REPORT NUMBER: SINCAP-CAL-18-011

NEW CAR ASSESSMENT PROGRAM (NCAP)
MOVING DEFORMABLE BARRIER SIDE IMPACT TEST

Mazda Motor Corporation
2018 Mazda CX-5
Four Door SUV

NHTSA No: O20185400

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

August 3, 2018

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
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Prepared by: Vanessa Hansen Date: August 3, 2018
Vanessa Hansen, Project Engineer

Approved by: Edward Dutton Date: August 3, 2018
Edward Dutton, Test Engineer
Transportation Test Operations

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. SINCAP-CAL-18-011	***2. Government Accession No.***	***3. Recipient's Catalog No.***
4. Title and Subtitle Final Report of New Car Assessment Program Side Impact MDB Testing of a 2018 Mazda CX-5 SUV NHTSA No.: O20185400		***5. Report Date*** August 3, 2018 ***6. Performing Organization Code*** CAL
Vanessa Hansen, Senior Test Engineer Edward Dutton , Operations Manager		***8. Performing Organization Report No.*** CAL-DOT-2018-011
9. Performing Organization Name and Address Calspan Corporation Transportation Test Operations 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 June 20, 2018 - August 3, 2018 ***14. Sponsoring Agency Code*** NRM-110

15. *Supplementary Notes*

16. Abstract

A 55/28, (61.90kph / 38.5 mph), 90^0 Moving Deformable Barrier NCAP Side Impact Test was conducted on the subject 2018 Mazda CX-5 SUV in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on June 20, 2018.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.96 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21°C. The target vehicle's maximum post-test static crush was 122mm located at level 3. The test vehicle's occupant performance data is as follows:

Measurement Description	Driver ATD (ES-2re)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	80.911
Maximum Thoracic Rib Deflection	mm	44	13.958
Total Abdominal Force	N	2500	560.905
Pubic Symphysis Force	N	6000	838.665

Measurement Description	Passenger ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	N/A	1000	208.29
Lower Spine Resultant Acceleration	G	82	64.624
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2329.124
Maximum Thoracic Rib Deflection	mm	38*	22.397
Maximum Abdominal Rib Deflection	mm	45*	23.861

** Proposed IARV*

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 MDB ES-2re SID-IIs	***18. Distribution Statement*** Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave. SE Washington, D.C. 20590 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833

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UNCLASSIFIED	UNCLASSIFIED	192	

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SECTION 1

TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test is part of the MY 2018 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract number DTNH22-14-D-00352. The purpose of this test is to generate comparative side impact performance in a 2018 Mazda CX-5 SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated October 2015.

SECTION 2

SUMMARY OF TEST RESULTS

A 2018 Mazda CX-5 SUV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.96 km/h. The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by the Calspan Corporation's Transportation Test Operations Center in Buffalo, New York on June 20, 2018. Pre-test and post-test photographs of the test vehicle, the MDB and the dummies (ES-2re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated October 2015. The side impact event was documented by 9 high-speed and 2 real-time cameras. Camera locations are included in this report.

The Dummies were instrumented in the following manner:

DRIVER ATD (ES-2re)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen forward, middle, and rear y-axis load cells
Lower spine (T12) tri-axial accelerometers
Public symphysis y-axis load cell

PASSENGER ATD (SID-IIs)
Primary and redundant head CG tri-axial accelerometers
Chest upper rib, middle rib, and lower rib y-axis displacement potentiometers
Abdomen upper rib and lower rib y-axis displacement potentiometers
Lower spine (T12) tri-axial accelerometers
Acetabulum and iliac wing y-axis load cells

Appendix B contains the vehicle and dummy response data. Dummy configuration and performance verification data can be found in APPENDIX C of this report. Appendix D of this report contains the test equipment and instrumentation calibration data.

DUMMY INJURY VALUES

Measurement Description	Driver ATD (ES-2re)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	80.911
Maximum Thorax Rib Deflection	mm	44	13.958
Combined Abdominal Force	N	2500	560.905
Pubic Symphysis Force	N	6000	838.665

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC36)		1000	208.290
Lower Spine (T12) Resultant Acceleration	G	82	64.624
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2329.124
Maximum Thoracic Rib Deflection	mm	38*	22.397
Maximum Abdominal Rib Deflection	mm	45*	23.861

*Proposed IARV

SUPPLEMENTAL RESTRAINT INFORMATION

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

GENERAL COMMENTS:

1. P1 serial number – F034
2. P4 serial number – DG8012

Data Anomalies:

The following channel was questionable for

- Driver Seat Track Y Acceleration, Exceeded Calibration Range 32.5ms
- Left B-Pillar Lower Y Acceleration, Exceeded Calibration Range 22ms
- Left B-Pillar Middle Y Acceleration, Exceeded Calibration Range 8.5ms

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 System 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 – Test Vehicle Accelerometer Locations

Data Sheet No. 7 – MDB Accelerometer Locations

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – MDB Summary of Results

Data Sheet No. 10 – Test Vehicle Profile Measurements

Data Sheet No. 11 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 12 – MDB Exterior Static Crush Measurements

Data Sheet No. 13 – Vehicle and MDB Damage Profile Distances

Data Sheet No. 14 – FMVSS No. 301 Static Rollover Results

Data Sheet No. 15 – Dummy/Vehicle Temperature and Humidity Stabilization Data

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	O20185400
Model Year	2018
Make	Mazda
Model	CX-5
Body Style	SUV
VIN	JM3KFABM3J0393739
Body Color	Silver
Odometer Reading (km/mi)	100
Engine Displacement (L)	2.5
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6-Speed
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

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

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

DATA FROM CERTIFICATION LABEL

Manufactured By	Mazda Motor Corporation
Date of Manufacture	04/18
Vehicle Type	MPV

GVWR (kg)	2061
GAWR Front (kg)	1069
GAWR Rear (kg)	992

VEHICLE SEATING AND WEIGHT CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total	
Designated Seating Capacity (DSC)	2	3	-	5	
Capacity Weight (VCW) (kg)				385	(A)
DSC X 68.04 kg				340.2	(B)
Cargo Weight (RCLW) (kg)				44.8	(A-B)

VEHICLE SEAT TYPE

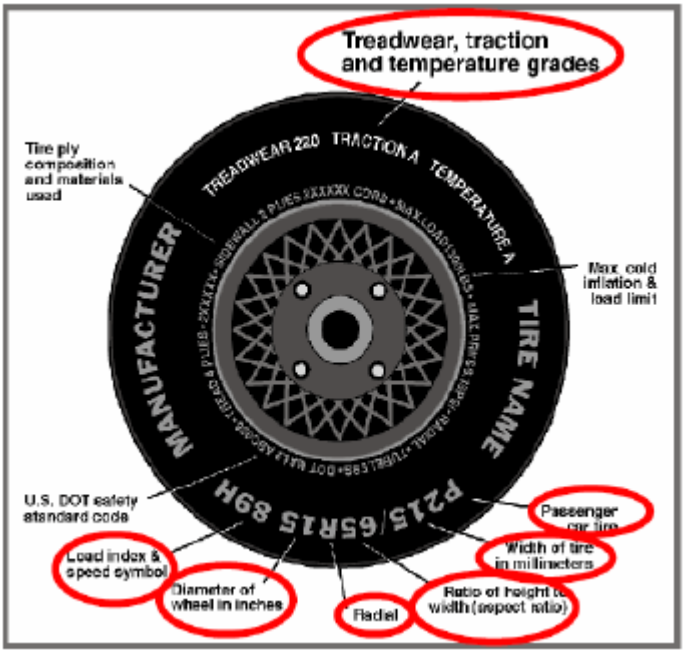
Seating Location	Type of Seat Pan				Type of Seat Back		
	Bucket	Bench	Split Bench	Contoured	Fixed	Adjustable W/ Lever	Adjustable W/ Knob
Front Seat	X					X	
Rear or Second Row Seat			X			X	
Third Row seat							

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

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018

VEHICLE TIRE INFORMATION

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



TIRE SIDEWALL INFORMATION

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	225/65R17	225/65R17
Tire Size on Vehicle	225/65R17	225/65R17
Tire Manufacturer	Yokohama	Yokohama
Tire Model	Geolander	Geolander
Treadwear	280	280
Traction	B	B
Temperature Grade	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Polyester, 2 Steel, 2 Nylon	2 Polyester, 2 Steel, 2 Nylon
Load Index/Speed Symbol	100H	100H
Tire Material	Rubber	Rubber
DOT Safety Code Left	FDF5 PC51318	FDF5 PC51318
DOT Safety Code Right	FDF5 PC51318	FDF5 PC51318

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

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	239	239	239	239
Tire Placard	kPa	230	230	230	230
Owner's Manual	kPa	230	230	230	230
As Tested	kPa	230	230	230	230

MDB TIRE SPECIFICATIONS

	Units	Requirement	LF	RF	LR	RR
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	207	207	207	207

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)			Fully Loaded		
		Front	Rear	Total	Front	Rear	Total	Front	Rear	Total
Left	kg	461	325		494	401		500	404	
Right	kg	454	304		472	342		462	353	
Ratio	%	59	41		57	43		56	44	
Totals	kg	915	629	1544	966	743	1709	962	757	1719

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1544	(A)
Sum of Actual Weight of 1 ES2re and 1 P572 ATD (SID-IIs)	kg	127	(B)
Rated Cargo / Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Target Vehicle Test Weight (TVTW)	kg	1715.8	(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	Fully Loaded	As Tested	Meets Requirement**
LF	mm	857	852	Yes
RF	mm	868	865	Yes
RR	mm	889	889	Yes
LR	mm	877	882	Yes
Vehicle CG (Aft of Front Axle)	mm	1189	1173	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	41	37	

**** The "As Tested" vehicle attitude measurements must be equal to or within ± 10mm of the "Fully Loaded" vehicle attitude measurements at each wheel well. Indicate "Yes" or "No" for "Meets Requirements".*

Test height adjustable suspension setting, if applicable: N/A

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

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Trunk Carpeting	12
Spare Tire	14
Jack	4
Tail Light	1
Passenger Side Door Internals	9
Ballast / Equipment Added	10

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

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL (°)		
	Max	Min	Mid
Driver Seat	13.9	8.9	11.4
Front Passenger Seat	Not Adjustable		
Front Center Seat*			
Struck Side Rear Seat	Fixed	Fixed	Fixed
Non-Struck Side Rear Seat	Fixed	Fixed	Fixed
Rear Center Seat*	Fixed	Fixed	Fixed

**if applicable*

SEAT HEIGHT AND ANGLE

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid-Fore/Aft	Forward-Most
Driver Seat	11.4	7	Max	-	-	-
			Mid	0	7	14
			Min	-	-	-
Front Passenger Seat	Not Adjustable		Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Front Center Seat*	N/A	N/A	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Non-Struck Side Rear Seat	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-
Rear Center Seat*	Fixed	Fixed	Max	-	-	-
			Mid	-	-	-
			Min	-	-	-

**if applicable*

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

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018

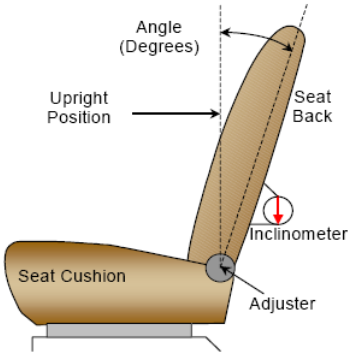
SEAT FORE / AFT POSITION

Seat	Total Fore / Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	260	27 (0-26)	130	13
Front Passenger Seat	260	27 (0-26)	130	13
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

**if applicable*

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated design angle. 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 seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as 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	67.5	-	5.5	-
Front Passenger Seat	71.2	-	5.7	-
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat w/ Seated Dummy	4.3	-	15.2	-
Non-Struck Side Rear Seat	4.3	-	15.2	-
Rear Center Seat*	4.3	-	15.2	-

**if applicable*

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

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018

SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1. For this test zero is defined as the uppermost position.

	Total # of Positions	Placed in Position #
Driver Seat	4	0 – Uppermost
Rear Seat	Fixed	Fixed

HEAD RESTRAINT ADJUSTMENT

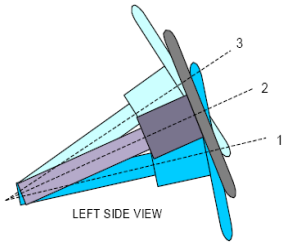
The driver's head restraint is adjusted to the highest and most full forward in-use position. The struck-side rear passenger's head restraint is adjusted to the lowest and most full forward in-use position.

	Total # of Positions	Placed in Position #
Driver Seat	4	Uppermost
Rear Seat	3	Lowest

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	23.1	
Geometric Center – Position 2	25.5	
Uppermost – Position 3	27.9	
Telescoping Steering Wheel Travel		50
Test Position	25.6	25

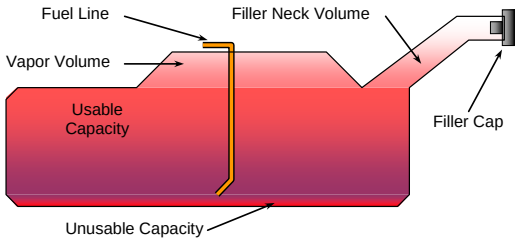


STEERING COLUMN ASSEMBLY

FUEL PUMP

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

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



VEHICLE FUEL TANK ASSEMBLY

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

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018

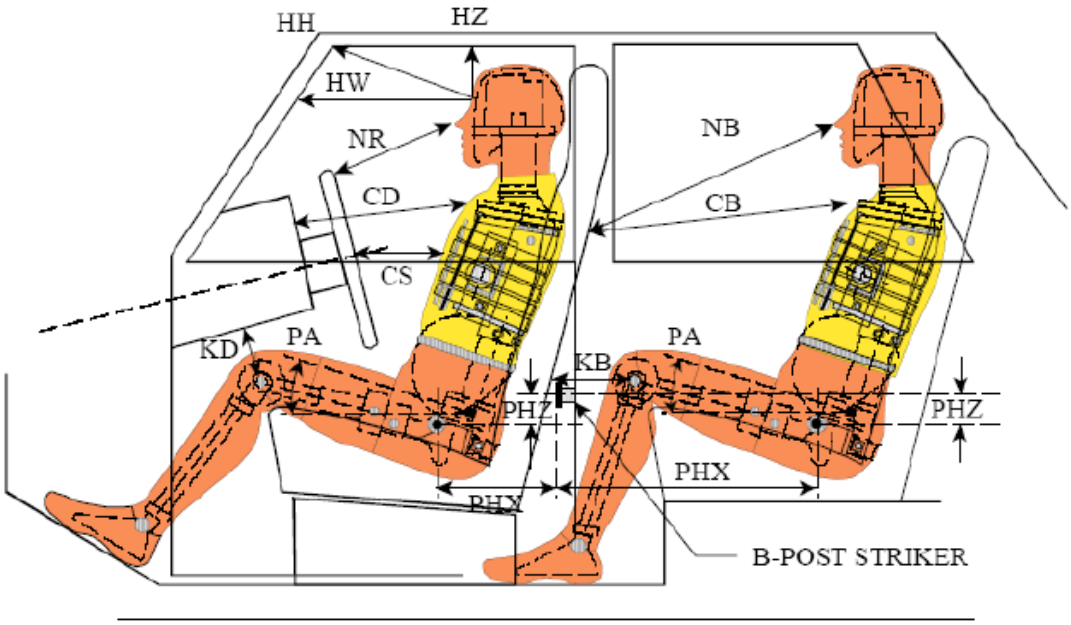
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	56.0
Usable Capacity of "Optional Tank" (see Form No. 1)	-
Usable Capacity of Standard Tank (see Owner's Manual)	56.0
Usable Capacity of Optional Tank (see Owner's Manual)	-
93% of Usable Capacity	52.08
Actual Amount of Solvent Used in Test	52.08
1/3 of Usable Capacity	18.6

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018



NOTE: 2-DOOR VEHICLE SHOWN. REAR DUMMY PHX & PHZ MEASUREMENTS FOR A 4-DOOR VEHICLE WOULD USE THE C-POST STRIKER AS A REFERENCE POINT

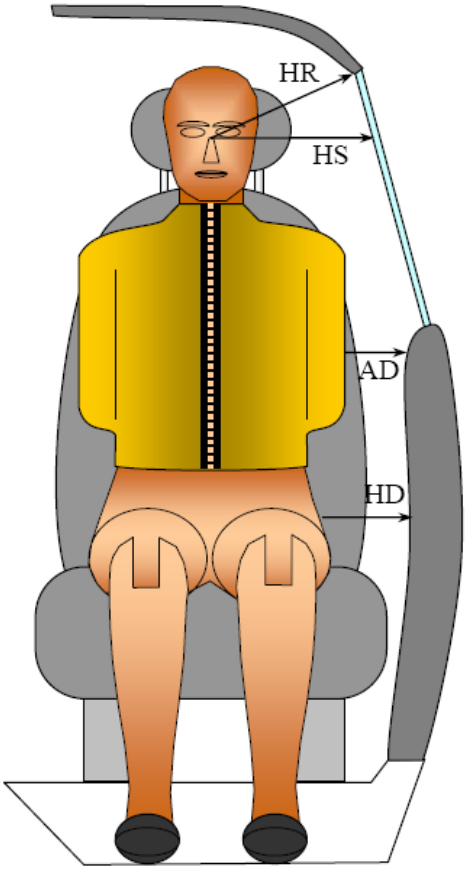
LEFT SIDE VIEW

DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Description	Driver (Serial No. F034)		Passenger (Serial No.DG8012)	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	355			
HW		Header to Windshield	595			
HZ	HZ	Head to Roof Liner	179		314	
NR	NB	Nose to Rim/Seat Back	448		550	
CD	CB	Chest to Dash/Seat Back	543		561	
CS		Chest to Steering Wheel	329			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	153	25.3	277	10
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	148	13.1	280	13.1
PAX°	PAX°	Pelvic Tilt Angle X		21.8		26.4
	PAY°	Pelvic Tilt Angle Y				0.2
PHX	PHX	Hip Point to Striker (X-Axis)	214		282	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	176		303	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018



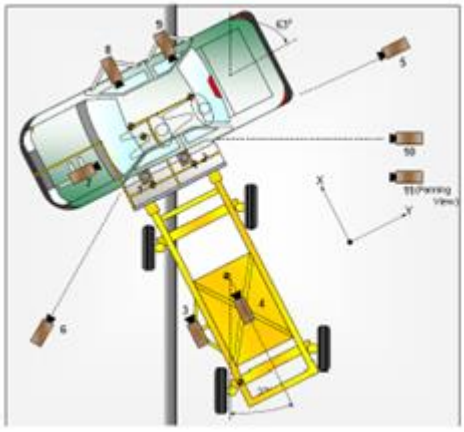
FRONT VIEW OF DUMMY

DUMMY LATERAL CLEARANCE DIMENSION INFORMATION

Code	Measurement Description	Units	Driver (Serial No. F034)	Passenger (Serial No. DG8012)
HR	Head to Side Header	mm	192	272
HS	Head to Side Window	mm	326	377
AD	Arm to Door	mm	92	168
HD	Hip Point to Door	mm	152	200

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	75	626	-9730	12.5	1000
2	Overhead Close-up	156	608	-9730	24	1000
3	Left Impact Point (MDB)	-1470	0	-847	25	1000
4	Side Overall (MDB)	-1140	838	-1587	12.5	1000
5	Rear	0	10650	1443	24	1000
6	Left Front	-4350	-5178	1233	24	1000
7	Driver Front (OB)				25	1000
8	Driver Side (OB)				12.5	1000
9	Passenger Side (OB)				12.5	1000
10	Real-time Left Rear				Zoom	60
11	Real-time In run				Zoom	60

Notes: *Reference: Impact Point projected to Ground*
+X = To Front of MDB, +Y = To Right of MDB, +Z = Down
**All measurements accurate to ± 6 mm.*

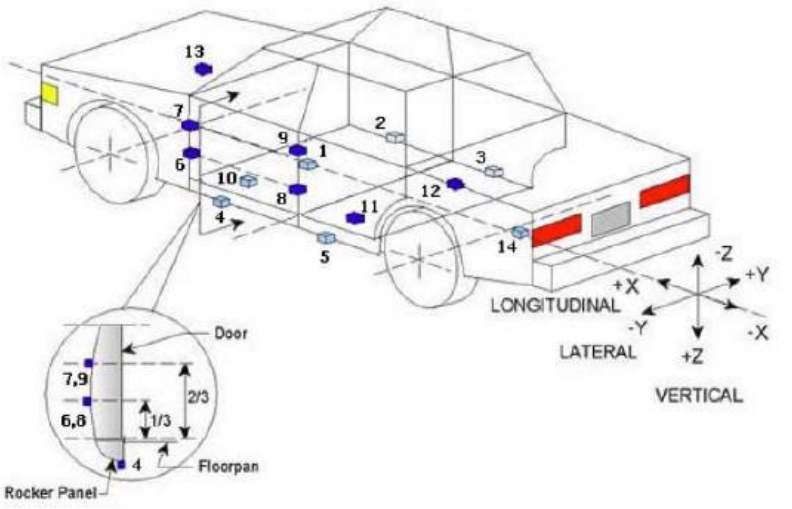
If applicable, explain why camera(s) did not operate as intended: All cameras operated normally

INSTRUMENTATION

Driver Dummy Channels	16
Passenger Dummy Channels	16
Vehicle Structure Accelerometers	23
MDB Accelerometers	7
Total	62

DATA SHEET NO. 6
TEST VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018



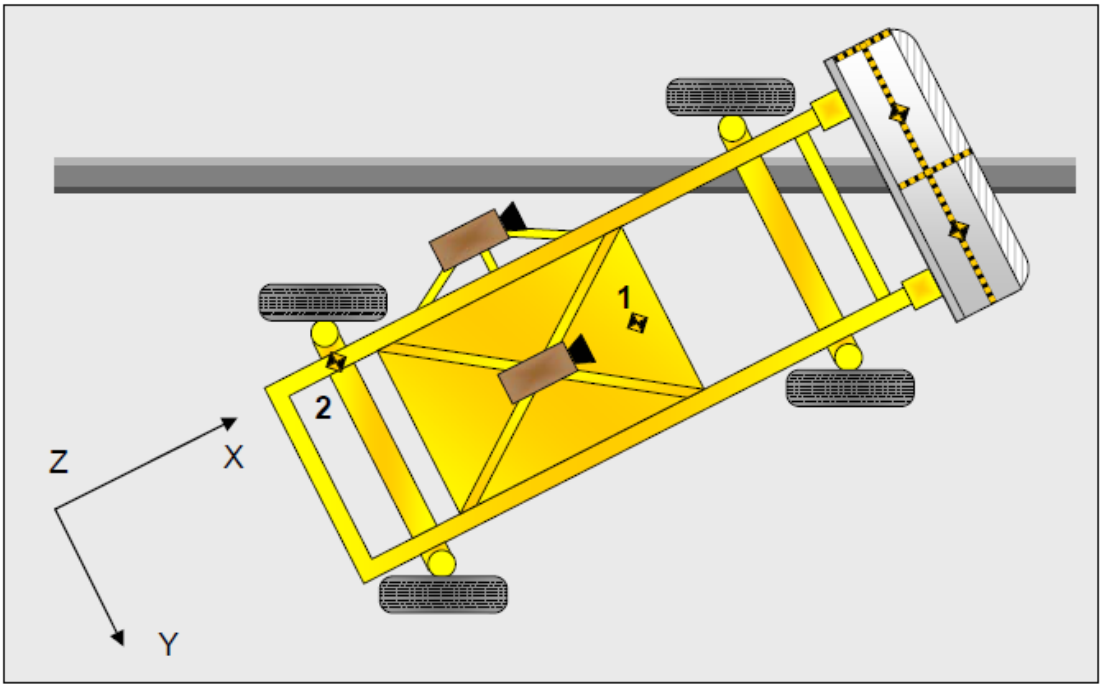
TEST VEHICLE ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2299	26	54
2	Right Sill at Front Seat	2715	660	306
3	Right Sill at Rear Seat	1822	665	295
4	Left Sill at Front Door	2769	-655	312
5	Left Sill at Rear Door	1808	-660	296
6	A-Post Lower	3066	-610	108
7	A-Post Middle	2992	-648	-469
8	B-Post Lower	2098	-685	204
9	B-Post Middle	2035	-698	-172
10	Front Seat Track	2102	-576	258
11	Rear Seat Structure	1550	-521	205
12	Rt. Rear Occ. Compartment	1938	399	333
13	Engine Block	3894	380	-75
14	Rear Above Axle	1000	-7	91

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

DATA SHEET NO. 7
MDB ACCELEROMETER LOCATIONS

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018



MDB ACCELEROMETER LOCATIONS

No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	1859	0	-330
2	MDB Rear	386	-660	-660

Reference: X – Face of MDB (+ forward)
Y – MDB centerline (+ to right)
Z – Ground plane (+ down)

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES-2re)	Rear Seat Dummy (SID-IIs)
Face	Curtain Air Bag	Curtain Air Bag
Top of Head	Side Headliner & Grab Handle	Curtain Air Bag & Rear Middle
Left Side of Head	Curtain Air Bag & Side Headliner	Curtain Air Bag
Back of Head	Curtain Air Bag, Side Headliner & Headrest	Curtain Air Bag, Rear Middle Seatback
Left Shoulder	Curtain Air Bag, Window & Door	Passenger Door
Upper Torso	Seatback & Torso/Pelvis Air Bag	Passenger Door
Lower Torso	Seatback	Passenger Door
Left Hip	Torso/Pelvis Air Bag	Passenger Door
Left Knee	Driver Door	Passenger Door

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

*Tailgate opened during impact but is still operational.

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

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	B-Pillar Buckled
Sill Separation	None
Windshield Damage	None
Side Window Damage	Driver Window has some cracks from Driver's Shoulder
Other Notable Effects	None

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

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2698
Vertical Impact Reference Line (Aft of Front Axle - Intended Impact Point)	mm		409
Actual Impact Point (Aft of Frontal Axle)	mm		403
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact Point	+6
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact Point	+2

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1,250
Overall Length Including Honeycomb Frame	4,120
Wheelbase of Framework Carriage	2,600
CG Location of Front Axle	1,120

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	392.5	297.5	690.0
Right	kg	386.0	291.5	677.5
Ratio	%	57.4%	42.6%	100.0%
Totals	kg	778.5	589.0	1367.5

SPEED AND ANGLE AT IMPACT DATA

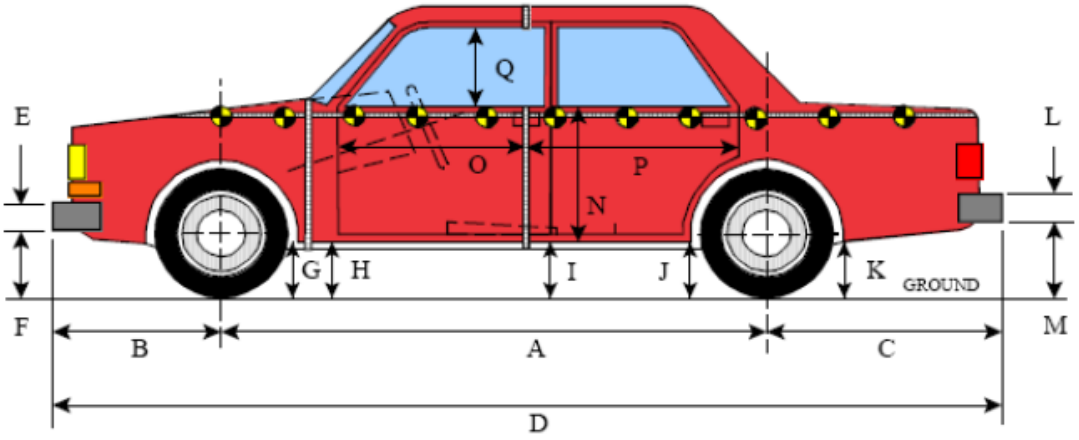
Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.10 to 62.70	61.96
Trap No. 2 Velocity (Redundant)	km/h	61.10 to 62.70	61.96
MDB CL to Target Vehicle CL	degrees	88.5 to 91.5	90.0
MDB Forward Line of Motion to Target Vehicle CL	degrees	62.5 to 63.5	63.0
MDB Crabbed angle to MDB Forward Line of Motion	degrees	26.0 to 28.0	27.0

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush (mm)
Row	Description	Height (mm)	Distance (mm)	Direction	
A	Center of Bumper	432	800	Left	244
B	Top of Bumper	533	700	Left	192
C	Mid-Level	686	800	Left	171
D	Top of Stack	813	800	Left	210

DATA SHEET NO. 10
TEST VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018



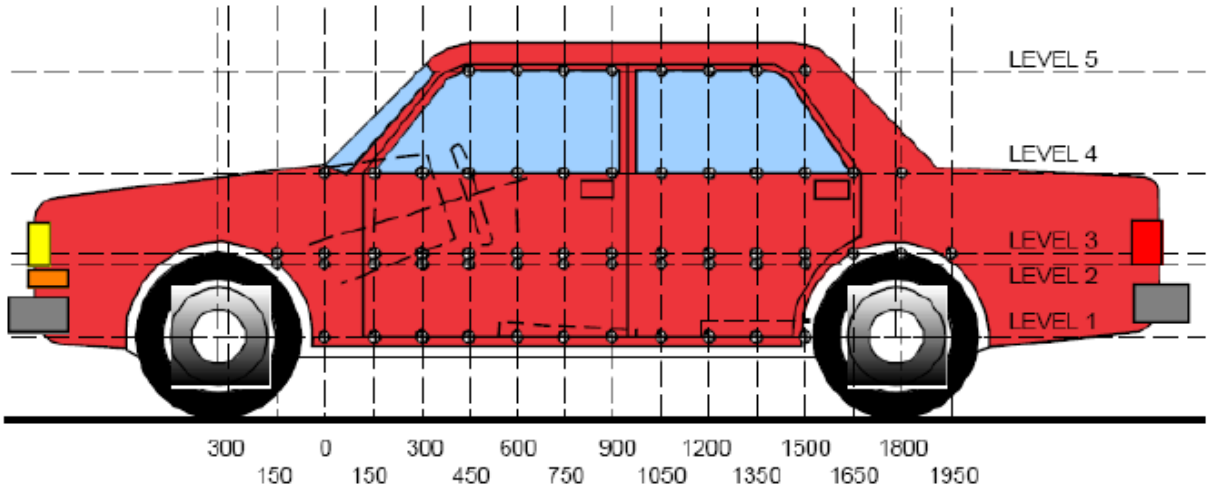
LEFT SIDE VIEW
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2698	2695	-3
B	Front Axle to FSOV	948	955	7
C	Rear Axle to RSOV	903	897	-6
D	Total Length at Centerline	4547	4547	0
E	Front Bumper Thickness	115	115	0
F	Front Bumper Bottom to Ground	459	449	-10
G	Sill Height at Front Wheel Well	251	240	-11
H	Sill Height at Front Door Leading Edge	241	250	9
I	Sill Height at B Pillar	241	247	6
J1	Sill Height at Rear Wheel Well	243	267	24
J2	Pinch Weld Height at Rear Wheel Well	254	266	12
K	Sill Height Aft of Rear Wheel Well	302	326	24
L	Rear Bumper Thickness	190	190	0
M	Rear Bumper Bottom to Ground	474	505	31
N	Sill Height to Window Bottom of Front Window Sill	876	870	-6
O	Front Door Leading Edge to Impact CL	687	688	1
P	Rear Door Trailing Edge to Impact CL	1360	1340	-20
Q	Front Window Opening	422	422	0
R	Right Side Length	4438	4436	-2
S	Left Side Length	4439	4452	13
T	Maximum Vehicle Width	1832	1714	-118

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Units	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	mm	417	97	900
2	Driver Hip Point	mm	693	120	900
3	Mid-Door	mm	770	122	1050
4	Window Sill	mm	1097	40	1650
5	Window Top	mm	1579	-1	1200

*window top level bent outward from original position

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. 11 … (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2018 Mazda CX-5 SUV NHTSA No.: O20185400
Test Program: NCAP Side MDB Impact Test Test Date: 6/20/2018

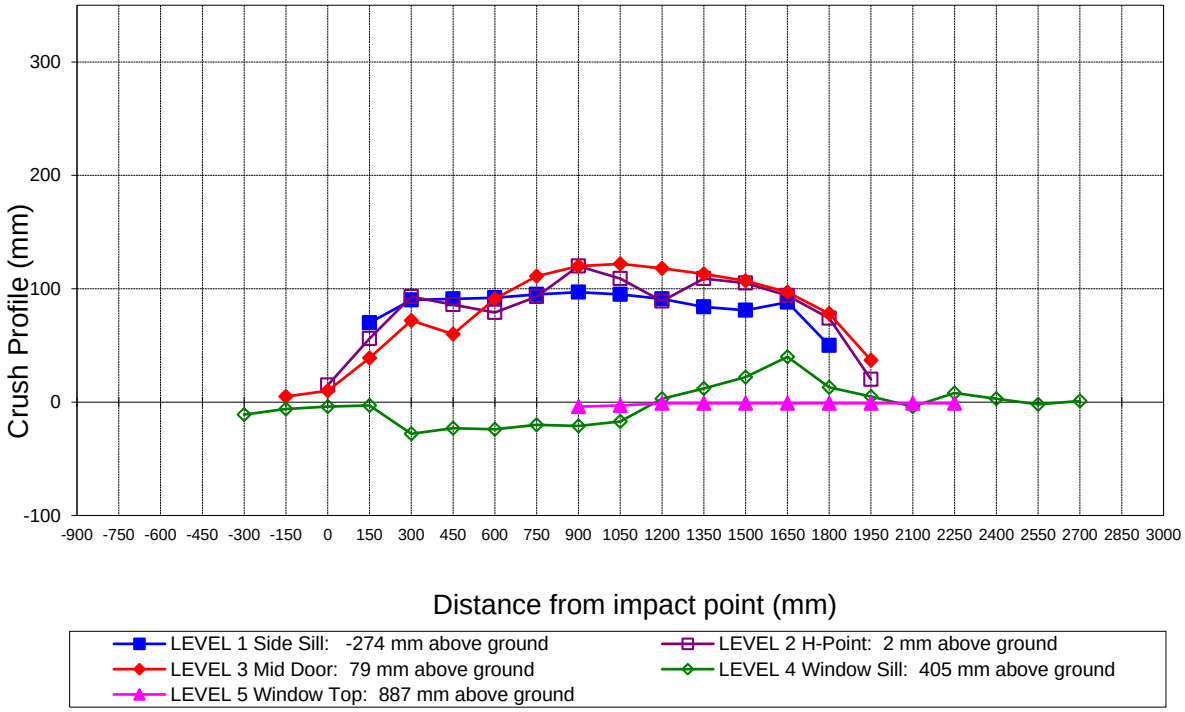
EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900															
-750															
-600															
-450															
-300				756					767					-11	
-150			921	793				916	799				5	-6	
0		918	918	818			903	912	822			15	6	-4	
150	909	911	908	831		839	855	869	834		70	56	39	-3	
300	913	903	904	836		823	810	832	864		90	93	72	-28	
450	915	903	906	920		824	817	846	943		91	86	60	-23	
600	915	905	908	847		823	826	817	871		92	79	91	-24	
750	915	905	908	849		820	812	797	869		95	93	111	-20	
900	913	906	908	851	620	816	786	788	872	624	97	120	120	-21	-4
1050	911	906	908	850	632	816	797	786	867	635	95	109	122	-17	-3
1200	907	905	907	850	635	816	816	789	847	636	91	89	118	3	-1
1350	904	904	906	848	633	820	795	793	836	634	84	109	113	12	-1
1500	903	904	905	846	631	822	799	798	824	632	81	105	107	22	-1
1650	903	908	907	842	627	815	814	810	802	628	88	94	97	40	-1
1800	906	919	916	842	620	856	845	838	829	621	50	74	78	13	-1
1950		920	919	851	611		900	882	846	612		20	37	5	-1
2100				861	599				865	600				-4	-1
2250				865	579				857	580				8	-1
2400				860					857					3	
2550				847					849					-2	
2700				825					824					1	
2850															
3000															

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 test based on an estimated impact point.

DATA SHEET NO. 11 (CONTINUED)
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

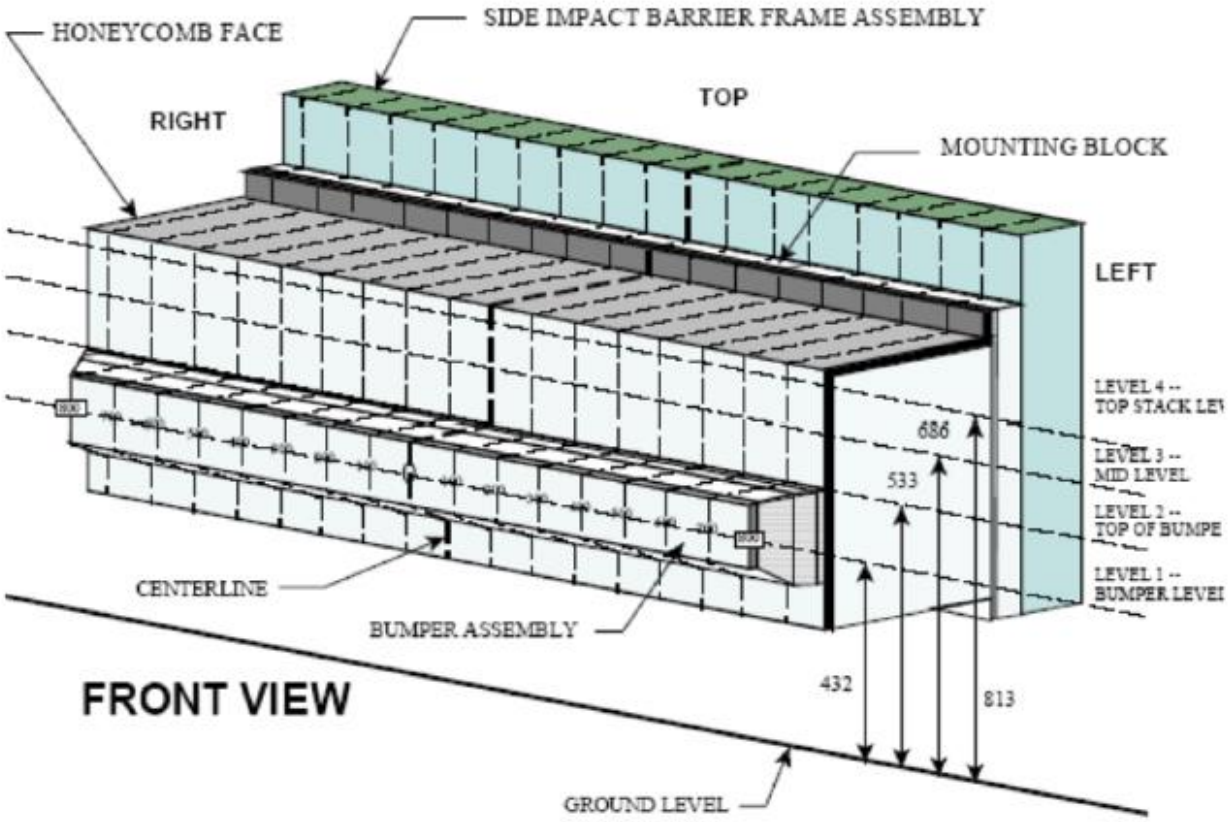
Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/2018



Vehicle Exterior Crush Measurements - Visual Representation

DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/18



NOTE: Dimensions are shown in millimeters, mm

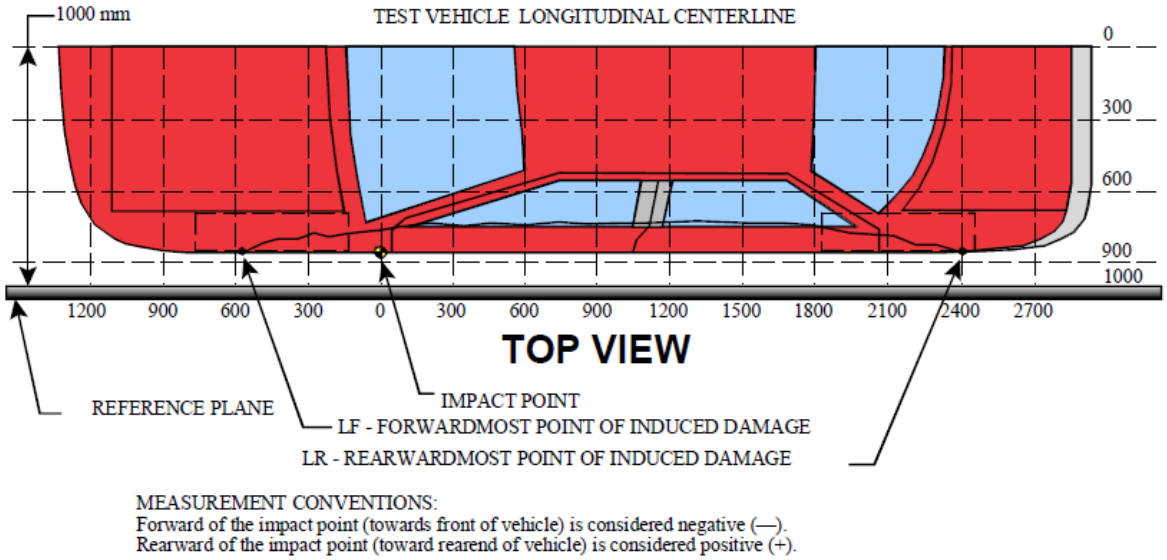
DEFORMABLE BARRIER STATIC CRUSH

Stack Level	Distance Right of Center								C/L	Distance Left of Center							
	800	700	600	500	400	300	200	100	0	100	200	300	400	500	600	700	800
1	236	231	230	229	228	228	228	227	226	224	224	223	223	223	225	243	244
2	166	168	168	168	165	164	162	159	159	156	154	154	155	153	153	162	192
3	146	122	105	96	98	118	126	102	84	84	88	91	93	100	112	153	171
4	160	129	102	91	97	119	134	106	97	102	103	117	123	147	167	184	210

DATA SHEET NO. 13
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/18

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



MEASUREMENT CONVENTIONS:
Forward of the impact point (towards front of vehicle) is considered negative (—).
Rearward of the impact point (toward rearend of vehicle) is considered positive (+).

VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	-150	3	84	79	5
2	270	3	161	95	66
3	690	3	195	92	103
4	1110	3	213	92	121
5	1530	3	200	95	105
6	1950	3	118	81	37

MDB DAMAGE PROFILE DISTANCES

DPD	Distance From Center of MDB	Level	Post-Test (mm)*
1	800 mm left of center	1	244
2	480 mm left of center	1	223
3	160 mm left of center	1	224
4	160 mm right of center	1	228
5	480 mm right of center	1	229
6	800 mm right of center	1	236

DATA SHEET NO. 14
FMVSS NO. 301 STATIC ROLLOVER RESULTS

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/18
Test Time:	11:28 AM	Temperature:	21˚C

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

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

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

D. Spillage Details: — No Spillage Occurred

FMVSS NO. 301 STATIC ROLLOVER DATA

ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	72	300	372
90° to 180°	62	300	362
180° to 270°	61	300	361
270° to 360°	64	300	364

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

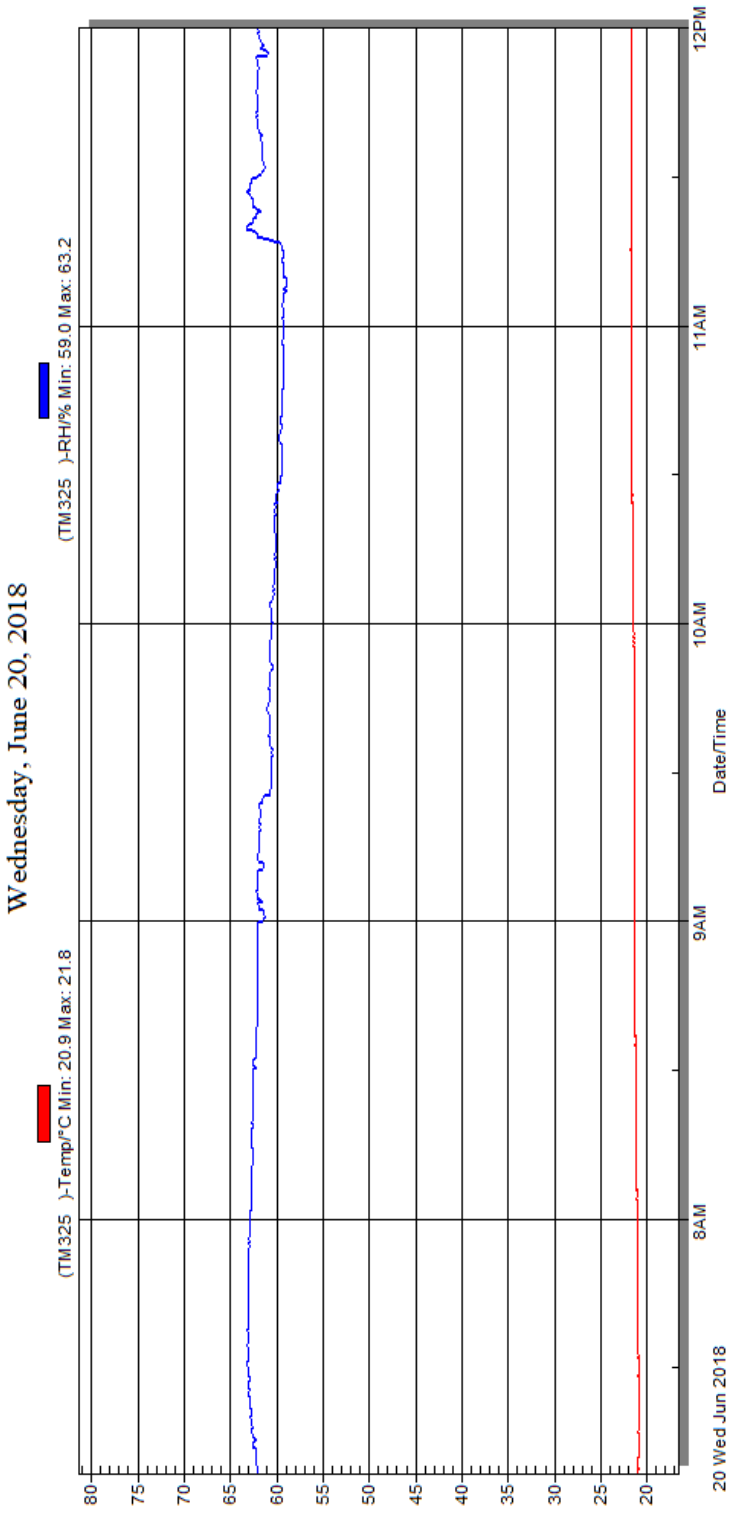
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 15
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle:	2018 Mazda CX-5 SUV	NHTSA No.:	O20185400
Test Program:	NCAP Side MDB Impact Test	Test Date:	6/20/18



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

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure A-1: As-Delivered Right Front 3/4 View of Test Vehicle

