spine T12 Y Accelerometer	ENDEVCO 7264CT	AC-P51327	4/16/2020	10/15/2020
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	5/6/2020	11/4/2020
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/6/2020	11/4/2020
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	5/6/2020	11/4/2020
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	5/6/2020	11/4/2020

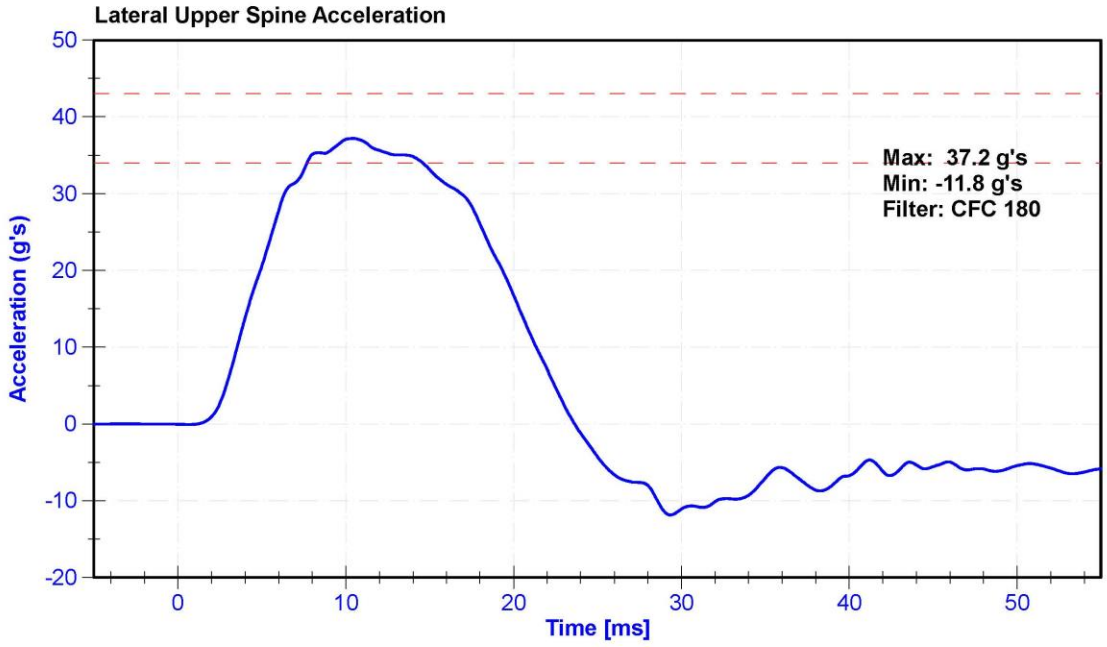


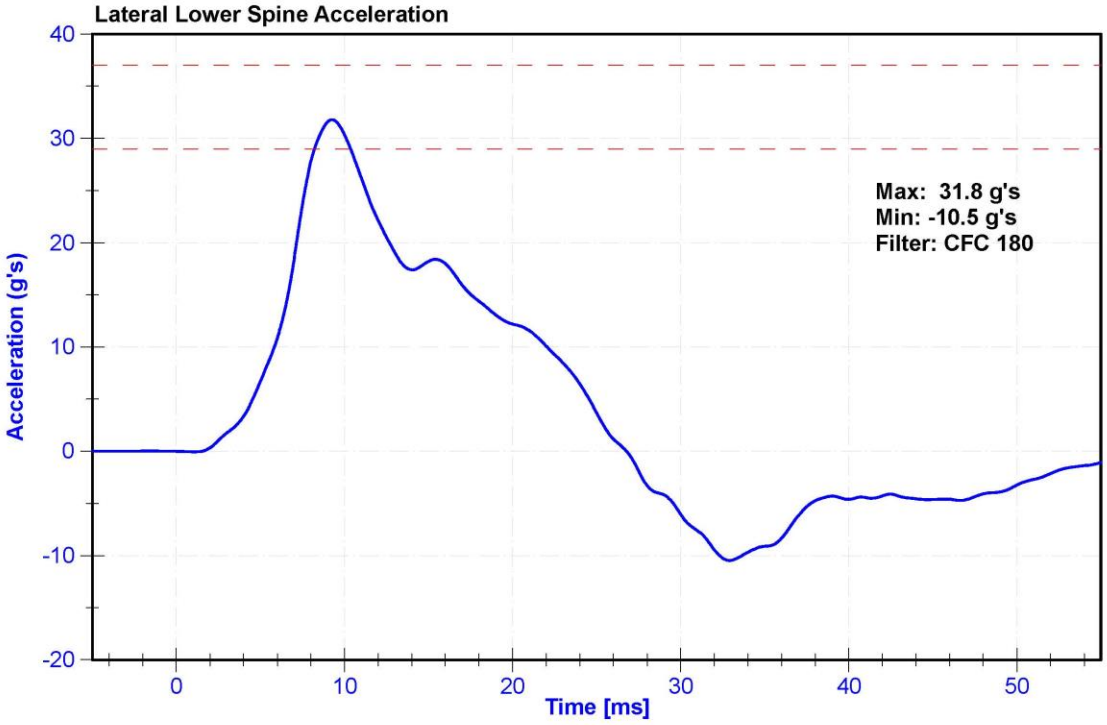

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 34.9 mm
Min: -1.2 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 29.3 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.8 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.6 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 37.2 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: 31.8 g's
Min: -10.5 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
-20
0
10
20
30
40
50

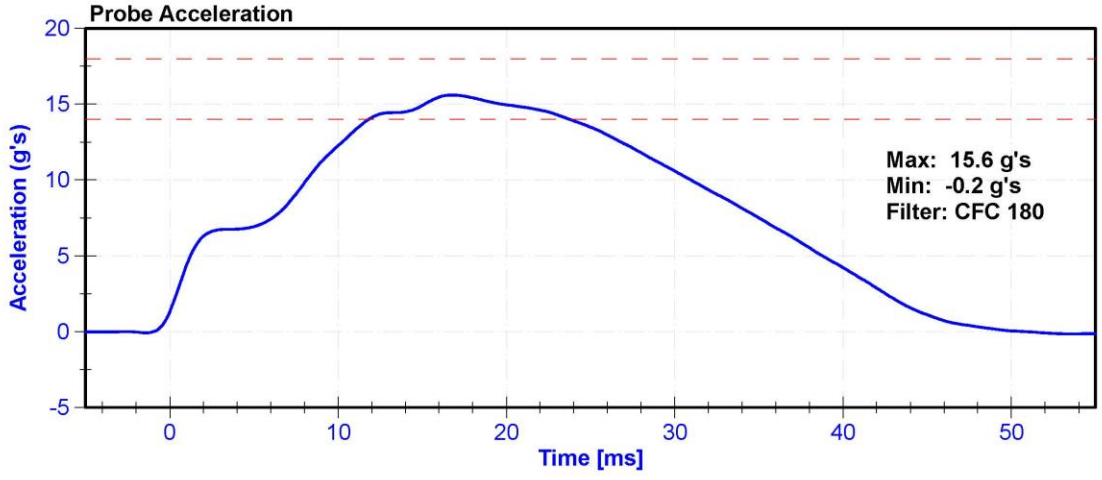
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

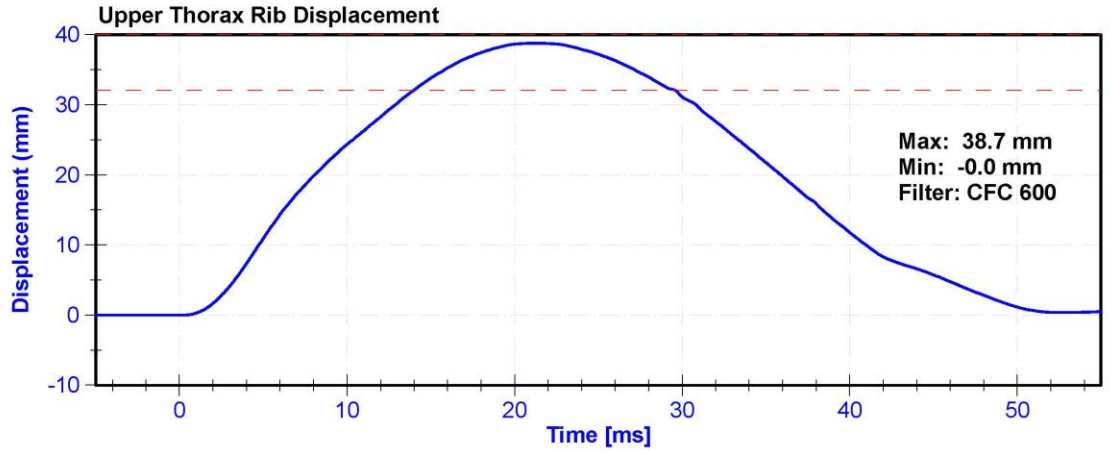
Results

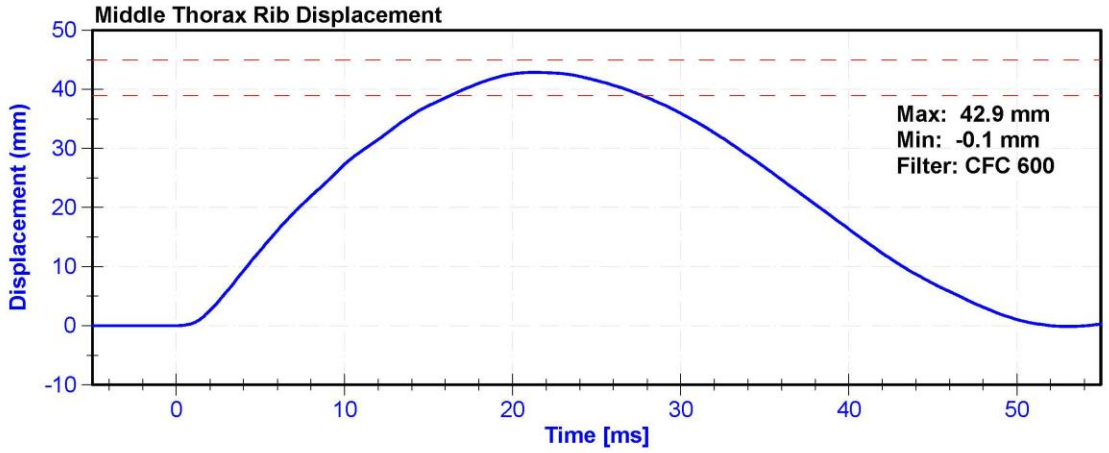
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	25	Pass
Velocity	4.2	4.4	m/s	4.23	Pass
Probe Acceleration	14	18	g's	15.6	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.1	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.0	Pass
Upper Thorax Rib Deflection	32	40	mm	38.7	Pass
Middle Thorax Rib Deflection	39	45	mm	42.9	Pass
Lower Thorax Rib Deflection	35	43	mm	38.5	Pass

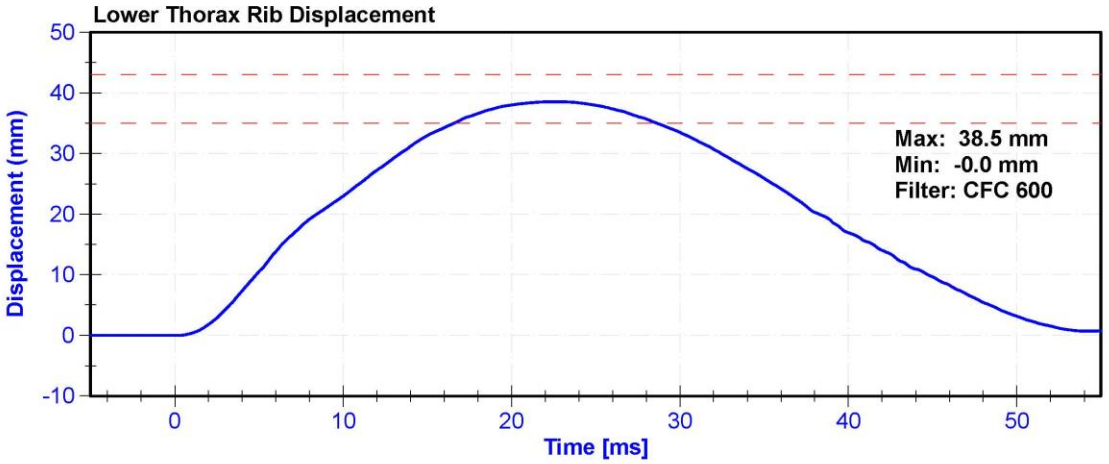
Transducer Calibrations

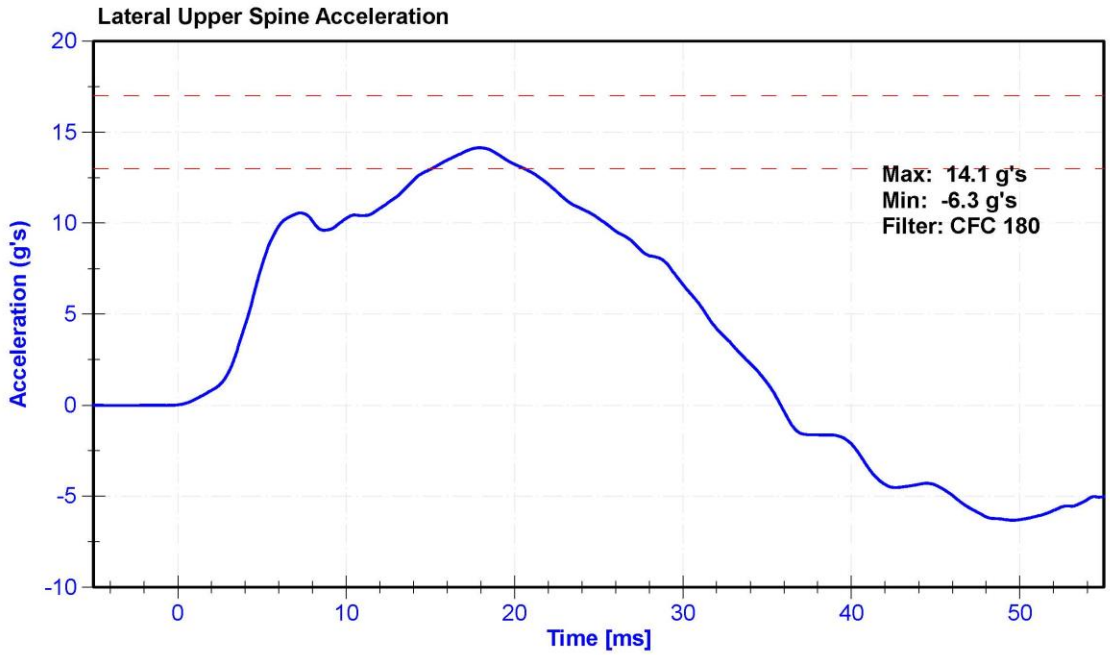
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	4/16/2020	10/15/2020
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51327	4/16/2020	10/15/2020
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/6/2020	11/4/2020
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	5/6/2020	11/4/2020
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	5/6/2020	11/4/2020

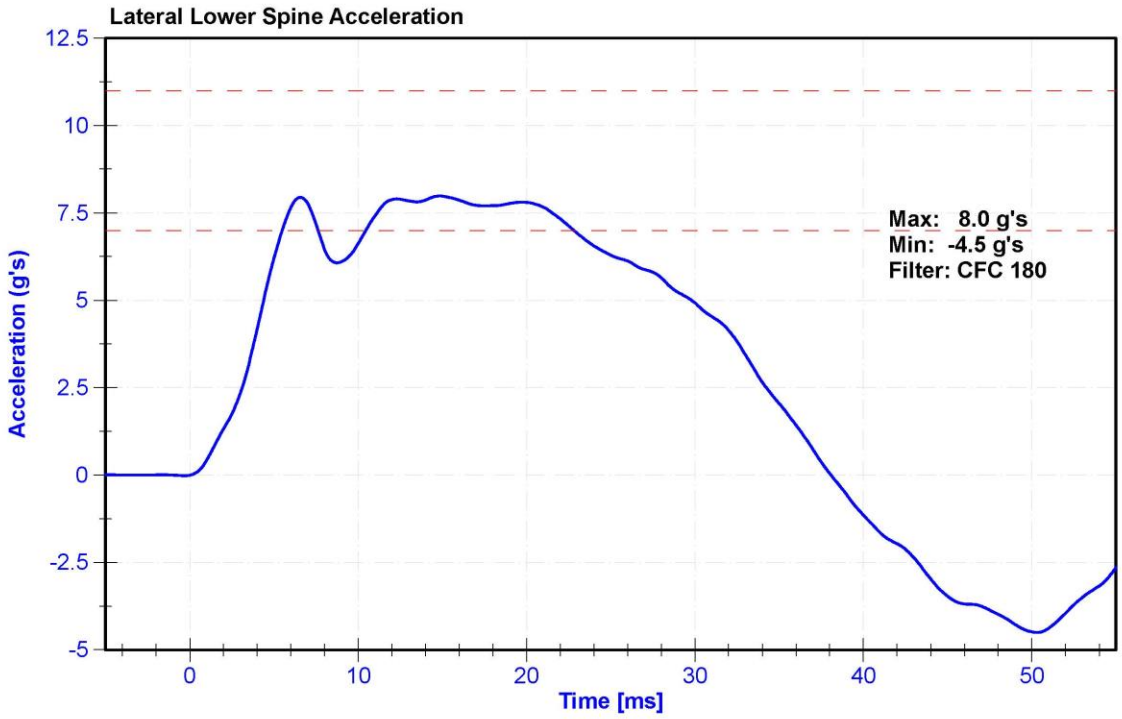



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.7 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.9 mm
Min: -0.1 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.5 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 14.1 g's
Min: -6.3 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: 8.0 g's
Min: -4.5 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50

