**REPORT NUMBER: SideNCAPPole-MGA-21-029**

# NEW CAR ASSESSMENT PROGRAM (NCAP)
# Side Impact Pole Test

**FORD MOTOR CO.**
**2021 Ford F-150 4x2 SuperCrew**
**NHTSA No.: M20210208**

**MGA RESEARCH CORPORATION**
**5000 Warren Road**
**Burlington, WI 53105**

**Test Date: March 12, 2021**

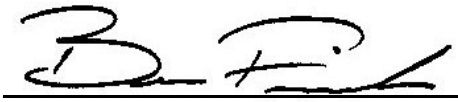
**Final Report Date: September 28, 2021**

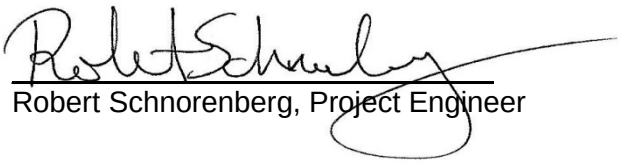
**FINAL REPORT**

**U.S. DEPARTMENT OF TRANSPORTATION**
**National Highway Traffic Safety Administration**
**Office of Crashworthiness Standards**
**Mail Code: NRM-100**
**1200 New Jersey Ave, SE**
**Room W43-410**
**Washington, DC 20590**

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.

Prepared by: 
Ben Fischer, Project Manager

Approved by: 
Robert Schnorenberg, Project Engineer

Approval Date: September 28, 2021

FINAL REPORT ACCEPTANCE BY OCWS:

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

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

## TECHNICAL REPORT DOCUMENTATION PAGE

| | | |
|---|---|---|
| **1. Report No.**<br>SideNCAPPole-MGA-21-029 | **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 a 2021 Ford F-150 4x2 SuperCrew<br>NHTSA No.: M20210208 | | **5. Report Date**<br>September 28, 2021<br>**6. Performing Organization Code**<br>MGA |
| **7. Author(s)**<br>Ben Fischer, Project Manager | | **8. Performing Organization Report No.**<br>SideNCAPPole-MGA-21-029 |
| **9. Performing Organization Name and Address**<br>MGA Research Corporation<br>5000 Warren Road<br>Burlington, WI 53105 | | **10. Work Unit No.**<br>**11. Contract or Grant No.**<br>DTNH22-14-D-00353 |
| **12. Sponsoring Agency Name and Address**<br>United States Department of Transportation<br>National Highway Traffic Safety Administration<br>Office of Crashworthiness Standards<br>Mail Code: NRM-100<br>1200 New Jersey Ave, SE, Room W43-410<br>Washington, DC 20590 | | **13. Type of Report and Period Covered:**<br>Final Test Report<br>March 12, 2021 to September 28, 2021<br>**14. Sponsoring Agency Code**<br>NRM-100 |
| **15. Supplementary Notes** | | |

**16. Abstract**

A 32.20 km/h, 75° oblique impact Side NCAP Test was conducted on the subject 2021 Ford F-150 4x2 SuperCrew 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. The test was conducted at the MGA Research Corporation facility in Burlington, Wisconsin on March 12, 2021.

The impact velocity was 32.27 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 22.0°C. The test vehicle post-test maximum crush was 334 mm at level 3. The test vehicle's performance was as follows:

| Measurement Description | Units | Driver ATD (SID-IIs) | |
|---|---|---|---|
| | | Threshold | Result |
| Head Injury Criteria ($HIC_{36}$) | | 1000 | 187 |
| Resultant Lower Spine Acceleration | g | 82 | 38 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 2327 |
| Maximum Thoracic Rib Deflection | mm | 38* | 23 |
| Maximum Abdomen Rib Deflection | mm | 45* | 21 |

*Proposed IARV

The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite door(s) 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, DC 20590 |

| | | | |
|---|---|---|---|
| **19. Security Classification of Report**<br>Unclassified | **20. Security Classification of Page**<br>Unclassified | **21. No. of Pages**<br>139 | **22. Price** |

## TABLE OF CONTENTS

## SECTION 1
## PURPOSE AND SUMMARY OF TEST

### PURPOSE

This side pole impact test is part of the MY 2021 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00353. The purpose of this test is to generate comparative side impact performance in a 2021 Ford F-150 4x2 SuperCrew. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated March 2020.

### SUMMARY

A rigid pole side impact test was conducted on a 2021 Ford F-150 4x2 SuperCrew. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.27 km/h. The test was conducted by MGA Research Corporation in Burlington, Wisconsin on March 12, 2021. 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. Camera locations and other pertinent camera information are included in this report.

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

Primary and Redundant Head CG Triaxial Accelerometers
Head Triaxial Angular Rate Sensors
Thorax Upper, Middle, and Lower Rib Displacement Potentiometers
Abdomen Upper Rib and Lower Rib Displacement Potentiometers
Lower Spine (T12) Triaxial Accelerometers
Iliac Load Cell
Acetabulum Load Cell

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

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

| Measurement Description | Units | Driver ATD (SID-IIs) | |
|---|---|---|---|
| | | Threshold | Result |
| Head Injury Criteria (HIC36) | | 1000 | 187 |
| Resultant Lower Spine Acceleration | g | 82 | 38 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 2327 |
| Maximum Thoracic Rib Deflection | mm | 38* | 23 |
| Maximum Abdomen Rib Deflection | mm | 45* | 21 |

*Proposed IARV

Supplemental restraint information is given below:

| 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 Curtain Airbag | Yes | Yes | Yes | Yes |
| Side Torso/Pelvis Airbag | Yes | Yes | No | |
| Side Airbag (Other) | | | | |
| Seat Belt Pretensioner | Yes | Yes | Yes | |
| Seat Belt Load Limiter | Yes | | Yes | |
| Other: | No | | No | |

The test data can be found on the NHTSA website at www.nhtsa.gov

## GENERAL COMMENTS

Load Cell Pole #8 Fy recorded no valid data.

## SECTION 2
## OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021

**TEST VEHICLE INFORMATION AND OPTIONS**

| | | | |
|---|---|---|---|
| NHTSA No. | M20210208 | Traction Control System (TCS) | Yes |
| Model Year | 2021 | Auto-Leveling System | No |
| Make | Ford | Automatic Door Locks (ADL) | Yes |
| Model | F-150 4x2 SuperCrew | Power Window Auto-Reverse | Yes |
| Body Style | 4-Door Pickup Truck | Other Optional Feature | No |
| VIN | 1FTEW1CP0MFA67235 | Driver Front Airbag | Yes |
| Body Color | Velocity Blue | Driver Curtain Airbag | Yes |
| Odometer Reading (km/mi) | 304 km / 189 mi | Driver Head/Torso Airbag | No |
| Engine Displacement (L) | 2.7 L | Driver Torso Airbag | No |
| Type/No. Cylinders | V6 | Driver Torso/Pelvis Airbag | Yes |
| Engine Placement | Longitudinal | Driver Pelvis Airbag | No |
| Transmission Type | Automatic | Driver Knee Airbag | Yes |
| Transmission Speeds | 10 | Rear Pass. Curtain Airbag | Yes |
| Overdrive | Yes | Rear Pass. Head/Torso Airbag | No |
| Final Drive | RWD | Rear Pass. Torso Airbag | No |
| Roof Rack | No | Rear Pass. Torso/Pelvis Airbag | No |
| Sunroof/T-Top | No | Rear Pass. Pelvis Airbag | No |
| Running Boards | No | Driver Seat Belt Pretensioner | Yes |
| Tilt Steering Wheel | Yes | Rear Pass. Seat Belt Pretensioner | Yes |
| Power Seats | No | Driver Load Limiter | Yes |
| Anti-Lock Brakes (ABS) | Yes | Rear Pass. Load Limiter | Yes |
| | | Other Safety Restraint | N/A |

| | |
|---|---|
| Does owner's manual provide instruction to turn off automatic door locks? | Yes |

**DATA FROM CERTIFICATION LABEL**

| | | | |
|---|---|---|---|
| Manufactured By | FORD MOTOR CO. | GVWR (kg) | 2903 |
| Date of Manufacture | 01/21 | GAWR Front (kg) | 1429 |
| Vehicle Type | Truck | GAWR Rear (kg) | 1542 |

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

| Measured Parameter | Front | Rear | Third | Total | |
|---|---|---|---|---|---|
| Designated Seating Capacity (DSC) | 2 | 3 | | 5 | |
| Capacity Weight (VCW) (kg) | | | | 766 | (A) |
| DSC x 68.04 kg | | | | 340 | (B) |
| Rated Cargo and Luggage Weight (RCLW) (kg) | | | | 136 | (A-B) |

* Rated Cargo and Luggage Weight (RCLW) limited to maximum of 300 lbs (136 kg).

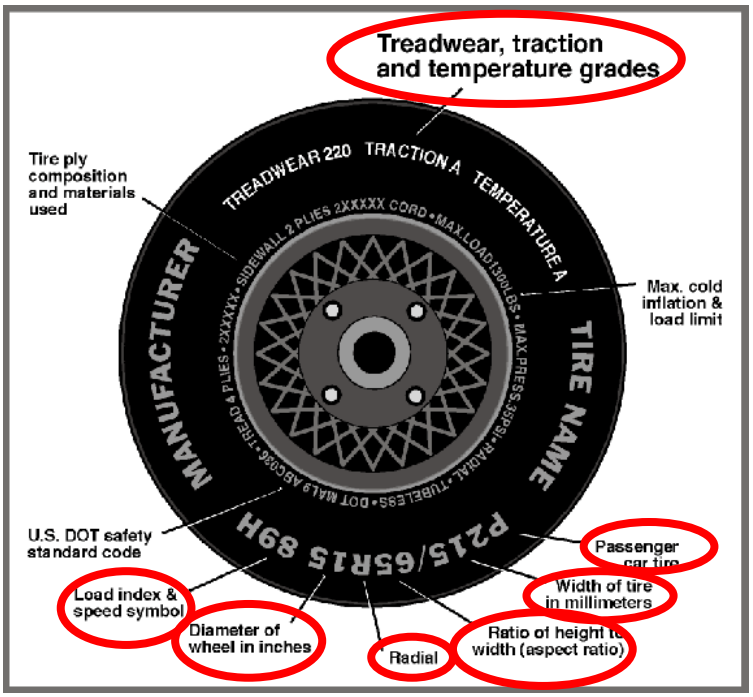
**VEHICLE SEAT TYPE**

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

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021

**VEHICLE TIRE INFORMATION**




| Measured Parameter | Front | Rear |
|---|---|---|
| Max. Tire Pressure (kPa) | 350 | 350 |
| Cold Pressure (kPa) | 240 | 240 |
| Recommended Tire Size | 275/60R20 | 275/60R20 |
| Tire Size on Vehicle | 275/60R20 | 275/60R20 |
| Tire Manufacturer | Goodyear | Goodyear |
| Tire Model | Wrangler Territory HT | Wrangler Territory HT |
| Treadwear | 680 | 680 |
| Traction | A | A |
| Temperature Grade | B | B |
| Tire Plies Sidewall | 2 Polyester | 2 Polyester |
| Tire Plies Body | 2 Polyester, 2 Steel, 1 Polyamide | 2 Polyester, 2 Steel, 1 Polyamide |
| Load Index/Speed Symbol | 115T | 115T |
| Tire Material | Rubber | Rubber |
| DOT Safety Code Left | 4BW0 JU1R | 4BW0 JU1R |
| DOT Safety Code Right | 4BW0 JU1R | 4BW0 JU1R |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021

### TEST PRESSURES

| | Units | LF | RF | LR | RR |
|---|---|---|---|---|---|
| As Delivered | kPa | 260 | 255 | 260 | 260 |
| Tire Placard | kPa | 240 | 240 | 240 | 240 |
| Owner's Manual | kPa | 240 | 240 | 240 | 240 |
| As Tested | kPa | 240 | 240 | 240 | 240 |

### TEST AXLE VEHICLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | | Fully Loaded | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Front | Rear | Total | Front | Rear | Total | Front | Rear | Total |
| Left | kg | 623.0 | 437.5 | | 639.5 | 520.5 | | 636.5 | 533.5 | |
| Right | kg | 620.5 | 446.5 | | 630.5 | 519.5 | | 613.0 | 532.5 | |
| Ratio | % | 58.4% | 41.6% | | 55.0% | 45.0% | | 54.0% | 46.0% | |
| Totals | kg | 1243.5 | 884.0 | 2127.5 | 1270.0 | 1040.0 | 2310.0 | 1249.5 | 1066.0 | 2315.5 |

### TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value | |
|---|---|---|---|
| Total Delivered Weight (UVW) | kg | 2127.5 | (A) |
| Actual Weight of 1 P572 ATD (SID-IIs) Used | kg | 52 | (B) |
| Rated Cargo/Luggage Weight (RCLW) | kg | 136 | (C) |
| Calculated Test Vehicle Target Weight (TVTW) | kg | 2315.5 | (A+B+C) |

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to 9 kg)? **YES**

### TEST VEHICLE ATTITUDES AND CG

| | Units | As Delivered | As Tested | Fully Loaded | Meets Requirement |
|---|---|---|---|---|---|
| Driver Door Sill Angle (front-to-back)* | deg | -1.8 | -1.6 | -1.6 | Yes |
| Front Pass. Door Sill Angle (front-to-back)* | deg | -1.8 | -1.5 | -1.4 | Yes |
| Front Bumper Angle (left-to-right)** | deg | 0.2 | 0.0 | 0.0 | Yes |
| Rear Bumper Angle (left-to-right)** | deg | -0.3 | -0.4 | -0.5 | Yes |
| Vehicle CG (Aft of Front Axle) | mm | 1539 | 1668 | 1705 | |
| Vehicle CG (Left (+) / Right (-) from Longitudinal Centerline) | mm | -3 | 4 | 9 | |

* 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.

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

| Component Description | Units | Weight |
|---|---|---|
| Weight of Ballast Added | kg | 93 |
| Components Removed: none | kg | |
| | | |

| | |
|---|---|
| Test height adjustable suspension setting, if applicable: | Not Applicable |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021

**TEST SURFACE MARKINGS**

| | Distance from 75° Impact Location Line (mm) |
|---|---|
| Fore 25 mm Target | 1038 |
| Aft 25 mm Target | 1041 |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021

**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 | Fixed | Fixed | Fixed |
| Front Passenger Seat | Fixed | Fixed | Fixed |
| 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) | | |
|---|---|---|---|---|---|---|
| | | | | Rear-Most | Mid | Forward-Most |
| Driver Seat | Fixed | Fixed | Max | Fixed | Fixed | Fixed |
| | | | Mid | Fixed | Fixed | Fixed |
| | | | Min | Fixed | Fixed | Fixed |
| Front Passenger Seat | Fixed | Fixed | Max | Fixed | Fixed | Fixed |
| | | | Mid | Fixed | Fixed | Fixed |
| | | | Min | Fixed | Fixed | Fixed |
| Front Center Seat | | | Max | | | |
| | | | Mid | | | |
| | | | Min | | | |
| Struck Side Rear Seat | Fixed | Fixed | Max | Fixed | Fixed | Fixed |
| | | | Mid | Fixed | Fixed | Fixed |
| | | | Min | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Max | Fixed | Fixed | Fixed |
| | | | Mid | Fixed | Fixed | Fixed |
| | | | Min | Fixed | Fixed | Fixed |
| Rear Center Seat | Fixed | Fixed | Max | Fixed | Fixed | Fixed |
| | | | Mid | Fixed | Fixed | Fixed |
| | | | Min | Fixed | Fixed | Fixed |

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

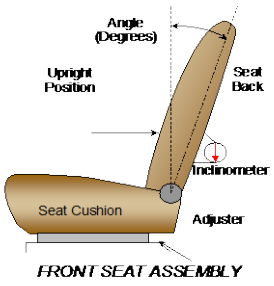
Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021

**SEAT FORE/AFT POSITIONS**

| Seat | Total Fore/Aft Travel | | Test Position from Forward-Most Position | |
|---|---|---|---|---|
| | mm | Detents (1st as 1) | mm | Detent (1st as 0) |
| Driver Seat | 255 | 38 | 0 | 0 |
| Front Passenger Seat | 241 | 36 | 0 | 0 |
| Front Center Seat | | | | |
| Struck Side Rear Seat | Fixed | | Fixed | |
| Non-Struck Side Rear Seat | Fixed | | Fixed | |
| Rear Center Seat | 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 S1 – Vehicle Setup Information for the 5th percentile female dummy in a Side NCAP MDB test. The rear center and non-struck side rear passenger's seat back is set to match the struck-side rear seat back.




| Seat | Total Seat Back Angle Range | | Test Position from Vertical | |
|---|---|---|---|---|
| | Degrees | Detents (1st as 1) | Degrees | Detent (1st as 0) |
| Driver Seat | 60.8 | 33 | -4.7 | 5 |
| Front Passenger Seat | 60.5 | 33 | -4.8 | 5 |
| Front Center Seat | | | | |
| Struck Side Rear Seat | Fixed | | Fixed | |
| Non-Struck Side Rear Seat | Fixed | | Fixed | |
| Rear Center Seat | Fixed | | Fixed | |

All seat back angles measured on outboard headrest post.

**SEAT BELT ANCHORAGE ADJUSTMENT**

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on S1 – Vehicle Setup Information.

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

**HEAD RESTRAINT ADJUSTMENT**

Head restraints are adjusted to the lowest and most full forward in-use position.

| | Total # of Positions | Placed in Position # |
|---|---|---|
| Driver Seat | 3 | 0 (Lowest as 0) / Forward |

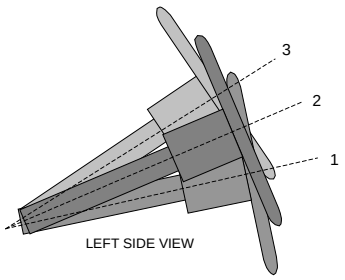
## DATA SHEET NO. 2 (CONTINUED)
## SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT, AND FUEL SYSTEM DATA

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021

### STEERING COLUMN ADJUSTMENT

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

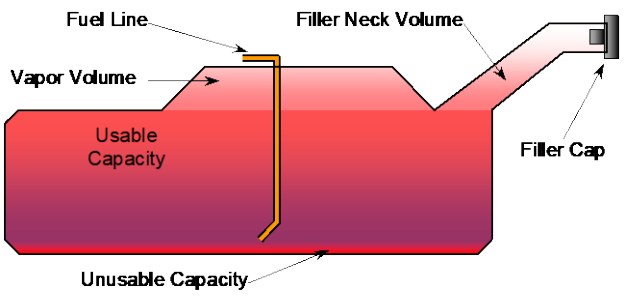
| | Wheel Angle (°) | Fore/Aft Position (mm) |
|---|---|---|
| Lowermost, Position 1 | 61.7 | |
| Geometric Center, Position 2 | 64.5 | |
| Uppermost, Position 3 | 67.3 | |
| Telescoping Steering Wheel Travel | | 51 |
| Test Position | 64.5 | 26 |



*STEERING COLUMN ASSEMBLY*

### FUEL PUMP

The vehicle is equipped with an electronic fuel pump. The electric fuel pump operates for 3 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 3 seconds following ignition actuation the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls the fuel pump is deactivated. Also, the fuel pump is shut-off by the restraint control module to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The filler neck is located on the driver's side.



*VEHICLE FUEL TANK ASSEMBLY*

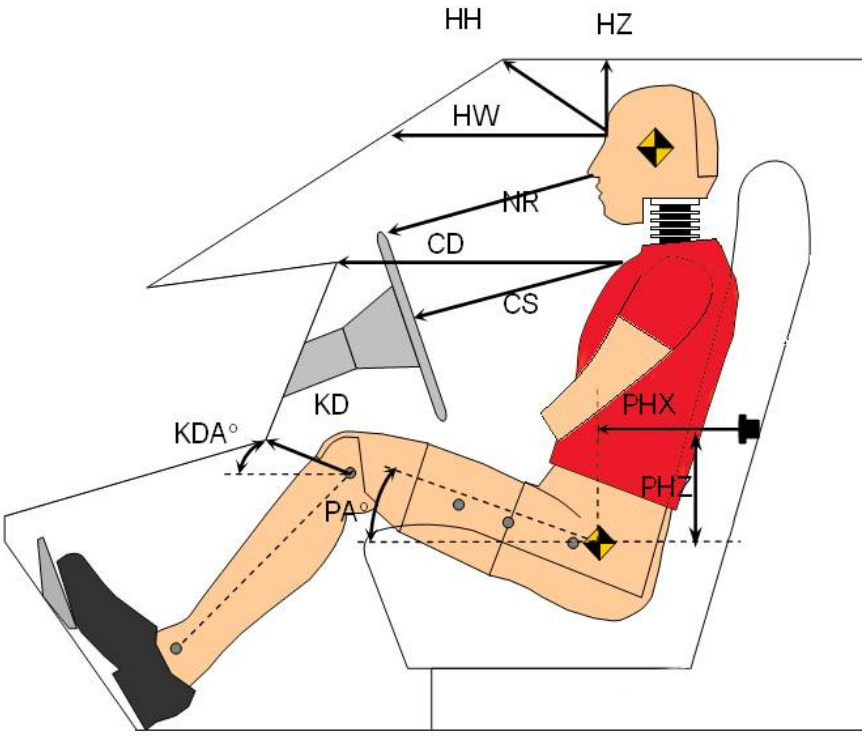
### FUEL TANK CAPACITY DATA

| | Liters |
|---|---|
| Usable Capacity of Standard Tank (see S1 – Vehicle Setup Information) | 102.2 |
| Usable Capacity of Optional Tank (see S1 – Vehicle Setup Information) | 140.4 |
| Usable Capacity of Standard Tank as Specified in Owner's Manual | 102.2 |
| Usable Capacity of Optional Tank as Specified in Owner's Manual | 140.4 |
| 93% of Usable Capacity | 95.1 |
| Actual Amount of Solvent Used | 95.0 |
| 1/3 of Usable Capacity | 34.1 |

Is the actual amount of solvent used in the test equal to 93% ± 1%
of the Usable Capacity stated in S1 – Vehicle Setup Information? **YES**

**DATA SHEET NO. 3**
**DUMMY LONGITUDINAL CLEARANCE DIMENSIONS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021

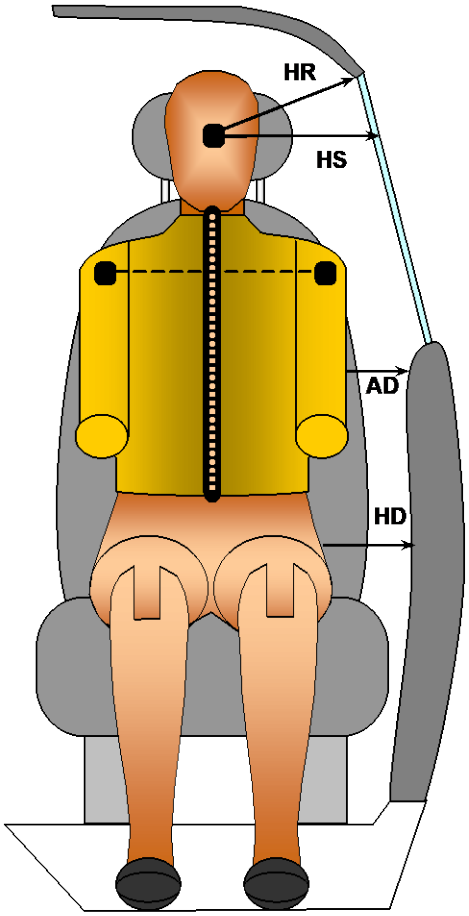



**LEFT SIDE VIEW**

| Code | Measurement Description | Driver | |
|---|---|---|---|
| | | Length (mm) | Angle (°) |
| HH | Head to Header | 349 | |
| HW | Head to Windshield | 670 | |
| HZ | Head to Roof Liner | 251 | |
| NR | Nose to Rim/Seat Back | 238 | |
| CD | Chest to Dashboard/Seat Back | 459 | |
| CS | Chest to Steering Wheel | 185 | |
| KDL / KDAL | Left Knee to Dash/Seat Back | 138 | 27.5 |
| KDR / KDAL | Right Knee to Dash/Seat Back | 144 | 29.1 |
| PAX | Pelvic Tilt Angle X | | 22.3 |
| PAY | Pelvic Tilt Angle Y | | -0.3 |
| PHX | Hip Point to Striker (X-Axis) | 451 | |
| PHZ | Hip Point to Striker (Z-Axis) | 57 | |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021

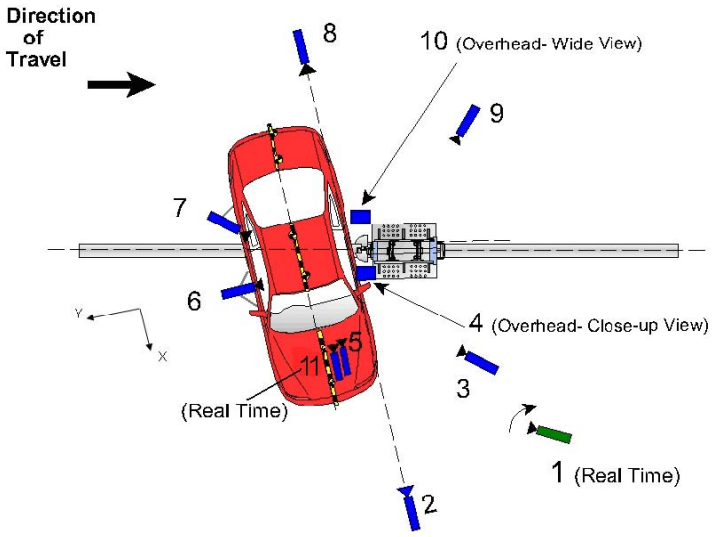


*FRONT VIEW OF DUMMY*

| Code | Measurement Description | Driver |
|---|---|---|
| | | Length (mm) |
| HR | Head to Side Header | 270 |
| HS | Head to Side Window | 394 |
| AD | Arm to Door | 194 |
| HD | Hip Point to Door | 183 |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021




Reference: (from Point of Impact for X and Y; from Ground for Z):
+X = Forward of Impact, + Y = Right of Impact, +Z = Down

| No. | Camera View | Coordinates* (mm) | | | Lens (mm) | Frame Rate (fps) |
|---|---|---|---|---|---|---|
| | | X | Y | Z | | |
| 1 | Real-Time Pan View | | | | | 30 |
| 2 | Front Ground Level | 6800 | -4095 | -1800 | 24 | 1000 |
| 3 | Impact Side 45° Forward | 4090 | -1995 | -1815 | 12 | 1000 |
| 4 | Overhead Closeup | 0 | 0 | -6700 | 85 | 1000 |
| 5 | Onboard – Driver Front | | | | 16 | 1000 |
| 6 | Onboard – Driver Side | | | | 8 | 1000 |
| 7 | Onboard – Driver Rear | | | | 8 | 1000 |
| 8 | Rear Ground Level | -7970 | -35 | -1820 | 24 | 1000 |
| 9 | Impact Side 45° Rearward | -4505 | -4290 | -1795 | 12 | 1000 |
| 10 | Overhead Wide View | 290 | 950 | -6540 | 12 | 1000 |
| 11 | Real-Time Dummy Front View | | | | | 30 |

*All measurements accurate to ±6 mm
Note: Vehicle was positioned at a 75° angle to the rigid pole.

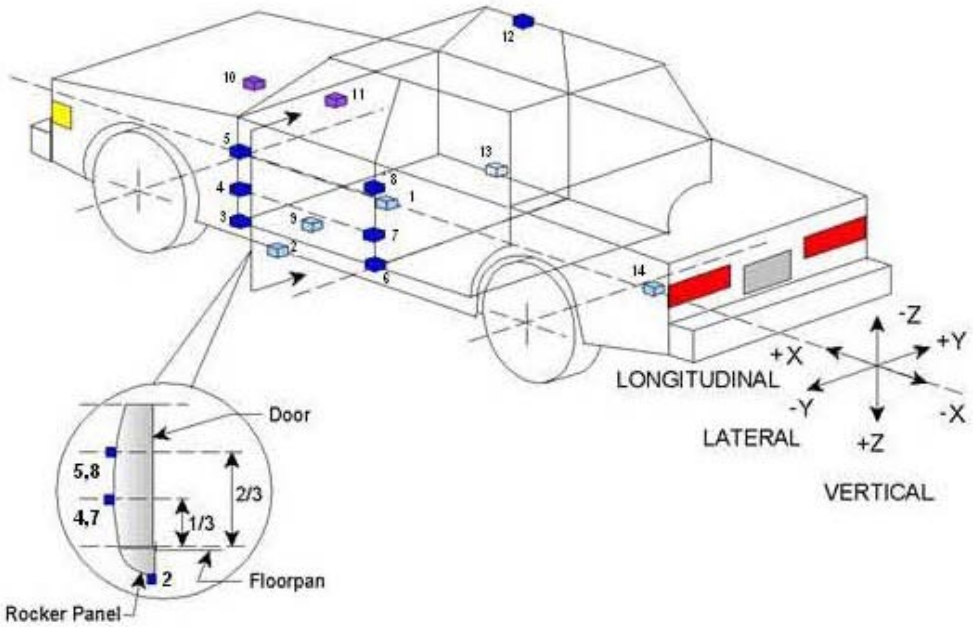
Explain why camera(s) did not operate as intended: None

**INSTRUMENTATION**

| | Number of Channels |
|---|---|
| Driver Dummy | 19 |
| Vehicle Structure | 18 |
| Pole Load Cells | 8 |
| Total | 45 |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021



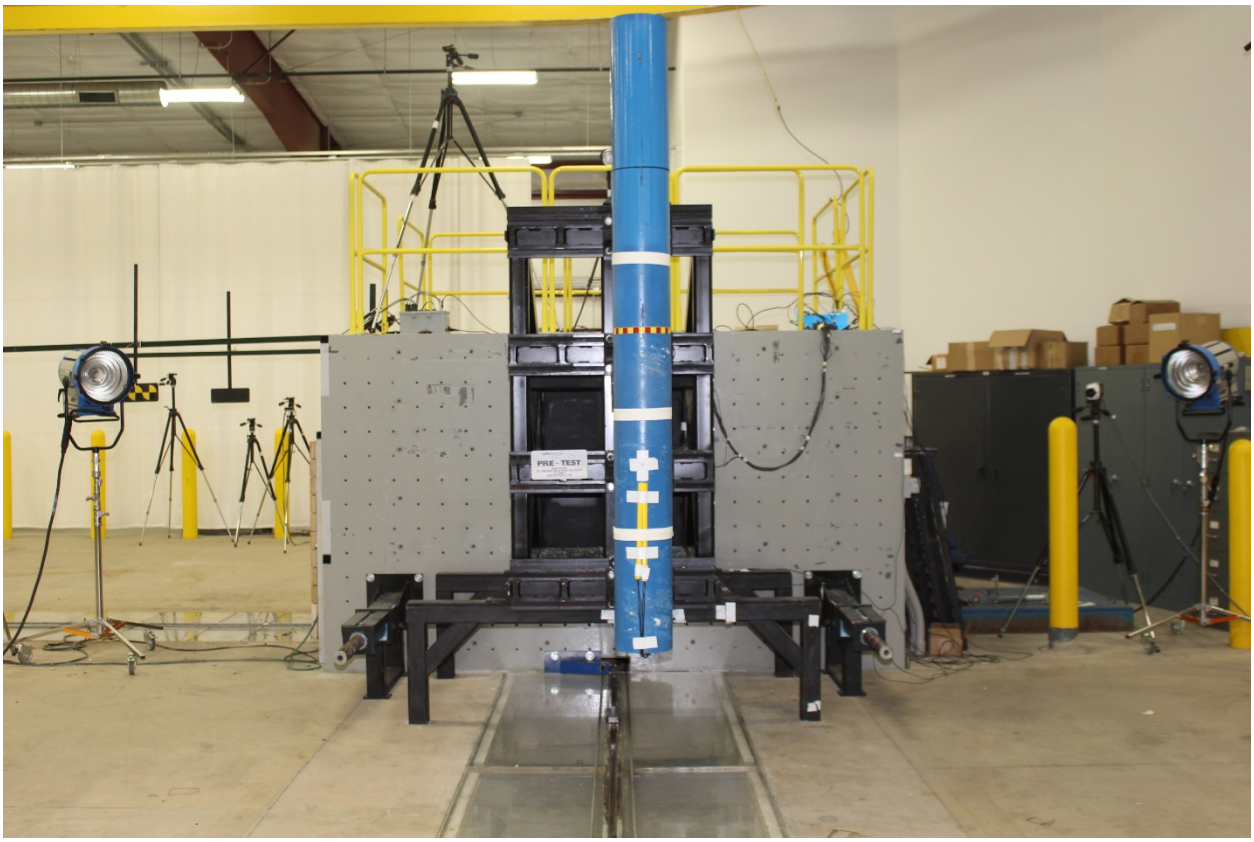

**TEST VEHICLE ACCELEROMETER LOCATIONS**

| No. | ID | Coordinates (mm) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | Vehicle CG | 3221 | 0 | -596 |
| 2 | Left Floor Sill | 3986 | -835 | -405 |
| 3 | A Pillar Sill | 4278 | -835 | -400 |
| 4 | A Pillar Low | 4216 | -897 | -680 |
| 5 | A Pillar Mid | 4222 | -900 | -890 |
| 6 | B Pillar Sill | 3059 | -835 | -423 |
| 7 | B Pillar Low | 2986 | -790 | -790 |
| 8 | B Pillar Mid | 2997 | -790 | -1040 |
| 9 | Driver Seat Track | 3306 | -445 | -585 |
| 10 | Engine Top | 4842 | 10 | -1077 |
| 11 | Firewall | 4767 | 0 | -1253 |
| 12 | Right Roof | 1235 | 634 | -1873 |
| 13 | Right Floor Sill | 3986 | 835 | -403 |
| 14 | Rear Floorpan | 1294 | 0 | -795 |

Reference: X – Test Vehicle Rear Bumper (+forward)
Y – Test Vehicle Centerline (+ to right)
Z – Ground Plane (+ down)

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021




254 mm Diameter Rigid Pole

| Load Cell Locations | |
|---|---|
| **ID** | **Height from Impact Surface (mm)** |
| 1 | 182 |
| 2 | 470 |
| 3 | 698 |
| 4 | 986 |
| 5 | 1212 |
| 6 | 1641 |
| 7 | 1854 |
| 8 | 2053 |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021

**TEST DUMMY INFORMATION AND CONTACT POINTS**

| Description | Driver Dummy (SID-IIs) |
|---|---|
| Face | Curtain Airbag |
| Top of Head | Curtain Airbag |
| Left Side of Head | Curtain Airbag |
| Back of Head | Curtain Airbag, Headrest |
| Left Shoulder | Side Torso/Pelvis Airbag, Seatback |
| Upper Torso | Seatback |
| Lower Torso | Seatback |
| Left Hip | Side Torso/Pelvis Airbag, Seat Cushion |
| Left Knee | None |

**POST-TEST DOOR PERFORMANCE**

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

**POST-TEST SEAT PERFORMANCE**

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

**POST-TEST STRUCTURAL OBSERVATIONS**

| Critical Areas of Performance | Observations and Conclusions |
|---|---|
| Pillar Performance | No Separation |
| Sill Separation | No Separation |
| Windshield Damage | Cracked |
| Side Window Damage | LF window cracked |
| Other Notable Effects | None |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021

**SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION**

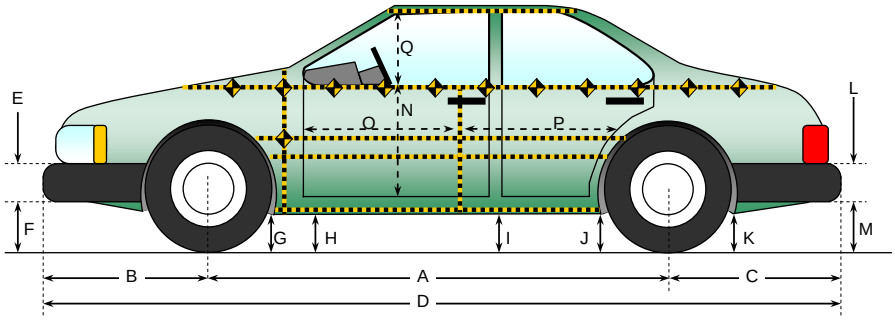
| Restraint Type | Struck Side Driver | | Struck Side Left Rear Passenger | |
|---|---|---|---|---|
| | Mounted | Deployed | Mounted | Deployed |
| Frontal Airbag | Yes | No | | |
| Knee Airbag | Yes | No | | |
| Side Curtain Airbag | Yes | Yes | Yes | Yes |
| Side Torso/Pelvis Airbag | Yes | Yes | No | |
| Side Airbag (Other) | | | | |
| Seat Belt Pretensioner | Yes | Yes | Yes | |
| Seat Belt Load Limiter | Yes | | Yes | |
| Other: | No | | No | |

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

| Measured Parameter | Units | Tolerance | Value |
|---|---|---|---|
| Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point) | mm | | 1257 |
| Actual Impact Point (Aft of Front Axle) | mm | | 1261 |
| Horizontal Offset (+forward / -rearward) | mm | +/- 38 of Intended Impact Point | -4 |
| Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion | degrees | 75 +/- 3 | 75.1 |
| Trap No. 1 Velocity (Primary) | km/h | 31.4 to 33.0 | 32.27 |
| Trap No. 2 Velocity (Redundant) | km/h | 31.4 to 33.0 | 32.31 |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021



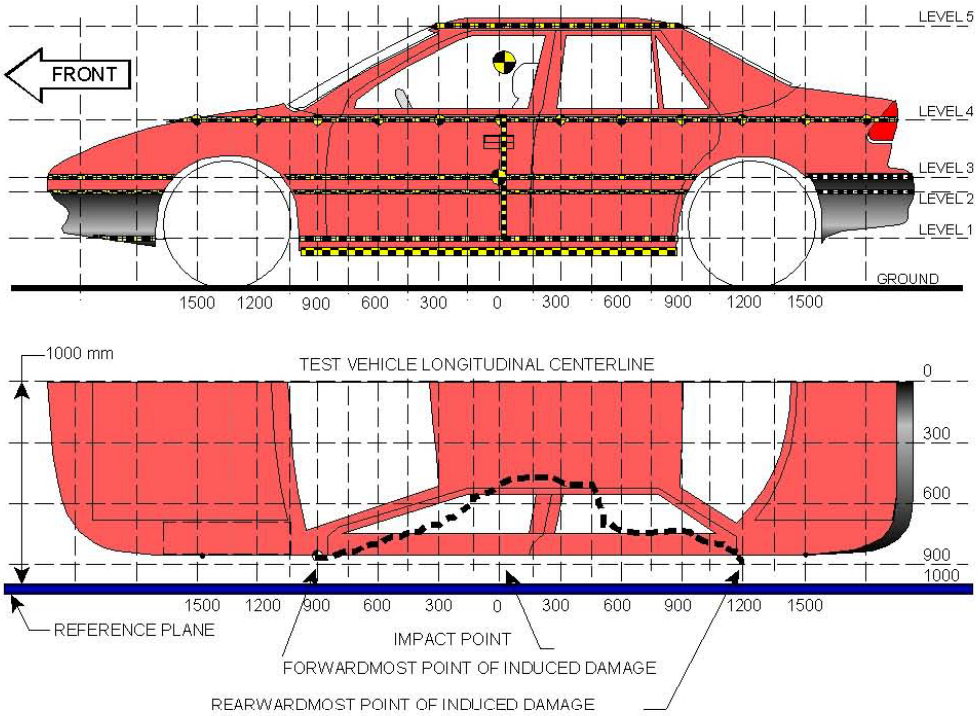

All measurements in (mm) with tolerance of ± 3 mm
**LEFT SIDE VIEW**

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

| Code | Measurement Description | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|
| A | Wheelbase | 3704 | 3670 | 34 |
| B | Front Axle to FSOV | 953 | 994 | -41 |
| C | Rear Axle to RSOV | 1226 | 1204 | 22 |
| D | Total Vehicle Length at Centerline | 5883 | 5868 | 15 |
| E | Front Bumper Thickness | 230 | 230 | 0 |
| F | Front Bumper Bottom to Ground | 329 | 325 | 4 |
| G | Sill Height at Front Wheel Well | 378 | 358 | 20 |
| H | Sill Height at Front Door Leading Edge | 381 | 361 | 20 |
| I | Sill Height at B-Pillar | 401 | 384 | 17 |
| J1 | Sill Height at Rear Wheel Well | 422 | 450 | -28 |
| J2 | Pinch Weld Height at Rear Wheel Well | 411 | 431 | -20 |
| K | Sill Height Aft of Rear Wheel Well | 450 | 495 | -45 |
| L | Rear Bumper Thickness | 165 | 165 | 0 |
| M | Rear Bumper Bottom to Ground | 400 | 399 | 1 |
| N | Sill Height to Bottom of Front Window Sill | 806 | 813 | -7 |
| O | Front Door Leading Edge to Impact CL | 604 | 513 | 91 |
| P | Rear Door Trailing Edge to Impact CL | 1608 | 1535 | 73 |
| Q | Front Window Opening | 611 | 590 | 21 |
| R | Right Side Length | 5516 | 5525 | -9 |
| S | Left Side Length | 5516 | 5405 | 111 |
| T | Vehicle Width at B-Pillars | 2056 | 2056 | 0 |
| U | Front Wheel Track Width | 1721 | | |
| V | Rear Wheel Track Width | 1736 | | |

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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021




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

**MAXIMUM EXTERIOR CRUSH MEAUREMENTS**

| Level | Measurement Description | Height Above Ground | Maximum Exterior Static Crush | Distance from Impact |
|---|---|---|---|---|
| 1 | Sill Top | 466 | 321 | 75 |
| 2 | Mid Door | 777 | 331 | 75 |
| 3 | Occupant H-Point | 924 | 334 | 75 |
| 4 | Window Sill | 1173 | 319 | 75 |
| 5 | Window Top | 1860 | 66 | 75 |

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

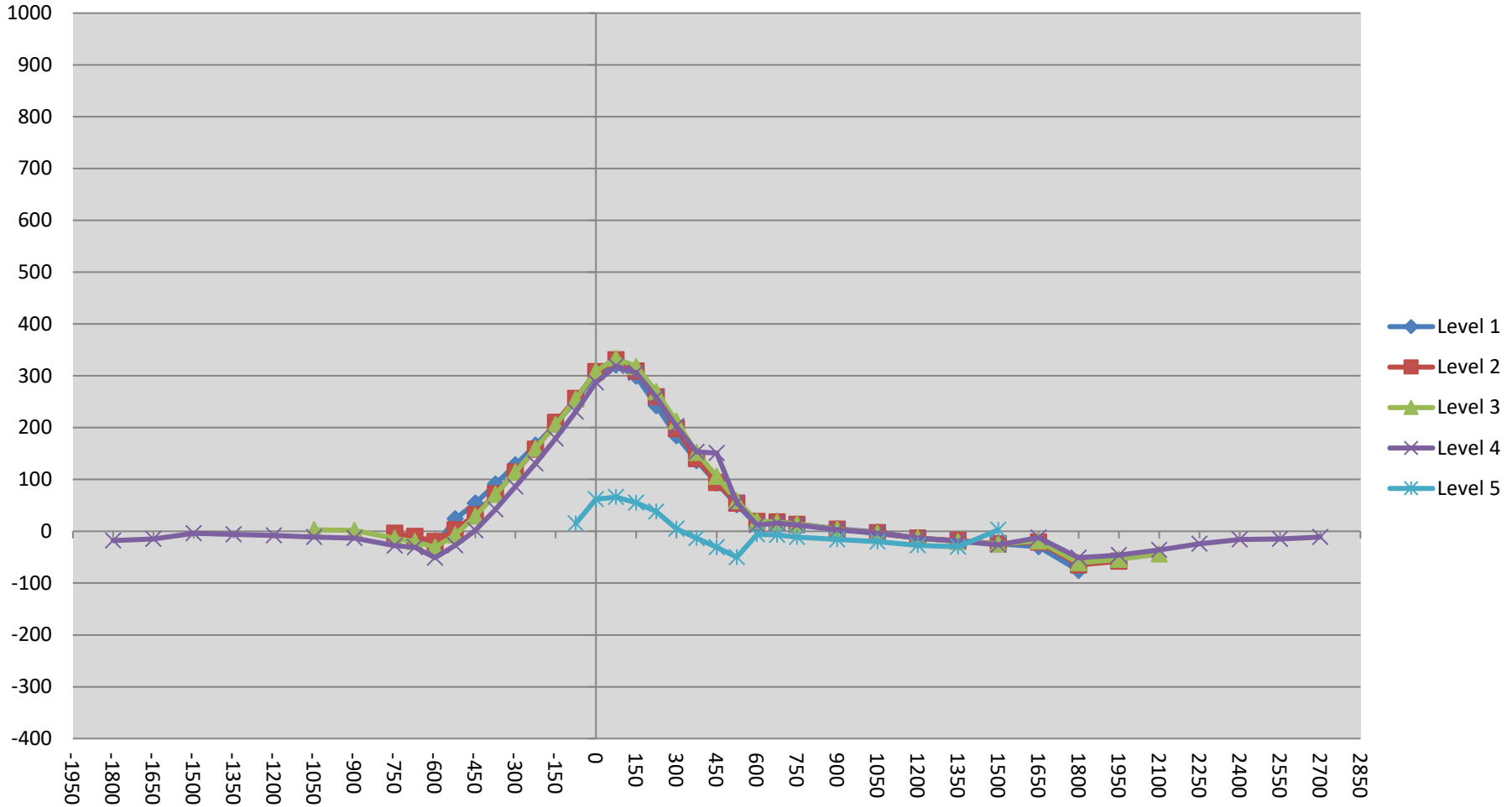
Test Vehicle: 2021 Ford F-150 4x2 SuperCrew NHTSA No.: M20210208
Test Program: NCAP Side Pole Impact Test Test Date: 3/12/2021

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.

| | Pre-Test | | | | | Post-Test | | | | | Difference | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| -2700 | | | | | | | | | | | | | | | |
| -2550 | | | | | | | | | | | | | | | |
| -2400 | | | | | | | | | | | | | | | |
| -2250 | | | | | | | | | | | | | | | |
| -2100 | | | | | | | | | | | | | | | |
| -1950 | | | | | | | | | | | | | | | |
| -1800 | | | | 243 | | | | | 225 | | | | | -18 | |
| -1650 | | | | 207 | | | | | 192 | | | | | -15 | |
| -1500 | | | | 182 | | | | | 178 | | | | | -4 | |
| -1350 | | | | 164 | | | | | 158 | | | | | -6 | |
| -1200 | | | | 150 | | | | | 142 | | | | | -8 | |
| -1050 | | | 83 | 138 | | | | 86 | 127 | | | | 3 | -11 | |
| -900 | | | 82 | 130 | | | | 84 | 117 | | | | 2 | -13 | |
| -825 | | | | | | | | | | | | | | | |
| -750 | | 86 | 93 | 120 | | | 82 | 79 | 92 | | | -4 | -14 | -28 | |
| -675 | 106 | 90 | 93 | 121 | | 91 | 80 | 73 | 90 | | -15 | -10 | -20 | -31 | |
| -600 | 115 | 95 | 96 | 117 | | 86 | 75 | 65 | 66 | | -29 | -20 | -31 | -51 | |
| -525 | 114 | 95 | 95 | 121 | | 138 | 98 | 88 | 94 | | 24 | 3 | -7 | -27 | |
| -450 | 113 | 97 | 95 | 119 | | 167 | 129 | 124 | 121 | | 54 | 32 | 29 | 2 | |
| -375 | 113 | 98 | 93 | 117 | | 204 | 170 | 164 | 159 | | 91 | 72 | 71 | 42 | |
| -300 | 111 | 98 | 91 | 114 | | 239 | 212 | 205 | 200 | | 128 | 114 | 114 | 86 | |
| -225 | 110 | 98 | 90 | 112 | | 276 | 256 | 250 | 243 | | 166 | 158 | 160 | 131 | |
| -150 | 109 | 97 | 89 | 110 | | 316 | 307 | 295 | 289 | | 207 | 210 | 206 | 179 | |
| -75 | 109 | 96 | 89 | 108 | 382 | 361 | 352 | 344 | 339 | 397 | 252 | 256 | 255 | 231 | 15 |
| 0 | 108 | 95 | 88 | 103 | 368 | 412 | 403 | 397 | 390 | 430 | 304 | 308 | 309 | 287 | 62 |
| 75 | 108 | 94 | 87 | 98 | 365 | 429 | 425 | 421 | 417 | 431 | 321 | 331 | 334 | 319 | 66 |
| 150 | 106 | 94 | 86 | 96 | 362 | 405 | 403 | 404 | 402 | 417 | 299 | 309 | 318 | 306 | 55 |
| 225 | 106 | 93 | 86 | 95 | 361 | 348 | 352 | 355 | 353 | 399 | 242 | 259 | 269 | 258 | 38 |
| 300 | 106 | 93 | 85 | 94 | 359 | 290 | 291 | 297 | 297 | 364 | 184 | 198 | 212 | 203 | 5 |
| 375 | 106 | 92 | 85 | 92 | 359 | 242 | 232 | 237 | 245 | 346 | 136 | 140 | 152 | 153 | -13 |
| 450 | 105 | 91 | 84 | 92 | 358 | 198 | 185 | 190 | 243 | 327 | 93 | 94 | 106 | 151 | -31 |
| 525 | 106 | 90 | 83 | 91 | 353 | 157 | 144 | 142 | 146 | 303 | 51 | 54 | 59 | 55 | -50 |
| 600 | 105 | 90 | 83 | 90 | 353 | 117 | 109 | 103 | 102 | 347 | 12 | 19 | 20 | 12 | -6 |
| 675 | 105 | 90 | 83 | 91 | 352 | 124 | 108 | 101 | 107 | 345 | 19 | 18 | 18 | 16 | -7 |
| 750 | 106 | 92 | 83 | 90 | 352 | 120 | 105 | 97 | 102 | 341 | 14 | 13 | 14 | 12 | -11 |
| 825 | | | | | | | | | | | | | | | |
| 900 | 107 | 93 | 84 | 90 | 352 | 112 | 97 | 88 | 93 | 336 | 5 | 4 | 4 | 3 | -16 |
| 1050 | 108 | 94 | 85 | 90 | 351 | 106 | 91 | 81 | 86 | 331 | -2 | -3 | -4 | -4 | -20 |
| 1200 | 110 | 95 | 86 | 90 | 351 | 97 | 82 | 73 | 77 | 324 | -13 | -13 | -13 | -13 | -27 |
| 1350 | 112 | 95 | 88 | 92 | 350 | 93 | 77 | 68 | 73 | 320 | -19 | -18 | -20 | -19 | -30 |
| 1500 | 116 | 97 | 87 | 92 | 347 | 92 | 73 | 63 | 66 | 350 | -24 | -24 | -24 | -26 | 3 |
| 1650 | 120 | 97 | 89 | 95 | | 90 | 76 | 70 | 83 | | -30 | -21 | -19 | -12 | |
| 1800 | 129 | 107 | 101 | 104 | | 53 | 42 | 40 | 53 | | -76 | -65 | -61 | -51 | |
| 1950 | | 89 | 96 | 106 | | | 31 | 42 | 60 | | | -58 | -54 | -46 | |
| 2100 | | | 85 | 107 | | | | 41 | 71 | | | | -44 | -36 | |
| 2250 | | | | 107 | | | | | 83 | | | | | -24 | |
| 2400 | | | | 103 | | | | | 87 | | | | | -16 | |
| 2550 | | | | 107 | | | | | 92 | | | | | -15 | |
| 2700 | | | | 118 | | | | | 107 | | | | | -11 | |

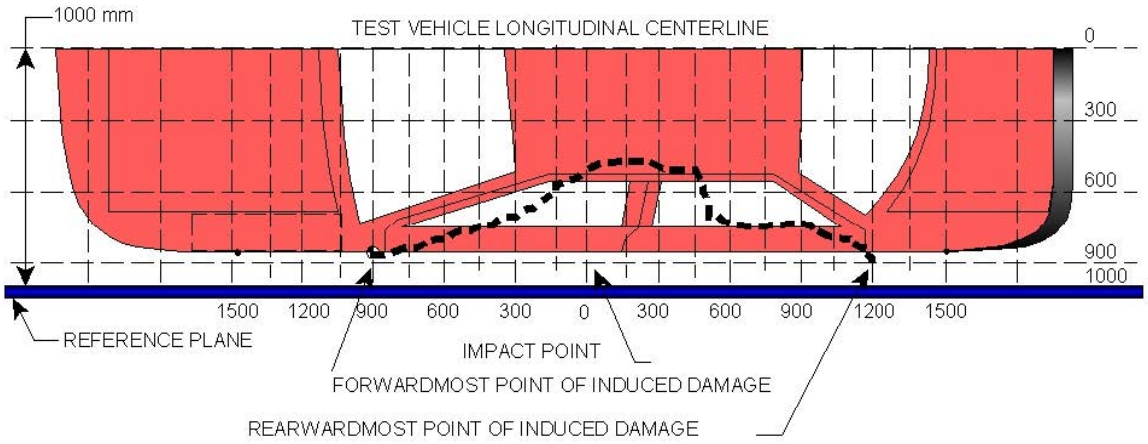
**DATA SHEET NO. 10 (CONTINUED)**
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021



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

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021




**VEHICLE DAMAGE PROFILE DISTANCES**

| DPD | Distance from Impact Point (mm) | Level | Pre-Test (mm) | Post-Test (mm) | Max. Static Crush (mm) |
|---|---|---|---|---|---|
| 1 | 615 | 3 | 83 | 96 | 13 |
| 2 | 370 | 3 | 85 | 242 | 157 |
| 3 | 125 | 3 | 86 | 413 | 327 |
| 4 | -120 | 3 | 89 | 317 | 228 |
| 5 | -365 | 3 | 93 | 172 | 79 |
| 6 | -610 | 3 | 96 | 61 | -35 |

**DATA SHEET NO. 11**
**FMVSS NO. 301 STATIC ROLLOVER RESULTS**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021

Test Time: 2:47 pm
Temperature: 22.0°C

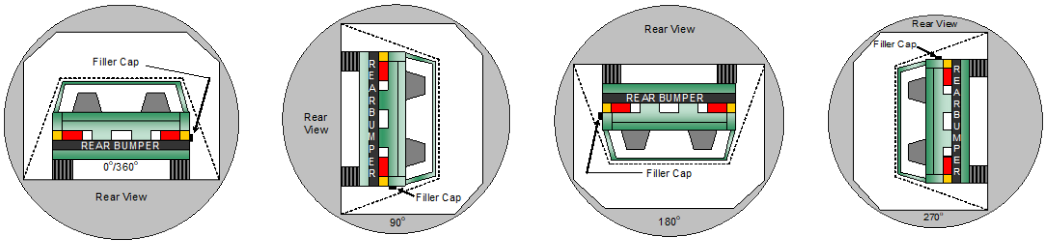
A. From impact until vehicle motion ceases: (Maximum Allowable = 1 ounce) 0.0 oz.

