

FINAL REPORT NUMBER: SPNCAP-TRC-24-004

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

**KIA CORPORATION
2024 Kia Carnival
NHTSA NUMBER: M20244214**

**PREPARED BY:
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Report Date: December 23, 2024

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: December 23, 2024

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

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Technical Report Documentation Page

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16. Abstract A 32.2 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject vehicle, a 2024 Kia Carnival, in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. This test was conducted by Transportation Research Center Inc. in East Liberty, Ohio, on July 24, 2024. The impact velocity was 32.17 km/h, and the ambient temperature at the struck (left) side of the target vehicle at the time of impact was 21.6° C. The test vehicle's post-test maximum crush was 357 mm at Level 2. The test or target vehicle's performance is given below: <table border="1"> <thead> <tr> <th></th><th>Unit</th><th>Threshold</th><th>Front SID-IIs</th></tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆):</td><td>NA</td><td>1000</td><td>199.810</td></tr> <tr> <td>Resultant Lower Spine Acceleration:</td><td>g's</td><td>82</td><td>35.330</td></tr> <tr> <td>Total Pelvic Force: (sum of acetabular and iliac forces)</td><td>N</td><td>5525</td><td>3291.50</td></tr> <tr> <td>Maximum Thoracic Rib Deflection</td><td>mm</td><td>38*</td><td>20.890</td></tr> <tr> <td>Maximum Abdomen Rib Deflection</td><td>mm</td><td>45*</td><td>23.910</td></tr> </tbody> </table> * Proposed IARV The doors on the struck side did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.					Unit	Threshold	Front SID-IIs	Head Injury Criteria (HIC ₃₆):	NA	1000	199.810	Resultant Lower Spine Acceleration:	g's	82	35.330	Total Pelvic Force: (sum of acetabular and iliac forces)	N	5525	3291.50	Maximum Thoracic Rib Deflection	mm	38*	20.890	Maximum Abdomen Rib Deflection	mm	45*	23.910
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17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave Washington, DC 20590																									
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SECTION 1

TEST PURPOSE AND PROCEDURE

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY24 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 2024 Kia Carnival manufactured by KIA CORPORATION. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated March 2020.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a model year 2024 Kia Carnival. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.17 km/h. The side impact test was conducted by Transportation Research Center Inc. in East Liberty, OH, on July 24, 2024. Pre-test and post-test photographs of the test vehicle and the side impact dummy (SID-IIs) are included in Appendix A of this report.

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

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

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

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

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

Measurement Description	Driver ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC ₃₆)	NA	1000	199.810
Lower Spine Acceleration Resultant	G	82	35.330
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3291.50
Maximum Thoracic Rib Deflection	mm	38*	20.890
Maximum Abdominal Rib Deflection	mm	45*	23.910

* Proposed IARV

Supplemental restraint information is given below:

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	N/A
Side Torso 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

GENERAL COMMENTS

Left Floor Sill AY; CF at 15.0 ms

Left Lower A-Post AY; CF at 34.0 ms

Left Mid A-Post AY; CF at 25.0 ms

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20244214
Model Year	2024
Make	Kia
Model	Carnival
Body Style	MPV
VIN	KNDNB4H3XR6441540
Body Color	Flare Red
Odometer Reading (km/mi)	14 mi
Engine Displacement (L)	3.5
Type/No. Cylinders	V/6
Engine Placement	Front
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes, Driver
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	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other	No

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

No

DATA FROM CERTIFICATION LABEL

Manufactured By	KIA CORPORATION
Date of Manufacturer	03/24
Vehicle Type	MPV

GVWR (LB)	5952
GAWR Front (LB)	3064
GAWR Rear (LB)	3263

VEHICLE SEATING AND WEIGHT CAPACITY DATA

	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	3	8
Vehicle Capacity Weight (VCW) (kg)				600.0
DSC X 68.0 kg				544.0
Rated Cargo and Luggage Weight (RCLW) (kg)				56.0

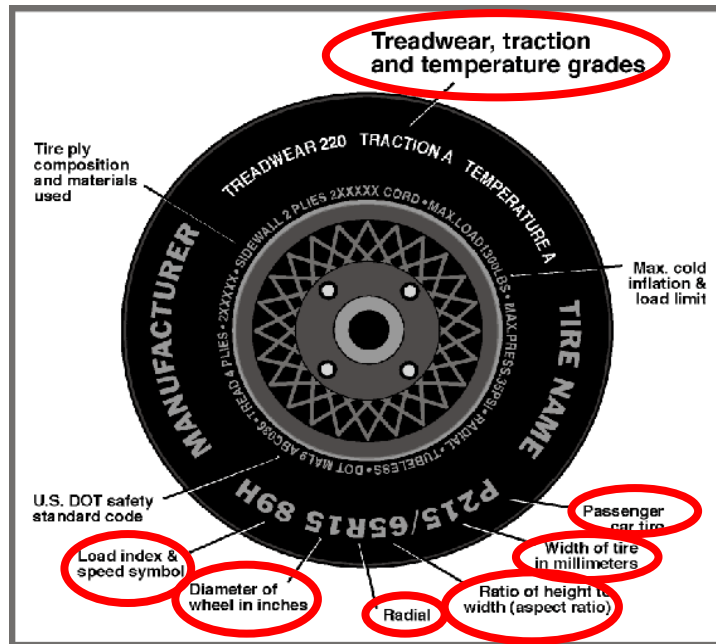
VEHICLE SEAT TYPE

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	N/A	Yes	N/A
Third row seat	N/A	N/A	Yes	N/A	N/A	Yes	N/A

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

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	255	255
Recommended Tire Size	235/65R17	235/65R17
Tire Size on Vehicle	235/65R17	235/65R17
Tire Manufacturer	Hankook	Hankook
Tire Model	Dynapro	Dynapro
Treadwear	540	540
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	6	6
Load Index/Speed Symbol	104H	104H
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	DOT 15M8R RT H0 0624	DOT 15M8R RT H0 0624
DOT Safety Code Right	DOT 15M8R RT H0 0624	DOT 15M8R RT H0 0624

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

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	248	248	248	248
Tire Placard	kPa	255	255	255	255
Owner's Manual	kPa	255	255	255	255
As Tested	kPa	255	255	255	255

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	578.2	463.8		598.2	504.0		599.6	511.2	
Right	kg	580.6	441.6		573.4	485.8		584.8	473.6	
Ratio	%	56.1	43.9		54.2	45.8		54.6	45.4	
Totals	kg	1158.8	905.4	2064.2	1171.6	989.8	2161.4	1184.4	984.8	2169.2

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total As Delivered Weight (UVW)	kg	2064.2
Actual Weight of 1 P572V ATD (SID-IIs) Dummy Used	kg	49.0
Rated Cargo/Luggage Weight (RCLW)	kg	56.0
Calculated Vehicle Target Weight (TVTW)	kg	2169.2

(A)
 (B)
 (C)
 (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

	Units	As Delivered	As Tested	Fully Loaded	Meets Requirement***
Driver Door Sill Angle (front-to-rear)*	Deg.	-0.2	0.3	0.3	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg.	-0.2	-0.2	-0.3	Yes
Front Bumper-Line Angle (left-to-right)**	Deg.	0.0	0.0	-0.1	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg.	0.0	-0.1	-0.2	Yes
Vehicle CG (Aft of Front Axle)	mm	1357	1417	1405	
Vehicle CG (Left (+) / Right (-) from longitudinal Centerline)	mm	8	17	21	

*ND=Nose Down (-), NU=Nose Up (+) **LD=Left Down (-), LU=Left Up (+)

*** The "As Tested" vehicle attitude measurements must be equal to or between the "As Delivered" and "Fully Loaded" vehicle attitude measurements. Indicate "Yes" or "No" for "Meets Requirements".

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

Test Vehicle: 2024 Kia Carnival
Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
Test Date: 7/24/2024

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Ballast: Steel plate	41.2
Components Removed: None	0.0

Test height adjustable suspension setting, if applicable:

N/A

TEST SURFACE MARKINGS

	Distance from 75° Impact Location Line (mm)
Fore 25 mm target	1760
Aft 25 mm target	1920

DATA SHEET NO. 2

SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL(°)		
	Max.	Min.	Mid
Driver Seat	19.8	9.8	14.8
Front Passenger Seat	Fixed	Fixed	Fixed
Front Center Seat*	N/A	N/A	N/A
Struck Side Rear Seat	N/A	N/A	N/A
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	14.8	293	Max	323	327	335
			Mid	293	295	302
			Min	263	264	270
Front Passenger Seat	Fixed	Fixed	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	N/A	N/A	N/A
Front Center Seat*	N/A	N/A	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	N/A	N/A	N/A
Struck Side Rear Seat	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
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 SYSTEMS DATA

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024

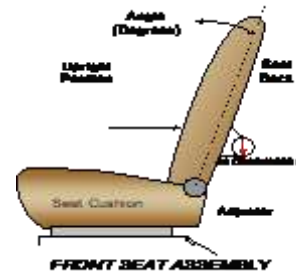
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position from Forward most Position	
	mm	Detents*	mm	Detent*
Driver Seat	220	Power	140	Power
Front Passenger Seat	240	61	0	0
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	N/A	N/A	N/A	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 such that the dummy's head is level. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck-side rear passenger seat back is positioned in accordance with the information provided by the manufacturer on Form No. 1. For the 5th percentile female dummy in a Side NCAP MDB test. The rear center and non-struck side rear passenger's seat back is set to match 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	64.7	N/A	28	N/A
Front Passenger Seat	63.4	N/A	28	N/A
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	N/A	N/A	N/A	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 BELT ANCHORAGE ADJUSTMENT

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

	Total # of Positions	Placed in Position #
Driver Seat	3	0

HEAD RESTRAINT ADJUSTMENT

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

	Total # of Positions	Placed in Position #
Driver Seat	9	0

DATA SHEET NO. 2 (CONTINUED)

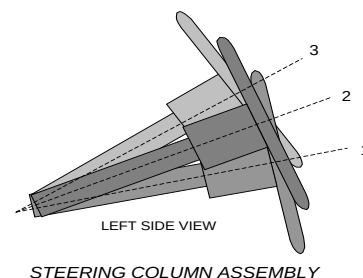
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024

STEERING COLUMN ADJUSTMENT

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

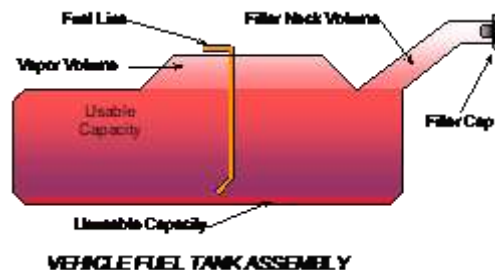


	Degrees	Fore/Aft Position, mm
Lowermost, Position No. 1	23.8	
Geometric Center, Position No. 2	26.7	
Uppermost, Position No. 3	29.6	
Telescoping Steering Wheel Travel		50
Test Position	26.7	25

FUEL PUMP

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

Fuel pump will run for approximately 3 seconds when the key or push start button is switched to "On" position, then, it will stop and will not resume operation unless the engine is cranking or running



FUEL TANK CAPACITY

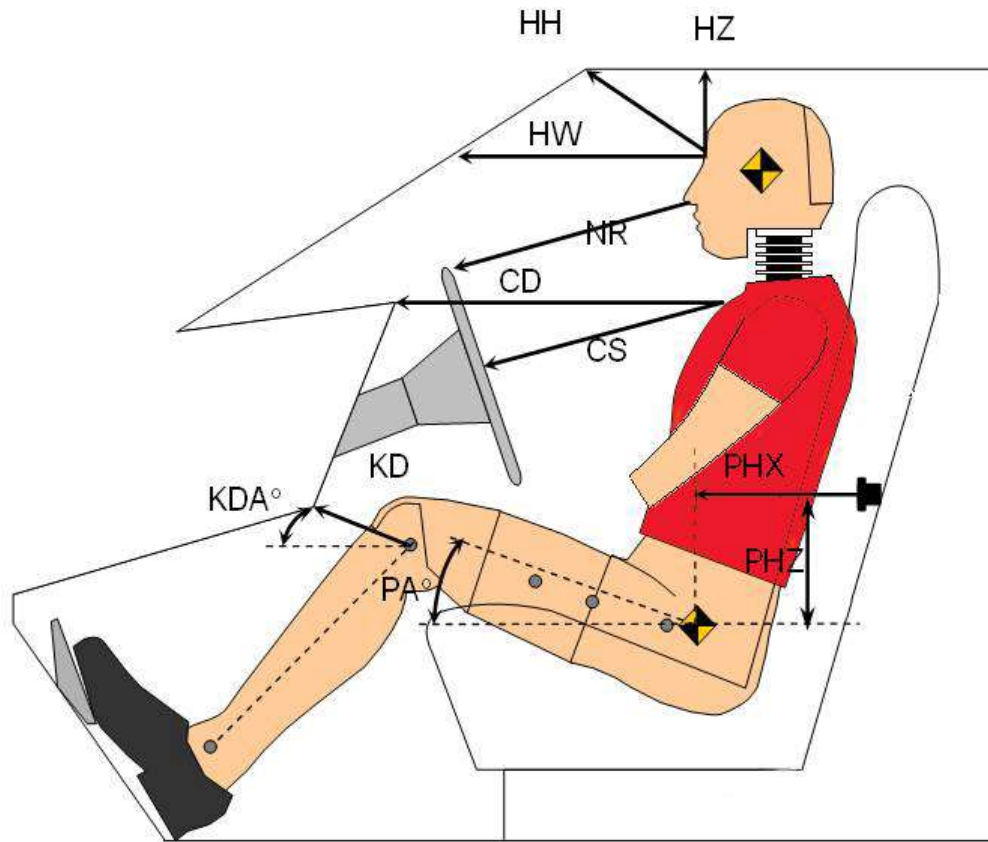
	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	72.0
Usable Capacity of "Optional" Tank (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner's Manual)	72.0
Usable Capacity of Optional Tank (see Owner's Manual)	N/A
93% of Usable Capacity	67.0
Actual Amount of Solvent Used in Test	67.0
1/3 of Usable Capacity	24.0

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: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024

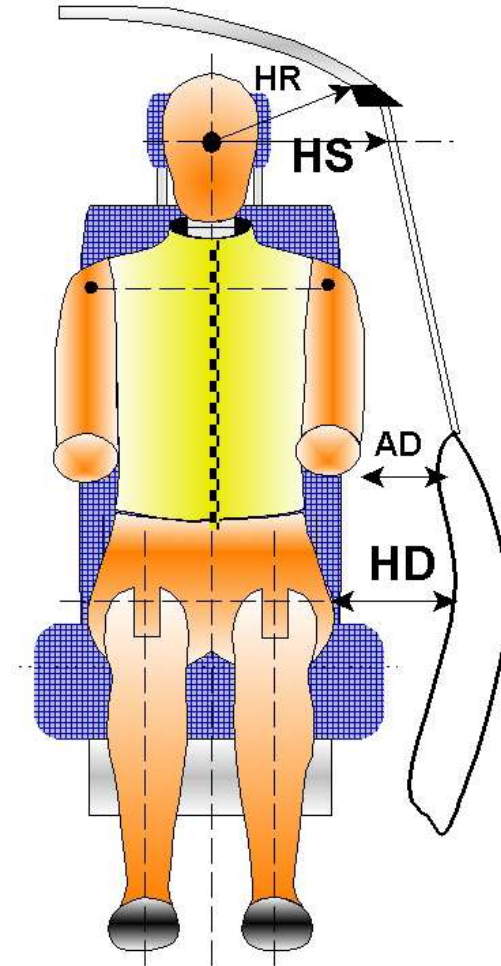


Code	Measurement Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	367	
HW	Head to Windshield	725	
HZ	Head to Visor	255	
NR	Nose to Rim	286	
CD	Chest to Dashboard	445	
CS	Chest to Steering Wheel	220	
KDL/KDLA°	Left Knee to Dash	136	0.0
KDR/KDRA°	Right Knee to Dash	133	0.0
PAX°	Pelvic Tilt Angle (X-axis)		18.2
PAY°	Pelvic Tilt Angle (Y-axis)		0.48
PHX	Hip Point to Striker (X-Axis)	338	
PHZ	Hip Point to Striker (Z-Axis)	202	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024

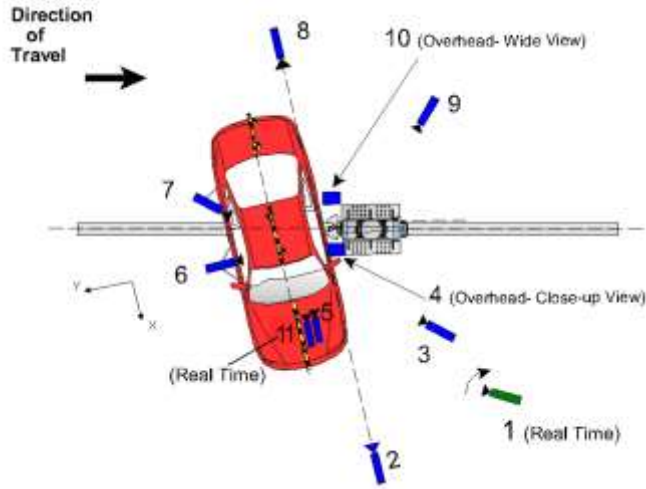


Code	Measurement Description	Length (mm)
HR	Head to Side Header	275
HS	Head to Side Window	392
AD	Arm to Door	282
HD	Hip Point to Door	185

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024



REFERENCE: (from point of impact for X and Y; from ground for Z)
 + X = Forward of vehicle, + Y = Right of vehicle, + Z = Down

Camera No.	View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Real time (24-30 fps) pan view of impact				Zoom	30
2	Front ground level – impact view	5135	-532	-1969	20	1000
3	Impact side 45° – forward pole view	2135	-1643	-1713	8.5	1000
4	Overhead Close-up view of impact	-43	119	-4315	28	1000
5	Onboard – dummy front view				25	1000
6	Onboard – dummy side view				8.5	1000
7	Onboard – dummy rear oblique view				8.5	1000
8	Rear ground level – impact view	-5146	2624	-1641	20	1000
9	Impact side 45° – rearward pole view	-3128	-1345	-1742	8.5	1000
10	Overhead wide view of impact	0	0	-4666	18.5	1000
11	Real time dummy front view				Zoom	60

All measurements accurate to +/- 6 mm.

NOTE: Vehicle was at a 75° angle to the rigid pole.

If applicable, explain why camera(s) did not run: N/A

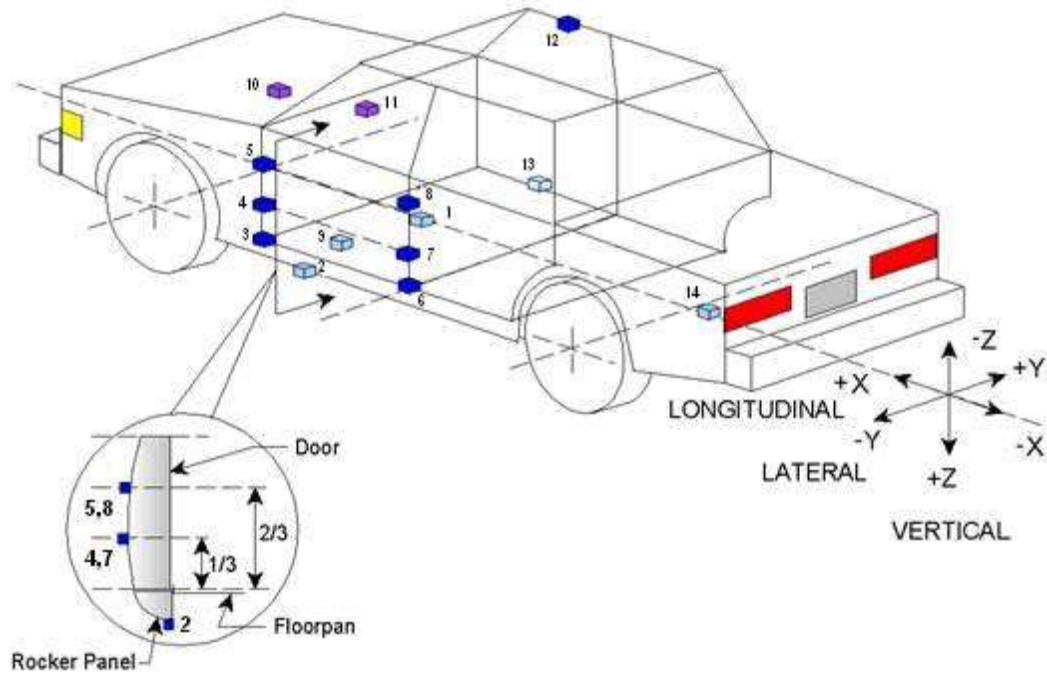
INSTRUMENTATION

	Number of Channels
Driver Dummy	16
Vehicle Structure	18
Pole Load Cells	8
TOTAL	42

DATA SHEET NO. 6
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2024 Kia Carnival
Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
Test Date: 7/24/2024



Accelerometer/Sensor Location				
	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	3233	107	-439
2	Left Floor Sill	3275	-749	-361
3	A-Pillar Sill	3586	-800	-402
4	A-Pillar Low	3699	-910	-582
5	A-Pillar Mid	3703	-892	-888
6	B-Pillar Sill	2440	-836	-412
7	B-Pillar Low	2632	-951	-577
8	B-Pillar Mid	2626	-925	-950
9	Driver Seat Track	2954	-644	-473
10	Engine Top	4258	127	-922
11	Firewall	4284	1	-1006
12	Right Roof	2818	720	-1657
13	Right Floor Sill	3276	742	-363
14	Rear Floorpan	646	5	-260

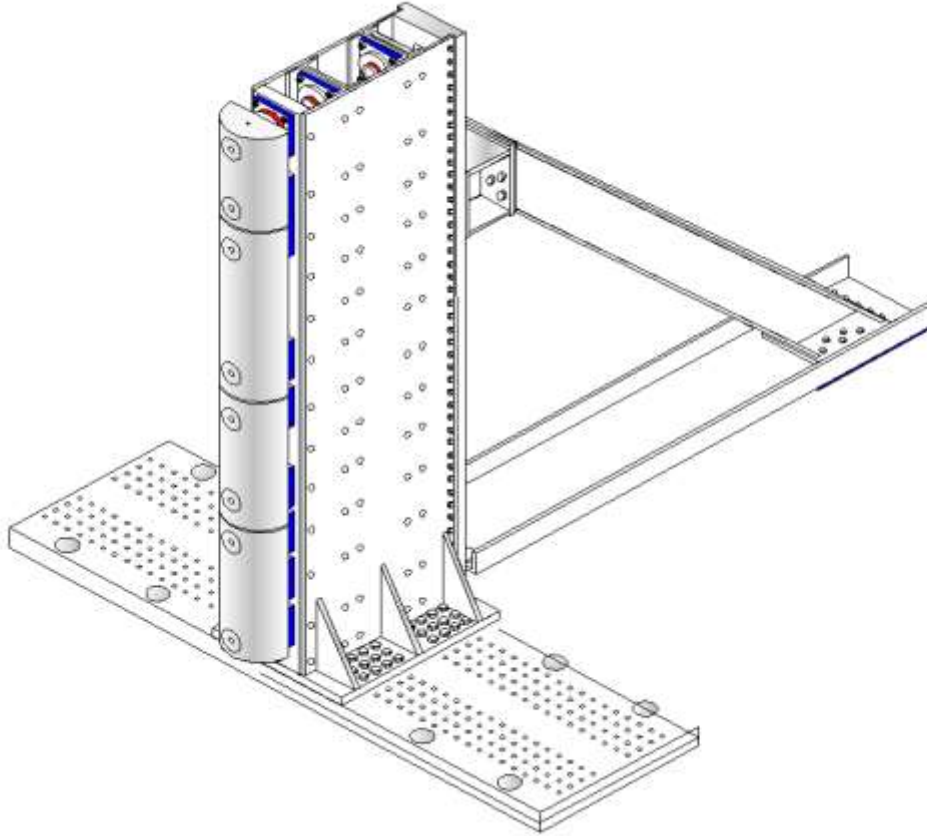
Reference: X - Test Vehicle Rear Bumper (+ forward)
Y - Test Vehicle Centerline (+ to right)
Z - Ground Plane (+ down)