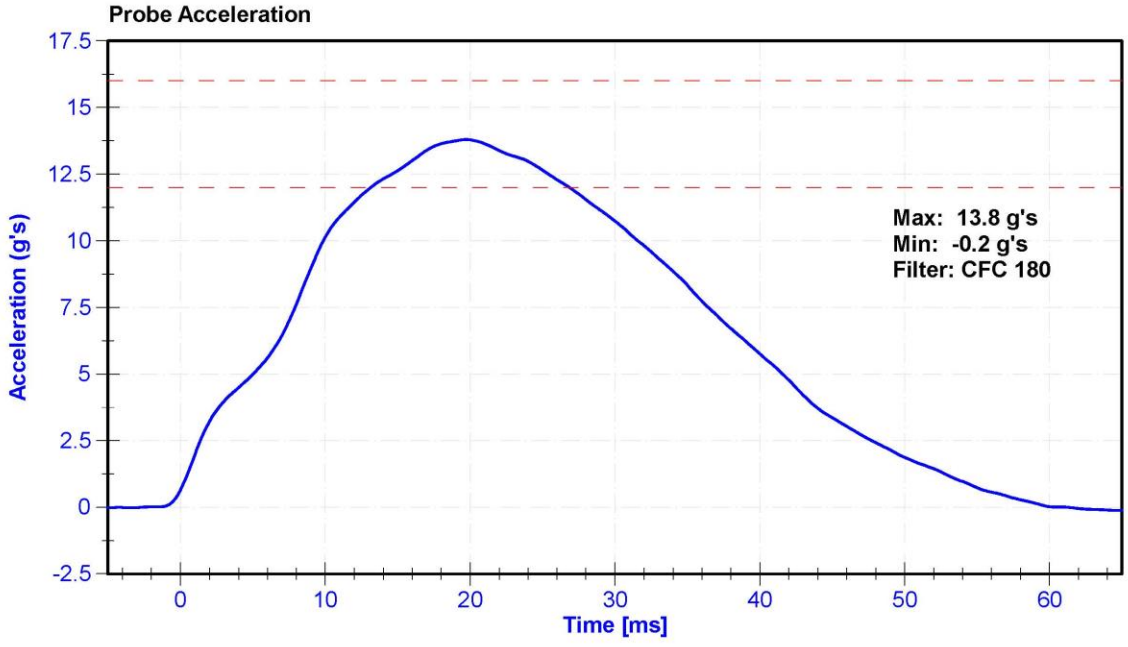
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

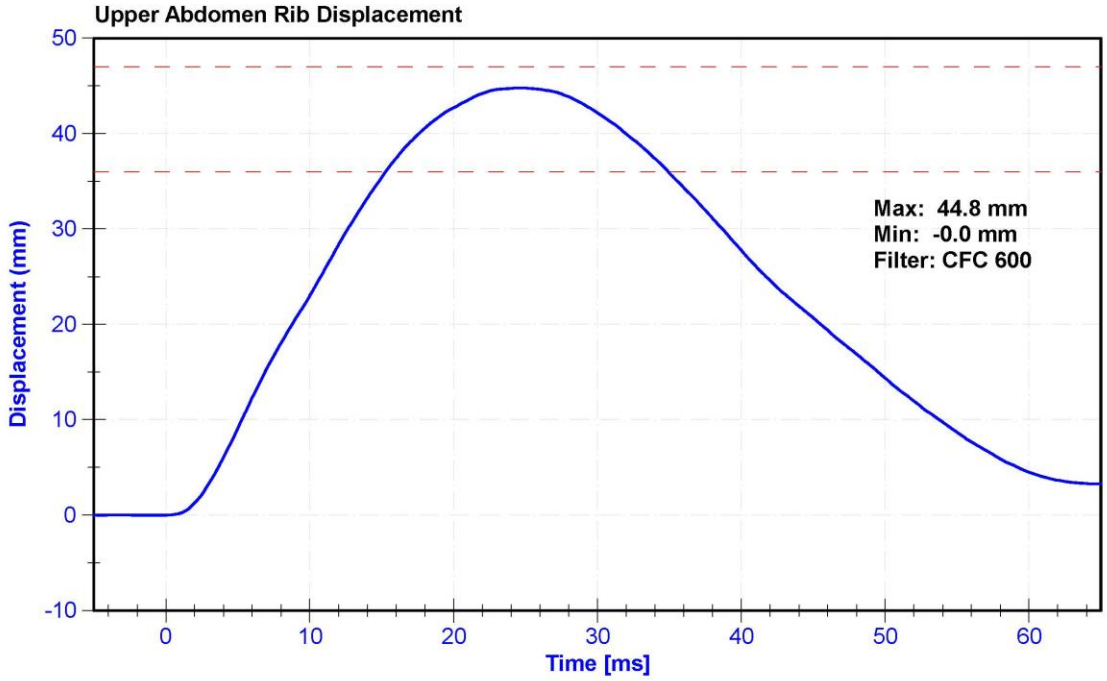
Results

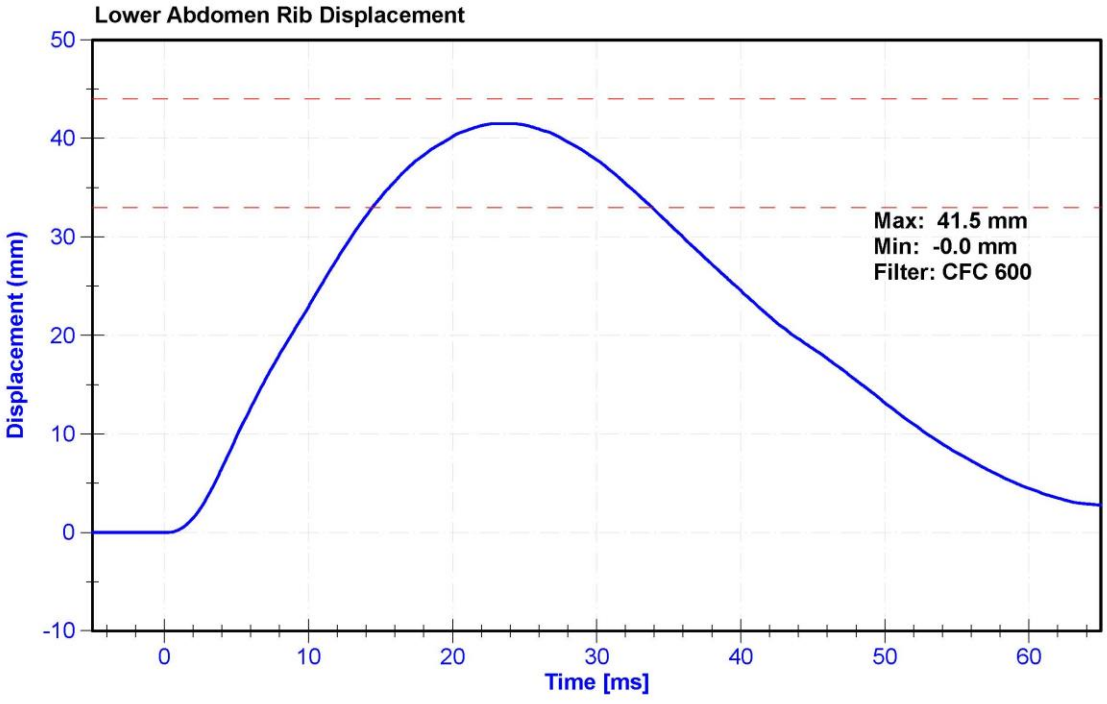
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	25.0	Pass
Velocity	4.2	4.4	m/s	4.22	Pass
Probe Acceleration	12	16	g's	13.8	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.3	Pass
Upper Abdomen Rib Deflection	36	47	mm	44.8	Pass
Lower Abdomen Rib Deflection	33	44	mm	41.5	Pass

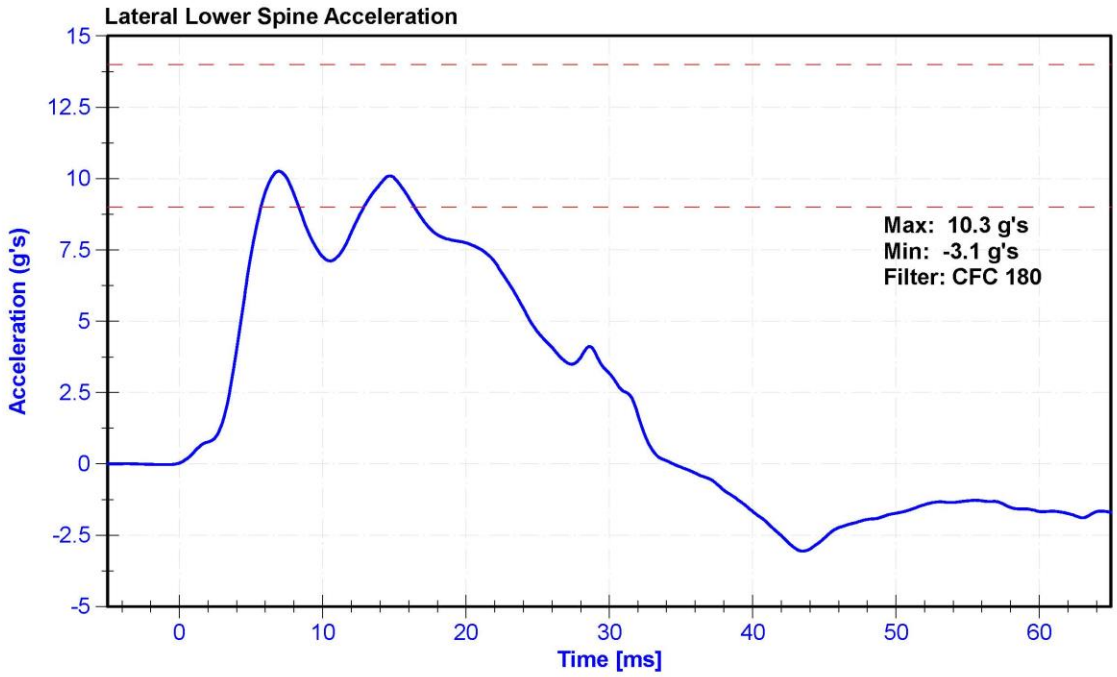
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51327	4/16/2020	10/15/2020
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	5/6/2020	11/4/2020
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	5/6/2020	11/4/2020




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 44.8 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.5 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
-5
0
10
20
30
40
50
60
Time [ms]
Max: 10.3 g's
Min: -3.1 g's
Filter: CFC 180

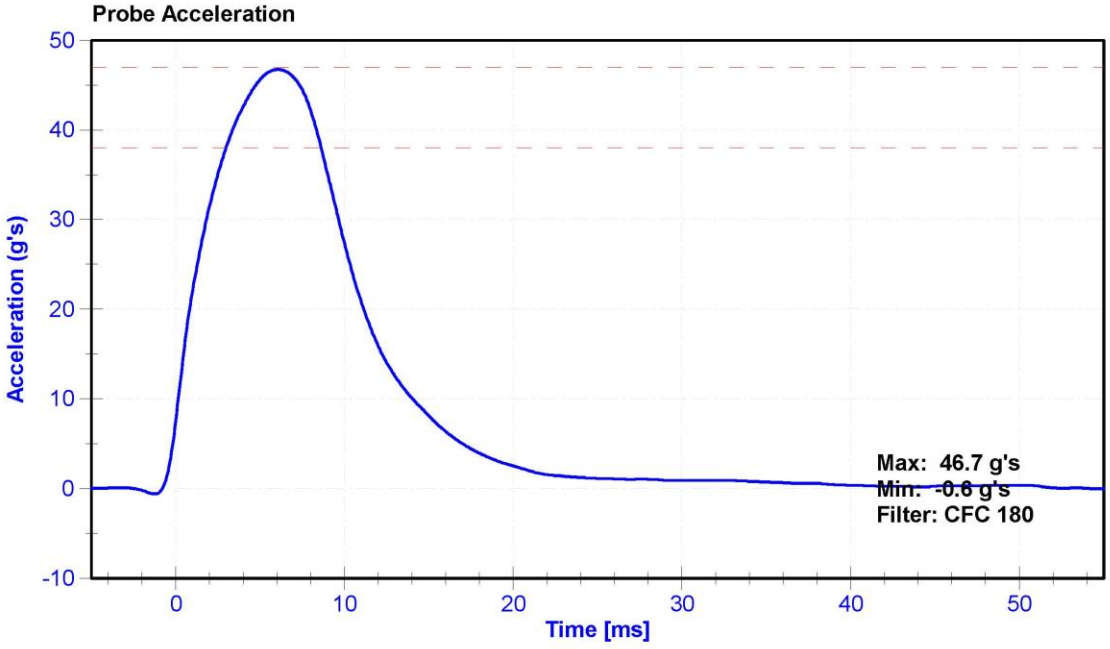
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

