

FINAL REPORT NUMBER: SINCAP-TRC-22-003

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

**FCA US LLC
2022 Jeep Grand Cherokee L
NHTSA NUMBER: M20220305**

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



Report Date: August 7, 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: August 7, 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 2022 Jeep Grand Cherokee L, 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 September 21, 2022. The impact velocity of the Moving Deformable Barrier (MDB) was 62.05 km/h, and the ambient temperature at the struck (left) side of the target vehicle at the time of impact was 22.1° C. The target vehicle post-test maximum crush was 279 mm at Level 2. The test vehicle's performance was as follows: <table border="0" style="margin-left: 40px;"> <thead> <tr> <th colspan="4" style="text-align: center;">Driver ATD (ES-2re)</th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">IARV</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">89</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">44</td> <td style="text-align: center;">19.9</td> </tr> <tr> <td>Total Abdominal Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">2500</td> <td style="text-align: center;">654.8</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td style="text-align: center;">N</td> <td style="text-align: center;">6000</td> <td style="text-align: center;">-1226.6</td> </tr> <tr> <td>Lower Spine Acceleration</td> <td style="text-align: center;">G</td> <td style="text-align: center;">82*</td> <td style="text-align: center;">26.6</td> </tr> </tbody> </table> <table border="0" style="margin-left: 40px;"> <thead> <tr> <th colspan="4" style="text-align: center;">Passenger ATD (SID-IIs)</th> </tr> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">IARV</th> <th style="text-align: center;">Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">92</td> </tr> <tr> <td>Lower Spine Resultant Acceleration</td> <td style="text-align: center;">g's</td> <td style="text-align: center;">82</td> <td style="text-align: center;">33.5</td> </tr> <tr> <td>Total Pelvic Force (sum of acetabular and iliac forces)</td> <td style="text-align: center;">N</td> <td style="text-align: center;">5525</td> <td style="text-align: center;">1669.9</td> </tr> <tr> <td>Maximum Thoracic Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">38*</td> <td style="text-align: center;">11.6</td> </tr> <tr> <td>Maximum Abdominal Rib Deflection</td> <td style="text-align: center;">mm</td> <td style="text-align: center;">45*</td> <td style="text-align: center;">26.5</td> </tr> </tbody> </table> <p style="margin-left: 40px;">* Proposed IARV</p>				Driver ATD (ES-2re)				Measurement Description	Units	IARV	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	89	Maximum Thoracic Rib Deflection	mm	44	19.9	Total Abdominal Force	N	2500	654.8	Pubic Symphysis Force	N	6000	-1226.6	Lower Spine Acceleration	G	82*	26.6	Passenger ATD (SID-IIs)				Measurement Description	Units	IARV	Result	Head Injury Criteria (HIC ₃₆)	N/A	1000	92	Lower Spine Resultant Acceleration	g's	82	33.5	Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1669.9	Maximum Thoracic Rib Deflection	mm	38*	11.6	Maximum Abdominal Rib Deflection	mm	45*	26.5
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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 2022 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 2022 Jeep Grand Cherokee L. 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 2022 Jeep Grand Cherokee L 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 62.05 km/h (38.56 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 September 21, 2022. Pre-test and post-test photographs of the test vehicle and the MDB and the dummies (ES-2re 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-2re)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	89
Maximum Thoracic Rib Deflection	mm	44	19.9
Combined Abdominal Force	N	2500	654.8
Pubic Symphysis Force	N	6000	-1226.6
Lower Spine (T12) Resultant Acceleration	G	82*	26.6

* Proposed IARV

Measurement Description	Passenger ATD (SID-IIs)		
	Units	Threshold	Result
Head Injury Criteria (HIC ₃₆)	N/A	1000	92
Lower Spine (T12) Resultant Acceleration	G	82	33.5
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	1669.9
Maximum Thoracic Rib Deflection	mm	38*	11.6
Maximum Abdominal Rib Deflection	mm	45*	26.5

* 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	Yes	No	No	N/A
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	No	No	N/A
Other Safety Restraint	No	N/A	No	N/A

GENERAL COMMENTS

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

LEFT LOWER A-POST AY; Channel failed after 10.0 ms

LEFT MID A-POST AY; Channel failed after 10.0 ms

LEFT LOWER B-POST AY; Channel failed after 10.0 ms

LEFT MID B-POST AY; Channel failed after 15.0 ms

DRIVER SEAT TRACK AY; Channel failed after 10.0 ms

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

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

Test Vehicle: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20220305
Model Year	2022
Make	Jeep
Model	Grand Cherokee
Body Style	MPV
VIN	1C4RJJBG4N8638863
Body Color	Velvet Red Pearl
Odometer Reading (km/mi)	17 mi
Engine Displacement (L)	3.6
Type/No. Cylinders	V/6
Engine Placement	Inline Front
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	RWD
Roof Rack	No
Sunroof/T-Top	Yes
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	Yes
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Passenger Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Passenger Load Limiter	No
Other Safety Restraint	No

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

DATA FROM CERTIFICATION LABEL

Manufactured By	FCA US LLC
Date of Manufacture	8-22
Vehicle Type	MPV

GVWR (kg)	2949
GAWR Front (kg)	1293
GAWR Rear (kg)	1679

VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	2	2	6
Capacity Weight (VCW) (kg)				544.0
DSC x 68.04 (kg)				408.24
Cargo Weight (RCLW) (kg)				135.76

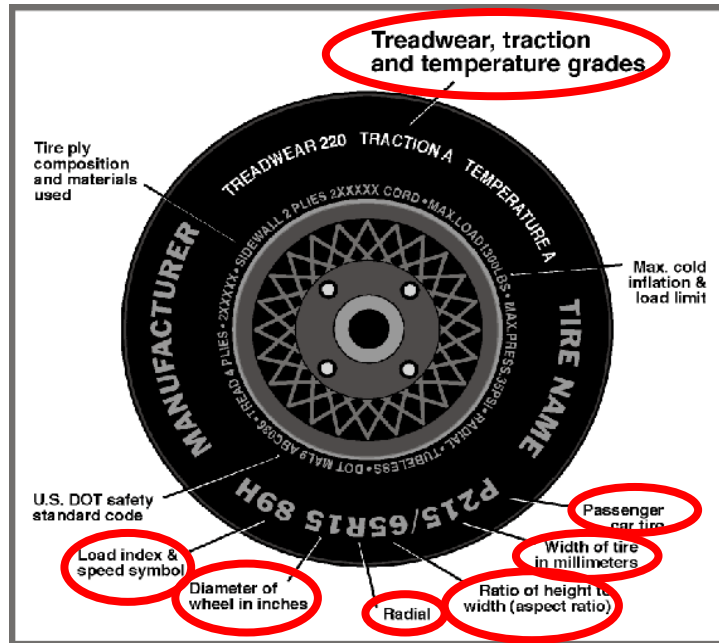
VEHICLE SEAT TYPE

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	N/A	Yes
Rear or Second Row Seat	Yes	N/A	N/A	N/A	N/A	Yes	N/A
Third Row Seat	N/A	N/A	Yes	N/A	Yes	N/A	N/A

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

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	250	250
Recommended Tire Size	265/60R18	265/60R18
Tire Size on Vehicle	265/60R18	265/60R18
Tire Manufacturer	Michelin	Michelin
Tire Model	Primacy LTX	Primacy LTX
Treadwear	540	540
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index/Speed Symbol	110H	110H
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	1AP 5E 01XX 2422	1AP 5E 01XX 2422
DOT Safety Code Right	1AP 5E 01XX 2422	1AP 5E 01XX 2422

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

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	214	221	214	221
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	526.0	543.0		550.2	661.2		541.6	676.4	
Right	kg	516.8	515.0		504.0	641.0		512.4	631.2	
Ratio	%	49.6	50.4		44.7	55.3		44.6	55.4	
Totals	kg	1042.8	1058.0	2100.8	1054.2	1302.2	2356.4	1054.0	1307.6	2361.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	2100.8	(A)
Actual Weight of 1 P572V ATD (SID-ILs) Dummy Used	kg	125.0	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	135.76	(C)
Calculated Vehicle Target Weight (TVT _W)	kg	2361.56	(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	887	893	Yes
RF	mm	891	896	Yes
RR	mm	885	882	Yes
LR	mm	871	868	Yes
Vehicle CG (Aft of Front Axle)	mm	1718	1713	
Vehicle CG (Left(+)/Right(-) from Longitudinal Centerline)	mm	+26	+23	

Test height adjustable suspension setting, if applicable:

N/A

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

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
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WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Ballast: Plate weight	136.6
Removed: None	0.0

TEST SURFACE MARKINGS

	Distance from 63° Impact Angle Line (mm)
Fore 25 mm target	964
Aft 25 mm target	982
Pre-Impact Angle Line	150

Parallel Track Target	X Location (mm)	Y Location (mm)
A	0	0
B	3412	1767
C	3412	2750
D	0	1135

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

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022

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	19.9	10.2	15.0
Front Passenger Seat	19.1	9.6	14.3
Front Center Seat*	N/A	N/A	N/A
Struck Side Rear Seat	N/A	19.1	N/A
Non-Struck Side Rear Seat	N/A	17.4	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	15.0	284	Max	325	328	340
			Mid	301	306	316
			Min	277	284	292
Front Passenger Seat	14.3	286	Max	329	335	341
			Mid	304	310	317
			Min	280	286	293
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	19.1	304	Max	N/A	N/A	N/A
			Mid	304	306	306
			Min	N/A	N/A	N/A
Non-Struck Side Rear Seat	17.4	301	Max	N/A	N/A	N/A
			Mid	301	302	302
			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: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
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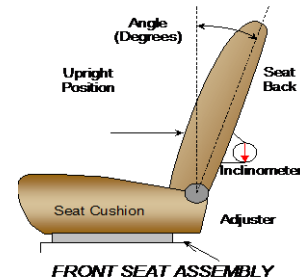
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position from Forwardmost Position	
	mm	Detents	mm	Detent
Driver Seat	250	N/A	125	N/A
Front Passenger Seat	250	N/A	125	N/A
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	180	19	180	18
Non-Struck Side Rear Seat	180	19	180	18
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	63	N/A	4.9	N/A
Front Passenger Seat	63	N/A	4.9	N/A
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat w/ Seated Dummy	23.2	13	7.9	0
Non-Struck Side Rear Seat	24.2	13	8.0	0
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	4	0, full up
Rear Seat	1	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	4	full up
Rear Seat	1	0

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

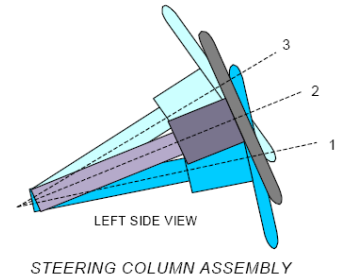
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STEERING COLUMN ADJUSTMENT

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.

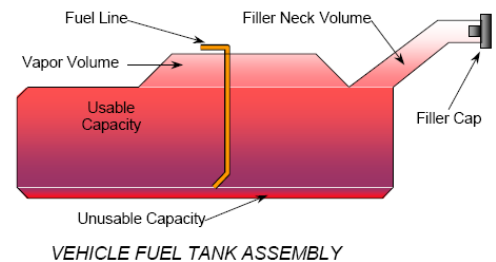
	Degrees	Fore/Aft Position (mm)
Lowermost, Position No. 1	19.1	0
Geometric Center, Position No. 2	21.8	30
Uppermost, Position No. 3	24.4	60
Telescoping Steering Wheel Travel		30
Test Position	21.8	60



FUEL PUMP

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

The fuel pump starts pumping fuel when the key is “ON” position. However, the fuel pump will stop in 5 seconds if the engine is not started.



FUEL TANK CAPACITY

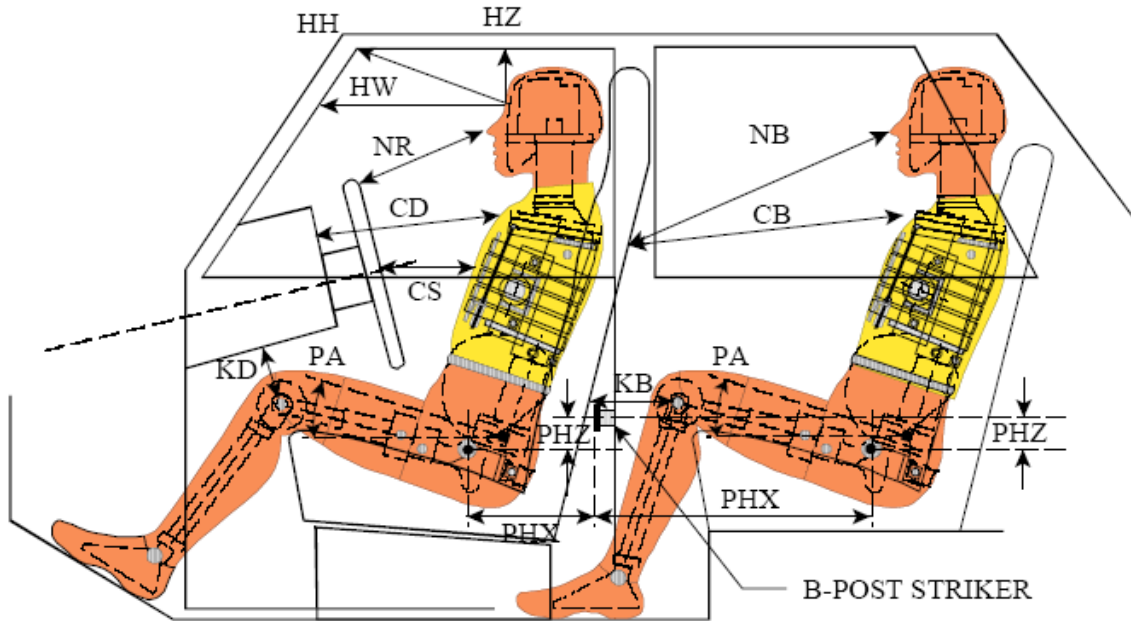
	Liters
Usable Capacity of “Standard Tank” (see Form No. 1)	87.1
Usable Capacity of “Optional Tank” (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner’s Manual)	87.1
Usable Capacity of Optional Tank (see Owner’s Manual)	N/A
93% of Usable Capacity	81.0
Actual Amount of Solvent Used in Test	81.0
1/3 of Usable Capacity	29.0

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

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

Test Vehicle: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022



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

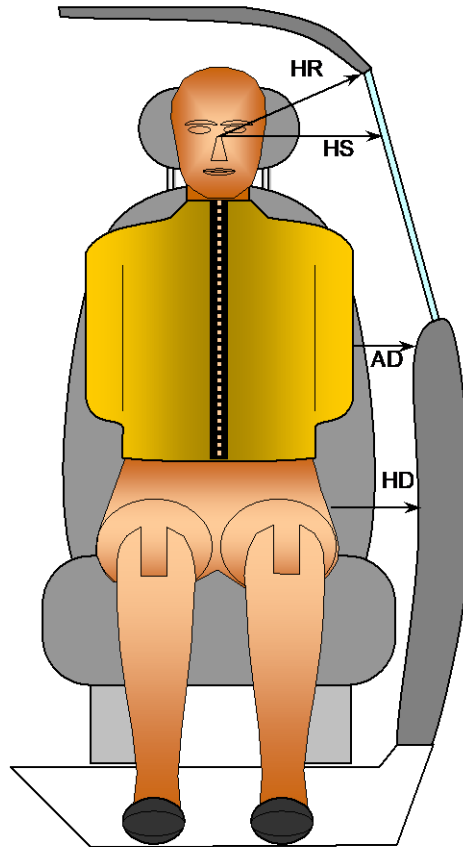
DUMMY LONGITUDINAL CLEARANCE DIMENSION INFORMATION

Driver Code	Pass. Code	Measurement Description	Driver		Passenger	
			Length (mm)	Angle	Length (mm)	Angle
HH		Header to Header	463			
HW		Header to Windshield	805			
HZ	HZ	Head to Roof Liner	175		281	
NR	NB	Nose to Rim/Seat Back	508		502	
CD	CB	Chest to Dash/Seat Back	678		519	
CS		Chest to Steering Wheel	442			
KD(L)/KDA(L)°	KB(L)/KBA(L)°	Left Knee to Dash/Seat Back	260	18.5	296	12.0
KD(R)/KDA(R)°	KB(R)/KBA(R)°	Right Knee to Dash/Seat Back	201	18.7	297	11.4
PAX°	PAX°	Pelvic Tilt Angle X		1.0		0.1
	PAY°	Pelvic Tilt Angle Y				20.8
PHX	PHX	Hip Point to Striker (X-Axis)	120		260	
PHZ	PHZ	Hip Point to Striker (Z-Axis)	71		140	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022



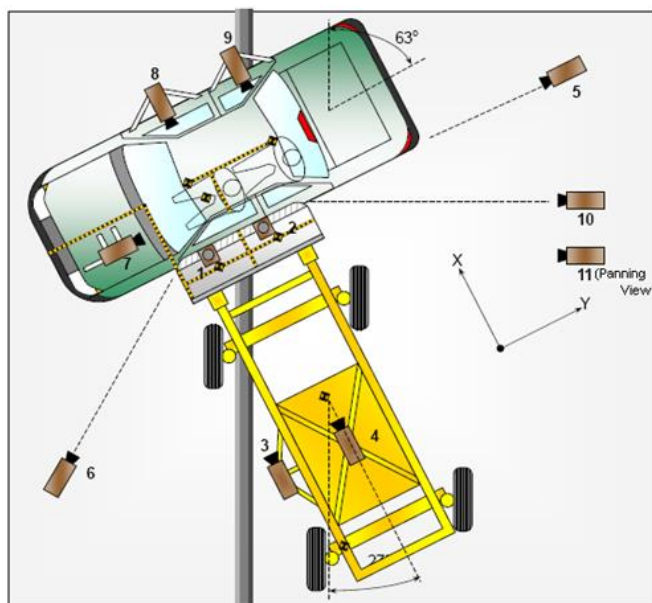
FRONT VIEW OF DUMMY

Code	Description	Units	Driver	Passenger
HR	Head to Side Header	mm	195	280
HS	Head to Side Window	mm	342	373
AD	Arm to Door	mm	88	146
HD	H-Point to Door	mm	176	168

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

Test Vehicle: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022



CAMERA LOCATIONS AND DATA

No.	Camera View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Overhead Overall	1585	0	5676	20	1000
2	Overhead Close-up	1390	0	5977	20	1000
3	Left Impact Point (MDB)	1525	912	867	25	1000
4	Side Overall (MDB)	2262	0	1421	8.5	1000
5	Rear	0	8957	1437	20	1000
6	Left Front	1960	-3130	1417	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: Camera number 11 failed

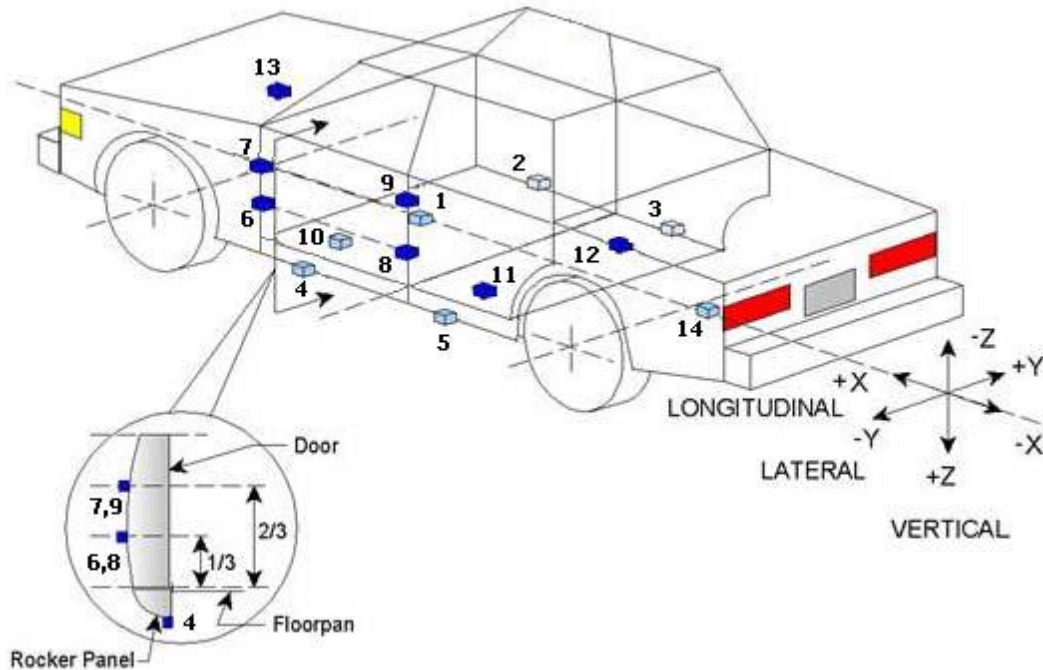
INSTRUMENTATION

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: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022



TEST VEHICLE ACCELEROMETER LOCATIONS

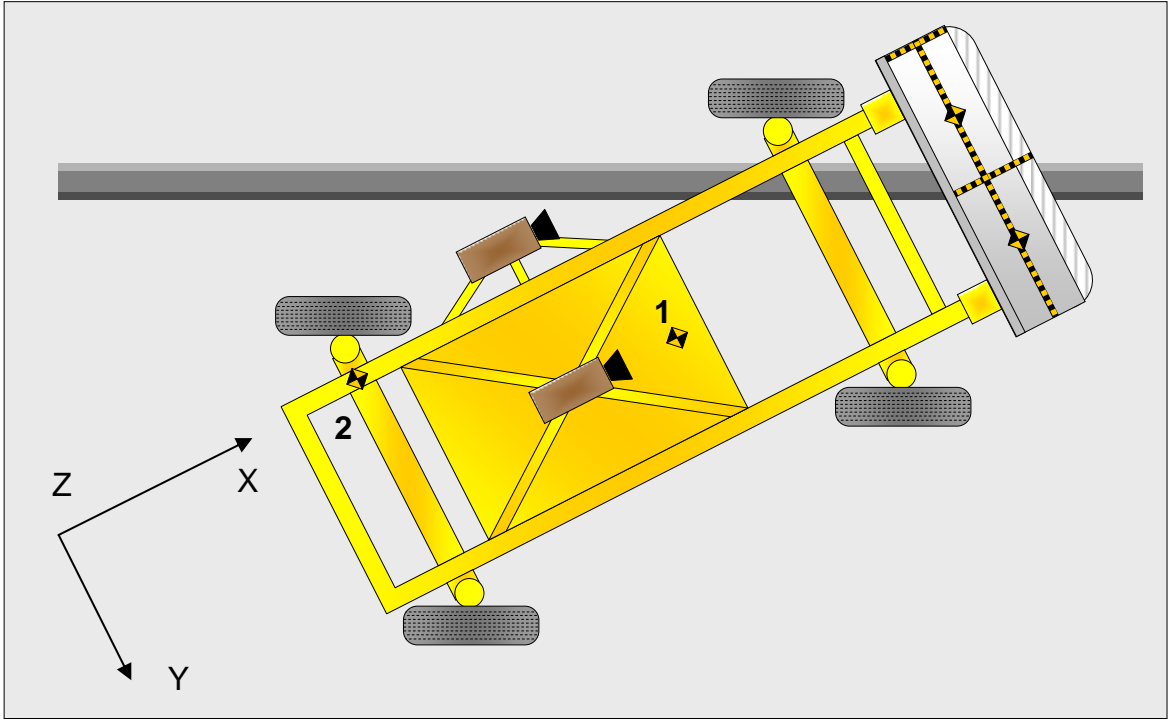
Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	3095	117	-620
2	Right Sill at Front Seat	2992	741	-450
3	Right Sill at Rear Seat	2078	739	-458
4	Left Sill at Front Door	3105	-749	-458
5	Left Sill at Rear Door	2070	-549	-430
6	A-Post Lower	3655	-879	-680
7	A-Post Middle	3640	-834	-1100
8	B-Post Lower	2550	-852	-700
9	B-Post Middle	2515	-839	-1089
10	Front Seat Track	2706	-560	-389
11	Rear Seat Structure	2200	-548	-507
12	Right Rear Occ. Compartment	2206	554	-461
13	Engine Block	4410	200	-1055
14	Rear Above Axle	1045	0	-532

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: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022



MDB ACCELEROMETER LOCATIONS

Loc. No.	Accelerometer Location	Coordinates (mm)		
		X	Y	Z
1	MDB CG	-2120	0	-530
2	MDB Rear	-2655	-650	-610

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

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

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Front Seat Dummy (ES2-re)	Rear Seat Dummy (SID-IIs)
Face	SCAB	SCAB
Top of Head	Side Header; SCAB	SCAB
Left Side of Head	SCAB	SCAB
Back of Head	Head Restraint	Head Restraint
Left Shoulder	SCAB	Door Panel
Upper Torso	Side Seat Bolster; SAB	Door Panel
Lower Torso	Side Seat Bolster; SAB	Door Panel
Left Hip	SAB	Door Panel
Left Knee	Door Panel	Door Panel

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	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	None
Side Window Damage	None
Other Notable Effects	None

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

Test Vehicle: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Struck Side Driver		Struck Side Rear Passenger	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	Yes	No		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	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		3100
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		512
Actual Impact Point (Aft of Front Axle)	mm		503
Horizontal Offset (+ forward / - rearward)	mm	+/- 50 of Intended Impact point	+9
Vertical Offset (+ down / - up)	mm	+/- 20 of Intended Impact point	-4

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

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022

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	1118

MDB WEIGHTS

	Units	Front Axle	Rear Axle	Total
Left	kg	409.4	272.4	681.8
Right	kg	367.6	317.6	685.2
Ratio	%	56.8	43.2	100.0
Totals	kg	777.0	590.0	1367.0

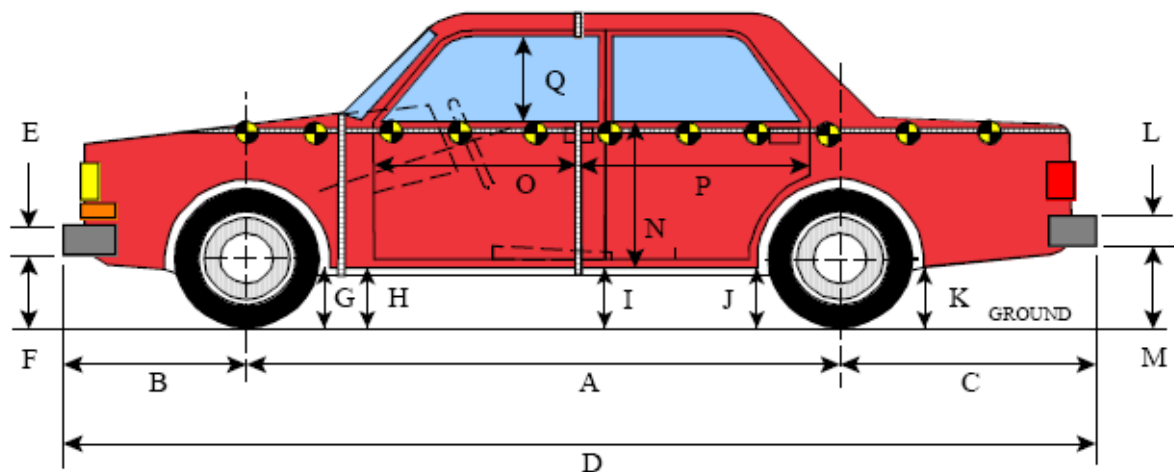
SPEED AND IMPACT ANGLE DATA

Measured Parameter	Units	Requirement	Value
Trap No. 1 Velocity (Primary)	km/h	61.1 to 62.7	62.05
Trap No. 2 Velocity (Redundant)	km/h	61.1 to 62.7	62.03
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: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022



LEFT SIDE VIEW

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

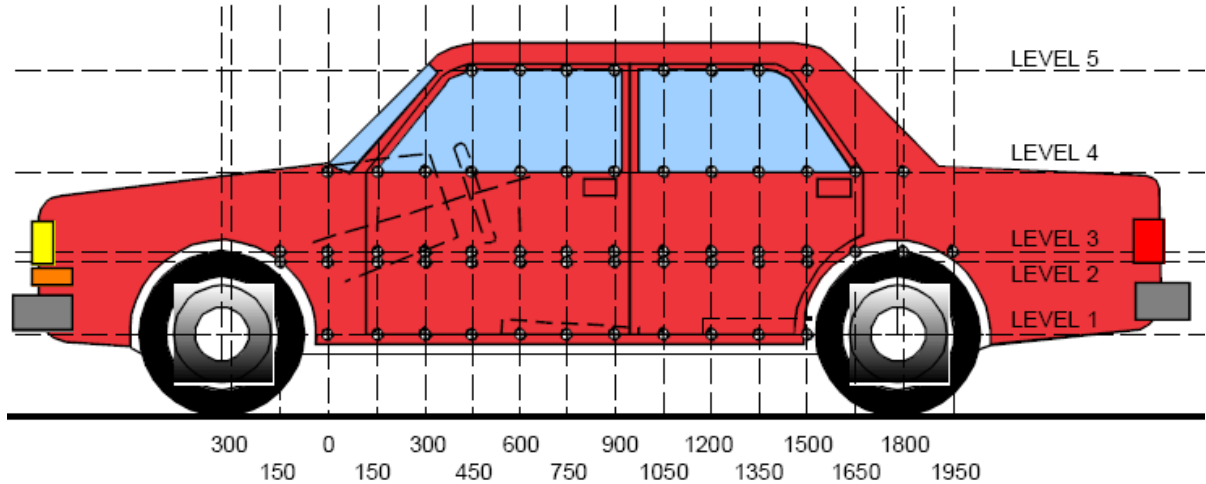
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	3100	3095	-5
B	Front Axle to Front Surface of Vehicle	910	910	0
C	Rear Axle to Rear Surface of Vehicle	1200	1200	0
D	Total Length at Centerline	5220	5220	0
E	Front Bumper Thickness	110	110	0
F	Front Bumper Bottom to Ground	564	575	11
G	Sill Height at Front Wheel Well	400	415	15
H	Sill Height at Front Door Leading Edge	414	425	11
I	Sill Height at B-Pillar	415	475	60
J1	Sill Height at Rear Wheel Well	427	515	88
J2	Pinch Weld Height at Rear Wheel Well	290	312	22
K	Sill Height Aft of Rear Wheel Well	488	517	29
L	Rear Bumper Thickness	130	130	0
M	Rear Bumper Bottom to Ground	565	578	13
N	Sill Height to Window Bottom Sill	880	815	-65
O	Front Door Leading Edge to Impact CL	726	723	-3
P	Rear Door Trailing Edge to Impact CL	1562	1475	-87
Q	Front Window Opening	430	440	10
R	Right Side Length	4985	4990	5
S	Left Side Length	4985	4990	5
T	Vehicle Width	1955	1945	-10
U	Front Wheel Track Width	1650	1654	4
V	Rear Wheel Track Width	1660	1663	3

DATA SHEET NO. 11
TEST VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022



LEFT SIDE VIEW

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance From Impact
1	Sill Top	500	190	1650
2	Driver Hip Point	803	279	1500
3	Mid-Door	776	277	1500
4	Window Sill	1181	74	1350
5	Window Top	1696	6	1350
				1800

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: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022

EXTERIOR CRUSH MEASUREMENTS AT EACH LEVEL

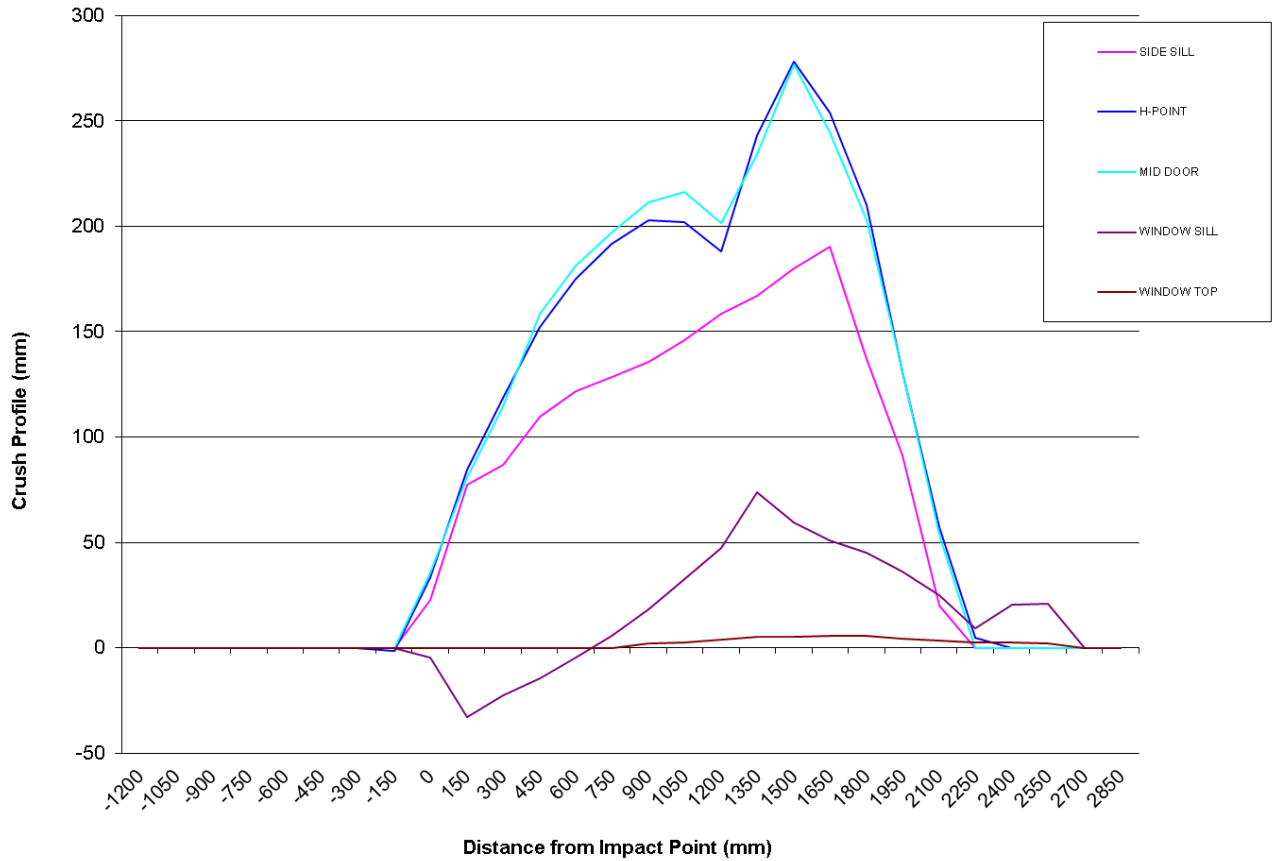
	Pre-Test					Post-Test					Crush				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-150	0	982	982	0	0	0	984	982	0	0	0	-2	0	0	0
0	945	963	964	842	0	922	930	928	847	0	23	33	36	-5	0
150	924	951	950	855	0	847	867	869	888	0	77	84	81	-33	0
300	906	949	947	862	0	820	830	833	885	0	86	119	114	-23	0
450	907	950	949	870	0	798	798	790	885	0	109	152	159	-15	0
600	910	952	950	879	0	788	777	769	883	0	122	175	181	-4	0
750	912	953	951	886	0	783	761	754	880	0	129	192	197	6	0
900	914	954	952	892	635	778	751	741	873	633	136	203	211	19	2
1050	915	954	952	897	664	769	752	736	864	662	146	202	216	33	2
1200	915	955	953	900	671	756	767	751	853	668	159	188	202	47	3
1350	912	952	950	902	674	745	709	716	828	668	167	243	234	74	6
1500	910	952	950	904	674	730	673	673	845	669	180	279	277	59	5
1650	909	951	949	905	674	719	697	705	854	669	190	254	244	51	5
1800	913	953	951	907	674	776	742	748	862	668	137	211	203	45	6
1950	925	958	957	909	672	834	828	826	872	668	91	130	131	37	4
2100	953	973	972	909	670	933	916	918	884	667	20	57	54	25	3
2250	0	980	0	908	668	0	975	0	898	665	0	5	0	10	3
2400	0	0	0	906	664	0	0	0	885	662	0	0	0	21	2
2550	0	0	0	905	659	0	0	0	884	656	0	0	0	21	3

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: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

