**REPORT NUMBER: SPNCAP-CAL-23-004**

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

**Mazda Motor Manufacturing De Mexico S.A. De C.V.**
**2023 Mazda CX-30**
**5 Door SUV**

**NHTSA No: O20235400**

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

**December 19, 2023**

**FINAL REPORT**

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

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number 693JJ920D000016.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof.

If trade or manufacturers' names or products are mentioned it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared by: Alexander Rudniski
Alexander Rudniski, Test Engineer
Date: December 19, 2023

Approved by: Vanessa Hansen
Vanessa Hansen, Operations Manager
Date: December 19, 2023

**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.***<br>SPNCAP-CAL-23-004 | ***2. Government Accession No.*** | ***3. Recipient's Catalog No.*** |
| ***4. Title and Subtitle***<br>Final Report of New Car Assessment Program<br>Side Impact Pole Testing of<br>2023 Mazda CX-30 5-door SUV<br>NHTSA No.: O20235400 | | ***5. Report Date***<br>December 19, 2023<br>***6. Performing Organization Code***<br>CAL |
| ***7. Author(s)***<br>Alexander Rudniski, Test Engineer<br>Vanessa Hansen, Operations Manager | | ***8. Performing Organization Report No.***<br>CAL-DOT-2023-004 |
| ***9. Performing Organization Name and Address***<br>Calspan Corporation<br>Transportation Test Operation<br>P.O. Box 400<br>Buffalo, New York 14225 | | ***10. Work Unit No.***<br><br>***11. Contract or Grant No.***<br>693JJ920D000016 |
| ***12. Sponsoring Agency Name and Address***<br>U.S. Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Crashworthiness Standards (NRM-110)<br>1200 New Jersey Ave.<br>Washington, D.C. 20590 | | ***13. Type of Report and Period Covered:***<br>Final Test Report,<br>April 14, 2023 - December 19, 2023<br>***14. Sponsoring Agency Code***<br>NRM-110 |
| **15. *Supplementary Notes*** | | |

***16. Abstract***

A 32.20 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject 2023 Mazda CX-30 SUV in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. This test was conducted at Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on April 14, 2023.

The impact velocity of the vehicle was 31.91 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle was 21°C. The target vehicle's maximum post-test static crush was 326 mm located at level 2. The test vehicle's occupant performance data is as follows:

| Measurement Description | Driver ATD (SID-IIs) (Serial No. 300) | | |
|---|---|---|---|
| | Units | Threshold | Result |
| Head Injury Criteria ($HIC_{36}$) | | 1000 | 160.916 |
| Resultant Lower Spine Acceleration | G | 82 | 39.665 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 3045.772 |
| Maximum Thoracic Rib Deflection | mm | 38 | 25.331 |
| Maximum Abdominal Rib Deflection | mm | 45 | 24.125 |

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

| | | | |
|---|---|---|---|
| ***19. Security Class. (of this report)***<br>UNCLASSIFIED | ***20. Security Class. (of this page)***<br>UNCLASSIFIED | ***21. No. of Pages***<br>126 | ***22. Price*** |

Form DOT F1700.7 (8-72)

## TABLE OF CONTENTS

# SECTION 1

# TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the 2023 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ920D000016. The purpose of this test is to generate comparative side impact performance in a 2023 Mazda CX-30 SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated March 2020.

## SECTION 2

## SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2023 Mazda CX-30 SUV. The subject vehicle was towed into the rigid pole at an angle of 75$^{o}$ and a velocity of 31.91 km/h. The test was conducted by Calspan Corporation's Transportation Test Operations facility in Buffalo, New York on April 14, 2023. Pre-test and post-test photographs of the test vehicle and side impact dummy (SID-IIs) are included in Appendix A of this report.

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

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

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

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

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

**INJURY READINGS**

| Measurement Description | Driver ATD (SID-IIs) | | |
|---|---|---|---|
| | Units | IARV | Result |
| Head Injury Criteria ($HIC_{36}$) | | 1000 | 160.916 |
| Resultant Lower Spine Acceleration | G | 82 | 39.665 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 3045.772 |
| Maximum Thoracic Rib Deflection | mm | 38* | 25.331 |
| Maximum Abdominal Rib Deflection | mm | 45* | 24.125 |

*****Proposed IARV

Supplemental restraint information was recorded as follows:

**SUPPLEMENTAL RESTRAINT INFORMATION**

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

**GENERAL COMMENTS:**

1. P1 serial number – 300

**Data Anomalies:**

- No Questionable Channels

## SECTION 3

## OCCUPANT AND VEHICLE INFORMATION

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – General Test and Vehicle Parameter Data

Data Sheet No. 2 – Seat, Seat Belt, Steering Wheel Adjustment and Fuel Systems Data

Data Sheet No. 3 – Dummy Longitudinal Clearance Dimensions

Data Sheet No. 4 – Dummy Lateral Clearance Dimensions

Data Sheet No. 5 – Camera and instrumentation Data

Data Sheet No. 6 – Vehicle Accelerometer Data

Data Sheet No. 7 – Rigid Pole Load Cell Data

Data Sheet No. 8 – Post-Test Observations

Data Sheet No. 9 – Test Vehicle Profile Measurements

Data Sheet No. 10 – Test Vehicle Exterior Crush Measurements

Data Sheet No. 11 – Vehicle Damage Profile Distances

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

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

## DATA SHEET NO. 1
## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Mazda CX-30 5-door SUV
NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test
Test Date: 04/14/2023

### TEST VEHICLE INFORMATION AND OPTIONS

| | |
|---|---|
| NHTSA No. | O20235400 |
| Model Year | 2023 |
| Make | Mazda |
| Model | CX-30 |
| Body Style | SUV |
| VIN | 3MVDMBCM8PM507931 |
| Body Color | Snowflake White Pearl |
| Odometer Reading (km/mi) | 145 mi |
| Engine Displacement (L) | 2.5 |
| Type / No. Cylinders | I4 |
| Engine Placement | Transverse |
| Transmission Type | Automatic |
| Transmission Speeds | 6-speed |
| Overdrive | Yes |
| Final Drive | All Wheel Drive |
| Roof Rack | No |
| Sunroof / T-Top | No |
| Running Boards | No |
| Tilt Steering Wheel | Yes |
| Power Seats | Yes |
| Anti-Lock Brakes (ABS) | Yes |

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

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

### DATA FROM CERTIFICATION LABEL

| | |
|---|---|
| Manufactured By | Mazda Motor Manufacturing De Mexico S.A. De C.V. |
| Date of Manufacture | 11/22 |
| Vehicle Type | MPV |

| | |
|---|---|
| GVWR (kg) | 1987 |
| GAWR Front (kg) | 1068 |
| GAWR Rear (kg) | 940 |

### VEHICLE SEATING AND WEIGHT CAPACITY DATA

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

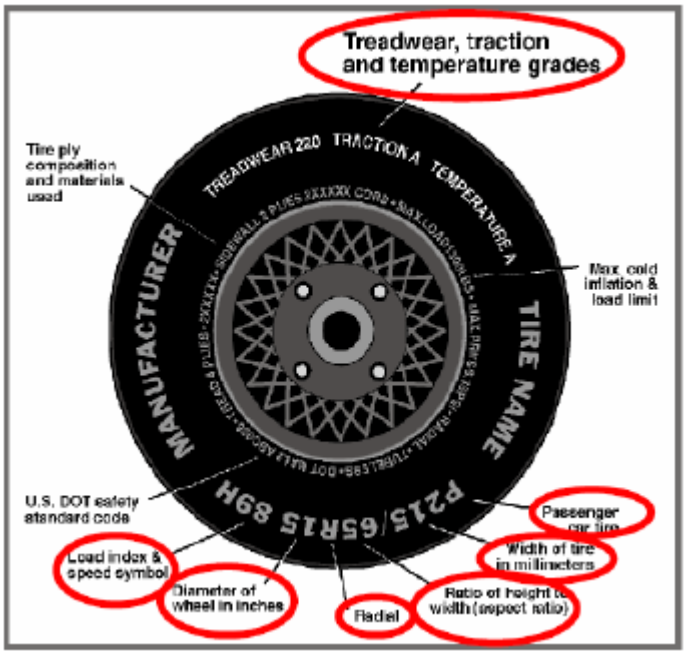
### VEHICLE SEAT TYPE

| Seating Location | Type of Seat Pan | | | | Type of Seat Back | | |
|---|---|---|---|---|---|---|---|
| | Bucket | Bench | Split Bench | Contoured | Fixed | Adjustable | |
| | | | | | | W/ Lever | 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: | 2023 Mazda CX-30 5-door SUV | NHTSA No.: | O20235400 |
| Test Program: | NCAP Side Pole Impact Test | Test Date: | 04/14/2023 |

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




**VEHICLE TIRE INFORMATION**

| Measured Parameter | Front | Rear |
|---|---|---|
| Maximum Tire Pressure (kPa) | 350 | 350 |
| Cold Pressure (kPa) | 250 | 250 |
| Recommended Tire Size | 215/55R18 | 215/55R18 |
| Tire Size on Vehicle | 215/55R18 | 215/55R18 |
| Tire Manufacturer | Bridgestone | Bridgestone |
| Tire Model | Turanza EL440 | Turanza EL440 |
| Treadwear | 480 | 480 |
| Traction | A | A |
| Temperature Grades | A | A |
| Tire Plies Sidewall | 1 Polyester | 1 Polyester |
| Tire Plies Body | 1 Polyester, 2 Steel, 1 Nylon | 1 Polyester, 2 Steel, 1 Nylon |
| Load Index/Speed Symbol | 95H | 95H |
| Tire Material | Rubber | Rubber |
| DOT Safety Code Left | 1V6 E2JB21 4122 | 1V6 E2JB21 4122 |
| DOT Safety Code Right | 1V6 E2JB21 4122 | 1V6 E2JB21 4122 |

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

Test Vehicle: 2023 Mazda CX-30 5-door SUV NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test Test Date: 04/14/2023

### TIRE PRESSURES

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

### TEST VEHICLE AXLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | | Fully Loaded | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Front | Rear | Total | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 466 | 296 | | 480 | 333 | | 484 | 337 | |
| Right | kg | 447 | 299 | | 472 | 312 | | 456 | 327 | |
| Ratio | % | 60.5 | 39.5 | | 60 | 40 | | 56.8 | 41.3 | |
| Totals | kg | 913 | 595 | 1508 | 952 | 645 | 1597 | 940 | 664 | 1604 |

### TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value | |
|---|---|---|---|
| Total As Delivered Weight (UVW) | kg | 1508.0 | (A) |
| Actual Weight of 1 P572V (SID-IIs) ATD Used | kg | 50.0 | (B) |
| Rated Cargo / Luggage Weight (RCLW) | kg | 44.8 | (C) |
| Calculated Vehicle Target Weight (TVTW) | kg | 1602.8 | (A+B+C) |

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

### TEST VEHICLE ATTITUDES AND CG

| Measurement Description | Units | As Delivered | As Tested | Fully Loaded | Meets Rqmt*** |
|---|---|---|---|---|---|
| Driver Door Sill Angle (front-to-rear)* | Deg | +0.80 | +0.80 | +1.00 | Yes |
| Front Passenger Sill Angle (front-to-rear)* | Deg | -0.35 | -0.50 | -0.70 | Yes |
| Front Bumper-Line Angle (left-to-right)** | Deg | -0.85 | -0.65 | -0.60 | Yes |
| Rear Bumper-Line Angle (left-to-right)** | Deg | 0.00 | -0.10 | -0.15 | Yes |
| Vehicle CG (Aft of Front Axle) | mm | 1046 | 1071 | 1098 | |
| Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline) | mm | 8 | 14 | 18 | |

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

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

Test Vehicle: 2023 Mazda CX-30 5-door SUV NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test Test Date: 04/14/2023

**WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW**

| Component Description | Weight (kg) |
|---|---|
| Trunk Carpeting | 8 |
| Spare Tire | 14 |
| Jack | 3 |
| Tail Light | 1 |
| Passenger Rear Window Glass | 2 |
| Right Rear Door Panel | 2.5 |
| | |
| Ballast / Equipment Added | 0 |

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

**Test Surface Markings**

| | Distance from 75° Impact Location Line (mm) |
|---|---|
| Fore 25 mm target | 957 |
| Aft 25 mm target | 958 |

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

Test Vehicle: 2023 Mazda CX-30 5-door SUV NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test Test Date: 04/14/2023

**SEAT POSITIONING**

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

**SCRL ANGLE RANGE**

| Seat | SCRL (°) | | |
|---|---|---|---|
| | Max | Min | Mid |
| Driver Seat | 17.1 | 9.1 | 13.1 |
| 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 |

**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 | 13.1 | 41 | Max | 40 | 53 | 65 |
| | | | Mid | 15 | 29 | 41 |
| | | | Min | 1 | 4 | 17 |
| Front Passenger Seat | Not Adjustable | | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |
| Front Center Seat | | | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |
| Struck Side Rear Seat | Fixed | Fixed | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |
| Non-Struck Side Rear Seat | Fixed | Fixed | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |
| Rear Center Seat | Fixed | Fixed | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |

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

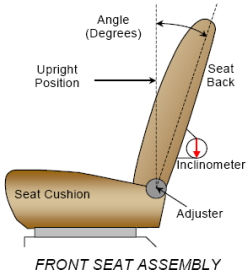
Test Vehicle: 2023 Mazda CX-30 5-door SUV
NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test
Test Date: 04/14/2023

### SEAT FORE / AFT POSITION

| Seat | Total Fore / Aft Travel | | Test Position from Forward most Position | |
|---|---|---|---|---|
| | mm | Detents* | mm | Detents* |
| Driver Seat | 258 | Power | 0 | Power |
| Front Passenger Seat | 255 | 33 (0-32) | 0 | 0 |
| Front Center Seat | | | | |
| Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Rear Center Seat | Fixed | Fixed | Fixed | Fixed |

### SEAT BACK ANGLE ADJUSTMENT

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



FRONT SEAT ASSEMBLY

| Seat | Total Seat Back Angle Range | | Test Position from Most Upright | |
|---|---|---|---|---|
| | Degrees | Detents* | Degrees | Detents* |
| Driver Seat w/Seated Dummy | 82.0 | Power | 5.6 | Power |
| Front Passenger Seat | 64.7 | 33 (0-32) | N/A | N/A |
| Front Center Seat | | | | |
| Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Rear Center Seat | Fixed | Fixed | Fixed | Fixed |

### SEAT BELT ANCHORAGE ADJUSTMENT

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

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

### HEAD RESTRAINT ADJUSTMENT

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

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

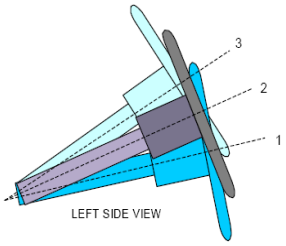
## DATA SHEET NO. 2 … (CONTINUED)
## SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

| | | | |
|---|---|---|---|
| Test Vehicle: | 2023 Mazda CX-30 5-door SUV | NHTSA No.: | O20235400 |
| Test Program: | NCAP Side Pole Impact Test | Test Date: | 04/14/2023 |

### STEERING COLUMN ADJUSTMENT

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

| | Degrees | Fore / Aft Position (mm) |
|---|---|---|
| Lowermost – Position 1 | 22.1 | |
| Geometric Center – Position 2 | 24.6 | |
| Uppermost – Position 3 | 27.0 | |
| Telescoping Steering Wheel Travel | | 68 |
| Test Position | 24.6 | 34 |

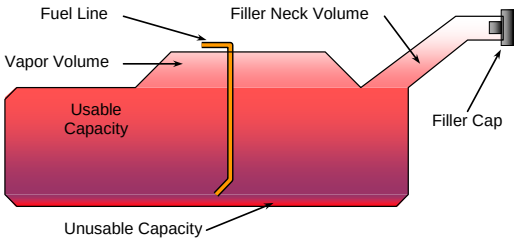


*STEERING COLUMN ASSEMBLY*

### FUEL PUMP

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

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



*VEHICLE FUEL TANK ASSEMBLY*

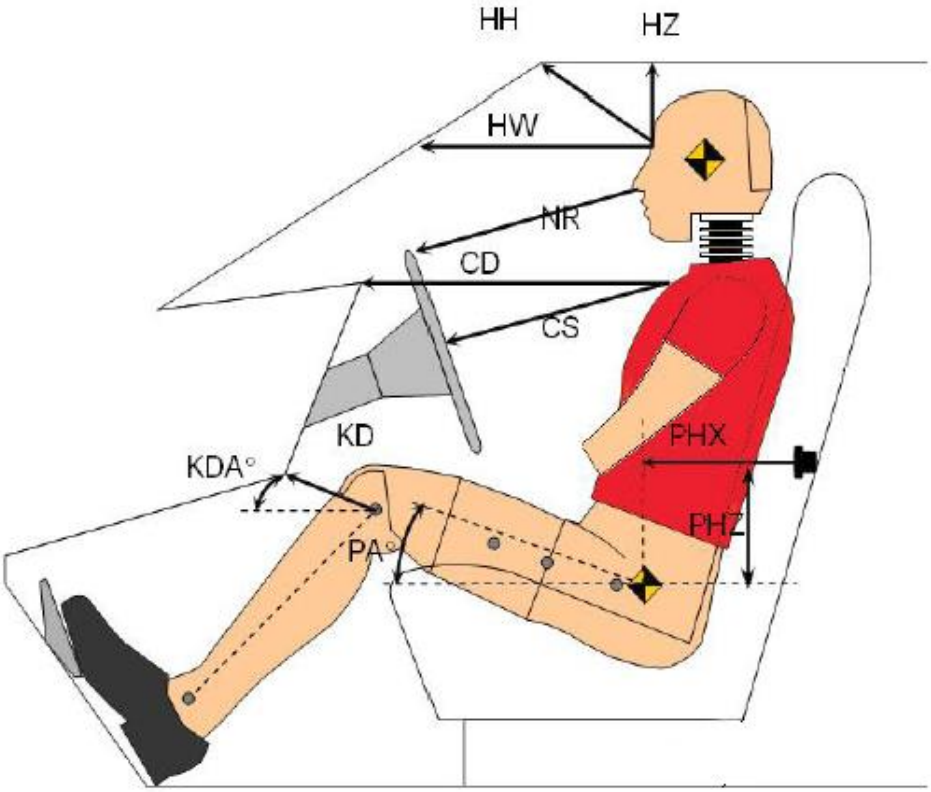
### FUEL TANK CAPACITY DATA

| Description | | | Liters |
|---|---|---|---|
| Usable Capacity of "Standard Tank" | - | see Form No. 1 | 47.7 |
| Usable Capacity of "Optional Tank" | - | see Form No. 1 | N/A |
| Usable Capacity of "Standard Tank" | - | see Owner's Manual | 48.0 |
| Usable Capacity of "Optional Tank" | - | see Owner's Manual | N/A |
| 93% of Usable Capacity | | | 44.4 |
| Actual Amount of Solvent Used in Test | | | 44.5 |
| 1/3 of Usable Capacity | | | 15.9 |

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: 2023 Mazda CX-30 5-door SUV
Test Program: NCAP Side Pole Impact Test
NHTSA No.: O20235400
Test Date: 04/14/2023



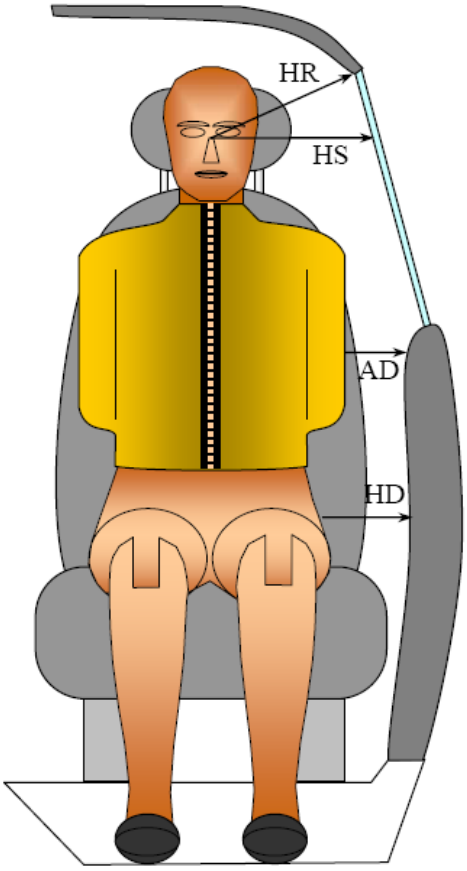

**Left Side View**

**DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION**

| Driver Code | Description | Driver (Serial No. 300) | |
|---|---|---|---|
| | | Length (mm) | Angle (◦) |
| HH | Head to Header | 229 | |
| HW | Head to Windshield | 502 | |
| HZ | Head to Roof Liner | 192 | |
| NR | Nose to Rim | 210 | |
| CD | Chest to Dash | 391 | |
| CS | Chest to Steering Wheel | 145 | |
| KD(L) / KDA(L)◦ | Left Knee to Dash | 114 | 36.9 |
| KD(R) / KDA(R)◦ | Right Knee to Dash | 104 | 45.1 |
| PAX◦ | Pelvic Tilt Angle (X-Axis) | | 18.3 |
| PAY◦ | Pelvic Tilt Angle (Y-Axis) | | 0.3 |
| PHX | Hip Point to Striker (X-Axis) | 339 | |
| PHZ | Hip Point to Striker (Z-Axis) | 171 | |

**DATA SHEET NO. 4**
**DUMMY LATERAL CLEARANCE DIMENSIONS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2023 Mazda CX-30 5-door SUV | NHTSA No.: | O20235400 |
| Test Program: | NCAP Side Pole Impact Test | Test Date: | 04/14/2023 |




*FRONT VIEW OF DUMMY*

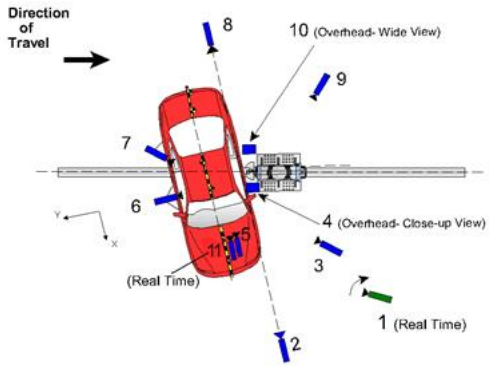
**DUMMY LATERAL CLEARANCE DIMENSION INFORMATION**

| Code | Measurement Description | Units | Driver - Length (Serial No. 300) |
|---|---|---|---|
| HR | Head To Side Header | mm | 225 |
| HS | Head to Side Window | mm | 365 |
| AD | Arm to Door | mm | 139 |
| HD | Hip Point to Door | mm | 243 |

**DATA SHEET NO. 5**
**CAMERA AND INSTRUMENTATION DATA**

Test Vehicle: 2023 Mazda CX-30 5-door SUV
Test Program: NCAP Side Pole Impact Test

NHTSA No.: O20235400
Test Date: 04/14/2023




## CAMERA LOCATIONS AND DATA

| No. | Camera View | Coordinates (mm) | | | Lens Length (mm) | Operating Frame Rate (fps) |
|---|---|---|---|---|---|---|
| | | X | Y | Z | | |
| 1 | Real-time (24 - 30 fps) pan view of impact | | | | Zoom | 30 |
| 2 | Front ground level - impact view | 7770 | 0 | -1524 | 28 | 1000 |
| 3 | Impact side 45º - forward pole view | 4489 | 1151 | -1370 | 24 | 1000 |
| 4 | Overhead Close-up view of impact | 0 | 0 | -9220 | 28 | 1000 |
| 5 | Onboard - dummy front view | | | | 25 | 1000 |
| 6 | Onboard - dummy side view | | | | 12.5 | 1000 |
| 7 | Onboard - dummy rear oblique view | | | | 12.5 | 1000 |
| 8 | Rear ground level - impact view | -8661 | -275 | -1557 | 28 | 1000 |
| 9 | Impact side 45º - rearward pole view | -4320 | 3719 | -1413 | 24 | 1000 |
| 10 | Overhead wide - view of impact | 0 | -275 | -9220 | 12.5 | 1000 |
| 11 | Real-time (24 - 30 fps) - dummy front view | | | | Zoom | 30 |

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

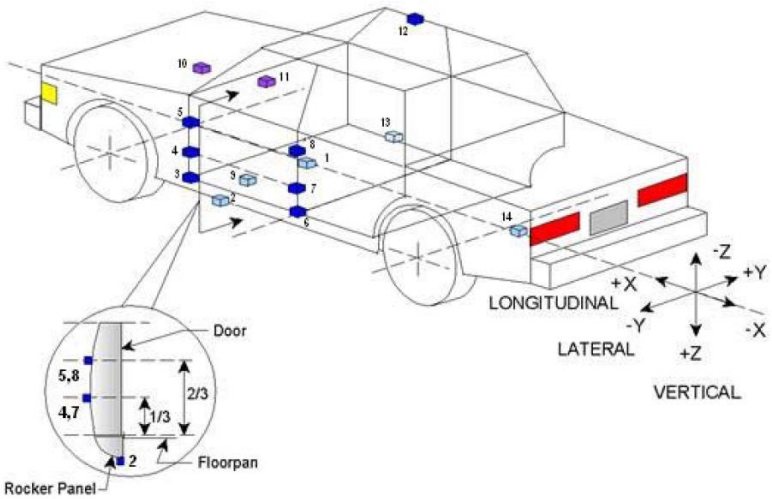
*Comments:* All cameras operated as intended.

## INSTRUMENTATION

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

**DATA SHEET NO. 6**
**VEHICLE ACCELEROMETER DATA**

Test Vehicle: 2023 Mazda CX-30 5-door SUV NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test Test Date: 04/14/2023




**TEST VEHICLE ACCELEROMETER LOCATIONS**

| No. | Accelerometer Location | Coordinates (mm) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | Vehicle CG | 2020 | 7 | 13 |
| 2 | Left Floor Sill | 2499 | -674 | 183 |
| 3 | A-Pillar Sill | 2924 | -607 | 181 |
| 4 | A-Pillar Low | 2996 | -610 | 2 |
| 5 | A-Pillar Mid | 2826 | -640 | -505 |
| 6 | B-Pillar Sill | 1974 | -676 | 175 |
| 7 | B-Pillar Low | 1891 | -686 | -9 |
| 8 | B-Pillar Mid | 1811 | -658 | -447 |
| 9 | Driver Seat Track | 2165 | -547 | 227 |
| 10 | Engine Top | 3545 | 151 | -312 |
| 11 | Firewall | 3208 | 165 | -191 |
| 12 | Right Roof | 1982 | 573 | -926 |
| 13 | Right Floor Sill | 2495 | 685 | 167 |
| 14 | Rear Floor Pan | 1036 | -22 | 28 |

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

**DATA SHEET NO. 7**
**RIGID POLE LOAD CELL DATA**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2023 Mazda CX-30 5-door SUV | NHTSA No.: | O20235400 |
| Test Program: | NCAP Side Pole Impact Test | Test Date: | 04/14/2023 |

**POLE BARRIER**

**RIGID POLE LOAD CELL LOCATIONS**

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

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

Test Vehicle: 2023 Mazda CX-30 5-door SUV NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test Test Date: 04/14/2023

## TEST DUMMY INFORMATION AND CONTACT POINTS

| Dummy Body Part | Driver Seat Dummy (SID-IIs) |
|---|---|
| Face | Curtain Airbag |
| Top of Head | Curtain Airbag |
| Left Side of Head | Curtain Airbag |
| Back of Head | Curtain Airbag & Head Restraint |
| Left Shoulder | Torso / Pelvis Airbag, Curtain Airbag and Seat Bolster |
| Upper Torso | Torso / Pelvis Airbag and Seat Bolster |
| Lower Torso | Seat Bolster |
| Left Hip | Torso / Pelvis Airbag, Seat Bolster & Seat Pan |
| Left Knee | Door Panel |

## POST-TEST DOOR PERFORMANCE

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

## POST-TEST SEAT PERFORMANCE

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

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

Test Vehicle: 2023 Mazda CX-30 5-door SUV NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test Test Date: 04/14/2023

## POST-TEST STRUCTURAL OBSERVATIONS

| Critical Areas of Performance | Observations and Conclusions |
|---|---|
| Pillar Performance | A-Pillar, B-Pillar and C-Pillars buckled |
| Sill Separation | 260 mm of sill separation at the rear door |
| Windshield Damage | None |
| Side Window Damage | Driver door window shattered, but remained laminated |
| Other Notable Effects | None |

## SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

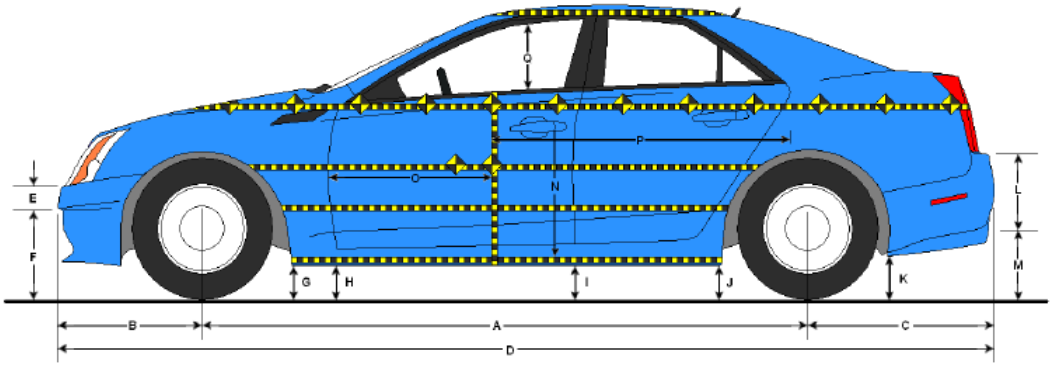
## VEHICLE SPEED, VEHICLE ANGLE AT IMPACT AND IMPACT POINT LOCATION DATA

| Measured Parameter | Units | Tolerance | Value |
|---|---|---|---|
| Vertical Impact Ref Line - Aft of Front Axle, Intended Impact Pt | mm | | 1112 |
| Actual Impact Point - Aft of Front Axle | mm | | 1119 |
| Horizontal Offset (+ forward / - rearward) | mm | +/- 38 * | -7 |
| Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion | deg | 75 +/- 3 | 75 |
| Trap No. 1 Velocity - Primary | kph | 31.4 to 33.0 | 31.91 |
| Trap No. 2 Velocity - Redundant | kph | 31.4 to 33.0 | 31.84 |

* Of Intended Impact Point

**DATA SHEET NO. 9**
**TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2023 Mazda CX-30 5-door SUV
Test Program: NCAP Side Pole Impact Test
NHTSA No.: O20235400
Test Date: 04/14/2023




LEFT SIDE VIEW

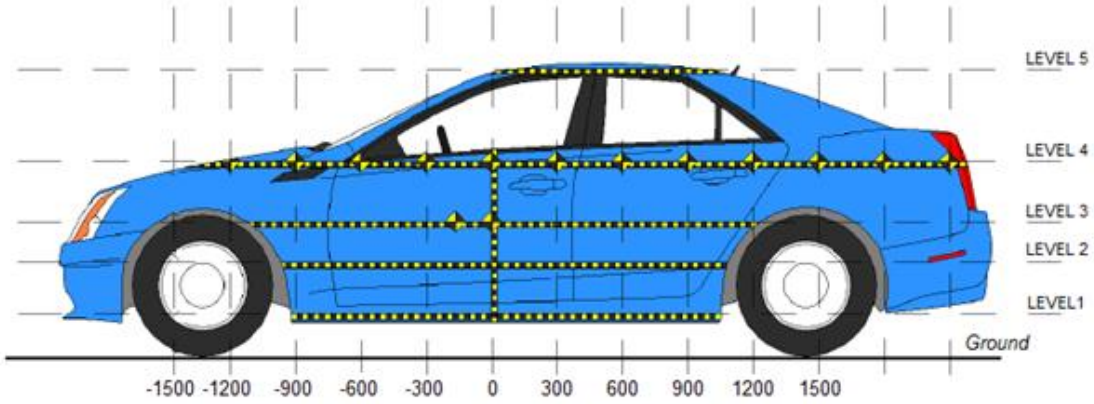
**VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION**

| Code | Description | Pre-Test | Post-Test | Change |
|---|---|---|---|---|
| A | Vehicle Wheelbase | 2652 | 2622 | -30 |
| B | Front Axle to FSOV | 899 | 912 | 13 |
| C | Rear Axle to RSOV | 828 | 821 | -7 |
| D | Total Length at Centerline | 4378 | 4355 | -23 |
| E | Front Bumper Thickness | 158 | 158 | 0 |
| F | Front Bumper Bottom to Ground | 322 | 333 | 11 |
| G | Sill Height at Front Wheel Well | 225 | 227 | 2 |
| H | Sill Height at Front Door Leading Edge | 241 | 241 | 0 |
| I | Sill Height at B-Pillar | 240 | 272 | 32 |
| J1 | Sill Height at Rear Wheel Well | 242 | 256 | 14 |
| J2 | Pinch Weld Height at Rear Wheel Well | 231 | 245 | 14 |
| K | Sill Height Aft of Rear Wheel Well | 309 | 320 | 11 |
| L | Rear Bumper Thickness | 195 | 195 | 0 |
| M | Rear Bumper Bottom to Ground | 442 | 442 | 0 |
| N | Sill Height to Bottom of Front Window Sill | 818 | 820 | 2 |
| O | Front Door Leading Edge to Impact CL | 602 | 530 | -72 |
| P | Rear Door Trailing Edge to Impact CL | 1463 | 1409 | -54 |
| Q | Front Window Opening | 325 | 308 | -17 |
| R | Right Side Length | 4294 | 4284 | -10 |
| S | Left Side Length | 4294 | 4237 | -57 |
| T | Vehicle Width at B-Pillars | 1797 | 1701 | -96 |
| U | Front Wheel Track Width | 1564 | 1565 | 1 |
| V | Rear Wheel Track Width | 1555 | 1560 | 5 |

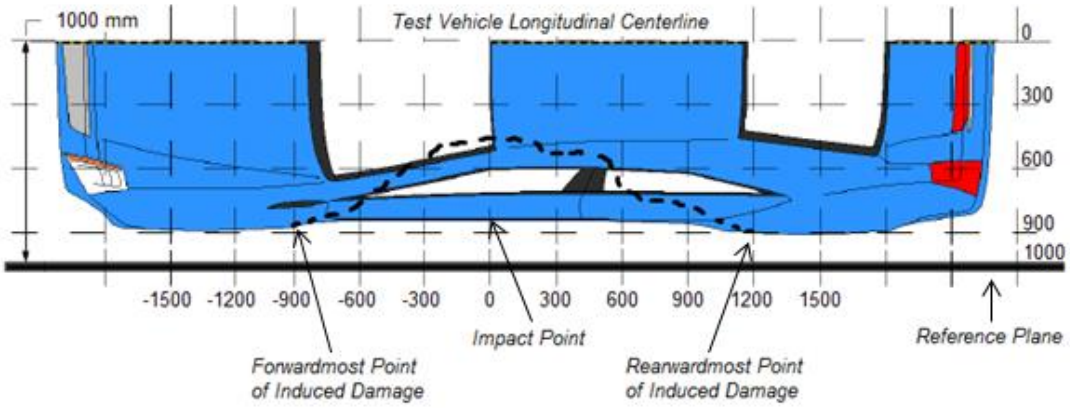
* All measurements in mm with tolerance of ± 3mm

**DATA SHEET NO. 10**
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2023 Mazda CX-30 5-door SUV NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test Test Date: 04/14/2023




***Left Side View***




***Overhead View***

**MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

| Level | Measurement Description | Units | Height Above Ground | Maximum Exterior Static Crush | Distance from Impact |
|---|---|---|---|---|---|
| 1 | Sill Top | mm | 357 | 263 | 0 |
| 2 | Occupant Hip Point | mm | 647 | 326 | 0 |
| 3 | Mid - Door | mm | 730 | 317 | 0 |
| 4 | Window Sill | mm | 1055 | 264 | 0 |
| 5 | Window Top | mm | 1500 | 38 | 300 |

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

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

Test Vehicle: 2023 Mazda CX-30 5-door SUV NHTSA No.: O20235400
Test Program: NCAP Side Pole Impact Test Test Date: 04/14/2023

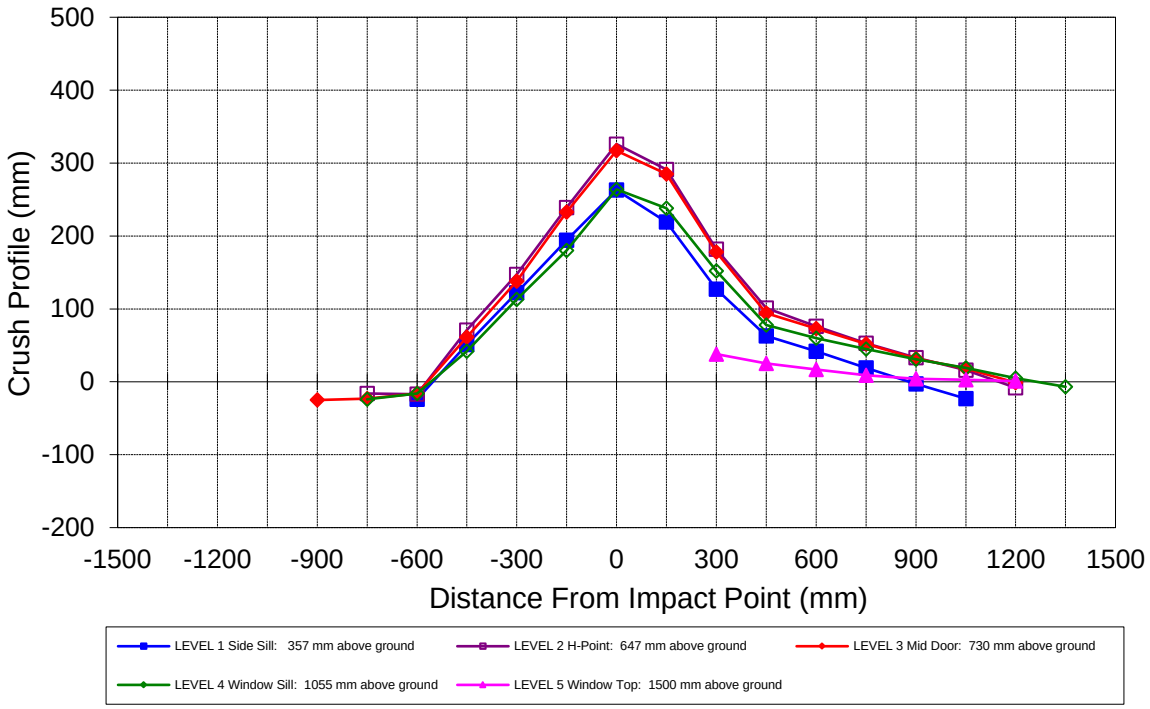
### EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

| | Pre-Test | | | | | Post-Test | | | | | Crush | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| **-1500** | | | | | | | | | | | | | | | |
| **-1350** | | | | | | | | | | | | | | | |
| **-1200** | | | | | | | | | | | | | | | |
| **-1050** | | | | | | | | | | | | | | | |
| **-900** | | | 897 | | | | | 922 | | | | | -25 | | |
| **-750** | | 897 | 893 | 775 | | | 913 | 916 | 799 | | | -16 | -23 | -24 | |
| **-600** | 889 | 898 | 894 | 802 | | 913 | 915 | 910 | 818 | | -24 | -17 | -16 | -16 | |
| **-450** | 888 | 895 | 889 | 814 | | 837 | 824 | 828 | 772 | | 51 | 71 | 61 | 42 | |
| **-300** | 887 | 892 | 884 | 849 | | 765 | 745 | 746 | 736 | | 122 | 147 | 138 | 113 | |
| **-150** | 885 | 889 | 881 | 826 | | 691 | 650 | 648 | 646 | | 194 | 239 | 233 | 180 | |
| **0** | 883 | 886 | 878 | 831 | | 620 | 560 | 561 | 567 | | 263 | 326 | 317 | 264 | |
| **150** | 881 | 883 | 876 | 834 | | 662 | 592 | 591 | 596 | | 219 | 291 | 285 | 238 | |
| **300** | 879 | 881 | 875 | 837 | 588 | 752 | 699 | 697 | 685 | 550 | 127 | 182 | 178 | 152 | 38 |
| **450** | 874 | 880 | 877 | 839 | 597 | 811 | 779 | 783 | 761 | 572 | 63 | 101 | 94 | 78 | 25 |
| **600** | 874 | 879 | 878 | 840 | 599 | 832 | 803 | 805 | 780 | 582 | 42 | 76 | 73 | 60 | 17 |
| **750** | 874 | 882 | 883 | 837 | 596 | 855 | 829 | 831 | 792 | 587 | 19 | 53 | 52 | 45 | 9 |
| **900** | 875 | 889 | 889 | 836 | 587 | 878 | 856 | 857 | 805 | 583 | -3 | 33 | 32 | 31 | 4 |
| **1050** | 878 | 895 | 898 | 834 | 573 | 901 | 879 | 880 | 815 | 570 | -23 | 16 | 18 | 19 | 3 |
| **1200** | | 898 | 899 | 835 | 544 | | 906 | 900 | 830 | 543 | | -8 | -1 | 5 | 1 |
| **1350** | | | | 839 | | | | | 846 | | | | | -7 | |
| **1500** | | | | | | | | | | | | | | | |

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

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

| | | | |
|---|---|---|---|
| Test Vehicle: | 2023 Mazda CX-30 5-door SUV | NHTSA No.: | O20235400 |
| Test Program: | NCAP Side Pole Impact Test | Test Date: | 04/14/2023 |

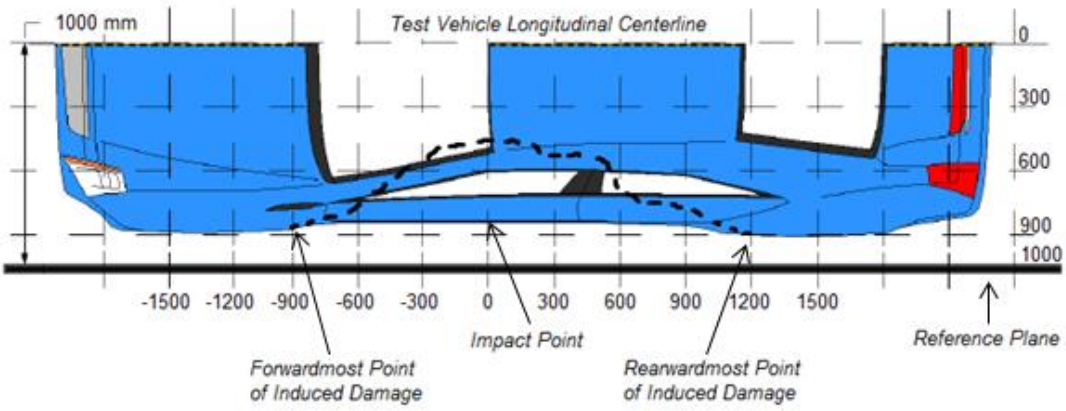



***Vehicle Exterior Crush Measurements - Visual Representation***

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

| | | | |
|---|---|---|---|
| Test Vehicle: | 2023 Mazda CX-30 5-door SUV | NHTSA No.: | O20235400 |
| Test Program: | NCAP Side Pole Impact Test | Test Date: | 04/14/2023 |

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




***Overhead View***

**VEHICLE DAMAGE PROFILE DISTANCES**

| DPD | Distance From Impact Point (mm) | Level | Post-Test (mm) | Pre-Test (mm) | Crush (mm) |
|---|---|---|---|---|---|
| 1 | -900 | 3 | 78 | 103 | -25 |
| 2 | -480 | 3 | 156 | 110 | 46 |
| 3 | -60 | 3 | 404 | 121 | 283 |
| 4 | 360 | 3 | 269 | 124 | 145 |
| 5 | 780 | 3 | 164 | 116 | 48 |
| 6 | 1200 | 3 | 100 | 101 | -1 |

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

| | | | |
|---|---|---|---|
| Test Vehicle: | 2023 Mazda CX-30 5-door SUV | NHTSA No.: | O20235400 |
| Test Program: | NCAP Side MDB Impact Test | Test Date: | 04/14/2023 |
| Test Time: | 8:29 AM | Temperature: | 21 °C |

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

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

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

D. Spillage Details: — No Spillage Occurred

**FMVSS NO. 301 STATIC ROLLOVER DATA**


**ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS**

| Test Phase | Rotation Time | Hold Time | Total Time |
|---|---|---|---|
| 0° to 90° | 73 | 300 | 373 |
| 90° to 180° | 59 | 300 | 359 |
| 180° to 270° | 63 | 300 | 363 |
| 270° to 360° | 67 | 300 | 367 |

**FMVSS NO. 301 ROLLOVER SPILLAGE TABLE**

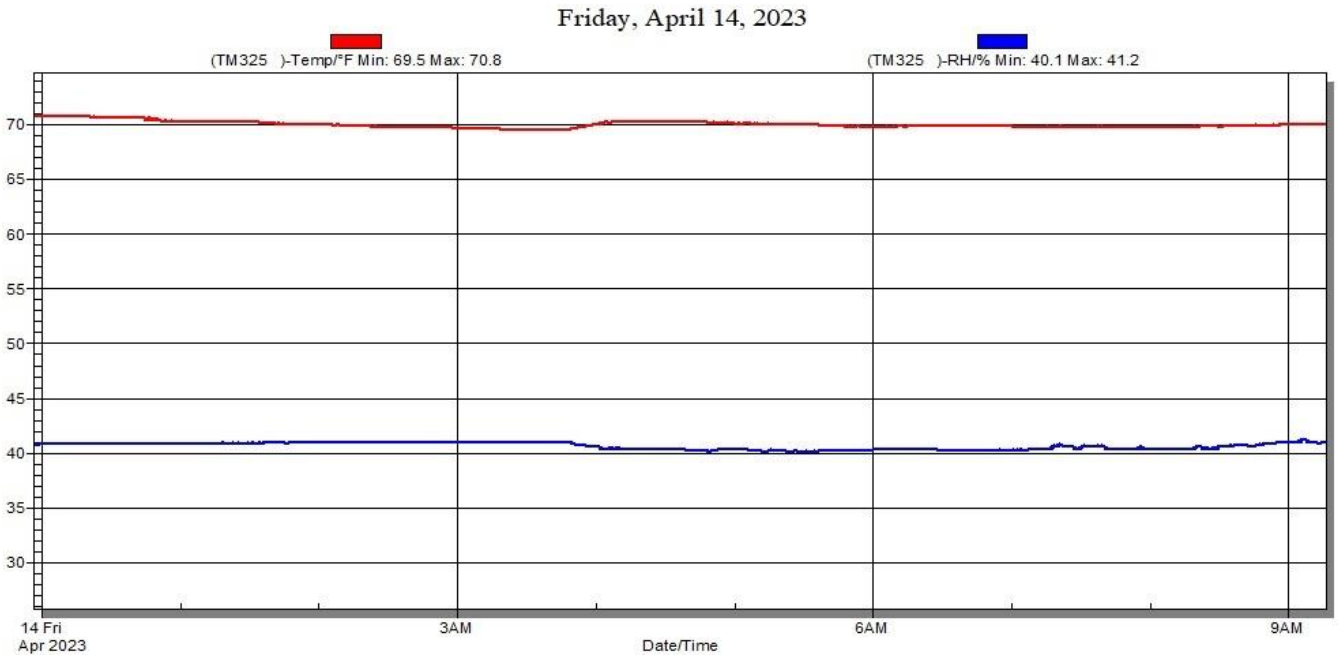
| Test Phase | First 5 Minutes | Sixth Minute | Seventh Minute | Eighth Minute |
|---|---|---|---|---|
| 0° to 90° | 0 | 0 | 0 | |
| 90° to 180° | 0 | 0 | 0 | |
| 180° to 270° | 0 | 0 | 0 | |
| 270° to 360° | 0 | 0 | 0 | |

**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. 13**
**DUMMY / VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2023 Mazda CX-30 5-door SUV | NHTSA No.: | O20235400 |
| Test Program: | NCAP Side Pole Impact Test | Test Date: | 04/14/2023 |