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle: 2024 Kia Carnival
Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
Test Date: 7/24/2024

FOIL 300K RIGID POLE



Load Cell Locations	
ID	Height From Top of Carrier (mm)
1	87
2	468
3	648
4	978
5	1168
6	1651
7	1816
8	2057

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

Test Vehicle: 2024 Kia Carnival
Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
Test Date: 7/24/2024

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver SID-IIs Dummy
Face	SCAB; SAB
Top of Head	SCAB
Left Side of Head	SCAB; SAB; Head Rest
Back of Head	Head Rest
Left Shoulder	SAB
Upper Torso	Side Seat Bolster
Lower Torso	Side Seat Bolster
Left Hip	SAB
Left Knee	Door Panel

POST-TEST DOOR PERFORMANCE

Description	Struck Side		Non-Struck Side		Rear Hatch/ Other Door
	Front	Rear	Front	Rear	
Remained Closed and Operational	Yes	Yes	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	Yes	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	A-pillar separation at the driver-side windshield top
Sill Separation	None
Windshield Damage	Cracked; some separation with driver-side A-pillar
Side Window Damage	Blown out
Other Notable Effects	Seat back reclined during impact

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

Test Vehicle: 2024 Kia Carnival
Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
Test Date: 7/24/2024

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side (Driver)		Struck Side (Rear Passenger)	
	Mounted	Deployed	Mounted	Deployed
Front Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	N/A
Side Torso 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

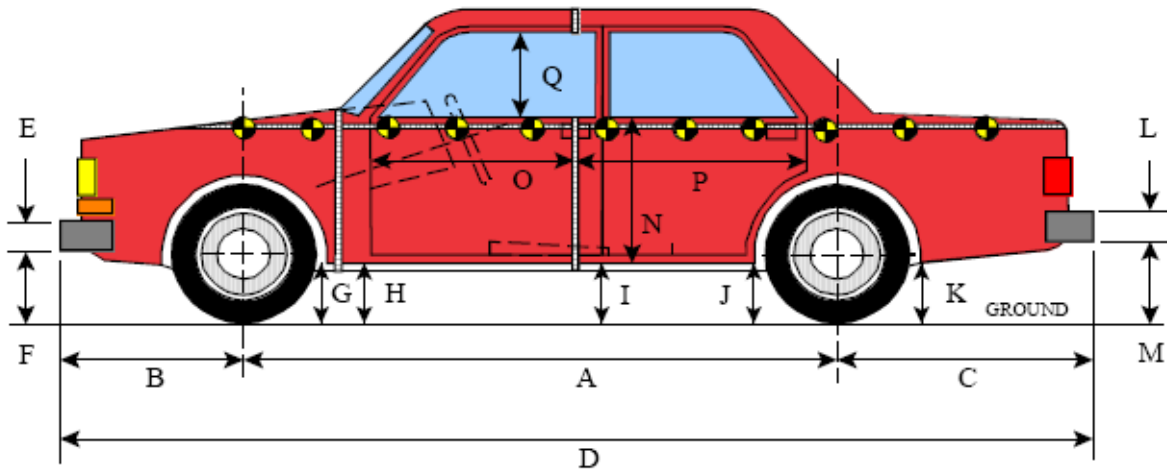
VEHICLE SPEED, VEHICLE ANGLE AT IMPACT AND IMPACT POINT LOCATION DATA

Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		1105
Actual Impact Point (Aft of Front Axle)	mm		1105
Horizontal Offset (+ forward / - rearward)	mm	+/- 38 of Intended Impact point	0
Angle Between Vehicle's Longitudinal Centerline and Line of Motion	degrees	75 +/- 3	75
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.17
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.12

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

Test Vehicle: 2024 Kia Carnival
Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
Test Date: 7/24/2024



LEFT SIDE VIEW

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

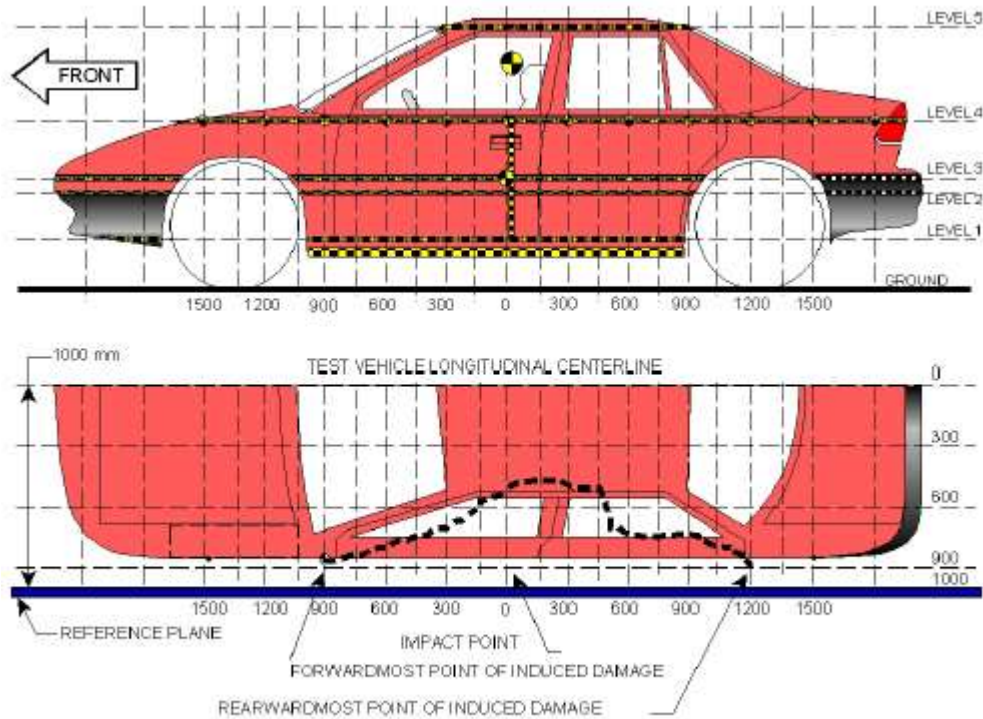
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Change
A	Wheelbase	3094	3067	-27
B	Front Axle to Front Surface of Vehicle	942	949	7
C	Rear Axle to Rear Surface of Vehicle	1122	1125	3
D	Total Length at Centerline	5158	5141	-17
E	Front Bumper Thickness	188	188	0
F	Front Bumper Bottom to Ground	447	495	48
G	Sill Height at Front Wheel Well	318	313	-5
H	Sill Height at Front Door Leading Edge	315	312	-3
I	Sill Height at B-Pillar	325	348	23
J1	Sill Height at Rear Wheel Well	360	385	25
J2	Pinch Weld Height at Rear Wheel Well	217	241	24
K	Sill Height Aft of Rear Wheel Well	428	446	18
L	Rear Bumper Thickness	110	110	0
M	Rear Bumper Bottom to Ground	473	477	4
N	Sill Height to Bottom of Front Window Sill	920	921	1
O	Front Door Leading Edge to Impact CL	609	491	-118
P	Rear Door Trailing Edge to Impact CL	1718	1659	-59
Q	Front Window Opening	463	432	-31
R	Right Side Length	5003	5008	5
S	Left Side Length	5000	4071	-929
T	Vehicle Width at B-Pillars	1988	1926	-62
U	Front Wheel Track Width	1750	1735	-15
V	Rear Wheel Track Width	1748	1748	0

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024



NOTE: All measurements are in millimeters (mm)

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	356	287	0
2	Occupant H-Point	788	357	0
3	Mid-Door	717	349	0
4	Window Sill	1102	312	0
5	Window Top	1612	164	0

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

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

Test Vehicle: 2024 Kia Carnival
Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
Test Date: 7/24/2024

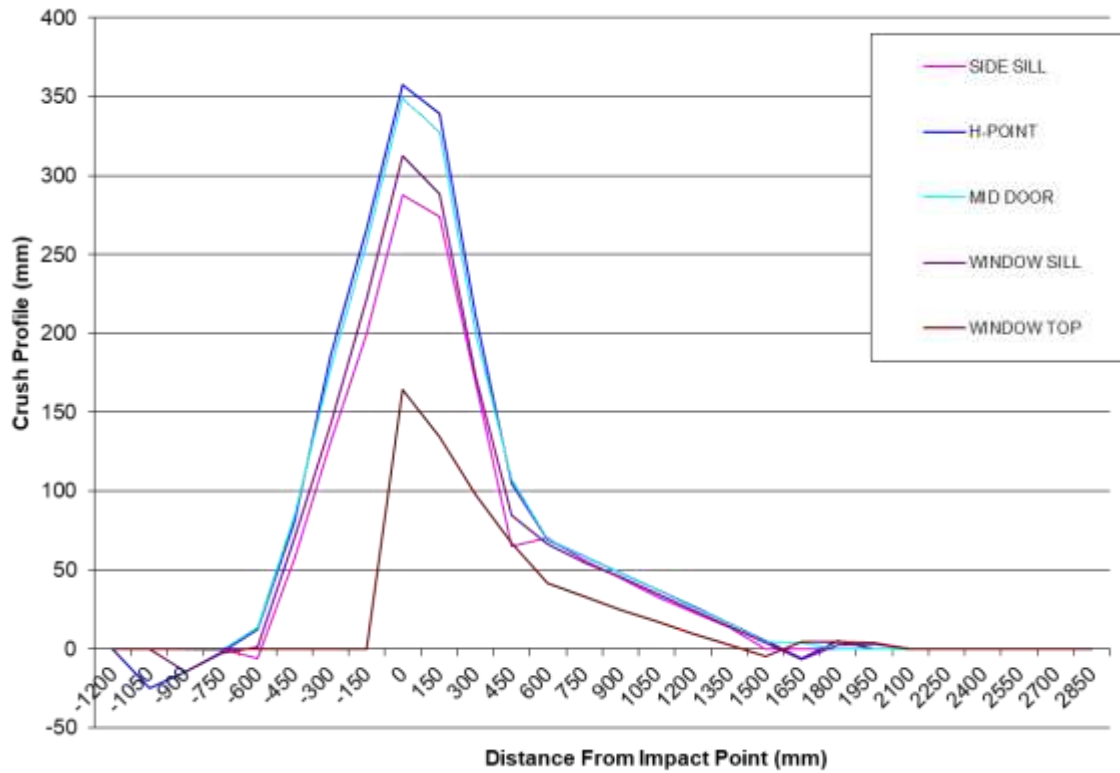
	Pre-Test					Post-Test					Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1050	0	998	0	0	0	0	1023	0	0	0	0	-25	0	0	0
-900	0	999	0	872	0	0	1013	0	886	0	0	-14	0	-14	0
-750	0	996	995	884	0	0	999	995	886	0	0	-3	0	-2	0
-600	966	986	989	891	0	972	974	976	890	0	-6	12	13	1	0
-450	942	982	980	896	0	884	901	895	826	0	58	81	85	70	0
-300	947	982	976	903	0	816	796	799	761	0	131	186	177	142	0
-150	950	982	976	910	0	751	716	719	689	0	199	266	257	221	0
0	953	982	976	915	708	666	625	627	603	544	287	357	349	312	164
150	955	983	976	920	711	681	644	649	631	577	274	339	327	289	134
300	957	983	976	924	713	789	772	776	752	615	168	211	200	172	98
450	958	983	976	929	714	893	878	868	844	647	65	105	108	85	67
600	957	981	975	934	714	887	912	906	868	673	70	69	69	66	41
750	956	980	974	937	714	900	922	915	882	681	56	58	59	55	33
900	955	979	973	940	714	910	931	925	894	689	45	48	48	46	25
1050	954	978	972	941	714	921	940	935	906	697	33	38	37	35	17
1200	954	978	974	942	714	931	951	947	917	704	23	27	27	25	10
1350	955	982	981	941	715	942	965	965	926	712	13	17	16	15	3
1500	962	989	991	939	715	962	984	987	935	719	0	5	4	4	-4
1650	0	996	992	937	711	0	1002	988	944	707	0	-6	4	-7	4
1800	0	994	0	931	708	0	989	0	928	703	0	5	0	3	5
1950	0	0	0	928	702	0	0	0	924	698	0	0	0	4	4

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

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

Test Vehicle: 2024 Kia Carnival
Test Program: SPNCAP Side Impact

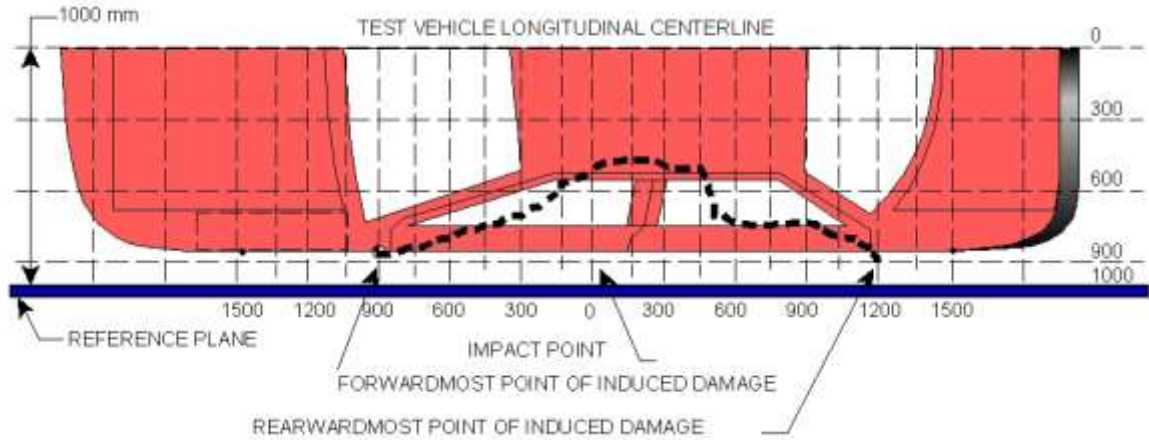
NHTSA No.: M20244214
Test Date: 7/24/2024



DATA SHEET NO. 11
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	1950	4	924	928	4
		5	698	702	
2	1500	2	984	989	5
3	900	2	931	979	48
		3	925	973	
4	450	3	868	976	108
5	0	2	625	982	357
6 ¹	-600	3	976	989	0

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

DATA SHEET NO. 12

FMVSS NO. 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

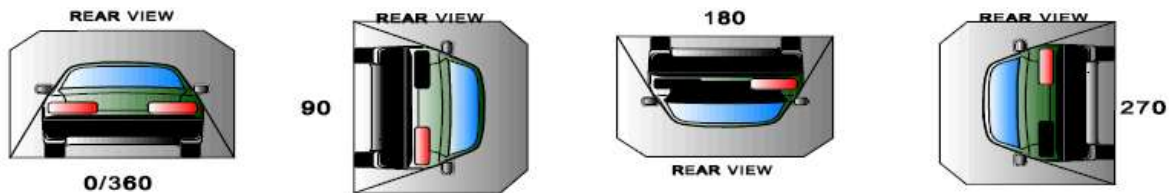
Test Vehicle: 2024 Kia Carnival
 Test Program: SPNCAP Side Impact

NHTSA No.: M20244214
 Test Date: 7/24/2024

Test Time: 16:18 Temperature: 21.6°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

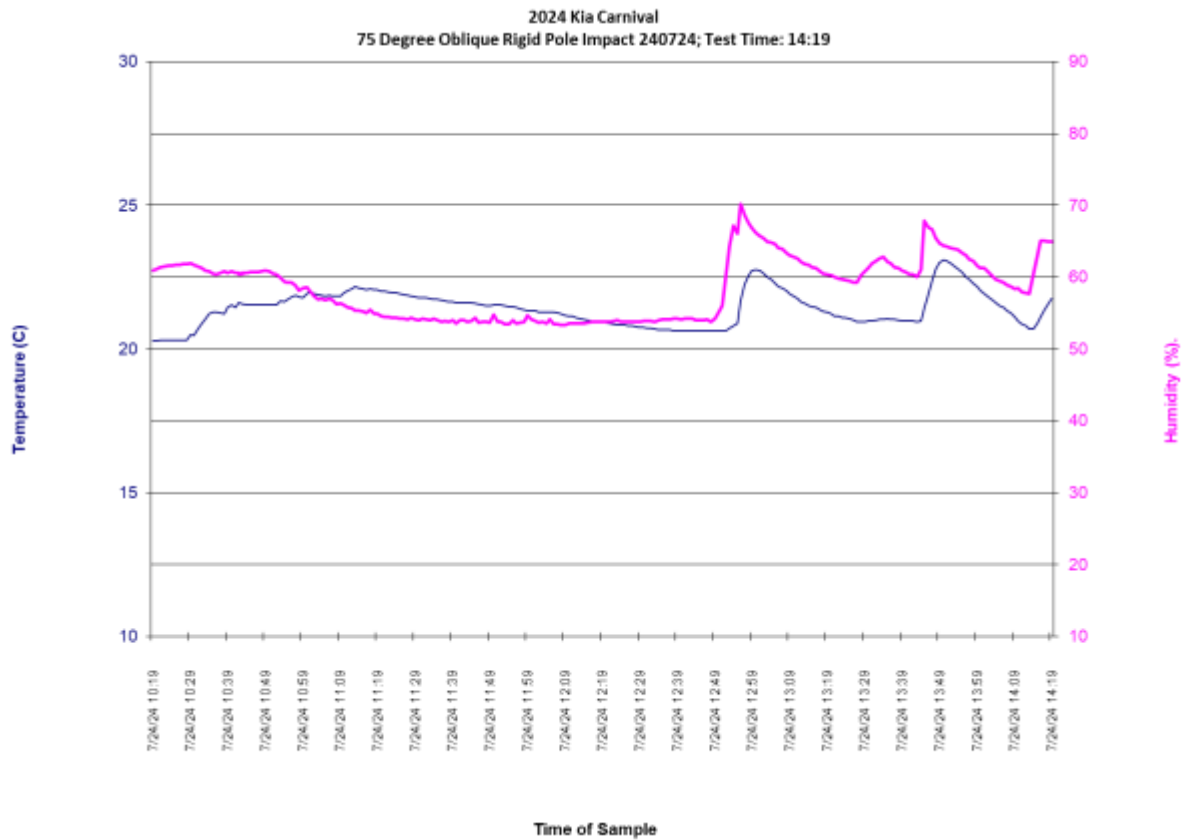
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0 to 90	0	0	0	0
90 to 180	0	0	0	0
180 to 270	0	0	0	0
270 to 360	0	0	0	0

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 13
DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA

Test Vehicle: 2024 Kia Carnival NHTSA No.: M20244214
Test Program: SPNCAP Side Impact Test Date: 7/24/2024



APPENDIX A
PHOTOGRAPHS

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7	Pre-Test Left Side View of Test Vehicle	A-7
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9	Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle	A-8
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24	Pre-Test Left Side View of Dummy Shoulder and Door Top View	A-16
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26	Pre-Test Front View of Seat Back Prior to Dummy Positioning	A-17
27	Pre-Test Front Close-Up View of Dummy Head and Shoulders in Relation to Head Restraint	A-17
28	Pre-Test Front View of Seat Pan Prior to Dummy Positioning	A-18
29	Pre-Test Overhead View of Dummy Thighs on Seat Pan	A-18
30	Pre-Test Left Side View of Dummy's Neck Showing Position of Adjustable Neck Bracket	A-19
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40	Pre-Test Dummy and Door Clearance View	A-24
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49	Post-Test Dummy Close-Up Torso Contact with Side Airbag View	A-29
50	Post-Test Dummy Close-Up Pelvis Contact with Vehicle Interior View	A-29
51	Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View	A-30
52	Post-Test Dummy Close-Up Knee Contact with Vehicle Interior View	A-30
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59	Pre-Test Pole Barrier Front View	A-34
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66	FMVSS No. 301 Static Rollover 90 Degrees	A-37
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73	Post-Test View of Shattered Vehicle Inner Door Panel	A-41



No. 001 As Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



No. 002 As Delivered Left Rear $\frac{3}{4}$ View of Test Vehicle



No. 003 Pre-Test Frontal View of Test Vehicle



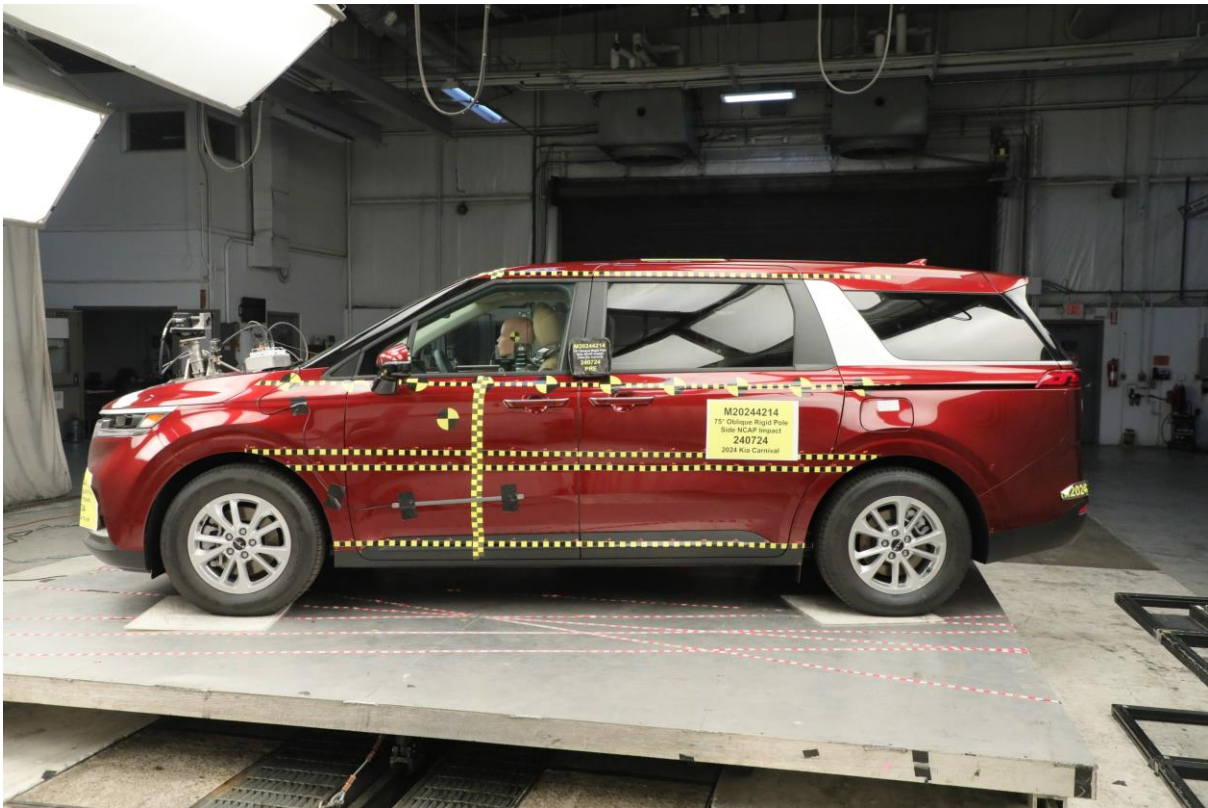
No. 004 Post-Test Frontal View of Test Vehicle



