

**RESEARCH FMVSS 214  
RIGID POLE SIDE IMPACT TEST**

**HYUNDAI MOTOR COMPANY  
2020 Hyundai Veloster**

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



**Report Date: October 20, 2021**

**FINAL REPORT**

**PREPARED FOR:  
Vehicle Research and Test Center  
P. O. Box 37  
East Liberty, OH 43319**

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**TRC TEST NUMBER: 210114**

Project Manager, John Shultz

Report Approved October 20, 2021:

Transportation Research Center Inc.

Final Report Accepted by:

\_\_\_\_\_ Date: \_\_\_\_\_  
Allison Loudon  
Project Engineer  
Vehicle Research & Test Center

Technical Report Documentation Page

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16. Abstract A 31.00 km/h, 75° Oblique Rigid Pole Research Side Impact Test was conducted on the subject 2020 Hyundai Veloster in accordance with the specifications of the Laboratory Test Procedure for the Research Side Impact Rigid Pole Test 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 14, 2021.  The impact velocity was 31.26 km/h, and the ambient temperature at the struck (driver's) side of the target vehicle at the time of impact was 21.0°C. The test vehicle post-test maximum crush was 277 mm at level 3. The test vehicle's performance was as follows:																													
<table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="2">Driver ATD (WorldSID-50M)</th> </tr> <tr> <th>Units</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criterion (HIC15)</td> <td>N/A</td> <td>280</td> </tr> <tr> <td>Brain Injury Criterion (BrIC)</td> <td>N/A</td> <td>0.54</td> </tr> <tr> <td>Peak Shoulder Force</td> <td>N</td> <td>-2000.5</td> </tr> <tr> <td>Peak Thoracic Rib Deflection</td> <td>mm</td> <td>34.39</td> </tr> <tr> <td>Peak Abdominal Rib Deflection</td> <td>mm</td> <td>29.93</td> </tr> <tr> <td>Pubic Symphysis Force</td> <td>N</td> <td>-1205.07</td> </tr> <tr> <td>Peak Resultant Sacro-Iliac Force</td> <td>N</td> <td>3176.4</td> </tr> </tbody> </table>				Measurement Description	Driver ATD (WorldSID-50M)		Units	Result	Head Injury Criterion (HIC15)	N/A	280	Brain Injury Criterion (BrIC)	N/A	0.54	Peak Shoulder Force	N	-2000.5	Peak Thoracic Rib Deflection	mm	34.39	Peak Abdominal Rib Deflection	mm	29.93	Pubic Symphysis Force	N	-1205.07	Peak Resultant Sacro-Iliac Force	N	3176.4
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The two doors on the struck side of the vehicle did not separate from the body at the hinges or latches and the opposite doors did not open during the side impact event.																													
17. Key Words Side Impact Pole WorldSID-50M		18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590																											
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## **SECTION 1**

### **PURPOSE AND TEST PROCEDURE**

#### **PURPOSE AND TEST PROCEDURE**

This rigid pole side impact test is a part of the Federal Motor Vehicle Safety Standard 214 Side Impact Protection program. It was conducted for the National Highway Traffic Safety Administration's (NHTSA) under 693JJ918D000019 by Transportation Research Center Inc.. The purpose of this test was to evaluate the repeatability, reproducibility, and durability of the WorldSID 50th percentile male ATD (WorldSID-50M) equipped with RibEye™, to determine whether the dummy is a viable option to replace the EuroSID-2 dummy with rib extension modifiers (ES-2re) in future side impact rigid pole tests conducted by NHTSA. The test was conducted using NHTSA's 'LABORATORY TEST PROCEDURE FOR FMVSS No. 214, DYNAMIC SIDE IMPACT PROTECTION – Rigid Pole Side Impact Test' dated September 2012 as a guideline.

## SECTION 2

### SUMMARY OF TEST RESULTS

A rigid pole side impact test was conducted on a 2020 Hyundai Veloster. The subject vehicle was towed into the rigid pole at an angle of 75° and a velocity of 31.26 km/h. The test was conducted by the Transportation Research Center Inc. in East Liberty, Ohio, on January 14, 2021. Pre-test and post test photographs of the test vehicle and side impact dummy (WorldSID-50M with RibEye) are included in APPENDIX A of this report.

The test setup was conducted following the FMVSS 214 test procedure dated September 2012, including instrumentation and camera placement. One WorldSID-50M with RibEye dummy was placed in the driver designated seating position per NHTSA's "WorldSID 50th Male Dummy Seating Procedure, April 2019 (<https://rosap.nhtl.bts.gov/view/dot/41900>).

The dummy was instrumented in the following manner:

- Head CG tri-axial accelerometer
- Head angular rate sensor
- Upper and lower neck load cells
- Shoulder load cell
- RibEye measurement system in thorax ribs 1-3 and abdominal ribs 1 and 2, with three LEDs per rib
- Upper (T1), middle (T4), and lower spine (T12) tri-axial accelerometers
- Lumbar load cell
- Pelvic tri-axial accelerometers
- Pubic load cell
- Left and right sacroiliac load cells
- Left femur 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 of this report contains the test equipment and instrumentation calibration data. Worksheets and plots found in Appendix E describe dummy positions in detail.

Dummy injury readings were recorded as follows:

Measurement Description	Driver ATD (WorldSID-50M)	
	Units	Result
Head Injury Criterion (HIC15)	N/A	280
Brain Injury Criterion (BrIC)	N/A	0.54
Peak Shoulder Force	N	-2000.5
Peak Thoracic Rib Deflection	mm	34.39
Peak Abdominal Rib Deflection	mm	29.93
Pubic Symphysis Force	N	-1205.07
Peak Resultant Sacro-Iliac Force	N	3176.4

Supplemental restraint information is given below:

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

### GENERAL COMMENTS

All doors remained closed throughout the test. No fuel spillage occurred during the impact and the static rollover test was not performed.

### Data Acquisition Explanations

Left Floor Sill Acceleration (Y); Open @ 23.0 ms

Left B-Pillar Sill Acceleration (Y); Open @ 20.0 ms

Left Mid B-Pillar Acceleration (Y); Open @ 19.0 ms

Driver Seat Track at Dummy H-Point Acceleration (Y); Open @ 58.0 ms

#### Ribeye Error Codes:

- 1 if the top sensor is blocked or sees too much ambient light
- 2 if the bottom sensor is blocked or sees too much ambient light
- 3 if both top and bottom sensors are blocked or see too much ambient light
- 4 if the middle sensor is blocked or sees too much ambient light
- 5 if the middle and top sensors are blocked or see too much ambient light
- 6 if the middle and bottom sensors are blocked or see too much ambient light
- 7 if all three sensors are blocked or see too much ambient light
- 8 if a divide-by-zero condition occurred in the data processing
- 9 if data goes past the end of the calibration curves

*\*error codes may be positive or negative in data and will occur to all x, y, and z channels*

**SECTION 3**  
**OCCUPANT AND VEHICLE INFORMATION**

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

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

**TEST VEHICLE INFORMATION AND OPTIONS**

Model Year	2020
Make	Hyundai
Model	Veloster
Body Style	Passenger Car
VIN	KMHTG6AFLXU026869
Body Color	Racing Red
Odometer Reading (km/mi)	50 mi.
Engine Displacement (L)	2.0
Type/No. Cylinders	Straight/4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes

Traction Control System (TCS)	Yes
Auto-Leveling System	No
Automatic Door Locks (ADL)	Yes
Power Window Auto-Reverse	Yes
Other Optional Feature	No
Driver Front Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	No
Rear Pass. Curtain Airbag	Yes
Rear Pass. Head/Torso Airbag	No
Rear Pass. Torso Airbag	No
Rear Pass. Torso/Pelvis Airbag	No
Rear Pass. Pelvis Airbag	No
Driver Seat Belt Pretensioner	Yes
Rear Pass. Seat Belt Pretensioner	No
Driver Load Limiter	Yes
Rear Pass. Load Limiter	No
Other 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
Date of Manufacturer	SEP/28/19
Vehicle Type	Passenger Car

GVWR (lbs)	3748
GAWR Front (lbs)	2183
GAWR Rear (lbs)	1808

**VEHICLE SEATING AND WEIGHT CAPACITY DATA**

	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	2	N/A	4
Vehicle Capacity Weight (VCW) (kg)				317.0
DSC X 68.04 kg				272.2
Rated Cargo and Luggage Weight (RCLW) (kg)				44.8

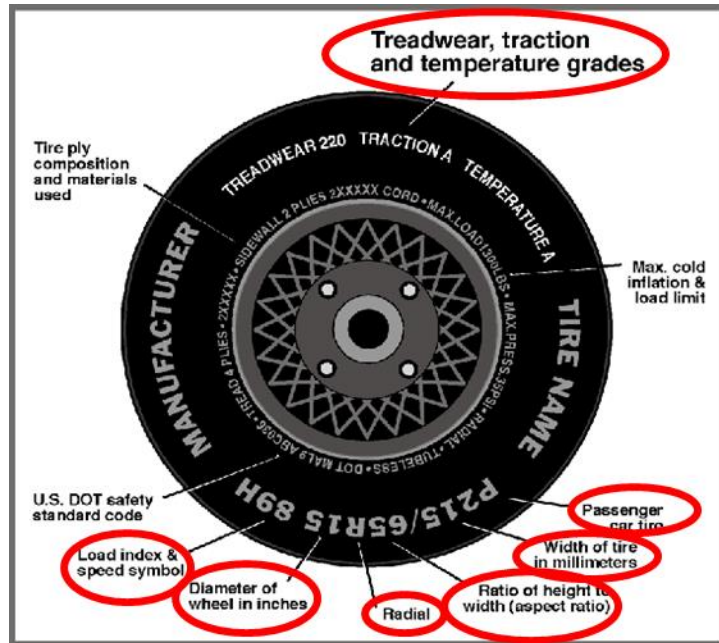
**VEHICLE SEAT TYPE**

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	N/A	Yes	N/A
Rear or Second Row Seat	Yes	N/A	N/A	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 Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



**DATA FROM TIRE PLACARD**

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	230	230
Recommended Tire Size	215/45R17	215/45R17
Tire Size on Vehicle	215/45R17	215/45R17
Tire Manufacturer	Nexen	Nexen
Tire Model	N Priz AH8	N Priz AH8
Treadwear	500	500
Traction	A	A
Temperature Grades	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	4	4
Load Index/Speed Symbol	87H	87H
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Left	UAOK HAHR 2219	UAOK HAHL 2219
DOT Safety Code Right	UAOK HAHR 2219	UAOK HAHR 2219

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

Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

**TIRE PRESSURES**

	Units	LF	RF	LR	RR
As Delivered	kPa	N/A	N/A	N/A	N/A
Tire Placard	kPa	230	230	230	230
Owner's Manual	kPa	230	230	230	230
As Tested	kPa	230	230	230	230

**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	383.8	241.0		403.0	294.0		419.2	291.0	
Right	kg	382.8	228.4		376.0	278.0		387.8	257.8	
Ratio	%	62.0	38.0		57.7	42.3		59.5	40.5	
Totals	kg	766.6	469.4	1236.0	779.0	572.0	1351.0	807.0	548.8	1355.8

**TARGET TEST WEIGHT CALCULATION**

Measured Parameter	Units	Value	
Total As Delivered Weight (UVW)	kg	1236.0	(A)
Actual Weight of 1 WorldSID-50M with RibEye Dummy Used	kg	75.0	(B)
Rated Cargo/Luggage Weight (RCLW)	kg	44.8	(C)
Calculated Vehicle Target Weight (TVTW)	kg	1355.8	(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.	0.0	+0.1	+0.2	Yes
Front Passenger Sill Angle (front-to-rear)*	Deg.	-0.3	-0.2	+0.2	Yes
Front Bumper-Line Angle (left-to-right)**	Deg.	-0.2	-0.3	-0.3	Yes
Rear Bumper-Line Angle (left-to-right)**	Deg.	0.0	-0.4	-0.4	Yes
Vehicle CG (Aft of Front Axle)	mm	1003	1118	1069	
Vehicle CG (Left (+) / Right (-) from longitudinal Centerline)	mm	+9	+25	+37	

\*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".

Test height adjustable suspension setting, if applicable:

N/A

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

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

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

<b>Component Description</b>	<b>Weight (kg)</b>
Ballast: None	0.0
Components removed: Head lights, tail lights, front & rear fascia, rear bumper beam, right side speakers, right side window motors, horn, muffler, rear spoiler, left side mirror and interior hatch trim	50.2

**DATA SHEET NO. 2**

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

Test Vehicle: 2020 Hyundai Veloster

Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

**SEAT POSITIONING**

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

**SCRL ANGLE RANGE**

Seat	SCRL(°)		
	Max.	Min.	Mid
Driver Seat	19.2	16.1	17.6
Front Passenger Seat	19.2	19.2	19.2
Front Center Seat*	N/A	N/A	N/A
Struck Side Rear Seat	N/A	N/A	17.8
Non-Struck Side Rear Seat	N/A	N/A	19.6
Rear Center Seat*	N/A	N/A	N/A

\* If applicable.

**SEAT HEIGHT AND ANGLE**

Seat	As Tested SCRL Angle (Mid) (°)	As Tested SCRP Height (mm)	SCRP Height Position	SCRP Height (mm)		
				Rearmost	Mid Fore/Aft	Forward-Most
Driver Seat	17.6	142	Max	121	131	140
			Mid	136	142	150
			Min	169	175	180
Front Passenger Seat	19.2	87	Max	N/A	N/A	N/A
			Mid	80	87	97
			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	17.8	317	Max	N/A	N/A	N/A
			Mid	N/A	317	N/A
			Min	N/A	N/A	N/A
Non-Struck Side Rear Seat	19.6	168	Max	N/A	N/A	N/A
			Mid	N/A	168	N/A
			Min	N/A	N/A	N/A
Rear Center Seat*	N/A	N/A	Max	N/A	N/A	N/A
			Mid	N/A	N/A	N/A
			Min	N/A	N/A	N/A

\* If applicable.

**DATA SHEET NO. 2 (CONTINUED)**

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

Test Vehicle: 2020 Hyundai Veloster

Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

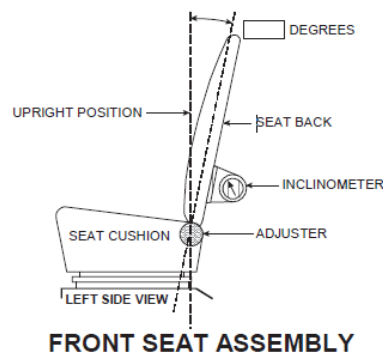
**SEAT FORE/AFT POSITION**

Seat	Total Fore/Aft Travel		Test Position from Forwardmost Position	
	mm	Detents*	mm	Detent*
Driver Seat	236	60	122	30
Front Passenger Seat	224	56	116	28
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	0	0	Fixed	N/A
Non-Struck Side Rear Seat	0	0	Fixed	N/A
Rear Center Seat*	N/A	N/A	N/A	N/A

\* If applicable.

**SEAT BACK ANGLE ADJUSTMENT**

The driver's seat back was positioned according to the manufacturer's information as provided on Form 1; resulting in a head rest post angle of 4.5° at the head rest post. The front passenger seat was set to match the driver seat.



Seat	Total Seat Back Angle Range		Test Position from Most Upright	
	Degrees	Detents*	Degrees	Detent*
Driver Seat w/ Seated Dummy	62.3	31	4.5	8
Front Passenger Seat	59.9	31	4.4	8
Front Center Seat*	N/A	N/A	N/A	N/A
Struck Side Rear Seat	0	Fixed	24.6	N/A
Non-Struck Side Rear Seat	0	Fixed	23.4	N/A
Rear Center Seat*	N/A	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 Veloster

Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

**SEAT BELT ANCHORAGE ADJUSTMENT**

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

	<b>Total # of Positions</b>	<b>Placed in Position #</b>
Driver Seat	Fixed	Fixed

**HEAD RESTRAINT ADJUSTMENT**

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

	<b>Total # of Positions</b>	<b>Placed in Position #</b>
Driver Seat	6	6, Uppermost

**DATA SHEET NO. 2 (CONTINUED)**

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

Test Vehicle: 2020 Hyundai Veloster

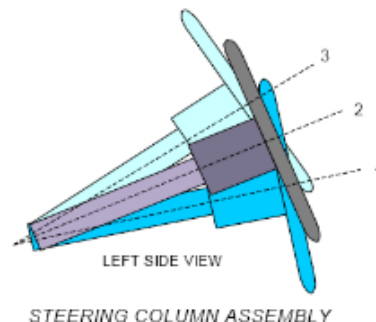
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

**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.

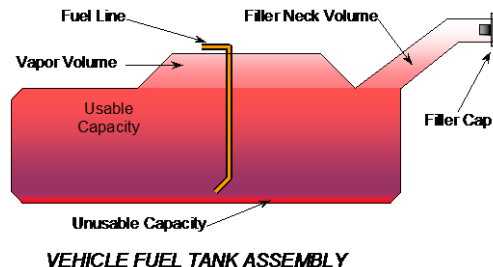
	<b>Degrees</b>	<b>Fore/Aft Position, mm</b>
Lowermost, Position No. 1	20.2	0
Geometric Center, Position No. 2	22.8	25
Uppermost, Position No. 3	25.5	50
Telescoping Steering Wheel Travel		50
Test Position	22.8	25



**FUEL PUMP**

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

Ignition key is "ON" position



**FUEL TANK CAPACITY**

	<b>Liters</b>
Usable Capacity of "Standard Tank" (see Form No. 1)	50.0
Usable Capacity of "Optional" Tank (see Form No. 1)	N/A
Usable Capacity of Standard Tank (see Owner's Manual)	50.0
Usable Capacity of Optional Tank (see Owner's Manual)	N/A
93% of Usable Capacity	46.5
Actual Amount of Solvent Used in Test	46.5
1/3 of Usable Capacity	16.7

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

**TABLE 1 WORLDSID-50M INSTRUMENTATION DATA**

Test Vehicle: 2020 Hyundai Veloster

Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

Driver Dummy Serial Number: EB8888

Location		Positive Direction		Negative Direction	
		Max.	Time (ms)	Max.	Time (ms)
Head Acceleration (g)	X	7.76	147.70	-11.97	62.40
	Y	53.96	60.90	-9.52	132.55
	Z	6.44	71.20	-14.65	45.40
	R	55.22	60.85		
Head Angular Rate (deg/sec)	X	1223.04	95.65	-1015.03	42.35
	Y	669.74	105.55	-412.00	236.20
	Z	884.29	262.00	-922.78	206.70
Upper Neck Force (N)	X	262.16	135.55	-213.97	41.90
	Y	220.73	36.35	-334.10	135.90
	Z	718.91	45.20	-25.79	148.30
Upper Neck Moment (Nm)	X	5.70	86.85	-27.73	68.30
	Y	8.99	93.95	-21.39	125.40
	Z	17.64	227.20	-16.33	95.15
Lower Neck Force (N)	X	291.81	134.05	-444.90	60.50
	Y	536.52	59.40	-436.53	113.95
	Z	828.05	45.85	-350.20	145.15
Lower Neck Moment (Nm)	X	30.74	38.60	-70.09	135.85
	Y	44.32	63.40	-68.70	135.90
	Z	17.92	230.65	-19.53	99.25
Driver Shoulder Force (N)	X	167.91	26.85	-729.60	48.25
	Y	42.68	163.65	-2000.51	58.10
	Z	682.26	60.90	-27.69	116.25
Shoulder Rear Ribeye Position (mm)	X	-44.98	91.05	-76.54	46.25
	Y	-54.42	41.20	-85.30	3.60
	Z	-47.85	105.80	-63.43	55.75
Length of Change (mm)		12.75	39.95	-2.16	17.85
Shoulder Middle Ribeye Position (mm)	X	-10.85	91.15	-43.63	49.80
	Y	-48.38	43.70	-96.82	3.70
	Z	-49.46	104.75	-65.31	56.95
Length of Change (mm)		42.97	41.20	-1.04	3.75
Shoulder Front Ribeye Position (mm)	X	25.85	88.35	0.70	19.00
	Y	-27.79	44.70	-83.92	2.70
	Z	-54.39	102.50	-67.79	56.70
Length of Change (mm)		51.95	45.95	-1.00	2.85

**TABLE 1 WORLDSID-50M INSTRUMENTATION DATA (CONTINUED)**

Test Vehicle: 2020 Hyundai Veloster

Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

Driver Dummy Serial Number: EB8888

Location		Positive Direction		Negative Direction	
		Max.	Time (ms)	Max.	Time (ms)
Thorax Rib 1 Rear Ribeye Position (mm)	X	-33.00	44.50	-45.72	19.30
	Y	-78.44	38.10	-99.28	-42.00
	Z	6.39	90.40	-14.92	15.80
Length of Change (mm)		19.81	39.15	-0.28	290.70
Thorax Rib 1 Middle Ribeye Position (mm)	X	6.21	41.20	-6.85	20.55
	Y	-73.30	39.20	-108.29	261.70
	Z	7.92	91.55	-16.26	16.10
Length of Change (mm)		34.39	39.20	-0.21	261.70
Thorax Rib 1 Front Ribeye Position (mm) <sup>1</sup>	X	48.07	40.40	31.65	100.50
	Y	-57.21	40.20	-98.58	193.15
	Z	6.07	91.60	-17.35	16.00
Length of Change (mm) <sup>1</sup>		30.90	39.35	-0.79	5.15
Thorax Rib 2 Rear Ribeye Position (mm)	X	-19.23	42.55	-31.61	15.10
	Y	-84.53	45.00	-99.32	-6.45
	Z	45.18	27.25	28.90	53.25
Length of Change (mm)		16.31	45.00	-0.03	-46.15
Thorax Rib 2 Middle Ribeye Position (mm)	X	19.42	42.60	-0.80	92.05
	Y	-87.81	44.60	-110.09	-14.60
	Z	46.77	26.90	28.65	53.50
Length of Change (mm)		20.71	44.60	-0.13	-14.60
Thorax Rib 2 Front Ribeye Position (mm)	X	56.25	43.50	38.43	97.40
	Y	-76.98	44.70	-102.31	261.70
	Z	51.09	26.85	34.23	53.90
Length of Change (mm)		16.64	44.70	-1.37	6.90
Thorax Rib 3 Rear Ribeye Position (mm) <sup>1</sup>	X	-42.97	7.80	-52.31	59.60
	Y	-78.41	42.05	-94.35	278.50
	Z	-28.85	26.50	-51.24	51.50
Length of Change (mm)		14.84	41.25	-0.57	277.10
Thorax Rib 3 Middle Ribeye Position (mm)	X	-8.93	7.80	-19.94	61.30
	Y	-79.57	41.20	-102.31	280.65
	Z	-26.90	26.40	-51.32	51.50
Length of Change (mm)		20.60	41.25	-0.95	280.65

**TABLE 1 WORLDSID-50M INSTRUMENTATION DATA (CONTINUED)**

Test Vehicle: 2020 Hyundai Veloster

Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

Driver Dummy Serial Number: EB8888

Location		Positive Direction		Negative Direction	
		Max.	Time (ms)	Max.	Time (ms)
Thorax Rib 3 Front Ribeye Position (mm)	X	29.90	40.30	12.05	94.95
	Y	-68.94	42.10	-92.73	268.15
	Z	-28.71	25.35	-51.71	51.70
Length of Change (mm)		13.22	44.10	-0.74	1.20
Abdomen Rib 1 Rear Ribeye Position (mm)	X	-25.86	7.80	-36.07	64.60
	Y	-73.76	39.60	-95.88	283.20
	Z	5.77	26.40	-12.53	50.25
Length of Change (mm)		21.36	39.90	-0.50	283.25
Abdomen Rib 1 Middle Ribeye Position (mm)	X	13.42	40.85	-1.88	64.00
	Y	-73.01	39.30	-104.86	281.70
	Z	6.80	25.35	-12.95	51.50
Length of Change (mm)		29.93	39.25	-0.50	281.70
Abdomen Rib 1 Front Ribeye Position (mm)	X	53.31	40.30	32.05	65.10
	Y	-63.28	39.30	-96.44	281.50
	Z	4.41	25.30	-13.76	51.50
Length of Change (mm)		19.45	39.40	-0.62	0.90
Abdomen Rib 2 Rear Ribeye Position (mm)	X	-6.44	42.70	-21.80	64.80
	Y	-74.18	40.10	-93.84	-8.80
	Z	38.57	26.40	20.47	50.20
Length of Change (mm)		19.18	40.10	-2.19	89.75
Abdomen Rib 2 Middle Ribeye Position (mm)	X	32.79	40.35	9.01	64.40
	Y	-76.04	39.00	-105.16	246.80
	Z	37.22	24.35	16.98	50.60
Length of Change (mm)		25.43	39.05	-1.60	246.85
Abdomen Rib 2 Front Ribeye Position (mm)	X	69.74	38.60	41.72	64.05
	Y	-66.69	40.10	-96.96	282.70
	Z	38.72	25.30	19.78	50.35
Length of Change (mm)		17.14	40.15	-0.55	0.80
T1 Acceleration (g)	X	10.09	20.05	-4.13	104.45
	Y	37.46	59.30	-8.41	101.95
	Z	14.19	19.90	-5.94	176.95
	R	39.98	59.35		

**TABLE 1 WORLDSID-50M INSTRUMENTATION DATA (CONTINUED)**

Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

Driver Dummy Serial Number: EB8888

Location		Positive Direction		Negative Direction	
		Max.	Time (ms)	Max.	Time (ms)
T4 Acceleration (g)	X	4.43	103.35	-10.52	20.00
	Y	18.62	19.75	-33.29	59.55
	Z	11.59	20.20	-4.04	172.45
	R	35.03	59.50		
T12 Acceleration (g)	X	9.23	19.50	-5.67	105.55
	Y	42.20	32.85	-12.27	88.80
	Z	11.13	29.75	-5.79	61.50
	R	43.57	32.85		
Pubic Symphysis (N)	Y	5.07	-35.00	-1205.07	43.20
Left Sacro-Iliac Force (N)	X	201.36	101.35	-391.00	51.80
	Y	8.49	-34.45	-3136.30	44.75
	Z	153.83	136.90	-421.63	43.15
Left Sacro-Iliac Moment (Nm)	X	6.83	284.15	-43.62	45.70
	Y	26.02	54.55	-9.20	40.85
	Z	31.07	36.80	-30.80	61.80
Right Sacro-Iliac Force (N)	X	349.26	69.65	-229.18	36.40
	Y	109.98	139.15	-1706.16	45.50
	Z	391.57	66.20	-62.75	17.50
Right Sacro-Iliac Moment (Nm)	X	29.50	65.95	-19.08	102.20
	Y	5.99	53.55	-15.49	70.50
	Z	23.56	37.85	-24.03	59.15
Lumbar Force (N)	X	444.20	58.60	-168.33	180.85
	Y	696.36	43.60	-199.61	88.35
	Z	1027.34	56.80	-130.74	142.10
Lumbar Moment (Nm)	X	43.63	56.90	-12.28	95.65
	Y	8.86	106.00	-24.27	59.10
	Z	11.01	42.80	-7.44	82.95
Pelvis Acceleration (g)	X	13.03	22.90	-14.48	49.25
	Y	58.92	44.25	-19.21	68.45
	Z	10.65	34.00	-8.64	49.15
	R	59.05	44.25		

**TABLE 1 WORLDSID-50M INSTRUMENTATION DATA (CONTINUED)**

Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

Driver Dummy Serial Number: EB8888

Location		Positive Direction		Negative Direction	
		Max.	Time (ms)	Max.	Time (ms)
Left Femur Force (N)	X	25.32	0.15	-554.26	44.55
	Y	110.63	29.70	-39.93	68.00
	Z	774.16	43.40	-298.79	98.15
Left Femur Moment (Nm)	X	112.33	49.70	-11.45	19.20
	Y	38.88	33.55	-6.10	141.00
	Z	37.44	38.00	-0.92	-31.05
Left Femoral Neck Force (N)	X	753.80	38.25	-6.39	-30.65
	Y	36.99	17.65	-1636.68	44.35
	Z	188.82	98.90	-1823.15	43.45
Left Outer Knee Force (N)	Y	606.20	35.60	-29.41	55.40
Left Inner Knee Force (N)	Y	3067.61	66.95	-36.54	19.35

<sup>1</sup>See data acquisition explanation

Positive Direction

Longitudinal Forward  
 Lateral Rightward  
 Vertical Downward

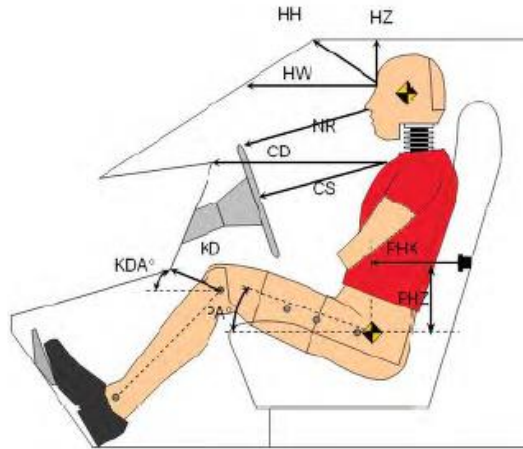
Negative Direction

Longitudinal Rearward  
 Lateral Leftward  
 Vertical Upward

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

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



Code	Measurement Description	Driver WorldSID-50M SN # EB8888	
		Length (mm)	Angle
HH	Header to Header	400	
HW	Header to Windshield	668	
HZ	Head to Roof Liner	164	
NR	Nose to Rim/Seat Back	466	
CD	Chest to Dash/Seat Back	614	
CS	Chest to Steering Wheel	397	
KD(L)/KDA(L)°	Left Knee to Dash/Seat Back	167	25.6
KD(R)/KDA(R)°	Right Knee to Dash/Seat Back	124	0.1
PAX°	Pelvic Tilt Angle X		0.4
PAY°	Pelvic Tilt Angle Y		2.2
PHX	Hip Point to Striker (X-Axis)	445	
PHZ	Hip Point to Striker (Z-Axis)	231	
HAX°	Head Tilt Angle X		1.0
HAY <sup>1</sup> °	Head Tilt Angle Y		-2.1
TAX°	Thorax Tilt Angle X		1.6
TAY°	Thorax Tilt Angle Y		-0.2
	Head Rest Angle		4.5
	H-Point Tool Angle		40.8
	Torso Angle		14.6
	Windshield Angle		62.1

Note: All measurements are in millimeters. 2-door vehicle shown. Rear dummy HX, HZ, PHX and PHZ measurements for 4-door vehicle would use the C-post striker as a reference point.

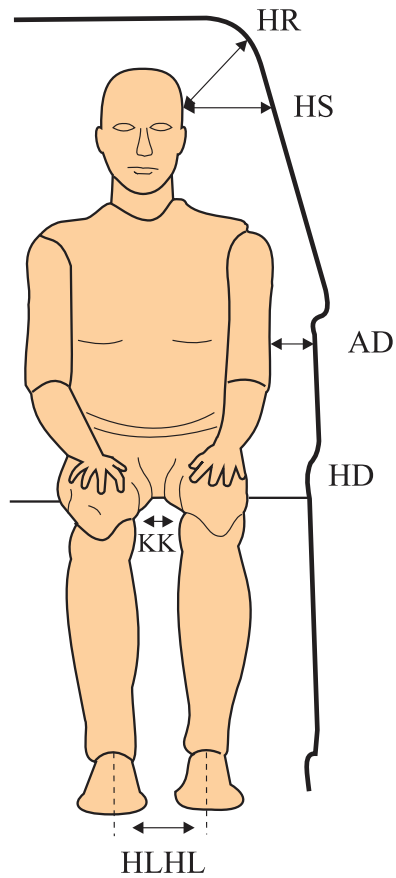
All tilt sensor angles are recorded digitally

WorldSID-50M neck was adjusted 0 notches

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

Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



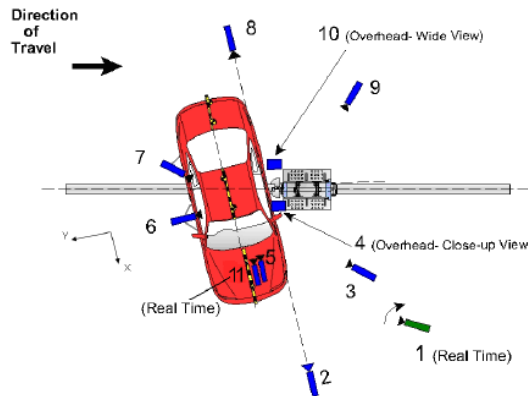
Code	Measurement Description	Driver WorldSID-50M SN # EB8888
HR	Head to Side Header	214
HS	Head to Side Window	327
AD	Arm to Door	139
HD	Hip Point to Door	110
KK	Knee to Knee	467
HLHL	Heel to Heel	352

Note: All measurements are in millimeters.

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

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



REFERENCE (from Point of Impact for X and Y; from Ground for Z):  
+ X = Forward of vehicle, + Y = Right of vehicle, + Z = Down

**CAMERA LOCATIONS AND DATA**

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	4366	0	-1467	20	1000
3	Impact side 45° – forward pole view	3195	-1126	-1620	20	1000
4	Overhead Close-up view of impact	0	0	-5252	28	1000
5	Onboard – dummy front view				12.5	1000
6	Onboard – dummy side view				12.5	1000
7	Onboard – dummy rear oblique view				12.5	1000
8	Rear ground level – impact view	-5151	0	-1462	20	1000
9	Impact side 45° – rearward pole view	-3058	-2819	-1454	20	1000
10	Overhead wide – view of impact	-301	280	-5261	18	1000
11	Real time (24-30 fps) – dummy front view				Zoom	30

\* All measurements accurate to ± 6 mm.

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

If applicable, explain why camera(s) did not operate as intended: N/A

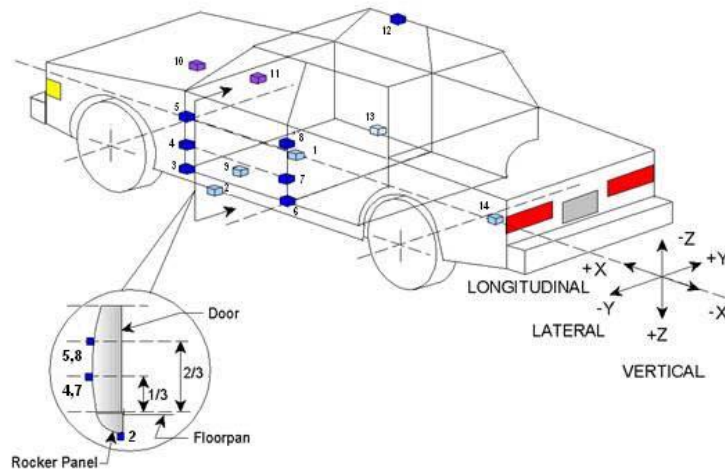
**INSTRUMENTATION**

Driver Dummy	135
Vehicle Structure	37
Pole Load Cells	8
Contact Channels	4
<b>TOTAL</b>	<b>184</b>

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

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



Location		Coordinates (mm)			Positive Direction		Negative Direction	
		X	Y	Z	Max	Time (ms)	Max	Time (ms)
1	Vehicle CG	2143	-40	-240				
	Longitudinal (g)				3.08	108.50	-7.73	48.85
	Lateral (g)				22.55	54.80	-3.68	136.25
	Vertical (g)				8.97	28.10	-12.97	19.40
	Resultant (g)				22.72	54.80		
2	Vehicle CG ARS	2142	-62	-239				
	Longitudinal (deg/s)				486.96	49.20	-132.78	134.75
	Lateral (deg/s)				77.89	21.55	-38.20	141.50
	Vertical (deg/s)				158.15	64.00	-12.22	20.75
3	Left Floor Sill Acceleration	2499	-682	-299				
	Lateral (g)				---	---	---	---
4	Left A-Pillar Sill Acceleration	2834	-740	-244				
	Lateral (g)				23.24	13.10	-46.73	35.95
5	Left Lower A-Pillar Acceleration	2870	-713	-80				
	Lateral (g)				22.48	13.25	-5.44	33.75
6	Left Mid A-Pillar Acceleration	2762	-684	-441				
	Lateral (g)				13.71	43.10	-0.73	3.70
7	Left B-Pillar Sill Acceleration	1808	-682	-298				
	Lateral (g)				---	---	---	---
8	Left Lower B-Pillar Acceleration	1530	-715	-90				
	Lateral (g)				17.21	40.25	-37.99	29.75
9	Left Mid B-Pillar Acceleration	1526	-702	-302				
	Lateral (g)				---	---	---	---

<sup>1</sup>See data acquisition explanation

**DATA SHEET NO. 6 (CONTINUED)**  
**VEHICLE ACCELEROMETER DATA**

Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

Location		Coordinates (mm)			Positive Direction		Negative Direction	
		X	Y	Z	Max	Time (ms)	Max	Time (ms)
10	Driver Seat Track at Dummy H-Point Acceleration	2003	-563	-325				
	Lateral (g)				---	---	---	---
11	Engine Top Acceleration	3599	409	-203				
	Longitudinal (g)				3.47	103.00	-8.83	39.65
	Lateral (g)				13.57	35.85	-4.28	184.75
12	Firewall Center Acceleration	3157	28	-164				
	Lateral (g)				16.42	42.70	-3.74	36.10
13	Right Roof at Vertical Impact Reference Line Acceleration	1771	560	-774				
	Lateral (g)				32.04	39.65	-1.53	297.75
14	Right Sill at Vertical Impact Reference Line Acceleration	2476	684	-301				
	Longitudinal (g)				4.02	36.40	-3.92	53.05
	Lateral (g)				16.84	42.60	-0.75	138.40
	Vertical (g)				3.72	46.85	-6.47	37.85
	Resultant (g)				17.07	42.70		
15	Right Sill at Rear Seat Acceleration	1520	731	-271				
	Longitudinal (g)				3.57	36.45	-4.62	54.25
	Lateral (g)				17.62	41.25	-0.98	168.30
	Vertical (g)				5.98	43.55	-5.10	24.15
	Resultant (g)				18.51	41.85		
16	Rear Floorpan Behind Rear Axle at Centerline Acceleration	922	71	-99				
	Longitudinal (g)				4.33	35.55	-5.67	48.95
	Lateral (g)				19.69	48.90	-0.82	275.95
17	Left Front Door Mid Centerline Acceleration	2174	-745	-47				
	Lateral (g)				181.43	9.75	-32.93	21.80
18	Left Front Door Mid Rear Acceleration	1790	-764	-40				
	Lateral (g)				161.06	7.85	-118.46	14.75
19	Left Front Door Upper Centerline Acceleration	2158	-733	-308				
	Lateral (g)				85.33	12.60	-22.30	32.00

<sup>1</sup>See data acquisition explanation

**DATA SHEET NO. 6 (CONTINUED)**  
**VEHICLE ACCELEROMETER DATA**

Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

Location		Coordinates (mm)			Positive Direction		Negative Direction	
		X	Y	Z	Max	Time (ms)	Max	Time (ms)
20	Left Rear Door Mid Rear Acceleration	1060	-705	-113				
	Lateral (g)				21.90	19.25	-0.56	277.85
21	Left Rear Door Upper Centerline Acceleration	1195	-698	-369				
	Lateral (g)				41.54	43.60	-26.17	48.85
22	Rear Deck Acceleration	185	12	-98				
	Longitudinal (g)				4.94	112.25	-15.70	50.50
	Lateral (g)				1.76	159.25	-24.42	49.45
	Vertical (g)				8.44	43.80	-7.42	37.90
	Resultant (g)				28.66	50.15		
23	Rear Deck ARS	186	-22	-103				
	Longitudinal (deg/s)				97.04	44.30	-20.14	270.15
	Lateral (deg/s)				39.52	18.85	-12.33	43.15
	Vertical (deg/s)				135.33	114.40	-17.22	30.60

\*0,0,0 located at rear bumper

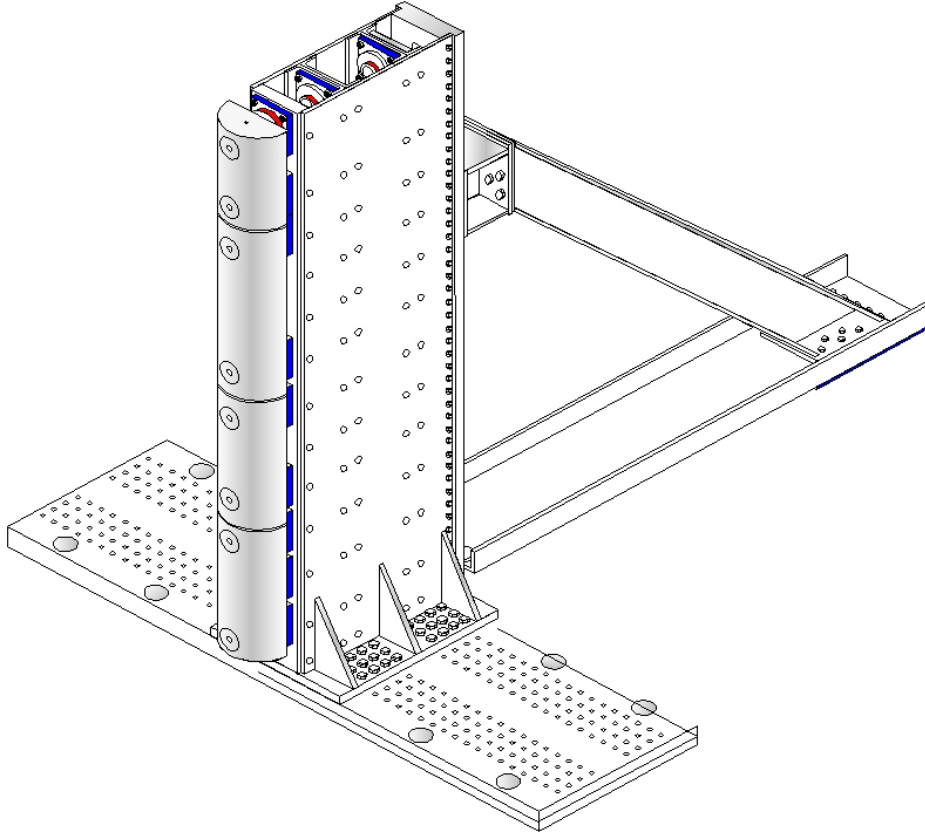
<sup>1</sup>See data acquisition explanation

**DATA SHEET NO. 7**  
**RIGID POLE LOAD CELL DATA**

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

**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 Veloster

Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

**TEST DUMMY INFORMATION AND CONTACT POINTS**

Dummy Body Part	Driver WorldSID-50M Dummy
Face	SCAB
Top of Head	SCAB, Head liner
Left Side of Head	SCAB, Head rest
Back of head	SCAB, Head rest
Left Shoulder	SAB
Upper Torso	Seatback bolster, SAB
Lower Torso	Seatback 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	N/A	Yes	Yes	Yes
Total Separation from Vehicle at Hinges or Latches	No	N/A	No	No	No
Latch or Hinge Systems Pulled Out of Their Anchorages	No	N/A	No	No	No
Disengaged from Latched Position	No	N/A	No	No	No
Latch Separated from Striker	No	N/A	No	No	No
Jammed Shut	Yes	N/A	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

\* Indicate "Yes", "No", or "NA".

**POST-TEST SEAT PERFORMANCE**

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

**POST-TEST STRUCTURAL OBSERVATIONS**

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	Good
Sill Separation	None
Windshield Damage	Along left A pillar and across top edge
Side Window Damage	Driver window broken out
Other Notable Effects	None

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

Test Vehicle: 2020 Hyundai Veloster

Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

**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

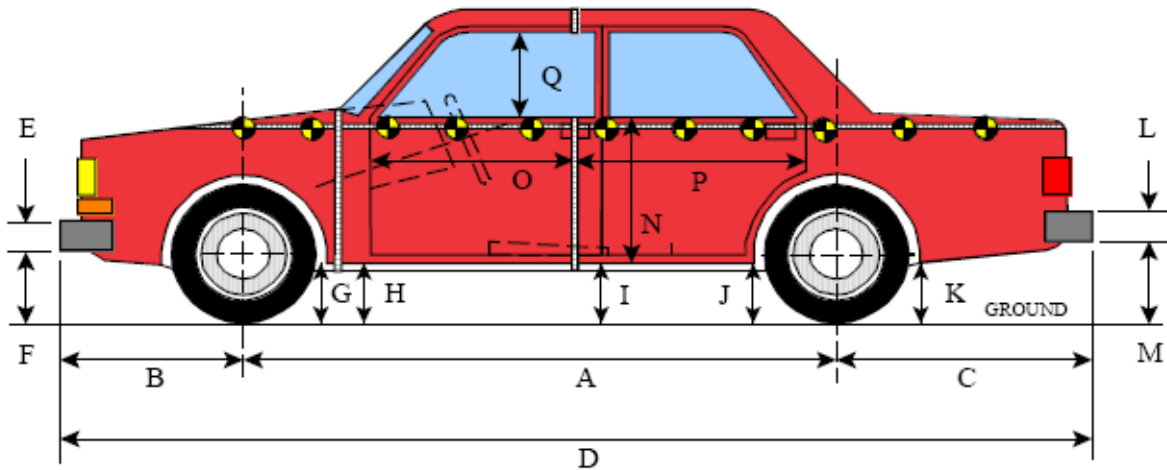
**VEHICLE SPEED, VEHICLE ANGLE AT IMPACT, AND IMPACT POINT LOCATION DATA**

Measured Parameter	Units	Tolerance	Value
Vertical Impact Reference Line (Aft of Front Axle) (Intended Impact Point)	mm		1328
Actual Impact Point (Aft of Front Axle)	mm		1326
Horizontal Offset (+ forward / - rearward)	mm	+/- 38 of Intended Impact Point	+2
Angle Between Vehicle's Longitudinal Centerline and Line of Forward Motion	Degrees	75 +/- 3	75
Trap No. 1 Velocity (Primary)	km/h	30.1 to 31.9	31.26
Trap No. 2 Velocity (Redundant)	km/h	30.1 to 31.9	31.30

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

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



**LEFT SIDE VIEW**

All MEASUREMENTS IN (mm) WITH TOLERANCE OF  $\pm 3$ mm

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

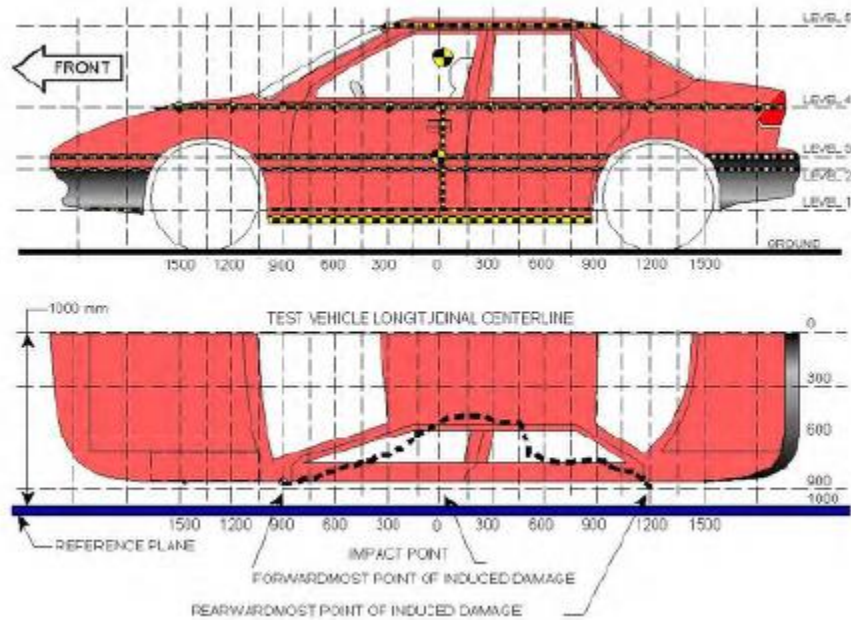
Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2640	2615	25
B	Front Axle to FSOV	866	866	0
C	Rear Axle to RSOV	734	734	0
D	Total Length at Centerline	4240	4210	30
E	Front Bumper Thickness	110	110	0
F	Front Bumper Bottom to Ground	405	430	-25
G	Sill Height at Front Wheel Well	273	285	-12
H	Sill Height at Front Door Leading Edge	278	283	-5
I	Sill Height at B Pillar	302	315	-13
J1	Sill Height at Rear Wheel Well	280	312	-32
J2	Pinch Weld Height at Rear Wheel Well	165	182	-17
K	Sill Height Aft of Rear Wheel Well	405	415	-10
L	Rear Bumper Thickness	125	125	0
M	Rear Bumper Bottom to Ground	582	580	2
N	Sill Height to Bottom of Front Window Sill	700	717	-17
O	Front Door Leading Edge to Impact CL	821	772	49
P	Rear Door Trailing Edge to Impact CL	509	472	37
Q	Front Window Opening	380	320	60
R	Right Side Length	4125	4120	5
S	Left Side Length	4125	4090	35
T	Maximum Vehicle Width at B-Pillars	1790	1715	75
U	Maximum Vehicle Width	1790	1985	-195

\*\*All Dimensions in mm

**DATA SHEET NO. 10  
VEHICLE EXTERIOR CRUSH MEASUREMENTS**

Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



**MAXIMUM EXTERIOR CRUSH MEASUREMENTS**

Level	Measurement Description	Height Above Ground	Maximum Exterior Static Crush	Distance from Impact
1	Sill Top	254	250	0
2	Occupant H-Point	505	265	0
3	Mid-Door	642	277	0
4	Window Sill	940	194	0
5	Window Top	1329	88	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 Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021

	Pre-Test					Post-Test					Difference					
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
-1050			891					910						-19		
-900	873	889	885	769		890	903	899	790		-17	-14	-14	-21		
-750	860	883	881	783		843	886	889	N/A		17	-3	-8	---		
-600	860	881	887	786		813	833	838	N/A		47	48	49	---		
-450	861	880	888	785		780	783	781	739		81	97	107	46		
-300	862	879	889	789		741	749	741	699		121	130	148	90		
-150	864	879	889	793	610	672	678	676	660	572	192	201	213	133	38	
0	864	879	887	796	616	614	614	610	602	528	250	265	277	194	88	
150	864	879	885	800	617	664	674	670	650	561	200	205	215	150	56	
300	863	879	881	801	615	747	757	747	711	579	116	122	134	90	36	
450	863	878	878	800	611	793	792	813	758	593	70	86	65	42	18	
600	861	879	878	799	601	834	826	810	763	594	27	53	68	36	7	
750	861	883	882	802	562	866	838	840	774	563	-5	45	42	28	-1	
900	873	893	888	807		900	845	862	784		-27	48	26	23		
1050			897	812				885	795				12	17		
1200				811					799					12		

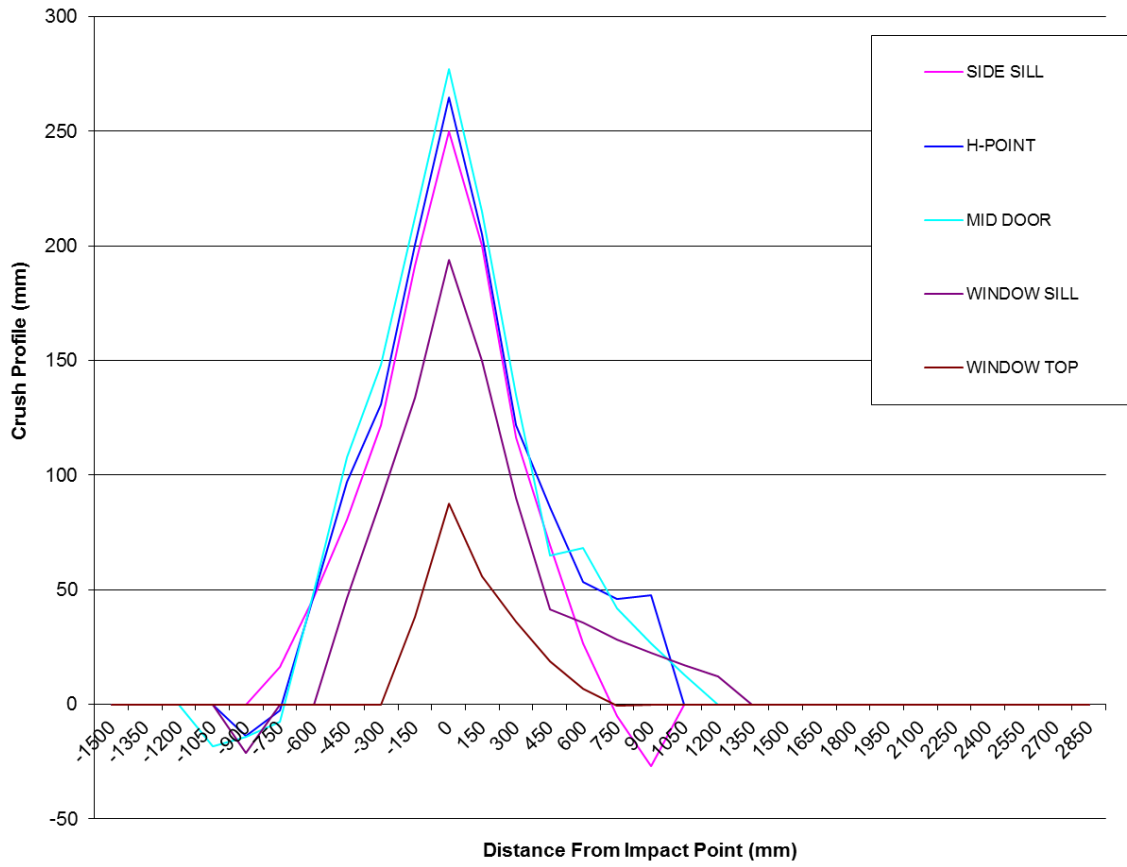
**NOTE:** Pre-test measurements are taken when the vehicle is in the “As Tested” weight condition. Vehicle measurements forward of the vertical impact reference line are negative. The crush profile grid is established prior to the test based on an estimated impact point. The vertical impact reference line was set at (0, 0, 0).

<sup>1</sup>Missing points post test

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

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

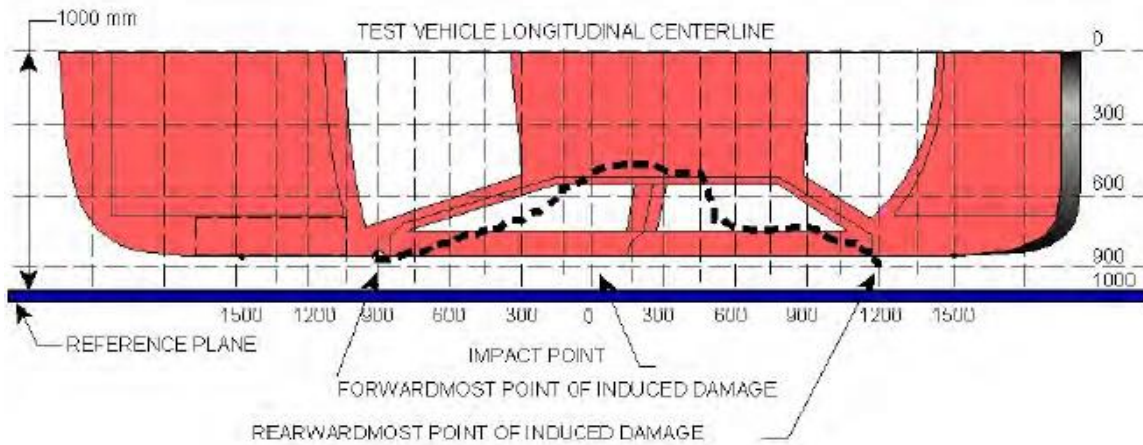
Test Date: 1/14/2021



**DATA SHEET NO. 11  
VEHICLE DAMAGE PROFILE DISTANCES**

Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



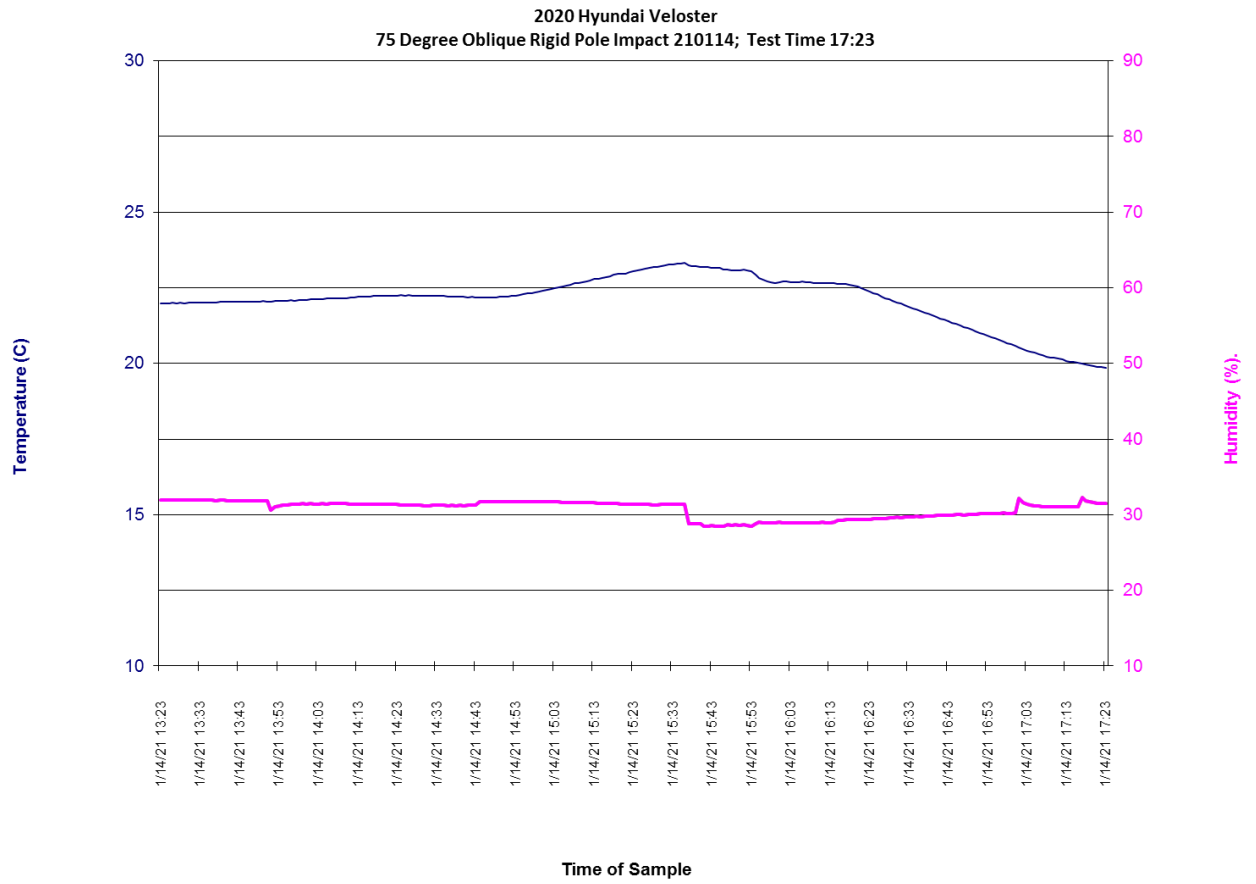
**VEHICLE DAMAGE PROFILE DISTANCES**

DPD	Distance From Impact Point (mm)	Level	Post-Test (mm)	Pre-Test (mm)	Crush (mm)
1	1200	4	799	811	12
2	750	2	838	883	45
3	450	2	792	878	86
4	0	3	610	887	277
5	-300	3	741	889	148
6 <sup>1</sup>	-750	1	843	860	0

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

**DATA SHEET NO. 12**  
**DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA**

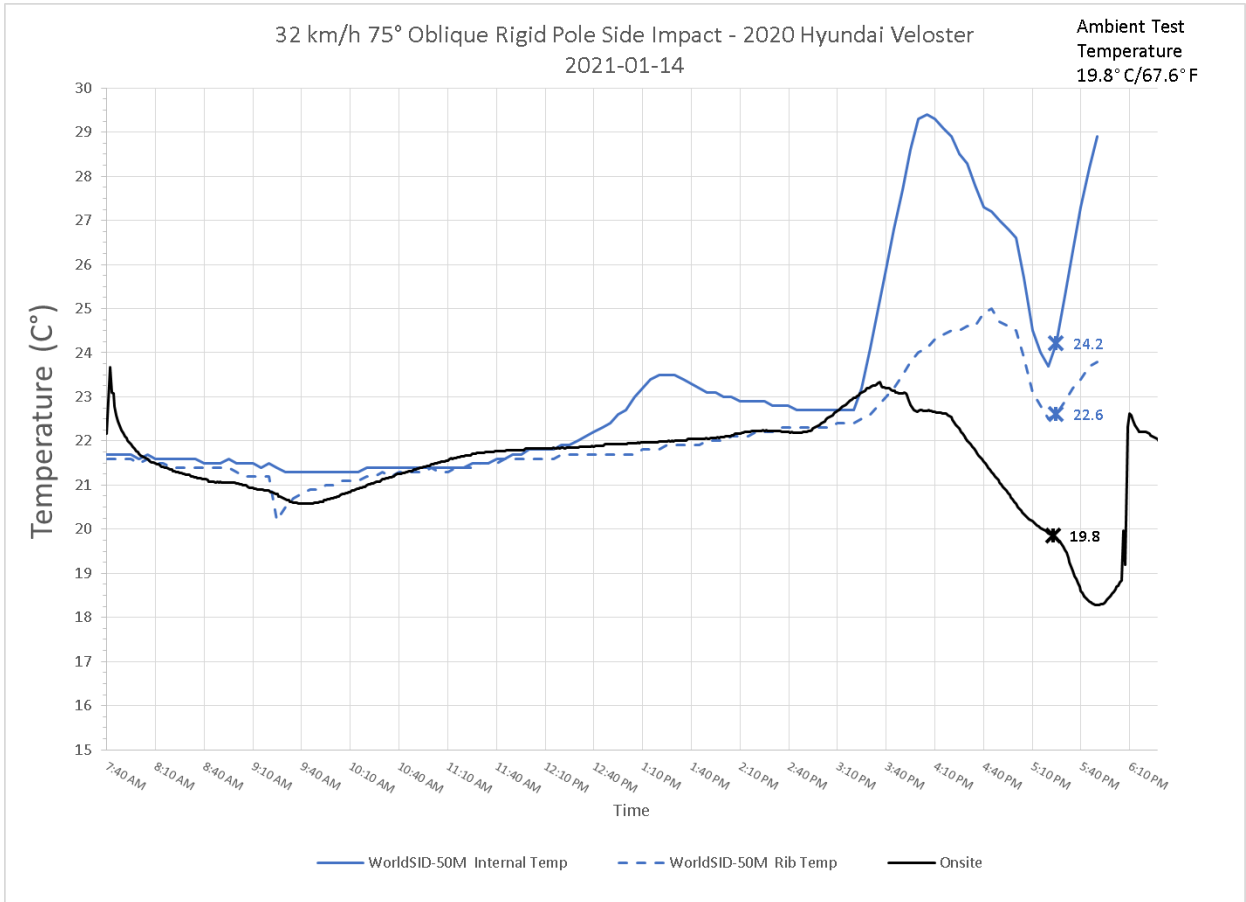
Test Vehicle: 2020 Hyundai Veloster  
 Test Program: Rigid Pole Side Impact Test Date: 1/14/2021



**DATA SHEET NO. 12, CONTINUED**  
**DUMMY/VEHICLE TEMPERATURE AND HUMIDITY STABILIZATION DATA**

Test Vehicle: 2020 Hyundai Veloster  
Test Program: Rigid Pole Side Impact

Test Date: 1/14/2021



**APPENDIX A  
PHOTOGRAPHS**

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3	Pre-Test Frontal View of Test Vehicle	A-5
4	Post-Test Frontal View of Test Vehicle	A-5
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7	Pre-Test Left Side View of Test Vehicle	A-7
8	Post-Test Left Side View of Test Vehicle	A-7
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13	Pre-Test Right Side View of Test Vehicle	A-10
14	Post-Test Right Side View of Test Vehicle	A-10
15	Pre-Test Overhead View of Test Area	A-11
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**No. 001 As Delivered Right Front  $\frac{3}{4}$  View of Test Vehicle**