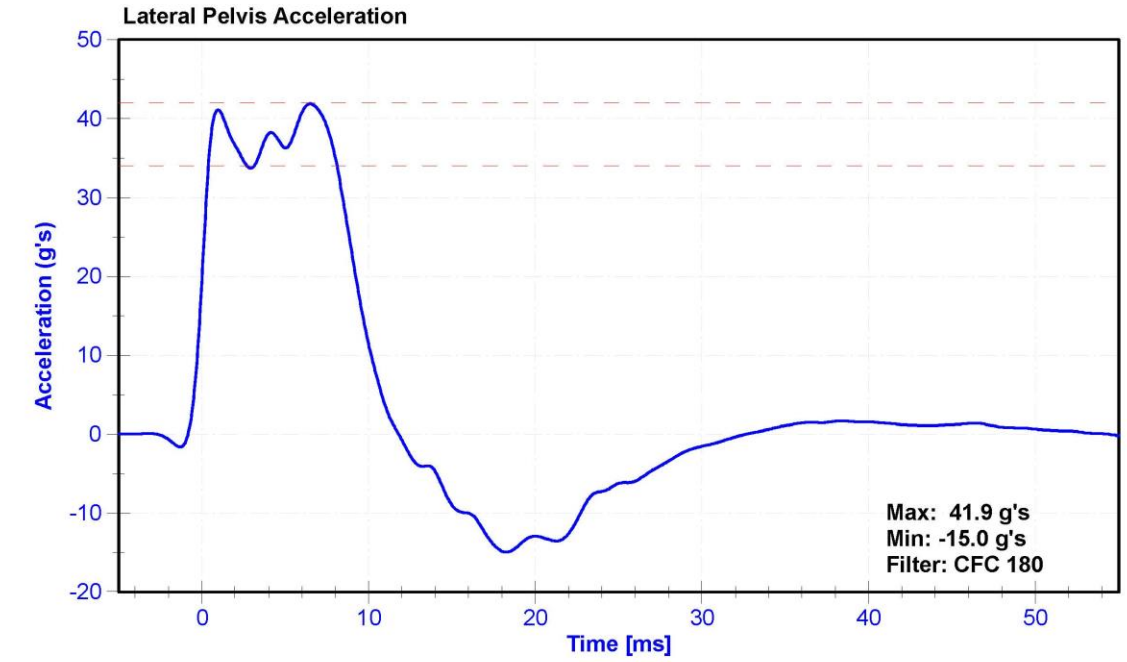
Results

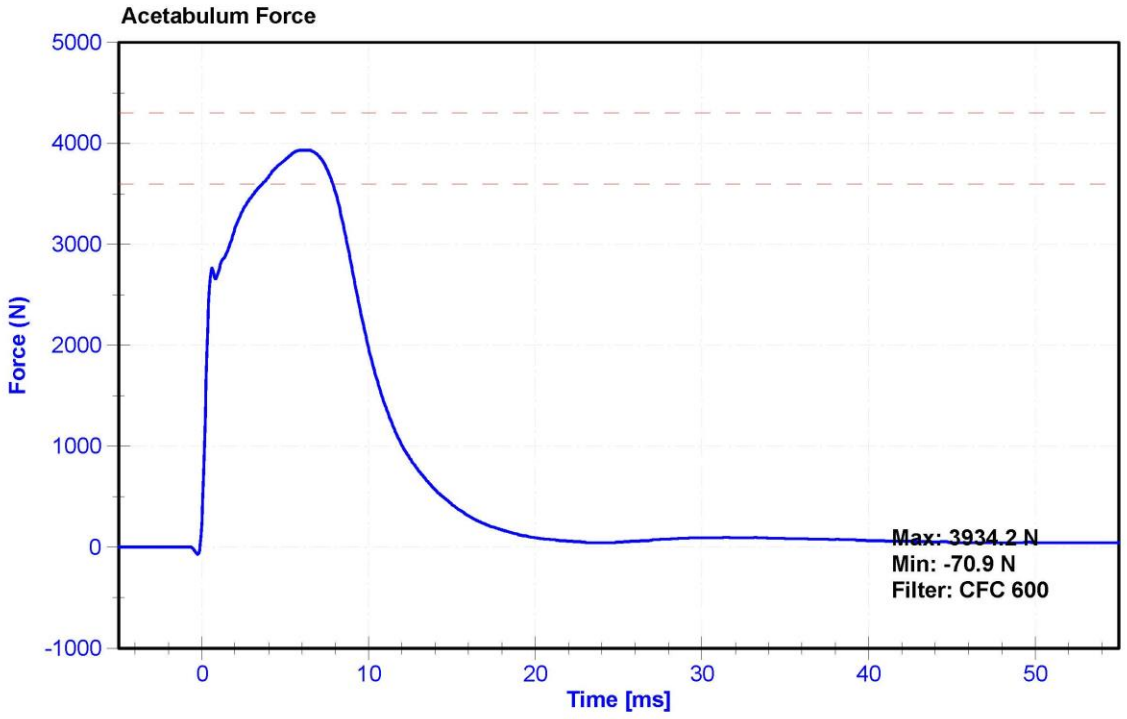
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	24	Pass
Velocity	6.6	6.8	m/s	6.61	Pass
Probe Acceleration	38	47	g's	46.7	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.9	Pass
Acetabulum Force	3600	4300	N	3934.2	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	4/16/2020	10/15/2020
Acetabulum Load Cell	Denton 3249J	LC-4986Fy	6/14/2019	6/13/2020
Certification Plug	SACO	13425	9/20/2019	N/A
Crash Test Plug	SACO	13014	7/23/2019	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 41.9 g's
Min: -15.0 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: 3934.2 N
Min: -70.9 N
Filter: CFC 600

DG8017
Left
5/12/2020

SID-IIs Pelvis Plug Certification Test

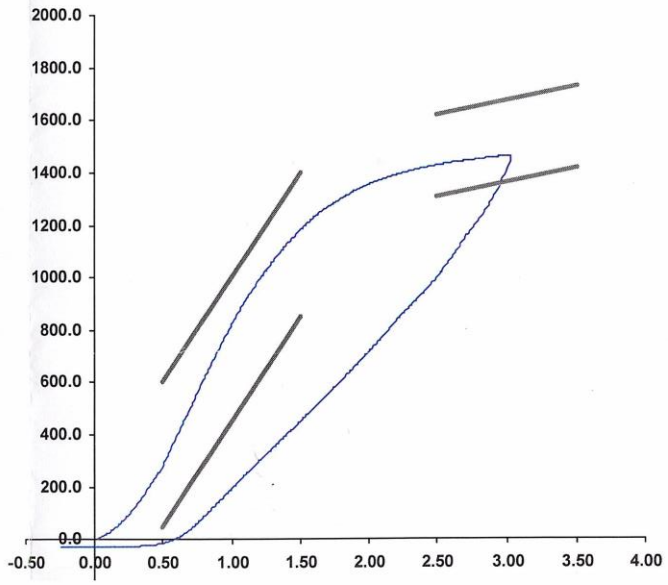
Plug S/N 13425
Test Number 11067
Report Number 11105
Test Date 9/20/2019 7:40:22 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	287.51	50.00	600.00
Force @ 1.5 mm (N)	1,187.54	850.00	1,400.00
Force @ 2.5 mm (N)	1,426.66	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,465.31	1,361.00	1,673.00

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

Crosshead Speed (mm / min) or Rat 12.7
Extension or Position Measured by XHD 100 (XHD100)

Force (-N) vs Extension (-mm)



DG8012
Crash
5/12/2020

SID-IIs Pelvis Plug Certification Test

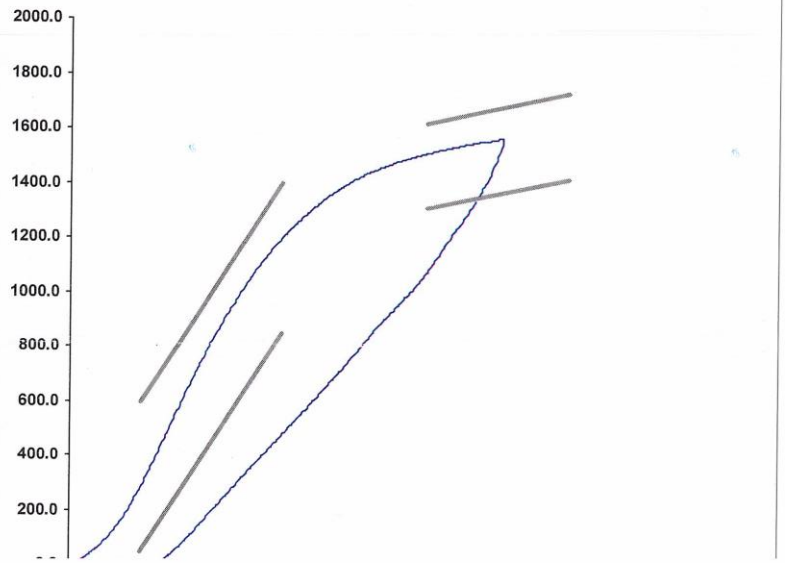
Plug S/N 13014
Test Number 10311
Report Number 10346
Test Date 7/23/2019 12:13:08 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	274.54	50.00	600.00
Force @ 1.5 mm (N)	1,200.76	850.00	1,400.00
Force @ 2.5 mm (N)	1,508.66	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,560.92	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)

Force (-N) vs Extension (-mm)



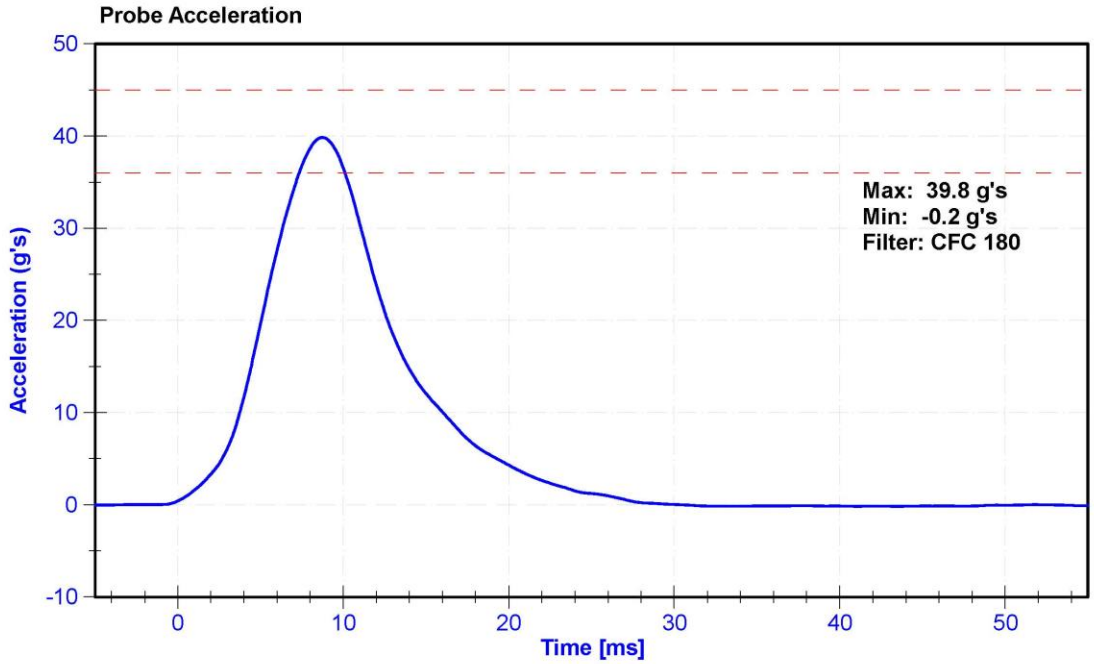
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

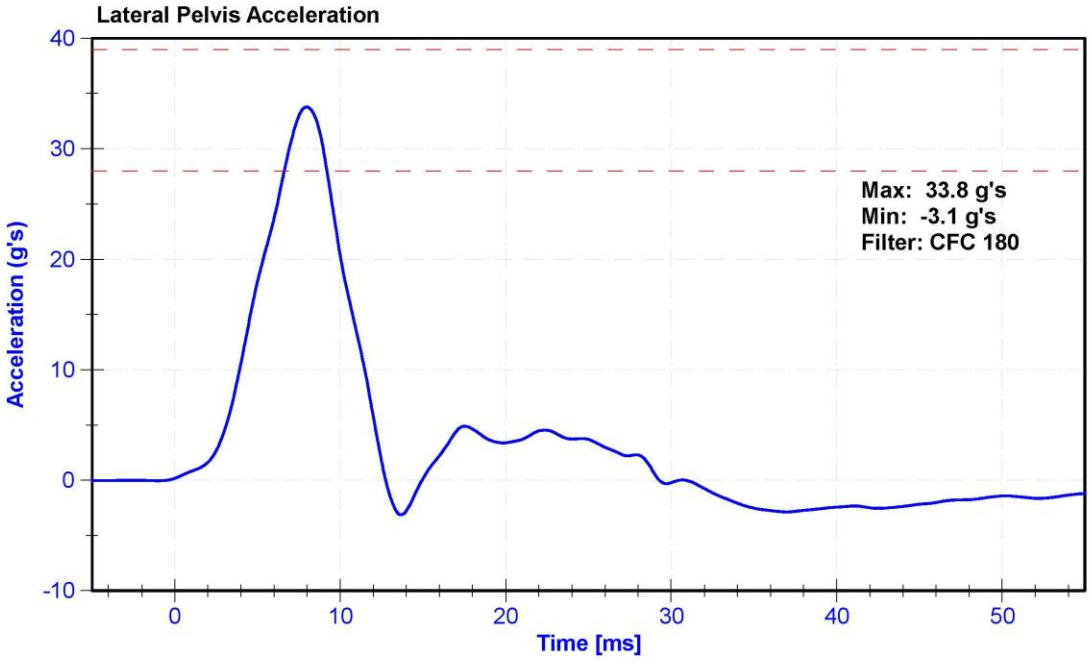
Results

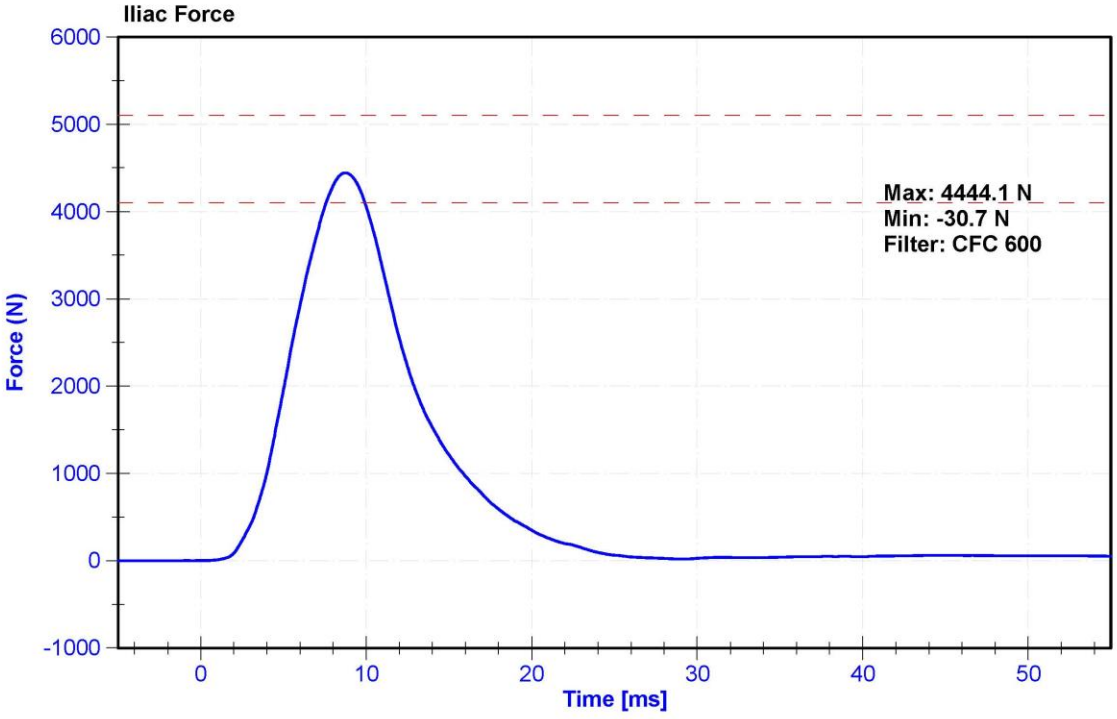
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	30.0	Pass
Velocity	4.2	4.4	m/s	4.36	Pass
Probe Acceleration	36	45	g's	39.8	Pass
Lateral Pelvis Acceleration	28	39	g's	33.8	Pass
Iliac Force	4100	5100	N	4444.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	4/16/2020	10/15/2020
Iliac Load Cell	DENTON 3228J	LC-290Fy	9/25/2019	9/24/2020




Lateral Pelvis Acceleration
Max: 33.8 g's
Min: -3.1 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]


Iliac Force
Max: 4444.1 N
Min: -30.7 N
Filter: CFC 600
Force (N)
Time [ms]

CALIBRATION TEST RESULTS

POST-TEST

SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

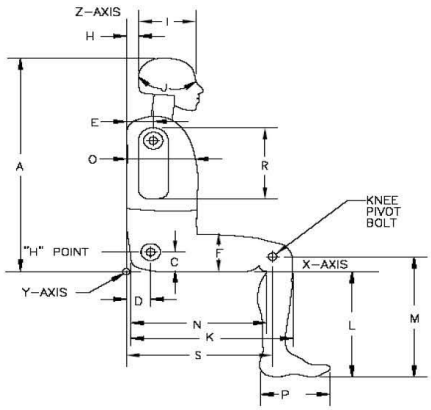
SERIAL NO: DG8012

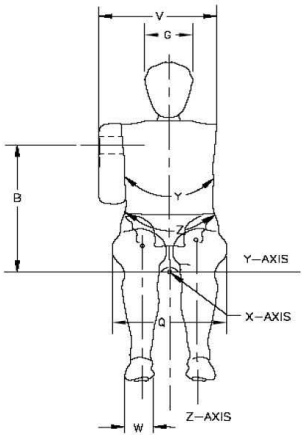
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Dutton Date: 05/19/2020

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	779	Pass
B	Shoulder Pivot Height	437	453	446	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	146	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	125	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	43	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	547	Pass
K	Buttock to Knee Length	514	540	537	Pass
L	Popliteal Height	343	369	357	Pass
M	Knee Pivot to floor height	392	409	405	Pass
N	Buttock Popliteal Length	416	442	433	Pass
O	Chest Depth w/o jacket	195	211	205	Pass
P	Foot Length	216	232	224	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	319	Pass
R	Arm Length	249	259	255	Pass
S	Knee Joint to seatback	477	493	487	Pass
V	Shoulder Width	341	357	346	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	867	Pass
Z	Waist Circumference	761	791	781	Pass