Figure A-2: As-Delivered Left Rear 3/4 View of Test Vehicle

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

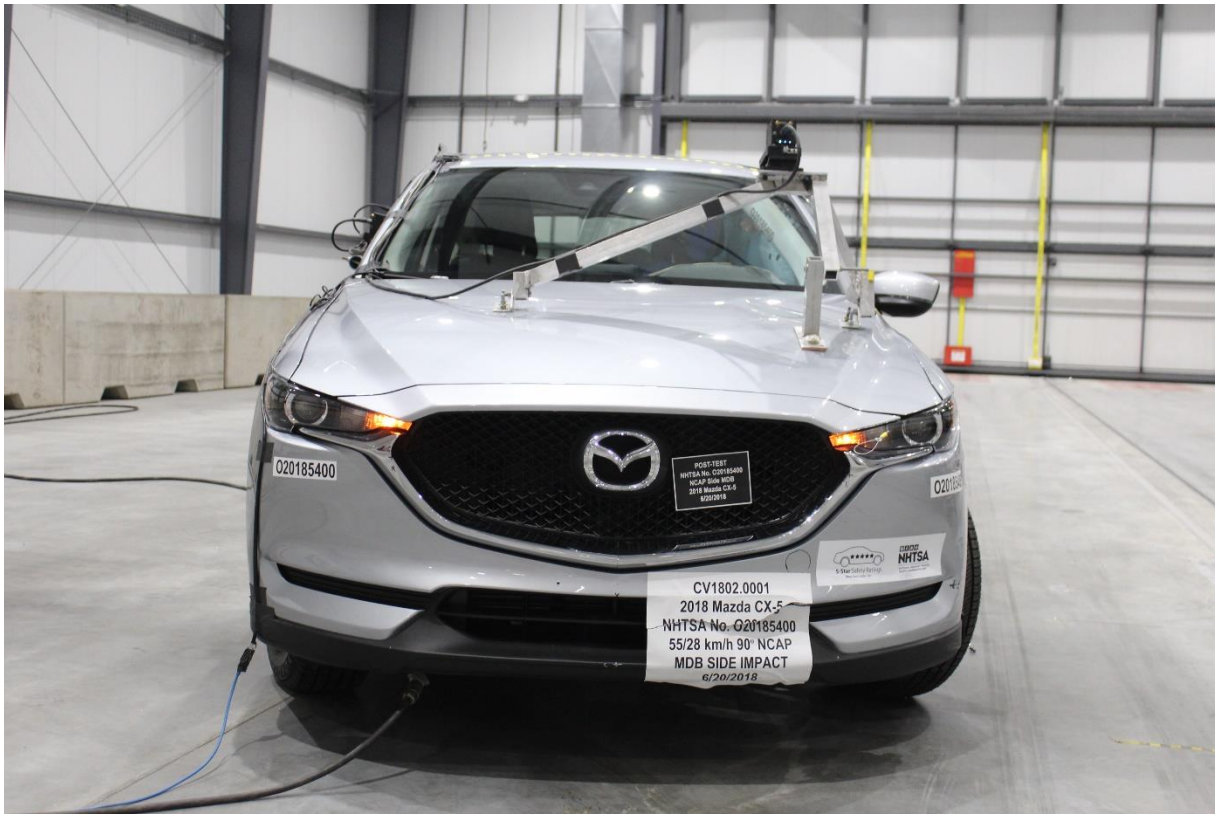


Figure A-4: Post-Test Frontal View of Test Vehicle

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

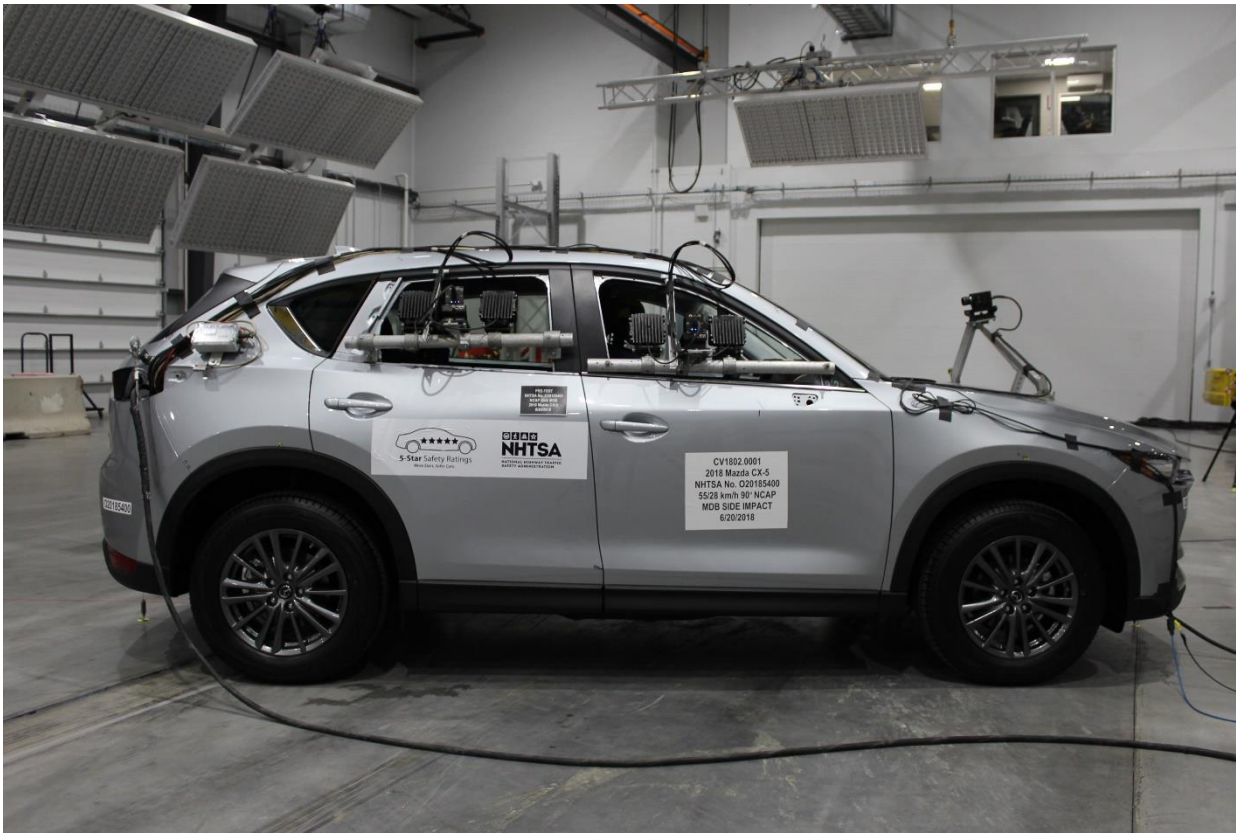


Figure A-13: Pre-Test Right Side View of Test Vehicle

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

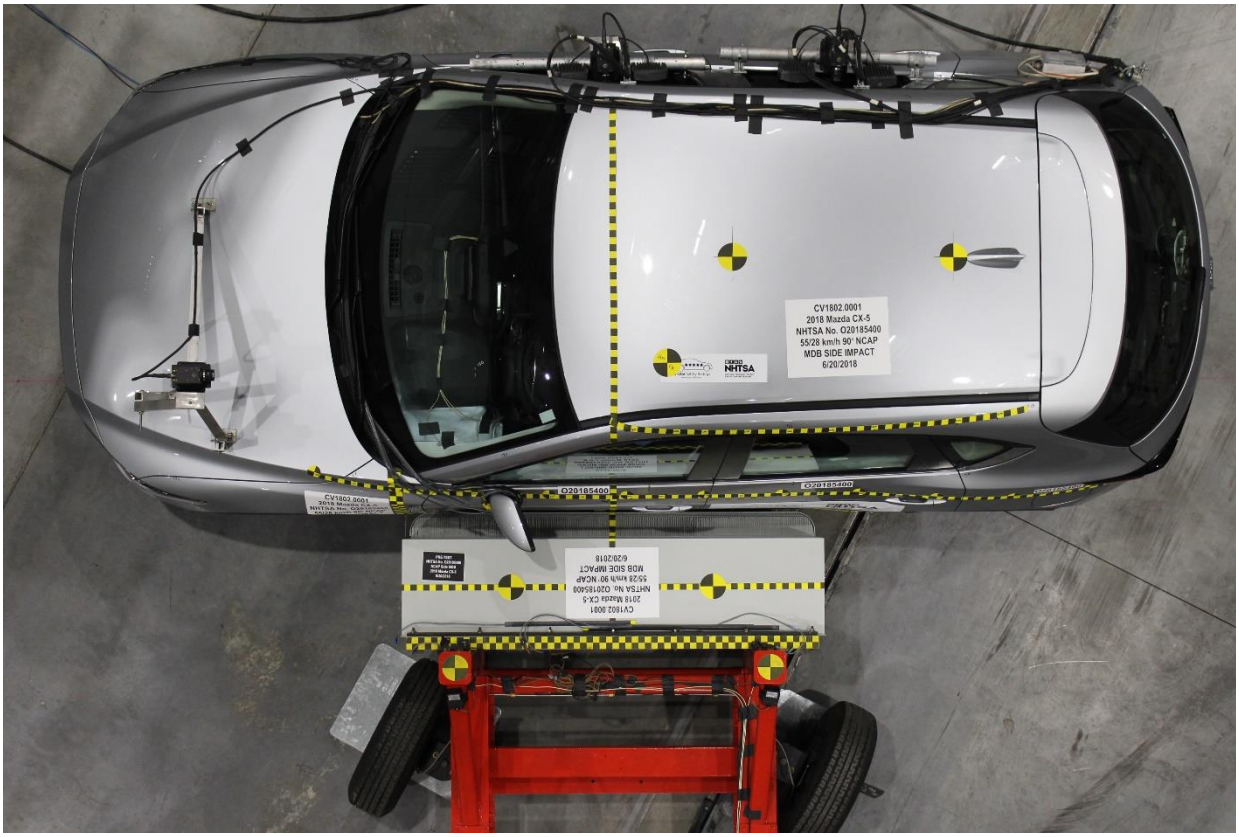


Figure A-15: Pre-Test Overhead View of the Test Area

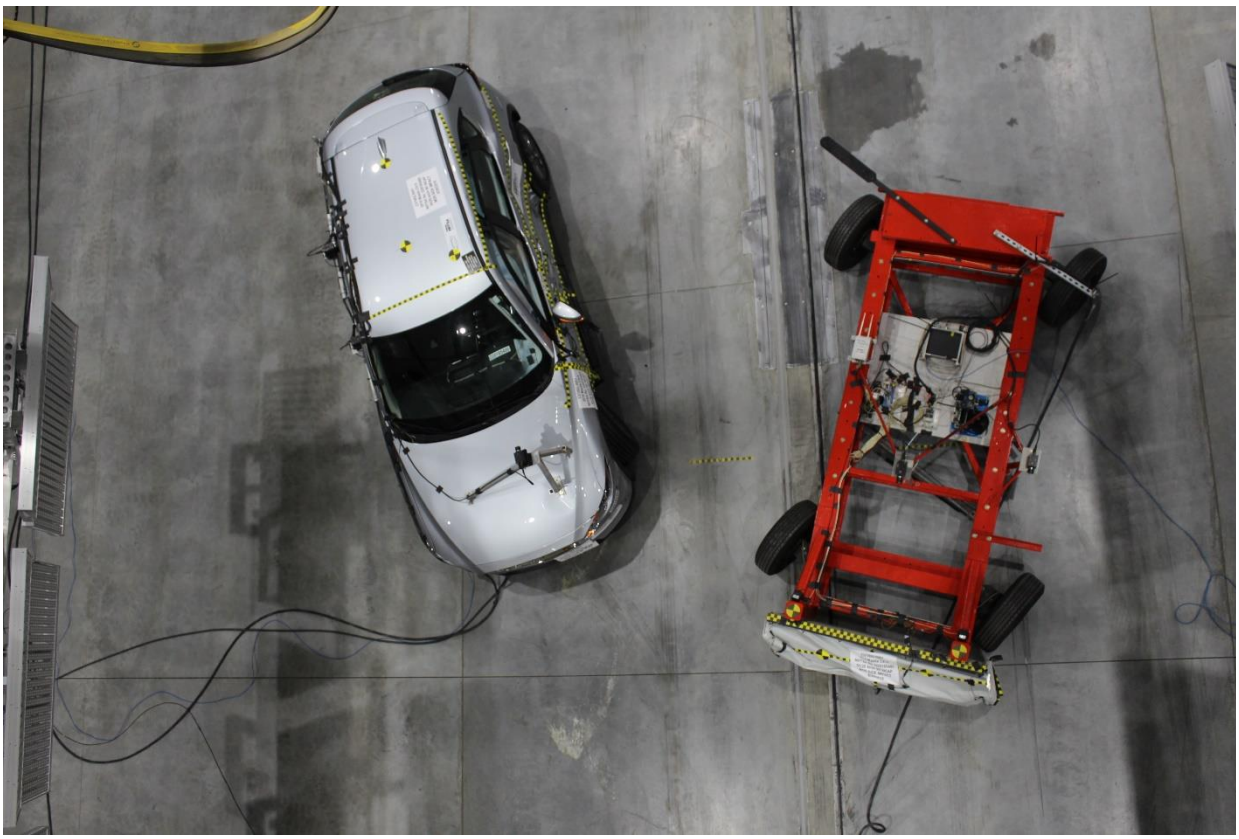


Figure A-16: Post-Test Overhead View of Test Area

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

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

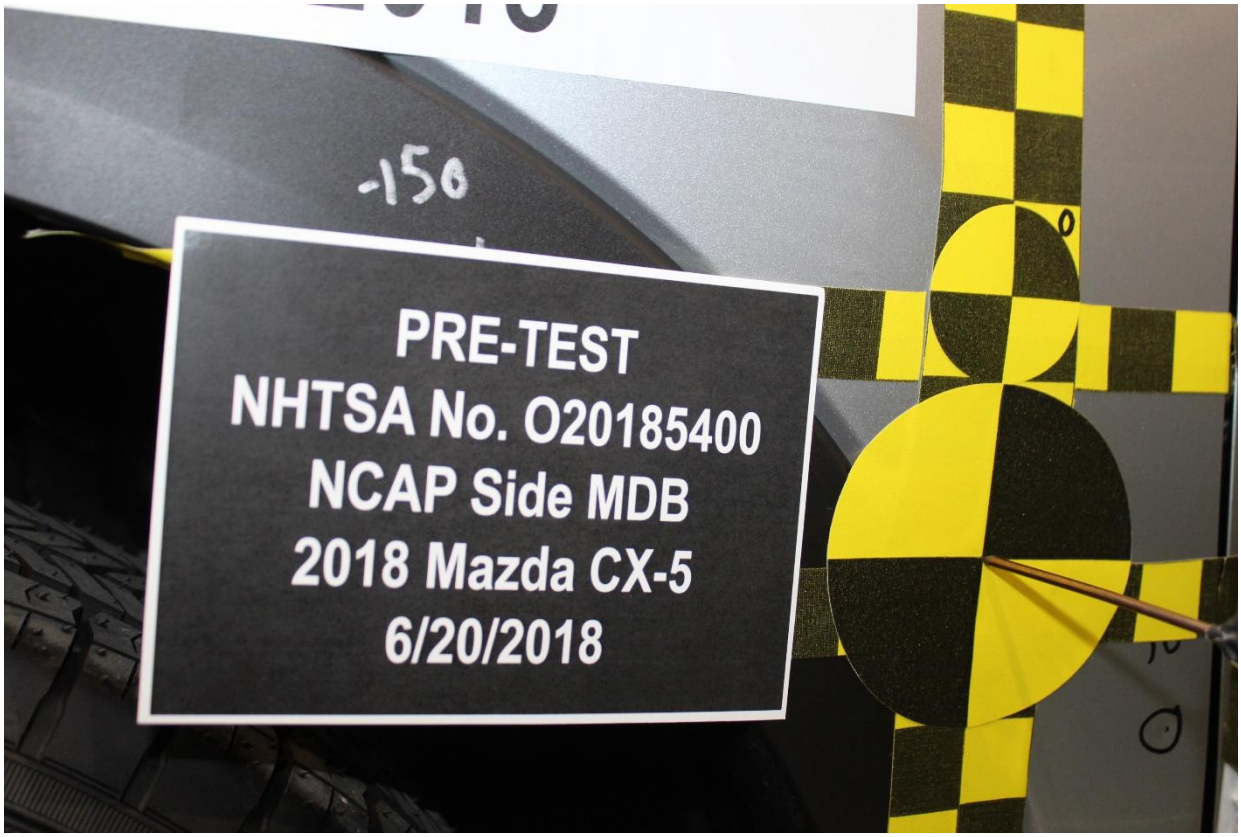


Figure A-19: Pre-Test Close-up View of Impact Point Target

Figure A-20: Post-Test Close-up View of Impact Point Target

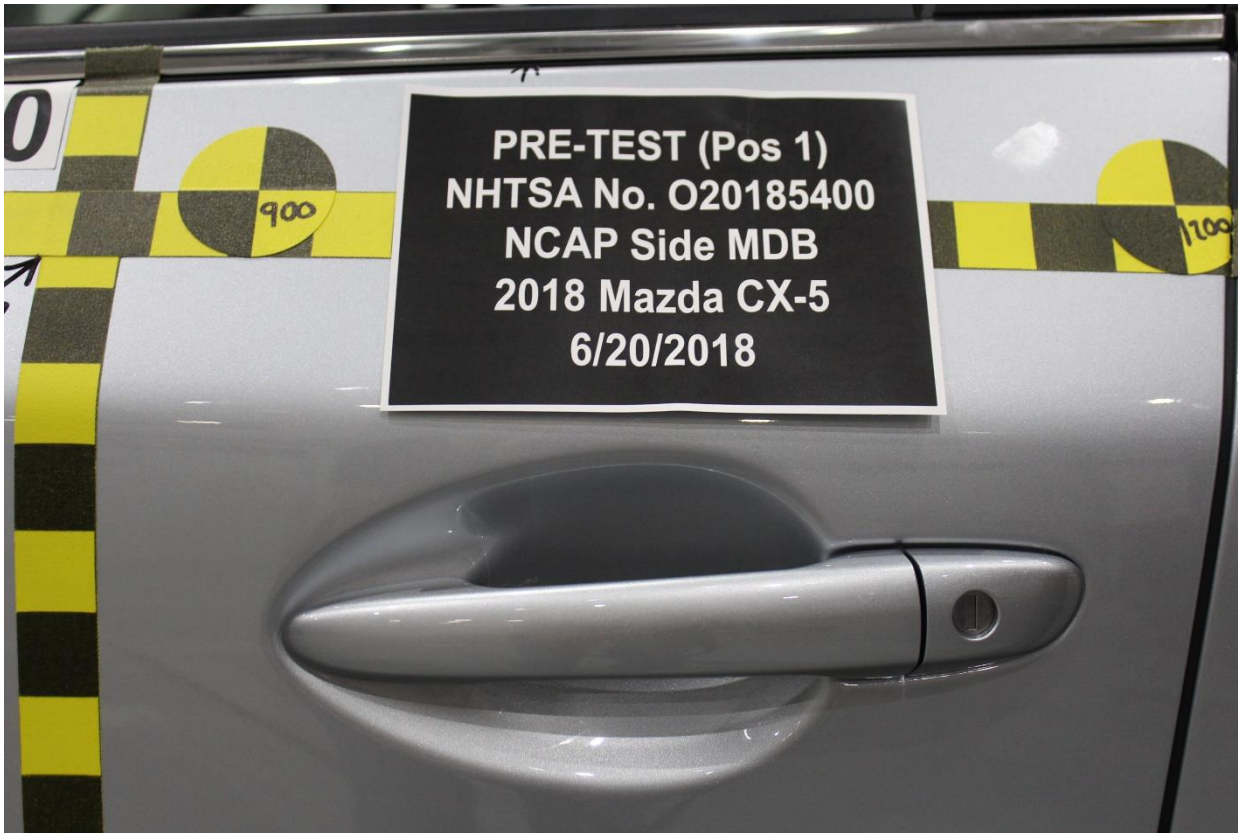


Figure A-21: Pre-Test Left Front Door Latch Close-Up

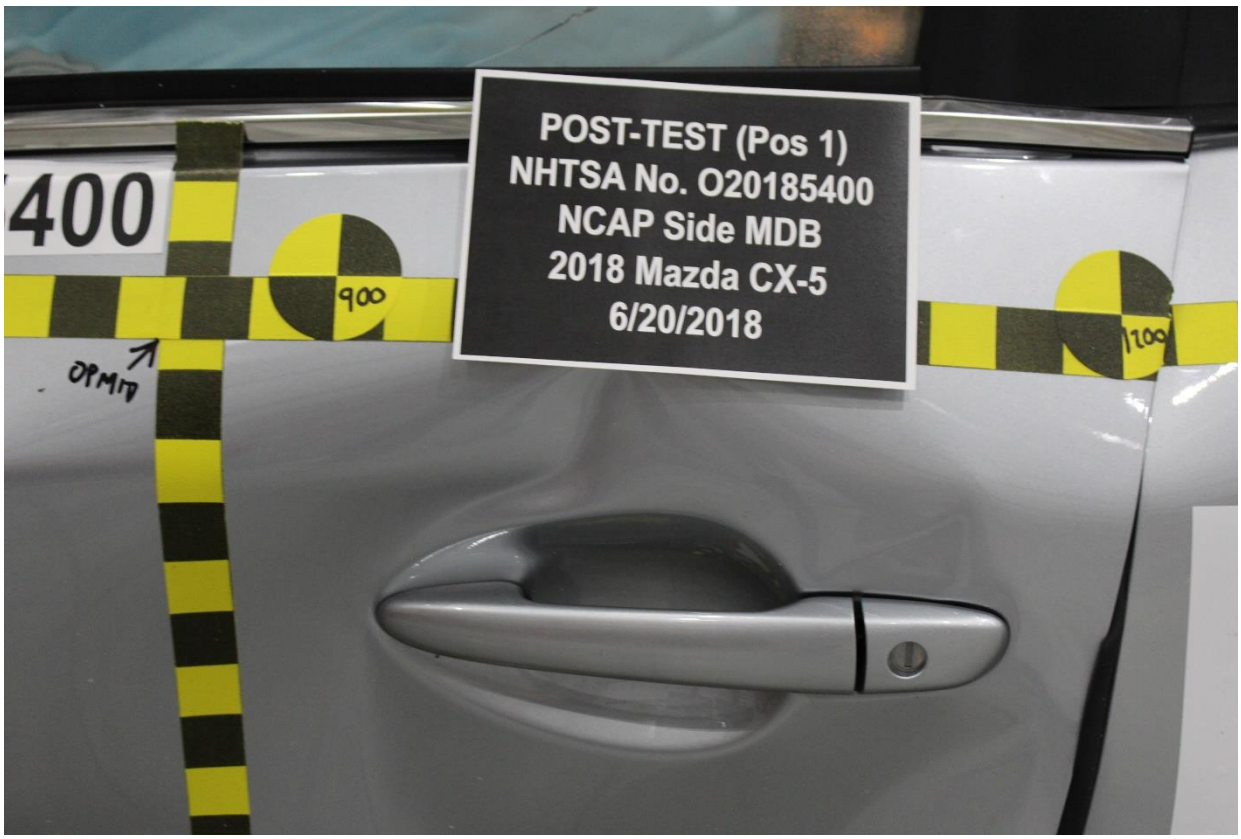


Figure A-22: Post-Test Left Front Door Latch Close-Up

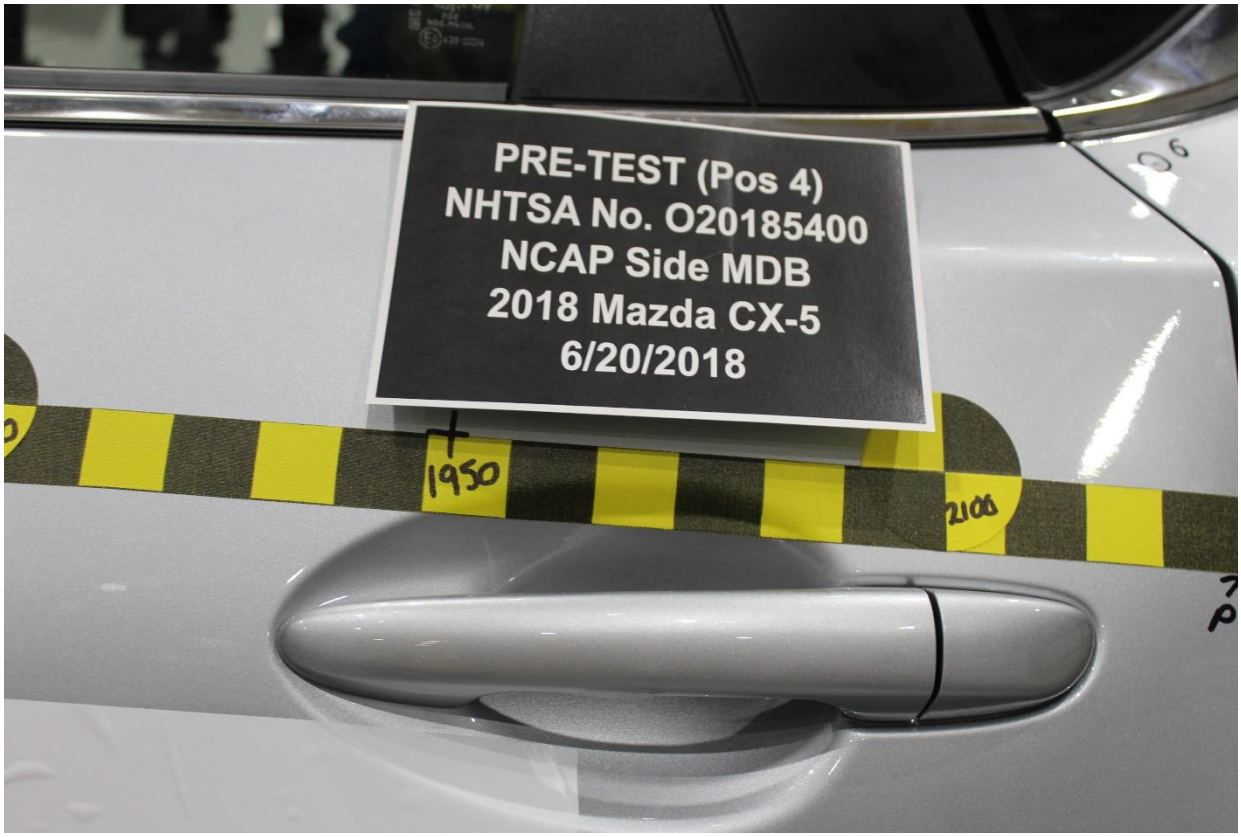


Figure A-23: Pre-Test Left Rear Door Latch Close-Up

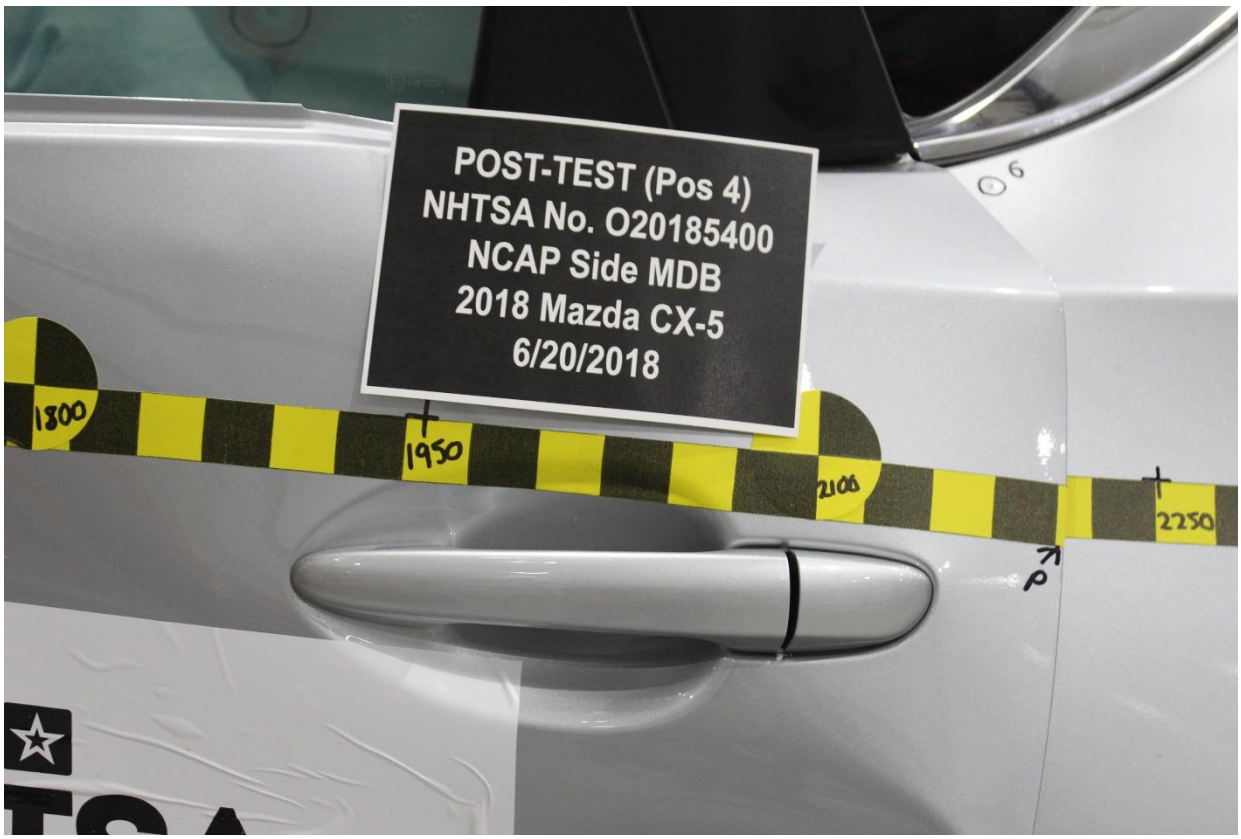


Figure A-24: Post-Test Left Rear Door Latch Close-Up

Figure A-25: Pre-Test Front Close-up View of Driver Dummy

Figure A-26: Post-Test Front Close-up View of Driver Dummy

Figure A-27: Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking

Figure A-28: Pre-Test Left Side View of Driver Dummy Shoulder and Door Top View

Figure A-29: Post-Test Left Side View of Driver Dummy Shoulder and Door Top View

Figure A-30: Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning

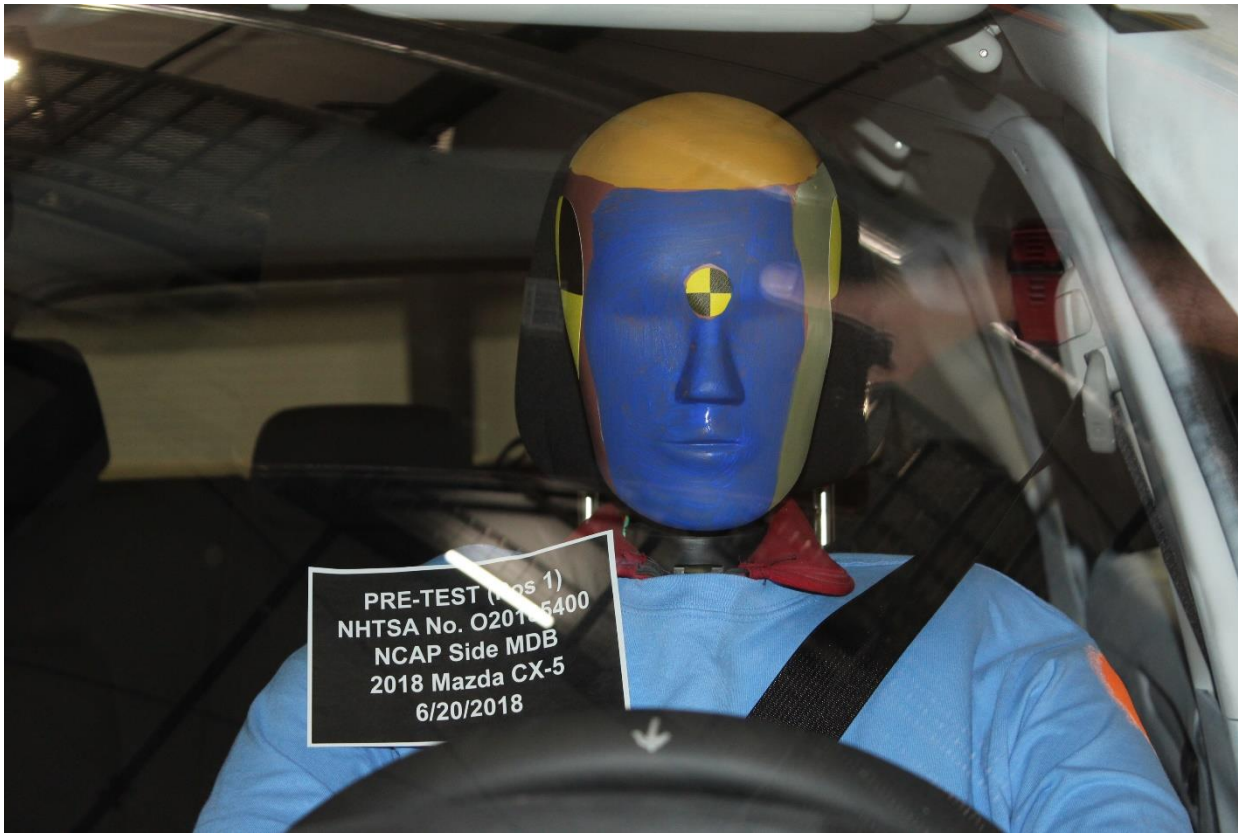


Figure A-31: Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint

Figure A-32: Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning

Figure A-33: Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan

Figure A-34: Pre-Test Placement of Driver Dummy's Feet

Figure A-35: Pre-Test View of Belt Anchorage for Driver Dummy

Figure A-36: Pre-Test Left Side View of Steering Wheel

Figure A-37: View of Disengaged Parking Brake

Figure A-38: Pre-Test View of Parking Brake

Figure A-39: Pre-test Close-Up Left Side View of Driver Seat Track

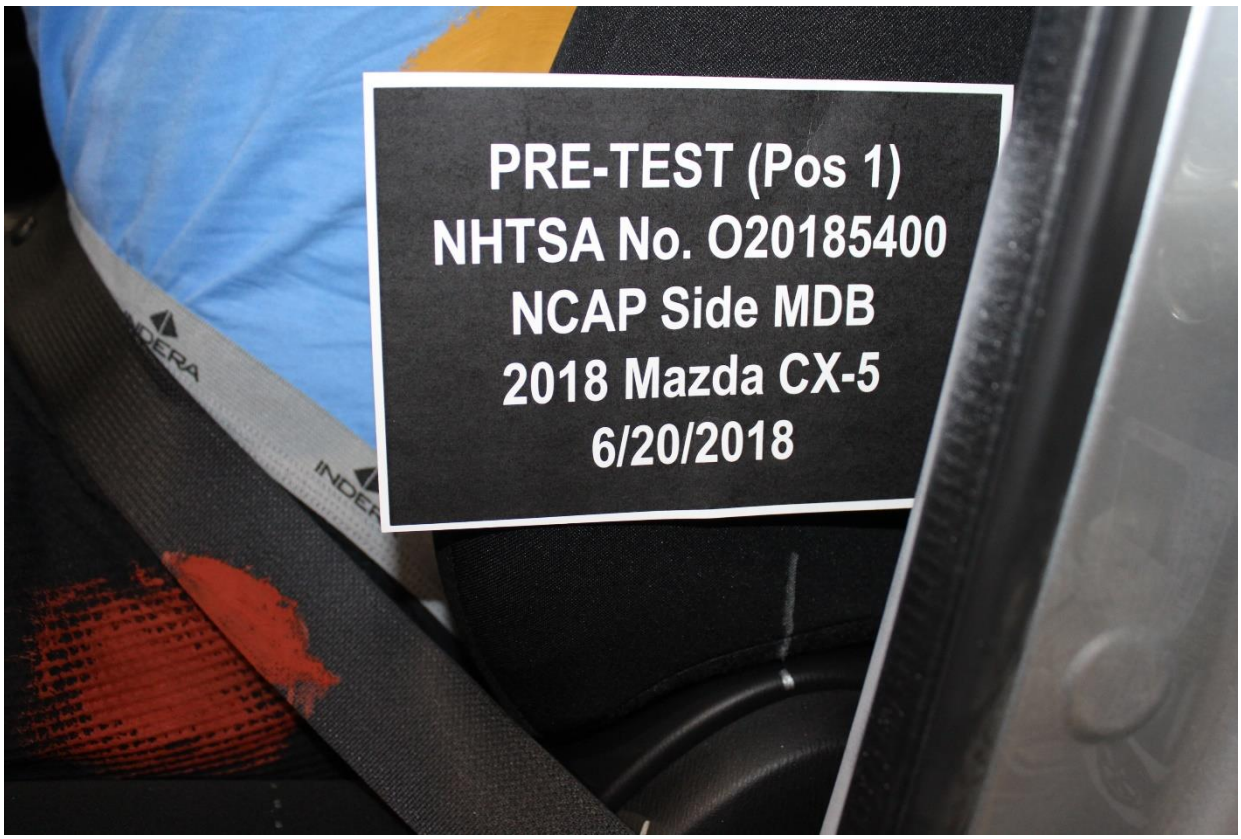


Figure A-40: Pre-Test Close-Up Left Side View of Driver Seat Back

Figure A-41: Pre-Test Close-Up View of Driver Seat Back or Head Restraint

Figure A-42: Pre-Test Driver Dummy and Door Clearance View

Figure A-43: Post-Test Driver Dummy and Door Clearance View

Figure A-44: Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment

Figure A-45: Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment

Figure A-46: Pre-Test Driver Inner Door Panel View

Figure A-47: Post-Test Driver Inner Door Panel View Showing Driver Dummy Contact Locations

Figure A-48: Post-Test Driver Dummy Close-Up Head Contact with Vehicle View

Figure A-49: Post-Test Driver Dummy Close-Up Head Contact with Side Air Bag View

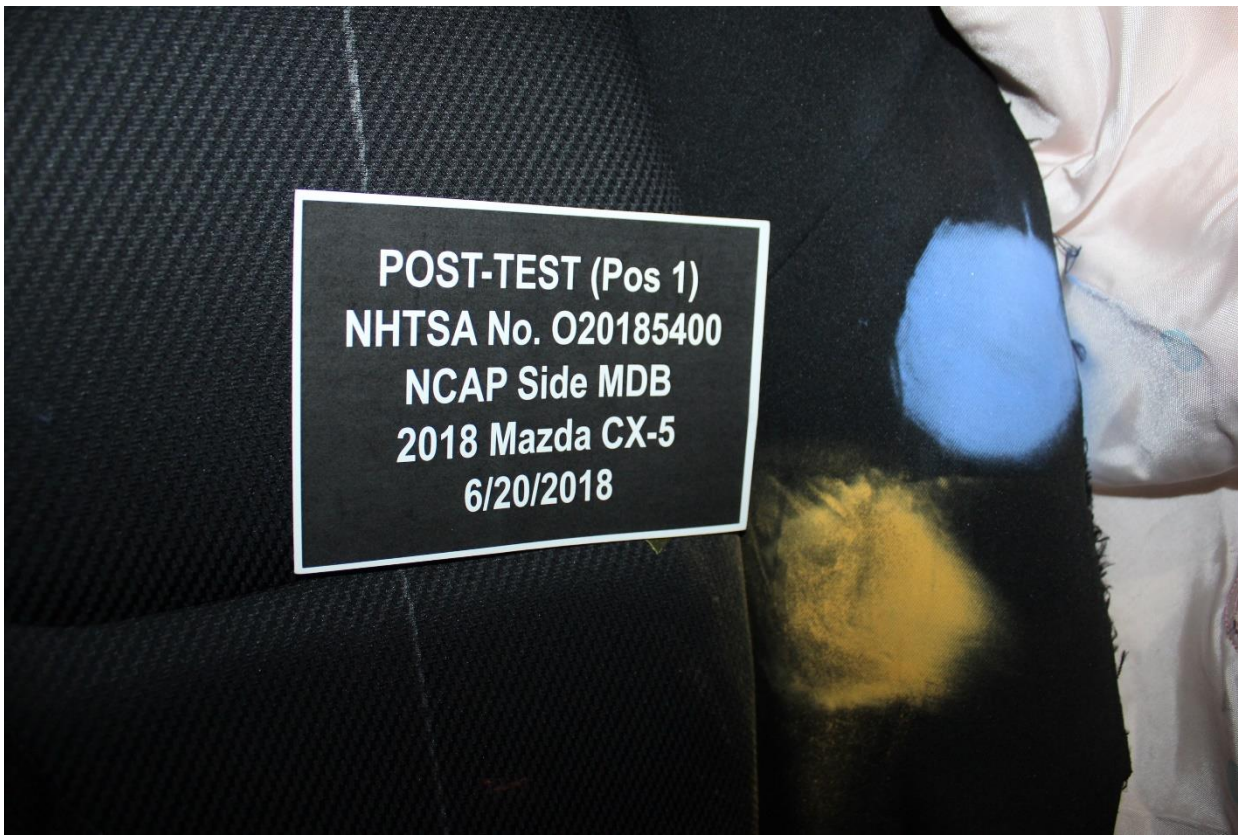


Figure A-50: Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View

Figure A-51: Post-Test Driver Dummy Close-Up Torso Contact with Side Air Bag View

Figure A-52: Post-Test Driver Dummy Close-Up Pelvis Contact View

Figure A-53: Post-Test Driver Dummy Close-Up Pelvis Contact with Side Air Bag View

Figure A-54: Post-Test Driver Dummy Close-Up Knee Contact View

Figure A-55: Pre-Test Left Side View of Rear Passenger Dummy Showing Belt and Chalking

Figure A-56: Pre-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View

Figure A-57: Post-Test Left Side View of Rear Passenger Dummy Shoulder and Door Top View

Figure A-58: Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning

Figure A-59: Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint

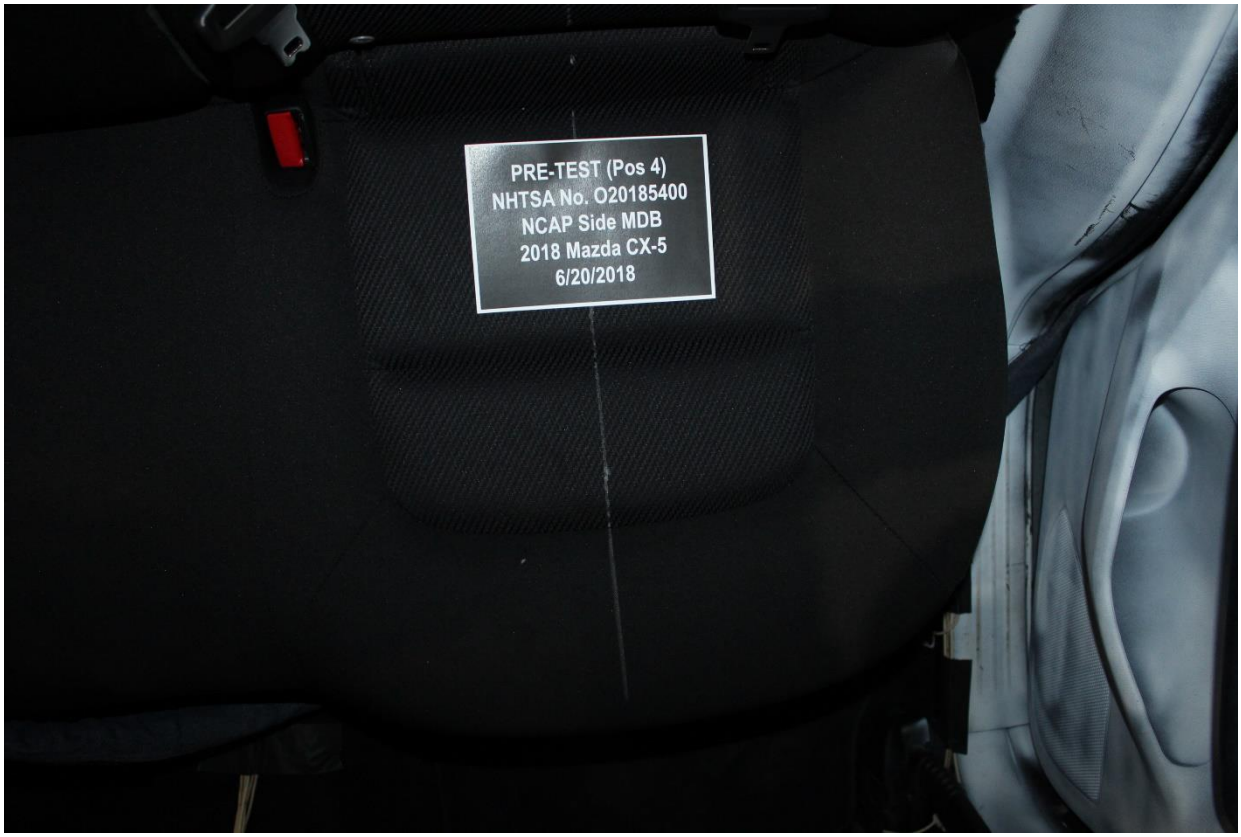


Figure A-60: Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning

Figure A-61: Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

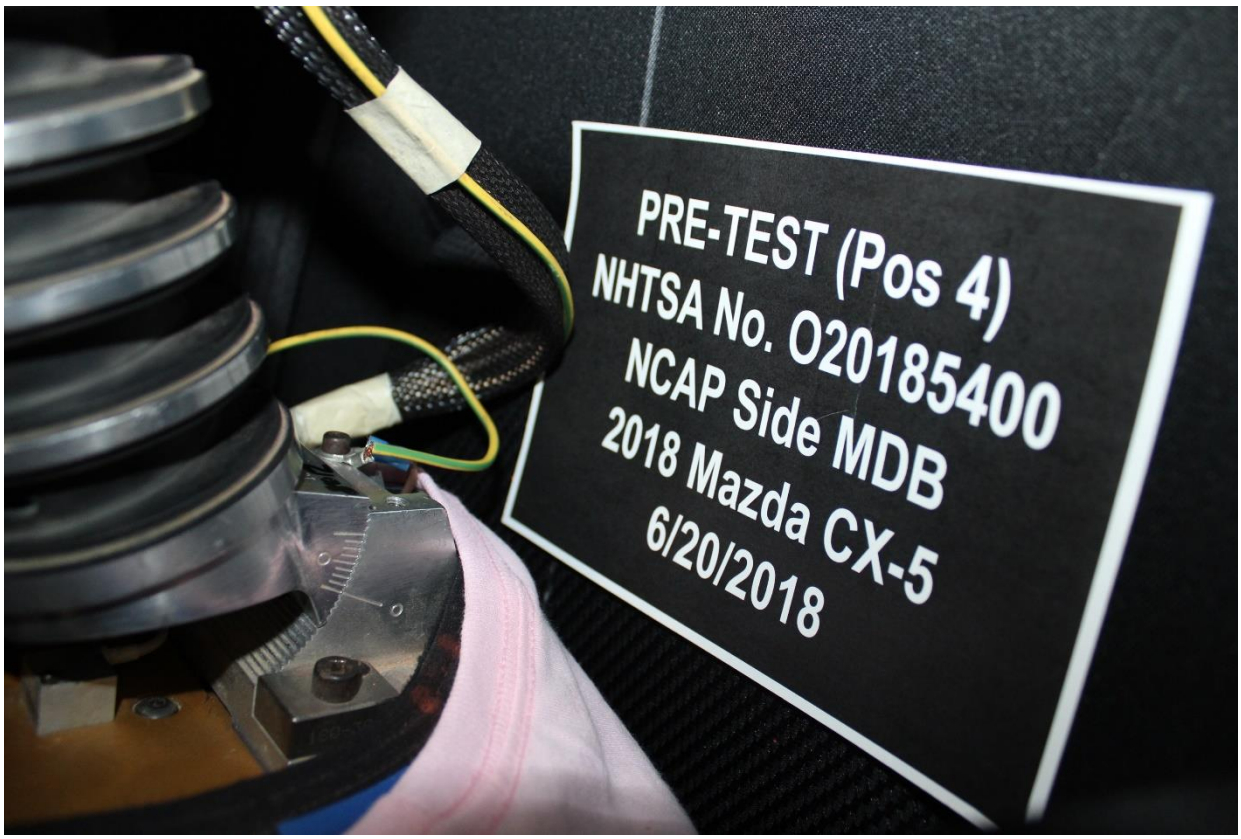


Figure A-62: Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket

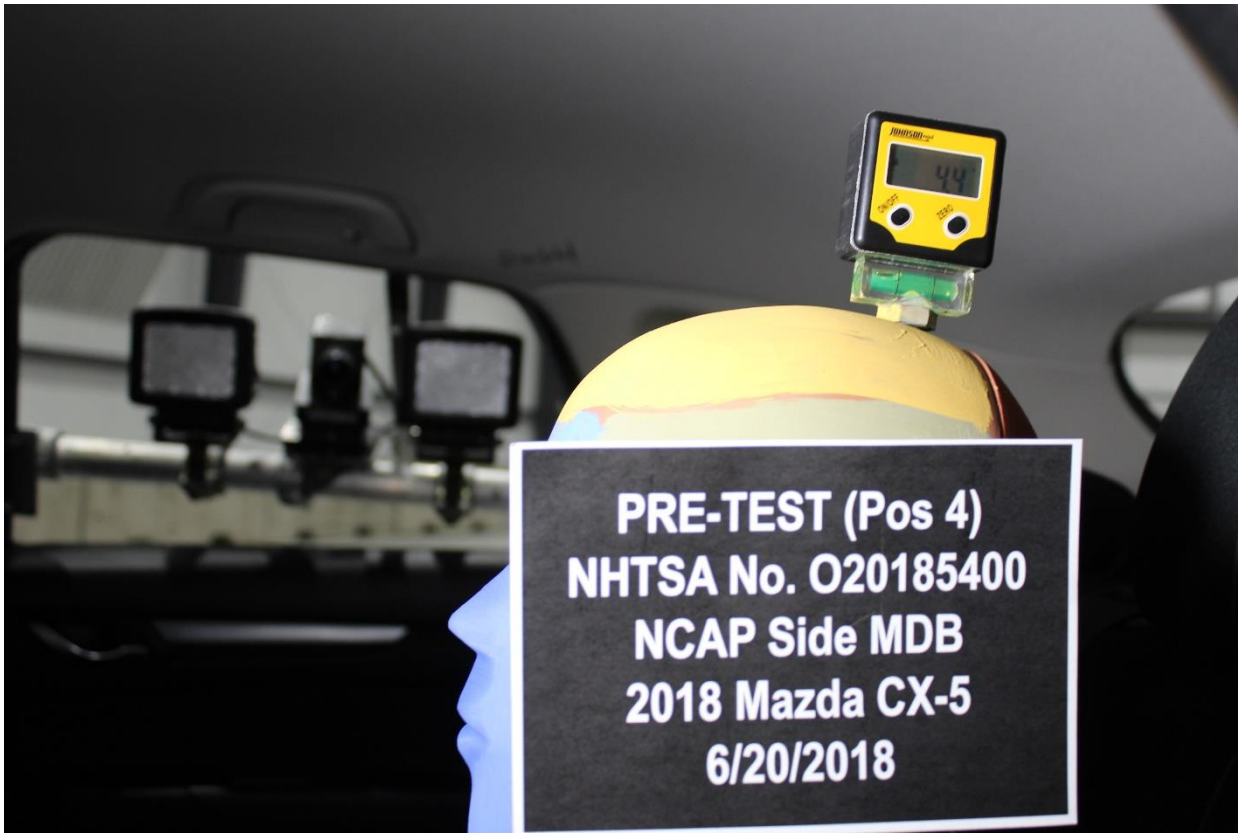


Figure A-63: Pre-Test View of Rear Passenger Dummy's Head Showing Dummy's Head is Level

Figure A-64: Pre-Test Placement of Rear Passenger Dummy's Feet

Figure A-65: Pre-Test View of Belt Anchorage for Rear Passenger Dummy

Figure A-66: Pre-Test Close-Up Left Side View of Rear Passenger Seat Track

Figure A-67: Pre-Test Close-Up Left Side View of Rear Passenger Seat Back

Figure A-68: Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint

Figure A-69: Pre-Test Rear Passenger Dummy and Door Clearance View

Figure A-70: Post-Test Rear Passenger Dummy and Door Clearance View

Figure A-71: Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment

Figure A-72: Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment

Figure A-73: Pre-Test Rear Passenger Inner Door Panel View

Figure A-74: Post-Test Rear Passenger Inner Door Panel View Showing Rear Passenger Contact Locations

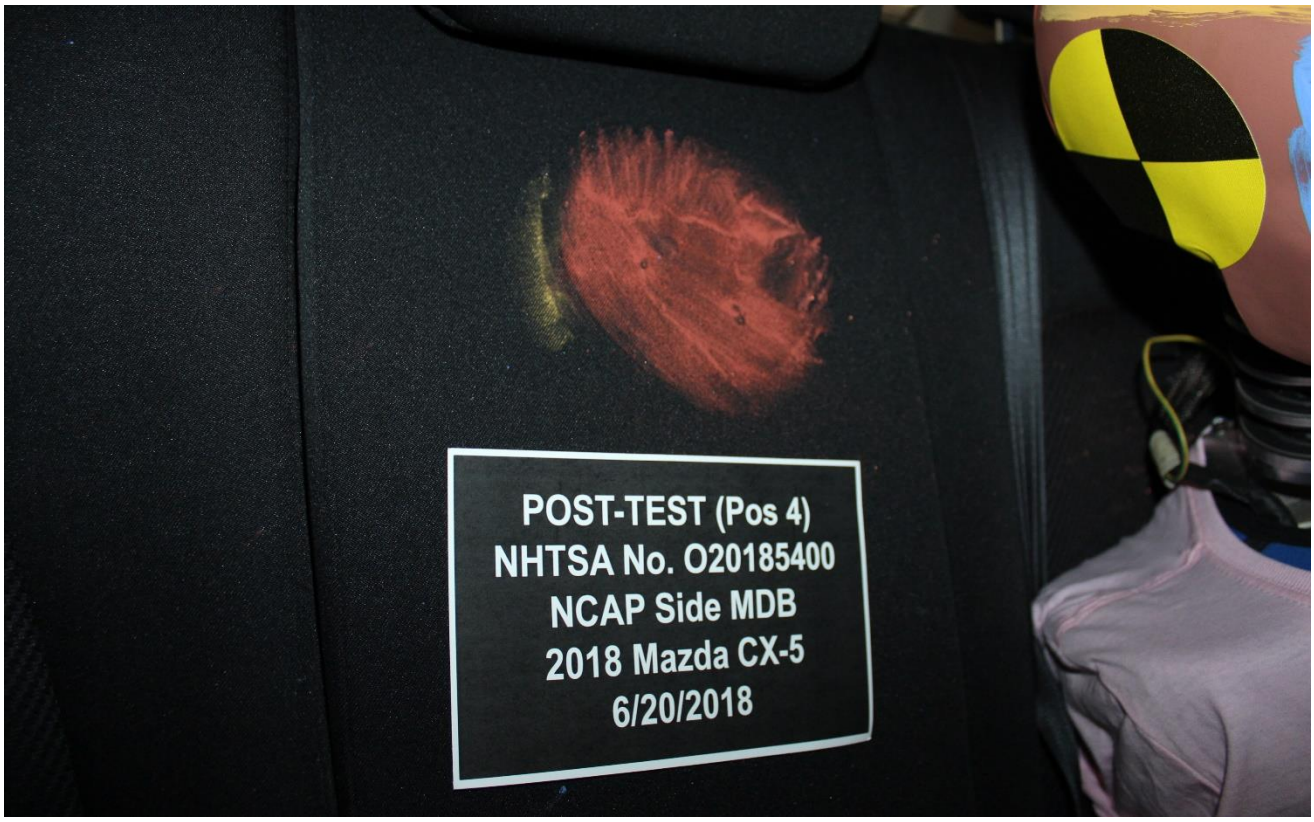


Figure A-75: Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View

Figure A-76: Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Air Bag View

Figure A-77: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View

Photo Not Applicable

Figure A-78: Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Air Bag View

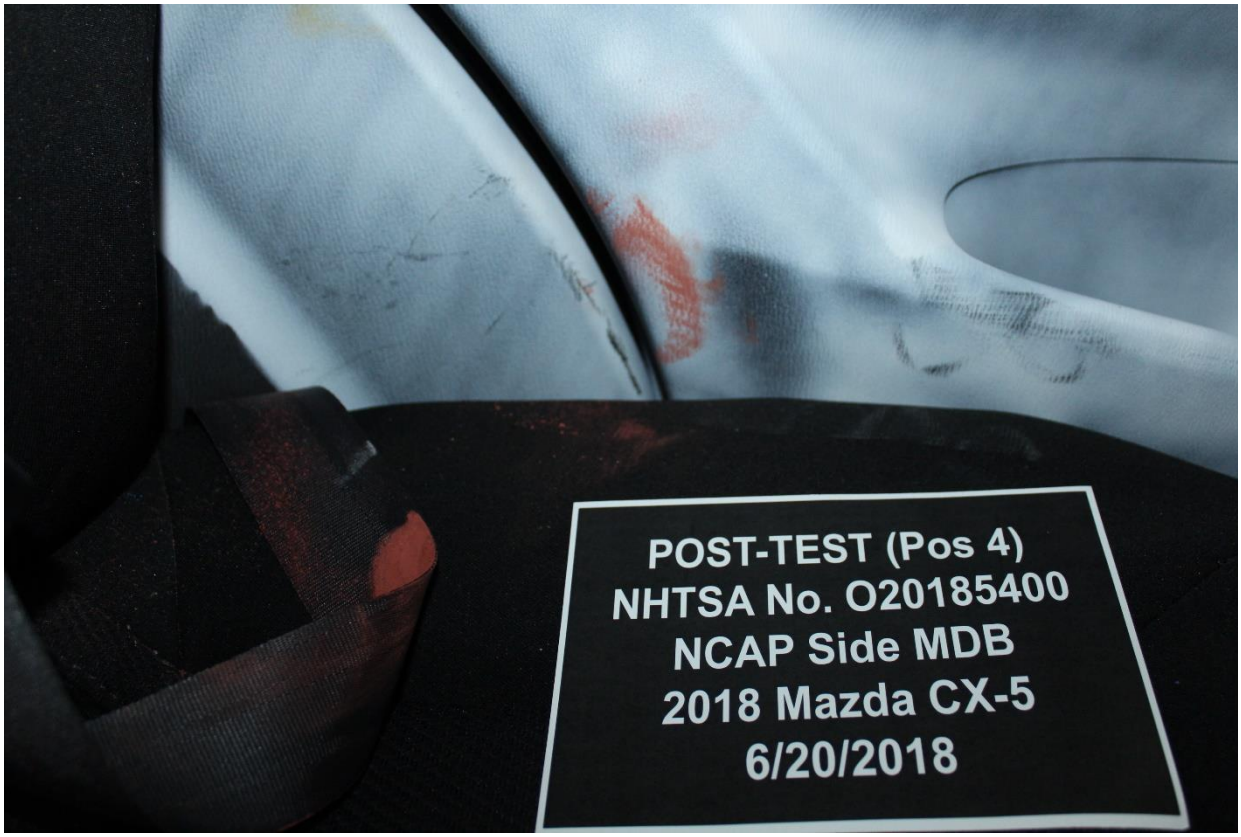


Figure A-79: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View

Photo Not Applicable

Figure A-80: Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Air Bag View

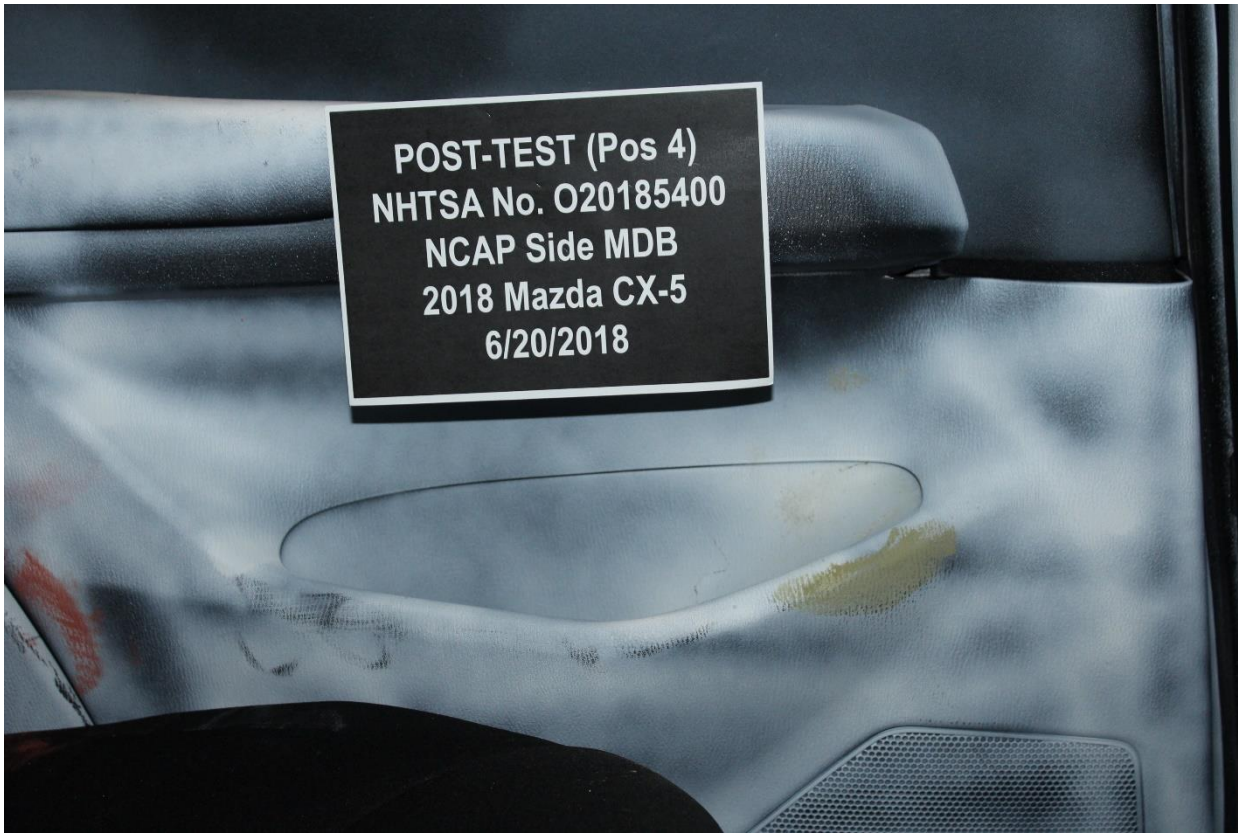


Figure A-81: Post-Test Rear Passenger Dummy Close-Up Knee Contact View

Figure A-82: Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

Figure A-83: Post-Test View of Fuel Filler Cap or Fuel Filler Neck

Figure A-84: Pre-Test Front View of MDB Impactor Face

Figure A-85: Post-Test Front View of MDB Impactor Face

Figure A-86: Pre-Test Top View of MDB Impactor Face

Figure A-87: Post-Test Top View of MDB Impactor Face

Figure A-88: Pre-Test Left Side View of MDB Impactor Face

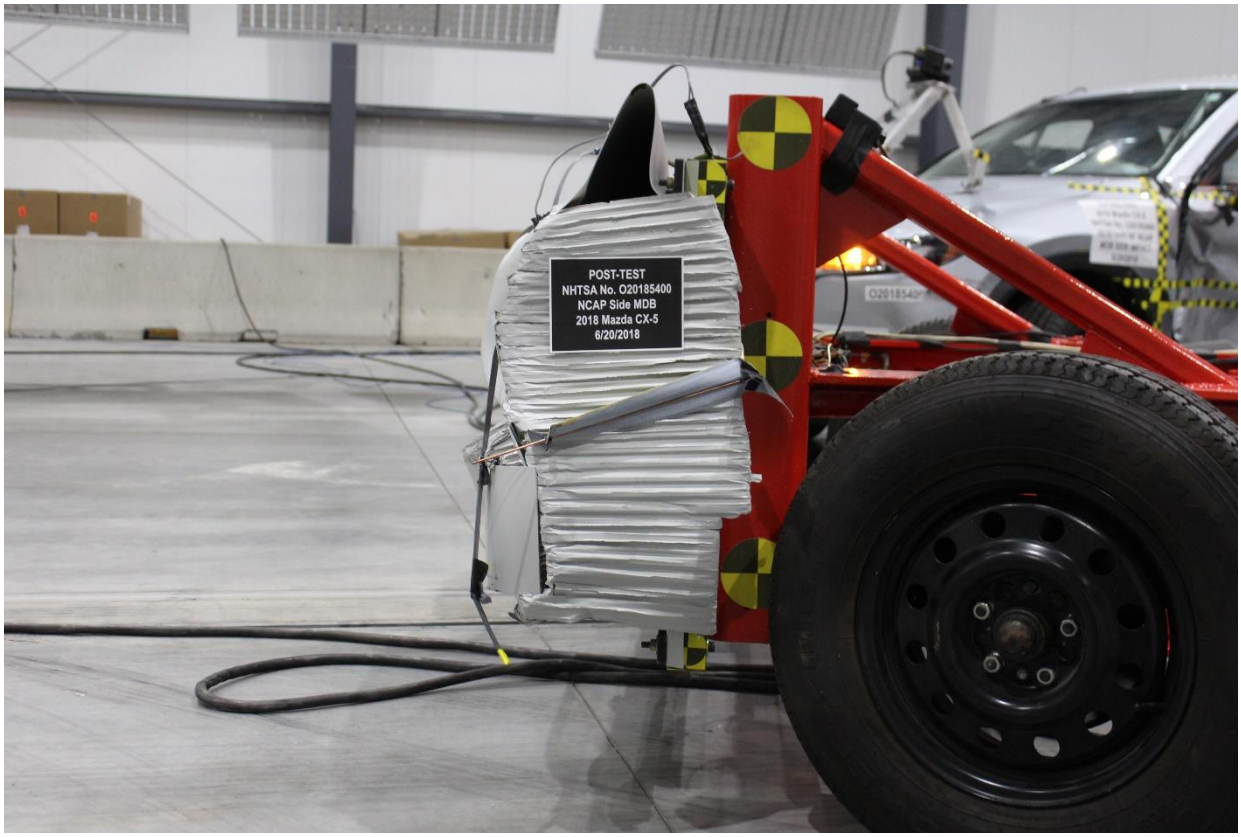


Figure A-89: Post-Test Left Side View of MDB Impactor Face

Figure A-90: Pre-Test Right Side View of MDB Impactor Face

Figure A-91: Post-Test Right Side View of MDB Impactor Face

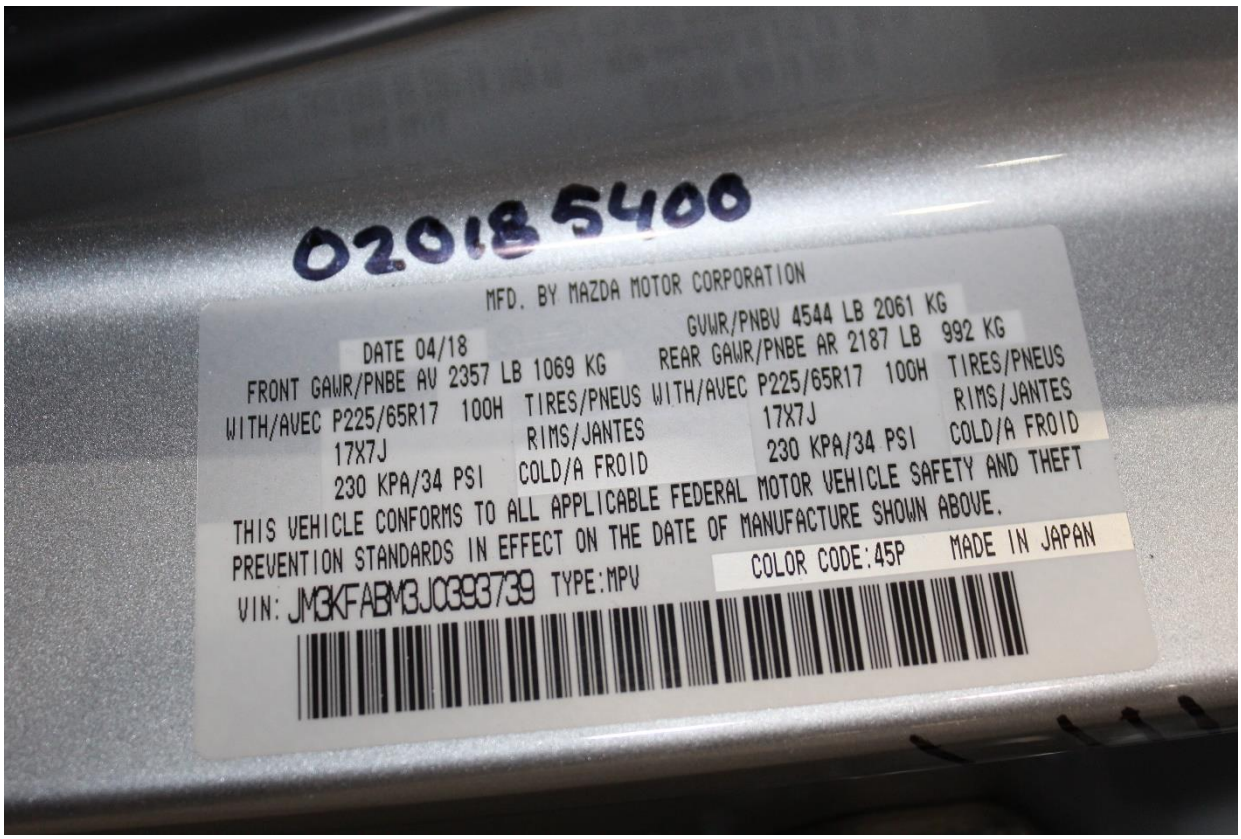


Figure A-92: Close-Up View of Vehicle's Certification Label

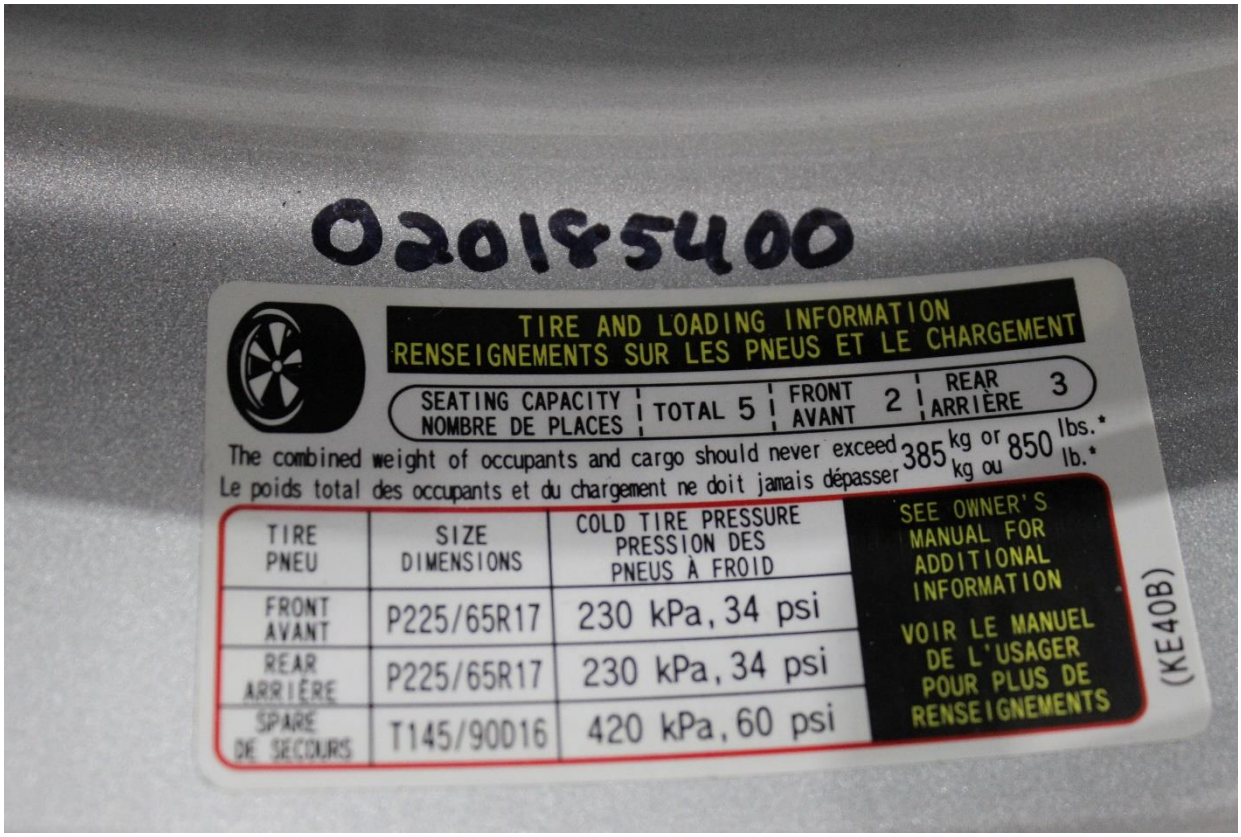


Figure A-93: Close-Up View of Vehicle's Tire Information Placard or Label

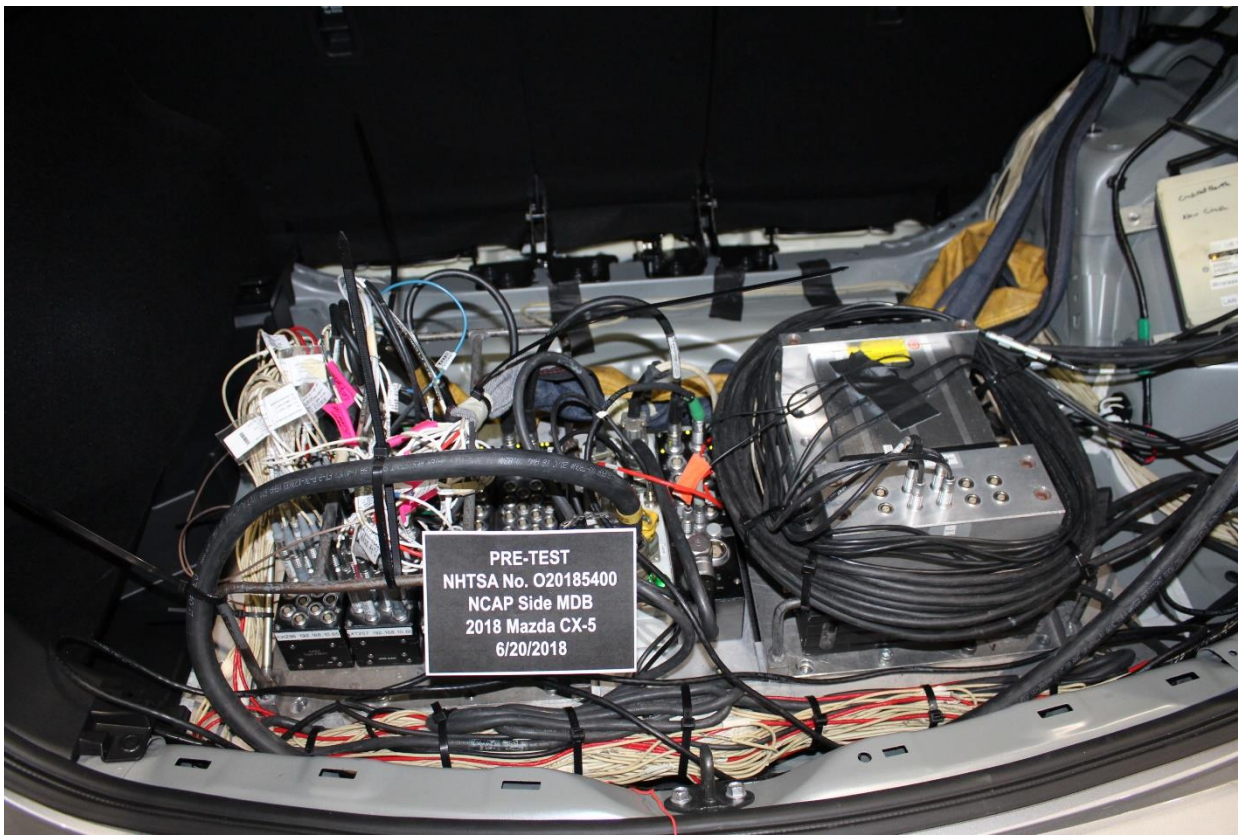


Figure A-94: Pre-Test Ballast View

Figure A-95: Post-Test Primary and Redundant Speed Trap Read-Out

Figure A-96: FMVSS No. 301 Static Rollover 0 Degrees

Figure A-97: FMVSS No. 301 Static Rollover 90 Degrees

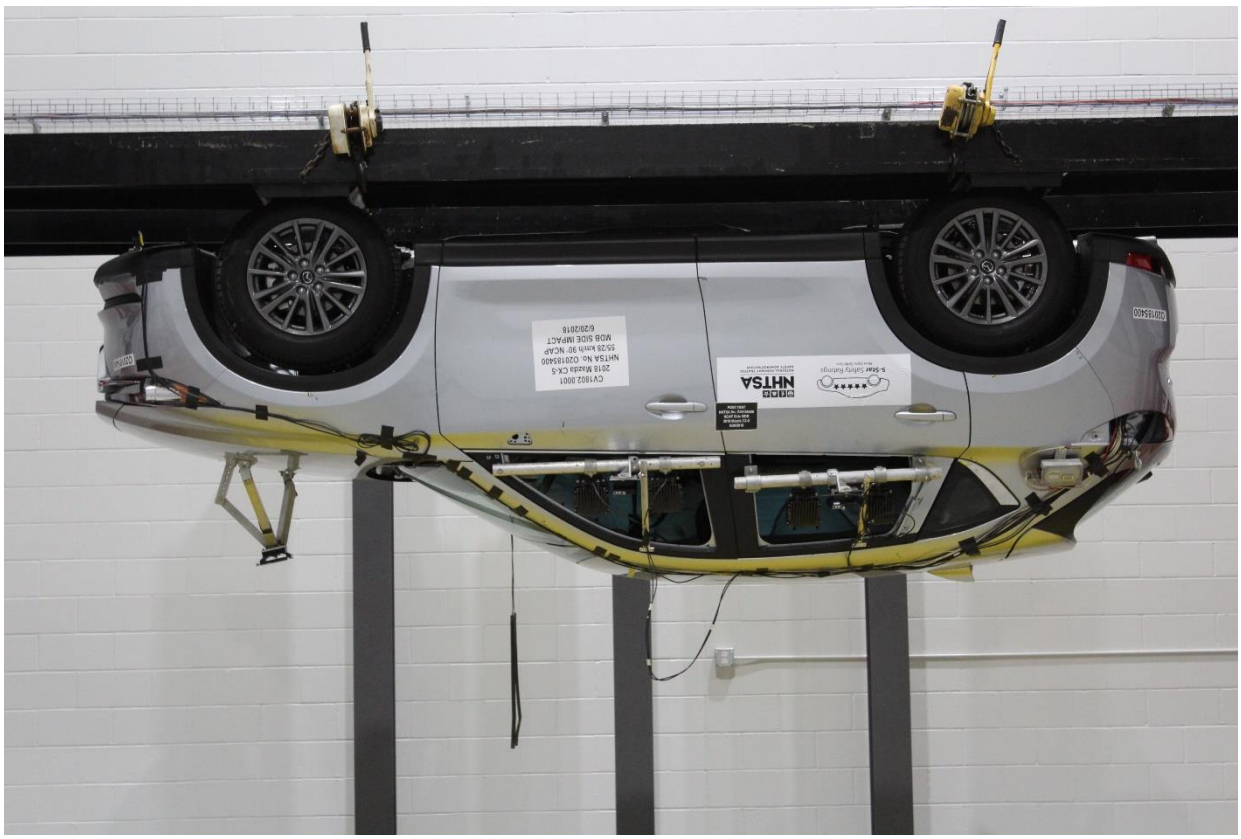


Figure A-98: FMVSS No. 301 Static Rollover 180 Degrees

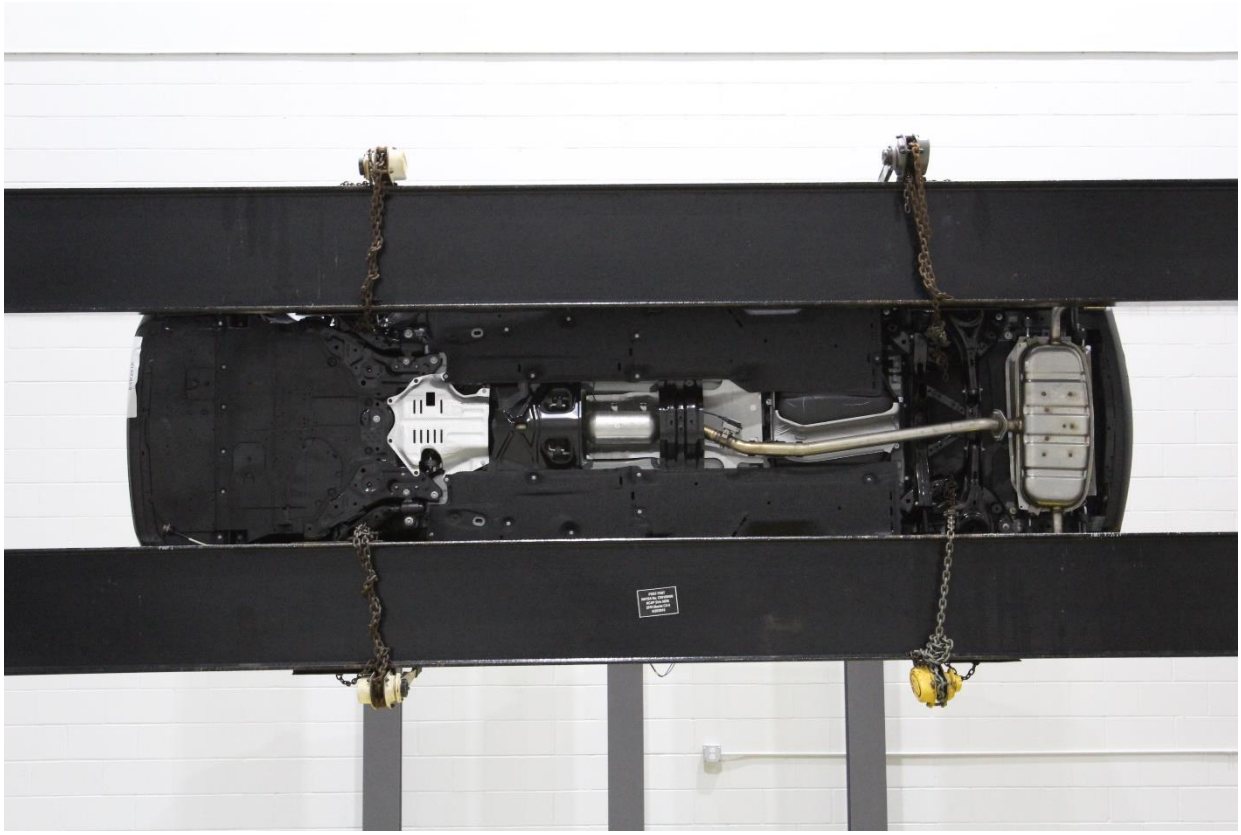


Figure A-99: FMVSS No. 301 Static Rollover 270 Degrees

Figure A-100: FMVSS No. 301 Static Rollover 360 Degrees

Figure A-101: Impact Event

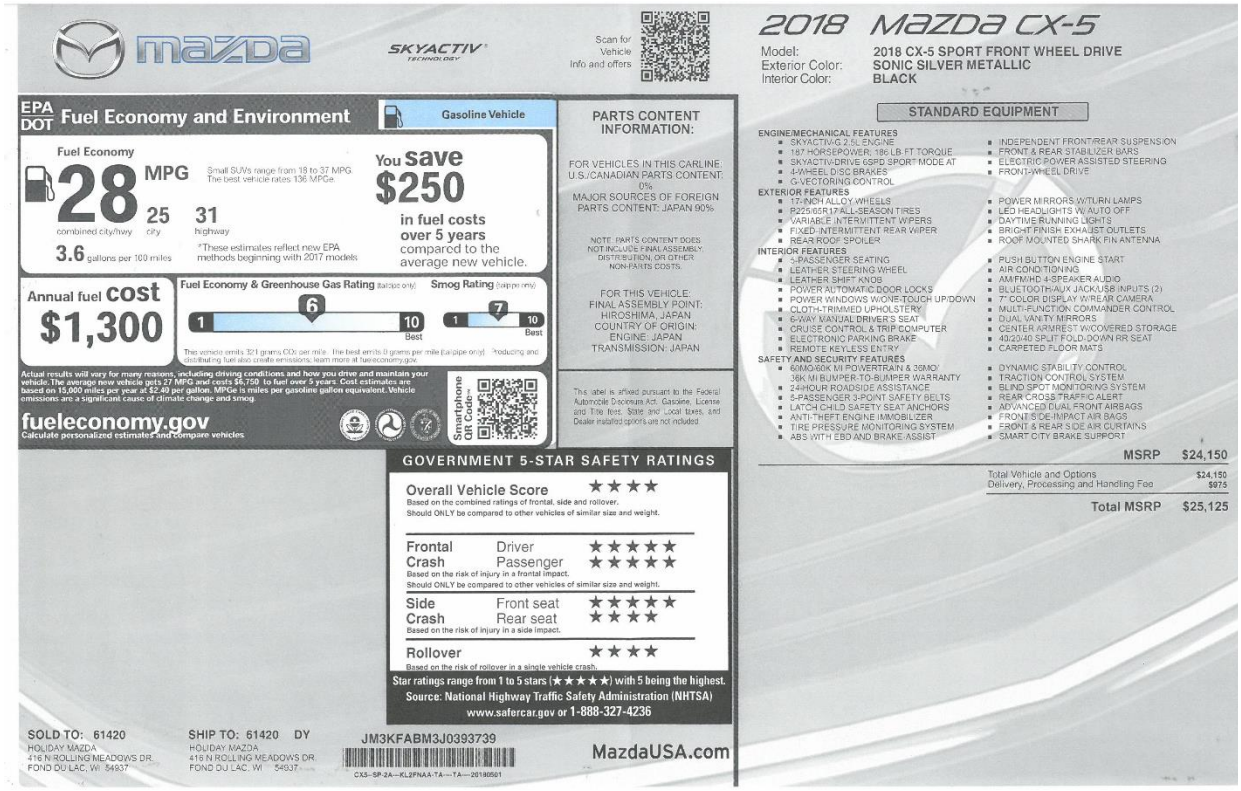
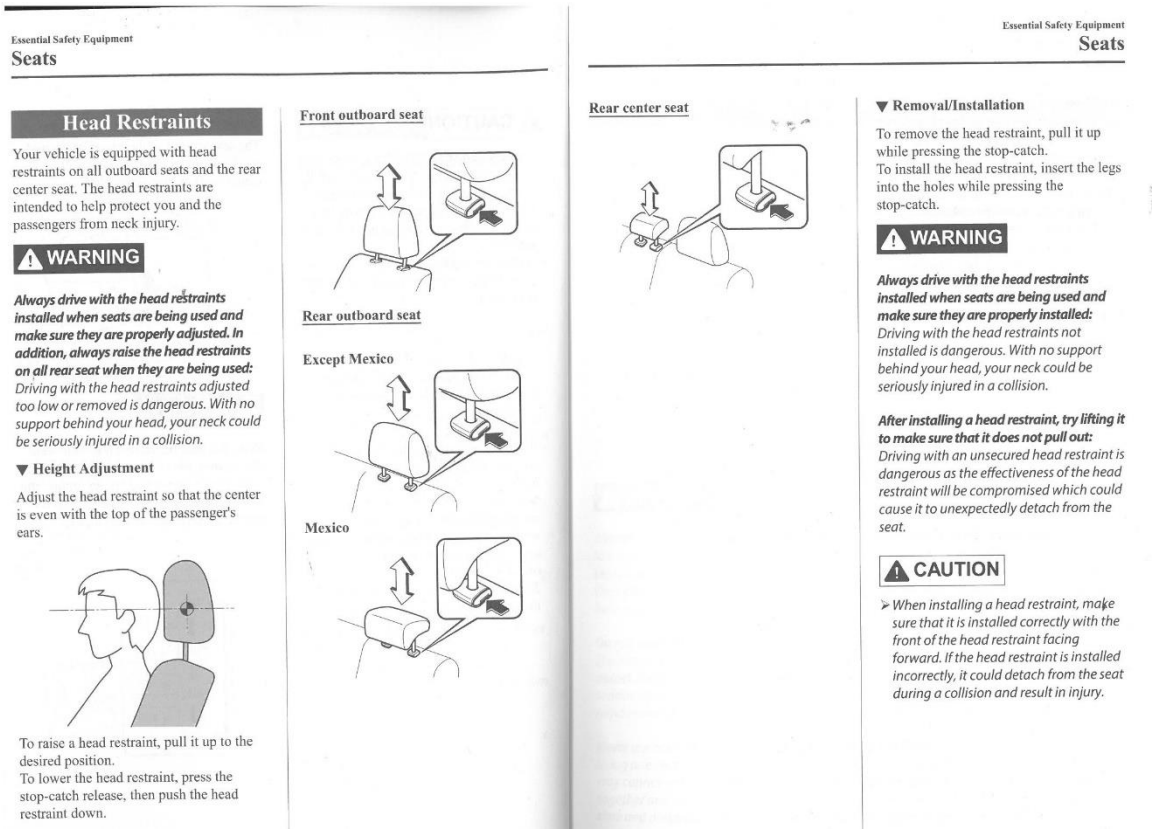


Figure A-102: Monroney Label



Essential Safety Equipment
Seats

Head Restraints

Your vehicle is equipped with head restraints on all outboard seats and the rear center seat. The head restraints are intended to help protect you and the passengers from neck injury.