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

# APPENDIX A

# PHOTOGRAPHS

## TABLE OF PHOTOGRAPHS


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


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

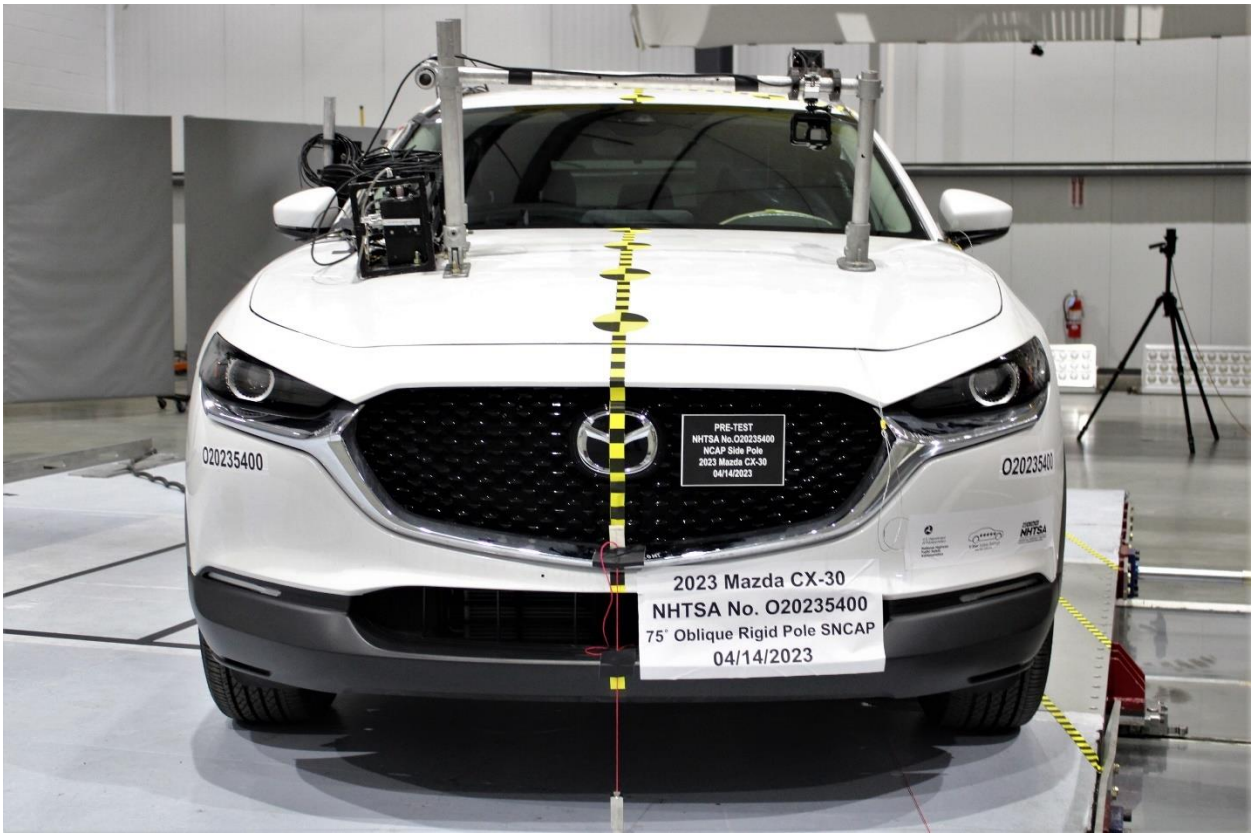



**Figure A-3: Pre-Test Frontal View of Test Vehicle**

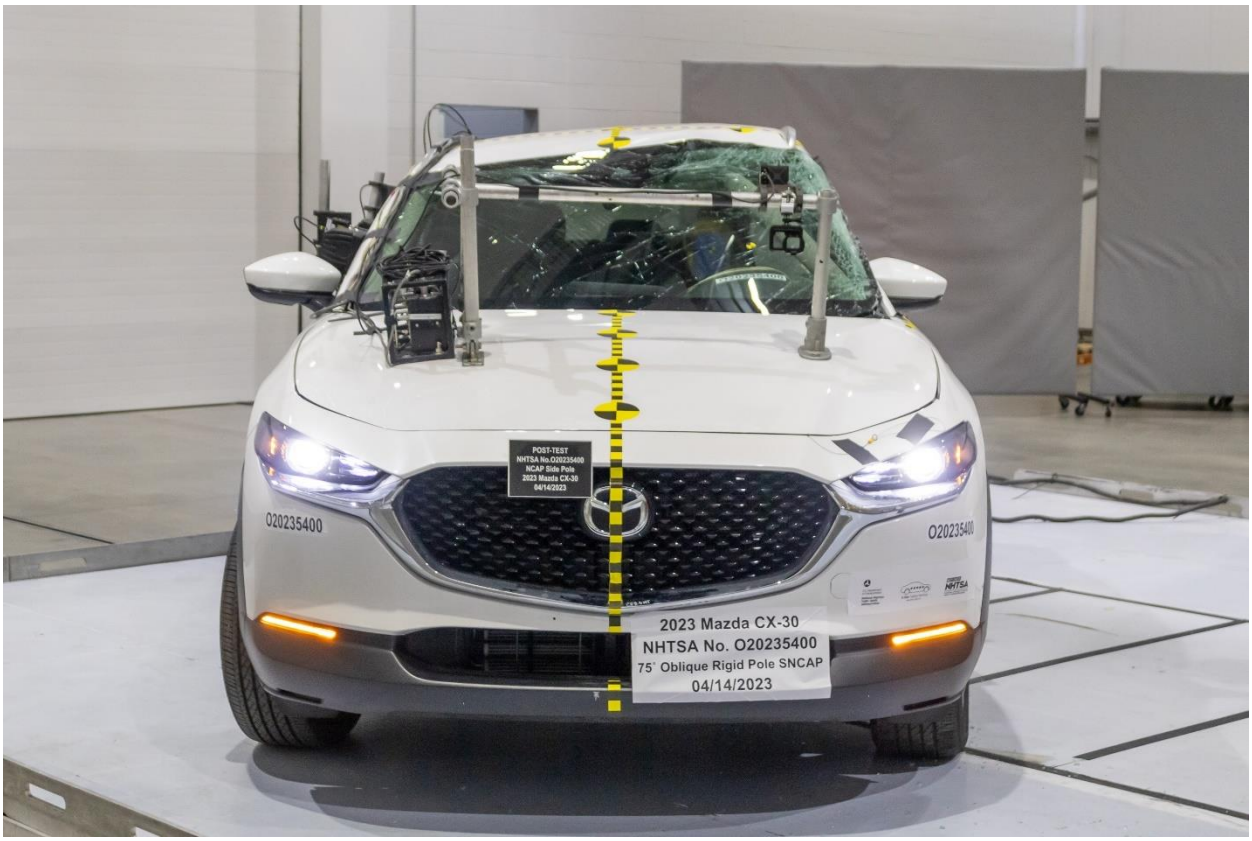



**Figure A-4: Post-Test Frontal View of Test Vehicle**


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


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


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


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


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


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

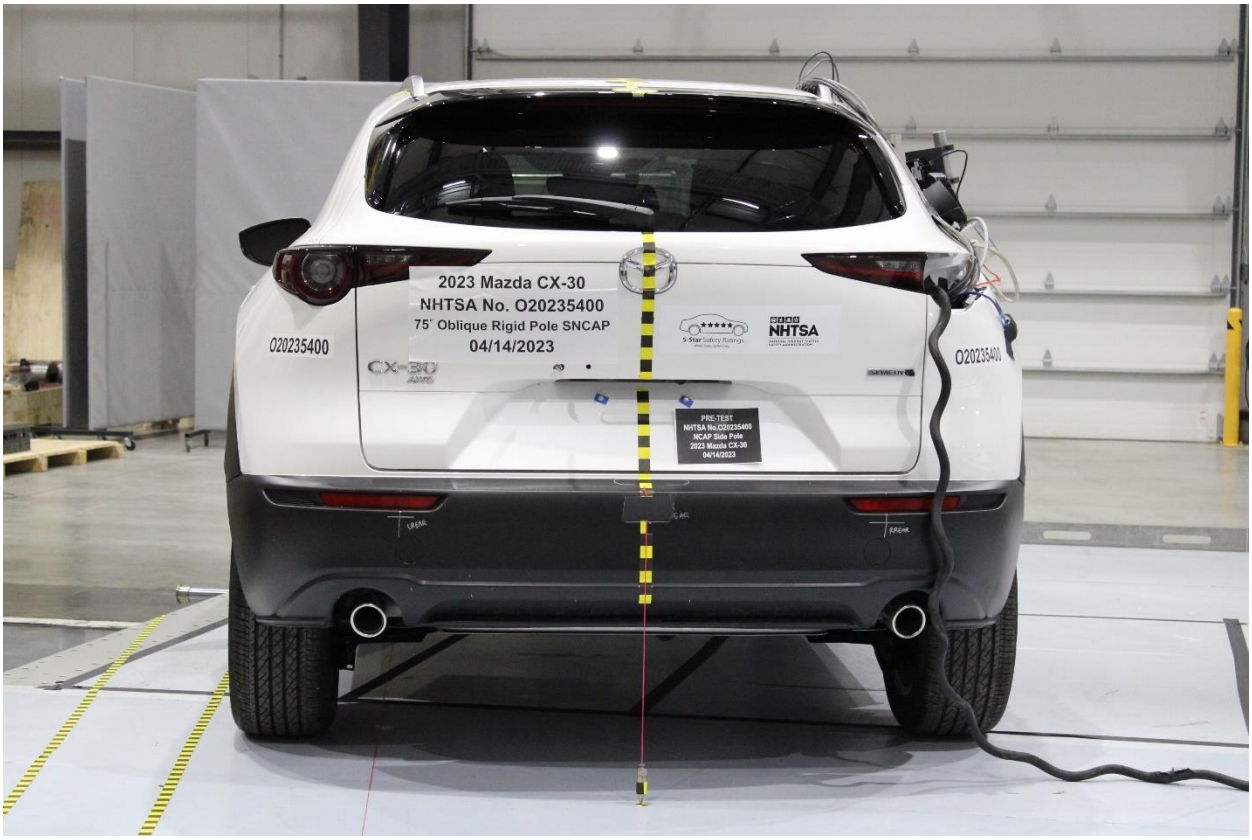



**Figure A-11: Pre-Test Rear View of Test Vehicle**


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

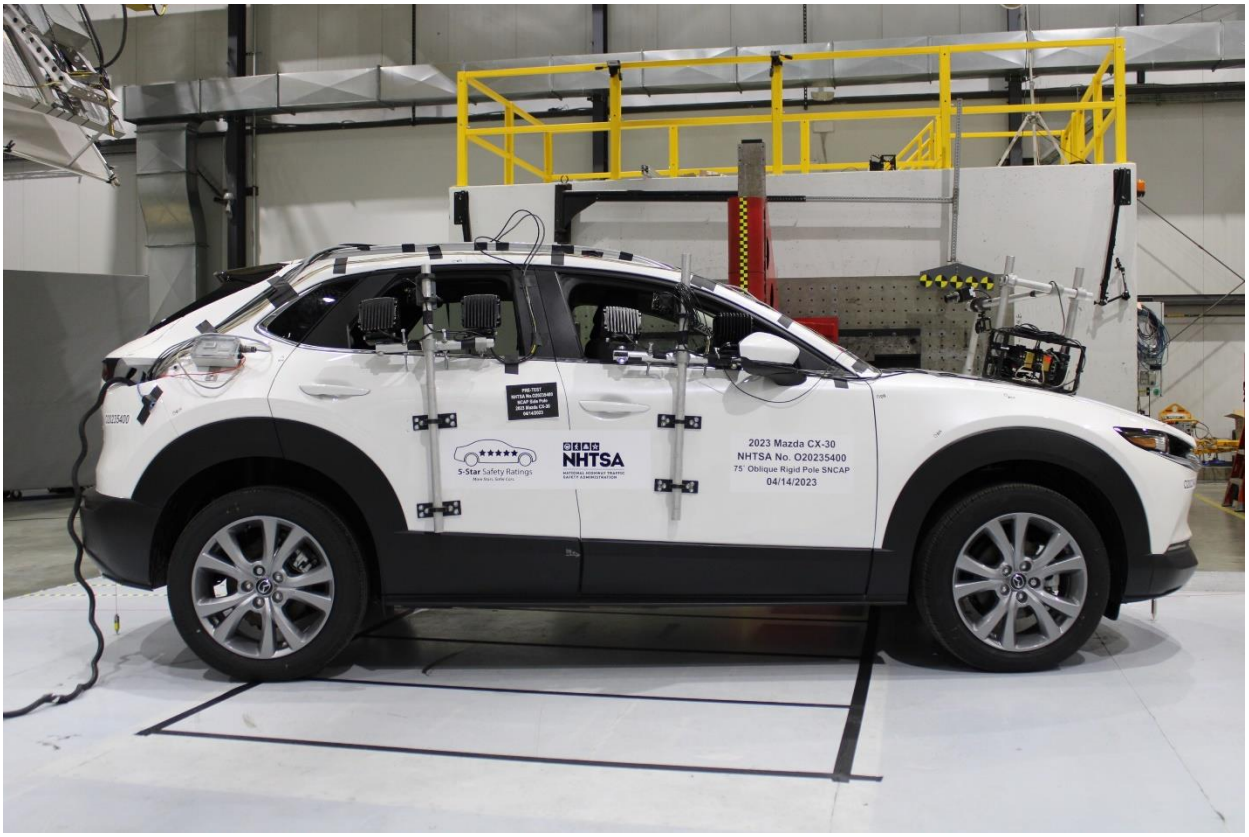



**Figure A-13: Pre-Test Right Side View of Test Vehicle**


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

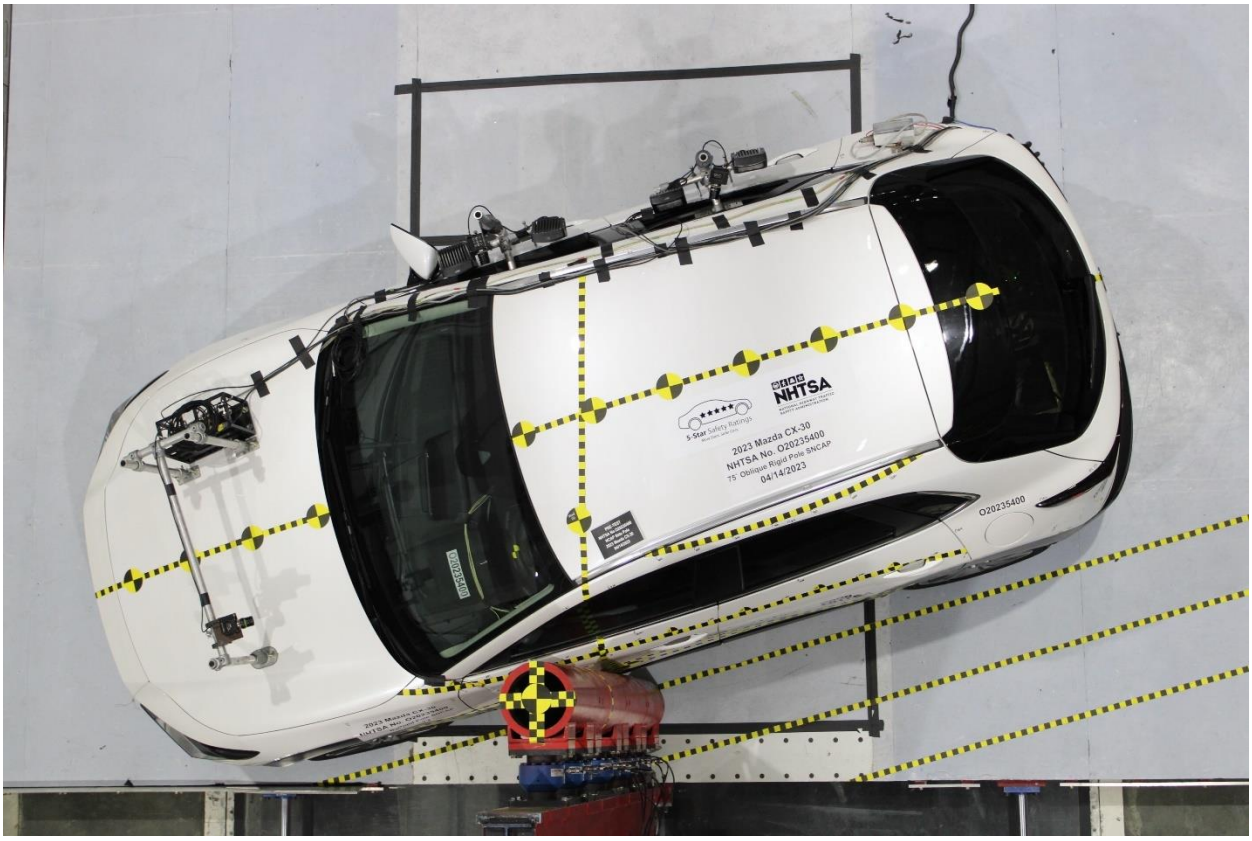



**Figure A-15: Pre-Test Overhead View of Test Area**

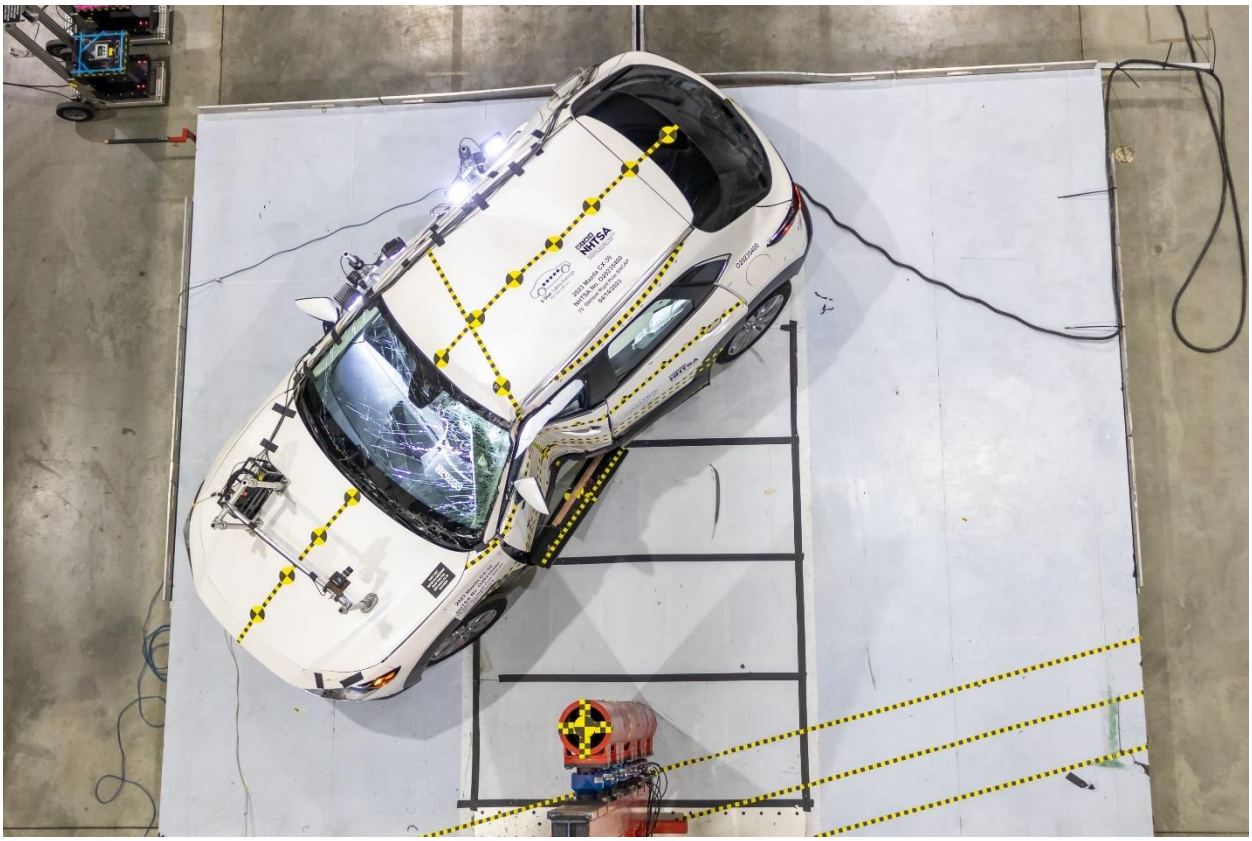



**Figure A-16: Post-Test Overhead View of Test Area**


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


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

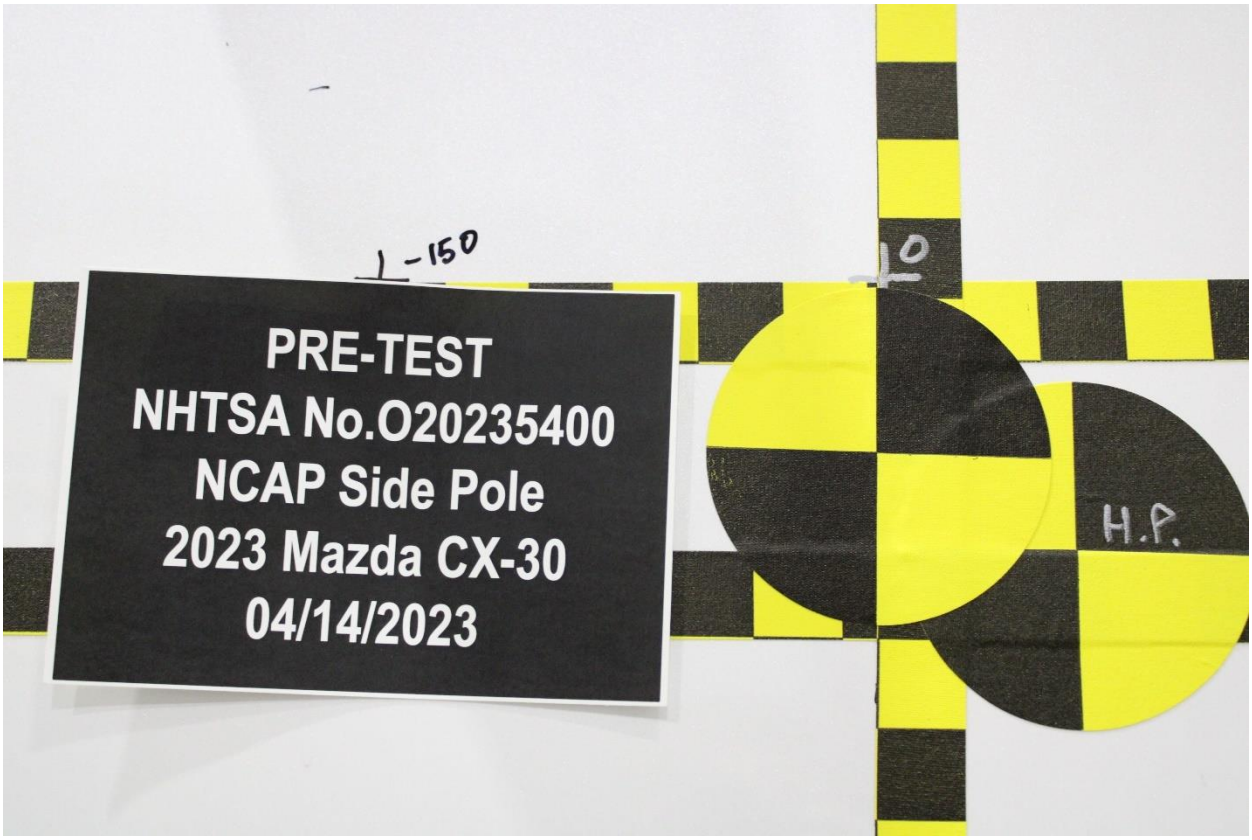



**Figure A-19: Pre-Test Close-Up View of Impact Point Target**


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

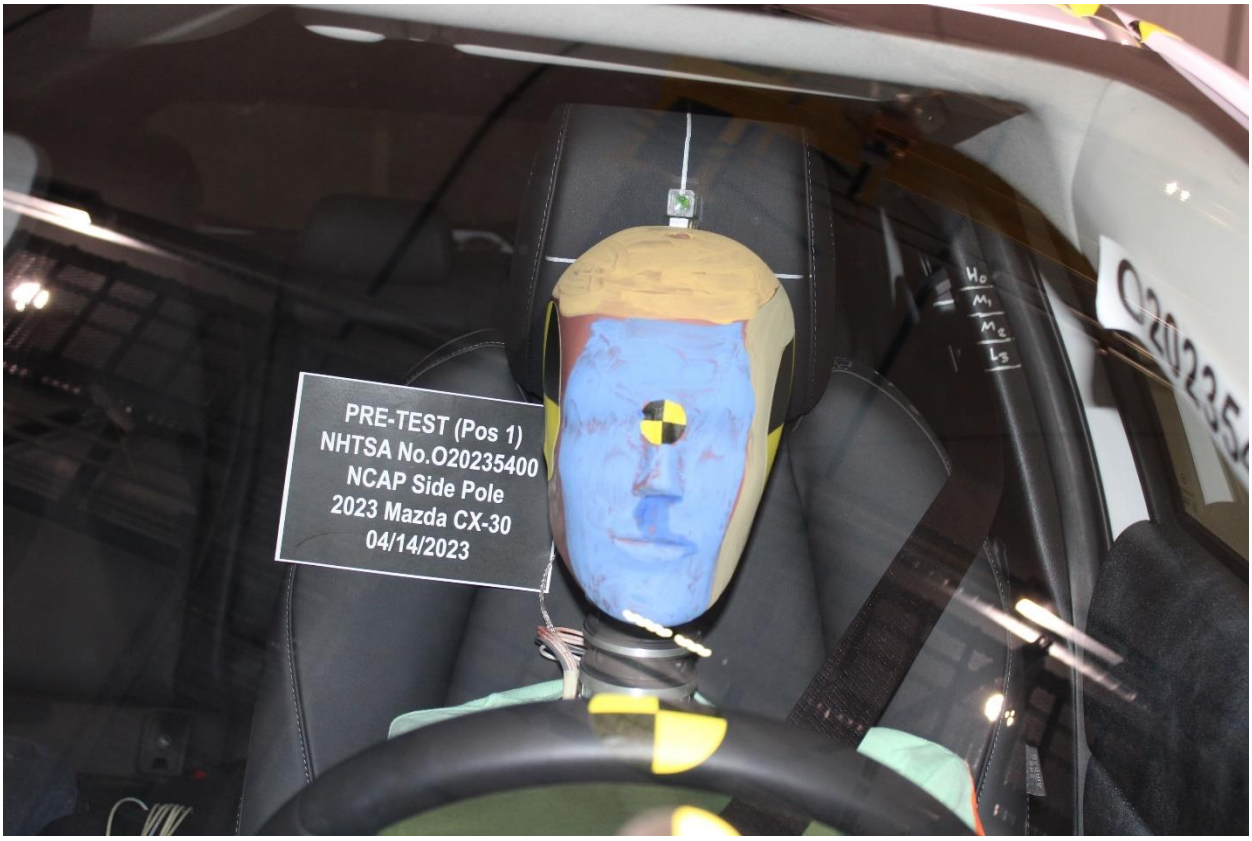



**Figure A-21: Pre-Test Front Close-Up View of Dummy Head and Chest**


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


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


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


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


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

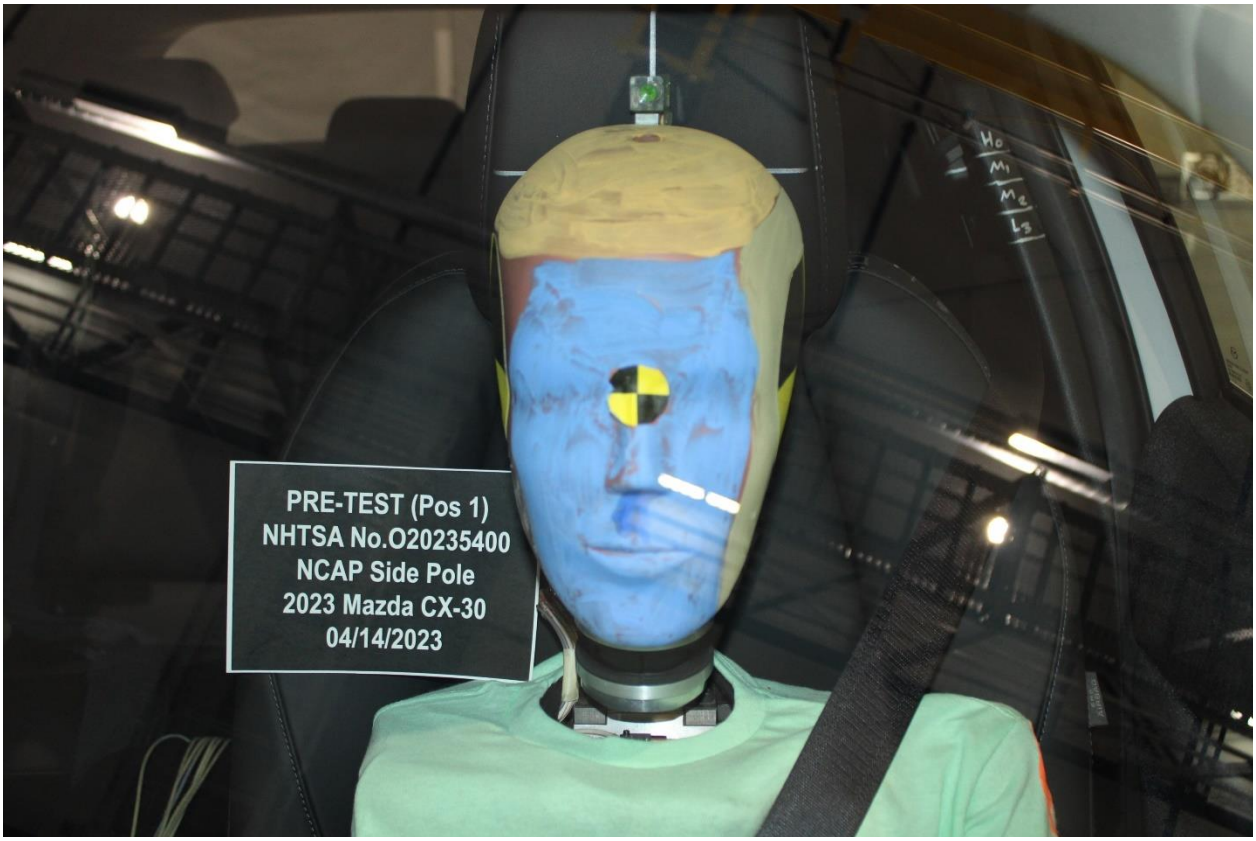



**Figure A-27: Pre-Test Frontal Close-Up View of Dummy Head / Shoulders in Relation to Head Restraint**


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


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


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


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


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


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


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


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


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


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

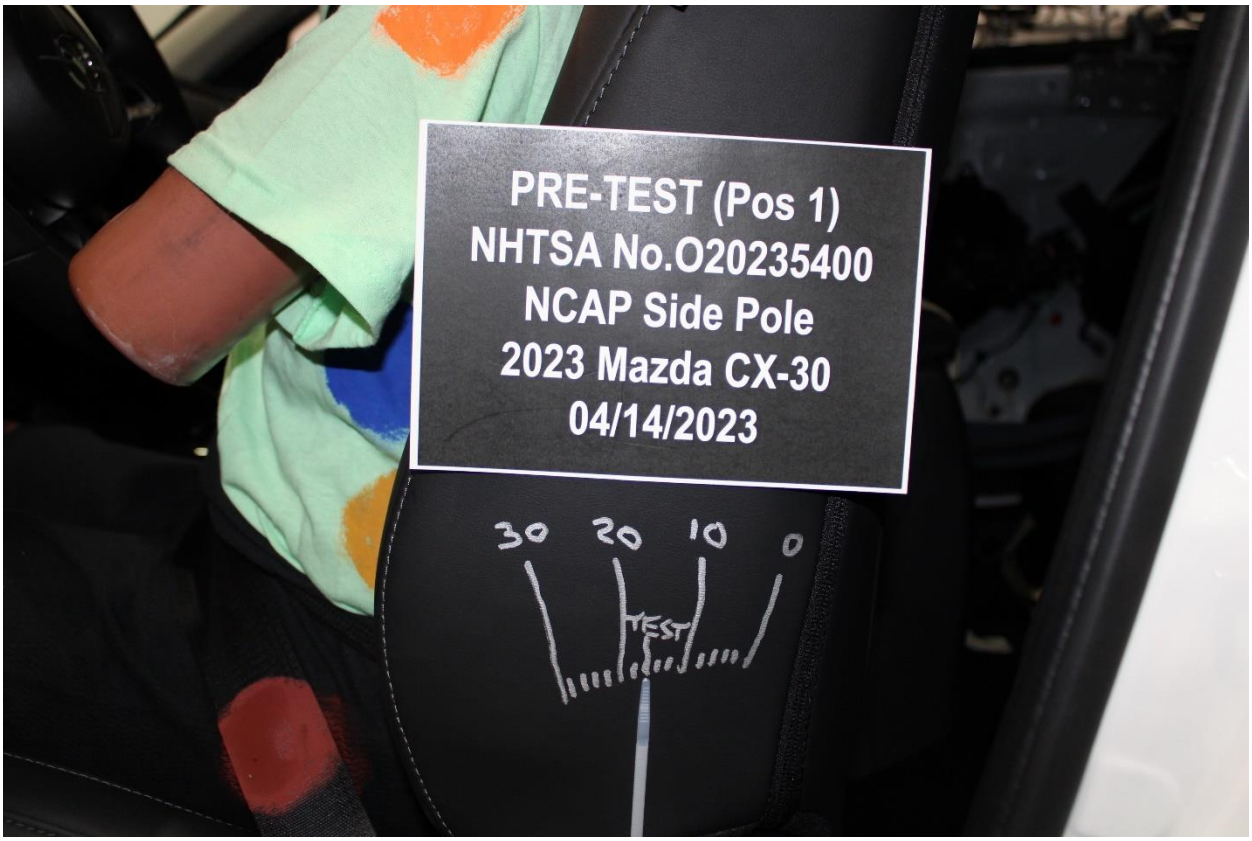



**Figure A-38: Pre-Test Close-Up Left Side View of Driver Seat Back**


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


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


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


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


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


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


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


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


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


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


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


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


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


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


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


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


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


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

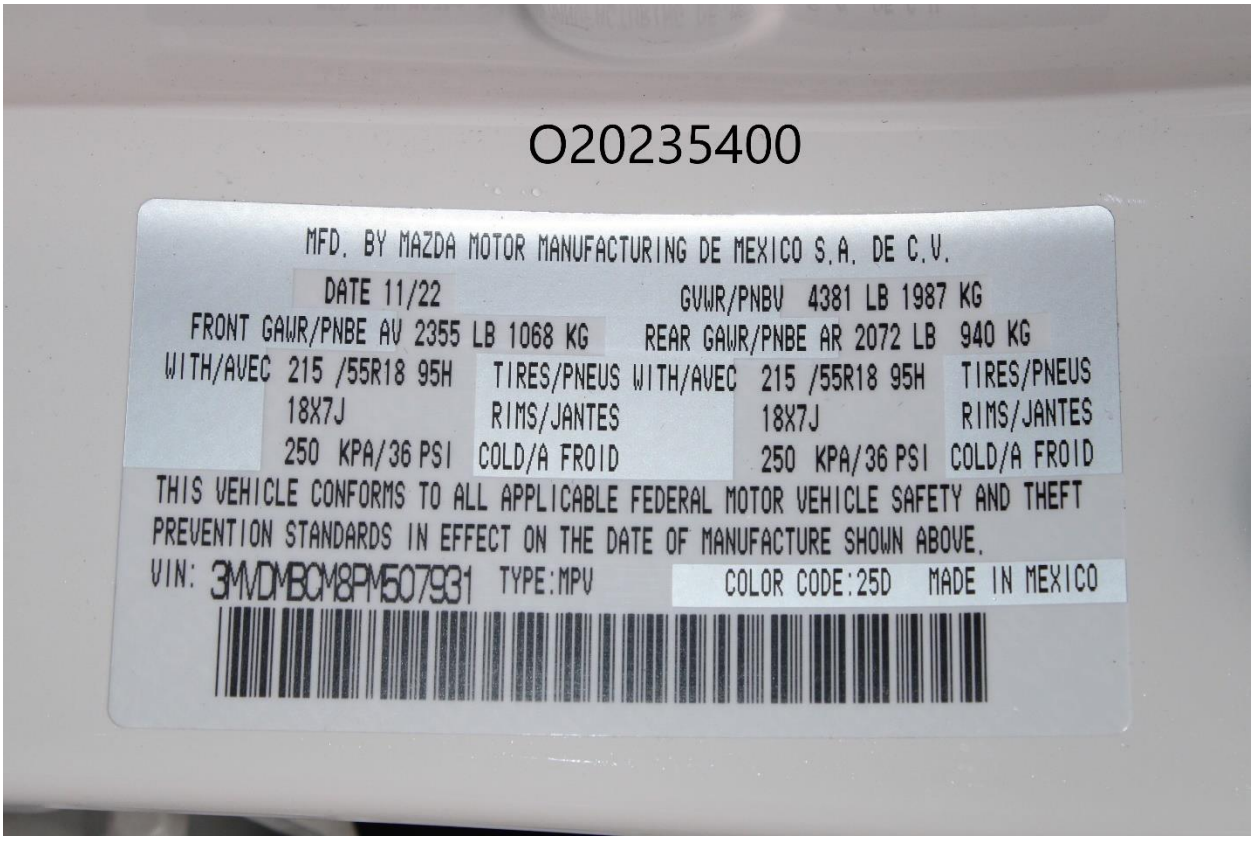



**Figure A-57: Close-Up View of Vehicle's Certification Label**


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

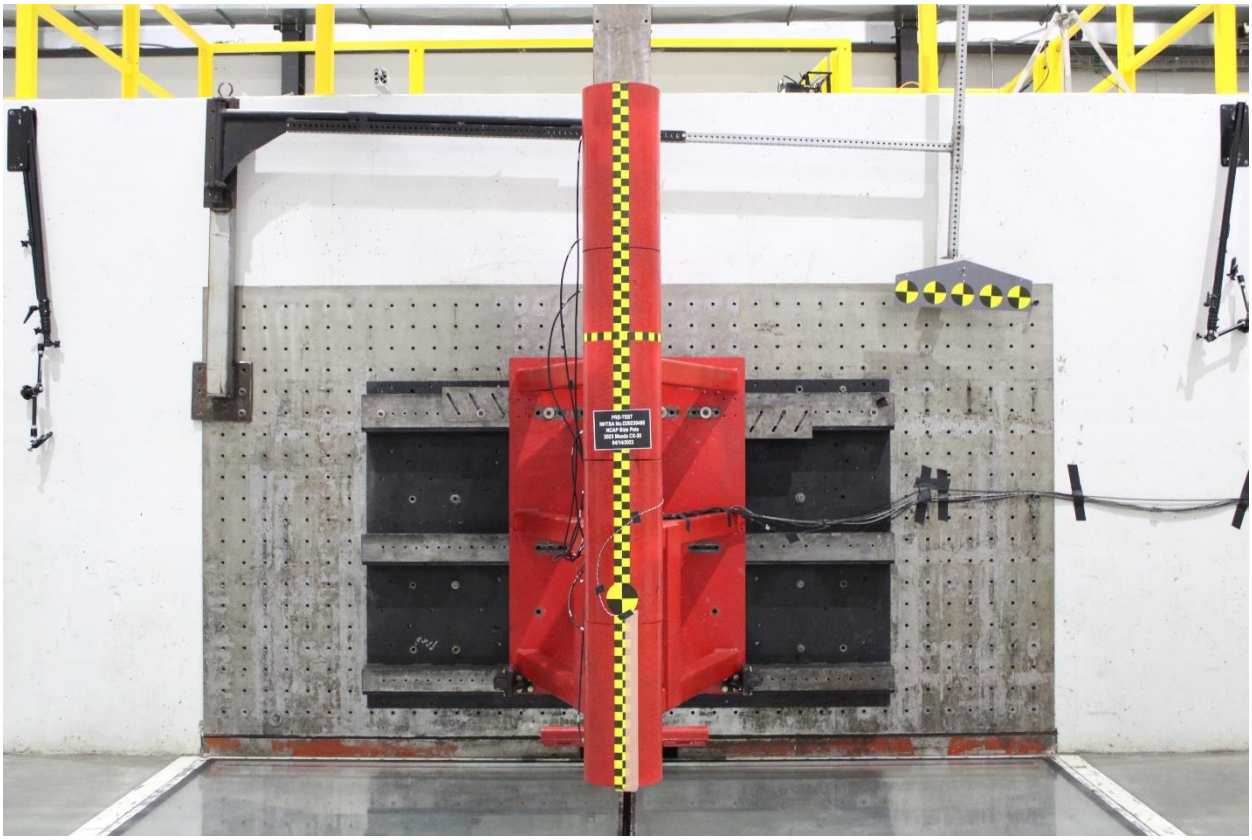