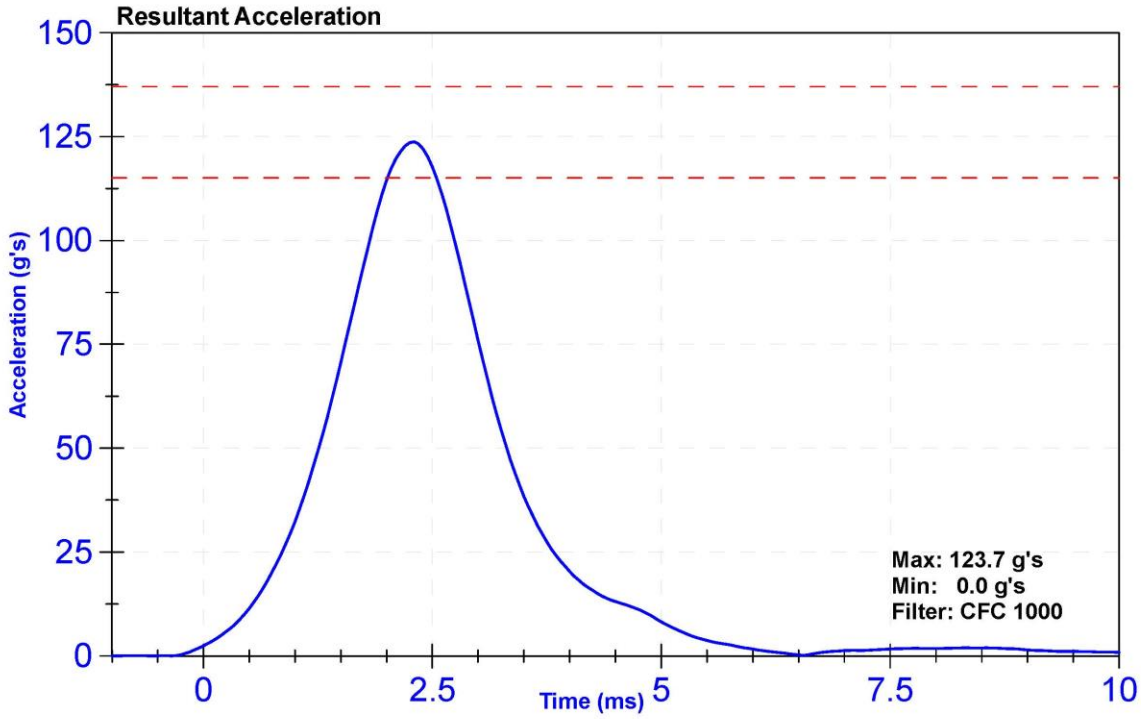
ATD Manufacturer	FTSS	Test Technician	M. Dudek
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

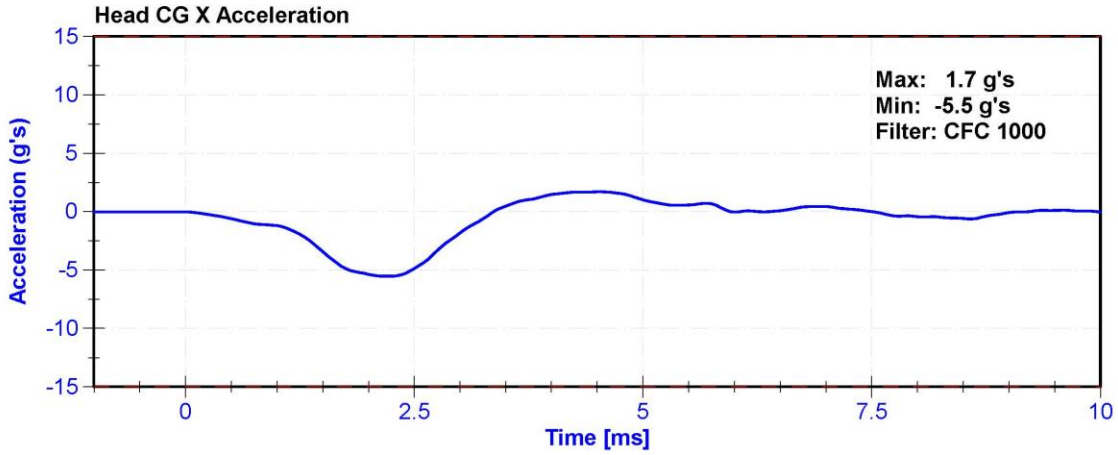
Results

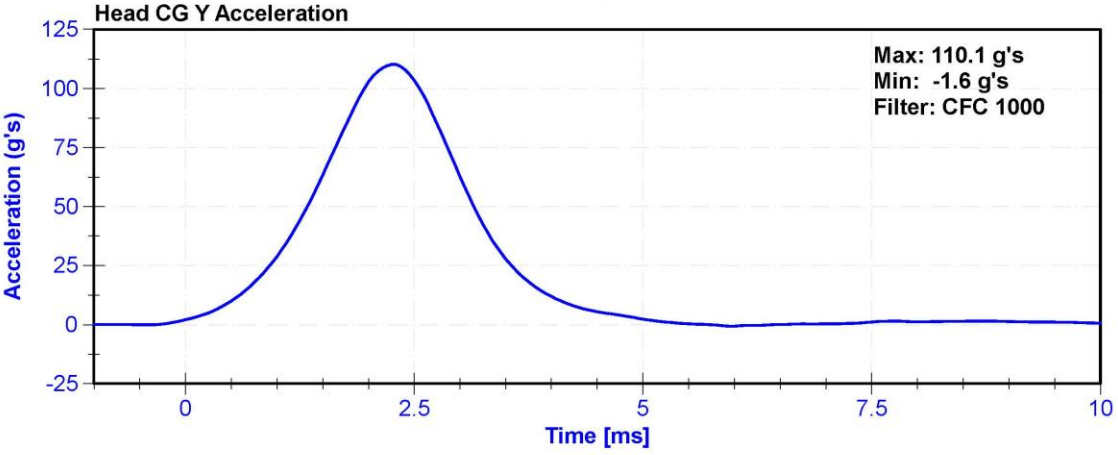
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.3	Pass
Humidity	10	70	%	36.7	Pass
Resultant Acceleration	115	137	g's	123.7	Pass
Oscillation	0	15	%	1.6	Pass
Fore-Aft Acceleration	-15	15	g's	-5.5	Pass

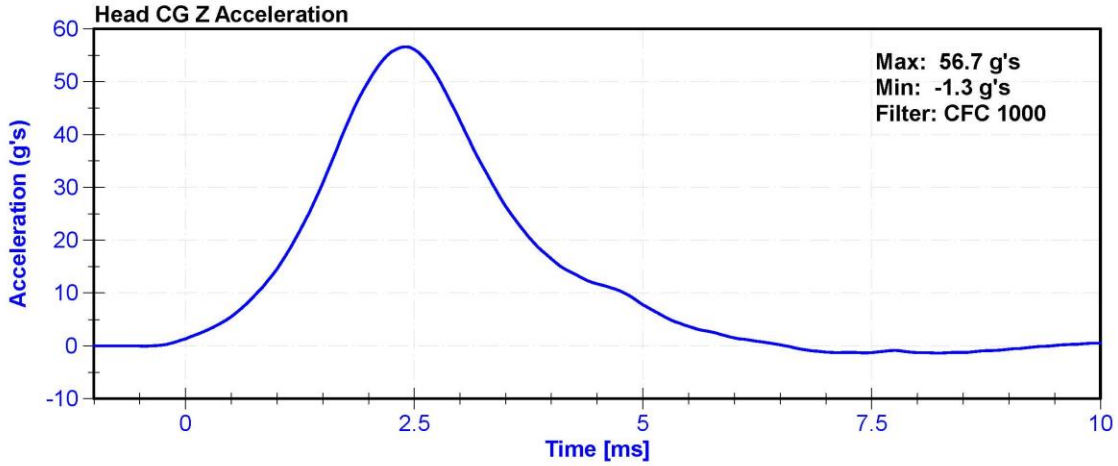
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264	AC-P74788	4/16/2020	10/15/2020
Y Accelerometer	ENDEVCO 7264CT	AC-P83432	4/16/2020	10/15/2020
Z Accelerometer	ENDEVCO 7264	AC-P83319	4/16/2020	10/15/2020




Head CG X Acceleration
Max: 1.7 g's
Min: -5.5 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: 110.1 g's
Min: -1.6 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: 56.7 g's
Min: -1.3 g's
Filter: CFC 1000
Acceleration (g's)
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]

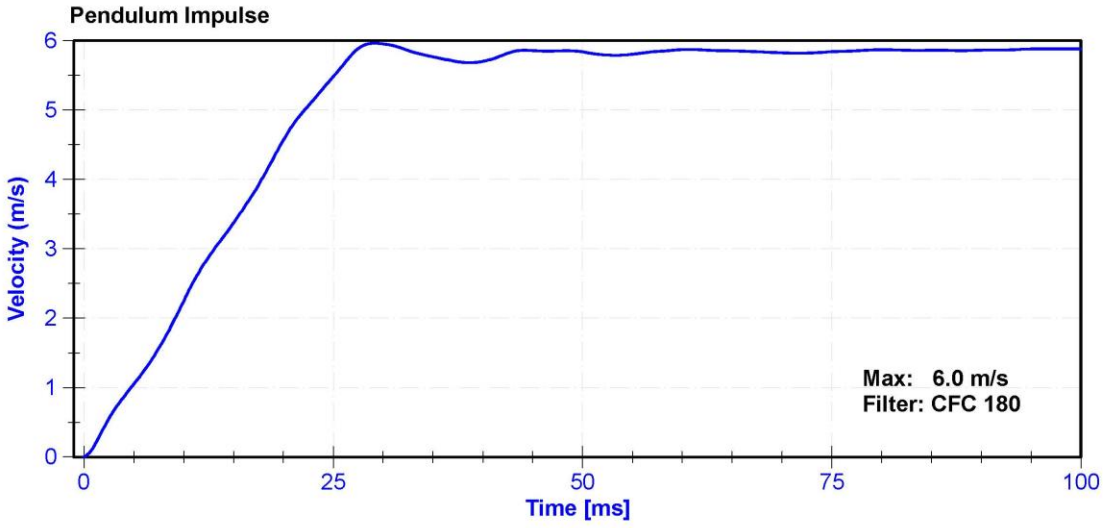
ATD Manufacturer	FTSS	Test Technician	C. Mantell
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

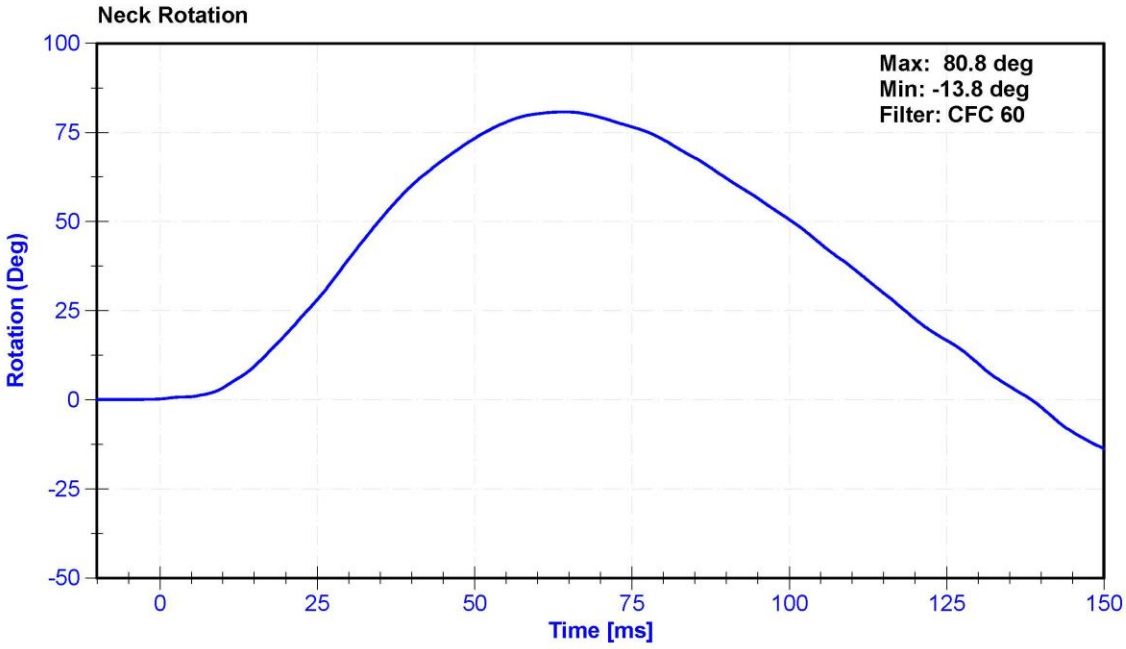
Results

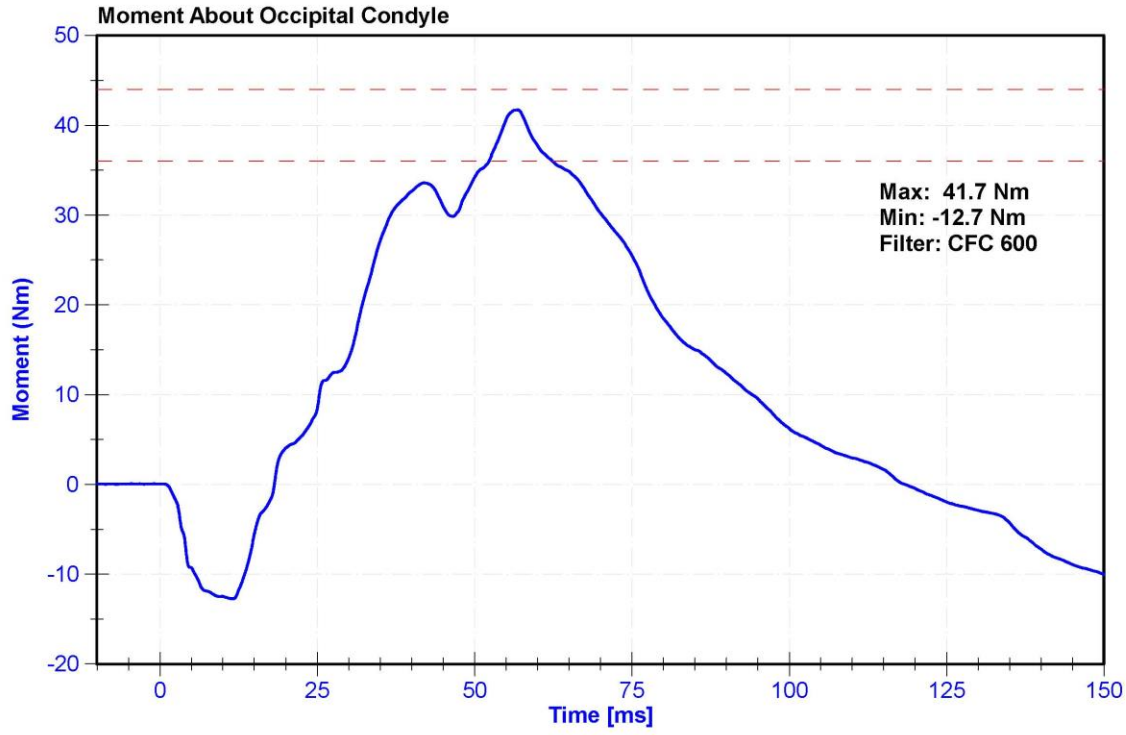
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.5	Pass
Humidity	10	70	%	36	Pass
Velocity	5.51	5.63	m/s	5.549	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.25	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.37	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.56	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.48	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.96	Pass
Neck Rotation	71	81	deg	80.8	Pass
Time at Maximum Rotation	50	70	ms	64.3	Pass
Moment about the OC	36	44	Nm	41.7	Pass
Moment Decay to 0 Nm	102	126	ms	118.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5M9 Pend	1/30/2020	1/29/2021
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	11/4/2019	11/3/2020
Condyle Potentiometer	Denton 78051-342	DS-185Pend	11/4/2019	11/3/2020
Upper Neck Load Cell	Denton 1716A	LC-2192Fy	6/20/2019	6/19/2020