WARNING

Always drive with the head restraints installed when seats are being used and make sure they are properly adjusted. In addition, always raise the head restraints on all rear seat when they are being used:
Driving with the head restraints adjusted too low or removed is dangerous. With no support behind your head, your neck could be seriously injured in a collision.

▼ **Height Adjustment**

Adjust the head restraint so that the center is even with the top of the passenger's ears.

To raise a head restraint, pull it up to the desired position.
To lower the head restraint, press the stop-catch release, then push the head restraint down.

Front outboard seat

Rear outboard seat

Except Mexico

Mexico

Essential Safety Equipment
Seats

Rear center seat

▼ **Removal/Installation**

To remove the head restraint, pull it up while pressing the stop-catch.
To install the head restraint, insert the legs into the holes while pressing the stop-catch.

WARNING

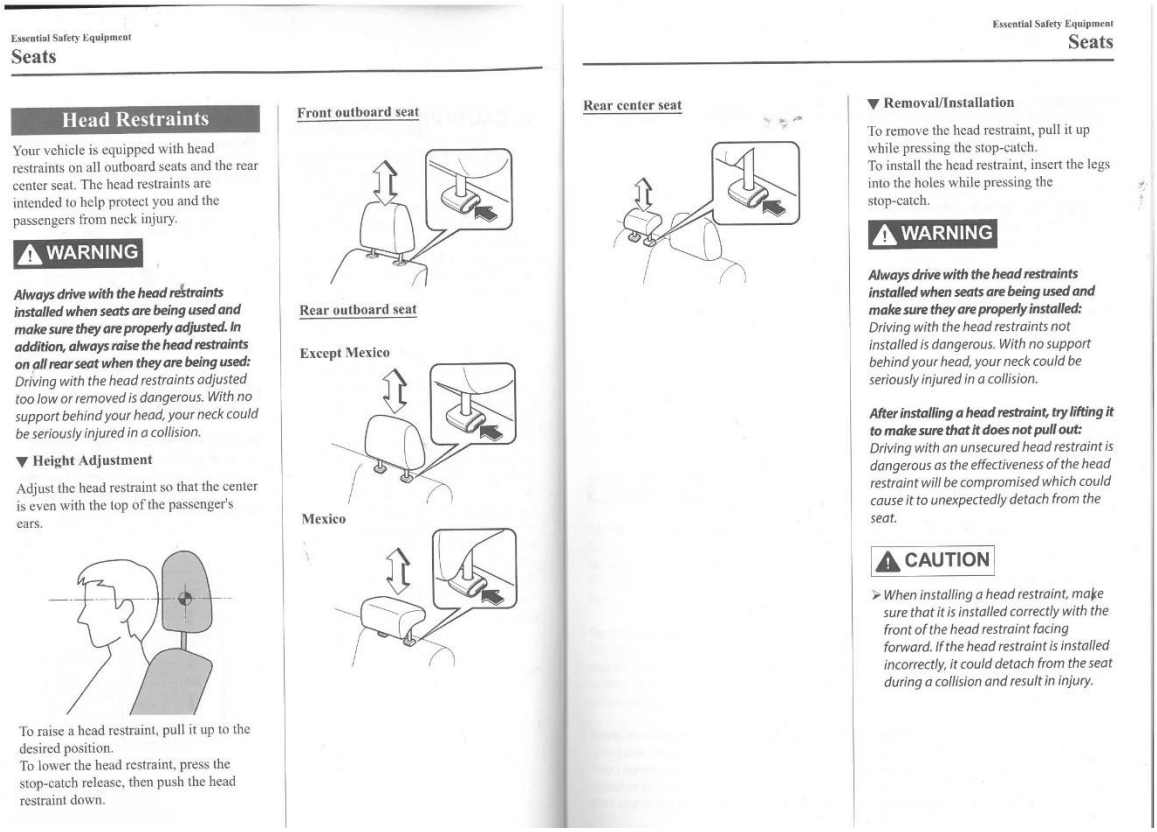
Always drive with the head restraints installed when seats are being used and make sure they are properly installed:
Driving with the head restraints not installed is dangerous. With no support behind your head, your neck could be seriously injured in a collision.

After installing a head restraint, try lifting it to make sure that it does not pull out:
Driving with an unsecured head restraint is dangerous as the effectiveness of the head restraint will be compromised which could cause it to unexpectedly detach from the seat.

CAUTION

➢ *When installing a head restraint, make sure that it is installed correctly with the front of the head restraint facing forward. If the head restraint is installed incorrectly, it could detach from the seat during a collision and result in injury.*

Figure A-103: Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual



Essential Safety Equipment
Seats

Head Restraints

Your vehicle is equipped with head restraints on all outboard seats and the rear center seat. The head restraints are intended to help protect you and the passengers from neck injury.

WARNING

Always drive with the head restraints installed when seats are being used and make sure they are properly adjusted. In addition, always raise the head restraints on all rear seat when they are being used:
Driving with the head restraints adjusted too low or removed is dangerous. With no support behind your head, your neck could be seriously injured in a collision.

▼ **Height Adjustment**

Adjust the head restraint so that the center is even with the top of the passenger's ears.

To raise a head restraint, pull it up to the desired position.
To lower the head restraint, press the stop-catch release, then push the head restraint down.

Front outboard seat

Rear outboard seat

Except Mexico

Mexico

Essential Safety Equipment
Seats

Rear center seat

▼ **Removal/Installation**

To remove the head restraint, pull it up while pressing the stop-catch.
To install the head restraint, insert the legs into the holes while pressing the stop-catch.

WARNING

Always drive with the head restraints installed when seats are being used and make sure they are properly installed:
Driving with the head restraints not installed is dangerous. With no support behind your head, your neck could be seriously injured in a collision.

After installing a head restraint, try lifting it to make sure that it does not pull out:
Driving with an unsecured head restraint is dangerous as the effectiveness of the head restraint will be compromised which could cause it to unexpectedly detach from the seat.

CAUTION

➢ *When installing a head restraint, make sure that it is installed correctly with the front of the head restraint facing forward. If the head restraint is installed incorrectly, it could detach from the seat during a collision and result in injury.*

Figure A-104: Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual-Rear Restraints Not Adjustable

APPENDIX B

VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver & Passenger Dummy Instrumentation Plots

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

Additional Driver & Passenger Dummy Instrumentation Data

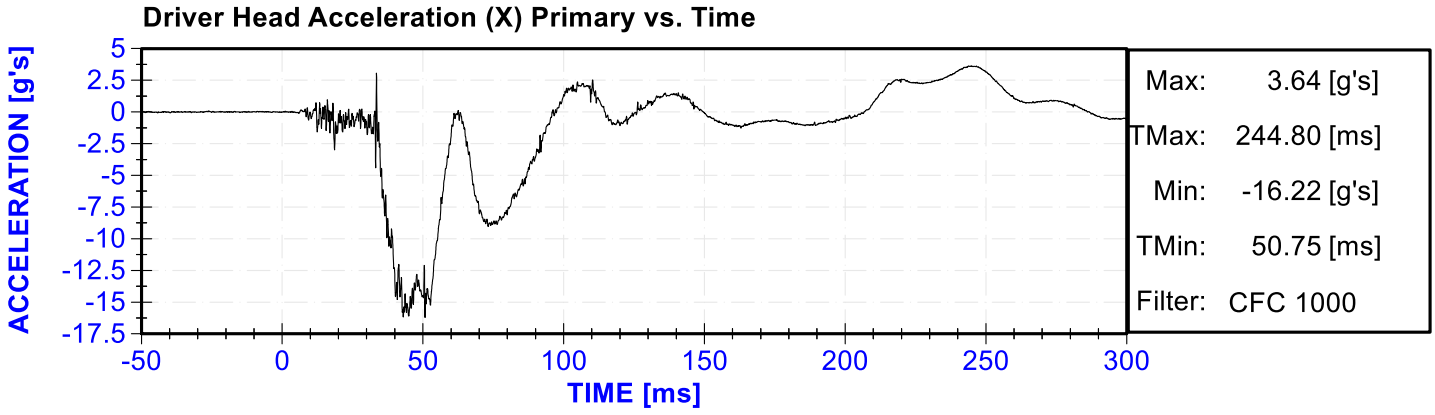
Driver Lower Spine T12 Acceleration (X)
Driver Lower Spine T12 Acceleration (Y)
Driver Lower Spine T12 Acceleration (Z)
Passenger Upper Thorax Rib Deflection (Y)
Passenger Middle Thorax Rib Deflection (Y)
Passenger Lower Thorax Rib Deflection (Y)
Passenger Upper Abdomen Rib Deflection (Y)
Passenger Lower Abdomen Rib Deflection (Y)
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Passenger Head Acceleration Redundant (X)
Passenger Head Acceleration Redundant (Y)
Passenger Head Acceleration Redundant (Z)

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Right Side Sill at Front Seat Acceleration (X)
Right Side Sill at Front Seat Acceleration (Y)
Right Side Sill at Front Seat Acceleration (Z)
Right Side Sill at Rear Seat Acceleration (X)
Right Side Sill at Rear Seat Acceleration (Y)
Right Side Sill at Rear Seat Acceleration (Z)
Left Side Sill at Front Seat Acceleration (Y)
Left Side Sill at Rear Seat Acceleration (Y)
Lower A-Post Acceleration (Y)
Middle A-Post Acceleration (Y)
Lower B-Post Acceleration (Y)
Middle B-Post Acceleration (Y)
Front Seat Track Acceleration (Y)
Rear Seat Structure Acceleration (Y)
Right Rear Occupant Compartment Acceleration (Y)
Engine Block (X)
Engine Block (Y)
Rear Floorpan Above Axle Acceleration (X)
Rear Floorpan Above Axle Acceleration (Y)
Rear Floorpan Above Axle Acceleration (Z)

MDB Instrumentation Data

MDB Center of Gravity Acceleration (X)
MDB Center of Gravity Acceleration (Y)
MDB Center of Gravity Acceleration (Z)
MDB Rear Acceleration (X)
MDB Rear Acceleration (Y)
Left MDB Contact Switch
Right MDB Contact Switch


Driver Head Acceleration (X) Primary vs. Time
ACCELERATION [g's]
TIME [ms]
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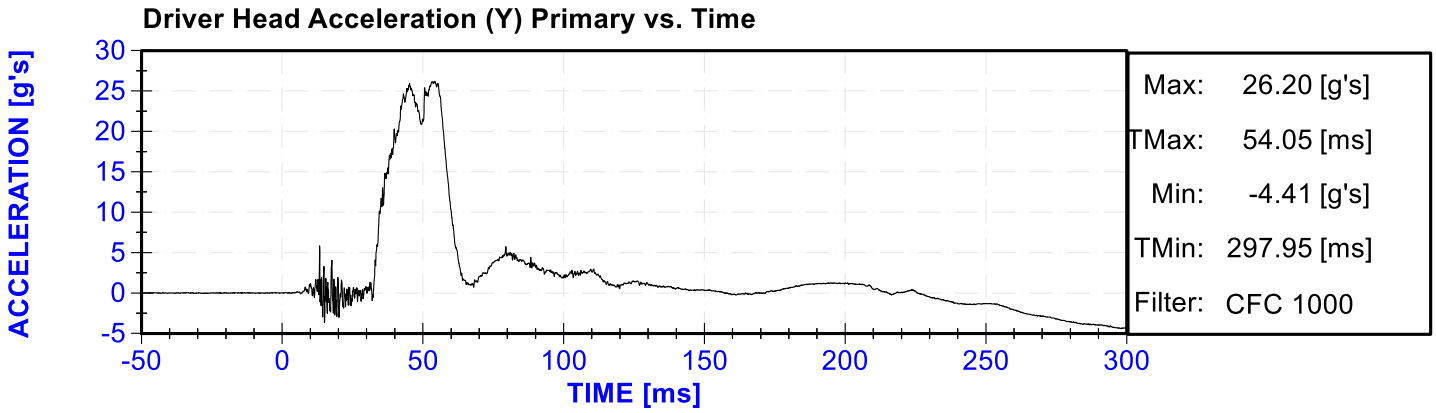
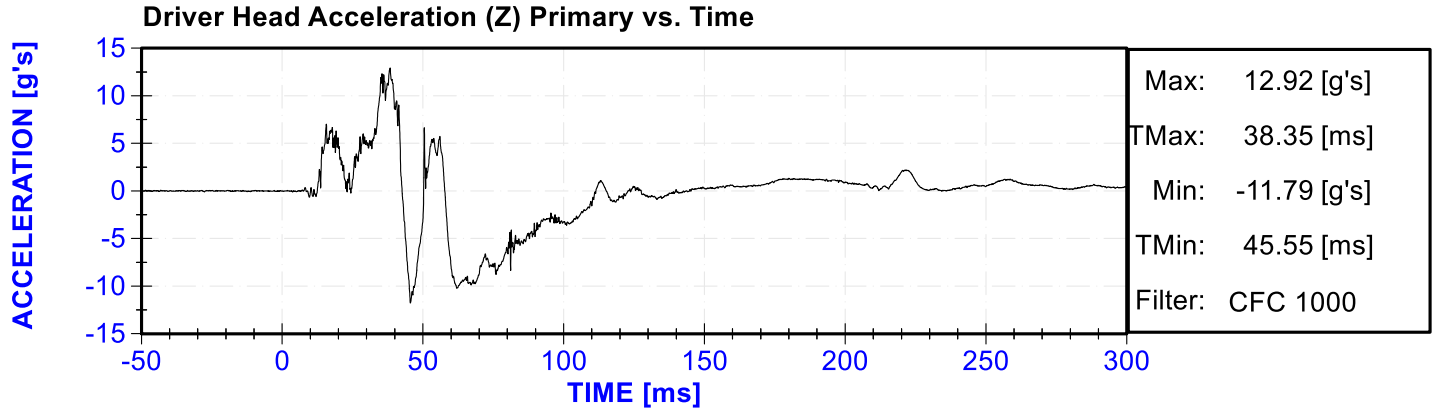
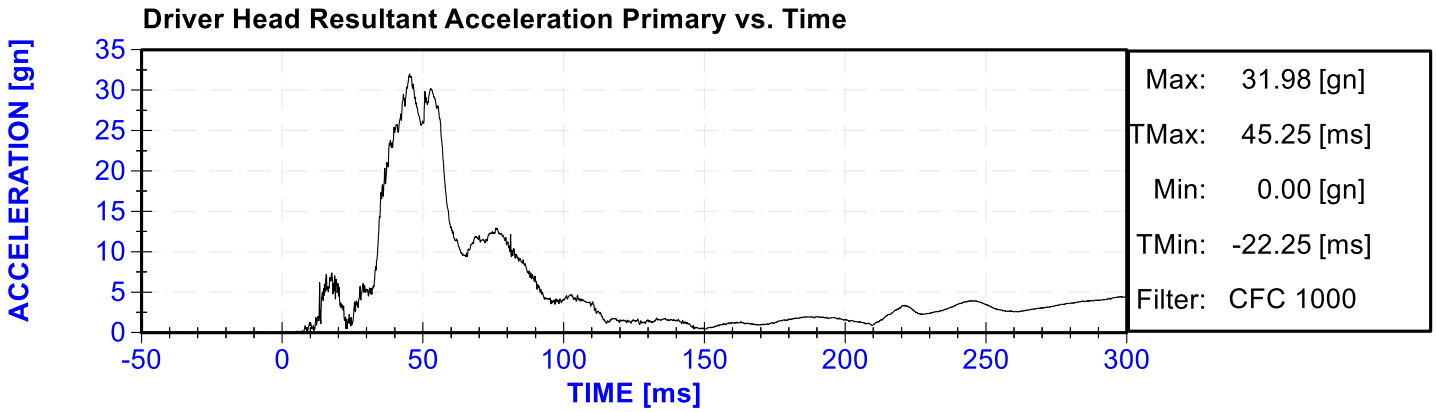
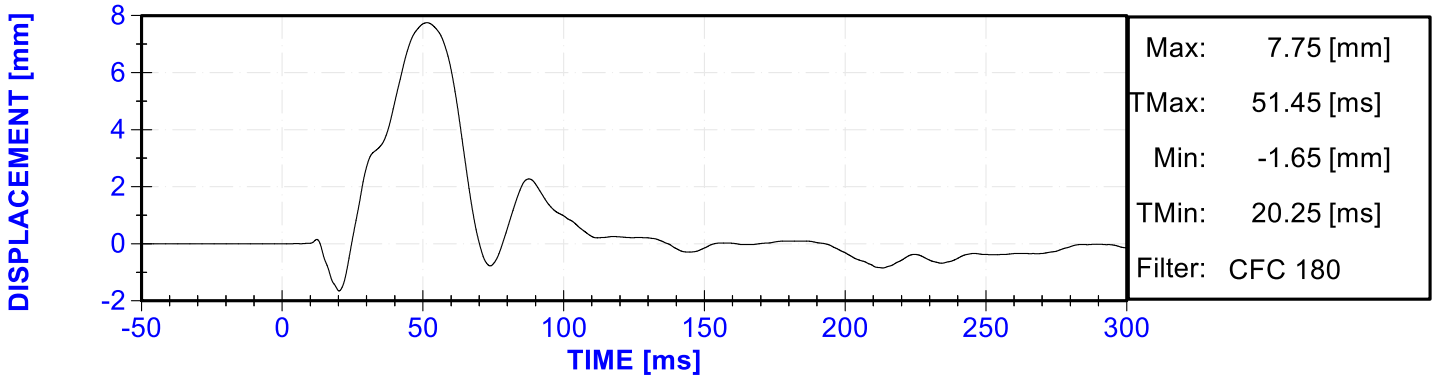
TMax: 244.80 [ms]
Min: -16.22 [g's]
TMin: 50.75 [ms]
Filter: CFC 1000


Driver Head Acceleration (Y) Primary vs. Time
ACCELERATION [g's]
TIME [ms]
Max: 26.20 [g's]
TMax: 54.05 [ms]
Min: -4.41 [g's]
TMin: 297.95 [ms]
Filter: CFC 1000

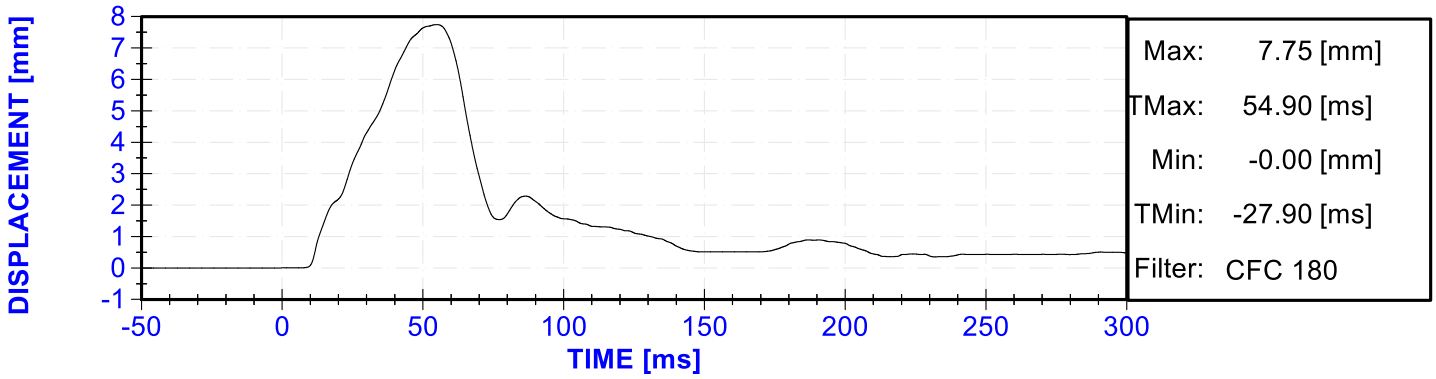

Driver Head Acceleration (Z) Primary vs. Time
ACCELERATION [g's]
TIME [ms]
Max: 12.92 [g's]
TMax: 38.35 [ms]
Min: -11.79 [g's]
TMin: 45.55 [ms]
Filter: CFC 1000


Driver Head Resultant Acceleration Primary vs. Time
ACCELERATION [gn]
TIME [ms]
Max: 31.98 [gn]
TMax: 45.25 [ms]
Min: 0.00 [gn]
TMin: -22.25 [ms]
Filter: CFC 1000

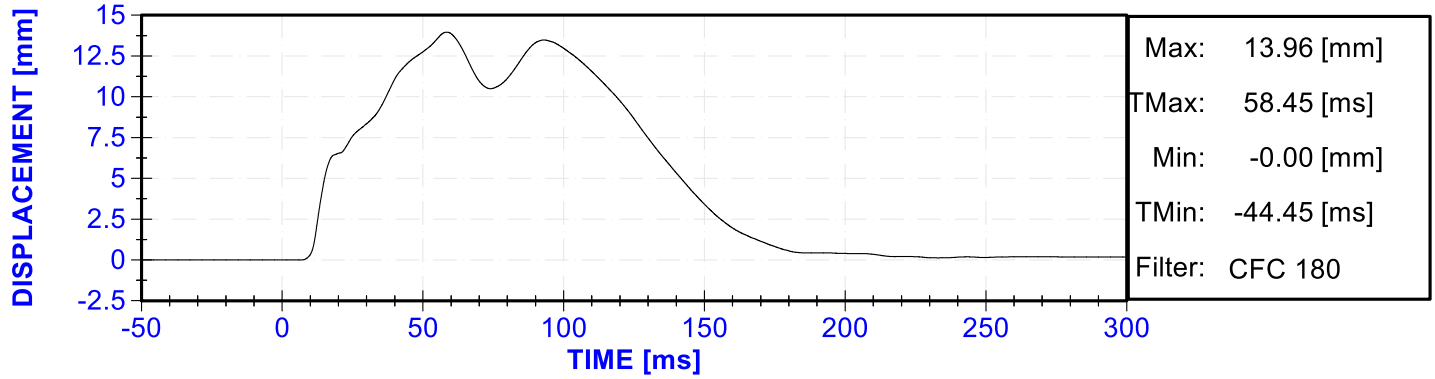
Driver Upper Thorax Rib Deflection (Y) vs. Time



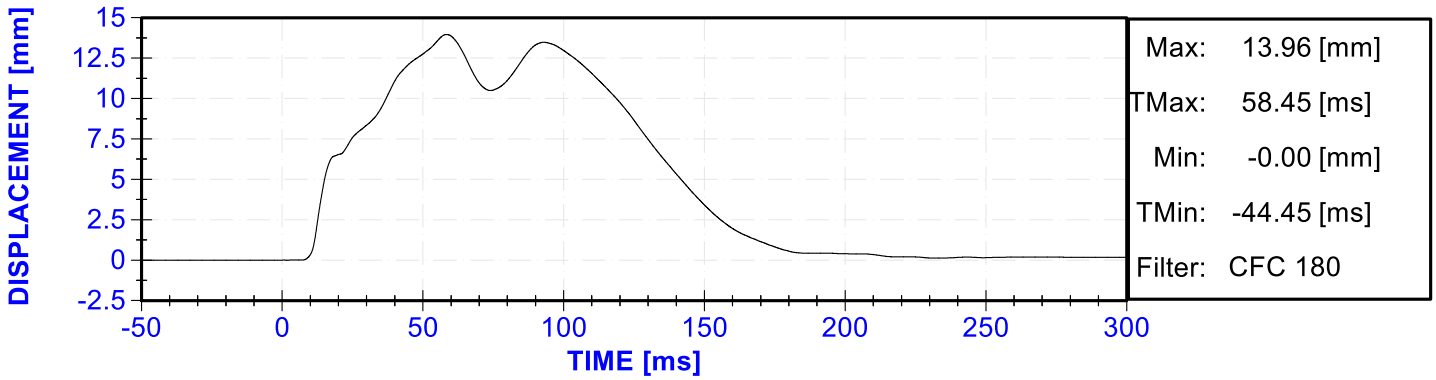
Driver Middle Thorax Rib Deflection (Y) vs. Time



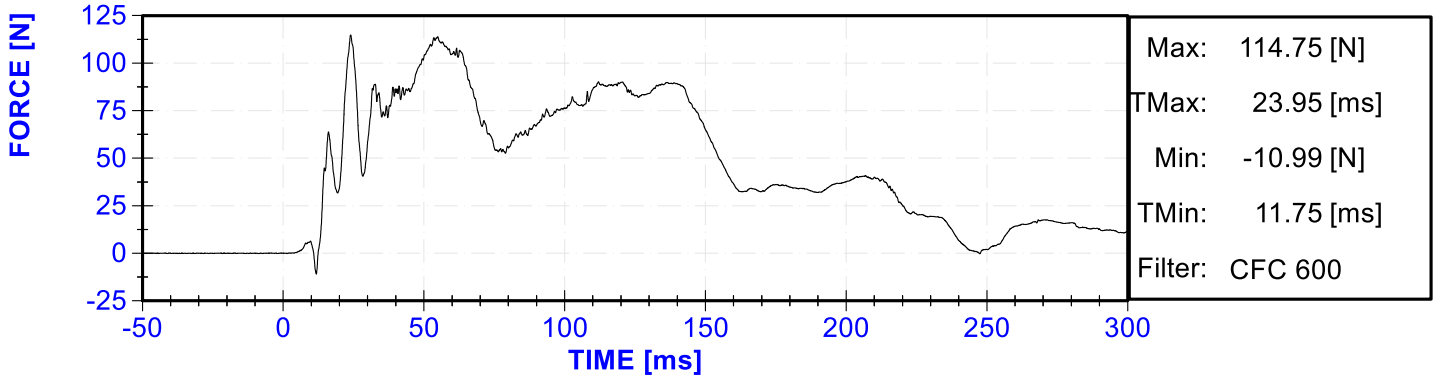
Driver Lower Thorax Rib Deflection (Y) vs. Time



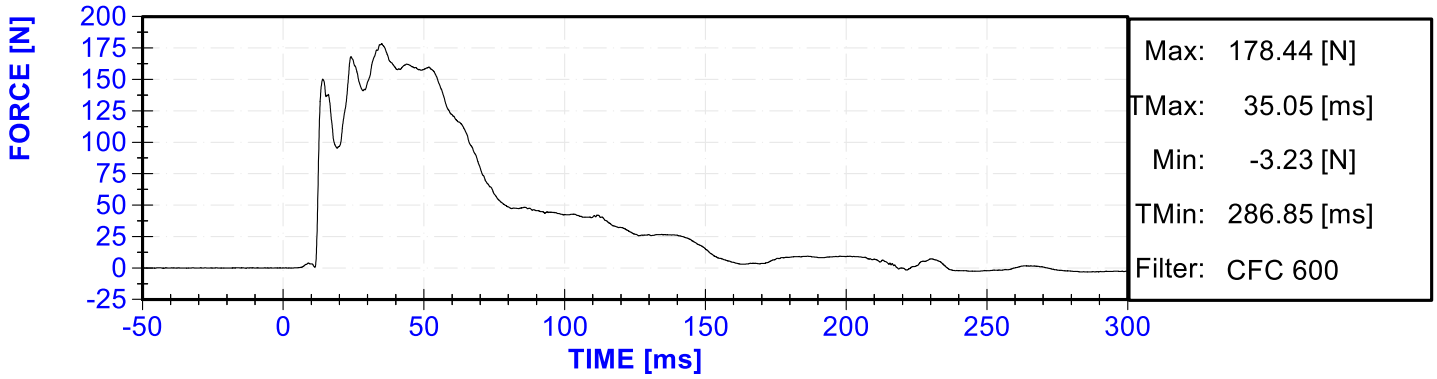
Driver Thorax Rib Deflection Maximum vs. Time



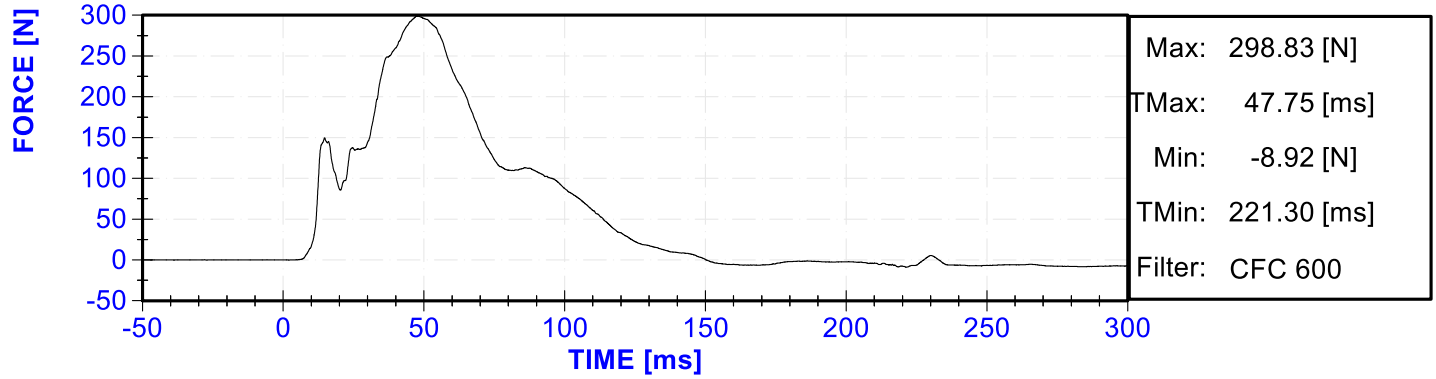
Driver Anterior Abdominal Force (Y) vs. Time



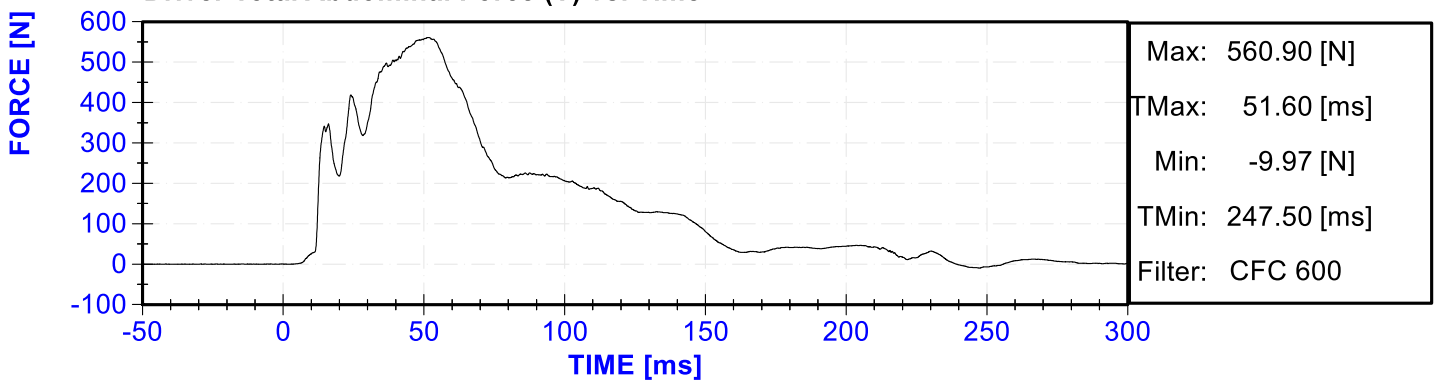
Driver Middle Abdominal Force (Y) vs. Time



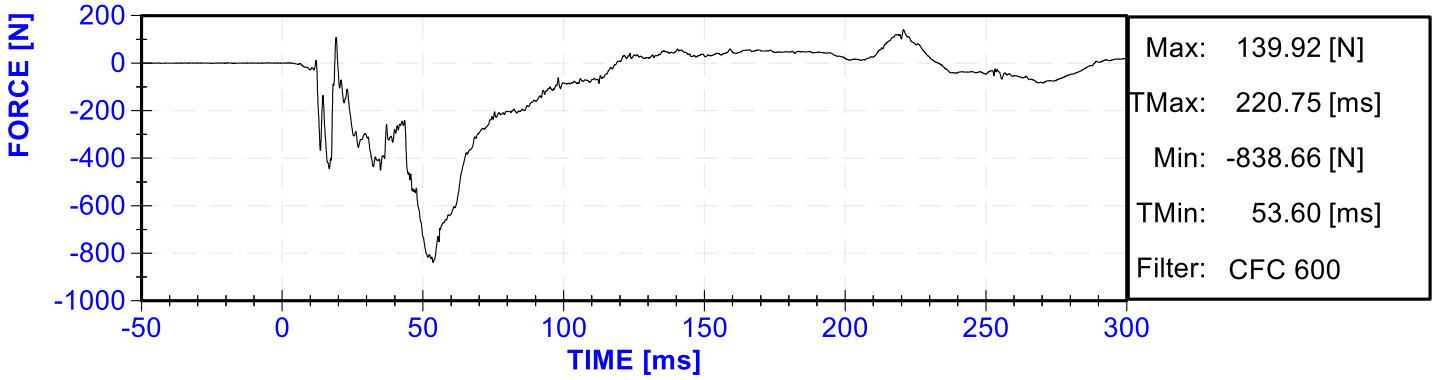
Driver Posterior Abdominal Force (Y) vs. Time



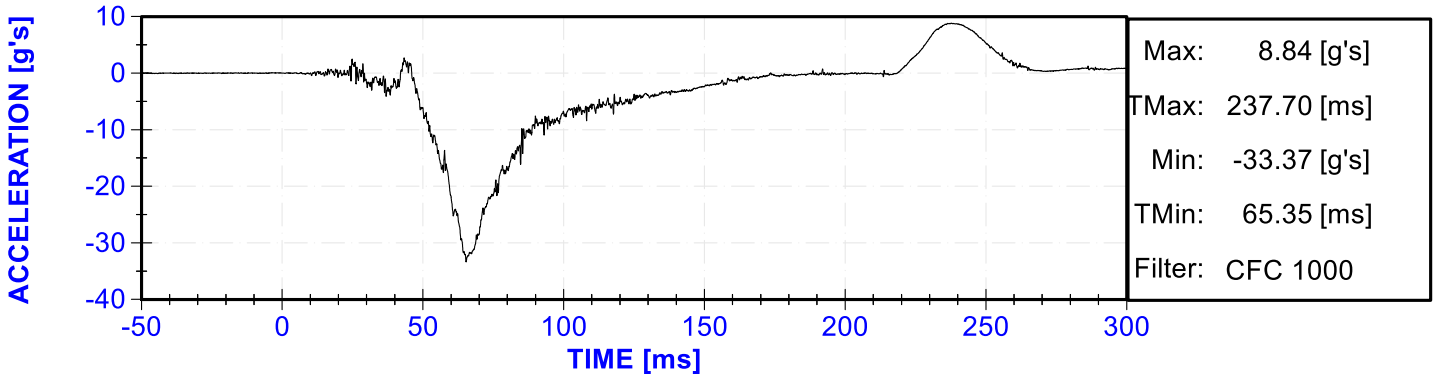
Driver Total Abdominal Force (Y) vs. Time



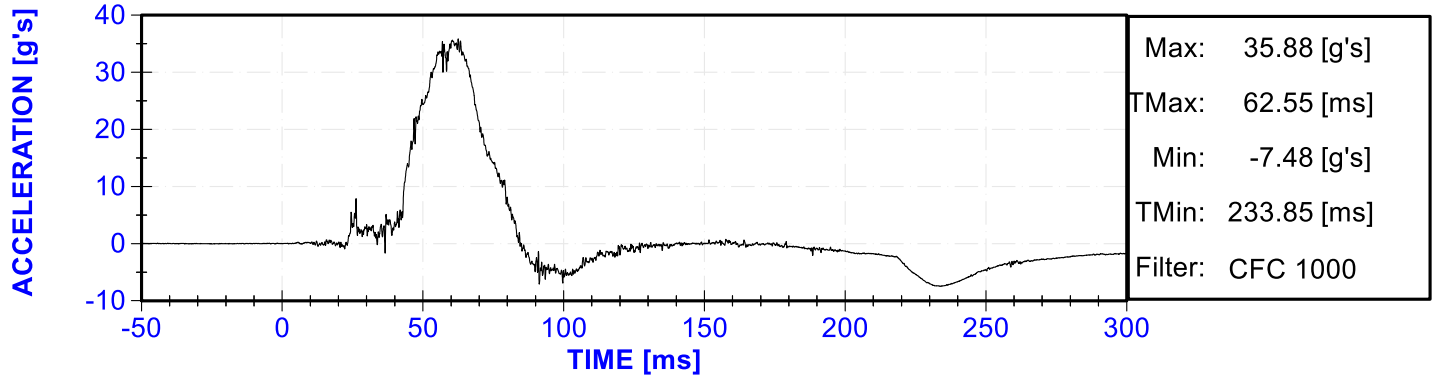
Driver Pubic Symphysis Force (Y) vs. Time



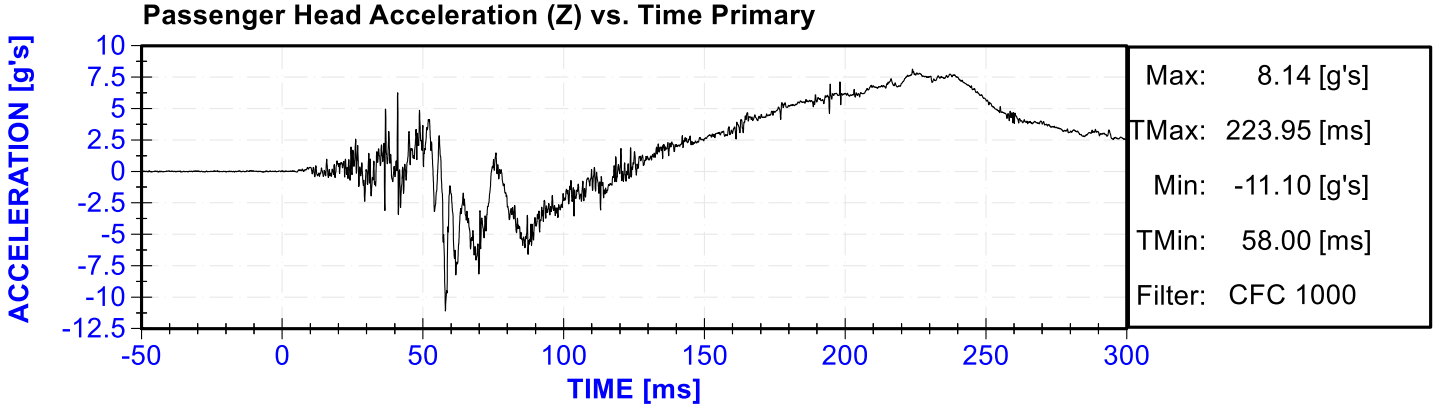
Passenger Head Acceleration (X) vs. Time Primary



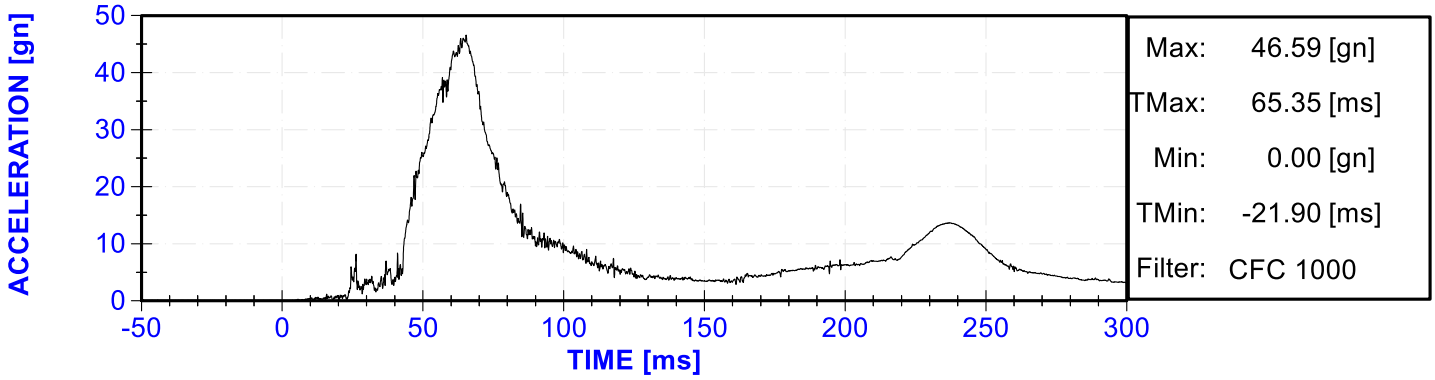
Passenger Head Acceleration (Y) vs. Time Primary



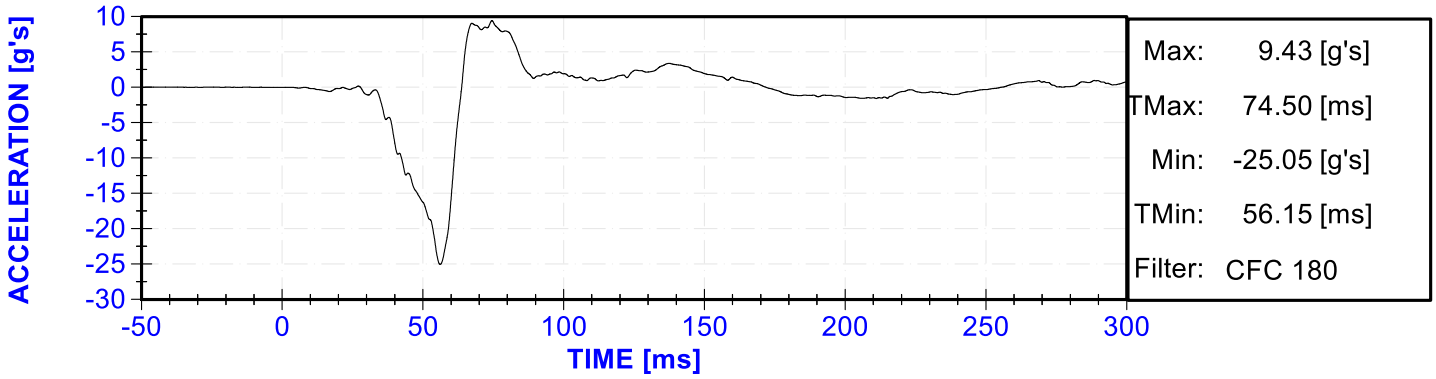
Passenger Head Acceleration (Z) vs. Time Primary



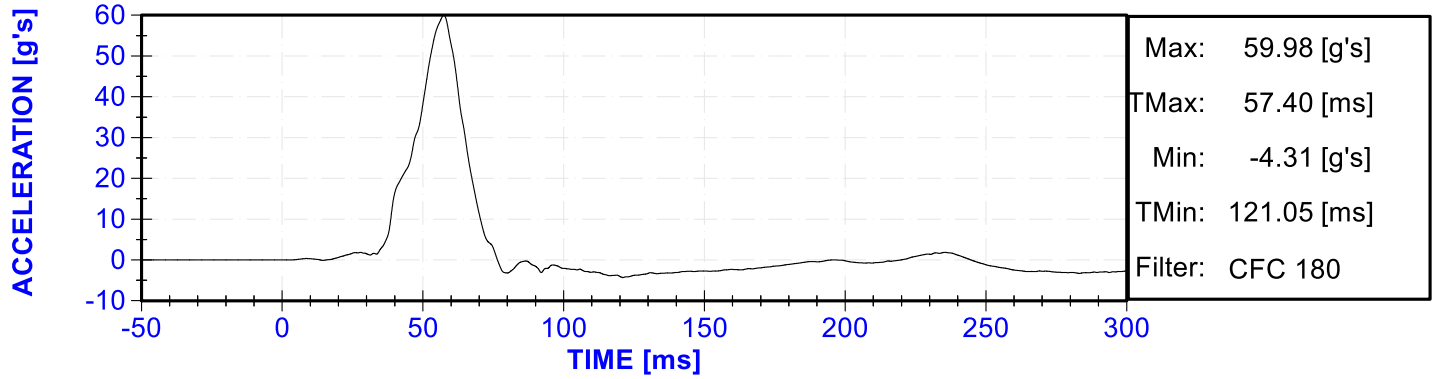
Passenger Head Resultant Acceleration Primary vs. Time



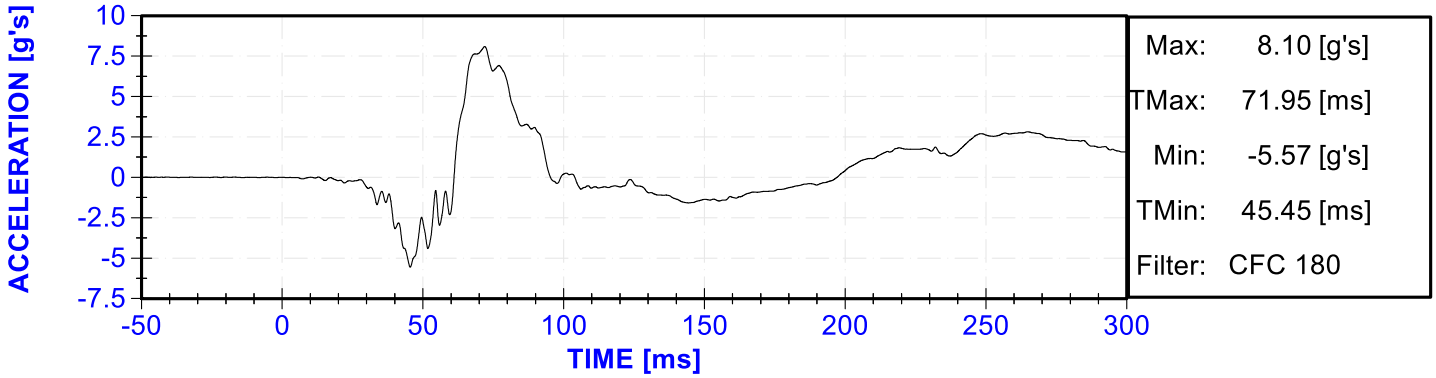
Passenger Lower Spine T12 Acceleration (X) vs. Time



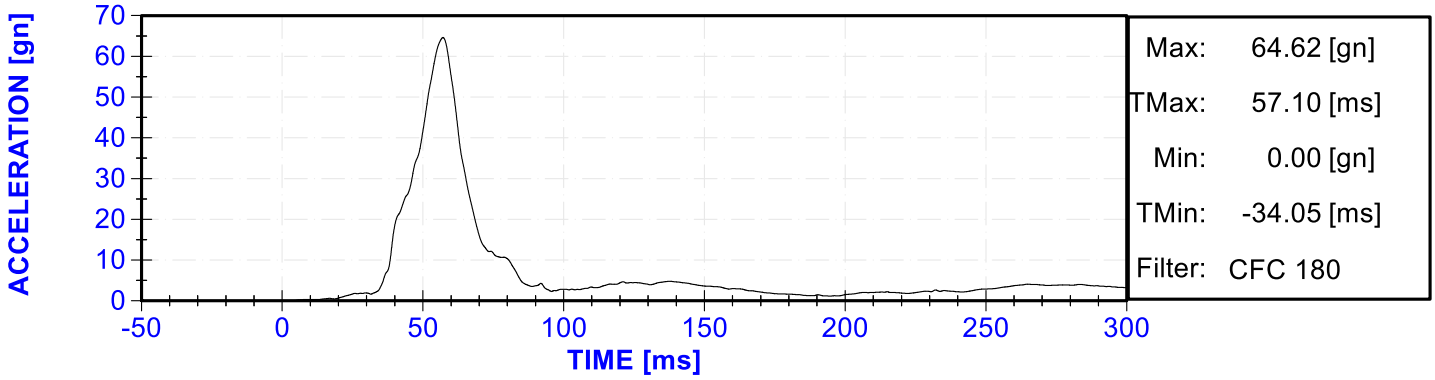
Passenger Lower Spine T12 Acceleration (Y) vs. Time



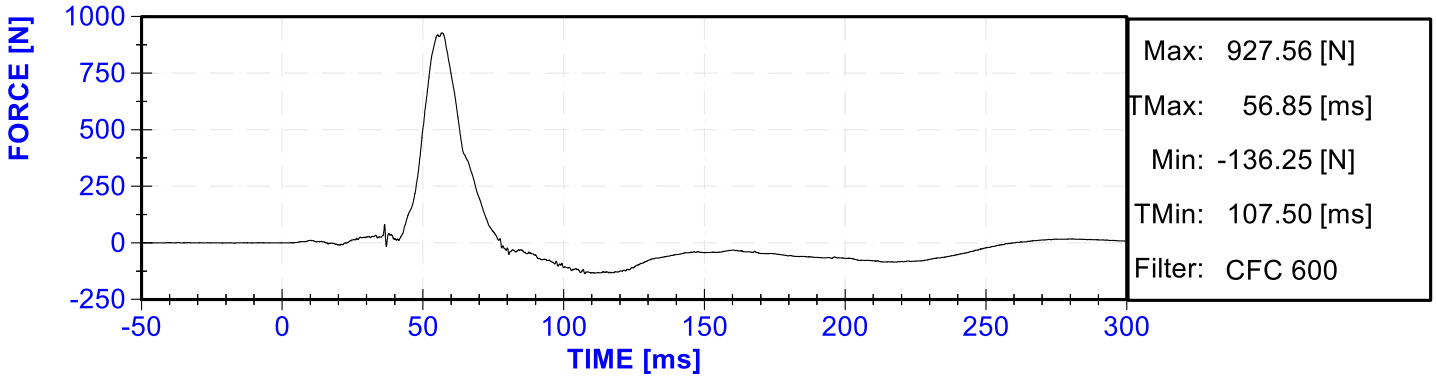
Passenger Lower Spine T12 Acceleration (Z) vs. Time



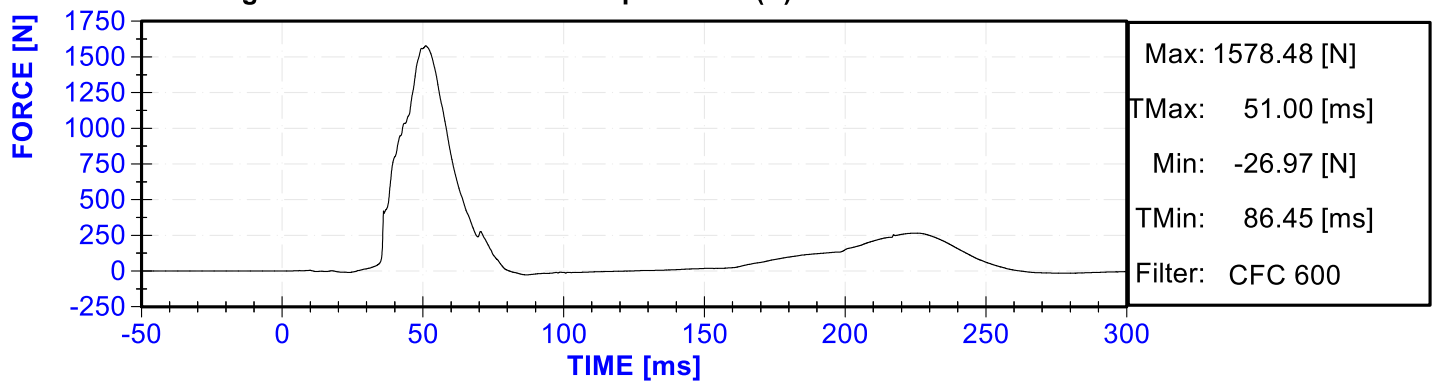
Passenger Lower Spine T12 Resultant Acceleration vs. Time



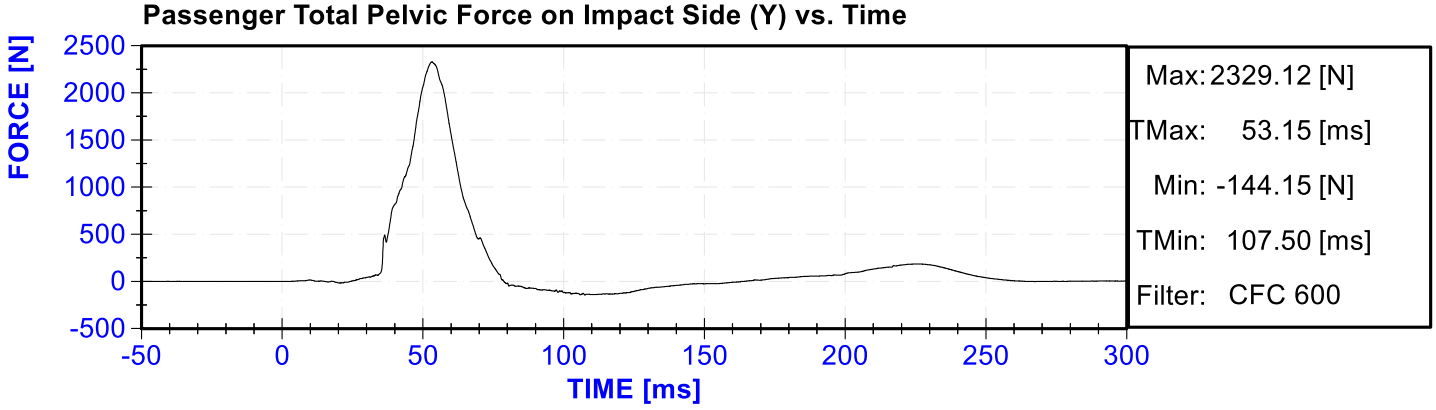
Passenger Iliac Force on Impact Side (Y) vs. Time



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



Passenger Total Pelvic Force on Impact Side (Y) vs. Time



APPENDIX C

DUMMY PERFORMANCE CALIBRATION TEST DATA

CALIBRATION TEST RESULTS

PRE-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

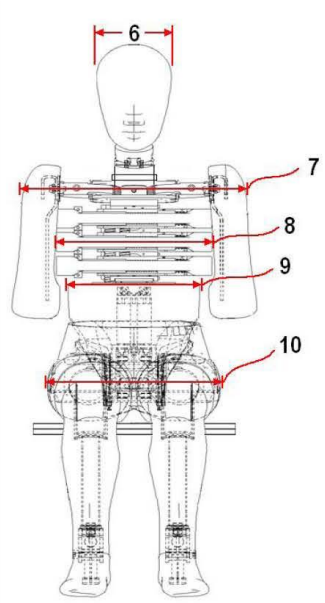
SERIAL NO: F034

(CONFIGURED FOR LEFT SIDE IMPACT)

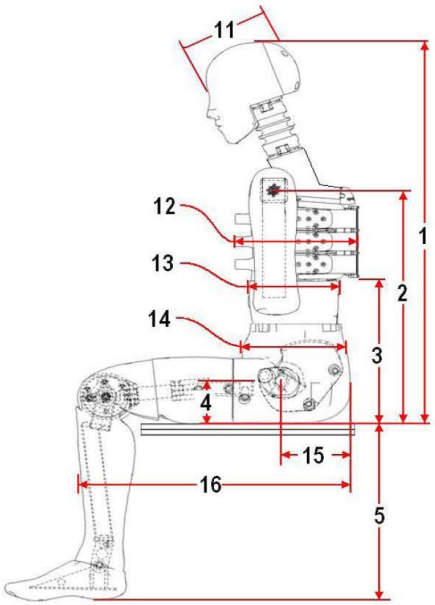
External Measurements - EuroSID-2re

Technician: K. Brogan Date: 6/13/2018

Dummy Serial Number: F034



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	910	Pass
2	Seat to Shoulder Joint	558	572	567	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	350	Pass
4	Seat to Hip Joint (center of bolt)	97	103	101	Pass
5	Sole to Seat, Sitting	333	451	418	Pass
6	Head Width	152	158	153	Pass
7	Shoulder/Arm Width	461	479	470	Pass
8	Thorax Width	322	332	325	Pass
9	Abdomen Width	273	287	281	Pass
10	Pelvis Lap Width	359	373	366	Pass
11	Head Depth	196	206	200	Pass
12	Thorax Depth	262	272	268	Pass
13	Abdomen Depth	194	204	199	Pass
14	Pelvis Depth	235	245	240	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	155	Pass
16	Back of Buttocks to Front Knee	597	615	602	Pass