**Figure A-59: Pre-Test Pole Barrier Front View**

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

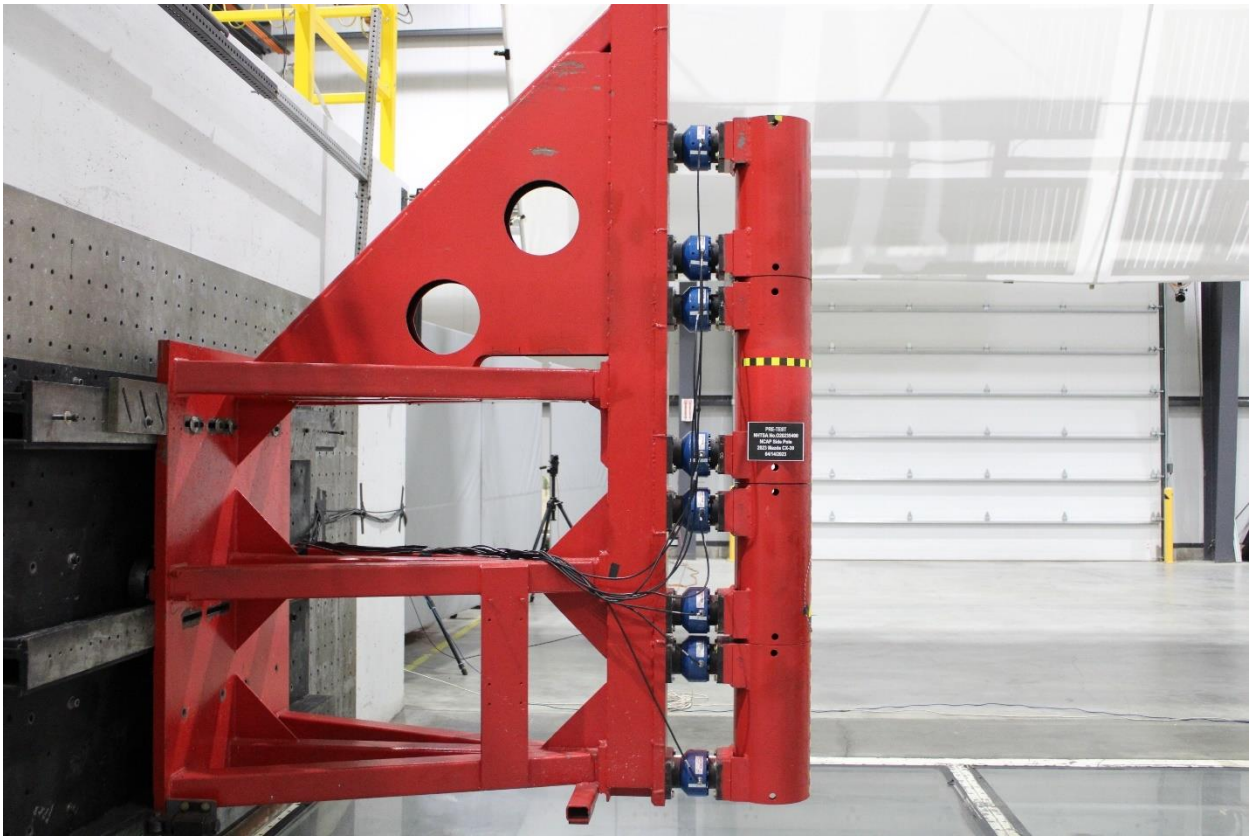


**Figure A-61: Pre-Test Pole Barrier Side View**

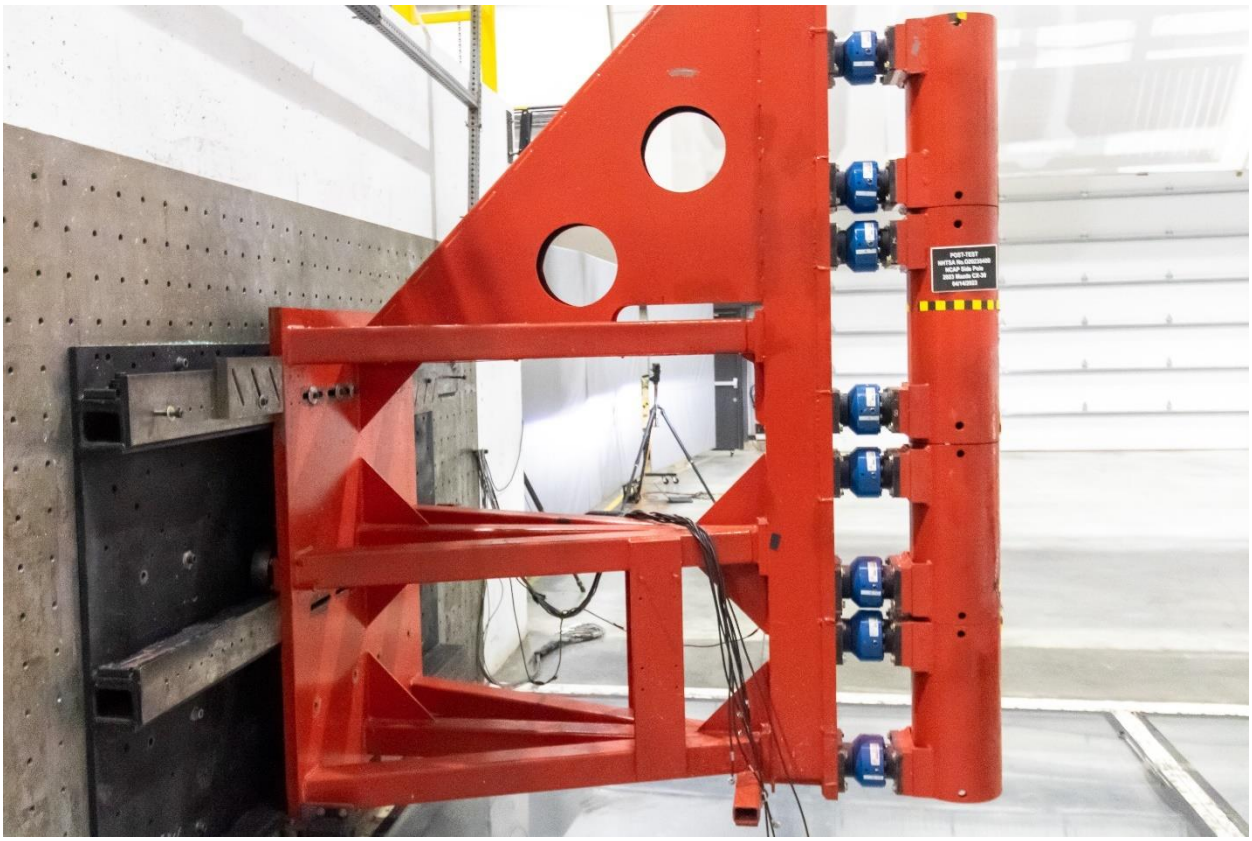


**Figure A-62: Post-Test Pole Barrier Side View**

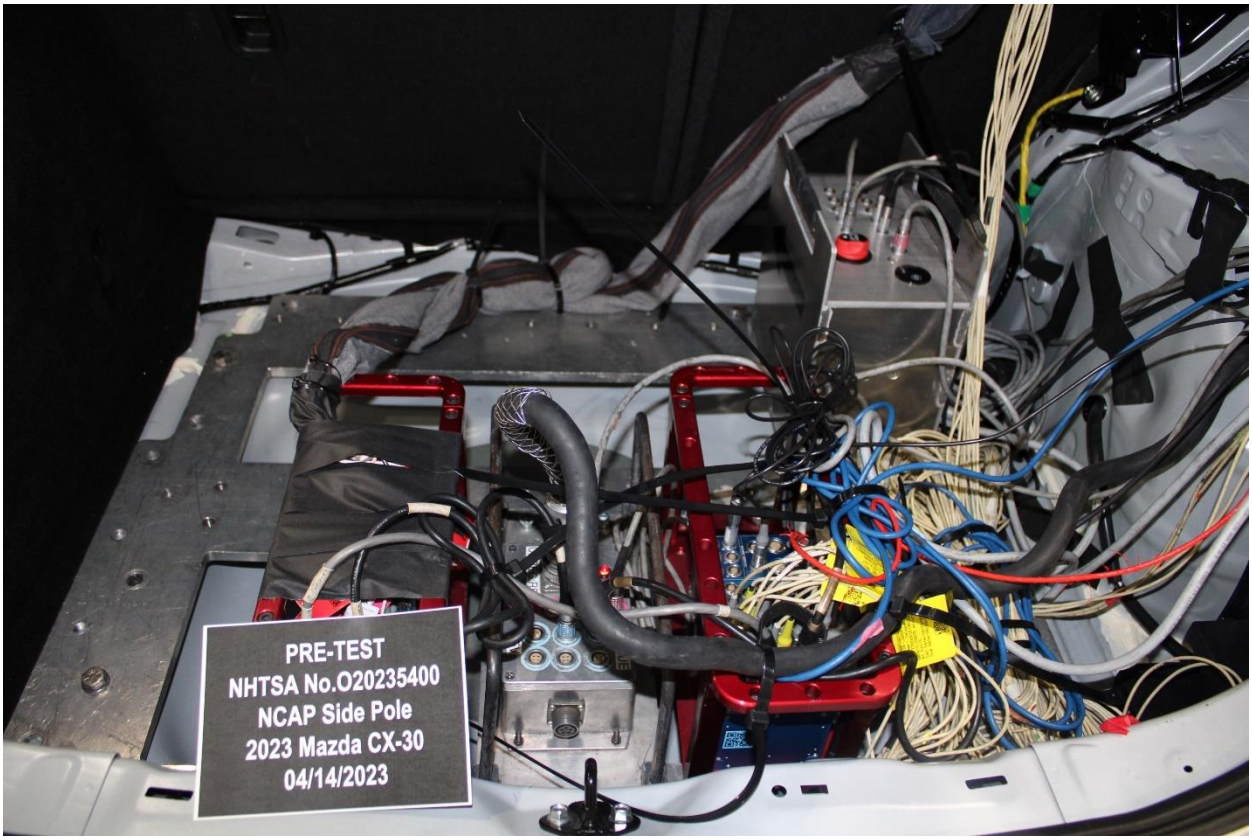



**Figure A-63: Pre-Test Ballast View**


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

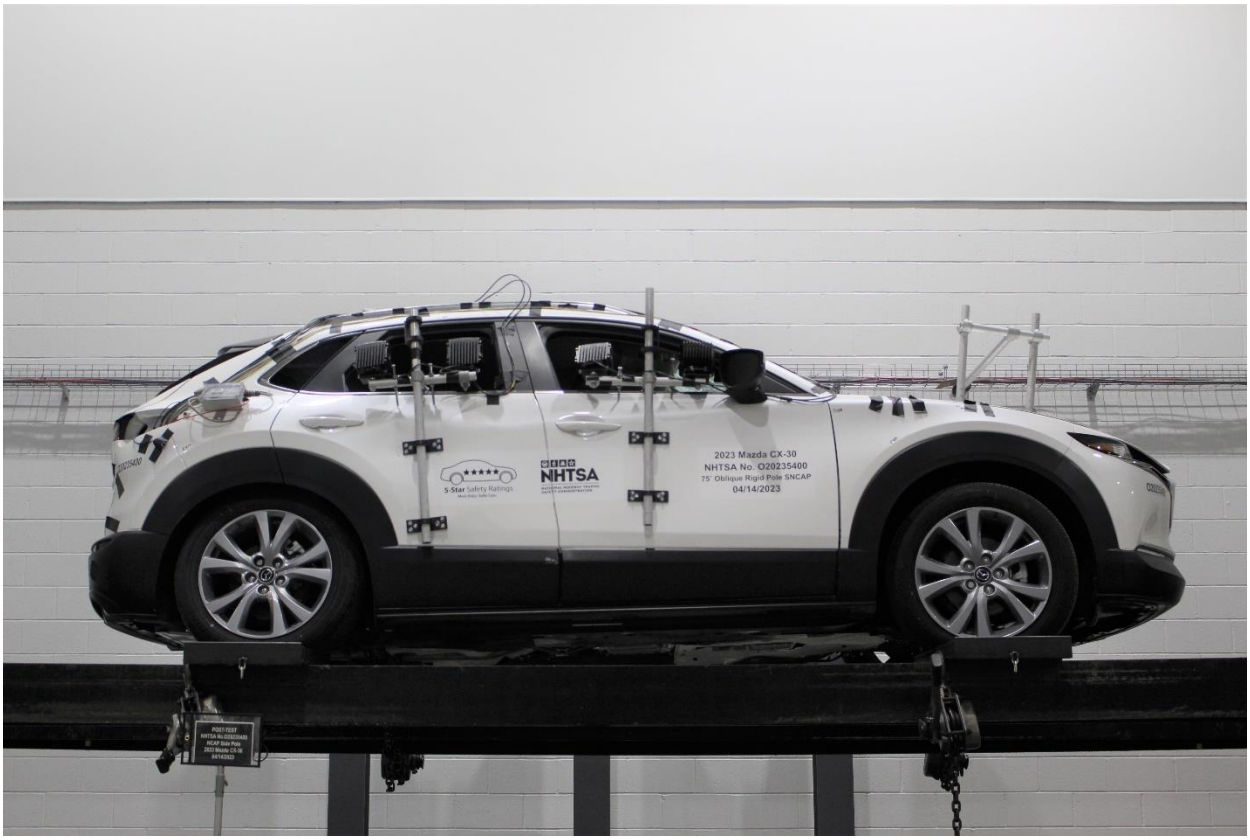



**Figure A-65: FMVSS No. 301 Static Rollover 0 Degrees**

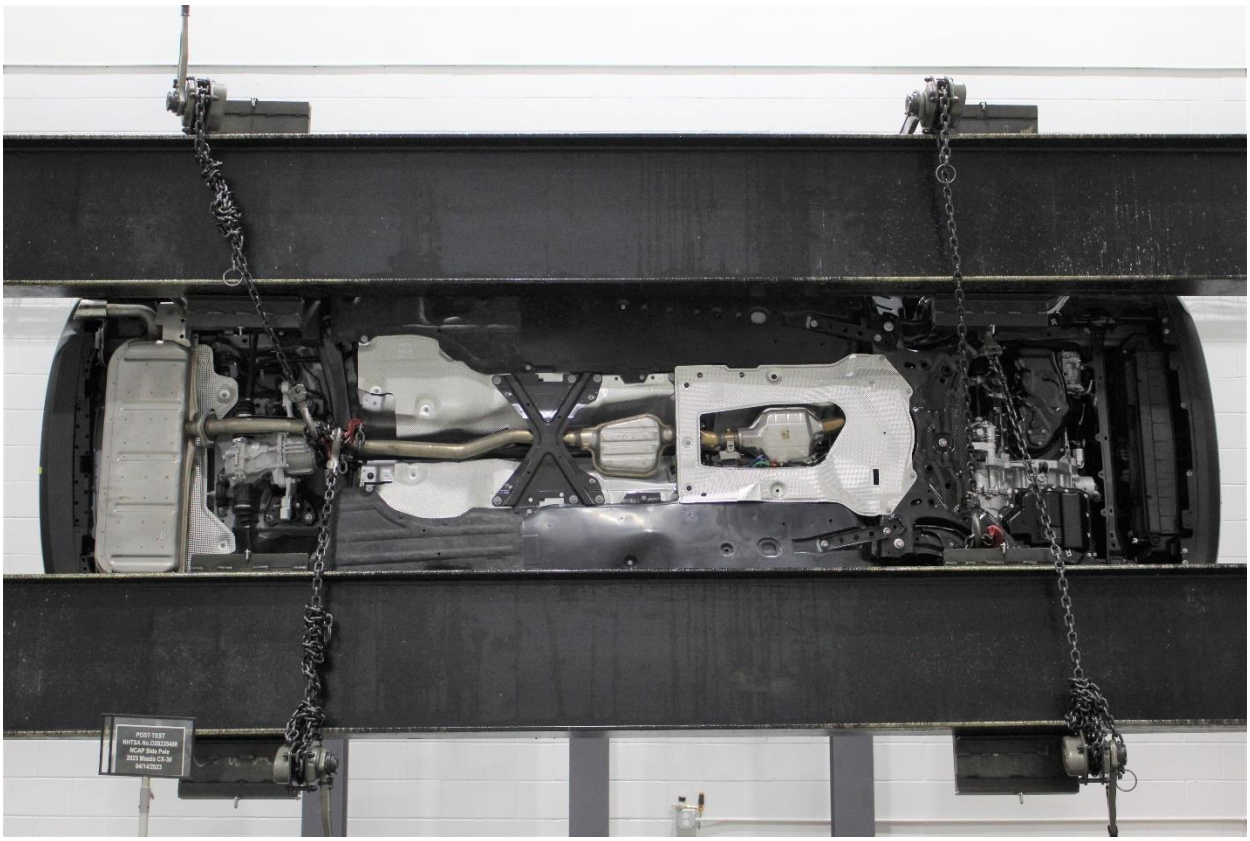


**Figure A-66: FMVSS No. 301 Static Rollover 90 Degrees**

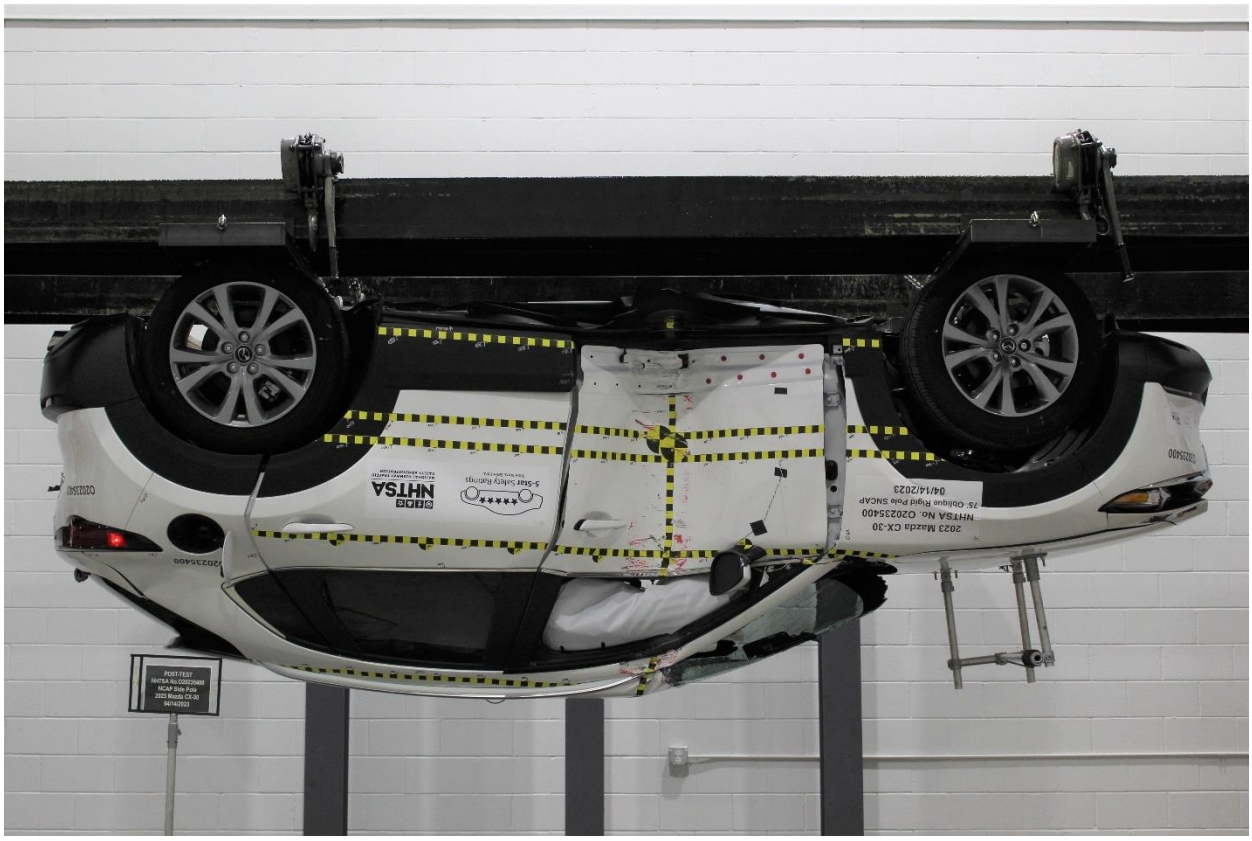



**Figure A-67: FMVSS No. 301 Static Rollover 180 Degrees**

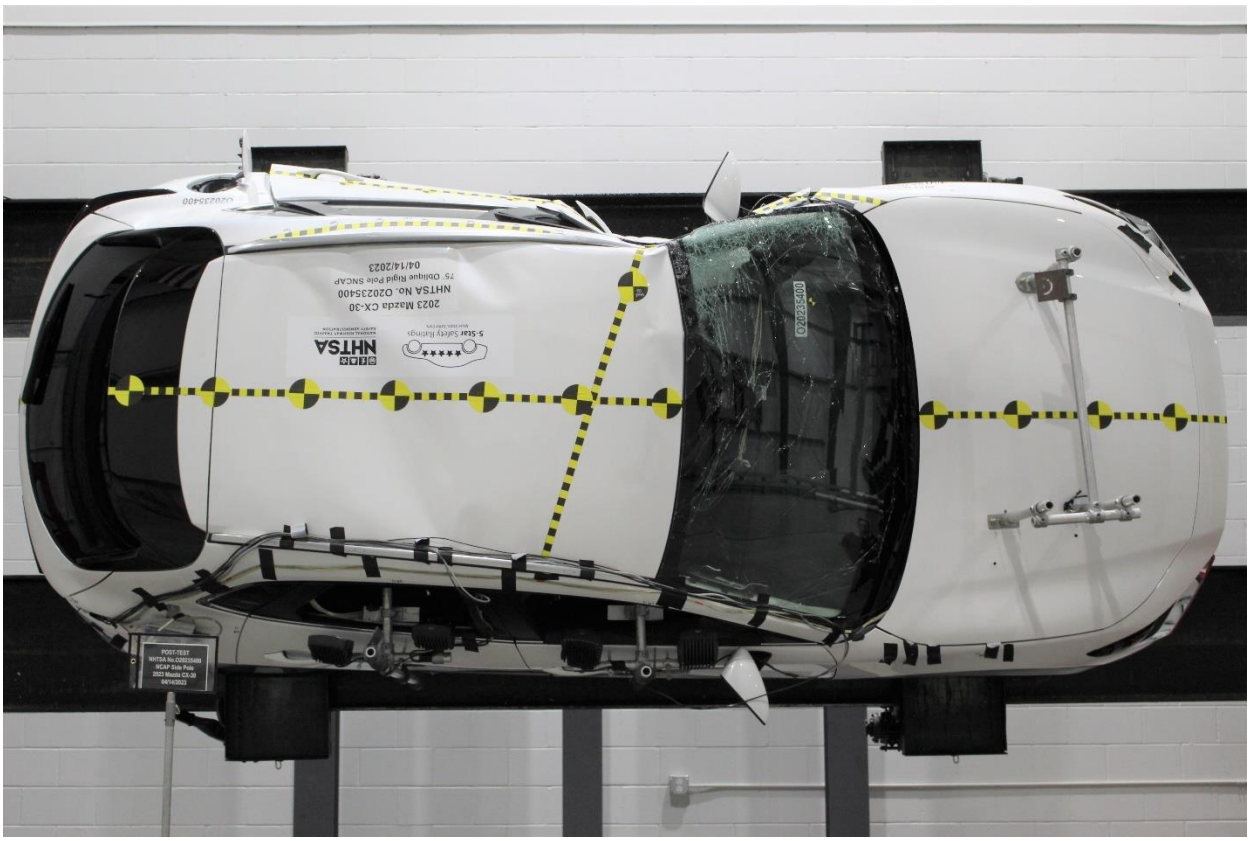



**Figure A-68: FMVSS No. 301 Static Rollover 270 Degrees**

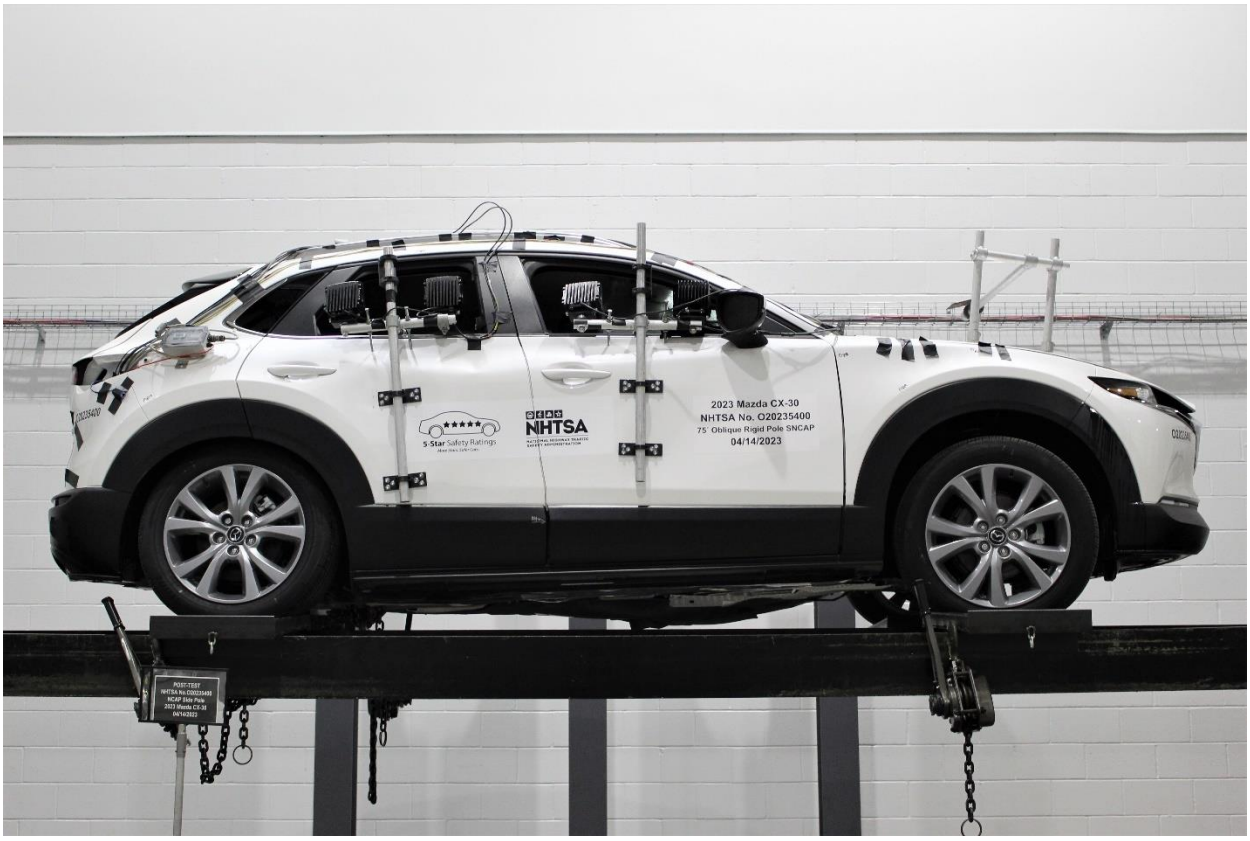



**Figure A-69: FMVSS No. 301 Static Rollover 360 Degrees**

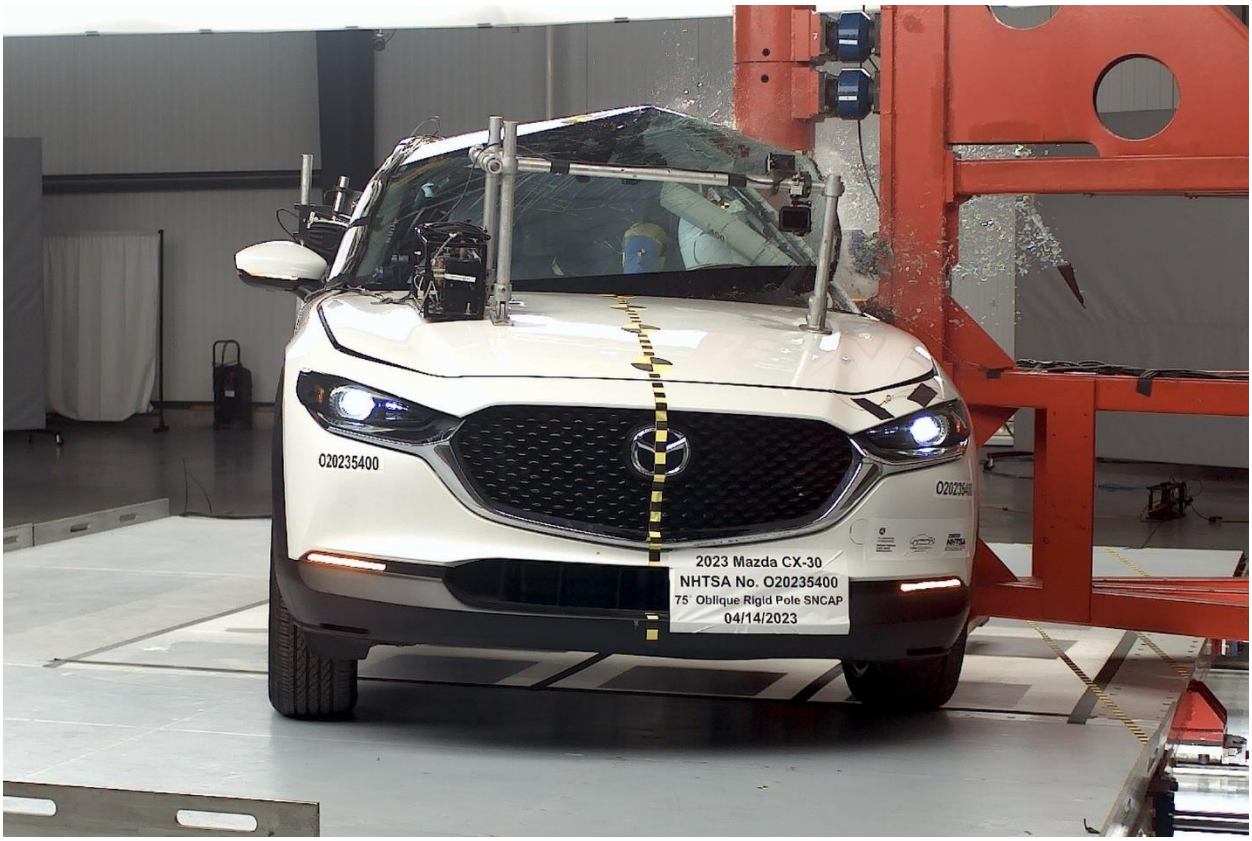



**Figure A-70: Impact Event**

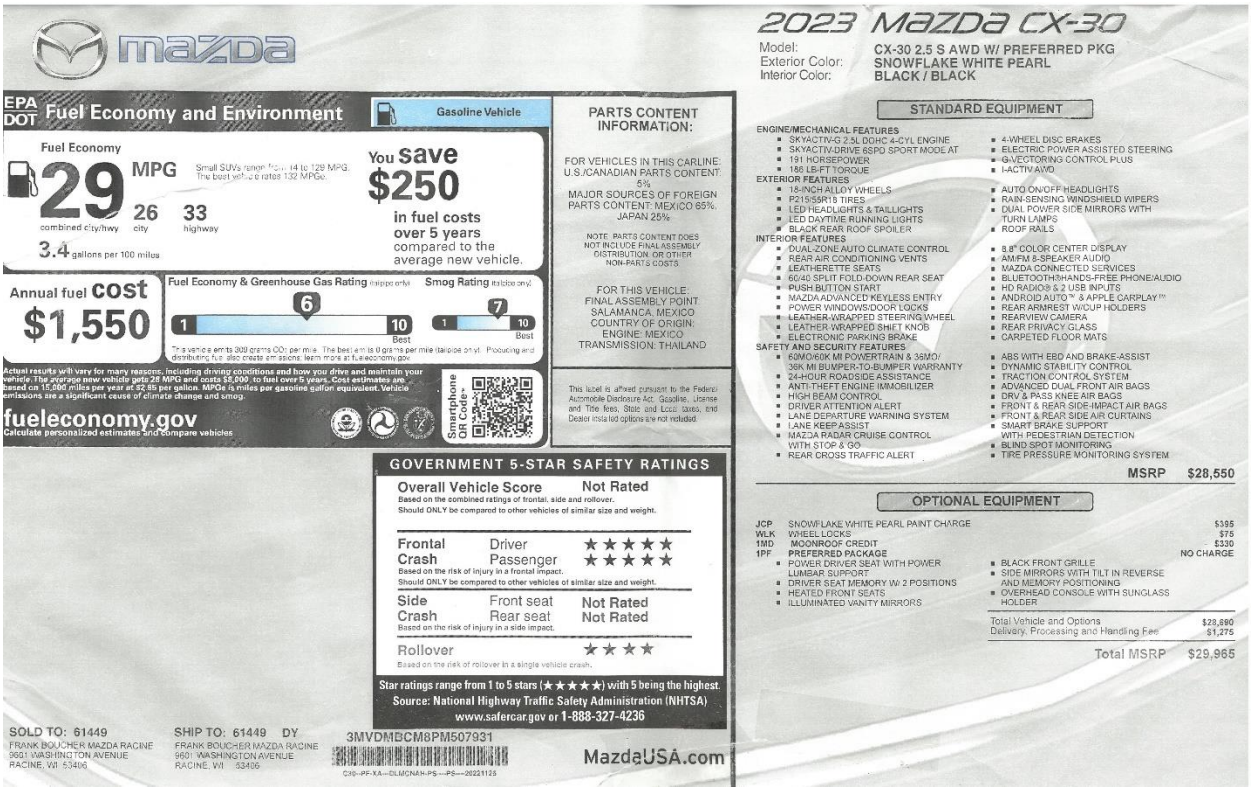



**Figure A-71: Monroney Label**

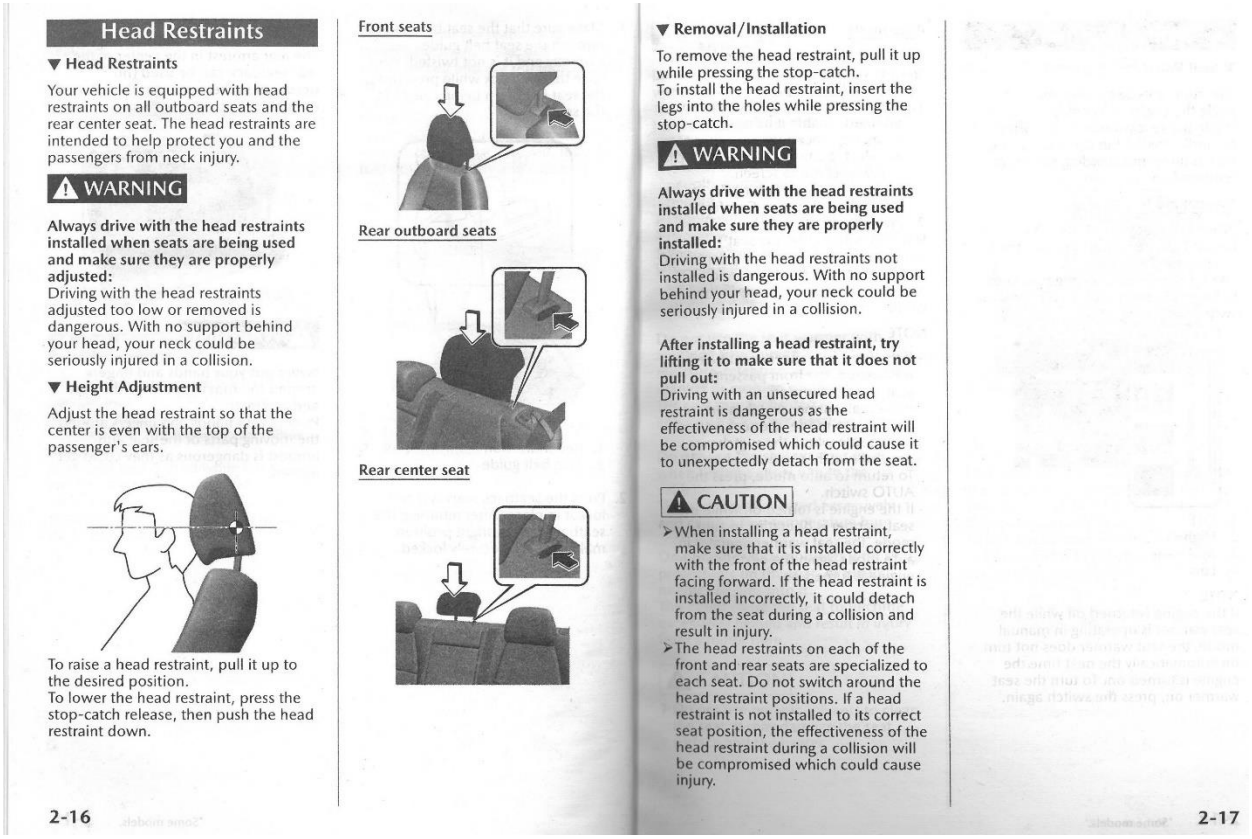



**Figure A-72: Head Restraint Use and Adjustment Information from Vehicle Owner's Manual**

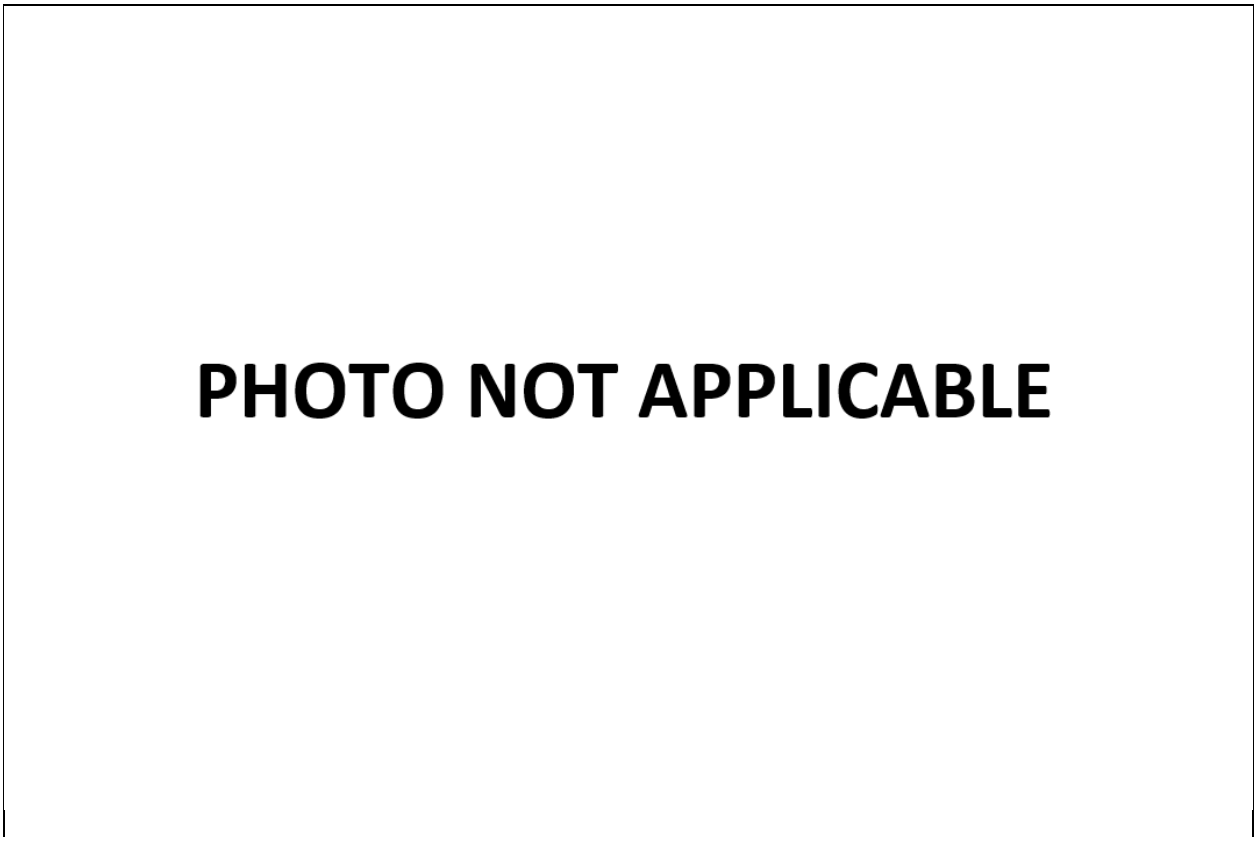



**Figure A-73: Post-Test View of Shattered Vehicle Inner Door Panel**

# APPENDIX B

# VEHICLE AND DUMMY RESPONSE DATA PLOTS

## TABLE OF DATA PLOTS

### Driver Dummy Instrumentation Plots

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

## Additional Driver Dummy Instrumentation Data

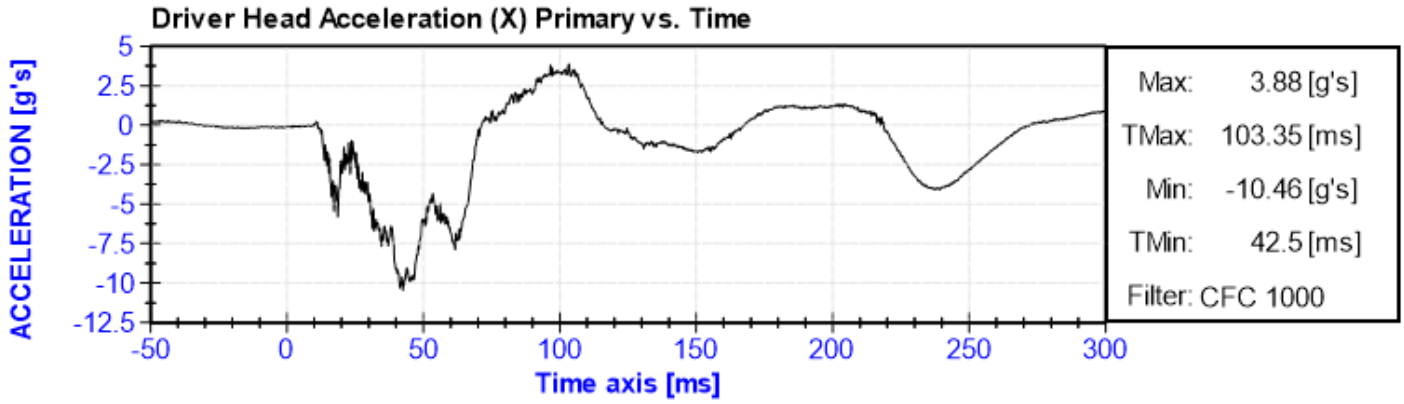
Driver Head Acceleration Redundant (X)
Driver Head Acceleration Redundant (Y)
Driver Head Acceleration Redundant (Z)
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection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

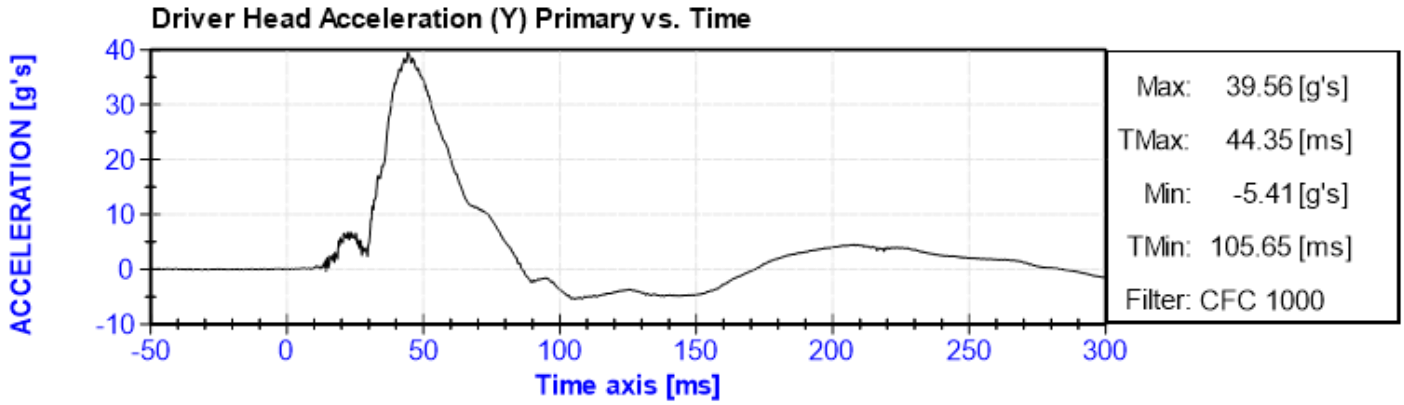
## Vehicle Instrumentation Data

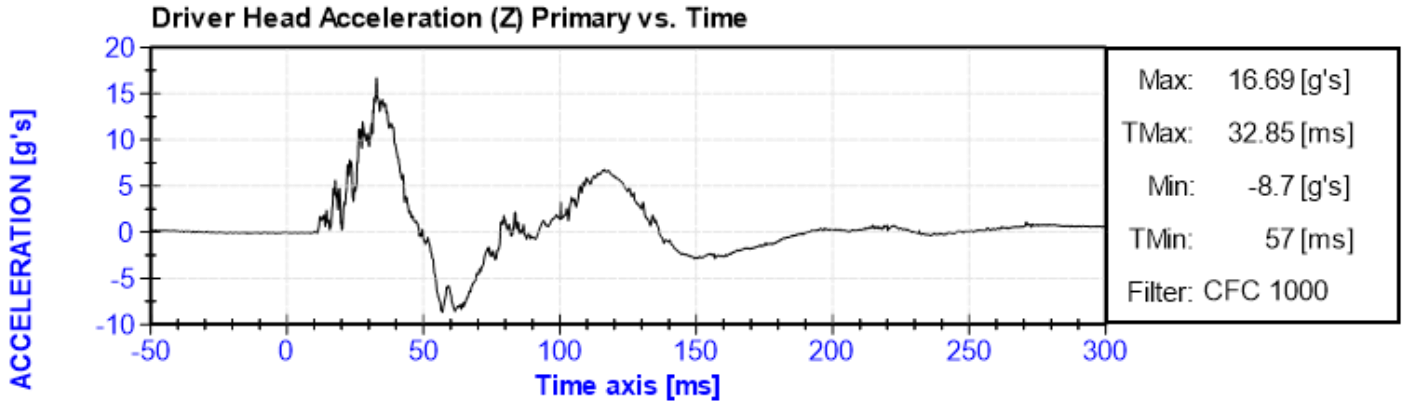
Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration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

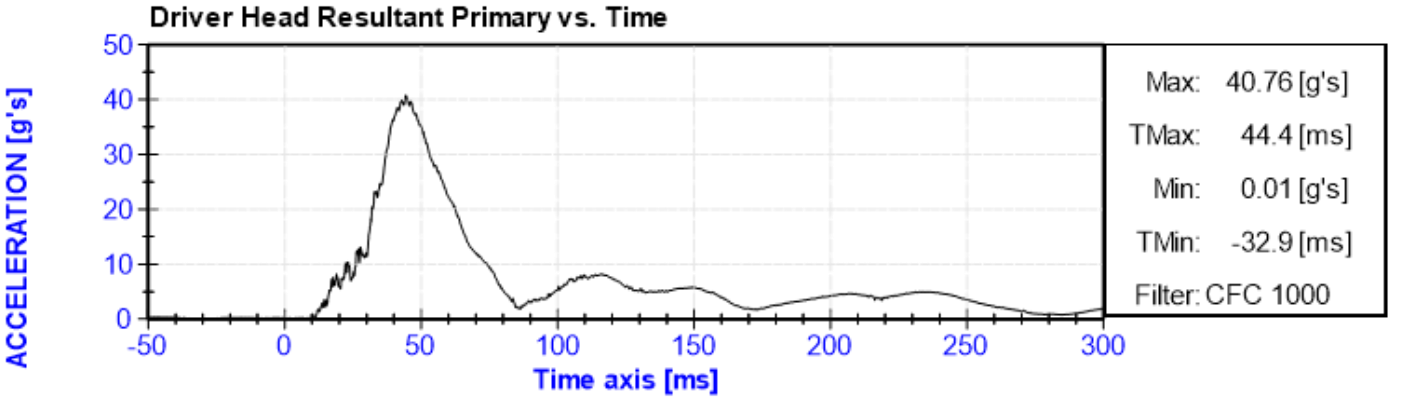
## Pole Instrumentation Data

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

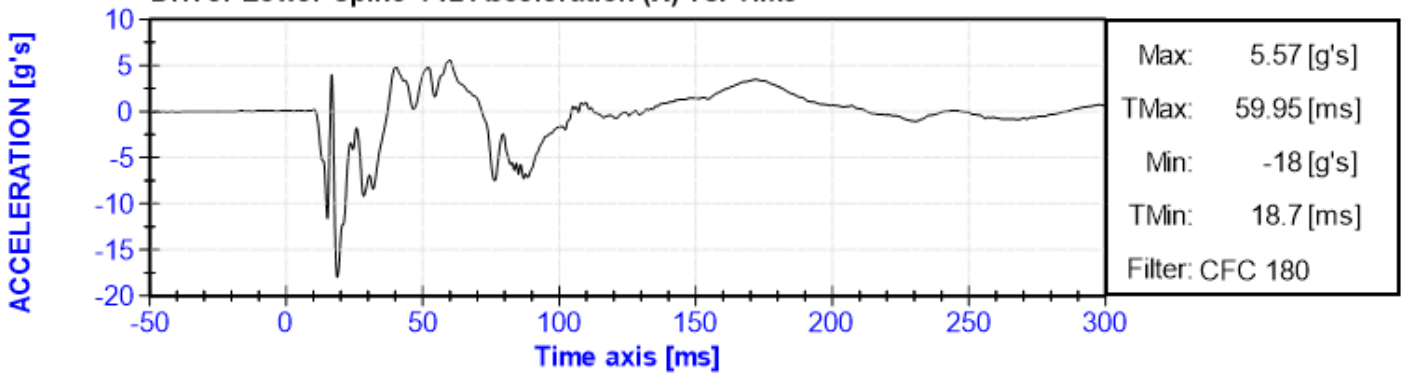

Driver Head Acceleration (X) Primary vs. Time
ACCELERATION [g's]
Time axis [ms]
Max: 3.88 [g's]
TMax: 103.35 [ms]
Min: -10.46 [g's]
TMin: 42.5 [ms]
Filter: CFC 1000


Driver Head Acceleration (Y) Primary vs. Time
ACCELERATION [g's]
Time axis [ms]
Max: 39.56 [g's]
TMax: 44.35 [ms]
Min: -5.41 [g's]
TMin: 105.65 [ms]
Filter: CFC 1000

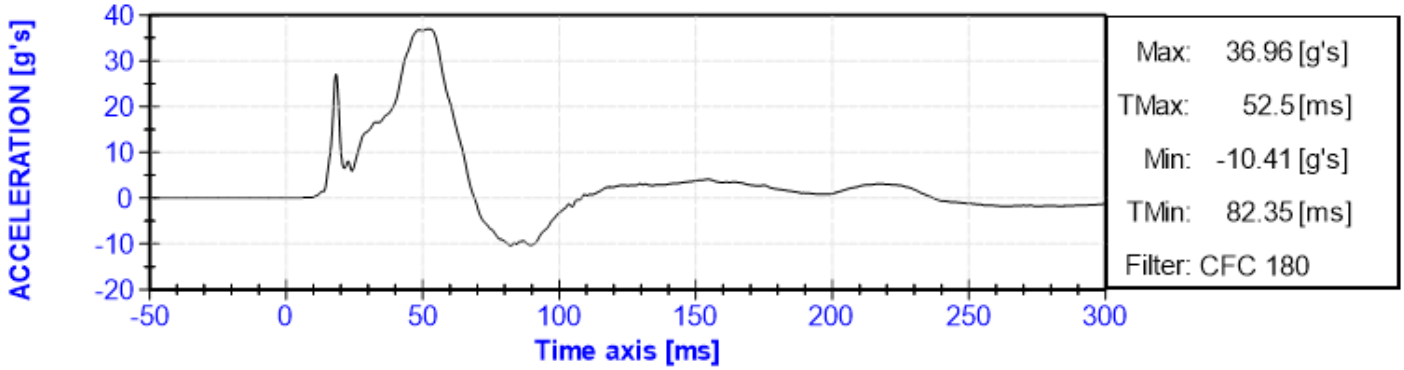

Driver Head Acceleration (Z) Primary vs. Time
ACCELERATION [g's]
Time axis [ms]
Max: 16.69 [g's]
TMax: 32.85 [ms]
Min: -8.7 [g's]
TMin: 57 [ms]
Filter: CFC 1000


Driver Head Resultant Primary vs. Time
ACCELERATION [g's]
Time axis [ms]
Max: 40.76 [g's]
TMax: 44.4 [ms]
Min: 0.01 [g's]
TMin: -32.9 [ms]
Filter: CFC 1000

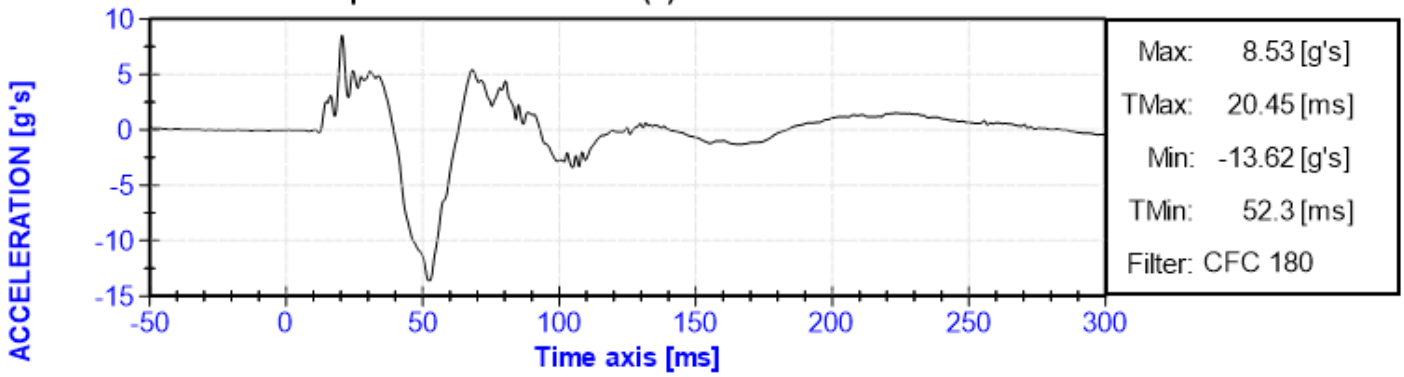
Driver Lower Spine T12 Acceleration (X) vs. Time



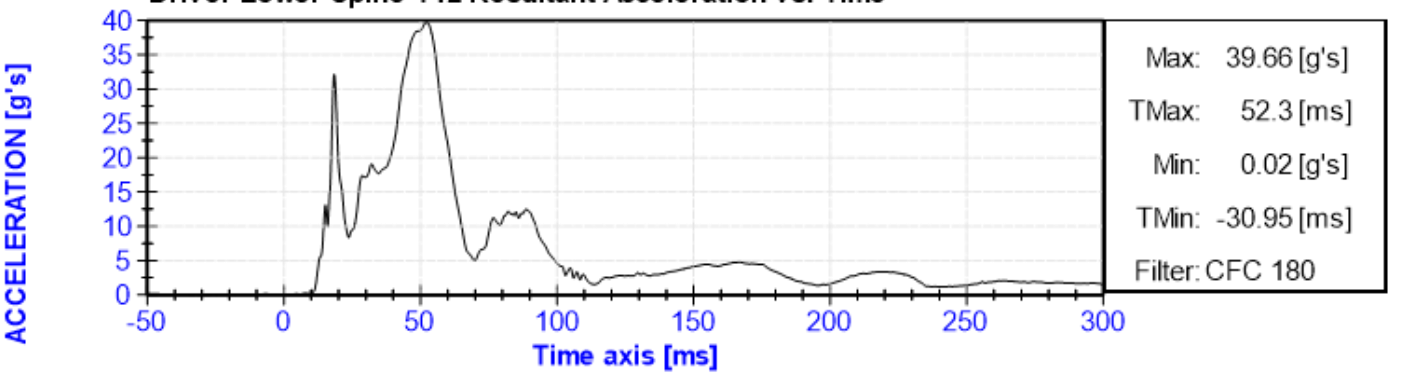

Driver Lower Spine T12 Acceleration (Y) vs. Time

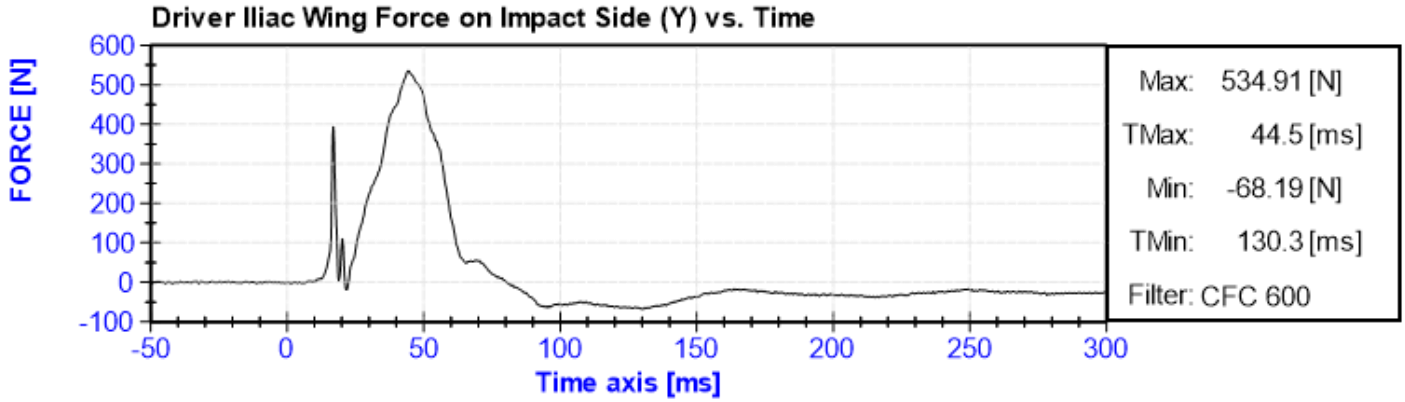


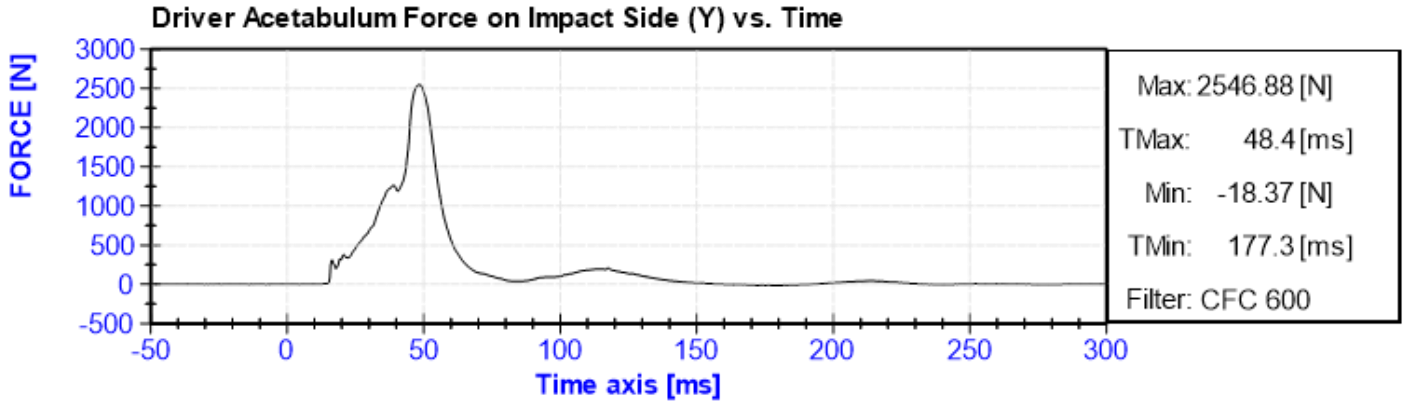

Driver Lower Spine T12 Acceleration (Z) vs. Time

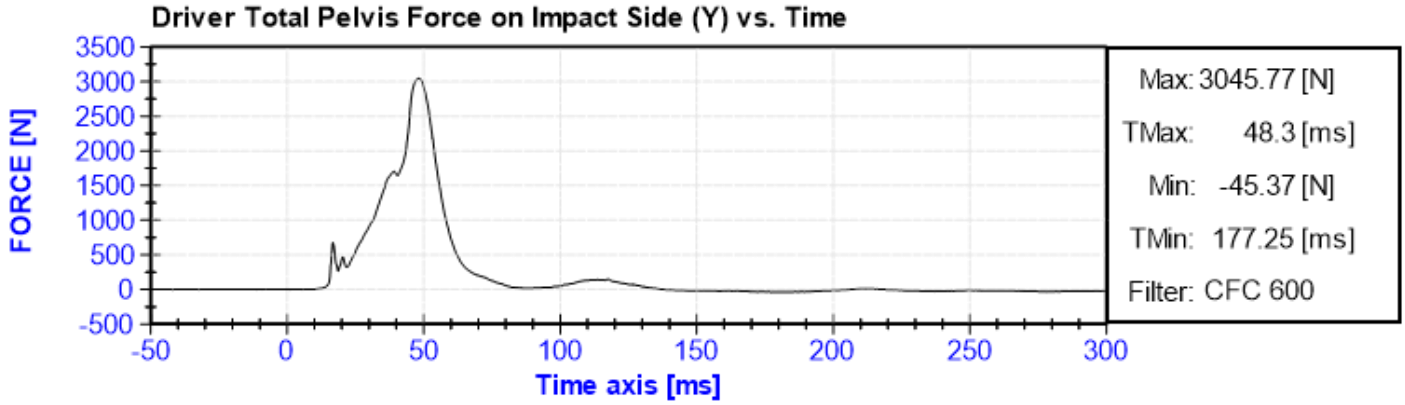



Driver Lower Spine T12 Resultant Acceleration vs. Time




Driver Iliac Wing Force on Impact Side (Y) vs. Time
FORCE [N]
600
500
400
300
200
100
0
-100
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 534.91 [N]
TMax: 44.5 [ms]
Min: -68.19 [N]
TMin: 130.3 [ms]
Filter: CFC 600


Driver Acetabulum Force on Impact Side (Y) vs. Time
FORCE [N]
3000
2500
2000
1500
1000
500
0
-500
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 2546.88 [N]
TMax: 48.4 [ms]
Min: -18.37 [N]
TMin: 177.3 [ms]
Filter: CFC 600


Driver Total Pelvis Force on Impact Side (Y) vs. Time
FORCE [N]
3500
3000
2500
2000
1500
1000
500
0
-500
-50
0
50
100
150
200
250
300
Time axis [ms]
Max: 3045.77 [N]
TMax: 48.3 [ms]
Min: -45.37 [N]
TMin: 177.25 [ms]
Filter: CFC 600