No. 005 Pre-Test Left Front $\frac{3}{4}$ View of Test Vehicle



No. 006 Post-Test Left Front $\frac{3}{4}$ View of Test Vehicle



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



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



No. 009 Pre-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



No. 010 Post-Test Left Rear $\frac{3}{4}$ View of Test Vehicle



No. 011 Pre-Test Rear View of Test Vehicle



No. 012 Post-Test Rear View of Test Vehicle



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



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



No. 015 Pre-Test Overhead View of Test Area



No. 016 Post-Test Overhead View of Test Area



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



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



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



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



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



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



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

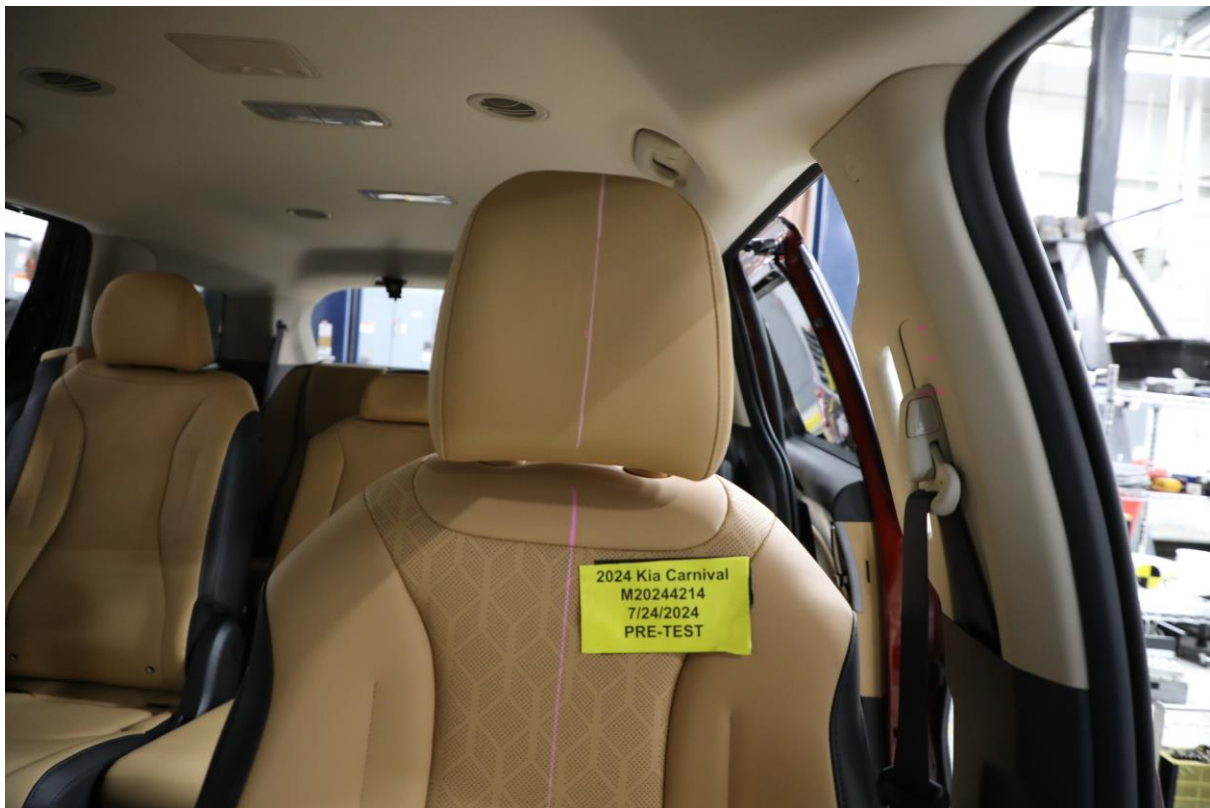
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No. 024 Pre-Test Left Side View of Dummy Shoulder and Door Top View



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



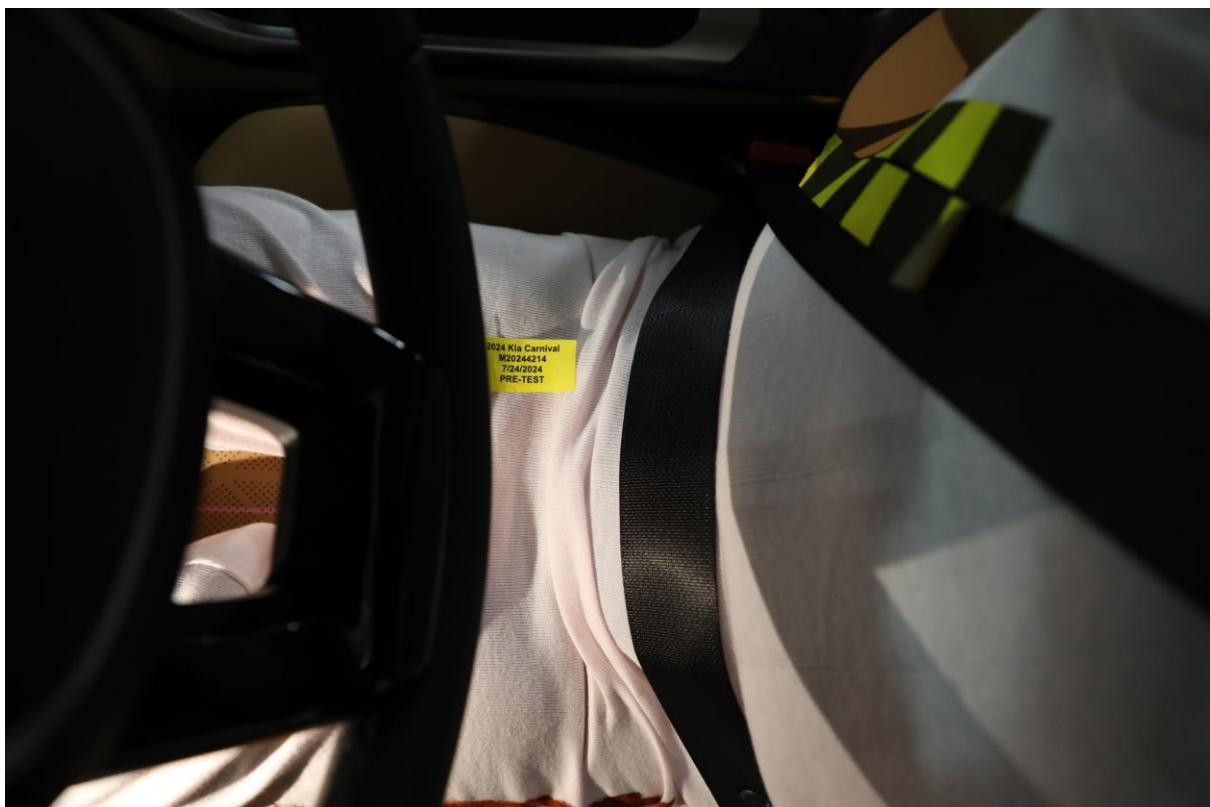
No. 026 Pre-Test Front View of Seat Back Prior to Dummy Positioning



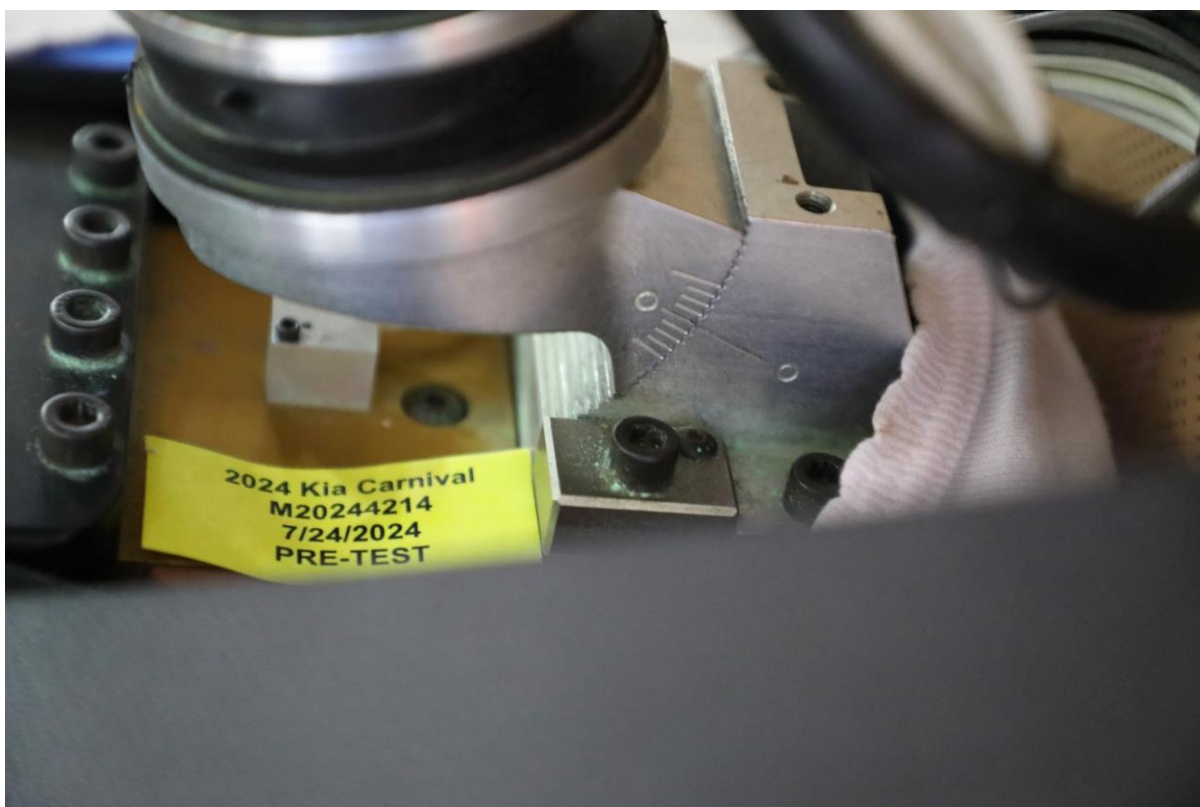
No. 027 Pre-Test Front Close-Up View of Dummy Head and Shoulders in Relation to Head Restraint



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



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



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



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



No. 032 Pre-Test Placement of Dummy Feet



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



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



No. 035 Pre-Test View of Disengaged Parking Brake



No. 036 Pre-Test View of Parking Brake



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



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



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



No. 040 Pre-Test Dummy and Door Clearance View



No. 041 Post-Test Dummy and Door Clearance View



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



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



No. 044 Pre-Test Inner Door Panel View



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



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

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No. 047 Post-Test Dummy Close-Up Head Contact with Side Airbag View



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



No. 049 Post-Test Dummy Close-Up Torso Contact with Side Airbag View



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



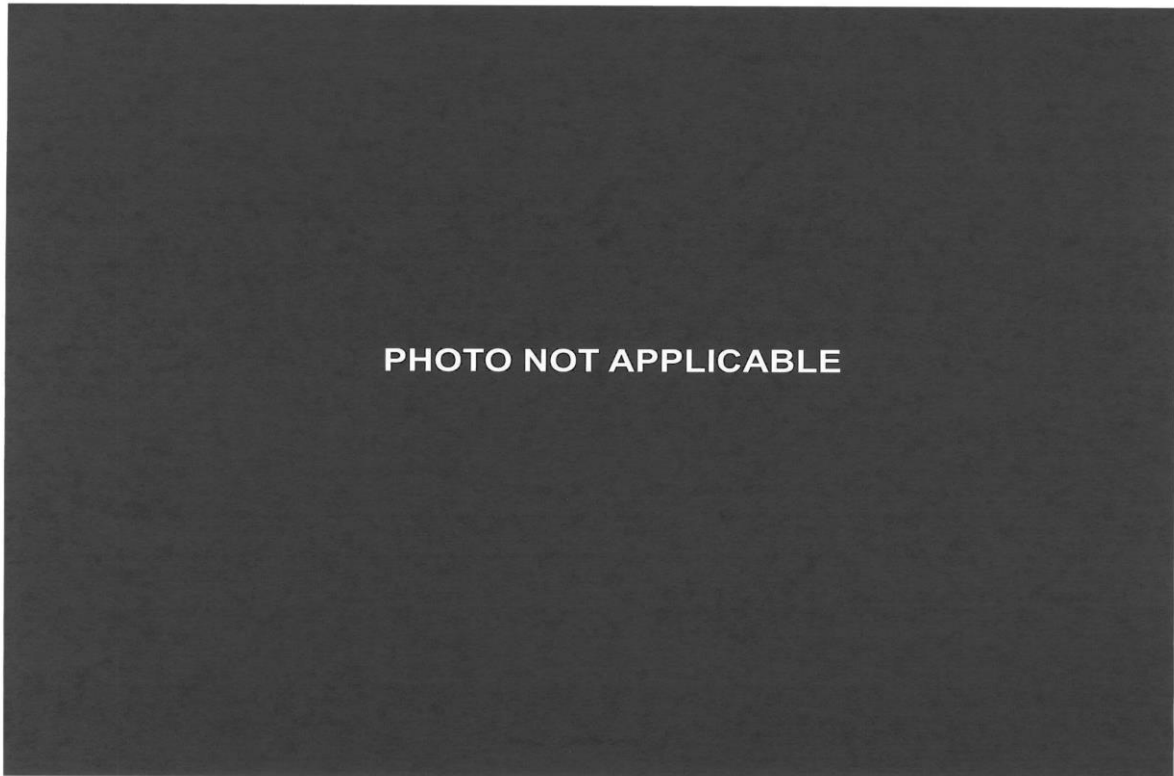
No. 051 Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View



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



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



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



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



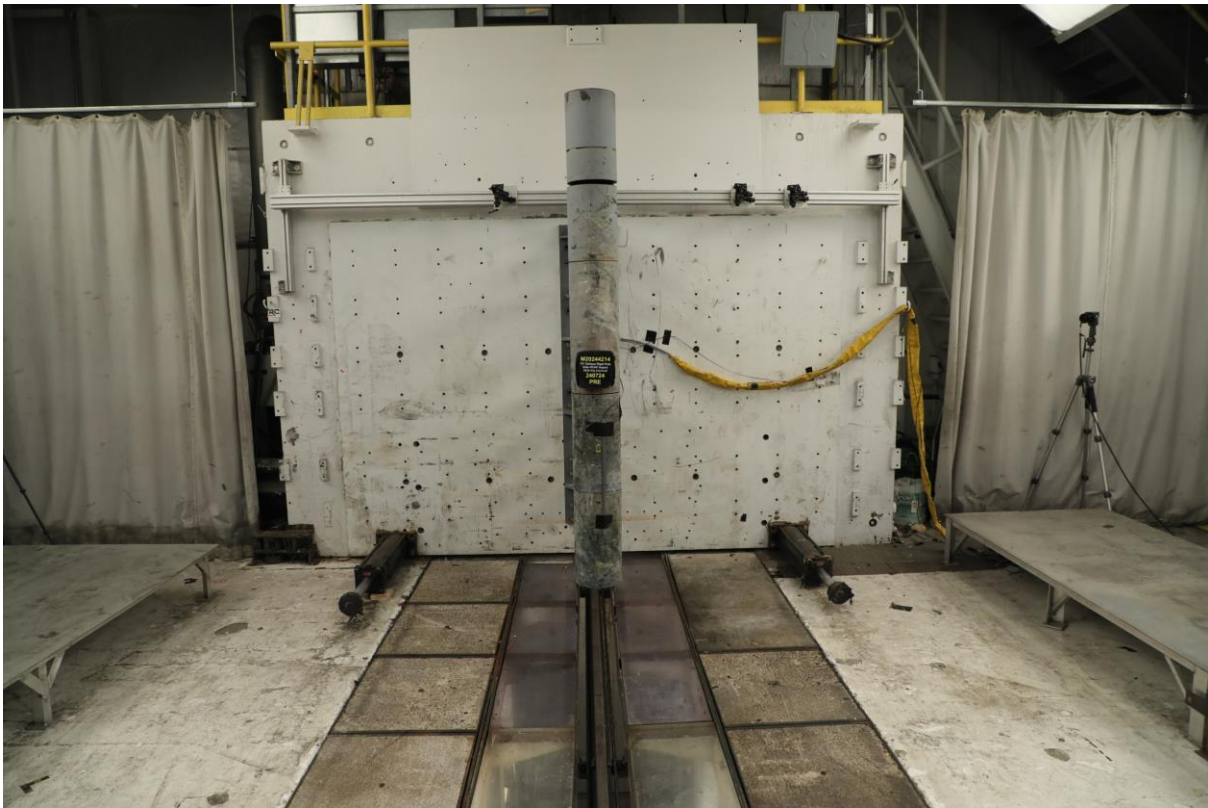
No. 056 Post-Test View of Fuel Filler Cap or Fuel Filler Neck



No. 057 Close-Up View of Vehicle Certification Label



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



No. 059 Pre-Test Pole Barrier Front View



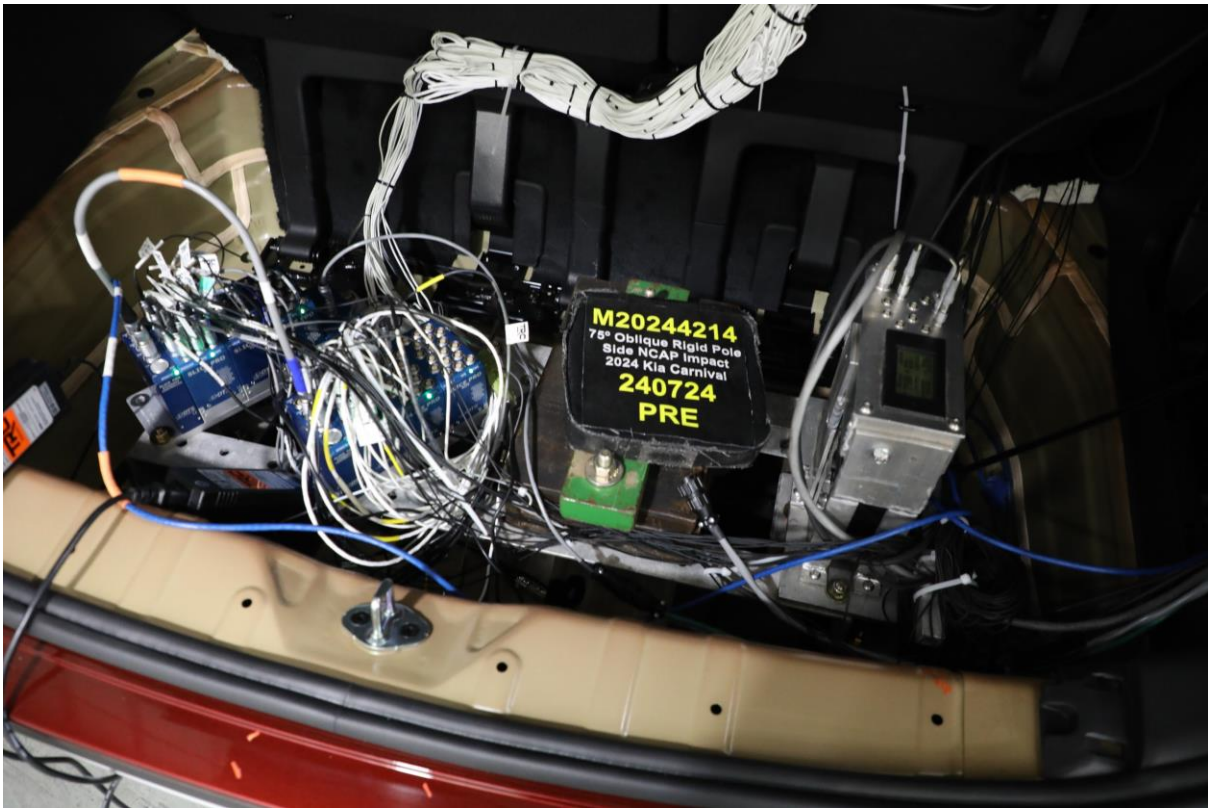
No. 060 Post-Test Pole Barrier Front View



