FINAL REPORT NUMBER: SPNCAP-TRC-20-004

NEW CAR ASSESSMENT PROGRAM (NCAP)
SIDE IMPACT POLE TEST

HYUNDAI MOTOR COMPANY
2020 Hyundai Venue 5-Door Hatchback
NHTSA NUMBER: M20204210

PREPARED BY:
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Report Date: April 2, 2020

FINAL REPORT

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

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Report Prepared By: ILO Project Operations Group

Report Approved By: 

John Shultz

Approval Date: April 2, 2020

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date: _____

Technical Report Documentation Page

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15. Supplemental Notes		

16. Abstract

A 32.2 km/h (20 mph), 75° oblique impact Side NCAP Test was conducted on the subject vehicle, a 2020 Hyundai Venue 5-Door Hatchback, in accordance with the specifications of the Office of Crashworthiness Standards Side NCAP Pole Laboratory Test Procedure for the generation of consumer information on vehicle side pole crash protection. This test was conducted by Transportation Research Center Inc. in East Liberty, Ohio, on January 22, 2020.

The impact velocity was 32.25 km/h, and the ambient temperature at the struck (left) side of the target vehicle at the time of impact was 21.7° C. The test vehicle's post-test maximum crush was 313 mm at Level 3.

The test or target vehicle's performance is given below:

	Unit	Threshold	Front SID-IIs
Head Injury Criteria (HIC_{36}):	NA	1000	343
Resultant Lower Spine Acceleration:	g's	82	42.1
Total Pelvic Force: (sum of acetabular and iliac forces)	N	5525	3513.7
Maximum Thoracic Rib Deflection	mm	38*	21.6
Maximum Abdomen Rib Deflection	mm	45*	31.6

* Proposed IARV

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

17. Key Words New Car Assessment Program (NCAP) Side Impact Pole Part 572V SID-IIs	18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave Washington, DC 20590

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TABLE OF CONTENTS

SECTION 1
TEST PURPOSE AND PROCEDURE

TEST PURPOSE AND PROCEDURE

This side impact test was conducted as part of the MY20 New Car Assessment Program Side Impact Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under Contract No. DTNH22-14-D-00354. The purpose of this test is to generate comparative side impact performance in a 2020 Hyundai Venue 5-Door Hatchback manufactured by HYUNDAI MOTOR COMPANY. The side impact test was conducted in accordance with the Office of Crashworthiness Standard's Side NCAP Pole Laboratory Test Procedure, dated October 2015.

SECTION 2

SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a model year 2020 Hyundai Venue 5-Door Hatchback. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 32.25 km/h. The side impact test was conducted by Transportation Research Center Inc. in East Liberty, OH, on January 22, 2020. Pre-test and post-test photographs of the test vehicle and the side impact dummy (SID-IIs) are included in Appendix A of this report.

One Part 572V (SID-IIs) dummy was placed in the driver designated seating position according to instructions specified in the OCWS Side NCAP Pole Laboratory Test Procedure, dated October 2015. Camera locations and other pertinent camera information are included in this report.

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

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

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

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

Measurement Description	Driver ATD (SID-IIs)		
	Units	IARV	Result
Head Injury Criteria (HIC_{36})	NA	1000	343
Lower Spine Acceleration Resultant	G	82	42.1
Total Pelvic Force (sum of acetabular and iliac forces)	N	5525	3513.7
Maximum Thoracic Rib Deflection	mm	38*	21.6
Maximum Abdominal Rib Deflection	mm	45*	31.6

* Proposed IARV

Supplemental restraint information is given below:

Restraint Type	Left Front (Driver) Occupant Location 1		Left Rear (Passenger) Occupant Location 4	
	Mounted	Deployed	Mounted	Deployed
Frontal Airbag	Yes	No		
Knee Airbag	No	N/A		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	N/A
Side Torso Airbag	No	N/A	No	N/A
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt Load Limiter	Yes	Unknown	No	N/A
Other Safety Restraint	No	N/A	No	N/A

GENERAL COMMENTS

Driver Seat Track at Dummy Hip Point Acceleration (Y): Channel failed at 28.0 ms

SECTION 3
OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M20204210	Traction Control System (TCS)	Yes
Model Year	2020	Auto-Leveling System	No
Make	Hyundai	Automatic Door Locks (ADL)	Yes
Model	Venue	Power Window Auto-Reverse	No
Body Style	5HB	Other Optional Feature	No
VIN	KMHRB8A33LU019059	Driver Front Airbag	Yes
Body Color	Galactic Gray	Driver Curtain Airbag	Yes
Odometer Reading (km/mi)	109 mi.	Driver Head/Torso Airbag	No
Engine Displacement (L)	1.6	Driver Torso Airbag	No
Type/No. Cylinders	Straight/4	Driver Torso/Pelvis Airbag	Yes
Engine Placement	Front Transverse	Driver Pelvis Airbag	No
Transmission Type	Automatic	Driver Knee Airbag	No
Transmission Speeds	CVT	Rear Pass. Curtain Airbag	Yes
Overdrive	No	Rear Pass. Head/Torso Airbag	No
Final Drive	FWD	Rear Pass. Torso Airbag	No
Roof Rack	No	Rear Pass. Torso/Pelvis Airbag	No
Sunroof/T-Top	No	Rear Pass. Pelvis Airbag	No
Running Boards	No	Driver Seat Belt Pretensioner	Yes
Tilt Steering Wheel	Yes	Rear Pass. Seat Belt Pretensioner	No
Power Seats	No	Driver Load Limiter	Yes
Anti-Lock Brakes (ABS)	Yes	Rear Pass. 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	HYUNDAI MOTOR COMPANY	GVWR (lbs)	3770
Date of Manufacturer	OCT/10/19	GAWR Front (lbs)	2101
Vehicle Type	MPV	GAWR Rear (lbs)	1889

VEHICLE SEATING AND WEIGHT CAPACITY DATA

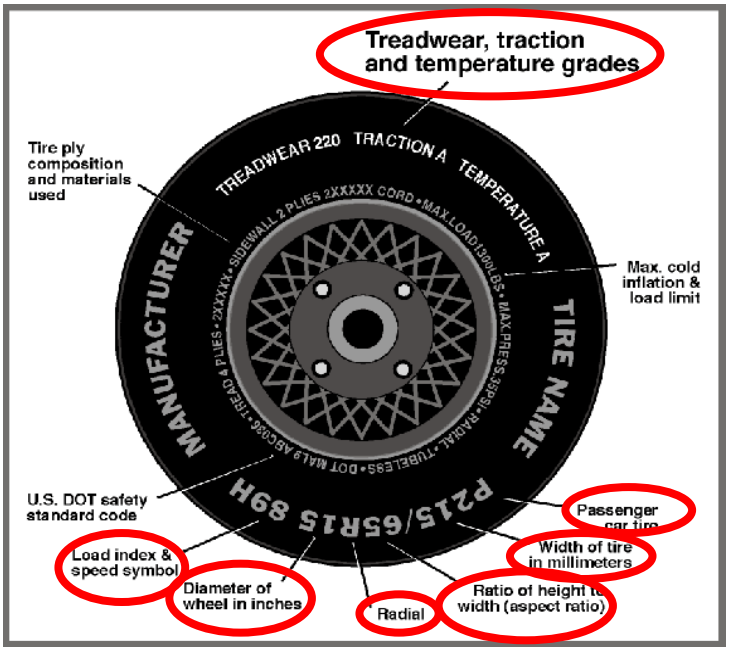
	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	N/A	5
Vehicle Capacity Weight (VCW) (kg)				380.0
DSC X 68.04 kg				340.2
Rated Cargo and Luggage Weight (RCLW) (kg)				39.8

VEHICLE SEAT TYPE

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

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

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	250	250
Recommended Tire Size	185/65R15	185/65R15
Tire Size on Vehicle	185/65R15	185/65R15
Tire Manufacturer	Hankook	Hankook
Tire Model	Kinergy GT	Kinergy GT
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	1	1
Tire Plies Body	4	4
Load Index/Speed Symbol	88 H	88 H
Tire Material	Steel/Polyester/Nylon	Steel/Polyester/Nylon
DOT Safety Code Left	1T7DF 1B H0 4019	1T7DF 1B H0 4019
DOT Safety Code Right	1T7DF 1B H0 4019	1T7DF 1B H0 4019

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

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

TIRE PRESSURES

	Units	LF	RF	LR	RR
As Delivered	kPa	248	248	248	248
Tire Placard	kPa	250	250	250	250
Owner's Manual	kPa	250	250	250	250
As Tested	kPa	250	250	250	250

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	362.0	243.4		382.0	271.0		379.4	280.2	
Right	kg	359.6	226.6		365.4	256.4		364.6	256.2	
Ratio	%	60.6	39.4		58.6	41.4		58.1	41.9	
Totals	kg	721.6	470.0	1191.6	747.4	527.4	1274.8	744.0	536.4	1280.4

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1191.6	(A)
Actual Weight of 1 P572V ATD (SID-IIs) Dummy Used	kg	49.0	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	39.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1280.4	(A+B+C)

Does the measured As Tested Vehicle Weight lie within the required weight range (i.e. Calculated Test Vehicle Target Weight – 4.5 kg to 9 kg)? ☒ YES ☐ NO

TEST VEHICLE ATTITUDES AND CG

	Units	As Delivered	As Tested	Fully Loaded	Meets Requirement***
Driver Door Sill Angle (front-to-rear)*	Deg.	-0.1	0.0	0.2	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg.	-0.2.	0.1	0.3	Yes
Front Bumper-Line Angle (left-to-right)**	Deg.	-0.4	-0.4	-0.6	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg.	0.0	-0.6	0.8	Yes
Vehicle CG (Aft of Front Axle)	mm	994	1043	1056	
Vehicle CG (Left (+) / Right (-) from longitudinal Centerline)	mm	+13	+19	+24	

*ND=Nose Down (-), NU=Nose Up (+) **LD=Left Down (-), LU=Left Up (+)
*** The "As Tested" vehicle attitude measurements must be equal to or between the "As Delivered" and "Fully Loaded" vehicle attitude measurements. Indicate "Yes" or "No" for "Meets Requirements".

WEIGHT OF BALLAST AND VEHICLE COMPONENTS REMOVED TO MEET TVTW

Component Description	Weight (kg)
Ballast: None	0.0
Components Removed: Rear bumper beam & fascia, tail lights, rear seat cushion and right front door speaker.	22.4

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

DATA SHEET NO. 2

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

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

SEAT POSITIONING

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

SCRL ANGLE RANGE

Seat	SCRL(°)		
	Max.	Min.	Mid
Driver Seat	17.1	14.2	15.7
Front Passenger Seat	N/A	N/A	14.4
Front Center Seat*	N/A	N/A	N/A
Struck Side Rear Seat	N/A	N/A	16.4
Non-Struck Side Rear Seat	N/A	N/A	16.9
Rear Center Seat*	N/A	N/A	12.9

* 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	15.7	176	Max	N/A	N/A	N/A
			Mid	152	166	176
			Min	N/A	N/A	N/A
Front Passenger Seat	14.4	179	Max	N/A	N/A	N/A
			Mid	165	170	179
			Min	N/A	N/A	N/A
Front Center Seat*	N/A	N/A	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	N/A	N/A	N/A
Struck Side Rear Seat	16.4	Fixed	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	N/A	N/A	N/A
Non-Struck Side Rear Seat	16.9	Fixed	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	N/A	N/A	N/A
Rear Center Seat*	12.9	Fixed	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	N/A	N/A	N/A

* If applicable.

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

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

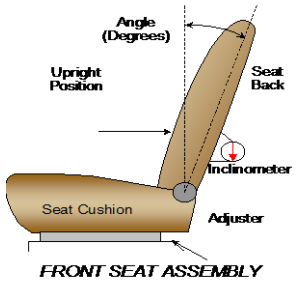
SEAT FORE/AFT POSITION

Seat	Total Fore/Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	230	35	0	0
Front Passenger Seat	217	34	0	0
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	Fixed	N/A	Fixed	N/A
Non-Struck Side Rear Seat	Fixed	N/A	Fixed	N/A
Rear Center Seat*	Fixed	N/A	Fixed	N/A

* If applicable.

SEAT BACK ANGLE ADJUSTMENT

The driver's seat back is positioned such that the dummy's head is level. The front center and front passenger's seat backs are positioned in a similar manner as the driver's seat back. The struck-side rear passenger seat back is positioned in accordance with the information provided by the manufacturer on Form No. 1. For the 5th percentile female dummy in a Side NCAP MDB test. The rear center and non-struck side rear passenger's seat back is set to match the struck-side rear seat back.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detent*
Driver Seat w/ Seated Dummy	60.0	30	2.9	8
Front Passenger Seat	60.8	30	2.8	8
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	Fixed	N/A	24.1	N/A
Non-Struck Side Rear Seat	Fixed	N/A	24.3	N/A
Rear Center Seat*	Fixed	N/A	22.4	N/A

* If applicable.

SEAT BELT ANCHORAGE ADJUSTMENT

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

	Total # of Positions	Placed in Position #
Driver Seat	Fixed	Fixed

HEAD RESTRAINT ADJUSTMENT

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

	Total # of Positions	Placed in Position #
Driver Seat	7	1, Lowermost

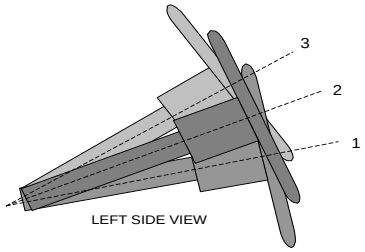
DATA SHEET NO. 2 (CONTINUED)
SEAT, SEAT BELT, STEERING WHEEL ADJUSTMENT AND FUEL SYSTEMS DATA

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

STEERING COLUMN ADJUSTMENT

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

	Degrees	Fore/Aft Position, mm
Lowermost, Position No. 1	24.3	0
Geometric Center, Position No. 2	27.0	24
Uppermost, Position No. 3	29.7	48
Telescoping Steering Wheel Travel		48
Test Position	27.0	24

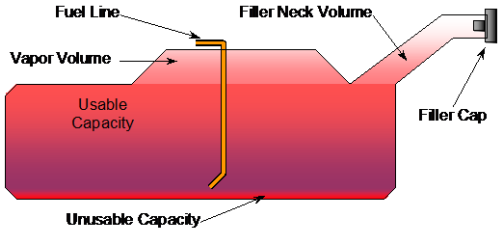


STEERING COLUMN ASSEMBLY

FUEL PUMP

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

Key is in the "ON" position.



VEHICLE FUEL TANK ASSEMBLY

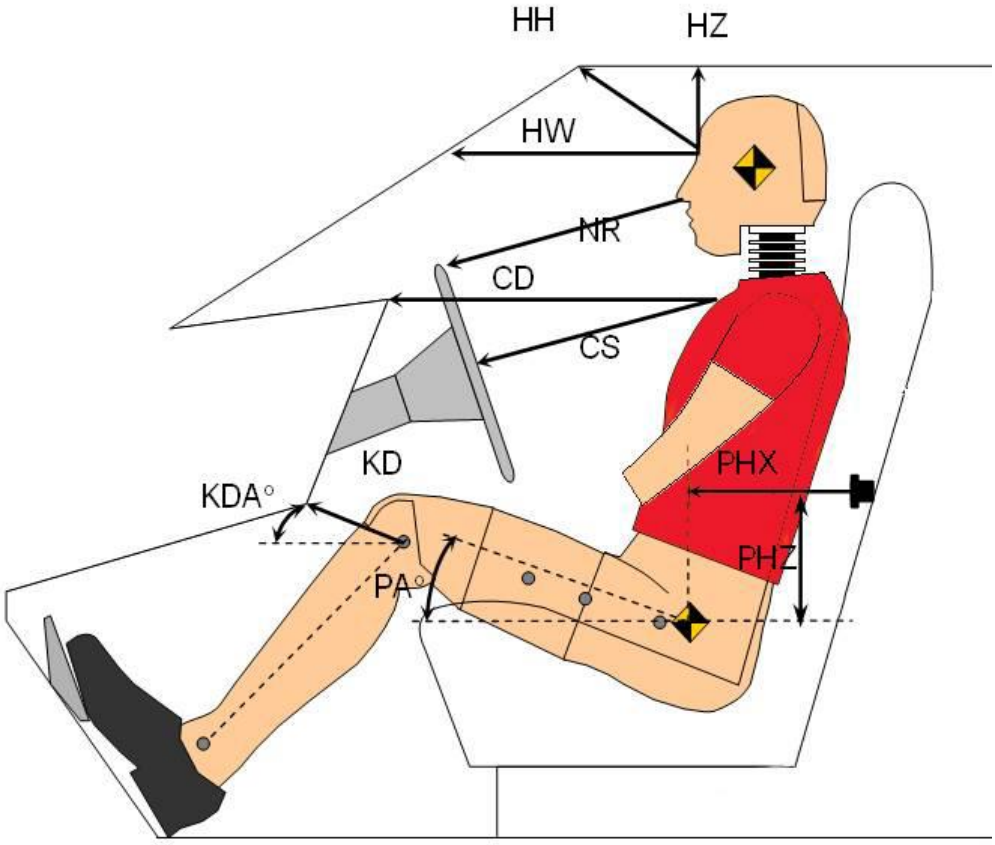
FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank" (see Form No. 1)	45.0
Usable Capacity of "Optional" Tank (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner's Manual)	45.0
Usable Capacity of Optional Tank (see Owner's Manual)	N/A
93% of Usable Capacity	41.9
Actual Amount of Solvent Used in Test	42.0
1/3 of Usable Capacity	15.0

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

DATA SHEET NO. 3
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

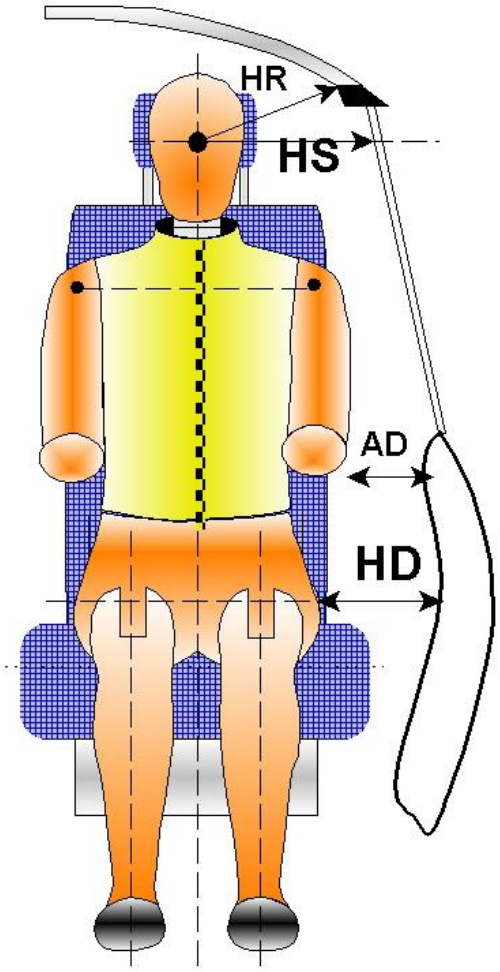
Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



Code	Measurement Description	Driver	
		Length (mm)	Angle (°)
HH	Head to Header	325	
HW	Head to Windshield	630	
HZ	Head to Visor	265	
NR	Nose to Rim	274	
CD	Chest to Dashboard	431	
CS	Chest to Steering Wheel	213	
KDL/KDLA°	Left Knee to Dash	127	22.7
KDR/KDRA°	Right Knee to Dash	112	24.5
PAX°	Pelvic Tilt Angle (X-axis)		0.4
PAY°	Pelvic Tilt Angle (Y-axis)		19.6
PHX	Hip Point to Striker (X-Axis)	271	
PHZ	Hip Point to Striker (Z-Axis)	166	

DATA SHEET NO. 4
DUMMY LATERAL CLEARANCE DIMENSIONS

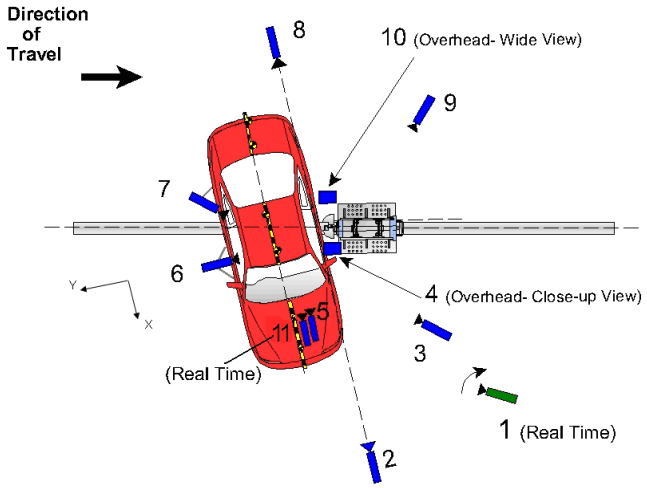
Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



Code	Measurement Description	Length (mm)
HR	Head to Side Header	273
HS	Head to Side Window	361
AD	Arm to Door	141
HD	Hip Point to Door	162

DATA SHEET NO. 5
CAMERA AND INSTRUMENTATION DATA

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



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

Camera No.	View	Coordinates (mm)			Lens Length (mm)	Operating Frame Rate (fps)
		X	Y	Z		
1	Real time (24-30 fps) pan view of impact				Zoom	30
2	Front ground level – impact view	5210	0	-1518	20	1000
3	Impact side 45° – forward pole view	2817	-2211	-1539	20	1000
4	Overhead Close-up view of impact	1844	-1413	-2636	28	1000
5	Onboard – dummy front view				25	1000
6	Onboard – dummy side view				12.5	1000
7	Onboard – dummy rear oblique view				12.5	1000
8	Rear ground level – impact view	-4735	0	-1470	20	1000
9	Impact side 45° – rearward pole view	-2710	-1289	-1492	20	1000
10	Overhead wide view of impact	-275	375	-5751	18.5	1000
11	Real time dummy front view				Zoom	30

All measurements accurate to +/- 6 mm.

