**FINAL REPORT NUMBER: SINCAP-TRC-20-001**

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

**KIA MOTORS CORPORATION**
**2020 Kia Soul 5-DR SUV**
**NHTSA NUMBER: M20204214**

**PREPARED BY:**
**Transportation Research Center Inc.**
**10820 State Route 347**
**P. O. Box B-67**
**East Liberty, OH 43319**

**Report Date: April 3, 2020**

**FINAL REPORT**

**PREPARED FOR:**
**U.S. DEPARTMENT OF TRANSPORTATION**
**National Highway Traffic Safety Administration**
**Office of Crashworthiness Standards**
**Mail Code: NRM-110**
**1200 New Jersey Ave, SE, Room W43-410**
**Washington, D.C. 20590**

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Report Prepared By: ILO Project Operations Group

Report Approved By: 

John Shultz

Approval Date: April 3, 2020

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date:

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

Date:

Technical Report Documentation Page

| | | |
|---|---|---|
| 1. Report No.<br>SINCAP-TRC-20-001 | 2. Government Accession No. | 3. Recipient's Catalog No. |
| 4. Title and Subtitle<br>Draft Report of New Car Assessment Program Side Impact MDB Testing of a 2020 Kia Soul 5-DR SUV, NHTSA No.: M20204214 | | 5. Report Date<br>April 3, 2020<br>6. Performing Organization Code<br>TRC Inc. |
| 7. Author(s)<br>John Shultz, Project Manager | | 8. Performing Organization Report Number<br>191030 |
| 9. Performing Organization Name and Address<br>Transportation Research Center Inc.<br>10820 State Route 347<br>East Liberty, OH 43319 | | 10. Work Unit No.<br>11. Contract or Grant No.<br>DTNH22-14-D-00354 |
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| 15. Supplemental Notes | | |

16. Abstract

This 55 / 28 km/h 90° Moving Deformable Barrier SINCAP Side Impact Test was conducted on the subject 2020 Kia Soul 5-DR SUV, in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the generation of consumer information on vehicle side crash protection. This test was conducted by Transportation Research Center Inc. in East Liberty, Ohio, on October 30, 2019.

The impact velocity of the Moving Deformable Barrier (MDB) was 61.96 km/h, and the ambient temperature at the struck (left) side of the target vehicle at the time of impact was 21.7° C. The target vehicle post-test maximum crush was 173 mm at Level 3. The test vehicle's performance was as follows:

**Driver ATD (ES-2re)**

| **Measurement Description** | **Units** | **IARV** | **Result** |
|---|---|---|---|
| Head Injury Criteria ($HIC_{36}$) | N/A | 1000 | 142 |
| Maximum Thoracic Rib Deflection | mm | 44 | 26.3 |
| Total Abdominal Force | N | 2500 | 1152.2 |
| Pubic Symphysis Force | N | 6000 | -2180.6 |
| Lower Spine Acceleration | G | 82* | 38.6 |

**Passenger ATD (SID-IIs)**

| **Measurement Description** | **Units** | **IARV** | **Result** |
|---|---|---|---|
| Head Injury Criteria ($HIC_{36}$) | N/A | 1000 | 422 |
| Lower Spine Resultant Acceleration | g's | 82 | 72.5 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 2716.7 |
| Maximum Thoracic Rib Deflection | mm | 38* | 25.7 |
| Maximum Abdominal Rib Deflection | mm | 45* | 40.8 |

* Proposed IARV

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

| | |
|---|---|
| 17. Key Words<br>New Car Assessment Program (NCAP)<br>Side Impact<br>MDB<br>ES-2re<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 this report)<br>Unclassified | 20. Security Classification (of this page)<br>Unclassified | 21. Number of Pages<br>215 | 22. Price |

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# SECTION 1
# TEST PURPOSE AND PROCEDURE

## TEST PURPOSE AND PROCEDURE

This moving deformable barrier side impact test was conducted as part of the MY 2020 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00354. The purpose of this test is to generate comparative side impact performance in a 2020 Kia Soul 5-DR SUV. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated October 2015.

## SECTION 2

## SUMMARY OF TEST RESULTS

A 2020 Kia Soul 5-DR SUV was impacted on the left (driver's) side by a Moving Deformable Barrier (MDB) which was moving forward in a 27° crabbed position to the tow road guidance system at a velocity of 61.96 km/h (38.50 mph). The target vehicle was stationary and was positioned at an angle of 63° to the line of forward motion. The side impact test was conducted by the Transportation Research Center Inc. in East Liberty, Ohio, on October 30, 2019. Pre-test and post-test photographs of the test vehicle and the MDB and the dummies (ES-2-re and SID-IIs) are included in this report.

Dummies were placed in the driver and left rear designated seating positions according to instructions specified in the OCWS Side Impact Laboratory Test Procedure, dated October 2015. The side impact event was documented by 11 cameras. Camera locations are included in this report.

The dummies were instrumented in the following manner:

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

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

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

Dummy injury readings were recorded as follows:

| Measurement Description | Driver ATD (ES-2-re) | | |
|---|---|---|---|
| | Units | Threshold | Result |
| Head Injury Criteria ($HIC_{36}$) | N/A | 1000 | 142 |
| Maximum Thoracic Rib Deflection | mm | 44 | 26.3 |
| Combined Abdominal Force | N | 2500 | 1152.2 |
| Pubic Symphysis Force | N | 6000 | -2180.6 |
| Lower Spine (T12) Resultant Acceleration | G | 82* | 38.6 |

* Proposed IARV

| Measurement Description | Passenger ATD (SID-IIs) | | |
|---|---|---|---|
| | Units | Threshold | Result |
| Head Injury Criteria ($HIC_{36}$) | N/A | 1000 | 422 |
| Lower Spine (T12) Resultant Acceleration | G | 82 | 72.5 |
| Total Pelvic Force (sum of acetabular and iliac forces) | N | 5525 | 2716.7 |
| Maximum Thoracic Rib Deflection | mm | 38* | 25.7 |
| Maximum Abdominal Rib Deflection | mm | 45* | 40.8 |

* 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 | | |
| Side Curtain Airbag | Yes | Yes | Yes | Yes |
| Side Torso/Pelvis Airbag | Yes | Yes | No | N/A |
| Side Pelvis Airbag | No | N/A | No | N/A |
| Knee Airbag | No | N/A | No | N/A |
| Seat Belt Pretensioner | Yes | Yes | No | N/A |
| Seat Belt Load Limiter | Yes | Unknown | No | N/A |
| Other Safety Restraint | No | N/A | No | N/A |

## GENERAL COMMENTS

All doors remained closed throughout the test. No fuel spillage occurred during the impact or the static rollover test which followed. Injury values for both ATDs were within the established performance thresholds.

Left Lower B-Post AY; Questionable data after 5.0 ms

Left Rear Seat Y; Questionable data after 6 ms

Top of Engine X and Y; Questionable data throughout

## SECTION 3
## OCCUPANT AND VEHICLE INFORMATION

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

**TEST VEHICLE INFORMATION AND OPTIONS**

| | |
|---|---|
| NHTSA No. | M20204214 |
| Model Year | 2020 |
| Make | Kia |
| Model | Soul |
| Body Style | MPV |
| VIN | KNDJ23AU4L7011046 |
| Body Color | Inferno Red |
| Odometer Reading (km/mi) | 88 mi |
| Engine Displacement (L) | 2.0 |
| Type/No. Cylinders | Gas/4 |
| Engine Placement | Front/Transverse |
| Transmission Type | Automatic |
| Transmission Speeds | CVT |
| Overdrive | Yes |
| Final Drive | FWD |
| Roof Rack | No |
| Sunroof/T-Top | No |
| Running Boards | No |
| Tilt Steering Wheel | Yes |
| Power Seats | No |
| Anti-Lock Brakes (ABS) | Yes |

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

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

**DATA FROM CERTIFICATION LABEL**

| | |
|---|---|
| Manufactured By | KIA MOTORS CORPORATION |
| Date of Manufacture | 01/19 |
| Vehicle Type | MPV |

| | |
|---|---|
| GVWR (kg) | 4023 |
| GAWR Front (kg) | 2315 |
| GAWR Rear (kg) | 2094 |

**VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION**

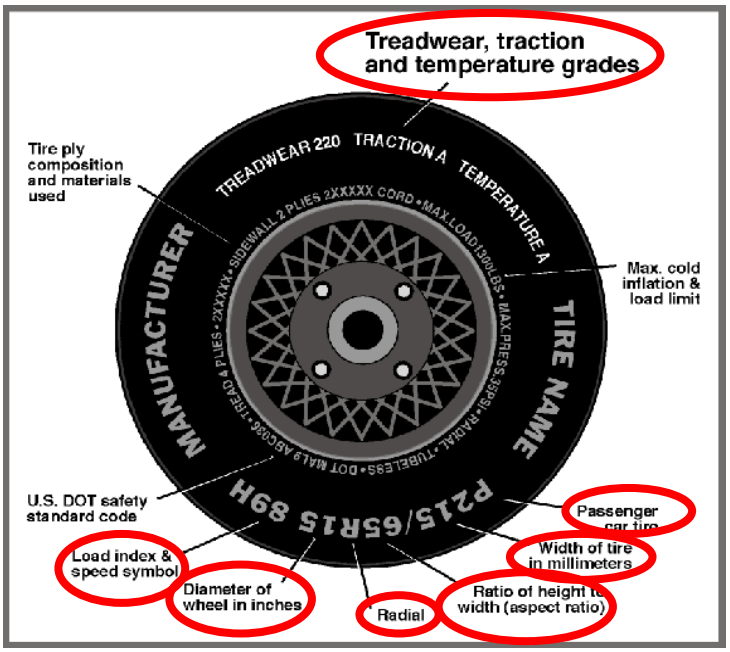
| Measured Parameter | Front | Rear | Third | Total |
|---|---|---|---|---|
| Designated Seating Capacity DSC) | 2 | 3 | N/A | 5 |
| Capacity Weight (VCW) (kg) | | | | 390.0 |
| DSC x 68.04 (kg) | | | | 340.2 |
| Cargo Weight (RCLW) (kg) | | | | 49.8 |

**VEHICLE SEAT TYPE**

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

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

Test Vehicle: 2020 Kia Soul 5-DR SUV
Test Program: SINCAP Side Impact
NHTSA No.: M20204214
Test Date: 10/30/2019




### DATA FROM TIRE PLACARD

| Measured Parameter | Front | Rear |
|---|---|---|
| Maximum Tire Pressure (kPa) | 350 | 350 |
| Cold Pressure (kPa) | 230 | 230 |
| Recommended Tire Size | 205/60R16 | 205/60R16 |
| Tire Size on Vehicle | 205/60R16 | 205/60R16 |
| Tire Manufacturer | Hankook | Hankook |
| Tire Model | Kinergy GT | Kinergy GT |
| Treadwear | 500 | 500 |
| Traction | A | A |
| Temperature Grades | A | A |
| Tire Plies Sidewall | 1 | 1 |
| Tire Plies Body | 4 | 4 |
| Load Index/Speed Symbol | 92H | 92H |
| Tire Material | Polyester/Steel/Nylon | Polyester/Steel/Nylon |
| DOT Safety Code Left | 1T79X 1B H0 5218 | 1T79X 1B H0 5218 |
| DOT Safety Code Right | 1T79X 1B H0 5218 | 1T79X 1B H0 5218 |

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

### TIRE PRESSURES

| | Units | LF | RF | LR | RR |
|---|---|---|---|---|---|
| As Delivered | kPa | 230 | 230 | 230 | 234 |
| Tire Placard | kPa | 230 | 230 | 230 | 230 |
| Owner's Manual | kPa | 230 | 230 | 230 | 230 |
| As Tested | kPa | 230 | 230 | 230 | 230 |

### MDB TIRE SPECIFICATIONS

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

### TEST VEHICLE AXLE WEIGHTS

| | Units | As Delivered (UVW) | | | As Tested (ATW) | | | Fully Loaded | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total | Front Axle | Rear Axle | Total |
| Left | kg | 408.6 | 257.2 | | 462.4 | 312.4 | | 450.4 | 334.0 | |
| Right | kg | 392.0 | 251.6 | | 406.8 | 296.8 | | 394.4 | 305.4 | |
| Ratio | % | 61.1 | 38.9 | | 58.8 | 41.2 | | 56.9 | 43.1 | |
| Totals | kg | 800.6 | 508.8 | 1309.4 | 869.2 | 609.2 | 1478.4 | 844.8 | 639.4 | 1484.2 |

### TARGET TEST WEIGHT CALCULATION

| Measured Parameter | Units | Value | |
|---|---|---|---|
| Total As Delivered Weight (UVW) | kg | 1309.4 | (A) |
| Actual Weight of 1 P572V ATD (SID-IIs) Dummy Used | kg | 125.0 | (B) |
| Rated Cargo/Luggage Weight (RCLW) | kg | 49.8 | (C) |
| Calculated Vehicle Target Weight (TVTW) | kg | 1484.2 | (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 ☐ NO

### TEST VEHICLE ATTITUDES AND CG

| Measurement Description | Units | Fully Loaded | As Tested | Meets Requirement |
|---|---|---|---|---|
| LF | mm | 698 | 695 | Yes |
| RF | mm | 705 | 699 | Yes |
| RR | mm | 689 | 697 | Yes |
| LR | mm | 679 | 682 | Yes |
| Vehicle CG (Aft of Front Axle) | mm | 1121 | 1072 | |
| Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline) | mm | +45 | +38 | |

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

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

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

| Component Description | Weight (kg) |
|---|---|
| Ballast: None | 0.0 |
| Removed: None | 0.0 |

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

**SEAT POSITIONING**

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

**SCRL ANGLE RANGE**

| Seat | SCRL(°) | | |
|---|---|---|---|
| | Max. | Min. | Mid |
| Driver Seat | 17.6 | 14.5 | 16.0 |
| Front Passenger Seat | N/A | N/A | 15.7 |
| Front Center Seat* | N/A | N/A | N/A |
| Struck Side Rear Seat | N/A | N/A | 15.0 |
| Non-Struck Side Rear Seat | N/A | N/A | 10.8 |
| Rear Center Seat* | N/A | N/A | 15.0 |

* If applicable.

**SEAT HEIGHT AND ANGLE**

| Seat | As Tested SCRL Angle (Mid) (°) | As Tested SCRP Height (mm) | SCRP Height Position | SCRP Height (mm) | | |
|---|---|---|---|---|---|---|
| | | | | Rearmost | Mid-Fore/Aft | Forward-Most |
| Driver Seat | 16 | 205 | Max | N/A | N/A | N/A |
| | | | Mid | 199 | 205 | 210 |
| | | | Min | N/A | N/A | N/A |
| Front Passenger Seat | 15.7 | 200 | Max | N/A | N/A | N/A |
| | | | Mid | 196 | 200 | 204 |
| | | | Min | N/A | N/A | N/A |
| Front Center Seat* | N/A | N/A | Max | N/A | N/A | N/A |
| | | | Mid | N/A | N/A | N/A |
| | | | Min | N/A | N/A | N/A |
| Struck Side Rear Seat | 15.0 | 147 | Max | N/A | N/A | N/A |
| | | | Mid | N/A | 147 | N/A |
| | | | Min | N/A | N/A | N/A |
| Non-Struck Side Rear Seat | 10.8 | 146 | Max | N/A | N/A | N/A |
| | | | Mid | N/A | 146 | N/A |
| | | | Min | N/A | N/A | N/A |
| Rear Center Seat* | 15.0 | 309 | Max | N/A | N/A | N/A |
| | | | Mid | N/A | 309 | N/A |
| | | | Min | N/A | N/A | N/A |

* If applicable.

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

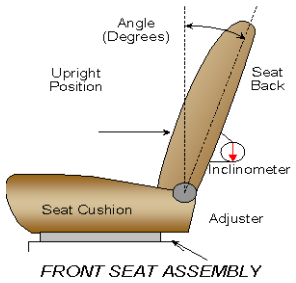
### SEAT FORE/AFT POSITION

| Seat | Total Fore/Aft Travel | | Test Position from Forwardmost Position | |
|---|---|---|---|---|
| | mm | Detents | mm | Detent |
| Driver Seat | 240 | 61 | 120 | 30 |
| Front Passenger Seat | 220 | 56 | 112 | 27 |
| Front Center Seat* | N/A | N/A | N/A | N/A |
| Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Rear Center Seat* | Fixed | Fixed | Fixed | Fixed |

* If applicable

### SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned to the manufacturer's designated seat back angle. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck side rear seat back is positioned such that the dummy's head is level. The rear center and non-struck side rear outboard seat backs are positioned in a similar manner as the struck-side rear seat back.




| Seat | Total Seat Back Angle Range | | Test Position from Most Upright | |
|---|---|---|---|---|
| | Degrees | Detents | Degrees | Detent |
| Driver Seat w/ Seated Dummy | 55.8 | 28 | -0.2 | 6 |
| Front Passenger Seat | 55.8 | 28 | -0.4 | 6 |
| Front Center Seat* | N/A | N/A | N/A | N/A |
| Struck Side Rear Seat w/ Seated Dummy | Fixed | Fixed | Fixed | Fixed |
| Non-Struck Side Rear Seat | Fixed | Fixed | Fixed | Fixed |
| Rear Center Seat* | Fixed | Fixed | Fixed | Fixed |

* If applicable

### SEAT BELT ANCHORAGE ADJUSTMENT

Seat belt anchorages are adjusted in accordance with the information provided by the manufacturer on Form No. 1.

| | Total # of Positions | Placed in Position # |
|---|---|---|
| Driver Seat | 3 | 1, Full up |
| Rear Seat | Fixed | Fixed |

### HEAD RESTRAINT ADJUSTMENT

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

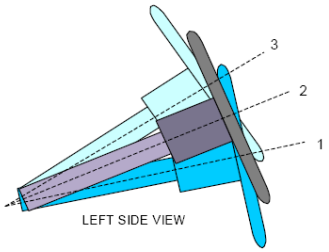
| | Total # of Positions | Placed in Position # |
|---|---|---|
| Driver Seat | 6 | 6, Full up |
| Rear Seat | Fixed | Fixed |

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

### STEERING COLUMN ADJUSTMENT

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



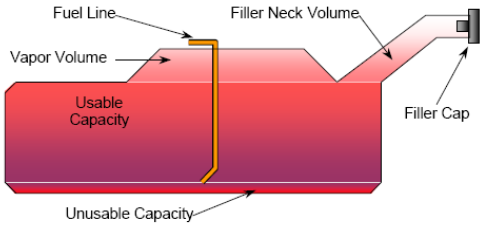
STEERING COLUMN ASSEMBLY

| | Degrees | Fore/Aft Position (mm) |
|---|---|---|
| Lowermost, Position No. 1 | 24.6 | 0 |
| Geometric Center, Position No. 2 | 27.0 | 23 |
| Uppermost, Position No. 3 | 29.3 | 46 |
| Telescoping Steering Wheel Travel | | 46 |
| Test Position | 27.0 | 23 |

### FUEL PUMP

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

Fuel pump will operate when engine system is normally operating



VEHICLE FUEL TANK ASSEMBLY

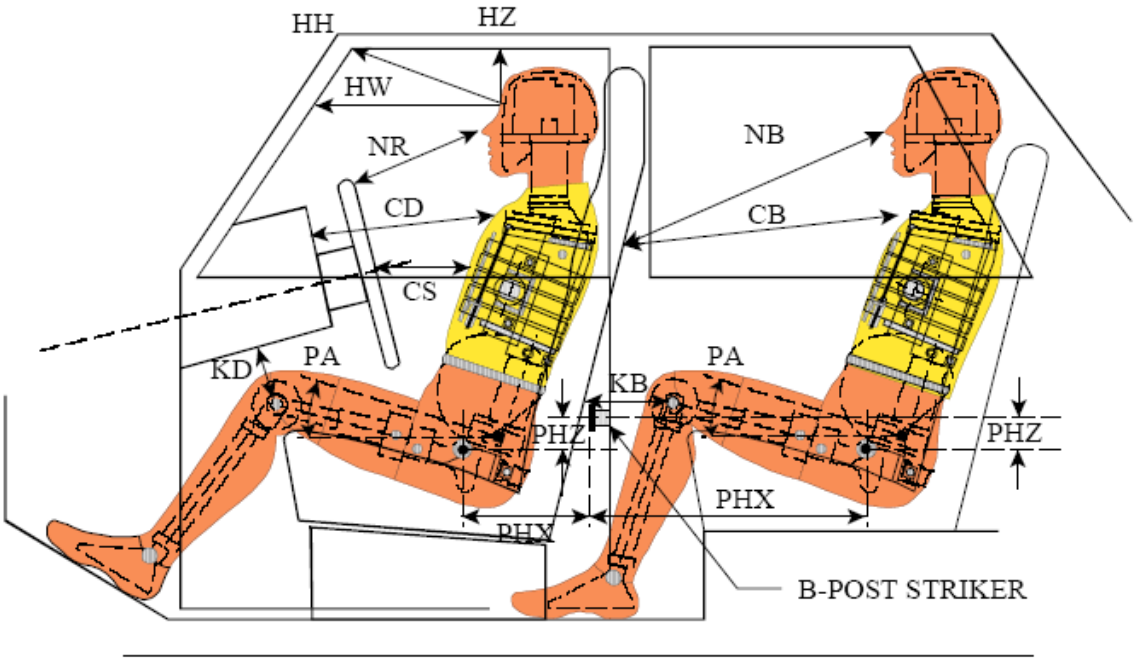
### FUEL TANK CAPACITY

| | Liters |
|---|---|
| Usable Capacity of "Standard Tank" (see Form No. 1) | 54.0 |
| Usable Capacity of "Optional Tank" (see Form No. 1) | N/A |
| Usable Capacity of Standard Tank (see Owner's Manual) | 54.0 |
| Usable Capacity of Optional Tank (see Owner's Manual) | N/A |
| 93% of Usable Capacity | 50.3 |
| Actual Amount of Solvent Used in Test | 50.3 |
| 1/3 of Usable Capacity | 18.0 |

**Is the Actual Amount of Solvent Used in the test equal to 93% ± 1% of the Usable Capacity stated in on Form No. 1?** ☒ YES ☐ NO

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019




LEFT SIDE VIEW

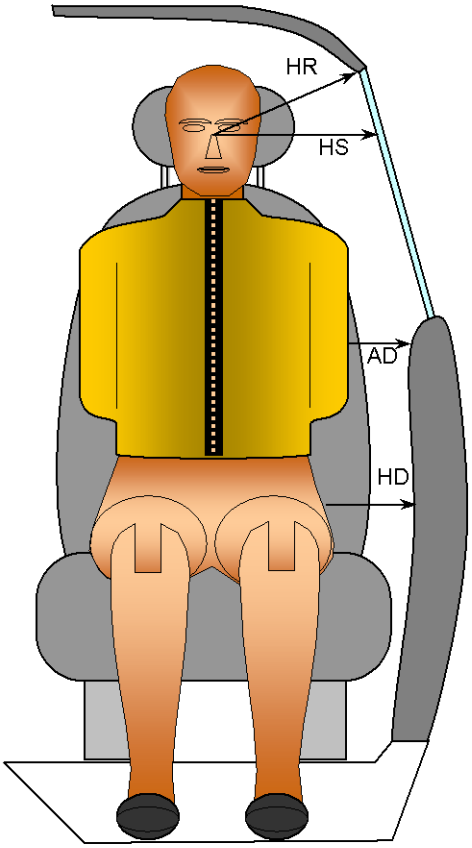
NOTE: 2-DOOR VEHICLE SHOWN. REAR DUMMY PHX & PHZ MEASUREMENTS FOR A 4-DOOR VEHICLE WOULD USE THE C-POST STRIKER AS A REFERENCE POINT

**DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION**

| Driver Code | Pass. Code | Measurement Description | Driver | | Passenger | |
|---|---|---|---|---|---|---|
| | | | Length (mm) | Angle | Length (mm) | Angle |
| HH | | Header to Header | 439 | | | |
| HW | | Header to Windshield | 630 | | | |
| HZ | HZ | Head to Roof Liner | 191 | | 300 | |
| NR | NB | Nose to Rim/Seat Back | 444 | | 678 | |
| CD | CB | Chest to Dash/Seat Back | 558 | | 619 | |
| CS | | Chest to Steering Wheel | 356 | | | |
| KD(L)/KDA(L)° | KB(L)/KBA(L)° | Left Knee to Dash/Seat Back | 161 | 26.0 | 309 | 0.0 |
| KD(R)/KDA(R)° | KB(R)/KBA(R)° | Right Knee to Dash/Seat Back | 150 | 26.4 | 307 | 0.0 |
| PAX° | PAX° | Pelvic Tilt Angle X | | 0.3 | | 0.4 |
| | PAY° | Pelvic Tilt Angle Y | | | | 20.5 |
| PHX | PHX | Hip Point to Striker (X-Axis) | 197 | | 233 | |
| PHZ | PHZ | Hip Point to Striker (Z-Axis) | 210 | | 243 | |

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

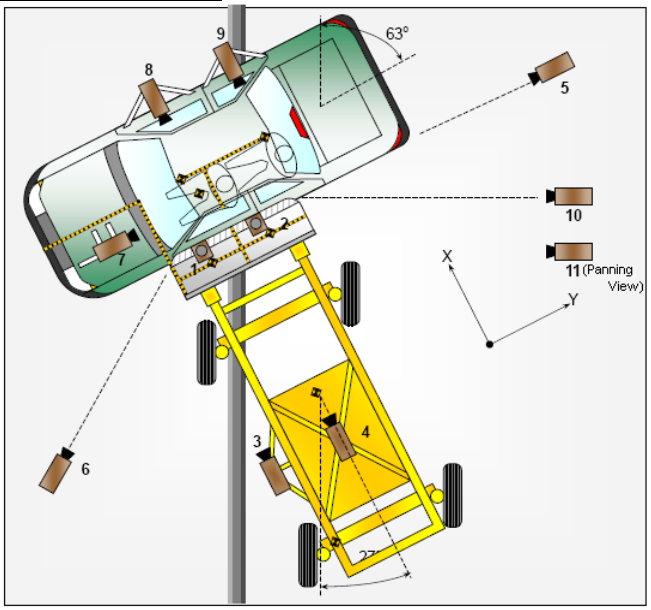


*FRONT VIEW OF DUMMY*

| Code | Description | Units | Driver | Passenger |
|---|---|---|---|---|
| HR | Head to Side Header | mm | 223 | 261 |
| HS | Head to Side Window | mm | 333 | 343 |
| AD | Arm to Door | mm | 83 | 135 |
| HD | H-Point to Door | mm | 156 | 163 |

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019




**CAMERA LOCATIONS AND DATA**

| No. | Camera View | Coordinates (mm) | | | Lens Length (mm) | Operating Frame Rate (fps) |
|---|---|---|---|---|---|---|
| | | X | Y | Z | | |
| 1 | Overhead Overall | -160 | 1150 | -5692 | 8.5 | 1000 |
| 2 | Overhead Close-up | 0 | 770 | -5692 | 28 | 1000 |
| 3 | Left Impact Point (MDB) | -1811 | 890 | -860 | 25 | 1000 |
| 4 | Side Overall (MDB) | -2420 | 0 | -1471 | 12.5 | 1000 |
| 5 | Rear | 0 | 6534 | -1510 | 20 | 1000 |
| 6 | Left Front | -3225 | -4808 | -1602 | 20 | 1000 |
| 7 | Driver Front (OB) | | | | 25 | 1000 |
| 8 | Driver Side (OB) | | | | 12.5 | 1000 |
| 9 | Passenger Side (OB) | | | | 12.5 | 1000 |
| 10 | Real-time Left Rear | | | | Zoom | 30 |
| 11 | Real-time Inrun | | | | Zoom | 30 |

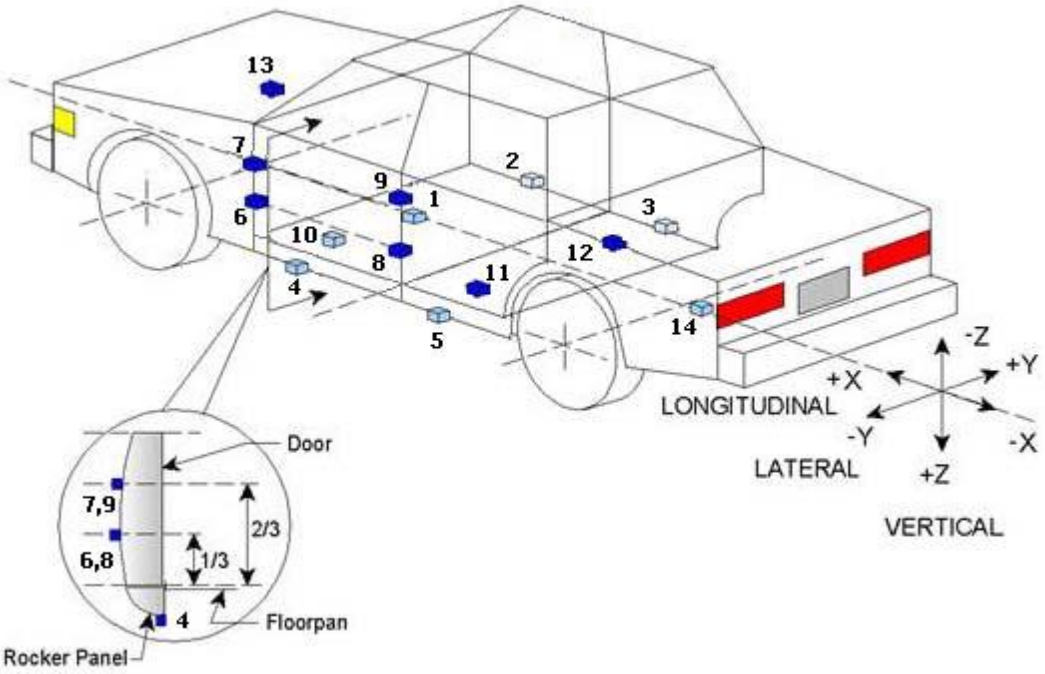
Reference: Impact Point projected to Ground; +X = To Front of MDB +Y = To Right of MDB; +Z = Down
*All measurements accurate to ± 6 mm.
If applicable, explain why camera(s) did not operate as intended: N/A

**INSTRUMENTATION**

| | |
|---|---|
| Driver Dummy Channels | 16 |
| Passenger Dummy Channels | 16 |
| Vehicle Structure Accelerometers | 23 |
| MBD Accelerometers | 5 |
| TOTAL | 60 |

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019



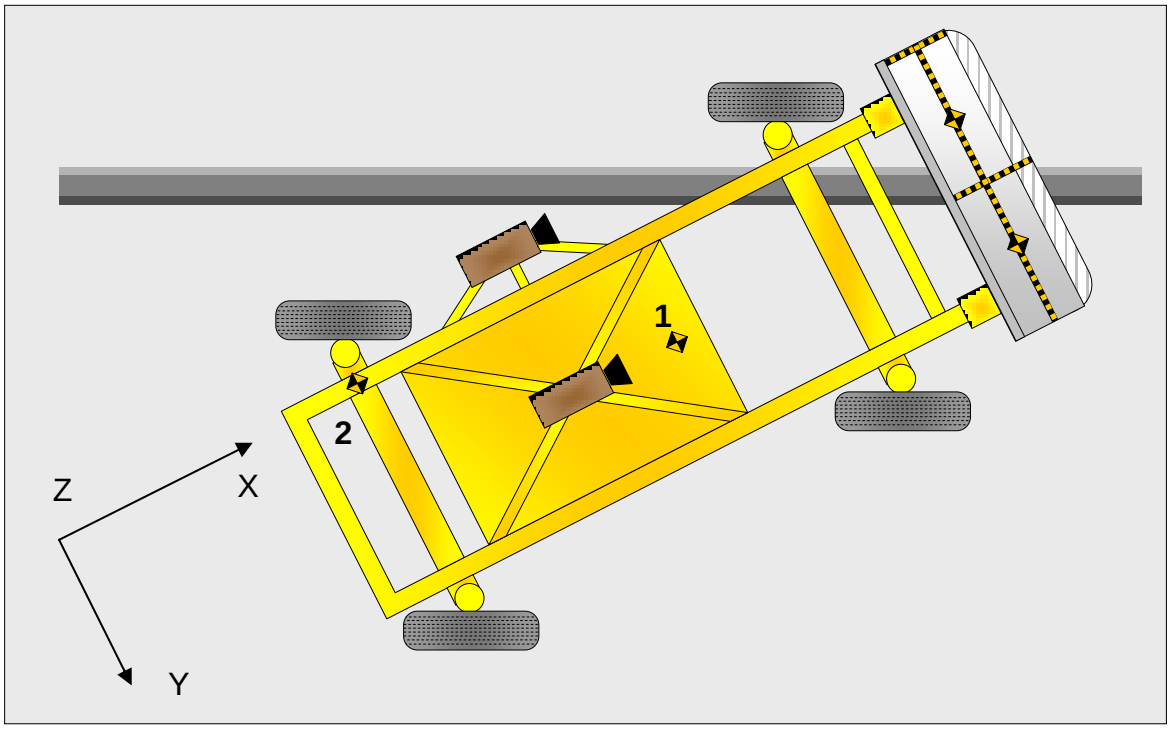

**TEST VEHICLE ACCELEROMETER LOCATIONS**

| Loc. No. | Accelerometer Location | Coordinates (mm) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | Vehicle CG | 2633 | 105 | -367 |
| 2 | Right Sill at Front Seat | 2515 | 670 | -372 |
| 3 | Right Sill at Rear Seat | 1573 | 680 | -374 |
| 4 | Left Sill at Front Door | 2516 | -670 | -374 |
| 5 | Left Sill at Rear Door | 1548 | -680 | -370 |
| 6 | A-Post Lower | 2860 | -877 | -513 |
| 7 | A-Post Middle | 2860 | -790 | -895 |
| 8 | B-Post Lower | 1811 | -807 | -593 |
| 9 | B-Post Middle | 1772 | -790 | -1019 |
| 10 | Front Seat Track | 2088 | -578 | -329 |
| 11 | Rear Seat Structure | 1395 | -670 | -376 |
| 12 | Right Rear Occ. Compartment | 1452 | 690 | -376 |
| 13 | Engine Block | 3482 | -20 | -850 |
| 14 | Rear Above Axle | 477 | 0 | -347 |

Reference: X - Rear surface of vehicle (+ forward)
Y - Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

**DATA SHEET NO. 7**
**MDB ACCELEROMETER LOCATIONS**

Test Vehicle: 2020 Kia Soul 5-DR SUV
Test Program: SINCAP Side Impact
NHTSA No.: M20204214
Test Date: 10/30/2019




**MDB ACCELEROMETER LOCATIONS**

| Loc. No. | Accelerometer Location | Coordinates (mm) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| 1 | MDB CG | -2179 | 0 | -505 |
| 2 | MDB Rear | -3648 | -650 | -618 |

Reference : X - Face of MDB (+ forward)
Y - MDB Centerline (+ to right)
Z - Ground Plane (+ down)

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

**TEST DUMMY INFORMATION AND CONTACT POINTS**

| Dummy Body Part | Front Seat Dummy (ES2-re) | Rear Seat Dummy (SID-IIs) |
|---|---|---|
| Face | SCAB | SCAB |
| Top of Head | SCAB | SCAB |
| Left Side of Head | SCAB, Head liner | SCAB |
| Back of Head | SCAB | SCAB |
| Left Shoulder | SCAB, SAB | SCAB, Door panel |
| Upper Torso | Seatback bolster, SAB | Arm rest |
| Lower Torso | Seatback bolster | Arm rest |
| Left Hip | SAB, Door panel | Door panel |
| Left Knee | Door panel | Door panel |

**POST-TEST DOOR PERFORMANCE**

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

**POST-TEST SEAT PERFORMANCE**

| Description | Struck Side | | Non-Struck Side | |
|---|---|---|---|---|
| | Front | Rear | Front | Rear |
| Seat Movement Along Seat Track | No | N/A | No | N/A |
| 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 | Good |
| Sill Separation | None |
| Windshield Damage | None |
| Side Window Damage | Left rear passenger window broken out |
| Other Notable Effects | None |

## DATA SHEET NO. 8 (CONTINUED)
## POST TEST OBSERVATIONS

Test Vehicle: 2020 Kia Soul 5-DR SUV
Test Program: SINCAP Side Impact
NHTSA No.: M20204214
Test Date: 10/30/2019

### SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

| Restraint Type | Struck Side Driver | | Struck Side Rear Passenger | |
|---|---|---|---|---|
| | Mounted | Deployed | Mounted | Deployed |
| Frontal Airbag | Yes | No | | |
| Knee Airbag | No | N/A | | |
| Side Curtain Airbag | Yes | Yes | Yes | Yes |
| Side Torso/Pelvis Airbag | Yes | Yes | No | N/A |
| Side Pelvis Airbag | No | N/A | No | N/A |
| Seat Belt Pretensioner | Yes | Yes | No | N/A |
| Seat Belt Load Limiter | Yes | Unknown | No | N/A |
| Other | No | N/A | No | N/A |

### IMPACT POINT LOCATION DATA

| Measured Parameter | Units | Tolerance | Value |
|---|---|---|---|
| Vehicle Wheel Base | mm | | 2601 |
| Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point) | mm | | 360 |
| Actual Impact Point (Aft of Front Axle) | mm | | 360 |
| Horizontal Offset ( + forward / - rearward) | mm | +/- 50 of Intended Impact point | 0 |
| Vertical Offset (+ down / - up) | mm | +/- 20 of Intended Impact point | -10 |

**DATA SHEET NO. 9**
**MDB SUMMARY OF RESULTS**

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

**MDB SPECIFICATIONS**

| Measurement Description | Length (mm) |
|---|---|
| Overall Width of Framework Carriage | 1252 |
| Overall Length Including Honeycomb Face | 4115 |
| Wheel Base of Framework Carriage | 2591 |
| C.G. Location aft of Front Axle | 1101 |

**MDB WEIGHTS**

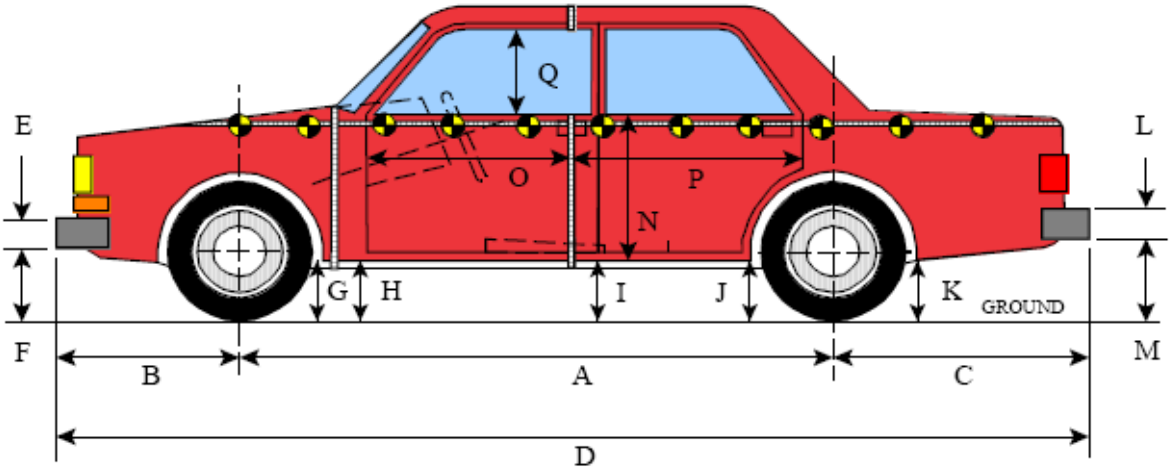
| | Units | Front Axle | Rear Axle | Total |
|---|---|---|---|---|
| Left | kg | 405.0 | 275.4 | 680.4 |
| Right | kg | 379.4 | 304.6 | 684.0 |
| Ratio | % | 57.5 | 42.5 | 100.0 |
| Totals | kg | 784.4 | 580.0 | 1364.4 |

**SPEED AND IMPACT ANGLE DATA**

| Measured Parameter | Units | Requirement | Value |
|---|---|---|---|
| Trap No. 1 Velocity (Primary) | km/h | 61.1 to 62.7 | 61.96 |
| Trap No. 2 Velocity (Redundant) | km/h | 61.1 to 62.7 | 61.99 |
| MDB CL to Target Vehicle CL | degrees | 88.5 to 91.5 | 90 |
| MDB Forward Line of Motion to Target Vehicle CL | degrees | 62.5 to 63.5 | 63 |
| MDB Crabbed Angle to MDB Forward Line of Motion | degrees | 26 to 28 | 27 |

**DATA SHEET NO. 10**
**TEST VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019



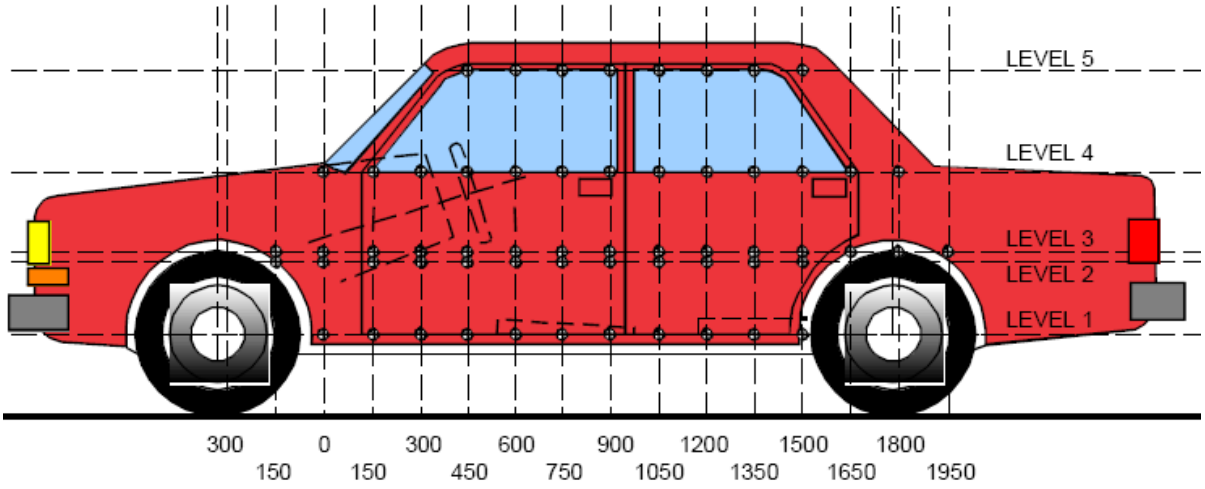

**LEFT SIDE VIEW**
All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3mm

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

| Code | Measurement Description | Pre-Test | Post-Test | Difference |
|---|---|---|---|---|
| A | Wheelbase | 2601 | 2600 | 1 |
| B | Front Axle to Front Surface of Vehicle | 842 | 842 | 0 |
| C | Rear Axle to Rear Surface of Vehicle | 738 | 738 | 0 |
| D | Total Length at Centerline | 4185 | 4185 | 0 |
| E | Front Bumper Thickness | 90 | 90 | 0 |
| F | Front Bumper Bottom to Ground | 438 | 447 | -9 |
| G | Sill Height at Front Wheel Well | 310 | 330 | -20 |
| H | Sill Height at Front Door Leading Edge | 313 | 350 | -37 |
| I | Sill Height at B-Pillar | 325 | 375 | -50 |
| J1 | Sill Height at Rear Wheel Well | 330 | 362 | -32 |
| J2 | Pinch Weld Height at Rear Wheel Well | 193 | 228 | -35 |
| K | Sill Height Aft of Rear Wheel Well | 393 | 436 | -43 |
| L | Rear Bumper Thickness | 80 | 80 | 0 |
| M | Rear Bumper Bottom to Ground | 405 | 440 | -35 |
| N | Sill Height to Window Bottom Sill | 781 | 715 | 66 |
| O | Front Door Leading Edge to Impact CL | 752 | 735 | 17 |
| P | Rear Door Trailing Edge to Impact CL | 1341 | 1310 | 31 |
| Q | Front Window Opening | 382 | 380 | 2 |
| R | Right Side Length | 3994 | 3980 | 14 |
| S | Left Side Length | 3985 | 3945 | 40 |
| T | Vehicle Width | 1805 | 1798 | 7 |

**DATA SHEET NO. 11**
**TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2020 Kia Soul 5-DR SUV
Test Program: SINCAP Side Impact
NHTSA No.: M20204214
Test Date: 10/30/2019




**LEFT SIDE VIEW**

**MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

| Level | Measurement Description | Height Above Ground | Maximum Exterior Static Crush | Distance From Impact |
|---|---|---|---|---|
| 1 | Sill Top | 386 | 77 | 1050 |
| 2 | Driver Hip Point | 657 | 172 | 1500 |
| 3 | Mid-Door | 738 | 173 | 1500 |
| 4 | Window Sill | 1060 | 76 | 1800 |
| 5 | Window Top | 1512 | 10 | 1350 |

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

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

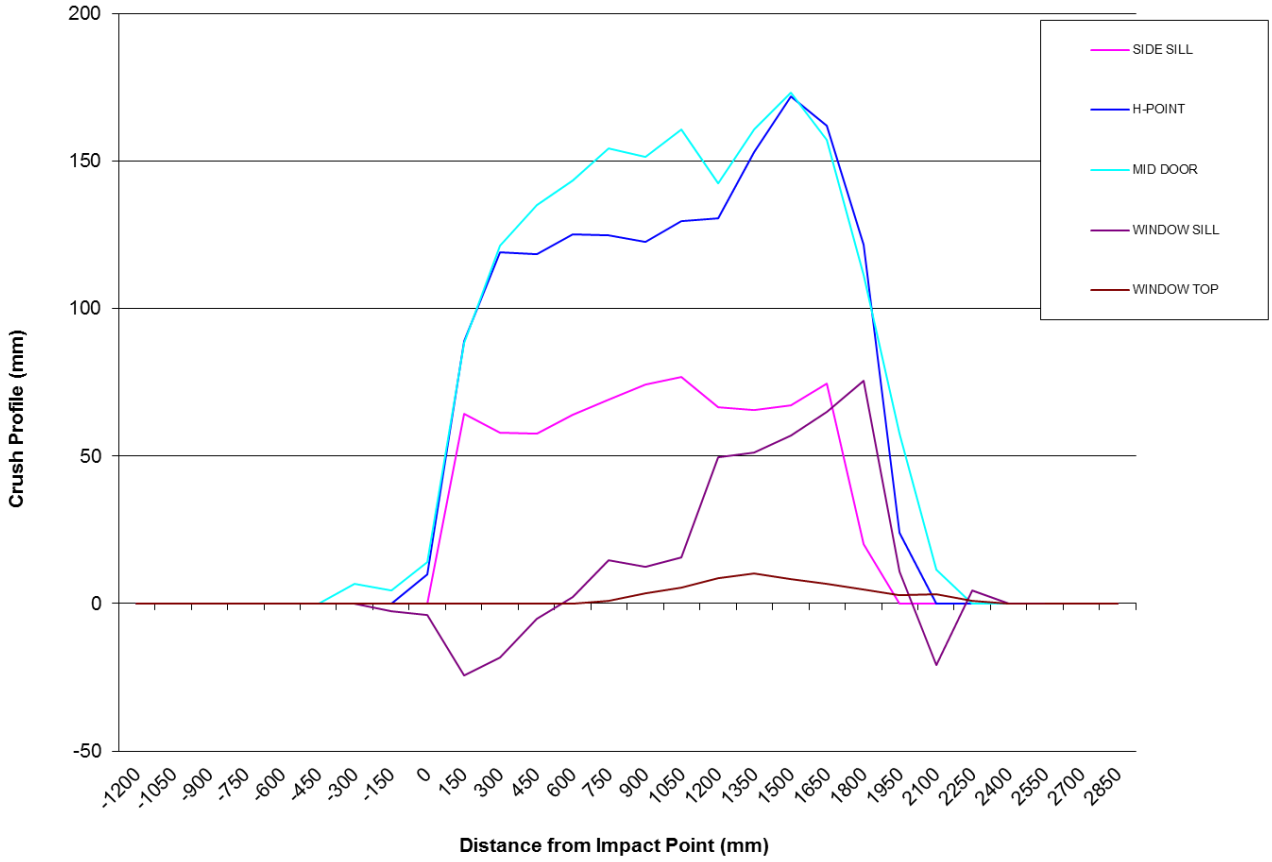
### EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

| | Pre-Test | | | | | Post-Test | | | | | Difference | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** | **1** | **2** | **3** | **4** | **5** |
| **-300** | 0 | 0 | 904 | 0 | 0 | 0 | 0 | 897 | 0 | 0 | 0 | 0 | 7 | 0 | 0 |
| **-150** | 0 | 903 | 903 | 706 | 0 | 0 | 903 | 898 | 709 | 0 | 0 | 0 | 5 | -3 | 0 |
| **0** | 0 | 899 | 893 | 758 | 0 | 0 | 889 | 879 | 762 | 0 | 0 | 10 | 14 | -4 | 0 |
| **150** | 884 | 886 | 881 | 776 | 0 | 820 | 797 | 793 | 800 | 0 | 64 | 89 | 88 | -24 | 0 |
| **300** | 865 | 882 | 881 | 787 | 0 | 807 | 763 | 760 | 805 | 0 | 58 | 119 | 121 | -18 | 0 |
| **450** | 860 | 883 | 883 | 795 | 0 | 803 | 764 | 748 | 800 | 0 | 57 | 119 | 135 | -5 | 0 |
| **600** | 862 | 884 | 885 | 802 | 0 | 798 | 759 | 741 | 800 | 0 | 64 | 125 | 144 | 2 | 0 |
| **750** | 864 | 884 | 885 | 808 | 634 | 795 | 759 | 731 | 793 | 634 | 69 | 125 | 154 | 15 | 0 |
| **900** | 865 | 883 | 885 | 814 | 639 | 791 | 761 | 734 | 801 | 635 | 74 | 122 | 151 | 13 | 4 |
| **1050** | 866 | 882 | 884 | 818 | 640 | 789 | 752 | 724 | 802 | 635 | 77 | 130 | 160 | 16 | 5 |
| **1200** | 866 | 879 | 882 | 821 | 641 | 799 | 748 | 740 | 771 | 632 | 67 | 131 | 142 | 50 | 9 |
| **1350** | 866 | 875 | 879 | 822 | 641 | 800 | 722 | 719 | 770 | 631 | 66 | 153 | 160 | 52 | 10 |
| **1500** | 868 | 872 | 875 | 822 | 640 | 801 | 700 | 702 | 765 | 632 | 67 | 172 | 173 | 57 | 8 |
| **1650** | 877 | 876 | 874 | 821 | 638 | 803 | 714 | 717 | 756 | 631 | 74 | 162 | 157 | 65 | 7 |
| **1800** | 886 | 895 | 888 | 820 | 635 | 866 | 773 | 776 | 744 | 630 | 20 | 122 | 112 | 76 | 5 |
| **1950** | 0 | 901 | 899 | 815 | 630 | 0 | 877 | 841 | 804 | 627 | 0 | 24 | 58 | 11 | 3 |
| **2100** | 0 | 0 | 901 | 809 | 625 | 0 | 0 | 890 | 830 | 621 | 0 | 0 | 11 | -21 | 4 |
| **2250** | 0 | 0 | 0 | 801 | 619 | 0 | 0 | 0 | 796 | 618 | 0 | 0 | 0 | 5 | 1 |

**NOTE:** Pre-test measurements are taken when the vehicle is in the “As Tested” weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point.