# APPENDIX C

## DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

## CALIBRATION TEST RESULTS

## PRE-TEST

## SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD

## SERIAL NO: 300

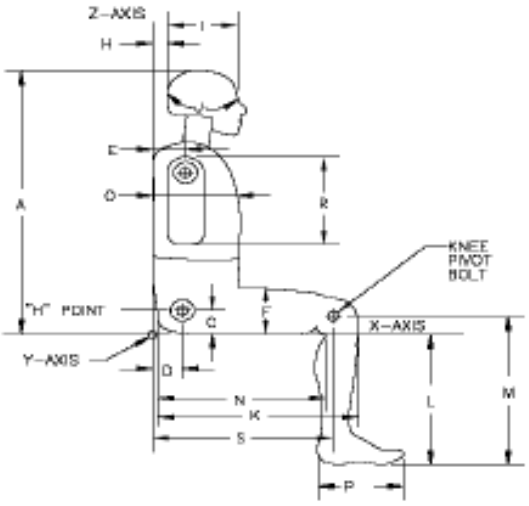
## (CONFIGURED FOR LEFT SIDE IMPACT)

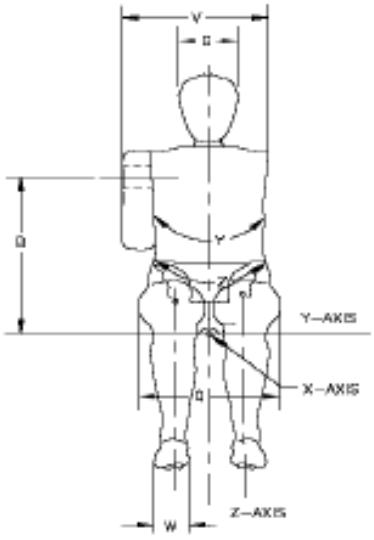
External Measurements - SID-IIs

Technician: K. Brogan

Date: 04/06/2023

Dummy Serial Number: 300




| Symbol | Description | Specification (mm) | | Result (mm) | Pass/Fail |
|---|---|---|---|---|---|
| A | Sitting Height | 772 | 788 | 783 | Pass |
| B | Shoulder Pivot Height | 437 | 453 | 444 | Pass |
| C | H-point Height | 79 | 89 | 83 | Pass |
| D | H-point from seatback | 141 | 151 | 145 | Pass |
| E | Shoulder Pivot from Backline | 97 | 107 | 101 | Pass |
| F | Thigh Clearance | 119 | 135 | 124 | Pass |
| G | Head Breadth | 140 | 148 | 144 | Pass |
| H | Head Back from Backline | 40 | 46 | 42 | Pass |
| I | Head Depth | 178 | 188 | 182 | Pass |
| J | Head Circumference | 541 | 551 | 545 | Pass |
| K | Buttock to Knee Length | 514 | 540 | 529 | Pass |
| L | Popliteal Height | 343 | 369 | 357 | Pass |
| M | Knee Pivot to floor height | 392 | 409 | 403 | Pass |
| N | Buttock Popliteal Length | 416 | 442 | 431 | Pass |
| O | Chest Depth w/o jacket | 195 | 211 | 199 | Pass |
| P | Foot Length | 216 | 232 | 221 | Pass |
| Q | Hip Breadth (w/pelvic plugs) | 313 | 323 | 319 | Pass |
| R | Arm Length | 249 | 259 | 252 | Pass |
| S | Knee Joint to seatback | 477 | 493 | 486 | Pass |
| V | Shoulder Width | 341 | 357 | 351 | Pass |
| W | Foot Width | 78 | 94 | 85 | Pass |
| Y | Chest Circumference w/jacket | 851 | 881 | 876 | Pass |
| Z | Waist Circumference | 761 | 791 | 777 | Pass |

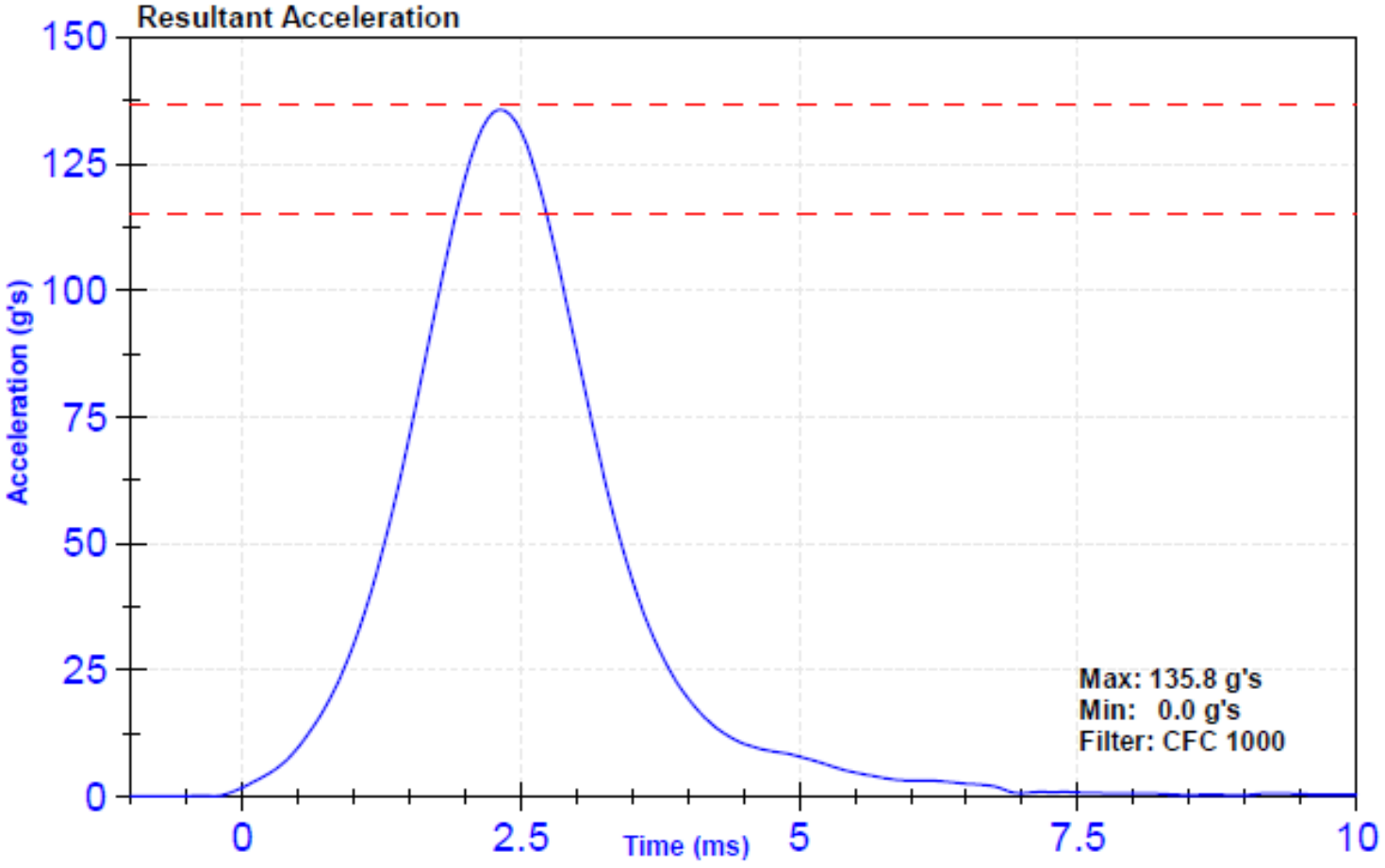
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | C. Mantell |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

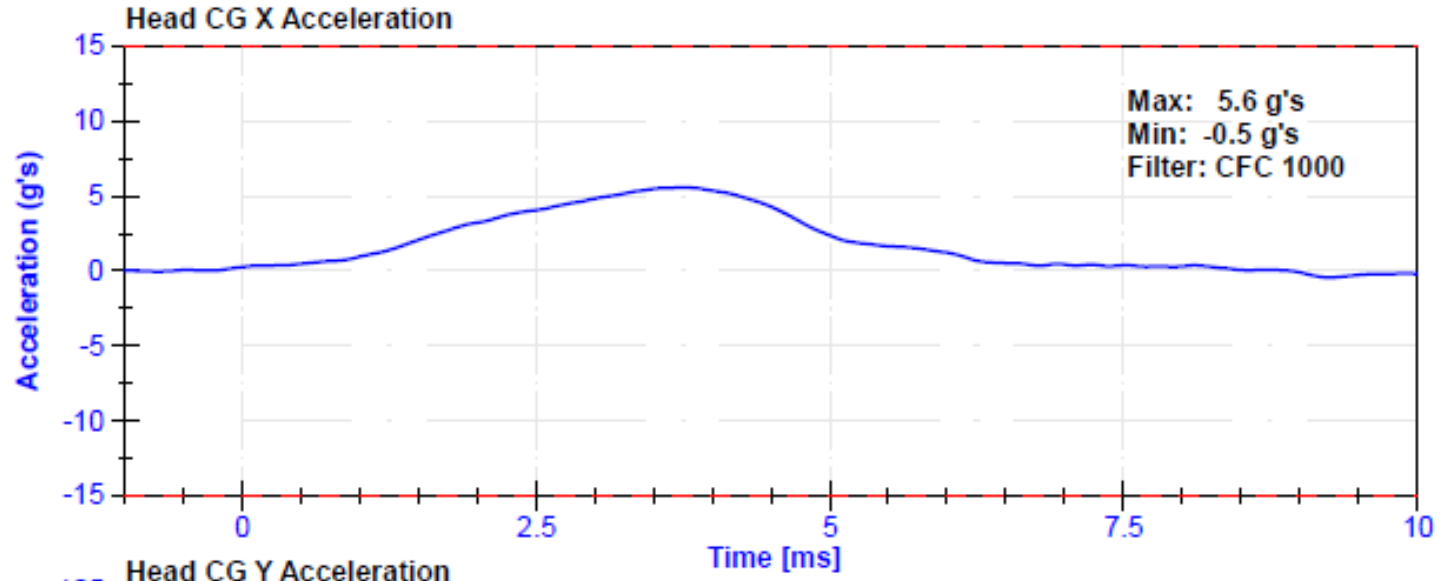
**Results**

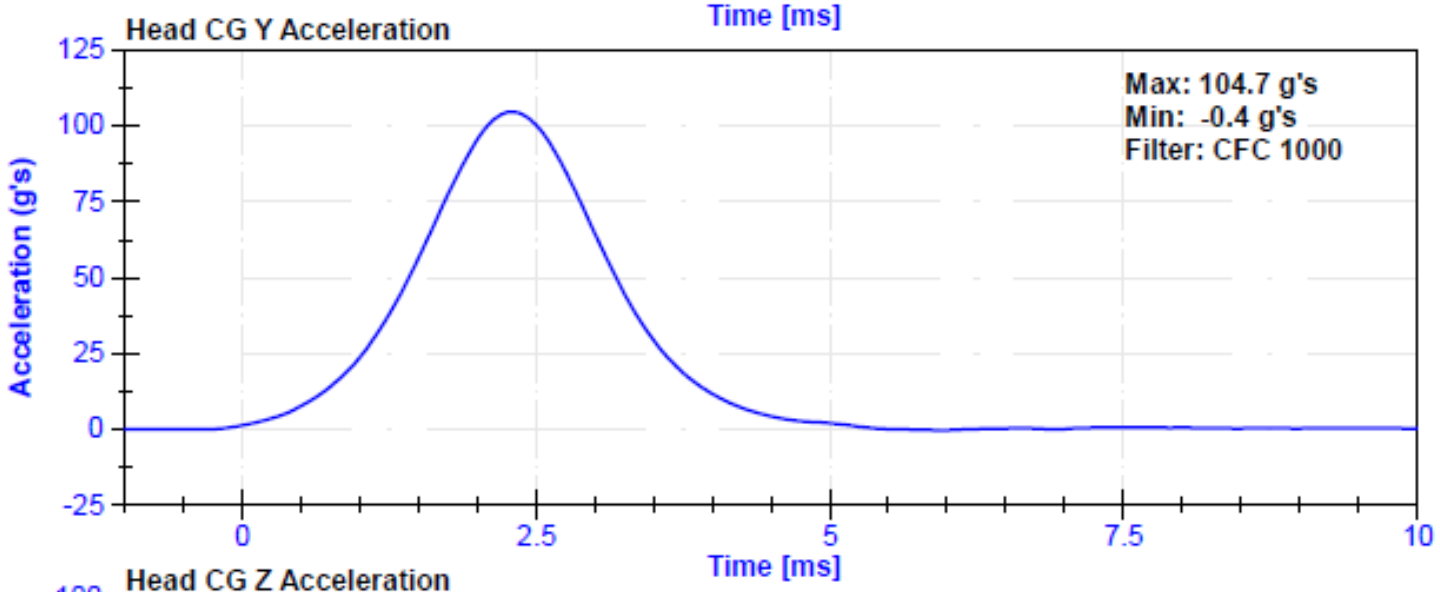
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 35.6 | Pass |
| Resultant Acceleration | 115 | 137 | g's | 135.8 | Pass |
| Oscillation | 0 | 15 | % | 2.3 | Pass |
| Fore-Aft Acceleration | -15 | 15 | g's | 5.6 | Pass |

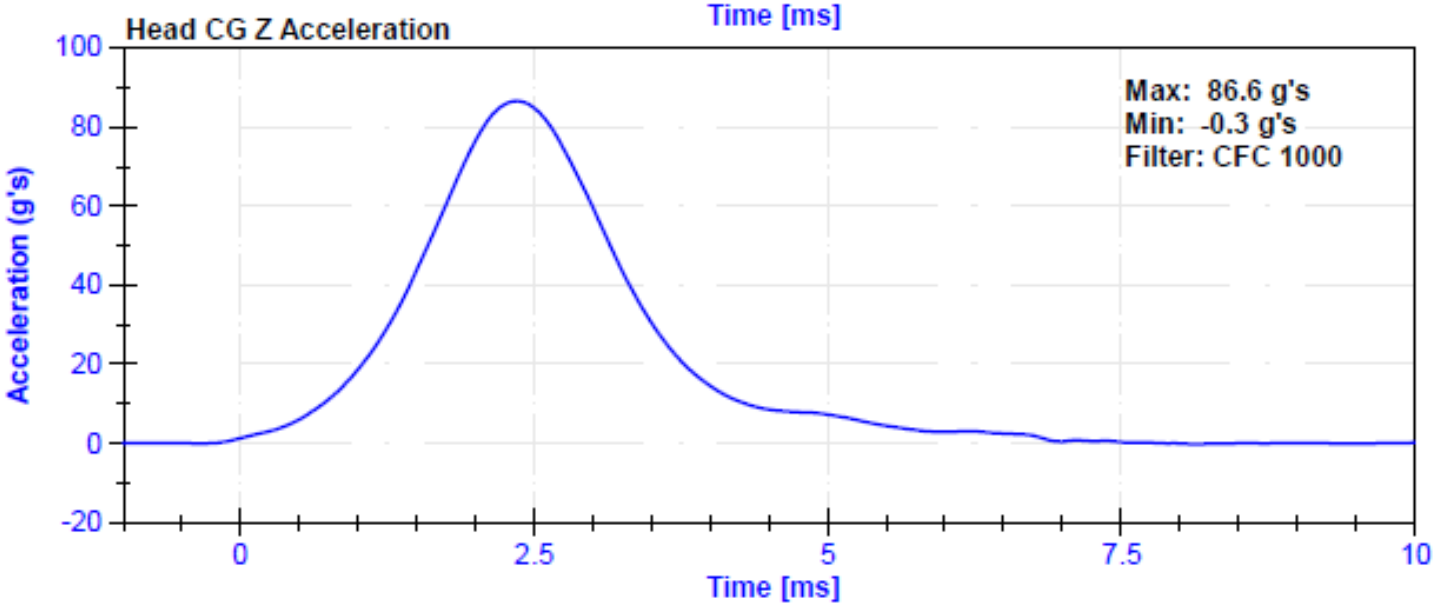
**Transducer Calibrations**

| Channel | Manufacturer | Serial Number | Calibratio Date | Calibratio Due Date |
|---|---|---|---|---|
| X Accelerometer | Endevco | P59018 | 4/4/2023 | 10/1/2023 |
| Y Accelerometer | Endevco | P79189 | 4/4/2023 | 10/1/2023 |
| Z Accelerometer | Endevco | P79587 | 4/4/2023 | 10/1/2023 |




Head CG X Acceleration
Max: 5.6 g's
Min: -0.5 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 104.7 g's
Min: -0.4 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 86.6 g's
Min: -0.3 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

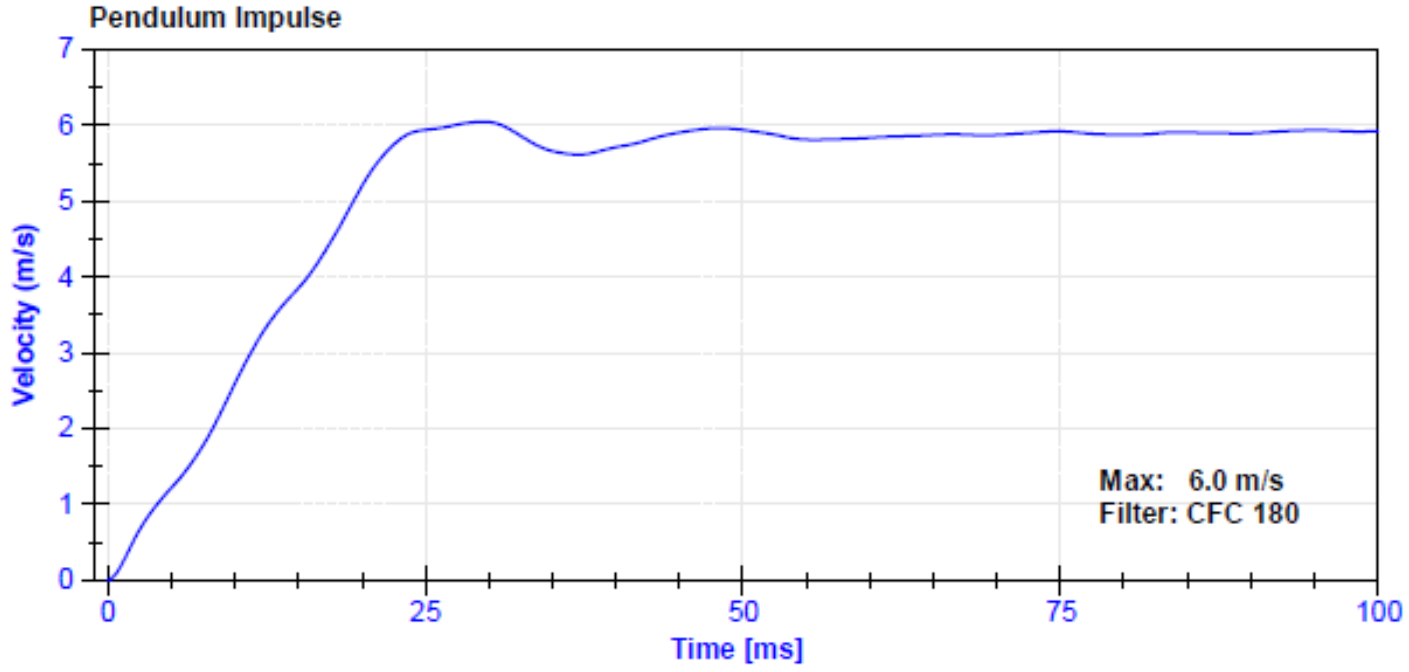
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | T. Roseman |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

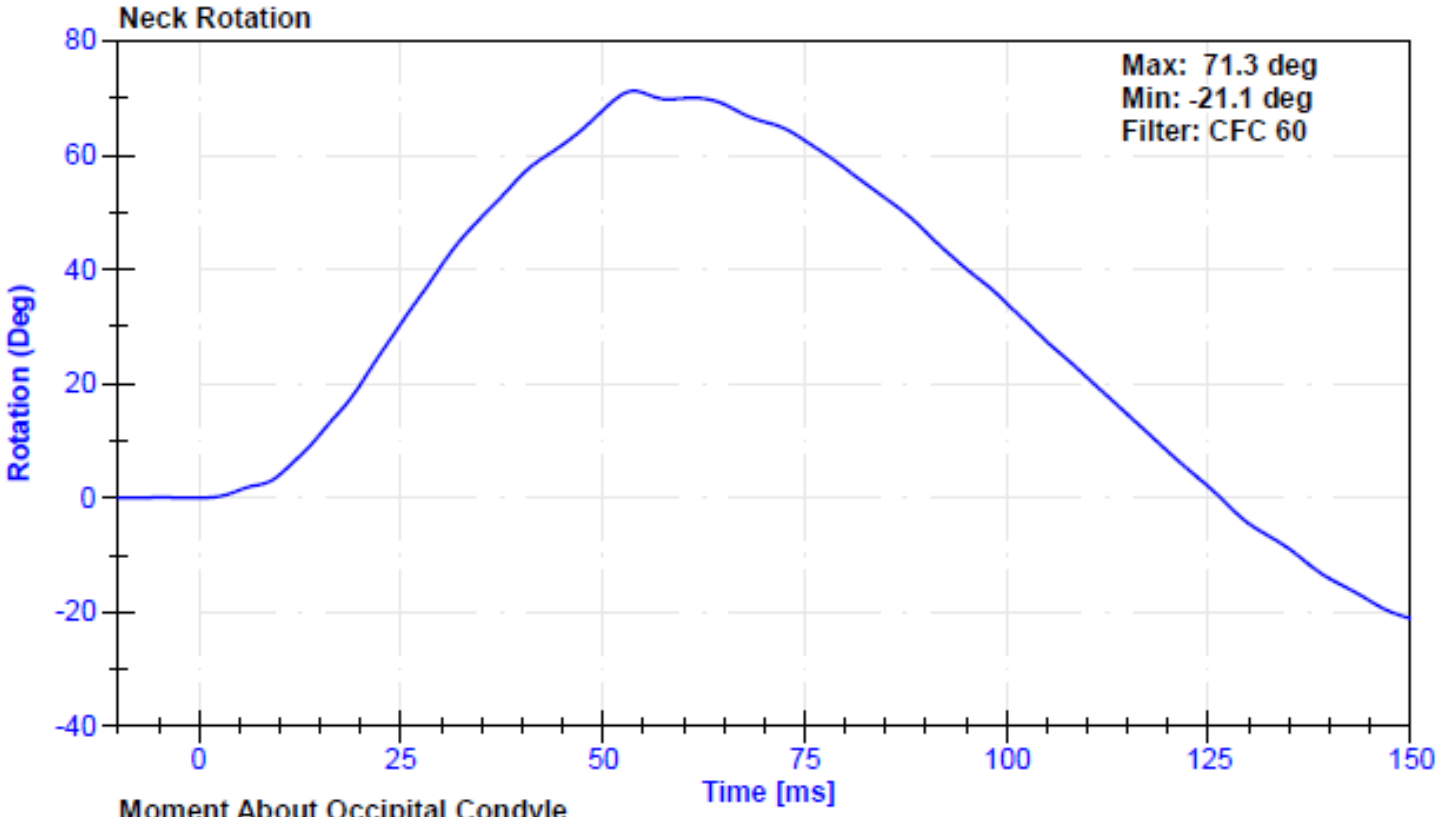
## Results

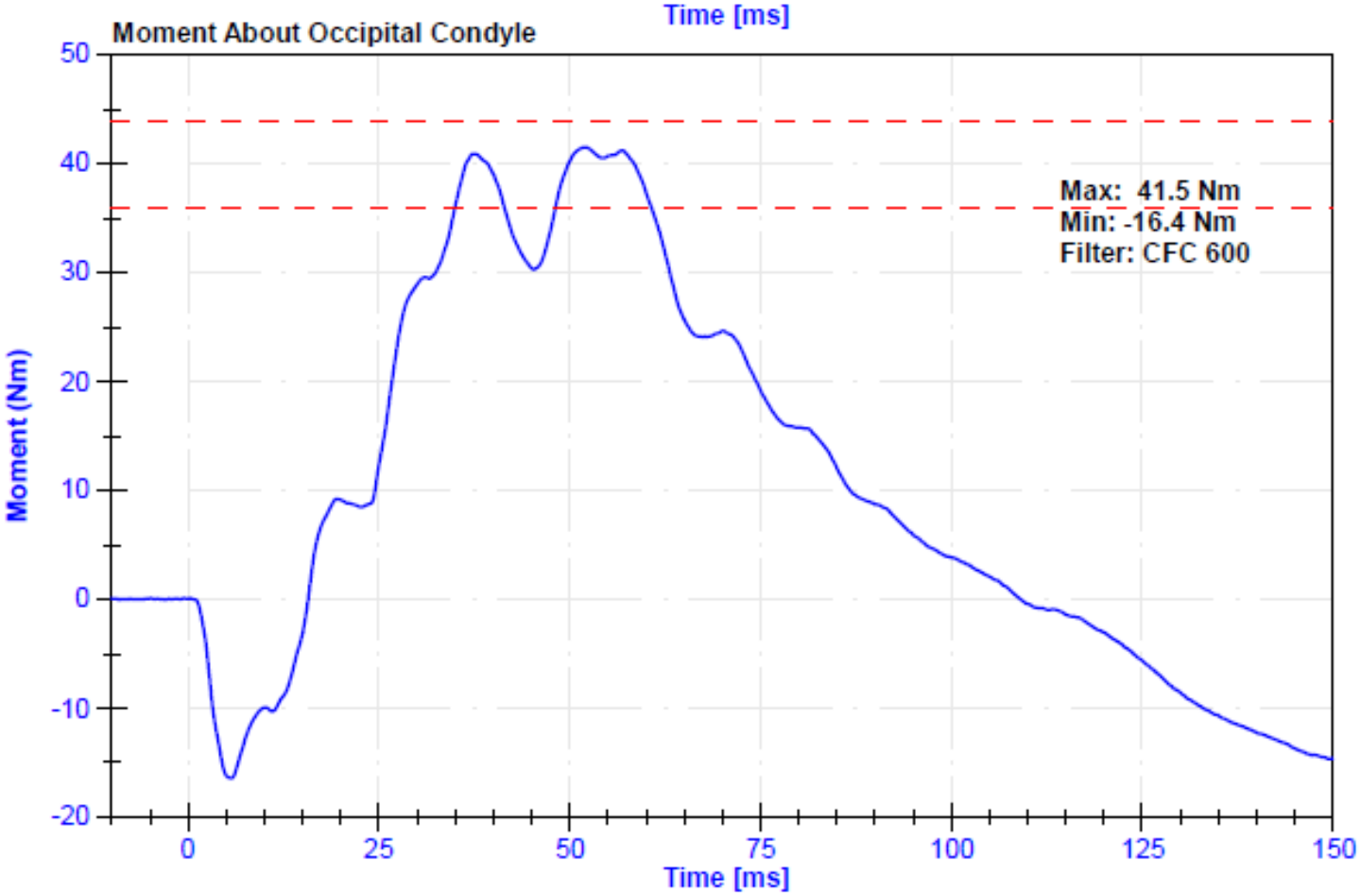
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | °C | 21.0 | Pass |
| Humidity | 10 | 70 | % | 26.3 | Pass |
| Velocity | 5.51 | 5.63 | m/s | 5.589 | Pass |
| Pendulum Impulse at 10ms | 2.2 | 2.8 | m/s | 2.60 | Pass |
| Pendulum Impulse at 15ms | 3.3 | 4.1 | m/s | 3.85 | Pass |
| Pendulum Impulse at 20ms | 4.4 | 5.4 | m/s | 5.20 | Pass |
| Pendulum Impulse at 25ms | 5.4 | 6.1 | m/s | 5.94 | Pass |
| Pendulum Impulse from 25 to 100ms | 5.5 | 6.2 | m/s | 6.05 | Pass |
| Neck Rotation | 71 | 81 | deg | 71.3 | Pass |
| Time at Maximum Rotation | 50 | 70 | ms | 53.9 | Pass |
| Moment about the OC | 36 | 44 | Nm | 41.5 | Pass |
| Moment Decay to 0 Nm | 102 | 126 | ms | 109.1 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 7231C-750 | 10/26/2022 | 10/26/2023 |
| Pendulum Potentiometer | Servo | 4961 | 11/11/2022 | 11/11/2023 |
| Condyle Potentiometer | Servo | DS185 | 11/11/2022 | 11/11/2023 |
| Upper Neck Load Cell | Humanetics | 1716A_1872-FY | 6/13/2022 | 6/13/2023 |




Neck Rotation
Max: 71.3 deg
Min: -21.1 deg
Filter: CFC 60
Rotation (Deg)
80
60
40
20
0
-20
-40
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 41.5 Nm
Min: -16.4 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

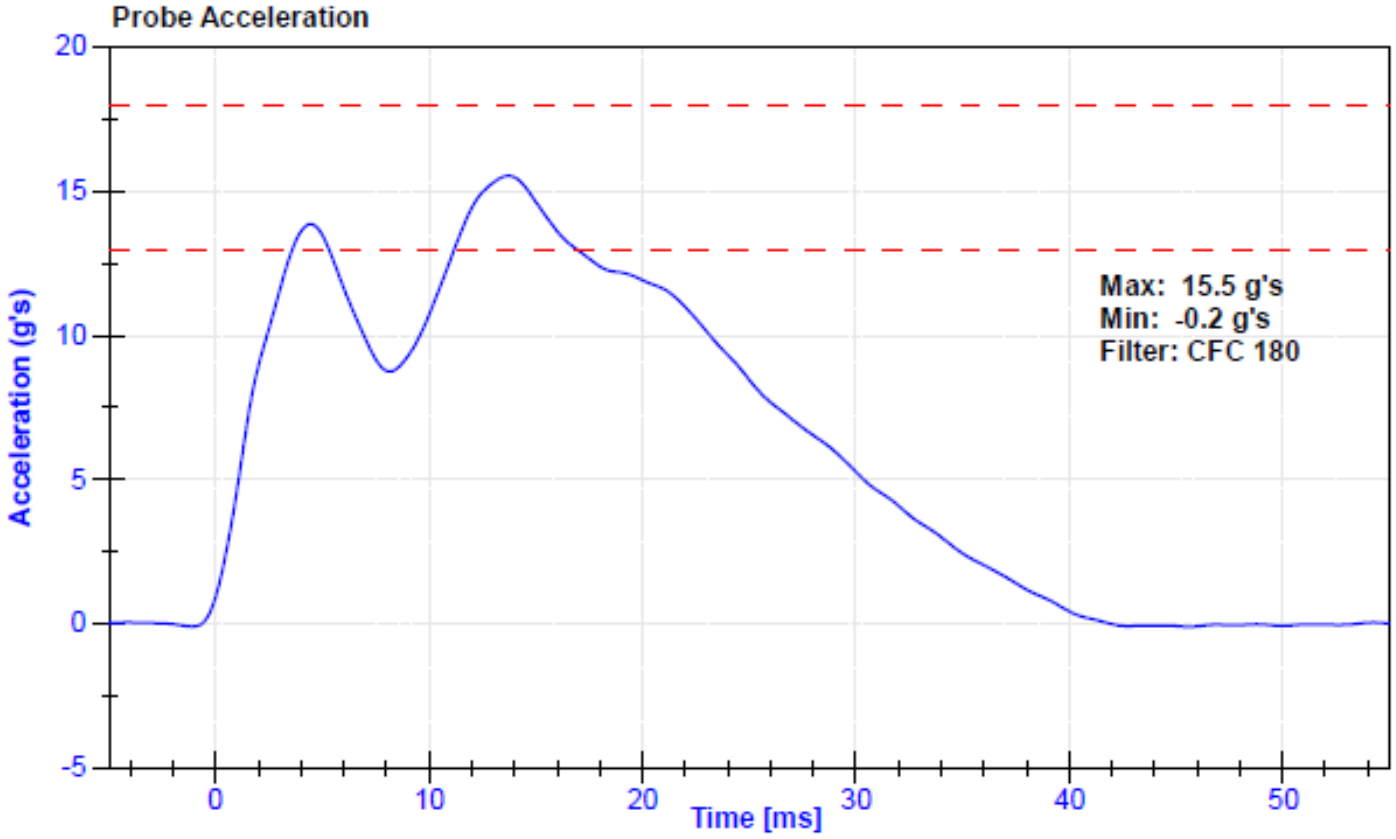
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | T. Roseman |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

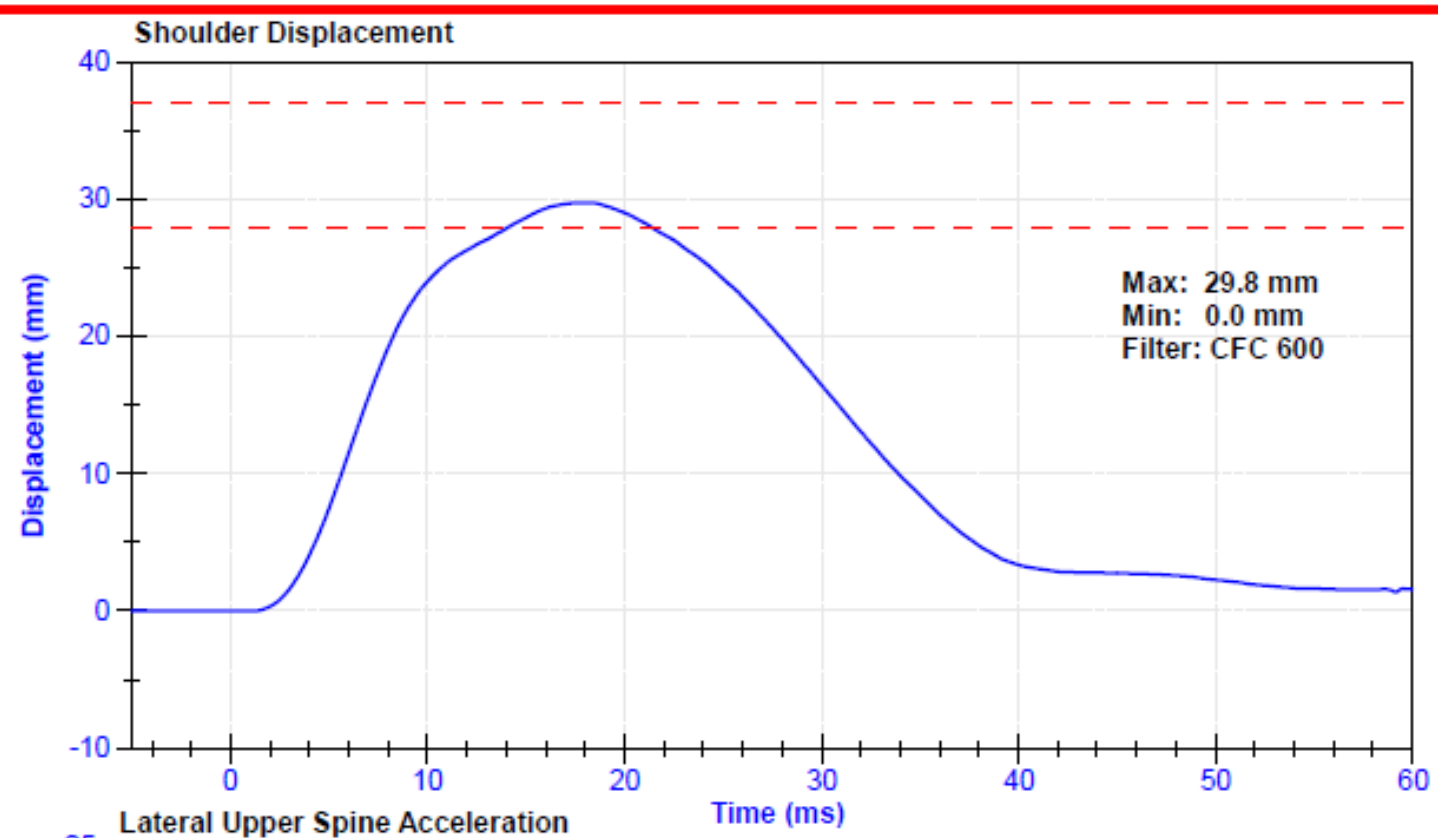
## Results

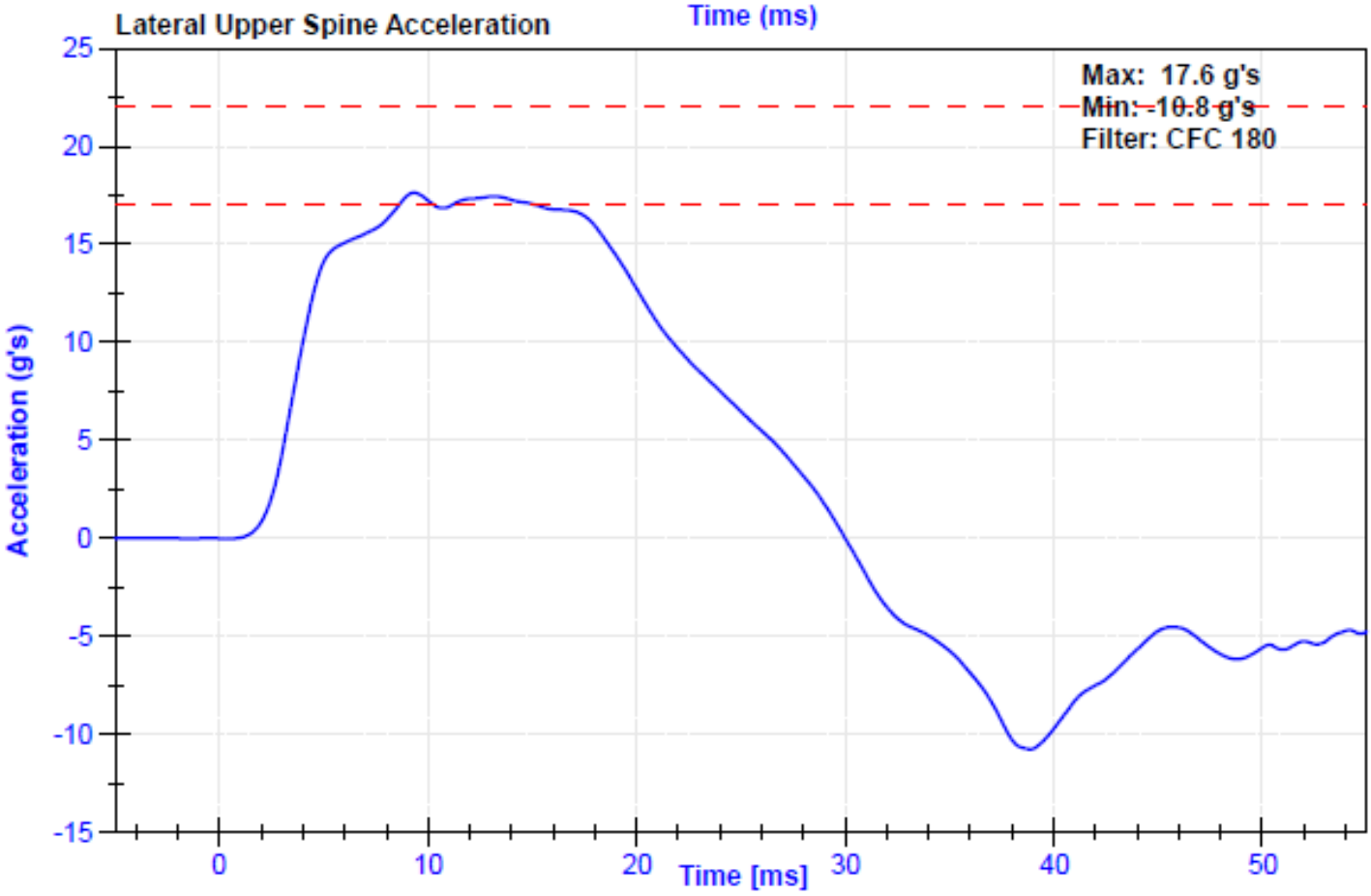
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 24.5 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.30 | Pass |
| Probe Acceleration | 13 | 18 | g's | 15.5 | Pass |
| Shoulder Deflection | 28 | 37 | mm | 29.8 | Pass |
| Lateral Upper Spine Acceleration | 17 | 22 | g's | 17.6 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Shoulder Potentiometer | Servo | 053GFE | 4/10/2023 | 10/9/2023 |
| Upper Spine Y Accelerometer | Endevco | T20880 | 4/4/2023 | 10/1/2023 |




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 29.8 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 17.6 g's
Min: -10.8 g's
Filter: CFC 180

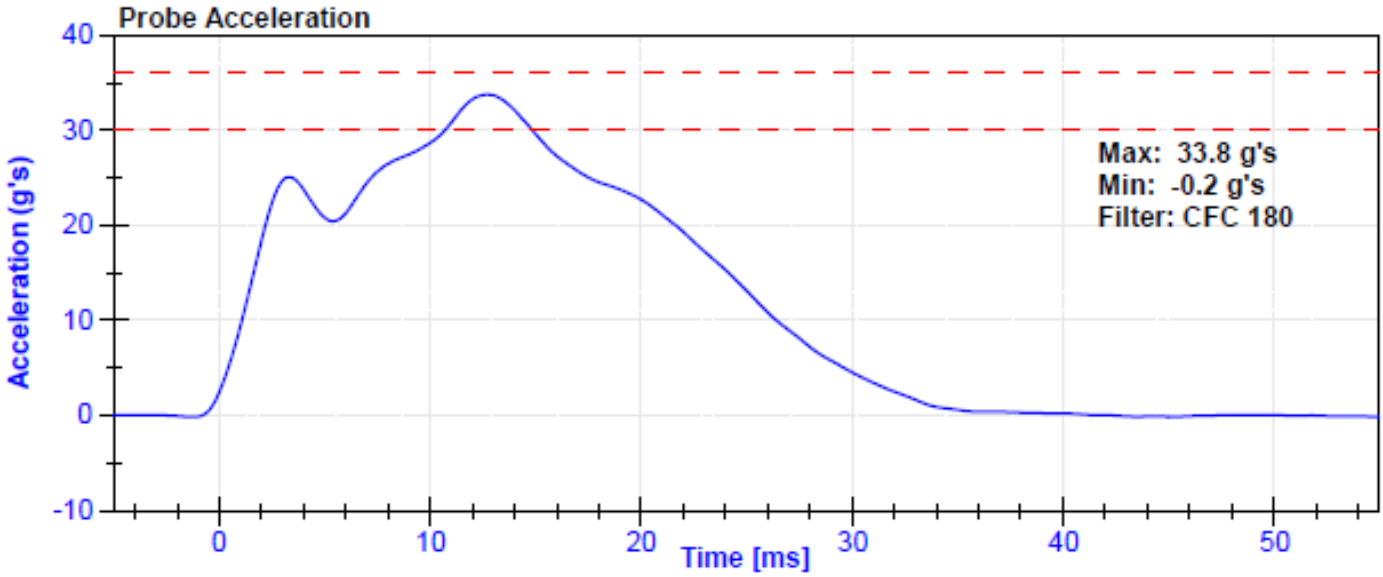
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | T. Roseman |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

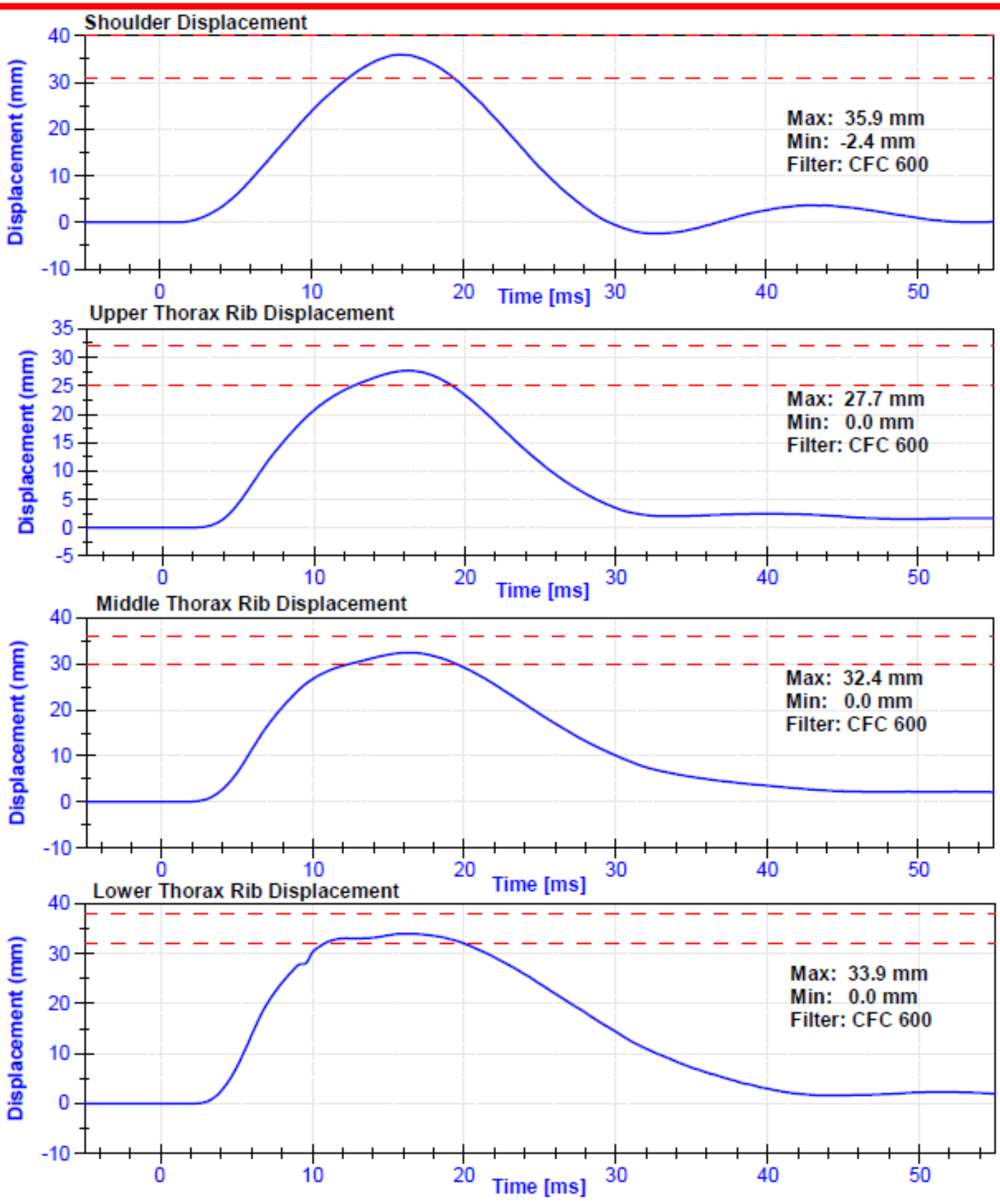
## Results

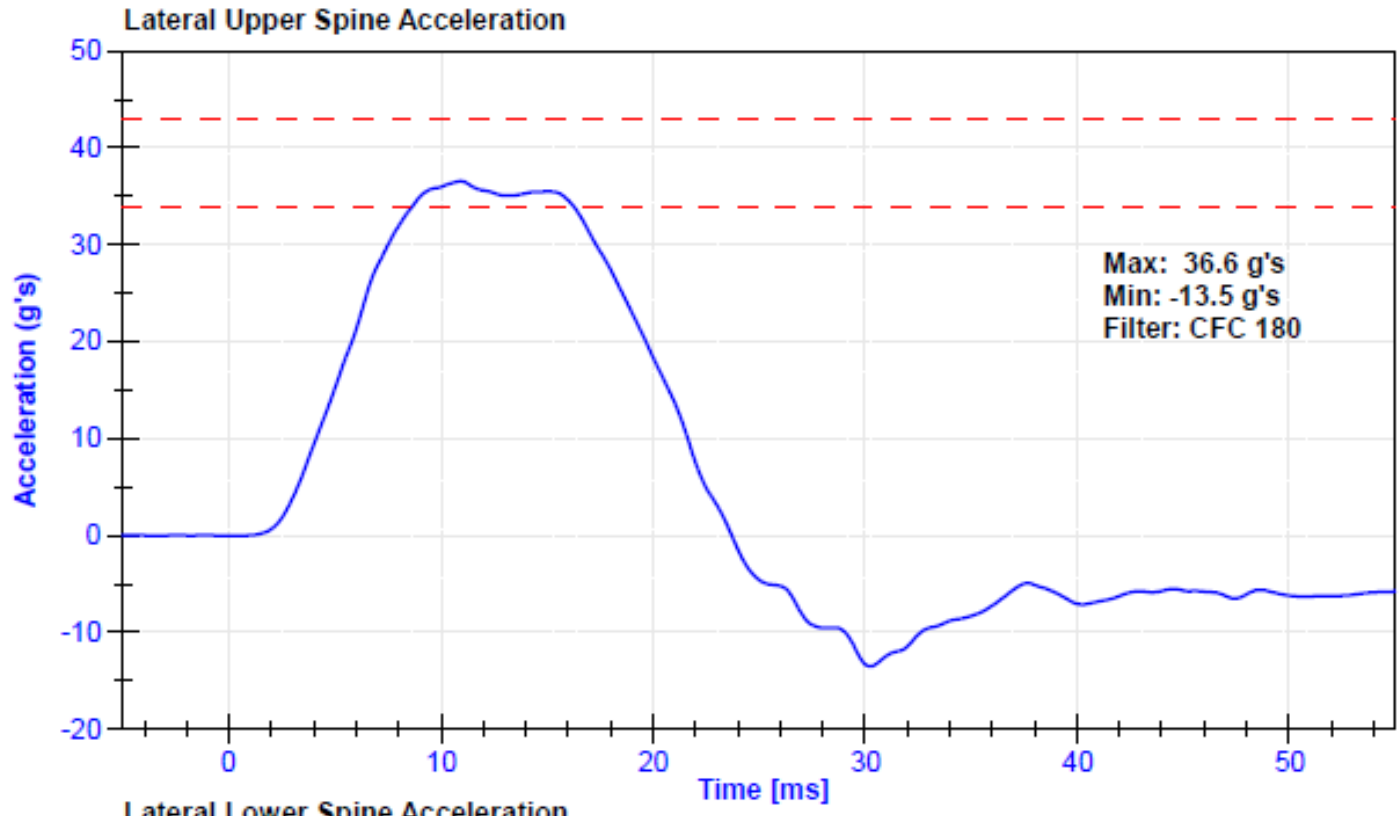
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 24.5 | Pass |
| Velocity | 6.6 | 6.8 | m/s | 6.69 | Pass |
| Probe Acceleration after 5 ms | 30 | 36 | g's | 33.8 | Pass |
| Lateral Upper Spine Acceleration | 34 | 43 | g's | 36.6 | Pass |
| Lateral Lower Spine Acceleration | 29 | 37 | g's | 34.0 | Pass |
| Shoulder Deflection | 31 | 40 | mm | 35.9 | Pass |
| Upper Thorax Rib Deflection | 25 | 32 | mm | 27.7 | Pass |
| Mid Thorax Rib Deflection | 30 | 36 | mm | 32.4 | Pass |
| Lower Thorax Rib Deflection | 32 | 38 | mm | 33.9 | Pass |