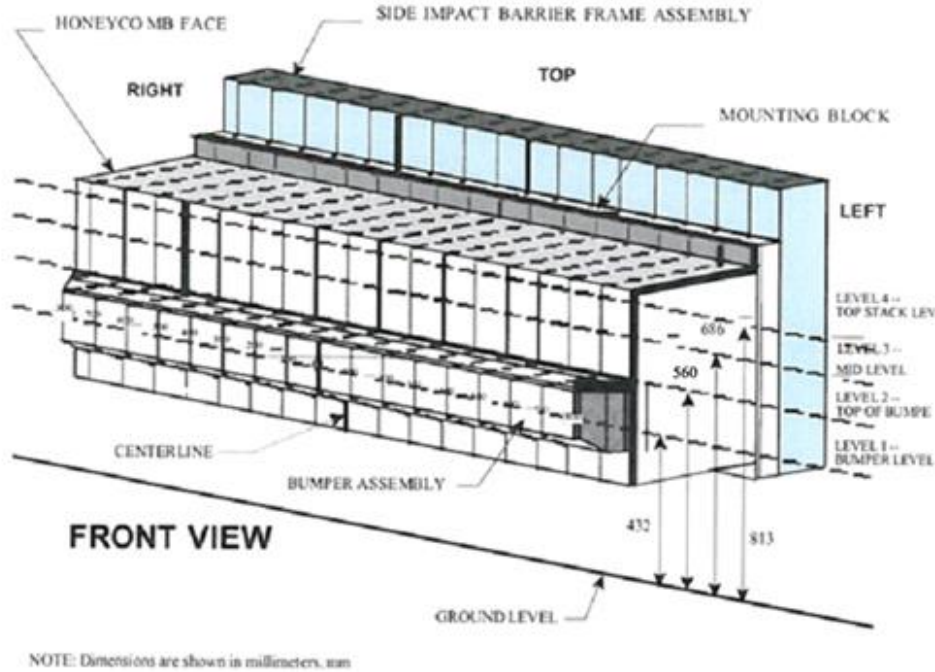
NHTSA No.: M20220305
Test Date: 9/21/2022



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

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022



MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE

Vertical Location			From Centerline		Maximum Crush
Row	Description	Height	Distance	Direction	
A	Center of Bumper	432	700	Right	253
B	Top of Bumper	560	800	Left	176
C	Mid-Level	686	800	Left	177
D	Top of Stack	813	700	Left	183

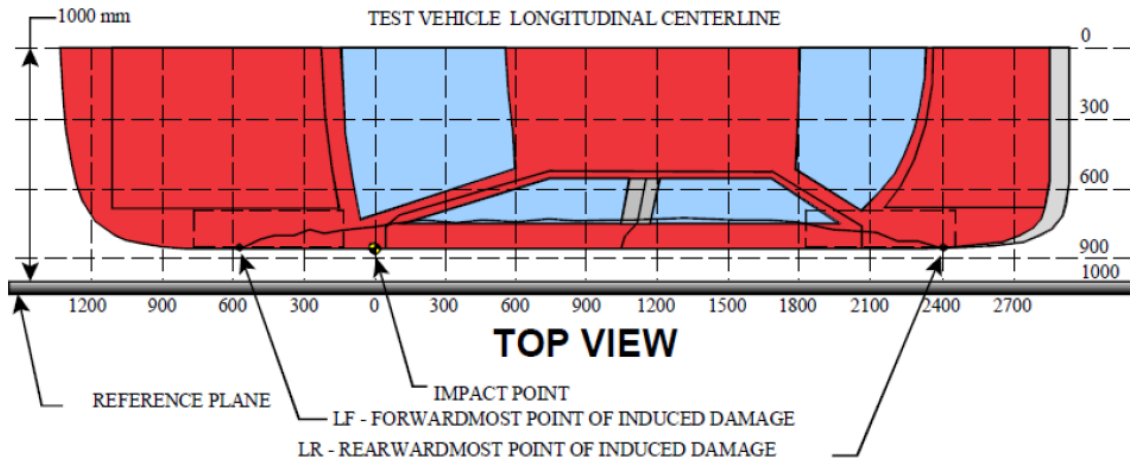
DEFORMABLE BARRIER STATIC CRUSH

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
1	251	253	252	251	251	249	249	249	248	247	247	247	247	245	245	245	240
2	147	146	145	142	145	144	141	139	138	136	136	136	138	139	140	155	176
3	152	96	72	82	128	104	80	73	85	89	87	80	84	97	127	181	177
4	128	94	68	79	97	122	109	98	90	87	91	102	118	131	150	183	173

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

Test Vehicle: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022



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 ¹	2550	4	884	905	21
2	2100	2	916	973	57
3	1500	2	673	952	279
4	1050	3	736	952	216
5	450	3	790	949	159
6 ¹	0	3	928	964	0

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	228	468	240
2	500 mm Left of Center	1	240	485	245
3	200 mm Left of Center	1	238	485	247
4	200 mm Right of Center	1	236	485	249
5	500 mm Right of Center	1	235	486	251
6	800 mm Right of Center	1	220	471	251

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**

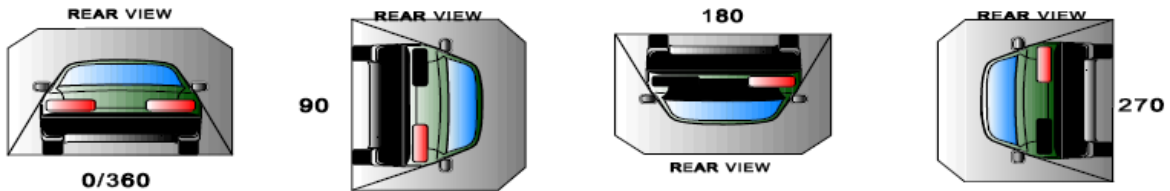
Test Vehicle: 2022 Jeep Grand Cherokee L
Test Program: SINCAP Side Impact

NHTSA No.: M20220305
Test Date: 9/21/2022

Test Time: 15:05 **Temperature:** 22.1°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

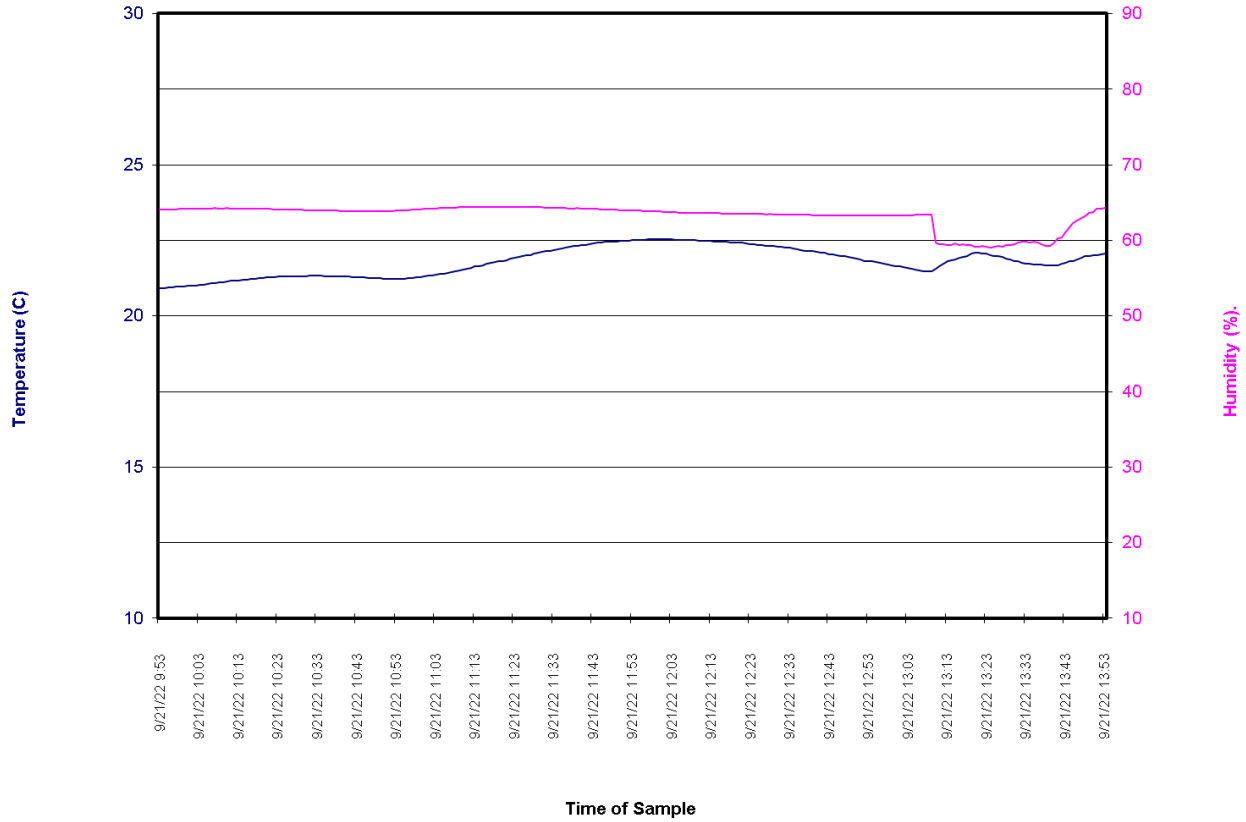
Test Phase	Spillage Location
0 to 90	None
90 to 180	None
180 to 270	None
270 to 360	None

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

Test Vehicle: 2022 Jeep Grand Cherokee L
 Test Program: SINCAP Side Impact

NHTSA No.: M20220305
 Test Date: 9/21/2022

M20220305 2022 Jeep Grand Cherokee L Left MDB Impact 220921: Test Time 13:53



**APPENDIX A
PHOTOGRAPHS**

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024	Post-Test Left Rear Door Latch Close-Up	A-17
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031	Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint	A-21
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001 As-Delivered Right Front $\frac{3}{4}$ View of Test Vehicle



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



003 Pre-Test Frontal View of Test Vehicle



004 Post-Test Frontal View of Test Vehicle



005 Pre-Test Left Front ¾ View of Test Vehicle



006 Post-Test Left Front ¾ View of Test Vehicle



007 Pre-Test Left Side View of Test Vehicle



008 Post-Test Left Side View of Test Vehicle



009 Pre-Test Left Rear ¾ View of Test Vehicle



010 Post-Test Left Rear ¾ View of Test Vehicle



011 Pre-Test Rear View of Test Vehicle



012 Post-Test Rear View of Test Vehicle



013 Pre-Test Right Side View of Test Vehicle



014 Post-Test Right Side View of Test Vehicle



015 Pre-Test Overhead View of Test Area



016 Post-Test Overhead View of Test Area



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



018 Pre-Test Right Side View of 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 Dummy¹



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

¹Label has wrong date of 9/21/21; the date should be 9/21/22



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

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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 Positioning¹

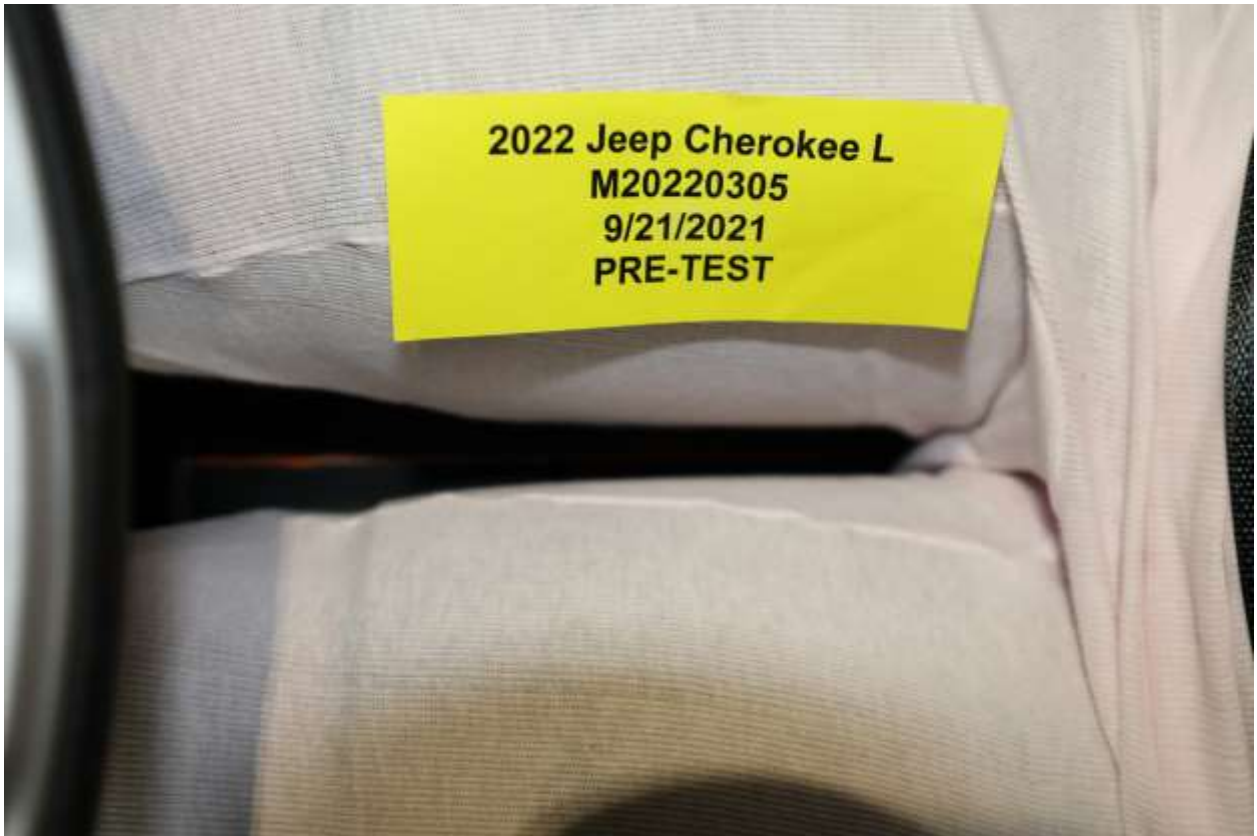


031 Pre-Test Frontal View of Driver Dummy Head and Shoulders in Relation to Head Restraint¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



032 Pre-Test Frontal View of Driver Seat Pan Prior to Dummy Positioning¹



033 Pre-Test Overhead View of Driver Dummy Thighs on Seat Pan¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



034 Pre-Test Placement of Driver's Dummy Feet

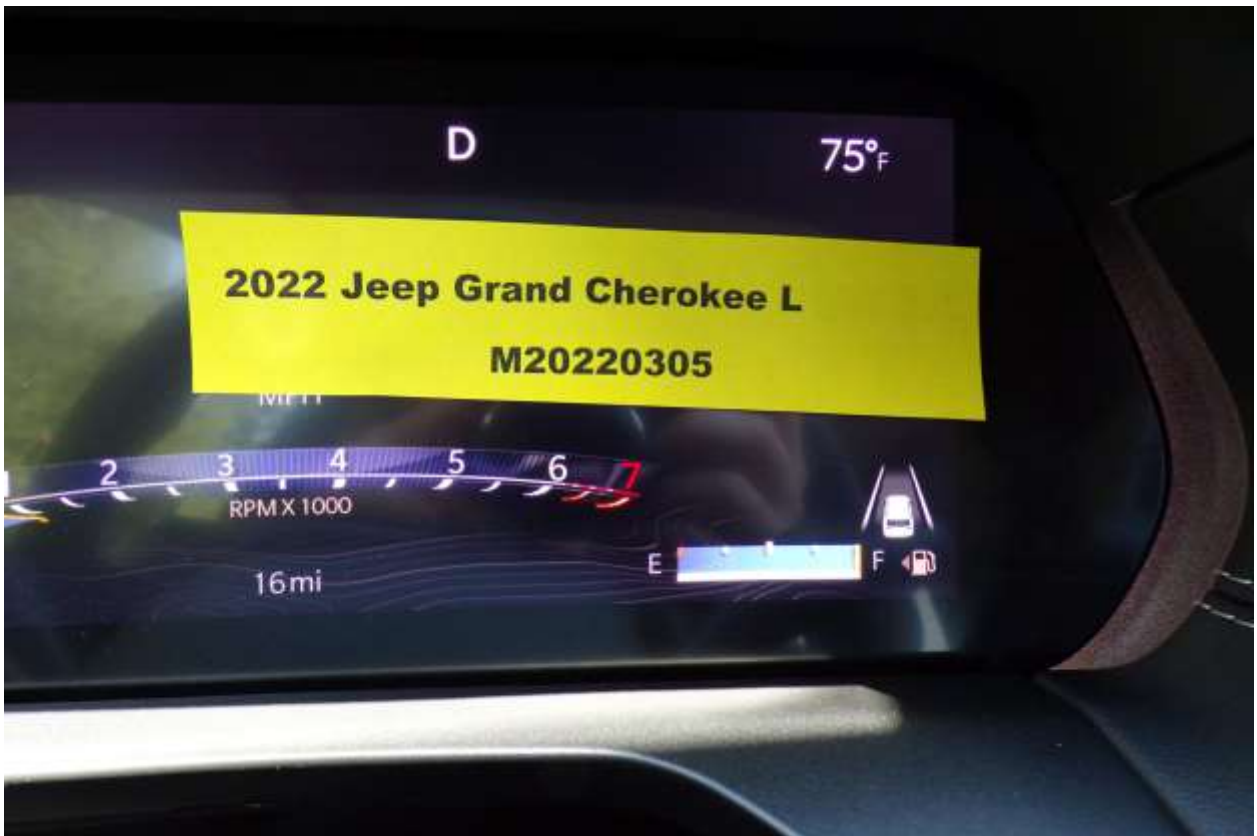


035 Pre-Test View of Belt Anchorage for Driver Dummy¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22

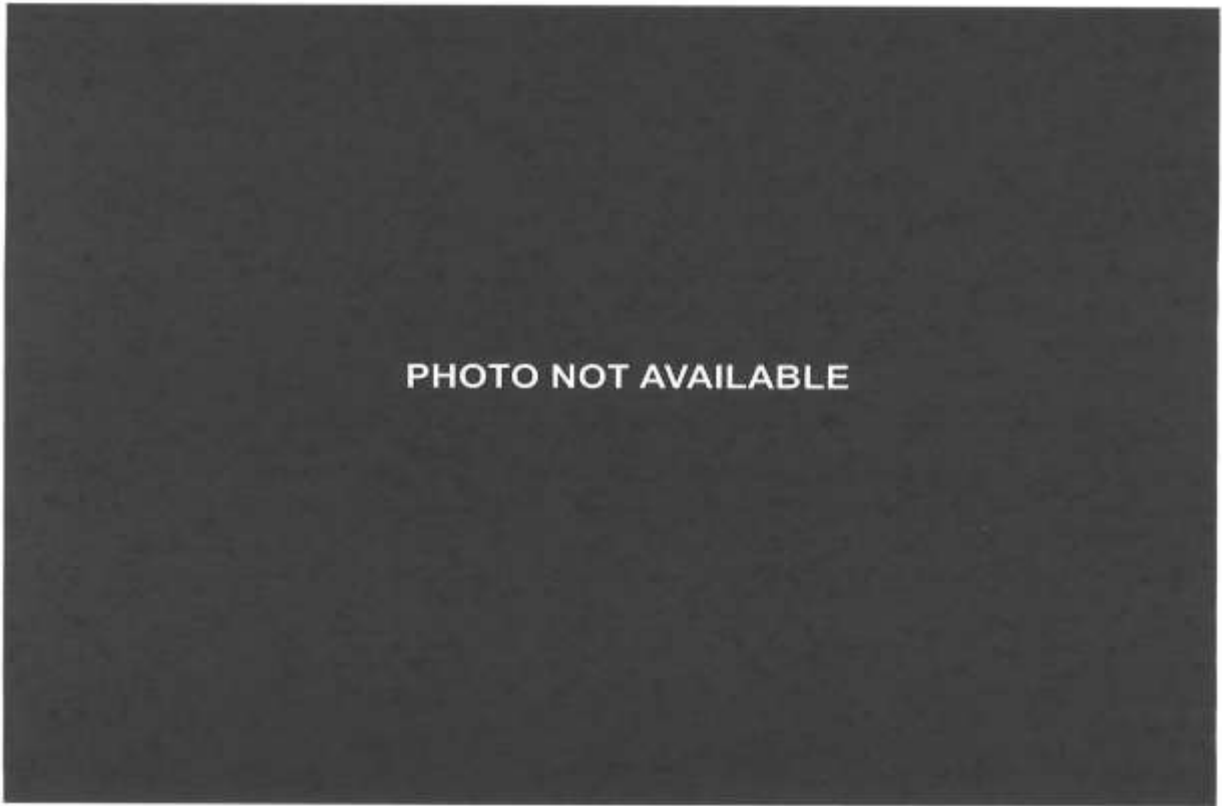


036 Pre-Test Left Side View of Steering Wheel¹

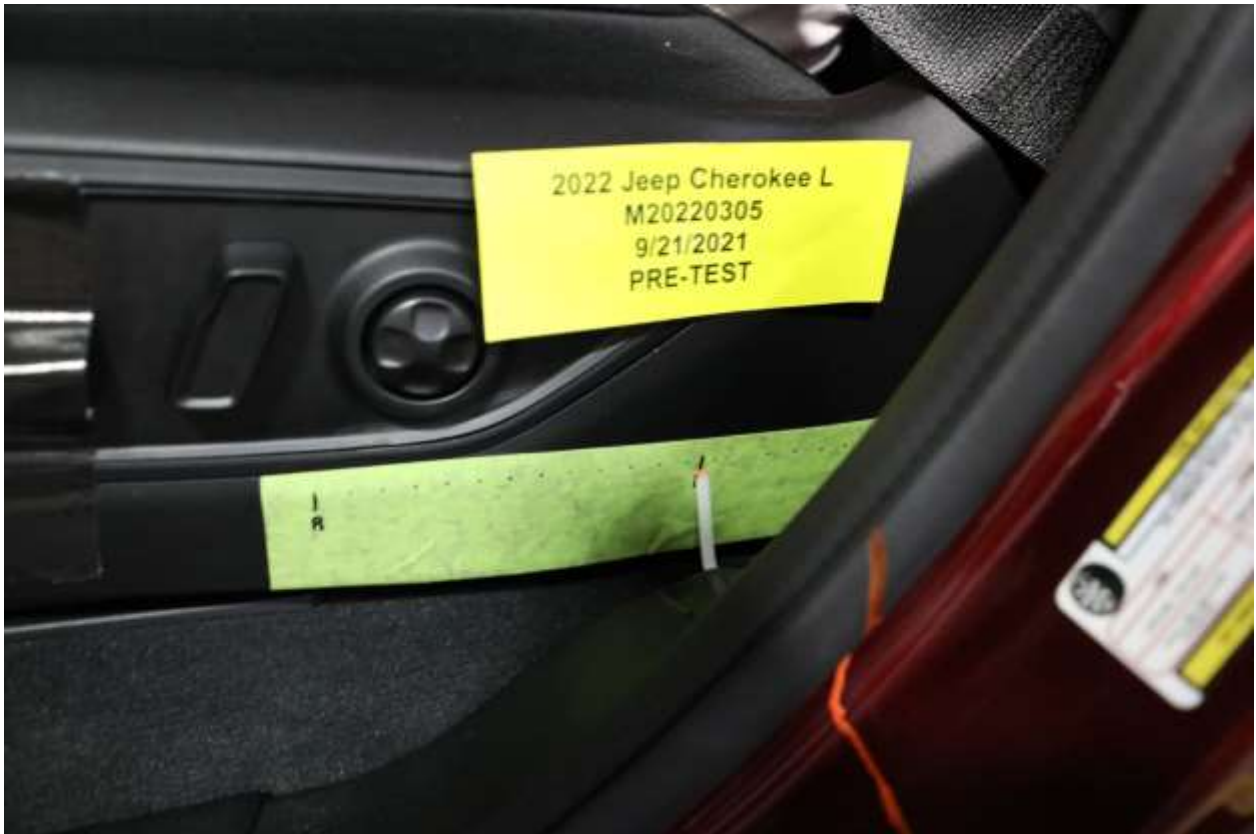


037 View of Disengaged Parking Brake

¹Label has wrong date of 9/21/21; the date should be 9/21/22



038 Pre-Test View of Parking Brake



039 Pre-Test Close-Up Left Side View of Driver Seat Track¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



040 Pre-Test Close-Up Left Side View of Driver Seat Back¹



041 Pre-Test Close-Up View of Driver Seat Back or Head Restraint¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



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 Positioning¹



059 Pre-Test Frontal View of Rear Passenger Dummy Head and Shoulders in Relation to Head Restraint¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



060 Pre-Test Overhead View of Rear Passenger Seat Pan Prior to Dummy Positioning¹



061 Pre-Test Overhead View of Rear Passenger Dummy Thighs on Seat Pan¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



062 Pre-Test View of Rear Passenger Dummy's Neck Showing Position of Adjustable Neck Bracket¹



063 Pre-Test View of Rear Passenger Dummy's Head Showing Dummy Head is Level¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



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



065 Pre-Test View of Belt Anchorage for Rear Passenger Dummy¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



066 Pre-Test Close-Up Left Side View of Rear Passenger Seat Track¹



067 Pre-Test Close-Up Left Side View of Rear Passenger Seat Back¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



068 Pre-Test Close-Up View of Rear Passenger Seat Back or Head Restraint¹

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¹Label has wrong date of 9/21/21; the date should be 9/21/22



069 Pre-Test Rear Passenger Dummy and Door Clearance View



070 Post-Test Rear Passenger Dummy and Door Clearance View



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



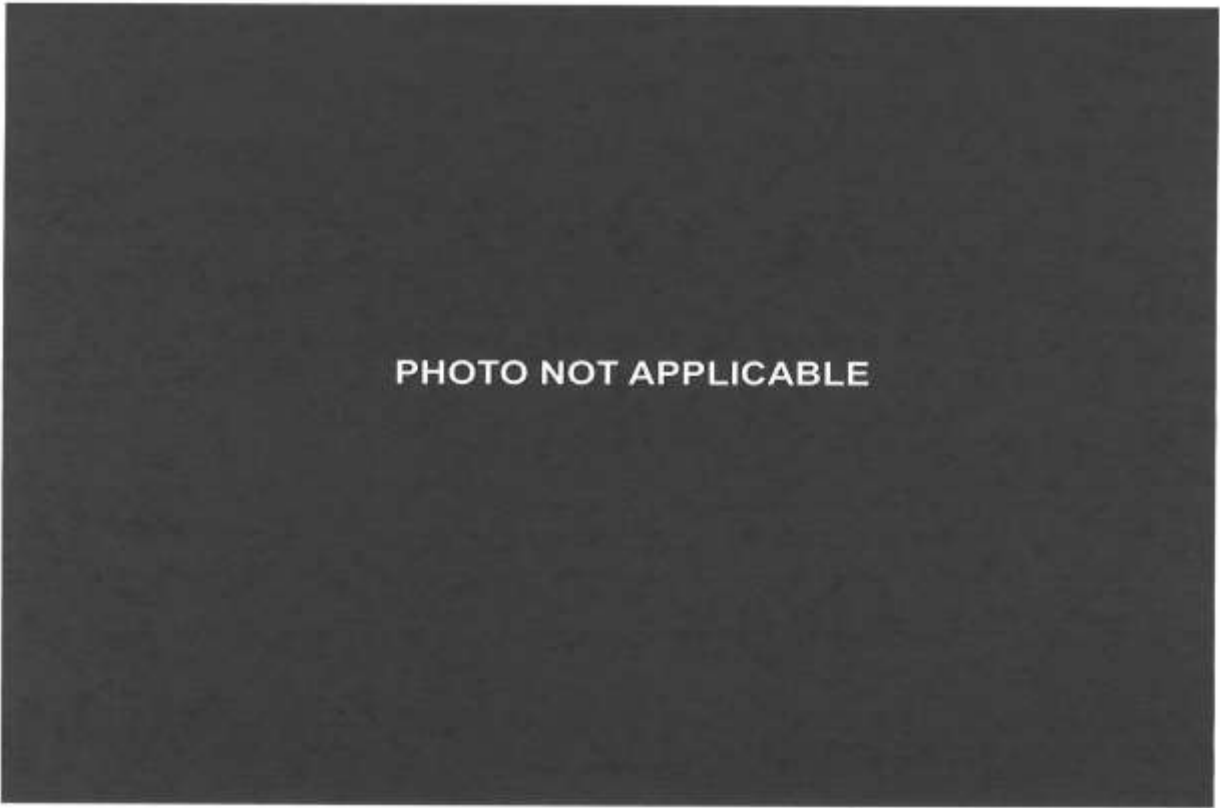
072 Post-Test Right Side View of Rear Passenger Dummy and Rear Seat Occupant Compartment



073 Pre-Test Rear Passenger Inner Door Panel View



074 Post-Test Rear Passenger Inner Door Panel View



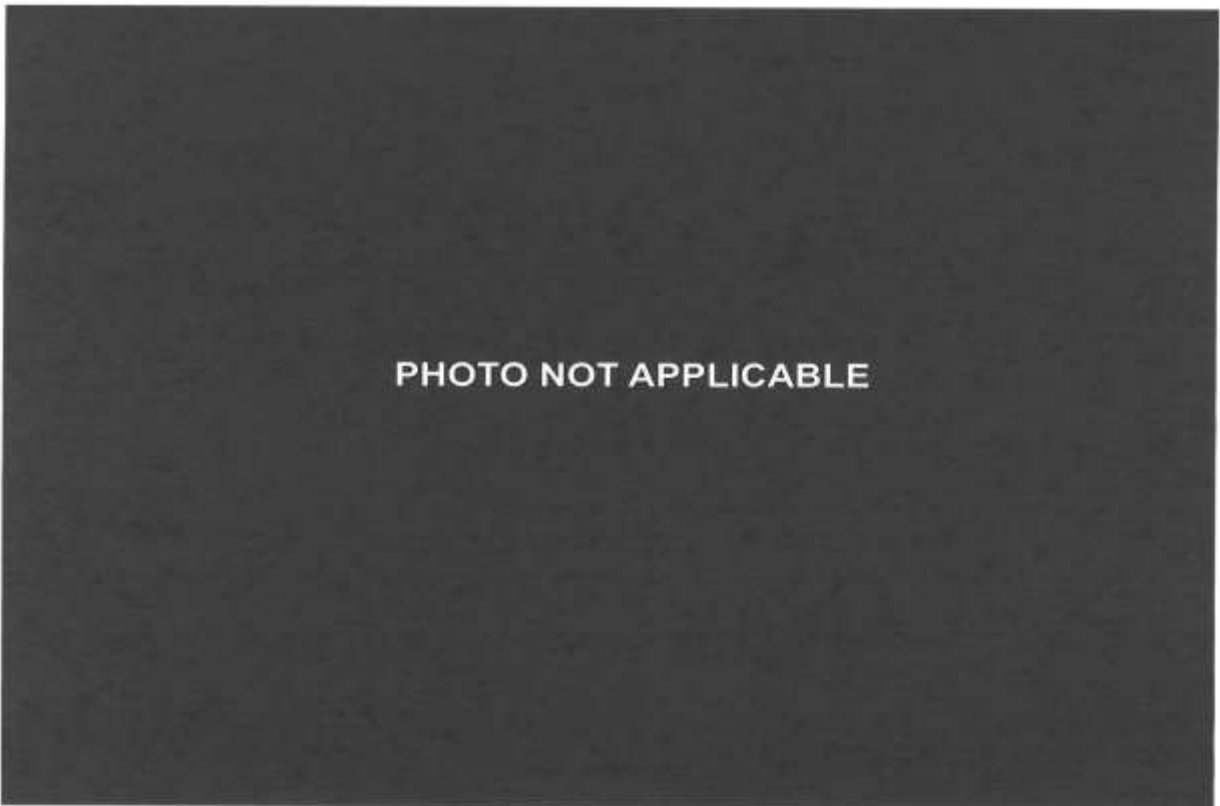
075 Post-Test Rear Passenger Dummy Close-Up Head Contact with Vehicle View



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



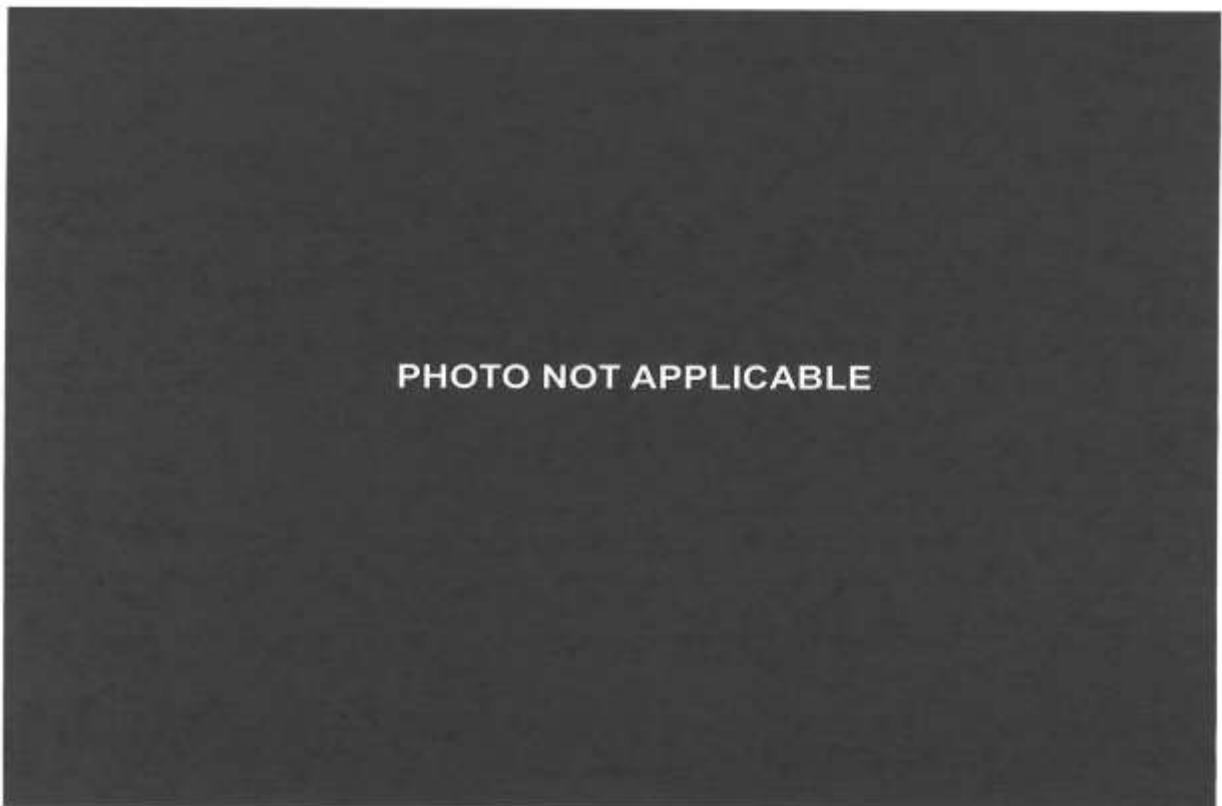
077 Post-Test Rear Passenger Dummy Close-Up Torso Contact with Vehicle Interior View



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



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



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



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

Intentionally Left Blank



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



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



084 Pre-Test Front View of MDB Impactor Face



085 Post-Test Front View of MDB Impactor Face



086 Pre-Test Top View of MDB Impactor Face



087 Post-Test Top View of MDB Impactor Face



088 Pre-Test Left Side View of MDB Impactor Face



089 Post-Test Left Side View of MDB Impactor Face



090 Pre-Test Right Side View of MDB Impactor Face



091 Post-Test Right Side View of MDB Impactor Face



092 Close-Up View of Vehicle's Certification Label¹

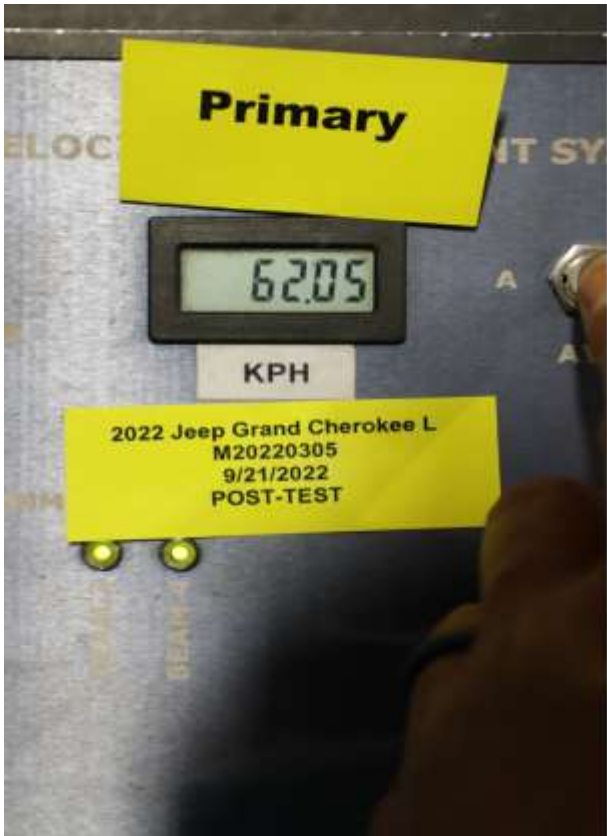


093 Close-Up View of Vehicle's Tire Information Placard or Label¹

¹Label has wrong date of 9/21/21; the date should be 9/21/22



094 Pre-Test Ballast View



095 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

Jeep 2022 MODEL YEAR **GRAND CHEROKEE L LIMITED 4X2**

For more information visit: www.jeep.com or call 1-877-1AM-JEEP FCA US LLC

MANUFACTURER'S SUGGESTED RETAIL PRICE OF THE MODEL INCLUDING DESTINATION PREPARATION
Base Price: \$46,645

STANDARD EQUIPMENT (EXcludes replacement optional equipment)
FUNCTIONAL SAFETY FEATURES
 Jeep Active Noise Control (Front Seated) (Noise Only)
 Four Wheel Traction Control
 Electronic Stability Control
 Power Windows
 Adaptive Cruise Control with Stop and Go
 Active Lane Management System
 Full-Speed Forward Collision Warning Plus
 ParkView Rear Backup Camera
 Forward Collision Warning with Stop and Go
 Blind Spot and Cross-Path Detection
 Advanced Brake Assist
 Pedestrian Cyclist Emergency Braking
 Automatic High Beam Headlamp Control
 Blind Spot Detection
 Rear View Camera
 Active Noise Control System
 Active Lock 4 Wheel Drive System
 Electronic Stability Control
 Hill Start Assist
 Tire Pressure Monitoring System
 Compass Turn Tilt
 Speed Sensitive Power Locks
 Security Alarm
 Rear Seat Object Alert

INTERIOR FEATURES
 12-speaker Svelt & 6-inch Touch Screen Display
 Cluster (18.25-inch 171 Color Display)
 Alpine CarPlay
 Google Android Auto™
 Jeep Connected Command Services w/ 100
 4G LTE Wi-Fi Hot Spot with 100mbps
 SiriusXM with 6 Month Radio Sub. (2nd 2022-01-31)
 Heated Steering Wheel
 Heated Front Seats

EXTERIOR FEATURES
 18-inch x 8.0-inch Fully Painted Aluminum Wheel
 205/55R18 All-Season LFR Tires
 LED Reflector Headlamps

OPTIONAL EQUIPMENT (See Dealer Standard Equipment)
 Wheel Rim Paint Coat Exterior Paint \$335
 Business Professional Package (20) \$3,000
 Trail-Pak Premium Subtotal \$3,075
 Connected 5 Star with 10.1-inch Touch Screen Display \$7,075
 570 Navigation \$4,000
 8 Amp/100 Speakers with Subwoofer \$600
 800 MBX Amplifier
 Connected Travel and Traffic Services \$1,700

DESTINATION CHARGE \$1,700

TOTAL PRICE: * \$51,845

WARRANTY COVERAGE
 5-year or 60,000-mile Powertrain Limited Warranty
 3-year or 50,000-mile Basic Limited Warranty
 Ask Dealer for a copy of the limited warranties or see your owner's manual for details.