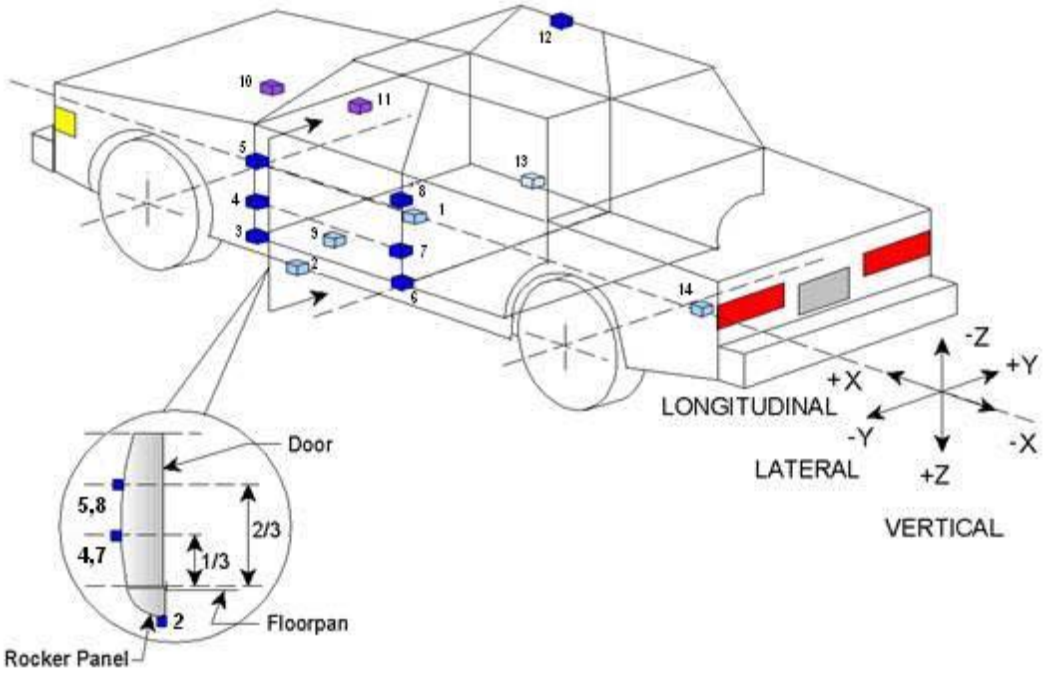
NOTE: Vehicle was at a 75° angle to the rigid pole.
If applicable, explain why camera(s) did not run: Camera view 6 triggered early resulting in no video coverage

INSTRUMENTATION

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

DATA SHEET NO. 6
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



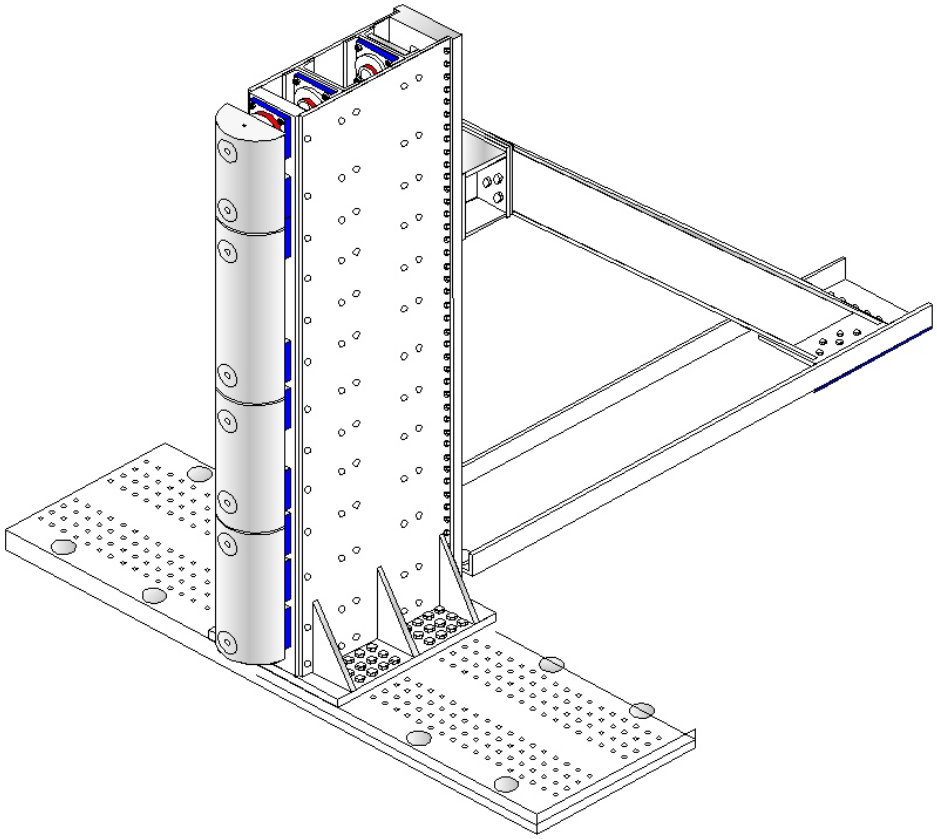
	Accelerometer/Sensor Location			
	ID	Coordinates (mm)		
		X	Y	Z
1	Vehicle CG	2395	100	-342
2	Left Floor Sill	2395	-690	-343
3	A-Pillar Sill	2675	-710	-384
4	A-Pillar Low	2770	-770	-560
5	A-Pillar Mid	2770	-785	-671
6	B-Pillar Sill	1650	-705	-346
7	B-Pillar Low	1785	-760	-561
8	B-Pillar Mid	1745	-745	-1100
9	Driver Seat Track	2040	-550	-340
10	Engine Top	3412	25	-870
11	Firewall	3212	10	-898
12	Right Roof	2060	528	-1521
13	Right Floor Sill	2395	685	-344
14	Rear Floorpan	405	-65	-311

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

DATA SHEET NO. 7
RIGID POLE LOAD CELL DATA

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

FOIL 300K RIGID POLE



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

DATA SHEET NO. 8
POST-TEST OBSERVATIONS

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

TEST DUMMY INFORMATION AND CONTACT POINTS

Dummy Body Part	Driver SID-IIs Dummy
Face	SCAB
Top of Head	SCAB
Left Side of Head	SCAB
Back of Head	SCAB, Headrest
Left Shoulder	Seat back bolster, SAB
Upper Torso	Seat back bolster
Lower Torso	Seat back bolster, SAB
Left Hip	SAB, Door panel
Left Knee	Door panel

POST-TEST DOOR PERFORMANCE

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

POST-TEST SEAT PERFORMANCE

Description	Struck Side		Non-Struck Side	
	Front	Rear	Front	Rear
Seat Movement Along Seat Track	No	N/A	No	N/A
Seat Disengagement from Floor pan	No	No	No	No
Seat Back Movement from Initial Position	No	No	No	No
Seat Back Collapse	No	No	No	No

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Good
Sill Separation	None
Windshield Damage	Major damage at driver A pillar and across top
Side Window Damage	Driver window broken out
Other Notable Effects	None

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

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

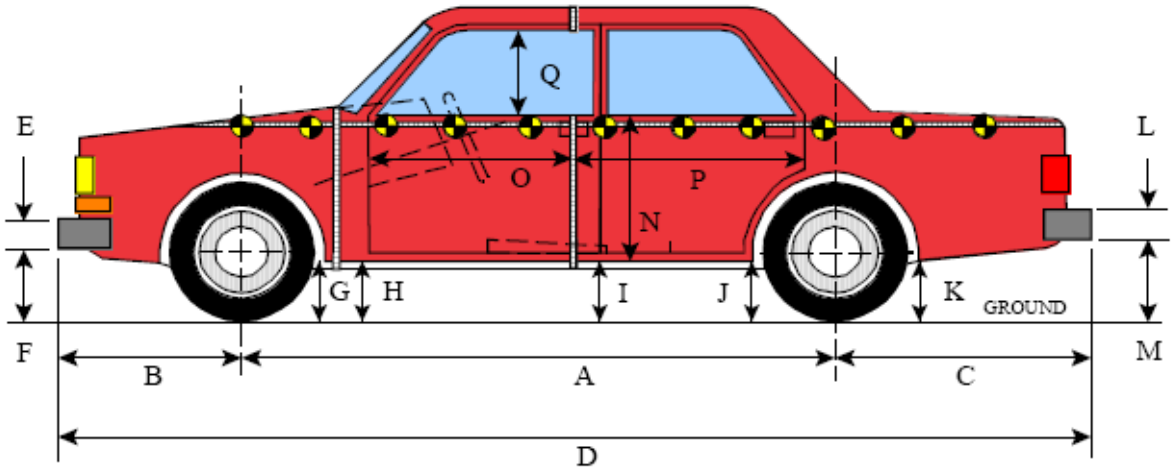
Restraint Type	Struck Side (Driver)		Struck Side (Rear Passenger)	
	Mounted	Deployed	Mounted	Deployed
Front Airbag	Yes	No		
Knee Airbag	No	N/A		
Side Curtain Airbag	Yes	Yes	Yes	Yes
Side Torso/Pelvis Airbag	Yes	Yes	No	N/A
Side Torso Airbag	No	N/A	No	N/A
Seat Belt Pretensioner	Yes	Yes	No	N/A
Seat Belt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

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

Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		1090
Actual Impact Point (Aft of Front Axle)	mm		1088
Horizontal Offset (+ forward / - rearward)	mm	+/- 38 of Intended Impact point	+2
Angle Between Vehicle's Longitudinal Centerline and Line of Motion	degrees	75 +/- 3	75
Trap No. 1 Velocity (Primary)	km/h	31.4 to 33.0	32.25
Trap No. 2 Velocity (Redundant)	km/h	31.4 to 33.0	32.24

DATA SHEET NO. 9
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



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

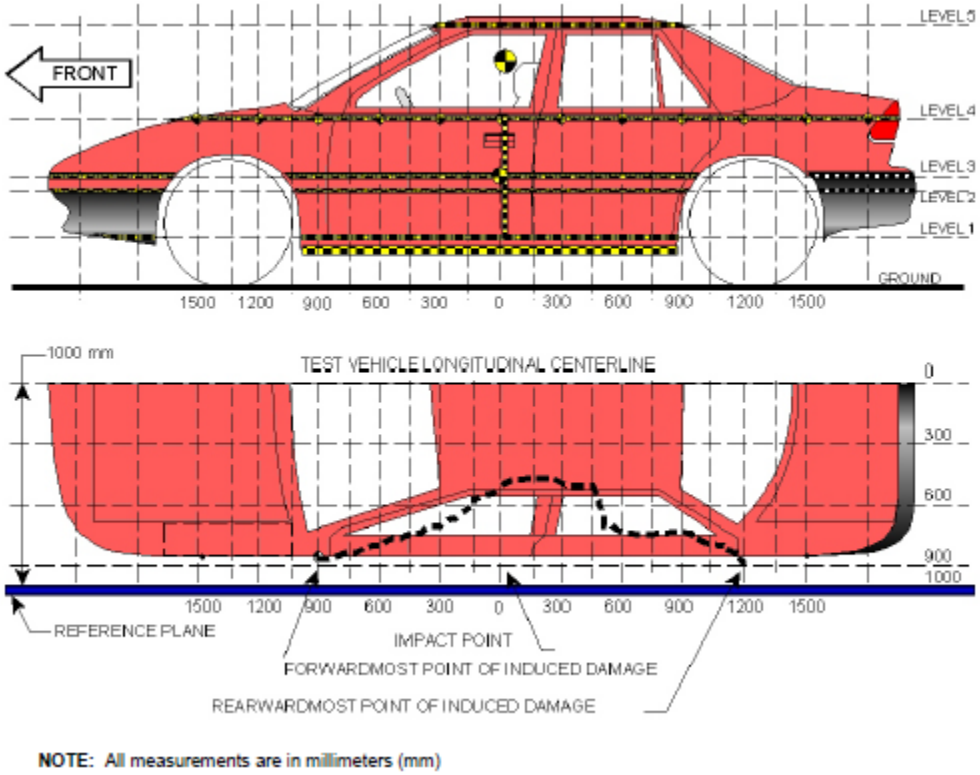
VEHICLE PRE- AND POST-TEST MEASUREMENT INFORMATION

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2520	2500	20
B	Front Axle to Front Surface of Vehicle	600	600	0
C	Rear Axle to Rear Surface of Vehicle	920	920	0
D	Total Length at Centerline	4040	4010	30
E	Front Bumper Thickness	65	65	0
F	Front Bumper Bottom to Ground	450	490	-40
G	Sill Height at Front Wheel Well	330	328	2
H	Sill Height at Front Door Leading Edge	333	341	-8
I	Sill Height at B-Pillar	440	458	-18
J1	Sill Height at Rear Wheel Well	365	406	-41
J2	Pinch Weld Height at Rear Wheel Well	195	221	-26
K	Sill Height Aft of Rear Wheel Well	460	505	-45
L	Rear Bumper Thickness	100	100	0
M	Rear Bumper Bottom to Ground	580	611	-31
N	Sill Height to Bottom of Front Window Sill	795	840	-45
O	Front Door Leading Edge to Impact CL	630	560	70
P	Rear Door Trailing Edge to Impact CL	1401	1310	91
Q	Front Window Opening	382	350	32
R	Right Side Length	3815	3820	-5
S	Left Side Length	3815	3765	50
T[1]	Vehicle Width at B-Pillars	1725	1630	95

[1] Max width = 1780

DATA SHEET NO. 10
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



NOTE: All measurements are in millimeters (mm)

MAXIMUM EXTERIOR CRUSH MEASUREMENTS

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	374	249	0
2	Occupant H-Point	620	304	0
3	Mid-Door	713	313	0
4	Window Sill	1015	274	0
5	Window Top	1494	96	0

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

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

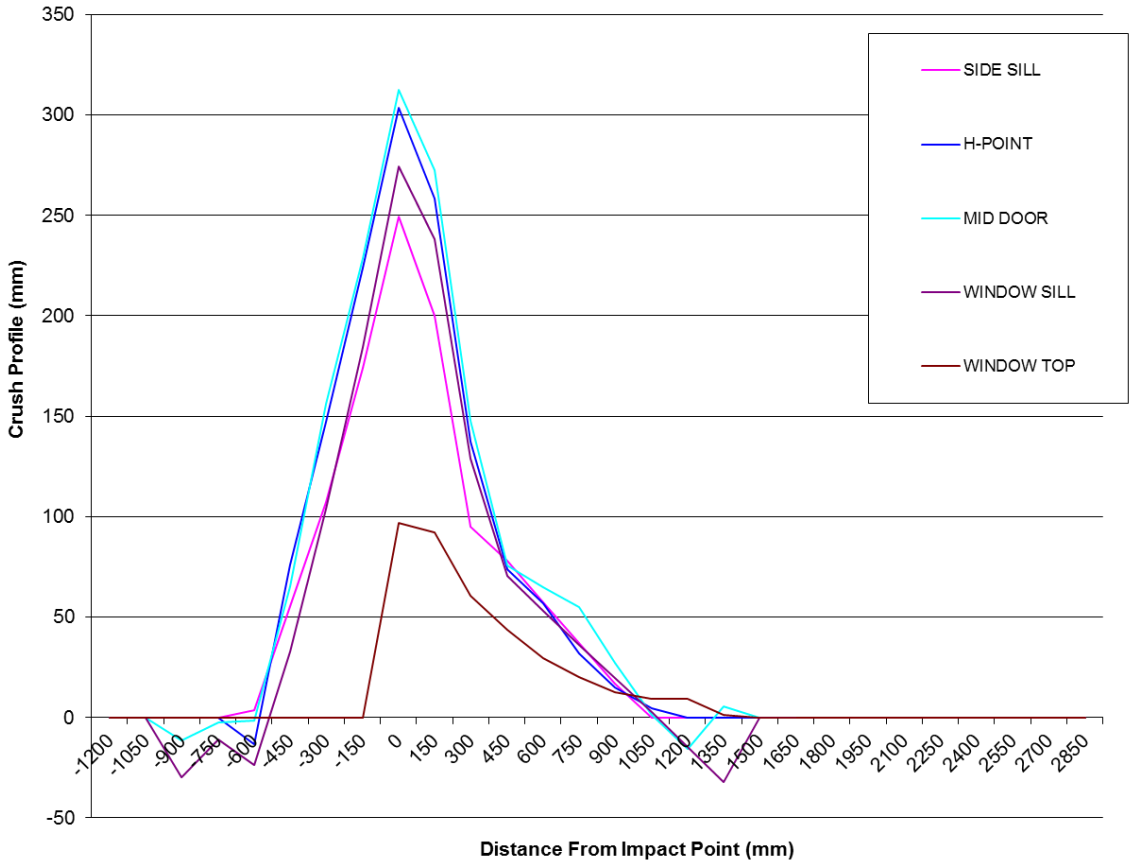
Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-900	0	0	886	741	0	0	0	897	771	0	0	0	-11	-30	0
-750	0	879	878	756	0	0	879	881	767	0	0	0	-3	-11	0
-600	842	862	861	770	0	839	875	863	794	0	3	-13	-2	-24	0
-450	829	854	858	784	0	774	778	793	751	0	55	76	65	33	0
-300	832	855	859	793	0	725	708	703	689	0	107	147	156	104	0
-150	835	856	861	801	0	661	632	632	616	0	174	224	229	185	0
0	838	858	862	806	570	589	554	549	532	474	249	304	313	274	96
150	840	859	863	811	576	641	600	590	573	484	199	259	273	238	92
300	843	859	863	814	577	748	721	716	686	517	95	138	147	128	60
450	843	858	863	818	578	765	784	787	747	535	78	74	76	71	43
600	845	857	862	819	577	788	800	798	766	548	57	57	64	53	29
750	848	857	862	820	575	811	825	806	784	555	37	32	56	36	20
900	848	865	866	819	570	831	850	839	800	557	17	15	27	19	13
1050	0	881	879	817	565	0	876	877	815	555	0	5	2	2	10
1200	0	0	885	813	556	0	0	900	828	547	0	0	-15	-15	9
1350	0	0	886	808	542	0	0	881	840	541	0	0	5	-32	1

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

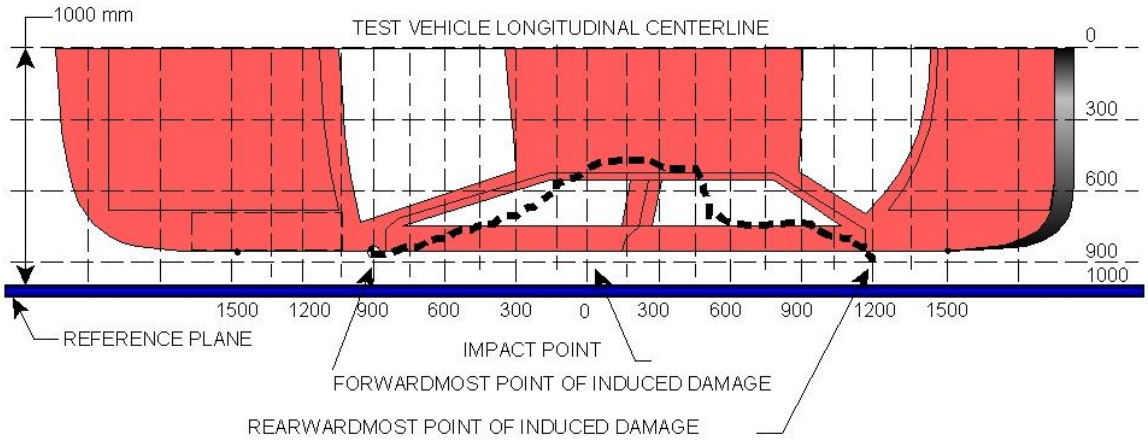
DATA SHEET NO. 10 (CONTINUED)
VEHICLE EXTERIOR CRUSH MEASUREMENTS

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



DATA SHEET NO. 11
VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



VEHICLE DAMAGE PROFILE DISTANCES

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	1350	3	881	886	5
2	900	3	839	866	27
3	600	3	798	862	64
4	300	3	716	863	147
5	-150	3	632	861	229
6[1]	-600	1	839	842	0

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

DATA SHEET NO. 12

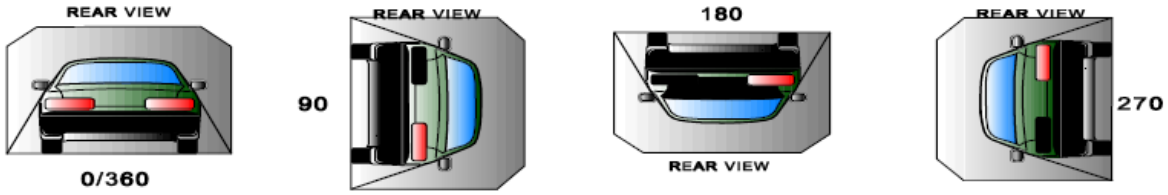
FMVSS NO. 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020

Test Time: 15:57 **Temperature:** 21.3ºC

A. From impact until vehicle motion ceases: 0 oz.
(Maximum allowable is 1 ounce)
B. For the 5 minute period after motion ceases: 0 oz.
(Maximum allowable is 5 ounces)
C. For the following 25 minutes: 0 oz.
(Maximum allowable is 1 ounce/minute)
D. Spillage Details: None

FMVSS 301 STATIC ROLLOVER DATA



ROLLOVER SOLVENT COLLECTION TIME TABLE IN SECONDS

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

FMVSS NO. 301 ROLLOVER SPILLAGE TABLE

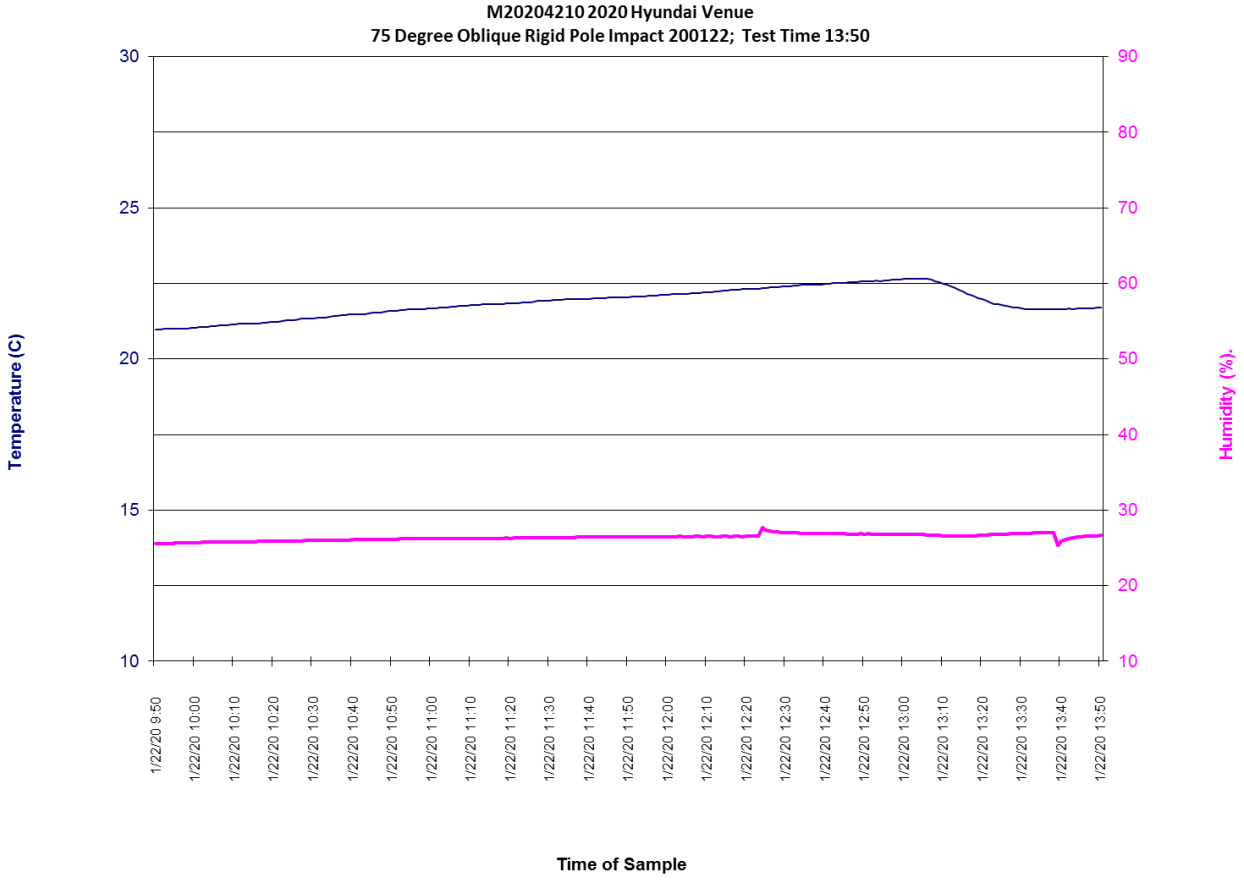
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0 to 90	0	0	0	0
90 to 180	0	0	0	0
180 to 270	0	0	0	0
270 to 360	0	0	0	0

ROLLOVER SOLVENT SPILLAGE LOCATION TABLE

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

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

Test Vehicle: 2020 Hyundai Venue 5-Door Hatchback NHTSA No.: M20204210
Test Program: SPNCAP Side Impact Test Date: 1/22/2020



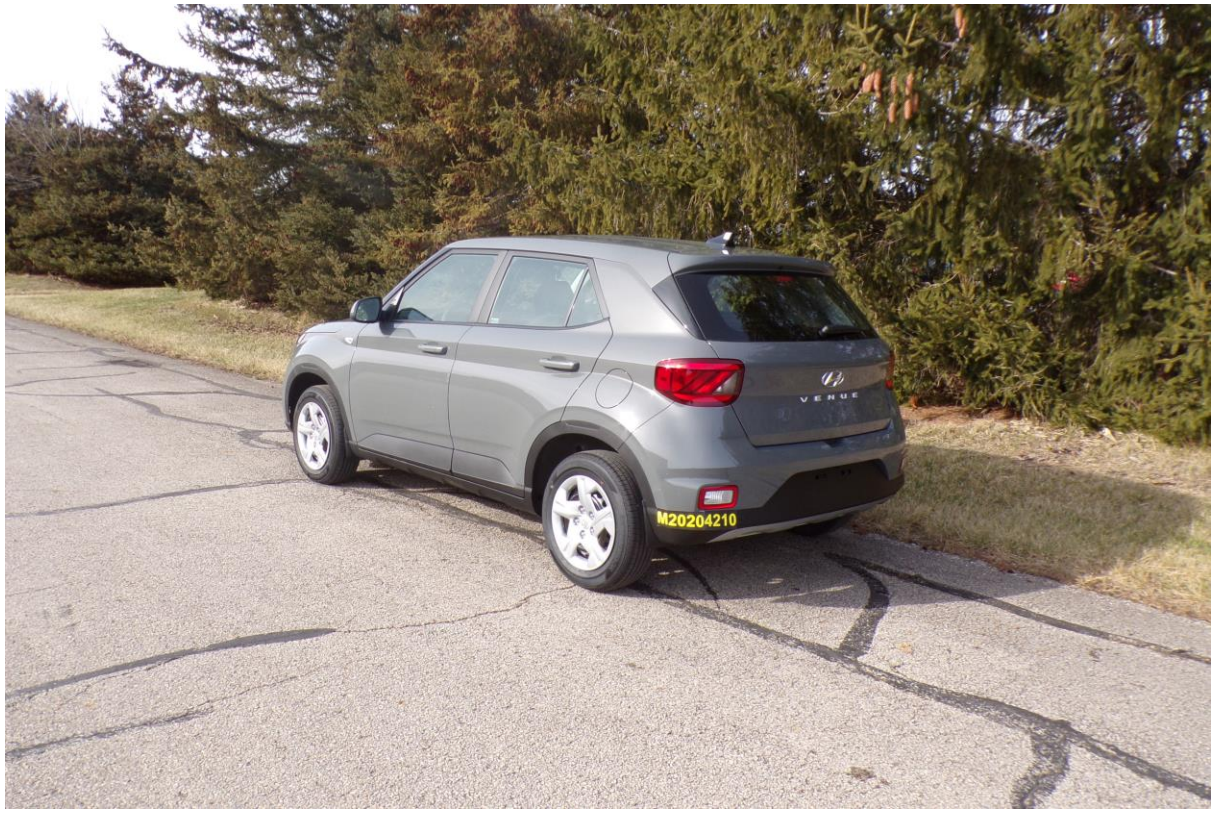
APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS (CONTINUED)