B. For the 5 minute period after motion ceases: (Maximum Allowable = 5 ounces) 0.0 oz.

C. For the following 25 minutes: (Maximum Allowable = 1 ounce / minute) None

D. Spillage Details: None

**FMVSS 301 STATIC ROLLOVER DATA**




0°/360° 90° 180° 270°

**ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS**

| Test Phase | Rotation Time | Hold Time | Total Time |
|---|---|---|---|
| 0° to 90° | 93 | 300 | 393 |
| 90° to 180° | 91 | 300 | 391 |
| 180° to 270° | 82 | 300 | 382 |
| 270° to 360° | 89 | 300 | 389 |

**FMVSS 301 ROLLOVER SPILLAGE TABLE (UNITS IN OUNCES)**

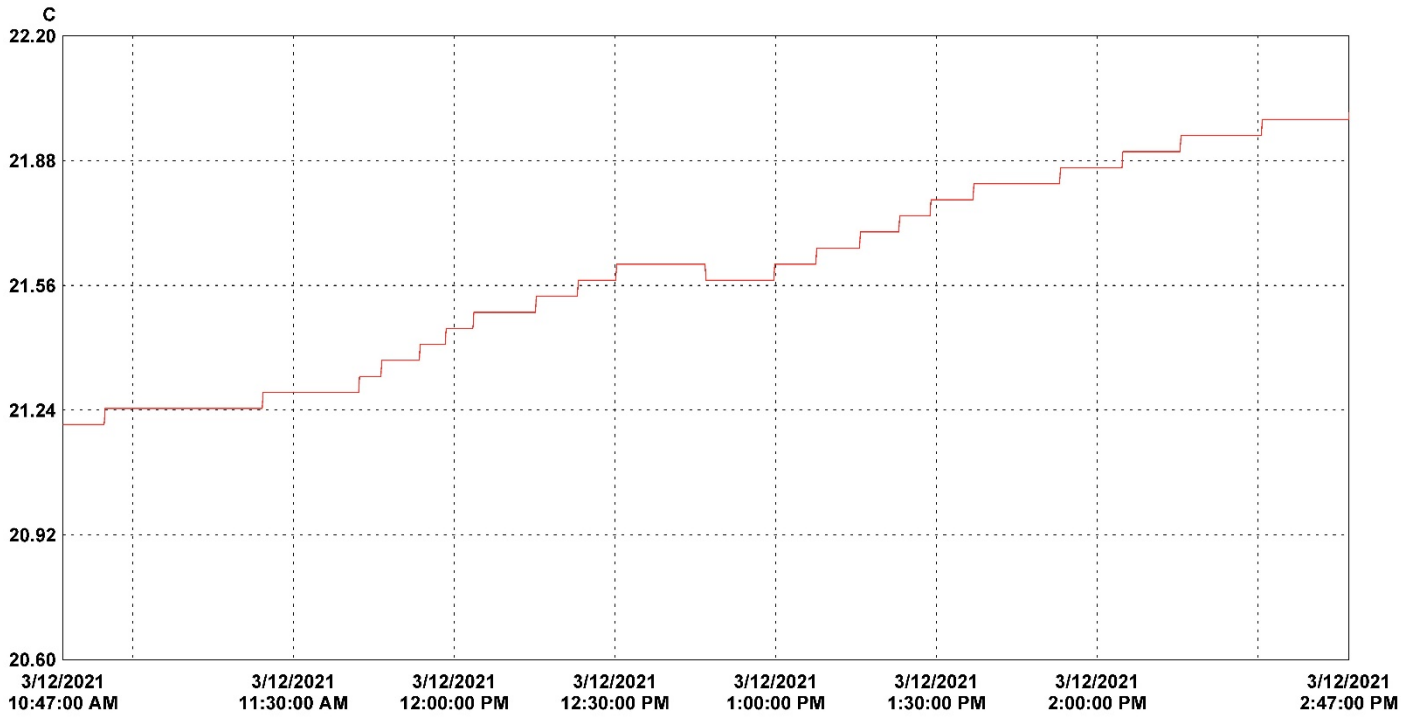
| Test Phase | First 5 Minutes | Sixth Minute | Seventh Minute | Eighth Minute |
|---|---|---|---|---|
| 0° to 90° | 0.0 | 0.0 | 0.0 | |
| 90° to 180° | 0.0 | 0.0 | 0.0 | |
| 180° to 270° | 0.0 | 0.0 | 0.0 | |
| 270° to 360° | 0.0 | 0.0 | 0.0 | |

**ROLLOVER SOLVENT SPILLAGE LOCATION TABLE**

| Test Phase | Spillage Location |
|---|---|
| 0° to 90° | |
| 90° to 180° | |
| 180° to 270° | |
| 270° to 360° | |

**DATA SHEET NO. 12**
**DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA**

Test Vehicle: 2021 Ford F-150 4x2 SuperCrew
Test Program: NCAP Side Pole Impact Test
NHTSA No.: M20210208
Test Date: 3/12/2021




30 minutes/div 4 hours (M/d/yyyy h:mm:ss tt) Central Time Graph file (truncated): M20210208 2021 Ford F-150 4x2 SuperCrew Side NCAP Pole.spg

| LN | Serial # | Description | CH | Value | Maximum | Average | Minimum | Units | CH description | Logger file |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 12032257 | VSC_South_Hall | 1 | | 21.99 | 21.60 | 21.20 | C | Temperature | 12032257_VSC_South_Hall.spl |

# APPENDIX A
# PHOTOGRAPHS

## TABLE OF PHOTOGRAPHS

Photo No. 001 - As Delivered Right Front Three-Quarter View of Test Vehicle


Photo No. 002 - As Delivered Left Rear Three-Quarter View of Test Vehicle

Photo No. 003 - Pre-Test Frontal View of Test Vehicle

Photo No. 004 - Post-Test Frontal View of Test Vehicle


Photo No. 005 - Pre-Test Left Front Three-Quarter View of Test Vehicle


Photo No. 006 - Post-Test Left Front Three-Quarter View of Test Vehicle

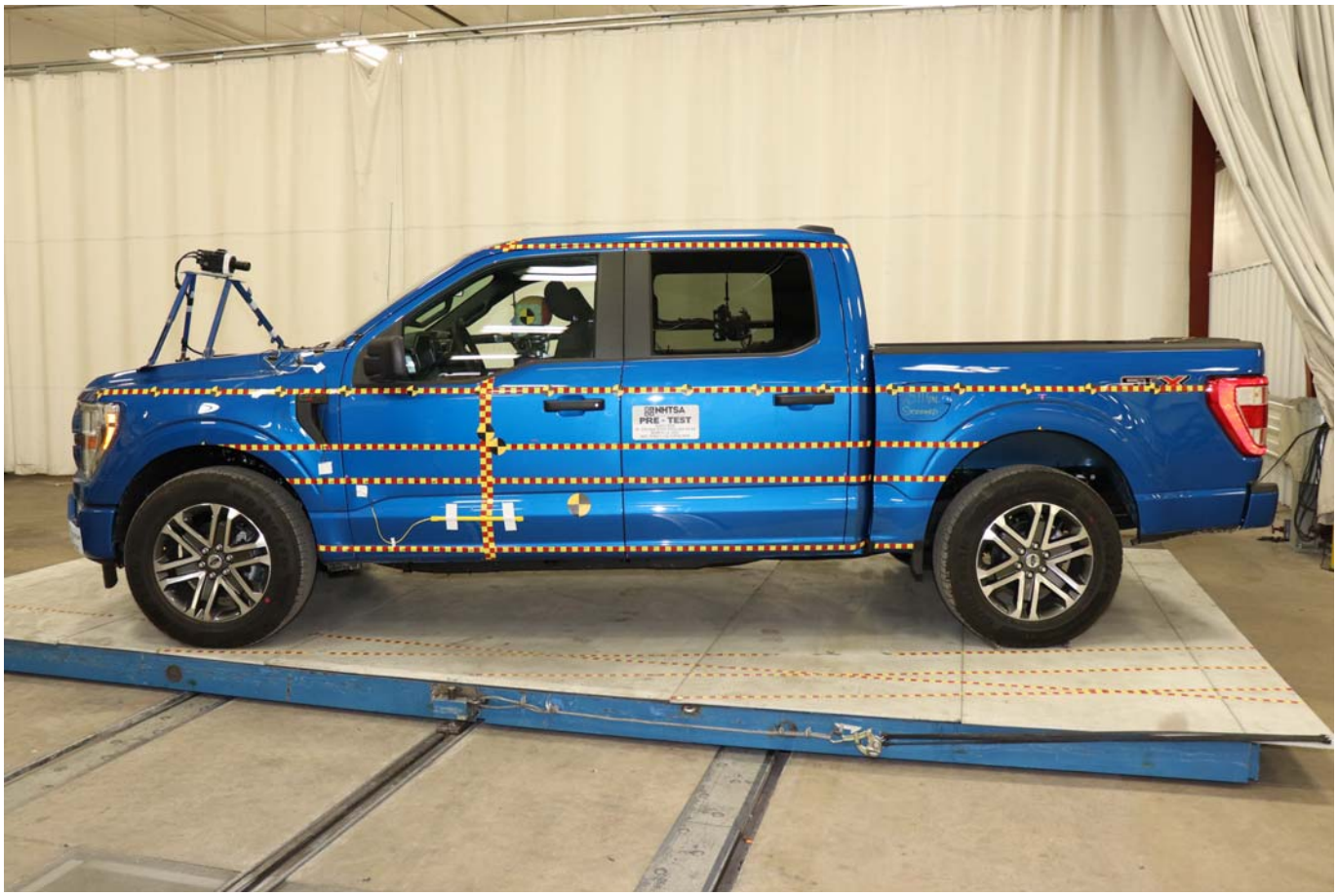



Photo No. 007 - Pre-Test Left Side View of Test Vehicle

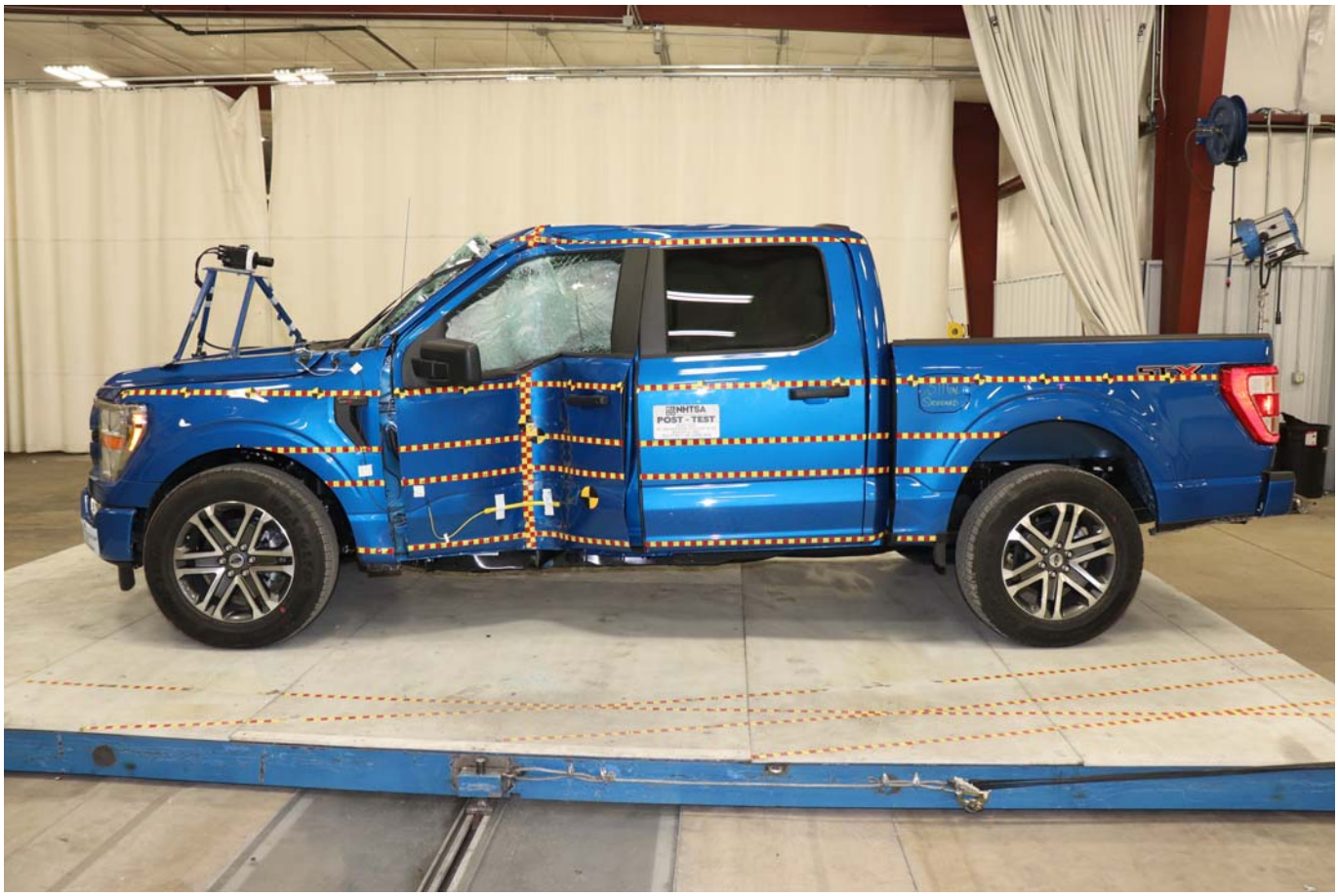



Photo No. 008 - Post-Test Left Side View of Test Vehicle

Photo No. 009 - Pre-Test Left Rear Three-Quarter View of Test Vehicle

Photo No. 010 - Post-Test Left Rear Three-Quarter View of Test Vehicle

Photo No. 011 - Pre-Test Rear View of Test Vehicle

Photo No. 012 - Post-Test Rear View of Test Vehicle

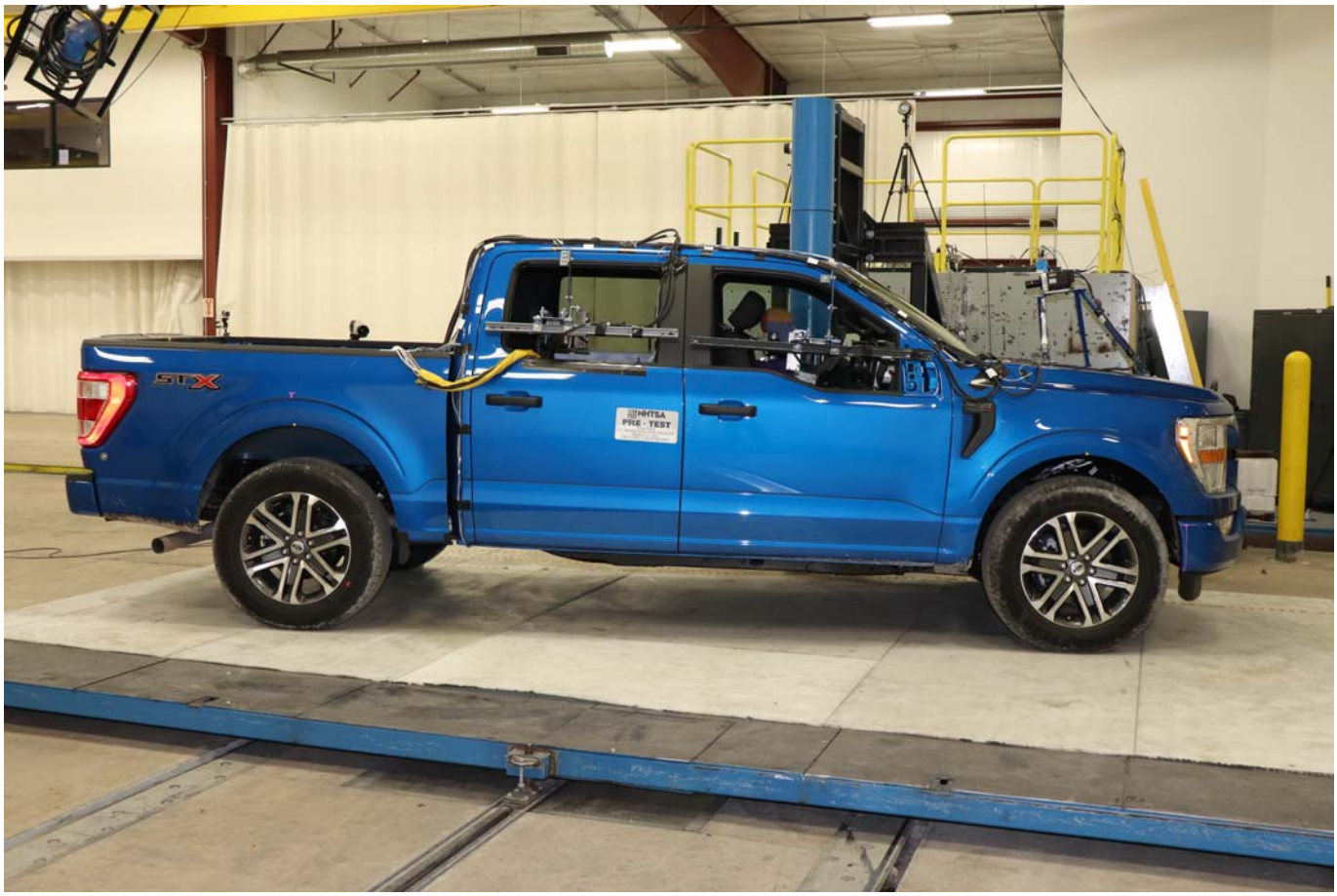


Photo No. 013 - Pre-Test Right Side View of Test Vehicle

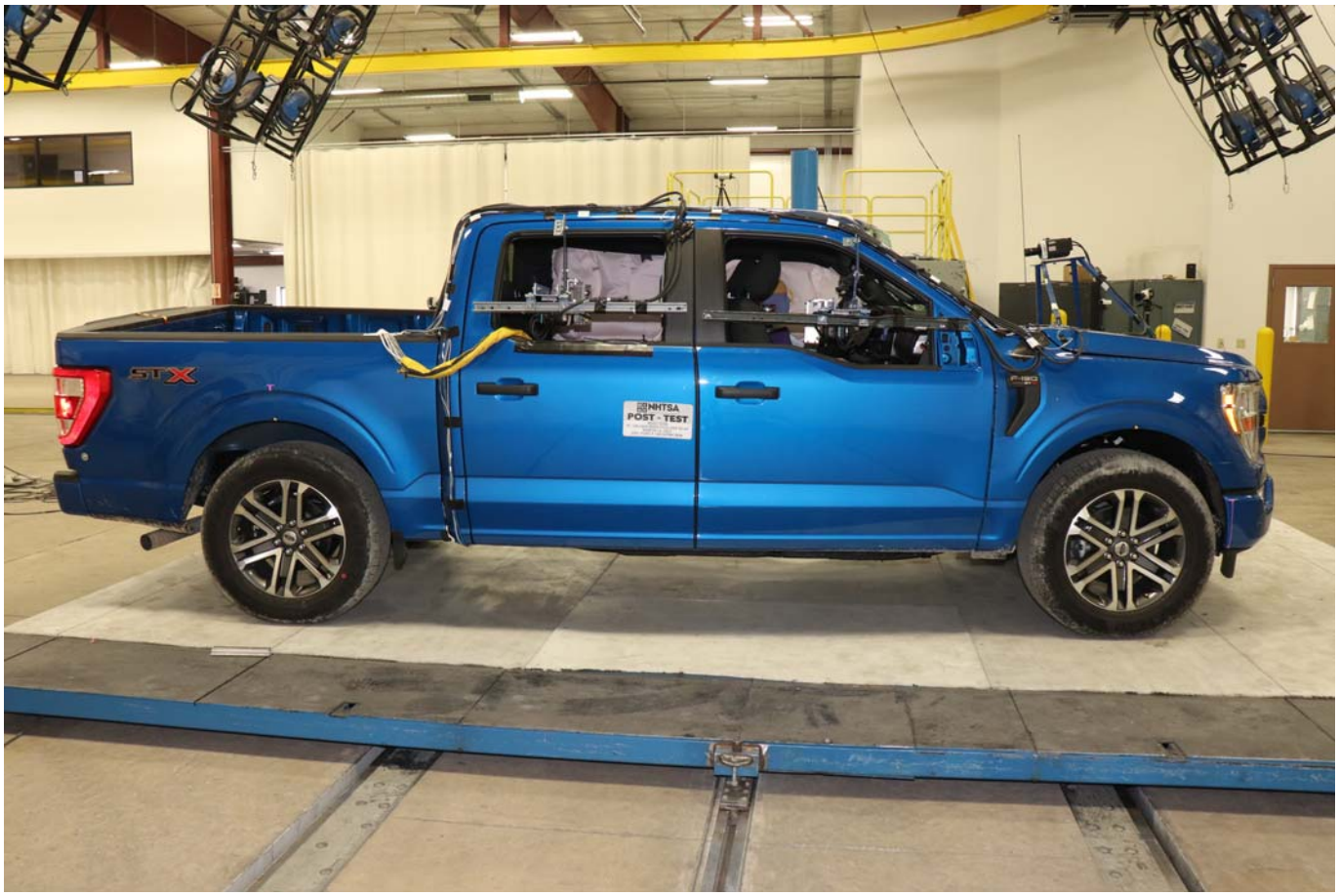


Photo No. 014 - Post-Test Right Side View of Test Vehicle

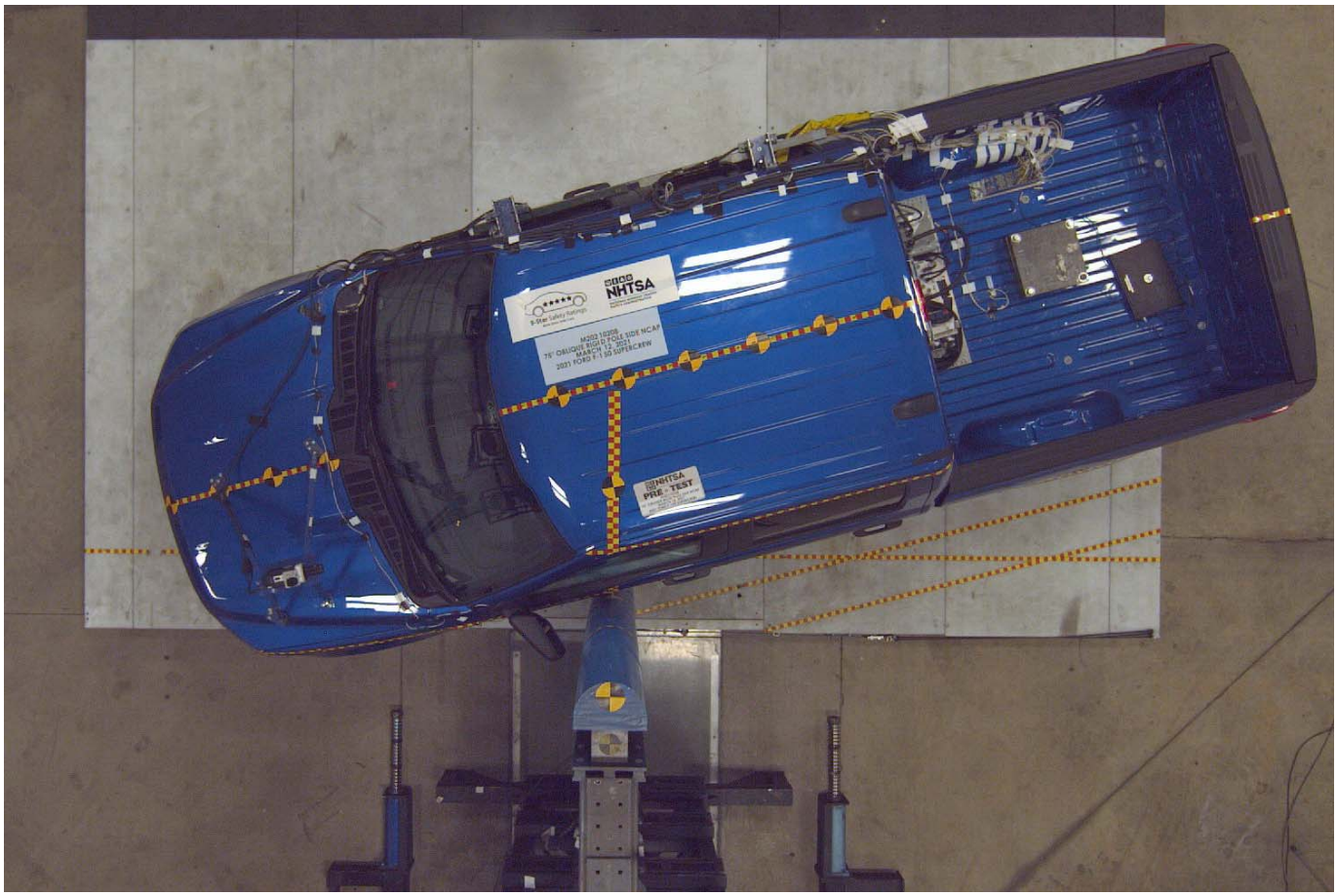


Photo No. 015 - Pre-Test Overhead View of Test Area

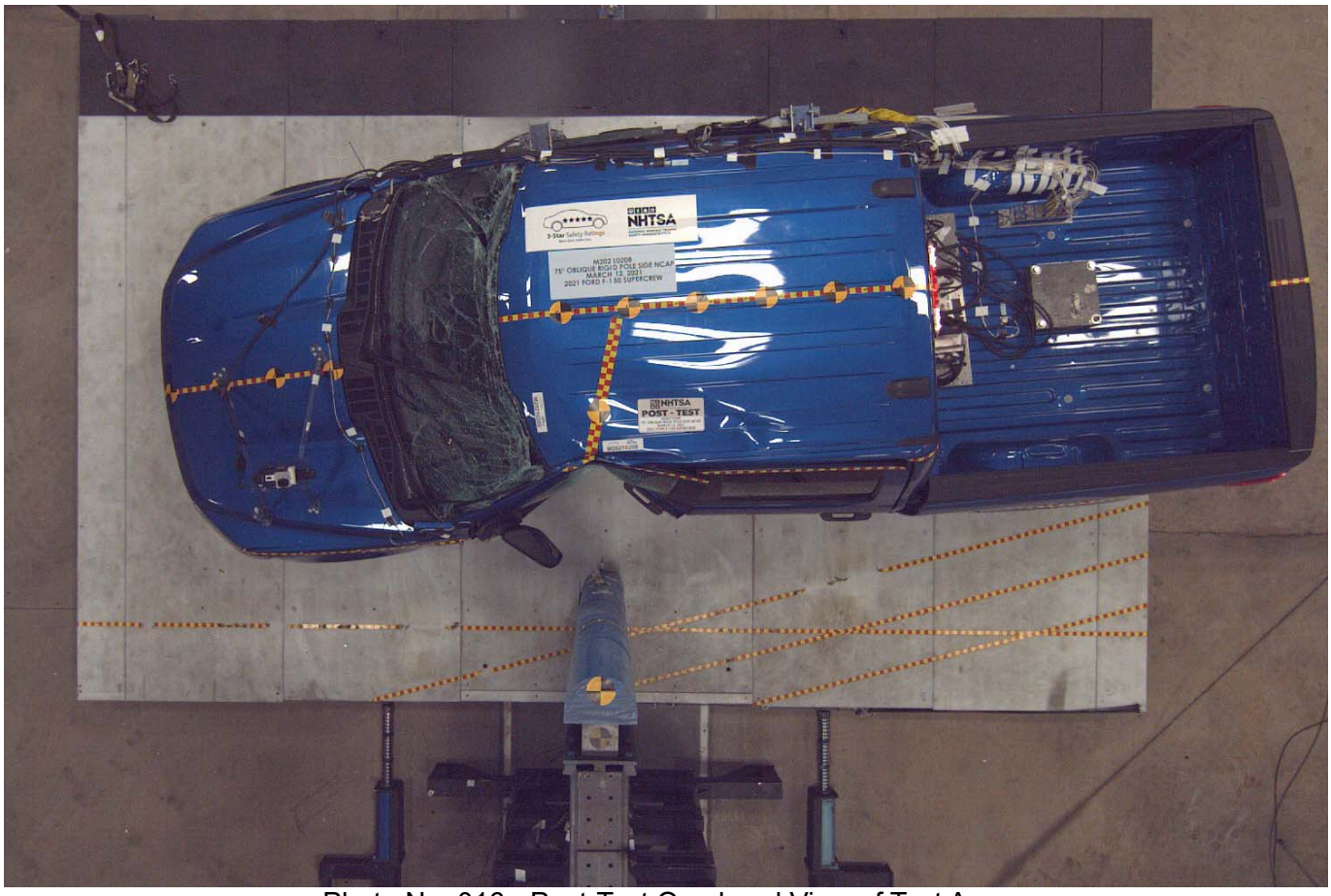


Photo No. 016 - Post-Test Overhead View of Test Area

Photo No. 017 - Pre-Test Left Side View of Pole Positioned Against Side of Vehicle

Photo No. 018 - Pre-Test Right Side View of Pole Positioned Against Side of Vehicle

Photo No. 019 - Pre-Test Close-Up View of Impact Point Target

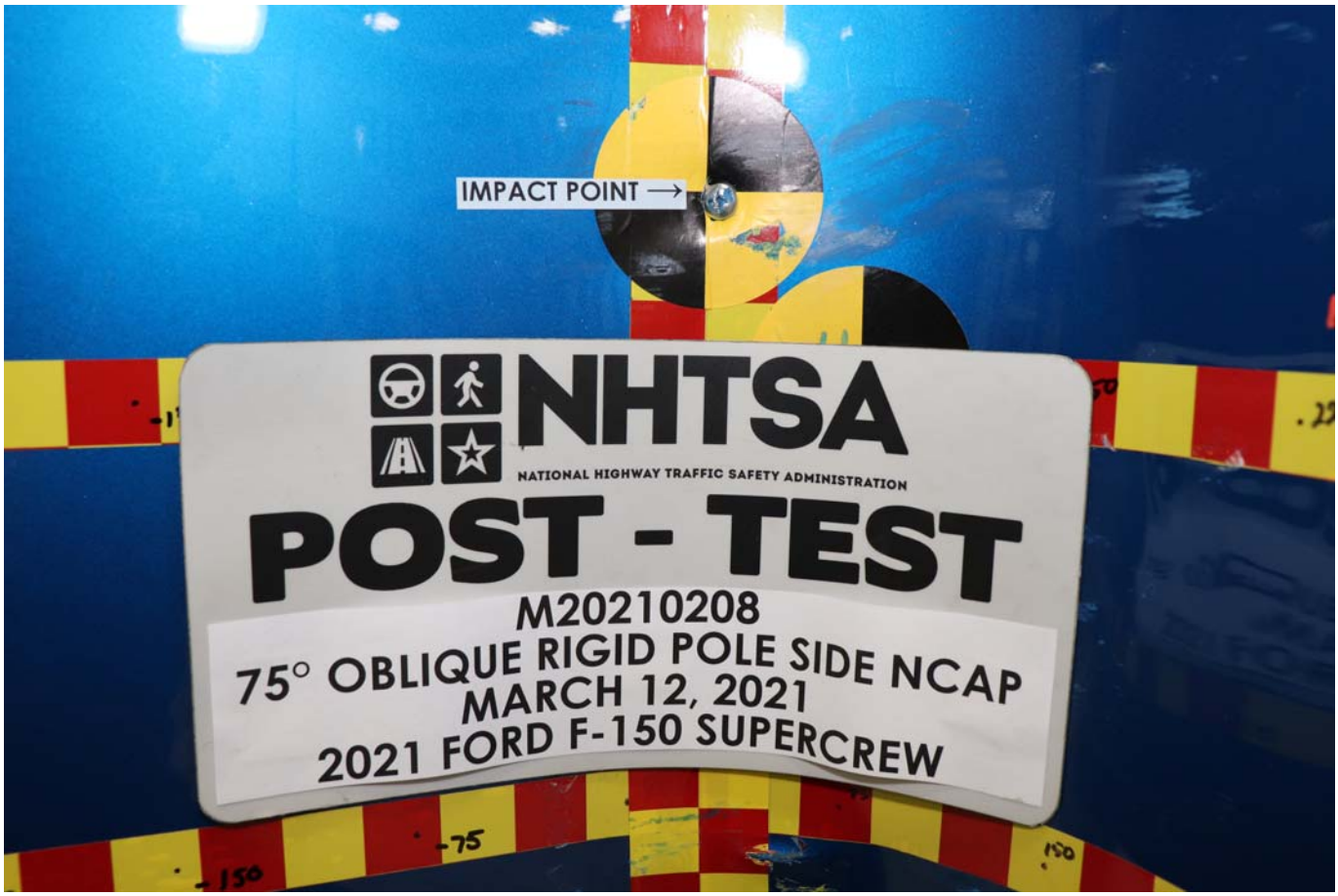


Photo No. 020 - Post-Test Close-Up View of Impact Point Target Showing Impact Location

Photo No. 021 - Pre-Test Front Close-Up View of Dummy Head and Chest

Photo No. 022 - Post-Test Front Close-Up View of Dummy

Photo No. 023 - Pre-Test Left Side View of Dummy Showing Belt and Chalking

Photo No. 024 - Pre-Test Left Side View of Dummy Shoulder and Door Top View

Photo No. 025 - Post-Test Left Side View of Dummy Shoulder and Door Top View

Photo No. 026 - Pre-Test Front View of Seat Back Prior to Dummy Positioning

Photo No. 027 - Pre-Test Front Close-Up View of Dummy Head and Shoulders in Relation to Head Restraint

Photo No. 028 - Pre-Test Front View of Seat Pan Prior to Dummy Positioning

Photo No. 029 - Pre-Test Overhead View of Dummy Thighs on Seat Pan

Photo No. 030 - Pre-Test Left Side View of Dummy Neck Showing Position of Adjustable Neck Bracket

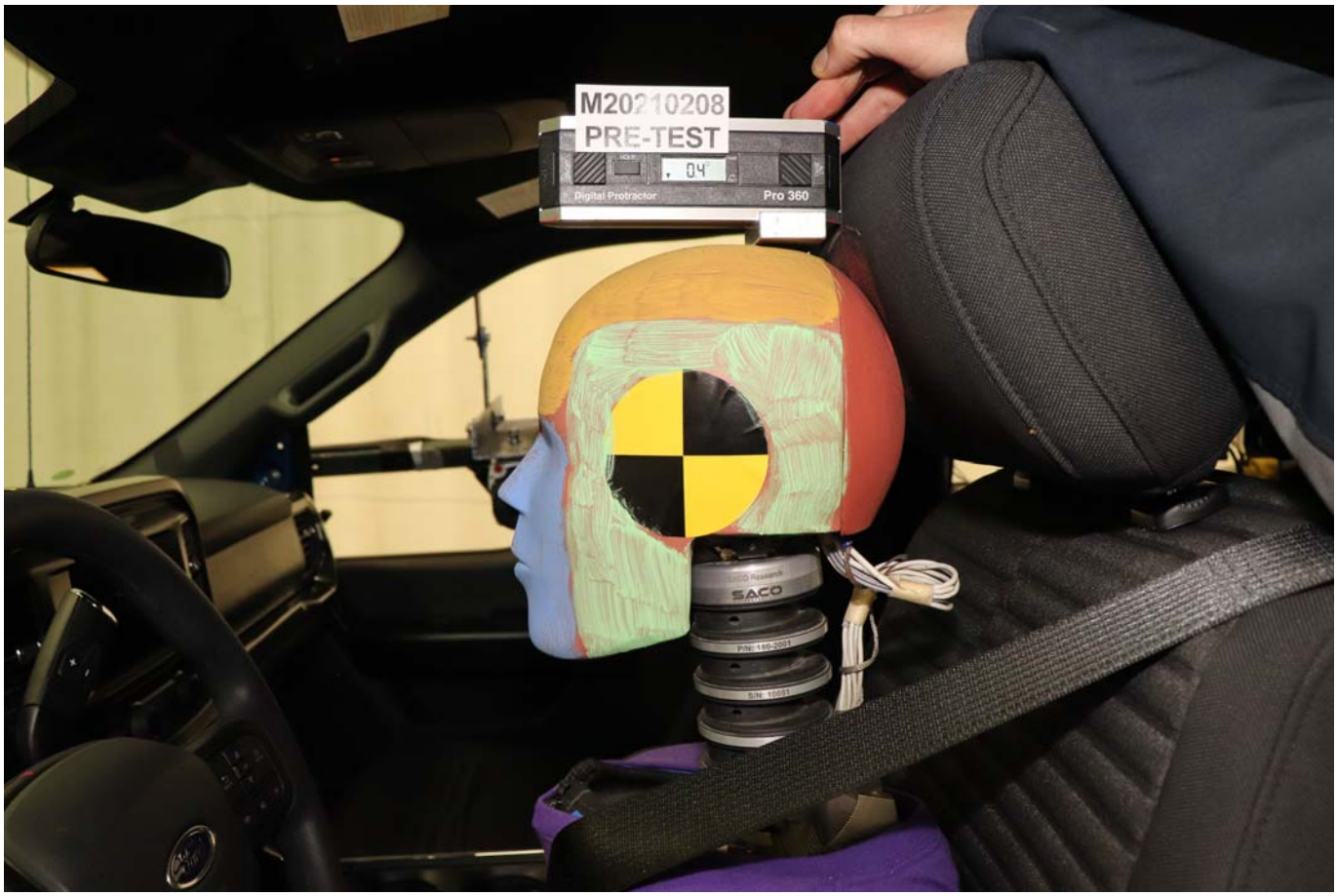


Photo No. 031 - Pre-Test Left Side View of Dummy Head Showing Dummy Head is Level

Photo No. 032 - Pre-Test Placement of Dummy Feet

Photo No. 033 - Pre-Test View of Belt Anchorage for Dummy

Photo No. 034 - Pre-Test Left Side View of Steering Wheel

Photo No. 035 - Pre-Test View of Disengaged Parking Brake

Photo No. 036 - Pre-Test View of Parking Brake

Photo No. 037 - Pre-Test Close-Up Left Side View of Driver Seat Track

Photo No. 038 - Pre-Test Close-Up Left Side View of Driver Seat Back

Photo No. 039 - Pre-Test Close-Up View of Driver Seat Back or Head Restraint

Photo No. 040 - Pre-Test Dummy and Door Clearance View

Photo No. 041 - Post-Test Dummy and Door Clearance View

Photo No. 042 - Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment

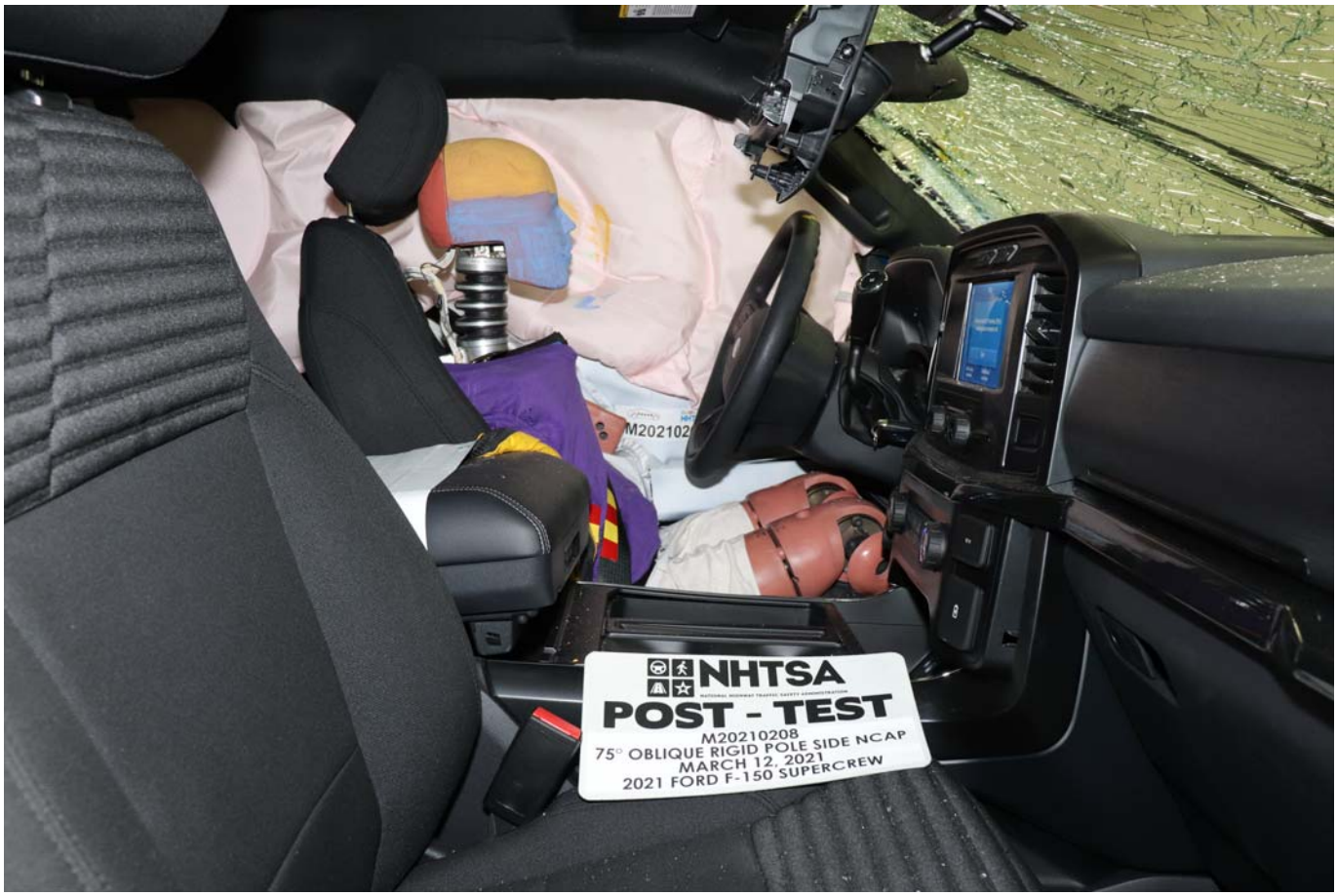


Photo No. 043 - Post-Test Right Side View of Dummy and Front Seat of Occupant Compartment

Photo No. 044 - Pre-Test Inner Door Panel View

Photo No. 045 - Post-Test Inner Door Panel View Showing Dummy Contact Location

Photo No. 046 - Post-Test Dummy Close-Up Head Contact with Vehicle Interior View

Photo No. 047 - Post-Test Dummy Close-Up Head Contact with Side Air Bag View

Photo No. 048 - Post-Test Dummy Close-Up Torso Contact with Vehicle Interior View

Photo No. 049 - Post-Test Dummy Close-Up Torso Contact with Side Air Bag View

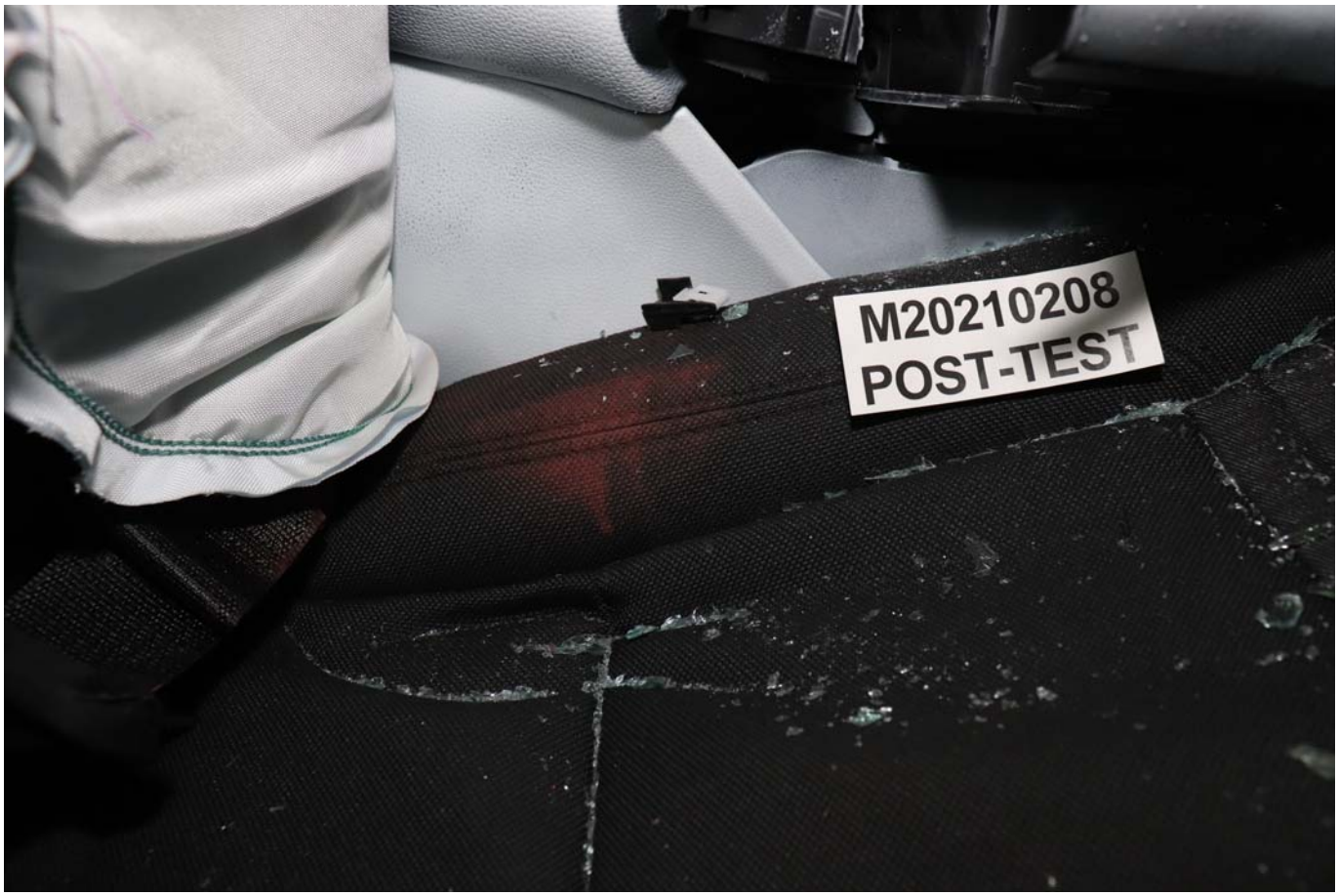


Photo No. 050 - Post-Test Dummy Close-Up Pelvis Contact with Vehicle Interior View