5 Year / 60,000 Mile Powertrain Warranty

Fuel Economy and Environment
 EPA DOT Fuel Economy and Environment Gasoline Vehicle
 Fuel Economy: 21 MPG (combined city/hwy) 19 city 26 highway
 4.8 gallons per 100 miles
 You spend \$2,000 more in fuel costs over 5 years compared to the average new vehicle.
 Annual fuel cost \$1,700
 Fuel Economy & Greenhouse Gas Rating (see EPA.gov) Strong Rating (see EPA.gov)
 fuel economy.gov
 GOVERNMENT 5-STAR SAFETY RATINGS
 PARTS CONTENT INFORMATION FOR VEHICLES IN THIS CAPLINE:
 U.S. CANADIAN PARTS CONTENT: 86%
 MAJOR SOURCES OF FOREIGN PARTS CONTENT:
 MEXICO: 24%
 NOTE: PARTS CONTENT DOES NOT INCLUDE PAINT, ACCESSORIES, EXTERIOR TRIM, OR OTHER NON-PARTS COSTS.
 FOR THIS VEHICLE:
 FINAL ASSEMBLY POINT: DETROIT, MICHIGAN, U.S.A.
 COUNTRY OF ORIGIN: ENGINE: UNITED STATES
 TRANSMISSION: UNITED STATES
 VEHICLE PROTECTION

102 Monroney Label

HEAD RESTRAINTS

Head restraints are designed to reduce the risk of injury by restricting head movement in the event of a rear impact. Head restraints should be adjusted so that the top of the head restraint is located above the top of your ear.

WARNING!

- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

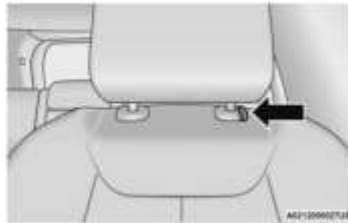
Front Head Restraints

Your vehicle is equipped with front four-way driver and passenger head restraints.

To raise the head restraint, pull upward on the head restraint. To lower the head restraint, push the adjustment button, located at the base of the head restraint, and push downward on the head restraint.

NOTE:

The head restraints should only be removed by qualified technicians, for service purposes only, if either of the head restraints require removal, see an authorized dealer.



Head Restraint Adjustment Button

To adjust the head restraint forward, pull the top of the head restraint toward the front of the vehicle as desired and release. To adjust the head restraint rearward, pull the top of the head restraint to the forward most position and release. The head restraint will return to the rear most position.



Forward Adjustment

WARNING!

- All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.
- Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.



Upright Position

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

Head Restraints — Second Row Captain's Chairs (If Equipped)

If the second row is equipped with captain's chairs, the head restraints are not adjustable or removable. They automatically fold forward when the seatback is folded, and do not return to their normal position when the seatback is raised. After returning the seatback to its upright position after a folding operation, raise the head restraint until it locks in place.

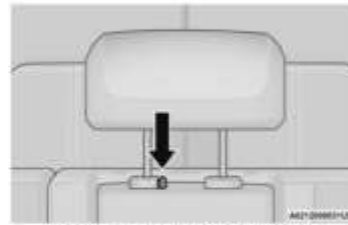
WARNING!
<ul style="list-style-type: none"> ● All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash. ● Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

Head Restraints — Second Row Bench (If Equipped)

If the second row is equipped with a bench seat, the head restraints on the outboard seats are not adjustable or removable. They automatically fold forward when the seatback is folded, and do not return to their normal position when the seatback is raised. After returning the seatback to its upright position after a folding operation, raise the head restraint until it locks in place.

The center head restraint has one adjustment position, and can be adjusted up or down when the seat is occupied. Pull up on the head restraint to raise it. To lower the head restraint, push the adjustment button located on the base of the head restraint, and push downward on the head restraint until it locks into place.

NOTE:
The center head restraint is not removable.



NOTE:
For information on child restraint tethering, see [page 228](#).


WARNING!
<ul style="list-style-type: none"> ● All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.

(Continued)

WARNING!
<ul style="list-style-type: none"> ● Head restraints should never be adjusted while the vehicle is in motion. Driving a vehicle with the head restraints improperly adjusted or removed could cause serious injury or death in the event of a collision.

Third Row Head Restraints — If Equipped

The third row head restraints are not adjustable or removable, but can be folded for improved visibility when the vehicle is in REVERSE, and there are no occupants in the seats.

 Press the Headrest Fold button within the Controls menu of the Uconnect system to power fold the third row head restraints. The head restraints will also automatically fold when the seatbacks are folded forward using the release handles on the backs of the seats from the cargo area.

NOTE:

- The head restraints must be raised manually when occupying the third row.
- Do not fold if there are passengers seated in the third row seats.

WARNING!
<ul style="list-style-type: none"> ● All occupants, including the driver, should not operate a vehicle or sit in a vehicle's seat until the head restraints are placed in their proper positions in order to minimize the risk of neck injury in the event of a crash.

(Continued)

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

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

Driver & Passenger Dummy Instrumentation Plots

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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

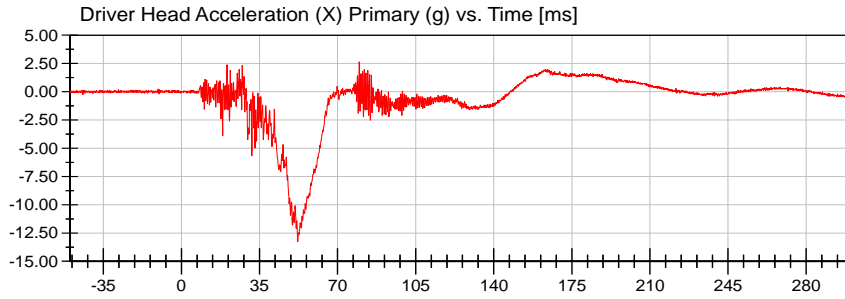
Test Lab: CTF

Test Number: 220921 (M20220305)

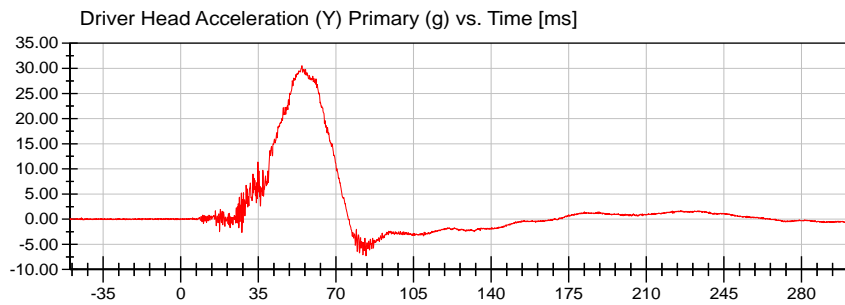
Test Date: 09/21/2022

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

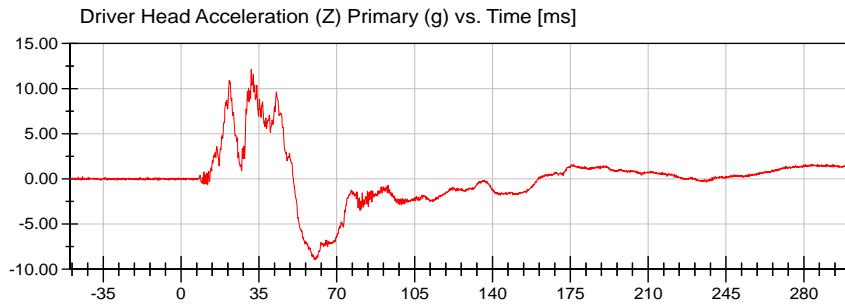
Position #4 SID IIs Dummy (DQ0570)



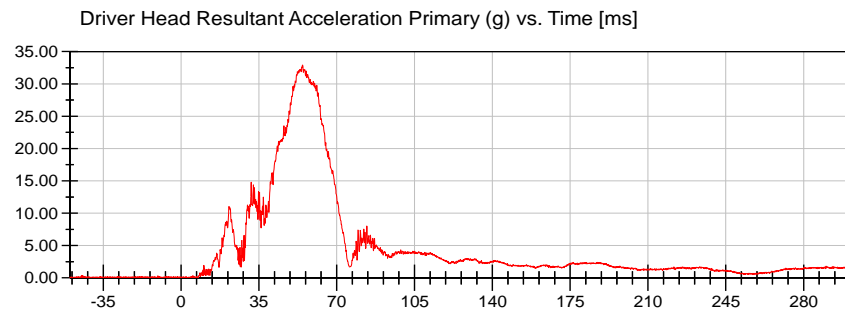
<Max>
2.63 g at 79.68 ms
<Min>
-13.28 g at 52.08 ms
CFC_1000



<Max>
30.54 g at 54.64 ms
<Min>
-7.30 g at 83.52 ms
CFC_1000



<Max>
12.13 g at 31.52 ms
<Min>
-8.94 g at 59.84 ms
CFC_1000



<Max>
32.92 g at 54.64 ms
<Min>
0.03 g at -49.76 ms
CFC_1000



NHTSA

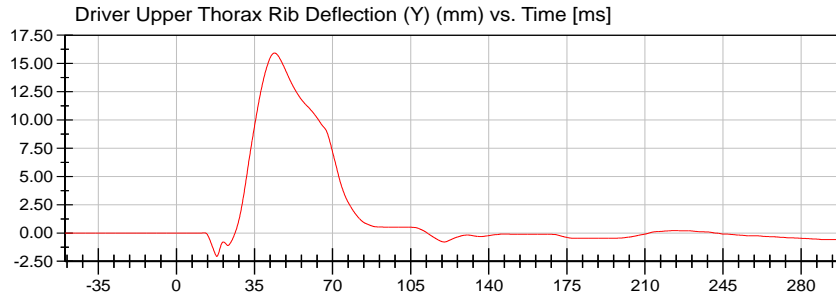
Test Lab: CTF

Test Number: 220921 (M20220305)

Test Date: 09/21/2022

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

Position #4 SID IIs Dummy (DQ0570)



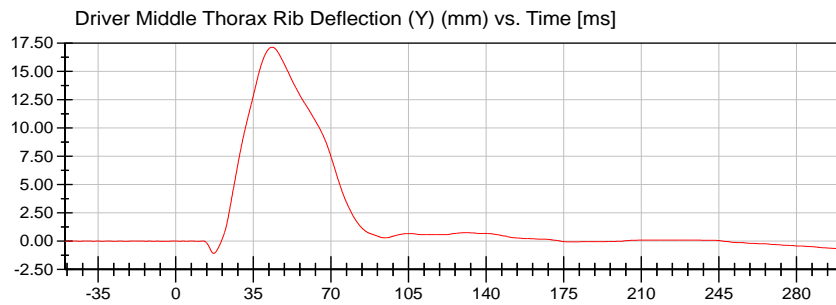
<Max>

15.92 mm at 44.00 ms

<Min>

-2.06 mm at 18.16 ms

CFC_180



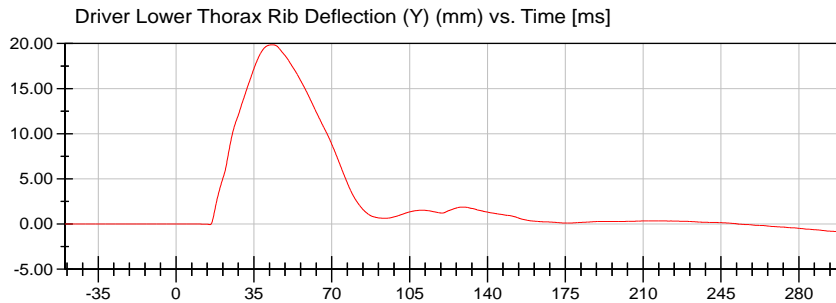
<Max>

17.14 mm at 43.52 ms

<Min>

-1.07 mm at 17.12 ms

CFC_180



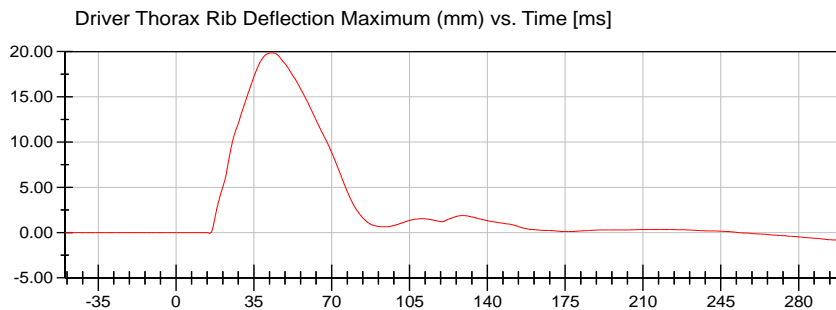
<Max>

19.85 mm at 43.12 ms

<Min>

-0.87 mm at 300.00 ms

CFC_180



<Max>

19.85 mm at 43.12 ms

<Min>

-0.87 mm at 300.00 ms

CFC_180



NHTSA

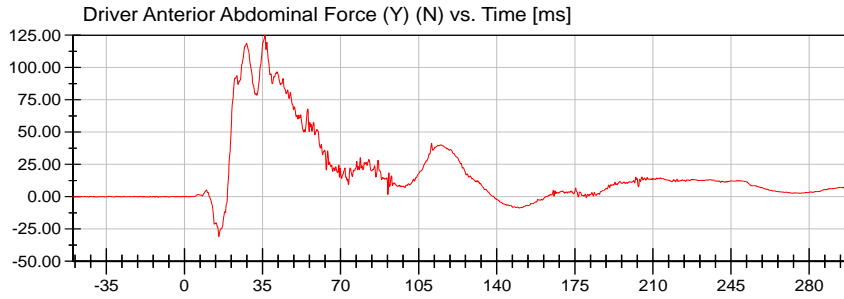
Test Lab: CTF

Test Number: 220921 (M20220305)

Test Date: 09/21/2022

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

Position #4 SID IIs Dummy (DQ0570)



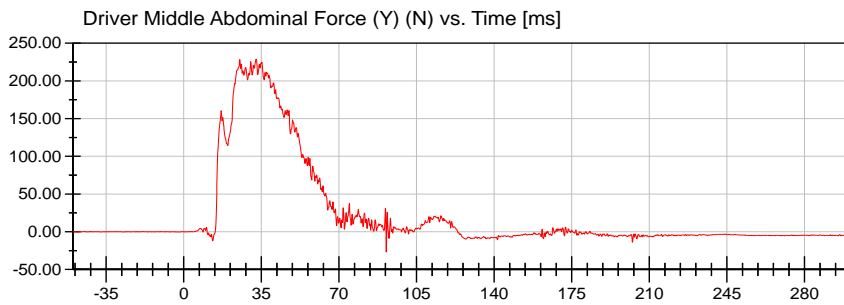
<Max>

124.99 N at 36.08 ms

<Min>

-31.00 N at 15.44 ms

CFC_600



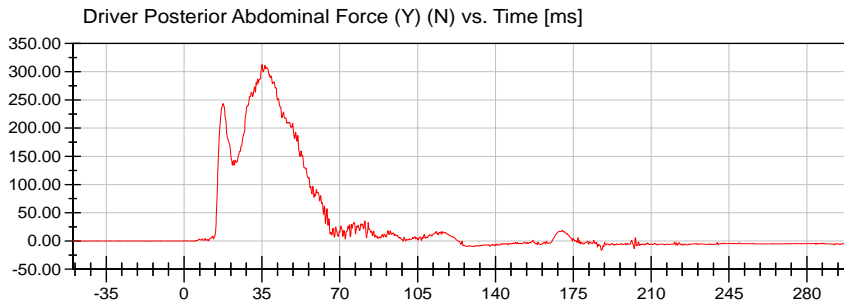
<Max>

228.96 N at 32.64 ms

<Min>

-26.79 N at 91.36 ms

CFC_600



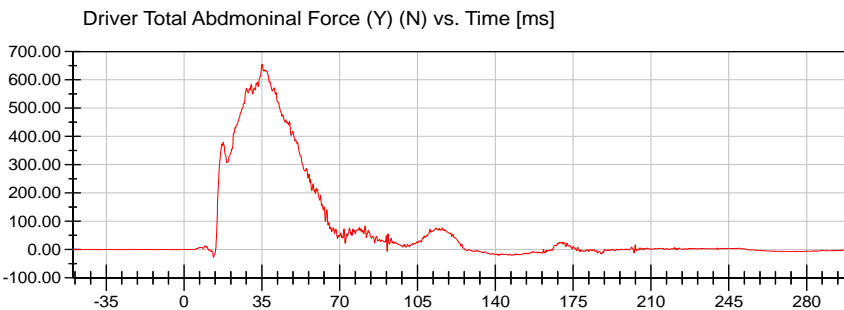
<Max>

312.42 N at 35.04 ms

<Min>

-16.43 N at 187.68 ms

CFC_600



<Max>

654.84 N at 35.12 ms

<Min>

-26.66 N at 13.20 ms

CFC_600



NHTSA

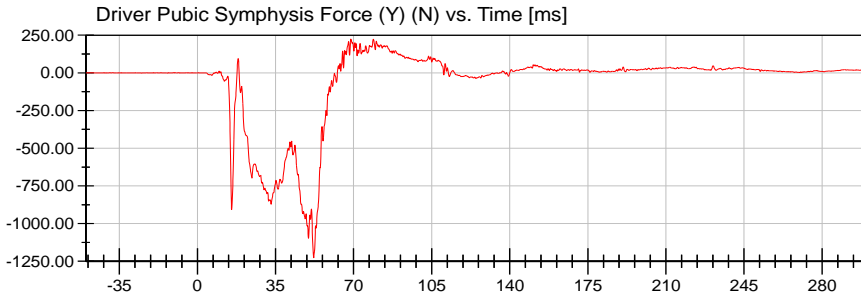
Test Lab: CTF

Test Number: 220921 (M20220305)

Test Date: 09/21/2022

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

Position #4 SID IIs Dummy (DQ0570)



<Max>

223.50 N at 68.72 ms

<Min>

-1,226.60 N at 52.08 ms

CFC_600



NHTSA

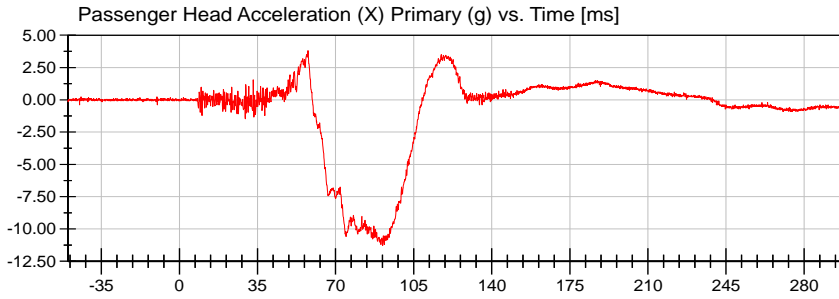
Test Lab: CTF

Test Number: 220921 (M20220305)

Test Date: 09/21/2022

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

Position #4 SID IIs Dummy (DQ0570)



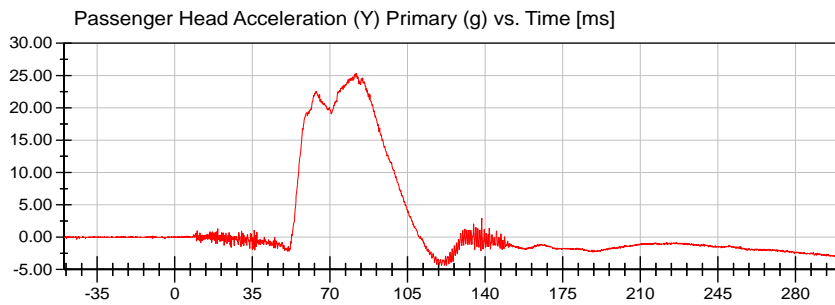
<Max>

3.81 g at 57.60 ms

<Min>

-11.27 g at 91.04 ms

CFC_1000



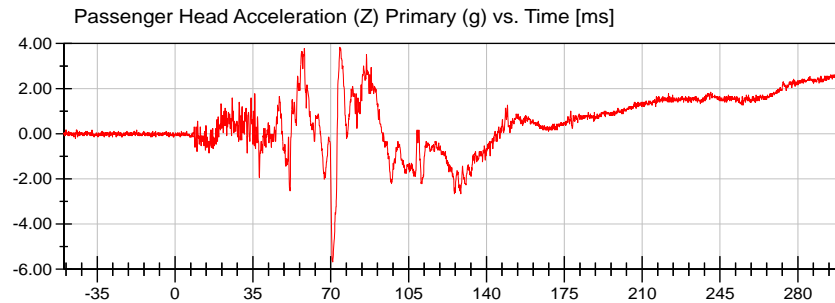
<Max>

25.35 g at 81.84 ms

<Min>

-4.37 g at 120.40 ms

CFC_1000



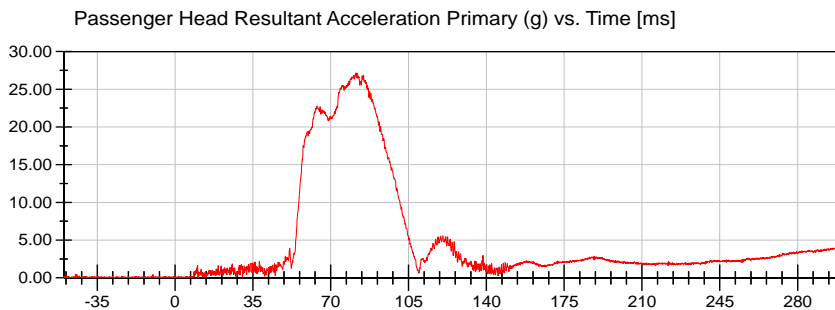
<Max>

3.84 g at 74.08 ms

<Min>

-5.68 g at 70.88 ms

CFC_1000



<Max>

27.18 g at 81.36 ms

<Min>

0.03 g at -49.92 ms

CFC_1000



NHTSA

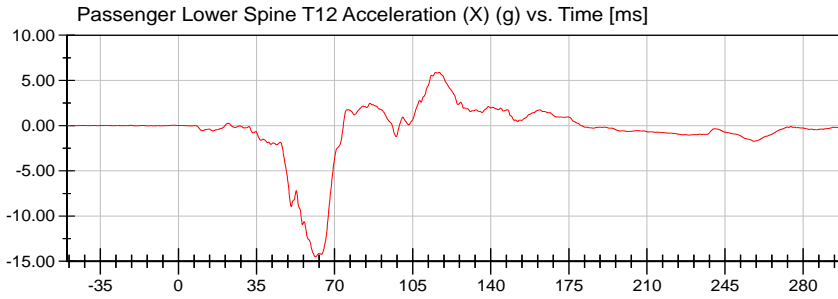
Test Lab: CTF

Test Number: 220921 (M20220305)

Test Date: 09/21/2022

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

Position #4 SID IIs Dummy (DQ0570)



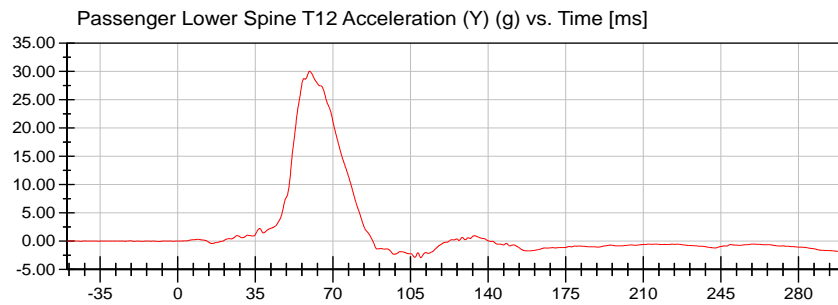
<Max>

5.90 g at 116.88 ms

<Min>

-14.50 g at 61.44 ms

CFC_180



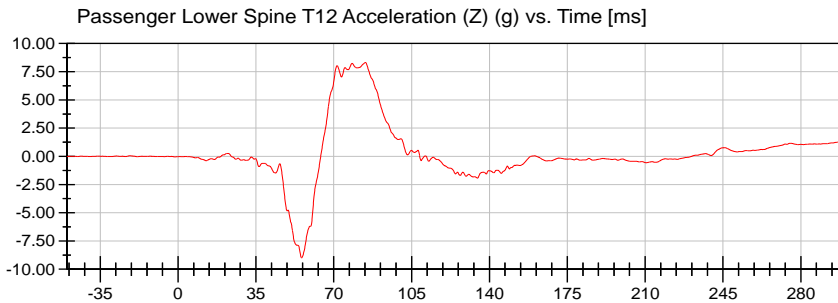
<Max>

30.04 g at 59.44 ms

<Min>

-2.92 g at 109.68 ms

CFC_180



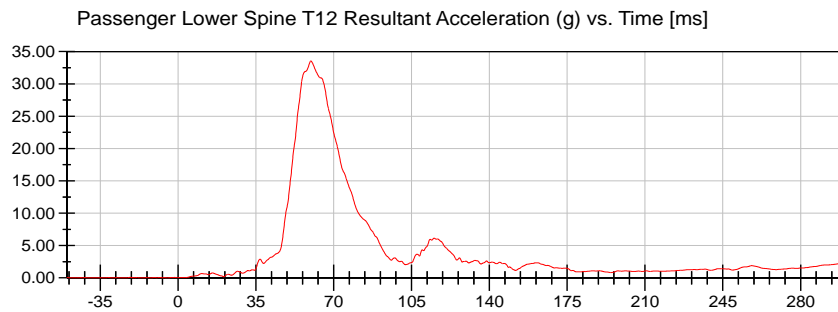
<Max>

8.32 g at 84.16 ms

<Min>

-9.00 g at 55.52 ms

CFC_180



<Max>

33.53 g at 59.68 ms

<Min>

0.00 g at -15.12 ms

CFC_180



NHTSA

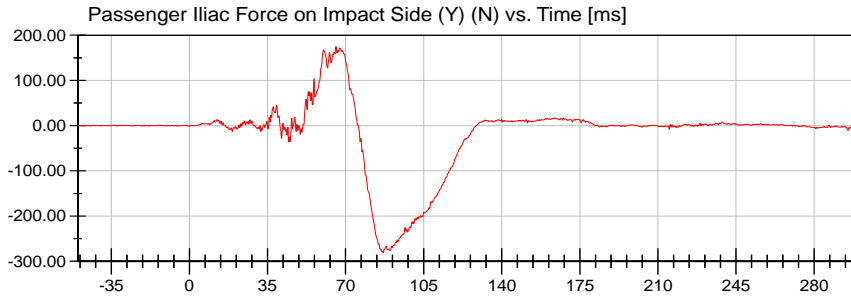
Test Lab: CTF

Test Number: 220921 (M20220305)

Test Date: 09/21/2022

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

Position #4 SID IIs Dummy (DQ0570)



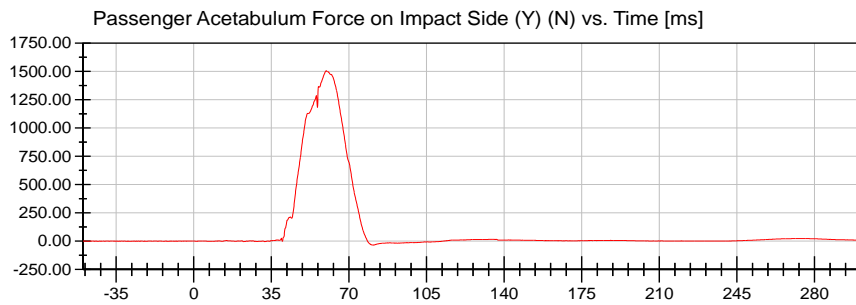
<Max>

174.73 N at 65.68 ms

<Min>

-281.02 N at 86.88 ms

CFC_600



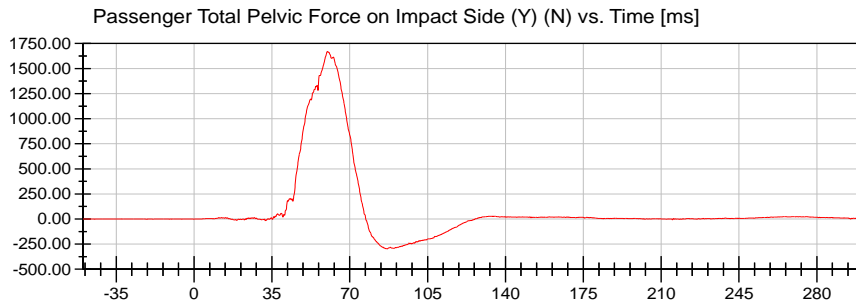
<Max>

1,505.46 N at 59.76 ms

<Min>

-34.40 N at 80.88 ms

CFC_600



<Max>

1,669.91 N at 60.00 ms

<Min>

-296.75 N at 86.88 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. 81

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. 81-1
Test Date: 8/30/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
Peak Resultant Acceleration	125 - 155 g	130.7 g	Yes
Peak Longitudinal Acceleration	(-15) - 15 g	9.4 g	Yes
Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse?	< 15 %	4.44 %	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

08.30.2022 10:05:26 360

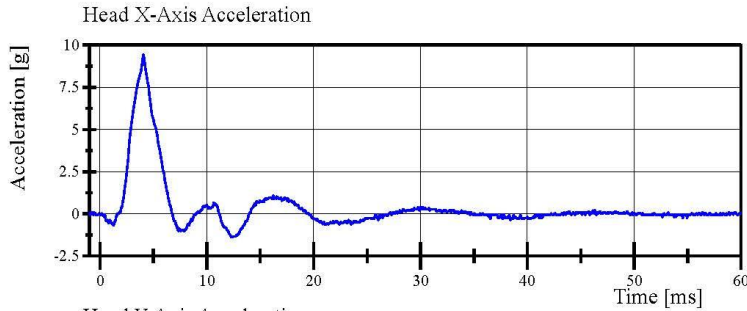


Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 81-1

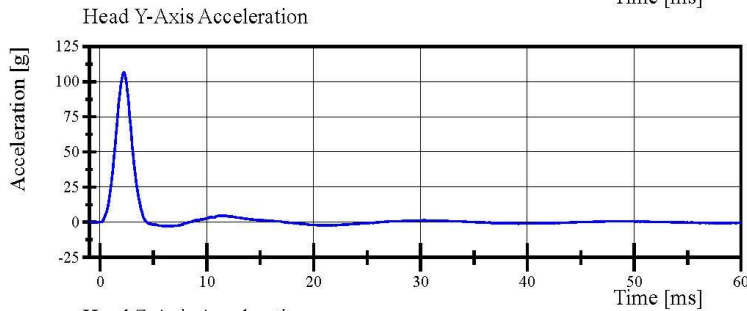
Test Date: 8/30/2022



Filter Class: CFC_1000

Max: 9.4 g at 4.1 ms

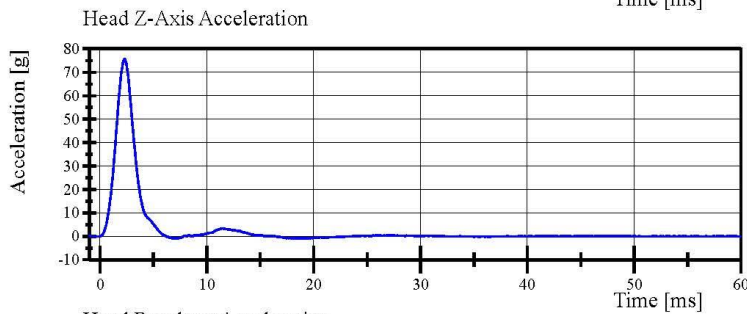
Min: -1.4 g at 12.3 ms



Filter Class: CFC_1000

Max: 106.7 g at 2.2 ms

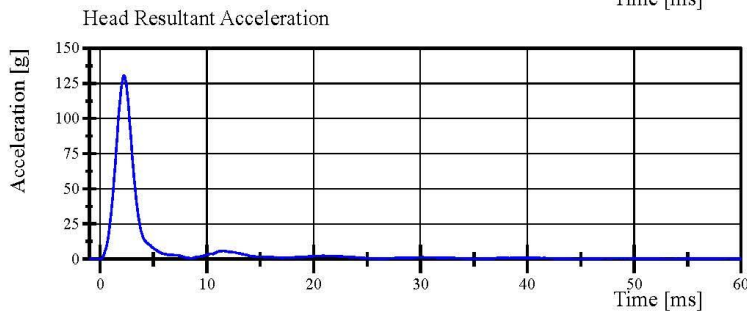
Min: -2.8 g at 6.1 ms



Filter Class: CFC_1000

Max: 75.9 g at 2.3 ms

Min: -1.0 g at 7.0 ms



Filter Class: CFC_1000

Max: 130.7 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

08.30.2022 10:06:22 360



Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	67 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-3.3) - (-3.5) m/s	-3.36 m/s	Yes
Maximum Headform Flexion			
Peak	(-49) - (-59) deg	-50.8 deg	Yes
Time of Peak	54 - 66 ms	58.1 ms	Yes
Headform Flexion Decay			
- Peak to Zero	53 - 88 ms	55.1 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 05053

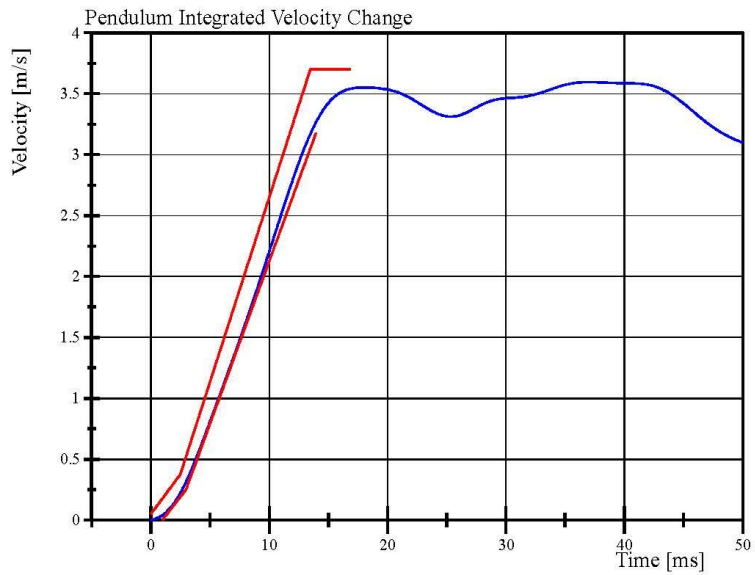
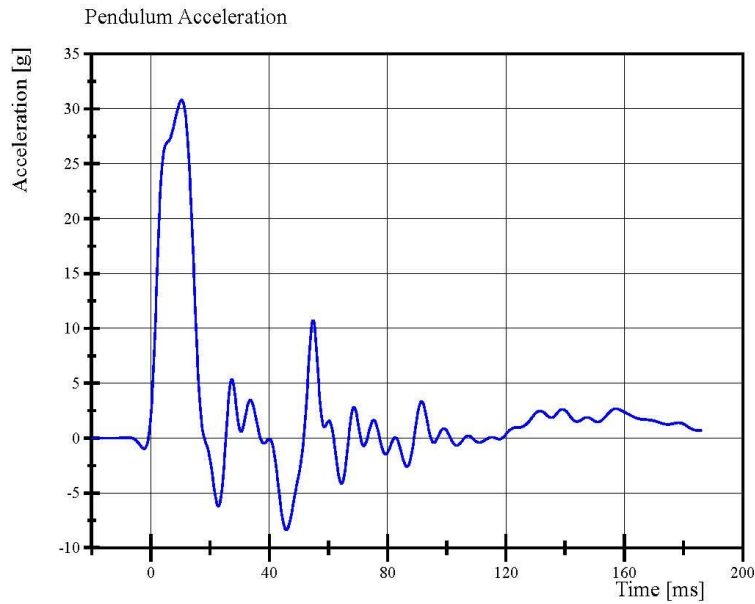
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.30.2022 08:39:21 1498



Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022



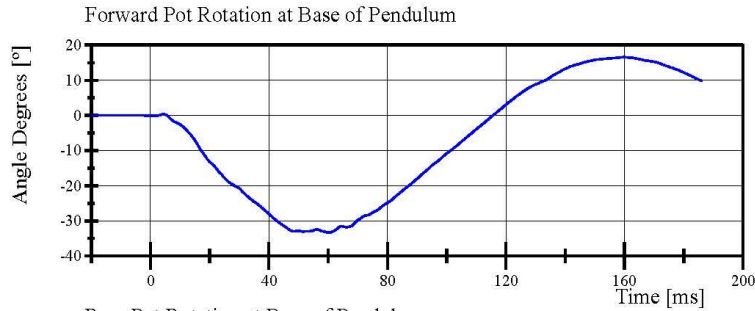
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.30.2022 08:39:55 1498

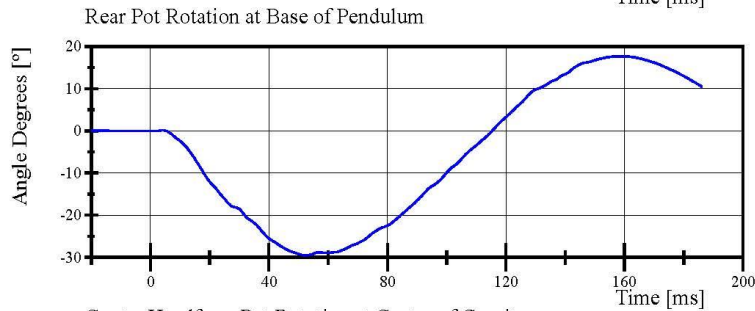


Transportation Research Center Inc.