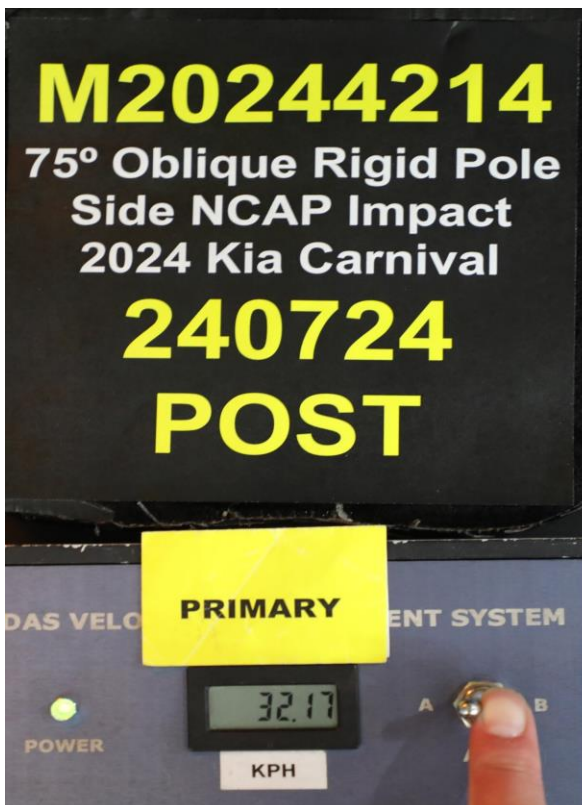
No. 061 Pre-Test Pole Barrier Side View



No. 062 Post-Test Pole Barrier Side View



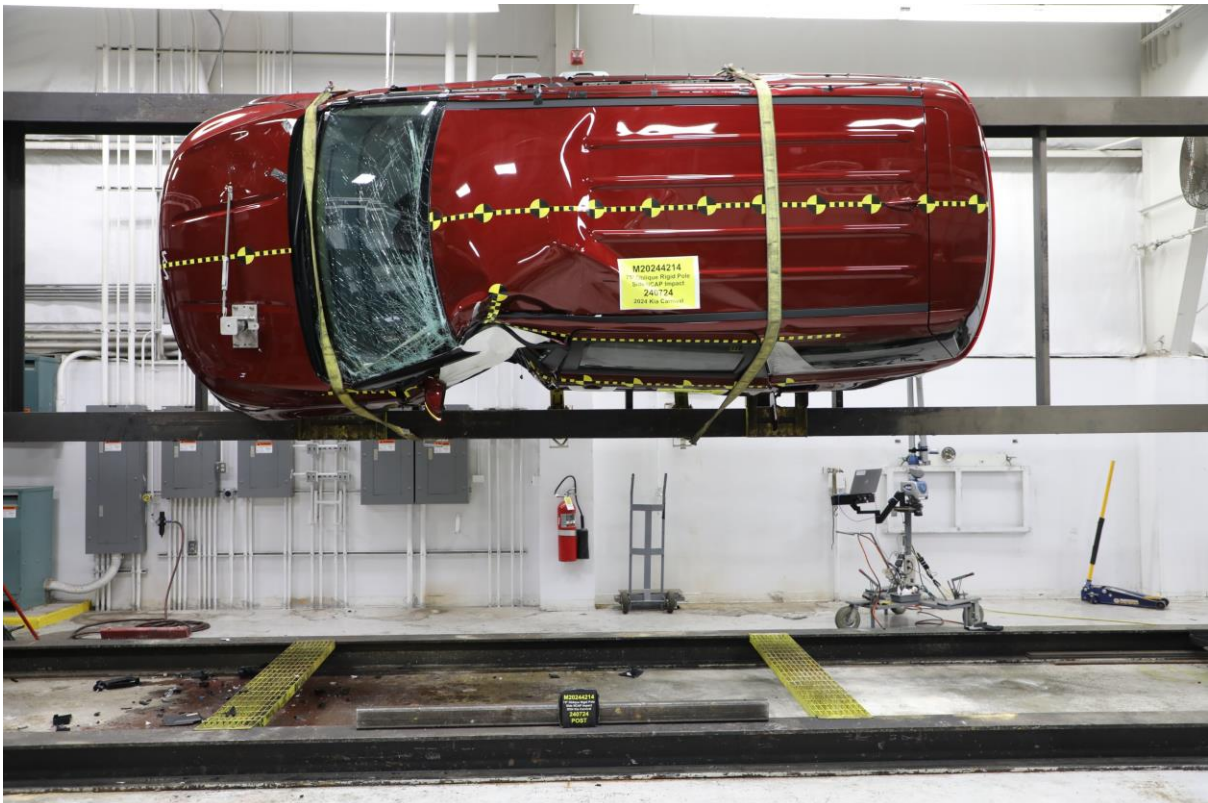
No. 063 Pre-Test Ballast View



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



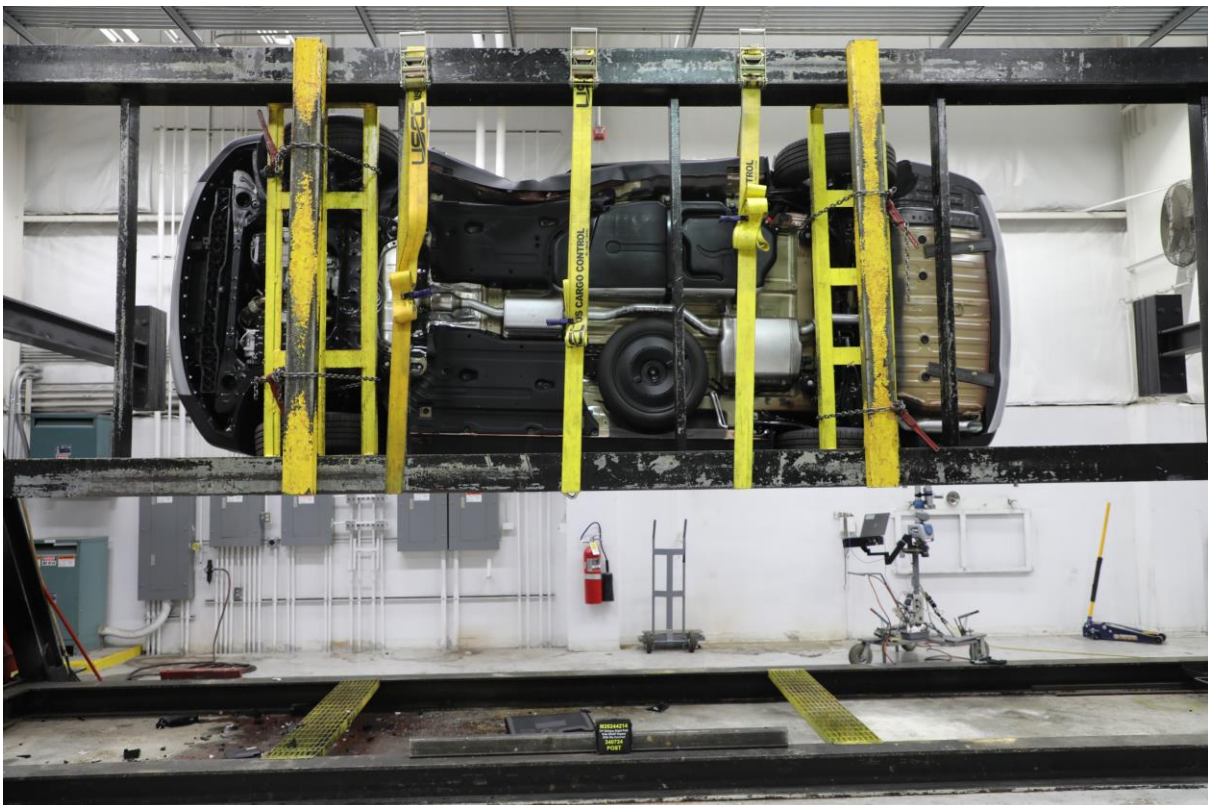
No. 065 FMVSS No. 301 Static Rollover 0 Degrees



No. 066 FMVSS No. 301 Static Rollover 90 Degrees



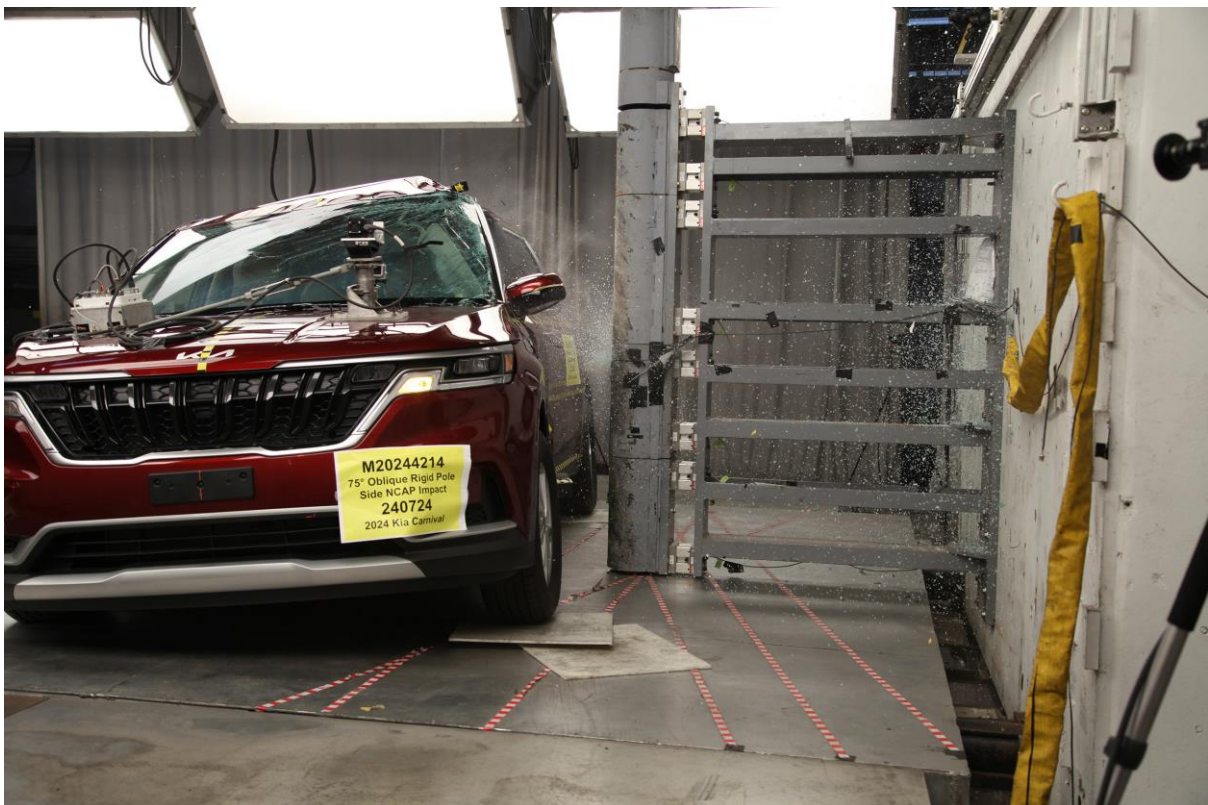
No. 067 FMVSS No. 301 Static Rollover 180 Degrees



No. 068 FMVSS No. 301 Static Rollover 270 Degrees



No. 069 FMVSS No. 301 Static Rollover 360 Degrees



No. 070 Impact Event

...RE LX SEAT... FEATURES
 ad to/in place of st... LX features
 Pass Seating w/ 2nd Row Child Minding Seat
 ver Adj. Driver's Seat w/ Power Lumbar
 rTex Seating Trim
 ated Front Seats
 ither-Wrapped Steering Wheel & Shift Knob

DITIONAL INSTALLED EQUIPMENT:
 ddition to or in place of standard features)
 eted Floor Mats (8-Passenger)

INCLUDING OPTIONS

INLAND FREIGHT AND HANDLING

...cluded
 Included
 Included
 Included
 Included

\$225.00

\$ 35,825.00

\$ 1,395.00

No. 071 Monroney Label

Fuel Economy and Environment

Fuel Economy

22 MPG
combined city/hwy

19 MPG
city

26 MPG
highway

4.5 gallons per 100 miles

MINIVANS range from 20 to 48 MPG.
The best vehicle rates 140 MPGe.

You spend \$2,500 more in fuel costs over 5 years
compared to the average new vehicle.

Annual fuel cost \$2,450

Fuel Economy & Greenhouse Gas Rating (tailpipe only)

5 (Best)

Smog Rating (tailpipe or evaporative)

5 (Best)

This vehicle emits 408 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions. Learn more at fuelconomy.gov.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 28 MPG and costs \$9,750 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.60 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fuelconomy.gov
Calculate personalized estimates and compare vehicles

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated
Based on the combined rating of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Frontal	Driver	Not Rated
Crash	Passenger	Not Rated
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side	Front seat	Not Rated
Crash	Rear seat	Not Rated
Star ratings based on the risk of injury in a side impact.		
Rollover		Not Rated

PARTS CONTENT INFORMATION

FOR VEHICLE LINE U.S. PARTS

MAJOR

N

Safety Features of your Kia

Seat

Type B

The rear seat passenger may use the switches to control the front passenger seat.

Sliding forward or rearward:

- To move the front passenger seat forward, press the switch (1). To move the front passenger seat rearward, press the switch (2).

Angle adjustment:

- To recline the front passenger seat-back forward, press the switch (3). To recline the front passenger seat-back rearward, press the switch (4).

Headrest (for front seat)

The driver's and front passenger's seats are equipped with a headrest for the occupant's safety and comfort.

Passenger walk-in switch (if equipped)

The headrest not only provides comfort for the driver and front passenger, but also helps protect the head and neck in the event of a collision. To maximize the effectiveness in case of accidents, the headrest should be adjusted so the middle of the headrest is as high as the center of gravity of an occupant's head. Generally, the center of gravity of most people's heads is similar with the height as the top of their eyes. Also, adjust the headrest as close to your head as possible. For this reason, the use

3 13

No. 072 Head Restraint Use and Adjustment Information from Vehicle Owner Manual

PHOTO NOT APPLICABLE

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

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

No.	Description	Page
1	Driver Head Acceleration (X) vs. Time	B-4
2	Driver Head Acceleration (Y) vs. Time	B-4
3	Driver Head Acceleration (Z) vs. Time	B-4
4	Driver Head Acceleration Resultant vs. Time	B-4
5	Driver Lower Spine T12 Acceleration (X) vs. Time	B-5
6	Driver Lower Spine T12 Acceleration (Y) vs. Time	B-5
7	Driver Lower Spine T12 Acceleration (Z) vs. Time	B-5
8	Driver Lower Spine T12 Acceleration Resultant vs. Time	B-5
9	Driver Iliac Wing Force on Impact Side (Y) vs. Time	B-6
10	Driver Acetabulum Force on Impact Side (Y) vs. Time	B-6
11	Driver Total Pelvis Force on Impact Side (Y) vs. Time	B-6

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

Additional Driver Dummy Instrumentation Data

Driver Head Acceleration (X) Redundant
Driver Head Acceleration (Y) Redundant
Driver Head Acceleration (Z) Redundant
Driver Upper Thorax Rib Deflection (Y)
Driver Middle Thorax Rib Deflection (Y)
Driver Lower Thorax Rib Deflection (Y)
Driver Upper Abdomen Rib Deflection (Y)
Driver Lower Abdomen Rib Deflection (Y)
Driver Head Angular Velocity (X)
Driver Head Angular Velocity (Y)
Driver 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)
 Left Floor Sill Acceleration (Y)
 Left A-Pillar Sill Acceleration (Y)
 Left Lower A-Pillar Acceleration (Y)
 Left Mid A-Pillar Acceleration (Y)
 Left B-Pillar Sill Acceleration (Y)
 Left Lower B-Pillar Acceleration (Y)
 Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy Hip Point Acceleration (Y)
 Engine Top Acceleration (X)
 Engine Top Acceleration (Y)
 Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)

Pole Instrumentation Data

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

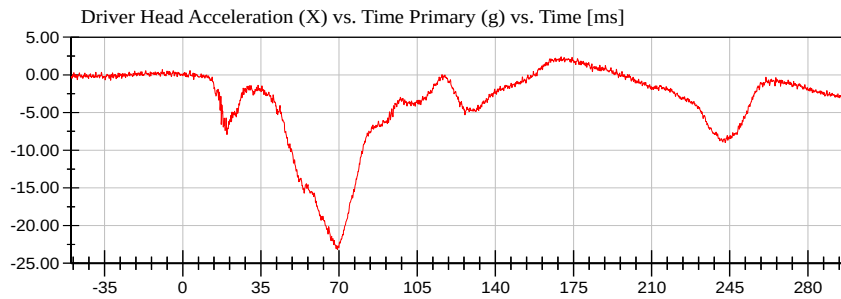
NHTSA

Position #1 SID IIs Dummy (297)

Test Date: 07/24/2024

Test Lab: CTF

Test Number: 240724 (M20244214)



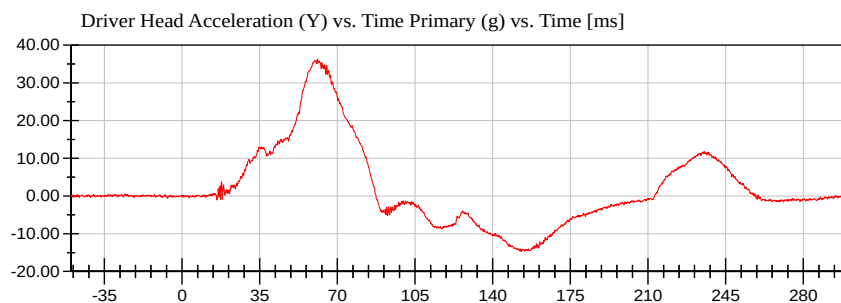
<Max>

2.40 g at 169.44 ms

<Min>

-23.18 g at 69.28 ms

CFC_1000



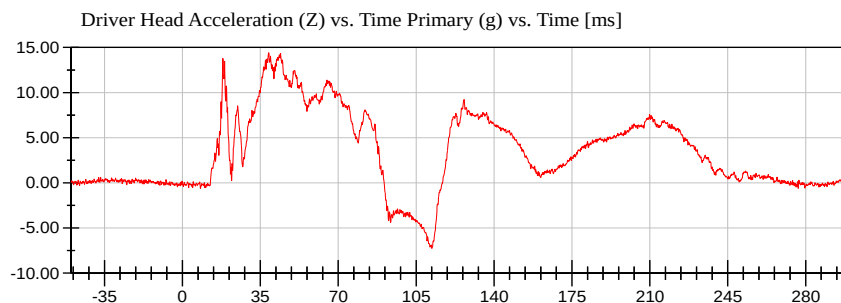
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36.25 g at 61.04 ms

<Min>

-14.74 g at 152.80 ms

CFC_1000



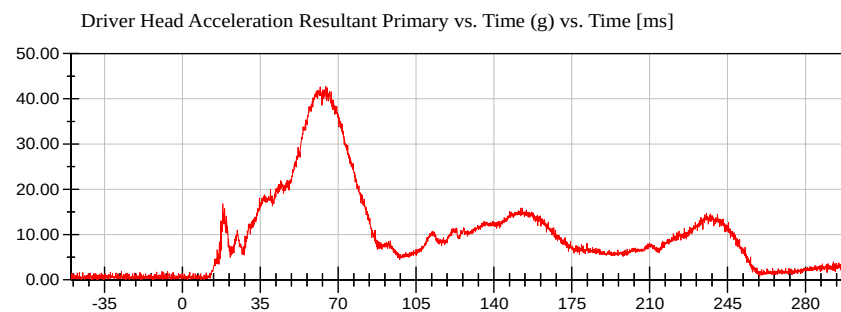
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14.42 g at 38.72 ms

<Min>

-7.26 g at 112.08 ms

CFC_1000



<Max>

42.75 g at 64.40 ms

<Min>

0.07 g at -38.40 ms

Prefiltered_> CFC 1000



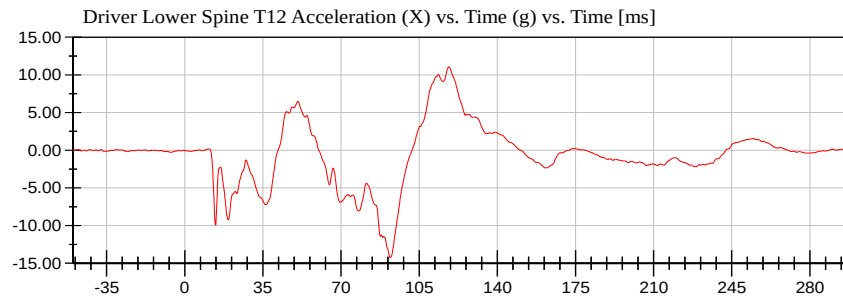
NHTSA

Test Lab: CTF

Test Number: 240724 (M20244214)

Position #1 SID IIs Dummy (297)

Test Date: 07/24/2024



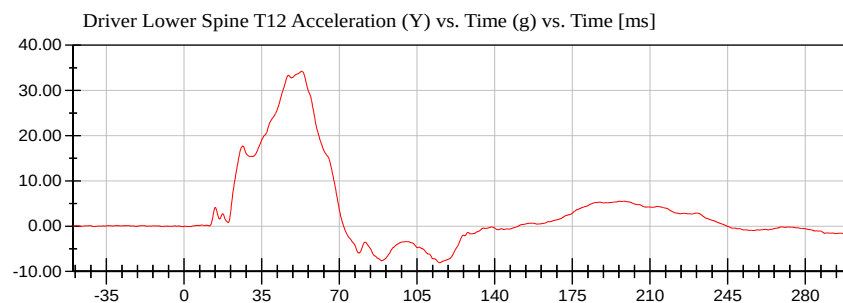
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-14.23 g at 92.08 ms

CFC_180



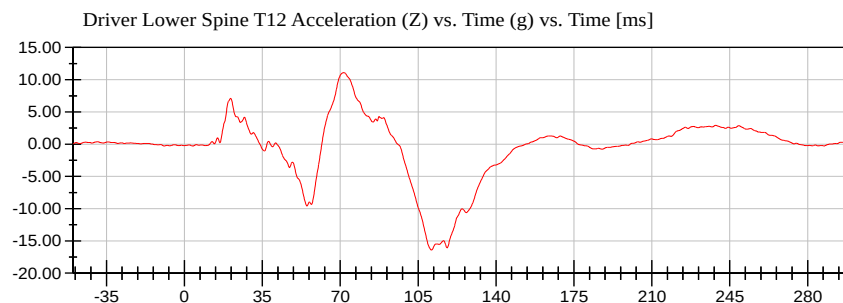
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34.22 g at 53.04 ms

<Min>

-8.06 g at 115.28 ms

CFC_180



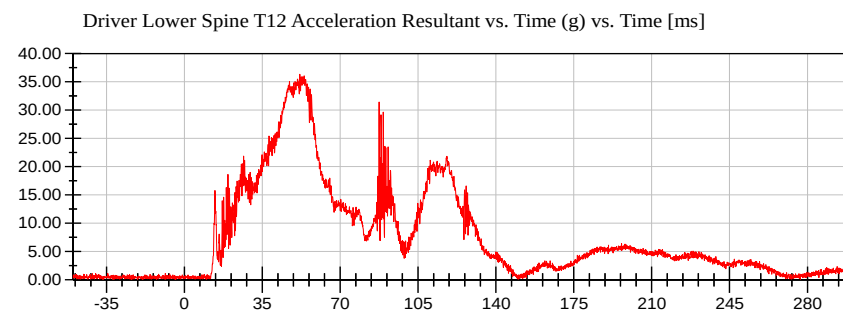
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11.09 g at 71.52 ms

<Min>

-16.41 g at 110.96 ms

CFC_180



<Max>

36.34 g at 51.92 ms

<Min>

0.05 g at -36.56 ms

Prefiltered_> CFC 1000



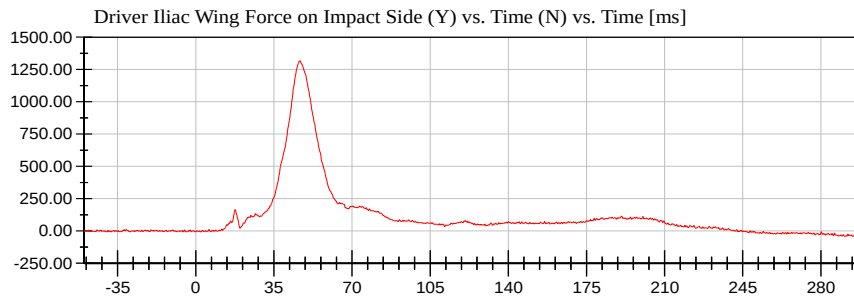
NHTSA

Test Lab: CTF

Test Number: 240724 (M20244214)

Position #1 SID IIs Dummy (297)

Test Date: 07/24/2024



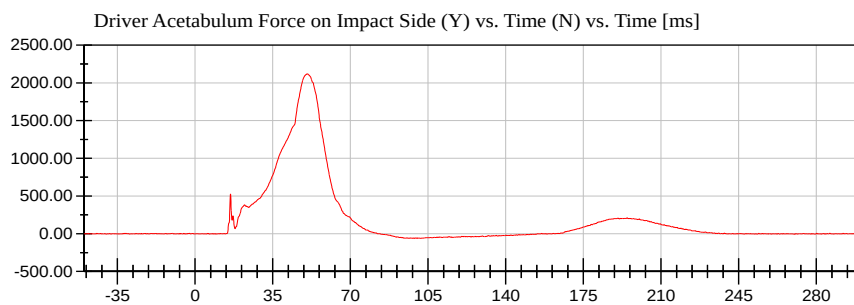
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1,317.38 N at 46.64 ms

<Min>

-43.97 N at 297.44 ms

CFC_600



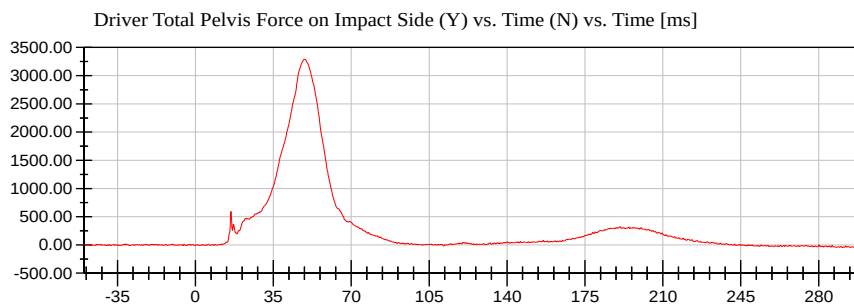
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2,119.62 N at 50.56 ms

<Min>

-60.63 N at 96.40 ms

CFC_600



<Max>

3,291.50 N at 49.20 ms

<Min>

-47.70 N at 297.36 ms

CFC_600



APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

TABLE OF CALIBRATION MEASUREMENTS AND PLOTS
SID-IIs (Driver) Dummy
Description

Table 1. External Measurements

Table 2. Head Drop Test

Resultant Head Acceleration (G's) vs. Time (ms)
Head (X) Acceleration (G's) vs. Time (ms)
Head (Y) Acceleration (G's) vs. Time (ms)
Head (Z) 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 297

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. 297 Calibration No. 69

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	780	Yes
B	Shoulder Pivot Height	437.0 - 453.0	450	Yes
C	H-Point Height	79.0 - 89.0	85	Yes
D	H-Point from Seat Back	141.0 - 151.0	147	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	102	Yes
F	Thigh Clearance	119.0 - 135.0	130	Yes
G	Head Breadth	140.0 - 148.0	147	Yes
H	Head Back from Backline	40.0 - 46.0	45	Yes
I	Head Depth	178.0 - 188.0	183	Yes
J	Head Circumference	541.0 - 551.0	544	Yes
K	Buttock to Knee Length	514.0 - 540.0	528	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	430	Yes
O	Chest Depth without Jacket	195.0 - 211.0	200	Yes
P	Foot Length (right)	216.0 - 232.0	223	Yes
P	Foot Length (left)	216.0 - 232.0	223	Yes
Q	Hip Breadth	313.0 - 323.0	319	Yes
R	Arm Length	249.0 - 259.0	254	Yes
S	Knee Joint to seat Back	478.0 - 493.0	485	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	347	Yes
W	Foot Width (right)	78.0 - 94.0	85	Yes
W	Foot Width (left)	78.0 - 94.0	85	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	877	Yes
Z	Waist Circumference	761.0 - 791.0	781	Yes

Revised 9/29/2005

Report Number: 297_S2F69

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Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	67 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	127.6 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-5.2 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	< 15 %	1.21 %	Yes

Test meets specifications.