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



**No. 003 Pre-Test Frontal View of Test Vehicle**



**No. 004 Post-Test Frontal View of Test Vehicle**



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



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



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



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



**No. 009 Pre-Test Left Rear 3/4 View of Test Vehicle**



**No. 010 Post-Test Left Rear 3/4 View of Test Vehicle**



**No. 011 Pre-Test Rear View of Test Vehicle**



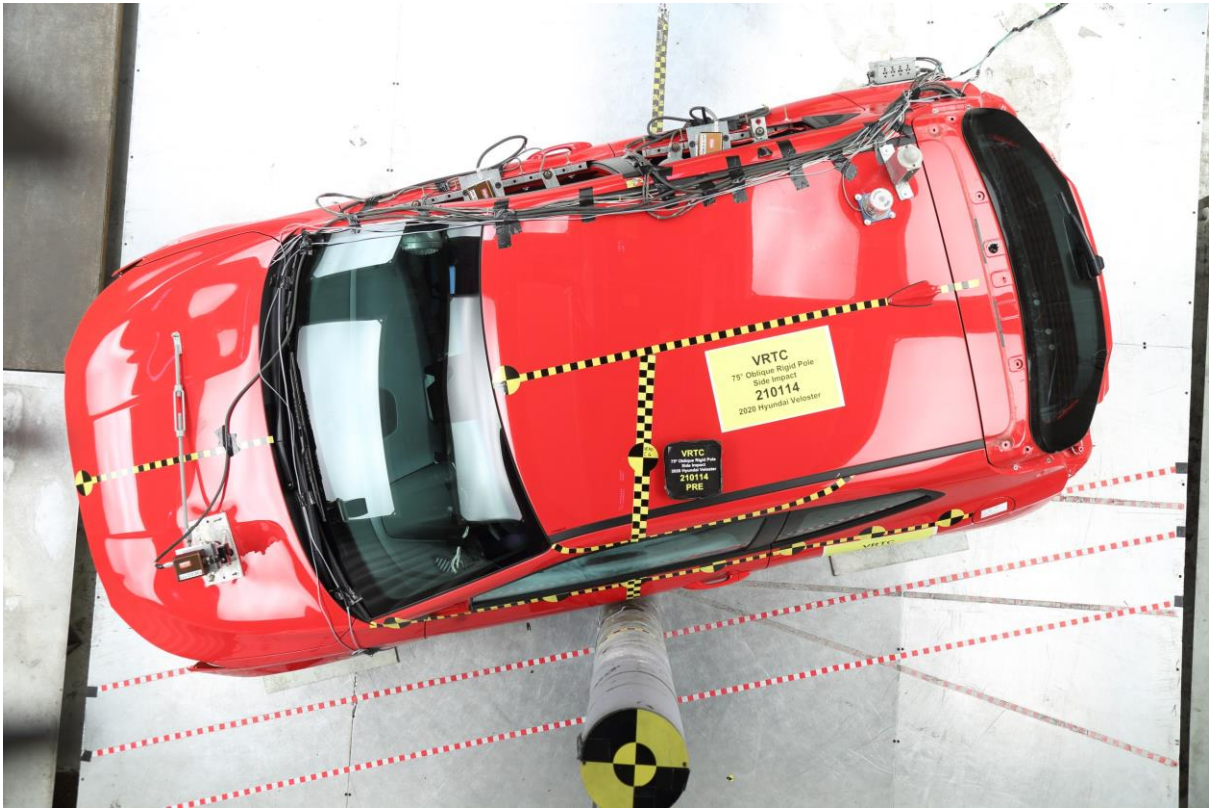
**No. 012 Post-Test Rear View of Test Vehicle**



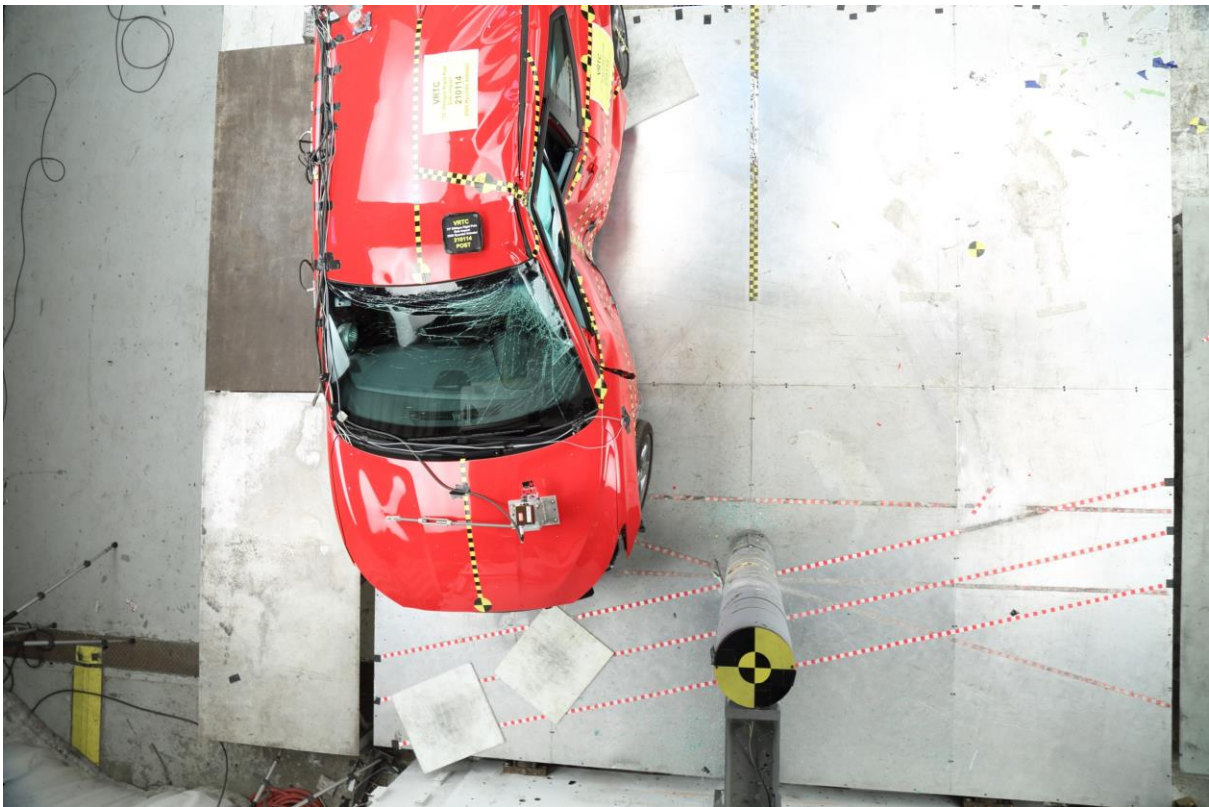
**No. 013 Pre-Test Right Side View of Test Vehicle**



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



**No. 015 Pre-Test Overhead View of Test Area**



**No. 016 Post-Test Overhead View of Test Area**



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



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



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



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



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



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



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

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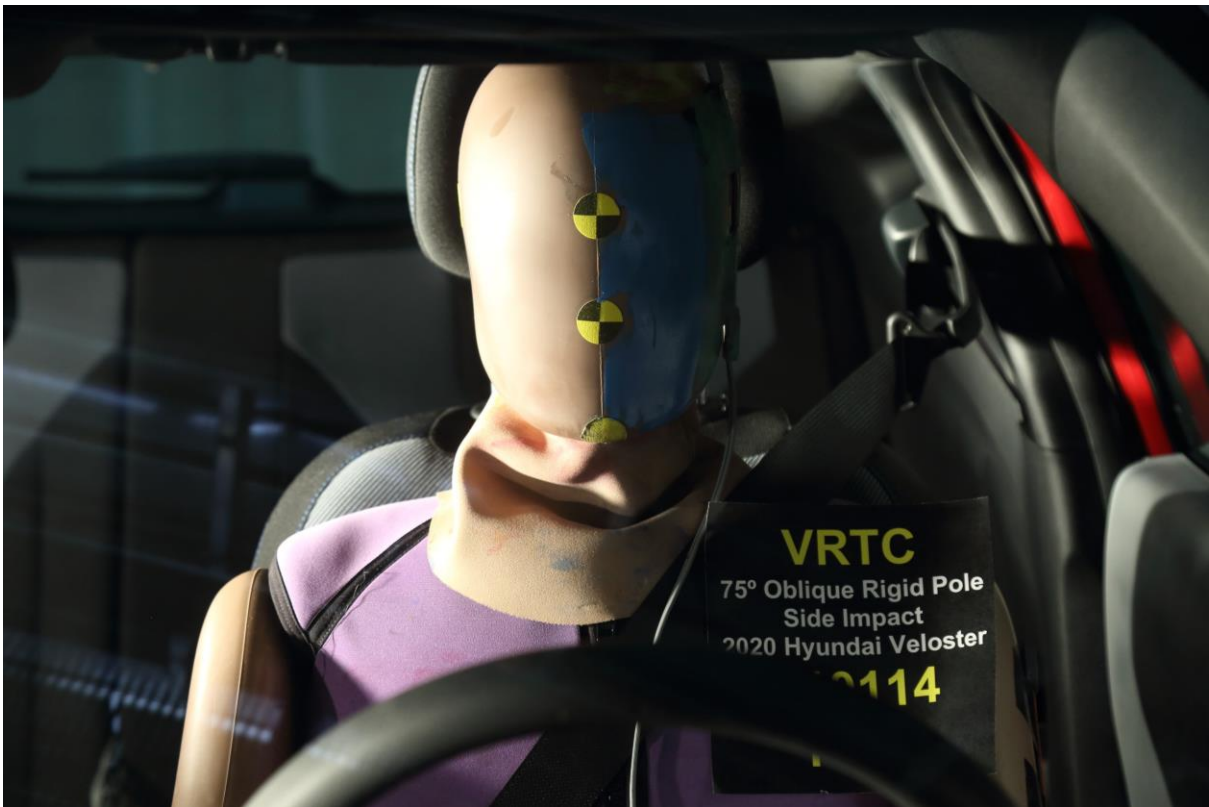
No. 024 Pre-Test Left Side View of Dummy Shoulder and Door Top View



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



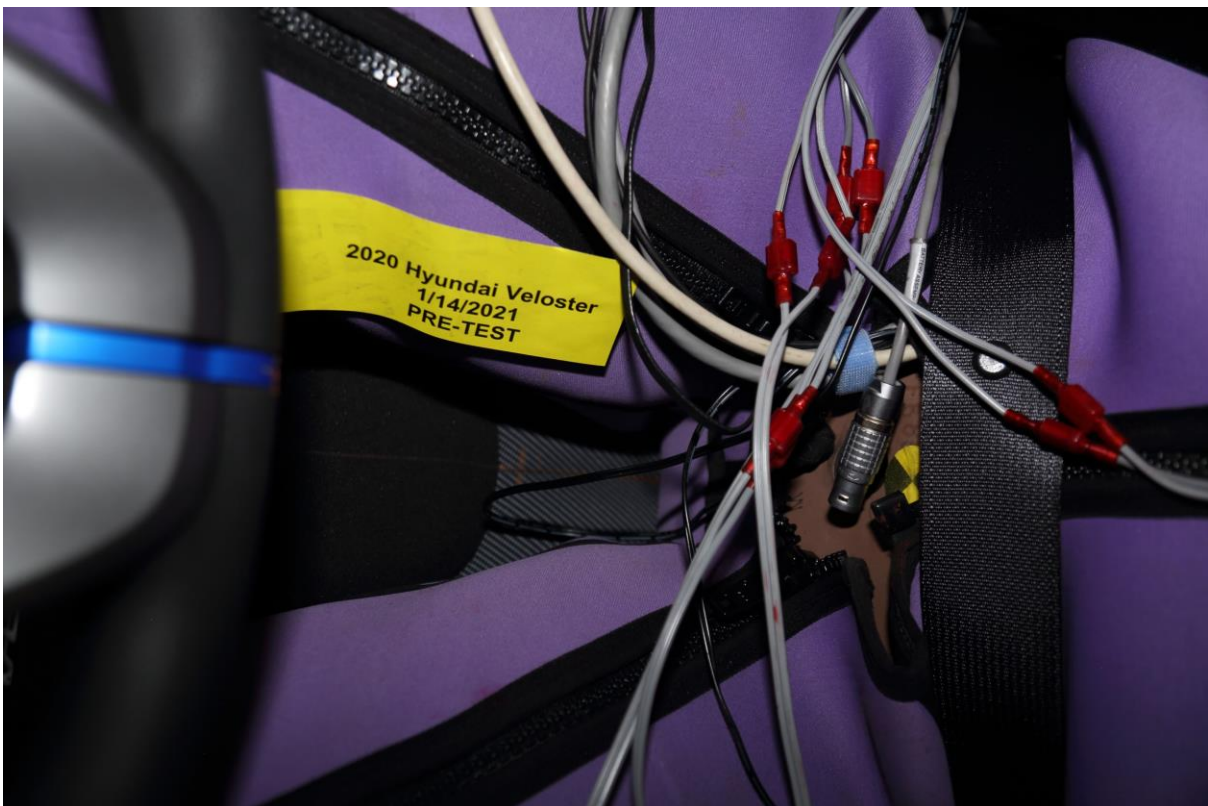
**No. 026 Pre-Test Front View of Seat Back Prior to Dummy Positioning**



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



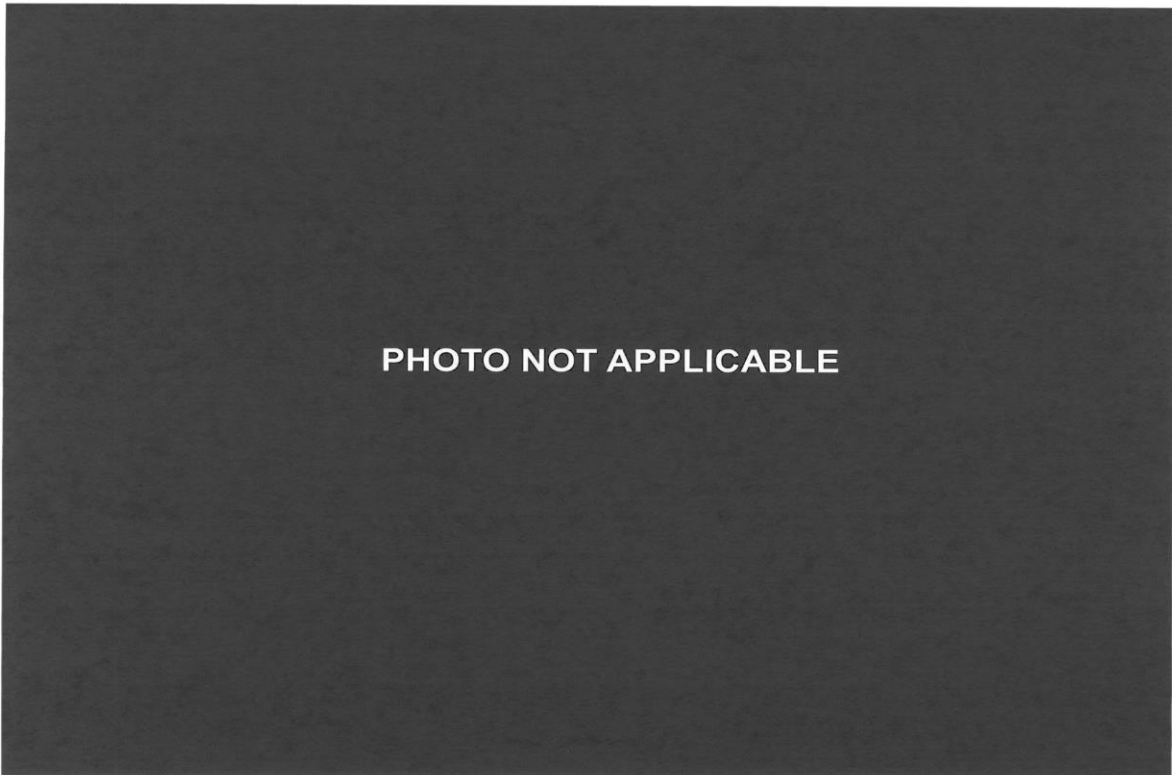
**No. 028 Pre-Test Front View of Seat Pan Prior to Dummy Positioning**



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



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



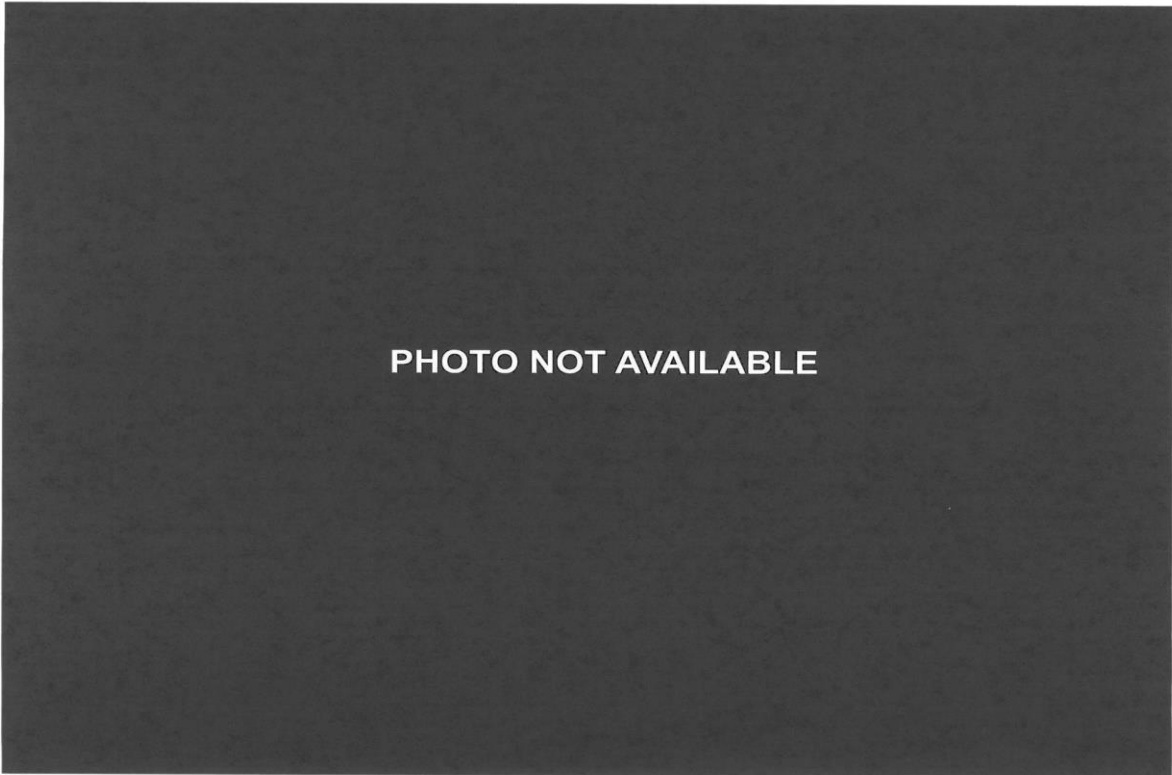
**No. 031 Pre-Test Left Side View of Dummy Head Showing Dummy Head is Level**



**No. 032 Pre-Test Placement of Dummy Feet**



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



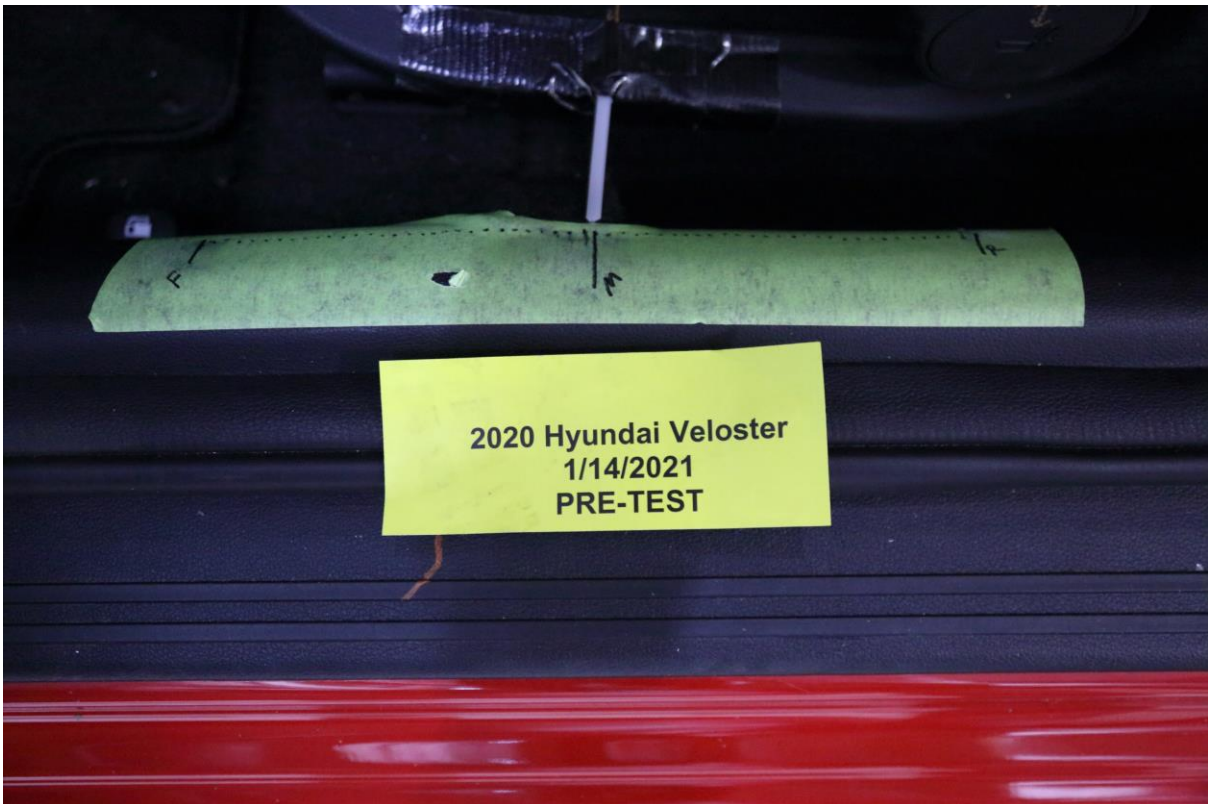
**No. 034 Pre-Test Left Side View of Steering Wheel**



**No. 035 Pre-Test View of Disengaged Parking Brake**



**No. 036 Pre-Test View of Parking Brake**



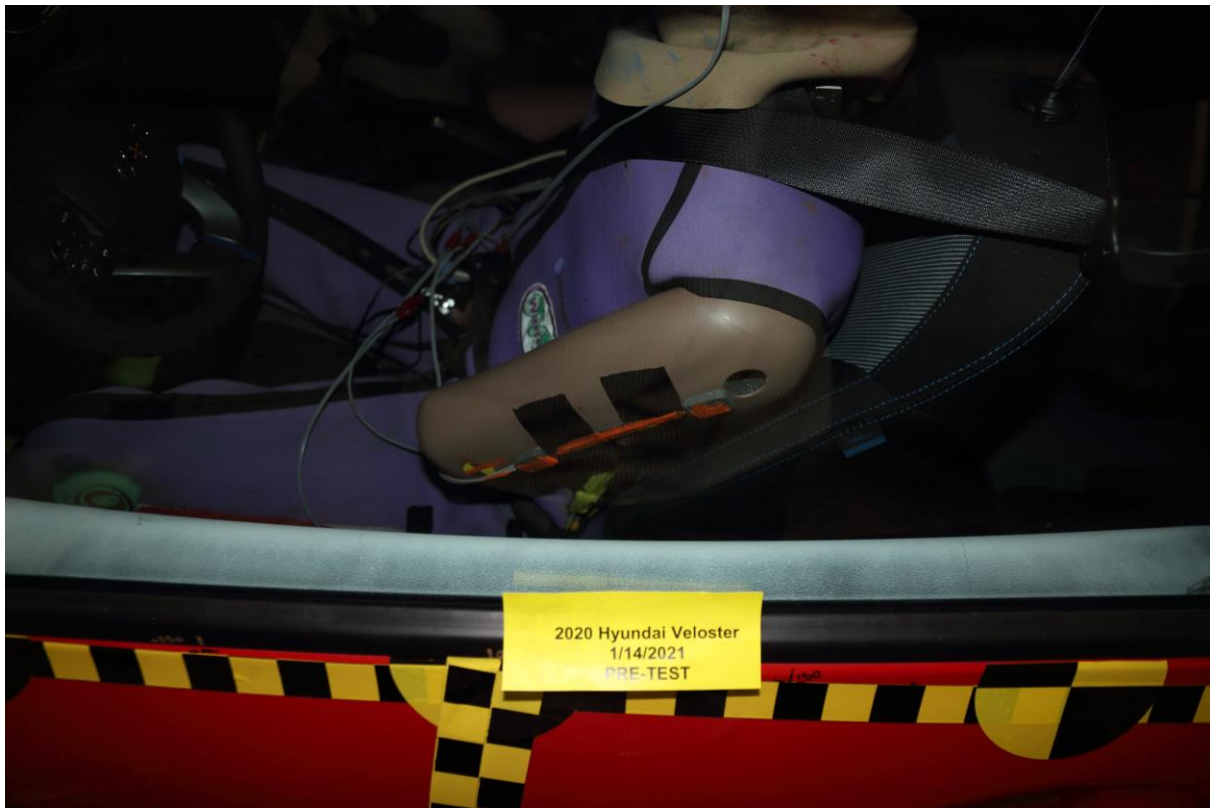
**No. 037 Pre-Test Close-Up Left Side View of Driver Seat Track**



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



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



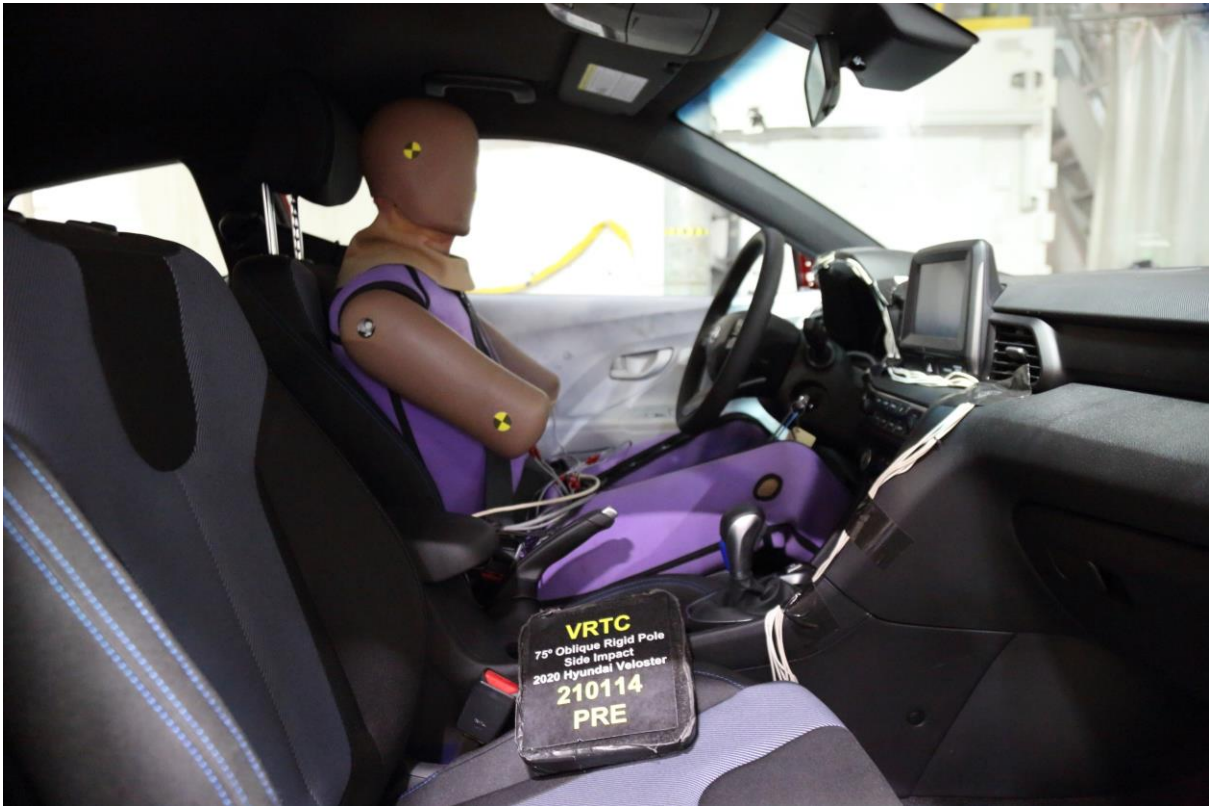
2020 Hyundai Veloster  
1/14/2021  
PRE-TEST

**No. 040 Pre-Test Dummy and Door Clearance View**



**VRTC**  
75° Oblique Rigid Pole  
Side Impact  
2020 Hyundai Veloster  
**210114**  
**POST**

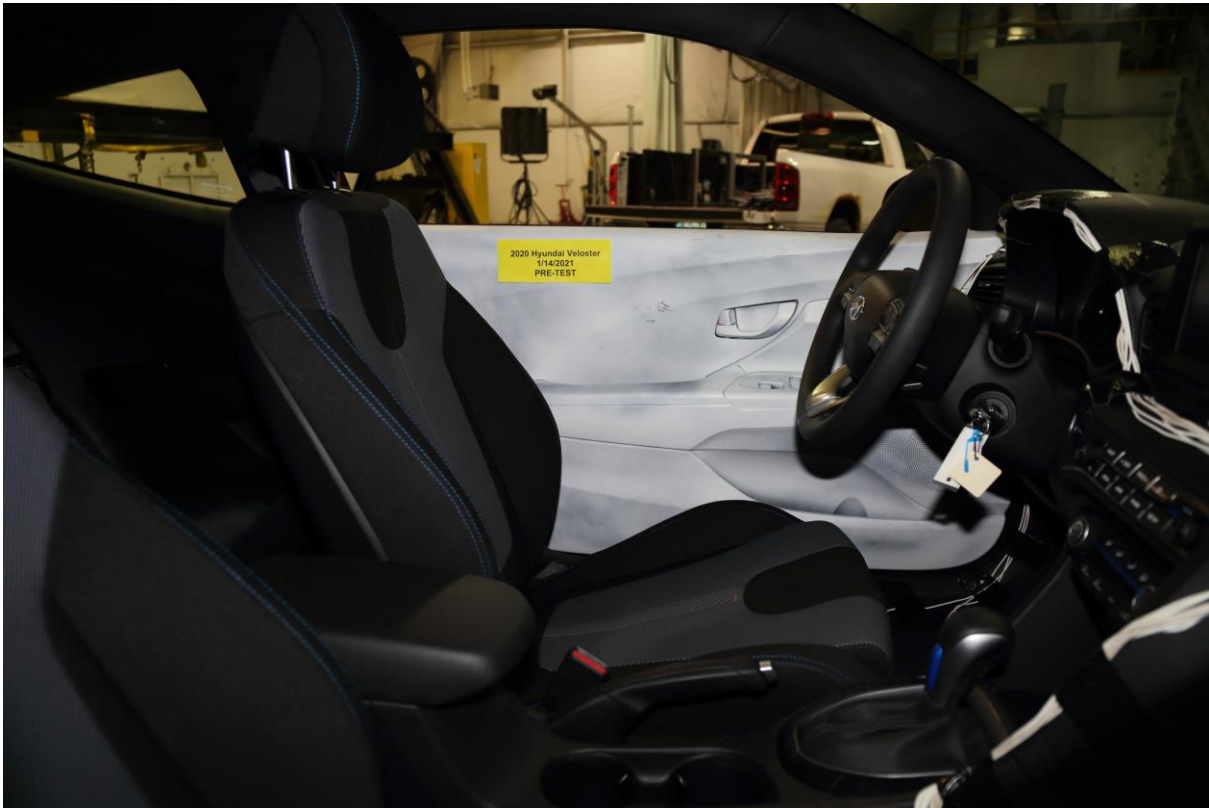
**No. 041 Post-Test Dummy and Door Clearance View**



**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**

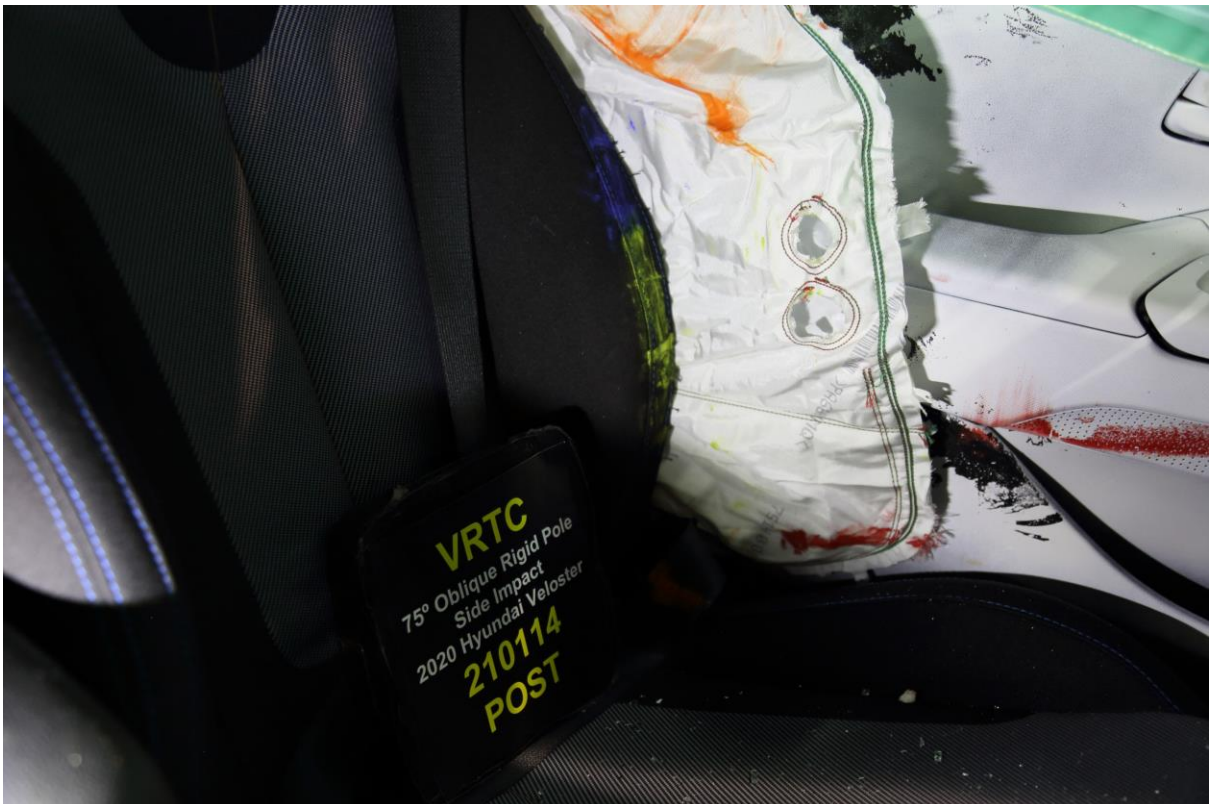
**PHOTO NOT APPLICABLE**

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

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



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



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



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



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



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



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

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

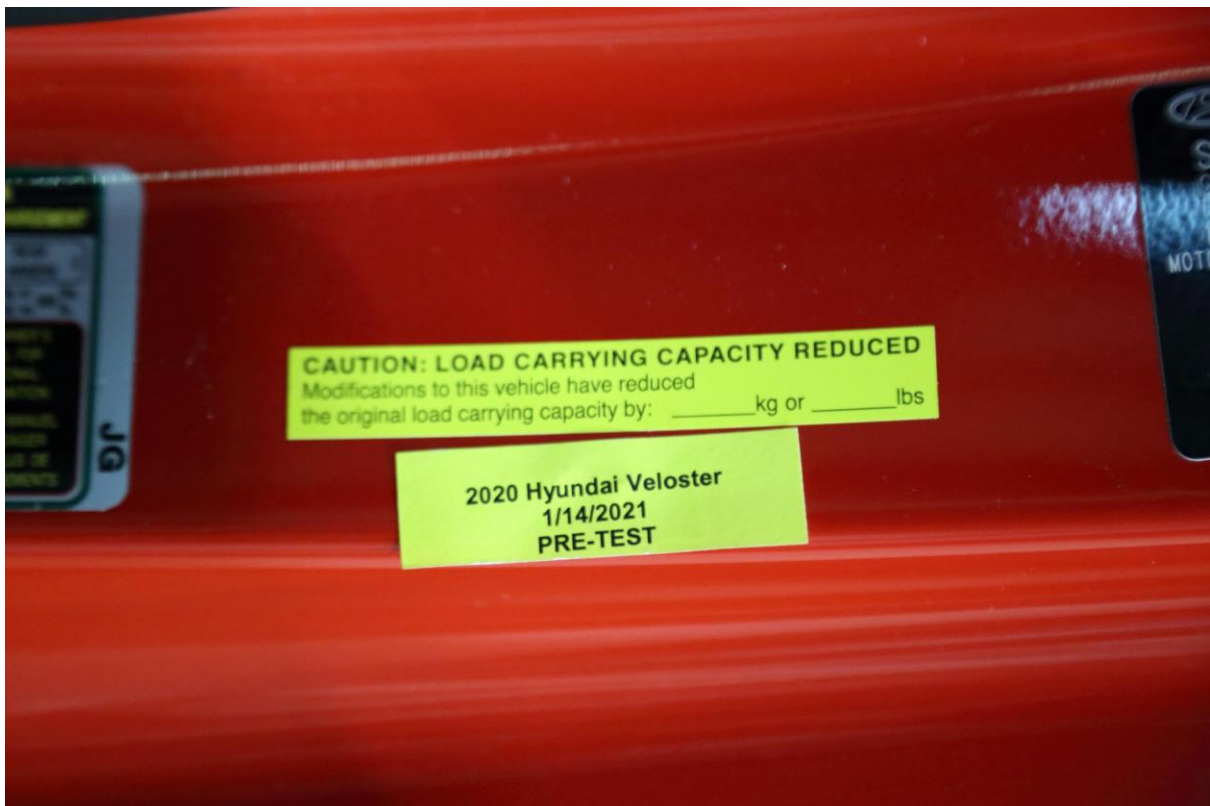
No. 055 Post-Test View of Fuel Filler Cap or Fuel Filler Neck



Fuel Filler Neck



No. 056 Close-Up View of Vehicle Certification Label

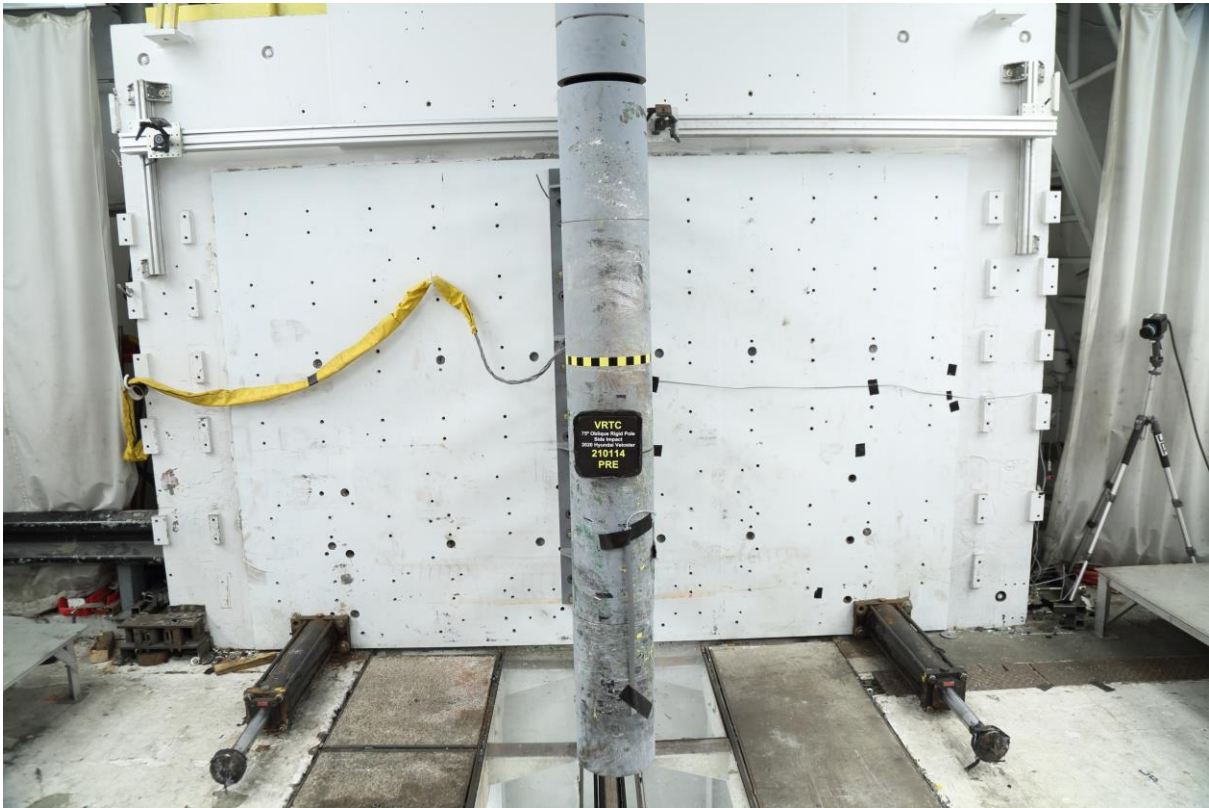


No. 056a Close-up View of Vehicle Reduced Load Carrying Capacity Label



No. 057 Close-Up View of Vehicle Tire Information Placard or Label

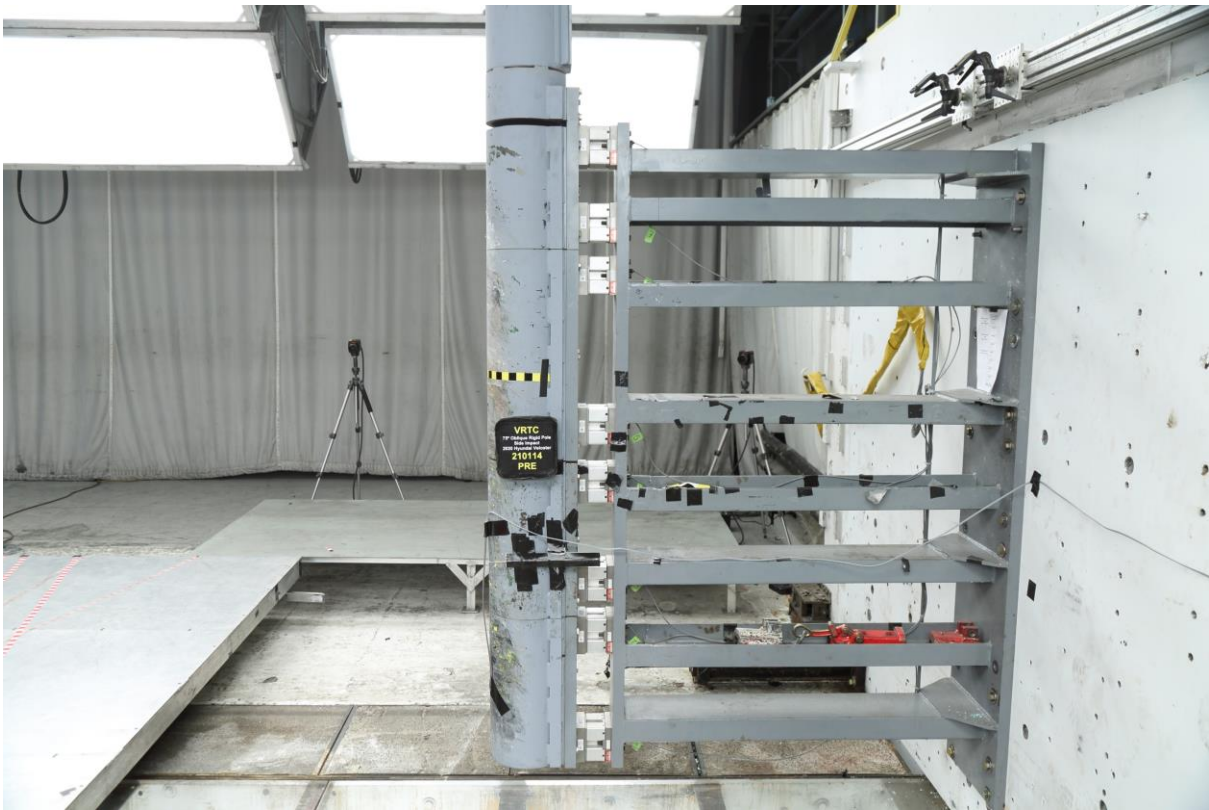
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**No. 058 Pre-Test Pole Barrier Front View**



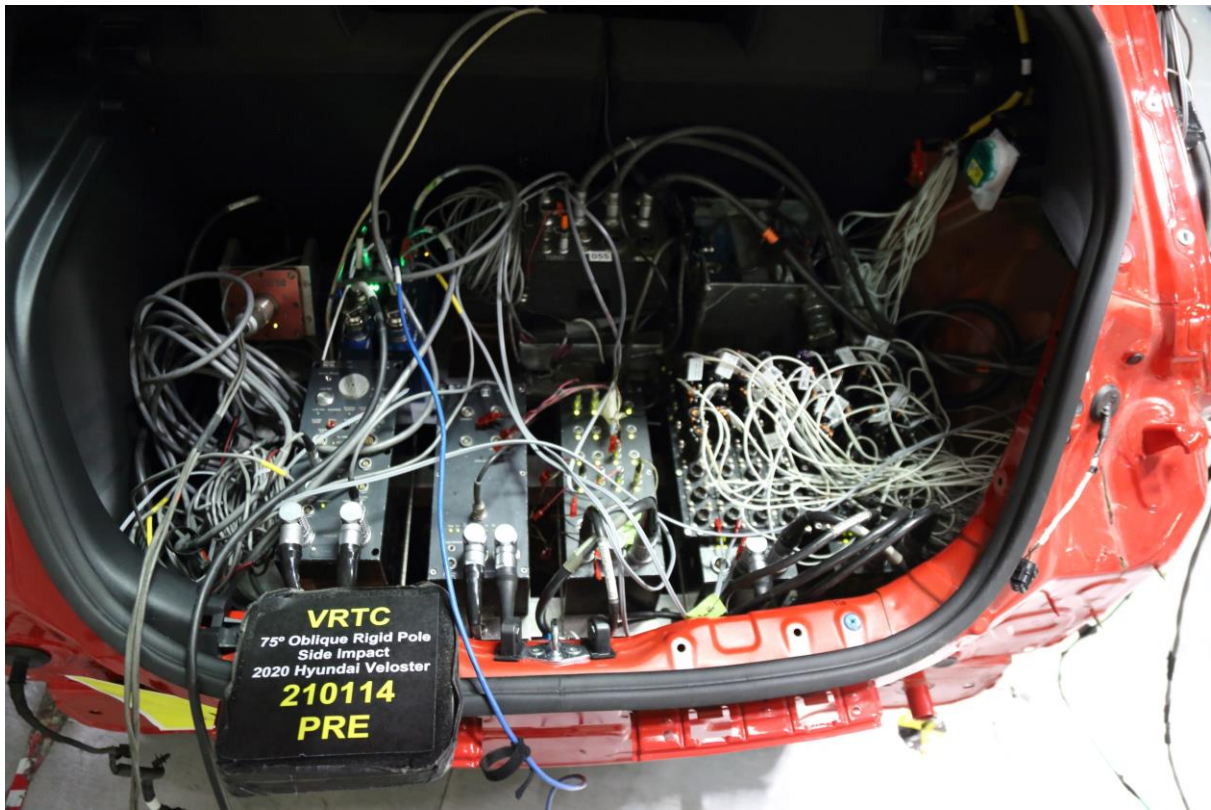
**No. 059 Post-Test Pole Barrier Front View**



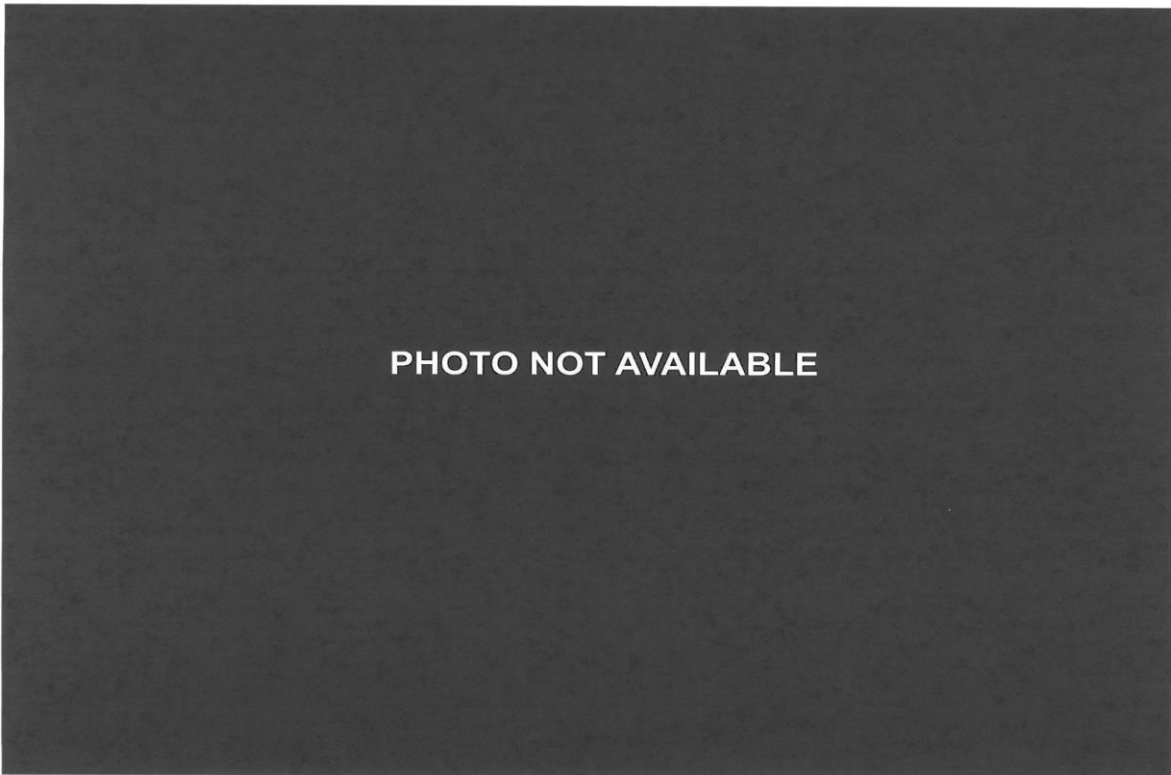
**No. 060 Pre-Test Pole Barrier Side View**



**No. 061 Post-Test Pole Barrier Side View**



**No. 062 Pre-Test Ballast View**



**No. 063 Post-Test Primary and Redundant Speed Trap Read Out**



**PHOTO NOT APPLICABLE**

**No. 064 FMVSS No. 301 Static Rollover 0 Degrees**



**PHOTO NOT APPLICABLE**

**No. 065 FMVSS No. 301 Static Rollover 90 Degrees**



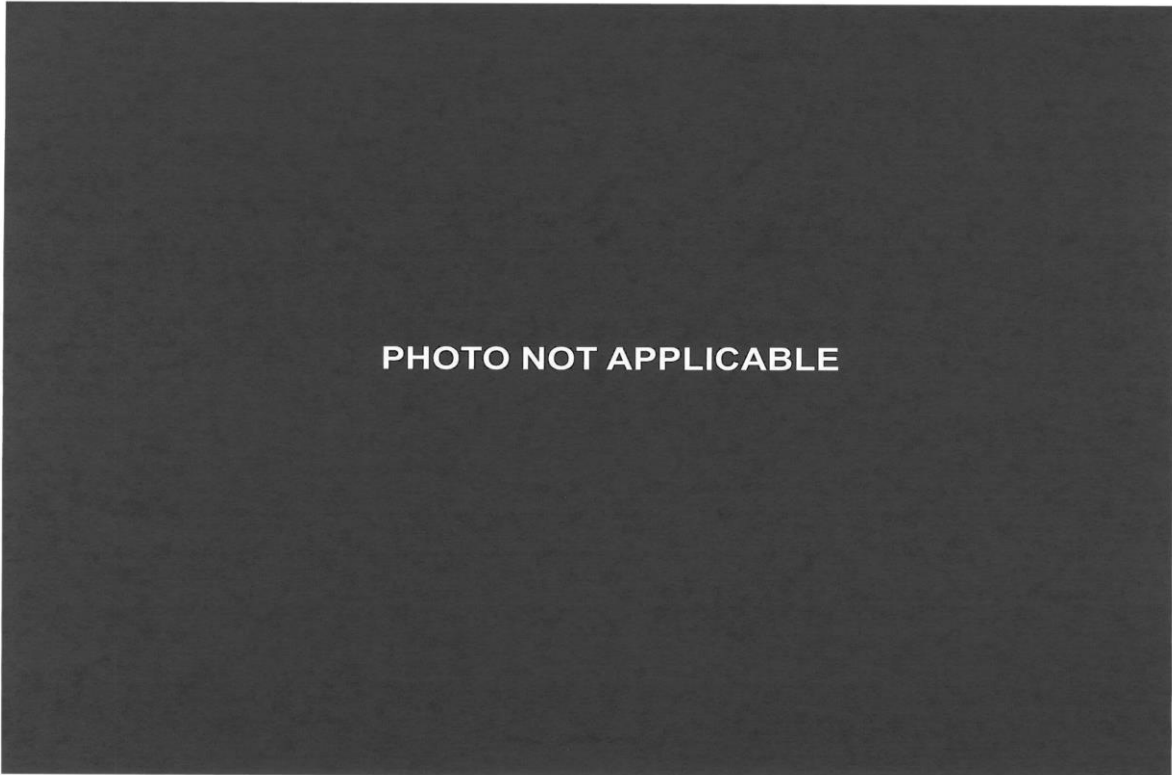
**PHOTO NOT APPLICABLE**

**No. 066 FMVSS No. 301 Static Rollover 180 Degrees**



**PHOTO NOT APPLICABLE**

**No. 067 FMVSS No. 301 Static Rollover 270 Degrees**



**No. 068 FMVSS No. 301 Static Rollover 360 Degrees**

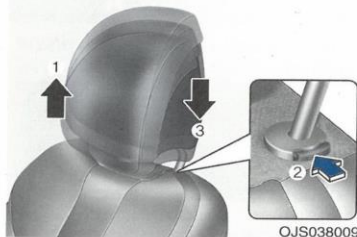


**No. 069 Impact Event**

<b>SOLD TO: MO011</b> DEAN TEAM HYUNDAI 14754 MANCHESTER ROAD BALLWIN MO 63011		<b>SHIPPED TO: MO011</b>		<b>GOVERNMENT 5-STAR SAFETY RATINGS</b>  This vehicle has not been rated by the government for overall vehicle score, frontal crash, side crash or rollover risk.  Source: National Highway Traffic Safety Administration (NHTSA). www.safercar.gov or 1-888-327-4236	
<b>VIN:</b> KMHTG6AFXLU026869 <b>MODEL:</b> F1302F45 <b>ENGINE:</b> G4NHKW665948 <b>PORT OF ENTRY:</b> PT <b>EXTERIOR COLOR:</b> RACING RED <b>INTERIOR/SEAT COLOR:</b> BLACK/BLACK <b>TRANSPORT:</b> TRUCK <b>ACCESSORY WEIGHT:</b> 8 lbs./ 3 kgs. <b>EMISSIONS:</b> This vehicle is certified to meet emission requirements in all 50 states					
<b>STANDARD FEATURES:</b> <b>AMERICA'S BEST WARRANTY</b> 5-year/60,000-mile New Vehicle Warranty* 10-year/100,000-mile Powertrain Warranty* 7-year/Unlimited-mile Anti-perforation Warranty* 5-year/Unlimited-mile Roadside Assistance *Limited warranties, see dealer for details  <b>ADVANCED SAFETY TECHNOLOGY</b> Electronic Stability Control (ESC) w/ Traction Control ABS w/ Electronic Brake-force Distribution & Brake Assist 4-Wheel Disc Brakes Forward Collision-Avoidance Assist Lane Keep Assist & Driver Attention Warning Rearview Camera w/ Dynamic Guidelines Driver's Blind Spot Mirror <b>POWERTRAIN TECHNOLOGY</b> 2.0L GDI, 147 HP, 132 lbs-ft Torque, DOHC 4-Cylinder Dual Continuous Variable Valve Timing 6-speed Automatic Transmission with Sportronic Drive Mode Select Torque Vectoring Control <b>EXTERIOR</b> 17-inch Alloy Wheels w/ 215/45 R17 Tires Projector Headlights LED Daytime Running Lights Center Exhaust Outlet Bodycolor Power Heated Mirrors <b>COMFORT &amp; CONVENIENCE</b> 7-inch Display Audio AM/FM w/ 6 speakers Android Auto(TM) & Apple CarPlay(TM) Support Auxiliary Input Jack Dual USB Charging Air Conditioning w/ Cabin Air Filter Steering Wheel Mounted Cruise, Audio & Phone Controls Automatic Headlight Control Bluetooth® Hands-Free Phone System Tilt-and-Telescopic Steering Column Illuminated Vanity Mirrors w/ Sliding Sunvisors 60/40 Split-Folding Rear Seat Remote Keyless Entry w/ Alarm Emergency Tire Puncture Kit in lieu of Spare Tire Full Tank of Gas		Manufacturer's Suggested Retail Price: <b>\$19,600.00</b>  <b>ADDED FEATURES:</b> *Carpeted Floor Mats \$135.00 *Cargo Net \$50.00 *Wheel Locks \$55.00			
		Inland Freight & Handling : \$930.00 <b>Total Price : \$20,770.00</b>			

**No. 70 Monroney Label**

**Safety system of your vehicle**

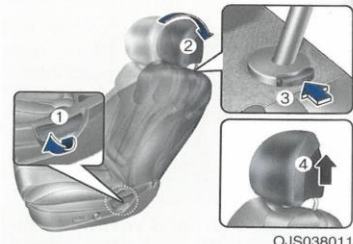


- Adjusting the height up and down**
- To raise the head restraint:
1. Pull it up to the desired position (1).
- To lower the head restraint:
1. Push and hold the release button (2) on the head restraint support.
  2. Lower the head restraint to the desired position (3).



**NOTICE**

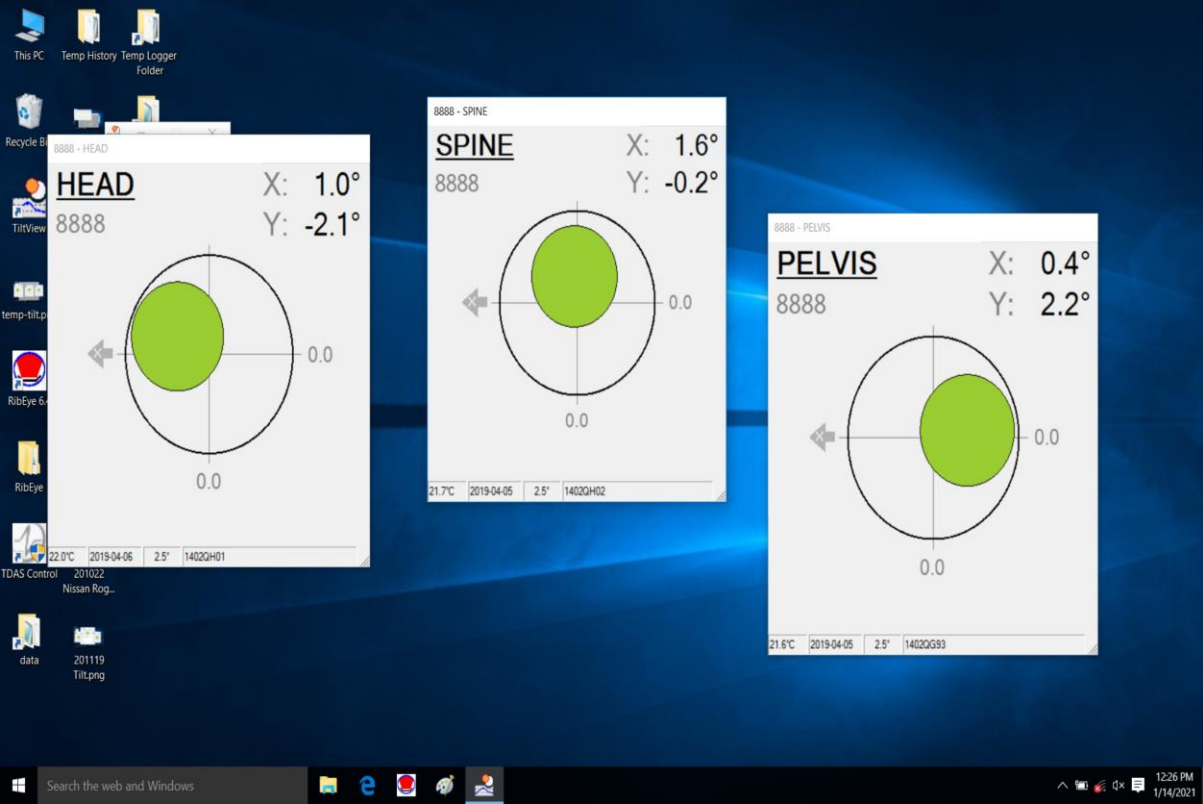
If you recline the seatback towards the front with the head restraint and seat cushion raised, the head restraint may come in contact with the sunvisor or other parts of the vehicle.



- Removal/Reinstallation**
- To remove the head restraint:
1. Recline the seatback (2) rearward using the seatback angle lever (1).
  2. Raise the head restraint as far as it can go.
  3. Press the head restraint release button (3) while pulling the head restraint up (4).