No. 001 As Delivered Right Front ¾ View of Test Vehicle



No. 002 As Delivered Left Rear ¾ View of Test Vehicle

No. 003 Pre-Test Frontal View of Test Vehicle

No. 004 Post-Test Frontal View of Test Vehicle

No. 005 Pre-Test Left Front ¾ View of Test Vehicle

No. 006 Post-Test Left Front ¾ View of Test Vehicle

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

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

No. 009 Pre-Test Left Rear ¾ View of Test Vehicle

No. 010 Post-Test Left Rear ¾ View of Test Vehicle

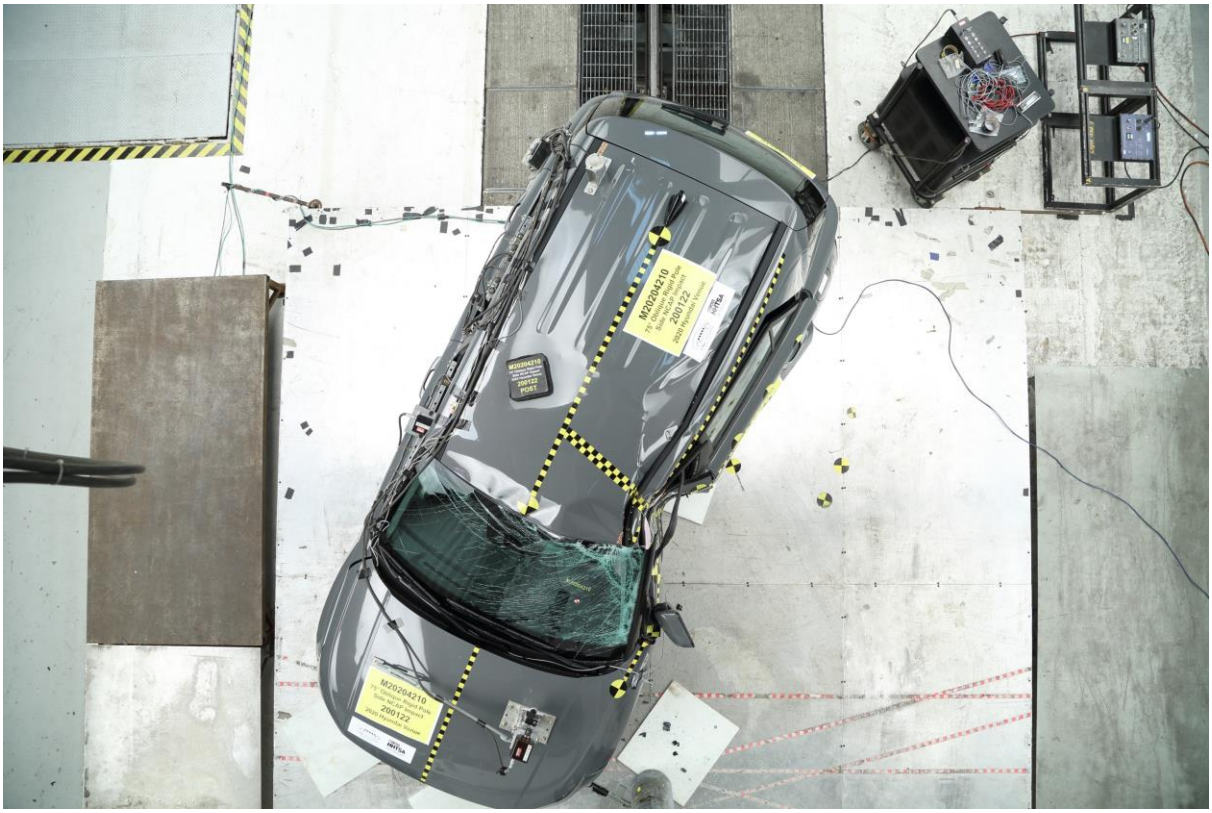
No. 011 Pre-Test Rear View of Test Vehicle

No. 012 Post-Test Rear View of Test Vehicle

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

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

No. 015 Pre-Test Overhead View of Test Area



No. 016 Post-Test Overhead View of Test Area

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

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

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

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

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

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

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

Intentionally Left Blank

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

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

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

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

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

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

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

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

No. 032 Pre-Test Placement of Dummy Feet

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

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

No. 035 Pre-Test View of Disengaged Parking Brake

No. 036 Pre-Test View of Parking Brake

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

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

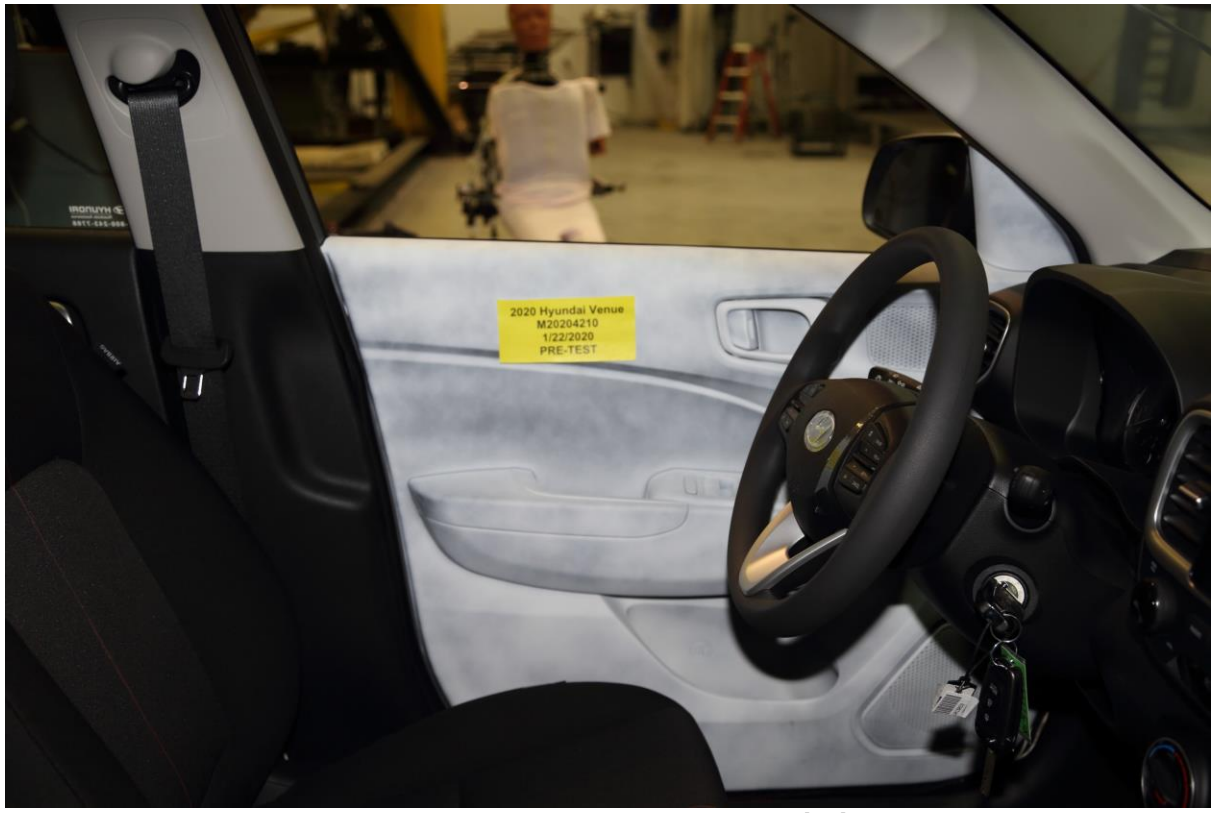
No. 039 Pre-Test Close-Up View of Driver Seat Back or Head Restraint

No. 040 Pre-Test Dummy and Door Clearance View

No. 041 Post-Test Dummy and Door Clearance View

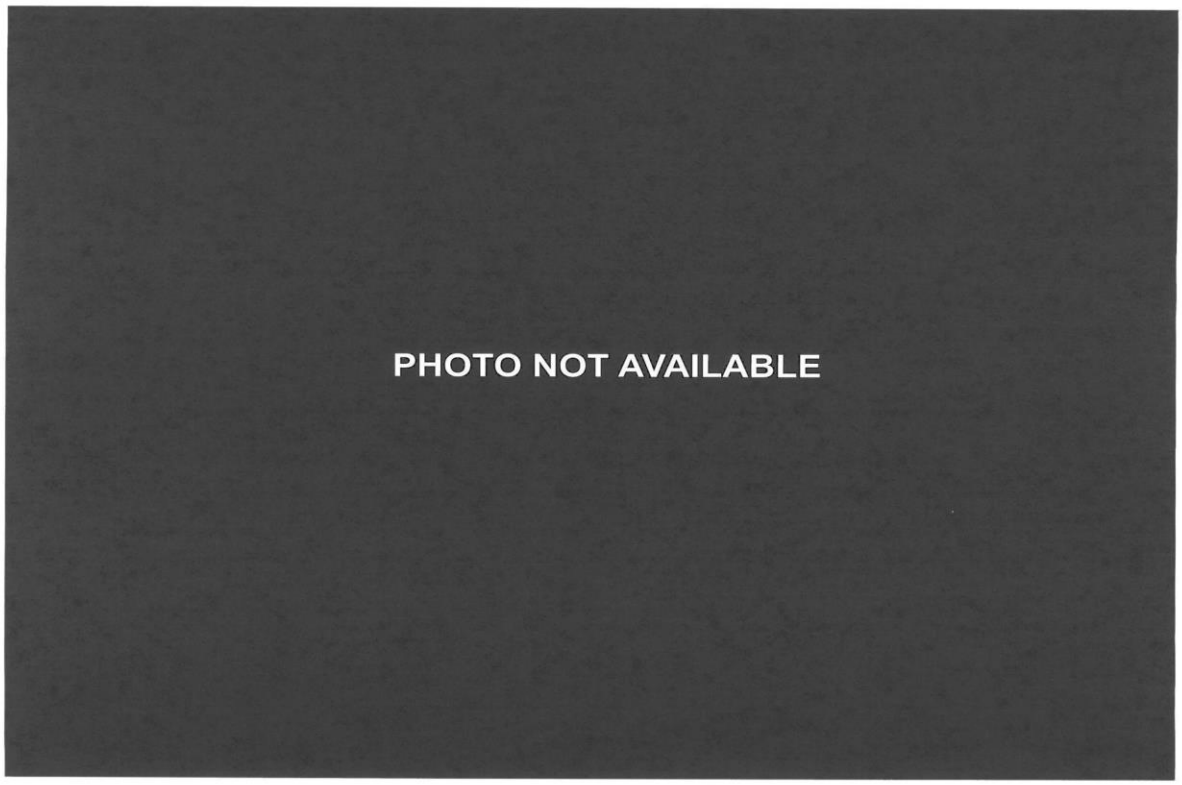
No. 042 Pre-Test Right Side View of Dummy and Front Seat of Occupant Compartment

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



No. 044 Pre-Test Inner Door Panel View

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



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

Intentionally Left Blank

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

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

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

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

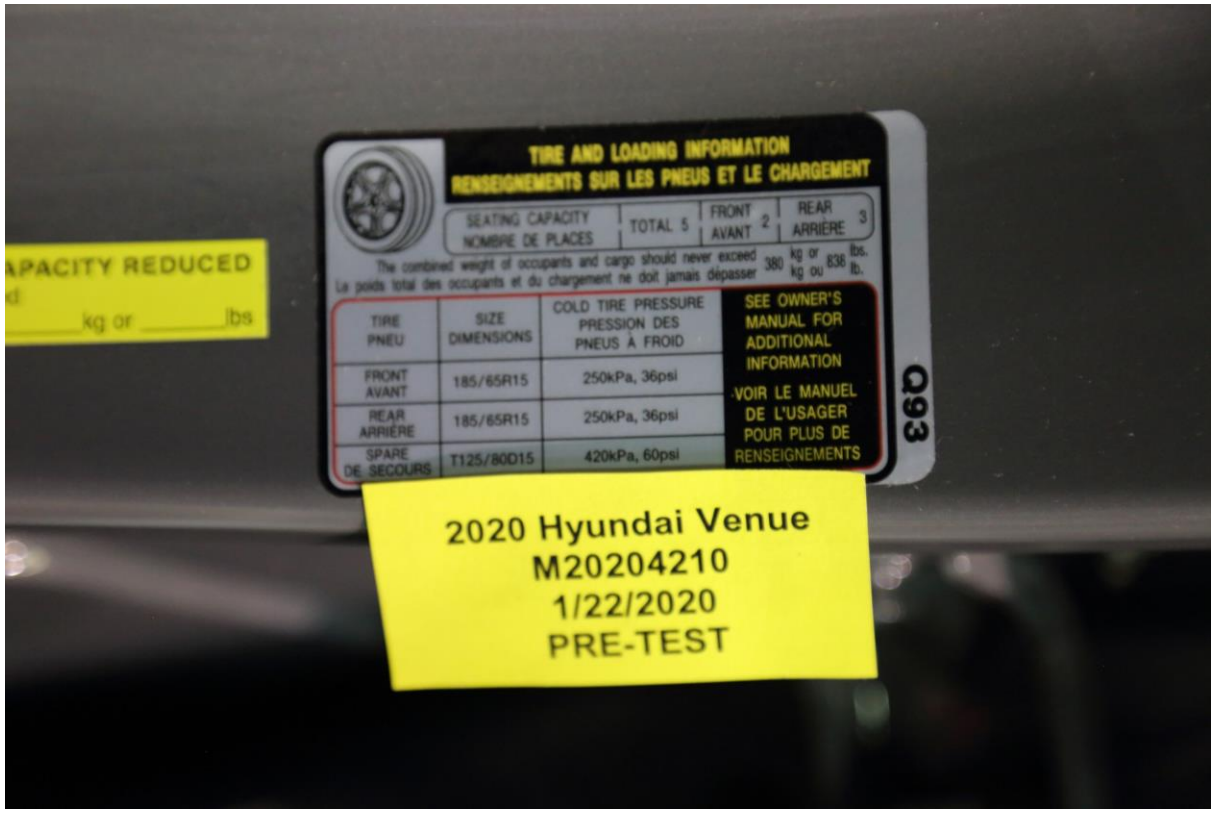
No. 051 Post-Test Dummy Close-Up Pelvis Contact with Side Airbag View

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

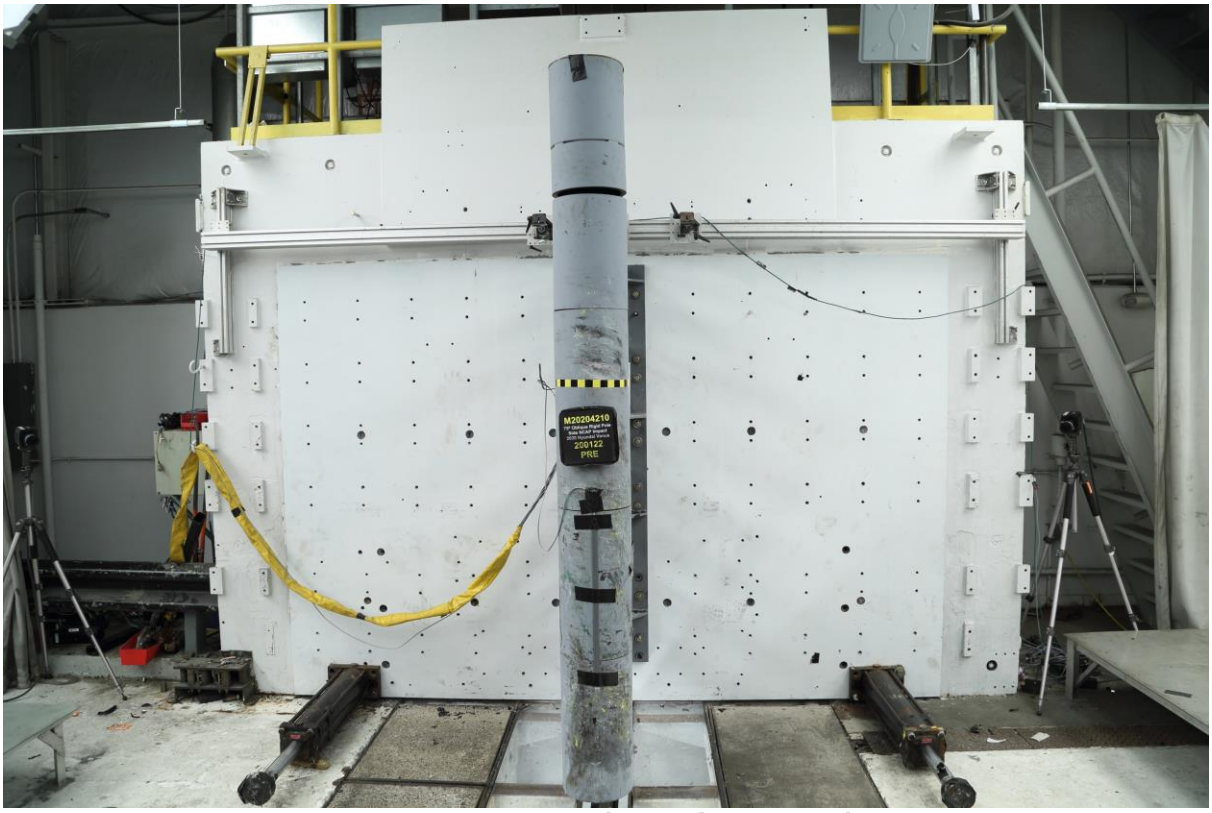
No. 053 Pre-Test View of Fuel Filler Cap or Fuel Filler Neck

No. 054 Post-Test View of Fuel Filler Cap or Fuel Filler Neck

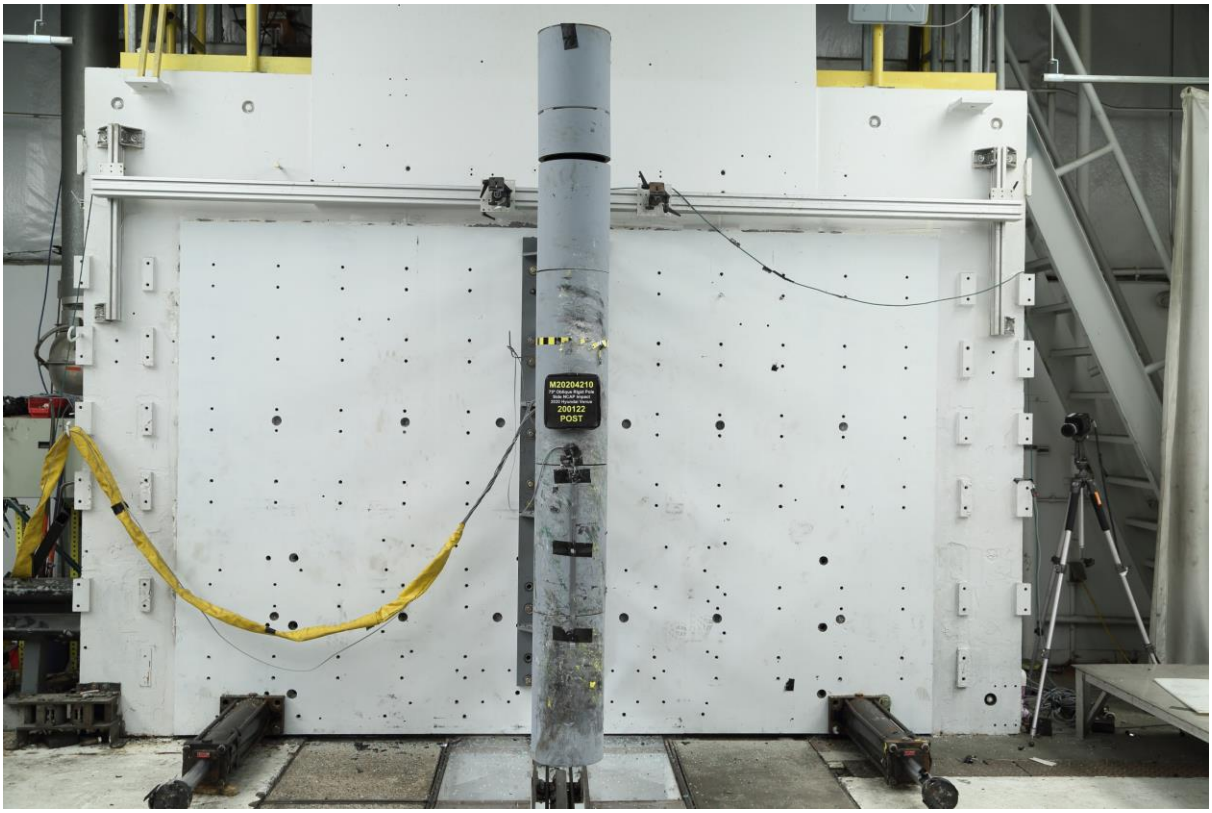
No. 055 Close-Up View of Vehicle Certification Label



No. 056 Close-Up View of Vehicle Tire Information Placard or Label



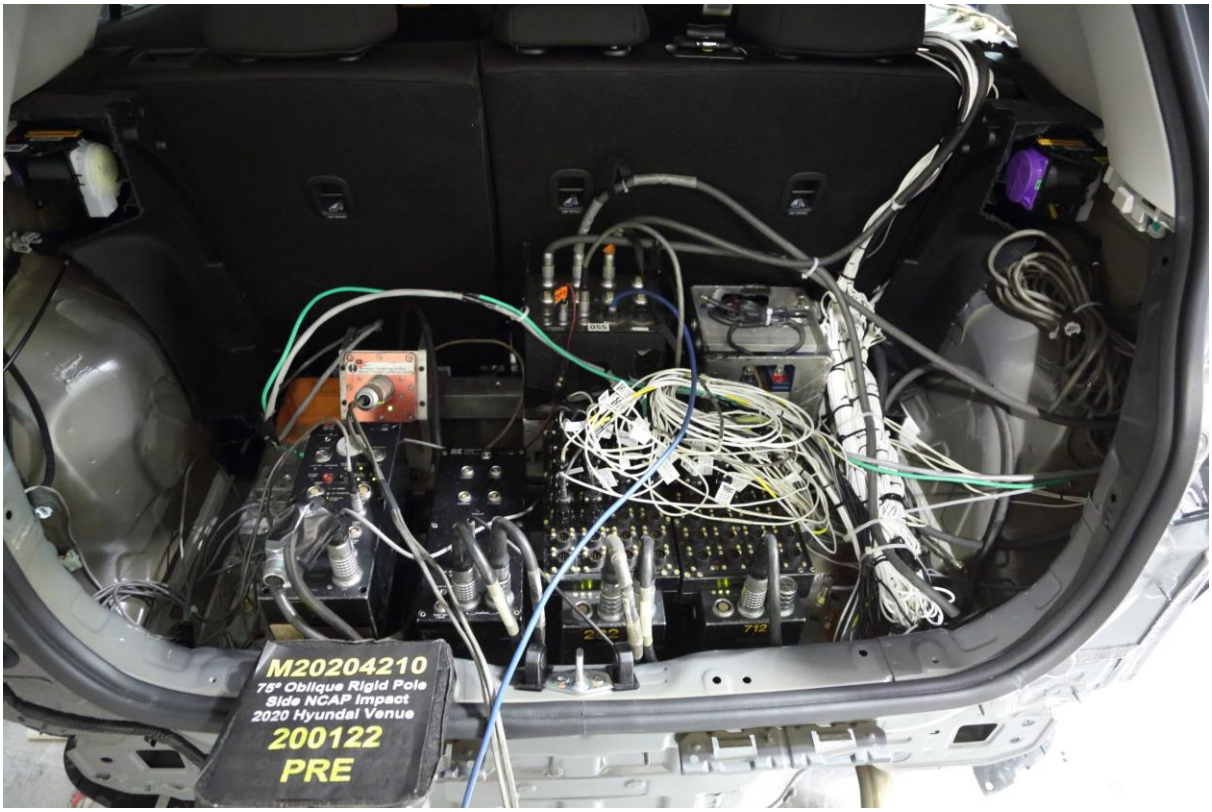
No. 057 Pre-Test Pole Barrier Front View



