

FINAL REPORT NUMBER: SINCAP-TRC-23-003

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

**HYUNDAI MOTOR COMPANY
2023 Hyundai Kona Electric
NHTSA NUMBER: M20234216**

**PREPARED BY:
Transportation Research Center Inc.
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Report Date: November 27, 2023

FINAL REPORT

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

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Report Prepared By: ILO Project Operations Group

Report Approved By: 

John Shultz

Approval Date: November 27, 2023

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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

Date: _____

Technical Report Documentation Page

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16. Abstract This 55 / 28 km/h 90° Moving Deformable Barrier SINCAP Side Impact Test was conducted on the subject 2023 Hyundai Kona Electric, 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 April 6, 2023. The impact velocity of the Moving Deformable Barrier (MDB) was 62.11 km/h, and the ambient temperature at the struck (left) side of the target vehicle at the time of impact was 21.2° C. The target vehicle post-test maximum crush was 241 mm at Level 2. The test vehicle's performance was as follows: <table border="1"> <thead> <tr> <th colspan="4">Driver ATD (ES-2re)</th> </tr> <tr> <th>Measurement Description</th><th>Units</th><th>IARV</th><th>Result</th></tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td><td>N/A</td><td>1000</td><td>128.960</td></tr> <tr> <td>Maximum Thoracic Rib Deflection</td><td>mm</td><td>44</td><td>19.120</td></tr> <tr> <td>Total Abdominal Force</td><td>N</td><td>2500</td><td>858.330</td></tr> <tr> <td>Pubic Symphysis Force</td><td>N</td><td>6000</td><td>-1414.070</td></tr> <tr> <td>Lower Spine Acceleration</td><td>G</td><td>82*</td><td>25.900</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="4">Passenger ATD (SID-IIs)</th> </tr> <tr> <th>Measurement Description</th><th>Units</th><th>IARV</th><th>Result</th></tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td><td>N/A</td><td>1000</td><td>236.800</td></tr> <tr> <td>Lower Spine Resultant Acceleration</td><td>g's</td><td>82</td><td>66.520</td></tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td><td>N</td><td>5525</td><td>2964.110</td></tr> <tr> <td>Maximum Thoracic Rib Deflection</td><td>mm</td><td>38*</td><td>34.910</td></tr> <tr> <td>Maximum Abdominal Rib Deflection</td><td>mm</td><td>45*</td><td>34.420</td></tr> </tbody> </table> * 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.				Driver ATD (ES-2re)				Measurement Description	Units	IARV	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	128.960	Maximum Thoracic Rib Deflection	mm	44	19.120	Total Abdominal Force	N	2500	858.330	Pubic Symphysis Force	N	6000	-1414.070	Lower Spine Acceleration	G	82*	25.900	Passenger ATD (SID-IIs)				Measurement Description	Units	IARV	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	236.800	Lower Spine Resultant Acceleration	g's	82	66.520	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2964.110	Maximum Thoracic Rib Deflection	mm	38*	34.910	Maximum Abdominal Rib Deflection	mm	45*	34.420
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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 2023 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. 693JJ920D000018. The purpose of this test is to generate comparative side impact performance in a 2023 Hyundai Kona Electric. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Laboratory Test Procedure dated March 2020.

SECTION 2

SUMMARY OF TEST RESULTS

A 2023 Hyundai Kona Electric 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 62.11 km/h (38.59 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 April 6, 2023. 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 March 2020. 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 instrumentation 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	128.960
Maximum Thoracic Rib Deflection	mm	44	19.120
Combined Abdominal Force	N	2500	858.330
Pubic Symphysis Force	N	6000	-1414.070
Lower Spine (T12) Resultant Acceleration	G	82*	25.900

* Proposed IARV

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	236.800
Lower Spine (T12) Resultant Acceleration	G	82	66.520
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	2964.110
Maximum Thoracic Rib Deflection	mm	38*	34.910
Maximum Abdominal Rib Deflection	mm	45*	34.420

* 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	N/A	No	N/A
Other	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 A-Post Acceleration (Y); Failed at 5.0 ms

Rear Floorpan Above Axle Acceleration (X); Failed at 18.0 ms

NHTSA number is incorrect in photos 1, 2, and 37

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20234216
Model Year	2023
Make	Hyundai
Model	Kona Electric
Body Style	MPV
VIN	KM8K23AGXPU170901
Body Color	Galactic Gray
Odometer Reading (km/mi)	11 mi
Engine Displacement (L)	N/A
Type/No. Cylinders	Electric
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	1
Overdrive	No
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	Yes
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	No

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	HYUNDAI MOTOR COMPANY
Date of Manufacture	NOV/2022
Vehicle Type	MPV

GVWR (lbs)	4762
GAWR Front (lbs)	2425
GAWR Rear (lbs)	2469

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

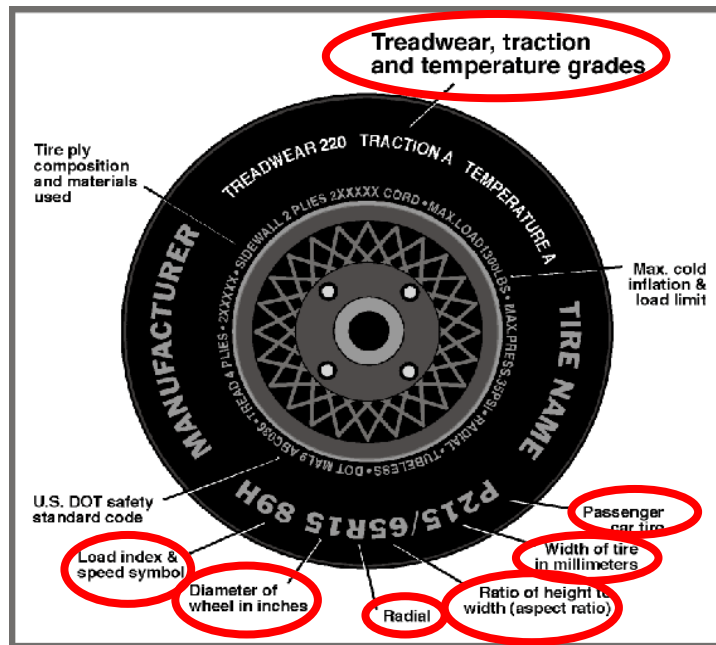
VEHICLE SEAT TYPE

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	N/A	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: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	215/55R17	215/55R17
Tire Size on Vehicle	215/55R17	215/55R17
Tire Manufacturer	Nexen	Nexen
Tire Model	NPRIZ AH8	NPRIZ AH8
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1	1
Tire Plies Body	4	4
Load Index/Speed Symbol	94V	94V
Tire Material	Polyester/Steel/Nylon	Polyester/Steel/Nylon
DOT Safety Code Left	UA8V CACR 4122	UA8V AMKL 4122
DOT Safety Code Right	UA8V CACR 4322	UA8V AMKL 4022

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

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	276	276	276	276
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa	250	250	250	250
As Tested	kPa	250	250	250	250

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	456.8	388.4		501.8	453.6		506.8	465.8	
Right	kg	445.4	379.6		458.0	427.0		453.0	419.4	
Ratio	%	54.0	46.0		52.2	47.8		52.0	48.0	
Totals	kg	902.2	768.0	1670.2	959.8	880.6	1840.4	959.8	885.2	1845.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1670.2	(A)
Actual Weight of 1 P572V ATD (SID-ILs) Dummy Used	kg	125.0	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	49.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1845.0	(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	735	733	Yes
RF	mm	743	742	Yes
RR	mm	747	742	Yes
LR	mm	735	734	Yes
Vehicle CG (Aft of Front Axle)	mm	1247	1244	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	+42	+30	

***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

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

Test Vehicle: 2023 Hyundai Kona Electric

NHTSA No.: M20234216

Test Program: SINCAP Side Impact

Test Date: 4/6/2023

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Ballast: None	0.0
Removed: non-struck side mirror, non-struck windows, rear speaker, rear taillights, rear bumper	12.4

TEST SURFACE MARKINGS

	Distance from 63° Impact Angle Line (mm)
Fore 25 mm target	900
Aft 25 mm target	919
Pre-Impact Angle Line	302

Parallel Track Target	X Location (mm)	Y Location (mm)
A	0	0
B	3425	1745
C	3425	5289
D	0	5289

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

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023

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	21.0	13.3	17.15
Front Passenger Seat	17.8	15.1	16.45
Front Center Seat*	N/A	N/A	N/A
Struck Side Rear Seat	19.6	19.6	19.6
Non-Struck Side Rear Seat	N/A	N/A	N/A
Rear Center Seat*	N/A	N/A	N/A

* 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	17.15	210	Max	232	236	242
			Mid	219.5	223	227
			Min	207	210	212
Front Passenger Seat	16.45	210	Max	236	240	244
			Mid	221	225	230
			Min	206	210	216
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	Fixed	Fixed	Max	N/A	N/A	N/A
			Mid	Fixed	Fixed	Fixed
			Min	N/A	N/A	N/A
Non-Struck Side Rear 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
Rear 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

* If applicable.

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

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
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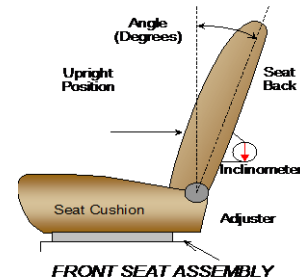
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position from Forwardmost Position	
	mm	Detents	mm	Detent
Driver Seat	240	N/A	120	N/A
Front Passenger Seat	240	37	120	19
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	Fixed	N/A	Fixed	N/A
Non-Struck Side Rear Seat	N/A	N/A	N/A	N/A
Rear Center Seat*	N/A	N/A	N/A	N/A

* 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	62.4	N/A	0.4	N/A
Front Passenger Seat	60.1	31	0.8	5
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*	N/A	N/A	N/A	N/A

* 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	0, Full Up
Rear Seat	1	0, 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	0, Full Up
Rear Seat	3	2, Full Down

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

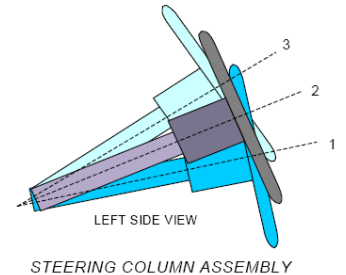
Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023

STEERING COLUMN ADJUSTMENT

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

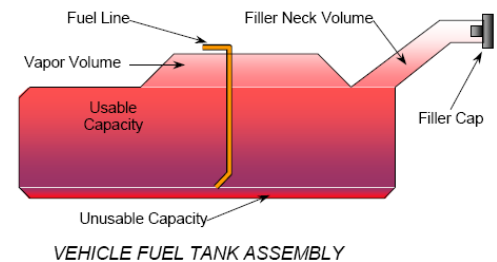
	Degrees	Fore/Aft Position (mm)
Lowermost, Position No. 1	23.3	0
Geometric Center, Position No. 2	25.8	23
Uppermost, Position No. 3	28.3	46
Telescoping Steering Wheel Travel		46
Test Position	25.8	23



FUEL PUMP

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

The vehicle is fully electric. The charge port is on the left side of the front of the vehicle



FUEL TANK CAPACITY

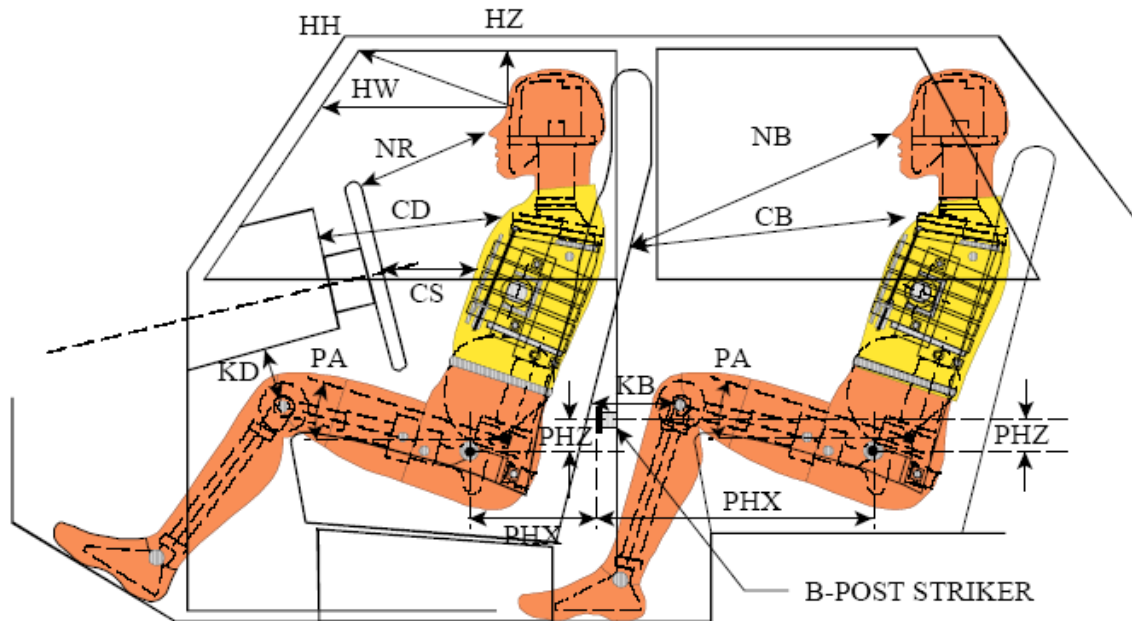
	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	N/A
Usable Capacity of "Optional Tank" (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner's Manual)	N/A
Usable Capacity of Optional Tank (see Owner's Manual)	N/A
93% of Usable Capacity	N/A
Actual Amount of Solvent Used in Test	N/A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

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



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

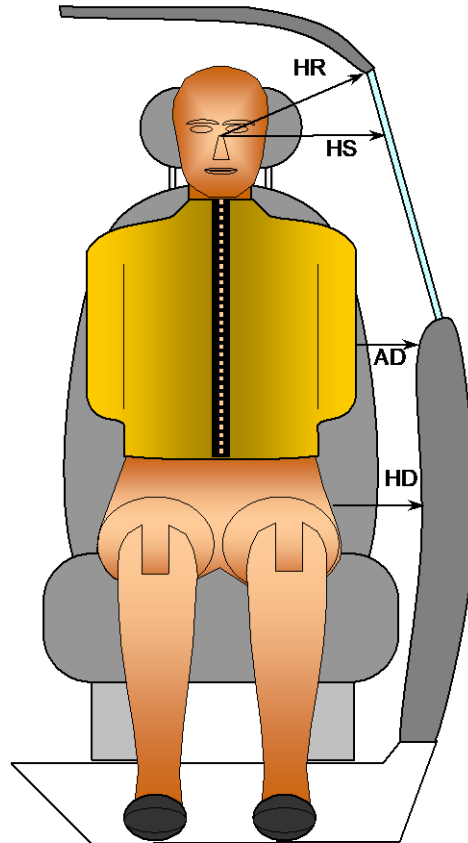
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	332			
HW		Header to Windshield	615			
HZ	HZ	Head to Roof Liner	150		272	
NR	NB	Nose to Rim/Seat Back	436		535	
CD	CB	Chest to Dash/Seat Back	537		530	
CS		Chest to Steering Wheel	347			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	149	30.0	253	14.4
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	115	19.4	256	15.0
PAX°	PAX°	Pelvic Tilt Angle X		0.5		0.5
	PAY°	Pelvic Tilt Angle Y				21.4
PHX	PHX	Hip Point to Striker (X-Axis)	180		238	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	244		277	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



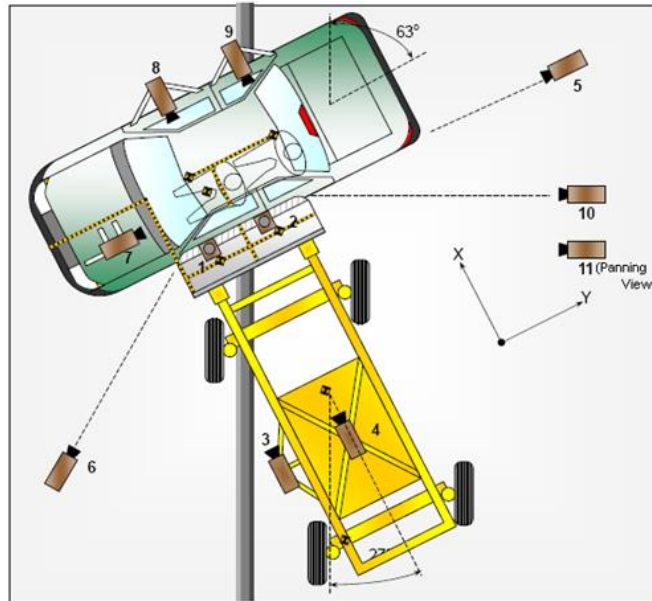
FRONT VIEW OF DUMMY

Code	Description	Units	Driver	Passenger
HR	Head to Side Header	mm	189	242
HS	Head to Side Window	mm	309	344
AD	Arm to Door	mm	97	150
HD	H-Point to Door	mm	145	176

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	1595	0	-5611	20	1000
2	Overhead Close-up	1412	0	-5989	20	1000
3	Left Impact Point (MDB)	1522	-923	-899	25	1000
4	Side Overall (MDB)	2301	0	-1420	8.5	1000
5	Rear	0	7448	-1637	20	1000
6	Left Front	0	-7310	-1544	20	1000
7	Driver Front (OB)				25	1000
8	Driver Side (OB)				8.5	1000
9	Passenger Side (OB)				8.5	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

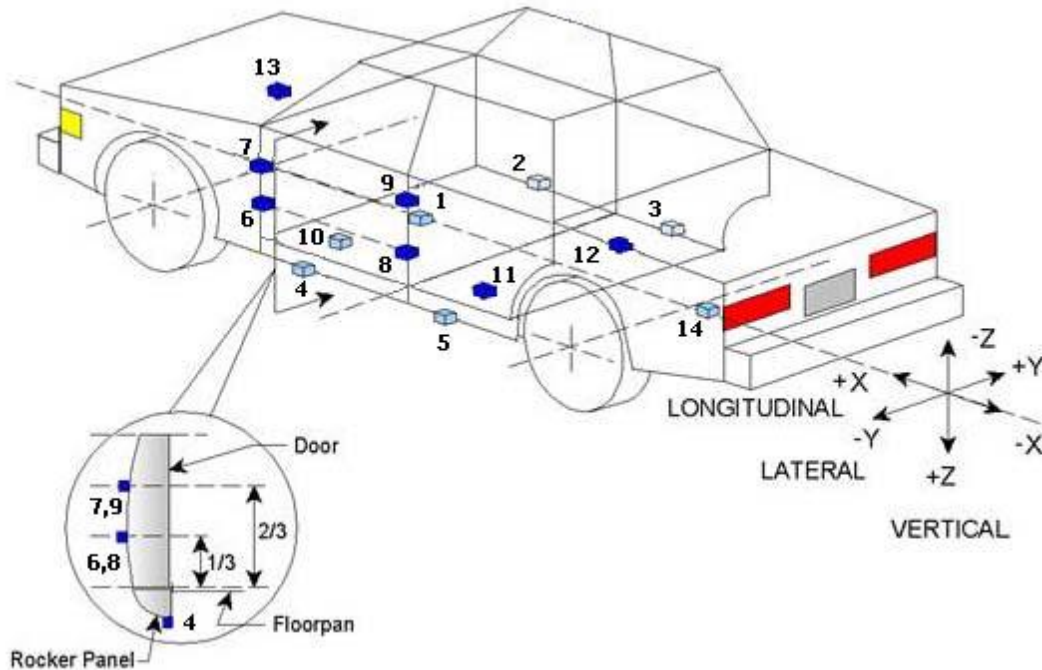
INSTRUMENTATION

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: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023



TEST VEHICLE ACCELEROMETER LOCATIONS

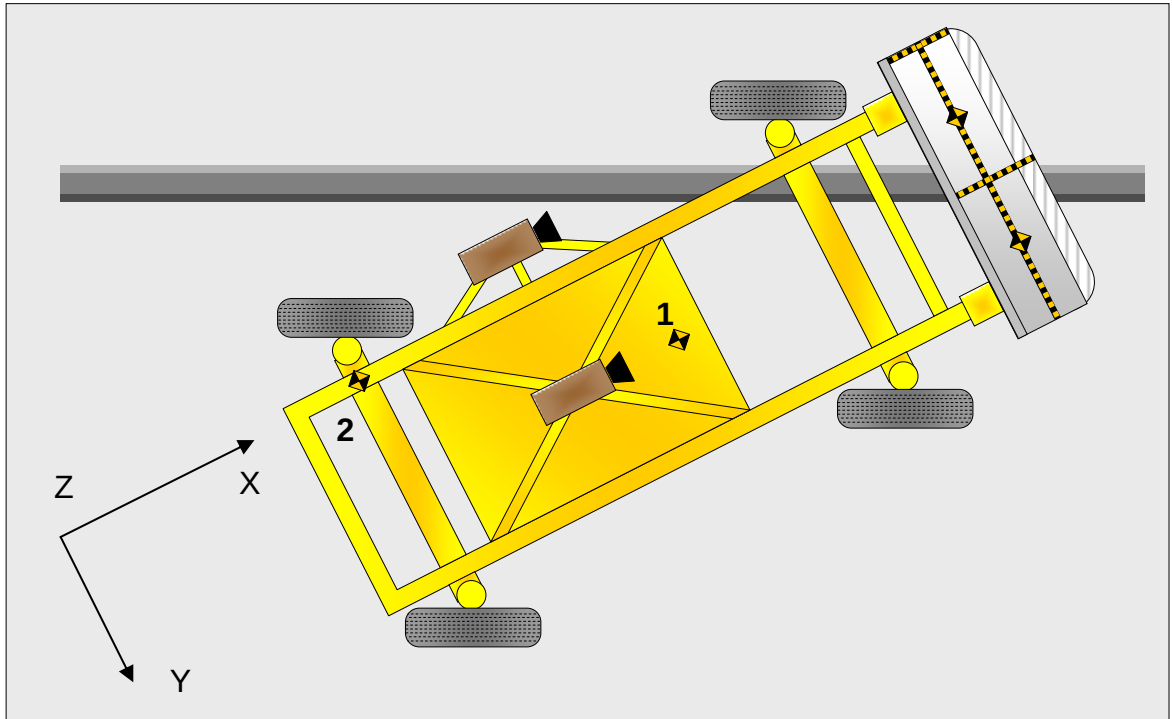
Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2560	115	-390
2	Right Sill at Front Seat	2515	707	-466
3	Right Sill at Rear Seat	1597	707	-280
4	Left Sill at Front Door	2504	-707	-356
5	Left Sill at Rear Door	1586	-707	-365
6	A-Post Lower	2855	-807	-503
7	A-Post Middle	2845	-790	-925
8	B-Post Lower	1795	-815	-592
9	B-Post Middle	1767	-797	-994
10	Front Seat Track	2043	-561	-392
11	Rear Seat Structure	1458	-477	-531
12	Right Rear Occ. Compartment	1458	597	-295
13	Engine Block	3437	11	-715
14	Rear Above Axle	805	0	-330

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: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	-2196	0	-500
2	MDB Rear	-3585	-645	-620

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

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES2-re)	Rear Seat Dummy (SID-IIs)
Face	None	SCAB
Top of Head	Side Header	SCAB
Left Side of Head	SCAB, Side Header	SCAB
Back of Head	Head Restraint; SCAB	SCAB; Head restraint
Left Shoulder	Door Panel; SAB	Door Panel
Upper Torso	SAB; Side Seat Bolster	Door Panel; Side Seat Bolster
Lower Torso	SAB; Side Seat Bolster	Door Panel; Side Seat Bolster
Left Hip	SAB; Door Panel	Door Panel; Side Seat Bolster
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	No	No	No
Seat Disengagement from Floor pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Good
Sill Separation	None
Windshield Damage	Cracked
Side Window Damage	Blown out
Other Notable Effects	None

DATA SHEET NO. 8 (CONTINUED)
POST TEST OBSERVATIONS

Test Vehicle: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023

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	No	No	N/A
Other:	No	N/A	No	N/A

IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vehicle Wheel Base	mm		2600
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		360
Actual Impact Point (Aft of Front Axle)	mm		351
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact point	+9
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact point	-8

DATA SHEET NO. 9
MDB SUMMARY OF RESULTS

Test Vehicle: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023

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	1114

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	424.8	258.0	682.8
Right	kg	354.8	330.0	684.8
Ratio	%	57.0	43.0	100.0
Totals	kg	779.6	588.0	1367.6

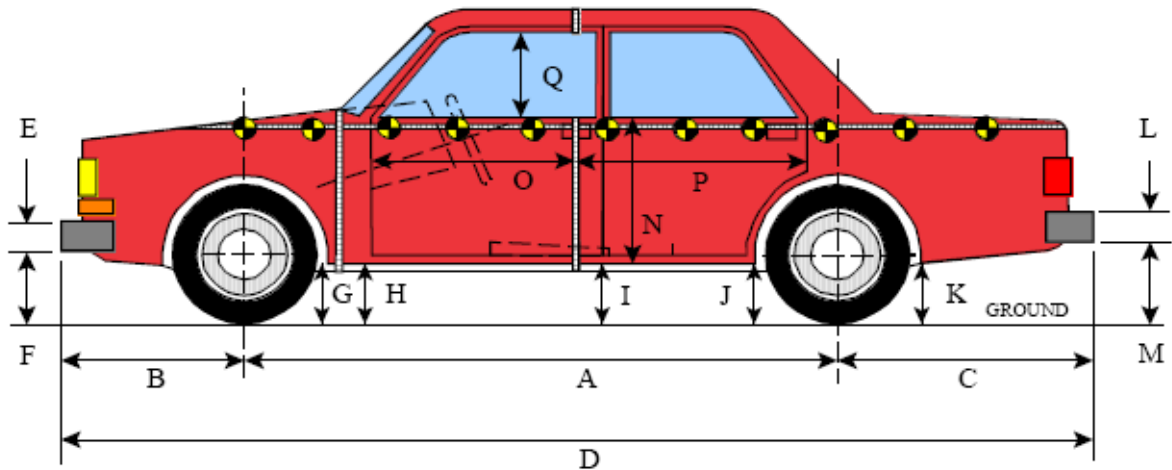
SPEED AND IMPACT ANGLE DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.11
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.12
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: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



LEFT SIDE VIEW

All MEASUREMENTS IN (mm) WITH TOLERANCE OF ± 3 mm

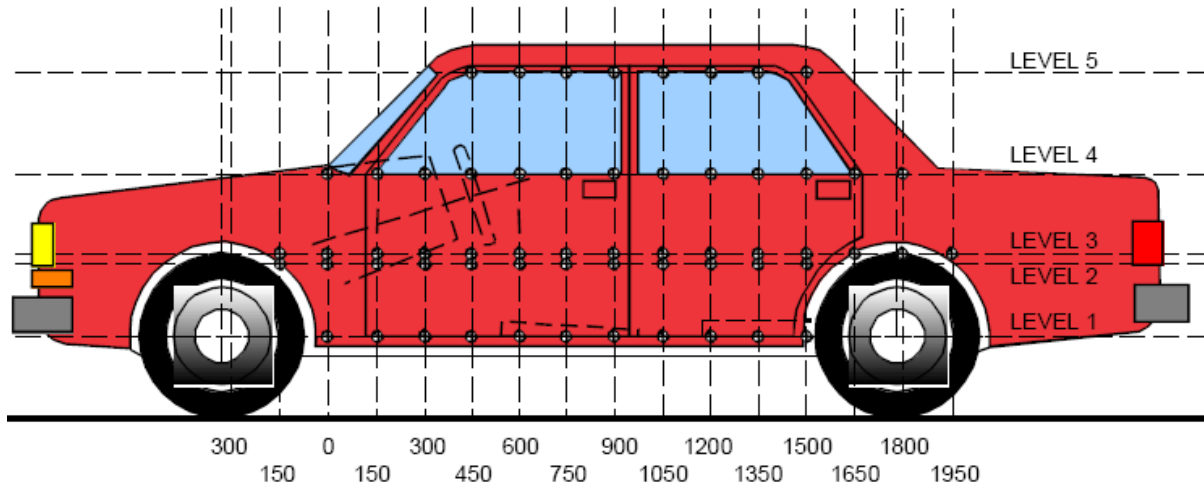
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Change
A	Wheelbase	2600	2610	10
B	Front Axle to Front Surface of Vehicle	853	853	0
C	Rear Axle to Rear Surface of Vehicle	742	742	0
D	Total Length at Centerline	4195	4200	5
E	Front Bumper Thickness	125	125	0
F	Front Bumper Bottom to Ground	410	358	-52
G	Sill Height at Front Wheel Well	285	277	-8
H	Sill Height at Front Door Leading Edge	280	292	12
I	Sill Height at B-Pillar	305	385	80
J1	Sill Height at Rear Wheel Well	318	339	21
J2	Pinch Weld Height at Rear Wheel Well	202	219	17
K	Sill Height Aft of Rear Wheel Well	370	394	24
L	Rear Bumper Thickness	200	200	0
M	Rear Bumper Bottom to Ground	355	393	38
N	Sill Height to Window Bottom Sill	800	655	-145
O	Front Door Leading Edge to Impact CL	745	710	-35
P	Rear Door Trailing Edge to Impact CL	1287	1265	-22
Q	Front Window Opening	405	395	-10
R	Right Side Length	4000	3995	-5
S	Left Side Length	4000	3995	-5
T	Vehicle Width	1800	1830	30
U	Front Wheel Track Width	1562	1562	0
V	Rear Wheel Track Width	1570	1570	0

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance From Impact
1	Sill Top	354	77	300
2	Driver Hip Point	610	241	1800
3	Mid-Door	759	238	1650
4	Window Sill	1025	101	1500
5	Window Top	1486	11	1500
				1650
				1950

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: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

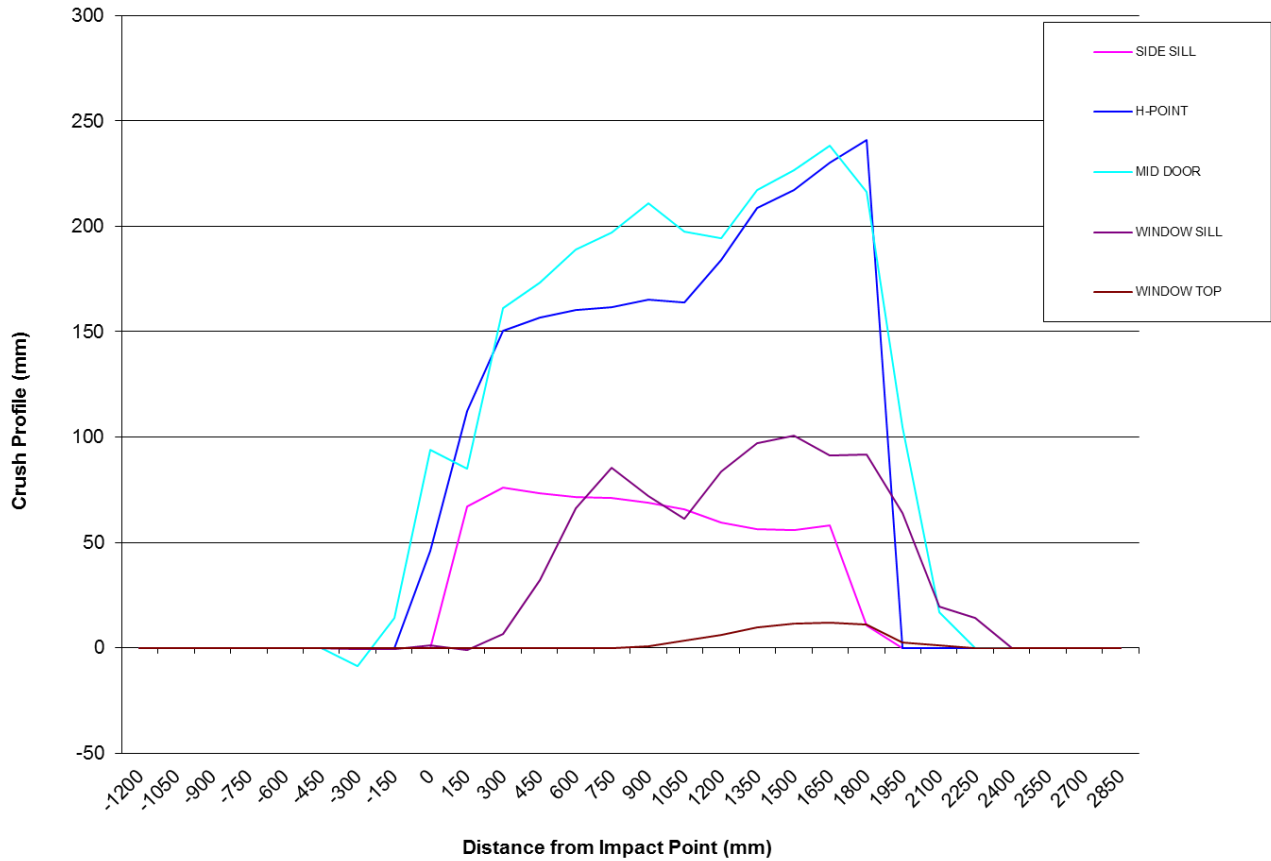
	Pre-Test					Post-Test					Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-300	0	0	905	743	0	0	0	913	744	0	0	0	-8	-1	0
-150	0	0	904	771	0	0	0	889	771	0	0	0	15	0	0
0	0	908	896	792	0	0	861	802	791	0	0	47	94	1	0
150	883	890	885	797	0	816	778	800	798	0	67	112	85	-1	0
300	870	882	887	799	0	793	732	726	792	0	77	150	161	7	0
450	869	884	891	804	0	796	727	717	773	0	73	157	174	31	0
600	871	885	893	818	0	800	725	704	752	0	71	160	189	66	0
750	873	886	894	830	0	802	724	697	745	0	71	162	197	85	0
900	875	885	893	840	608	806	720	682	768	608	69	165	211	72	0
1050	873	883	892	846	612	808	719	694	785	608	65	164	198	61	4
1200	870	879	889	852	612	811	695	694	768	606	59	184	195	84	6
1350	868	874	883	849	611	812	665	666	752	601	56	209	217	97	10
1500	865	870	877	842	609	809	653	650	741	598	56	217	227	101	11
1650	865	876	872	834	604	807	646	634	742	593	58	230	238	92	11
1800	870	890	881	825	594	859	649	664	733	583	11	241	217	92	11
1950	0	0	889	815	579	0	0	784	751	577	0	0	105	64	2
2100	0	0	902	830	555	0	0	885	810	554	0	0	17	20	1
2250	0	0	0	836	0	0	0	0	822	0	0	0	0	14	0

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: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

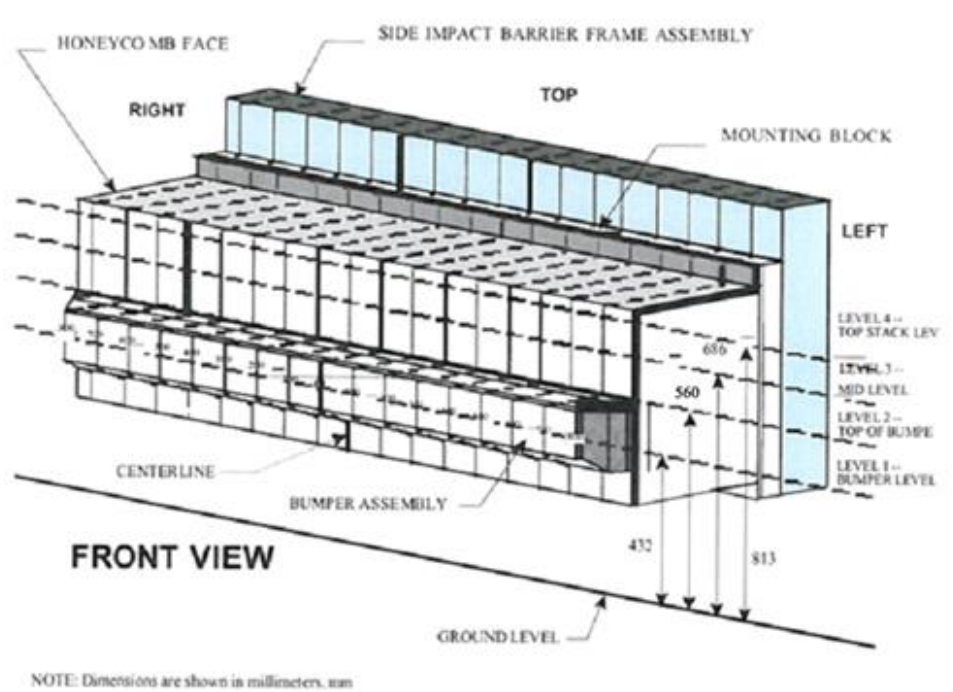
NHTSA No.: M20234216
Test Date: 4/6/2023



DATA SHEET NO. 12
MDB EXTERIOR STATIC CRUSH MEASUREMENTS

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	800	Left	231
B	Top of Bumper	560	800	Left	111
C	Mid-Level	686	800	Left	124
D	Top of Stack	813	800	Left	144

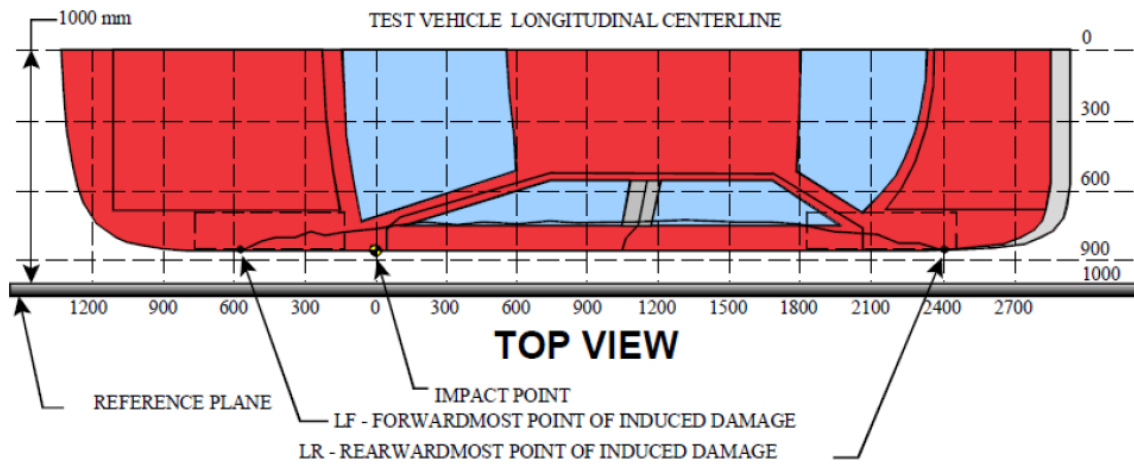
DEFORMABLE BARRIER STATIC CRUSH

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	208	204	198	196	195	194	194	192	187	183	181	179	179	178	186	204	231
2	74	70	69	68	69	71	76	71	74	69	67	67	68	70	75	84	111
3	50	28	27	31	37	47	67	58	33	23	21	22	27	36	48	69	124
4	40	25	20	24	38	60	75	82	57	49	40	41	44	55	68	81	144

DATA SHEET NO. 13
VEHICLE AND MDB DAMAGE PROFILE DISTANCES

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



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	822	836	14
2	1800	2	649	890	241
3	1350	3	666	883	217
4	750	3	697	894	197
5	300	3	726	887	161
6 ¹	-150	3	889	904	15

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	242	473	231
2	500 mm Left of Center	1	307	485	178
3	200 mm Left of Center	1	304	485	181
4	200 mm Right of Center	1	292	486	194
5	500 mm Right of Center	1	290	486	196
6	800 mm Right of Center	1	268	476	208

¹ DPD 6 is defined as zero crush since the crush does not extend to the end of the vehicle.

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

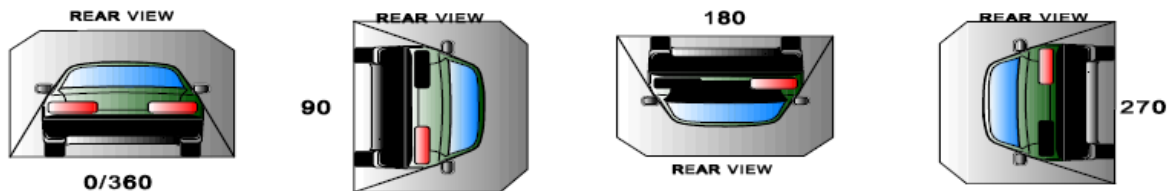
Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023

Test Time: 15:45 **Temperature:** 21.2°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

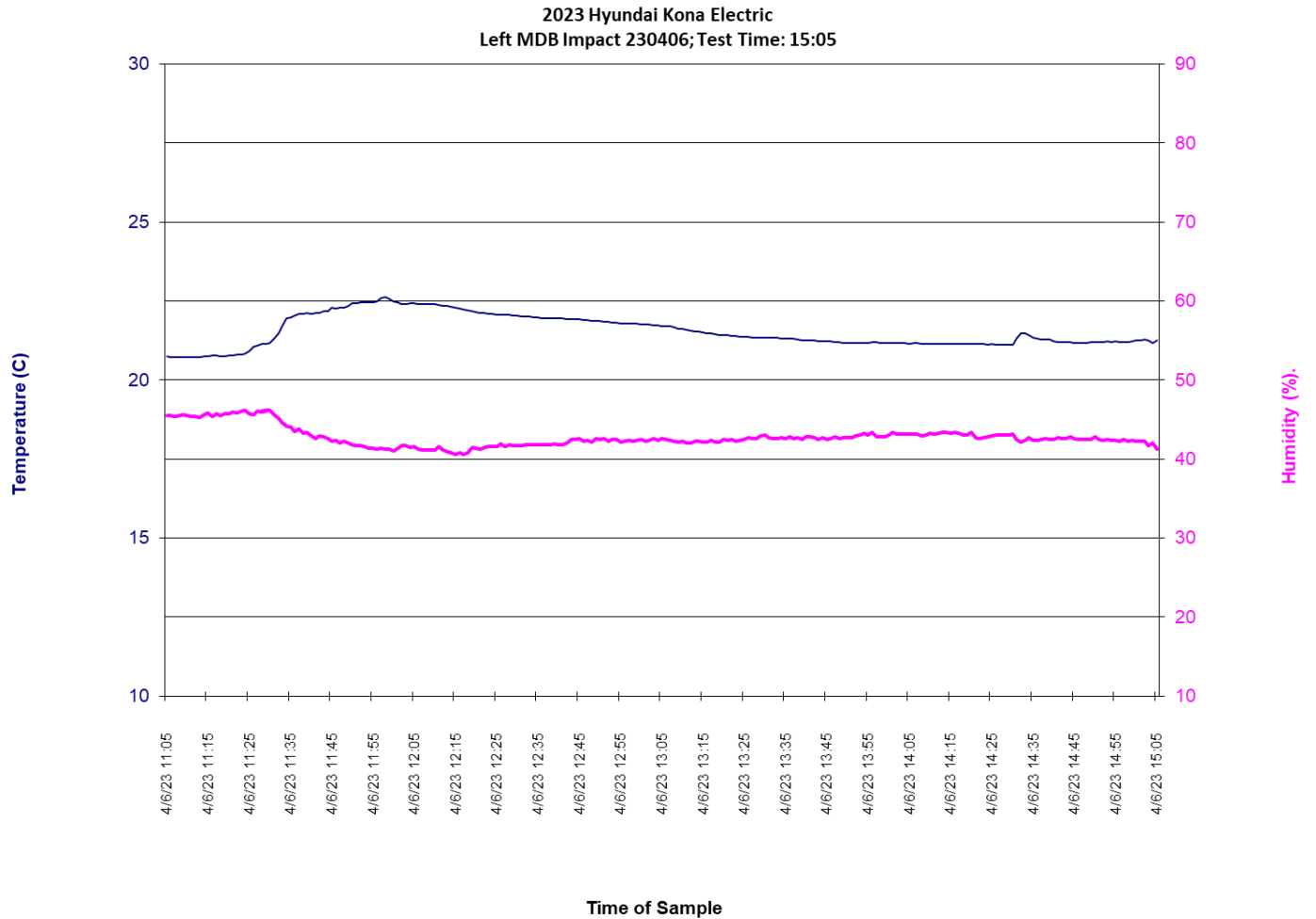
ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023



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

Test Vehicle: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023

ELECTRIC VEHICLE PROPULSION SYSTEM

Type of Electric Vehicle (Electric/Hybrid): Electric
Propulsion Battery Type: Lithium ion battery
Nominal Voltage: 356 V
Physical Location of Automatic Propulsion Battery Disconnect: Inside battery system

Auxiliary Battery Type: 12V

PROPULSION BATTERY SYSTEM DATA (COTR-supplied):

Electrolyte Fluid Type: Liquid electrolyte containing LiPF6 salt
Electrolyte Fluid Specific Gravity: 1.197g/cm3
Electrolyte Fluid Kinematic Viscosity: 3.0 cP centistokes
Electrolyte Fluid Color: Transparent pale yellow
Propulsion Battery Coolant Type, Color, Specific Gravity (if applicable): Water + ethylene glycol, blue

Location of Battery Modules

- ☐ Inside Passenger Compartment
☒ Outside Passenger Compartment

Propulsion Battery State of Charge:

- ☒ Maximum state of charge

Test Voltage (No less than 95% of Maximum State of Charge): 95%

OR

- ☐ Range of Normal Operating Voltage

Test Voltage (Within Normal Operative Voltage Range): _____

RECORDED BY: Franklin Xu
APPROVED BY: John Shultz

DATE: 4/6/2023
DATE: 4/7/2023

Test Vehicle:	<u>2023 Hyundai Kona Electric</u>	NHTSA No.:	<u>M20234216</u>
Test Program:	<u>SINCAP Side Impact</u>	Test Date:	<u>4/6/2023</u>

Next to battery-side high voltage cable connector

Comments:

DATE: 4/6/2023

DATE: 4/7/2023

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

Test Vehicle: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023

VOLTMETER INFORMATION

The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10MΩ.

NOTE: An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.

Make: Fluke ; Model: 87V ; S/N: 15860164
Internal Impedance Value: 50 MΩ
Resolution: 0.00001 V
Last Calibration Date: 9/23/2022

PROPULSION BATTERY VOLTAGE

The measurement shall be made with the propulsion battery connected to the vehicle propulsion system, and the vehicle in the “ready-to-drive” (propulsion motor(s) activated) position.

NOTE: If the voltage measurement is not at the voltage or within the normal operating voltage range specified by the manufacturer, the battery must be charged.

V_b = 403.8 V

ELECTRICAL ISOLATION MEASUREMENTS
PROPULSION BATTERY TO VEHICLE CHASSIS

Vehicle chassis point(s) will be determined and supplied to the Contractor by the COTR.

V₁ = 280.3 V
V₂ = 298.6 V

PROPULSION BATTERY TO VEHICLE CHASSIS ACROSS RESISTOR

The known resistance R_o (in ohms) should be approximately 500 times the nominal operating voltage of the vehicle (in volts) per SAE J1766.

R_o = 164,800 Ω
V₁' = 30.01 V Pre-Impact
V₂' = 30.37 V Pre-Impact

DATA SHEET NO. 305-3
PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS FOR
INDICANT FMVSS NO. 305 TESTING (CONT'D)

Test Vehicle: 2023 Hyundai Kona Electric
Test Program: SINCAP Side Impact

NHTSA No.: M20234216
Test Date: 4/6/2023

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant.

$$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$$

$$R_{i1} = \underline{2,838,672} \ \Omega \text{ Pre-Impact}$$

$$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$$

$$R_{i2} = \underline{2,821,847} \ \Omega \text{ Pre-Impact}$$

$$R_i = \text{The lesser of } R_{i1} \text{ and } R_{i2}$$

$$R_i = \underline{2,821,847} \ \Omega \text{ Pre-Impact}$$

$$R_i/V_b = \text{Electrical Isolation Value/ Nominal Battery Voltage}$$

$$R_i/V_b = \underline{6,988} \ \Omega \text{ V Pre-Impact}$$

NOTE: The minimum Electrical Isolation Value is 500 Ω / V.

Is the measured Electrical Isolation Value $\geq 500 \ \Omega$ / V?

☒ Yes

☐ No

Comments:

RECORDED BY: Franklin Xu
APPROVED BY: John Shultz

DATE: 4/6/2023
DATE: 4/7/2023

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

Test Vehicle: 2023 Hyundai Kona Electric NHTSA No.: M20234216
Test Program: SINCAP Side Impact Test Date: 4/6/2023

VOLTMETER INFORMATION

The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10MΩ.

NOTE: An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.

Make: Fluke; Model: 87V; S/N: 15860164
Internal Impedance Value: 50 MΩ
Nominal Propulsion Battery Voltage (Vb): 0.300 V

ELECTRICAL ISOLATION MEASUREMENTS

Record V1, V2, V1', V2' voltage measurements immediately after the impacted vehicle comes to rest.

V1 =	<u>47.5</u>	V	Post-Impact	Time:	<u>2</u>	minutes	<u>17</u>	s
V2 =	<u>33.5</u>	V	Post-Impact	Time:	<u>2</u>	minutes	<u>55</u>	s
V1' =	<u>0.061</u>	V	Post-Impact	Time:	<u>3</u>	minutes	<u>46</u>	s
V2' =	<u>0.071</u>	V	Post-Impact	Time:	<u>4</u>	minutes	<u>01</u>	s

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant.

$$R_{i1} = R_o (1 + V_2/V_1) [(V_1 - V_1')/V_1']$$

Ri1 = 218,551,760 Ω Post-Impact Time: 4 minutes 01 s

$$R_{i2} = R_o (1 + V_1/V_2) [(V_2 - V_2')/V_2']$$

Ri2 = 187,612,796 Ω Post-Impact Time: 4 minutes 01 s

Ri = The lesser of Ri1 and Ri2

Ri = 187,612,796 Ω Post-Impact Time: 4 minutes 01 s

Ri/Vb = Electrical Isolation Value/ Nominal Battery Voltage

Ri/Vb = 625,375,987 Ω/V Post-Impact Time: 4 minutes 01 s

NOTE: The minimum Electrical Isolation Value is 500 Ω/ V.

Is the measured Electrical Isolation Value $\geq 500 \Omega / V$?

☒ Yes

☐ No (Fail)

DATA SHEET NO. 305-4
POST-IMPACT DATA FOR INDICANT FMVSS NO. 305 TESTING (CONT'D)

PROPULSION BATTERY SYSTEM COMPONENTS

Describe any Propulsion Battery Module movement within the passenger compartment.
[Supply photographs as appropriate]:

Has the Propulsion Battery Module moved within the passenger compartment?

☐ Yes (Fail) ☒ No

Describe any intrusion of an outside Propulsion Battery Component into the passenger compartment. [Supply photographs as appropriate]:

Has an outside Propulsion Battery Component intruded into the passenger compartment?

☐ Yes (Fail) ☒ No

Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?

☐ Yes (Fail) ☒ No

RECORDED BY: Franklin Xu
APPROVED BY: John Shultz

DATE: 4/6/2023
DATE: 4/7/2023

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

Test Vehicle: 2023 Hyundai Kona Electric
 Test Program: SINCAP Side Impact

NHTSA No.: M20234216
 Test Date: 4/6/2023



PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Test Phase	Rotation Time (spec. 1-3 min)				FMVSS No. 301 Hold Time		Total Time				Next Whole Minute Interval	
0°-90°	1	min.	32	sec.	8	min.	10	min.	0	sec.	10	min.
90°-180°	1	min.	31	sec.	8	min.	20	min.	3	sec.	21	min.
180°-270°	1	min.	30	sec.	8	min.	30	min.	0	sec.	31	min.
270°-360°	1	min.	31	sec.	8	min.	40	min.	1	sec.	41	min.

TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

**NOTE: The maximum allowable Propulsion Battery Electrolyte Spillage is
5.0 Liters.**

Test Phase	Propulsion Battery Electrolyte Spillage (L)	Spillage Location
0°-90°	0	N/A
90°-180°	0	N/A
180°-270°	0	N/A
270°-360°	0	N/A

Total Spillage: 0 L

Is the total Propulsion Battery Electrolyte Spillage greater than 5.0 Liters?

☐ Yes (Fail) ☒ No

Is the Propulsion Battery Electrolyte Spillage visible in the passenger compartment?