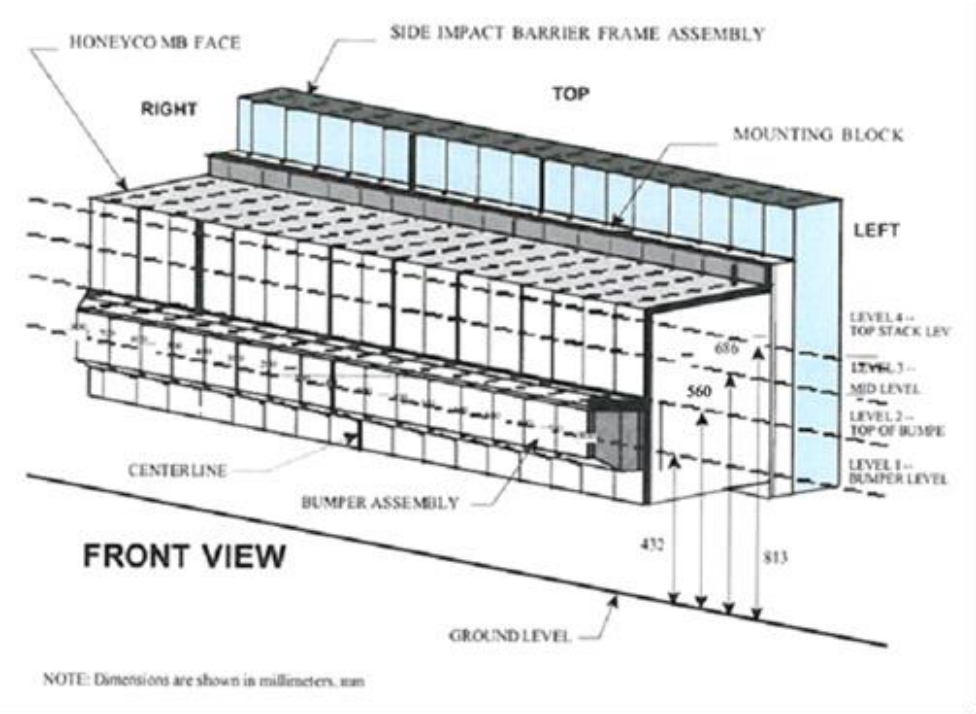
## DATA SHEET NO. 11 (CONTINUED)
## TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019



**DATA SHEET NO. 12**
**MDB EXTERIOR STATIC CRUSH MEASUREMENTS**

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019




**MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE**

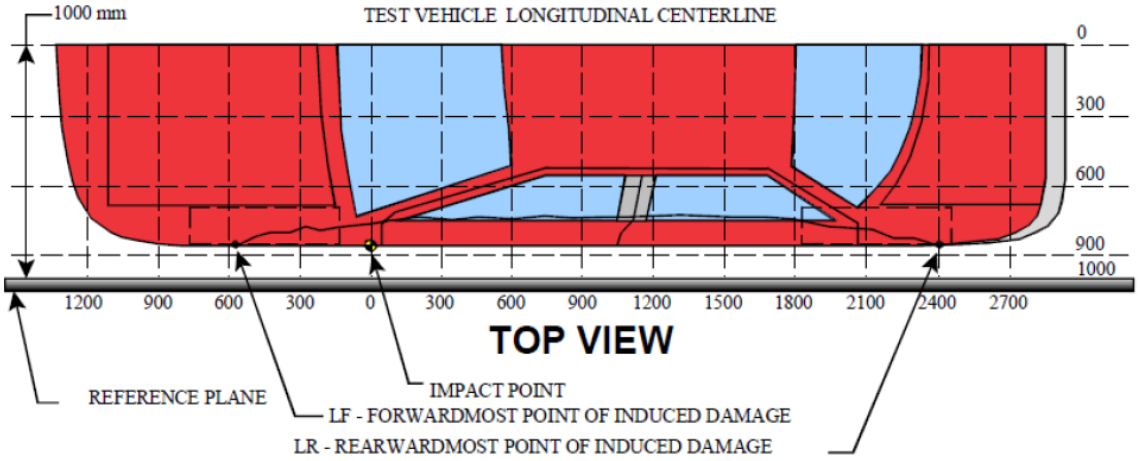
| Vertical Location | | | From Centerline | | Maximum Crush |
|---|---|---|---|---|---|
| Row | Description | Height | Distance | Direction | |
| A | Center of Bumper | 432 | 700 | Left | 245 |
| B | Top of Bumper | 560 | 800 | Left | 139 |
| C | Mid-Level | 686 | 800 | Left | 143 |
| D | Top of Stack | 813 | 800 | Left | 174 |

**DEFORMABLE BARRIER STATIC CRUSH**

| Stack Level | Distance Right of Center | | | | | | | | C/L | Distance Left of Center | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 800 | 700 | 600 | 500 | 400 | 300 | 200 | 100 | 0 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| 1 | 180 | 182 | 184 | 187 | 189 | 191 | 194 | 195 | 196 | 199 | 202 | 206 | 210 | 215 | 223 | 245 | 244 |
| 2 | 70 | 74 | 79 | 84 | 93 | 94 | 97 | 88 | 91 | 96 | 78 | 71 | 60 | 59 | 65 | 96 | 139 |
| 3 | 70 | 27 | 24 | 58 | 80 | 67 | 66 | 44 | 44 | 31 | 29 | 31 | 39 | 52 | 72 | 92 | 143 |
| 4 | 46 | 15 | 20 | 43 | 60 | 48 | 63 | 50 | 50 | 47 | 46 | 50 | 56 | 62 | 72 | 104 | 174 |

## DATA SHEET NO. 13
## VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019




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

### VEHICLE DAMAGE PROFILE DISTANCES

| DPD | Distance From Impact Point (mm) | Level | Post-Test (mm) | Pre-Test (mm) | Crush (mm) |
|---|---|---|---|---|---|
| 1 | 2250 | 4 | 796 | 801 | 5 |
| 2 | 1800 | 2 | 773 | 895 | 122 |
| 3 | 1200 | 3 | 740 | 882 | 142 |
| 4 | 750 | 3 | 731 | 885 | 154 |
| 5 | 150 | 2 | 797 | 886 | 89 |
| 6 | -300 | 3 | 897 | 904 | 7 |

### MDB DAMAGE PROFILE DISTANCES

| DPD | Distance From Center of MDB | Level | Post-Test (mm) | Pre-Test (mm) | Crush (mm) |
|---|---|---|---|---|---|
| 1 | 800 mm Left of Center | 1 | 224 | 468 | 244 |
| 2 | 500 mm Left of Center | 1 | 270 | 485 | 215 |
| 3 | 200 mm Left of Center | 1 | 283 | 485 | 202 |
| 4 | 200 mm Right of Center | 1 | 292 | 486 | 194 |
| 5 | 500 mm Right of Center | 1 | 299 | 486 | 187 |
| 6 | 800 mm Right of Center | 1 | 293 | 473 | 180 |

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019

**Test Time:** 15:56 **Temperature:** 21.7°C

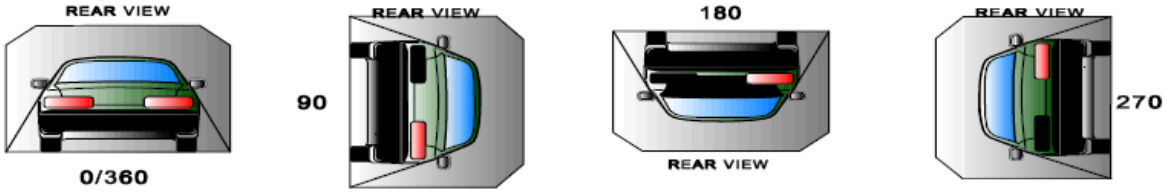
A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 ounce)

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

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

D. Spillage Details: None

**FMVSS 301 STATIC ROLLOVER DATA**




**ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS**

| Test Phase | Rotation Time | Hold Time | Total Time |
|---|---|---|---|
| 0 to 90 | 90 | 330 | 420 |
| 90 to 180 | 90 | 330 | 840 |
| 180 to 270 | 90 | 330 | 1260 |
| 270 to 360 | 90 | 330 | 1680 |

**FMVSS NO. 301 ROLLOVER SPILLAGE TABLE**

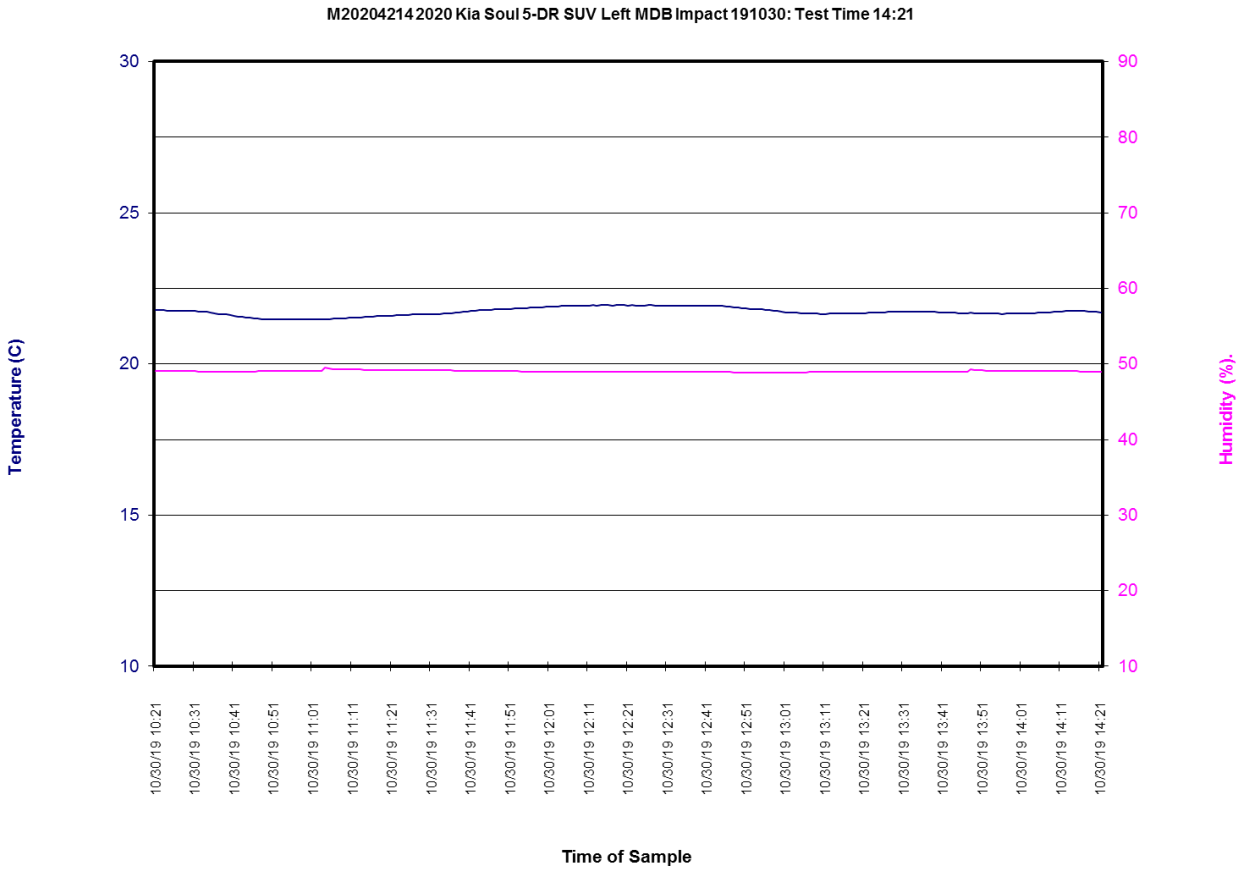
| Test Phase | First 5 Minutes | Sixth Minute | Seventh Minute | Eighth Minute |
|---|---|---|---|---|
| 0 to 90 | 0 | 0 | 0 | N/A |
| 90 to 180 | 0 | 0 | 0 | N/A |
| 180 to 270 | 0 | 0 | 0 | N/A |
| 270 to 360 | 0 | 0 | 0 | N/A |

**ROLLOVER SOLVENT SPILLAGE LOCATION TABLE**

| Test Phase | Spillage Location |
|---|---|
| 0 to 90 | None |
| 90 to 180 | None |
| 180 to 270 | None |
| 270 to 360 | None |

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204214
Test Program: SINCAP Side Impact Test Date: 10/30/2019