Neck Rotation
Max: 80.8 deg
Min: -13.8 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: 41.7 Nm
Min: -12.7 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

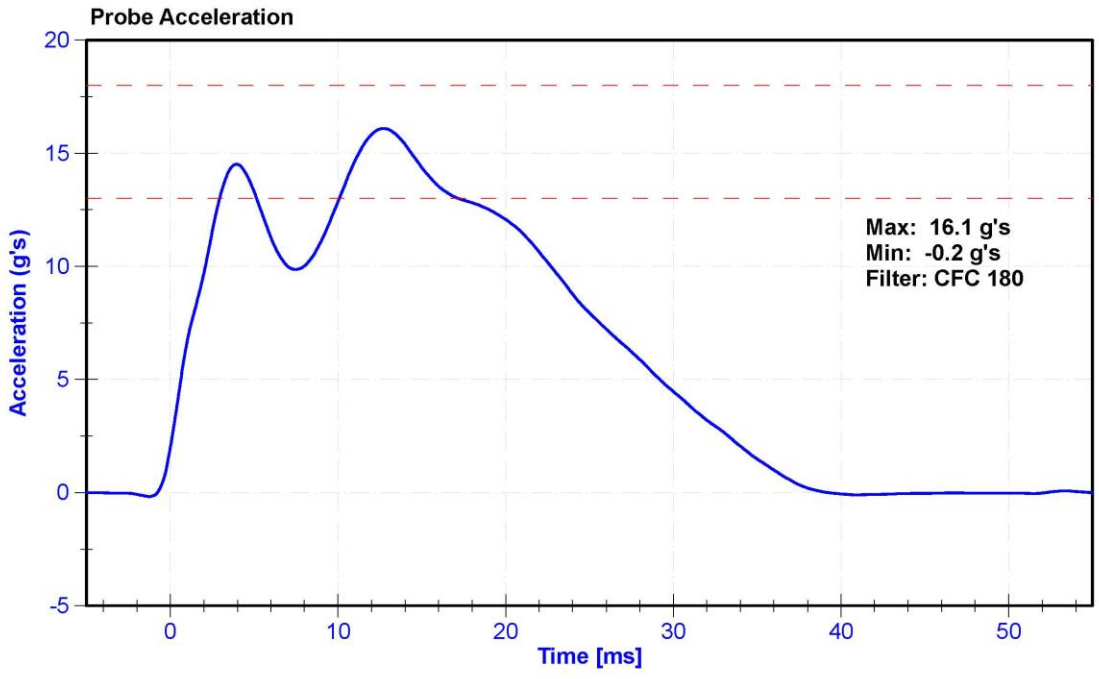
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

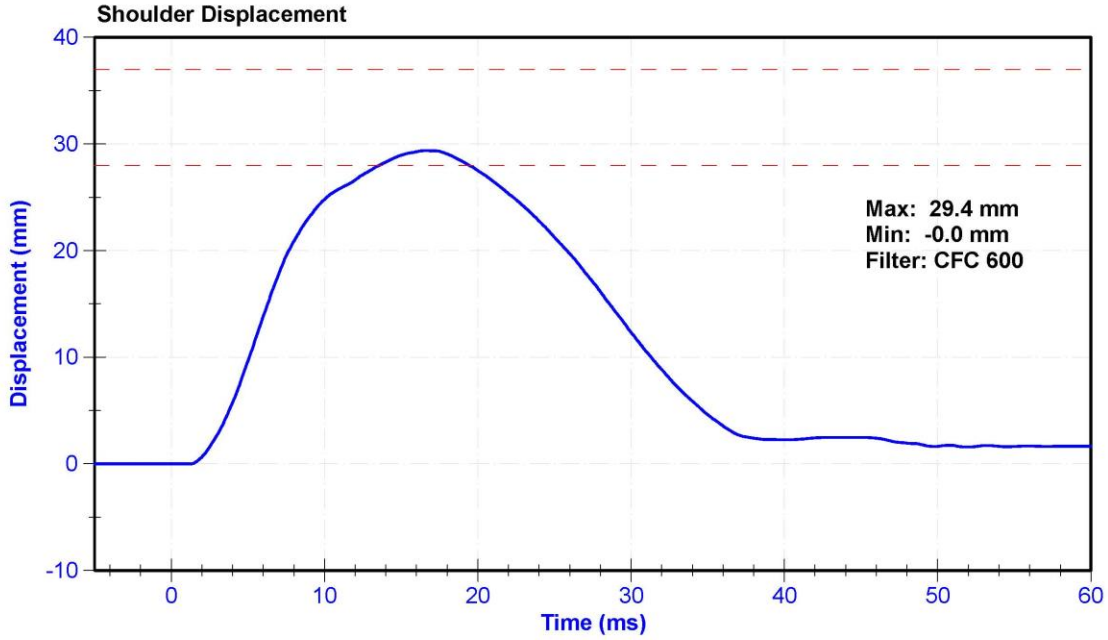
Results

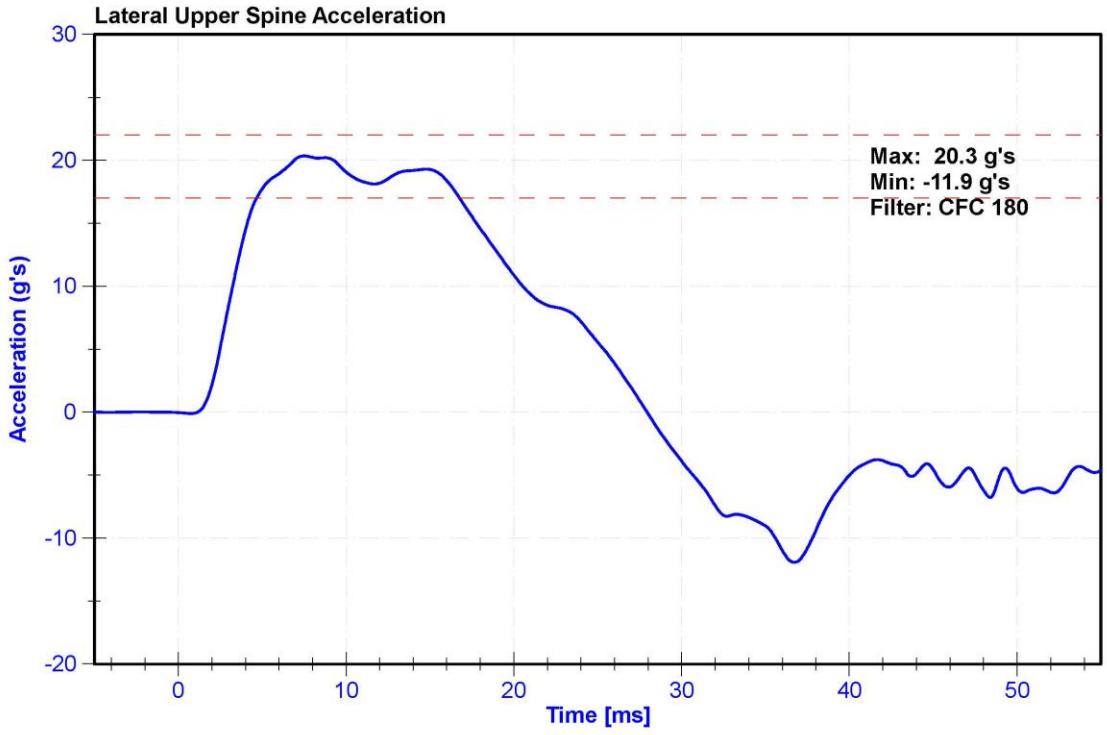
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.7	Pass
Humidity	10	70	%	29	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	13	18	g's	16.1	Pass
Shoulder Deflection	28	37	mm	29.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.3	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	5/6/2020	11/4/2020
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	4/16/2020	10/15/2020




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 29.4 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.3 g's
Min: -11.9 g's
Filter: CFC 180

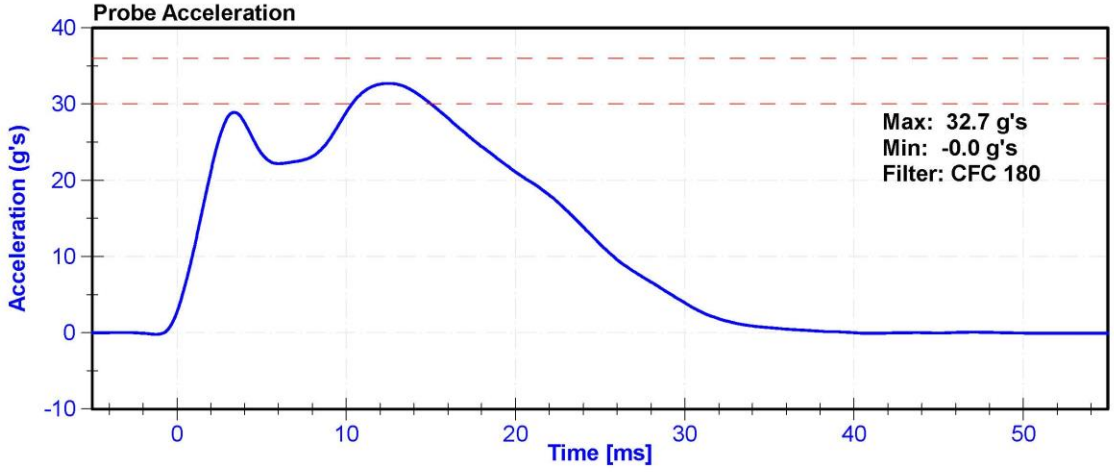
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

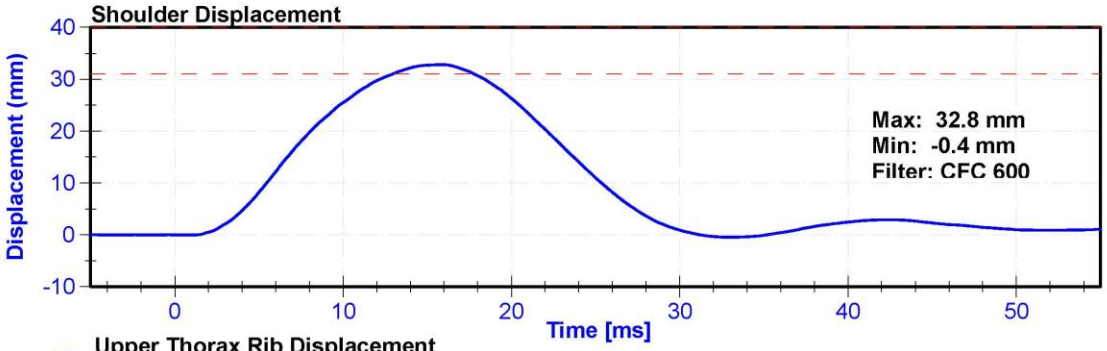
Results

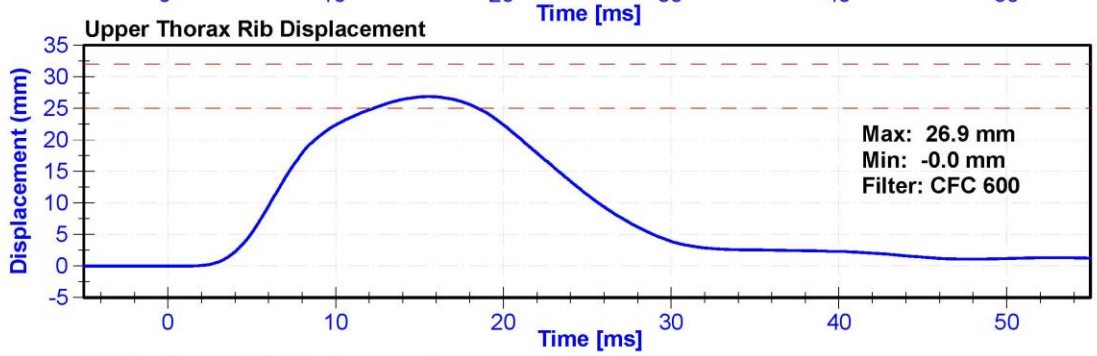
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.2	Pass
Humidity	10	70	%	29.0	Pass
Velocity	6.6	6.8	m/s	6.70	Pass
Probe Acceleration after 5 ms	30	36	g's	32.7	Pass
Lateral Upper Spine Acceleration	34	43	g's	38.8	Pass
Lateral Lower Spine Acceleration	29	37	g's	33.0	Pass
Shoulder Deflection	31	40	mm	32.8	Pass
Upper Thorax Rib Deflection	25	32	mm	26.9	Pass
Mid Thorax Rib Deflection	30	36	mm	31.7	Pass
Lower Thorax Rib Deflection	32	38	mm	33.9	Pass

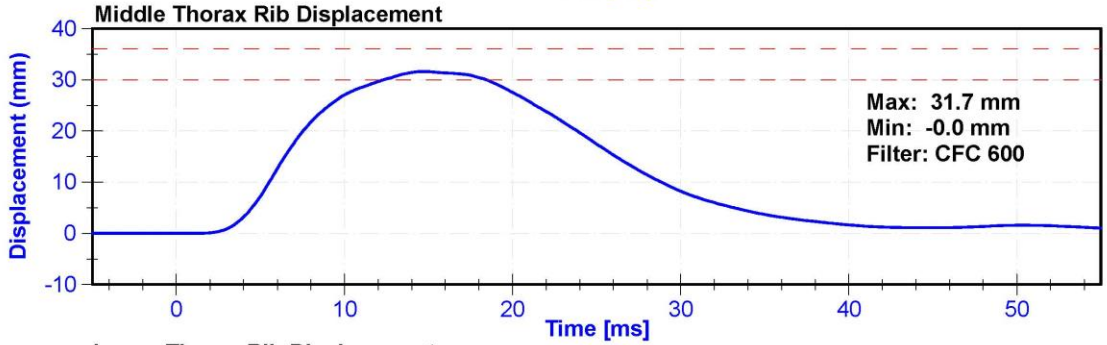
Transducer Calibrations

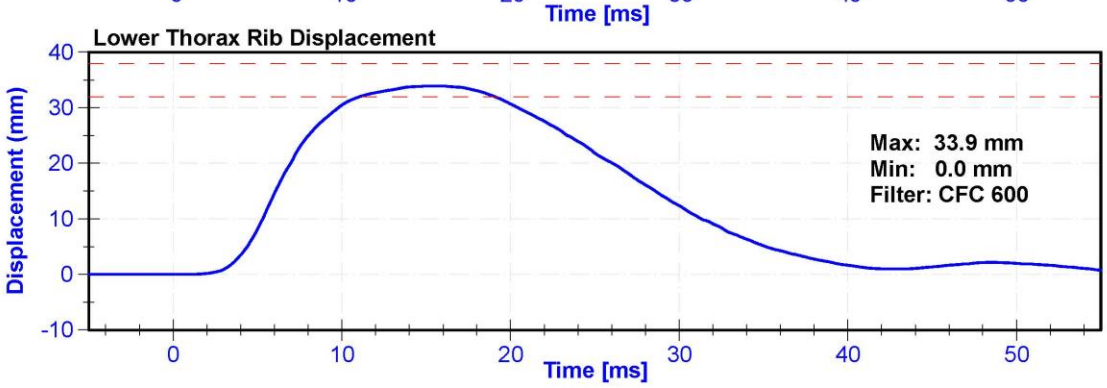
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P64148	4/16/2020	10/15/2020
Upper Spine T12 Y Accelerometer	ENDEVCO 7264CT	AC-P51327	4/16/2020	10/15/2020
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	5/6/2020	11/4/2020
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/6/2020	11/4/2020
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	5/6/2020	11/4/2020
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	5/6/2020	11/4/2020