☐ Yes (Fail) ☒ No

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

VOLTMETER INFORMATION

The voltmeter used in this test shall measure DC values and have an internal impedance of at least 10MΩ.

NOTE: An oscilloscope meeting the above requirements may need to be used to adequately measure voltage in some vehicles.

Make: Fluke ; Model: 87V ; S/N: 15860164
 Internal Impedance Value: 50 MΩ
 Nominal Propulsion Battery Voltage (Vb): 0.3 V

ELECTRICAL ISOLATION MEASUREMENTS

Record V1, V2, V1', V2' voltage measurements at the start of each successive increment of 90°, 180°, 270°, and 360° of the static rollover test.

V1 =	<u>0.161</u>	V @ 90°	Time:	<u>2</u>	minutes	<u>36</u>	s
V1 =	<u>0.090</u>	V @ 180°	Time:	<u>11</u>	minutes	<u>31</u>	s
V1 =	<u>0.009</u>	V @ 270°	Time:	<u>21</u>	minutes	<u>30</u>	s
V1 =	<u>0.071</u>	V @ 360°	Time:	<u>32</u>	minutes	<u>18</u>	s
V2 =	<u>0.049</u>	V @ 90°	Time:	<u>2</u>	minutes	<u>44</u>	s
V2 =	<u>0.067</u>	V @ 180°	Time:	<u>11</u>	minutes	<u>40</u>	s
V2 =	<u>0.005</u>	V @ 270°	Time:	<u>21</u>	minutes	<u>36</u>	s
V2 =	<u>0.046</u>	V @ 360°	Time:	<u>32</u>	minutes	<u>30</u>	s
V1' =	<u>0.007</u>	V @ 90°	Time:	<u>2</u>	minutes	<u>57</u>	s
V1' =	<u>0.016</u>	V @ 180°	Time:	<u>11</u>	minutes	<u>59</u>	s
V1' =	<u>0.002</u>	V @ 270°	Time:	<u>21</u>	minutes	<u>49</u>	s
V1' =	<u>0.016</u>	V @ 360°	Time:	<u>32</u>	minutes	<u>46</u>	s
V2' =	<u>0.004</u>	V @ 90°	Time:	<u>2</u>	minutes	<u>01</u>	s
V2' =	<u>0.063</u>	V @ 180°	Time:	<u>11</u>	minutes	<u>08</u>	s
V2' =	<u>0.002</u>	V @ 270°	Time:	<u>21</u>	minutes	<u>02</u>	s
V2' =	<u>0.004</u>	V @ 360°	Time:	<u>32</u>	minutes	<u>56</u>	s

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

ELECTRICAL ISOLATION CALCULATIONS

NOTE: If measured voltage is zero and results in a division by zero, record "Zero Volts." This "zero voltage" condition is considered as being compliant.

$$Ri1 = Ro (1 + V2/V1) [(V1-V1')/V1']$$

Ri1 =	<u>4,729,043</u>	Ω	@ 90°	Time:	<u>3</u>	minutes	<u>01</u>	s
Ri1 =	<u>1,329,616</u>	Ω	@ 180°	Time:	<u>12</u>	minutes	<u>08</u>	s
Ri1 =	<u>897,244</u>	Ω	@ 270°	Time:	<u>22</u>	minutes	<u>02</u>	s
Ri1 =	<u>933,528</u>	Ω	@ 360°	Time:	<u>32</u>	minutes	<u>56</u>	s

$$Ri2 = Ro (1 + V1/V2) [(V2-V2')/V2']$$

Ri2 =	<u>7,945,714</u>	Ω	@ 90°	Time:	<u>3</u>	minutes	<u>01</u>	s
Ri2 =	<u>24,519</u>	Ω	@ 180°	Time:	<u>12</u>	minutes	<u>08</u>	s
Ri2 =	<u>692,160</u>	Ω	@ 270°	Time:	<u>22</u>	minutes	<u>02</u>	s
Ri2 =	<u>4,401,235</u>	Ω	@ 360°	Time:	<u>32</u>	minutes	<u>56</u>	s

Ri = The lesser of Ri1 and Ri2

Ri =	<u>4,729,043</u>	Ω	@ 90°	Time:	<u>3</u>	minutes	<u>01</u>	s
Ri =	<u>24,519</u>	Ω	@ 180°	Time:	<u>12</u>	minutes	<u>08</u>	s
Ri =	<u>692,160</u>	Ω	@ 270°	Time:	<u>22</u>	minutes	<u>02</u>	s
Ri =	<u>933,528</u>	Ω	@ 360°	Time:	<u>32</u>	minutes	<u>56</u>	s

Ri/Vb = Electrical Isolation Value/ Nominal Battery Voltage

RiVb =	<u>15,763,478</u>	Ω	@ 90°	Time:	<u>3</u>	minutes	<u>01</u>	s
RiVb =	<u>81,730</u>	Ω	@ 180°	Time:	<u>12</u>	minutes	<u>08</u>	s
RiVb =	<u>2,307,200</u>	Ω	@ 270°	Time:	<u>22</u>	minutes	<u>02</u>	s
RiVb =	<u>3,111,761</u>	Ω	@ 360°	Time:	<u>32</u>	minutes	<u>56</u>	s

NOTE: The minimum Electrical Isolation Value is 500 Ω/ V.

Is the measured Electrical Isolation Value ≥500 Ω/ V?

☒ Yes ☐ No (Fail)

Comments: _____

RECORDED BY: Franklin Xu
 APPROVED BY: John Shultz

DATE: 4/6/2023
 DATE: 4/7/203

APPENDIX A
PHOTOGRAPHS

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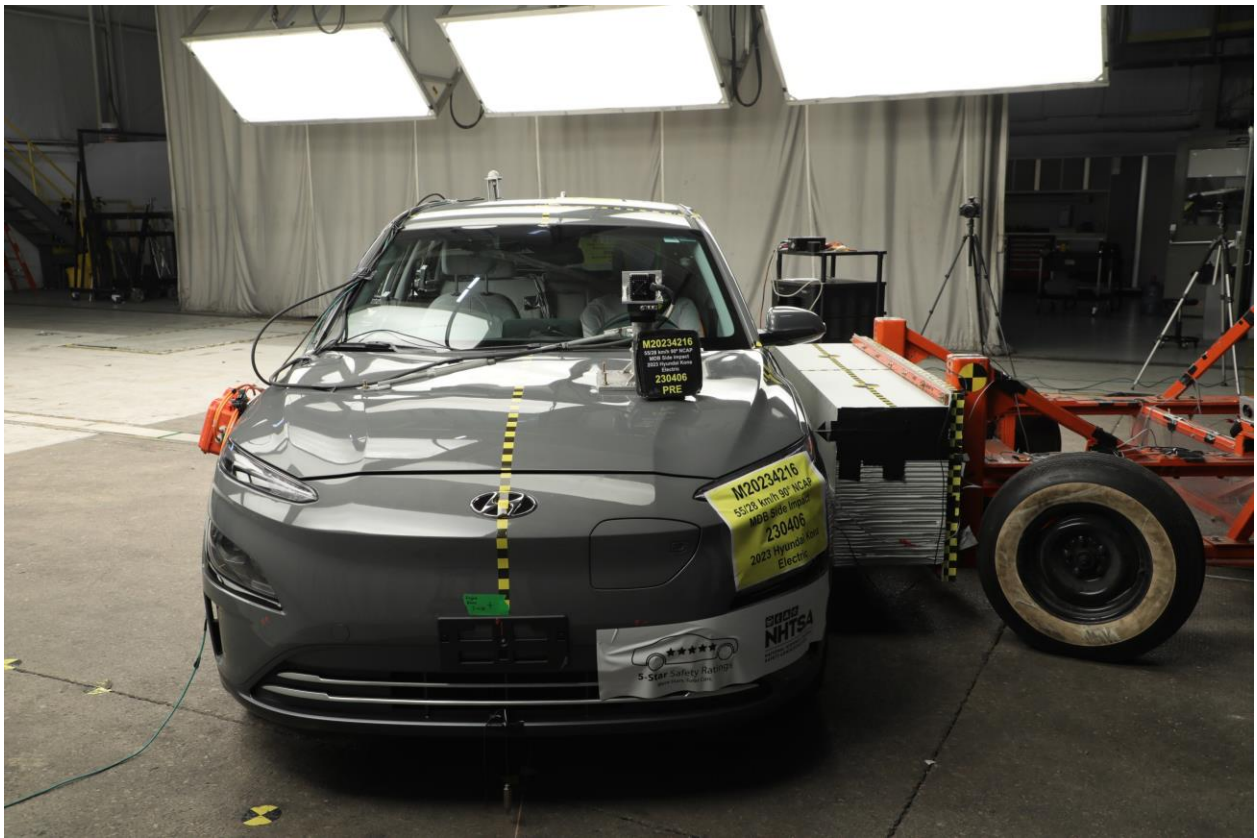


001 As-Delivered Right Front $\frac{3}{4}$ View of Test Vehicle¹

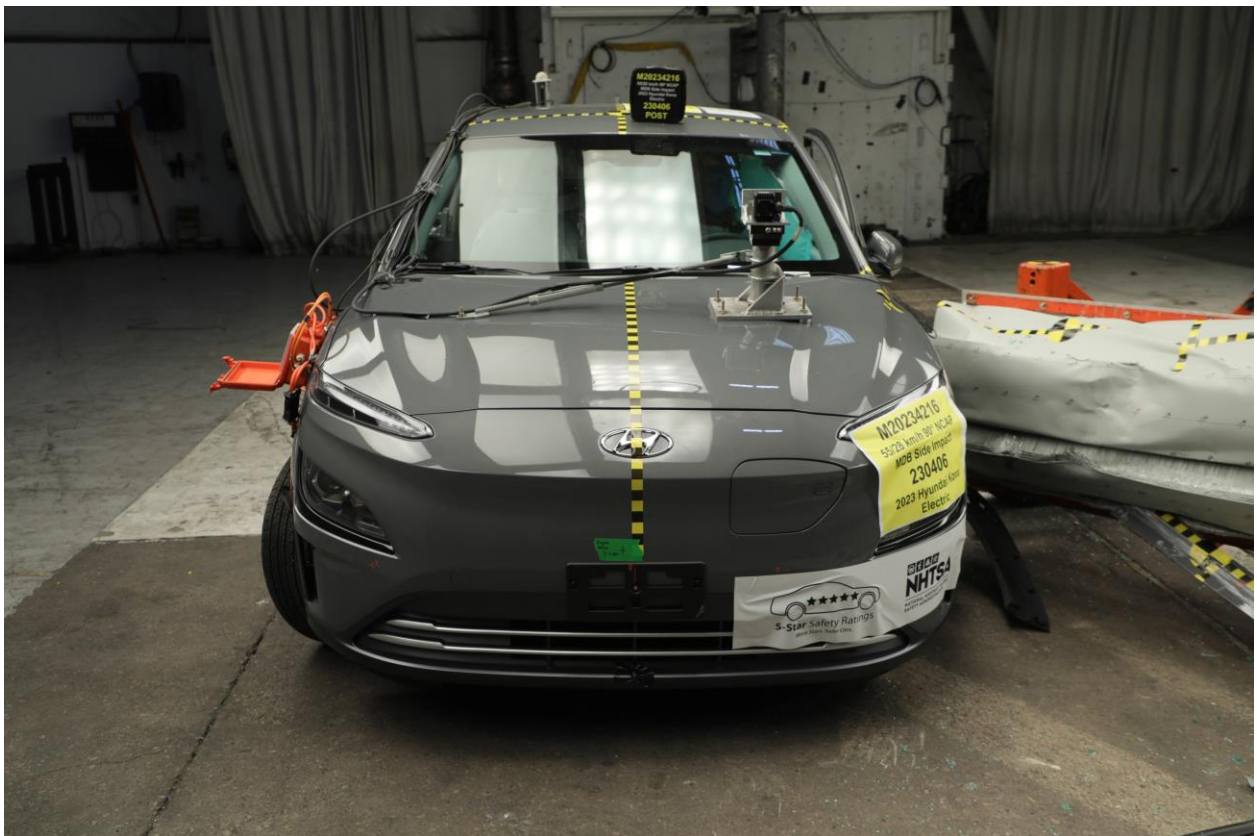


002 As-Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle¹

¹ NHTSA number is incorrect.



003 Pre-Test Frontal View of Test Vehicle



004 Post-Test Frontal View of Test Vehicle



005 Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



006 Post-Test Left Front $\frac{3}{4}$ 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 $\frac{3}{4}$ View of Test Vehicle



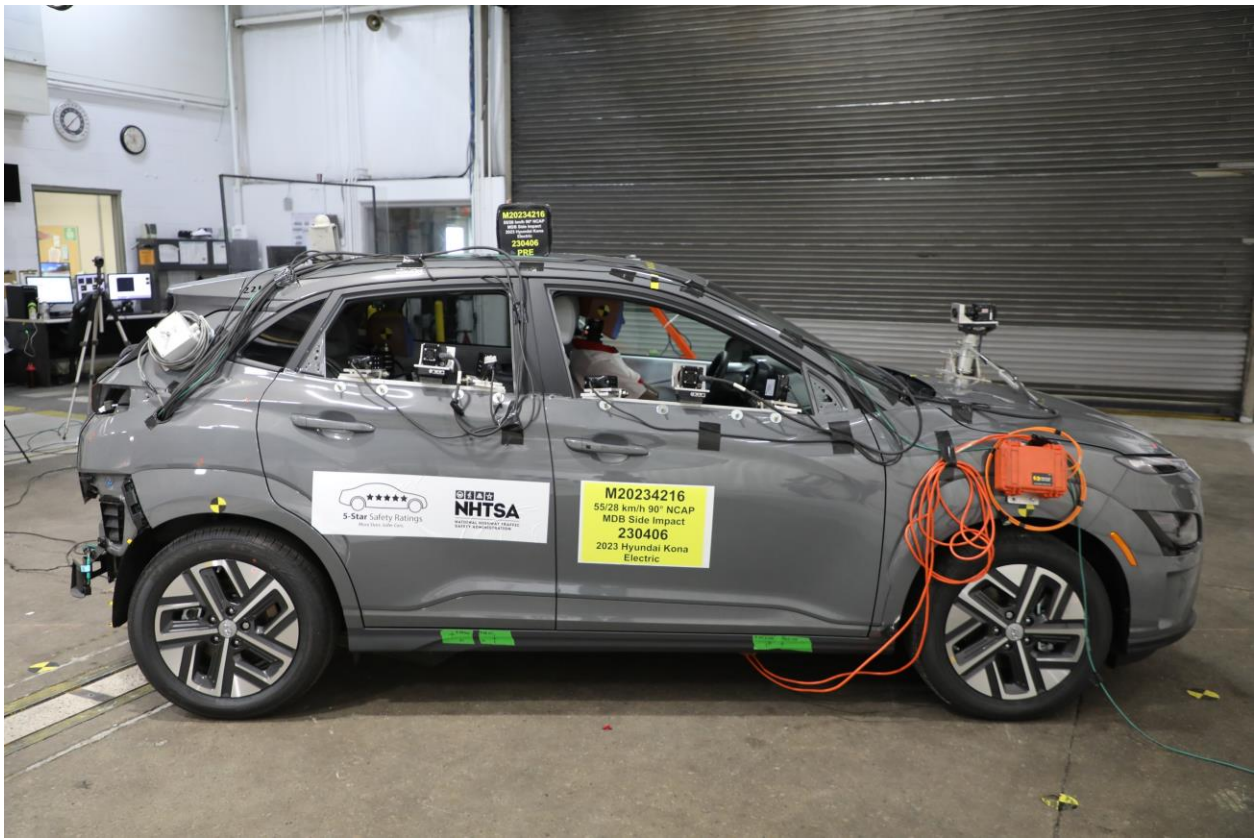
010 Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



011 Pre-Test Rear View of Test Vehicle



012 Post-Test Rear View of Test Vehicle



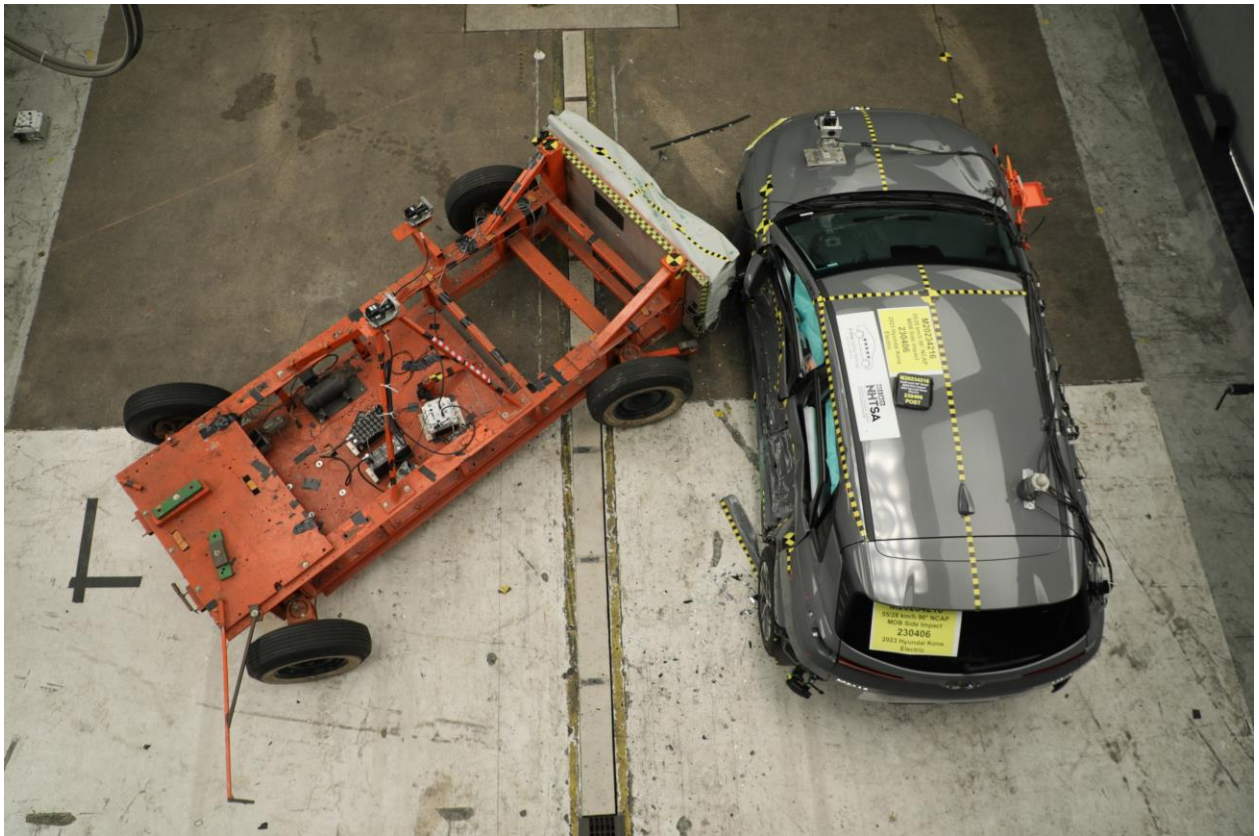
013 Pre-Test Right Side View of Test Vehicle



014 Post-Test Right Side View of Test Vehicle



015 Pre-Test Overhead View of Test Area



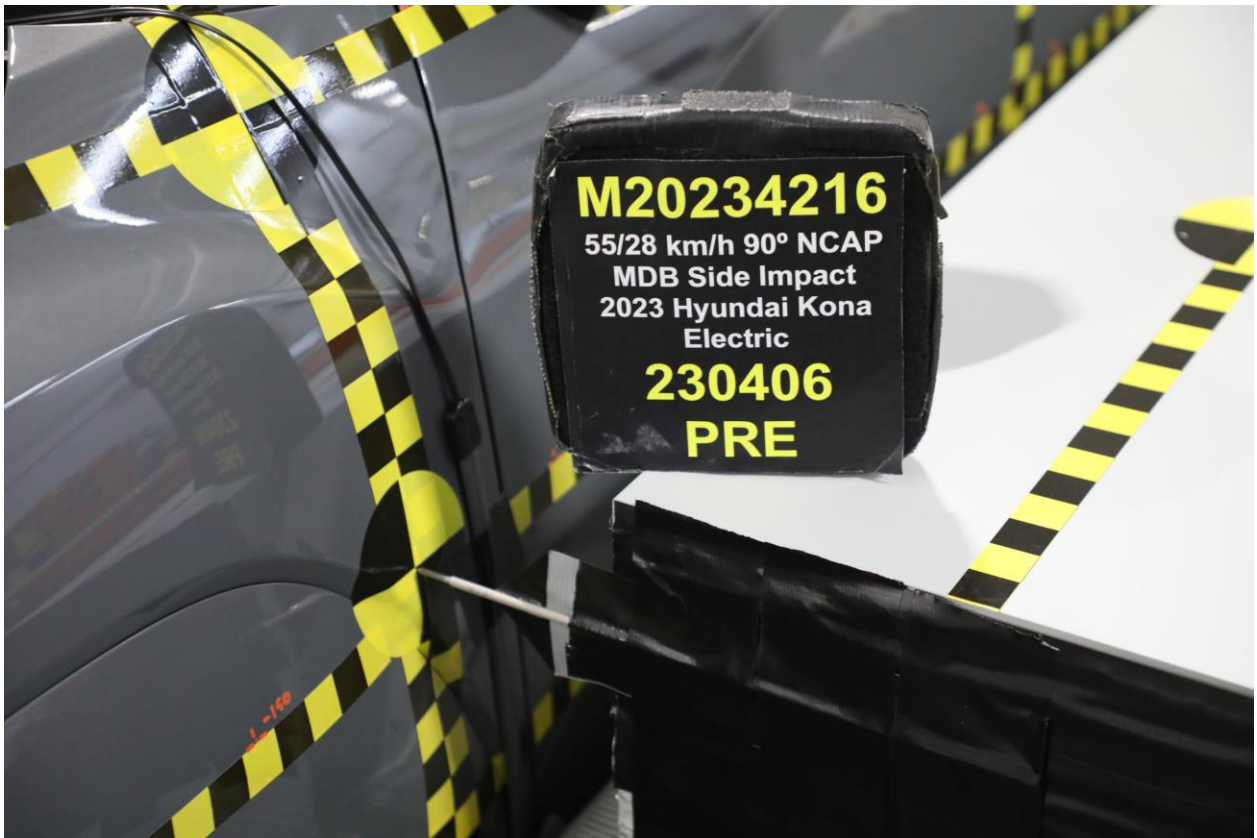
016 Post-Test Overhead View of Test Area



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



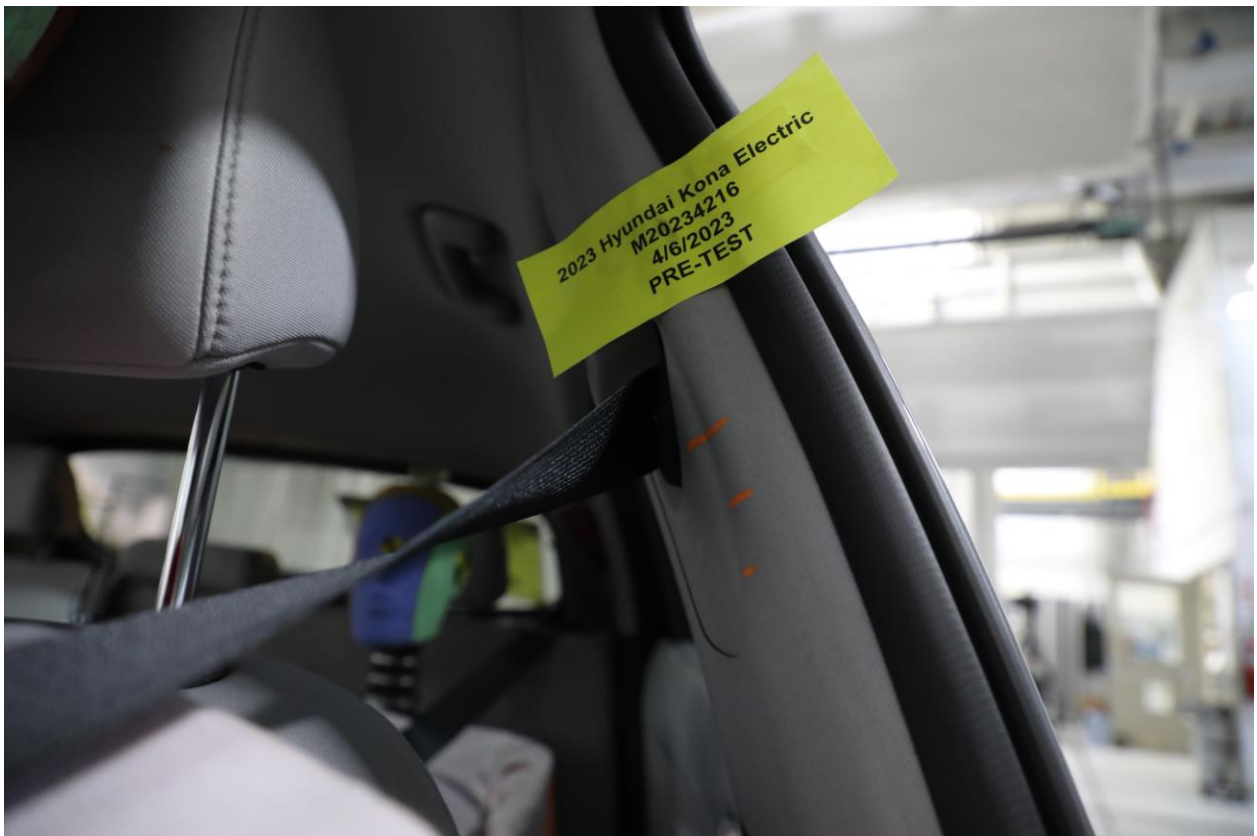
032 Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning



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



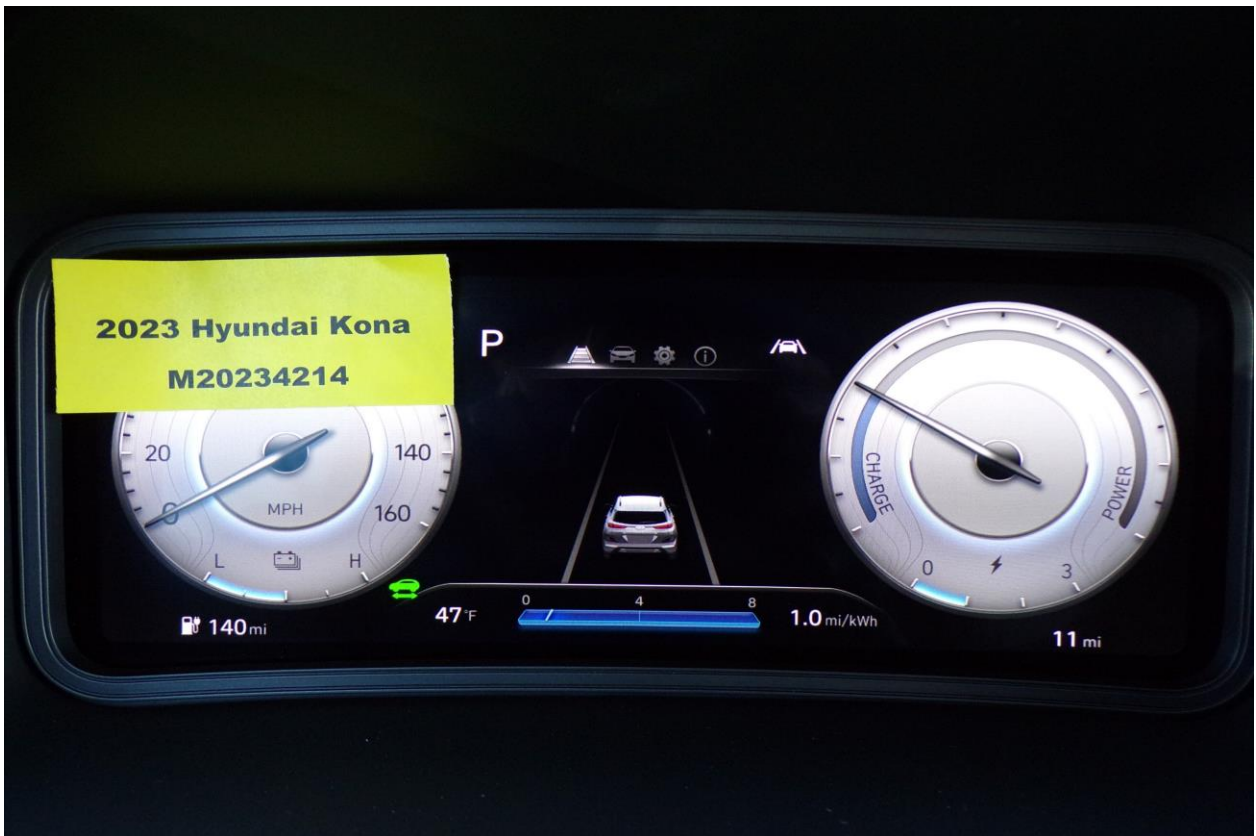
034 Pre-Test Placement of Driver's Dummy Feet



035 Pre-Test View of Belt Anchorage for Driver Dummy



036 Pre-Test Left Side View of Steering Wheel



037 View of Disengaged Parking Brake¹

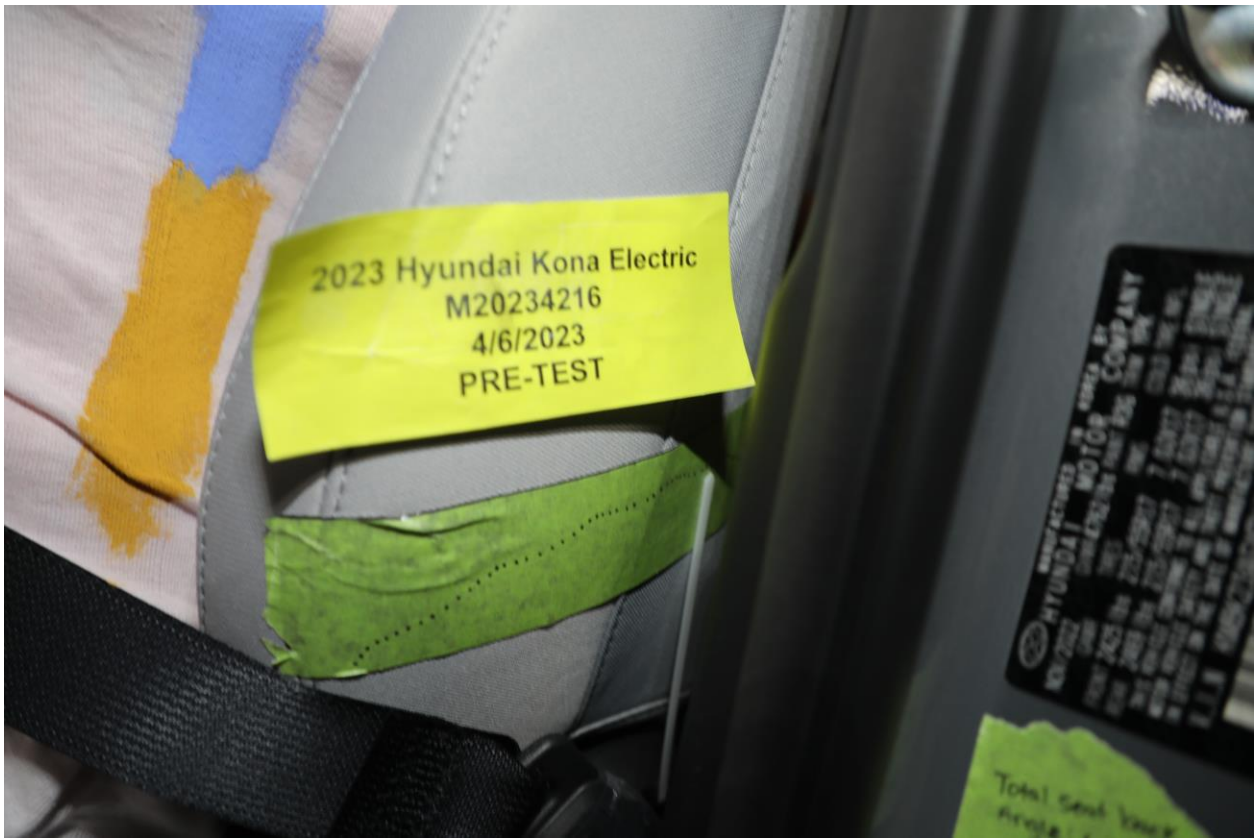
¹ NHTSA number is incorrect.



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



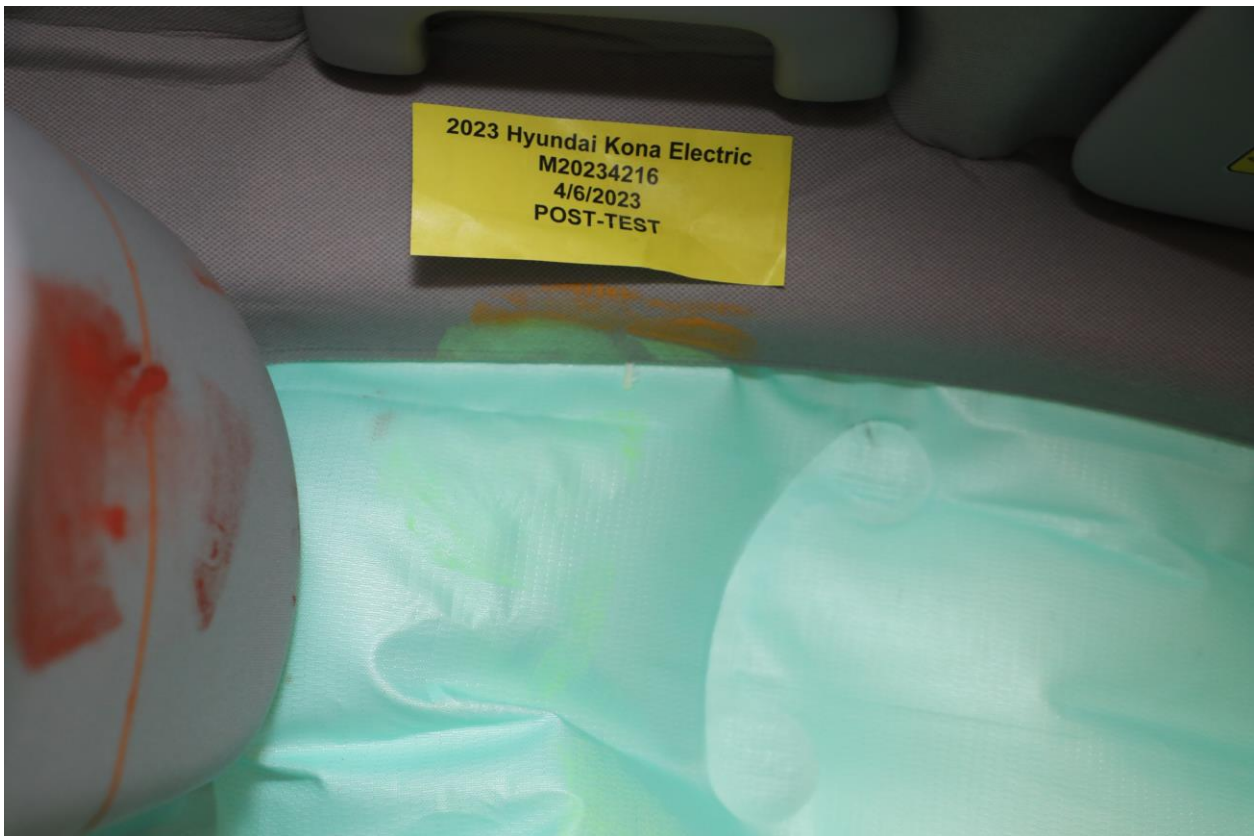
046 Pre-Test Driver Inner Door Panel View



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



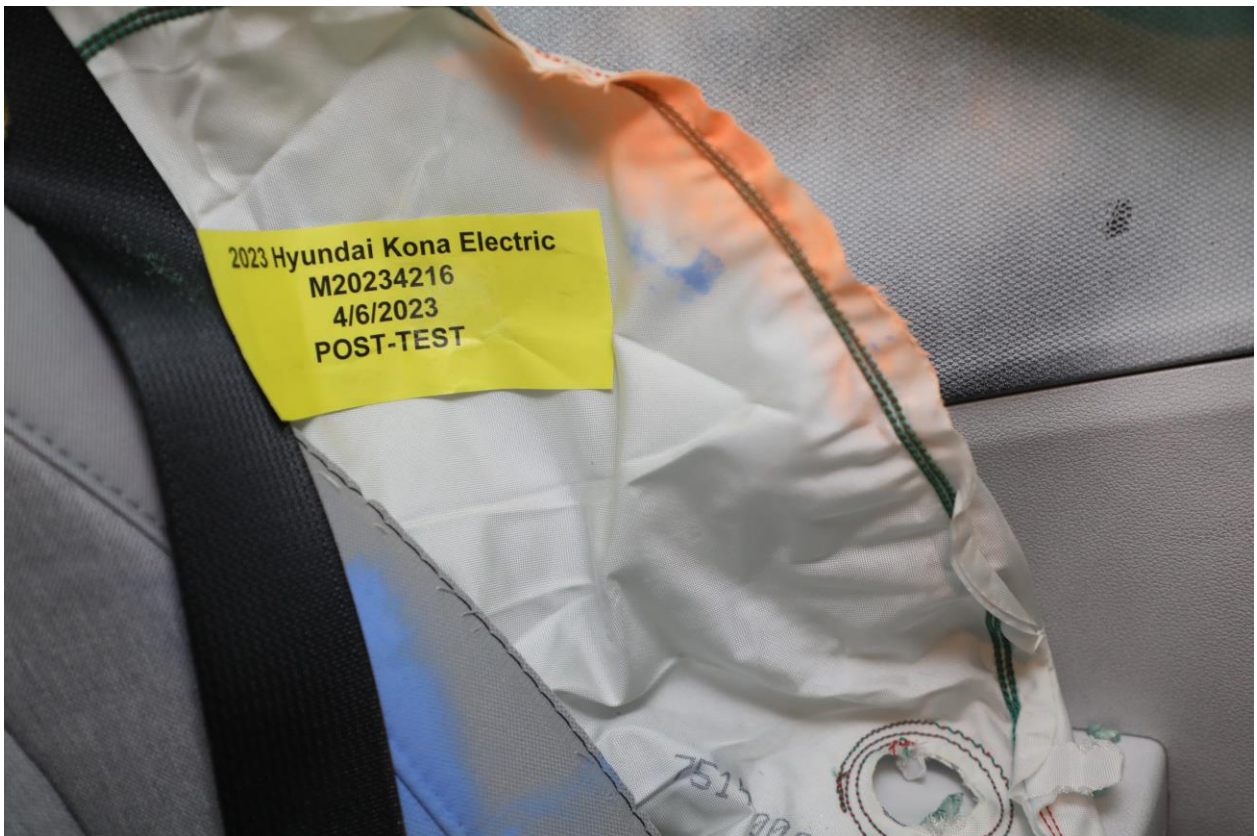
048 Post-Test Driver Dummy Close-Up Head Contact with Vehicle View



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



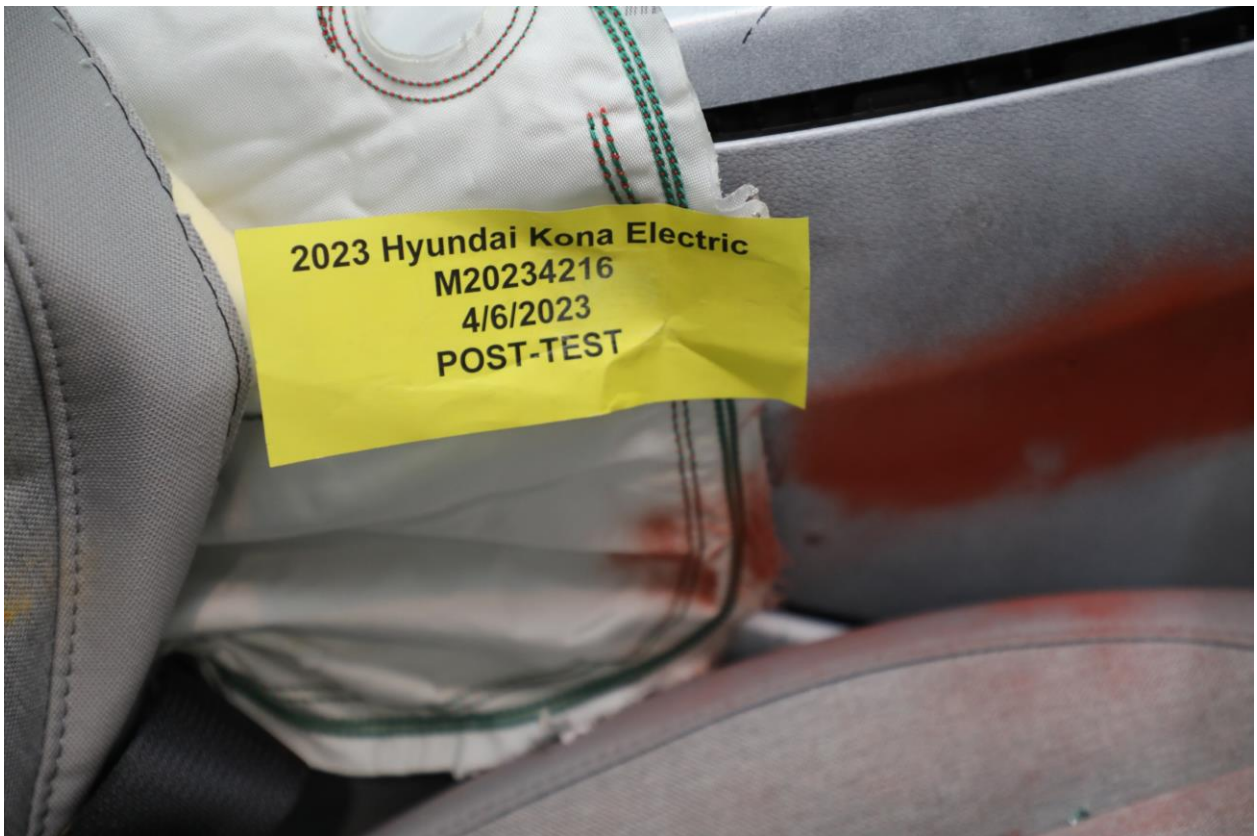
050 Post-Test Driver Dummy Close-Up Torso Contact with Vehicle Interior View



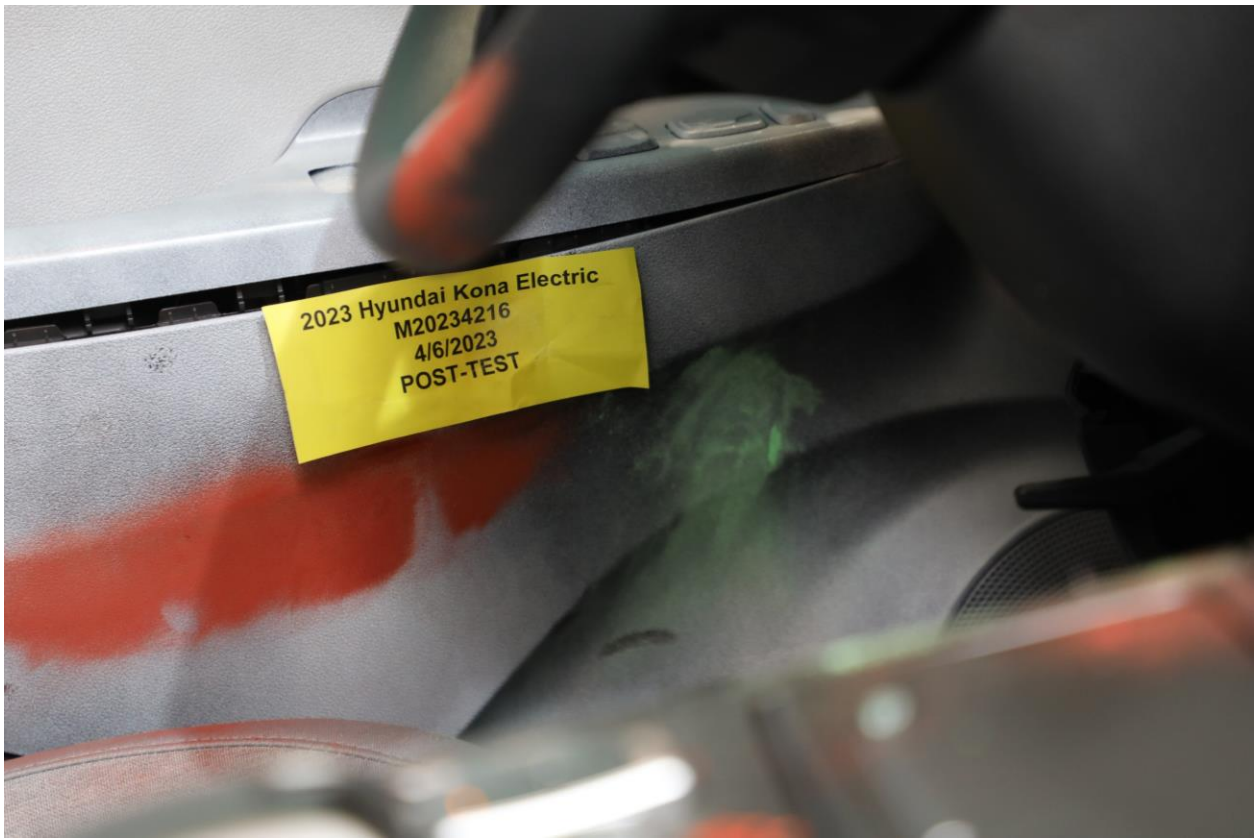
051 Post-Test Driver Dummy Close-Up Torso Contact with Side Airbag View



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



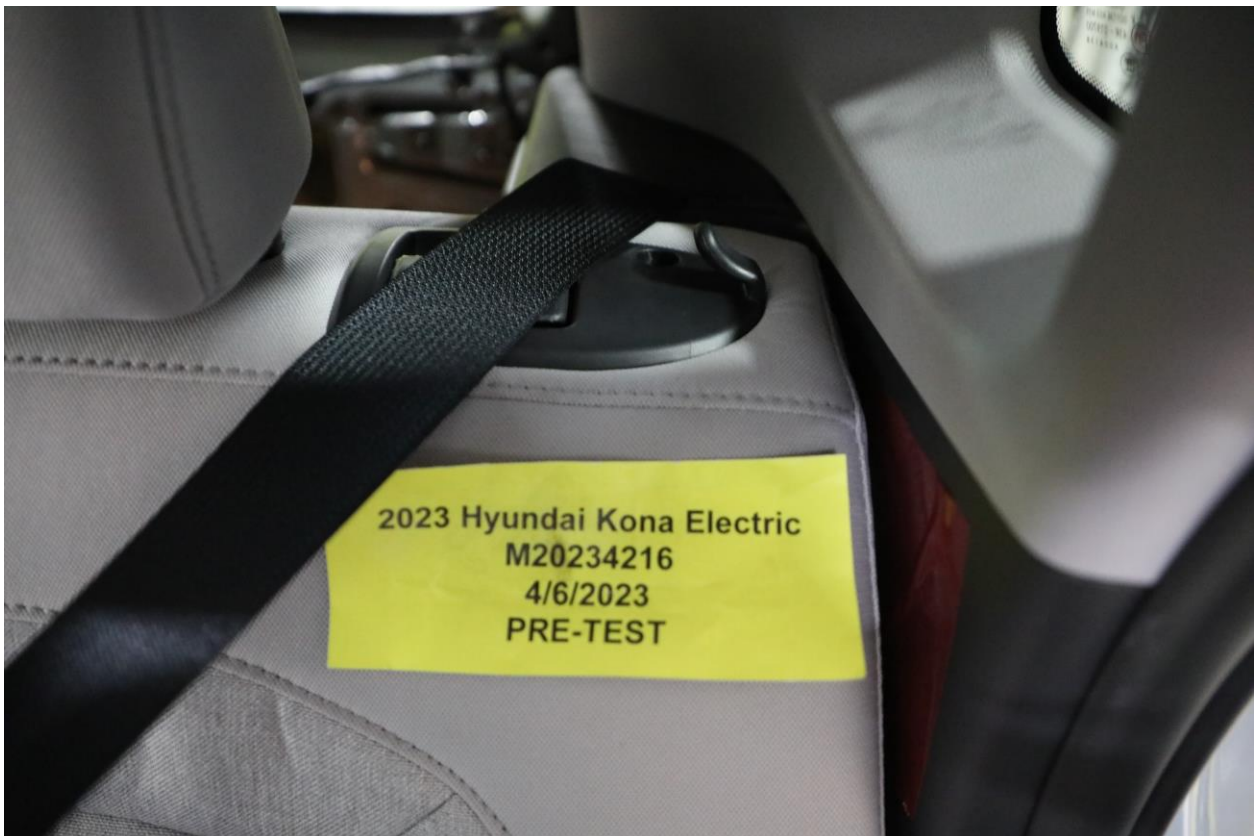
062 Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket