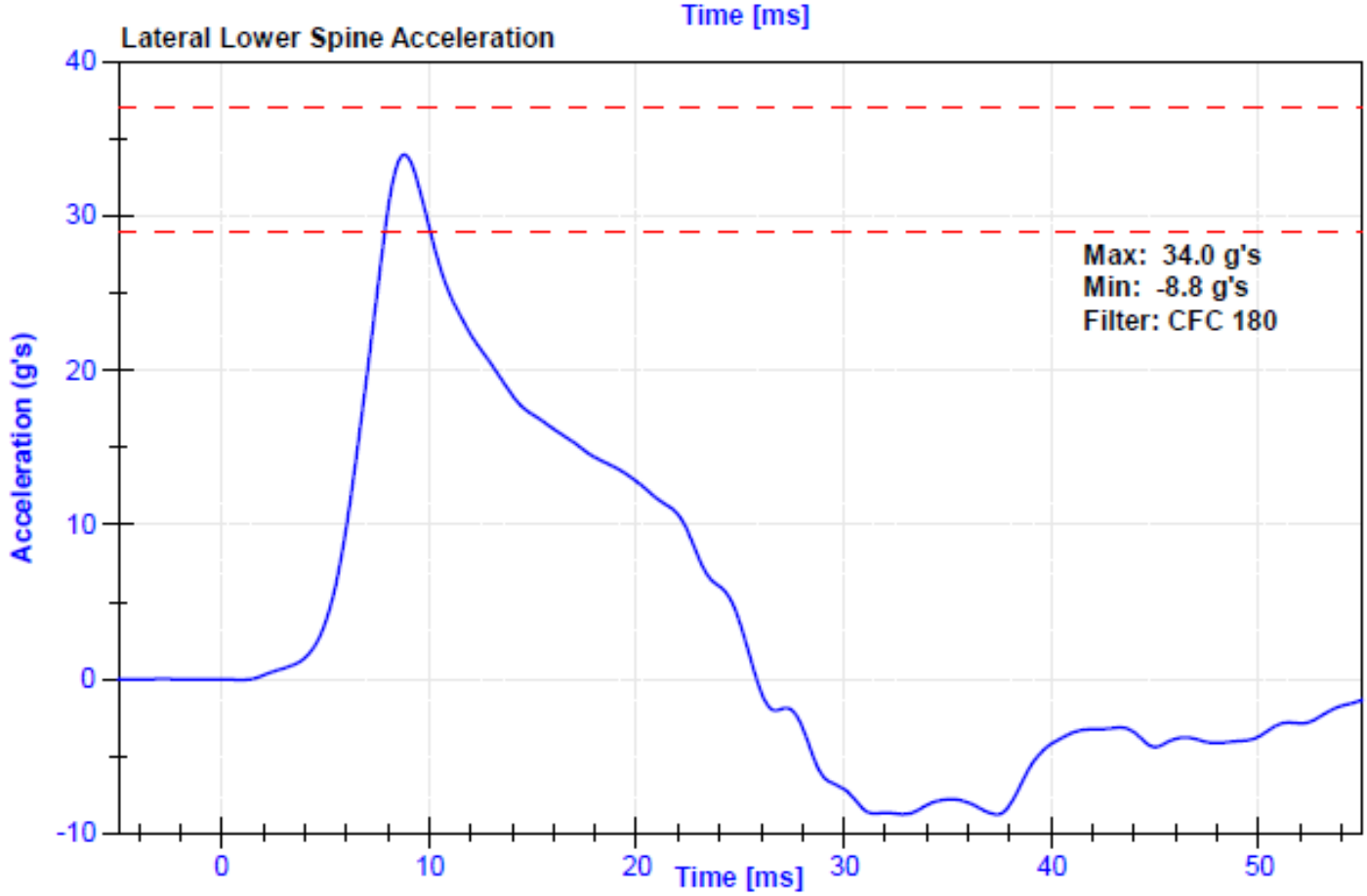
## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Upper Spine T1 Y Accelerometer | Endevco | T20880 | 4/4/2023 | 10/1/2023 |
| Upper Spine T12 Y Accelerometer | Endevco | P52071 | 4/4/2023 | 10/1/2023 |
| Shoulder Potentiometer | Servo | 053GFE | 4/10/2023 | 10/9/2023 |
| Upper Thorax Rib Potentiometer | Servo | 2316GFE | 4/10/2023 | 10/9/2023 |
| Middle Thorax Rib Potentiometer | Servo | 040GFE | 4/10/2023 | 10/9/2023 |
| Lower Thorax Rib Potentiometer | Servo | 1156GFE | 4/10/2023 | 10/9/2023 |




Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 35.9 mm
Min: -2.4 mm
Filter: CFC 600
Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 27.7 mm
Min: 0.0 mm
Filter: CFC 600
Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 32.4 mm
Min: 0.0 mm
Filter: CFC 600
Lower Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 33.9 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 36.6 g's
Min: -13.5 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 34.0 g's
Min: -8.8 g's
Filter: CFC 180

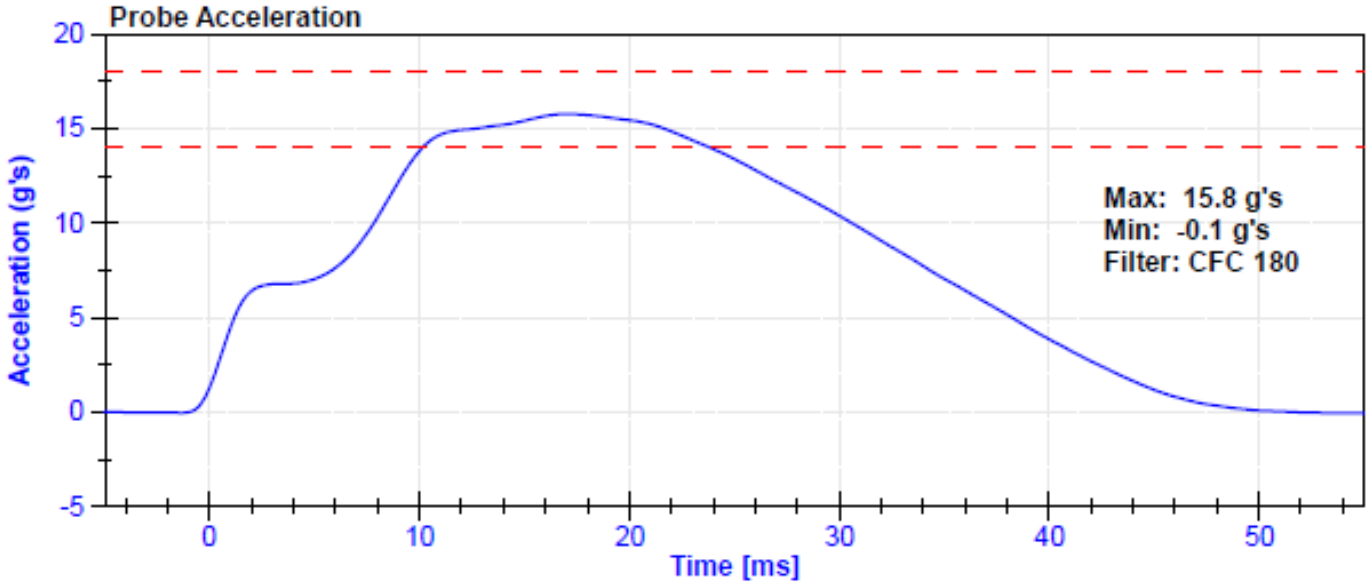
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | T. Roseman |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

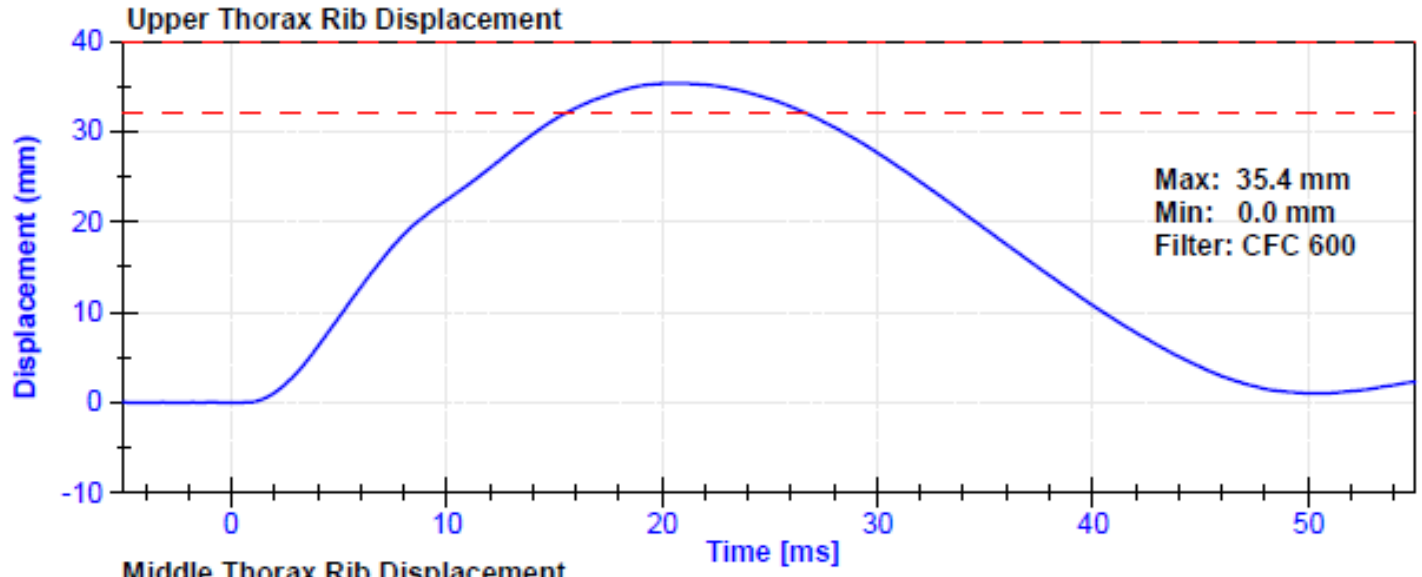
**Results**

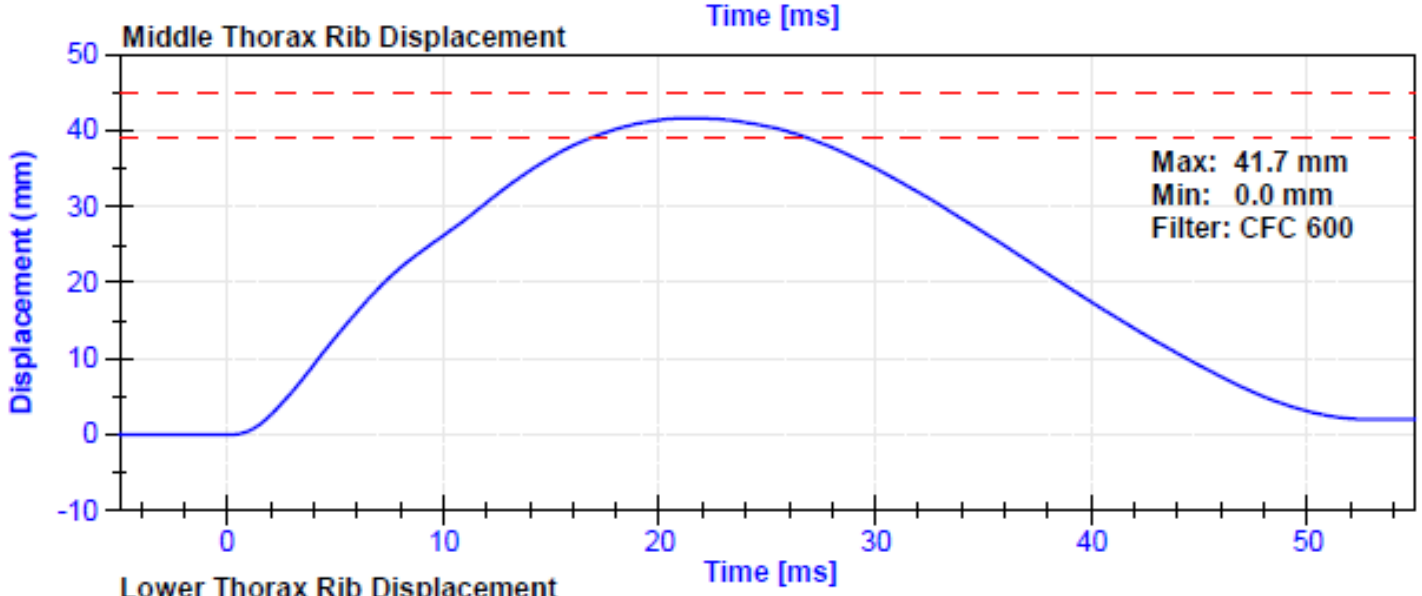
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 24.5 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.31 | Pass |
| Probe Acceleration | 14 | 18 | g's | 15.8 | Pass |
| Lateral Upper Spine Acceleration | 13 | 17 | g's | 14.1 | Pass |
| Lateral Lower Spine Acceleration | 7 | 11 | g's | 8.7 | Pass |
| Upper Thorax Rib Deflection | 32 | 40 | mm | 35.4 | Pass |
| Middle Thorax Rib Deflection | 39 | 45 | mm | 41.7 | Pass |
| Lower Thorax Rib Deflection | 35 | 43 | mm | 39.2 | Pass |

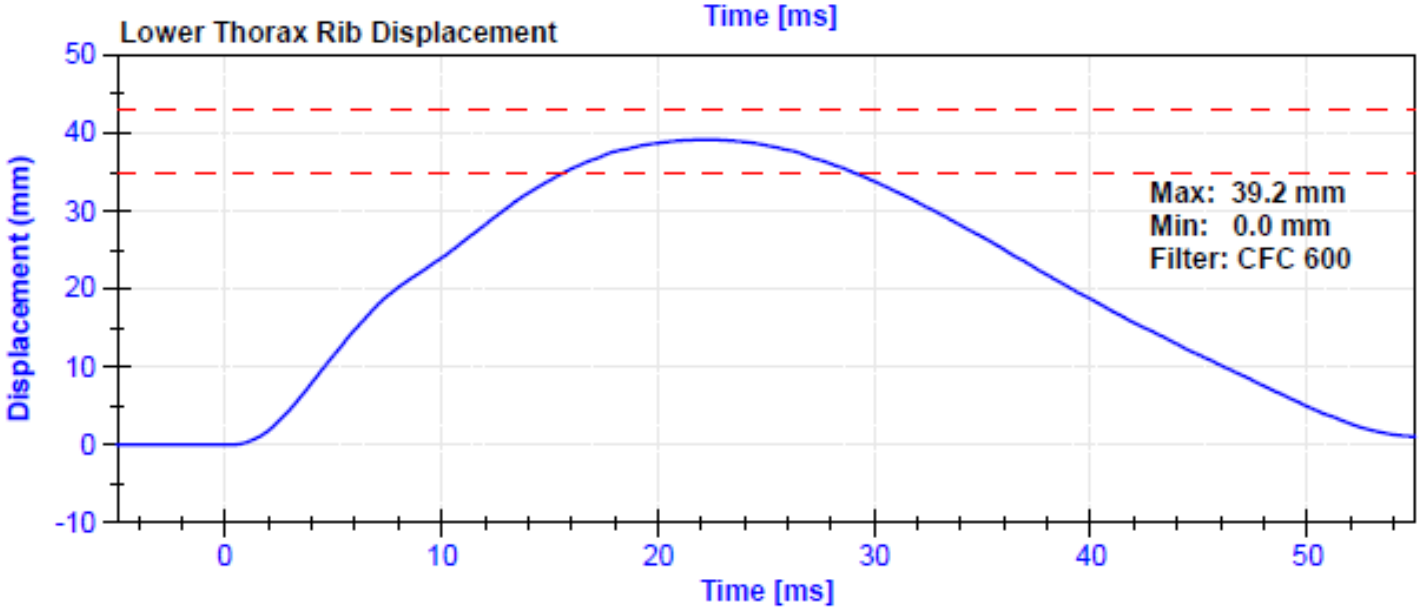
**Transducer Calibrations**

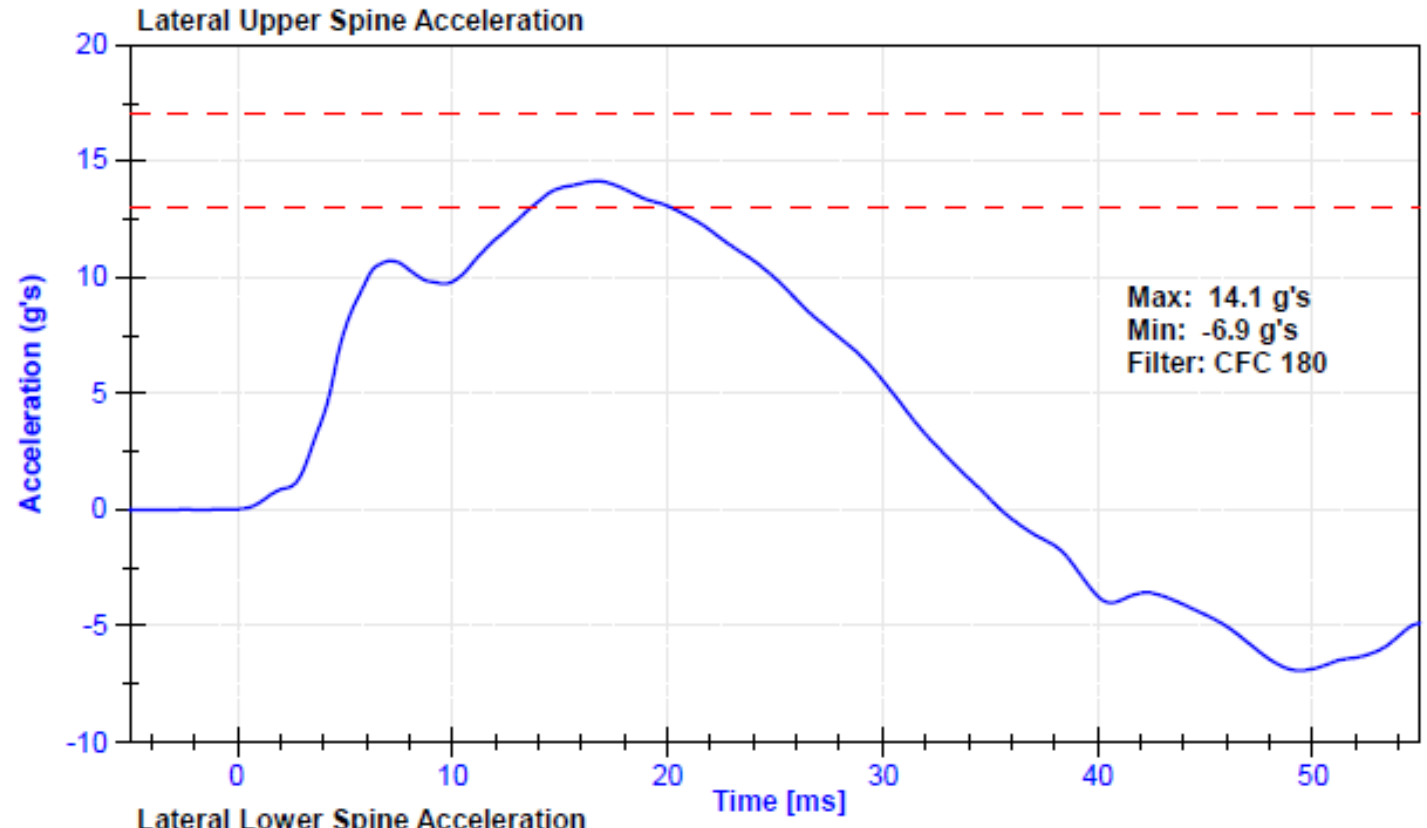
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Upper Spine Y Accelerometer | Endevco | T20880 | 4/4/2023 | 10/1/2023 |
| Lower Spine Y Accelerometer | Endevco | P52071 | 4/4/2023 | 10/1/2023 |
| Upper Thorax Rib Potentiometer | Servo | 2316GFE | 4/10/2023 | 10/9/2023 |
| Middle Thorax Rib Potentiometer | Servo | 040GFE | 4/10/2023 | 10/9/2023 |
| Lower Thorax Rib Potentiometer | Servo | 1156GFE | 4/10/2023 | 10/9/2023 |

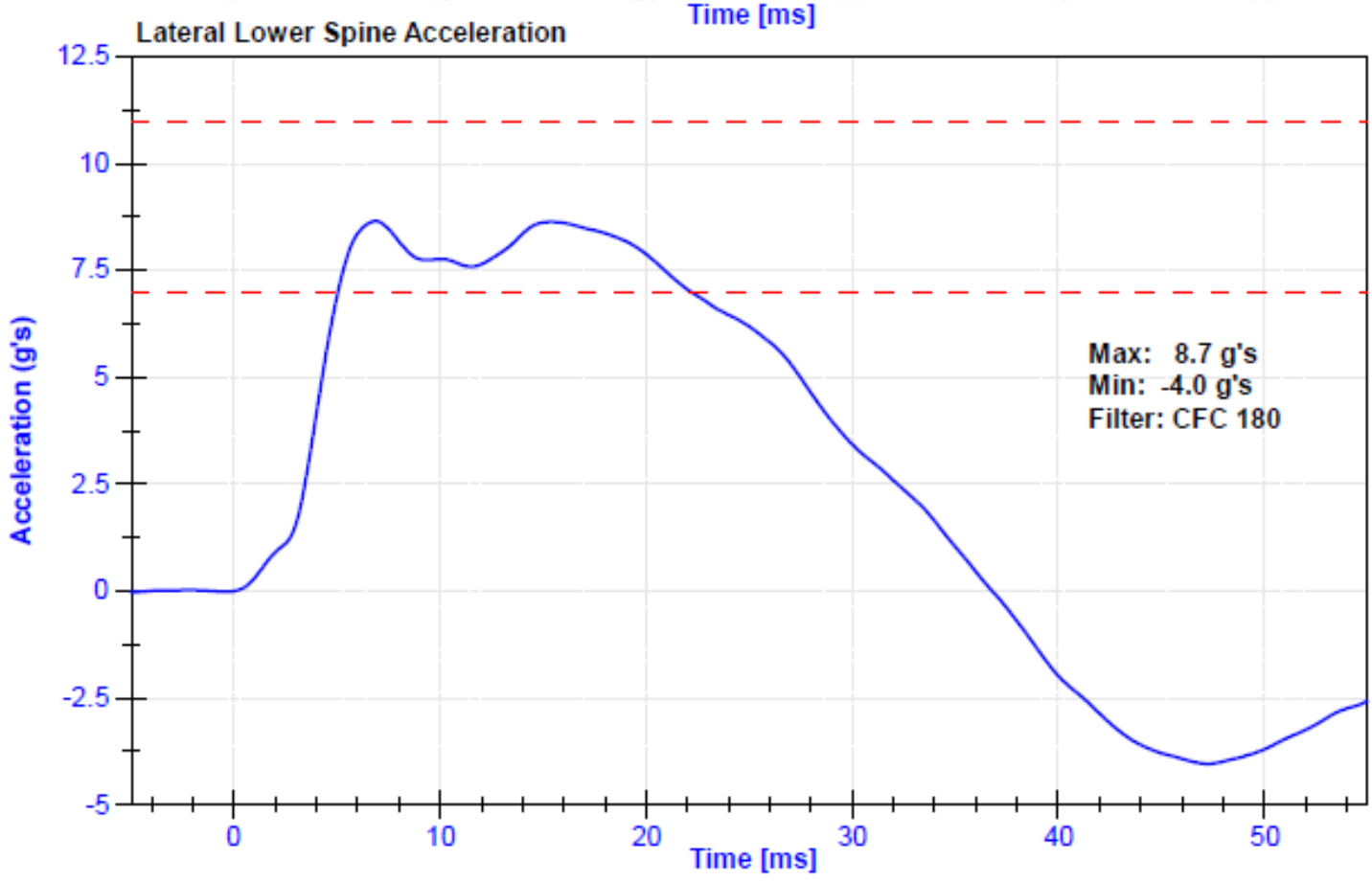



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 35.4 mm
Min: 0.0 mm
Filter: CFC 600


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: 39.2 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 14.1 g's
Min: -6.9 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 8.7 g's
Min: -4.0 g's
Filter: CFC 180

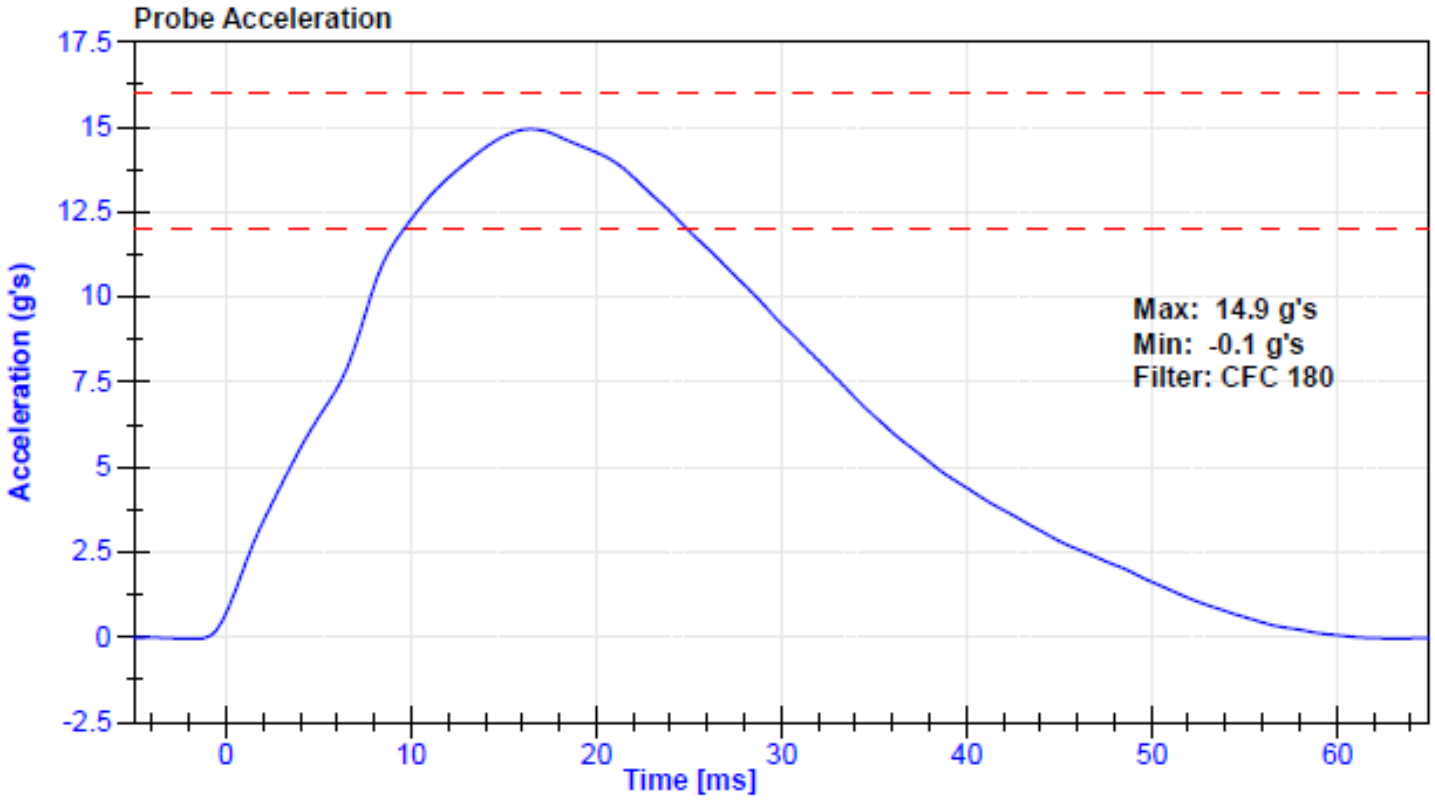
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | T. Roseman |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

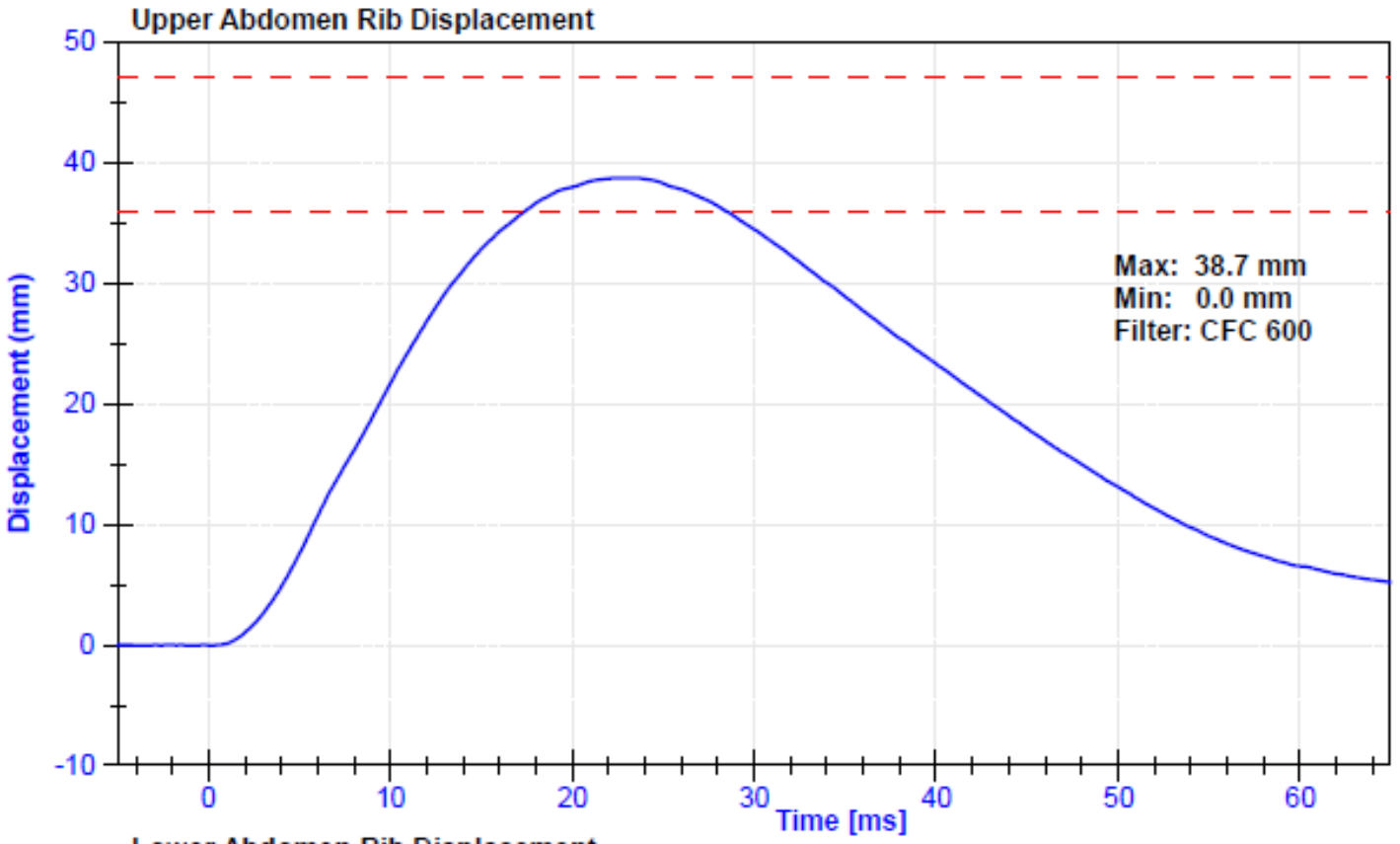
**Results**

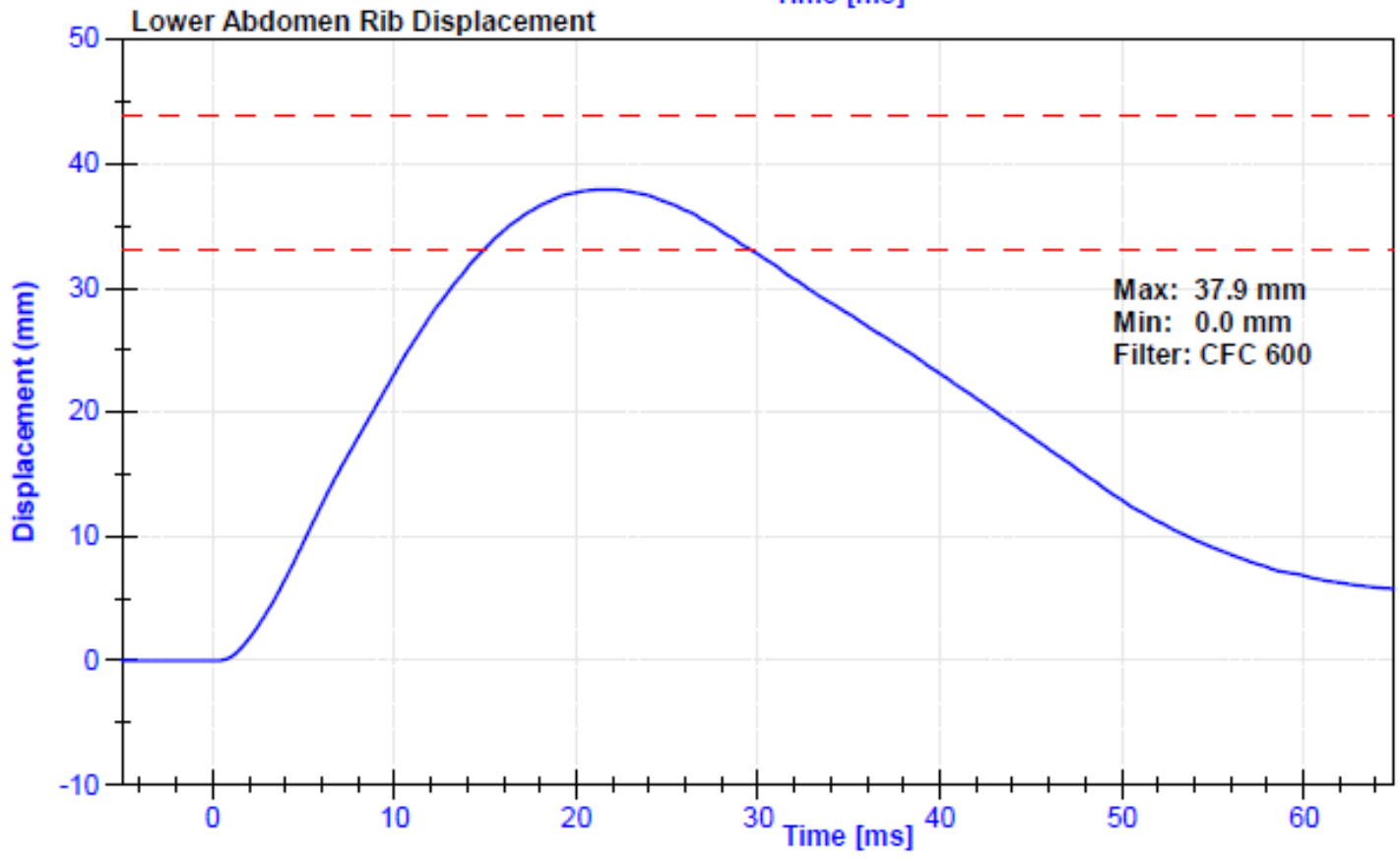
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 24.5 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.32 | Pass |
| Probe Acceleration | 12 | 16 | g's | 14.9 | Pass |
| Lateral Lower Spine Acceleration | 9 | 14 | g's | 11.8 | Pass |
| Upper Abdomen Rib Deflection | 36 | 47 | mm | 38.7 | Pass |
| Lower Abdomen Rib Deflection | 33 | 44 | mm | 37.9 | Pass |

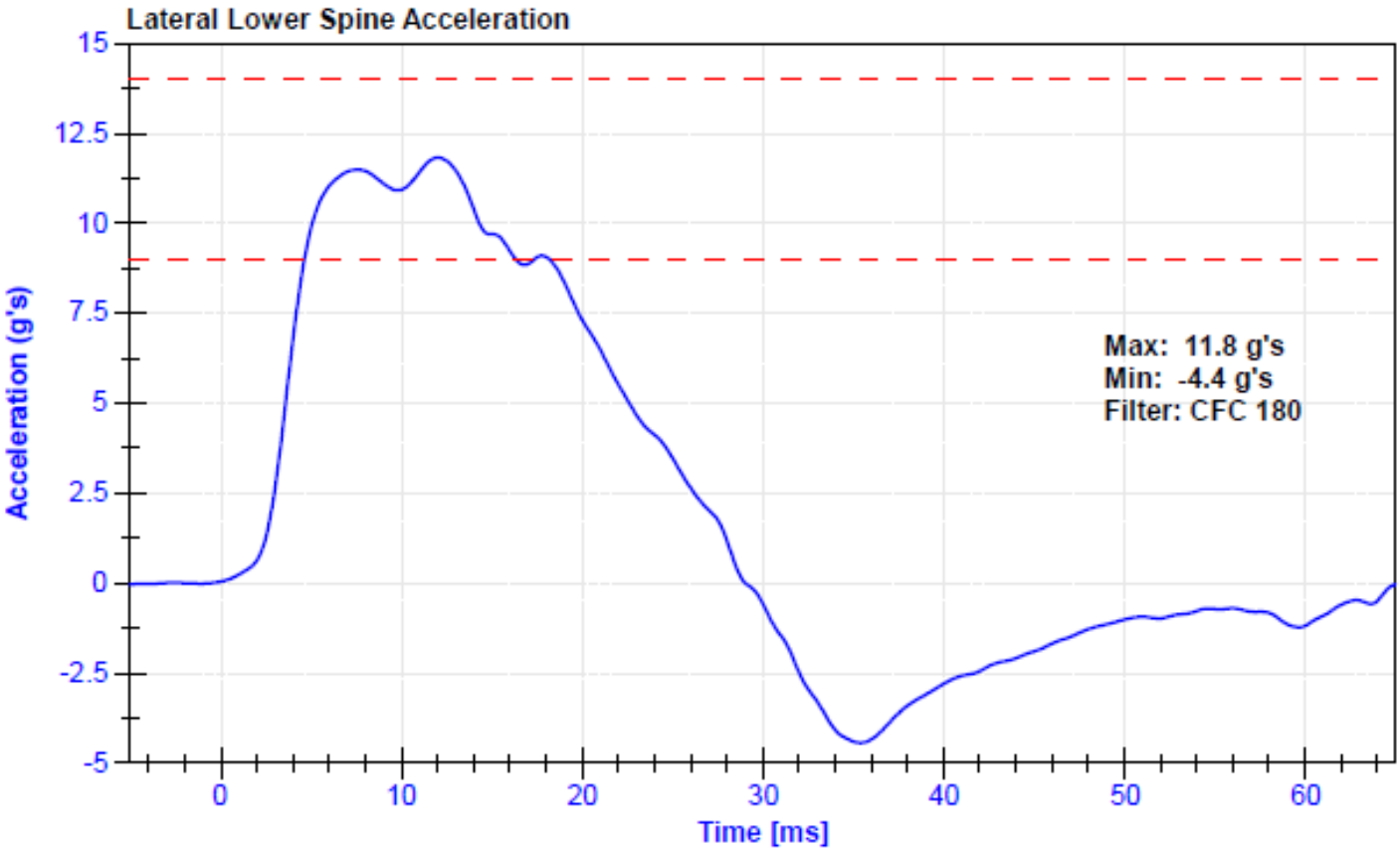
**Transducer Calibrations**

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Probe Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Lower Spine Y Accelerometer | Endevco | P52071 | 4/4/2023 | 10/1/2023 |
| Upper Abdomen Rib Potentiometer | Servo | 307GFE | 4/10/2023 | 10/9/2023 |
| Lower Abdomen Rib Potentiometer | Servo | 308GFE | 4/10/2023 | 10/9/2023 |




Upper Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 38.7 mm
Min: 0.0 mm
Filter: CFC 600


Lower Abdomen Rib Displacement
Displacement (mm)
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
Time [ms]
Max: 37.9 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
-5
0
10
20
30
40
50
60
Time [ms]
Max: 11.8 g's
Min: -4.4 g's
Filter: CFC 180

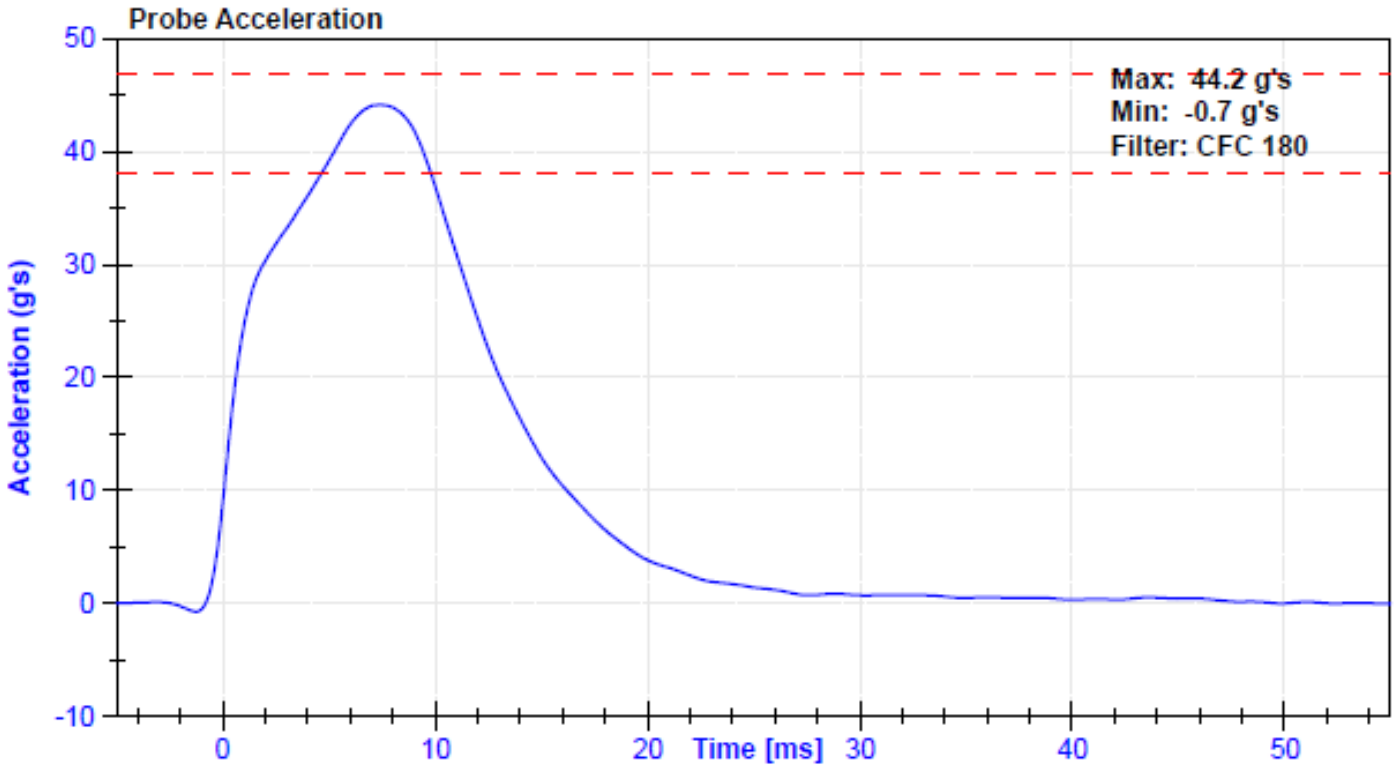
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

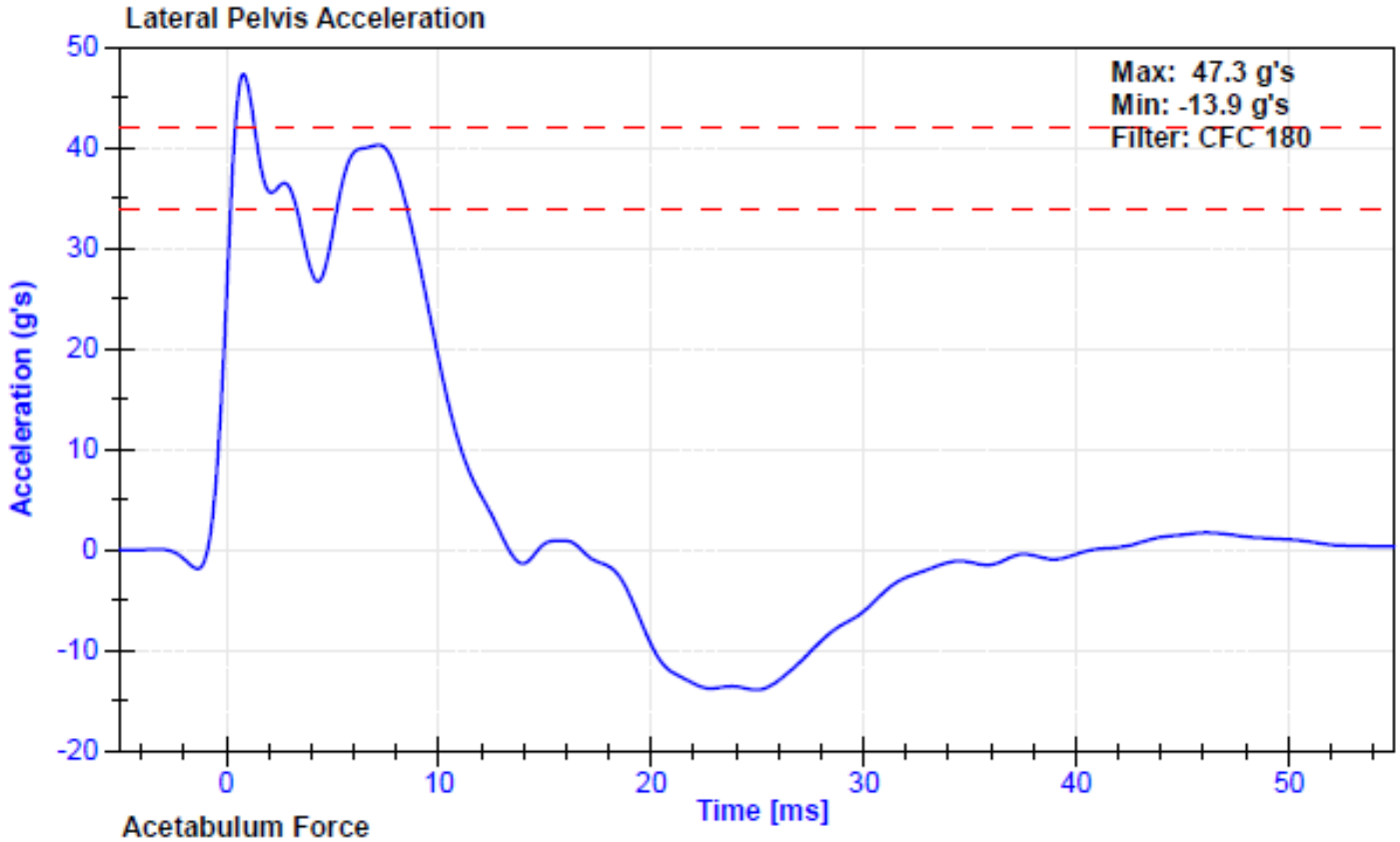
**Results**

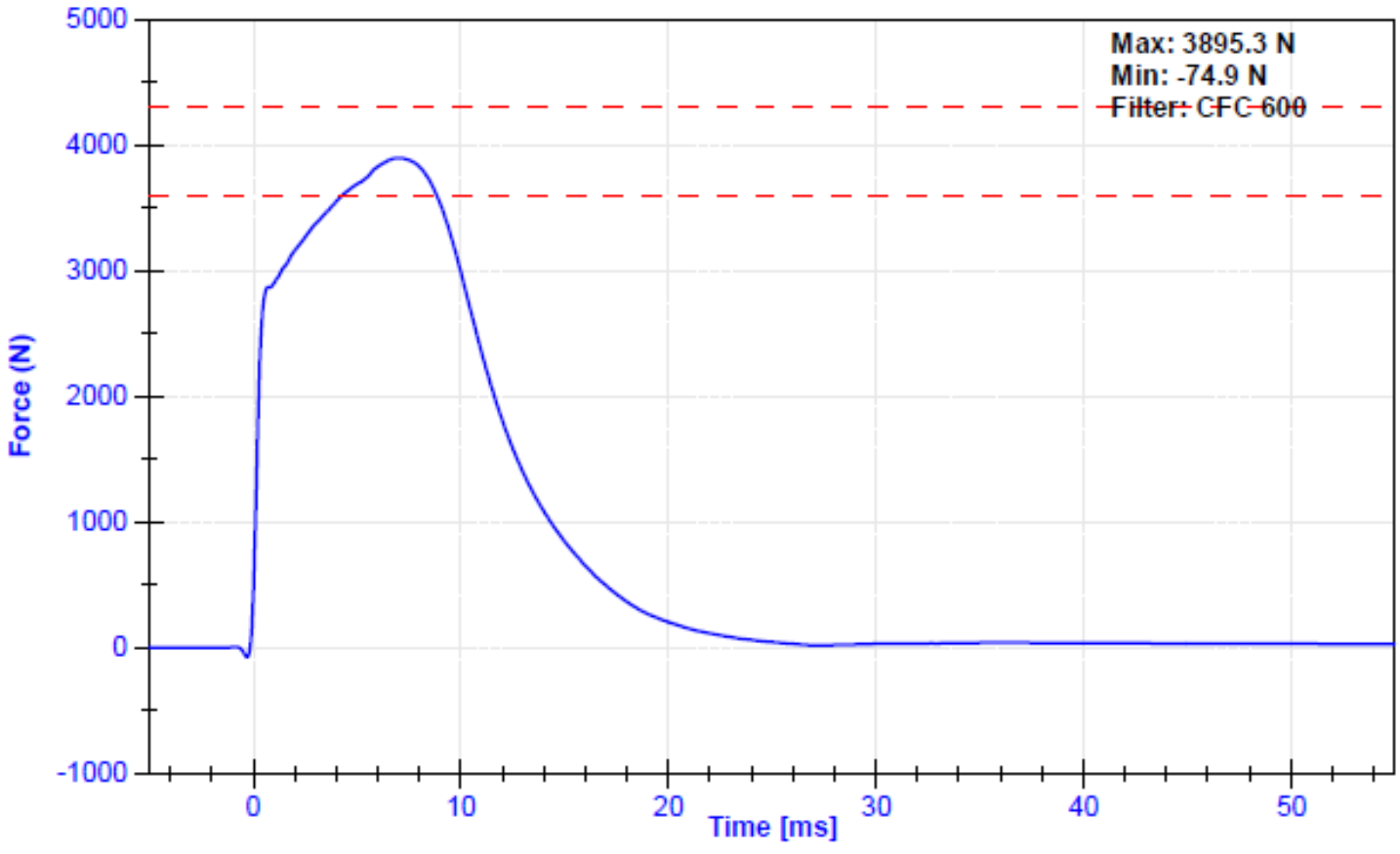
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.0 | Pass |
| Humidity | 10 | 70 | % | 26.5 | Pass |
| Velocity | 6.6 | 6.8 | m/s | 6.74 | Pass |
| Probe Acceleration | 38 | 47 | g's | 44.2 | Pass |
| Lateral Pelvis Acceleration after 6ms | 34 | 42 | g's | 40.3 | Pass |
| Acetabulum Force | 3600 | 4300 | N | 3895.3 | Pass |