Photo No. 051 - Post-Test Dummy Close-Up Pelvis Contact with Side Air Bag View

PHOTOGRAPH NOT APPLICABLE

Photo No. 052 - Post-Test Dummy Close-Up Knee Contact with Vehicle Interior View

Photo No. 053 - Post-Test Right Side View of Dummy and Rear Seat of Occupant Compartment

PHOTOGRAPH NOT APPLICABLE

Photo No. 054 - Post-Test Inner Rear Passenger Torso Air Bag Deployment View

Photo No. 055 - Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

Photo No. 056 - Post-Test View of Fuel Filler Cap or Fuel Filler Neck

Photo No. 057 - Close-Up View of Vehicle Certification Label

Photo No. 058 - Close-Up View of Vehicle Tire Information Placard or Label

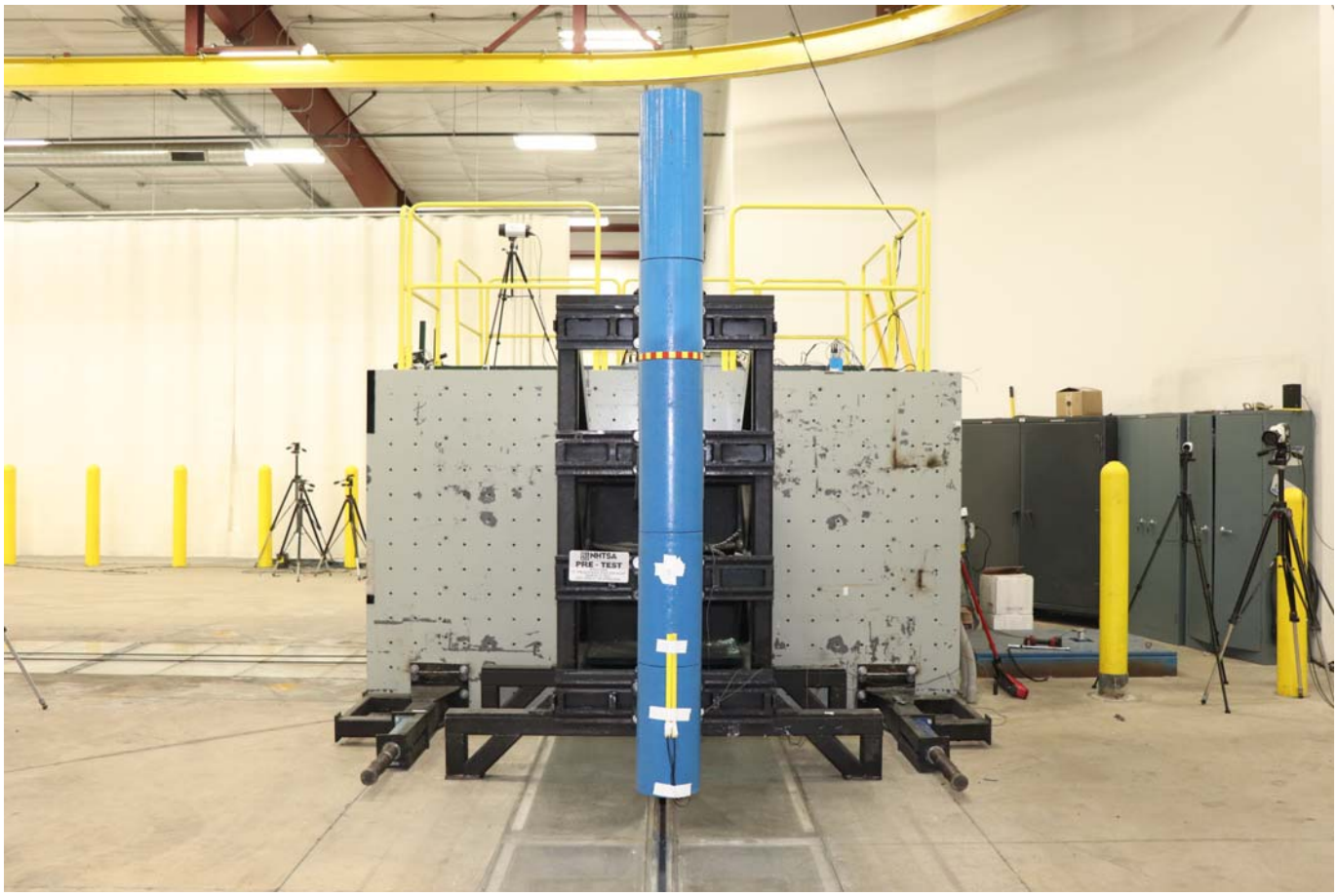


Photo No. 059 - Pre-Test Pole Barrier Front View

Photo No. 060 - Post-Test Pole Barrier Front View


Photo No. 061 - Pre-Test Pole Barrier Side View


Photo No. 062 - Post-Test Pole Barrier Side View


Photo No. 063 - Pre-Test Ballast View


Photo No. 064 - Post-Test Primary and Redundant Speed Trap Read-Out

Photo No. 065 - FMVSS Photo No. 301 Static Rollover 0 Degrees

Photo No. 066 - FMVSS Photo No. 301 Static Rollover 90 Degrees

Photo No. 067 - FMVSS Photo No. 301 Static Rollover 180 Degrees

Photo No. 068 - FMVSS Photo No. 301 Static Rollover 270 Degrees

Photo No. 069 - FMVSS Photo No. 301 Static Rollover 360 Degrees


Photo No. 070 - Impact Event

Ford
Go Further
ford.com

VEHICLE DESCRIPTION
**F-150**
2021 F-150 4X2 SUPERCREW
145" WHEELBASE
2.7L V6 ECOBOOST
ELEC TEN-SPEED AUTO W/TOW M

EXTERIOR
VELOCITY BLUE
INTERIOR
BLACK SPORT CLOTH40/CON/40

MF **A67235**

**STANDARD EQUIPMENT INCLUDED AT NO EXTRA CHARGE**

**EXTERIOR**
- DAYTIME RUNNING LAMPS
- EASY FUEL® CAPLESS FILLER
- FULLY BOXED STEEL FRAME
- HALOGEN HEADLAMPS
- HEADLAMPS - AUTO HIGH BEAM
- HEADLAMPS - AUTOLAMP (ON/OFF)
- LOCKING REMOVABLE TAILGATE
- PICKUP BOX TIE DOWN HOOKS
- TRAILER SWAY CONTROL
- WIPERS- INTERMITTENT

**INTERIOR**
- 4" PRODUCTIVITY SCREEN
- 60/40 FOLD-UP REAR BENCH SEAT
- DUAL SUNVISORS
- MESSAGE CTR: OUTSIDE TEMP, COMPASS, TRIP COMPUTER
- POWERPOINTS - 12V
- TILT/TELESCOPE STR COLUMN

**FUNCTIONAL**
- AUTO HOLD
- AUTO START STOP TECH
- CURVE CONTROL
- DYNAMIC HITCH ASSIST
- FAIL-SAFE COOLING SYSTEM
- FORDPASS CONNECT™ 4G HOTSPOT TELEMATICS MODEM
- GAS-CHARGED SHOCKS
- HILL START ASSIST
- OUTBOARD MNTD REAR SHOCKS
- PRE-COLLISION ASSIST W/AEB
- PWR RACK AND PINION STEER
- REAR VIEW CAMERA
- SELECTSHIFT®

**SAFETY/SECURITY**
- ADVANCETRAC® WITH RSC®
- AIRBAGS - FRONT SEAT MOUNTED SIDE IMPACT
- AIRBAGS - SAFETY CANOPY®
- CTR HIGH MOUNT STOP LAMP
- SECURILOCK® ANTI-THEFT SYS
- SOS POST-CRASH ALERT SYS™
- TIRE PRESSURE MONIT SYS

**WARRANTY**
- 3YR/36,000 BUMPER / BUMPER
- 5YR/100,000 DIESEL ENGINE
- 5YR/60,000 POWERTRAIN
- 5YR/60,000 ROADSIDE ASSIST
- 8YR/100,000 HYBRID BATTERY

| INCLUDED ON THIS VEHICLE | (MSRP) |
|---|---|
| **EQUIPMENT GROUP 101A** | 920.00 |
| •XL SERIES | |
| •XL POWER EQUIPMENT GROUP | |
| •CRUISE CONTROL | |
| •REVERSE SENSING SYSTEM | |
| **OPTIONAL EQUIPMENT/OTHER** | |
| 2.7L V6 ECOBOOST | 1,195.00 |
| 275/60R20 BSW ALL-SEASON | NO CHARGE |
| 3.55 RATIO REGULAR AXLE | NO CHARGE |
| 6400# GVWR PACKAGE | |
| FRONT LICENSE PLATE BRACKET | NO CHARGE |
| COLOR-CORDINATED CARPET | 145.00 |
| ENGINE BLOCK HEATER | 90.00 |
| 50 STATE EMISSIONS | NO CHARGE |
| CLASS IV TRAILER HITCH | 205.00 |
| STX APPEARANCE PACKAGE | 1,780.00 |
| .REAR-WINDOW DEFROSTER | |
| .FOG LAMPS | |
| .PRIVACY GLASS | |
| 20" 6-SPOKE MAGNETIC PKT WHLS | 1,000.00 |
| EXTENDED RANGE 36GAL FUEL TANK | 445.00 |
| STX SPORT CLOTH 40/CON/40 | 295.00 |

187.6 Mi

| PRICE INFORMATION | (MSRP) |
|---|---|
| BASE PRICE | $36,650.00 |
| TOTAL OPTIONS/OTHER | 6,075.00 |
| TOTAL VEHICLE & OPTIONS/OTHER | 42,725.00 |
| DESTINATION & DELIVERY | 1,695.00 |
| **TOTAL BEFORE DISCOUNTS** | 44,420.00 |
| **XL HIGH DISCOUNT** | - 750.00 |
| **STX APPEARANCE DISCT** | - 750.00 |
| **XL HIGH STX WHEEL** | - 595.00 |
| **TOTAL SAVINGS** | - 2,095.00 |

SOLD TO
Golf Mill Motor Sales, Inc.
9401 N. Milwaukee Ave.
Niles IL 60714
41C 066

SHIP TO (IF OTHER THAN SOLD TO)

SHIP THROUGH

RAMP ONE
CG59

RAMP TWO

FINAL ASSEMBLY PLANT
DEARBORN

METHOD OF TRANSP.
CONVOY

ITEM #:
41-0004 O/T 2

**TOTAL MSRP $42,325.00**

FORD CREDIT
Whether you decide to lease or finance your vehicle, you'll find the choices that are right for you. See your dealer for details or visit www.ford.com/finance.

This label is affixed pursuant to the Federal Automobile Information Disclosure Act. Gasoline, License, and Title Fees, State and Local taxes are not included. Dealer installed options or accessories are not included unless listed above.

LM171 N RB 2X 125 005397 12 17 20

EPA DOT **Fuel Economy and Environment**
Gasoline Vehicle

Fuel Economy
**22** MPG
combined city/hwy
20 city
26 highway
4.5 gallons per 100 miles

Standard Pickup Trucks range from 14 to 27 MPG. The best vehicle rates 141 MPGe.

You **spend $1,750** more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel **cost $1,850**

Fuel Economy & Greenhouse Gas Rating (tailpipe only) 4 (1 / 10 Best)
Smog Rating (tailpipe only) 6 (1 / 10 Best)

This vehicle emits 406 grams $CO_2$ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at fueleconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs $7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at $2.70 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

**fueleconomy.gov**
Calculate personalized estimates and compare vehicles

Smartphone QR Code

**GOVERNMENT 5-STAR SAFETY RATINGS**

| | | |
|---|---|---|
| **Overall Vehicle Score** | | **Not Rated** |
| Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight. | | |
| **Frontal Crash** | Driver | **Not Rated** |
| | Passenger | **Not Rated** |
| Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight. | | |
| **Side Crash** | Front seat | **Not Rated** |
| | Rear seat | **Not Rated** |
| Based on the risk of injury in a side impact. | | |
| **Rollover** | | **Not Rated** |
| Based on the risk of rollover in a single-vehicle crash. | | |

Star ratings range from 1 to 5 stars (★★★★★), with 5 being the highest. Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236

1FTEW1CP0MFA67235

43 YEARS FORD F-SERIES
AMERICA'S BEST SELLING TRUCKS
BUILT FORD TOUGH

For equipped vehicles, The FordPass Connect™ modem is active and sending vehicle data (e.g., diagnostics) to Ford. See in-vehicle Settings for connectivity options.

FordPass Connect service™ and FordPass App™ required for certain remote features (see App Terms for more information). Connected service and related feature functionality is subject to compatible AT&T network availability. Evolving technology / cellular networks may affect functionality and availability, or continued provision of some features, prohibiting them from functioning. Message and data rates may apply. See your local Ford website for our privacy policy.

Ford | FORD PROTECT®
Insist on Ford Protect! The only extended service plan fully backed by Ford and honored at every Ford dealership in the U.S., Canada and Mexico. See your Ford dealer or visit www.FordOwner.com.

SCAN OR TEXT 1FMFA67235 TO 48028
Msg & Data rates may apply. Text HELP for help
www.ford.com/help/privacy-terms

⚠ **WARNING:** Operating, servicing and maintaining a passenger vehicle, pickup truck, van, or off-road vehicle can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. For more information go to www.P65Warnings.ca.gov/passenger-vehicle.

Photo No. 071 - Monroney Label

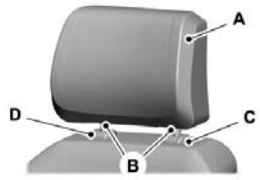
## Front Seats

- Bend your legs slightly so that you can press the pedals fully.
- Position the shoulder strap of the seatbelt over the center of your shoulder and position the lap strap tightly across your hips.

Make sure that your driving position is comfortable and that you can maintain full control of your vehicle.

### MANUAL SEATS (If Equipped)

#### Head Restraint Components




The head restraints consist of:

A An energy absorbing head restraint.
B Two steel stems.
C Guide sleeve adjust and release button.
D Guide sleeve unlock and remove button (If equipped).

#### Adjusting the Head Restraint

*4-Way Head Restraints*

⚠ **WARNING:** Fully adjust the head restraint before you sit in or operate your vehicle. This will help minimize the risk of neck injury in the event of a crash. Do not adjust the head restraint when your vehicle is moving.

⚠ **WARNING:** The head restraint is a safety device. Whenever possible it should be installed and properly adjusted when the seat is occupied. Failure to adjust the head restraint properly could reduce its effectiveness during certain impacts.

**Note:** *Adjust the seat backrest to an upright driving position before adjusting the head restraint. Adjust the head restraint so that the top of it is level with the top of your head and as far forward as possible. Make sure that you remain comfortable. If you are extremely tall, adjust the head restraint to its highest position.*

Pull the head restraint up to raise it.

To lower the head restraint:

1. Press and hold the adjust and release button.
2. Push the head restraint down.

To tilt the head restraint:

1. Adjust the seat backrest to an upright driving or riding position.



F-150 (TFD) Canada/United States of America, enUSA, Edition date: 202007, First-Printing

## Front Seats

2. Pivot the head restraint forward toward your head to the preferred position.

After the head restraint reaches the forward-most tilt position, pivot it forward again to release it to the rearward, untilted position.

**Note:** *Do not attempt to force the head restraint backward after it is tilted. Instead, continue tilting it forward until the head restraint releases to the upright position.*

#### Removing the Head Restraint

1. Pull up the head restraint until it reaches the highest adjustment position.
2. Press and hold the adjust and release button and the unlock and remove button.
3. Pull up the head restraint.

**Note:** *You cannot remove head restraints that have audio system speakers.*

#### Installing the Head Restraint

Align the steel stems into the guide sleeves and push the head restraint down until it locks.

#### Moving the Seat Backward and Forward

*Manual Seat Adjustment*

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

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

#### Adjusting the Seat Backrest

*Manual Seat Adjustment*



F-150 (TFD) Canada/United States of America, enUSA, Edition date: 202007, First-Printing

Photo No. 072 - Head Restraint Use and Adjustment Information from Vehicle Owners Manual

Photo No. 073 - Post-Test View of Shattered Vehicle Inner Door Panel

# APPENDIX B
# 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 CG Redundant Acceleration (X) vs. Time

Driver Head CG Redundant Acceleration (Y) vs. Time

Driver Head CG Redundant Acceleration (Z) vs. Time

Driver Head Angular Velocity X (Deg/Sec) vs. Time

Driver Head Angular Velocity Y (Deg/Sec) vs. Time

Driver Head Angular Velocity Z (Deg/Sec) vs. Time

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)

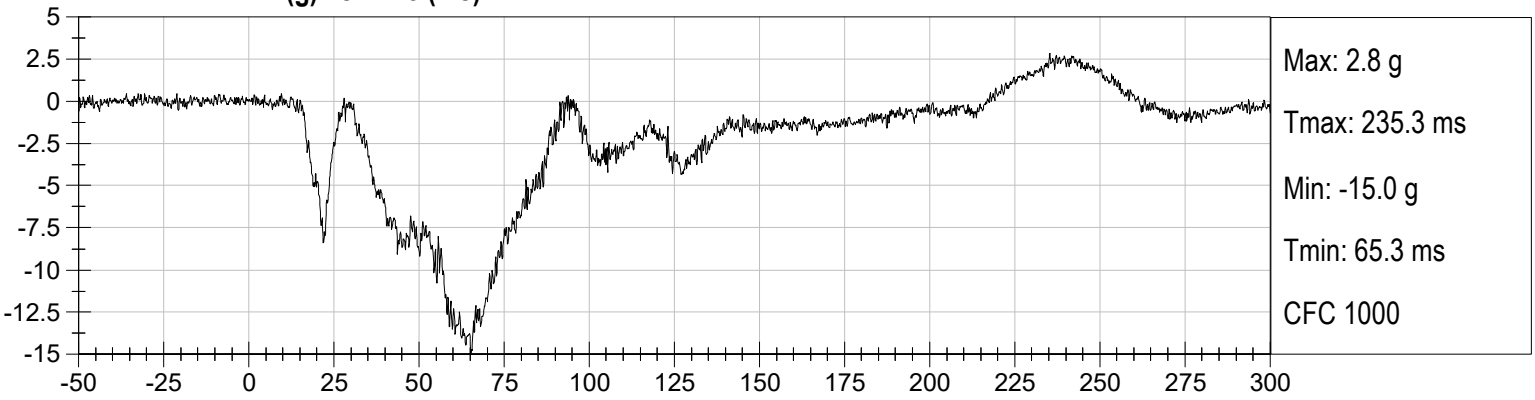
Load Cell Pole Barrier #5 Force (Y)

Load Cell Pole Barrier #6 Force (Y)

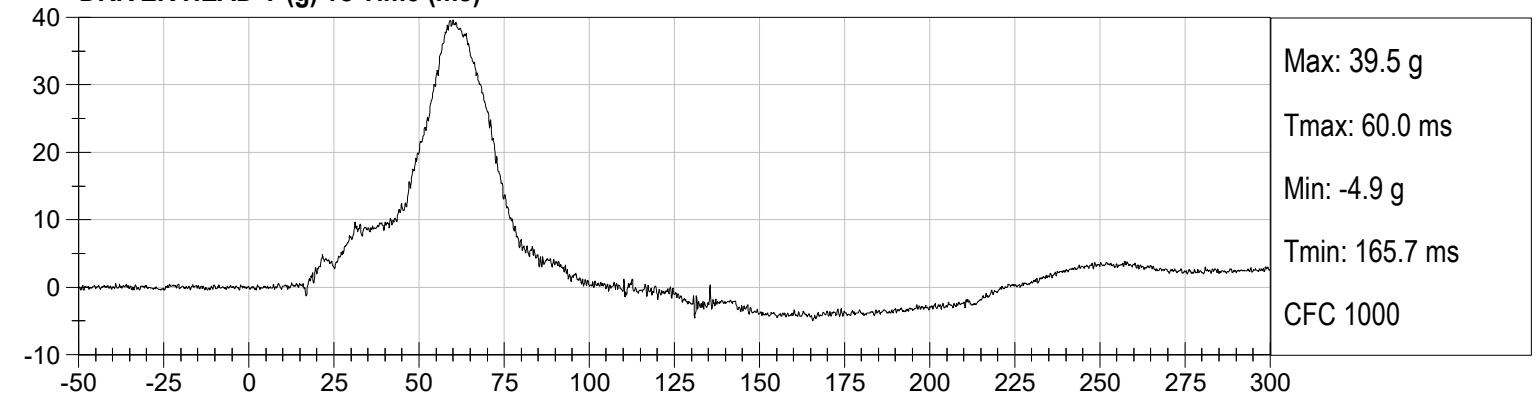
Load Cell Pole Barrier #7 Force (Y)

Load Cell Pole Barrier #8 Force (Y)

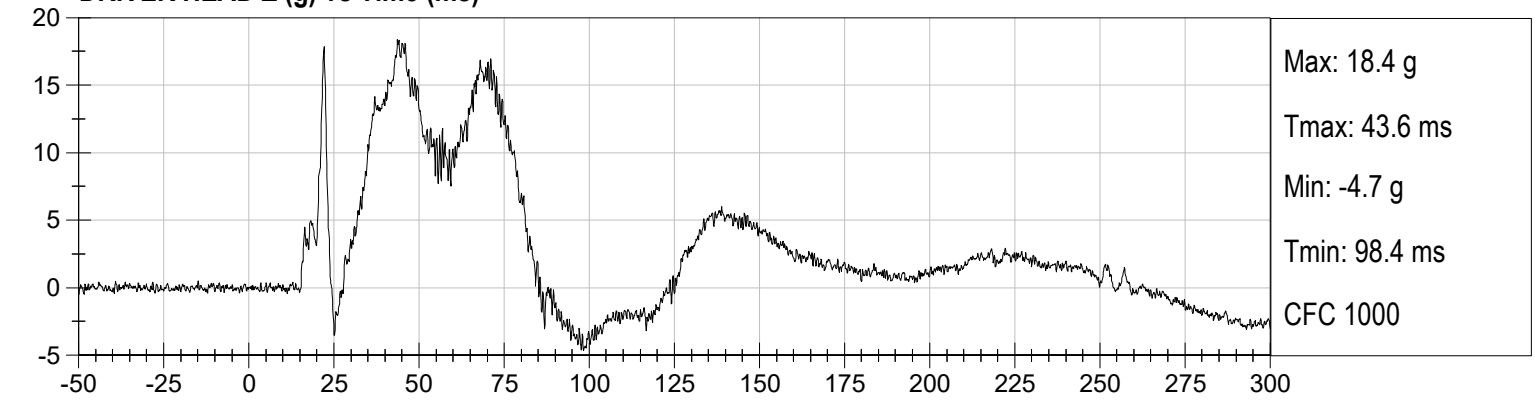
## DRIVER HEAD X (g) vs Time (ms)



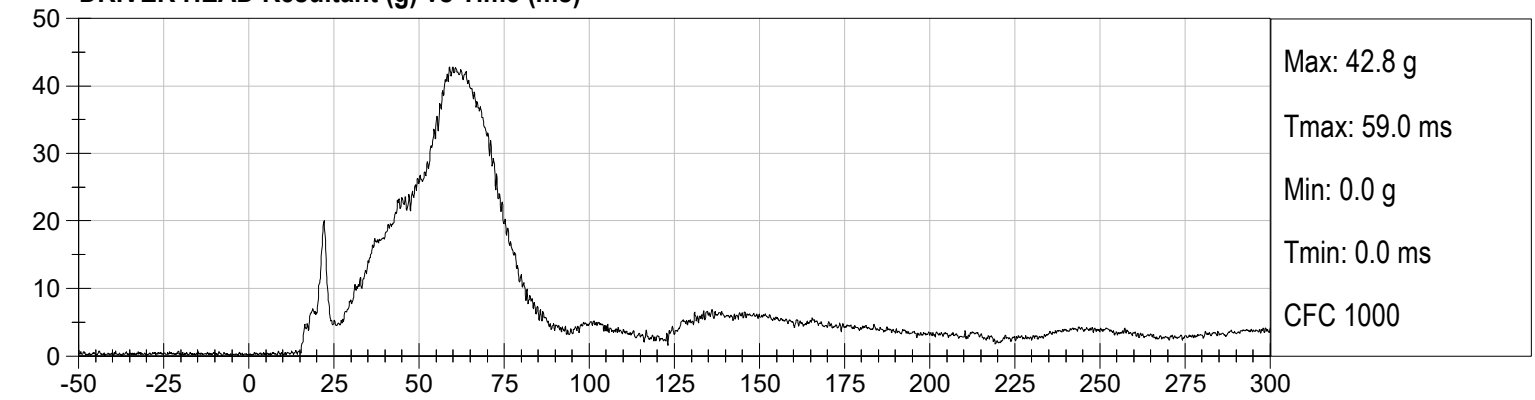

## DRIVER HEAD Y (g) vs Time (ms)



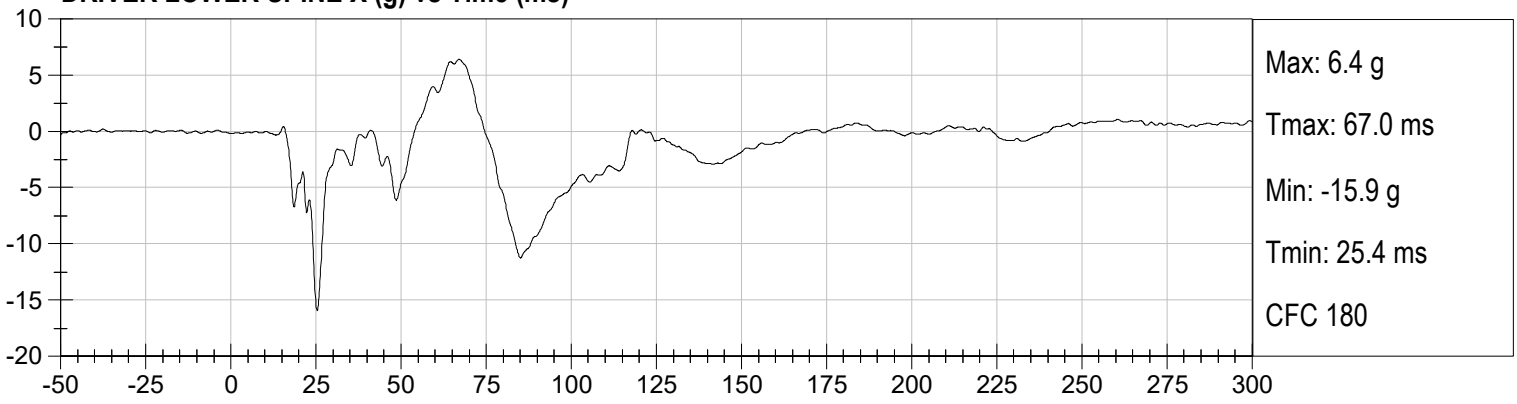

## DRIVER HEAD Z (g) vs Time (ms)



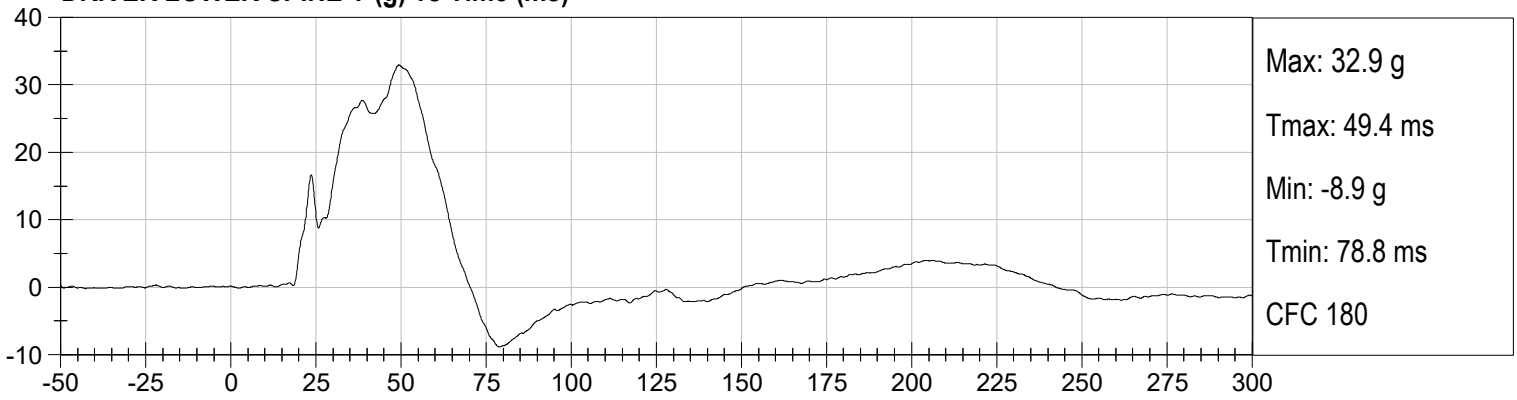

## DRIVER HEAD Resultant (g) vs Time (ms)



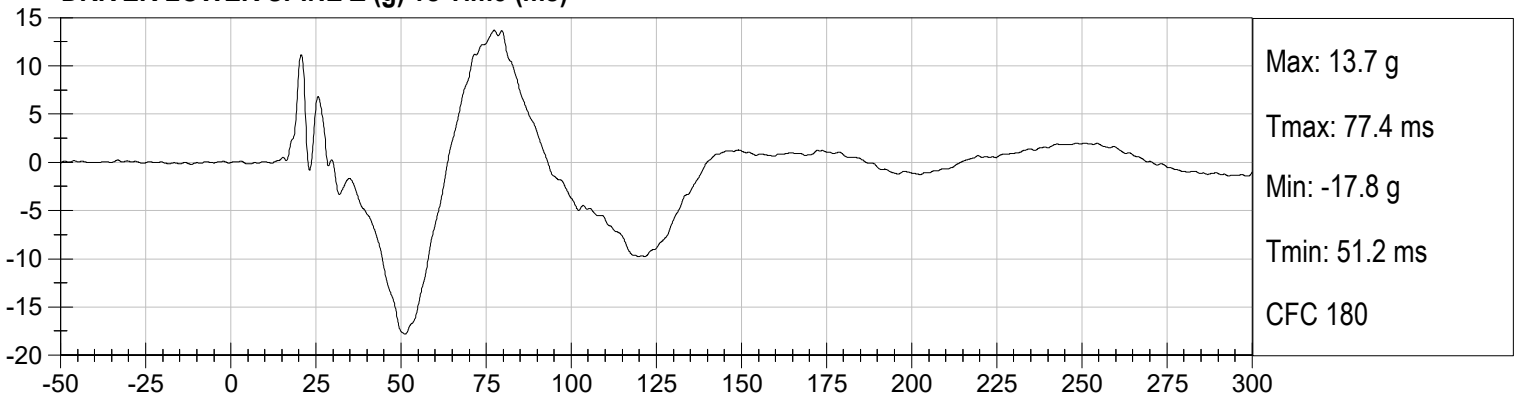
## DRIVER LOWER SPINE X (g) vs Time (ms)



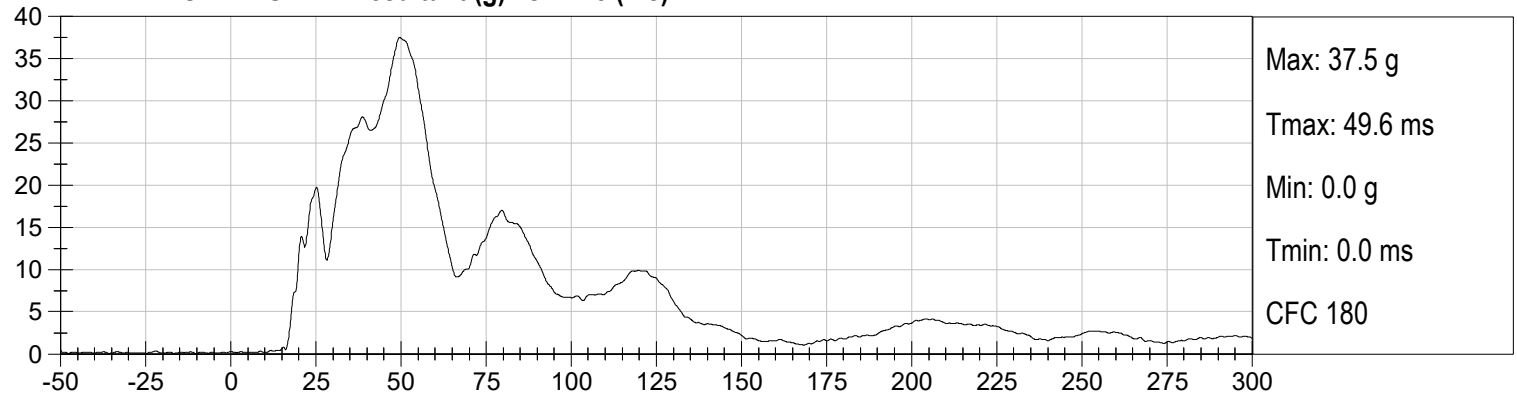

## DRIVER LOWER SPINE Y (g) vs Time (ms)



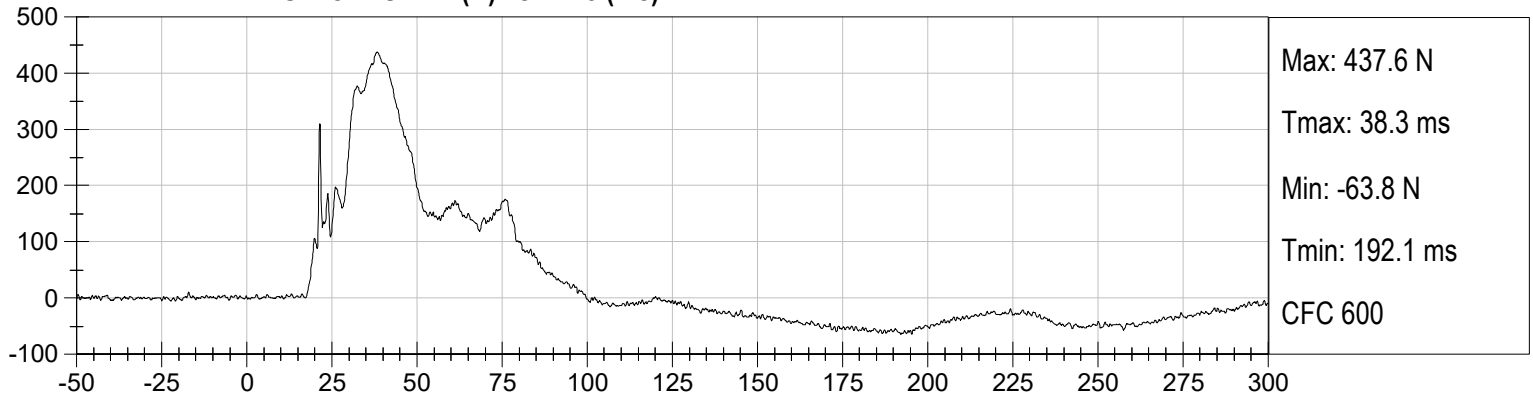

## DRIVER LOWER SPINE Z (g) vs Time (ms)



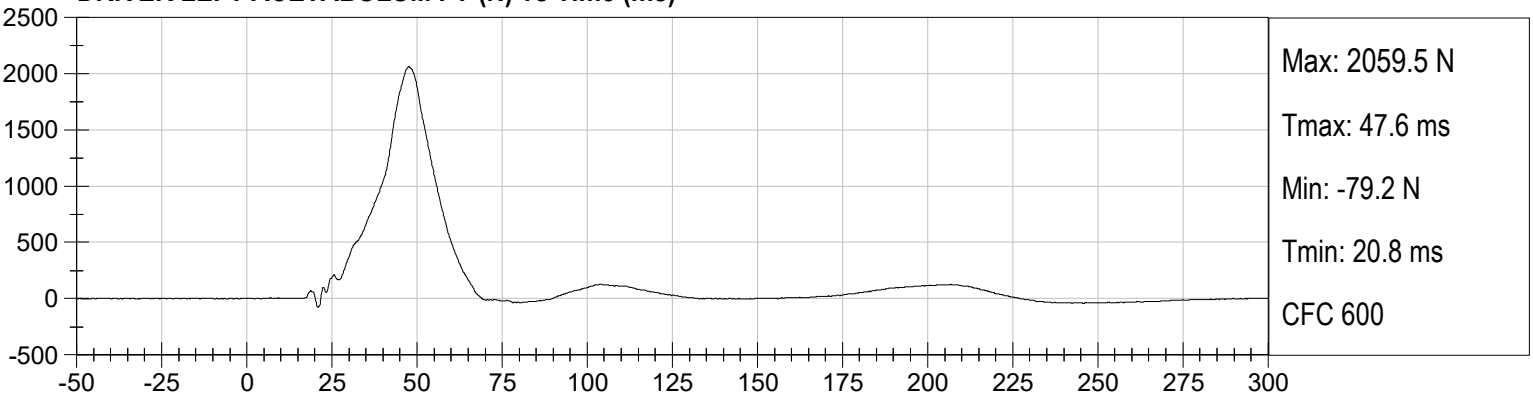

## DRIVER LOWER SPINE Resultant (g) vs Time (ms)



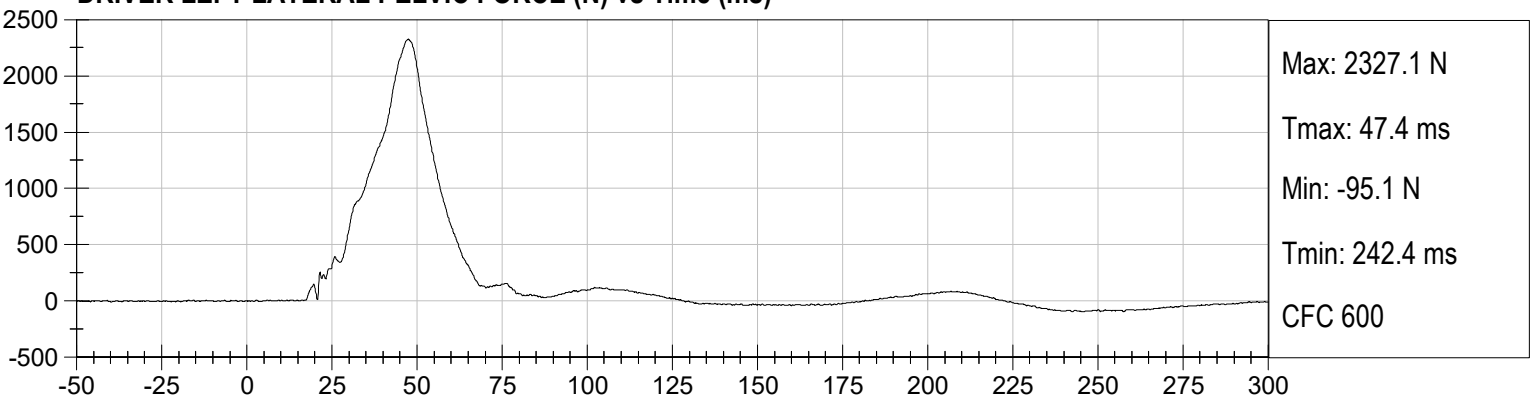
## DRIVER LEFT ILIUM CREST FY (N) vs Time (ms)




## DRIVER LEFT ACETABULUM FY (N) vs Time (ms)




## DRIVER LEFT LATERAL PELVIC FORCE (N) vs Time (ms)



# APPENDIX C
# DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

## CALIBRATION TEST RESULTS

## PRE-TEST

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

**SID-IIsD External Measurements**
**SN: 296**

| No. | Name | Spec. (mm) | Result | Pass/Fail |
|---|---|---|---|---|
| **A** | Sitting Height | 772 - 788 | 784 | Pass |
| **B** | Shoulder Pivot Height | 437 - 453 | 442 | 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 | 99 | Pass |
| **F** | Thigh Clearance | 119 -135 | 121 | Pass |
| **G** | Head Breadth | 140 - 148 | 142 | Pass |
| **H** | Head Back from Backline | 40 - 46 | 45 | Pass |
| **I** | Head Depth | 178 - 188 | 180 | Pass |
| **J** | Head Circumference | 541 - 551 | 548 | Pass |
| **K** | Buttock to Knee Length | 514 - 540 | 535 | Pass |
| **L** | Popliteal Height | 343 - 369 | 358 | Pass |
| **M** | Knee Pivot to Floor Height | 392 - 409 | 404 | Pass |
| **N** | Buttock Popliteal Length | 416 - 442 | 435 | Pass |
| **O** | Chest Depth w/o Jacket | 195 - 211 | 206 | Pass |
| **P** | Foot Length | 216 - 232 | 219 | Pass |
| **Q** | Hip Breadth (w/ pelvic plugs) | 313 - 323 | 316 | Pass |
| **R** | Arm Length | 249 - 259 | 250 | Pass |
| **S** | Knee Joint to Seatback | 477 - 493 | 481 | Pass |
| **V** | Shoulder Width | 341 - 357 | 346 | Pass |
| **W** | Foot Width | 78 - 94 | 85 | Pass |
| **Y** | Chest Circumference w/ jacket | 851 - 881 | 870 | Pass |
| **Z** | Waist Circumference | 761 - 791 | 772 | Pass |

**MGA RESEARCH CORPORATION**

**HEAD DROP TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test ID:** D210721

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.8 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 22 | Pass |
| Peak Resultant Acceleration | G's | 115 to 137 | 131 | Pass |
| Peak Longitudinal Acceleration | G's | +/- 15 | -4.1 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | <15% | Yes | Pass |
| | | Overall Test Results | | Pass |