PHOTO NOT APPLICABLE

No. 072 Post-Test View of Shattered Vehicle Inner Door Panel



No. 073 WorldSID-50M Pre-Test Tilt Sensor View

**APPENDIX B**  
**VEHICLE AND DUMMY RESPONSE DATA PLOTS**

## TABLE OF DATA PLOTS

### Driver Dummy & Vehicle Instrumentation Plots

<b>No.</b>	<b>Description</b>	<b>Page</b>
1	Driver Head Acceleration (X)	B-8
2	Driver Head Acceleration (Y)	B-8
3	Driver Head Acceleration (Z)	B-8
4	Driver Head Resultant Acceleration	B-8
5	Driver Head Angular Rate (X)	B-9
6	Driver Head Angular Rate (Y)	B-9
7	Driver Head Angular Rate (Z)	B-9
8	Driver Upper Neck Force (X)	B-10
9	Driver Upper Neck Force (Y)	B-10
10	Driver Upper Neck Force (Z)	B-10
11	Driver Upper Neck Moment (X)	B-11
12	Driver Upper Neck Moment (Y)	B-11
13	Driver Upper Neck Moment (Z)	B-11
14	Driver Lower Neck Force (X)	B-12
15	Driver Lower Neck Force (Y)	B-12
16	Driver Lower Neck Force (Z)	B-12
17	Driver Lower Neck Moment (X)	B-13
18	Driver Lower Neck Moment (Y)	B-13
19	Driver Lower Neck Moment (Z)	B-13
20	Driver Shoulder Force (X)	B-14
21	Driver Shoulder Force (Y)	B-14
22	Driver Shoulder Force (Z)	B-14
23	Driver Shoulder Rear Displacement (X)	B-15
24	Driver Shoulder Rear Displacement (Y)	B-15
25	Driver Shoulder Rear Displacement (Z)	B-15
26	Driver Shoulder Rear Length Change	B-15
27	Driver Shoulder Middle Displacement (X)	B-16
28	Driver Shoulder Middle Displacement (Y)	B-16
29	Driver Shoulder Middle Displacement (Z)	B-16
30	Driver Shoulder Middle Length Change	B-16
31	Driver Shoulder Front Displacement (X)	B-17
32	Driver Shoulder Front Displacement (Y)	B-17
33	Driver Shoulder Front Displacement (Z)	B-17
34	Driver Shoulder Front Length Change	B-17

## TABLE OF DATA PLOTS, CONTINUED

### Driver Dummy & Vehicle Instrumentation Plots

<b>No.</b>	<b>Description</b>	<b>Page</b>
35	Driver Thorax Rib 1 Rear Displacement (X)	B-18
36	Driver Thorax Rib 1 Rear Displacement (Y)	B-18
37	Driver Thorax Rib 1 Rear Displacement (Z)	B-18
38	Driver Thorax Rib 1 Rear Length Change	B-18
39	Driver Thorax Rib 1 Middle Displacement (X)	B-19
40	Driver Thorax Rib 1 Middle Displacement (Y)	B-19
41	Driver Thorax Rib 1 Middle Displacement (Z)	B-19
42	Driver Thorax Rib 1 Middle Length Change	B-19
43	Driver Thorax Rib 1 Front Displacement (X)	B-20
44	Driver Thorax Rib 1 Front Displacement (Y)	B-20
45	Driver Thorax Rib 1 Front Displacement (Z)	B-20
46	Driver Thorax Rib 1 Front Length Change	B-20
47	Driver Thorax Rib 2 Rear Displacement (X)	B-21
48	Driver Thorax Rib 2 Rear Displacement (Y)	B-21
49	Driver Thorax Rib 2 Rear Displacement (Z)	B-21
50	Driver Thorax Rib 2 Rear Length Change	B-21
51	Driver Thorax Rib 2 Middle Displacement (X)	B-22
52	Driver Thorax Rib 2 Middle Displacement (Y)	B-22
53	Driver Thorax Rib 2 Middle Displacement (Z)	B-22
54	Driver Thorax Rib 2 Middle Length Change	B-22
55	Driver Thorax Rib 2 Front Displacement (X)	B-23
56	Driver Thorax Rib 2 Front Displacement (Y)	B-23
57	Driver Thorax Rib 2 Front Displacement (Z)	B-23
58	Driver Thorax Rib 2 Front Length Change	B-23
59	Driver Thorax Rib 3 Rear Displacement (X)	B-24
60	Driver Thorax Rib 3 Rear Displacement (Y)	B-24
61	Driver Thorax Rib 3 Rear Displacement (Z)	B-24
62	Driver Thorax Rib 3 Rear Length Change	B-24
63	Driver Thorax Rib 3 Middle Displacement (X)	B-25
64	Driver Thorax Rib 3 Middle Displacement (Y)	B-25
65	Driver Thorax Rib 3 Middle Displacement (Z)	B-25
66	Driver Thorax Rib 3 Middle Length Change	B-25

## TABLE OF DATA PLOTS, CONTINUED

### Driver Dummy & Vehicle Instrumentation Plots

<b>No.</b>	<b>Description</b>	<b>Page</b>
67	Driver Thorax Rib 3 Front Displacement (X)	B-26
68	Driver Thorax Rib 3 Front Displacement (Y)	B-26
69	Driver Thorax Rib 3 Front Displacement (Z)	B-26
70	Driver Thorax Rib 3 Front Length Change	B-26
71	Driver Abdomen Rib 1 Rear Displacement (X)	B-27
72	Driver Abdomen Rib 1 Rear Displacement (Y)	B-27
73	Driver Abdomen Rib 1 Rear Displacement (Z)	B-27
74	Driver Abdomen Rib 1 Rear Length Change	B-27
75	Driver Abdomen Rib 1 Middle Displacement (X)	B-28
76	Driver Abdomen Rib 1 Middle Displacement (Y)	B-28
77	Driver Abdomen Rib 1 Middle Displacement (Z)	B-28
78	Driver Abdomen Rib 1 Middle Length Change	B-28
79	Driver Abdomen Rib 1 Front Displacement (X)	B-29
80	Driver Abdomen Rib 1 Front Displacement (Y)	B-29
81	Driver Abdomen Rib 1 Front Displacement (Z)	B-29
82	Driver Abdomen Rib 1 Front Length Change	B-29
83	Driver Abdomen Rib 2 Rear Displacement (X)	B-30
84	Driver Abdomen Rib 2 Rear Displacement (Y)	B-30
85	Driver Abdomen Rib 2 Rear Displacement (Z)	B-30
86	Driver Abdomen Rib 2 Rear Length Change	B-30
87	Driver Abdomen Rib 2 Middle Displacement (X)	B-31
88	Driver Abdomen Rib 2 Middle Displacement (Y)	B-31
89	Driver Abdomen Rib 2 Middle Displacement (Z)	B-31
90	Driver Abdomen Rib 2 Middle Length Change	B-31
91	Driver Abdomen Rib 2 Front Displacement (X)	B-32
92	Driver Abdomen Rib 2 Front Displacement (Y)	B-32
93	Driver Abdomen Rib 2 Front Displacement (Z)	B-32
94	Driver Abdomen Rib 2 Front Length Change	B-32
95	Driver Spine T1 Acceleration (X)	B-33
96	Driver Spine T1 Acceleration (Y)	B-33
97	Driver Spine T1 Acceleration (Z)	B-33
98	Driver Spine T1 Acceleration Resultant	B-33

## TABLE OF DATA PLOTS, CONTINUED

### Driver Dummy & Vehicle Instrumentation Plots

<b>No.</b>	<b>Description</b>	<b>Page</b>
99	Driver Spine T4 Acceleration (X)	B-34
100	Driver Spine T4 Acceleration (Y)	B-34
101	Driver Spine T4 Acceleration (Z)	B-34
102	Driver Spine T4 Acceleration Resultant	B-34
103	Driver Spine T12 Acceleration (X)	B-35
104	Driver Spine T12 Acceleration (Y)	B-35
105	Driver Spine T12 Acceleration (Z)	B-35
106	Driver Spine T12 Acceleration Resultant	B-35
107	Driver Pubic Symphysis Force (Y)	B-36
108	Driver Sacro-iliac Left Force (X)	B-37
109	Driver Sacro-iliac Left Force (Y)	B-37
110	Driver Sacro-iliac Left Force (Z)	B-37
111	Driver Sacro-iliac Left Force (X)	B-38
112	Driver Sacro-iliac Left Force (Y)	B-38
113	Driver Sacro-iliac Left Force (Z)	B-38
114	Driver Sacro-iliac Right Force (X)	B-39
115	Driver Sacro-iliac Right Force (Y)	B-39
116	Driver Sacro-iliac Right Force (Z)	B-39
117	Driver Sacro-iliac Right Force (X)	B-40
118	Driver Sacro-iliac Right Force (Y)	B-40
119	Driver Sacro-iliac Right Force (Z)	B-40
120	Driver Lumbar Force (X)	B-41
121	Driver Lumbar Force (Y)	B-41
122	Driver Lumbar Force (Z)	B-41
123	Driver Lumbar Moment (X)	B-42
124	Driver Lumbar Moment (Y)	B-42
125	Driver Lumbar Moment (Z)	B-42
126	Driver Pelvic Acceleration (X)	B-43
127	Driver Pelvic Acceleration (Y)	B-43
128	Driver Pelvic Acceleration (Z)	B-43
129	Driver Pelvic Acceleration Resultant	B-43
130	Driver Left Femur Force (X)	B-44
131	Driver Left Femur Force (Y)	B-44
132	Driver Left Femur Force (Z)	B-44

## TABLE OF DATA PLOTS, CONTINUED

### Driver Dummy & Vehicle Instrumentation Plots

No.	Description	Page
133	Driver Left Femur Moment (X)	B-45
134	Driver Left Femur Moment (Y)	B-45
135	Driver Left Femur Moment (Z)	B-45
136	Driver Femoral Neck Force (X)	B-46
137	Driver Femoral Neck Force (Y)	B-46
138	Driver Femoral Neck Force (Z)	B-46
139	Driver Left Outer Knee Force (Y)	B-47
140	Driver Left Outer Knee Force (Y)	B-47
141	Vehicle Center of Gravity Acceleration (X)	B-48
142	Vehicle Center of Gravity Acceleration (Y)	B-48
143	Vehicle Center of Gravity Acceleration (Z)	B-48
144	Vehicle Center of Gravity Acceleration Resultant	B-48
145	Vehicle Center of Gravity Angular Rate (X)	B-49
146	Vehicle Center of Gravity Angular Rate (Y)	B-49
147	Vehicle Center of Gravity Angular Rate (Z)	B-49
148	Left Floor Sill Acceleration (Y)	B-50
149	Left A-Pillar Sill Acceleration (Y)	B-50
150	Left Lower A-Pillar Acceleration (Y)	B-50
151	Left Mid A-Pillar Acceleration (Y)	B-50
152	Left B-Pillar Sill Acceleration (Y)	B-51
153	Left Lower B-Pillar Acceleration (Y)	B-51
154	Left Mid B-Pillar Acceleration (Y)	B-51
155	Driver Seat Track at Dummy H-Point Acceleration (Y)	B-51
156	Engine Top Acceleration (X)	B-52
157	Engine Top Acceleration (Y)	B-52
158	Firewall Center Acceleration (Y)	B-52
159	Right Roof at Vertical Impact Reference Line Acceleration (Y)	B-52
160	Right Sill at Vertical Impact Reference Line Acceleration (X)	B-53
161	Right Sill at Vertical Impact Reference Line Acceleration (Y)	B-53
162	Right Sill at Vertical Impact Reference Line Acceleration (Z)	B-53
163	Right Sill at Vertical Impact Reference Line Acceleration Resultant	B-53
164	Right Sill at Rear Seat Acceleration (X)	B-54
165	Right Sill at Rear Seat Acceleration (Y)	B-54
166	Right Sill at Rear Seat Acceleration (Z)	B-54
167	Right Sill at Rear Seat Acceleration Resultant	B-54

## TABLE OF DATA PLOTS, CONTINUED

### Driver Dummy & Vehicle Instrumentation Plots

<b>No.</b>	<b>Description</b>	<b>Page</b>
<b>168</b>	Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)	<b>B-55</b>
<b>169</b>	Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)	<b>B-55</b>
<b>170</b>	Left Front Door Mid Centerline Acceleration (Y)	<b>B-55</b>
<b>171</b>	Left Front Door Mid Rear Acceleration (Y)	<b>B-56</b>
<b>172</b>	Left Front Door Upper Centerline Acceleration (Y)	<b>B-56</b>
<b>173</b>	Left Rear Door Mid Rear Acceleration (Y)	<b>B-56</b>
<b>174</b>	Left Rear Door Upper Centerline Acceleration (Y)	<b>B-56</b>
<b>175</b>	Rear Deck Acceleration (X)	<b>B-57</b>
<b>176</b>	Rear Deck Acceleration (Y)	<b>B-57</b>
<b>177</b>	Rear Deck Acceleration (Z)	<b>B-57</b>
<b>178</b>	Rear Deck Acceleration Resultant	<b>B-57</b>
<b>179</b>	Rear Deck Angular Rate (X)	<b>B-58</b>
<b>180</b>	Rear Deck Angular Rate (Y)	<b>B-58</b>
<b>181</b>	Rear Deck Angular Rate (Z)	<b>B-58</b>
<b>182</b>	Driver Head Contact	<b>B-59</b>
<b>183</b>	Driver Shoulder Contact	<b>B-59</b>
<b>184</b>	Driver Thorax Contact	<b>B-59</b>
<b>185</b>	Driver Pelvis Contact	<b>B-59</b>
<b>186</b>	Load Cell Pole Barrier #1 Force (Y)	<b>B-60</b>
<b>187</b>	Load Cell Pole Barrier #2 Force (Y)	<b>B-60</b>
<b>188</b>	Load Cell Pole Barrier #3 Force (Y)	<b>B-60</b>
<b>189</b>	Load Cell Pole Barrier #4 Force (Y)	<b>B-60</b>
<b>190</b>	Load Cell Pole Barrier #5 Force (Y)	<b>B-61</b>
<b>191</b>	Load Cell Pole Barrier #6 Force (Y)	<b>B-61</b>
<b>191</b>	Load Cell Pole Barrier #7 Force (Y)	<b>B-61</b>
<b>193</b>	Load Cell Pole Barrier #8 Force (Y)	<b>B-61</b>

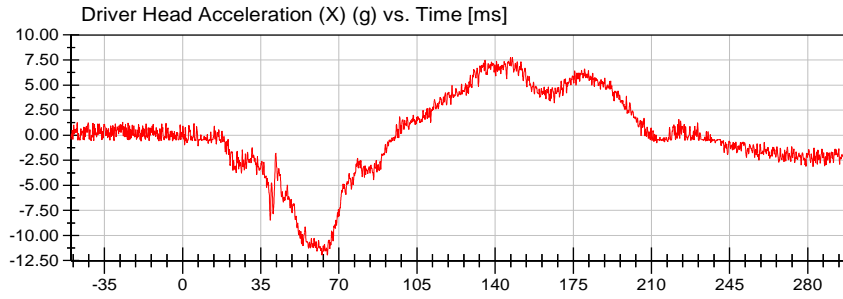
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ( )



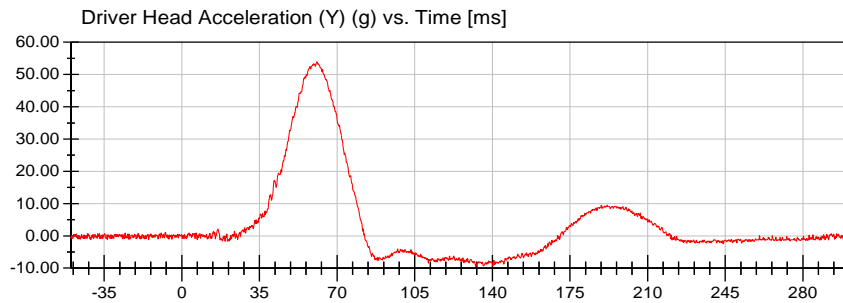
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7.76 g at 147.70 ms

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-11.97 g at 62.40 ms

CFC\_1000



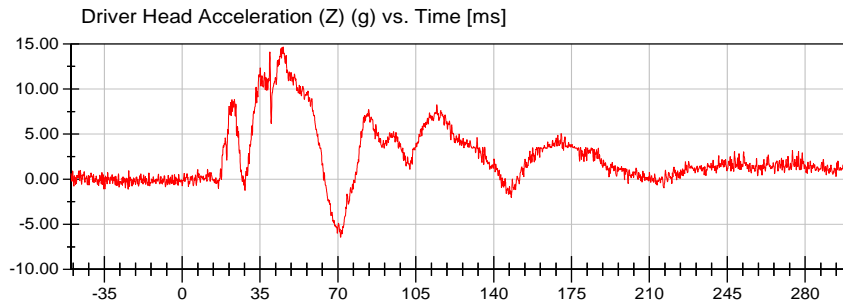
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53.96 g at 60.90 ms

**<Min>**

-9.52 g at 132.55 ms

CFC\_1000



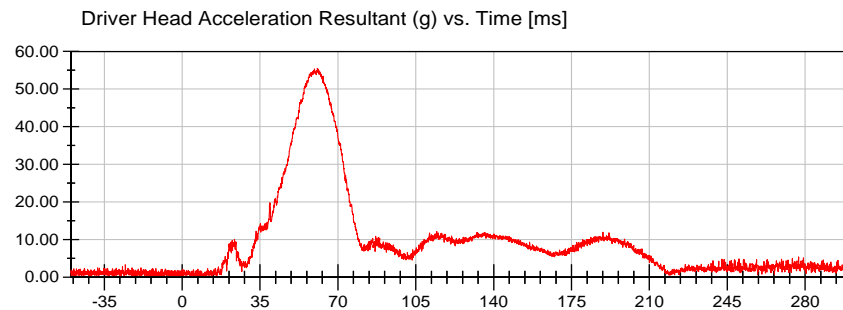
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14.65 g at 45.40 ms

**<Min>**

-6.44 g at 71.20 ms

CFC\_1000



**<Max>**

55.49 g at 60.80 ms

**<Min>**

0.38 g at -27.85 ms

Prefiltered\_> CFC 1000

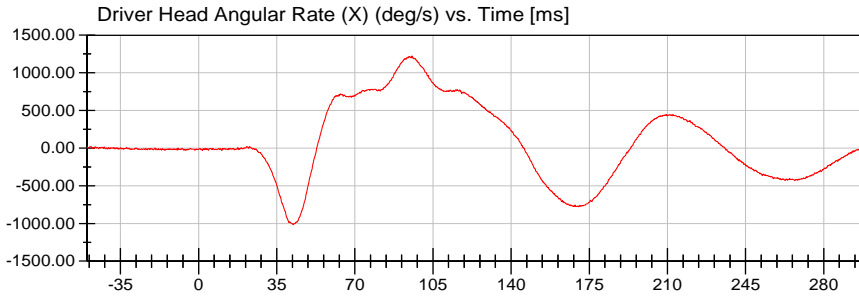


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



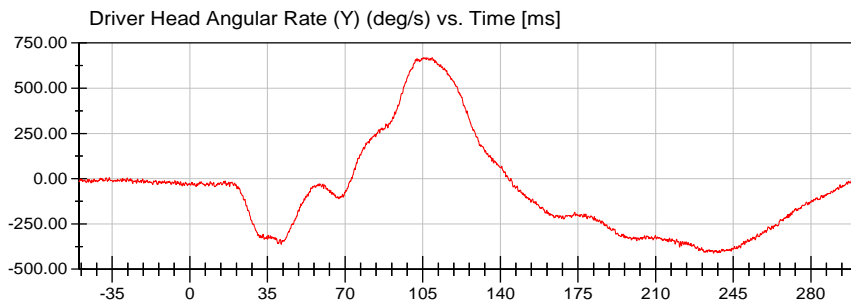
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1,223.04 deg/s at 95.65 ms

**<Min>**

-1,015.03 deg/s at 42.35 ms

CFC\_1000



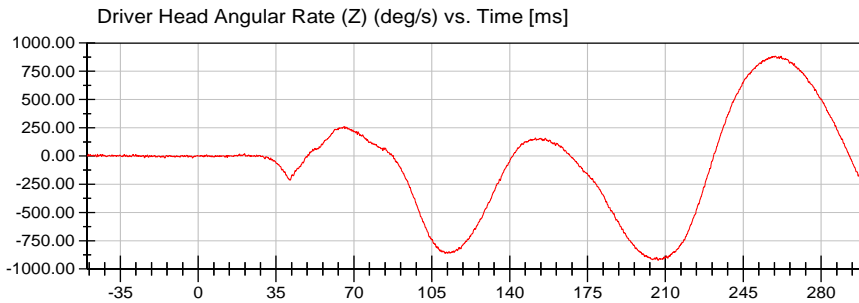
**<Max>**

669.74 deg/s at 105.55 ms

**<Min>**

-412.00 deg/s at 236.20 ms

CFC\_1000



**<Max>**

884.29 deg/s at 262.00 ms

**<Min>**

-922.78 deg/s at 206.70 ms

CFC\_1000



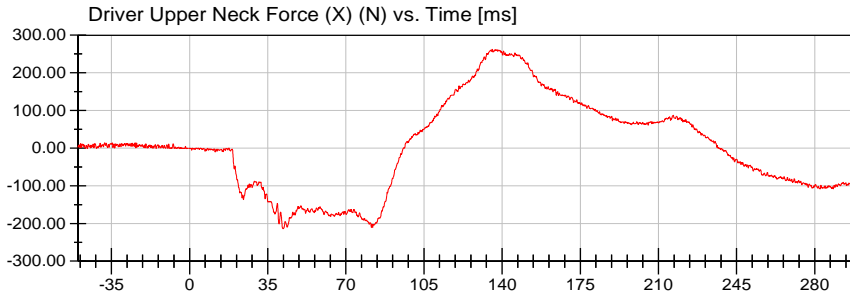
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



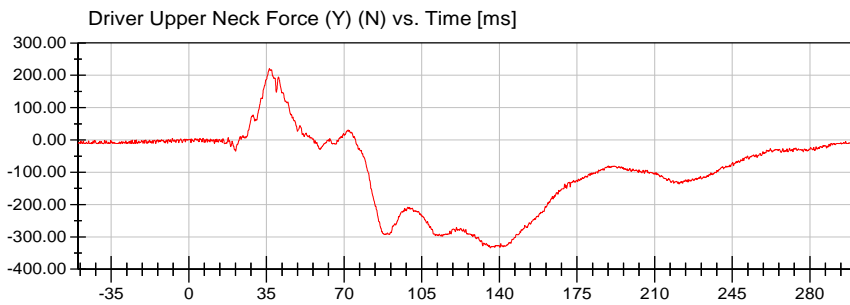
**<Max>**

262.16 N at 135.55 ms

**<Min>**

-213.97 N at 41.90 ms

CFC\_1000



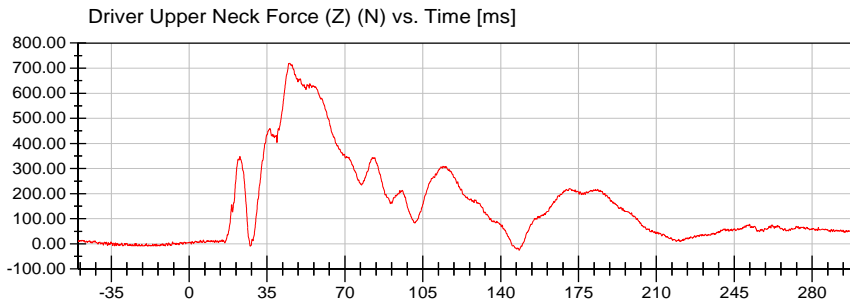
**<Max>**

220.73 N at 36.35 ms

**<Min>**

-334.10 N at 135.90 ms

CFC\_1000



**<Max>**

718.91 N at 45.20 ms

**<Min>**

-25.79 N at 148.30 ms

CFC\_1000



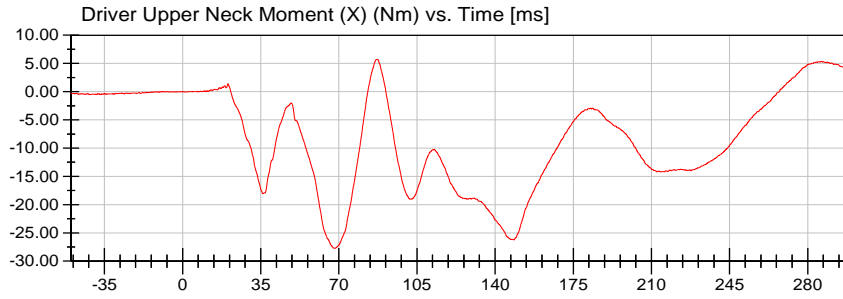
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



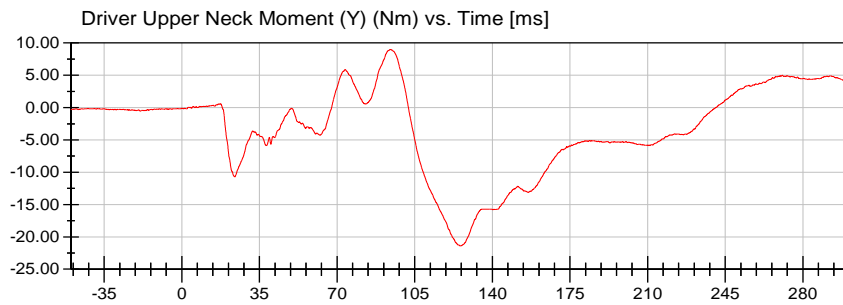
**<Max>**

5.70 Nm at 86.85 ms

**<Min>**

-27.73 Nm at 68.30 ms

CFC\_600



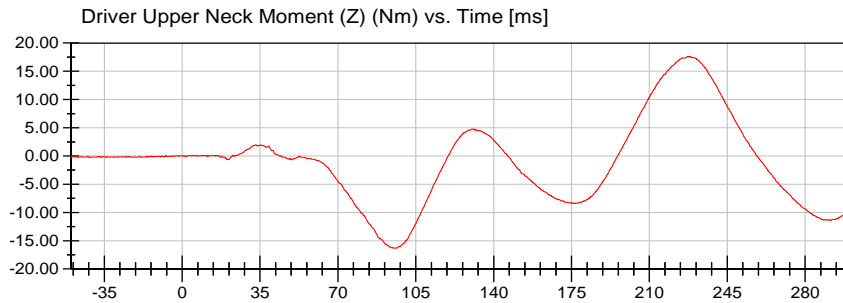
**<Max>**

8.99 Nm at 93.95 ms

**<Min>**

-21.39 Nm at 125.40 ms

CFC\_600



**<Max>**

17.64 Nm at 227.20 ms

**<Min>**

-16.33 Nm at 95.15 ms

CFC\_600



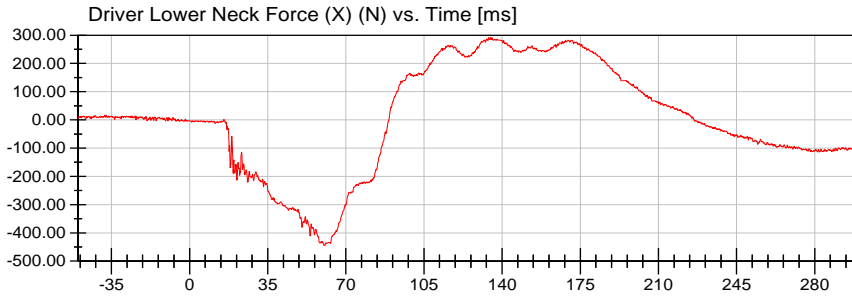
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



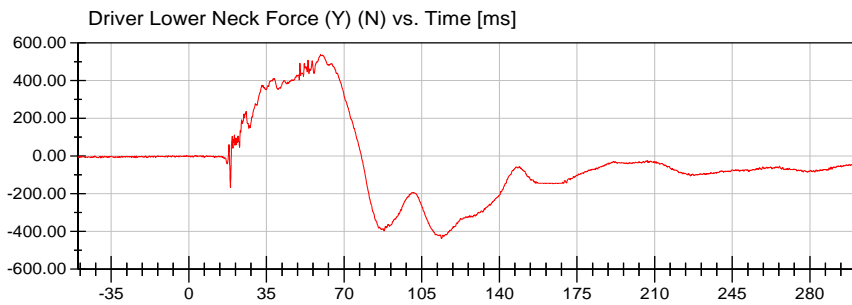
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291.81 N at 134.05 ms

**<Min>**

-444.90 N at 60.50 ms

CFC\_1000



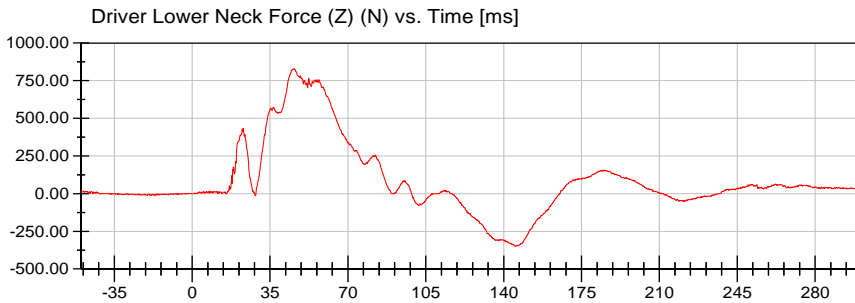
**<Max>**

536.52 N at 59.40 ms

**<Min>**

-436.53 N at 113.95 ms

CFC\_1000



**<Max>**

828.05 N at 45.85 ms

**<Min>**

-350.20 N at 145.15 ms

CFC\_1000



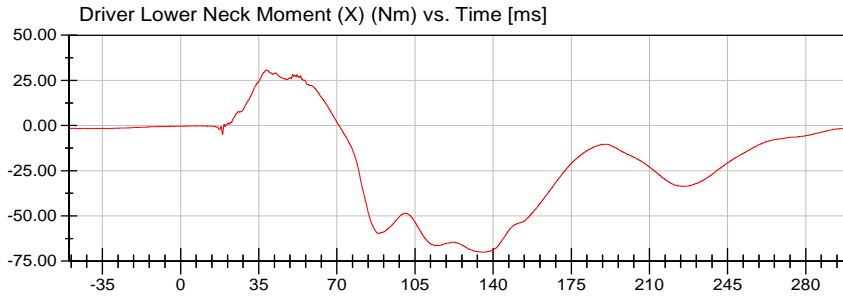
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



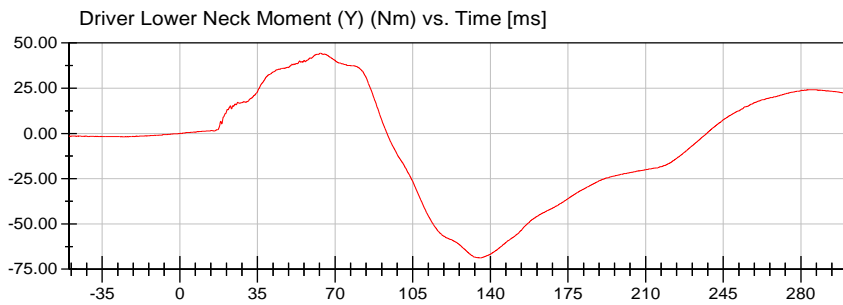
**<Max>**

30.74 Nm at 38.60 ms

**<Min>**

-70.09 Nm at 135.85 ms

CFC\_600



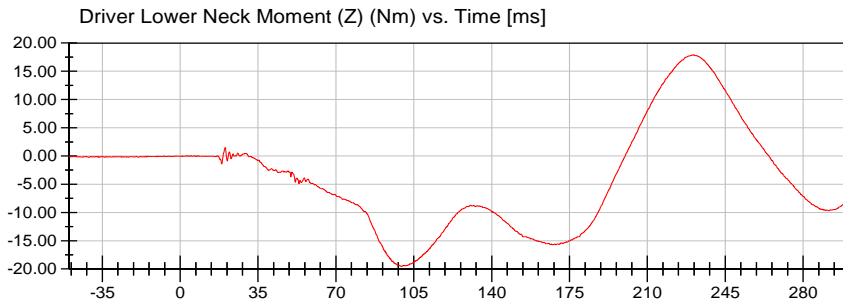
**<Max>**

44.31 Nm at 63.40 ms

**<Min>**

-68.70 Nm at 135.90 ms

CFC\_600



**<Max>**

17.92 Nm at 230.65 ms

**<Min>**

-19.53 Nm at 99.25 ms

CFC\_600



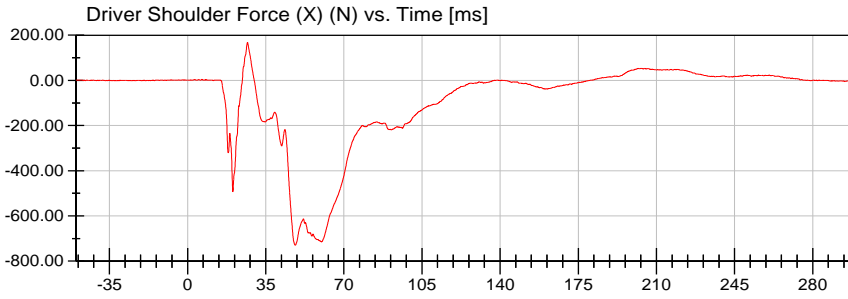
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



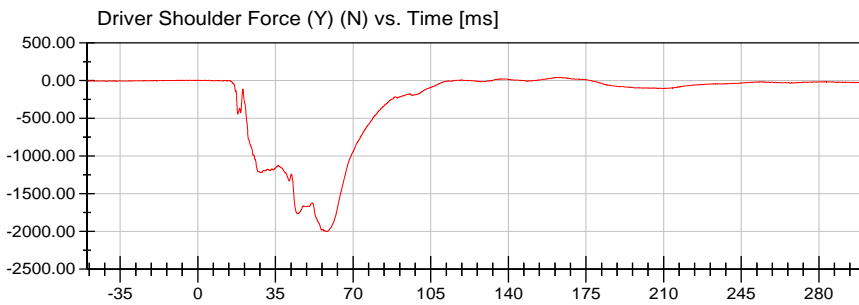
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167.91 N at 26.85 ms

**<Min>**

-729.60 N at 48.25 ms

CFC\_600



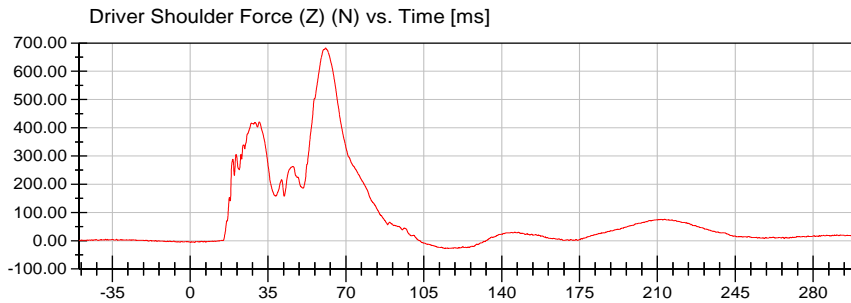
**<Max>**

42.68 N at 163.65 ms

**<Min>**

-2,000.51 N at 58.10 ms

CFC\_600



**<Max>**

682.25 N at 60.90 ms

**<Min>**

-27.69 N at 116.25 ms

CFC\_600

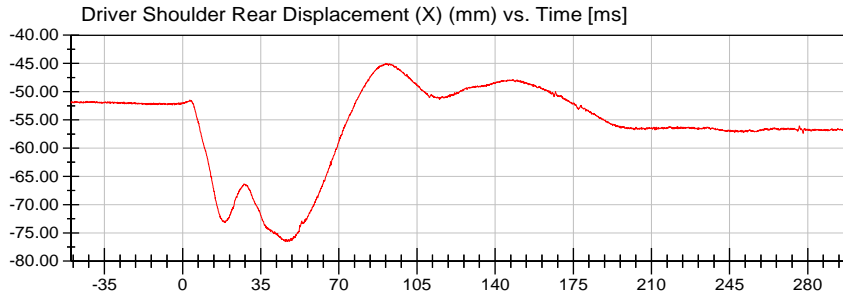


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



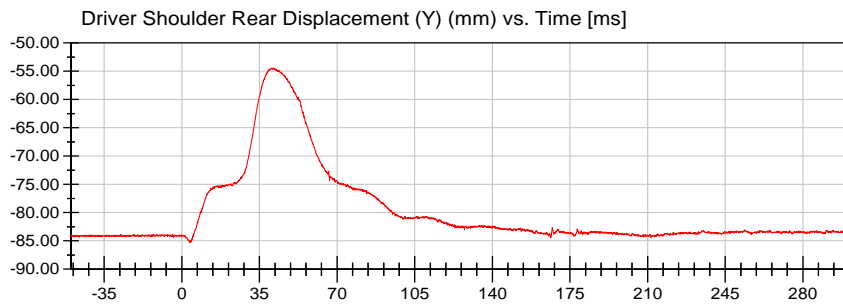
**<Max>**

-44.98 mm at 91.05 ms

**<Min>**

-76.54 mm at 46.25 ms

Unfiltered



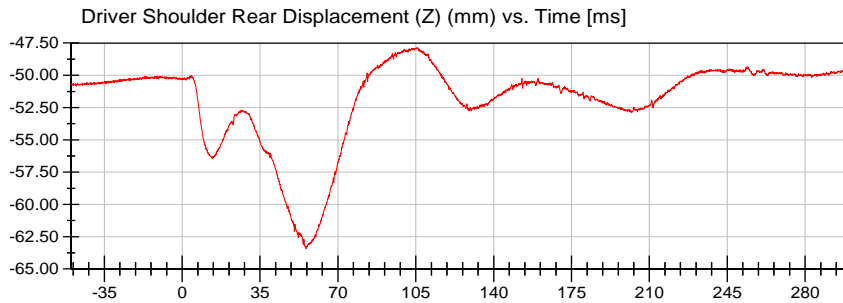
**<Max>**

-54.42 mm at 41.20 ms

**<Min>**

-85.30 mm at 3.60 ms

Unfiltered



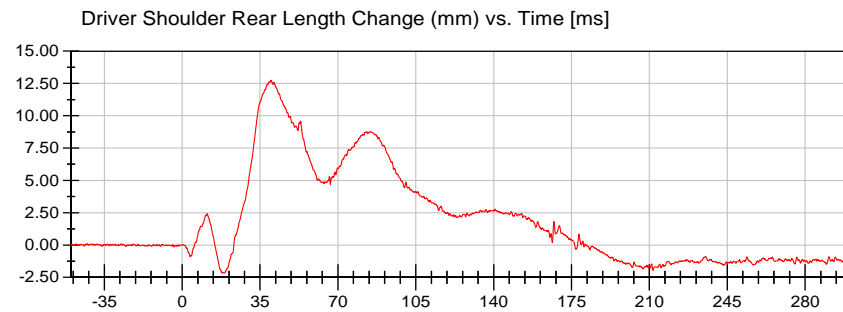
**<Max>**

-47.85 mm at 105.80 ms

**<Min>**

-63.43 mm at 55.75 ms

Unfiltered



**<Max>**

12.75 mm at 39.95 ms

**<Min>**

-2.15 mm at 17.85 ms

CFC\_600



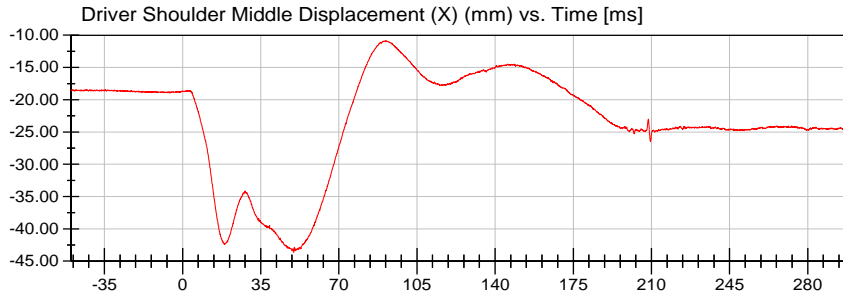
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



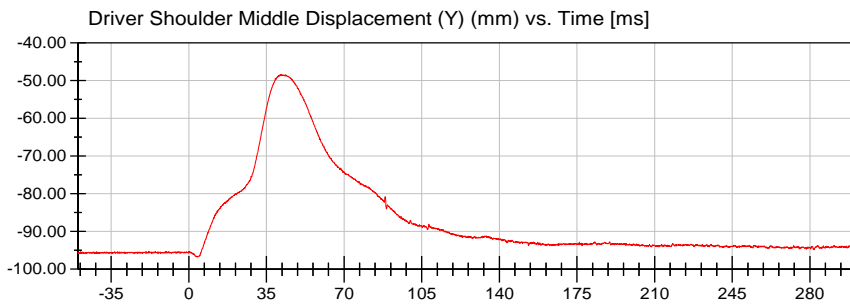
**<Max>**

-10.85 mm at 91.15 ms

**<Min>**

-43.63 mm at 49.80 ms

Unfiltered



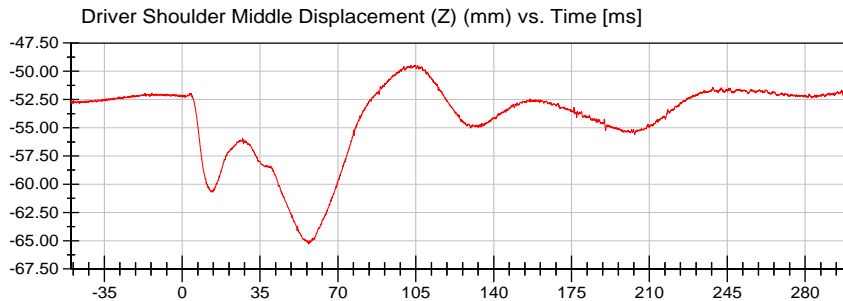
**<Max>**

-48.38 mm at 43.70 ms

**<Min>**

-96.82 mm at 3.70 ms

Unfiltered



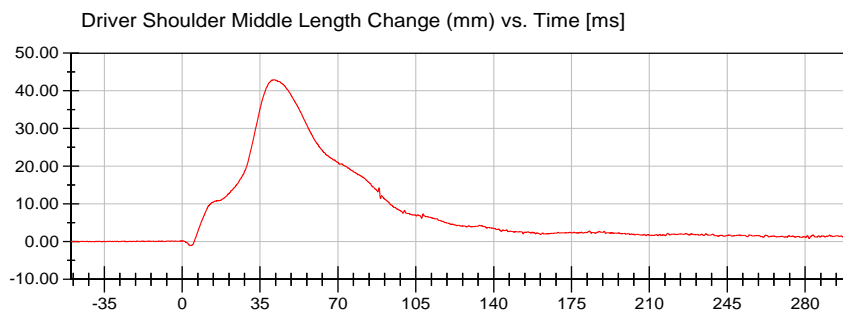
**<Max>**

-49.46 mm at 104.75 ms

**<Min>**

-65.31 mm at 56.95 ms

Unfiltered



**<Max>**

42.97 mm at 41.20 ms

**<Min>**

-1.04 mm at 3.75 ms

CFC\_600

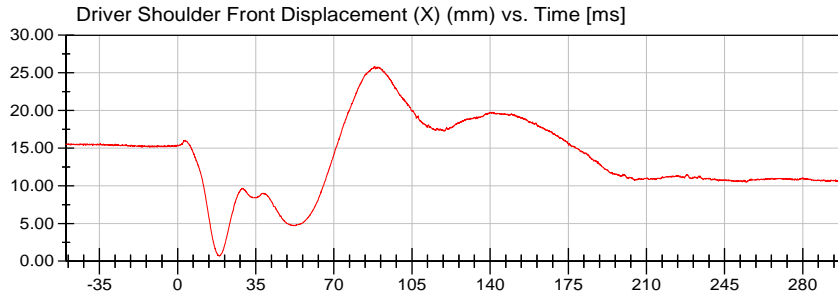


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



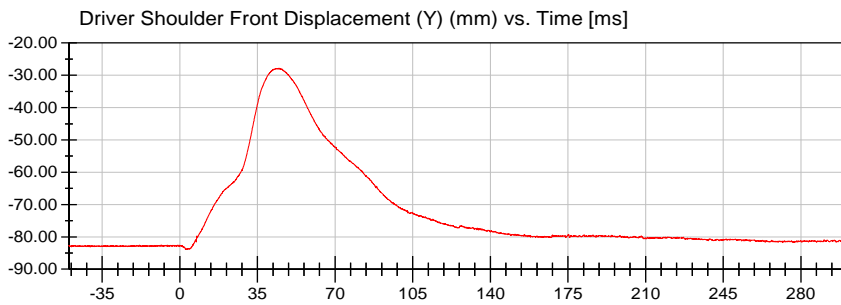
**<Max>**

25.85 mm at 88.35 ms

**<Min>**

0.70 mm at 19.00 ms

Unfiltered



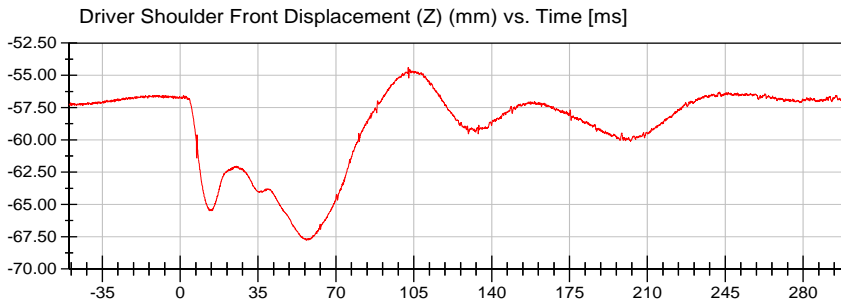
**<Max>**

-27.79 mm at 44.70 ms

**<Min>**

-83.92 mm at 2.70 ms

Unfiltered



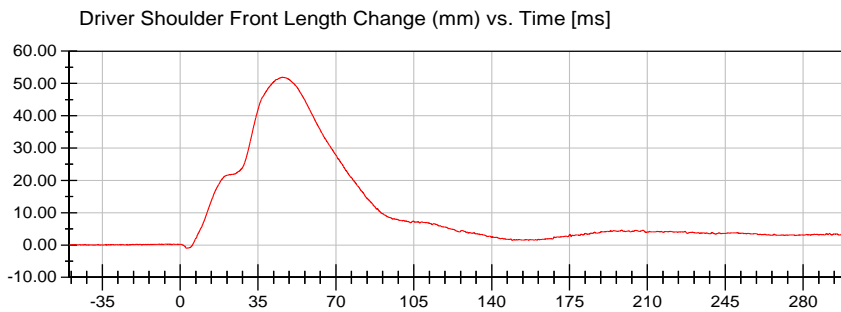
**<Max>**

-54.39 mm at 102.50 ms

**<Min>**

-67.79 mm at 56.70 ms

Unfiltered



**<Max>**

51.95 mm at 45.95 ms

**<Min>**

-1.00 mm at 2.85 ms

CFC\_600

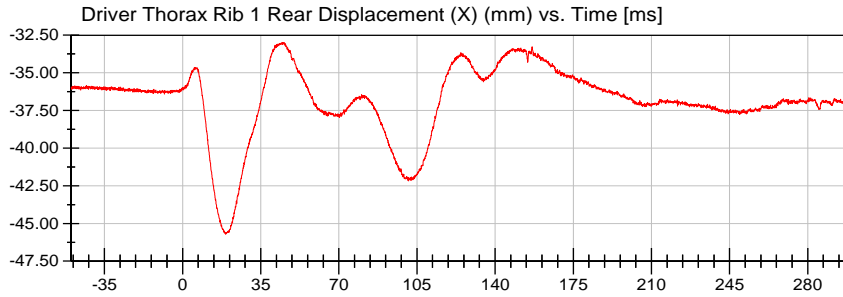


**VRTC**

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

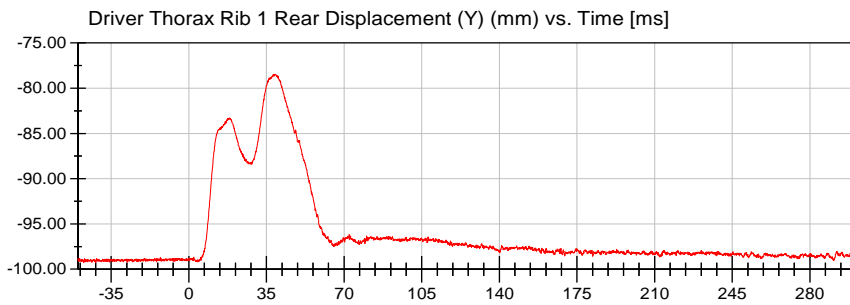
Test Date: 01/14/2021



**<Max>**  
-32.99 mm at 44.50 ms

**<Min>**  
-45.72 mm at 19.30 ms

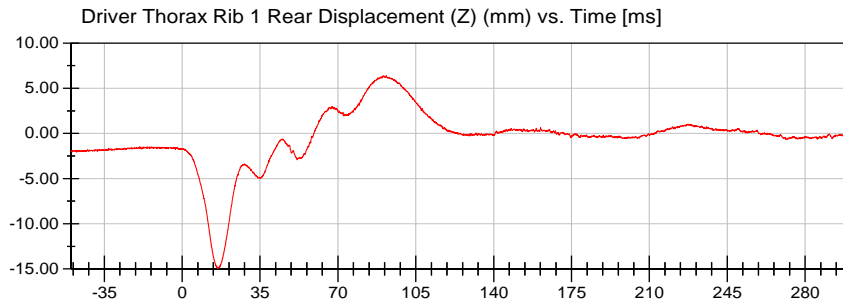
Unfiltered



**<Max>**  
-78.44 mm at 38.10 ms

**<Min>**  
-99.28 mm at -42.00 ms

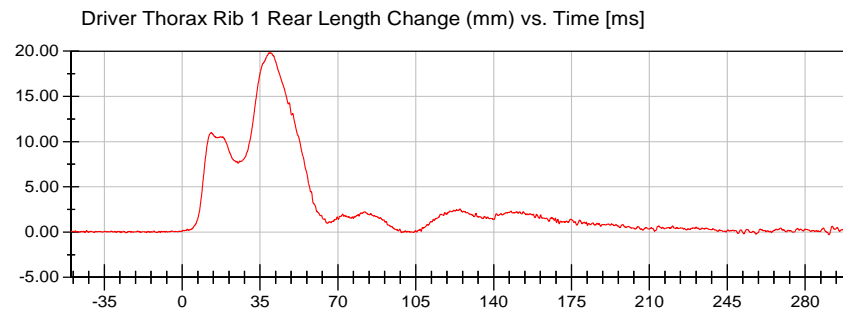
Unfiltered



**<Max>**  
6.39 mm at 90.40 ms

**<Min>**  
-14.92 mm at 15.80 ms

Unfiltered



**<Max>**  
19.81 mm at 39.15 ms

**<Min>**  
-0.28 mm at 290.70 ms

CFC\_600



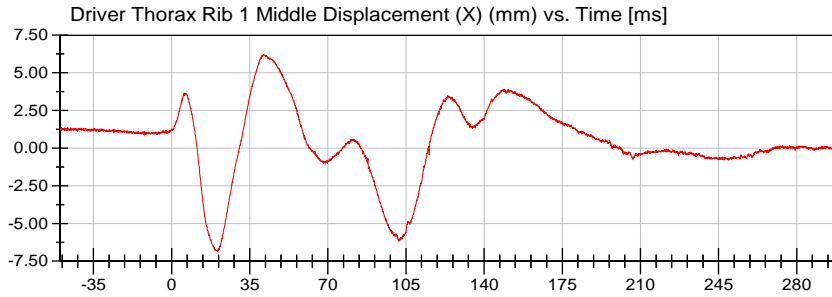
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



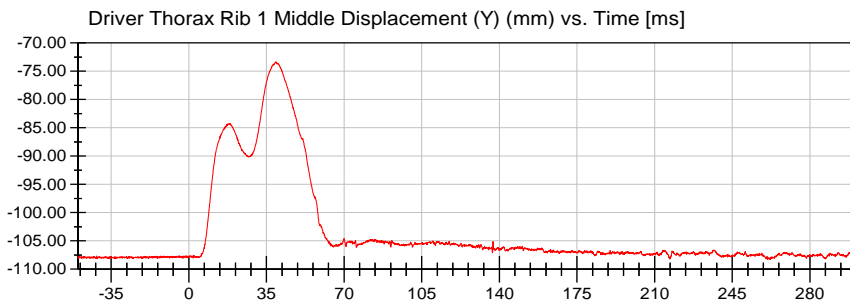
**<Max>**

6.21 mm at 41.20 ms

**<Min>**

-6.85 mm at 20.55 ms

Unfiltered



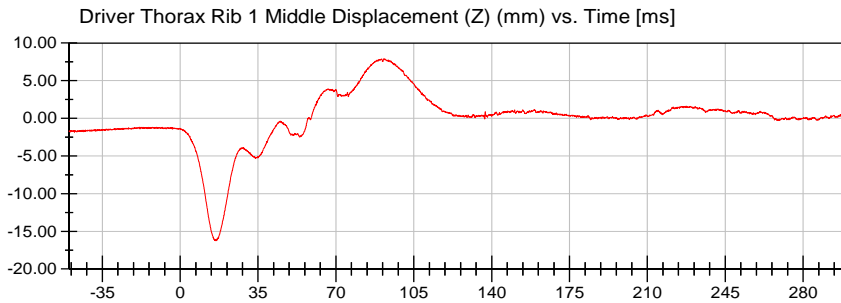
**<Max>**

-73.30 mm at 39.20 ms

**<Min>**

-108.29 mm at 261.70 ms

Unfiltered



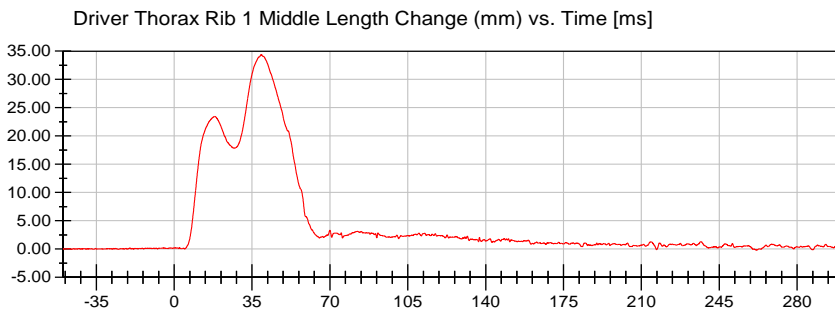
**<Max>**

7.92 mm at 91.55 ms

**<Min>**

-16.26 mm at 16.10 ms

Unfiltered



**<Max>**

34.39 mm at 39.20 ms

**<Min>**

-0.21 mm at 261.70 ms

CFC\_600

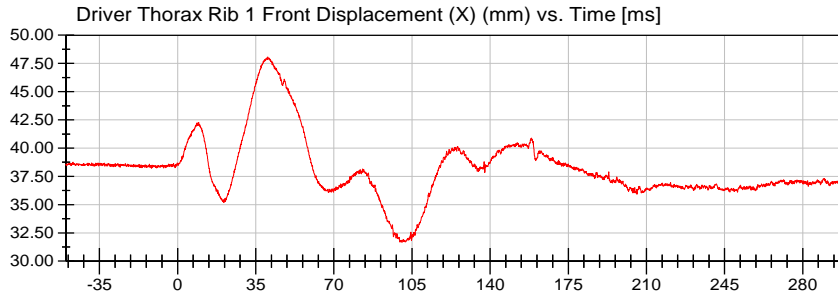


**VRTC**

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



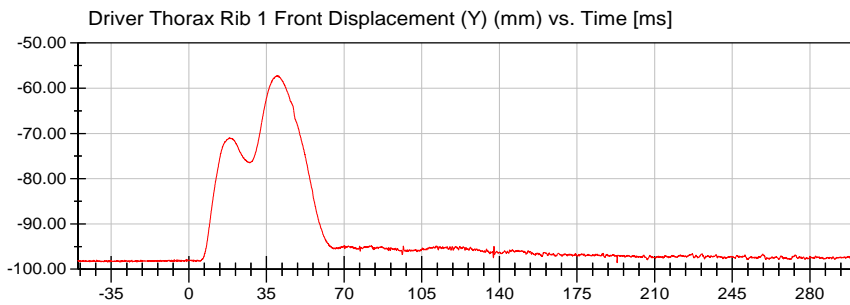
**<Max>**

48.07 mm at 40.40 ms

**<Min>**

31.65 mm at 100.50 ms

Unfiltered



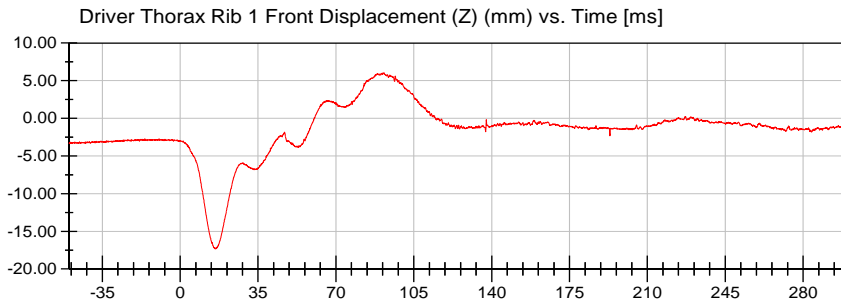
**<Max>**

-57.21 mm at 40.20 ms

**<Min>**

-98.58 mm at 193.15 ms

Unfiltered



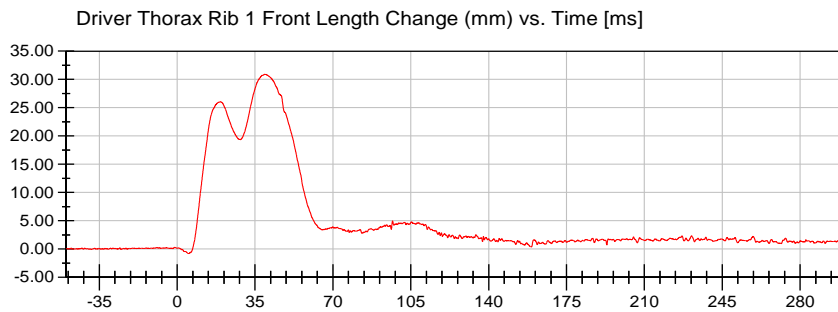
**<Max>**

6.07 mm at 91.60 ms

**<Min>**

-17.34 mm at 16.00 ms

Unfiltered



**<Max>**

30.90 mm at 39.35 ms

**<Min>**

-0.79 mm at 5.15 ms

CFC\_600

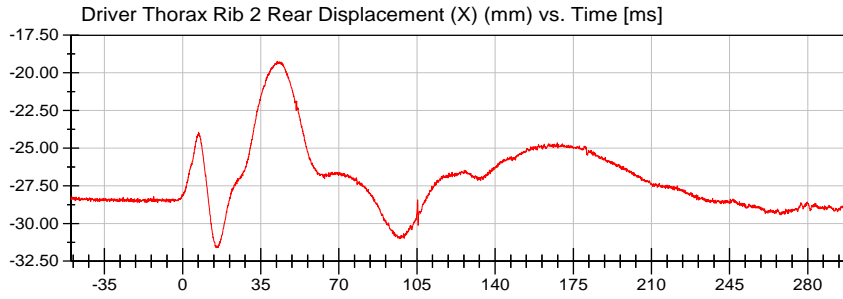


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



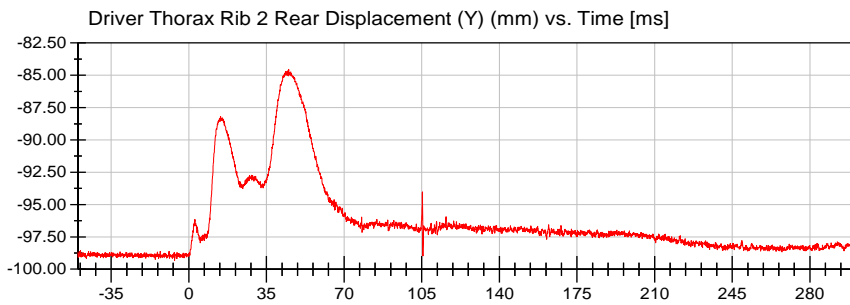
**<Max>**

-19.23 mm at 42.55 ms

**<Min>**

-31.61 mm at 15.10 ms

Unfiltered



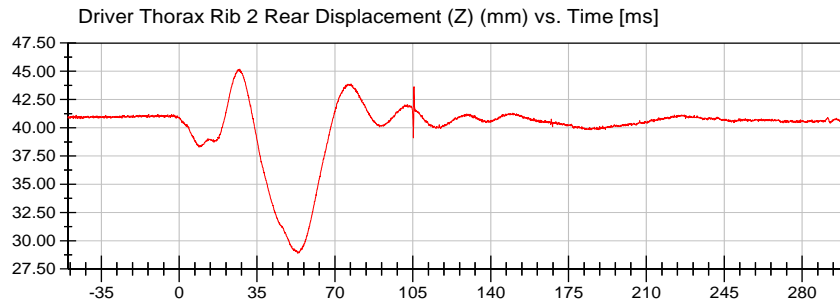
**<Max>**

-84.53 mm at 45.00 ms

**<Min>**

-99.32 mm at -6.45 ms

Unfiltered



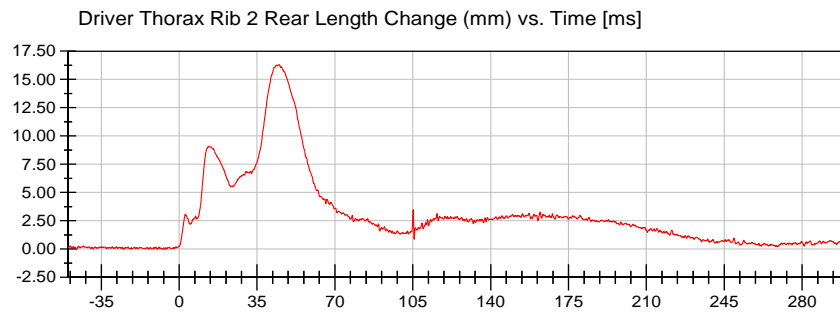
**<Max>**

45.18 mm at 27.25 ms

**<Min>**

28.90 mm at 53.25 ms

Unfiltered



**<Max>**

16.31 mm at 45.00 ms

**<Min>**

-0.03 mm at -46.15 ms

CFC\_600



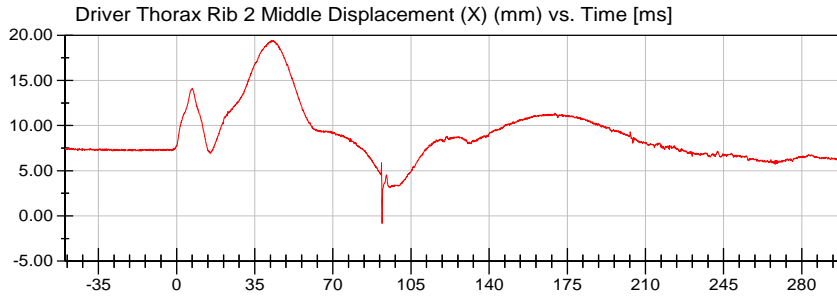
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



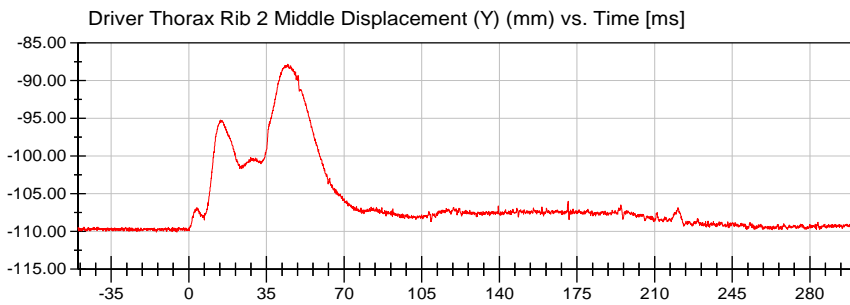
**<Max>**

19.42 mm at 42.60 ms

**<Min>**

-0.80 mm at 92.05 ms

Unfiltered



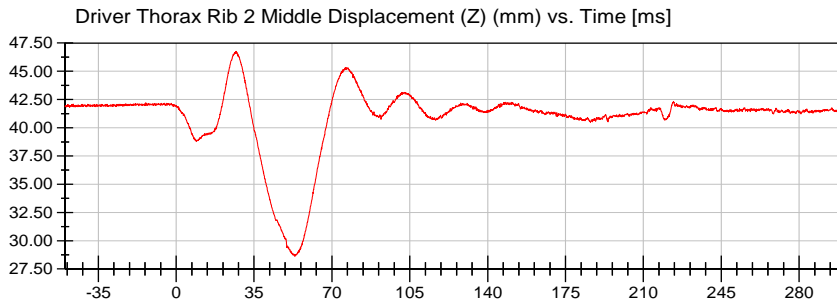
**<Max>**

-87.81 mm at 44.60 ms

**<Min>**

-110.09 mm at -14.60 ms

Unfiltered



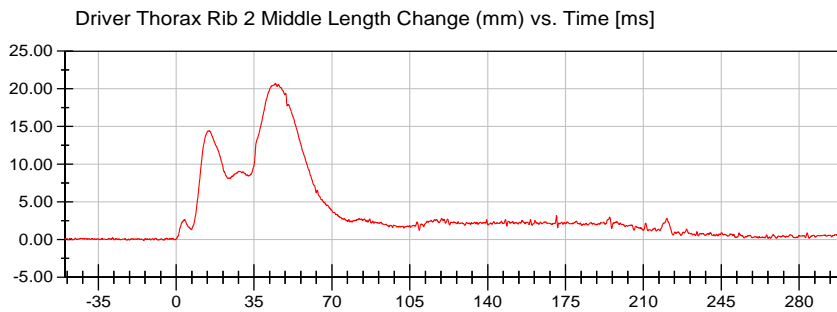
**<Max>**

46.77 mm at 26.90 ms

**<Min>**

28.65 mm at 53.50 ms

Unfiltered



**<Max>**

20.71 mm at 44.60 ms

**<Min>**

-0.13 mm at -14.60 ms

CFC\_600



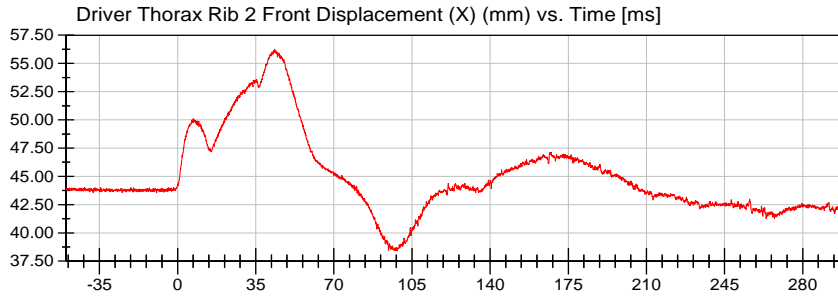
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