**Transducer Calibrations**

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Pelvis Y Accelerometer | Endevco | P51731 | 4/4/2023 | 10/1/2023 |
| Acetabulum Load Cell | Denton | 267-FY | 8/11/2022 | 8/11/2023 |
| Certification Plug | SACO | | | N/A |
| Crash Test Plug | SACO | | | N/A |




Lateral Pelvis Acceleration
Max: 47.3 g's
Min: -13.9 g's
Filter: CFC 180
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 3895.3 N
Min: -74.9 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

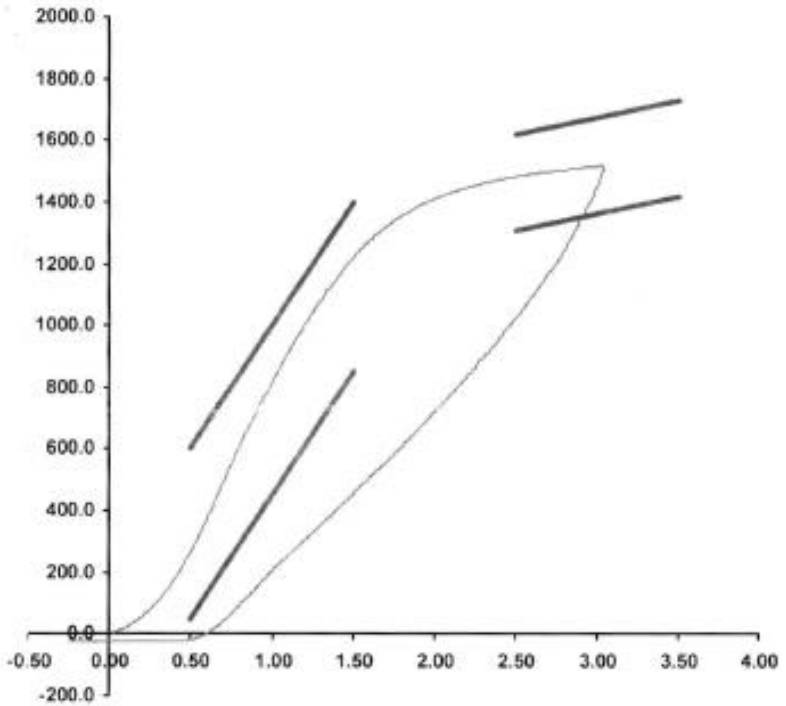
Cert 4/11/23

## SID-IIs Pelvis Plug Certification Test

Plug S/N 15460
Test Number 20121
Report Number 20175
Test Date 9/9/2021 11:01:56 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 272 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,225 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,484 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,517 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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

Notes:

Operator

Part Number 180-4450

Template No 107 09-Sep-21
SACO Research

By : DC Date : 9/9/2021

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

SACO RESEARCH

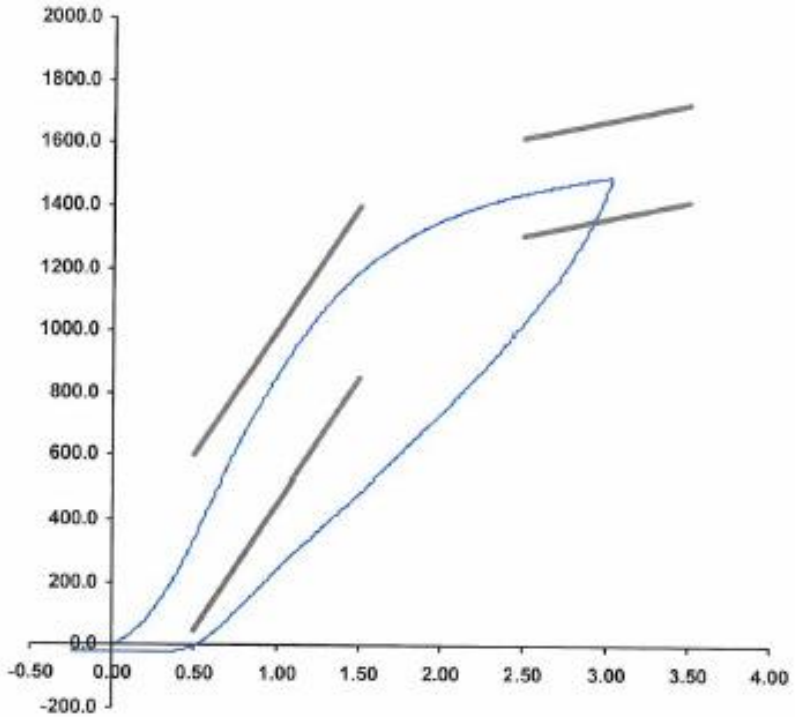
Impact
300 7-25-2023

## SID-IIs Pelvis Plug Certification Test

Plug S/N 15240
Test Number 17991
Report Number 18040
Test Date 3/10/2021 1:09:49 PM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 344 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,189 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,441 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,494 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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

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

Notes:

Operator

Part Number 180-4450

Template No 107 10-Mar-21
SACO Research

By : DC Date : 3/10/2021

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

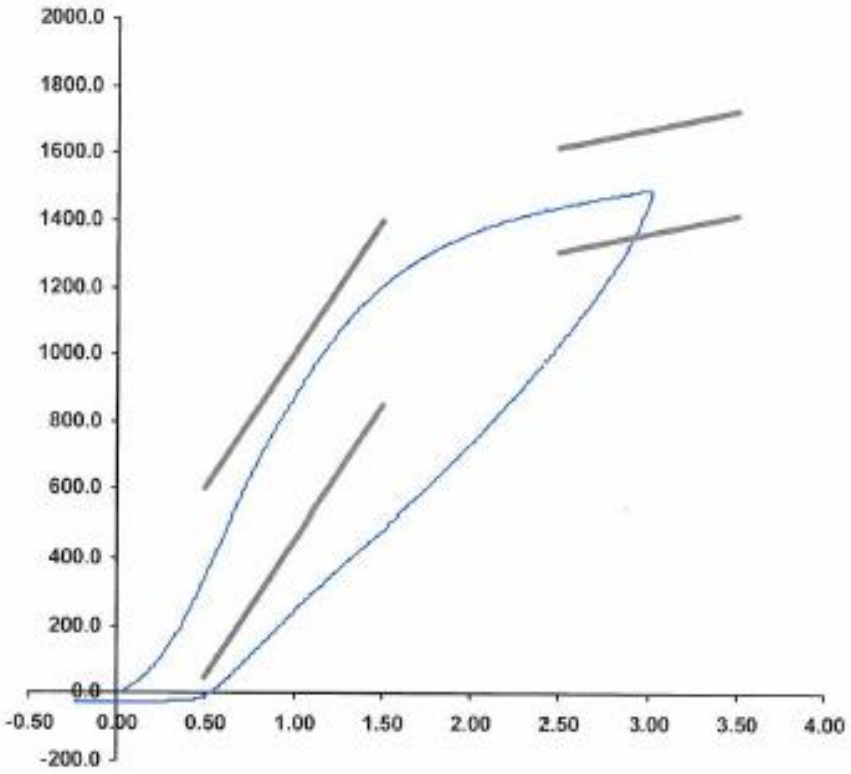
NOAN - IMPACT
300 2-25-2023

## SID-IIs Pelvis Plug Certification Test

Plug S/N 15172
Test Number 17888
Report Number 17937
Test Date 3/8/2021 12:09:30 PM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 352 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,209 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,445 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,493 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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

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

Notes:

Operator

Part Number 180-4450

Template No 107 08-Mar-21
SACO Research

By : DC Date : 3/8/2021



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

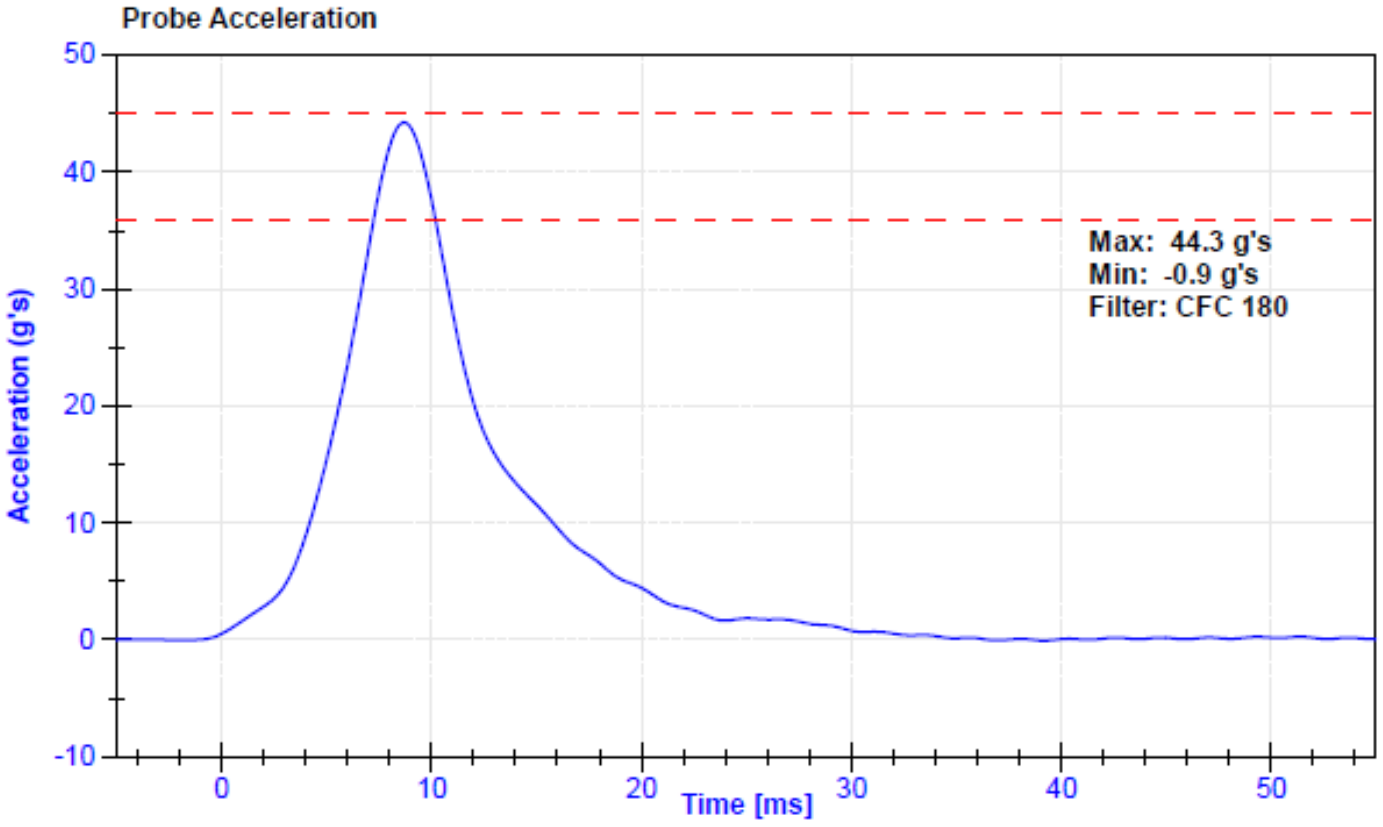
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | D. Sakona |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

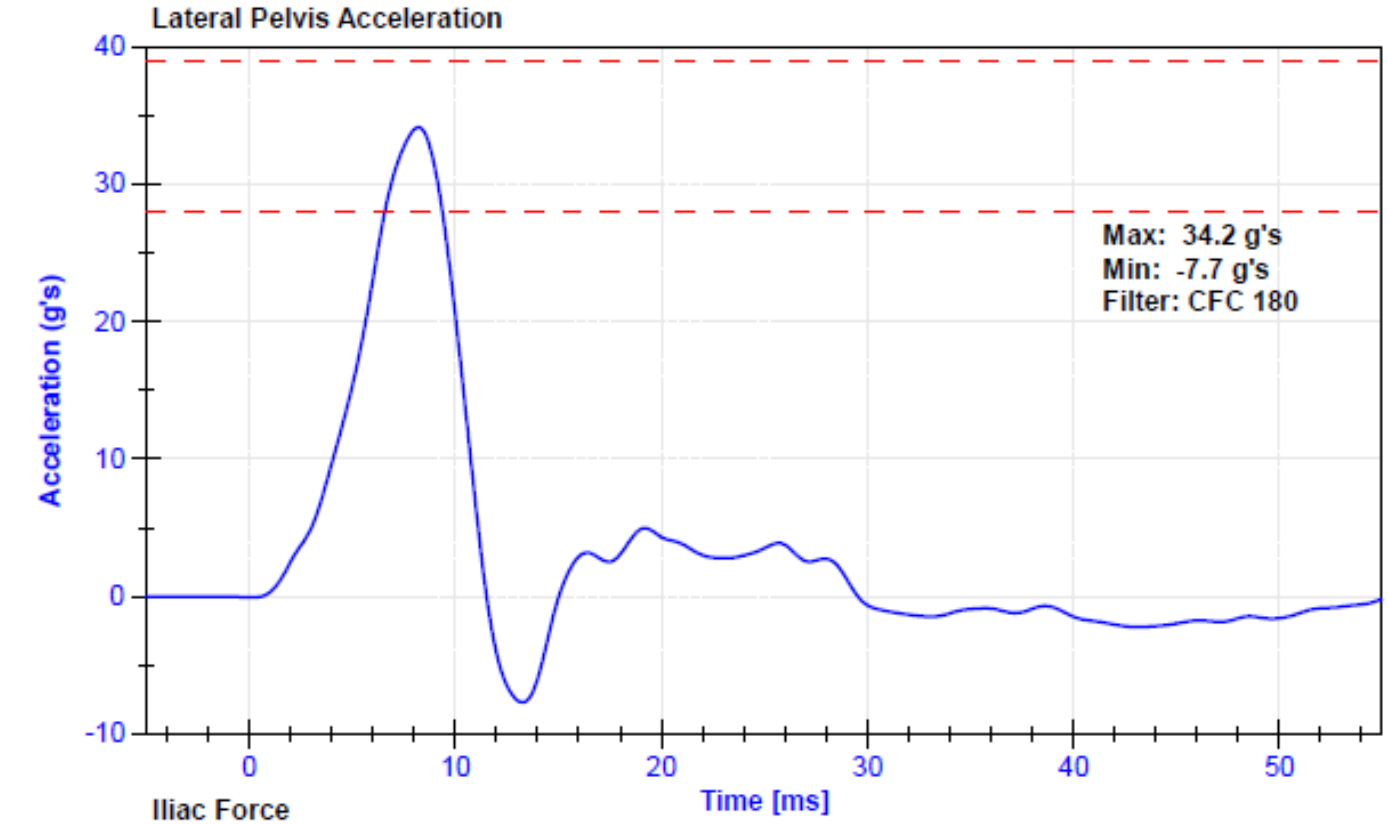
**Results**

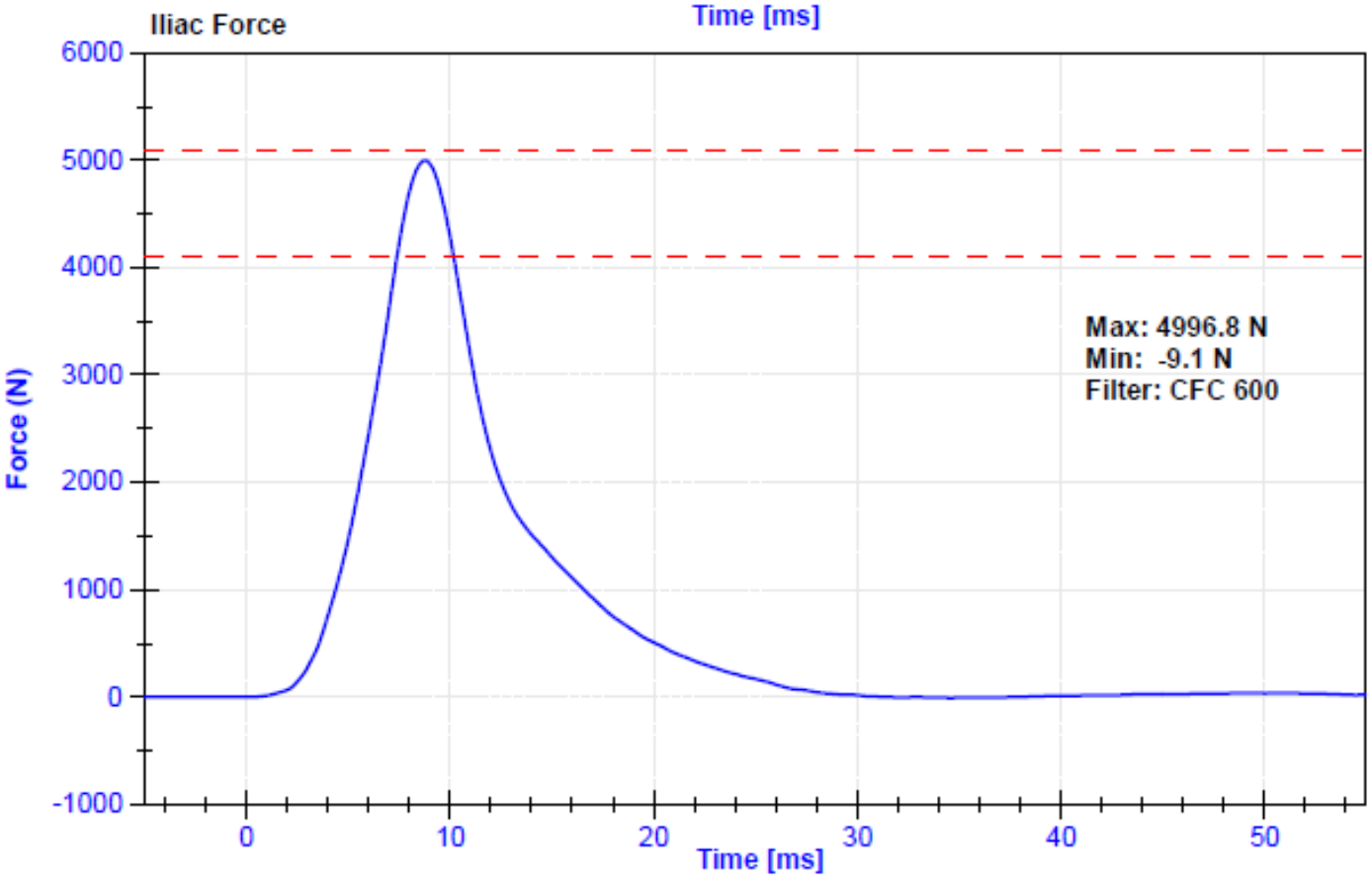
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.0 | Pass |
| Humidity | 10 | 70 | % | 26.5 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.35 | Pass |
| Probe Acceleration | 36 | 45 | g's | 44.3 | Pass |
| Lateral Pelvis Acceleration | 28 | 39 | g's | 34.2 | Pass |
| Iliac Force | 4100 | 5100 | N | 4996.8 | Pass |

**Transducer Calibrations**

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Pelvis Y Accelerometer | Endevco | P51731 | 4/4/2023 | 10/1/2023 |
| Iliac Load Cell | Denton | 280-FY | 8/11/2022 | 8/11/2023 |




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 34.2 g's
Min: -7.7 g's
Filter: CFC 180


Iliac Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4996.8 N
Min: -9.1 N
Filter: CFC 600

**CALIBRATION TEST RESULTS**

**POST-TEST**

**SID-IIS 5TH PERCENTILE FEMALE - DRIVER ATD**

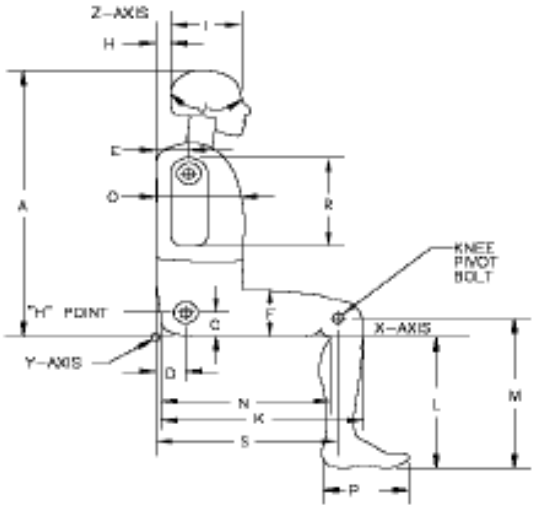
**SERIAL NO: 300**

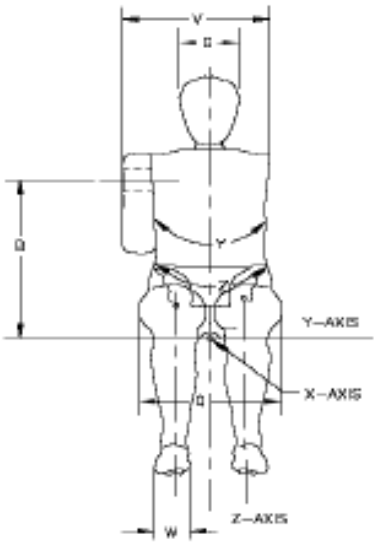
**(CONFIGURED FOR LEFT SIDE IMPACT)**

External Measurements - SID-IIs

Technician: K. Brogan  Date: 04/18/2023

Dummy Serial Number: 300




| Symbol | Description | Specification (mm) | | Result (mm) | Pass/Fail |
|---|---|---|---|---|---|
| A | Sitting Height | 772 | 788 | 781 | Pass |
| B | Shoulder Pivot Height | 437 | 453 | 444 | Pass |
| C | H-point Height | 79 | 89 | 84 | Pass |
| D | H-point from seatback | 141 | 151 | 145 | Pass |
| E | Shoulder Pivot from Backline | 97 | 107 | 100 | Pass |
| F | Thigh Clearance | 119 | 135 | 122 | Pass |
| G | Head Breadth | 140 | 148 | 144 | Pass |
| H | Head Back from Backline | 40 | 46 | 42 | Pass |
| I | Head Depth | 178 | 188 | 181 | Pass |
| J | Head Circumference | 541 | 551 | 547 | Pass |
| K | Buttock to Knee Length | 514 | 540 | 528 | Pass |
| L | Popliteal Height | 343 | 369 | 357 | Pass |
| M | Knee Pivot to floor height | 392 | 409 | 403 | Pass |
| N | Buttock Popliteal Length | 416 | 442 | 430 | Pass |
| O | Chest Depth w/o jacket | 195 | 211 | 201 | Pass |
| P | Foot Length | 216 | 232 | 221 | Pass |
| Q | Hip Breadth (w/pelvic plugs) | 313 | 323 | 318 | Pass |
| R | Arm Length | 249 | 259 | 252 | Pass |
| S | Knee Joint to seatback | 477 | 493 | 486 | Pass |
| V | Shoulder Width | 341 | 357 | 348 | Pass |
| W | Foot Width | 78 | 94 | 85 | Pass |
| Y | Chest Circumference w/jacket | 851 | 881 | 876 | Pass |
| Z | Waist Circumference | 761 | 791 | 777 | Pass |

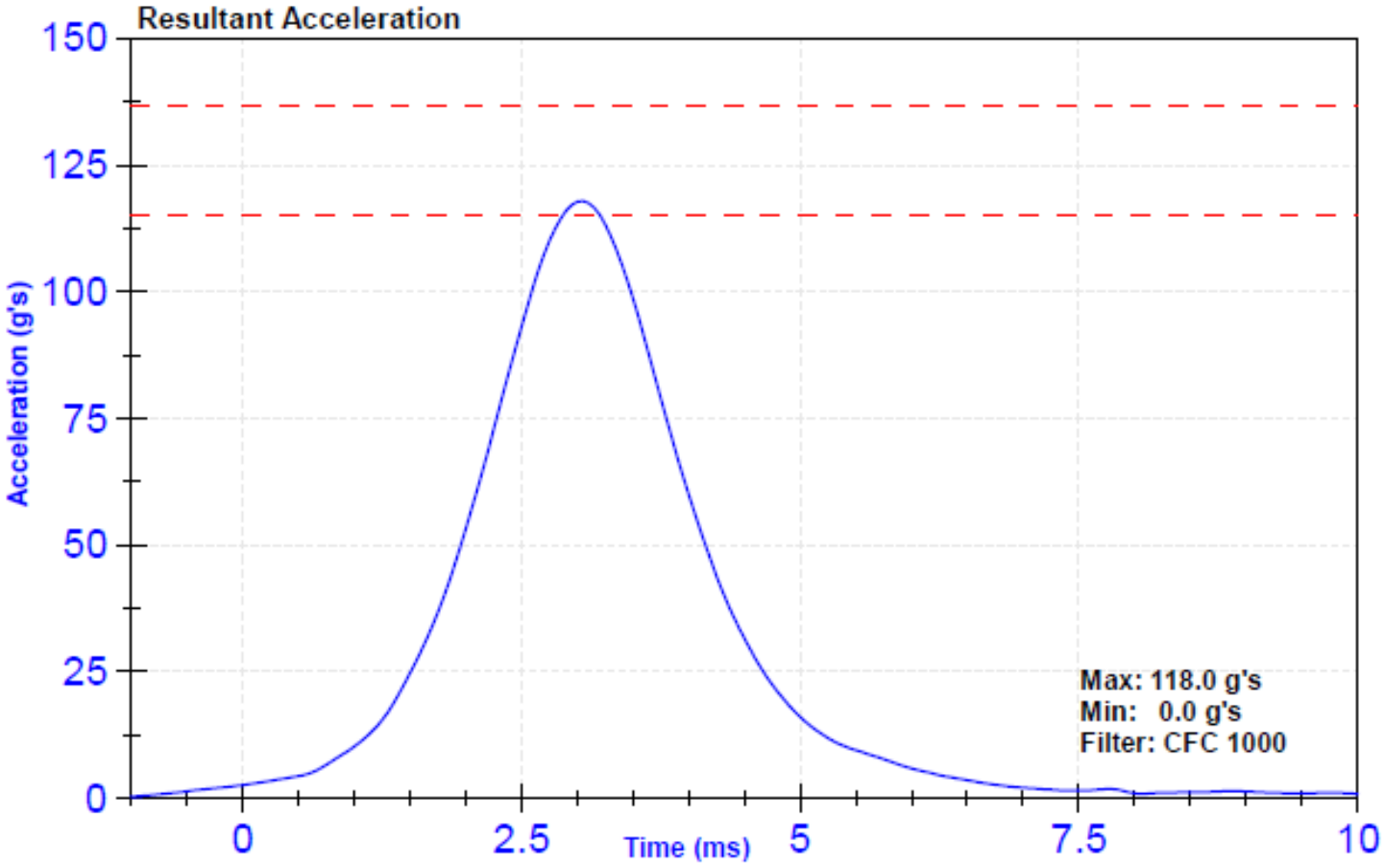
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | T. Roseman |
| ATD Serial Number | 300 | Laboratory Supervisor | K. Brogan |

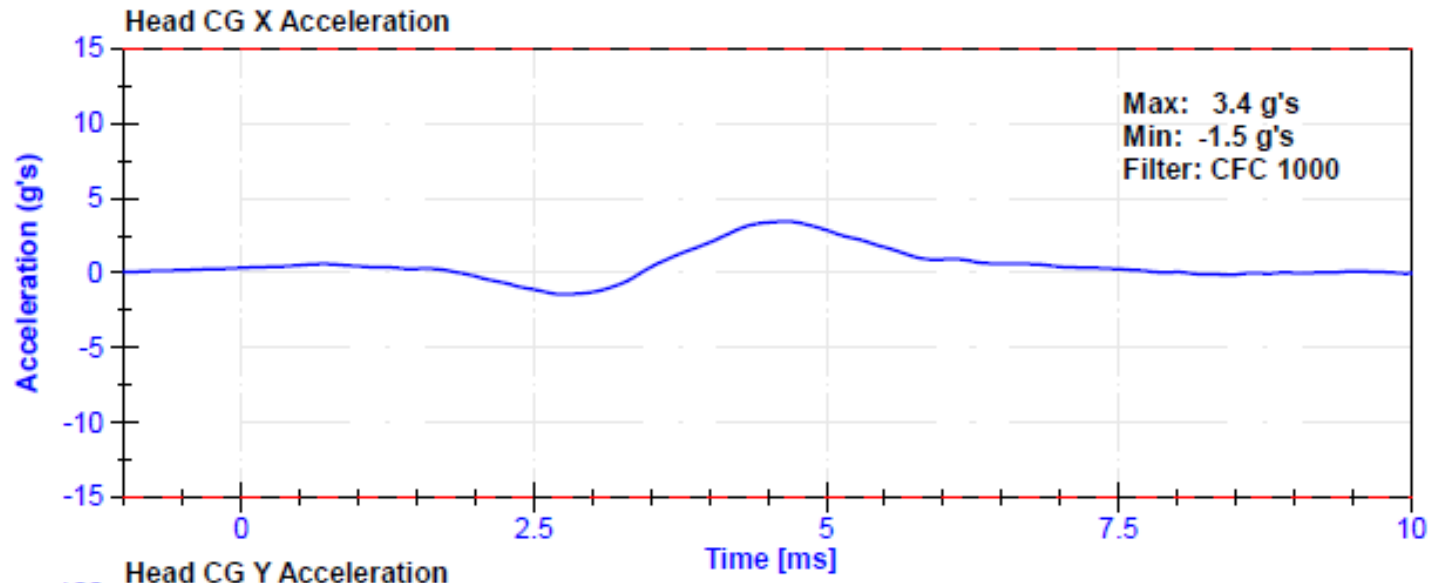
**Results**

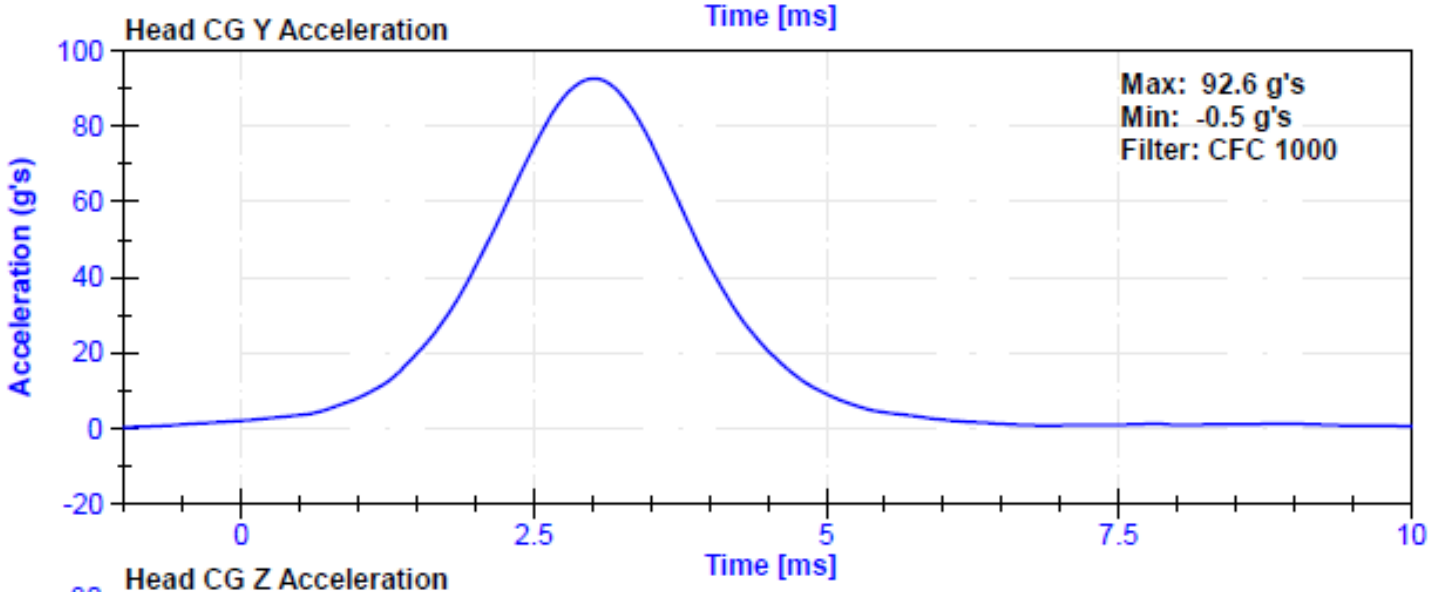
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 20.9 | Pass |
| Humidity | 10 | 70 | % | 15.2 | Pass |
| Resultant Acceleration | 115 | 137 | g's | 118.0 | Pass |
| Oscillation | 0 | 15 | % | 1.5 | Pass |
| Fore-Aft Acceleration | -15 | 15 | g's | 3.4 | Pass |

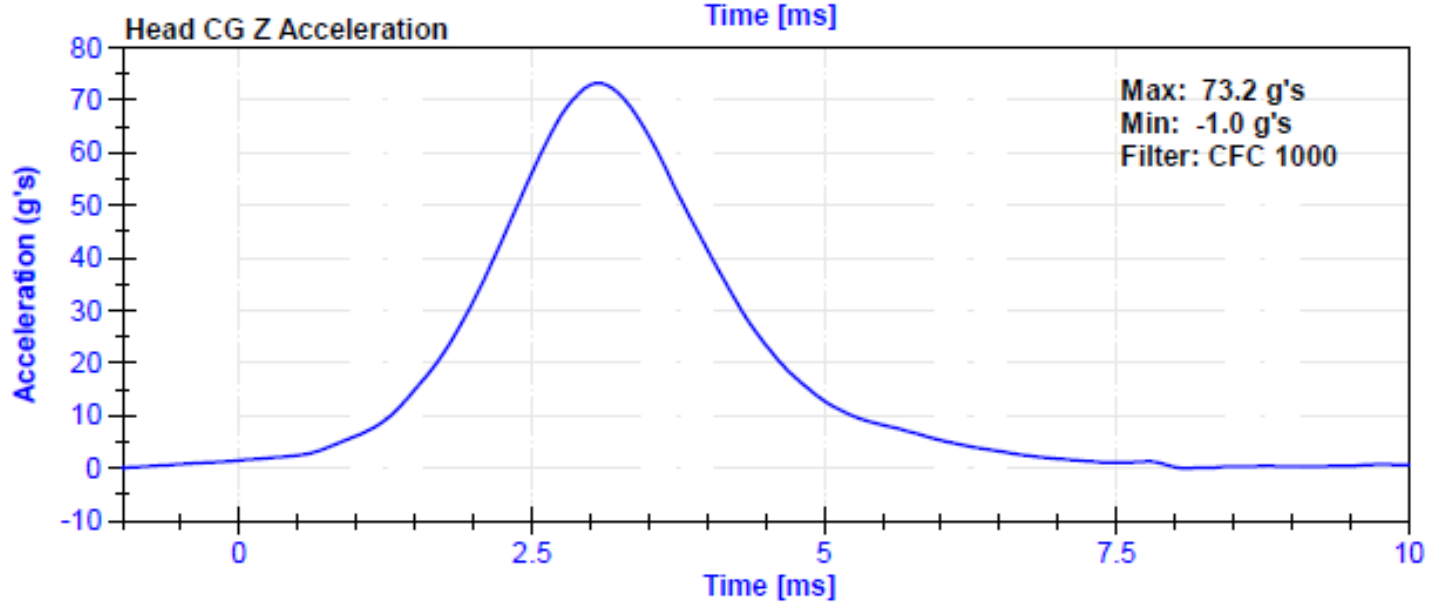
**Transducer Calibrations**

| Channel | Manufacturer | Serial Number | Calibratio Date | Calibratio Due Date |
|---|---|---|---|---|
| X Accelerometer | Endevco | P59018 | 4/4/2023 | 10/1/2023 |
| Y Accelerometer | Endevco | P79189 | 4/4/2023 | 10/1/2023 |
| Z Accelerometer | Endevco | P79587 | 4/4/2023 | 10/1/2023 |




Head CG X Acceleration
Max: 3.4 g's
Min: -1.5 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Y Acceleration
Max: 92.6 g's
Min: -0.5 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]


Head CG Z Acceleration
Max: 73.2 g's
Min: -1.0 g's
Filter: CFC 1000
Acceleration (g's)
Time [ms]

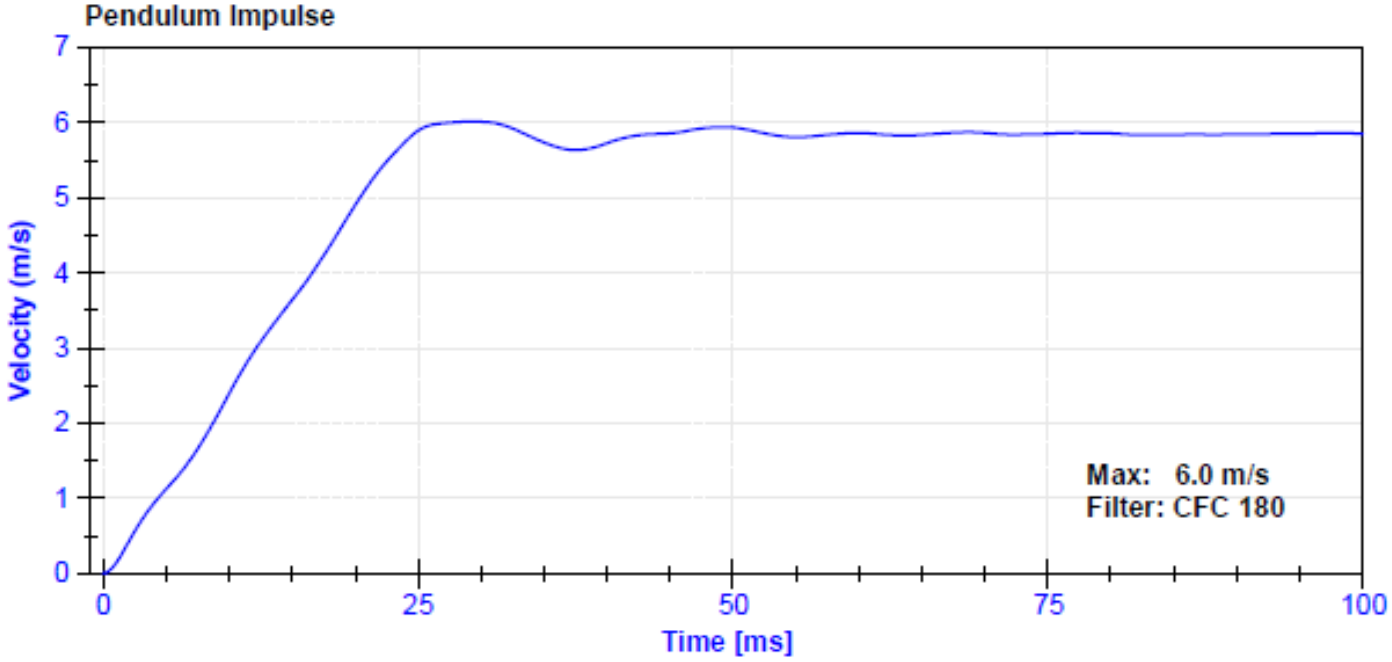
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | C. Mantell |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

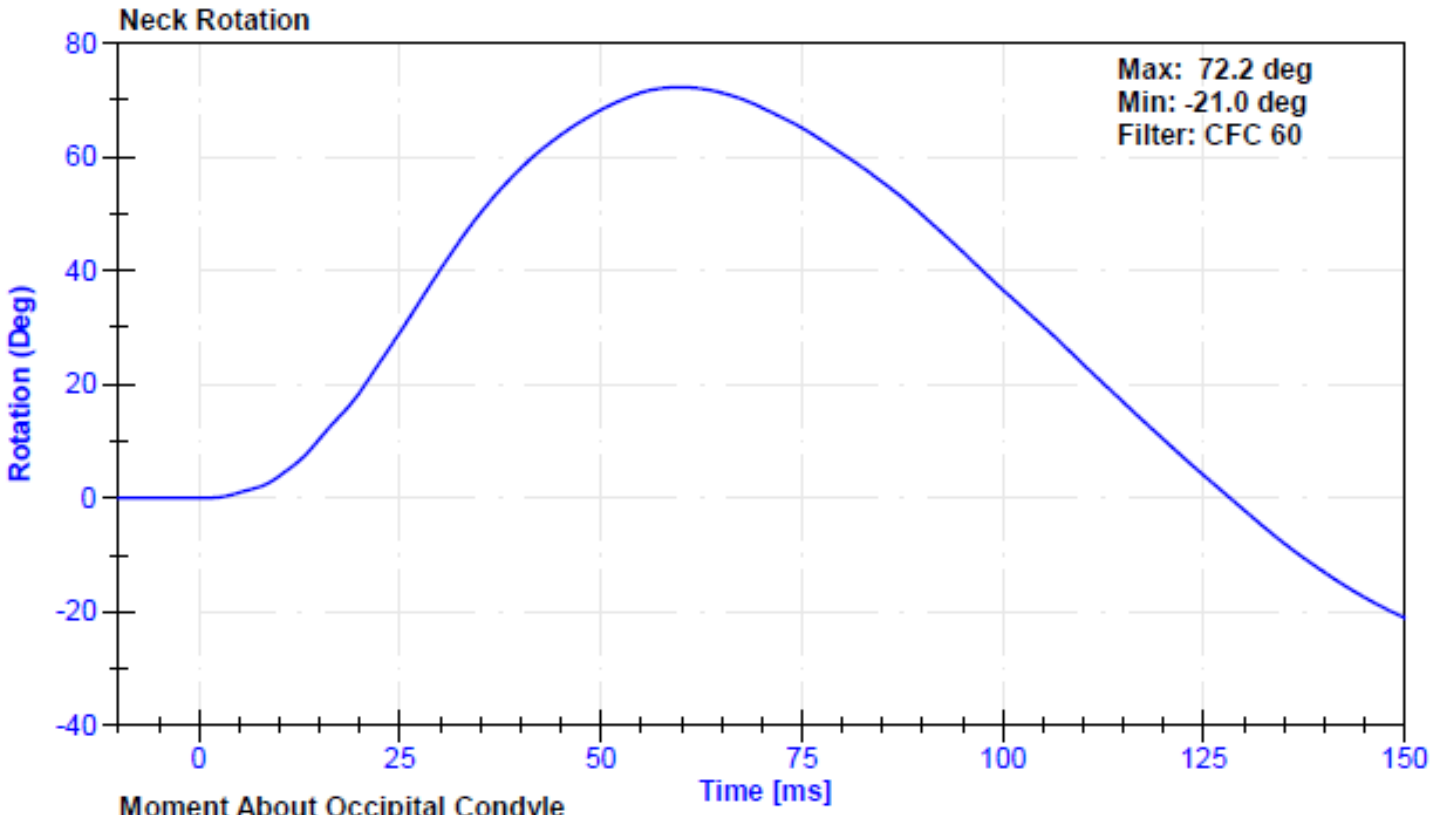
**Results**

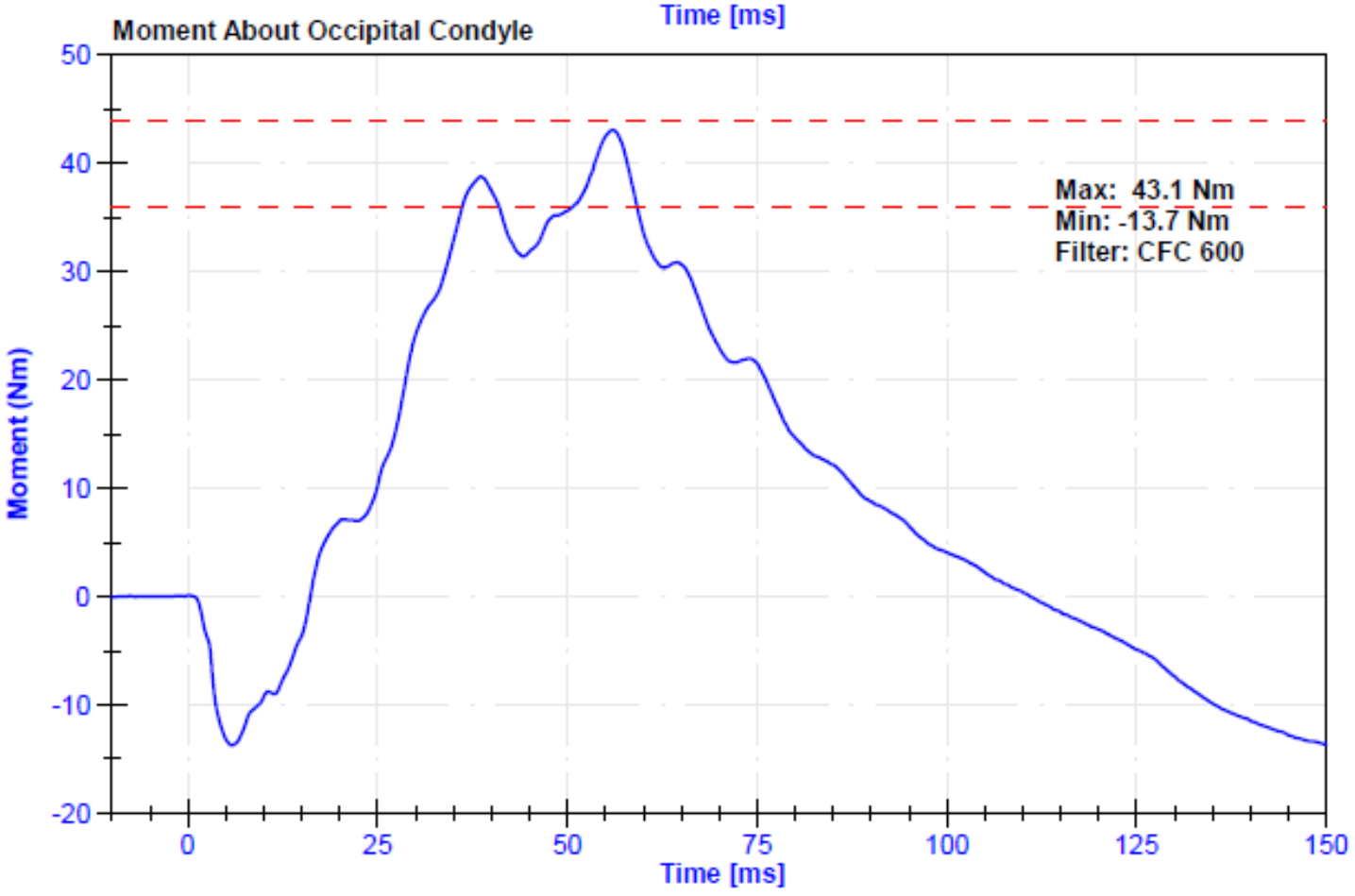
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | °C | 21.6 | Pass |
| Humidity | 10 | 70 | % | 29.1 | Pass |
| Velocity | 5.51 | 5.63 | m/s | 5.620 | Pass |
| Pendulum Impulse at 10ms | 2.2 | 2.8 | m/s | 2.40 | Pass |
| Pendulum Impulse at 15ms | 3.3 | 4.1 | m/s | 3.64 | Pass |
| Pendulum Impulse at 20ms | 4.4 | 5.4 | m/s | 4.90 | Pass |
| Pendulum Impulse at 25ms | 5.4 | 6.1 | m/s | 5.89 | Pass |
| Pendulum Impulse from 25 to 100ms | 5.5 | 6.2 | m/s | 6.01 | Pass |
| Neck Rotation | 71 | 81 | deg | 72.2 | Pass |
| Time at Maximum Rotation | 50 | 70 | ms | 59.9 | Pass |
| Moment about the OC | 36 | 44 | Nm | 43.1 | Pass |
| Moment Decay to 0 Nm | 102 | 126 | ms | 111.1 | Pass |

**Transducer Calibrations**

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | 7231C-750 | 10/26/2022 | 10/26/2023 |
| Pendulum Potentiometer | Servo | 4961 | 11/11/2022 | 11/11/2023 |
| Condyle Potentiometer | Servo | DS185 | 11/11/2022 | 11/11/2023 |
| Upper Neck Load Cell | Humanetics | 1716A_1872-FY | 6/13/2022 | 6/13/2023 |




Neck Rotation
Max: 72.2 deg
Min: -21.0 deg
Filter: CFC 60
Rotation (Deg)
80
60
40
20
0
-20
-40
0
25
50
75
100
125
150
Time [ms]


Moment About Occipital Condyle
Max: 43.1 Nm
Min: -13.7 Nm
Filter: CFC 600
Moment (Nm)
50
40
30
20
10
0
-10
-20
0
25
50
75
100
125
150
Time [ms]

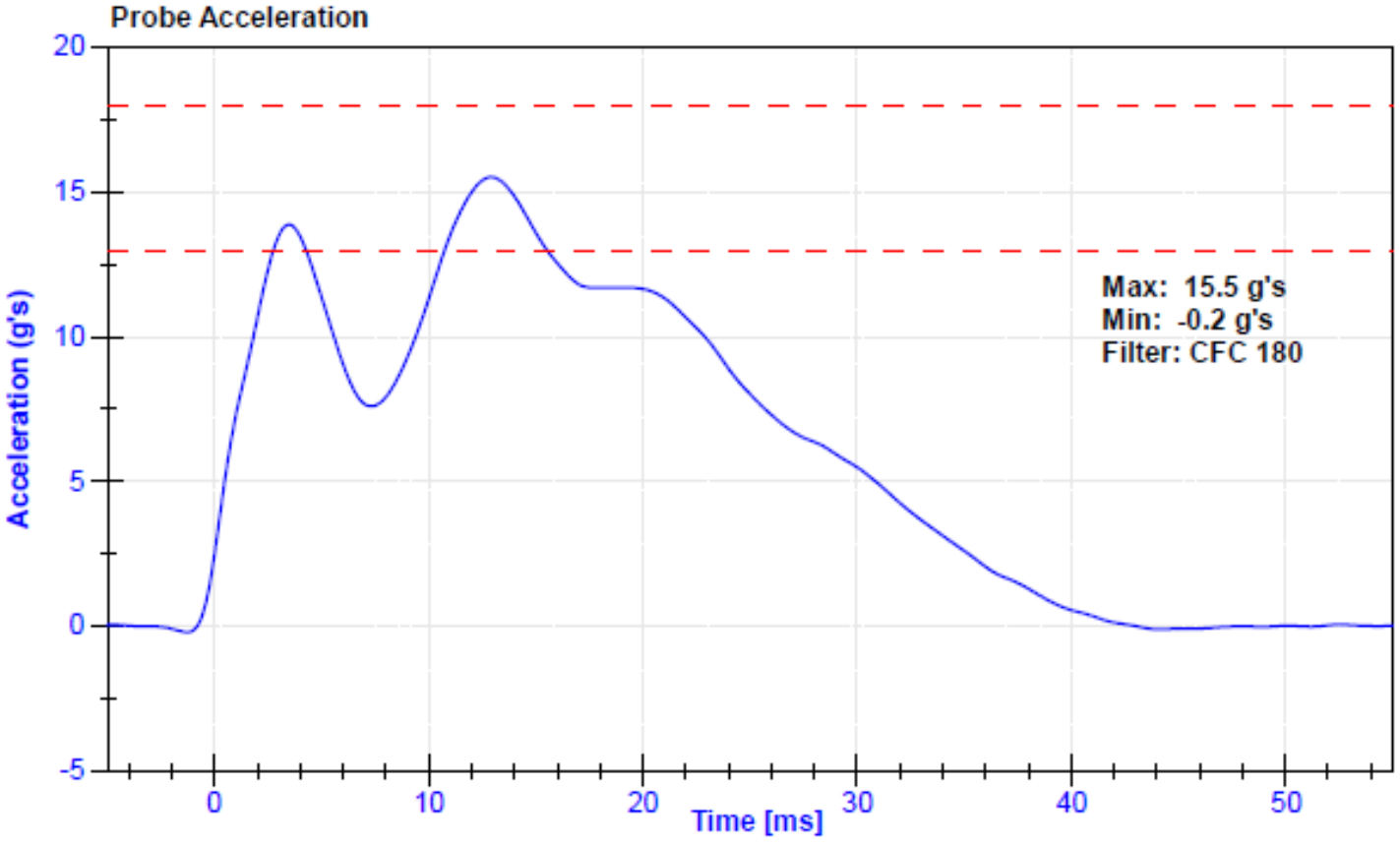
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | C. Mantell |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