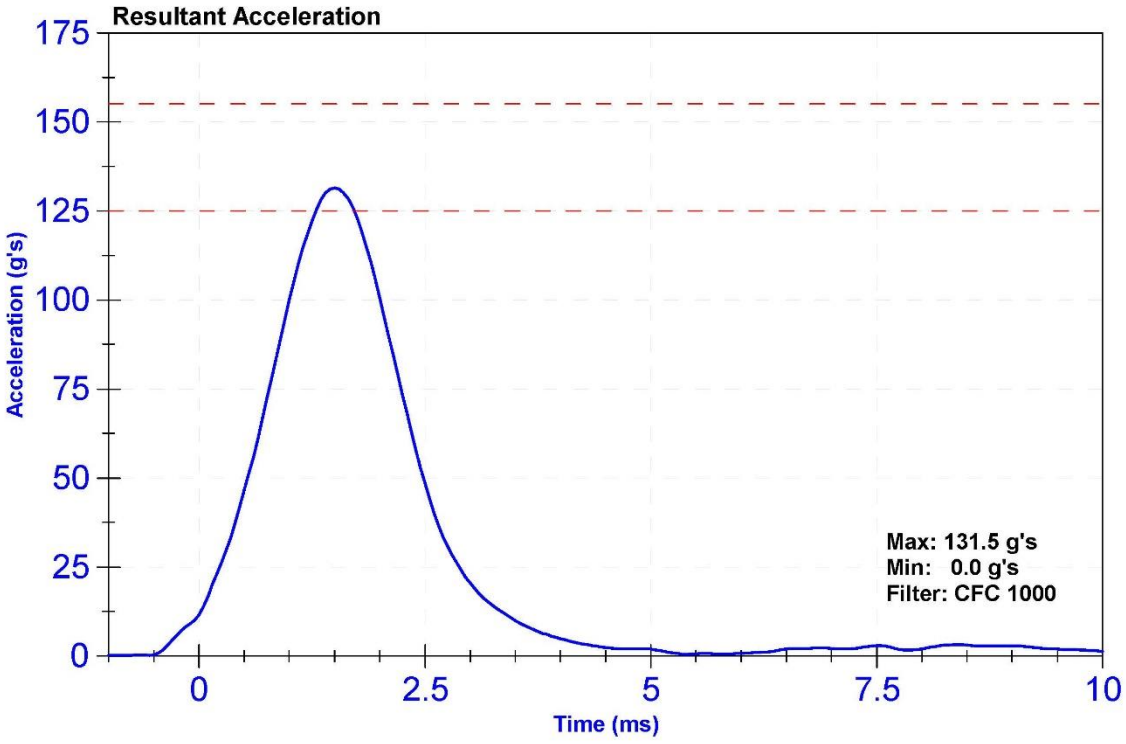
ATD Manufacturer	FTSS	Test Technician	J.Pericak
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

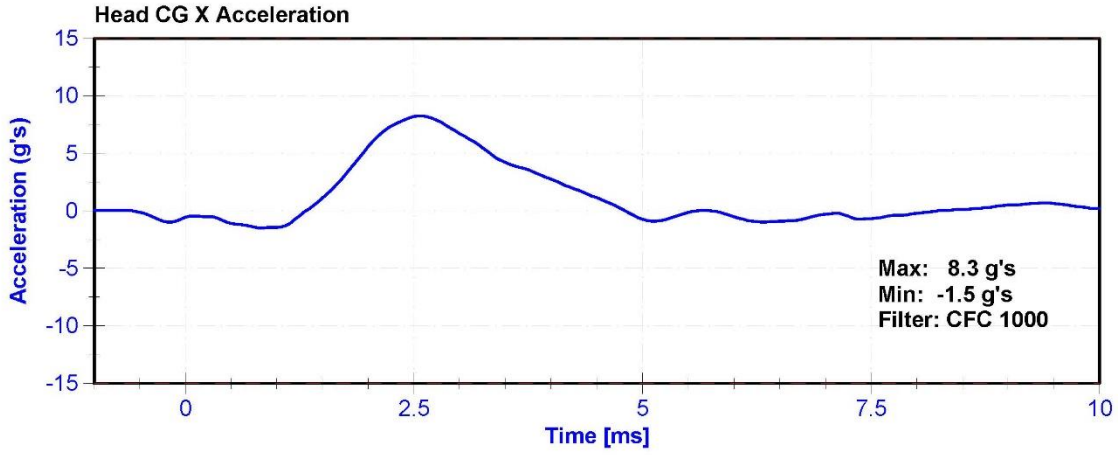
Results

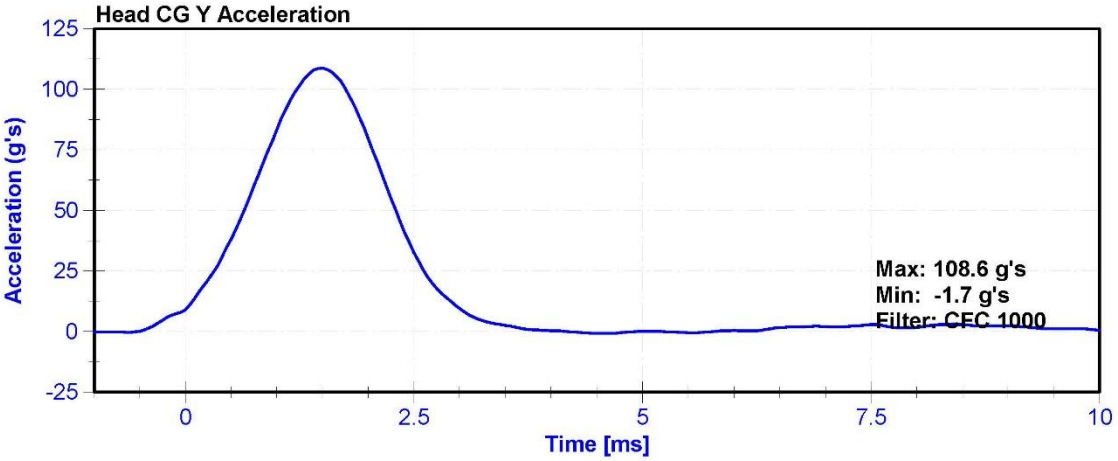
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	55.6	Pass
Resultant Acceleration	125	155	g's	131.5	Pass
Oscillation	0	15	%	2.48	Pass
Fore-Aft Acceleration	-15	15	g's	8.3	Pass

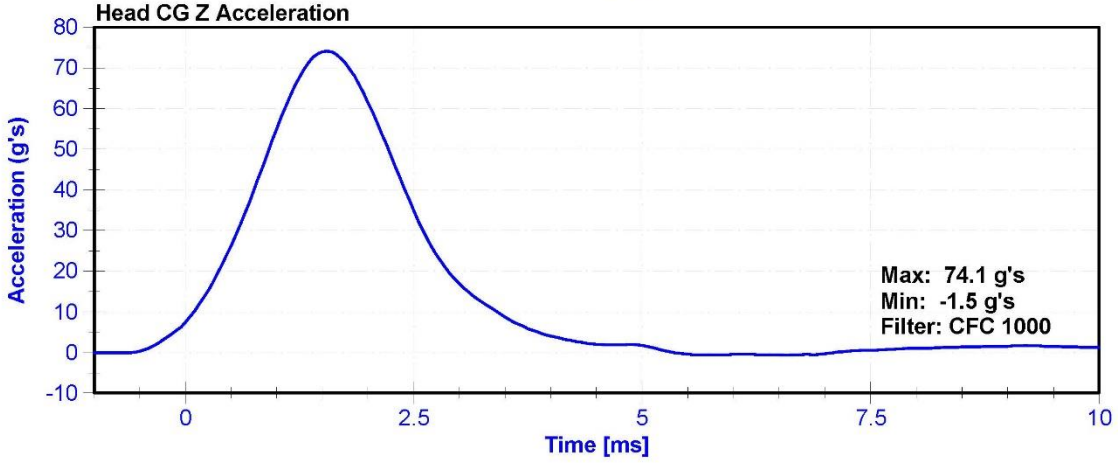
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58904	5/7/2018	11/5/2018
Y Accelerometer	ENDEVCO 7264CT	AC-P58911	5/7/2018	11/5/2018
Z Accelerometer	ENDEVCO 7264CT	AC-P58776	5/7/2018	11/5/2018




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 8.3 g's
Min: -1.5 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 108.6 g's
Min: -1.7 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
80
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]
Max: 74.1 g's
Min: -1.5 g's
Filter: CFC 1000

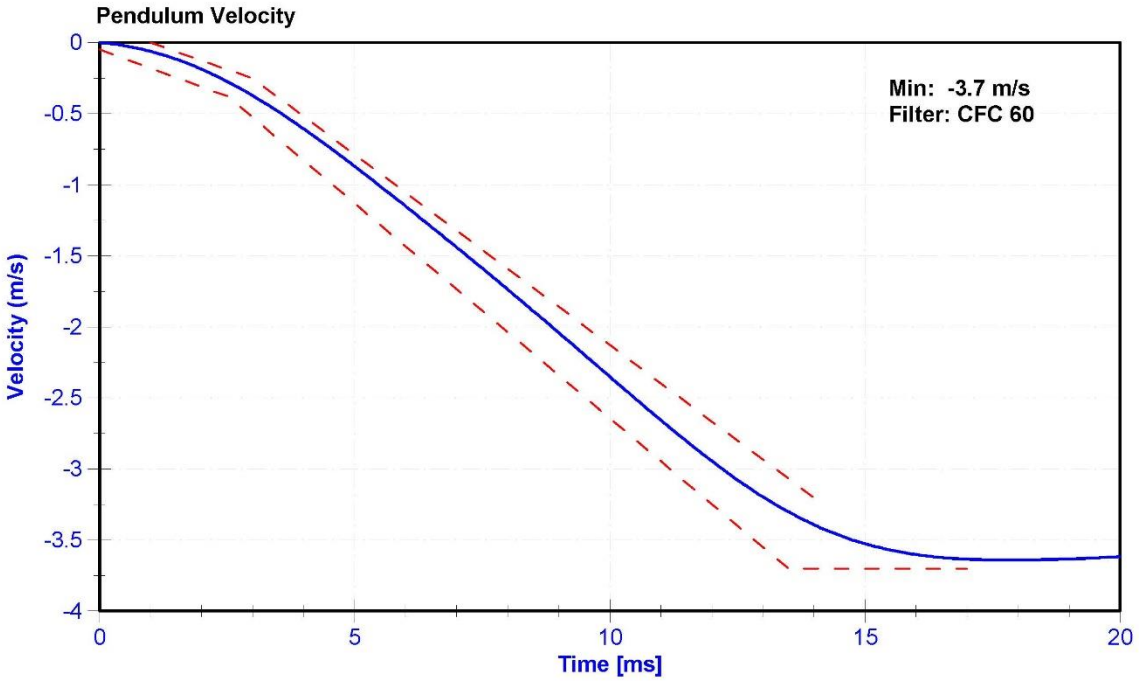
ATD Manufacturer	FTSS	Test Technician	J. Pericak
ATD Serial Number	F034	Laboratory Supervisor	K.Brogan

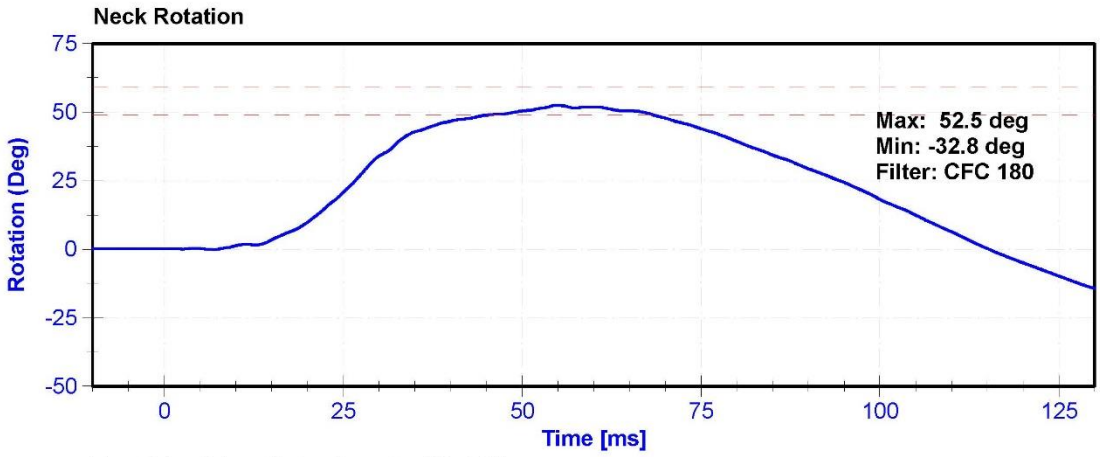
Results

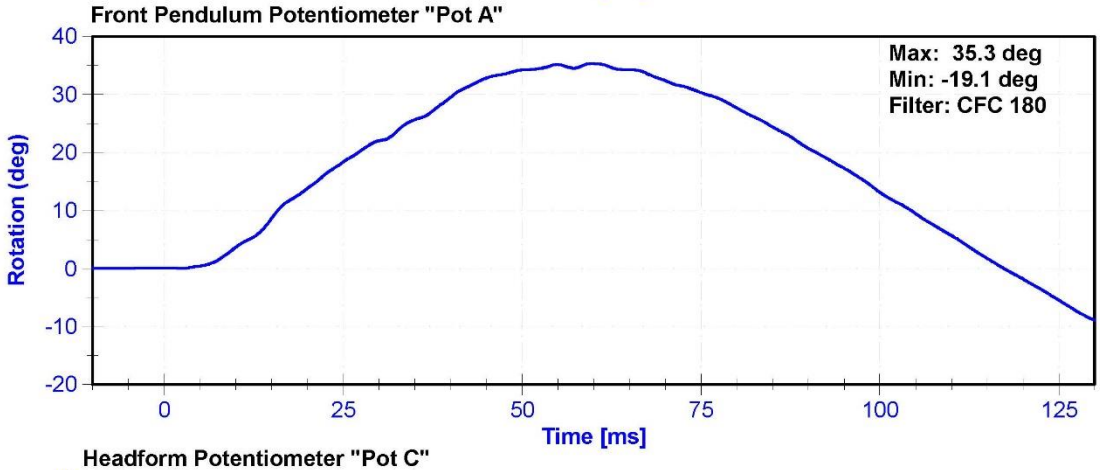
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	55.2	Pass
Velocity	3.3	3.5	m/s	3.40	Pass
Lateral Neck Rotation	49	59	deg	52.5	Pass
Time at Maximum Rotation	54	66	ms	54.9	Pass
Time of Rotation Decay from Maximum	53	88	ms	60.3	Pass

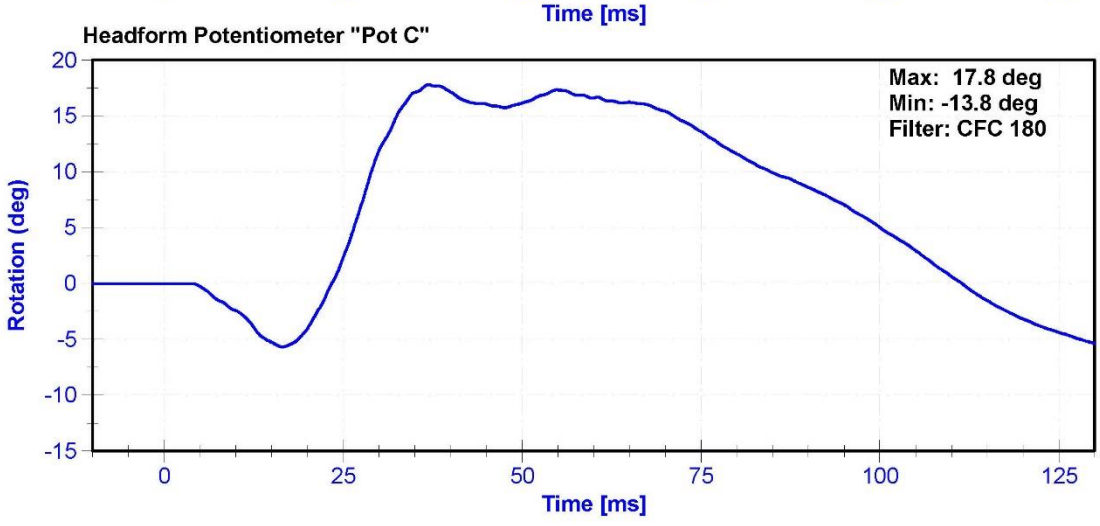
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Front Pendulum Potentiometer	SP22G	DS-094	10/30/2017	10/30/2018
Headform Potentiometer	SP22G	DS-095	10/30/2017	10/30/2018




Neck Rotation
Rotation (Deg)
Time [ms]
Max: 52.5 deg
Min: -32.8 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 35.3 deg
Min: -19.1 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 17.8 deg
Min: -13.8 deg
Filter: CFC 180

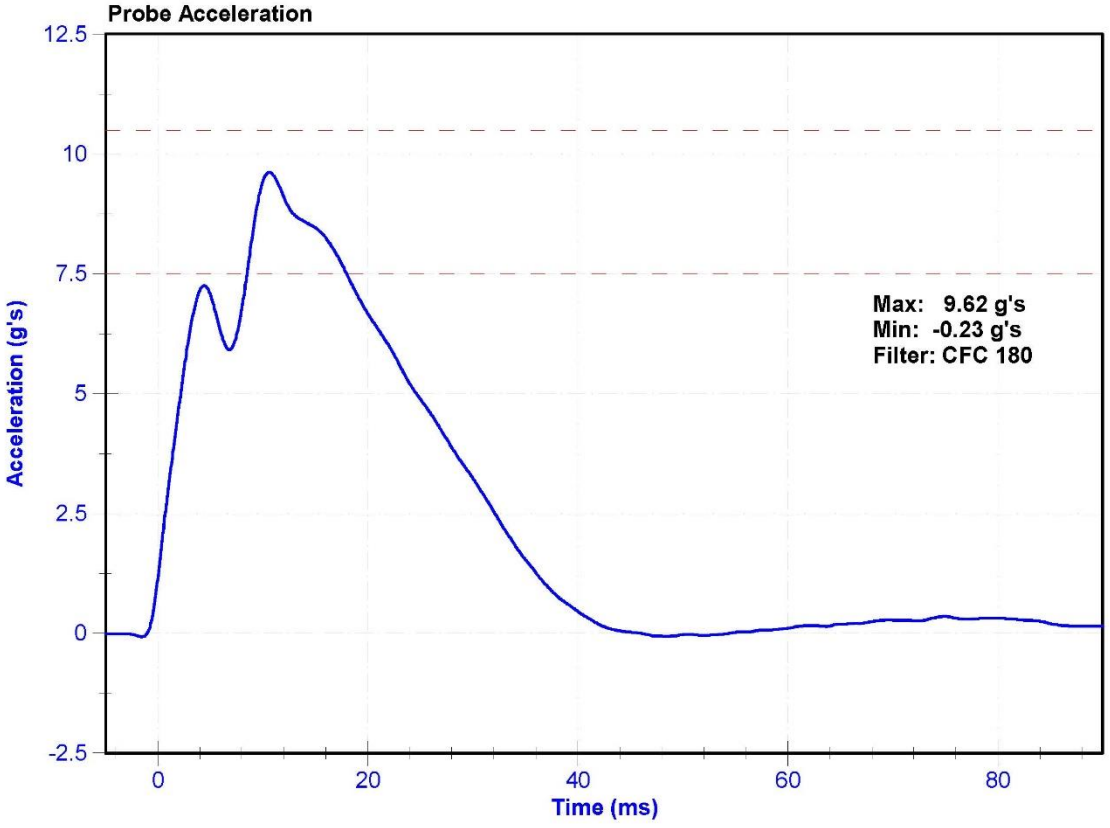
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	41.9	Pass
Velocity	4.2	4.4	m/s	4.23	Pass
Probe Acceleration	7.5	10.5	g's	9.62	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018



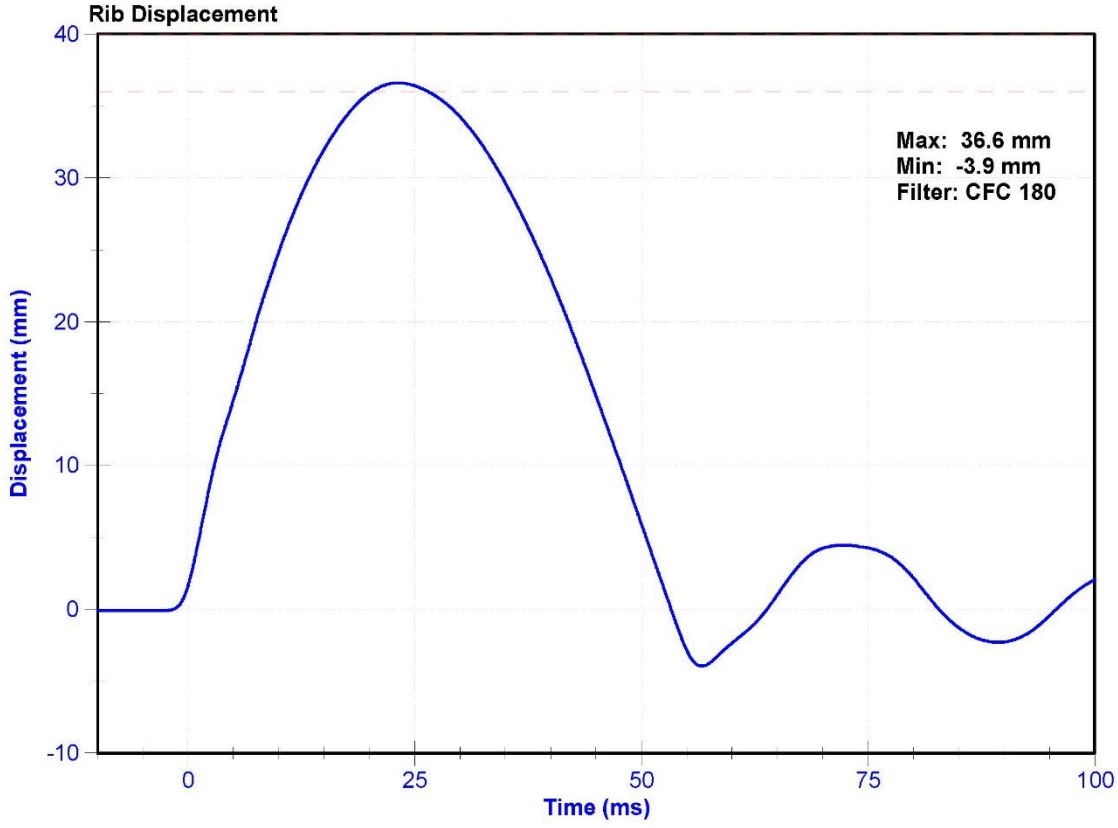
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	40.6	Pass
Rib Displacement	36	40	mm	36.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	9/27/2017	9/27/2018



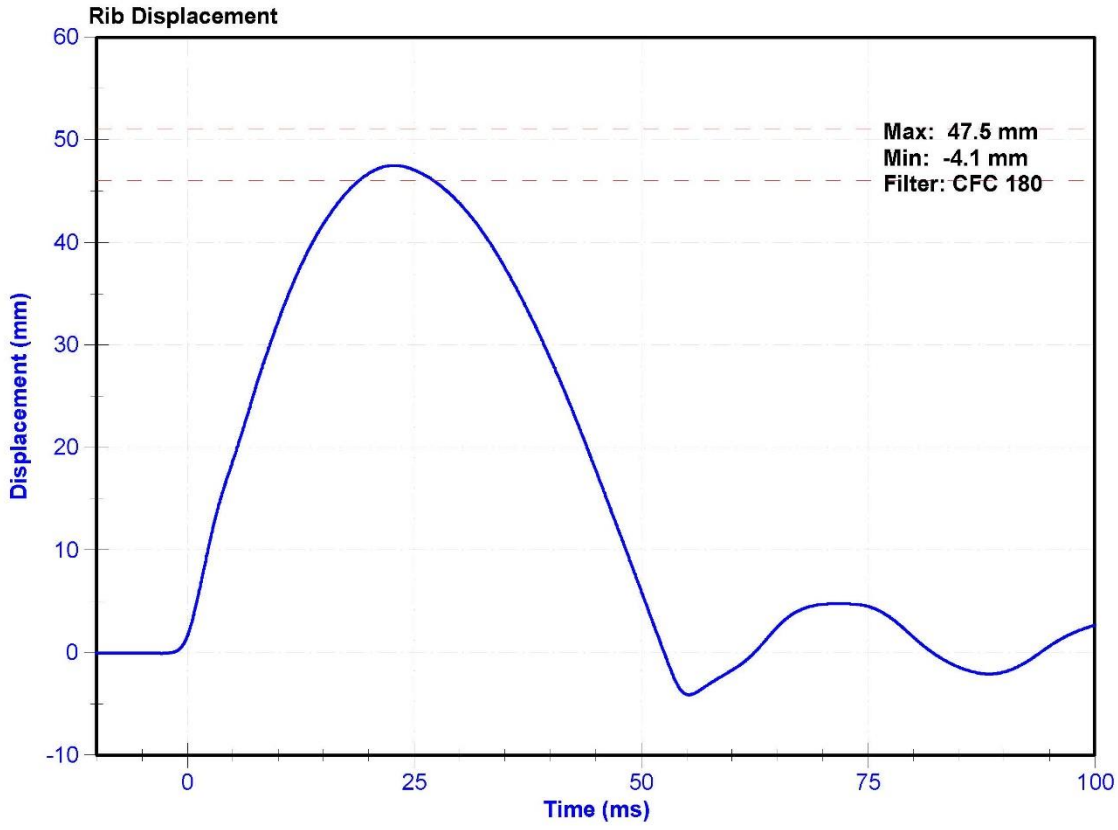
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.7	Pass
Humidity	10	70	%	40.6	Pass
Rib Displacement	46	51	mm	47.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	9/27/2017	9/27/2018



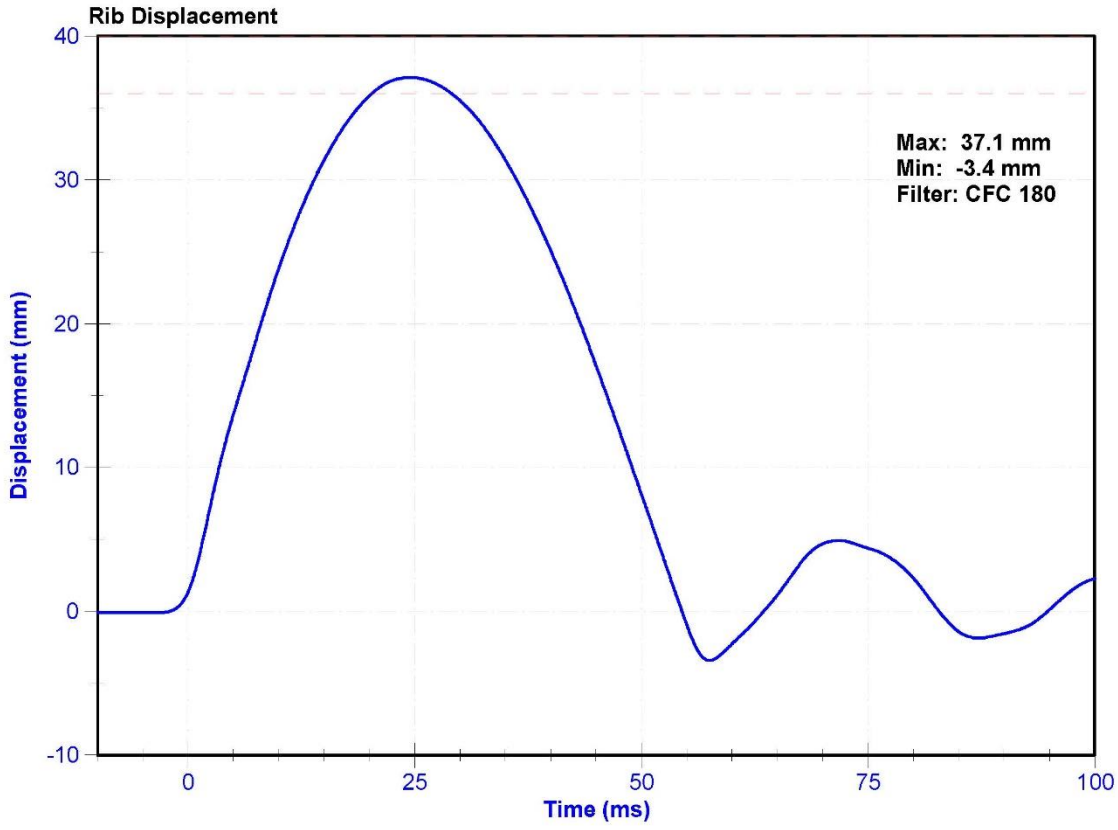
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	42.2	Pass
Rib Displacement	36	40	mm	37.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	9/27/2017	9/27/2018



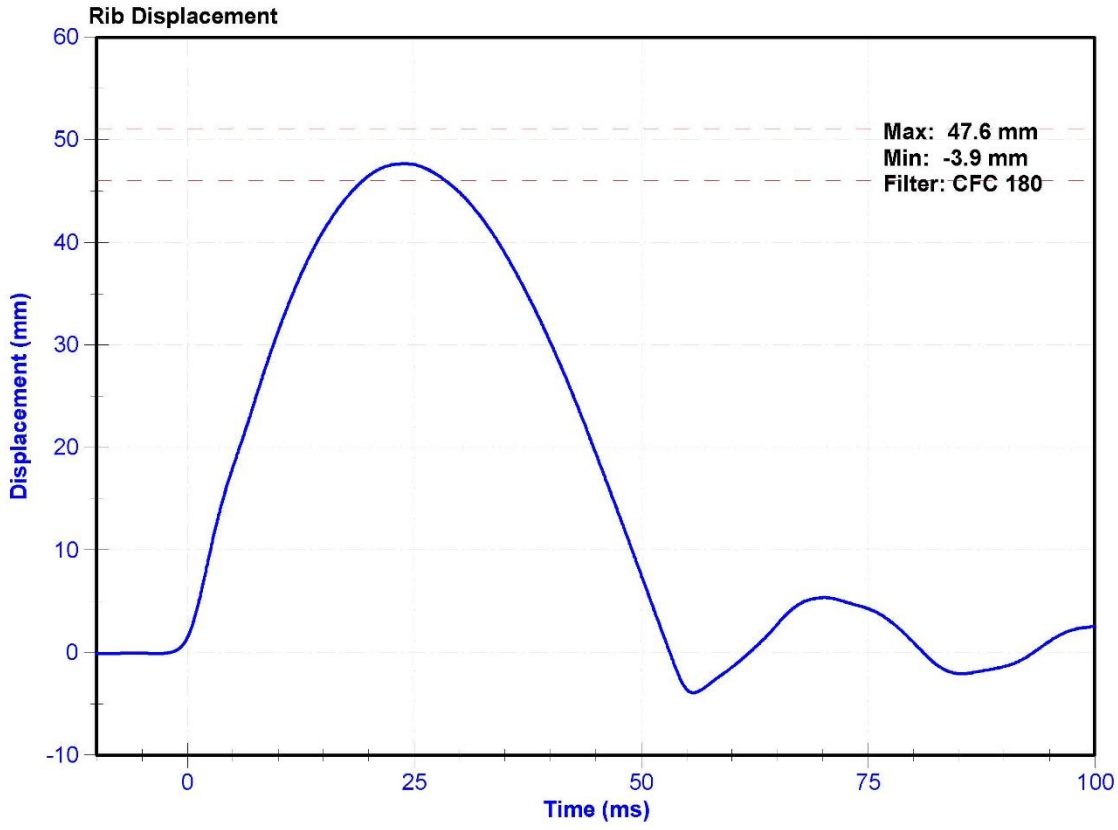
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.8	Pass
Humidity	10	70	%	45.2	Pass
Rib Displacement	46	51	mm	47.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	9/27/2017	9/27/2018



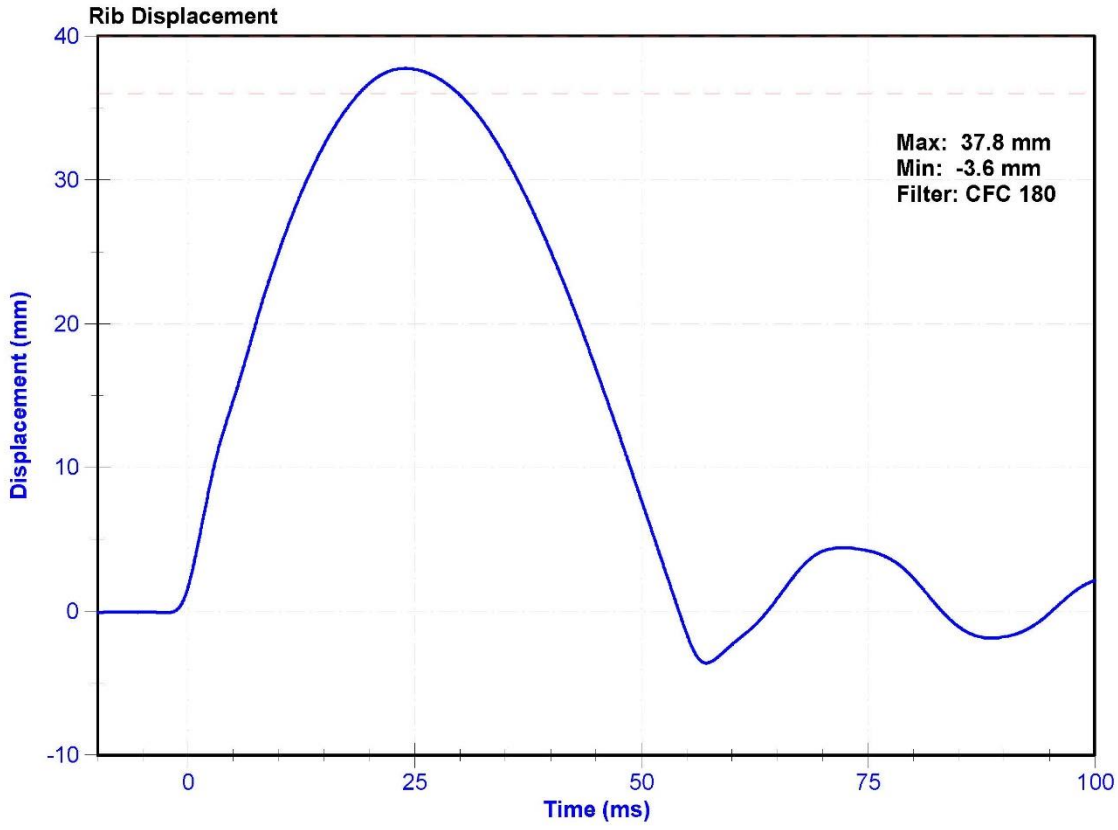
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	46.7	Pass
Rib Displacement	36	40	mm	37.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	9/27/2017	9/27/2018



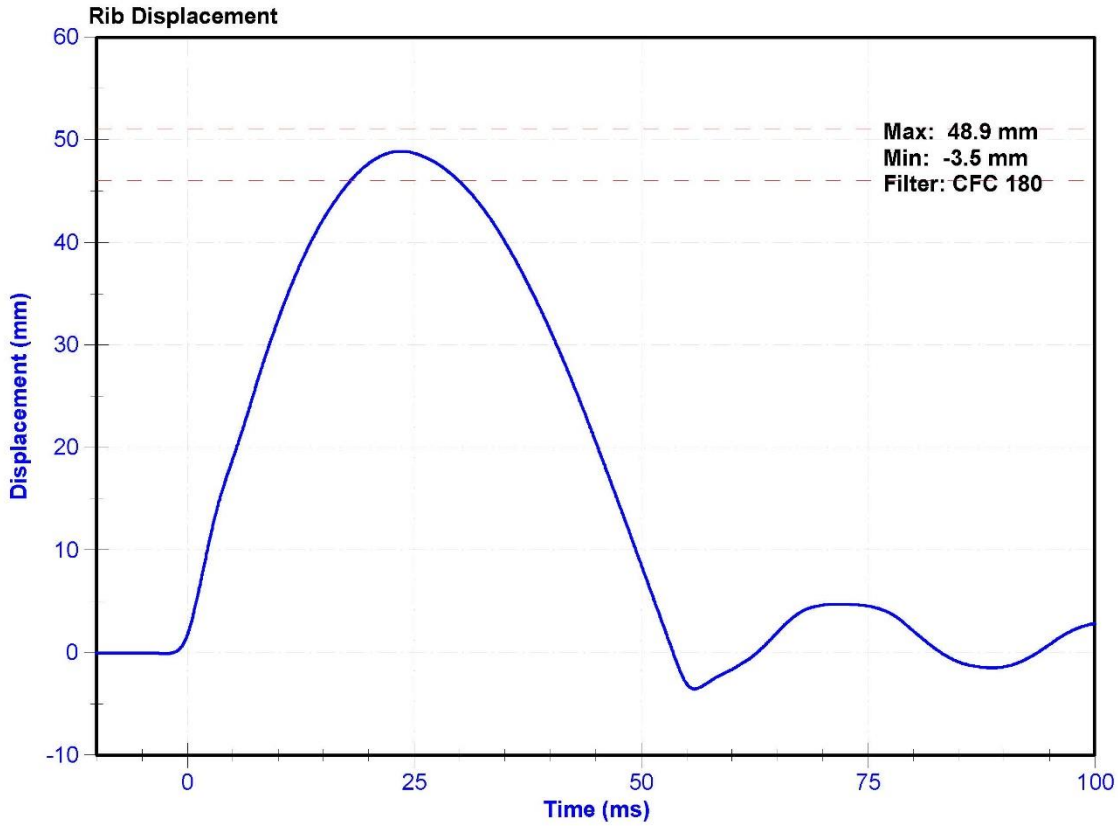
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	46.7	Pass
Rib Displacement	46	51	mm	48.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	9/27/2017	9/27/2018



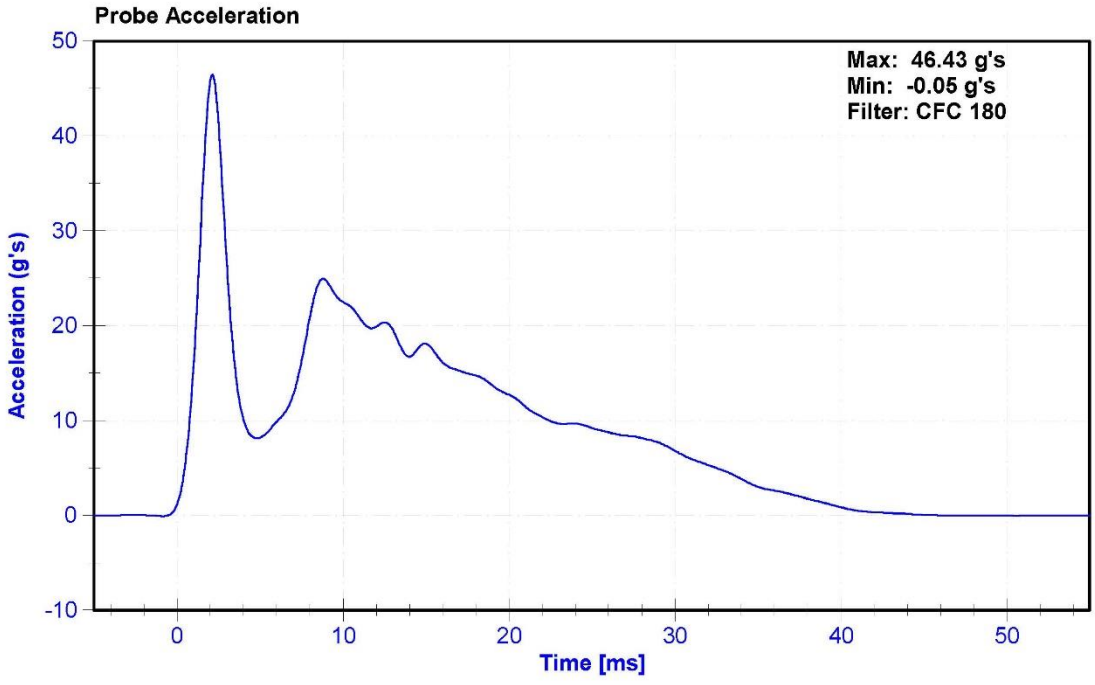
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

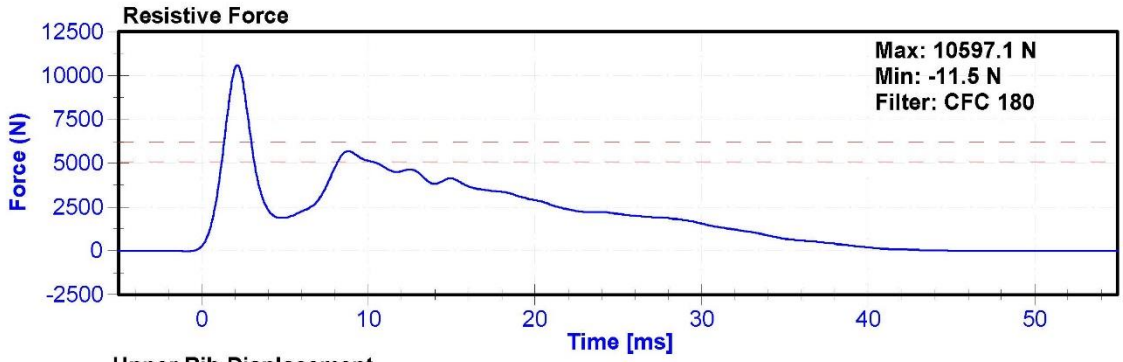
Results

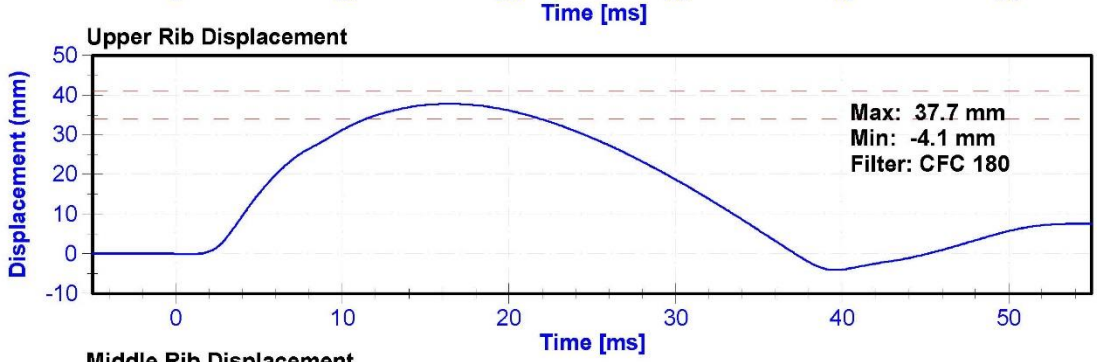
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	42.0	Pass
Velocity	5.4	5.6	m/s	5.57	Pass
Resistive Force after 6ms	5100	6200	N	5689.6	Pass
Upper Thorax Rib Deflection	34	41	mm	37.7	Pass
Mid Thorax Rib Deflection	37	45	mm	41.6	Pass
Lower Thorax Rib Deflection	37	44	mm	41.0	Pass

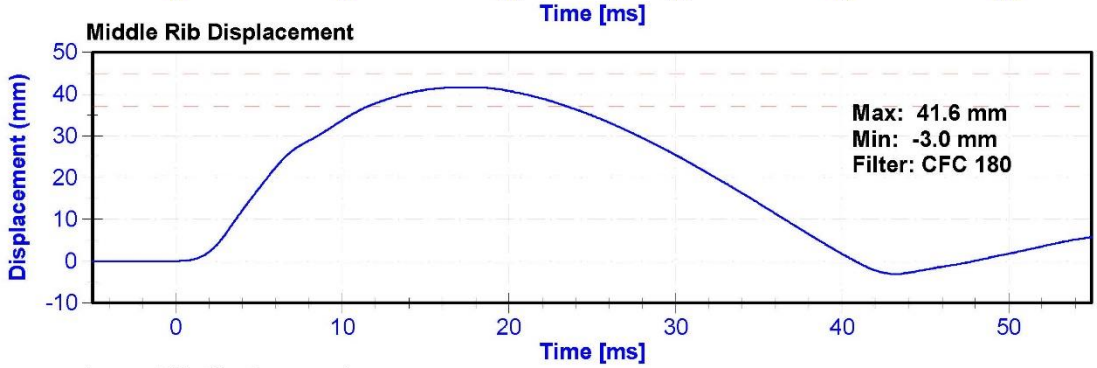
Transducer Calibrations

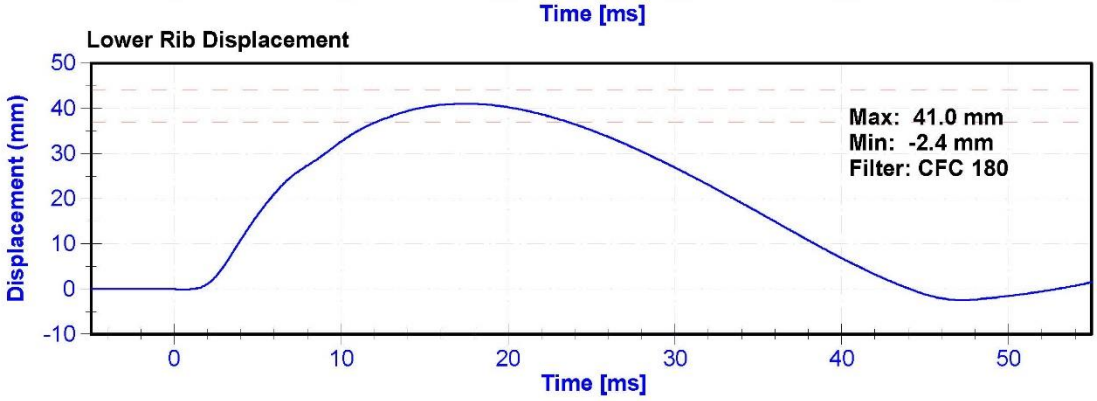
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Upper Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	9/27/2017	9/27/2018
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	9/27/2017	9/27/2018
Lower Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	9/27/2017	9/27/2018




Resistive Force
Max: 10597.1 N
Min: -11.5 N
Filter: CFC 180
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]


Upper Rib Displacement
Max: 37.7 mm
Min: -4.1 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Middle Rib Displacement
Max: 41.6 mm
Min: -3.0 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]


Lower Rib Displacement
Max: 41.0 mm
Min: -2.4 mm
Filter: CFC 180
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]

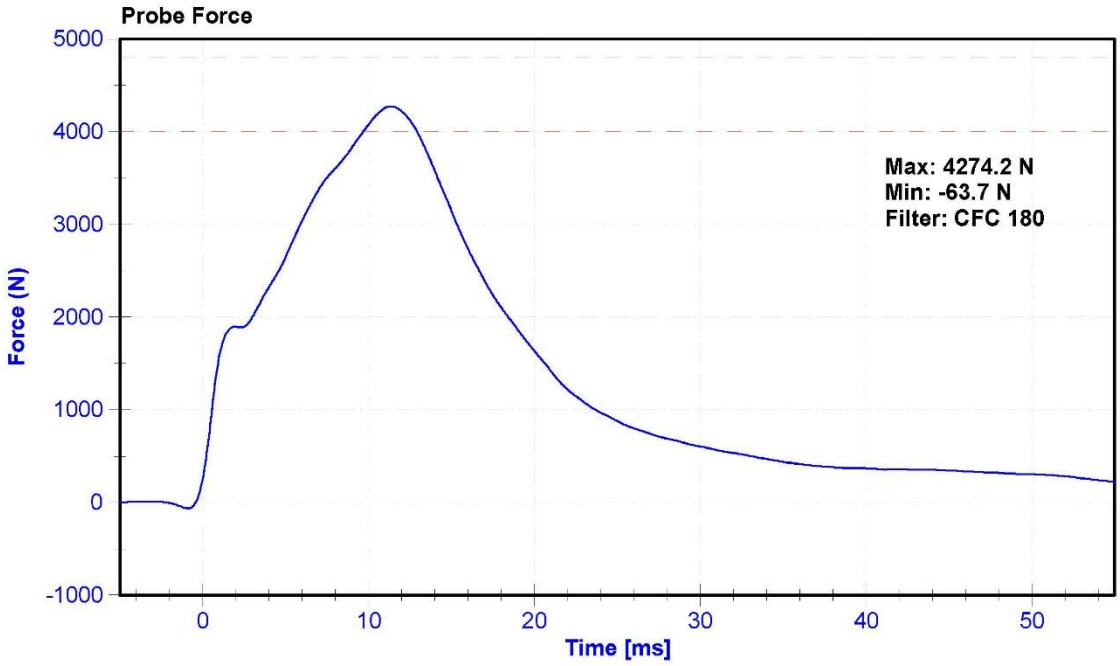
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	FO34	Laboratory Supervisor	K.Brogan

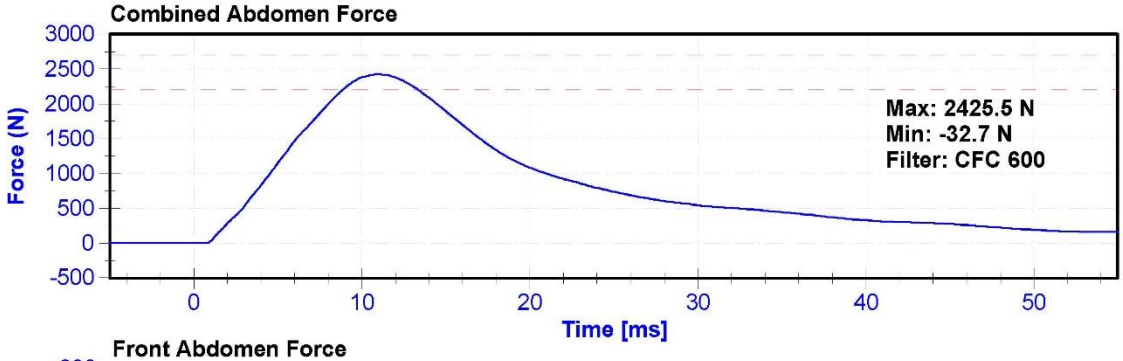
Results

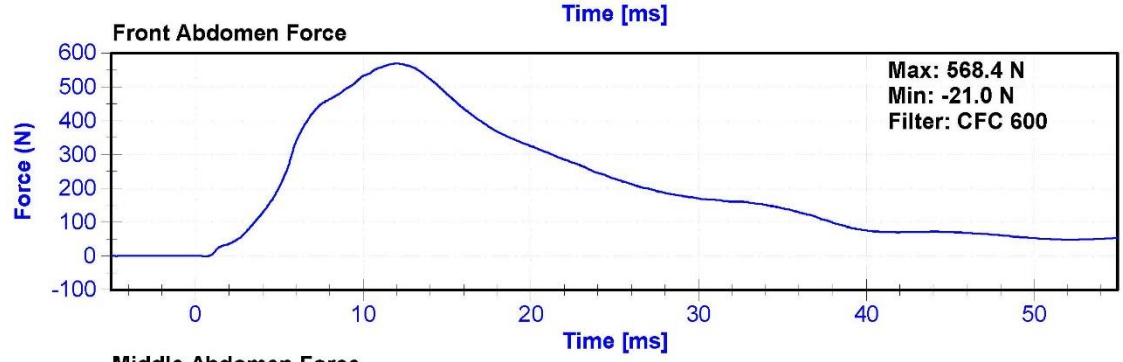
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.9	Pass
Humidity	10	70	%	40.9	Pass
Velocity	3.9	4.1	m/s	3.98	Pass
Combined Abdomen Force	2200	2700	N	2425.5	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.90	Pass
Resistive Probe Force	4000	4800	N	4274.2	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.35	Pass

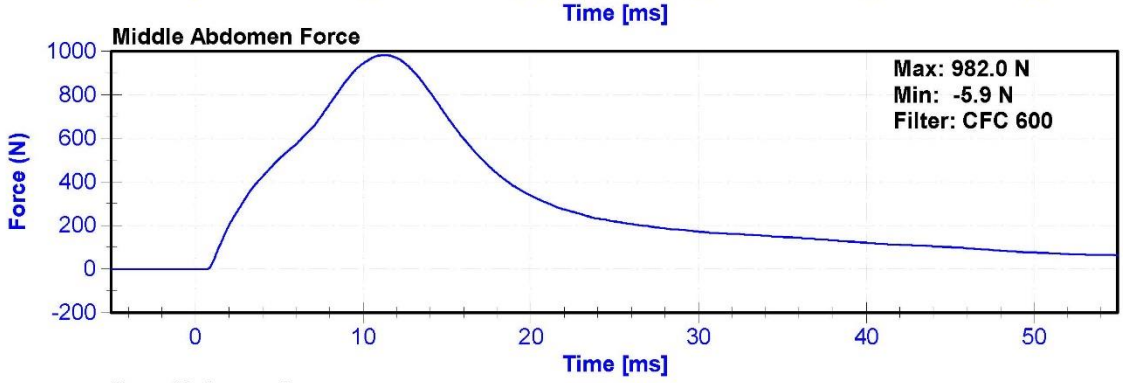
Transducer Calibrations

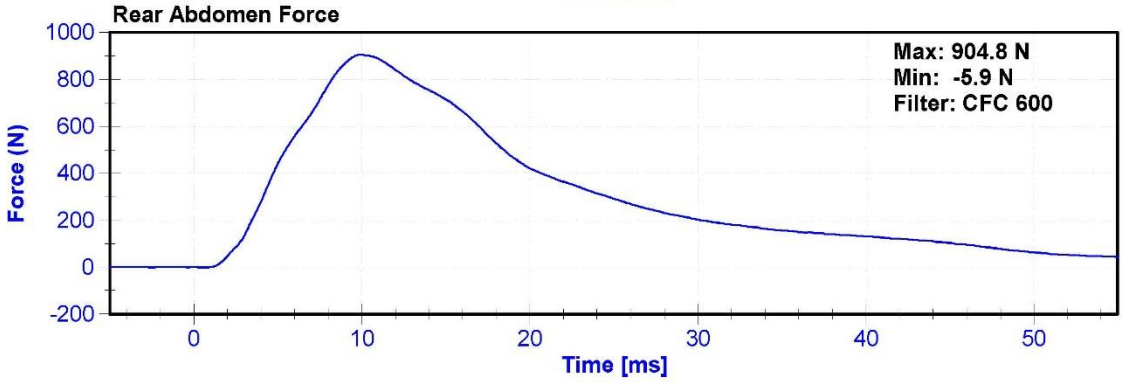
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Front Abdomen Load Cell	DENTON 2631	LC-1440	6/4/2018	6/4/2019
Middle Abdomen Load Cell	DENTON 2631	LC-1525	6/4/2018	6/4/2019
Rear Abdomen Load Cell	DENTON 2631	LC-1528	6/4/2018	6/4/2019




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2425.5 N
Min: -32.7 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 568.4 N
Min: -21.0 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 982.0 N
Min: -5.9 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 904.8 N
Min: -5.9 N
Filter: CFC 600

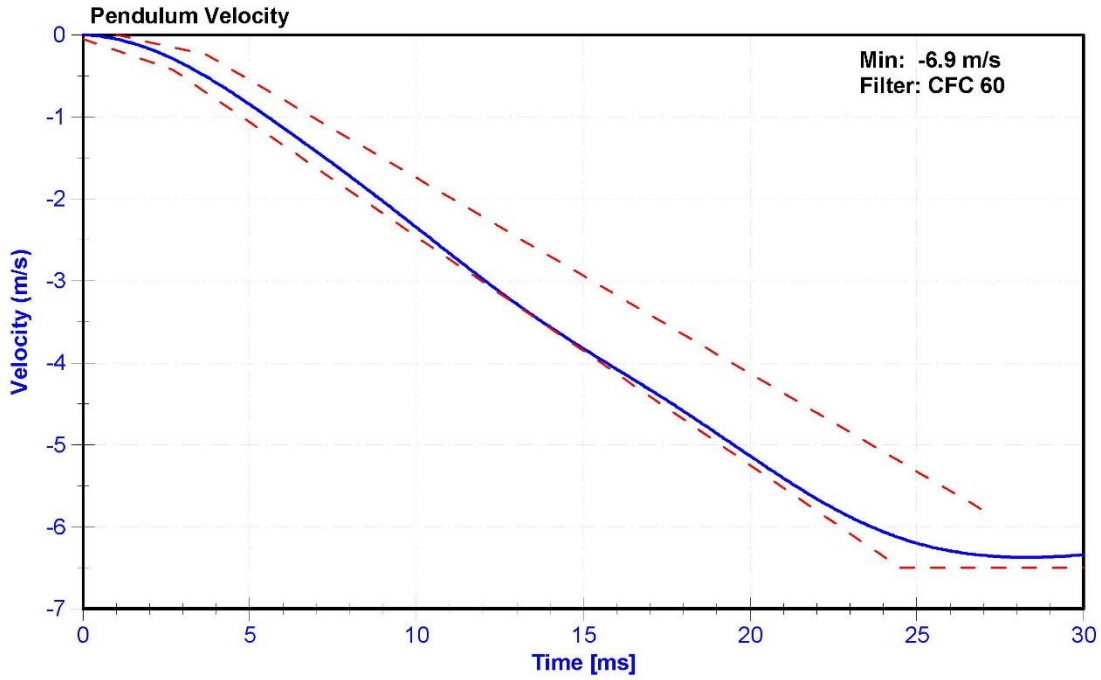
ATD Manufacturer	FTSS	Test Technician	J. Pericak
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

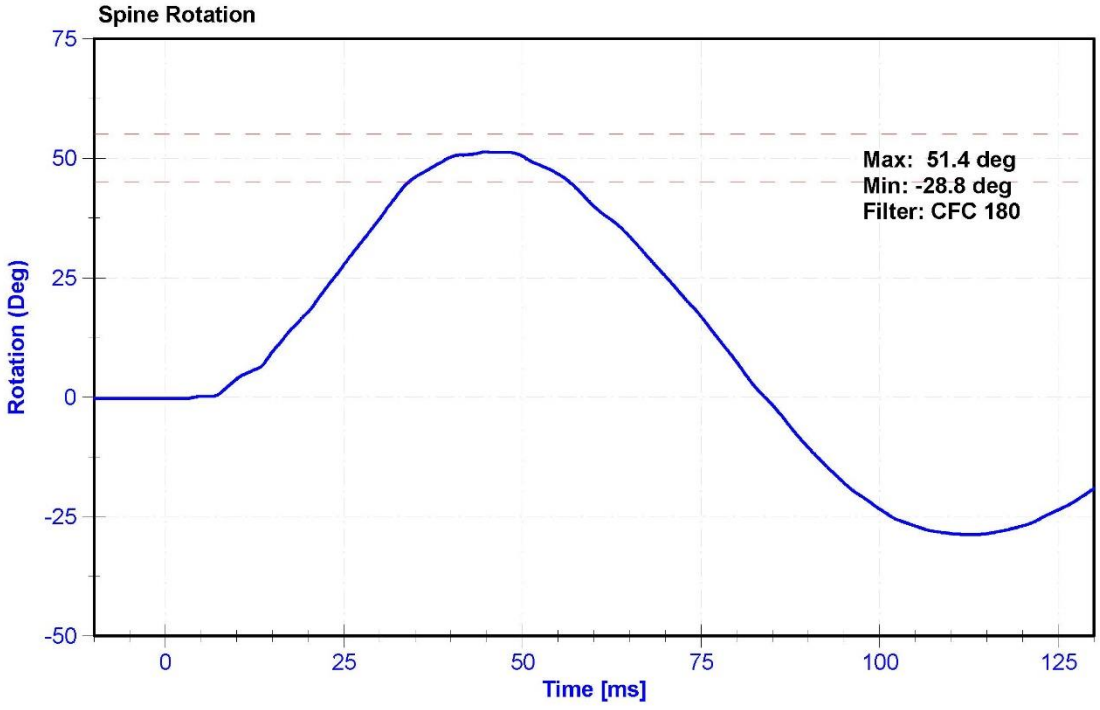
Results

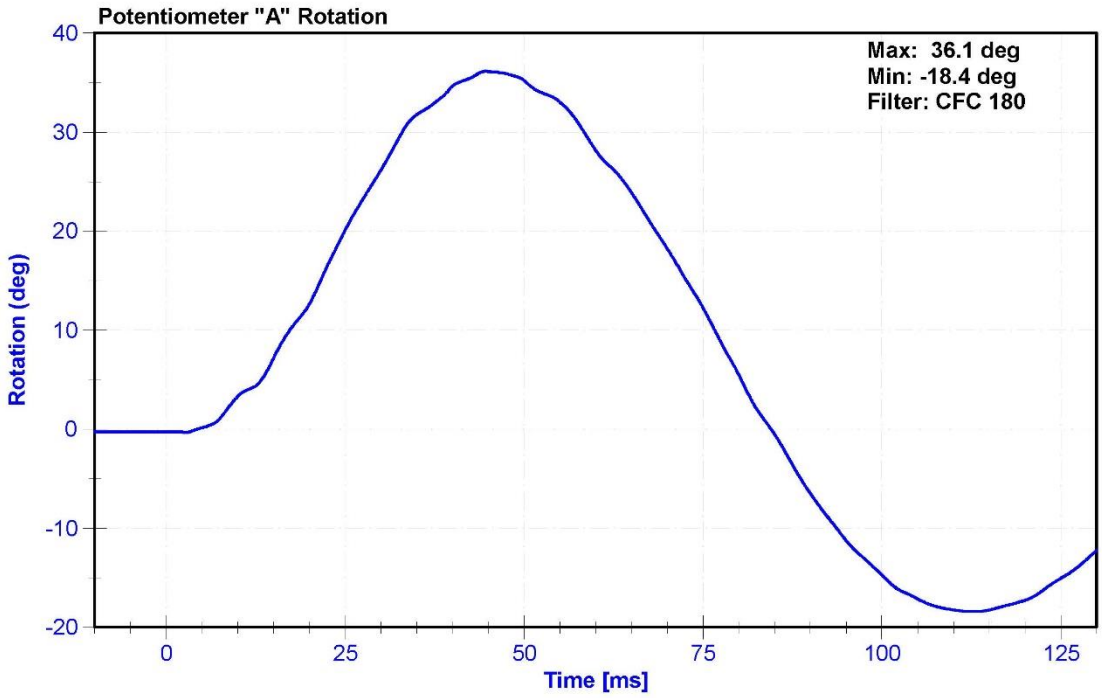
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	56.2	Pass
Velocity	5.95	6.15	m/s	6.113	Pass
Lateral Spine Rotation	45	55	deg	51.4	Pass
Time at Maximum Rotation	39	53	ms	44.8	Pass
Time of Decay to Zero Degrees	37	57	ms	39.1	Pass
Pulse within Corridor?	-	-	-		

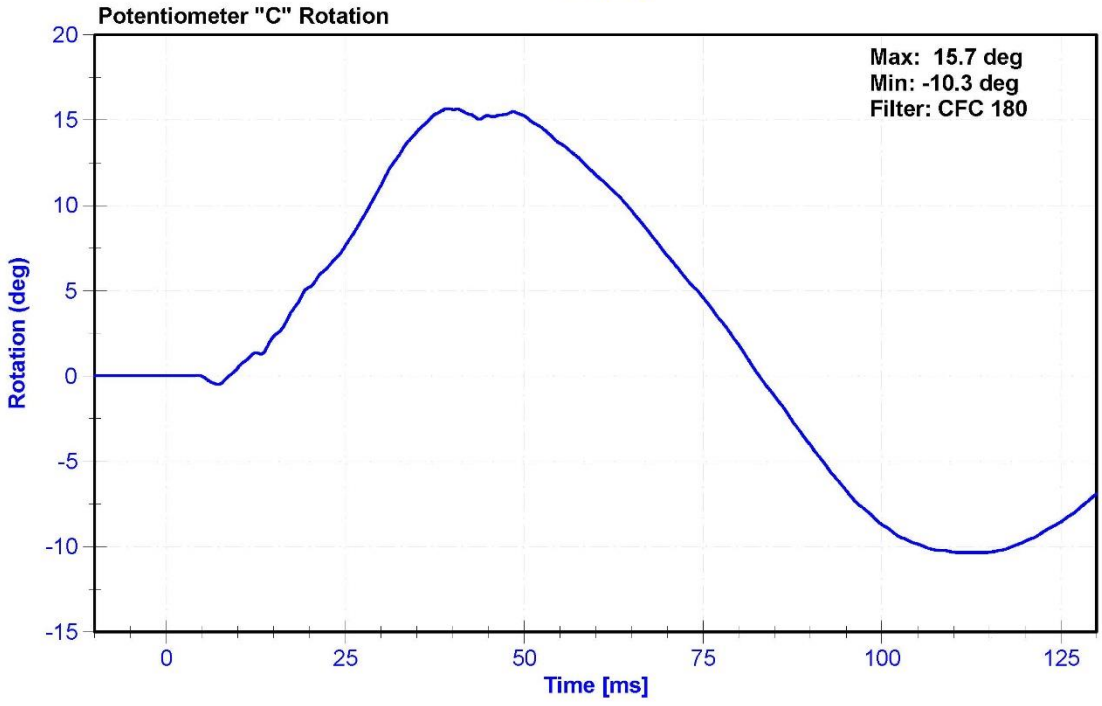
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Pendulum "A" Potentiometer	SP22G	DS-094	10/30/2017	10/30/2018
Condyle "B" Potentiometer	SP22G	DS-095	10/30/2017	10/30/2018