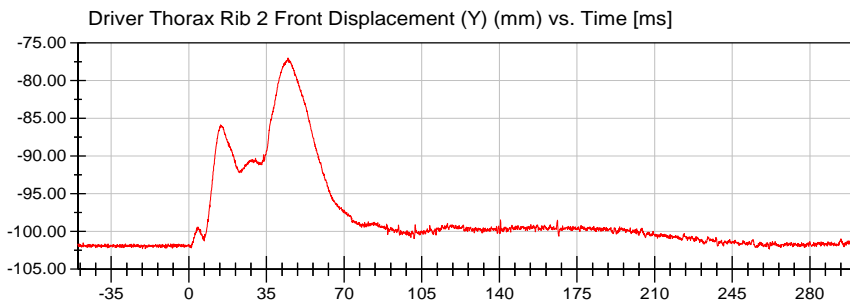
**<Max>**

56.25 mm at 43.50 ms

**<Min>**

38.43 mm at 97.40 ms

Unfiltered



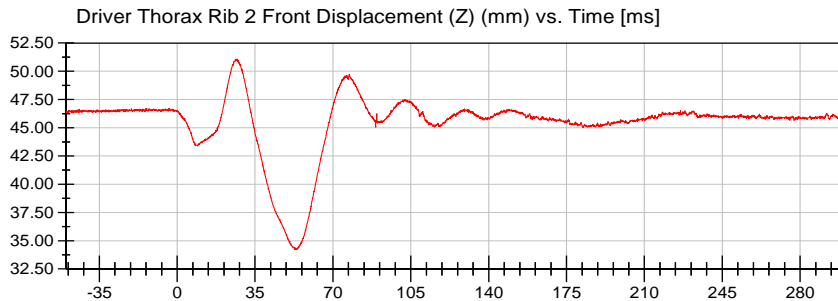
**<Max>**

-76.98 mm at 44.70 ms

**<Min>**

-102.31 mm at 261.70 ms

Unfiltered



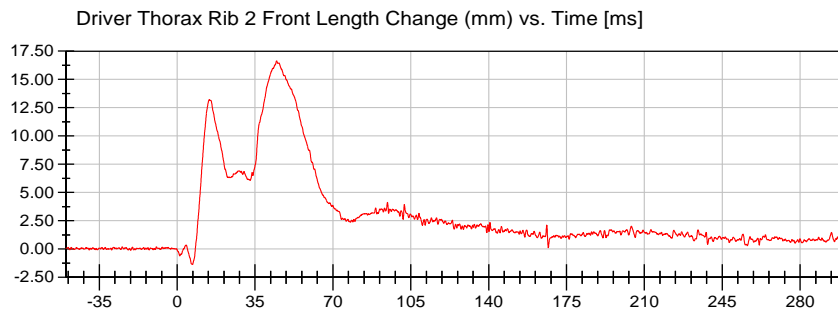
**<Max>**

51.09 mm at 26.85 ms

**<Min>**

34.23 mm at 53.90 ms

Unfiltered



**<Max>**

16.64 mm at 44.70 ms

**<Min>**

-1.37 mm at 6.90 ms

CFC\_600



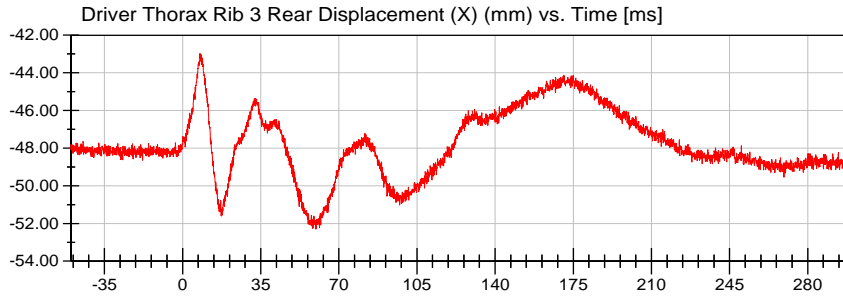
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



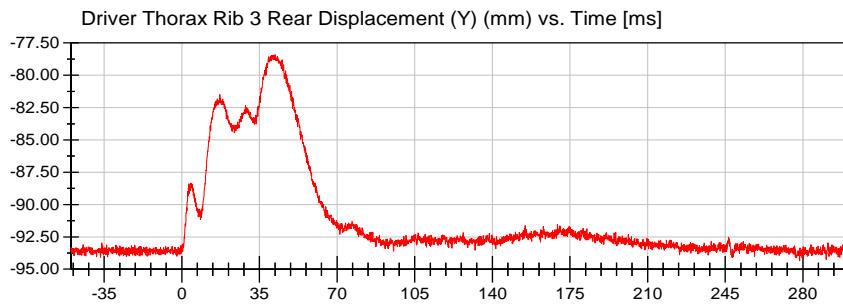
**<Max>**

-42.97 mm at 7.80 ms

**<Min>**

-52.31 mm at 59.60 ms

Unfiltered



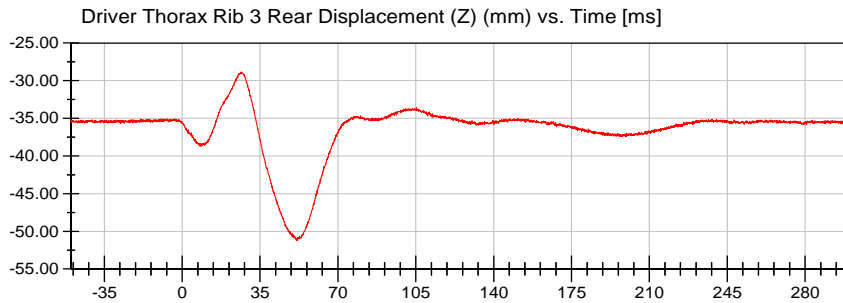
**<Max>**

-78.41 mm at 42.05 ms

**<Min>**

-94.35 mm at 278.50 ms

Unfiltered



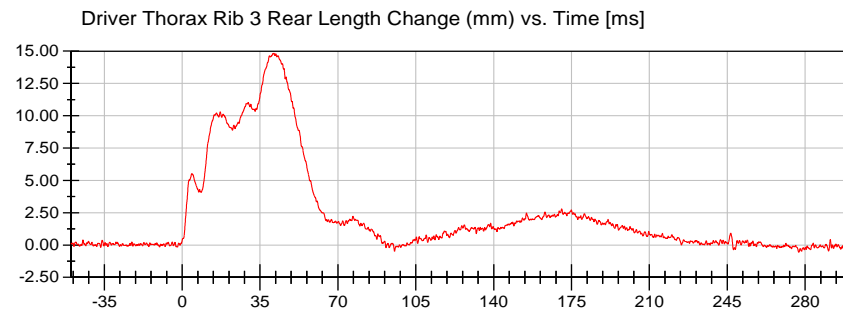
**<Max>**

-28.85 mm at 26.50 ms

**<Min>**

-51.24 mm at 51.50 ms

Unfiltered



**<Max>**

14.83 mm at 41.25 ms

**<Min>**

-0.57 mm at 277.10 ms

CFC\_600



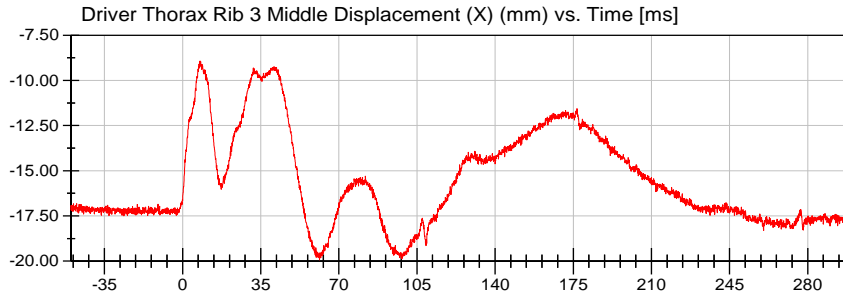
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



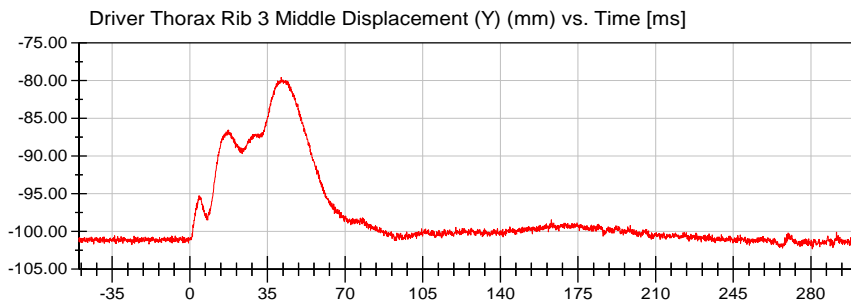
**<Max>**

-8.93 mm at 7.80 ms

**<Min>**

-19.94 mm at 61.30 ms

Unfiltered



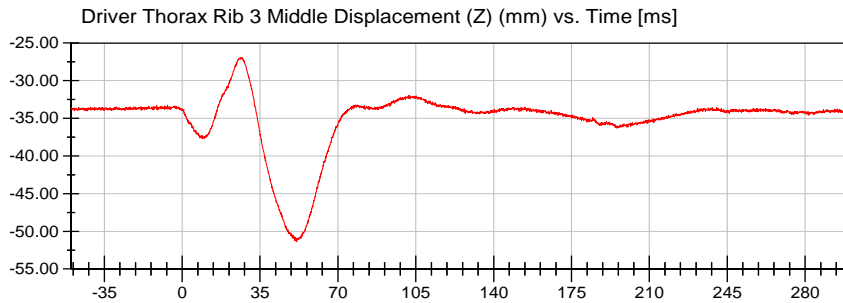
**<Max>**

-79.57 mm at 41.20 ms

**<Min>**

-102.31 mm at 280.65 ms

Unfiltered



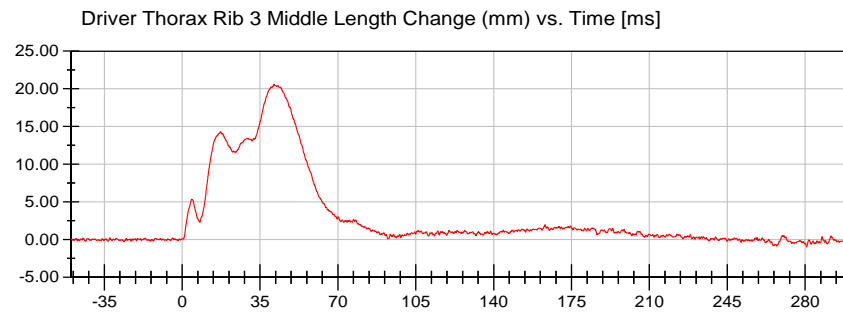
**<Max>**

-26.90 mm at 26.40 ms

**<Min>**

-51.31 mm at 51.50 ms

Unfiltered



**<Max>**

20.60 mm at 41.25 ms

**<Min>**

-0.95 mm at 280.65 ms

CFC\_600



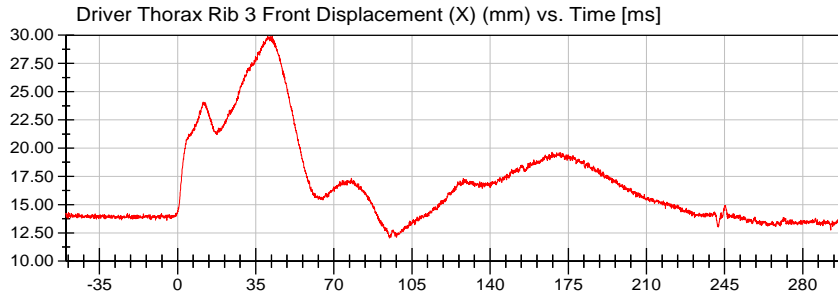
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



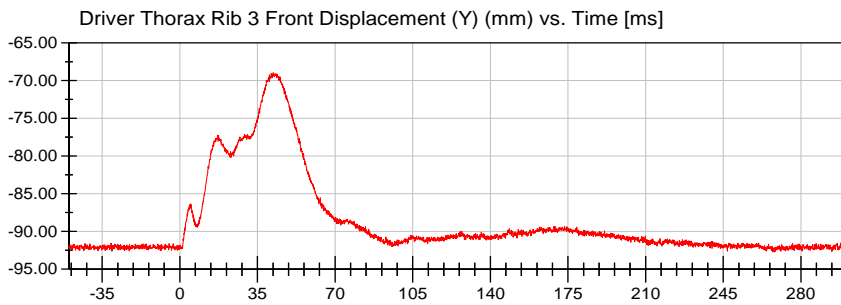
**<Max>**

29.90 mm at 40.30 ms

**<Min>**

12.05 mm at 94.95 ms

Unfiltered



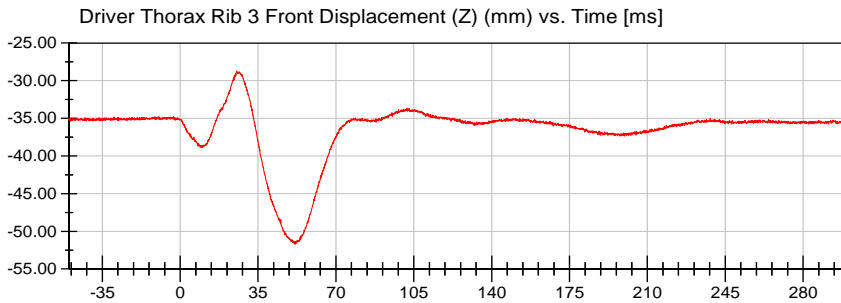
**<Max>**

-68.94 mm at 42.10 ms

**<Min>**

-92.73 mm at 268.15 ms

Unfiltered



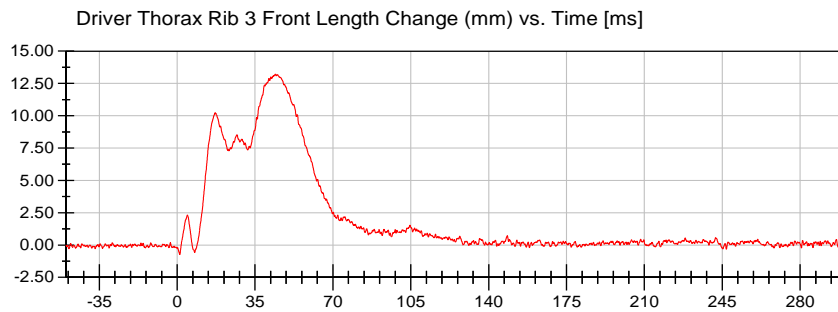
**<Max>**

-28.71 mm at 25.35 ms

**<Min>**

-51.71 mm at 51.70 ms

Unfiltered



**<Max>**

13.22 mm at 44.10 ms

**<Min>**

-0.74 mm at 1.20 ms

CFC\_600



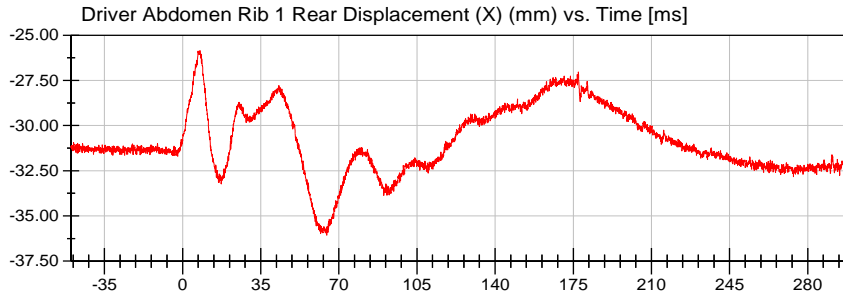
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



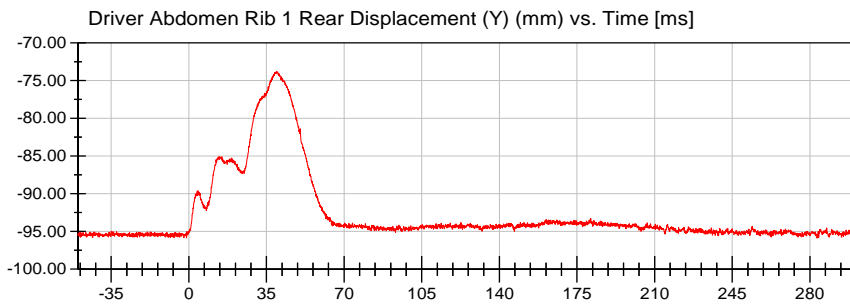
**<Max>**

-25.86 mm at 7.80 ms

**<Min>**

-36.07 mm at 64.60 ms

Unfiltered



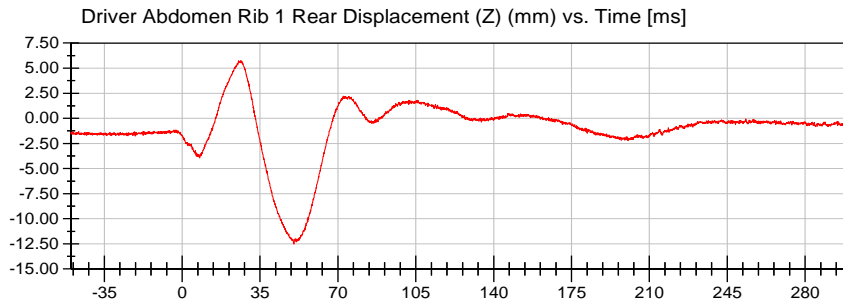
**<Max>**

-73.76 mm at 39.60 ms

**<Min>**

-95.88 mm at 283.20 ms

Unfiltered



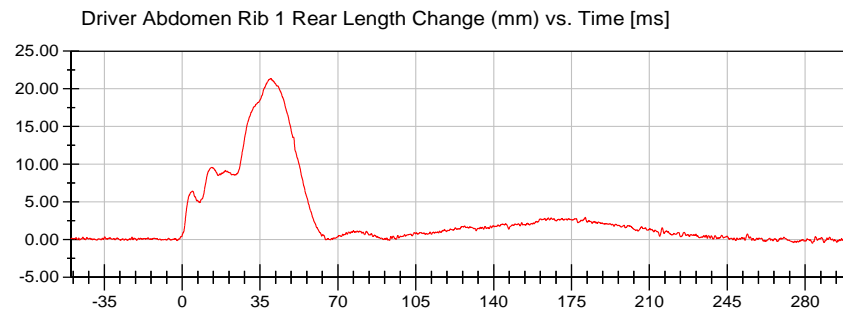
**<Max>**

5.77 mm at 26.40 ms

**<Min>**

-12.53 mm at 50.25 ms

Unfiltered



**<Max>**

21.36 mm at 39.90 ms

**<Min>**

-0.50 mm at 283.25 ms

CFC\_600

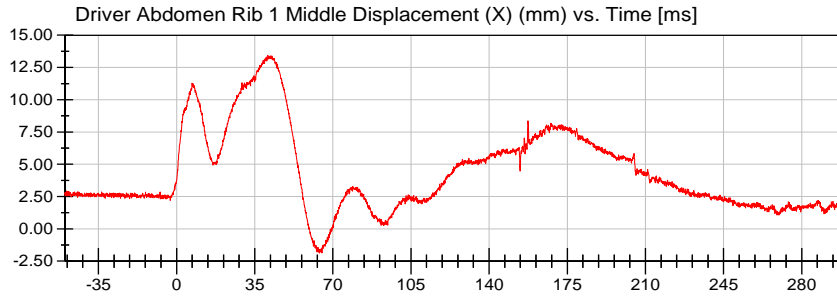


**VRTC**

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



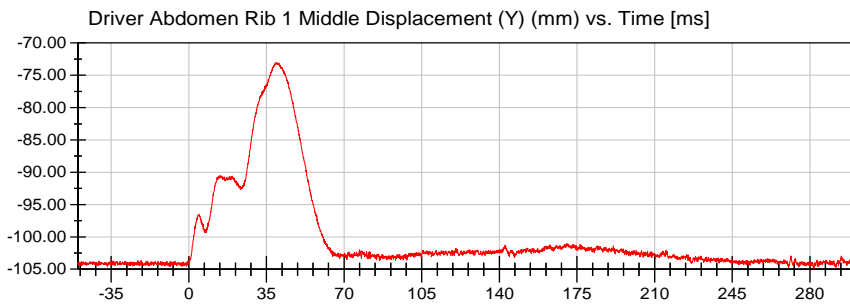
**<Max>**

13.42 mm at 40.85 ms

**<Min>**

-1.88 mm at 64.00 ms

Unfiltered



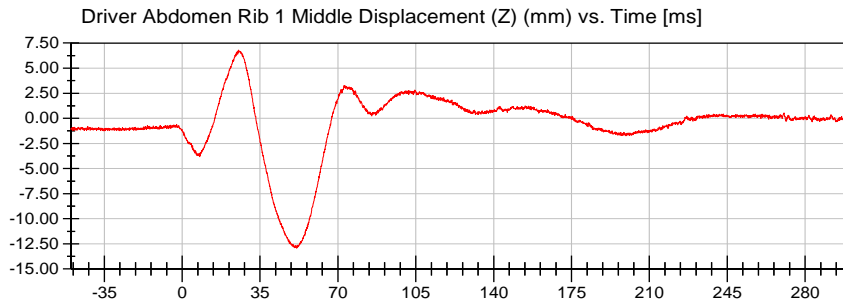
**<Max>**

-73.01 mm at 39.30 ms

**<Min>**

-104.86 mm at 281.70 ms

Unfiltered



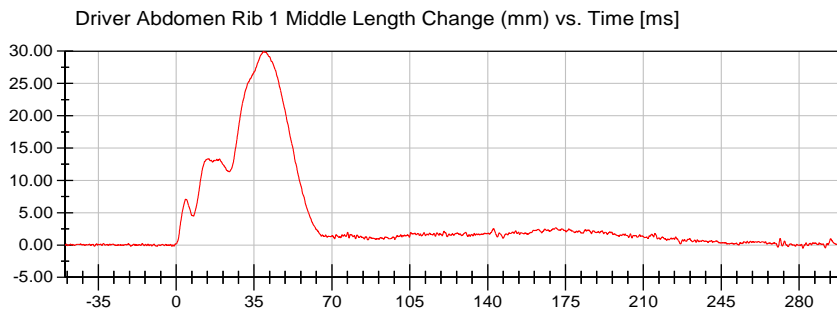
**<Max>**

6.80 mm at 25.35 ms

**<Min>**

-12.94 mm at 51.50 ms

Unfiltered



**<Max>**

29.93 mm at 39.25 ms

**<Min>**

-0.50 mm at 281.70 ms

CFC\_600



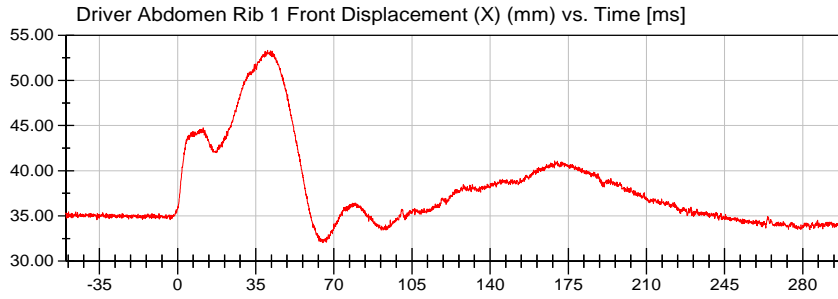
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



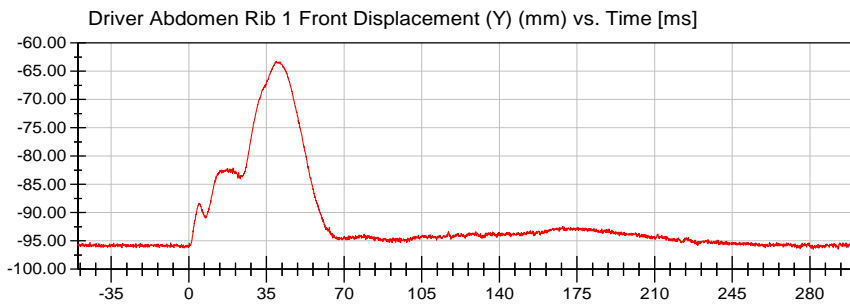
**<Max>**

53.31 mm at 40.30 ms

**<Min>**

32.05 mm at 65.10 ms

Unfiltered



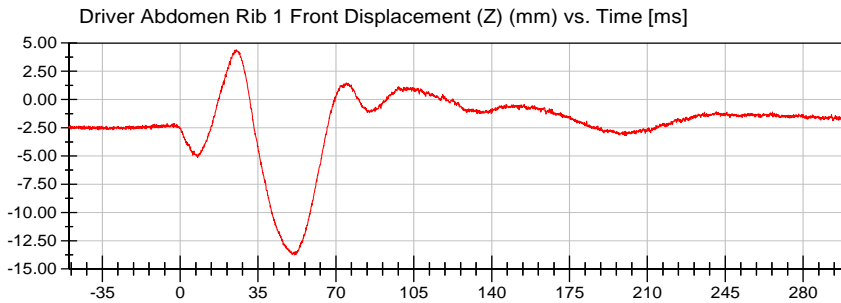
**<Max>**

-63.28 mm at 39.30 ms

**<Min>**

-96.44 mm at 281.50 ms

Unfiltered



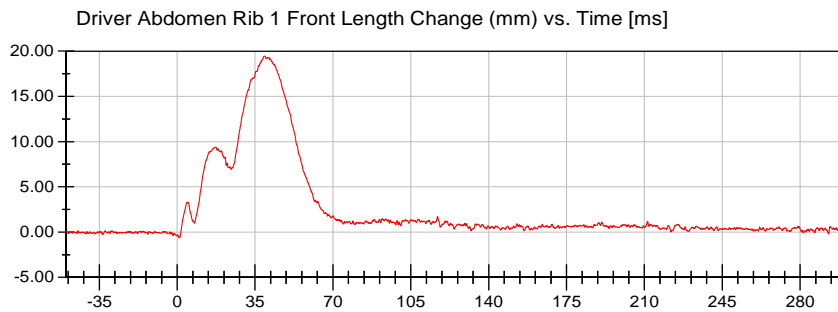
**<Max>**

4.41 mm at 25.30 ms

**<Min>**

-13.76 mm at 51.50 ms

Unfiltered



**<Max>**

19.45 mm at 39.40 ms

**<Min>**

-0.62 mm at 0.90 ms

CFC\_600



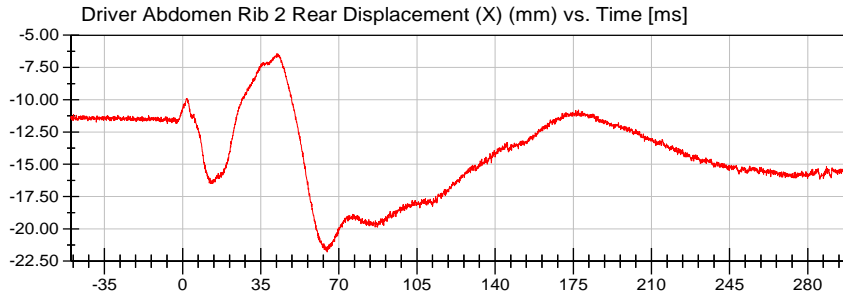
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



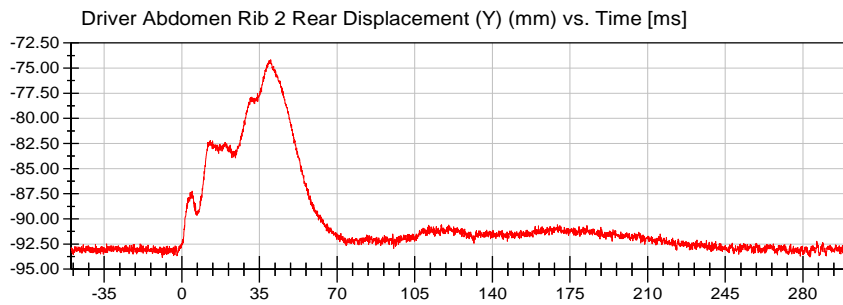
**<Max>**

-6.44 mm at 42.70 ms

**<Min>**

-21.80 mm at 64.80 ms

Unfiltered



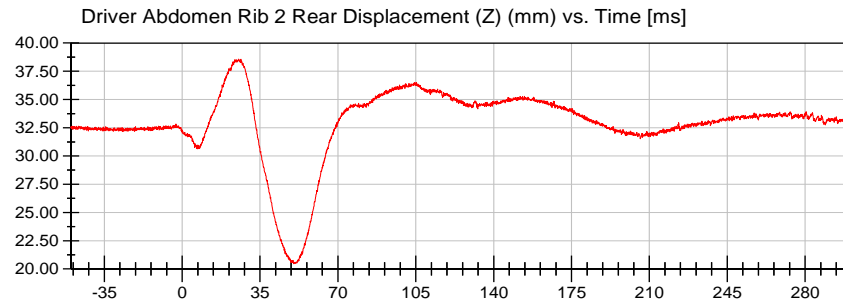
**<Max>**

-74.18 mm at 40.10 ms

**<Min>**

-93.84 mm at -8.80 ms

Unfiltered



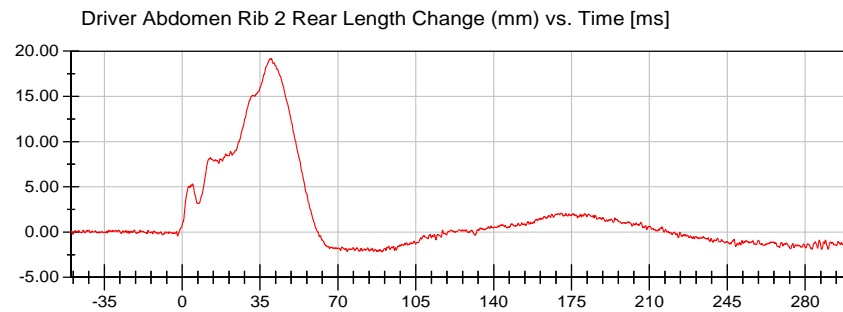
**<Max>**

38.57 mm at 26.40 ms

**<Min>**

20.47 mm at 50.20 ms

Unfiltered



**<Max>**

19.18 mm at 40.10 ms

**<Min>**

-2.19 mm at 89.75 ms

CFC\_600

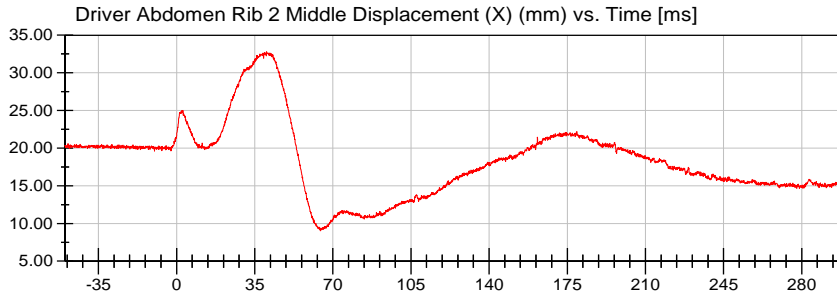


**VRTC**

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



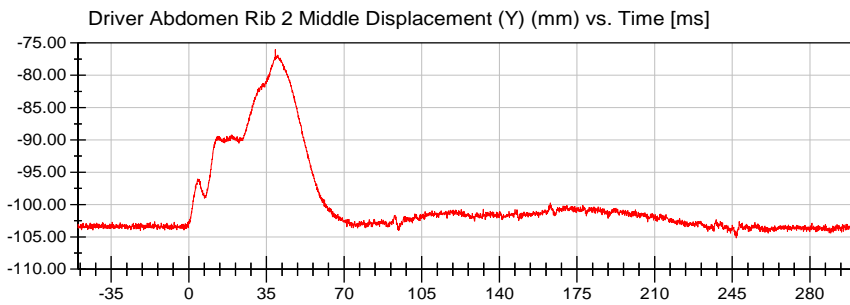
**<Max>**

32.79 mm at 40.35 ms

**<Min>**

9.01 mm at 64.40 ms

Unfiltered



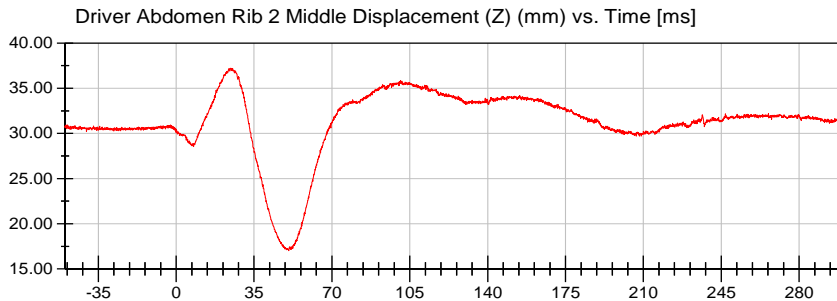
**<Max>**

-76.04 mm at 39.00 ms

**<Min>**

-105.16 mm at 246.80 ms

Unfiltered



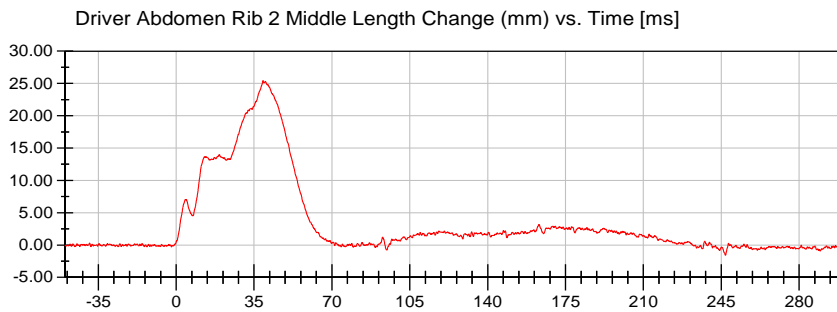
**<Max>**

37.22 mm at 24.35 ms

**<Min>**

16.97 mm at 50.60 ms

Unfiltered



**<Max>**

25.43 mm at 39.05 ms

**<Min>**

-1.60 mm at 246.85 ms

CFC\_600

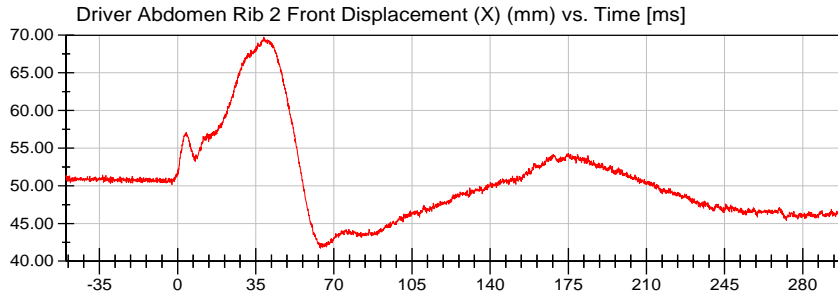


**VRTC**

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



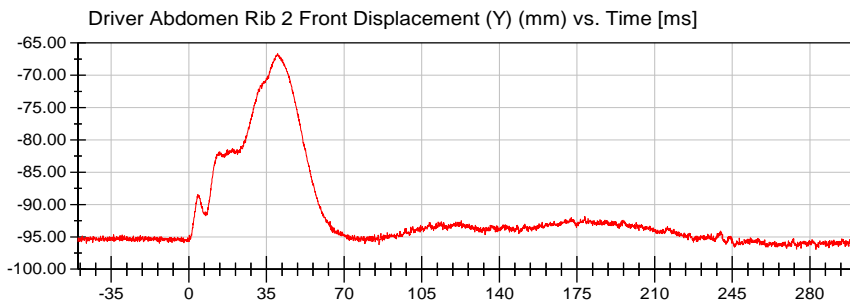
**<Max>**

69.74 mm at 38.60 ms

**<Min>**

41.72 mm at 64.05 ms

Unfiltered



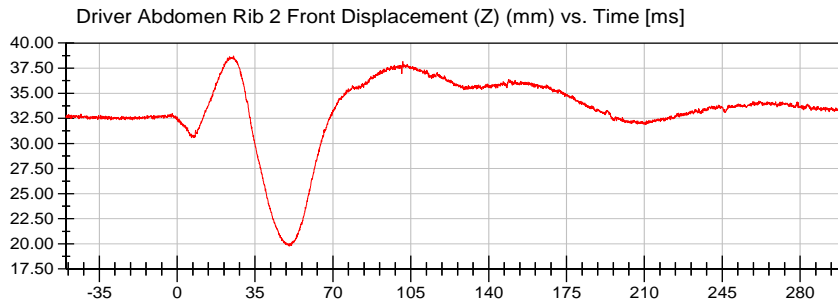
**<Max>**

-66.69 mm at 40.10 ms

**<Min>**

-96.96 mm at 282.70 ms

Unfiltered



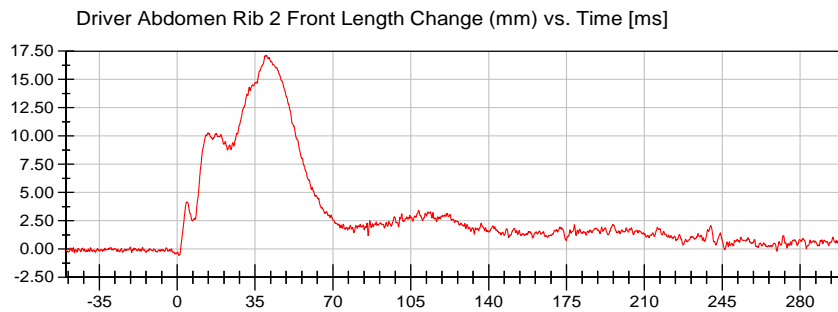
**<Max>**

38.72 mm at 25.30 ms

**<Min>**

19.78 mm at 50.35 ms

Unfiltered



**<Max>**

17.14 mm at 40.15 ms

**<Min>**

-0.55 mm at 0.80 ms

CFC\_600



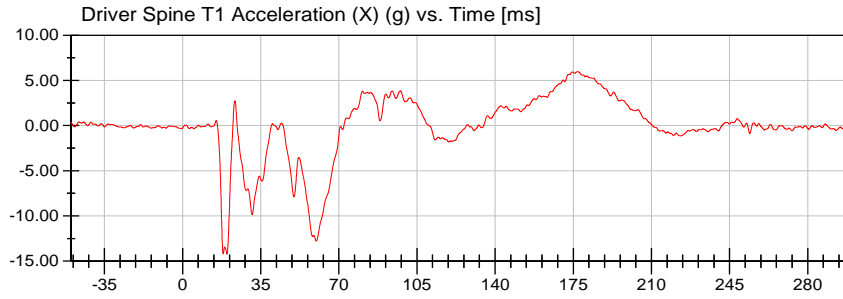
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ( )



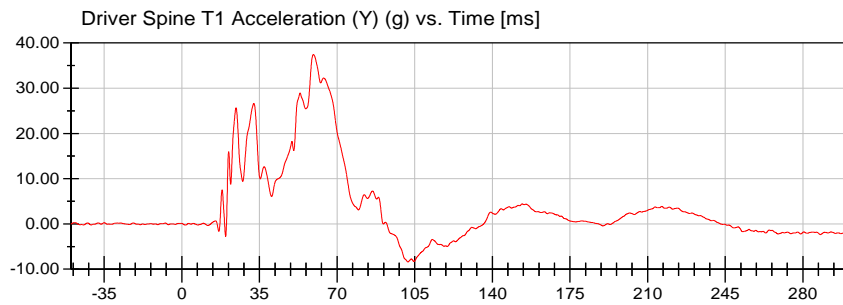
**<Max>**

5.96 g at 176.95 ms

**<Min>**

-14.22 g at 19.90 ms

CFC\_180



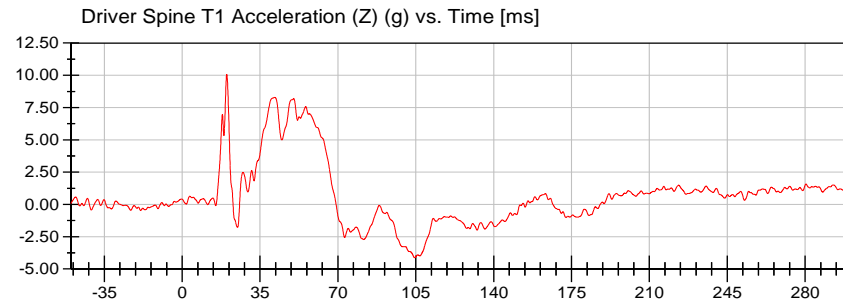
**<Max>**

37.46 g at 59.30 ms

**<Min>**

-8.41 g at 101.95 ms

CFC\_180



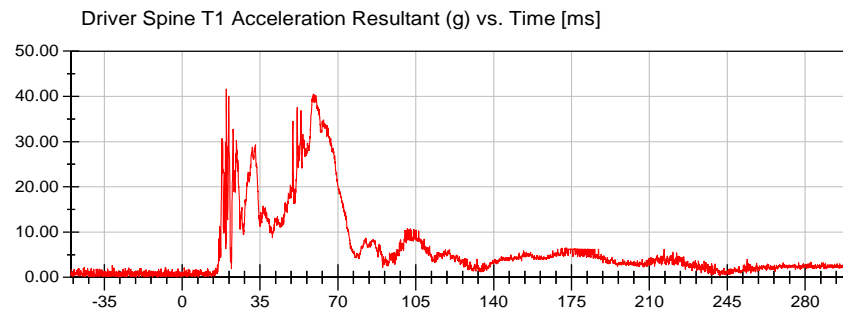
**<Max>**

10.06 g at 20.05 ms

**<Min>**

-4.12 g at 104.45 ms

CFC\_180



**<Max>**

41.59 g at 19.85 ms

**<Min>**

0.10 g at -35.65 ms

Prefiltered\_> CFC 1000



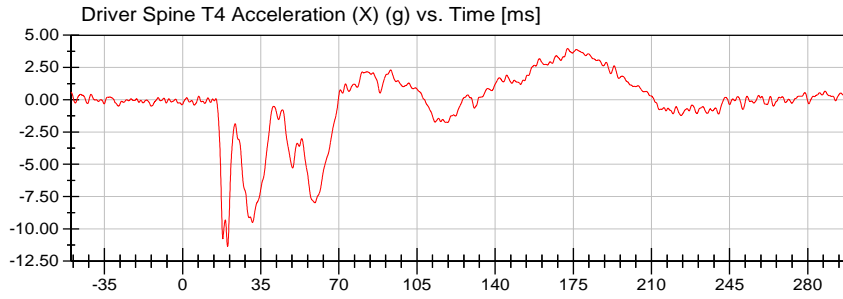
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



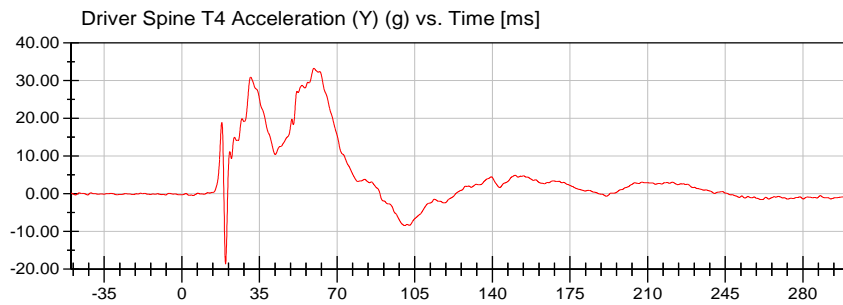
**<Max>**

3.96 g at 172.45 ms

**<Min>**

-11.37 g at 20.20 ms

CFC\_180



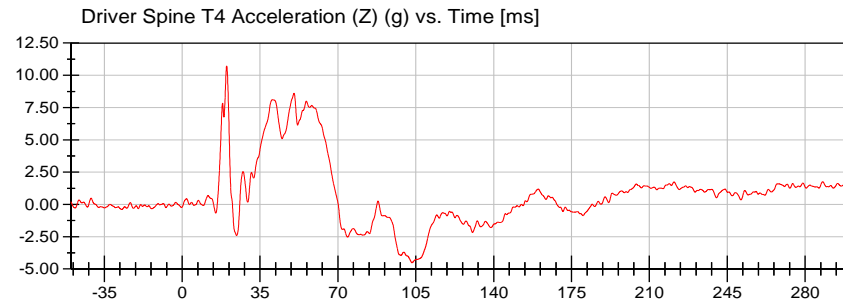
**<Max>**

33.28 g at 59.55 ms

**<Min>**

-18.62 g at 19.75 ms

CFC\_180



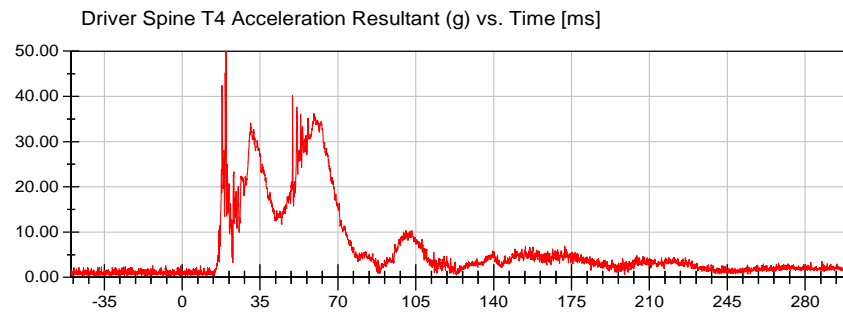
**<Max>**

10.72 g at 20.00 ms

**<Min>**

-4.52 g at 103.35 ms

CFC\_180



**<Max>**

49.99 g at 19.75 ms

**<Min>**

0.26 g at -6.45 ms

Prefiltered\_> CFC 1000

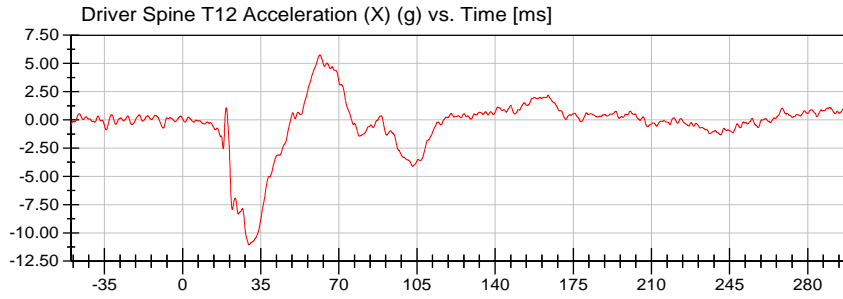


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



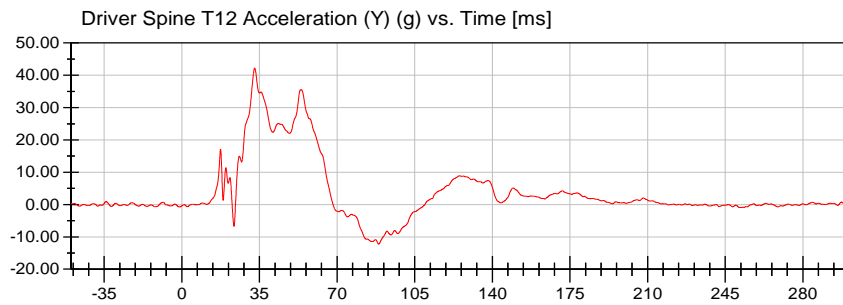
**<Max>**

5.75 g at 61.50 ms

**<Min>**

-11.06 g at 29.75 ms

CFC\_180



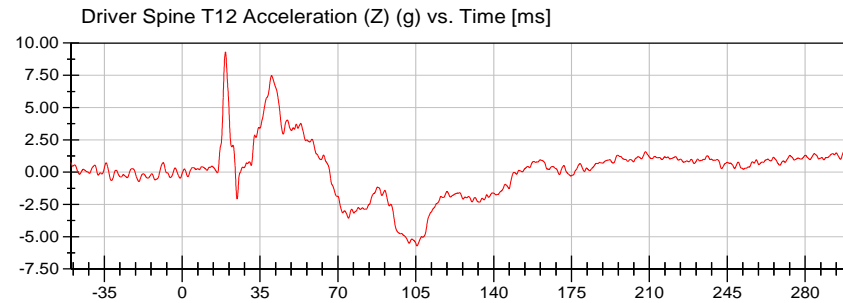
**<Max>**

42.20 g at 32.85 ms

**<Min>**

-12.27 g at 88.80 ms

CFC\_180



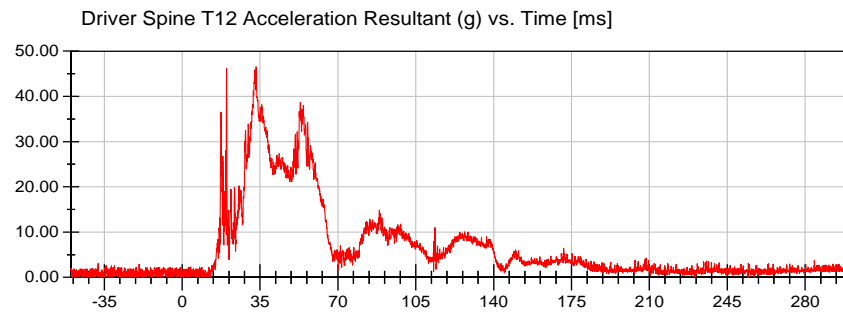
**<Max>**

9.29 g at 19.50 ms

**<Min>**

-5.71 g at 105.55 ms

CFC\_180



**<Max>**

46.56 g at 33.25 ms

**<Min>**

0.05 g at -49.45 ms

Prefiltered\_> CFC 1000



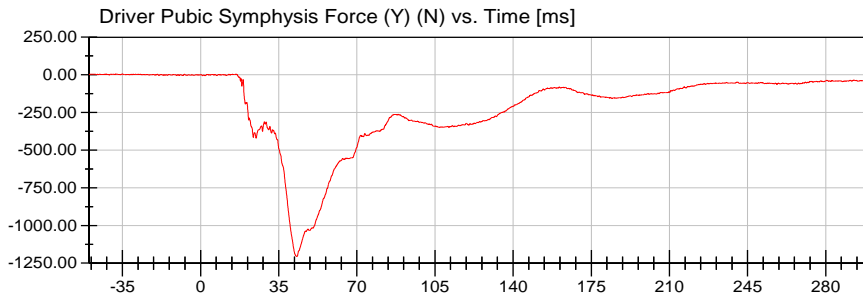
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



**<Max>**

5.07 N at -35.00 ms

**<Min>**

-1,205.07 N at 43.20 ms

CFC\_600

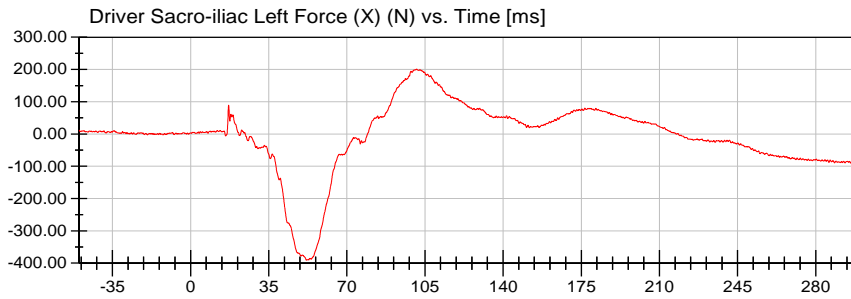


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



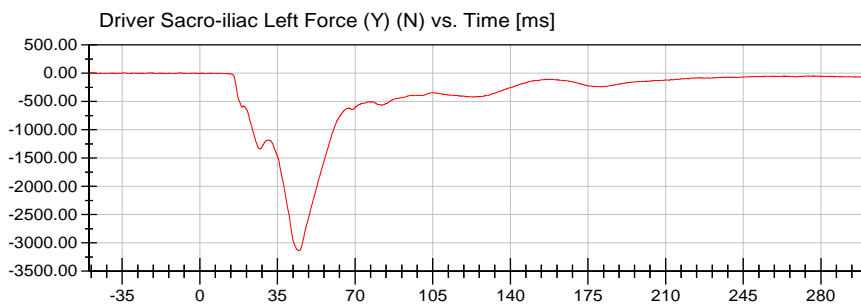
**<Max>**

201.36 N at 101.35 ms

**<Min>**

-391.00 N at 51.80 ms

CFC\_600



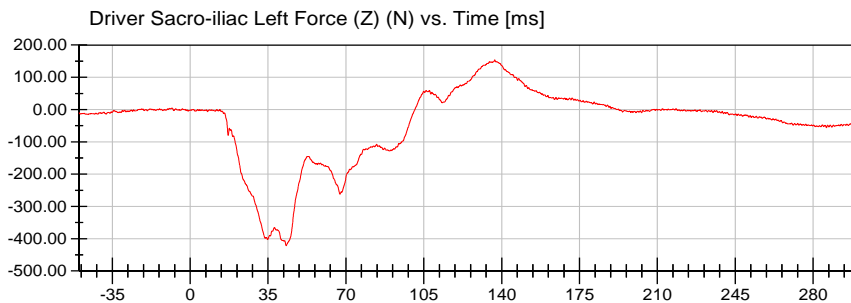
**<Max>**

8.49 N at -34.45 ms

**<Min>**

-3,136.30 N at 44.75 ms

CFC\_600



**<Max>**

153.83 N at 136.90 ms

**<Min>**

-421.63 N at 43.15 ms

CFC\_600



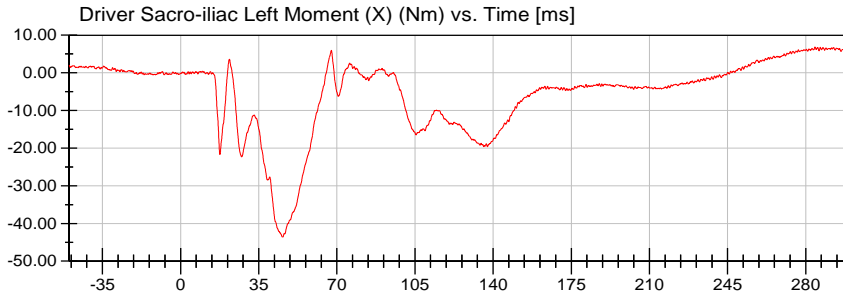
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



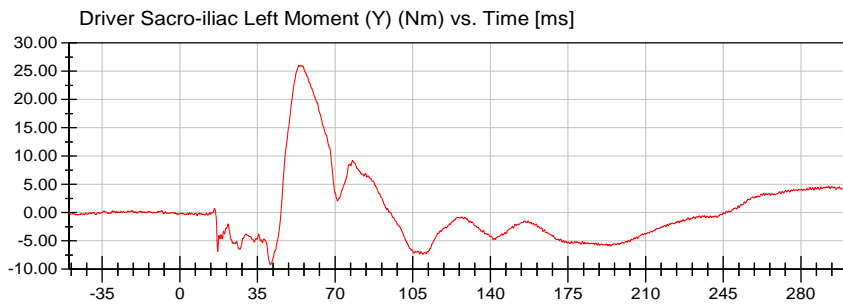
**<Max>**

6.83 Nm at 284.15 ms

**<Min>**

-43.62 Nm at 45.70 ms

CFC\_600



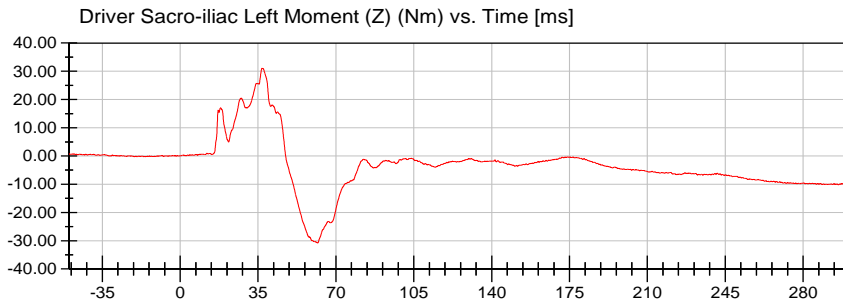
**<Max>**

26.02 Nm at 54.55 ms

**<Min>**

-9.20 Nm at 40.85 ms

CFC\_600



**<Max>**

31.07 Nm at 36.80 ms

**<Min>**

-30.80 Nm at 61.80 ms

CFC\_600



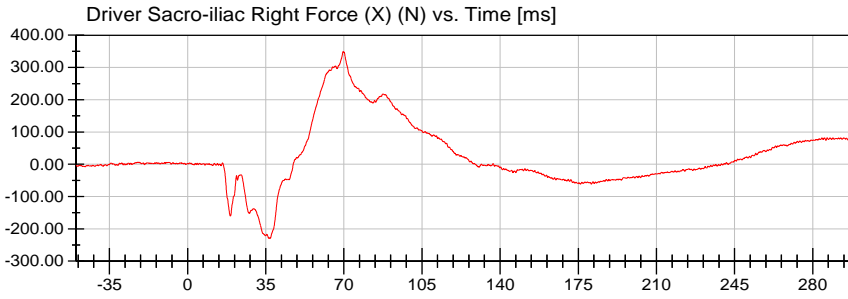
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



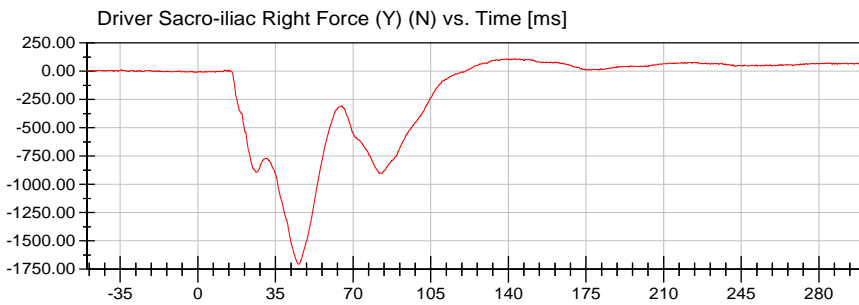
**<Max>**

349.26 N at 69.65 ms

**<Min>**

-229.18 N at 36.40 ms

CFC\_600



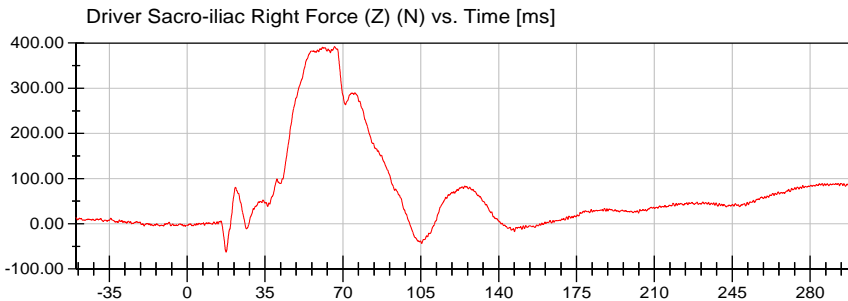
**<Max>**

109.98 N at 139.15 ms

**<Min>**

-1,706.16 N at 45.50 ms

CFC\_600



**<Max>**

391.56 N at 66.20 ms

**<Min>**

-62.75 N at 17.50 ms

CFC\_600



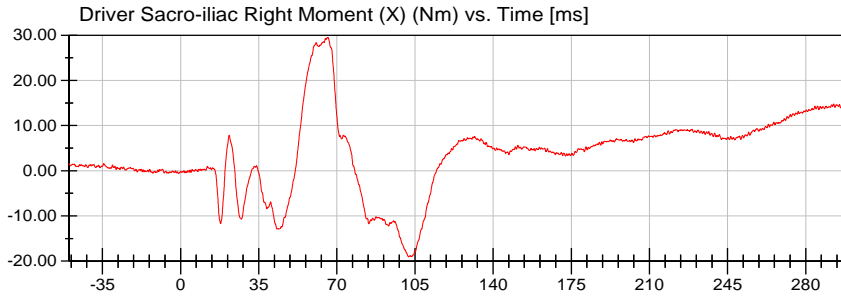
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



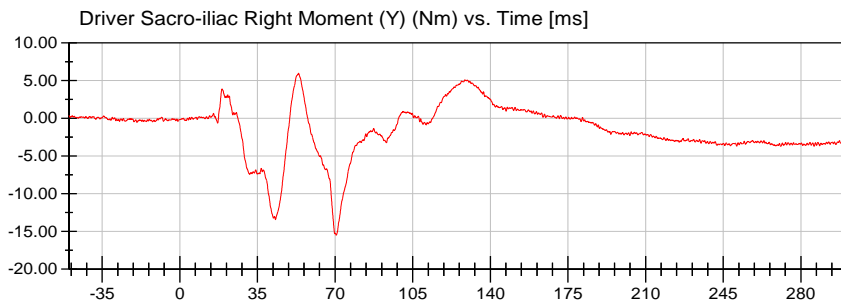
**<Max>**

29.50 Nm at 65.95 ms

**<Min>**

-19.08 Nm at 102.20 ms

CFC\_600



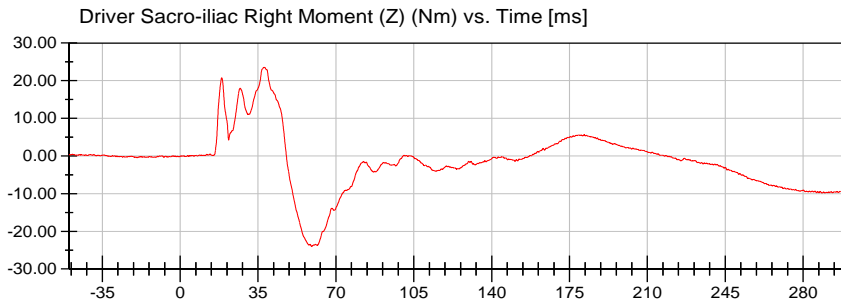
**<Max>**

5.99 Nm at 53.55 ms

**<Min>**

-15.49 Nm at 70.50 ms

CFC\_600



**<Max>**

23.56 Nm at 37.85 ms

**<Min>**

-24.03 Nm at 59.15 ms

CFC\_600

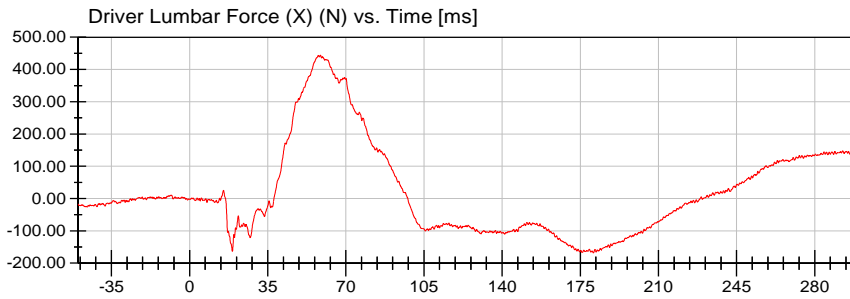


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



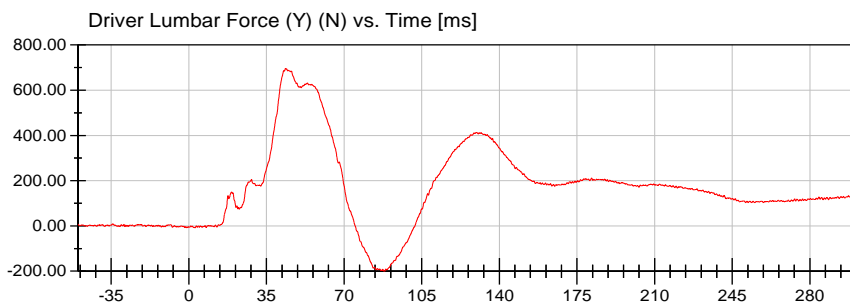
**<Max>**

444.20 N at 58.60 ms

**<Min>**

-168.33 N at 180.85 ms

CFC\_600



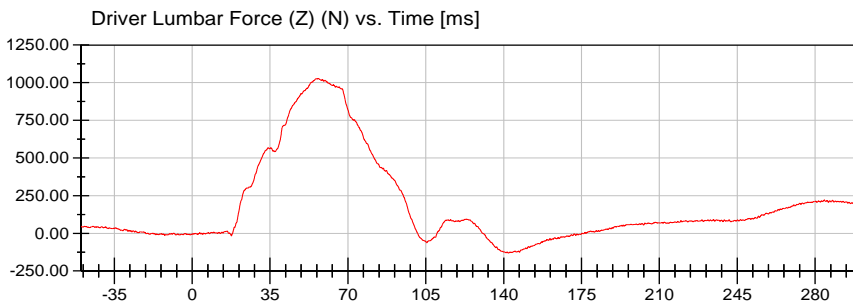
**<Max>**

696.36 N at 43.60 ms

**<Min>**

-199.61 N at 88.35 ms

CFC\_600



**<Max>**

1,027.34 N at 56.80 ms

**<Min>**

-130.74 N at 142.10 ms

CFC\_600



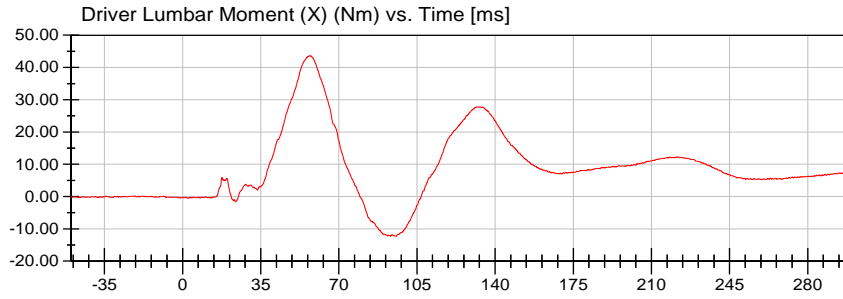
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