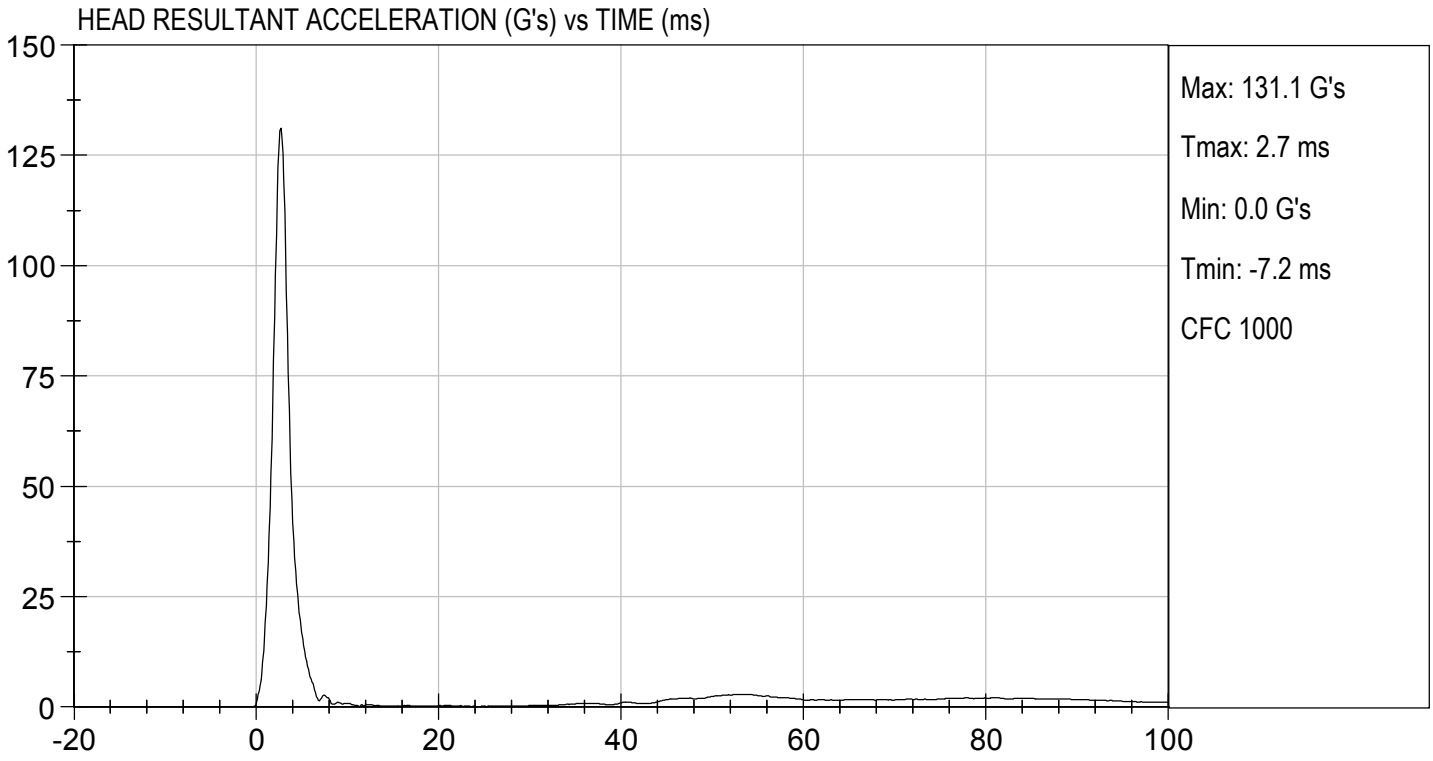
Gerald Guerrero
Laboratory Technician

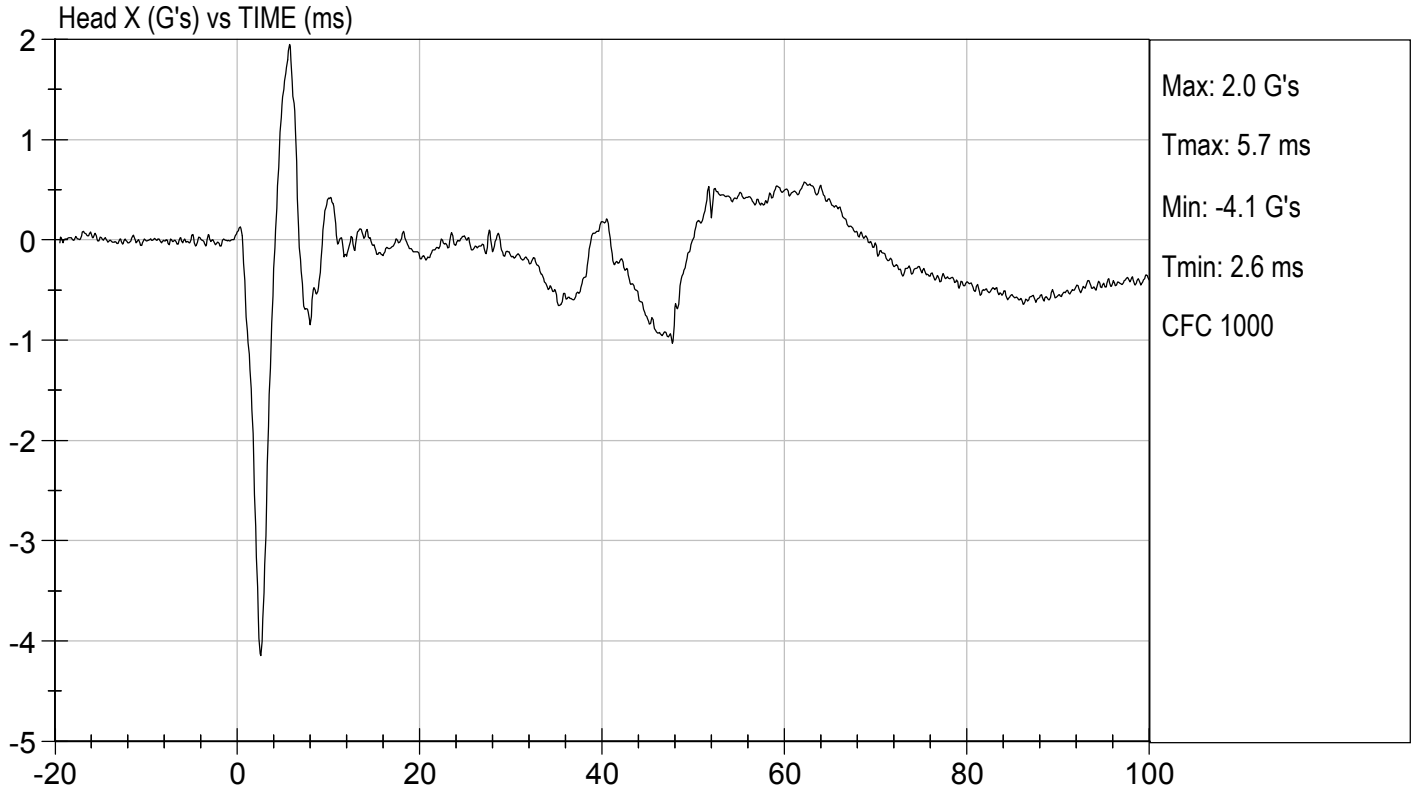
03/05/2021
Test Date

Approved By

TEST DESC: HEAD DROP

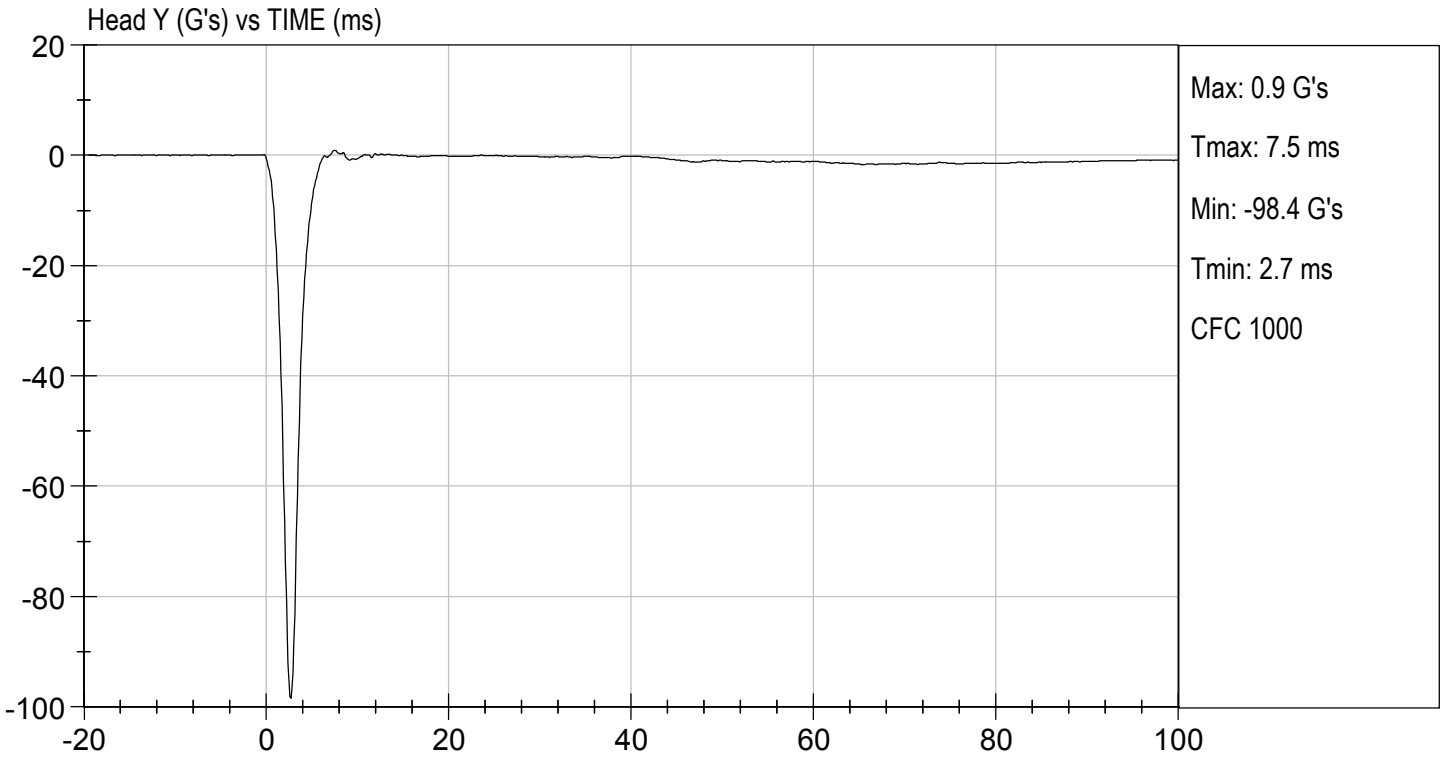
TEST DATE: 03/05/2021
TEST #: D210721

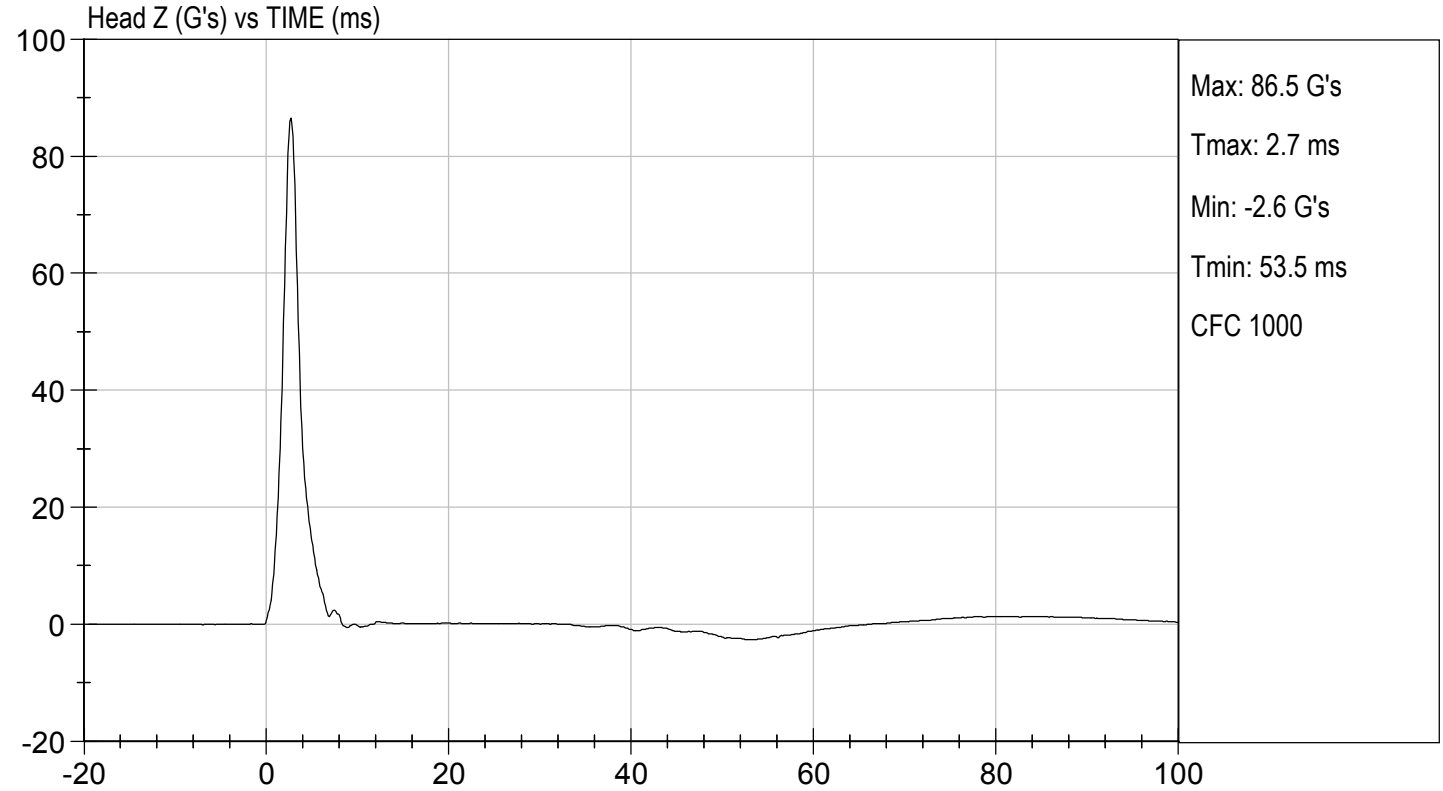


TEST DESC: HEAD DROP

TEST DATE: 03/05/2021
TEST #: D210721



**MGA RESEARCH CORPORATION**

**LATERAL NECK PENDULUM TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210722

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | | deg C | 20.6 to 22.2 | 21.5 | Pass |
| Humidity | | % | 10 to 70 | 23 | Pass |
| Impact Velocity | | m/s | 5.51 to 5.63 | 5.58 | Pass |
| Pendulum Velocity | 10 ms | m/s | 2.20 to 2.80 | 2.75 | Pass |
| | 15 ms | m/s | 3.30 to 4.10 | 3.92 | Pass |
| | 20 ms | m/s | 4.40 to 5.40 | 5.34 | Pass |
| | 25 ms | m/s | 5.40 to 6.10 | 5.65 | Pass |
| | 25-100 ms | m/s | 5.50 to 6.20 | 5.67 | Pass |
| Maximum D-Plane Rotation | | deg | 71 to 81 | 75 | Pass |
| Time of Maximum D-Plane Rotation | | ms | 50 to 70 | 60 | Pass |
| Maximum Occipital Condyle Moment | | Nm | -44 to -36 | -38 | Pass |
| Time of Moment Decay to 0 Nm | | ms | 102 to 126 | 119 | Pass |
| | | | Overall Test Results | | Pass |

Gerald Guerrero

Laboratory Technician

03/08/2021

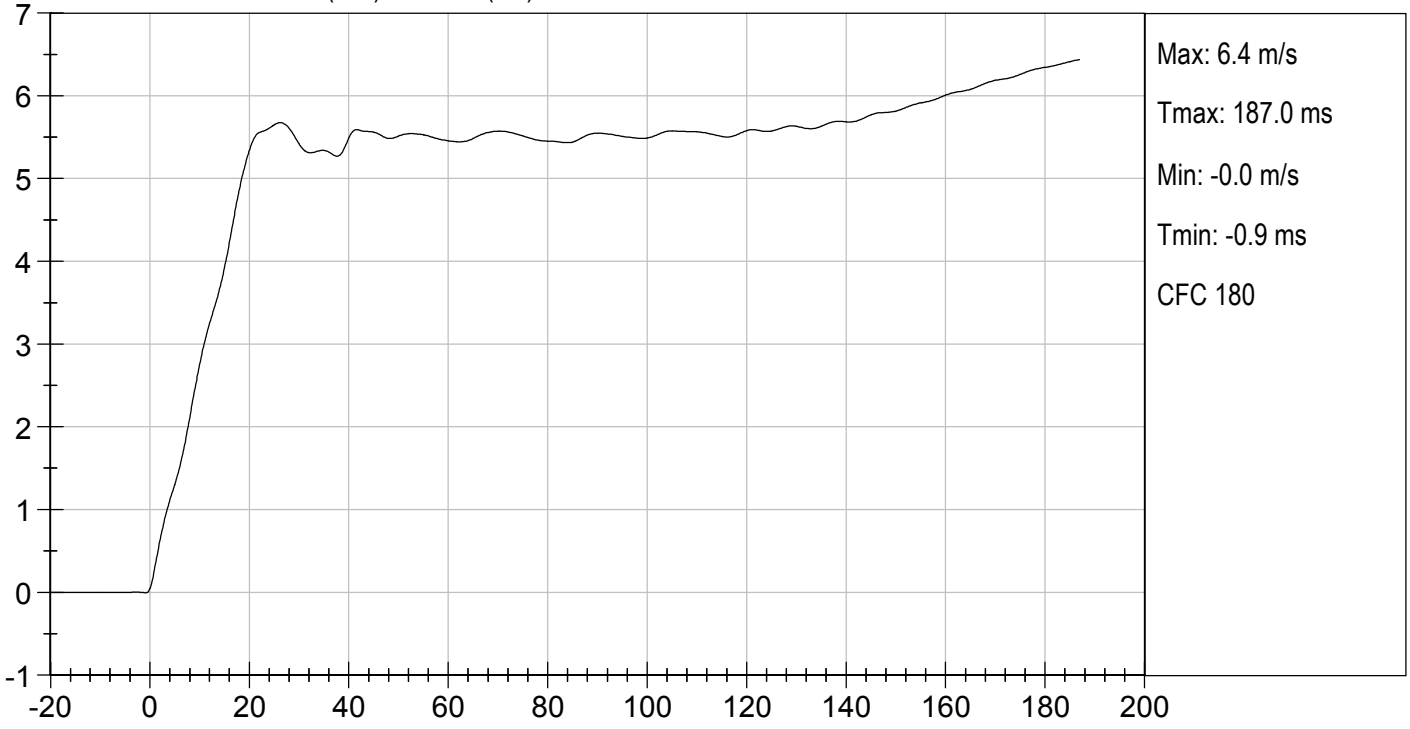
Test Date

Approved By

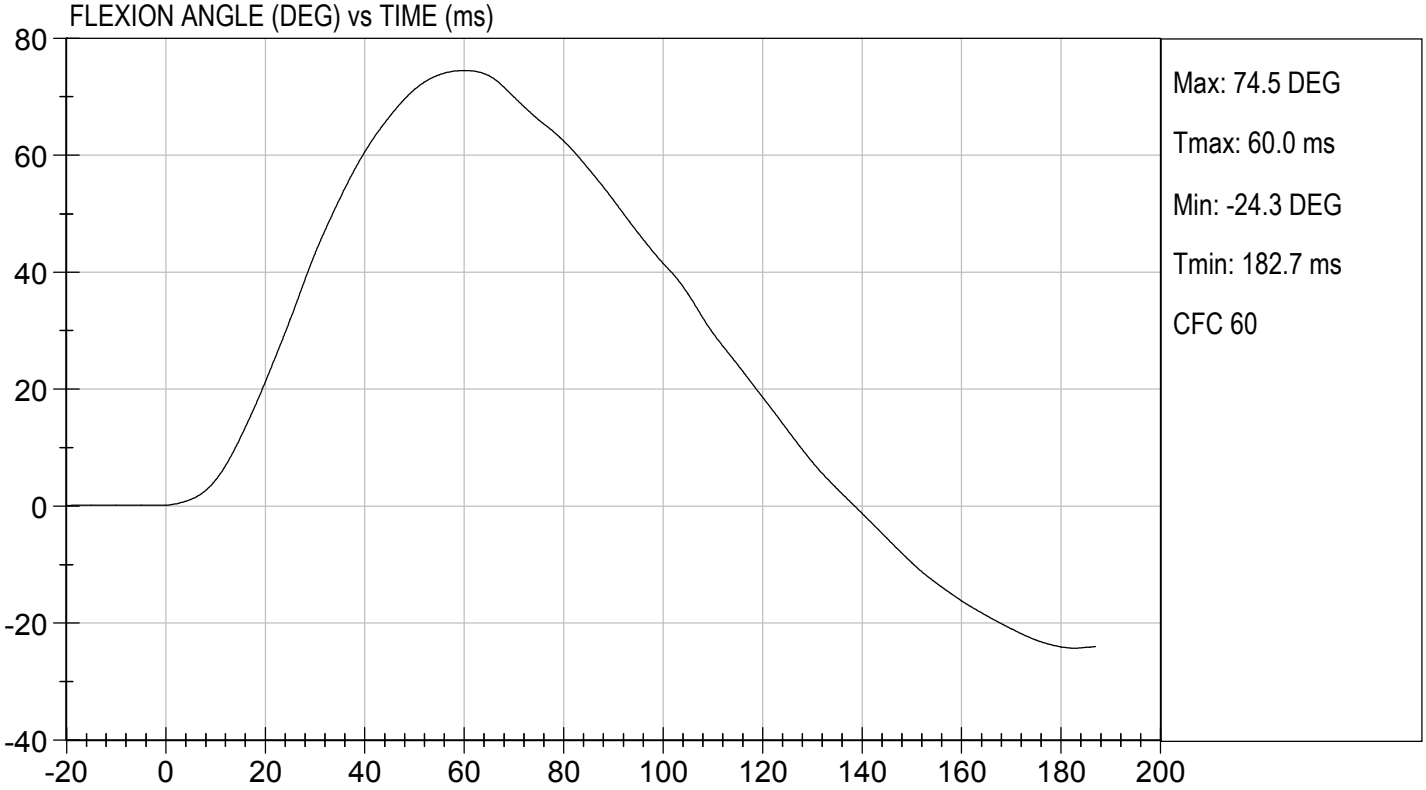
TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 03/08/2021
TEST #: D210722

PENDULUM VELOCITY (m/s) vs TIME (ms)

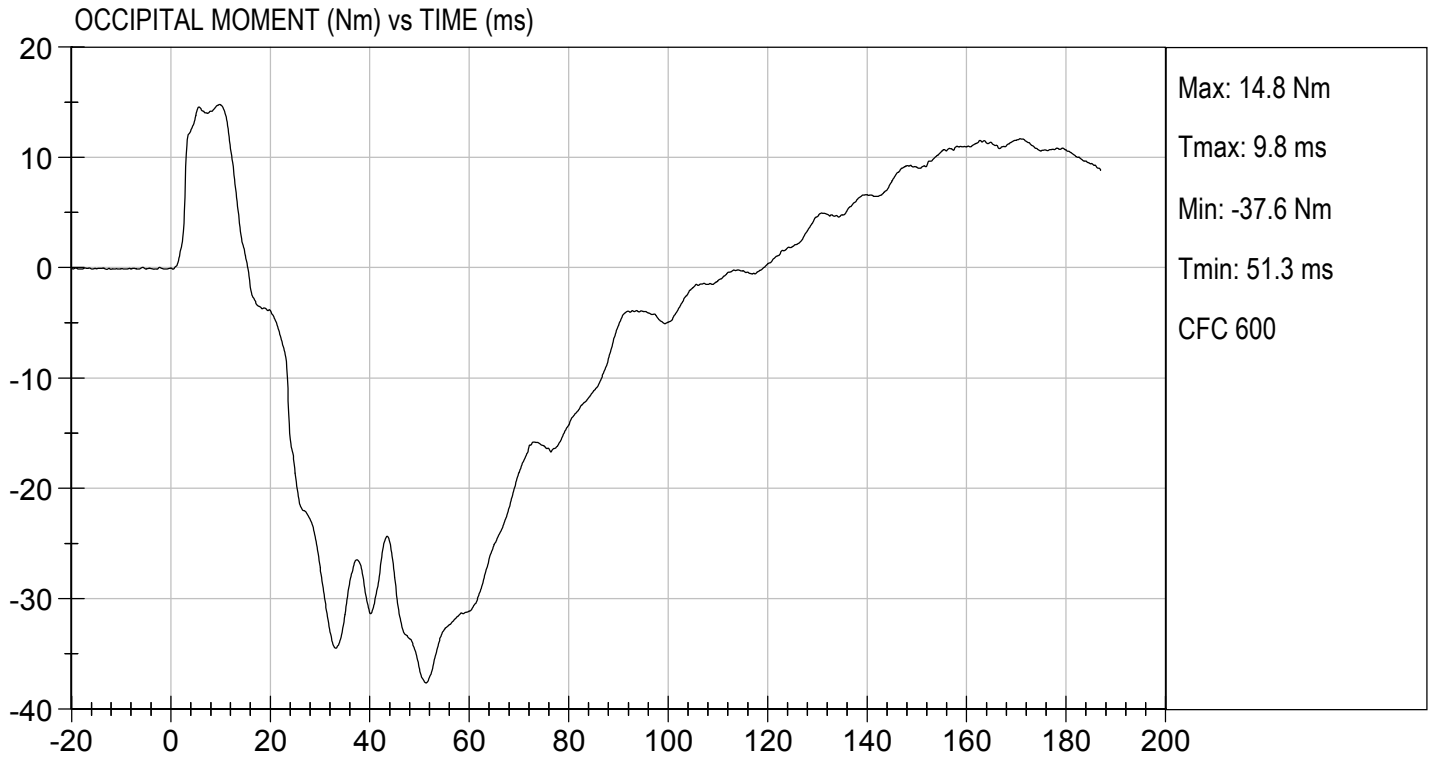



FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 03/08/2021
TEST #: D210722



**MGA RESEARCH CORPORATION**

**SHOULDER IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test ID:** D210723

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.8 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 28 | Pass |
| Impact Velocity | m/s | 4.20 to 4.40 | 4.27 | Pass |
| Maximum Probe Acceleration | G's | 13 to 18 | 15 | Pass |
| Shoulder Displacement | mm | 28 to 37 | 32 | Pass |
| Upper Spine (T1) Y Acceleration | G's | 17 to 22 | 18 | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero
Laboratory Technician

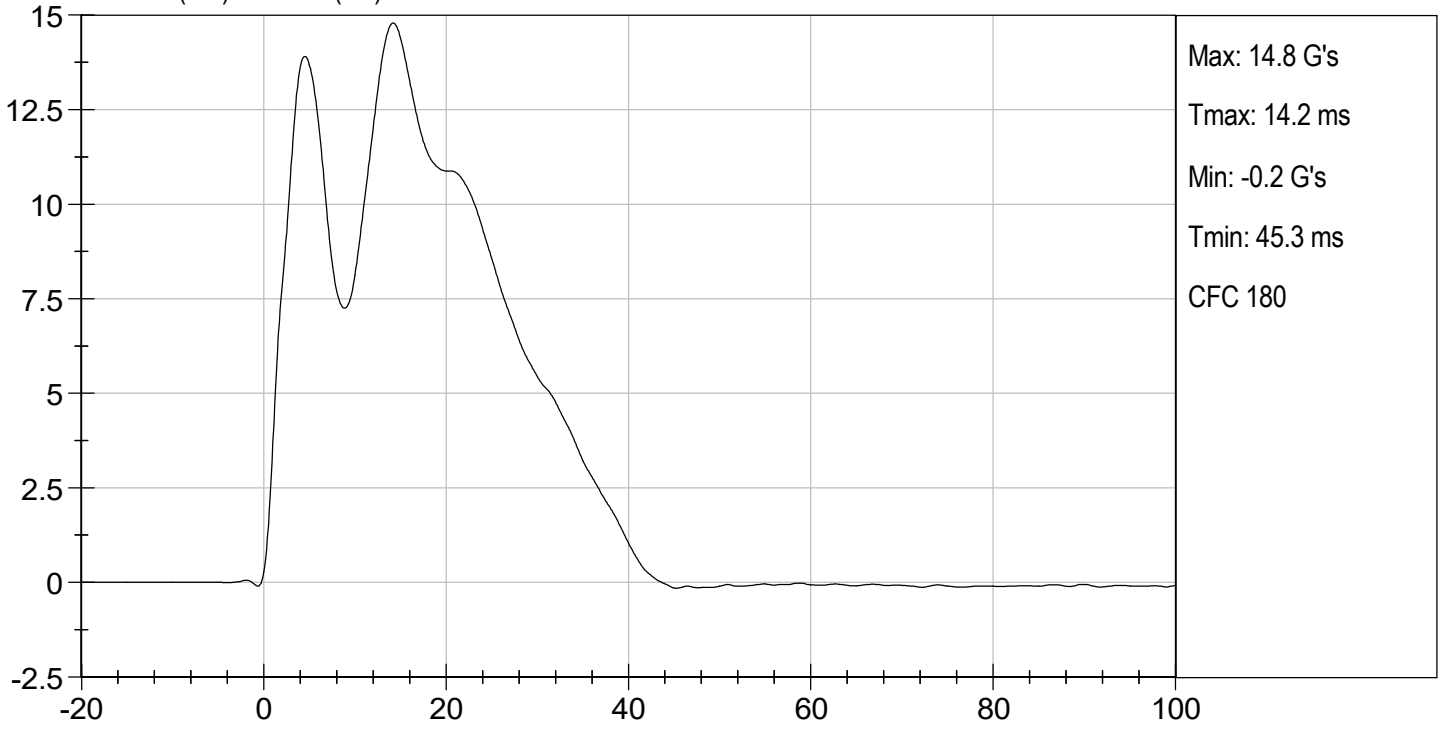
03/08/2021
Test Date

Approved By

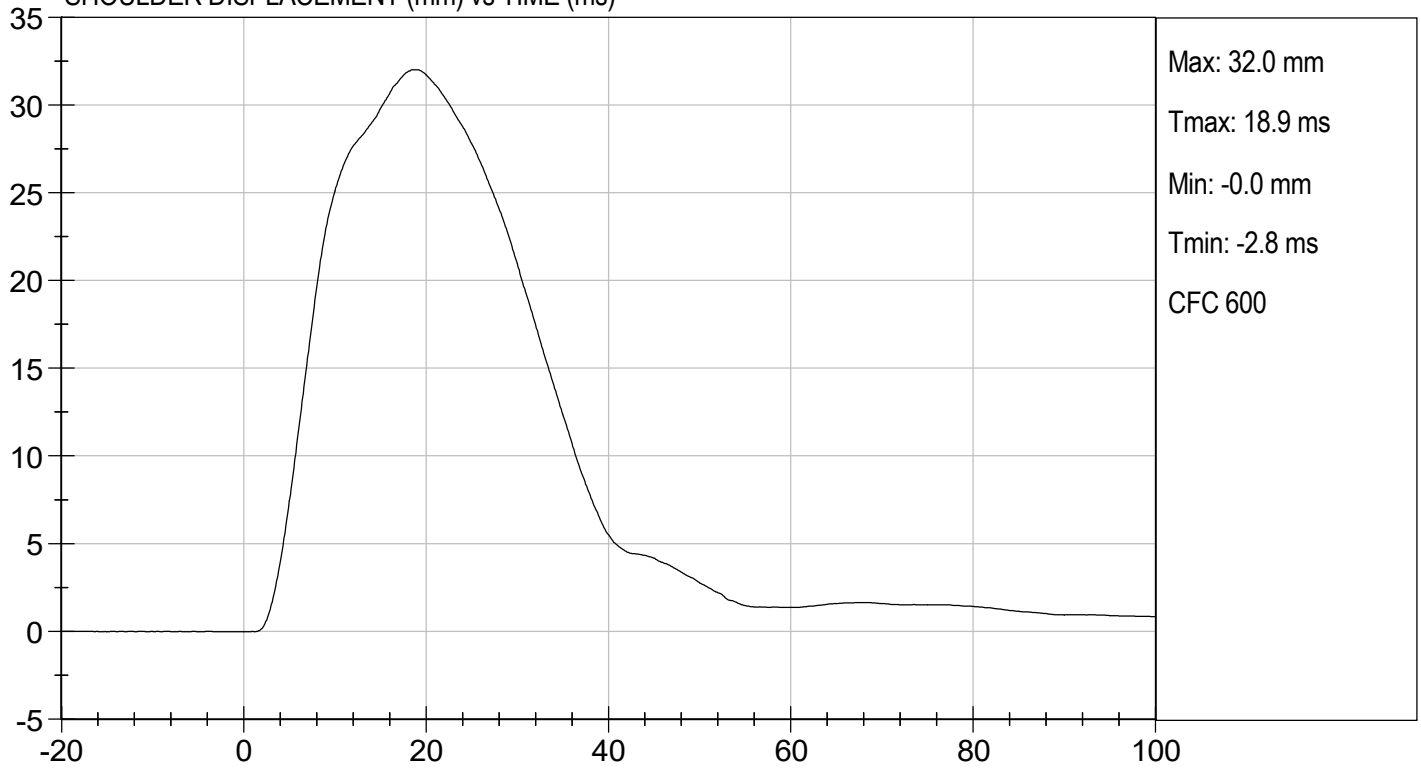
TEST DESC: SHOULDER IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 03/08/2021
TEST #: D210723

PROBE (G's) vs TIME (ms)

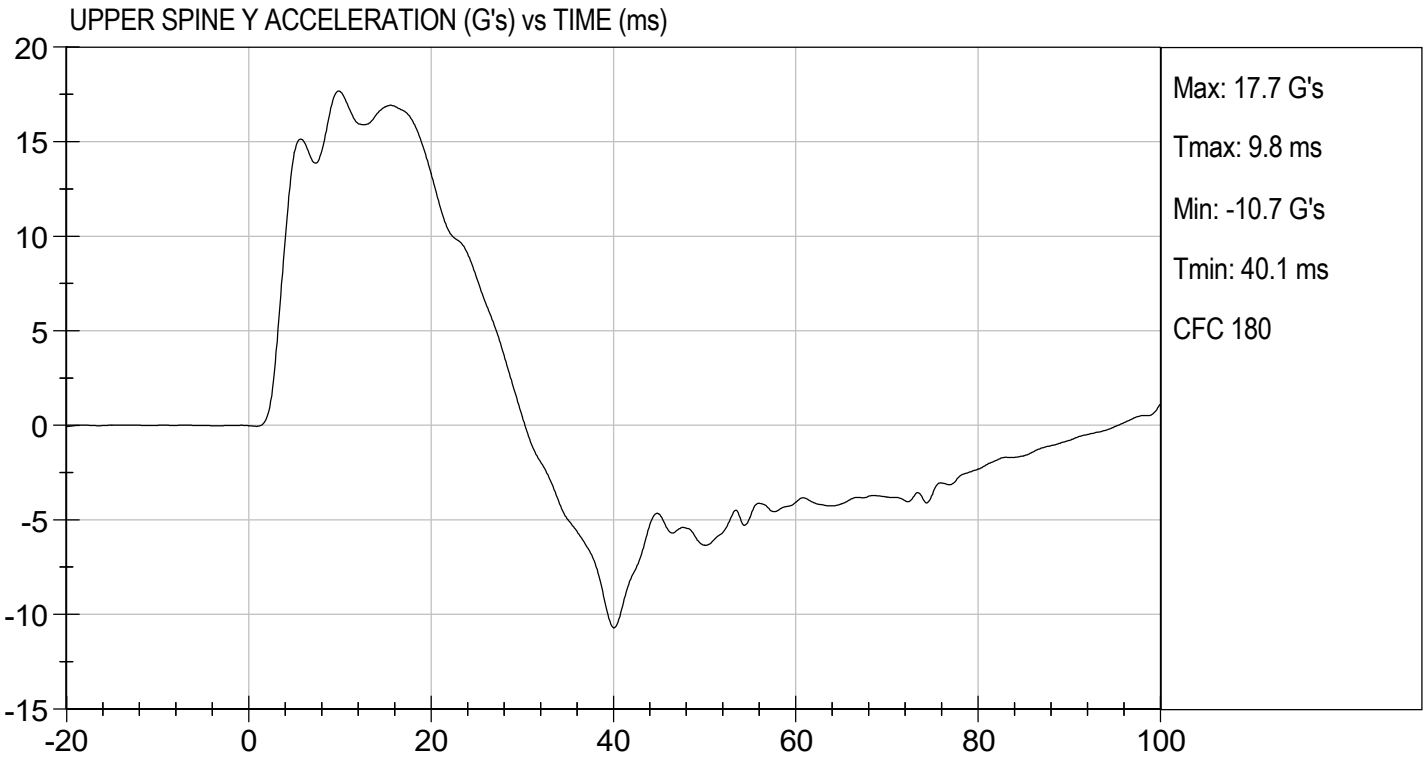



SHOULDER DISPLACEMENT (mm) vs TIME (ms)



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 03/08/2021
TEST #: D210723



**MGA RESEARCH CORPORATION**

**THORAX (WITH ARM) IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210724

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.8 | Pass |
| Humidity | % | 10 to 70 | 28 | Pass |
| Impact Velocity | m/s | 6.60 to 6.80 | 6.77 | Pass |
| Maximum Probe Acceleration | G's | 30 to 36 | 33 | Pass |
| Shoulder Displacement | mm | 31 to 40 | 38 | Pass |
| Upper Rib Displacement | mm | 25 to 32 | 30 | Pass |
| Middle Rib Displacement | mm | 30 to 36 | 32 | Pass |
| Lower Rib Displacement | mm | 32 to 38 | 34 | Pass |
| Upper Spine (T1) Y Acceleration | G's | 34 to 43 | 37 | Pass |
| Lower Spine (T12) Y Acceleration | G's | 29 to 37 | 33 | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero
Laboratory Technician

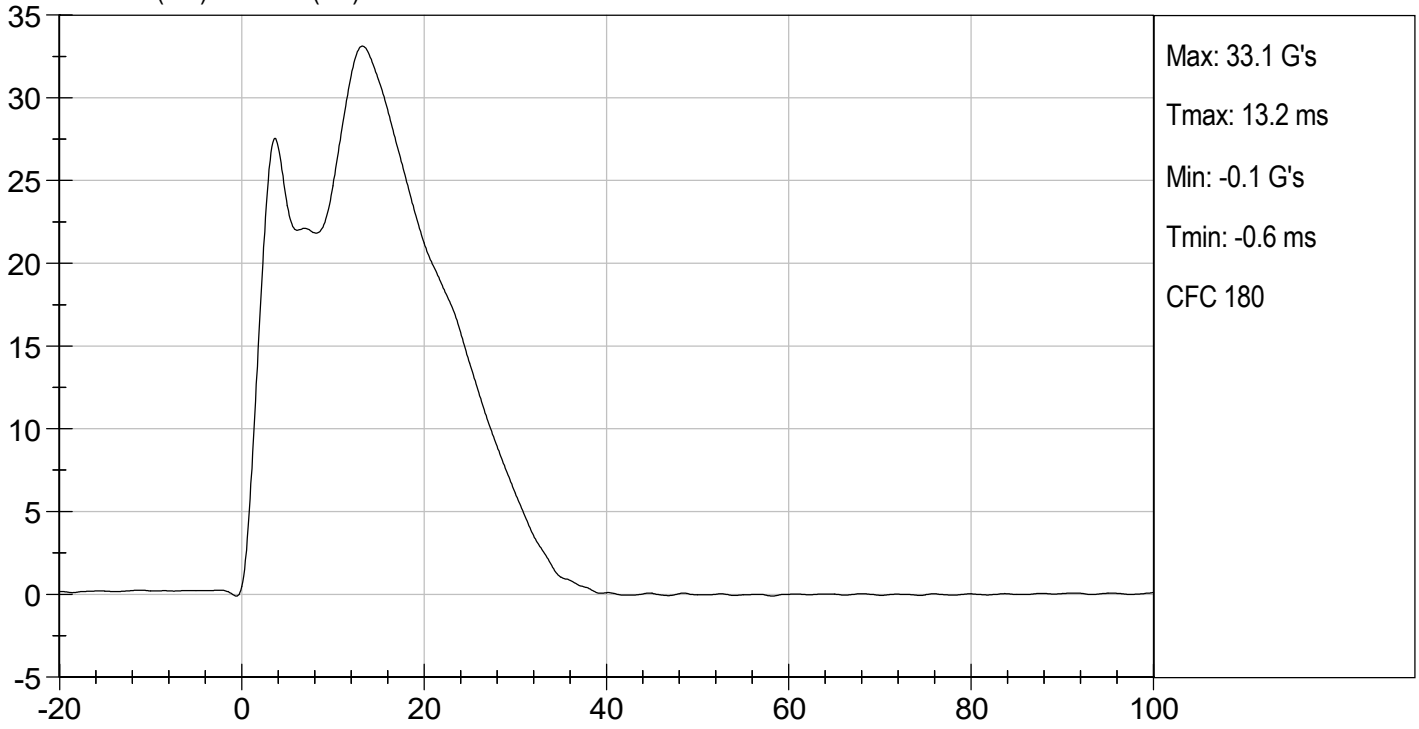
03/08/2021
Test Date

Approved By

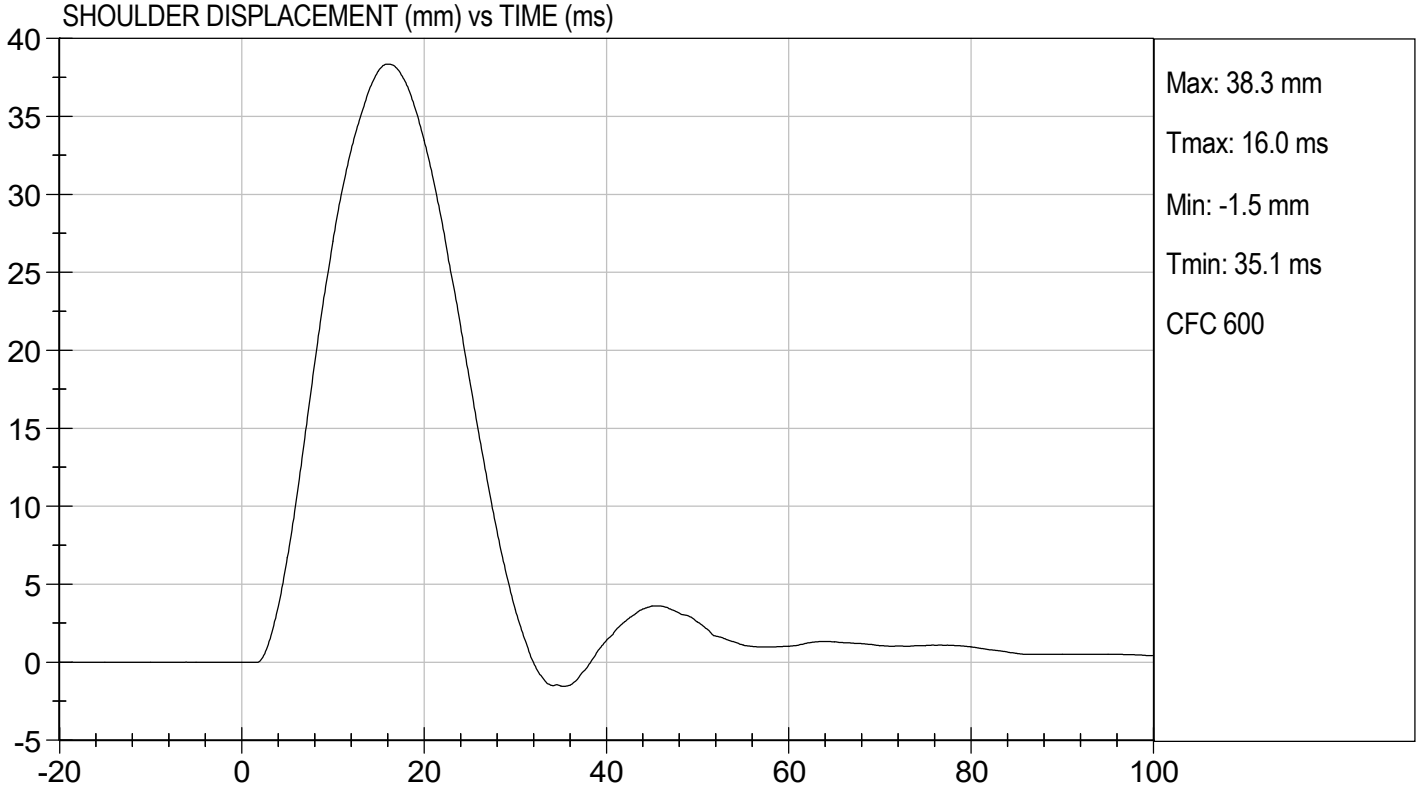
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 03/08/2021
TEST #: D210724

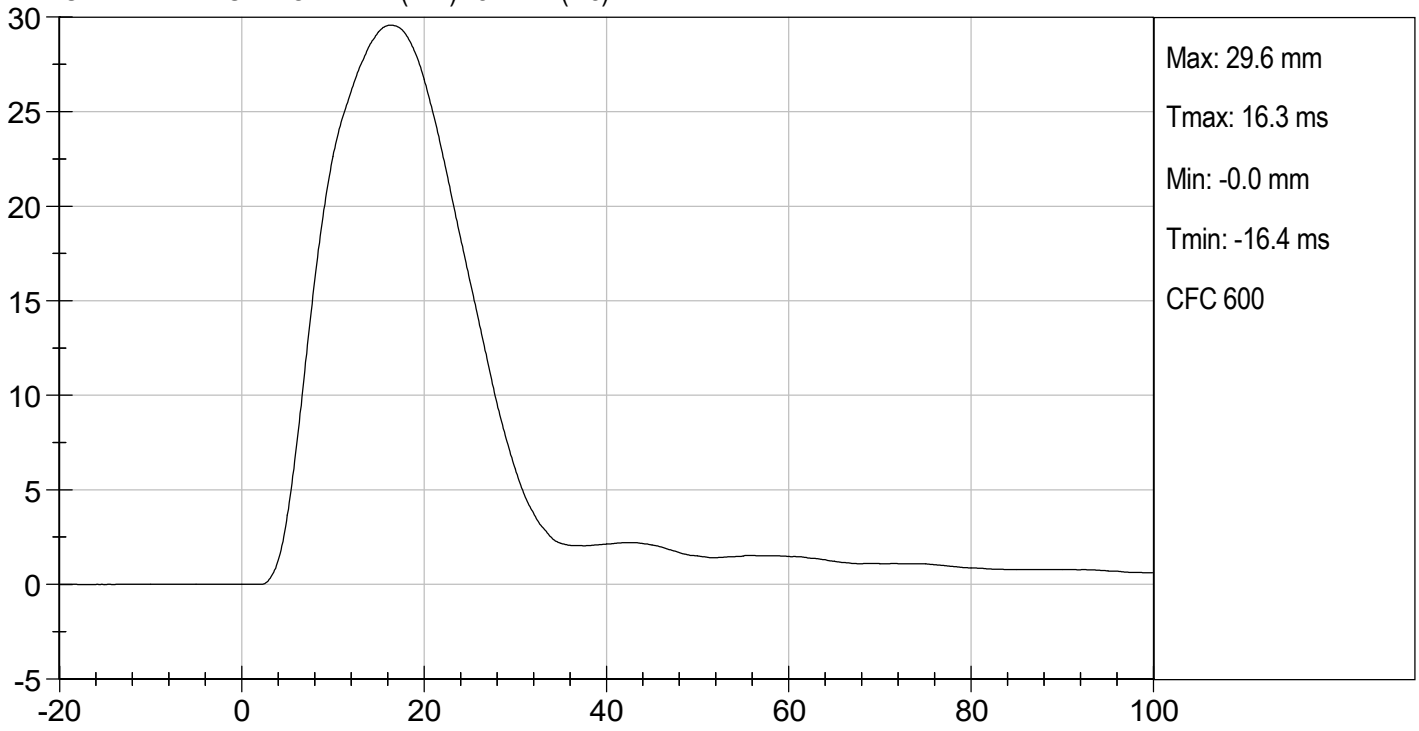
PROBE (G's) vs TIME (ms)



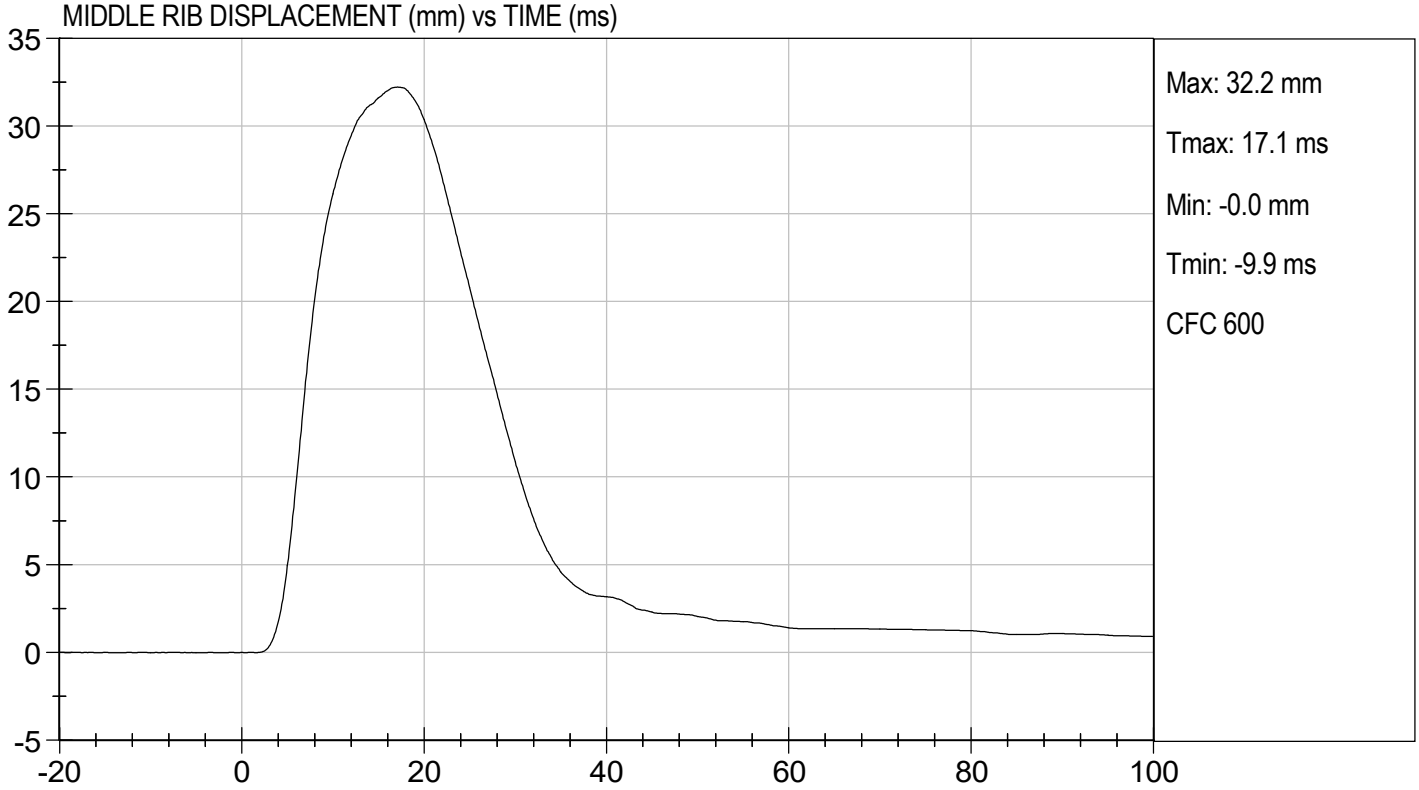

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



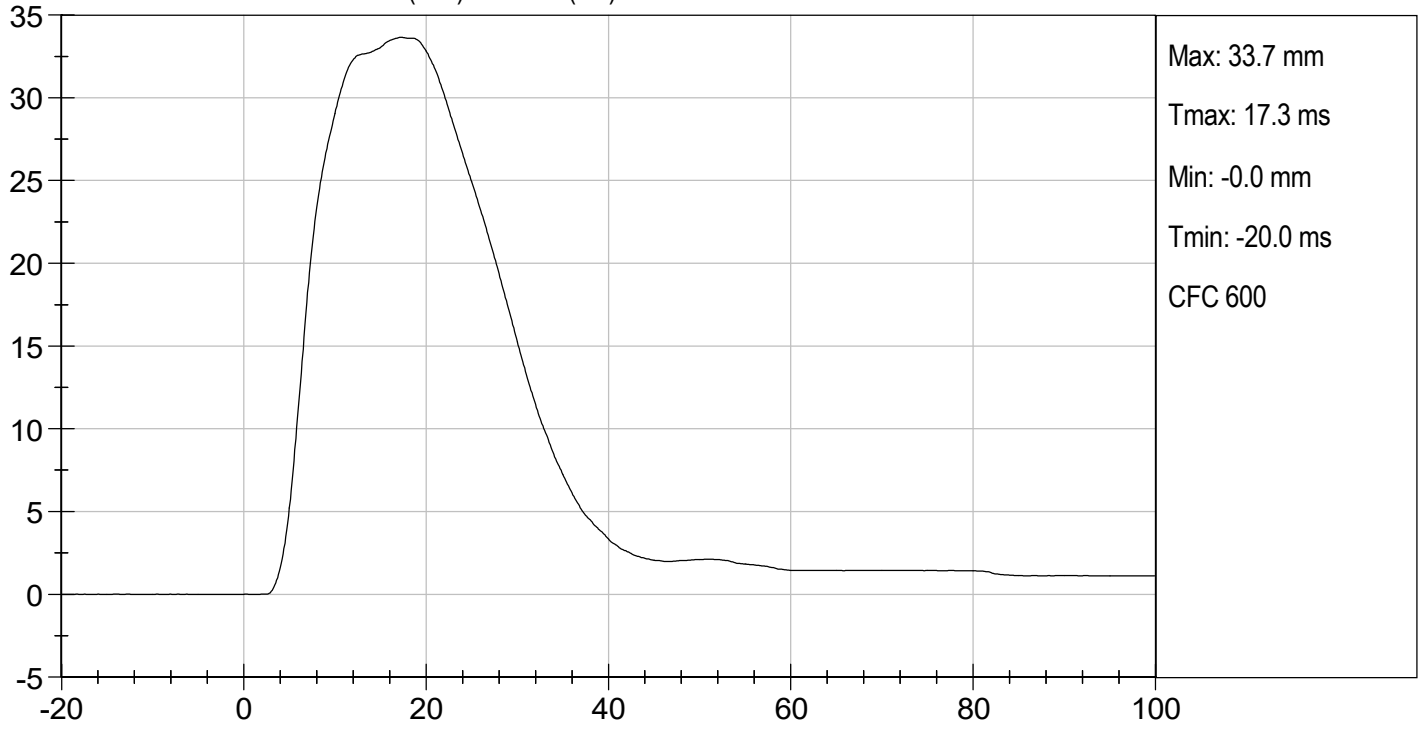

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



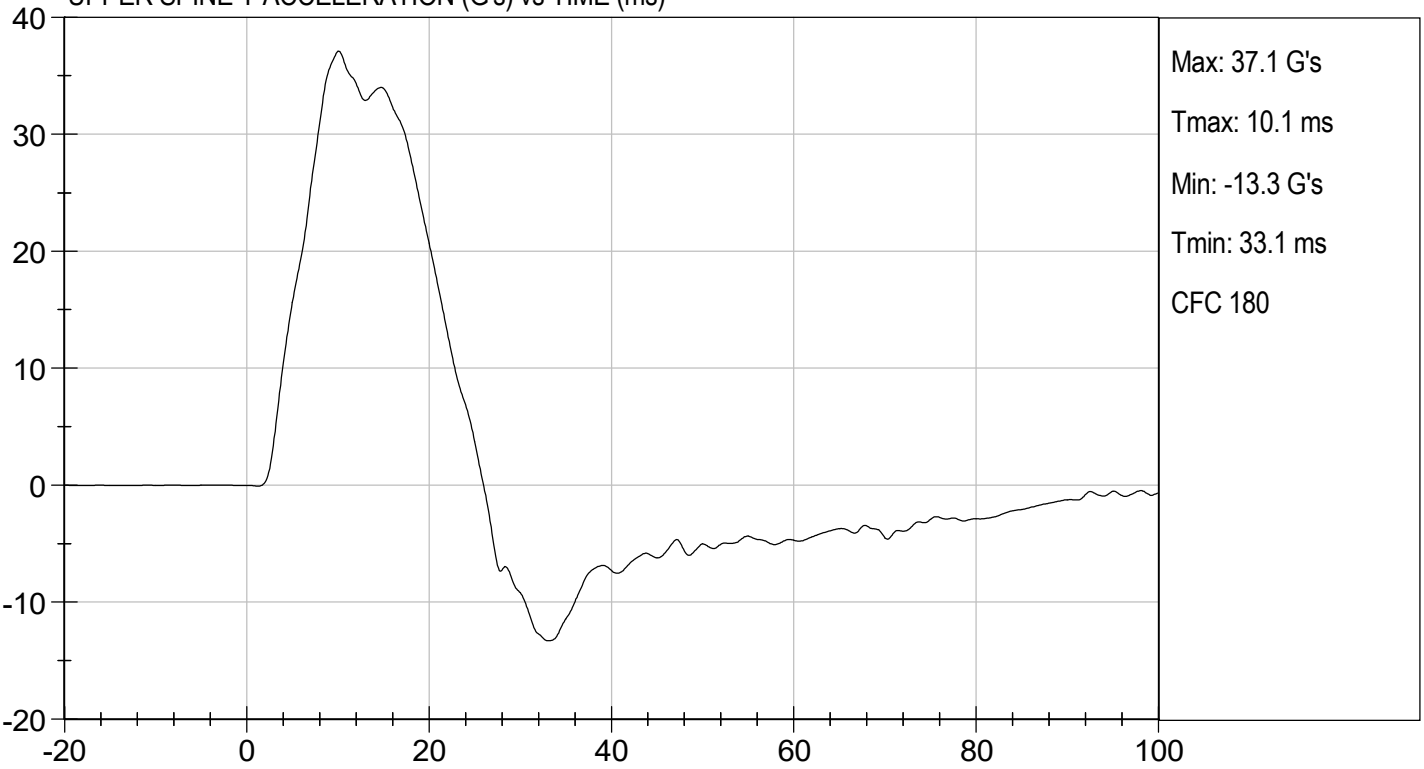
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 03/08/2021
TEST #: D210724