Pendulum Velocity
Min: -6.9 m/s
Filter: CFC 60
Velocity (m/s)
0
-1
-2
-3
-4
-5
-6
-7
0
5
10
15
20
25
30
Time [ms]


Spine Rotation
Max: 51.4 deg
Min: -28.8 deg
Filter: CFC 180
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 36.1 deg
Min: -18.4 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]


Potentiometer "C" Rotation
Max: 15.7 deg
Min: -10.3 deg
Filter: CFC 180
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]

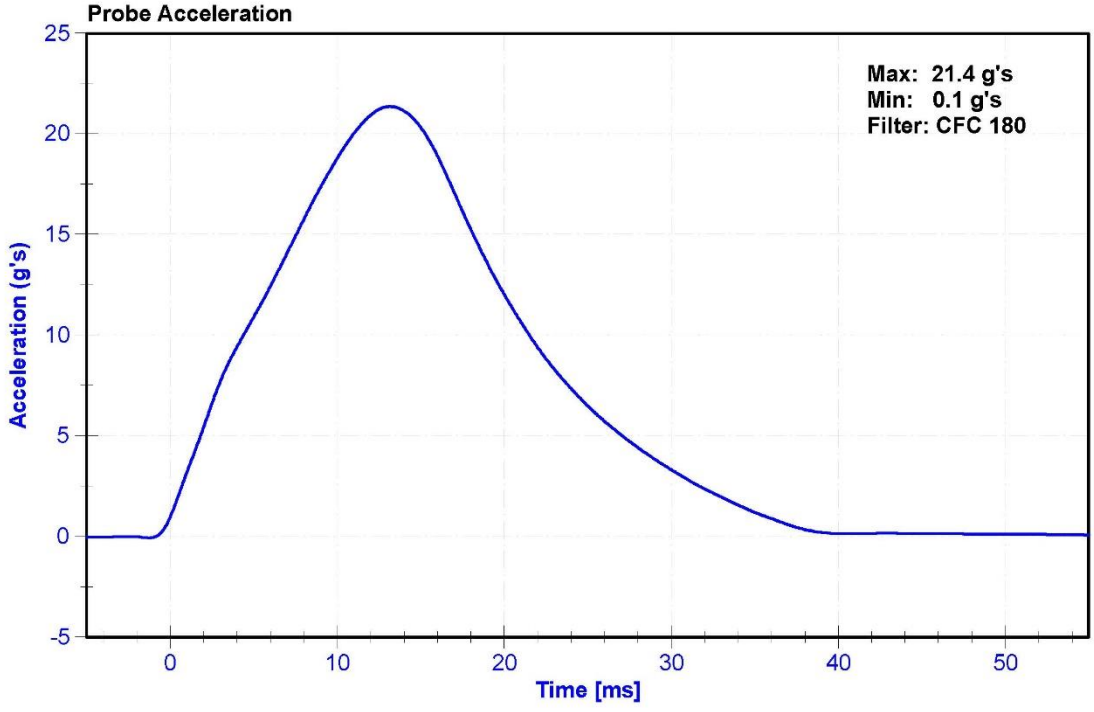
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

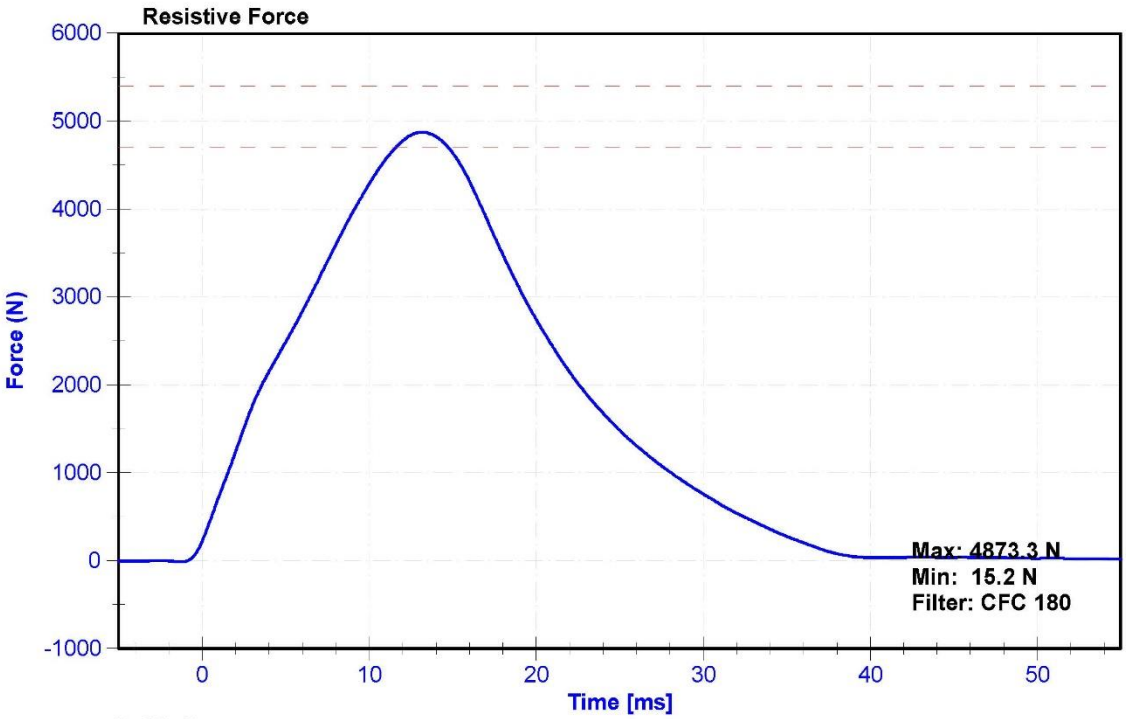
Results

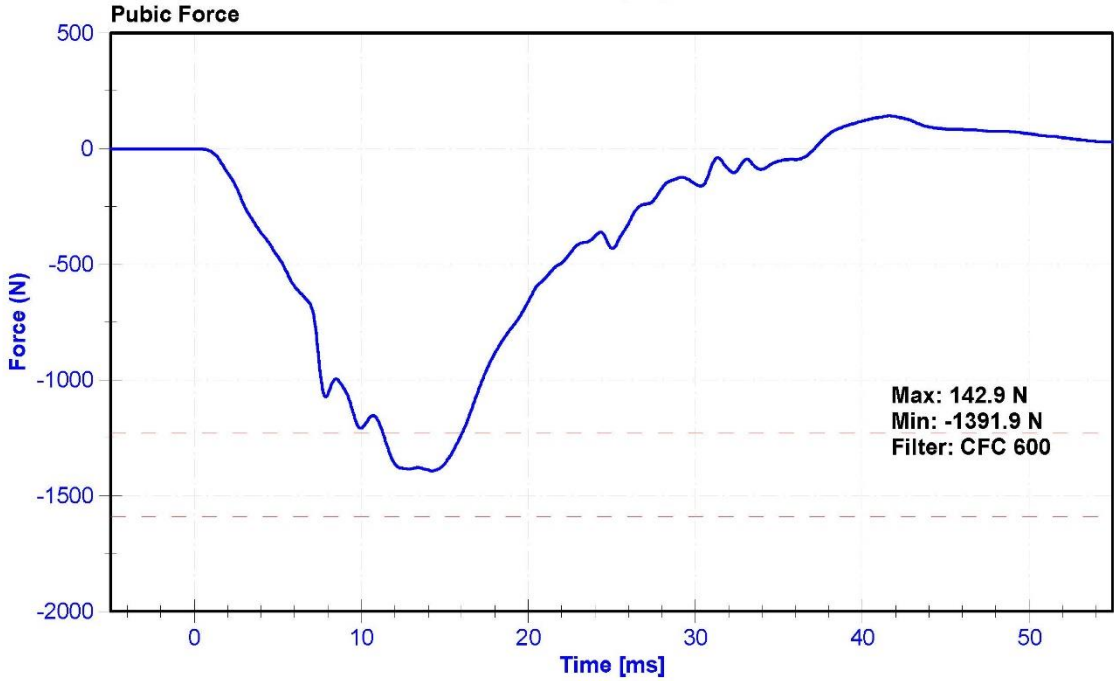
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	42.2	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Resistive Force	4700	5400	N	4873.3	Pass
Time at Peak Resistive Force	11.8	16.1	ms	13.15	Pass
Pubic Force	-1590	-1230	N	-1391.9	Pass
Time at Peak Pubic Force	12.2	17.0	ms	14.25	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Pubic Load Cell	Denton 3096JFL	LC-464fy	6/4/2018	6/4/2019




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4873.3 N
Min: 15.2 N
Filter: CFC 180


Pubic Force
Force (N)
500
0
-500
-1000
-1500
-2000
0
10
20
30
40
50
Time [ms]
Max: 142.9 N
Min: -1391.9 N
Filter: CFC 600

CALIBRATION TEST RESULTS

PRE-TEST

SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

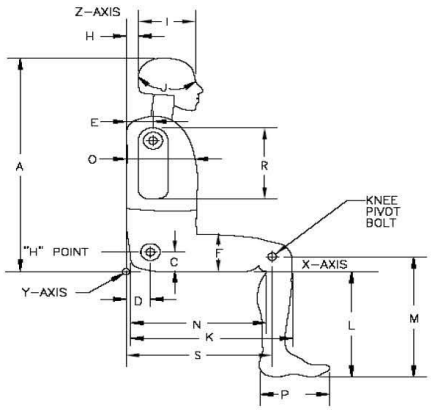
SERIAL No: DG8012

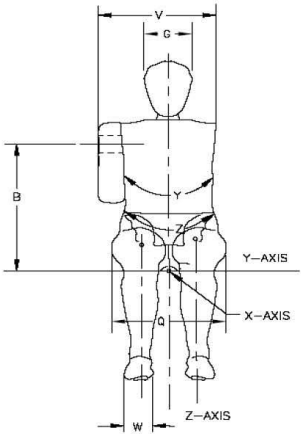
(CONFIGURED FOR LEFT SIDE IMPACT)

External Measurements - SID-IIs

Technician: K. Brogan Date: 6/12/2018

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	782	Pass
B	Shoulder Pivot Height	437	453	445	Pass
C	H-point Height	79	89	85	Pass
D	H-point from seatback	141	151	147	Pass
E	Shoulder Pivot from Backline	97	107	103	Pass
F	Thigh Clearance	119	135	129	Pass
G	Head Breadth	140	148	143	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	183	Pass
J	Head Circumference	541	551	545	Pass
K	Buttock to Knee Length	514	540	531	Pass
L	Popliteal Height	343	369	354	Pass
M	Knee Pivot to floor height	392	409	400	Pass
N	Buttock Popliteal Length	416	442	429	Pass
O	Chest Depth w/o jacket	195	211	207	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	317	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	485	Pass
V	Shoulder Width	341	357	345	Pass
W	Foot Width	78	94	85	Pass
Y	Chest Circumference w/jacket	851	881	865	Pass
Z	Waist Circumference	761	791	770	Pass

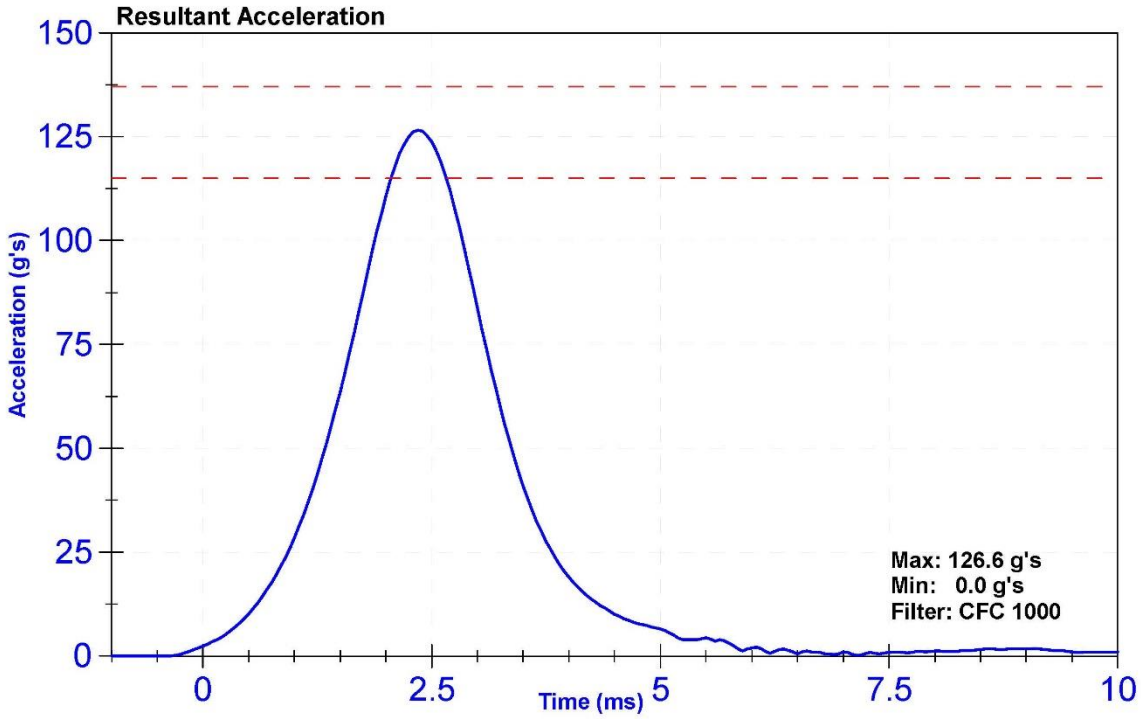
ATD Manufacturer	FTSS	Test Technician	J.Pericak
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

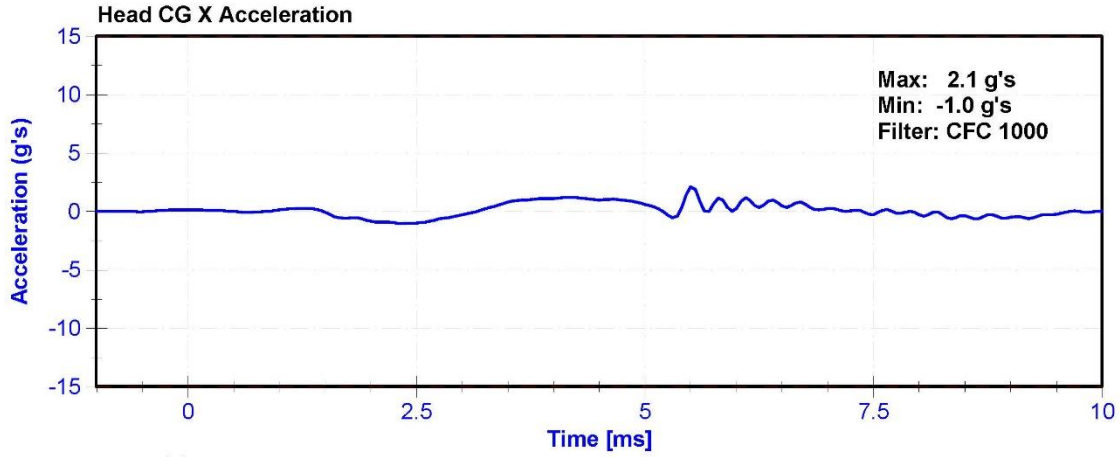
Results

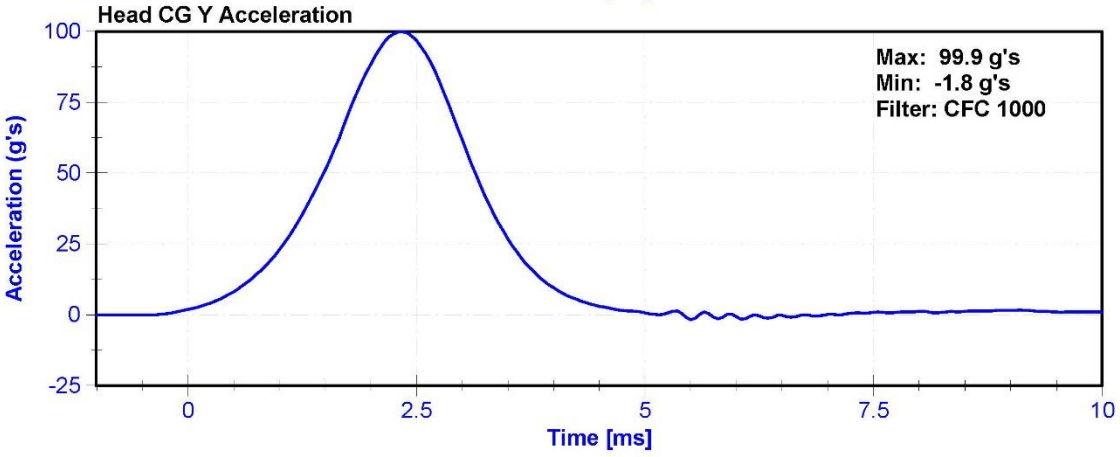
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	58	Pass
Resultant Acceleration	115	137	g's	126.6	Pass
Oscillation	0	15	%	3.5	Pass
Fore-Aft Acceleration	-15	15	g's	2.1	Pass

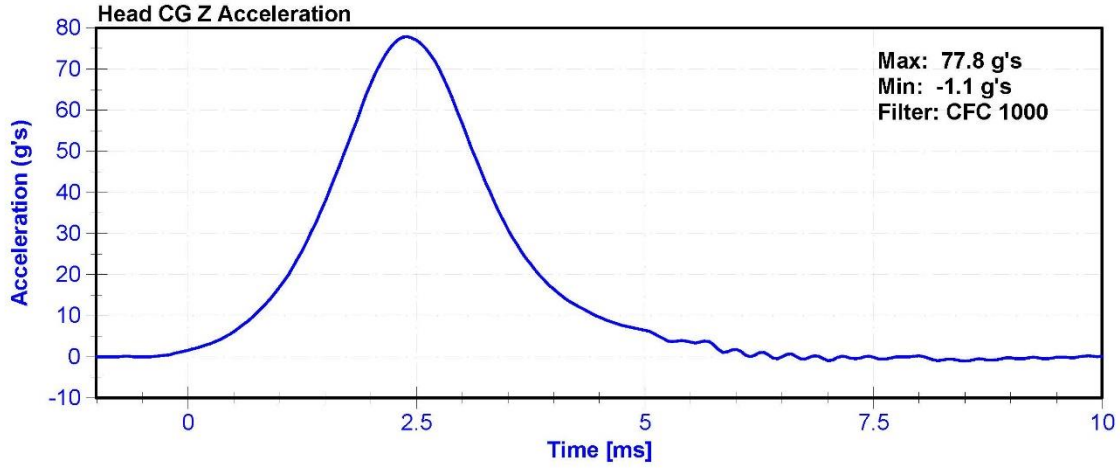
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P51685	5/4/2018	11/2/2018
Y Accelerometer	ENDEVCO 7264CT	AC-P51682	5/4/2018	11/2/2018
Z Accelerometer	ENDEVCO 7264CT	AC-P51699	5/4/2018	11/2/2018




Head CG X Acceleration
Max: 2.1 g's
Min: -1.0 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: 99.9 g's
Min: -1.8 g's
Filter: CFC 1000
Acceleration (g's)
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]


Head CG Z Acceleration
Max: 77.8 g's
Min: -1.1 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]

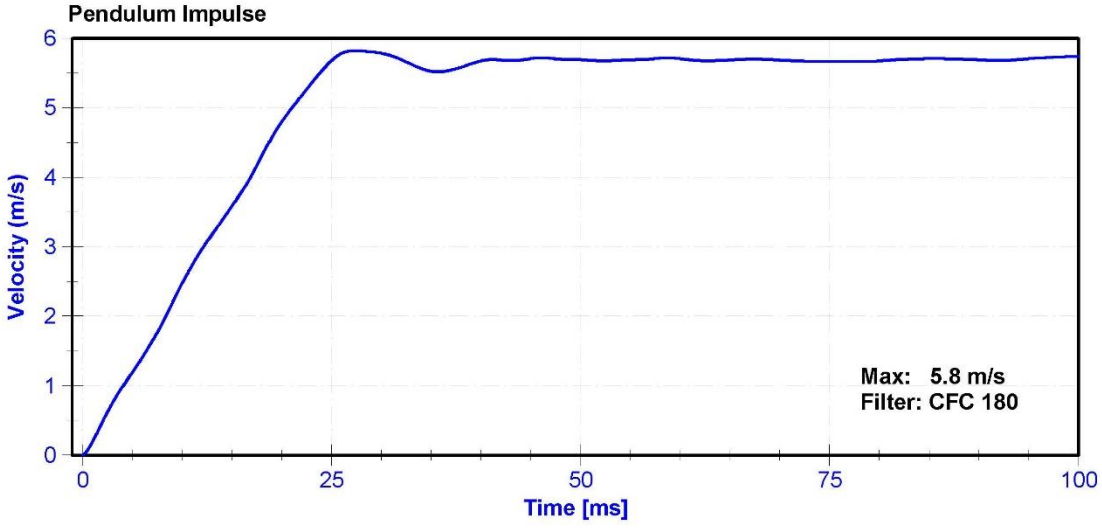
ATD Manufacturer	FTSS	Test Technician	J.Pericak
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

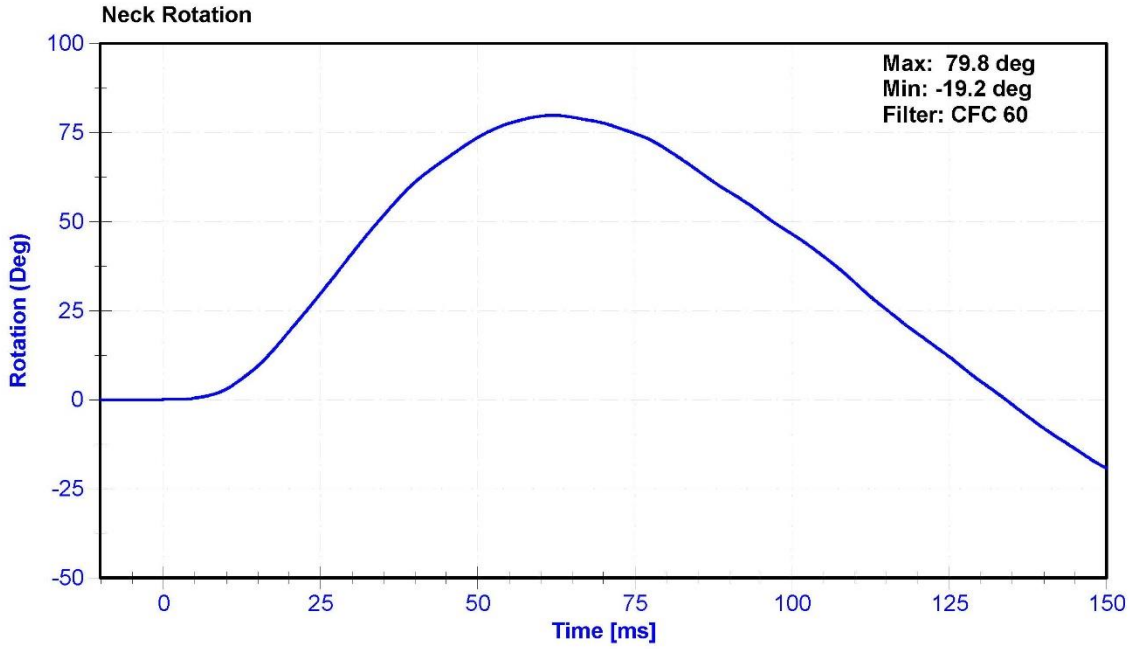
Results

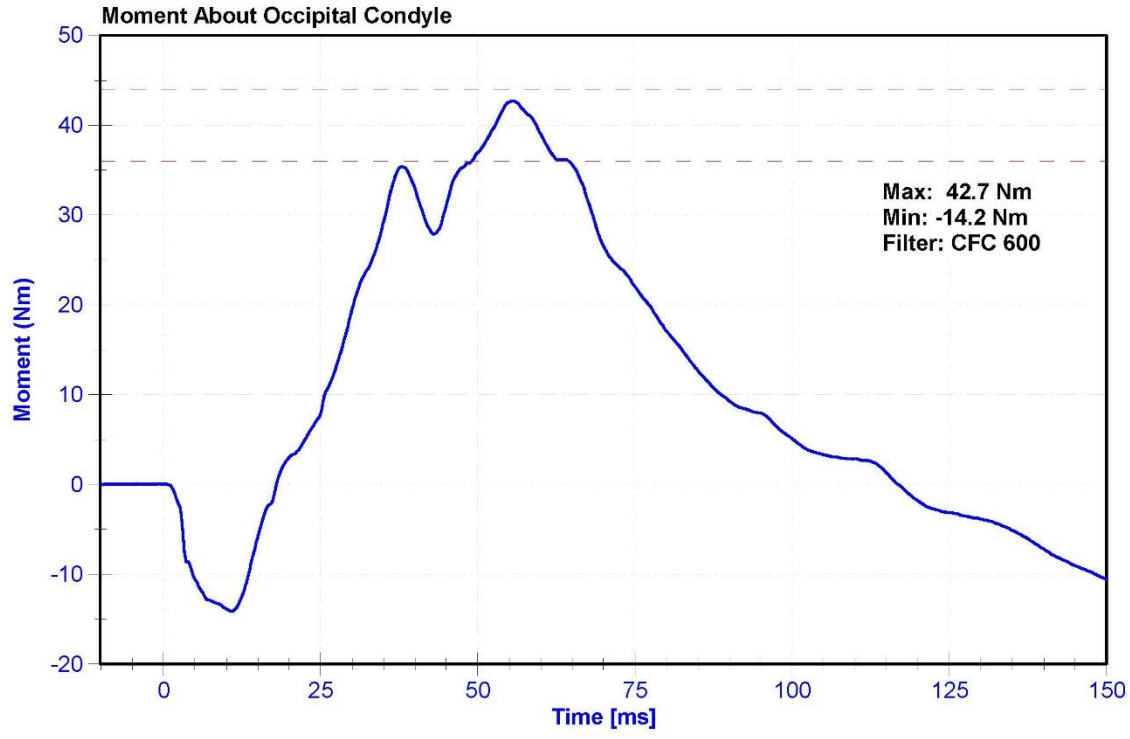
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	40.6	Pass
Velocity	5.51	5.63	m/s	5.546	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.47	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.59	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	4.80	Pass
Pendulum Impulse at 25ms	5.4	6.1	m/s	5.68	Pass
Pendulum Impulse from 25 to 100ms	5.5	6.2	m/s	5.82	Pass
Neck Rotation	71	81	deg	79.8	Pass
Time at Maximum Rotation	50	70	ms	61.9	Pass
Moment about the OC	36	44	Nm	42.7	Pass
Moment Decay to 0 Nm	102	126	ms	116.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	10/27/2017	10/27/2018
Condyle Potentiometer	Denton 78051-342	DS-185Pend	10/27/2017	10/27/2018
Upper Neck Load Cell	Denton 1716	LC-1872 FY	7/26/2017	7/26/2018




Neck Rotation
Max: 79.8 deg
Min: -19.2 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: 42.7 Nm
Min: -14.2 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

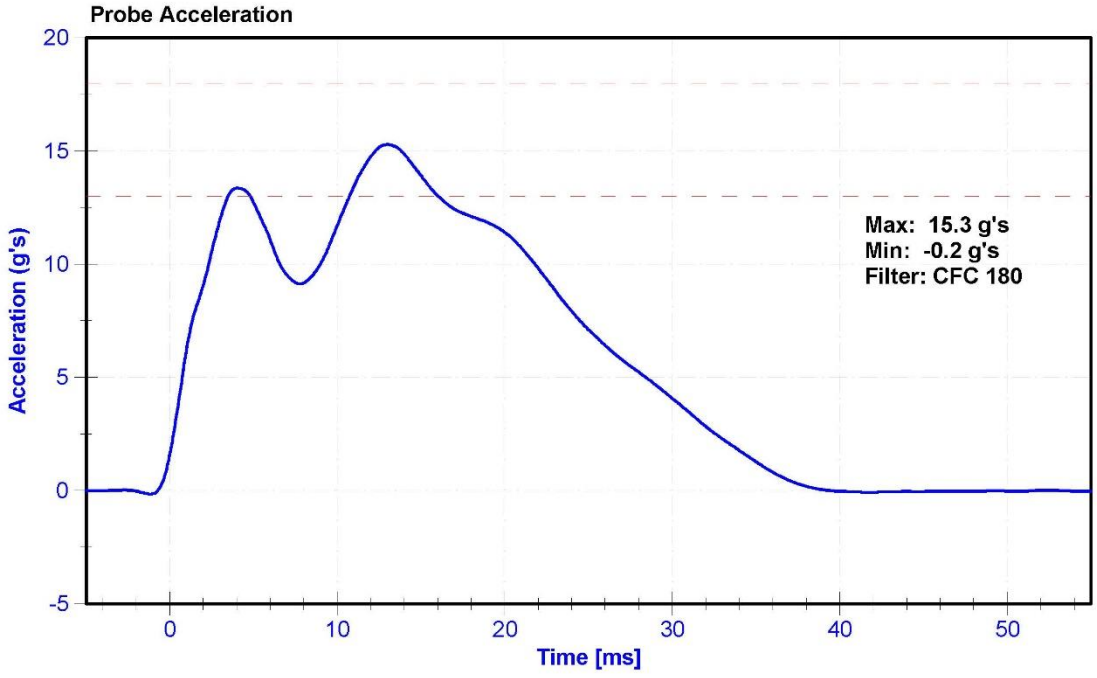
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

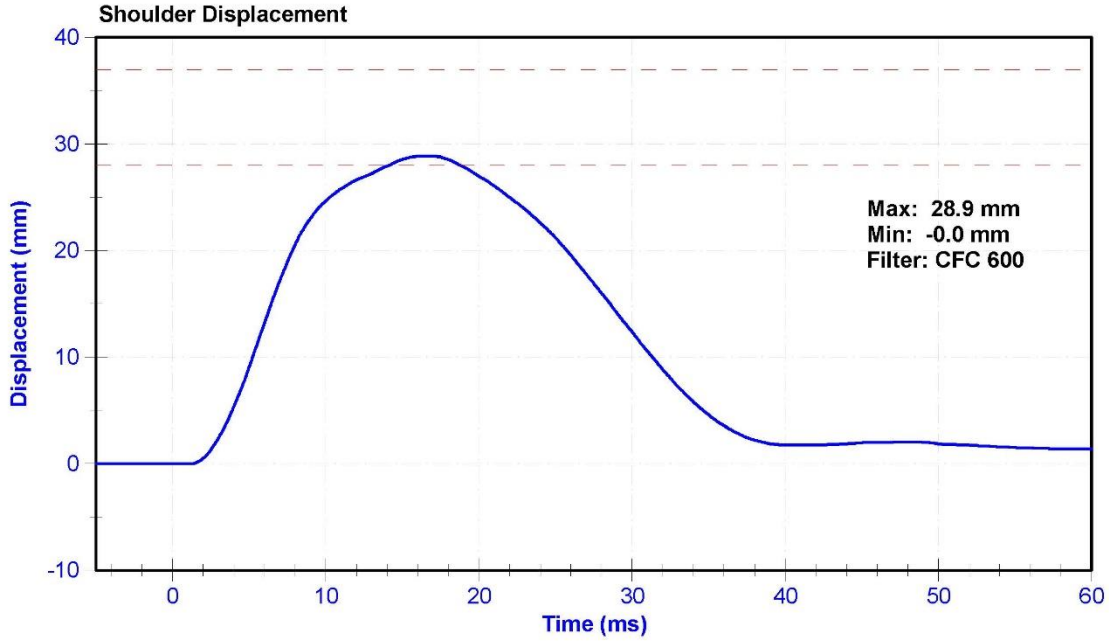
Results

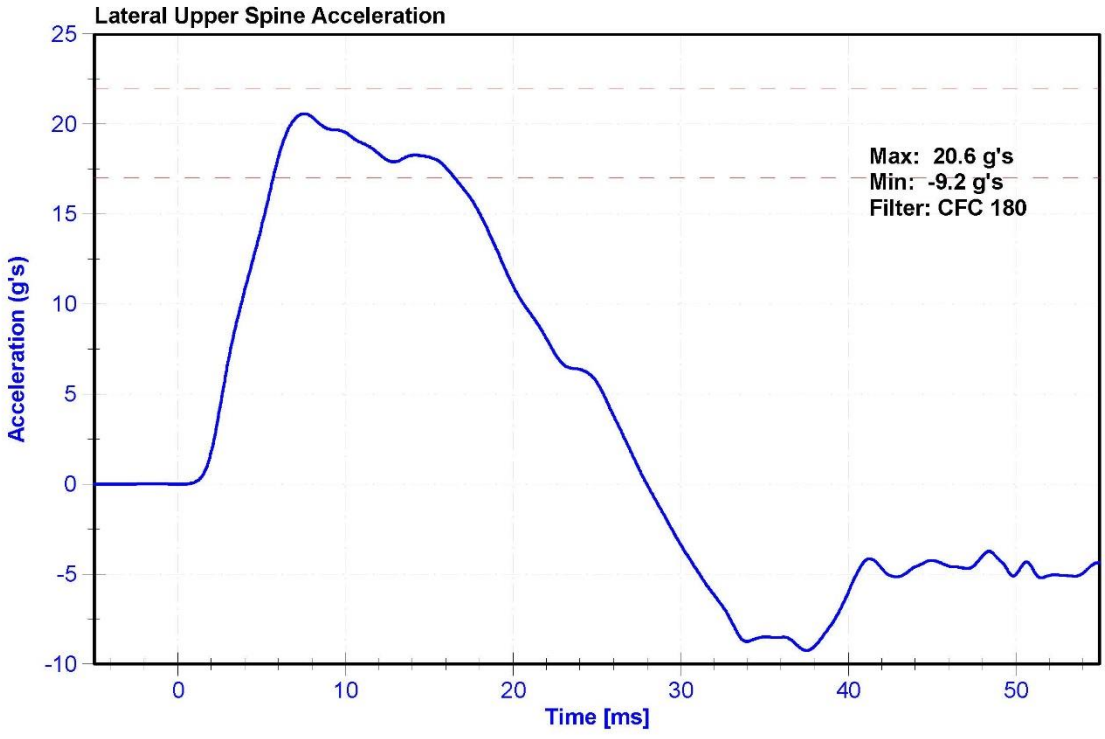
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	45.5	Pass
Velocity	4.2	4.4	m/s	4.39	Pass
Probe Acceleration	13	18	g's	15.3	Pass
Shoulder Deflection	28	37	mm	28.9	Pass
Lateral Upper Spine Acceleration	17	22	g's	20.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	9/27/2017	9/27/2018
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P63561	5/4/2018	11/2/2018




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 28.9 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 20.6 g's
Min: -9.2 g's
Filter: CFC 180

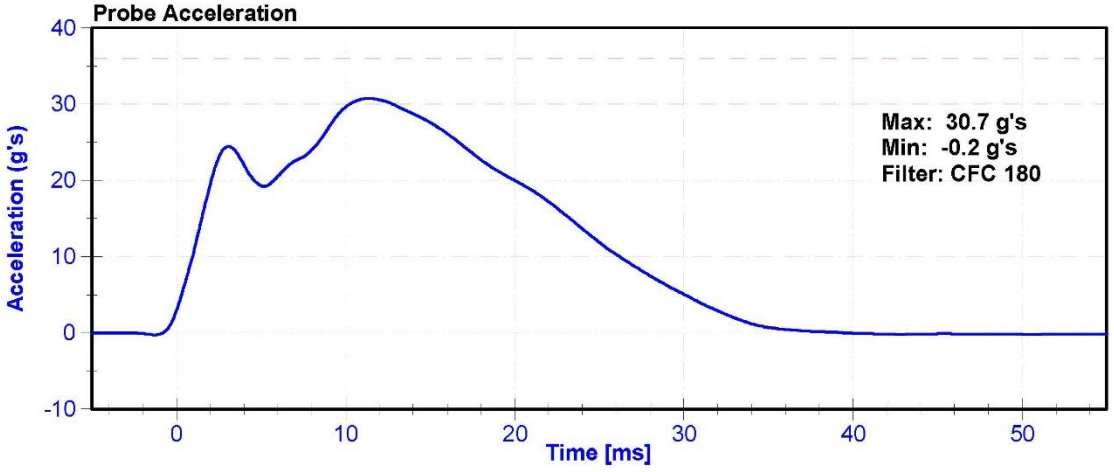
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

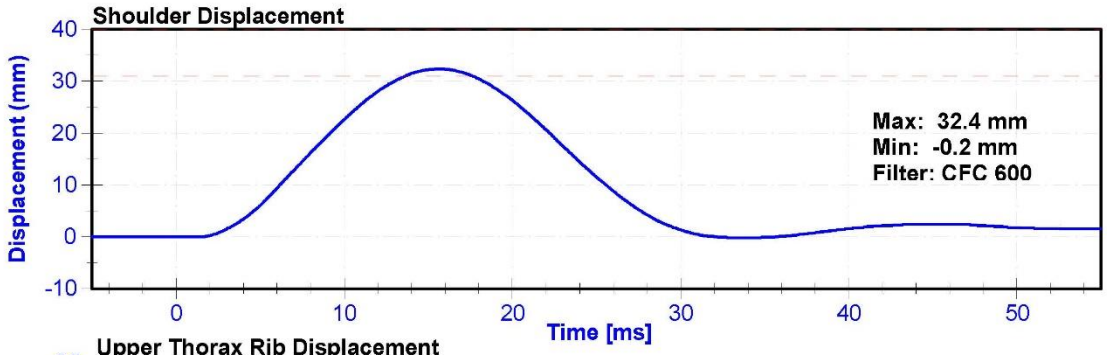
Results

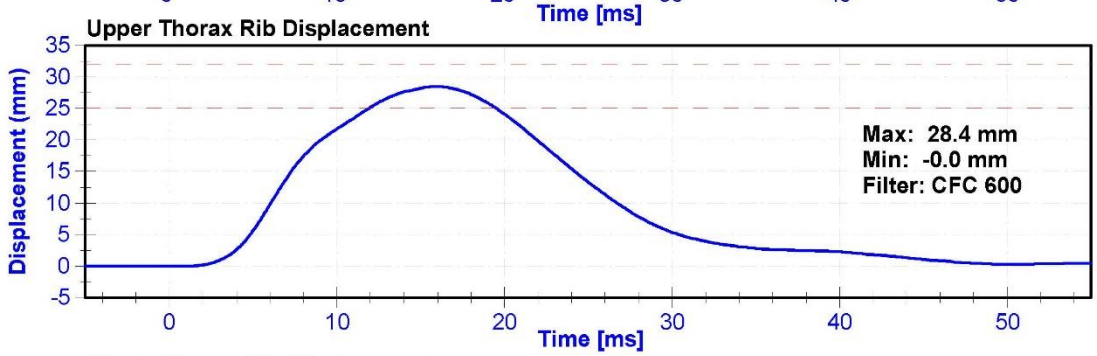
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	45.1	Pass
Velocity	6.6	6.8	m/s	6.79	Pass
Probe Acceleration after 5 ms	30	36	g's	30.7	Pass
Lateral Upper Spine Acceleration	34	43	g's	37.6	Pass
Lateral Lower Spine Acceleration	29	37	g's	31.5	Pass
Shoulder Deflection	31	40	mm	32.4	Pass
Upper Thorax Rib Deflection	25	32	mm	28.4	Pass
Mid Thorax Rib Deflection	30	36	mm	33.3	Pass
Lower Thorax Rib Deflection	32	38	mm	36.1	Pass

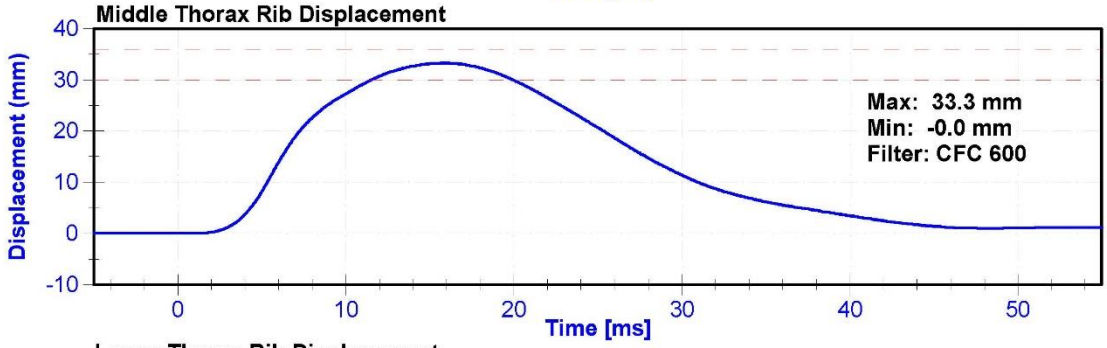
Transducer Calibrations

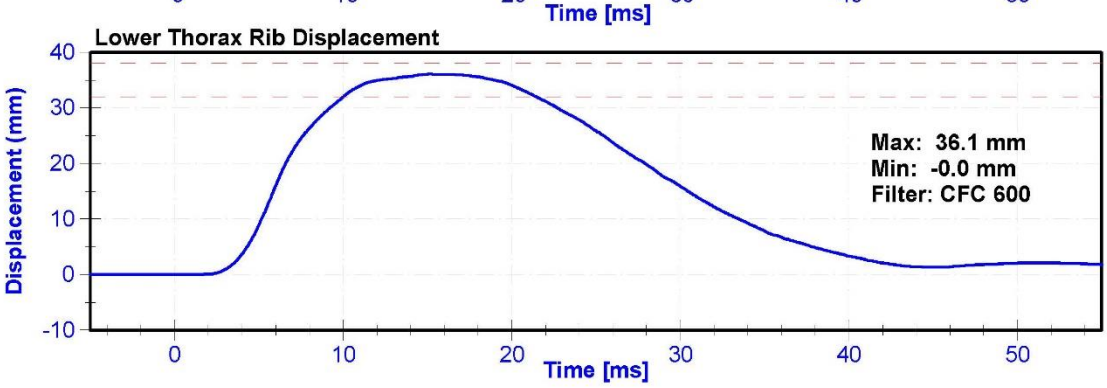
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P63561	5/4/2018	11/2/2018
Upper Spine T12 Y Accelerometer	ENDEVCO 7264	AC-P83319	5/4/2018	11/2/2018
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	9/27/2017	9/27/2018
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/15/2018	5/15/2019
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	12/11/2017	12/11/2018
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	9/27/2017	9/27/2018

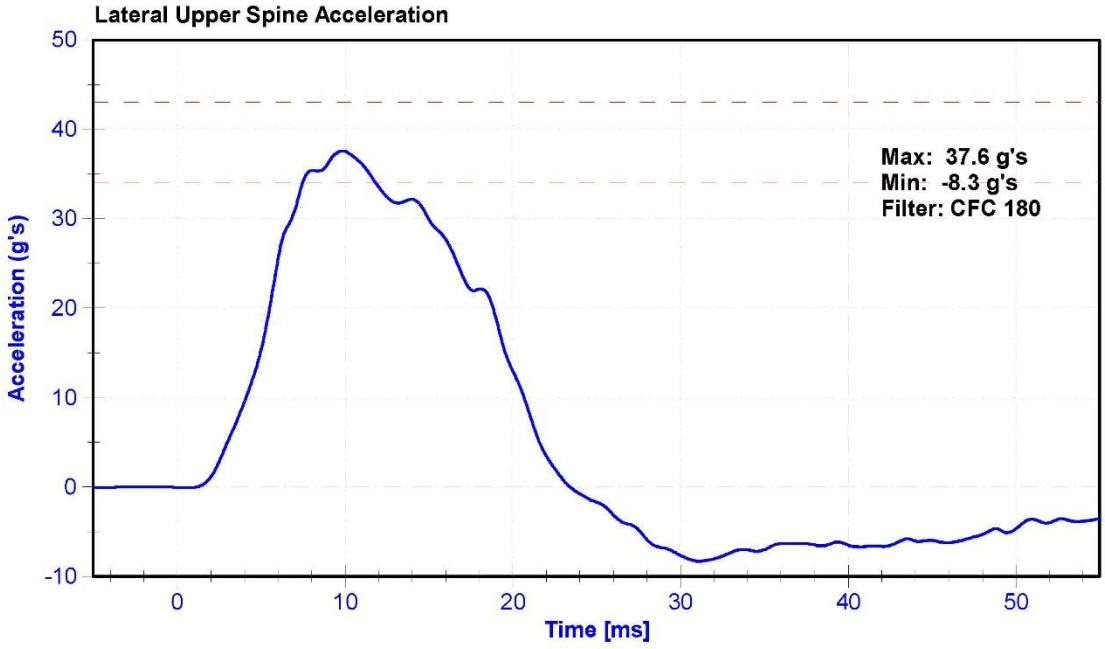


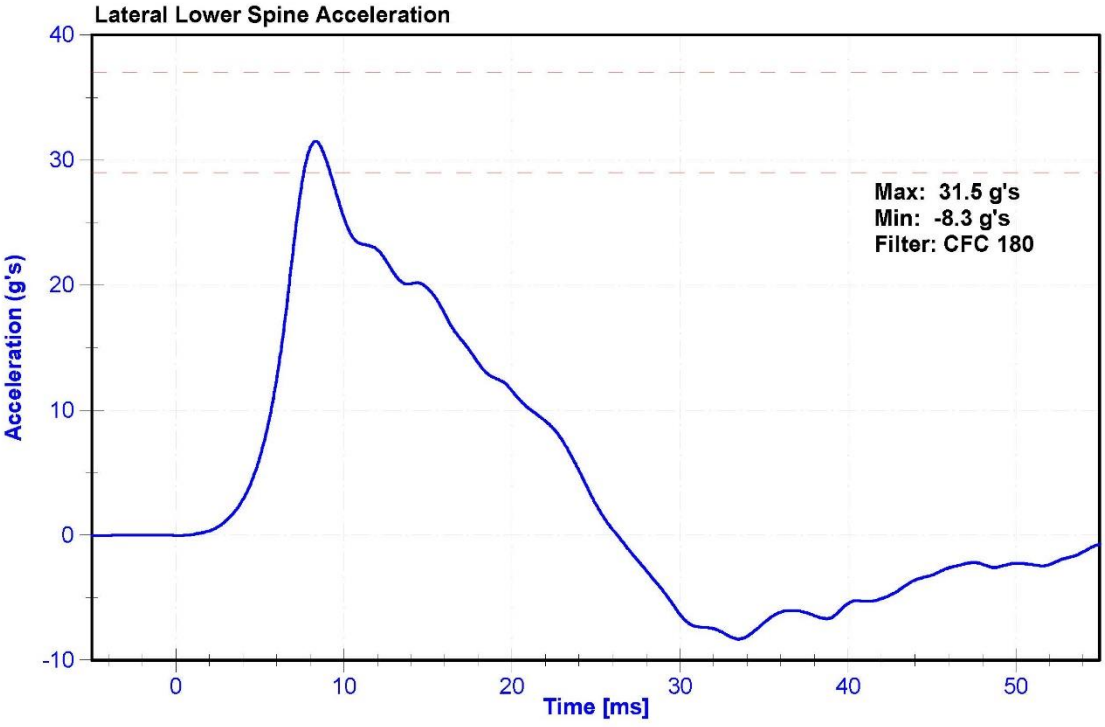

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 32.4 mm
Min: -0.2 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 28.4 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.3 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 36.1 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 37.6 g's
Min: -8.3 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
50
40
30
20
10
0
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 31.5 g's
Min: -8.3 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

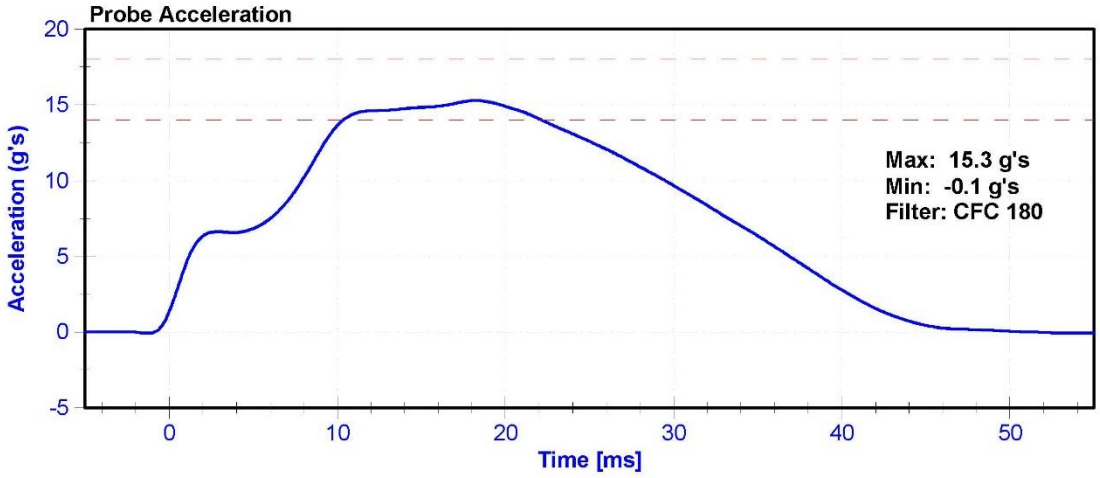
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

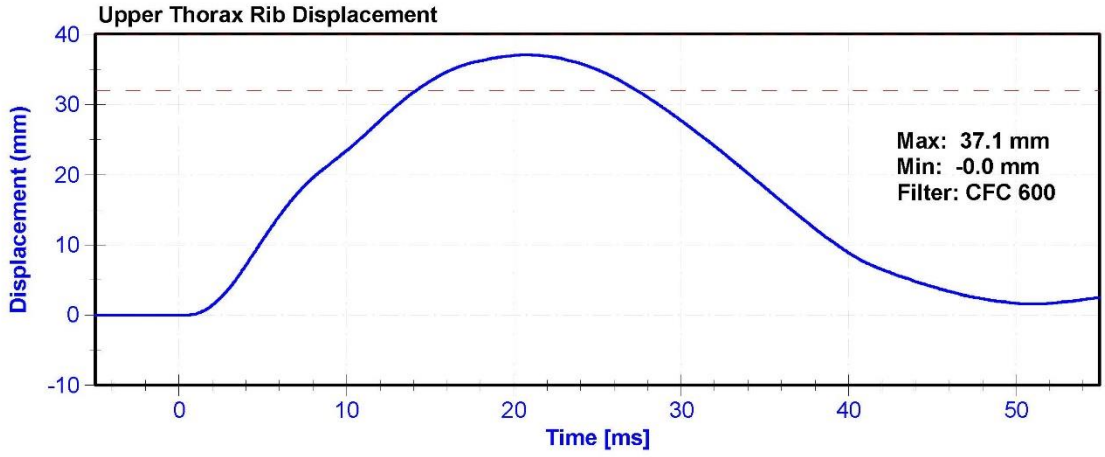
Results

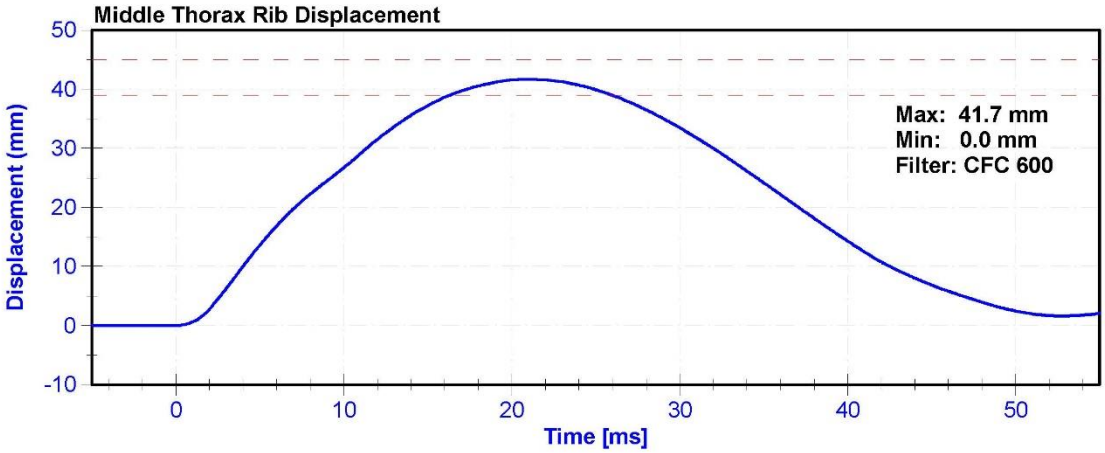
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22	Pass
Humidity	10	70	%	46.3	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	14	18	g's	15.3	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.4	Pass
Lateral Lower Spine Acceleration	7	11	g's	10.2	Pass
Upper Thorax Rib Deflection	32	40	mm	37.1	Pass
Middle Thorax Rib Deflection	39	45	mm	41.7	Pass
Lower Thorax Rib Deflection	35	43	mm	38.3	Pass

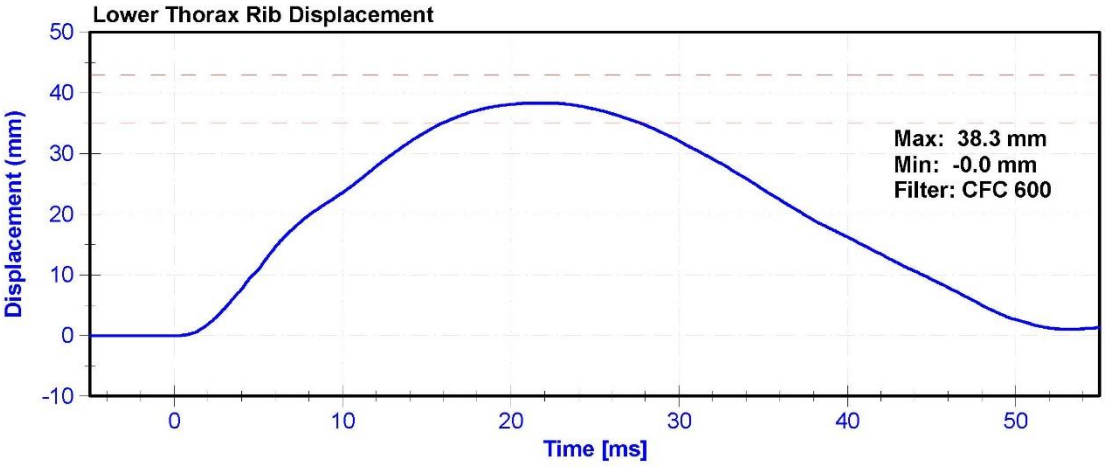
Transducer Calibrations

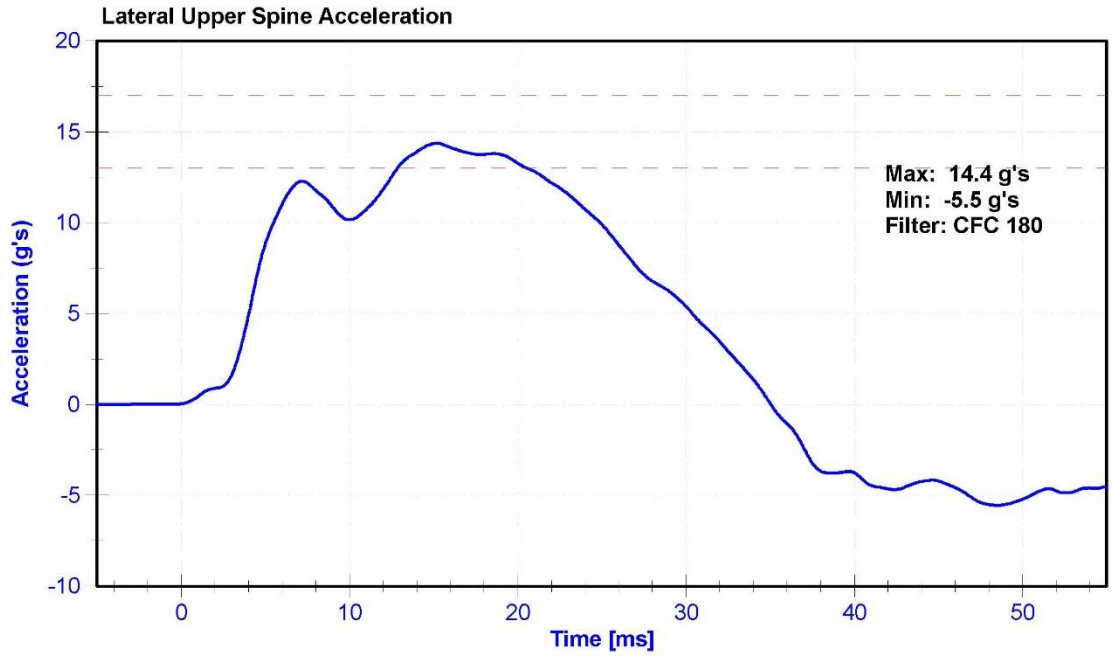
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P63561	5/4/2018	11/2/2018
Lower Spine Y Accelerometer	ENDEVCO 7264	AC-P83319	5/4/2018	11/2/2018
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/15/2018	5/15/2019
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	12/11/2017	12/11/2018
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	9/27/2017	9/27/2018

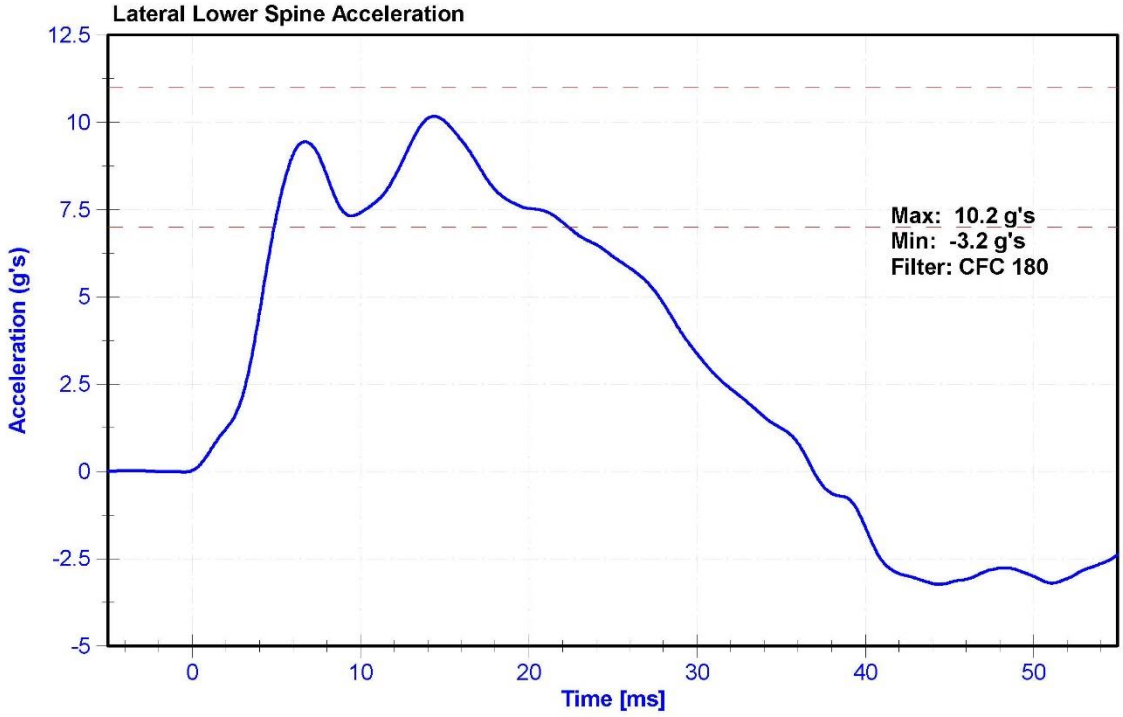



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.1 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 41.7 mm
Min: 0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 38.3 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 14.4 g's
Min: -5.5 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: 10.2 g's
Min: -3.2 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

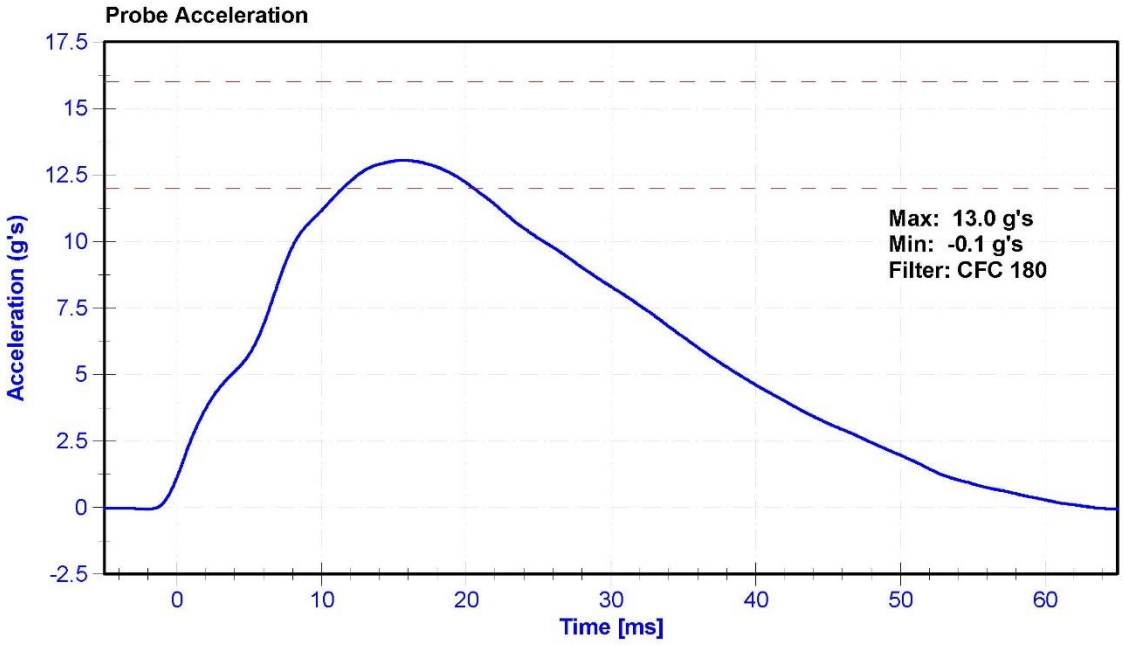
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