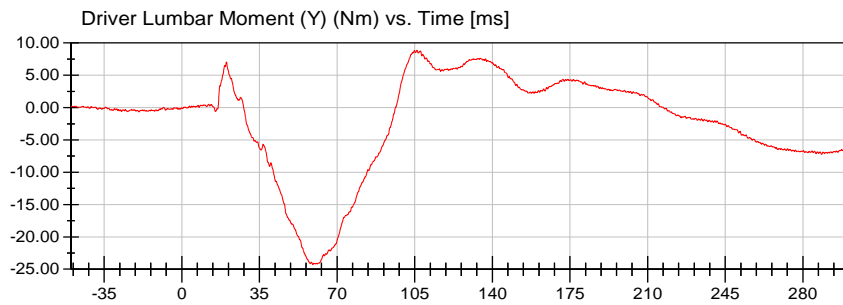
**<Max>**

43.63 Nm at 56.90 ms

**<Min>**

-12.28 Nm at 95.65 ms

CFC\_600



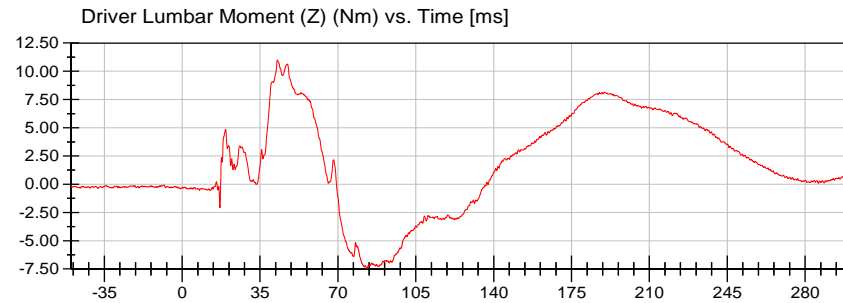
**<Max>**

8.86 Nm at 106.00 ms

**<Min>**

-24.27 Nm at 59.10 ms

CFC\_600



**<Max>**

11.01 Nm at 42.80 ms

**<Min>**

-7.44 Nm at 82.95 ms

CFC\_600



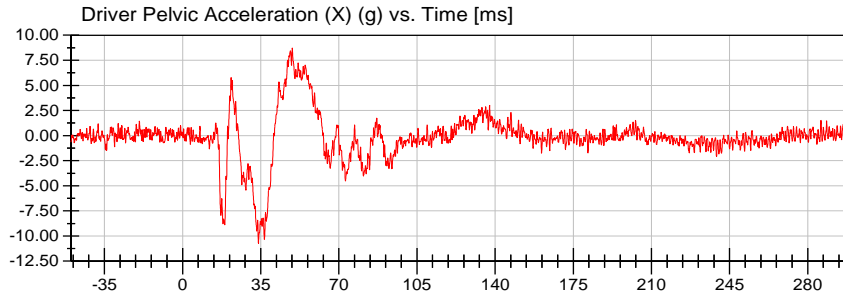
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



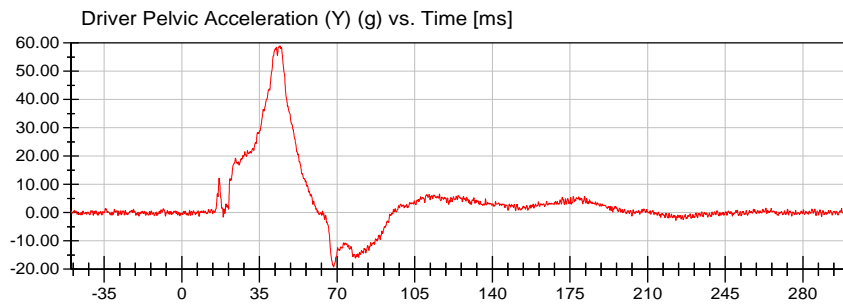
**<Max>**

8.71 g at 49.15 ms

**<Min>**

-10.74 g at 34.00 ms

CFC\_1000



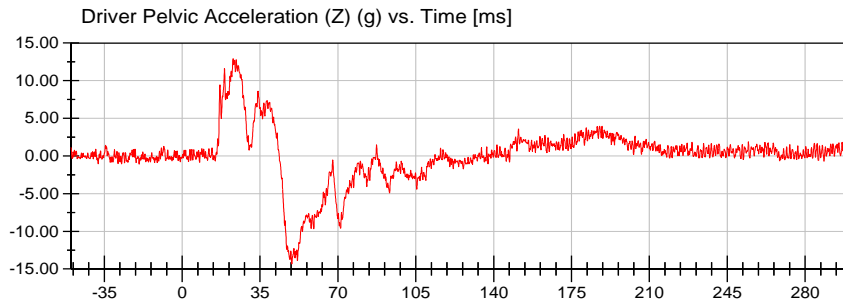
**<Max>**

58.92 g at 44.25 ms

**<Min>**

-19.21 g at 68.45 ms

CFC\_1000



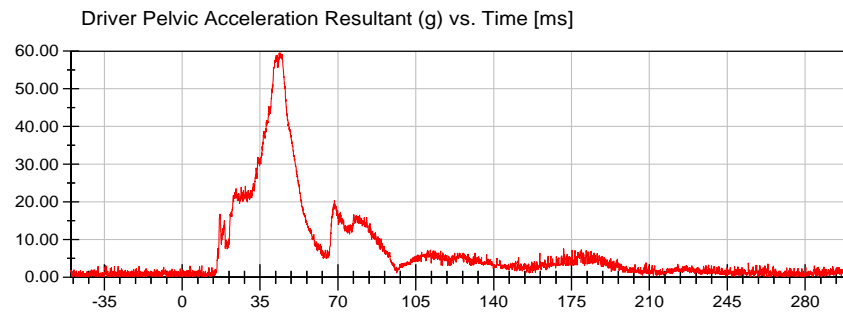
**<Max>**

12.91 g at 22.90 ms

**<Min>**

-14.35 g at 49.25 ms

CFC\_1000



**<Max>**

59.51 g at 43.60 ms

**<Min>**

0.24 g at -9.70 ms

Prefiltered\_> CFC 1000



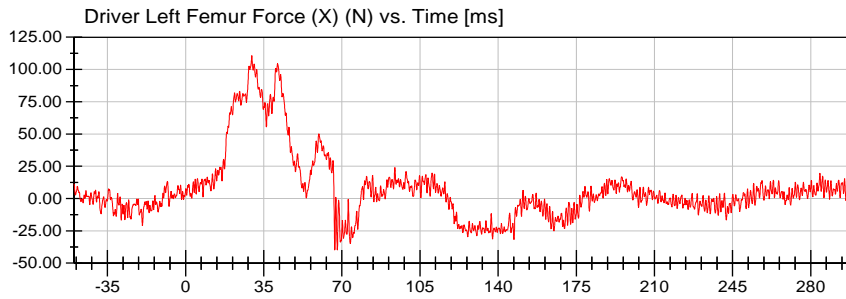
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



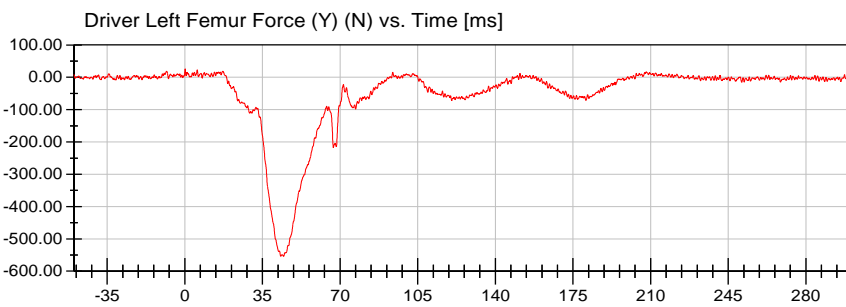
**<Max>**

110.63 N at 29.70 ms

**<Min>**

-39.93 N at 68.00 ms

CFC\_600



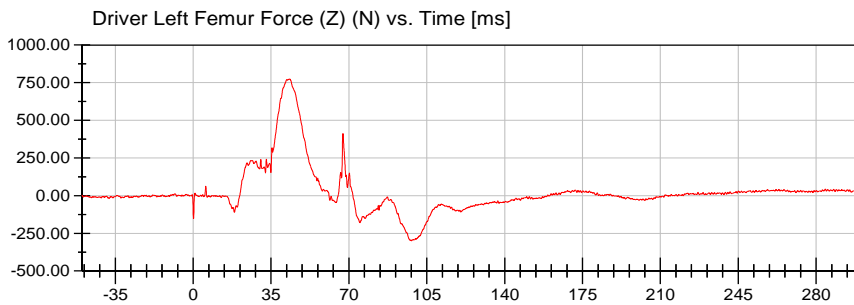
**<Max>**

25.32 N at 0.15 ms

**<Min>**

-554.26 N at 44.55 ms

CFC\_600



**<Max>**

774.16 N at 43.40 ms

**<Min>**

-298.79 N at 98.15 ms

CFC\_600



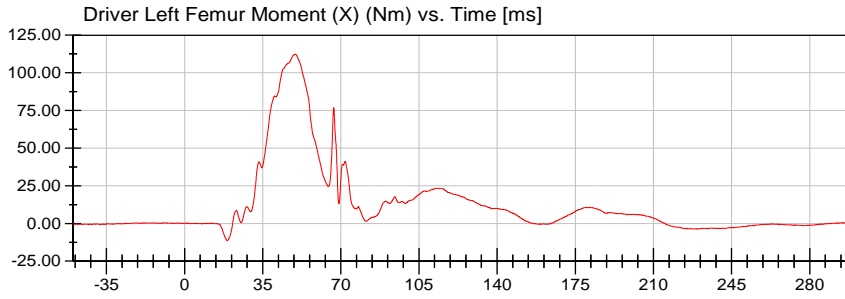
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



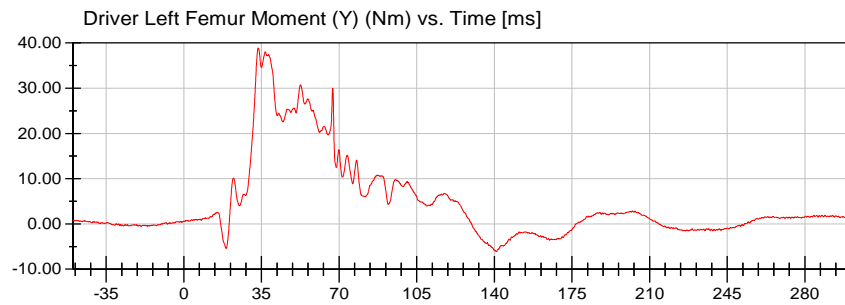
**<Max>**

112.33 Nm at 49.70 ms

**<Min>**

-11.44 Nm at 19.20 ms

CFC\_600



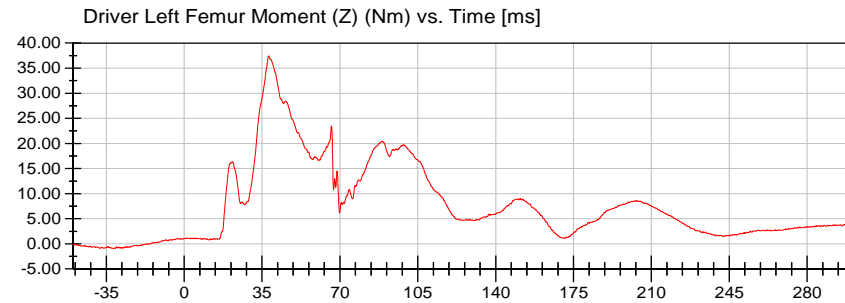
**<Max>**

38.87 Nm at 33.55 ms

**<Min>**

-6.10 Nm at 141.00 ms

CFC\_600



**<Max>**

37.44 Nm at 38.00 ms

**<Min>**

-0.92 Nm at -31.05 ms

CFC\_600



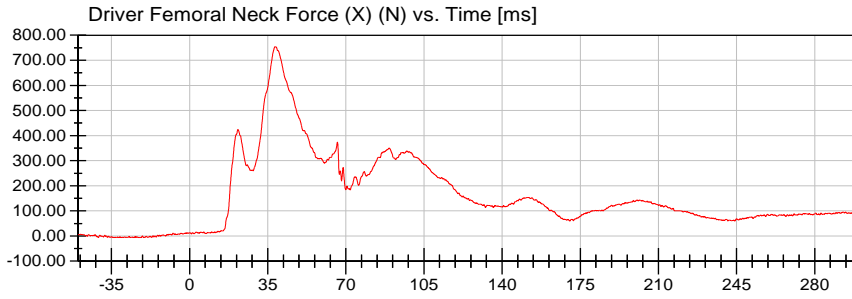
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



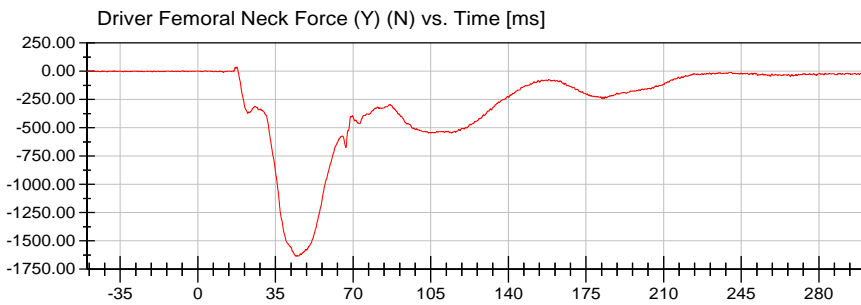
**<Max>**

753.80 N at 38.25 ms

**<Min>**

-6.39 N at -30.65 ms

CFC\_600



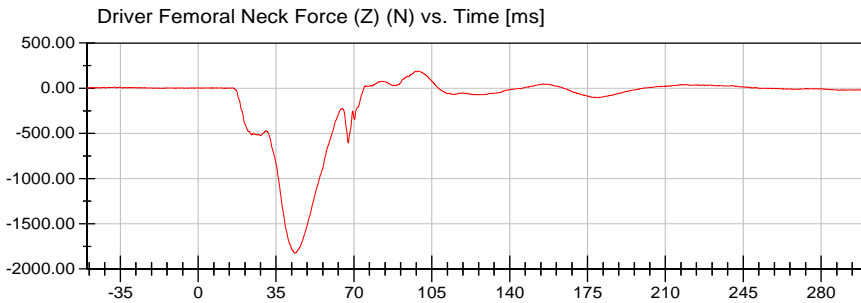
**<Max>**

36.99 N at 17.65 ms

**<Min>**

-1,636.68 N at 44.35 ms

CFC\_600



**<Max>**

188.82 N at 98.90 ms

**<Min>**

-1,823.15 N at 43.45 ms

CFC\_600



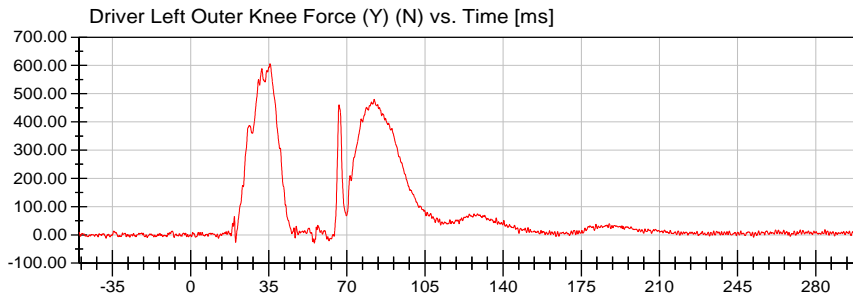
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



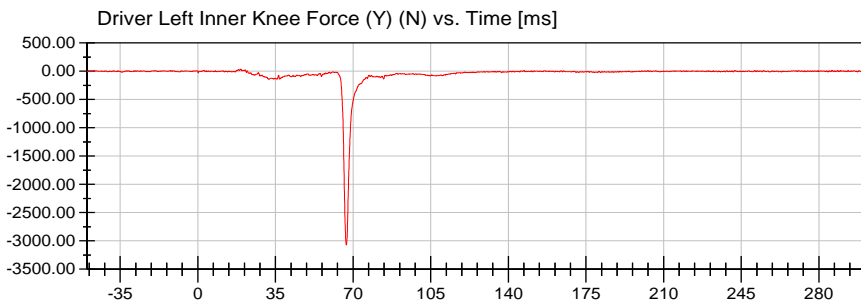
**<Max>**

606.20 N at 35.60 ms

**<Min>**

-29.41 N at 55.40 ms

CFC\_600



**<Max>**

36.54 N at 19.35 ms

**<Min>**

-3,067.61 N at 66.95 ms

CFC\_600

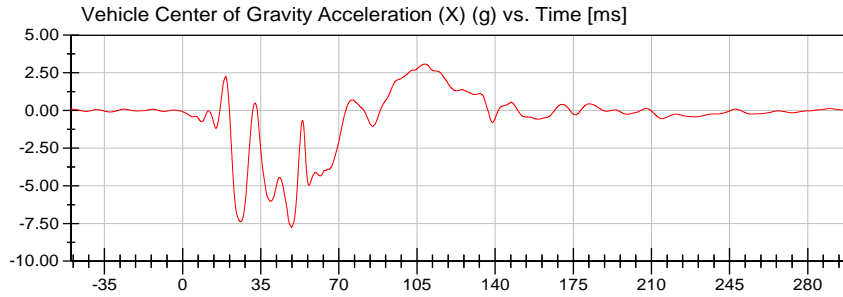


# VRTC

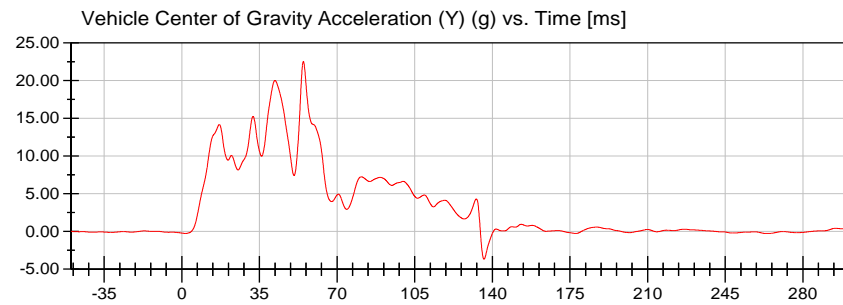
Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

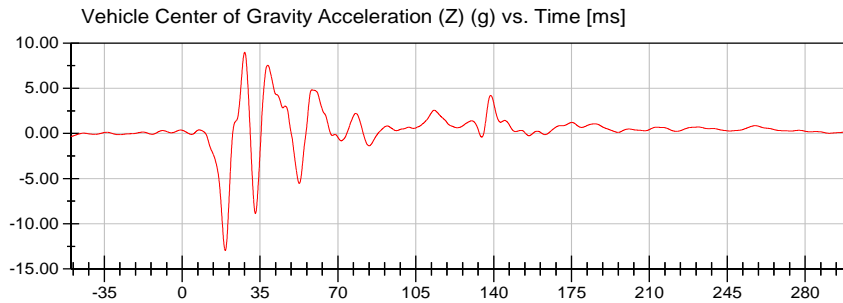
Test Date: 01/14/2021



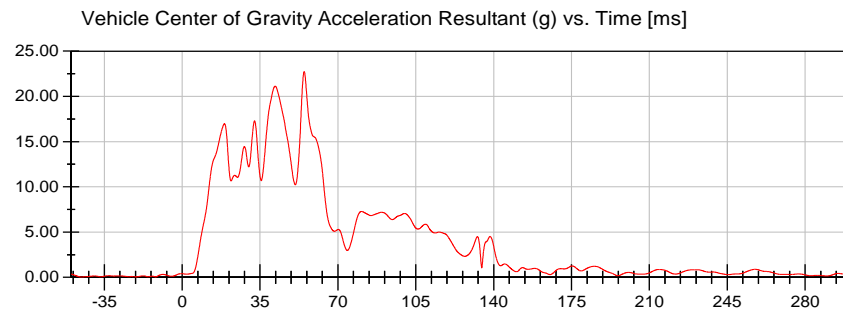
**<Max>**  
3.08 g at 108.50 ms  
**<Min>**  
-7.73 g at 48.85 ms  
CFC\_60



**<Max>**  
22.55 g at 54.80 ms  
**<Min>**  
-3.68 g at 136.25 ms  
CFC\_60



**<Max>**  
8.97 g at 28.10 ms  
**<Min>**  
-12.97 g at 19.40 ms  
CFC\_60



**<Max>**  
22.72 g at 54.80 ms  
**<Min>**  
0.03 g at -45.45 ms  
CFC\_60



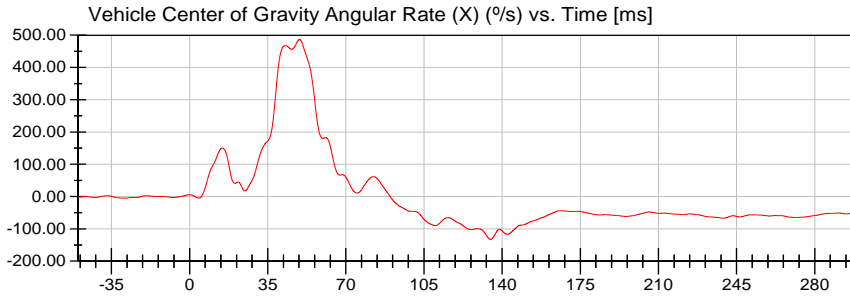
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



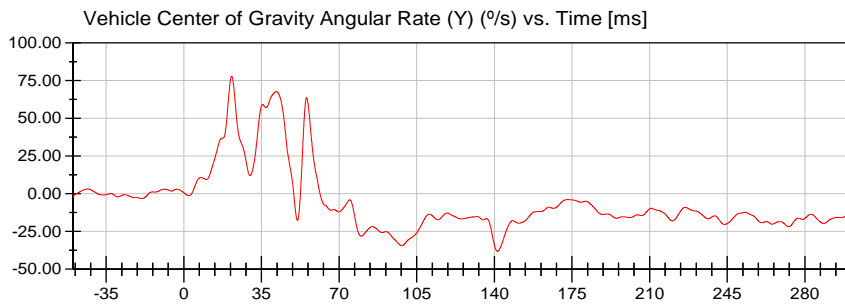
**<Max>**

486.96 °/s at 49.20 ms

**<Min>**

-132.78 °/s at 134.75 ms

CFC\_60



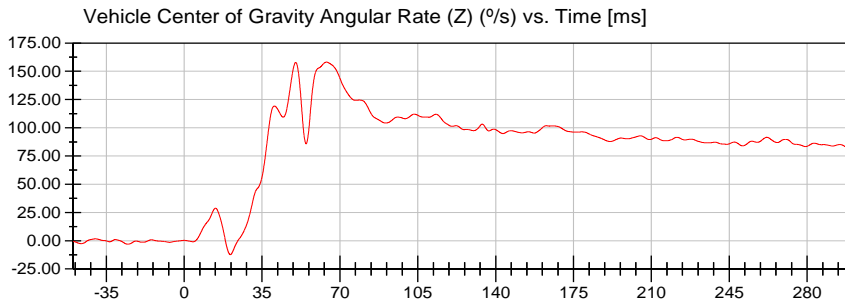
**<Max>**

77.89 °/s at 21.55 ms

**<Min>**

-38.19 °/s at 141.50 ms

CFC\_60



**<Max>**

158.15 °/s at 64.00 ms

**<Min>**

-12.22 °/s at 20.75 ms

CFC\_60

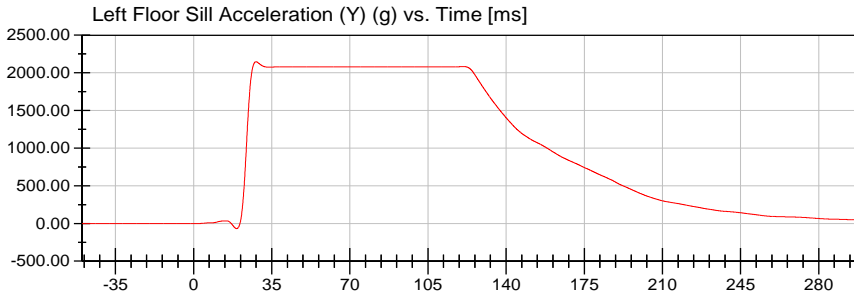


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



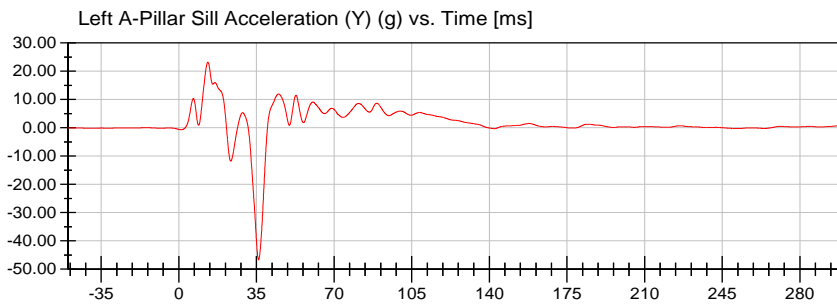
**<Max>**

2,147.39 g at 27.95 ms

**<Min>**

-67.38 g at 19.30 ms

CFC\_60



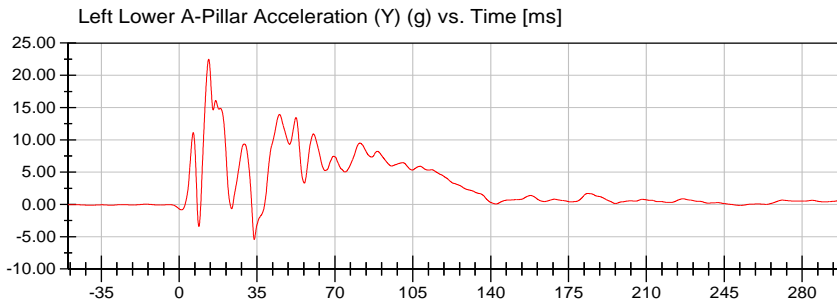
**<Max>**

23.24 g at 13.10 ms

**<Min>**

-46.73 g at 35.95 ms

CFC\_60



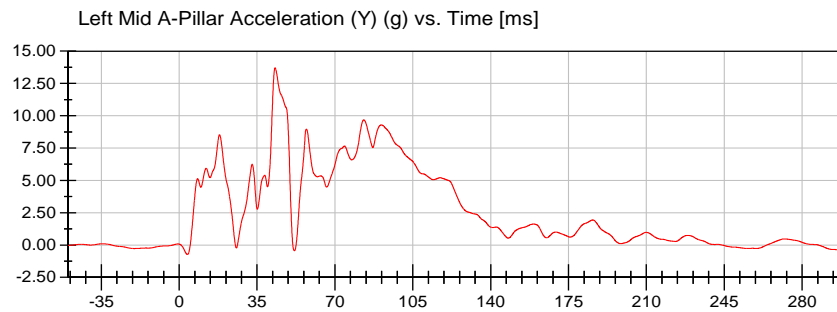
**<Max>**

22.48 g at 13.25 ms

**<Min>**

-5.44 g at 33.75 ms

CFC\_60



**<Max>**

13.71 g at 43.10 ms

**<Min>**

-0.73 g at 3.70 ms

CFC\_60

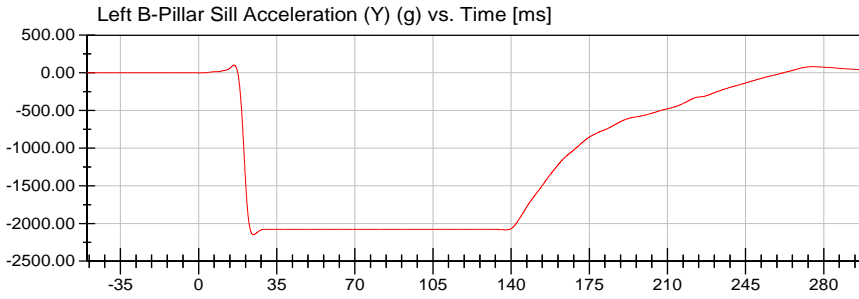


# VRTC

Test Lab: CTF  
Test Number: 210114 ( )

Position #1 (11WS)

Test Date: 01/14/2021



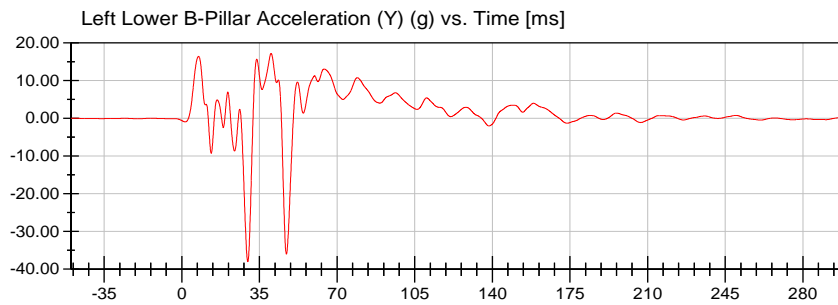
**<Max>**

101.20 g at 15.90 ms

**<Min>**

-2,149.77 g at 24.55 ms

CFC\_60



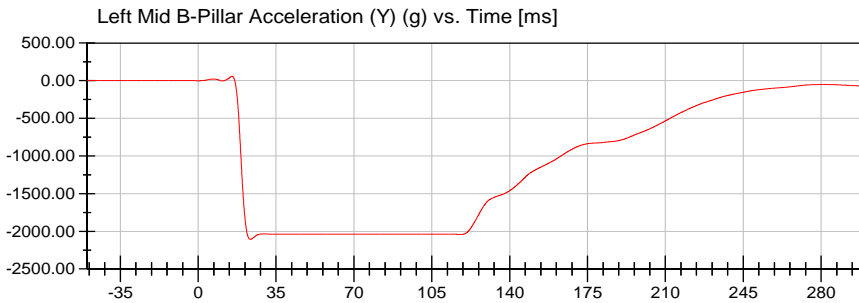
**<Max>**

17.21 g at 40.25 ms

**<Min>**

-37.99 g at 29.75 ms

CFC\_60



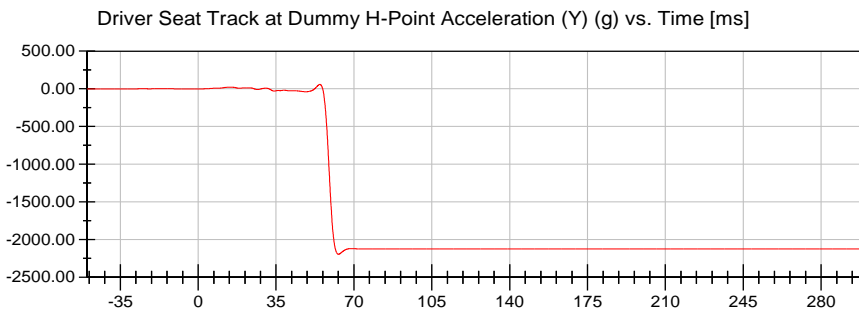
**<Max>**

59.08 g at 15.25 ms

**<Min>**

-2,106.23 g at 23.50 ms

CFC\_60



**<Max>**

57.91 g at 54.70 ms

**<Min>**

-2,193.94 g at 63.05 ms

CFC\_60



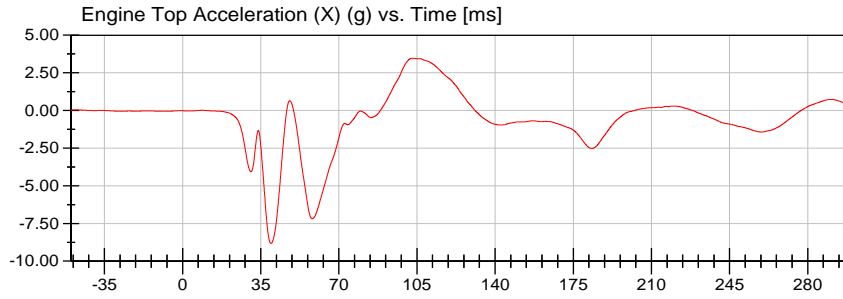
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ( )



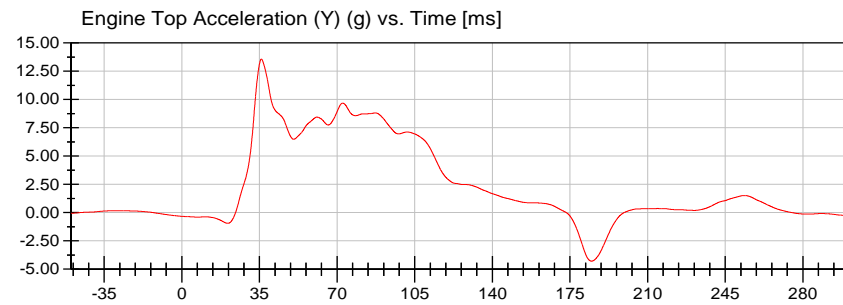
**<Max>**

3.47 g at 103.00 ms

**<Min>**

-8.83 g at 39.65 ms

CFC\_60



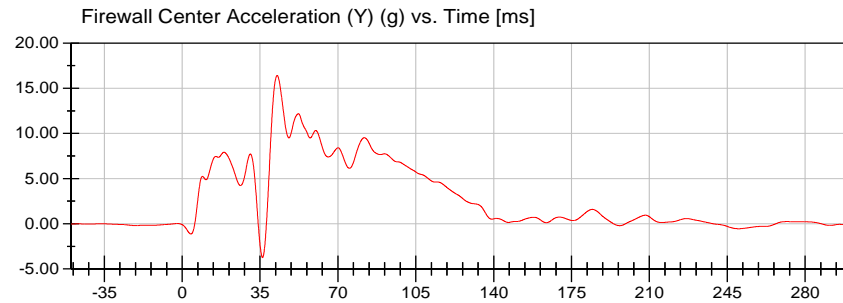
**<Max>**

13.57 g at 35.85 ms

**<Min>**

-4.28 g at 184.75 ms

CFC\_60



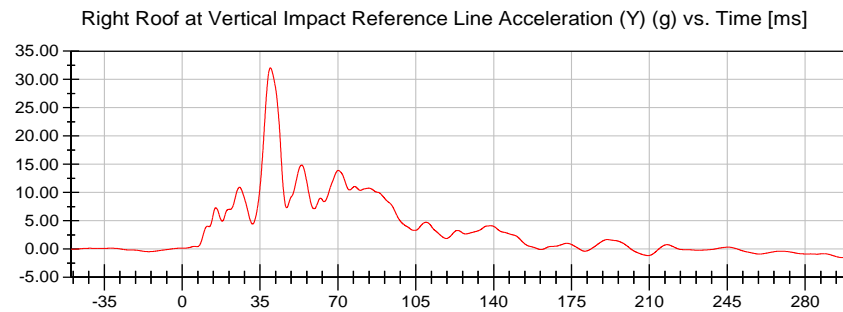
**<Max>**

16.42 g at 42.70 ms

**<Min>**

-3.73 g at 36.10 ms

CFC\_60



**<Max>**

32.04 g at 39.65 ms

**<Min>**

-1.53 g at 297.75 ms

CFC\_60



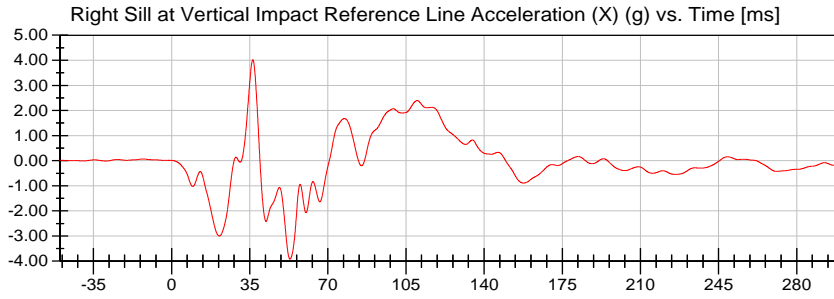
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



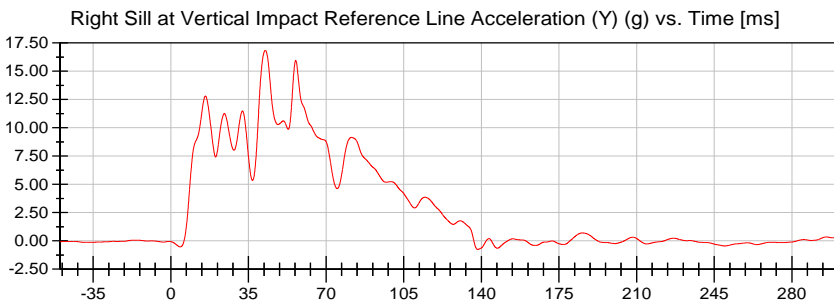
**<Max>**

4.02 g at 36.40 ms

**<Min>**

-3.92 g at 53.05 ms

CFC\_60



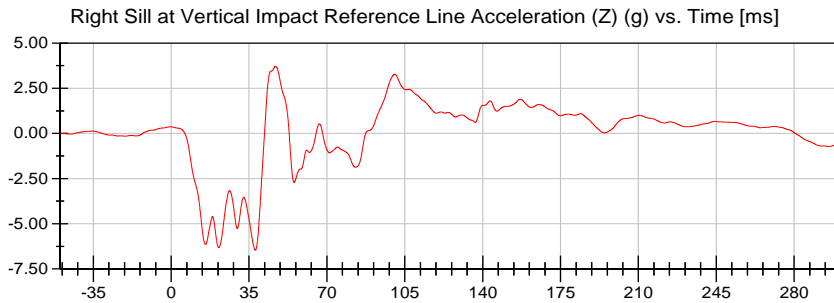
**<Max>**

16.84 g at 42.60 ms

**<Min>**

-0.75 g at 138.40 ms

CFC\_60



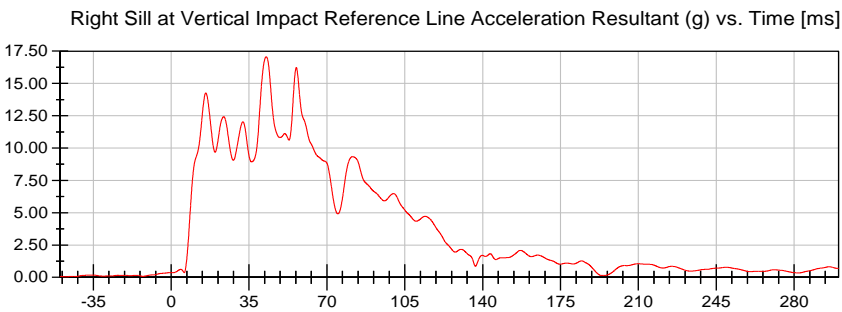
**<Max>**

3.72 g at 46.85 ms

**<Min>**

-6.47 g at 37.85 ms

CFC\_60



**<Max>**

17.06 g at 42.70 ms

**<Min>**

0.05 g at -47.45 ms

CFC\_60



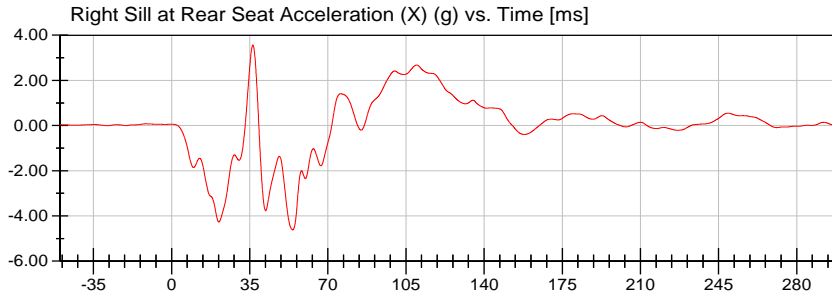
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



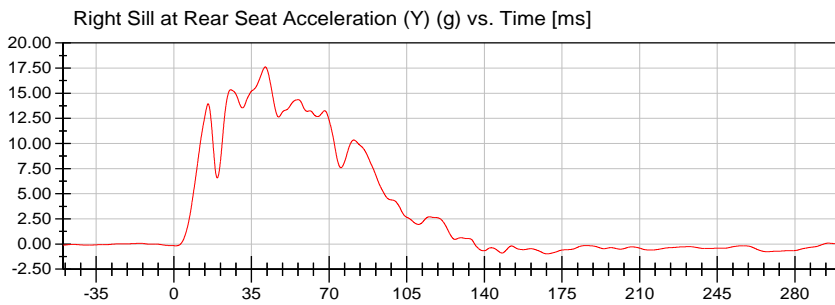
**<Max>**

3.57 g at 36.45 ms

**<Min>**

-4.62 g at 54.25 ms

CFC\_60



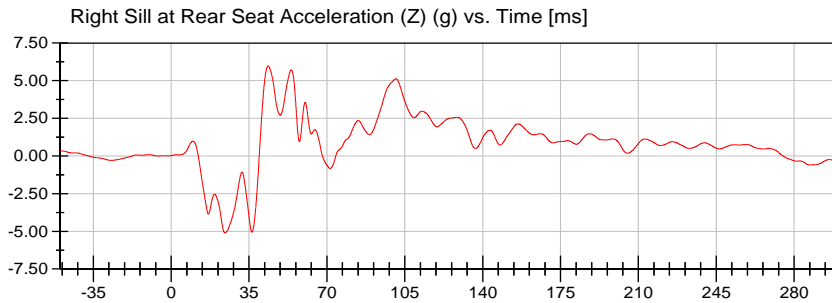
**<Max>**

17.62 g at 41.25 ms

**<Min>**

-0.98 g at 168.30 ms

CFC\_60



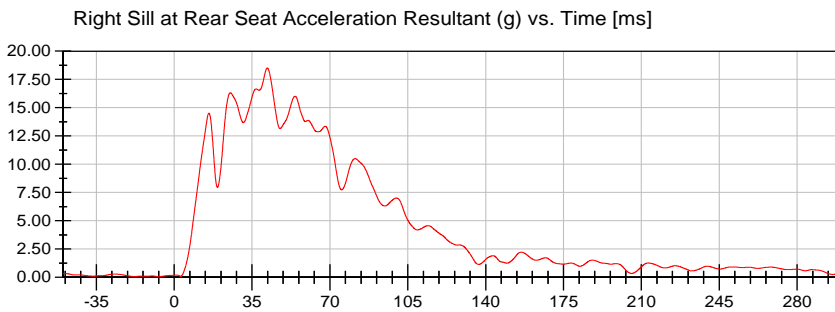
**<Max>**

5.98 g at 43.55 ms

**<Min>**

-5.10 g at 24.15 ms

CFC\_60



**<Max>**

18.51 g at 41.85 ms

**<Min>**

0.06 g at -6.95 ms

CFC\_60



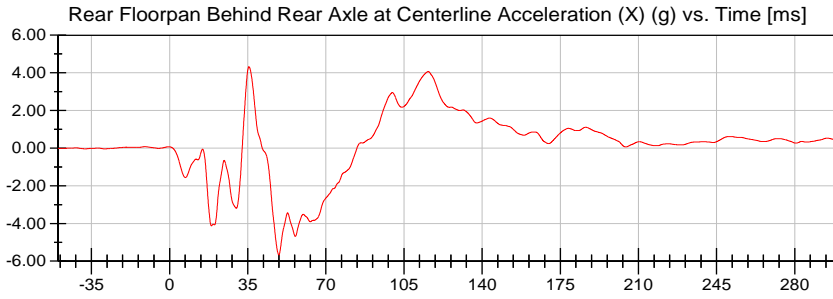
**VRTC**

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



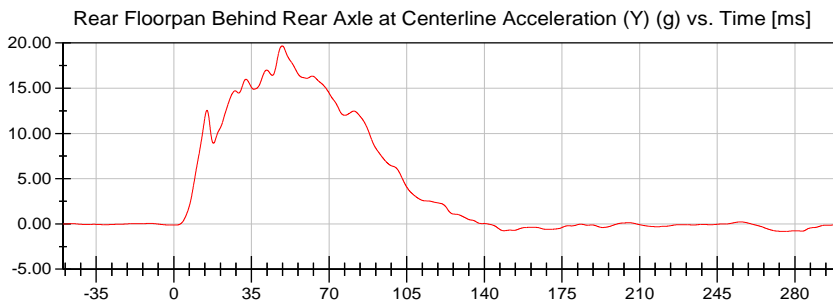
**<Max>**

4.33 g at 35.55 ms

**<Min>**

-5.67 g at 48.95 ms

CFC\_60



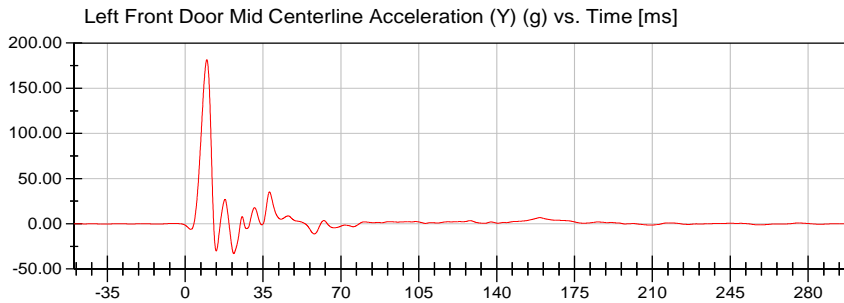
**<Max>**

19.68 g at 48.90 ms

**<Min>**

-0.81 g at 275.95 ms

CFC\_60



**<Max>**

181.43 g at 9.75 ms

**<Min>**

-32.93 g at 21.80 ms

CFC\_60



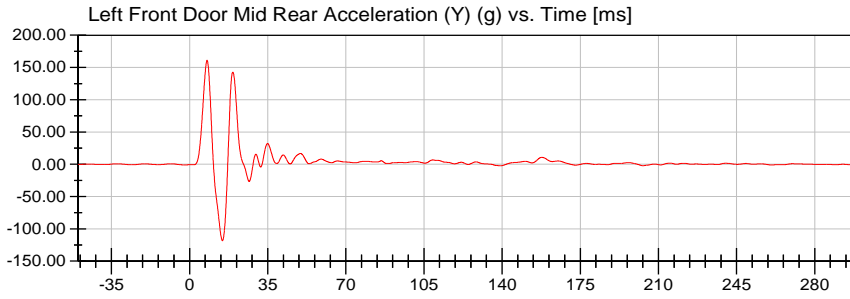
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



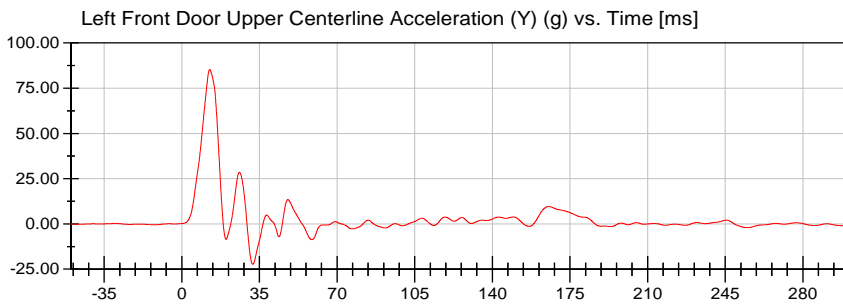
**<Max>**

161.06 g at 7.85 ms

**<Min>**

-118.46 g at 14.75 ms

CFC\_60



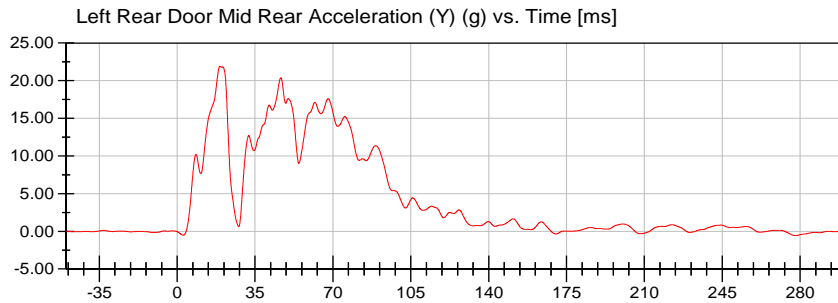
**<Max>**

85.33 g at 12.60 ms

**<Min>**

-22.30 g at 32.00 ms

CFC\_60



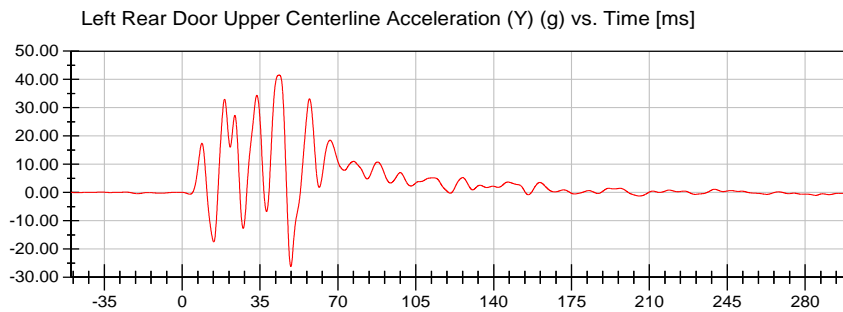
**<Max>**

21.90 g at 19.25 ms

**<Min>**

-0.56 g at 277.85 ms

CFC\_60



**<Max>**

41.54 g at 43.60 ms

**<Min>**

-26.17 g at 48.85 ms

CFC\_60

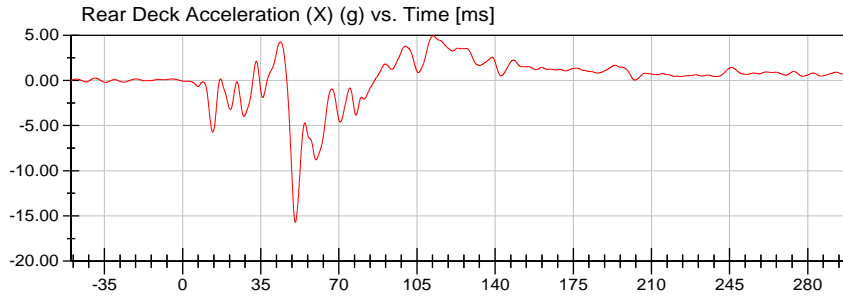


# VRTC

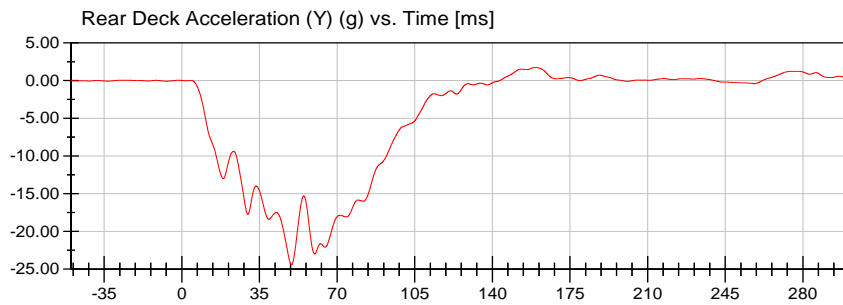
Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

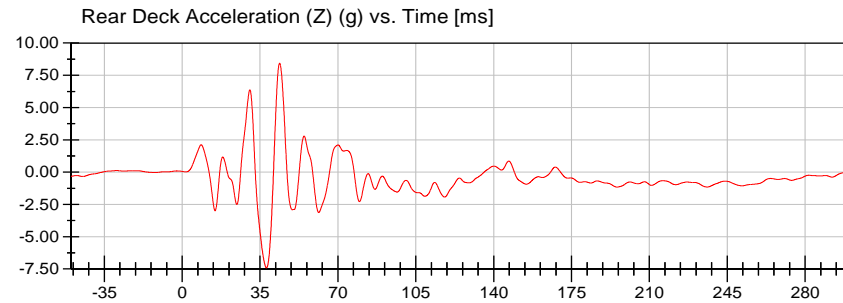
Test Date: 01/14/2021



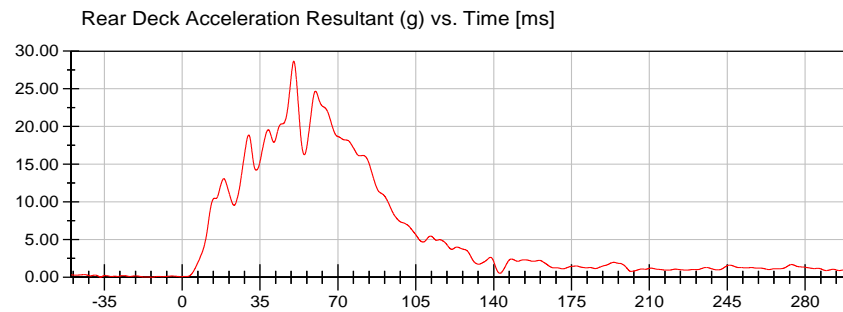
**<Max>**  
4.94 g at 112.25 ms  
**<Min>**  
-15.69 g at 50.50 ms  
CFC\_60



**<Max>**  
1.76 g at 159.25 ms  
**<Min>**  
-24.42 g at 49.45 ms  
CFC\_60



**<Max>**  
8.44 g at 43.80 ms  
**<Min>**  
-7.42 g at 37.90 ms  
CFC\_60



**<Max>**  
28.66 g at 50.15 ms  
**<Min>**  
0.02 g at -13.65 ms  
CFC\_60



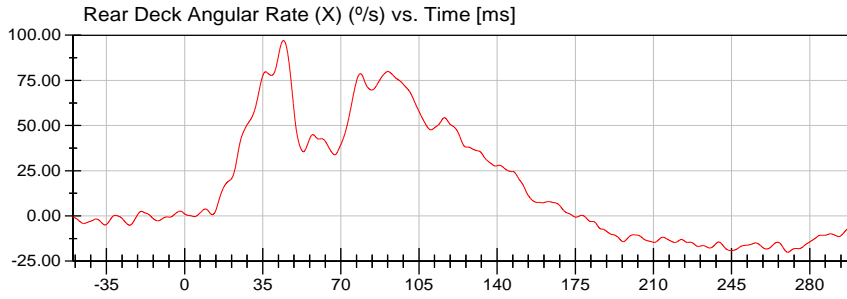
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



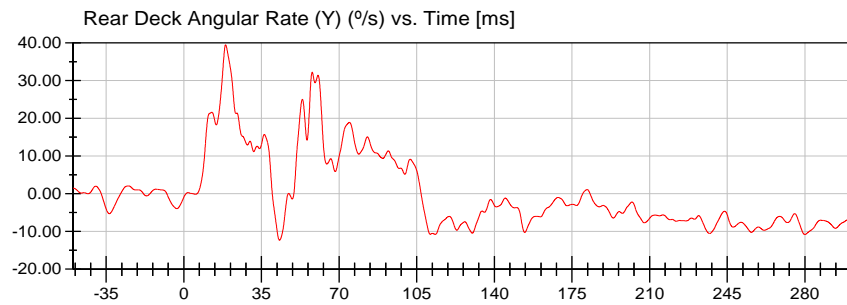
**<Max>**

97.04 °/s at 44.30 ms

**<Min>**

-20.13 °/s at 270.15 ms

CFC\_60



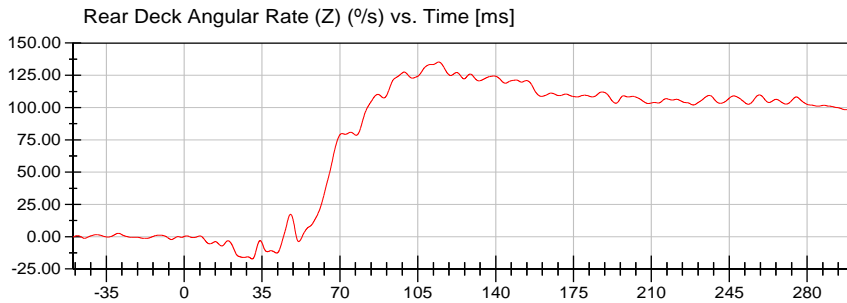
**<Max>**

39.52 °/s at 18.85 ms

**<Min>**

-12.33 °/s at 43.15 ms

CFC\_60



**<Max>**

135.33 °/s at 114.40 ms

**<Min>**

-17.22 °/s at 30.60 ms

CFC\_60



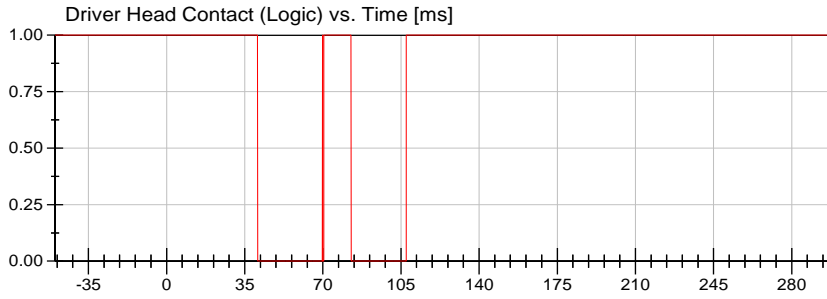
# VRTC

Position #1 (11WS)

Test Date: 01/14/2021

Test Lab: CTF

Test Number: 210114 ()



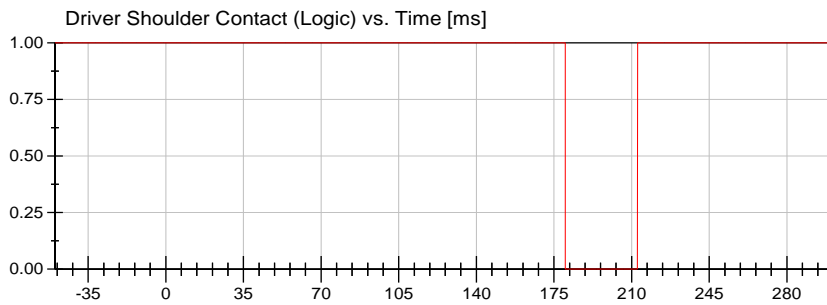
**<Max>**

1.00 Logic at -50.00 ms

**<Min>**

0.00 Logic at 40.80 ms

Unfiltered



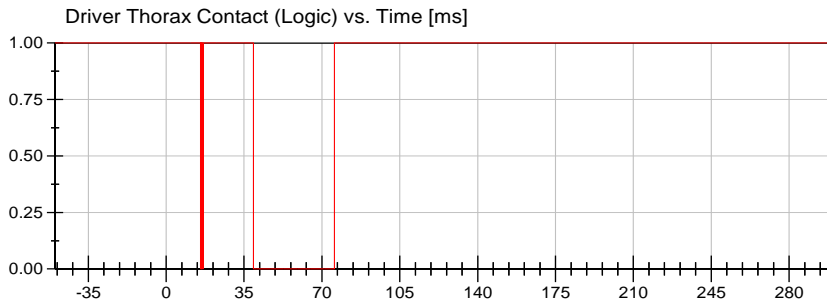
**<Max>**

1.00 Logic at -50.00 ms

**<Min>**

0.00 Logic at 180.15 ms

Unfiltered



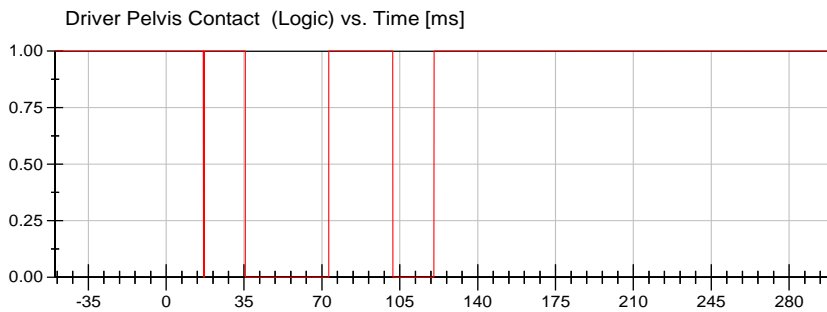
**<Max>**

1.00 Logic at -50.00 ms

**<Min>**

0.00 Logic at 15.45 ms

Unfiltered



**<Max>**

1.00 Logic at -50.00 ms

**<Min>**

0.00 Logic at 16.75 ms

Unfiltered

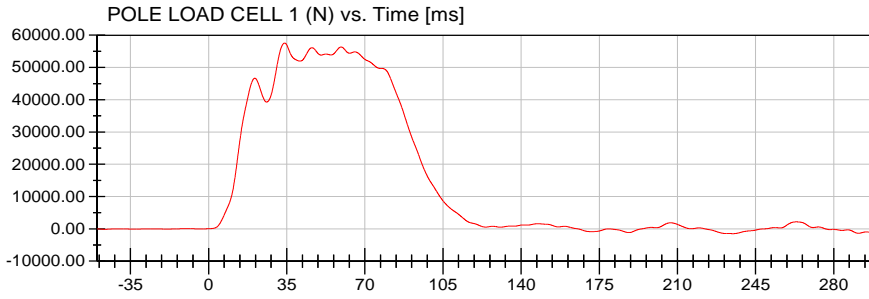


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



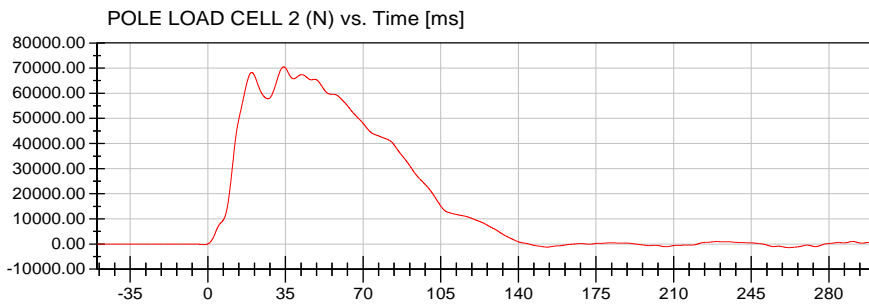
**<Max>**

57,552.61 N at 34.10 ms

**<Min>**

-1,486.10 N at 234.90 ms

CFC\_60



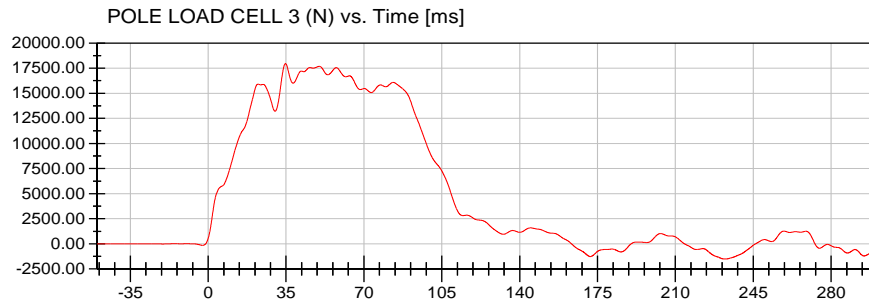
**<Max>**

70,487.20 N at 34.20 ms

**<Min>**

-1,413.19 N at 262.00 ms

CFC\_60



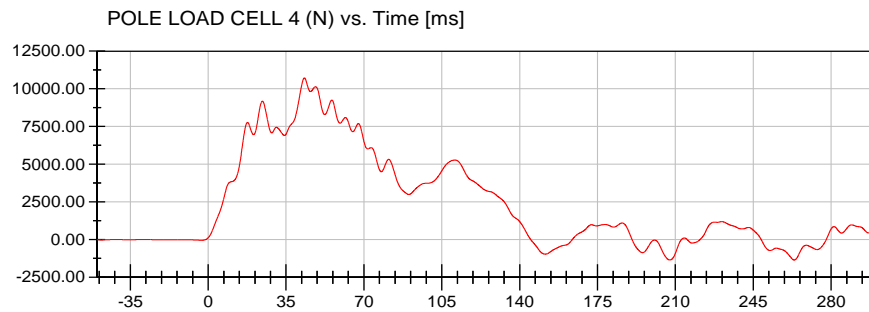
**<Max>**

17,950.73 N at 34.75 ms

**<Min>**

-1,509.53 N at 232.25 ms

CFC\_60



**<Max>**

10,725.77 N at 43.25 ms

**<Min>**

-1,352.79 N at 263.40 ms

CFC\_60

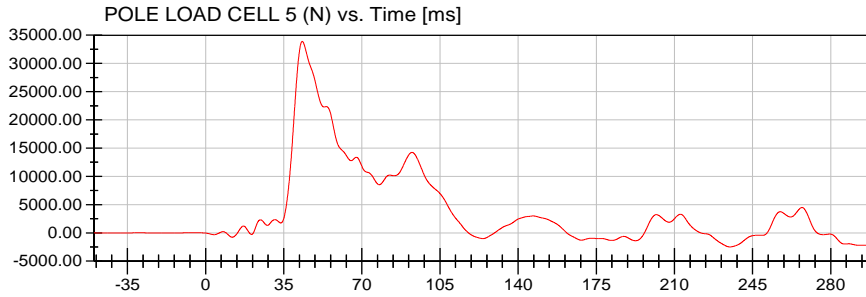


# VRTC

Test Lab: CTF  
Test Number: 210114 ()