No. 058 Post-Test Pole Barrier Front View

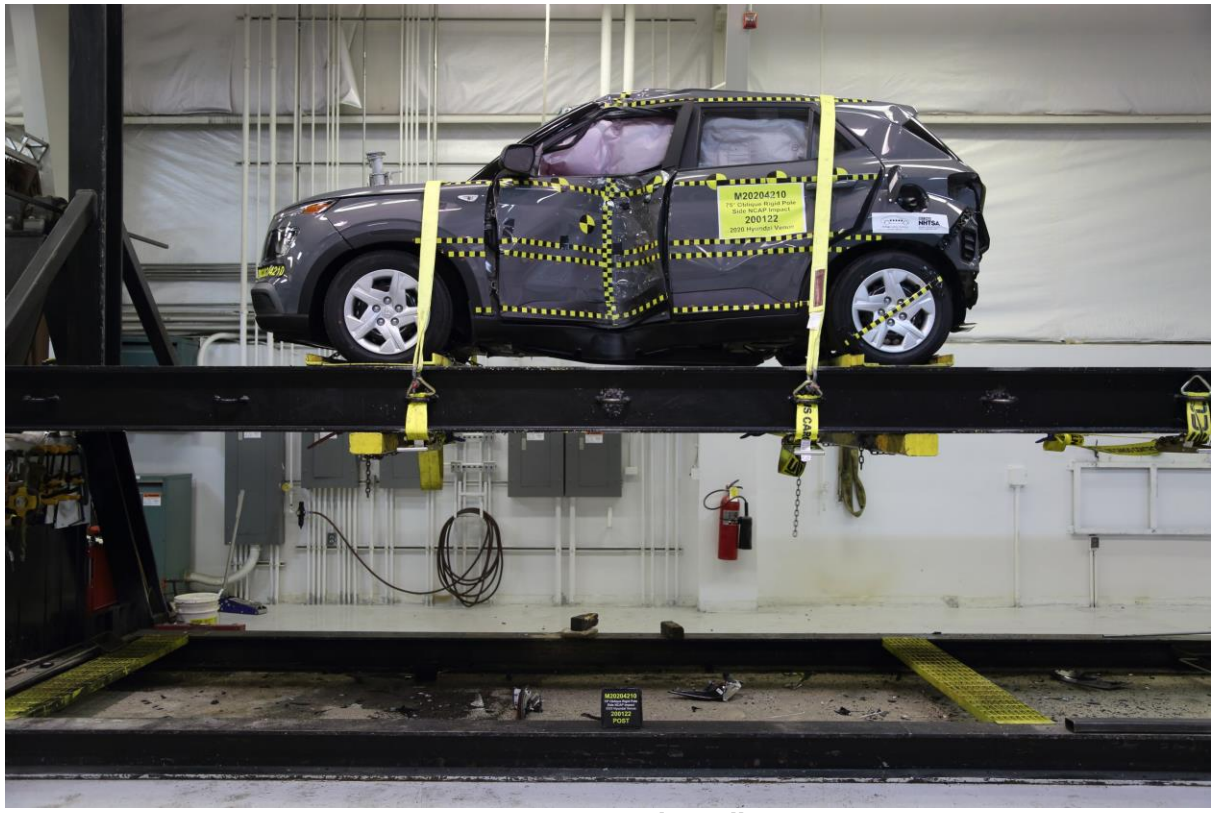
No. 059 Pre-Test Pole Barrier Side View

No. 060 Post-Test Pole Barrier Side View

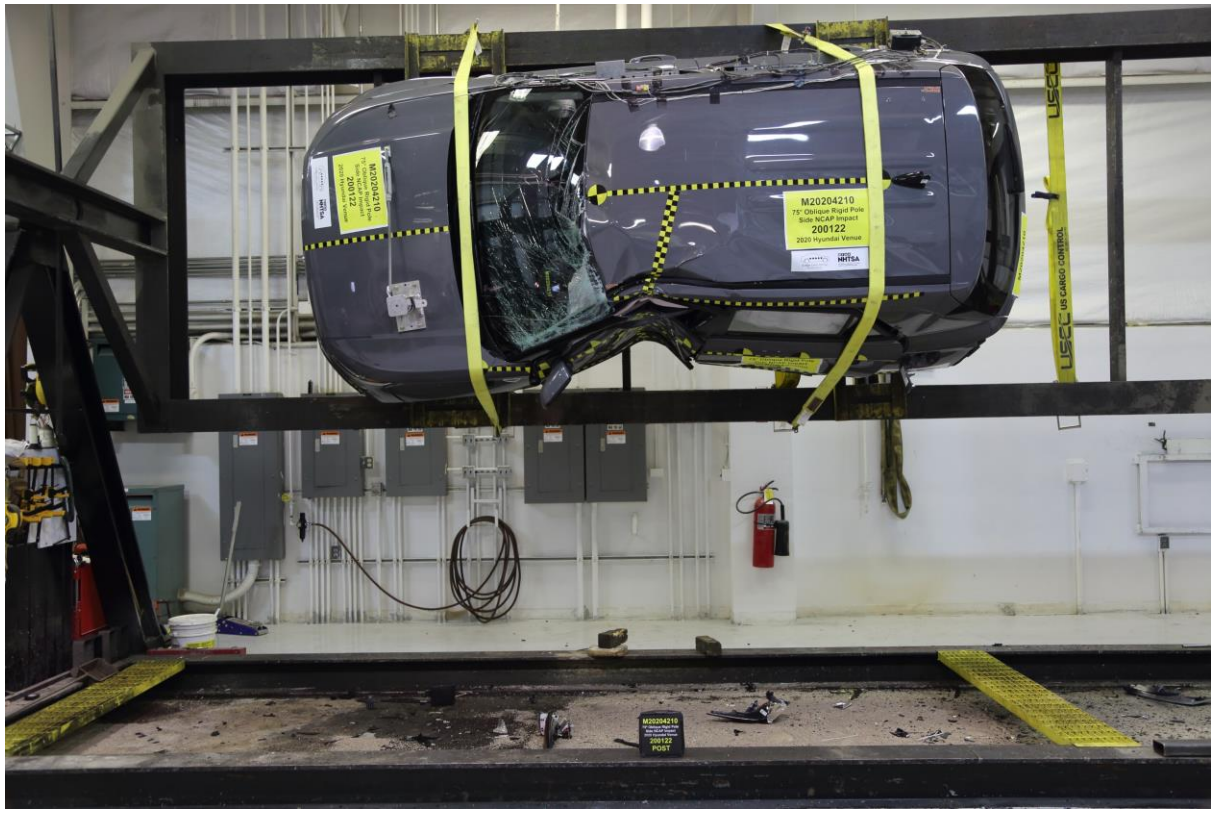


No. 061 Pre-Test Ballast View

No. 062 Post-Test Primary and Redundant Speed Trap Read Out



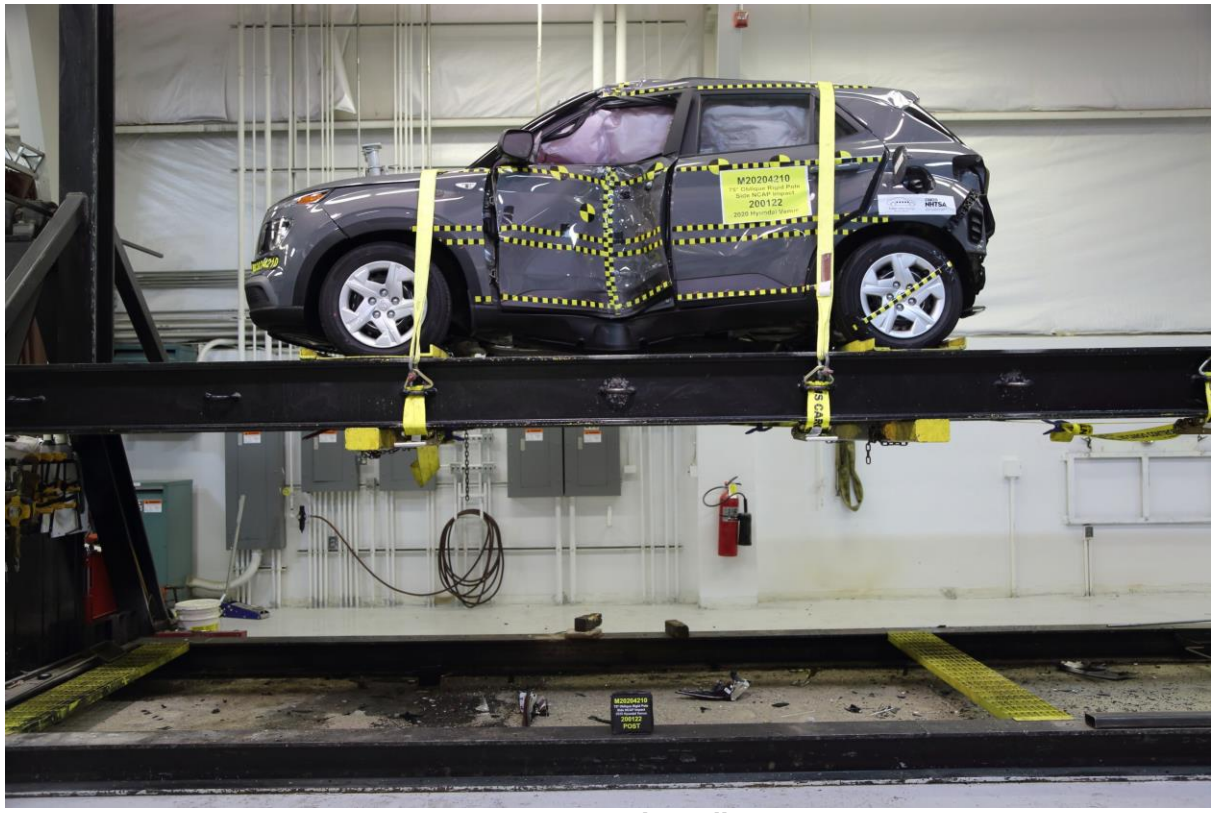
No. 063 FMVSS No. 301 Static Rollover 0 Degrees



No. 064 FMVSS No. 301 Static Rollover 90 Degrees

No. 065 FMVSS No. 301 Static Rollover 180 Degrees

No. 066 FMVSS No. 301 Static Rollover 270 Degrees



No. 067 FMVSS No. 301 Static Rollover 360 Degrees

No. 068 Impact Event

HYUNDAI **2020 VENUE SE**

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Packed with Safety & Connectivity Technology

SOLD TO: NY083 SHIPPED TO: NY083
VISION HYUNDAI
2525 W. HENRIETTA ROAD
ROCHESTER NY 14623

VIN:	KMHRB8A33LU019059
MODEL:	30402F45
ENGINE:	G4FMKU274526
PORT OF ENTRY:	PH
EXTERIOR COLOR:	GALACTIC GRAY
INTERIOR/SEAT COLOR:	BLACK/BLACK
TRANSPORT:	TRUCK
ACCESSORY WEIGHT:	7 lbs./ 3 kgs.
EMISSIONS:	This vehicle is certified to meet emission requirements in all 50 states

GOVERNMENT 5-STAR SAFETY RATINGS

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

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

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy: **32** combined city/hwy MPG (30 city, 34 highway). Small SUVs range from 18 to 120 MPG. The best vehicle rates 136 MPGe.
3.1 gallons per 100 miles

You save **$1,250** in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost **$1,250**

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 7 (1 Worst, 10 Best)
Smog Rating (tailpipe only): 5 (1 Worst, 10 Best)

This vehicle emits 284 grams CO_2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; taxes move all fuels/energy sources.

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

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STANDARD FEATURES:

AMERICA'S BEST WARRANTY	
5-year/60,000-mile New Vehicle Warranty*	INCLUDED
10-year/100,000-mile Powertrain Warranty*	INCLUDED
7-year/Unlimited-mile Anti-perforation Warranty*	INCLUDED
5-year/Unlimited-mile Roadside Assistance	INCLUDED
*Limited warranties, see dealer for details	
ADVANCED SAFETY TECHNOLOGY	
Forward Collision Avoidance Assist w/ Pedestrian Detection	INCLUDED
Lane Keeping Assist	INCLUDED
Electronic Stability Control (ESC) w/ Traction Control	INCLUDED
Front, Front Side Impact & Side Curtain Airbags	INCLUDED
Rearview Camera	INCLUDED
Driver Attention Warning	INCLUDED
Tire Pressure Monitoring System	INCLUDED
POWERTRAIN TECHNOLOGY	
1.6L DPI, 121 HP, 113 lbs-ft Torque, DOHC 4-Cylinder	INCLUDED
Continuous Variable Valve Timing	INCLUDED
Thermal Management Module	INCLUDED
Dual Injection	INCLUDED
Intelligent Variable Transmission	INCLUDED
Hillstart Assist Control	INCLUDED
EXTERIOR	
15-Inch Wheels w/ Full Covers	INCLUDED
185/65R15 Tires	INCLUDED
Body Color Outside Mirrors	INCLUDED
Body Color Door Handles	INCLUDED
COMFORT & CONVENIENCE	
AM/FM/ Audio System w/ 4 Speakers	INCLUDED
8-inch color touchscreen with	INCLUDED
Smartphone/USB & Auxiliary Input Jacks	INCLUDED
Android Auto (TM) & Apple CarPlay (TM)	INCLUDED
Air Conditioning	INCLUDED
Dual Illuminated Vanity Mirrors with Sliding Sunvisor (Driver Only)	INCLUDED
Steering Wheel Mounted Audio & Cruise Controls	INCLUDED
Tilt & Telescopic Steering Wheel	INCLUDED
6-way Adjustable Driver Seat Including Height Adjustment	INCLUDED
60/40 Split-Folding Rear Seat	INCLUDED
2 Stage Rear Cargo Floor	INCLUDED
Dome & Cargo Lights	INCLUDED
Remote Keyless Entry w/ Panic Alert	INCLUDED
Compact Temporary Spare Tire	INCLUDED
*Full Tank of Gas	INCLUDED

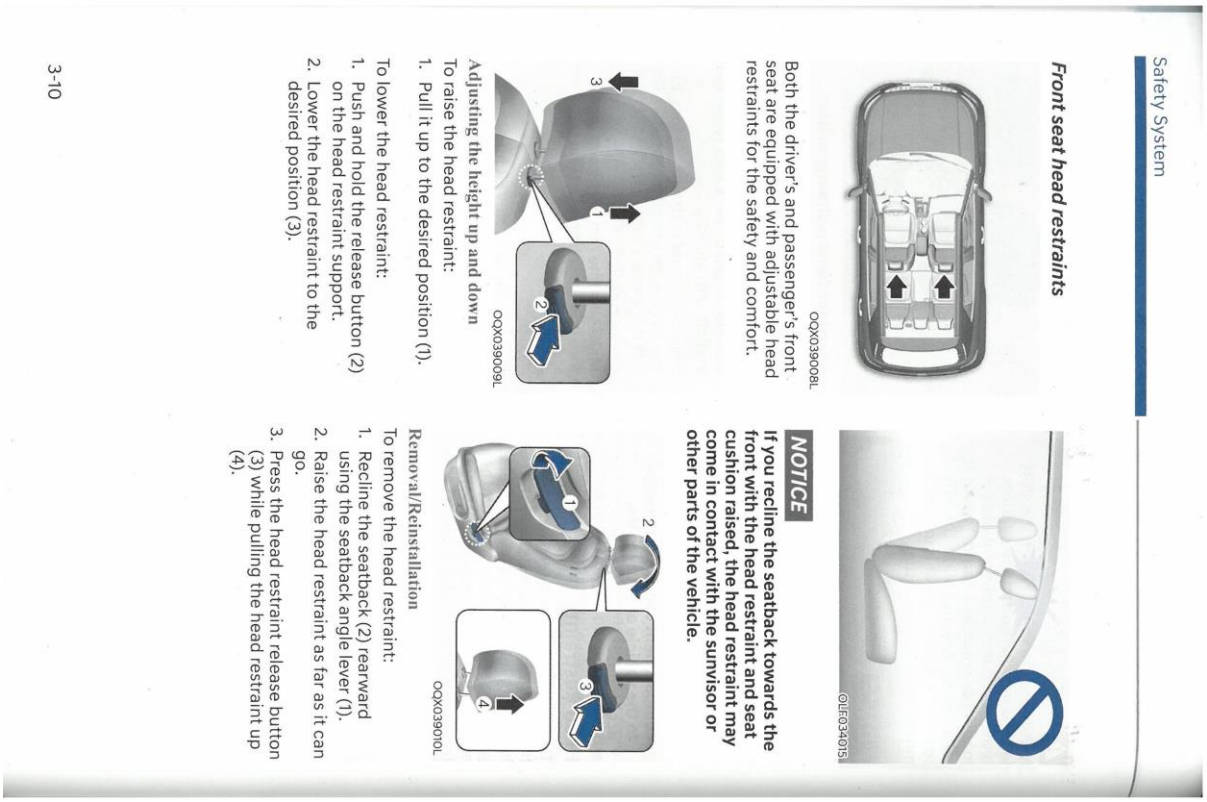
Manufacturer's Suggested Retail Price:	$18,450.00
ADDED FEATURES:	
*Carpeted Floor Mats	$135.00
*Cargo Net	$50.00
*Mud Guards	$120.00
Inland Freight & Handling :	$1,095.00
Total Price :	**$19,850.00**

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

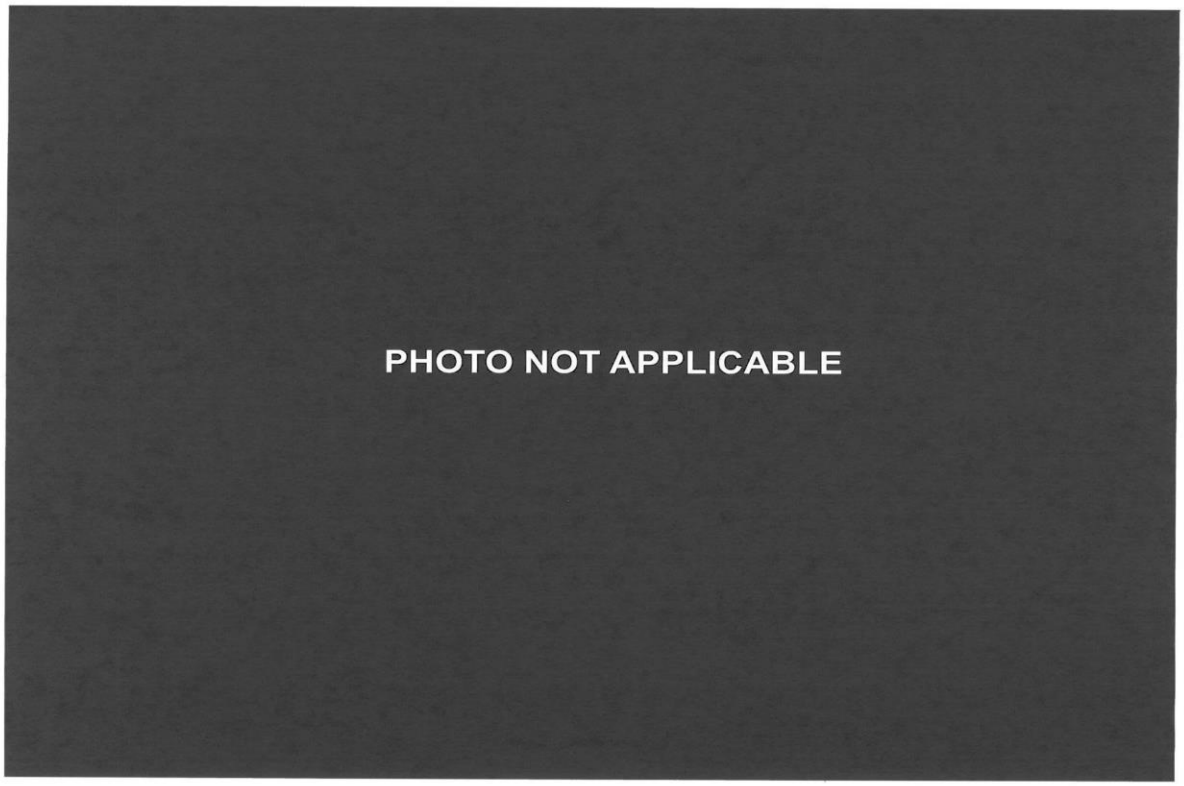
PARTS CONTENT INFORMATION
FOR VEHICLE IN THIS CARLINE:
U.S./CANADIAN PARTS CONTENT:
MAJOR SOURCES OF FOREIGN PARTS CONTENT: KOREA: 97 %
EUROPE: 1 %
Note: Parts content does not include final assembly, distribution, or other non-parts costs.
FOR THIS VEHICLE:
FINAL ASSEMBLY POINT: ULSAN, KOREA
COUNTRY OF ORIGIN:
ENGINE: KOREA
TRANSMISSION: KOREA

311 A 3280QLIBER

No. 069 Monroney Label



No. 070 Head Restraint Use and Adjustment Information from Vehicle Owner Manual



No. 071 Post-Test View of Shattered Vehicle Inner Door Panel

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

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

Additional Driver Dummy Instrumentation Data

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

Vehicle Instrumentation Data

Vehicle Center of Gravity Acceleration (X)
Vehicle Center of Gravity Acceleration (Y)
Vehicle Center of Gravity Acceleration (Z)
Left Floor Sill Acceleration (Y)
Left A-Pillar Sill Acceleration (Y)
Left Lower A-Pillar Acceleration (Y)
Left Mid A-Pillar Acceleration (Y)
Left B-Pillar Sill Acceleration (Y)
Left Lower B-Pillar Acceleration (Y)
Left Mid B-Pillar Acceleration (Y)
Driver Seat Track at Dummy Hip Point Acceleration (Y)
Engine Top Acceleration (X)
Engine Top Acceleration (Y)
Firewall Center Acceleration (Y)
Right Roof at Vertical Impact Reference Line Acceleration (Y)
Right Sill at Vertical Impact Reference Line Acceleration (Y)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)
Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)

Pole Instrumentation Data

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

NHTSA

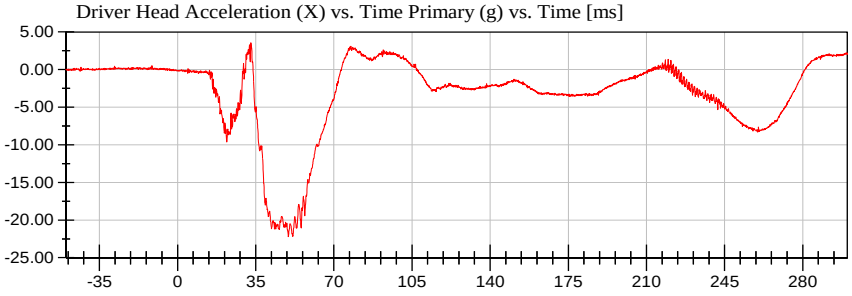
Test Date: 01/22/2020

Position #1 SID IIs Dummy (297)

Test Lab: CTF

Test Number: 200122 (M20204210)

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



<Max>

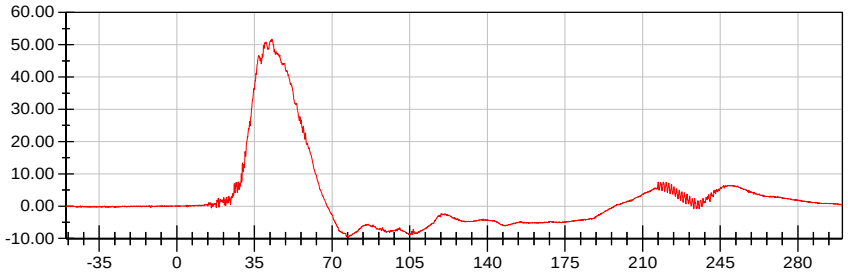
3.55 g at 32.88 ms

<Min>

-22.20 g at 49.60 ms

CFC_1000

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



<Max>

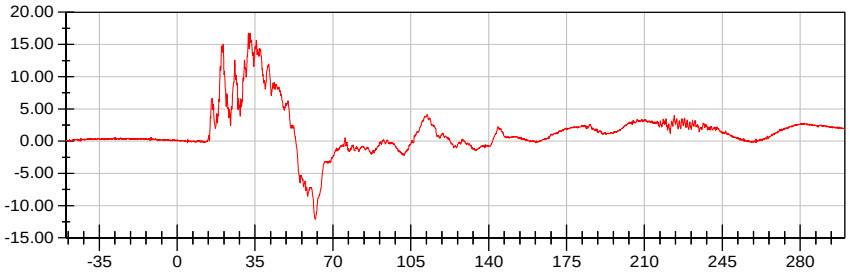
51.76 g at 42.88 ms

<Min>

-9.61 g at 77.36 ms

CFC_1000

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



<Max>

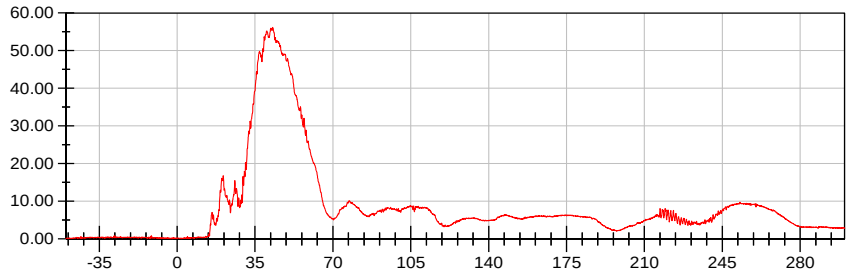
16.75 g at 32.08 ms

<Min>

-12.15 g at 62.00 ms

CFC_1000

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



<Max>

56.18 g at 42.88 ms

<Min>

0.05 g at -3.12 ms

CFC_1000

NHTSA

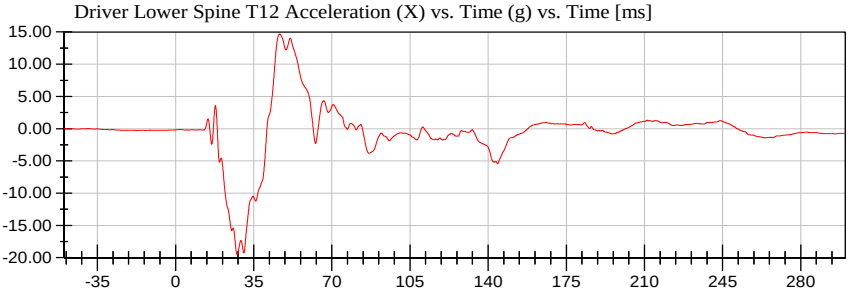
Test Date: 01/22/2020

Position #1 SID IIs Dummy (297)

Test Lab: CTF

Test Number: 200122 (M20204210)