Condition: Used

Comments:

Head Skin S/N: 1330

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

06.27.2024 08:52:54 232

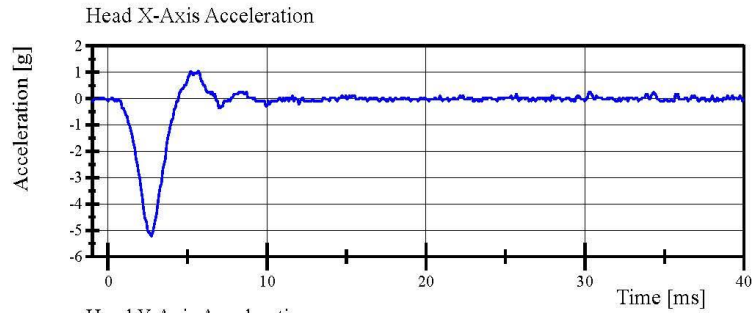


Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. 297 Certification No. 69-1

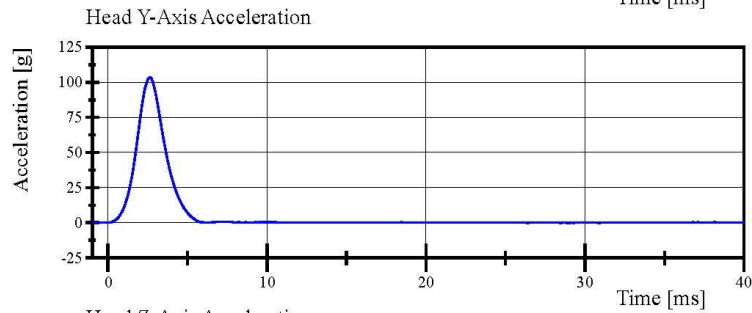
Test Date: 6/27/2024



Filter Class: CFC_1000

Max: 1.0 g at 5.2 ms

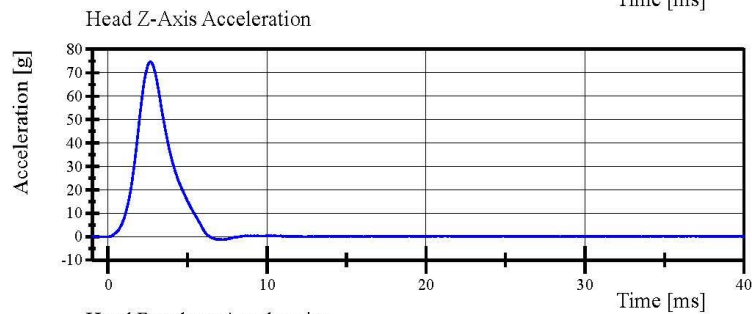
Min: -5.2 g at 2.7 ms



Filter Class: CFC_1000

Max: 103.4 g at 2.6 ms

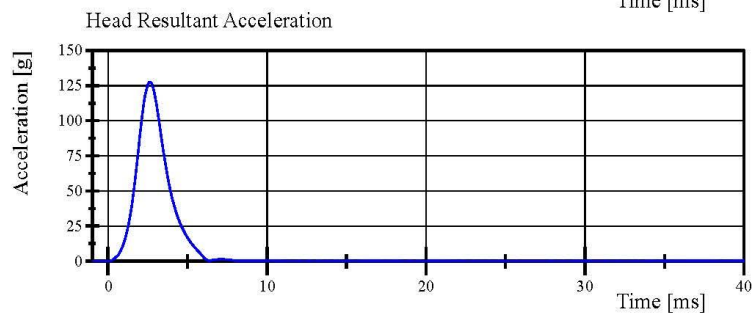
Min: -0.2 g at 29.0 ms



Filter Class: CFC_1000

Max: 74.7 g at 2.6 ms

Min: -1.3 g at 7.2 ms



Filter Class: CFC_1000

Max: 127.6 g at 2.6 ms

Min: 0.0 g at -0.8 ms

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

06.27.2024 08:53:39 232



Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.627 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.281 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.337 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	4.524 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.588 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.792 m/s	Yes
Maximum Headform Flexion			
Peak	(-71) - (-81) deg	-76.8 deg	Yes
Time of Peak	50 - 70 ms	61.3 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	40.6 N·m	Yes
Decay to 0 N·m	102 - 126 ms	113.8 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 779

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

06.27.2024 09:28:22 751

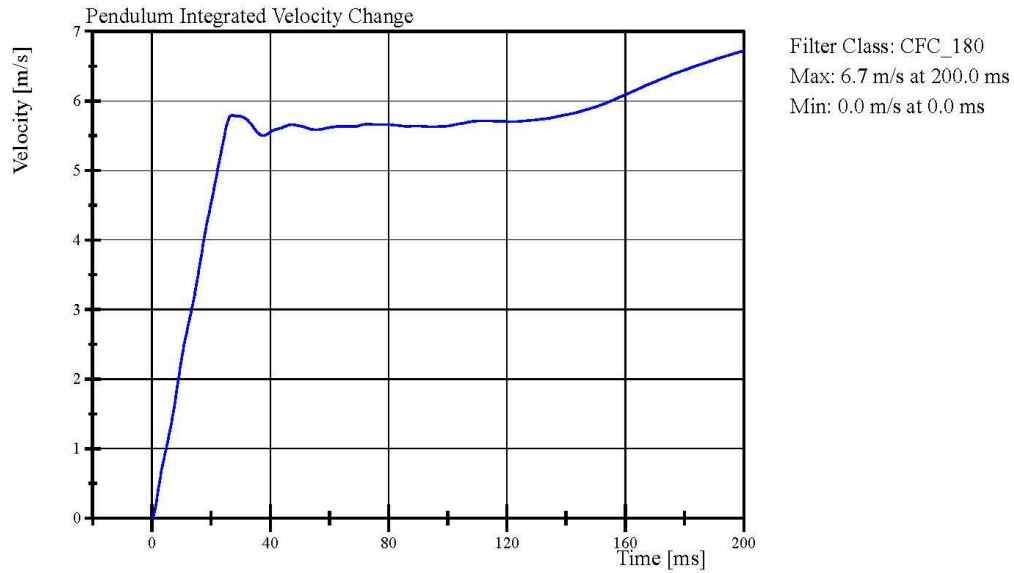
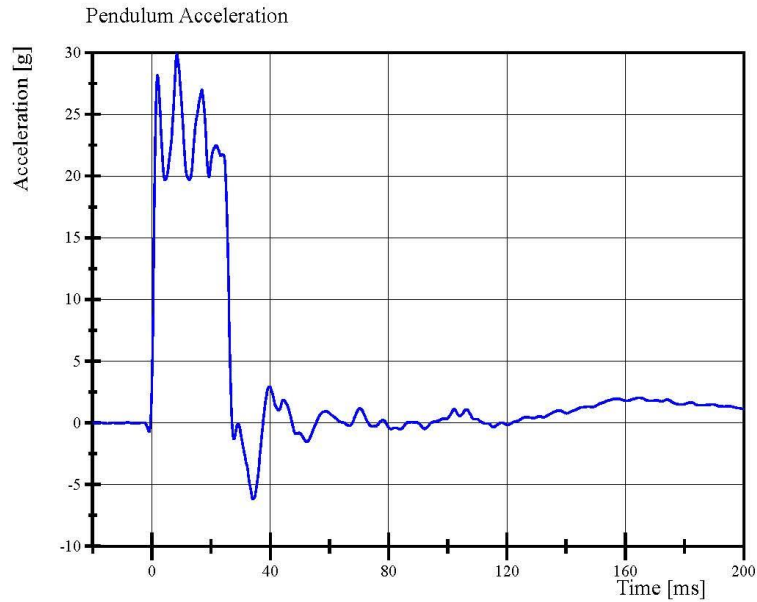


Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024



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

06.27.2024 09:29:53 751



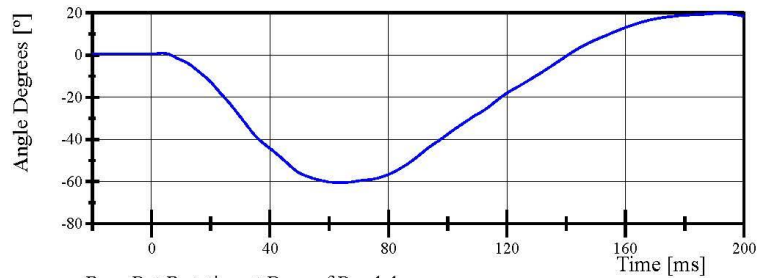
Transportation Research Center Inc.

Left Lateral Neck

SID IIS Serial No. 297 Certification No. 69-1

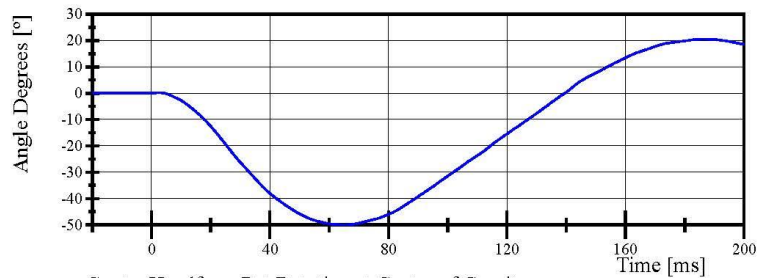
Test Date: 6/27/2024

Forward Pot Rotation at Base of Pendulum



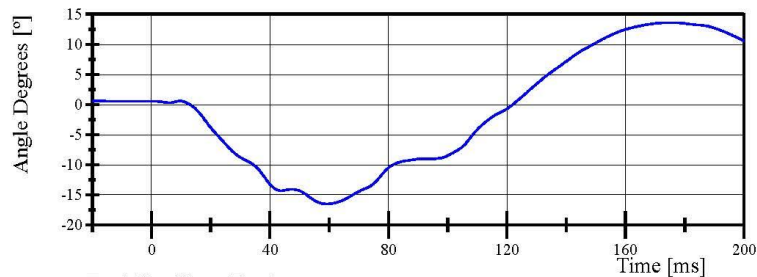
Filter Class: CFC_60
Max: 20.0 ° at 191.9 ms
Min: -60.5 ° at 63.7 ms

Rear Pot Rotation at Base of Pendulum



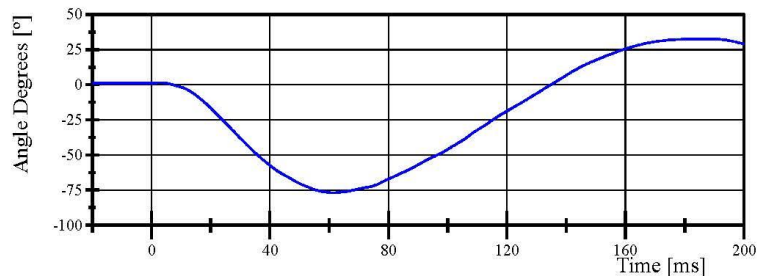
Filter Class: CFC_60
Max: 20.5 ° at 186.6 ms
Min: -49.9 ° at 64.8 ms

Center Headform Pot Rotation at Center of Gravity



Filter Class: CFC_60
Max: 13.6 ° at 175.3 ms
Min: -16.5 ° at 59.3 ms

Total Headform Flexion



Filter Class: CFC_60
Max: 32.6 ° at 188.7 ms
Min: -76.8 ° at 61.3 ms

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

06.27.2024 09:29:53 751

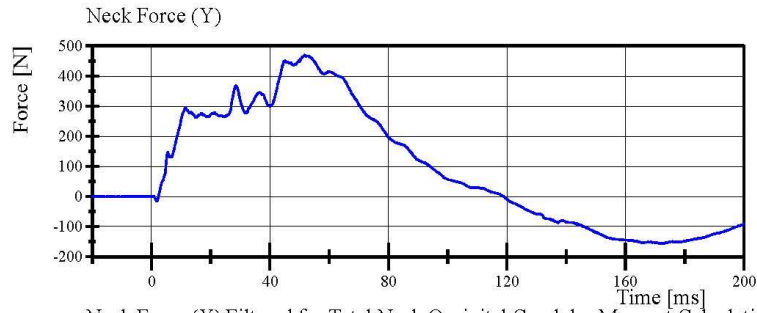


Transportation Research Center Inc.

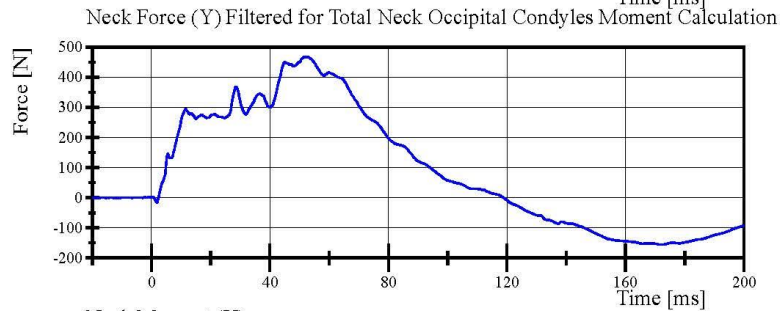
Left Lateral Neck

SID IIs Serial No. 297 Certification No. 69-1

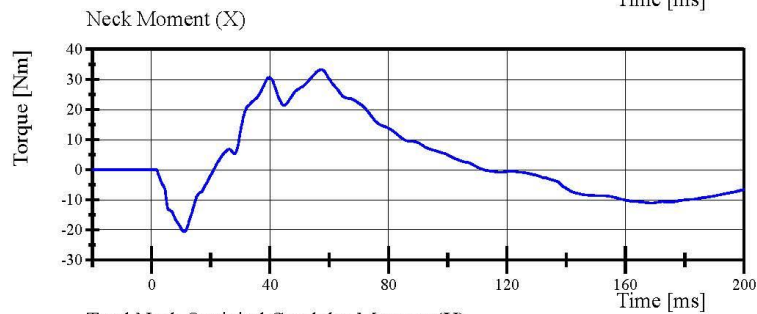
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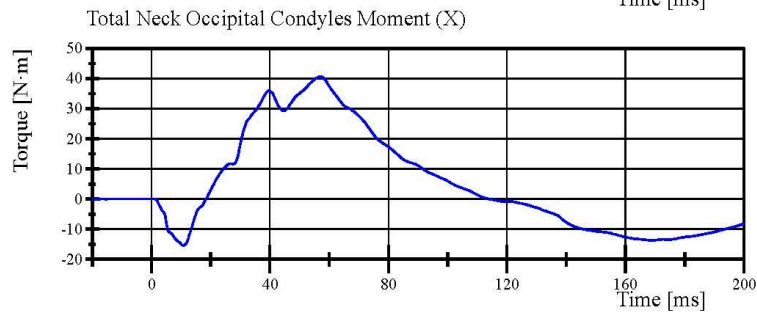
Filter Class: CFC_1000
Max: 469.9 N at 51.7 ms
Min: -156.4 N at 172.0 ms



Filter Class: CFC_600
Max: 468.5 N at 51.8 ms
Min: -156.2 N at 172.2 ms



Filter Class: CFC_600
Max: 33.3 Nm at 57.4 ms
Min: -20.5 Nm at 11.0 ms



Filter Class: Without_(Constar
Max: 40.6 N·m at 56.9 ms
Min: -15.4 N·m at 10.8 ms

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

06.27.2024 09:29:54 751



Transportation Research Center Inc.

Left Lateral Shoulder

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.4 g	Yes
Shoulder Displacement	28 - 37 mm	32.1 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	18.7 g	Yes

Test meets specifications.

Condition: Used

Comments:

Arm S/N: 940L

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

06.27.2024 10:55:52 858

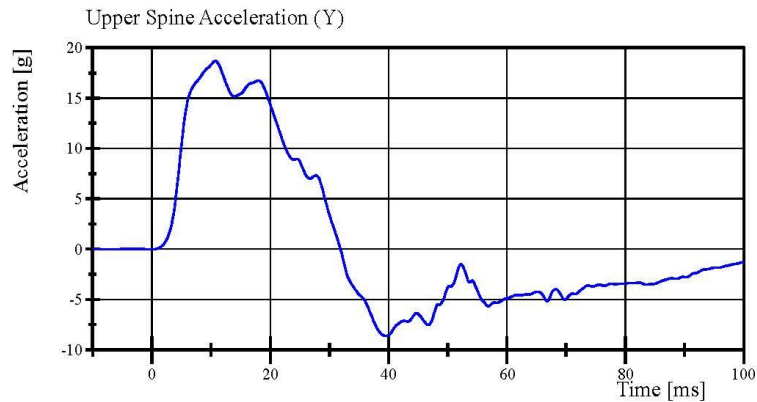
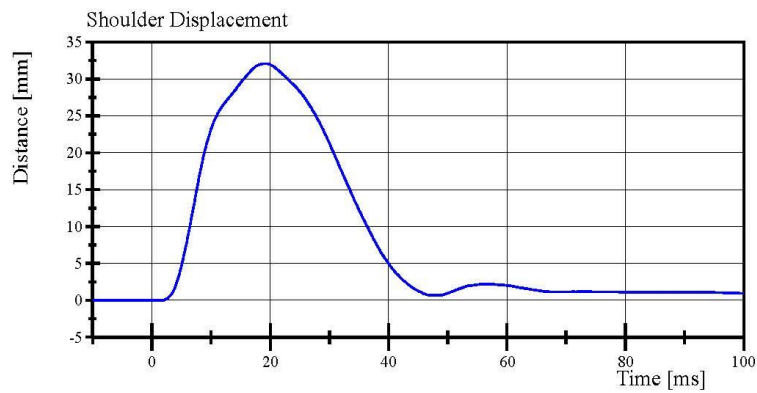
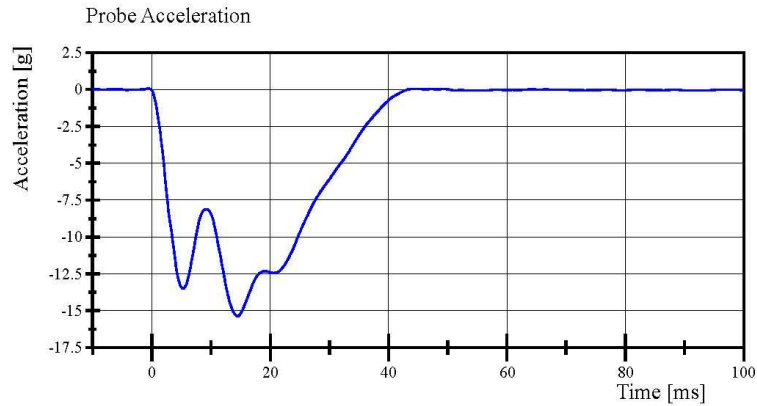


Transportation Research Center Inc.

Left Lateral Shoulder

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024



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

06.27.2024 10:57:05 858



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 69-1
Test Date: 6/27/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.728 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-34.1 g	Yes
Shoulder Displacement	31 - 40 mm	35.5 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	27.2 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	32.8 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	36.7 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	36.5 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	35.2 g	Yes

Test meets specifications.