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

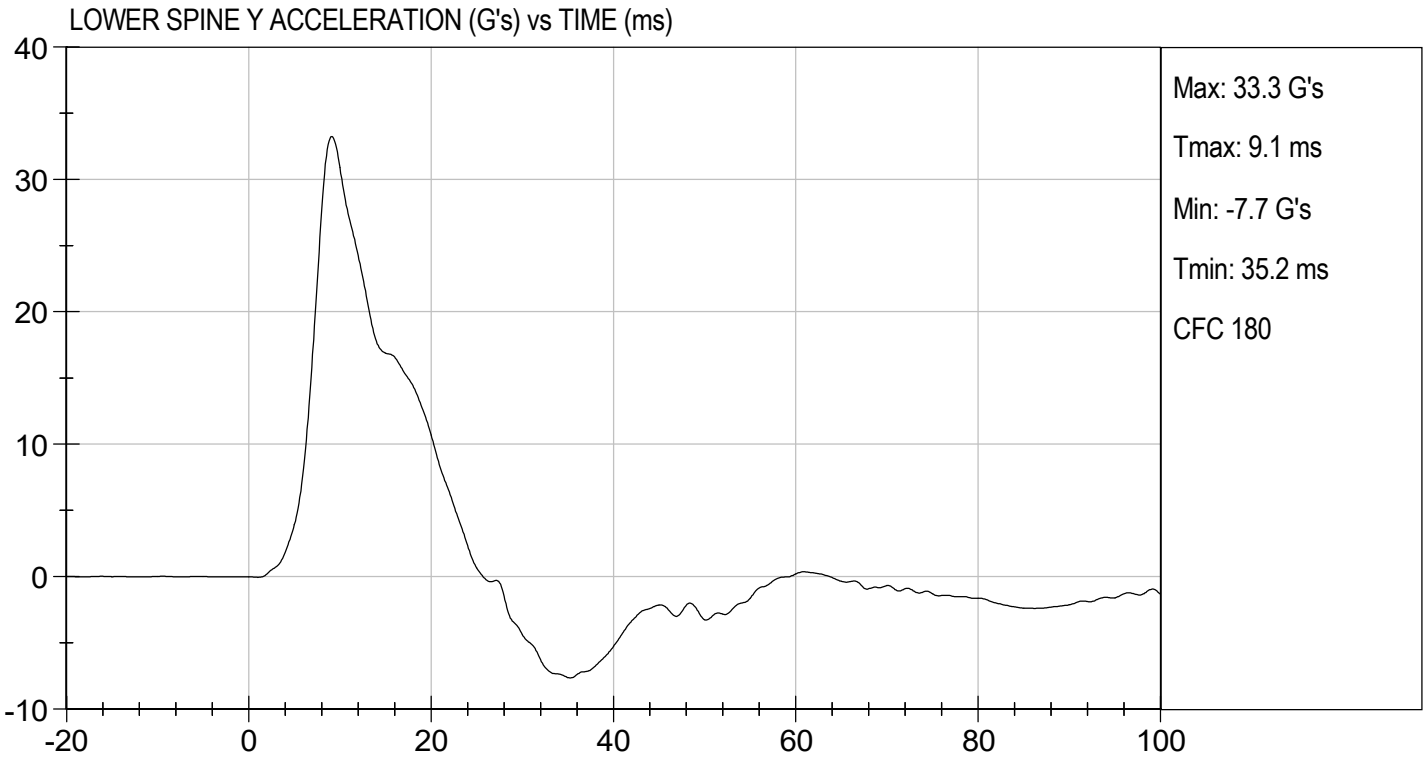



UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 03/08/2021
TEST #: D210724



**MGA RESEARCH CORPORATION**

**THORAX (WITHOUT ARM) IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210725

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.8 | Pass |
| Humidity | % | 10 to 70 | 28 | Pass |
| Impact Velocity | m/s | 4.20 to 4.40 | 4.27 | Pass |
| Maximum Probe Acceleration | G's | 14 to 18 | 15 | Pass |
| Upper Rib Displacement | mm | 32 to 40 | 38 | Pass |
| Middle Rib Displacement | mm | 39 to 45 | 43 | Pass |
| Lower Rib Displacement | mm | 35 to 43 | 40 | Pass |
| Upper Spine (T1) Y Acceleration | G's | 13 to 17 | 14 | Pass |
| Lower Spine (T12) Y Acceleration | G's | 7 to 11 | 9 | Pass |
| | | Overall Test Results | | Pass |

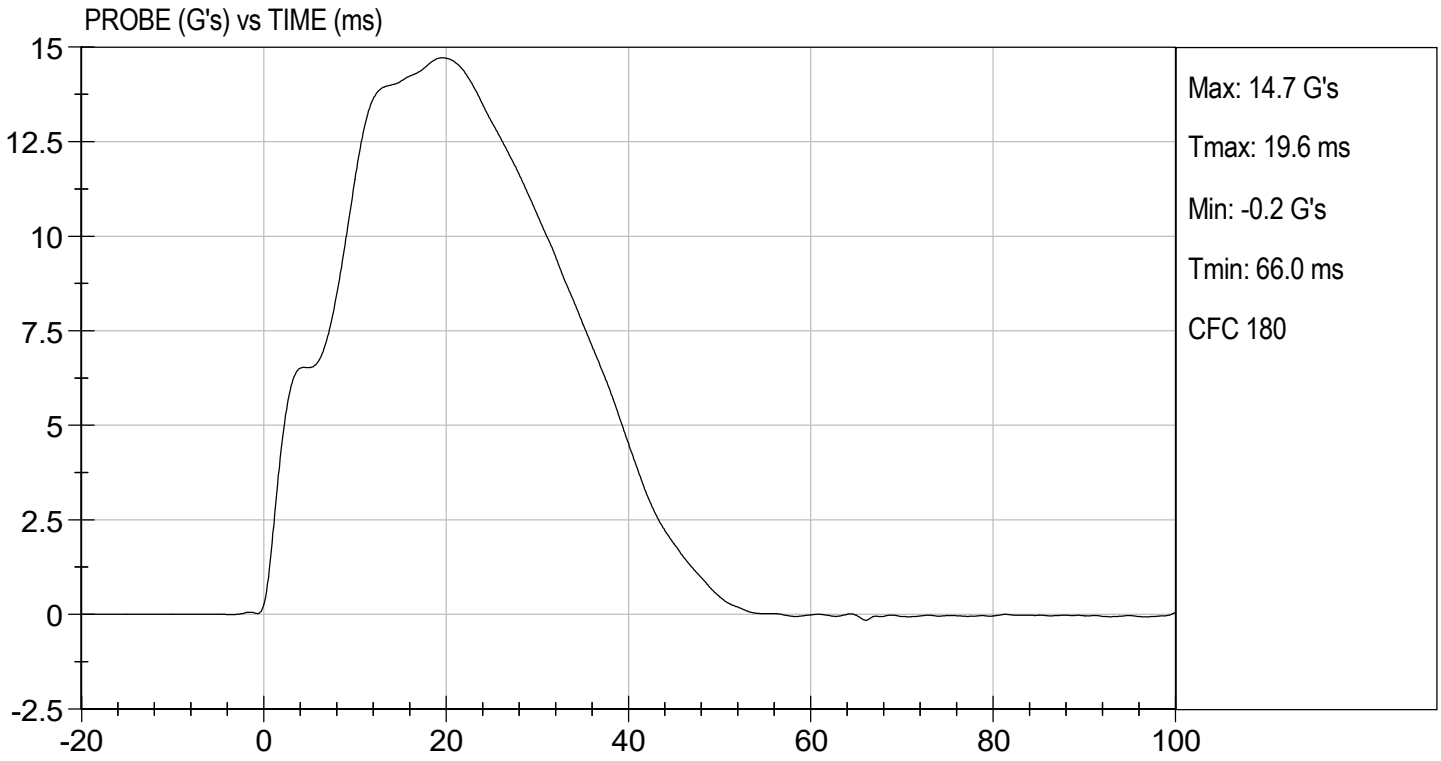
Gerald Guerrero
Laboratory Technician

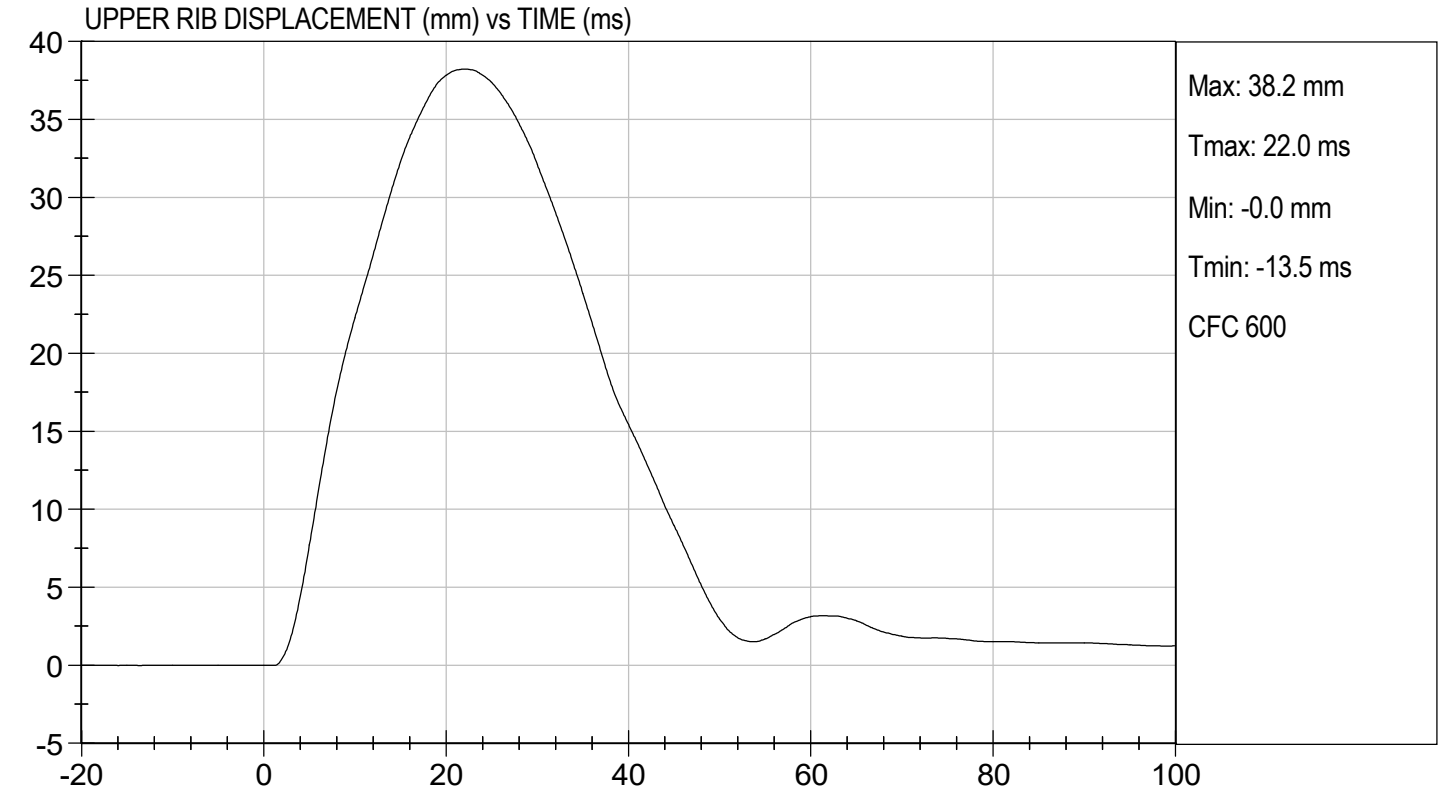
03/08/2021
Test Date

Approved By

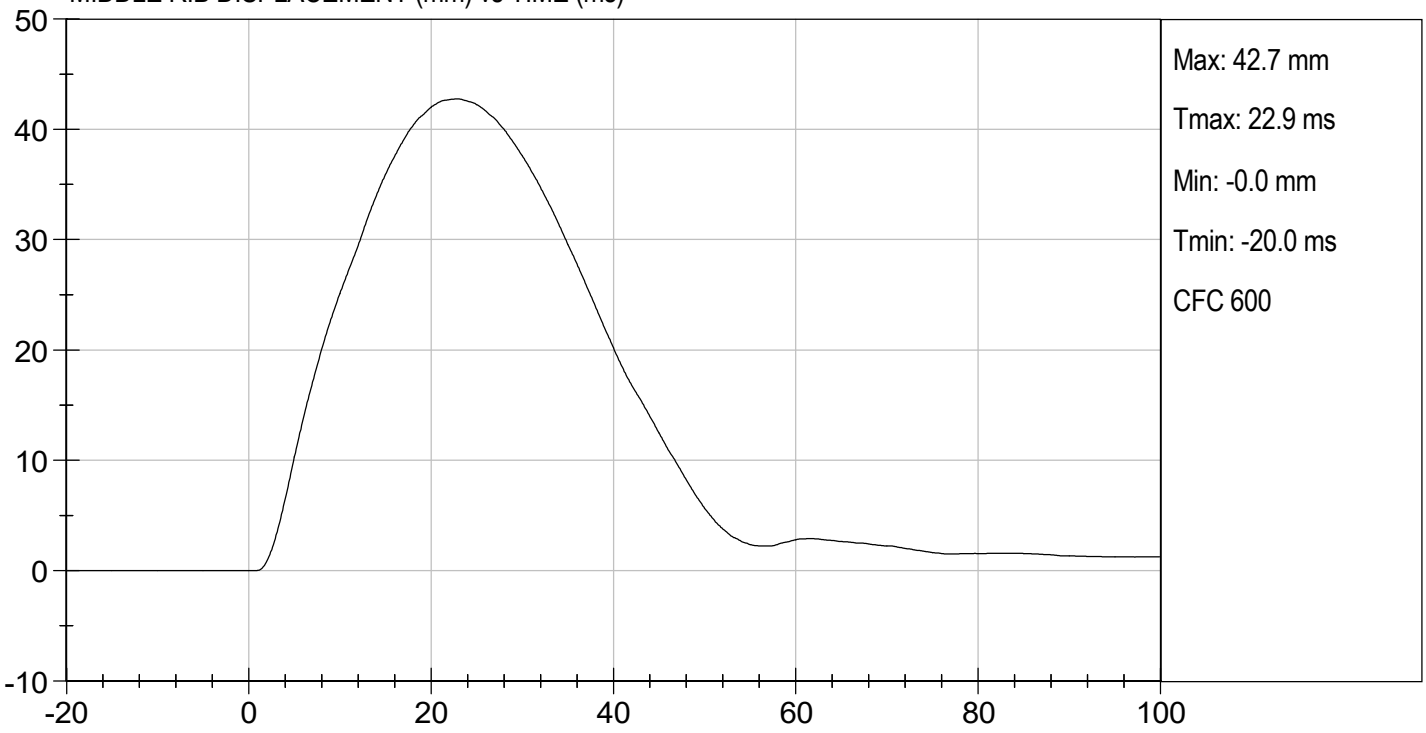
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 03/08/2021
TEST #: D210725

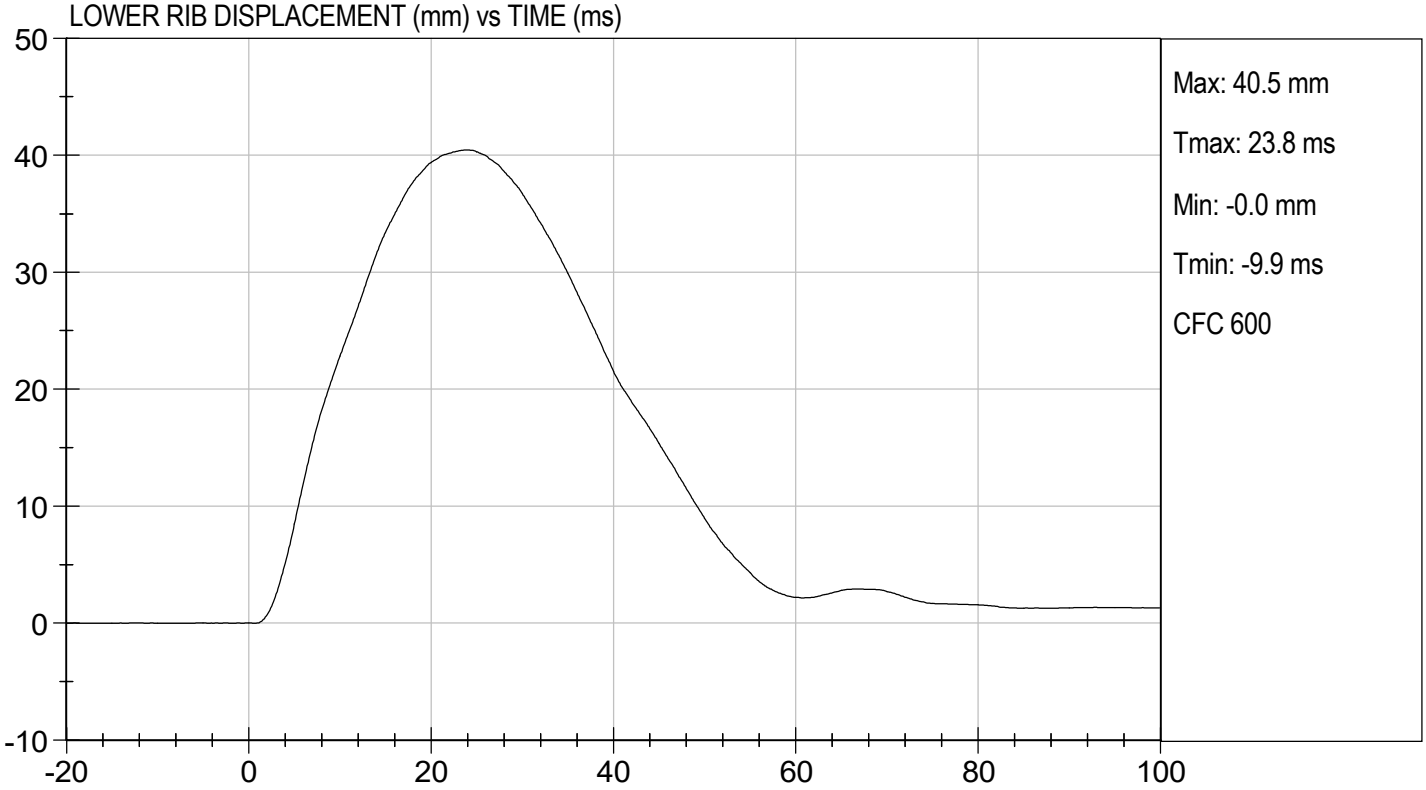


MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



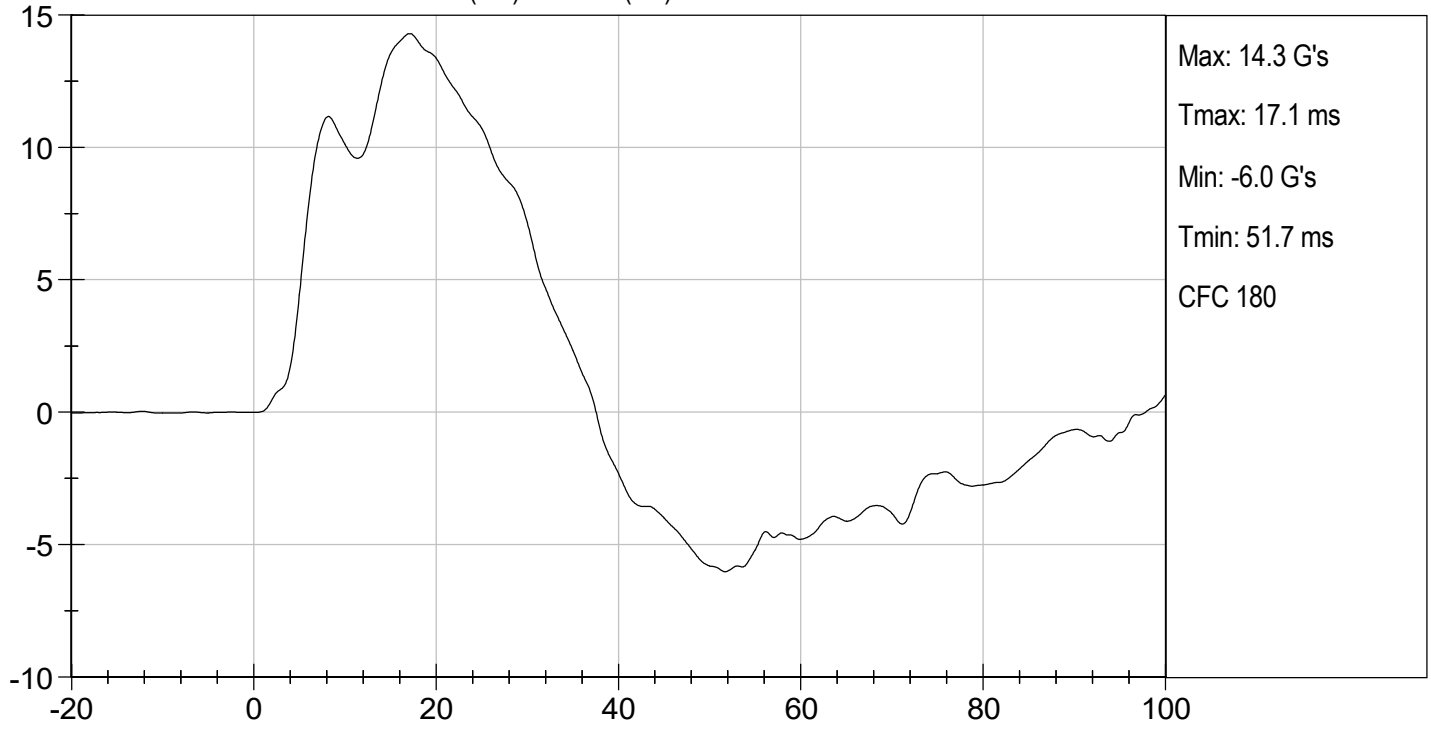

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



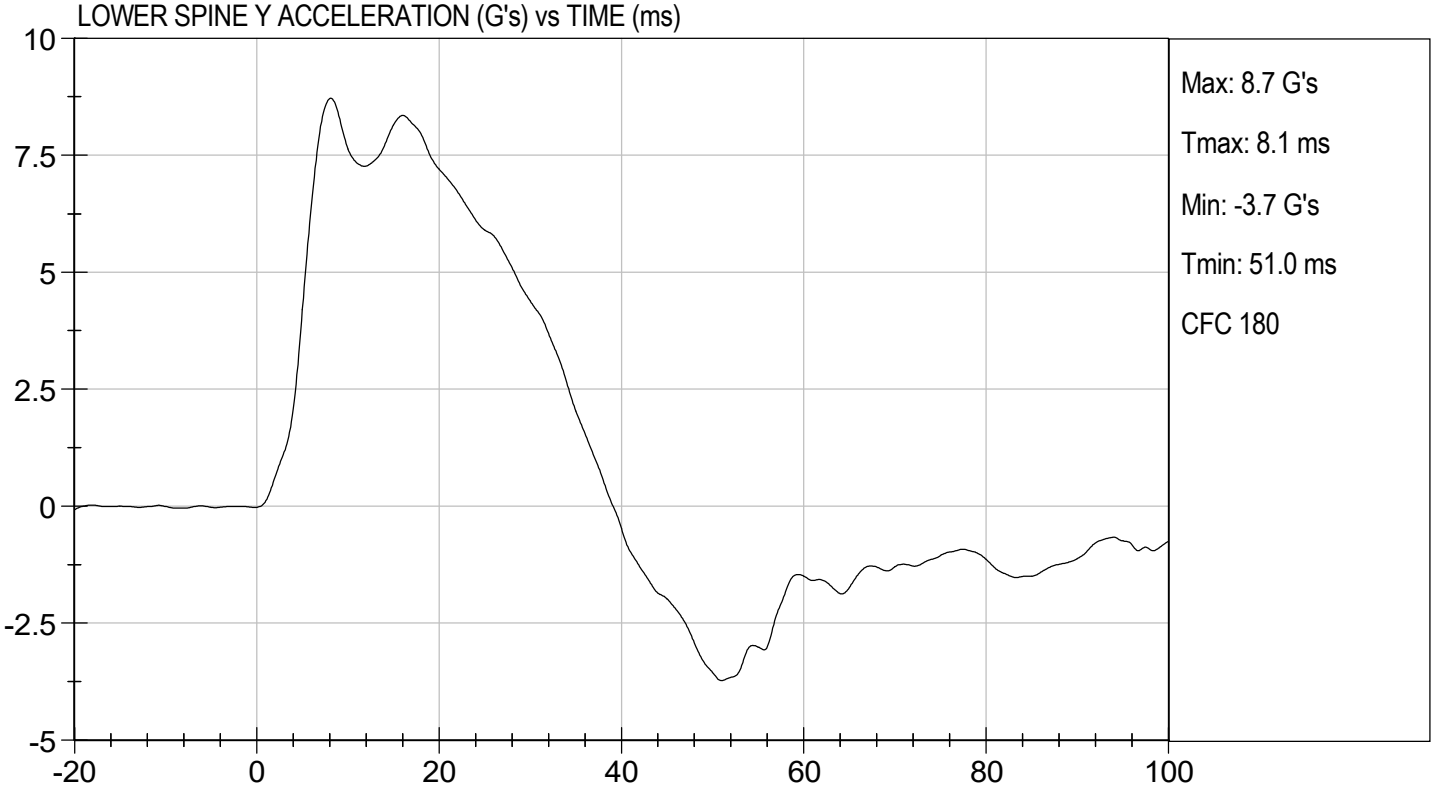
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.01 ft/s, 4.27 m/s

TEST DATE: 03/08/2021
TEST #: D210725

UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)




LOWER SPINE Y ACCELERATION (G's) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**ABDOMINAL IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210726

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21 | Pass |
| Humidity | % | 10 to 70 | 27 | Pass |
| Impact Velocity | m/s | 4.20 to 4.40 | 4.34 | Pass |
| Maximum Probe Acceleration | G's | 12 to 16 | 14 | Pass |
| Upper Abdomen Rib Displacement | mm | 36 to 47 | 40 | Pass |
| Lower Abdomen Rib Displacement | mm | 33 to 44 | 39 | Pass |
| Lower Spine (T12) Y Acceleration | G's | 9 to 14 | 12 | Pass |
| | | Overall Test Results | | Pass |

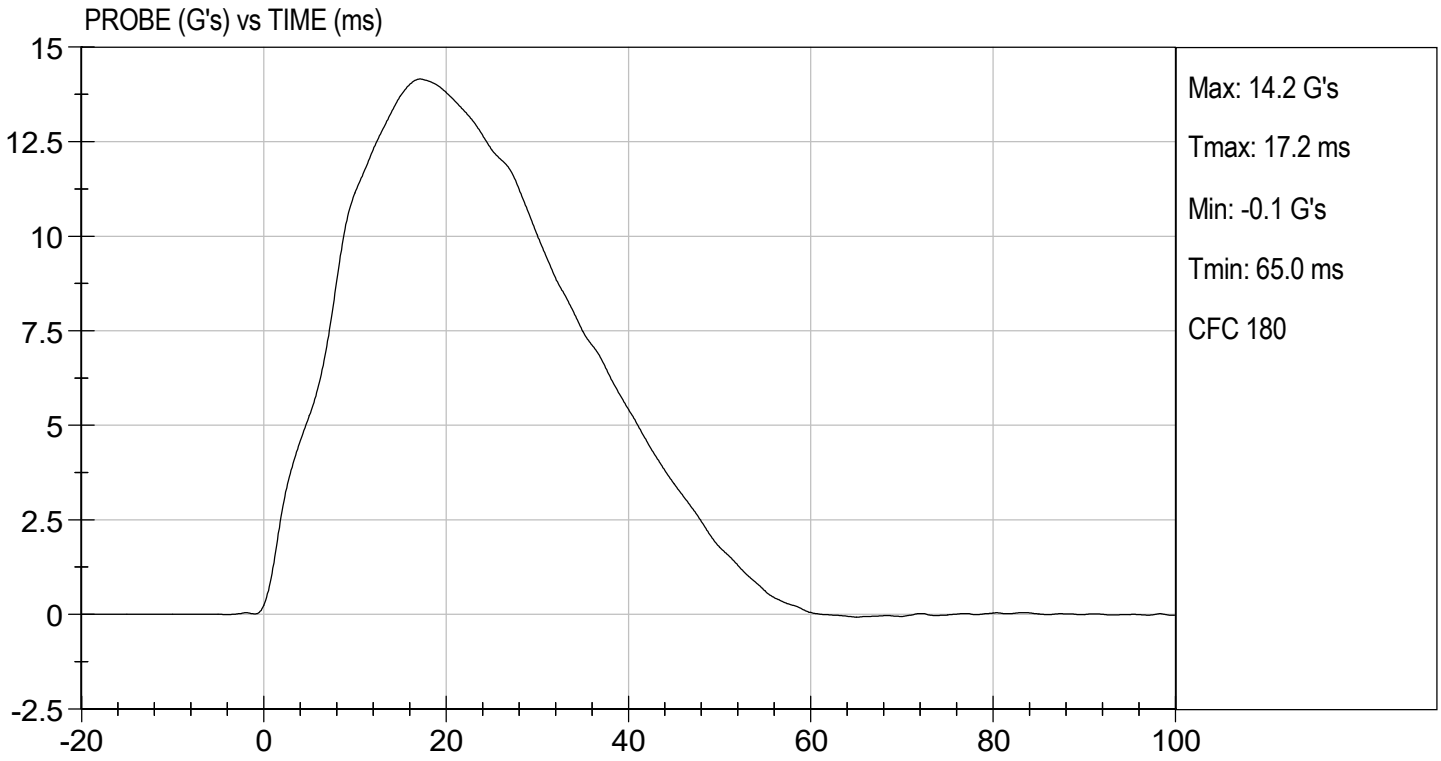
Gerald Guerrero
Laboratory Technician

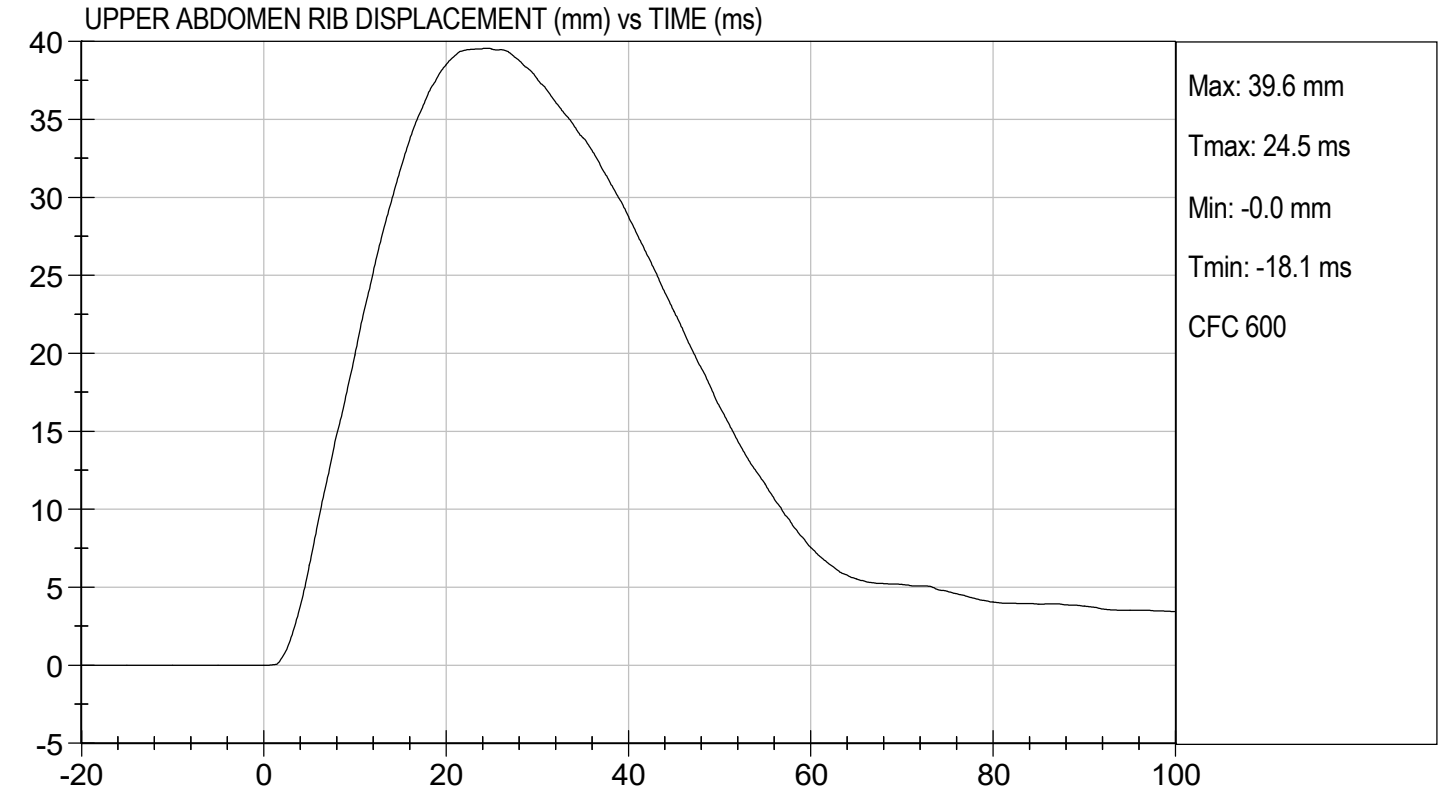
03/09/2021
Test Date

Approved By

TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 03/09/2021
TEST #: D210726

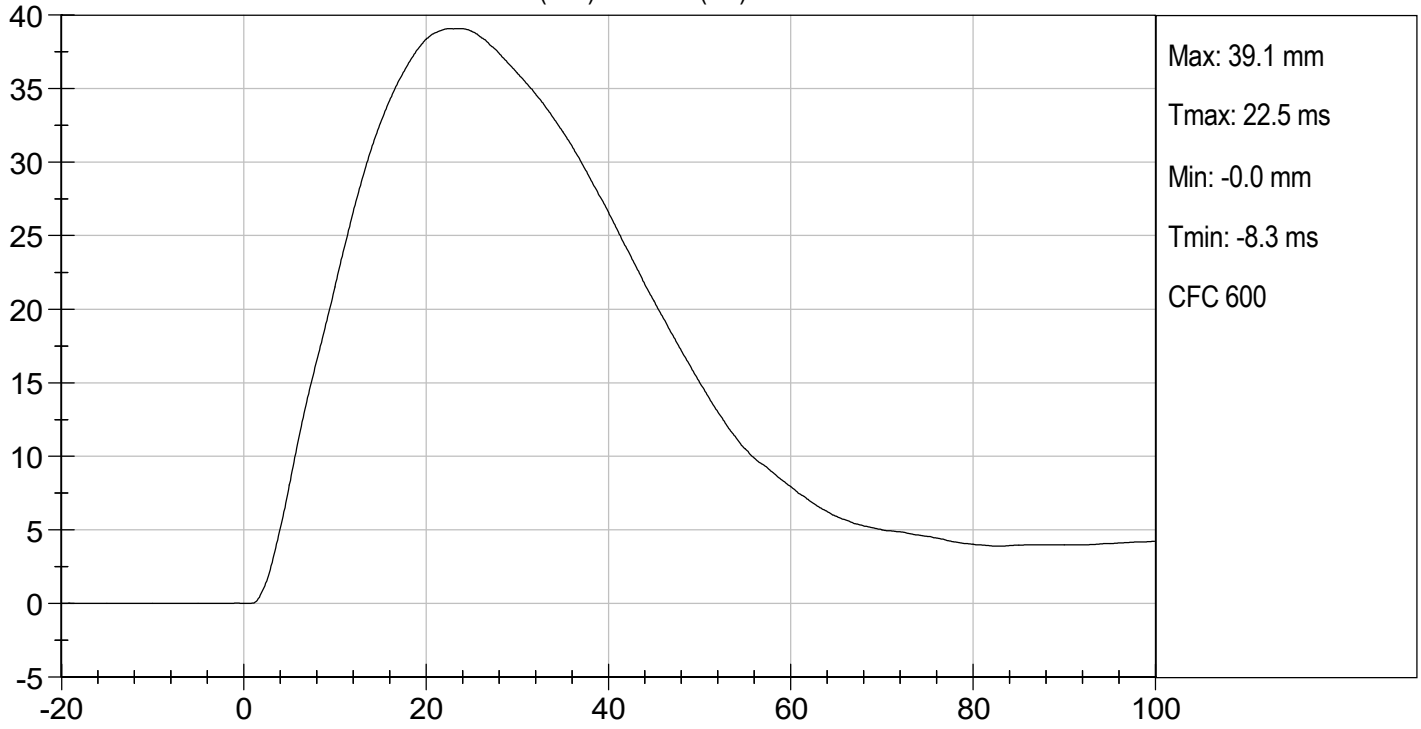


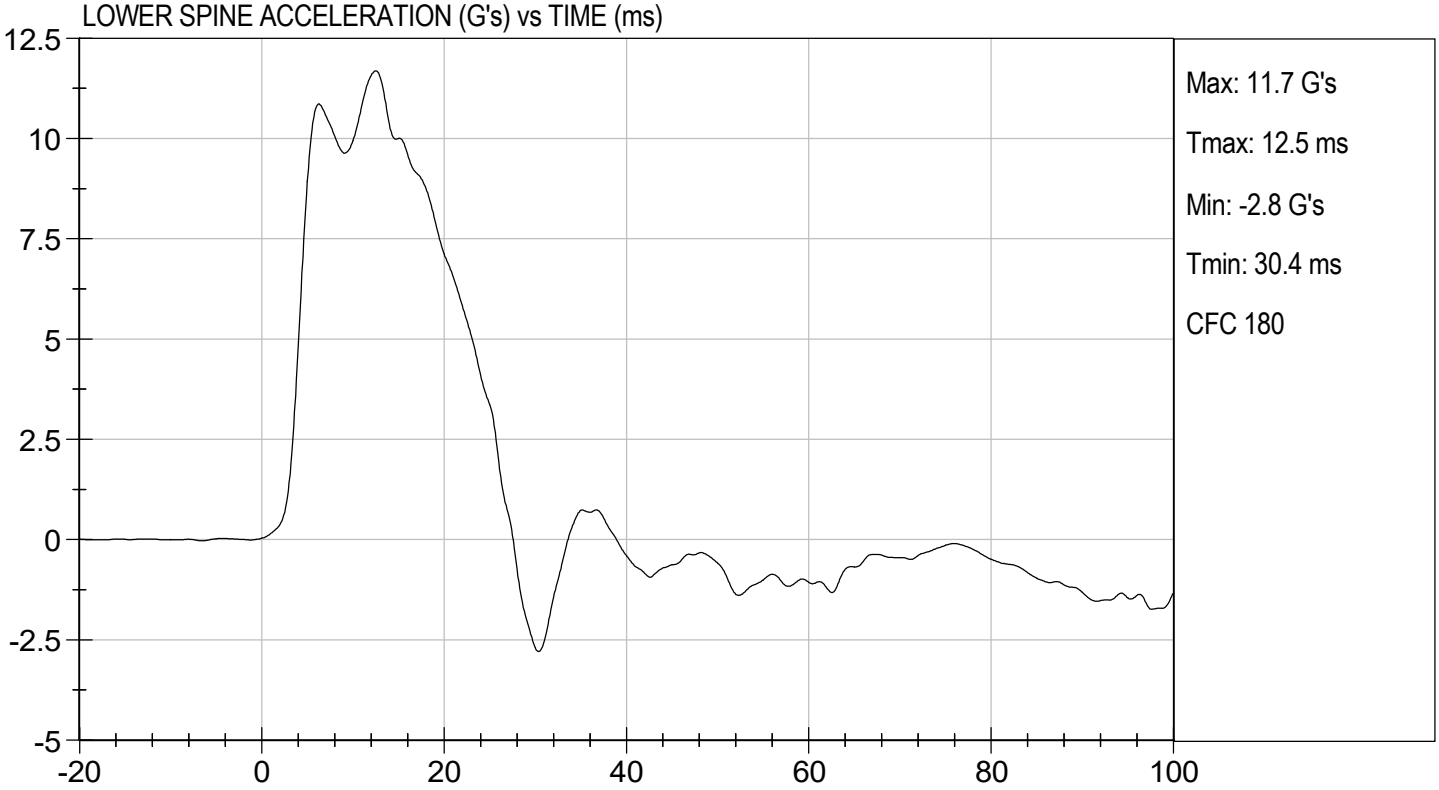
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 03/09/2021
TEST #: D210726

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)




LOWER SPINE ACCELERATION (G's) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**PELVIS IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210727

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21 | Pass |
| Humidity | % | 10 to 70 | 27 | Pass |
| Impact Velocity | m/s | 6.60 to 6.80 | 6.60 | Pass |
| Maximum Probe Acceleration | G's | 38 to 47 | 41 | Pass |
| Pelvis Y Acceleration After 6 ms | G's | 34 to 42 | 38 | Pass |
| Peak Acetabulum Force | N | 3600 to 4300 | 3,949 | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero

Laboratory Technician

03/09/2021

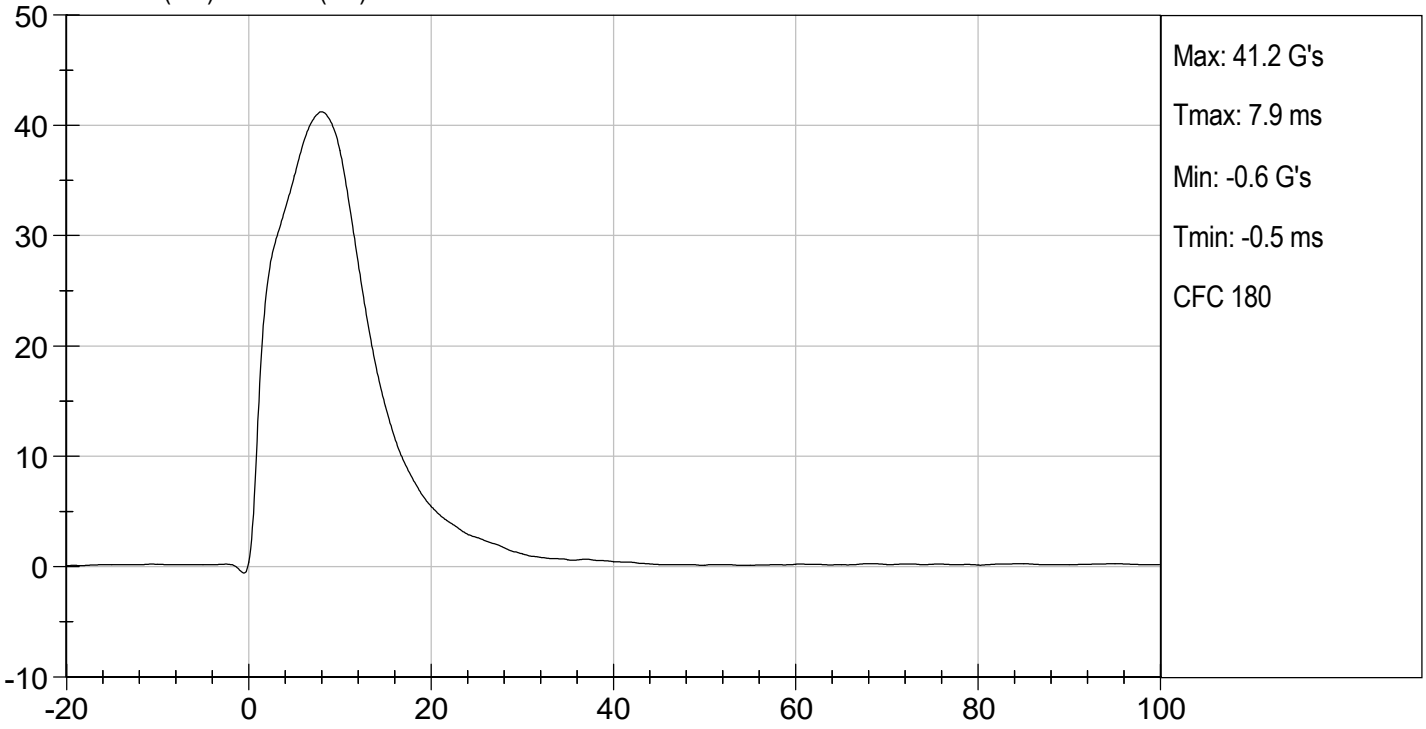
Test Date

Approved By

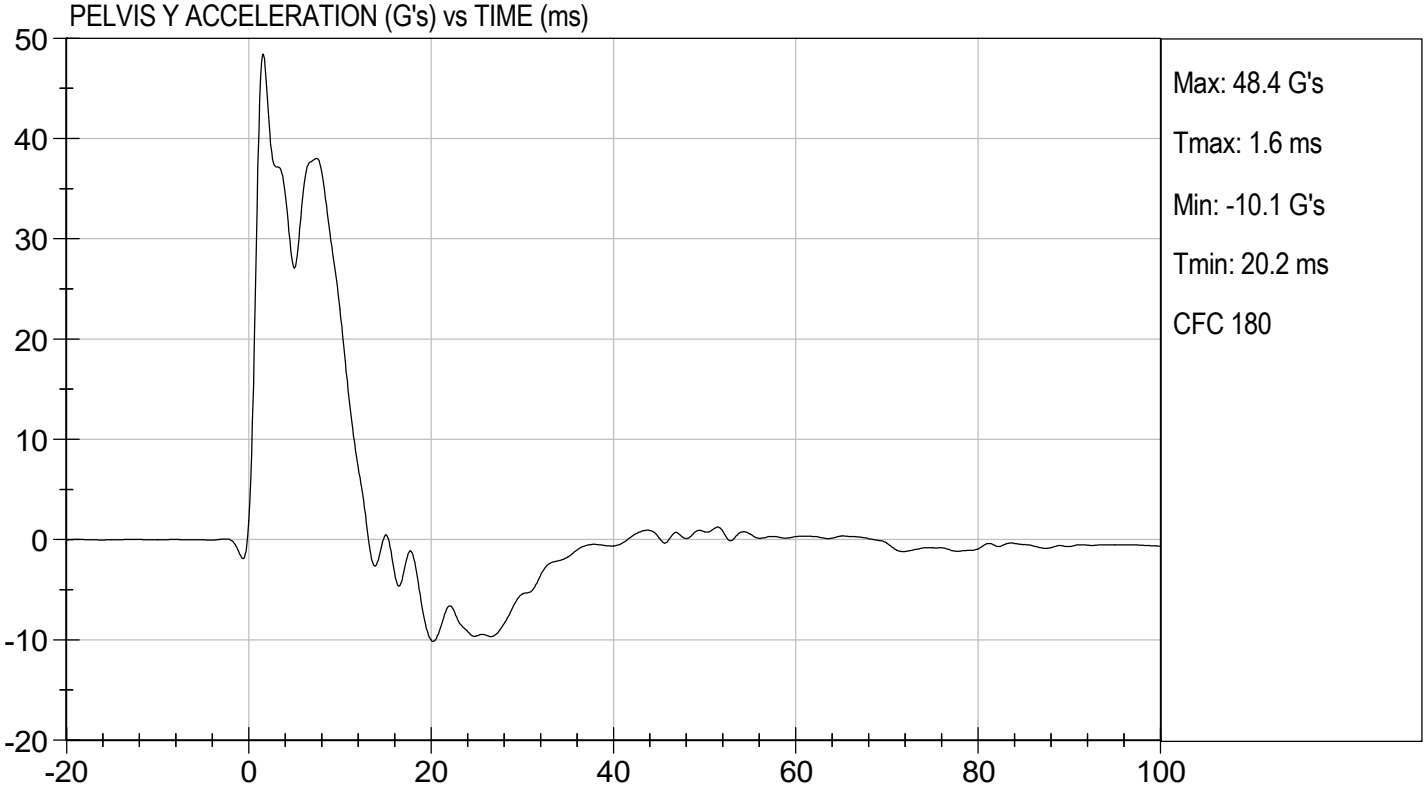
TEST DESC: PELVIS IMPACT
VELOCITY: 21.64 ft/s, 6.60 m/s

TEST DATE: 03/09/2021
TEST #: D210727

PROBE (G's) vs TIME (ms)