# APPENDIX A
# PHOTOGRAPHS

## TABLE OF PHOTOGRAPHS

## TABLE OF PHOTOGRAPHS (CONTINUED)

## TABLE OF PHOTOGRAPHS (CONTINUED)

## TABLE OF PHOTOGRAPHS (CONTINUED)


**001** As-Delivered Right Front ¾ View of Test Vehicle


**002** As-Delivered Left Rear ¾ View of Test Vehicle


**003** Pre-Test Frontal View of Test Vehicle


**004** Post-Test Frontal View of Test Vehicle


**005** Pre-Test Left Front ¾ View of Test Vehicle


**006** Post-Test Left Front ¾ View of Test Vehicle


**007** Pre-Test Left Side View of Test Vehicle


**008** Post-Test Left Side View of Test Vehicle


**009** Pre-Test Left Rear ¾ View of Test Vehicle


**010** Post-Test Left Rear ¾ View of Test Vehicle

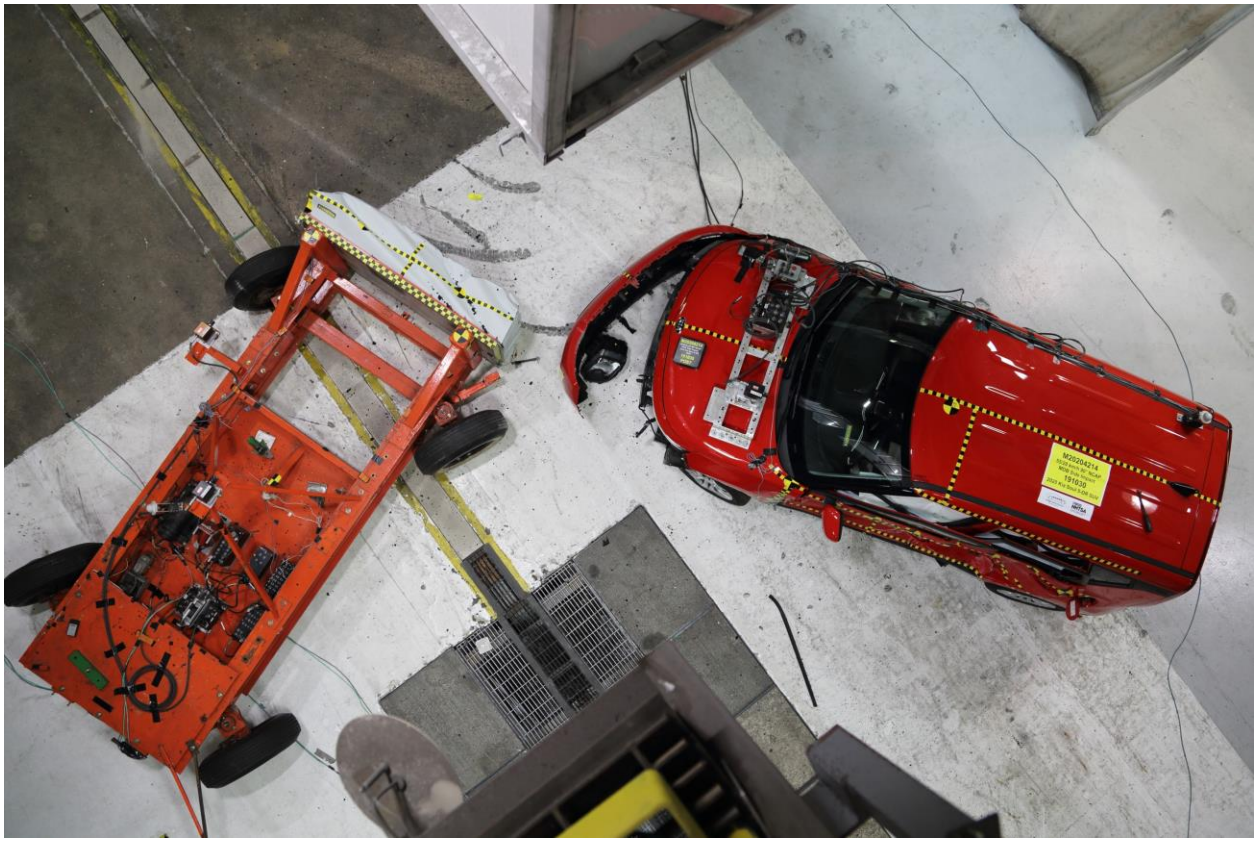

**011** Pre-Test Rear View of Test Vehicle


**012** Post-Test Rear View of Test Vehicle


**013** Pre-Test Right Side View of Test Vehicle


**014** Post-Test Right Side View of Test Vehicle

**015** Pre-Test Overhead View of Test Area



**016** Post-Test Overhead View of Test Area


**017** Pre-Test Left Side View of MDB Positioned Against Side of Test Vehicle


**018** Pre-Test Right Side View MDB Positioned Against Side of Test Vehicle


**019** Pre-Test Close-Up View of Impact Point Target


**020** Post-Test Close-Up View of Impact Point Target


**021** Pre-Test Left Front Door Latch Close-Up


**022** Post-Test Left Front Door Latch Close-Up


**023** Pre-Test Left Rear Door Latch Close-Up


**024** Post-Test Left Rear Door Latch Close-Up


**025** Pre-Test Front Close-Up View of Driver Dummy

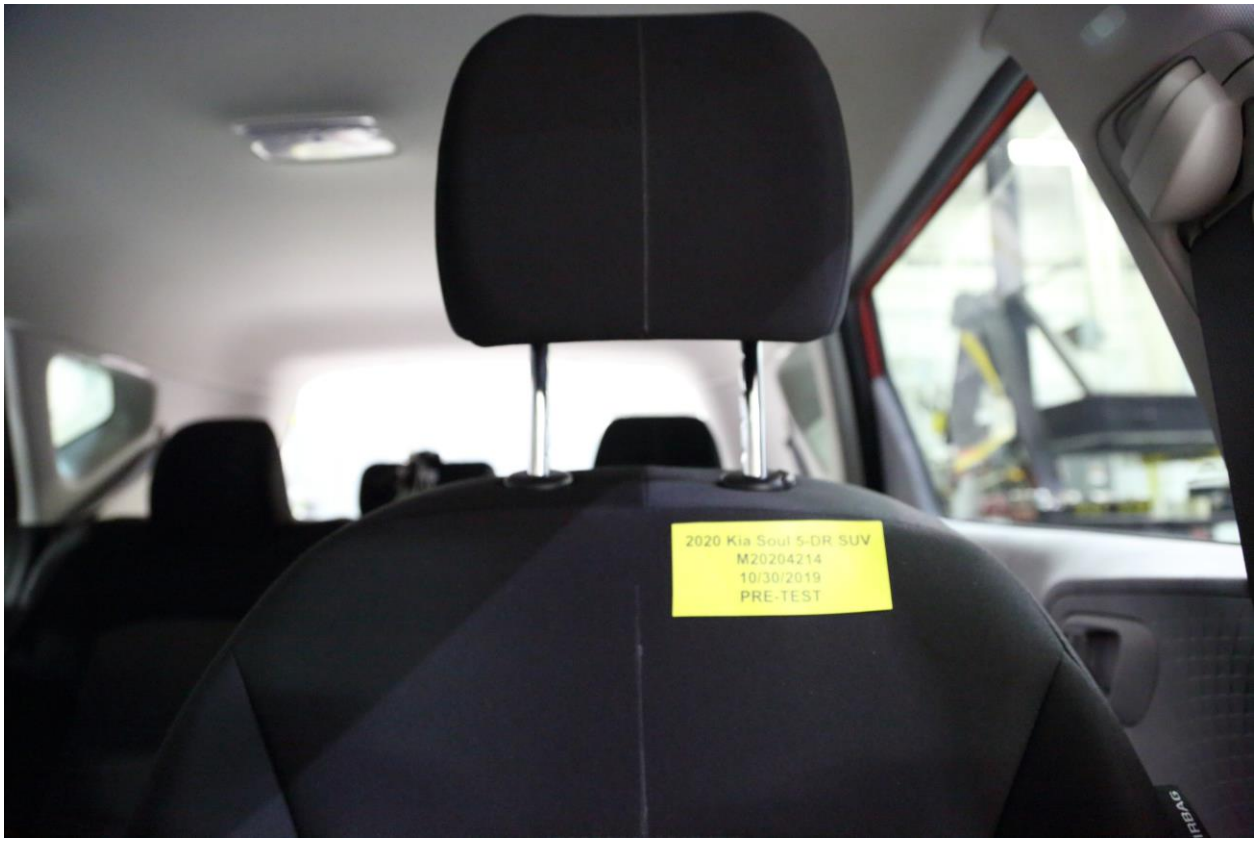

**026** Post-Test Front Close-Up View of Driver Dummy


**027** Pre-Test Left Side View of Driver Dummy Showing Belt and Chalking

Intentionally Left Blank


**028** Pre-Test Left Side View of Driver Dummy Shoulder and Door Top


**029** Post-Test Left Side View of Driver Dummy Shoulder and Door Top




**030** Pre-Test Frontal View of Driver Seat Back Prior to Dummy Positioning


**031** Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint


**032** Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning


**033** Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan


**034** Pre-Test Placement of Driver's Dummy Feet


**035** Pre-Test View of Belt Anchorage for Driver Dummy


**036** Pre-Test Left Side View of Steering Wheel


**037** View of Disengaged Parking Brake


**038** Pre-Test View of Parking Brake


**039** Pre-Test Close-Up Left Side View of Driver Seat Track


**040** Pre-Test Close-Up Left Side View of Driver Seat Back


**041** Pre-Test Close-Up View of Driver Seat Back or Head Restraint

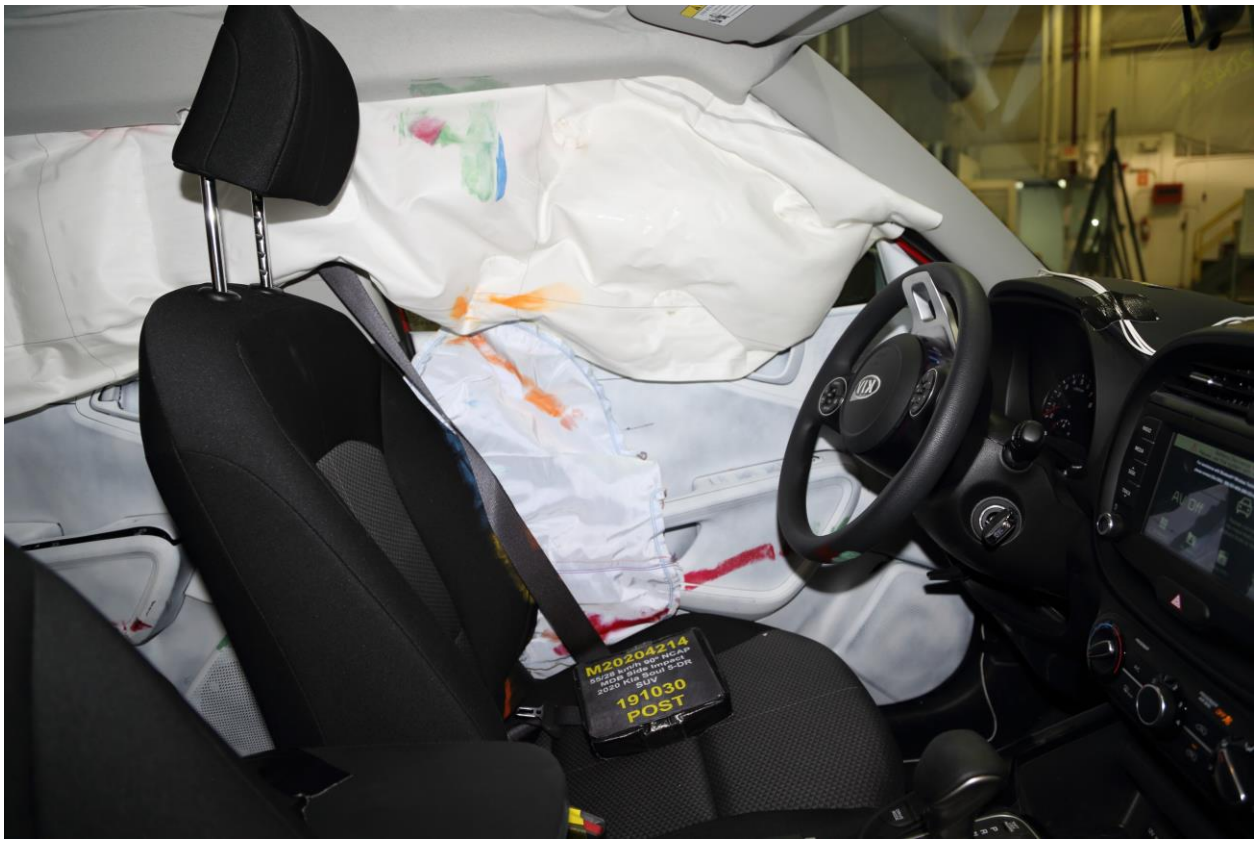

**042** Pre-Test Driver Dummy and Door Clearance View


**043** Post-Test Driver Dummy and Door Clearance View


**044** Pre-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment


**045** Post-Test Right Side View of Driver Dummy and Front Seat of Occupant Compartment


**046** Pre-Test Driver Inner Door Panel View



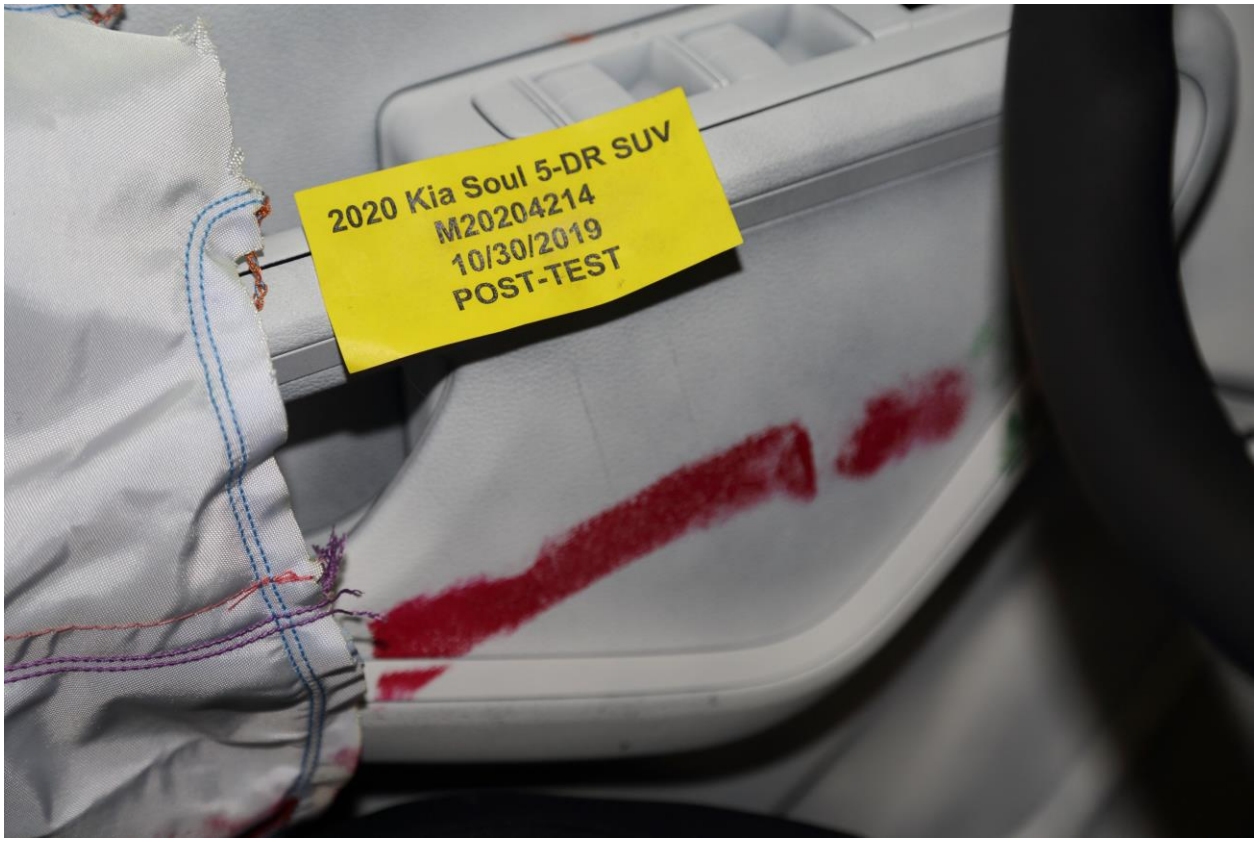

**047** Post-Test Driver Inner Door Panel View Showing Driver Dummy Contact Locations


**048** Post-Test Driver Dummy Close-Up Head Contact with Vehicle View


**049** Post-Test Driver Dummy Close-Up Head Contact with Side Airbag View


**050** Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View


**051** Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View




**052** Post-Test Driver Dummy Close-Up Pelvis Contact View


**053** Post-Test Driver Dummy Close-Up Pelvis Contact with Side Airbag View


**054** Post-Test Driver Dummy Close-Up Knee Contact View


**055** Pre-Test Left Side View of Passenger Dummy Showing Belt and Chalking

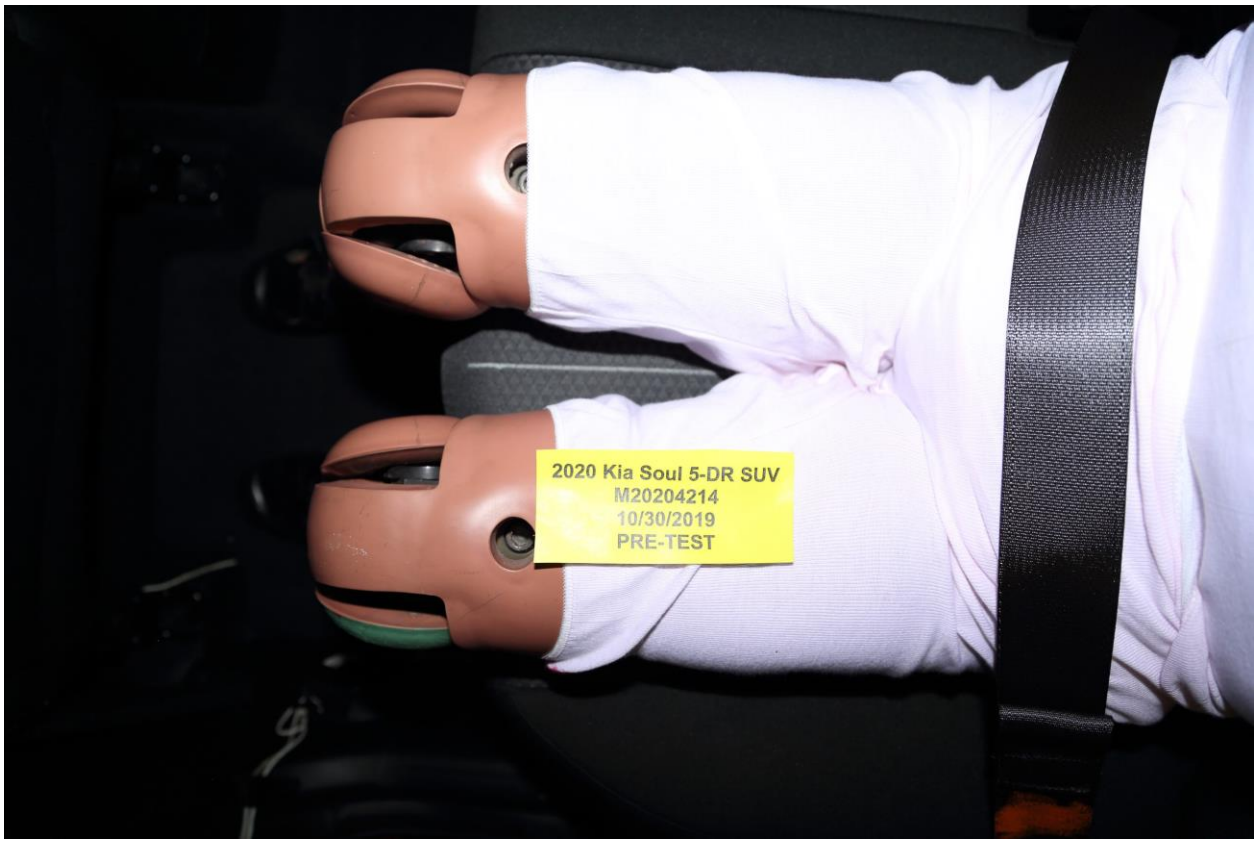

**056** Pre-Test Left Side View of Passenger Dummy Shoulder and Door Top View


**057** Post-Test Left Side View of Passenger Dummy Shoulder and Door Top View

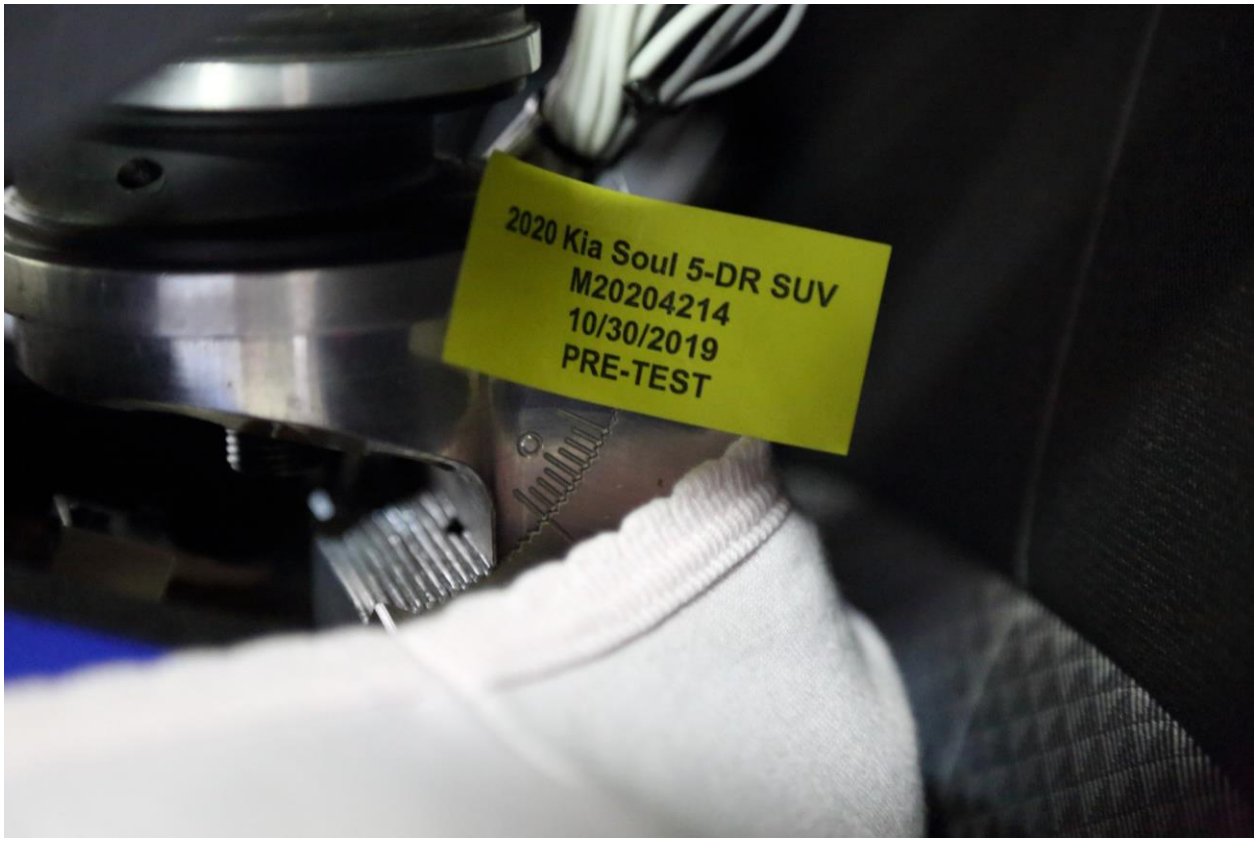

**058** Pre-Test Frontal View of Rear Passenger Seat Back Prior to Dummy Positioning


**059** Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint


**060** Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning




**061** Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan

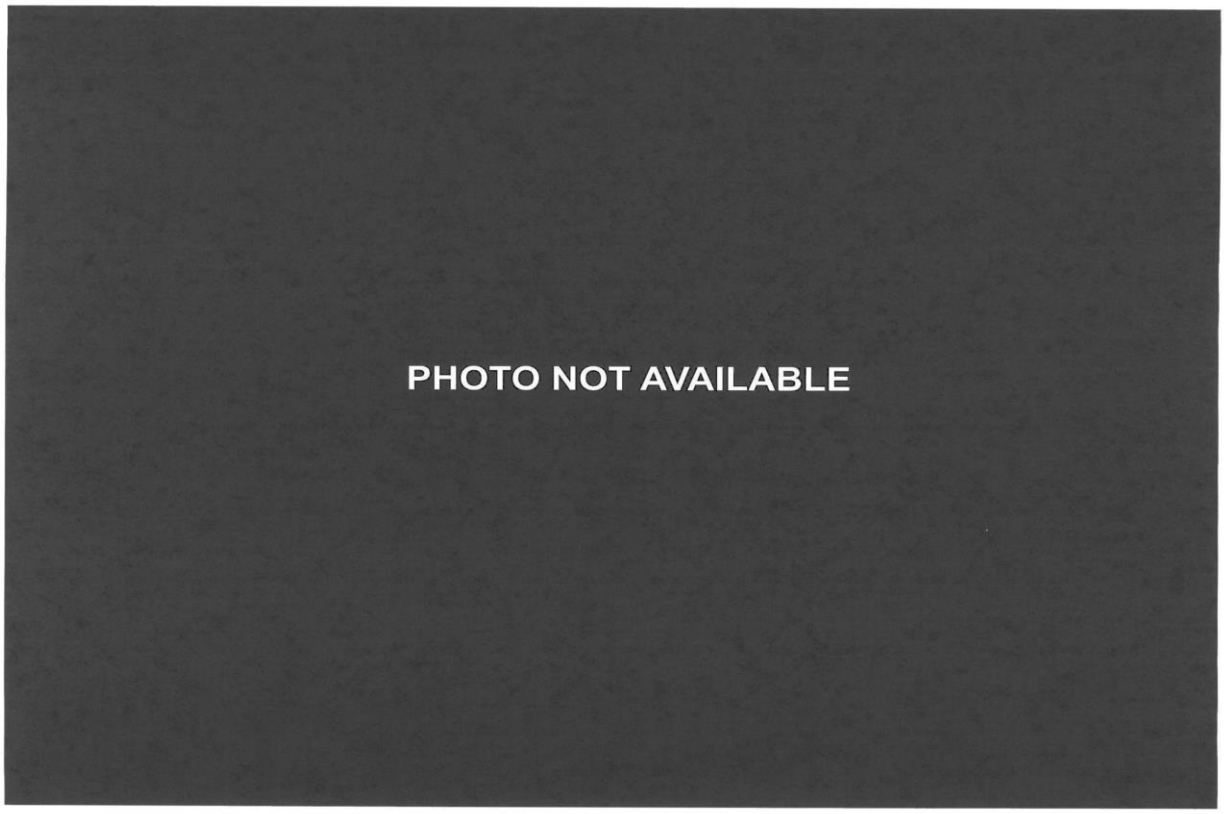



**062** Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket

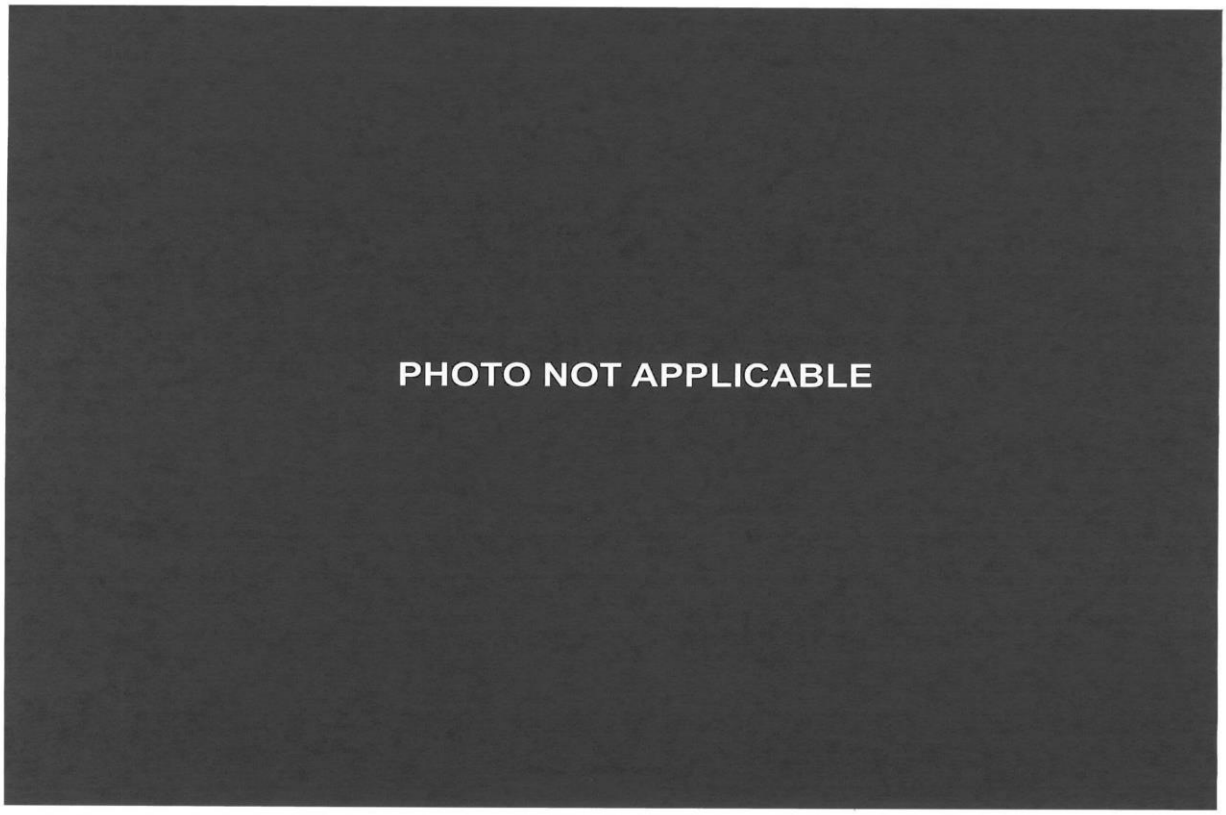

**063** Pre-Test View of Rear Passenger Dummy's Head Showing Dummy Head is Level


**064** Pre-Test Placement of Rear Passenger Dummy's Feet

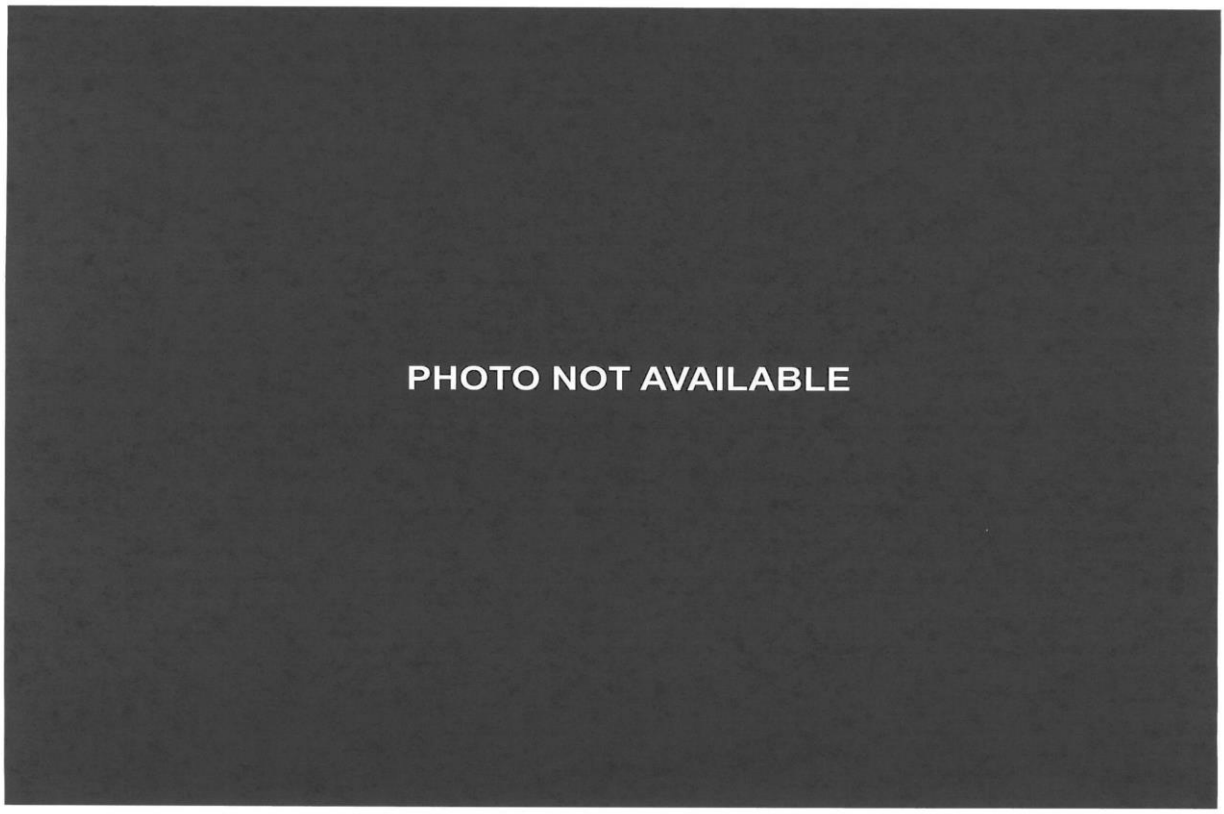

**065** Pre-Test View of Belt Anchorage for Rear Passenger Dummy




**066** Pre-Test Close-Up Left Side View of Rear Passenger Seat Track




**067** Pre-test Close-Up Left Side View of Rear Passenger Seat Back




**068** Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint

Intentionally Left Blank


**069** Pre-Test Rear Passenger Dummy and Door Clearance View

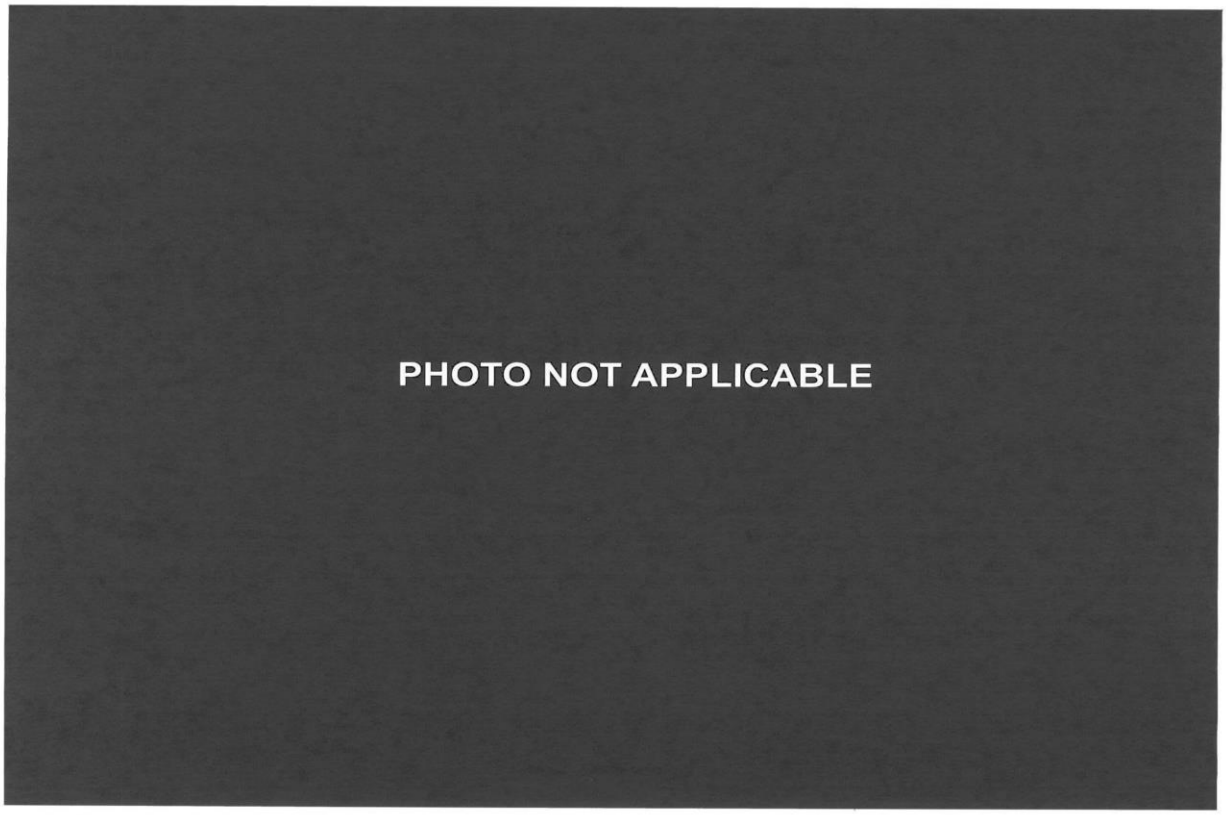

**070** Post-Test Rear Passenger Dummy and Door Clearance View


**071** Pre-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment

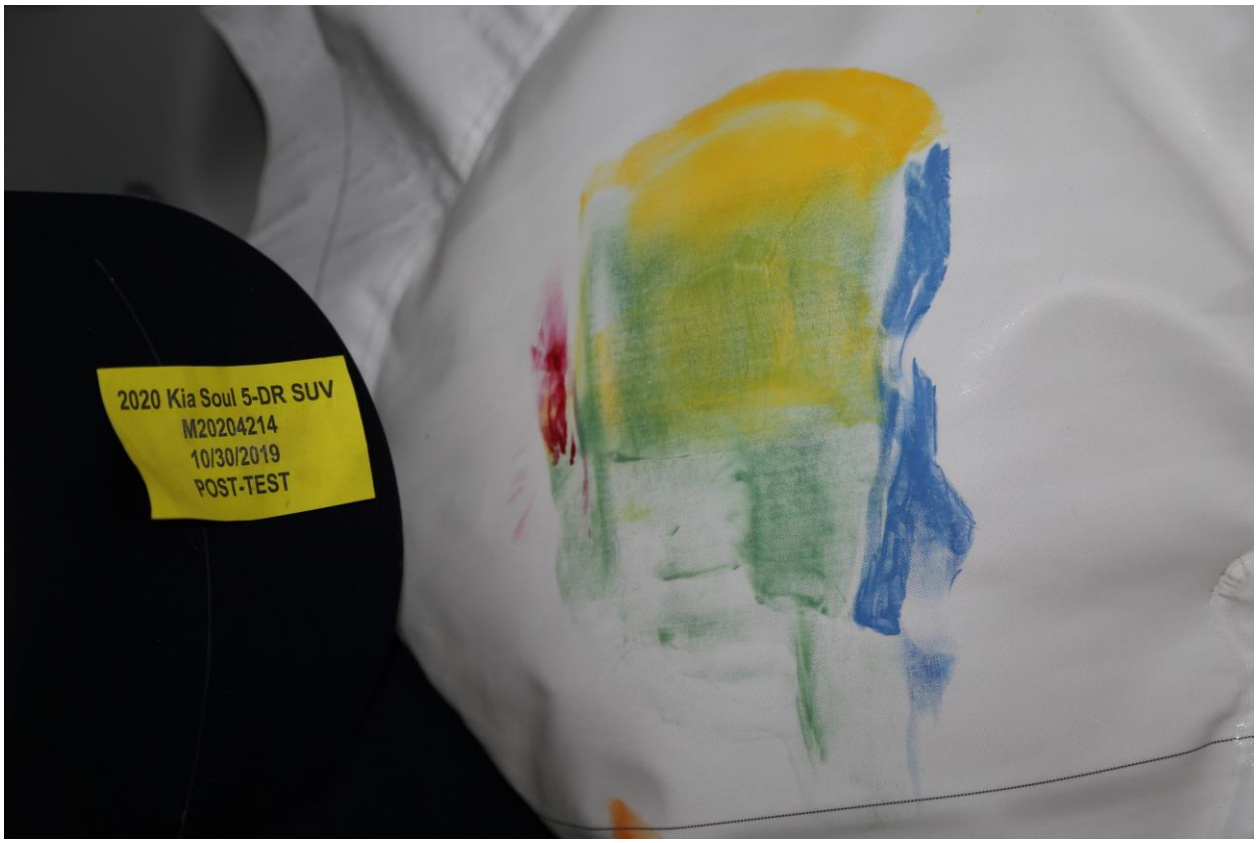

**072** Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment


**073** Pre-Test Rear Passenger Inner Door Panel View

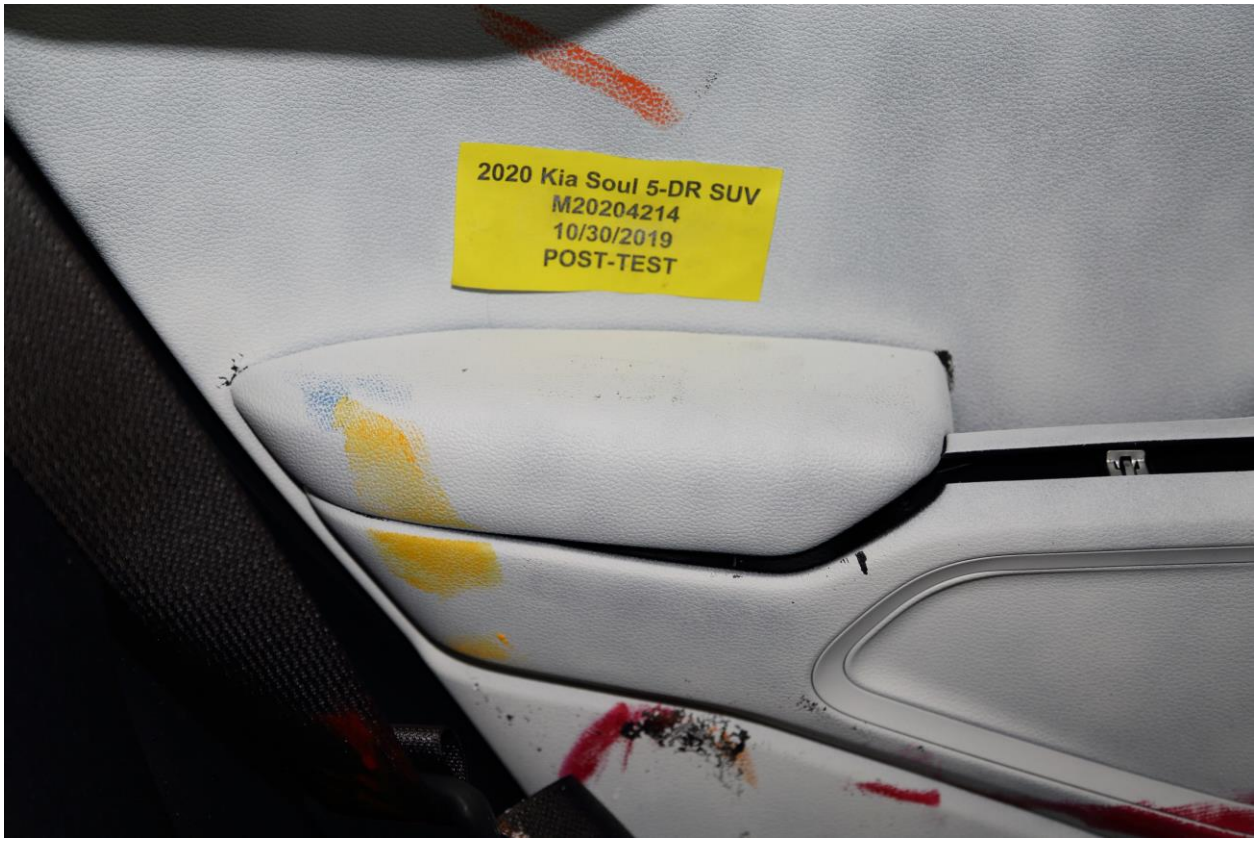

**074** Post-Test Rear Passenger Inner Door Panel View



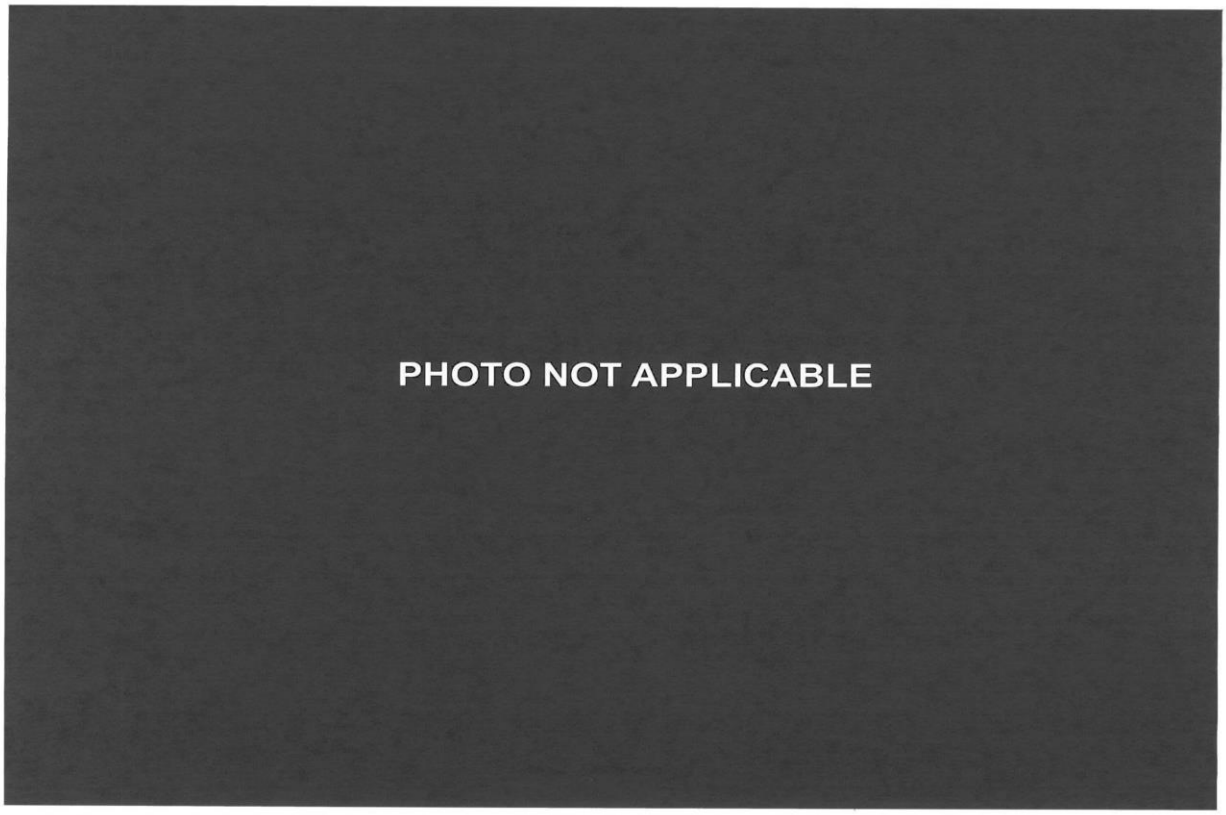

**075** Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View




**076** Post-Test Rear Passenger Dummy Close-Up Head Contact with Side Airbag View

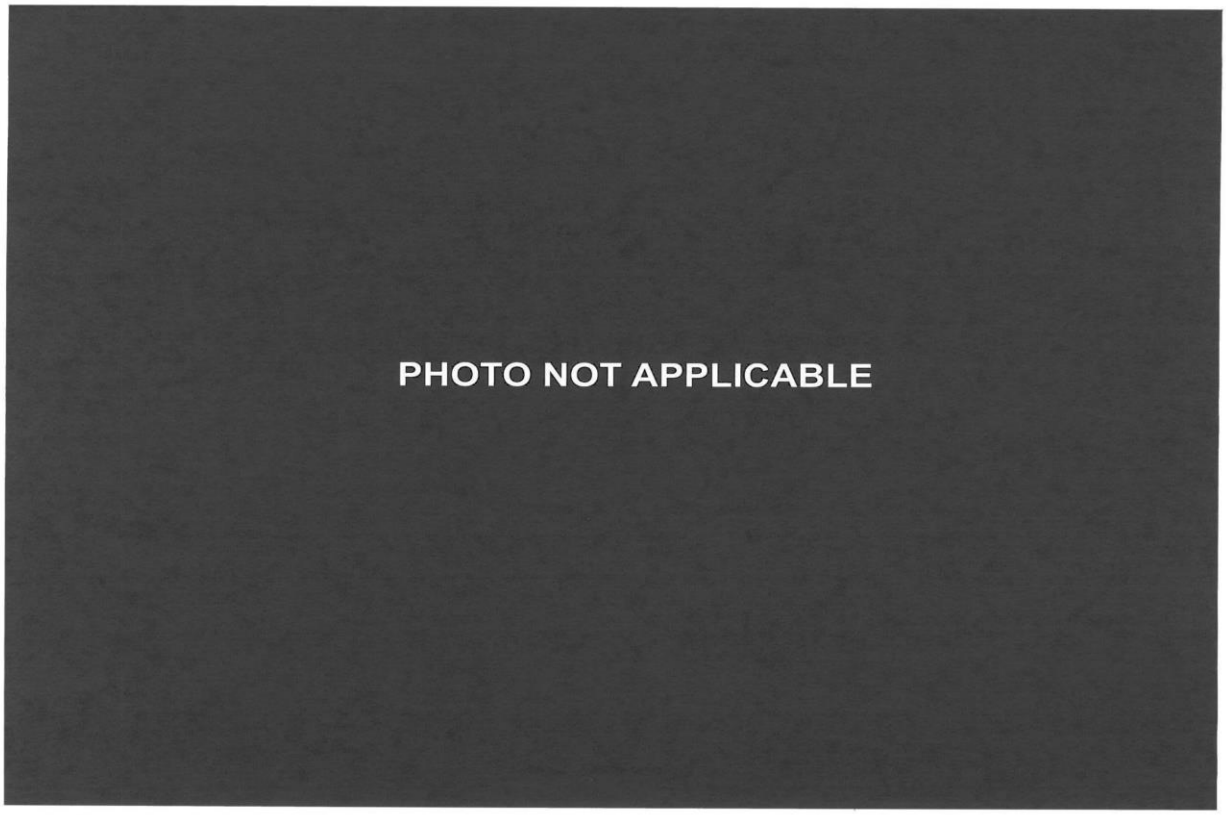



**077** Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View




**078** Post-Test Rear Passenger Dummy Close-Up Torso Contact with Side Airbag View


**079** Post-Test Rear Passenger Dummy Close-Up Pelvis Contact View




**080** Post-Test Rear Passenger Dummy Close-Up Pelvis Contact with Side Airbag View

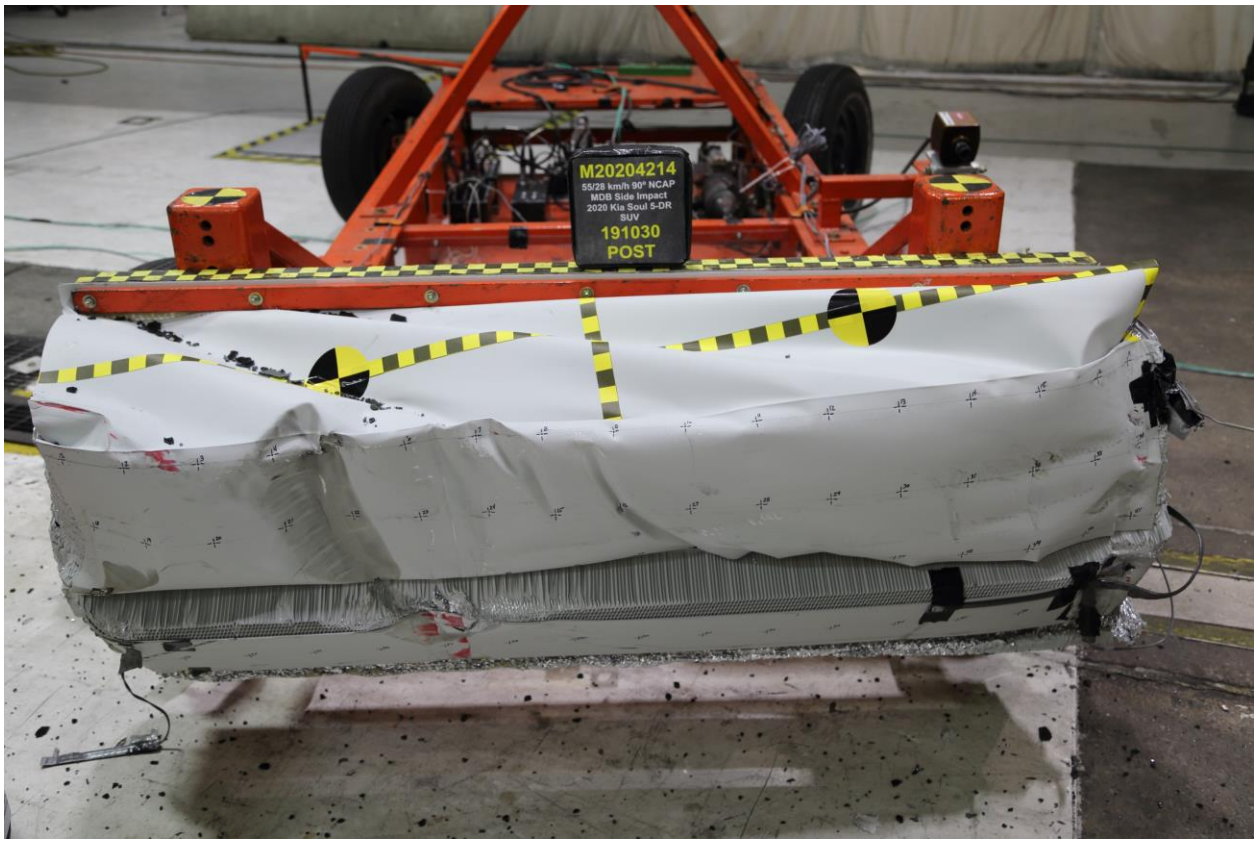

**081** Post-Test Rear Passenger Dummy Close-Up Knee Contact View

Intentionally Left Blank


**082** Pre-Test View of Fuel Filler Cap or Fuel Filler Neck


**083** Post-Test View of Fuel Filler Cap or Fuel Filler Neck


**084** Pre-Test Front View of MDB Impactor Face




**085** Post-Test Front View of MDB Impactor Face


**086** Pre-Test Top View of MDB Impactor Face


**087** Post-Test Top View of MDB Impactor Face


**088** Pre-Test Left Side View of MDB Impactor Face


**089** Post-Test Left Side View of MDB Impactor Face


**090** Pre-Test Right Side View of MDB Impactor Face


**091** Post-Test Right Side View of MDB Impactor Face

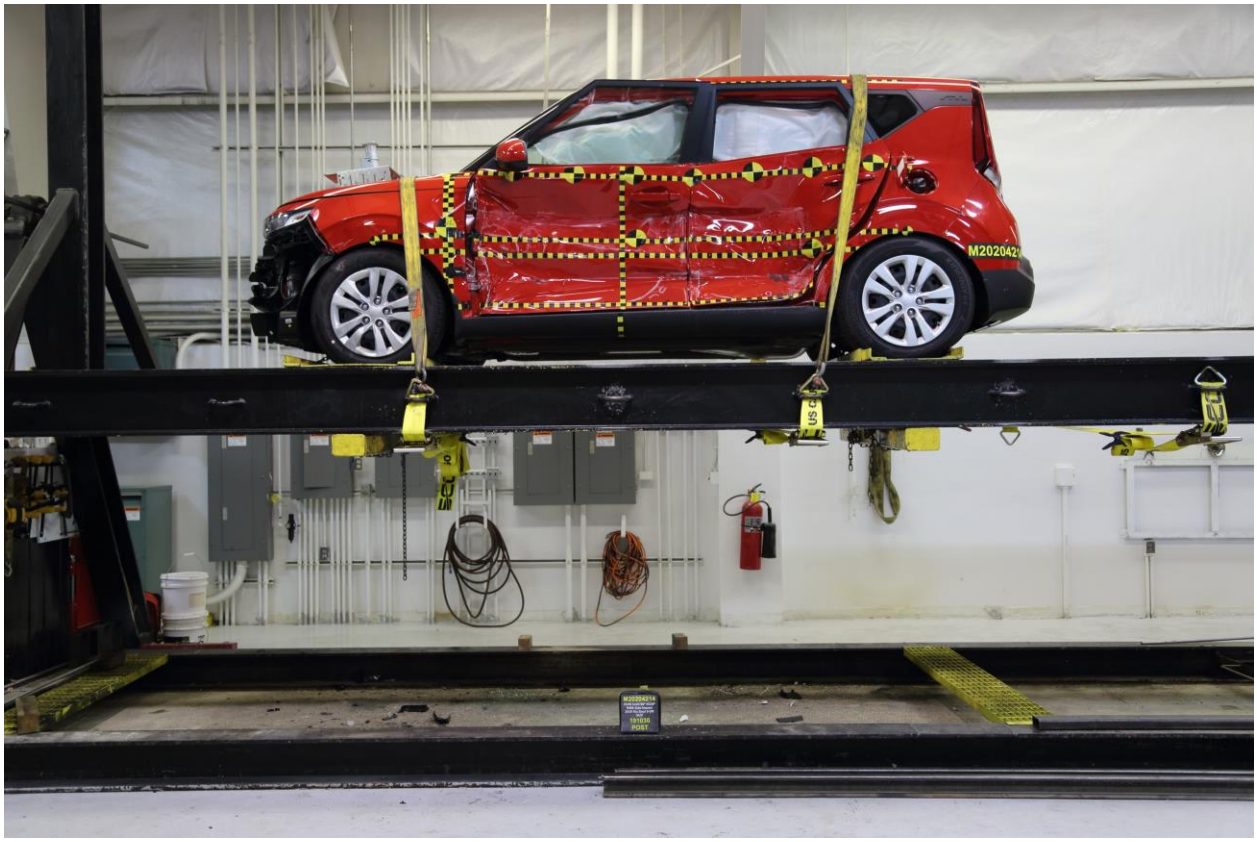

**092** Close-Up View of Vehicle's Certification Label


**093** Close-Up View of Vehicle's Tire Information Placard or Label

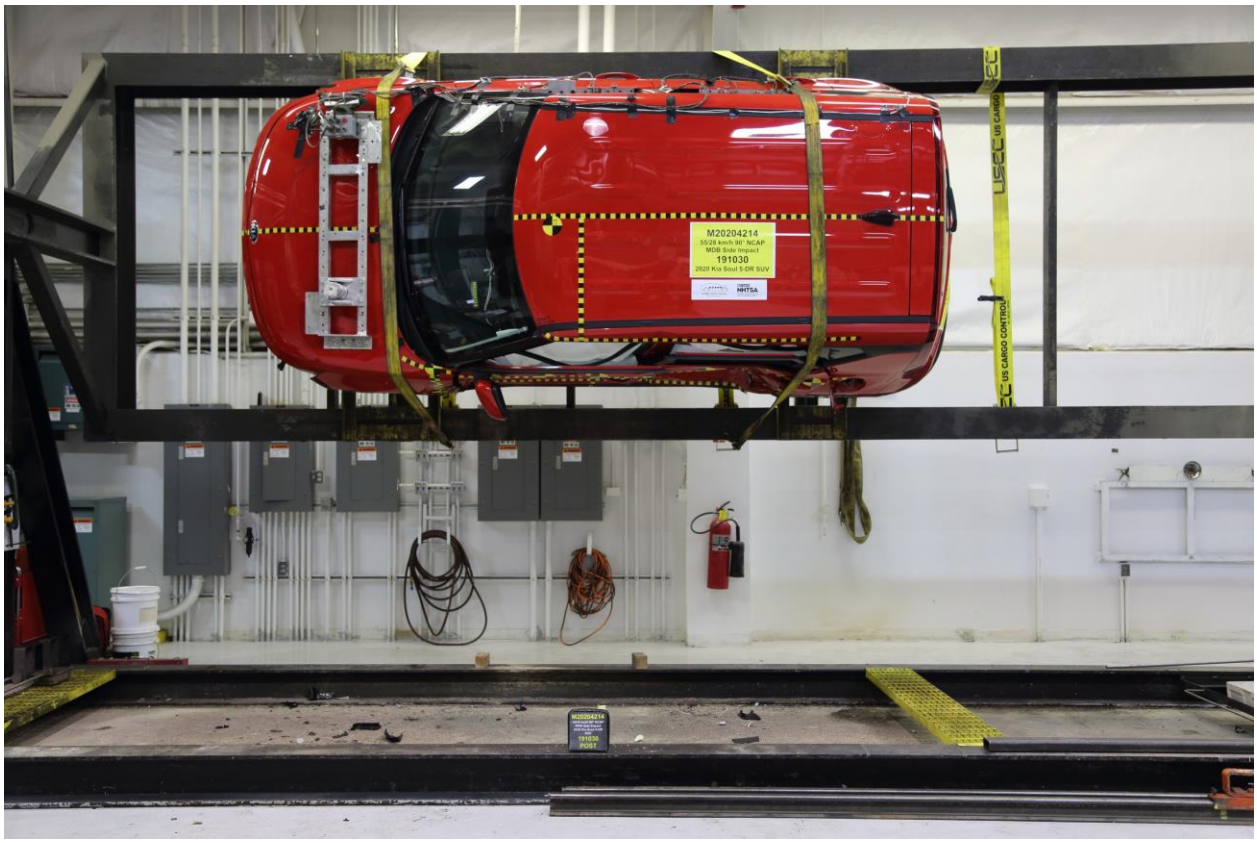

**094** Pre-Test Ballast View



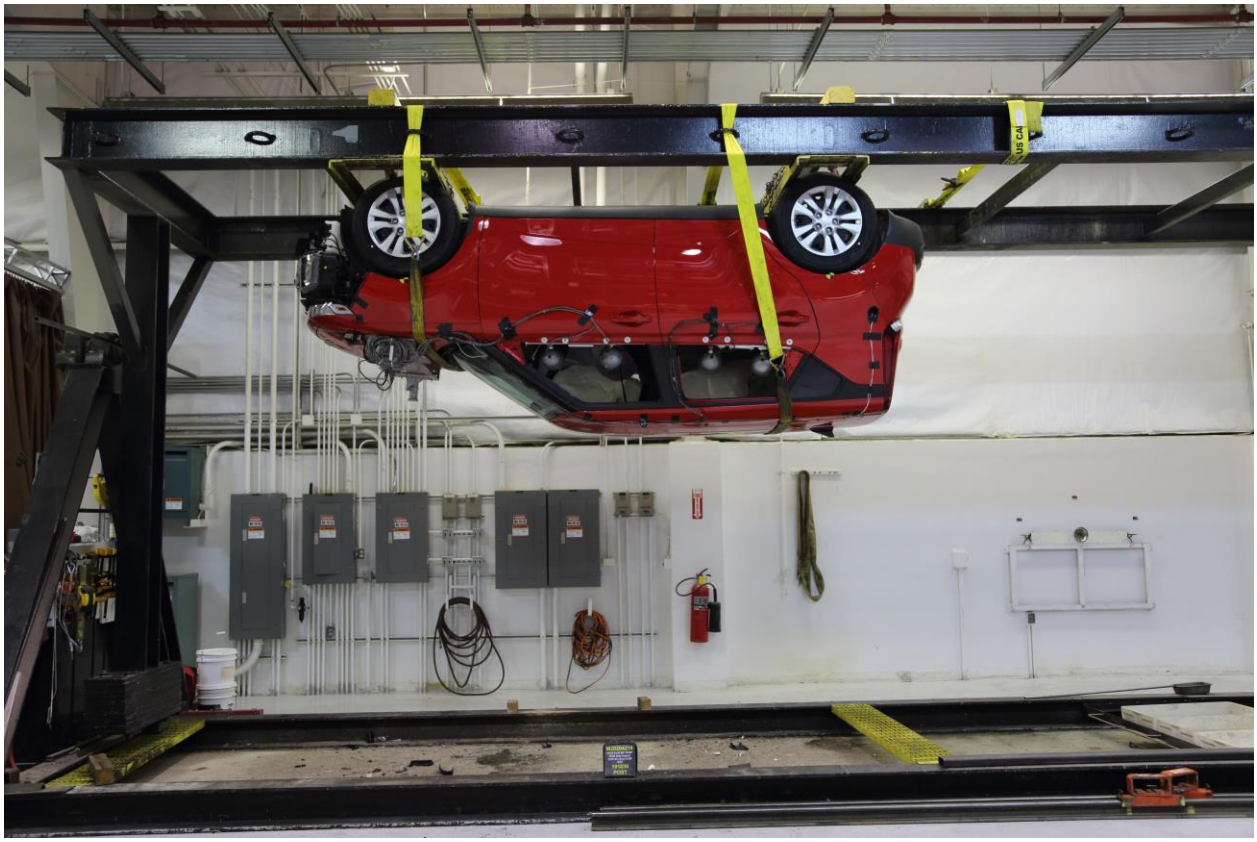
**095** No. Post-Test Primary and Redundant Speed Trap Read-Out



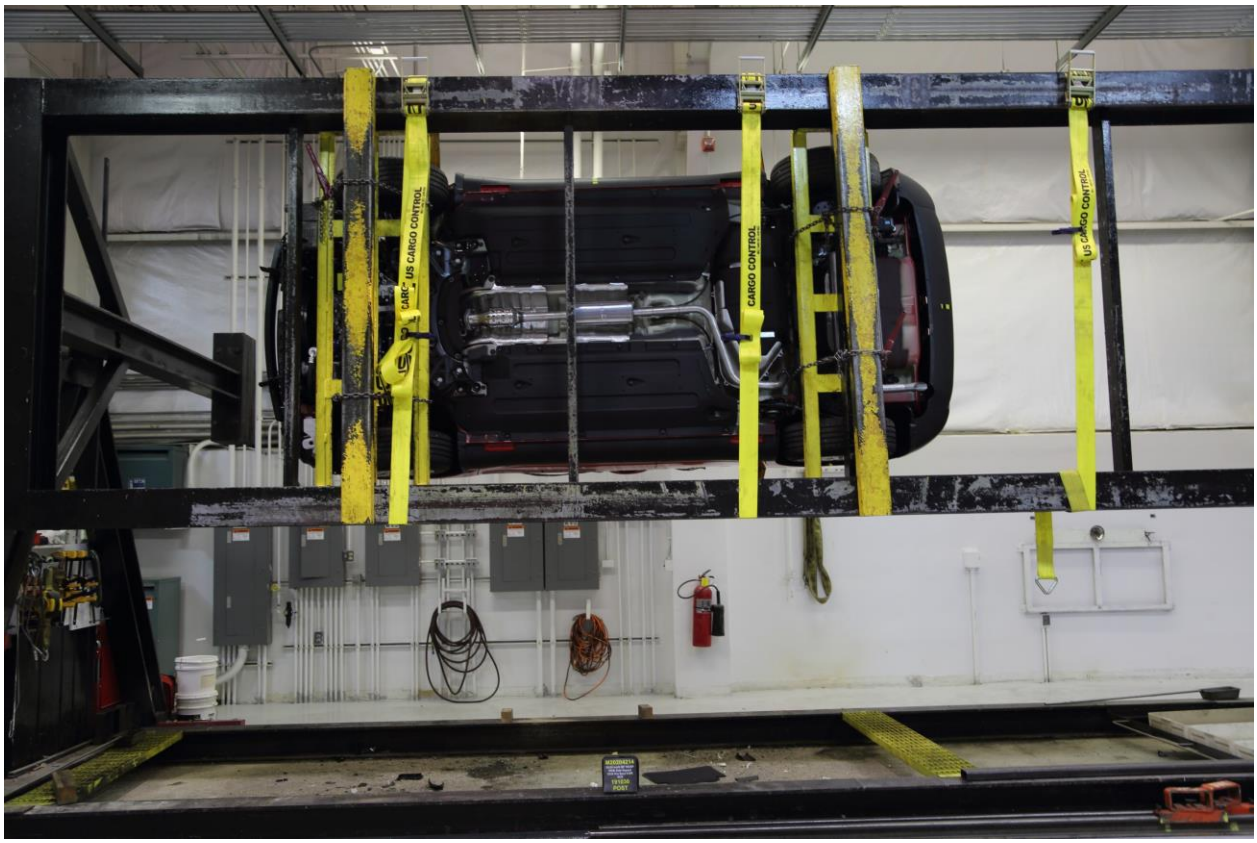
**096** FMVSS No. 301 Static Rollover 0 Degrees



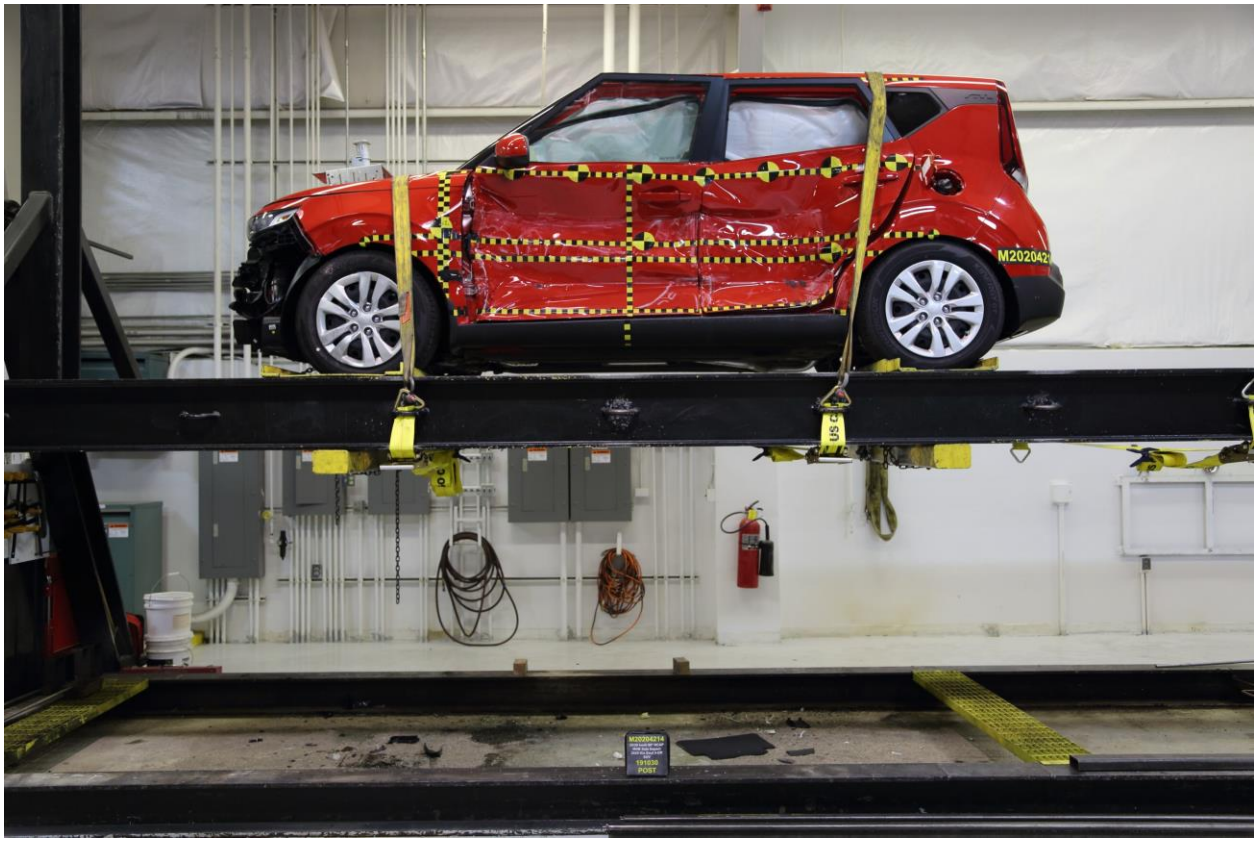

**097** FMVSS No. 301 Static Rollover 90 Degrees



**098** FMVSS No. 301 Static Rollover 180 Degrees

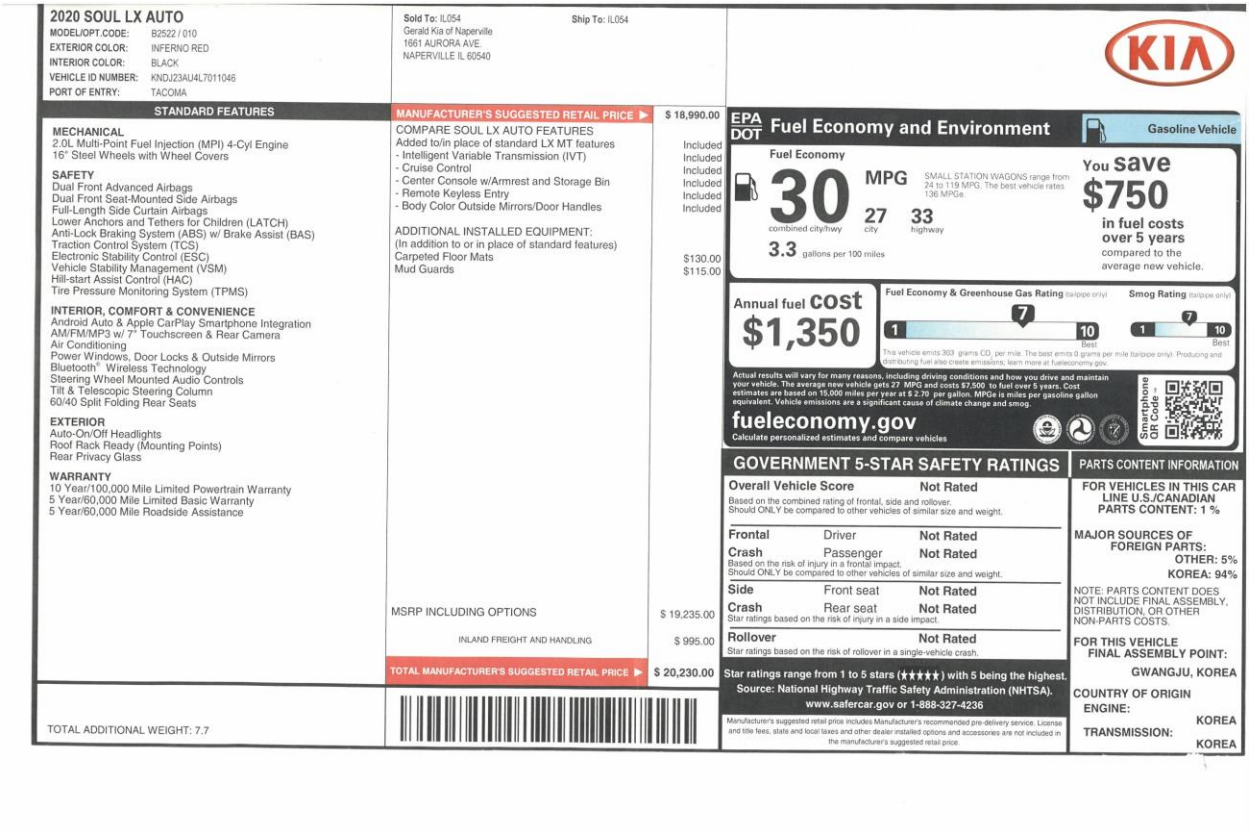



**099** FMVSS No. 301 Static Rollover 270 Degrees



**100** FMVSS No. 301 Static Rollover 360 Degrees


**101** Impact Event



2020 SOUL LX AUTO
MODEL/OPT.CODE: B2522 / 010
EXTERIOR COLOR: INFERNO RED
INTERIOR COLOR: BLACK
VEHICLE ID NUMBER: KNDJ23AU4L7011046
PORT OF ENTRY: TACOMA

Sold To: IL054
Gerald Kia of Naperville
1661 AURORA AVE.
NAPERVILLE IL 60540

Ship To: IL054

STANDARD FEATURES

MECHANICAL
2.0L Multi-Point Fuel Injection (MPI) 4-Cyl Engine
16" Steel Wheels with Wheel Covers

SAFETY
Dual Front Advanced Airbags
Dual Front Seat-Mounted Side Airbags
Full-Length Side Curtain Airbags
Lower Anchors and Tethers for Children (LATCH)
Anti-Lock Braking System (ABS) w/ Brake Assist (BAS)
Traction Control System (TCS)
Electronic Stability Control (ESC)
Vehicle Stability Management (VSM)
Hill-start Assist Control (HAC)
Tire Pressure Monitoring System (TPMS)

INTERIOR, COMFORT & CONVENIENCE
Android Auto & Apple CarPlay Smartphone Integration
AM/FM/MP3 w/ 7" Touchscreen & Rear Camera
Air Conditioning
Power Windows, Door Locks & Outside Mirrors
Bluetooth® Wireless Technology
Steering Wheel Mounted Audio Controls
Tilt & Telescopic Steering Column
60/40 Split Folding Rear Seats

EXTERIOR
Auto-On/Off Headlights
Roof Rack Ready (Mounting Points)
Rear Privacy Glass

WARRANTY
10 Year/100,000 Mile Limited Powertrain Warranty
5 Year/60,000 Mile Limited Basic Warranty
5 Year/60,000 Mile Roadside Assistance

| | |
|---|---|
| MANUFACTURER'S SUGGESTED RETAIL PRICE ▶ | $ 18,990.00 |
| COMPARE SOUL LX AUTO FEATURES | |
| Added to/in place of standard LX MT features | |
| - Intelligent Variable Transmission (IVT) | Included |
| - Cruise Control | Included |
| - Center Console w/Armrest and Storage Bin | Included |
| - Remote Keyless Entry | Included |
| - Body Color Outside Mirrors/Door Handles | Included |
| ADDITIONAL INSTALLED EQUIPMENT: | |
| (In addition to or in place of standard features) | |
| Carpeted Floor Mats | $130.00 |
| Mud Guards | $115.00 |
| MSRP INCLUDING OPTIONS | $ 19,235.00 |
| INLAND FREIGHT AND HANDLING | $ 995.00 |
| TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE ▶ | $ 20,230.00 |

TOTAL ADDITIONAL WEIGHT: 7.7

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy
30 MPG combined city/hwy
27 city
33 highway
3.3 gallons per 100 miles
SMALL STATION WAGONS range from 24 to 119 MPG. The best vehicle rates 136 MPGe.

You save $750 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $1,350

Fuel Economy & Greenhouse Gas Rating (tailpipe only) 7 (1 – 10, Best)
Smog Rating (tailpipe only) 7 (1 – 10, Best)
This vehicle emits 393 grams CO2 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 app QR Code

GOVERNMENT 5-STAR SAFETY RATINGS

| | | |
|---|---|---|
| Overall Vehicle Score | | Not Rated |
| Based on the combined rating 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 |
| Star ratings based on the risk of injury in a side impact. | | |
| Rollover | | Not Rated |
| Star ratings 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

Manufacturer's suggested retail price includes Manufacturer's recommended pre-delivery service. License and title fees, state and local taxes and other dealer installed options and accessories are not included in the manufacturer's suggested retail price.

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 1 %

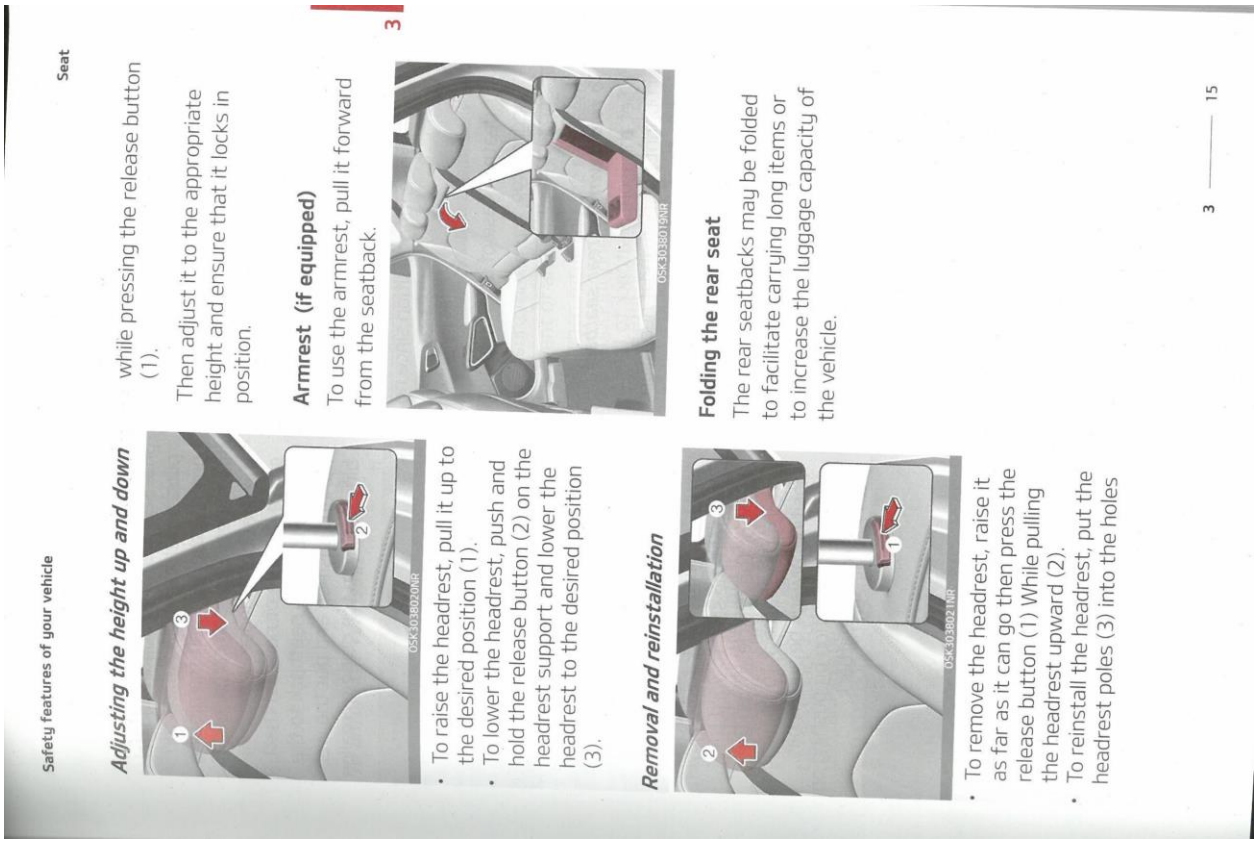
MAJOR SOURCES OF FOREIGN PARTS:
OTHER: 5%
KOREA: 94%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE FINAL ASSEMBLY POINT:
GWANGJU, KOREA

COUNTRY OF ORIGIN
ENGINE: KOREA
TRANSMISSION: KOREA

**102** Monroney Label



Seat

while pressing the release button (1).