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



<Max>

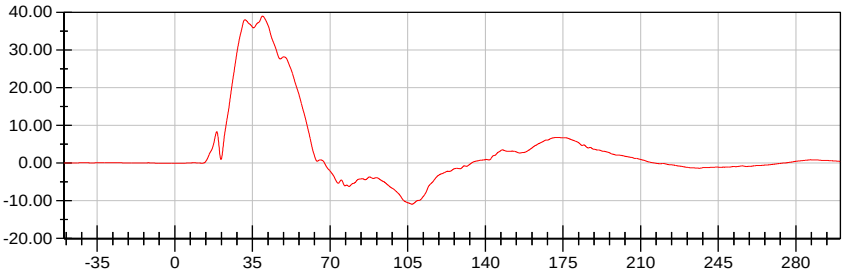
14.66 g at 46.64 ms

<Min>

-19.50 g at 27.52 ms

CFC_180

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



<Max>

39.03 g at 39.52 ms

<Min>

-10.90 g at 106.96 ms

CFC_180

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

<Max>

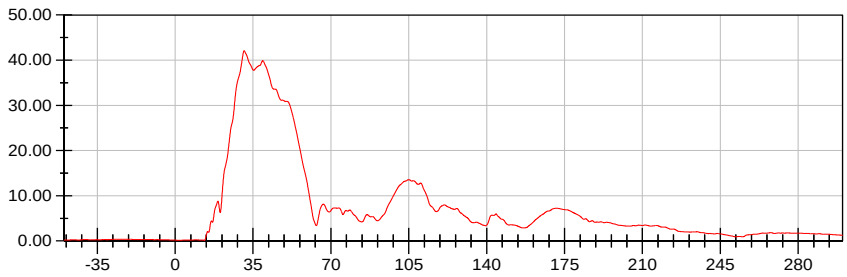
10.68 g at 21.92 ms

<Min>

-9.22 g at 101.12 ms

CFC_180

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



<Max>

42.07 g at 31.04 ms

<Min>

0.09 g at 13.20 ms

CFC_180

NHTSA

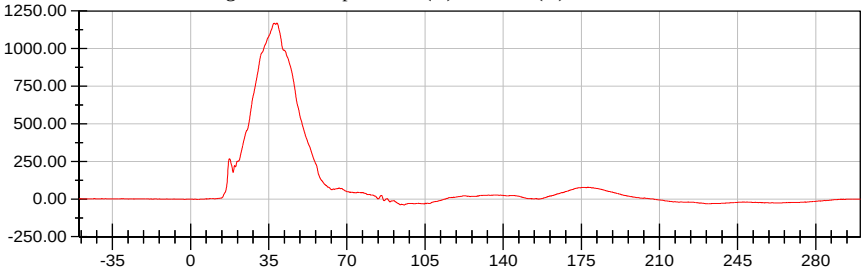
Test Date: 01/22/2020

Position #1 SID IIs Dummy (297)

Test Lab: CTF

Test Number: 200122 (M20204210)

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



<Max>

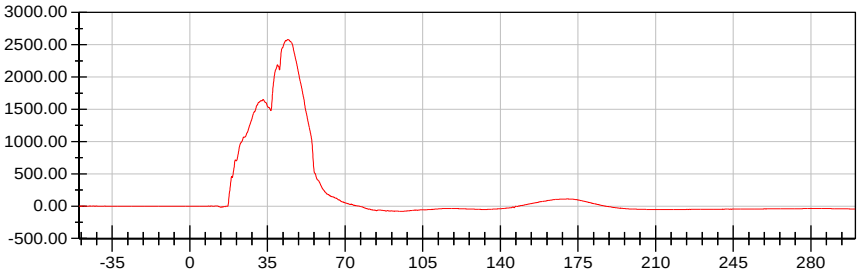
1,169.45 N at 38.72 ms

<Min>

-39.11 N at 95.68 ms

CFC_600

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



<Max>

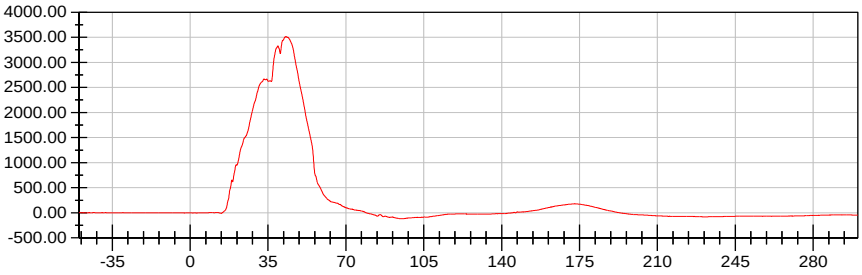
2,582.02 N at 44.16 ms

<Min>

-80.94 N at 95.20 ms

CFC_600

Driver Total Pelvis Force on Impact Side (Y) vs. Time (N) vs. Time [ms]



<Max>

3,513.69 N at 43.12 ms

<Min>

-118.88 N at 95.52 ms

CFC_600

APPENDIX C
DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

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

Pre-Test Calibration Sheets
Driver S/N 297

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. 297 Calibration No. 44

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	780	Yes
B	Shoulder Pivot Height	437.0 - 453.0	450	Yes
C	H-Point Height	79.0 - 89.0	85	Yes
D	H-Point from Seat Back	141.0 - 151.0	147	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	102	Yes
F	Thigh Clearance	119.0 - 135.0	130	Yes
G	Head Breadth	140.0 - 148.0	147	Yes
H	Head Back from Backline	40.0 - 46.0	45	Yes
I	Head Depth	178.0 - 188.0	183	Yes
J	Head Circumference	541.0 - 551.0	544	Yes
K	Buttock to Knee Length	514.0 - 540.0	528	Yes
L	Popliteal Height	343.0 - 369.0	353	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	400	Yes
N	Buttock Popliteal Length	416.0 - 442.0	430	Yes
O	Chest Depth without Jacket	195.0 - 211.0	199	Yes
P	Foot Length (right)	216.0 - 232.0	223	Yes
P	Foot Length (left)	216.0 - 232.0	223	Yes
Q	Hip Breadth	313.0 - 323.0	320	Yes
R	Arm Length	249.0 - 259.0	254	Yes
S	Knee Joint to seat Back	478.0 - 493.0	485	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	347	Yes
W	Foot Width (right)	78.0 - 94.0	85	Yes
W	Foot Width (left)	78.0 - 94.0	85	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	879	Yes
Z	Waist Circumference	761.0 - 791.0	782	Yes

Transportation Research Center Inc.

Left Lateral Head Drop
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	124.2 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-2.6 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	< 15 %	1.15 %	Yes

Test meets specifications.

Condition: Used

Comments:
Head S/N: 1330

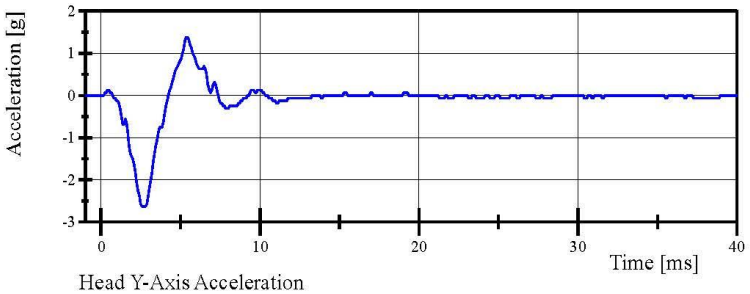
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 11:44:05 197

Transportation Research Center Inc.

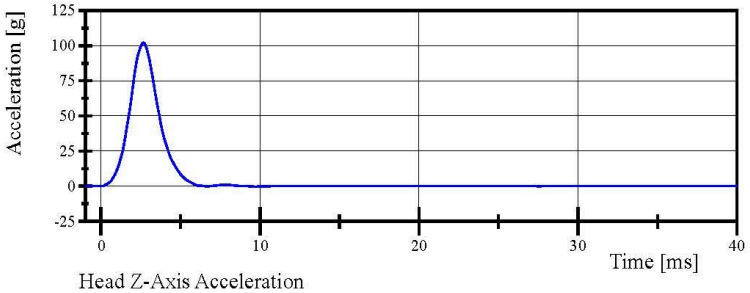
Left Lateral Head Drop
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Head X-Axis Acceleration



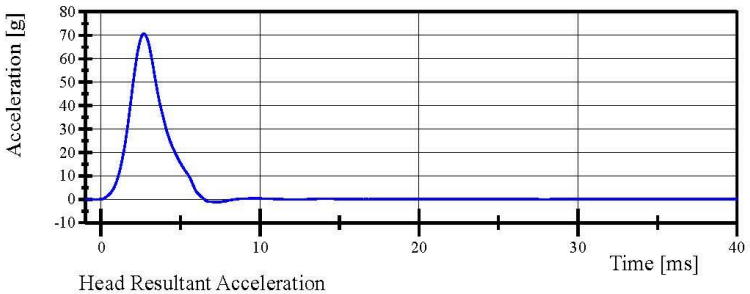
Filter Class: CFC_1000
Max: 1.4 g at 5.4 ms
Min: -2.6 g at 2.6 ms

Head Y-Axis Acceleration



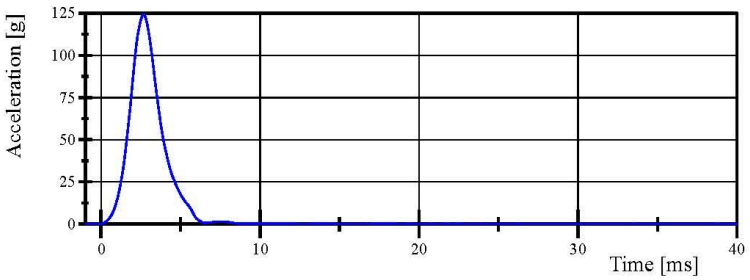
Filter Class: CFC_1000
Max: 102.1 g at 2.6 ms
Min: -0.2 g at 9.6 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 70.6 g at 2.7 ms
Min: -1.2 g at 7.2 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 124.2 g at 2.6 ms
Min: 0.0 g at -1.0 ms

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

12.10.2019 11:44:52 197

Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.604 m/s	Yes
Pendulum Integrated Velocity Change at 10 ms	2.20 - 2.80 m/s	2.467 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.607 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	4.847 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.787 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.911 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-79.6 deg	Yes
Time of Peak	50 - 70 ms	62.7 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	41.7 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	102 - 126 ms	122.6 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: 779

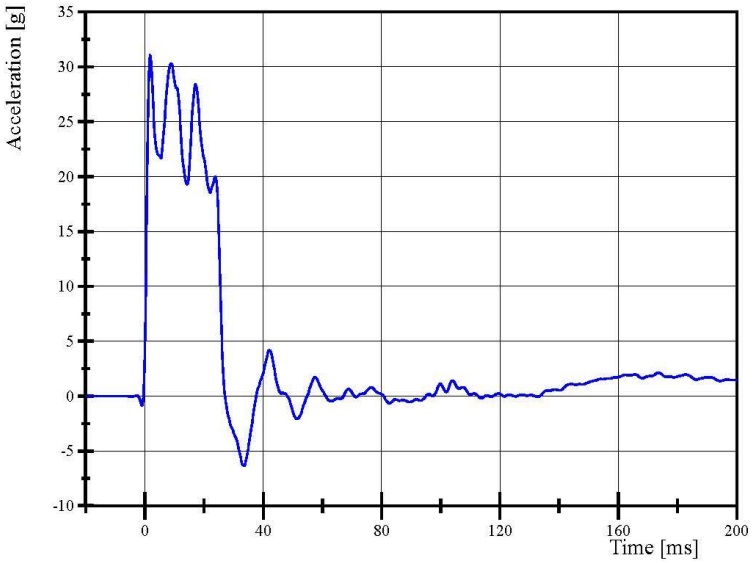
Specification Source: CFR49 Part 572 Subpart V with Polarity in accordance with J211

12.10.2019 12:10:22 718

Transportation Research Center Inc.

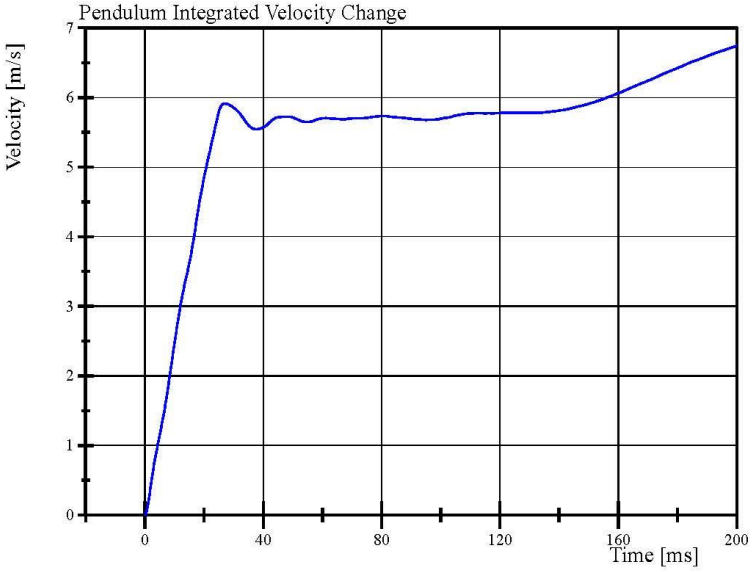
Left Lateral Neck
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Pendulum Acceleration



Filter Class: CFC_180
Max: 31.1 g at 1.8 ms
Min: -6.4 g at 33.6 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 6.7 m/s at 200.0 ms
Min: 0.0 m/s at 0.0 ms

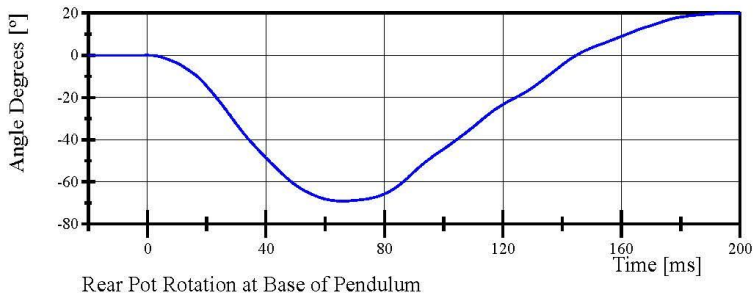
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 12:10:48 718

Transportation Research Center Inc.

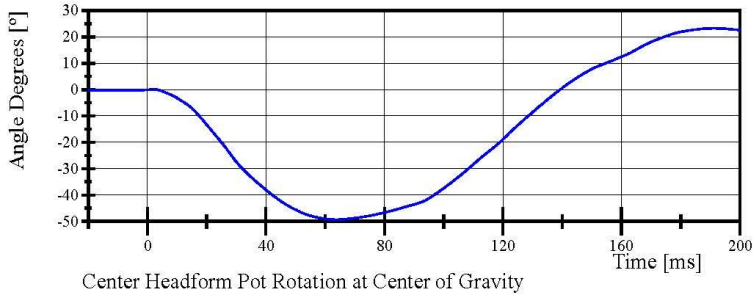
Left Lateral Neck
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Forward Pot Rotation at Base of Pendulum



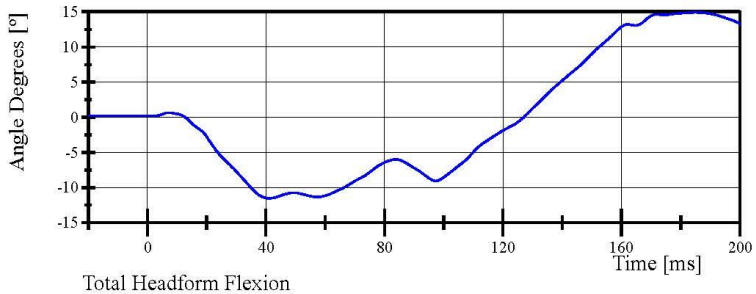
Filter Class: CFC_60
Max: 20.0 ° at 195.0 ms
Min: -69.2 ° at 65.8 ms

Rear Pot Rotation at Base of Pendulum



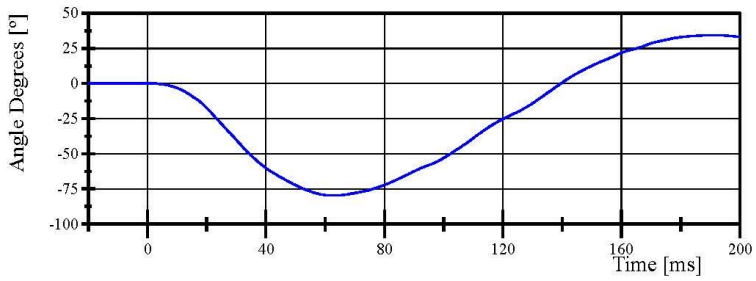
Filter Class: CFC_60
Max: 23.3 ° at 191.2 ms
Min: -49.3 ° at 63.9 ms

Center Headform Pot Rotation at Center of Gravity



Filter Class: CFC_60
Max: 14.9 ° at 184.8 ms
Min: -11.5 ° at 41.0 ms

Total Headform Flexion



Filter Class: CFC_60
Max: 34.4 ° at 191.1 ms
Min: -79.6 ° at 62.7 ms

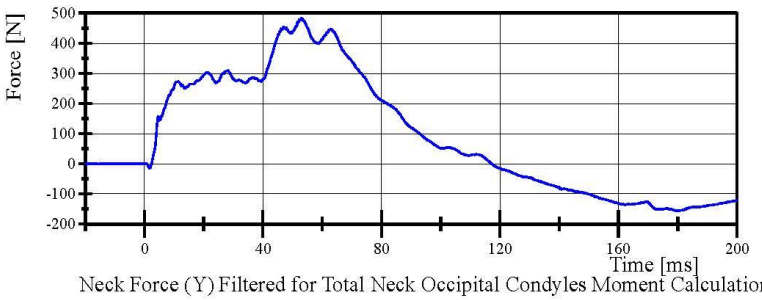
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 12:10:48 718

Transportation Research Center Inc.

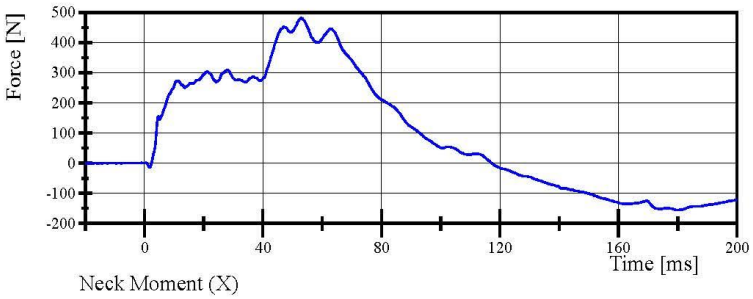
Left Lateral Neck
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Neck Force (Y)



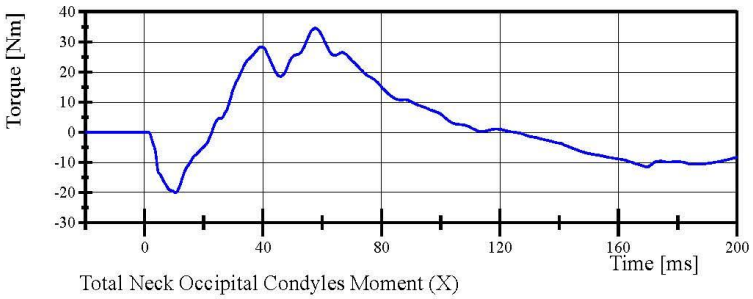
Filter Class: CFC_1000
Max: 482.9 N at 53.0 ms
Min: -155.7 N at 180.0 ms

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



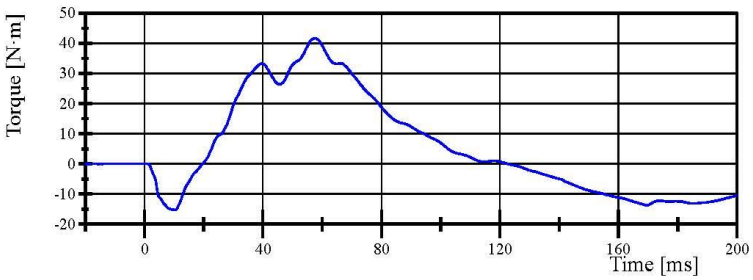
Filter Class: CFC_600
Max: 481.8 N at 53.0 ms
Min: -155.4 N at 180.1 ms

Neck Moment (X)



Filter Class: CFC_600
Max: 34.6 Nm at 57.6 ms
Min: -20.1 Nm at 10.5 ms

Total Neck Occipital Condyles Moment (X)



Filter Class: Without_(Constar
Max: 41.7 N·m at 57.5 ms
Min: -15.3 N·m at 10.3 ms

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

12.10.2019 12:10:49 718

Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.27 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-14.9 g	Yes
Shoulder Displacement	28 - 37 mm	30.9 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	19.1 g	Yes

Test meets specifications.

Condition: Used
Comments:
Left Arm S/N: 940L
Shoulder Rib S/N: 180-3355 259

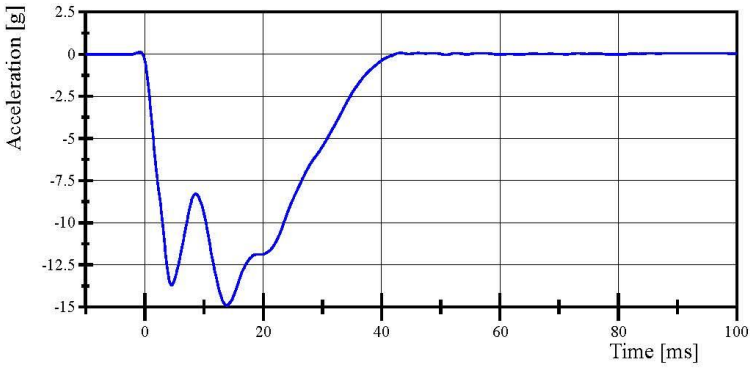
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 08:50:22 911

Transportation Research Center Inc.

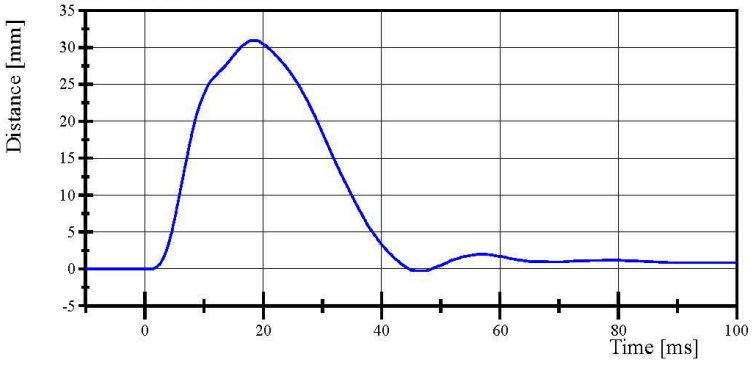
Left Lateral Shoulder
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Probe Acceleration



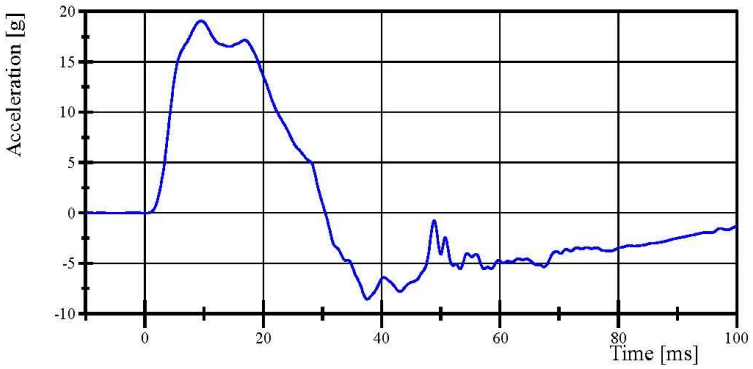
Filter Class: CFC_180
Max: 0.1 g at -0.8 ms
Min: -14.9 g at 13.8 ms

Shoulder Displacement



Filter Class: CFC_600
Max: 30.9 mm at 18.7 ms
Min: -0.2 mm at 47.4 ms

Upper Spine Acceleration (Y)



Filter Class: CFC_180
Max: 19.1 g at 9.5 ms
Min: -8.6 g at 37.5 ms

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

12.10.2019 08:50:53 911

Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.740 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-32.9 g	Yes
Shoulder Displacement	31 - 40 mm	35.7 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	27.0 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	31.0 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	34.1 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	37.7 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	35.1 g	Yes

Test meets specifications.

Condition: Used

Comments:
Left Arm S/N: 940L
Shoulder Rib S/N: 180-3355 259
Upper Thorax Rib #1 S/N: DM5020
Middle Thorax Rib #2 S/N: DM5021
Lower Thorax Rib #3 S/N: DM5022

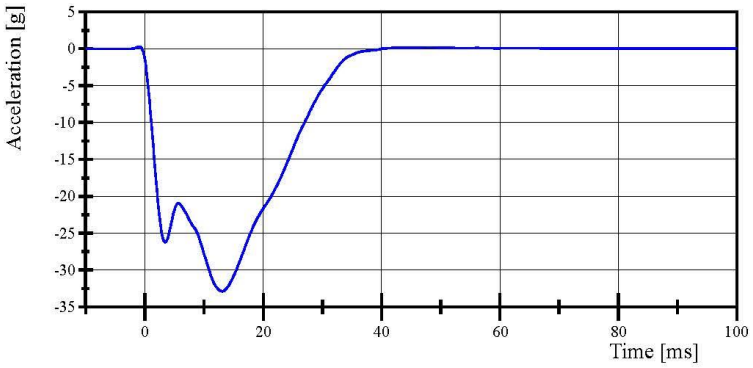
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 10:09:29 606

Transportation Research Center Inc.