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

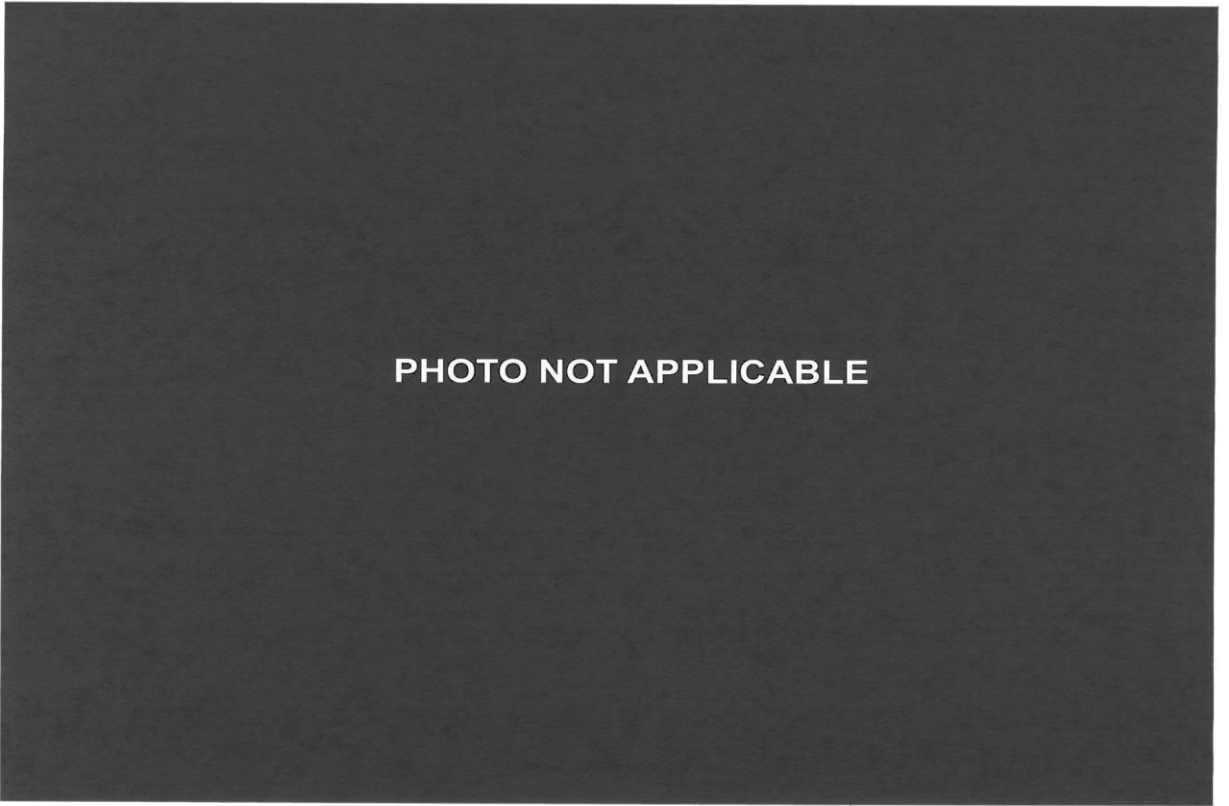


PHOTO NOT APPLICABLE

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

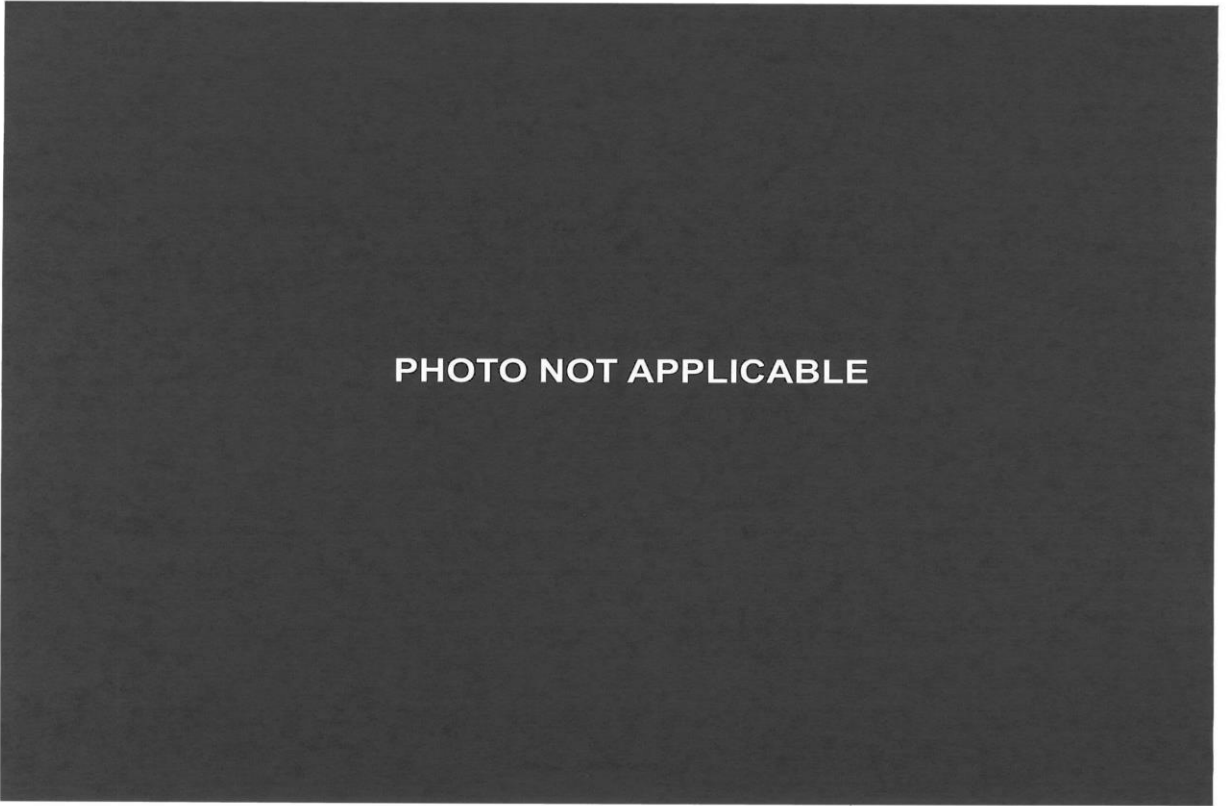


PHOTO NOT APPLICABLE

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

PHOTO NOT AVAILABLE

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



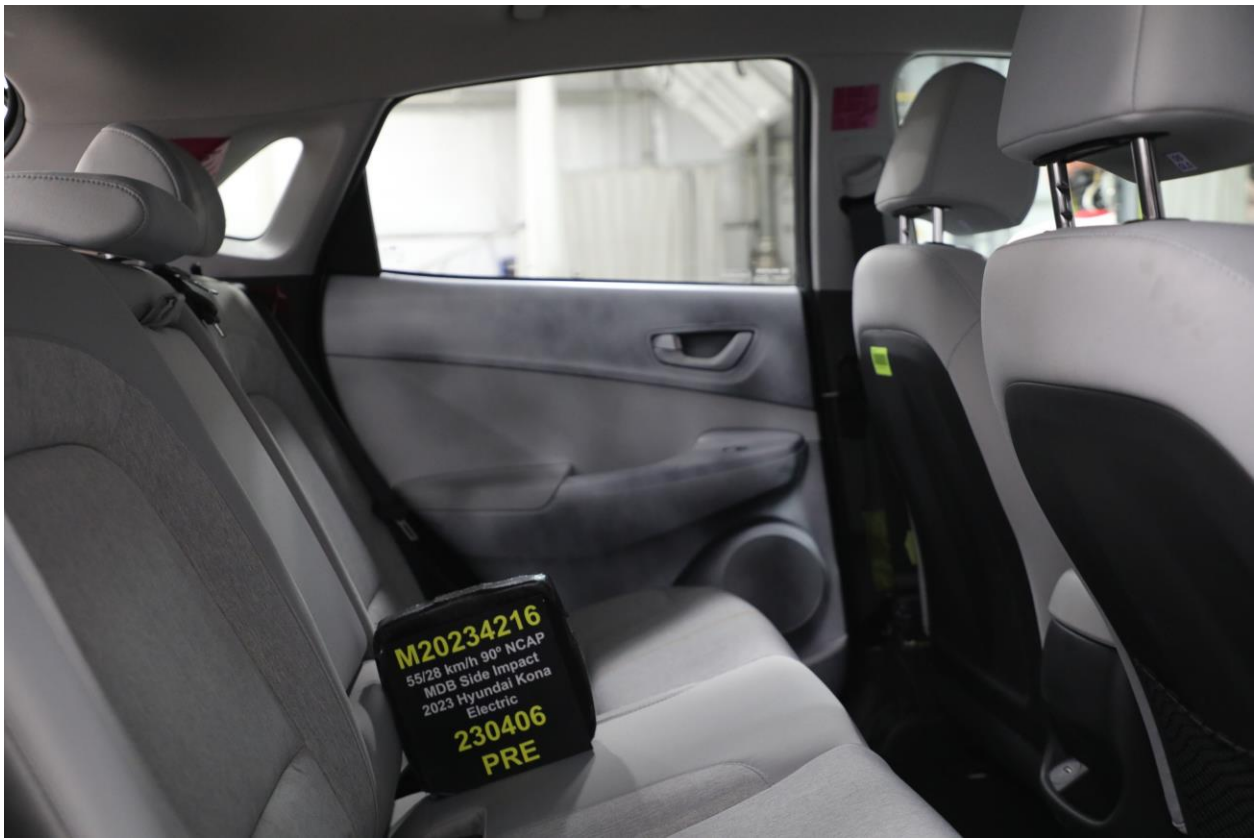
070 Post-Test Rear Passenger Dummy and Door Clearance View



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



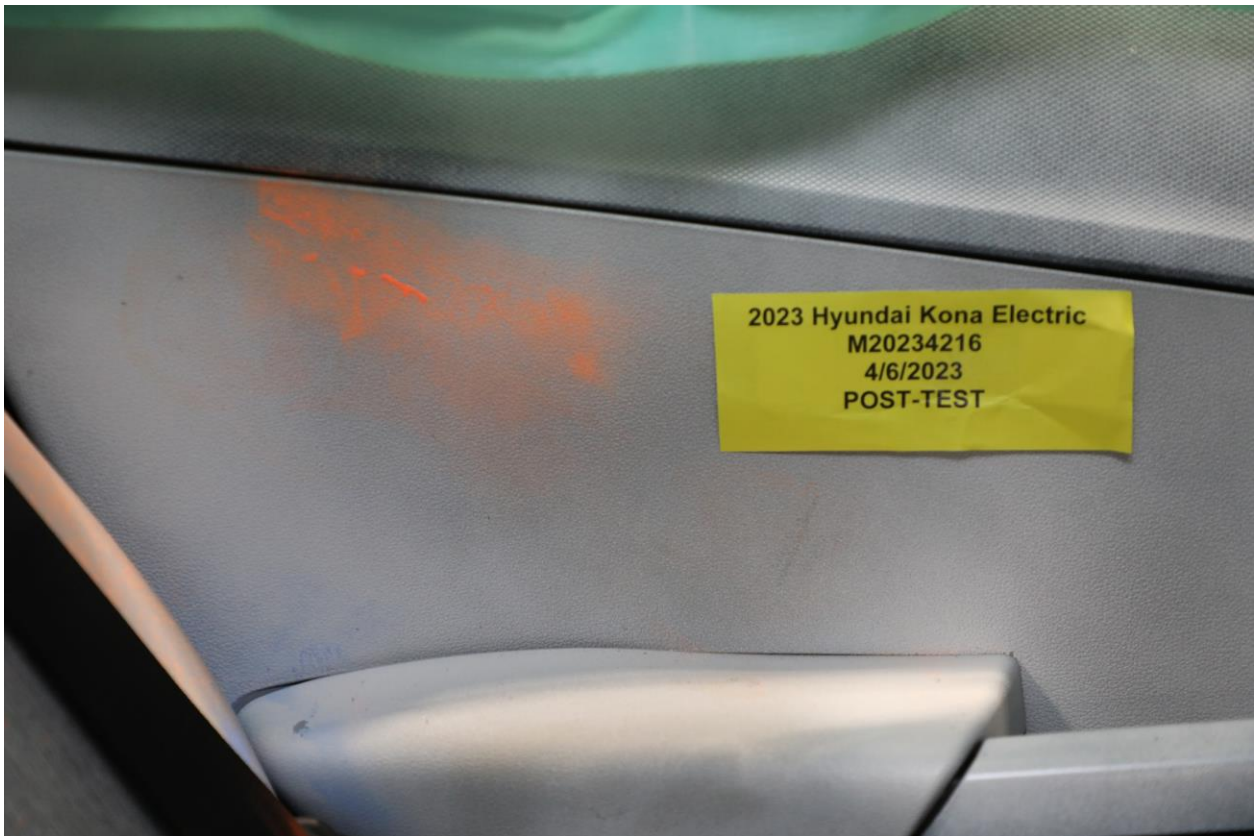
074 Post-Test Rear Passenger Inner Door Panel View



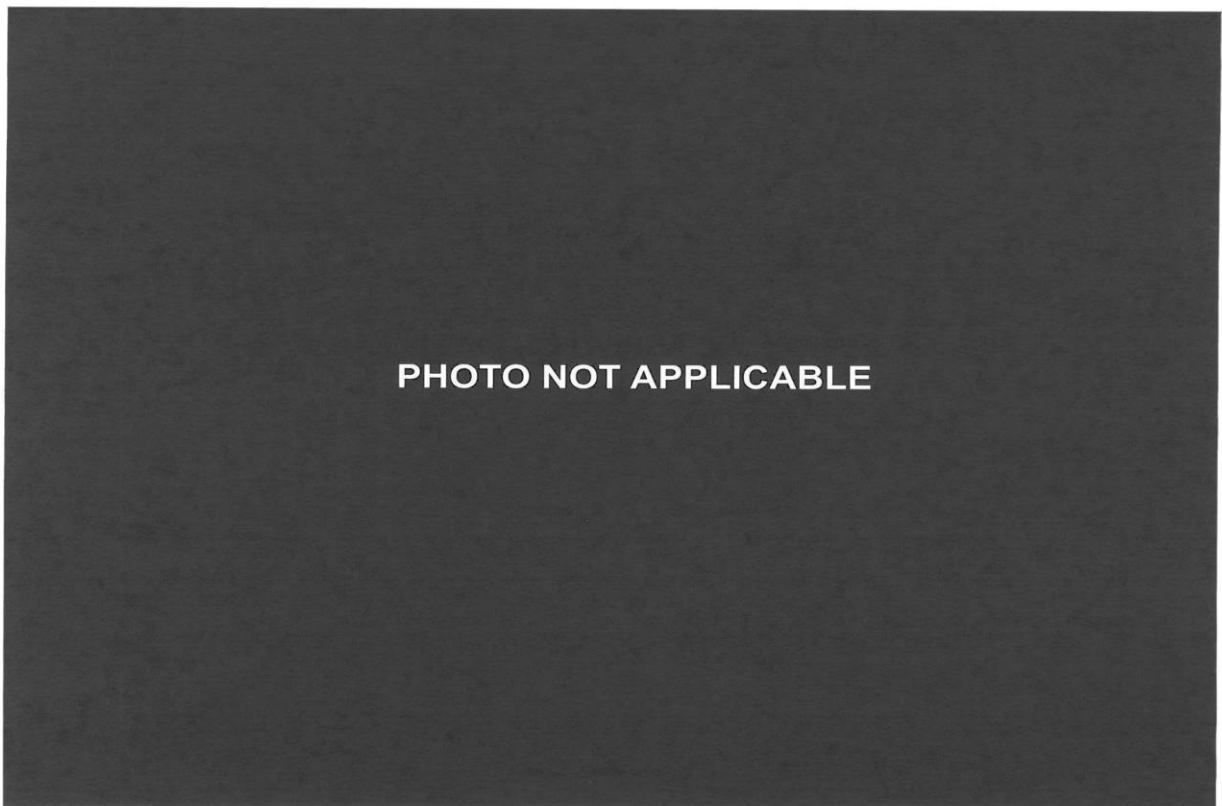
075 Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View



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



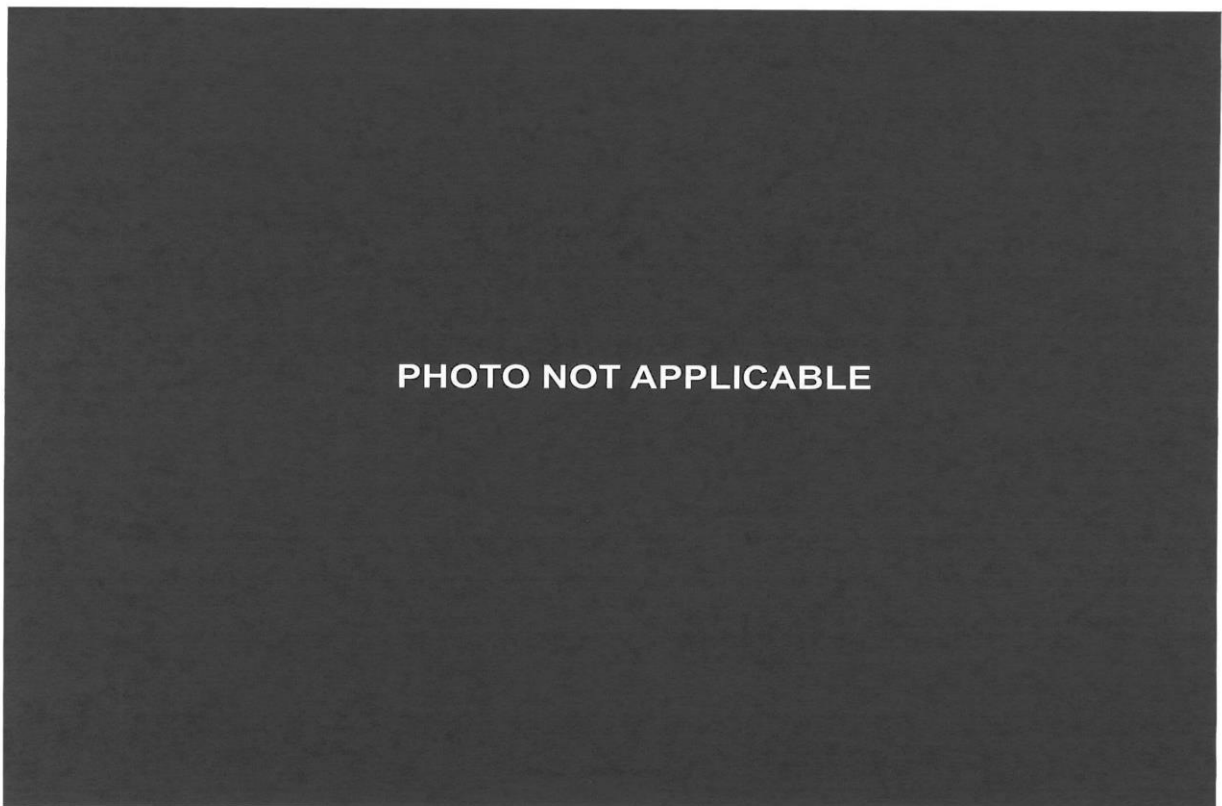
077 Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View



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 Charge Port View



083 Post-Test Charge Port View



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



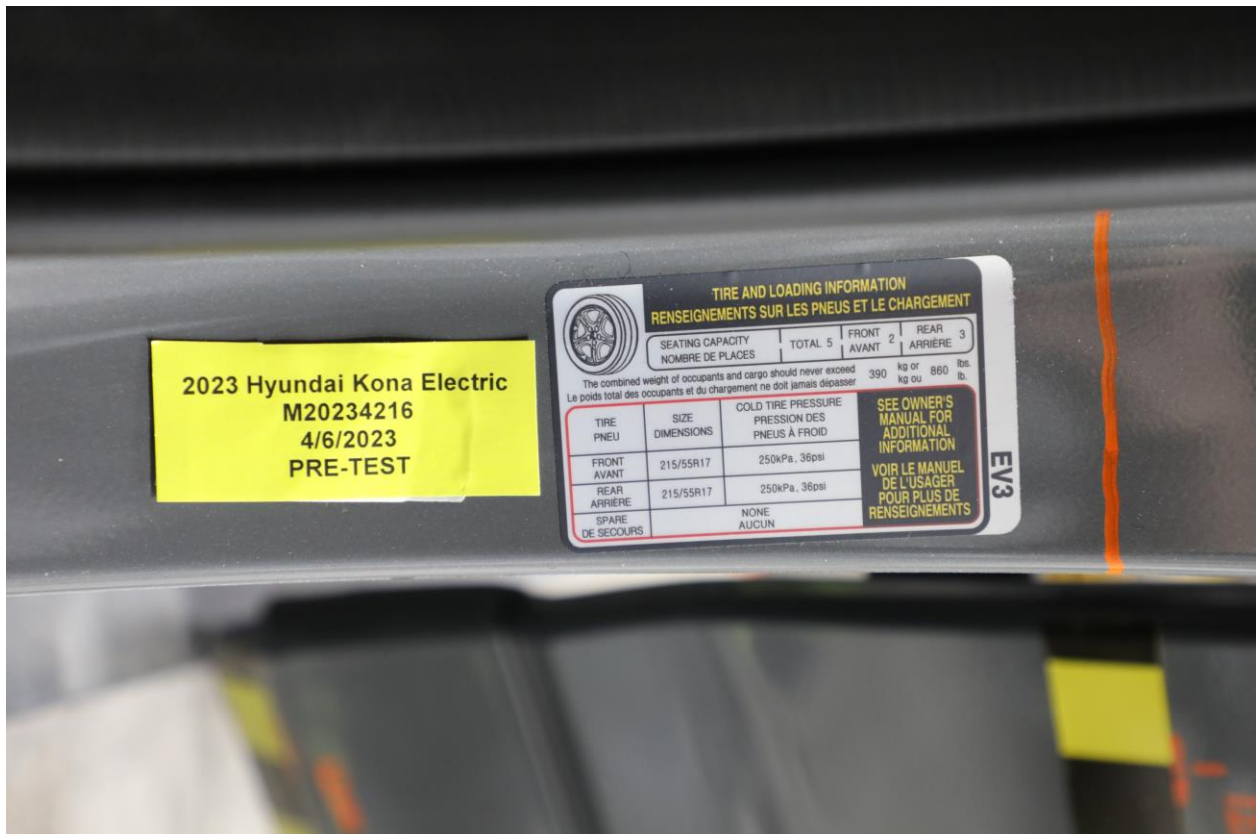
090 Pre-Test Right Side View of MDB Impactor Face



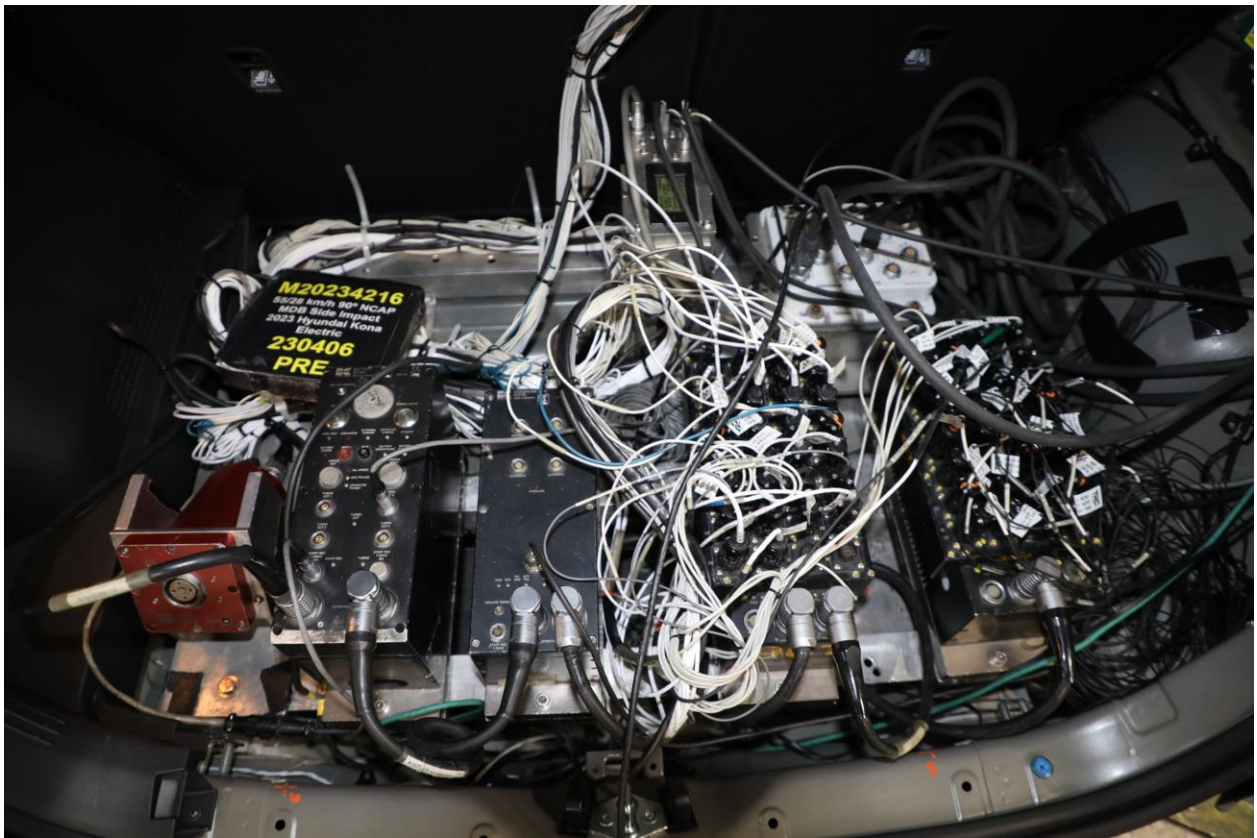
091 Post-Test Right Side View of MDB Impactor Face



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



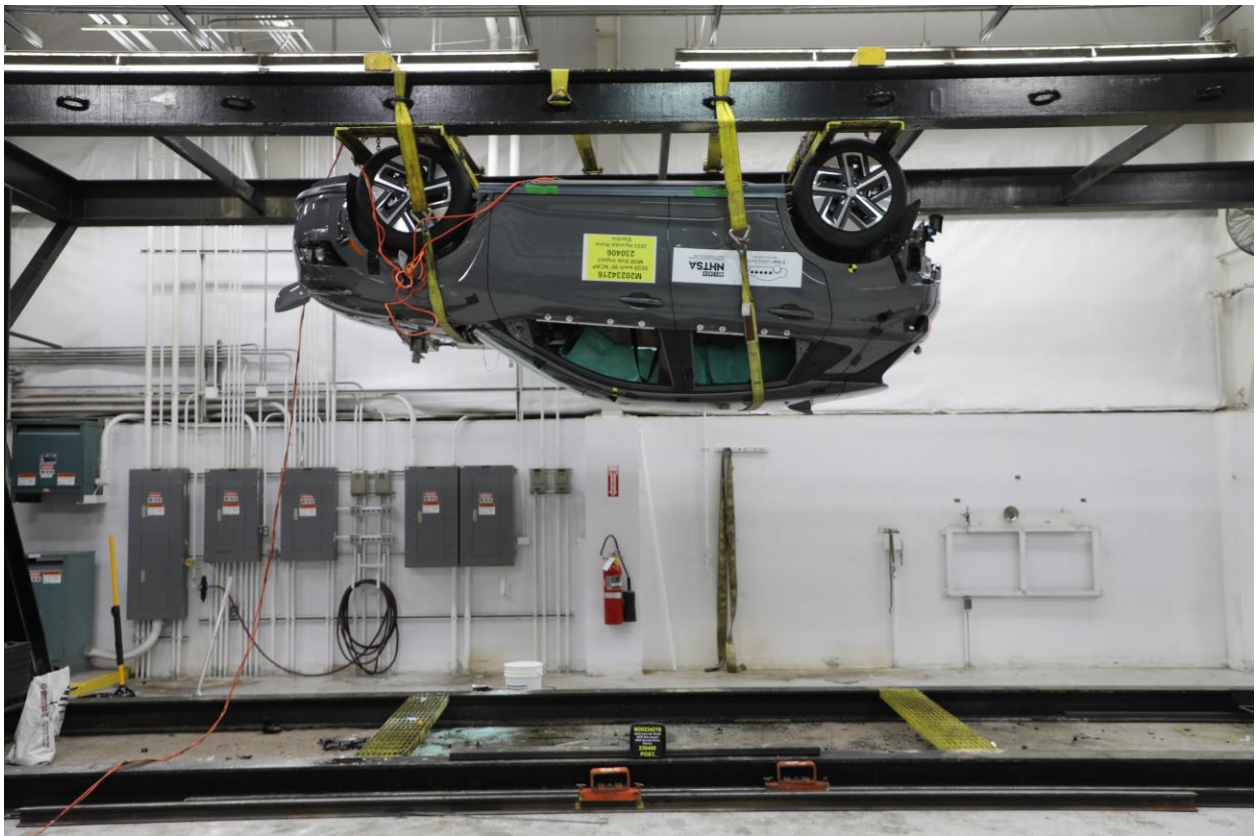
095 No. Post-Test Primary and Redundant Speed Trap Read-Out



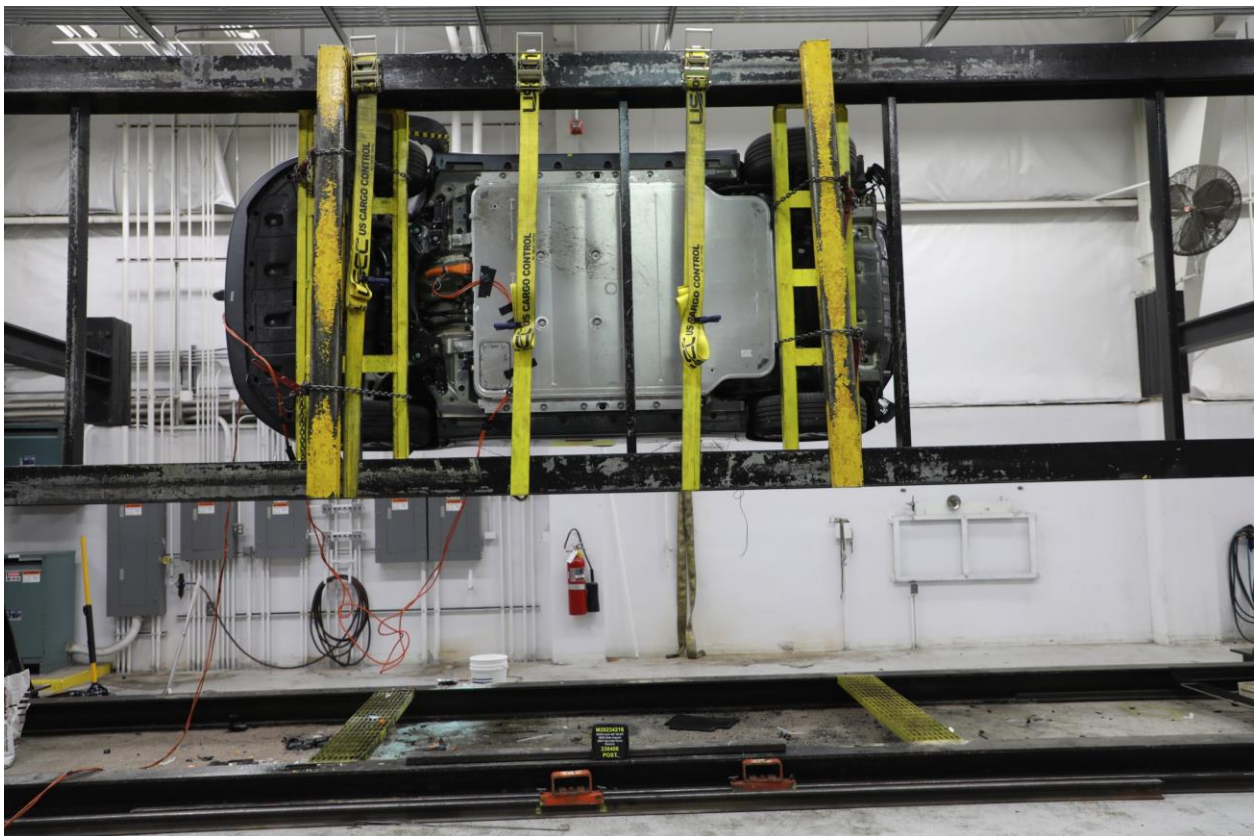
096 FMVSS No. 301 Static Rollover 0 Degrees



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



2023 KONA ELECTRIC SE

SOLD TO: NY077 SHIPPED TO: NY077
TOWNE HYUNDAI
3303 SOUTHWESTERN BLVD.
ORCHARD PARK NY 14127

VIN: KM8K23AGXPJ170901
MODEL: Q04R2FEZ
ENGINE: EM16NBA227CS
PORT OF ENTRY: PH
EXTERIOR COLOR: GALACTIC GRAY
INTERIOR/SEAT COLOR: GRAY/GRAY
TRANSPORT: TRUCK
ACCESSORY WEIGHT: 12 lbs / 5 kgs
EMISSIONS: This vehicle meets emissions requirements in all 50 states and is a CARB certified Zero Emission Vehicle (ZEV)

GOVERNMENT 5-STAR SAFETY RATINGS

This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.

Source: National Highway Traffic Safety Administration (NHTSA).
www.safercar.gov or 1-888-327-4236

STANDARD FEATURES:

AMERICA'S BEST WARRANTY

5-year/50,000-mile New Vehicle Warranty*
10-year/100,000-mile Powertrain Warranty*
10-year/100,000-mile Electric Battery Warranty*
7-year/Unlimited-mile Anti-perforation Warranty*
3-year/50,000-mile Complimentary Maintenance*

ADVANCED SAFETY TECHNOLOGY

Front, Front Side & Side-Curtain Airbags
Forward Collision-Avoidance Assist
Blind Spot Collision-Avoidance Assist
Rear Cross-Traffic Collision-Avoidance Assist
Lane Following Assist
Driver Attention Warning
Rear Occupant Alert, Safe Exit Warning
Immobilizer

POWERTRAIN TECHNOLOGY

Single, Front-Mounted Electric Motor
Lithium Ion Battery System
CC Fast Charging Capability
Shift-By-Wire Gear Selector
Regenerative Brake Level Control Paddles

EXTERIOR

17" Alloy Wheels
LED Daytime Running Lights
Heated Side Mirror w/ Turn Signal Indicators

COMFORT & CONVENIENCE

Proximity Key w/ Push Button Start
Power Driver's Seat w/ Lumbar Support
Heated Front Seats
Automatic Temperature Control
10.25" Digital Instrument Cluster
Rearview Mirror
Front and Rear USB Charging Ports
8" Color Touchscreen Audio Display
Android Auto(TM) & Apple CarPlay(TM)
Bluetooth® Connected Services System (enrollment req.)
Bluetooth® Remote Start (3-year Complimentary Service)
SiriusXM® Radio w/ 90 Day Platinum trial subscription.
Not Available in AK & HI
The Mobility Kit (in Lieu of Spare Tire)
Full Battery Charge

Manufacturer's Suggested Retail Price:

\$33,555.00

ADDED FEATURES:

*Carpeted Floor Mats

\$120.00

*Cargo Tray

\$30.00

*First Aid Kit

\$70.00

*Wheel Locks

\$70.00

Int'l Freight & Handling:

\$1,295.00

Total Price:

\$35,275.00

Over 250 miles of All-Electric Range



Fuel Economy and Environment

Fuel Economy

120 MPGe
combined city/hwy

Small SUVs range from 14 to 129 MPGe. The best vehicle rates 132 MPGe.

134 city
106 highway
28 kW-hrs per 100 miles

Driving Range
When fully charged, vehicle can travel about 258 miles
Charge Time: 9.5 hours (240V)

You Save \$5,000
in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost \$600

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

Smog Rating (tailpipe only)

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 28 MPGe and costs \$8,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$5.14 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline license and title fees state and local taxes and dealer installed options and accessories are not included in the manufacturer's suggested retail price. This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1231 et seq. which prohibits its removal or alteration prior to delivery to the ultimate purchaser.

PARTS CONTENT INFORMATION
FOR VEHICLE IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT:
MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 95 %

Note: Parts content does not include final assembly, distribution, or other non-parts costs.

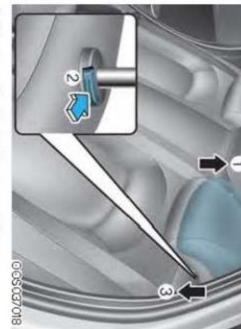
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: ULSAN, KOREA
COUNTRY OF ORIGIN:
ENGINE: KOREA
TRANSMISSION: KOREA

348 A 3603QTREAS

102 Monroney Label

3-16

Safety System



Adjusting the height up and down

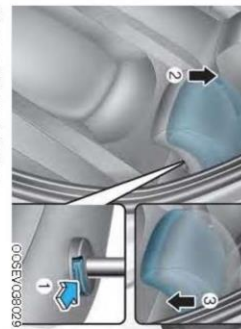
To raise the head restraint:

1. Pull it up to the desired position (1).

To lower the head restraint:

1. Push and hold the release button (2) on the head restraint support.

2. Lower the head restraint to the desired position (3).



Removal/Reinstallation

To remove the head restraint:

1. Raise the head restraint as far as it can go.

2. Press the head restraint release button (1) while pulling the head restraint up (2).

To reinstall the head restraint:

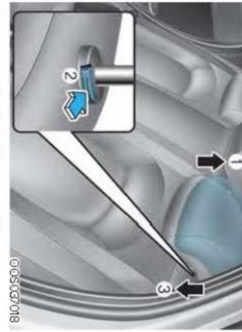
1. Put the head restraint poles into the holes (3) while pressing the release button (1).

2. Adjust the head restraint to the appropriate height.



WARNING
Make sure the head restraint locks in position after adjusting it to properly protect the occupants.

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



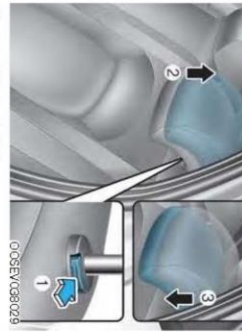
Adjusting the height up and down

To raise the head restraint:

1. Pull it up to the desired position (1).

To lower the head restraint:

1. Push and hold the release button (2) on the head restraint support.
2. Lower the head restraint to the desired position (3).



Removal/Reinstallation

To remove the head restraint:

1. Raise the head restraint as far as it can go.
2. Press the head restraint release button (1) while pulling the head restraint up (2).

To reinstall the head restraint:

1. Put the head restraint poles into the holes (3) while pressing the release button (1).
2. Adjust the head restraint to the appropriate height.

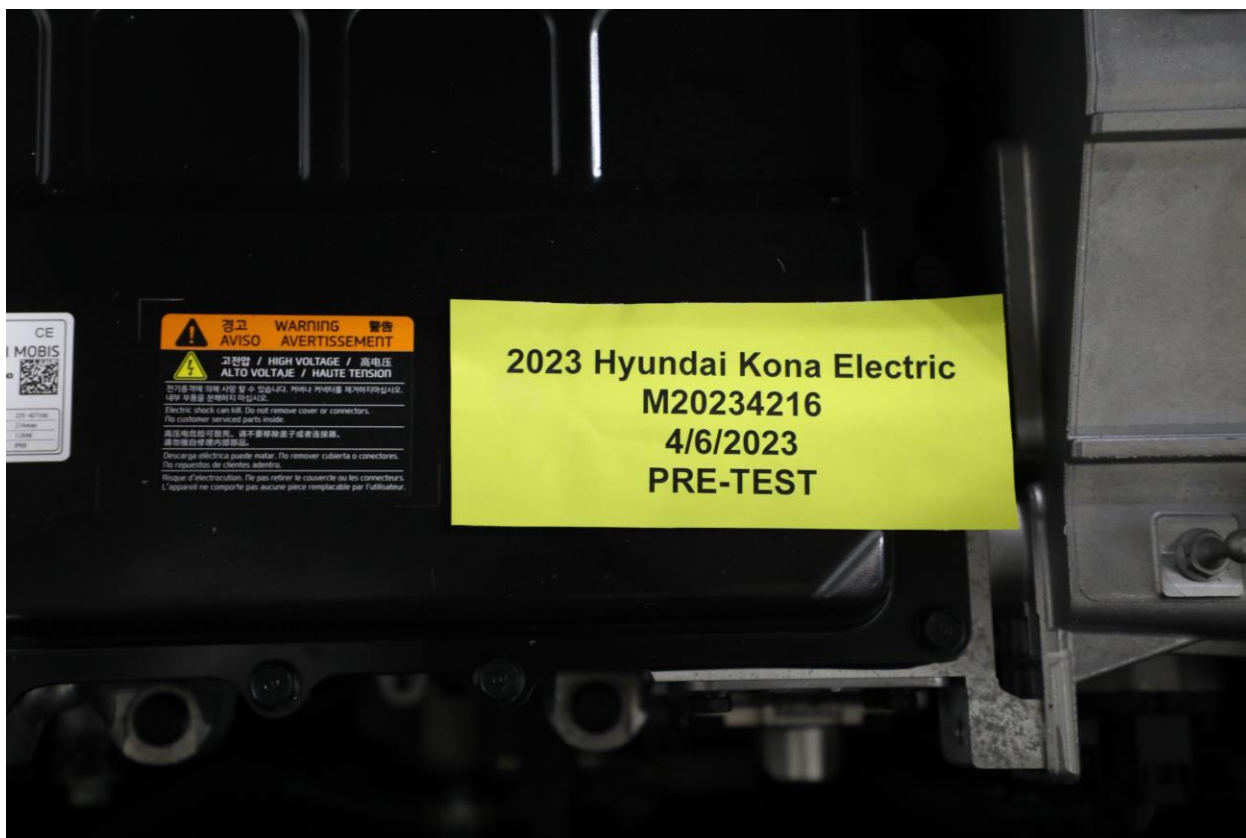
WARNING

Make sure the head restraint locks in position after adjusting it to properly protect the occupants.

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



305-01 Auxiliary Power Module Warning Label



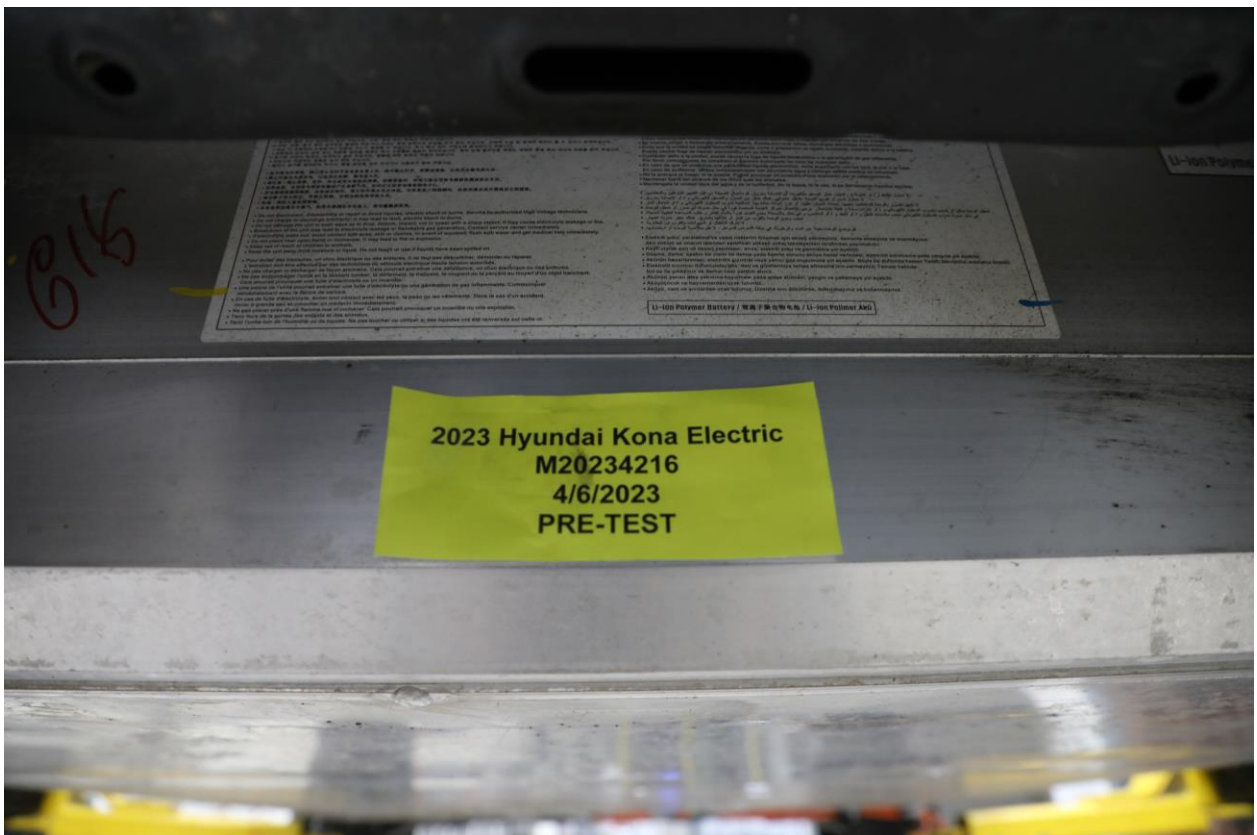
305-02 Power Inverter Warning Label



305-03 First Responder Warning Label



305-04 First Responder Warning Location



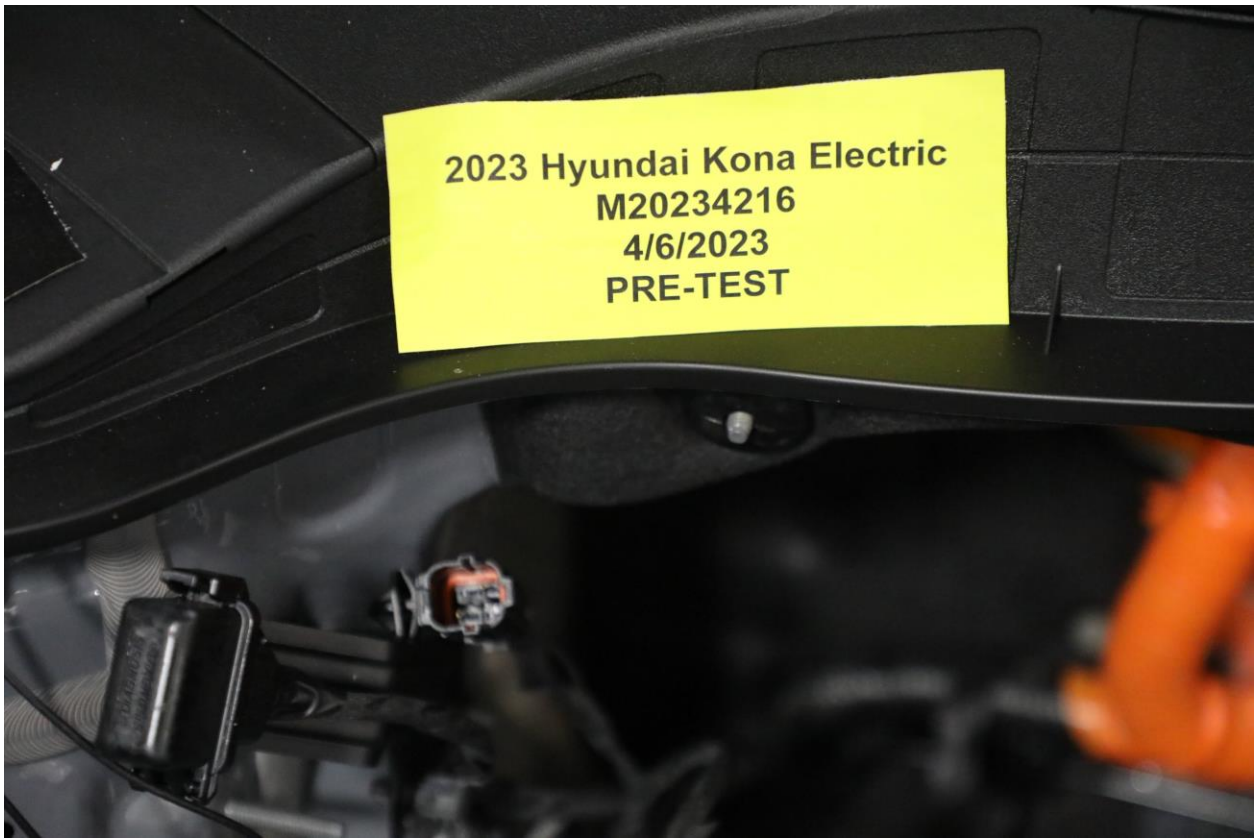
305-05 Other Vehicle Label(s) Related to Electrical Propulsion System



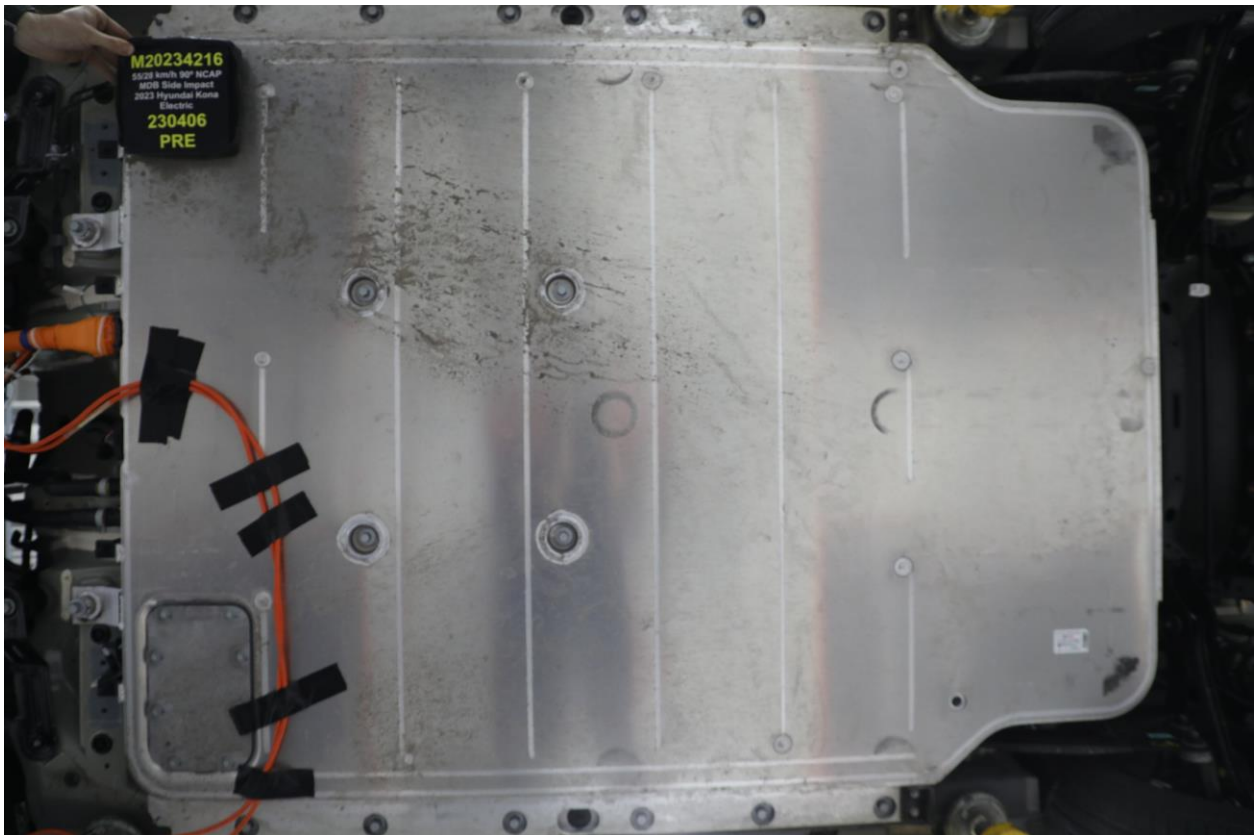
305-06 Manual High Voltage Service Disconnect in Place



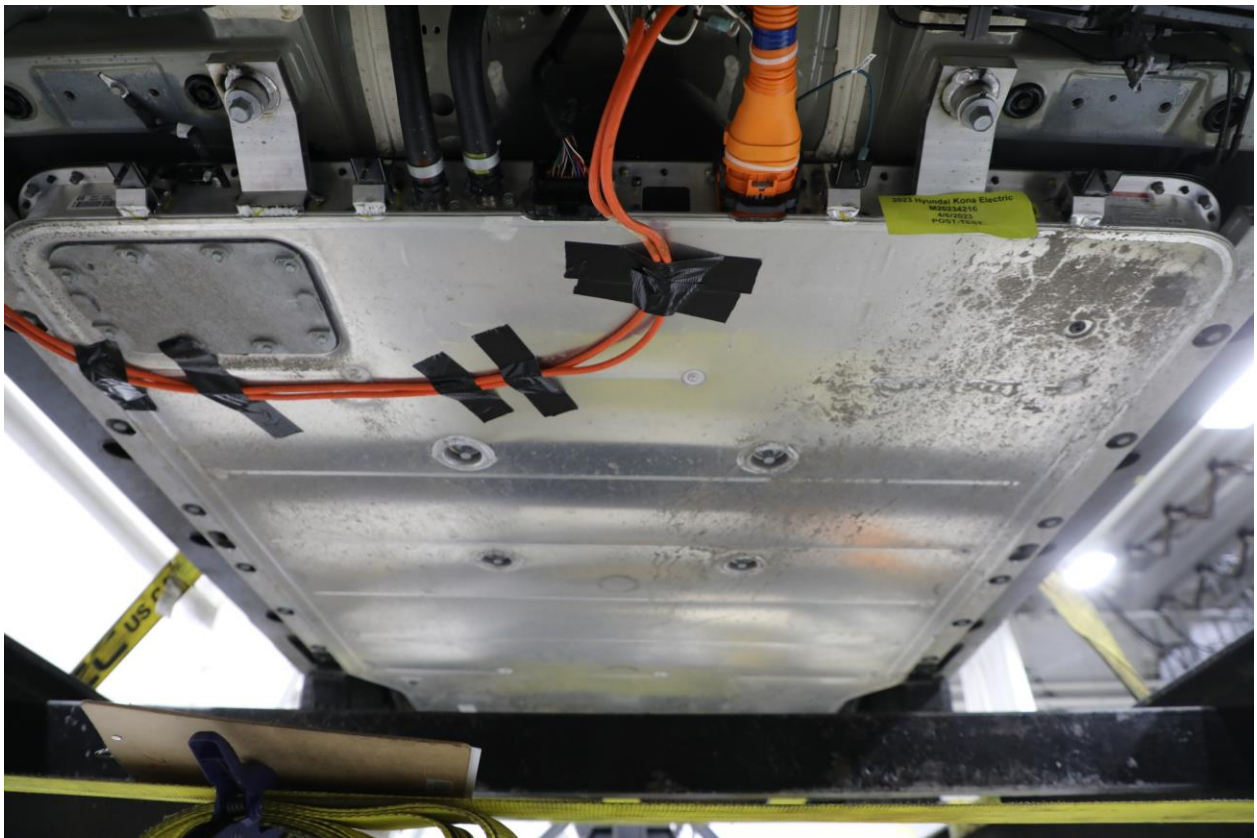
305-07 Manual High Voltage Service Disconnect Removed