Then adjust it to the appropriate height and ensure that it locks in position.

**Armrest (if equipped)**

To use the armrest, pull it forward from the seatback.

OSK3038019NR

**Folding the rear seat**

The rear seatbacks may be folded to facilitate carrying long items or to increase the luggage capacity of the vehicle.

3 — 15

Safety features of your vehicle

***Adjusting the height up and down***

OSK3038020NR

- To raise the headrest, pull it up to the desired position (1).
- To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest to the desired position (3).

***Removal and reinstallation***

OSK3038021NR

- To remove the headrest, raise it as far as it can go then press the release button (1) While pulling the headrest upward (2).
- To reinstall the headrest, put the headrest poles (3) into the holes

**103** Driver Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

Safety features of your vehicle

Seat

while pressing the release button (1).

Then adjust it to the appropriate height and ensure that it locks in position.

**Armrest (if equipped)**

To use the armrest, pull it forward from the seatback.

3

OSK3038019NR

***Adjusting the height up and down***

OSK3038020NR

- To raise the headrest, pull it up to the desired position (1).
- To lower the headrest, push and hold the release button (2) on the headrest support and lower the headrest to the desired position (3).

***Removal and reinstallation***

OSK3038021NR

- To remove the headrest, raise it as far as it can go then press the release button (1) While pulling the headrest upward (2).
- To reinstall the headrest, put the headrest poles (3) into the holes

**Folding the rear seat**

The rear seatbacks may be folded to facilitate carrying long items or to increase the luggage capacity of the vehicle.

3 — 15

**104** Left Rear Passenger Head Restraint Use and Adjustment Information from Vehicle Owner's Manual

# APPENDIX B
# VEHICLE AND DUMMY RESPONSE DATA PLOTS

## TABLE OF DATA PLOTS

### Driver & Passenger Dummy Instrumentation Plots

The following additional data can be obtained from the Research and Development section of the NHTSA website (http://www.nhtsa.gov)

**Additional Driver & Passenger Dummy Instrumentation Data**

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

## Vehicle Instrumentation Data

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

## MDB Instrumentation Data

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

**NHTSA**

Test Date: 10/30/2019

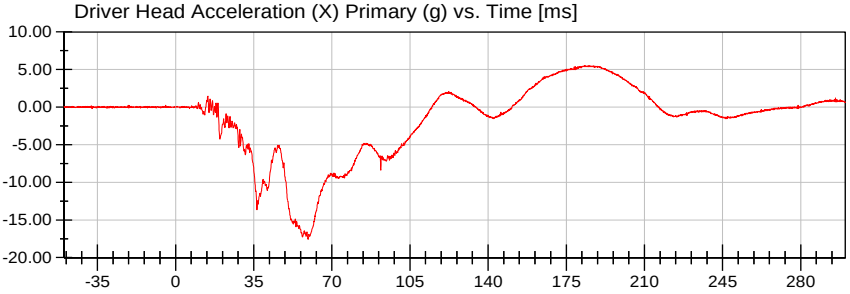
Test Lab: CTF

Position #1 ES-2 Dummy with Rib Extension (F030)

Test Number: 191030 (M20204214)

Position #4 SID IIs Dummy (305)

Driver Head Acceleration (X) Primary (g) vs. Time [ms]




**<Max>**

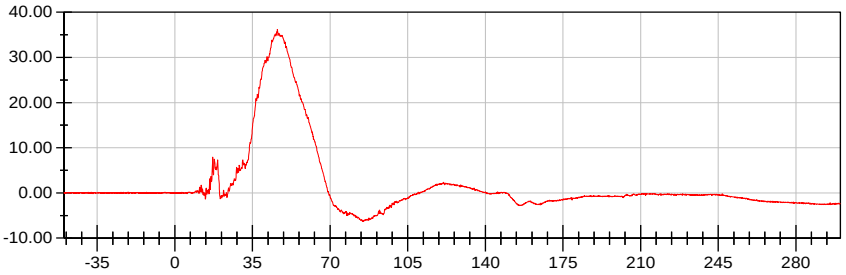
5.52 g at 183.12 ms

**<Min>**

-17.59 g at 59.36 ms

CFC_1000

Driver Head Acceleration (Y) Primary (g) vs. Time [ms]




**<Max>**

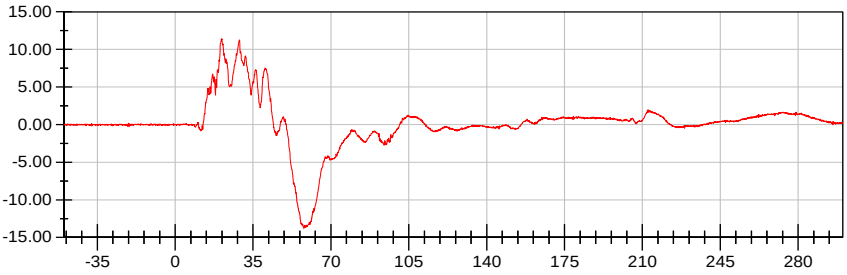
36.19 g at 46.24 ms

**<Min>**

-6.29 g at 84.56 ms

CFC_1000

Driver Head Acceleration (Z) Primary (g) vs. Time [ms]




**<Max>**

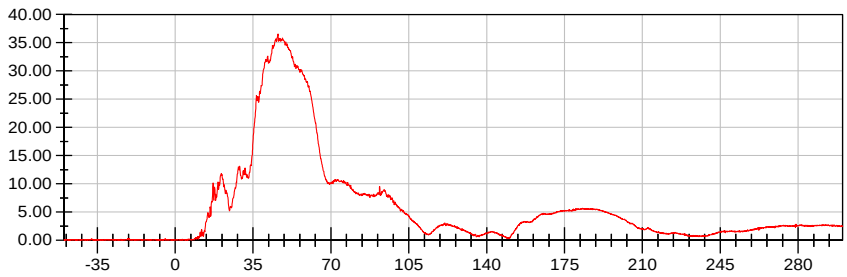
11.38 g at 20.72 ms

**<Min>**

-13.78 g at 57.76 ms

CFC_1000

Driver Head Resultant Acceleration Primary (g) vs. Time [ms]




**<Max>**

36.57 g at 46.24 ms

**<Min>**

0.03 g at -49.76 ms

CFC_1000

**NHTSA**

Test Date: 10/30/2019

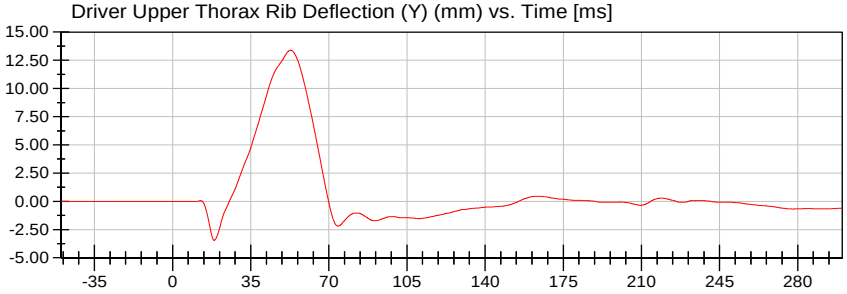
Test Lab: CTF

Position #1 ES-2 Dummy with Rib Extension (F030)

Test Number: 191030 (M20204214)

Position #4 SID IIs Dummy (305)

Driver Upper Thorax Rib Deflection (Y) (mm) vs. Time [ms]




**<Max>**

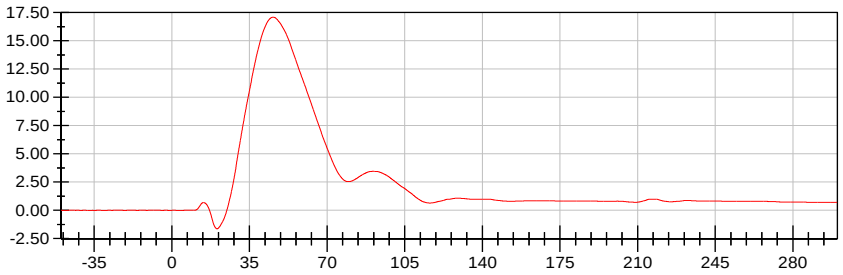
13.38 mm at 52.88 ms

**<Min>**

-3.45 mm at 18.64 ms

CFC_180

Driver Middle Thorax Rib Deflection (Y) (mm) vs. Time [ms]




**<Max>**

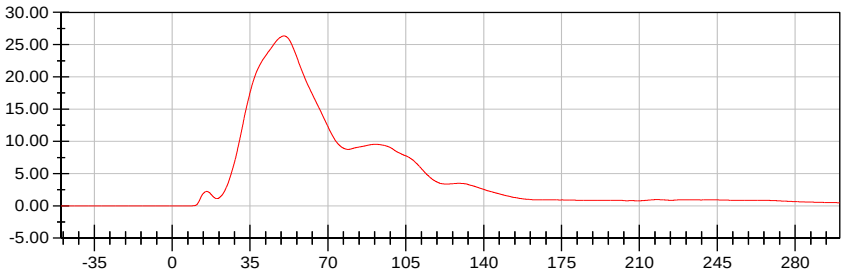
17.09 mm at 45.60 ms

**<Min>**

-1.64 mm at 20.40 ms

CFC_180

Driver Lower Thorax Rib Deflection (Y) (mm) vs. Time [ms]




**<Max>**

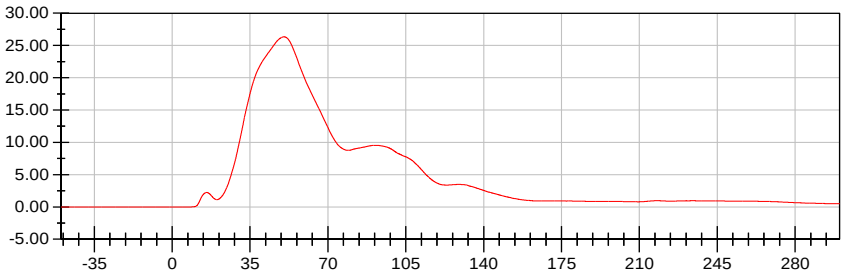
26.34 mm at 50.32 ms

**<Min>**

0.00 mm at 6.64 ms

CFC_180

Driver Thorax Rib Deflection Maximum (mm) vs. Time [ms]




**<Max>**

26.34 mm at 50.32 ms

**<Min>**

0.00 mm at 6.64 ms

CFC_180

**NHTSA**

Test Date: 10/30/2019

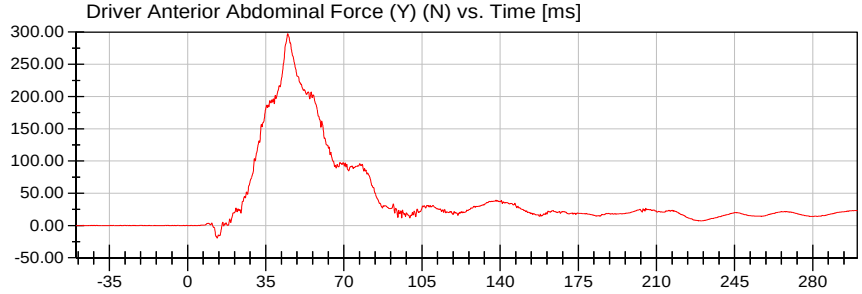
Test Lab: CTF

Position #1 ES-2 Dummy with Rib Extension (F030)

Test Number: 191030 (M20204214)

Position #4 SID IIs Dummy (305)

Driver Anterior Abdominal Force (Y) (N) vs. Time [ms]




**<Max>**

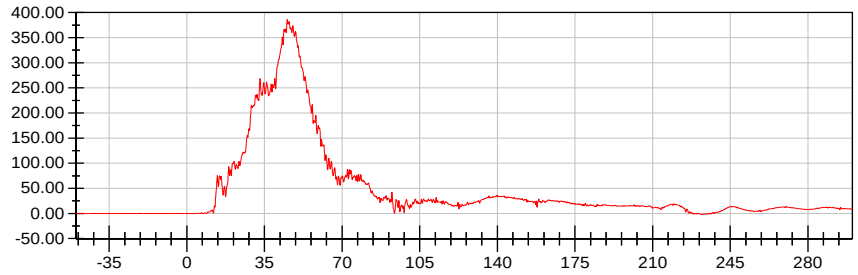
297.36 N at 44.88 ms

**<Min>**

-19.50 N at 13.28 ms

CFC_600

Driver Middle Abdominal Force (Y) (N) vs. Time [ms]




**<Max>**

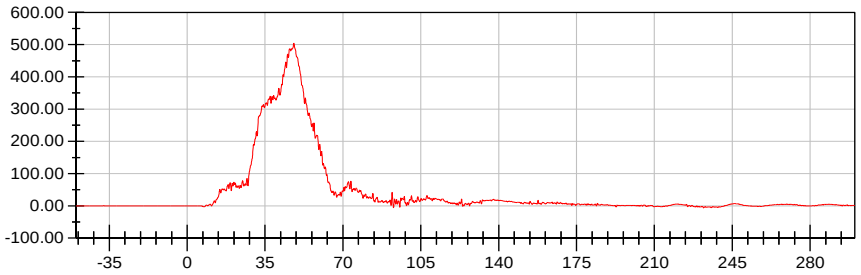
385.96 N at 45.28 ms

**<Min>**

-2.30 N at 232.16 ms

CFC_600

Driver Posterior Abdominal Force (Y) (N) vs. Time [ms]




**<Max>**

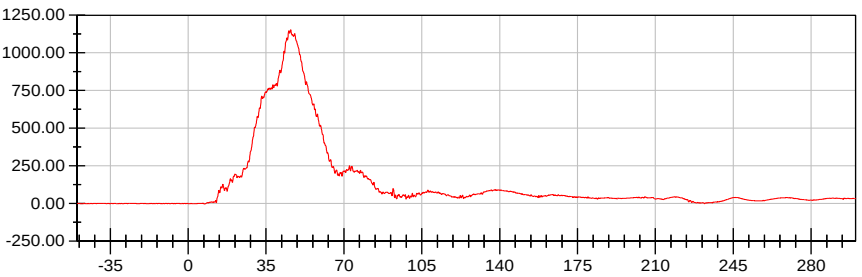
503.95 N at 47.92 ms

**<Min>**

-6.45 N at 232.08 ms

CFC_600

Driver Total Abdmoninal Force (Y) (N) vs. Time [ms]




**<Max>**

1,152.18 N at 46.08 ms

**<Min>**

-2.12 N at 7.28 ms

CFC_600

**NHTSA**

Test Date: 10/30/2019

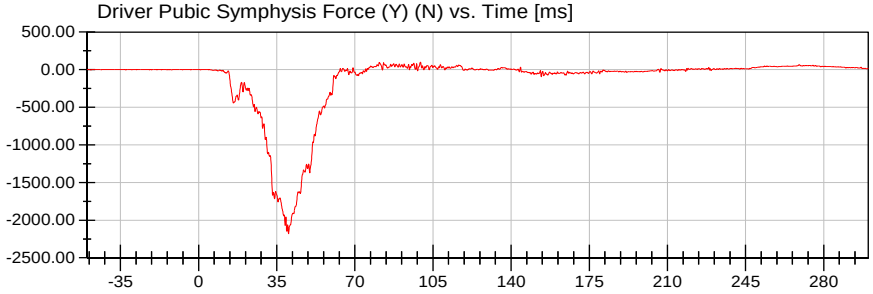
Test Lab: CTF

Position #1 ES-2 Dummy with Rib Extension (F030)

Test Number: 191030 (M20204214)

Position #4 SID IIs Dummy (305)

Driver Pubic Symphysis Force (Y) (N) vs. Time [ms]




**<Max>**

98.29 N at 99.36 ms

**<Min>**

-2,180.58 N at 40.32 ms

CFC_600

**NHTSA**

Test Date: 10/30/2019

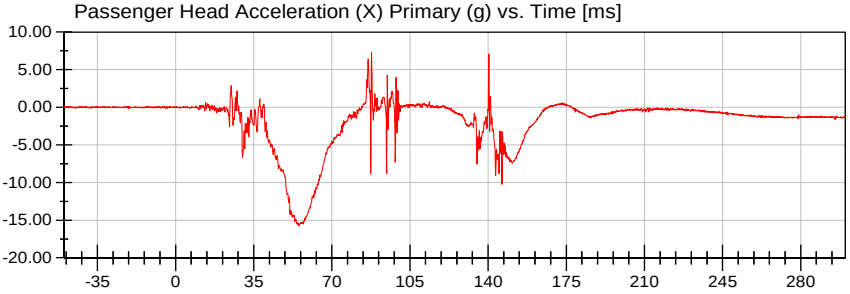
Test Lab: CTF

Position #1 ES-2 Dummy with Rib Extension (F030)

Test Number: 191030 (M20204214)

Position #4 SID IIs Dummy (305)

Passenger Head Acceleration (X) Primary (g) vs. Time [ms]




**<Max>**

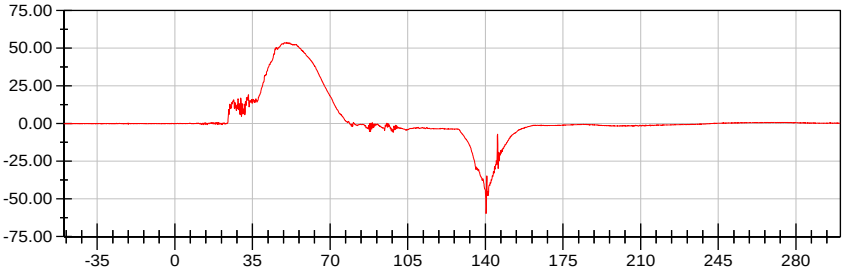
7.27 g at 87.76 ms

**<Min>**

-15.78 g at 55.28 ms

CFC_1000

Passenger Head Acceleration (Y) Primary (g) vs. Time [ms]




**<Max>**

53.89 g at 50.24 ms

**<Min>**

-59.67 g at 140.32 ms

CFC_1000

Passenger Head Acceleration (Z) Primary (g) vs. Time [ms]


**<Max>**

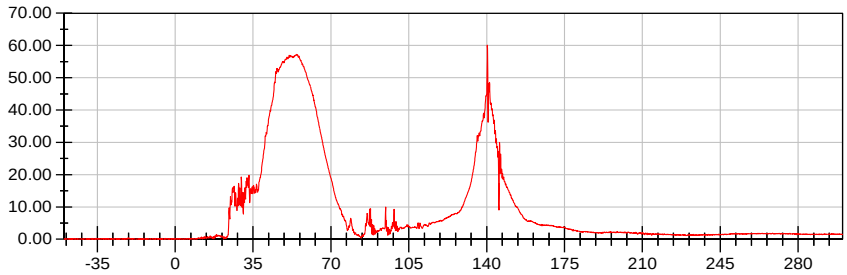
10.40 g at 139.36 ms

**<Min>**

-18.39 g at 56.08 ms

CFC_1000

Passenger Head Resultant Acceleration Primary (g) vs. Time [ms]




**<Max>**

60.14 g at 140.32 ms

**<Min>**

0.04 g at -48.16 ms

CFC_1000

**NHTSA**

Test Date: 10/30/2019

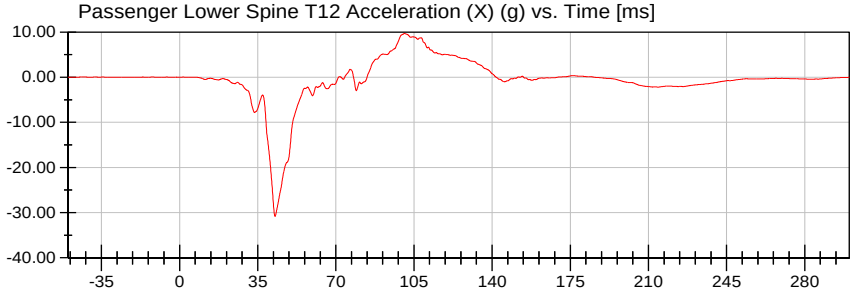
Test Lab: CTF

Position #1 ES-2 Dummy with Rib Extension (F030)

Test Number: 191030 (M20204214)

Position #4 SID IIs Dummy (305)

Passenger Lower Spine T12 Acceleration (X) (g) vs. Time [ms]




**<Max>**

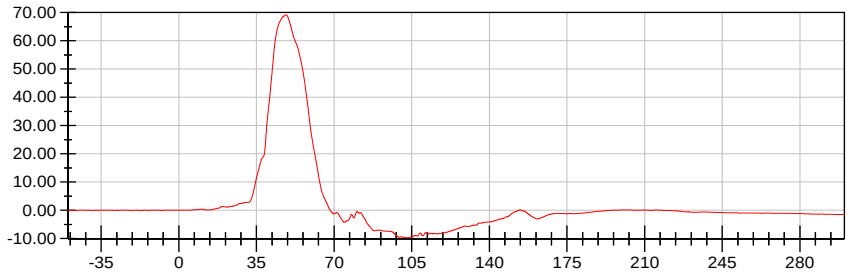
9.69 g at 100.80 ms

**<Min>**

-30.81 g at 42.80 ms

CFC_180

Passenger Lower Spine T12 Acceleration (Y) (g) vs. Time [ms]




**<Max>**

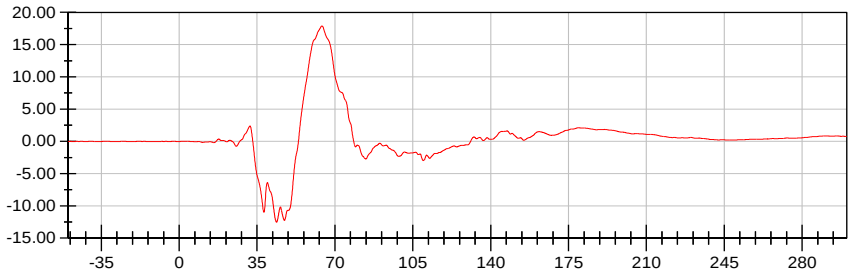
69.15 g at 48.40 ms

**<Min>**

-9.67 g at 103.20 ms

CFC_180

Passenger Lower Spine T12 Acceleration (Z) (g) vs. Time [ms]




**<Max>**

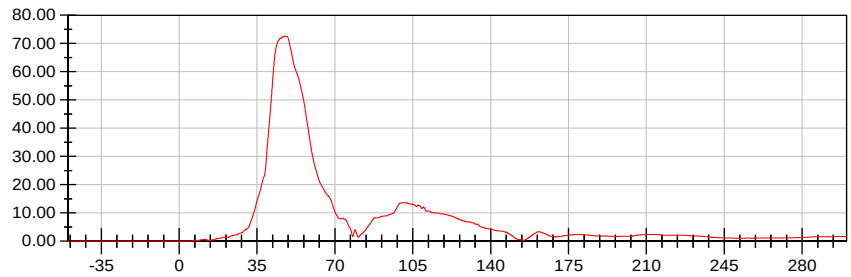
17.91 g at 64.16 ms

**<Min>**

-12.55 g at 43.76 ms

CFC_180

Passenger Lower Spine T12 Resultant Acceleration (g) vs. Time [ms]




**<Max>**

72.53 g at 47.28 ms

**<Min>**

0.00 g at -39.52 ms

CFC_180

**NHTSA**

Test Date: 10/30/2019

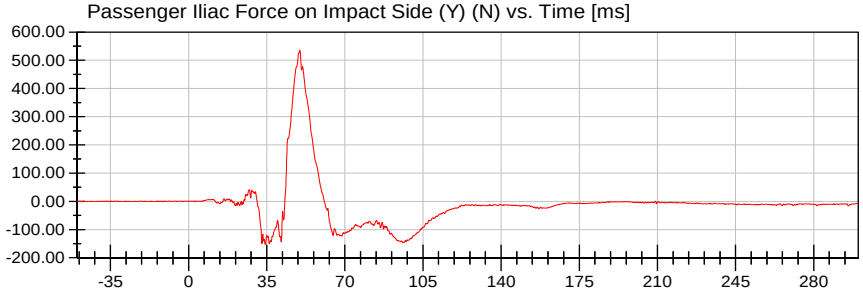
Test Lab: CTF

Position #1 ES-2 Dummy with Rib Extension (F030)

Test Number: 191030 (M20204214)

Position #4 SID IIs Dummy (305)

Passenger Iliac Force on Impact Side (Y) (N) vs. Time [ms]




**<Max>**

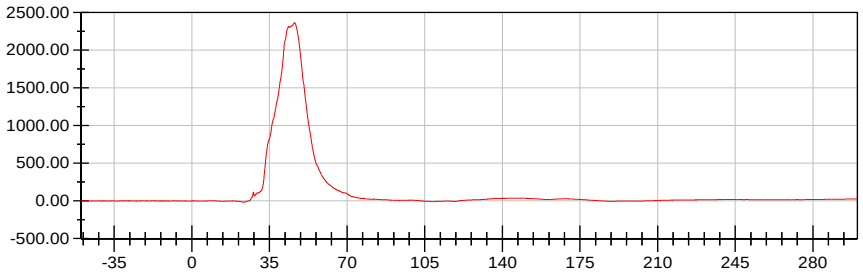
534.50 N at 49.84 ms

**<Min>**

-152.77 N at 34.32 ms

CFC_600

Passenger Acetabulum Force on Impact Side (Y) (N) vs. Time [ms]




**<Max>**

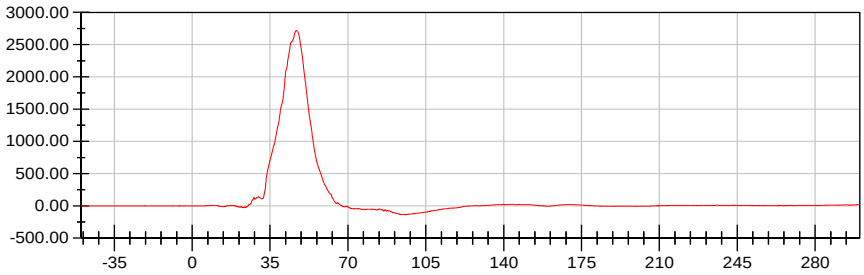
2,365.25 N at 46.40 ms

**<Min>**

-16.37 N at 23.60 ms

CFC_600

Passenger Total Pelvic Force on Impact Side (Y) (N) vs. Time [ms]




**<Max>**

2,716.73 N at 46.88 ms

**<Min>**

-138.05 N at 95.92 ms

CFC_600

# APPENDIX C
# DUMMY PERFORMANCE CALIBRATION TEST DATA

## TABLE OF CALIBRATION MEASUREMENTS AND PLOTS

### ES-2re (Driver) Dummy

### Description

## TABLE OF CALIBRATION MEASUREMENTS AND PLOTS

### SID-IIs (Rear Passenger) Dummy

### Description

**Table 1.** External Measurements
**Table 2.** Head Drop Test
- Head (X) Acceleration (G's) vs. Time (ms)
- Head (Y) Acceleration (G's) vs. Time (ms)
- Head (Z) Acceleration (G's) vs. Time (ms)
- Resultant Head Acceleration (G's) vs. Time (ms)

**Table 3.** Lateral Neck Pendulum Test
- Pendulum Velocity (m/s) vs. Time (ms)
- Flexion Angle (°) vs. Time (ms)
- Moment About Occipital Condyle (Nm) vs. Time (ms)

**Table 4.** Shoulder Impact Test
- Impactor Acceleration (G's) vs. Time (ms)
- Shoulder Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)

**Table 5.** Thorax (With Arm) Impact Test
- Impactor Acceleration (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)
- Lower Rib Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

**Table 6.** Thorax (Without Arm) Impact Test
- Impactor Acceleration (G's) vs. Time (ms)
- Upper Rib Displacement (mm) vs. Time (ms)
- Middle Rib Displacement (mm) vs. Time (ms)
- Lower Rib Displacement (mm) vs. Time (ms)
- Upper Spine Acceleration (G's) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

**Table 7.** Abdomen Impact Test
- Impactor Acceleration (G's) vs. Time (ms)
- Upper Abdominal Rib Displacement (mm) vs. Time (ms)
- Lower Abdominal Rib Displacement (mm) vs. Time (ms)
- Lower Spine Acceleration (G's) vs. Time (ms)

**Table 8.** Pelvis Plug Quasi-Static Test (Optional*)
**Table 9.** Pelvis Acetabulum Impact Test
- Impactor Acceleration (G's) vs. Time (ms)
- Pelvis (Y) Acceleration (G's) vs. Time (ms)
- Acetabulum Force (N) vs. Time (ms)

**Table 10.** Pelvis Iliac Impact Test
- Impactor Acceleration (G's) vs. Time (ms)
- Pelvis (Y) Acceleration (G's) vs. Time (ms)
- Iliac Force (N) vs. Time (ms)

**Pre-Test Calibration Sheets**
**Driver S/N F030**

**Transportation Research Center Inc.**
**572U ES-2re Dummy**
**External Dimensions**
**Serial No. F030 Calibration No. 67**

| Symbol | Description | Specification | Results | Pass |
|---|---|---|---|---|
| | | mm | mm | |
| 1 | Sitting Height | 900.0 - 918.0 | 909 | Yes |
| 2 | Seat to Shoulder Joint | 558.0 - 572.0 | 560 | Yes |
| 3 | Seat to Lower Face of Thoracic Spine Box | 346.0 - 356.0 | 347 | Yes |
| 4 | Seat to Hip Joint (center of bolt) | 97.0 - 103.0 | 98 | Yes |
| 5 | Sole to Seat, Sitting | 433.0 - 451.0 | 444 | Yes |
| 6 | Head Width | 152.0 - 158.0 | 155 | Yes |
| 7 | Shoulder/Arm Width | 461.0 - 479.0 | 475 | Yes |
| 8 | Thorax Width | 322.0 - 332.0 | 328 | Yes |
| 9 | Abdomen Width | 273.0 - 287.0 | 280 | Yes |
| 10 | Pelvis Lap Width | 359.0 - 373.0 | 367 | Yes |
| 11 | Head Depth | 196.0 - 206.0 | 201 | Yes |
| 12 | Thorax Depth | 262.0 - 272.0 | 262 | Yes |
| 13 | Abdomen Depth | 194.0 - 204.0 | 199 | Yes |
| 14 | Pelvis Depth | 235.0 - 245.0 | 242 | Yes |
| 15 | Back of Buttocks to Hip Joint (center of bolt) | 150.0 - 160.0 | 156 | Yes |
| 16 | Back of Buttocks to Front of Knee | 597.0 - 615.0 | 605 | Yes |

Baseline 10/07/05

# Transportation Research Center Inc.

Left Lateral Head Drop
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| Peak Resultant Acceleration | 125 - 155 g | 146.5 g | Yes |
| Peak Longitudinal Acceleration | (-15) - 15 g | 7.8 g | Yes |
| Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse? | < 15 % | 3.67 % | Yes |

**Test meets specifications.**

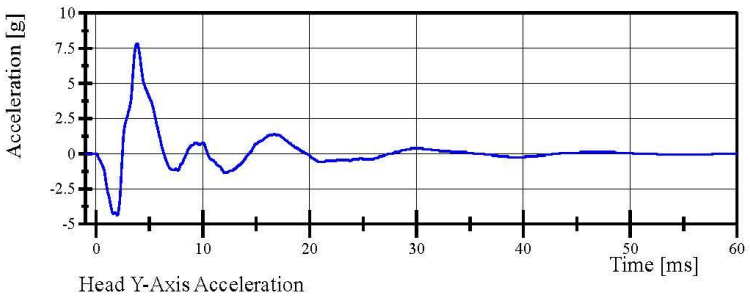
**Condition: Used**

**Comments:**
**Head Skin S/N: DP6812**

# Transportation Research Center Inc.

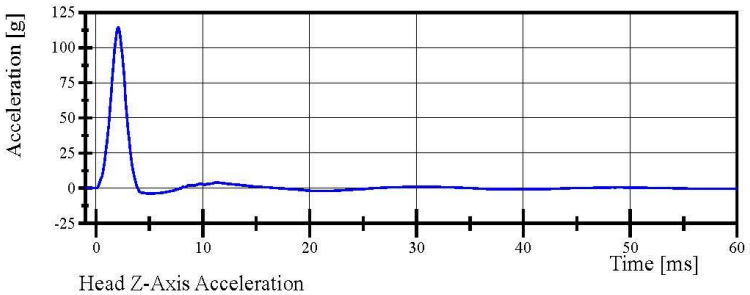
Left Lateral Head Drop
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019

Head X-Axis Acceleration



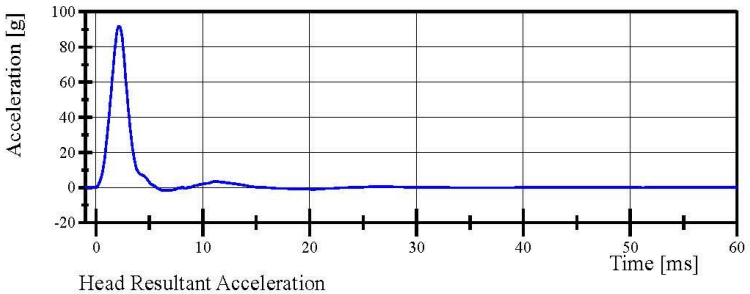

Filter Class: CFC_1000
Max: 7.8 g at 3.8 ms
Min: -4.4 g at 2.0 ms

Head Y-Axis Acceleration



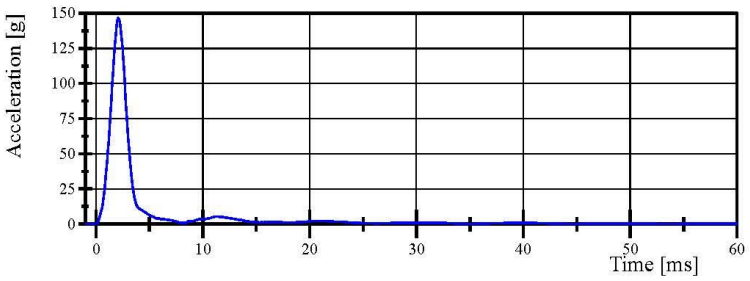

Filter Class: CFC_1000
Max: 114.5 g at 2.1 ms
Min: -3.9 g at 5.0 ms

Head Z-Axis Acceleration




Filter Class: CFC_1000
Max: 91.9 g at 2.2 ms
Min: -1.6 g at 6.6 ms

Head Resultant Acceleration




Filter Class: CFC_1000
Max: 146.5 g at 2.1 ms
Min: 0.0 g at -1.0 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.10.2019 08:14:20 326

# Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 67-15
Test Date: 10/25/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Pendulum Integrated Velocity Change within Corridor | Yes | Yes | Yes |
| Pendulum Velocity | (-3.3) - (-3.5) m/s | -3.36 m/s | Yes |
| Maximum Headform Flexion | | | |
| Peak | (-49) - (-59) deg | -51.1 deg | Yes |
| Time of Peak | 54 - 66 ms | 55.8 ms | Yes |
| Headform Flexion Decay - Peak to Zero | 53 - 88 ms | 57.8 ms | Yes |

**Test meets specifications.**

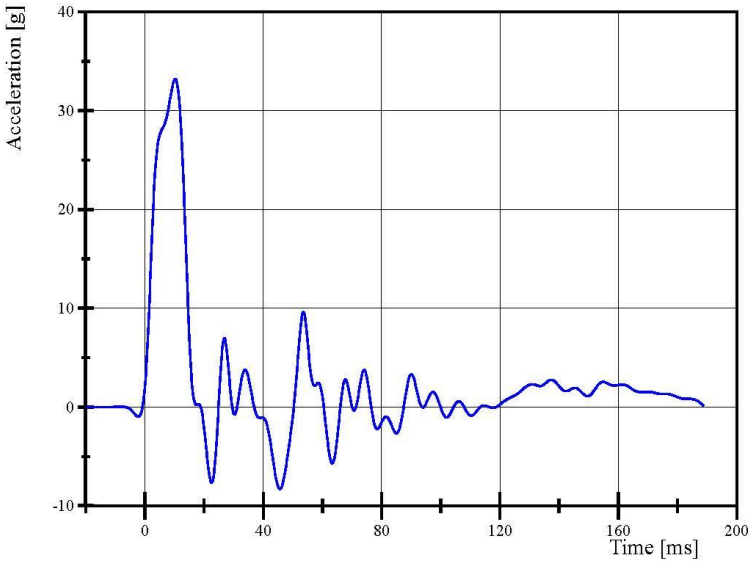
**Condition: New**

**Comments:**
**Neck S/N: 05053**

# Transportation Research Center Inc.

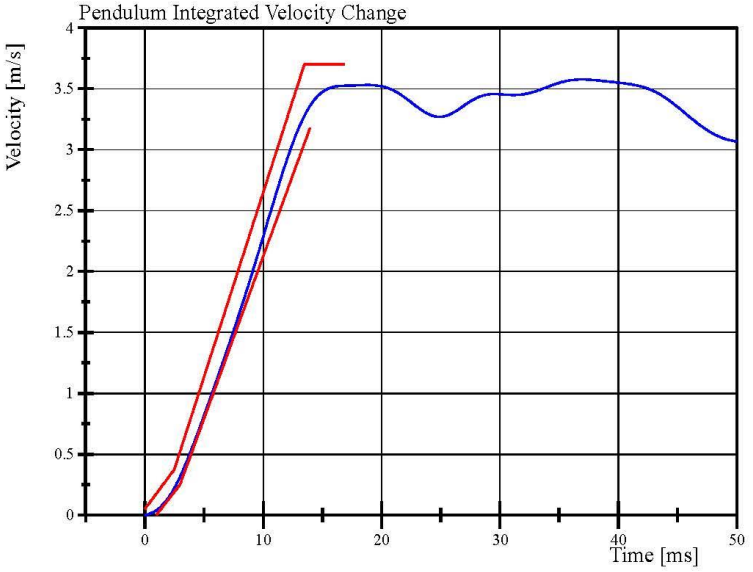
Left Lateral Neck
ES-2re Serial No. F030 Certification No. 67-15
Test Date: 10/25/2019

Pendulum Acceleration




Filter Class: CFC_60
Max: 33.2 g at 10.2 ms
Min: -8.3 g at 45.6 ms

Pendulum Integrated Velocity Change




Filter Class: CFC_60
Max: 3.6 m/s at 37.0 ms
Min: 0.0 m/s at 0.0 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

10.25.2019 07:27:40 1465

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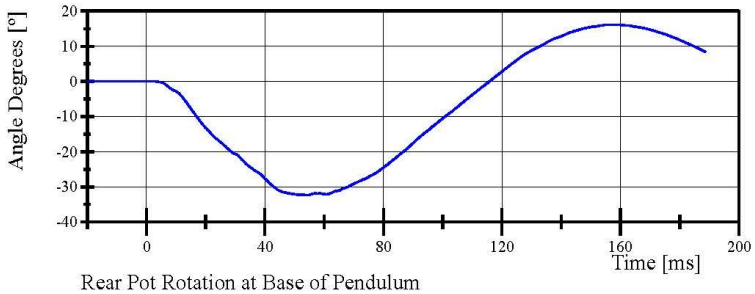
# Transportation Research Center Inc.

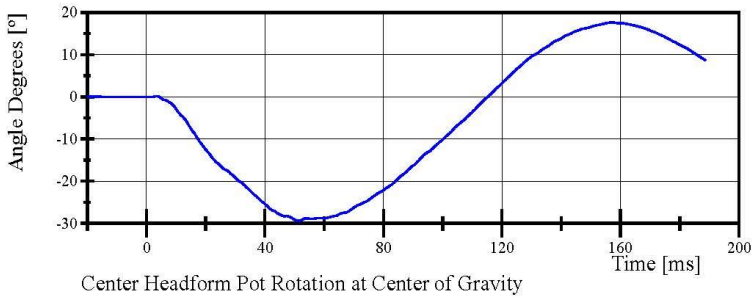
Left Lateral Neck
ES-2re Serial No. F030 Certification No. 67-15
Test Date: 10/25/2019

Forward Pot Rotation at Base of Pendulum



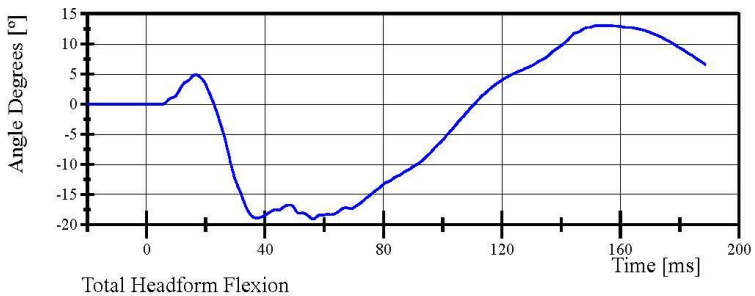

Filter Class: CFC_180
Max: 16.1 ° at 155.8 ms
Min: -32.3 ° at 54.4 ms

Rear Pot Rotation at Base of Pendulum



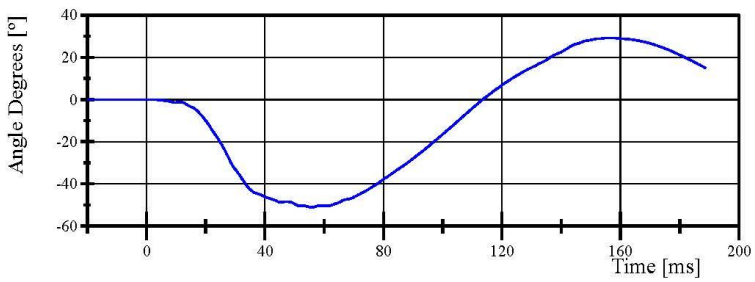

Filter Class: CFC_180
Max: 17.6 ° at 157.0 ms
Min: -29.4 ° at 51.2 ms

Center Headform Pot Rotation at Center of Gravity




Filter Class: CFC_180
Max: 13.1 ° at 155.4 ms
Min: -19.1 ° at 56.2 ms

Total Headform Flexion




Filter Class: CFC_180
Max: 29.2 ° at 155.7 ms
Min: -51.1 ° at 55.8 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

10.25.2019 07:27:41 1465

# Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/12/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 60 % | Yes |
| Test Probe Velocity | 4.2 - 4.4 m/s | 4.30 m/s | Yes |
| Test Probe Acceleration | (-7.5) - (-10.5) g | -9.45 g | Yes |

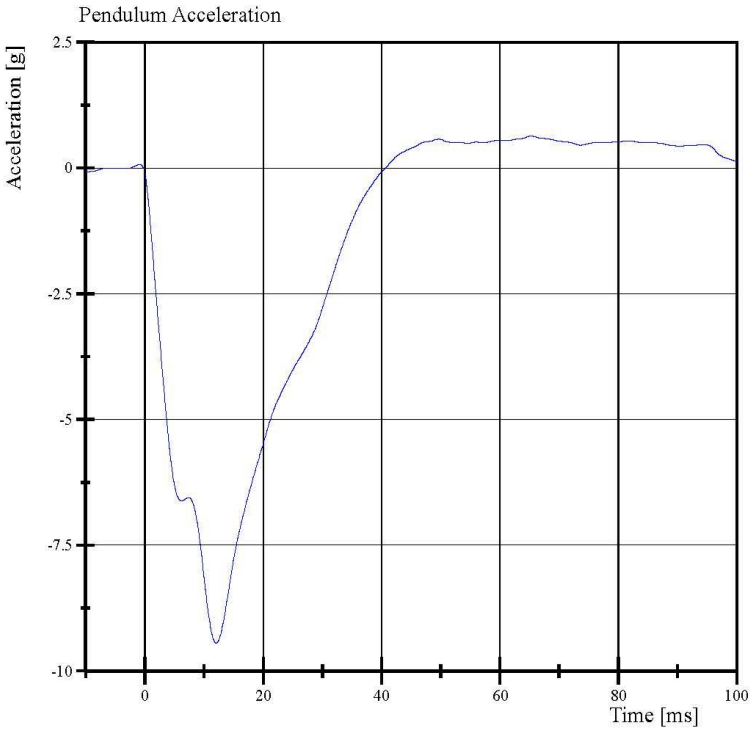
**Test meets specifications.**

**Condition: Used**

**Comments:**
**Arm S/N: 175-3501-07014**

# Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/12/2019




Filter Class: CFC_180
Max: 0.6 g at 65.2 ms
Min: -9.4 g at 12.1 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.12.2019 10:35:32 565

# Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 38.1 mm | Yes |

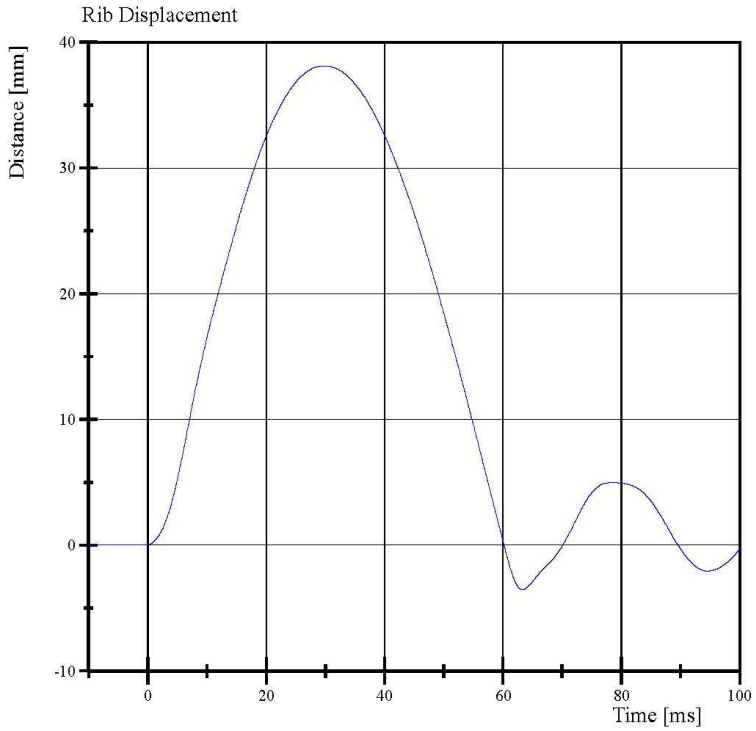
**Test meets specifications.**

**Condition: Used**

**Comments:**
**Drop Height: 462mm**
**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019




Filter Class: CFC_180
Max: 38.1 mm at 29.8 ms
Min: -3.6 mm at 63.3 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.10.2019 08:52:38 493

# Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.0 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 46.9 mm | Yes |