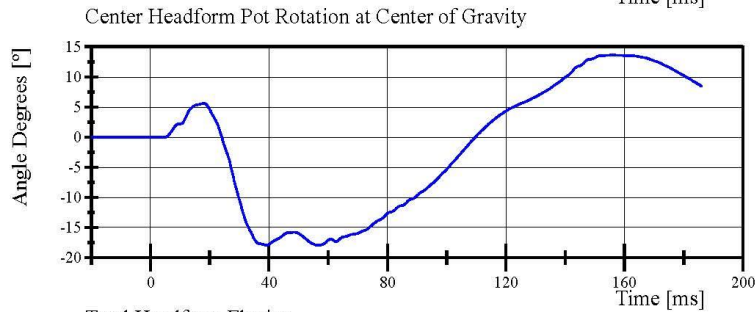
Left Lateral Neck
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022



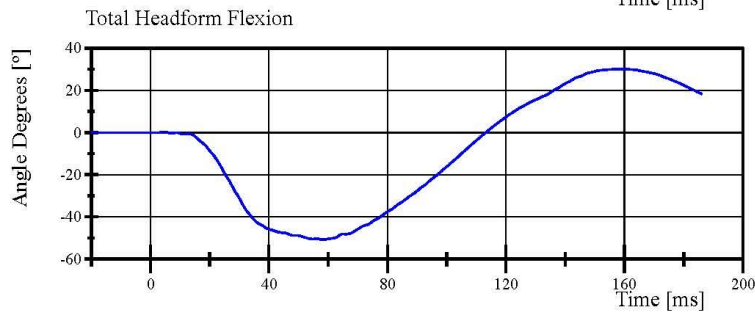
Filter Class: CFC_180
Max: 16.6 ° at 159.8 ms
Min: -33.4 ° at 60.2 ms



Filter Class: CFC_180
Max: 17.7 ° at 158.6 ms
Min: -29.5 ° at 52.1 ms



Filter Class: CFC_180
Max: 13.7 ° at 155.9 ms
Min: -17.9 ° at 39.1 ms



Filter Class: CFC_180
Max: 30.2 ° at 159.1 ms
Min: -50.8 ° at 58.1 ms

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

08.30.2022 08:39:55 1498



Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	67 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.24 m/s	Yes
Test Probe Acceleration	(-7.5) - (-10.5) g	-10.09 g	Yes

Test meets specifications.

Condition: Used

Comments:

Arm S/N: 175-3501-07014

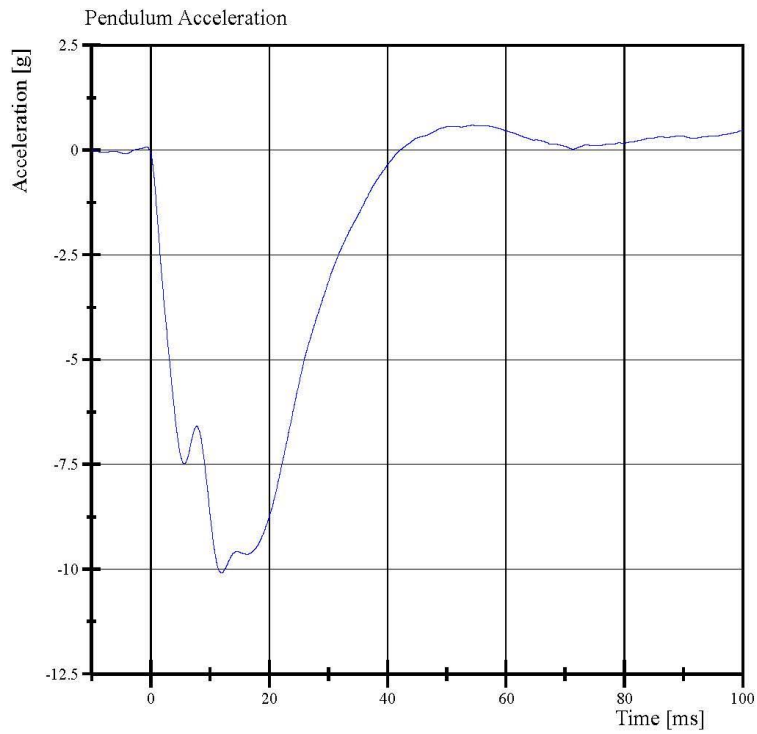
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.30.2022 10:40:58 595



Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022



Filter Class: CFC_180
Max: 0.6 g at 54.3 ms
Min: -10.1 g at 11.9 ms

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

08.30.2022 10:43:03 595



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	69 %	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: EK6973

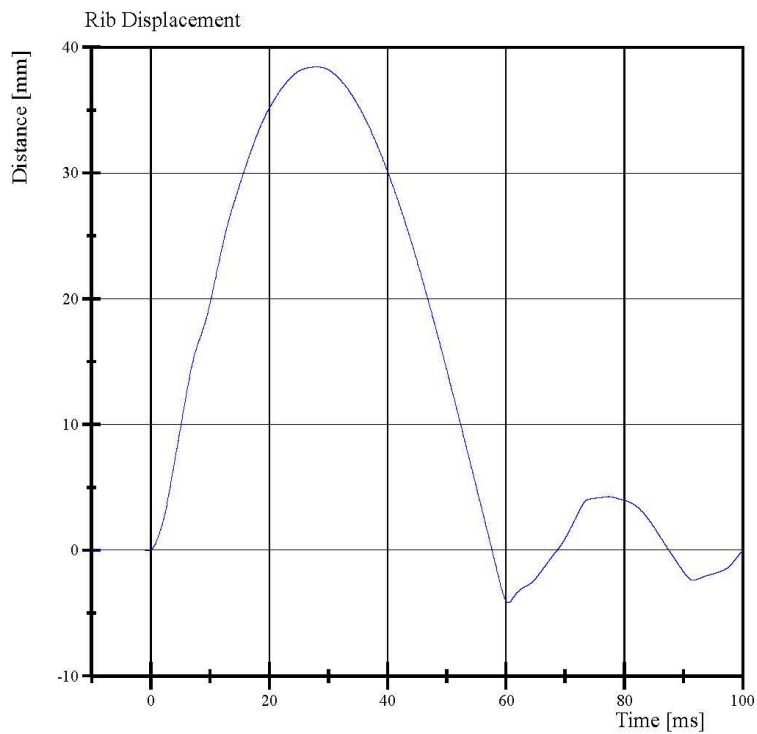
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.29.2022 14:11:15 637



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022



Filter Class: CFC_180
Max: 38.4 mm at 28.0 ms
Min: -4.2 mm at 60.4 ms

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

08.29.2022 14:12:12 637



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	70 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.3 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6973

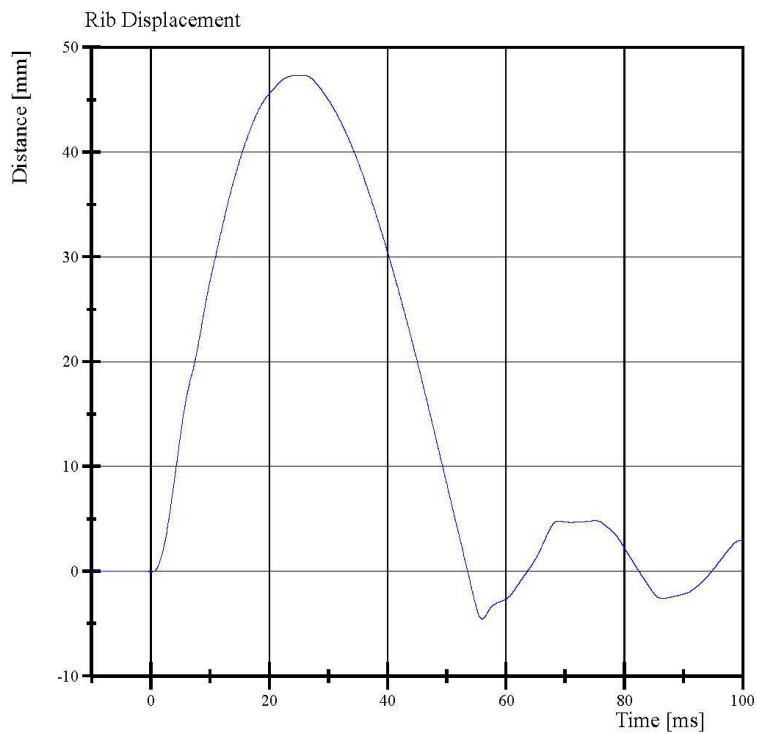
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.29.2022 13:58:52 544



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022



Filter Class: CFC_180
Max: 47.3 mm at 25.7 ms
Min: -4.6 mm at 56.0 ms

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

08.29.2022 14:08:08 544



Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	38.7 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462mm

Rib Foam S/N: EK6970

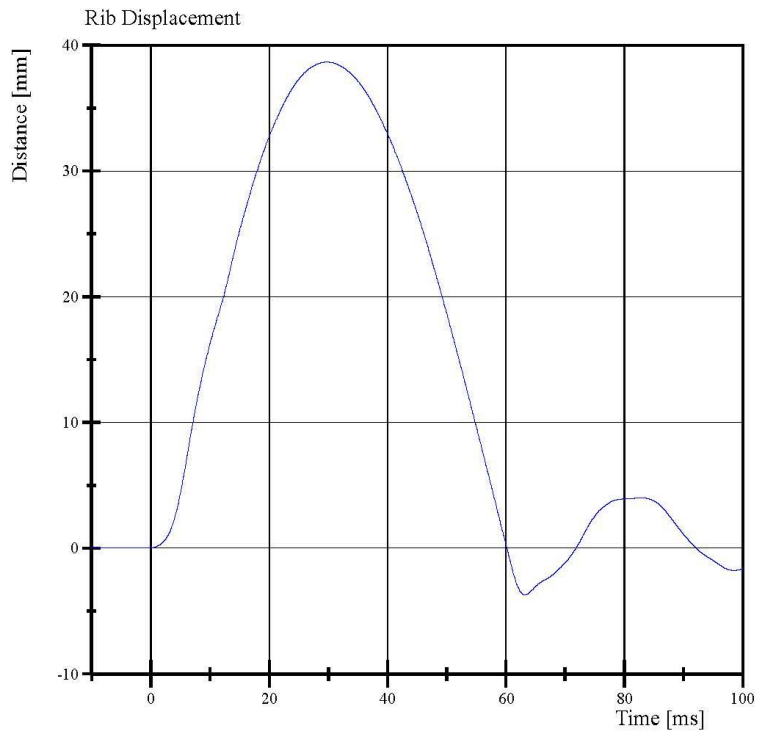
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.29.2022 15:36:34 611



Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022



Filter Class: CFC_180
Max: 38.7 mm at 29.7 ms
Min: -3.7 mm at 63.2 ms

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

08.29.2022 15:37:13 611



Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	50.1 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6970

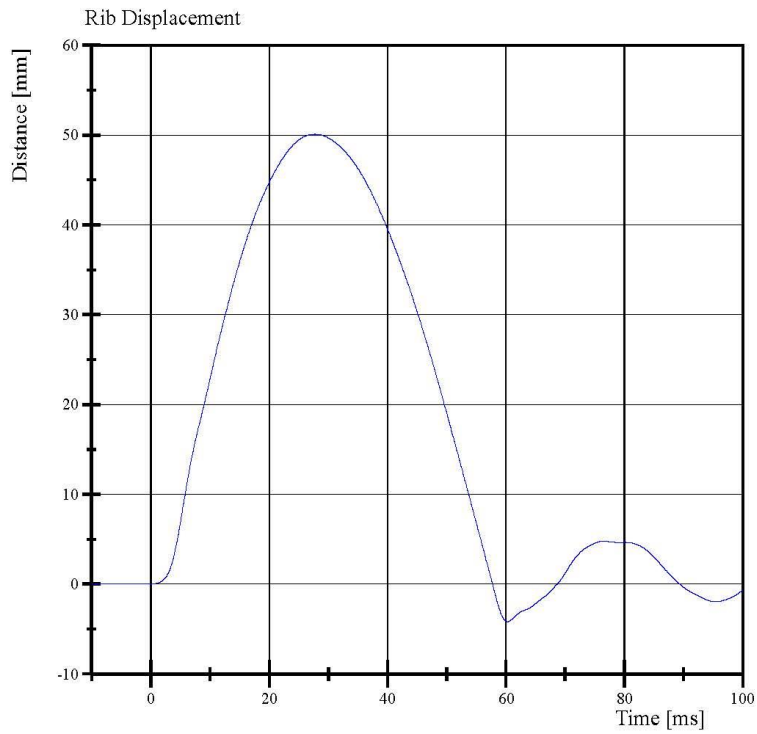
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.29.2022 15:29:54 509



Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022



Filter Class: CFC_180
Max: 50.1 mm at 27.7 ms
Min: -4.2 mm at 60.2 ms

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

08.29.2022 15:31:00 509



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	37.9 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462 mm

Rib Foam S/N: EK6971

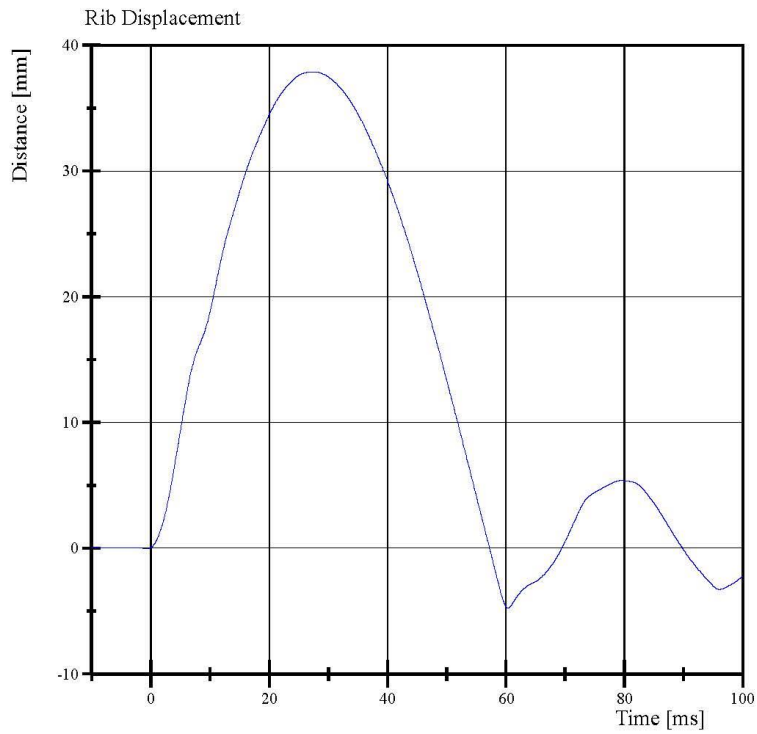
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.29.2022 15:53:27 627



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022



Filter Class: CFC_180
Max: 37.9 mm at 27.4 ms
Min: -4.8 mm at 60.3 ms

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

08.29.2022 15:54:20 627



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	46.0 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

08.29.2022 15:44:36 541



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/29/2022



Filter Class: CFC_180
Max: 46.0 mm at 24.3 ms
Min: -5.2 mm at 54.5 ms

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

08.29.2022 15:45:40 541



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
Impactor Velocity	5.4 - 5.60 m/s	5.475 m/s	Yes
Peak Impactor Force after 6 ms	(-5,100) - (-6,200) N	-5,357.5 N	Yes
Upper Rib Displacement	34 - 41 mm	39.0 mm	Yes
Center Rib Displacement	37 - 45 mm	41.1 mm	Yes
Lower Rib Displacement	37 - 44 mm	40.0 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

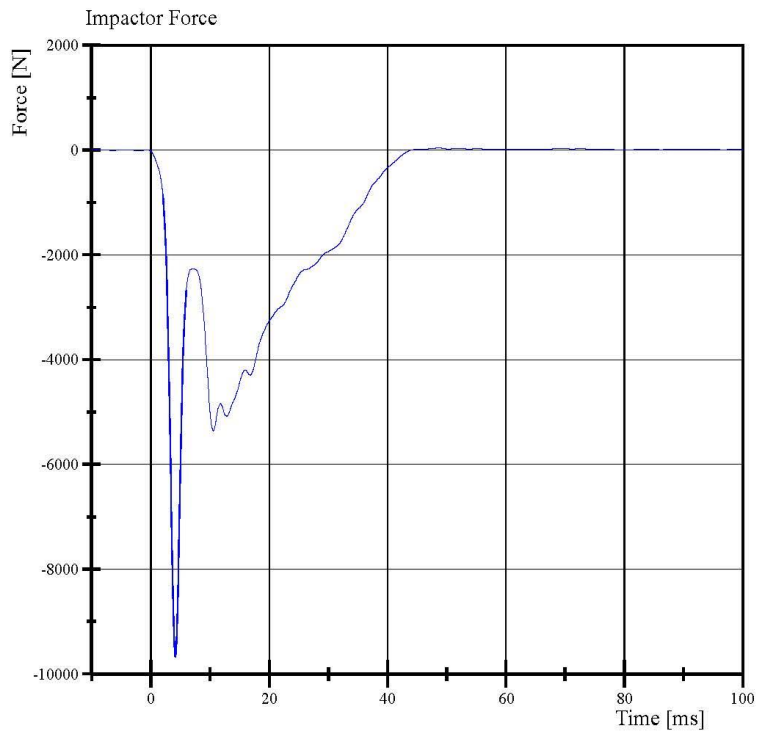
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.30.2022 10:50:10.485



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022



Filter Class: CFC_180
Max: 45.8 N at 48.6 ms
Min: -9,667.9 N at 4.2 ms

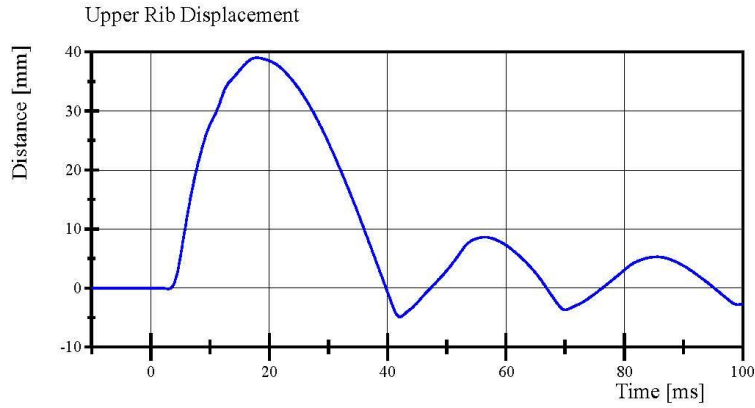
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.30.2022 10:52:57.485

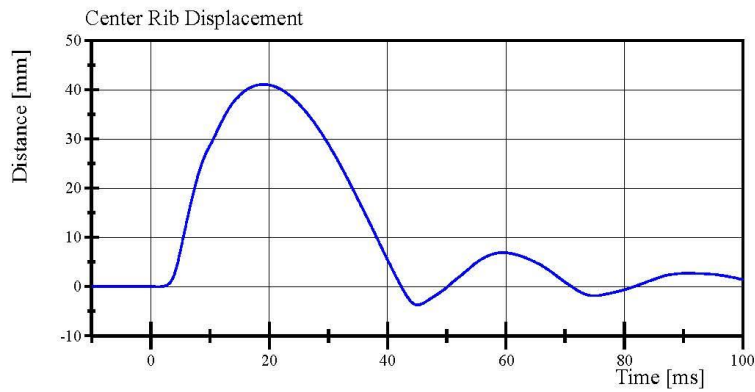


Transportation Research Center Inc.

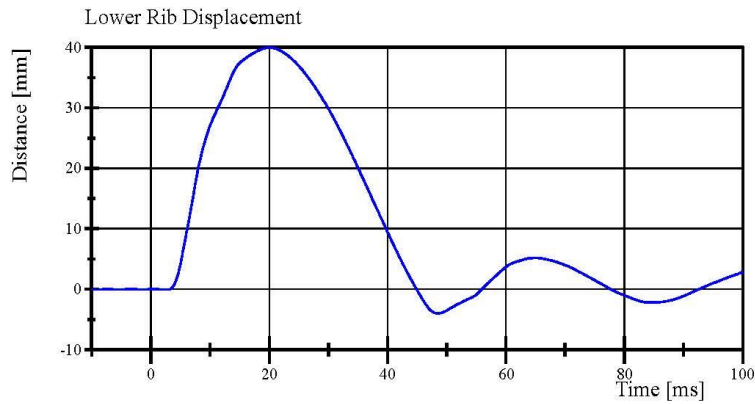
Left Lower Thorax
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022



Filter Class: CFC_180
Max: 39.0 mm at 17.9 ms
Min: -4.9 mm at 42.1 ms



Filter Class: CFC_180
Max: 41.1 mm at 19.0 ms
Min: -3.7 mm at 45.0 ms



Filter Class: CFC_180
Max: 40.0 mm at 20.0 ms
Min: -4.0 mm at 48.5 ms

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

08.30.2022 10:52:57.485



Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 81-2
Test Date: 8/29/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	67 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-5.95) - (-6.15) m/s	-6.113 m/s	Yes
Maximum Headform Flexion			
Peak	(-45) - (-55) deg	-47.7 deg	Yes
Time of Peak	39 - 53 ms	43.2 ms	Yes
Headform Flexion Decay			
- Peak to Zero	37 - 57 ms	37.1 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Lumbar S/N: 150365

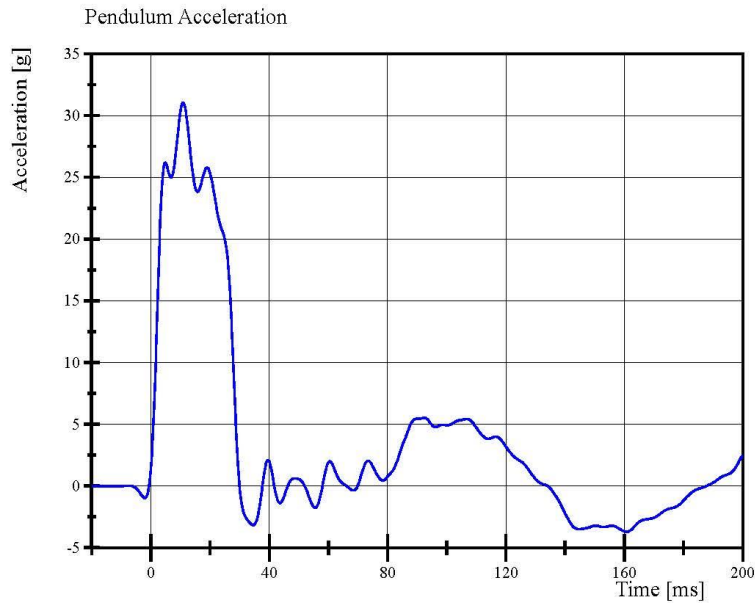
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.29.2022 14:36:32 670

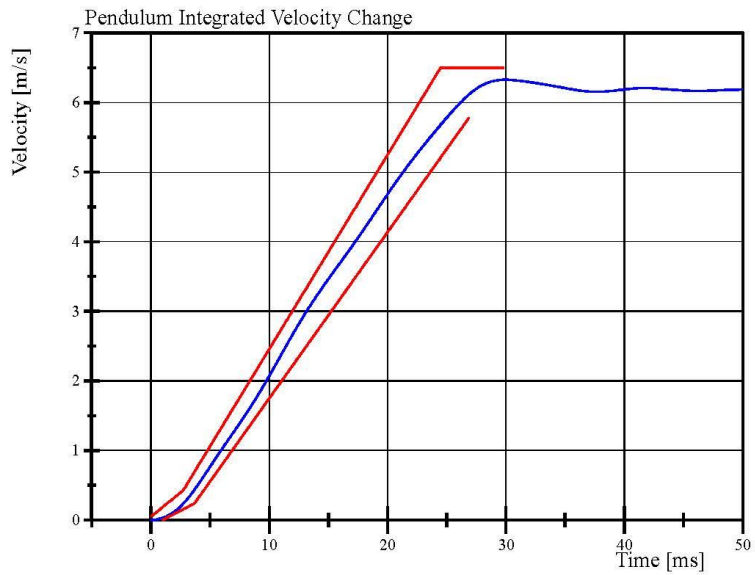


Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 81-2
Test Date: 8/29/2022



Filter Class: CFC_60
Max: 31.1 g at 10.9 ms
Min: -3.7 g at 160.7 ms



Filter Class: CFC_60
Max: 6.3 m/s at 30.0 ms
Min: 0.0 m/s at 0.0 ms

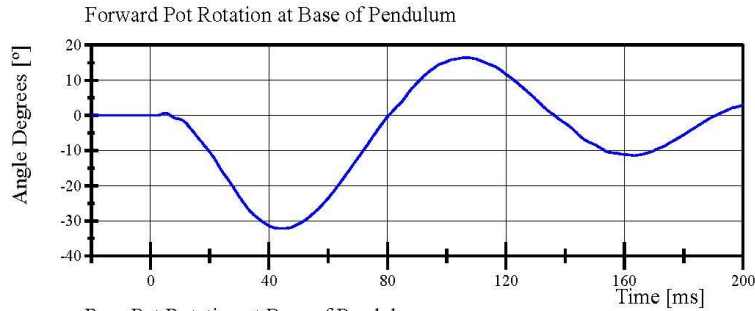
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.29.2022 14:42:15 670

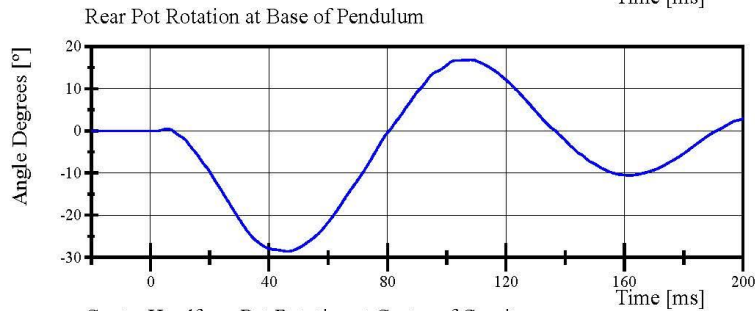


Transportation Research Center Inc.

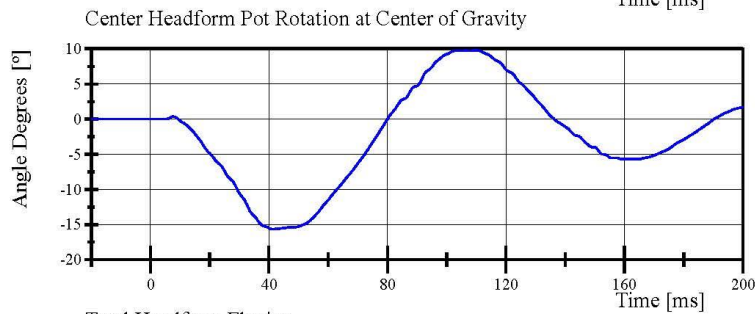
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 81-2
Test Date: 8/29/2022



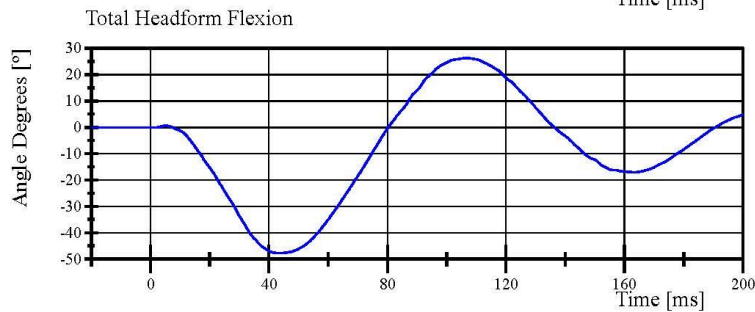
Filter Class: CFC_180
Max: 16.4 ° at 106.6 ms
Min: -32.1 ° at 43.3 ms



Filter Class: CFC_180
Max: 16.8 ° at 108.1 ms
Min: -28.5 ° at 46.2 ms



Filter Class: CFC_180
Max: 9.8 ° at 109.8 ms
Min: -15.6 ° at 41.1 ms



Filter Class: CFC_180
Max: 26.2 ° at 106.6 ms
Min: -47.7 ° at 43.2 ms

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

08.29.2022 14:42:15 670



Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	66 %	Yes
Test Probe Velocity	3.9 - 4.1 m/s	4.05 m/s	Yes
Test Probe Force			
Peak	4,000 - 4,800 N	4,268.7 N	Yes
Time of Peak	10.6 - 13.0 ms	12.56 ms	Yes
Total Abdominal Force			
Peak	2,200 - 2,700 N	2,550.7 N	Yes
Time of Peak	10.0 - 12.3 ms	12.16 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Abdomen S/N: 1066

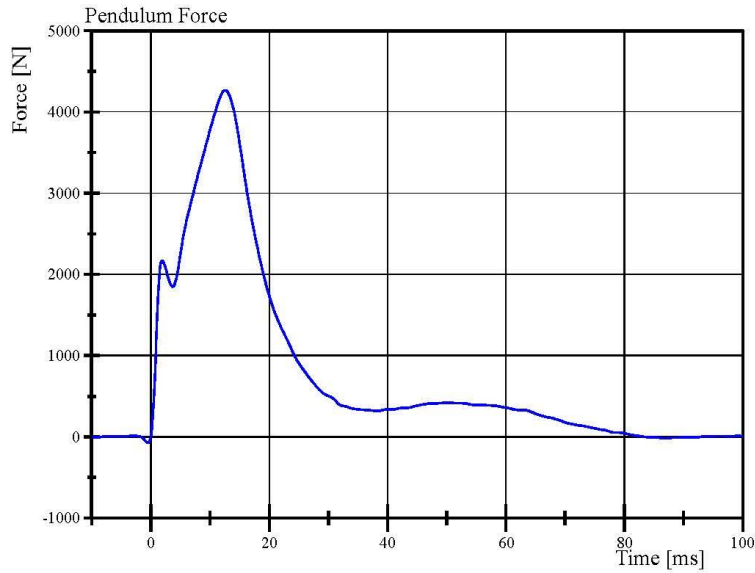
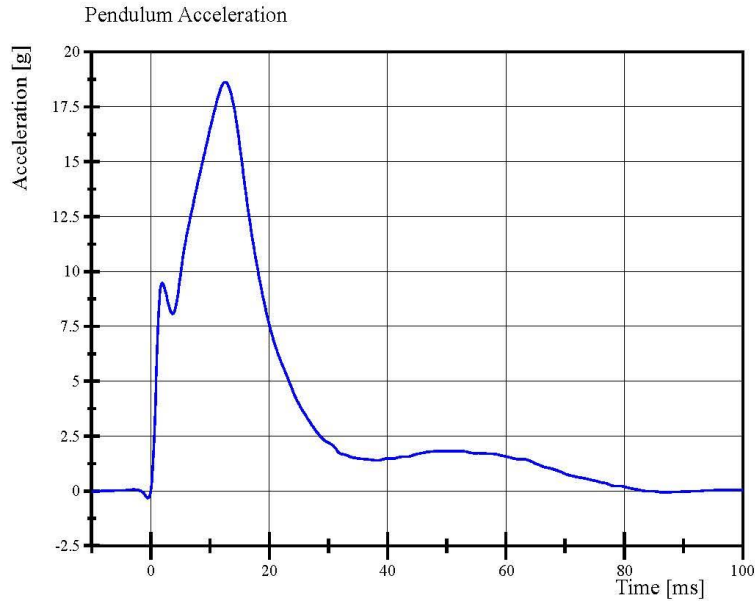
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.30.2022 11:05:59 643



Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022



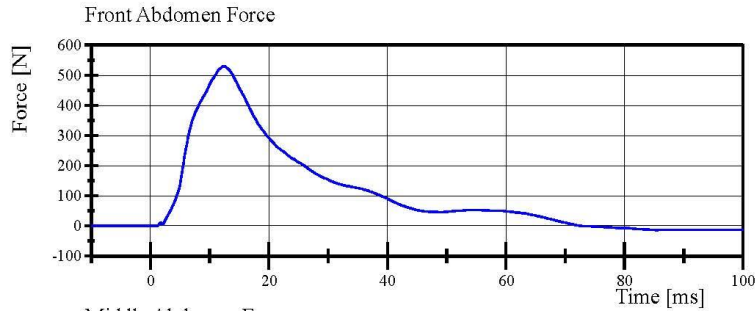
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.30.2022 11:06:24 643

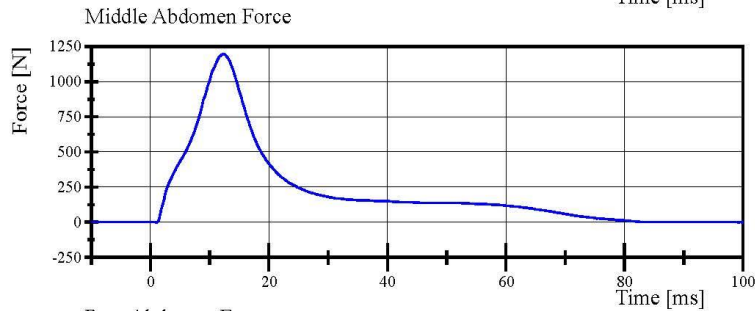


Transportation Research Center Inc.