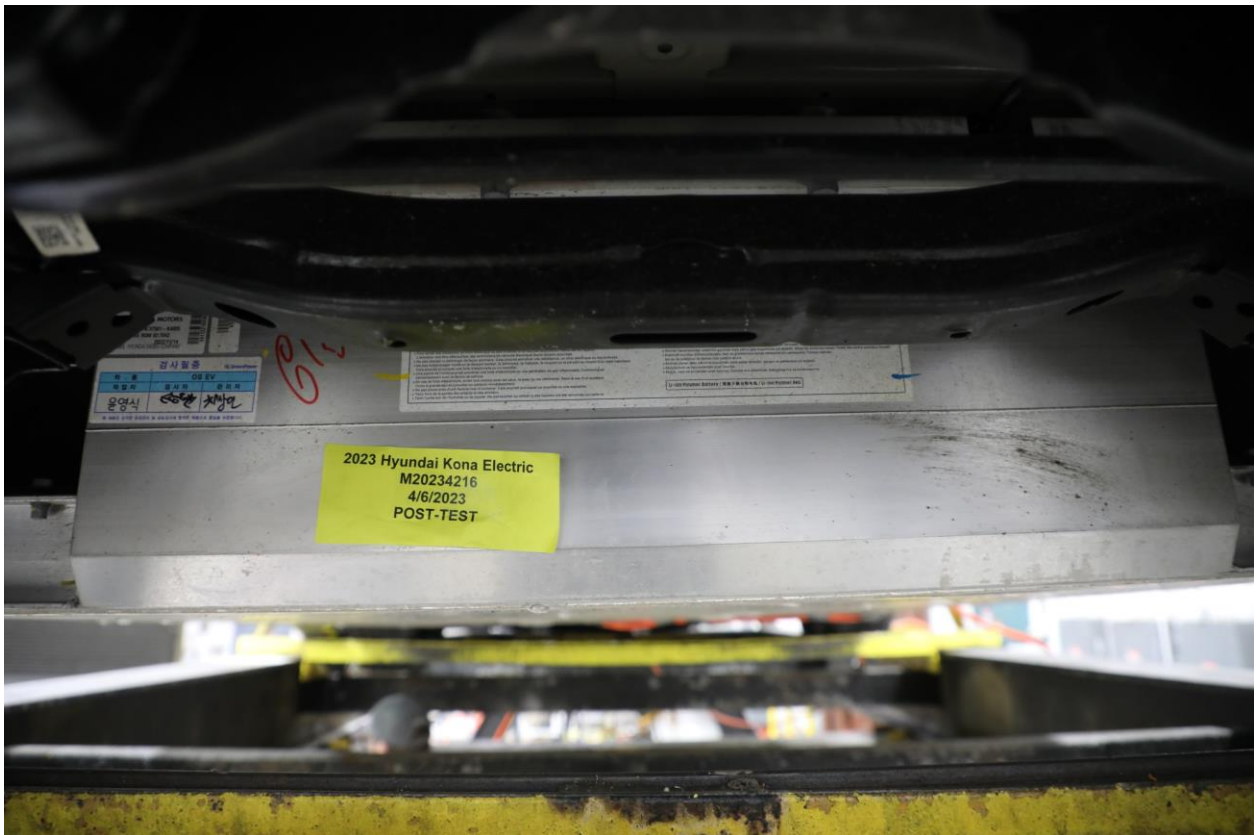
305-08 Manual High Voltage Service Disconnect Removed



305-09 Pre-Impact View of Propulsion Battery



305-10 Post-Impact Front View of Propulsion Battery



305-11 Post-Impact Rear View of Propulsion Battery



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



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



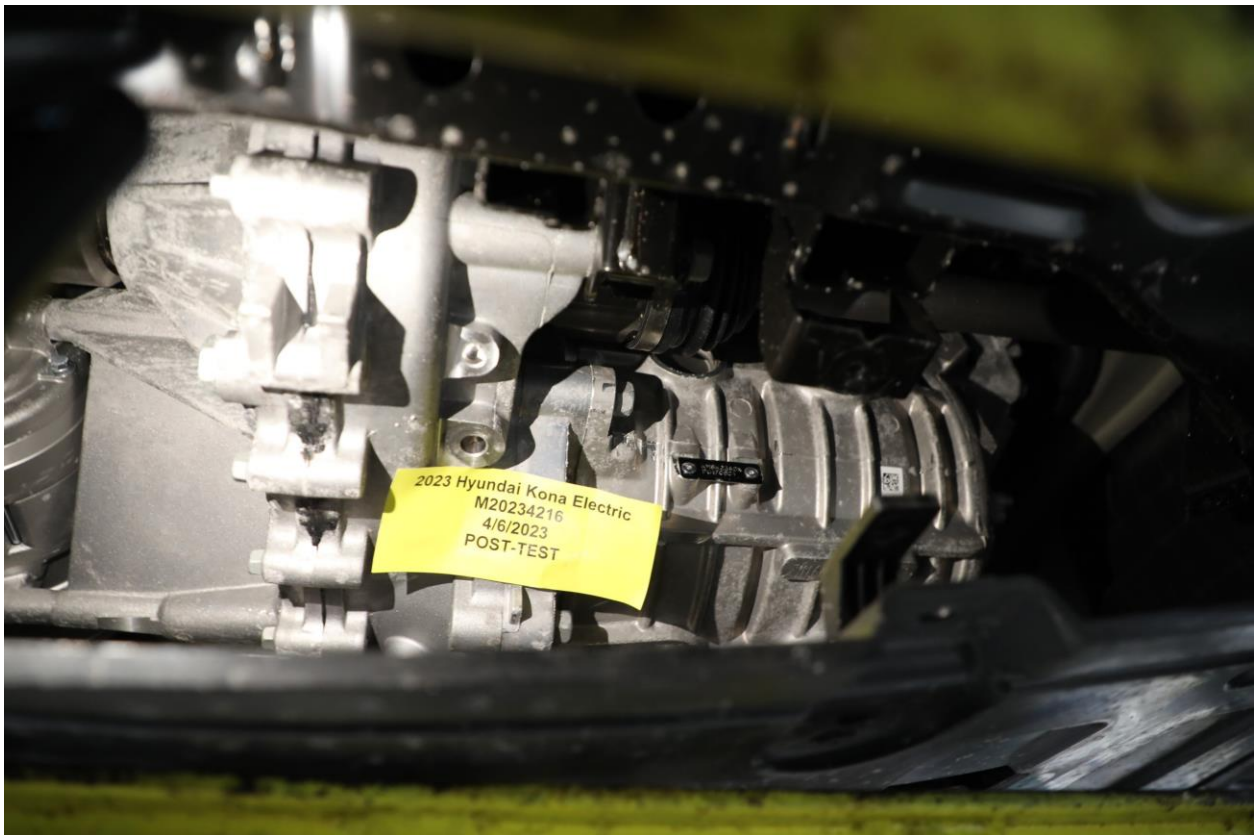
305-14 Pre-Impact View of Propulsion Battery Module(s)



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



305-16 Pre-Impact View of Electric Propulsion Drive



305-17 Post-Impact View of Electric Propulsion Drive



305-18 Pre-Impact View of High Voltage Interconnect(s)



305-19 Pre-Impact View Propulsion Battery Venting System(s)

PHOTO NOT APPLICABLE

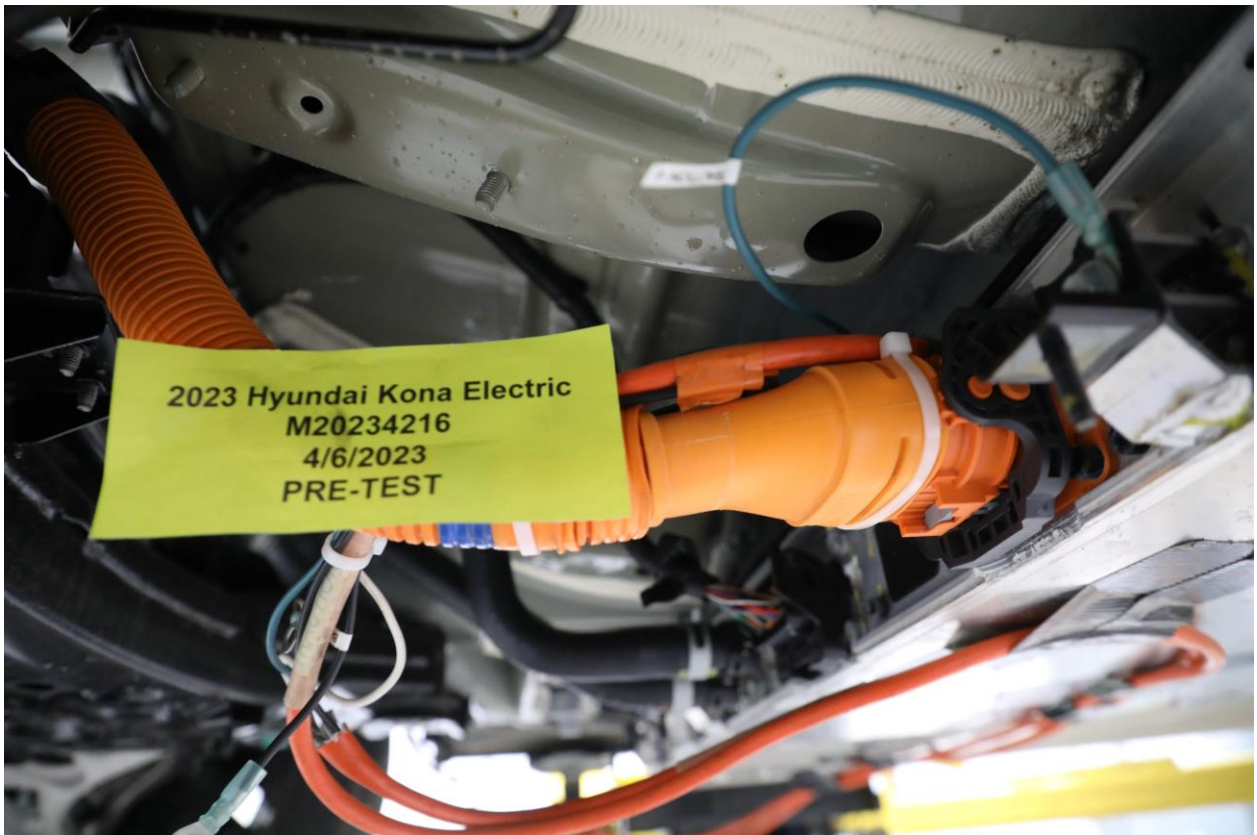
305-20 Pre-Impact View of Other Visible Electric Propulsion Components



305-21 Pre-Impact View of Ground Lead Attached



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



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



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



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

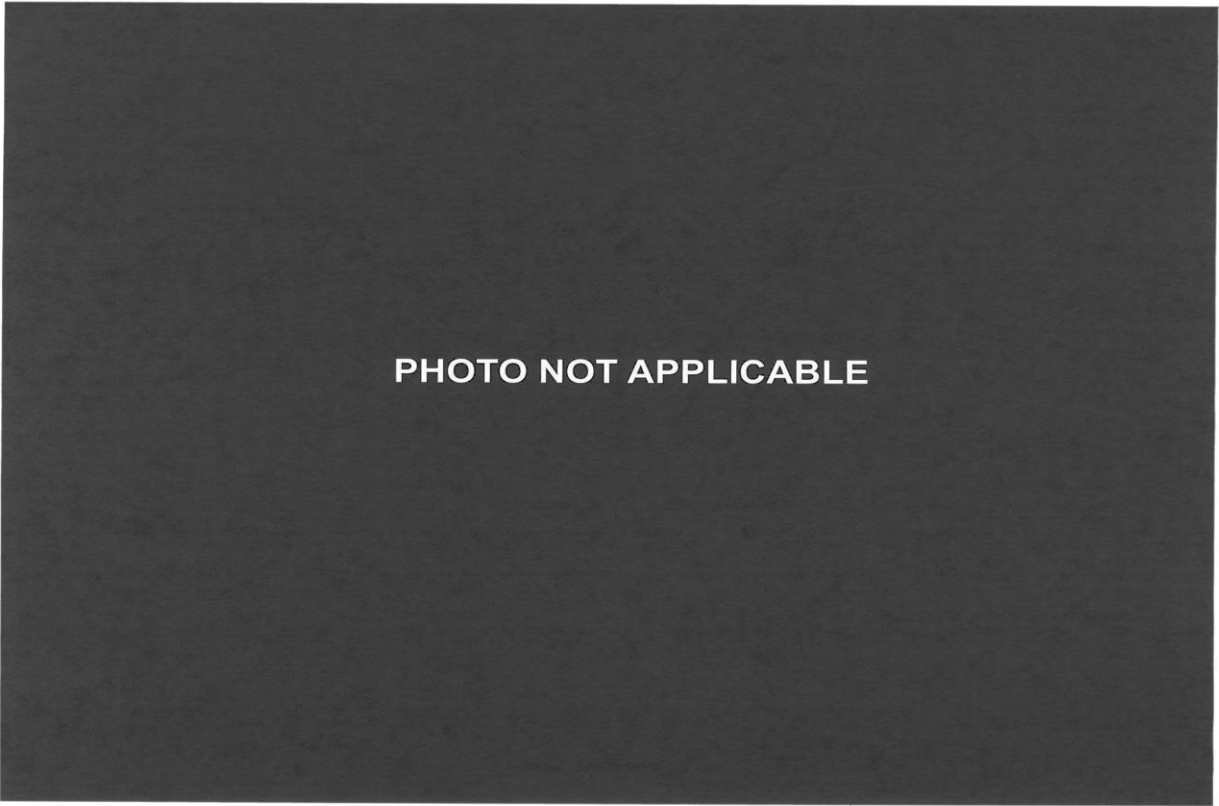


PHOTO NOT APPLICABLE

305-26 Pre-Impact View of Other Test Devices

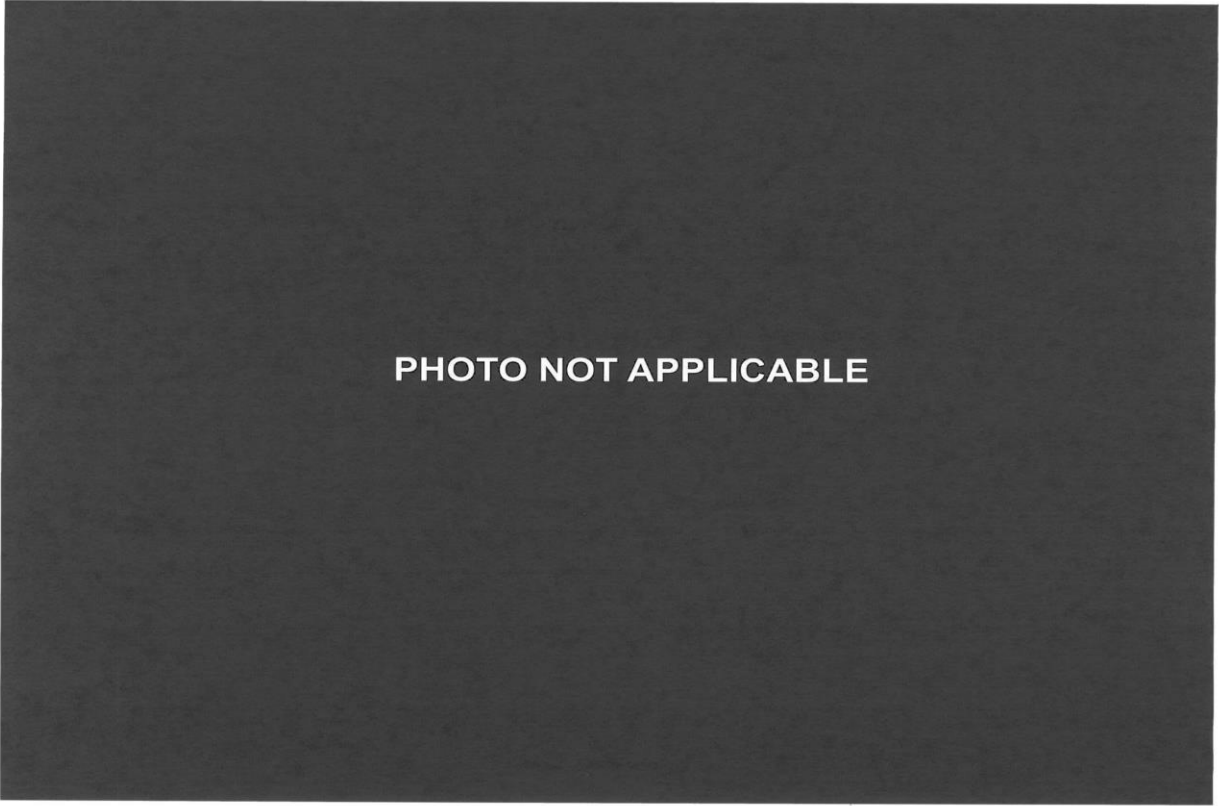
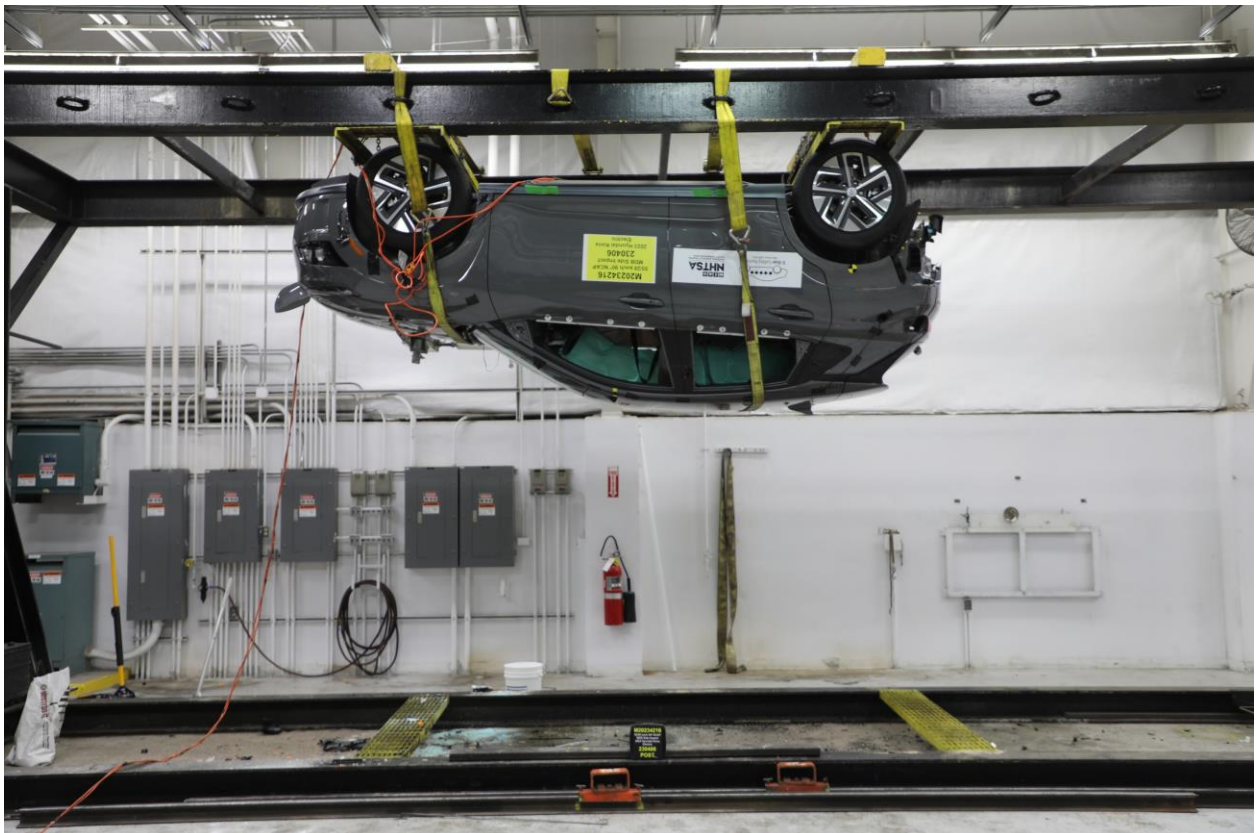


PHOTO NOT APPLICABLE

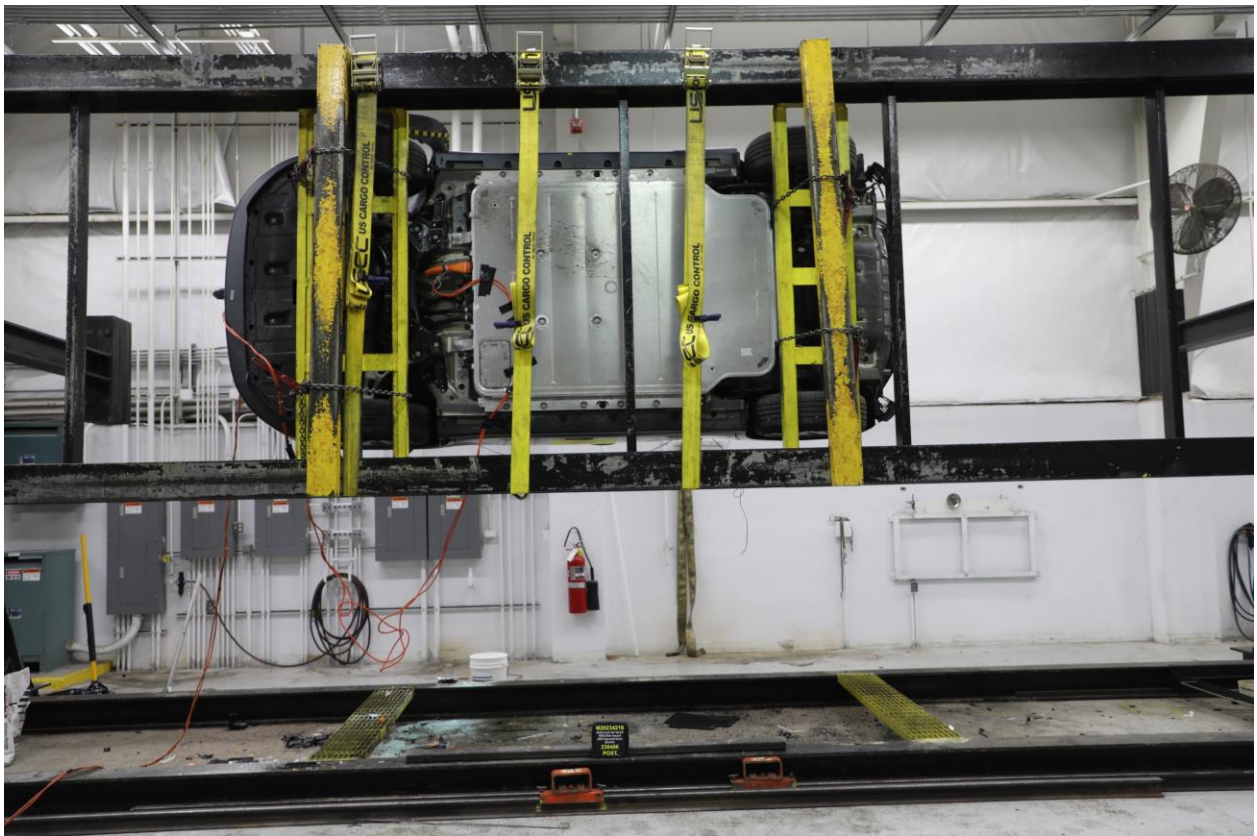
305-27 Post-Impact View of Other Test Devices



305-28 FMVSS No. 305 Static Rollover at 90°



305-29 FMVSS No. 305 Static Rollover at 180°



305-30 FMVSS No. 305 Static Rollover at 270°



305-31 FMVSS No. 305 Static Rollover at 360°

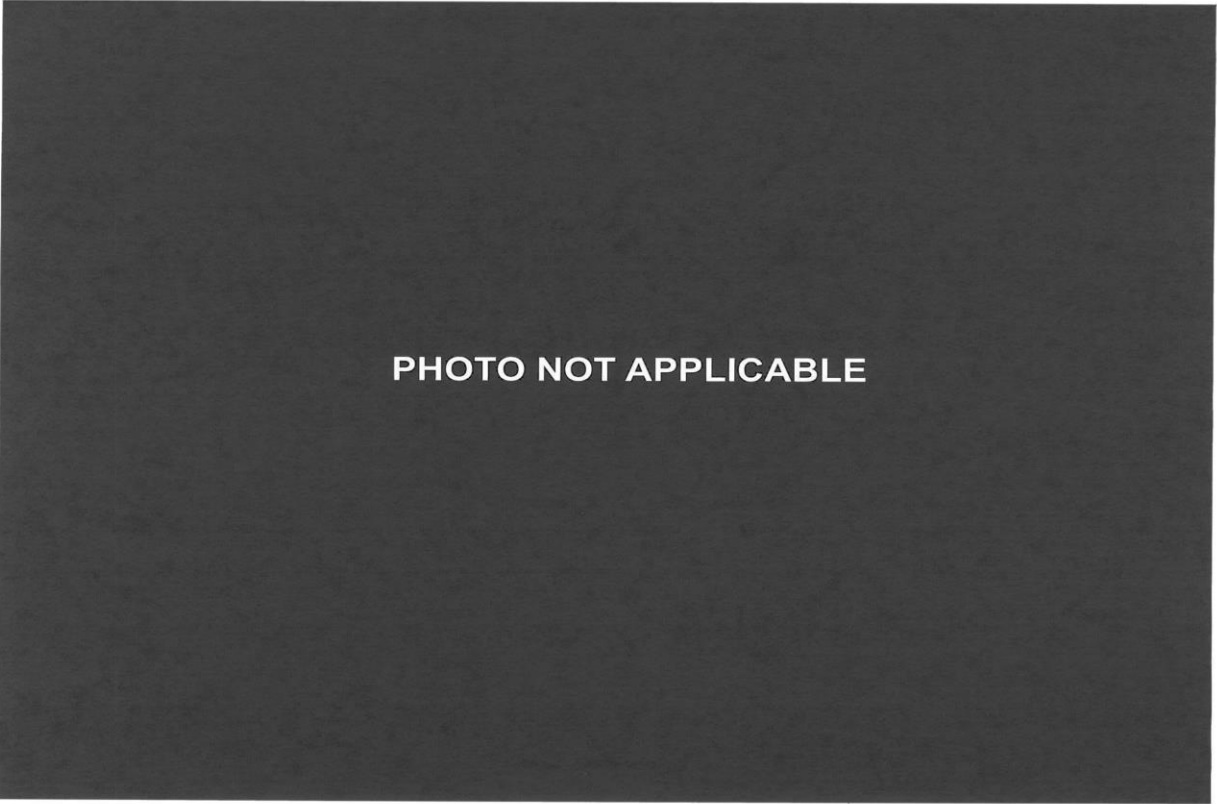


PHOTO NOT APPLICABLE

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

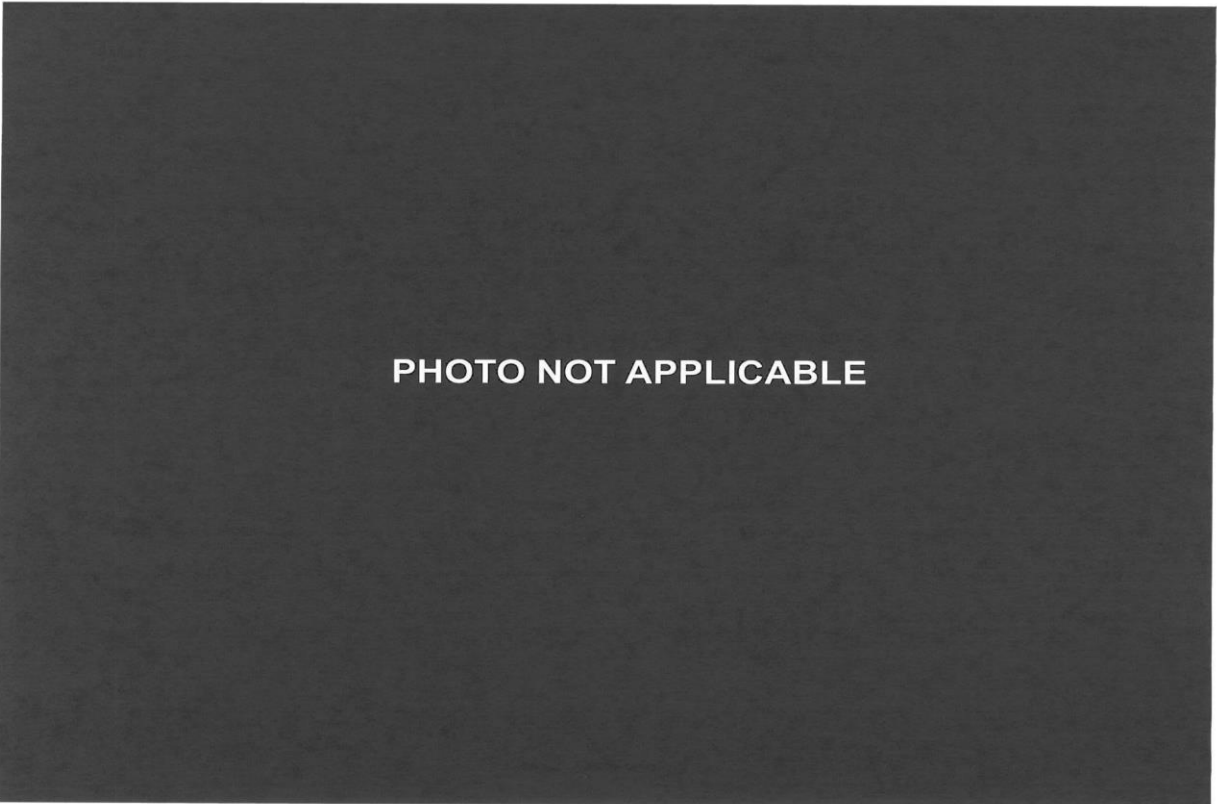


PHOTO NOT APPLICABLE

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

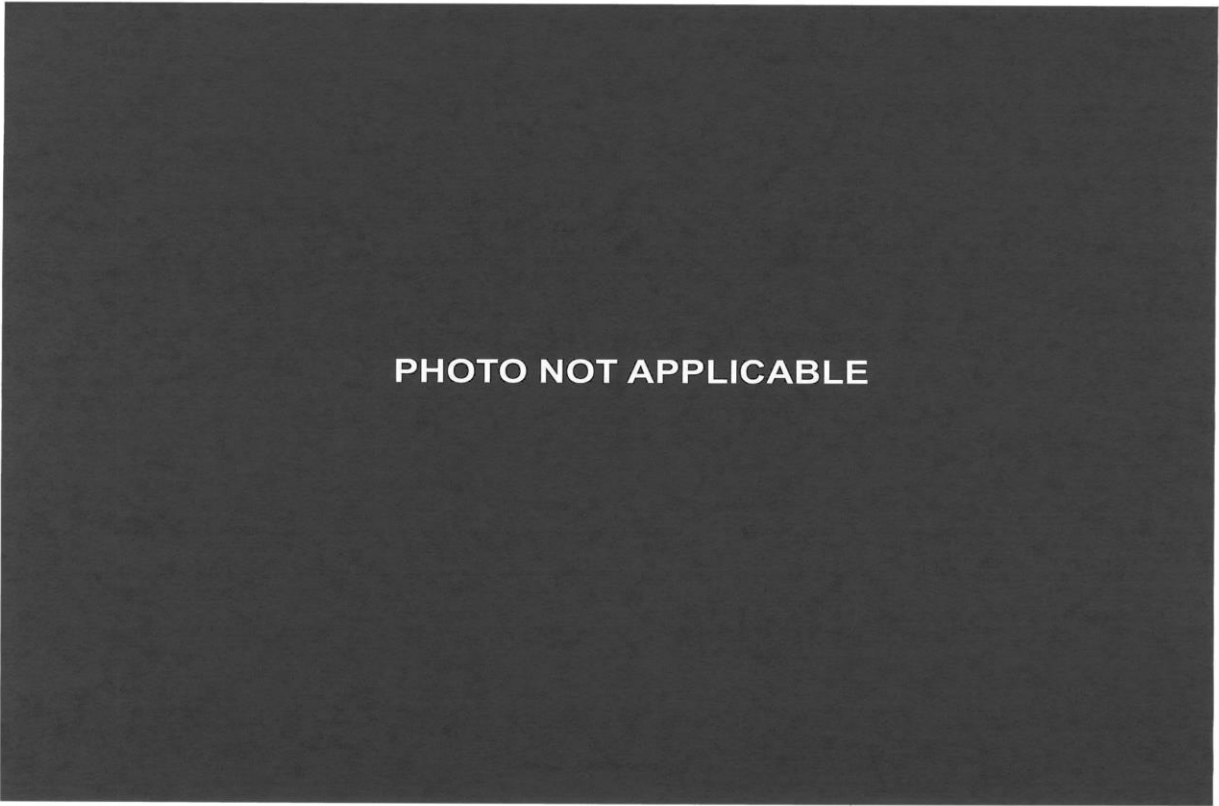


PHOTO NOT APPLICABLE

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

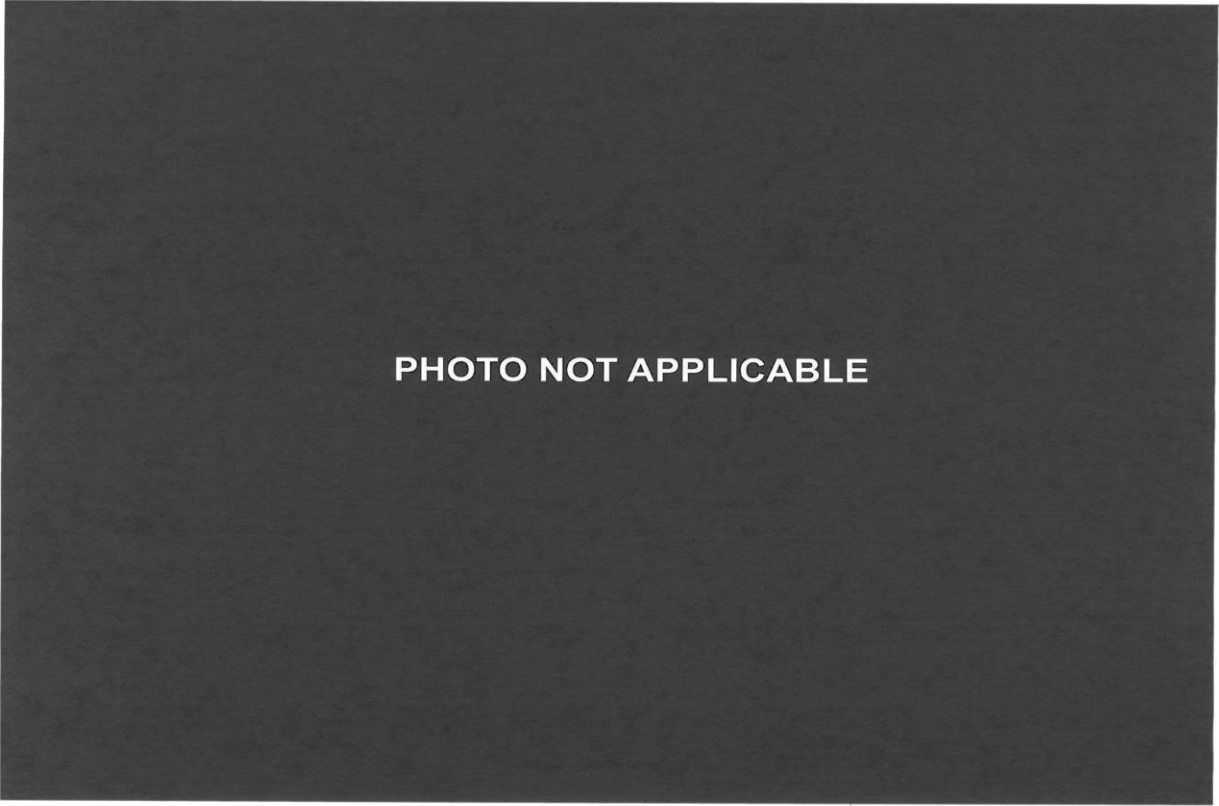


PHOTO NOT APPLICABLE

305-35 Post-Impact View of Battery Component Intrusion

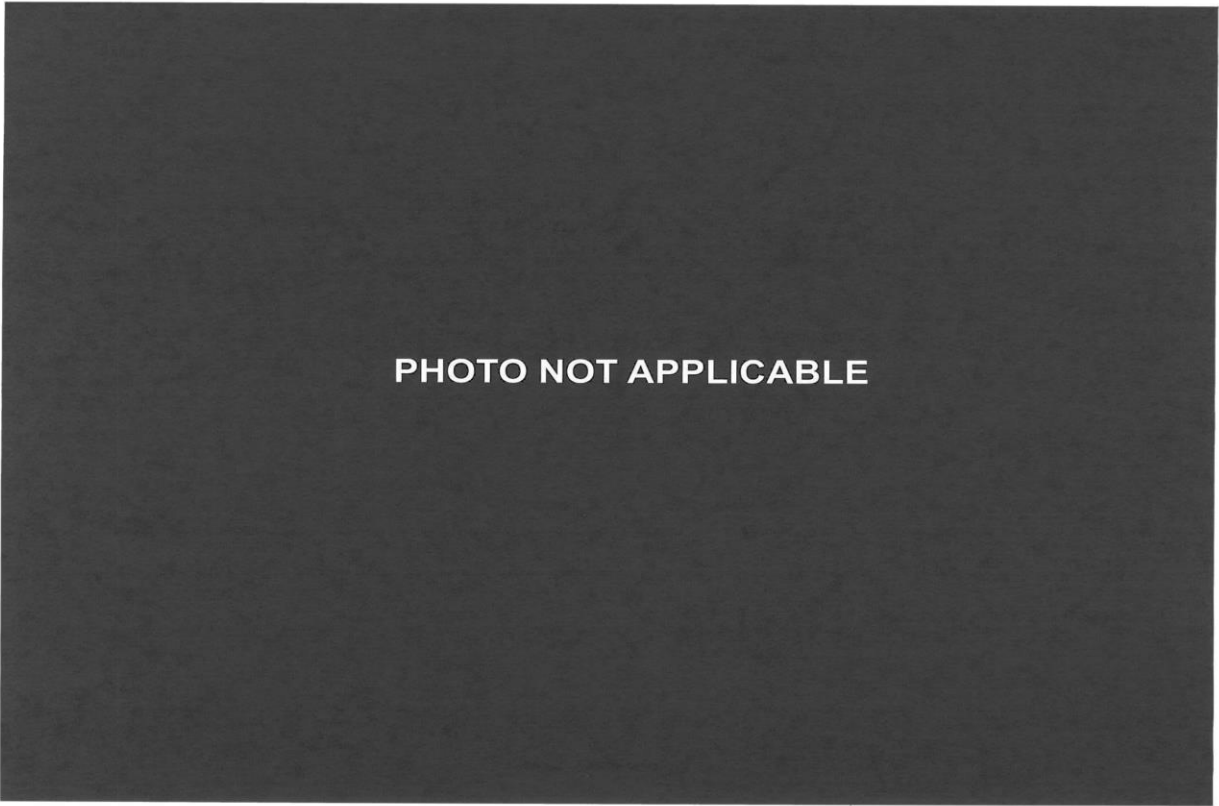


PHOTO NOT APPLICABLE

305-36 Post-Impact View of Battery Module Movement or Retention Loss

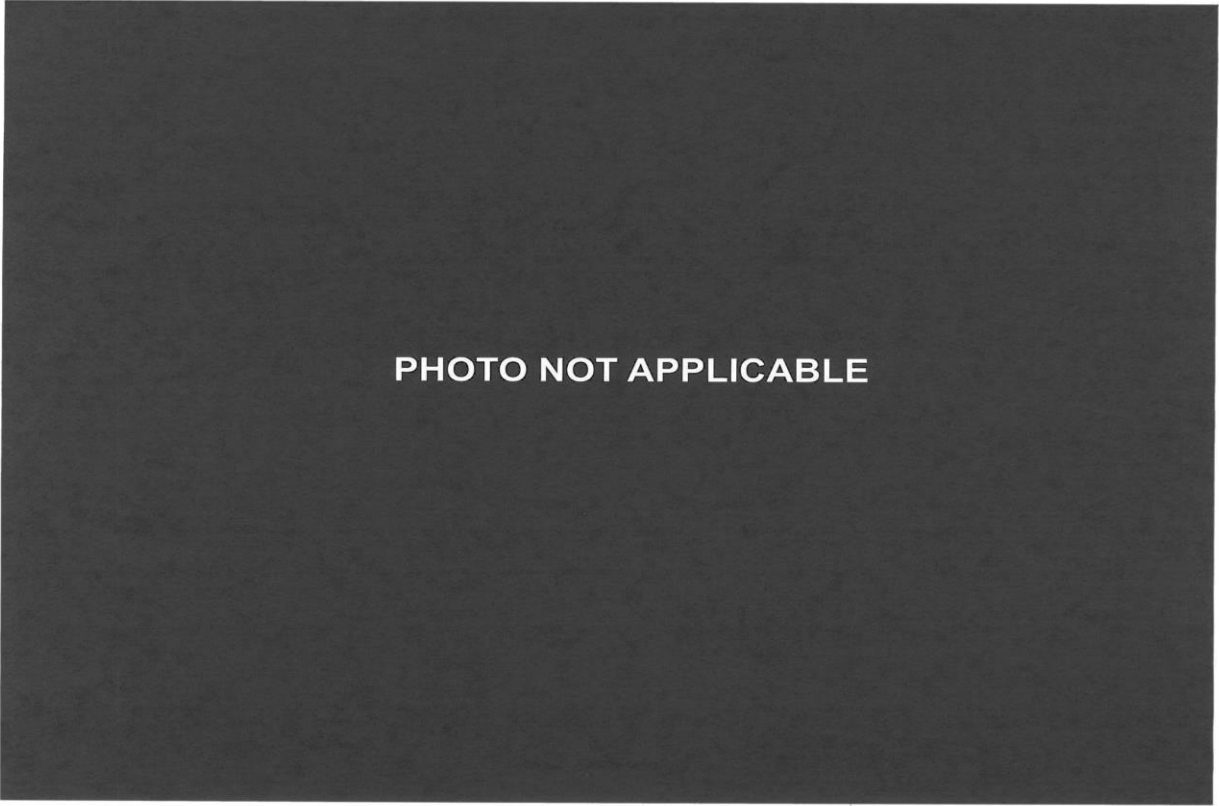


PHOTO NOT APPLICABLE

305-37 Post-Impact View of Propulsion Battery Electrolyte Spillage Location

PHOTO NOT APPLICABLE

No. 305-38 Post-Test View of Propulsion Battery Electrolyte Spillage Location

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver & Passenger Dummy Instrumentation Plots

No.	Description	Page
1	Driver Head Acceleration (X) Primary vs. Time	B-5
2	Driver Head Acceleration (Y) Primary vs. Time	B-5
3	Driver Head Acceleration (Z) Primary vs. Time	B-5
4	Driver Head Resultant Acceleration Primary vs. Time	B-5
5	Driver Upper Thorax Rib Deflection (Y) vs. Time	B-6
6	Driver Middle Thorax Rib Deflection (Y) vs. Time	B-6
7	Driver Lower Thorax Rib Deflection (Y) vs. Time	B-6
8	Driver Thorax Rib Deflection Maximum vs. Time	B-6
9	Driver Anterior Abdominal Force (Y) vs. Time	B-7
10	Driver Middle Abdominal Force (Y) vs. Time	B-7
11	Driver Posterior Abdominal Force (Y) vs. Time	B-7
12	Driver Total Abdominal Force (Y) vs. Time	B-7
13	Driver Pubic Symphysis Force (Y) vs. Time	B-8
14	Passenger Head Acceleration (X) Primary vs. Time	B-9
15	Passenger Head Acceleration (Y) Primary vs. Time	B-9
16	Passenger Head Acceleration (Z) Primary vs. Time	B-9
17	Passenger Head Resultant Acceleration Primary vs. Time	B-9
18	Passenger Lower Spine T12 Acceleration (X) vs. Time	B-10
19	Passenger Lower Spine T12 Acceleration (Y) vs. Time	B-10
20	Passenger Lower Spine T12 Acceleration (Z) vs. Time	B-10
21	Passenger Lower Spine T12 Resultant Acceleration vs. Time	B-10
22	Passenger Iliac Force on Impact Side (Y) vs. Time	B-11
23	Passenger Acetabulum Force on Impact Side (Y) vs. Time	B-11
24	Passenger Total Pelvic Force on Impact Side (Y) vs. Time	B-11

The following additional data can be obtained from the Research and Development section of the NHTSA website (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

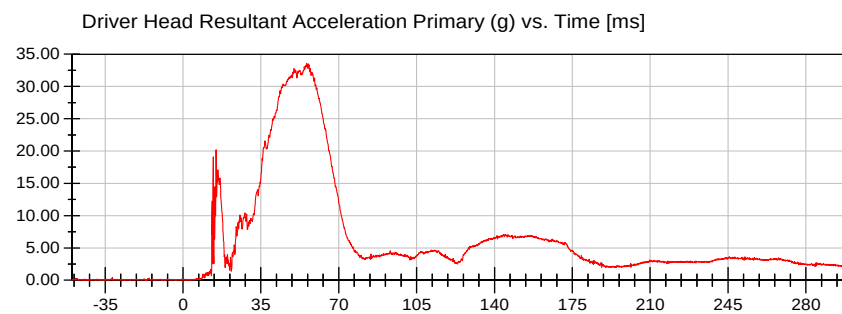
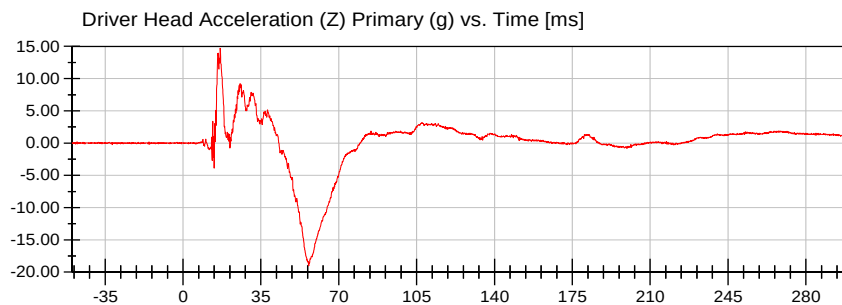
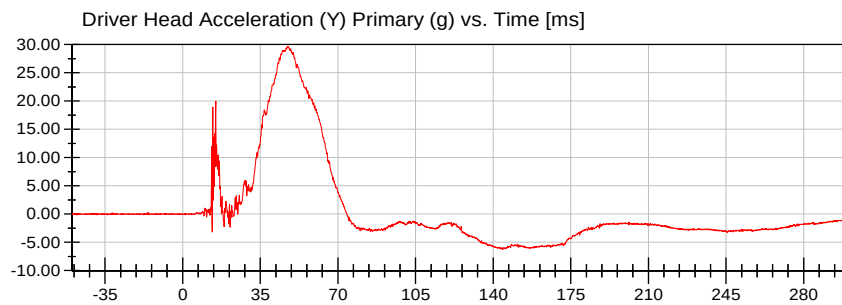
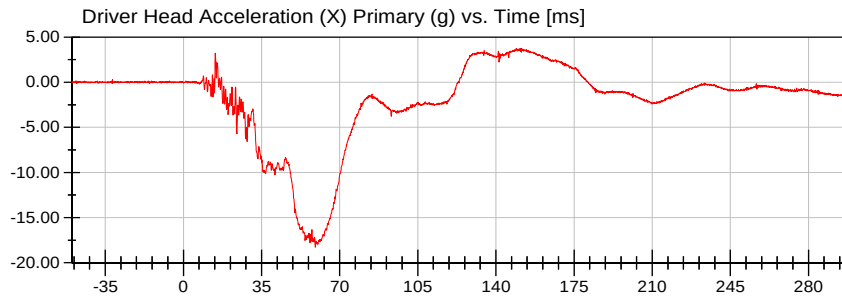
Test Lab: CTF

Test Number: 230406 (M20234216)

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

Position #4 SID IIs Dummy (DQ0570)

Test Date: 04/06/2023



NHTSA

Test Lab: CTF

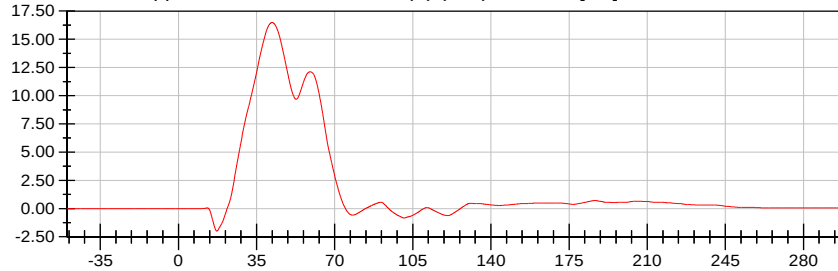
Test Number: 230406 (M20234216)

Test Date: 04/06/2023

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

Position #4 SID IIs Dummy (DQ0570)

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



<Max>

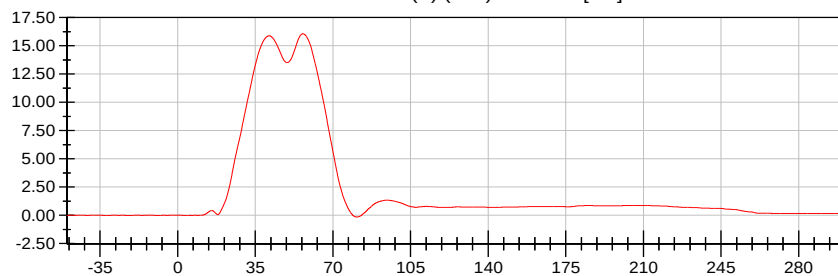
16.49 mm at 42.00 ms

<Min>

-1.99 mm at 17.20 ms

CFC_180

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



<Max>

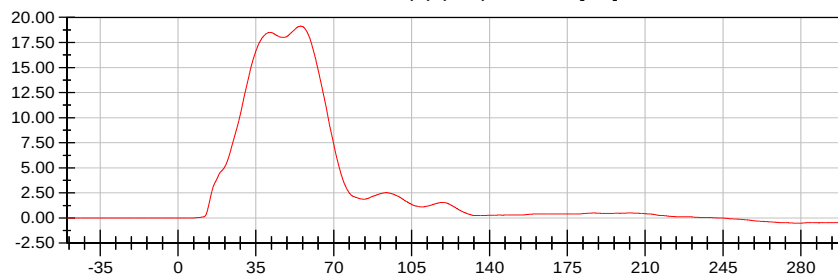
16.07 mm at 56.48 ms

<Min>

-0.14 mm at 80.80 ms

CFC_180

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



<Max>

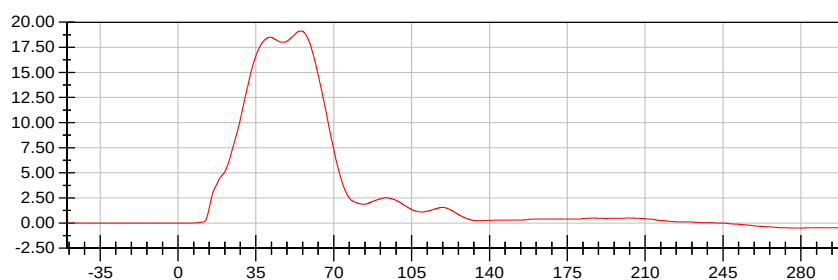
19.12 mm at 55.12 ms

<Min>

-0.50 mm at 280.16 ms

CFC_180

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



<Max>

19.12 mm at 55.12 ms

<Min>

-0.50 mm at 280.16 ms

CFC_180



NHTSA

Test Lab: CTF

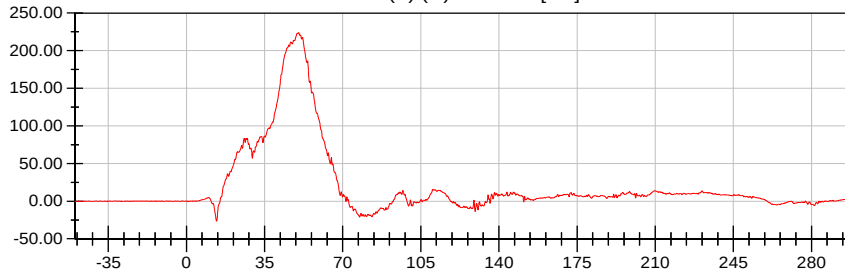
Test Number: 230406 (M20234216)