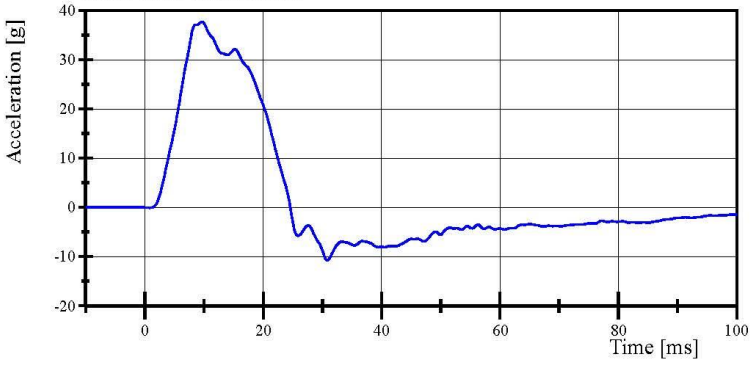
Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Probe Acceleration



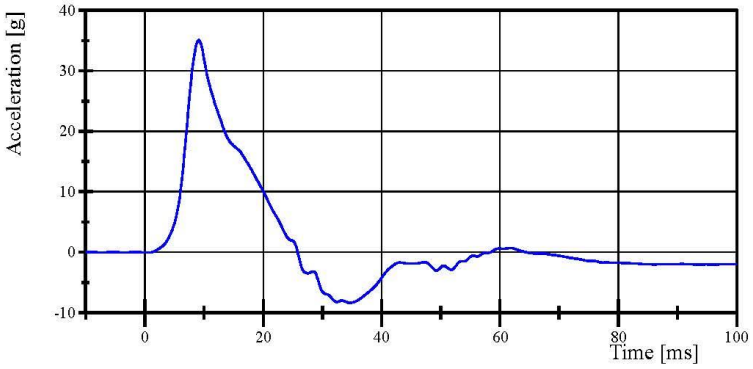
Filter Class: CFC_180
Max: 0.3 g at -1.0 ms
Min: -32.9 g at 13.1 ms

Upper Spine Acceleration



Filter Class: CFC_180
Max: 37.7 g at 9.7 ms
Min: -10.8 g at 30.8 ms

Lower Spine Acceleration



Filter Class: CFC_180
Max: 35.1 g at 9.1 ms
Min: -8.4 g at 34.6 ms

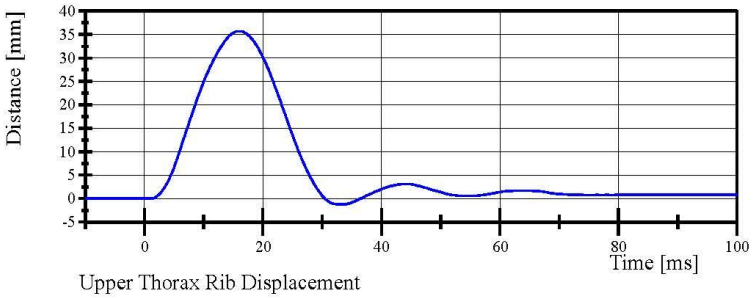
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 10:10:22 606

Transportation Research Center Inc.

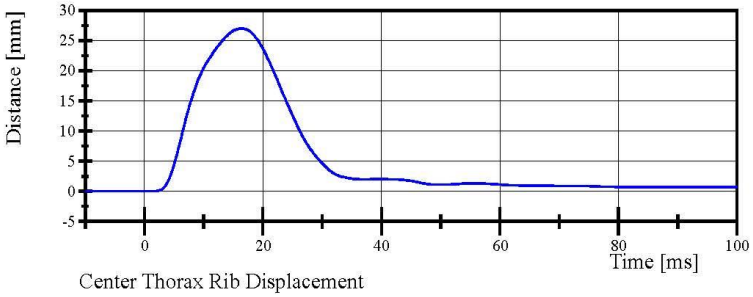
Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Shoulder Rib Displacement



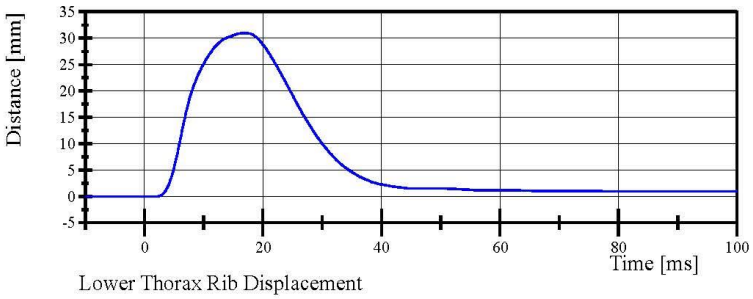
Filter Class: CFC_600
Max: 35.7 mm at 15.8 ms
Min: -1.3 mm at 32.9 ms

Upper Thorax Rib Displacement



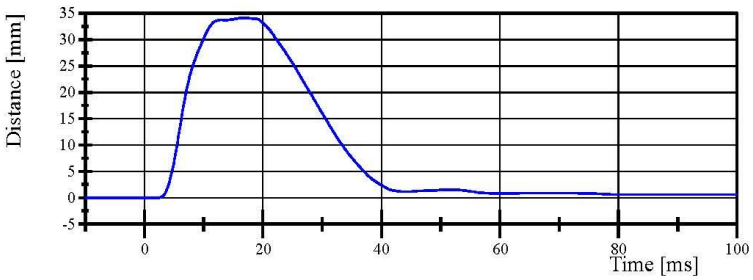
Filter Class: CFC_600
Max: 27.0 mm at 16.3 ms
Min: -0.0 mm at -6.8 ms

Center Thorax Rib Displacement



Filter Class: CFC_600
Max: 31.0 mm at 16.7 ms
Min: -0.0 mm at 1.9 ms

Lower Thorax Rib Displacement



Filter Class: CFC_600
Max: 34.1 mm at 16.5 ms
Min: -0.0 mm at 1.4 ms

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

12.10.2019 10:10:22 606

Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.333 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-15.4 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	37.3 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	41.8 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	9.3 g	Yes

Test meets specifications.

Condition: Used

Comments:
Upper Thorax Rib #1 S/N: DM5020
Middle Thorax Rib #2 S/N: DM5021
Lower Thorax Rib #3 S/N: DM5022

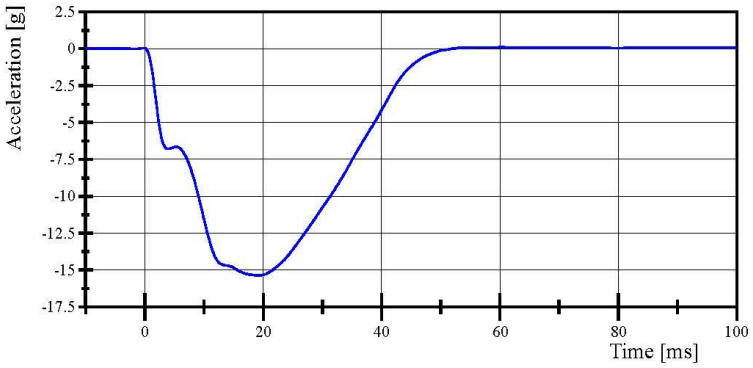
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 09:22:14 840

Transportation Research Center Inc.

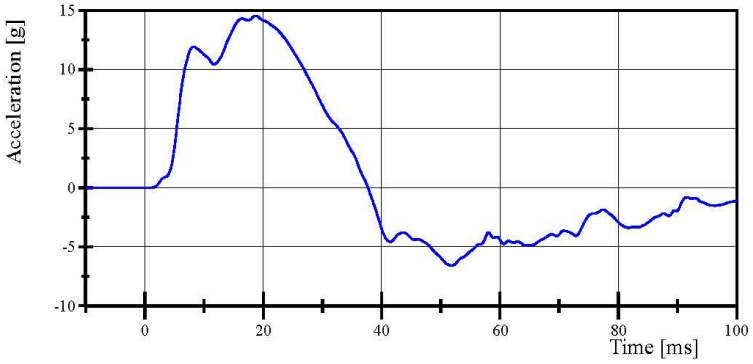
Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Probe Acceleration



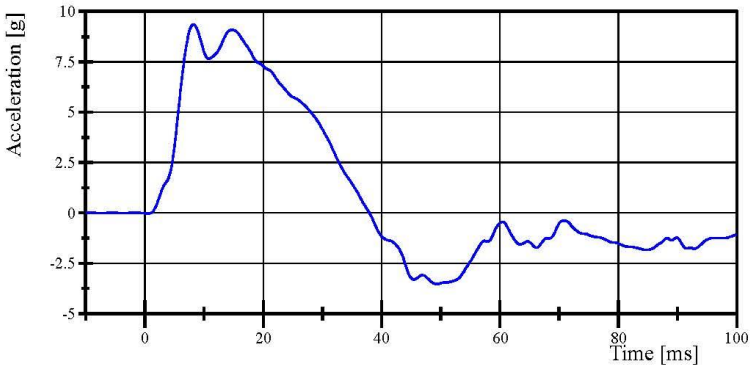
Filter Class: CFC_180
Max: 0.1 g at 60.4 ms
Min: -15.4 g at 19.1 ms

Upper Spine Acceleration



Filter Class: CFC_180
Max: 14.5 g at 18.7 ms
Min: -6.6 g at 51.8 ms

Lower Spine Acceleration



Filter Class: CFC_180
Max: 9.3 g at 8.2 ms
Min: -3.5 g at 49.4 ms

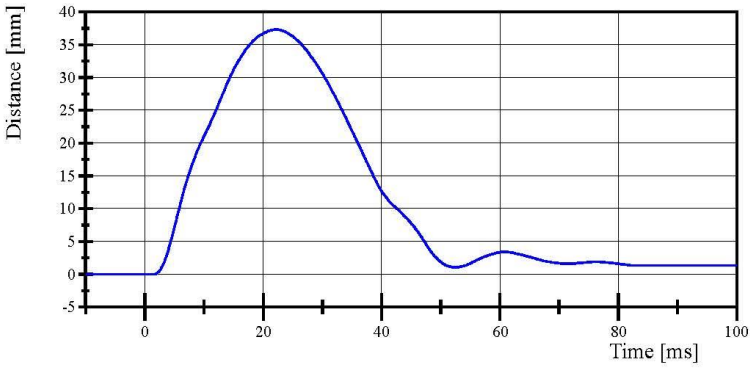
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 09:22:58 840

Transportation Research Center Inc.

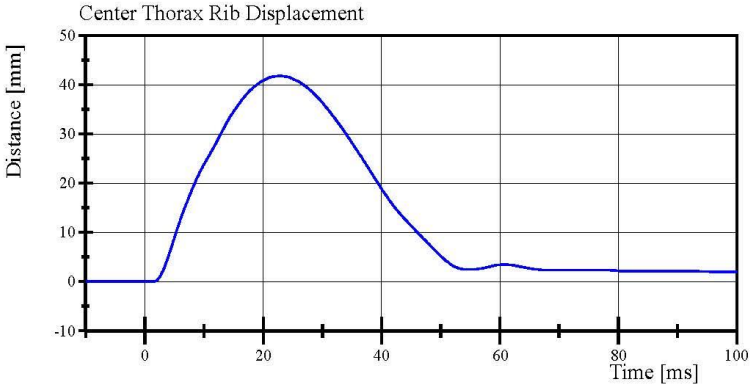
Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Upper Thorax Rib Displacement



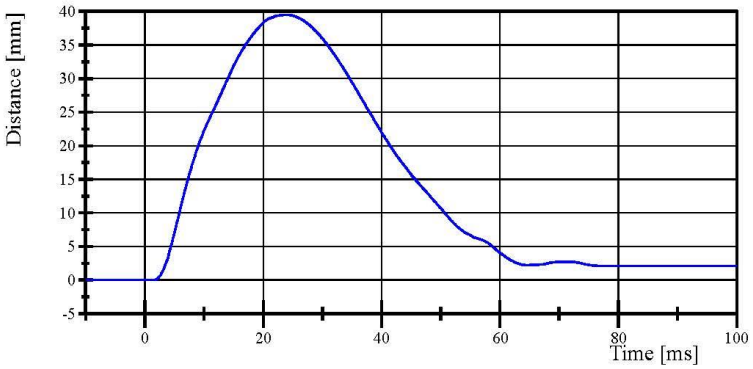
Filter Class: CFC_600
Max: 37.3 mm at 22.2 ms
Min: -0.0 mm at 1.2 ms

Center Thorax Rib Displacement



Filter Class: CFC_600
Max: 41.8 mm at 22.8 ms
Min: -0.0 mm at 1.4 ms

Lower Thorax Rib Displacement



Filter Class: CFC_600
Max: 39.5 mm at 24.2 ms
Min: -0.0 mm at 1.4 ms

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

12.10.2019 09:22:59 840

Transportation Research Center Inc.

Left Lateral Abdomen
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.5 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	39.0 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	39.6 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	10.99 g	Yes

Test meets specifications.

Condition: Used

Comments:
Upper Abdominal Rib S/N: DM7281
Lower Abdominal Rib S/N: DM7275

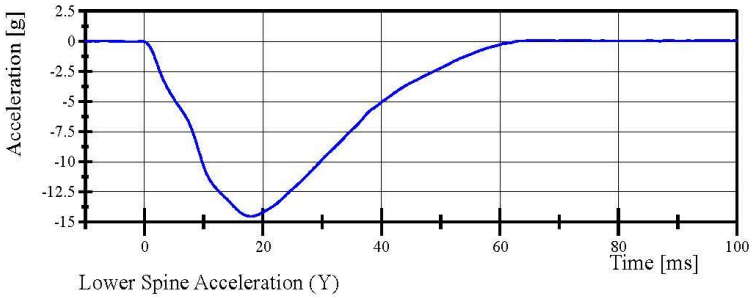
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 09:03:19 669

Transportation Research Center Inc.

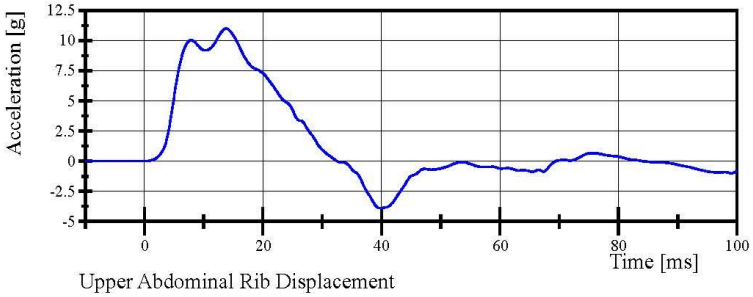
Left Lateral Abdomen
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Probe Acceleration



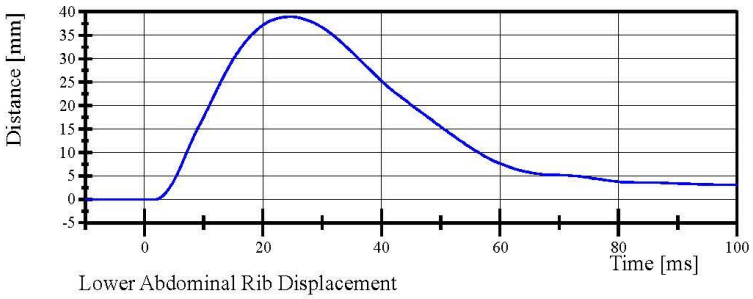
Filter Class: CFC_180
Max: 0.1 g at 67.3 ms
Min: -14.5 g at 17.9 ms

Lower Spine Acceleration (Y)



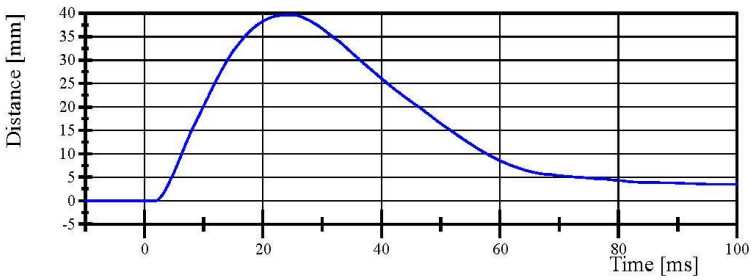
Filter Class: CFC_180
Max: 11.0 g at 13.8 ms
Min: -3.9 g at 39.8 ms

Upper Abdominal Rib Displacement



Filter Class: CFC_600
Max: 39.0 mm at 24.8 ms
Min: -0.0 mm at 1.7 ms

Lower Abdominal Rib Displacement



Filter Class: CFC_600
Max: 39.6 mm at 23.8 ms
Min: -0.0 mm at 1.8 ms

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

12.10.2019 09:04:12 669

Transportation Research Center Inc.

Left Lateral Pelvis
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.61 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-44.12 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	38.1 g	Yes
Acetabulum Force	3,600 - 4,300 N	4,238.7 N	Yes

Test meets specifications.

Condition: Used

Comments:
Pelvis Skin S/N: EN1590
Pelvis Plug Info:
Manufacturer: Saco
S/N: 12779
Cal Date: 20190117

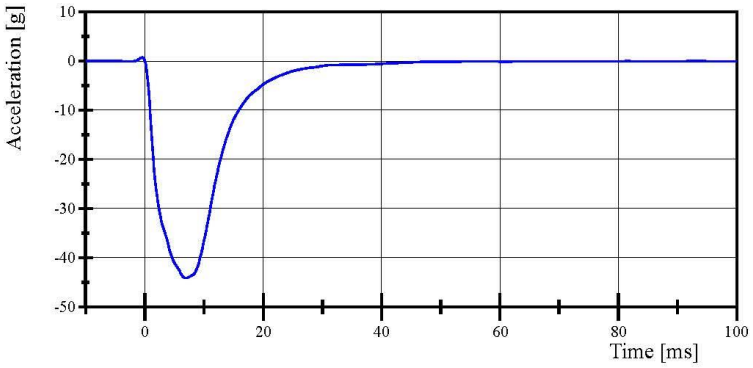
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 08:31:11 422

Transportation Research Center Inc.

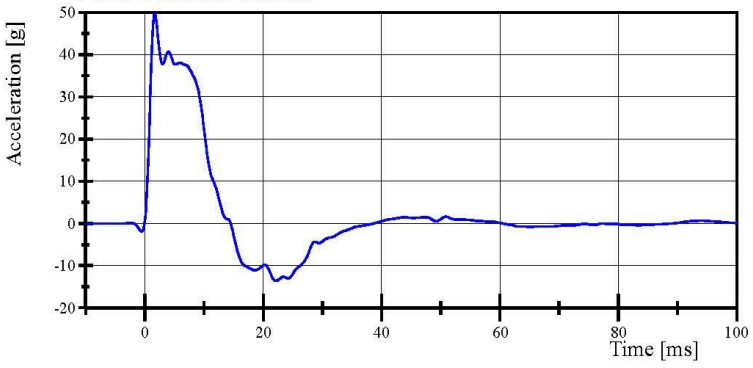
Left Lateral Pelvis
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Probe Acceleration



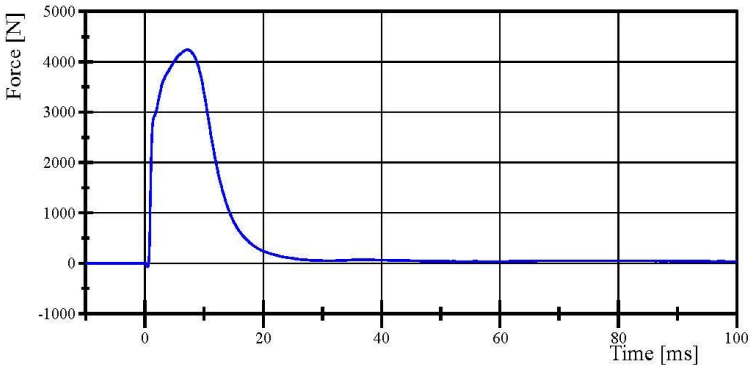
Filter Class: CFC_180
Max: 0.8 g at -0.5 ms
Min: -44.1 g at 7.0 ms

Pelvis Y-Axis Acceleration



Filter Class: CFC_180
Max: 49.8 g at 1.7 ms
Min: -13.6 g at 22.2 ms

Acetabulum Y-Axis Force



Filter Class: CFC_600
Max: 4,238.7 N at 7.2 ms
Min: -72.7 N at 0.5 ms

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

12.10.2019 08:37:21 422

Transportation Research Center Inc.

Left Lateral Iliac
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.23 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-40.4 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	29.4 g	Yes
Iliac Force	4,100 - 5,100 N	4,662.1 N	Yes

Test meets specifications.

Condition: Used

Comments:
Pelvis S/N: EN1590

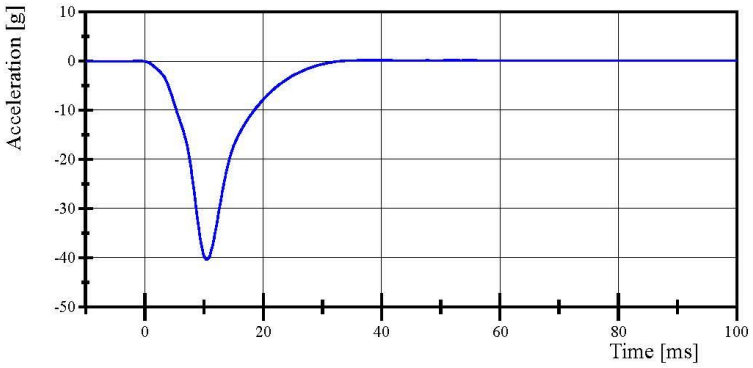
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

12.10.2019 11:06:36 702

Transportation Research Center Inc.

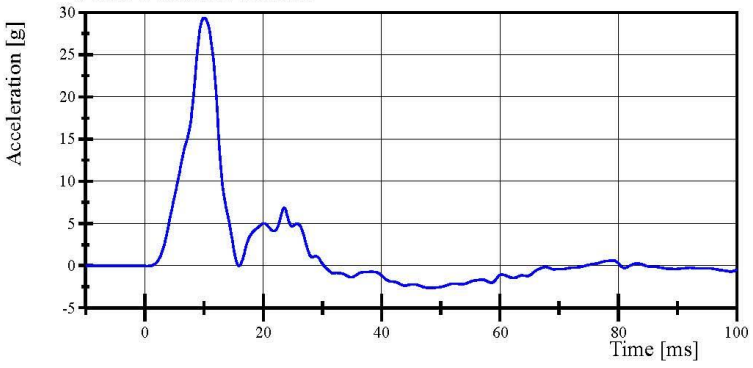
Left Lateral Iliac
SID IIs Serial No. 297 Certification No. 44-1
Test Date: 12/10/2019

Probe Acceleration



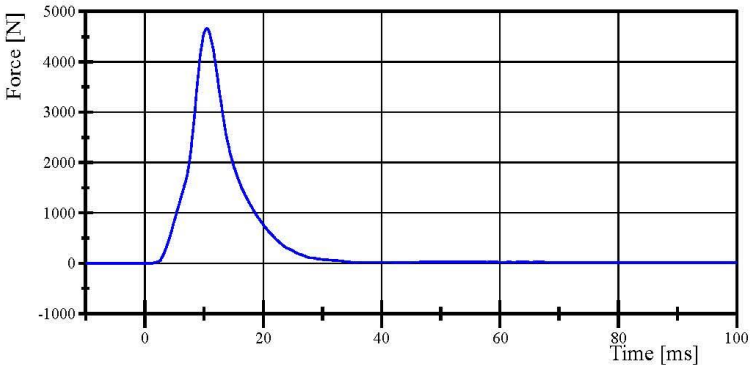
Filter Class: CFC_180
Max: 0.2 g at 55.1 ms
Min: -40.4 g at 10.5 ms

Pelvis Y-Axis Acceleration



Filter Class: CFC_180
Max: 29.4 g at 10.0 ms
Min: -2.6 g at 48.1 ms

Iliac Y-Axis Force



Filter Class: CFC_600
Max: 4,662.1 N at 10.5 ms
Min: -1.0 N at -4.1 ms

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

12.10.2019 11:07:22 702

Post-Test Calibration Sheets
Driver S/N 297

Transportation Research Center Inc.
SIDIIs Dummy - Level D
External Dimensions
Serial No. 297 Calibration No. 45

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Sitting Height	772.0 - 788.0	781	Yes
B	Shoulder Pivot Height	437.0 - 453.0	450	Yes
C	H-Point Height	79.0 - 89.0	85	Yes
D	H-Point from Seat Back	141.0 - 151.0	147	Yes
E	Shoulder Pivot from Backline	97.0 - 107.0	102	Yes
F	Thigh Clearance	119.0 - 135.0	131	Yes
G	Head Breadth	140.0 - 148.0	147	Yes
H	Head Back from Backline	40.0 - 46.0	45	Yes
I	Head Depth	178.0 - 188.0	183	Yes
J	Head Circumference	541.0 - 551.0	544	Yes
K	Buttock to Knee Length	514.0 - 540.0	528	Yes
L	Popliteal Height	343.0 - 369.0	353	Yes
M	Knee Pivot to Floor Height	393.0 - 409.0	400	Yes
N	Buttock Popliteal Length	416.0 - 442.0	430	Yes
O	Chest Depth without Jacket	195.0 - 211.0	200	Yes
P	Foot Length (right)	216.0 - 232.0	223	Yes
P	Foot Length (left)	216.0 - 232.0	223	Yes
Q	Hip Breadth	313.0 - 323.0	320	Yes
R	Arm Length	249.0 - 259.0	254	Yes
S	Knee Joint to seat Back	478.0 - 493.0	485	Yes
V	Shoulder Width (only one arm installed)	341.0 - 357.0	347	Yes
W	Foot Width (right)	78.0 - 94.0	85	Yes
W	Foot Width (left)	78.0 - 94.0	85	Yes
Y	Chest Circumference with Jacket	851.0 - 881.0	879	Yes
Z	Waist Circumference	761.0 - 791.0	782	Yes

Transportation Research Center Inc.