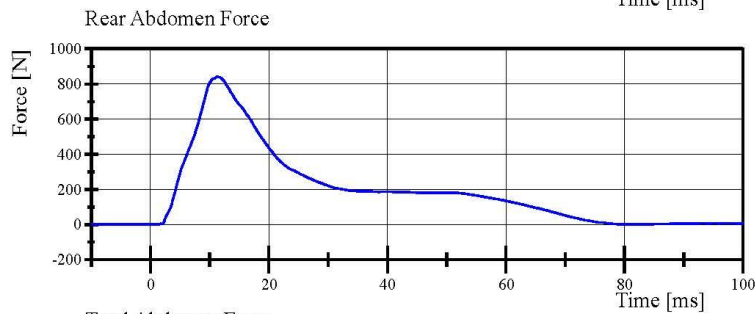
Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022



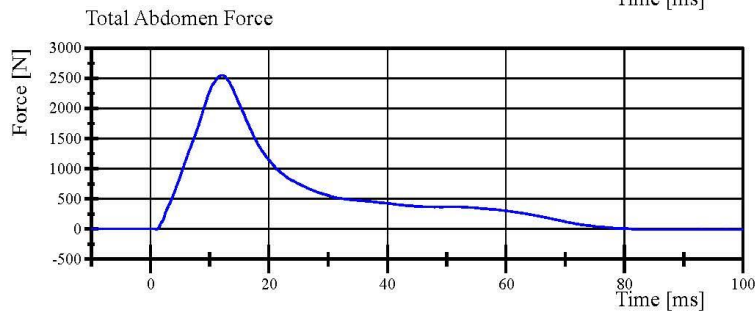
Filter Class: CFC_600
Max: 529.8 N at 12.3 ms
Min: -14.1 N at 85.4 ms



Filter Class: CFC_600
Max: 1,196.0 N at 12.3 ms
Min: -1.7 N at 1.0 ms



Filter Class: CFC_600
Max: 841.1 N at 11.4 ms
Min: -0.2 N at -8.7 ms



Filter Class: CFC_600
Max: 2,550.7 N at 12.2 ms
Min: -11.4 N at 85.4 ms

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

08.30.2022 11:06:25 643



Transportation Research Center Inc.

Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.30 m/s	Yes
Test Probe Force			
Peak	4,700 - 5,400 N	5,122.2 N	Yes
Time of Peak	11.8 - 16.1 ms	13.44 ms	Yes
Pubic Symphysis Force			
Peak	(-1,230) - (-1,590) N	-1,263.5 N	Yes
Time of Peak	12.2 - 17.0 ms	13.12 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: N/A

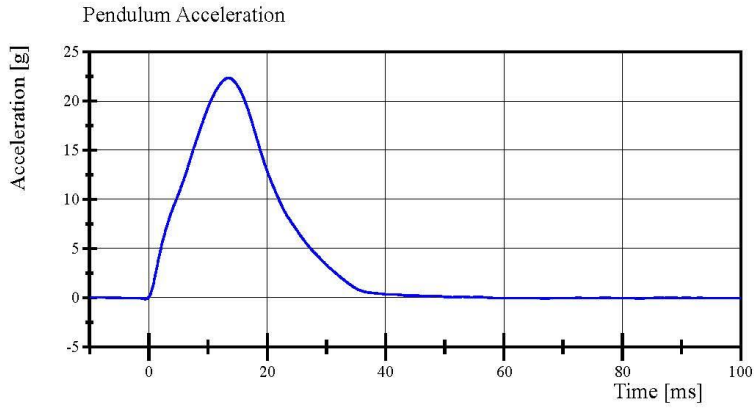
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

08.30.2022 11:13:32 609

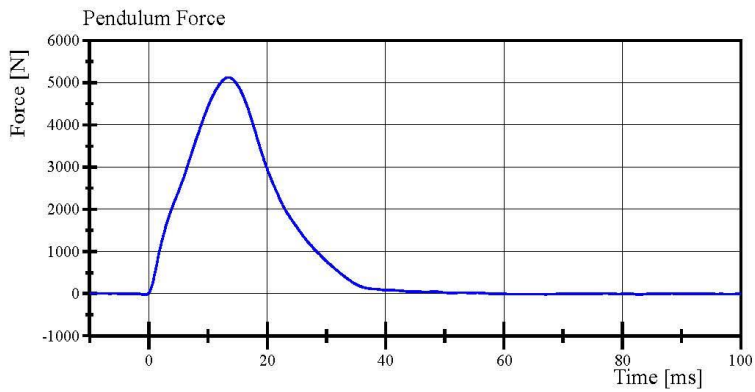


Transportation Research Center Inc.

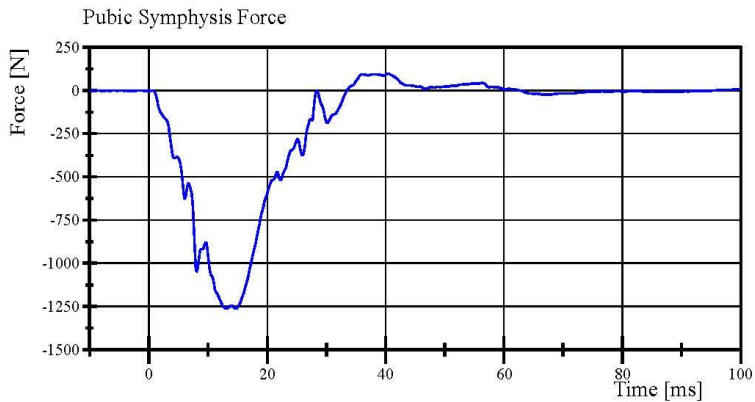
Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 81-1
Test Date: 8/30/2022



Filter Class: CFC_180
Max: 22.4 g at 13.4 ms
Min: -0.1 g at -0.6 ms



Filter Class: CFC_180
Max: 5,122.2 N at 13.4 ms
Min: -25.9 N at -0.6 ms



Filter Class: CFC_600
Max: 98.5 N at 40.4 ms
Min: -1,263.5 N at 13.1 ms

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

08.30.2022 11:14:16 609



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

Transportation Research Center Inc.
572U ES-2re Dummy
External Dimensions
Serial No. F030 Calibration No. 82

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. 82-2
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	55 %	Yes
Peak Resultant Acceleration	125 - 155 g	146.6 g	Yes
Peak Longitudinal Acceleration	(-15) - 15 g	9.4 g	Yes
Is Resultant Acceleration Curve Unimodal within 15% of Main Pulse?	< 15 %	3.97 %	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

09.22.2022 12:41:12 361

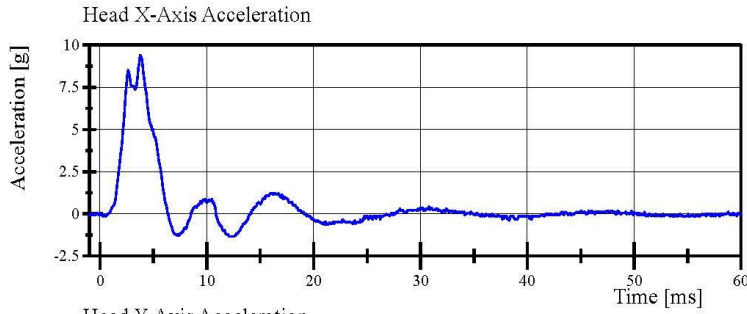


Transportation Research Center Inc.

Left Lateral Head Drop

ES-2re Serial No. F030 Certification No. 82-2

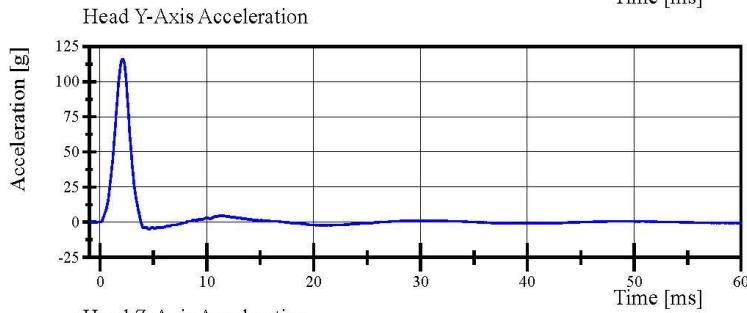
Test Date: 9/22/2022



Filter Class: CFC_1000

Max: 9.4 g at 3.8 ms

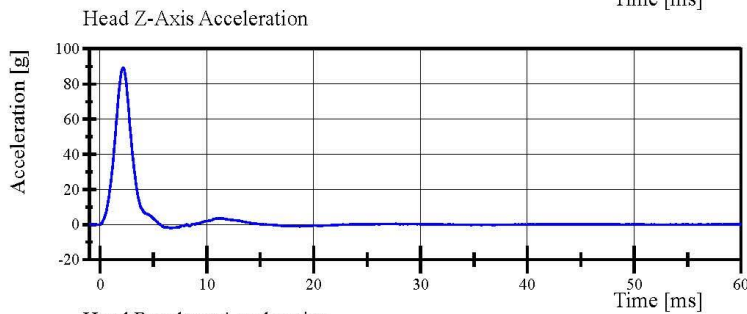
Min: -1.4 g at 12.1 ms



Filter Class: CFC_1000

Max: 116.2 g at 2.2 ms

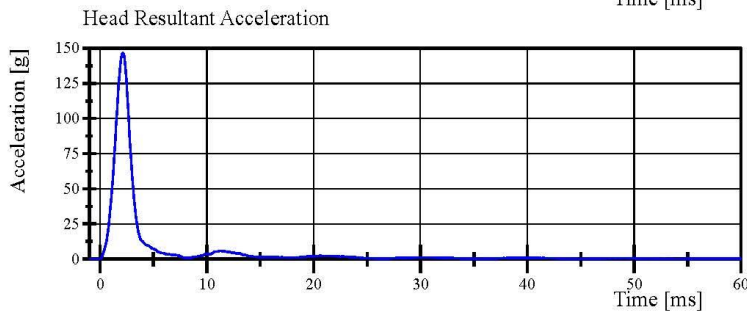
Min: -4.9 g at 4.6 ms



Filter Class: CFC_1000

Max: 89.2 g at 2.2 ms

Min: -1.9 g at 6.6 ms



Filter Class: CFC_1000

Max: 146.6 g at 2.2 ms

Min: 0.0 g at -0.8 ms

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

09.22.2022 12:41:51 361



Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/23/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-3.3) - (-3.5) m/s	-3.33 m/s	Yes
Maximum Headform Flexion			
Peak	(-49) - (-59) deg	-51.1 deg	Yes
Time of Peak	54 - 66 ms	55.2 ms	Yes
Headform Flexion Decay			
- Peak to Zero	53 - 88 ms	56.3 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 05053

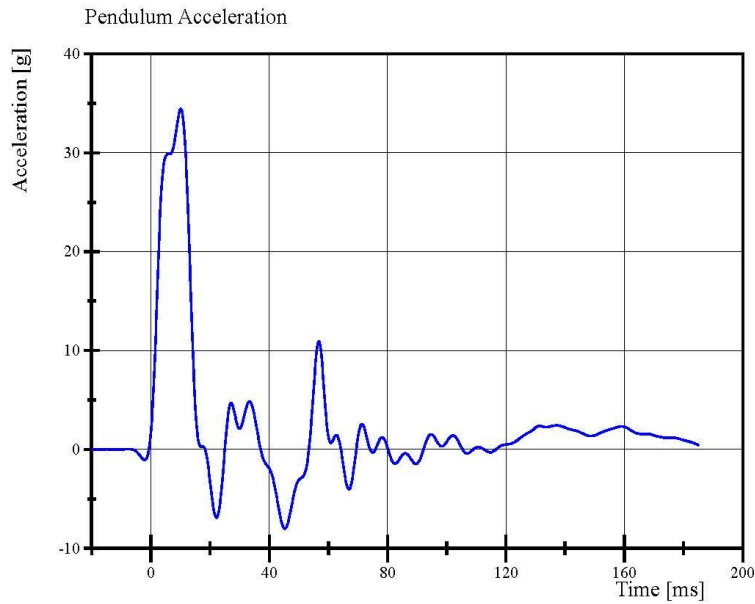
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.23.2022 10:08:31 1510

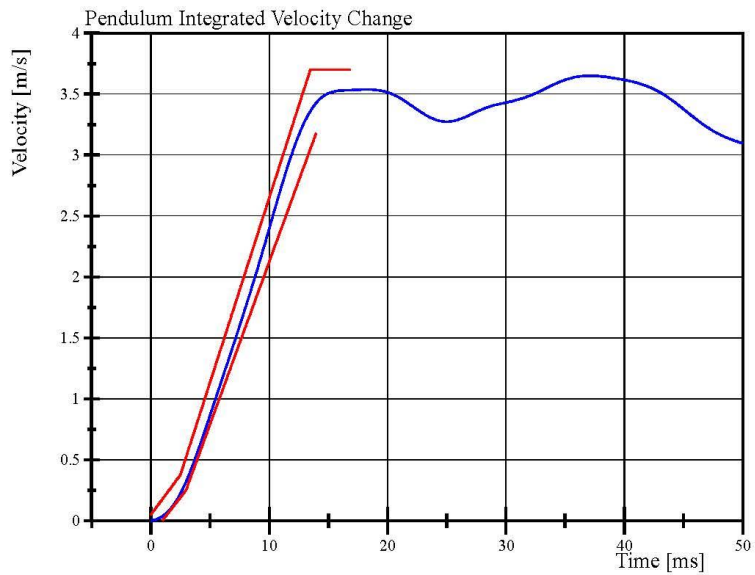


Transportation Research Center Inc.

Left Lateral Neck
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/23/2022



Filter Class: CFC_60
Max: 34.4 g at 10.1 ms
Min: -8.0 g at 45.3 ms



Filter Class: CFC_60
Max: 3.7 m/s at 37.0 ms
Min: 0.0 m/s at 0.0 ms

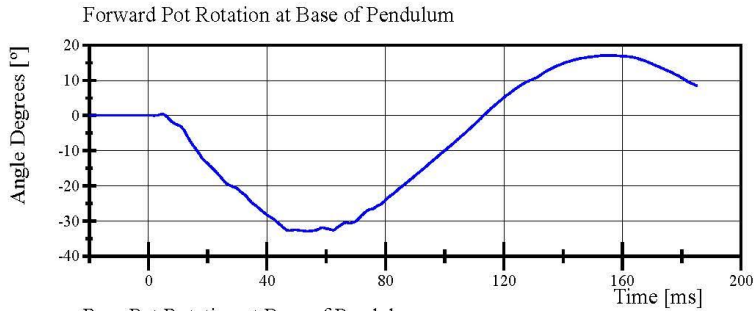
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.23.2022 10:19:26 1510

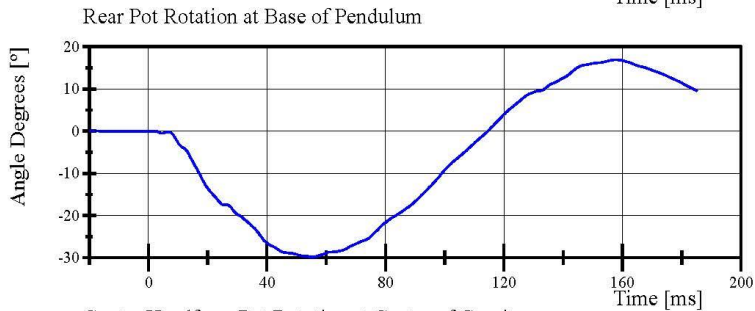


Transportation Research Center Inc.

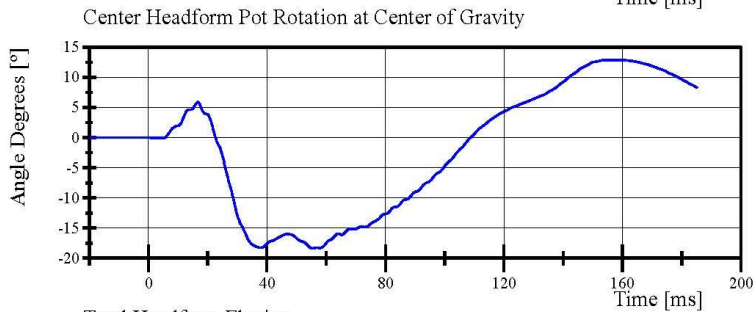
Left Lateral Neck
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/23/2022



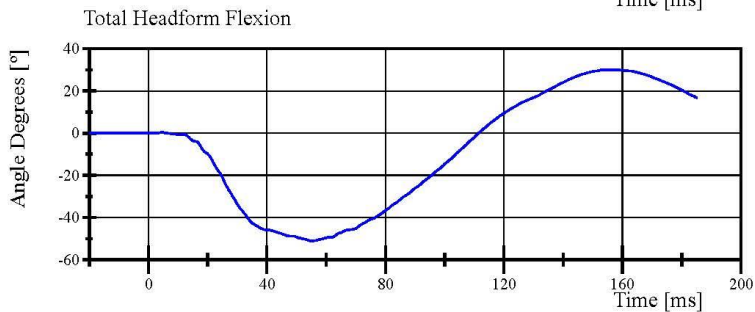
Filter Class: CFC_180
Max: 17.1 ° at 154.7 ms
Min: -32.9 ° at 53.7 ms



Filter Class: CFC_180
Max: 16.9 ° at 157.8 ms
Min: -29.8 ° at 55.5 ms



Filter Class: CFC_180
Max: 12.9 ° at 154.2 ms
Min: -18.4 ° at 55.4 ms



Filter Class: CFC_180
Max: 30.0 ° at 154.6 ms
Min: -51.1 ° at 55.2 ms

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

09.23.2022 10:19:26 1510



Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/23/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.25 m/s	Yes
Test Probe Acceleration	(-7.5) - (-10.5) g	-9.71 g	Yes

Test meets specifications.

Condition: Used

Comments:

Arm S/N: 175-3501-07014

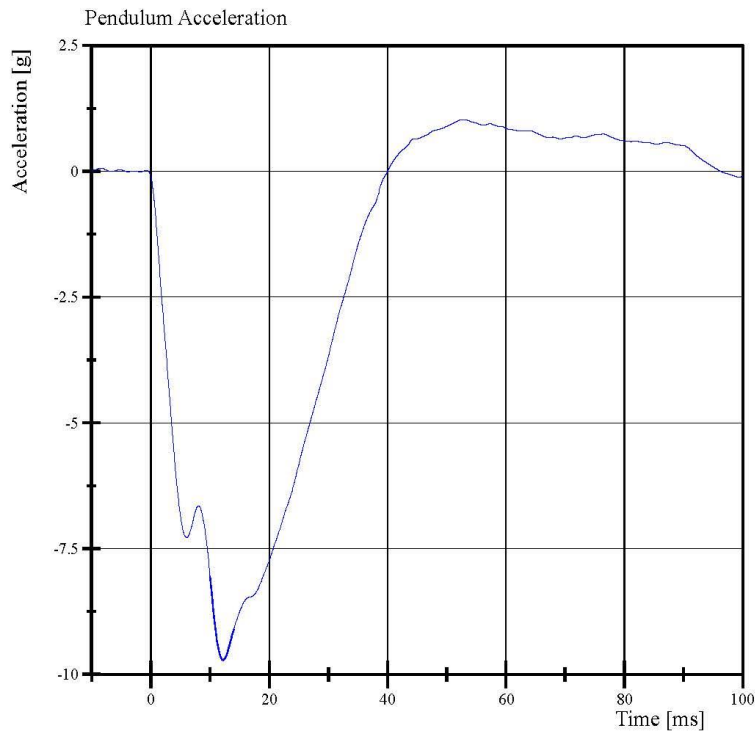
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.23.2022 13:30:16 711



Transportation Research Center Inc.

Left Lateral Shoulder
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/23/2022



Filter Class: CFC_180
Max: 1.0 g at 52.7 ms
Min: -9.7 g at 12.2 ms

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

09.23.2022 13:30:50 711



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	61 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	38.1 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462 mm

Rib Foam S/N: EK6973

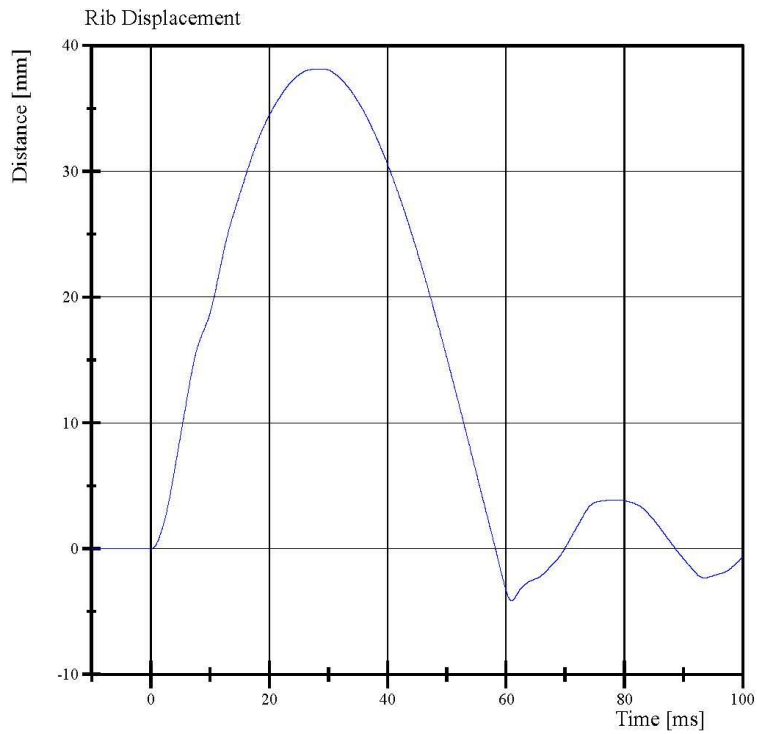
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.22.2022 09:15:26 627



Transportation Research Center Inc.

3.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 38.1 mm at 29.0 ms
Min: -4.1 mm at 61.0 ms

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

09.22.2022 09:16:03 627



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	60 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	47.7 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6973

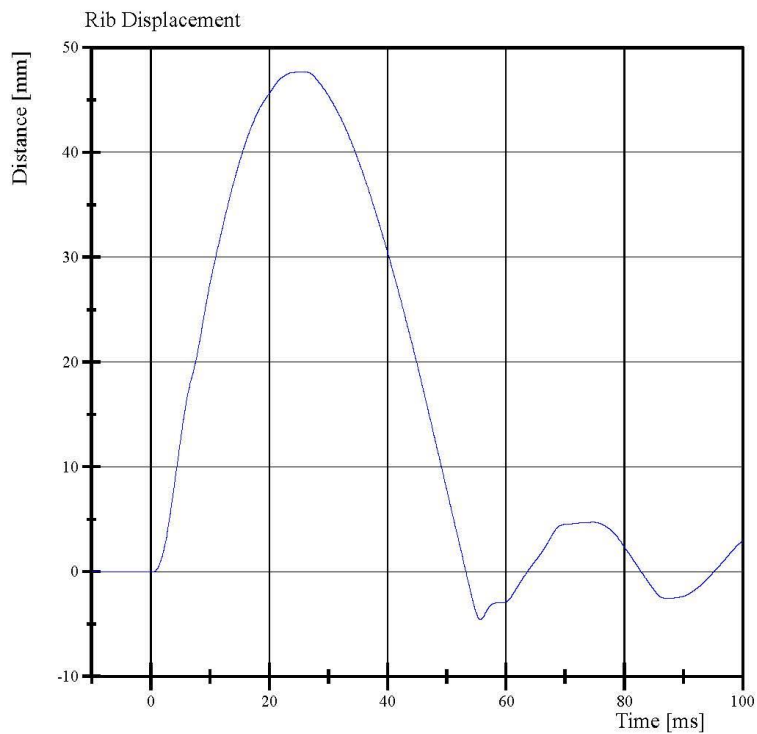
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.22.2022 09:09:37 526



Transportation Research Center Inc.

4.0 m/s Upper Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 47.7 mm at 26.1 ms
Min: -4.6 mm at 55.7 ms

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

09.22.2022 09:10:19 526



Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	60 %	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: EK6970

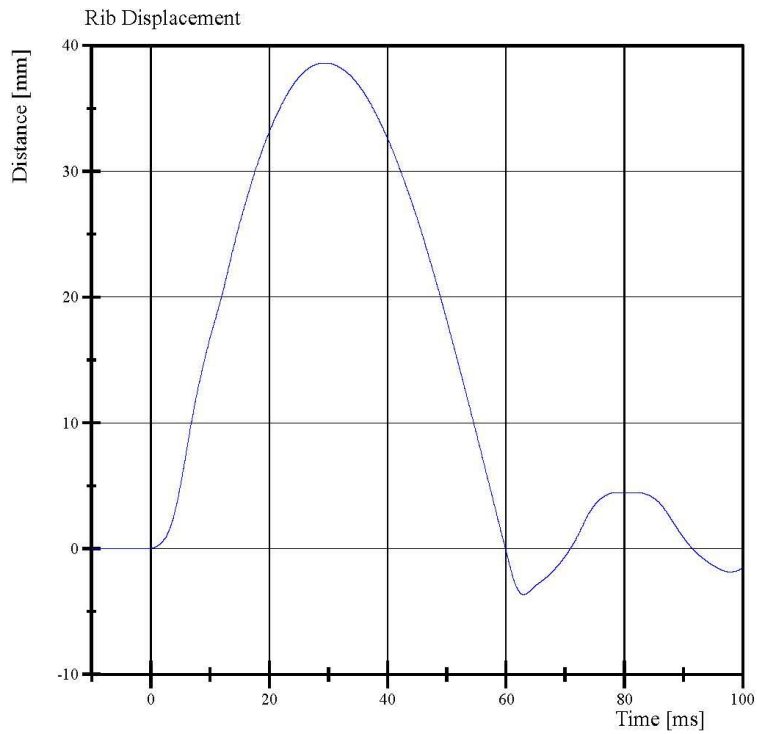
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.22.2022 09:28:06 611



Transportation Research Center Inc.

3.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 38.6 mm at 29.4 ms
Min: -3.7 mm at 63.0 ms

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

09.22.2022 09:28:38 611



Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	60 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	50.1 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6970

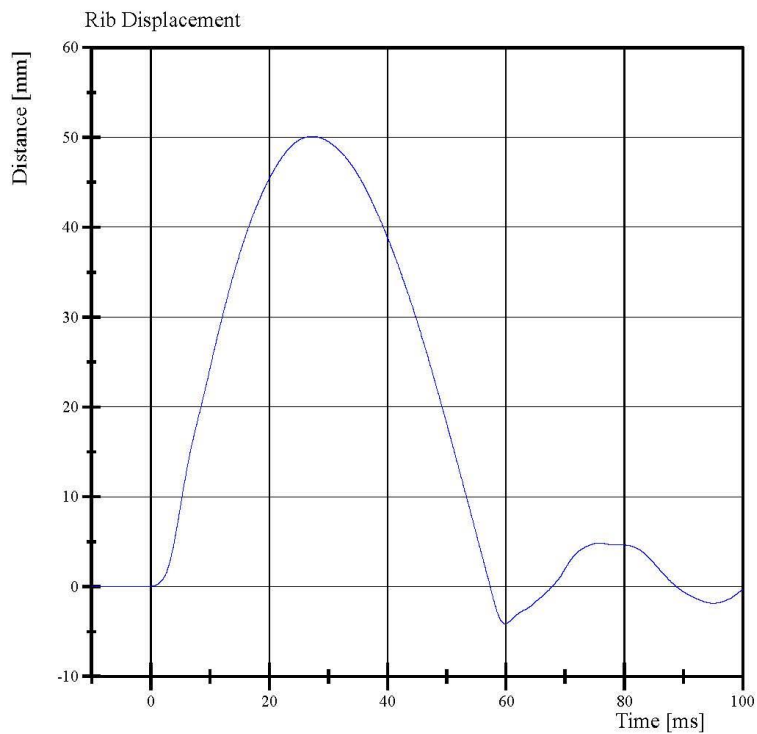
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.22.2022 09:22:48 519



Transportation Research Center Inc.

4.0 m/s Middle Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 50.1 mm at 27.3 ms
Min: -4.1 mm at 59.8 ms

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

09.22.2022 09:23:25 519



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	58 %	Yes
3.0 m/s Test Rib Displacement (454 mm to 464 mm)	36 - 40 mm	37.9 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 462 mm

Rib Foam S/N: EK6971

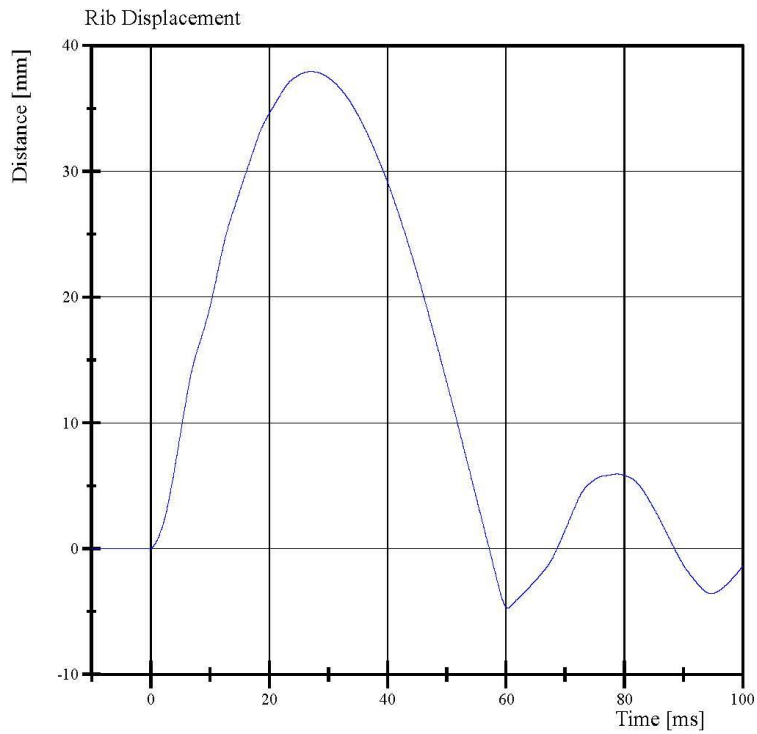
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.22.2022 09:47:17 638



Transportation Research Center Inc.

3.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 37.9 mm at 27.0 ms
Min: -4.7 mm at 60.3 ms

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

09.22.2022 09:47:56 638



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	57 %	Yes
4.0 m/s Test Rib Displacement (807 mm to 823 mm)	46 - 51 mm	46.8 mm	Yes

Test meets specifications.

Condition: Used

Comments:

Drop Height: 816 mm

Rib Foam S/N: EK6971

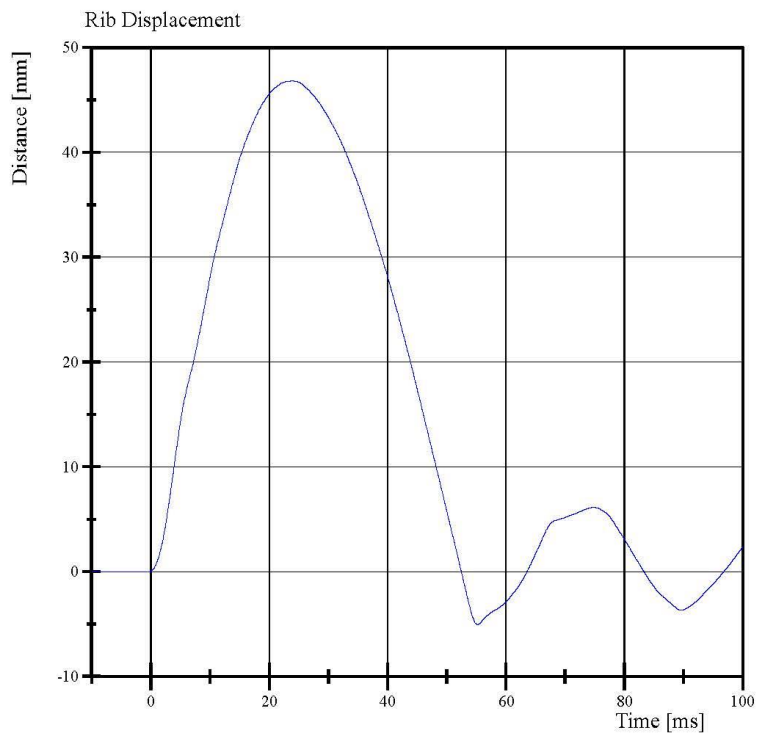
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.22.2022 09:42:03 543



Transportation Research Center Inc.

4.0 m/s Lower Full Rib Module
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 46.8 mm at 23.9 ms
Min: -5.1 mm at 55.2 ms

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

09.22.2022 09:42:51 543



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 82-3
Test Date: 9/26/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	50 %	Yes
Impactor Velocity	5.4 - 5.60 m/s	5.464 m/s	Yes
Peak Impactor Force after 6 ms	(-5,100) - (-6,200) N	-5,352.3 N	Yes
Upper Rib Displacement	34 - 41 mm	38.5 mm	Yes
Center Rib Displacement	37 - 45 mm	41.0 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

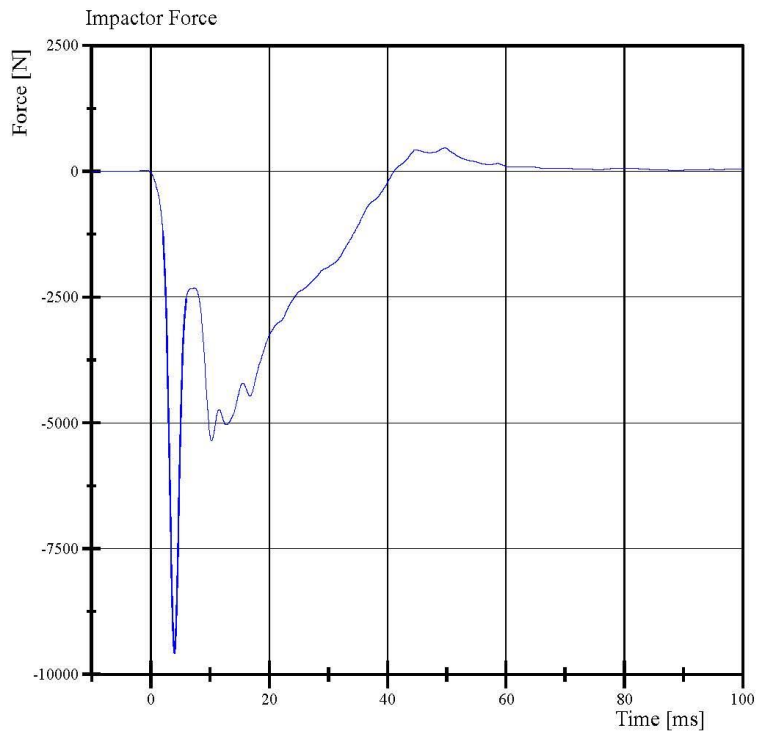
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.26.2022 07:49:19 578



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 82-3
Test Date: 9/26/2022



Filter Class: CFC_180
Max: 465.5 N at 49.7 ms
Min: -9,576.8 N at 4.0 ms

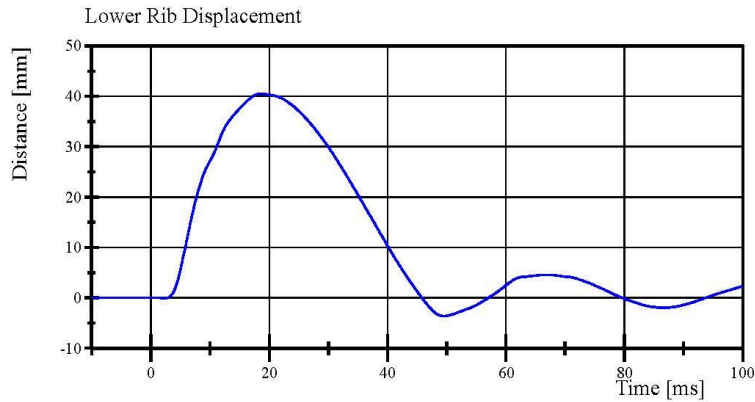
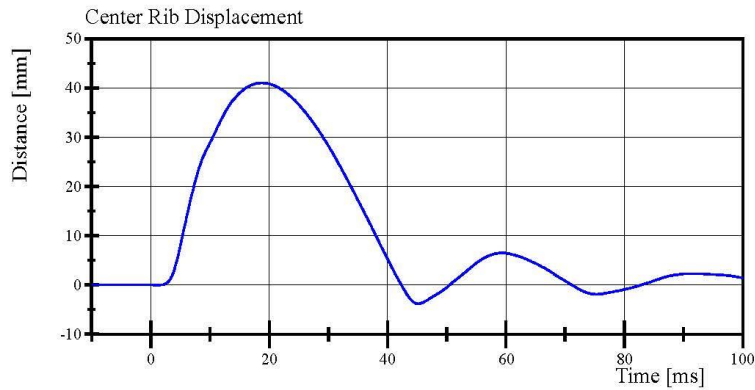
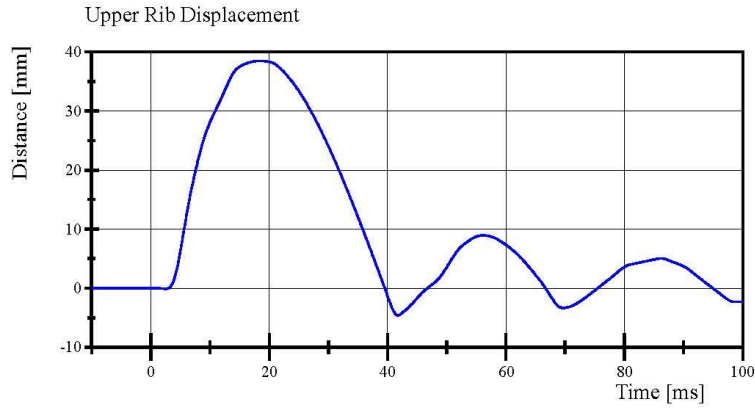
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.26.2022 07:50:30 578



Transportation Research Center Inc.