Condition: Used

Comments:

Left Arm S/N: 940L

Shoulder Rib S/N: 550

Upper Thorax Rib S/N: DM5020

Middle Thorax Rib S/N: DM5021

Lower Thorax Rib S/N: DM5022

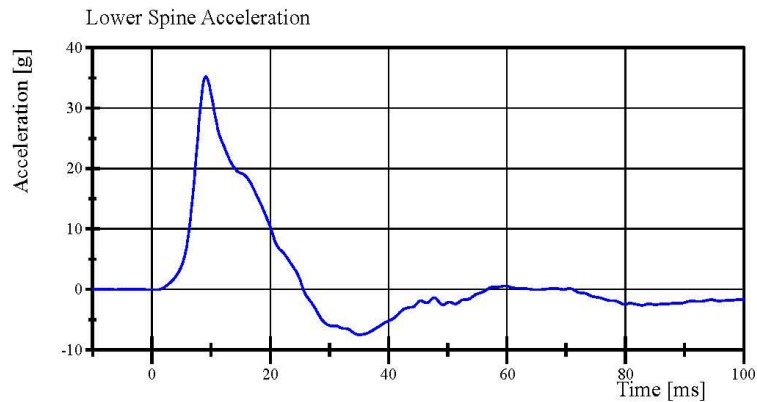
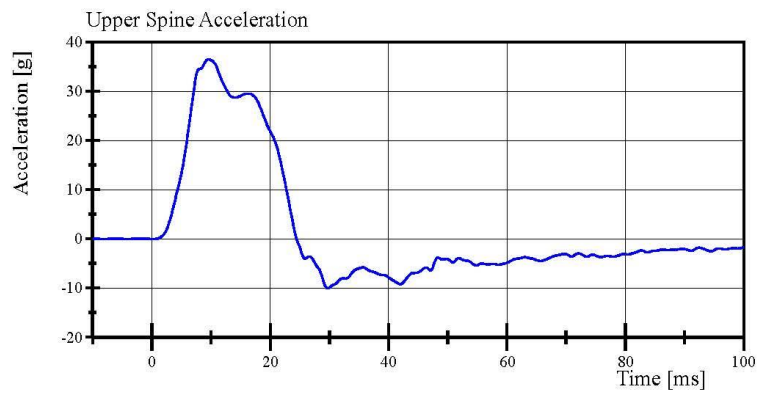
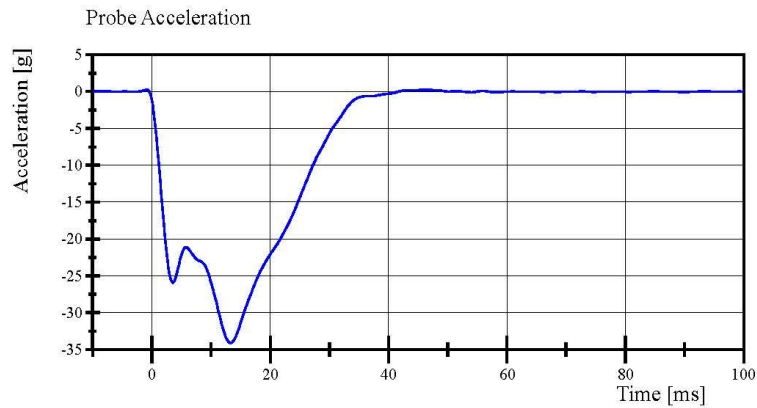
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

06.27.2024 12:32:04 642



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 69-1
Test Date: 6/27/2024



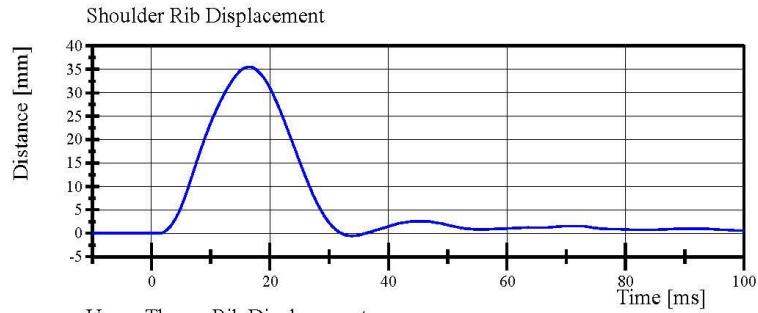
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

06.27.2024 12:32:59 642

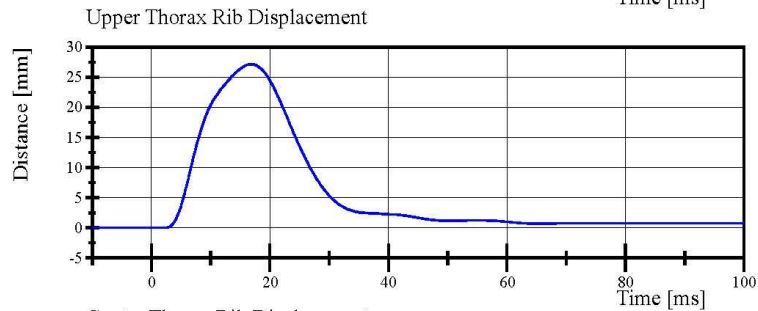


Transportation Research Center Inc.

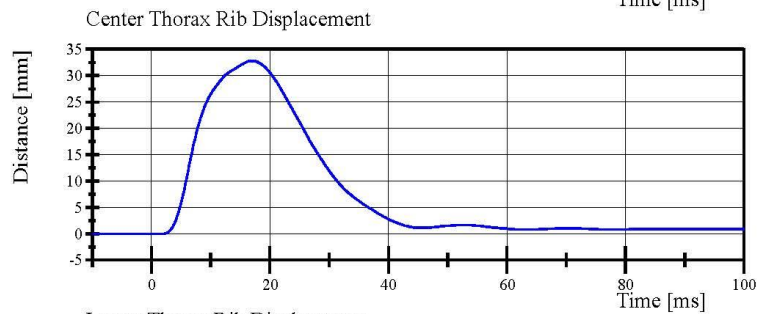
Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 69-1
Test Date: 6/27/2024



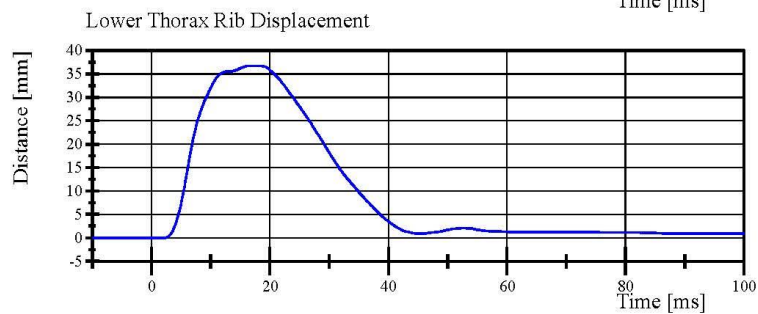
Filter Class: CFC_600
Max: 35.5 mm at 16.6 ms
Min: -0.5 mm at 33.8 ms



Filter Class: CFC_600
Max: 27.2 mm at 16.8 ms
Min: -0.0 mm at -9.4 ms



Filter Class: CFC_600
Max: 32.8 mm at 17.0 ms
Min: -0.0 mm at 1.9 ms



Filter Class: CFC_600
Max: 36.7 mm at 17.2 ms
Min: -0.0 mm at 2.2 ms

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

06.27.2024 12:33:00 642



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 69-1
Test Date: 6/27/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.360 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-15.5 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	35.6 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	42.0 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	41.6 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	13.5 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	9.5 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

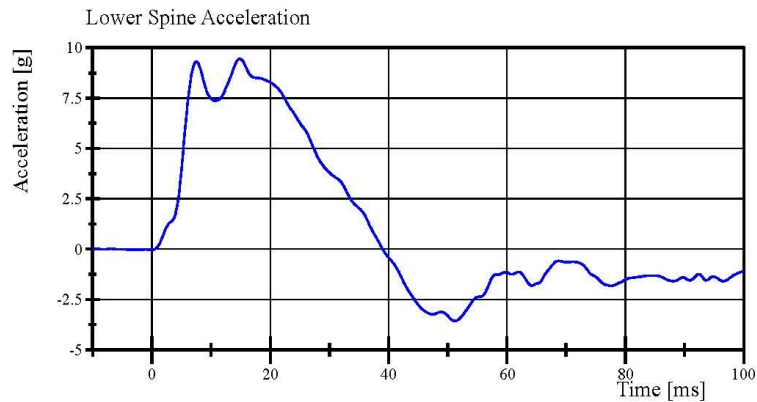
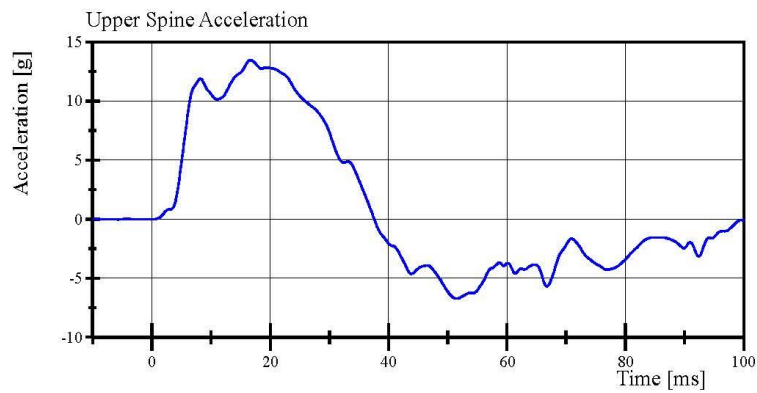
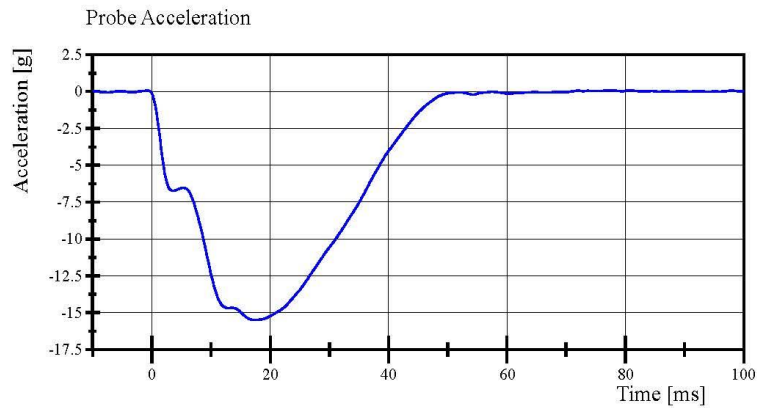
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

06.27.2024 11:35:45 843



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 69-1
Test Date: 6/27/2024



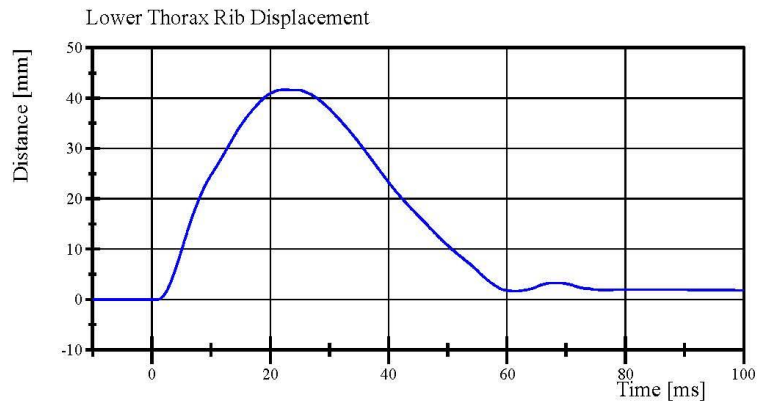
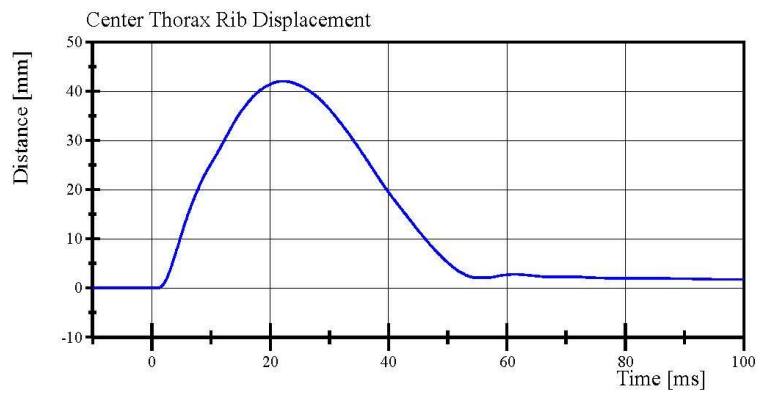
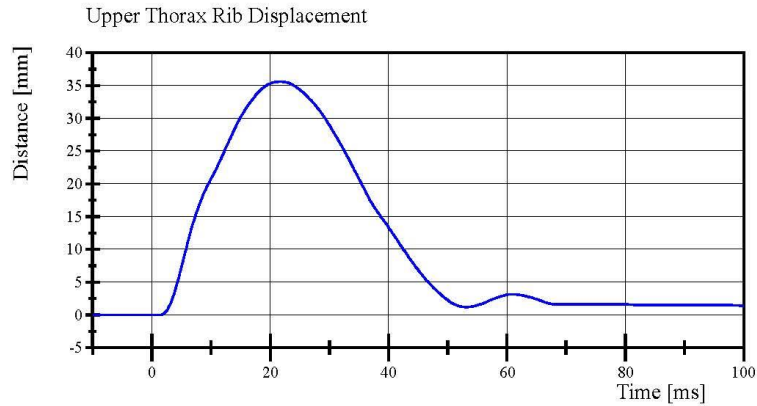
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

06.27.2024 11:36:22 843



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 69-1
Test Date: 6/27/2024



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

06.27.2024 11:36:22 843



Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.39 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.8 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	37.3 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	40.4 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	11.17 g	Yes

Test meets specifications.

Condition: Used

Comments:

Upper Abdominal Rib S/N: DM7281

Lower Abdominal Rib S/N: DM7275

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

06.27.2024 11:13:04 685

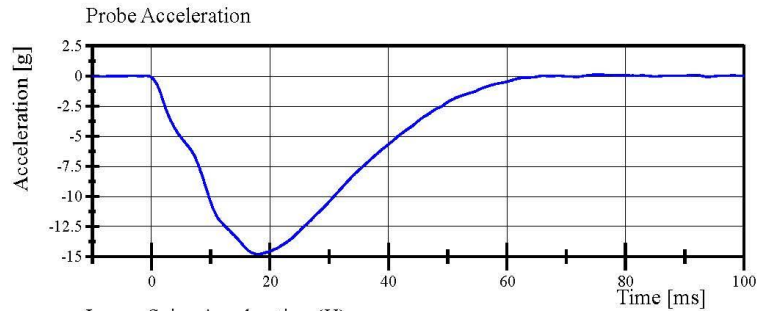


Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. 297 Certification No. 69-1

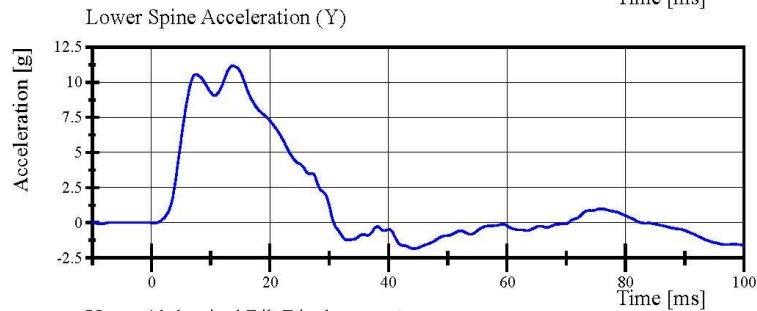
Test Date: 6/27/2024



Filter Class: CFC_180

Max: 0.1 g at 75.6 ms

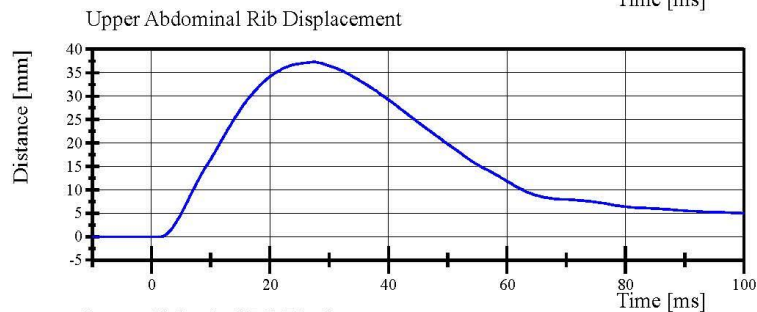
Min: -14.8 g at 17.9 ms



Filter Class: CFC_180

Max: 11.2 g at 13.8 ms

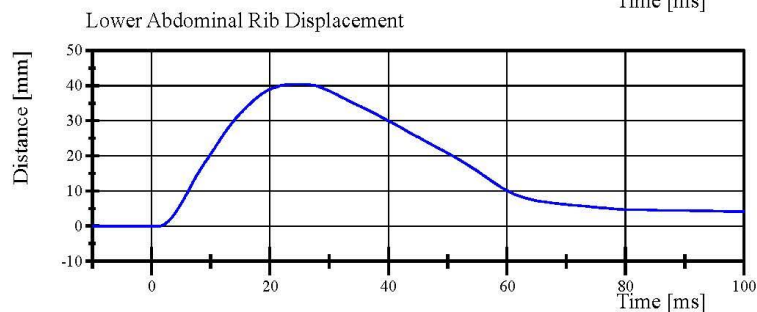
Min: -1.8 g at 44.3 ms



Filter Class: CFC_600

Max: 37.3 mm at 27.4 ms

Min: -0.0 mm at -8.1 ms



Filter Class: CFC_600

Max: 40.4 mm at 25.4 ms

Min: -0.0 mm at 1.0 ms

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

06.27.2024 11:13:45 685



Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	70 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.62 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-42.00 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	34.7 g	Yes
Acetabulum Force	3,600 - 4,300 N	3,699.2 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: 1171

Pelvis Plug Info:

Manufacturer: Saco

S/N: 14638

Cal Date: 20201221

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

06.27.2024 10:40:57 467

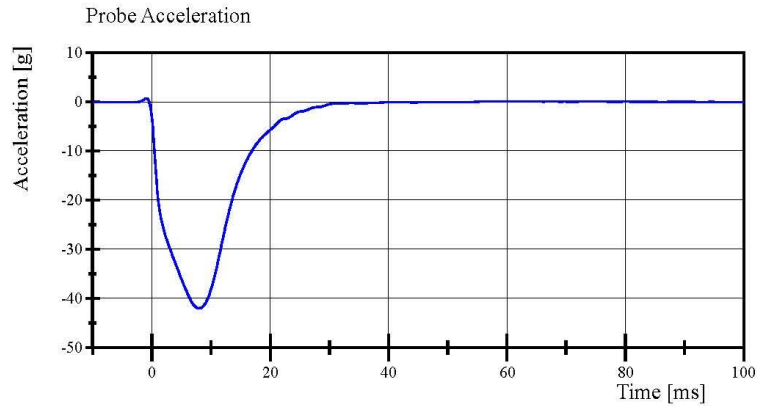


Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. 297 Certification No. 69-1

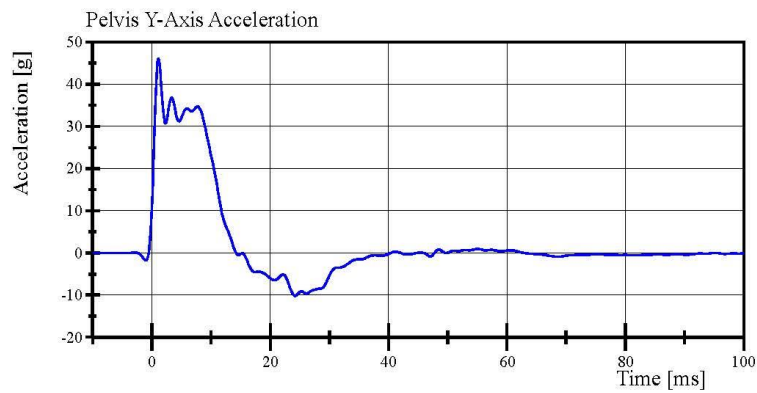
Test Date: 6/27/2024



Filter Class: CFC_180

Max: 0.7 g at -1.0 ms

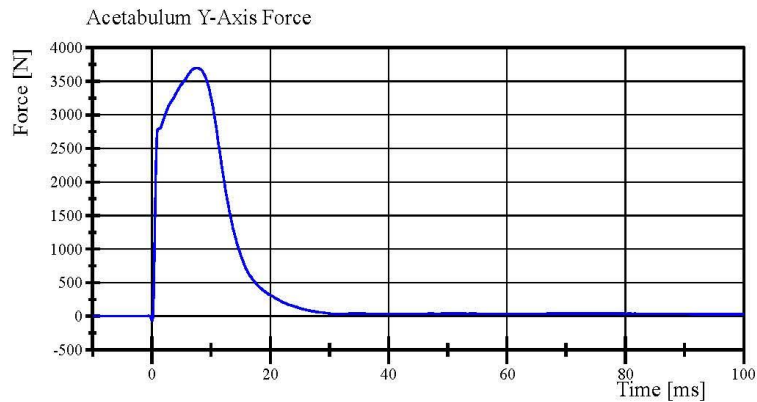
Min: -42.0 g at 7.9 ms



Filter Class: CFC_180

Max: 46.0 g at 1.1 ms

Min: -10.2 g at 24.2 ms



Filter Class: CFC_600

Max: 3,699.2 N at 7.5 ms

Min: -65.6 N at 0.0 ms

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

06.27.2024 10:42:11 467



Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.24 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-40.2 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	31.8 g	Yes
Iliac Force	4,100 - 5,100 N	4,667.5 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: 1171

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

06.27.2024 12:55:58 722

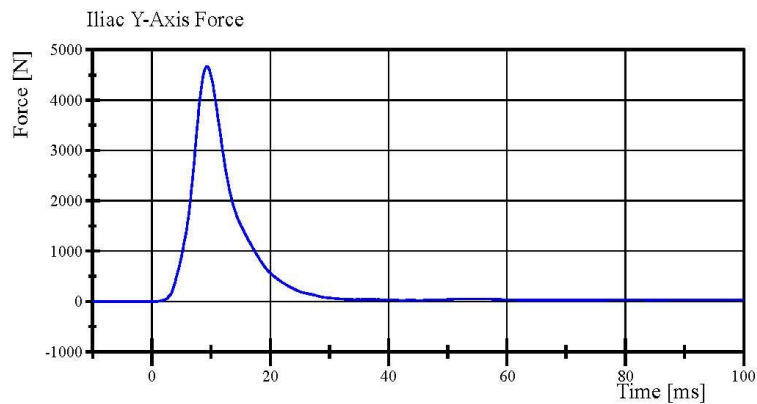
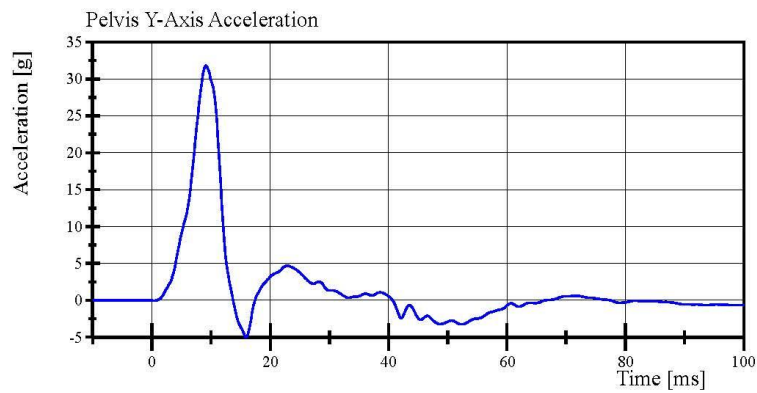
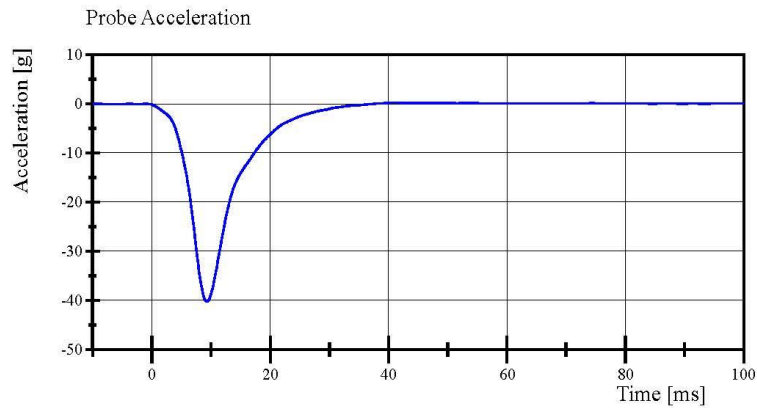


Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. 297 Certification No. 69-1

Test Date: 6/27/2024



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

06.27.2024 12:56:34 722



Post-Test Calibration Sheets
Driver S/N 297

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. 297 Calibration No. 70

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	780	Yes
B	Shoulder Pivot Height	437.0 - 453.0	450	Yes
C	H-Point Height	79.0 - 89.0	85	Yes
D	H-Point from Seat Back	141.0 - 151.0	147	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	102	Yes
F	Thigh Clearance	119.0 - 135.0	130	Yes
G	Head Breadth	140.0 - 148.0	147	Yes
H	Head Back from Backline	40.0 - 46.0	45	Yes
I	Head Depth	178.0 - 188.0	183	Yes
J	Head Circumference	541.0 - 551.0	544	Yes
K	Buttock to Knee Length	514.0 - 540.0	528	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	430	Yes
O	Chest Depth without Jacket	195.0 - 211.0	200	Yes
P	Foot Length (right)	216.0 - 232.0	223	Yes
P	Foot Length (left)	216.0 - 232.0	223	Yes
Q	Hip Breadth	313.0 - 323.0	319	Yes
R	Arm Length	249.0 - 259.0	254	Yes
S	Knee Joint to seat Back	478.0 - 493.0	485	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	347	Yes
W	Foot Width (right)	78.0 - 94.0	85	Yes
W	Foot Width (left)	78.0 - 94.0	85	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	877	Yes
Z	Waist Circumference	761.0 - 791.0	781	Yes

Revised 9/29/2005

Report Number: 297_S2F70

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Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	129.5 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-6.0 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	< 15 %	1.03 %	Yes

Test meets specifications.