Left Lateral Head Drop
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Peak Head Resultant Acceleration	115 - 137 g	127.0 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-5.5 g	Yes
Is Head Resultant Acceleration Curve Unimodal within 15% of Peak?	< 15 %	3.17 %	Yes

Test meets specifications.

Condition: Used

Comments:
Head S/N: 1330

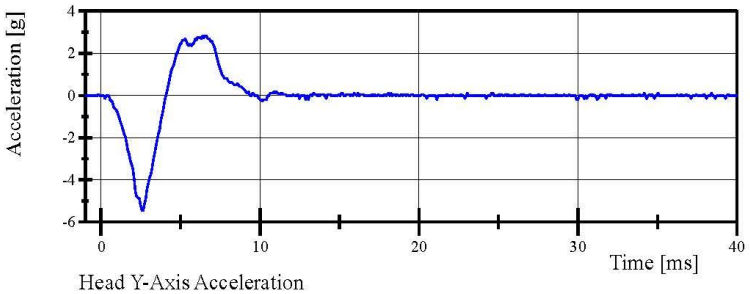
Specification Source: CFR49 Part 572 Subpart V with Polarity in accordance with J211

01.23.2020 11:57:00 234

Transportation Research Center Inc.

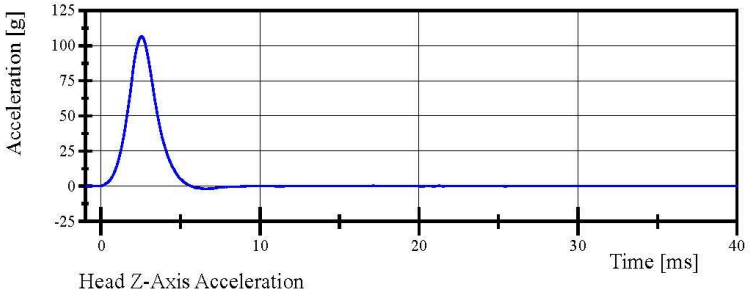
Left Lateral Head Drop
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Head X-Axis Acceleration



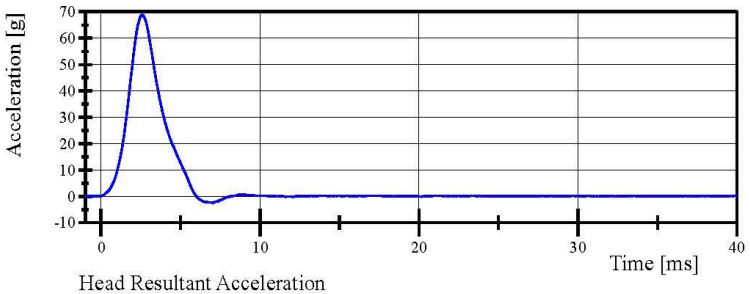
Filter Class: CFC_1000
Max: 2.8 g at 6.4 ms
Min: -5.5 g at 2.6 ms

Head Y-Axis Acceleration



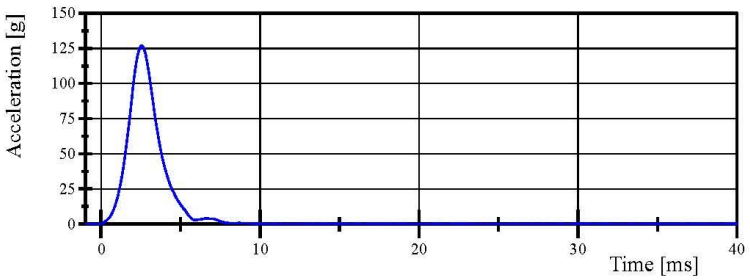
Filter Class: CFC_1000
Max: 106.6 g at 2.6 ms
Min: -1.8 g at 6.6 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 68.8 g at 2.6 ms
Min: -2.5 g at 7.0 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 127.0 g at 2.6 ms
Min: 0.0 g at -1.0 ms

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

01.23.2020 11:57:36 234

Transportation Research Center Inc.

Left Lateral Neck
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Pendulum Velocity	(-5.51) - (-5.63) m/s	-5.606 m/s	Yes
Pendulum Integrated Velocity Change at 10 ms	2.20 - 2.80 m/s	2.292 m/s	Yes
Change at 15 ms	3.30 - 4.10 m/s	3.382 m/s	Yes
Change at 20 ms	4.40 - 5.40 m/s	4.604 m/s	Yes
Change at 25 ms	5.40 - 6.10 m/s	5.567 m/s	Yes
Change at 25 to 100 ms	5.50 - 6.20 m/s	5.839 m/s	Yes
Maximum Headform Flexion occurring between 50ms and 70ms.			
Peak	(-71) - (-81) deg	-78.7 deg	Yes
Time of Peak	50 - 70 ms	63.5 ms	Yes
Total Neck Occipital Condyles Moment	36 - 44 N·m	38.4 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	102 - 126 ms	124.6 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: 779

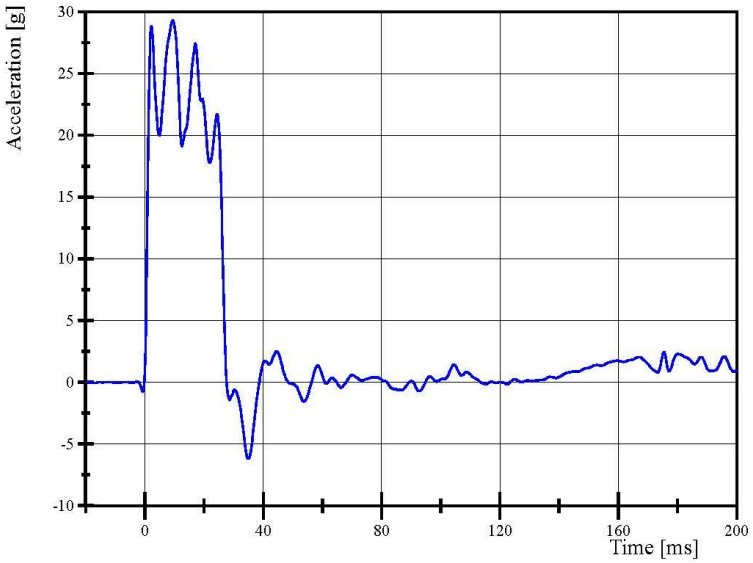
Specification Source: CFR49 Part 572 Subpart V with Polarity in accordance with J211

01.23.2020 14:28:41 748

Transportation Research Center Inc.

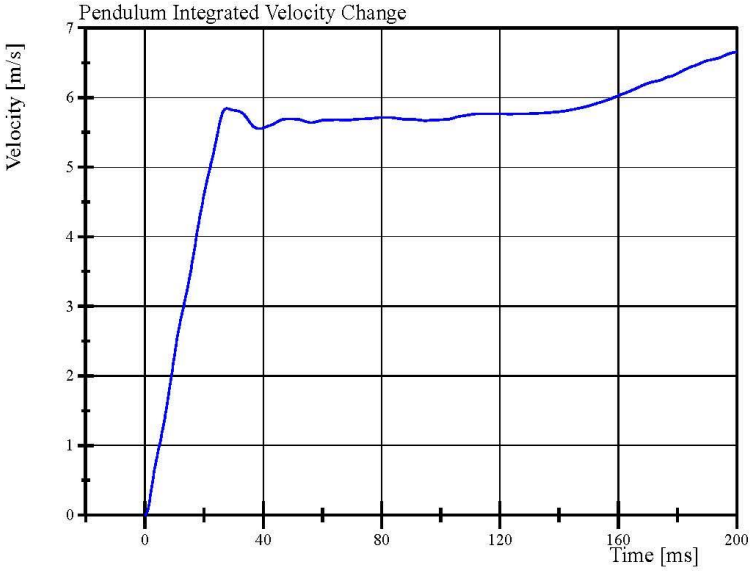
Left Lateral Neck
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Pendulum Acceleration



Filter Class: CFC_180
Max: 29.3 g at 9.4 ms
Min: -6.2 g at 34.9 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 6.7 m/s at 200.0 ms
Min: 0.0 m/s at 0.0 ms

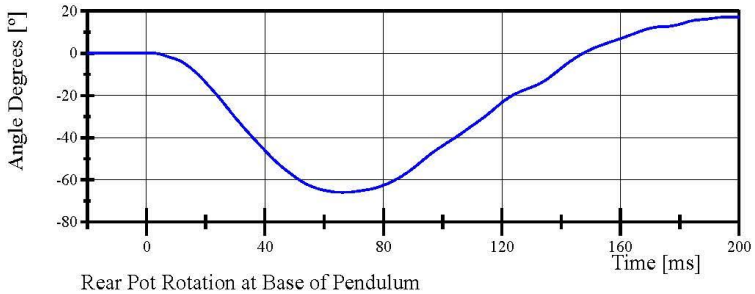
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

01.23.2020 14:29:14 748

Transportation Research Center Inc.

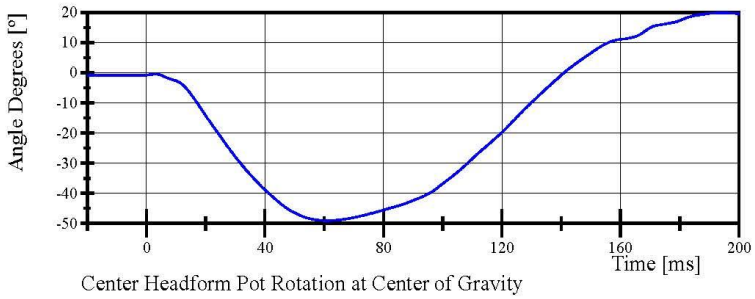
Left Lateral Neck
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Forward Pot Rotation at Base of Pendulum



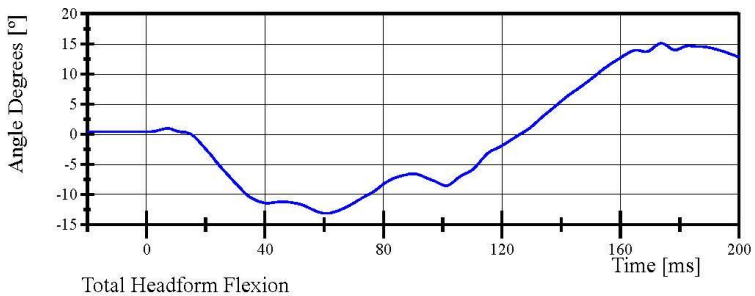
Filter Class: CFC_60
Max: 17.3 ° at 196.4 ms
Min: -66.0 ° at 66.2 ms

Rear Pot Rotation at Base of Pendulum



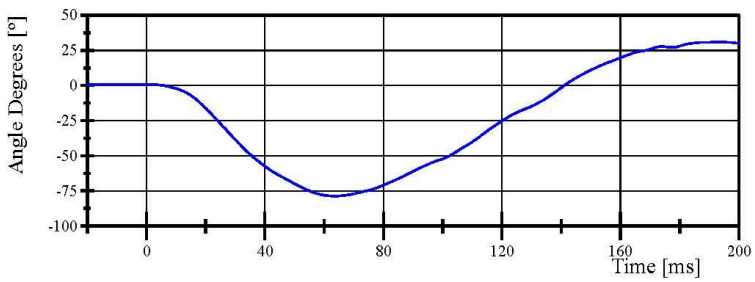
Filter Class: CFC_60
Max: 19.9 ° at 194.4 ms
Min: -49.1 ° at 61.2 ms

Center Headform Pot Rotation at Center of Gravity



Filter Class: CFC_60
Max: 15.1 ° at 173.8 ms
Min: -13.1 ° at 60.6 ms

Total Headform Flexion



Filter Class: CFC_60
Max: 31.0 ° at 193.8 ms
Min: -78.7 ° at 63.5 ms

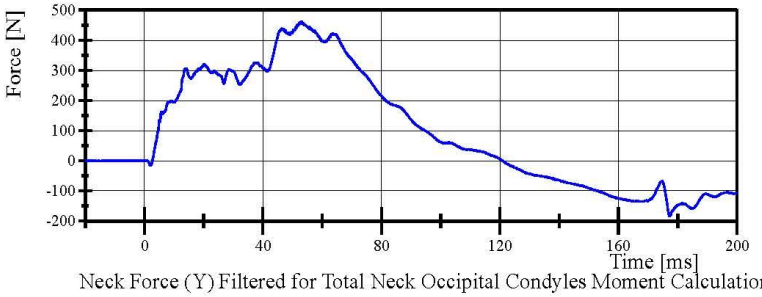
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

01.23.2020 14:29:14 748

Transportation Research Center Inc.

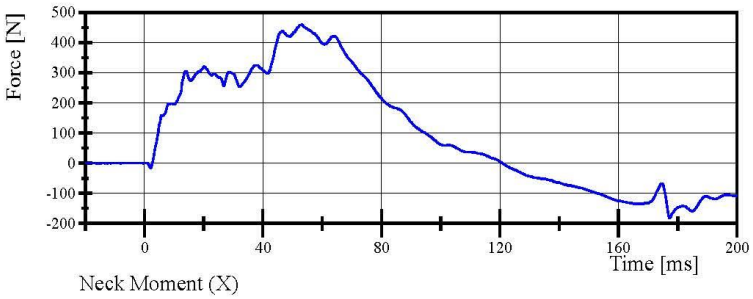
Left Lateral Neck
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Neck Force (Y)



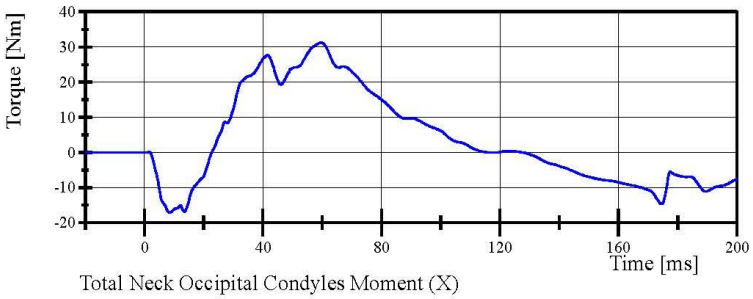
Filter Class: CFC_1000
Max: 461.9 N at 53.0 ms
Min: -184.1 N at 177.2 ms

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



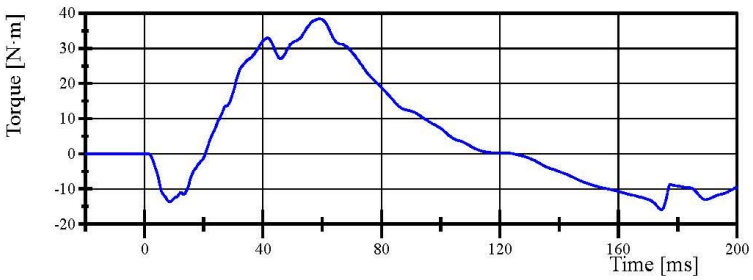
Filter Class: CFC_600
Max: 459.8 N at 53.1 ms
Min: -183.3 N at 177.3 ms

Neck Moment (X)



Filter Class: CFC_600
Max: 31.2 Nm at 59.8 ms
Min: -17.1 Nm at 8.5 ms

Total Neck Occipital Condyles Moment (X)



Filter Class: Without_(Constar
Max: 38.4 N·m at 59.1 ms
Min: -15.9 N·m at 174.6 ms

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

01.23.2020 14:29:14 748

Transportation Research Center Inc.

Left Lateral Shoulder
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Impactor Acceleration	(-13) - (-18) g	-15.0 g	Yes
Shoulder Displacement	28 - 37 mm	31.8 mm	Yes
Upper Spine Lateral Acceleration	17 - 22 g	19.2 g	Yes

Test meets specifications.

Condition: Used

Comments:
Left Arm S/N: 940L
Shoulder Rib S/N: 180-3355 259

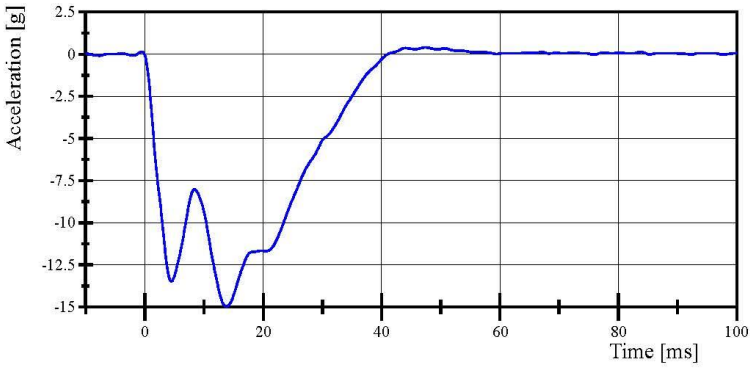
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

01.23.2020 07:45:04 836

Transportation Research Center Inc.

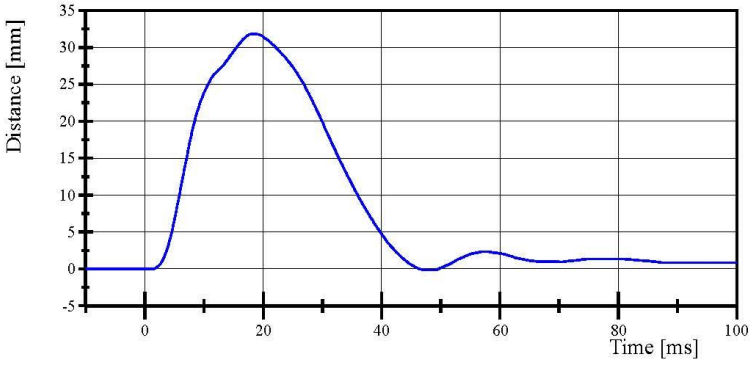
Left Lateral Shoulder
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Probe Acceleration



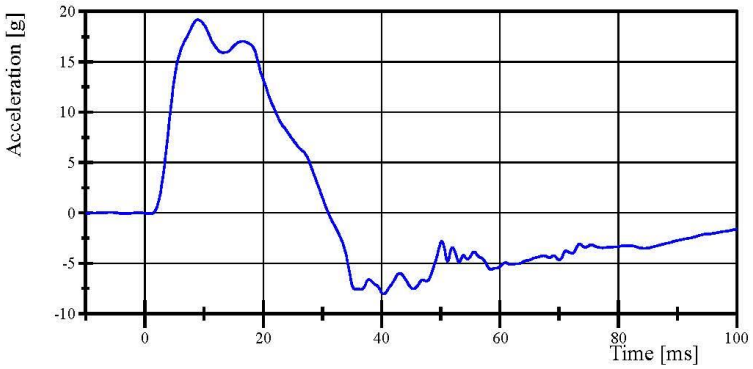
Filter Class: CFC_180
Max: 0.4 g at 47.4 ms
Min: -15.0 g at 13.8 ms

Shoulder Displacement



Filter Class: CFC_600
Max: 31.8 mm at 18.2 ms
Min: -0.2 mm at 48.8 ms

Upper Spine Acceleration (Y)



Filter Class: CFC_180
Max: 19.2 g at 8.9 ms
Min: -8.0 g at 40.3 ms

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

01.23.2020 07:45:35 836

Transportation Research Center Inc.

Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Impactor Velocity	6.60 - 6.80 m/s	6.758 m/s	Yes
Impactor Acceleration	(-30) - (-36) g	-33.2 g	Yes
Shoulder Displacement	31 - 40 mm	34.8 mm	Yes
Upper Thorax Rib Displacement	25 - 32 mm	27.0 mm	Yes
Center Thorax Rib Displacement	30 - 36 mm	31.6 mm	Yes
Lower Thorax Rib Displacement	32 - 38 mm	34.0 mm	Yes
Upper Spine Lateral Acceleration	34 - 43 g	37.5 g	Yes
Lower Spine Lateral Acceleration	29 - 37 g	35.7 g	Yes

Test meets specifications.

Condition: Used

Comments:
Left Arm S/N: 940L
Shoulder Rib S/N: 180-3355 259
Upper Thorax Rib #1 S/N: DM5020
Middle Thorax Rib #2 S/N: DM5021
Lower Thorax Rib #3 S/N: DM5022

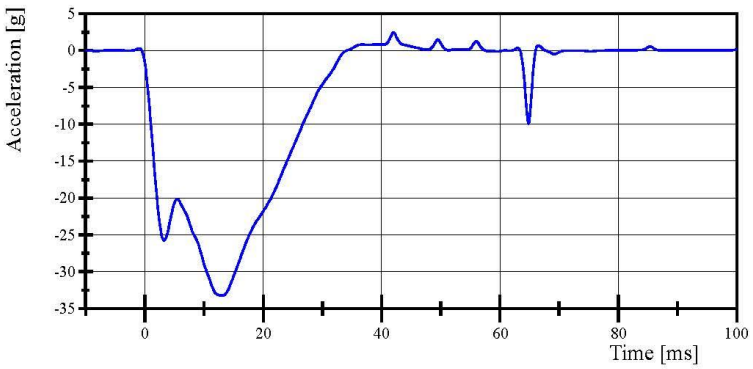
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

01.23.2020 09:01:34 631

Transportation Research Center Inc.

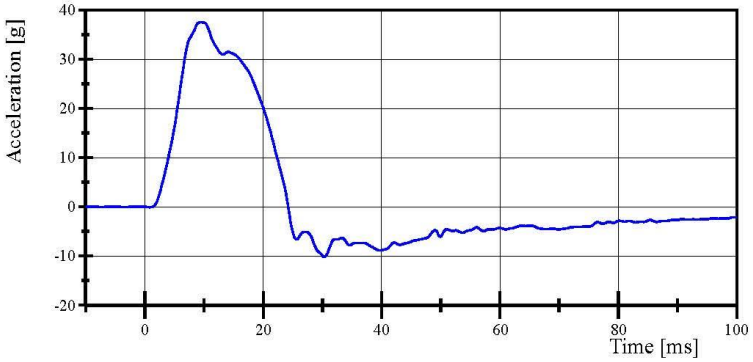
Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Probe Acceleration



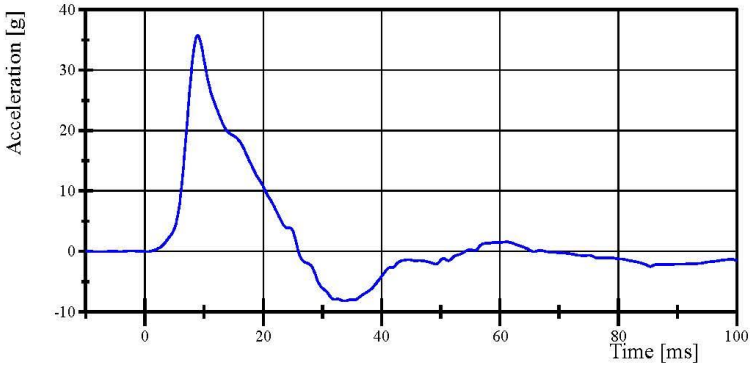
Filter Class: CFC_180
Max: 2.5 g at 42.0 ms
Min: -33.2 g at 13.0 ms

Upper Spine Acceleration



Filter Class: CFC_180
Max: 37.5 g at 9.5 ms
Min: -10.2 g at 30.3 ms

Lower Spine Acceleration



Filter Class: CFC_180
Max: 35.7 g at 8.9 ms
Min: -8.2 g at 33.8 ms

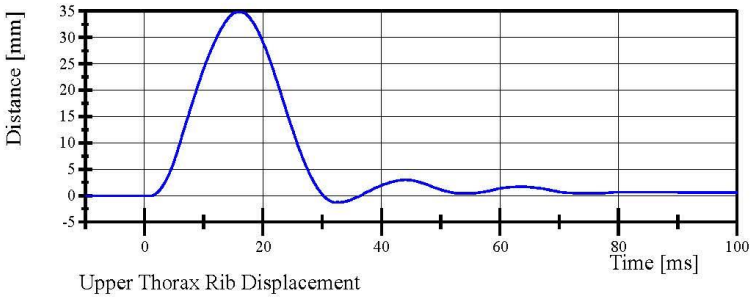
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

01.23.2020 09:02:40 631

Transportation Research Center Inc.