Test Date: 04/06/2023

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

Position #4 SID IIs Dummy (DQ0570)

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



<Max>

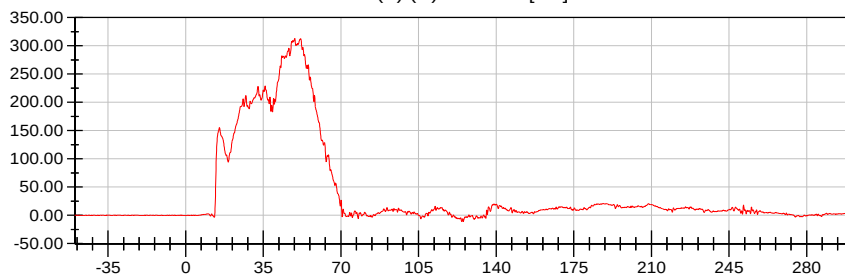
223.94 N at 50.32 ms

<Min>

-26.43 N at 13.52 ms

CFC_600

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



<Max>

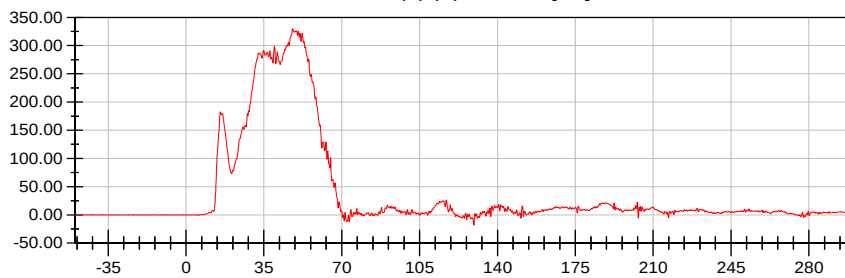
312.63 N at 49.20 ms

<Min>

-11.28 N at 124.48 ms

CFC_600

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



<Max>

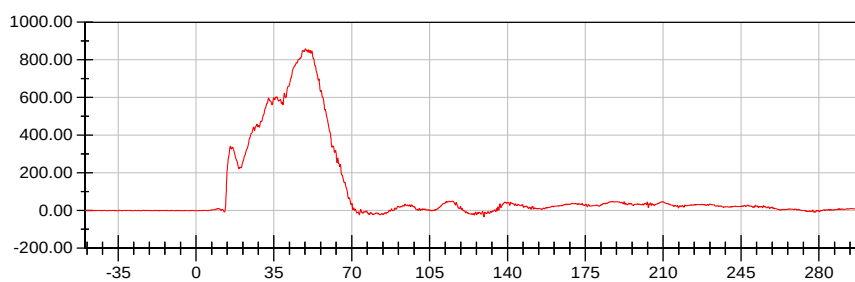
329.86 N at 47.92 ms

<Min>

-18.04 N at 129.36 ms

CFC_600

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



<Max>

858.33 N at 49.20 ms

<Min>

-32.68 N at 129.36 ms

CFC_600



NHTSA

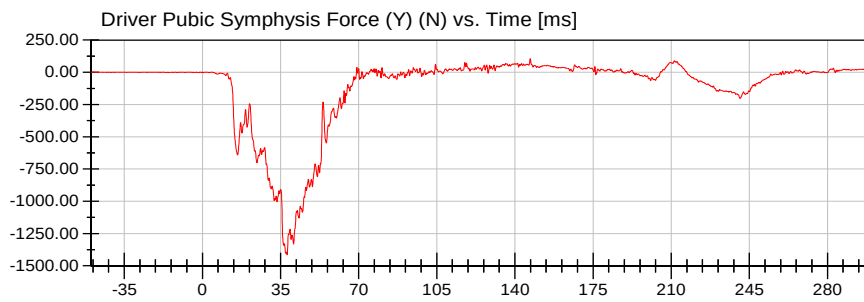
Test Lab: CTF

Test Number: 230406 (M20234216)

Test Date: 04/06/2023

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

Position #4 SID IIs Dummy (DQ0570)



<Max>

105.17 N at 146.88 ms

<Min>

-1,414.07 N at 37.92 ms

CFC_600



NHTSA

Test Lab: CTF

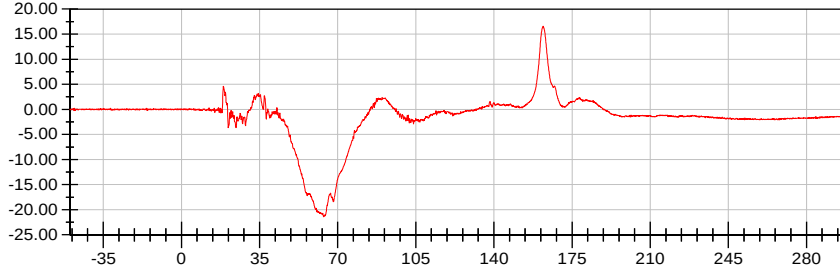
Test Number: 230406 (M20234216)

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

Position #4 SID IIs Dummy (DQ0570)

Test Date: 04/06/2023

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



<Max>

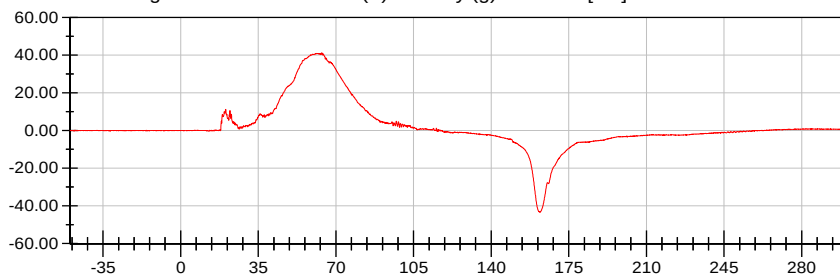
16.55 g at 161.92 ms

<Min>

-21.40 g at 63.76 ms

CFC_1000

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



<Max>

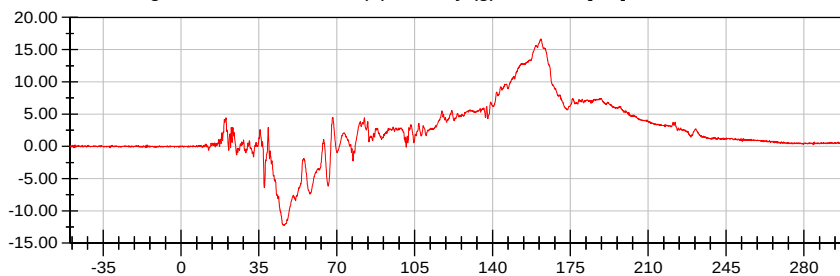
41.22 g at 63.52 ms

<Min>

-43.26 g at 161.84 ms

CFC_1000

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



<Max>

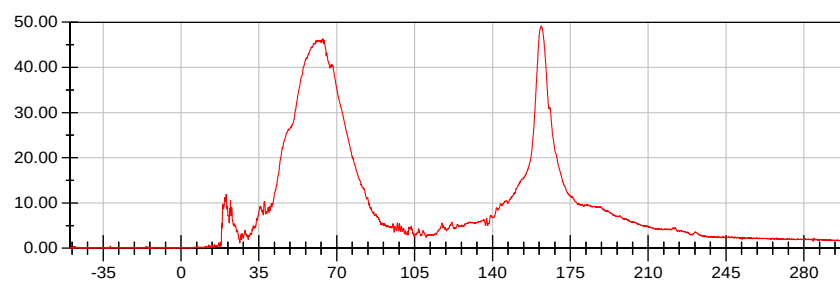
16.67 g at 161.76 ms

<Min>

-12.29 g at 46.48 ms

CFC_1000

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



<Max>

49.14 g at 161.84 ms

<Min>

0.04 g at -49.04 ms

CFC_1000



NHTSA

Test Lab: CTF

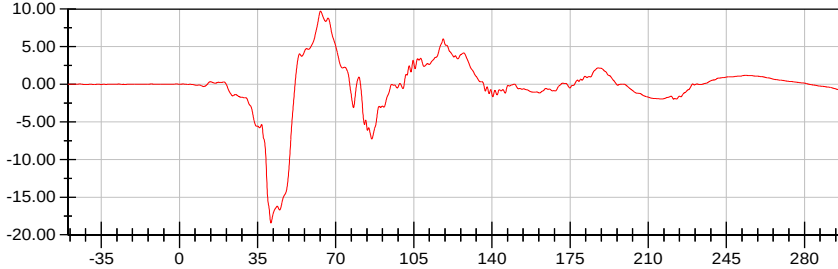
Test Number: 230406 (M20234216)

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

Position #4 SID IIs Dummy (DQ0570)

Test Date: 04/06/2023

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



<Max>

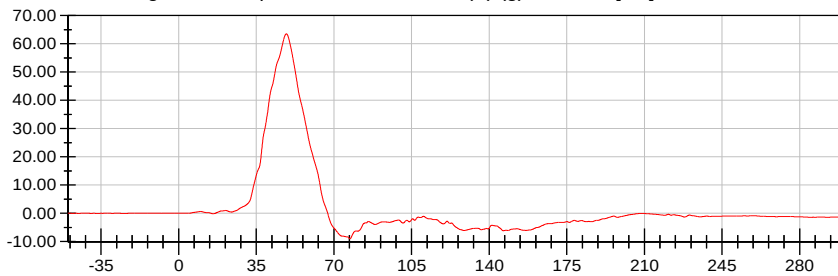
9.71 g at 63.20 ms

<Min>

-18.42 g at 41.04 ms

CFC_180

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



<Max>

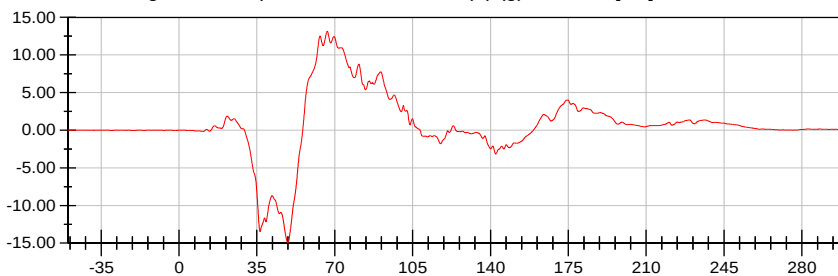
63.54 g at 48.56 ms

<Min>

-8.98 g at 77.20 ms

CFC_180

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



<Max>

13.15 g at 66.64 ms

<Min>

-14.91 g at 48.88 ms

CFC_180

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



<Max>

66.52 g at 48.48 ms

<Min>

0.01 g at -46.72 ms

CFC_180



NHTSA

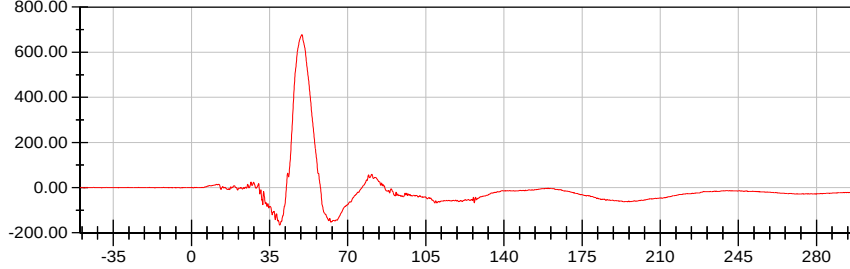
Test Lab: CTF

Test Number: 230406 (M20234216)

Position #1 ES-2 Dummy with Rib Extension (F030)
Position #4 SID IIs Dummy (DQ0570)

Test Date: 04/06/2023

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



<Max>

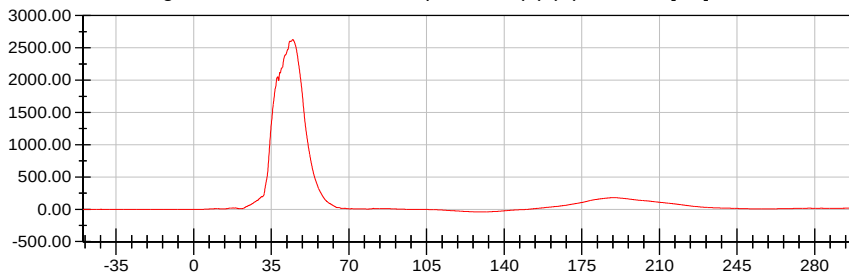
678.08 N at 49.52 ms

<Min>

-165.71 N at 39.60 ms

CFC_600

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



<Max>

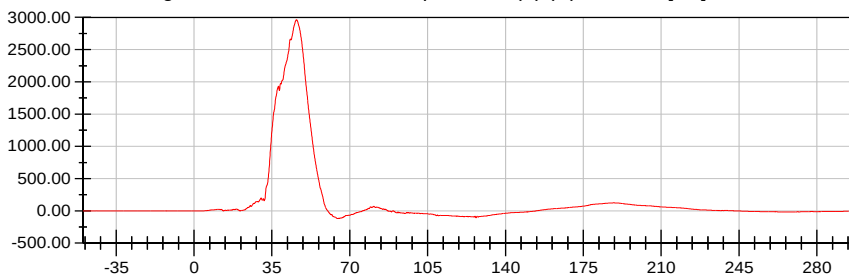
2,629.42 N at 44.72 ms

<Min>

-42.16 N at 129.60 ms

CFC_600

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



<Max>

2,964.11 N at 46.08 ms

<Min>

-117.90 N at 64.72 ms

CFC_600



APPENDIX C
DUMMY PERFORMANCE CALIBRATION TEST DATA

TABLE OF CALIBRATION MEASUREMENTS AND PLOTS

ES-2re (Driver) 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 Neck Pendulum Test

- Pendulum Velocity (m/s) vs. Time (ms)
- Flexion Angle (°) vs. Time (ms)
- Potentiometer A (°) vs. Time (ms)
- Potentiometer B (°) vs. Time (ms)
- Potentiometer C (°) vs. Time (ms)

Table 4. Shoulder Impact Test

- Impactor Acceleration (G's) vs. Time (ms)

Table 5. Thorax – Upper Rib Drop Test

- Upper Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)
- Upper Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

Table 6. Thorax – Middle Rib Drop Test

- Middle Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)
- Middle Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

Table 7. Thorax – Lower Rib Drop Test

- Lower Rib Displacement @ 459 mm Drop Height (mm) vs. Time (ms)
- Lower Rib Displacement @ 815 mm Drop Height (mm) vs. Time (ms)

Table 8. Thorax – Full Body Impact Test

- Pendulum Acceleration (G's) vs. Time (ms)
- Impactor Force (kN) vs. Time (ms)
- Upper Rib Displacement (mm) vs. Time (ms)
- Middle Rib Displacement (mm) vs. Time (ms)
- Lower Rib Displacement (mm) vs. Time (ms)

Table 9. Abdomen Impact Test

- Impactor Force (kN) vs. Time (ms)
- Front Abdomen Force (kN) vs. Time (ms)
- Middle Abdomen Force (kN) vs. Time (ms)
- Rear Abdomen Force (kN) vs. Time (ms)
- Total Abdomen Force (kN) vs. Time (ms)

Table 10. Lumbar Spine Flexion Test

- Pendulum Velocity (m/s) vs. Time (ms)
- Spine Flexion Angle (°) vs. Time (ms)
- Potentiometer A (°) vs. Time (ms)
- Potentiometer B (°) vs. Time (ms)
- Potentiometer C (°) vs. Time (ms)

Table 11. Pelvis Impact Test

- Pendulum Acceleration (G's) vs. Time (ms)
- Impactor Force (kN) vs. Time (ms)
- Pubic Symphysis (Y) Force (kN) vs. Time (ms)

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. 87

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	443	Yes
6	Head Width	152.0 - 158.0	154	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	279	Yes
10	Pelvis Lap Width	359.0 - 373.0	366	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. 87-1

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Peak Resultant Acceleration	125 - 155 g	137.8 g	Yes
Peak Longitudinal Acceleration	(-15) - 15 g	7.0 g	Yes
Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse?	< 15 %	3.87 %	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

03.06.2023 09:39:29 362

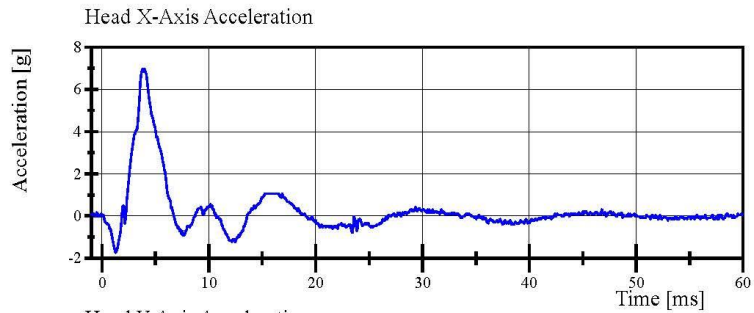


Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 87-1

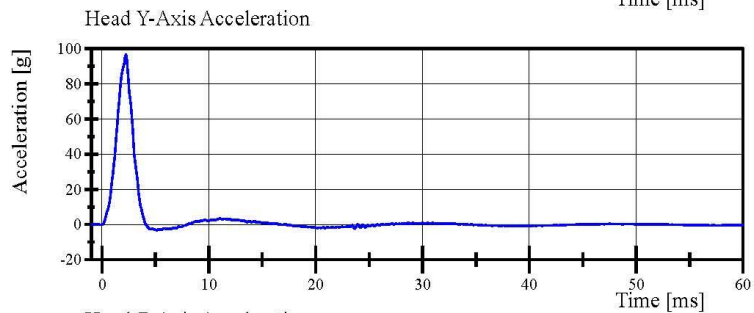
Test Date: 3/6/2023



Filter Class: CFC_1000

Max: 7.0 g at 3.8 ms

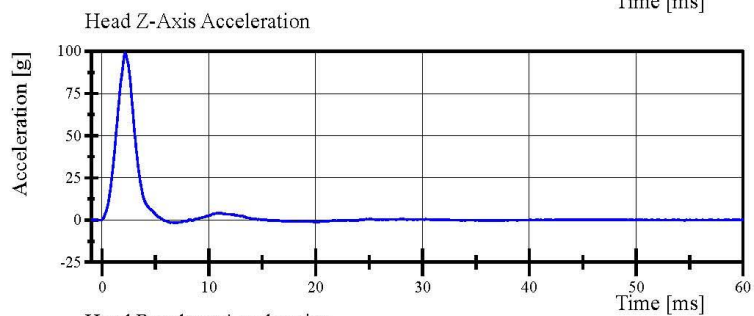
Min: -1.7 g at 1.3 ms



Filter Class: CFC_1000

Max: 96.7 g at 2.2 ms

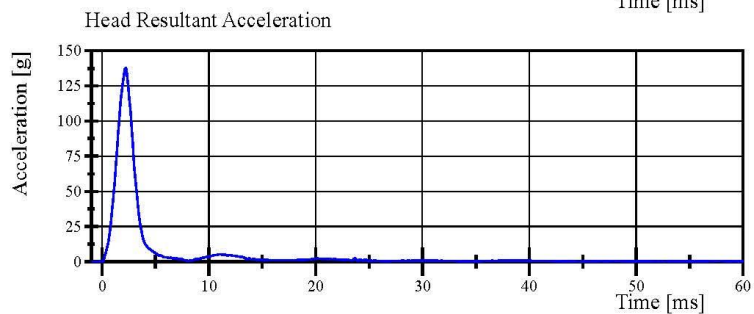
Min: -3.2 g at 5.1 ms



Filter Class: CFC_1000

Max: 99.0 g at 2.2 ms

Min: -1.7 g at 6.9 ms



Filter Class: CFC_1000

Max: 137.8 g at 2.2 ms

Min: 0.0 g at -0.2 ms

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

03.06.2023 09:39:55 362



Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 87-2
Test Date: 3/7/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-3.3) - (-3.5) m/s	-3.35 m/s	Yes
Maximum Headform Flexion			
Peak	(-49) - (-59) deg	-51.4 deg	Yes
Time of Peak	54 - 66 ms	57.8 ms	Yes
Headform Flexion Decay			
- Peak to Zero	53 - 88 ms	54.6 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 05053

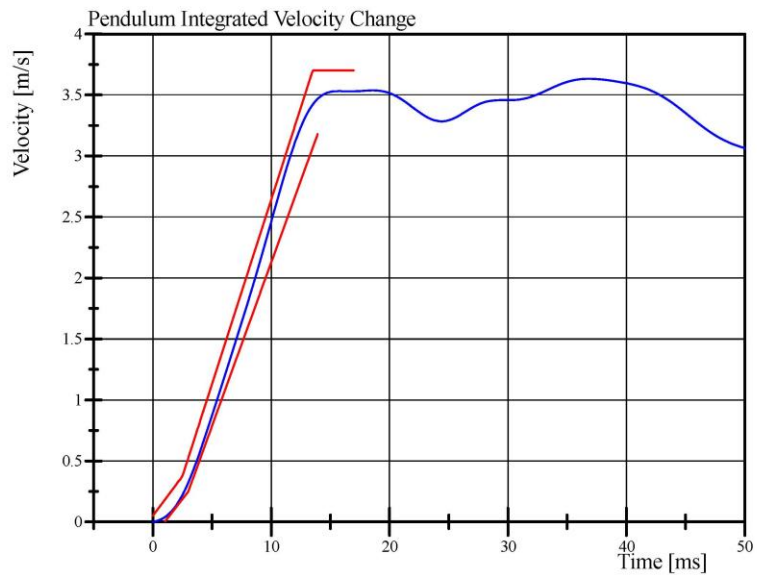
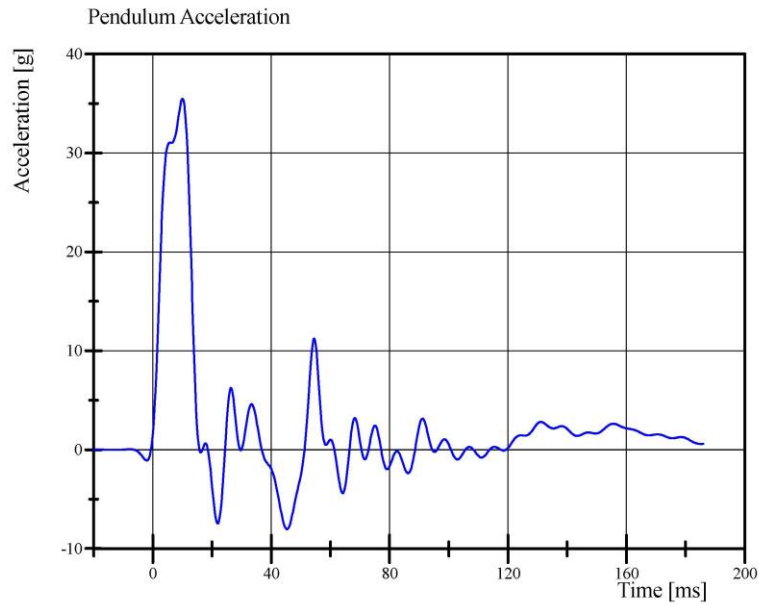
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.07.2023 08:11:29 1500



Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 87-2
Test Date: 3/7/2023



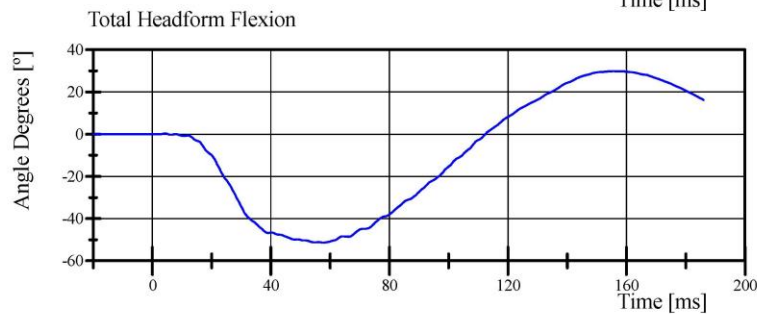
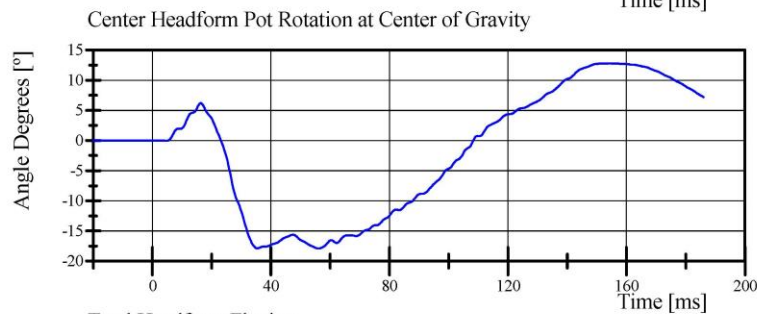
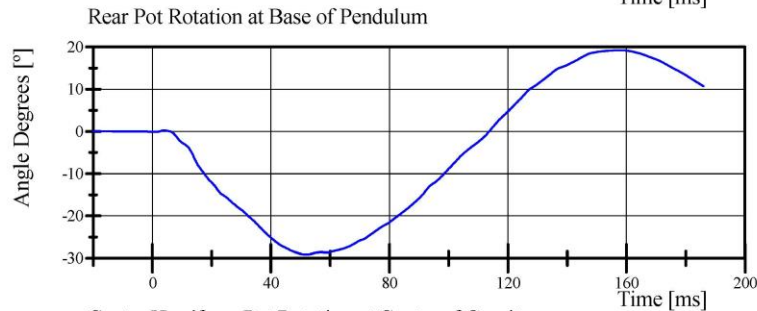
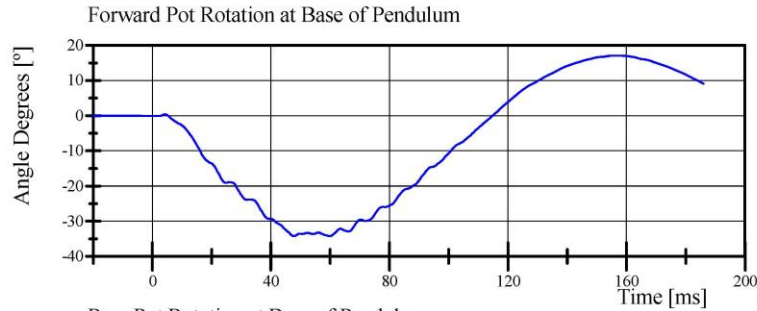
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.07.2023 08:12:23 1500



Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 87-2
Test Date: 3/7/2023



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

03.07.2023 08:12:24 1500



Transportation Research Center Inc.

Left Lateral Shoulder

ES-2re Serial No. F030 Certification No. 87-2

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.23 m/s	Yes
Test Probe Acceleration	(-7.5) - (-10.5) g	-9.56 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

03.06.2023 14:00:54 608

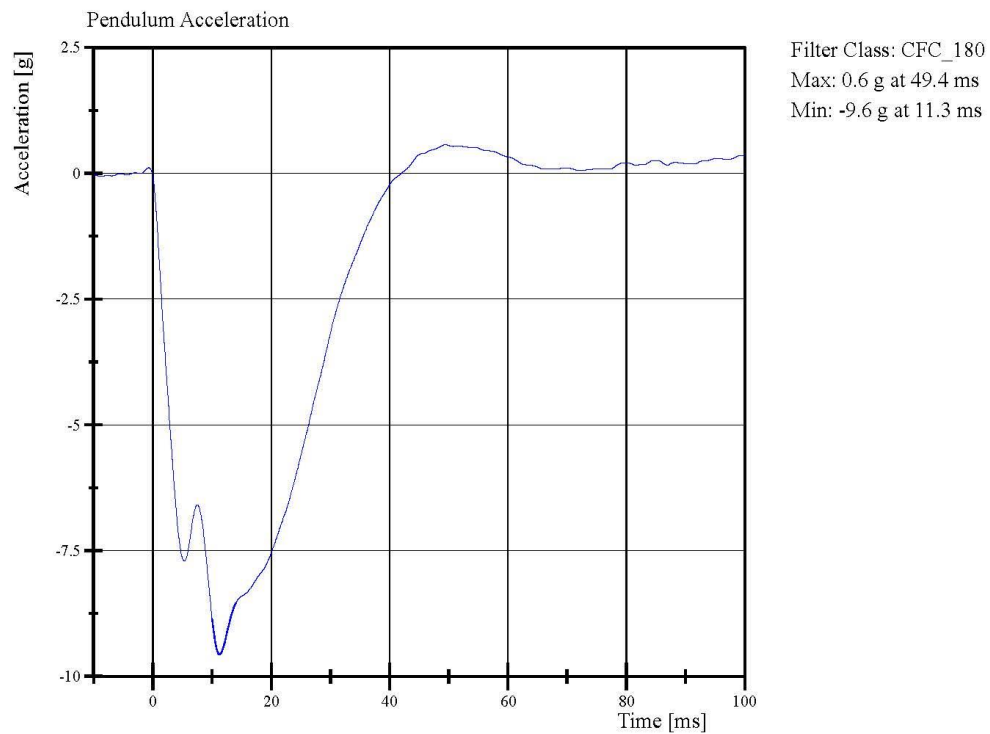


Transportation Research Center Inc.

Left Lateral Shoulder

ES-2re Serial No. F030 Certification No. 87-2

Test Date: 3/6/2023



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

03.06.2023 14:01:21 608



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	38.6 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462mm

Rib Foam S/N: EK6973

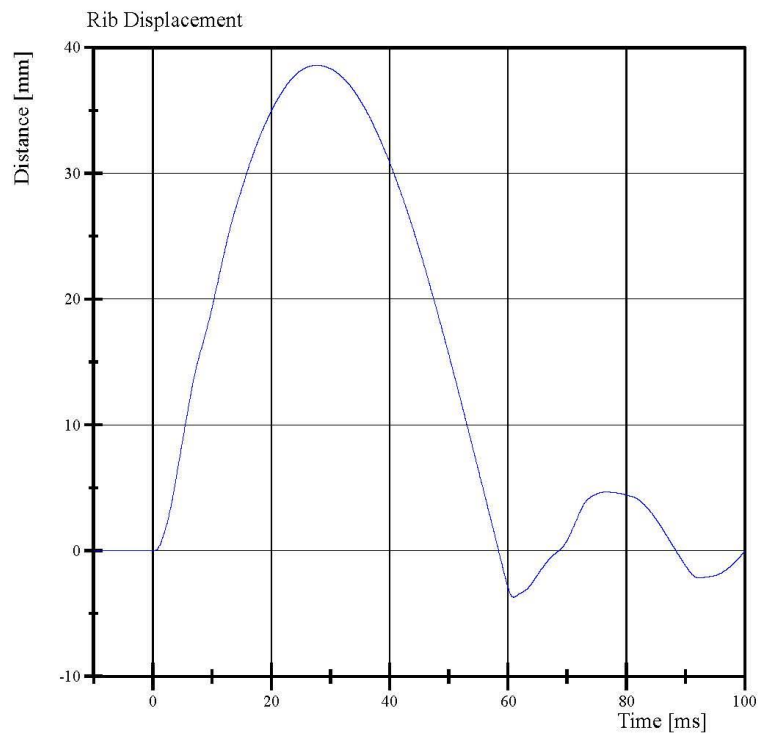
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 11:22:05 636



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023



Filter Class: CFC_180
Max: 38.6 mm at 27.8 ms
Min: -3.7 mm at 61.0 ms

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

03.06.2023 11:22:25 636



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module

ES-2re Serial No. F030 Certification No. 87-1

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.9 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6973

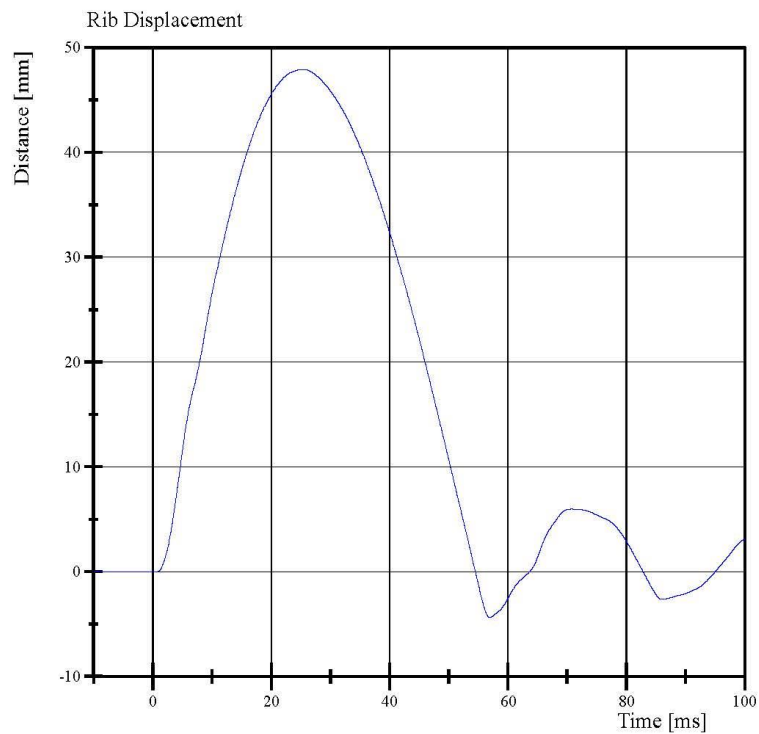
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 11:21:05 514



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023



Filter Class: CFC_180
Max: 47.9 mm at 25.4 ms
Min: -4.4 mm at 57.0 ms

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

03.06.2023 11:21:37 514



Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	38.3 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462mm

Rib Foam S/N: EK6970

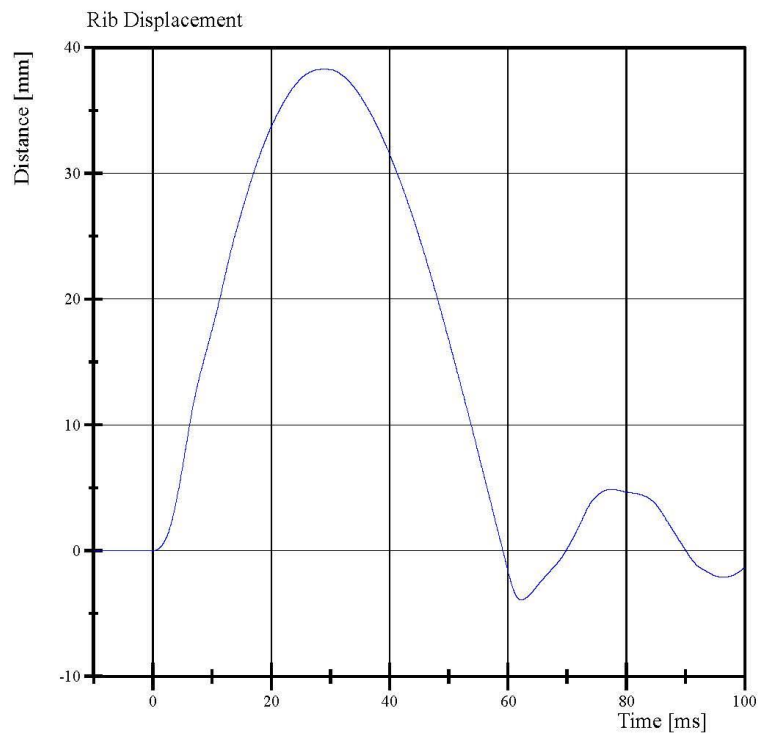
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 11:35:05 608



Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023



Filter Class: CFC_180
Max: 38.3 mm at 28.7 ms
Min: -3.9 mm at 62.2 ms

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

03.06.2023 11:35:37 608



Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module

ES-2re Serial No. F030 Certification No. 87-2

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	49.5 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6970

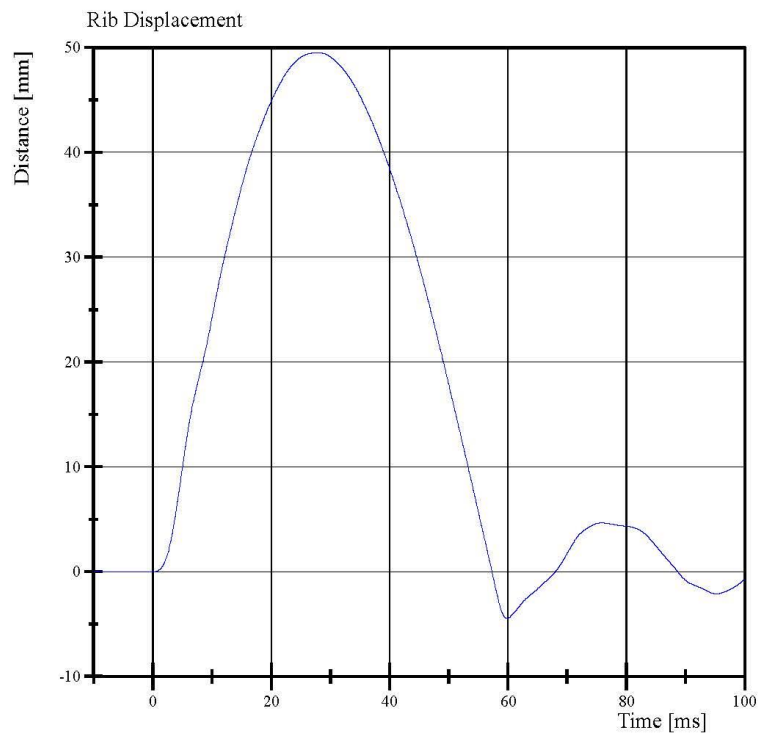
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 11:29:27 524



Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 87-2
Test Date: 3/6/2023



Filter Class: CFC_180
Max: 49.5 mm at 27.8 ms
Min: -4.5 mm at 59.8 ms

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

03.06.2023 11:30:09 524



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module

ES-2re Serial No. F030 Certification No. 87-1

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	37.7 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462 mm

Rib Foam S/N: EK6971

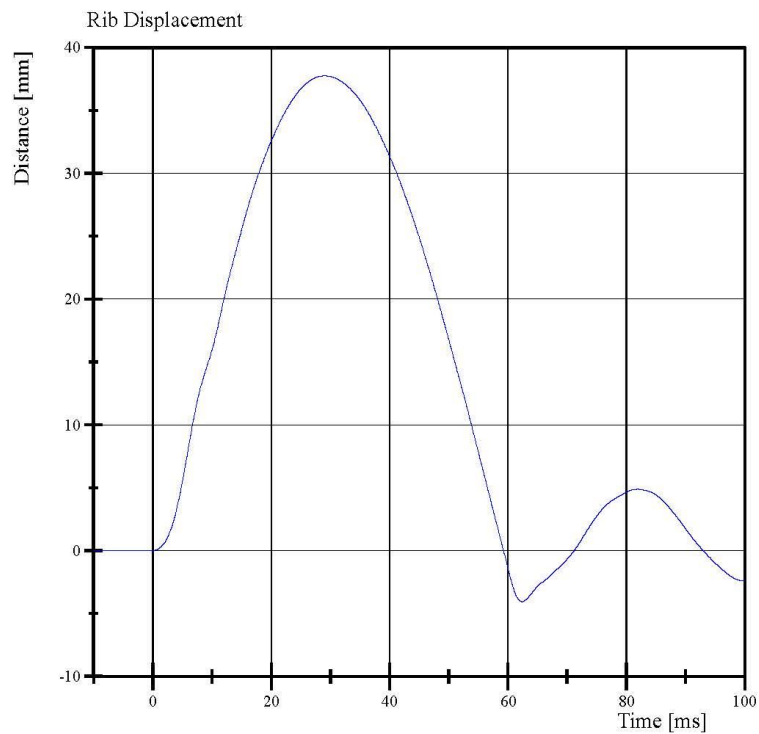
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 14:45:24 610



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023



Filter Class: CFC_180
Max: 37.7 mm at 29.0 ms
Min: -4.1 mm at 62.3 ms

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

03.06.2023 14:45:40 610



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module

ES-2re Serial No. F030 Certification No. 87-1

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.1 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6971

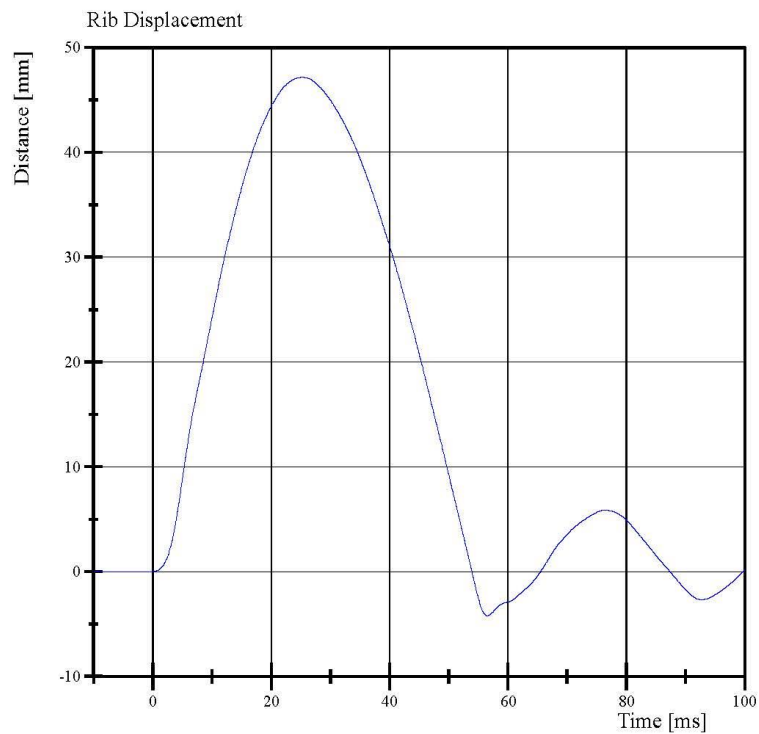
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 11:38:49 501



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023



Filter Class: CFC_180
Max: 47.1 mm at 25.3 ms
Min: -4.2 mm at 56.5 ms

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

03.06.2023 11:39:18 501



Transportation Research Center Inc.

Left Lower Thorax

ES-2re Serial No. F030 Certification No. 87-2

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Impactor Velocity	5.4 - 5.60 m/s	5.430 m/s	Yes
Peak Impactor Force after 6 ms	(-5,100) - (-6,200) N	-5,282.1 N	Yes
Upper Rib Displacement	34 - 41 mm	39.8 mm	Yes
Center Rib Displacement	37 - 45 mm	41.3 mm	Yes
Lower Rib Displacement	37 - 44 mm	40.5 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

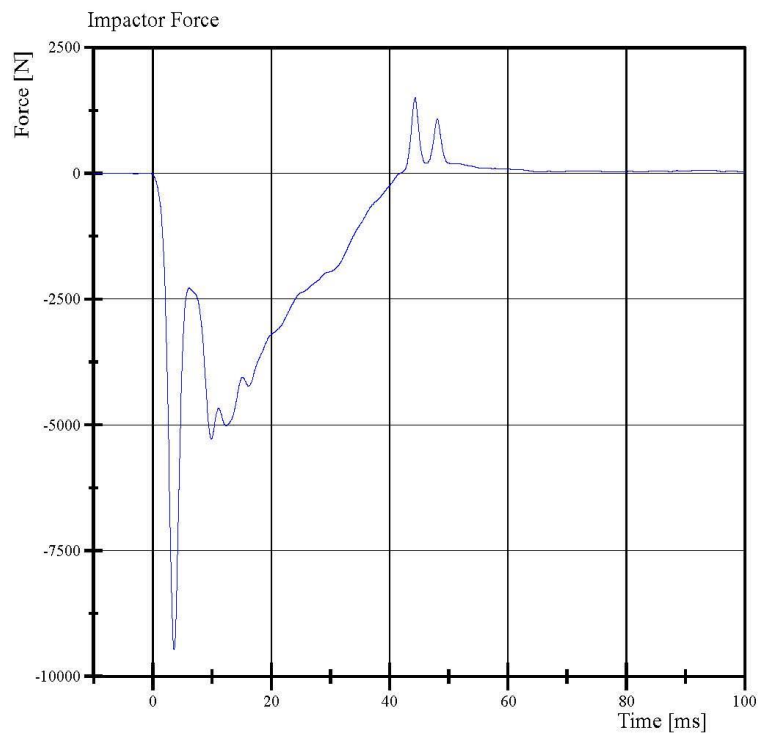
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 14:06:26 513



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 87-2
Test Date: 3/6/2023



Filter Class: CFC_180
Max: 1,499.3 N at 44.3 ms
Min: -9,470.2 N at 3.6 ms

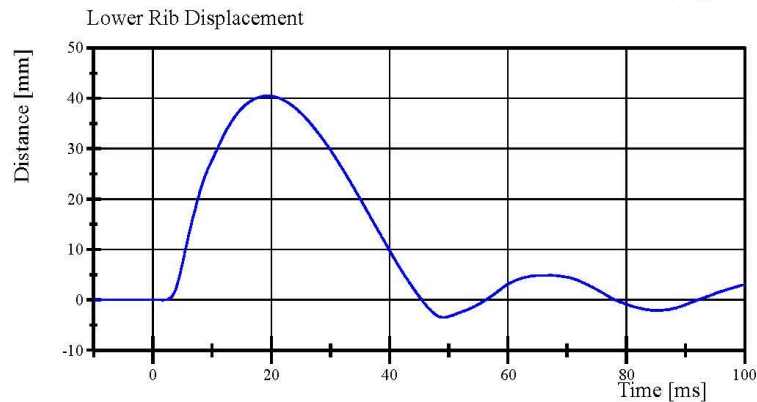
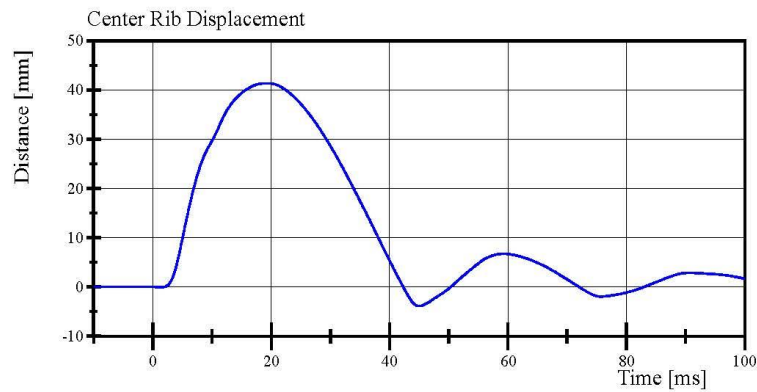
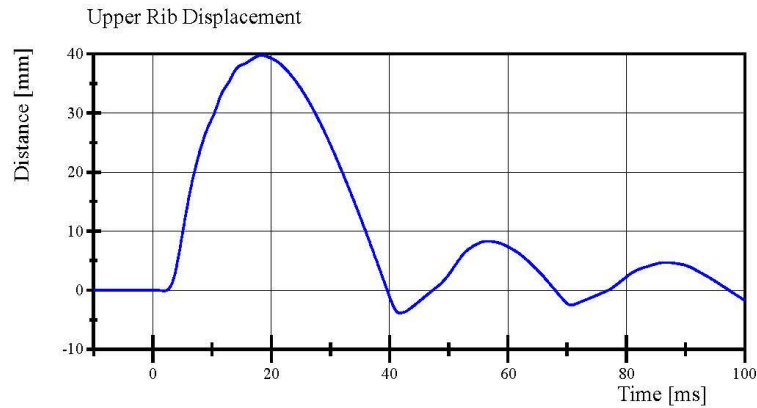
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 14:07:23 513



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 87-2
Test Date: 3/6/2023



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

03.06.2023 14:07:23 513



Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 87-3
Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-5.95) - (-6.15) m/s	-6.134 m/s	Yes
Maximum Headform Flexion			
Peak	(-45) - (-55) deg	-45.7 deg	Yes
Time of Peak	39 - 53 ms	41.9 ms	Yes
Headform Flexion Decay			
- Peak to Zero	37 - 57 ms	38.3 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Lumbar S/N: DS3472

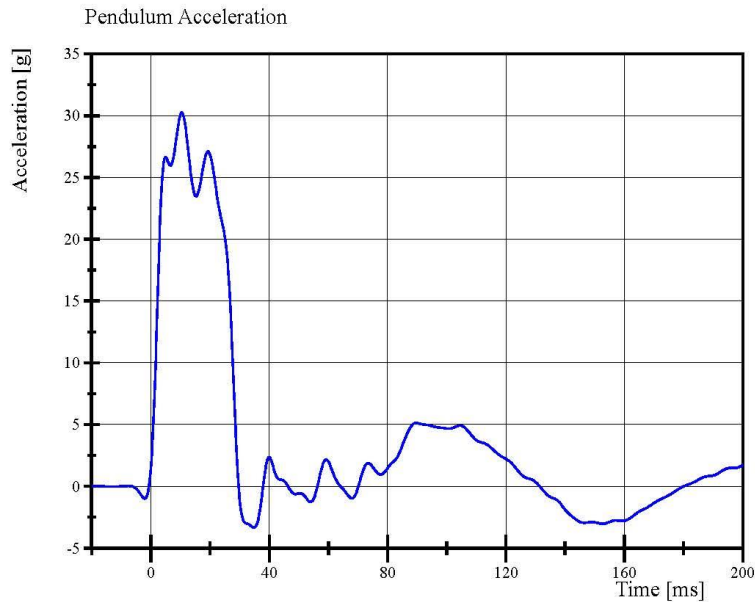
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 12:30:00 669

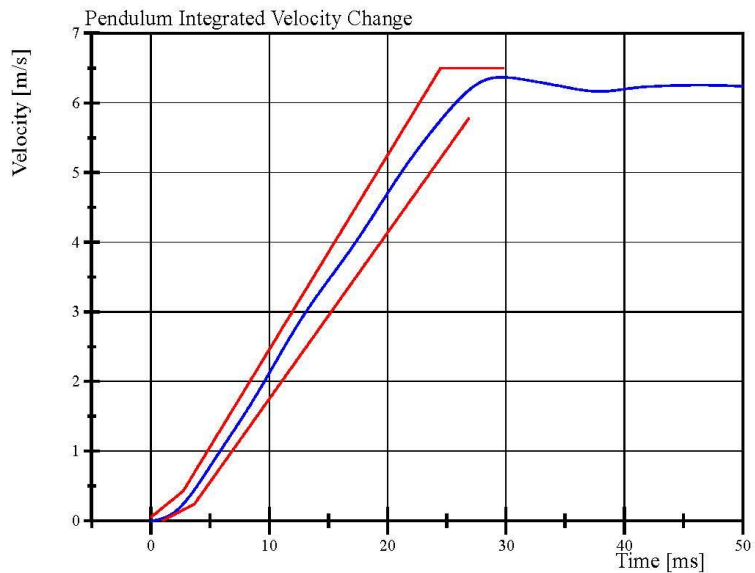


Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 87-3
Test Date: 3/6/2023



Filter Class: CFC_60
Max: 30.3 g at 10.5 ms
Min: -3.3 g at 34.8 ms



Filter Class: CFC_60
Max: 6.4 m/s at 29.7 ms
Min: 0.0 m/s at 0.0 ms

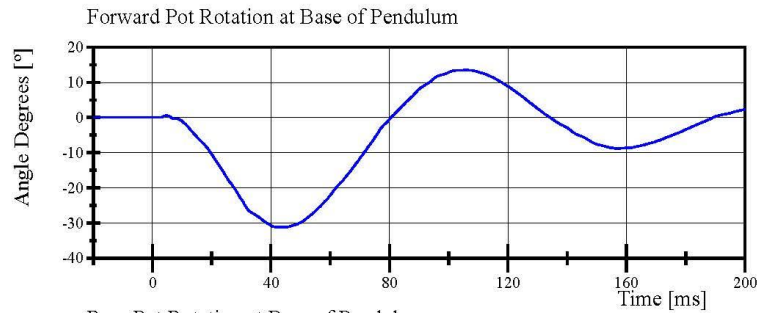
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 12:30:31 669

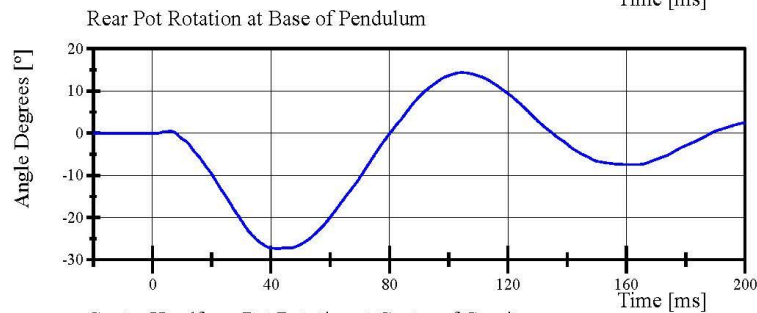


Transportation Research Center Inc.