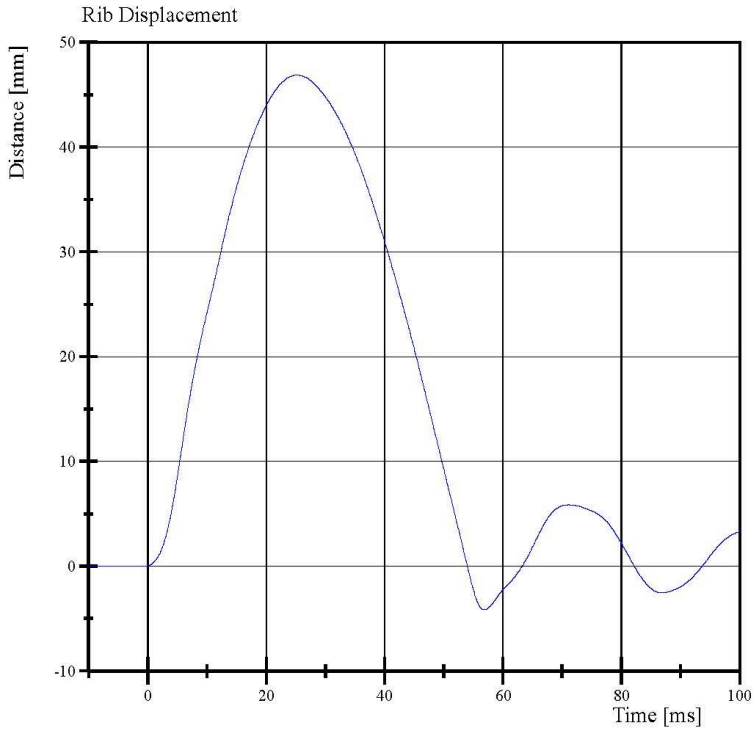
**Test meets specifications.**

**Condition: Used**

**Comments:**
**Drop Height: 816mm**
**Rib Module: 175-4008-A**

## Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019




Filter Class: CFC_180
Max: 46.9 mm at 25.2 ms
Min: -4.2 mm at 56.9 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.10.2019 08:47:43 401

# Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.0 °C | Yes |
| Relative Humidity | 10 - 70 % | 58 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 38.1 mm | Yes |

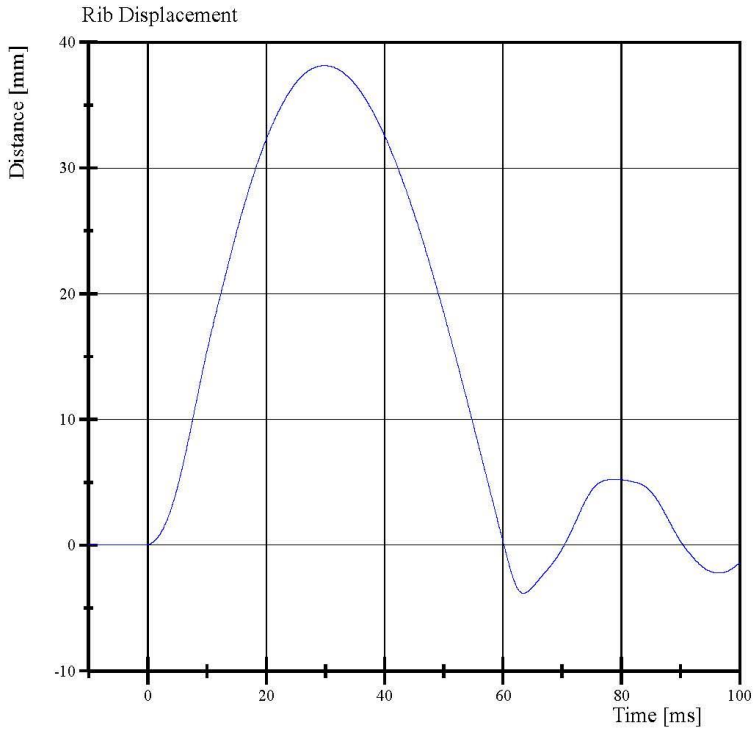
**Test meets specifications.**

**Condition: Used**

**Comments:**
**Drop Height: 462 mm**
**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019




Filter Class: CFC_180
Max: 38.1 mm at 29.8 ms
Min: -3.8 mm at 63.5 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.10.2019 09:20:56 501

# Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 49.6 mm | Yes |

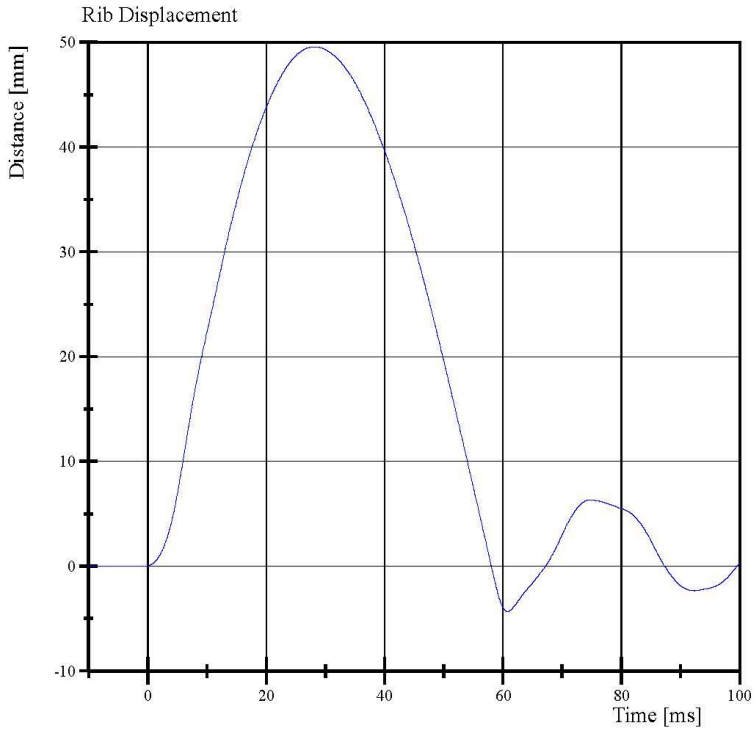
**Test meets specifications.**

**Condition: Used**

**Comments:**
**Drop Height: 816 mm**
**Rib Module: 175-4008-A**

# Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019




Filter Class: CFC_180
Max: 49.6 mm at 28.2 ms
Min: -4.3 mm at 60.7 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.10.2019 09:15:33 413

# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 38.1 mm | Yes |

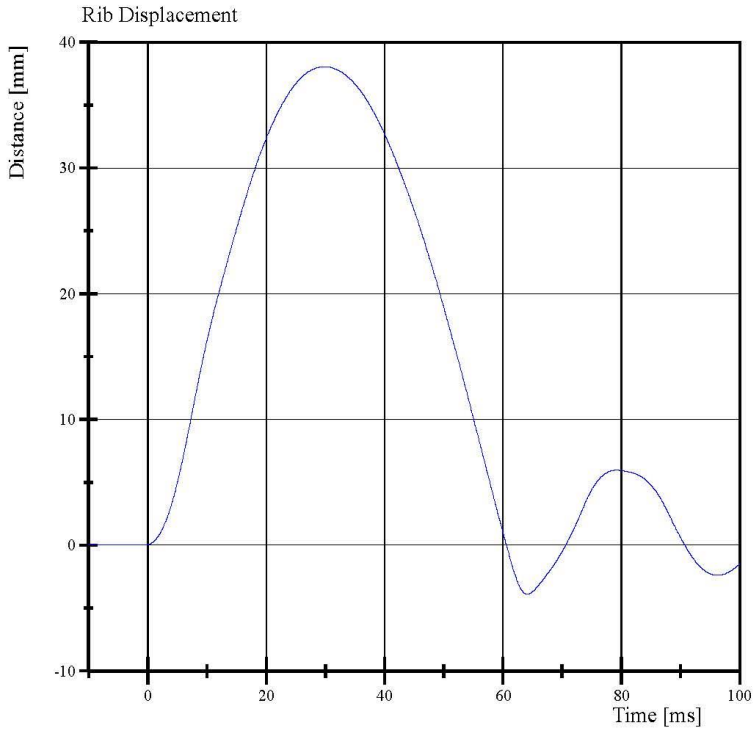
**Test meets specifications.**

**Condition: Used**

**Comments:**
**Drop Height: 462 mm**
**Rib Module: 175-4008-A-06-017**

# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019




Filter Class: CFC_180
Max: 38.1 mm at 29.8 ms
Min: -3.9 mm at 64.2 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.10.2019 09:37:14 476

# Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 49.1 mm | Yes |

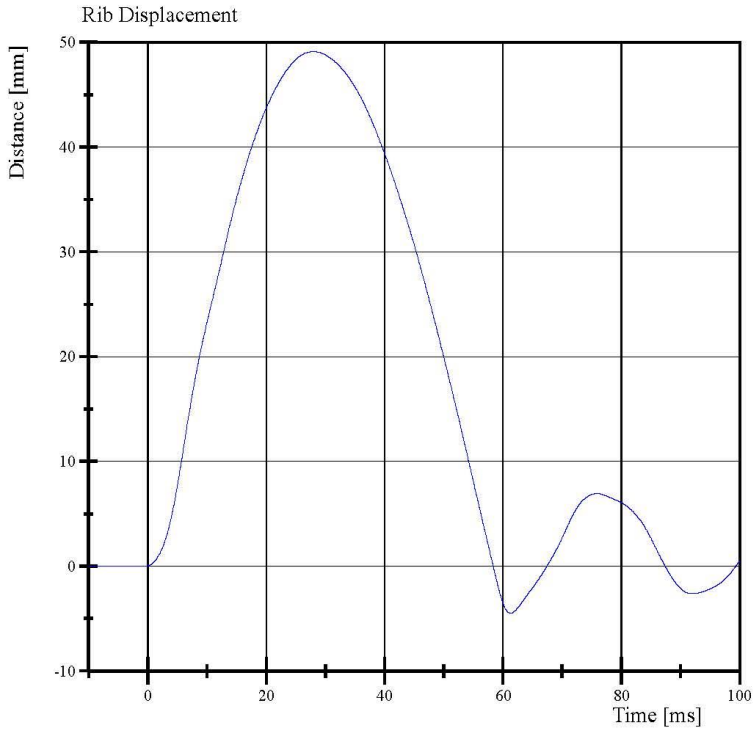
**Test meets specifications.**

**Condition: Used**

**Comments:**
**Drop Height: 816 mm**
**Rib Module: 175-4008-A-06-017**

## Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/10/2019




Filter Class: CFC_180
Max: 49.1 mm at 28.0 ms
Min: -4.5 mm at 61.3 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.10.2019 09:32:01 406

# Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 67-4
Test Date: 9/12/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 57 % | Yes |
| Impactor Velocity | 5.4 - 5.60 m/s | 5.476 m/s | Yes |
| Peak Impactor Force after 6 ms | (-5,100) - (-6,200) N | -5,939.6 N | Yes |
| Upper Rib Displacement | 34 - 41 mm | 38.7 mm | Yes |
| Center Rib Displacement | 37 - 45 mm | 41.4 mm | Yes |
| Lower Rib Displacement | 37 - 44 mm | 41.7 mm | Yes |

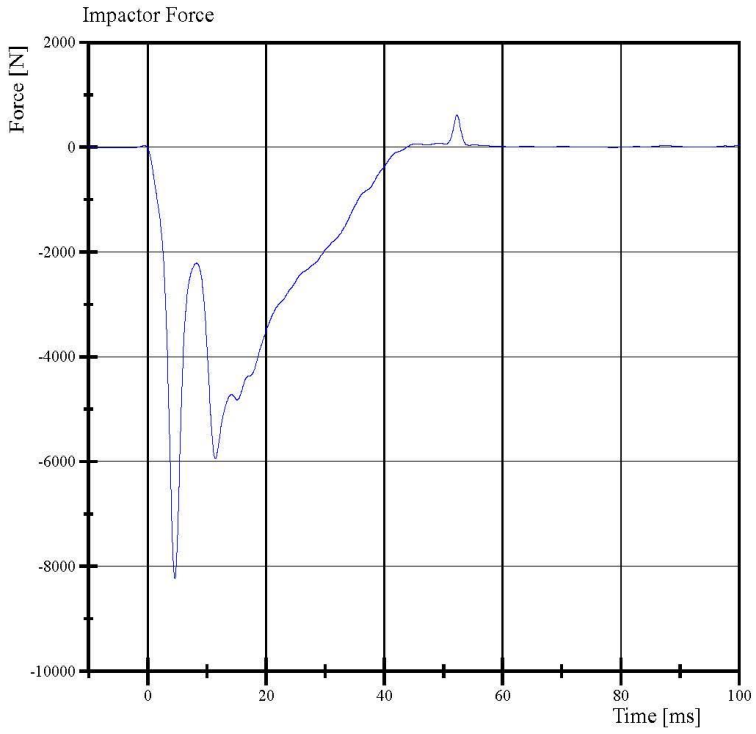
**Test meets specifications.**

**Condition: Used**

**Comments:**
**Upper Rib Module S/N: 175-4008-A**
**Upper Rib Foam S/N: 175-4003-EK6973**
**Middle Rib Module S/N: 175-4008-A**
**Middle Rib Foam S/N: 175-4003-EK6970**
**Lower Rib Module S/N: 175-4008-A-06-017**
**Lower Rib Foam S/N: 175-4008-EK6971**

## Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 67-4
Test Date: 9/12/2019




Filter Class: CFC_180
Max: 616.1 N at 52.3 ms
Min: -8,231.5 N at 4.6 ms

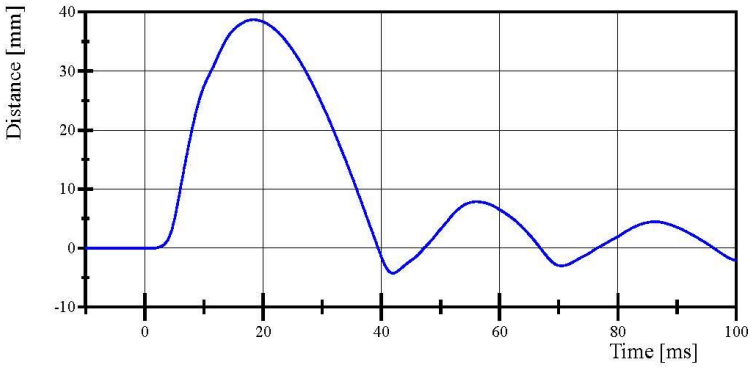
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.12.2019 12:59:54 438

# Transportation Research Center Inc.

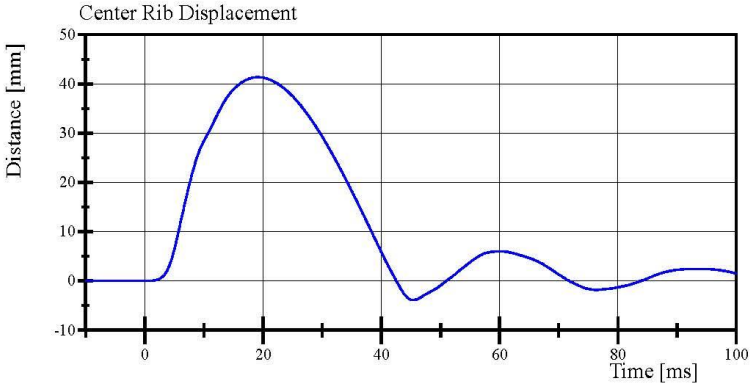
Left Lower Thorax
ES-2re Serial No. F030 Certification No. 67-4
Test Date: 9/12/2019

Upper Rib Displacement



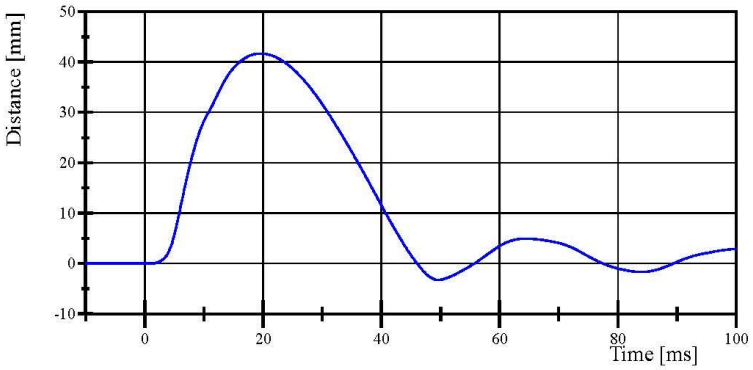

Filter Class: CFC_180
Max: 38.7 mm at 18.4 ms
Min: -4.2 mm at 41.9 ms

Center Rib Displacement




Filter Class: CFC_180
Max: 41.4 mm at 19.1 ms
Min: -3.9 mm at 45.4 ms

Lower Rib Displacement




Filter Class: CFC_180
Max: 41.7 mm at 19.5 ms
Min: -3.3 mm at 49.7 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.12.2019 12:59:54 438

# Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 67-12
Test Date: 10/25/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 40 % | Yes |
| Pendulum Integrated Velocity Change within Corridor | Yes | Yes | Yes |
| Pendulum Velocity | (-5.95) - (-6.15) m/s | -6.110 m/s | Yes |
| Maximum Headform Flexion | | | |
| Peak | (-45) - (-55) deg | -49.4 deg | Yes |
| Time of Peak | 39 - 53 ms | 43.1 ms | Yes |
| Headform Flexion Decay - Peak to Zero | 37 - 57 ms | 37.2 ms | Yes |

**Test meets specifications.**

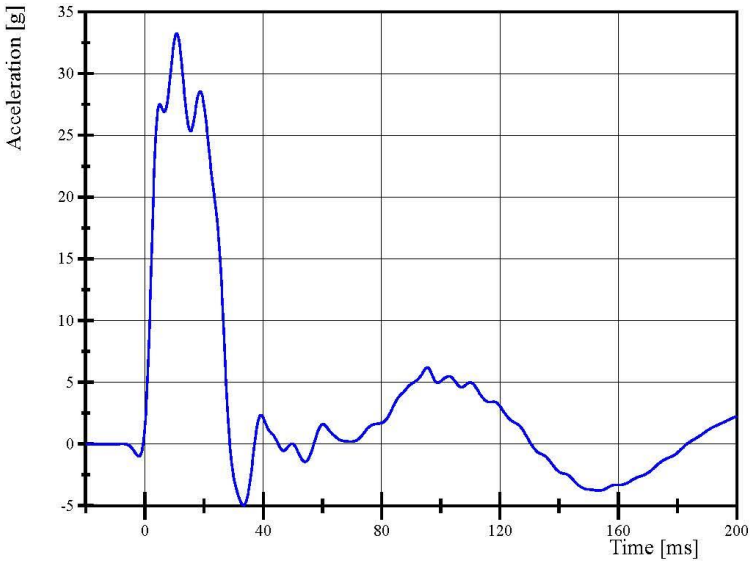
**Condition: Used**

**Comments:**
**Lumbar S/N: 150365**

# Transportation Research Center Inc.

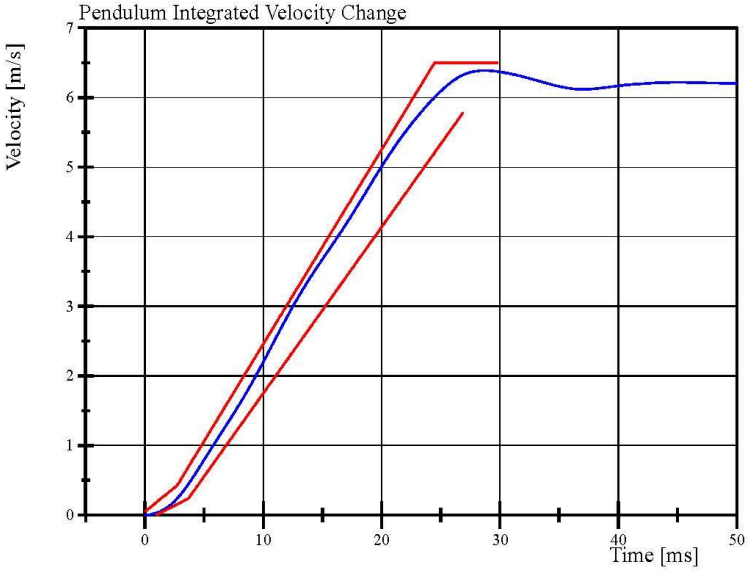
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 67-12
Test Date: 10/25/2019

Pendulum Acceleration




Filter Class: CFC_60
Max: 33.3 g at 10.7 ms
Min: -4.9 g at 33.4 ms

Pendulum Integrated Velocity Change




Filter Class: CFC_60
Max: 6.4 m/s at 28.7 ms
Min: 0.0 m/s at 0.0 ms

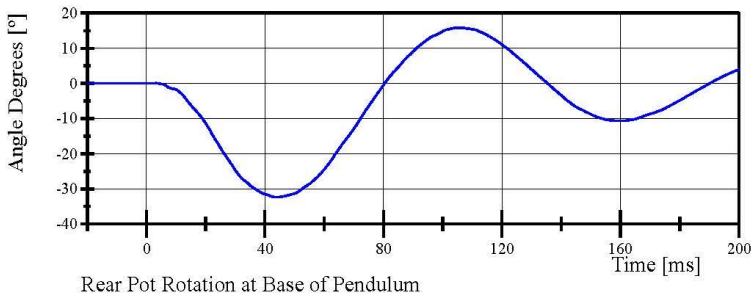
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

10.25.2019 06:47:25 637

# Transportation Research Center Inc.

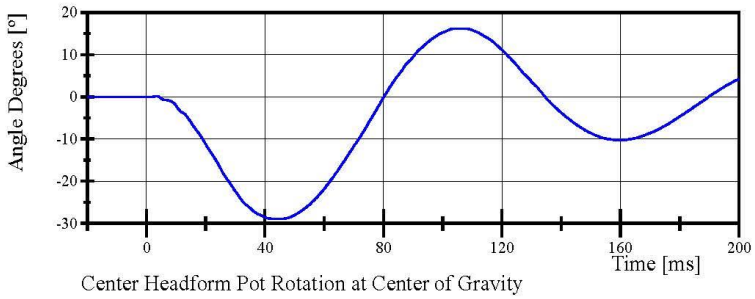
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 67-12
Test Date: 10/25/2019

Forward Pot Rotation at Base of Pendulum



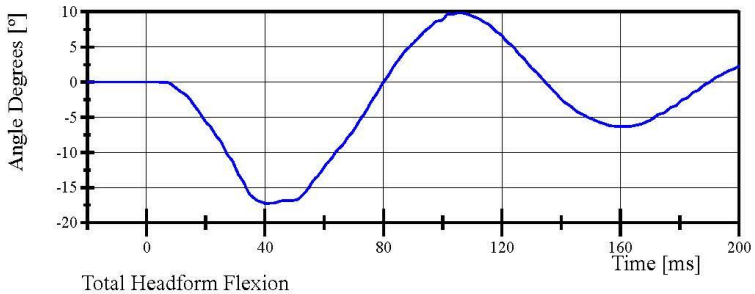

Filter Class: CFC_180
Max: 15.8 ° at 105.8 ms
Min: -32.3 ° at 43.4 ms

Rear Pot Rotation at Base of Pendulum



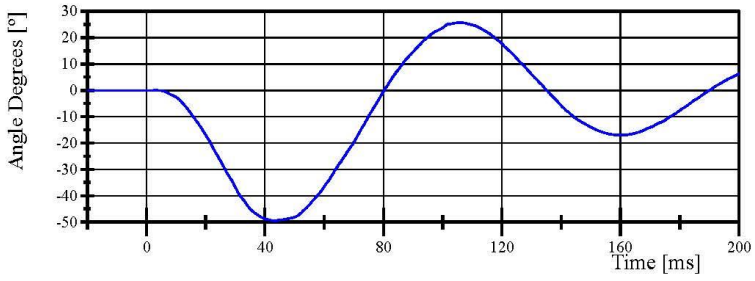

Filter Class: CFC_180
Max: 16.2 ° at 106.4 ms
Min: -29.0 ° at 44.8 ms

Center Headform Pot Rotation at Center of Gravity




Filter Class: CFC_180
Max: 9.9 ° at 105.6 ms
Min: -17.3 ° at 40.7 ms

Total Headform Flexion




Filter Class: CFC_180
Max: 25.7 ° at 105.7 ms
Min: -49.4 ° at 43.1 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

10.25.2019 06:47:25 637

# Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/12/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 58 % | Yes |
| Test Probe Velocity | 3.9 - 4.1 m/s | 4.05 m/s | Yes |
| Test Probe Force | | | |
| Peak | 4,000 - 4,800 N | 4,149.0 N | Yes |
| Time of Peak | 10.6 - 13.0 ms | 11.92 ms | Yes |
| Total Abdominal Force | | | |
| Peak | 2,200 - 2,700 N | 2,534.8 N | Yes |
| Time of Peak | 10.0 - 12.3 ms | 11.68 ms | Yes |

**Test meets specifications.**

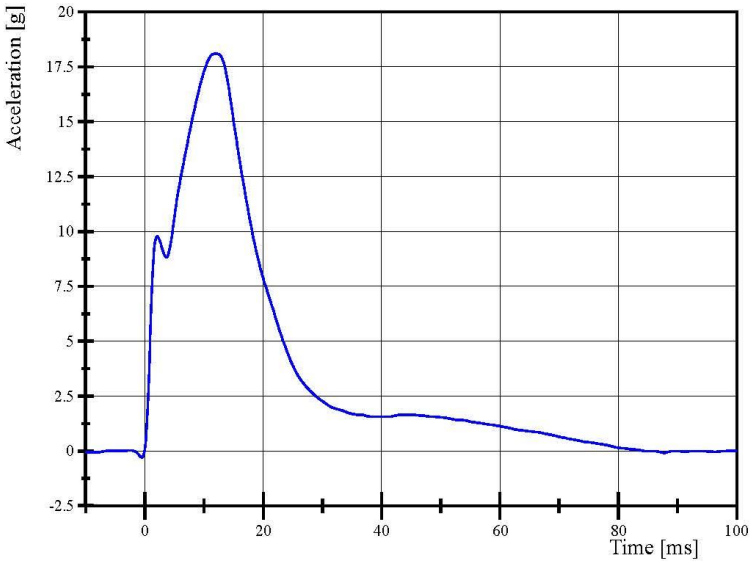
**Condition: Used**

**Comments:**
**Abdomen S/N: 1066**

# Transportation Research Center Inc.

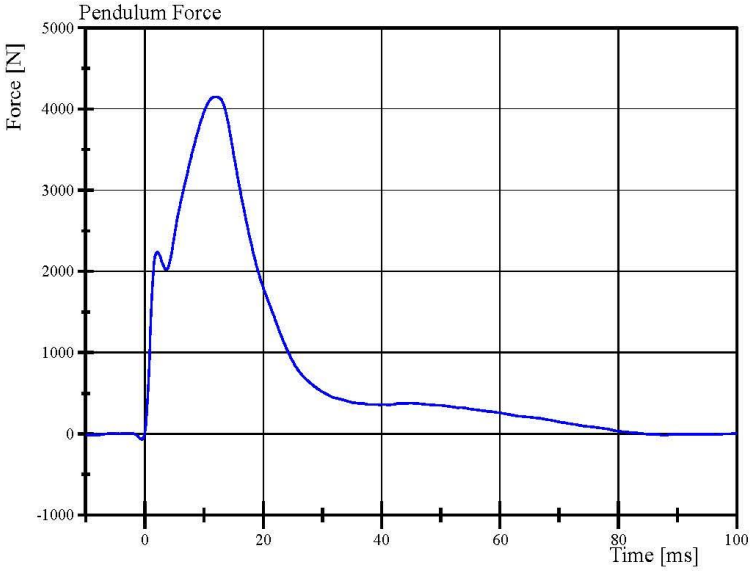
Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/12/2019

Pendulum Acceleration




Filter Class: CFC_180
Max: 18.1 g at 11.9 ms
Min: -0.3 g at -0.5 ms

Pendulum Force




Filter Class: CFC_180
Max: 4,149.0 N at 11.9 ms
Min: -67.5 N at -0.5 ms

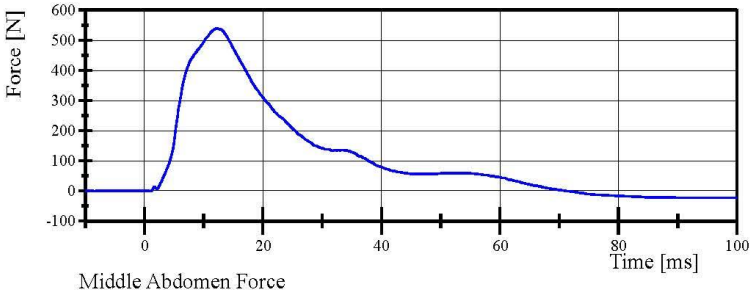
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

10.25.2019 14:46:50 628

## Transportation Research Center Inc.

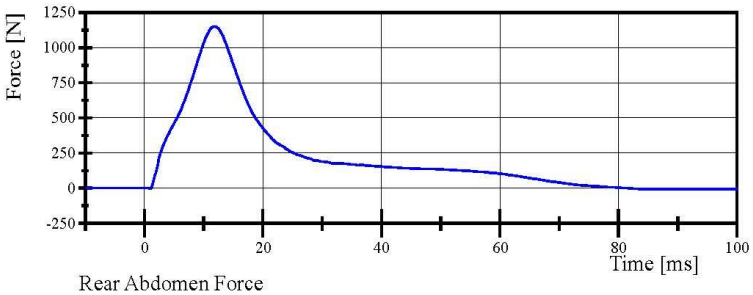
Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/12/2019

Front Abdomen Force



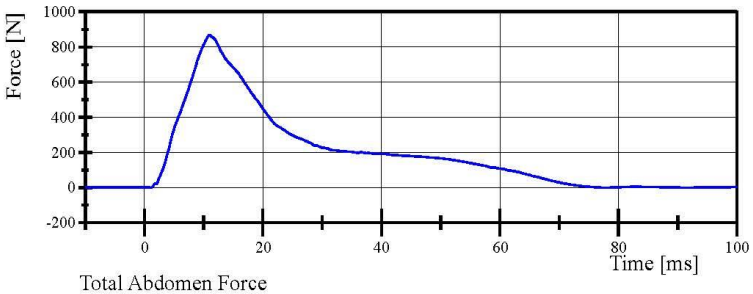

Filter Class: CFC_600
Max: 539.4 N at 12.2 ms
Min: -23.5 N at 91.7 ms

Middle Abdomen Force



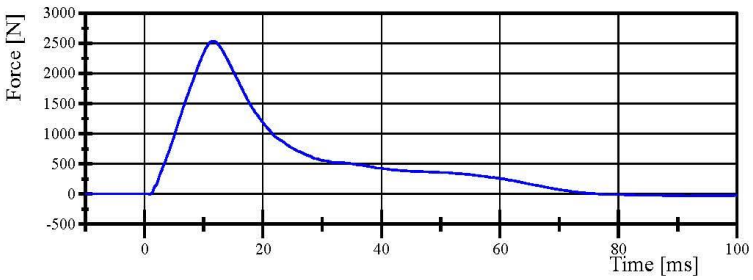

Filter Class: CFC_600
Max: 1,151.2 N at 11.8 ms
Min: -7.2 N at 91.4 ms

Rear Abdomen Force




Filter Class: CFC_600
Max: 867.0 N at 11.0 ms
Min: -1.6 N at 77.8 ms

Total Abdomen Force




Filter Class: CFC_600
Max: 2,534.8 N at 11.7 ms
Min: -32.0 N at 91.6 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

10.25.2019 14:46:50 628

# Transportation Research Center Inc.

Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/12/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 58 % | Yes |
| Test Probe Velocity | 4.2 - 4.4 m/s | 4.35 m/s | Yes |
| Test Probe Force | | | |
| Peak | 4,700 - 5,400 N | 5,219.4 N | Yes |
| Time of Peak | 11.8 - 16.1 ms | 13.84 ms | Yes |
| Pubic Symphysis Force | | | |
| Peak | (-1,230) - (-1,590) N | -1,304.5 N | Yes |
| Time of Peak | 12.2 - 17.0 ms | 13.60 ms | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Pelvis Skin S/N: N/A**

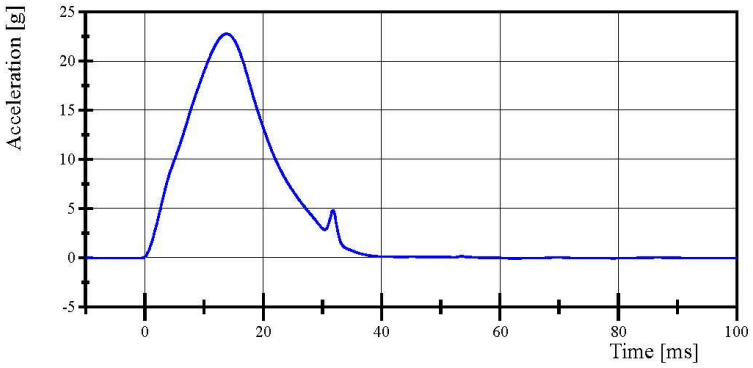
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.12.2019 11:49:30 575

# Transportation Research Center Inc.

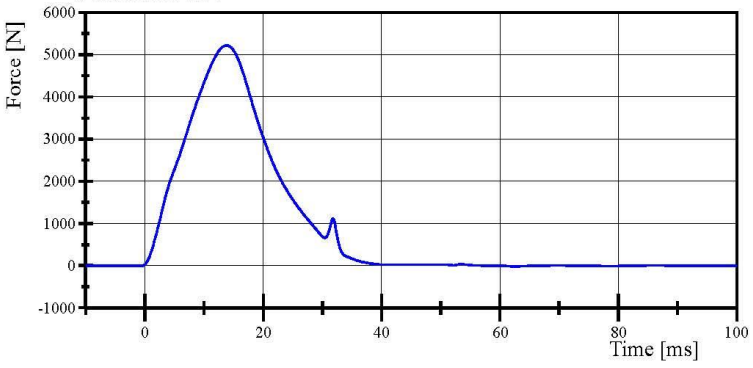
Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 67-1
Test Date: 9/12/2019

Pendulum Acceleration



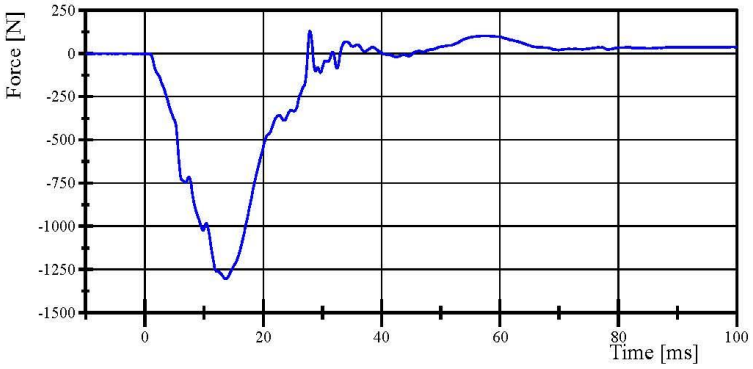

Filter Class: CFC_180
Max: 22.8 g at 13.8 ms
Min: -0.1 g at 62.7 ms

Pendulum Force




Filter Class: CFC_180
Max: 5,219.4 N at 13.8 ms
Min: -16.6 N at 62.7 ms

Pubic Symphysis Force




Filter Class: CFC_600
Max: 130.1 N at 27.9 ms
Min: -1,304.5 N at 13.6 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.12.2019 11:50:05 575

**Post-Test Calibration Sheets**
**Driver S/N F030**

**Transportation Research Center Inc.**
**572U ES-2re Dummy**
**External Dimensions**
**Serial No. F030 Calibration No. 68**

| Symbol | Description | Specification | Results | Pass |
|---|---|---|---|---|
| | | mm | mm | |
| 1 | Sitting Height | 900.0 - 918.0 | 909 | Yes |
| 2 | Seat to Shoulder Joint | 558.0 - 572.0 | 560 | Yes |
| 3 | Seat to Lower Face of Thoracic Spine Box | 346.0 - 356.0 | 347 | Yes |
| 4 | Seat to Hip Joint (center of bolt) | 97.0 - 103.0 | 98 | Yes |
| 5 | Sole to Seat, Sitting | 433.0 - 451.0 | 444 | Yes |
| 6 | Head Width | 152.0 - 158.0 | 155 | Yes |
| 7 | Shoulder/Arm Width | 461.0 - 479.0 | 475 | Yes |
| 8 | Thorax Width | 322.0 - 332.0 | 328 | Yes |
| 9 | Abdomen Width | 273.0 - 287.0 | 280 | Yes |
| 10 | Pelvis Lap Width | 359.0 - 373.0 | 367 | Yes |
| 11 | Head Depth | 196.0 - 206.0 | 201 | Yes |
| 12 | Thorax Depth | 262.0 - 272.0 | 262 | Yes |
| 13 | Abdomen Depth | 194.0 - 204.0 | 199 | Yes |
| 14 | Pelvis Depth | 235.0 - 245.0 | 242 | Yes |
| 15 | Back of Buttocks to Hip Joint (center of bolt) | 150.0 - 160.0 | 156 | Yes |
| 16 | Back of Buttocks to Front of Knee | 597.0 - 615.0 | 605 | Yes |

Baseline 10/07/05

# Transportation Research Center Inc.

Left Lateral Head Drop
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.7 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Peak Resultant Acceleration | 125 - 155 g | 137.2 g | Yes |
| Peak Longitudinal Acceleration | (-15) - 15 g | 8.7 g | Yes |
| Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse? | < 15 % | 4.33 % | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Head Skin S/N: DP6812**

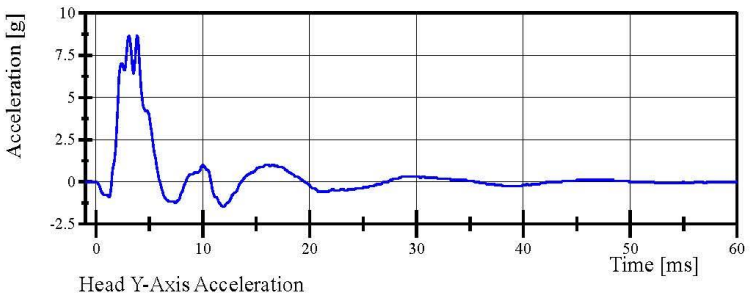
Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 08:01:29 327

# Transportation Research Center Inc.

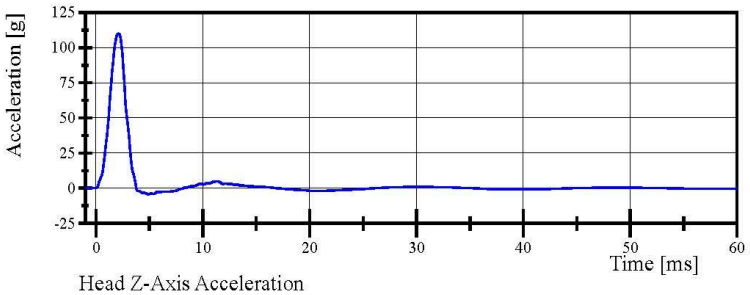
Left Lateral Head Drop
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

Head X-Axis Acceleration



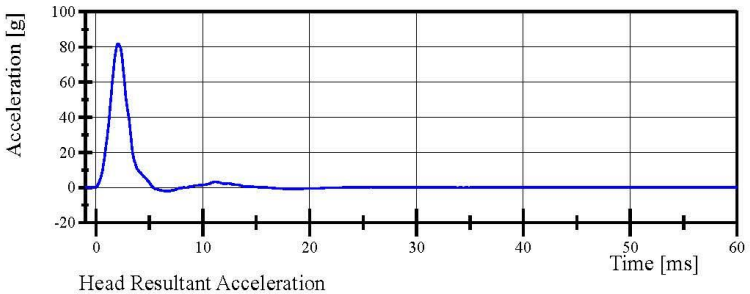

Filter Class: CFC_1000
Max: 8.7 g at 3.1 ms
Min: -1.5 g at 11.8 ms

Head Y-Axis Acceleration



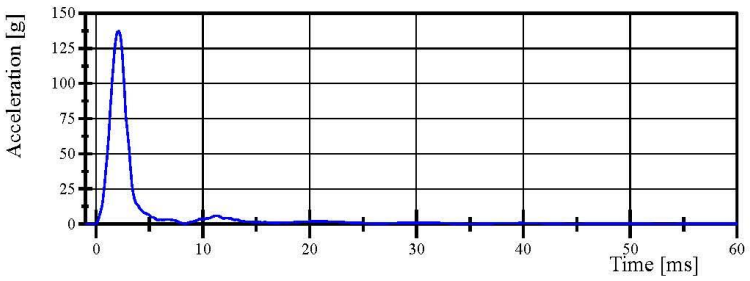

Filter Class: CFC_1000
Max: 110.1 g at 2.1 ms
Min: -4.3 g at 4.9 ms

Head Z-Axis Acceleration




Filter Class: CFC_1000
Max: 81.8 g at 2.1 ms
Min: -1.9 g at 6.6 ms

Head Resultant Acceleration




Filter Class: CFC_1000
Max: 137.2 g at 2.1 ms
Min: 0.0 g at -1.0 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 08:02:12 327

# Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Pendulum Integrated Velocity Change within Corridor | Yes | Yes | Yes |
| Pendulum Velocity | (-3.3) - (-3.5) m/s | -3.36 m/s | Yes |
| Maximum Headform Flexion | | | |
| Peak | (-49) - (-59) deg | -51.3 deg | Yes |
| Time of Peak | 54 - 66 ms | 56.6 ms | Yes |
| Headform Flexion Decay - Peak to Zero | 53 - 88 ms | 58.1 ms | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Neck S/N: 05053**

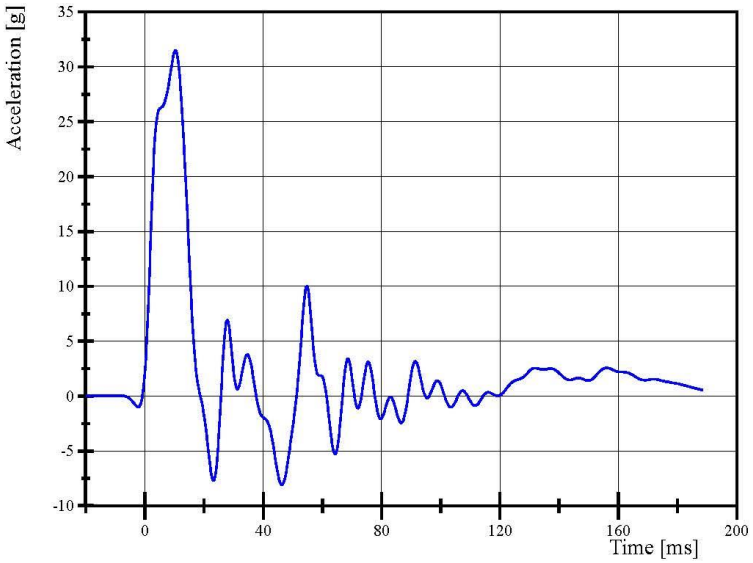
Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 11:41:52 1468

# Transportation Research Center Inc.

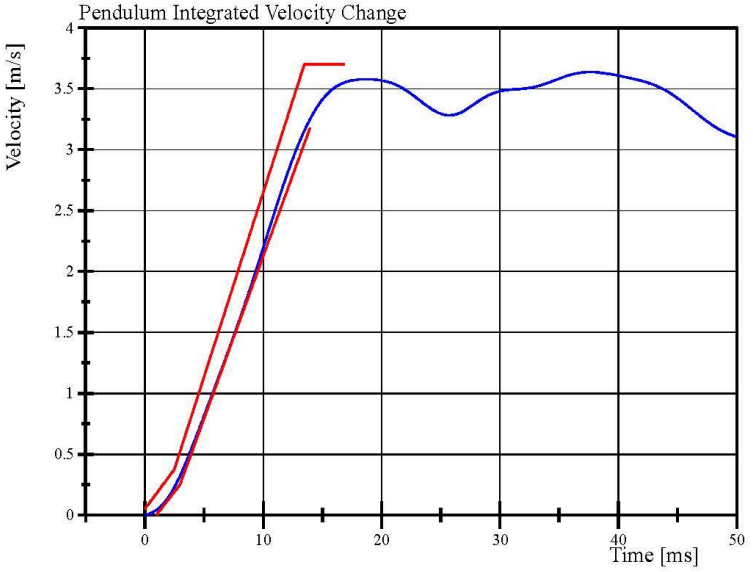
Left Lateral Neck
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

Pendulum Acceleration




Filter Class: CFC_60
Max: 31.5 g at 10.3 ms
Min: -8.1 g at 46.2 ms

Pendulum Integrated Velocity Change




Filter Class: CFC_60
Max: 3.6 m/s at 37.6 ms
Min: 0.0 m/s at 0.0 ms

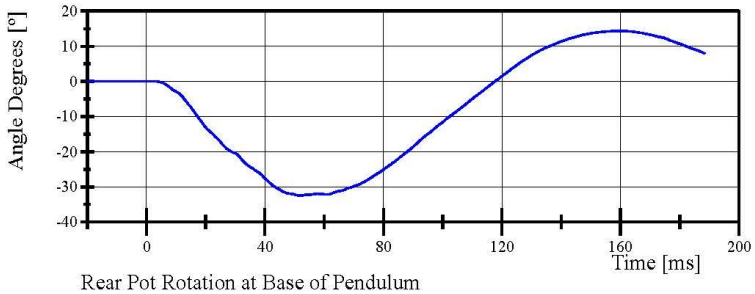
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 11:43:59 1468

# Transportation Research Center Inc.

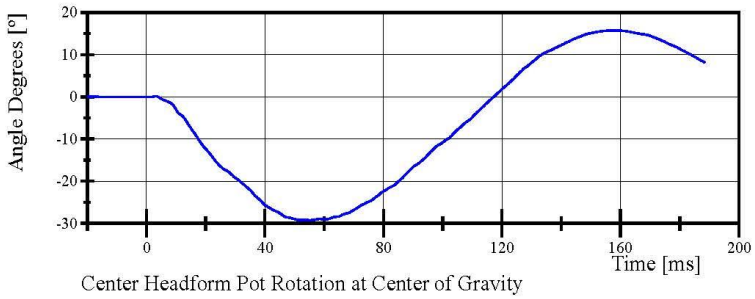
Left Lateral Neck
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

Forward Pot Rotation at Base of Pendulum



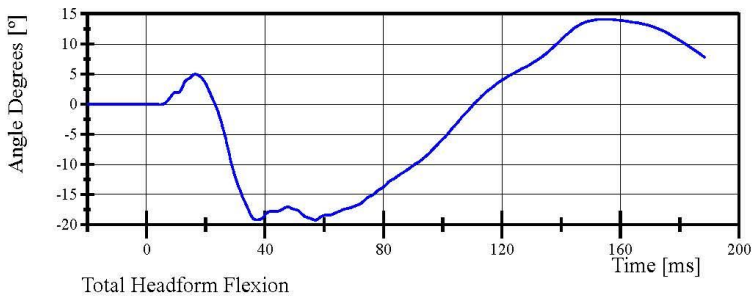

Filter Class: CFC_180
Max: 14.3 ° at 159.7 ms
Min: -32.5 ° at 51.8 ms

Rear Pot Rotation at Base of Pendulum



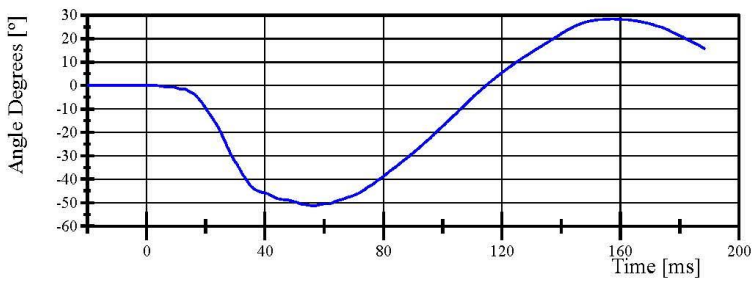

Filter Class: CFC_180
Max: 15.7 ° at 159.0 ms
Min: -29.3 ° at 55.1 ms

Center Headform Pot Rotation at Center of Gravity




Filter Class: CFC_180
Max: 14.1 ° at 153.4 ms
Min: -19.2 ° at 57.0 ms

Total Headform Flexion




Filter Class: CFC_180
Max: 28.3 ° at 157.2 ms
Min: -51.3 ° at 56.6 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 11:43:59 1468

# Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 47 % | Yes |
| Test Probe Velocity | 4.2 - 4.4 m/s | 4.29 m/s | Yes |
| Test Probe Acceleration | (-7.5) - (-10.5) g | -9.60 g | Yes |