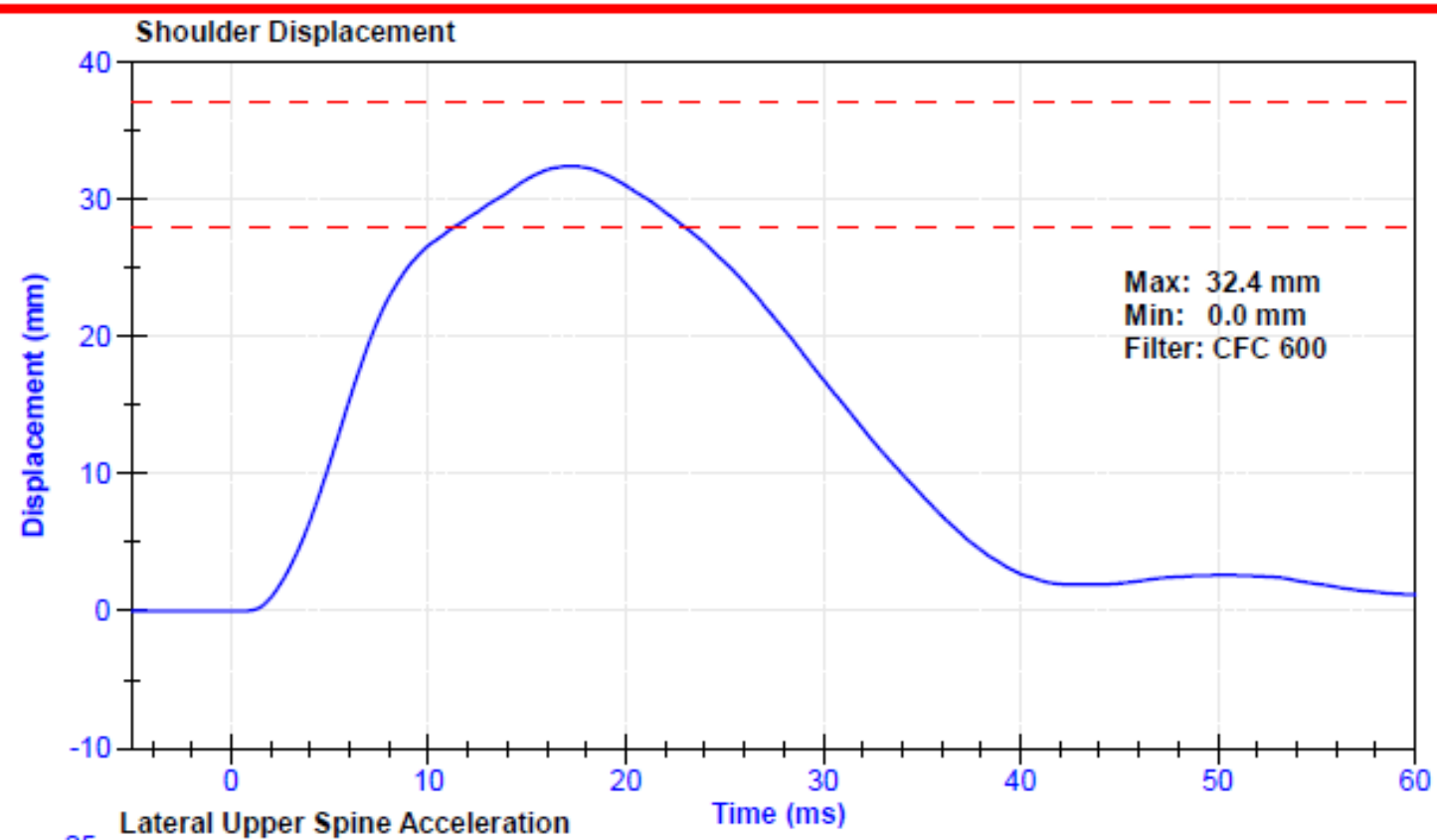
## Results

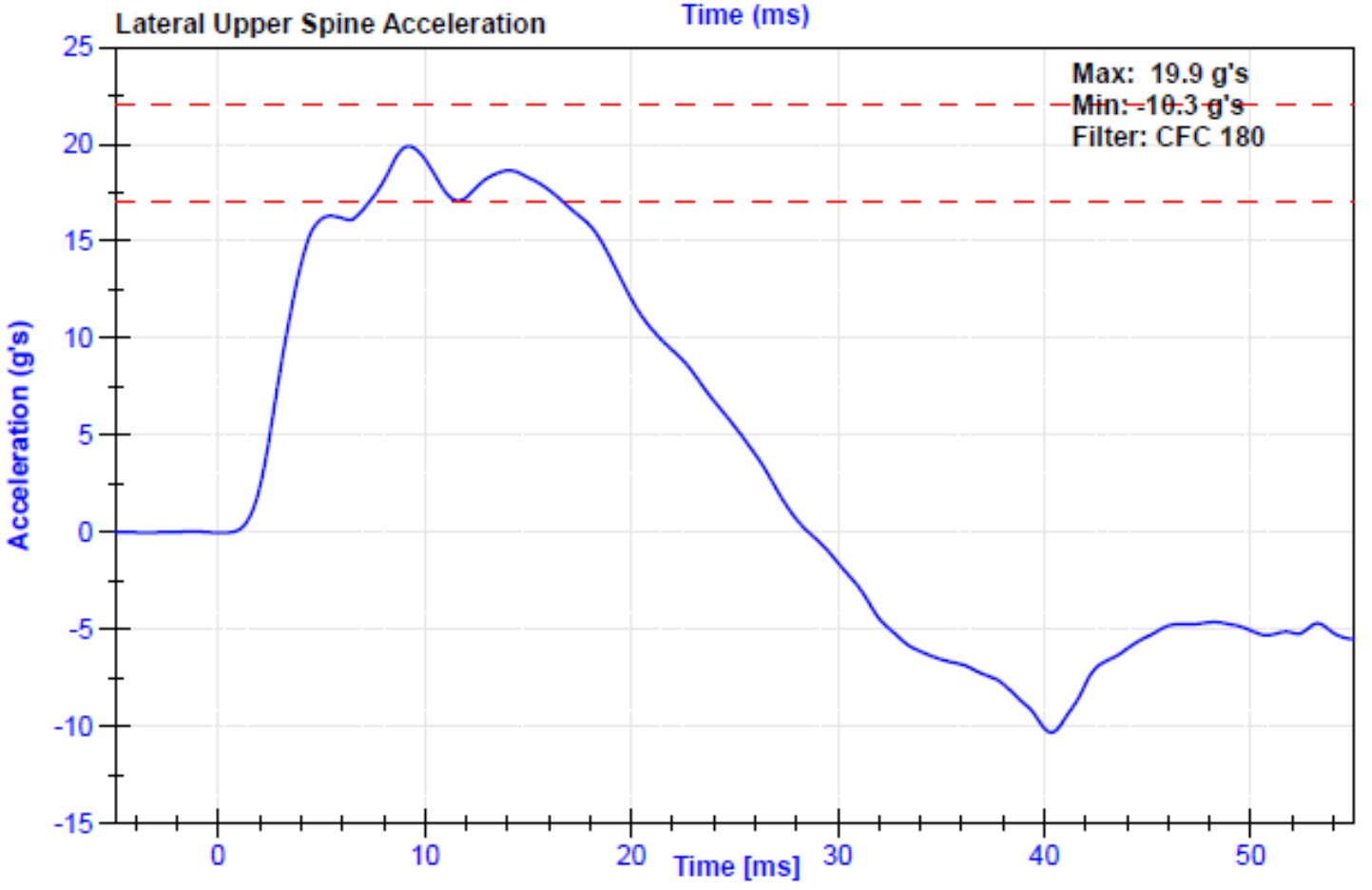
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 29.0 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.34 | Pass |
| Probe Acceleration | 13 | 18 | g's | 15.5 | Pass |
| Shoulder Deflection | 28 | 37 | mm | 32.4 | Pass |
| Lateral Upper Spine Acceleration | 17 | 22 | g's | 19.9 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Shoulder Potentiometer | Servo | 053GFE | 4/10/2023 | 10/9/2023 |
| Upper Spine Y Accelerometer | Endevco | T20880 | 4/4/2023 | 10/1/2023 |




Shoulder Displacement
Displacement (mm)
Time (ms)
Max: 32.4 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 19.9 g's
Min: -10.3 g's
Filter: CFC 180

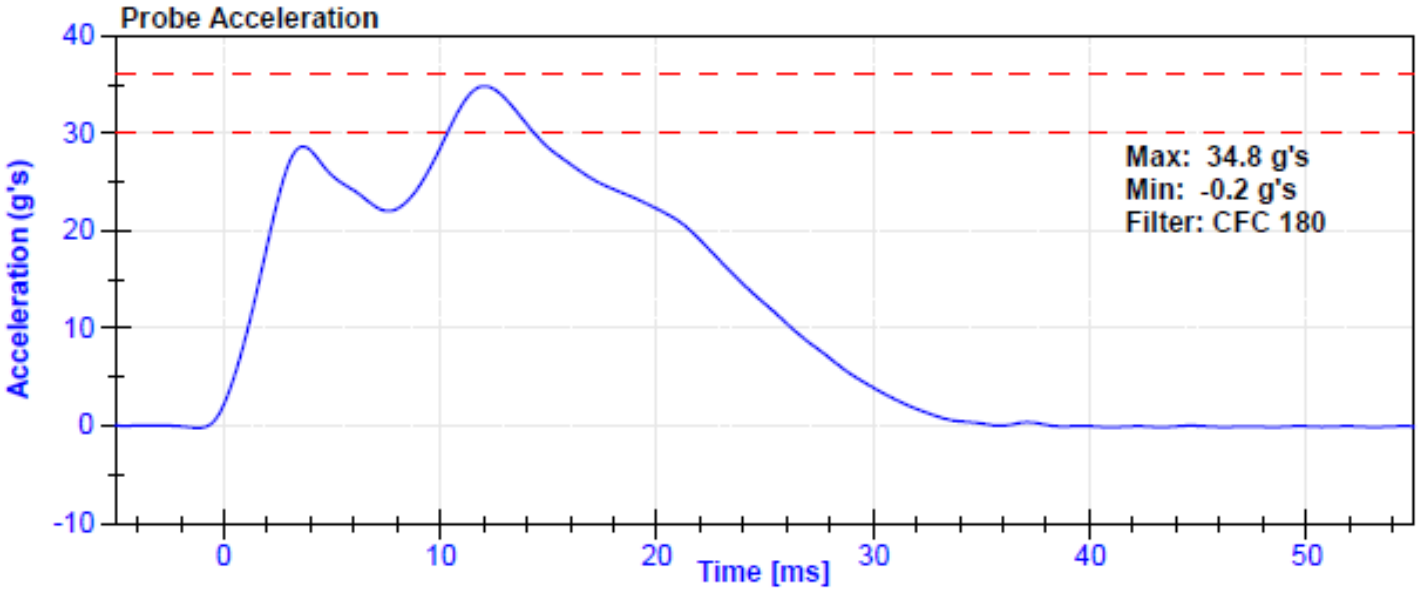
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | C. Mantell |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

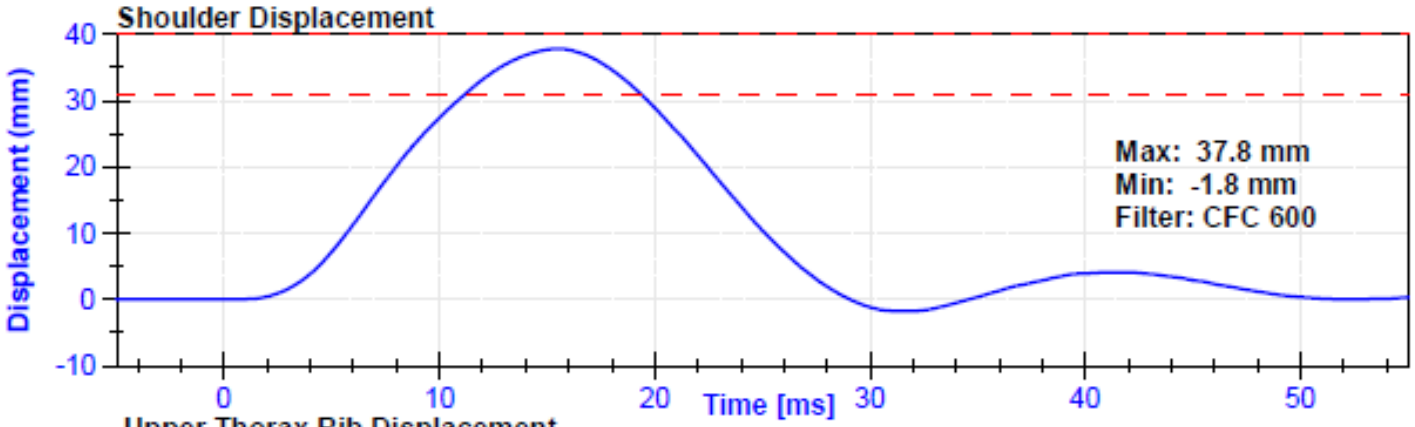
## Results

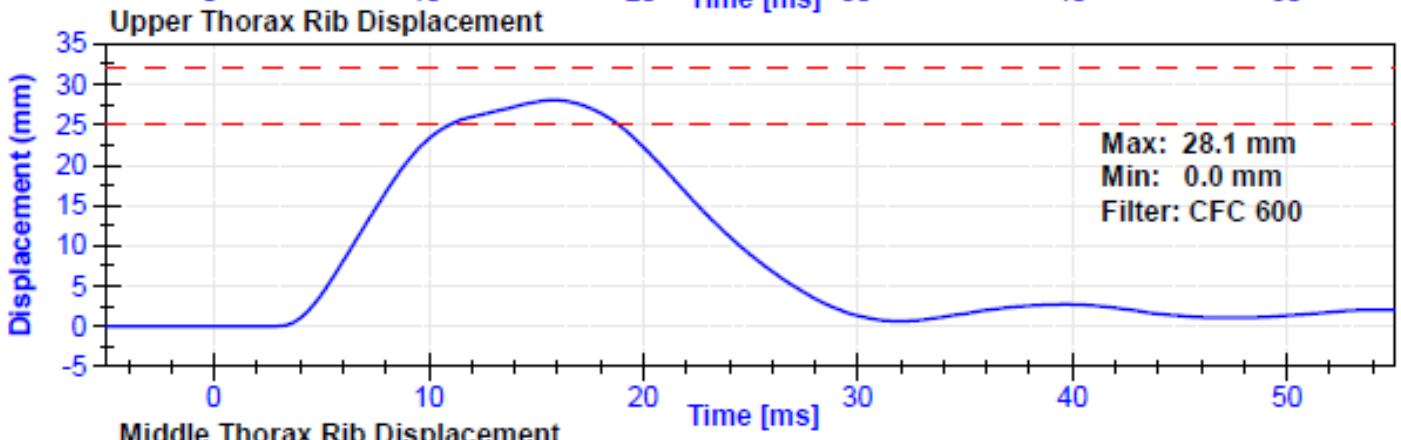
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 29.0 | Pass |
| Velocity | 6.6 | 6.8 | m/s | 6.73 | Pass |
| Probe Acceleration after 5 ms | 30 | 36 | g's | 34.8 | Pass |
| Lateral Upper Spine Acceleration | 34 | 43 | g's | 38.5 | Pass |
| Lateral Lower Spine Acceleration | 29 | 37 | g's | 35.3 | Pass |
| Shoulder Deflection | 31 | 40 | mm | 37.8 | Pass |
| Upper Thorax Rib Deflection | 25 | 32 | mm | 28.1 | Pass |
| Mid Thorax Rib Deflection | 30 | 36 | mm | 33.3 | Pass |
| Lower Thorax Rib Deflection | 32 | 38 | mm | 35.7 | Pass |

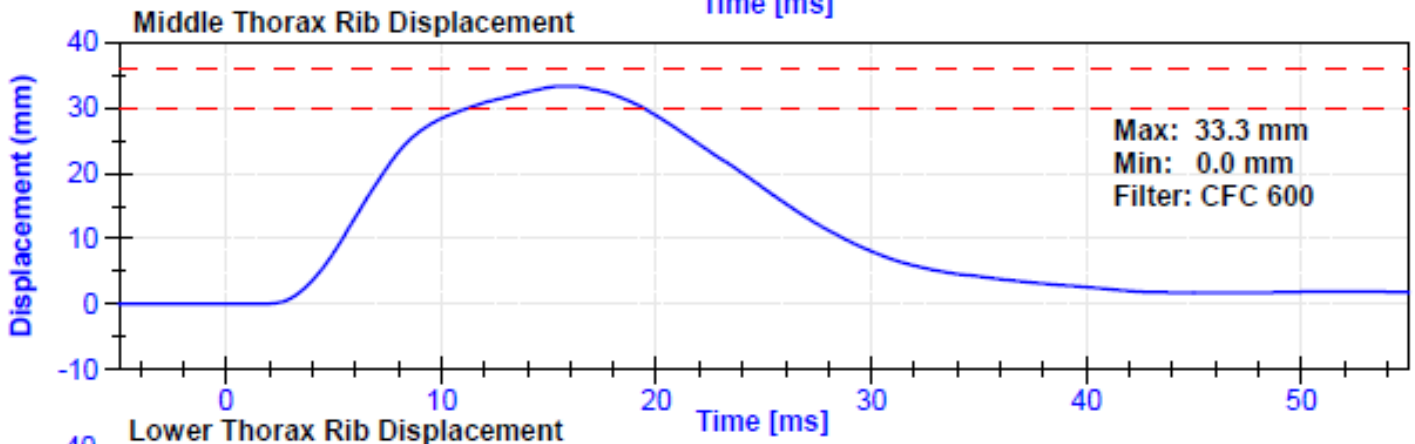
## Transducer Calibrations

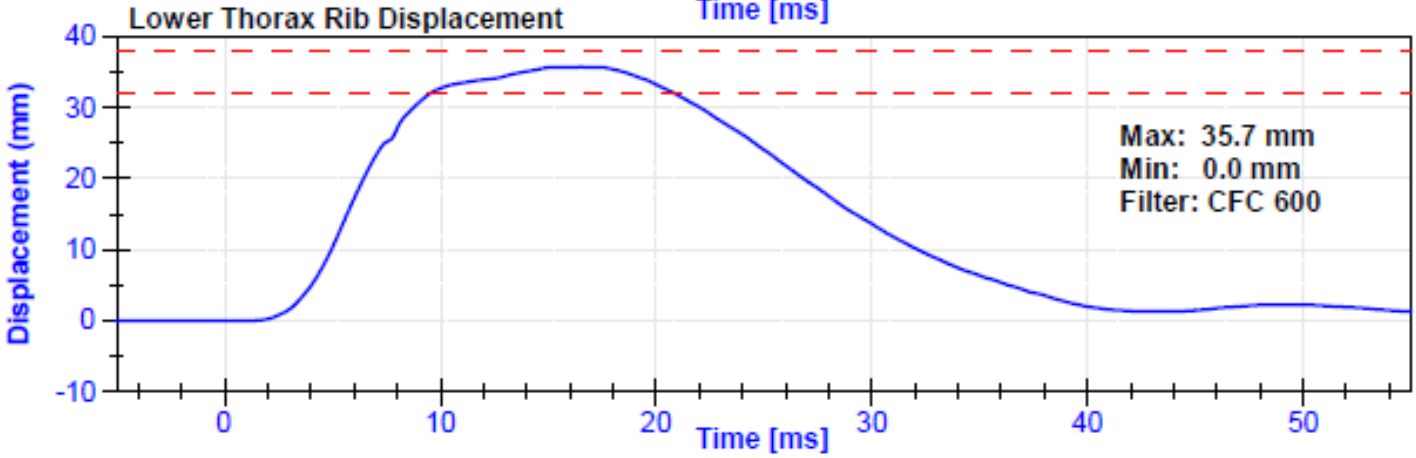
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Upper Spine T1 Y Accelerometer | Endevco | T20880 | 4/4/2023 | 10/1/2023 |
| Upper Spine T12 Y Accelerometer | Endevco | P52071 | 4/4/2023 | 10/1/2023 |
| Shoulder Potentiometer | Servo | 053GFE | 4/10/2023 | 10/9/2023 |
| Upper Thorax Rib Potentiometer | Servo | 2316GFE | 4/10/2023 | 10/9/2023 |
| Middle Thorax Rib Potentiometer | Servo | 040GFE | 4/10/2023 | 10/9/2023 |
| Lower Thorax Rib Potentiometer | Servo | 1156GFE | 4/10/2023 | 10/9/2023 |

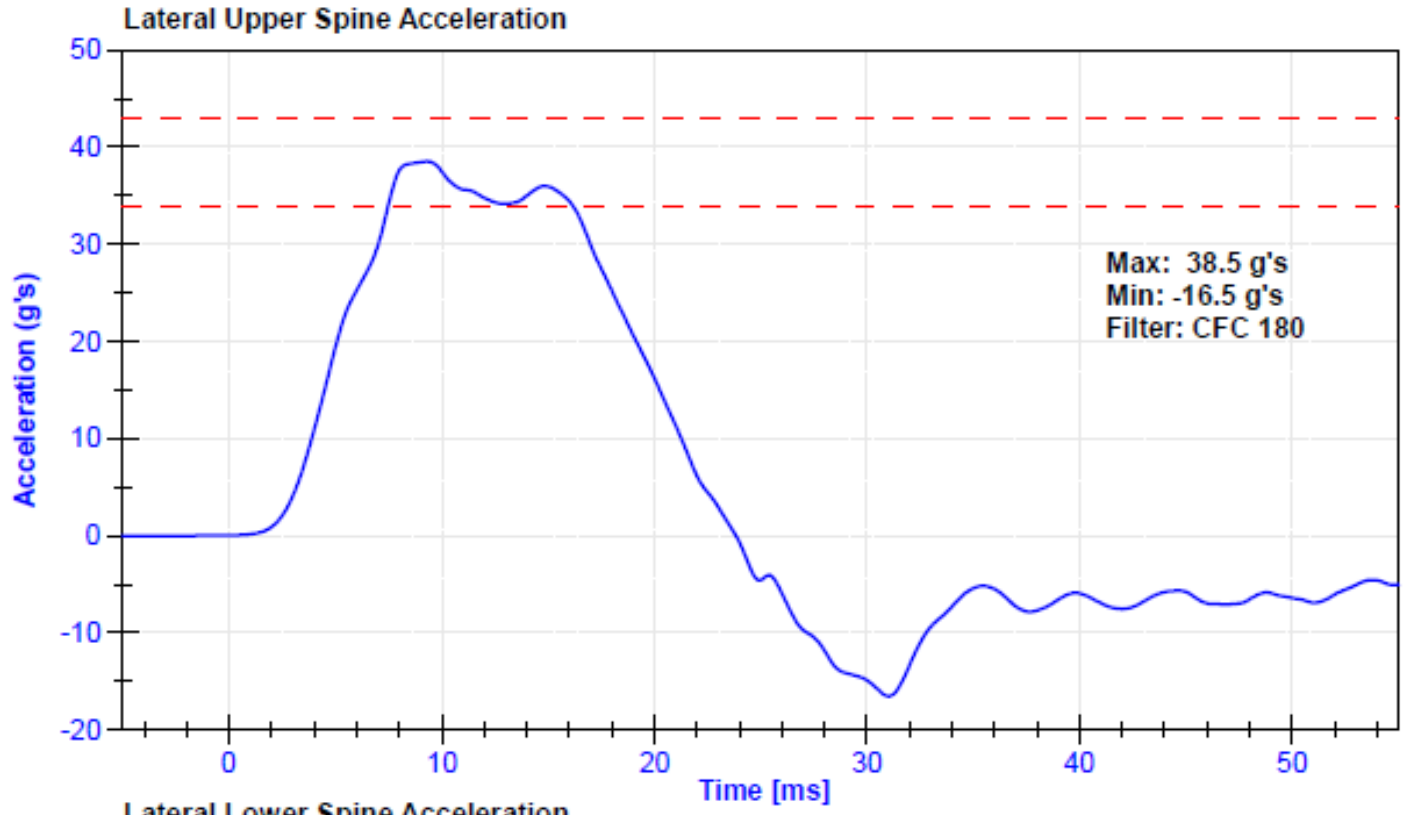


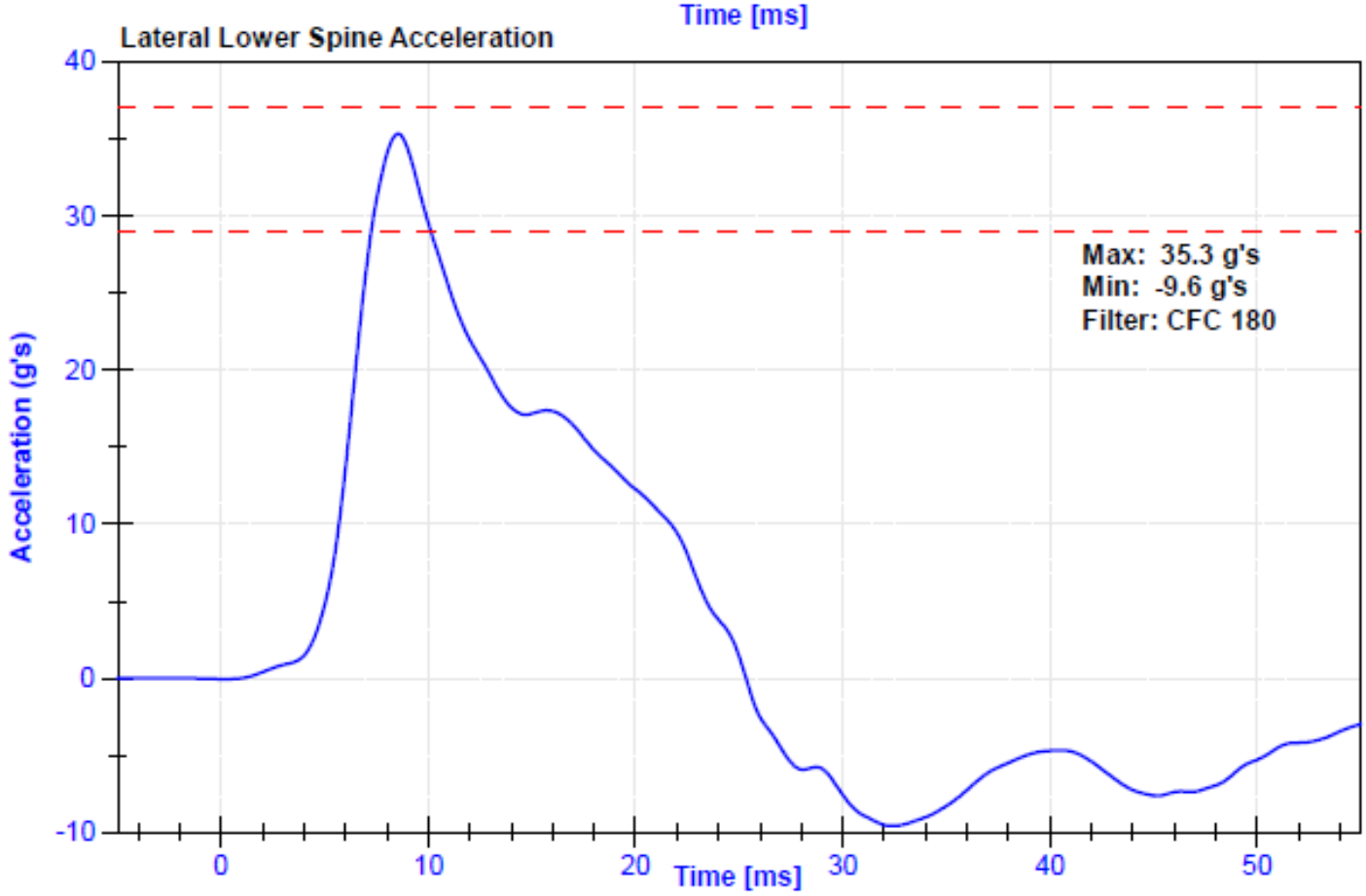

Shoulder Displacement
Displacement (mm)
Time [ms]
Max: 37.8 mm
Min: -1.8 mm
Filter: CFC 600


Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 28.1 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: 35.7 mm
Min: 0.0 mm
Filter: CFC 600


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 38.5 g's
Min: -16.5 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 35.3 g's
Min: -9.6 g's
Filter: CFC 180

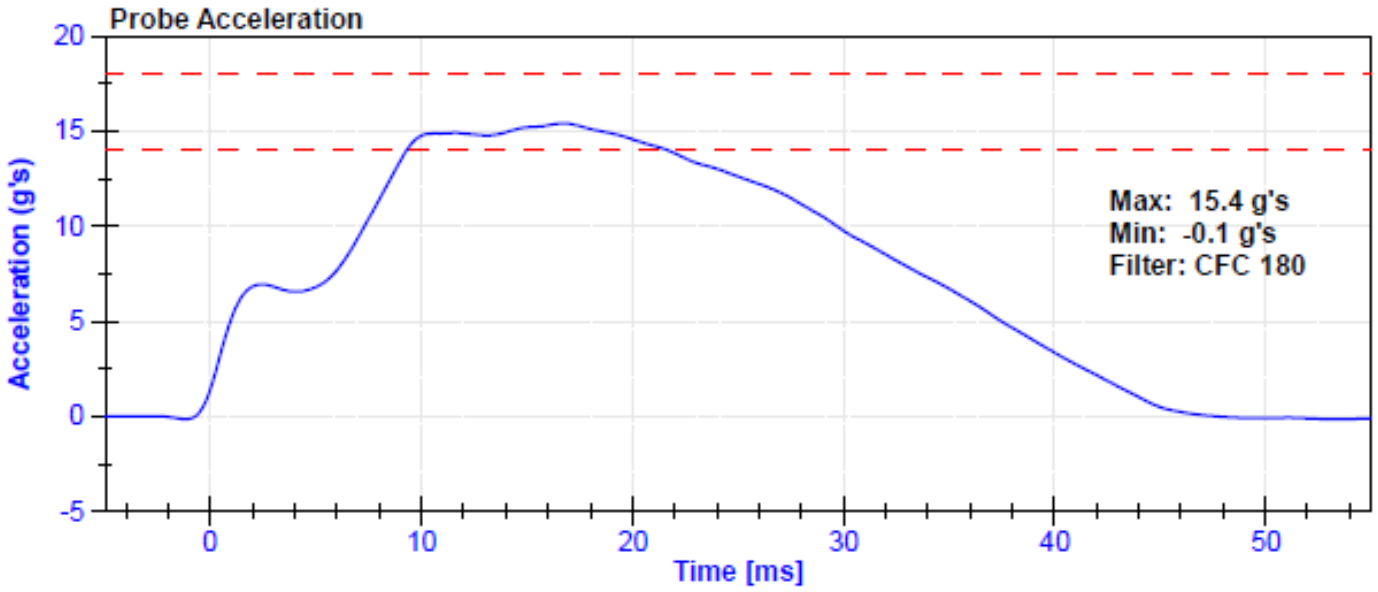
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | C. Mantell |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

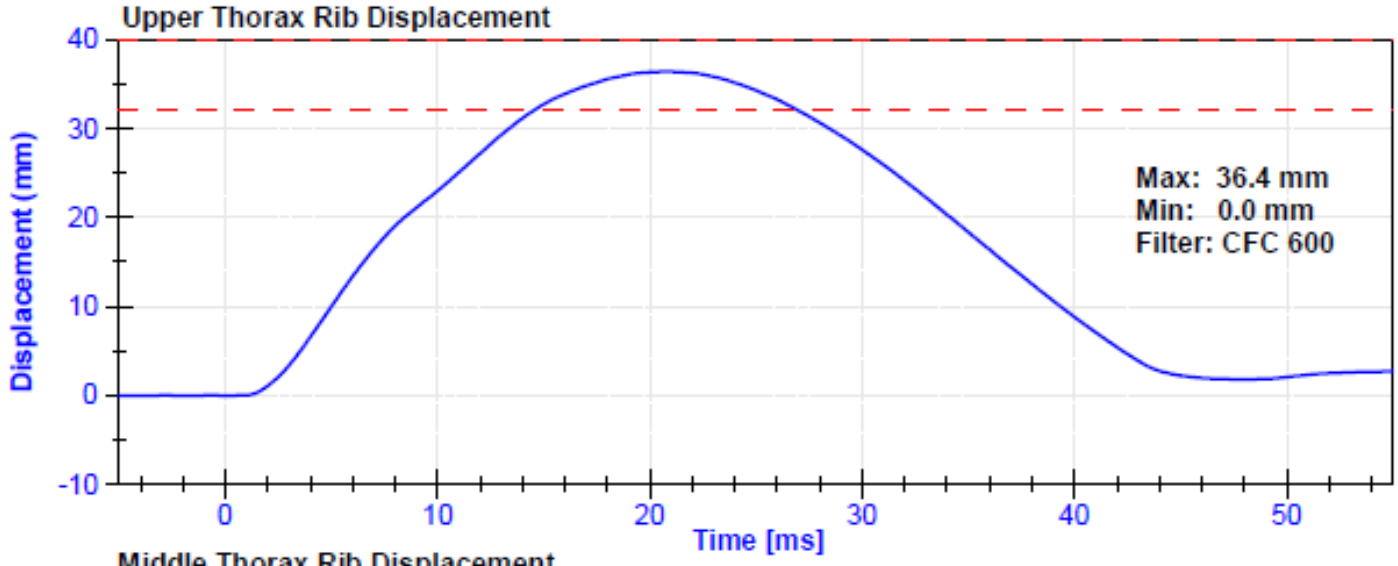
**Results**

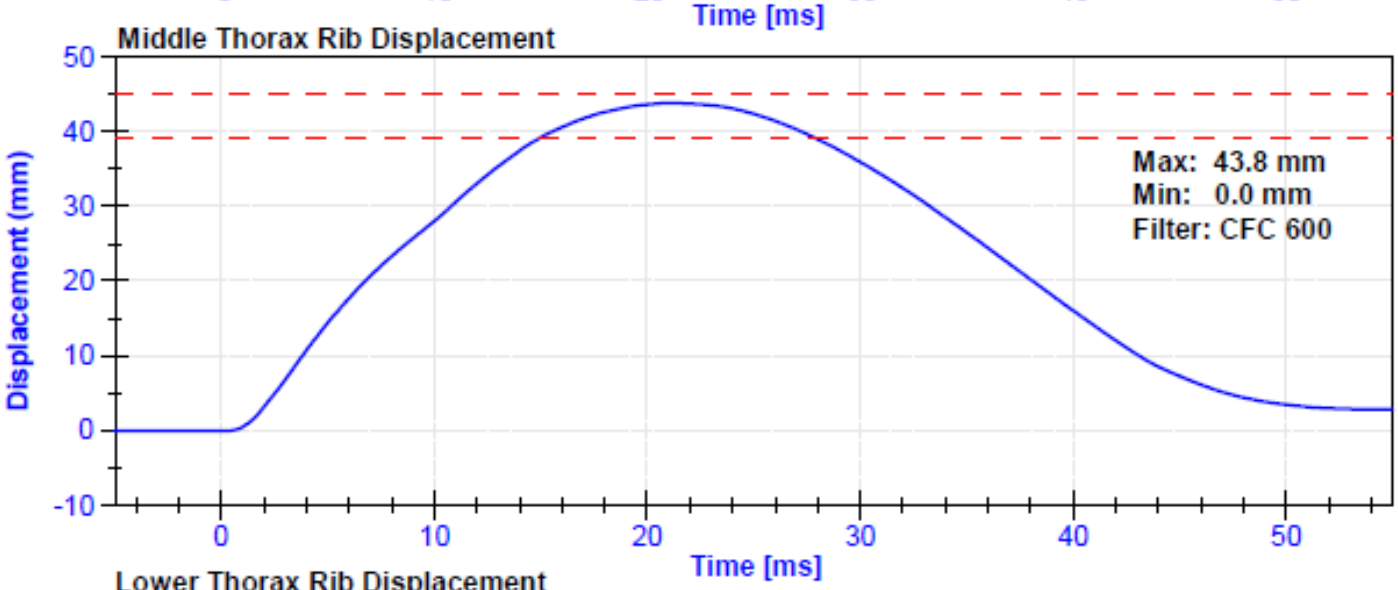
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 29.0 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.35 | Pass |
| Probe Acceleration | 14 | 18 | g's | 15.4 | Pass |
| Lateral Upper Spine Acceleration | 13 | 17 | g's | 14.6 | Pass |
| Lateral Lower Spine Acceleration | 7 | 11 | g's | 10.8 | Pass |
| Upper Thorax Rib Deflection | 32 | 40 | mm | 36.4 | Pass |
| Middle Thorax Rib Deflection | 39 | 45 | mm | 43.8 | Pass |
| Lower Thorax Rib Deflection | 35 | 43 | mm | 42.9 | Pass |

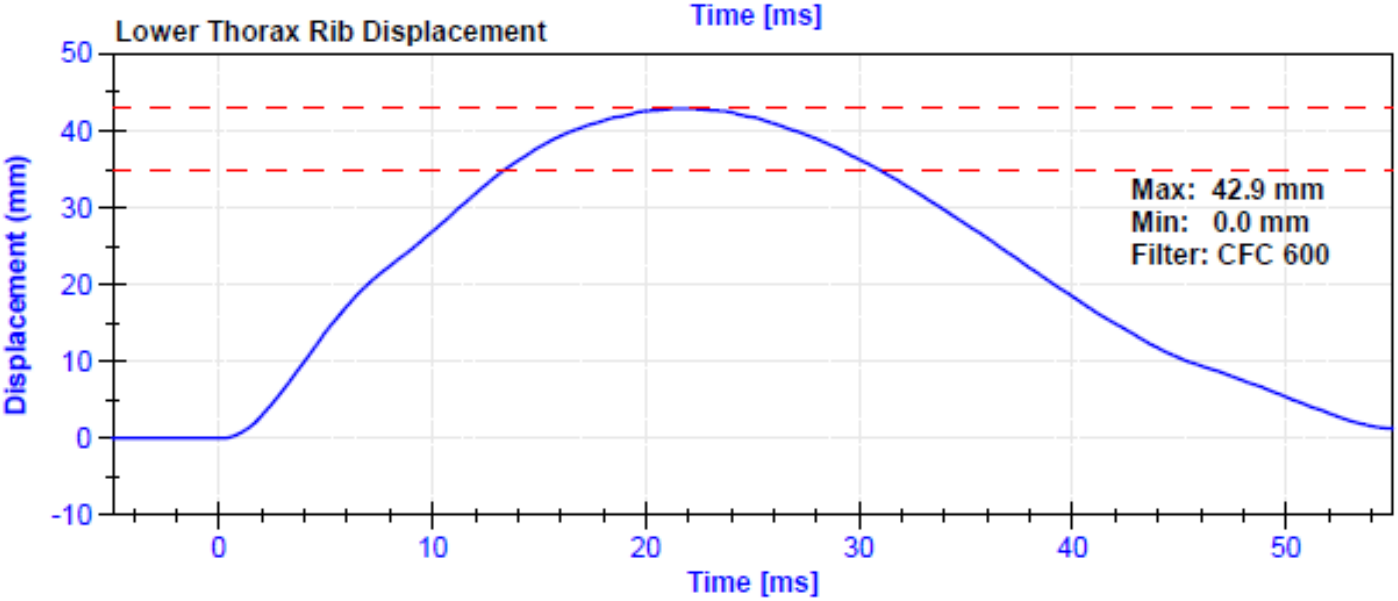
**Transducer Calibrations**

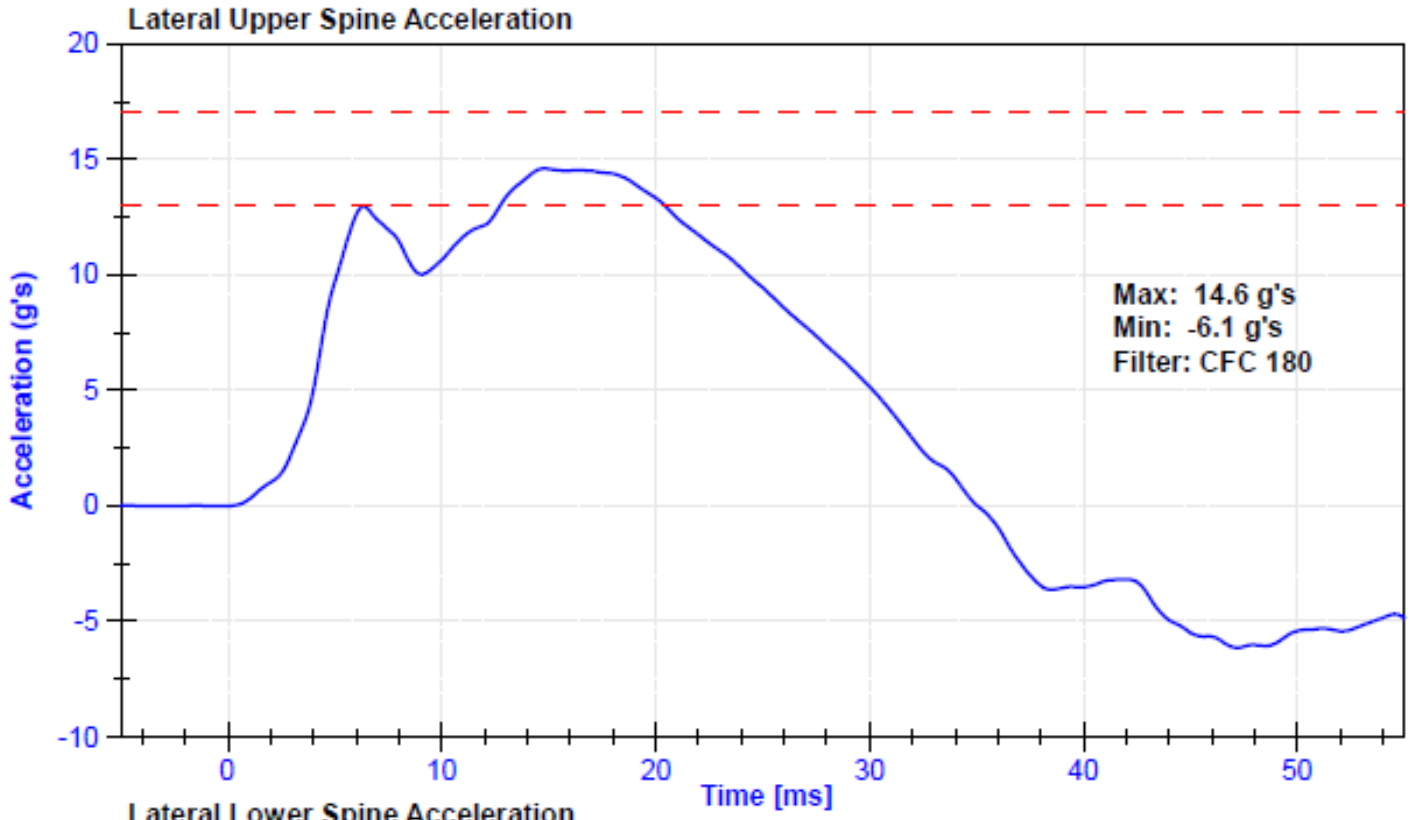
| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Upper Spine Y Accelerometer | Endevco | T20880 | 4/4/2023 | 10/1/2023 |
| Lower Spine Y Accelerometer | Endevco | P52071 | 4/4/2023 | 10/1/2023 |
| Upper Thorax Rib Potentiometer | Servo | 2316GFE | 4/10/2023 | 10/9/2023 |
| Middle Thorax Rib Potentiometer | Servo | 040GFE | 4/10/2023 | 10/9/2023 |
| Lower Thorax Rib Potentiometer | Servo | 1156GFE | 4/10/2023 | 10/9/2023 |

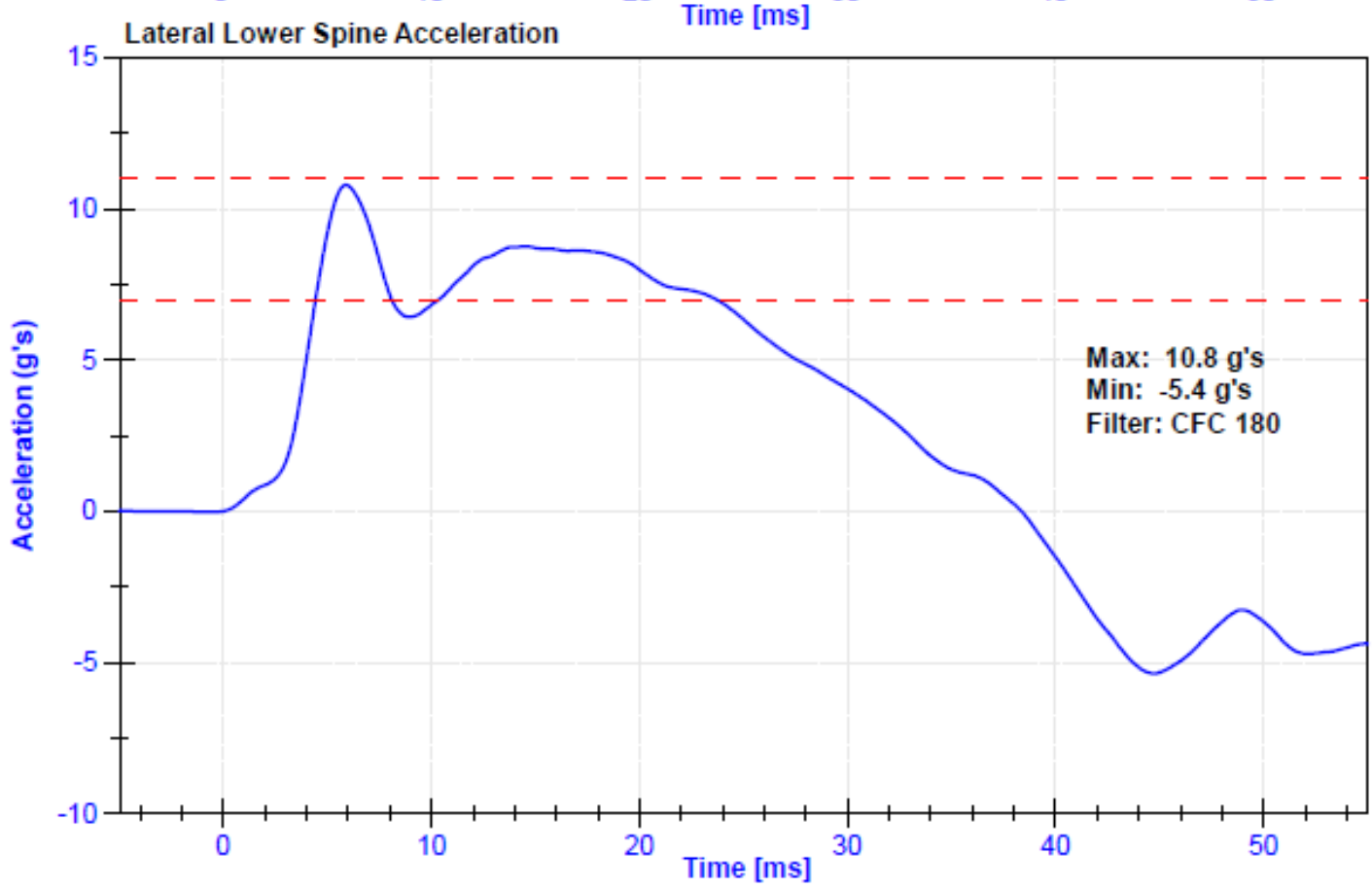



Upper Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 36.4 mm
Min: 0.0 mm
Filter: CFC 600


Middle Thorax Rib Displacement
Displacement (mm)
Time [ms]
Max: 43.8 mm
Min: 0.0 mm
Filter: CFC 600


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


Lateral Upper Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 14.6 g's
Min: -6.1 g's
Filter: CFC 180


Lateral Lower Spine Acceleration
Acceleration (g's)
Time [ms]
Max: 10.8 g's
Min: -5.4 g's
Filter: CFC 180