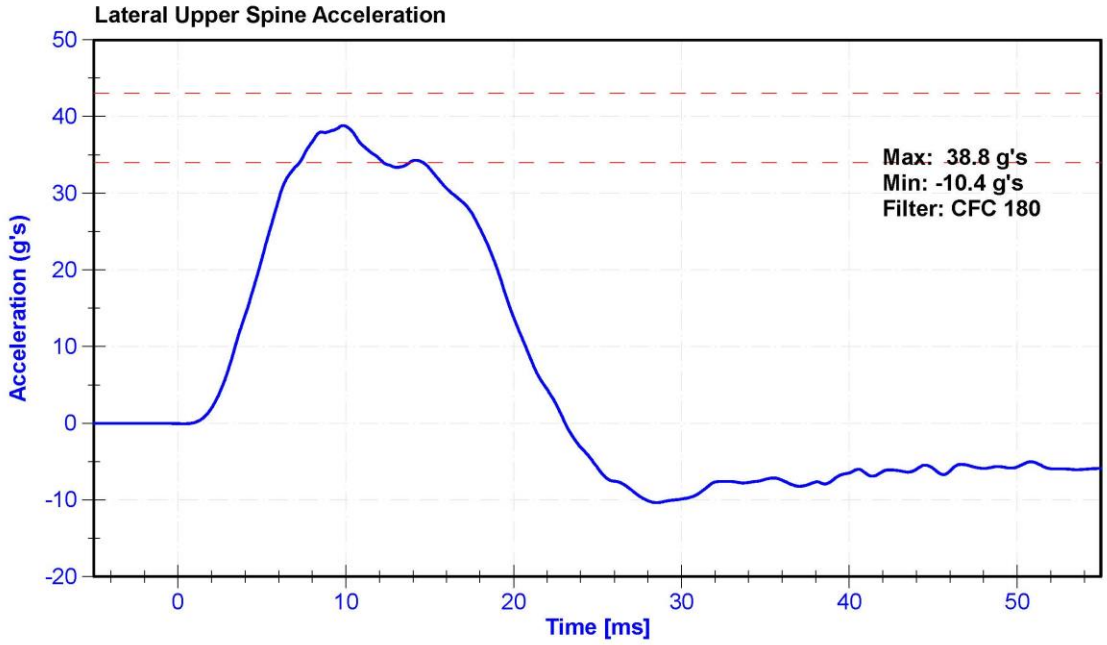


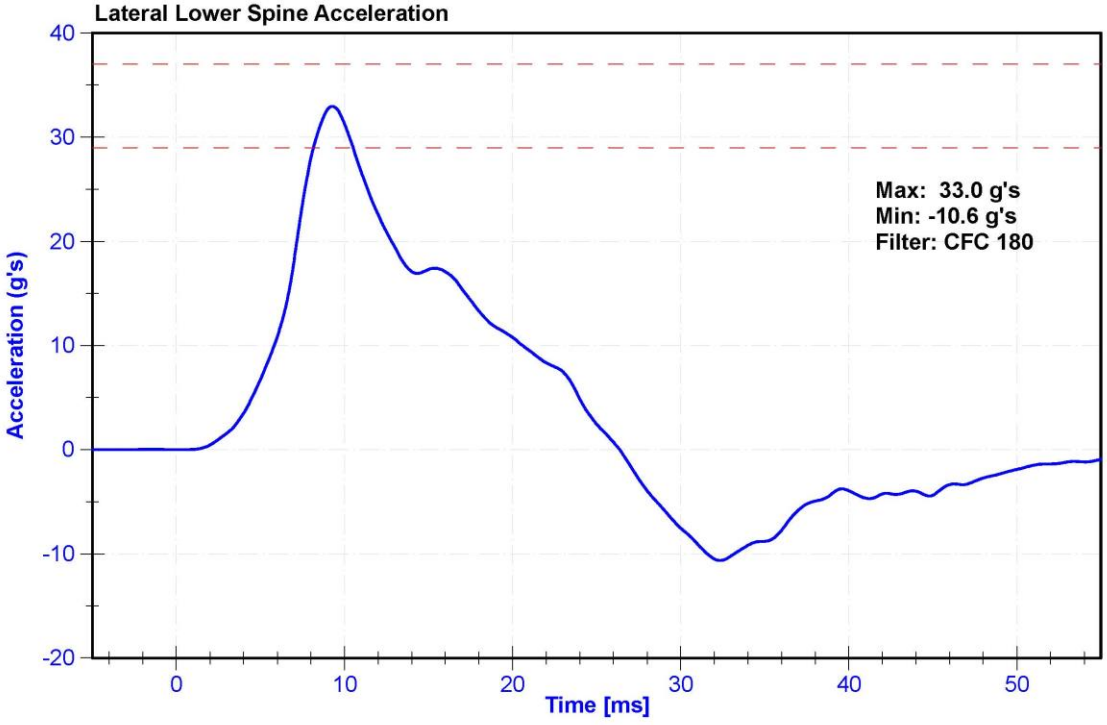

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 32.8 mm
Min: -0.4 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 26.9 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 31.7 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.9 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 38.8 g's
Min: -10.4 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]


Lateral Lower Spine Acceleration
Max: 33.0 g's
Min: -10.6 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]

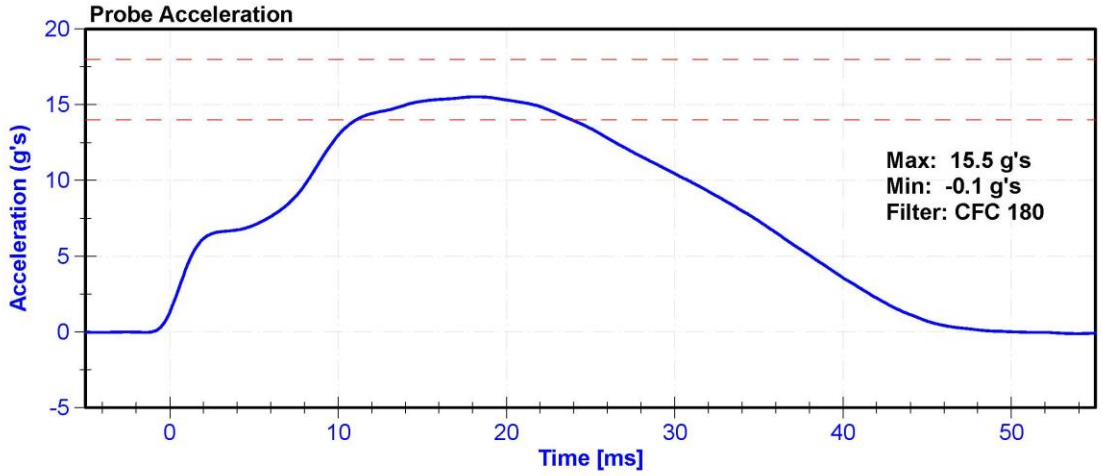
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

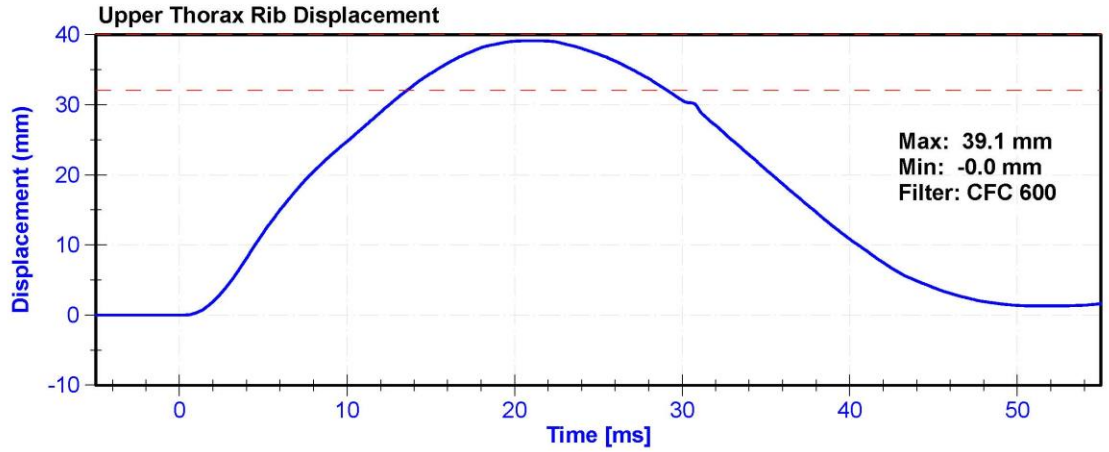
Results

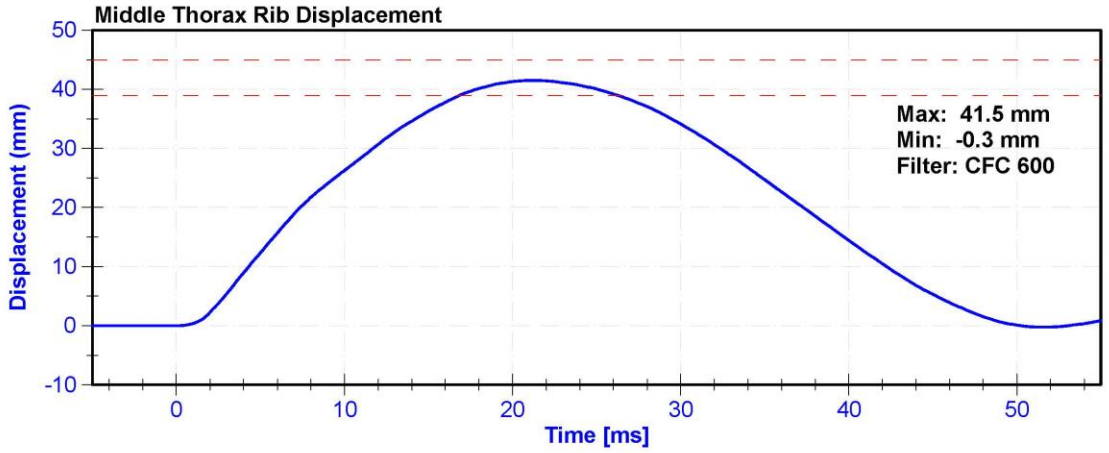
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.9	Pass
Humidity	10	70	%	29	Pass
Velocity	4.2	4.4	m/s	4.22	Pass
Probe Acceleration	14	18	g's	15.5	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.9	Pass
Lateral Lower Spine Acceleration	7	11	g's	8.1	Pass
Upper Thorax Rib Deflection	32	40	mm	39.1	Pass
Middle Thorax Rib Deflection	39	45	mm	41.5	Pass
Lower Thorax Rib Deflection	35	43	mm	35.2	Pass

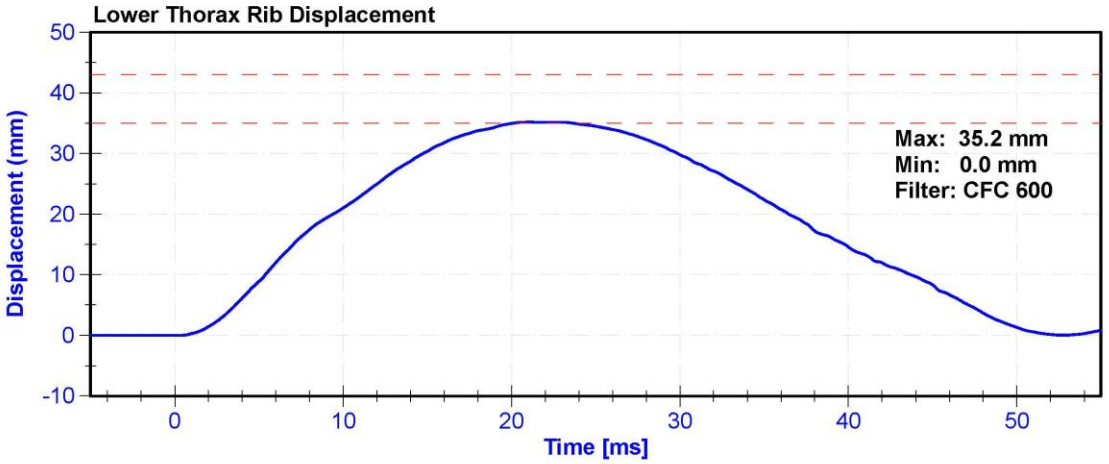
Transducer Calibrations

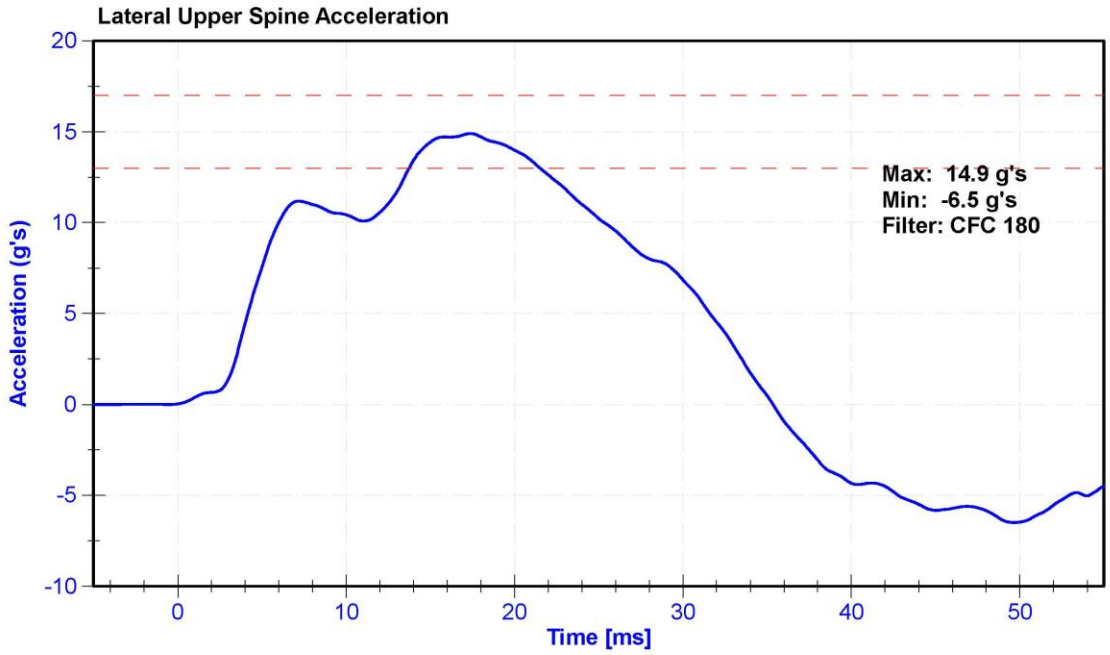
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P64148	4/16/2020	10/15/2020
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51327	4/16/2020	10/15/2020
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/6/2020	11/4/2020
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	5/6/2020	11/4/2020
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	5/6/2020	11/4/2020

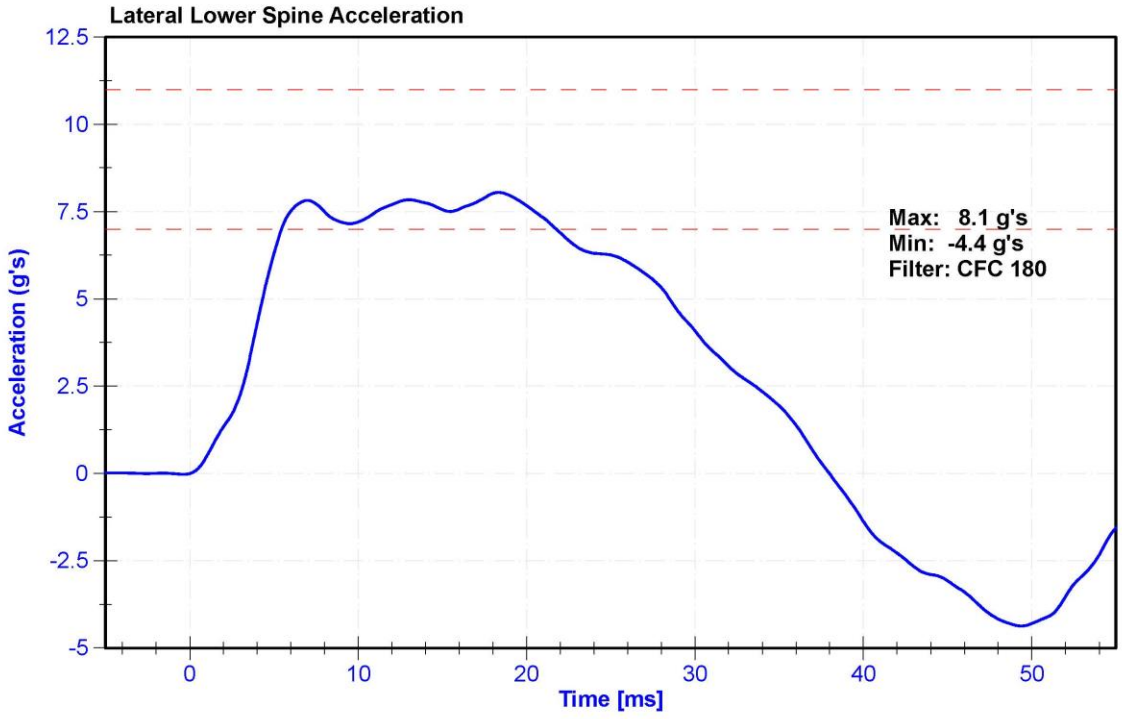



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 39.1 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.5 mm
Min: -0.3 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.2 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 14.9 g's
Min: -6.5 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: 8.1 g's
Min: -4.4 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
12.5
10
7.5
5
2.5
0
-2.5
-5
0
10
20
30
40
50