Condition: Used

Comments:

Head Skin S/N: 1330

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

07.25.2024 13:15:39 230

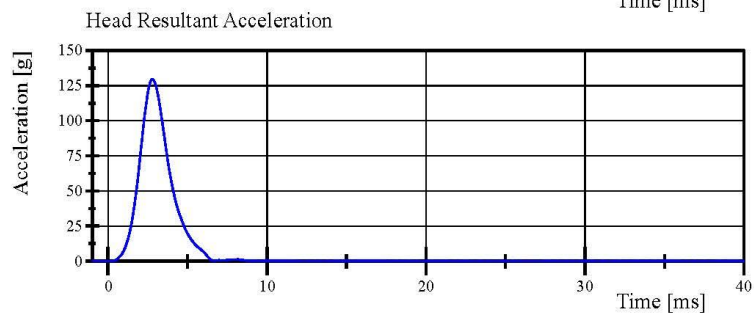
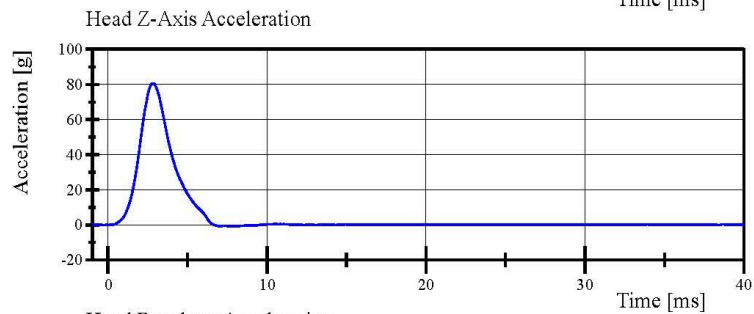
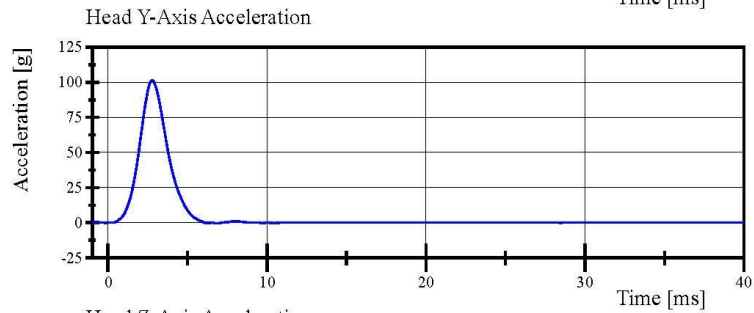
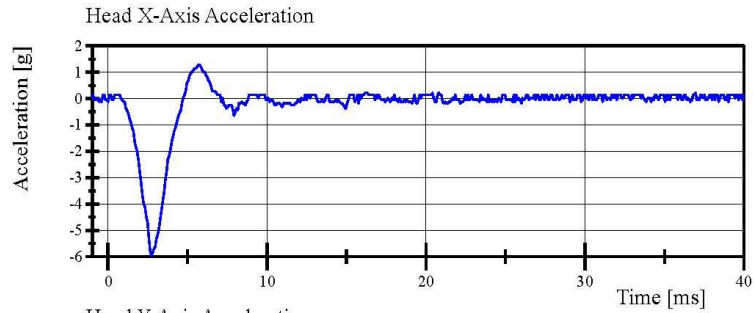


Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024



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

07.25.2024 13:16:02 230



Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	67 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.630 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.260 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.389 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	4.614 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.644 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.836 m/s	Yes
Maximum Headform Flexion			
Peak	(-71) - (-81) deg	-79.6 deg	Yes
Time of Peak	50 - 70 ms	62.7 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	39.9 N·m	Yes
Decay to 0 N·m	102 - 126 ms	116.3 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 779

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

07.25.2024 13:41:50 747

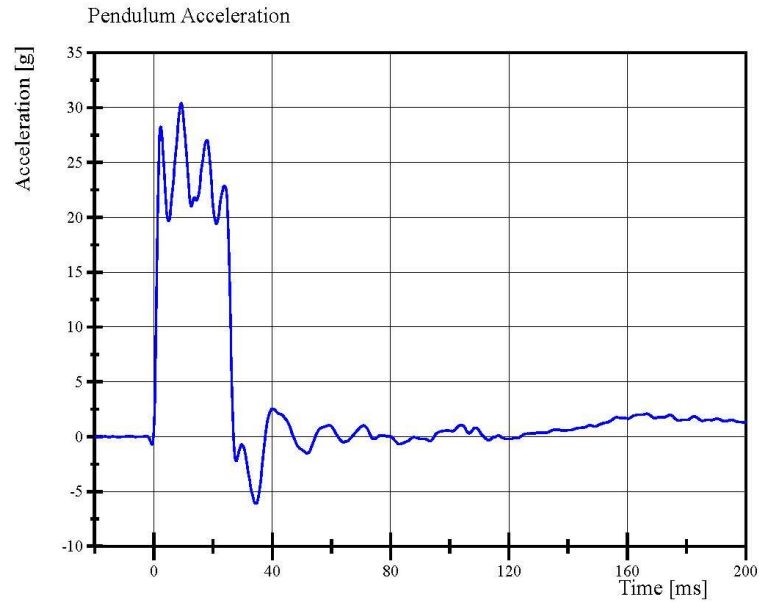


Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 297 Certification No. 70-1

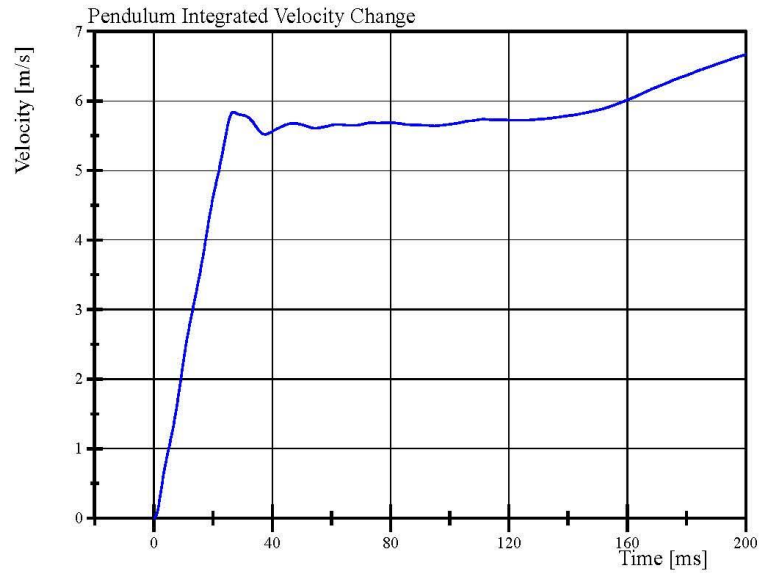
Test Date: 7/25/2024



Filter Class: CFC_180

Max: 30.4 g at 9.3 ms

Min: -6.1 g at 34.5 ms



Filter Class: CFC_180

Max: 6.7 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

07.25.2024 13:42:13 747



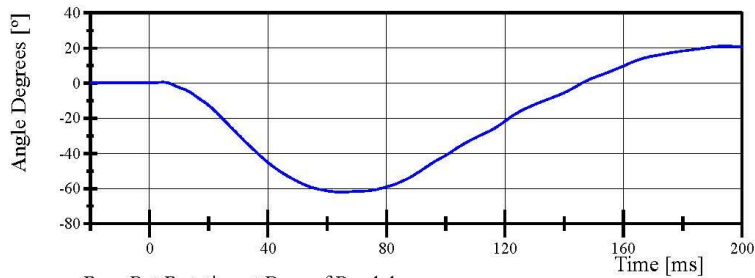
Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. 297 Certification No. 70-1

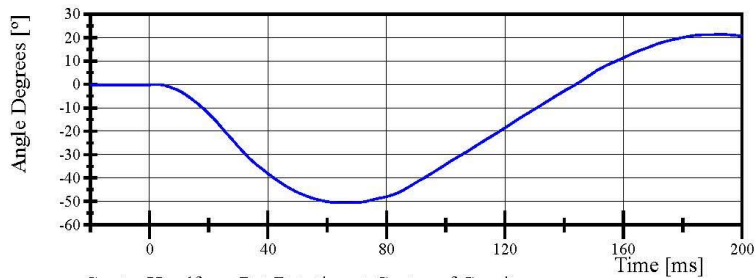
Test Date: 7/25/2024

Forward Pot Rotation at Base of Pendulum



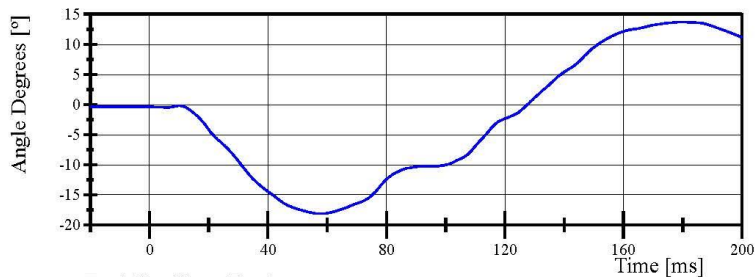
Filter Class: CFC_60
Max: 21.2 ° at 194.1 ms
Min: -62.0 ° at 65.0 ms

Rear Pot Rotation at Base of Pendulum



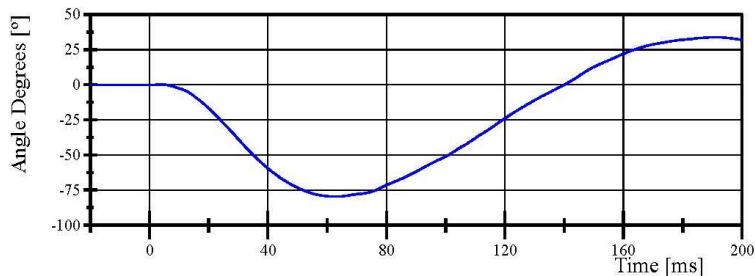
Filter Class: CFC_60
Max: 21.3 ° at 193.1 ms
Min: -50.6 ° at 65.6 ms

Center Headform Pot Rotation at Center of Gravity



Filter Class: CFC_60
Max: 13.7 ° at 179.5 ms
Min: -18.1 ° at 57.8 ms

Total Headform Flexion



Filter Class: CFC_60
Max: 33.8 ° at 191.2 ms
Min: -79.6 ° at 62.7 ms

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

07.25.2024 13:42:13 747

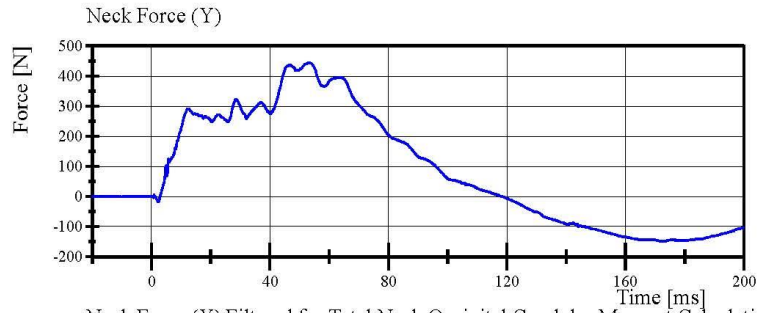


Transportation Research Center Inc.

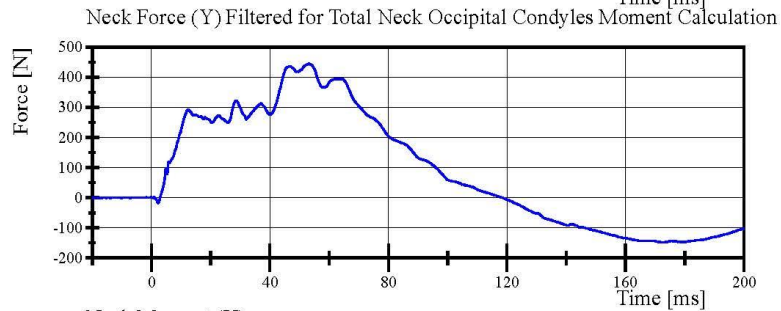
Left Lateral Neck

SID IIs Serial No. 297 Certification No. 70-1

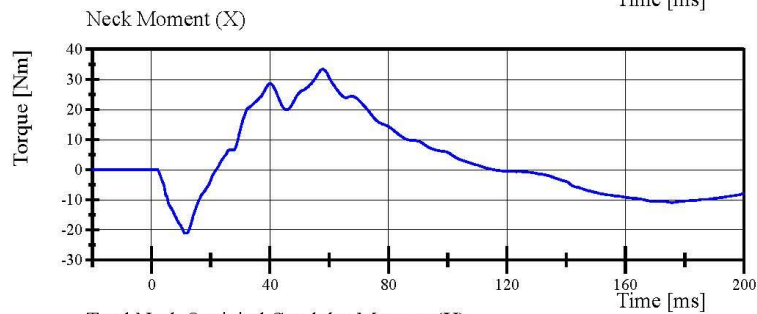
Test Date: 7/25/2024



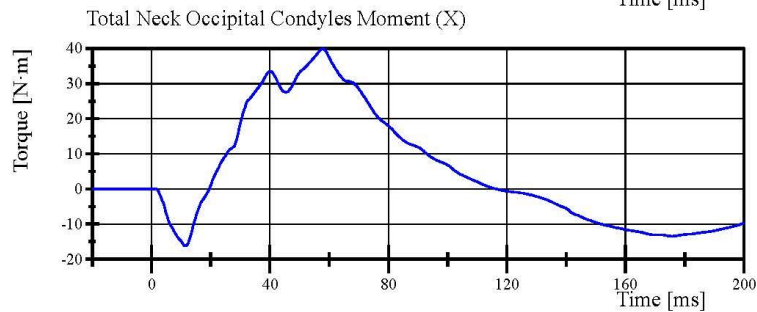
Filter Class: CFC_1000
Max: 445.0 N at 53.1 ms
Min: -149.3 N at 172.6 ms



Filter Class: CFC_600
Max: 444.6 N at 53.1 ms
Min: -148.7 N at 172.6 ms



Filter Class: CFC_600
Max: 33.3 Nm at 57.8 ms
Min: -21.1 Nm at 11.8 ms



Filter Class: Without_(Constar
Max: 39.9 N·m at 57.8 ms
Min: -16.2 N·m at 11.1 ms

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

07.25.2024 13:42:14 747



Transportation Research Center Inc.

Left Lateral Shoulder

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	70 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.4 g	Yes
Shoulder Displacement	28 - 37 mm	32.0 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	18.8 g	Yes

Test meets specifications.

Condition: Used

Comments:

Arm S/N: 940L

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

07.25.2024 09:51:10 846

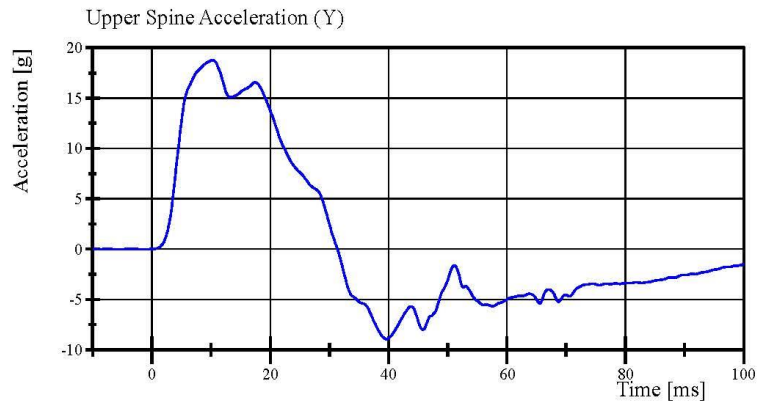
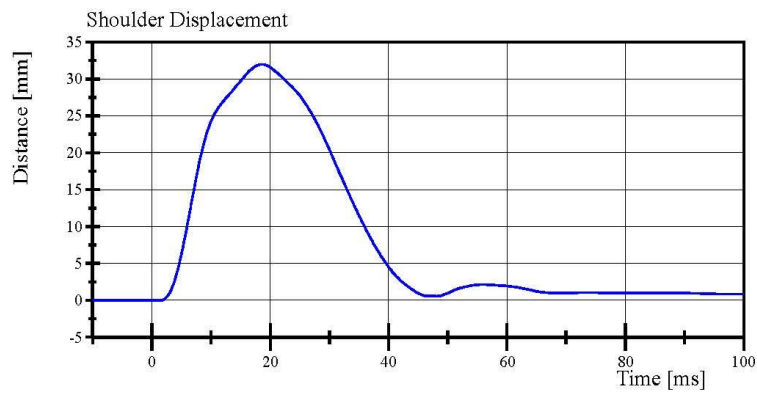
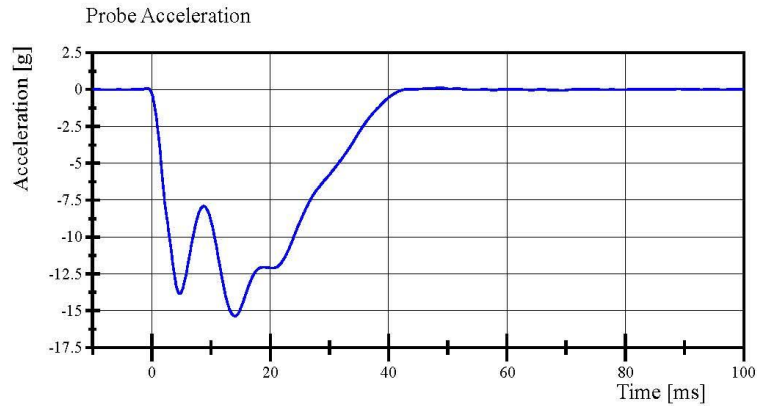


Transportation Research Center Inc.

Left Lateral Shoulder

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024



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

07.25.2024 09:51:34 846



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 70-1
Test Date: 7/25/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	70 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.736 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-34.4 g	Yes
Shoulder Displacement	31 - 40 mm	35.3 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	27.5 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	33.4 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	37.0 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	37.5 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	34.6 g	Yes

Test meets specifications.

Condition: Used

Comments:

Left Arm S/N: 940L

Shoulder Rib S/N: 550

Upper Thorax Rib S/N: DM5020

Middle Thorax Rib S/N: DM5021

Lower Thorax Rib S/N: DM5022

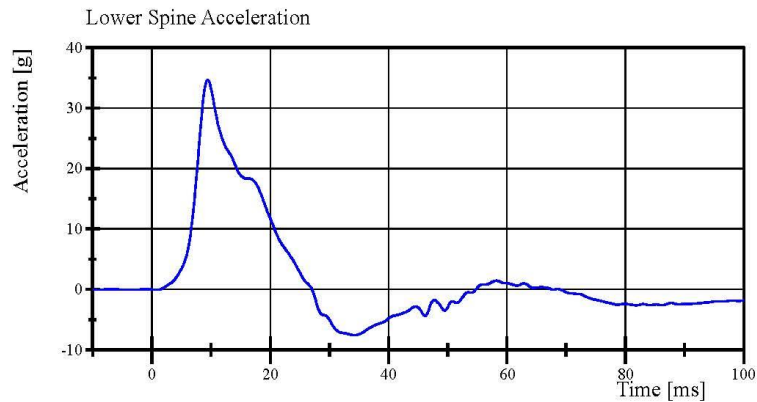
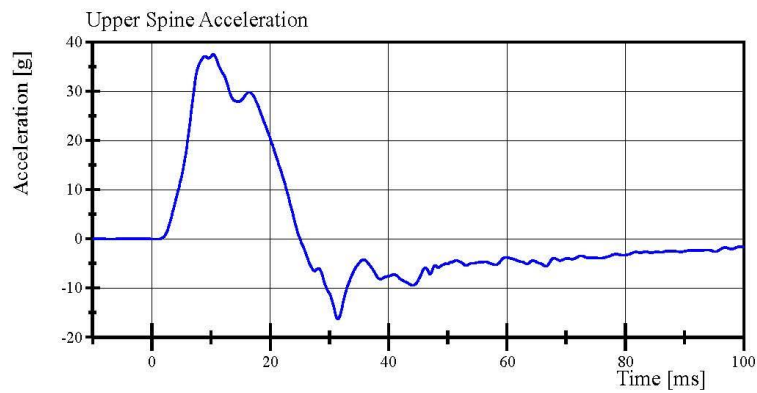
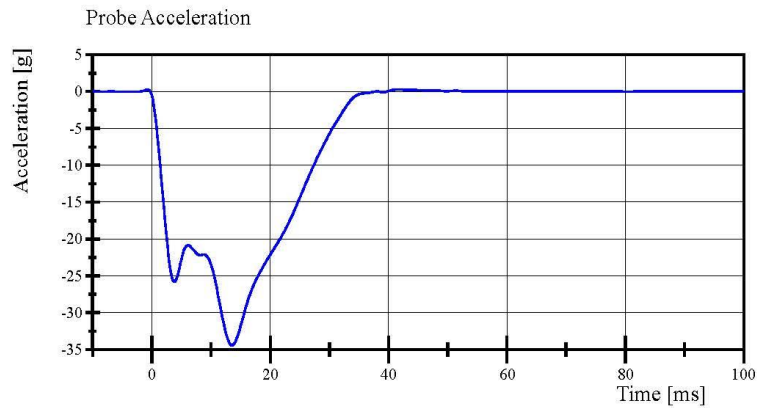
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