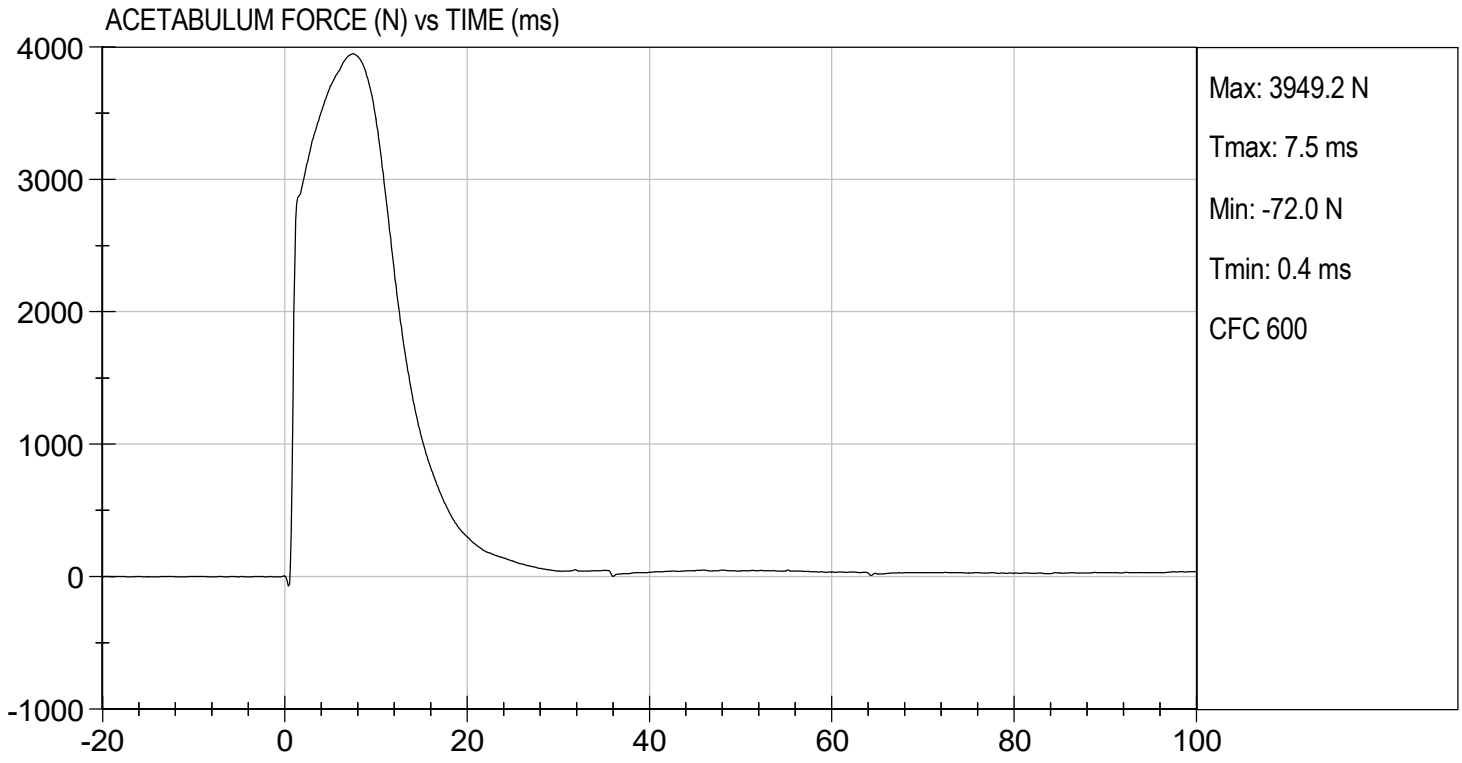



PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: PELVIS IMPACT
VELOCITY: 21.64 ft/s, 6.60 m/s

TEST DATE: 03/09/2021
TEST #: D210727



**MGA RESEARCH CORPORATION**

**ILIAC IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210728

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.5 | Pass |
| Humidity | % | 10 to 70 | 23 | Pass |
| Impact Velocity | m/s | 4.20 to 4.40 | 4.34 | Pass |
| Maximum Probe Acceleration | G's | 36 to 45 | 42 | Pass |
| Pelvis Y Acceleration | G's | 28 to 39 | 34 | Pass |
| Peak Pelvis Iliac Force | N | 4100 to 5100 | 4,851 | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero

Laboratory Technician

03/08/2021

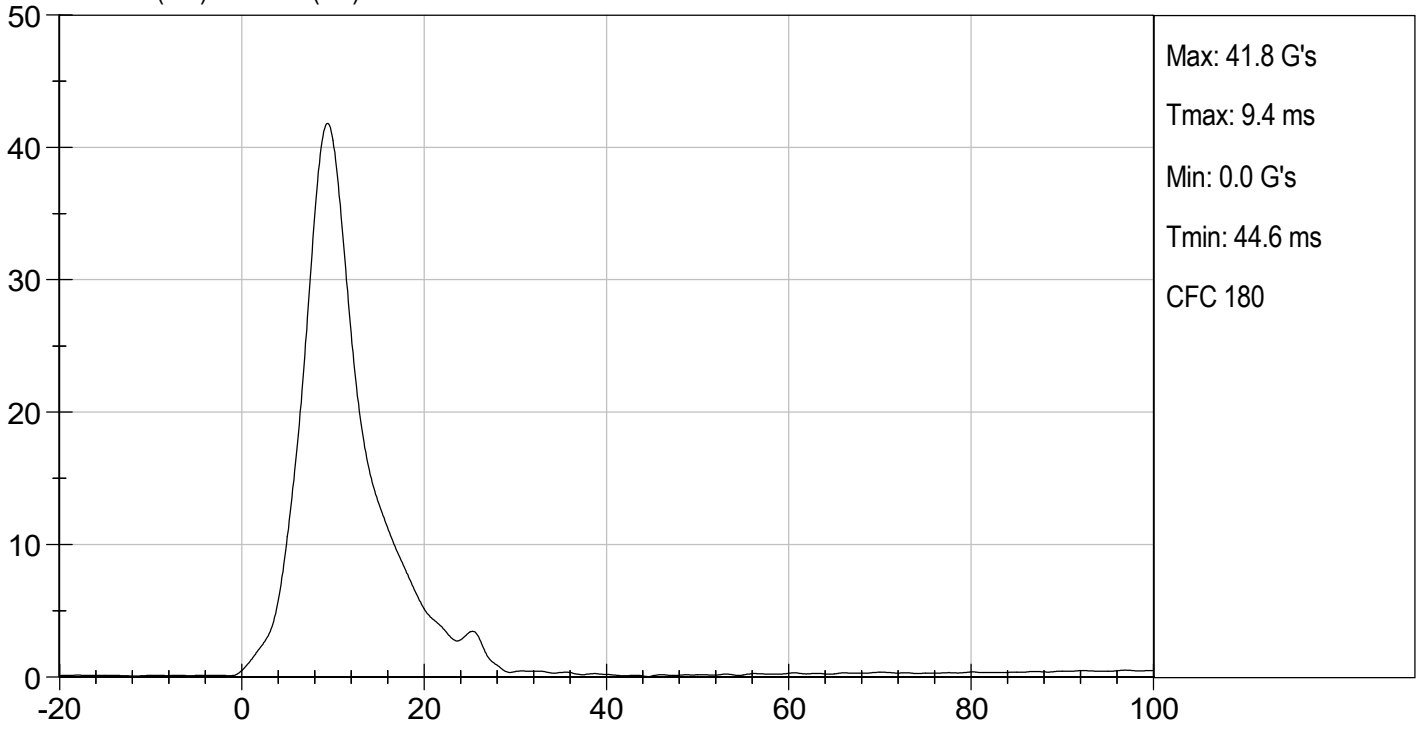
Test Date

Approved By

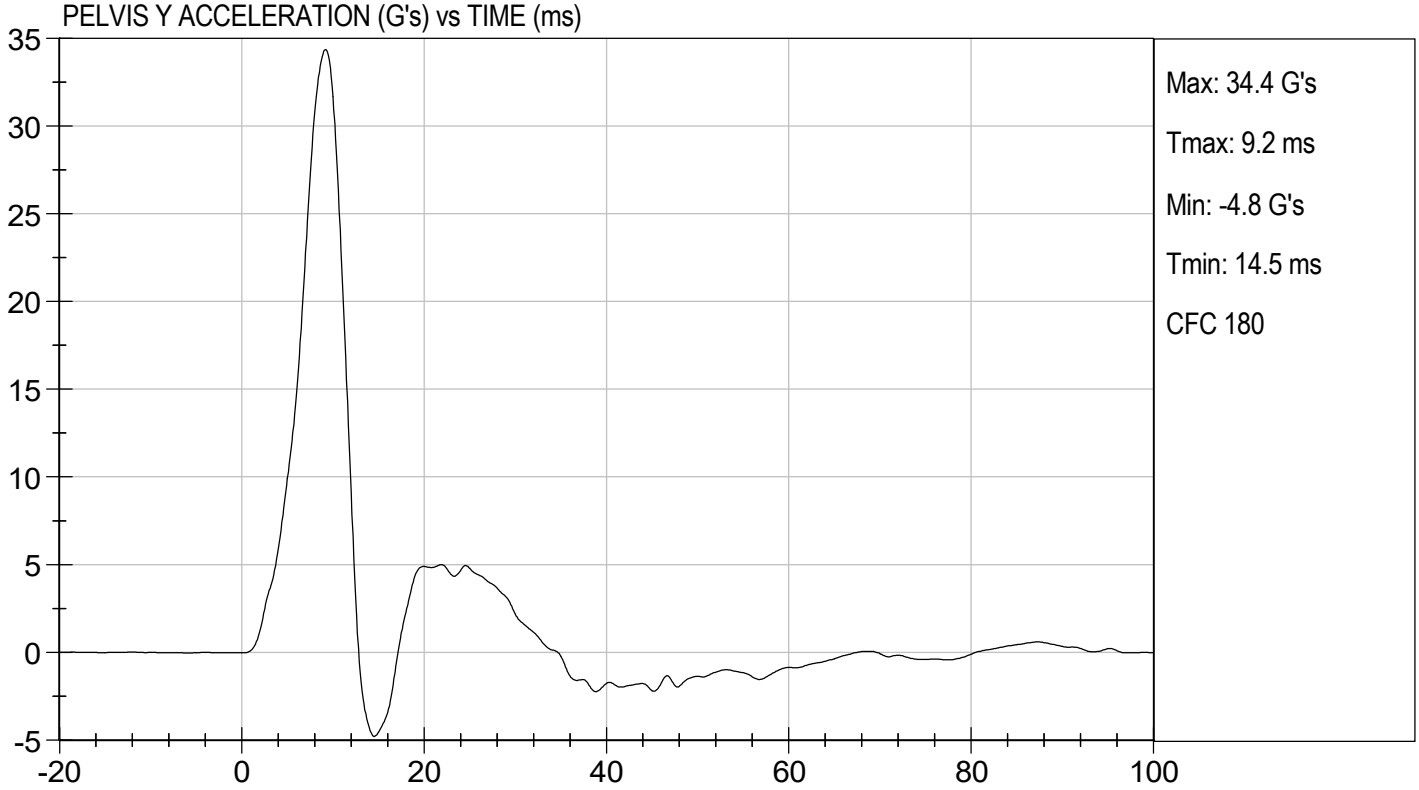
TEST DESC: ILLIAC
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 03/08/2021
TEST #: D210728

PROBE (G's) vs TIME (ms)

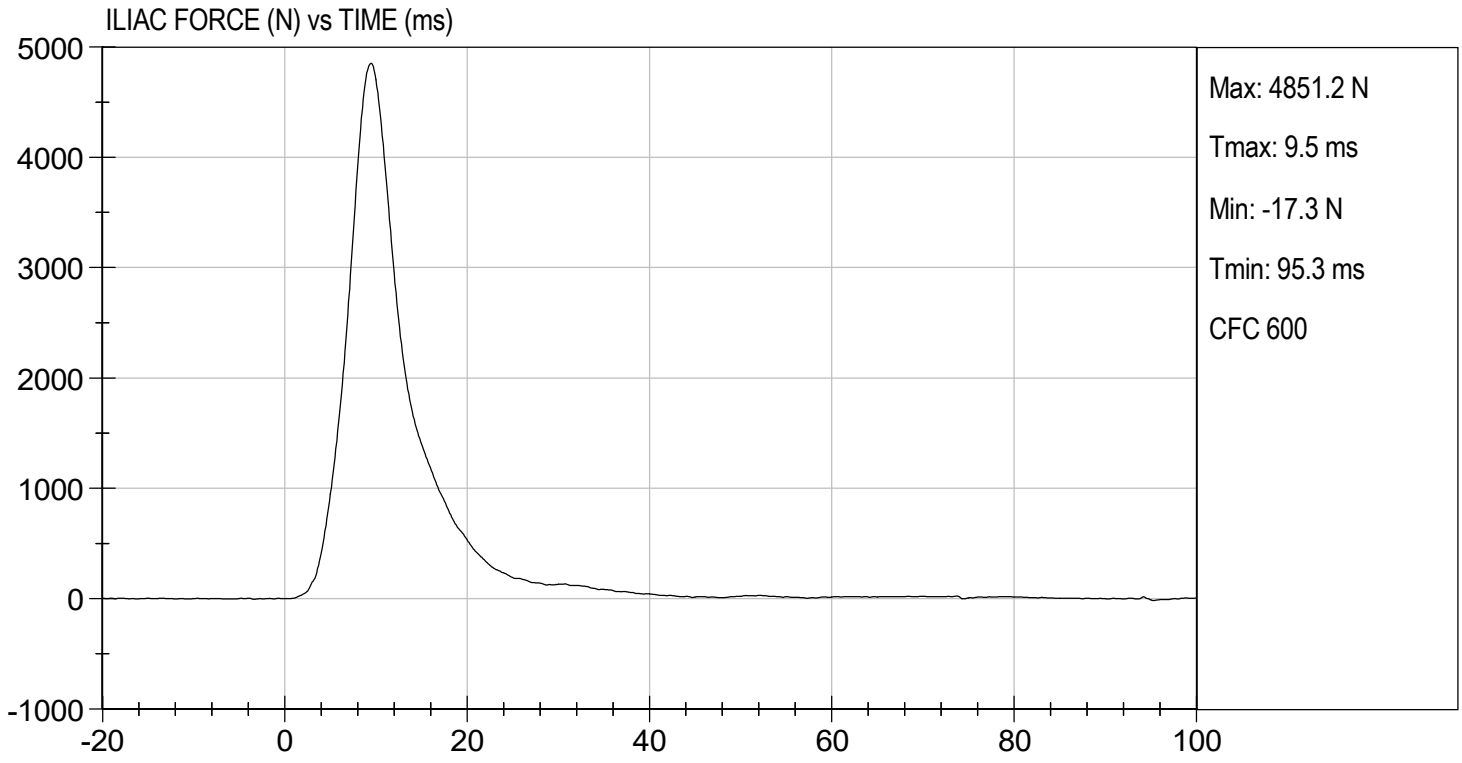



PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: ILLIAC
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 03/08/2021
TEST #: D210728



## CALIBRATION TEST RESULTS

## POST-TEST

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

**SID-IIsD External Measurements**
**SN: 296**

| No. | Name | Spec. (mm) | Result | Pass/Fail |
|---|---|---|---|---|
| **A** | Sitting Height | 772 - 788 | 784 | Pass |
| **B** | Shoulder Pivot Height | 437 - 453 | 442 | 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 | 99 | Pass |
| **F** | Thigh Clearance | 119 -135 | 121 | Pass |
| **G** | Head Breadth | 140 - 148 | 142 | Pass |
| **H** | Head Back from Backline | 40 - 46 | 45 | Pass |
| **I** | Head Depth | 178 - 188 | 180 | Pass |
| **J** | Head Circumference | 541 - 551 | 548 | Pass |
| **K** | Buttock to Knee Length | 514 - 540 | 535 | Pass |
| **L** | Popliteal Height | 343 - 369 | 358 | Pass |
| **M** | Knee Pivot to Floor Height | 392 - 409 | 404 | Pass |
| **N** | Buttock Popliteal Length | 416 - 442 | 435 | Pass |
| **O** | Chest Depth w/o Jacket | 195 - 211 | 206 | Pass |
| **P** | Foot Length | 216 - 232 | 219 | Pass |
| **Q** | Hip Breadth (w/ pelvic plugs) | 313 - 323 | 316 | Pass |
| **R** | Arm Length | 249 - 259 | 250 | Pass |
| **S** | Knee Joint to Seatback | 477 - 493 | 481 | Pass |
| **V** | Shoulder Width | 341 - 357 | 346 | Pass |
| **W** | Foot Width | 78 - 94 | 85 | Pass |
| **Y** | Chest Circumference w/ jacket | 851 - 881 | 870 | Pass |
| **Z** | Waist Circumference | 761 - 791 | 772 | Pass |

**MGA RESEARCH CORPORATION**

**HEAD DROP TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test ID:** D210871

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 24 | Pass |
| Peak Resultant Acceleration | G's | 115 to 137 | 130 | Pass |
| Peak Longitudinal Acceleration | G's | +/- 15 | -3.6 | Pass |
| Unimodal | N/A | Yes | Yes | Pass |
| Oscillations | N/A | <15% | Yes | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero
Laboratory Technician

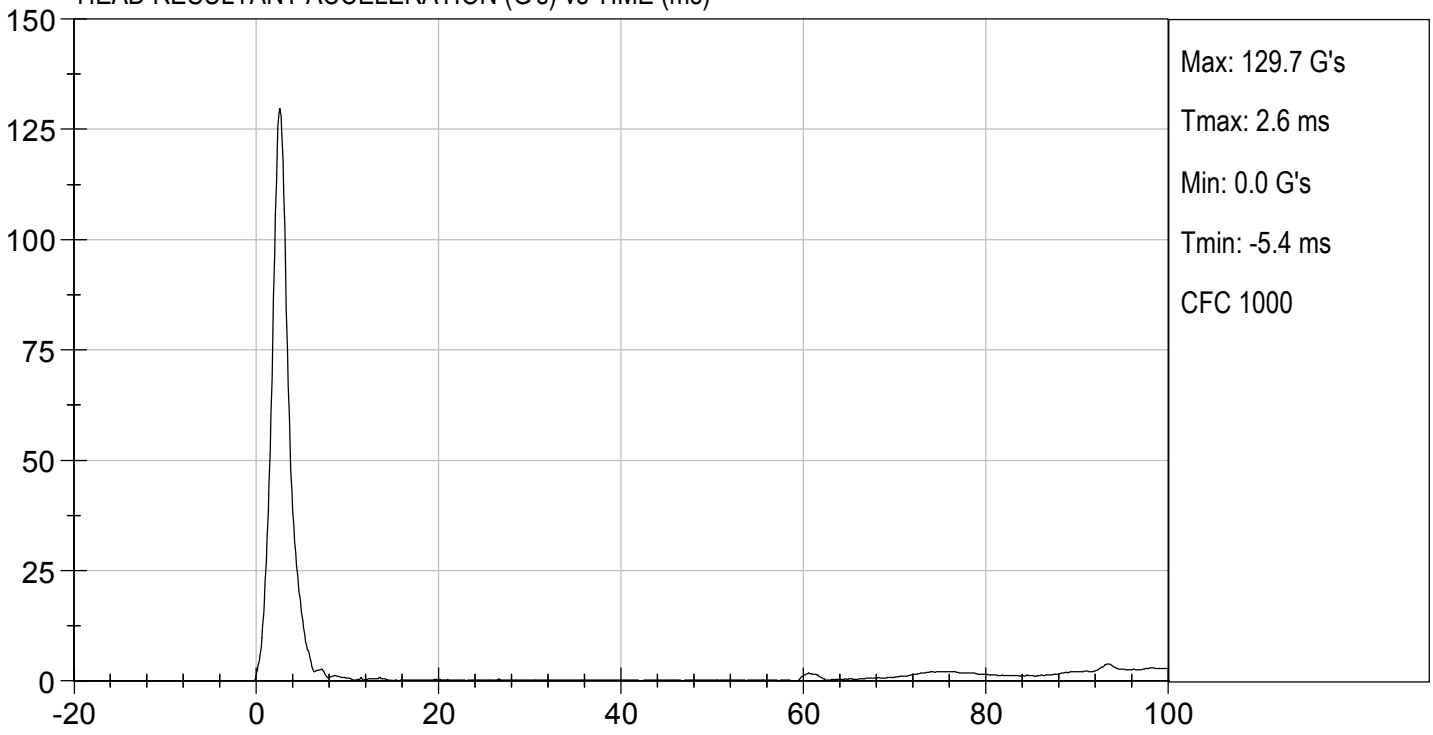
03/16/2021
Test Date

Approved By

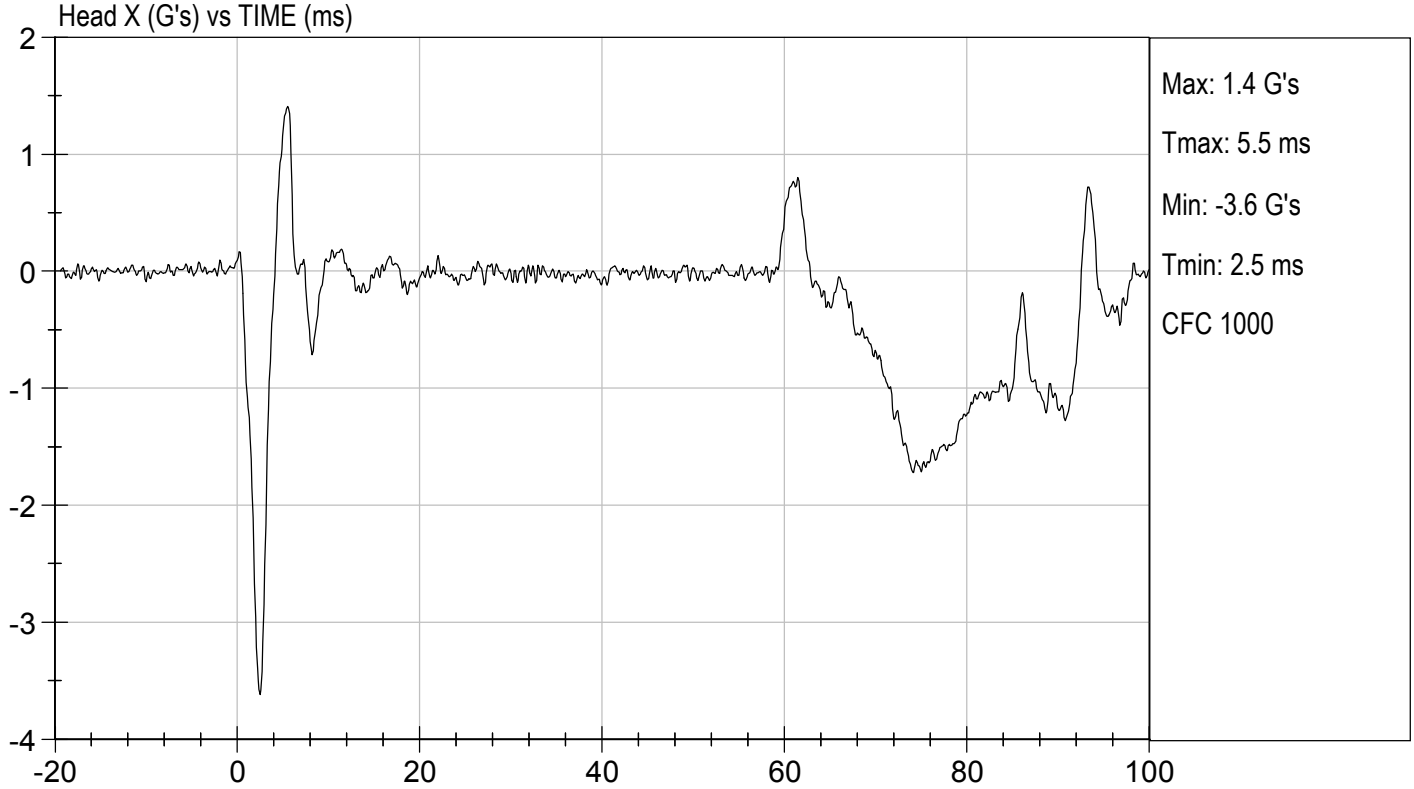
TEST DESC: HEAD DROP

TEST DATE: 03/16/2021
TEST #: D210871

HEAD RESULTANT ACCELERATION (G's) vs TIME (ms)

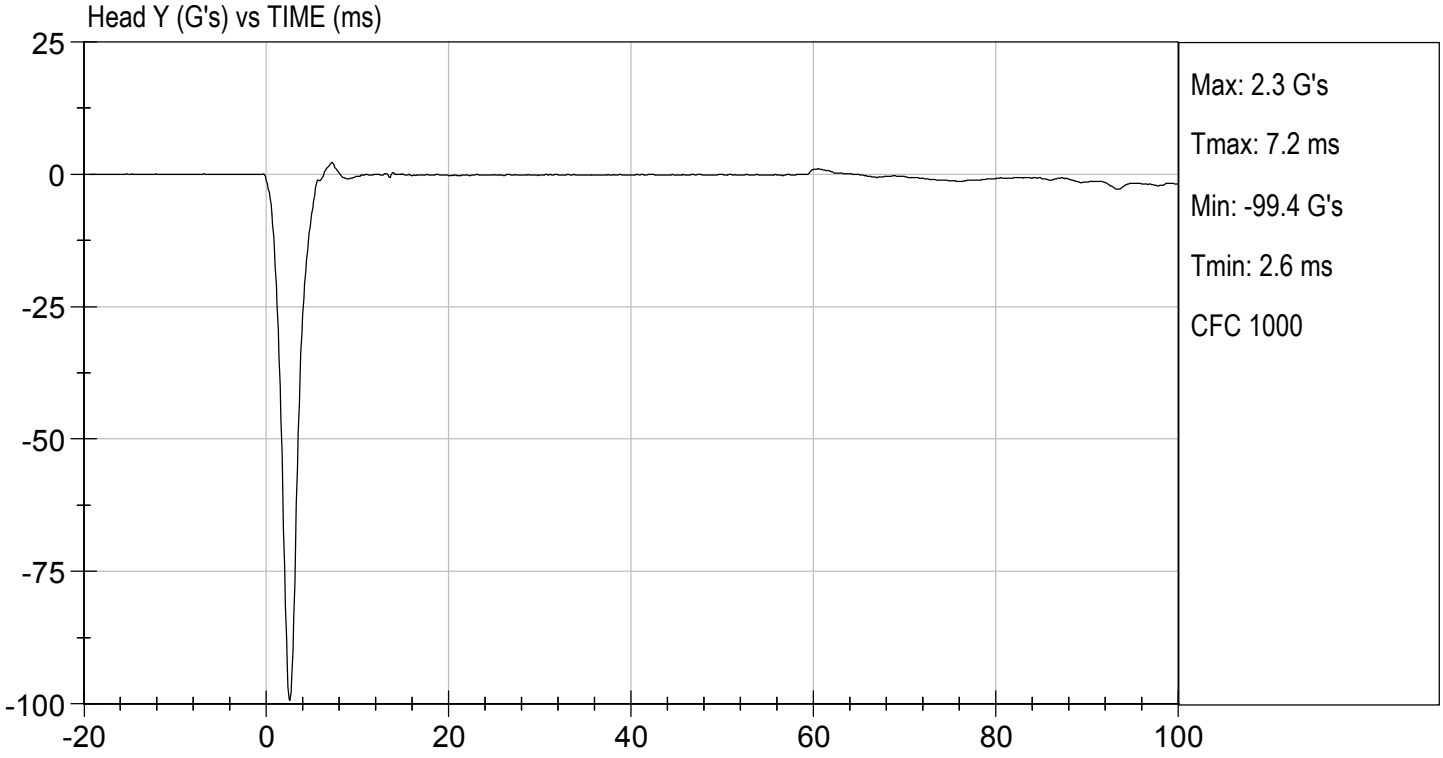


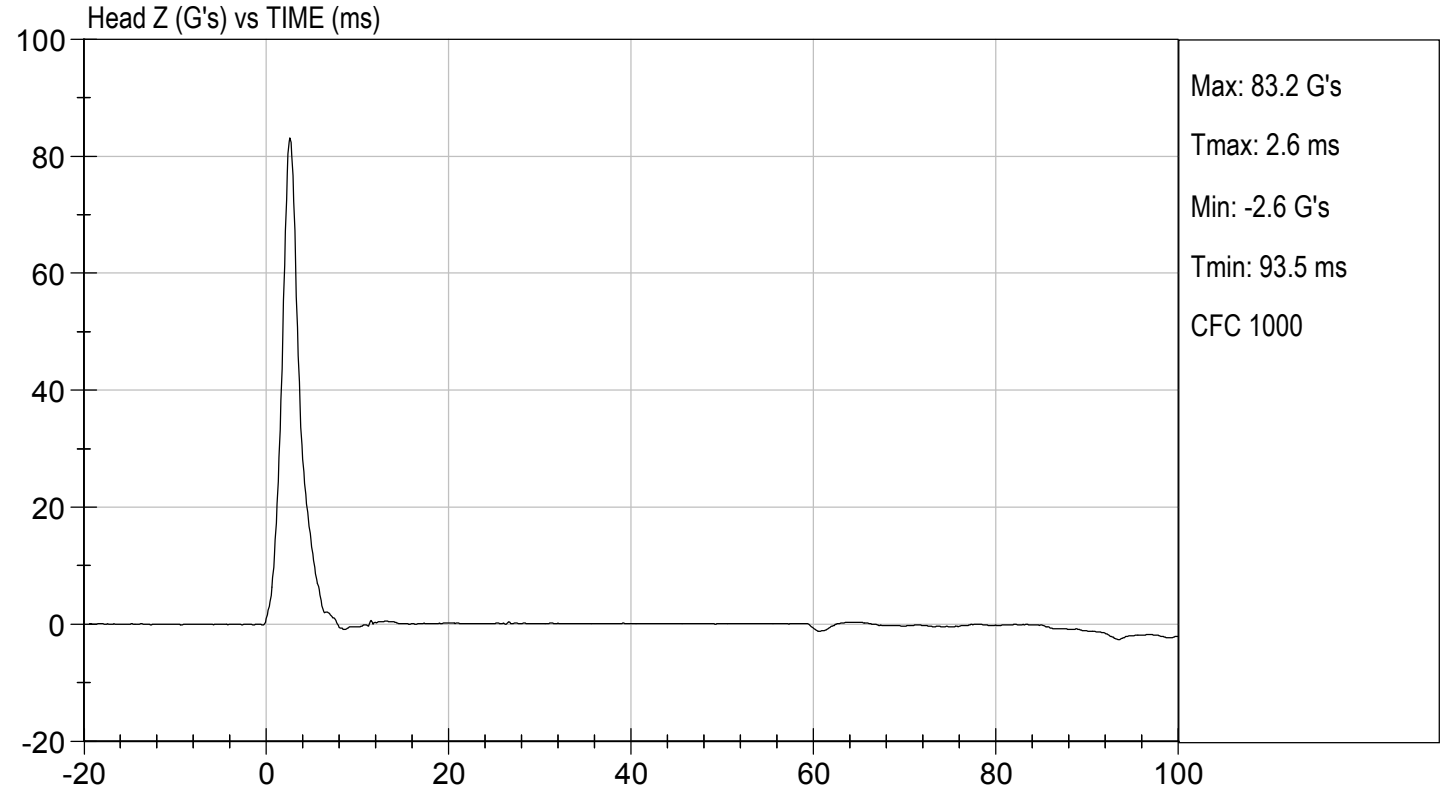

Head X (G's) vs TIME (ms)



TEST DESC: HEAD DROP

TEST DATE: 03/16/2021
TEST #: D210871



**MGA RESEARCH CORPORATION**

**LATERAL NECK PENDULUM TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210872

| Tested Parameter | | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|---|
| Temperature | | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Humidity | | % | 10 to 70 | 23 | Pass |
| Impact Velocity | | m/s | 5.51 to 5.63 | 5.58 | Pass |
| Pendulum Velocity | 10 ms | m/s | 2.20 to 2.80 | 2.72 | Pass |
| | 15 ms | m/s | 3.30 to 4.10 | 3.87 | Pass |
| | 20 ms | m/s | 4.40 to 5.40 | 5.31 | Pass |
| | 25 ms | m/s | 5.40 to 6.10 | 5.67 | Pass |
| | 25-100 ms | m/s | 5.50 to 6.20 | 5.69 | Pass |
| Maximum D-Plane Rotation | | deg | 71 to 81 | 72 | Pass |
| Time of Maximum D-Plane Rotation | | ms | 50 to 70 | 63 | Pass |
| Maximum Occipital Condyle Moment | | Nm | -44 to -36 | -38 | Pass |
| Time of Moment Decay to 0 Nm | | ms | 102 to 126 | 120 | Pass |
| | | | Overall Test Results | | Pass |

Gerald Guerrero

Laboratory Technician

03/16/2021

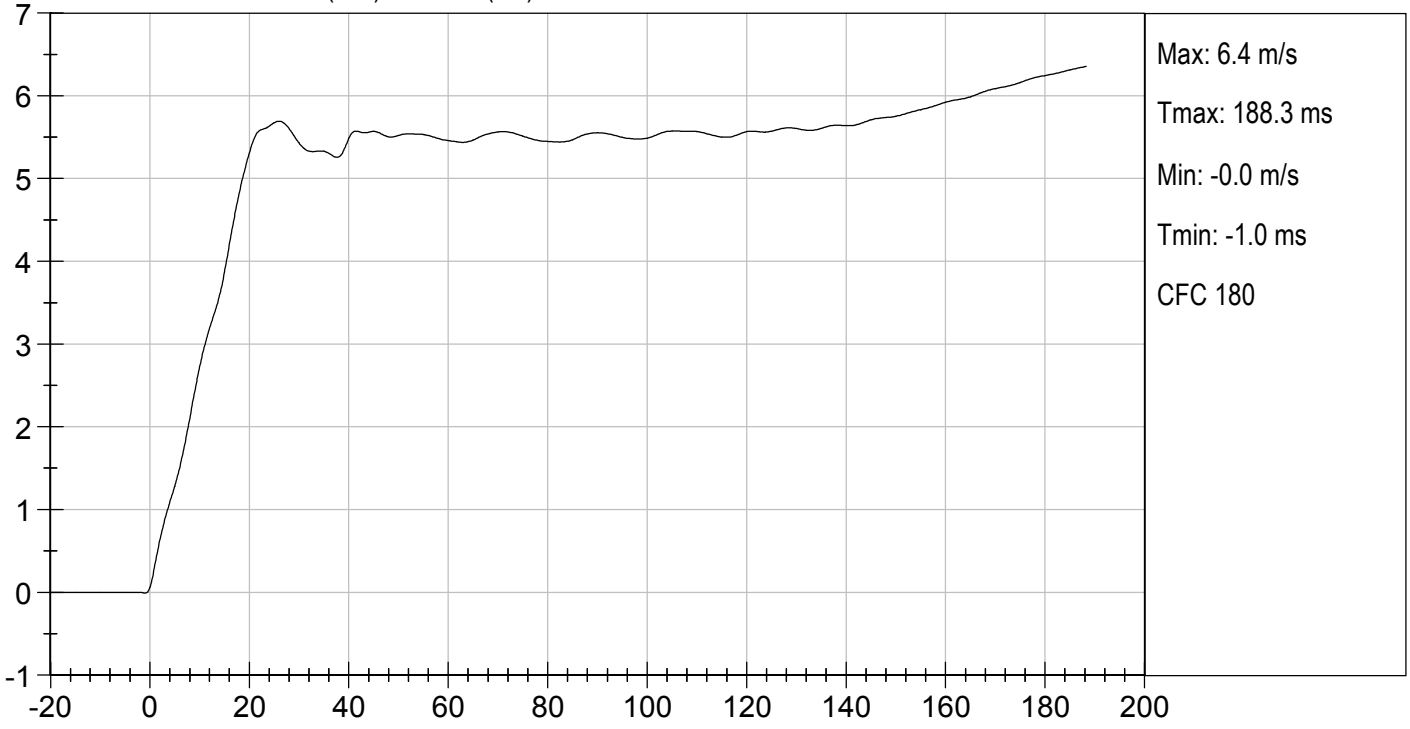
Test Date

Approved By

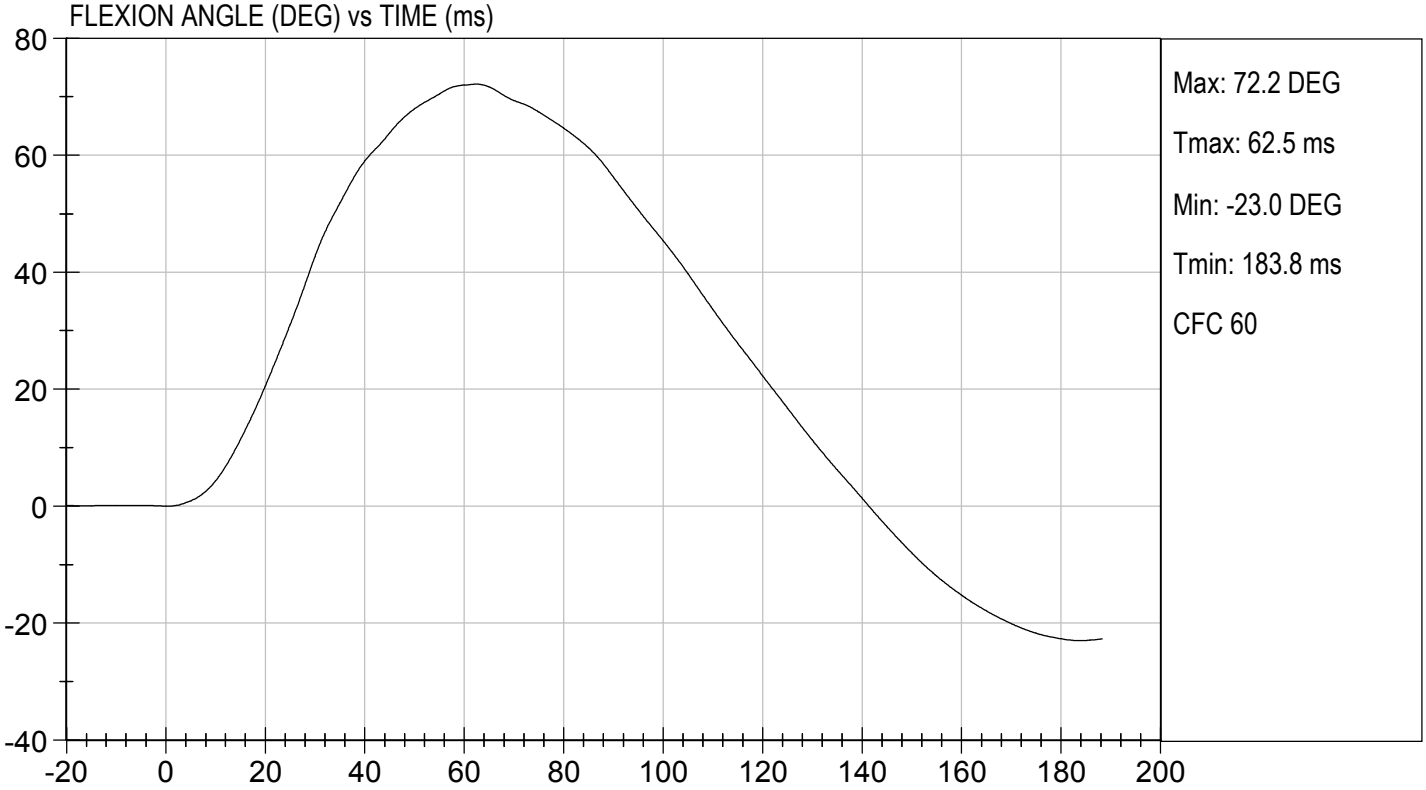
TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 03/16/2021
TEST #: D210872

PENDULUM VELOCITY (m/s) vs TIME (ms)

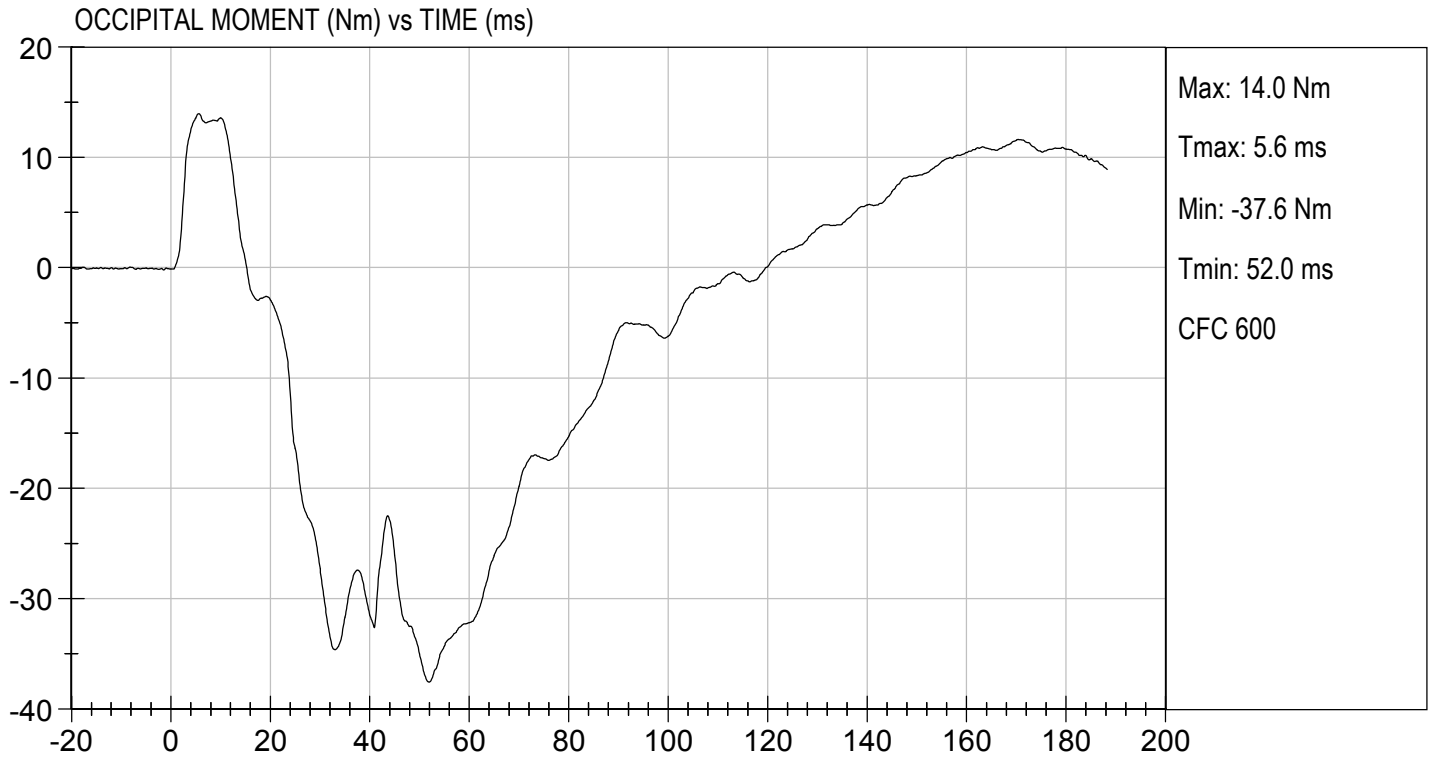



FLEXION ANGLE (DEG) vs TIME (ms)



TEST DESC: NECK BENDING
VELOCITY: 18.32 ft/s, 5.58 m/s

TEST DATE: 03/16/2021
TEST #: D210872



**MGA RESEARCH CORPORATION**

**SHOULDER IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test ID:** D210873

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Laboratory Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Laboratory Relative Humidity | % | 10 to 70 | 20 | Pass |
| Impact Velocity | m/s | 4.20 to 4.40 | 4.30 | Pass |
| Maximum Probe Acceleration | G's | 13 to 18 | 15 | Pass |
| Shoulder Displacement | mm | 28 to 37 | 32 | Pass |
| Upper Spine (T1) Y Acceleration | G's | 17 to 22 | 18 | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero
Laboratory Technician

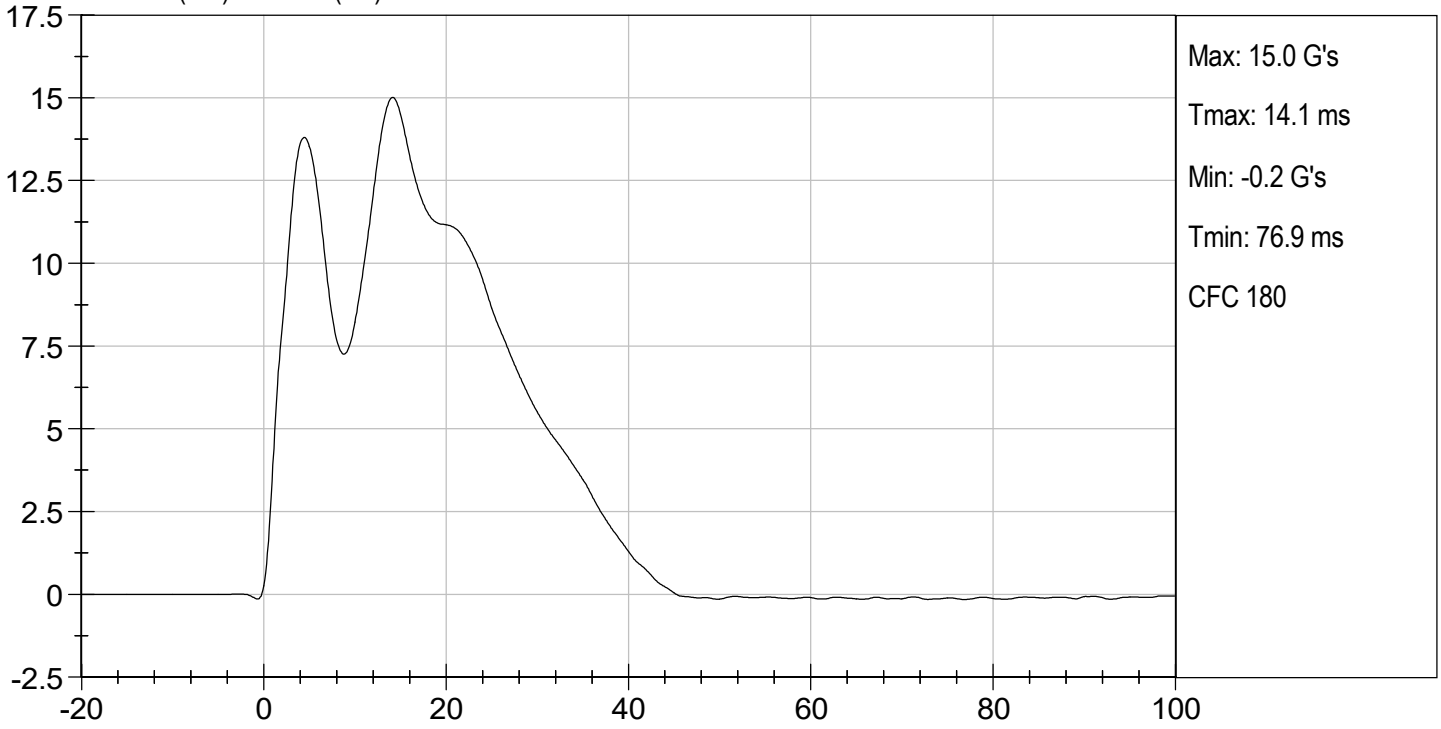
03/15/2021
Test Date

Approved By

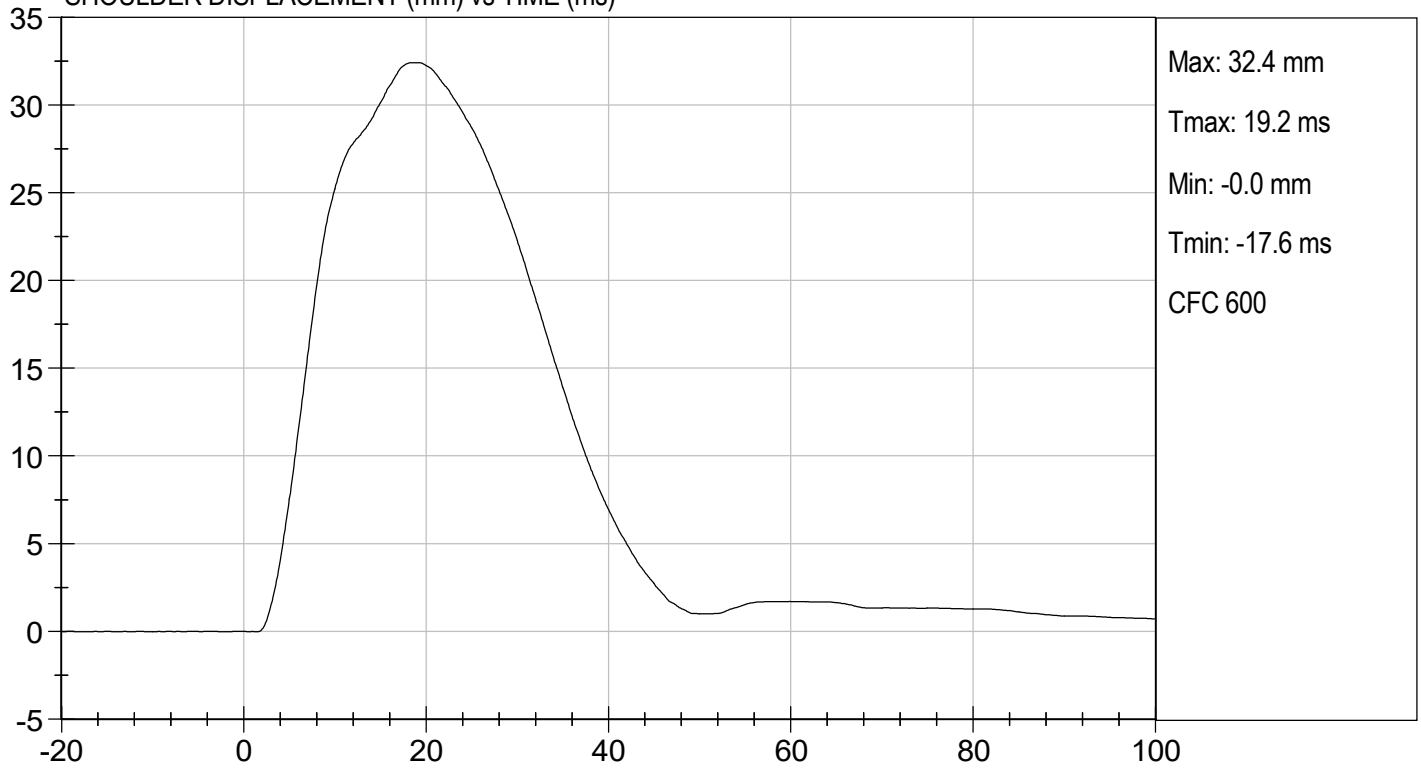
TEST DESC: SHOULDER IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 03/15/2021
TEST #: D210873