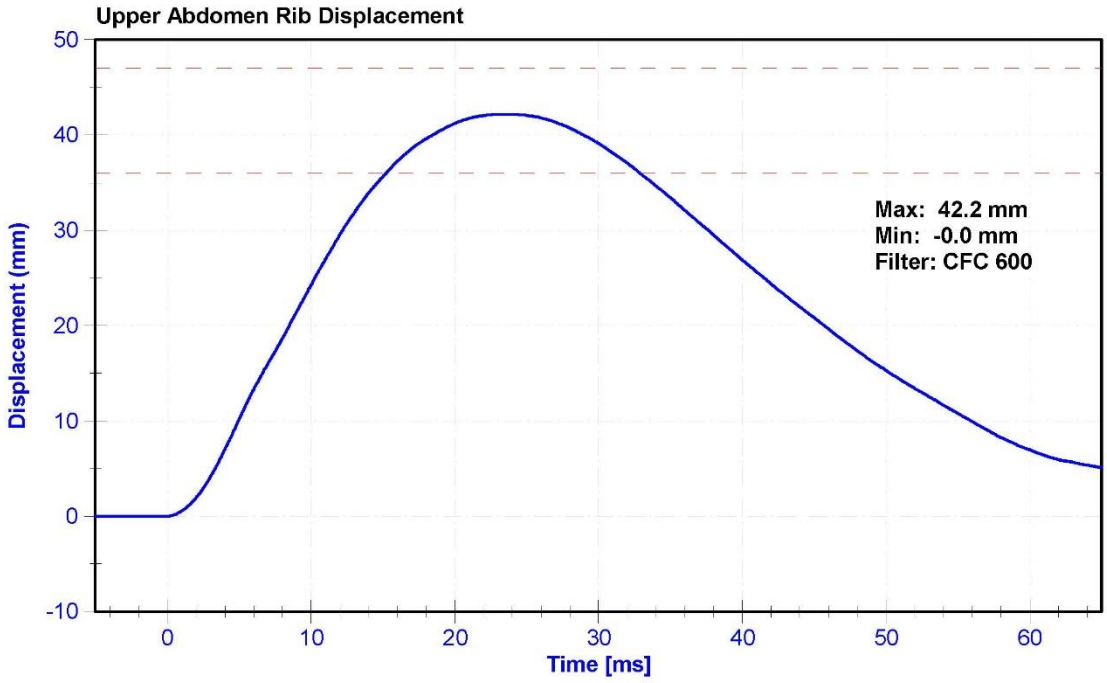
Results

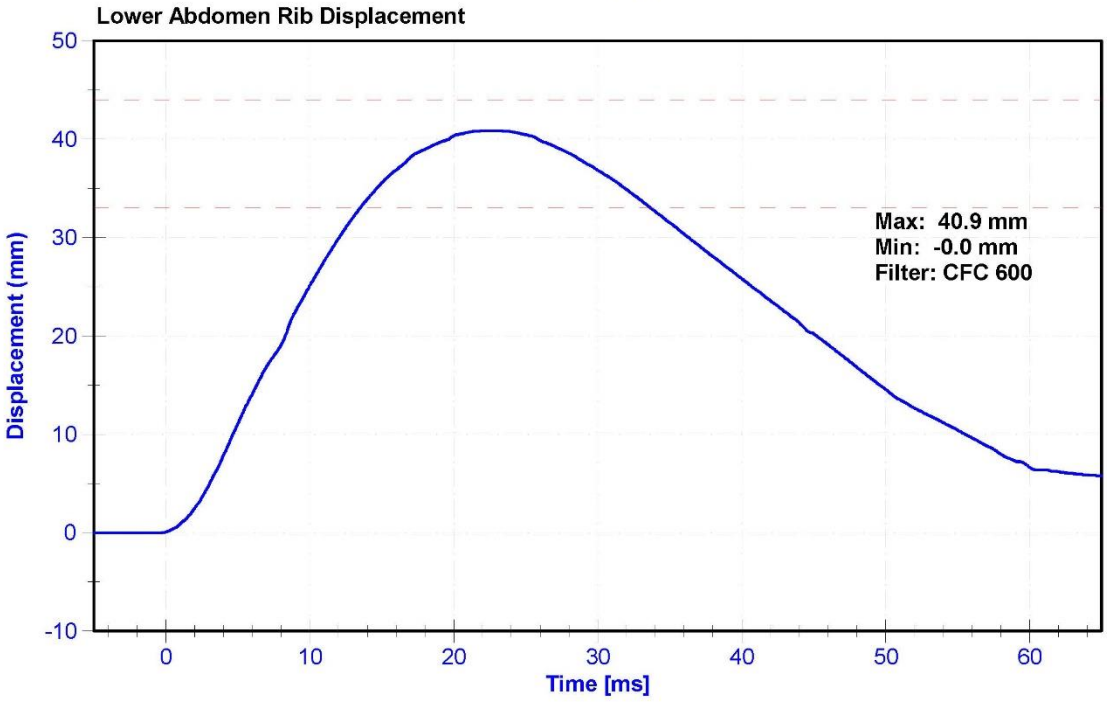
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	48.4	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	12	16	g's	13.0	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.5	Pass
Upper Abdomen Rib Deflection	36	47	mm	42.2	Pass
Lower Abdomen Rib Deflection	33	44	mm	40.9	Pass

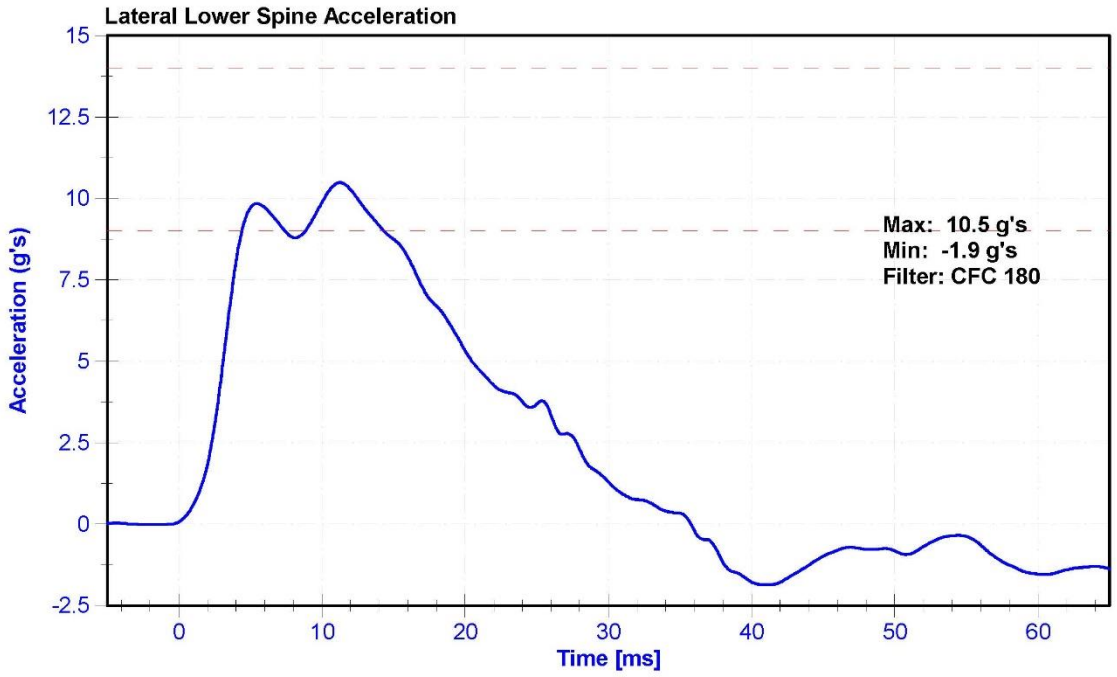
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Lower Spine Y Accelerometer	ENDEVCO 7264	AC-P83319	5/4/2018	11/2/2018
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	9/27/2017	9/27/2018
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	9/27/2017	9/27/2018




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.2 mm
Min: -0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.9 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
0
10
20
30
40
50
60
Time [ms]
Max: 10.5 g's
Min: -1.9 g's
Filter: CFC 180

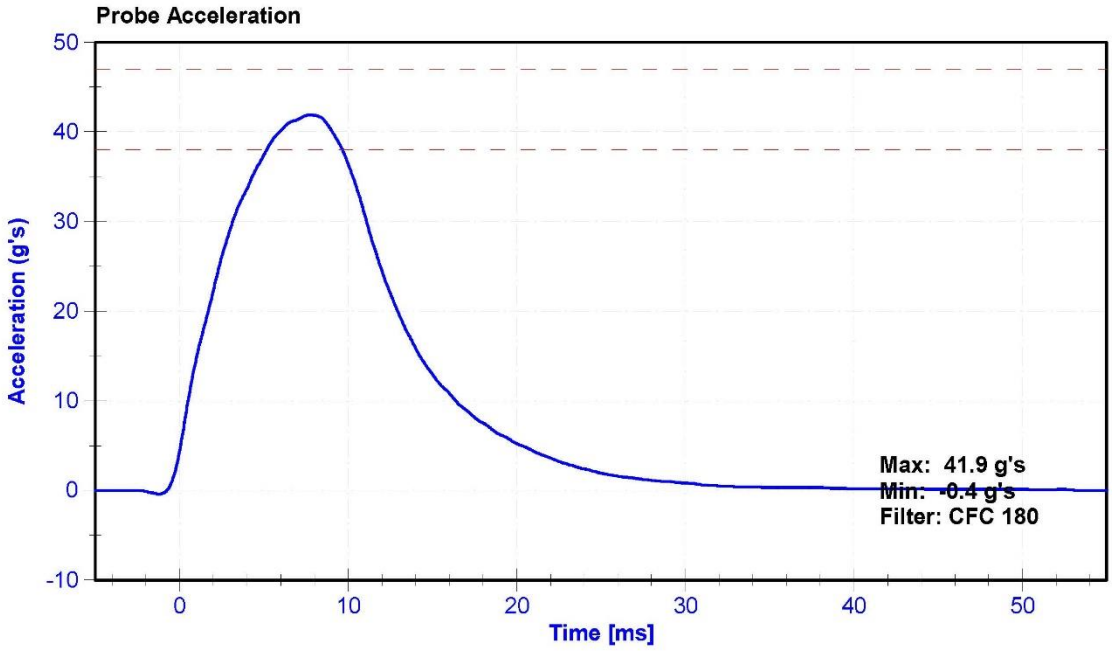
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

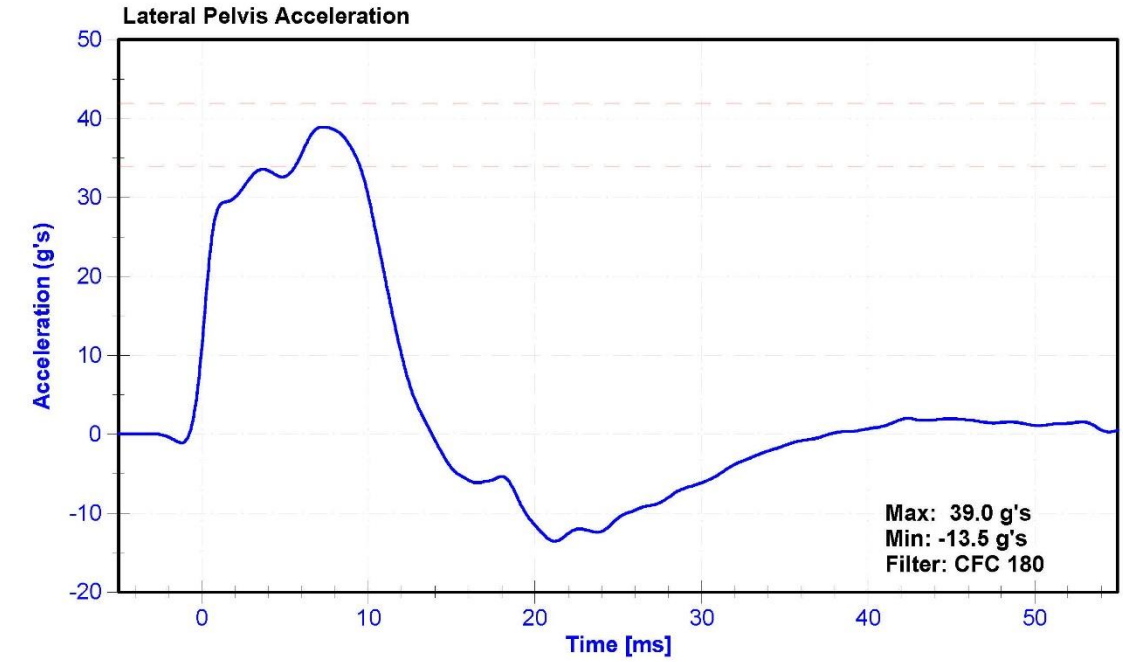
Results

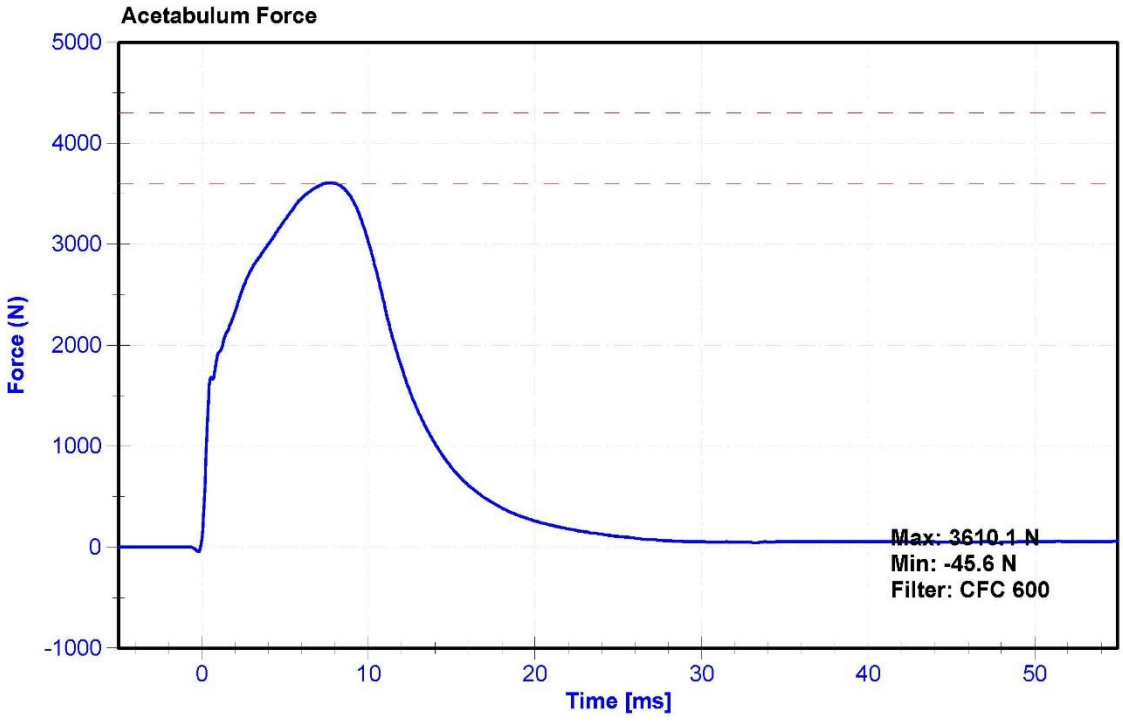
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	39.9	Pass
Velocity	6.6	6.8	m/s	6.66	Pass
Probe Acceleration	38	47	g's	41.9	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	39.0	Pass
Acetabulum Force	3600	4300	N	3610.1	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	5/4/2018	11/2/2018
Acetabulum Load Cell	Denton 3249J	LC-4986Fy	6/4/2018	6/4/2019
Certification Plug	Humanetics	12110	02/27/2018	N/A
Crash Test Plug	Humanetics	11473	08/30/2016	N/A




Lateral Pelvis Acceleration
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]
Max: 39.0 g's
Min: -13.5 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: 3610.1 N
Min: -45.6 N
Filter: CFC 600

DG8012 Crash 6/12/2018

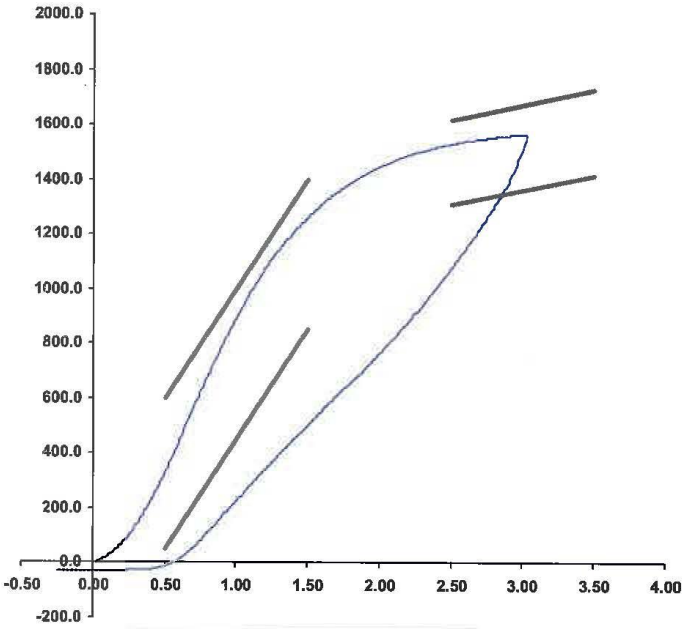
SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 11473
Test Number 2961
Report Number 2958
Test Date 8/30/2016 11:36:03 AM

	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	336.94	50.00	600.00
Force @ 1.5 mm (N)	1,263.71	850.00	1,400.00
Force @ 2.5 mm (N)	1,530.09	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,565.56	1,361.00	1,673.00

Force (-N) vs Extension (-mm)



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

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

Notes:

Operator DC

Part Number 180-4450

Template No 107 30-Aug-16
SACO Research

By : DC Date : 8/30/16

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

DG8012 cert 6/12/2018

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 12110
Test Number 6468
Report Number 6483
Test Date 2/27/2018 11:23:30 AM

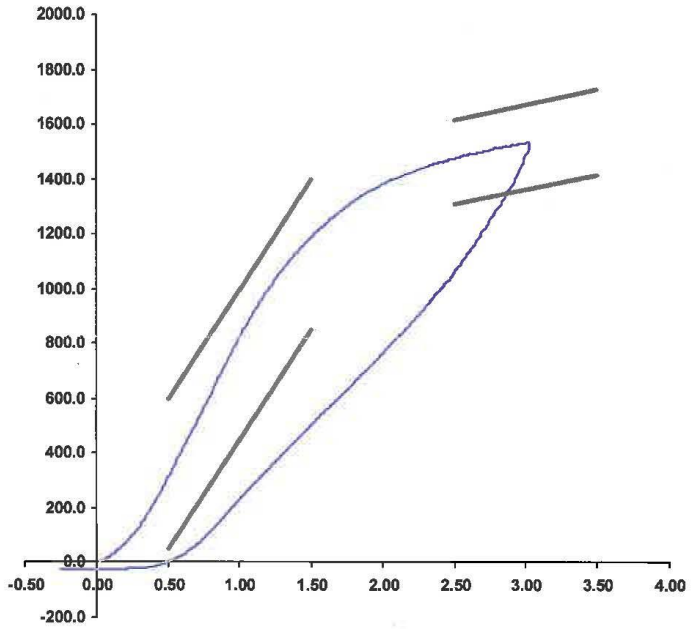
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	318.16	50.00	600.00
Force @ 1.5 mm (N)	1,194.22	850.00	1,400.00
Force @ 2.5 mm (N)	1,474.98	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,534.45	1,361.00	1,673.00

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

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

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 27-Feb-18
SACO Research

By : DC Date : 2/27/18

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

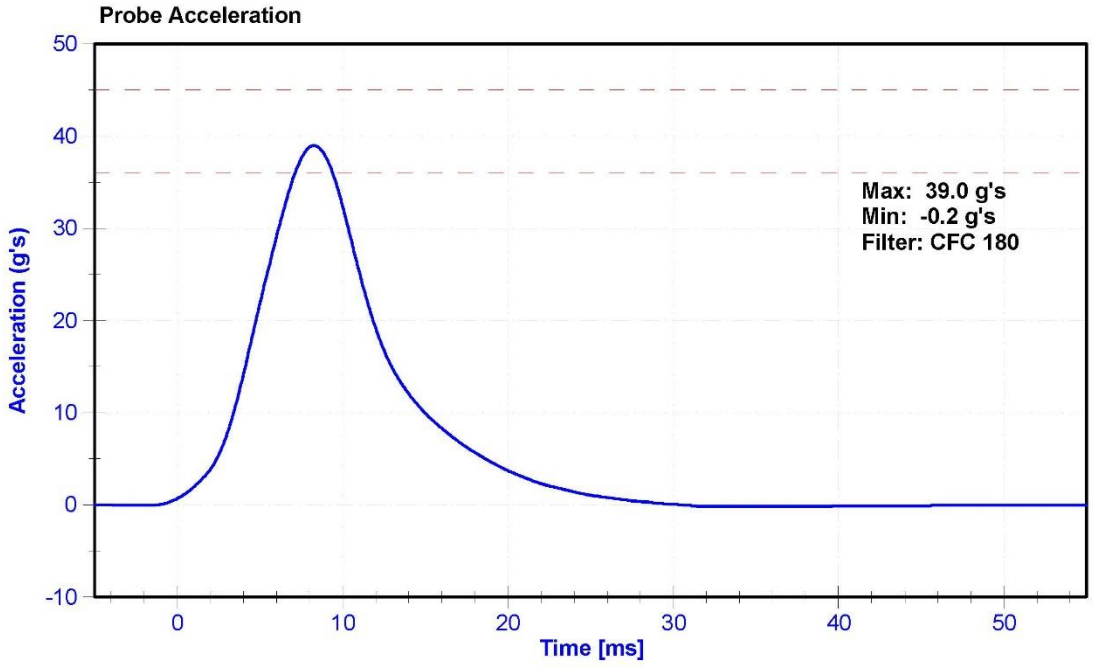
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K.Brogan

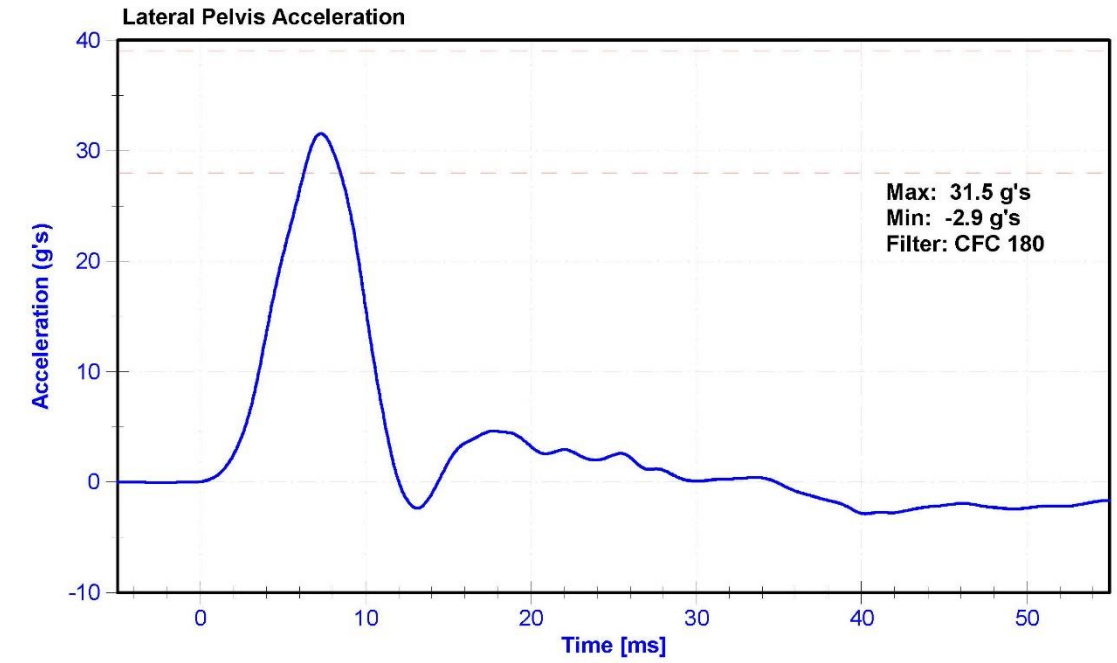
Results

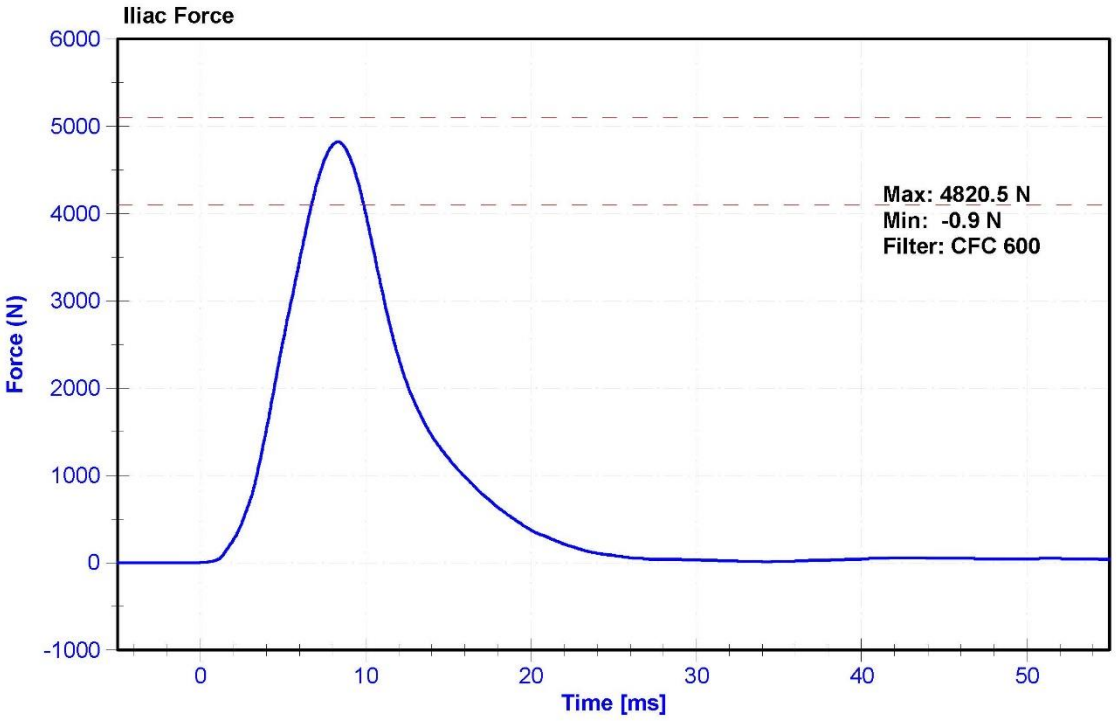
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	44.1	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	39.0	Pass
Lateral Pelvis Acceleration	28	39	g's	31.5	Pass
Iliac Force	4100	5100	N	4820.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	5/4/2018	11/2/2018
Iliac Load Cell	DENTON 3228J	LC-113Fy	6/4/2018	6/4/2019




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 31.5 g's
Min: -2.9 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4820.5 N
Min: -0.9 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

EUROSID 2 (ES-2RE) MALE – DRIVER ATD

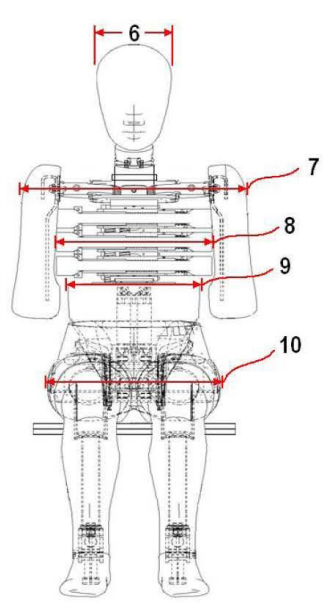
SERIAL NO: F034

(CONFIGURED FOR LEFT SIDE IMPACT)

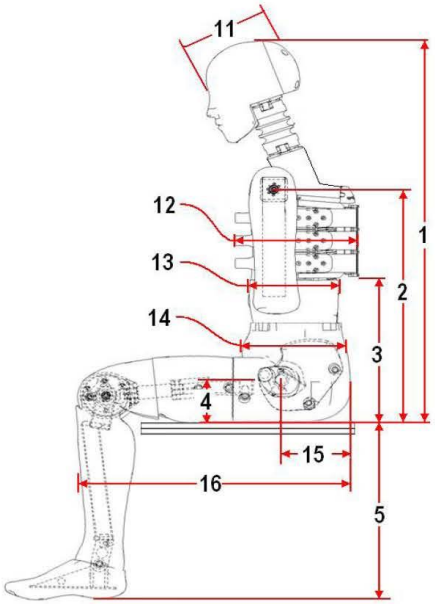
External Measurements - EuroSID-2re

Technician: D. Reinhard Date: 6/25/2018

Dummy Serial Number: F034



FRONT VIEW



SIDE VIEW

Dim. No.	Description	Specification (mm)		Result (mm)	Pass/Fail
1	Sitting Height	900	918	911	Pass
2	Seat to Shoulder Joint	558	572	566	Pass
3	Seat to Lower Face of Thoracic Spine Box	346	356	350	Pass
4	Seat to Hip Joint (center of bolt)	97	103	100	Pass
5	Sole to Seat, Sitting	333	451	419	Pass
6	Head Width	152	158	153	Pass
7	Shoulder/Arm Width	461	479	469	Pass
8	Thorax Width	322	332	326	Pass
9	Abdomen Width	273	287	280	Pass
10	Pelvis Lap Width	359	373	367	Pass
11	Head Depth	196	206	201	Pass
12	Thorax Depth	262	272	268	Pass
13	Abdomen Depth	194	204	200	Pass
14	Pelvis Depth	235	245	239	Pass
15	Back of Buttocks to Hip Joint (center of bolt)	150	160	156	Pass
16	Back of Buttocks to Front Knee	597	615	603	Pass

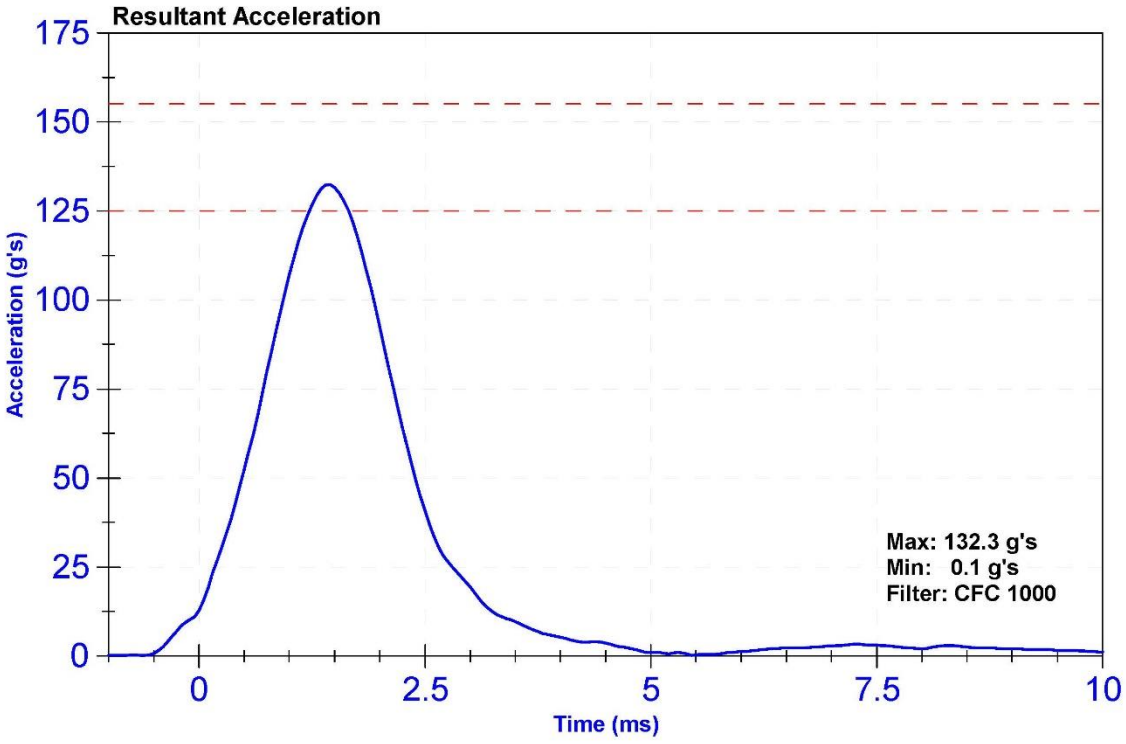
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

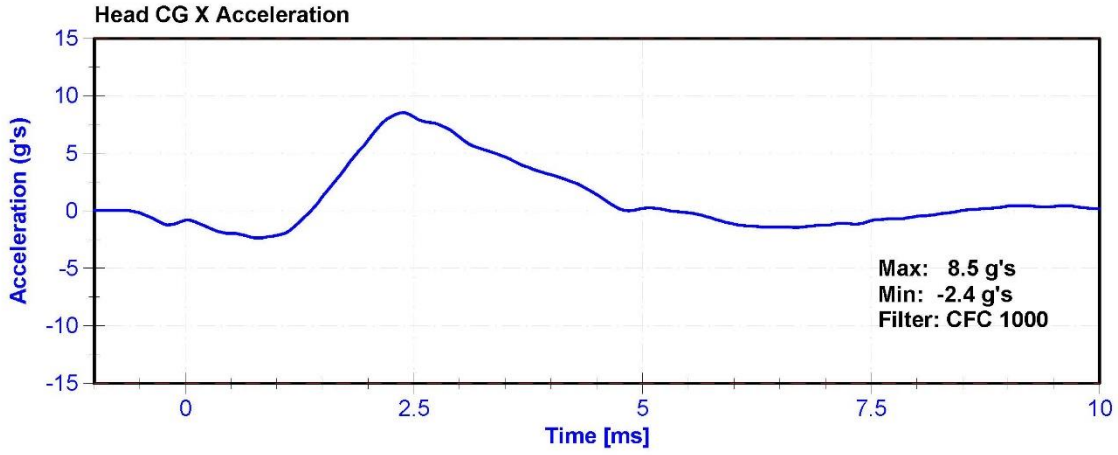
Results

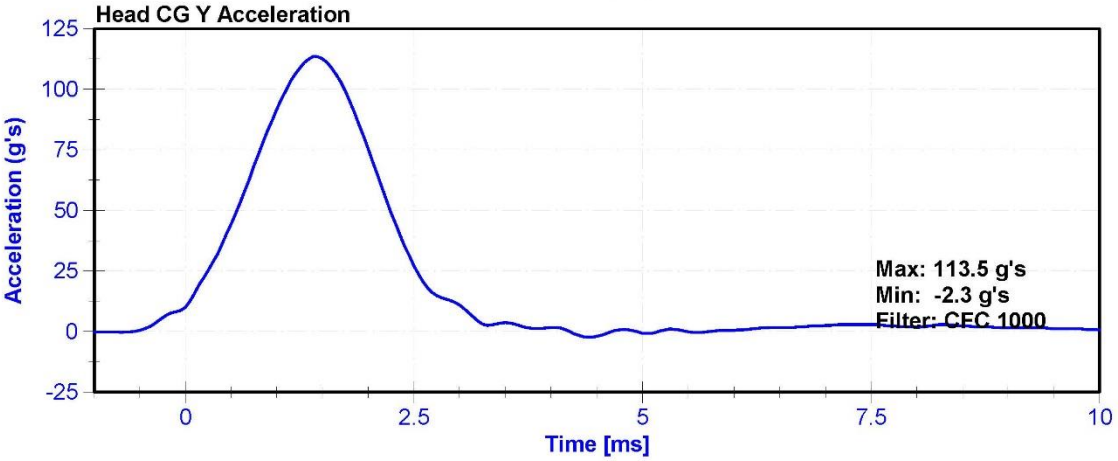
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.0	Pass
Humidity	10	70	%	60.2	Pass
Resultant Acceleration	125	155	g's	132.3	Pass
Oscillation	0	15	%	3.01	Pass
Fore-Aft Acceleration	-15	15	g's	8.5	Pass

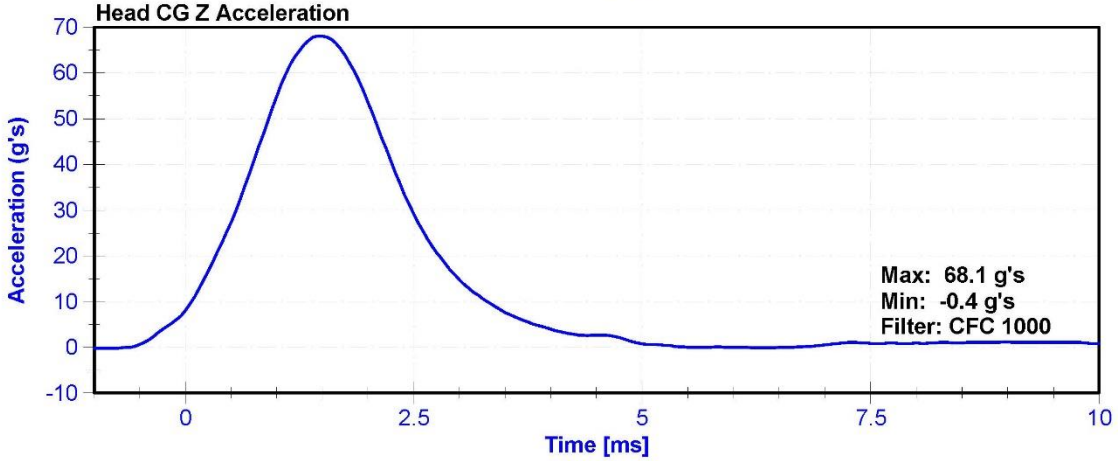
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P58904	5/7/2018	11/5/2018
Y Accelerometer	ENDEVCO 7264CT	AC-P58911	5/7/2018	11/5/2018
Z Accelerometer	ENDEVCO 7264CT	AC-P58776	5/7/2018	11/5/2018




Head CG X Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
-15
0
2.5
5
7.5
10
Time [ms]
Max: 8.5 g's
Min: -2.4 g's
Filter: CFC 1000


Head CG Y Acceleration
Acceleration (g's)
125
100
75
50
25
0
-25
0
2.5
5
7.5
10
Time [ms]
Max: 113.5 g's
Min: -2.3 g's
Filter: CFC 1000


Head CG Z Acceleration
Acceleration (g's)
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]
Max: 68.1 g's
Min: -0.4 g's
Filter: CFC 1000

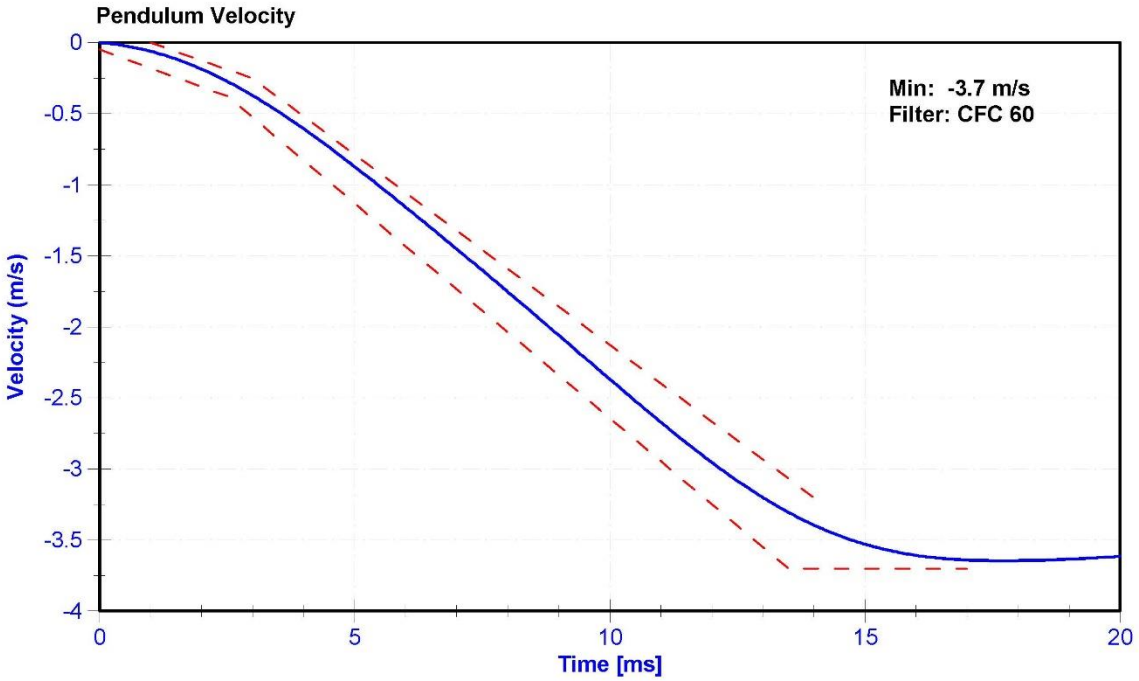
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K.Brogan

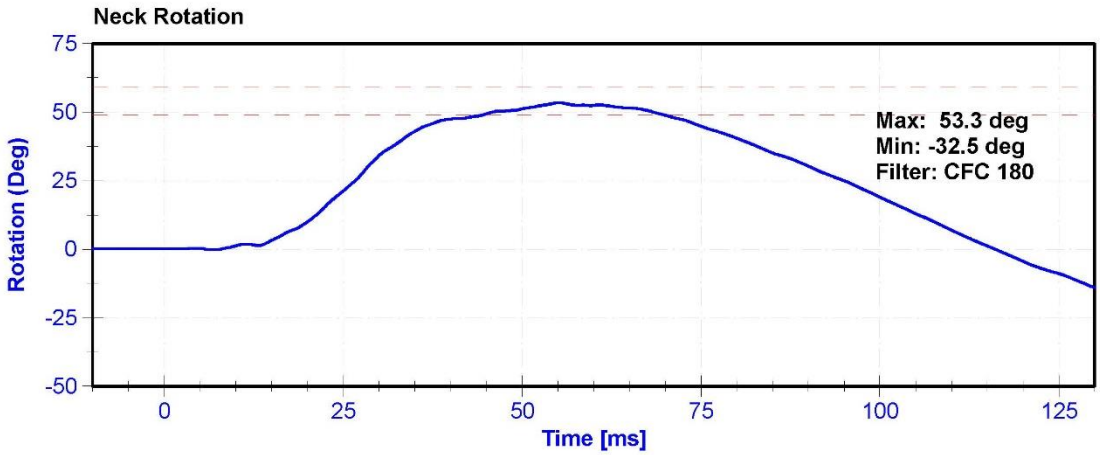
Results

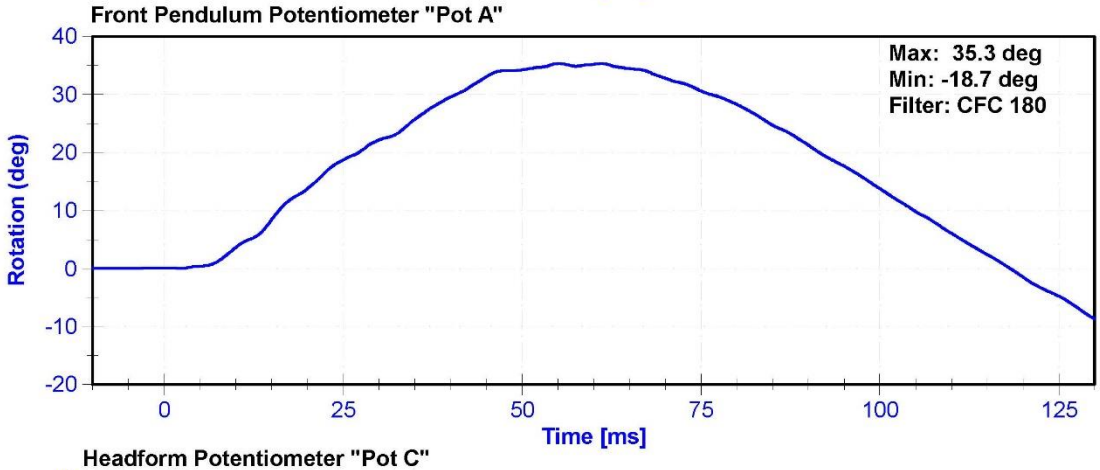
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.3	Pass
Humidity	10	70	%	51.6	Pass
Velocity	3.3	3.5	m/s	3.42	Pass
Lateral Neck Rotation	49	59	deg	53.3	Pass
Time at Maximum Rotation	54	66	ms	55.1	Pass
Time of Rotation Decay from Maximum	53	88	ms	61.0	Pass

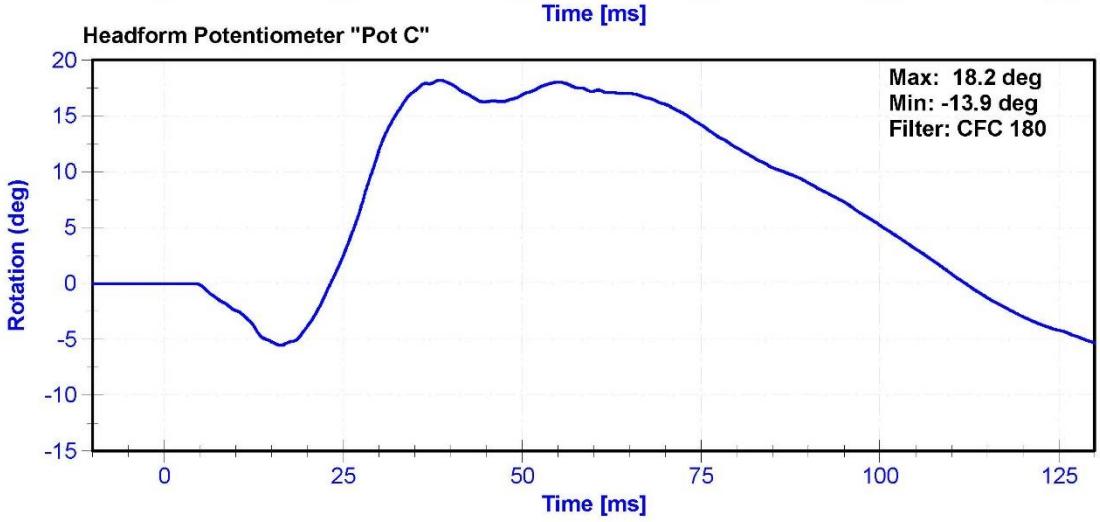
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Front Pendulum Potentiometer	SP22G	DS-094	10/30/2017	10/30/2018
Headform Potentiometer	SP22G	DS-095	10/30/2017	10/30/2018




Neck Rotation
Rotation (Deg)
Time [ms]
Max: 53.3 deg
Min: -32.5 deg
Filter: CFC 180


Front Pendulum Potentiometer "Pot A"
Rotation (deg)
Time [ms]
Max: 35.3 deg
Min: -18.7 deg
Filter: CFC 180


Headform Potentiometer "Pot C"
Rotation (deg)
Time [ms]
Max: 18.2 deg
Min: -13.9 deg
Filter: CFC 180

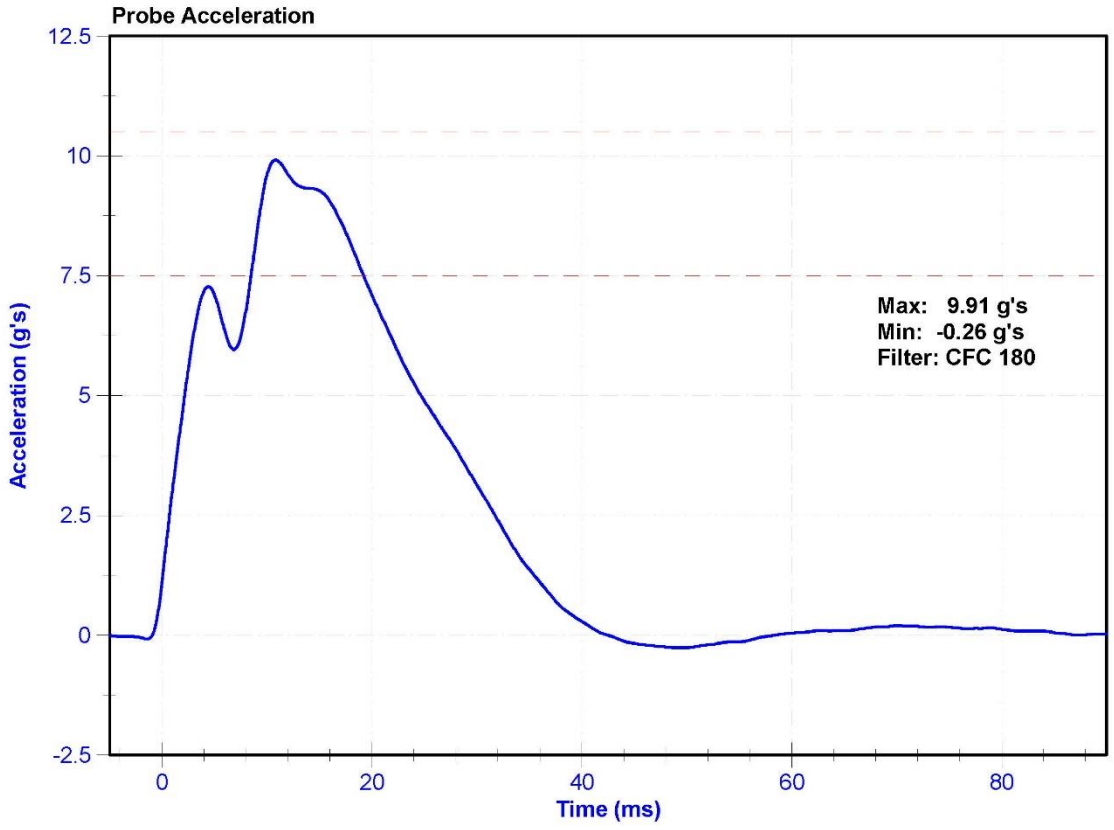
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	54.8	Pass
Velocity	4.2	4.4	m/s	4.22	Pass
Probe Acceleration	7.5	10.5	g's	9.91	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018



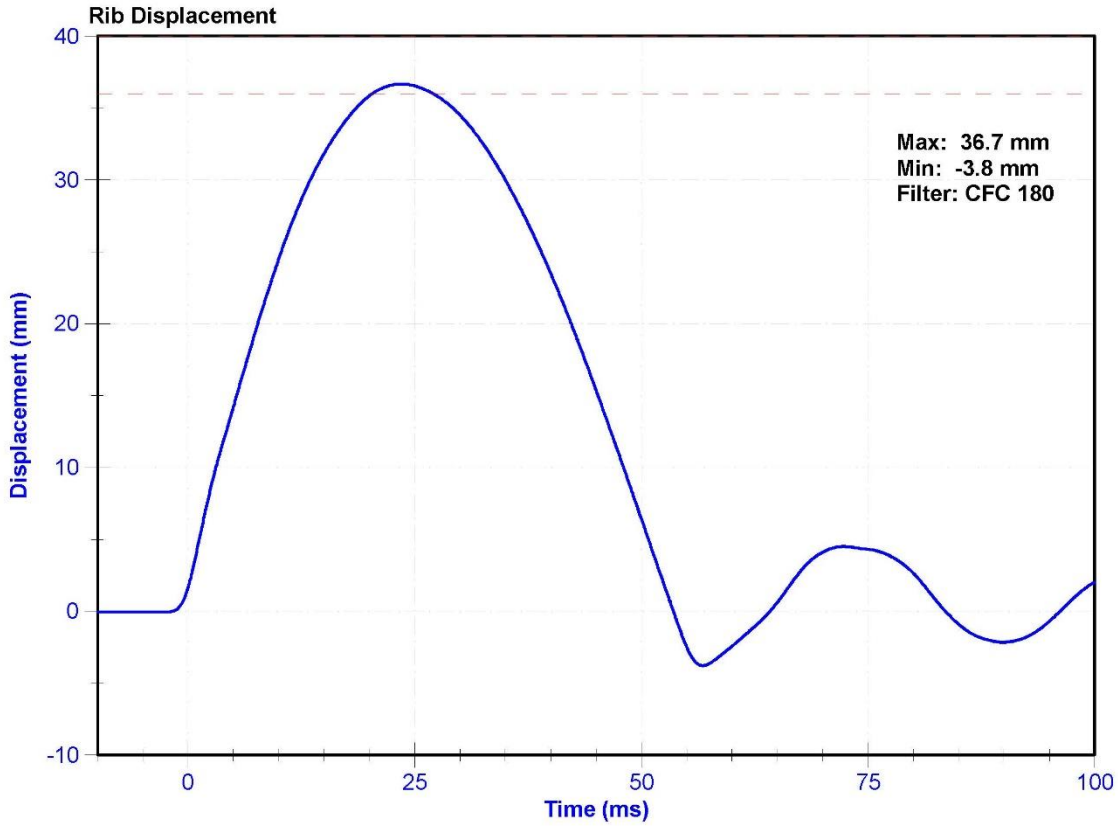
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	50.6	Pass
Rib Displacement	36	40	mm	36.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	9/27/2017	9/27/2018



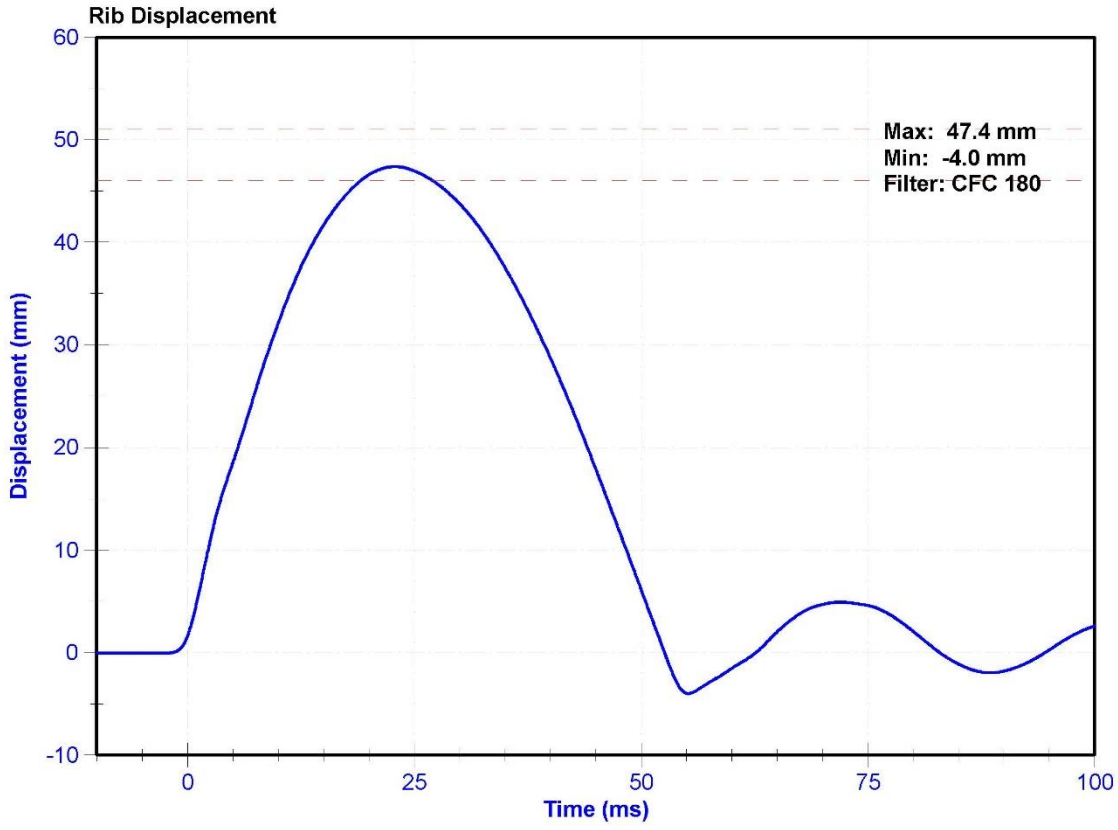
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	53.4	Pass
Rib Displacement	46	51	mm	47.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	9/27/2017	9/27/2018



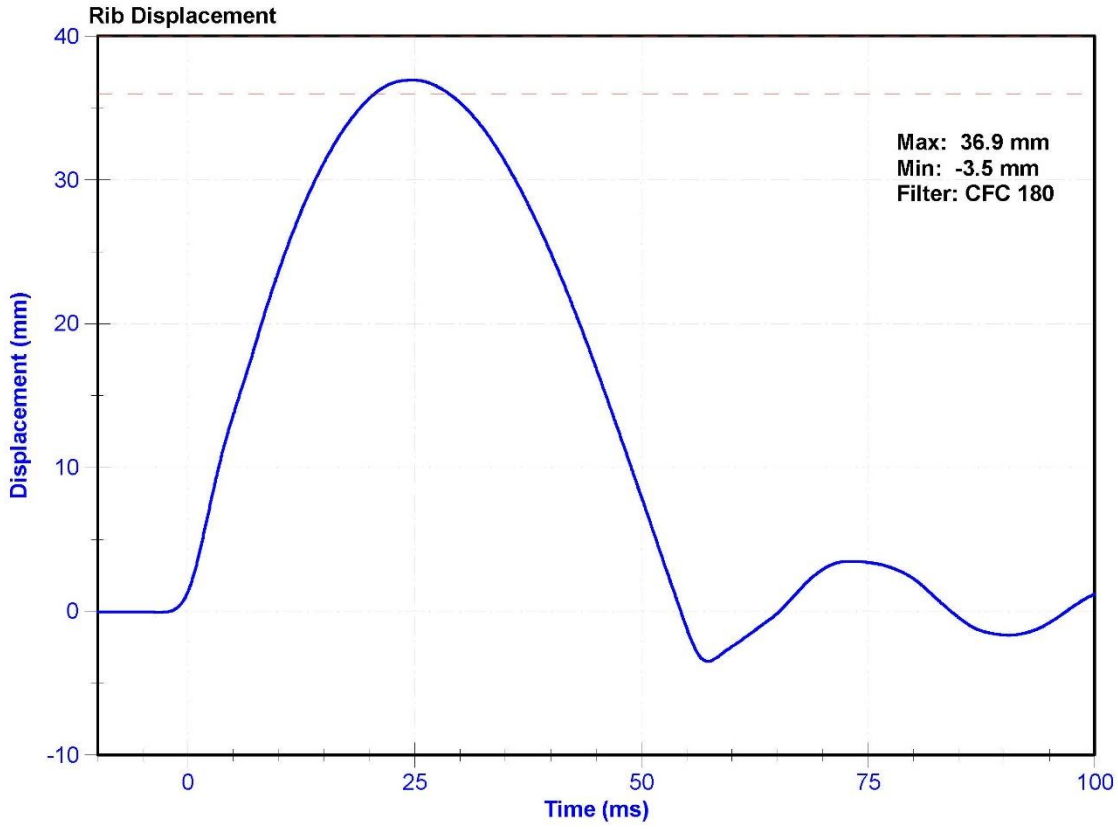
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.0	Pass
Humidity	10	70	%	42.2	Pass
Rib Displacement	36	40	mm	36.9	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	9/27/2017	9/27/2018



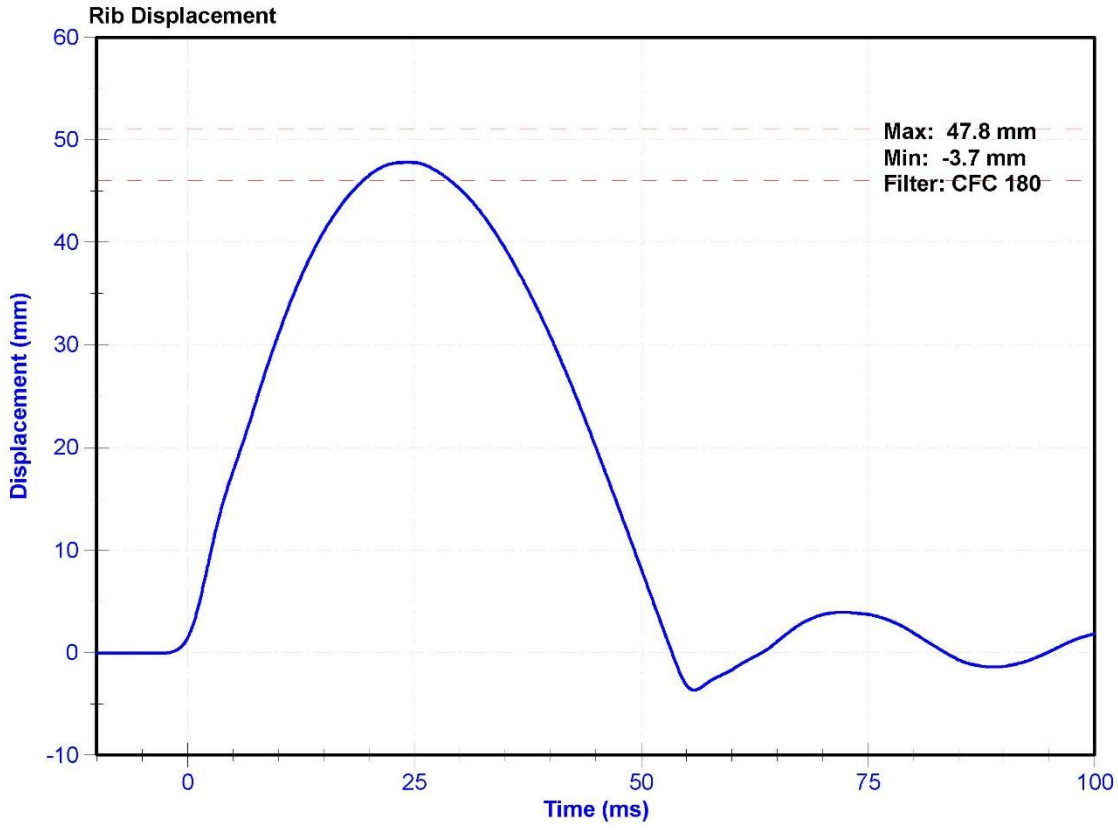
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	44.5	Pass
Rib Displacement	46	51	mm	47.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	9/27/2017	9/27/2018



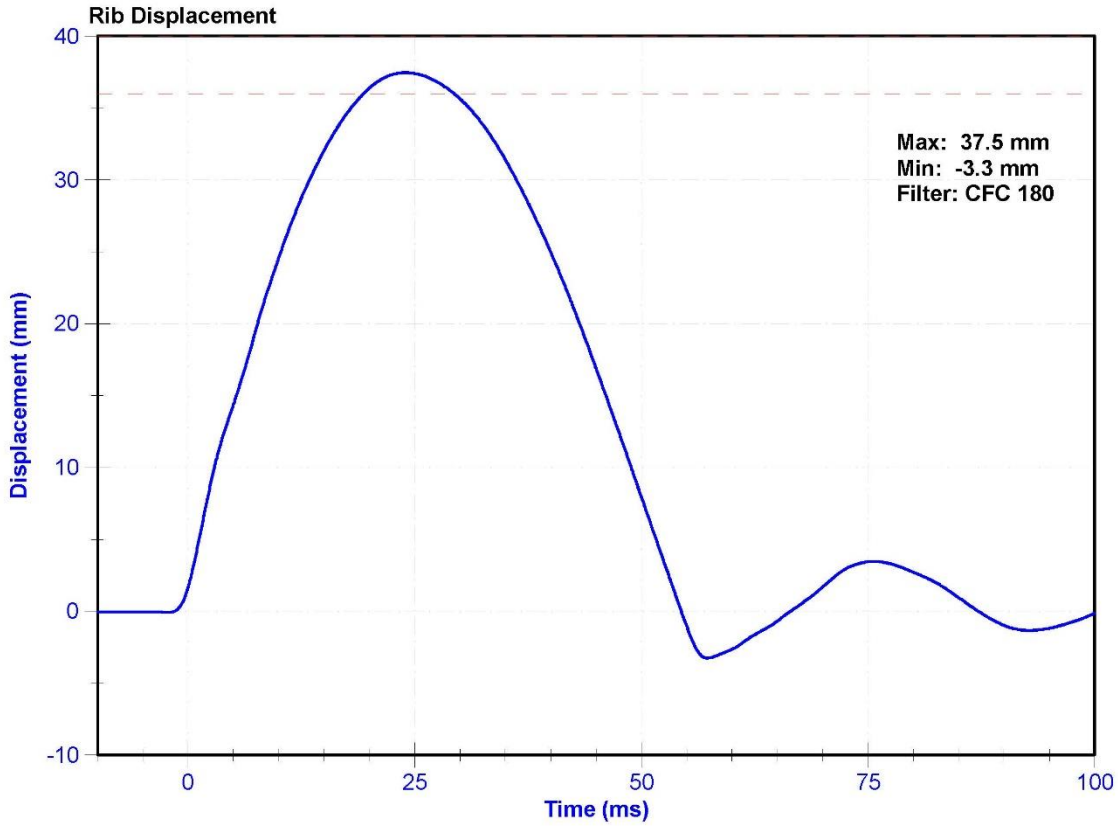
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	42.6	Pass
Rib Displacement	36	40	mm	37.5	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	9/27/2017	9/27/2018