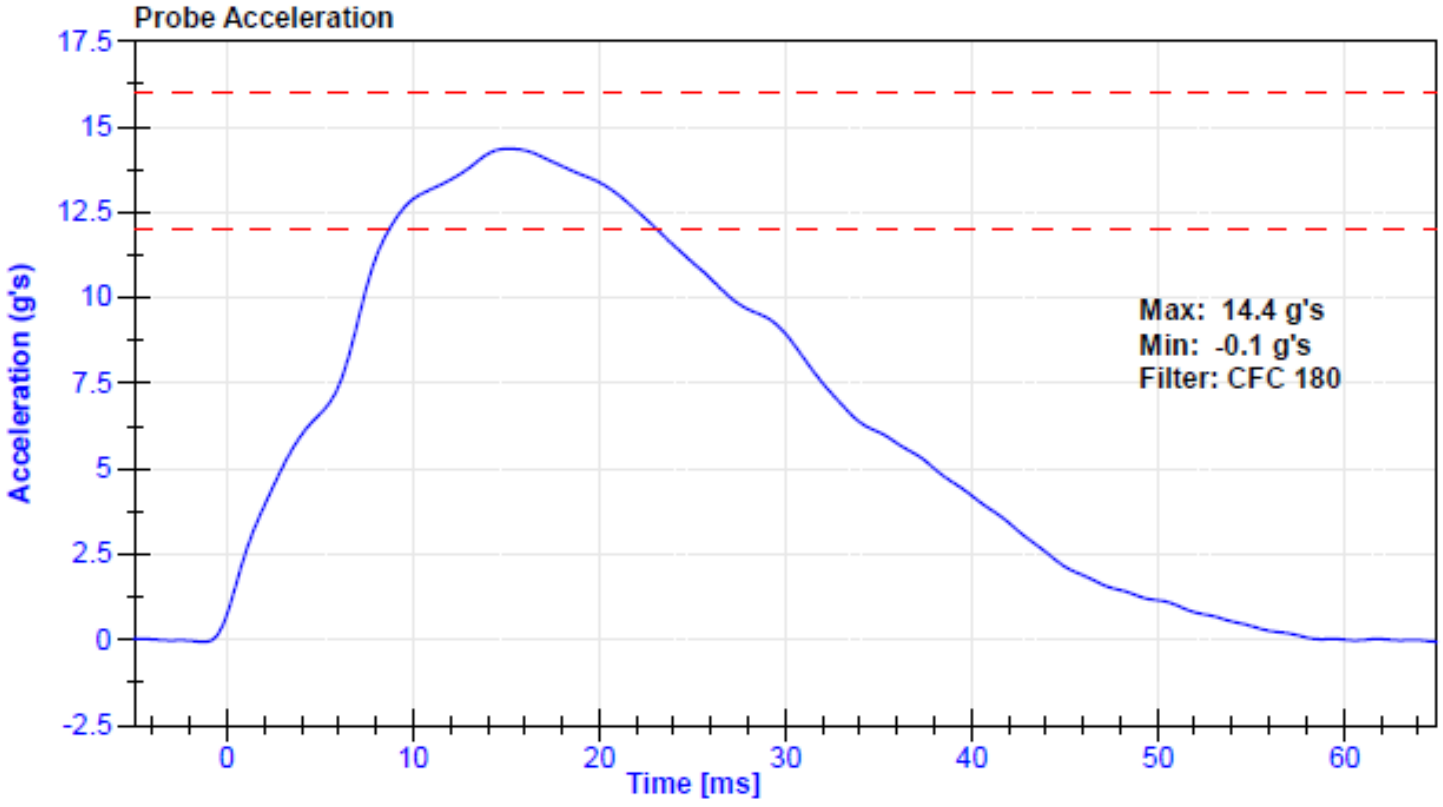
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | C. Mantell |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

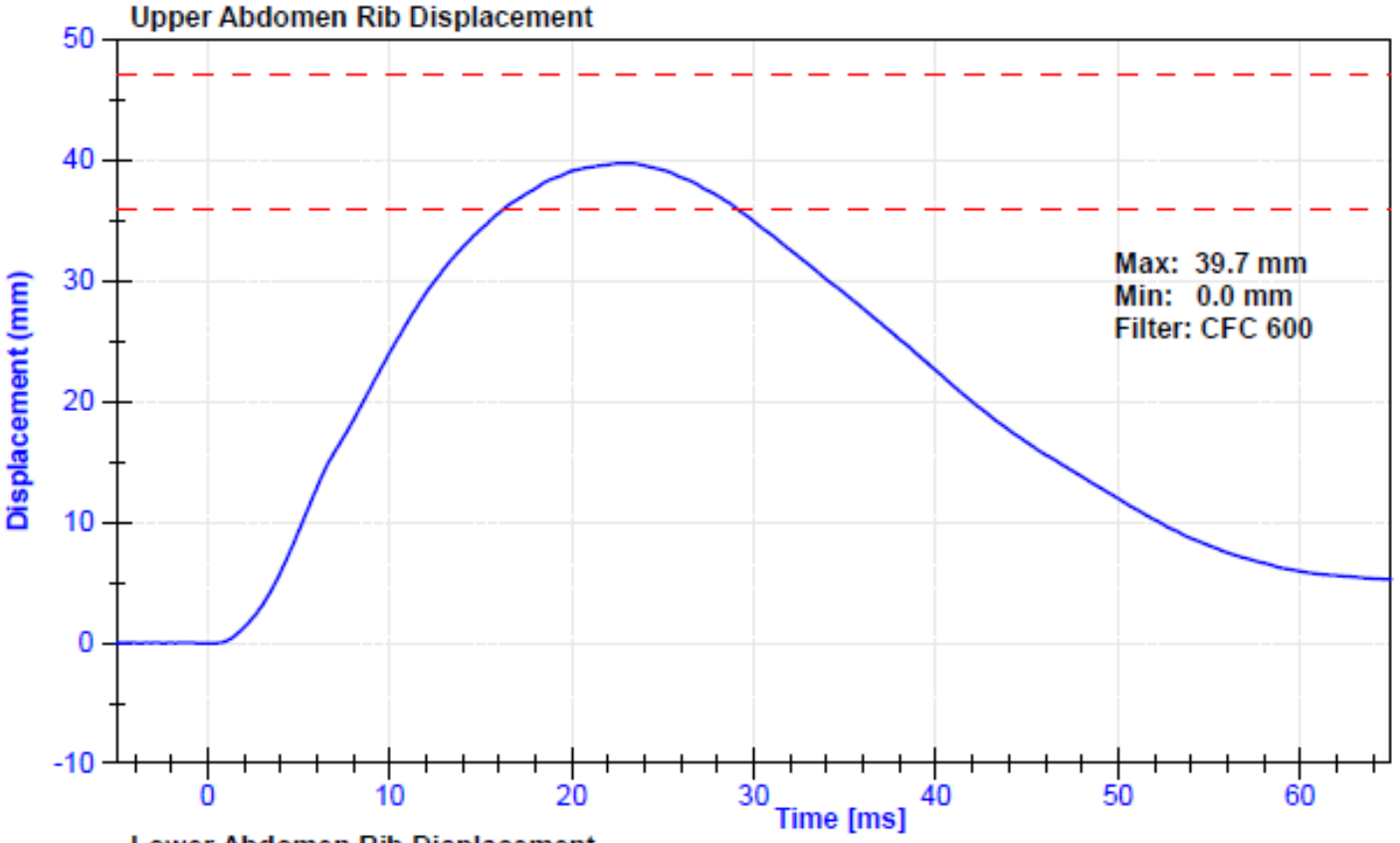
**Results**

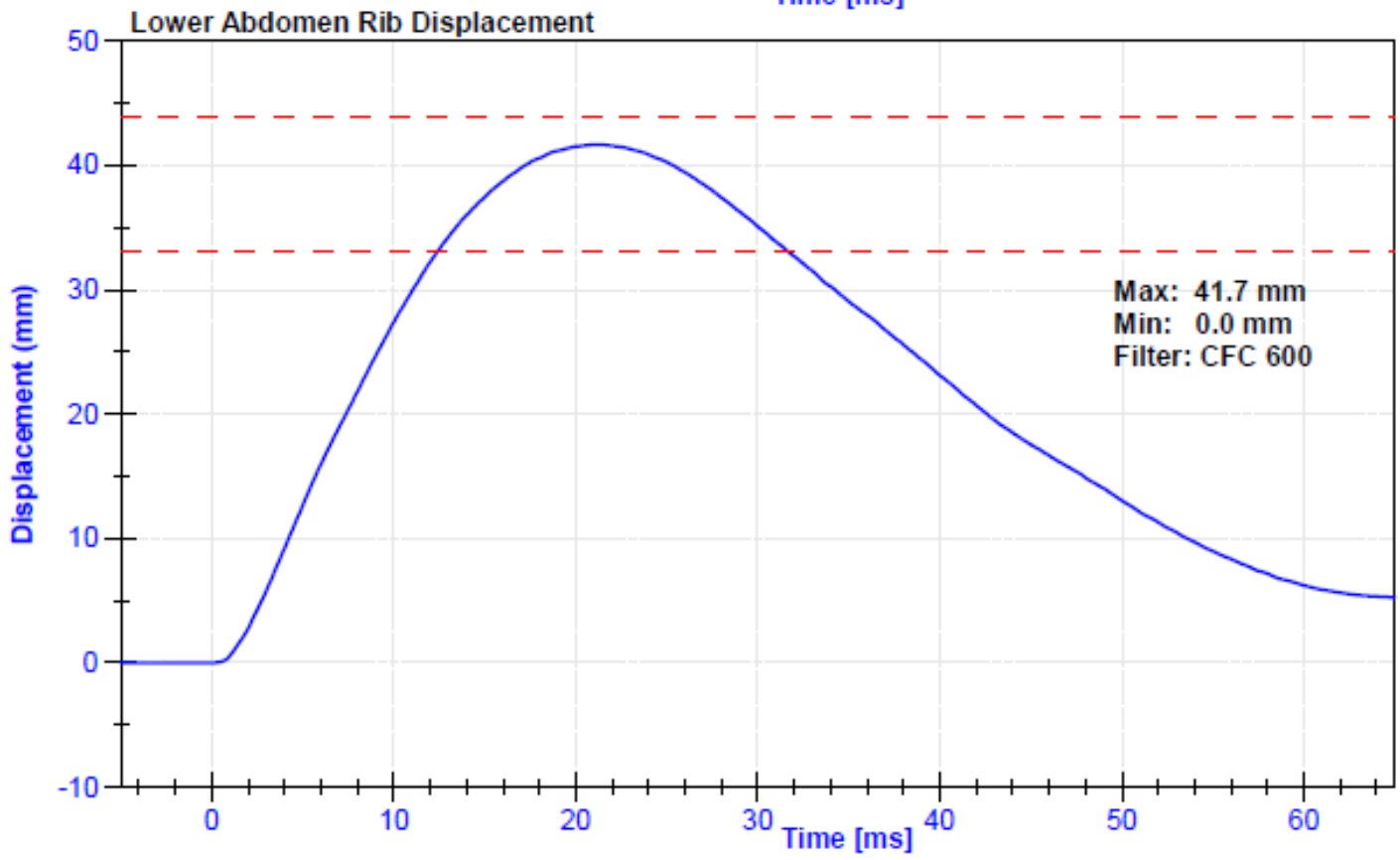
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 29.0 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.35 | Pass |
| Probe Acceleration | 12 | 16 | g's | 14.4 | Pass |
| Lateral Lower Spine Acceleration | 9 | 14 | g's | 13.1 | Pass |
| Upper Abdomen Rib Deflection | 36 | 47 | mm | 39.7 | Pass |
| Lower Abdomen Rib Deflection | 33 | 44 | mm | 41.7 | Pass |

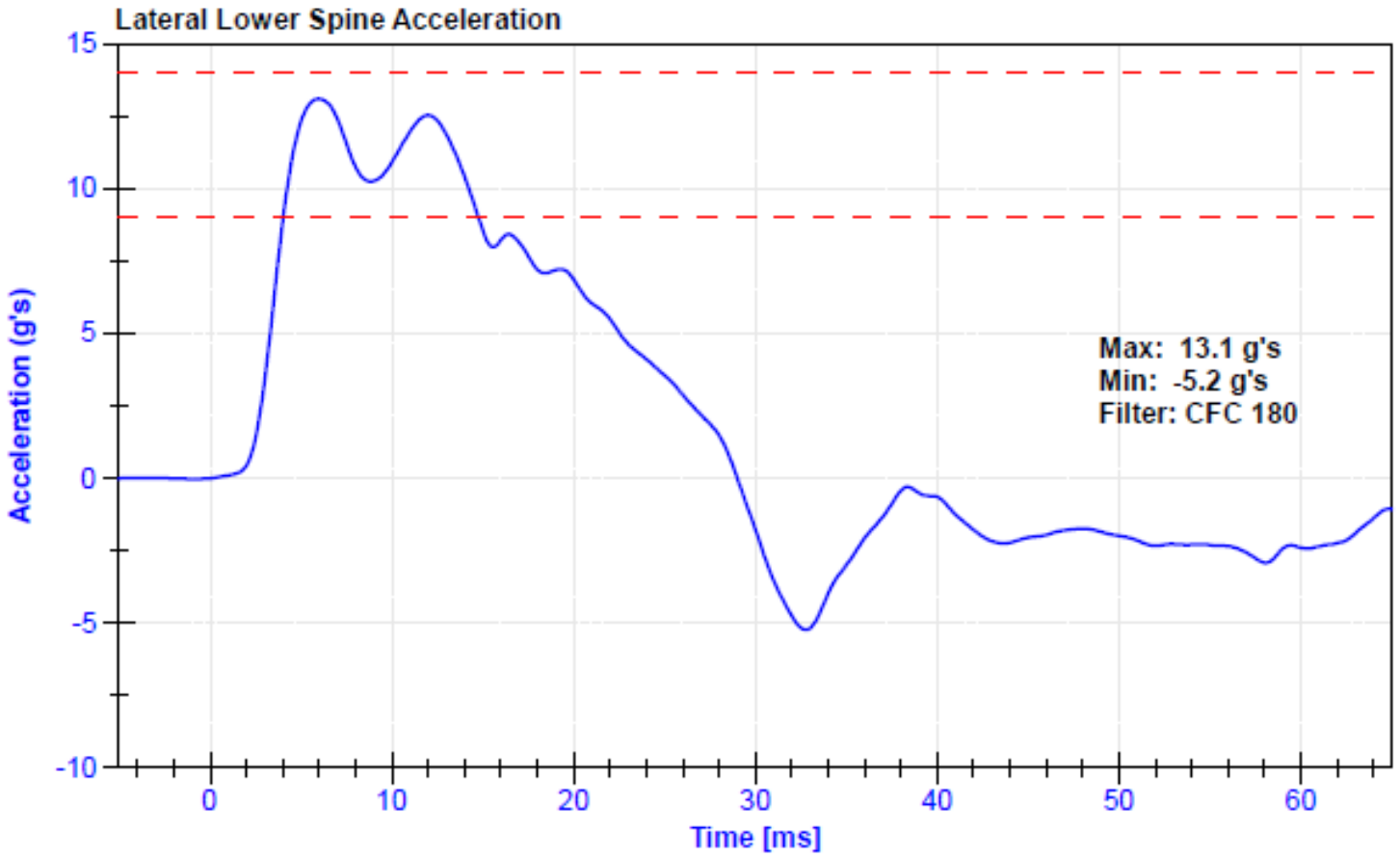
**Transducer Calibrations**

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Probe Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Lower Spine Y Accelerometer | Endevco | P52071 | 4/4/2023 | 10/1/2023 |
| Upper Abdomen Rib Potentiometer | Servo | 307GFE | 4/10/2023 | 10/9/2023 |
| Lower Abdomen Rib Potentiometer | Servo | 308GFE | 4/10/2023 | 10/9/2023 |




Upper Abdomen Rib Displacement
Displacement (mm)
Time [ms]
Max: 39.7 mm
Min: 0.0 mm
Filter: CFC 600


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


Lateral Lower Spine Acceleration
Acceleration (g's)
15
10
5
0
-5
-10
0
10
20
30
40
50
60
Time [ms]
Max: 13.1 g's
Min: -5.2 g's
Filter: CFC 180

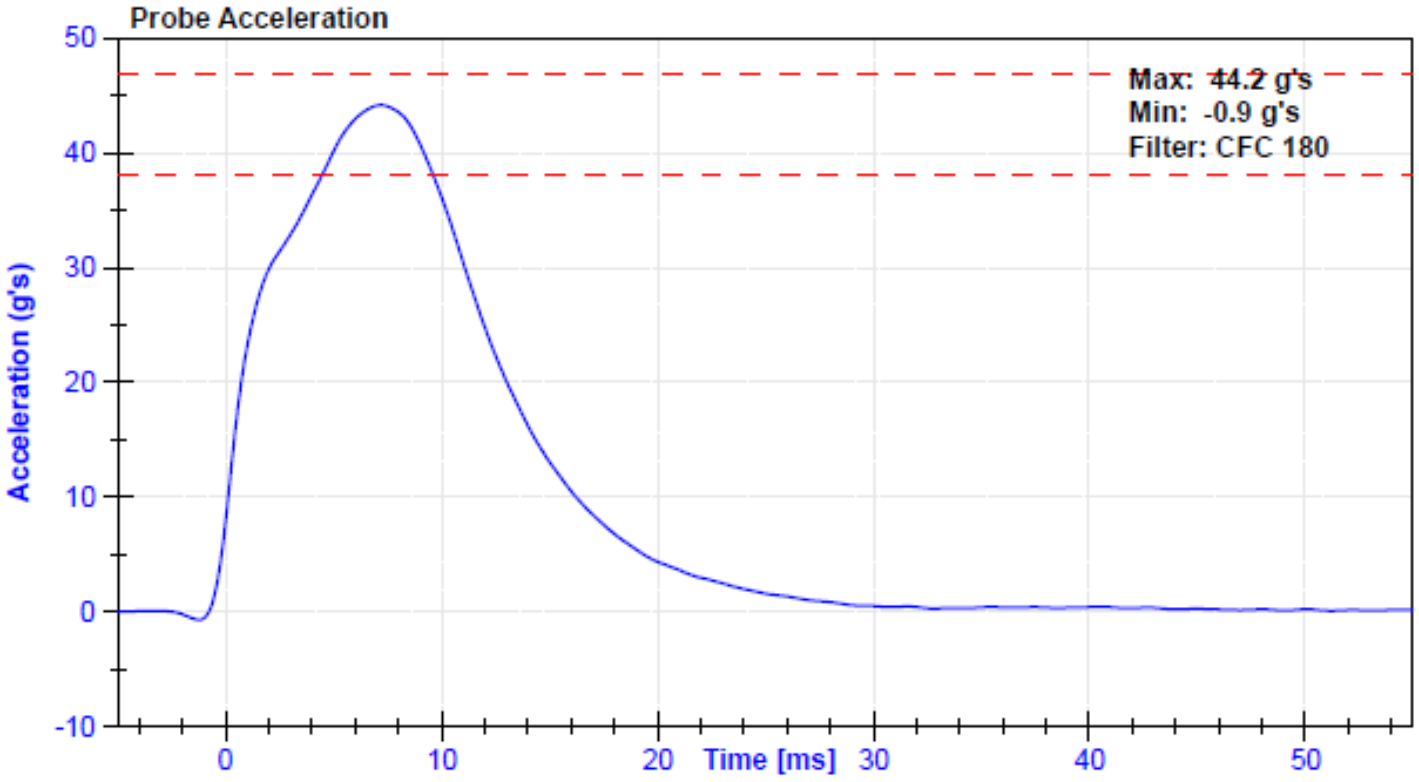
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | C. Mantell |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

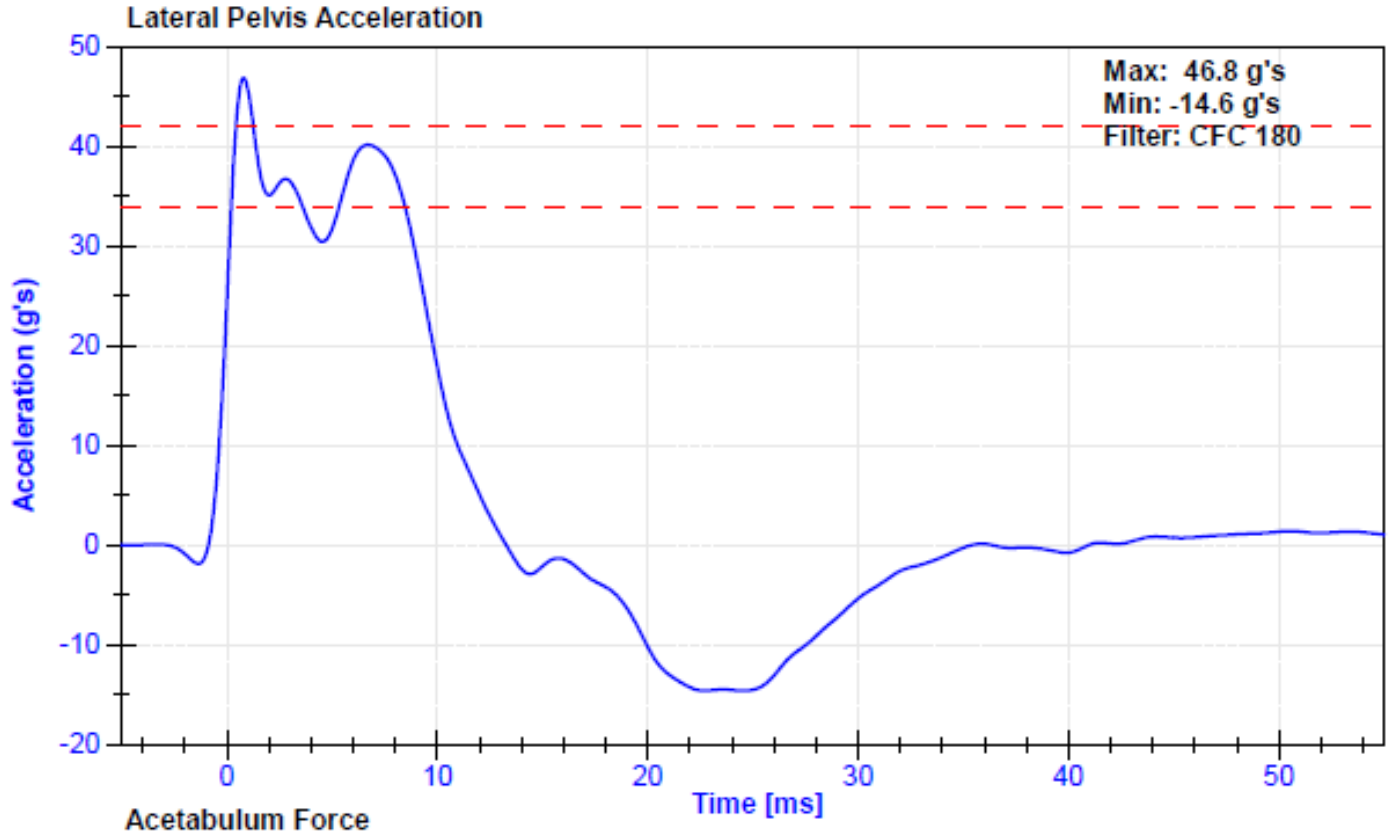
## Results

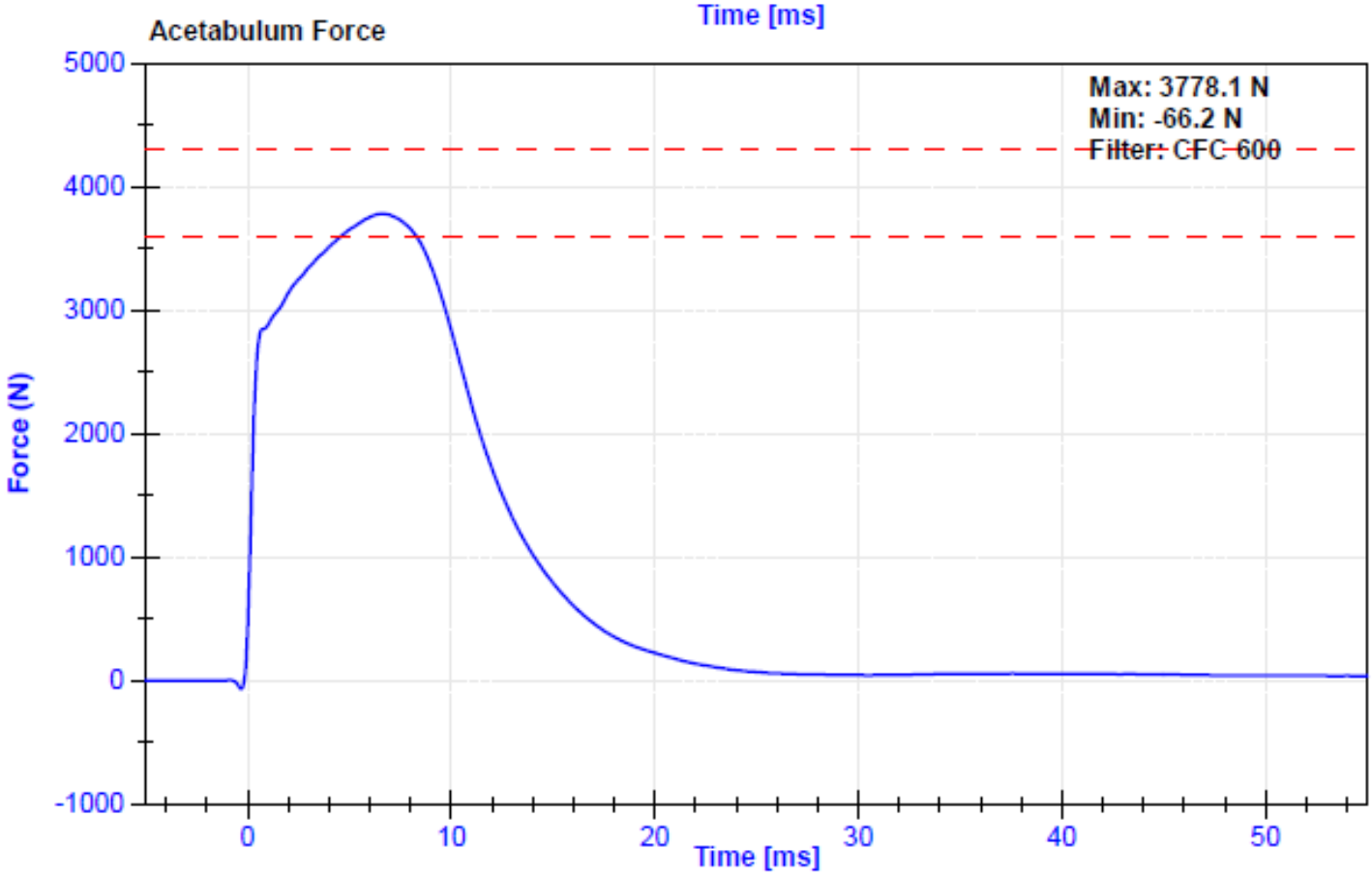
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 29.0 | Pass |
| Velocity | 6.6 | 6.8 | m/s | 6.75 | Pass |
| Probe Acceleration | 38 | 47 | g's | 44.2 | Pass |
| Lateral Pelvis Acceleration after 6ms | 34 | 42 | g's | 40.1 | Pass |
| Acetabulum Force | 3600 | 4300 | N | 3778.1 | Pass |

## Transducer Calibrations

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Pelvis Y Accelerometer | Endevco | P51731 | 4/4/2023 | 10/1/2023 |
| Acetabulum Load Cell | Denton | 267-FY | 8/11/2022 | 8/11/2023 |
| Certification Plug | SACO | | | N/A |
| Crash Test Plug | SACO | | | N/A |




Lateral Pelvis Acceleration
Max: 46.8 g's
Min: -14.6 g's
Filter: CFC 180
Acceleration (g's)
50
40
30
20
10
0
-10
-20
0
10
20
30
40
50
Time [ms]


Acetabulum Force
Max: 3778.1 N
Min: -66.2 N
Filter: CFC 600
Force (N)
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]

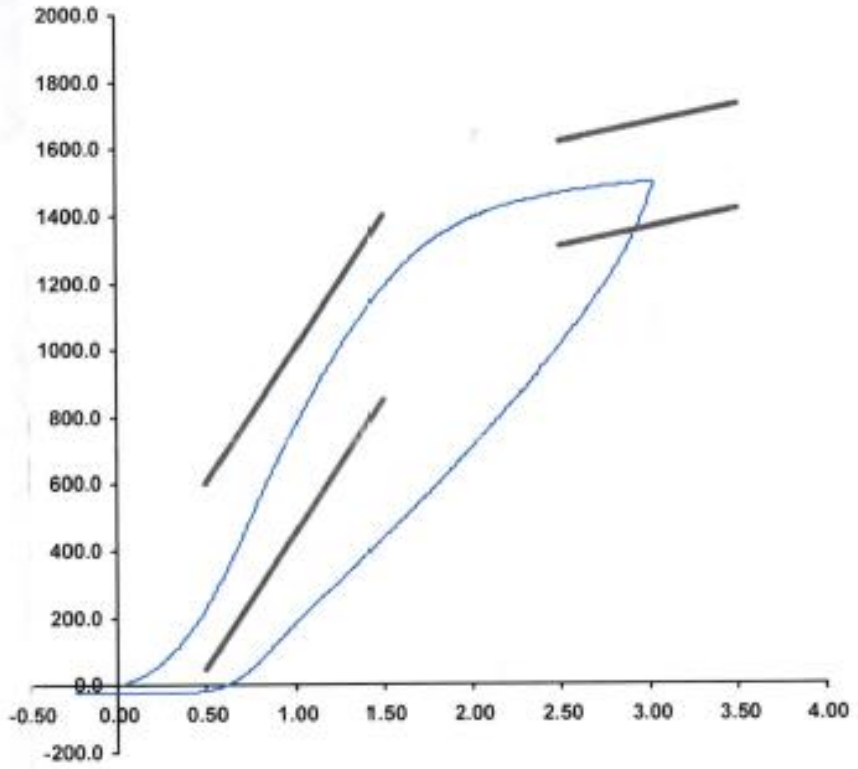
Cert 4/18/23

## SID-IIs Pelvis Plug Certification Test

Plug S/N 15445
Test Number 20106
Report Number 20160
Test Date 9/9/2021 10:36:55 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 232 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,187 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,467 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,500 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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

Notes:

Operator

Part Number 180-4450

Template No 107 09-Sep-21
SACO Research

By : DC Date : 9/9/2021

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

SACO RESEARCH

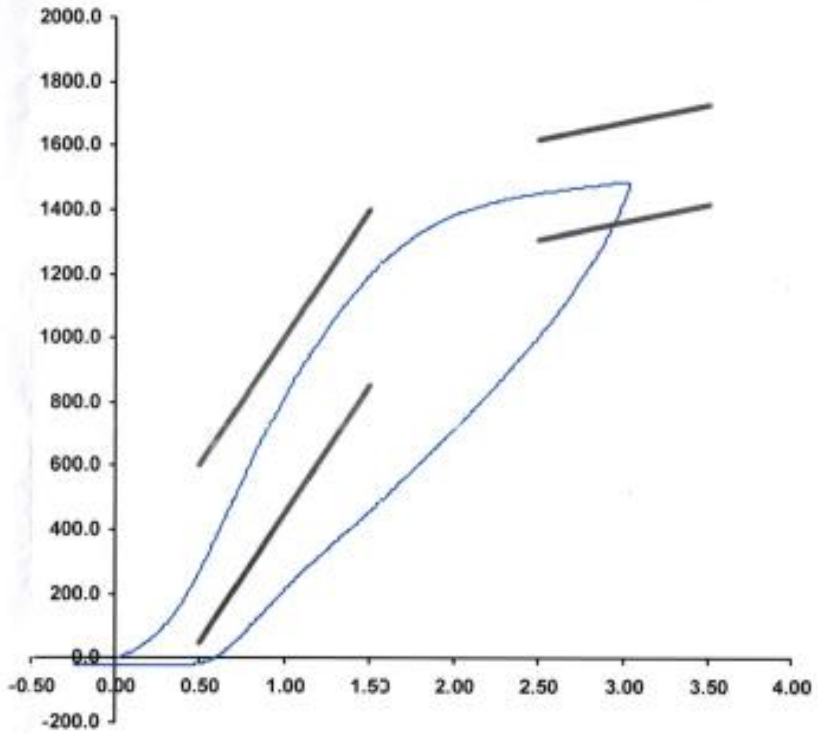
CrashTest 4/18/22

## SID-IIs Pelvis Plug Certification Test

Plug S/N 15412
Test Number 19881
Report Number 19934
Test Date 8/3/2021 11:43:30 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 283 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,202 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,453 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,486 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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

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

Notes:

Operator

Part Number 180-4450

Template No 107 03-Aug-21
SACO Research

By : DC Date : 8/3/2021

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

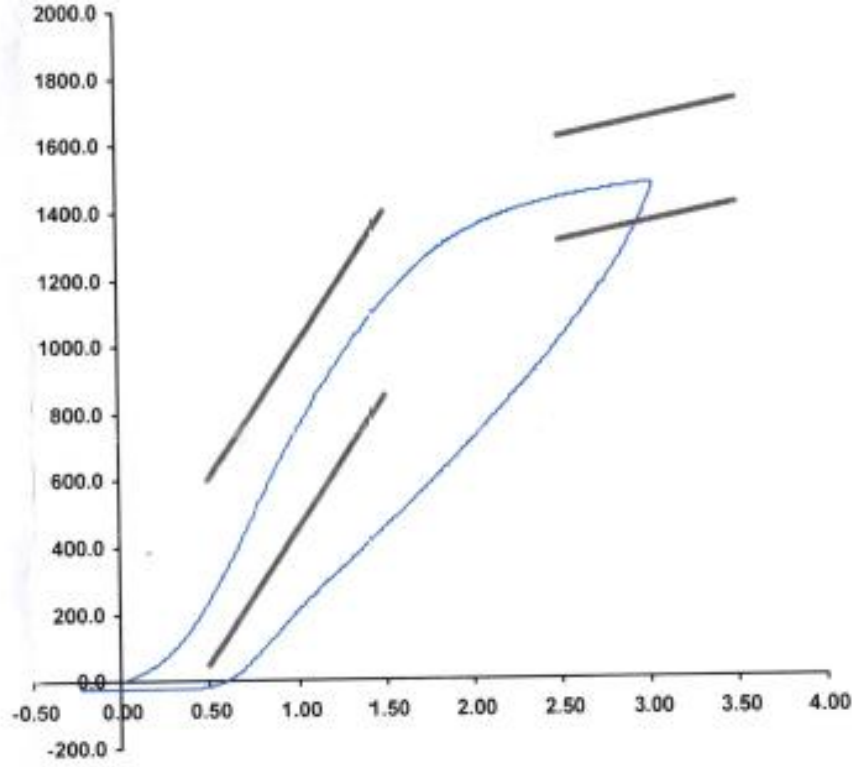
Non Impact
4/18/23

## SID-IIs Pelvis Plug Certification Test

Plug S/N 15426
Test Number 20086
Report Number 20140
Test Date 9/9/2021 9:55:28 AM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 247 | 50 | 600 |
| Force @ 1.5 mm (N) | 1,140 | 850 | 1,400 |
| Force @ 2.5 mm (N) | 1,438 | 1,306 | 1,618 |
| Force @ 3.0 mm (N) | 1,481 | 1,361 | 1,673 |

Force (-N) vs Extension (-mm)




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

Notes:

Operator

Part Number 180-4450

Template No 107 09-Sep-21
SACO Research

By : DC Date : 9/9/2021

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

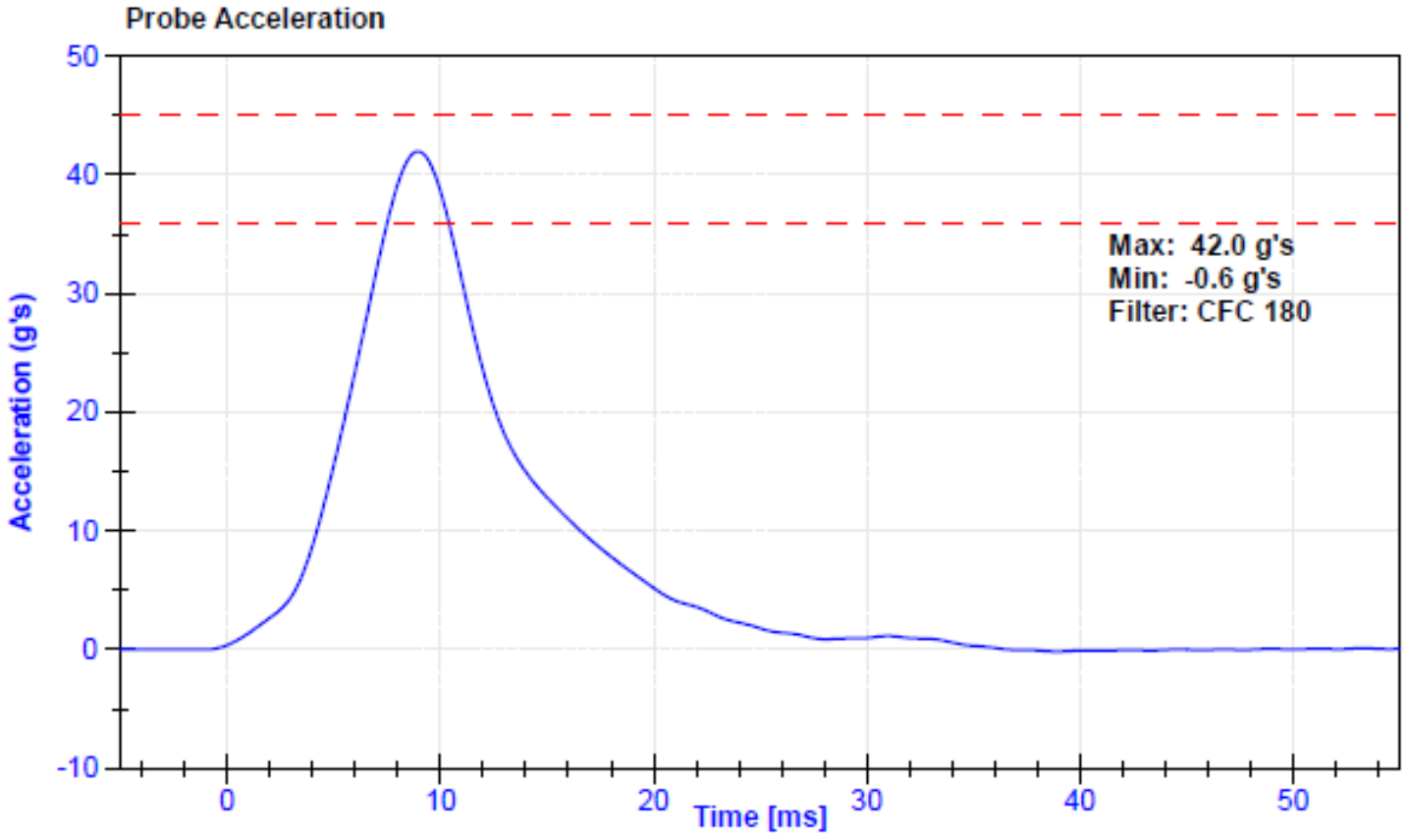
| | | | |
|---|---|---|---|
| ATD Manufacturer | FTSS | Test Technician | C. Mantell |
| ATD Serial Number | 300 | Laboratory Supervisor | C. Mantell |

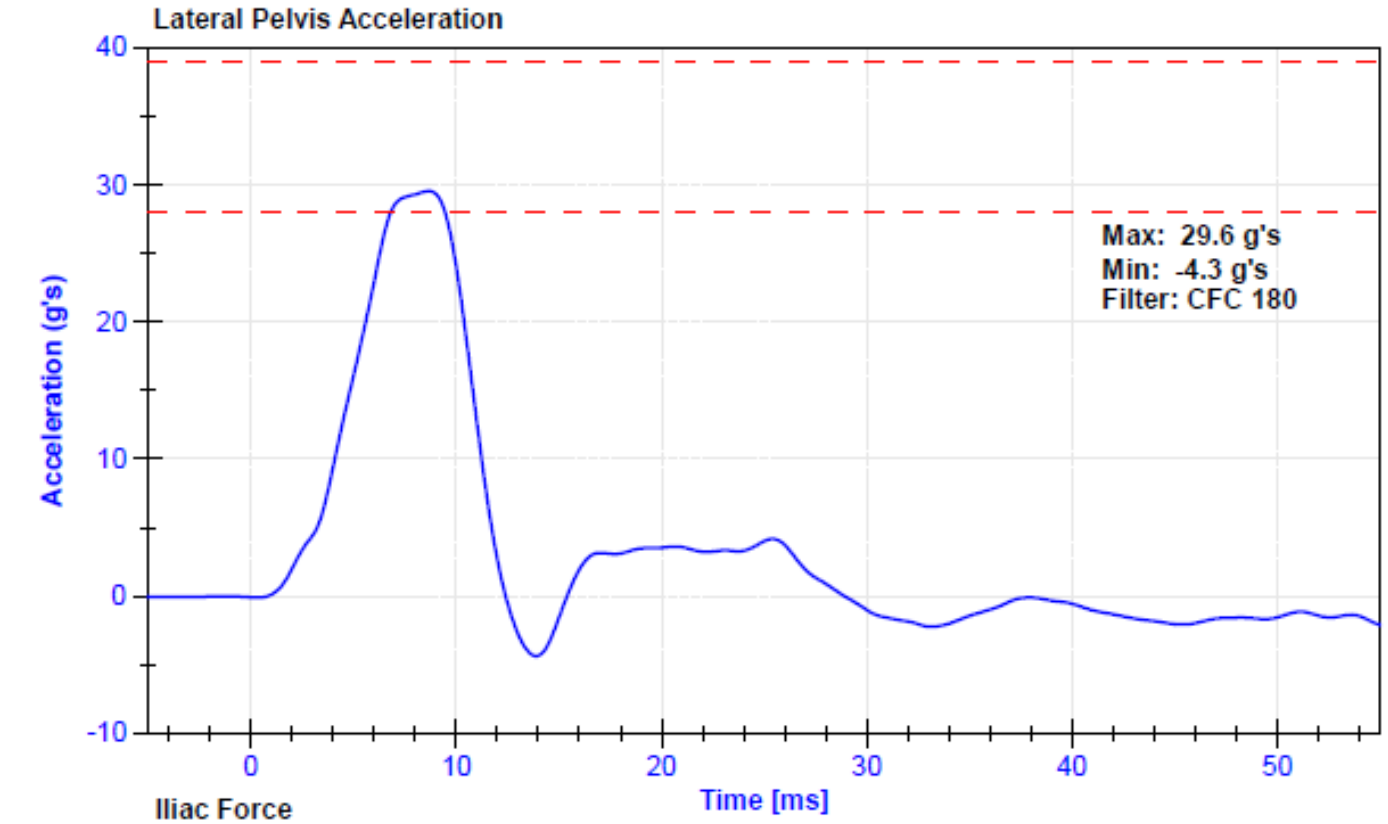
**Results**

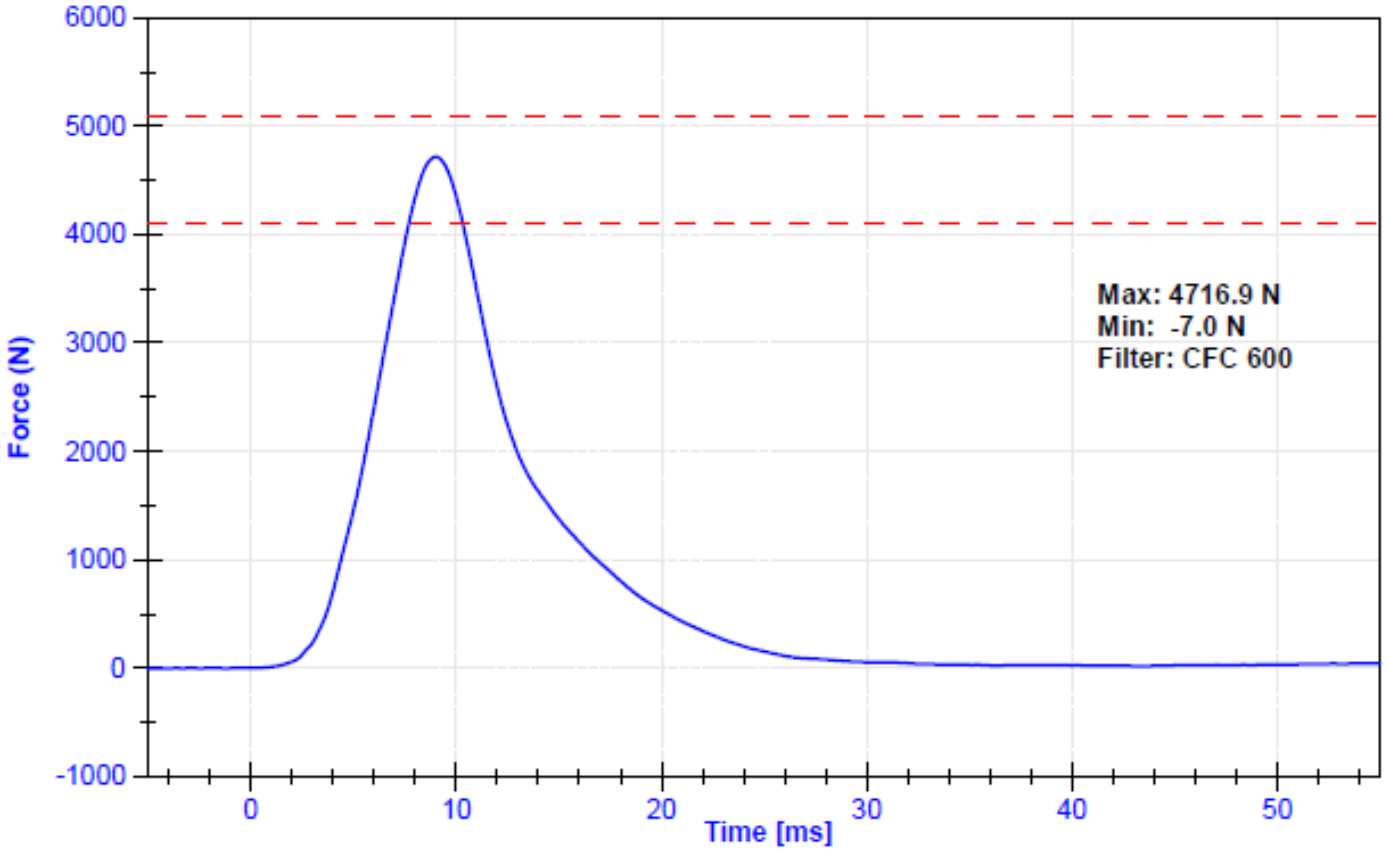
| Test Parameter | Minimum Specification | Maximum Specification | Unit | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | 20.6 | 22.2 | ºC | 21.1 | Pass |
| Humidity | 10 | 70 | % | 29.0 | Pass |
| Velocity | 4.2 | 4.4 | m/s | 4.34 | Pass |
| Probe Acceleration | 36 | 45 | g's | 42.0 | Pass |
| Lateral Pelvis Acceleration | 28 | 39 | g's | 29.6 | Pass |
| Iliac Force | 4100 | 5100 | N | 4716.9 | Pass |

**Transducer Calibrations**

| Channel | Manufacturer | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| Pendulum Accelerometer | Endevco | P51736 | 10/25/2022 | 10/25/2023 |
| Pelvis Y Accelerometer | Endevco | P51731 | 4/4/2023 | 10/1/2023 |
| Iliac Load Cell | Denton | 280-FY | 8/11/2022 | 8/11/2023 |




Lateral Pelvis Acceleration
Acceleration (g's)
40
30
20
10
0
-10
0
10
20
30
40
50
Time [ms]
Max: 29.6 g's
Min: -4.3 g's
Filter: CFC 180


Iliac Force
Force (N)
6000
5000
4000
3000
2000
1000
0
-1000
0
10
20
30
40
50
Time [ms]
Max: 4716.9 N
Min: -7.0 N
Filter: CFC 600

# APPENDIX D

# TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

**Table 1 – Dummy Instrumentation (SID-IIs)**

| | | | | SID-IIs S/N: 300 | | |
|---|---|---|---|---|---|---|
| | | | | **Serial Number** | **Manufacturer** | **Calibration Date** |
| Head Accelerometers | | | X | P59018 | Endevco | 4/4/2023 |
| | | | Y | P79189 | Endevco | 4/4/2023 |
| | | | Z | P79587 | Endevco | 4/4/2023 |
| Head Accelerometers - Redundant | | | X | P68057 | Endevco | 4/4/2023 |
| | | | Y | P58986 | Endevco | 4/4/2023 |
| | | | Z | P52025 | Endevco | 4/4/2023 |
| Displacement Potentiometer | Shoulder | | Y | | | |
| | Thoracic Rib | Upper | Y | 2316GFE | Servo | 4/10/2023 |
| | | Middle | Y | 040GFE | Servo | 4/10/2023 |
| | | Lower | Y | 1156GFE | Servo | 4/10/2023 |
| | Abdominal Rib | Upper | Y | 307GFE | Servo | 4/10/2023 |
| | | Lower | Y | 308GFE | Servo | 4/10/2023 |
| Lower Spine Accelerometers (T12) | | | X | P64003 | Endevco | 4/4/2023 |
| | | | Y | P52071 | Endevco | 4/4/2023 |
| | | | Z | P17283 | Endevco | 4/4/2023 |
| Acetabulum Load Cell | | | Y | 267-FY | Denton | 8/11/2022 |
| Lilac Wing Load Cell | | | Y | 280-FY | Denton | 8/11/2022 |
| Pelvis Plug (Struck Side) | | | | 15240 | SACO | 3/10/2021 |
| Pelvis Plug (Non-Struck Side) | | | | 15172 | SACO | 3/8/2021 |

**Table 2 – Vehicle Instrumentation**

| Vehicle Instrumentation | | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|---|
| Vehicle Center of Gravity | X | A336631 | Measurement Specialties | 4/7/2023 |
| Vehicle Center of Gravity | Y | A352417 | Measurement Specialties | 4/7/2023 |
| Vehicle Center of Gravity | Z | A352418 | Measurement Specialties | 4/7/2023 |
| Left Floor Sill | Y | G22235 | Endevco | 3/23/2023 |
| A-Pillar Sill | Y | G22615 | Endevco | 3/23/2023 |
| A-Pillar Low | Y | A396620 | Measurement Specialties | 2/27/2023 |
| A-Pillar Mid | Y | G22588 | Endevco | 3/23/2023 |
| B-Pillar Sill | Y | G22222 | Endevco | 3/23/2023 |
| B-Pillar Low | Y | G22427 | Endevco | 3/23/2023 |
| B-Pillar Mid | Y | A431210 | Measurement Specialties | 2/27/2023 |
| Driver Seat | Y | A315917 | Measurement Specialties | 2/27/2023 |
| Engine Top | X | A280841 | Measurement Specialties | 12/1/2022 |
| Engine Top | Y | A283613 | Measurement Specialties | 12/1/2022 |
| Firewall | Y | G21391 | Endevco | 3/23/2023 |
| Right Roof | Y | A431347 | Measurement Specialties | 2/27/2023 |
| Right Floor Sill | Y | A255996 | Measurement Specialties | 2/27/2023 |
| Rear Floorpan | X | A274248 | Measurement Specialties | 11/29/2022 |
| Rear Floorpan | Y | A301877 | Measurement Specialties | 11/29/2022 |

**Table 3 – Pole Instrumentation**

| Pole Instrumentation | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|
| Load Cell 1 | 1220AF-1117006-F0 | Interface | 7/19/2022 |
| Load Cell 2 | 1220AF-18870-F0 | Interface | 7/19/2022 |
| Load Cell 3 | 1220AF-1117025-F0 | Interface | 7/19/2022 |
| Load Cell 4 | 1220AF-1130989-F0 | Interface | 7/19/2022 |
| Load Cell 5 | 1220AF-1117017-F0 | Interface | 7/19/2022 |
| Load Cell 6 | 1220AF-1117019-F0 | Interface | 7/19/2022 |
| Load Cell 7 | 1220AF-1117035-F0 | Interface | 7/19/2022 |
| Load Cell 8 | 1220AF-1117011-F0 | Interface | 7/19/2022 |