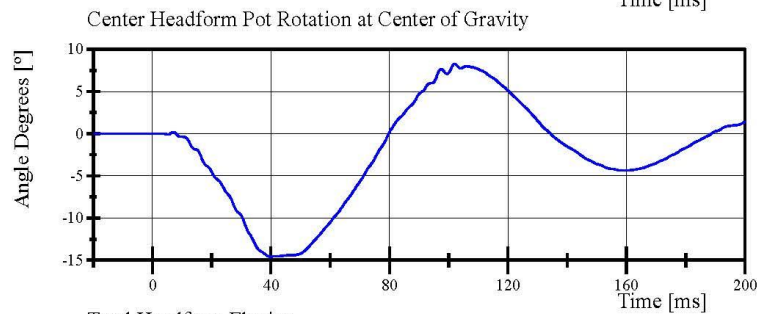
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 87-3
Test Date: 3/6/2023



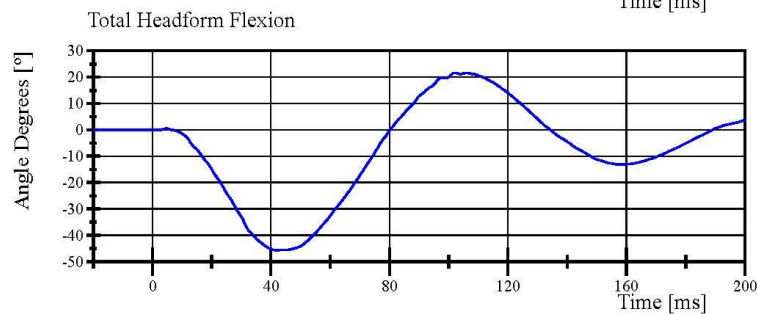
Filter Class: CFC_180
Max: 13.5 ° at 105.8 ms
Min: -31.2 ° at 44.4 ms



Filter Class: CFC_180
Max: 14.4 ° at 104.5 ms
Min: -27.4 ° at 42.3 ms



Filter Class: CFC_180
Max: 8.3 ° at 102.1 ms
Min: -14.6 ° at 39.8 ms



Filter Class: CFC_180
Max: 21.6 ° at 102.2 ms
Min: -45.7 ° at 41.9 ms

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

03.06.2023 12:30:31 669



Transportation Research Center Inc.

Left Lateral Abdomen

ES-2re Serial No. F030 Certification No. 87-1

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Test Probe Velocity	3.9 - 4.1 m/s	4.04 m/s	Yes
Test Probe Force			
Peak	4,000 - 4,800 N	4,315.7 N	Yes
Time of Peak	10.6 - 13.0 ms	11.52 ms	Yes
Total Abdominal Force			
Peak	2,200 - 2,700 N	2,414.3 N	Yes
Time of Peak	10.0 - 12.3 ms	11.36 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Abdomen S/N: 1066

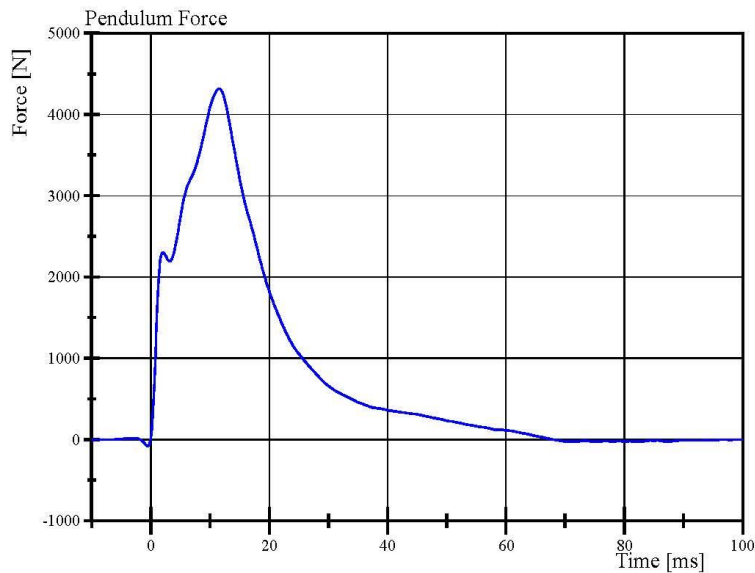
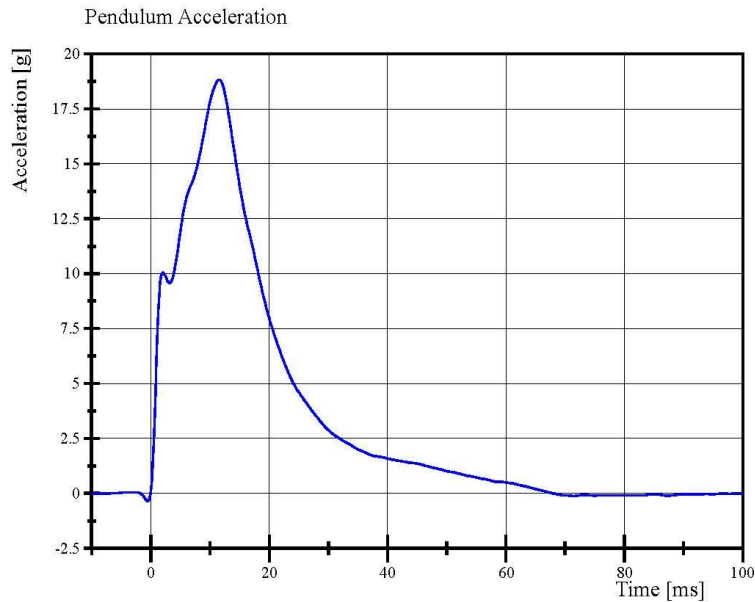
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 13:44:38 504



Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023



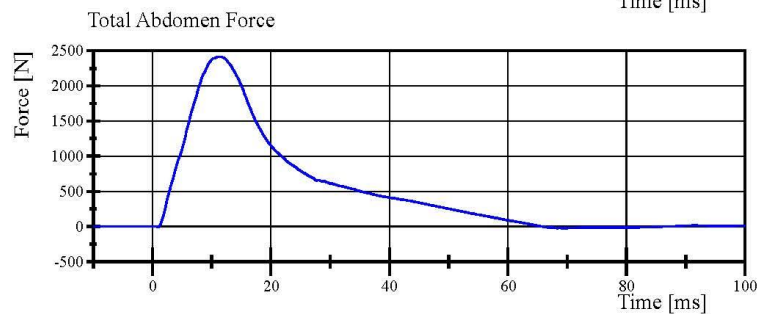
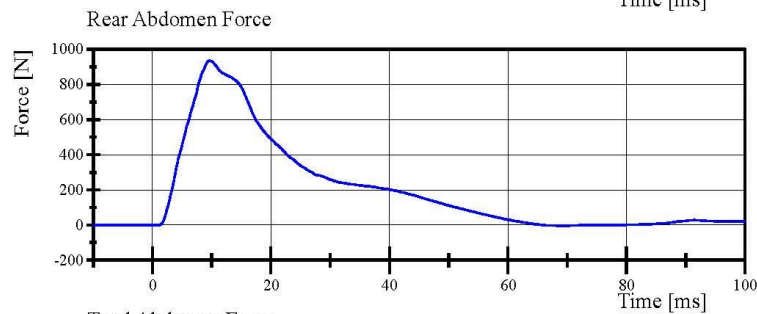
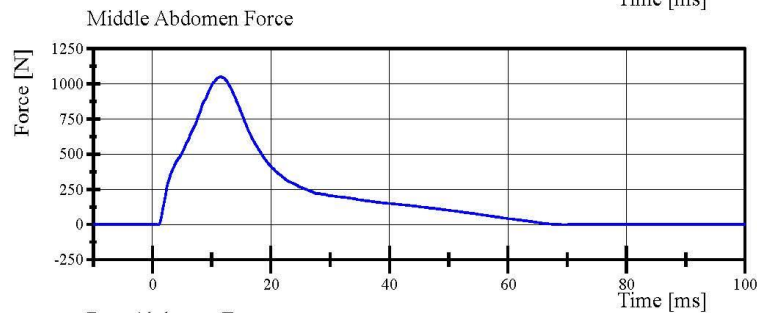
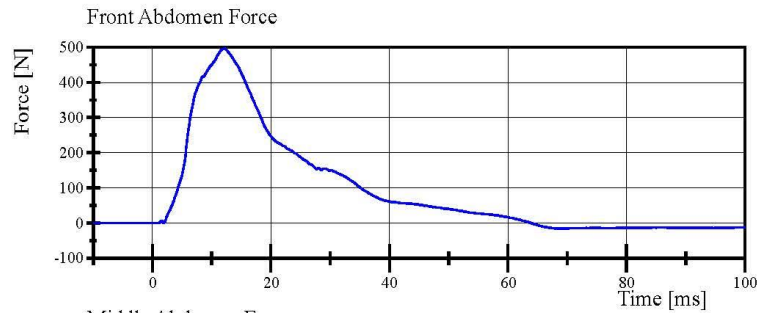
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

03.06.2023 13:45:05 504



Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 87-1
Test Date: 3/6/2023



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

03.06.2023 13:45:05 504



Transportation Research Center Inc.

Left Lateral Pelvis

ES-2re Serial No. F030 Certification No. 87-1

Test Date: 3/6/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.37 m/s	Yes
Test Probe Force			
Peak	4,700 - 5,400 N	5,304.1 N	Yes
Time of Peak	11.8 - 16.1 ms	12.72 ms	Yes
Pubic Symphysis Force			
Peak	(-1,230) - (-1,590) N	-1,382.8 N	Yes
Time of Peak	12.2 - 17.0 ms	13.52 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

03.06.2023 13:52:11 633

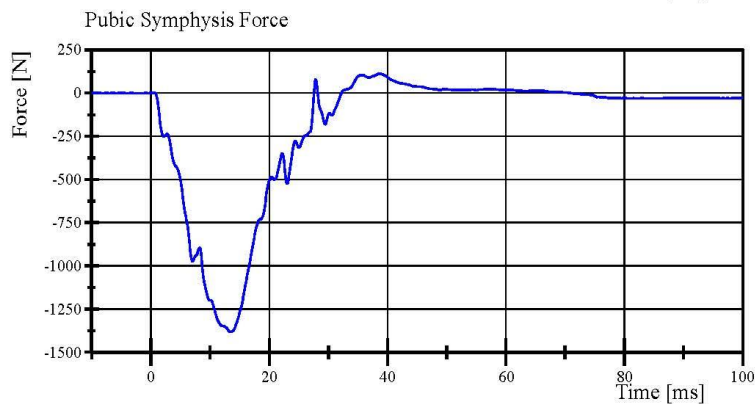
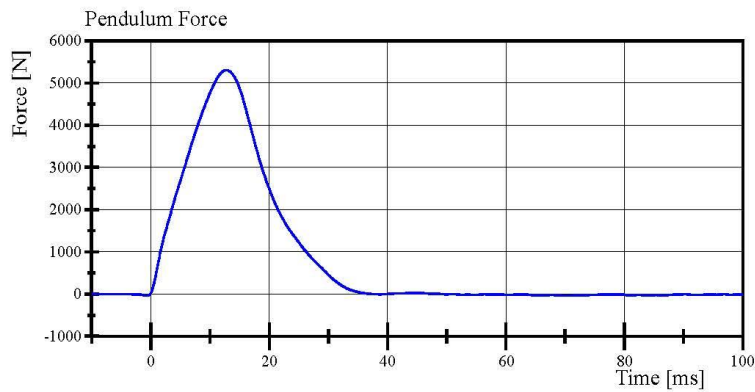
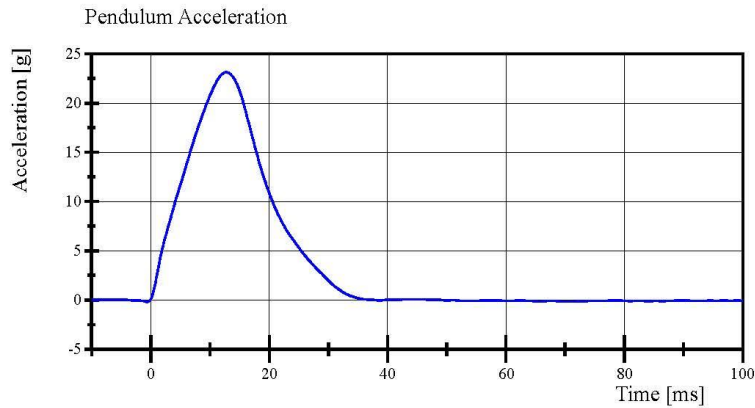


Transportation Research Center Inc.

Left Lateral Pelvis

ES-2re Serial No. F030 Certification No. 87-1

Test Date: 3/6/2023



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

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Post-Test Calibration Sheets
Driver S/N F030

Transportation Research Center Inc.
572U ES-2re Dummy
External Dimensions
Serial No. F030 Calibration No. 88

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	443	Yes
6	Head Width	152.0 - 158.0	154	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	279	Yes
10	Pelvis Lap Width	359.0 - 373.0	366	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. 88-3

Test Date: 4/11/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Peak Resultant Acceleration	125 - 155 g	142.1 g	Yes
Peak Longitudinal Acceleration	(-15) - 15 g	8.7 g	Yes
Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse?	< 15 %	3.39 %	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

04.11.2023 09:01:43 362

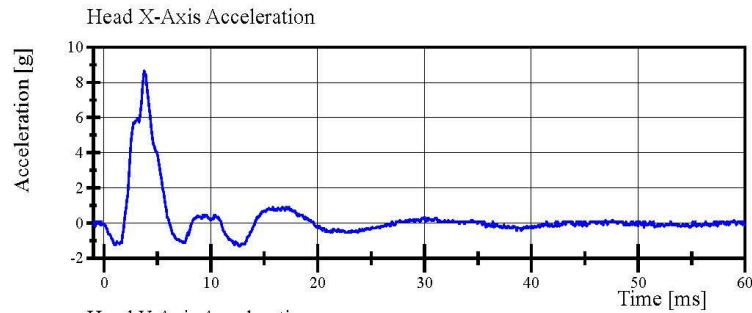


Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 88-3

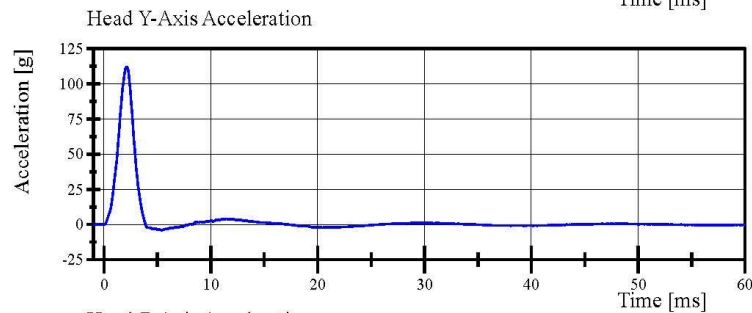
Test Date: 4/11/2023



Filter Class: CFC_1000

Max: 8.7 g at 3.8 ms

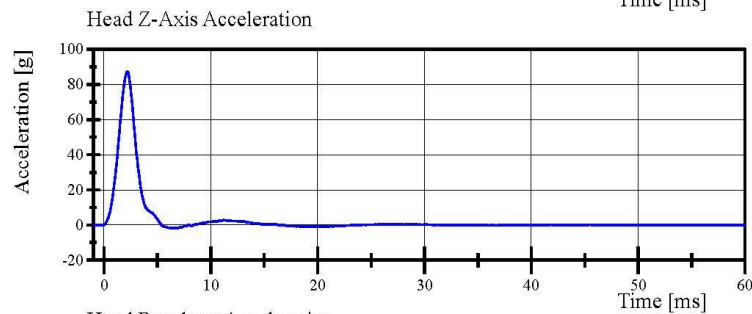
Min: -1.3 g at 12.6 ms



Filter Class: CFC_1000

Max: 112.3 g at 2.2 ms

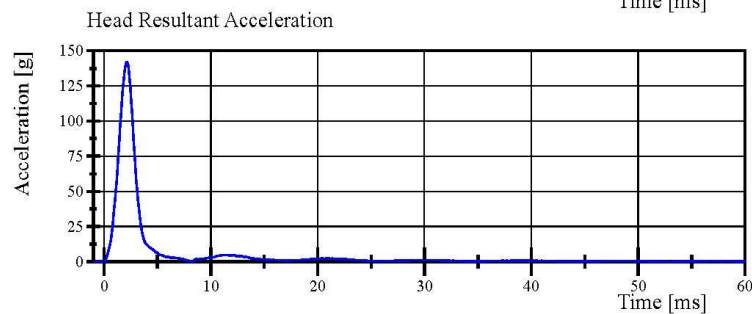
Min: -4.1 g at 5.4 ms



Filter Class: CFC_1000

Max: 87.2 g at 2.2 ms

Min: -1.7 g at 6.3 ms



Filter Class: CFC_1000

Max: 142.1 g at 2.2 ms

Min: 0.0 g at -0.5 ms

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

04.11.2023 09:02:23 362



Transportation Research Center Inc.

Left Lateral Neck

ES-2re Serial No. F030 Certification No. 88-2

Test Date: 4/11/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-3.3) - (-3.5) m/s	-3.35 m/s	Yes
Maximum Headform Flexion			
Peak	(-49) - (-59) deg	-51.6 deg	Yes
Time of Peak	54 - 66 ms	54.2 ms	Yes
Headform Flexion Decay			
- Peak to Zero	53 - 88 ms	57.8 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 05053

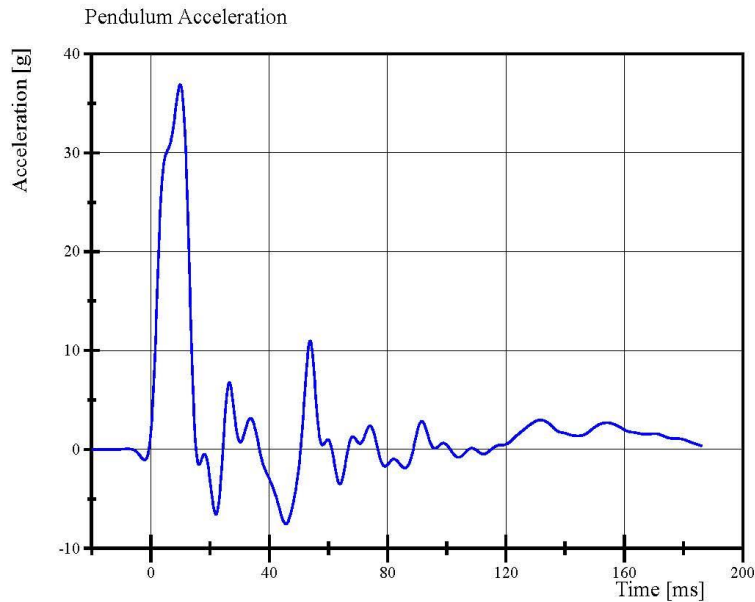
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 08:58:07 1497



Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 88-2
Test Date: 4/11/2023



Filter Class: CFC_60
Max: 36.9 g at 9.9 ms
Min: -7.5 g at 45.6 ms



Filter Class: CFC_60
Max: 3.6 m/s at 36.7 ms
Min: 0.0 m/s at 0.0 ms

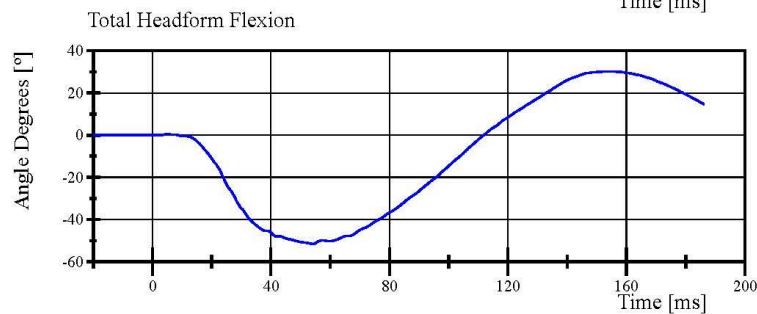
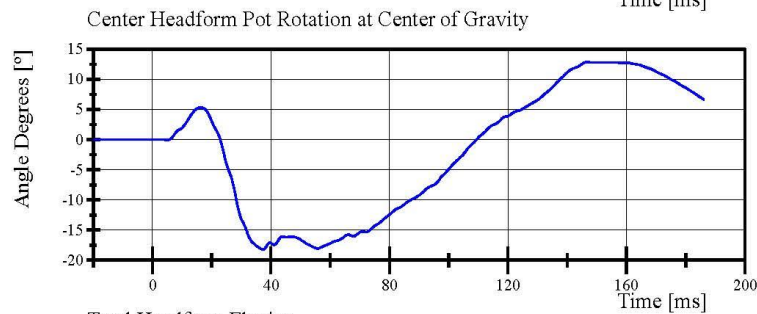
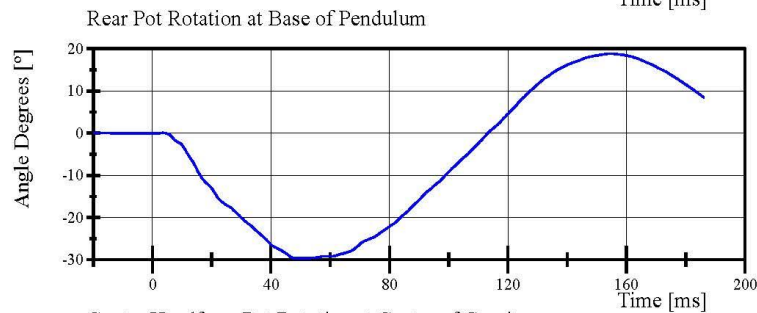
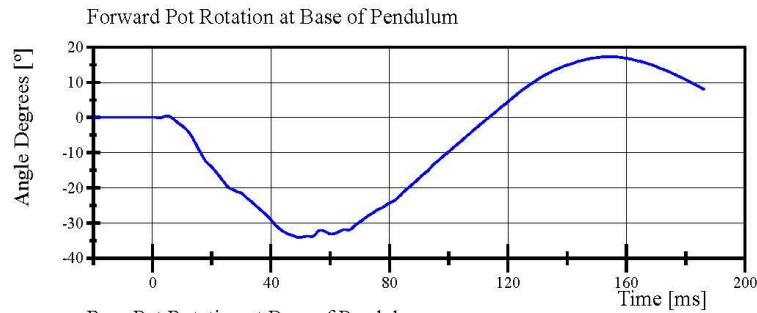
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 08:58:45 1497



Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 88-2
Test Date: 4/11/2023



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

04.11.2023 08:58:45 1497



Transportation Research Center Inc.

Left Lateral Shoulder

ES-2re Serial No. F030 Certification No. 88-1

Test Date: 4/11/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.22 m/s	Yes
Test Probe Acceleration	(-7.5) - (-10.5) g	-9.98 g	Yes

Test meets specifications.

Condition: Used

Comments:

Arm S/N: 175-3501-07014

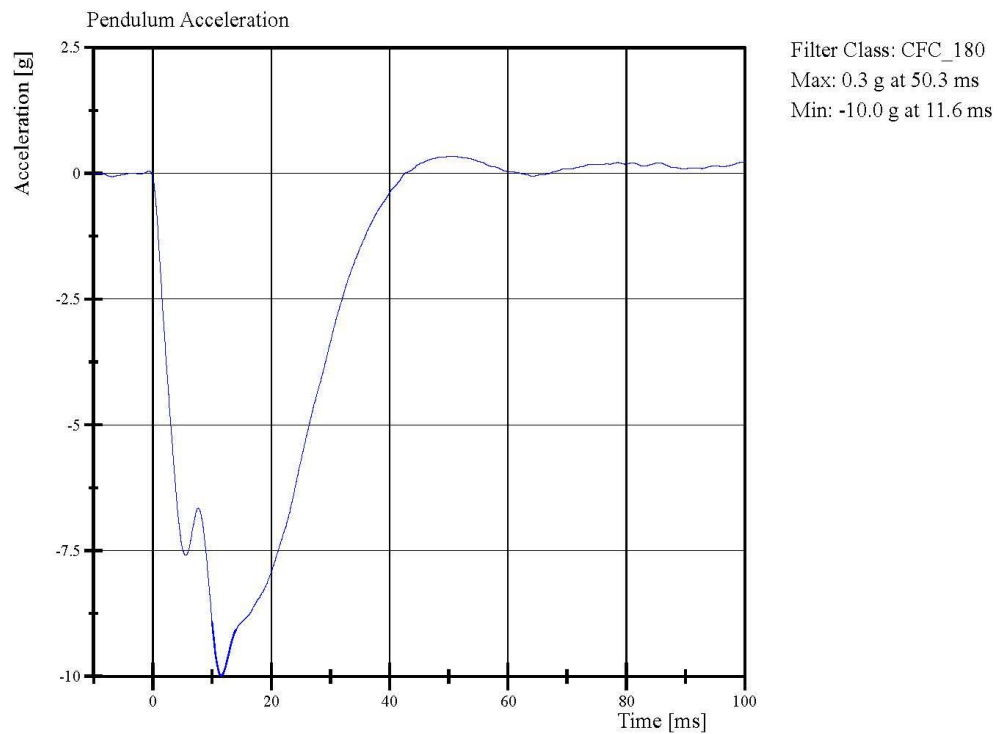
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 13:16:55 619



Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023



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

04.11.2023 13:17:19 619



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/10/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	37 %	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 Foam S/N: EK6973

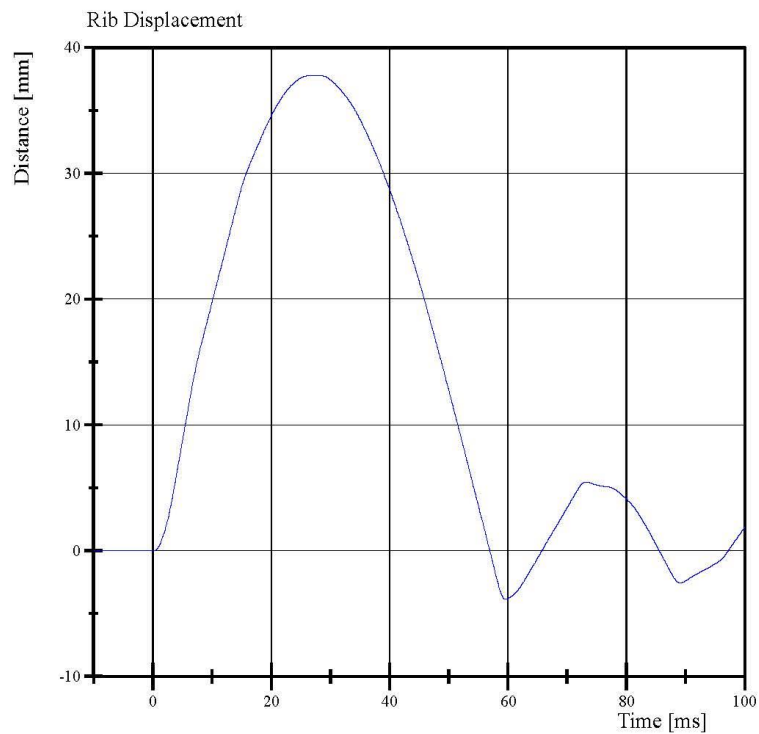
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 13:22:02 626



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/10/2023



Filter Class: CFC_180
Max: 37.8 mm at 28.1 ms
Min: -3.9 mm at 59.6 ms

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

04.11.2023 13:22:37 626



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module

ES-2re Serial No. F030 Certification No. 88-1

Test Date: 4/10/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.1 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6973

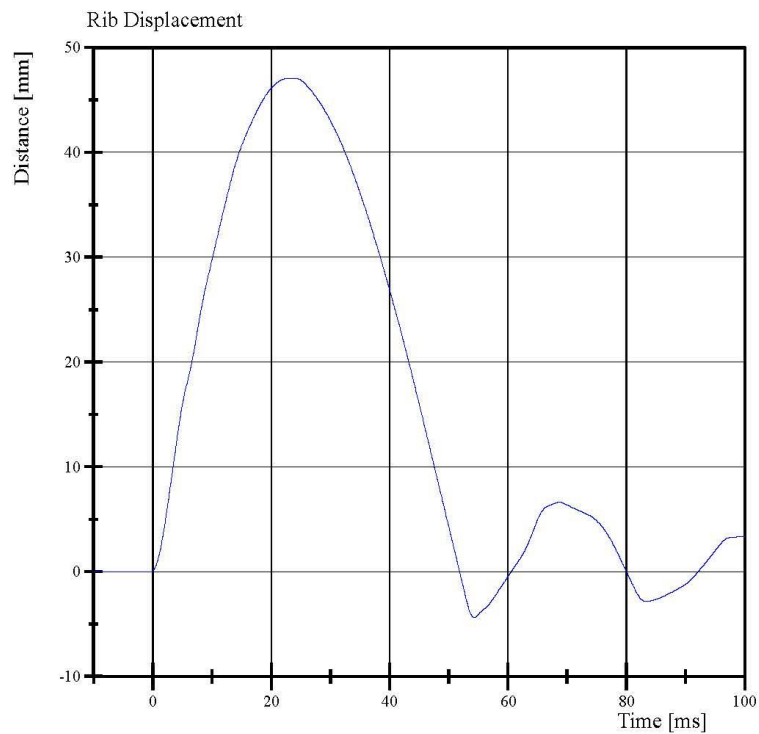
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 13:42:38 539



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/10/2023



Filter Class: CFC_180
Max: 47.1 mm at 23.8 ms
Min: -4.4 mm at 54.2 ms

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

04.11.2023 13:43:33 539



Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/10/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	38.4 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462mm

Rib Foam S/N: EK6970

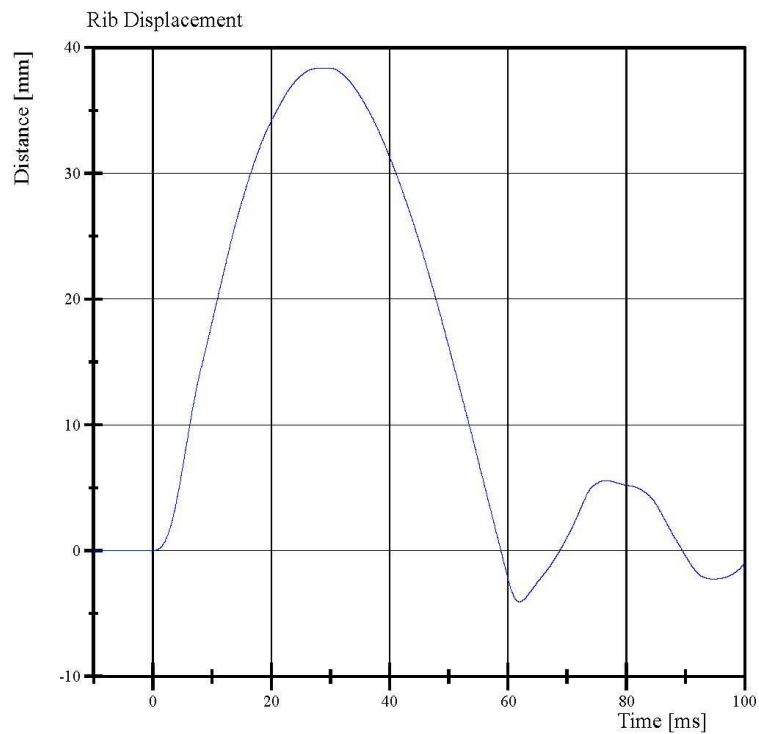
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 10:11:44 614



Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/10/2023



Filter Class: CFC_180
Max: 38.4 mm at 29.5 ms
Min: -4.1 mm at 61.9 ms

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

04.11.2023 10:12:25 614



Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module

ES-2re Serial No. F030 Certification No. 88-1

Test Date: 4/10/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	50.0 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6970

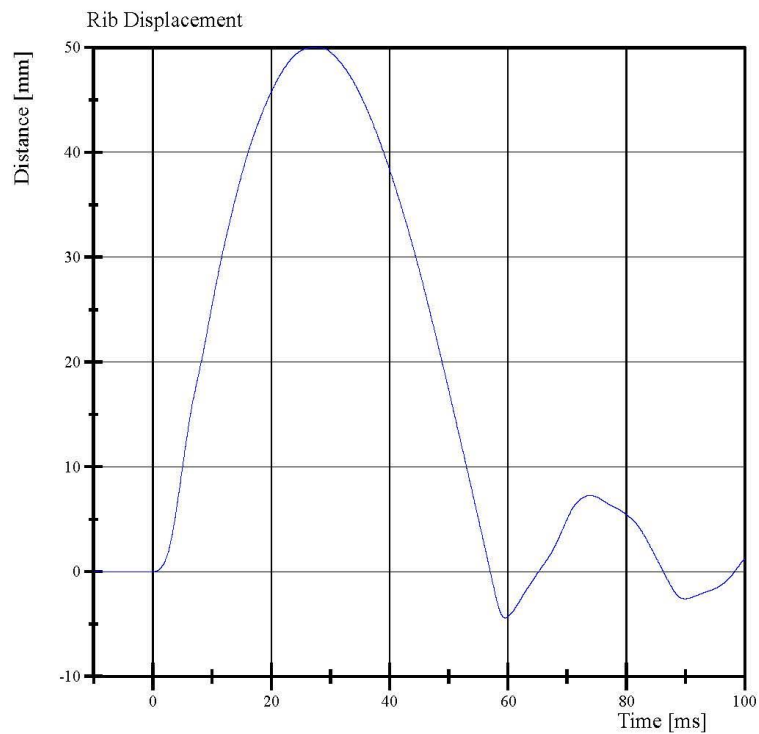
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 13:13:12 516



Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/10/2023



Filter Class: CFC_180
Max: 50.0 mm at 27.4 ms
Min: -4.4 mm at 59.5 ms

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

04.11.2023 13:13:45 516



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module

ES-2re Serial No. F030 Certification No. 88-1

Test Date: 4/10/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	37.7 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462 mm

Rib Foam S/N: EK6971

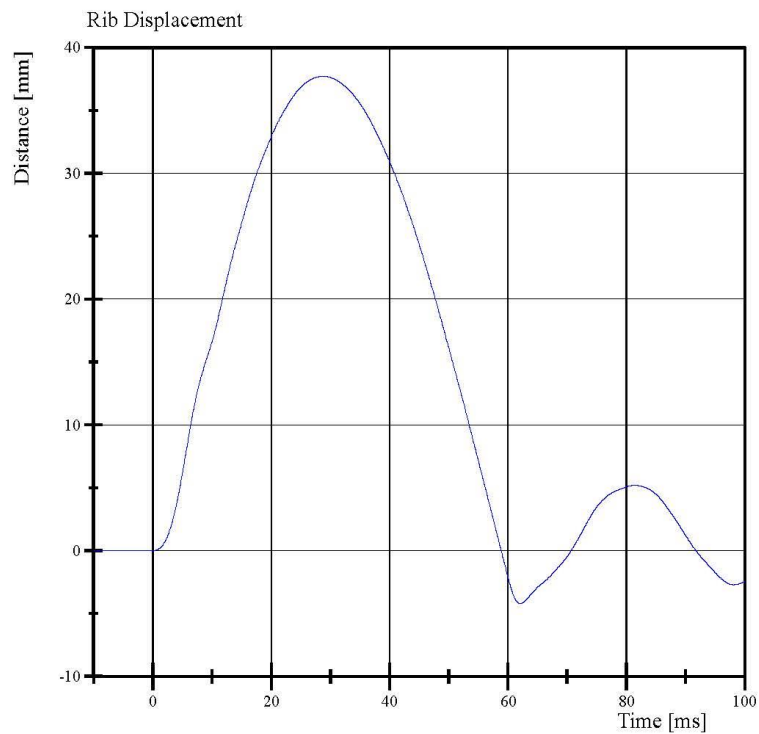
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 13:20:36 631



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/10/2023



Filter Class: CFC_180
Max: 37.7 mm at 28.7 ms
Min: -4.2 mm at 62.1 ms

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

04.11.2023 13:21:02 631



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module

ES-2re Serial No. F030 Certification No. 88-1

Test Date: 4/10/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.4 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6971

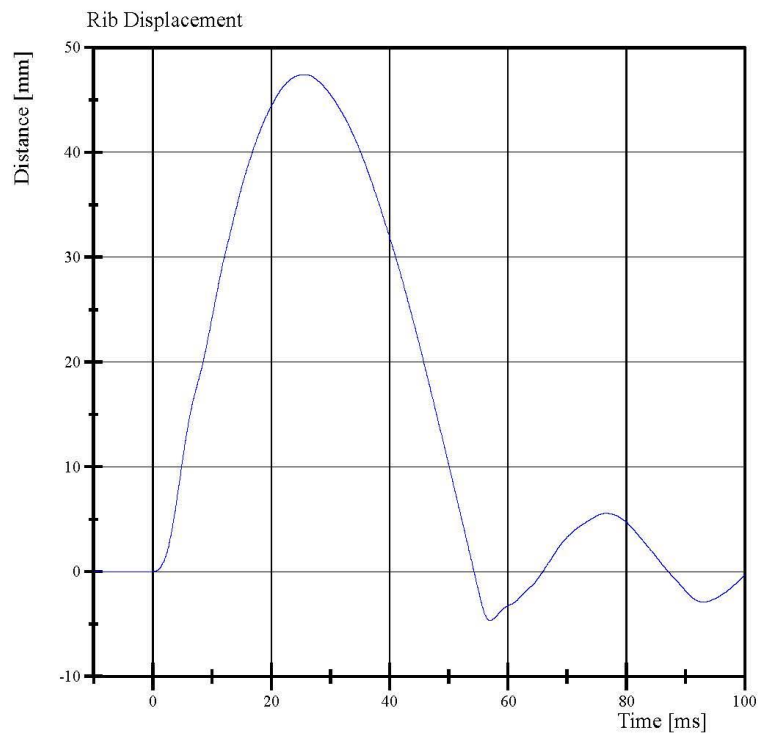
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 13:19:31 520



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/10/2023



Filter Class: CFC_180
Max: 47.4 mm at 25.6 ms
Min: -4.7 mm at 57.0 ms

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

04.11.2023 13:20:02 520



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Impactor Velocity	5.4 - 5.60 m/s	5.455 m/s	Yes
Peak Impactor Force after 6 ms	(-5,100) - (-6,200) N	-5,832.2 N	Yes
Upper Rib Displacement	34 - 41 mm	36.7 mm	Yes
Center Rib Displacement	37 - 45 mm	39.9 mm	Yes
Lower Rib Displacement	37 - 44 mm	40.5 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

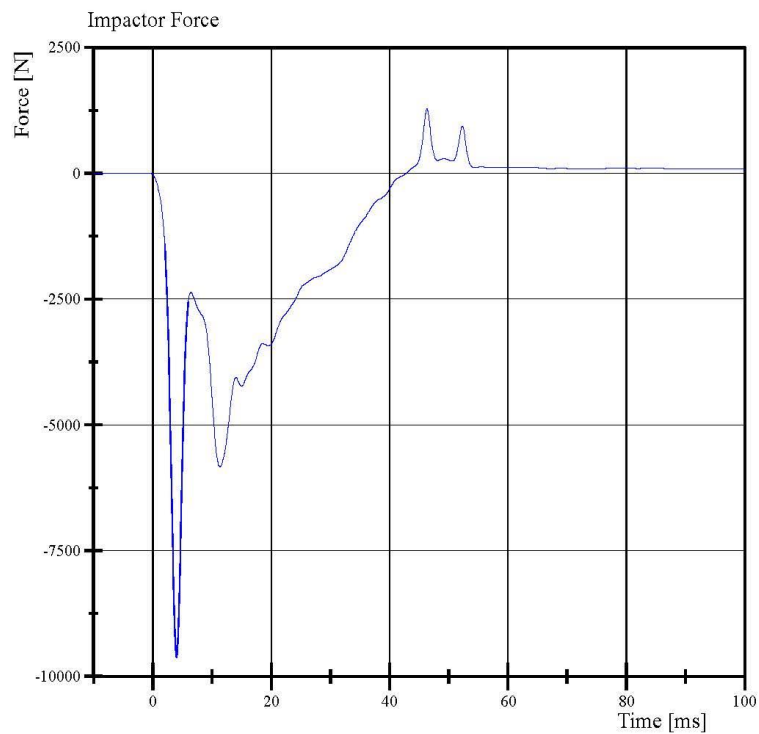
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 14:17:12 498



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023



Filter Class: CFC_180
Max: 1,291.2 N at 46.3 ms
Min: -9,618.9 N at 4.0 ms

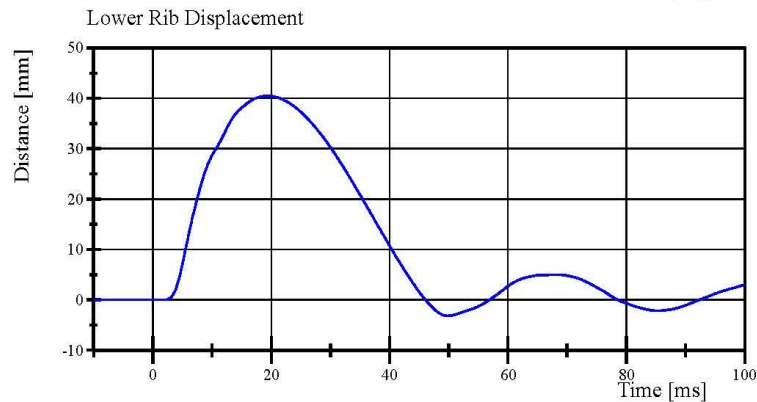
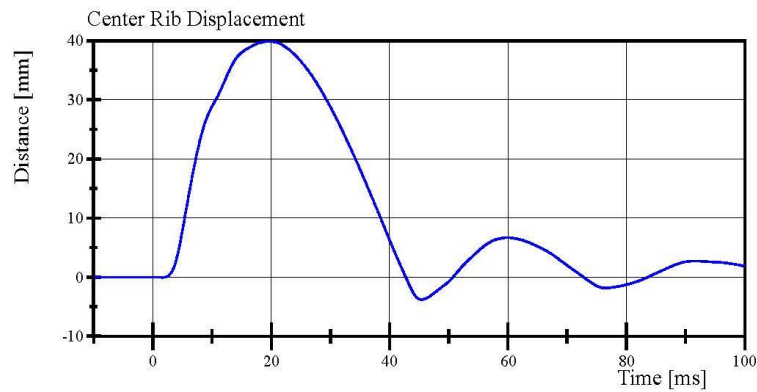
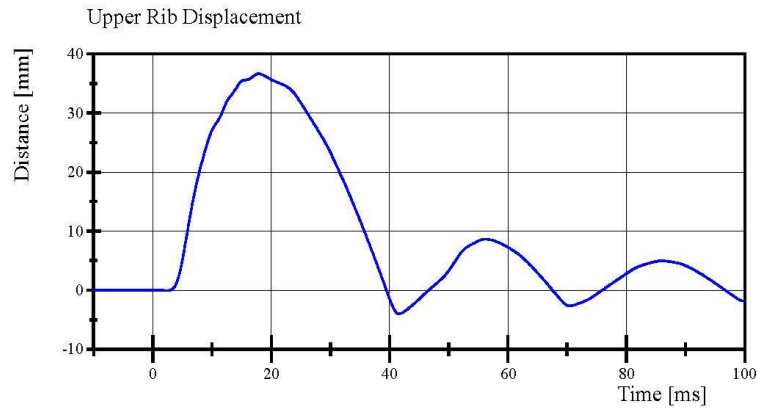
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 14:18:09 498



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023



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

04.11.2023 14:18:09 498



Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 88-4
Test Date: 4/11/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-5.95) - (-6.15) m/s	-6.132 m/s	Yes
Maximum Headform Flexion			
Peak	(-45) - (-55) deg	-46.8 deg	Yes
Time of Peak	39 - 53 ms	40.7 ms	Yes
Headform Flexion Decay			
- Peak to Zero	37 - 57 ms	39.0 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Lumbar S/N: DS3472

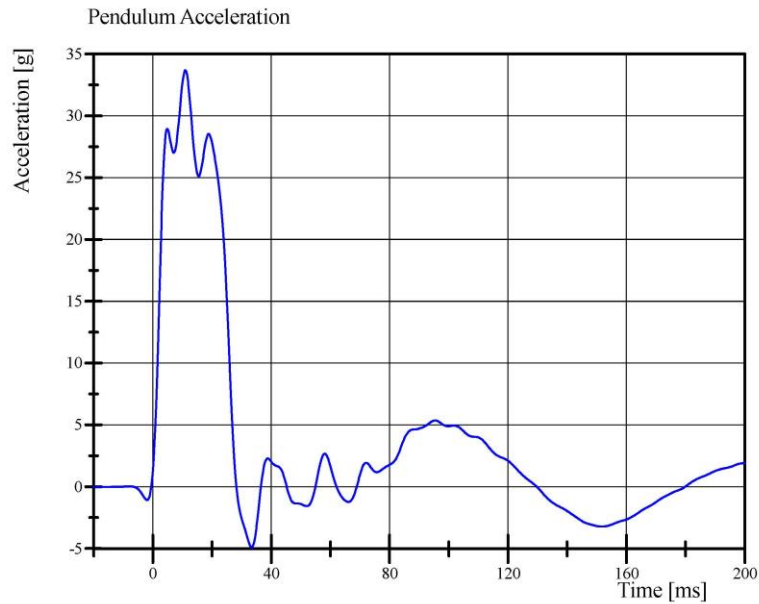
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 10:08:20 668

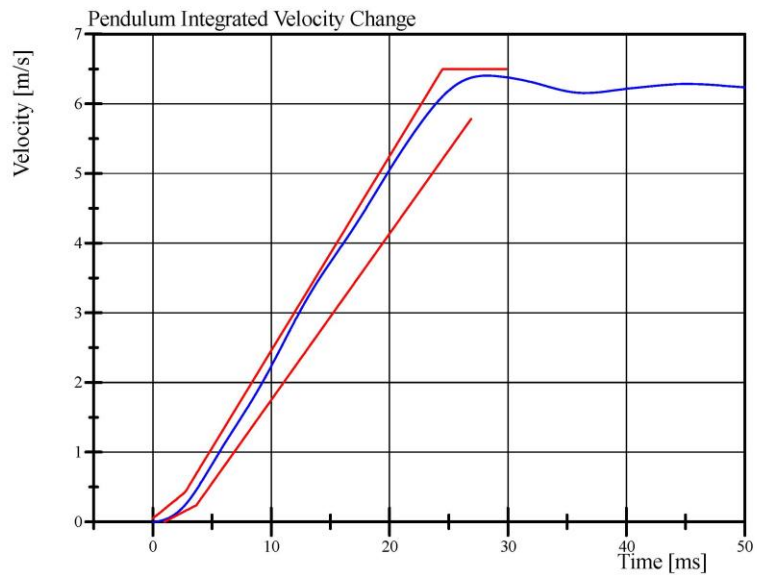


Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 88-4
Test Date: 4/11/2023



Filter Class: CFC_60
Max: 33.7 g at 11.0 ms
Min: -4.9 g at 33.4 ms



Filter Class: CFC_60
Max: 6.4 m/s at 28.2 ms
Min: 0.0 m/s at 0.0 ms

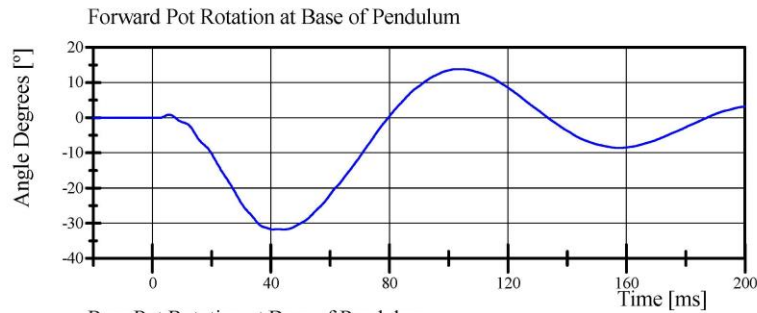
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 10:08:54 668

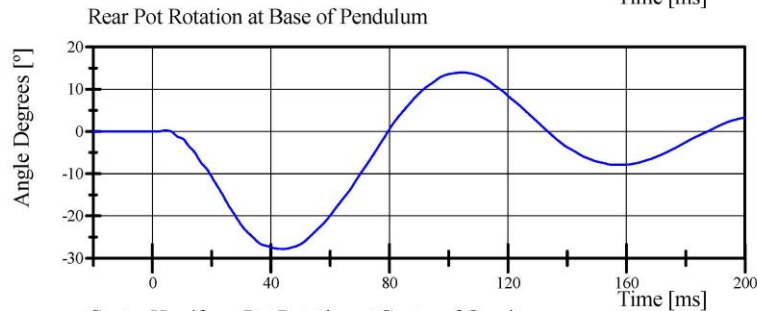


Transportation Research Center Inc.