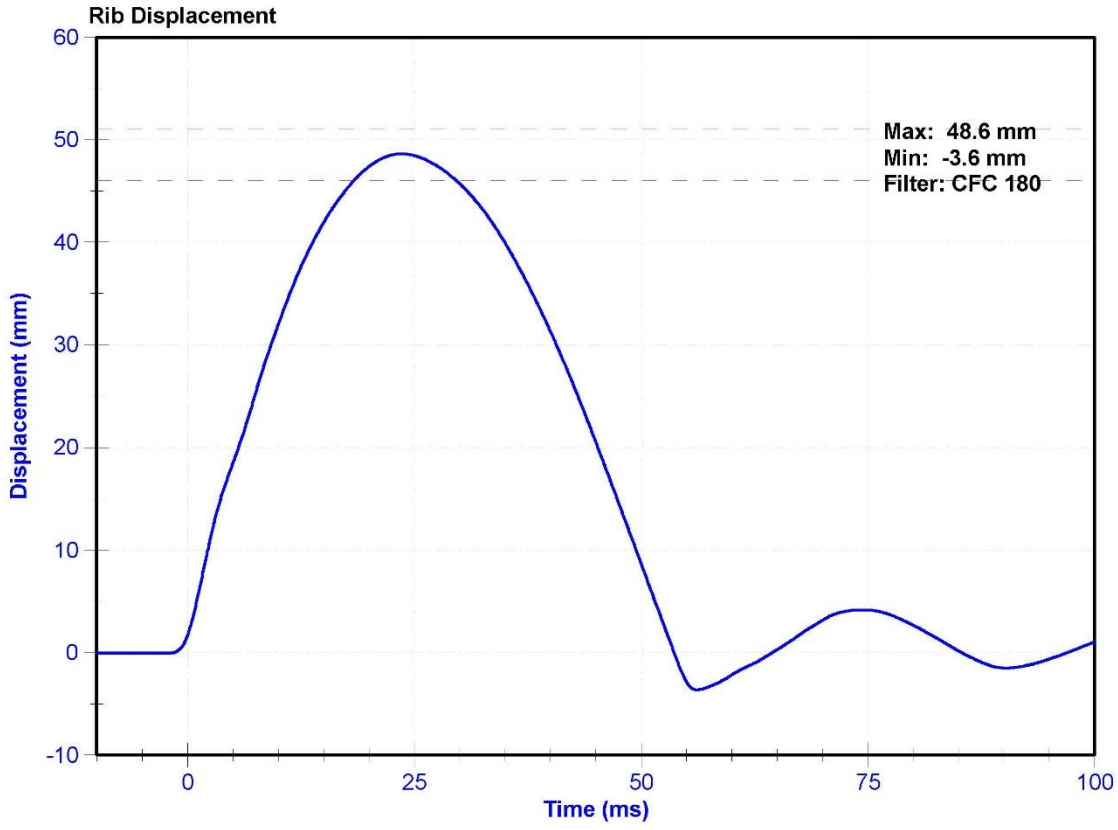
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

Results

Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	48.6	Pass
Rib Displacement	46	51	mm	48.6	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	9/27/2017	9/27/2018



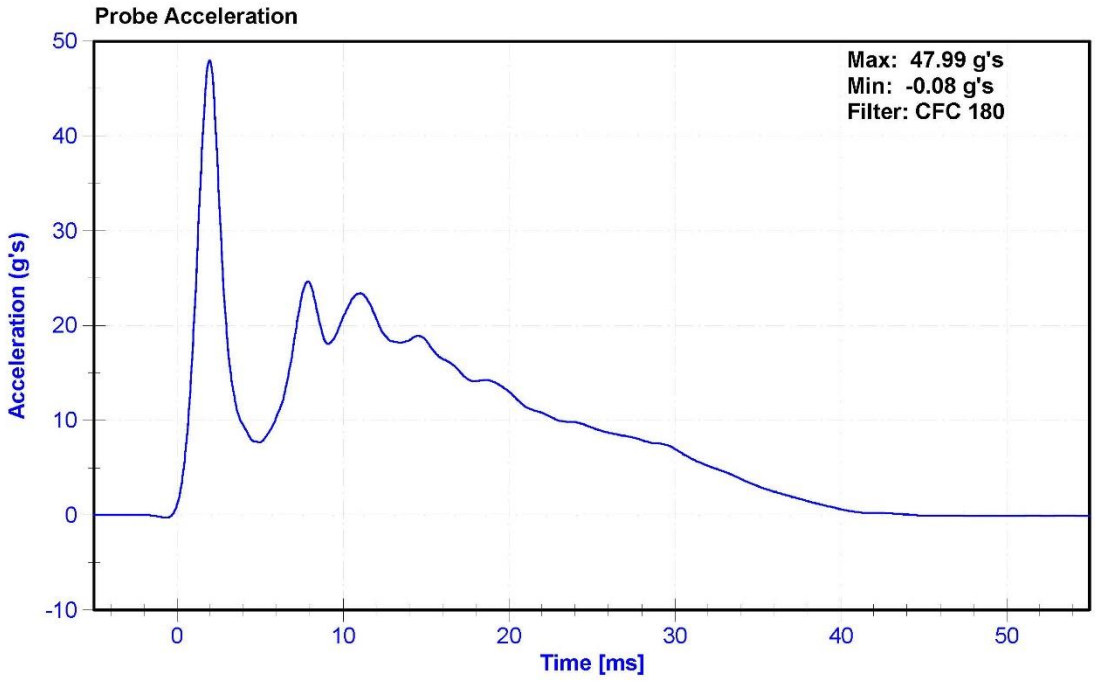
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

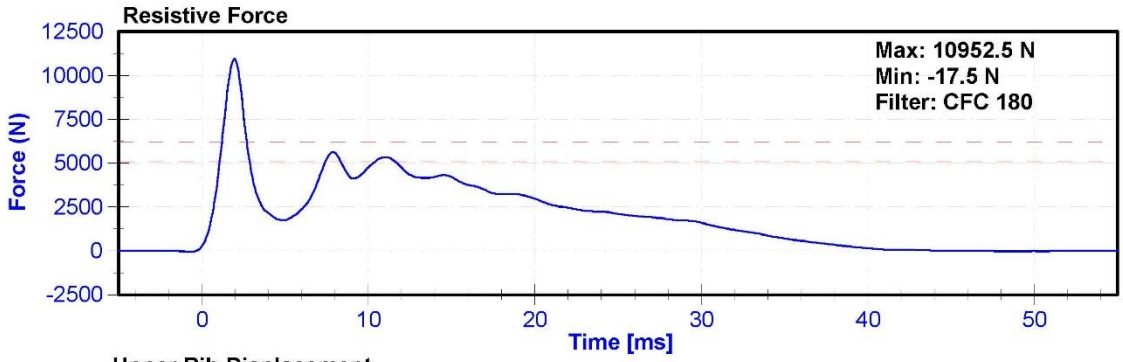
Results

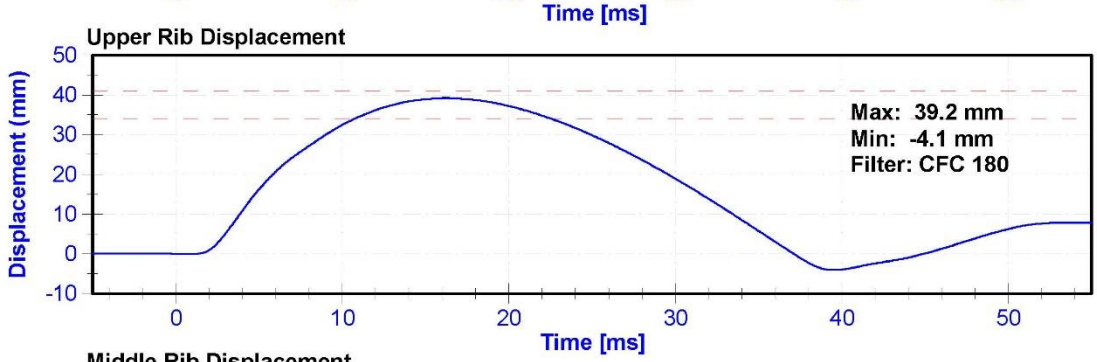
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.1	Pass
Humidity	10	70	%	53.6	Pass
Velocity	5.4	5.6	m/s	5.56	Pass
Resistive Force after 6ms	5100	6200	N	5630.3	Pass
Upper Thorax Rib Deflection	34	41	mm	39.2	Pass
Mid Thorax Rib Deflection	37	45	mm	42.4	Pass
Lower Thorax Rib Deflection	37	44	mm	41.1	Pass

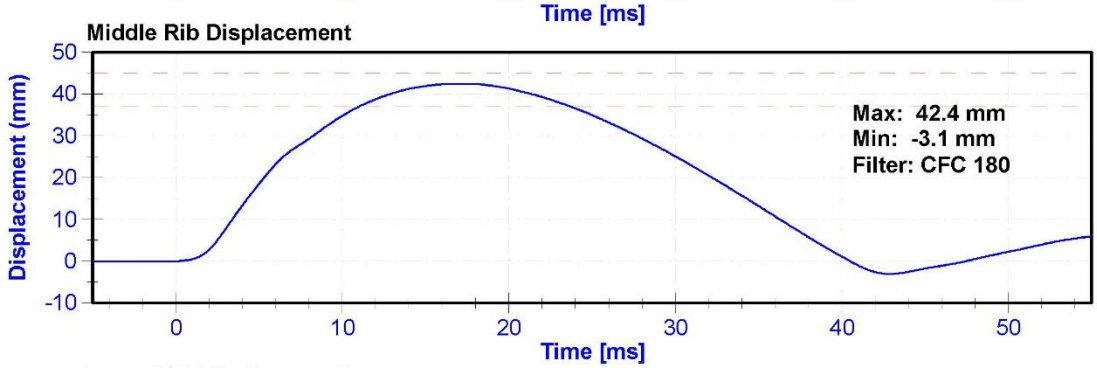
Transducer Calibrations

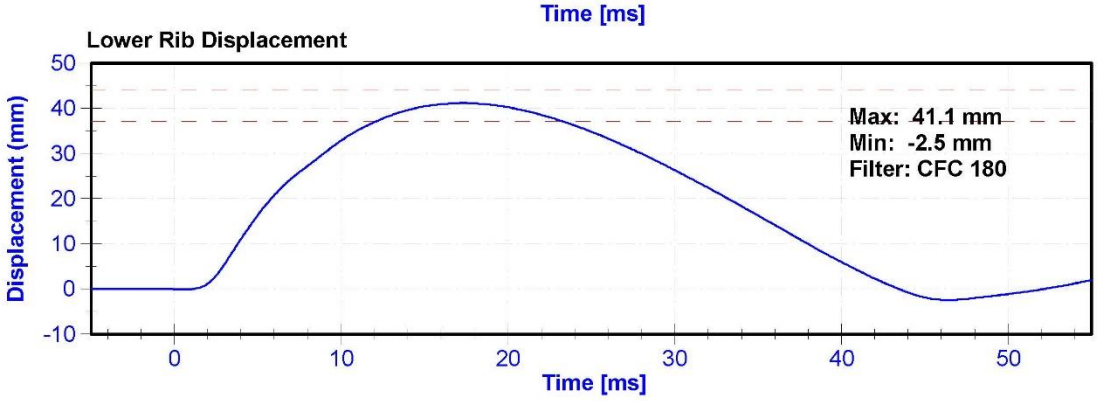
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Upper Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-183GFE	9/27/2017	9/27/2018
Middle Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-184GFE	9/27/2017	9/27/2018
Lower Thorax Rib Potentiometer	Honeywell MLT-38000203	DS-182GFE	9/27/2017	9/27/2018




Resistive Force
Force (N)
12500
10000
7500
5000
2500
0
-2500
0
10
20
30
40
50
Time [ms]
Max: 10952.5 N
Min: -17.5 N
Filter: CFC 180


Upper Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 39.2 mm
Min: -4.1 mm
Filter: CFC 180


Middle Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 42.4 mm
Min: -3.1 mm
Filter: CFC 180


Lower Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 41.1 mm
Min: -2.5 mm
Filter: CFC 180

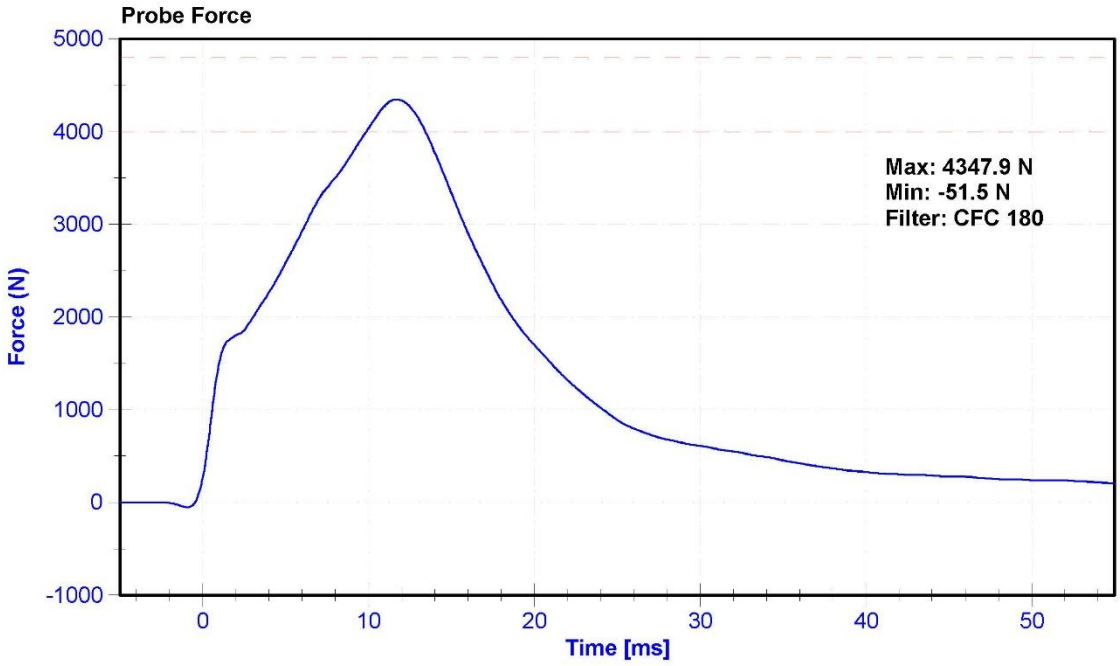
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	FO34	Laboratory Supervisor	K.Brogan

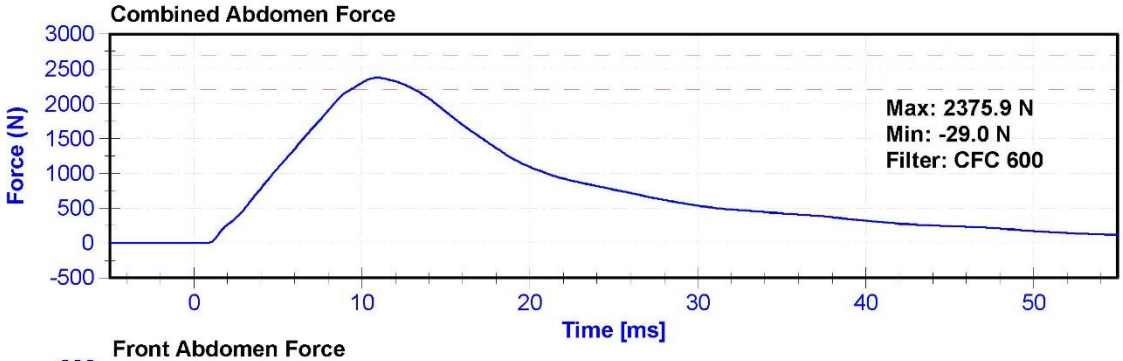
Results

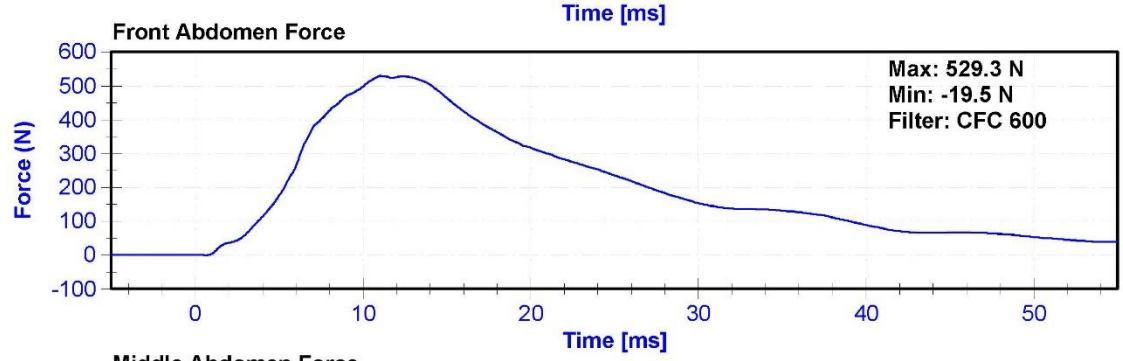
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.2	Pass
Humidity	10	70	%	50.6	Pass
Velocity	3.9	4.1	m/s	3.99	Pass
Combined Abdomen Force	2200	2700	N	2375.9	Pass
Time at Peak Abdomen Force	10.0	12.3	ms	10.95	Pass
Resistive Probe Force	4000	4800	N	4347.9	Pass
Time at Peak Resistive Force	10.6	13.0	ms	11.70	Pass

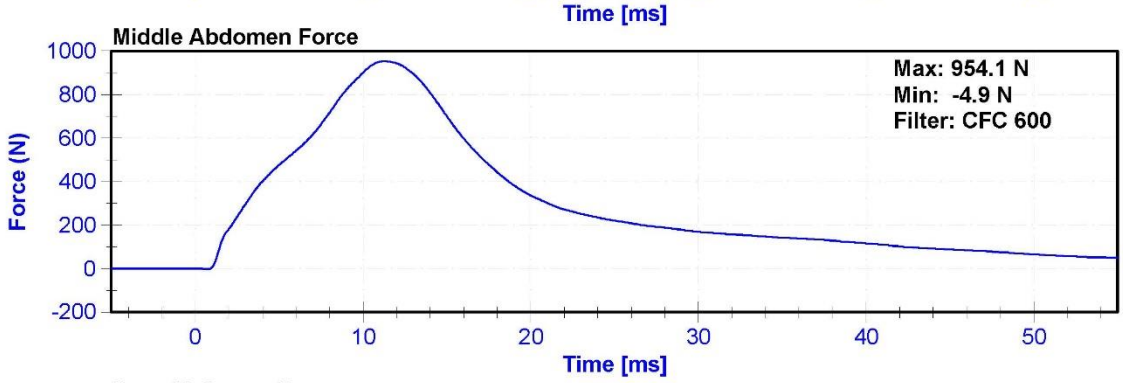
Transducer Calibrations

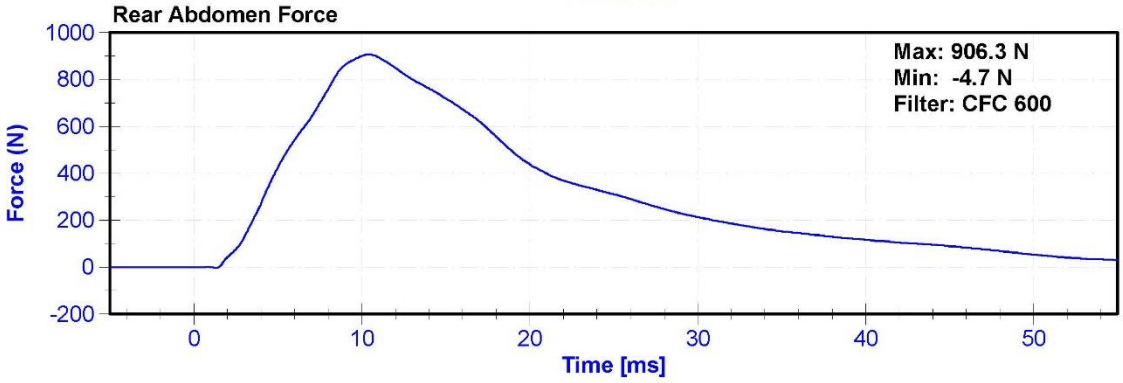
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Front Abdomen Load Cell	DENTON 2631	LC-1440	6/4/2018	6/4/2019
Middle Abdomen Load Cell	DENTON 2631	LC-1525	6/4/2018	6/4/2019
Rear Abdomen Load Cell	DENTON 2631	LC-1528	6/4/2018	6/4/2019




Combined Abdomen Force
Force (N)
Time [ms]
Max: 2375.9 N
Min: -29.0 N
Filter: CFC 600


Front Abdomen Force
Force (N)
Time [ms]
Max: 529.3 N
Min: -19.5 N
Filter: CFC 600


Middle Abdomen Force
Force (N)
Time [ms]
Max: 954.1 N
Min: -4.9 N
Filter: CFC 600


Rear Abdomen Force
Force (N)
Time [ms]
Max: 906.3 N
Min: -4.7 N
Filter: CFC 600

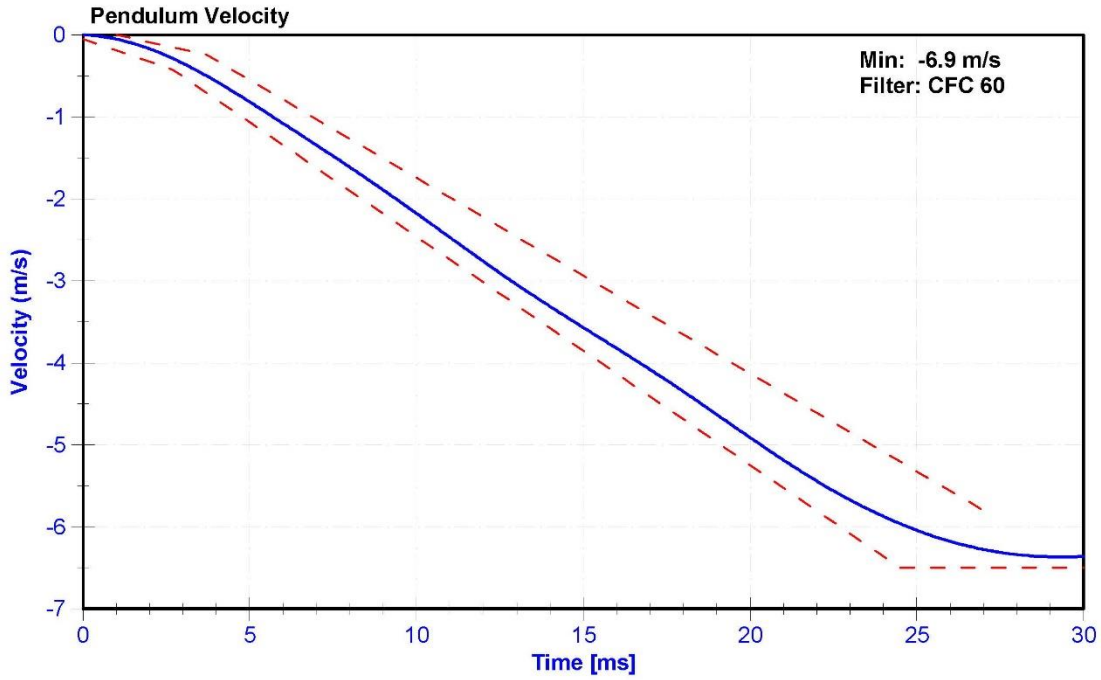
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

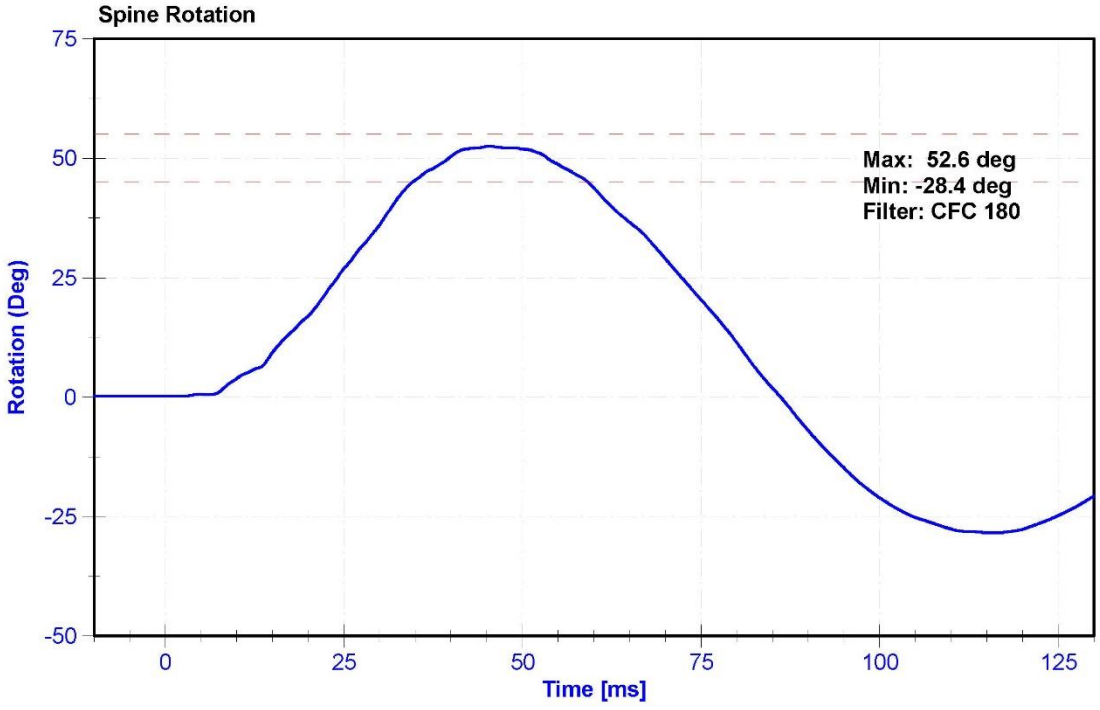
Results

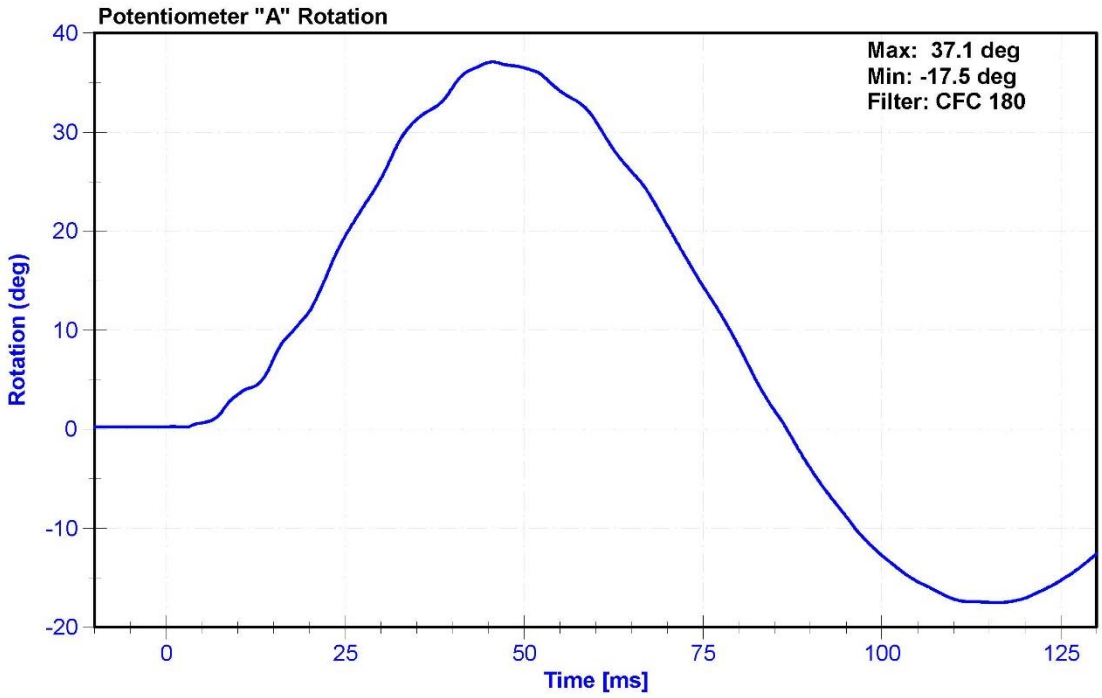
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.9	Pass
Humidity	10	70	%	52.0	Pass
Velocity	5.95	6.15	m/s	6.113	Pass
Lateral Spine Rotation	45	55	deg	52.6	Pass
Time at Maximum Rotation	39	53	ms	45.4	Pass
Time of Decay to Zero Degrees	37	57	ms	40.7	Pass
Pulse within Corridor?	-	-	-		

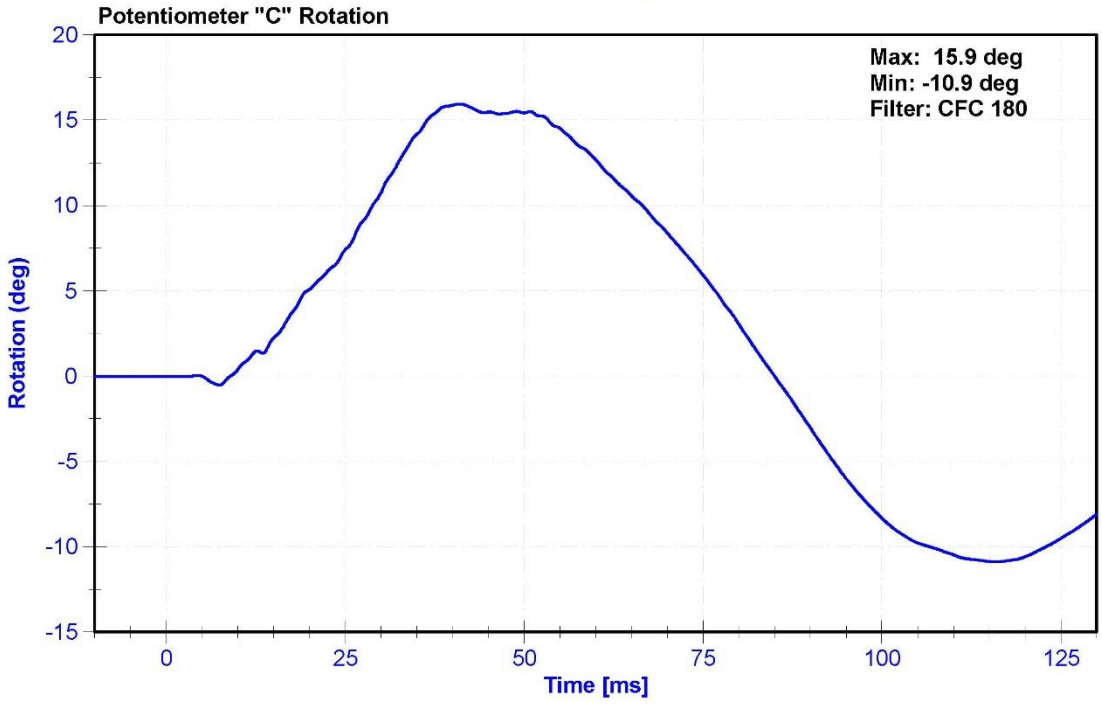
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Pendulum "A" Potentiometer	SP22G	DS-094	10/30/2017	10/30/2018
Condyle "B" Potentiometer	SP22G	DS-095	10/30/2017	10/30/2018


Pendulum Velocity
Min: -6.9 m/s
Filter: CFC 60
Velocity (m/s)
0
-1
-2
-3
-4
-5
-6
-7
0
5
10
15
20
25
30
Time [ms]


Spine Rotation
Max: 52.6 deg
Min: -28.4 deg
Filter: CFC 180
Rotation (Deg)
75
50
25
0
-25
-50
0
25
50
75
100
125
Time [ms]


Potentiometer "A" Rotation
Max: 37.1 deg
Min: -17.5 deg
Filter: CFC 180
Rotation (deg)
40
30
20
10
0
-10
-20
0
25
50
75
100
125
Time [ms]


Potentiometer "C" Rotation
Max: 15.9 deg
Min: -10.9 deg
Filter: CFC 180
Rotation (deg)
20
15
10
5
0
-5
-10
-15
0
25
50
75
100
125
Time [ms]

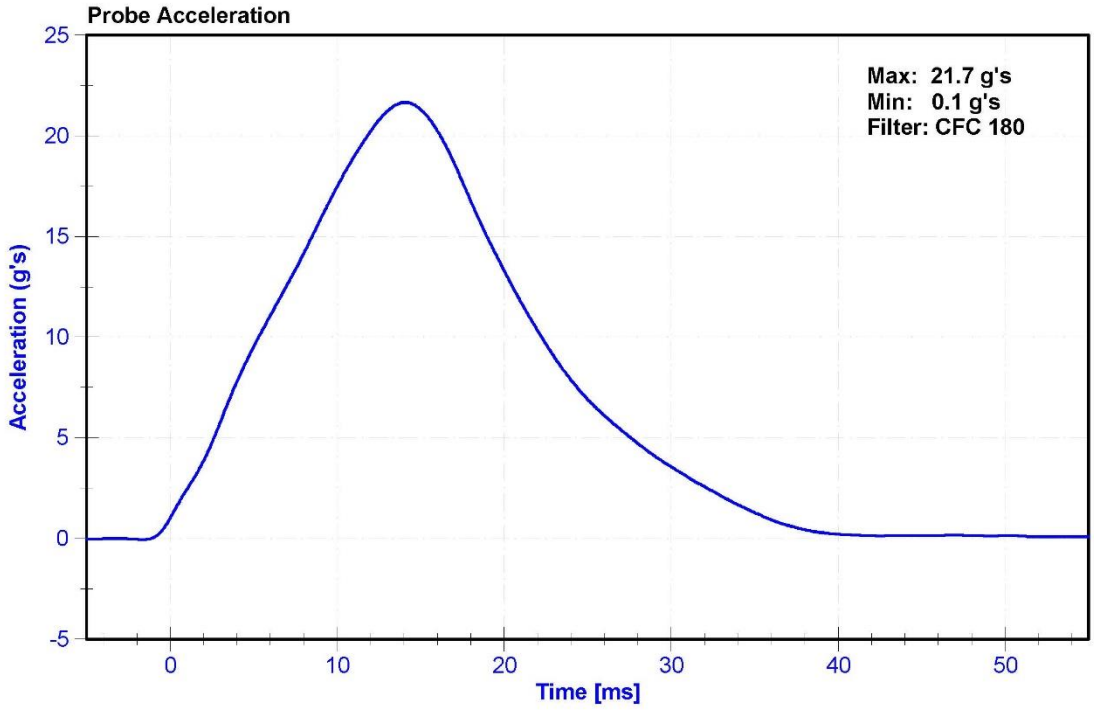
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	F034	Laboratory Supervisor	K. Brogan

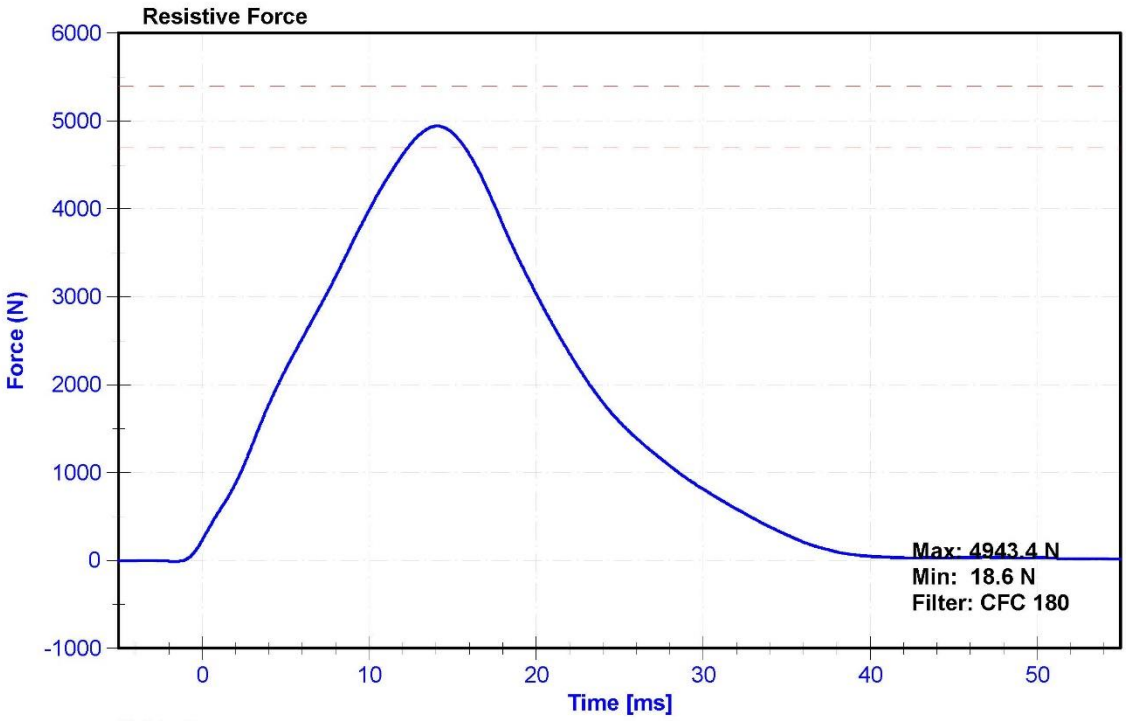
Results

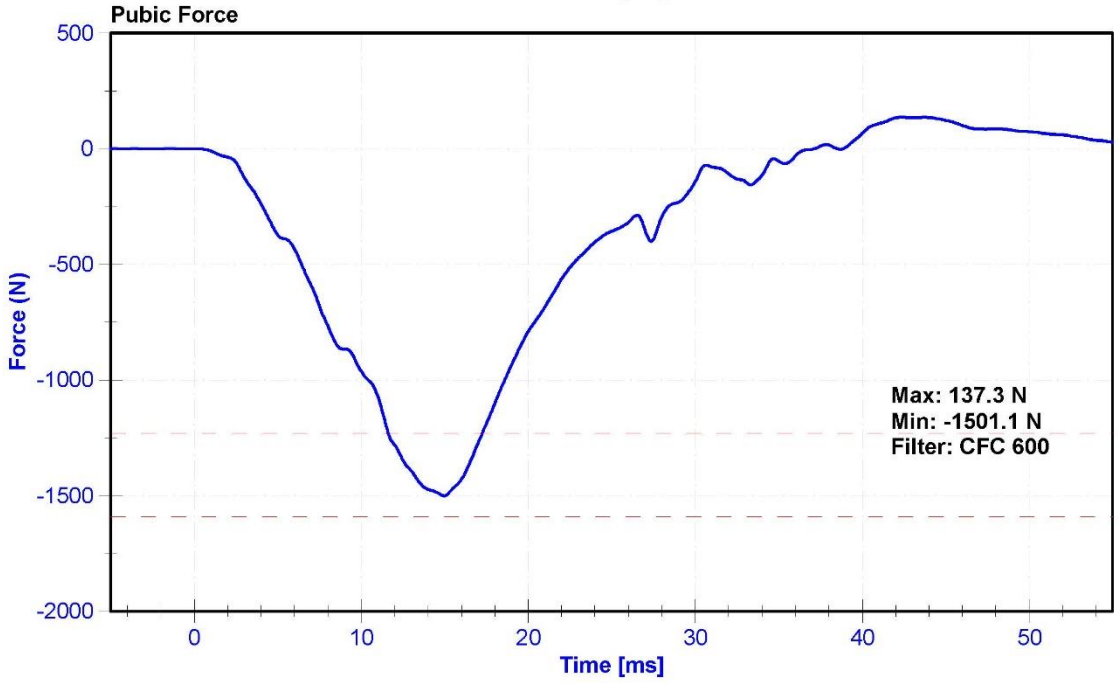
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	49.9	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Resistive Force	4700	5400	N	4943.4	Pass
Time at Peak Resistive Force	11.8	16.1	ms	14.10	Pass
Pubic Force	-1590	-1230	N	-1501.1	Pass
Time at Peak Pubic Force	12.2	17.0	ms	14.95	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Pubic Load Cell	Denton 3096JFL	LC-464fy	6/4/2018	6/4/2019




Resistive Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4943.4 N
Min: 18.6 N
Filter: CFC 180


Pubic Force
Force (N)
500
0
-500
-1000
-1500
-2000
0
10
20
30
40
50
Time [ms]
Max: 137.3 N
Min: -1501.1 N
Filter: CFC 600

CALIBRATION TEST RESULTS

POST-TEST

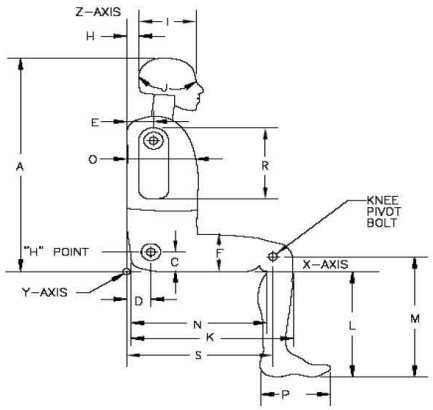
SID-IIS 5TH PERCENTILE FEMALE - PASSENGER ATD

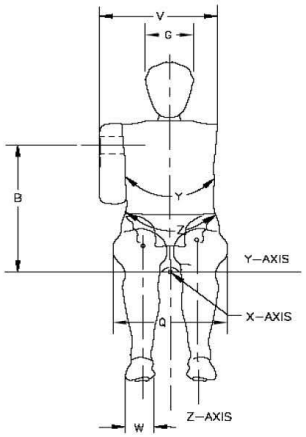
SERIAL No: DG8012

External Measurements - SID-IIs

Technician: D.Reinhard Date: 6/25/2018

Dummy Serial Number: DG8012





Symbol	Description	Specification (mm)		Result (mm)	Pass/Fail
A	Sitting Height	772	788	783	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	129	Pass
G	Head Breadth	140	148	144	Pass
H	Head Back from Backline	40	46	44	Pass
I	Head Depth	178	188	184	Pass
J	Head Circumference	541	551	546	Pass
K	Buttock to Knee Length	514	540	532	Pass
L	Popliteal Height	343	369	355	Pass
M	Knee Pivot to floor height	392	409	399	Pass
N	Buttock Popliteal Length	416	442	430	Pass
O	Chest Depth w/o jacket	195	211	206	Pass
P	Foot Length	216	232	221	Pass
Q	Hip Breadth (w/pelvic plugs)	313	323	316	Pass
R	Arm Length	249	259	254	Pass
S	Knee Joint to seatback	477	493	484	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	771	Pass

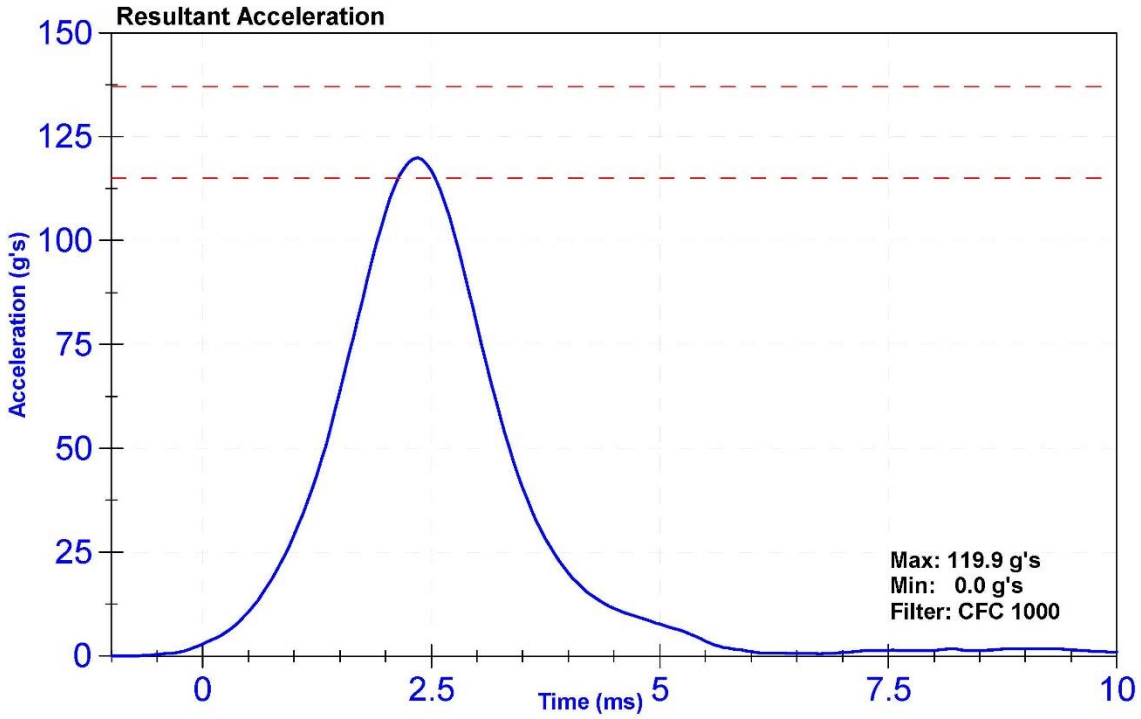
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

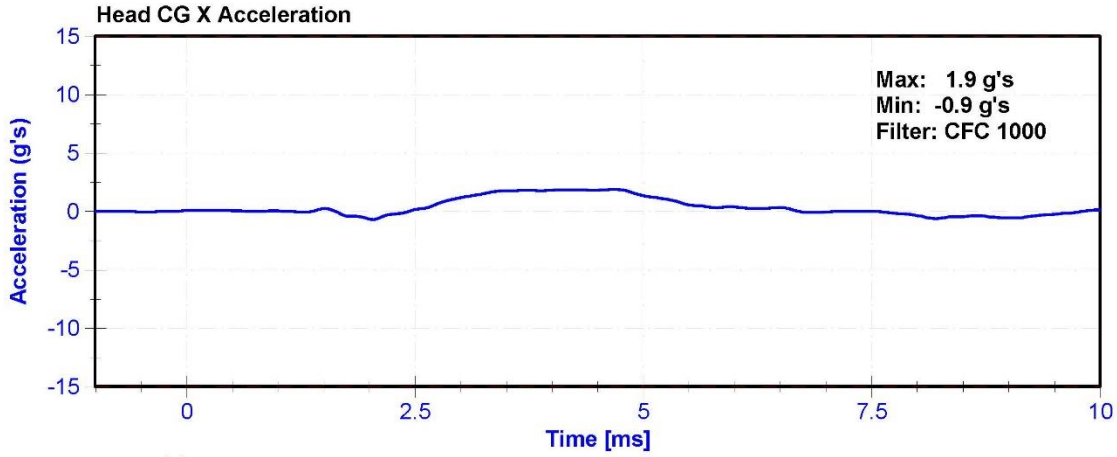
Results

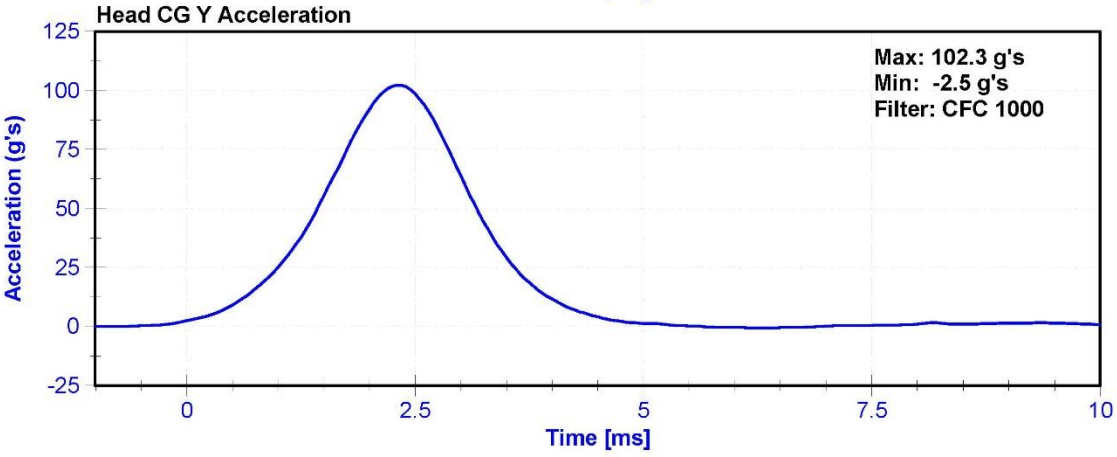
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	20.6	Pass
Humidity	10	70	%	48.5	Pass
Resultant Acceleration	115	137	g's	119.9	Pass
Oscillation	0	15	%	2.3	Pass
Fore-Aft Acceleration	-15	15	g's	1.9	Pass

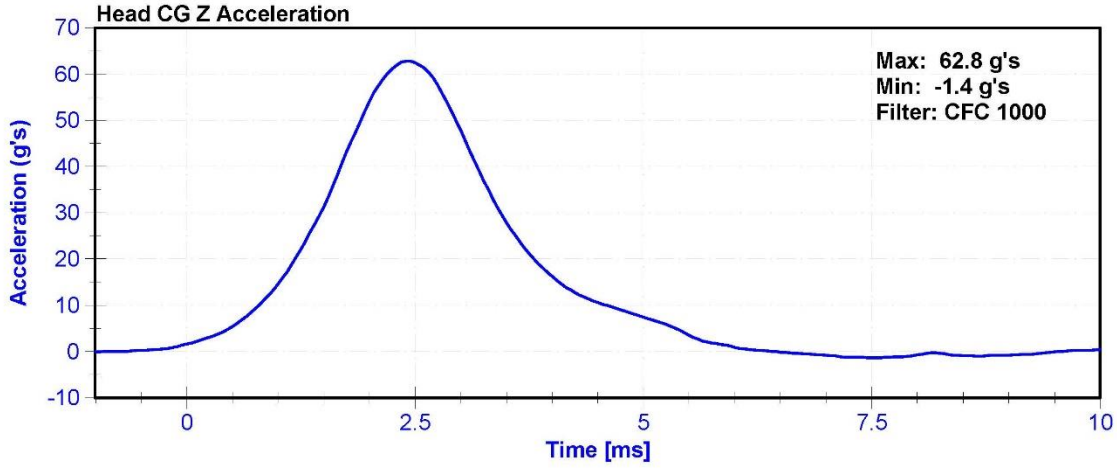
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
X Accelerometer	ENDEVCO 7264CT	AC-P51685	5/4/2018	11/2/2018
Y Accelerometer	ENDEVCO 7264CT	AC-P51682	5/4/2018	11/2/2018
Z Accelerometer	ENDEVCO 7264CT	AC-P51699	5/4/2018	11/2/2018




Head CG X Acceleration
Max: 1.9 g's
Min: -0.9 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: -2.5 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: 62.8 g's
Min: -1.4 g's
Filter: CFC 1000
Acceleration (g's)
70
60
50
40
30
20
10
0
-10
0
2.5
5
7.5
10
Time [ms]

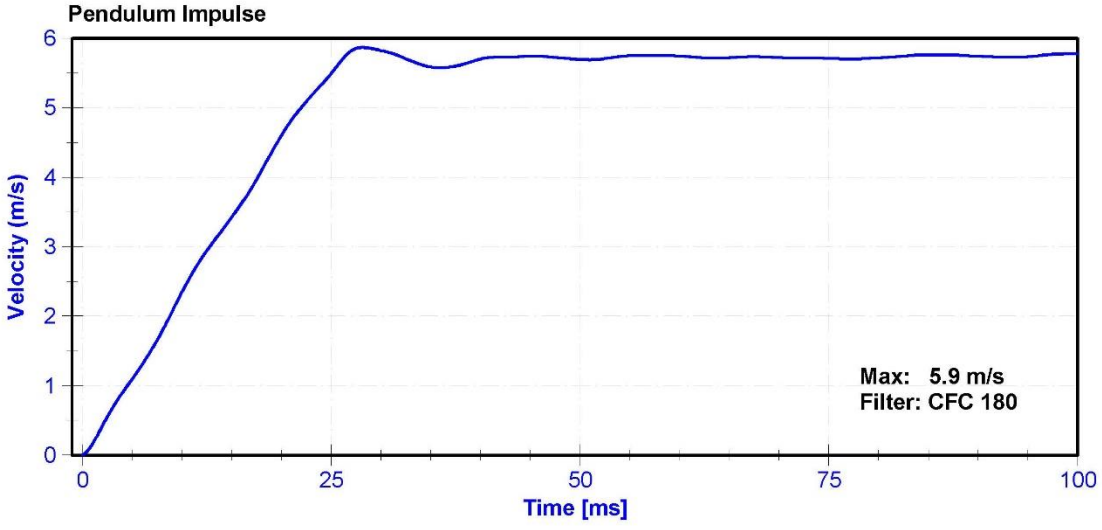
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

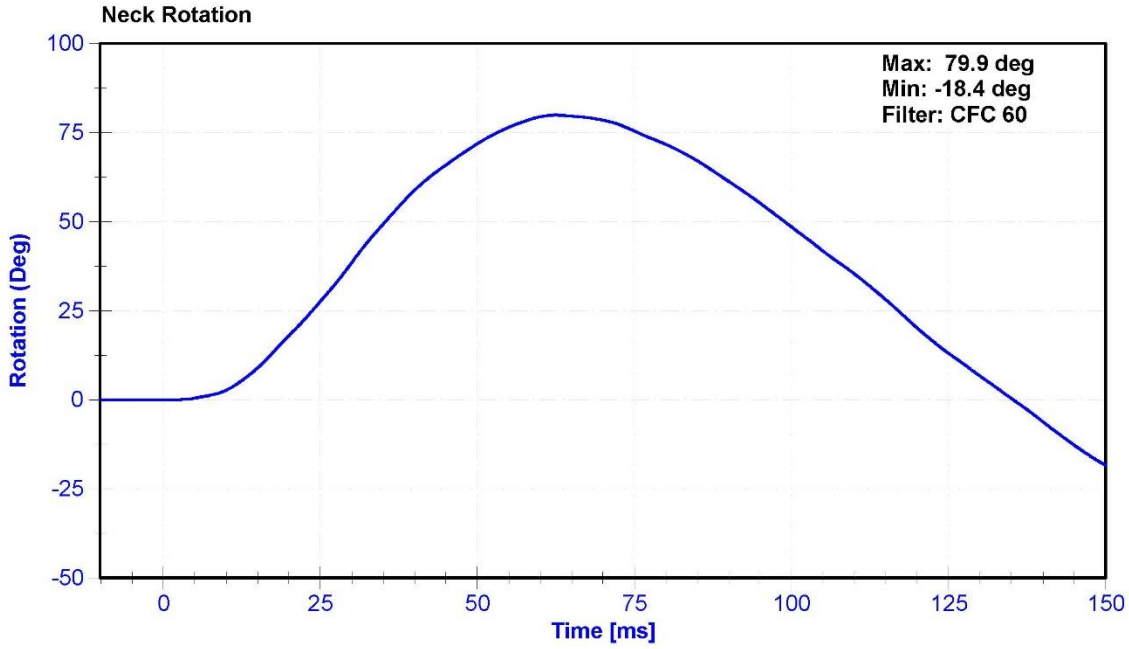
Results

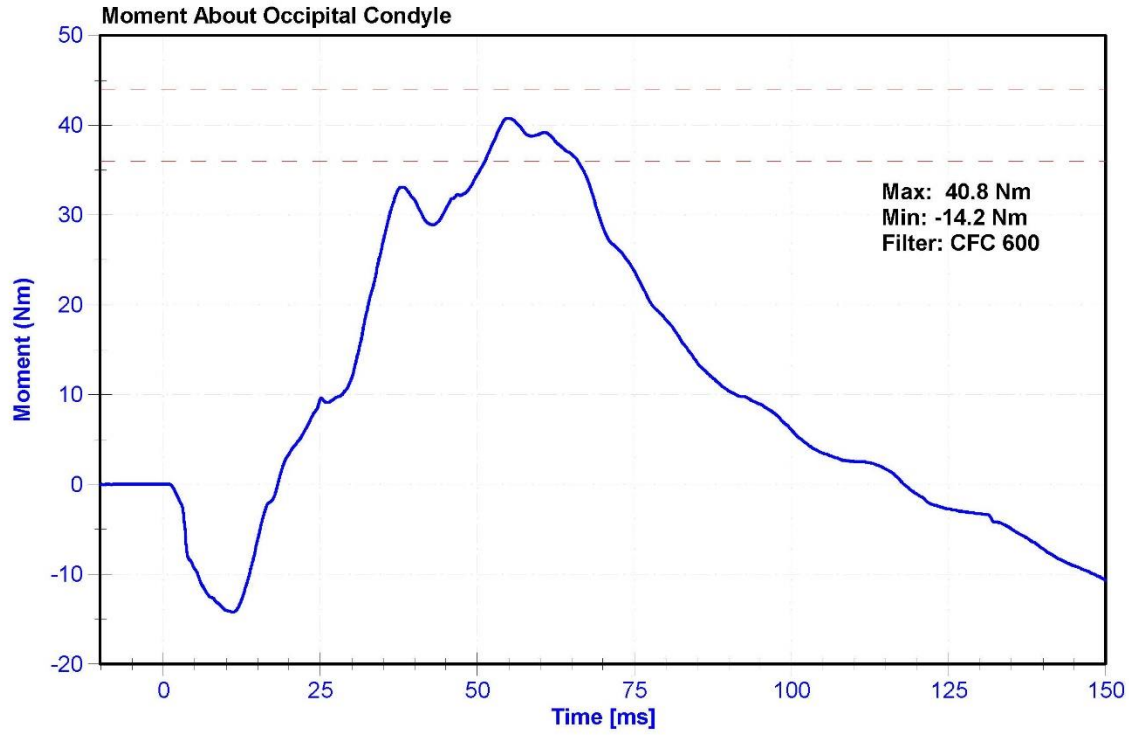
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21	Pass
Humidity	10	70	%	54	Pass
Velocity	5.51	5.63	m/s	5.583	Pass
Pendulum Impulse at 10ms	2.2	2.8	m/s	2.35	Pass
Pendulum Impulse at 15ms	3.3	4.1	m/s	3.43	Pass
Pendulum Impulse at 20ms	4.4	5.4	m/s	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	5.87	Pass
Neck Rotation	71	81	deg	79.9	Pass
Time at Maximum Rotation	50	70	ms	62.5	Pass
Moment about the OC	36	44	Nm	40.8	Pass
Moment Decay to 0 Nm	102	126	ms	118.0	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7231CT	AC-AH5F3	5/11/2018	5/11/2019
Pendulum Potentiometer	Denton 78051-342	DS-184Pend	10/27/2017	10/27/2018
Condyle Potentiometer	Denton 78051-342	DS-185Pend	10/27/2017	10/27/2018
Upper Neck Load Cell	Denton 1716	LC-1872 FY	7/26/2017	7/26/2018




Neck Rotation
Max: 79.9 deg
Min: -18.4 deg
Filter: CFC 60
Rotation (Deg)
100
75
50
25
0
-25
-50
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 40.8 Nm
Min: -14.2 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

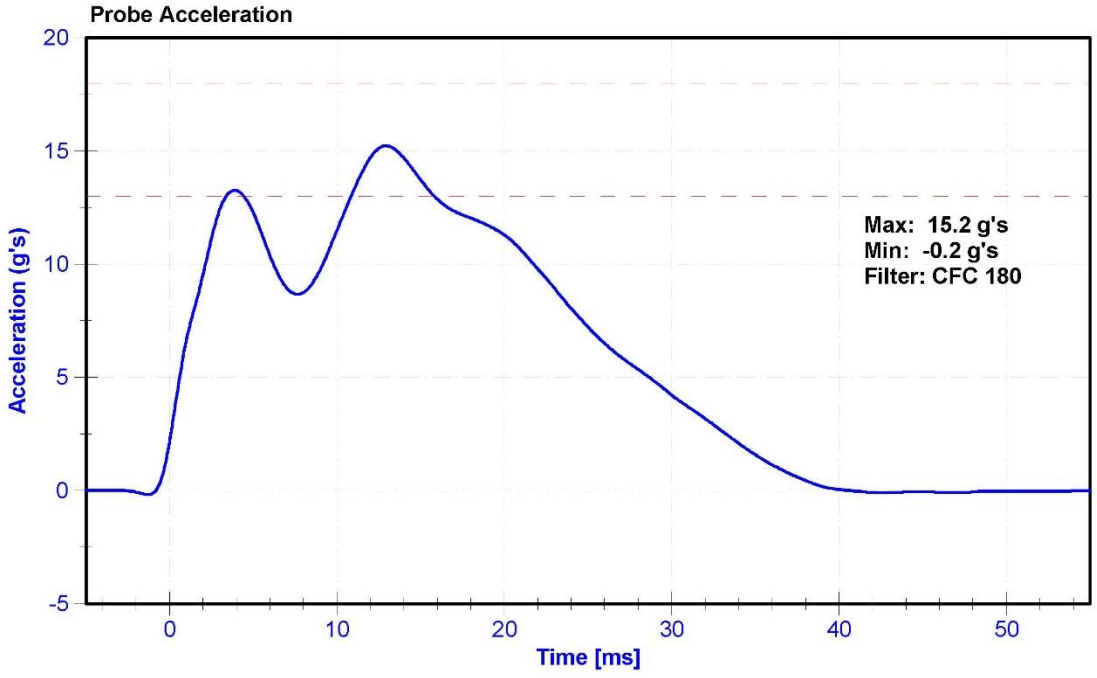
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

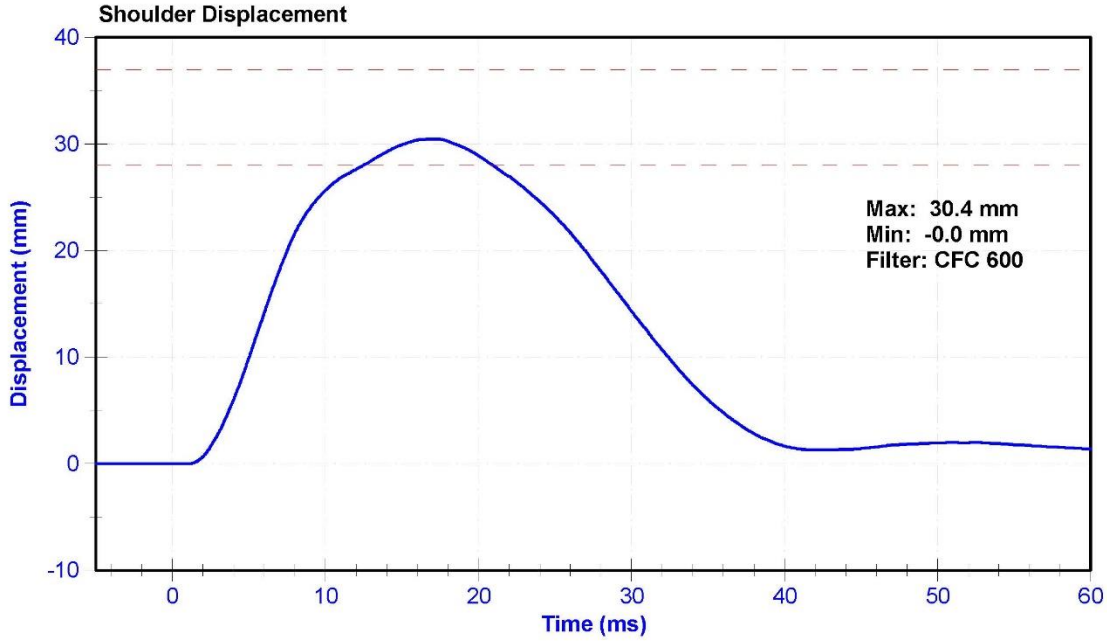
Results

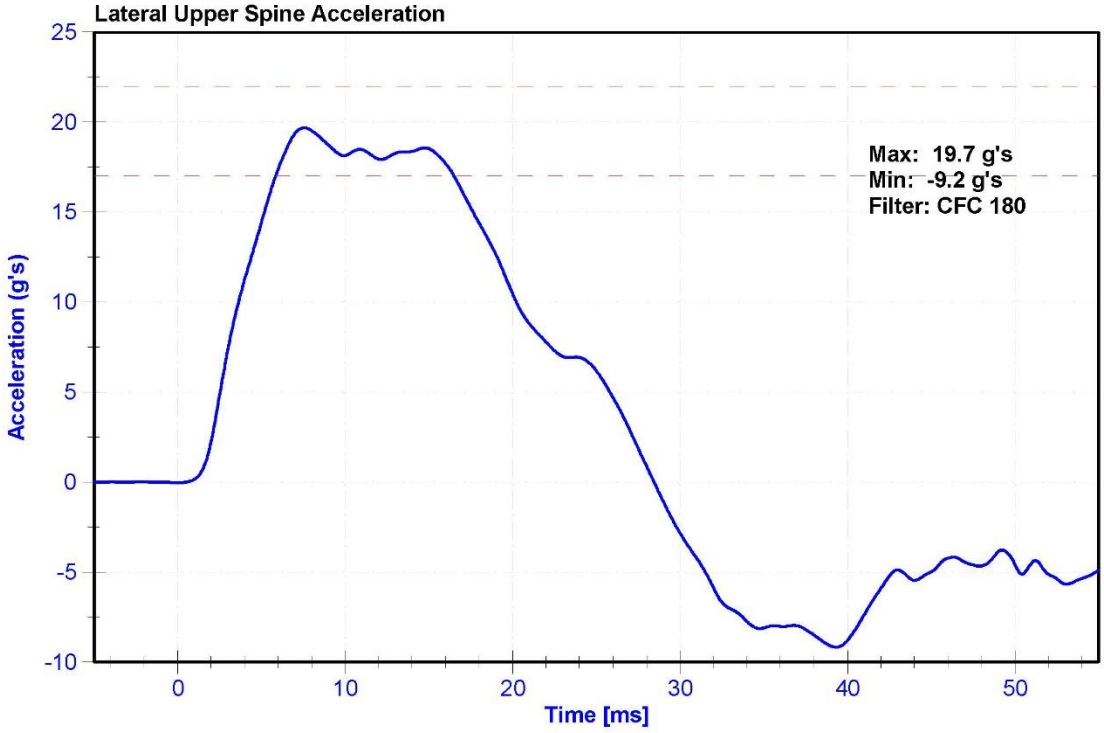
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	48.7	Pass
Velocity	4.2	4.4	m/s	4.39	Pass
Probe Acceleration	13	18	g's	15.2	Pass
Shoulder Deflection	28	37	mm	30.4	Pass
Lateral Upper Spine Acceleration	17	22	g's	19.7	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	9/27/2017	9/27/2018
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P63561	5/4/2018	11/2/2018