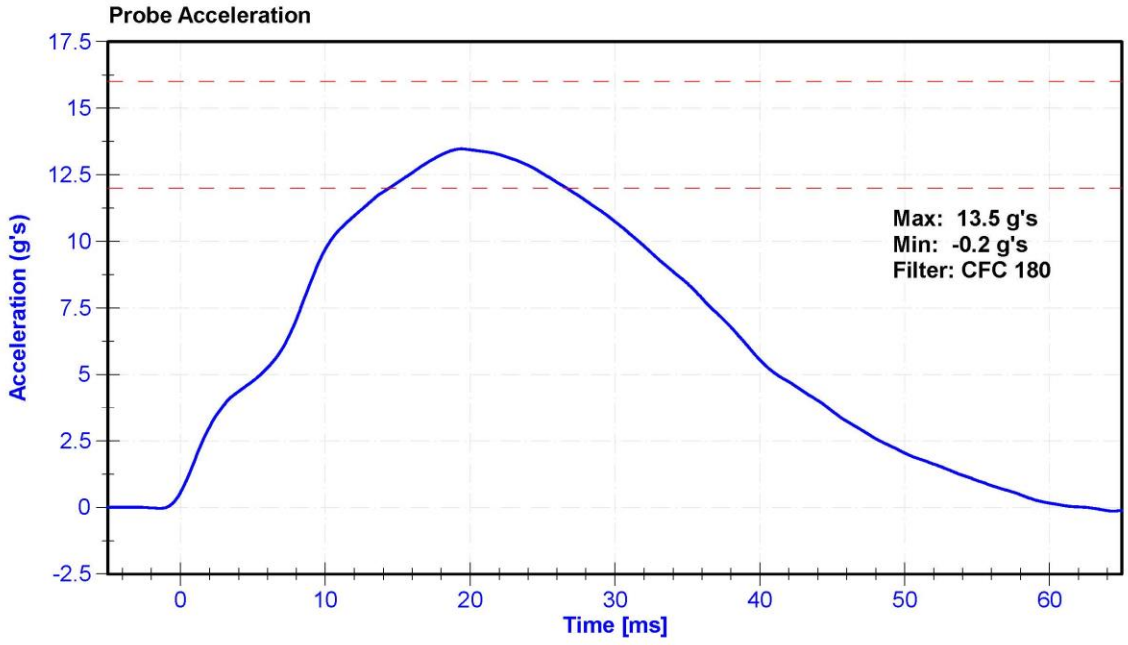
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

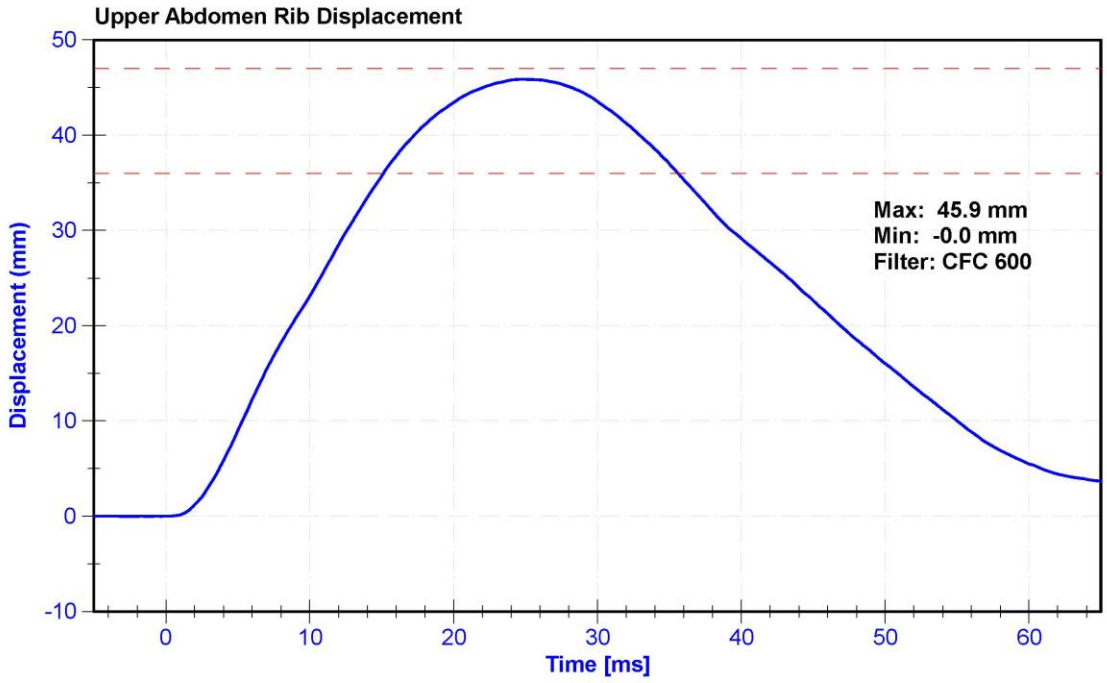
Results

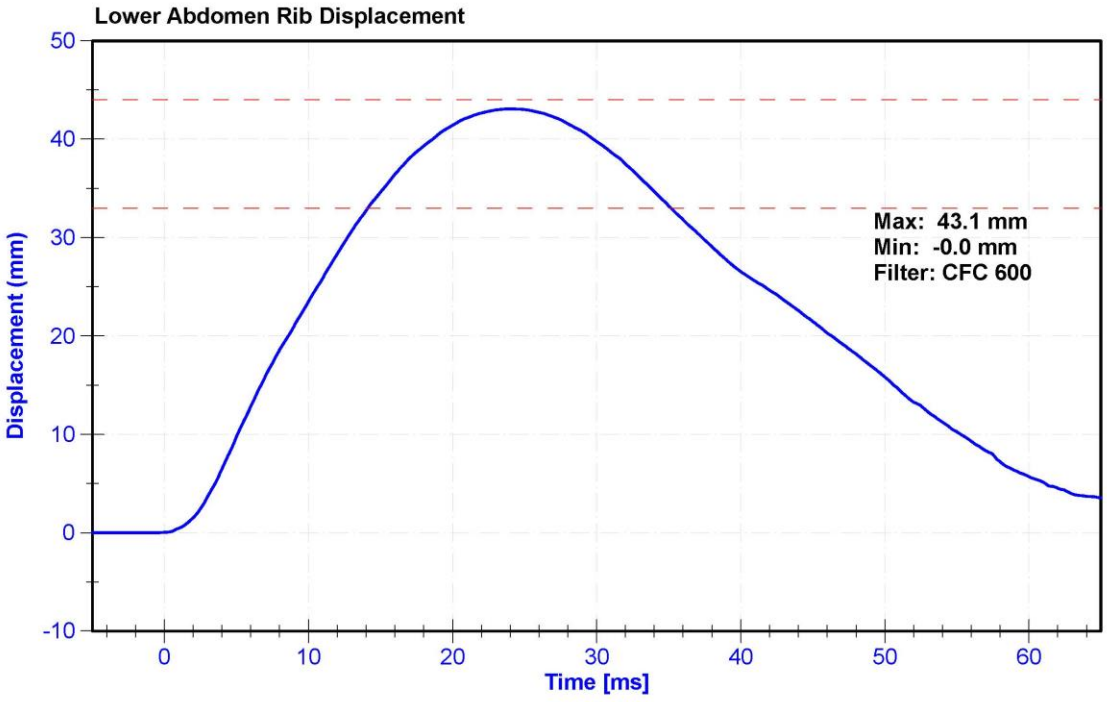
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	21.0	Pass
Humidity	10	70	%	32.0	Pass
Velocity	4.2	4.4	m/s	4.23	Pass
Probe Acceleration	12	16	g's	13.5	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.2	Pass
Upper Abdomen Rib Deflection	36	47	mm	45.9	Pass
Lower Abdomen Rib Deflection	33	44	mm	43.1	Pass

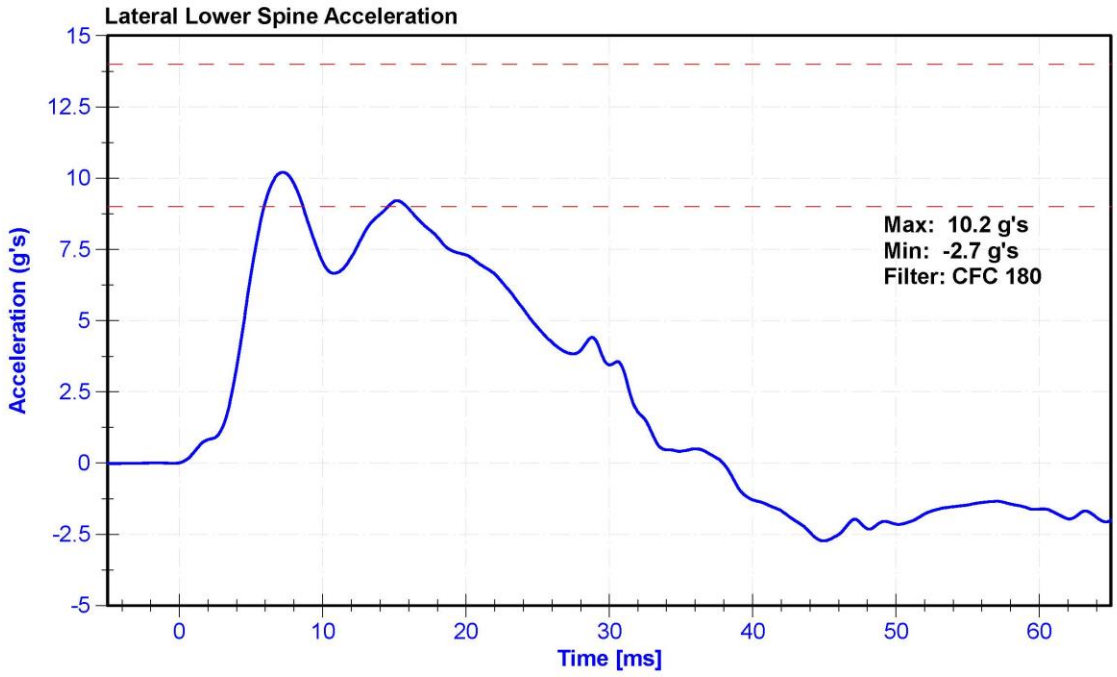
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Lower Spine Y Accelerometer	ENDEVCO 7264CT	AC-P51327	4/16/2020	10/15/2020
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	5/6/2020	11/4/2020
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	5/6/2020	11/4/2020




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 45.9 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.1 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
-5
0
10
20
30
40
50
60
Time [ms]
Max: 10.2 g's
Min: -2.7 g's
Filter: CFC 180

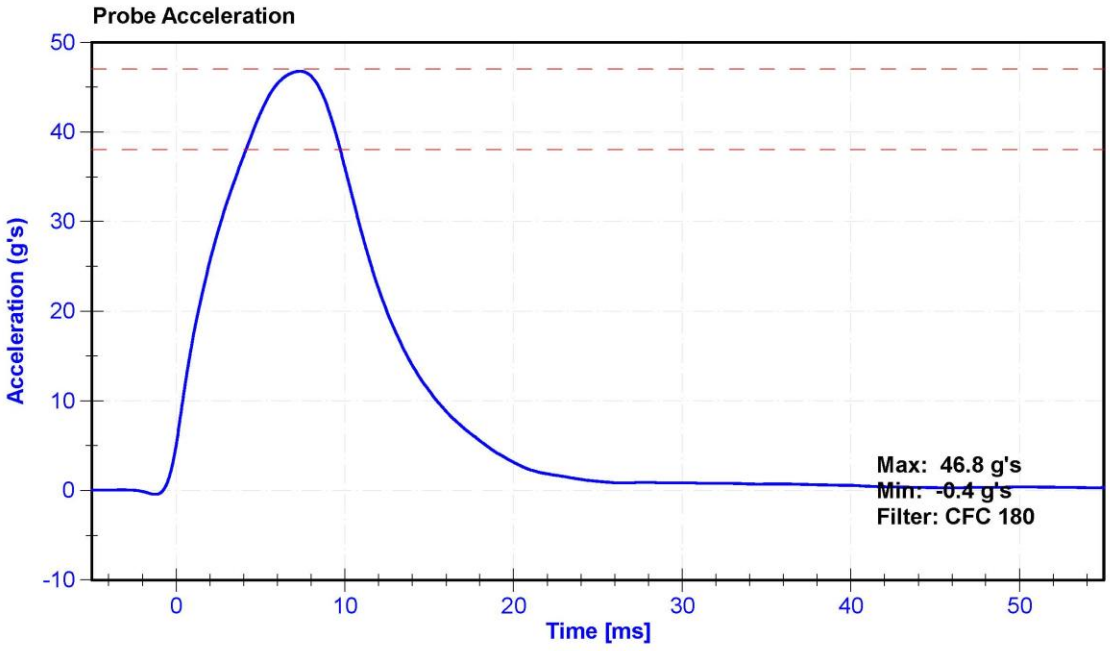
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

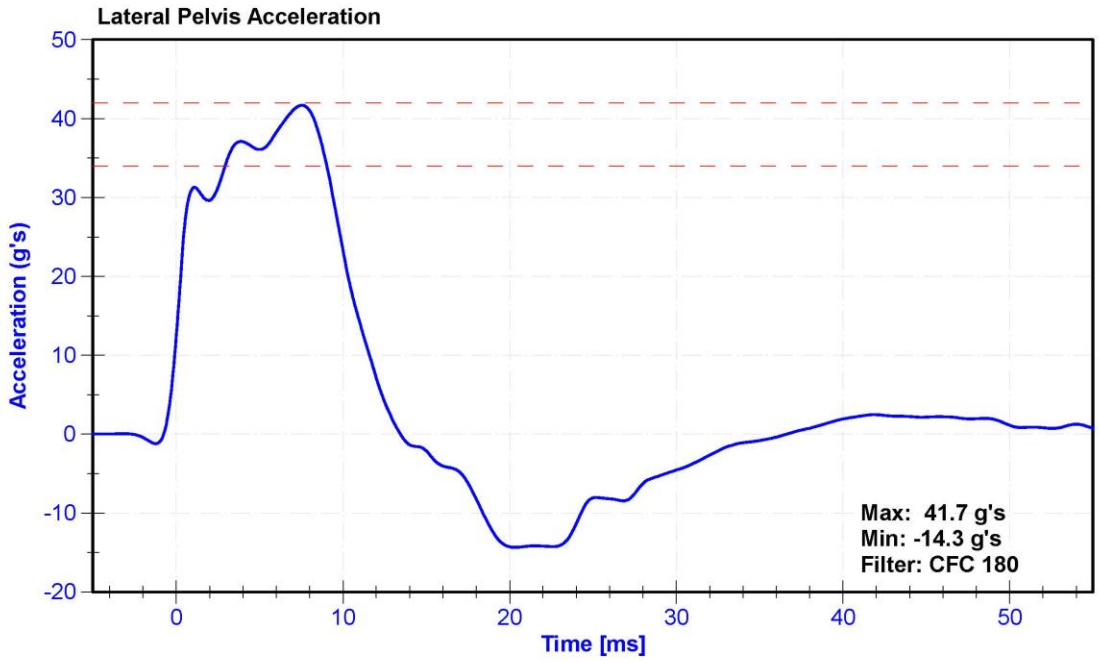
Results

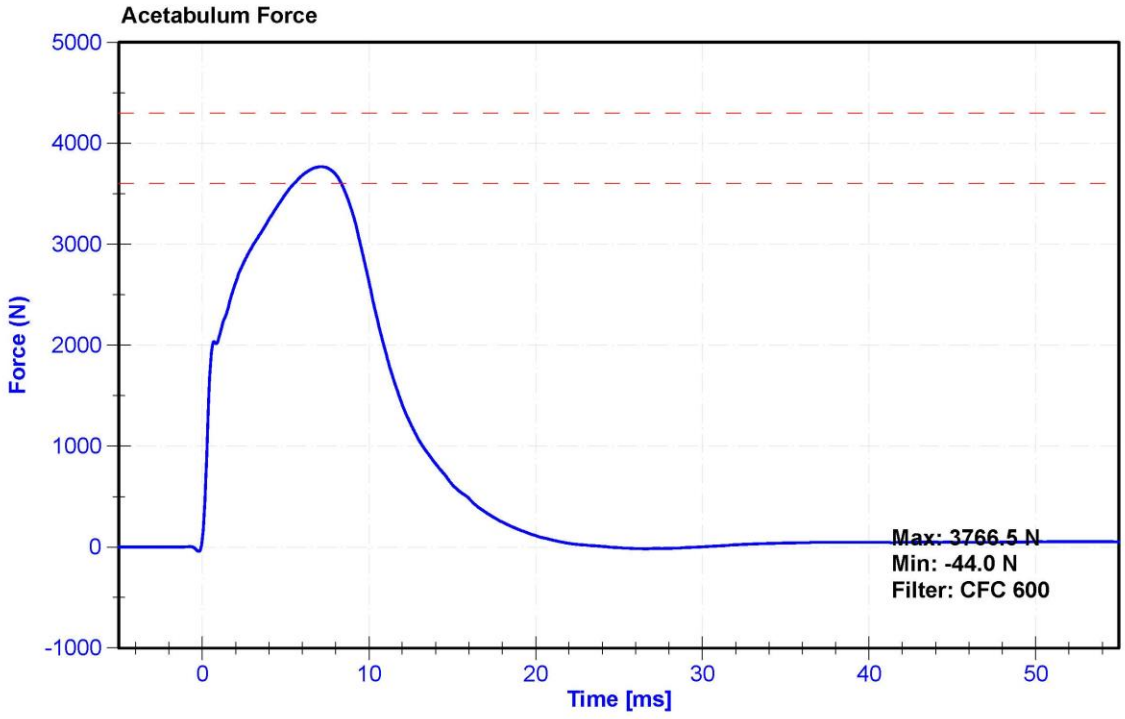
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.8	Pass
Humidity	10	70	%	30	Pass
Velocity	6.6	6.8	m/s	6.63	Pass
Probe Acceleration	38	47	g's	46.8	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.7	Pass
Acetabulum Force	3600	4300	N	3766.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	4/16/2020	10/15/2020
Acetabulum Load Cell	Denton 3249J	LC-4986Fy	6/14/2019	6/13/2020
Certification Plug	SACO	13207	8/8/2019	N/A
Crash Test Plug	SACO	12603	9/20/2019	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 41.7 g's
Min: -14.3 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: 3766.5 N
Min: -44.0 N
Filter: CFC 600