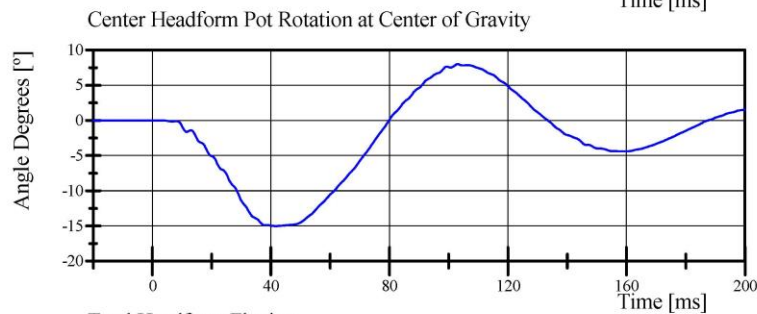
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 88-4
Test Date: 4/11/2023



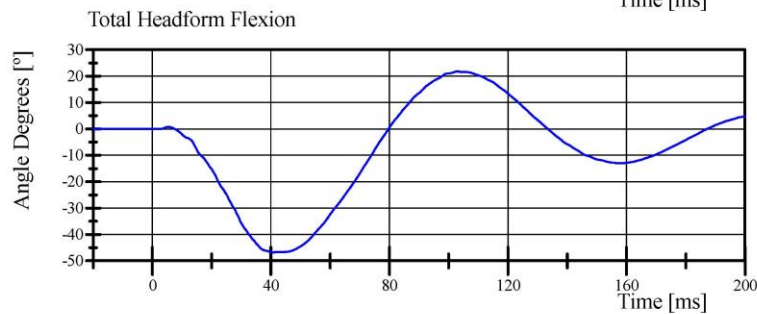
Filter Class: CFC_180
Max: 13.8 ° at 102.4 ms
Min: -31.8 ° at 40.6 ms



Filter Class: CFC_180
Max: 14.0 ° at 104.5 ms
Min: -27.8 ° at 44.1 ms



Filter Class: CFC_180
Max: 8.0 ° at 103.0 ms
Min: -15.0 ° at 41.7 ms



Filter Class: CFC_180
Max: 21.8 ° at 102.9 ms
Min: -46.8 ° at 40.7 ms

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

04.11.2023 10:08:54 668



Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Test Probe Velocity	3.9 - 4.1 m/s	4.04 m/s	Yes
Test Probe Force			
Peak	4,000 - 4,800 N	4,415.5 N	Yes
Time of Peak	10.6 - 13.0 ms	11.60 ms	Yes
Total Abdominal Force			
Peak	2,200 - 2,700 N	2,395.0 N	Yes
Time of Peak	10.0 - 12.3 ms	10.96 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Abdomen S/N: 1066

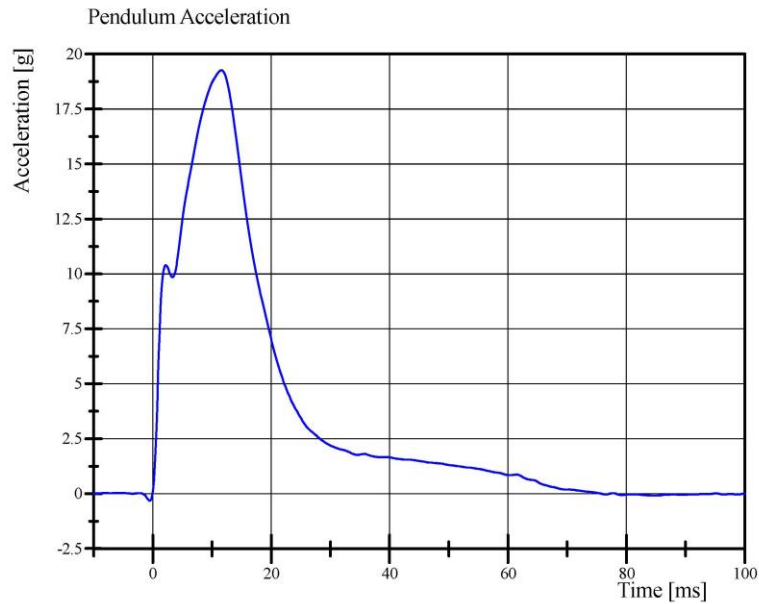
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 14:25:55 633

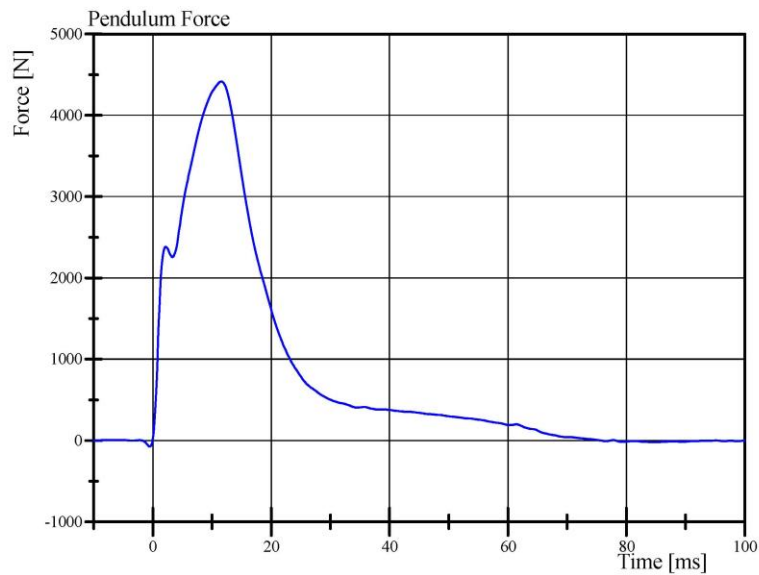


Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023



Filter Class: CFC_180
Max: 19.3 g at 11.6 ms
Min: -0.3 g at -0.5 ms



Filter Class: CFC_180
Max: 4,415.5 N at 11.6 ms
Min: -74.3 N at -0.5 ms

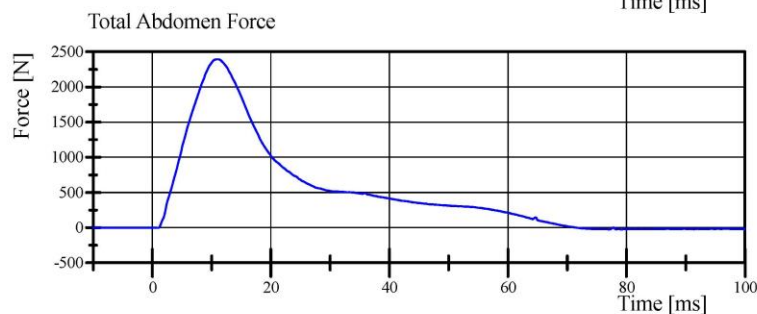
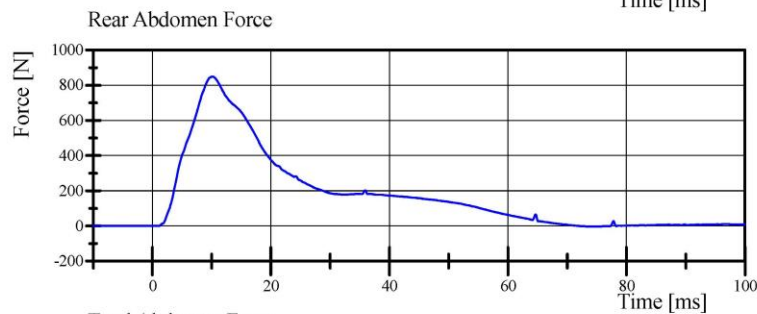
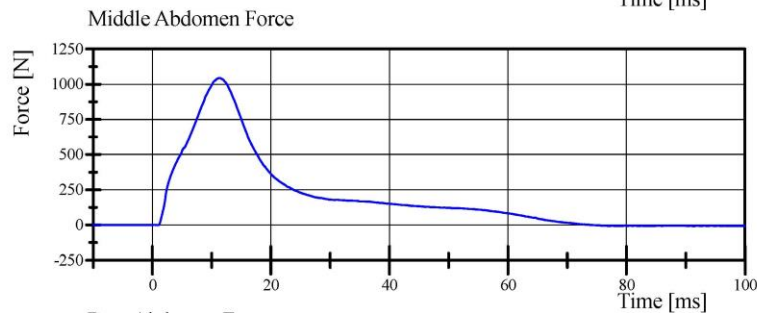
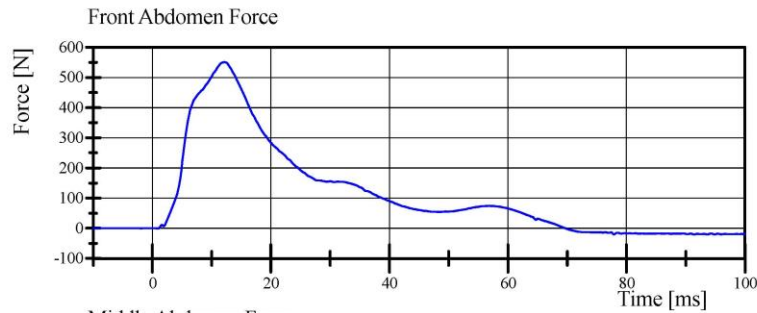
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 14:26:41 633



Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023



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

04.11.2023 14:26:41 633



Transportation Research Center Inc.

Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.35 m/s	Yes
Test Probe Force			
Peak	4,700 - 5,400 N	5,331.4 N	Yes
Time of Peak	11.8 - 16.1 ms	12.64 ms	Yes
Pubic Symphysis Force			
Peak	(-1,230) - (-1,590) N	-1,346.9 N	Yes
Time of Peak	12.2 - 17.0 ms	12.96 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: N/A

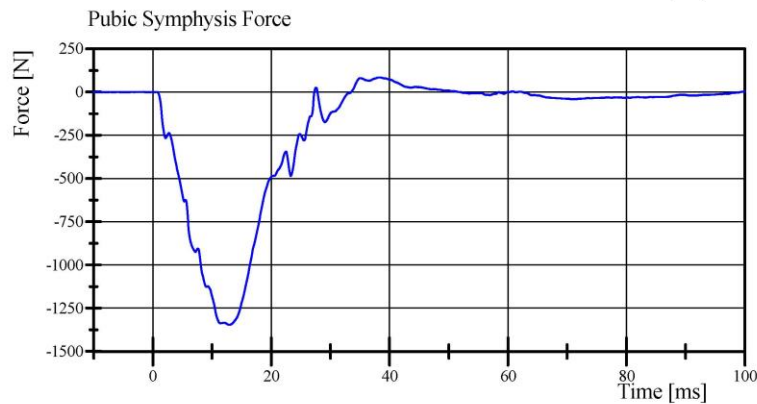
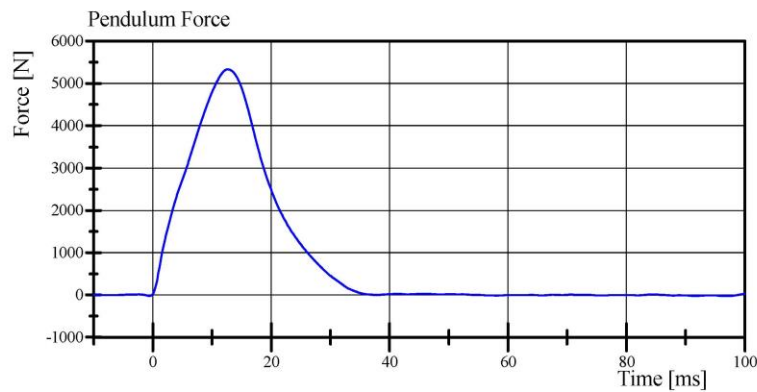
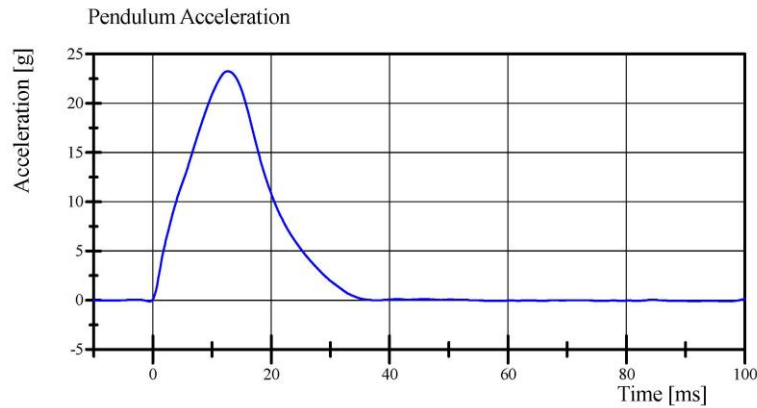
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

04.11.2023 14:30:32 599



Transportation Research Center Inc.

Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 88-1
Test Date: 4/11/2023



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

04.11.2023 14:30:54 599



Pre-Test Calibration Sheets
Driver S/N DQ0570

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. DQ0570 Calibration No. 20

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	785	Yes
B	Shoulder Pivot Height	437.0 - 453.0	445	Yes
C	H-Point Height	79.0 - 89.0	83	Yes
D	H-Point from Seat Back	141.0 - 151.0	147	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	101	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	45	Yes
I	Head Depth	178.0 - 188.0	184	Yes
J	Head Circumference	541.0 - 551.0	545	Yes
K	Buttock to Knee Length	514.0 - 540.0	533	Yes
L	Popliteal Height	343.0 - 369.0	353	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	400	Yes
N	Buttock Popliteal Length	416.0 - 442.0	427	Yes
O	Chest Depth without Jacket	195.0 - 211.0	200	Yes
P	Foot Length (right)	216.0 - 232.0	220	Yes
P	Foot Length (left)	216.0 - 232.0	220	Yes
Q	Hip Breadth	313.0 - 323.0	316	Yes
R	Arm Length	249.0 - 259.0	254	Yes
S	Knee Joint to seat Back	478.0 - 493.0	486	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	349	Yes
W	Foot Width (right)	78.0 - 94.0	84	Yes
W	Foot Width (left)	78.0 - 94.0	84	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	870	Yes
Z	Waist Circumference	761.0 - 791.0	780	Yes

Revised 9/29/2005



Report Number: DQ0570_S2H20

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Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. DQ0570 Certification No. 20-1

Test Date: 3/3/2023

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	128.7 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	1.5 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	< 15 %	1.18 %	Yes

Test meets specifications.

Condition: Used

Comments:

Head Skin S/N: DP8345

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

03.03.2023 12:48:34 235

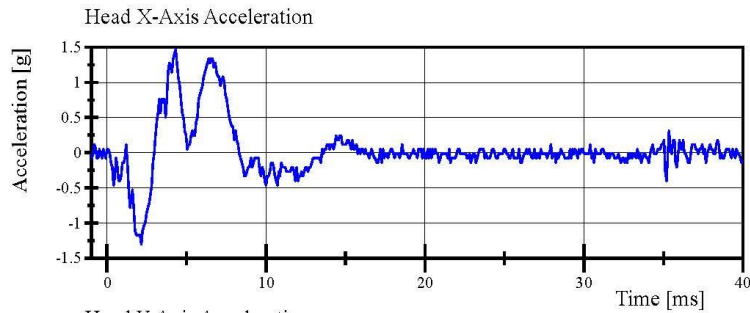


Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. DQ0570 Certification No. 20-1

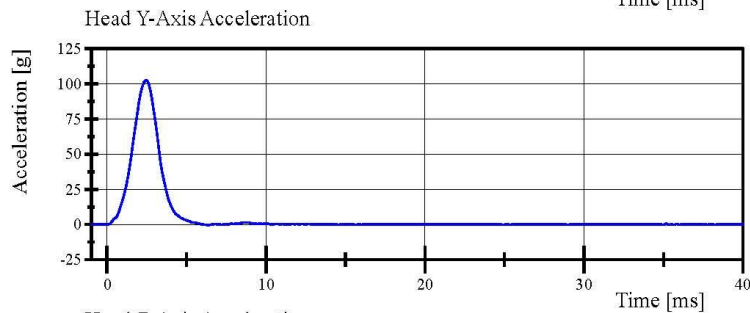
Test Date: 3/3/2023



Filter Class: CFC_1000

Max: 1.5 g at 4.3 ms

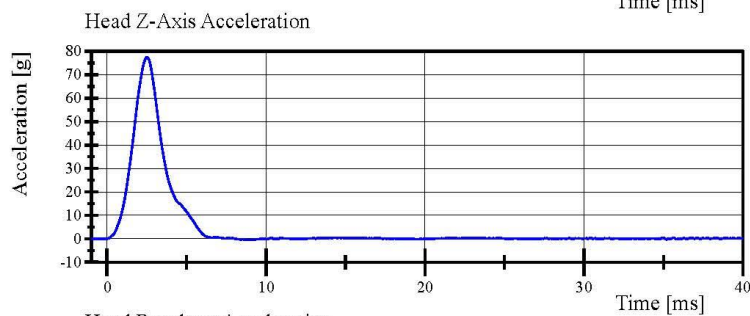
Min: -1.3 g at 2.2 ms



Filter Class: CFC_1000

Max: 102.8 g at 2.5 ms

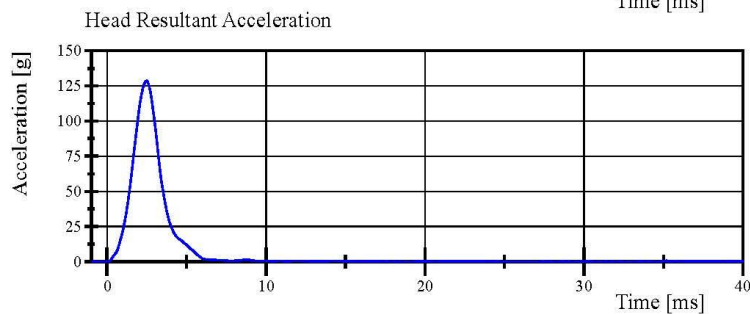
Min: -0.3 g at 6.4 ms



Filter Class: CFC_1000

Max: 77.5 g at 2.5 ms

Min: -0.5 g at 8.9 ms



Filter Class: CFC_1000

Max: 128.7 g at 2.5 ms

Min: 0.0 g at 18.6 ms

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

03.03.2023 12:48:58 235



Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 20-1

Test Date: 3/3/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	38 %	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	2.641 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.877 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	5.206 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.826 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.834 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-71.8 deg	Yes
Time of Peak	50 - 70 ms	58.6 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	40.6 N·m	Yes
Total Neck Occipital Condyles Moment			
Decay Time to 0 N·m	102 - 126 ms	110.3 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 717

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

03.03.2023 13:10:20 749

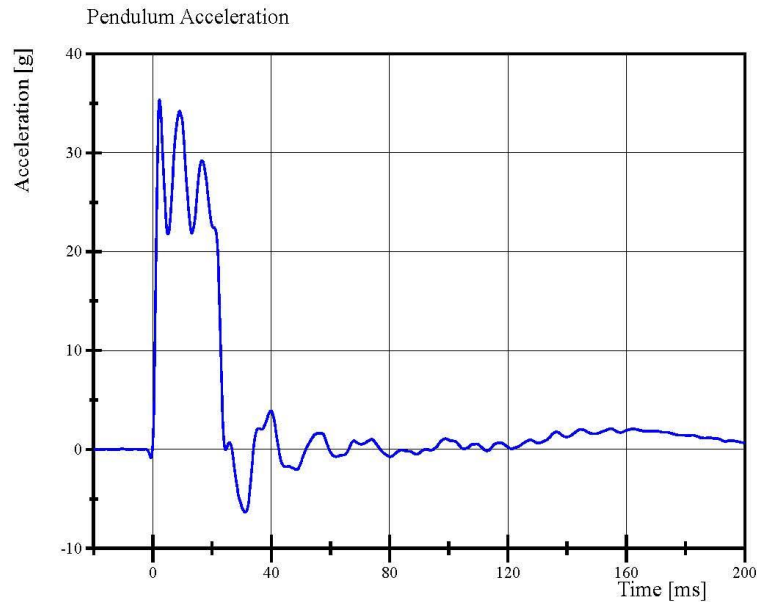


Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 20-1

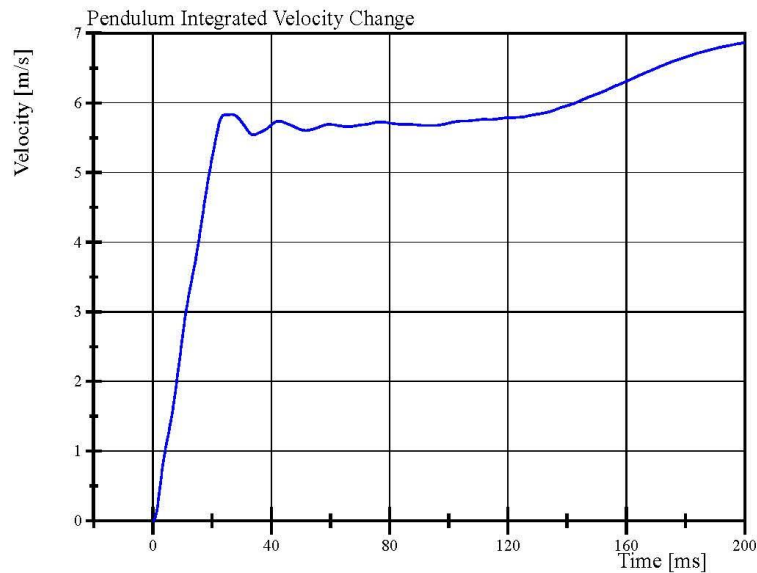
Test Date: 3/3/2023



Filter Class: CFC_180

Max: 35.4 g at 2.2 ms

Min: -6.4 g at 31.1 ms



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

03.03.2023 13:10:47 749

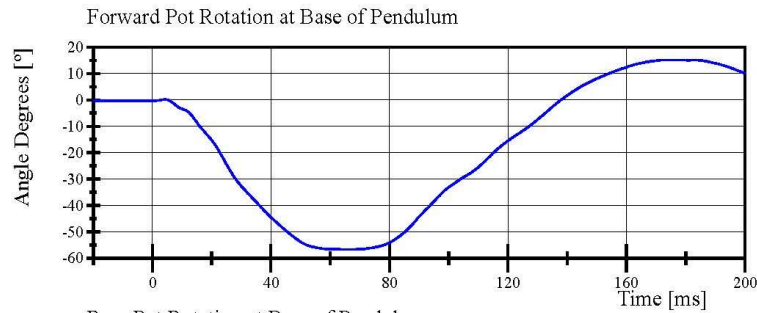


Transportation Research Center Inc.

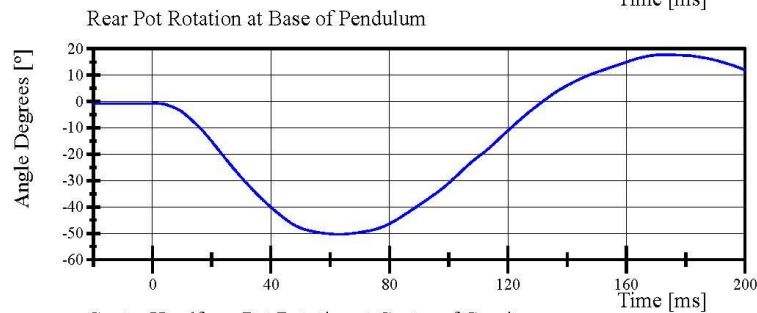
Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 20-1

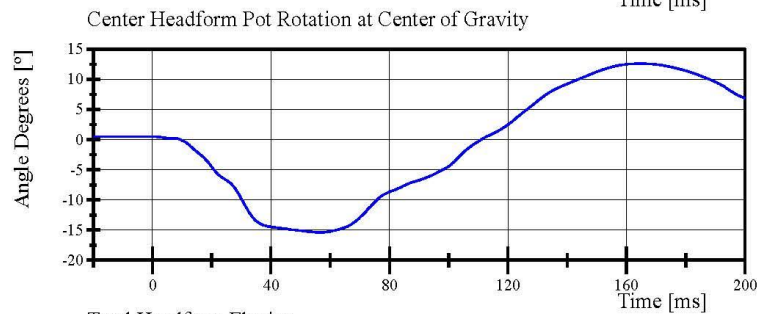
Test Date: 3/3/2023



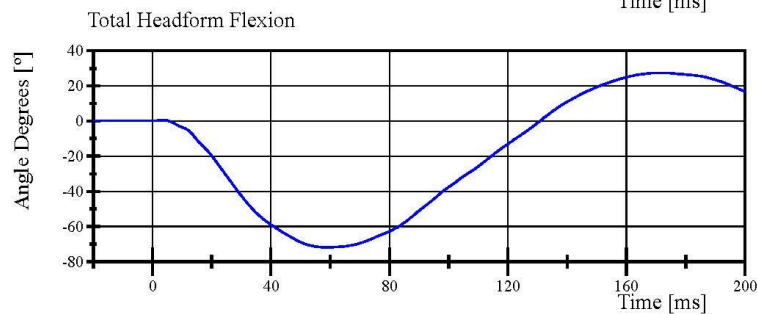
Filter Class: CFC_60
Max: 15.1 ° at 174.7 ms
Min: -56.6 ° at 66.3 ms



Filter Class: CFC_60
Max: 17.7 ° at 172.6 ms
Min: -50.3 ° at 63.2 ms



Filter Class: CFC_60
Max: 12.6 ° at 164.6 ms
Min: -15.4 ° at 56.5 ms



Filter Class: CFC_60
Max: 27.4 ° at 171.3 ms
Min: -71.8 ° at 58.6 ms

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

03.03.2023 13:10:47 749



Transportation Research Center Inc.

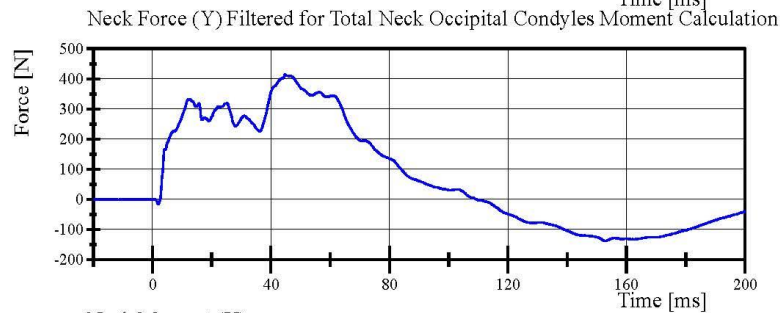
Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 20-1

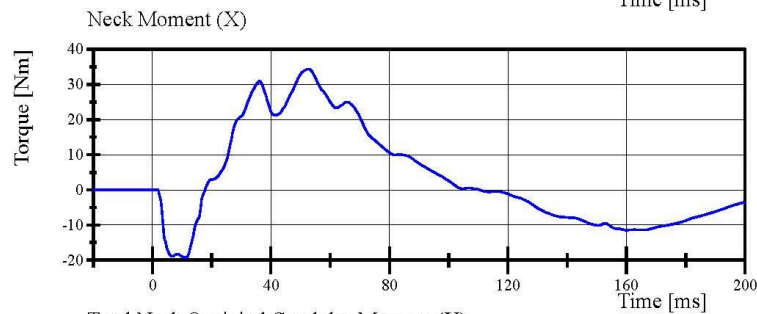
Test Date: 3/3/2023



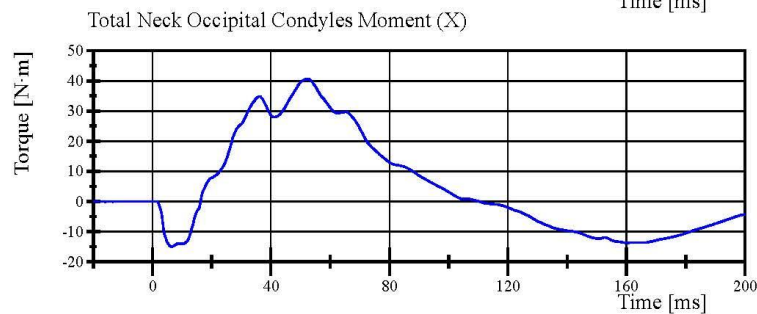
Filter Class: CFC_1000
Max: 416.8 N at 44.6 ms
Min: -138.2 N at 153.1 ms



Filter Class: CFC_600
Max: 414.6 N at 44.7 ms
Min: -138.0 N at 152.9 ms



Filter Class: CFC_600
Max: 34.4 Nm at 52.4 ms
Min: -19.2 Nm at 10.8 ms



Filter Class: Without_(Constar
Max: 40.6 N·m at 52.3 ms
Min: -14.9 N·m at 6.2 ms

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

03.03.2023 13:10:47 749



Transportation Research Center Inc.

Left Lateral Shoulder

SID IIs Serial No. DQ0570 Certification No. 20-1

Test Date: 3/3/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.32 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.0 g	Yes
Shoulder Displacement	28 - 37 mm	31.0 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	18.5 g	Yes

Test meets specifications.

Condition: Used

Comments:

Left Arm S/N: DP8451

Shoulder Rib S/N: DO9814

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

03.03.2023 09:39:43 866

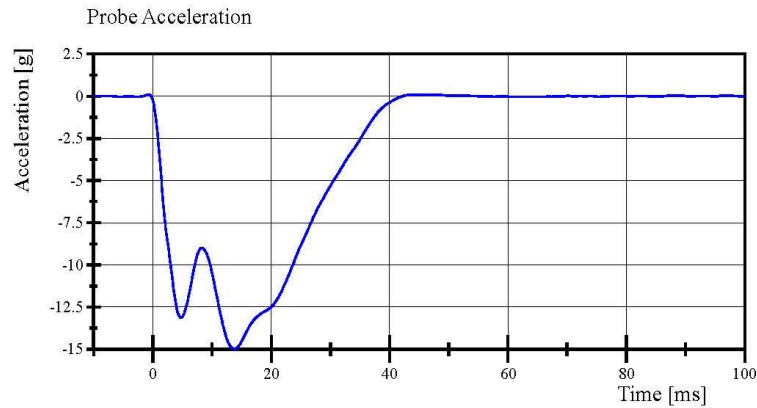


Transportation Research Center Inc.

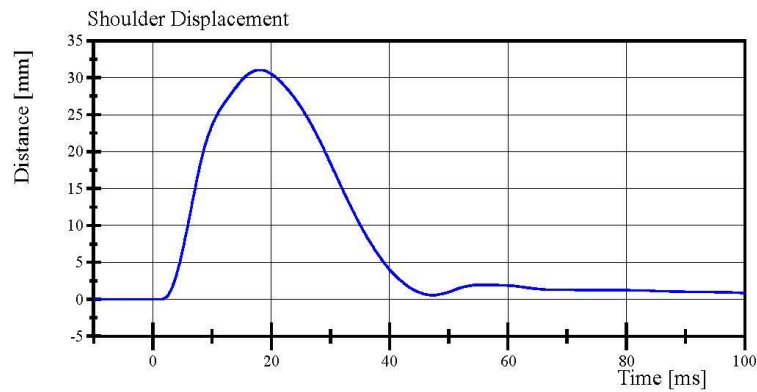
Left Lateral Shoulder

SID IIs Serial No. DQ0570 Certification No. 20-1

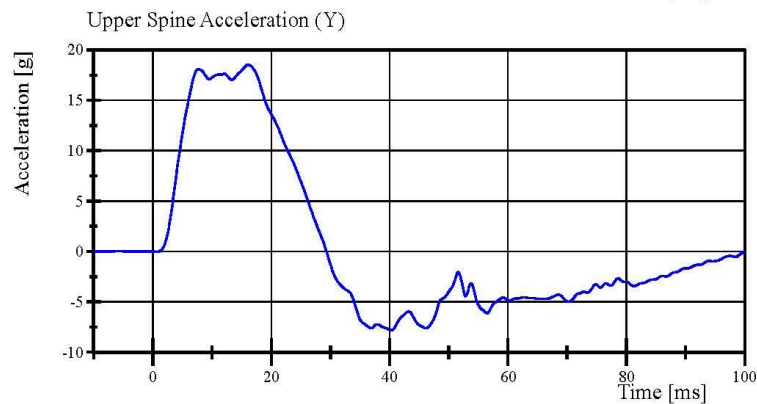
Test Date: 3/3/2023



Filter Class: CFC_180
Max: 0.1 g at 45.4 ms
Min: -15.0 g at 13.8 ms



Filter Class: CFC_600
Max: 31.0 mm at 18.1 ms
Min: -0.0 mm at -5.0 ms



Filter Class: CFC_180
Max: 18.5 g at 16.2 ms
Min: -7.8 g at 40.3 ms

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

03.03.2023 09:40:11 866



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 20-1
Test Date: 3/3/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.687 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-34.8 g	Yes
Shoulder Displacement	31 - 40 mm	35.2 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	28.1 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	31.5 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	33.8 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	36.8 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	36.0 g	Yes

Test meets specifications.

Condition: Used

Comments:

Left Arm S/N: DP8451

Shoulder Rib S/N: 180-3355 DO9814

Upper Thorax Rib S/N: 180-3362 DP6492

Middle Thorax Rib S/N: 180-3362 DP6493

Lower Thorax Rib S/N: 180-3362 DP7664

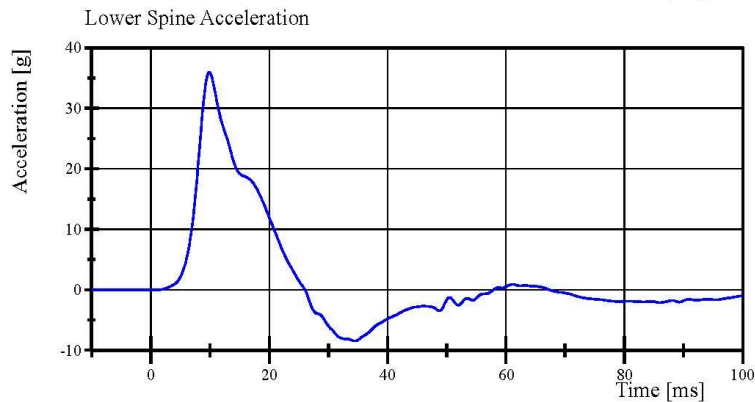
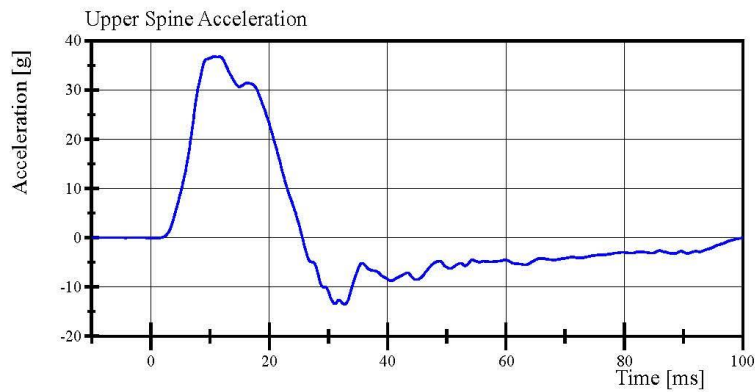
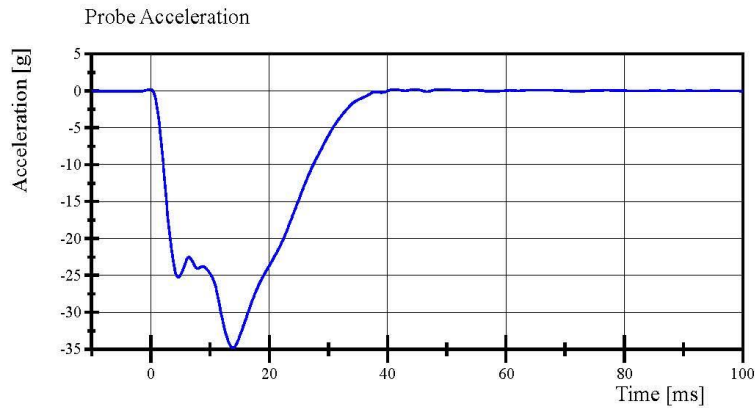
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

03.03.2023 10:44:04 641



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 20-1
Test Date: 3/3/2023



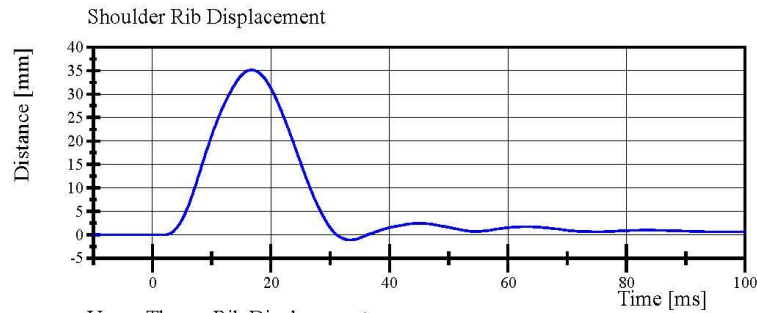
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

03.03.2023 10:52:26 641

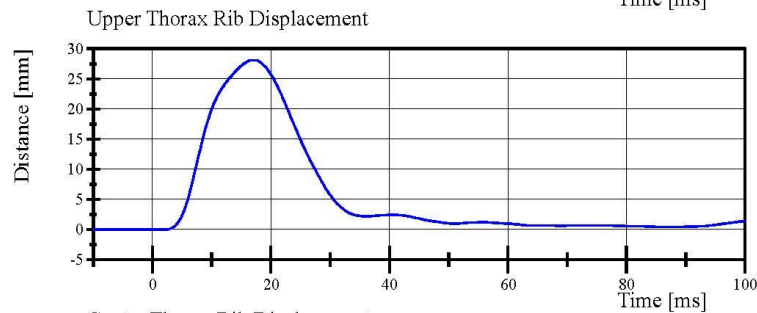


Transportation Research Center Inc.

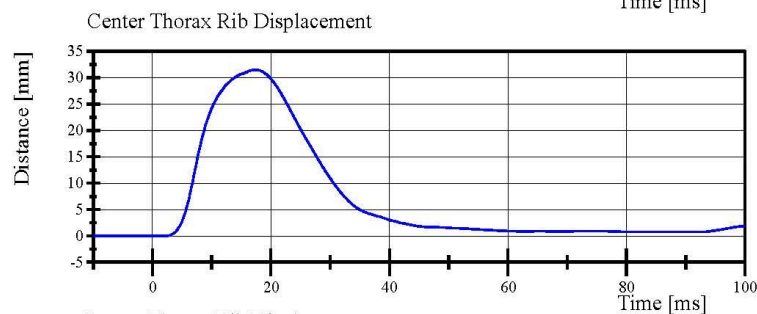
Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 20-1
Test Date: 3/3/2023



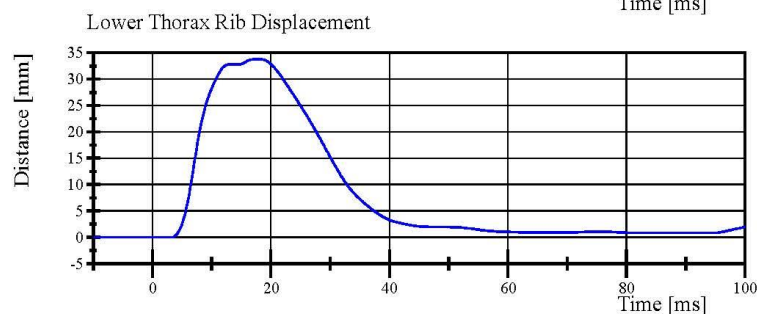
Filter Class: CFC_600
Max: 35.2 mm at 16.7 ms
Min: -1.1 mm at 33.3 ms



Filter Class: CFC_600
Max: 28.1 mm at 17.0 ms
Min: -0.0 mm at -6.8 ms



Filter Class: CFC_600
Max: 31.5 mm at 17.4 ms
Min: -0.0 mm at -1.0 ms



Filter Class: CFC_600
Max: 33.8 mm at 17.5 ms
Min: -0.0 mm at 3.1 ms

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

03.03.2023 10:52:26 641



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 20-1
Test Date: 3/3/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.325 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-16.4 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	36.6 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	41.4 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	39.0 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	15.3 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	10.3 g	Yes

Test meets specifications.

Condition: Used

Comments:

Upper Thorax Rib S/N: 180-3362 DP6492

Middle Thorax Rib S/N: 180-3362 DP6493

Lower Thorax Rib S/N: 180-3362 DP7664

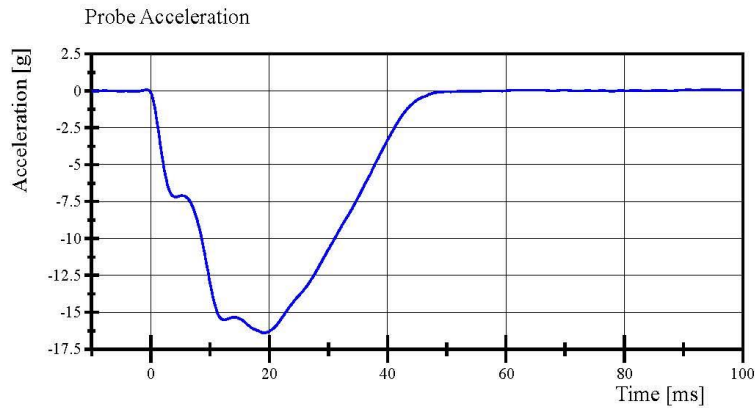
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

03.03.2023 09:57:26 878

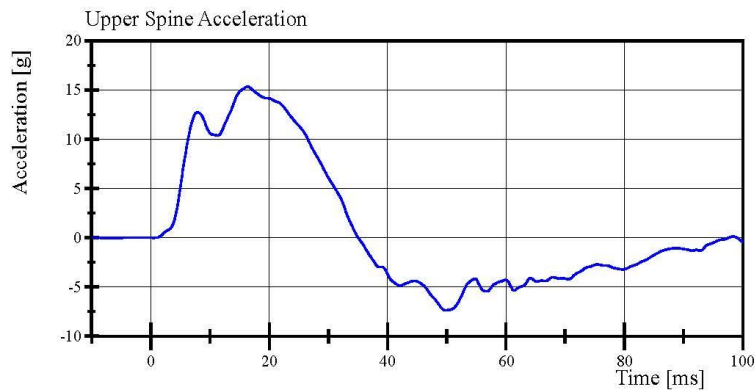


Transportation Research Center Inc.

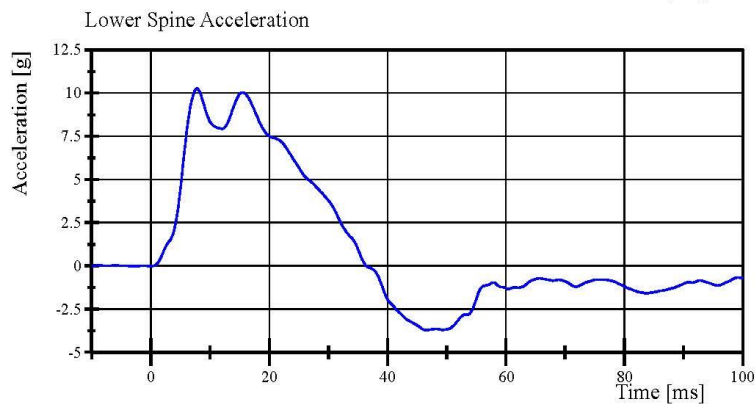
Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 20-1
Test Date: 3/3/2023



Filter Class: CFC_180
Max: 0.1 g at 93.7 ms
Min: -16.4 g at 19.1 ms



Filter Class: CFC_180
Max: 15.3 g at 16.3 ms
Min: -7.4 g at 49.8 ms



Filter Class: CFC_180
Max: 10.3 g at 7.8 ms
Min: -3.7 g at 46.5 ms

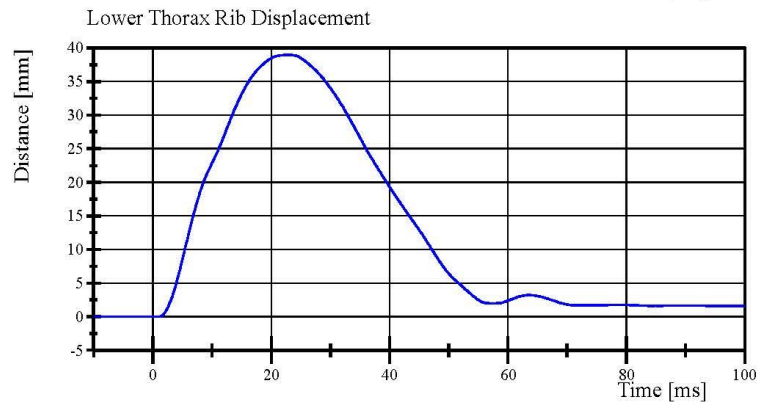
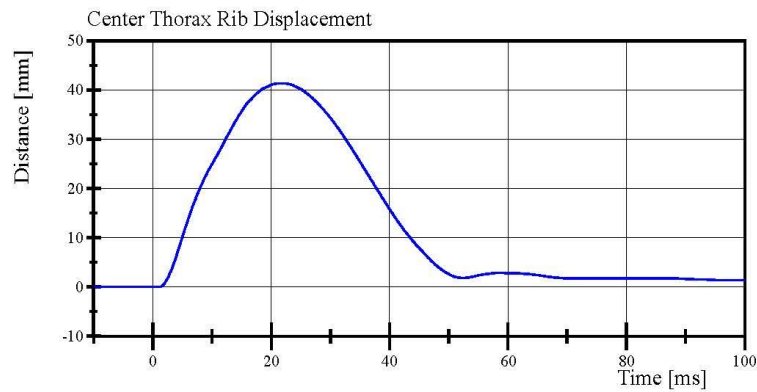
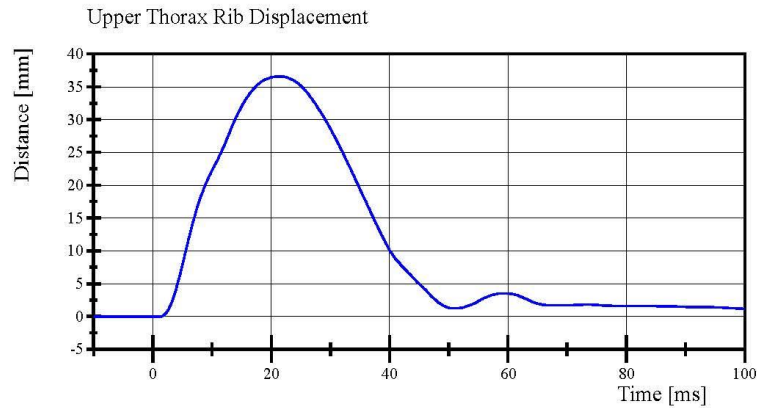
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

03.03.2023 09:58:06 878



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 20-1
Test Date: 3/3/2023



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

03.03.2023 09:58:07 878



Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. DQ0570 Certification No. 20-1

Test Date: 3/3/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.8 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	38.4 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	39.3 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	11.28 g	Yes

Test meets specifications.

Condition: Used

Comments:

Upper Abdominal Rib S/N: 180-3368 DP5142

Lower Abdominal Rib S/N: 180-3368 DP5143

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

03.03.2023 09:49:18 711

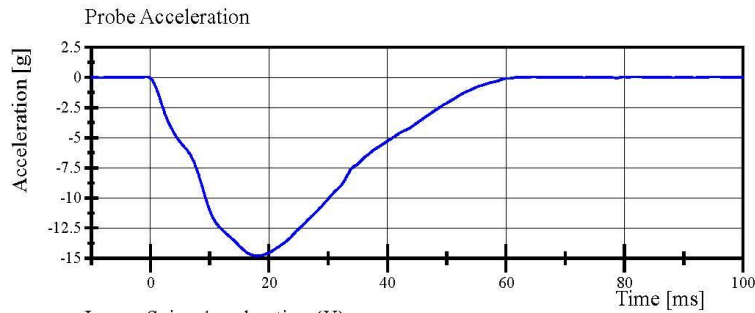


Transportation Research Center Inc.

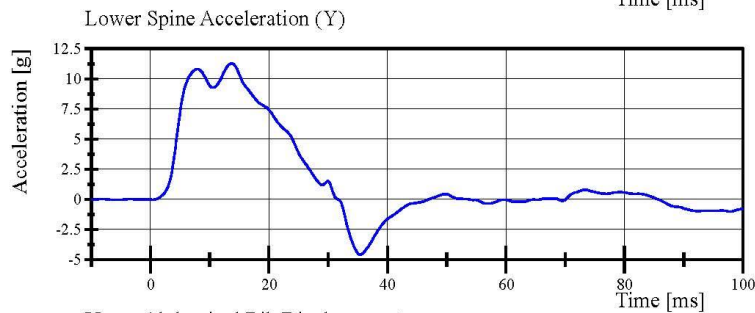
Left Lateral Abdomen

SID IIs Serial No. DQ0570 Certification No. 20-1

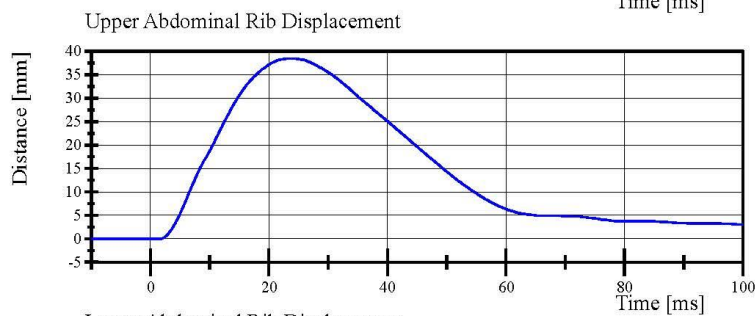
Test Date: 3/3/2023



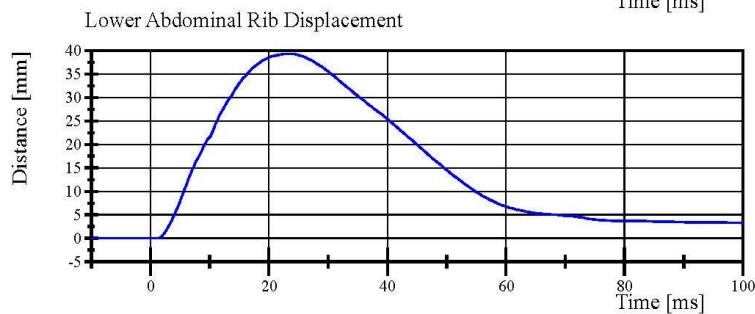
Filter Class: CFC_180
Max: 0.0 g at 82.2 ms
Min: -14.8 g at 18.0 ms



Filter Class: CFC_180
Max: 11.3 g at 13.7 ms
Min: -4.6 g at 35.4 ms



Filter Class: CFC_600
Max: 38.4 mm at 23.8 ms
Min: -0.0 mm at 1.6 ms



Filter Class: CFC_600
Max: 39.3 mm at 23.0 ms
Min: -0.0 mm at 1.0 ms

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

03.03.2023 09:49:46 711



Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. DQ0570 Certification No. 20-1

Test Date: 3/3/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.62 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-44.90 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	38.8 g	Yes
Acetabulum Force	3,600 - 4,300 N	3,967.5 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: 1173

Pelvis Plug Info:

Manufacturer: SACO

S/N: 13797

Cal Date: 20200508

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

03.03.2023 11:31:14 471

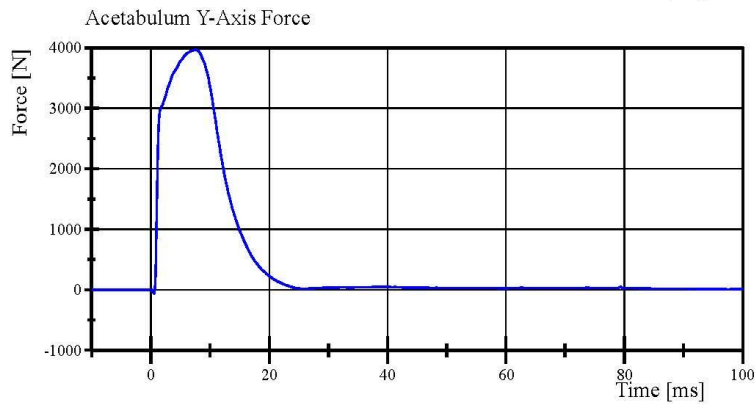
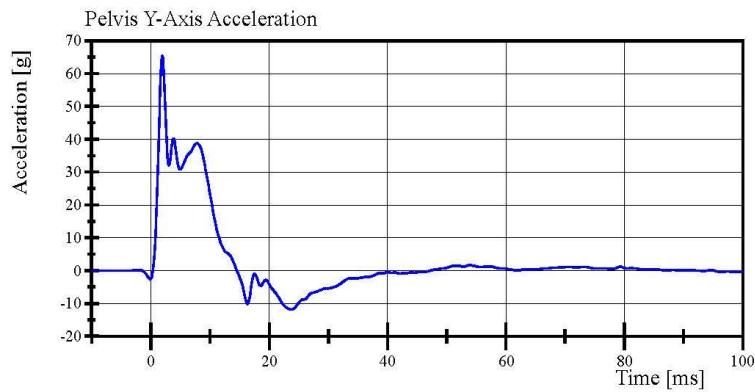
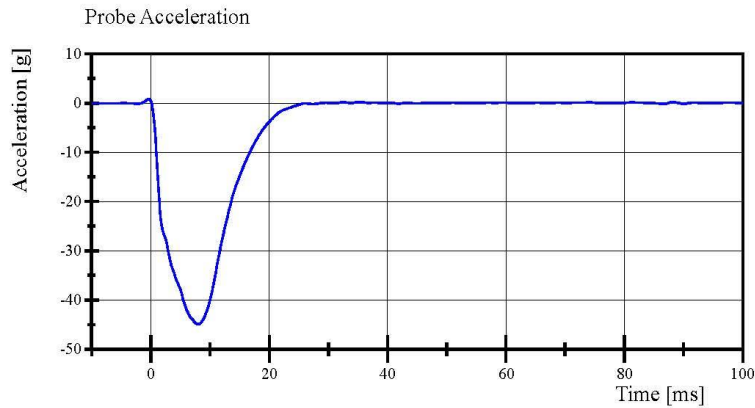


Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. DQ0570 Certification No. 20-1

Test Date: 3/3/2023



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

03.03.2023 11:32:31 471



Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. DQ0570 Certification No. 20-1

Test Date: 3/3/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.26 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-42.5 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	36.7 g	Yes
Iliac Force	4,100 - 5,100 N	4,890.9 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: 000173

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

03.03.2023 09:29:06 635

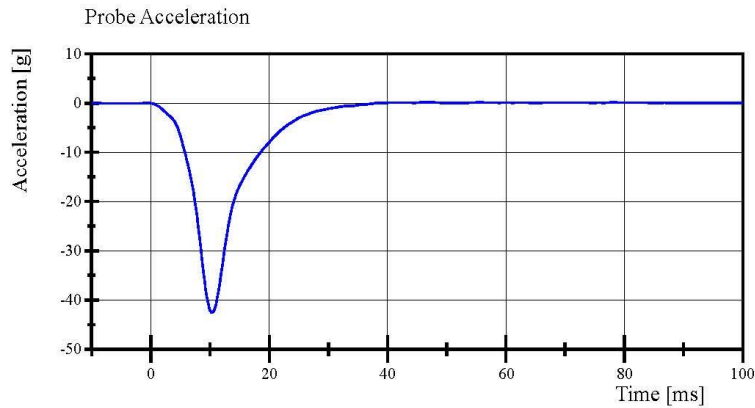


Transportation Research Center Inc.