07.25.2024 11:33:45 530



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 70-1
Test Date: 7/25/2024



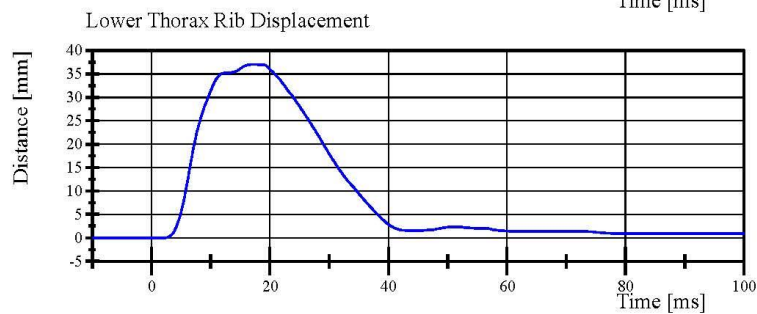
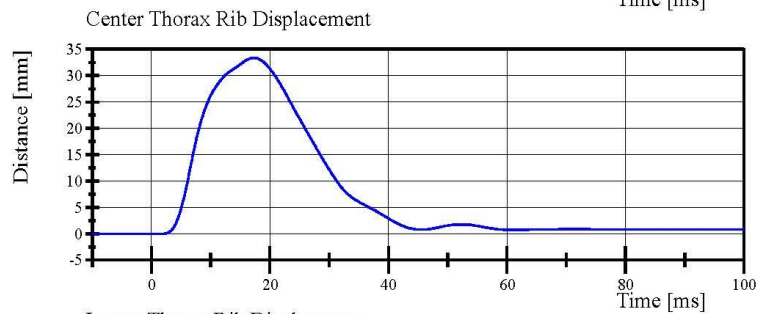
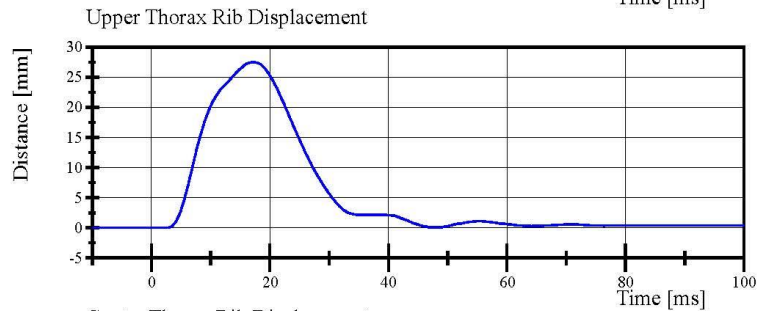
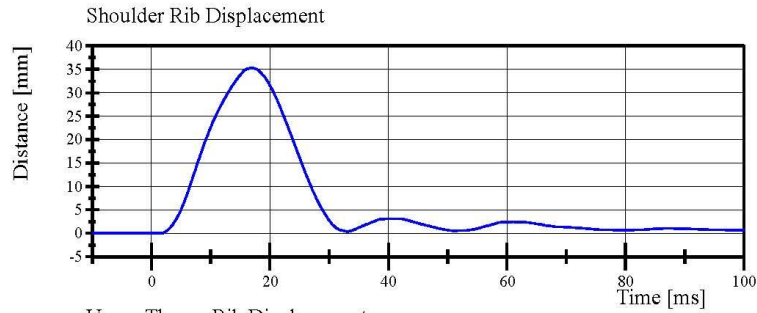
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

07.25.2024 11:34:18 530



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 70-1
Test Date: 7/25/2024



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

07.25.2024 11:34:18 530



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 70-2
Test Date: 7/25/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.326 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-15.6 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	34.1 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	41.9 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	42.7 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	13.7 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	9.3 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

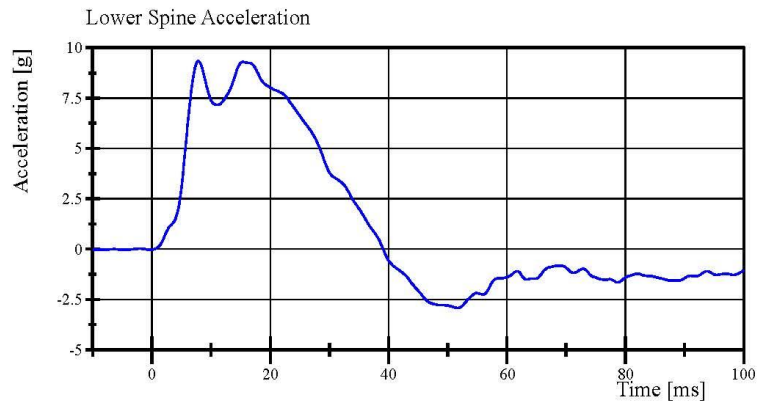
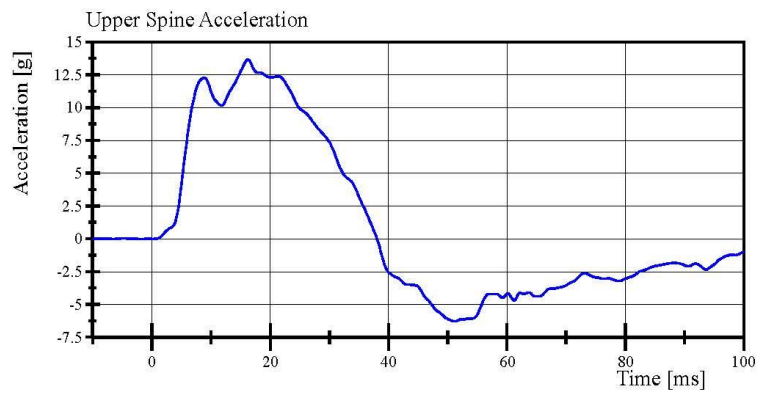
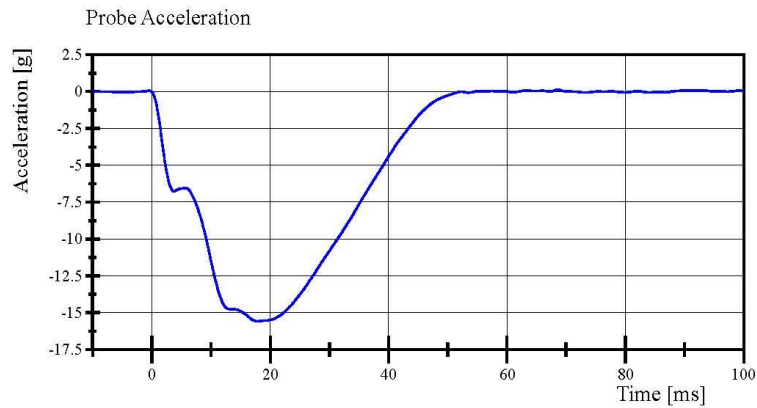
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

07.25.2024 11:09:40 781



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 70-2
Test Date: 7/25/2024



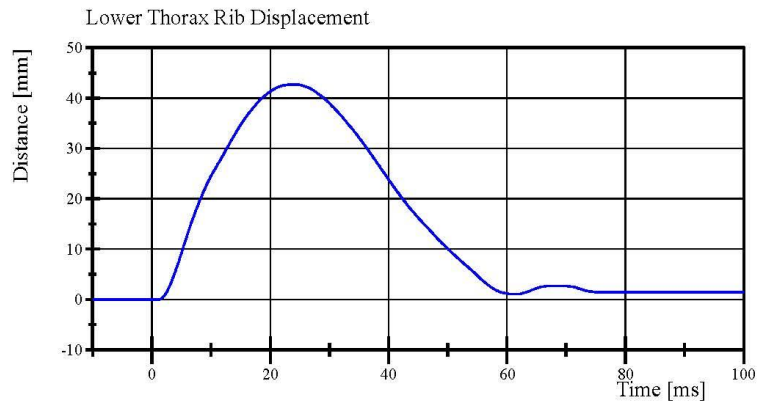
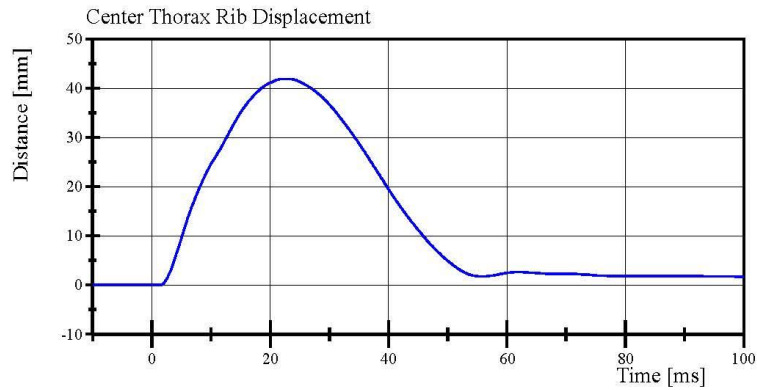
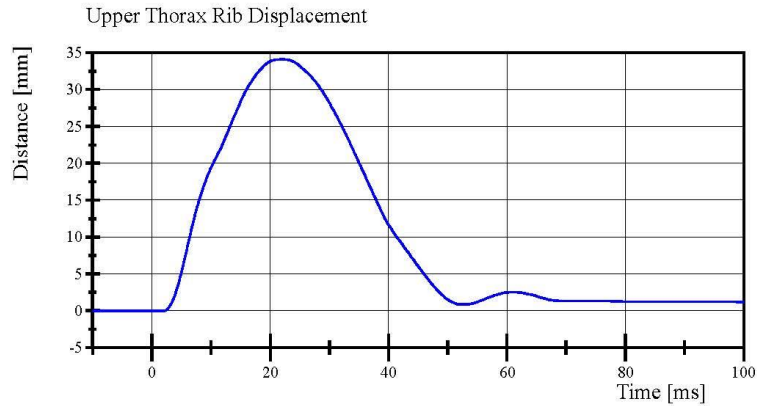
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

07.25.2024 11:10:50 781



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 70-2
Test Date: 7/25/2024



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

07.25.2024 11:10:51 781



Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. 297 Certification No. 70-2

Test Date: 7/25/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.7 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.36 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.4 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	35.5 mm	No
Lower Abdominal Rib Displacement	33 - 44 mm	39.9 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	11.17 g	Yes

Test does not meet specifications.

Condition: Used

Comments:

Upper Abdominal Rib S/N: DM7281

Lower Abdominal Rib S/N: DM7275

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

07.25.2024 11:46:47 672

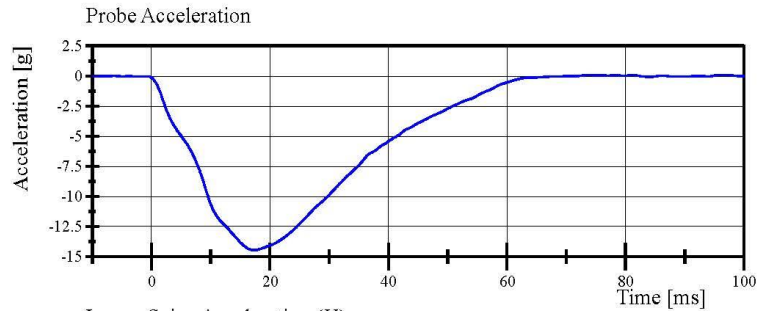


Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. 297 Certification No. 70-2

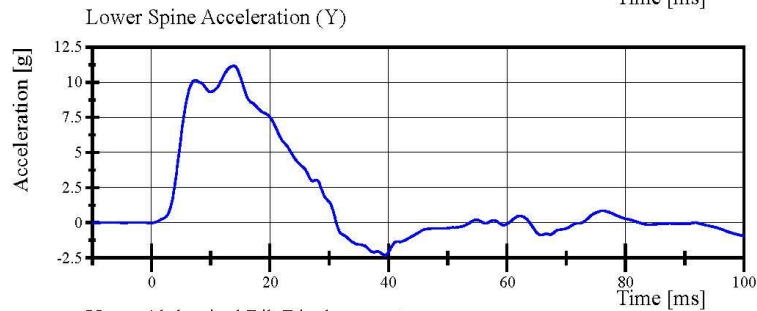
Test Date: 7/25/2024



Filter Class: CFC_180

Max: 0.1 g at 96.6 ms

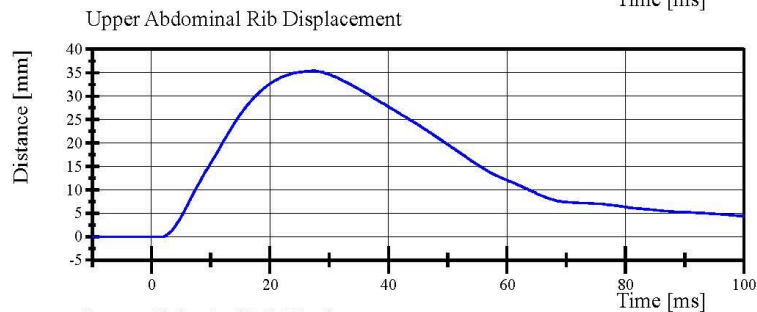
Min: -14.4 g at 17.3 ms



Filter Class: CFC_180

Max: 11.2 g at 13.9 ms

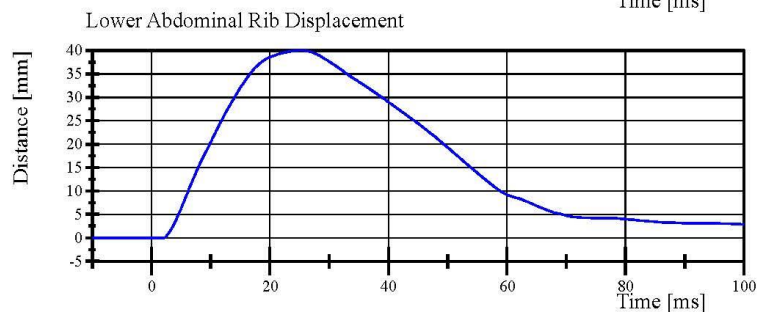
Min: -2.3 g at 39.4 ms



Filter Class: CFC_600

Max: 35.5 mm at 27.4 ms

Min: -0.0 mm at 1.8 ms



Filter Class: CFC_600

Max: 39.9 mm at 25.4 ms

Min: -0.0 mm at 2.0 ms

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

07.25.2024 11:47:37 672



Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.61 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-42.75 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	36.0 g	Yes
Acetabulum Force	3,600 - 4,300 N	3,734.1 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: 1171

Pelvis Plug Info:

Manufacturer: Saco

S/N: 14536

Cal Date: 20201221

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

07.25.2024 09:22:27 455

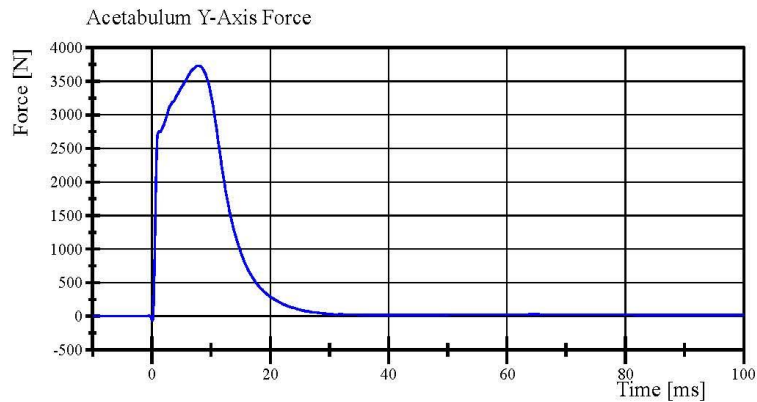
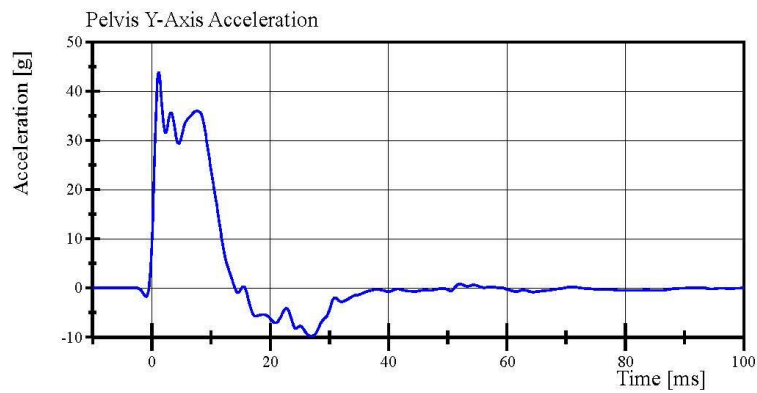
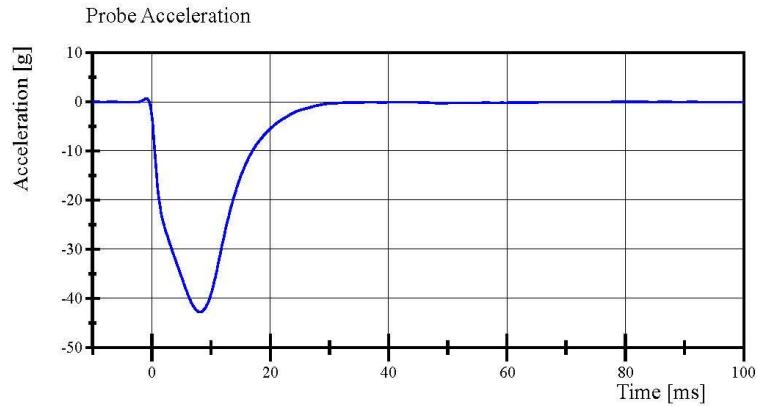


Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024



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

07.25.2024 09:23:06 455



Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.24 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-39.6 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	31.2 g	Yes
Iliac Force	4,100 - 5,100 N	4,546.4 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: 1171

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

07.25.2024 12:53:03 662

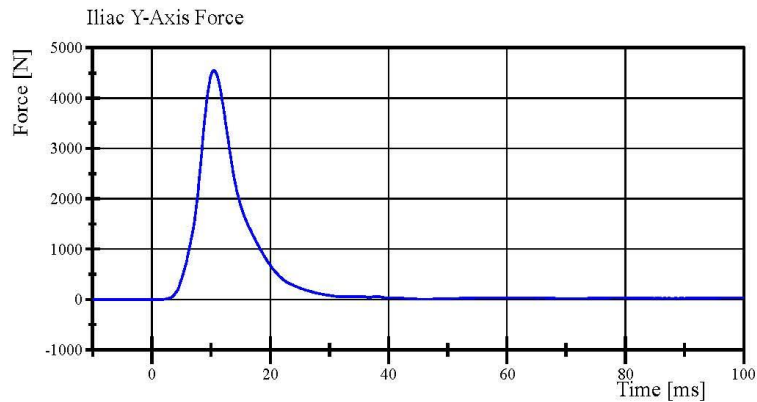
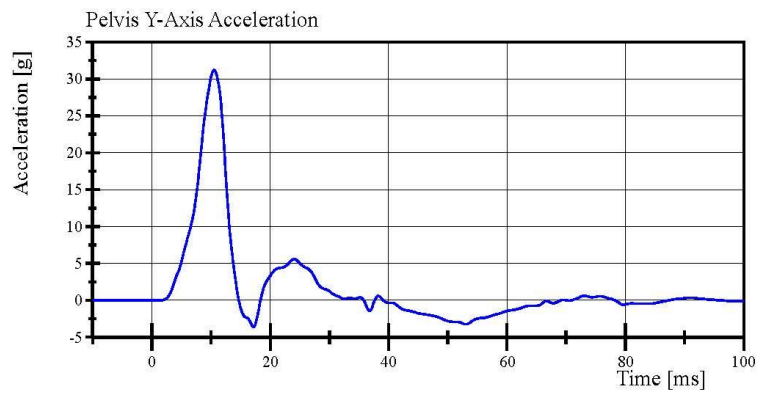
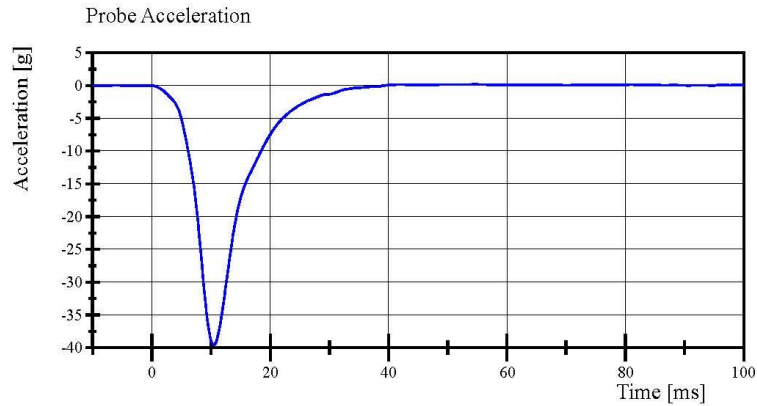


Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. 297 Certification No. 70-1

Test Date: 7/25/2024



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

07.25.2024 12:53:35 662



APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 297			
				Serial Number	Manufacturer	Calibration Date	
Head Accelerometers				X	T17622	Endevco	24-May-2024
				Y	T24507	Endevco	24-May-2024
				Z	T17636	Endevco	24-May-2024
Displacement Potentiometers	Shoulder			Y	N/A	N/A	N/A
	Thoracic Rib	Upper	Y	023	Servo	26-Apr-2024	
		Middle	Y	063	Servo	26-Apr-2024	
		Lower	Y	043	Servo	26-Apr-2024	
	Abdominal Rib	Upper	Y	1152	Servo	26-Apr-2024	
		Lower	Y	051	Servo	26-Apr-2024	
Lower Spine Accelerometers (T12)				X	T20232	Endevco	24-May-2024
				Y	T21084	Endevco	24-May-2024
				Z	T17633	Endevco	24-May-2024
Acetabulum Load Cell				Y	235-FY	FTSS	26-Apr-2024
Iliac Wing Load Cell				Y	320-FY	Denton	26-Apr-2024
Pelvis Plug (struck side)					14629	Saco	21-Dec-2020
Pelvis Plug (non-struck side)					14633	Saco	21-Dec-2020

TABLE 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	A400080	Measurement Specialties	18-Jun-2024
Vehicle Center of Gravity	Y	A400075	Measurement Specialties	18-Jun-2024
Vehicle Center of Gravity	Z	A386347	Measurement Specialties	23-May-2024
Left Floor Sill	Y	A377510	Measurement Specialties	25-Mar-2024
A-Pillar Sill	Y	A377503	Measurement Specialties	18-Jun-2024
A-Pillar Low	Y	A377499	Measurement Specialties	18-Jun-2024
A-Pillar Mid	Y	A400072	Measurement Specialties	18-Jun-2024
B-Pillar Sill	Y	A400073	Measurement Specialties	18-Jun-2024
B-Pillar Low	Y	A377514	Measurement Specialties	18-Jun-2024
B-Pillar Mid	Y	A386298	Measurement Specialties	30-Apr-2024
Driver Seat	Y	A378291	Measurement Specialties	23-May-2024
Engine Top	X	A377498	Measurement Specialties	18-Jun-2024
Engine Top	Y	A377495	Measurement Specialties	18-Jun-2024
Firewall	Y	A377515	Measurement Specialties	18-Jun-2024
Right Roof	Y	A400097	Measurement Specialties	22-Mar-2024
Right Floor Sill	Y	A386353	Measurement Specialties	18-Jun-2024
Rear Floor Pan	X	A377509	Measurement Specialties	18-Jun-2024
Rear Floor Pan	Y	A377511	Measurement Specialties	18-Jun-2024

TABLE 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	DK7091S	Humanetics	4-Jan-2024
Load Cell 2	DK7120S	Humanetics	4-Jan-2024
Load Cell 3	DK7118S	Humanetics	4-Jan-2024
Load Cell 4	DK7124S	Humanetics	4-Jan-2024
Load Cell 5	DK7111S	Humanetics	4-Jan-2024
Load Cell 6	DK7126S	Humanetics	4-Jan-2024
Load Cell 7	DK7112S	Humanetics	4-Jan-2024
Load Cell 8	DK7074S	Humanetics	4-Jan-2024