Left Lower Thorax
ES-2re Serial No. F030 Certification No. 82-3
Test Date: 9/26/2022



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

09.26.2022 07:50:30 578



Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 82-5
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	50 %	Yes
Pendulum Integrated Velocity Change within Corridor	Yes	Yes	Yes
Pendulum Velocity	(-5.95) - (-6.15) m/s	-6.117 m/s	Yes
Maximum Headform Flexion			
Peak	(-45) - (-55) deg	-46.3 deg	Yes
Time of Peak	39 - 53 ms	41.9 ms	Yes
Headform Flexion Decay			
- Peak to Zero	37 - 57 ms	34.4 ms	No

Test does not meet specifications.

Condition: Used

Comments:

Lumbar S/N: 150365

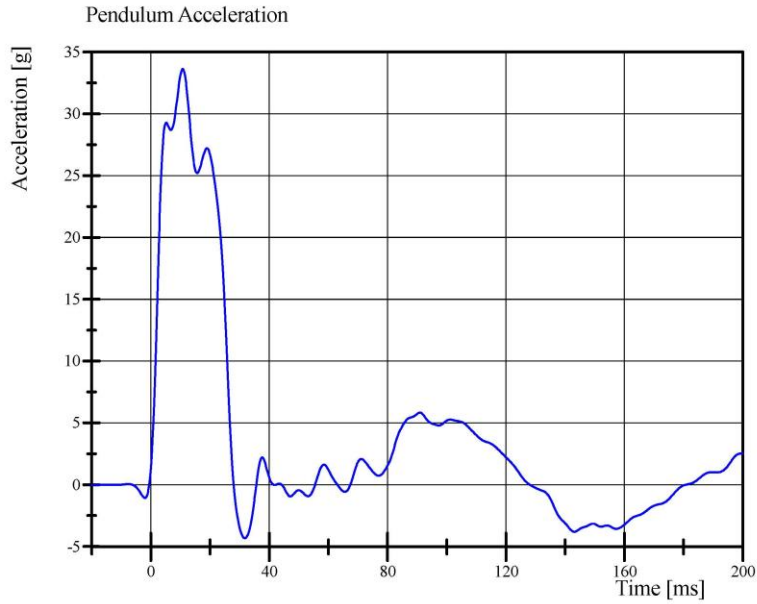
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.22.2022 13:54:20 669

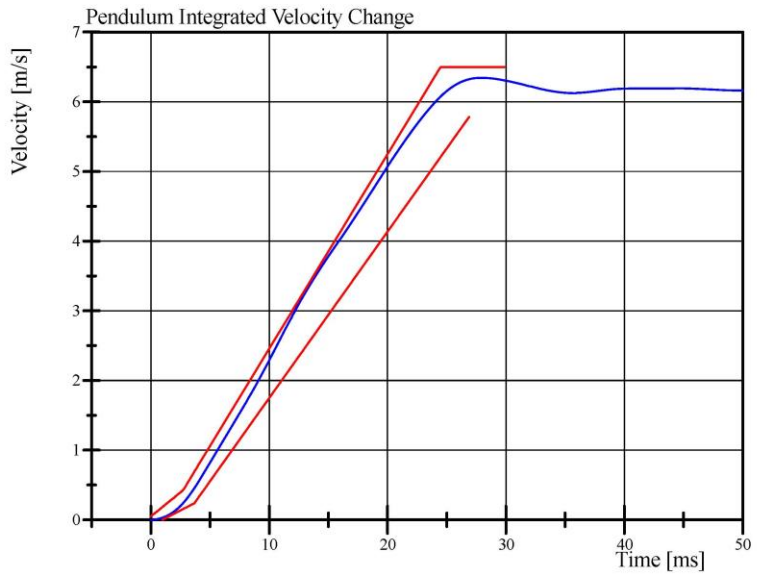


Transportation Research Center Inc.

Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 82-5
Test Date: 9/22/2022



Filter Class: CFC_60
Max: 33.6 g at 10.8 ms
Min: -4.3 g at 31.8 ms



Filter Class: CFC_60
Max: 6.3 m/s at 28.0 ms
Min: 0.0 m/s at 0.0 ms

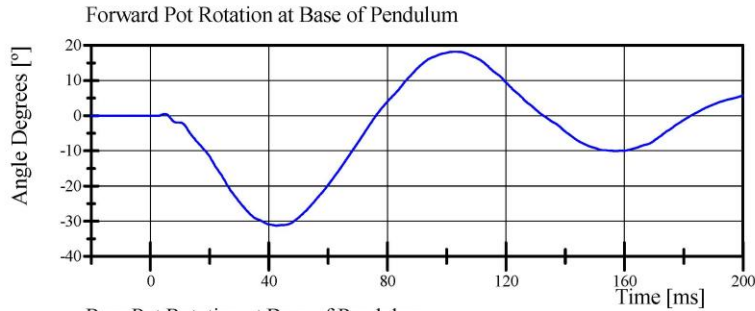
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.22.2022 13:54:51 669

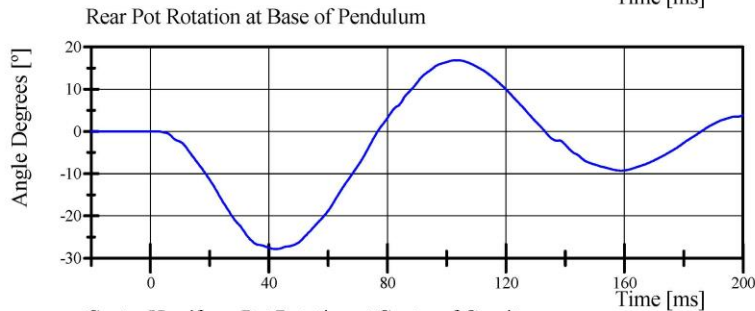


Transportation Research Center Inc.

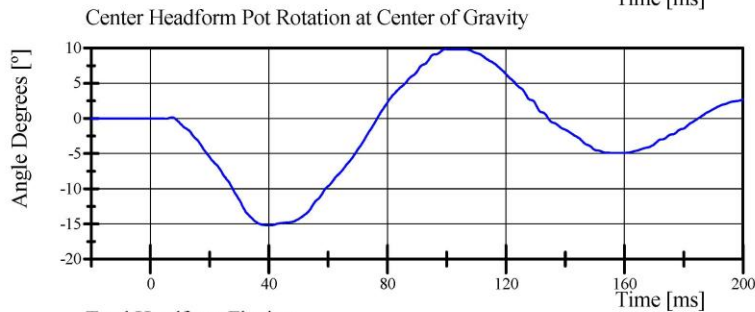
Left Lateral Lumbar
ES-2re Serial No. F030 Certification No. 82-5
Test Date: 9/22/2022



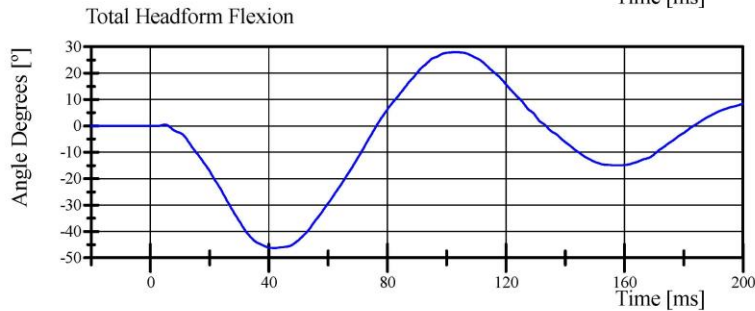
Filter Class: CFC_180
Max: 18.2 ° at 102.9 ms
Min: -31.2 ° at 42.5 ms



Filter Class: CFC_180
Max: 16.9 ° at 103.4 ms
Min: -27.8 ° at 42.2 ms



Filter Class: CFC_180
Max: 9.8 ° at 99.6 ms
Min: -15.2 ° at 40.1 ms



Filter Class: CFC_180
Max: 27.9 ° at 103.0 ms
Min: -46.3 ° at 41.9 ms

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

09.22.2022 13:54:51 669



Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/26/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Test Probe Velocity	3.9 - 4.1 m/s	4.06 m/s	Yes
Test Probe Force			
Peak	4,000 - 4,800 N	4,393.4 N	Yes
Time of Peak	10.6 - 13.0 ms	12.32 ms	Yes
Total Abdominal Force			
Peak	2,200 - 2,700 N	2,340.3 N	Yes
Time of Peak	10.0 - 12.3 ms	11.92 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Abdomen S/N: 1066

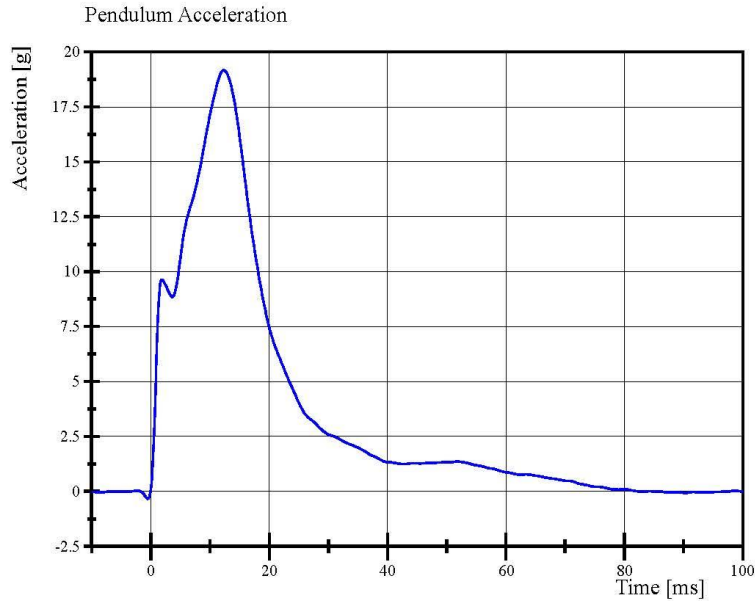
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.26.2022 08:27:24 690

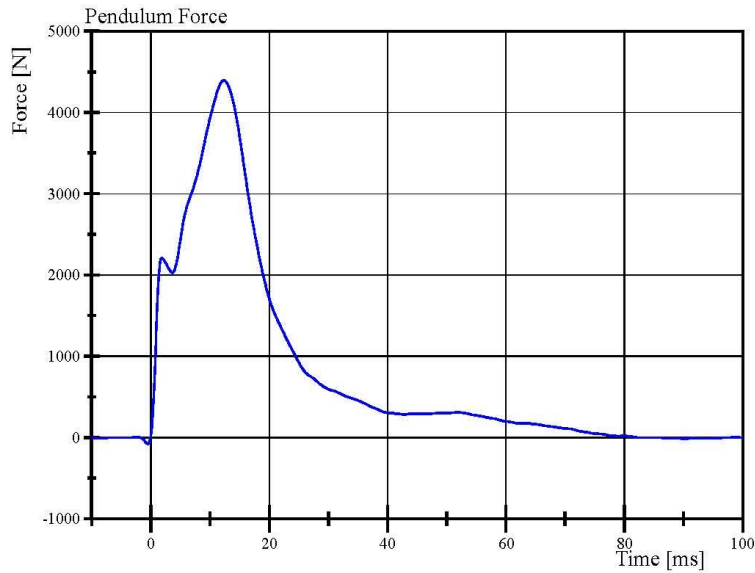


Transportation Research Center Inc.

Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/26/2022



Filter Class: CFC_180
Max: 19.2 g at 12.3 ms
Min: -0.3 g at -0.5 ms



Filter Class: CFC_180
Max: 4,393.4 N at 12.3 ms
Min: -77.1 N at -0.5 ms

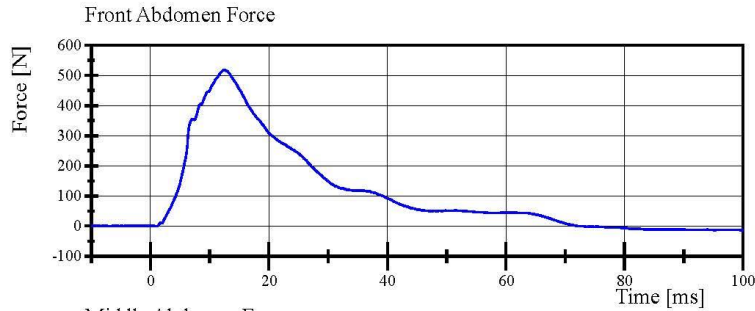
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.26.2022 08:28:49 690

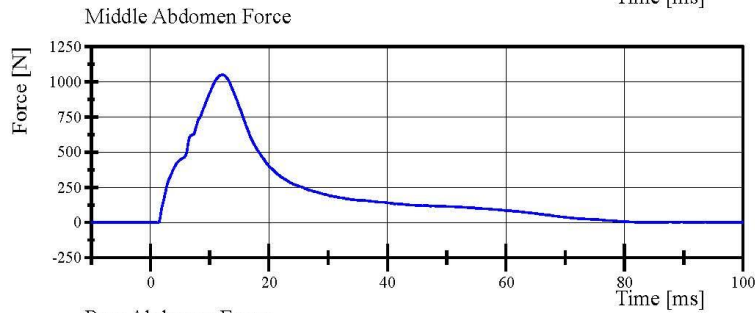


Transportation Research Center Inc.

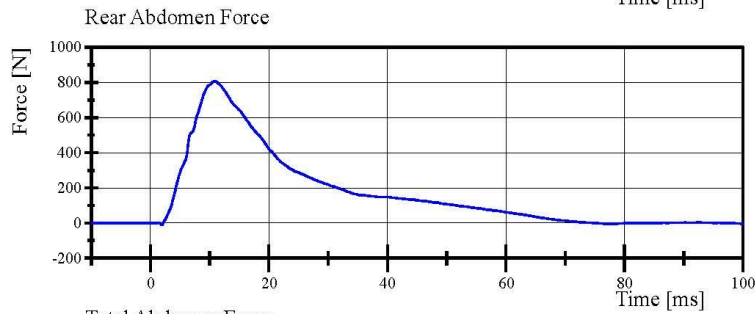
Left Lateral Abdomen
ES-2re Serial No. F030 Certification No. 82-1
Test Date: 9/26/2022



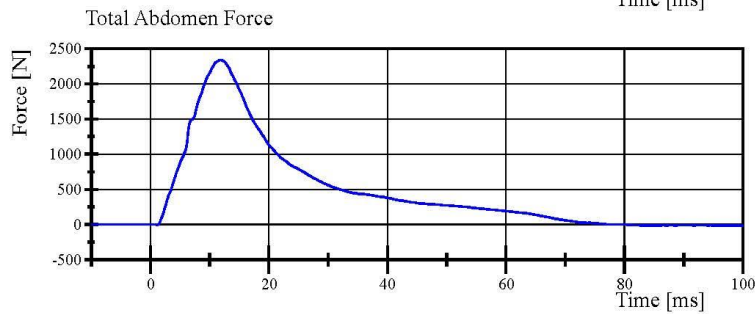
Filter Class: CFC_600
Max: 517.5 N at 12.4 ms
Min: -13.5 N at 99.8 ms



Filter Class: CFC_600
Max: 1,050.8 N at 12.2 ms
Min: -2.1 N at 1.2 ms



Filter Class: CFC_600
Max: 808.0 N at 10.9 ms
Min: -11.3 N at 1.9 ms



Filter Class: CFC_600
Max: 2,340.3 N at 11.9 ms
Min: -16.8 N at 99.9 ms

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

09.26.2022 08:28:50 690



Transportation Research Center Inc.

Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 82-2
Test Date: 9/26/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	49 %	Yes
Test Probe Velocity	4.2 - 4.4 m/s	4.31 m/s	Yes
Test Probe Force			
Peak	4,700 - 5,400 N	5,081.3 N	Yes
Time of Peak	11.8 - 16.1 ms	13.52 ms	Yes
Pubic Symphysis Force			
Peak	(-1,230) - (-1,590) N	-1,287.1 N	Yes
Time of Peak	12.2 - 17.0 ms	13.68 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: N/A

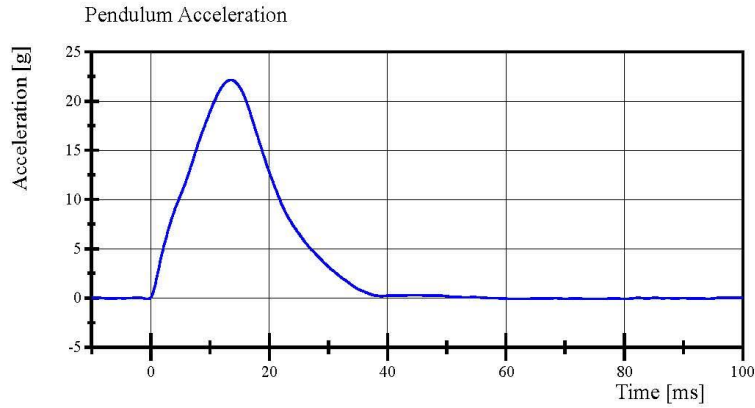
Specification Source: CFR49 Part 572 Subpart U
with Polarity in accordance with J211

09.26.2022 09:10:43 596

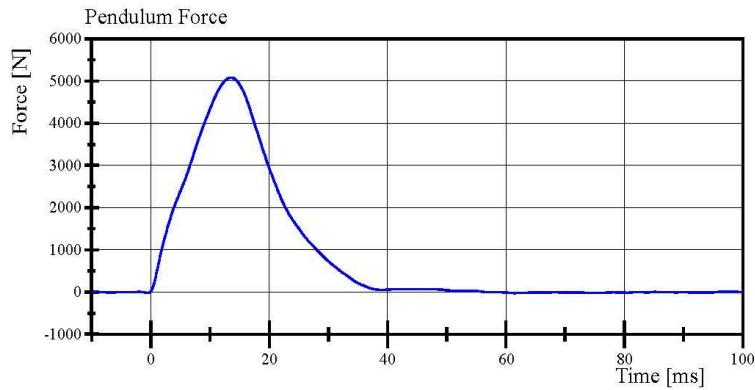


Transportation Research Center Inc.

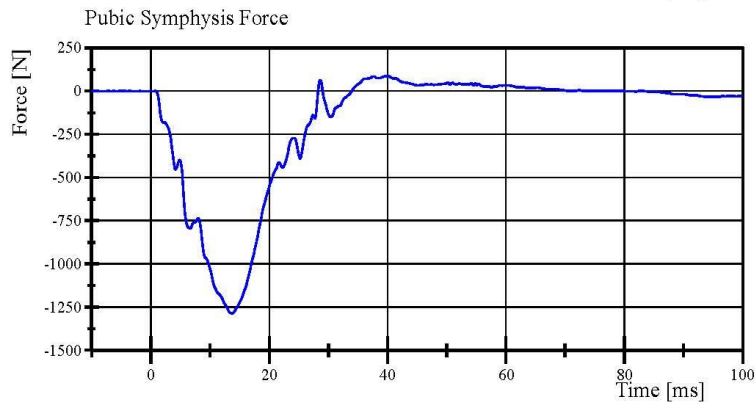
Left Lateral Pelvis
ES-2re Serial No. F030 Certification No. 82-2
Test Date: 9/26/2022



Filter Class: CFC_180
Max: 22.2 g at 13.5 ms
Min: -0.1 g at 61.4 ms



Filter Class: CFC_180
Max: 5,081.3 N at 13.5 ms
Min: -20.7 N at 61.4 ms



Filter Class: CFC_600
Max: 87.8 N at 39.9 ms
Min: -1,287.1 N at 13.7 ms

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

09.26.2022 09:11:31 596



Pre-Test Calibration Sheets
Driver S/N DQ5070

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. DQ0570 Calibration No. 14

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



Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. DQ0570 Certification No. 14-1

Test Date: 9/1/2022

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	66 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	134.7 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	1.7 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	< 15 %	1.53 %	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

09.01.2022 13:00:30 235

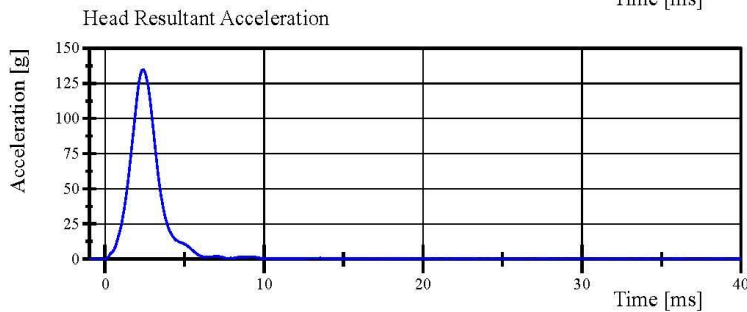
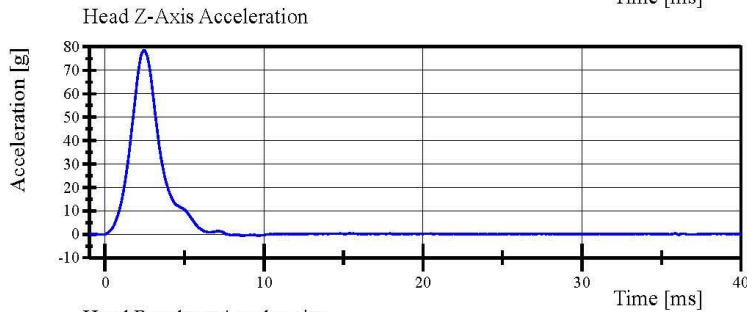
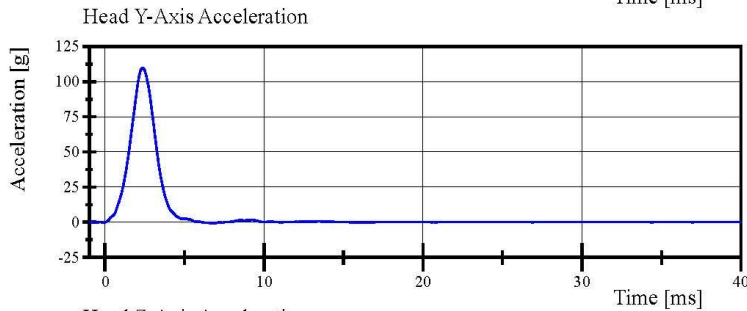
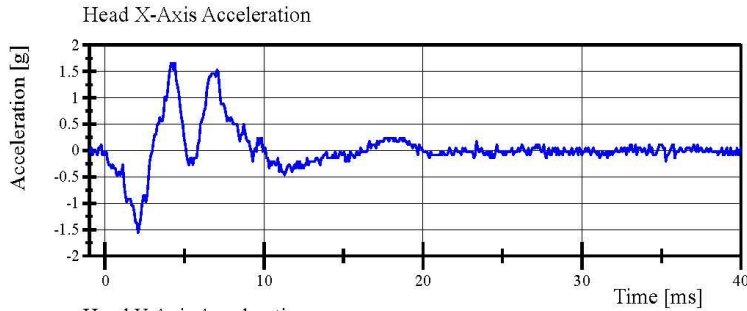


Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. DQ0570 Certification No. 14-1

Test Date: 9/1/2022



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

09.01.2022 13:04:16 235



Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	67 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.608 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.550 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.771 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	5.038 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.855 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.859 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-73.7 deg	Yes
Time of Peak	50 - 70 ms	59.0 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	41.6 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	102 - 126 ms	111.8 ms	Yes

Test meets specifications.

Condition: Used

Comments:

Neck S/N: 717

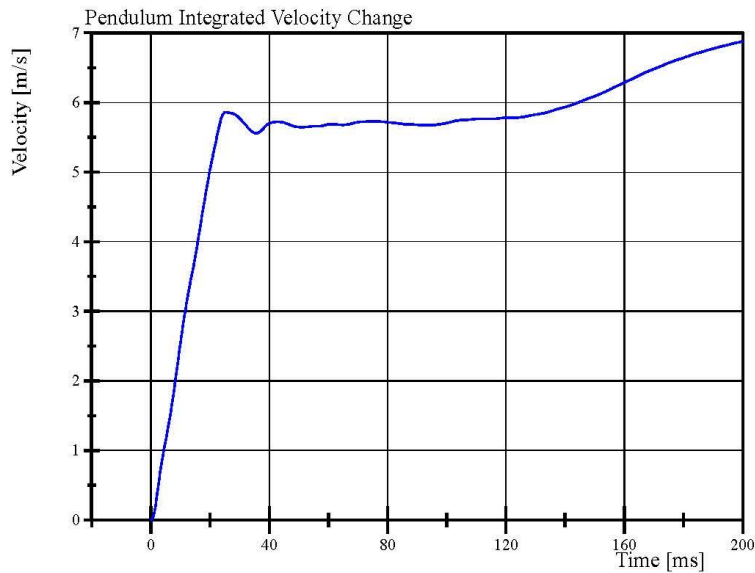
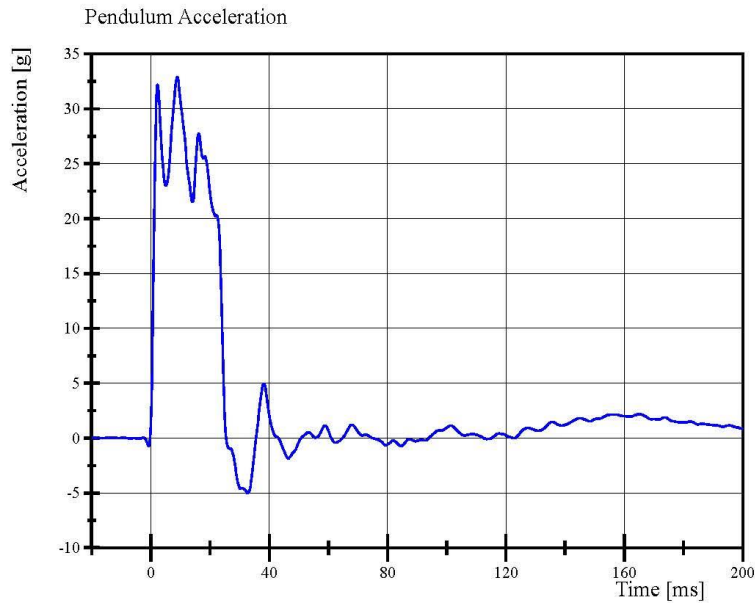
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 13:25:23 747



Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



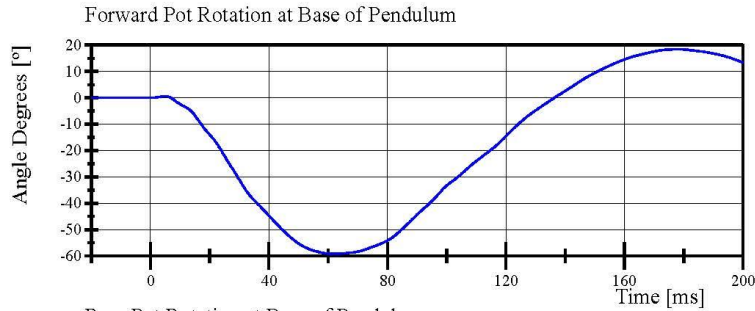
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 13:26:14 747

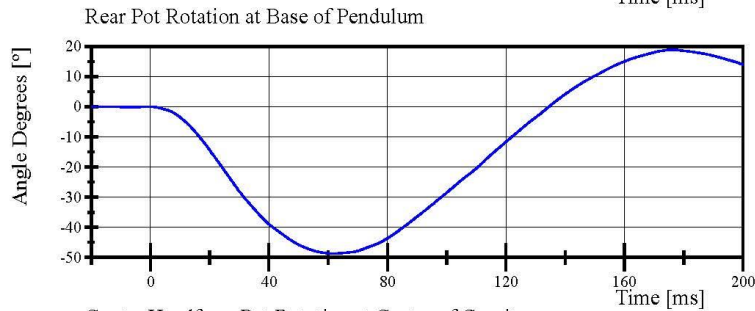


Transportation Research Center Inc.

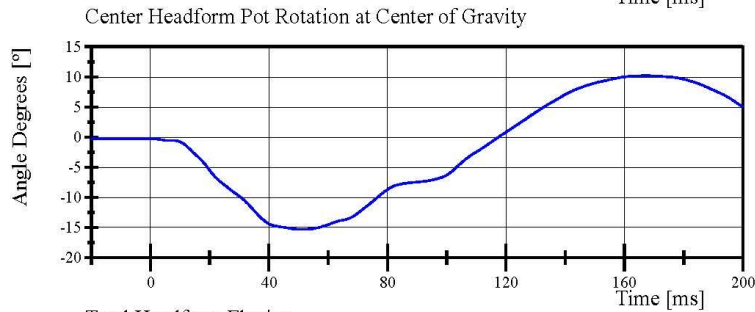
Left Lateral Neck
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



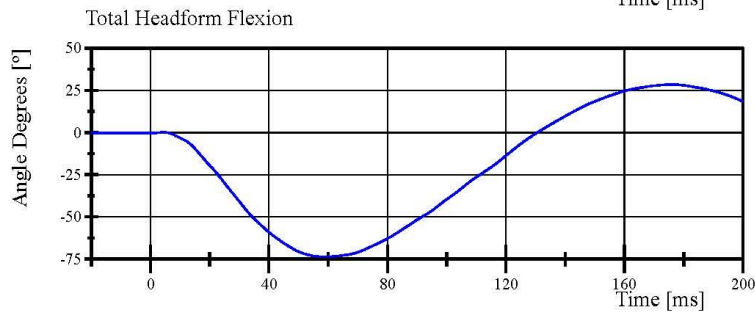
Filter Class: CFC_60
Max: 18.5 ° at 178.3 ms
Min: -59.2 ° at 61.8 ms



Filter Class: CFC_60
Max: 18.9 ° at 176.2 ms
Min: -48.8 ° at 61.8 ms



Filter Class: CFC_60
Max: 10.2 ° at 167.1 ms
Min: -15.3 ° at 50.8 ms



Filter Class: CFC_60
Max: 28.4 ° at 176.1 ms
Min: -73.7 ° at 59.0 ms

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

09.01.2022 13:26:14 747

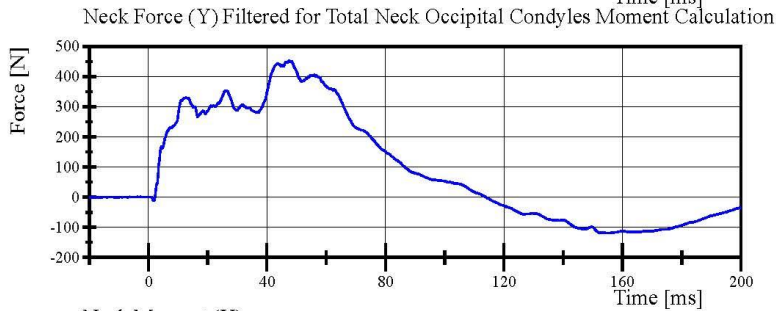


Transportation Research Center Inc.

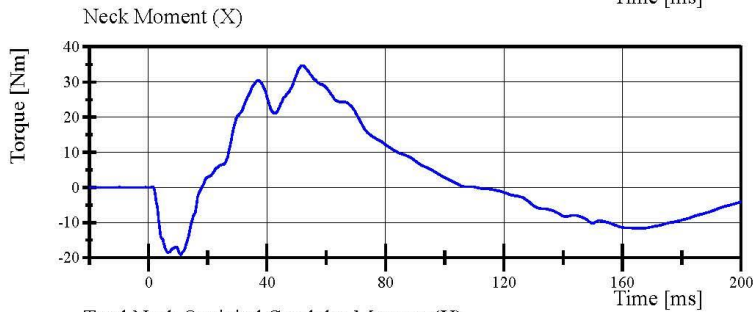
Left Lateral Neck
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



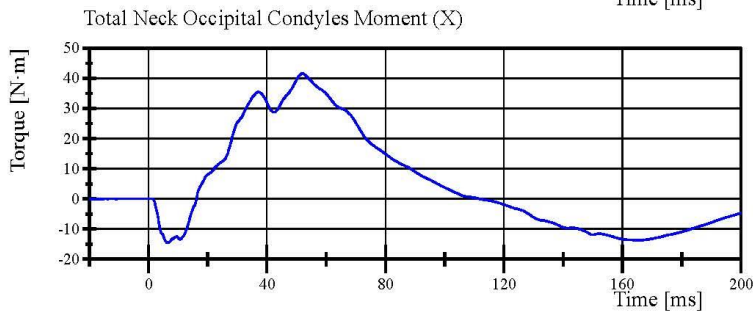
Filter Class: CFC_1000
Max: 455.5 N at 47.4 ms
Min: -120.1 N at 155.7 ms



Filter Class: CFC_600
Max: 452.4 N at 47.4 ms
Min: -119.6 N at 155.6 ms



Filter Class: CFC_600
Max: 34.7 Nm at 51.8 ms
Min: -19.1 Nm at 10.9 ms



Filter Class: Without_(Constar
Max: 41.6 N·m at 52.2 ms
Min: -14.6 N·m at 6.5 ms

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

09.01.2022 13:26:14 747



Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.34 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.2 g	Yes
Shoulder Displacement	28 - 37 mm	32.4 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	19.4 g	Yes

Test meets specifications.

Condition: Used

Comments:

Left Arm S/N: DP8451

Shoulder Rib S/N: DO9814

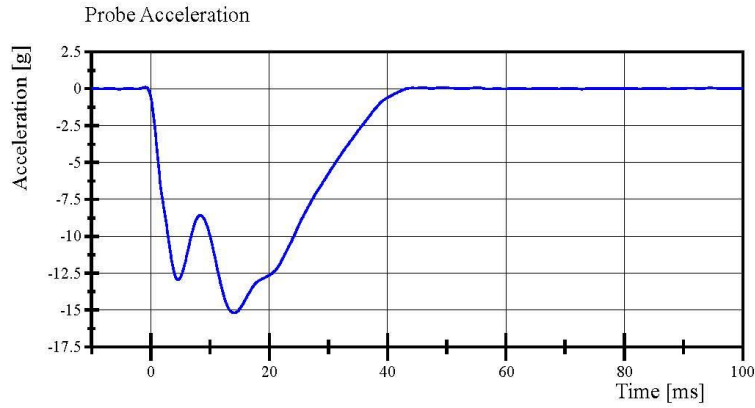
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 10:43:27 825

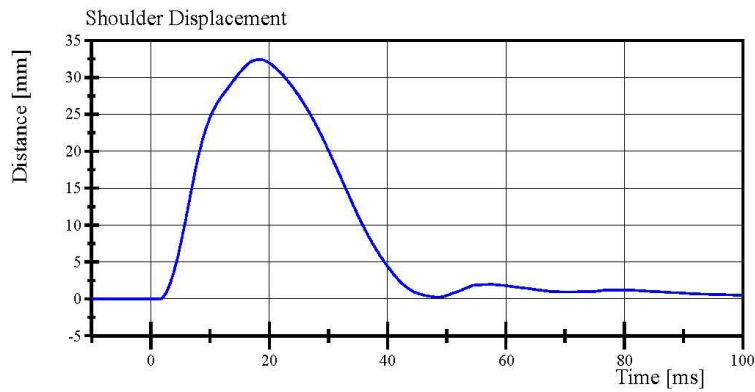


Transportation Research Center Inc.