Position #1 (11WS)

Test Date: 01/14/2021



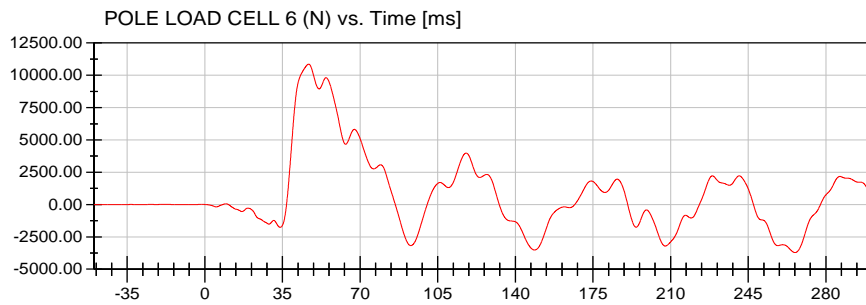
**<Max>**

33,889.73 N at 43.30 ms

**<Min>**

-2,488.81 N at 234.80 ms

CFC\_60



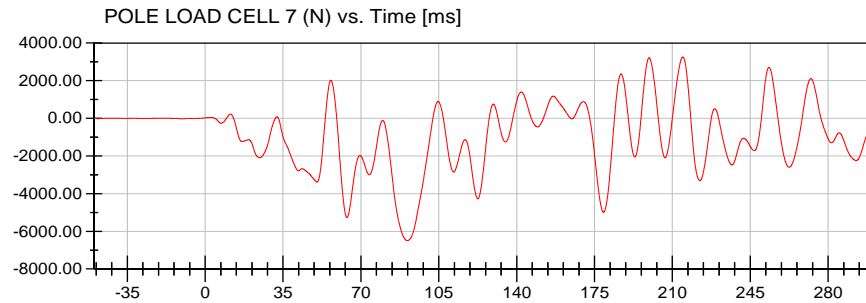
**<Max>**

10,863.10 N at 46.85 ms

**<Min>**

-3,717.90 N at 266.10 ms

CFC\_60



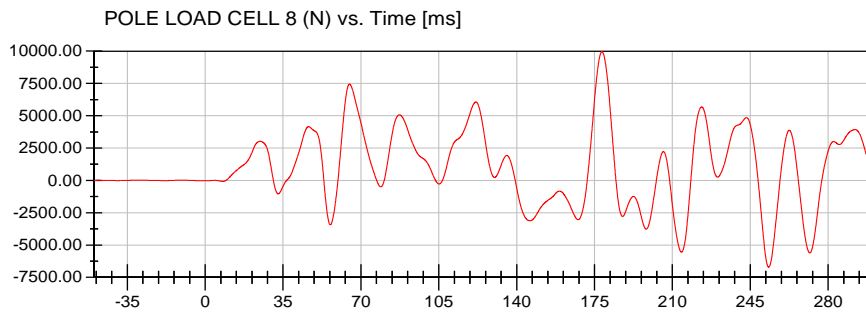
**<Max>**

3,257.32 N at 214.65 ms

**<Min>**

-6,492.02 N at 90.85 ms

CFC\_60



**<Max>**

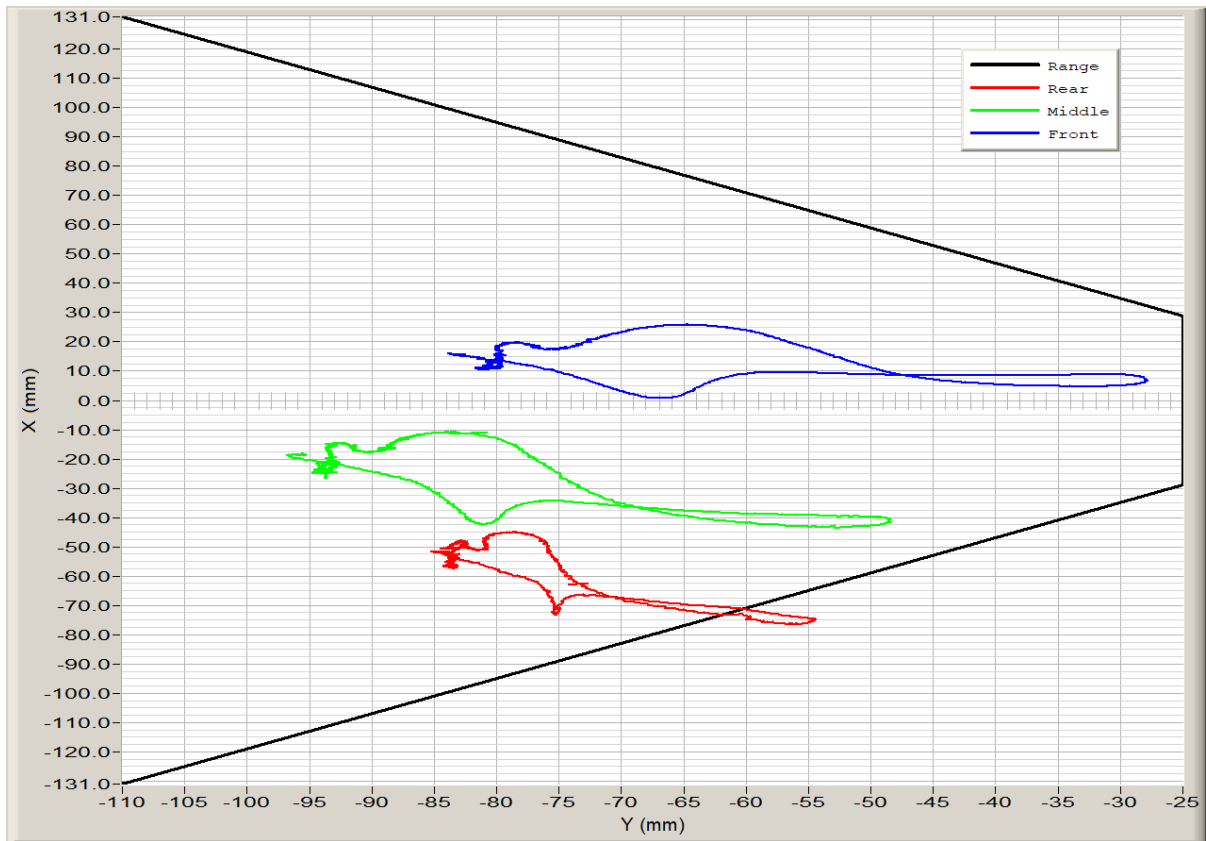
9,965.18 N at 178.30 ms

**<Min>**

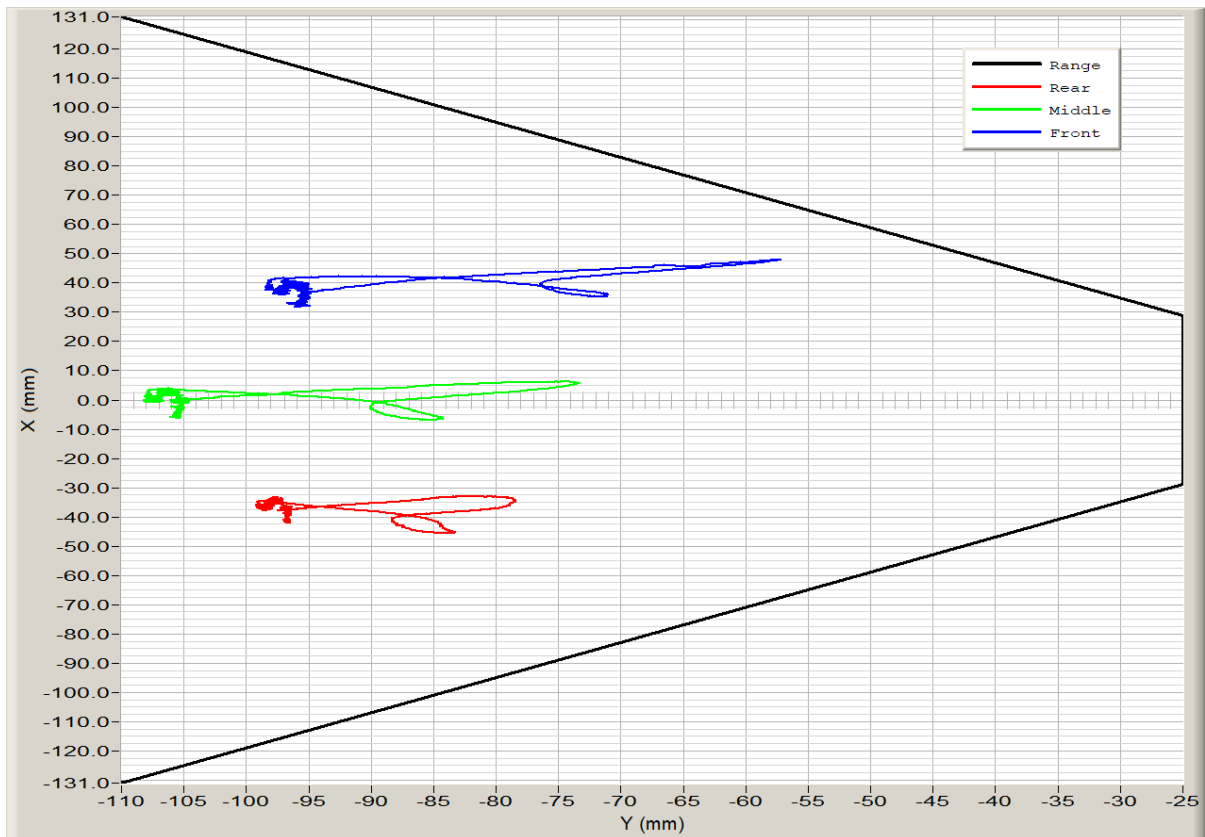
-6,715.51 N at 253.25 ms

CFC\_60

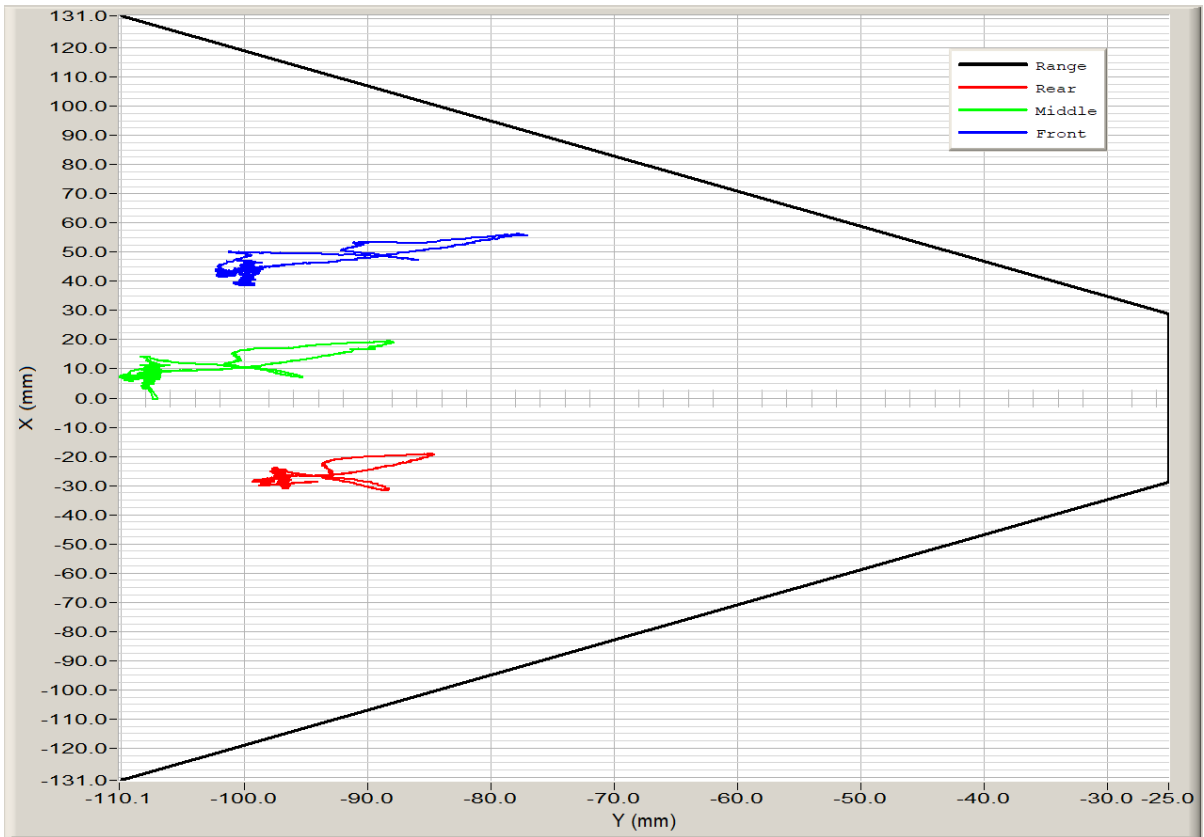




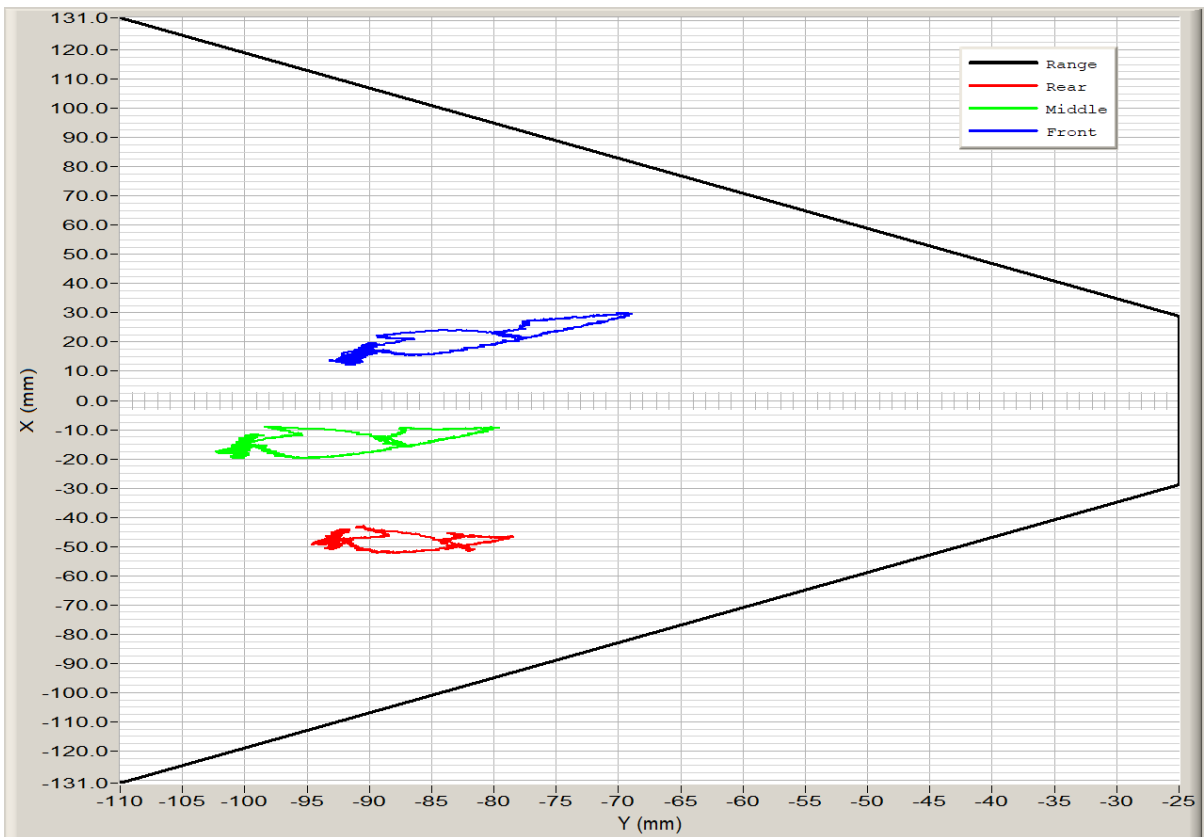
Shoulder\_XY



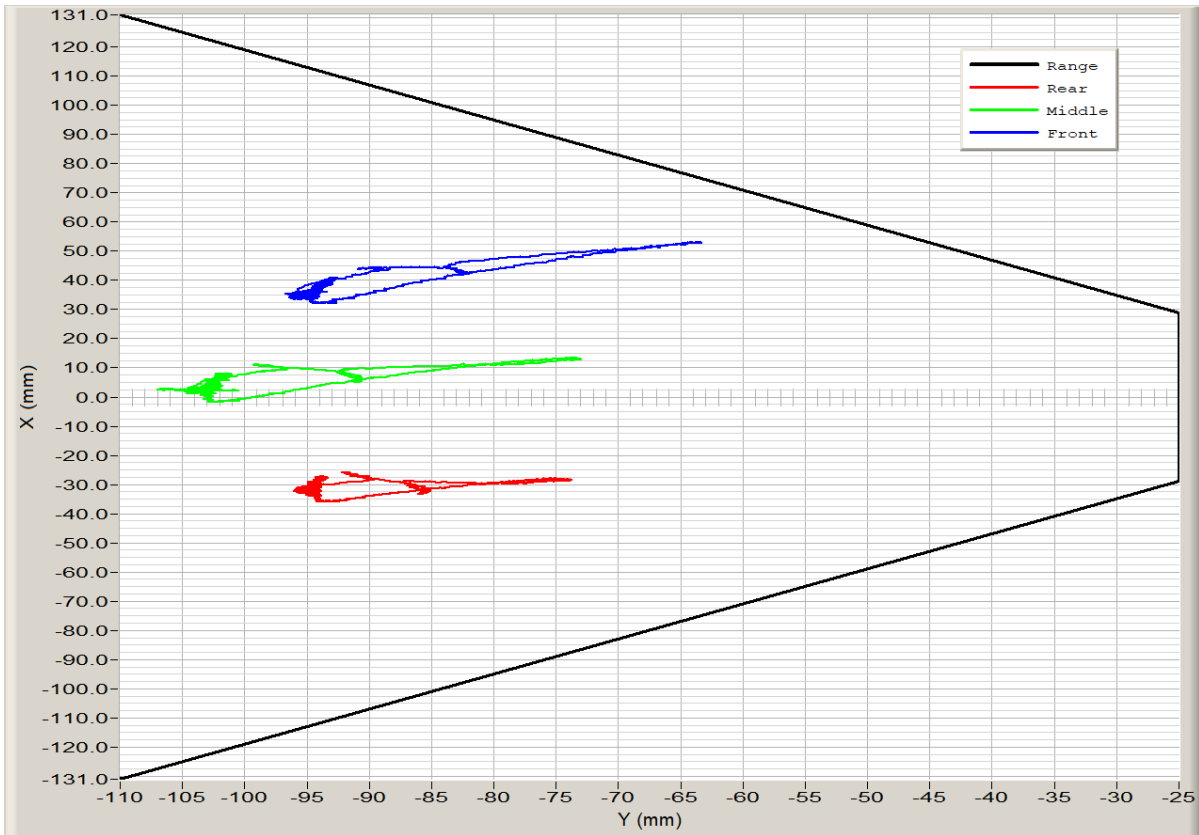
Thorax\_1\_XY



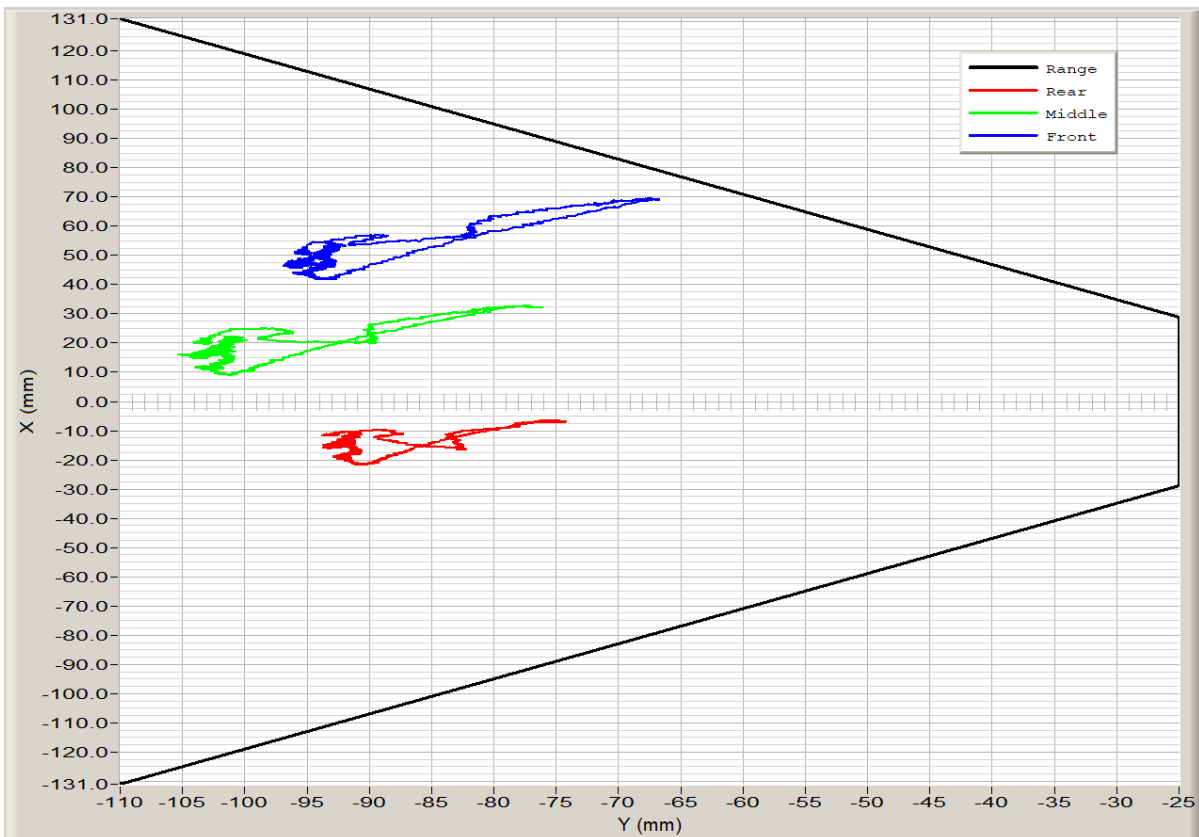
Thorax\_2\_XY



Thorax\_3\_XY



Abdomen\_1\_XY



Abdomen\_2\_XY

**APPENDIX C**  
**DUMMY PERFORMANCE QUALIFICATION TEST DATA**

## TABLE OF QUALIFICATION MEASUREMENTS AND PLOTS

### WorldSID-50M (Driver) Dummy

#### Description

**Table 1.** External Measurements

**Table 2.** Front Head Drop Test

Resultant Head Acceleration (G's) vs. Time (ms)

Head (X) Acceleration (G's) vs. Time (ms)

Head (Y) Acceleration (G's) vs. Time (ms)

Head (Z) Acceleration (G's) vs. Time (ms)

**Table 3.** Left Lateral Head Drop Test

Resultant Head Acceleration (G's) vs. Time (ms)

Head (X) Acceleration (G's) vs. Time (ms)

Head (Y) Acceleration (G's) vs. Time (ms)

Head (Z) Acceleration (G's) vs. Time (ms)

**Table 4.** Right Lateral Head Drop Test

Resultant Head Acceleration (G's) vs. Time (ms)

Head (X) Acceleration (G's) vs. Time (ms)

Head (Y) Acceleration (G's) vs. Time (ms)

Head (Z) Acceleration (G's) vs. Time (ms)

**Table 5.** Left Lateral Neck Pendulum Test

Pendulum Acceleration (G's) vs. Time (ms)

Pendulum Velocity (m/s) vs. Time (ms)

Flexion Angle (°) vs. Time (ms)

Forward Potentiometer Rotation at Base of Pendulum (°) vs. Time (ms)

Rear Potentiometer Rotation at Base of Pendulum (°) vs. Time (ms)

Center Headform Potentiometer Rotation at CG (°) vs. Time (ms)

Neck Force Y (N) vs. Time (ms)

Neck Force Y (N) Filtered for Total Neck Occipital Condyle Moment Calculation vs. Time (ms)

Neck Moment X (Nm) vs. Time (ms)

Total Neck Occipital Condyle Moment X (Nm) vs. Time (ms)

**Table 6.** Right Lateral Neck Pendulum Test

Pendulum Acceleration (G's) vs. Time (ms)

Pendulum Velocity (m/s) vs. Time (ms)

Flexion Angle (°) vs. Time (ms)

Forward Potentiometer Rotation at Base of Pendulum (°) vs. Time (ms)

Rear Potentiometer Rotation at Base of Pendulum (°) vs. Time (ms)

Center Headform Potentiometer Rotation at CG (°) vs. Time (ms)

Neck Force Y (N) vs. Time (ms)

Neck Force Y (N) Filtered for Total Neck Occipital Condyle Moment Calculation vs. Time (ms)

Neck Moment X (Nm) vs. Time (ms)

Total Neck Occipital Condyle Moment X (Nm) vs. Time (ms)

**Table 7.** Left Lateral Shoulder Impact Test

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

Impactor Force (N) vs. Time (ms)

Shoulder Displacement (mm) vs. Time (ms)

**Table 8.** Left Lateral Thorax with Arm Impact Test

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

Impactor Force (N) vs. Time (ms)

## TABLE OF QUALIFICATION MEASUREMENTS AND PLOTS (CONTUNUED)

### WorldSID-50M (Driver) Dummy

#### Description

Upper Spine Acceleration (G's) vs. Time (ms)  
Lower Spine Acceleration (G's) vs. Time (ms)  
Upper Thorax Rib Displacement (mm) vs. Time (ms)  
Center Thorax Rib Displacement (mm) vs. Time (ms)  
Lower Thorax Rib Displacement (mm) vs. Time (ms)

**Table 9.** Left Lateral Thorax without Arm Impact Test

Impactor Acceleration (G's) vs. Time (ms)  
Impactor Force (N) vs. Time (ms)  
Upper Spine Acceleration (G's) vs. Time (ms)  
Lower Spine Acceleration (G's) vs. Time (ms)  
Upper Thorax Rib Displacement (mm) vs. Time (ms)  
Center Thorax Rib Displacement (mm) vs. Time (ms)  
Lower Thorax Rib Displacement (mm) vs. Time (ms)

**Table 10.** Left Lateral Abdomen Impact Test

Impactor Acceleration (G's) vs. Time (ms)  
Impactor Force (N) vs. Time (ms)  
Upper Abdominal Rib Displacement (mm) vs. Time (ms)  
Lower Abdominal Rib Displacement (mm) vs. Time (ms)  
Lower Spine Acceleration (G's) vs. Time (ms)

**Table 11.** Left Lateral Pelvis Impact Test

Impactor Acceleration (G's) vs. Time (ms)  
Impactor Force (N) vs. Time (ms)  
Pelvis Acceleration Y (G's) vs. Time (ms)  
Lower Spine Acceleration Y (G's) vs. Time (ms)

**Pre-Test Calibration Sheets**  
**Driver S/N EB8888**

Transportation Research Center Inc.  
WorldSID-50M  
External Measurements  
Serial No. EB8888      Certification No. 05

WorldSID-50M Angular Reference Measurements					
Parameter	Symbol	Tilt Sensor (°)	Inclinometer (°)		
			Center	Left	Right
Head X-Axis	A1	0	n/a	n/a	n/a
Head Y-Axis	A2	2.2	n/a	2	Note 1
Neck Bracket X-Axis	A3	n/a	-0.5	n/a	n/a
Neck Bracket Y-Axis	A4	n/a	-3.1	n/a	n/a
Thorax X-Axis	A5	1.3	n/a	n/a	n/a
Thorax Y-Axis	A6	3.9	n/a	n/a	n/a
Pelvis X-Axis	A7	0.7	n/a	n/a	n/a
Pelvis Y-Axis	A8	10.2	n/a	n/a	n/a
H-point Tool	A9	n/a	n/a	32.8	33.7

WorldSID-50M External Linear Dimensions				
Parameter	Symbol	Specification (mm)		
		Center	Left	Right
Seated Height	L1	870	n/a	n/a
Hip Pivot Height	L2	n/a	89	89
Hip Pivot to Back Line	L3	n/a	187	176
Thigh Clearance	L4	n/a	181	180
Knee Height	L5	n/a	580	583
Knee to Backline	L6	n/a	667	670
Head Back to Seat Back	L7	156	n/a	n/a
Thorax Rib 1 Front to Back	L8	n/a	209	209
Abdomen Rib 2 Front to Back	L9	n/a	223	226
Arm Length	L10	n/a	330	330
Width Across Arms	L11	482	n/a	n/a
Waist Width	L12	341	n/a	n/a

Note 1: No land marks on the right side of head. Unable to align level.

## Transportation Research Center Inc.

Front Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 4-1

Test Date: 10/28/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Peak Head Resultant Acceleration	211 - 261 g	230.0 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	4.3 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	1.48 %	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

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11.29.2020 14:55:46 952

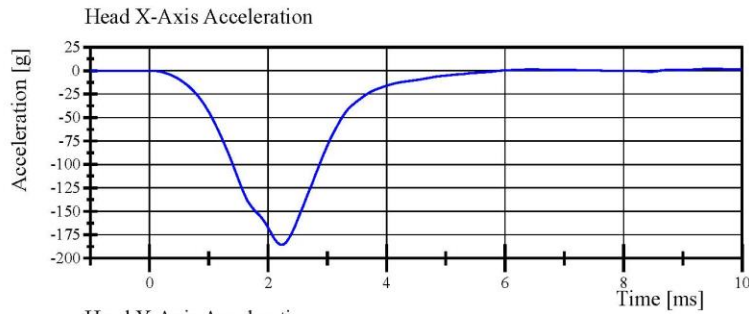


# Transportation Research Center Inc.

Front Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 4-1

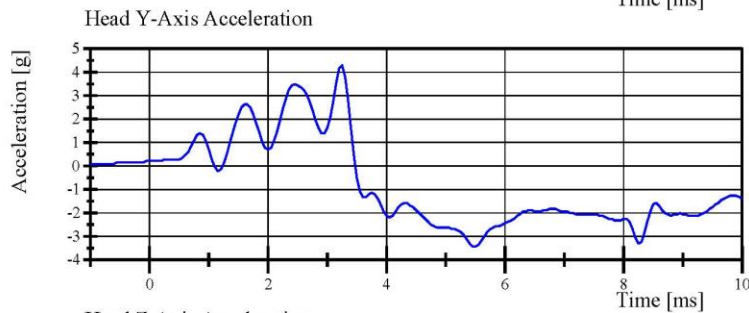
Test Date: 10/28/2020



Filter Class: CFC\_1000

Max: 2.2 g at 9.5 ms

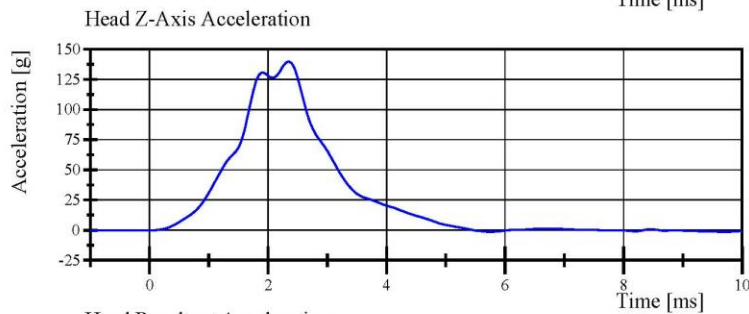
Min: -185.6 g at 2.3 ms



Filter Class: CFC\_1000

Max: 4.3 g at 3.3 ms

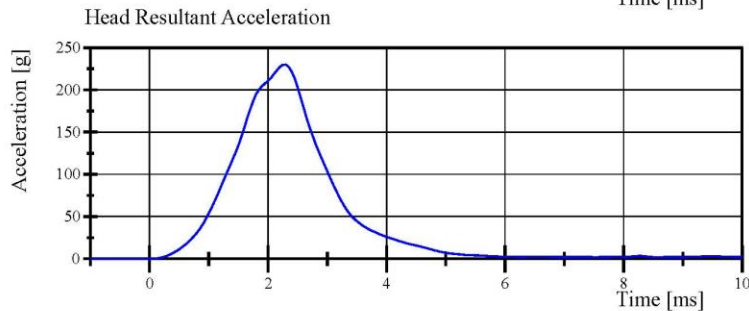
Min: -3.4 g at 5.5 ms



Filter Class: CFC\_1000

Max: 140.1 g at 2.4 ms

Min: -1.4 g at 5.8 ms



Filter Class: CFC\_1000

Max: 230.0 g at 2.3 ms

Min: 0.1 g at -1.0 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
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## Transportation Research Center Inc.

Left Lateral Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 4-1

Test Date: 10/28/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Peak Head Resultant Acceleration	107 - 126 g	117.4 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-2.8 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	1.89 %	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
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11.29.2020 15:09:47 946

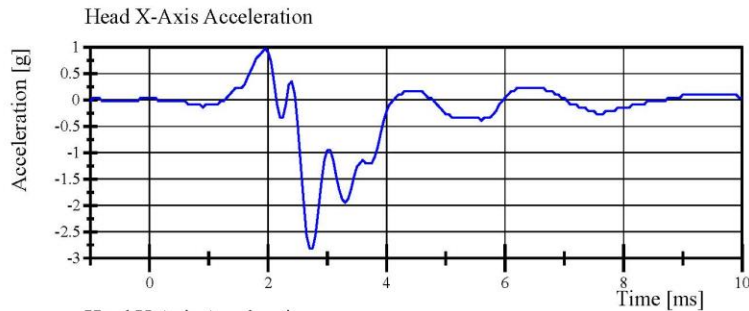


# Transportation Research Center Inc.

Left Lateral Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 4-1

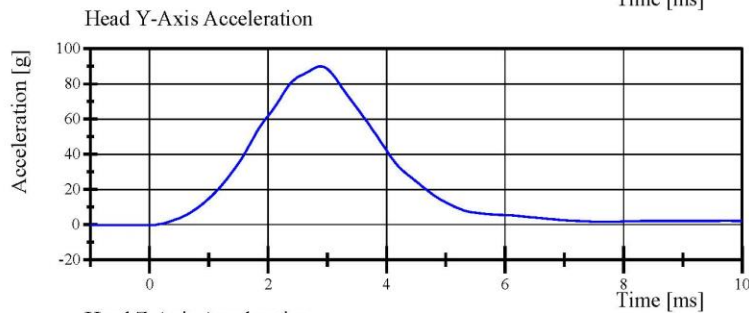
Test Date: 10/28/2020



Filter Class: CFC\_1000

Max: 1.0 g at 2.0 ms

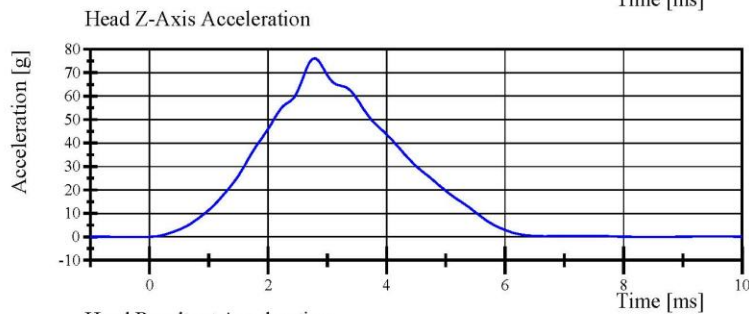
Min: -2.8 g at 2.7 ms



Filter Class: CFC\_1000

Max: 90.0 g at 2.9 ms

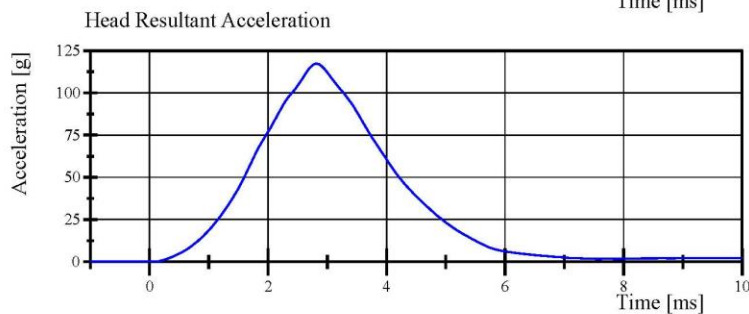
Min: -0.3 g at -0.8 ms



Filter Class: CFC\_1000

Max: 76.1 g at 2.8 ms

Min: -0.1 g at 8.5 ms



Filter Class: CFC\_1000

Max: 117.4 g at 2.8 ms

Min: 0.2 g at -0.5 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
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## Transportation Research Center Inc.

Right Lateral Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 4-1

Test Date: 10/28/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Peak Head Resultant Acceleration	107 - 126 g	112.3 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-3.9 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	1.88 %	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

Specification Source: WorldSID 50th(WS) VRTC Nov 2020.xlsx  
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11.29.2020 15:14:24 944

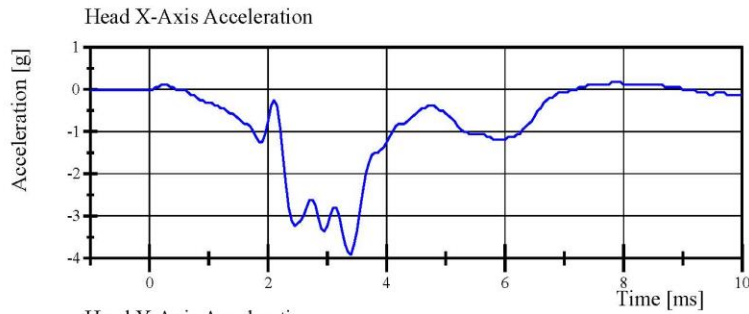


# Transportation Research Center Inc.

Right Lateral Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 4-1

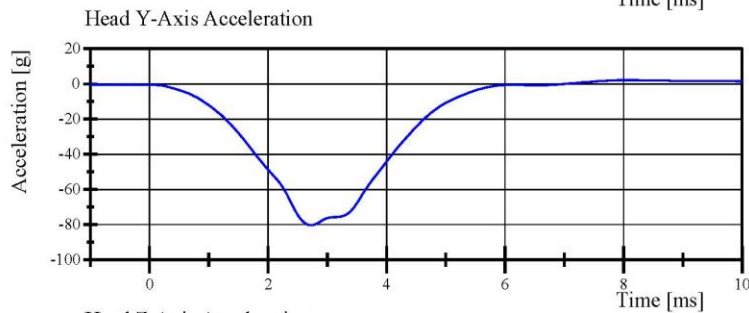
Test Date: 10/28/2020



Filter Class: CFC\_1000

Max: 0.2 g at 7.8 ms

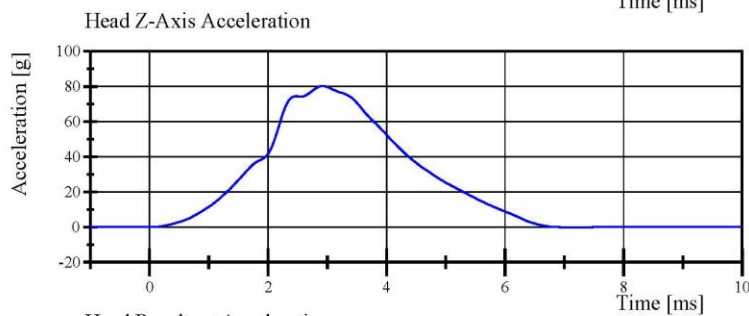
Min: -3.9 g at 3.4 ms



Filter Class: CFC\_1000

Max: 2.1 g at 8.0 ms

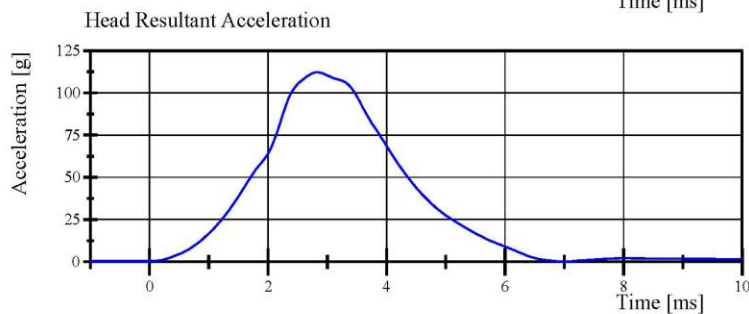
Min: -80.3 g at 2.7 ms



Filter Class: CFC\_1000

Max: 80.3 g at 2.9 ms

Min: -0.2 g at 7.2 ms



Filter Class: CFC\_1000

Max: 112.3 g at 2.9 ms

Min: 0.2 g at 7.0 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
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## Transportation Research Center Inc.

Left Lateral Neck  
 WorldSID 50th Serial No. EB8888 Certification No. 4-5  
 Test Date: 11/6/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	(-3.30) - (-3.50) m/s	-3.332 m/s	Yes
Pendulum Integrated Velocity Change at 4 ms	0.87 - 1.09 m/s	0.999 m/s	Yes
Change at 8 ms	1.72 - 2.1 m/s	2.003 m/s	Yes
Change at 12 ms	2.63 - 3.17 m/s	3.001 m/s	Yes
Maximum Headform Flexion	(-50) - (-61) deg	-55.3 deg	Yes
Headform Flexion Decay - from Peak to Zero Degrees	58 - 72 ms	61.0 ms	Yes
Total Neck Occipital Condyles Moment	54 - 67 N·m	60.8 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	71 - 87 ms	77.4 ms	Yes
Maximum Forward Pot Rotation			
Peak	(-32) - (-39) °	-35.9 °	Yes
Time of Peak	56 - 68 ms	62.2 ms	Yes
Maximum Rear Pot Rotation			
Peak	(-29) - (-36) °	-32.0 °	Yes
Time of Peak	56 - 68 ms	64.0 ms	Yes
Maximum Headform Angular Rate	(-2,047) - (-2,503) °/s	-2,307.3 °/s	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

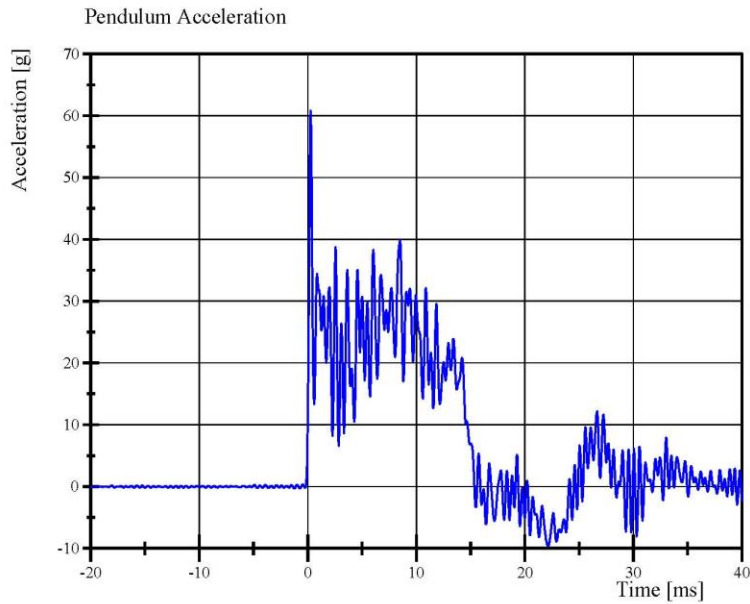


# Transportation Research Center Inc.

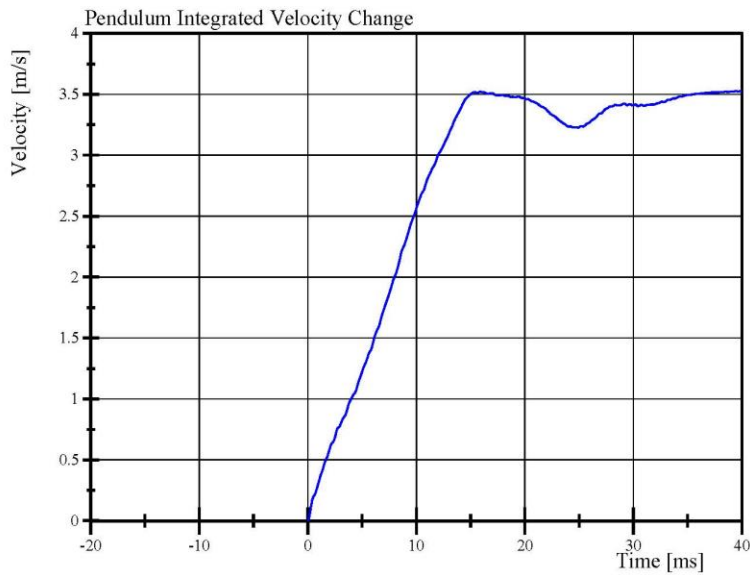
Left Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 4-5

Test Date: 11/6/2020



Filter Class: CFC\_1000  
Max: 60.8 g at 0.3 ms  
Min: -9.6 g at 22.2 ms



Filter Class: CFC\_1000  
Max: 3.5 m/s at 39.5 ms  
Min: 0.0 m/s at -0.0 ms

Specification Source: WordSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

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Report Number: EB8888\_WSH04

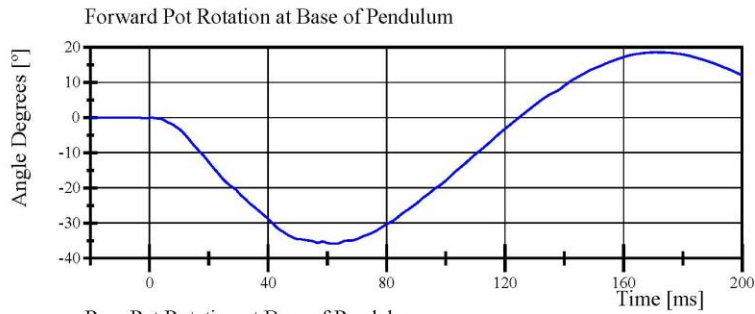
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# Transportation Research Center Inc.

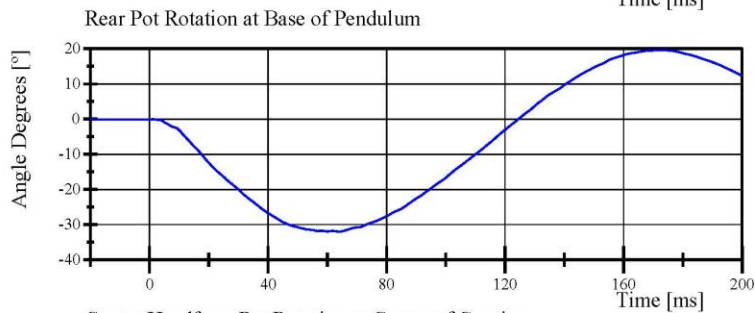
Left Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 4-5

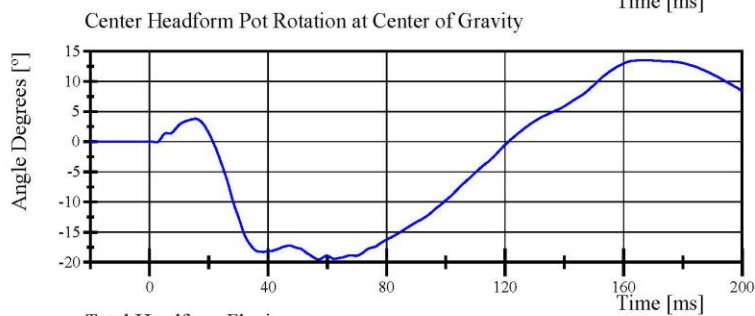
Test Date: 11/6/2020



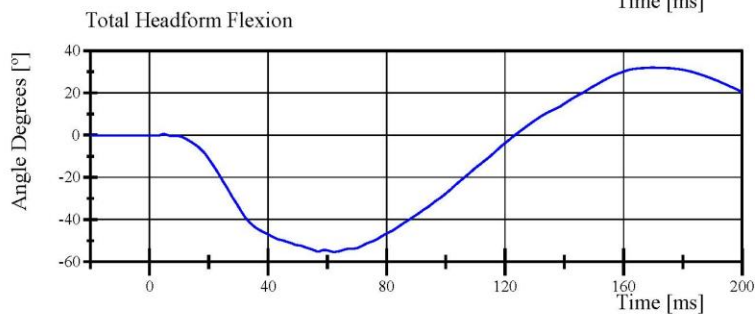
Filter Class: CFC\_180  
Max: 18.6 ° at 170.7 ms  
Min: -35.9 ° at 62.2 ms



Filter Class: CFC\_180  
Max: 19.6 ° at 172.9 ms  
Min: -32.0 ° at 64.0 ms



Filter Class: CFC\_180  
Max: 13.5 ° at 168.6 ms  
Min: -19.5 ° at 57.0 ms



Filter Class: CFC\_180  
Max: 32.0 ° at 169.7 ms  
Min: -55.3 ° at 62.3 ms

Specification Source: WordSID 50th(W5) VRTC Nov 2020.xlsx  
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Report Number: EB8888\_WSH04

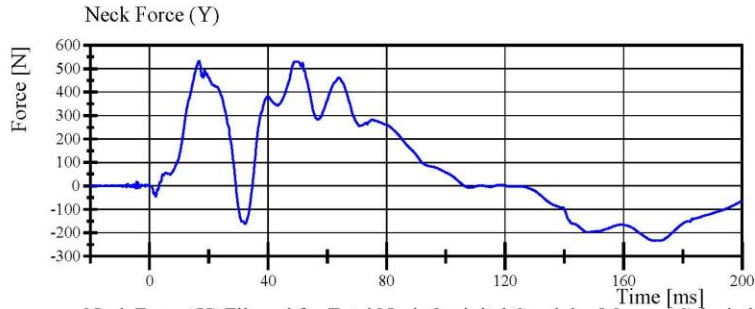
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# Transportation Research Center Inc.

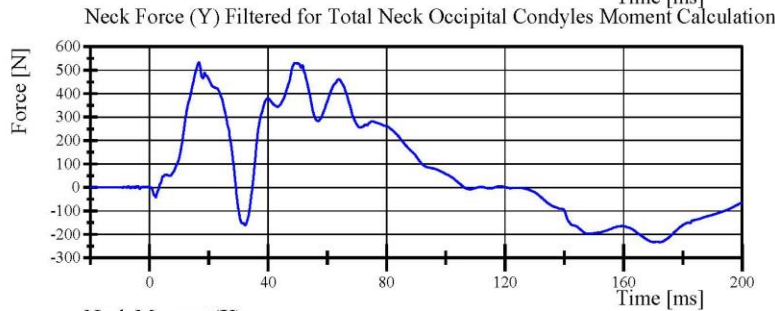
Left Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 4-5

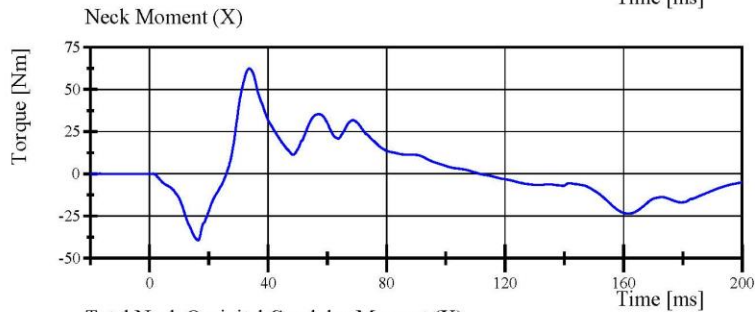
Test Date: 11/6/2020



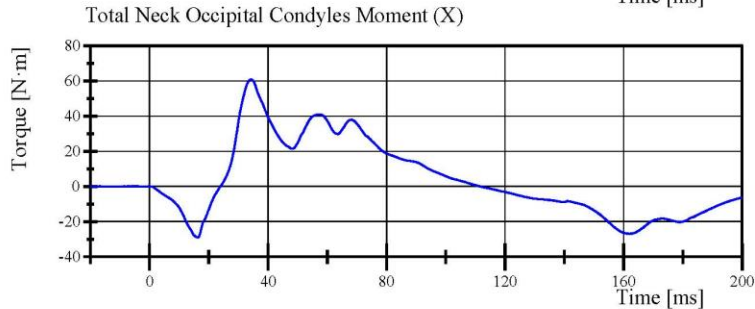
Filter Class: CFC\_1000  
Max: 532.9 N at 16.7 ms  
Min: -233.8 N at 172.2 ms



Filter Class: CFC\_600  
Max: 532.4 N at 16.7 ms  
Min: -233.4 N at 172.2 ms



Filter Class: CFC\_600  
Max: 62.4 Nm at 33.7 ms  
Min: -39.2 Nm at 16.4 ms



Filter Class: Without\_(Consta  
Max: 60.8 N·m at 34.2 ms  
Min: -29.0 N·m at 16.3 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
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Report Number: EB8888\_WSH04

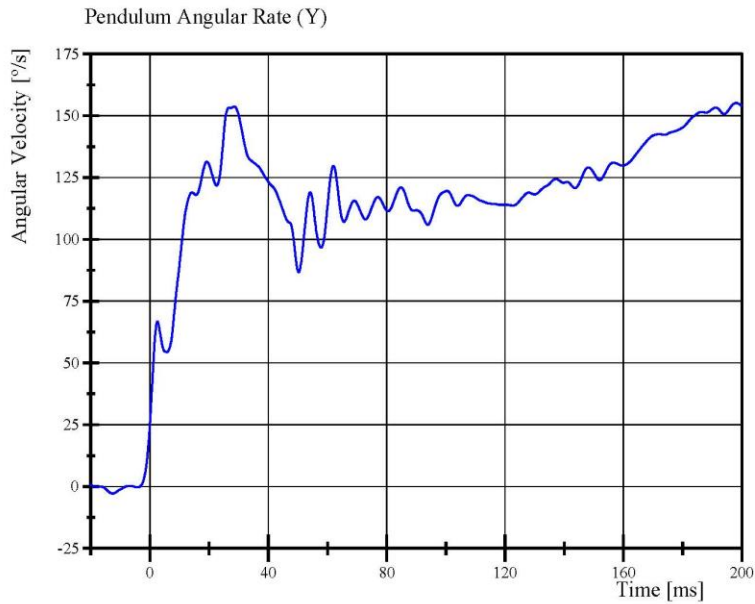
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# Transportation Research Center Inc.

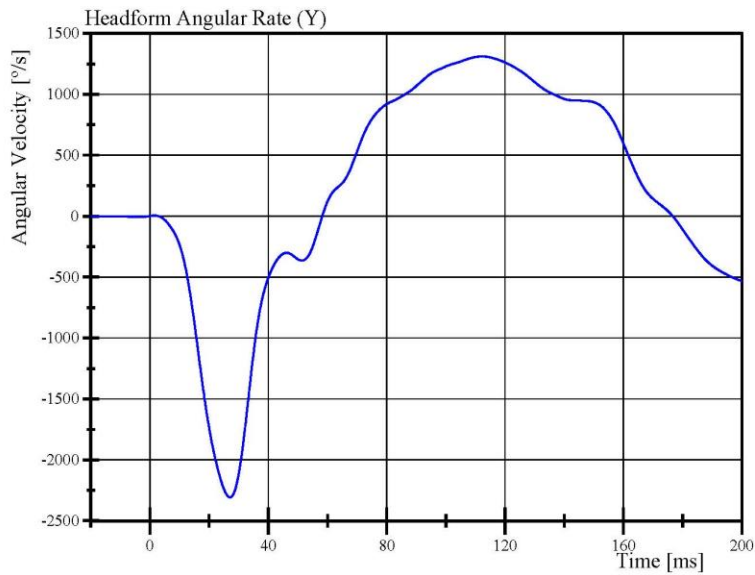
Left Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 4-5

Test Date: 11/6/2020



Filter Class: CFC\_60  
Max: 155.1 °/s at 198.1 ms  
Min: -2.8 °/s at -12.6 ms



Filter Class: CFC\_60  
Max: 1,311.0 °/s at 112.2 ms  
Min: -2,307.3 °/s at 27.1 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
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## Transportation Research Center Inc.

Right Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 4-2

Test Date: 11/5/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	3.30 - 3.50 m/s	3.322 m/s	Yes
Pendulum Integrated Velocity Change at 4 ms	(-0.87) - (-1.09) m/s	-0.984 m/s	Yes
Change at 8 ms	(-1.72) - (-2.1) m/s	-1.948 m/s	Yes
Change at 12 ms	(-2.63) - (-3.17) m/s	-2.941 m/s	Yes
Maximum Headform Flexion	50 - 61 deg	52.9 deg	Yes
Headform Flexion Decay - from Peak to Zero Degrees	58 - 72 ms	60.2 ms	Yes
Total Neck Occipital Condyles Moment	(-54) - (-67) N·m	-61.5 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	71 - 87 ms	77.1 ms	Yes
Maximum Forward Pot Rotation			
Peak	32 - 39 °	34.2 °	Yes
Time of Peak	56 - 68 ms	62.3 ms	Yes
Maximum Rear Pot Rotation			
Peak	29 - 36 °	30.6 °	Yes
Time of Peak	56 - 68 ms	60.4 ms	Yes
Maximum Headform Angular Rate	2,047 - 2,503 %/s	2,257.1 %/s	Yes

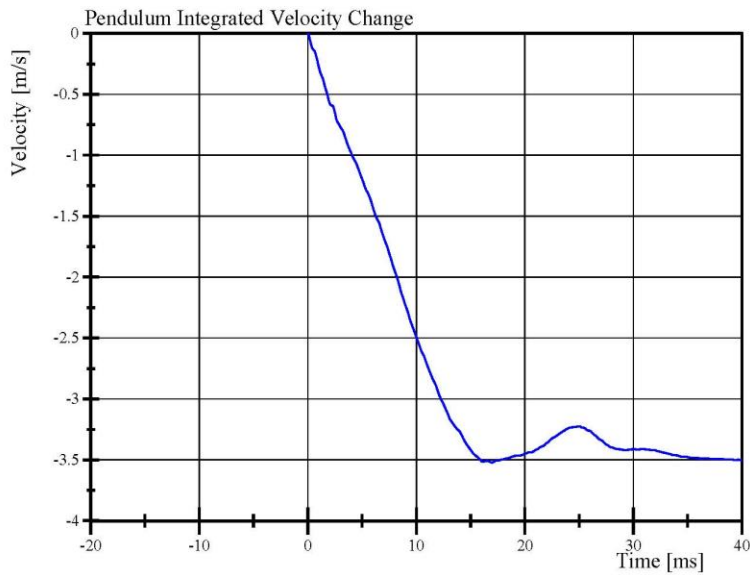
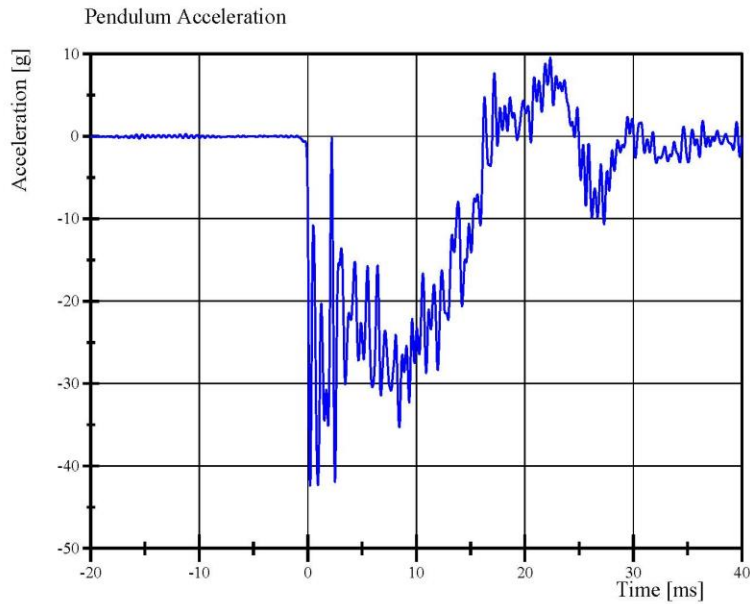
**Test meets specifications.**

**Condition: Used**

**Comments:**

# Transportation Research Center Inc.

Right Lateral Neck  
WorldSID 50th Serial No. EB8888 Certification No. 4-2  
Test Date: 11/5/2020

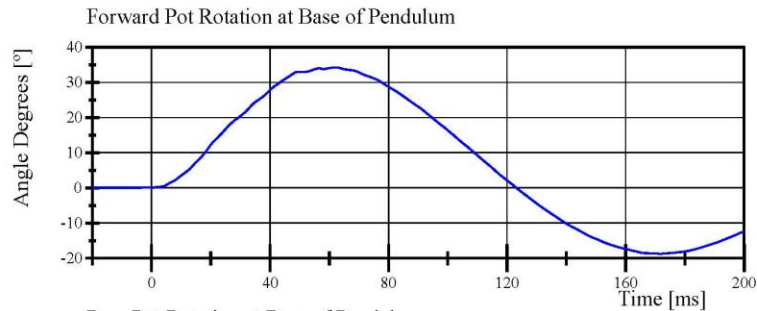


# Transportation Research Center Inc.

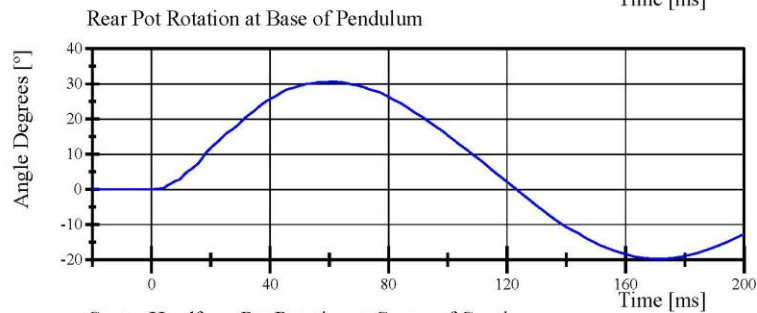
Right Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 4-2

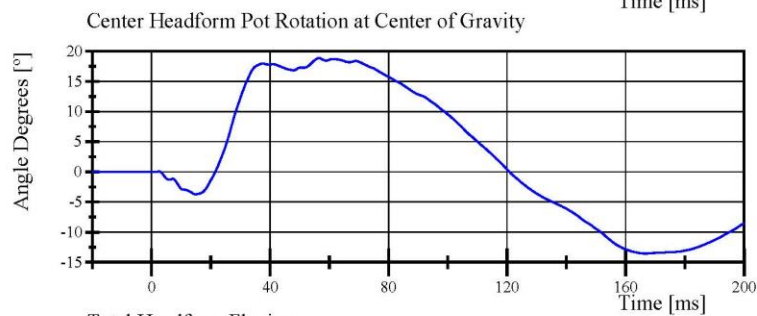
Test Date: 11/5/2020



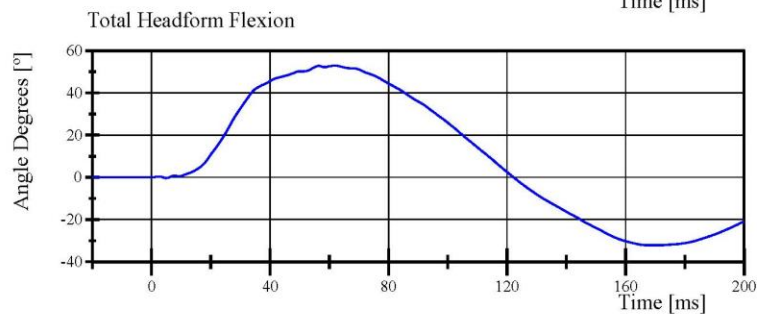
Filter Class: CFC\_180  
Max: 34.2 ° at 62.3 ms  
Min: -18.7 ° at 171.8 ms



Filter Class: CFC\_180  
Max: 30.6 ° at 60.4 ms  
Min: -19.8 ° at 170.8 ms



Filter Class: CFC\_180  
Max: 18.9 ° at 56.5 ms  
Min: -13.5 ° at 166.7 ms



Filter Class: CFC\_180  
Max: 52.9 ° at 62.1 ms  
Min: -32.1 ° at 167.5 ms

Specification Source: WordSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

11.29.2020 16:48:10 4021



Report Number: EB8888\_WSH04

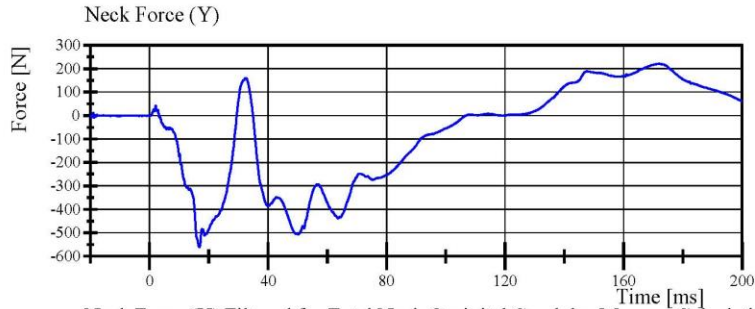
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# Transportation Research Center Inc.