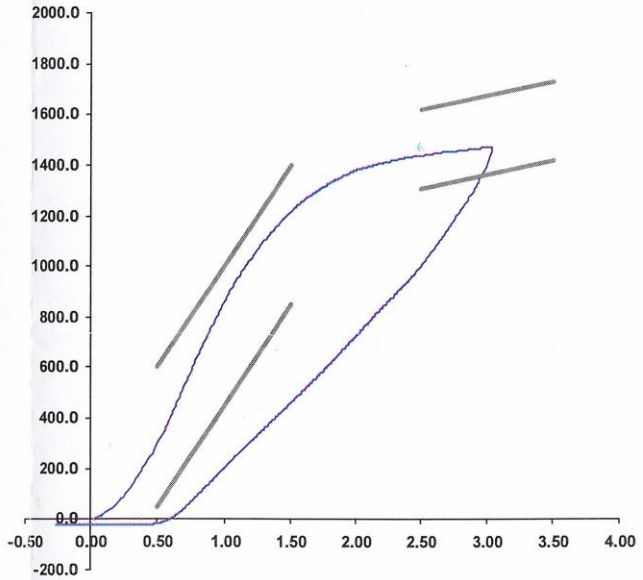
Cert 2
DG6012
5/19/20

SID-IIs Pelvis Plug Certification Test

Plug S/N 13207
Test Number 10602
Report Number 10637
Test Date 8/8/2019 1:13:27 PM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	302.50	50.00	600.00
Force @ 1.5 mm (N)	1,215.61	850.00	1,400.00
Force @ 2.5 mm (N)	1,435.66	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,469.43	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 **08-Aug-19**
SACO Research

By : DC Date : 8/8/2019

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

SACO RESEARCH

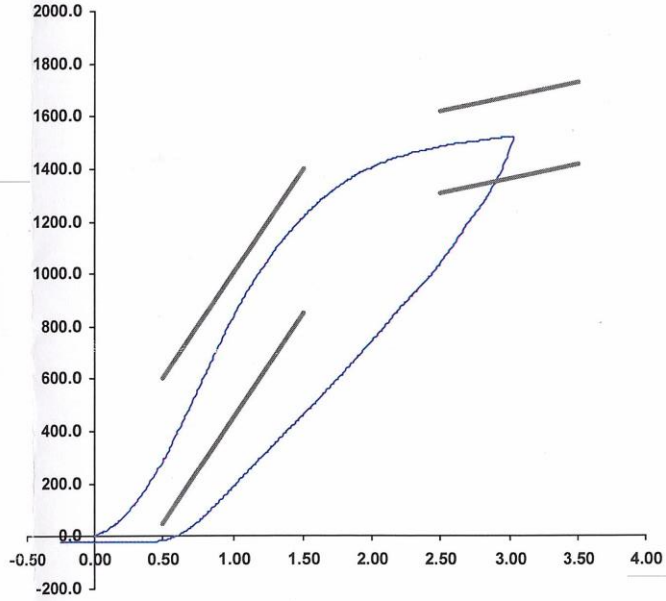
Crash DC 8012
5/19/20

SID-IIs Pelvis Plug Certification Test

Plug S/N 13405
Test Number 11047
Report Number 11085
Test Date 9/20/2019 7:09:46 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	295.08	50.00	600.00
Force @ 1.5 mm (N)	1,220.05	850.00	1,400.00
Force @ 2.5 mm (N)	1,484.34	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,521.89	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator

Part Number 180-4450

Template No 107 20-Sep-19
SACO Research

By : DC Date : 9/20/2019

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

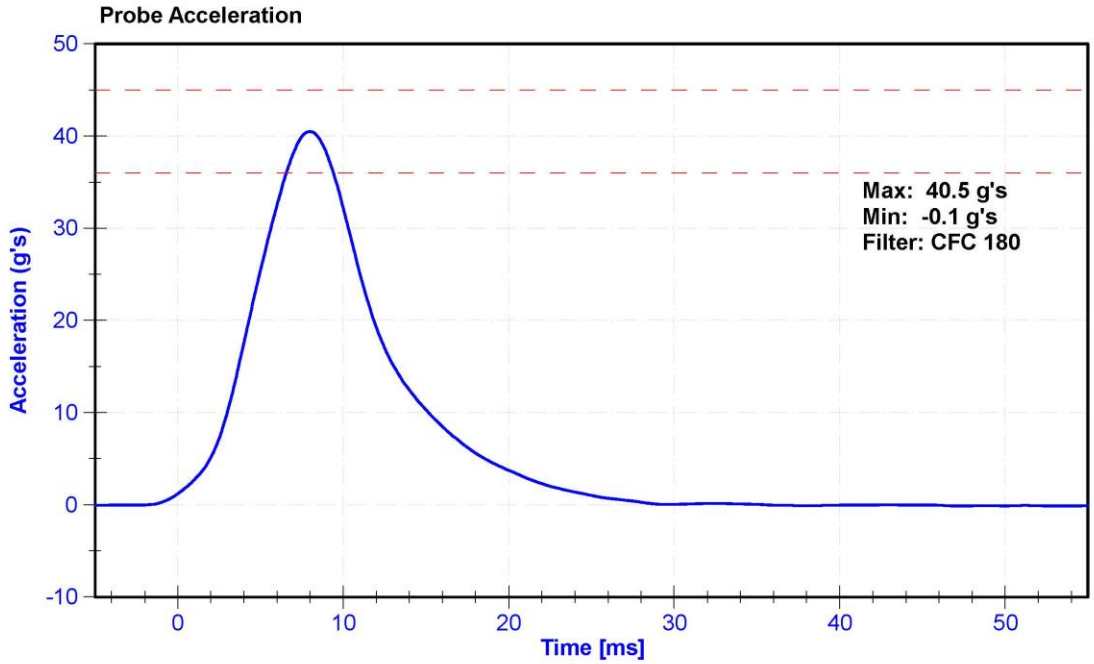
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

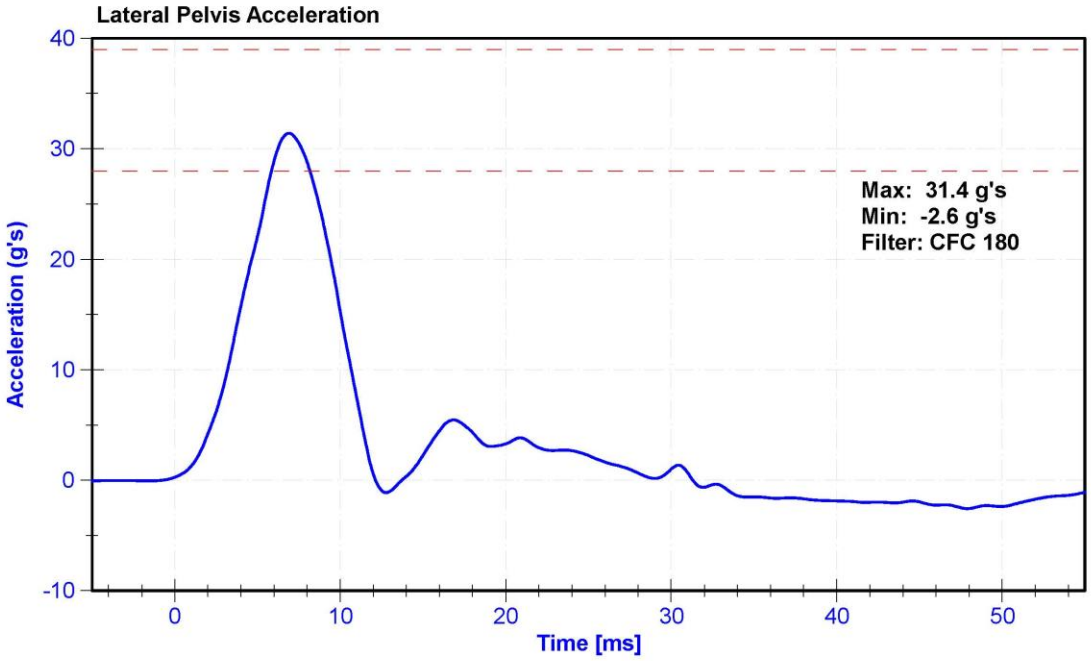
Results

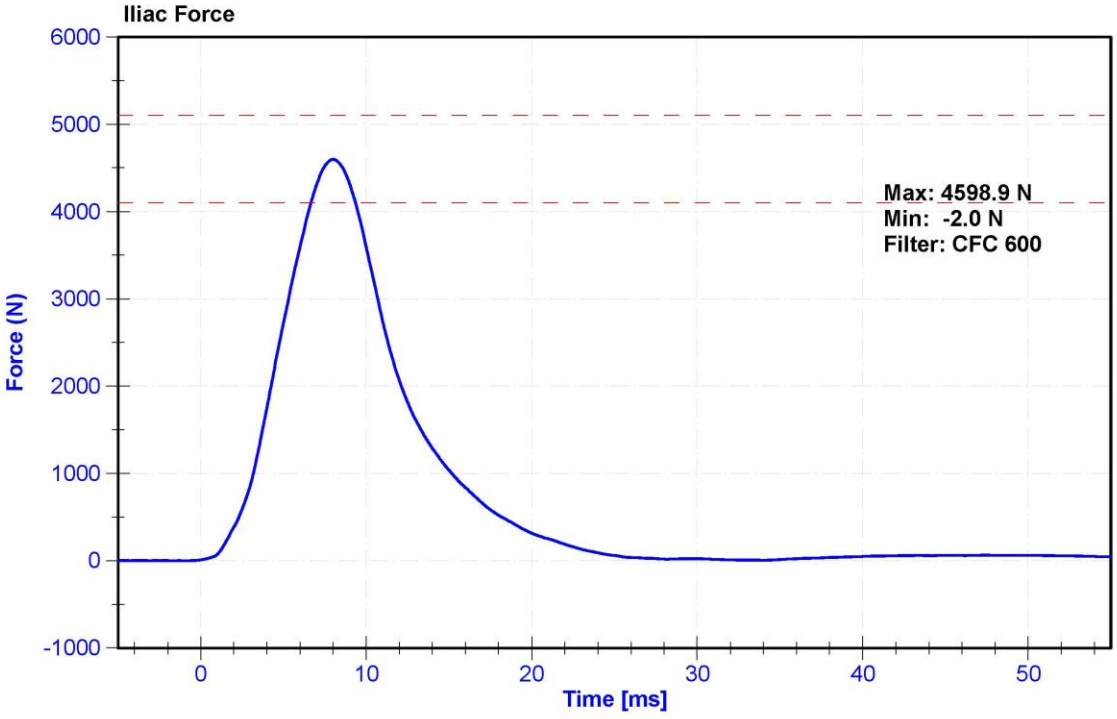
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	ºC	20.6	Pass
Humidity	10	70	%	29.0	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	40.5	Pass
Lateral Pelvis Acceleration	28	39	g's	31.4	Pass
Iliac Force	4100	5100	N	4598.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	MSI 64C-2000	A286228	1/29/2020	7/29/2020
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	4/16/2020	10/15/2020
Iliac Load Cell	DENTON 3228J	LC-290Fy	9/25/2019	9/24/2020




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 31.4 g's
Min: -2.6 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4598.9 N
Min: -2.0 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	4/16/2020
			Y	AC-P83432	ENDEVCO	4/16/2020
			Z	AC-P83319	ENDEVCO	4/16/2020
Head Accelerometers - Redundant			X	AC-P80334	ENDEVCO	4/16/2020
			Y	AC-P52155	ENDEVCO	4/16/2020
			Z	AC-P83322	ENDEVCO	4/16/2020
Displacement Potentiometer	Shoulder		Y			
	Thoracic Rib	Upper	Y	DS-2165GFE	Servo	5/6/2020
		Middle	Y	DS-45 GFE	Servo	5/6/2020
		Lower	Y	DS-011GFE	Servo	5/6/2020
	Abdominal Rib	Upper	Y	DS-008GFE	Servo	5/6/2020
		Lower	Y	DS-1774GFE	Servo	5/6/2020
Lower Spine Accelerometers (T12)			X	AC-P71272	ENDEVCO	4/16/2020
			Y	AC-P51327	ENDEVCO	4/16/2020
			Z	AC-P52067	ENDEVCO	4/16/2020
Acetabulum Load Cell			Y	LC-4986Fy	DENTON	6/14/2019
Lilac Wing Load Cell			Y	LC-290Fy	DENTON	9/25/2019
Pelvis Plug (Struck Side)				13014	SACO	7/23/2019
Pelvis Plug (Non-Struck Side)						

Table 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A315809	MSI 1201-1000	3/17/2020
Vehicle Center of Gravity	Y	A315845	MSI 1201-1000	3/17/2020
Vehicle Center of Gravity	Z	A315946	MSI 1201-1000	3/17/2020
Left Floor Sill	Y	AC-A247191	MSI 1201-1000	2/24/2020
A-Pillar Sill	Y	AC-A280391	MSI 1201-1000	2/20/2020
A-Pillar Low	Y	A315078	MSI 1201-1000	3/31/2020
A-Pillar Mid	Y	A315997	MSI 1201-1000	3/20/2020
B-Pillar Sill	Y	A315007	MSI 1201-1000	3/20/2020
B-Pillar Low	Y	A315830	MSI 1201-1000	3/31/2020
B-Pillar Mid	Y	A315783	MSI 1201-1000	3/20/2020
Driver Seat	Y	A315803	MSI 1201-1000	3/31/2020
Engine Top	X	AC-A255839	MSI 1201-1000	3/24/2020
Engine Top	Y	AC-A280826	MSI 1201-1000	3/25/2020
Firewall	Y	A315088	MSI 1201-1000	2/4/2020
Right Roof	Y	A315934	MSI 1201-1000	3/11/2020
Right Floor Sill	Y	A315747	MSI 1201-1000	3/4/2020
Rear Floorpan	X	AC-A217573	MSI 1201-1000	3/24/2020
Rear Floorpan	Y	AC-A280985	MSI 1201-1000	3/26/2020

Table 3 – Pole Instrumentation

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