PROBE (G's) vs TIME (ms)

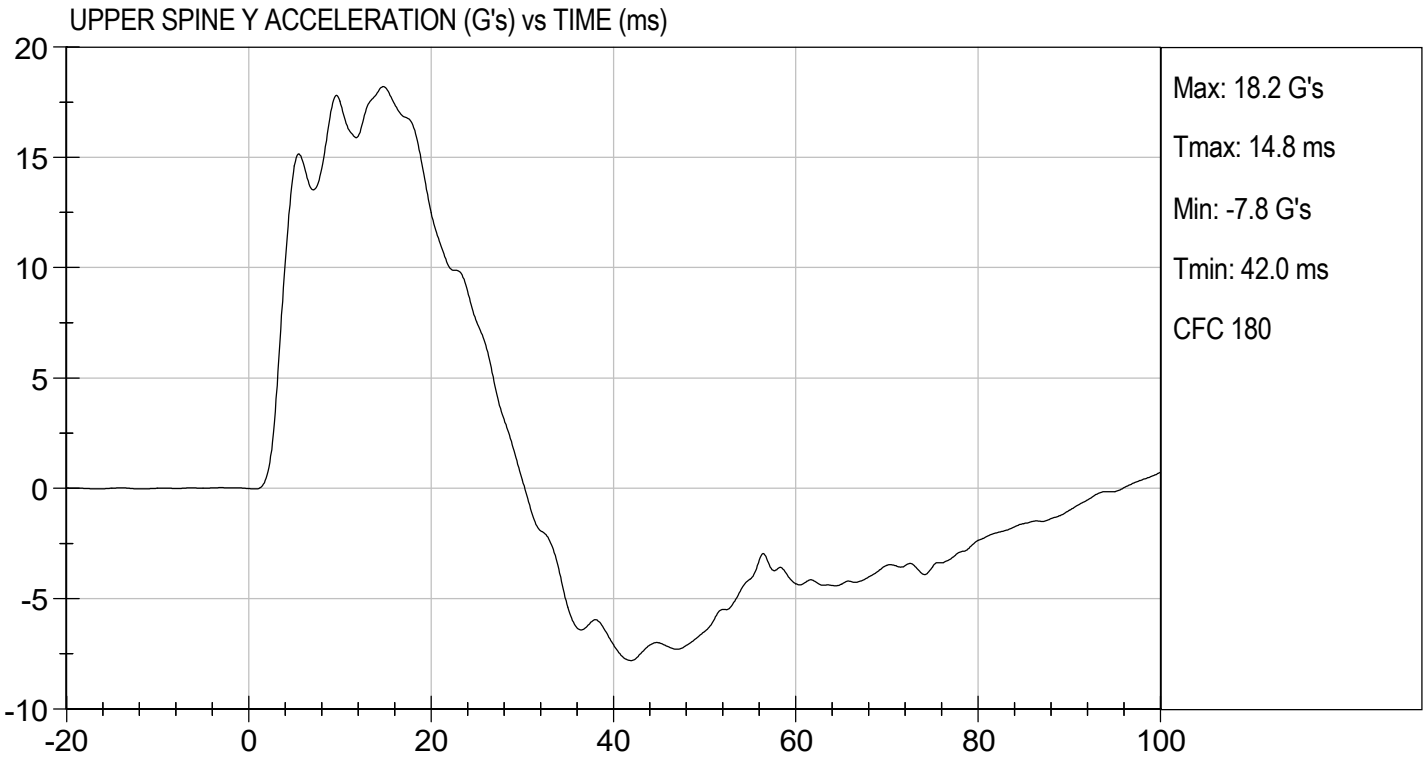



SHOULDER DISPLACEMENT (mm) vs TIME (ms)



TEST DESC: SHOULDER IMPACT
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 03/15/2021
TEST #: D210873



**MGA RESEARCH CORPORATION**

**THORAX (WITH ARM) IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210874

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Humidity | % | 10 to 70 | 20 | Pass |
| Impact Velocity | m/s | 6.60 to 6.80 | 6.77 | Pass |
| Maximum Probe Acceleration | G's | 30 to 36 | 33 | Pass |
| Shoulder Displacement | mm | 31 to 40 | 37 | Pass |
| Upper Rib Displacement | mm | 25 to 32 | 29 | Pass |
| Middle Rib Displacement | mm | 30 to 36 | 32 | Pass |
| Lower Rib Displacement | mm | 32 to 38 | 34 | Pass |
| Upper Spine (T1) Y Acceleration | G's | 34 to 43 | 37 | Pass |
| Lower Spine (T12) Y Acceleration | G's | 29 to 37 | 33 | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero
Laboratory Technician

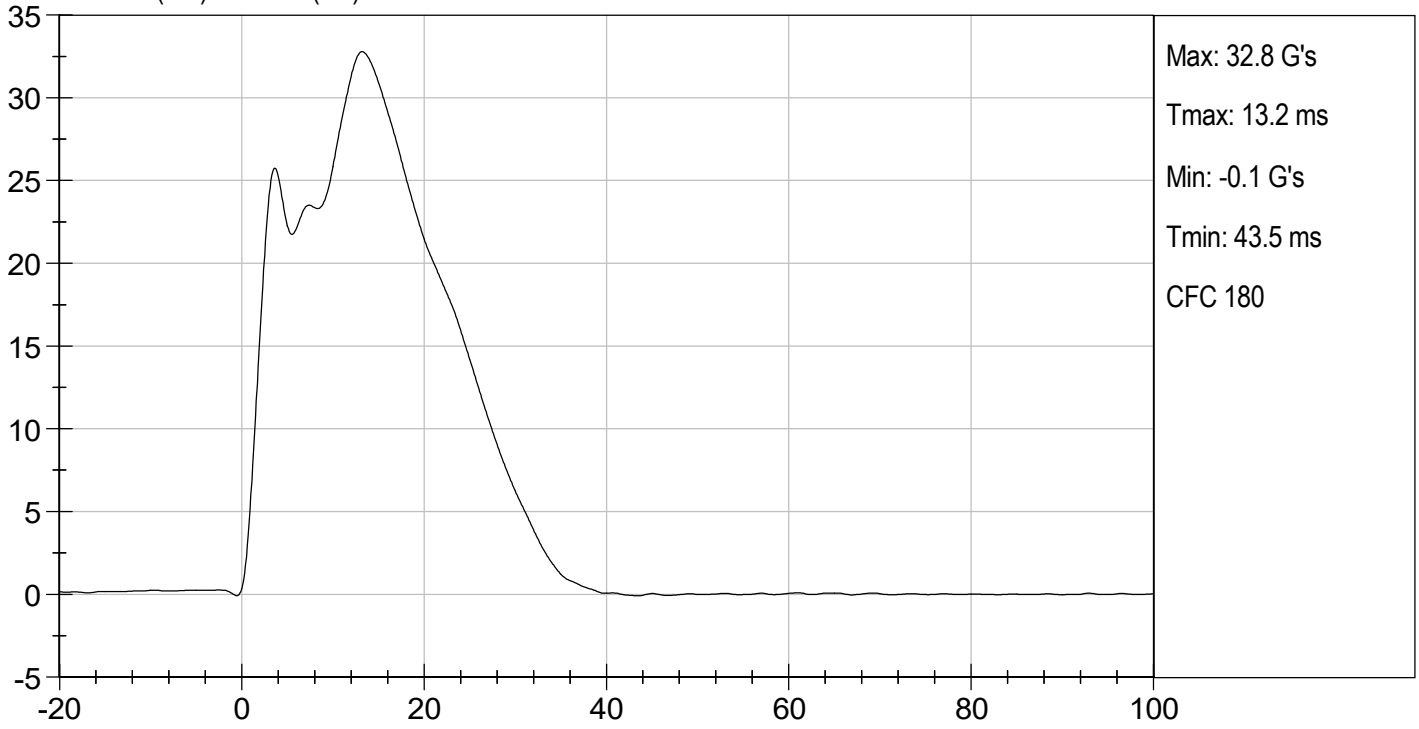
03/15/2021
Test Date

Approved By

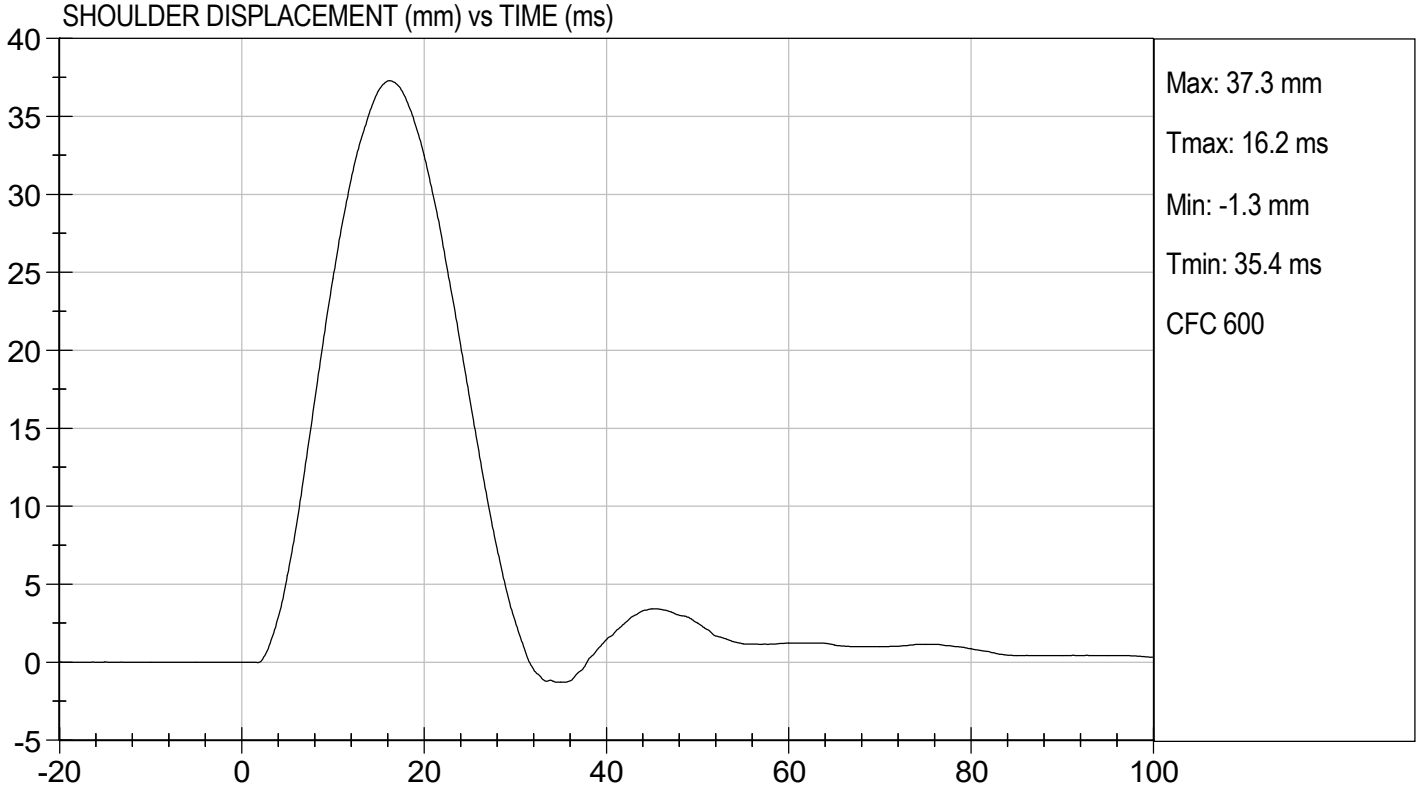
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 03/15/2021
TEST #: D210874

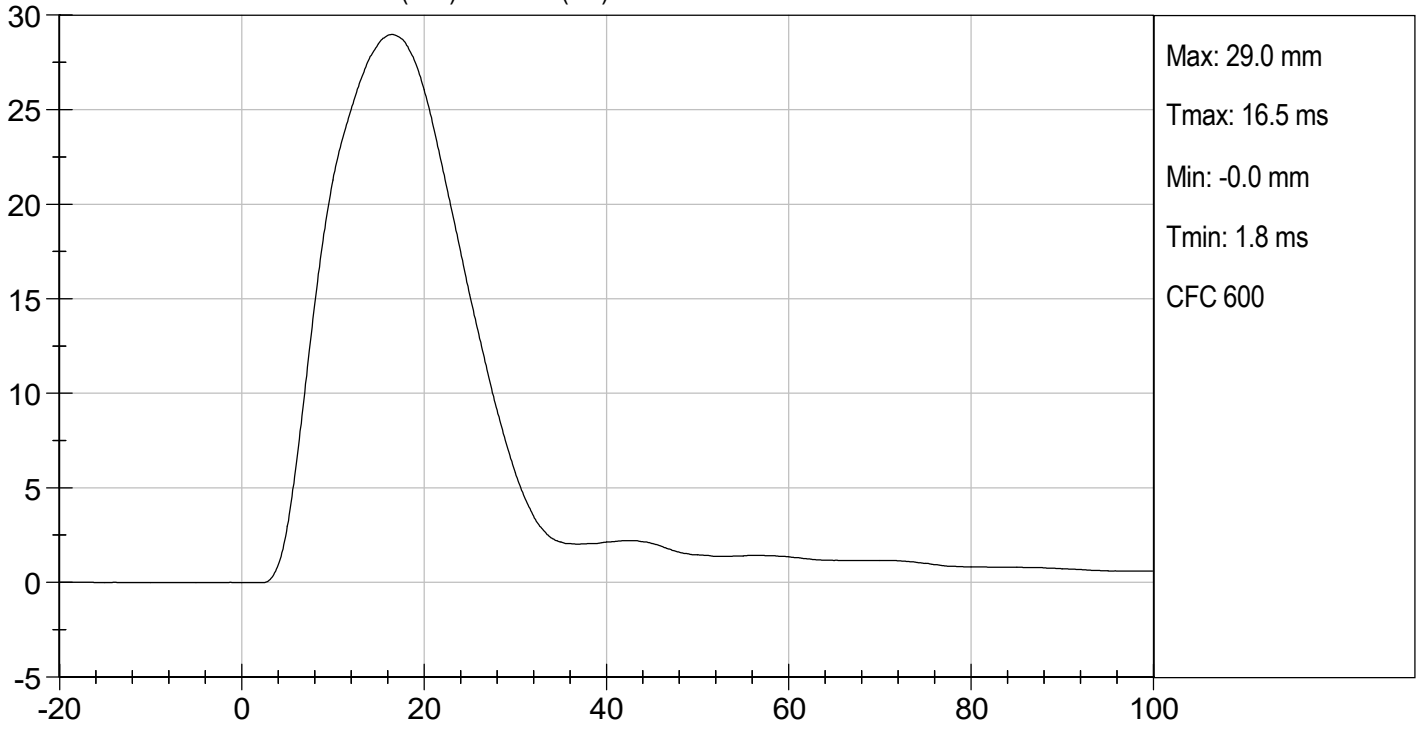
PROBE (G's) vs TIME (ms)



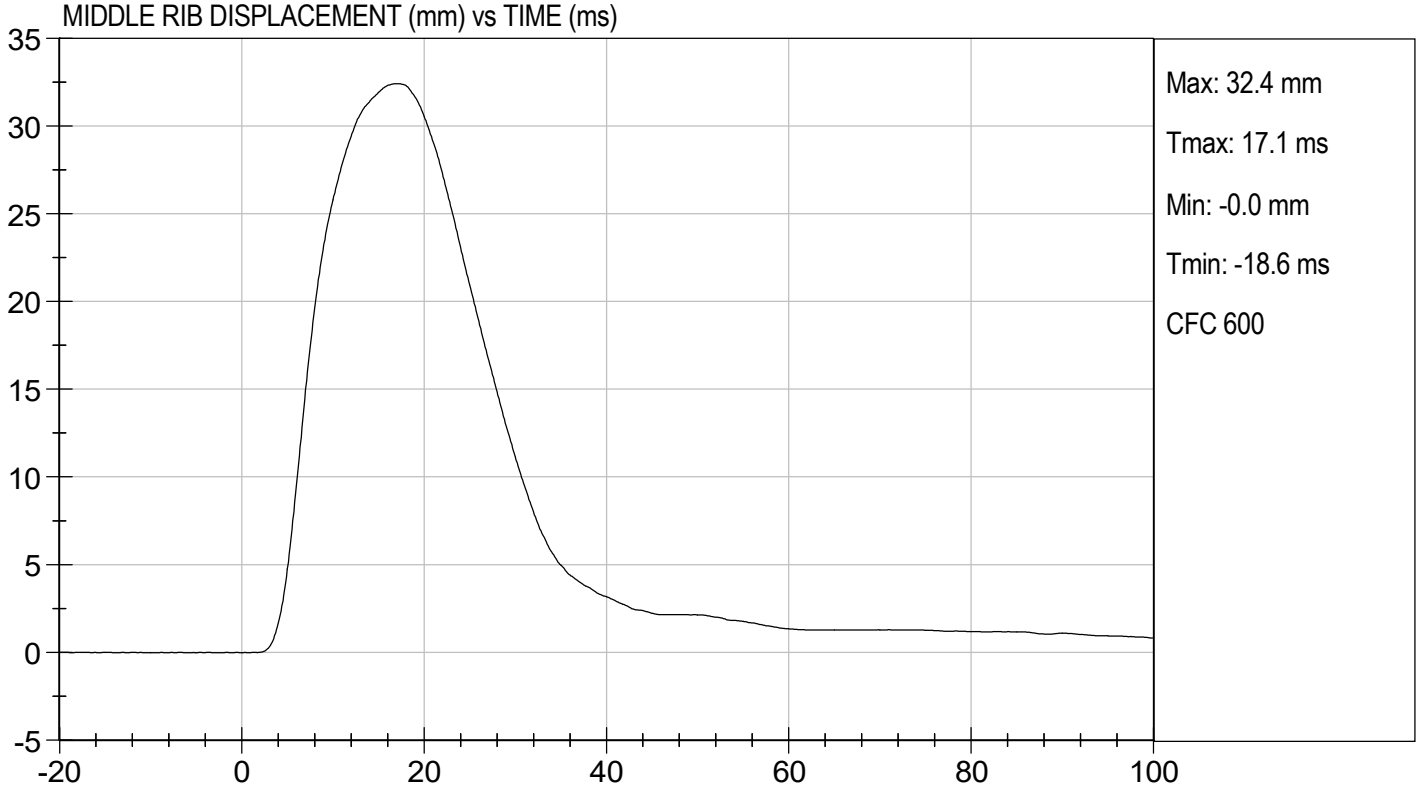

SHOULDER DISPLACEMENT (mm) vs TIME (ms)



UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



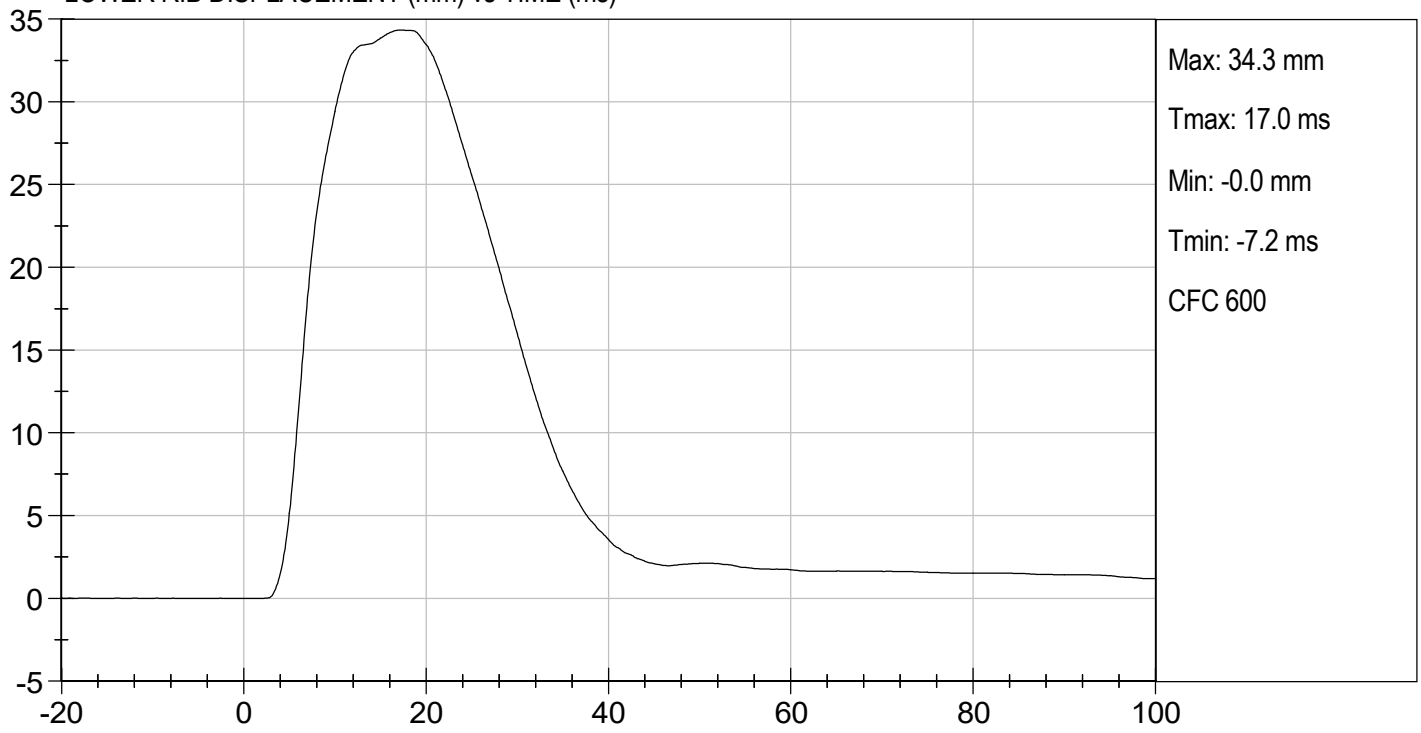

MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



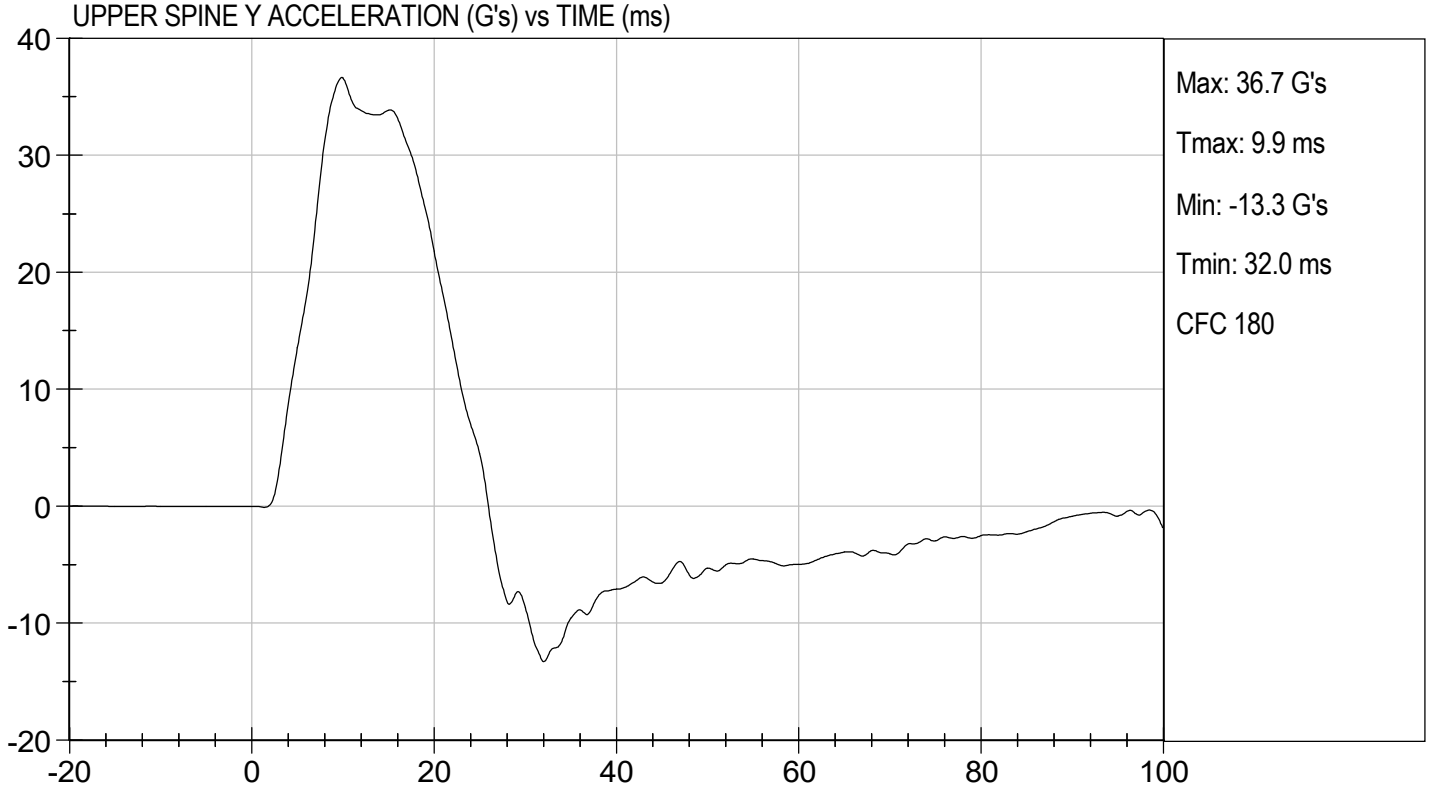
TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 03/15/2021
TEST #: D210874

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

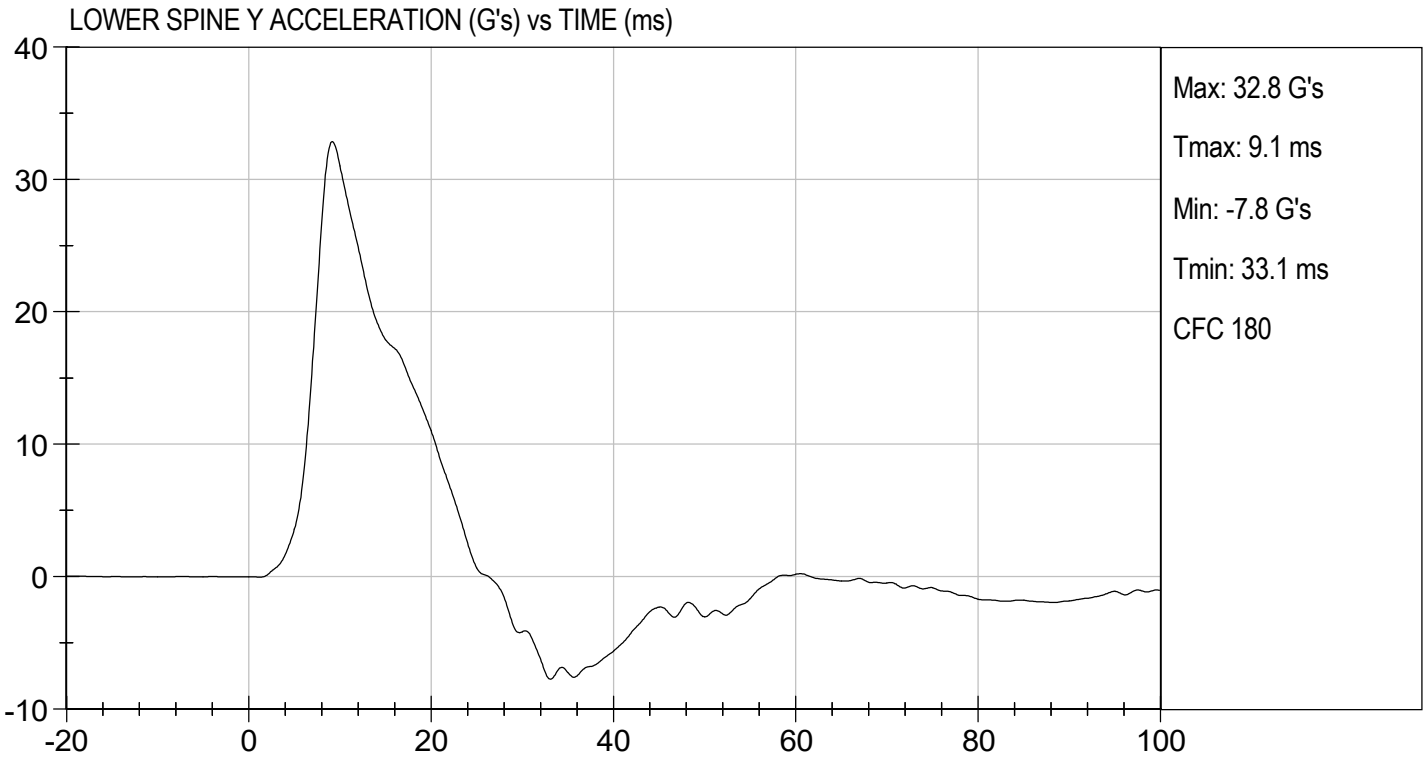



UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: THORAX IMPACT WITH ARM
VELOCITY: 22.22 ft/s, 6.77 m/s

TEST DATE: 03/15/2021
TEST #: D210874



**MGA RESEARCH CORPORATION**

**THORAX (WITHOUT ARM) IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210875

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Humidity | % | 10 to 70 | 20 | Pass |
| Impact Velocity | m/s | 4.20 to 4.40 | 4.30 | Pass |
| Maximum Probe Acceleration | G's | 14 to 18 | 15 | Pass |
| Upper Rib Displacement | mm | 32 to 40 | 38 | Pass |
| Middle Rib Displacement | mm | 39 to 45 | 42 | Pass |
| Lower Rib Displacement | mm | 35 to 43 | 40 | Pass |
| Upper Spine (T1) Y Acceleration | G's | 13 to 17 | 14 | Pass |
| Lower Spine (T12) Y Acceleration | G's | 7 to 11 | 9 | Pass |
| | | Overall Test Results | | Pass |

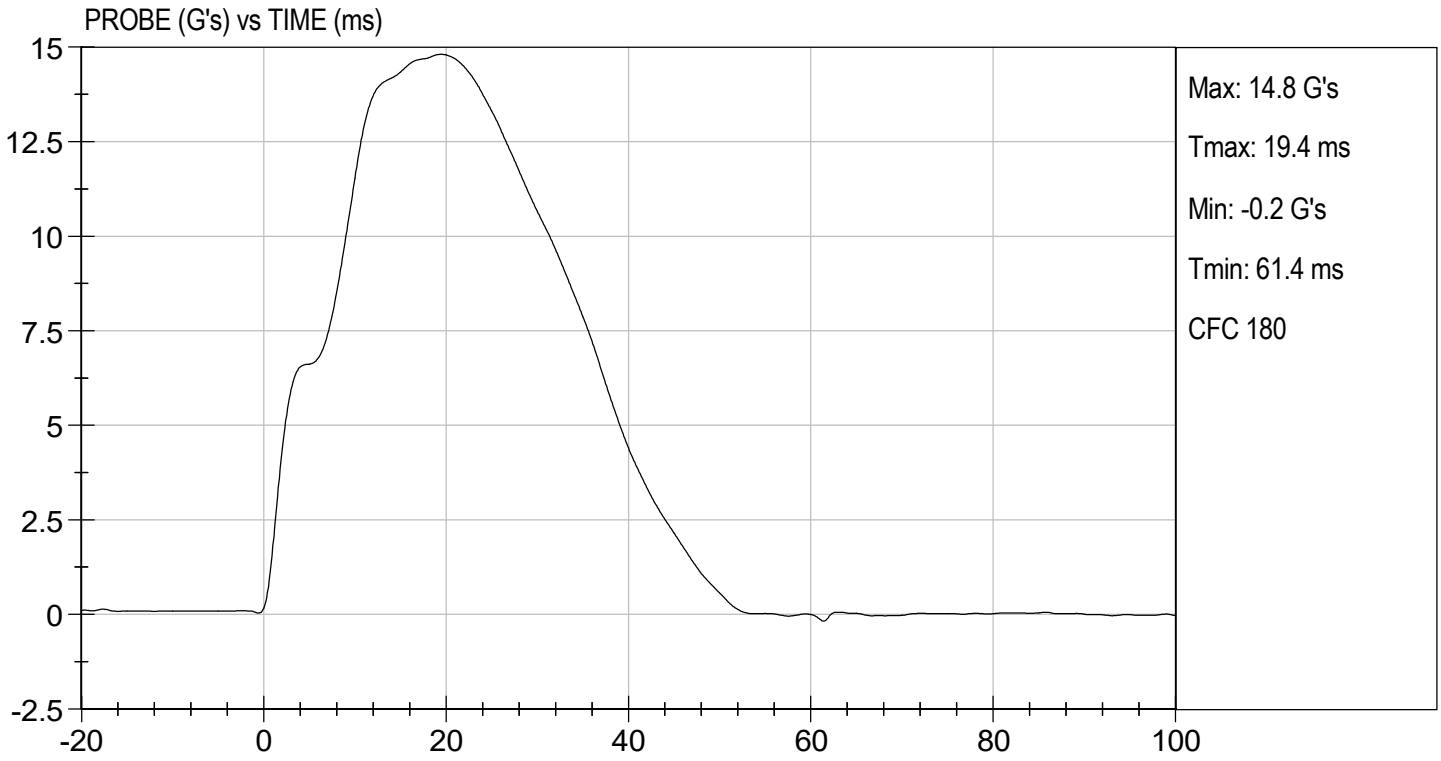
Gerald Guerrero
Laboratory Technician

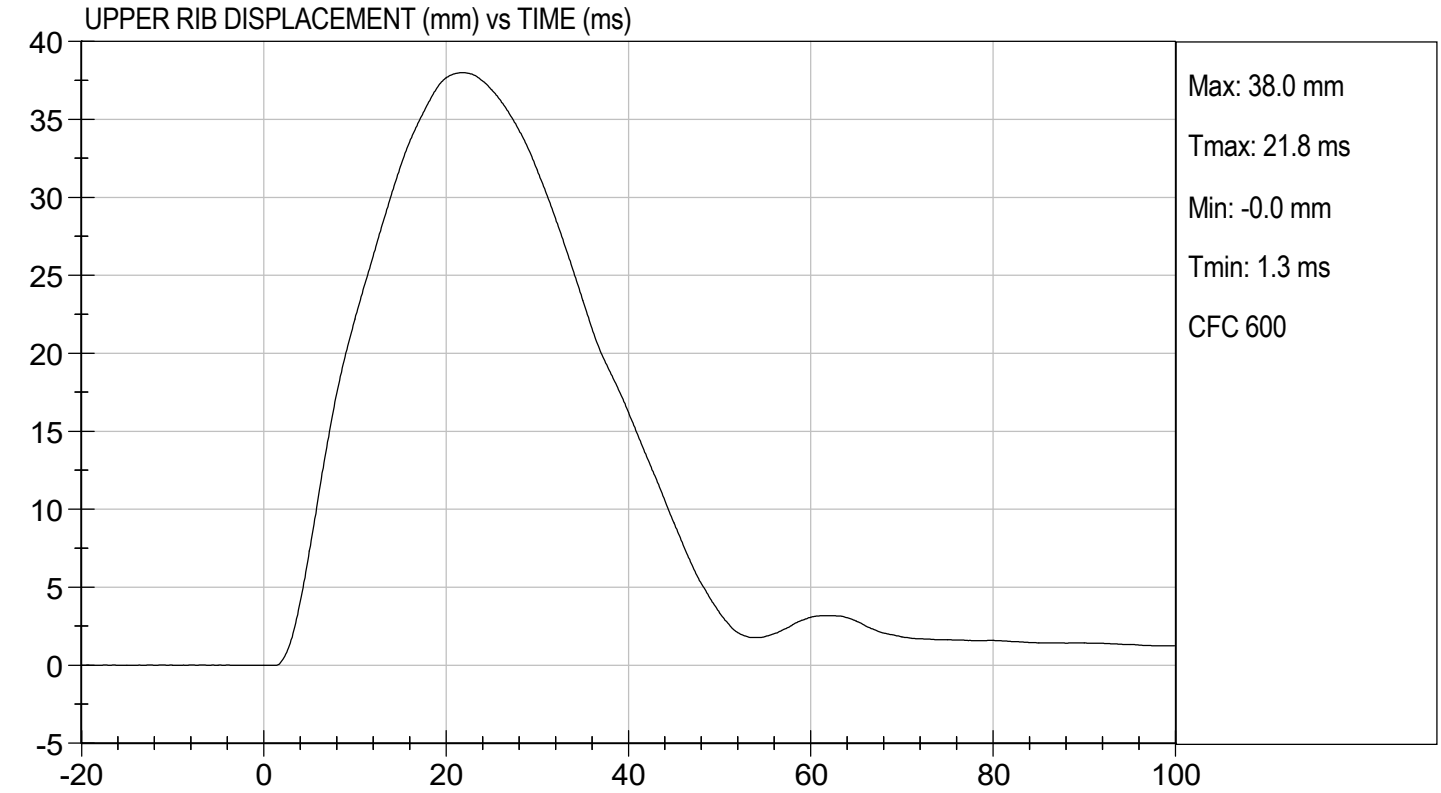
03/15/2021
Test Date

Approved By

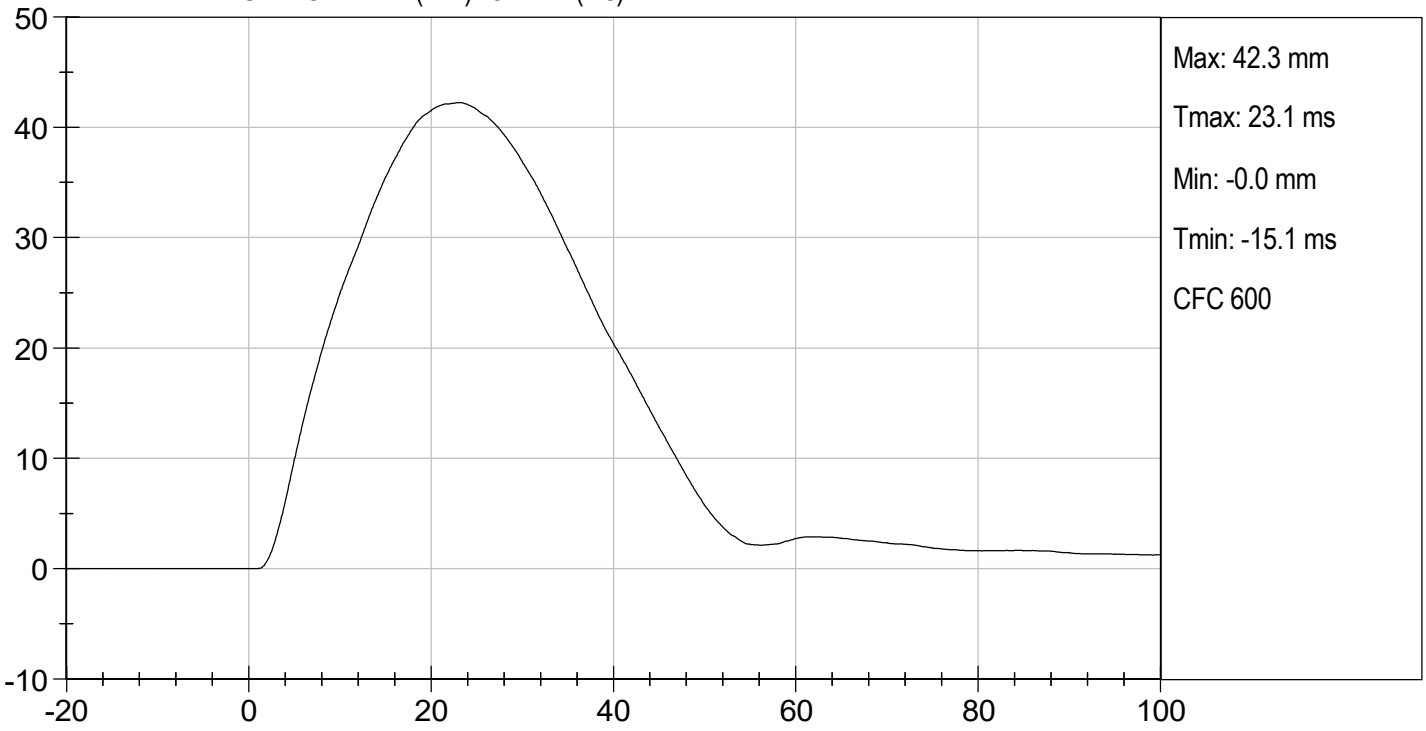
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 03/15/2021
TEST #: D210875

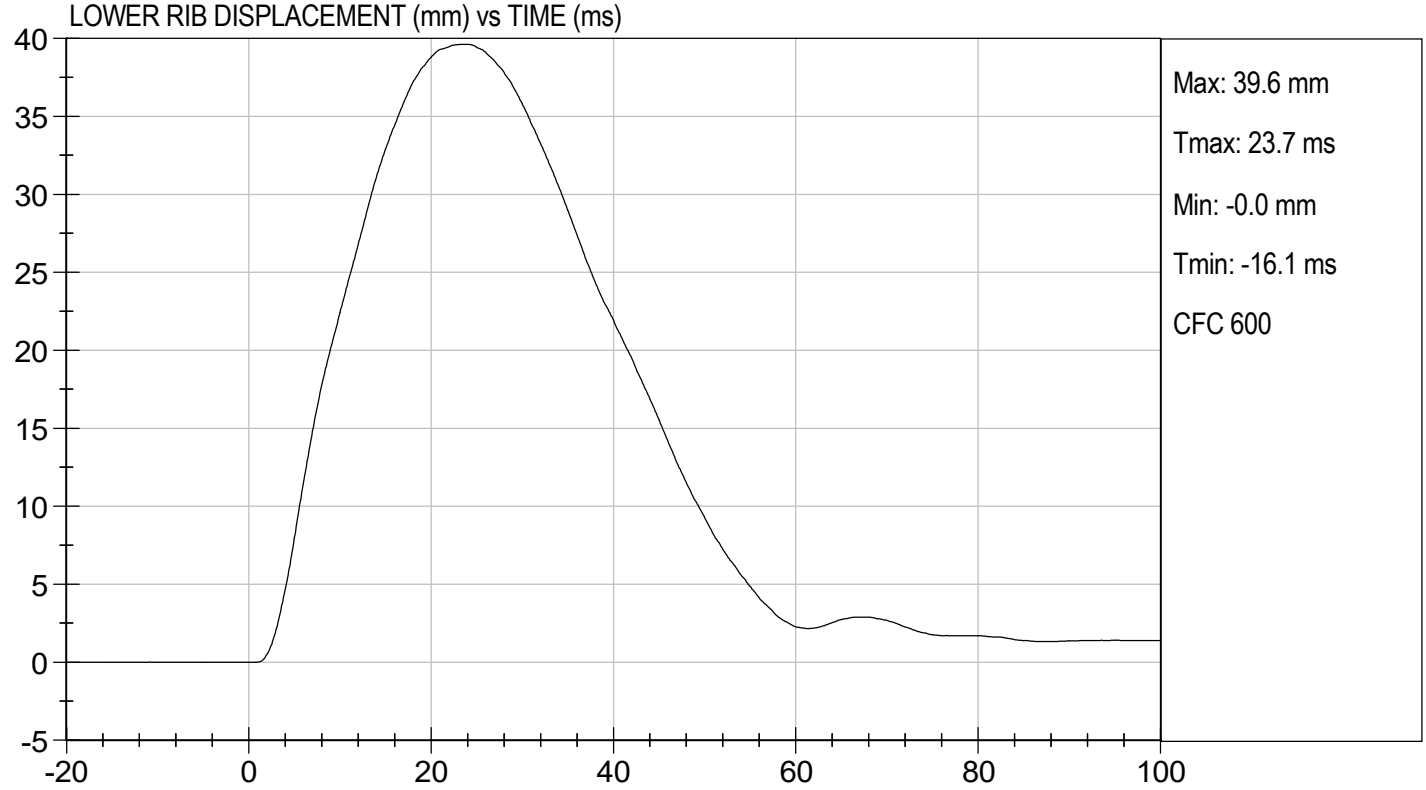


MIDDLE RIB DISPLACEMENT (mm) vs TIME (ms)



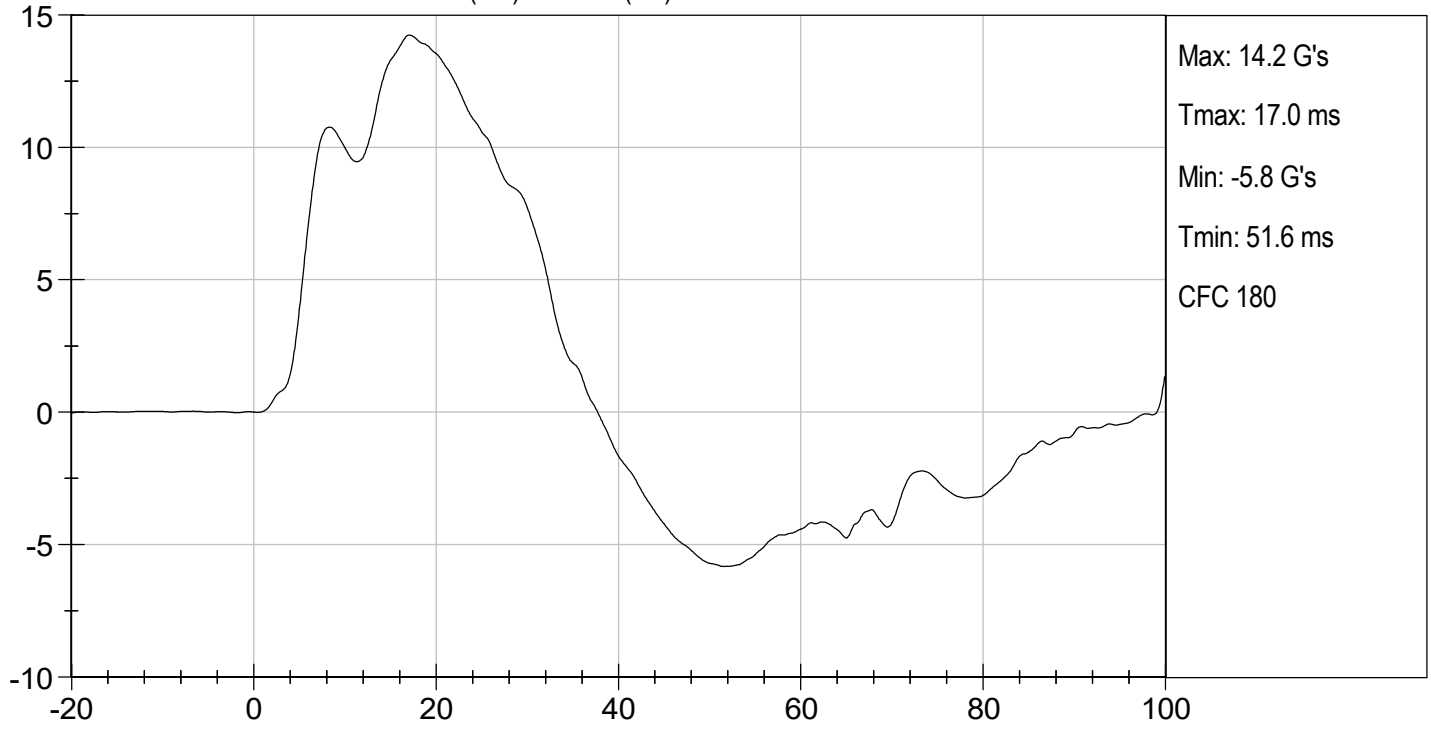

LOWER RIB DISPLACEMENT (mm) vs TIME (ms)