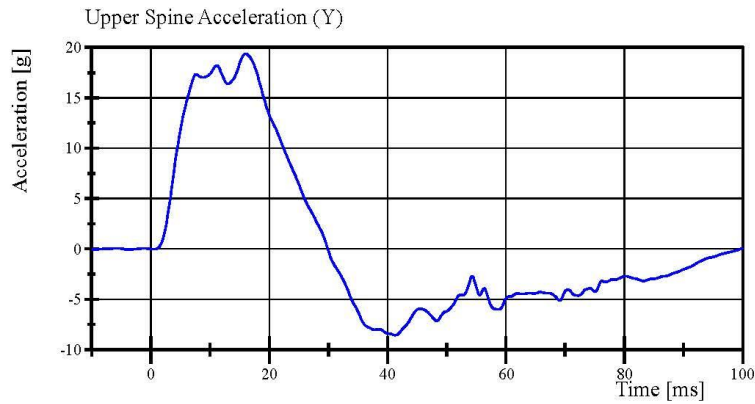
Left Lateral Shoulder
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



Filter Class: CFC_180
Max: 0.1 g at -1.0 ms
Min: -15.2 g at 14.1 ms



Filter Class: CFC_600
Max: 32.4 mm at 18.2 ms
Min: -0.0 mm at 1.4 ms



Filter Class: CFC_180
Max: 19.4 g at 16.0 ms
Min: -8.6 g at 41.3 ms

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

09.01.2022 10:44:43 825



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.696 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-33.3 g	Yes
Shoulder Displacement	31 - 40 mm	35.8 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	28.7 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	32.3 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	34.8 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	35.0 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	34.1 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

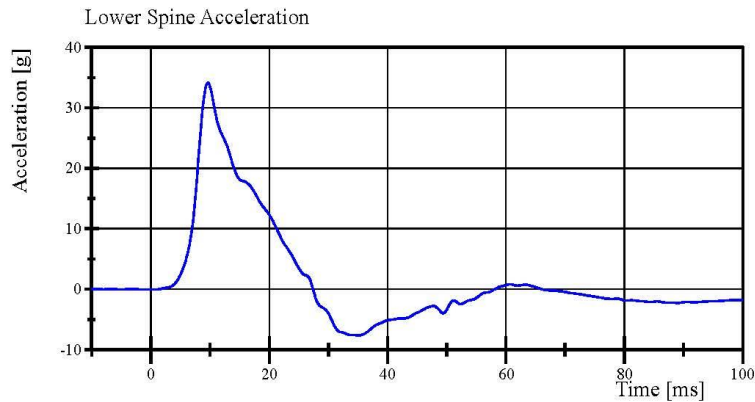
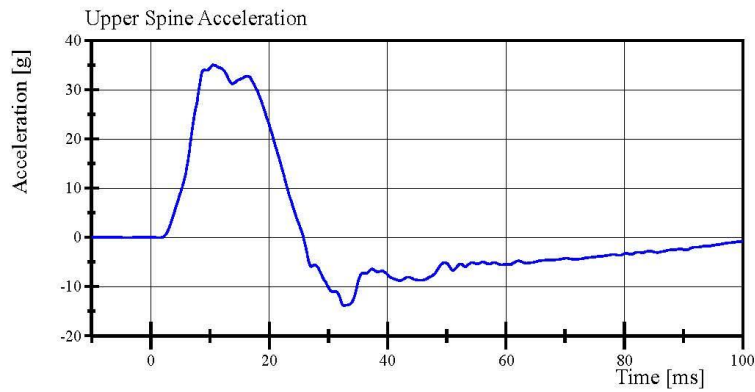
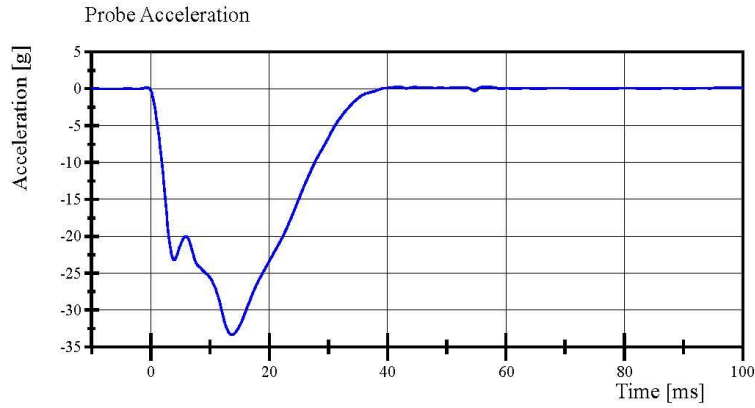
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 11:43:32 593



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



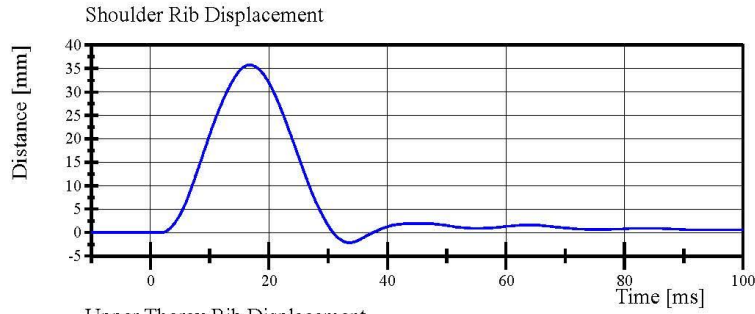
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 11:44:40 593

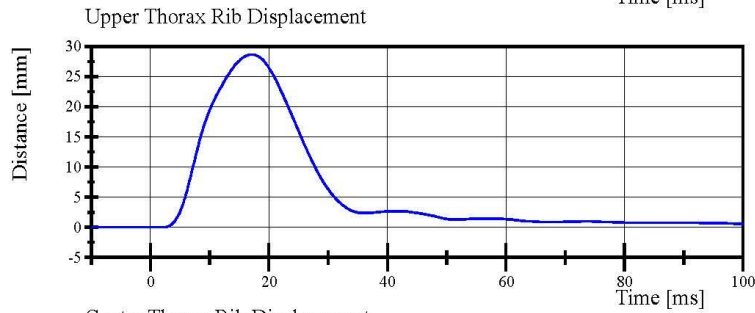


Transportation Research Center Inc.

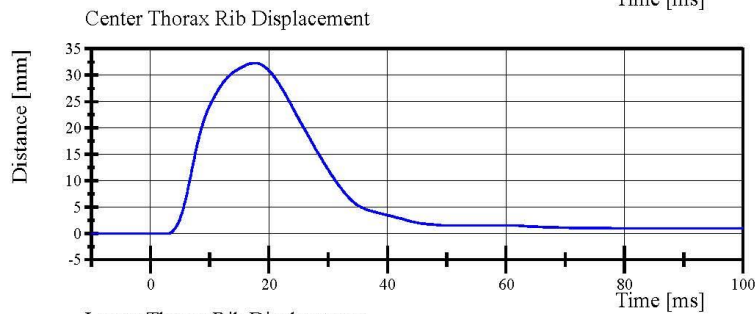
Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



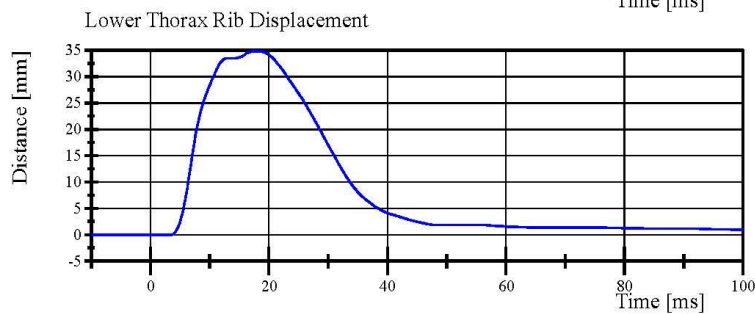
Filter Class: CFC_600
Max: 35.8 mm at 16.8 ms
Min: -2.2 mm at 33.6 ms



Filter Class: CFC_600
Max: 28.7 mm at 17.1 ms
Min: -0.0 mm at -7.2 ms



Filter Class: CFC_600
Max: 32.3 mm at 17.8 ms
Min: -0.0 mm at 3.0 ms



Filter Class: CFC_600
Max: 34.8 mm at 17.5 ms
Min: -0.0 mm at 3.5 ms

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

09.01.2022 11:44:40 593



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	69 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.324 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-15.9 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	38.0 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	42.7 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	39.5 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	14.5 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	9.7 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

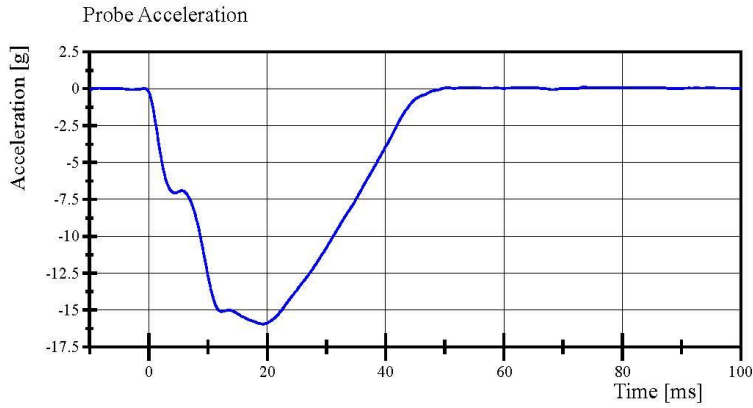
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 11:12:37 813

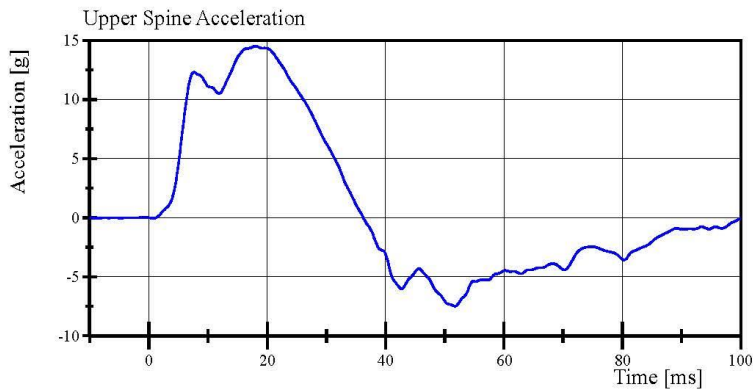


Transportation Research Center Inc.

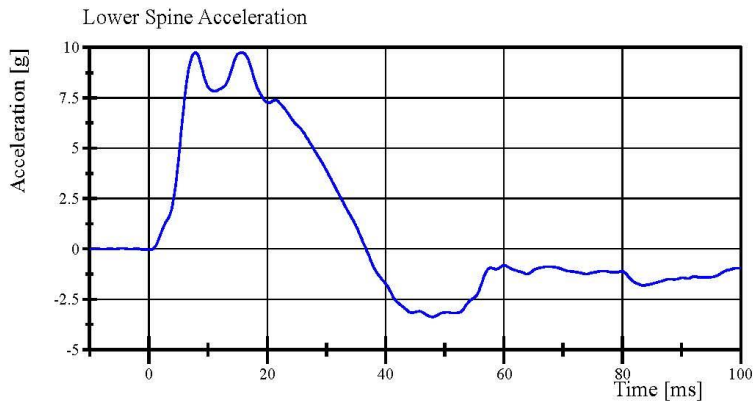
Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



Filter Class: CFC_180
Max: 0.1 g at 73.5 ms
Min: -15.9 g at 19.3 ms



Filter Class: CFC_180
Max: 14.5 g at 18.0 ms
Min: -7.5 g at 51.8 ms



Filter Class: CFC_180
Max: 9.7 g at 15.7 ms
Min: -3.4 g at 47.9 ms

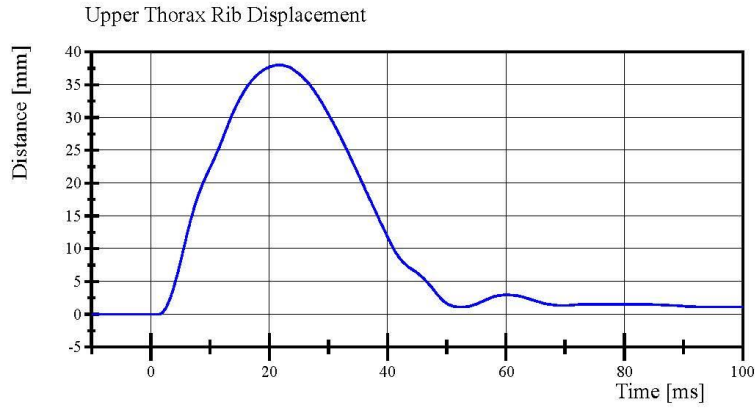
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 11:13:14 813

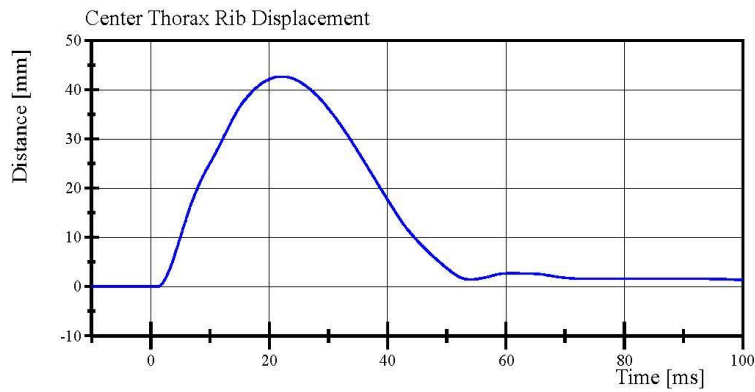


Transportation Research Center Inc.

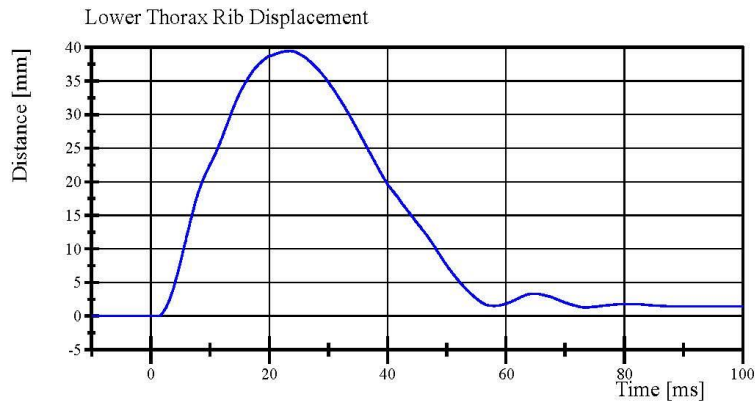
Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



Filter Class: CFC_600
Max: 38.0 mm at 21.8 ms
Min: -0.0 mm at 1.3 ms



Filter Class: CFC_600
Max: 42.7 mm at 22.0 ms
Min: -0.0 mm at 1.2 ms



Filter Class: CFC_600
Max: 39.5 mm at 23.5 ms
Min: -0.0 mm at 1.2 ms

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

09.01.2022 11:13:15 813



Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. DQ0570 Certification No. 14-1

Test Date: 9/1/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	68 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.27 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.3 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	39.6 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	40.8 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	10.40 g	Yes

Test meets specifications.

Condition: Used

Comments:

Upper Abdominal Rib S/N: 180-3368 DP5142

Lower Abdominal Rib S/N: 180-3368 DP5143

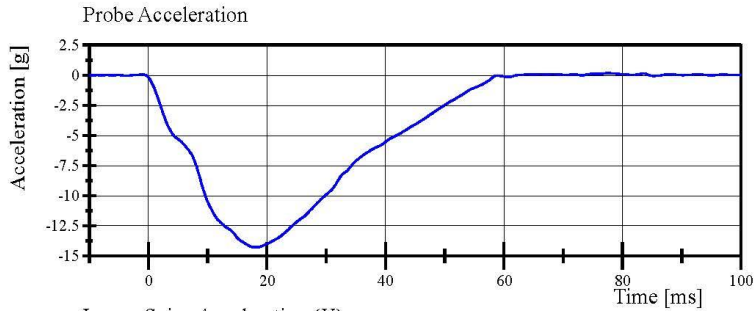
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 11:02:43 668

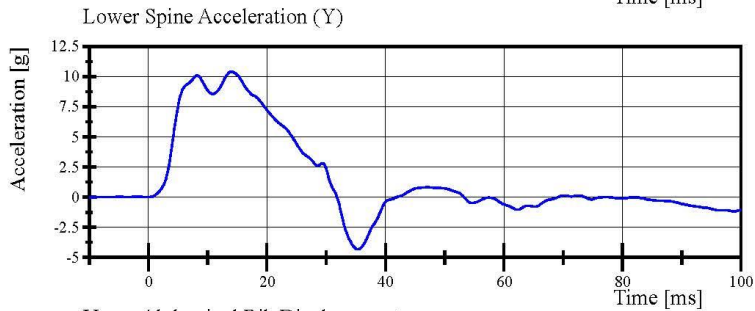


Transportation Research Center Inc.

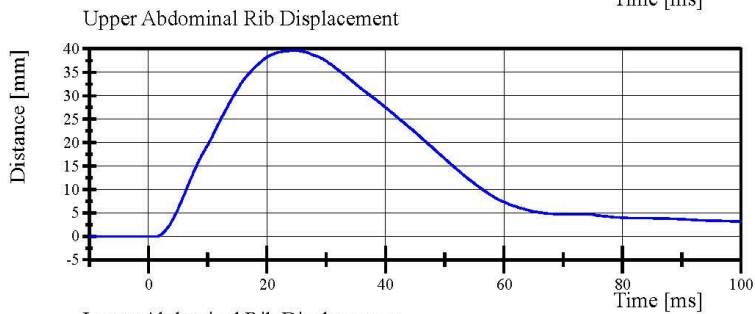
Left Lateral Abdomen
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



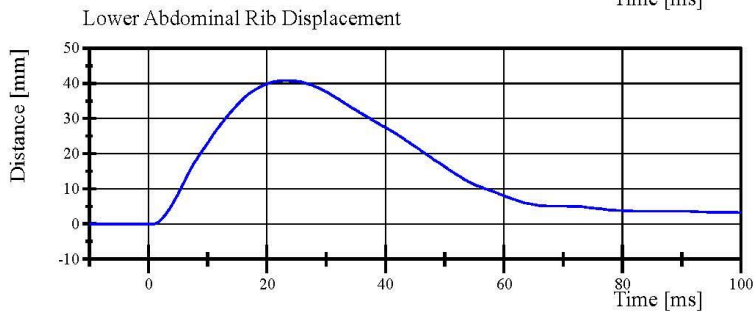
Filter Class: CFC_180
Max: 0.2 g at 77.5 ms
Min: -14.3 g at 18.1 ms



Filter Class: CFC_180
Max: 10.4 g at 14.0 ms
Min: -4.3 g at 35.3 ms



Filter Class: CFC_600
Max: 39.6 mm at 25.0 ms
Min: -0.0 mm at 1.4 ms



Filter Class: CFC_600
Max: 40.8 mm at 23.0 ms
Min: -0.0 mm at -3.0 ms

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

09.01.2022 11:03:21 668



Transportation Research Center Inc.

Left Lateral Pelvis
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022

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	6.62 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-46.43 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	41.8 g	Yes
Acetabulum Force	3,600 - 4,300 N	4,072.6 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: EN1613

Pelvis Plug Info:

Manufacturer: SACO

S/N: 13764

Cal Date: 20200325

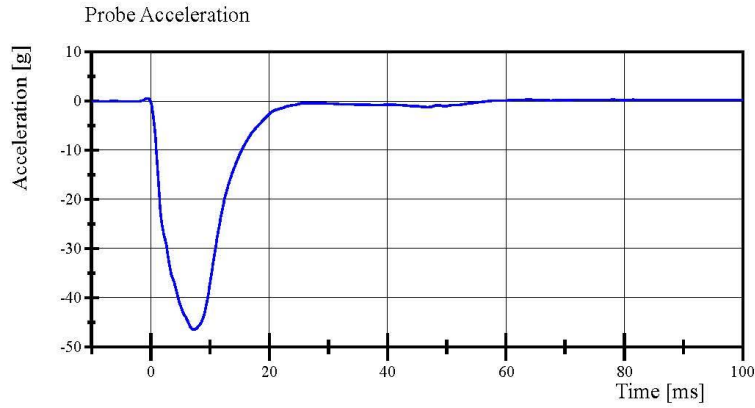
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.01.2022 12:39:30 443

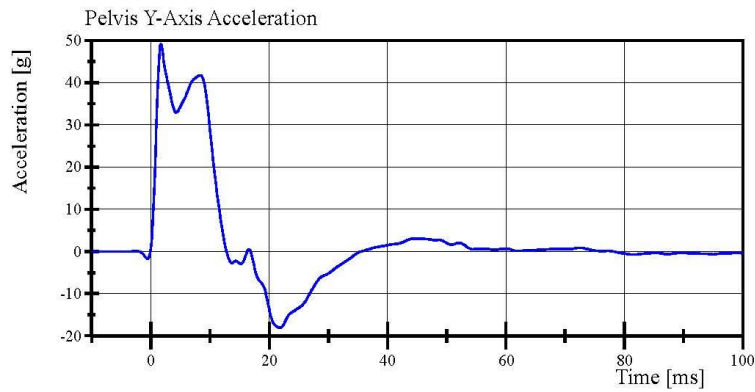


Transportation Research Center Inc.

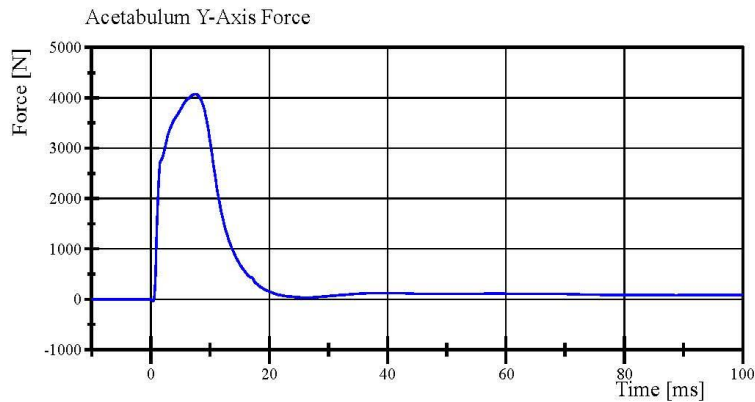
Left Lateral Pelvis
SID IIs Serial No. DQ0570 Certification No. 14-1
Test Date: 9/1/2022



Filter Class: CFC_180
Max: 0.6 g at -0.6 ms
Min: -46.4 g at 7.3 ms



Filter Class: CFC_180
Max: 49.2 g at 1.7 ms
Min: -18.1 g at 21.8 ms



Filter Class: CFC_600
Max: 4,072.6 N at 7.5 ms
Min: -34.7 N at 0.4 ms

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

09.01.2022 12:40:53 443



Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. DQ0570 Certification No. 14-2

Test Date: 9/1/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	67 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.39 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-37.3 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	29.0 g	Yes
Iliac Force	4,100 - 5,100 N	4,286.1 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: EN1613

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

09.02.2022 07:45:55 631

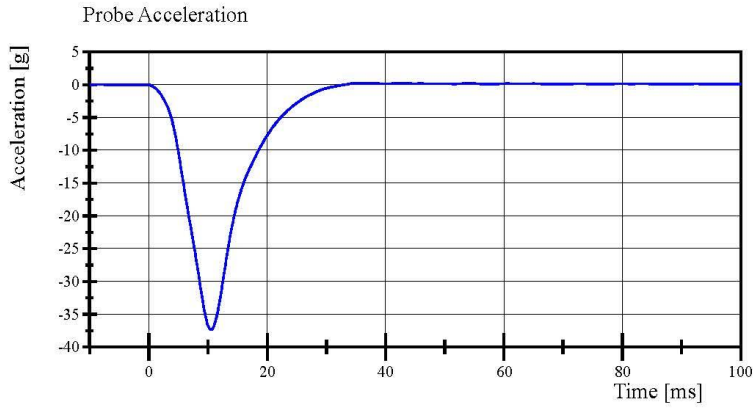


Transportation Research Center Inc.

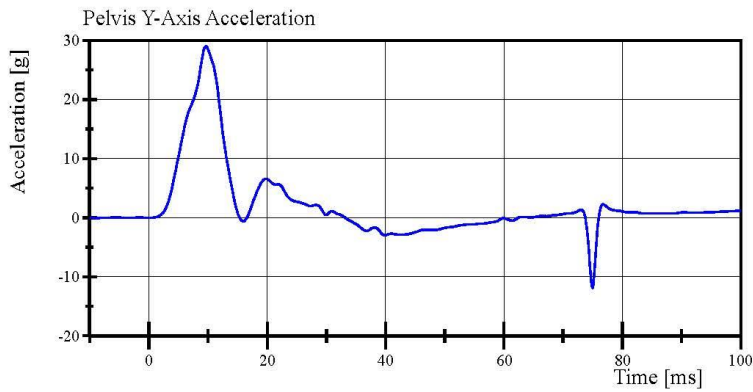
Left Lateral Iliac

SID IIs Serial No. DQ0570 Certification No. 14-2

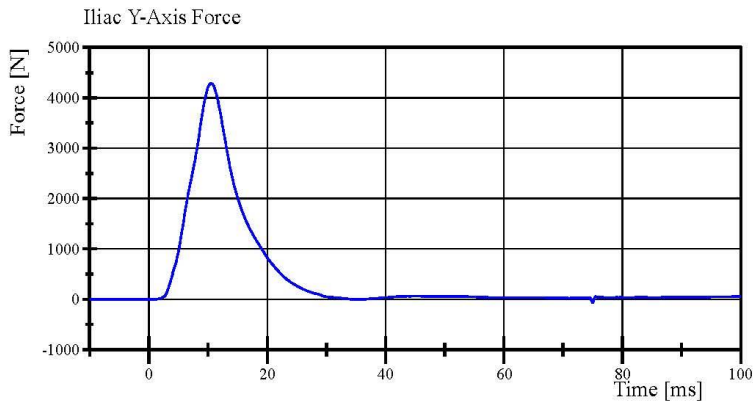
Test Date: 9/1/2022



Filter Class: CFC_180
Max: 0.2 g at 34.8 ms
Min: -37.3 g at 10.5 ms



Filter Class: CFC_180
Max: 29.0 g at 9.7 ms
Min: -11.9 g at 75.0 ms



Filter Class: CFC_600
Max: 4,286.1 N at 10.5 ms
Min: -66.2 N at 75.0 ms

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

09.02.2022 07:46:29 631



**Post-Test Calibration Sheets
Driver S/N DQ5070**

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. DQ0570 Calibration No. 15

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



Transportation Research Center Inc.

Left Lateral Head Drop
SID IIs Serial No. DQ0570 Certification No. 15-2
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	58 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	135.3 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-4.8 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	< 15 %	1.08 %	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

09.22.2022 13:26:47 235

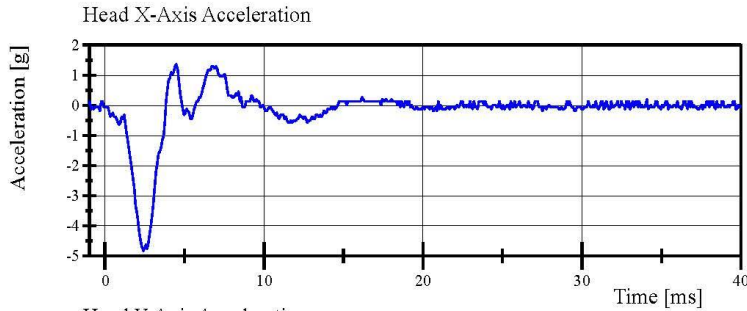


Transportation Research Center Inc.

Left Lateral Head Drop

SID IIs Serial No. DQ0570 Certification No. 15-2

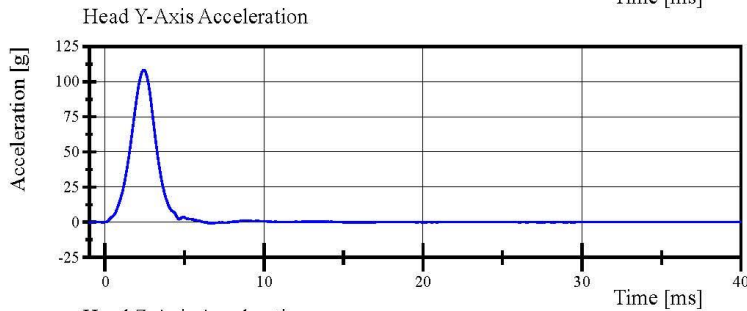
Test Date: 9/22/2022



Filter Class: CFC_1000

Max: 1.4 g at 4.5 ms

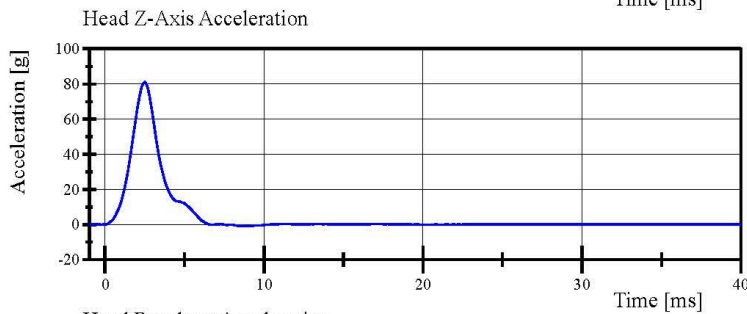
Min: -4.8 g at 2.4 ms



Filter Class: CFC_1000

Max: 108.3 g at 2.4 ms

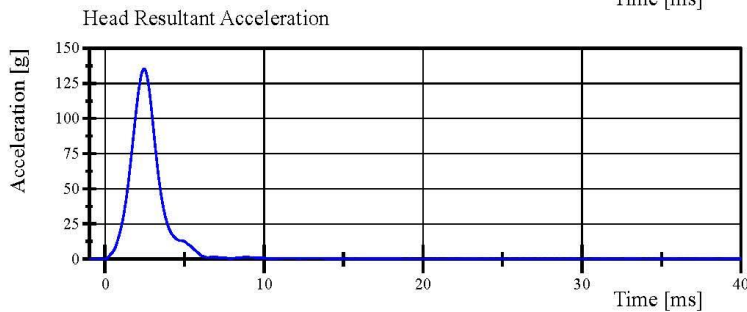
Min: -0.6 g at 6.6 ms



Filter Class: CFC_1000

Max: 81.1 g at 2.5 ms

Min: -0.9 g at 9.0 ms



Filter Class: CFC_1000

Max: 135.3 g at 2.5 ms

Min: 0.1 g at 19.3 ms

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

09.22.2022 13:27:55 235



Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 15-1

Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	50 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.622 m/s	Yes
Pendulum Integrated Velocity			
Change at 10 ms	2.20 - 2.80 m/s	2.670 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.922 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	5.283 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.822 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.831 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-74.0 deg	Yes
Time of Peak	50 - 70 ms	60.2 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	41.7 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	102 - 126 ms	111.1 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

09.22.2022 14:14:25 748

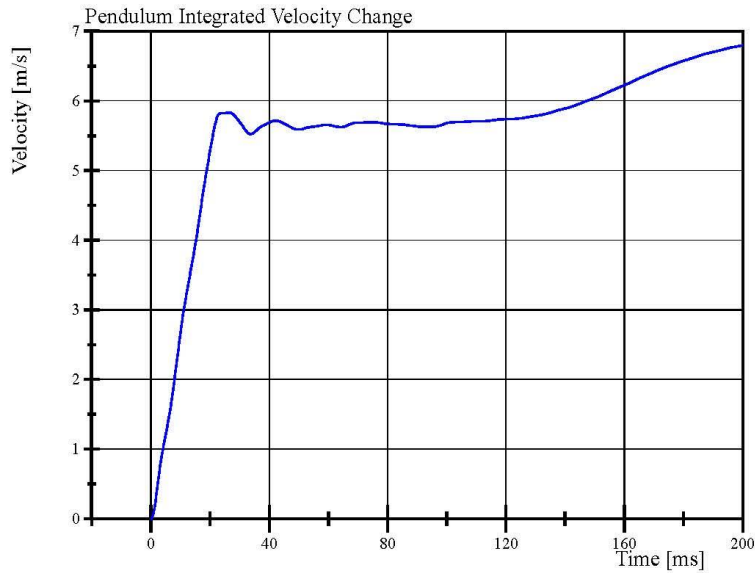
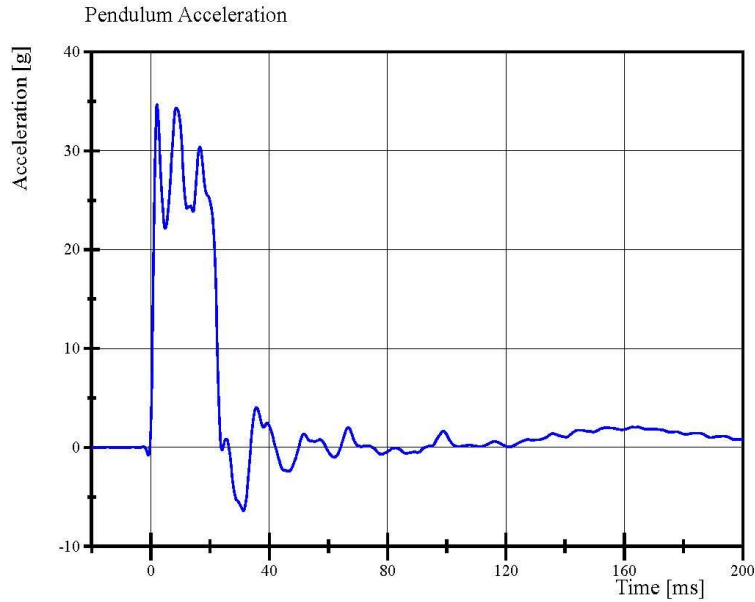


Transportation Research Center Inc.

Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 15-1

Test Date: 9/22/2022



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

09.22.2022 14:15:06 748

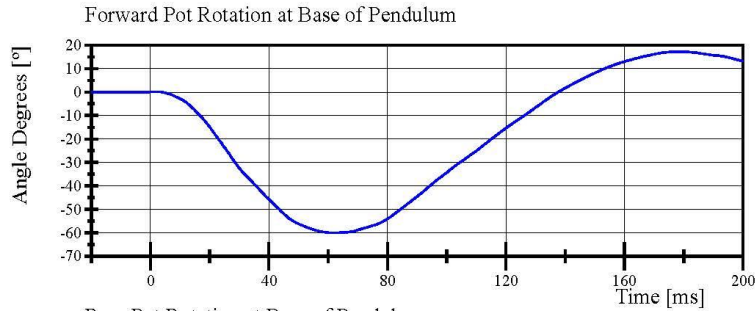


Transportation Research Center Inc.

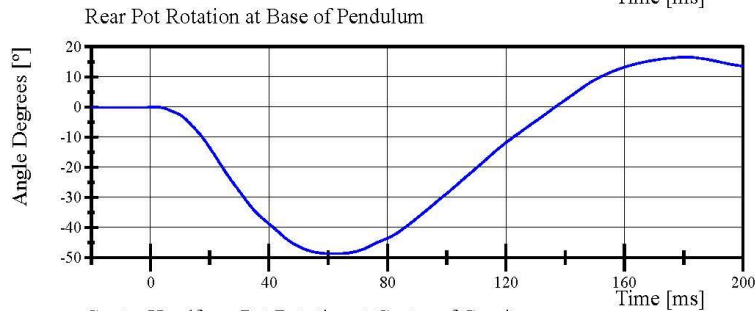
Left Lateral Neck

SID IIs Serial No. DQ0570 Certification No. 15-1

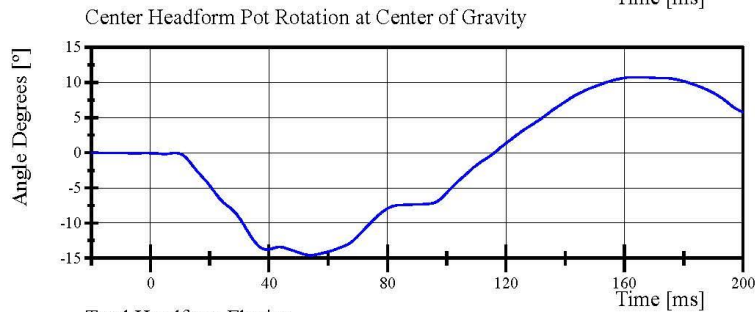
Test Date: 9/22/2022



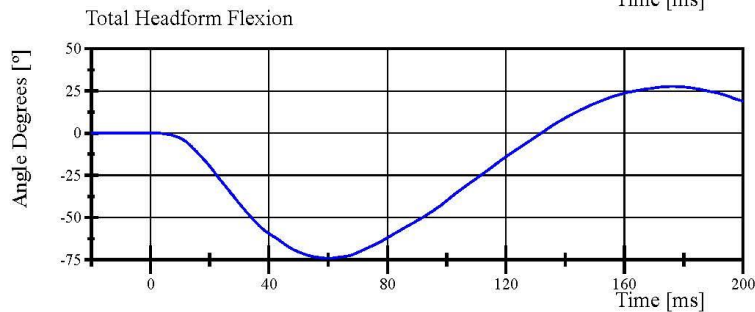
Filter Class: CFC_60
Max: 17.3 ° at 178.5 ms
Min: -60.0 ° at 61.8 ms



Filter Class: CFC_60
Max: 16.6 ° at 181.0 ms
Min: -48.7 ° at 60.7 ms



Filter Class: CFC_60
Max: 10.7 ° at 164.0 ms
Min: -14.6 ° at 54.1 ms



Filter Class: CFC_60
Max: 27.7 ° at 176.2 ms
Min: -74.0 ° at 60.2 ms

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

09.22.2022 14:15:07 748

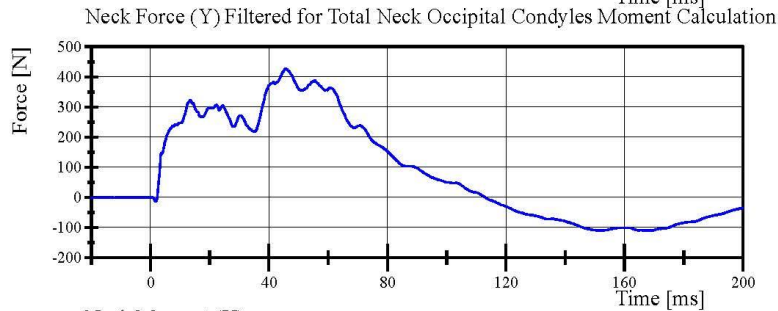


Transportation Research Center Inc.