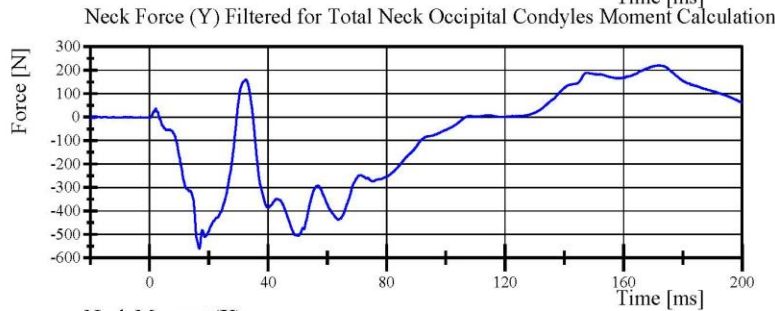
Right Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 4-2

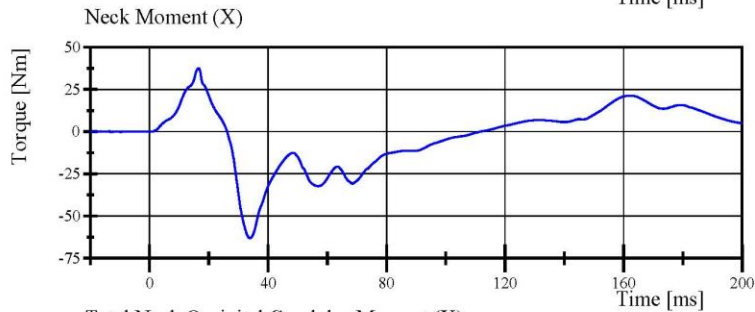
Test Date: 11/5/2020



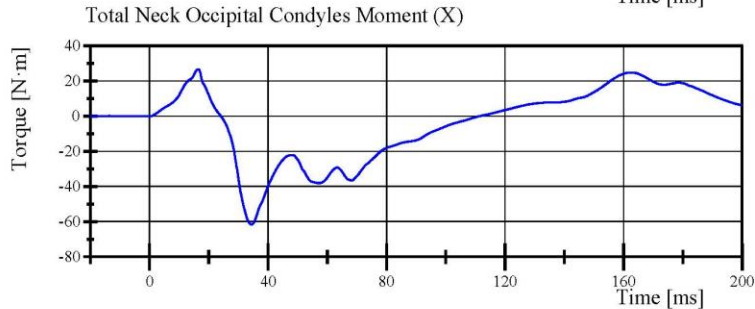
Filter Class: CFC\_1000  
Max: 221.4 N at 172.0 ms  
Min: -560.9 N at 16.8 ms



Filter Class: CFC\_600  
Max: 220.9 N at 172.0 ms  
Min: -560.9 N at 16.8 ms



Filter Class: CFC\_600  
Max: 37.5 Nm at 16.6 ms  
Min: -63.0 Nm at 33.9 ms



Filter Class: Without\_(Consta  
Max: 26.7 N·m at 16.5 ms  
Min: -61.5 N·m at 34.4 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

11.29.2020 16:48:10 4021



Report Number: EB8888\_WSH04

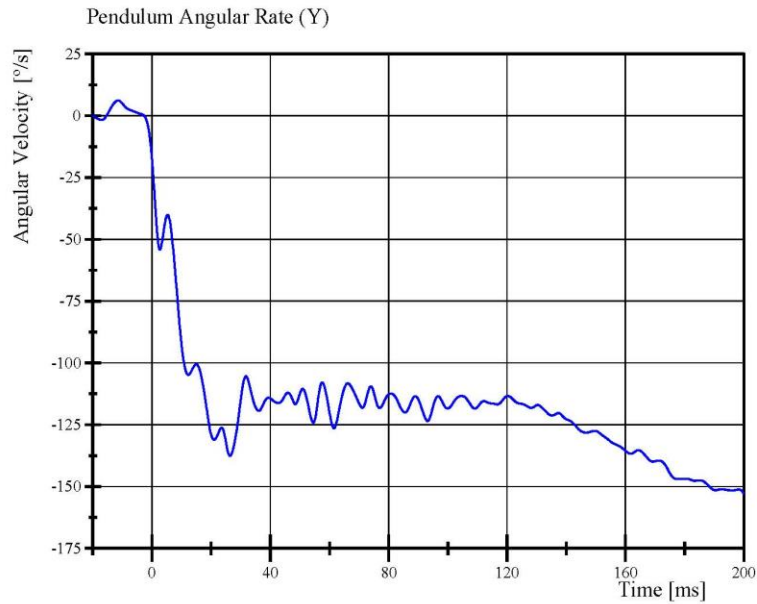
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# Transportation Research Center Inc.

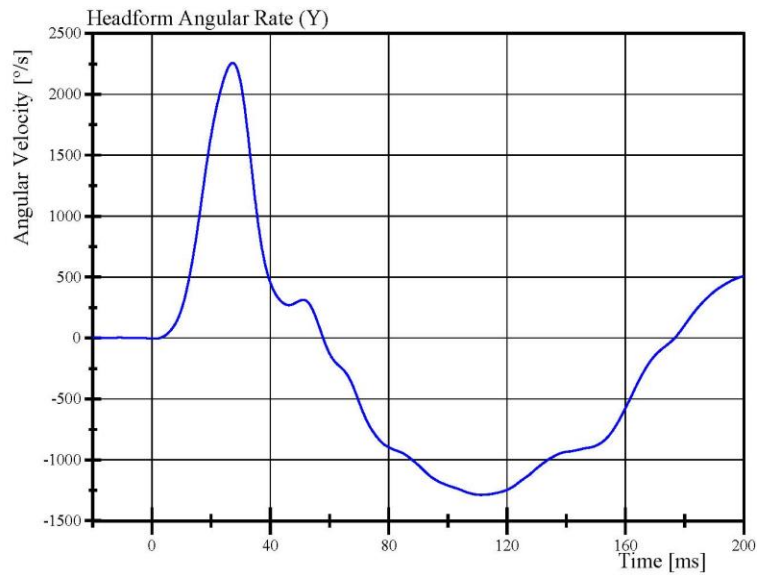
Right Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 4-2

Test Date: 11/5/2020



Filter Class: CFC\_60  
Max: 6.2 °/s at -11.5 ms  
Min: -152.9 °/s at 200.0 ms



Filter Class: CFC\_60  
Max: 2,257.1 °/s at 27.3 ms  
Min: -1,287.4 °/s at 111.2 ms

Specification Source: WordSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

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Report Number: EB8888\_WSH04

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## Transportation Research Center Inc.

Left Neck Torsion  
WorldSID 50th Serial No. EB8888 Certification No. 4-3  
Test Date:10/30/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	5.1 - 5.3 m/s	5.18 m/s	Yes
Pendulum Integrated Velocity Change at 10 ms	2.09 - 2.37 m/s	2.261 m/s	Yes
Change at 15 ms	3.19 - 3.63 m/s	3.436 m/s	Yes
Change at 20 ms	4.27 - 4.87 m/s	4.575 m/s	Yes
Peak Fixture Rotation	(-41.5) - (-51) °	-47.83 °	Yes
Decay Time to 0 deg from Peak Angle	35 - 43 ms	39.7 ms	Yes
Peak Head Angular Velocity Z-axis	(-1,345) - (-1,655) %/s	-1,548.3 %/s	Yes
Peak Lower Neck Moment Z-axis	34 - 42 N·m	38.5 N·m	Yes

**Test meets specifications.**

**Condition: Used**

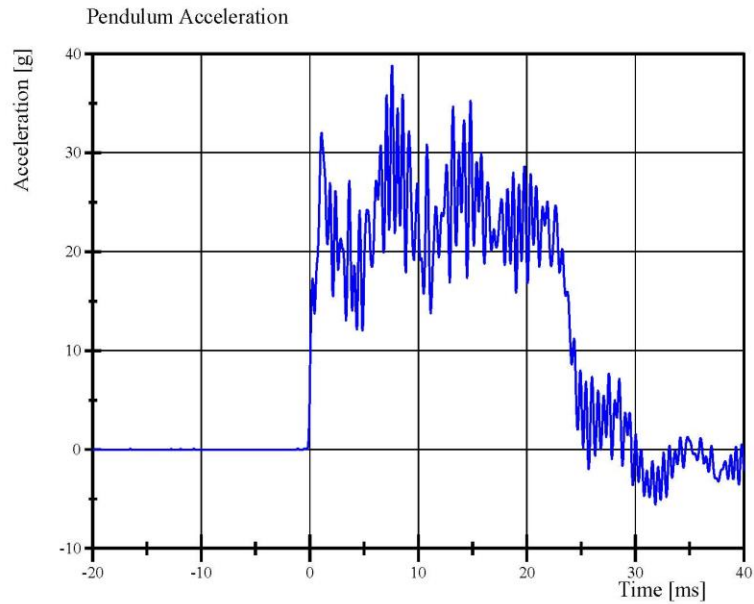
**Comments:**

# Transportation Research Center Inc.

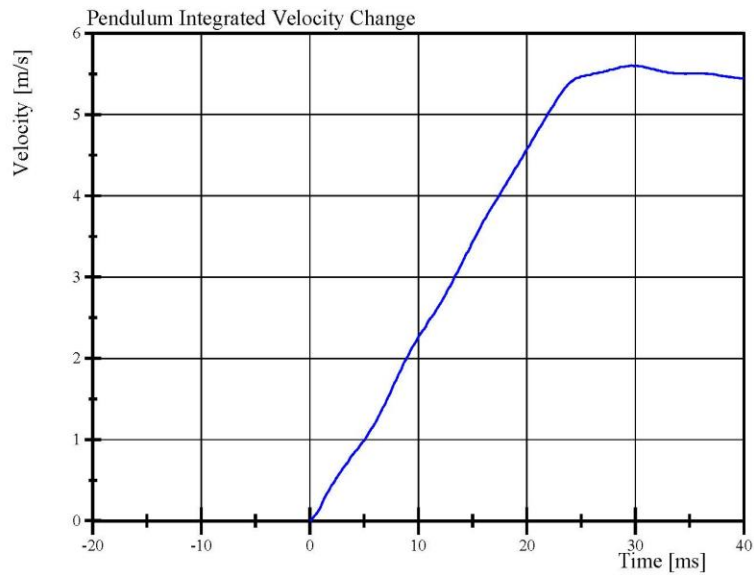
Left Lateral

WorldSID 50th Serial No. EB8888 Certification No. 4-3

Test Date: 10/30/2020



Filter Class: CFC\_1000  
Max: 38.8 g at 7.6 ms  
Min: -5.6 g at 31.9 ms



Filter Class: CFC\_1000  
Max: 5.6 m/s at 29.7 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: WorldSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

11.29.2020 17:10:40 4008



Report Number: EB8888\_WSH04

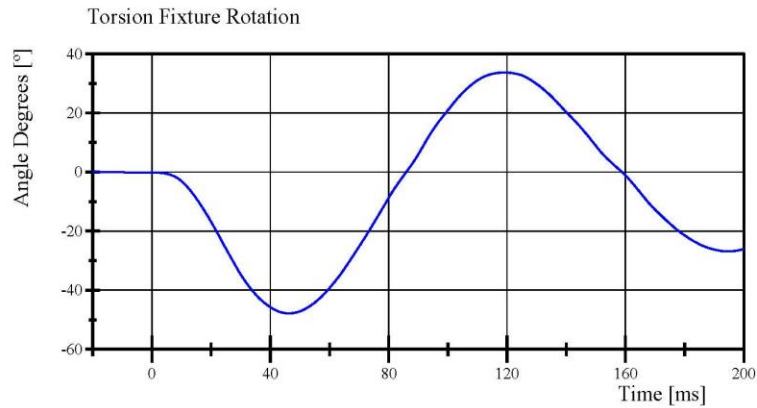
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# Transportation Research Center Inc.

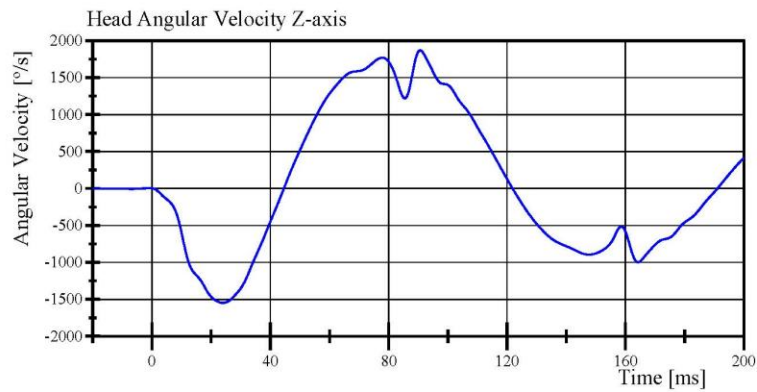
Left Lateral

WorldSID 50th Serial No. EB8888 Certification No. 4-3

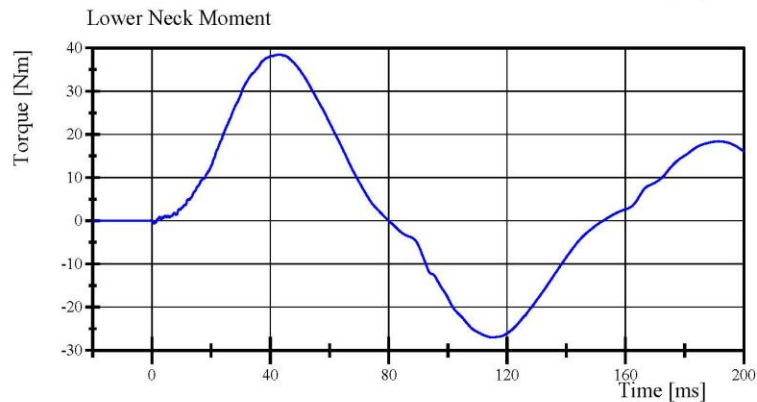
Test Date: 10/30/2020



Filter Class: CFC\_60  
Max: 33.7 ° at 119.1 ms  
Min: -47.8 ° at 46.3 ms



Filter Class: CFC\_60  
Max: 1,868.8 °/s at 90.6 ms  
Min: -1,548.3 °/s at 24.0 ms



Filter Class: CFC\_600  
Max: 38.5 Nm at 43.3 ms  
Min: -26.9 Nm at 115.3 ms

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

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Report Number: EB8888\_WSH04

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## Transportation Research Center Inc.

Right Neck Torsion  
WorldSID 50th Serial No. EB8888 Certification No. 4-6  
Test Date:11/4/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Pendulum Velocity	5.1 - 5.3 m/s	5.19 m/s	Yes
Pendulum Integrated Velocity Change at 10 ms	2.09 - 2.37 m/s	2.239 m/s	Yes
Change at 15 ms	3.19 - 3.63 m/s	3.386 m/s	Yes
Change at 20 ms	4.27 - 4.87 m/s	4.544 m/s	Yes
Peak Fixture Rotation	41.5 - 51 °	46.80 °	Yes
Decay Time to 0 deg from Peak Angle	35 - 43 ms	39.2 ms	Yes
Peak Head Angular Velocity Z-axis	1,345 - 1,655 %/s	1,557.8 %/s	Yes
Peak Lower Neck Moment Z-axis	(-34) - (-42) N·m	-38.7 N·m	Yes

**Test meets specifications.**

**Condition: Used**

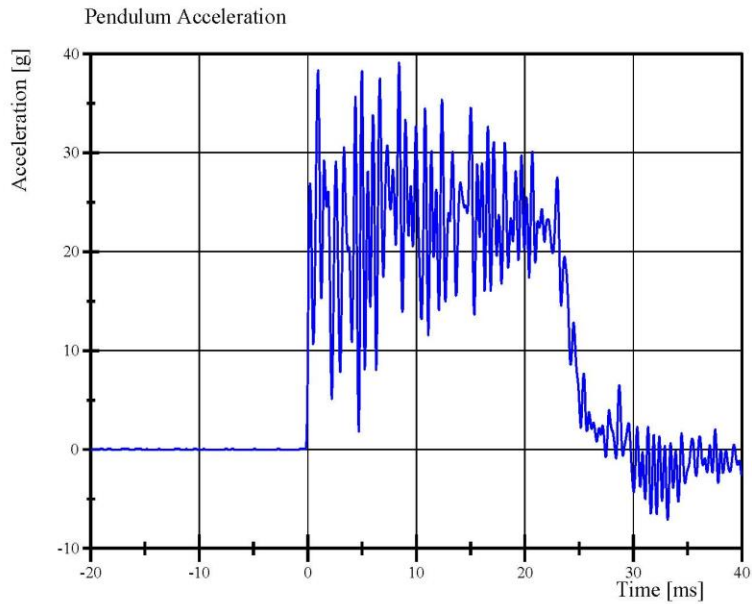
**Comments:**

# Transportation Research Center Inc.

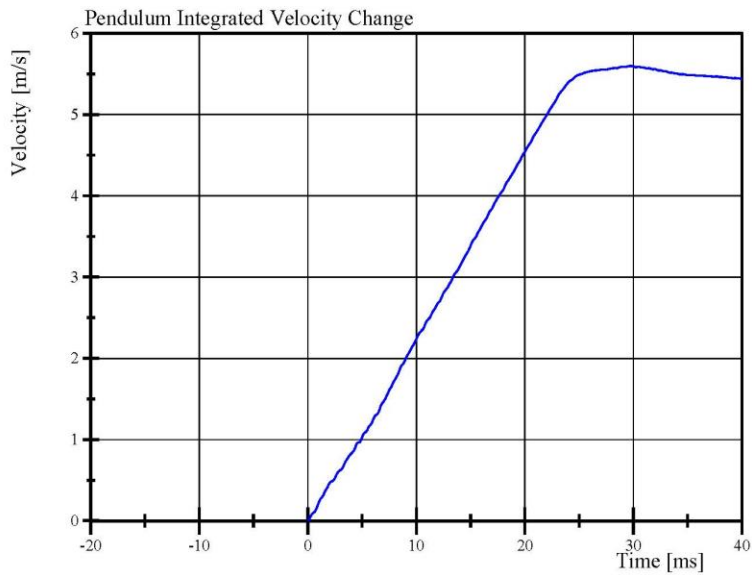
Right Lateral

WorldSID 50th Serial No. EB8888 Certification No. 4-6

Test Date: 11/4/2020



Filter Class: CFC\_1000  
Max: 39.1 g at 8.4 ms  
Min: -7.1 g at 33.2 ms



Filter Class: CFC\_1000  
Max: 5.6 m/s at 29.8 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

11.29.2020 17:31:07 4008



Report Number: EB8888\_WSH04

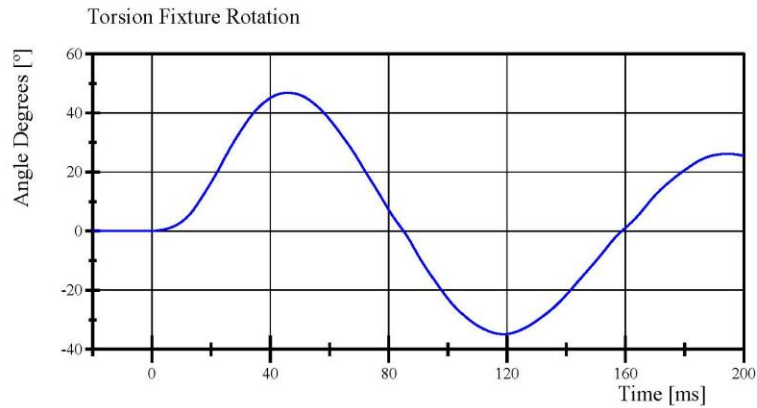
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# Transportation Research Center Inc.

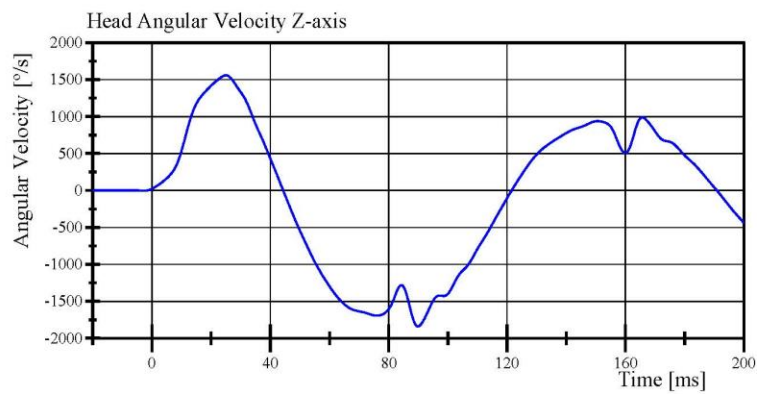
Right Lateral

WorldSID 50th Serial No. EB8888 Certification No. 4-6

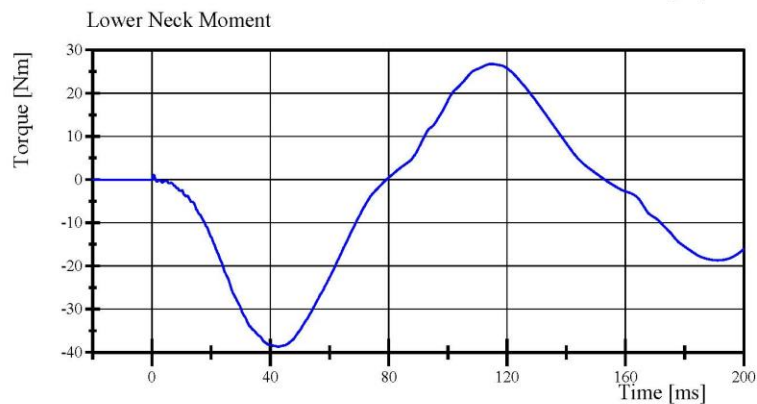
Test Date: 11/4/2020



Filter Class: CFC\_60  
Max: 46.8 ° at 45.9 ms  
Min: -34.9 ° at 118.8 ms



Filter Class: CFC\_60  
Max: 1,557.8 °/s at 25.0 ms  
Min: -1,840.1 °/s at 89.9 ms



Filter Class: CFC\_600  
Max: 26.7 Nm at 114.9 ms  
Min: -38.7 Nm at 42.7 ms

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

11.29.2020 17:31:07 4008



Report Number: EB8888\_WSH04

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## Transportation Research Center Inc.

Left Lateral Shoulder  
WorldSID 50th Serial No. EB8888 Certification No. 4-2  
Test Date: 10/27/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.31 m/s	Yes
Impactor Force	2,600 - 3,300 N	3,090.7 N	Yes
Shoulder Force	(-1,470) - (-1,800) N	-1,553.9 N	Yes
S1 RibEye Max	37 - 46 mm	43.6 mm	Yes

**Test meet specifications.**

**Condition: Used**

**Comments:**

**Internal Temp: 22.1°C**

## Transportation Research Center Inc.

Left Lateral Shoulder

WorldSID 50th Serial No. EB8888 Certification No. 5-5

Test Date: 11/6/2020

<b>Test Parameter</b>	<b>Specification</b>	<b>Test Results</b>	<b>Pass</b>
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.32 m/s	Yes
Impactor Force	2,600 - 3,300 N	2,815.7 N	Yes
Shoulder Force	(-1,470) - (-1,800) N	-1,652.8 N	Yes
S1 RibEye Max	37 - 46 mm	39.3 mm	Yes

**Test meets specifications.**

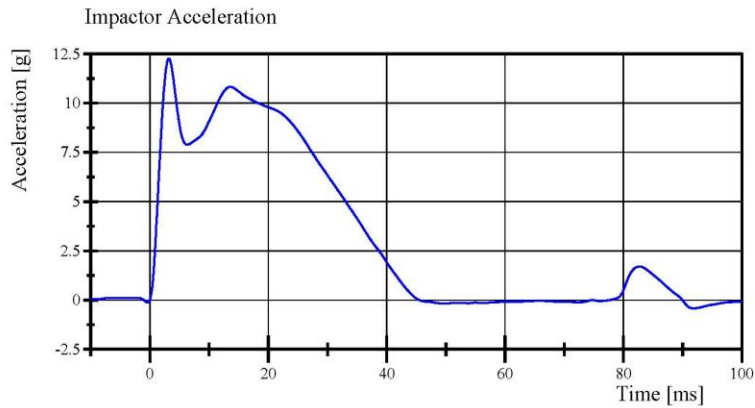
**Condition: Used**

**Comments:**

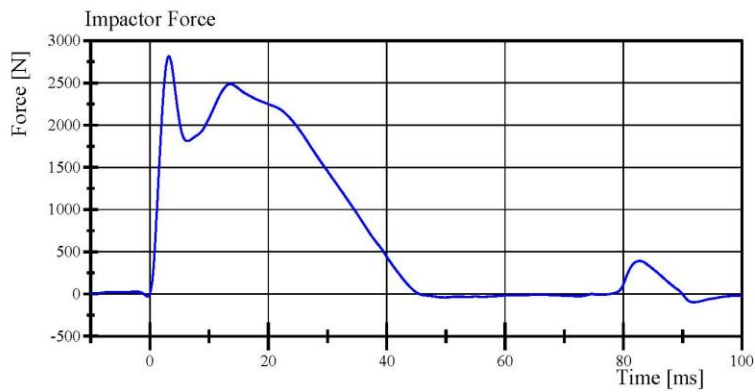
**Internal Temp: 21.1°C**

# Transportation Research Center Inc.

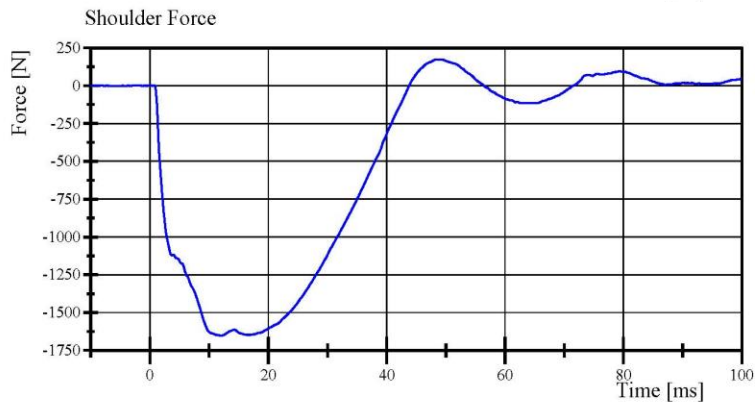
Left Lateral Shoulder  
WorldSID 50th Serial No. EB8888 Certification No. 5-5  
Test Date: 11/6/2020



Filter Class: CFC\_180  
Max: 12.3 g at 3.2 ms  
Min: -0.4 g at 91.9 ms



Filter Class: CFC\_180  
Max: 2,815.7 N at 3.2 ms  
Min: -96.8 N at 91.9 ms



Filter Class: CFC\_600  
Max: 174.7 N at 49.1 ms  
Min: -1,652.8 N at 12.1 ms

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

11.30.2020 20:03:34 997



## Transportation Research Center Inc.

Left Lateral Thorax with Arm

WorldSID 50th Serial No. EB8888 Certification No. 5-5

Test Date: 11/10/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Impactor Velocity	6.6 - 6.8 m/s	6.74 m/s	Yes
Impactor Force	5,300 - 6,200 N	5,803.2 N	Yes
Upper Thorax Rib Displacement	35 - 47 mm	35.1 mm	Yes
Center Thorax Rib Displacement	46 - 56 mm	49.6 mm	Yes
Lower Thorax Rib Displacement	33.5 - 40.5 mm	35.41 mm	Yes
Upper Spine Lateral Acceleration	28 - 37 g	32.9 g	Yes
Lower Spine Lateral Acceleration	22 - 28 g	24.8 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

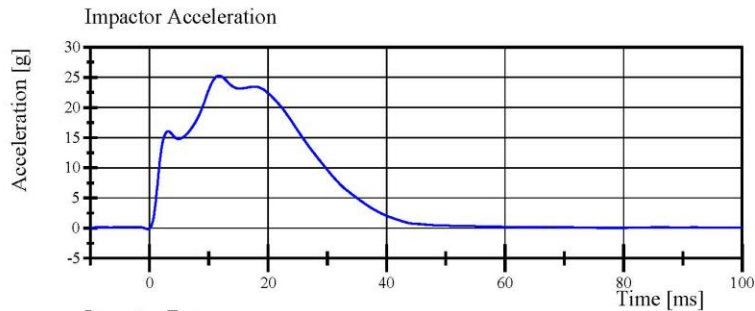
**Internal Temp: 22.9°C**

# Transportation Research Center Inc.

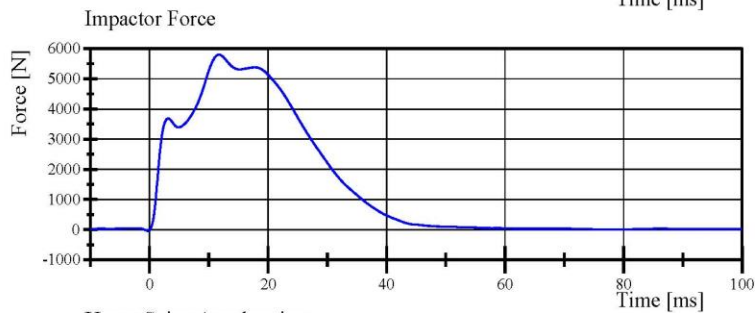
Left Lateral Thorax with Arm

WorldSID 50th Serial No. EB8888 Certification No. 5-5

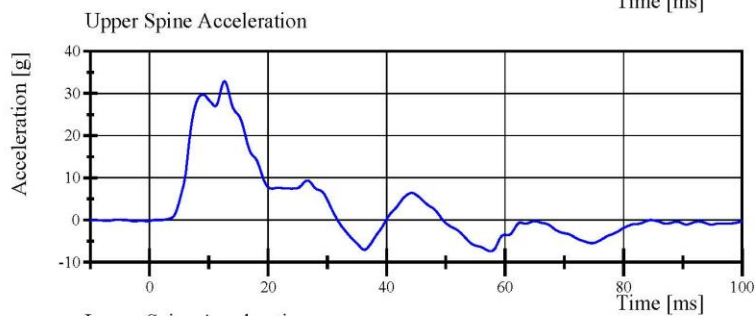
Test Date: 11/10/2020



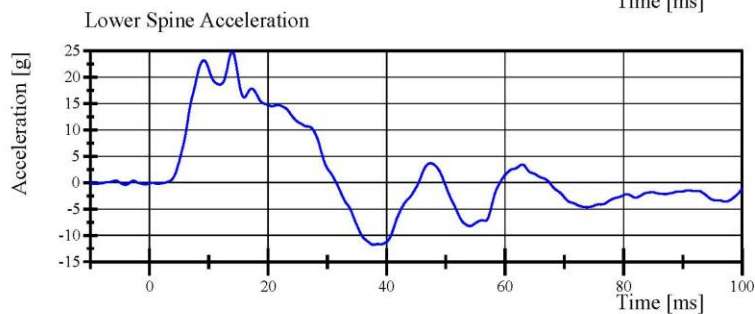
Filter Class: CFC\_180  
Max: 25.3 g at 11.7 ms  
Min: -0.2 g at -0.3 ms



Filter Class: CFC\_180  
Max: 5,803.2 N at 11.7 ms  
Min: -38.2 N at -0.3 ms



Filter Class: CFC\_180  
Max: 32.9 g at 12.7 ms  
Min: -7.3 g at 57.6 ms



Filter Class: CFC\_180  
Max: 24.8 g at 14.0 ms  
Min: -11.8 g at 37.8 ms

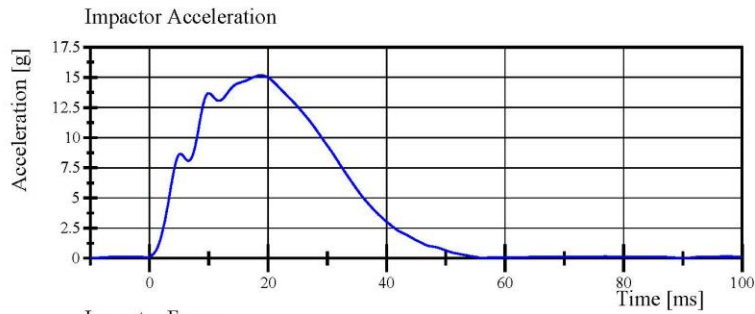
Specification Source: WordSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

12.01.2020 16:04:56 1000

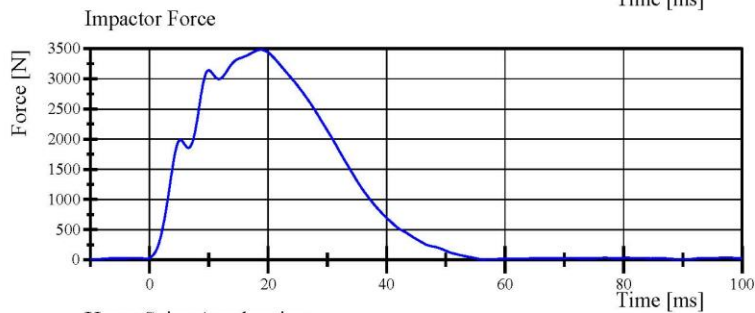


# Transportation Research Center Inc.

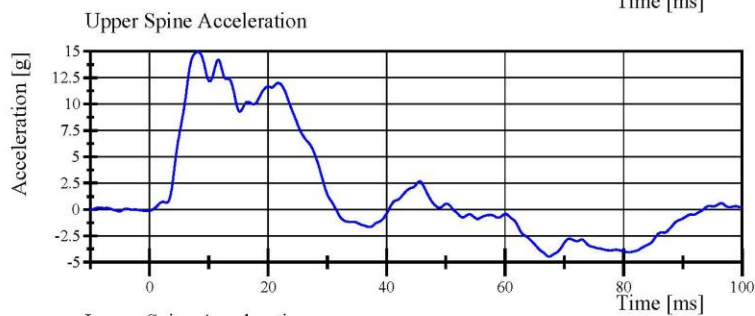
Left Lateral Thorax without Arm  
WorldSID 50th Serial No. EB8888 Certification No. 4-2  
Test Date: 10/26/2020



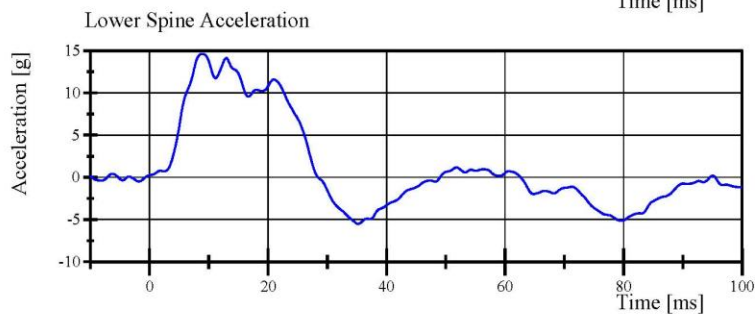
Filter Class: CFC\_180  
Max: 15.2 g at 18.8 ms  
Min: 0.0 g at 56.3 ms



Filter Class: CFC\_180  
Max: 3,482.4 N at 18.8 ms  
Min: 4.7 N at 56.3 ms



Filter Class: CFC\_180  
Max: 14.9 g at 8.2 ms  
Min: -4.5 g at 67.4 ms



Filter Class: CFC\_180  
Max: 14.6 g at 8.9 ms  
Min: -5.5 g at 35.2 ms



## Transportation Research Center Inc.

Left Lateral Abdomen  
WorldSID 50th Serial No. EB8888 Certification No. 4-1  
Test Date: 10/27/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.33 m/s	Yes
Impactor Force	2,700 - 3,100 N	2,996.5 N	Yes
Upper Abdominal Rib Displacement	32.5 - 39.5 mm	33.82 mm	Yes
Lower Abdominal Rib Displacement	32 - 38 mm	33.1 mm	Yes
Lower Spine Lateral Acceleration	14.5 - 19.5 g	17.99 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

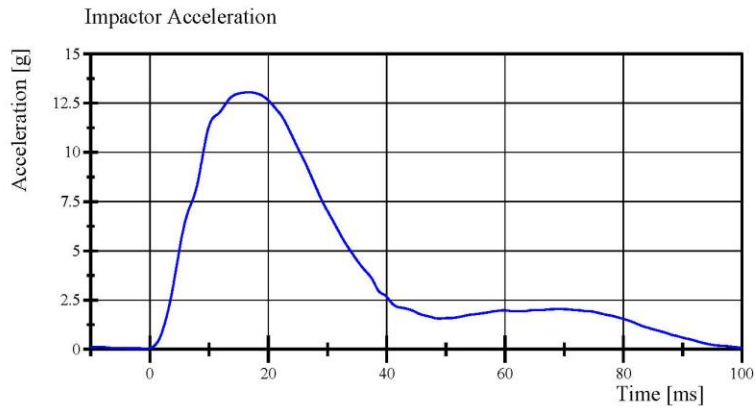
**Internal Temp: 21°C**

# Transportation Research Center Inc.

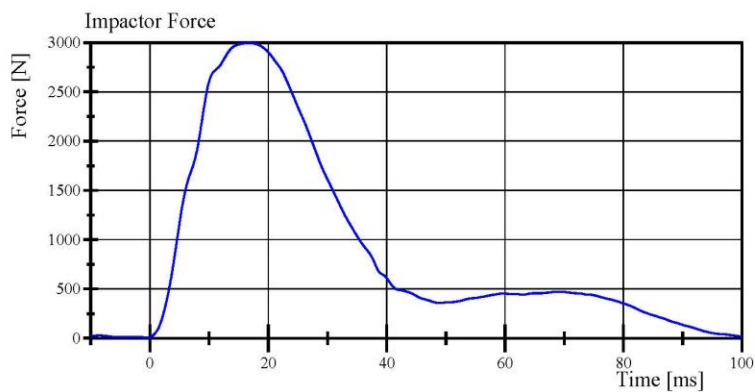
Left Lateral Abdomen

WorldSID 50th Serial No. EB8888 Certification No. 4-1

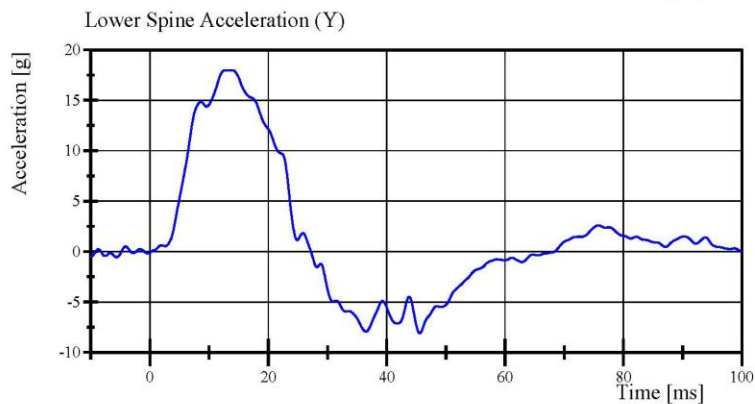
Test Date: 10/27/2020



Filter Class: CFC\_180  
Max: 13.1 g at 16.7 ms  
Min: 0.0 g at -0.5 ms



Filter Class: CFC\_180  
Max: 2,996.5 N at 16.7 ms  
Min: 7.8 N at -0.5 ms



Filter Class: CFC\_180  
Max: 18.0 g at 14.0 ms  
Min: -8.1 g at 45.6 ms

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

11.29.2020 14:52:20 1001



Report Number: EB8888\_WSH04

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## Transportation Research Center Inc.

Left Lateral Pelvis

WorldSID 50th Serial No. EB8888 Certification No. 4-1

Test Date: 10/27/2020

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Impactor Velocity	6.6 - 6.8 m/s	6.71 m/s	Yes
Impactor Force	6,800 - 8,200 N	7,329.8 N	Yes
Pelvis Lateral Acceleration	38.5 - 48.5 g	40.75 g	Yes
Lower Spine Lateral Acceleration	10 - 14 g	12.0 g	Yes
Pubic Lateral Force	(-1,300) - (-1,590) N	-1,361.4 N	Yes
Sacroiliac Lateral Force	(-1,860) - (-2,280) N	-2,051.1 N	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Intenal Temp: 24.5°C**

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

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11.29.2020 17:35:04 999

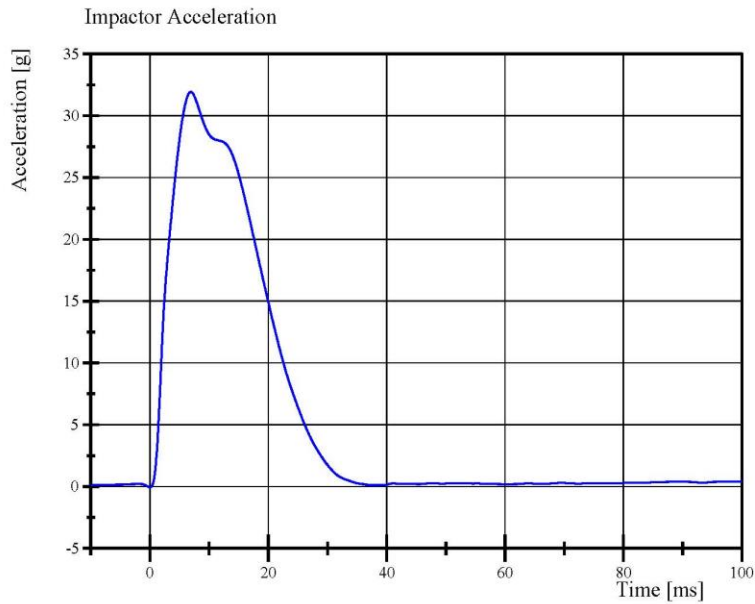


# Transportation Research Center Inc.

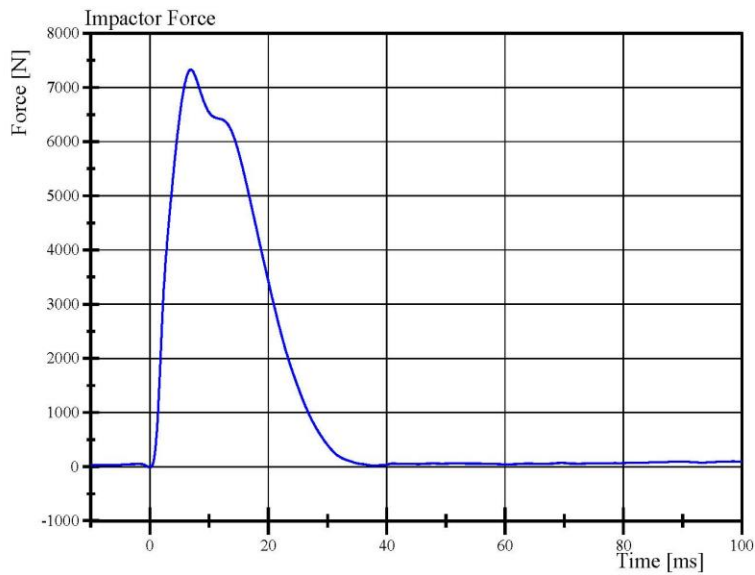
Left Lateral Pelvis

WorldSID 50th Serial No. EB8888 Certification No. 4-1

Test Date: 10/27/2020



Filter Class: CFC\_180  
Max: 31.9 g at 6.9 ms  
Min: -0.1 g at 0.0 ms



Filter Class: CFC\_180  
Max: 7,329.8 N at 6.9 ms  
Min: -13.1 N at 0.0 ms

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

11.29.2020 17:35:41 999



Report Number: EB8888\_WSH04

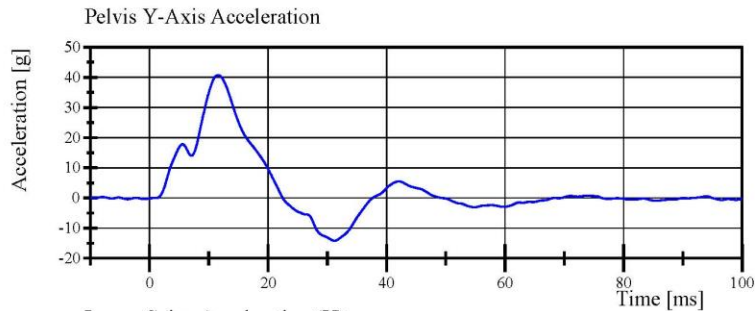
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# Transportation Research Center Inc.

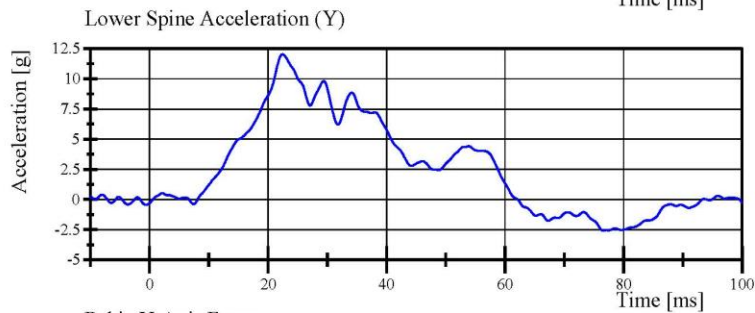
Left Lateral Pelvis

WorldSID 50th Serial No. EB8888 Certification No. 4-1

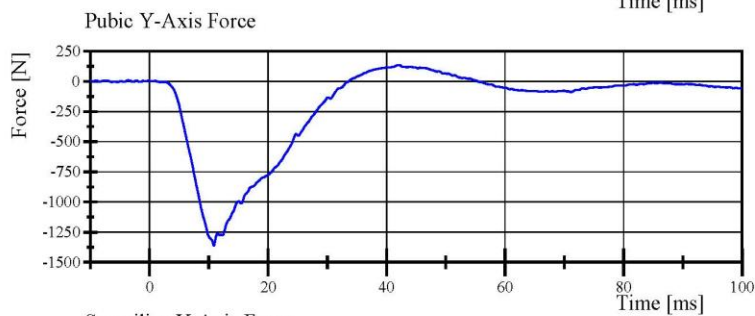
Test Date: 10/27/2020



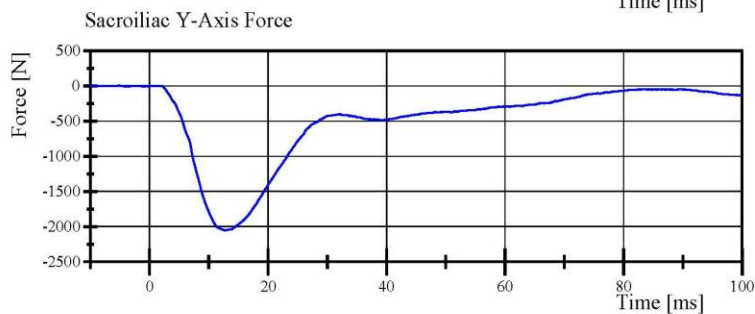
Filter Class: CFC\_180  
Max: 40.8 g at 11.6 ms  
Min: -14.2 g at 31.3 ms



Filter Class: CFC\_180  
Max: 12.0 g at 22.5 ms  
Min: -2.6 g at 76.6 ms



Filter Class: CFC\_600  
Max: 136.2 N at 42.1 ms  
Min: -1,361.4 N at 10.9 ms



Filter Class: CFC\_600  
Max: 3.9 N at -5.2 ms  
Min: -2,051.1 N at 12.8 ms

Specification Source: WordSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

11.29.2020 17:35:42 999



Report Number: EB8888\_WSH04

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**Post-Test Calibration Sheets  
Driver S/N EB8888**

Transportation Research Center Inc.  
WorldSID-50M  
External Measurements  
Serial No. EB8888      Certification No. 05

WorldSID-50M Angular Reference Measurements					
Parameter	Symbol	Tilt Sensor (°)	Inclinometer (°)		
			Center	Left	Right
Head X-Axis	A1	0	n/a	n/a	n/a
Head Y-Axis	A2	2.2	n/a	2	Note 1
Neck Bracket X-Axis	A3	n/a	-0.5	n/a	n/a
Neck Bracket Y-Axis	A4	n/a	-3.1	n/a	n/a
Thorax X-Axis	A5	1.3	n/a	n/a	n/a
Thorax Y-Axis	A6	3.9	n/a	n/a	n/a
Pelvis X-Axis	A7	0.7	n/a	n/a	n/a
Pelvis Y-Axis	A8	10.2	n/a	n/a	n/a
H-point Tool	A9	n/a	n/a	33.1	33.9

WorldSID-50M External Linear Dimensions				
Parameter	Symbol	Specification (mm)		
		Center	Left	Right
Seated Height	L1	870	n/a	n/a
Hip Pivot Height	L2	n/a	89	89
Hip Pivot to Back Line	L3	n/a	187	177
Thigh Clearance	L4	n/a	181	180
Knee Height	L5	n/a	580	583
Knee to Backline	L6	n/a	667	670
Head Back to Seat Back	L7	156	n/a	n/a
Thorax Rib 1 Front to Back	L8	n/a	209	209
Abdomen Rib 2 Front to Back	L9	n/a	223	226
Arm Length	L10	n/a	330	330
Width Across Arms	L11	482	n/a	n/a
Waist Width	L12	341	n/a	n/a

Note 1: No land marks on the right side of head. Unable to align level.

## Transportation Research Center Inc.

Front Head Drop  
WorldSID 50th Serial No. EB8888 Certification No. 6-2  
Test Date: 1/18/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Peak Head Resultant Acceleration	211 - 261 g	219.4 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	3.9 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	1.58 %	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

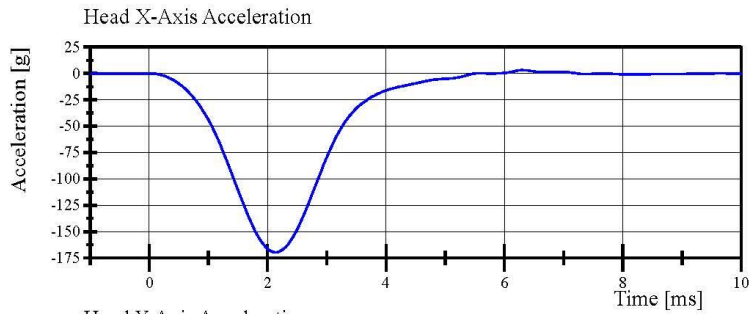
**Head Skin S/N: EG2845**

# Transportation Research Center Inc.

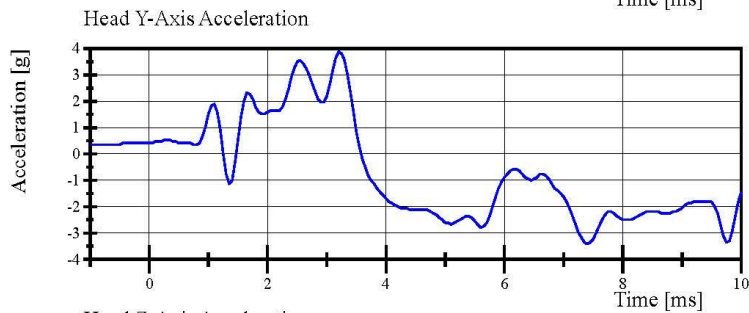
Front Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 6-2

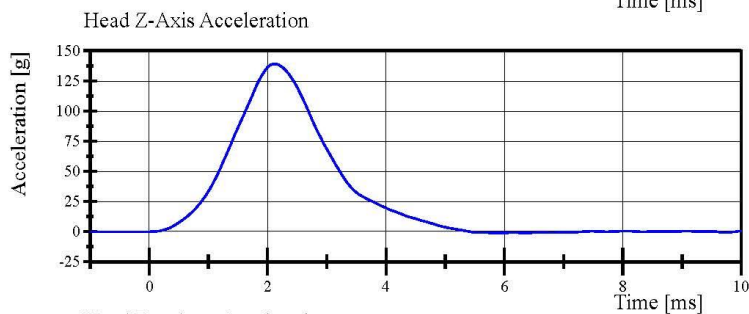
Test Date: 1/18/2021



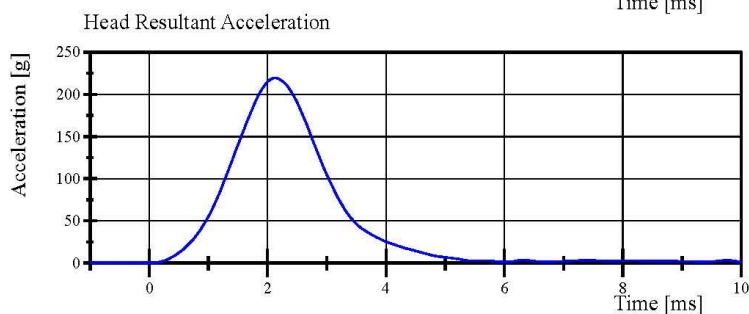
Filter Class: CFC\_1000  
Max: 3.2 g at 6.3 ms  
Min: -169.7 g at 2.2 ms



Filter Class: CFC\_1000  
Max: 3.9 g at 3.2 ms  
Min: -3.4 g at 7.4 ms



Filter Class: CFC\_1000  
Max: 139.2 g at 2.1 ms  
Min: -1.3 g at 6.0 ms



Filter Class: CFC\_1000  
Max: 219.4 g at 2.2 ms  
Min: 0.4 g at -1.0 ms



## Transportation Research Center Inc.

Left Lateral Head Drop  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/18/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Peak Head Resultant Acceleration	107 - 126 g	110.9 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-1.1 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	2.87 %	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

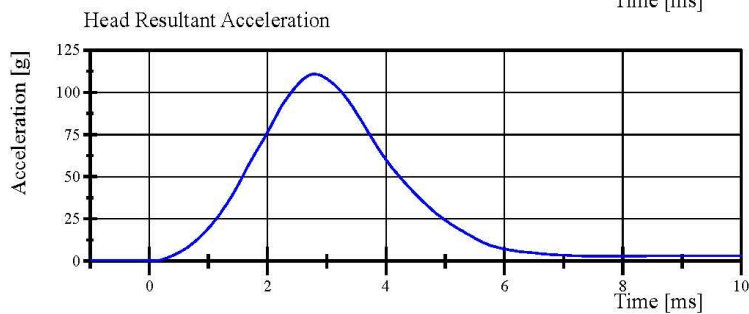
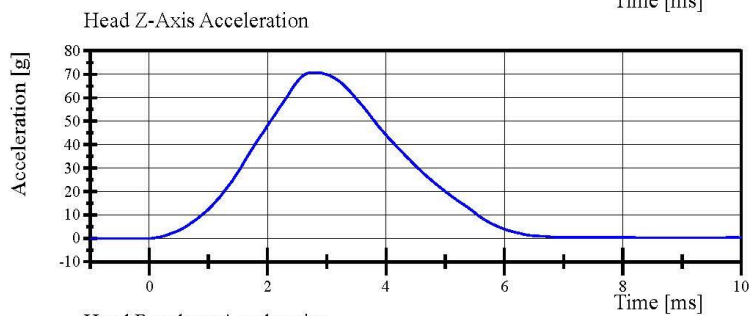
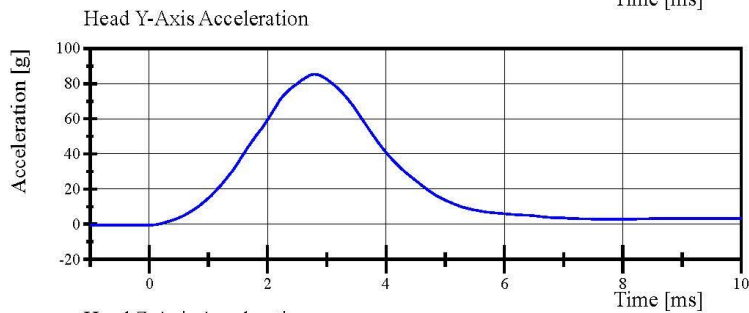
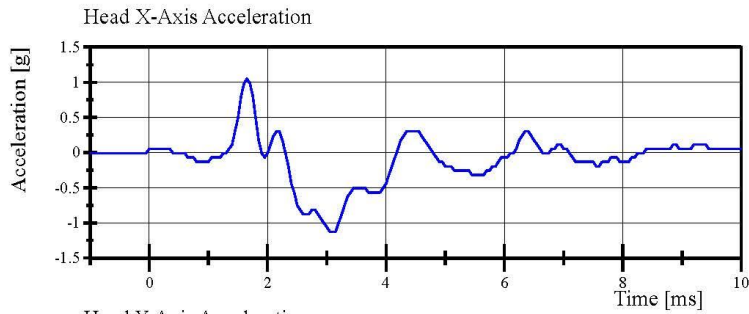
**Head Skin S/N: EG2845**

# Transportation Research Center Inc.

Left Lateral Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 6-1

Test Date: 1/18/2021



## Transportation Research Center Inc.

Right Lateral Head Drop  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/18/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Peak Head Resultant Acceleration	107 - 126 g	113.8 g	Yes
Peak Head Longitudinal Acceleration	(-15) - 15 g	-5.8 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	2.64 %	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

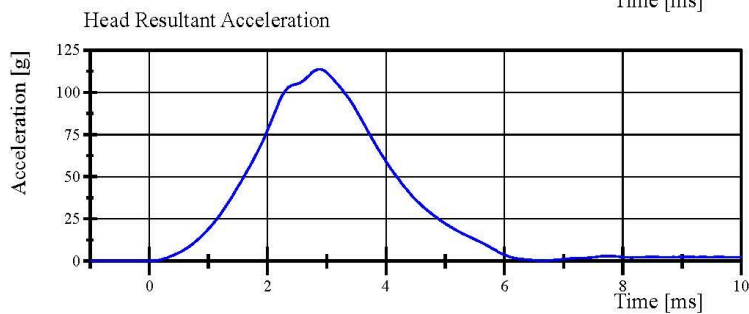
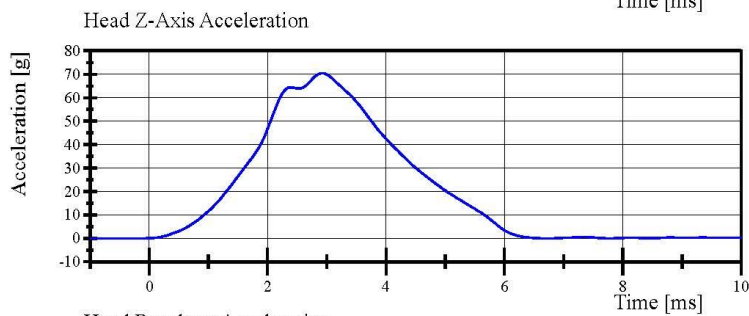
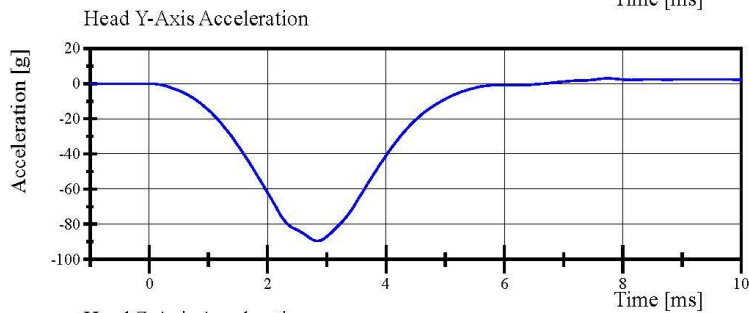
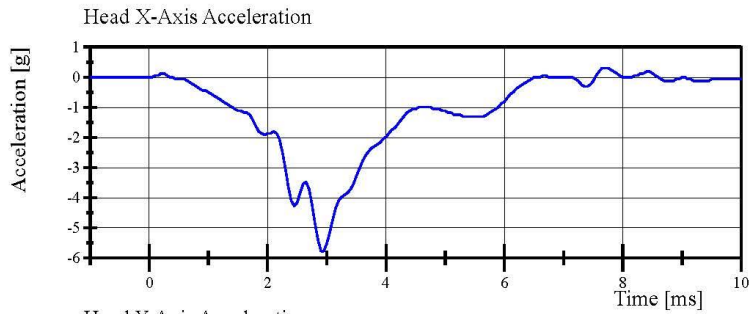
**Head Skin S/N: EG2845**

# Transportation Research Center Inc.

Right Lateral Head Drop

WorldSID 50th Serial No. EB8888 Certification No. 6-1

Test Date: 1/18/2021



## Transportation Research Center Inc.

Left Lateral Neck  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/15/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Velocity	(-3.30) - (-3.50) m/s	-3.334 m/s	Yes
Pendulum Integrated Velocity Change at 4 ms	0.87 - 1.09 m/s	0.976 m/s	Yes
Change at 8 ms	1.72 - 2.1 m/s	1.899 m/s	Yes
Change at 12 ms	2.63 - 3.17 m/s	2.884 m/s	Yes
Maximum Headform Flexion	(-50) - (-61) deg	-54.7 deg	Yes
Headform Flexion Decay - from Peak to Zero Degrees	58 - 72 ms	61.0 ms	Yes
Total Neck Occipital Condyles Moment	54 - 67 N·m	62.4 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	71 - 87 ms	75.9 ms	Yes
Maximum Forward Pot Rotation			
Peak	(-32) - (-39) °	-35.2 °	Yes
Time of Peak	56 - 68 ms	60.9 ms	Yes
Maximum Rear Pot Rotation			
Peak	(-29) - (-36) °	-31.5 °	Yes
Time of Peak	56 - 68 ms	62.2 ms	Yes
Maximum Headform Angular Rate	(-2,047) - (-2,503) %/s	-2,287.4 %/s	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