**Test meets specifications.**

**Condition: Used**

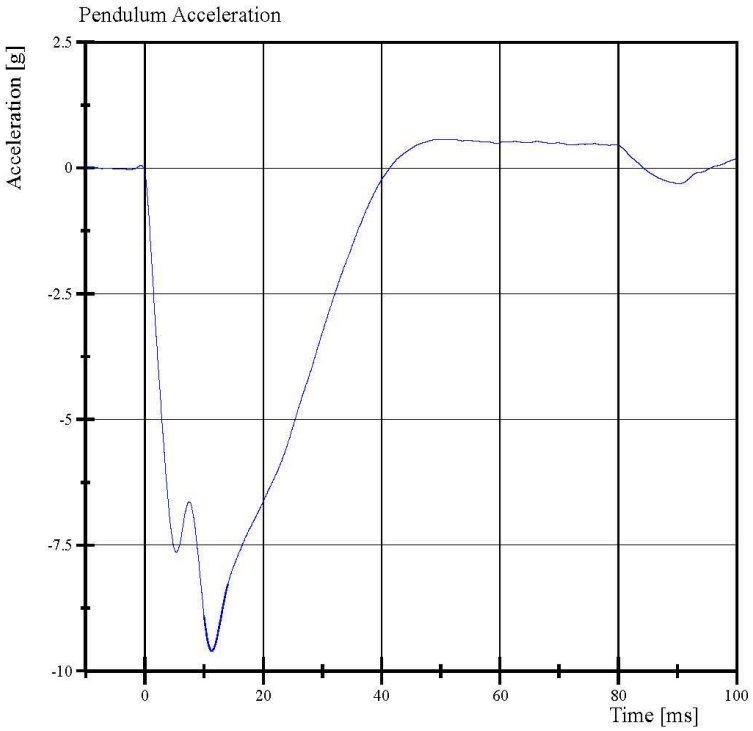
**Comments:**
**Arm S/N: 175-3501-07014**

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:22:40 547

# Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019




Filter Class: CFC_180
Max: 0.6 g at 49.8 ms
Min: -9.6 g at 11.3 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:23:46 547

# Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 35 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 37.8 mm | Yes |

**Test meets specifications.**

**Condition: Used**

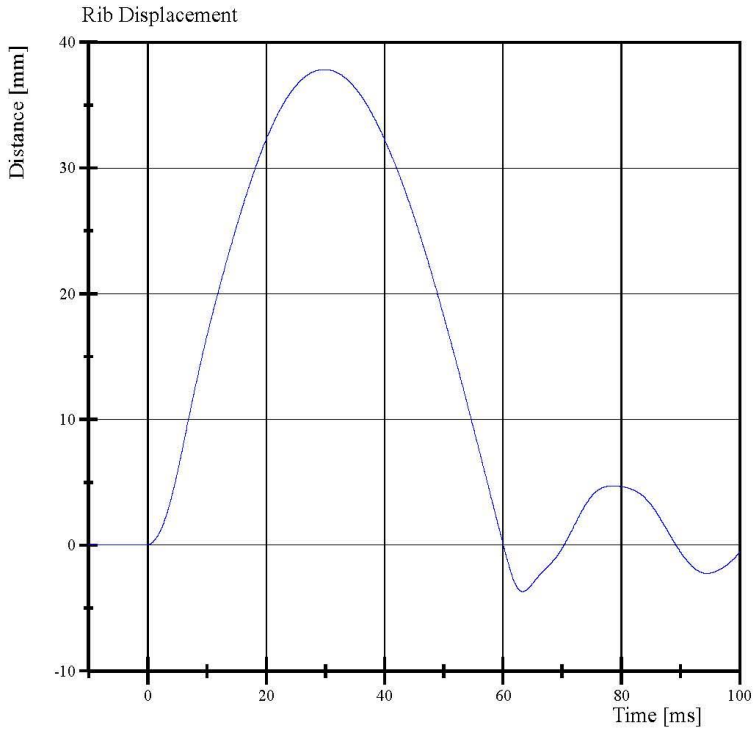
**Comments:**
**Drop Height: 462mm**
**Rib Module: 175-4008-A**

Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 07:57:25 453

# Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019




Filter Class: CFC_180
Max: 37.8 mm at 29.8 ms
Min: -3.7 mm at 63.3 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 07:58:36 453

# Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.5 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 46.8 mm | Yes |

**Test meets specifications.**

**Condition: Used**

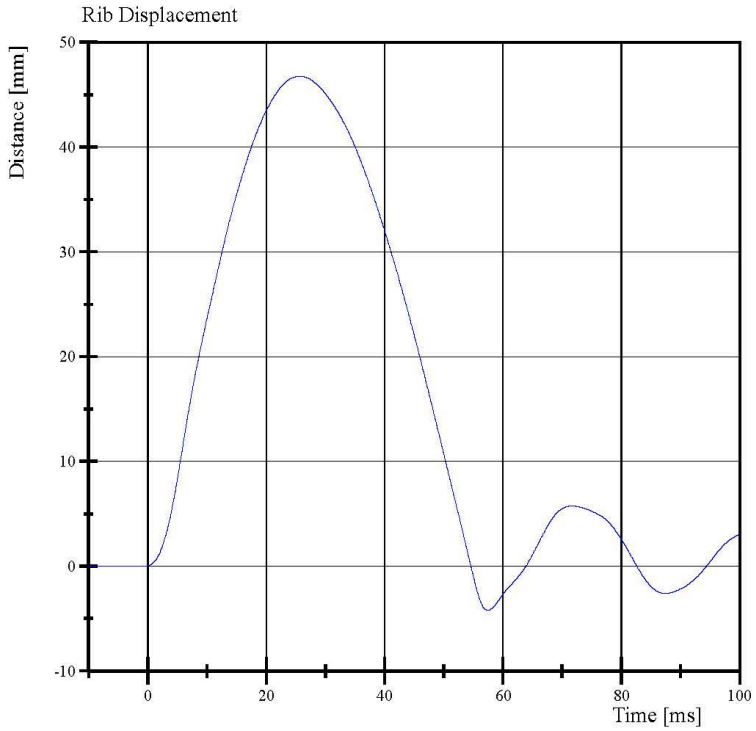
**Comments:**
**Drop Height: 816mm**
**Rib Module: 175-4008-A**

Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 07:51:48 380

# Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019




Filter Class: CFC_180
Max: 46.8 mm at 25.7 ms
Min: -4.2 mm at 57.4 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 07:52:39 380

# Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.9 °C | Yes |
| Relative Humidity | 10 - 70 % | 41 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 38.0 mm | Yes |

**Test meets specifications.**

**Condition: Used**

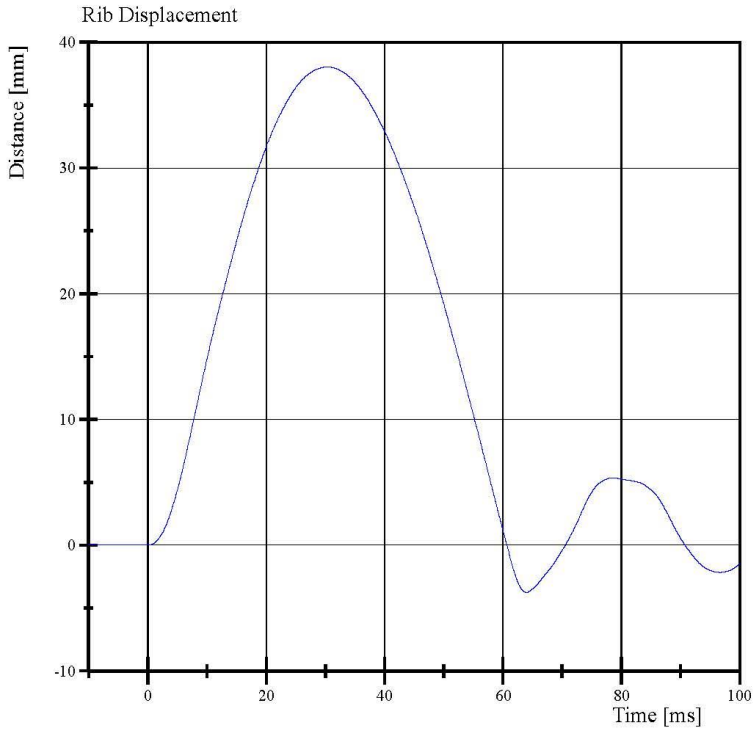
**Comments:**
**Drop Height: 462 mm**
**Rib Module: 175-4008-A**

Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 08:21:22 419

# Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019




Filter Class: CFC_180
Max: 38.0 mm at 30.3 ms
Min: -3.8 mm at 63.9 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 08:21:47 419

# Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 49.4 mm | Yes |

**Test meets specifications.**

**Condition: Used**

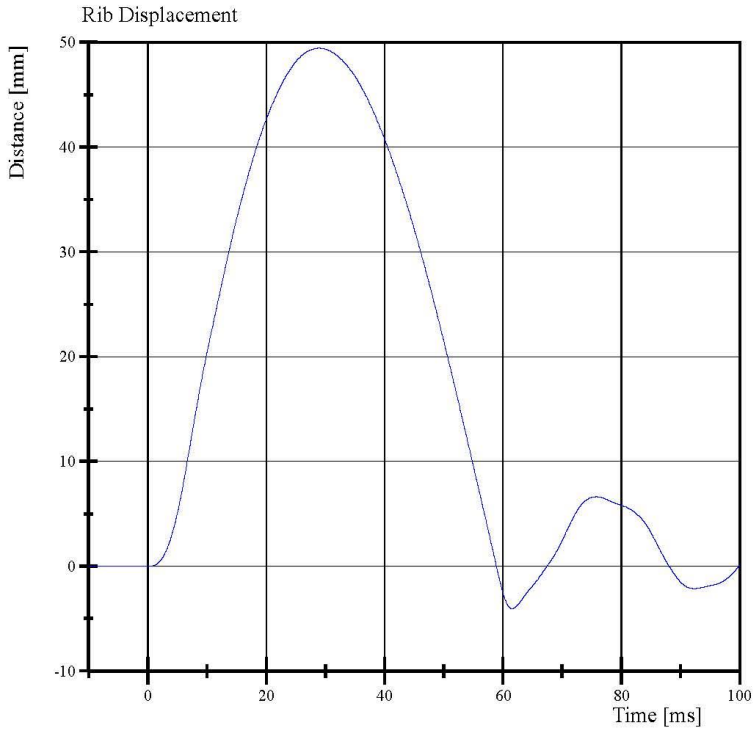
**Comments:**
**Drop Height: 816 mm**
**Rib Module: 175-4008-A**

Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 08:13:17 347

# Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019




Filter Class: CFC_180
Max: 49.4 mm at 29.0 ms
Min: -4.1 mm at 61.5 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 08:14:09 347

# Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.2 °C | Yes |
| Relative Humidity | 10 - 70 % | 42 % | Yes |
| 3.0 m/s Test Rib Displacement (454 mm to 464 mm) | 36 - 40 mm | 37.4 mm | Yes |

**Test meets specifications.**

**Condition: Used**

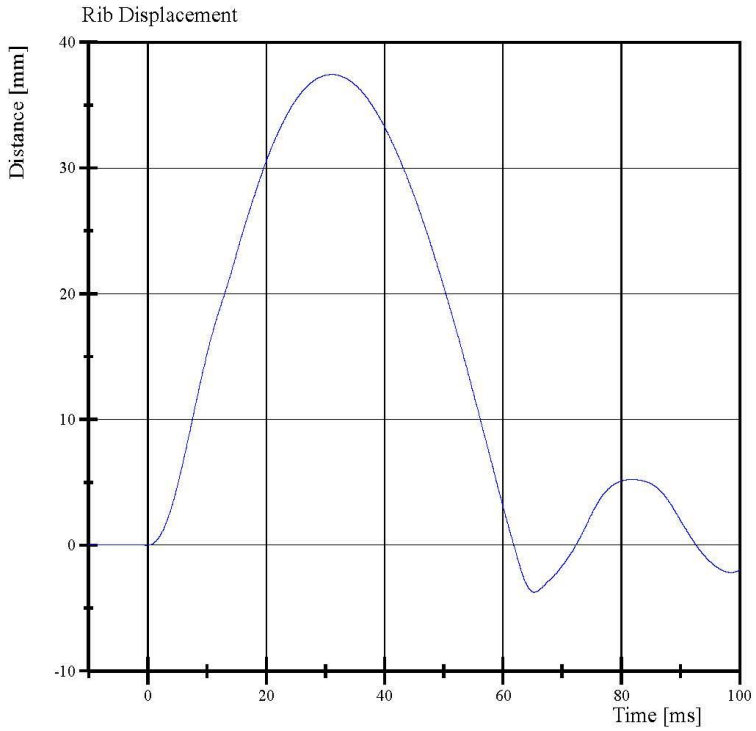
**Comments:**
**Drop Height: 462 mm**
**Rib Module: 175-4008-A-06-017**

Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 08:38:59 443

## Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019




Filter Class: CFC_180
Max: 37.4 mm at 31.1 ms
Min: -3.7 mm at 65.3 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 08:39:34 443

# Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 40 % | Yes |
| 4.0 m/s Test Rib Displacement (807 mm to 823 mm) | 46 - 51 mm | 49.0 mm | Yes |

**Test meets specifications.**

**Condition: Used**

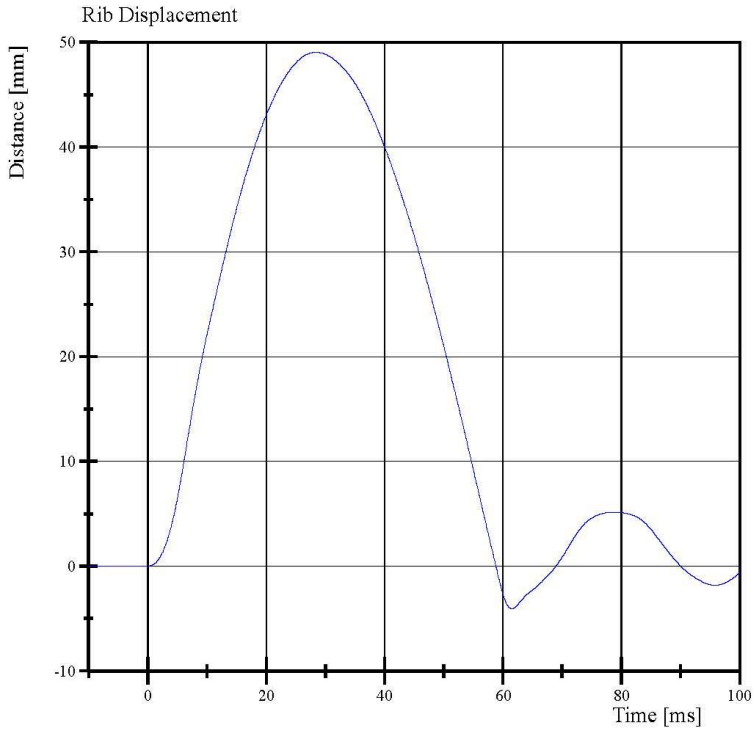
**Comments:**
**Drop Height: 816 mm**
**Rib Module: 175-4008-A-06-017**

Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 08:28:41 371

## Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019




Filter Class: CFC_180
Max: 49.0 mm at 28.5 ms
Min: -4.1 mm at 61.5 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 08:29:22 371

# Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 45 % | Yes |
| Impactor Velocity | 5.4 - 5.60 m/s | 5.460 m/s | Yes |
| Peak Impactor Force after 6 ms | (-5,100) - (-6,200) N | -5,796.6 N | Yes |
| Upper Rib Displacement | 34 - 41 mm | 38.2 mm | Yes |
| Center Rib Displacement | 37 - 45 mm | 40.9 mm | Yes |
| Lower Rib Displacement | 37 - 44 mm | 40.9 mm | Yes |

**Test meets specifications.**

**Condition: Used**

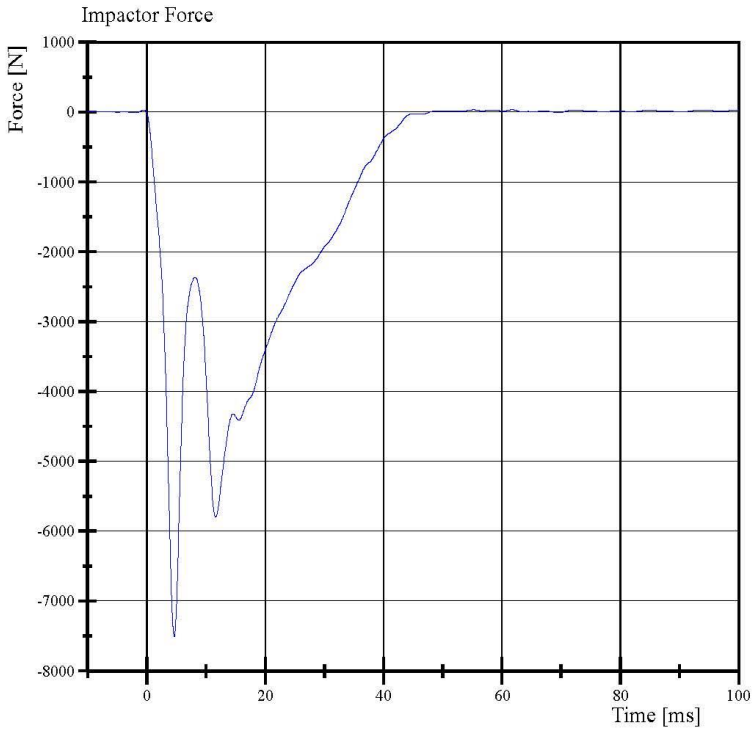
**Comments:**
**Upper Rib Module S/N: 175-4008-A**
**Upper Rib Foam S/N: 175-4003-EK6973**
**Middle Rib Module S/N: 175-4008-A**
**Middle Rib Foam S/N: 175-4003-EK6970**
**Lower Rib Module S/N: 175-4008-A-06-017**
**Lower Rib Foam S/N: 175-4008-EK6971**

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:31:04 431

# Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019




Filter Class: CFC_180
Max: 34.9 N at 55.2 ms
Min: -7,509.0 N at 4.6 ms

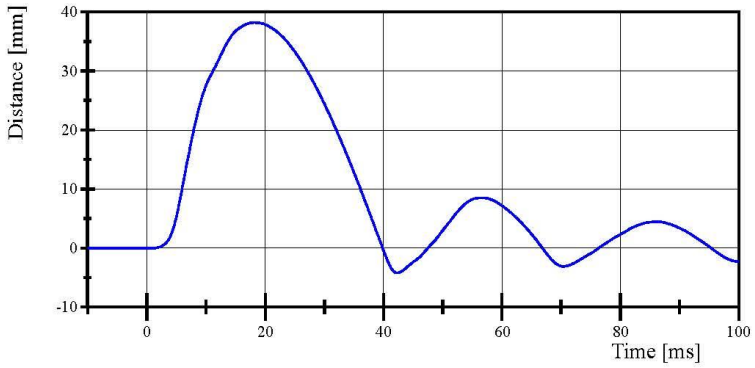
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:33:33 431

# Transportation Research Center Inc.

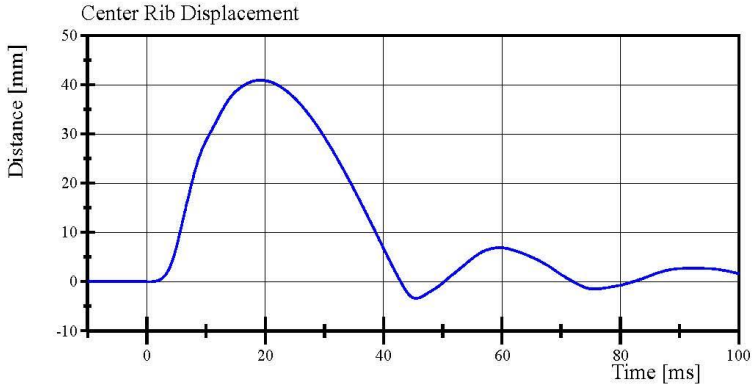
Left Lower Thorax
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

Upper Rib Displacement



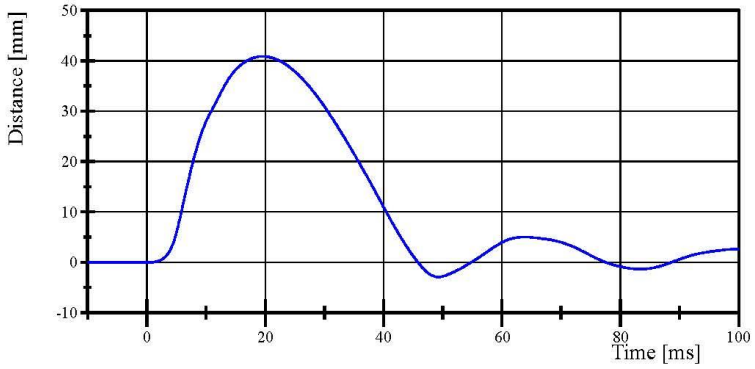

Filter Class: CFC_180
Max: 38.2 mm at 18.2 ms
Min: -4.2 mm at 42.3 ms

Center Rib Displacement




Filter Class: CFC_180
Max: 40.9 mm at 19.1 ms
Min: -3.4 mm at 45.5 ms

Lower Rib Displacement




Filter Class: CFC_180
Max: 40.9 mm at 19.6 ms
Min: -2.9 mm at 49.2 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:33:33 431

# Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 68-2
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.5 °C | Yes |
| Relative Humidity | 10 - 70 % | 37 % | Yes |
| Pendulum Integrated Velocity Change within Corridor | Yes | Yes | Yes |
| Pendulum Velocity | (-5.95) - (-6.15) m/s | -6.108 m/s | Yes |
| Maximum Headform Flexion | | | |
| Peak | (-45) - (-55) deg | -48.8 deg | Yes |
| Time of Peak | 39 - 53 ms | 45.3 ms | Yes |
| Headform Flexion Decay - Peak to Zero | 37 - 57 ms | 37.1 ms | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Lumbar S/N: 150365**

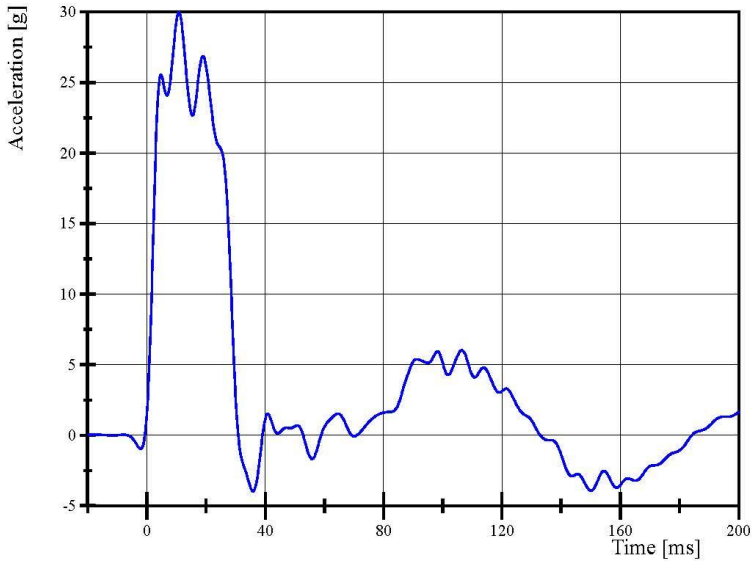
Specification Source: CFR49 Part 572 Subpart U with Polarity in accordance with J211

11.04.2019 12:08:30 639

# Transportation Research Center Inc.

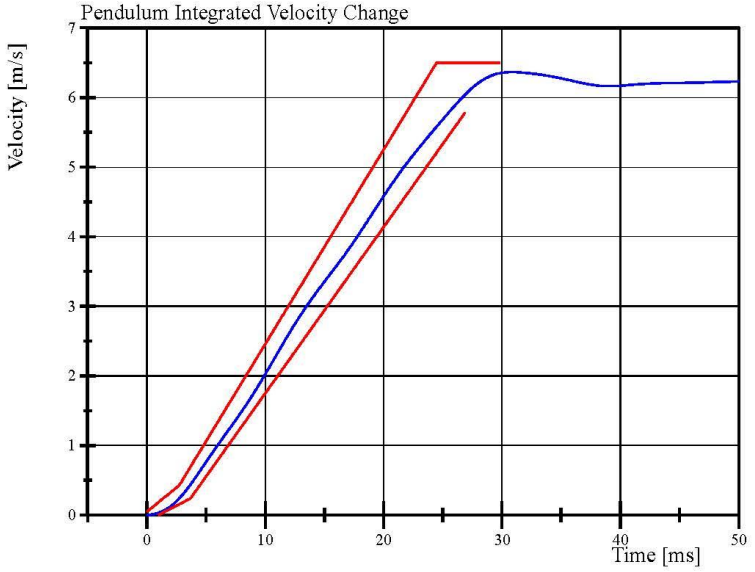
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 68-2
Test Date: 11/4/2019

Pendulum Acceleration




Filter Class: CFC_60
Max: 30.0 g at 10.8 ms
Min: -4.0 g at 35.8 ms

Pendulum Integrated Velocity Change




Filter Class: CFC_60
Max: 6.4 m/s at 30.9 ms
Min: 0.0 m/s at 0.0 ms

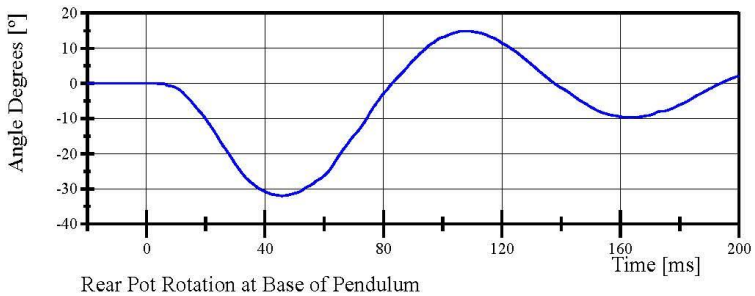
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 12:09:49 639

# Transportation Research Center Inc.

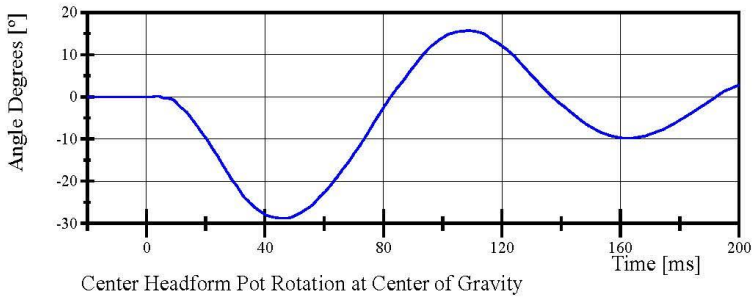
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 68-2
Test Date: 11/4/2019

Forward Pot Rotation at Base of Pendulum



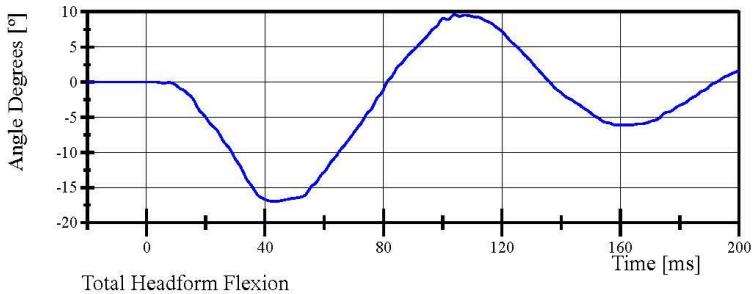

Filter Class: CFC_180
Max: 14.9 ° at 106.8 ms
Min: -32.0 ° at 45.8 ms

Rear Pot Rotation at Base of Pendulum



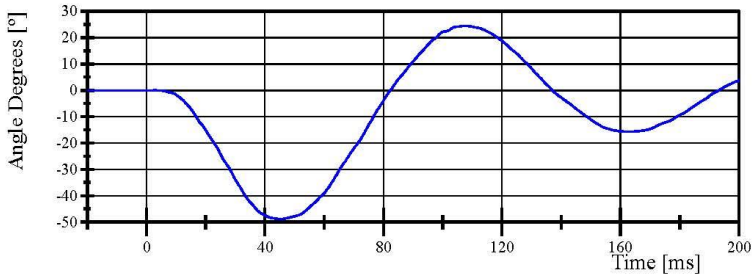

Filter Class: CFC_180
Max: 15.7 ° at 108.6 ms
Min: -28.8 ° at 46.1 ms

Center Headform Pot Rotation at Center of Gravity




Filter Class: CFC_180
Max: 9.6 ° at 104.0 ms
Min: -16.9 ° at 43.7 ms

Total Headform Flexion




Filter Class: CFC_180
Max: 24.4 ° at 107.5 ms
Min: -48.8 ° at 45.3 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 12:09:49 639

# Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 40 % | Yes |
| Test Probe Velocity | 3.9 - 4.1 m/s | 4.05 m/s | Yes |
| Test Probe Force | | | |
| Peak | 4,000 - 4,800 N | 4,109.9 N | Yes |
| Time of Peak | 10.6 - 13.0 ms | 11.52 ms | Yes |
| Total Abdominal Force | | | |
| Peak | 2,200 - 2,700 N | 2,470.8 N | Yes |
| Time of Peak | 10.0 - 12.3 ms | 11.12 ms | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Abdomen S/N: 1066**

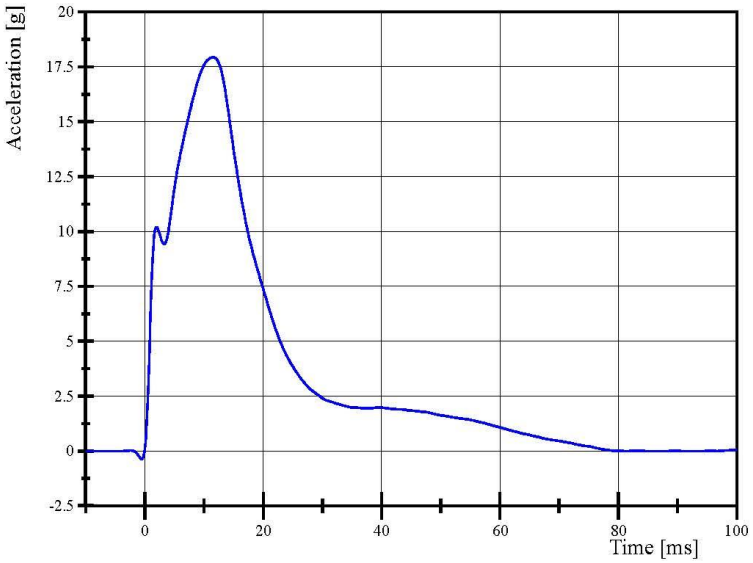
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:42:23 579

# Transportation Research Center Inc.

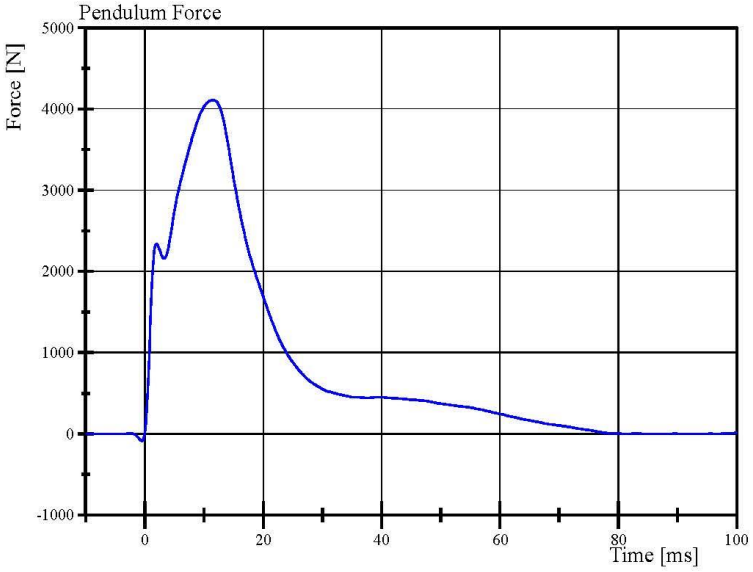
Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

Pendulum Acceleration




Filter Class: CFC_180
Max: 17.9 g at 11.5 ms
Min: -0.4 g at -0.6 ms

Pendulum Force




Filter Class: CFC_180
Max: 4,109.9 N at 11.5 ms
Min: -85.9 N at -0.6 ms

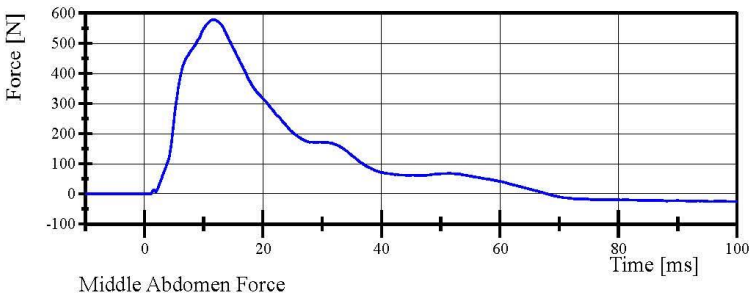
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:43:03 579

# Transportation Research Center Inc.

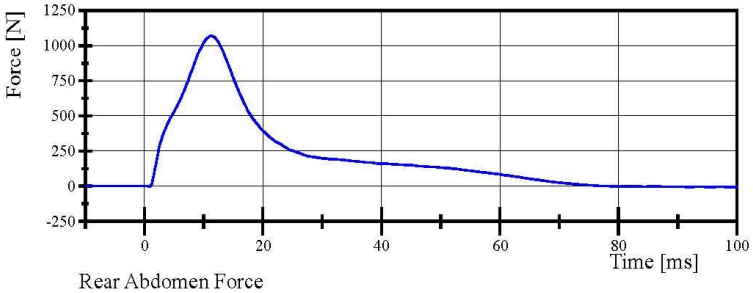
Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

Front Abdomen Force



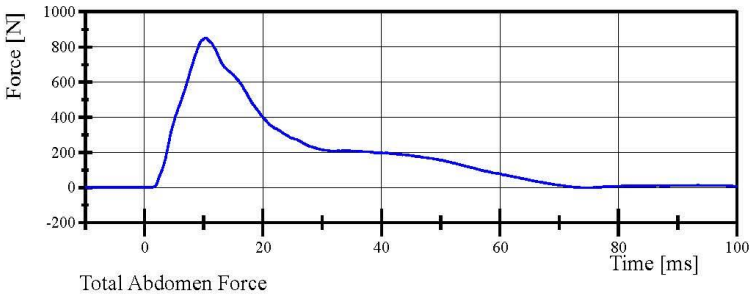

Filter Class: CFC_600
Max: 578.1 N at 11.7 ms
Min: -25.3 N at 98.9 ms

Middle Abdomen Force



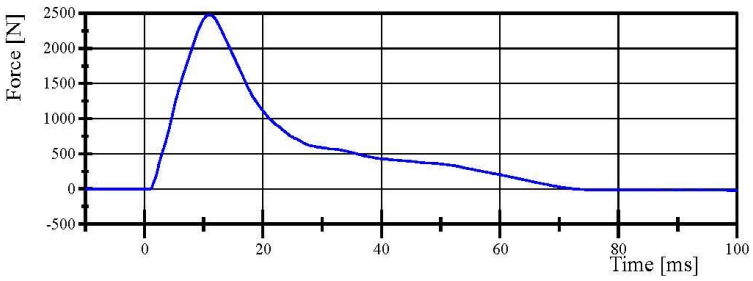

Filter Class: CFC_600
Max: 1,068.6 N at 11.3 ms
Min: -5.5 N at 95.1 ms

Rear Abdomen Force




Filter Class: CFC_600
Max: 852.3 N at 10.4 ms
Min: -1.6 N at 75.3 ms

Total Abdomen Force




Filter Class: CFC_600
Max: 2,470.8 N at 11.1 ms
Min: -21.5 N at 99.5 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:43:03 579

# Transportation Research Center Inc.

Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 38 % | Yes |
| Test Probe Velocity | 4.2 - 4.4 m/s | 4.33 m/s | Yes |
| Test Probe Force | | | |
| Peak | 4,700 - 5,400 N | 5,130.4 N | Yes |
| Time of Peak | 11.8 - 16.1 ms | 12.64 ms | Yes |
| Pubic Symphysis Force | | | |
| Peak | (-1,230) - (-1,590) N | -1,264.5 N | Yes |
| Time of Peak | 12.2 - 17.0 ms | 12.48 ms | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Pelvis Skin S/N: N/A**

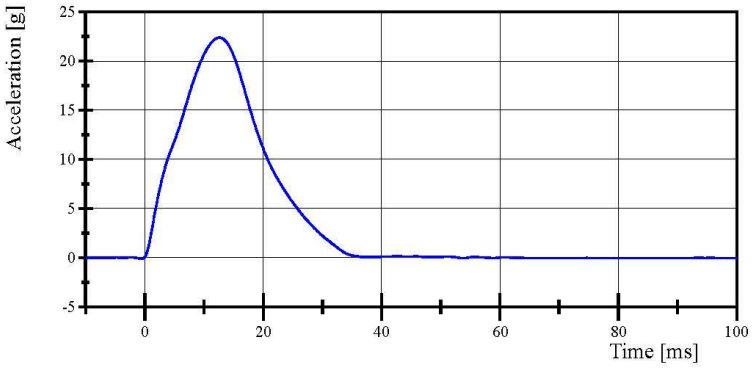
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:57:22 536

# Transportation Research Center Inc.

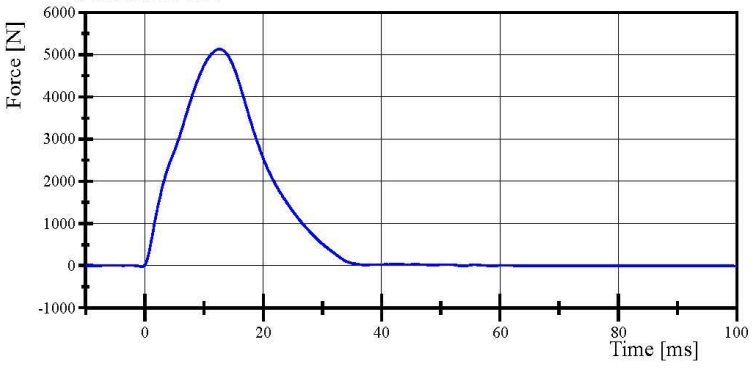
Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 68-1
Test Date: 11/4/2019

Pendulum Acceleration



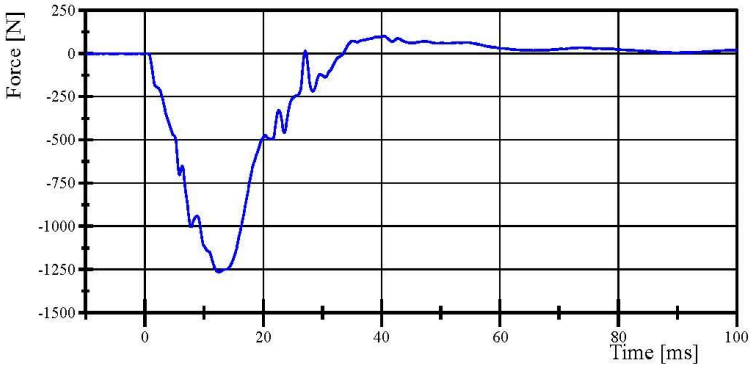

Filter Class: CFC_180
Max: 22.4 g at 12.6 ms
Min: -0.1 g at -0.6 ms

Pendulum Force




Filter Class: CFC_180
Max: 5,130.4 N at 12.6 ms
Min: -20.6 N at -0.6 ms

Pubic Symphysis Force




Filter Class: CFC_600
Max: 102.6 N at 40.4 ms
Min: -1,264.5 N at 12.5 ms

Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

11.04.2019 13:58:26 536

**Pre-Test Calibration Sheets**
**Passenger S/N 305**

**Transportation Research Center Inc.**
**SIDIIs Dummy - Level D**
**External Dimensions**
**Serial No. 305 Calibration No. 75**

| Symbol | Description | Specification | Results | Pass |
|---|---|---|---|---|
| | | mm | mm | |
| A | Sitting Height | 772.0 - 788.0 | 780 | Yes |
| B | Shoulder Pivot Height | 437.0 - 453.0 | 448 | Yes |
| C | H-Point Height | 79.0 - 89.0 | 86 | Yes |
| D | H-Point from Seat Back | 141.0 - 151.0 | 146 | Yes |
| E | Shoulder Pivot from Backline | 97.0 - 107.0 | 100 | Yes |
| F | Thigh Clearance | 119.0 - 135.0 | 130 | Yes |
| G | Head Breadth | 140.0 - 148.0 | 145 | Yes |
| H | Head Back from Backline | 40.0 - 46.0 | 44 | Yes |
| I | Head Depth | 178.0 - 188.0 | 185 | Yes |
| J | Head Circumference | 541.0 - 551.0 | 543 | Yes |
| K | Buttock to Knee Length | 514.0 - 540.0 | 532 | Yes |
| L | Popliteal Height | 343.0 - 369.0 | 349 | Yes |
| M | Knee Pivot to Floor Height | 393.0 - 409.0 | 397 | Yes |
| N | Buttock Popliteal Length | 416.0 - 442.0 | 434 | Yes |
| O | Chest Depth without Jacket | 195.0 - 211.0 | 197 | Yes |
| P | Foot Length (right) | 216.0 - 232.0 | 222 | Yes |
| P | Foot Length (left) | 216.0 - 232.0 | 220 | Yes |
| Q | Hip Breadth | 313.0 - 323.0 | 320 | Yes |
| R | Arm Length | 249.0 - 259.0 | 253 | Yes |
| S | Knee Joint to seat Back | 478.0 - 493.0 | 483 | Yes |
| V | Shoulder Width (only one arm installed) | 341.0 - 357.0 | 350 | Yes |
| W | Foot Width (right) | 78.0 - 94.0 | 85 | Yes |
| W | Foot Width (left) | 78.0 - 94.0 | 85 | Yes |
| Y | Chest Circumference with Jacket | 851.0 - 881.0 | 878 | Yes |
| Z | Waist Circumference | 761.0 - 791.0 | 780 | Yes |

# Transportation Research Center Inc.

Left Lateral Head Drop
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 18.9 - 25.6 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| Peak Head Resultant Acceleration | 115 - 137 g | 123.3 g | Yes |
| Peak Head Longitudinal Acceleration | (-15) - 15 g | -3.3 g | Yes |
| Is Head Resultant Acceleration Curve Unimodal within 15% of Peak? | < 15 % | 2.53 % | Yes |

**Test meets specifications.**

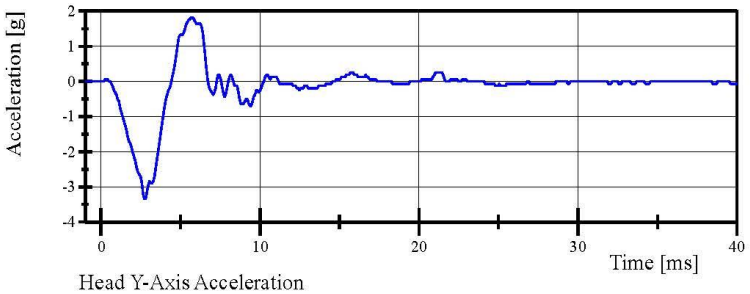
**Condition: Used**

**Comments:**
**Head Skin S/N: 1253**

# Transportation Research Center Inc.

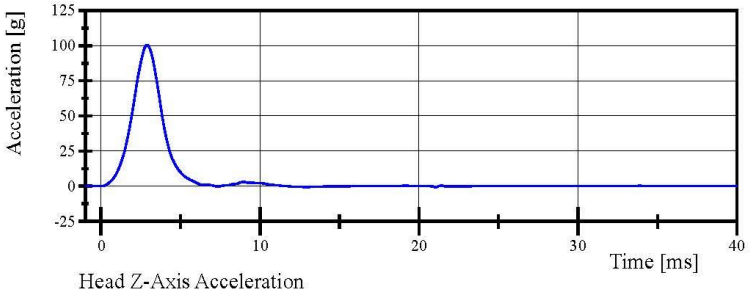
Left Lateral Head Drop
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 9/10/2019

Head X-Axis Acceleration



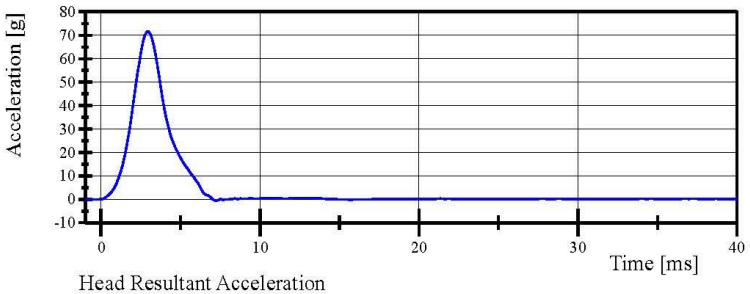

Filter Class: CFC_1000
Max: 1.8 g at 5.7 ms
Min: -3.3 g at 2.7 ms

Head Y-Axis Acceleration



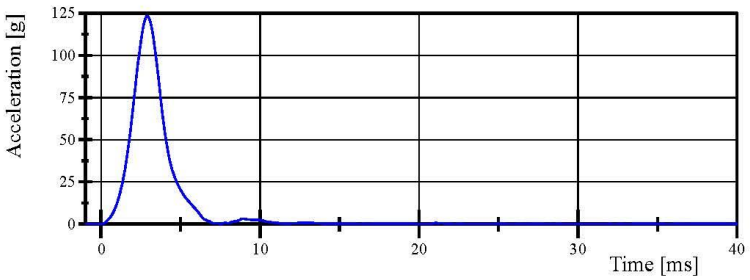

Filter Class: CFC_1000
Max: 100.4 g at 2.9 ms
Min: -0.7 g at 21.0 ms

Head Z-Axis Acceleration




Filter Class: CFC_1000
Max: 71.7 g at 3.0 ms
Min: -0.6 g at 7.2 ms

Head Resultant Acceleration




Filter Class: CFC_1000
Max: 123.3 g at 2.9 ms
Min: 0.0 g at -1.0 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.10.2019 07:10:51 194

# Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. 305 Certification No. 75-1
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| Pendulum Velocity | (-5.51) - (-5.63) m/s | -5.604 m/s | Yes |
| Pendulum Integrated Velocity Change at 10 ms | 2.20 - 2.80 m/s | 2.571 m/s | Yes |
| Change at 15 ms | 3.30 - 4.10 m/s | 3.664 m/s | Yes |
| Change at 20 ms | 4.40 - 5.40 m/s | 4.940 m/s | Yes |
| Change at 25 ms | 5.40 - 6.10 m/s | 5.930 m/s | Yes |
| Change at 25 to 100 ms | 5.50 - 6.20 m/s | 6.114 m/s | Yes |
| Maximum Headform Flexion occurring between 50ms and 70ms. | | | |
| Peak | (-71) - (-81) deg | -73.5 deg | Yes |
| Time of Peak | 50 - 70 ms | 69.6 ms | Yes |
| Total Neck Occipital Condyles Moment | 36 - 44 N·m | 38.8 N·m | Yes |
| Total Neck Occipital Condyles Moment Decay Time to 0 N·m | 102 - 126 ms | 122.7 ms | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Neck S/N: 180-2001-606**

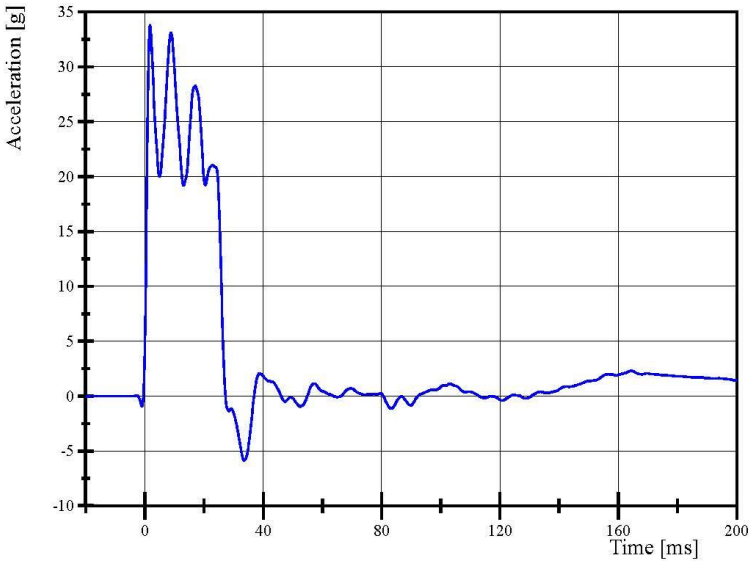
Specification Source: CFR49 Part 572 Subpart V with Polarity in accordance with J211