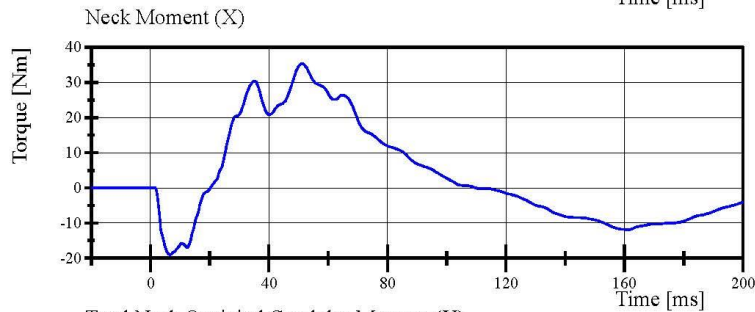
Left Lateral Neck
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022



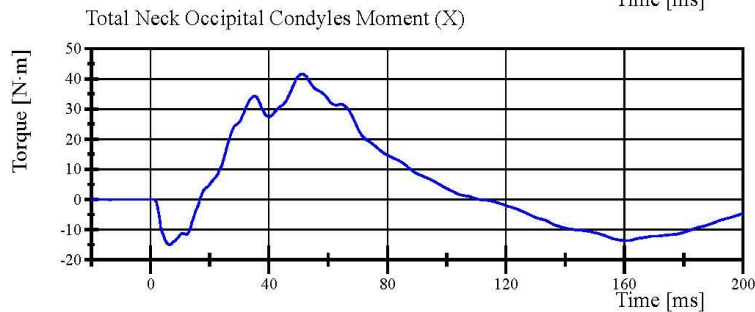
Filter Class: CFC_1000
Max: 428.9 N at 45.6 ms
Min: -110.3 N at 169.0 ms



Filter Class: CFC_600
Max: 427.7 N at 45.6 ms
Min: -110.2 N at 169.0 ms



Filter Class: CFC_600
Max: 35.4 Nm at 51.4 ms
Min: -19.0 Nm at 6.6 ms



Filter Class: Without_(Constar
Max: 41.7 N·m at 51.3 ms
Min: -15.0 N·m at 6.4 ms

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

09.22.2022 14:15:07 748



Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	62 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.34 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.1 g	Yes
Shoulder Displacement	28 - 37 mm	31.2 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	18.2 g	Yes

Test meets specifications.

Condition: Used

Comments:

Left Arm S/N: DP8451

Shoulder Rib S/N: DO9814

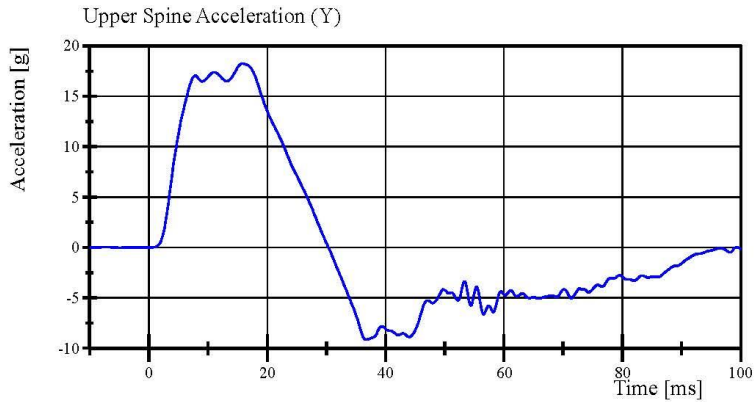
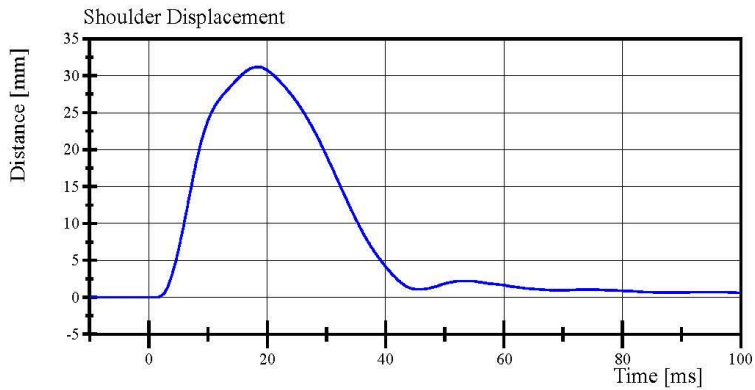
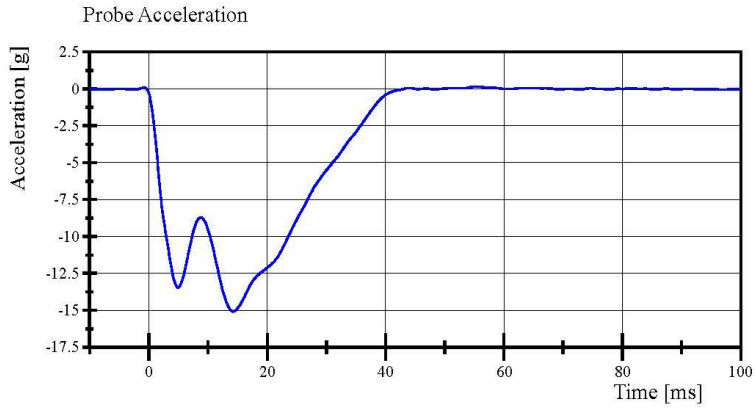
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.22.2022 08:23:44 831



Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022



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

09.22.2022 08:24:14 831



Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	60 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.695 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-33.2 g	Yes
Shoulder Displacement	31 - 40 mm	34.4 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	28.4 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	32.8 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	36.0 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	34.9 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	33.9 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

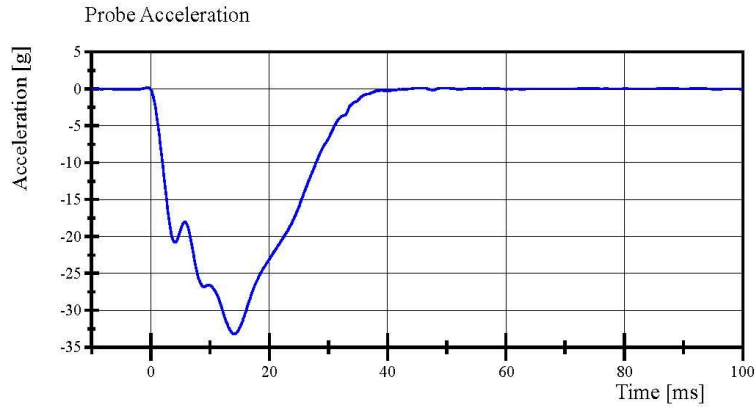
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.22.2022 10:10:44 623

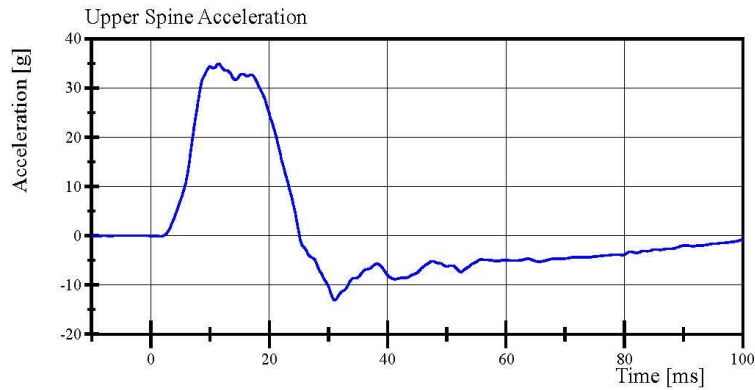


Transportation Research Center Inc.

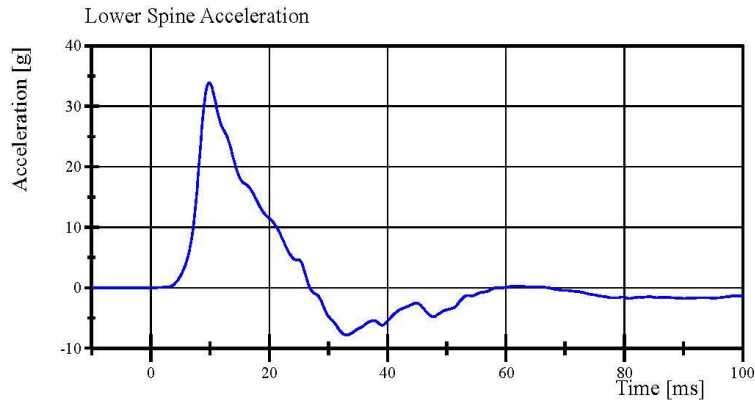
Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 0.2 g at -0.6 ms
Min: -33.2 g at 14.1 ms



Filter Class: CFC_180
Max: 34.9 g at 11.4 ms
Min: -13.1 g at 31.0 ms



Filter Class: CFC_180
Max: 33.9 g at 9.8 ms
Min: -7.8 g at 33.0 ms

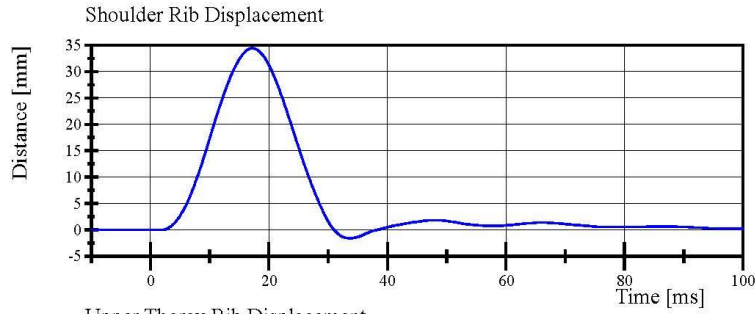
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.22.2022 10:12:05 623

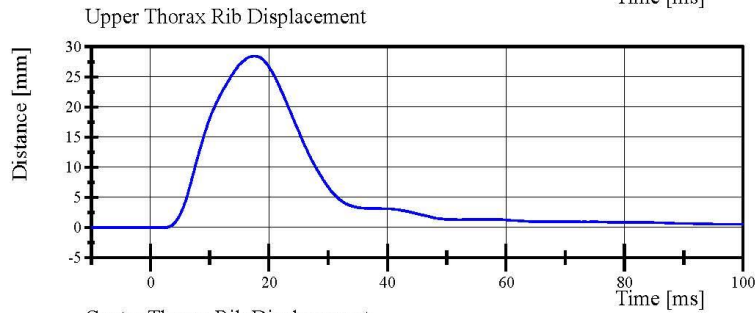


Transportation Research Center Inc.

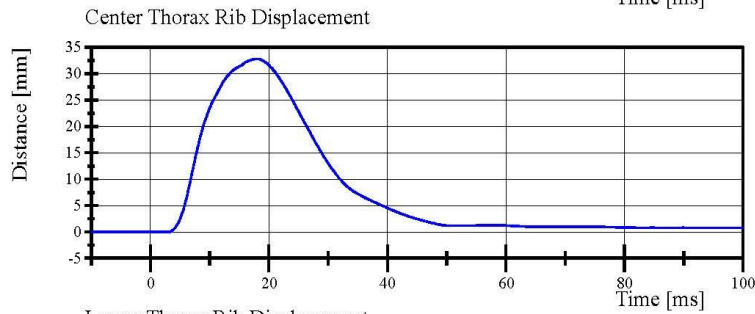
Left Lateral Thorax with Arm
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022



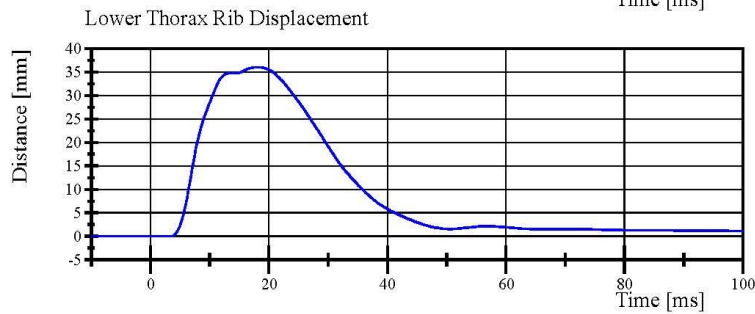
Filter Class: CFC_600
Max: 34.4 mm at 17.2 ms
Min: -1.6 mm at 33.7 ms



Filter Class: CFC_600
Max: 28.4 mm at 17.4 ms
Min: -0.0 mm at -6.5 ms



Filter Class: CFC_600
Max: 32.8 mm at 18.2 ms
Min: -0.0 mm at 3.0 ms



Filter Class: CFC_600
Max: 36.0 mm at 17.7 ms
Min: -0.0 mm at 3.5 ms

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

09.22.2022 10:12:05 623



Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	61 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.333 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-16.3 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	34.4 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	42.0 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	41.5 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	14.3 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	9.9 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

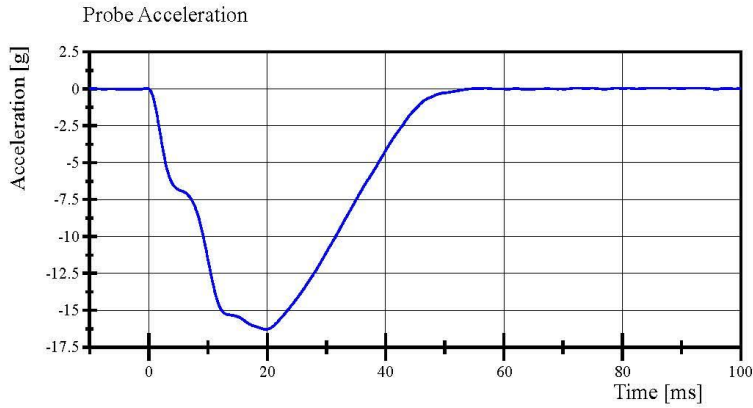
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.22.2022 08:45:42 813

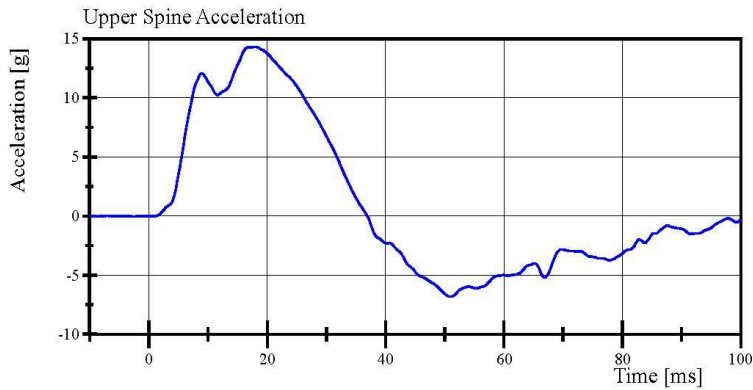


Transportation Research Center Inc.

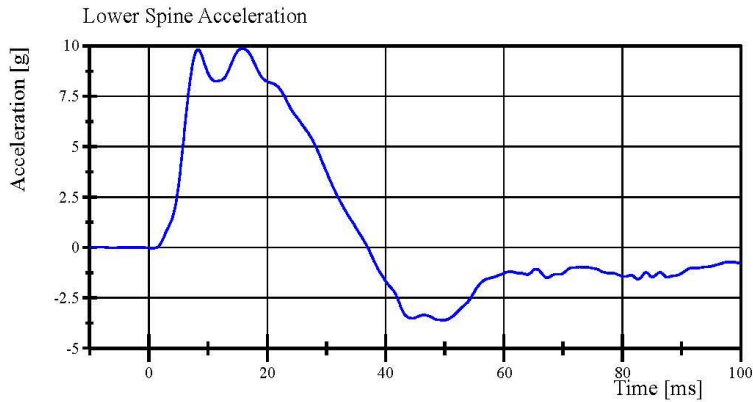
Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 0.1 g at 92.0 ms
Min: -16.3 g at 19.7 ms



Filter Class: CFC_180
Max: 14.3 g at 18.0 ms
Min: -6.8 g at 51.0 ms



Filter Class: CFC_180
Max: 9.9 g at 15.8 ms
Min: -3.6 g at 49.8 ms

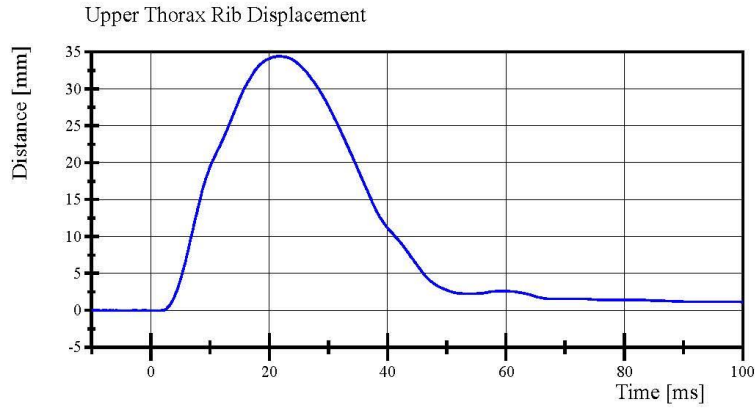
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.22.2022 08:46:21 813

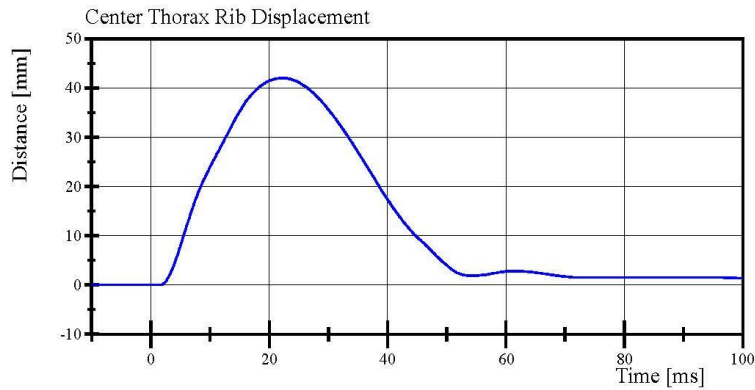


Transportation Research Center Inc.

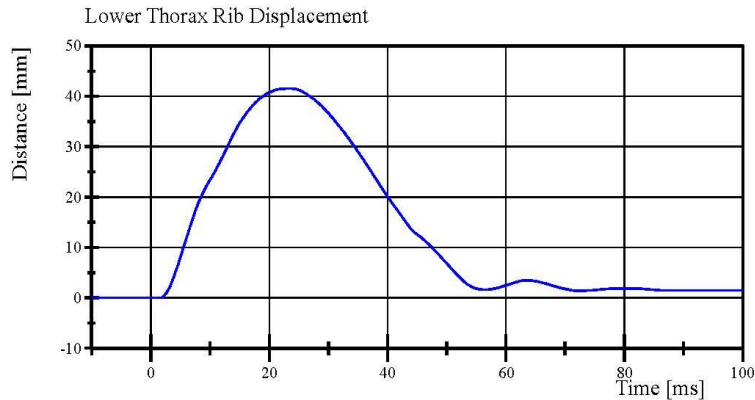
Left Lateral Thorax without Arm
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022



Filter Class: CFC_600
Max: 34.4 mm at 21.7 ms
Min: -0.0 mm at -3.9 ms



Filter Class: CFC_600
Max: 42.0 mm at 22.2 ms
Min: -0.0 mm at 1.5 ms



Filter Class: CFC_600
Max: 41.5 mm at 23.4 ms
Min: -0.0 mm at 1.6 ms

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

09.22.2022 08:46:22 813



Transportation Research Center Inc.

Left Lateral Abdomen

SID IIs Serial No. DQ0570 Certification No. 15-1

Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	62 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.3 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	40.3 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	41.1 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	10.89 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

09.22.2022 08:32:38 651

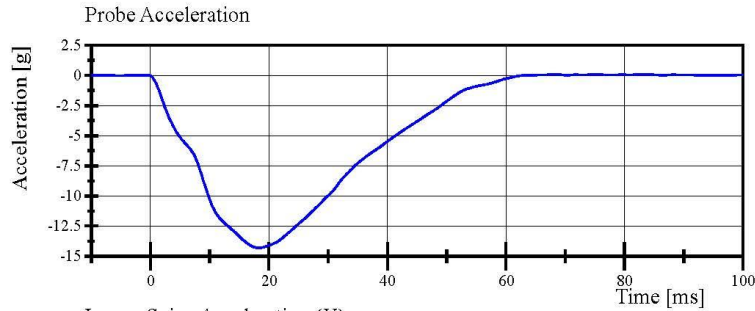


Transportation Research Center Inc.

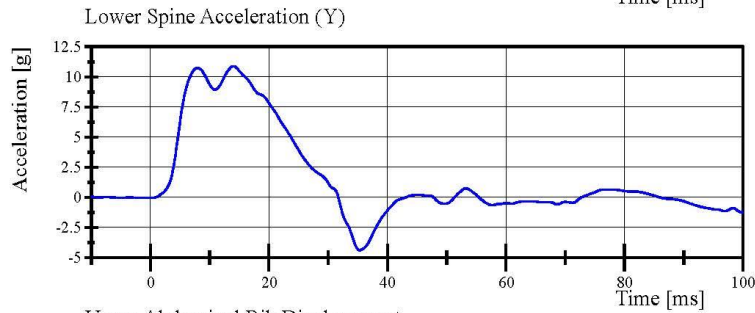
Left Lateral Abdomen

SID IIs Serial No. DQ0570 Certification No. 15-1

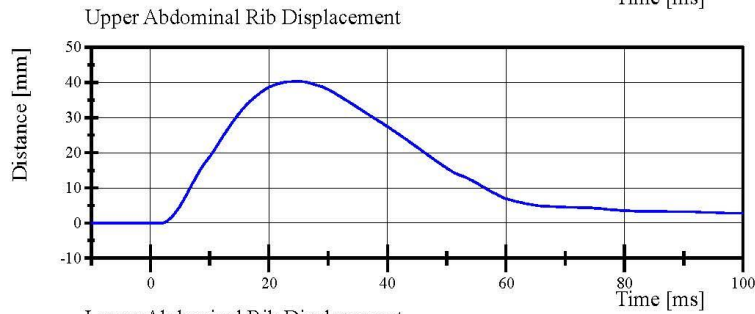
Test Date: 9/22/2022



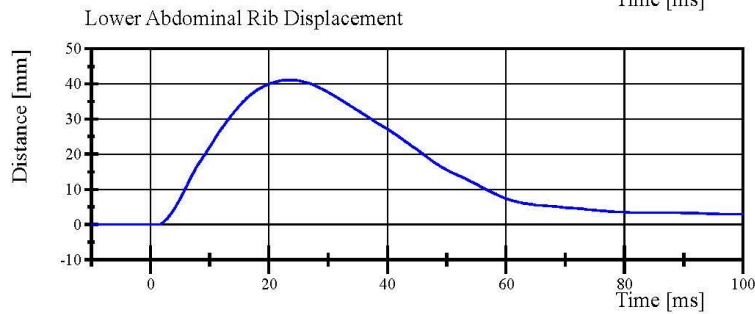
Filter Class: CFC_180
Max: 0.1 g at 75.2 ms
Min: -14.3 g at 18.2 ms



Filter Class: CFC_180
Max: 10.9 g at 13.9 ms
Min: -4.4 g at 35.4 ms



Filter Class: CFC_600
Max: 40.3 mm at 24.9 ms
Min: -0.0 mm at 1.8 ms



Filter Class: CFC_600
Max: 41.1 mm at 23.4 ms
Min: -0.0 mm at 1.3 ms

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

09.22.2022 08:33:10 651



Transportation Research Center Inc.

Left Lateral Pelvis

SID IIs Serial No. DQ0570 Certification No. 15-1

Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	58 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.62 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-46.61 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	41.1 g	Yes
Acetabulum Force	3,600 - 4,300 N	4,171.7 N	Yes

Test meets specifications.

Condition: Used

Comments:

Pelvis Skin S/N: EN1613

Pelvis Plug Info:

Manufacturer: SACO

S/N: 13774

Cal Date: 20200325

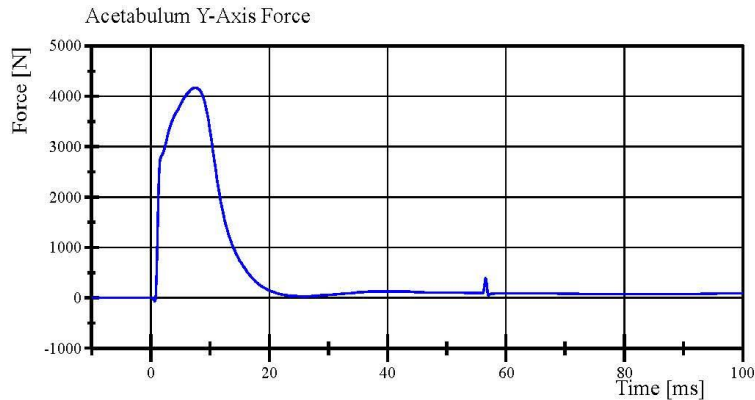
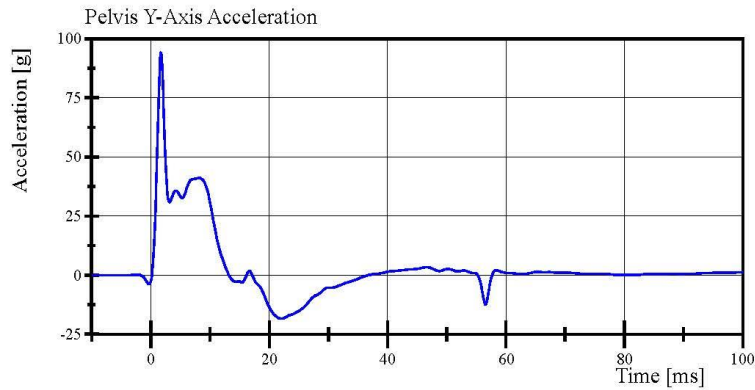
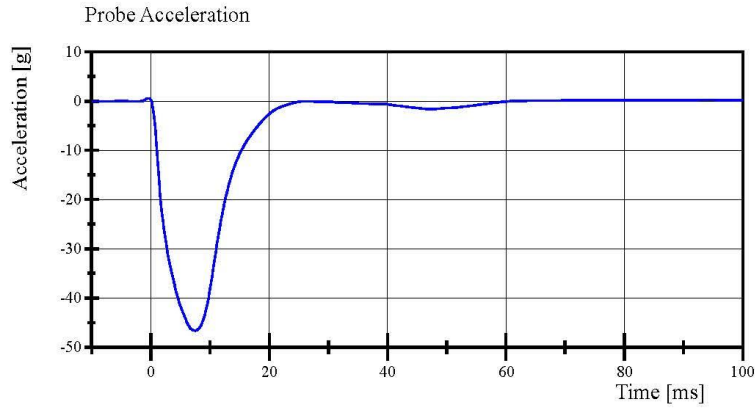
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

09.22.2022 10:41:48 445



Transportation Research Center Inc.

Left Lateral Pelvis
SID IIs Serial No. DQ0570 Certification No. 15-1
Test Date: 9/22/2022



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

09.22.2022 10:44:12 445



Transportation Research Center Inc.

Left Lateral Iliac

SID IIs Serial No. DQ0570 Certification No. 15-3

Test Date: 9/22/2022

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.39 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-35.6 g	No
Peak Pelvis Lateral Acceleration	28 - 39 g	24.1 g	No
Iliac Force	4,100 - 5,100 N	3,800.3 N	No

Test does not meet specifications.

Condition: Used

Comments:

Pelvis Skin S/N: EN1613

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

09.22.2022 15:05:50 640

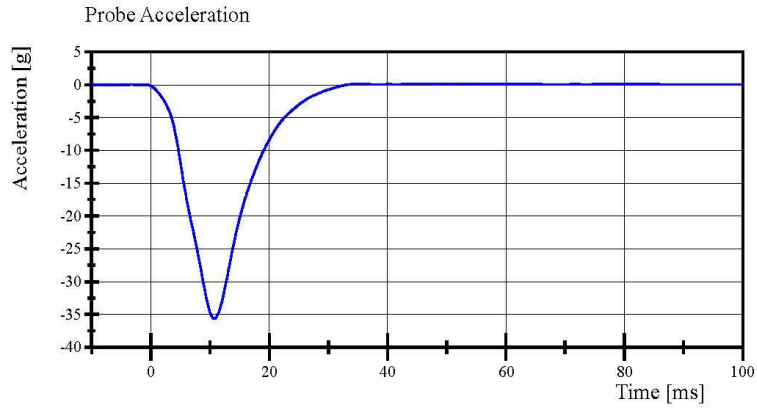


Transportation Research Center Inc.

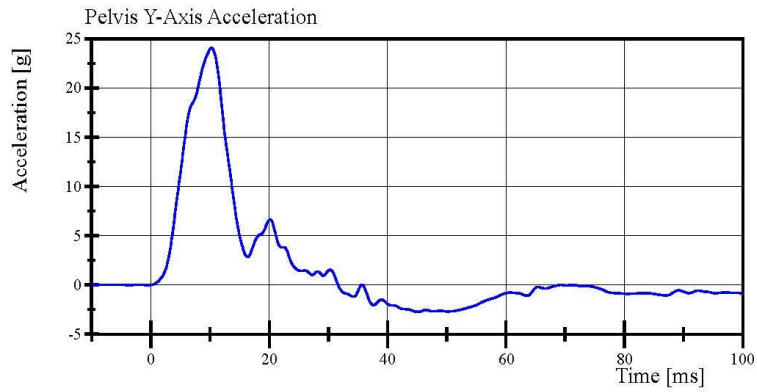
Left Lateral Iliac

SID IIs Serial No. DQ0570 Certification No. 15-3

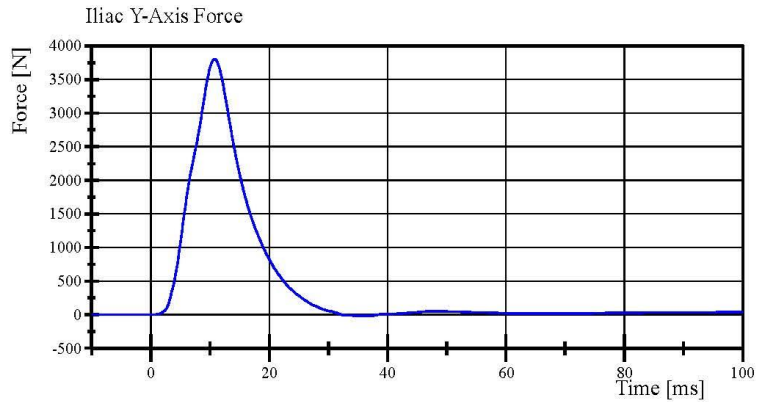
Test Date: 9/22/2022



Filter Class: CFC_180
Max: 0.2 g at 43.8 ms
Min: -35.6 g at 10.7 ms



Filter Class: CFC_180
Max: 24.1 g at 10.2 ms
Min: -2.7 g at 45.1 ms



Filter Class: CFC_600
Max: 3,800.3 N at 10.8 ms
Min: -20.5 N at 37.0 ms

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

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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	29-Aug-2022	
	Y	T10352	Endevco	29-Aug-2022	
	Z	P91950	Endevco	29-Aug-2022	
Redundant Head Accelerometers	X	T16771	Endevco	29-Aug-2022	
	Y	P83368	Endevco	29-Aug-2022	
	Z	P91904	Endevco	29-Aug-2022	
Thoracic Rib Displacement Potentiometers	Upper	Y	111	Honeywell	1-Mar-2022
	Middle	Y	174	FTSS	1-Mar-2022
	Lower	Y	0913	Honeywell	1-Mar-2022
Abdomen Load Cells	Front	Y	1441	Denton	1-Mar-2022
	Middle	Y	1436	Denton	1-Mar-2022
	Rear	Y	1437	Denton	1-Mar-2022
Lower Spine Accelerometers (T12)	X	T11866	Endevco	29-Aug-2022	
	Y	P91615	Endevco	29-Aug-2022	
	Z	P64884	Endevco	29-Aug-2022	
Acetabulum Load Cell	Y	N/A	N/A	N/A	
Pubic Symphysis Load Cell	Y	465-FY	Denton	1-Mar-2022	

TABLE 2 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N DQ0570		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers			X	T11432	Endevco	31-Aug-2022
			Y	P93774	Endevco	31-Aug-2022
			Z	P91566	Endevco	31-Aug-2022
Redundant Head Accelerometers			X	P93766	Endevco	31-Aug-2022
			Y	P93762	Endevco	31-Aug-2022
			Z	P93761	Endevco	31-Aug-2022
Displacement Potentiometers	Shoulder		N/A	N/A	N/A	N/A
	Thoracic Rib	Upper	Y	007	Servo	4-Mar-2022
		Middle	Y	037	Servo	4-Mar-2022
		Lower	Y	048	Servo	4-Mar-2022
	Abdominal Rib	Upper	Y	1295	Servo	4-Mar-2022
Lower		Y	1136	Servo	4-Mar-2022	
Lower Spine Accelerometers (T12)			X	P94545	Endevco	31-Aug-2022
			Y	P94647	Endevco	31-Aug-2022
			Z	P94530	Endevco	31-Aug-2022
Acetabulum Load Cell			Y	DK7483S-FY	FTSS	3-Mar-2022
Iliac Wing Load Cell			Y	287-FY	Denton	3-Mar-2022
Pelvis Plug (struck side)				13767	SACO	25-Mar-2020
Pelvis Plug (non-struck side)				13768	SACO	25-Mar-2020

TABLE 3 – Vehicle Instrumentation

Vehicle Instrumentation			Serial Number	Manufacturer	Calibration Date
1	Vehicle Center of Gravity	X	A230699	Measurement Specialties	12-Apr-2022
	Vehicle Center of Gravity	Y	A378311	Measurement Specialties	4-Apr-2022
	Vehicle Center of Gravity	Z	A378324	Measurement Specialties	12-Apr-2022
2	Right Sill at Front Seat	X	A300441	Measurement Specialties	19-Apr-2022
	Right Sill at Front Seat	Y	A318488	Measurement Specialties	23-Mar-2022
	Right Sill at Front Seat	Z	A377536	Measurement Specialties	19-Apr-2022
3	Right Sill at Rear Seat	X	A298247	Measurement Specialties	26-May-2022
	Right Sill at Rear Seat	Y	A378376	Measurement Specialties	26-May-2022
	Right Sill at Rear Seat	Z	A318467	Measurement Specialties	19-Apr-2022
4	Left Sill at Front Door	Y	A300448	Measurement Specialties	19-Apr-2022
5	Left Sill at Rear Door	Y	A400122	Measurement Specialties	19-Apr-2022
6	Left A-Post Lower	Y	A297074	Measurement Specialties	26-May-2022
7	Left A-Post Middle	Y	A298550	Measurement Specialties	12-Apr-2022
8	Left B-Post Lower	Y	A241132	Measurement Specialties	12-Apr-2022
9	B-Post Middle	Y	A318447	Measurement Specialties	19-Apr-2022
10	Front Seat Track	Y	A377501	Measurement Specialties	26-May-2022
11	Rear Seat Track or Structure	Y	A251672	Measurement Specialties	23-May-2022
12	Right Rear Occupant Compartment	Y	A378332	Measurement Specialties	4-Apr-2022
13	Engine Block	X	A378323	Measurement Specialties	4-Apr-2022
	Engine Block	Y	A241155	Measurement Specialties	19-Apr-2022
14	Rear Floorpan Above Axle	X	A298539	Measurement Specialties	26-May-2022
	Rear Floorpan Above Axle	Y	A298543	Measurement Specialties	26-May-2022
	Rear Floorpan Above Axle	Z	A377493	Measurement Specialties	26-May-2022

TABLE 4 – MDB Instrumentation

MDB Instrumentation		Serial Number	Manufacturer	Calibration Date
MDB Center of Gravity	X	A300443	Measurement Specialties	23-Mar-22
MDB Center of Gravity	Y	A297062	Measurement Specialties	23-Mar-22
MDB Center of Gravity	Z	A254898	Measurement Specialties	23-Mar-22
Left Frame Rail at Rear Axle Centerline	X	A297045	Measurement Specialties	22-Mar-22
Left Frame Rail at Rear Axle Centerline	Y	A297050	Measurement Specialties	22-Mar-22