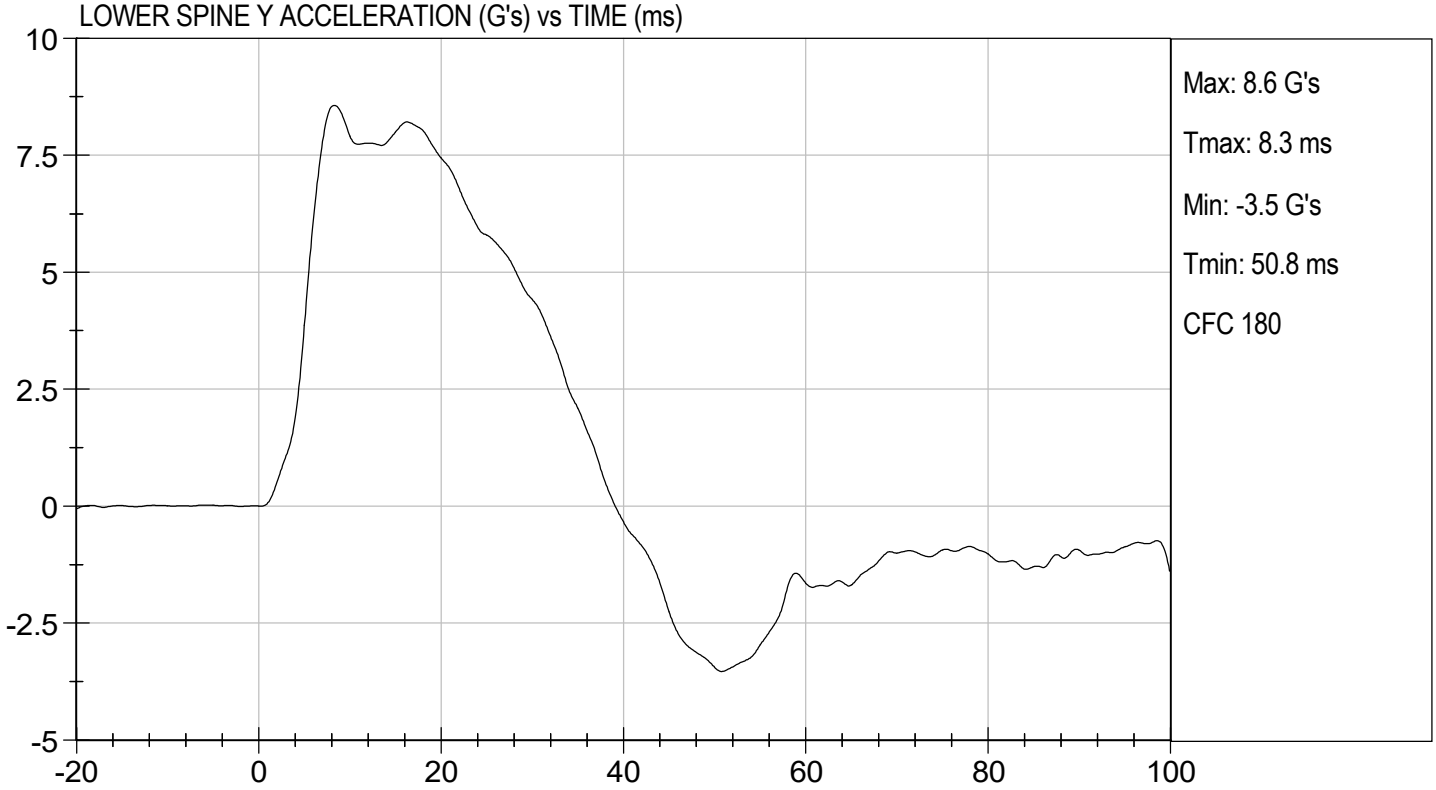
TEST DESC: THORAX IMPACT WITHOUT ARM
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 03/15/2021
TEST #: D210875

UPPER SPINE Y ACCELERATION (G's) vs TIME (ms)




LOWER SPINE Y ACCELERATION (G's) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**ABDOMINAL IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210876

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Humidity | % | 10 to 70 | 20 | Pass |
| Impact Velocity | m/s | 4.20 to 4.40 | 4.34 | Pass |
| Maximum Probe Acceleration | G's | 12 to 16 | 14 | Pass |
| Upper Abdomen Rib Displacement | mm | 36 to 47 | 39 | Pass |
| Lower Abdomen Rib Displacement | mm | 33 to 44 | 37 | Pass |
| Lower Spine (T12) Y Acceleration | G's | 9 to 14 | 11 | Pass |
| | | Overall Test Results | | Pass |

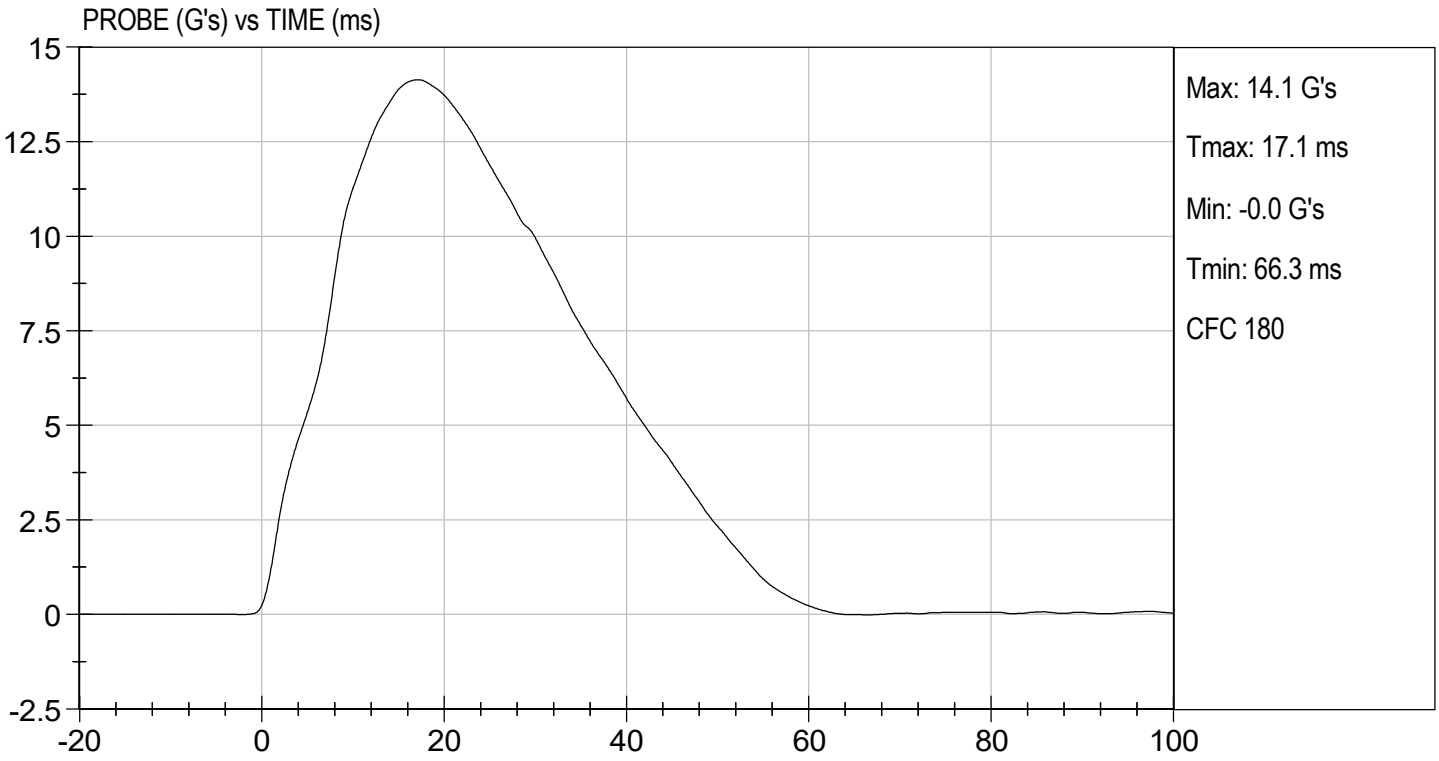
Gerald Guerrero
Laboratory Technician

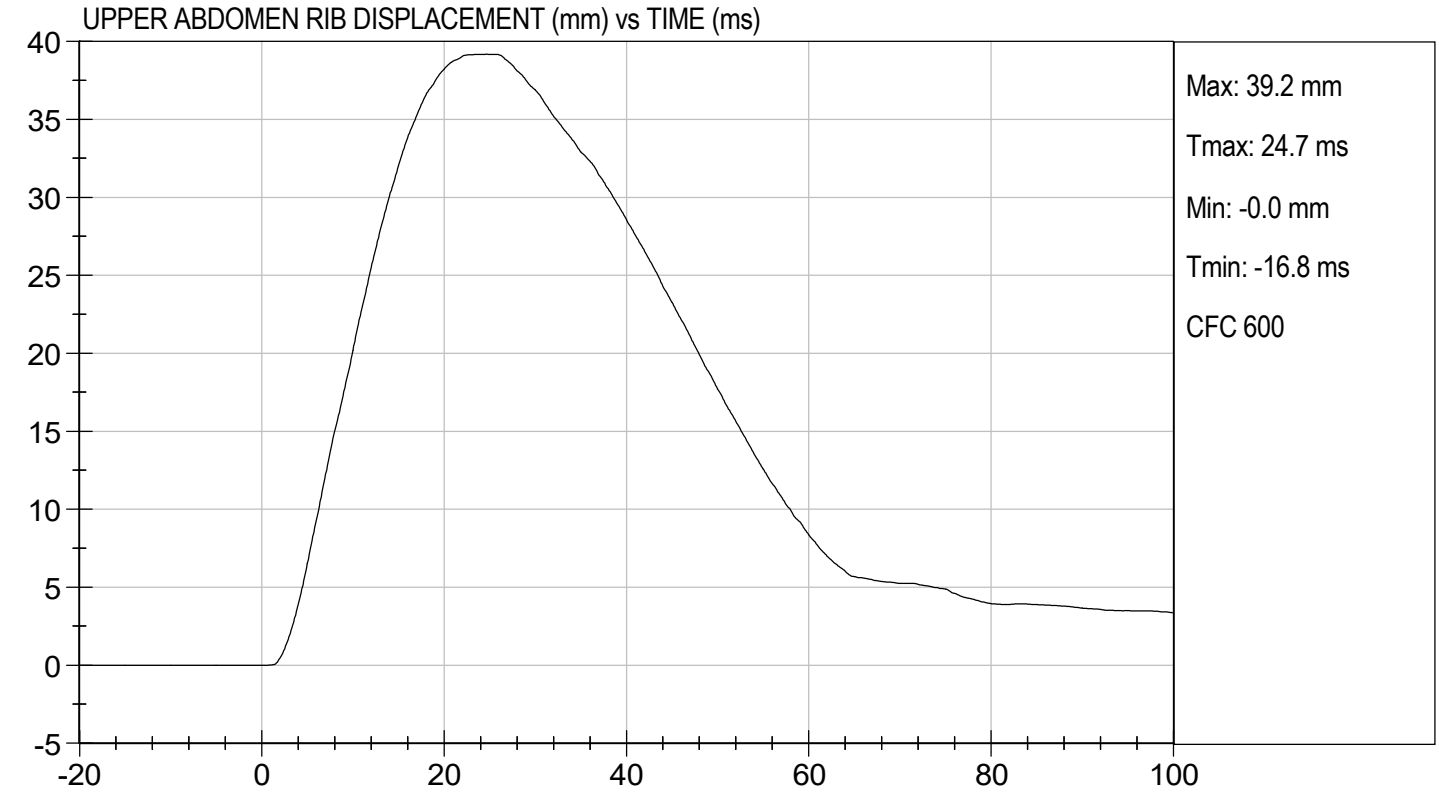
03/15/2021
Test Date

Approved By

TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 03/15/2021
TEST #: D210876

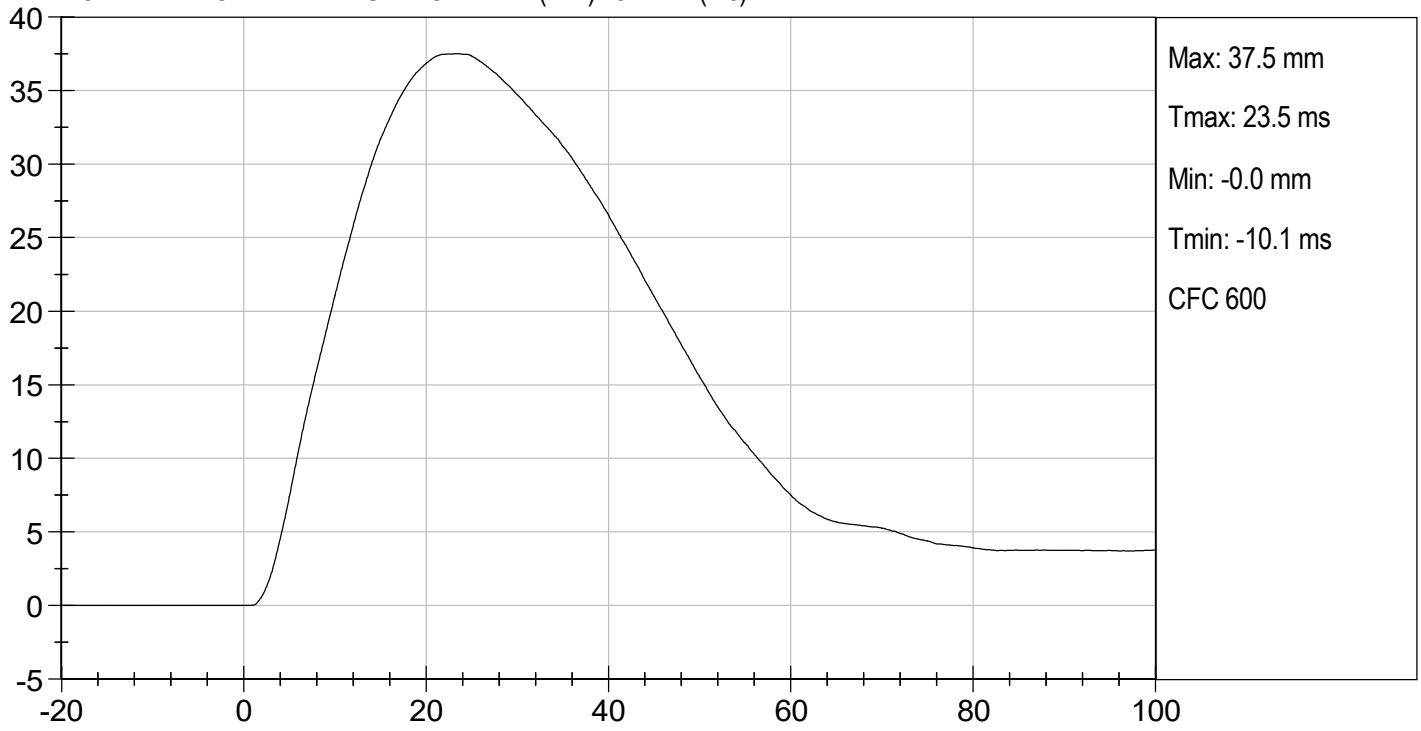


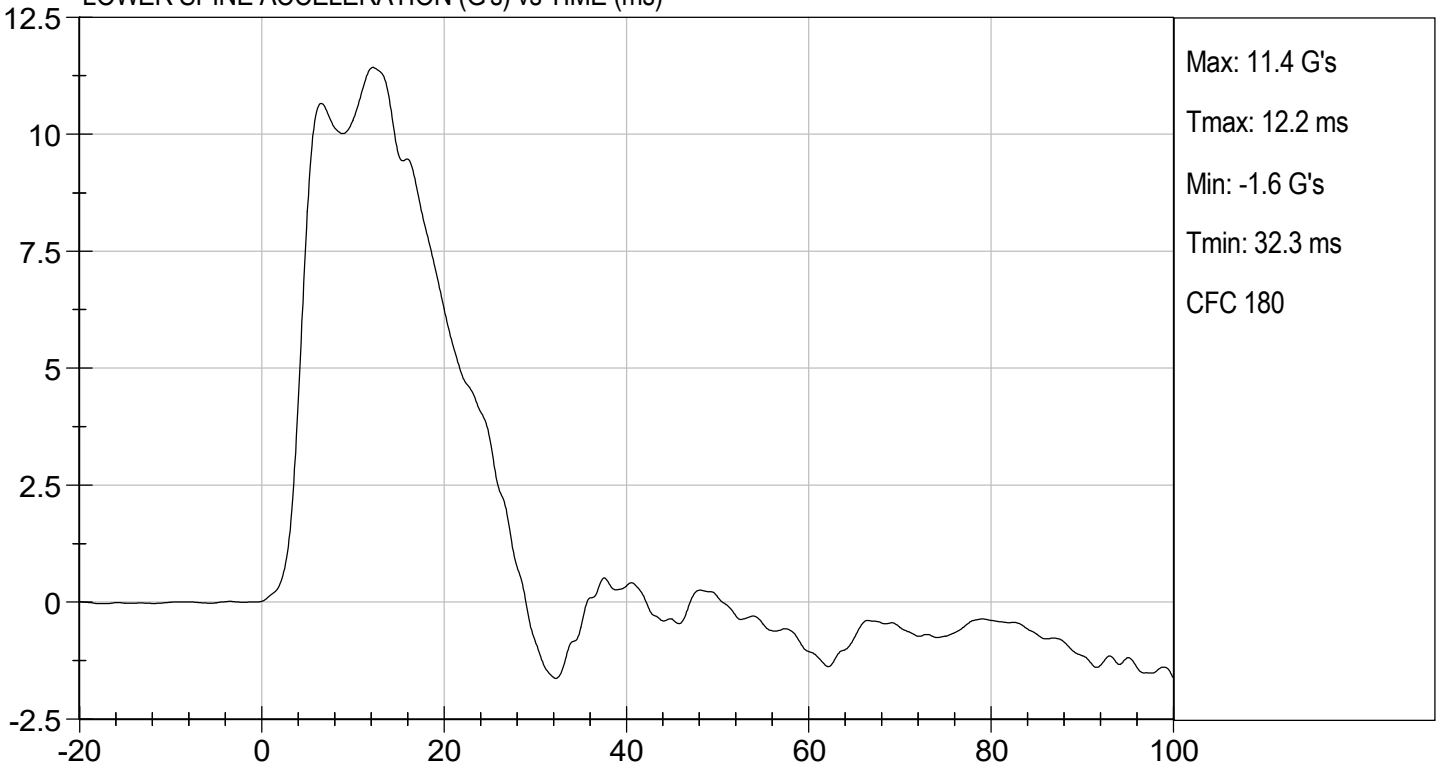
TEST DESC: ABDOMEN IMPACT
VELOCITY: 14.24 ft/s, 4.34 m/s

TEST DATE: 03/15/2021
TEST #: D210876

LOWER ABDOMEN RIB DISPLACEMENT (mm) vs TIME (ms)




LOWER SPINE ACCELERATION (G's) vs TIME (ms)



**MGA RESEARCH CORPORATION**

**PELVIS IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210877

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.7 | Pass |
| Humidity | % | 10 to 70 | 20 | Pass |
| Impact Velocity | m/s | 6.60 to 6.80 | 6.60 | Pass |
| Maximum Probe Acceleration | G's | 38 to 47 | 41 | Pass |
| Pelvis Y Acceleration After 6 ms | G's | 34 to 42 | 37 | Pass |
| Peak Acetabulum Force | N | 3600 to 4300 | 3,805 | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero
Laboratory Technician

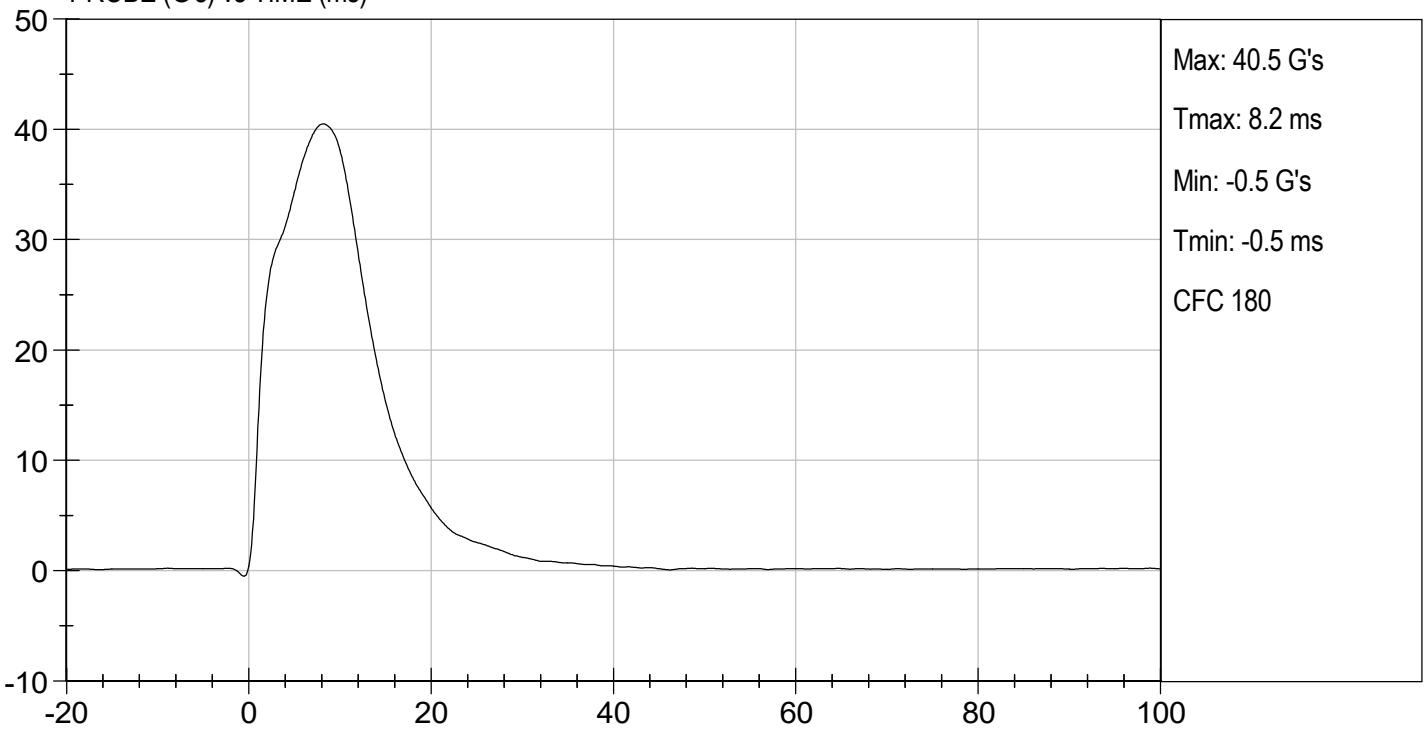
03/15/2021
Test Date

Approved By

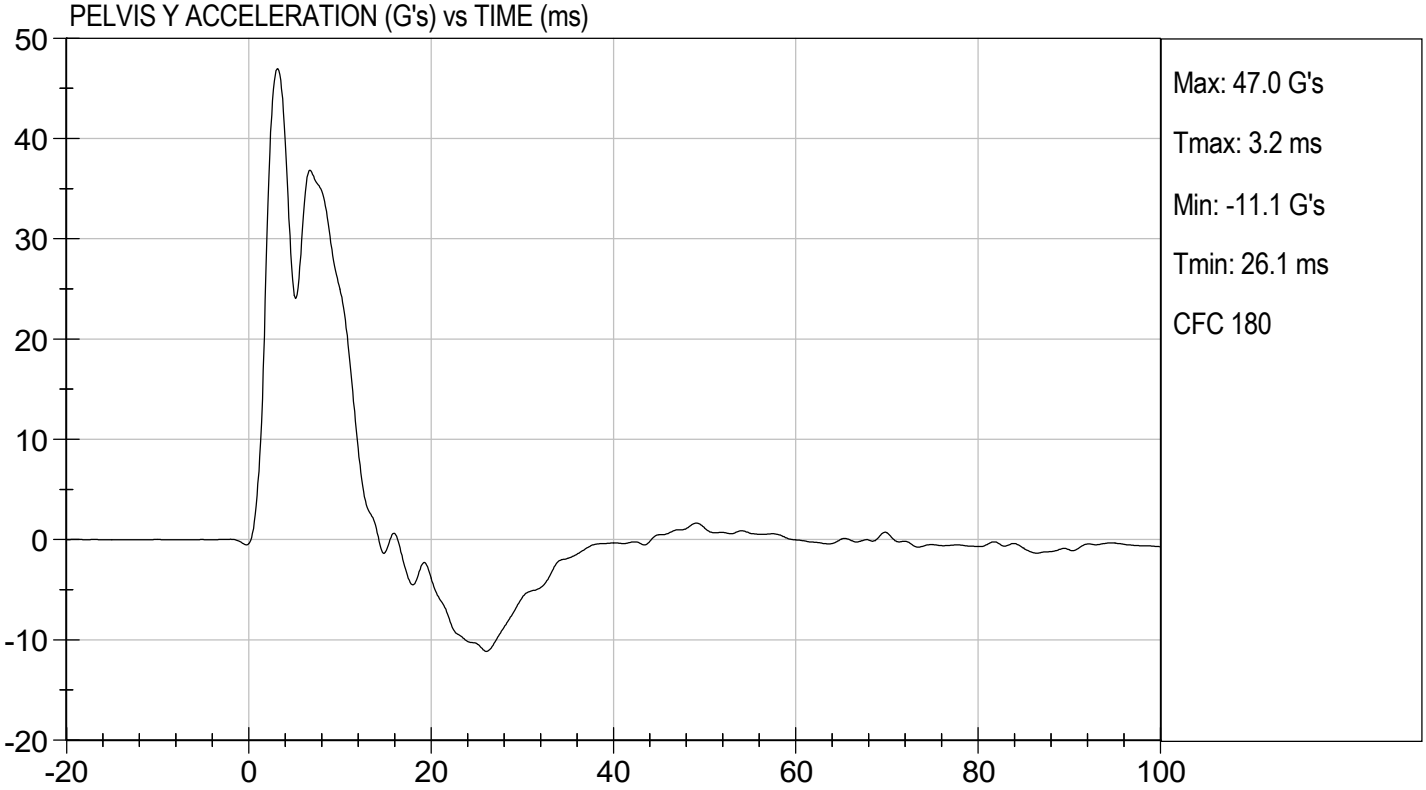
TEST DESC: PELVIS IMPACT
VELOCITY: 21.64 ft/s, 6.60 m/s

TEST DATE: 03/15/2021
TEST #: D210877

PROBE (G's) vs TIME (ms)

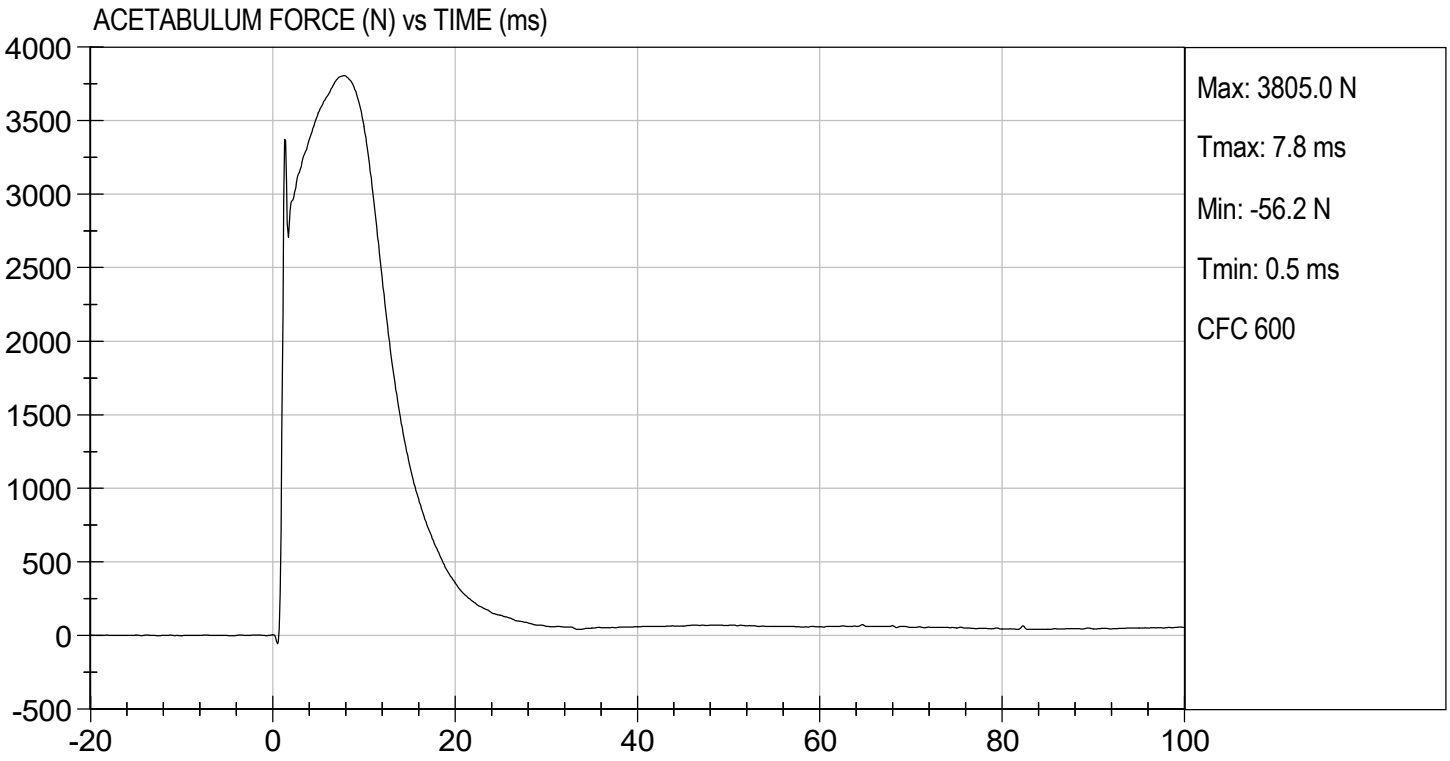



PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: PELVIS IMPACT
VELOCITY: 21.64 ft/s, 6.60 m/s

TEST DATE: 03/15/2021
TEST #: D210877



**MGA RESEARCH CORPORATION**

**ILIAC IMPACT TEST**

**SID-IIs BUILD LEVEL D DUMMY**

**ATD Serial No:** 296 **Test I.D:** D210878

| Tested Parameter | Units | Specification | Result | Pass/Fail |
|---|---|---|---|---|
| Temperature | deg C | 20.6 to 22.2 | 21.1 | Pass |
| Humidity | % | 10 to 70 | 20 | Pass |
| Impact Velocity | m/s | 4.20 to 4.40 | 4.30 | Pass |
| Maximum Probe Acceleration | G's | 36 to 45 | 43 | Pass |
| Pelvis Y Acceleration | G's | 28 to 39 | 36 | Pass |
| Peak Pelvis Iliac Force | N | 4100 to 5100 | 5,050 | Pass |
| | | Overall Test Results | | Pass |

Gerald Guerrero
Laboratory Technician

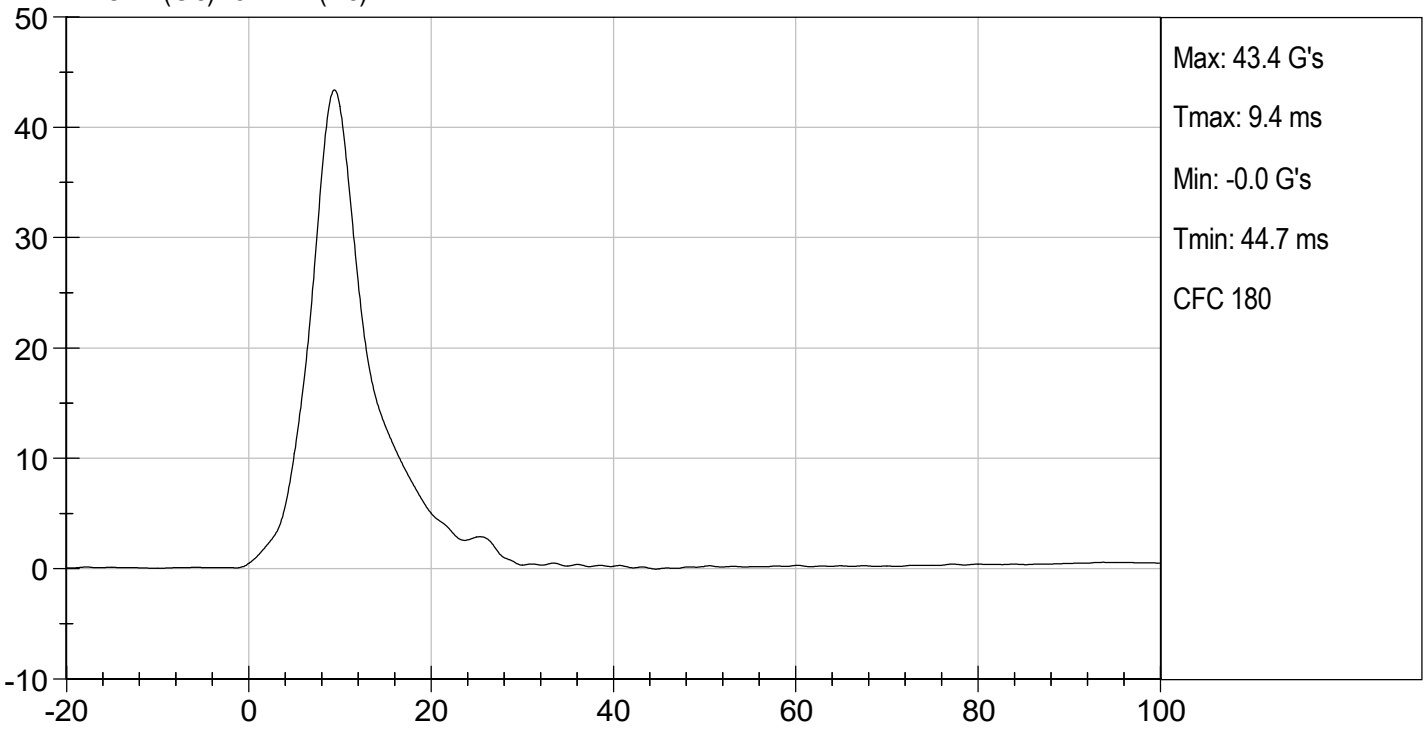
03/15/2021
Test Date

Approved By

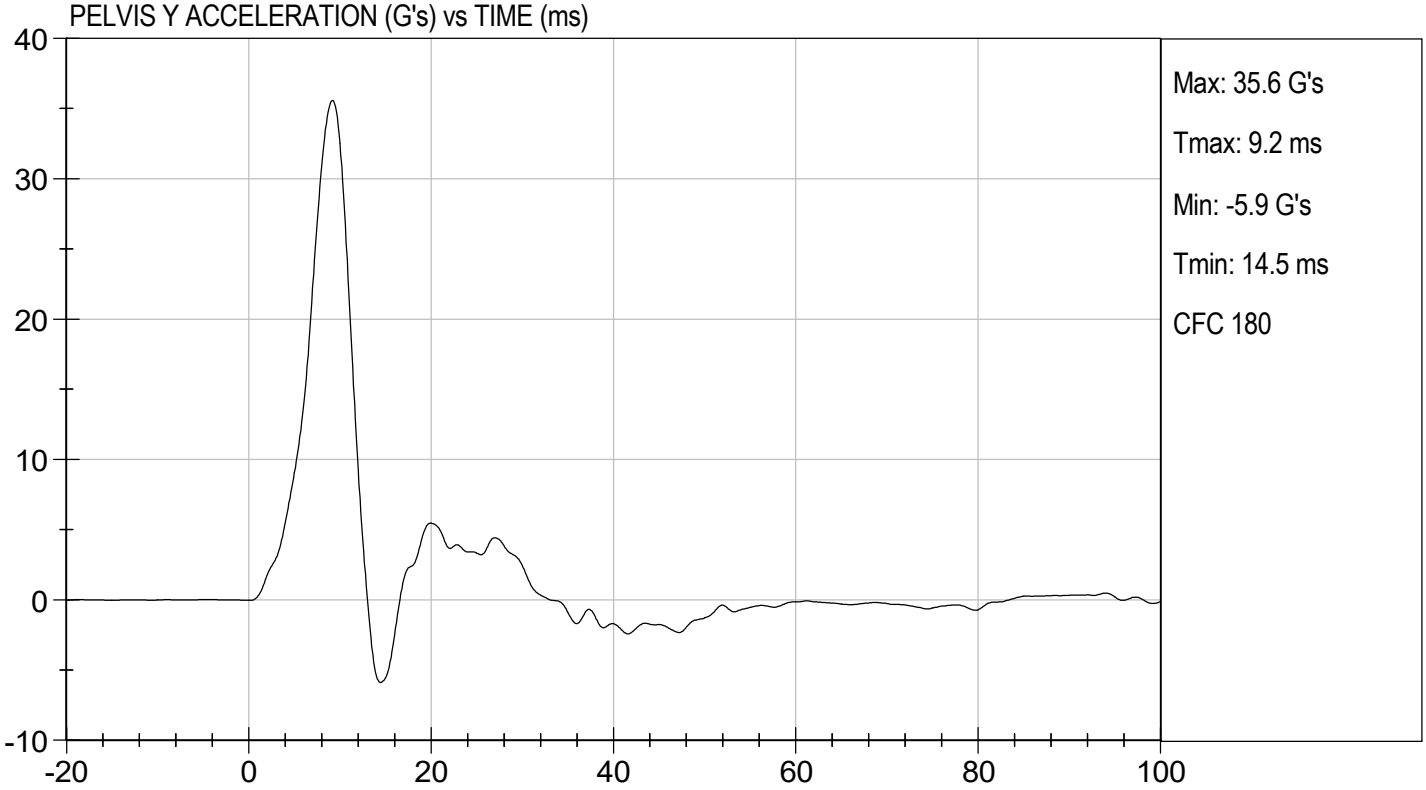
TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 03/15/2021
TEST #: D210878

PROBE (G's) vs TIME (ms)

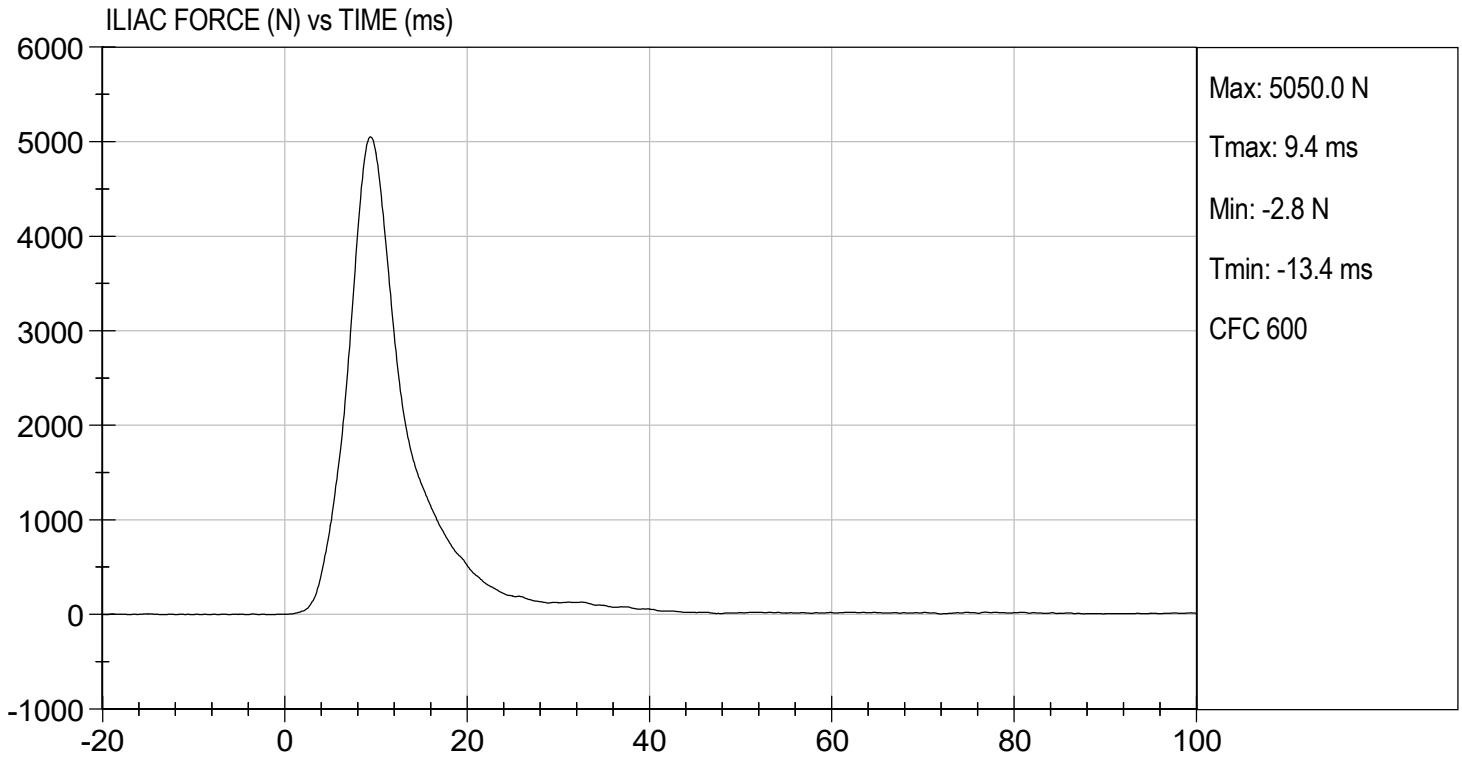



PELVIS Y ACCELERATION (G's) vs TIME (ms)



TEST DESC: ILLIAC
VELOCITY: 14.12 ft/s, 4.30 m/s

TEST DATE: 03/15/2021
TEST #: D210878



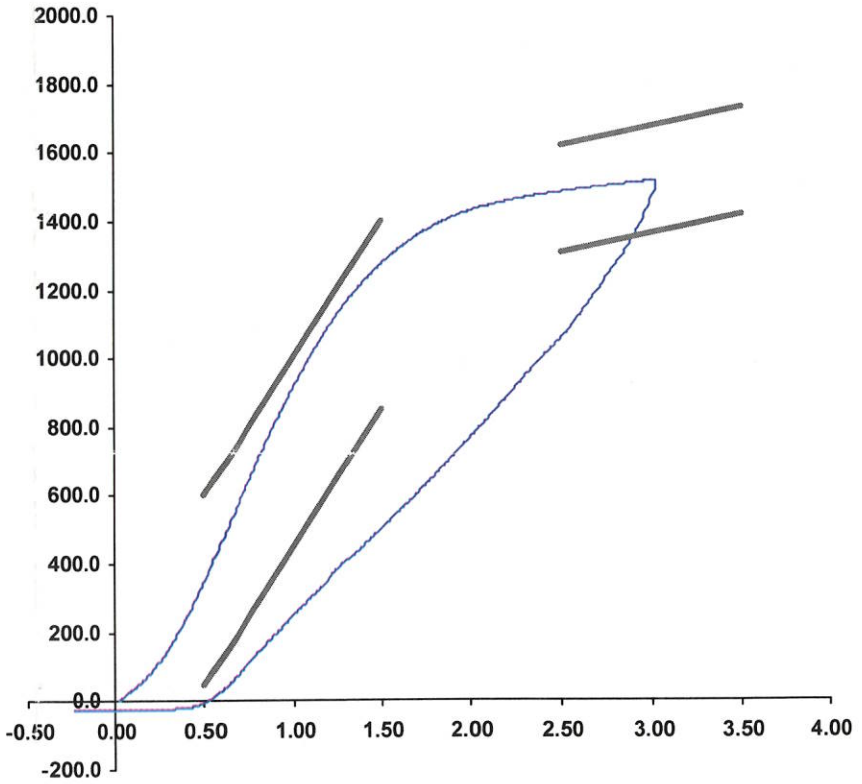
SACO RESEARCH

## SID-IIs Pelvis Plug Certification Test

Plug S/N 14036
Test Number 13510
Report Number 13555
Test Date 5/22/2020 1:04:11 PM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 359.78 | 50.00 | 600.00 |
| Force @ 1.5 mm (N) | 1,278.20 | 850.00 | 1,400.00 |
| Force @ 2.5 mm (N) | 1,483.29 | 1,306.00 | 1,618.00 |
| Force @ 3.0 mm (N) | 1,515.10 | 1,361.00 | 1,673.00 |

Force (-N) vs Extension (-mm)




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

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

Notes:

Operator

Part Number 180-4450

Template No 107 22-May-20
SACO Research

By : DC Date : 5 - 22 - 2020

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

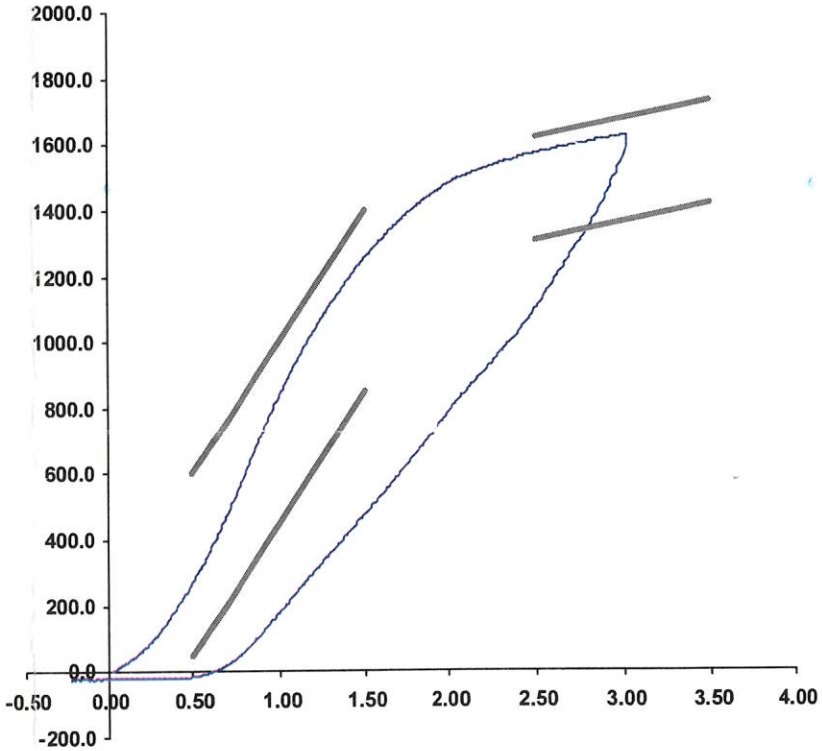
SACO RESEARCH

## SID-IIs Pelvis Plug Certification Test

Plug S/N 13095
Test Number 10415
Report Number 10450
Test Date 7/30/2019 4:45:40 PM

| | Test Results | Spec Min | Spec Max |
|---|---|---|---|
| Force @ 0.5 mm (N) | 281.39 | 50.00 | 600.00 |
| Force @ 1.5 mm (N) | 1,259.09 | 850.00 | 1,400.00 |
| Force @ 2.5 mm (N) | 1,572.76 | 1,306.00 | 1,618.00 |
| Force @ 3.0 mm (N) | 1,622.44 | 1,361.00 | 1,673.00 |

Force (-N) vs Extension (-mm)




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

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

Notes:

**Operator**

**Part Number** 180-4450

**Template No 107** **30-Jul-19**
SACO Research

By : DC Date : 7/30/2019

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

# APPENDIX D
# TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

**Table 1 – Dummy Instrumentation**

| | | | | SID-IIs S/N 296 | | |
|---|---|---|---|---|---|---|
| | | | | Serial Number | Manufacturer | Calibration Date |
| Head CG Accelerometers | | | X | P85003 | Endevco | 01/18/2021 |
| | | | Y | P94783 | Endevco | 01/18/2021 |
| | | | Z | P94786 | Endevco | 01/18/2021 |
| | | | Xr | P94938 | Endevco | 01/18/2021 |
| | | | Yr | P96854 | Endevco | 01/18/2021 |
| | | | Zr | P97386 | Endevco | 01/18/2021 |
| Head Angular Rate Sensors | | | X | ARS7325 | DTS | 09/14/2020 |
| | | | Y | ARS7354 | DTS | 08/04/2020 |
| | | | Z | ARS7371 | DTS | 09/14/2020 |
| Displacement Potentiometers | Thoracic Rib | Upper | Y | G012 | Servo | 12/23/2020 |
| | | Middle | Y | G1163 | FTSS | 12/23/2020 |
| | | Lower | Y | G1158 | FTSS | 12/23/2020 |
| | Abdominal Rib | Upper | Y | G1146 | FTSS | 12/23/2020 |
| | | Lower | Y | G1126 | FTSS | 12/23/2020 |
| Lower Spine Accelerometers (T12) | | | X | P79418 | Endevco | 01/18/2021 |
| | | | Y | P79439 | Endevco | 01/18/2021 |
| | | | Z | P79614 | Endevco | 01/18/2021 |
| Acetabulum Load Cell | | | Y | ACG4285 | FTSS | 02/10/2021 |
| Iliac Wing Load Cell | | | Y | IWG3023 | FTSS | 02/10/2021 |
| Pelvis Plug (struck side) | | | | 14036 | SACO | 05/22/2020 |
| Pelvis Plug (non-struck side) | | | | 13095 | SACO | 07/30/2019 |

**Table 2 – Vehicle Instrumentation**

| | | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|---|
| Vehicle Center of Gravity | X | PCB1441 | PCB | 02/17/2021 |
| Vehicle Center of Gravity | Y | PCB1137 | PCB | 02/15/2021 |
| Vehicle Center of Gravity | Z | PCB1320 | PCB | 02/17/2021 |
| Left Floor Sill | Y | A356243 | MSI | 12/05/2020 |
| A-Pillar Sill | Y | A356214 | MSI | 12/14/2020 |
| A-Pillar Low | Y | PCB1226 | PCB | 02/09/2021 |
| A-Pillar Mid | Y | T19994 | Endevco | 09/28/2020 |
| B-Pillar Sill | Y | PCB1138 | PCB | 11/02/2020 |
| B-Pillar Low | Y | PCB1263 | PCB | 12/31/2020 |
| B-Pillar Mid | Y | A340789 | MSI | 12/05/2020 |
| Driver Seat | Y | A337171 | MSI | 11/12/2020 |
| Engine Top | X | A337227 | MSI | 09/22/2020 |
| Engine Top | Y | A356215 | MSI | 12/12/2020 |
| Firewall | Y | A360966 | MSI | 12/14/2020 |
| Right Roof | Y | A370381 | MSI | 03/11/2021 |
| Right Floor Sill | Y | T22745 | Endevco | 11/02/2020 |
| Rear Floorpan | X | A370352 | MSI | 03/09/2021 |
| Rear Floorpan | Y | A370344 | MSI | 03/09/2021 |

**Table 3 – Pole Instrumentation**

| | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|
| Load Cell 1 | DG6277 | FTSS | 07/30/2018 |
| Load Cell 2 | DG6278 | FTSS | 07/30/2018 |
| Load Cell 3 | DG6279 | FTSS | 07/30/2018 |
| Load Cell 4 | DG6280 | FTSS | 07/30/2018 |
| Load Cell 5 | DG6281 | FTSS | 07/30/2018 |
| Load Cell 6 | DG6283 | FTSS | 07/30/2018 |
| Load Cell 7 | DG6284 | FTSS | 07/30/2018 |
| Load Cell 8 | DG6582 | FTSS | 07/30/2018 |