09.10.2019 09:02:41 720

# Transportation Research Center Inc.

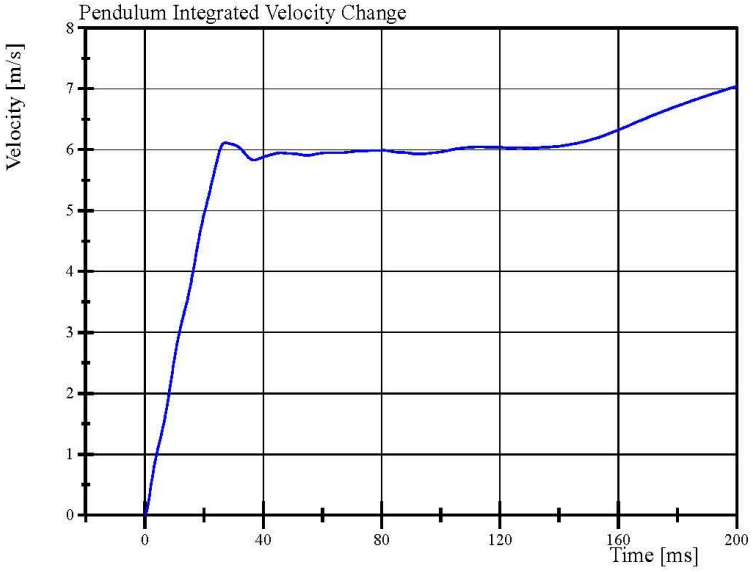
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 75-1
Test Date: 9/10/2019

Pendulum Acceleration




Filter Class: CFC_180
Max: 33.8 g at 1.8 ms
Min: -5.9 g at 33.6 ms

Pendulum Integrated Velocity Change




Filter Class: CFC_180
Max: 7.0 m/s at 200.0 ms
Min: 0.0 m/s at 0.0 ms

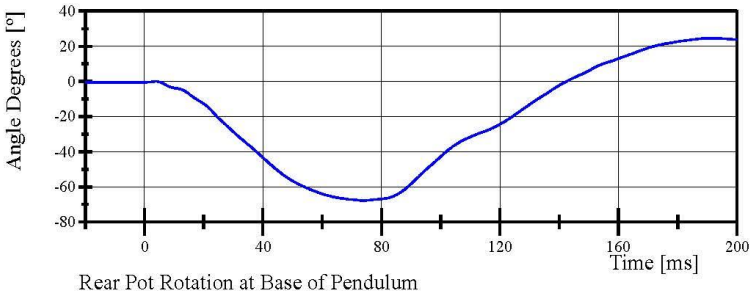
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.10.2019 09:03:26 720

# Transportation Research Center Inc.

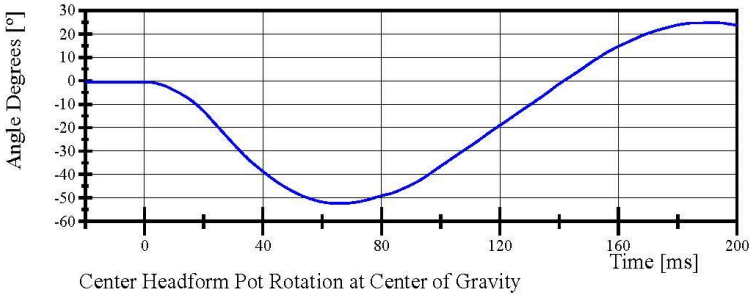
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 75-1
Test Date: 9/10/2019

Forward Pot Rotation at Base of Pendulum



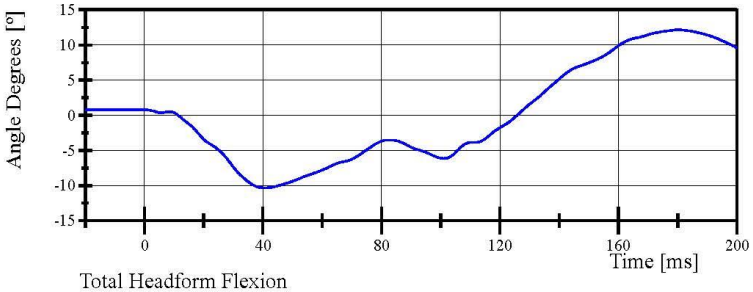

Filter Class: CFC_60
Max: 24.7 ° at 191.0 ms
Min: -67.7 ° at 73.9 ms

Rear Pot Rotation at Base of Pendulum



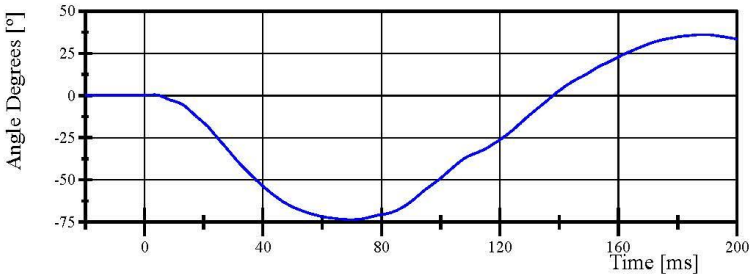

Filter Class: CFC_60
Max: 24.8 ° at 192.2 ms
Min: -52.4 ° at 65.8 ms

Center Headform Pot Rotation at Center of Gravity




Filter Class: CFC_60
Max: 12.1 ° at 180.2 ms
Min: -10.3 ° at 40.7 ms

Total Headform Flexion




Filter Class: CFC_60
Max: 36.1 ° at 189.1 ms
Min: -73.5 ° at 69.6 ms

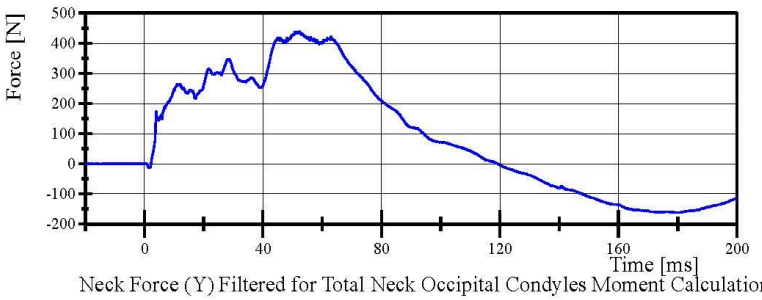
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.10.2019 09:03:26 720

# Transportation Research Center Inc.

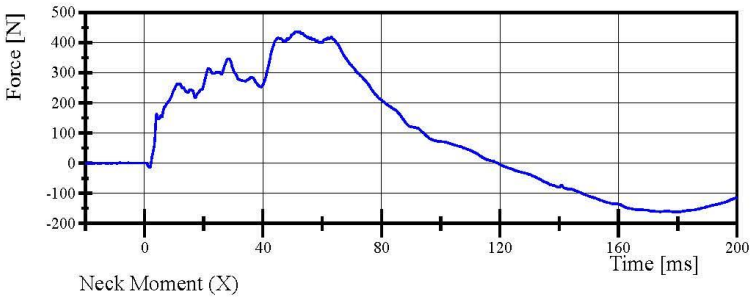
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 75-1
Test Date: 9/10/2019

Neck Force (Y)



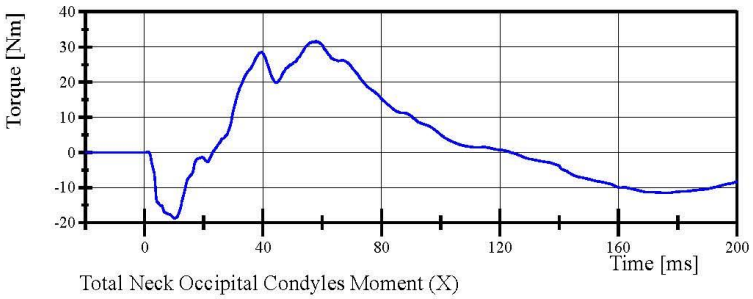

Filter Class: CFC_1000
Max: 439.0 N at 52.3 ms
Min: -162.6 N at 179.2 ms

Neck Force (Y) Filtered for Total Neck Occipital Condyles Moment Calculation



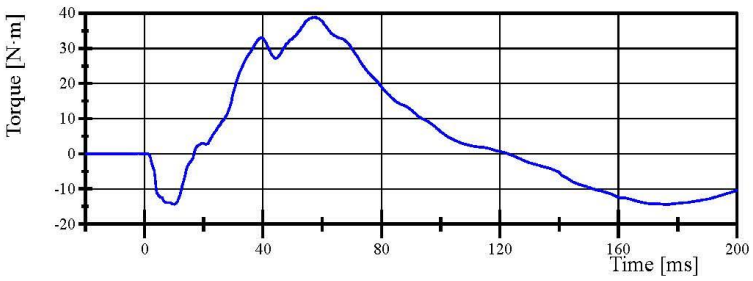

Filter Class: CFC_600
Max: 437.4 N at 52.3 ms
Min: -162.4 N at 179.3 ms

Neck Moment (X)




Filter Class: CFC_600
Max: 31.6 Nm at 57.8 ms
Min: -18.7 Nm at 10.2 ms

Total Neck Occipital Condyles Moment (X)




Filter Class: Without_(Constar
Max: 38.8 N·m at 57.8 ms
Min: -14.4 N·m at 176.2 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.10.2019 09:03:27 720

# Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. 305 Certification No. 75-1
Test Date: 9/9/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| Impactor Velocity | 4.2 - 4.4 m/s | 4.32 m/s | Yes |
| Impactor Acceleration | (-13) - (-18) g | -15.8 g | Yes |
| Shoulder Displacement | 28 - 37 mm | 33.2 mm | Yes |
| Upper Spine Lateral Acceleration | 17 - 22 g | 17.3 g | Yes |

**Test meets specifications.**

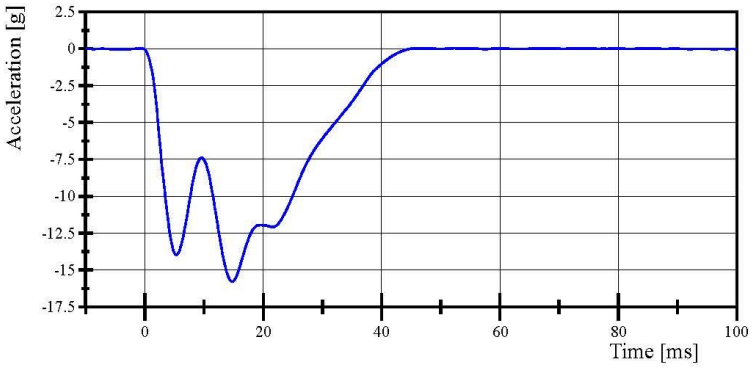
**Condition: Used**

**Comments:**
**Left Arm S/N: 952**

# Transportation Research Center Inc.

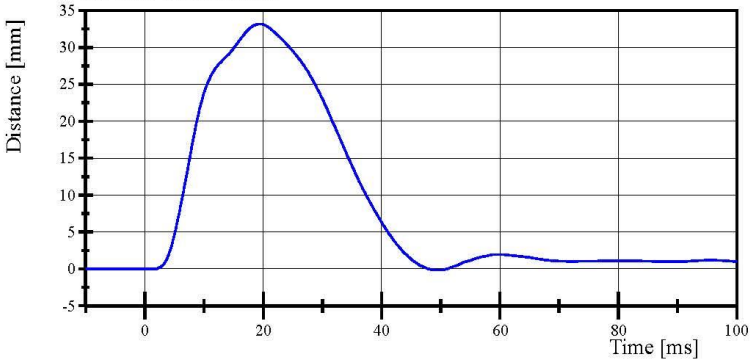
Left Lateral Shoulder
SID IIs Serial No. 305 Certification No. 75-1
Test Date: 9/9/2019

Probe Acceleration



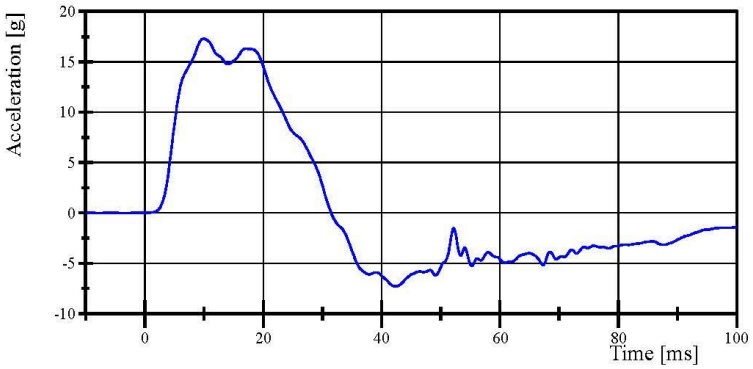

Filter Class: CFC_180
Max: 0.0 g at 52.2 ms
Min: -15.8 g at 14.8 ms

Shoulder Displacement




Filter Class: CFC_600
Max: 33.2 mm at 19.5 ms
Min: -0.2 mm at 49.8 ms

Upper Spine Acceleration (Y)




Filter Class: CFC_180
Max: 17.3 g at 9.9 ms
Min: -7.3 g at 42.4 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.09.2019 13:10:42 838

# Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 10/8/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.2 °C | Yes |
| Relative Humidity | 10 - 70 % | 40 % | Yes |
| Impactor Velocity | 6.60 - 6.80 m/s | 6.743 m/s | Yes |
| Impactor Acceleration | (-30) - (-36) g | -30.7 g | Yes |
| Shoulder Displacement | 31 - 40 mm | 35.7 mm | Yes |
| Upper Thorax Rib Displacement | 25 - 32 mm | 27.3 mm | Yes |
| Center Thorax Rib Displacement | 30 - 36 mm | 32.6 mm | Yes |
| Lower Thorax Rib Displacement | 32 - 38 mm | 35.8 mm | Yes |
| Upper Spine Lateral Acceleration | 34 - 43 g | 36.7 g | Yes |
| Lower Spine Lateral Acceleration | 29 - 37 g | 29.3 g | Yes |

**Test meets specifications.**

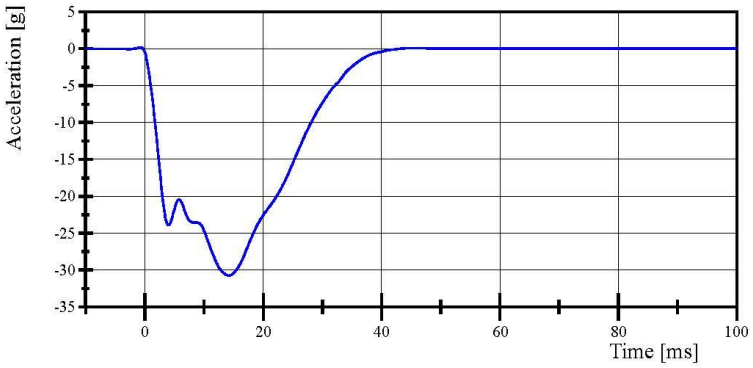
**Condition: Used**

**Comments:**
**Left Arm S/N: 952**
**Shoulder Rib S/N: 180-3355 DM4450**
**Upper Thorax Rib S/N: 2135**
**Middle Thorax Rib S/N: 2136**
**Lower Thorax Rib S/N: 2137**
*** New Upper Bib-Rib #180-3360**
*** New Thorax Pad #180-3451**

# Transportation Research Center Inc.

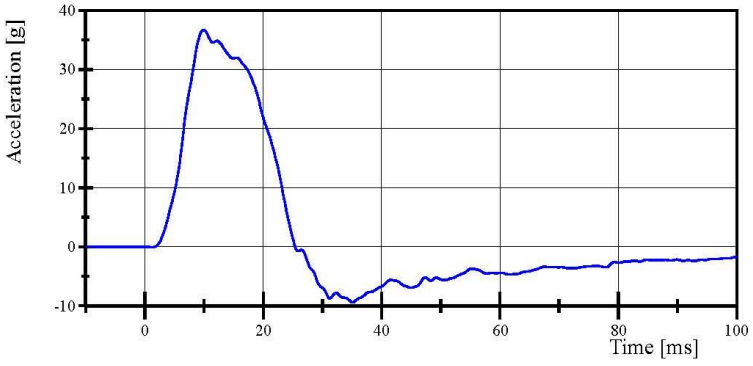
Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 10/8/2019

Probe Acceleration



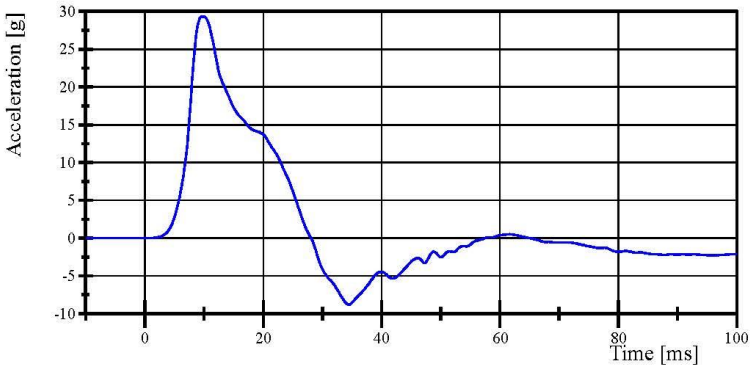

Filter Class: CFC_180
Max: 0.2 g at -0.7 ms
Min: -30.7 g at 14.2 ms

Upper Spine Acceleration




Filter Class: CFC_180
Max: 36.7 g at 9.9 ms
Min: -9.4 g at 35.1 ms

Lower Spine Acceleration




Filter Class: CFC_180
Max: 29.3 g at 9.8 ms
Min: -8.8 g at 34.5 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

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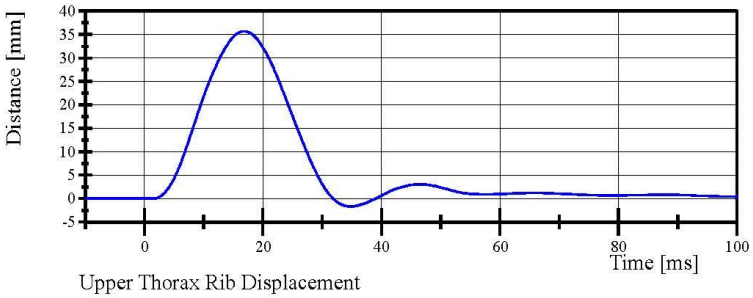
# Transportation Research Center Inc.

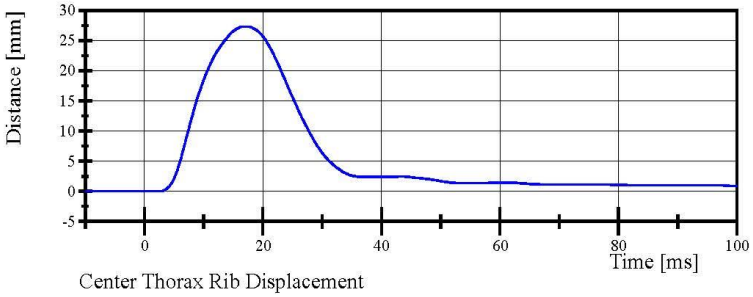
Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 10/8/2019

Shoulder Rib Displacement



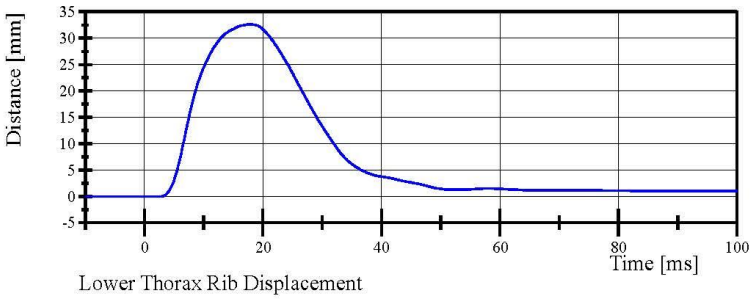

Filter Class: CFC_600
Max: 35.7 mm at 16.9 ms
Min: -1.7 mm at 34.8 ms

Upper Thorax Rib Displacement



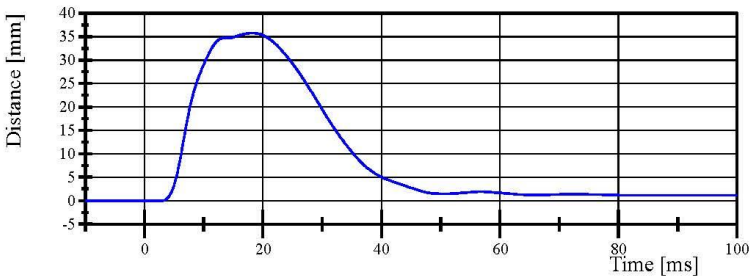

Filter Class: CFC_600
Max: 27.3 mm at 17.1 ms
Min: -0.0 mm at 2.6 ms

Center Thorax Rib Displacement




Filter Class: CFC_600
Max: 32.6 mm at 17.7 ms
Min: -0.0 mm at -0.9 ms

Lower Thorax Rib Displacement




Filter Class: CFC_600
Max: 35.8 mm at 18.1 ms
Min: -0.0 mm at 2.8 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

10.08.2019 15:06:27 592

# Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 10/8/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.1 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Impactor Velocity | 4.20 - 4.40 m/s | 4.285 m/s | Yes |
| Impactor Acceleration | (-14) - (-18) g | -15.5 g | Yes |
| Upper Thorax Rib Displacement | 32 - 40 mm | 36.1 mm | Yes |
| Center Thorax Rib Displacement | 39 - 45 mm | 41.5 mm | Yes |
| Lower Thorax Rib Displacement | 35 - 43 mm | 38.5 mm | Yes |
| Upper Spine Lateral Acceleration | 13 - 17 g | 14.0 g | Yes |
| Lower Spine Lateral Acceleration | 7 - 11 g | 9.4 g | Yes |

**Test meets specifications.**

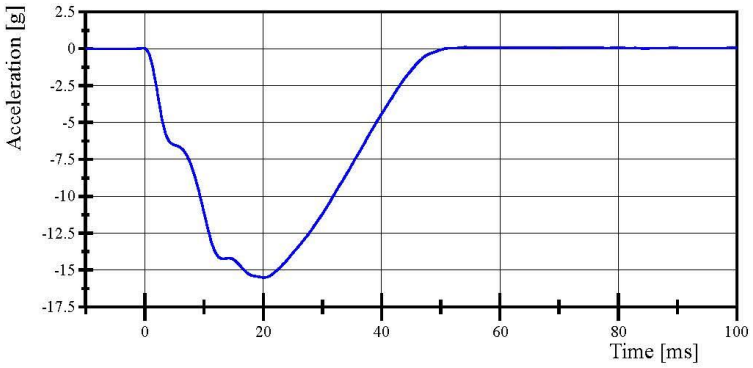
**Condition: Used**

**Comments:**
**Upper Thorax Rib S/N: 2135**
**Middle Thorax Rib S/N: 2136**
**Lower Thorax Rib S/N: 2137**
*** New Upper Bib-Rib #180-3360**
*** New Thorax Pad #180-3451**

# Transportation Research Center Inc.

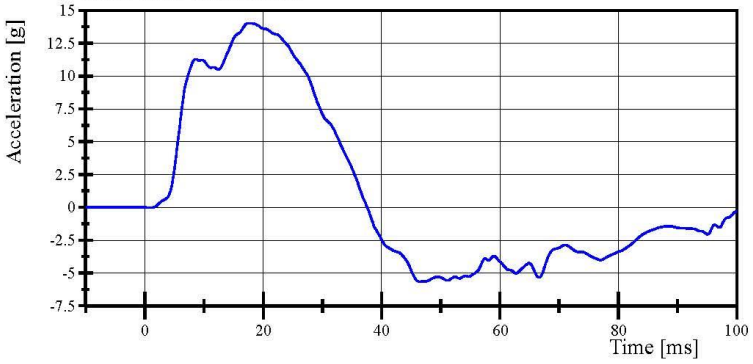
Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 10/8/2019

Probe Acceleration



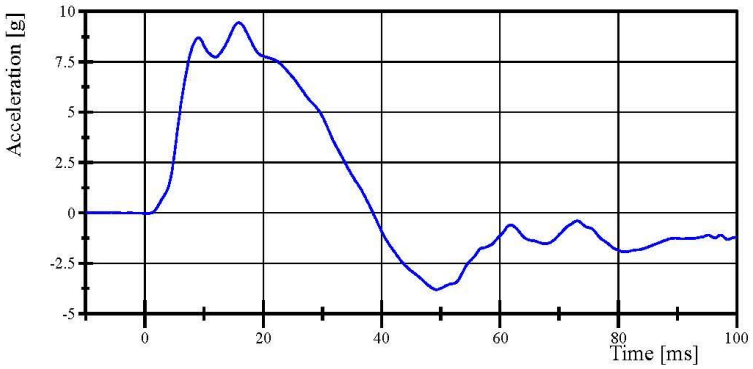

Filter Class: CFC_180
Max: 0.1 g at 54.1 ms
Min: -15.5 g at 20.1 ms

Upper Spine Acceleration




Filter Class: CFC_180
Max: 14.0 g at 17.5 ms
Min: -5.7 g at 46.4 ms

Lower Spine Acceleration




Filter Class: CFC_180
Max: 9.4 g at 15.8 ms
Min: -3.8 g at 49.3 ms

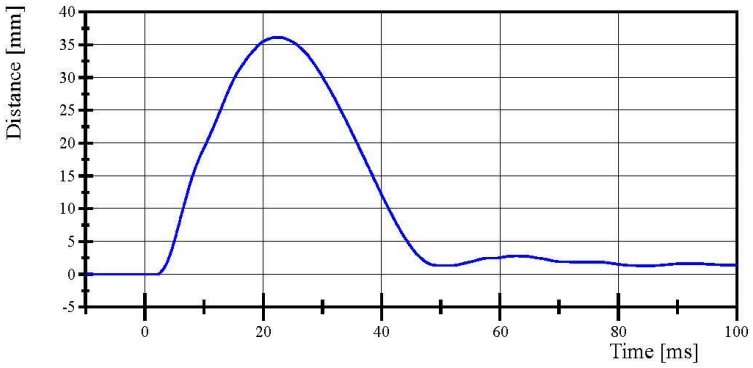
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

10.08.2019 14:30:41 806

# Transportation Research Center Inc.

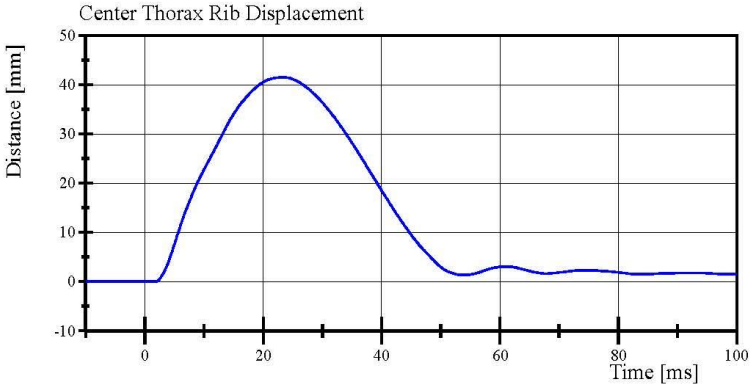
Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 10/8/2019

Upper Thorax Rib Displacement



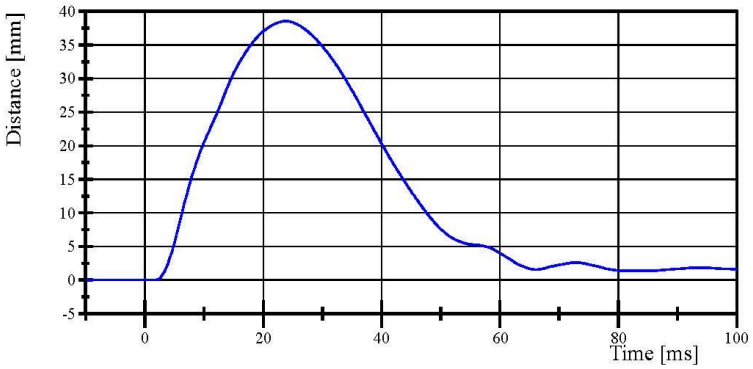

Filter Class: CFC_600
Max: 36.1 mm at 22.5 ms
Min: -0.0 mm at 1.9 ms

Center Thorax Rib Displacement




Filter Class: CFC_600
Max: 41.5 mm at 23.0 ms
Min: -0.0 mm at 1.7 ms

Lower Thorax Rib Displacement




Filter Class: CFC_600
Max: 38.5 mm at 23.8 ms
Min: -0.0 mm at -4.7 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

10.08.2019 14:30:41 806

# Transportation Research Center Inc.

Left Lateral Abdomen
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 10/8/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.5 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Impactor Velocity | 4.2 - 4.4 m/s | 4.29 m/s | Yes |
| Impactor Acceleration | (-12) - (-16) g | -12.9 g | Yes |
| Upper Abdominal Rib Displacement | 36 - 47 mm | 44.8 mm | Yes |
| Lower Abdominal Rib Displacement | 33 - 44 mm | 41.8 mm | Yes |
| Lower Spine Lateral Acceleration | 9 - 14.0 g | 10.06 g | Yes |

**Test meets specifications.**

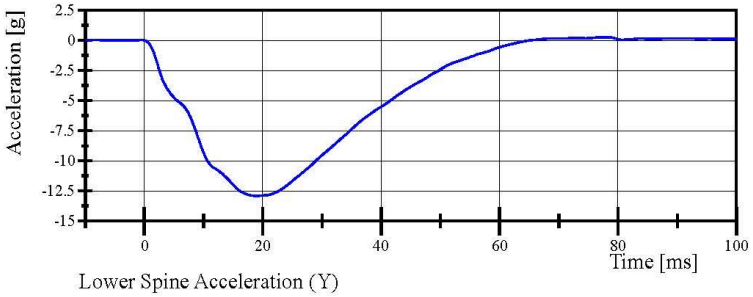
**Condition: Used**

**Comments:**
**Upper Abdominal Rib S/N: 1997**
**Lower Abdominal Rib S/N: DS1234**
*** New Abdominal Pad # 180-3452**

# Transportation Research Center Inc.

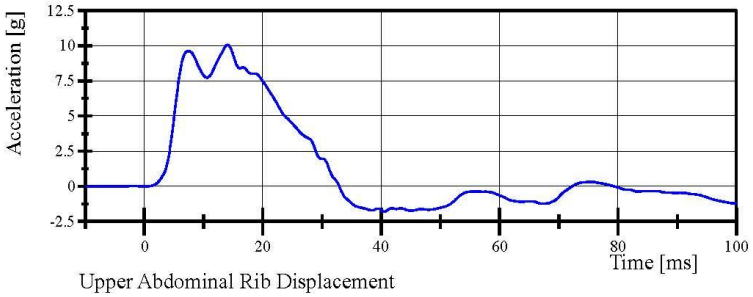
Left Lateral Abdomen
SID IIs Serial No. 305 Certification No. 75-2
Test Date: 10/8/2019

Probe Acceleration



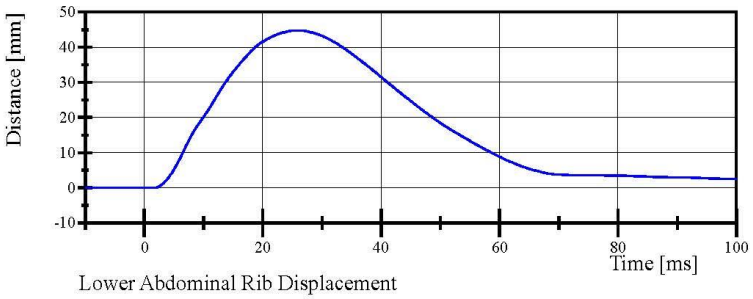

Filter Class: CFC_180
Max: 0.2 g at 78.2 ms
Min: -12.9 g at 18.8 ms

Lower Spine Acceleration (Y)



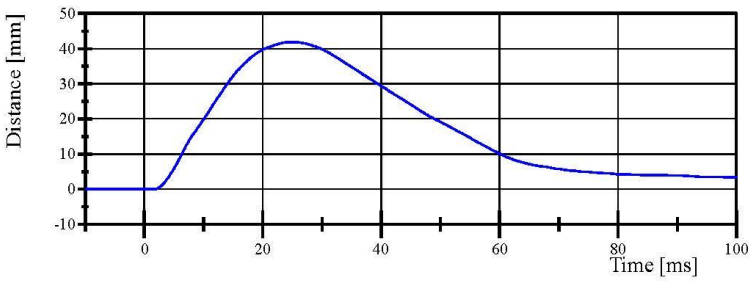

Filter Class: CFC_180
Max: 10.1 g at 14.1 ms
Min: -1.8 g at 40.6 ms

Upper Abdominal Rib Displacement




Filter Class: CFC_600
Max: 44.8 mm at 25.8 ms
Min: -0.0 mm at 1.8 ms

Lower Abdominal Rib Displacement




Filter Class: CFC_600
Max: 41.8 mm at 25.0 ms
Min: -0.0 mm at 0.8 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

10.08.2019 13:42:50 637

# Transportation Research Center Inc.

Left Lateral Pelvis
SID IIs Serial No. 305 Certification No. 75-3
Test Date: 9/10/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 20.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 59 % | Yes |
| Pendulum Velocity | 6.6 - 6.8 m/s | 6.62 m/s | Yes |
| Impactor Acceleration | (-38.0) - (-47.0) g | -42.57 g | Yes |
| Peak Pelvis Lateral Acceleration after 6ms | 34 - 42 g | 38.5 g | Yes |
| Acetabulum Force | 3,600 - 4,300 N | 3,797.0 N | Yes |

**Test meets specifications.**

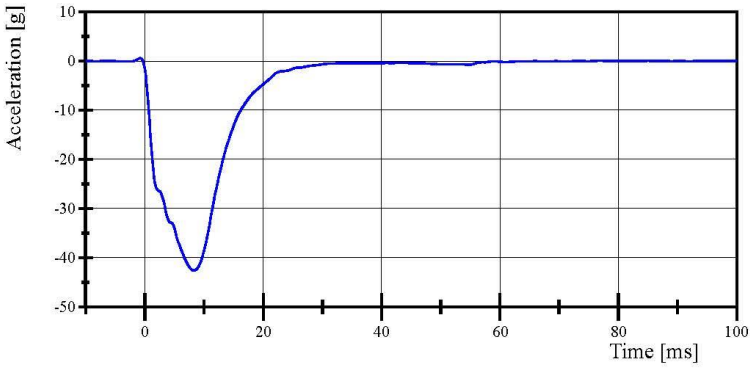
**Condition: Used**

**Comments:**
**Pelvis Skin S/N: 884**
**Pelvis Plug Info:**
**Manufacturer: SACO**
**S/N: 11602**
**Cal Date: 20161004**

# Transportation Research Center Inc.

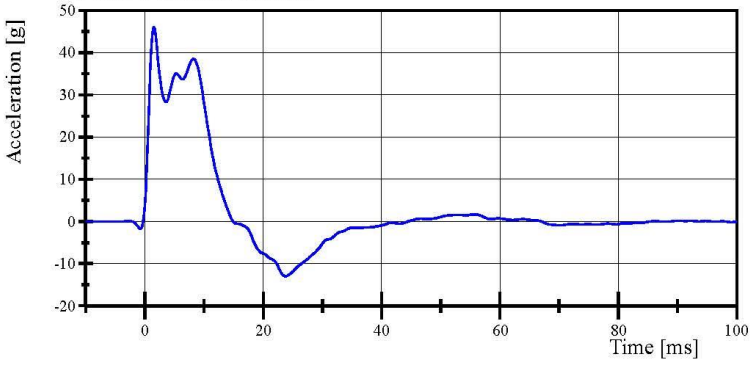
Left Lateral Pelvis
SID IIs Serial No. 305 Certification No. 75-3
Test Date: 9/10/2019

Probe Acceleration



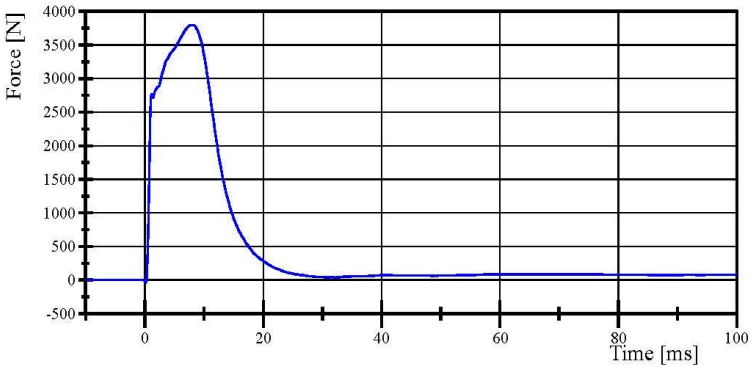

Filter Class: CFC_180
Max: 0.6 g at -0.8 ms
Min: -42.6 g at 8.2 ms

Pelvis Y-Axis Acceleration




Filter Class: CFC_180
Max: 46.1 g at 1.5 ms
Min: -13.0 g at 23.8 ms

Acetabulum Y-Axis Force




Filter Class: CFC_600
Max: 3,797.0 N at 8.1 ms
Min: -37.9 N at 0.2 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.10.2019 11:59:57 441

# Transportation Research Center Inc.

Left Lateral Iliac
SID IIs Serial No. 305 Certification No. 75-1
Test Date: 9/9/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.0 °C | Yes |
| Relative Humidity | 10 - 70 % | 58 % | Yes |
| Pendulum Velocity | 4.2 - 4.4 m/s | 4.27 m/s | Yes |
| Impactor Acceleration | (-36) - (-45) g | -38.2 g | Yes |
| Peak Pelvis Lateral Acceleration | 28 - 39 g | 31.4 g | Yes |
| Iliac Force | 4,100 - 5,100 N | 4,509.5 N | Yes |

**Test meets specifications.**

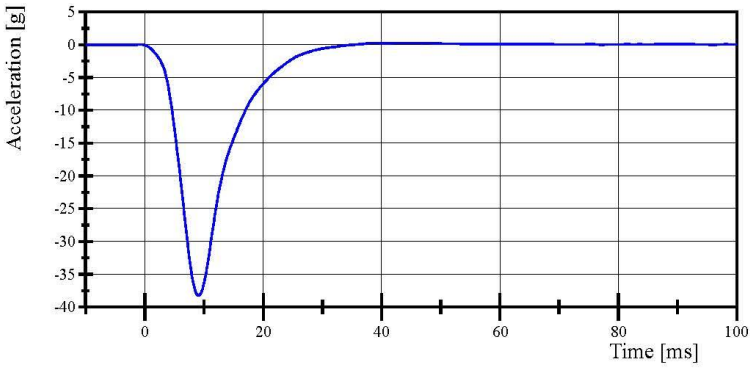
**Condition: Used**

**Comments:**
**Pelvis Skin S/N: 884**

# Transportation Research Center Inc.

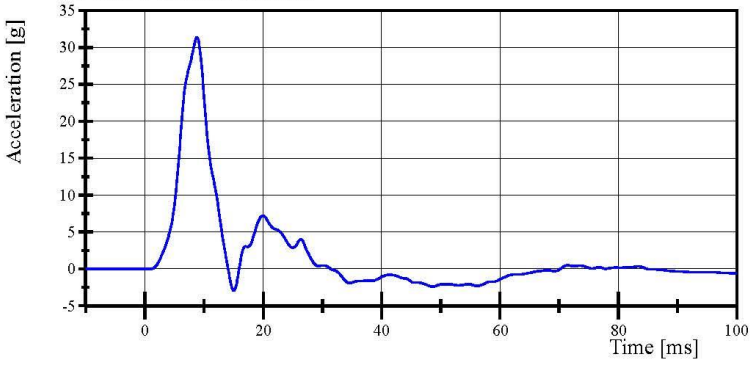
Left Lateral Iliac
SID IIs Serial No. 305 Certification No. 75-1
Test Date: 9/9/2019

Probe Acceleration



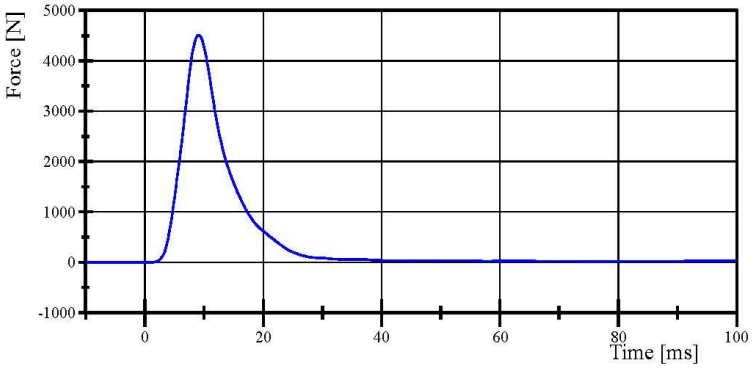

Filter Class: CFC_180
Max: 0.3 g at 44.6 ms
Min: -38.2 g at 9.0 ms

Pelvis Y-Axis Acceleration




Filter Class: CFC_180
Max: 31.4 g at 8.8 ms
Min: -2.9 g at 15.0 ms

Iliac Y-Axis Force




Filter Class: CFC_600
Max: 4,509.5 N at 9.1 ms
Min: -0.7 N at -5.1 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.09.2019 12:58:52 679

**Post-Test Calibration Sheets**
**Passenger S/N 305**

**Transportation Research Center Inc.**
**SIDIIs Dummy - Level D**
**External Dimensions**
**Serial No. 305 Calibration No. 76**

| Symbol | Description | Specification | Results | Pass |
|---|---|---|---|---|
| | | mm | mm | |
| A | Sitting Height | 772.0 - 788.0 | 780 | Yes |
| B | Shoulder Pivot Height | 437.0 - 453.0 | 448 | Yes |
| C | H-Point Height | 79.0 - 89.0 | 86 | Yes |
| D | H-Point from Seat Back | 141.0 - 151.0 | 146 | Yes |
| E | Shoulder Pivot from Backline | 97.0 - 107.0 | 100 | Yes |
| F | Thigh Clearance | 119.0 - 135.0 | 130 | Yes |
| G | Head Breadth | 140.0 - 148.0 | 145 | Yes |
| H | Head Back from Backline | 40.0 - 46.0 | 44 | Yes |
| I | Head Depth | 178.0 - 188.0 | 185 | Yes |
| J | Head Circumference | 541.0 - 551.0 | 543 | Yes |
| K | Buttock to Knee Length | 514.0 - 540.0 | 532 | Yes |
| L | Popliteal Height | 343.0 - 369.0 | 349 | Yes |
| M | Knee Pivot to Floor Height | 393.0 - 409.0 | 397 | Yes |
| N | Buttock Popliteal Length | 416.0 - 442.0 | 434 | Yes |
| O | Chest Depth without Jacket | 195.0 - 211.0 | 197 | Yes |
| P | Foot Length (right) | 216.0 - 232.0 | 222 | Yes |
| P | Foot Length (left) | 216.0 - 232.0 | 220 | Yes |
| Q | Hip Breadth | 313.0 - 323.0 | 320 | Yes |
| R | Arm Length | 249.0 - 259.0 | 253 | Yes |
| S | Knee Joint to seat Back | 478.0 - 493.0 | 483 | Yes |
| V | Shoulder Width (only one arm installed) | 341.0 - 357.0 | 350 | Yes |
| W | Foot Width (right) | 78.0 - 94.0 | 85 | Yes |
| W | Foot Width (left) | 78.0 - 94.0 | 85 | Yes |
| Y | Chest Circumference with Jacket | 851.0 - 881.0 | 878 | Yes |
| Z | Waist Circumference | 761.0 - 791.0 | 780 | Yes |

# Transportation Research Center Inc.

Left Lateral Head Drop
SID IIs Serial No. 305 Certification No. 76-2
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 18.9 - 25.6 °C | 21.8 °C | Yes |
| Relative Humidity | 10 - 70 % | 34 % | Yes |
| Peak Head Resultant Acceleration | 115 - 137 g | 122.6 g | Yes |
| Peak Head Longitudinal Acceleration | (-15) - 15 g | -5.0 g | Yes |
| Is Head Resultant Acceleration Curve Unimodal within 15% of Peak? | < 15 % | 2.20 % | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Head Skin S/N: 1253**

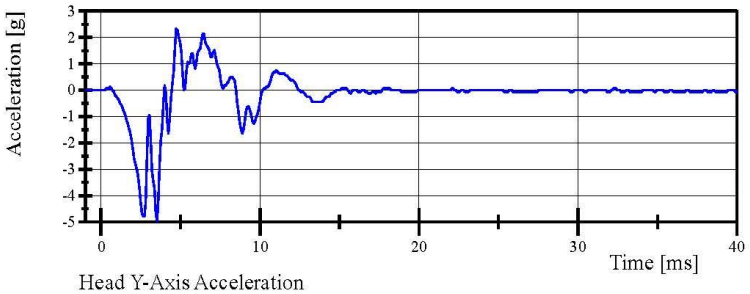
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.04.2019 07:13:20 196

# Transportation Research Center Inc.

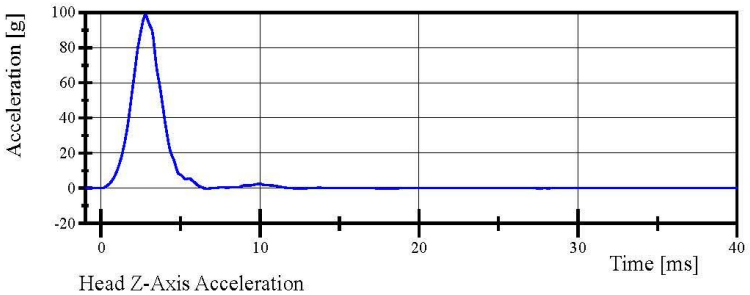
Left Lateral Head Drop
SID IIs Serial No. 305 Certification No. 76-2
Test Date: 11/4/2019

Head X-Axis Acceleration



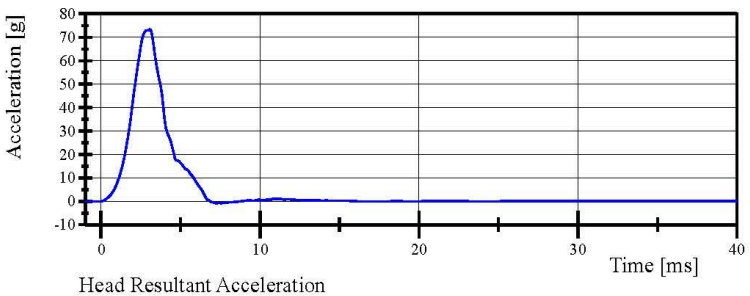

Filter Class: CFC_1000
Max: 2.3 g at 4.7 ms
Min: -5.0 g at 3.5 ms

Head Y-Axis Acceleration



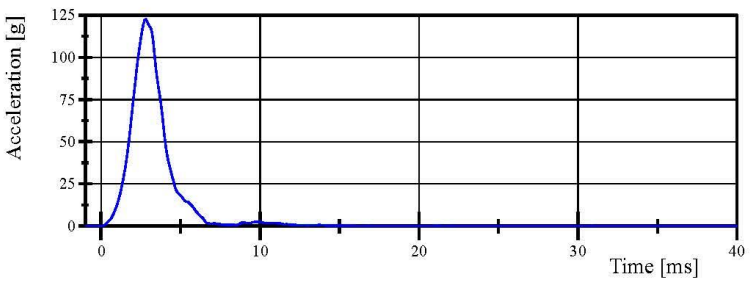

Filter Class: CFC_1000
Max: 98.6 g at 2.8 ms
Min: -0.2 g at 6.6 ms

Head Z-Axis Acceleration




Filter Class: CFC_1000
Max: 73.4 g at 3.0 ms
Min: -0.8 g at 7.2 ms

Head Resultant Acceleration




Filter Class: CFC_1000
Max: 122.6 g at 2.8 ms
Min: 0.0 g at -1.0 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.04.2019 07:13:49 196

# Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. 305 Certification No. 76-3
Test Date: 11/4/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 39 % | Yes |
| Pendulum Velocity | (-5.51) - (-5.63) m/s | -5.599 m/s | Yes |
| Pendulum Integrated Velocity Change at 10 ms | 2.20 - 2.80 m/s | 2.524 m/s | Yes |
| Change at 15 ms | 3.30 - 4.10 m/s | 3.680 m/s | Yes |
| Change at 20 ms | 4.40 - 5.40 m/s | 5.025 m/s | Yes |
| Change at 25 ms | 5.40 - 6.10 m/s | 5.911 m/s | Yes |
| Change at 25 to 100 ms | 5.50 - 6.20 m/s | 5.932 m/s | Yes |
| Maximum Headform Flexion occurring between 50ms and 70ms. | | | |
| Peak | (-71) - (-81) deg | -74.5 deg | Yes |
| Time of Peak | 50 - 70 ms | 67.5 ms | Yes |
| Total Neck Occipital Condyles Moment | 36 - 44 N·m | 42.6 N·m | Yes |
| Total Neck Occipital Condyles Moment Decay Time to 0 N·m | 102 - 126 ms | 120.6 ms | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Neck S/N: 180-2001-606**