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 30.4 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.7 g's
Min: -9.2 g's
Filter: CFC 180

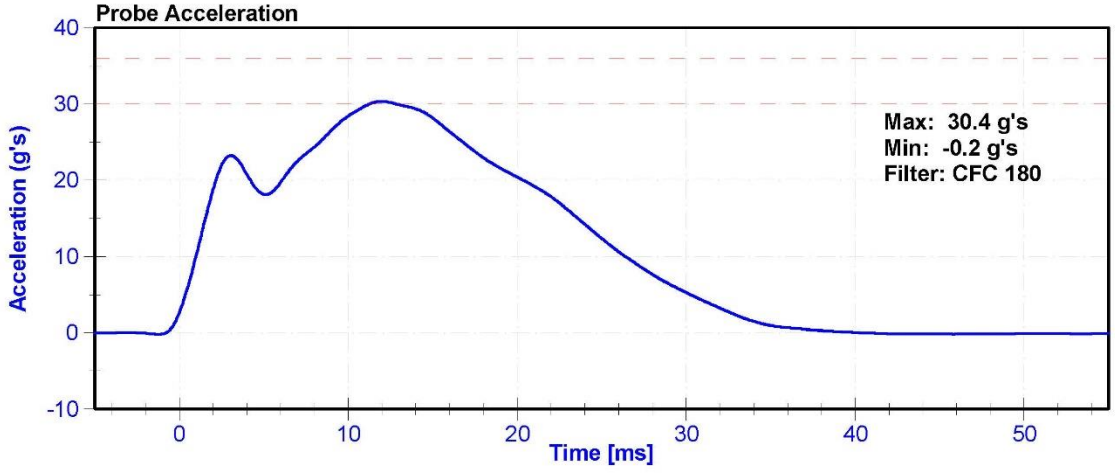
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

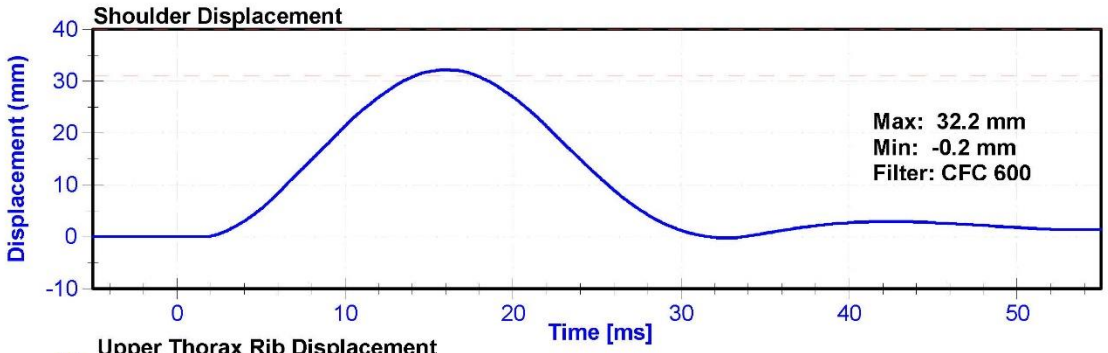
Results

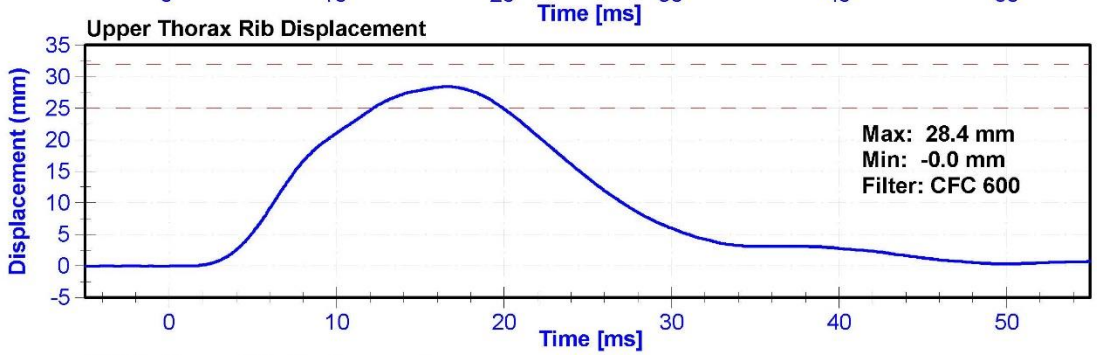
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	47.1	Pass
Velocity	6.6	6.8	m/s	6.79	Pass
Probe Acceleration after 5 ms	30	36	g's	30.4	Pass
Lateral Upper Spine Acceleration	34	43	g's	39.8	Pass
Lateral Lower Spine Acceleration	29	37	g's	31.3	Pass
Shoulder Deflection	31	40	mm	32.2	Pass
Upper Thorax Rib Deflection	25	32	mm	28.4	Pass
Mid Thorax Rib Deflection	30	36	mm	34.1	Pass
Lower Thorax Rib Deflection	32	38	mm	36.9	Pass

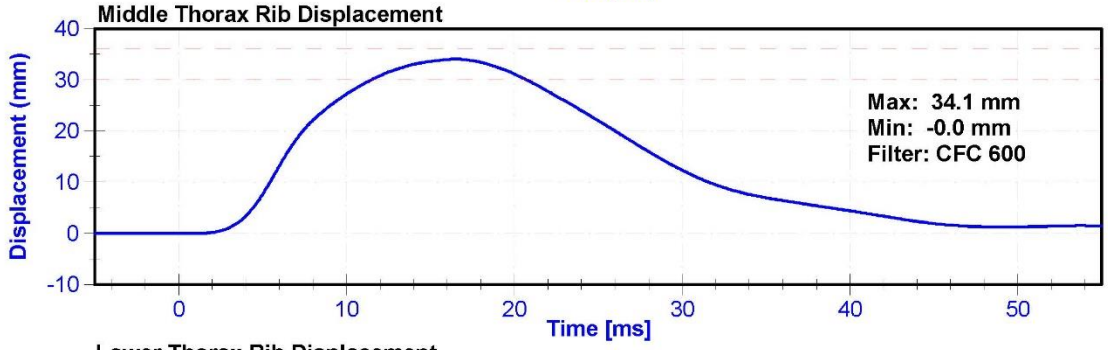
Transducer Calibrations

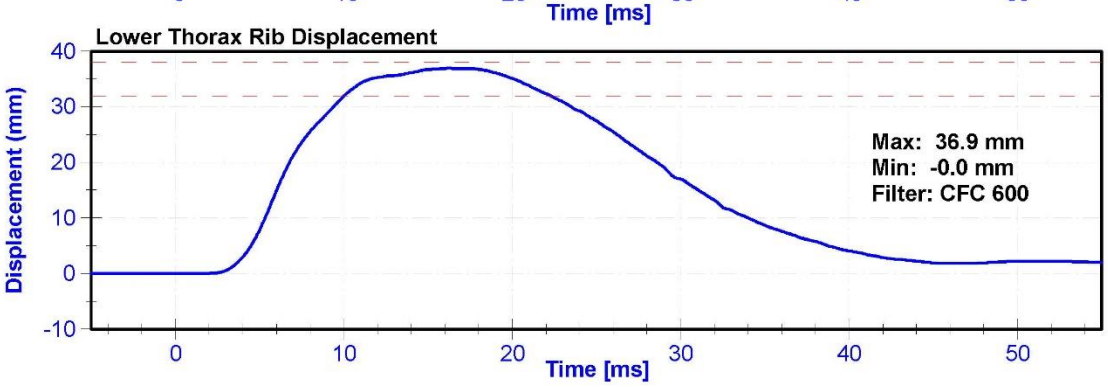
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Upper Spine T1 Y Accelerometer	ENDEVCO 7264CT	AC-P63561	5/4/2018	11/2/2018
Upper Spine T12 Y Accelerometer	ENDEVCO 7264	AC-P83319	5/4/2018	11/2/2018
Shoulder Potentiometer	Servo 08TC1-3745	DS-1845GFE	9/27/2017	9/27/2018
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/15/2018	5/15/2019
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	12/11/2017	12/11/2018
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	9/27/2017	9/27/2018

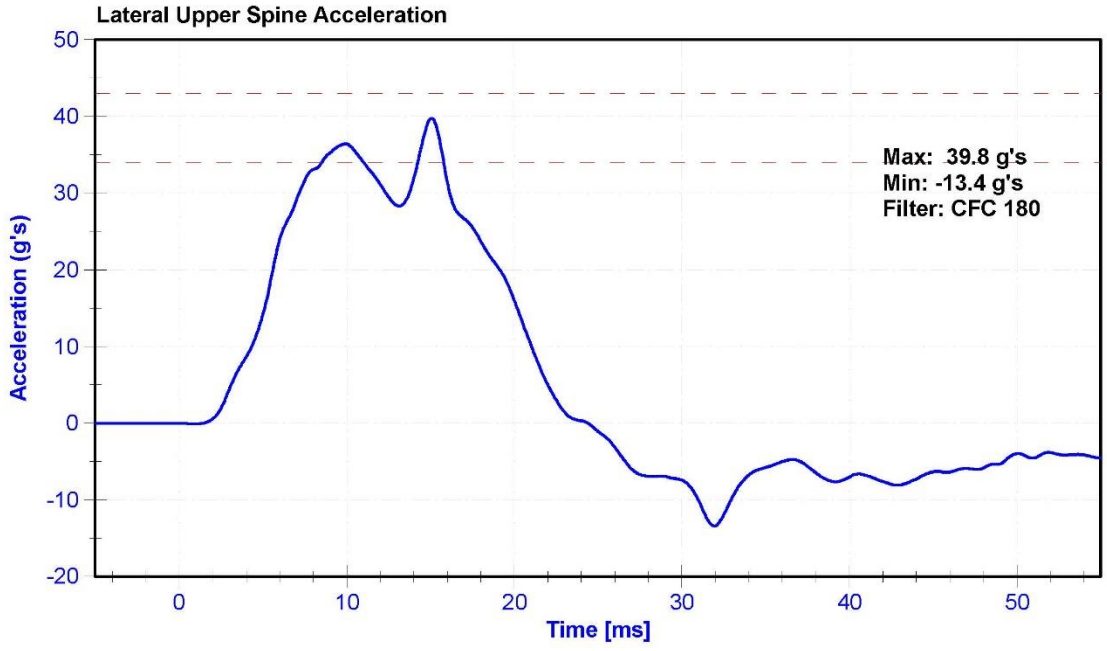


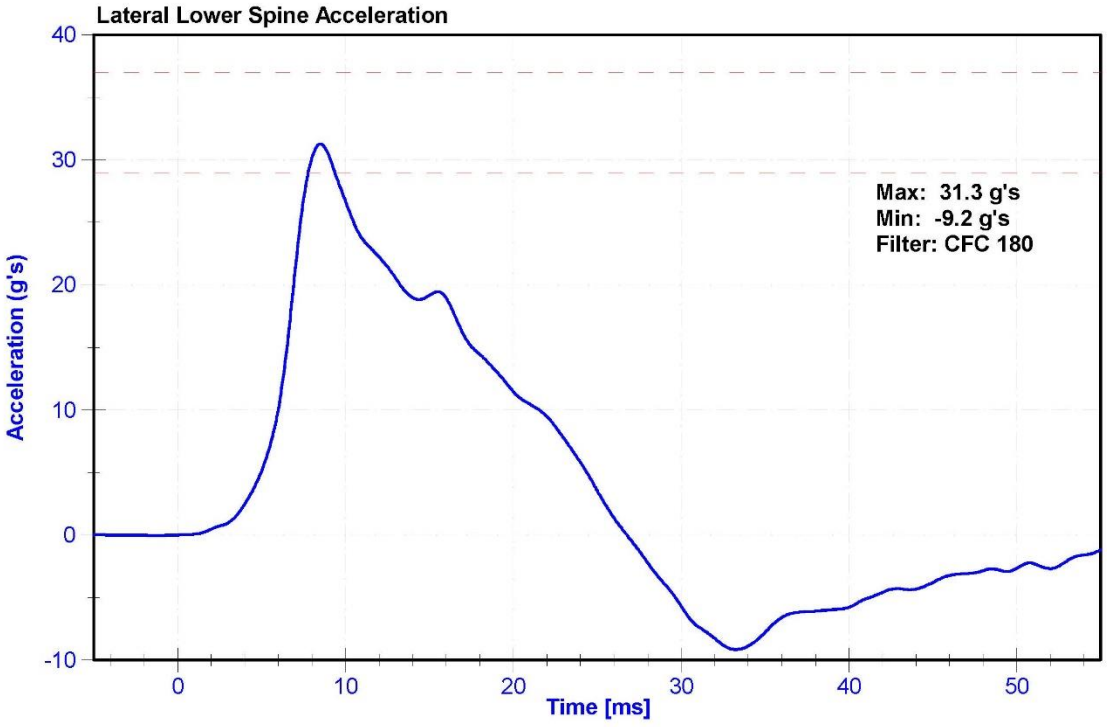

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 32.2 mm
Min: -0.2 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 28.4 mm
Min: -0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 34.1 mm
Min: -0.0 mm
Filter: CFC 600


Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 36.9 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Max: 39.8 g's
Min: -13.4 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: 31.3 g's
Min: -9.2 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
40
30
20
10
0
-10
0
10
20
30
40
50

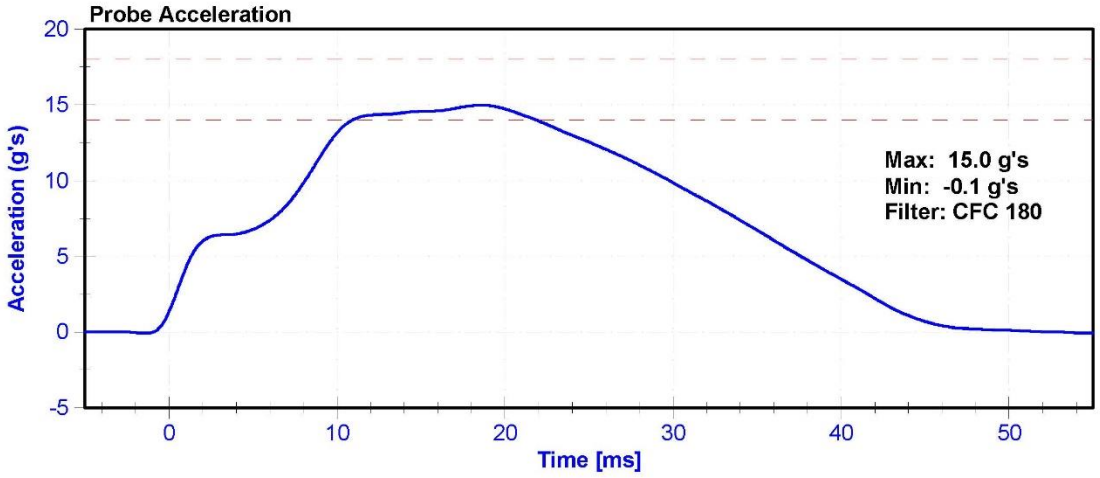
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

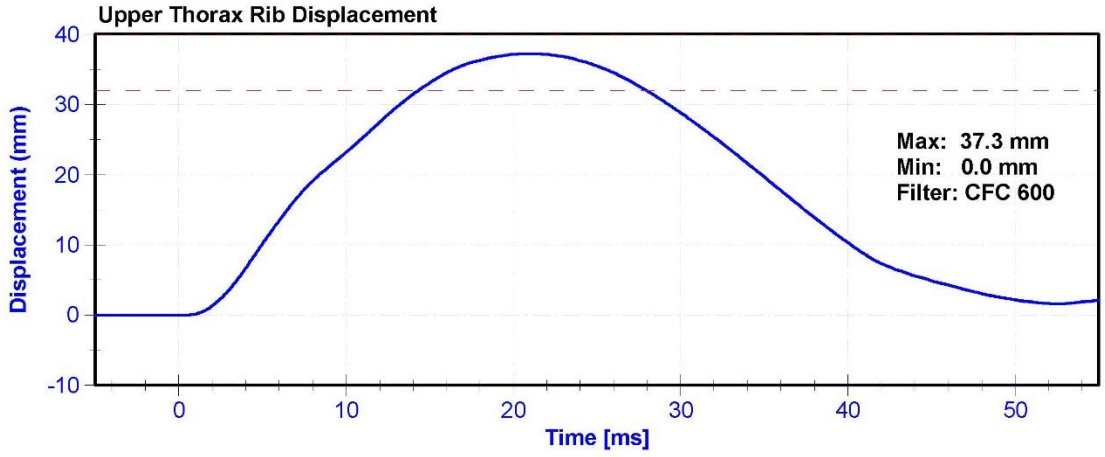
Results

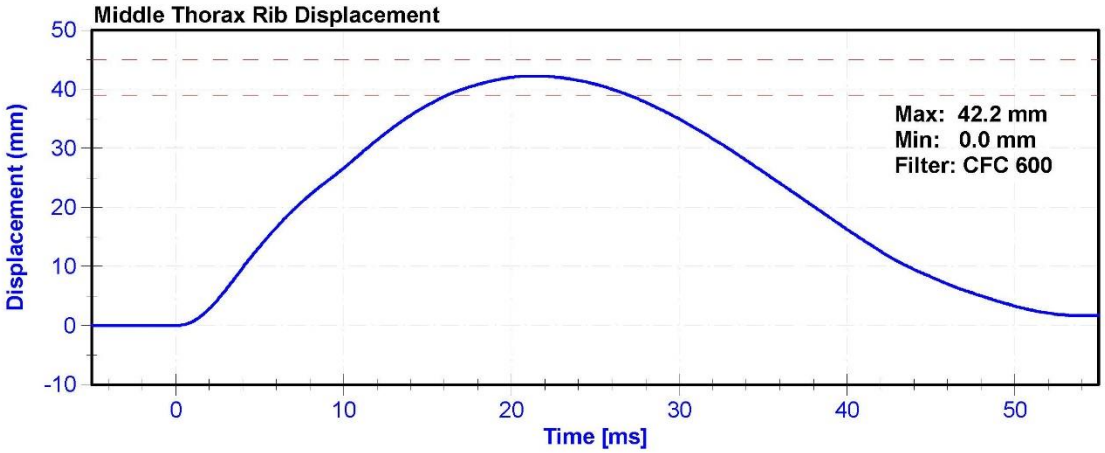
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22	Pass
Humidity	10	70	%	46.3	Pass
Velocity	4.2	4.4	m/s	4.38	Pass
Probe Acceleration	14	18	g's	15.0	Pass
Lateral Upper Spine Acceleration	13	17	g's	14.3	Pass
Lateral Lower Spine Acceleration	7	11	g's	9.7	Pass
Upper Thorax Rib Deflection	32	40	mm	37.3	Pass
Middle Thorax Rib Deflection	39	45	mm	42.2	Pass
Lower Thorax Rib Deflection	35	43	mm	39.0	Pass

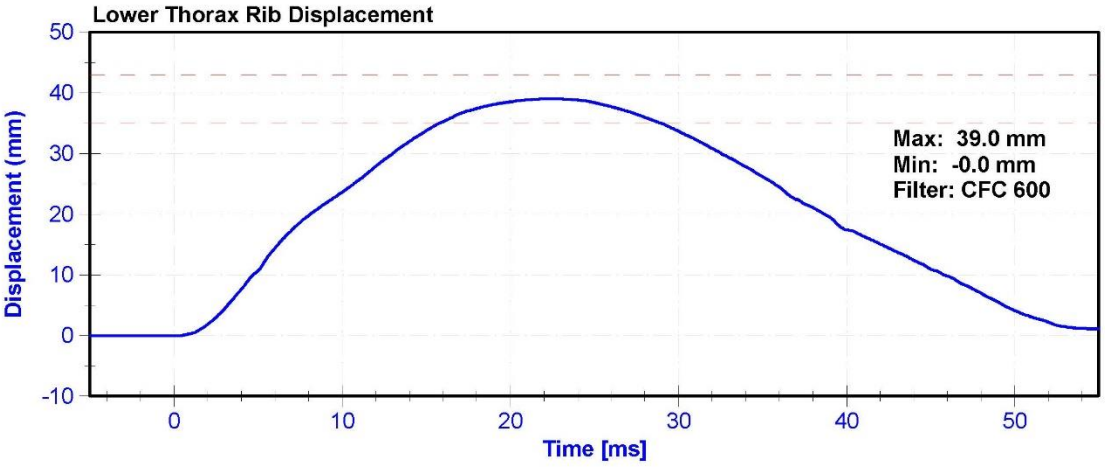
Transducer Calibrations

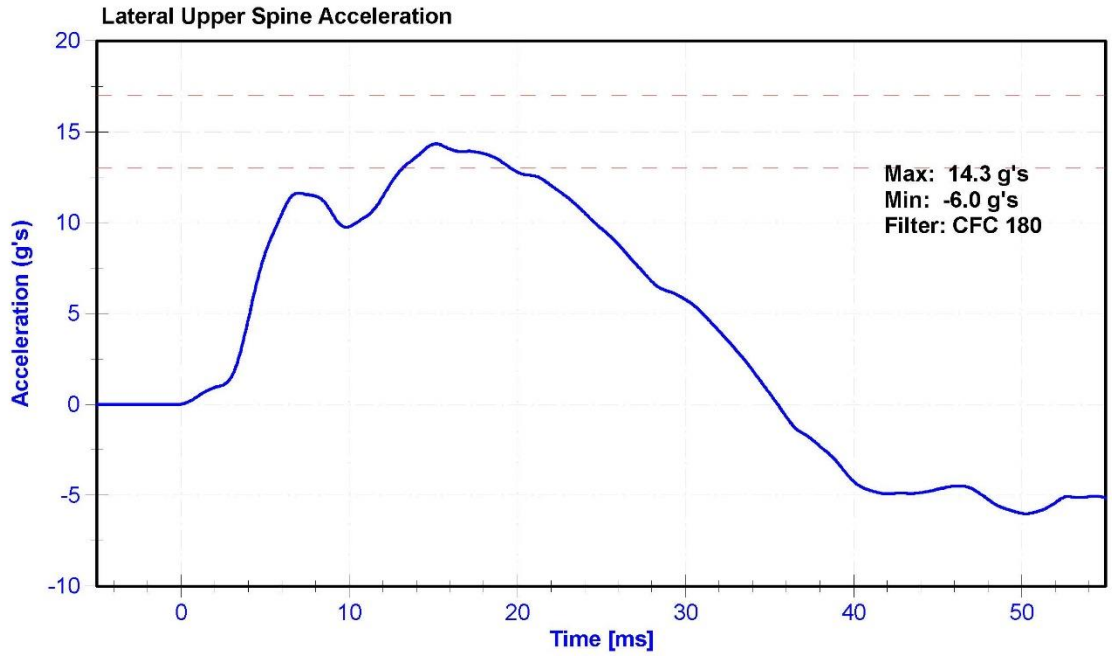
Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Upper Spine Y Accelerometer	ENDEVCO 7264CT	AC-P63561	5/4/2018	11/2/2018
Lower Spine Y Accelerometer	ENDEVCO 7264	AC-P83319	5/4/2018	11/2/2018
Upper Thorax Rib Potentiometer	Servo 1246	DS-2165GFE	5/15/2018	5/15/2019
Middle Thorax Rib Potentiometer	Servo 08TC1-3621	DS-45 GFE	12/11/2017	12/11/2018
Lower Thorax Rib Potentiometer	Servo 08TC1-3787	DS-011GFE	9/27/2017	9/27/2018

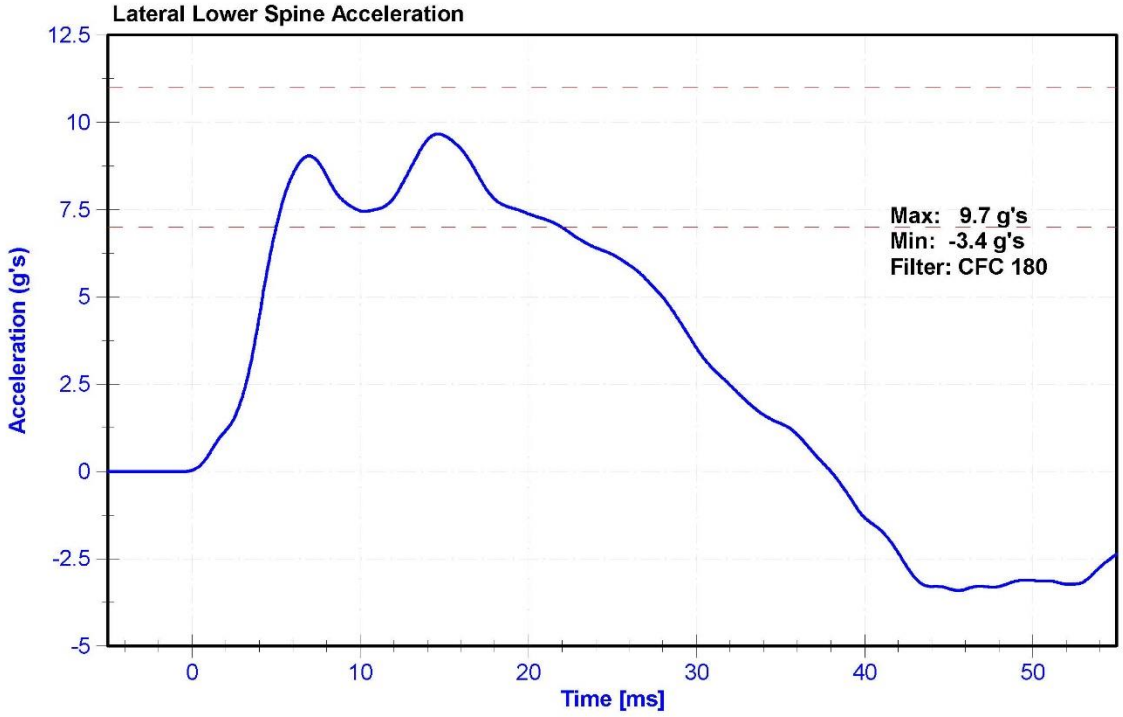



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 37.3 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 42.2 mm
Min: 0.0 mm
Filter: CFC 600


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


Lateral Upper Spine Acceleration
Max: 14.3 g's
Min: -6.0 g's
Filter: CFC 180
Acceleration (g's)
Time [ms]
20
15
10
5
0
-5
-10
0
10
20
30
40
50


Lateral Lower Spine Acceleration
Max: 9.7 g's
Min: -3.4 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

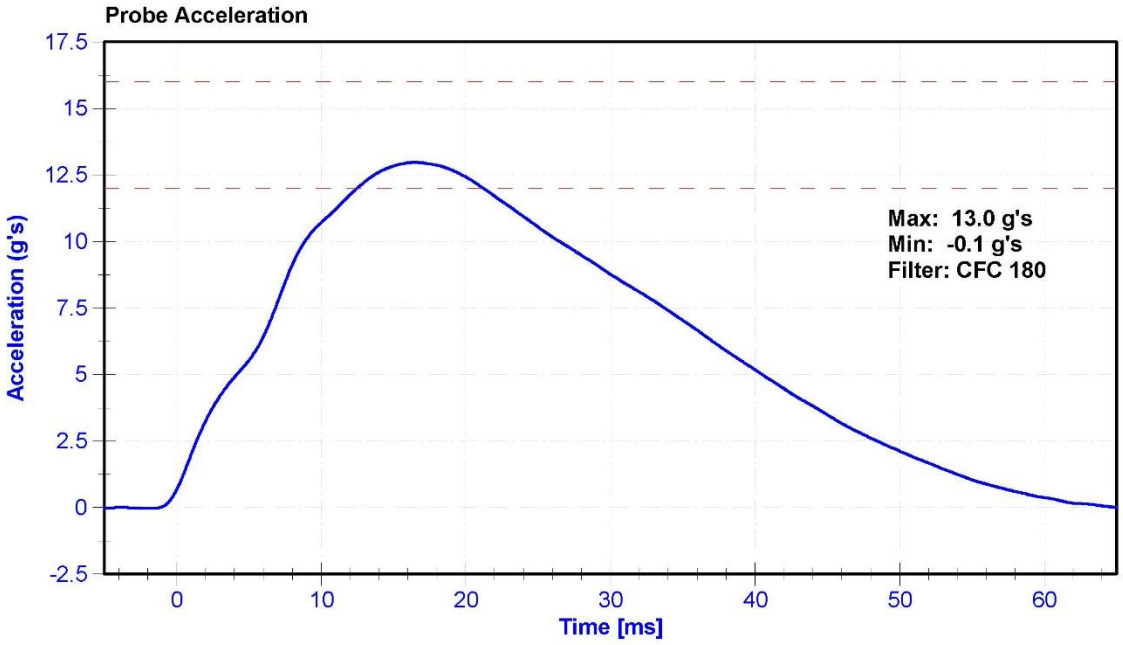
ATD Manufacturer	FTSS	Test Technician	D. Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

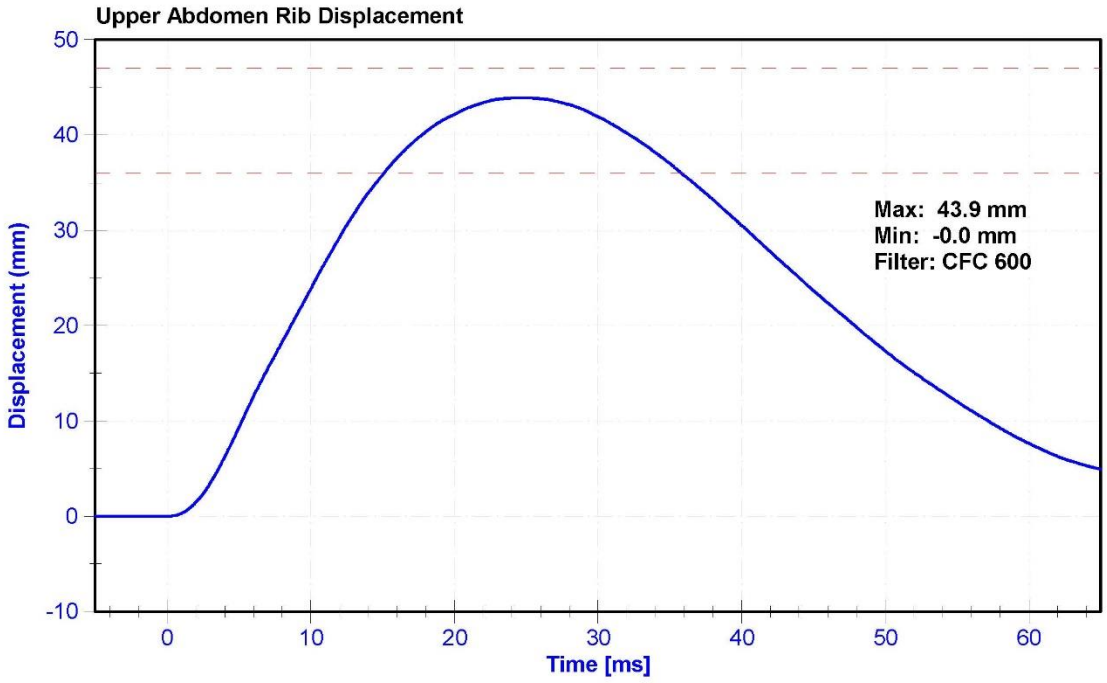
Results

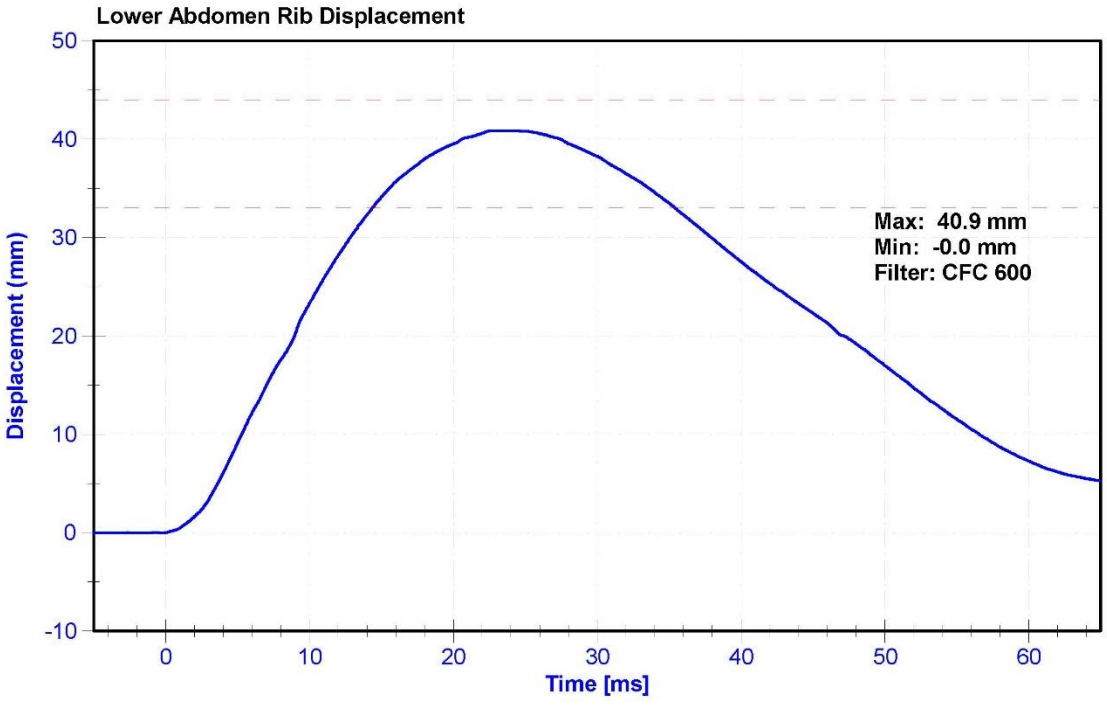
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	47.0	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	12	16	g's	13.0	Pass
Lateral Lower Spine Acceleration	9	14	g's	10.0	Pass
Upper Abdomen Rib Deflection	36	47	mm	43.9	Pass
Lower Abdomen Rib Deflection	33	44	mm	40.9	Pass

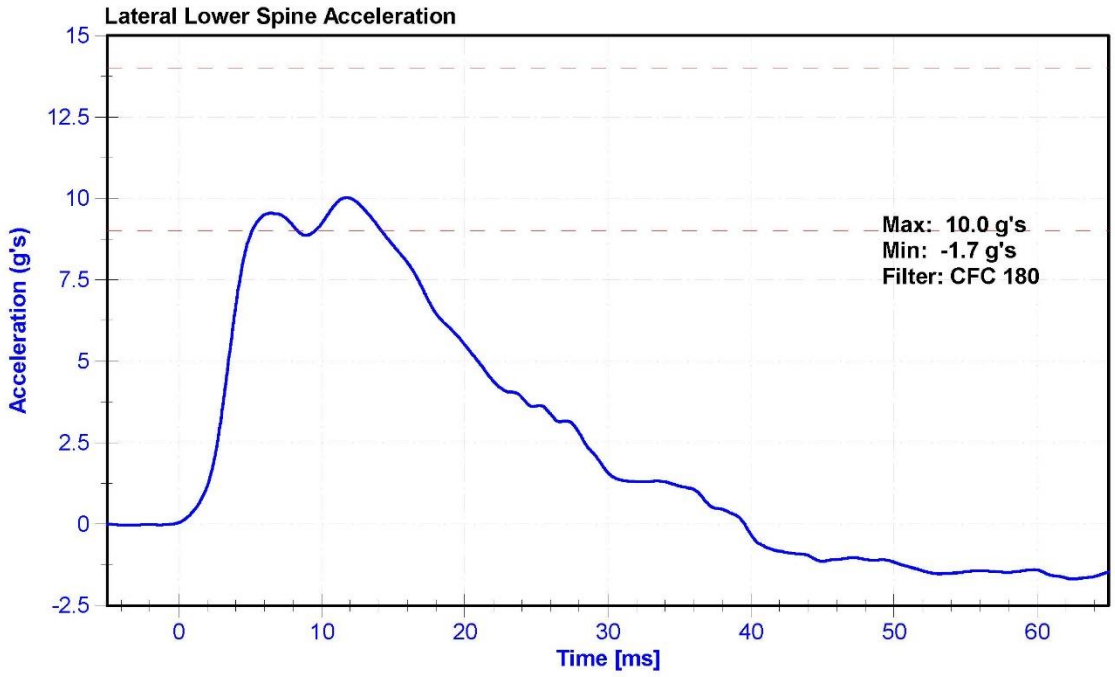
Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Probe Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Lower Spine Y Accelerometer	ENDEVCO 7264	AC-P83319	5/4/2018	11/2/2018
Upper Abdomen Rib Potentiometer	Servo 08TC1-3725	DS-008GFE	9/27/2017	9/27/2018
Lower Abdomen Rib Potentiometer	Servo 08TC1-3745	DS-1774GFE	9/27/2017	9/27/2018




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


Lower Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 40.9 mm
Min: -0.0 mm
Filter: CFC 600


Lateral Lower Spine Acceleration
Acceleration (g's)
15
12.5
10
7.5
5
2.5
0
-2.5
0
10
20
30
40
50
60
Time [ms]
Max: 10.0 g's
Min: -1.7 g's
Filter: CFC 180

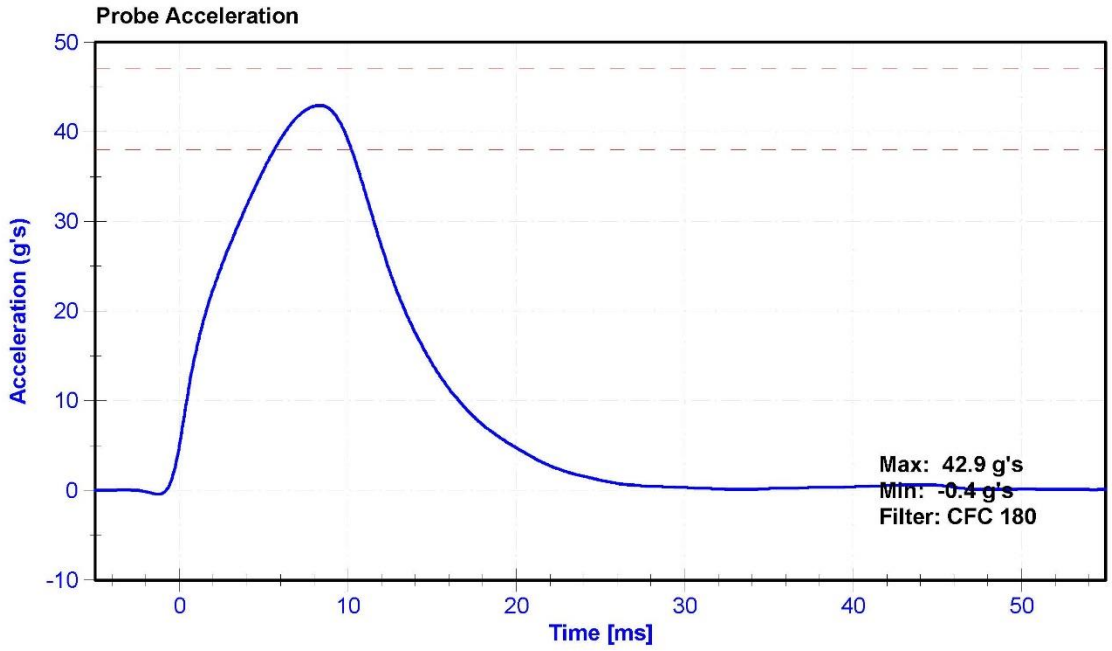
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K. Brogan

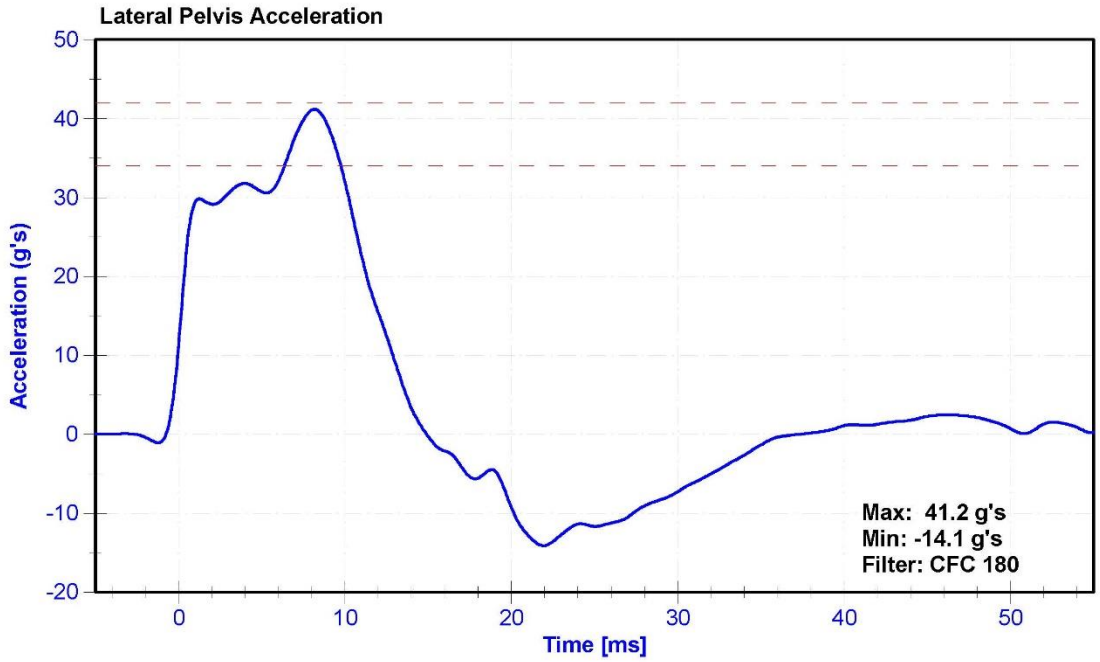
Results

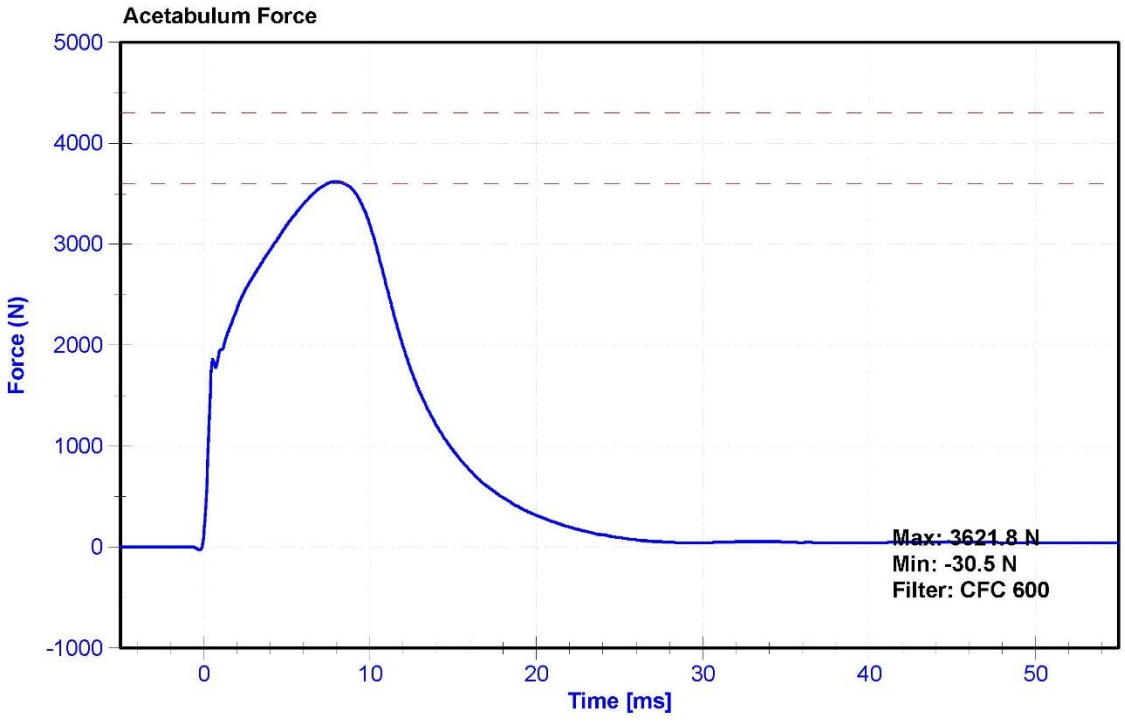
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	22.1	Pass
Humidity	10	70	%	51	Pass
Velocity	6.6	6.8	m/s	6.67	Pass
Probe Acceleration	38	47	g's	42.9	Pass
Lateral Pelvis Acceleration after 6ms	34	42	g's	41.2	Pass
Acetabulum Force	3600	4300	N	3621.8	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	5/4/2018	11/2/2018
Acetabulum Load Cell	Denton 3249J	LC-4986Fy	6/4/2018	6/4/2019
Certification Plug	Humanetics	12109	02/27/2018	N/A
Crash Test Plug	Humanetics	12149	02/28/2018	N/A




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


Acetabulum Force
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 3621.8 N
Min: -30.5 N
Filter: CFC 600

SID-IIs Pelvis Plug Certification Test

Plug S/N 12149
Test Number 6508
Report Number 6523
Test Date 2/28/2018 10:11:51 AM

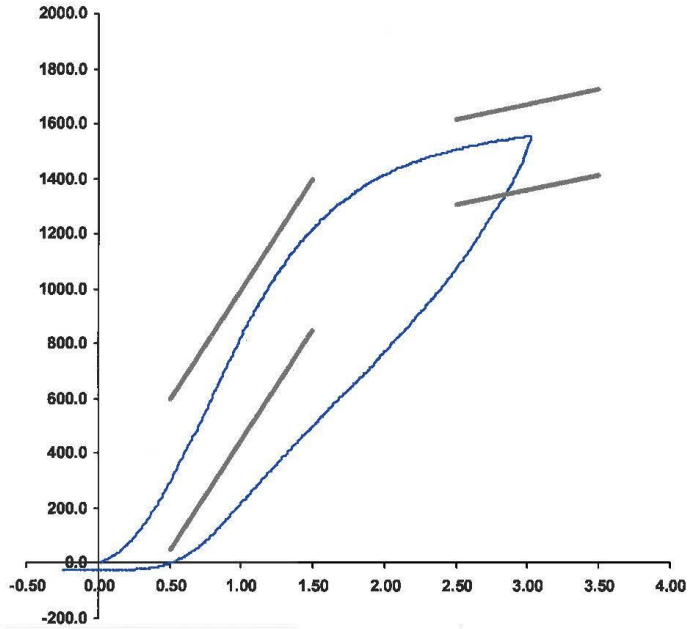
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	297.57	50.00	600.00
Force @ 1.5 mm (N)	1,222.16	850.00	1,400.00
Force @ 2.5 mm (N)	1,507.82	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,557.36	1,361.00	1,673.00

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

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

Notes:

Force (-N) vs Extension (-mm)



Operator 12123

Part Number 180-4450

Template No 107 28-Feb-18
SACO Research

By : DC Date : 2/28/18

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

SACO RESEARCH

SID-IIs Pelvis Plug Certification Test

Plug S/N 12109
Test Number 6467
Report Number 6482
Test Date 2/27/2018 11:22:31 AM

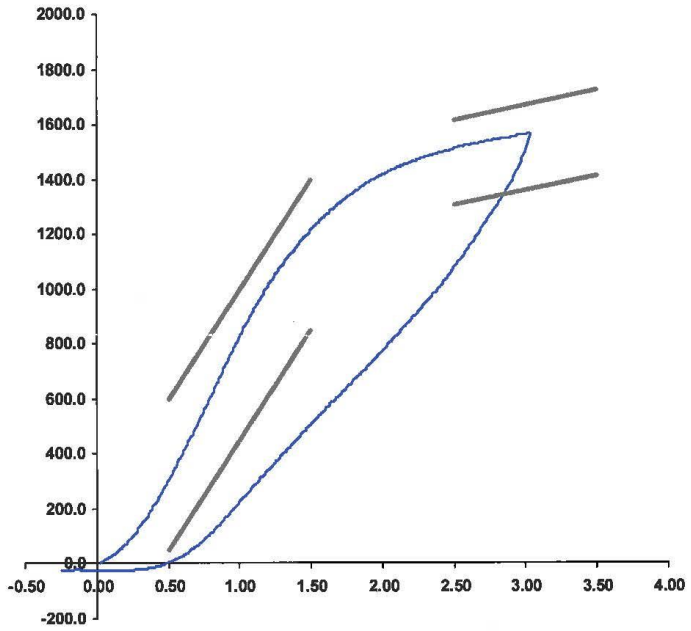
	Test Results	Spec Min	Spec Max
Force @ 0.5 mm (N)	307.86	50.00	600.00
Force @ 1.5 mm (N)	1,216.42	850.00	1,400.00
Force @ 2.5 mm (N)	1,513.50	1,306.00	1,618.00
Force @ 3.0 mm (N)	1,565.73	1,361.00	1,673.00

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

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

Notes:

Force (-N) vs Extension (-mm)



Operator

Part Number 180-4450

Template No 107 27-Feb-18
SACO Research

By : DC Date : 2/27/18

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

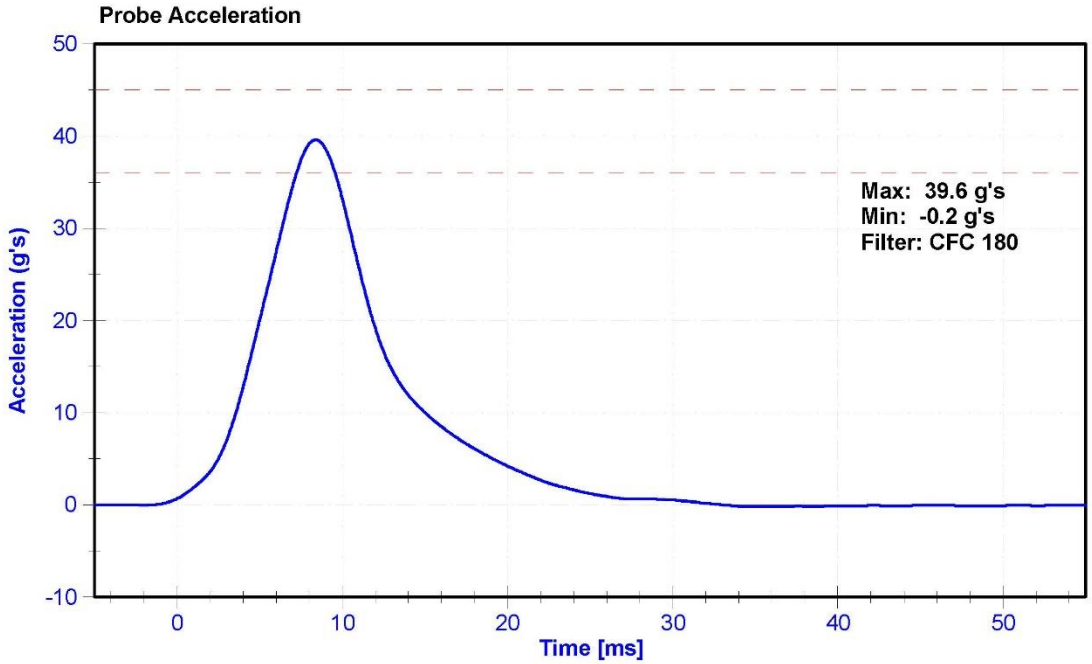
ATD Manufacturer	FTSS	Test Technician	D.Reinhard
ATD Serial Number	DG8012	Laboratory Supervisor	K.Brogan

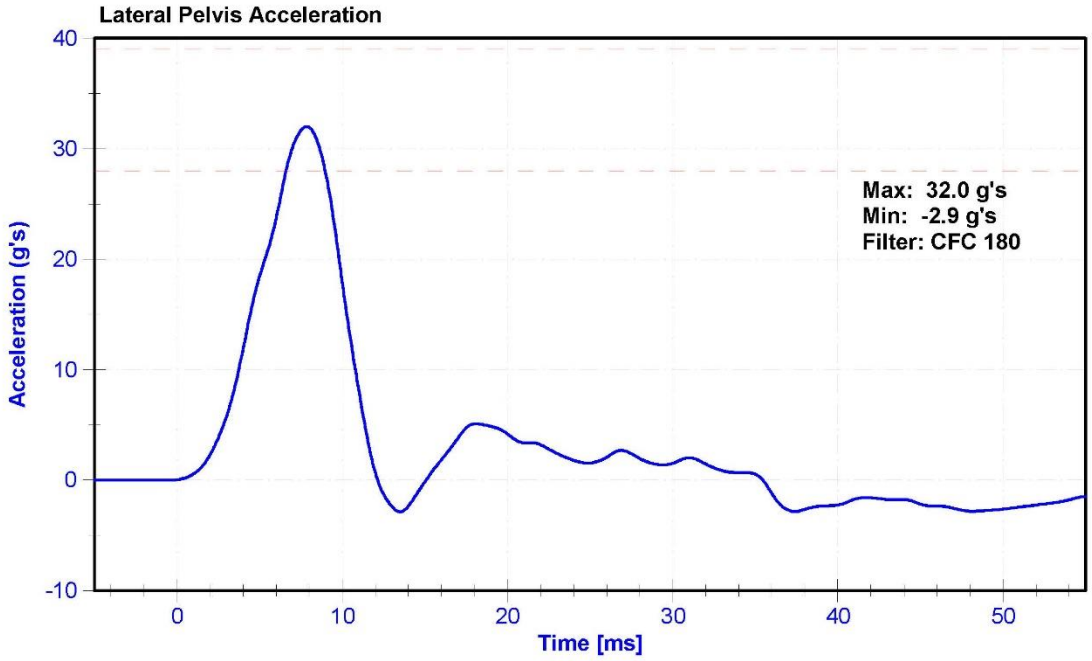
Results

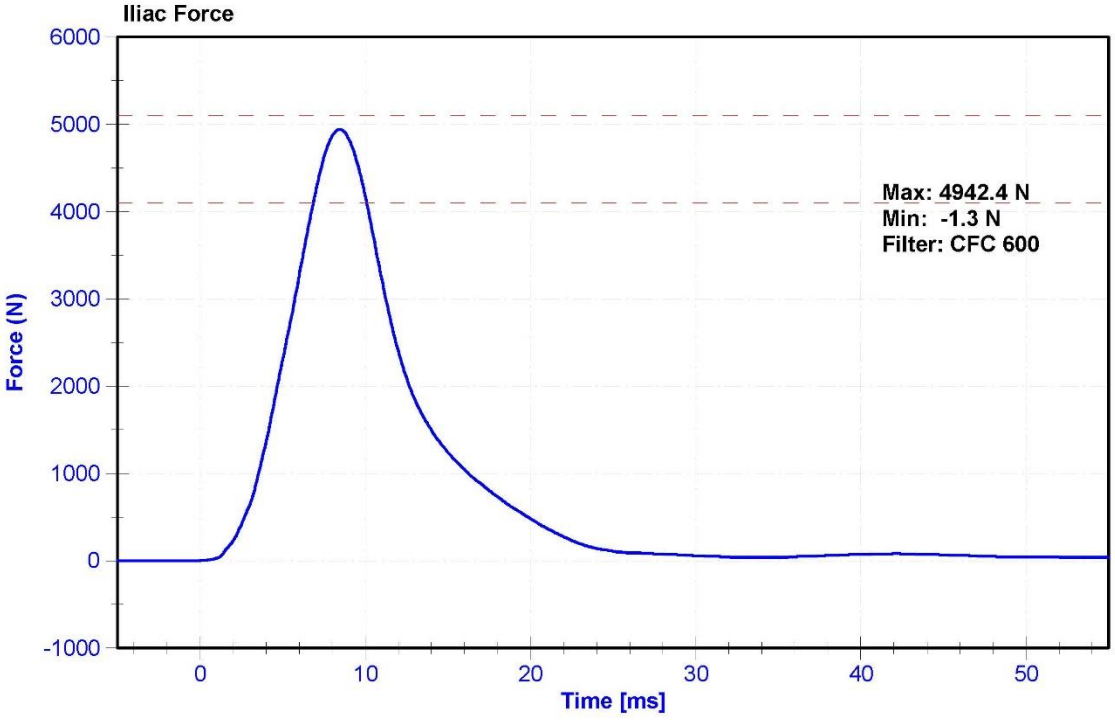
Test Parameter	Minimum Specification	Maximum Specification	Unit	Result	Pass/Fail
Temperature	20.6	22.2	°C	21.6	Pass
Humidity	10	70	%	51.1	Pass
Velocity	4.2	4.4	m/s	4.37	Pass
Probe Acceleration	36	45	g's	39.6	Pass
Lateral Pelvis Acceleration	28	39	g's	32.0	Pass
Iliac Force	4100	5100	N	4942.4	Pass

Transducer Calibrations

Channel	Manufacturer	Serial Number	Calibration Date	Calibration Due Date
Pendulum Accelerometer	ENDEVCO 7264CT	AC-P32453	10/17/2017	10/17/2018
Pelvis Y Accelerometer	ENDEVCO 7264CT	AC-P51875	5/4/2018	11/2/2018
Iliac Load Cell	DENTON 3228J	LC-113Fy	6/4/2018	6/4/2019




Lateral Pelvis Acceleration
Acceleration (g's)
Time [ms]
Max: 32.0 g's
Min: -2.9 g's
Filter: CFC 180


Iliac Force
Force (N)
Time [ms]
Max: 4942.4 N
Min: -1.3 N
Filter: CFC 600

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

Table 1 – Dummy Instrumentation (ES-2re)

			ES-2re S/N: F034		
			Serial Number	Manufacturer	Calibration Date
Head Accelerometers	Primary	X	AC-P58904	ENDEVCO	5/7/2018
		Y	AC-P58911	ENDEVCO	5/7/2018
		Z	AC-P58776	ENDEVCO	5/7/2018
	Redundant	X	AC-P58887	ENDEVCO	5/7/2018
		Y	AC-P58888	ENDEVCO	5/7/2018
		Z	AC-P51734	ENDEVCO	5/7/2018
Thorax Rib Displacement Potentiometers	Upper	Y	DS-183GFE	Honeywell	9/27/2017
	Middle	Y	DS-184GFE	Honeywell	9/27/2017
	Lower	Y	DS-182GFE	Honeywell	9/27/2017
Abdomen Load Cells	Forward	Y	LC-1440	DENTON	6/4/2018
	Middle	Y	LC-1525	DENTON	6/4/2018
	Rear	Y	LC-1528	DENTON	6/4/2018
Lower Spine Accelerometers (T12)		X	AC-P52079	ENDEVCO	5/8/2018
		Y	AC-P51948	ENDEVCO	5/8/2018
		Z	AC-P51269	ENDEVCO	5/8/2018
Pubic Symphysis Load Cell		Y	LC-464fy	DENTON	6/4/2018

Table 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N: DG8012		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	AC-P51685	ENDEVCO	5/4/2018
			Y	AC-P51682	ENDEVCO	5/4/2018
			Z	AC-P51699	ENDEVCO	5/4/2018
		Redundant	X	AC-P51701	ENDEVCO	5/4/2018
			Y	AC-P45019	ENDEVCO	5/4/2018
			Z	AC-P51690	ENDEVCO	5/4/2018
Displacement Potentiometers	Thoracic Rib	Upper	Y	DS-2165GFE	Servo	5/15/2018
		Middle	Y	DS-45 GFE	Servo	12/11/2017
		Lower	Y	DS-011GFE	Servo	9/27/2017
	Abdominal Rib	Upper	Y	DS-008GFE	Servo	9/27/2017
		Lower	Y	DS-1774GFE	Servo	9/27/2017
Lower Spine Accelerometers (T12)			X	AC-P74788	ENDEVCO	5/4/2018
			Y	AC-P83319	ENDEVCO	5/4/2018
			Z	AC-P83432	ENDEVCO	5/4/2018
Acetabulum Load Cell			Y	LC-4986Fy	DENTON	6/4/2018
Iliac Wing Load Cell			Y	LC-113Fy	DENTON	6/4/2018
Pelvis Plug (struck side)				11473	SACO	8/3/2016
Pelvis Plug (non-struck side)				-	-	-

Table 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	AC-A184912	MSI 1201-1000	5/24/2018
	Vehicle Center of Gravity	Y	AC-A197014	MSI 1201-1000	4/28/2018
	Vehicle Center of Gravity	Z	AC-A247195	MSI 1201-1000	4/2/2018
2	Right Sill at Front Seat	X	AC-A247201	MSI 1201-1000	12/21/2017
	Right Sill at Front Seat	Y	AC-A217550	MSI 1201-1000	12/30/2017
	Right Sill at Front Seat	Z	AC-A184903	MSI 1201-1000	12/29/2017
3	Right Sill at Rear Seat	X	AC-A254667	MSI 1201-1000	3/21/2018
	Right Sill at Rear Seat	Y	AC-A254663	MSI 1201-1000	3/21/2018
	Right Sill at Rear Seat	Z	AC-A254673	MSI 1201-1000	3/21/2018
4	Left Sill at Front Door	Y	AC-A217543	MSI 1201-1000	5/9/2018
5	Left Sill at Rear Door	Y	AC-A196997	MSI 1201-1000	3/10/2018
6	Left A-Post Lower	Y	AC-A197042	MSI 1201-1000	4/28/2018
7	Left A-Post Middle	Y	AC-A197044	MSI 1201-1000	4/2/2018
8	Left B-Post Lower	Y	AC-A192194	MSI 1201-1000	2/2/2018
9	Left B-Post Middle	Y	AC-A250371	MSI 1201-1007	1/17/2018
10	Front Seat Track	Y	AC-A250370	MSI 1201-1000	1/29/2018
11	Rear Seat Track or Structure	Y	AC-A247209	MSI 1201-1000	4/28/2018
12	Right Rear Occ. Compartment	Y	AC-A197052	MSI 1201-1000	4/2/2018
13	Engine Block	X	AC-A184944	MSI 1201-1000	5/9/2018
	Engine Block	Y	AC-A217574	MSI 1201-1000	12/21/2017
14	Rear Floorpan Above Axle	X	AC-A217535	MSI 1201-1000	4/3/2018
	Rear Floorpan Above Axle	Y	AC-A217582	MSI 1201-1000	12/21/2017
	Rear Floorpan Above Axle	Z	AC-A222641	MSI 1201-1000	1/23/2018

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	AC-A197006	MSI 1201-1000	4/3/2018
MDB Center of Gravity	Y	AC-A197023	MSI 1201-1000	4/3/2018
MDB Center of Gravity	Z	AC-A197032	MSI 1201-1000	4/3/2018
Left Frame at Rear Axle Centerline	X	AC-A002415	MSI 1201	3/27/2018
Left Frame at Rear Axle Centerline	Y	AC-A197003	MSI 1201-1000	3/27/2018