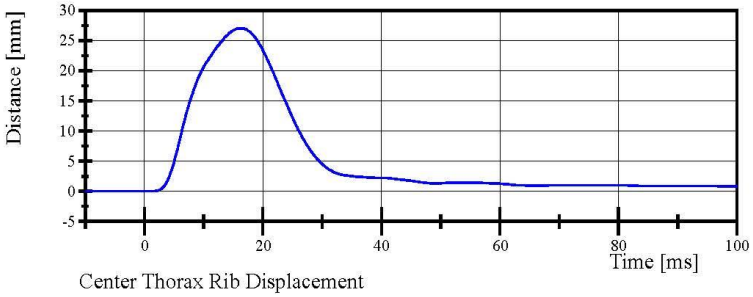
Left Lateral Thorax with Arm
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Shoulder Rib Displacement



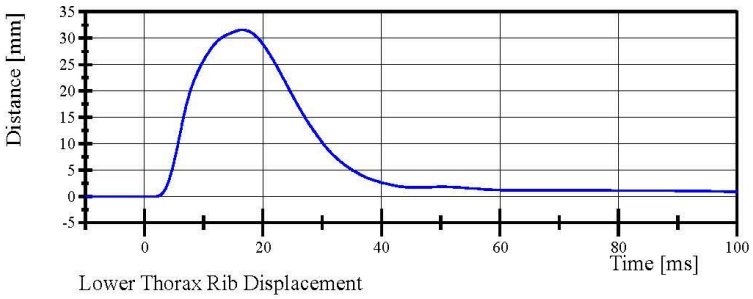
Filter Class: CFC_600
Max: 34.8 mm at 15.8 ms
Min: -1.2 mm at 32.2 ms

Upper Thorax Rib Displacement



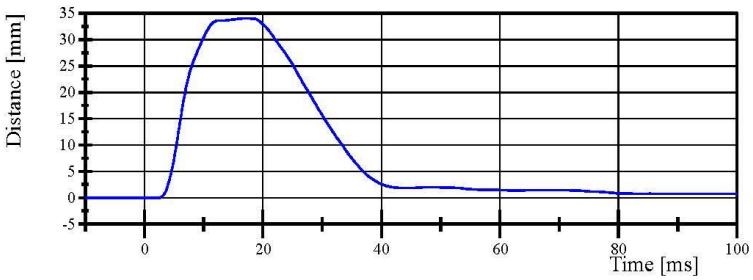
Filter Class: CFC_600
Max: 27.0 mm at 16.2 ms
Min: -0.0 mm at -7.0 ms

Center Thorax Rib Displacement



Filter Class: CFC_600
Max: 31.6 mm at 16.6 ms
Min: -0.0 mm at -2.5 ms

Lower Thorax Rib Displacement



Filter Class: CFC_600
Max: 34.0 mm at 16.9 ms
Min: -0.0 mm at 2.3 ms

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

01.23.2020 09:02:40 631

Transportation Research Center Inc.

Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Impactor Velocity	4.20 - 4.40 m/s	4.332 m/s	Yes
Impactor Acceleration	(-14) - (-18) g	-15.4 g	Yes
Upper Thorax Rib Displacement	32 - 40 mm	36.3 mm	Yes
Center Thorax Rib Displacement	39 - 45 mm	41.2 mm	Yes
Lower Thorax Rib Displacement	35 - 43 mm	39.1 mm	Yes
Upper Spine Lateral Acceleration	13 - 17 g	14.4 g	Yes
Lower Spine Lateral Acceleration	7 - 11 g	9.4 g	Yes

Test meets specifications.

Condition: Used

Comments:
Upper Thorax Rib #1 S/N: DM5020
Middle Thorax Rib #2 S/N: DM5021
Lower Thorax Rib #3 S/N: DM5022

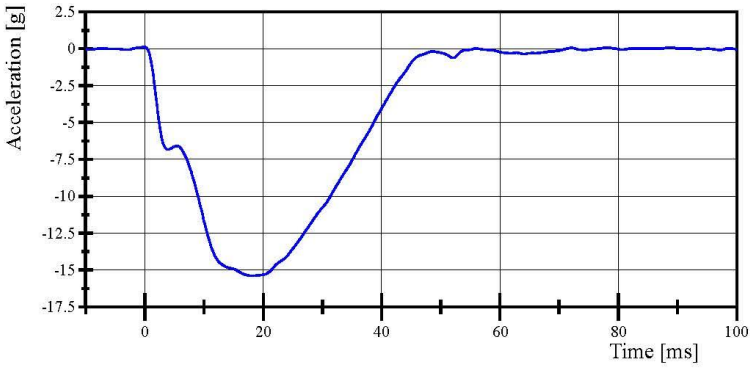
Specification Source: CFR49 Part 572 Subpart V with Polarity in accordance with J211

01.23.2020 08:27:01 796

Transportation Research Center Inc.

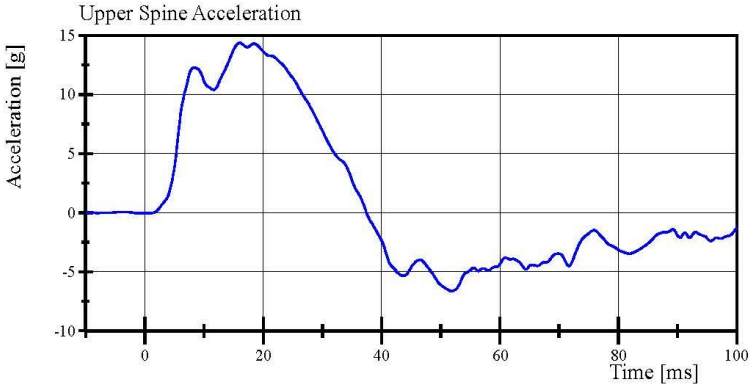
Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Probe Acceleration



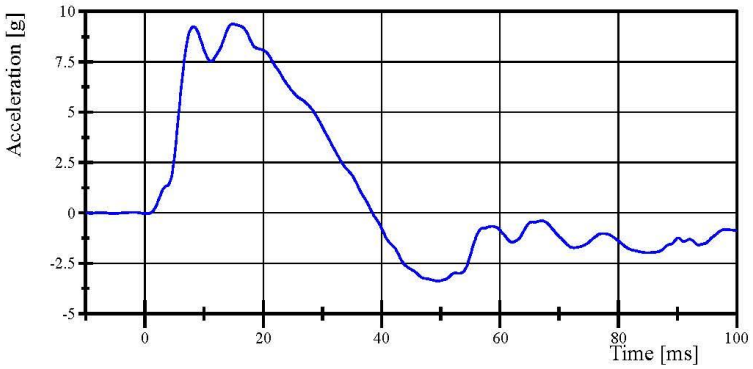
Filter Class: CFC_180
Max: 0.1 g at -0.2 ms
Min: -15.4 g at 18.0 ms

Upper Spine Acceleration



Filter Class: CFC_180
Max: 14.4 g at 16.0 ms
Min: -6.6 g at 51.8 ms

Lower Spine Acceleration



Filter Class: CFC_180
Max: 9.4 g at 14.9 ms
Min: -3.4 g at 49.5 ms

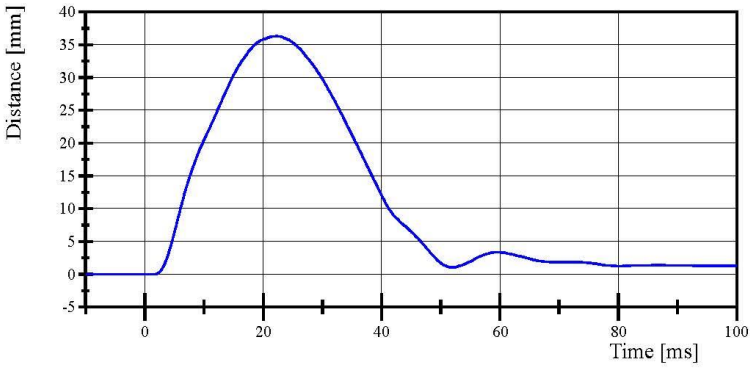
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

01.23.2020 08:27:38 796

Transportation Research Center Inc.

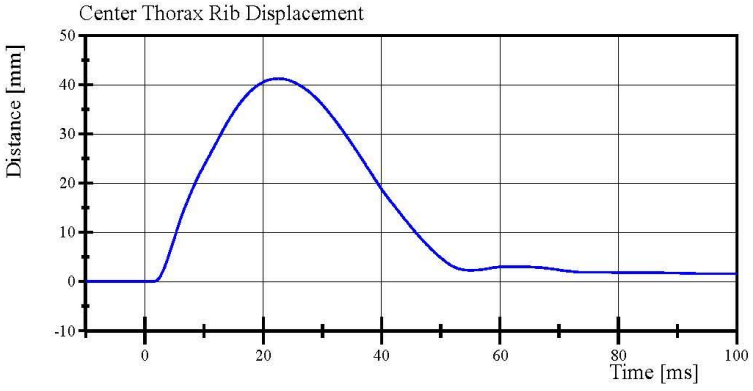
Left Lateral Thorax without Arm
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Upper Thorax Rib Displacement



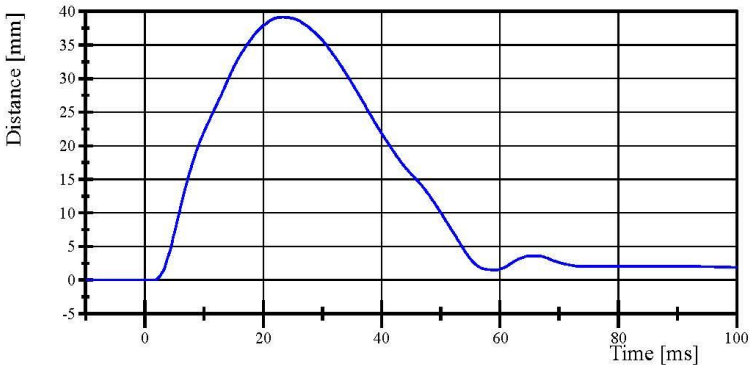
Filter Class: CFC_600
Max: 36.3 mm at 22.3 ms
Min: -0.0 mm at 0.2 ms

Center Thorax Rib Displacement



Filter Class: CFC_600
Max: 41.2 mm at 22.6 ms
Min: -0.0 mm at -10.0 ms

Lower Thorax Rib Displacement



Filter Class: CFC_600
Max: 39.1 mm at 23.4 ms
Min: -0.0 mm at 1.5 ms

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

01.23.2020 08:27:38 796

Transportation Research Center Inc.

Left Lateral Abdomen
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.28 m/s	Yes
Impactor Acceleration	(-12) - (-16) g	-14.4 g	Yes
Upper Abdominal Rib Displacement	36 - 47 mm	42.4 mm	Yes
Lower Abdominal Rib Displacement	33 - 44 mm	38.4 mm	Yes
Lower Spine Lateral Acceleration	9 - 14.0 g	10.74 g	Yes

Test meets specifications.

Condition: Used

Comments:
Upper Abdominal Rib S/N: DM7281
Lower Abdominal Rib S/N: DM7275

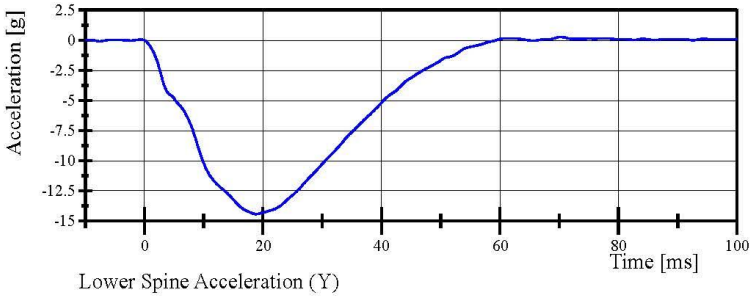
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

01.23.2020 08:08:41 653

Transportation Research Center Inc.

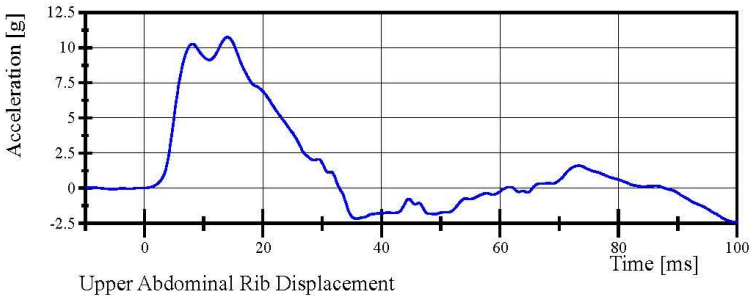
Left Lateral Abdomen
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Probe Acceleration



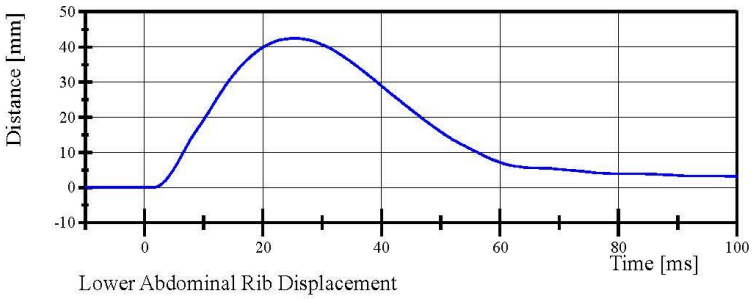
Filter Class: CFC_180
Max: 0.3 g at 70.2 ms
Min: -14.4 g at 18.9 ms

Lower Spine Acceleration (Y)



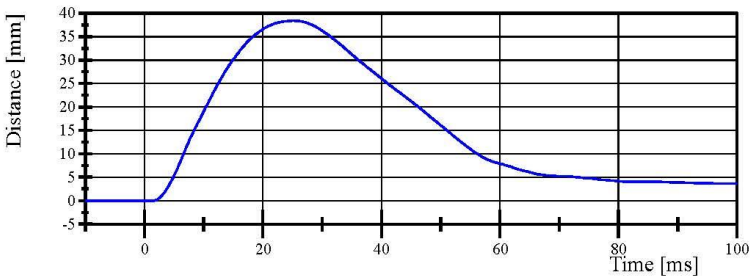
Filter Class: CFC_180
Max: 10.7 g at 14.0 ms
Min: -2.4 g at 100.0 ms

Upper Abdominal Rib Displacement



Filter Class: CFC_600
Max: 42.4 mm at 25.4 ms
Min: -0.0 mm at -9.8 ms

Lower Abdominal Rib Displacement



Filter Class: CFC_600
Max: 38.4 mm at 25.1 ms
Min: -0.0 mm at -10.0 ms

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

01.23.2020 08:09:14 653

Transportation Research Center Inc.

Left Lateral Pelvis
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Pendulum Velocity	6.6 - 6.8 m/s	6.64 m/s	Yes
Impactor Acceleration	(-38.0) - (-47.0) g	-44.40 g	Yes
Peak Pelvis Lateral Acceleration after 6ms	34 - 42 g	37.8 g	Yes
Acetabulum Force	3,600 - 4,300 N	4,106.6 N	Yes

Test meets specifications.

Condition: Used

Comments:
Pelvis Skin S/N: EN1590
Pelvis Plug Info:
Manufacturer: Saco
S/N: 12580
Cal Date: 20181003

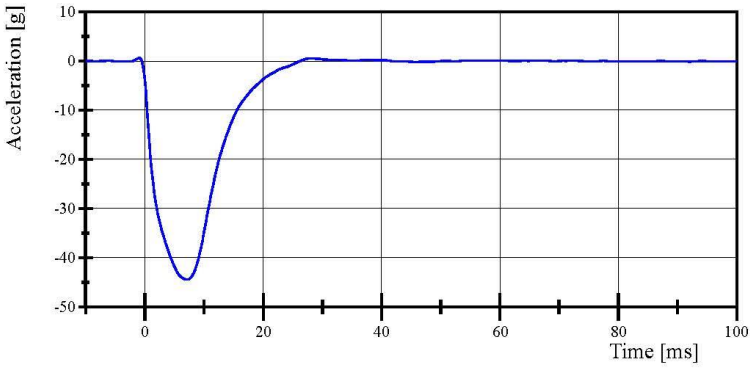
Specification Source: CFR49 Part 572 Subpart V with Polarity in accordance with J211

01.23.2020 07:34:40 465

Transportation Research Center Inc.

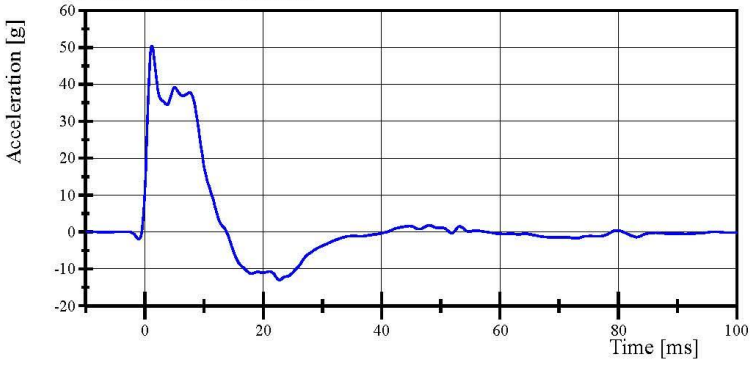
Left Lateral Pelvis
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Probe Acceleration



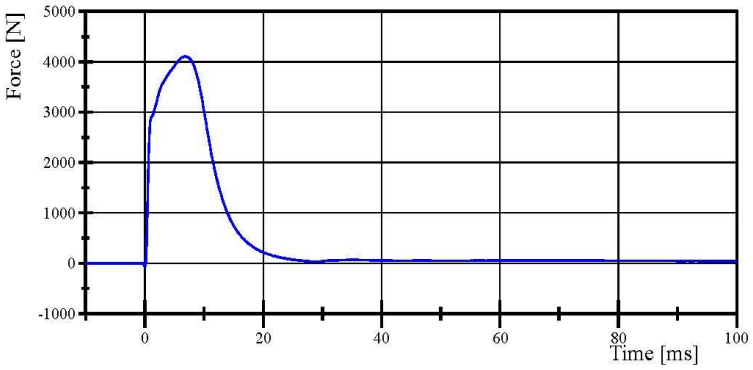
Filter Class: CFC_180
Max: 0.6 g at -1.0 ms
Min: -44.4 g at 7.1 ms

Pelvis Y-Axis Acceleration



Filter Class: CFC_180
Max: 50.4 g at 1.2 ms
Min: -13.0 g at 22.7 ms

Acetabulum Y-Axis Force



Filter Class: CFC_600
Max: 4,106.6 N at 6.8 ms
Min: -68.6 N at 0.0 ms

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

01.23.2020 07:36:14 465

Transportation Research Center Inc.

Left Lateral Iliac
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Pendulum Velocity	4.2 - 4.4 m/s	4.21 m/s	Yes
Impactor Acceleration	(-36) - (-45) g	-41.8 g	Yes
Peak Pelvis Lateral Acceleration	28 - 39 g	31.5 g	Yes
Iliac Force	4,100 - 5,100 N	4,862.3 N	Yes

Test meets specifications.

Condition: Used

Comments:
Pelvis S/N: EN1590

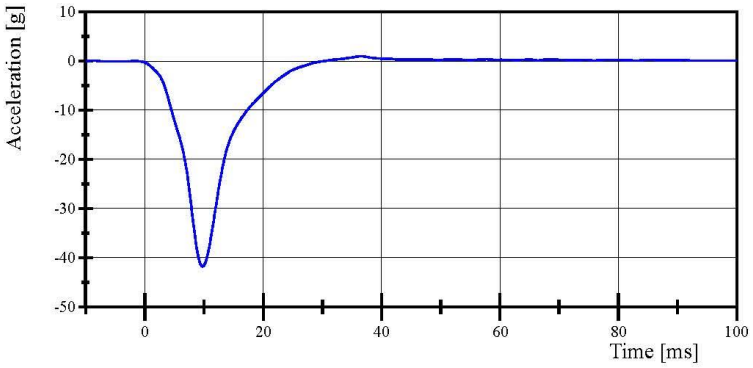
Specification Source: CFR49 Part 572 Subpart V
with Polarity in accordance with J211

01.23.2020 10:09:50 690

Transportation Research Center Inc.

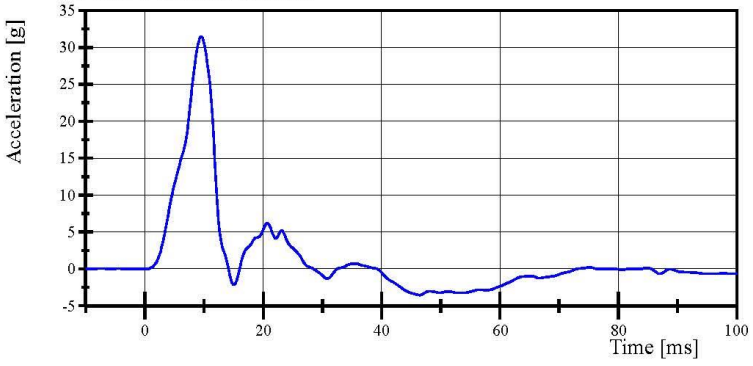
Left Lateral Iliac
SID IIs Serial No. 297 Certification No. 45-1
Test Date: 1/23/2020

Probe Acceleration



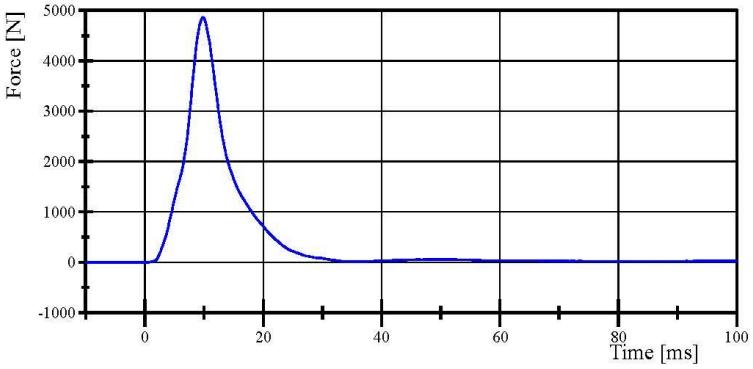
Filter Class: CFC_180
Max: 1.0 g at 36.5 ms
Min: -41.8 g at 9.8 ms

Pelvis Y-Axis Acceleration



Filter Class: CFC_180
Max: 31.5 g at 9.5 ms
Min: -3.6 g at 46.4 ms

Iliac Y-Axis Force



Filter Class: CFC_600
Max: 4,862.3 N at 9.8 ms
Min: -0.9 N at -7.4 ms

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

01.23.2020 10:10:17 690

APPENDIX D
TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA

TABLE 1 – Dummy Instrumentation (SID-IIs)

				SID-IIs S/N 297		
				Serial Number	**Manufacturer**	**Calibration Date**
Head Accelerometers			X	P93539	Endevco	9-Oct-2019
			Y	P93549	Endevco	10-Oct-2019
			Z	P93776	Endevco	10-Oct-2019
Displacement Potentiometers	Shoulder		Y	N/A	N/A	N/A
	Thoracic Rib	Upper	Y	023	Servo	25-Sep-2019
		Middle	Y	01815	Servo	9-Apr-2019
		Lower	Y	043	Servo	18-Apr-2019
	Abdominal Rib	Upper	Y	01811	Servo	9-Apr-2019
		Lower	Y	051	Servo	18-Apr-2019
Lower Spine Accelerometers (T12)			X	P94425	Endevco	10-Oct-2019
			Y	P91522	Endevco	10-Oct-2019
			Z	P91511	Endevco	10-Oct-2019
Acetabulum Load Cell			Y	235-FY	FTSS	18-Apr-2019
Iliac Wing Load Cell			Y	320-FY	FTSS	18-Apr-2019
Pelvis Plug (struck side)				12639	SACO	21-Nov-2018
Pelvis Plug (non-struck side)				12565	SACO	3-Oct-2018

TABLE 2 – Vehicle Instrumentation

Vehicle Instrumentation		Serial Number	Manufacturer	Calibration Date
Vehicle Center of Gravity	X	T11818	Endevco	10-Sep-2019
Vehicle Center of Gravity	Y	T11829	Endevco	1-Nov-2019
Vehicle Center of Gravity	Z	P57961	Endevco	1-Nov-2019
Left Floor Sill	Y	P50398	Endevco	26-Nov-2019
A-Pillar Sill	Y	T11445	Endevco	5-Sep-2019
A-Pillar Low	Y	P94561	Endevco	11-Oct-2019
A-Pillar Mid	Y	P87822	Endevco	16-Dec-2019
B-Pillar Sill	Y	P73587	Endevco	11-Oct-2019
B-Pillar Low	Y	P50313	Endevco	1-Nov-2019
B-Pillar Mid	Y	P50491	Endevco	1-Nov-2019
Driver Seat	Y	P94489	Endevco	12-Dec-2019
Engine Top	X	T11835	Endevco	1-Nov-2019
Engine Top	Y	P61501	Endevco	1-Nov-2019
Firewall	Y	P81065	Endevco	10-Jan-2020
Right Roof	Y	P58472	Endevco	26-Nov-2019
Right Floor Sill	Y	P74951	Endevco	14-Jan-2020
Rear Floor Pan	X	P44288	Endevco	1-Nov-2019
Rear Floor Pan	Y	T11449	Endevco	1-Nov-2019

TABLE 3 – Pole Instrumentation

Pole Instrumentation	Serial Number	Manufacturer	Calibration Date
Load Cell 1	DK7091S	Humanetics	13-Nov-2019
Load Cell 2	DK7120S	Humanetics	13-Nov-2019
Load Cell 3	DK7118S	Humanetics	13-Nov-2019
Load Cell 4	DK7124S	Humanetics	13-Nov-2019
Load Cell 5	DK7111S	Humanetics	13-Nov-2019
Load Cell 6	DK7126S	Humanetics	13-Nov-2019
Load Cell 7	DK7112S	Humanetics	13-Nov-2019
Load Cell 8	DK7074S	Humanetics	13-Nov-2019