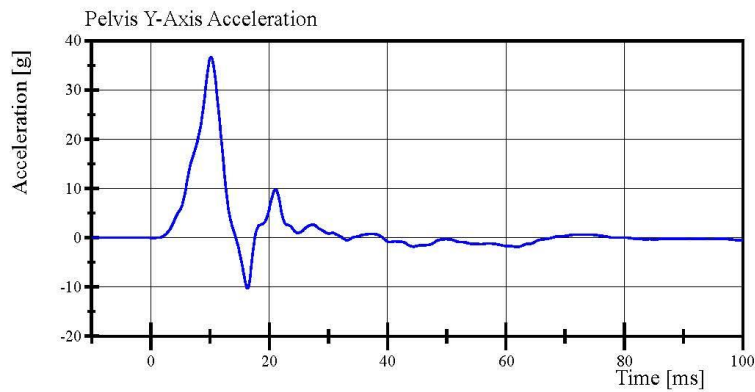
Left Lateral Iliac

SID IIs Serial No. DQ0570 Certification No. 20-1

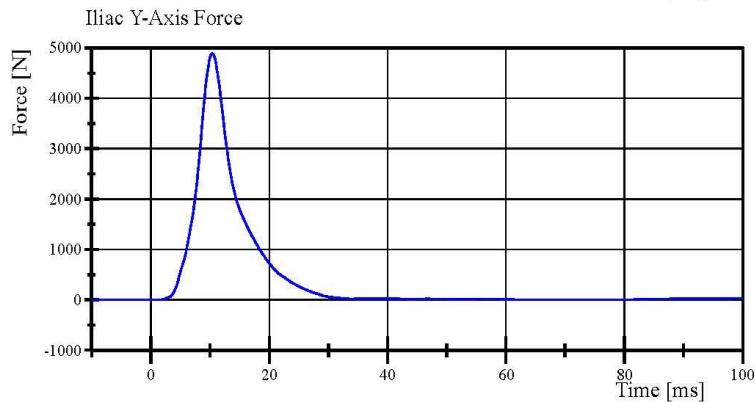
Test Date: 3/3/2023



Filter Class: CFC_180
Max: 0.2 g at 46.4 ms
Min: -42.5 g at 10.3 ms



Filter Class: CFC_180
Max: 36.7 g at 10.2 ms
Min: -10.3 g at 16.3 ms



Filter Class: CFC_600
Max: 4,890.9 N at 10.4 ms
Min: -0.7 N at -5.8 ms

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

03.03.2023 09:29:42 635



Post-Test Calibration Sheets
Driver S/N DQ0570

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. DQ0570 Calibration No. 21

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	785	Yes
B	Shoulder Pivot Height	437.0 - 453.0	445	Yes
C	H-Point Height	79.0 - 89.0	83	Yes
D	H-Point from Seat Back	141.0 - 151.0	147	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	101	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	45	Yes
I	Head Depth	178.0 - 188.0	184	Yes
J	Head Circumference	541.0 - 551.0	545	Yes
K	Buttock to Knee Length	514.0 - 540.0	533	Yes
L	Popliteal Height	343.0 - 369.0	353	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	400	Yes
N	Buttock Popliteal Length	416.0 - 442.0	427	Yes
O	Chest Depth without Jacket	195.0 - 211.0	200	Yes
P	Foot Length (right)	216.0 - 232.0	220	Yes
P	Foot Length (left)	216.0 - 232.0	220	Yes
Q	Hip Breadth	313.0 - 323.0	316	Yes
R	Arm Length	249.0 - 259.0	254	Yes
S	Knee Joint to seat Back	478.0 - 493.0	486	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	349	Yes
W	Foot Width (right)	78.0 - 94.0	84	Yes
W	Foot Width (left)	78.0 - 94.0	84	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	870	Yes
Z	Waist Circumference	761.0 - 791.0	780	Yes

Revised 9/29/2005



Report Number: DQ0570_S2H21

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Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. DQ0570 Certification No. 21-1

Test Date: 4/7/2023

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	134.5 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-4.9 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	< 15 %	1.15 %	Yes

Test meets specifications.

Condition: Used

Comments:

Head Skin S/N: DP8345

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

04.07.2023 10:40:27 234

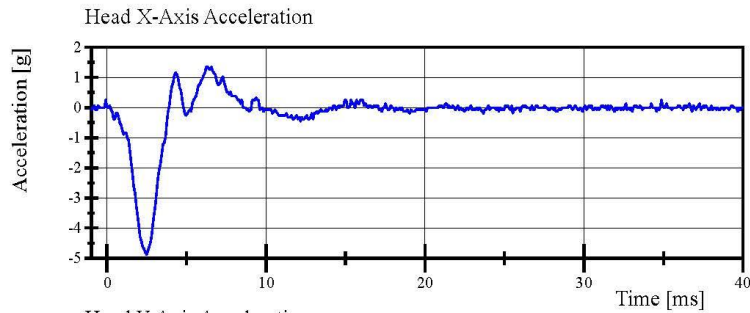


Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. DQ0570 Certification No. 21-1

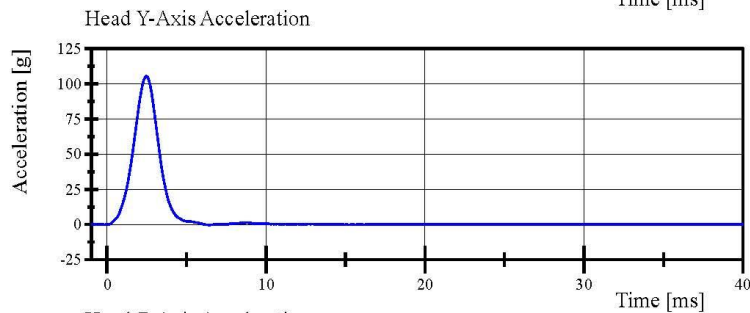
Test Date: 4/7/2023



Filter Class: CFC_1000

Max: 1.3 g at 6.2 ms

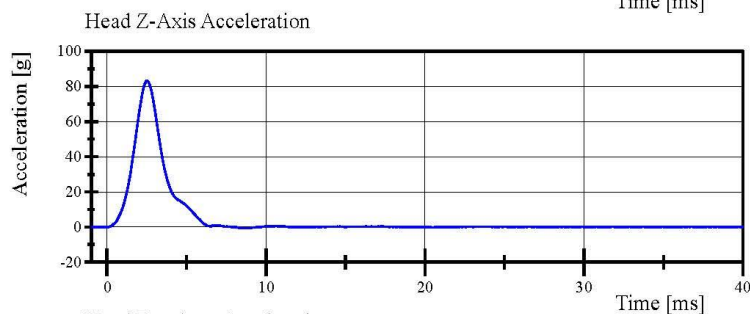
Min: -4.9 g at 2.5 ms



Filter Class: CFC_1000

Max: 105.6 g at 2.5 ms

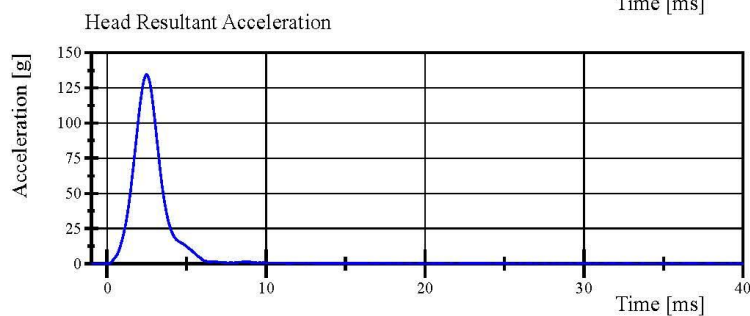
Min: -0.3 g at 6.4 ms



Filter Class: CFC_1000

Max: 83.2 g at 2.5 ms

Min: -0.6 g at 8.9 ms



Filter Class: CFC_1000

Max: 134.5 g at 2.5 ms

Min: 0.0 g at -0.2 ms

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

04.07.2023 10:40:51 234



Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 21-1

Test Date: 4/7/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.594 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.600 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.884 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	5.176 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.686 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.695 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-71.5 deg	Yes
Time of Peak	50 - 70 ms	58.2 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	41.1 N·m	Yes
Total Neck Occipital Condyles Moment			
Decay Time to 0 N·m	102 - 126 ms	109.8 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 717

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

04.07.2023 11:01:07 751

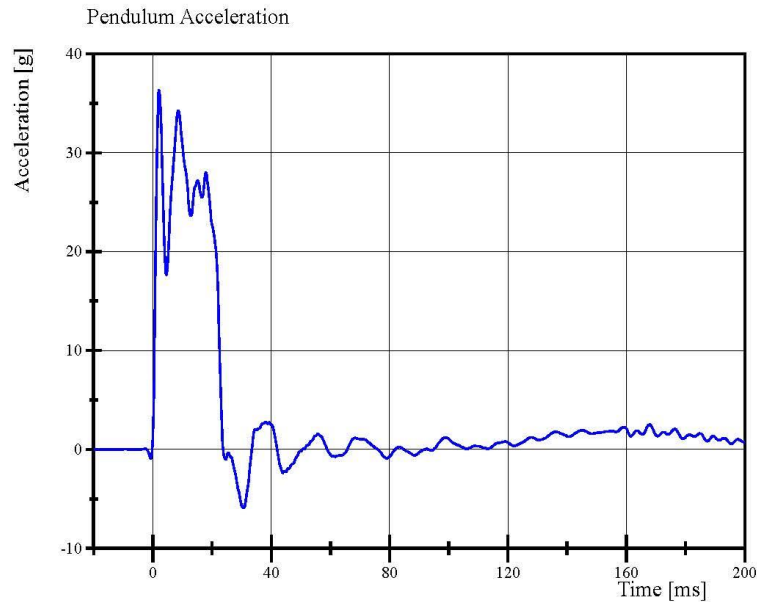


Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 21-1

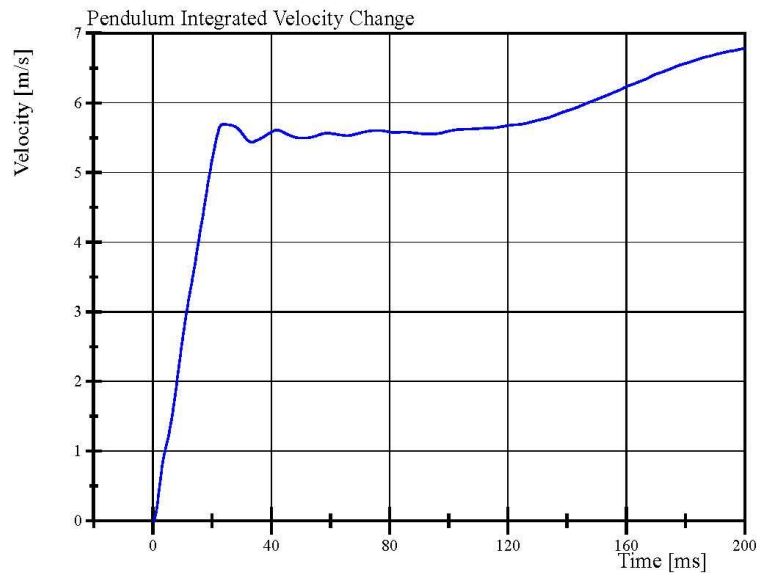
Test Date: 4/7/2023



Filter Class: CFC_180

Max: 36.3 g at 2.1 ms

Min: -5.9 g at 30.7 ms



Filter Class: CFC_180

Max: 6.8 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

04.07.2023 11:01:30 751

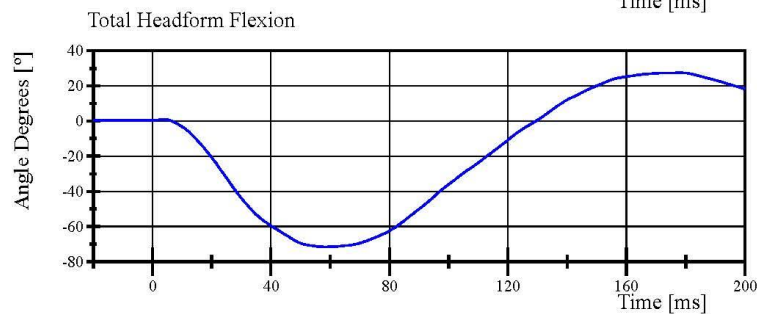
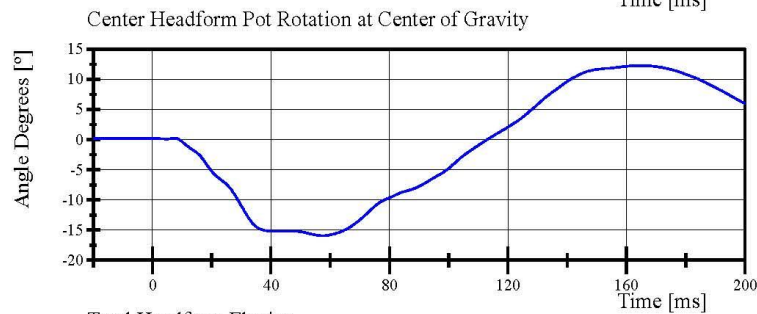
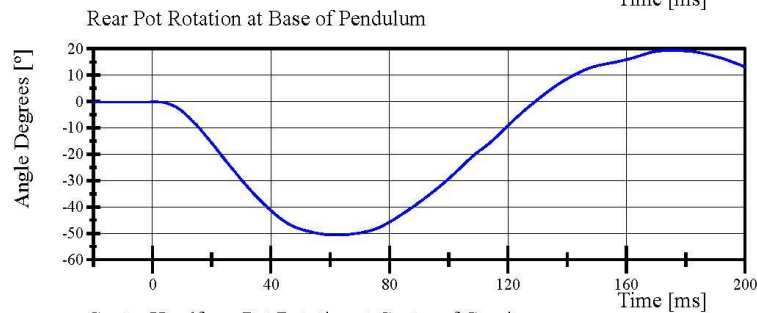
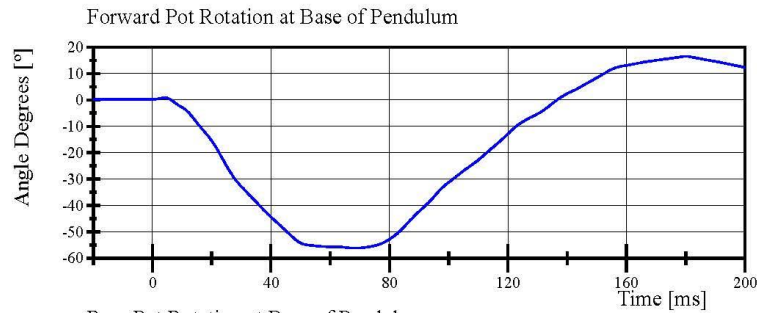


Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 21-1

Test Date: 4/7/2023



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

04.07.2023 11:01:30 751



Transportation Research Center Inc.

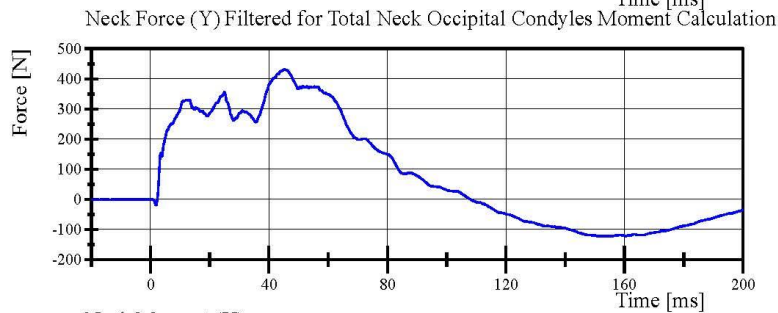
Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 21-1

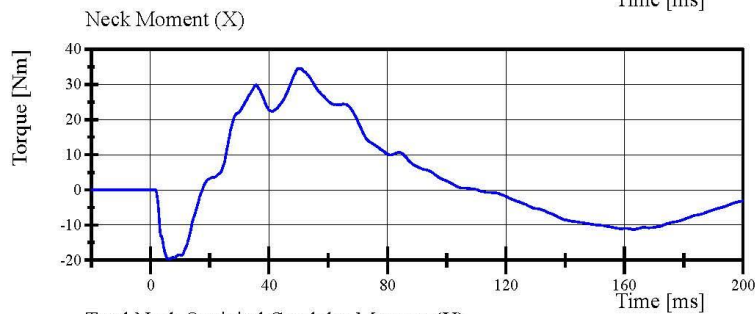
Test Date: 4/7/2023



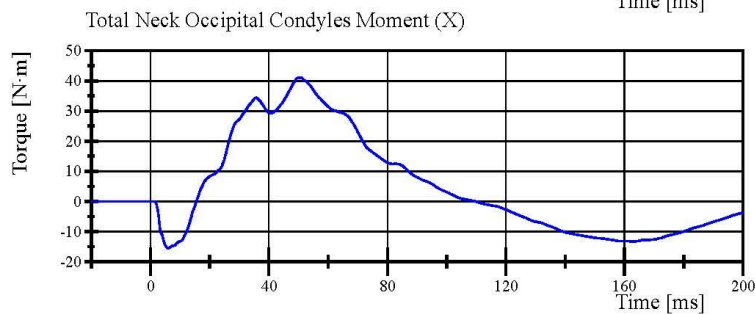
Filter Class: CFC_1000
Max: 432.0 N at 45.3 ms
Min: -123.3 N at 153.6 ms



Filter Class: CFC_600
Max: 431.6 N at 45.3 ms
Min: -122.8 N at 153.7 ms



Filter Class: CFC_600
Max: 34.6 Nm at 50.0 ms
Min: -19.7 Nm at 6.2 ms



Filter Class: Without_(Constar
Max: 41.1 N·m at 50.1 ms
Min: -15.5 N·m at 5.9 ms

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

04.07.2023 11:01:31 751



Transportation Research Center Inc.

Left Lateral Shoulder

SID IIs Serial No. DQ0570 Certification No. 21-1

Test Date: 4/7/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.1 g	Yes
Shoulder Displacement	28 - 37 mm	31.3 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	18.6 g	Yes

Test meets specifications.

Condition: Used

Comments:

Left Arm S/N: DP8451

Shoulder Rib S/N: DO9814

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

04.07.2023 08:25:05 855

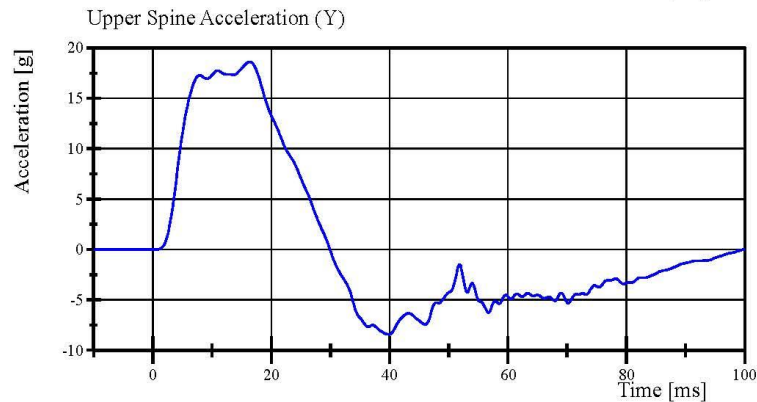
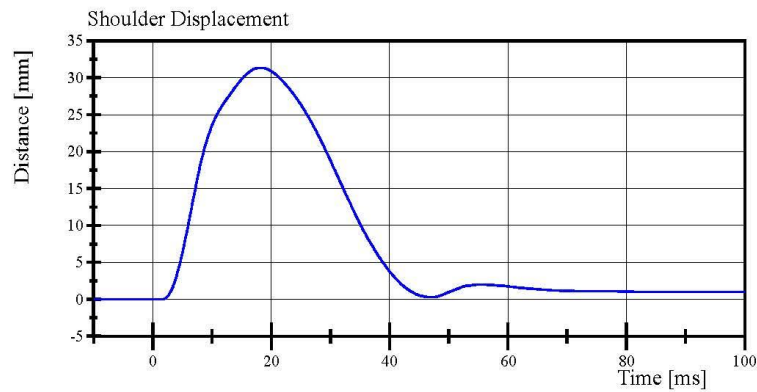
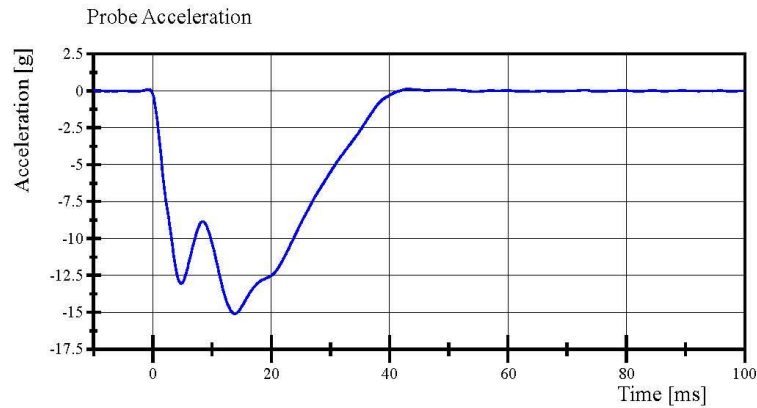


Transportation Research Center Inc.

Left Lateral Shoulder

SID IIs Serial No. DQ0570 Certification No. 21-1

Test Date: 4/7/2023



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

04.07.2023 08:25:33 855



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 21-1
Test Date: 4/7/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.688 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-34.2 g	Yes
Shoulder Displacement	31 - 40 mm	36.2 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	28.8 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	31.6 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	33.3 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	36.5 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	35.7 g	Yes

Test meets specifications.

Condition: Used

Comments:

Left Arm S/N: DP8451

Shoulder Rib S/N: 180-3355 DO9814

Upper Thorax Rib S/N: 180-3362 DP6492

Middle Thorax Rib S/N: 180-3362 DP6493

Lower Thorax Rib S/N: 180-3362 DP7664

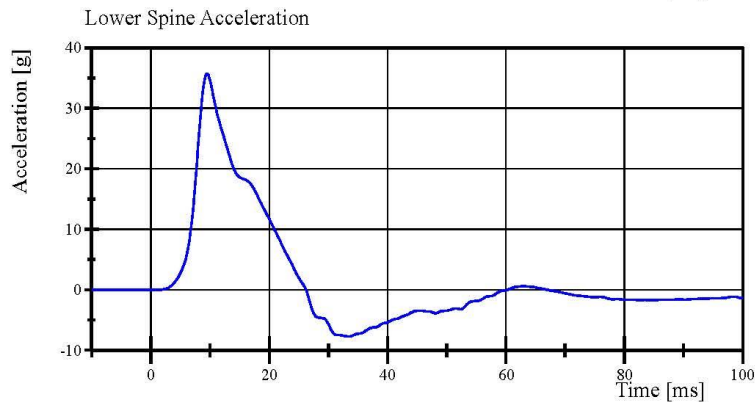
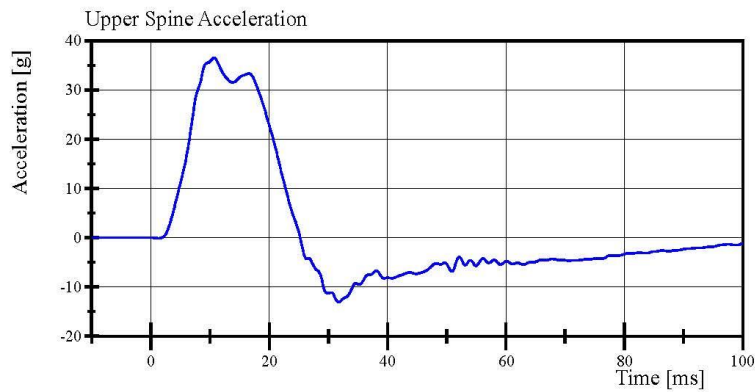
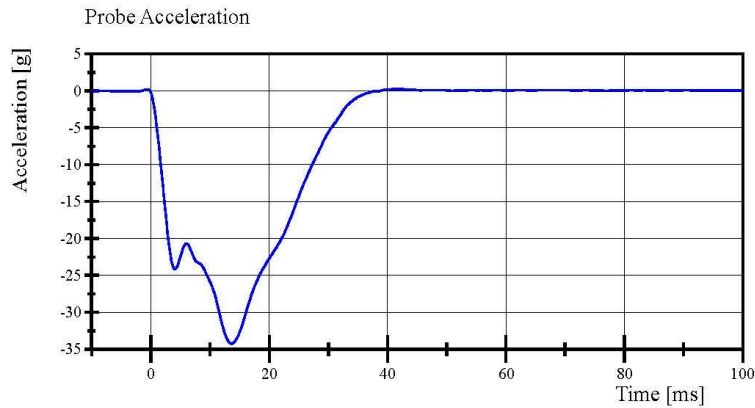
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

04.07.2023 09:14:06 636



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 21-1
Test Date: 4/7/2023



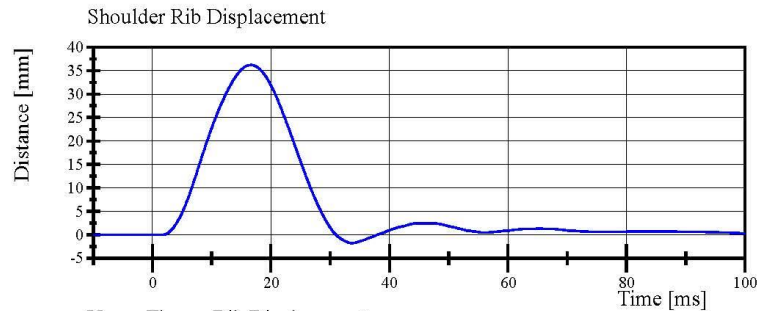
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

04.07.2023 09:19:52 636

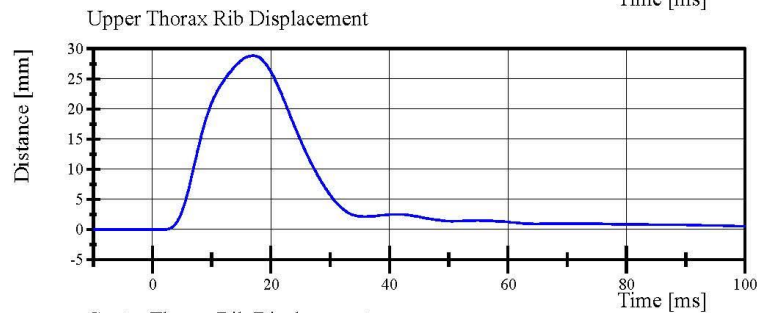


Transportation Research Center Inc.

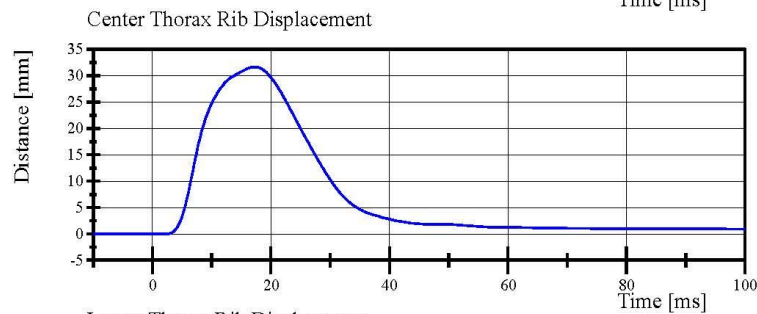
Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 21-1
Test Date: 4/7/2023



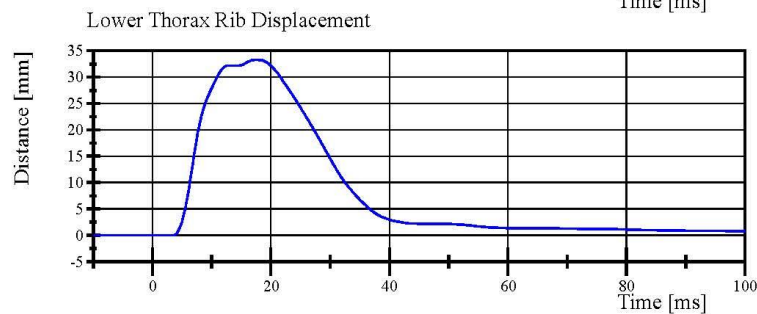
Filter Class: CFC_600
Max: 36.2 mm at 16.7 ms
Min: -1.8 mm at 33.7 ms



Filter Class: CFC_600
Max: 28.8 mm at 17.0 ms
Min: -0.0 mm at -10.0 ms



Filter Class: CFC_600
Max: 31.6 mm at 17.2 ms
Min: -0.0 mm at -3.0 ms



Filter Class: CFC_600
Max: 33.3 mm at 17.5 ms
Min: -0.0 mm at 3.4 ms

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

04.07.2023 09:19:52 636



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 21-1
Test Date: 4/7/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.322 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-16.3 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	36.9 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	41.8 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	39.0 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	15.4 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	10.1 g	Yes

Test meets specifications.

Condition: Used

Comments:

Upper Thorax Rib S/N: 180-3362 DP6492

Middle Thorax Rib S/N: 180-3362 DP6493

Lower Thorax Rib S/N: 180-3362 DP7664

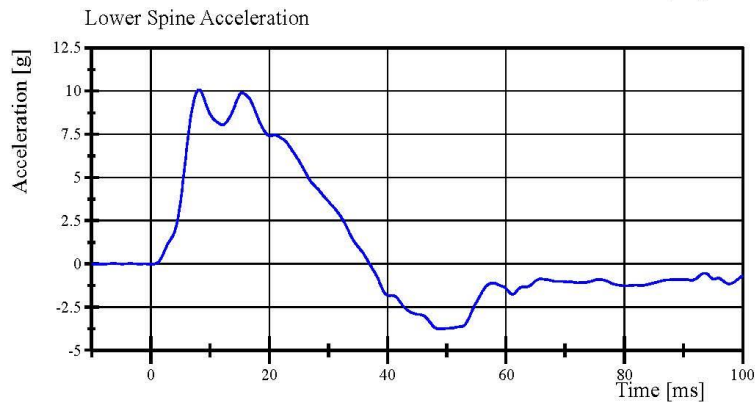
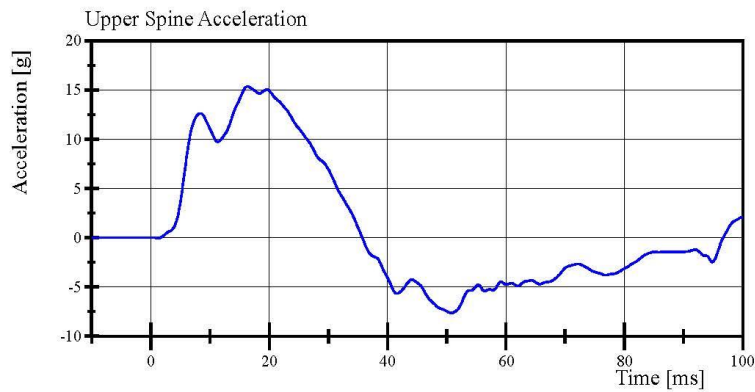
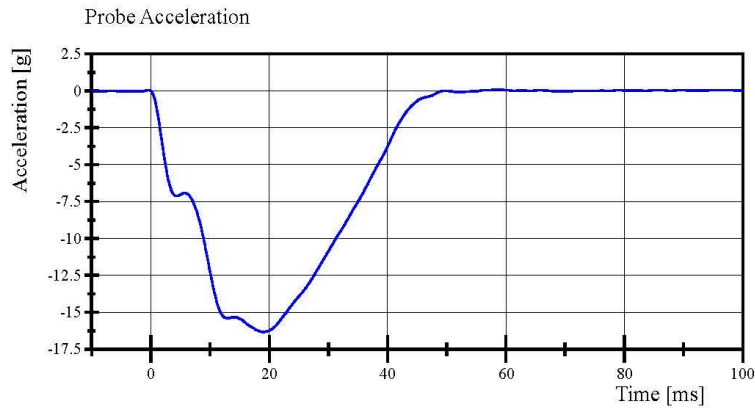
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

04.07.2023 08:41:35 886



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 21-1
Test Date: 4/7/2023



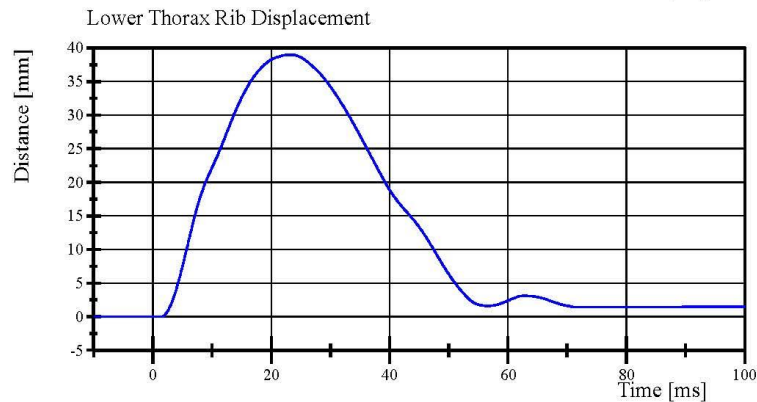
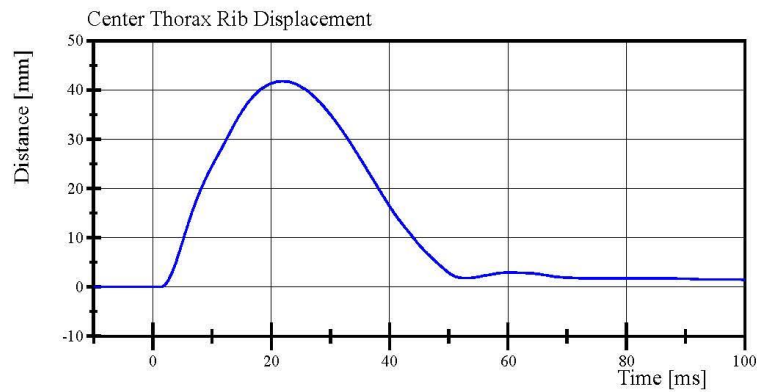
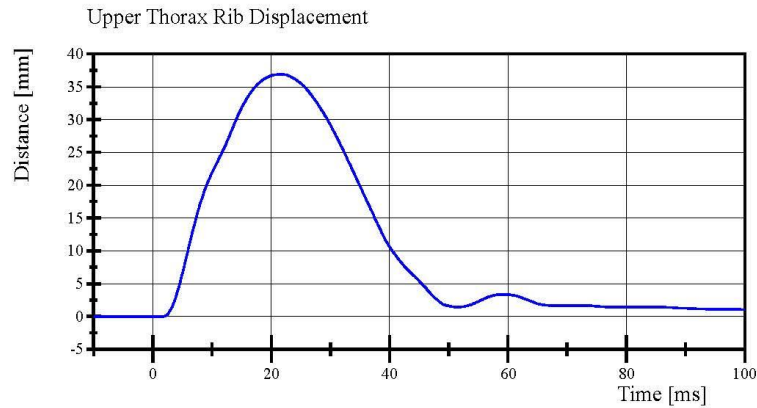
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

04.07.2023 08:42:13 886



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 21-1
Test Date: 4/7/2023



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

04.07.2023 08:42:13 886



Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. DQ0570 Certification No. 21-1

Test Date: 4/7/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.27 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.9 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	39.1 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	36.5 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	11.50 g	Yes

Test meets specifications.

Condition: Used

Comments:

Upper Abdominal Rib S/N: 180-3368 DP5142

Lower Abdominal Rib S/N: 180-3368 DP5143

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

04.07.2023 08:32:28 701

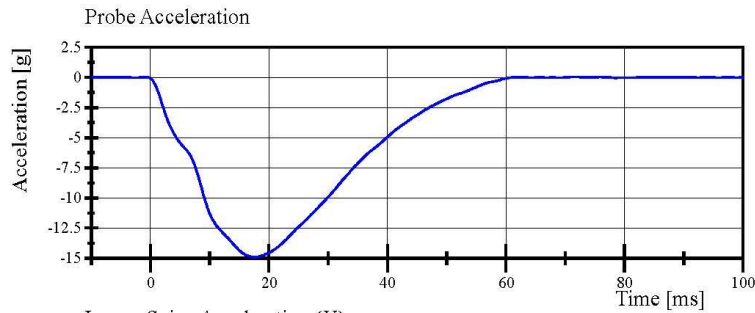


Transportation Research Center Inc.

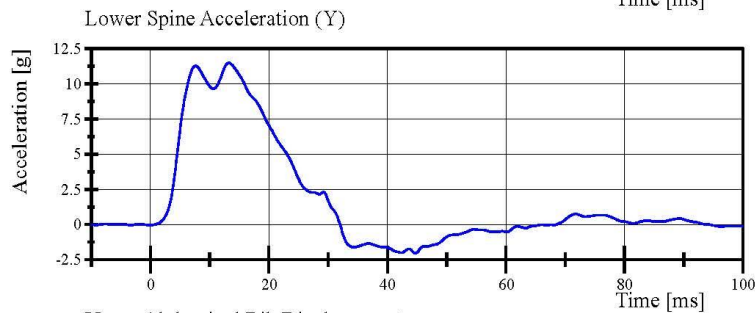
Left Lateral Abdomen

SID IIs Serial No. DQ0570 Certification No. 21-1

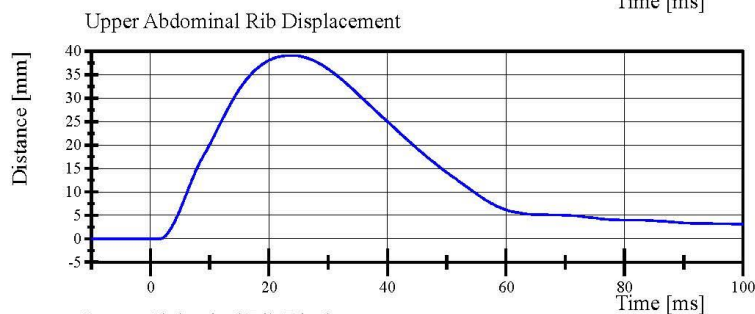
Test Date: 4/7/2023



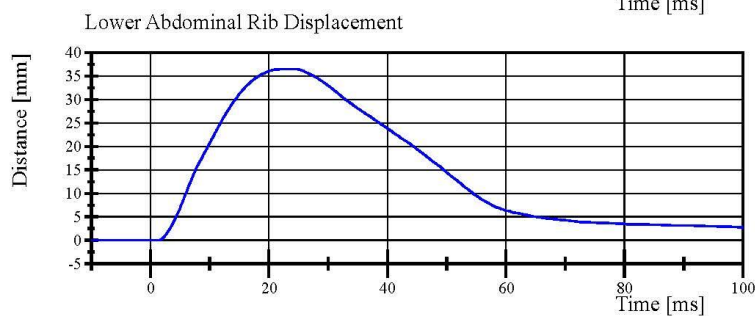
Filter Class: CFC_180
Max: 0.0 g at 71.6 ms
Min: -14.9 g at 17.6 ms



Filter Class: CFC_180
Max: 11.5 g at 13.2 ms
Min: -2.0 g at 44.6 ms



Filter Class: CFC_600
Max: 39.1 mm at 23.8 ms
Min: -0.0 mm at 1.5 ms



Filter Class: CFC_600
Max: 36.5 mm at 23.3 ms
Min: -0.0 mm at 1.0 ms

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

04.07.2023 08:32:58 701



Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. DQ0570 Certification No. 21-1

Test Date: 4/7/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.62 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-43.80 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	38.4 g	Yes
Acetabulum Force	3,600 - 4,300 N	3,798.5 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: 1173

Pelvis Plug Info:

Manufacturer: SACO

S/N: 13811

Cal Date: 20200508

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

04.07.2023 10:01:17.454

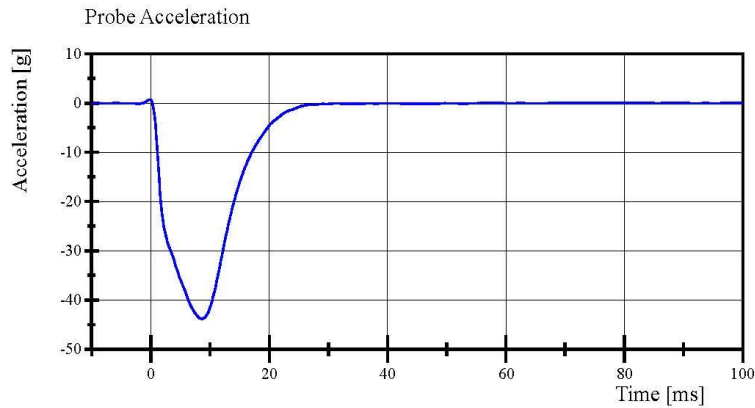


Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. DQ0570 Certification No. 21-1

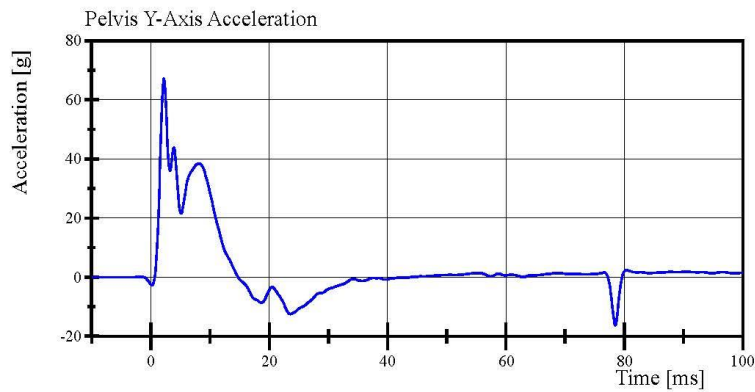
Test Date: 4/7/2023



Filter Class: CFC_180

Max: 0.7 g at -0.2 ms

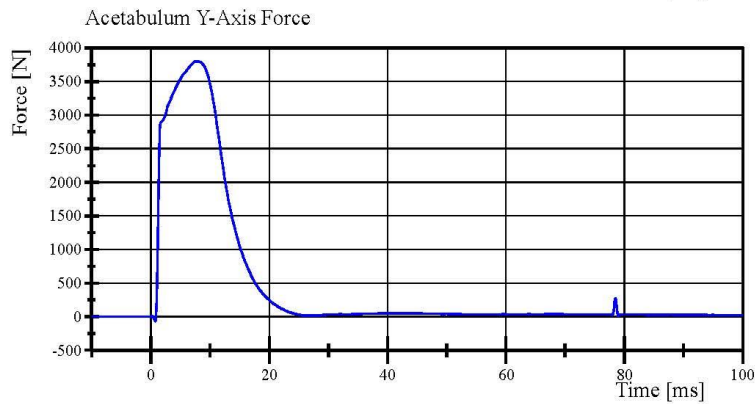
Min: -43.8 g at 8.6 ms



Filter Class: CFC_180

Max: 67.2 g at 2.2 ms

Min: -16.4 g at 78.5 ms



Filter Class: CFC_600

Max: 3,798.5 N at 7.6 ms

Min: -67.7 N at 0.7 ms

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

04.07.2023 10:02:42 454



Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. DQ0570 Certification No. 21-4

Test Date: 4/12/2023

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.25 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-43.4 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	39.4 g	No
Iliac Force	4,100 - 5,100 N	5,145.7 N	No

Test does not meet specifications.

Condition: Used

Comments:

Pelvis Skin S/N: 000173

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

04.12.2023 10:33:21 691

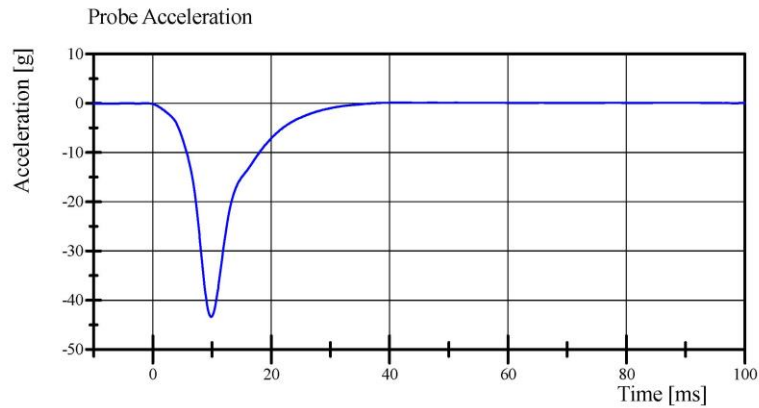


Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. DQ0570 Certification No. 21-4

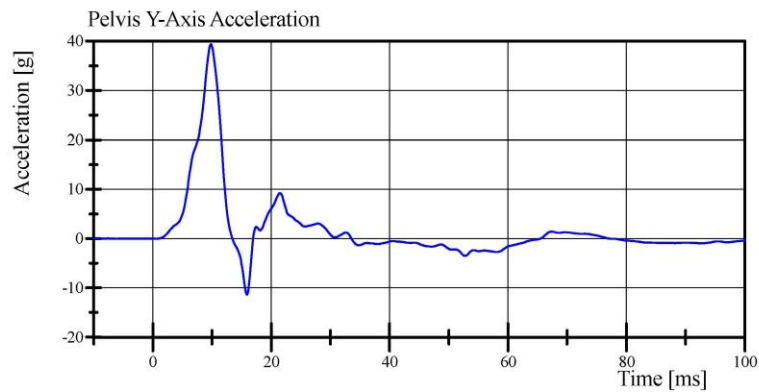
Test Date: 4/12/2023



Filter Class: CFC_180

Max: 0.2 g at 42.9 ms

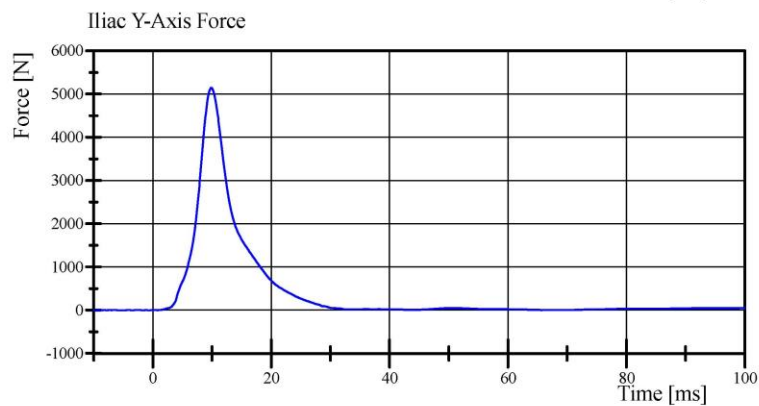
Min: -43.4 g at 9.8 ms



Filter Class: CFC_180

Max: 39.4 g at 9.8 ms

Min: -11.4 g at 15.9 ms



Filter Class: CFC_600

Max: 5,145.7 N at 9.8 ms

Min: -0.6 N at -5.6 ms

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

04.12.2023 10:34:31 691



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	13-Feb-2023
	Y		T10352	Endevco	13-Feb-2023
	Z		P87064	Endevco	14-Feb-2023
Redundant Head Accelerometers	X		T16771	Endevco	13-Feb-2023
	Y		P83368	Endevco	13-Feb-2023
	Z		P91904	Endevco	13-Feb-2023
Thoracic Rib Displacement Potentiometers	Upper	Y	111	Honeywell	14-Feb-2023
	Middle	Y	174	FTSS	14-Feb-2023
	Lower	Y	0913	Honeywell	14-Feb-2023
Abdomen Load Cells	Front	Y	1441	Denton	14-Feb-2023
	Middle	Y	1436	Denton	14-Feb-2023
	Rear	Y	1437	Denton	14-Feb-2023
Lower Spine Accelerometers (T12)	X		T11866	Endevco	13-Feb-2023
	Y		P91615	Endevco	13-Feb-2023
	Z		P64884	Endevco	13-Feb-2023
Acetabulum Load Cell		Y	N/A	N/A	N/A
Pubic Symphysis Load Cell		Y	465-FY	Denton	14-Feb-2023

TABLE 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N DQ0570			
				Serial Number	Manufacturer	Calibration Date	
Head Accelerometers				X	T11432	Endevco	10-Feb-2023
				Y	P93774	Endevco	10-Feb-2023
				Z	P91566	Endevco	10-Feb-2023
Redundant Head Accelerometers				X	P93766	Endevco	10-Feb-2023
				Y	P93762	Endevco	10-Feb-2023
				Z	P93761	Endevco	10-Feb-2023
Displacement Potentiometers	Shoulder			N/A	N/A	N/A	N/A
	Thoracic Rib	Upper	Y	007	Servo	13-Feb-2023	
		Middle	Y	037	Servo	13-Feb-2023	
		Lower	Y	048	Servo	13-Feb-2023	
	Abdominal Rib	Upper	Y	1295	Servo	13-Feb-2023	
		Lower	Y	1136	Servo	13-Feb-2023	
Lower Spine Accelerometers (T12)				X	P94545	Endevco	10-Feb-2023
				Y	P94647	Endevco	10-Feb-2023
				Z	P94530	Endevco	10-Feb-2023
Acetabulum Load Cell				Y	DK7483S-FY	FTSS	13-Feb-2023
Iliac Wing Load Cell				Y	287-FY	Denton	13-Feb-2023
Pelvis Plug (struck side)					13800	SACO	8-May-2020
Pelvis Plug (non-struck side)					13803	SACO	8-May-2020

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A300441	Measurement Specialties	7-Oct-2022
	Vehicle Center of Gravity	Y	A298374	Measurement Specialties	28-Mar-2023
	Vehicle Center of Gravity	Z	A378309	Measurement Specialties	29-Mar-2023
2	Right Sill at Front Seat	X	A381829	Measurement Specialties	29-Mar-2023
	Right Sill at Front Seat	Y	A300432	Measurement Specialties	29-Mar-2023
	Right Sill at Front Seat	Z	A318447	Measurement Specialties	28-Mar-2023
3	Right Sill at Rear Seat	X	A230699	Measurement Specialties	28-Mar-2023
	Right Sill at Rear Seat	Y	A381823	Measurement Specialties	28-Mar-2023
	Right Sill at Rear Seat	Z	A377406	Measurement Specialties	29-Mar-2023
4	Left Sill at Front Door	Y	A297050	Measurement Specialties	29-Mar-2023
5	Left Sill at Rear Door	Y	A298329	Measurement Specialties	29-Mar-2023
6	Left A-Post Lower	Y	A300430	Measurement Specialties	29-Mar-2023
7	Left A-Post Middle	Y	A222964	Measurement Specialties	29-Mar-2023
8	Left B-Post Lower	Y	A367454	Measurement Specialties	28-Mar-2023
9	B-Post Middle	Y	A381830	Measurement Specialties	29-Mar-2023
10	Front Seat Track	Y	A378311	Measurement Specialties	29-Mar-2023
11	Rear Seat Track or Structure	Y	A386354	Measurement Specialties	28-Mar-2023
12	Right Rear Occupant Compartment	Y	A298339	Measurement Specialties	7-Oct-2022
13	Engine Block	X	A300452	Measurement Specialties	29-Mar-2023
	Engine Block	Y	A381834	Measurement Specialties	29-Mar-2023
14	Rear Floorpan Above Axle	X	A377197	Measurement Specialties	28-Mar-2023
	Rear Floorpan Above Axle	Y	A378379	Measurement Specialties	28-Mar-2023
	Rear Floorpan Above Axle	Z	A298558	Measurement Specialties	29-Mar-2023

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	A378352	Measurement Specialties	7-Oct-2022
MDB Center of Gravity	Y	A300428	Measurement Specialties	7-Oct-2022
MDB Center of Gravity	Z	A227171	Measurement Specialties	6-Oct-2022
Left Frame Rail at Rear Axle Centerline	X	A349899	Measurement Specialties	10-Nov-2022
Left Frame Rail at Rear Axle Centerline	Y	A349898	Measurement Specialties	10-Nov-2022