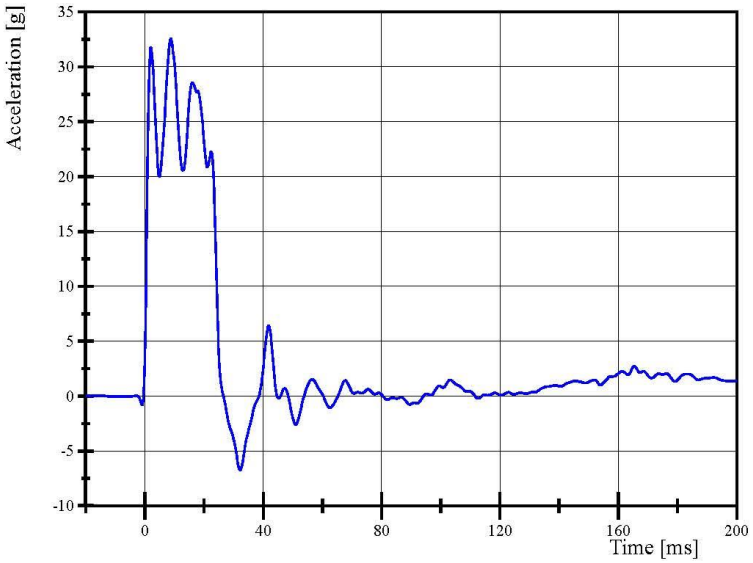
Specification Source: CFR49 Part 572 Subpart V with Polarity in accordance with J211

11.04.2019 10:52:07 718

# Transportation Research Center Inc.

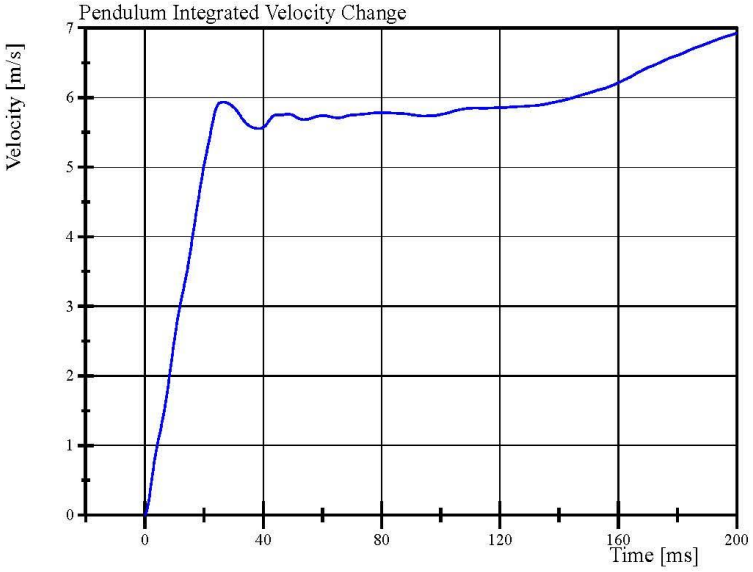
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 76-3
Test Date: 11/4/2019

Pendulum Acceleration




Filter Class: CFC_180
Max: 32.6 g at 8.7 ms
Min: -6.7 g at 32.2 ms

Pendulum Integrated Velocity Change




Filter Class: CFC_180
Max: 6.9 m/s at 200.0 ms
Min: 0.0 m/s at 0.0 ms

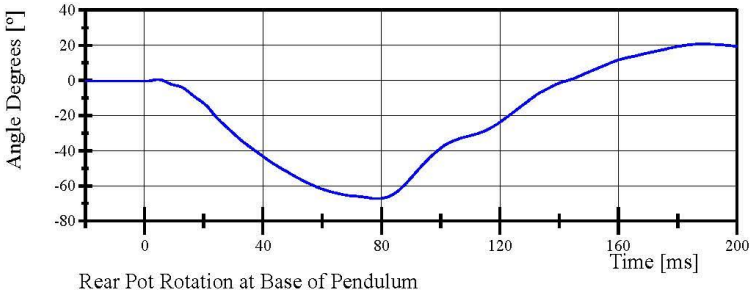
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.04.2019 10:53:18 718

# Transportation Research Center Inc.

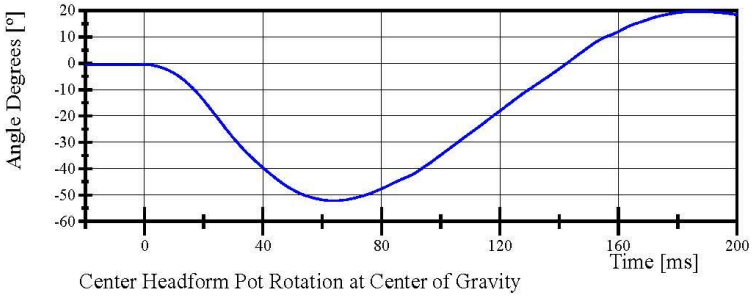
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 76-3
Test Date: 11/4/2019

Forward Pot Rotation at Base of Pendulum



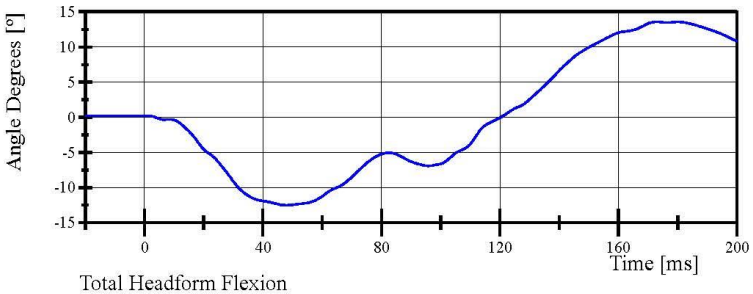

Filter Class: CFC_60
Max: 20.8 ° at 188.2 ms
Min: -67.3 ° at 78.6 ms

Rear Pot Rotation at Base of Pendulum



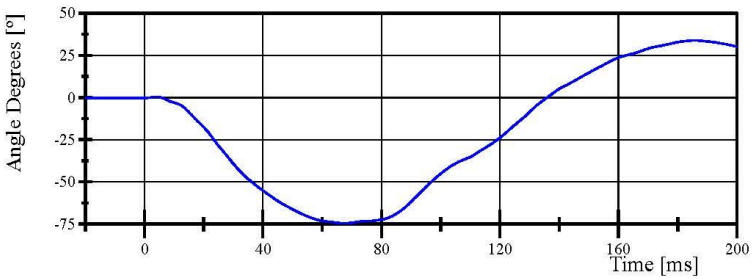

Filter Class: CFC_60
Max: 19.6 ° at 187.3 ms
Min: -52.2 ° at 63.9 ms

Center Headform Pot Rotation at Center of Gravity




Filter Class: CFC_60
Max: 13.6 ° at 173.0 ms
Min: -12.5 ° at 47.8 ms

Total Headform Flexion




Filter Class: CFC_60
Max: 33.8 ° at 185.8 ms
Min: -74.5 ° at 67.5 ms

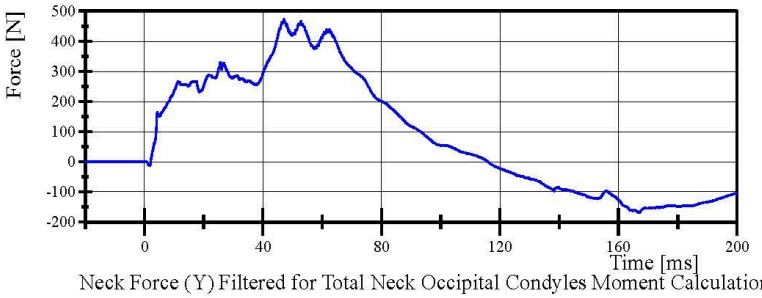
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.04.2019 10:53:18 718

# Transportation Research Center Inc.

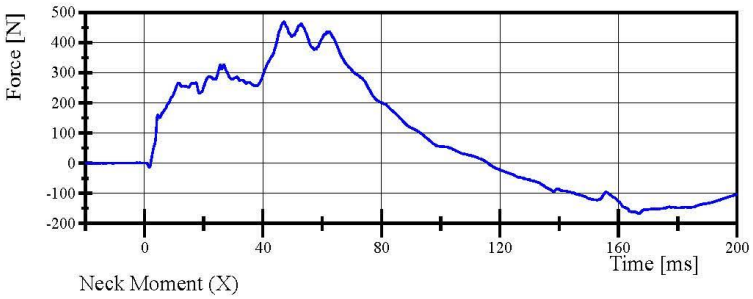
Left Lateral Neck
SID IIs Serial No. 305 Certification No. 76-3
Test Date: 11/4/2019

Neck Force (Y)



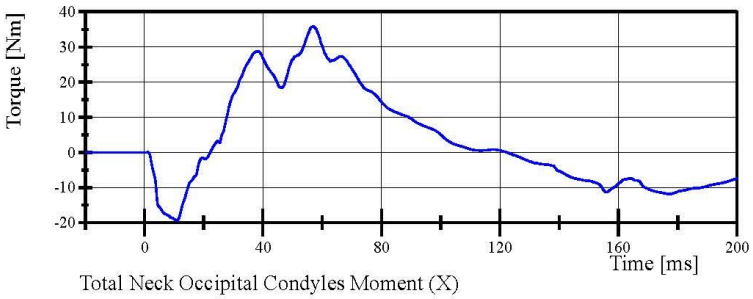

Filter Class: CFC_1000
Max: 473.2 N at 47.1 ms
Min: -167.9 N at 166.7 ms

Neck Force (Y) Filtered for Total Neck Occipital Condyles Moment Calculation



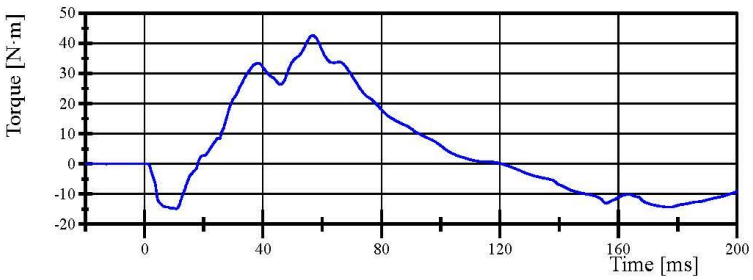

Filter Class: CFC_600
Max: 469.4 N at 47.1 ms
Min: -167.8 N at 167.0 ms

Neck Moment (X)




Filter Class: CFC_600
Max: 35.9 Nm at 57.1 ms
Min: -19.4 Nm at 11.0 ms

Total Neck Occipital Condyles Moment (X)




Filter Class: Without_(Constar
Max: 42.6 N·m at 57.0 ms
Min: -14.9 N·m at 10.7 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.04.2019 10:53:19 718

# Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.4 °C | Yes |
| Relative Humidity | 10 - 70 % | 37 % | Yes |
| Impactor Velocity | 4.2 - 4.4 m/s | 4.35 m/s | Yes |
| Impactor Acceleration | (-13) - (-18) g | -15.8 g | Yes |
| Shoulder Displacement | 28 - 37 mm | 34.1 mm | Yes |
| Upper Spine Lateral Acceleration | 17 - 22 g | 17.7 g | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Left Arm S/N: 952**

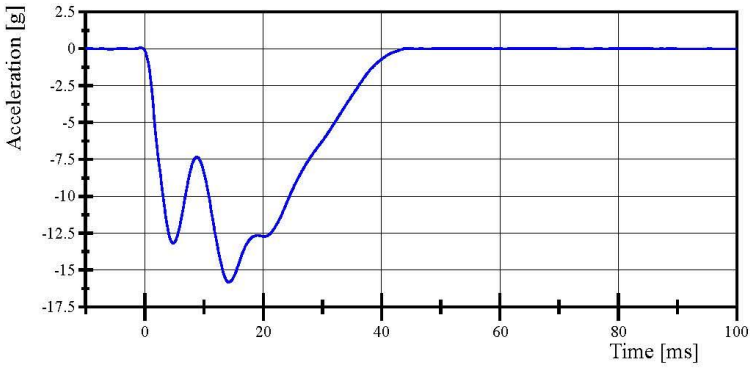
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 10:46:01 926

# Transportation Research Center Inc.

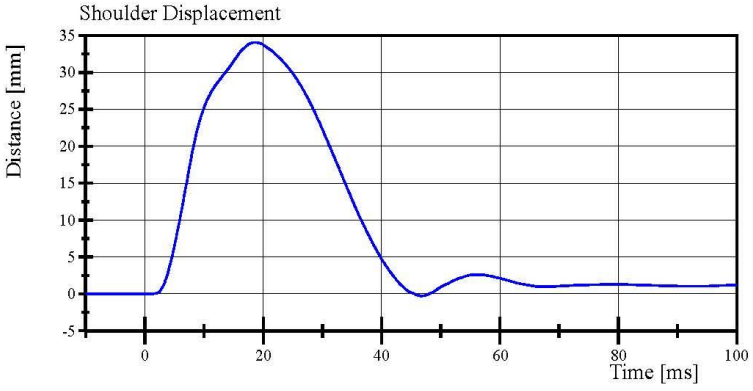
Left Lateral Shoulder
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

Probe Acceleration



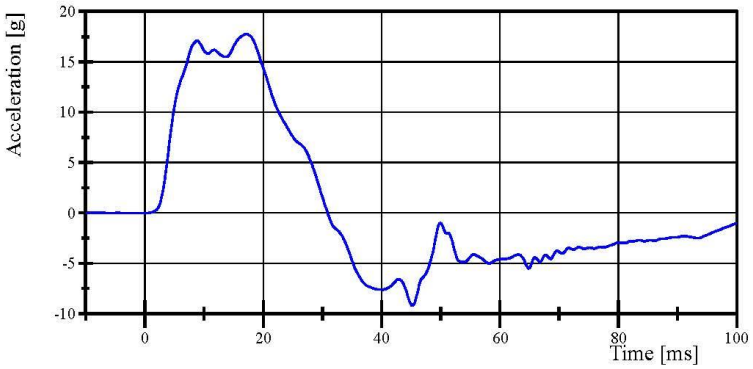

Filter Class: CFC_180
Max: 0.1 g at -0.7 ms
Min: -15.8 g at 14.2 ms

Shoulder Displacement




Filter Class: CFC_600
Max: 34.1 mm at 18.6 ms
Min: -0.3 mm at 46.8 ms

Upper Spine Acceleration (Y)




Filter Class: CFC_180
Max: 17.7 g at 17.1 ms
Min: -9.2 g at 45.2 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 10:46:43 926

# Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 34 % | Yes |
| Impactor Velocity | 6.60 - 6.80 m/s | 6.730 m/s | Yes |
| Impactor Acceleration | (-30) - (-36) g | -33.4 g | Yes |
| Shoulder Displacement | 31 - 40 mm | 36.9 mm | Yes |
| Upper Thorax Rib Displacement | 25 - 32 mm | 28.2 mm | Yes |
| Center Thorax Rib Displacement | 30 - 36 mm | 33.0 mm | Yes |
| Lower Thorax Rib Displacement | 32 - 38 mm | 36.4 mm | Yes |
| Upper Spine Lateral Acceleration | 34 - 43 g | 37.4 g | Yes |
| Lower Spine Lateral Acceleration | 29 - 37 g | 32.8 g | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Left Arm S/N: 952**
**Shoulder Rib S/N: 180-3355 DM4450**
**Upper Thorax Rib S/N: 2135**
**Middle Thorax Rib S/N: 2136**
**Lower Thorax Rib S/N: 2137**

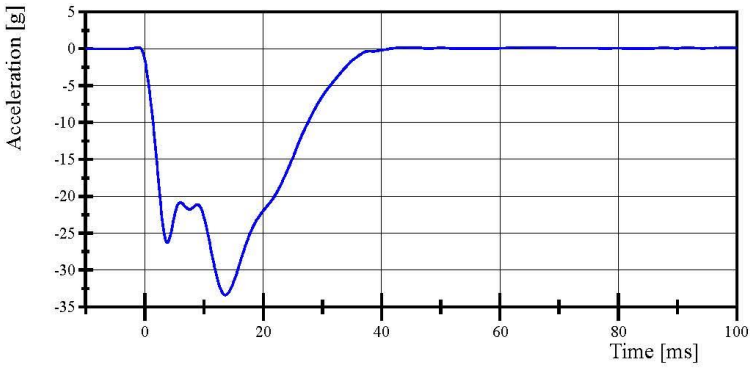
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 12:13:40 572

# Transportation Research Center Inc.

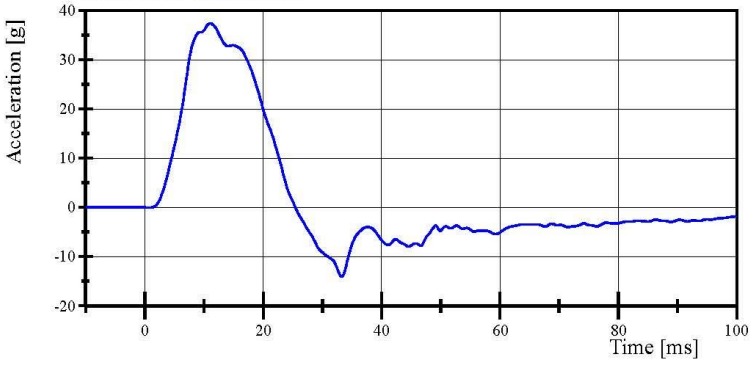
Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

Probe Acceleration



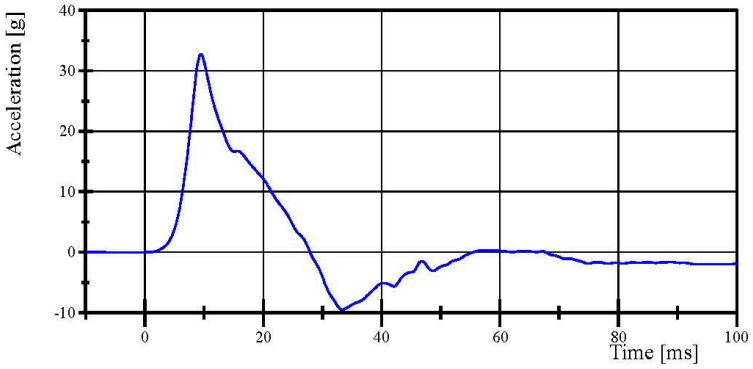

Filter Class: CFC_180
Max: 0.2 g at 62.9 ms
Min: -33.4 g at 13.6 ms

Upper Spine Acceleration




Filter Class: CFC_180
Max: 37.4 g at 11.0 ms
Min: -14.1 g at 33.3 ms

Lower Spine Acceleration




Filter Class: CFC_180
Max: 32.8 g at 9.4 ms
Min: -9.5 g at 33.4 ms

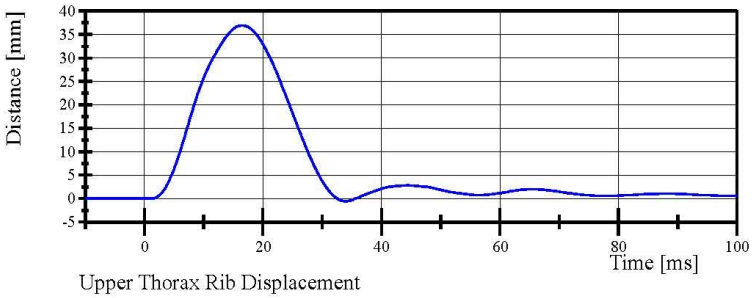
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 12:14:37 572

# Transportation Research Center Inc.

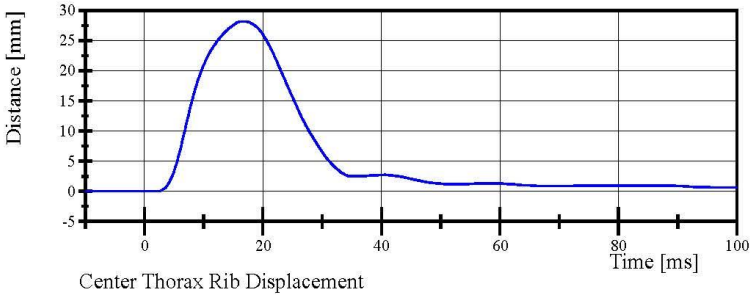
Left Lateral Thorax with Arm
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

Shoulder Rib Displacement



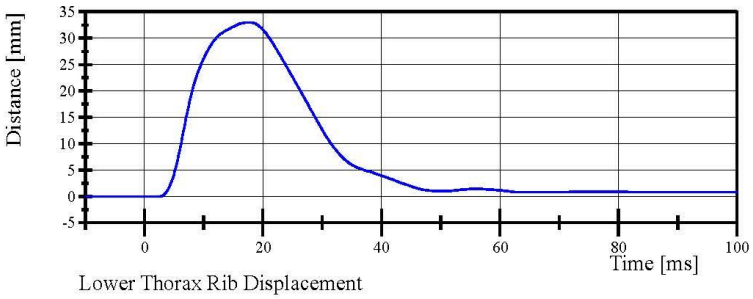

Filter Class: CFC_600
Max: 36.9 mm at 16.5 ms
Min: -0.6 mm at 33.9 ms

Upper Thorax Rib Displacement



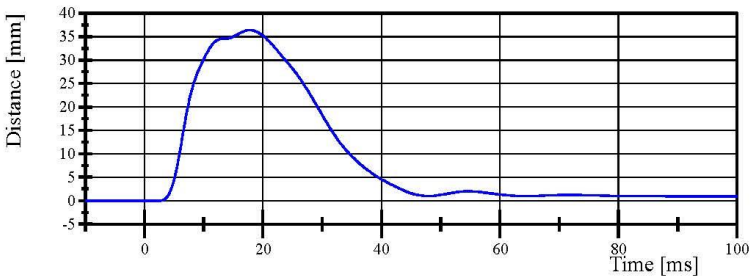

Filter Class: CFC_600
Max: 28.2 mm at 16.6 ms
Min: -0.0 mm at 2.3 ms

Center Thorax Rib Displacement




Filter Class: CFC_600
Max: 33.0 mm at 17.4 ms
Min: -0.0 mm at 2.4 ms

Lower Thorax Rib Displacement




Filter Class: CFC_600
Max: 36.4 mm at 17.8 ms
Min: -0.0 mm at 2.1 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 12:14:37 572

# Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Impactor Velocity | 4.20 - 4.40 m/s | 4.277 m/s | Yes |
| Impactor Acceleration | (-14) - (-18) g | -15.2 g | Yes |
| Upper Thorax Rib Displacement | 32 - 40 mm | 35.9 mm | Yes |
| Center Thorax Rib Displacement | 39 - 45 mm | 40.9 mm | Yes |
| Lower Thorax Rib Displacement | 35 - 43 mm | 37.3 mm | Yes |
| Upper Spine Lateral Acceleration | 13 - 17 g | 14.9 g | Yes |
| Lower Spine Lateral Acceleration | 7 - 11 g | 8.6 g | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Upper Thorax Rib S/N: 2135**
**Middle Thorax Rib S/N: 2136**
**Lower Thorax Rib S/N: 2137**

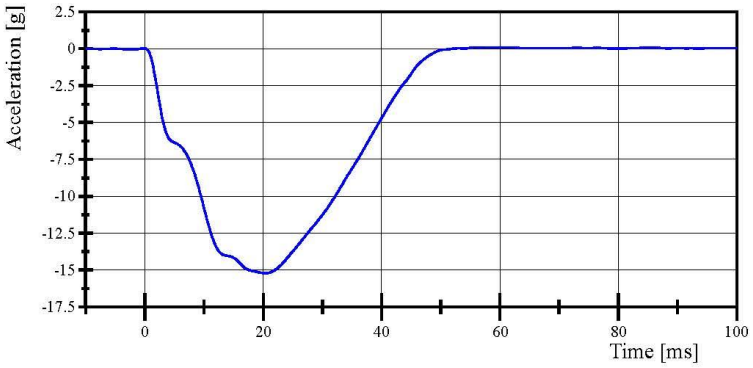
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 11:49:40 788

# Transportation Research Center Inc.

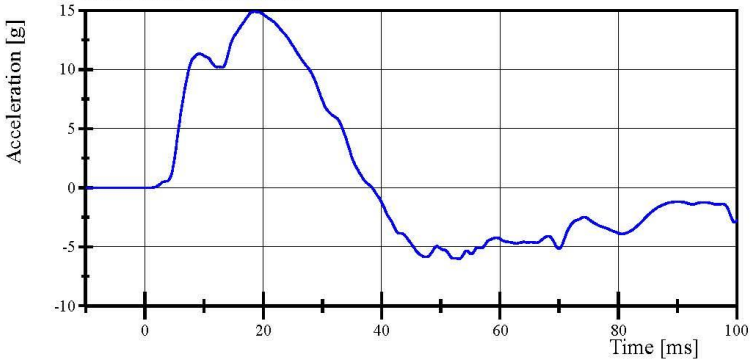
Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

Probe Acceleration



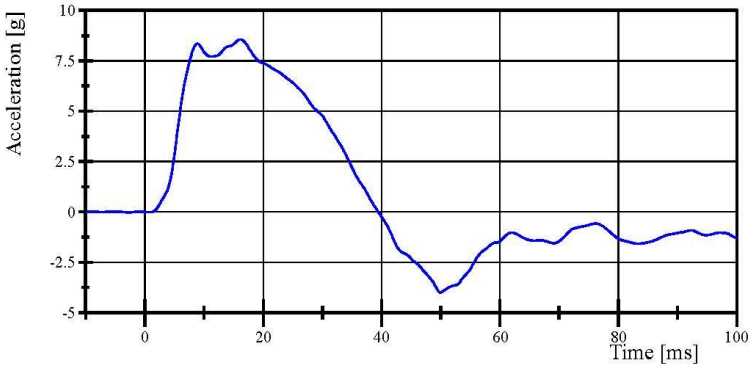

Filter Class: CFC_180
Max: 0.1 g at 61.4 ms
Min: -15.2 g at 20.3 ms

Upper Spine Acceleration




Filter Class: CFC_180
Max: 14.9 g at 18.6 ms
Min: -6.0 g at 53.0 ms

Lower Spine Acceleration




Filter Class: CFC_180
Max: 8.6 g at 16.1 ms
Min: -4.0 g at 50.0 ms

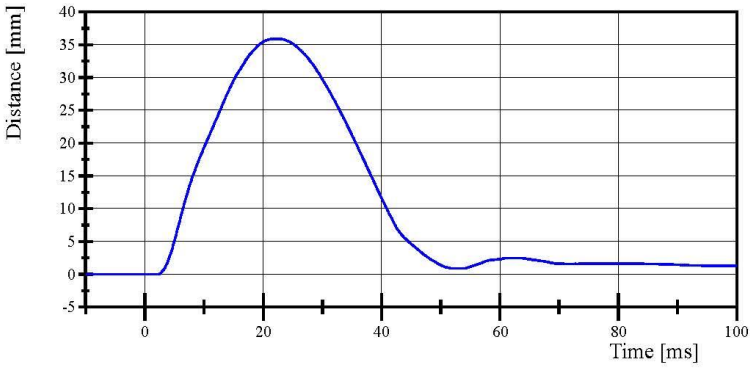
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 11:50:37 788

# Transportation Research Center Inc.

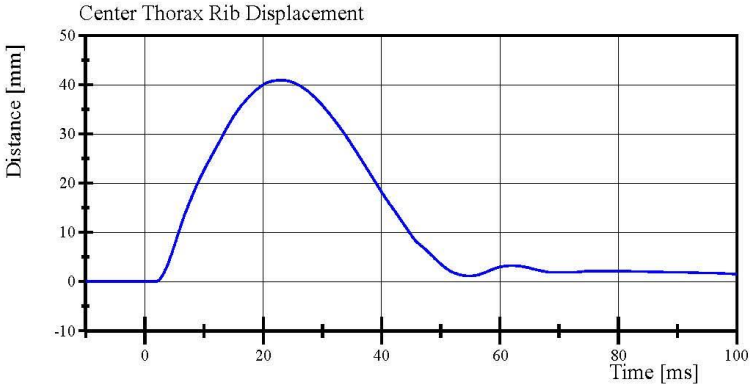
Left Lateral Thorax without Arm
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

Upper Thorax Rib Displacement



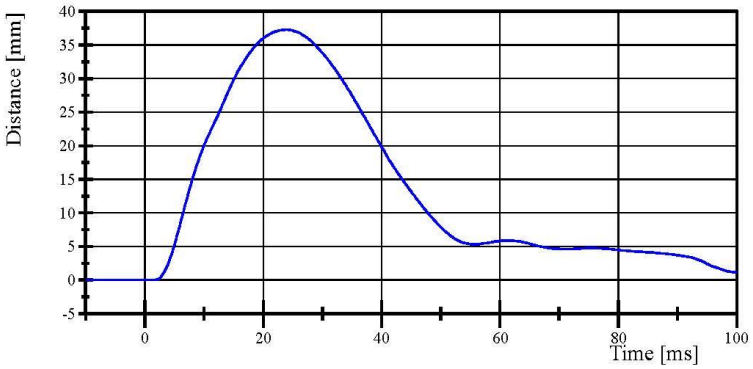

Filter Class: CFC_600
Max: 35.9 mm at 21.9 ms
Min: -0.0 mm at 2.2 ms

Center Thorax Rib Displacement




Filter Class: CFC_600
Max: 40.9 mm at 22.9 ms
Min: -0.0 mm at 1.8 ms

Lower Thorax Rib Displacement




Filter Class: CFC_600
Max: 37.3 mm at 23.9 ms
Min: -0.0 mm at 1.4 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 11:50:37 788

# Transportation Research Center Inc.

Left Lateral Abdomen
SID IIs Serial No. 305 Certification No. 76-2
Test Date: 11/1/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.5 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Impactor Velocity | 4.2 - 4.4 m/s | 4.28 m/s | Yes |
| Impactor Acceleration | (-12) - (-16) g | -13.2 g | Yes |
| Upper Abdominal Rib Displacement | 36 - 47 mm | 45.7 mm | Yes |
| Lower Abdominal Rib Displacement | 33 - 44 mm | 41.5 mm | Yes |
| Lower Spine Lateral Acceleration | 9 - 14.0 g | 9.81 g | Yes |

**Test meets specifications.**

**Condition: Used**
**Comments:**
**Upper Abdominal Rib S/N: 1997**
**Lower Abdominal Rib S/N: DS1234**

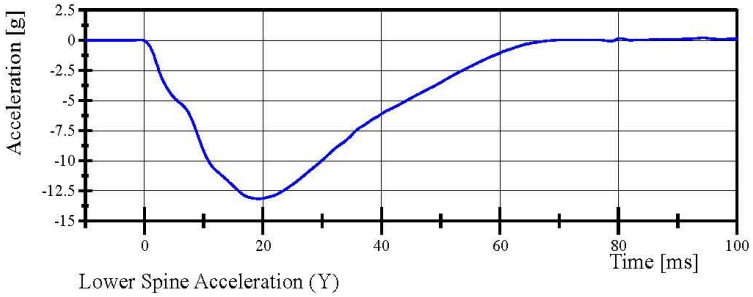
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 13:30:50 792

# Transportation Research Center Inc.

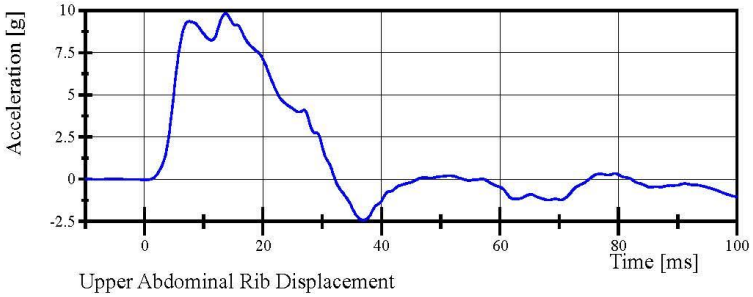
Left Lateral Abdomen
SID IIs Serial No. 305 Certification No. 76-2
Test Date: 11/1/2019

Probe Acceleration



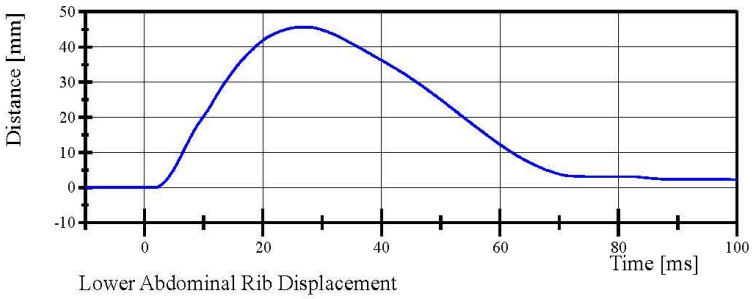

Filter Class: CFC_180
Max: 0.2 g at 94.4 ms
Min: -13.2 g at 19.3 ms

Lower Spine Acceleration (Y)



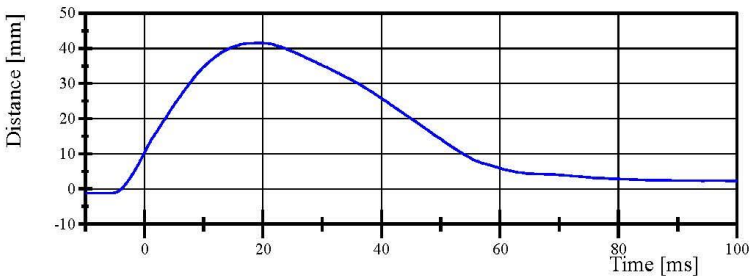

Filter Class: CFC_180
Max: 9.8 g at 13.7 ms
Min: -2.4 g at 37.0 ms

Upper Abdominal Rib Displacement




Filter Class: CFC_600
Max: 45.7 mm at 26.6 ms
Min: -0.0 mm at 1.8 ms

Lower Abdominal Rib Displacement




Filter Class: CFC_600
Max: 41.5 mm at 19.4 ms
Min: -1.2 mm at -7.8 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 13:31:31 792

# Transportation Research Center Inc.

Left Lateral Pelvis
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 34 % | Yes |
| Pendulum Velocity | 6.6 - 6.8 m/s | 6.62 m/s | Yes |
| Impactor Acceleration | (-38.0) - (-47.0) g | -43.16 g | Yes |
| Peak Pelvis Lateral Acceleration after 6ms | 34 - 42 g | 39.4 g | Yes |
| Acetabulum Force | 3,600 - 4,300 N | 4,206.9 N | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Pelvis Skin S/N: 884**
**Pelvis Plug Info:**
**Manufacturer: SACO**
**S/N: 12550**
**Cal Date: 20181002**

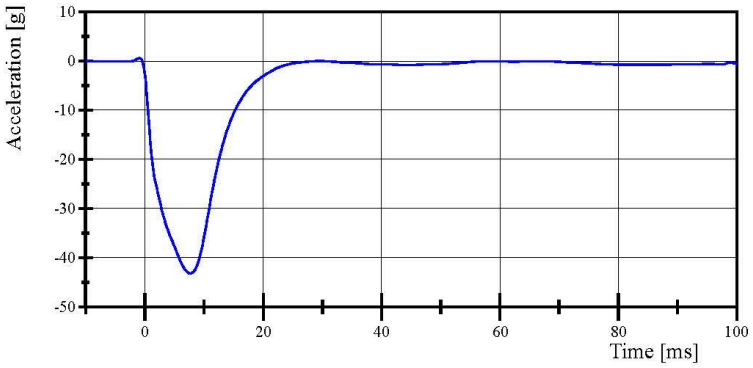
Specification Source: CFR49 Part 572 Subpart V with Polarity in accordance with J211

11.01.2019 13:42:04 443

# Transportation Research Center Inc.

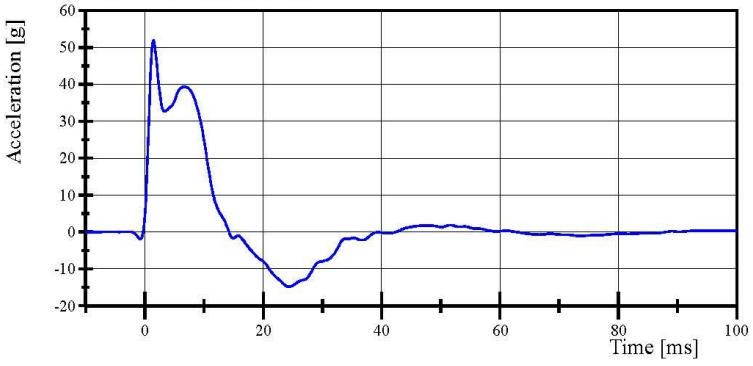
Left Lateral Pelvis
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

Probe Acceleration



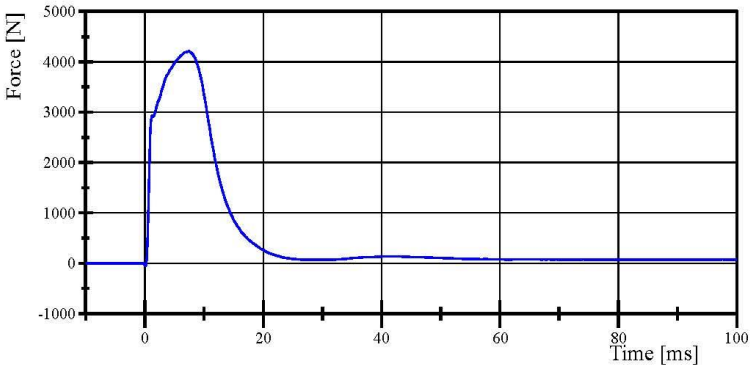

Filter Class: CFC_180
Max: 0.6 g at -0.9 ms
Min: -43.2 g at 7.7 ms

Pelvis Y-Axis Acceleration




Filter Class: CFC_180
Max: 51.9 g at 1.4 ms
Min: -14.8 g at 24.3 ms

Acetabulum Y-Axis Force




Filter Class: CFC_600
Max: 4,206.9 N at 7.4 ms
Min: -52.4 N at 0.1 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 13:43:22 443

# Transportation Research Center Inc.

Left Lateral Iliac
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

| Test Parameter | Specification | Test Results | Pass |
|---|---|---|---|
| Temperature | 20.6 - 22.2 °C | 21.6 °C | Yes |
| Relative Humidity | 10 - 70 % | 36 % | Yes |
| Pendulum Velocity | 4.2 - 4.4 m/s | 4.28 m/s | Yes |
| Impactor Acceleration | (-36) - (-45) g | -40.8 g | Yes |
| Peak Pelvis Lateral Acceleration | 28 - 39 g | 32.9 g | Yes |
| Iliac Force | 4,100 - 5,100 N | 4,934.9 N | Yes |

**Test meets specifications.**

**Condition: Used**

**Comments:**
**Pelvis Skin S/N: 884**

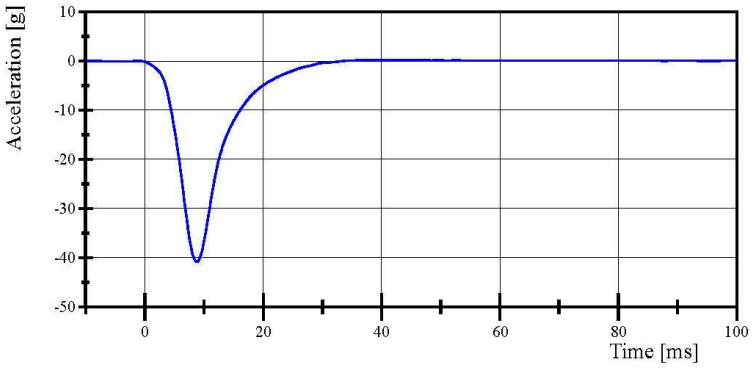
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 08:53:42 652

# Transportation Research Center Inc.

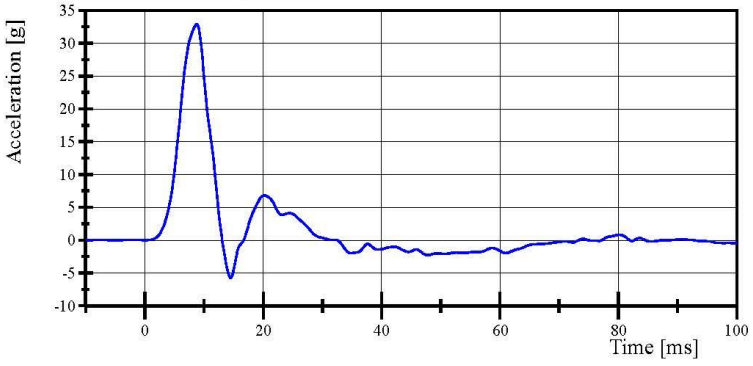
Left Lateral Iliac
SID IIs Serial No. 305 Certification No. 76-1
Test Date: 11/1/2019

Probe Acceleration



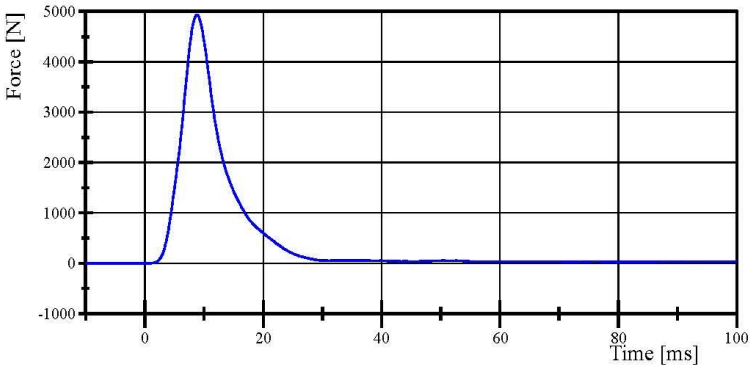

Filter Class: CFC_180
Max: 0.2 g at 38.2 ms
Min: -40.8 g at 8.8 ms

Pelvis Y-Axis Acceleration




Filter Class: CFC_180
Max: 32.9 g at 8.7 ms
Min: -5.7 g at 14.5 ms

Iliac Y-Axis Force




Filter Class: CFC_600
Max: 4,934.9 N at 8.8 ms
Min: -0.6 N at -5.0 ms

Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

11.01.2019 08:54:42 652

# APPENDIX D
# TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

**TABLE 1 – Dummy Instrumentation (ES-2re)**

| | | | ES-2re S/N F030 | | |
|---|---|---|---|---|---|
| | | | **Serial Number** | **Manufacturer** | **Calibration Date** |
| Head Accelerometers | | X | P87680 | Endevco | 9-Oct-2019 |
| | | Y | T10352 | Endevco | 9-Oct-2019 |
| | | Z | P91950 | Endevco | 9-Oct-2019 |
| Redundant Head Accelerometers | | X | T11817 | Endevco | 9-Oct-2019 |
| | | Y | P83368 | Endevco | 9-Oct-2019 |
| | | Z | P94483 | Endevco | 9-Oct-2019 |
| Thoracic Rib Displacement Potentiometers | Upper | Y | 111 | Honeywell | 16-Apr-2019 |
| | Middle | Y | 174 | FTSS | 16-Apr-2019 |
| | Lower | Y | 173 | FTSS | 16-Apr-2019 |
| Abdomen Load Cells | Front | Y | 1441 | Denton | 16-Apr-2019 |
| | Middle | Y | 1436 | Denton | 16-Apr-2019 |
| | Rear | Y | 1437 | Denton | 16-Apr-2019 |
| Lower Spine Accelerometers (T12) | | X | T11866 | Endevco | 9-Oct-2019 |
| | | Y | P87139 | Endevco | 9-Oct-2019 |
| | | Z | P64884 | Endevco | 9-Oct-2019 |
| Acetabulum Load Cell | | Y | N/A | N/A | N/A |
| Pubic Symphysis Load Cell | | Y | 457-FY | Denton | 16-Apr-2019 |

**TABLE 2 – Dummy Instrumentation (SID-IIs)**

| | | | | SID-IIs S/N 305 | | |
|---|---|---|---|---|---|---|
| | | | | **Serial Number** | **Manufacturer** | **Calibration Date** |
| Head Accelerometers | | | X | T11432 | Endevco | 14-Oct-2019 |
| | | | Y | P93774 | Endevco | 14-Oct-2019 |
| | | | Z | P91566 | Endevco | 14-Oct-2019 |
| Redundant Head Accelerometers | | | X | P91615 | Endevco | 14-Oct-2019 |
| | | | Y | P93762 | Endevco | 14-Oct-2019 |
| | | | Z | P93761 | Endevco | 14-Oct-2019 |
| Displacement Potentiometers | Shoulder | | N/A | N/A | N/A | N/A |
| | Thoracic Rib | Upper | Y | 007 | Servo | 18-Apr-2019 |
| | | Middle | Y | 037 | Servo | 18-Apr-2019 |
| | | Lower | Y | 036 | Servo | 23-May-2019 |
| | Abdominal Rib | Upper | Y | 1295 | Servo | 18-Apr-2019 |
| | | Lower | Y | 1136 | Servo | 18-Apr-2019 |
| Lower Spine Accelerometers (T12) | | | X | P94545 | Endevco | 14-Oct-2019 |
| | | | Y | P94647 | Endevco | 14-Oct-2019 |
| | | | Z | P94530 | Endevco | 14-Oct-2019 |
| Acetabulum Load Cell | | | Y | DK7483S-FY | FTSS | 18-Apr-2019 |
| Iliac Wing Load Cell | | | Y | 287-FY | Denton | 18-Apr-2019 |
| Pelvis Plug (struck side) | | | | 12542 | SACO | 2-Oct-2018 |
| Pelvis Plug (non-struck side) | | | | 36473 | FTSS | 29-Sep-2010 |

**TABLE 3 – Vehicle Instrumentation**

| Vehicle Instrumentation | | | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|---|---|
| 1 | Vehicle Center of Gravity | X | T11841 | Endevco | 5-Sep-2019 |
| | Vehicle Center of Gravity | Y | T11815 | Endevco | 5-Sep-2019 |
| | Vehicle Center of Gravity | Z | T11813 | Endevco | 5-Sep-2019 |
| 2 | Right Sill at Front Seat | X | P94485 | Endevco | 17-Jun-2019 |
| | Right Sill at Front Seat | Y | T11835 | Endevco | 18-Jun-2019 |
| | Right Sill at Front Seat | Z | P61501 | Endevco | 8-May-2019 |
| 3 | Right Sill at Rear Seat | X | P57192 | Endevco | 16-Jul-2019 |
| | Right Sill at Rear Seat | Y | T11850 | Endevco | 22-Oct-2019 |
| | Right Sill at Rear Seat | Z | P57917 | Endevco | 8-May-2019 |
| 4 | Left Sill at Front Door | Y | P91492 | Endevco | 7-May-2019 |
| 5 | Left Sill at Rear Door | Y | P97889 | Endevco | 8-May-2019 |
| 6 | Left A-Post Lower | Y | P50313 | Endevco | 8-May-2019 |
| 7 | Left A-Post Middle | Y | P50491 | Endevco | 8-May-2019 |
| 8 | Left B-Post Lower | Y | P44288 | Endevco | 8-May-2019 |
| 9 | B-Post Middle | Y | T11449 | Endevco | 18-Jun-2019 |
| 10 | Front Seat Track | Y | P94561 | Endevco | 11-Oct-2019 |
| 11 | Rear Seat Track or Structure | Y | T11839 | Endevco | 10-Sep-2019 |
| 12 | Right Rear Occupant Compartment | Y | P50400 | Endevco | 7-May-2019 |
| 13 | Engine Block | X | P80720 | Endevco | 7-May-2019 |
| | Engine Block | Y | P50428 | Endevco | 7-May-2019 |
| 14 | Rear Floorpan Above Axle | X | T11818 | Endevco | 10-Sep-2019 |
| | Rear Floorpan Above Axle | Y | P57961 | Endevco | 7-May-2019 |
| | Rear Floorpan Above Axle | Z | T11829 | Endevco | 10-May-2019 |

**TABLE 4 – MDB Instrumentation**

| MDB Instrumentation | | Serial Number | Manufacturer | Calibration Date |
|---|---|---|---|---|
| MDB Center of Gravity | X | P75713 | Endevco | 10-Sep-19 |
| MDB Center of Gravity | Y | P76171 | Endevco | 10-Sep-19 |
| MDB Center of Gravity | Z | P76114 | Endevco | 10-Sep-19 |
| Left Frame Rail at Rear Axle Centerline | X | P75115 | Endevco | 10-Sep-19 |
| Left Frame Rail at Rear Axle Centerline | Y | P94567 | Endevco | 10-Sep-19 |