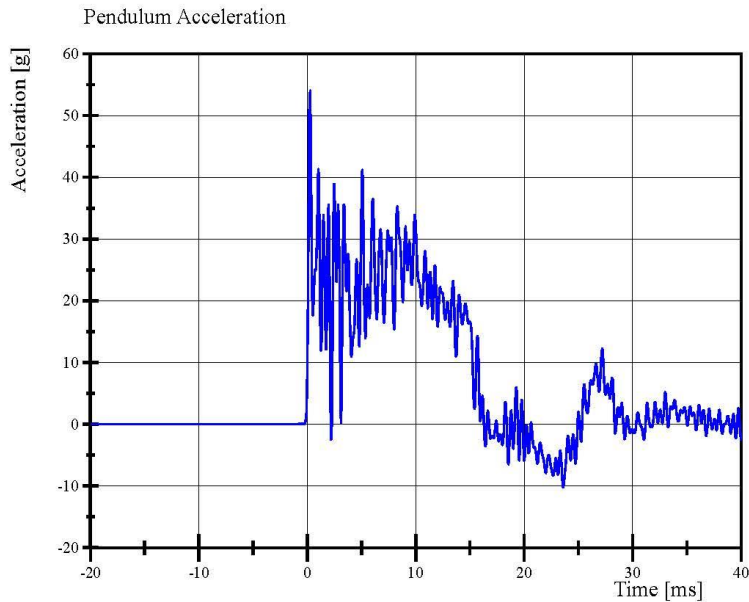
**Neck S/N: EE8804**

# Transportation Research Center Inc.

Left Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 6-1

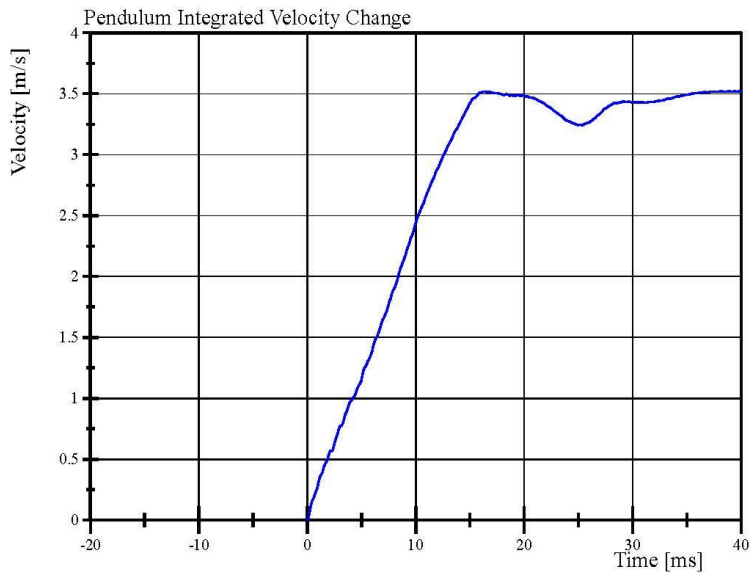
Test Date: 1/15/2021



Filter Class: CFC\_1000

Max: 54.0 g at 0.3 ms

Min: -10.2 g at 23.6 ms



Filter Class: CFC\_1000

Max: 3.5 m/s at 39.9 ms

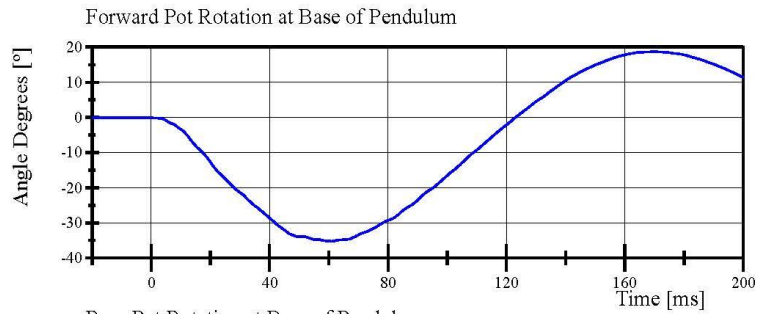
Min: 0.0 m/s at -0.0 ms

# Transportation Research Center Inc.

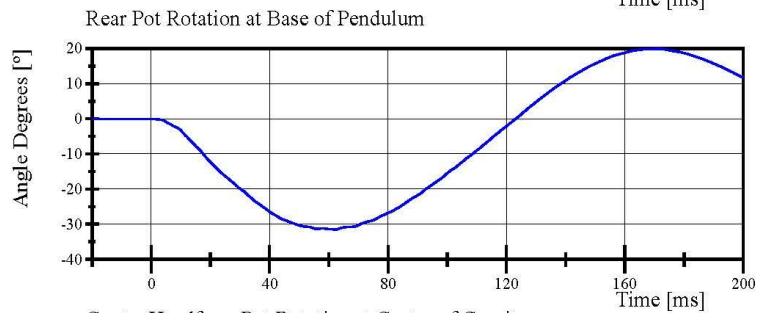
Left Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 6-1

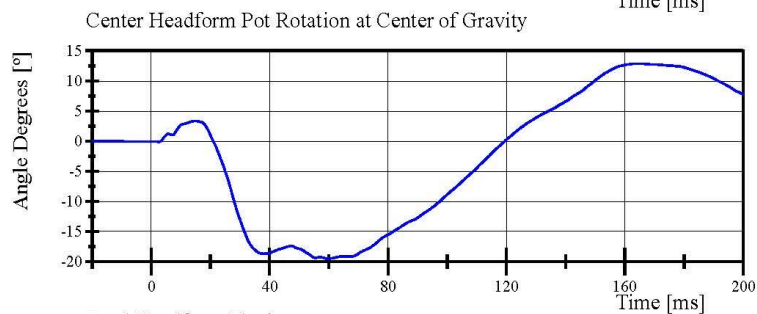
Test Date: 1/15/2021



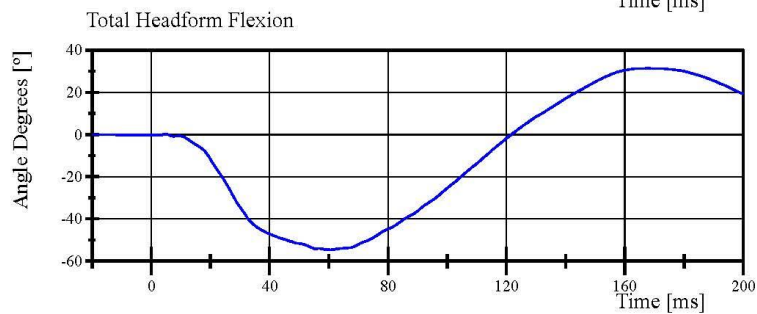
Filter Class: CFC\_180  
Max: 18.7 ° at 170.1 ms  
Min: -35.2 ° at 60.9 ms



Filter Class: CFC\_180  
Max: 19.9 ° at 170.9 ms  
Min: -31.5 ° at 62.2 ms



Filter Class: CFC\_180  
Max: 12.9 ° at 164.5 ms  
Min: -19.4 ° at 59.4 ms



Filter Class: CFC\_180  
Max: 31.4 ° at 167.8 ms  
Min: -54.7 ° at 60.7 ms

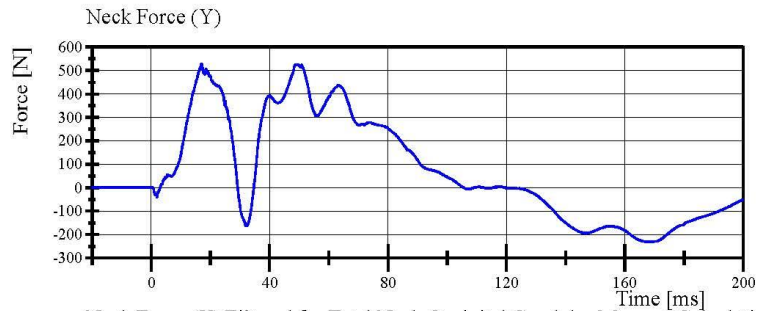


# Transportation Research Center Inc.

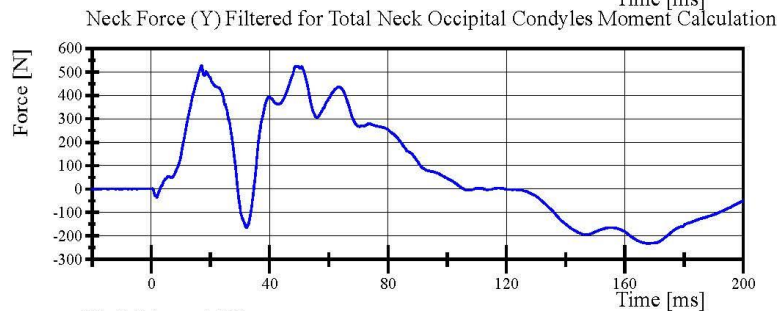
Left Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 6-1

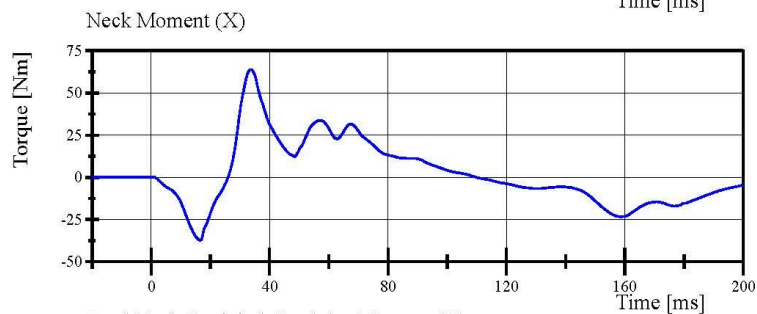
Test Date: 1/15/2021



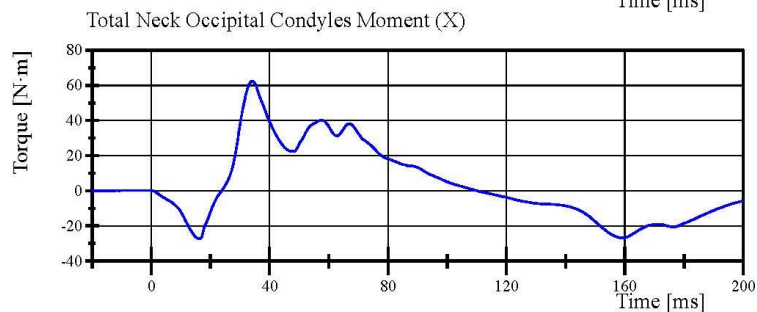
Filter Class: CFC\_1000  
Max: 528.2 N at 17.0 ms  
Min: -232.0 N at 167.8 ms



Filter Class: CFC\_600  
Max: 526.9 N at 17.0 ms  
Min: -231.8 N at 167.8 ms



Filter Class: CFC\_600  
Max: 64.0 Nm at 33.6 ms  
Min: -37.2 Nm at 16.6 ms



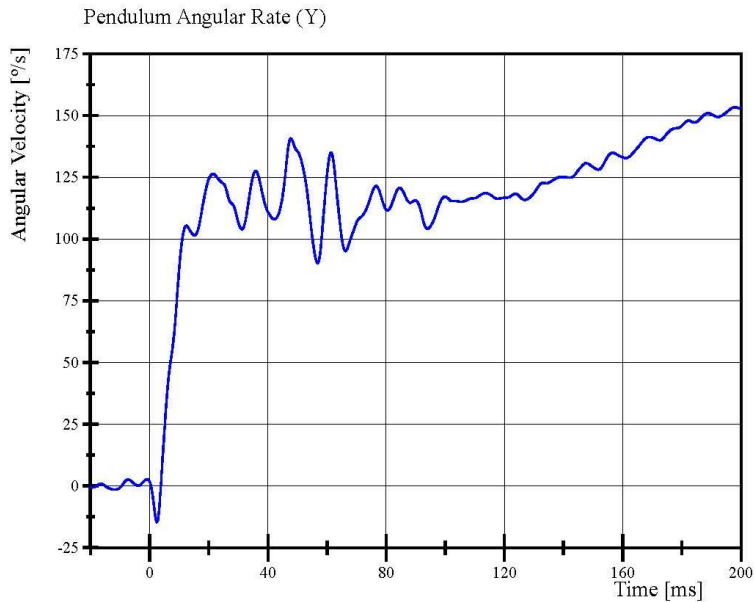
Filter Class: Without\_(Constar  
Max: 62.4 N·m at 34.1 ms  
Min: -27.3 N·m at 16.2 ms

# Transportation Research Center Inc.

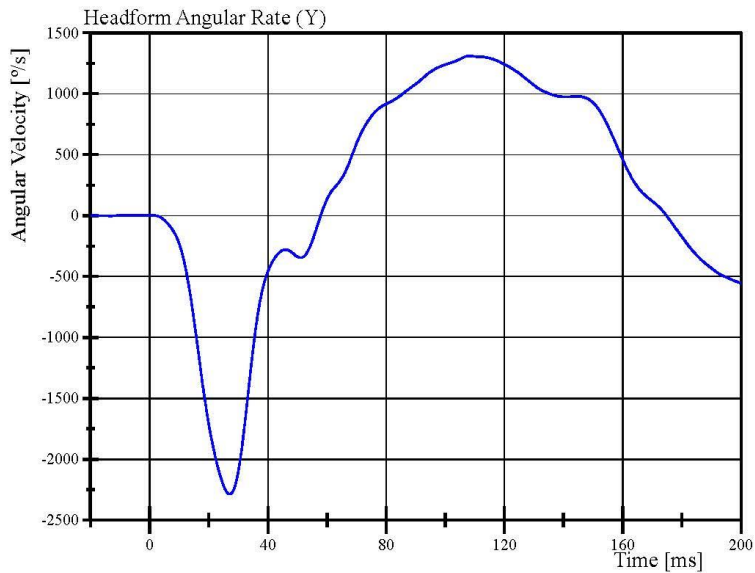
Left Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 6-1

Test Date: 1/15/2021



Filter Class: CFC\_60  
Max: 153.4 %/s at 197.9 ms  
Min: -14.6 %/s at 2.5 ms



Filter Class: CFC\_60  
Max: 1,309.1 %/s at 108.0 ms  
Min: -2,287.4 %/s at 27.1 ms



## Transportation Research Center Inc.

Right Lateral Neck  
 WorldSID 50th Serial No. EB8888 Certification No. 6-1  
 Test Date: 1/18/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Pendulum Velocity	3.30 - 3.50 m/s	3.333 m/s	Yes
Pendulum Integrated Velocity Change at 4 ms	(-0.87) - (-1.09) m/s	-1.021 m/s	Yes
Change at 8 ms	(-1.72) - (-2.1) m/s	-1.981 m/s	Yes
Change at 12 ms	(-2.63) - (-3.17) m/s	-3.016 m/s	Yes
Maximum Headform Flexion	50 - 61 deg	53.8 deg	Yes
Headform Flexion Decay - from Peak to Zero Degrees	58 - 72 ms	60.1 ms	Yes
Total Neck Occipital Condyles Moment	(-54) - (-67) N·m	-63.6 N·m	Yes
Total Neck Occipital Condyles Moment Decay Time to 0 N·m	71 - 87 ms	76.7 ms	Yes
Maximum Forward Pot Rotation			
Peak	32 - 39 °	34.8 °	Yes
Time of Peak	56 - 68 ms	60.9 ms	Yes
Maximum Rear Pot Rotation			
Peak	29 - 36 °	30.8 °	Yes
Time of Peak	56 - 68 ms	59.9 ms	Yes
Maximum Headform Angular Rate	2,047 - 2,503 %/s	2,302.2 %/s	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Neck S/N: EE8804**

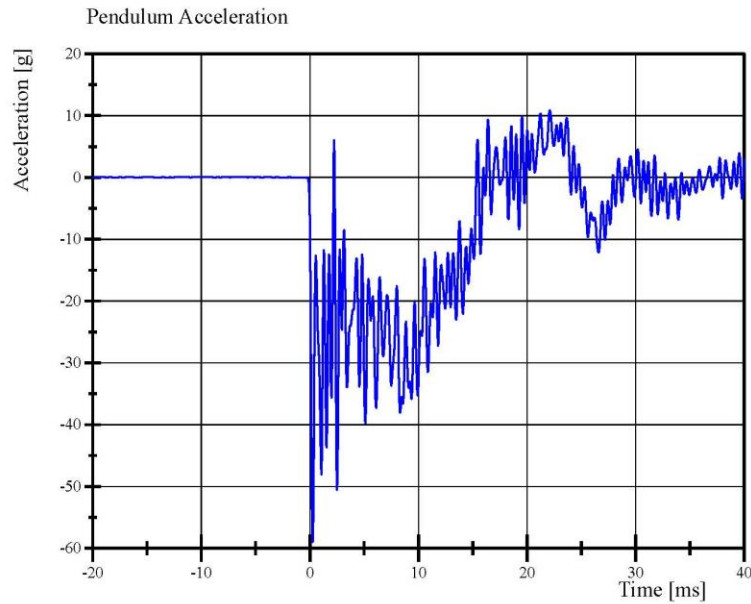


# Transportation Research Center Inc.

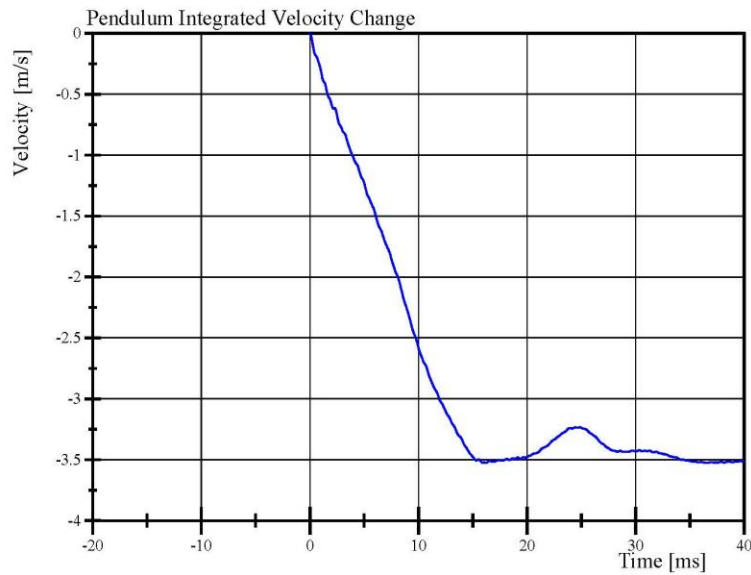
Right Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 6-1

Test Date: 1/18/2021



Filter Class: CFC\_1000  
Max: 10.9 g at 22.1 ms  
Min: -59.0 g at 0.3 ms



Filter Class: CFC\_1000  
Max: 0.0 m/s at 0.0 ms  
Min: -3.5 m/s at 16.3 ms

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

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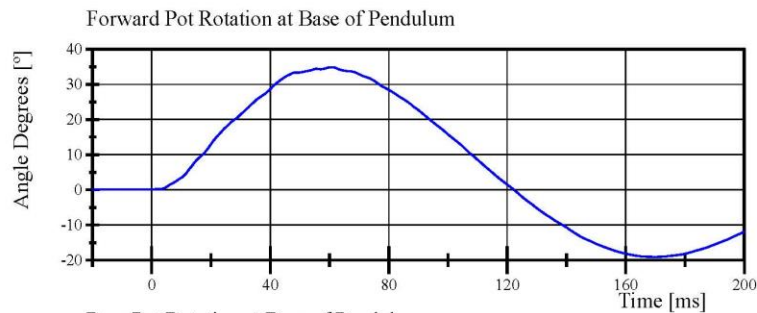


# Transportation Research Center Inc.

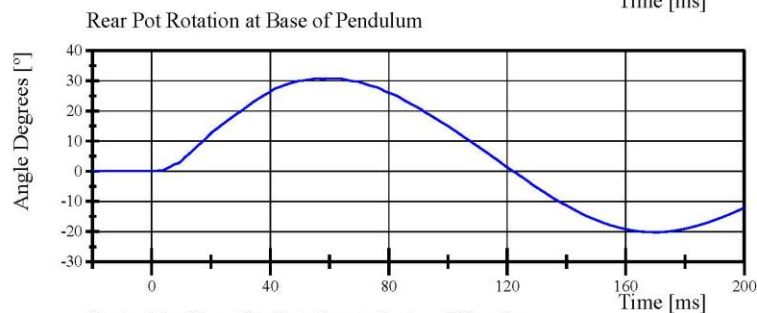
Right Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 6-1

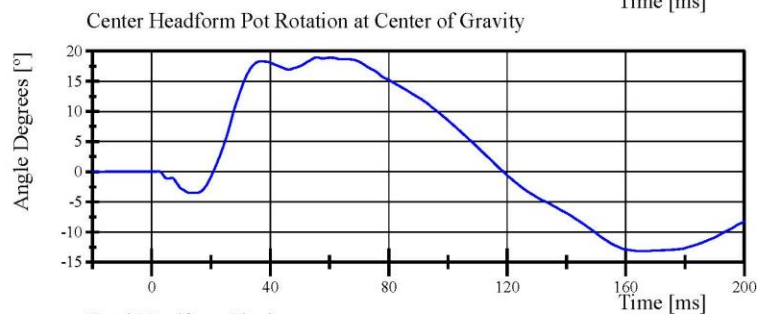
Test Date: 1/18/2021



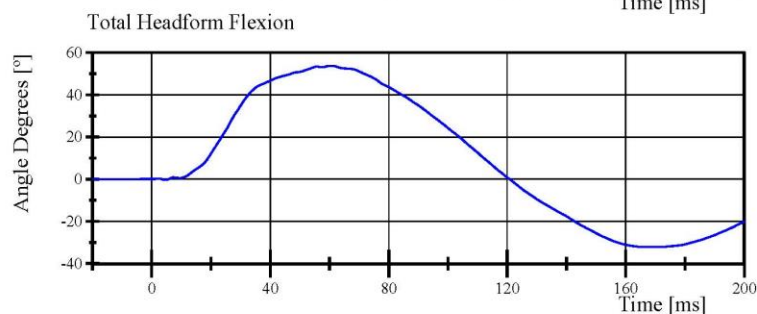
Filter Class: CFC\_180  
Max: 34.8 ° at 60.9 ms  
Min: -19.1 ° at 169.9 ms



Filter Class: CFC\_180  
Max: 30.8 ° at 59.9 ms  
Min: -20.2 ° at 170.5 ms



Filter Class: CFC\_180  
Max: 19.0 ° at 55.8 ms  
Min: -13.1 ° at 165.3 ms



Filter Class: CFC\_180  
Max: 53.8 ° at 60.7 ms  
Min: -32.2 ° at 169.2 ms

Specification Source: WordSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

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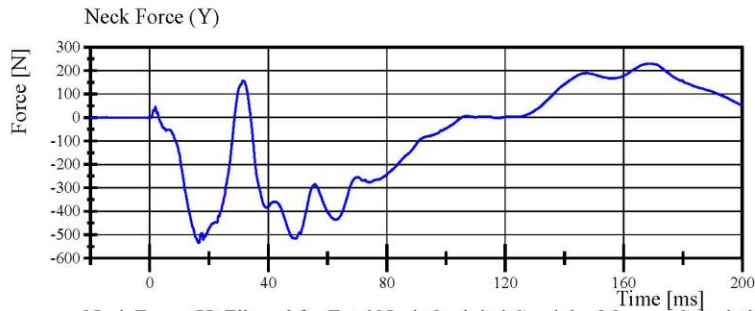


# Transportation Research Center Inc.

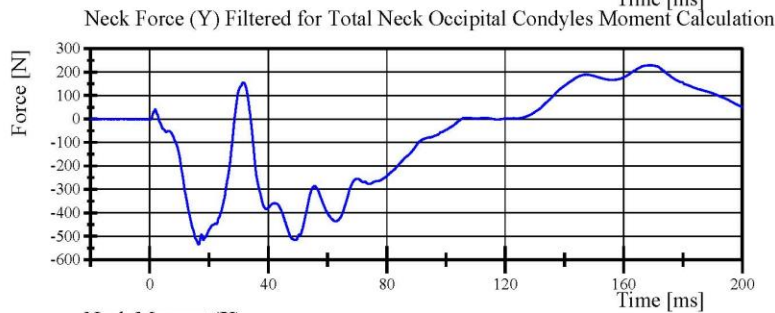
Right Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 6-1

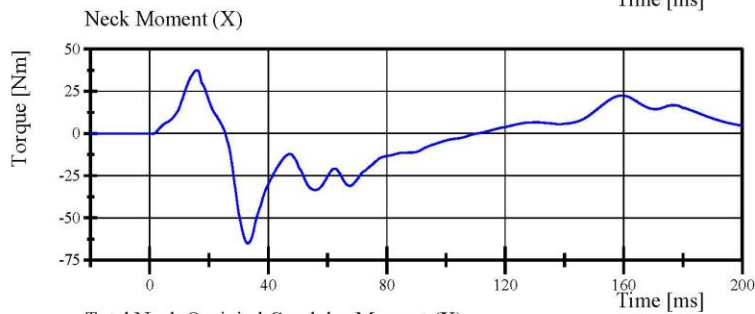
Test Date: 1/18/2021



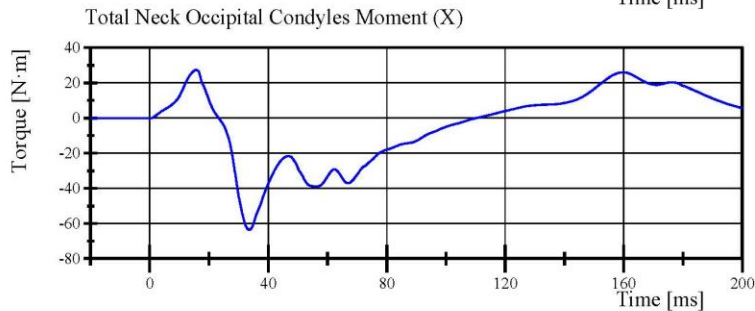
Filter Class: CFC\_1000  
Max: 229.7 N at 169.2 ms  
Min: -534.5 N at 16.5 ms



Filter Class: CFC\_600  
Max: 229.5 N at 169.2 ms  
Min: -534.9 N at 16.6 ms



Filter Class: CFC\_600  
Max: 37.4 Nm at 16.1 ms  
Min: -65.1 Nm at 33.2 ms



Filter Class: Without\_(Constar  
Max: 27.3 N·m at 15.6 ms  
Min: -63.6 N·m at 33.6 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

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Report Number: EB8888\_WSH06

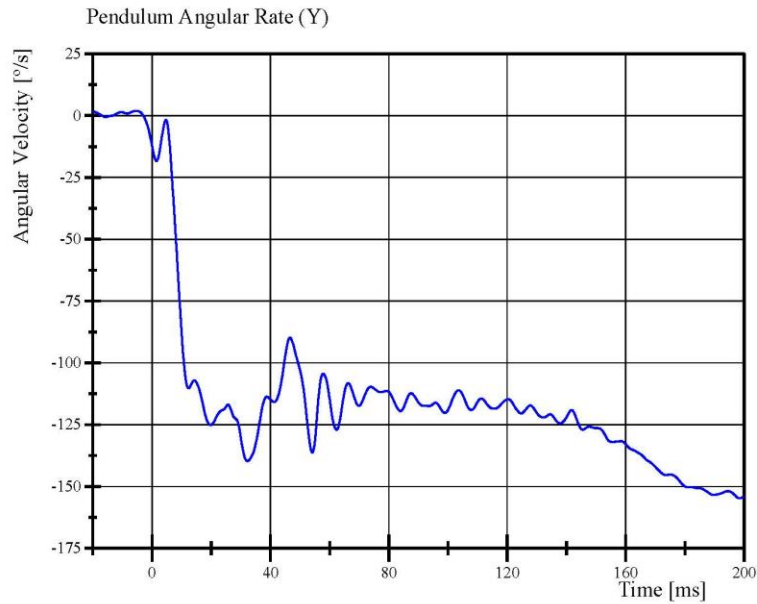
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# Transportation Research Center Inc.

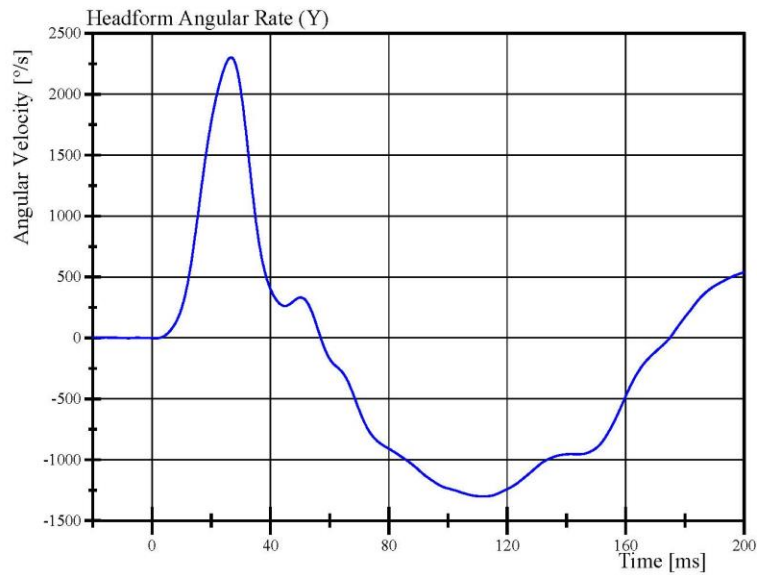
Right Lateral Neck

WorldSID 50th Serial No. EB8888 Certification No. 6-1

Test Date: 1/18/2021



Filter Class: CFC\_60  
Max: 1.9 °/s at -5.3 ms  
Min: -154.7 °/s at 198.5 ms



Filter Class: CFC\_60  
Max: 2,302.2 °/s at 26.7 ms  
Min: -1,301.7 °/s at 111.9 ms

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
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## Transportation Research Center Inc.

Left Lateral Torsion

WorldSID 50th Serial No. EB8888 Certification No. 6-3

Test Date: 1/19/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Velocity	5.1 - 5.3 m/s	5.18 m/s	Yes
Pendulum Integrated Velocity Change at 10 ms	2.09 - 2.37 m/s	2.149 m/s	Yes
Change at 15 ms	3.19 - 3.63 m/s	3.246 m/s	Yes
Change at 20 ms	4.27 - 4.87 m/s	4.323 m/s	Yes
Peak Fixture Rotation	(-41.5) - (-51) °	-46.61 °	Yes
Decay Time to 0 deg from Peak Angle	35 - 43 ms	39.3 ms	Yes
Peak Head Angular Velocity Z-axis	(-1,345) - (-1,655) %/s	-1,504.4 %/s	Yes
Peak Lower Neck Moment Z-axis	34 - 42 N·m	37.5 N·m	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Neck S/N: EE8804**

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

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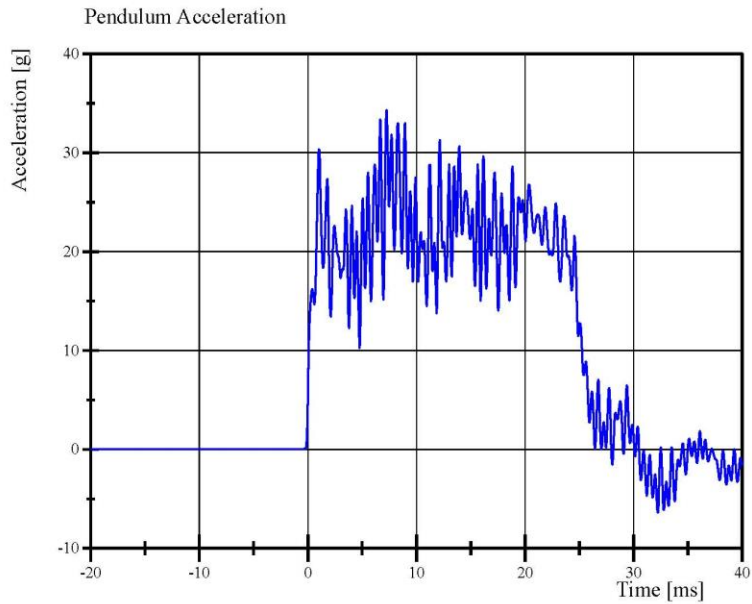


# Transportation Research Center Inc.

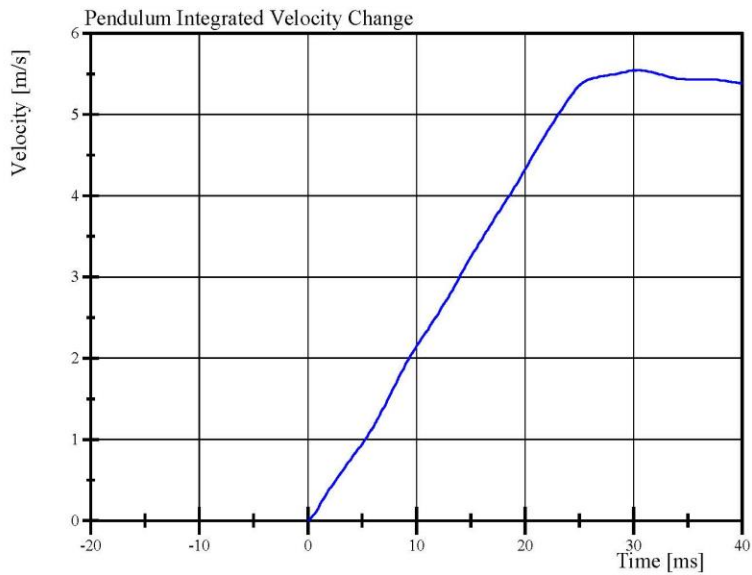
Left Lateral

WorldSID 50th Serial No. EB8888 Certification No. 6-3

Test Date: 1/19/2021



Filter Class: CFC\_1000  
Max: 34.3 g at 7.3 ms  
Min: -6.4 g at 32.2 ms



Filter Class: CFC\_1000  
Max: 5.5 m/s at 30.5 ms  
Min: 0.0 m/s at 0.0 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020

Report Number: EB8888\_WSH06

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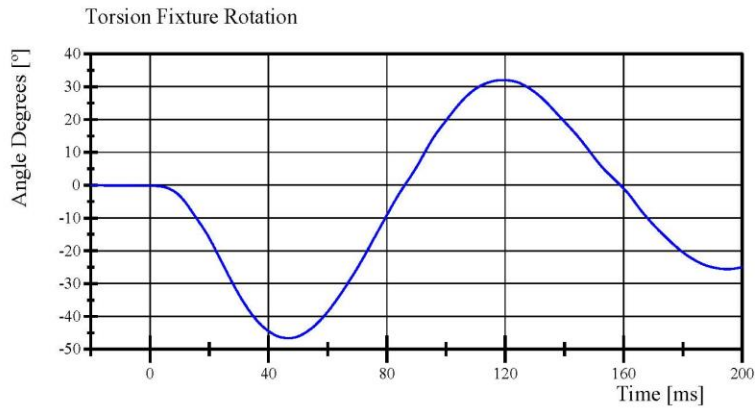


# Transportation Research Center Inc.

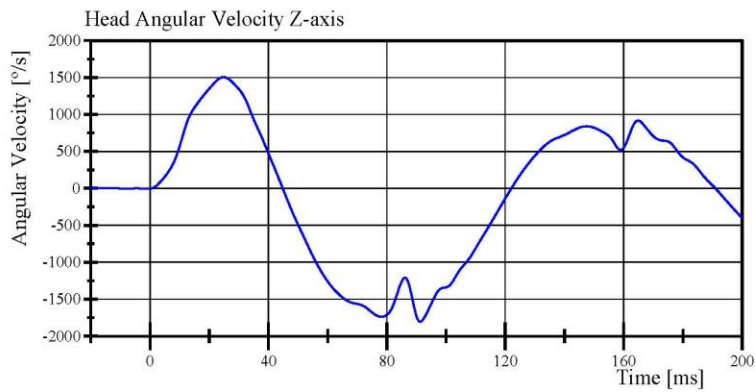
Left Lateral

WorldSID 50th Serial No. EB8888 Certification No. 6-3

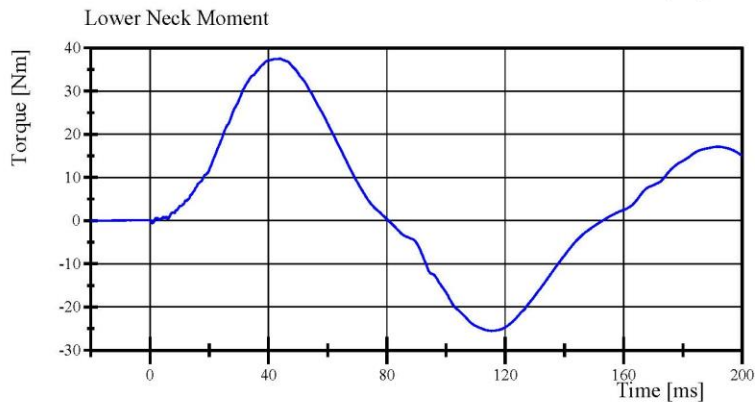
Test Date: 1/19/2021



Filter Class: CFC\_60  
Max: 32.0 ° at 119.2 ms  
Min: -46.6 ° at 46.8 ms



Filter Class: CFC\_60  
Max: 1,504.4 °/s at 24.9 ms  
Min: -1,804.8 °/s at 91.3 ms



Filter Class: CFC\_600  
Max: 37.5 Nm at 43.9 ms  
Min: -25.5 Nm at 115.3 ms

Specification Source: WorldSID 50th(W5) VRTC Nov 2020.xlsx  
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## Transportation Research Center Inc.

Right Lateral Torsion

WorldSID 50th Serial No. EB8888 Certification No. 6-2

Test Date: 1/20/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	5.1 - 5.3 m/s	5.18 m/s	Yes
Pendulum Integrated Velocity Change at 10 ms	2.09 - 2.37 m/s	2.241 m/s	Yes
Change at 15 ms	3.19 - 3.63 m/s	3.403 m/s	Yes
Change at 20 ms	4.27 - 4.87 m/s	4.574 m/s	Yes
Peak Fixture Rotation	41.5 - 51 °	46.23 °	Yes
Decay Time to 0 deg from Peak Angle	35 - 43 ms	39.0 ms	Yes
Peak Head Angular Velocity Z-axis	1,345 - 1,655 %/s	1,559.9 %/s	Yes
Peak Lower Neck Moment Z-axis	(-34) - (-42) N·m	-38.3 N·m	Yes

**Test meets specifications.**

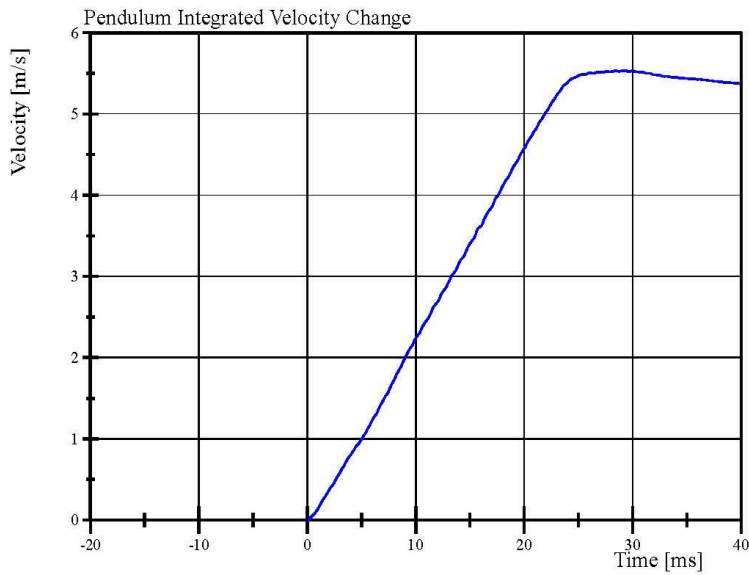
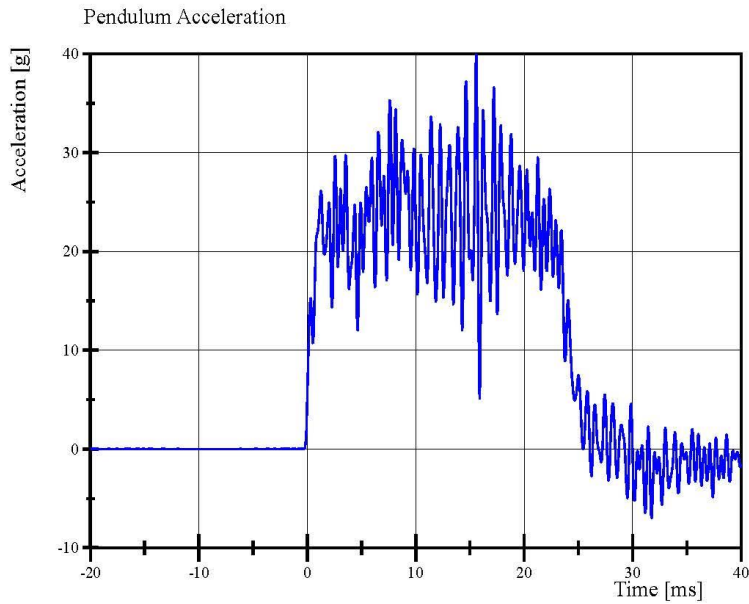
**Condition: Used**

**Comments:**

**Neck S/N: EE8804**

# Transportation Research Center Inc.

Right Lateral  
WorldSID 50th Serial No. EB8888 Certification No. 6-2  
Test Date: 1/20/2021



Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qalification Manual 11\_09\_2020  
Report Number: EB8888\_WSH06 Page 30 of 44

01.20.2021 09:29:14 4009

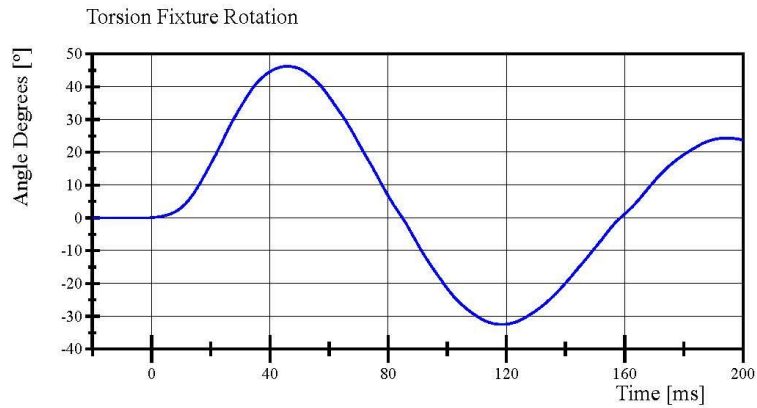


# Transportation Research Center Inc.

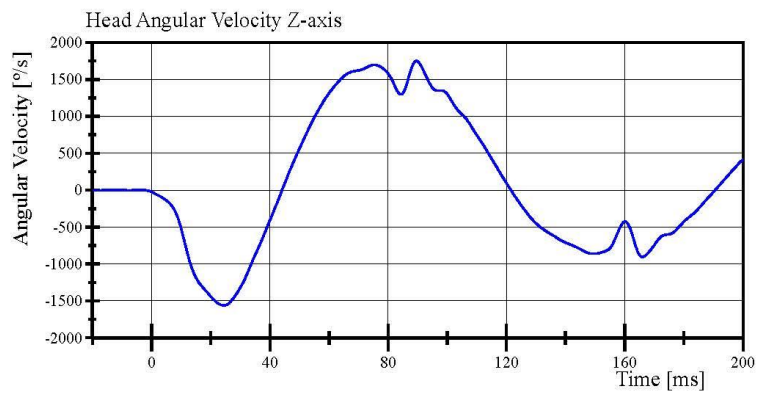
Right Lateral

WorldSID 50th Serial No. EB8888 Certification No. 6-2

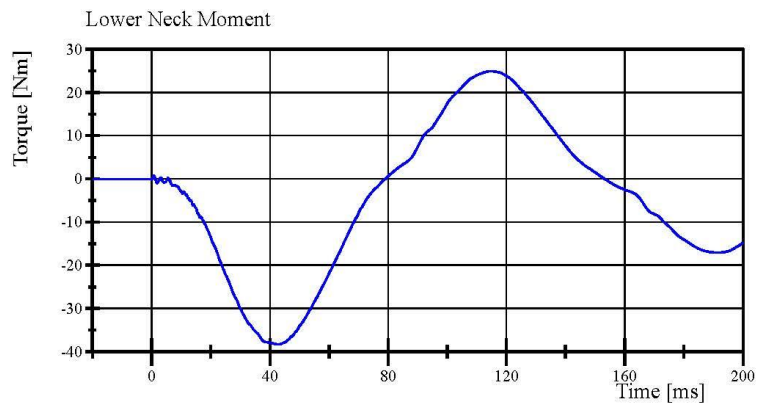
Test Date: 1/20/2021



Filter Class: CFC\_60  
Max: 46.2 ° at 45.9 ms  
Min: -32.5 ° at 118.4 ms



Filter Class: CFC\_60  
Max: 1,749.6 °/s at 89.5 ms  
Min: -1,559.9 °/s at 24.5 ms



Filter Class: CFC\_600  
Max: 24.9 Nm at 114.8 ms  
Min: -38.3 Nm at 42.5 ms



## Transportation Research Center Inc.

Left Lateral Shoulder  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/19/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.30 m/s	Yes
Impactor Force	2,600 - 3,300 N	2,978.2 N	Yes
Shoulder Force	(-1,470) - (-1,800) N	-1,628.5 N	Yes
S1 RibEye Max	37 - 46 mm	39.9 mm	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Arm S/N: EG3799**

**Shoulder Rib S/N: DW1916**

**Tilt:**

**Head X -0.5**

**Y -0.6**

**Spine X 1.00**

**Y 1.00**

**Pelvis X 0.6**

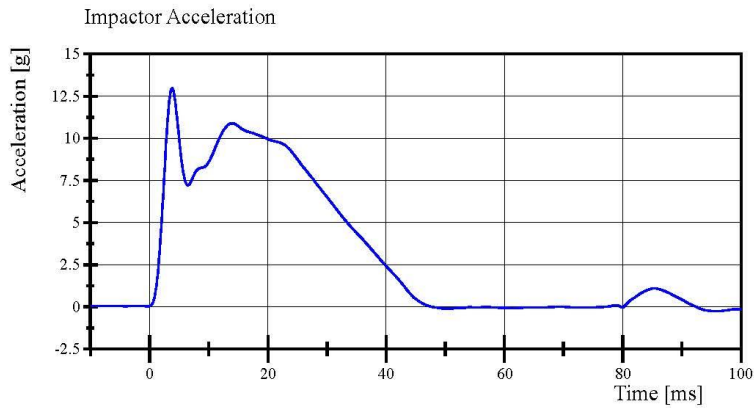
**Y 5.1**

# Transportation Research Center Inc.

Left Lateral Shoulder

WorldSID 50th Serial No. EB8888 Certification No. 6-1

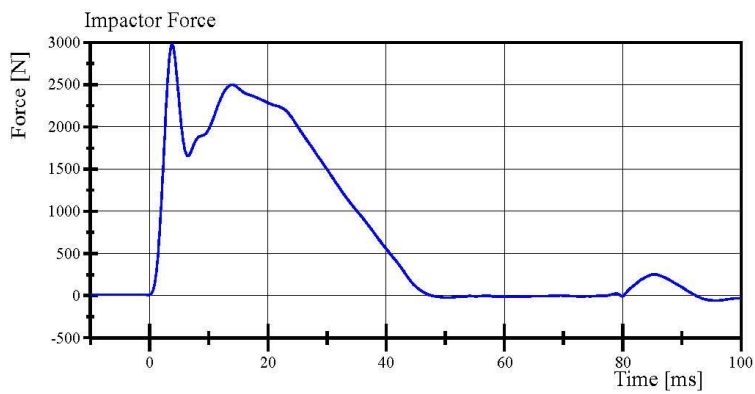
Test Date: 1/19/2021



Filter Class: CFC\_180

Max: 13.0 g at 3.8 ms

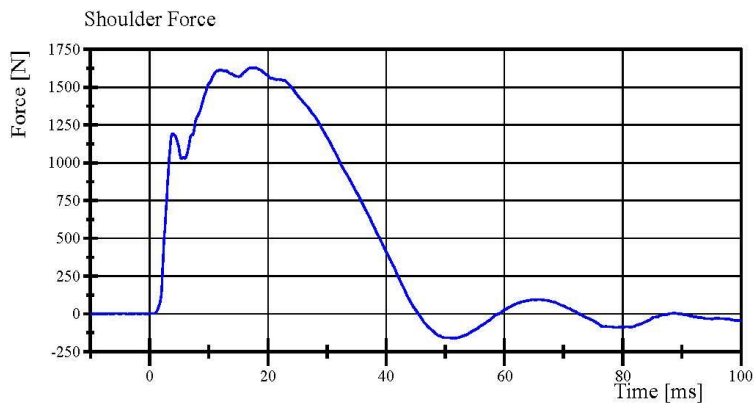
Min: -0.3 g at 95.8 ms



Filter Class: CFC\_180

Max: 2,978.2 N at 3.8 ms

Min: -59.1 N at 95.8 ms



Filter Class: CFC\_600

Max: 1,628.5 N at 17.6 ms

Min: -162.3 N at 51.3 ms

Specification Source: WordSID 50th(WS) VRTC Nov 2020.xlsx  
WorldSID 50th\_Qualification Manual 11\_09\_2020

Report Number: EB8888\_WSH06

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## Transportation Research Center Inc.

Left Lateral Thorax with Arm  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/20/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Impactor Velocity	6.6 - 6.8 m/s	6.69 m/s	Yes
Impactor Force	5,300 - 6,200 N	5,856.7 N	Yes
Upper Thorax Rib Displacement	35 - 47 mm	41.0 mm	Yes
Center Thorax Rib Displacement	46 - 56 mm	46.8 mm	Yes
Lower Thorax Rib Displacement	33.5 - 40.5 mm	35.57 mm	Yes
Upper Spine Lateral Acceleration	28 - 37 g	35.9 g	Yes
Lower Spine Lateral Acceleration	22 - 28 g	27.0 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Arm S/N: EG3799**

**Shoulder Rib S/N: DW1916**

**Thorax Rib 1 S/N: EB5400**

**Thorax Rib 2 S/N: EB5401**

**Thorax Rib 3 S/N: EB5402**

**RibEye S/N: 125**

**Tilt:**

**Head X -0.6**

**Y -0.5**

**Spine X -0.1**

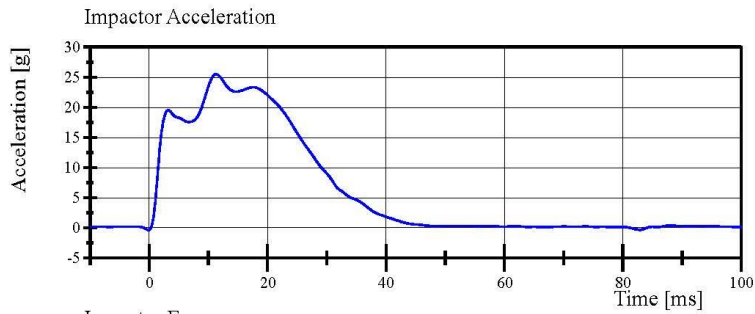
**Y 1.4**

**Pelvis X -0.5**

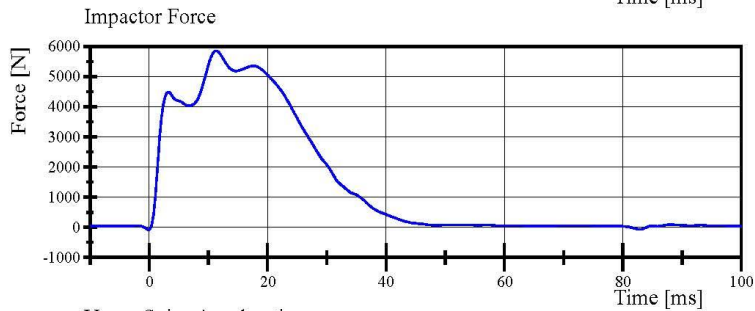
**Y 4.9**

# Transportation Research Center Inc.

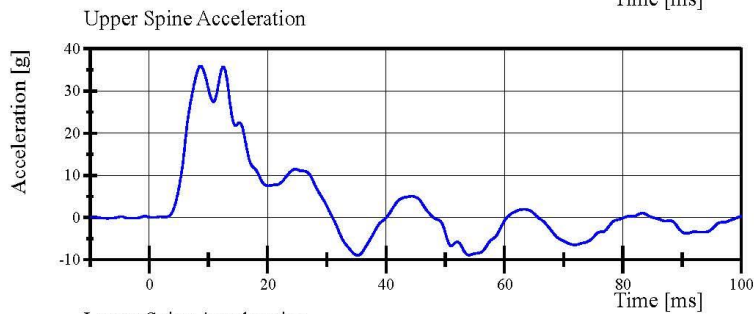
Left Lateral Thorax with Arm  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/20/2021



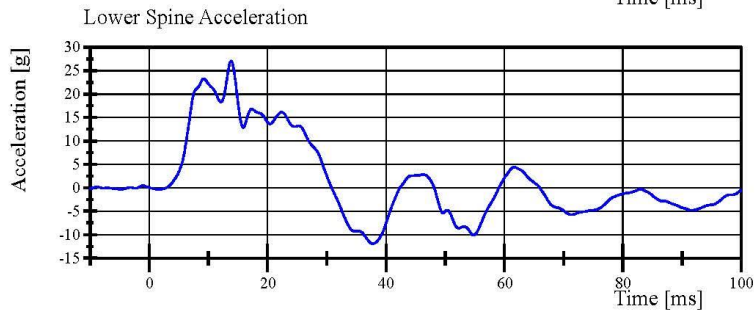
Filter Class: CFC\_180  
Max: 25.5 g at 11.3 ms  
Min: -0.4 g at -0.1 ms



Filter Class: CFC\_180  
Max: 5,856.7 N at 11.3 ms  
Min: -80.7 N at -0.1 ms



Filter Class: CFC\_180  
Max: 35.9 g at 8.7 ms  
Min: -9.0 g at 35.2 ms



Filter Class: CFC\_180  
Max: 27.0 g at 13.9 ms  
Min: -11.9 g at 37.8 ms

## Transportation Research Center Inc.

Left Lateral Thorax without Arm  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/20/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Impactor Velocity	4.2 - 4.4 m/s	4.31 m/s	Yes
Impactor Force	3,200 - 3,800 N	3,506.3 N	Yes
Upper Thorax Rib Displacement	33 - 43 mm	36.8 mm	Yes
Center Thorax Rib Displacement	35 - 43 mm	41.3 mm	Yes
Lower Thorax Rib Displacement	32 - 40 mm	36.1 mm	Yes
Upper Spine Lateral Acceleration	14 - 20 g	17.1 g	Yes
Lower Spine Lateral Acceleration	14 - 22 g	16.8 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Thorax Rib 1 S/N: EB5400**

**Thorax Rib 2 S/N: EB5401**

**Thorax Rib 3 S/N: EB5402**

**RibEye S/N: 125**

**Tilt:**

**Head X -0.2**

**Y 0.0**

**Spine X 0.1**

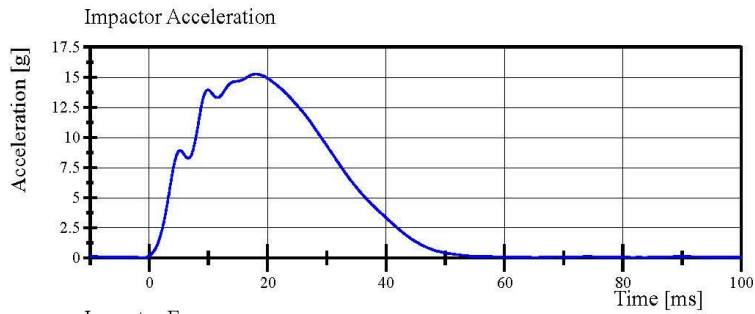
**Y 1.8**

**Pelvis X 0.7**

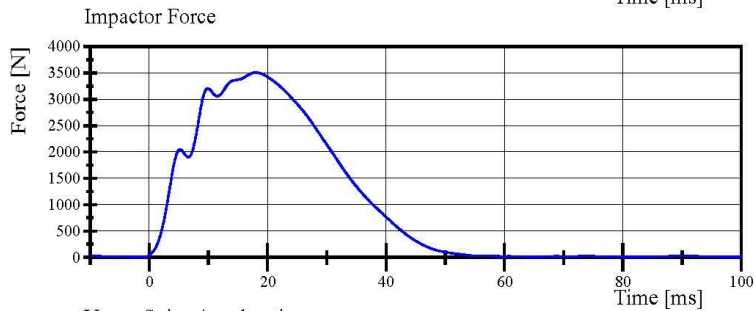
**Y 4.6**

# Transportation Research Center Inc.

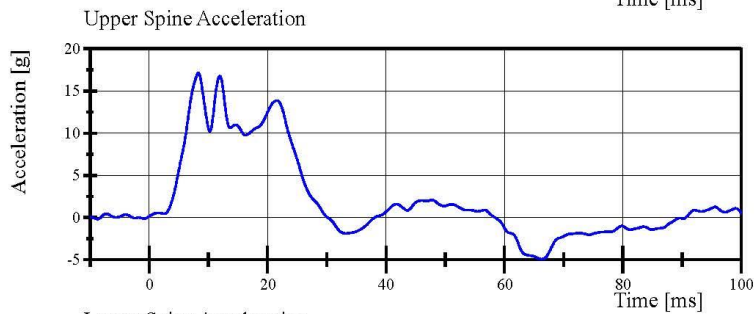
Left Lateral Thorax without Arm  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/20/2021



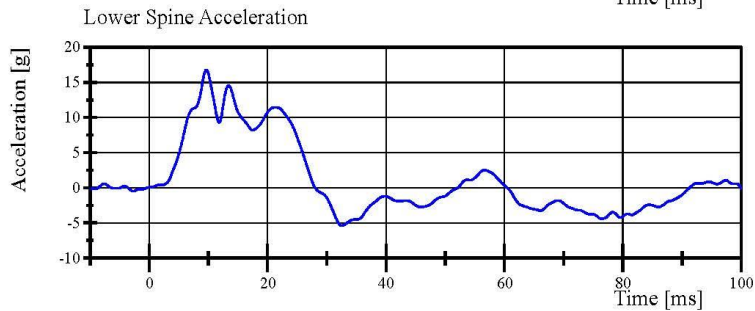
Filter Class: CFC\_180  
Max: 15.3 g at 18.0 ms  
Min: 0.0 g at -1.0 ms



Filter Class: CFC\_180  
Max: 3,506.3 N at 18.0 ms  
Min: 6.4 N at -1.0 ms



Filter Class: CFC\_180  
Max: 17.1 g at 8.3 ms  
Min: -4.9 g at 66.3 ms



Filter Class: CFC\_180  
Max: 16.8 g at 9.7 ms  
Min: -5.4 g at 32.5 ms

## Transportation Research Center Inc.

Left Lateral Abdomen  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/20/2021

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	4.33 m/s	Yes
Impactor Force	2,700 - 3,100 N	2,853.6 N	Yes
Upper Abdominal Rib Displacement	32.5 - 39.5 mm	34.43 mm	Yes
Lower Abdominal Rib Displacement	32 - 38 mm	35.1 mm	Yes
Lower Spine Lateral Acceleration	14.5 - 19.5 g	17.25 g	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Abdomen Rib #1 S/N: DY5252**

**Abdomen Rib #2 S/N: DY5253**

**Tilt:**

**Head X 0.8**

**Y -0.8**

**Spine X 1.5**

**Y 1.1**

**Pelvis X 0.0**

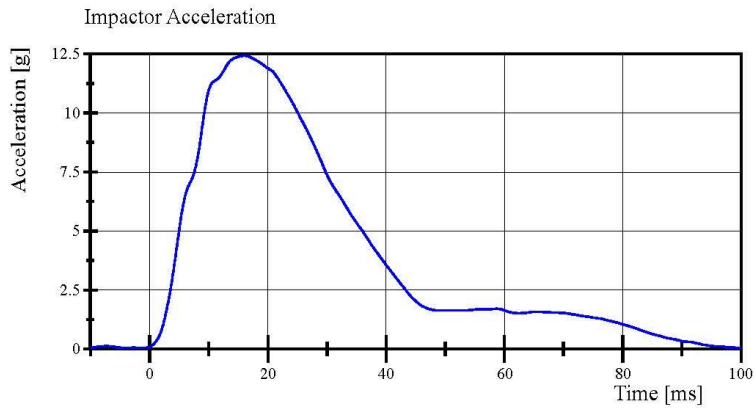
**Y 4.5**

# Transportation Research Center Inc.

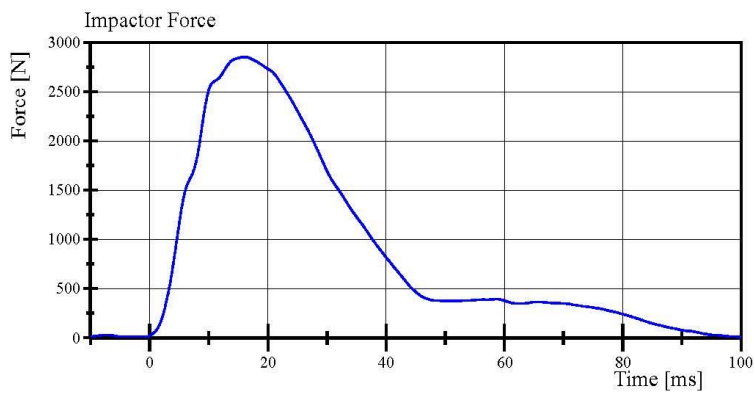
Left Lateral Abdomen

WorldSID 50th Serial No. EB8888 Certification No. 6-1

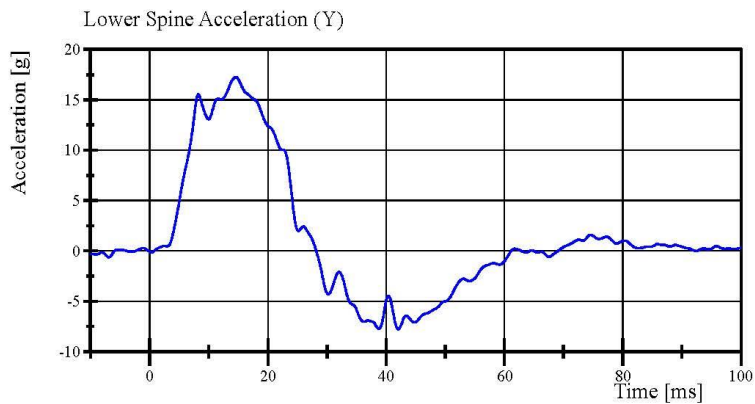
Test Date: 1/20/2021



Filter Class: CFC\_180  
Max: 12.4 g at 16.0 ms  
Min: 0.0 g at 100.0 ms



Filter Class: CFC\_180  
Max: 2,853.6 N at 16.0 ms  
Min: 6.0 N at 100.0 ms



Filter Class: CFC\_180  
Max: 17.3 g at 14.6 ms  
Min: -7.8 g at 42.1 ms



## Transportation Research Center Inc.

Left Lateral Pelvis  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/20/2021

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Impactor Velocity	6.6 - 6.8 m/s	6.74 m/s	Yes
Impactor Force	6,800 - 8,200 N	7,419.5 N	Yes
Pelvis Lateral Acceleration	38.5 - 48.5 g	39.38 g	Yes
Lower Spine Lateral Acceleration	10 - 14 g	11.2 g	Yes
Pubic Lateral Force	(-1,300) - (-1,590) N	-1,384.5 N	Yes
Sacroiliac Lateral Force	(-1,860) - (-2,280) N	-2,018.9 N	Yes

**Test meets specifications.**

**Condition: Used**

**Comments:**

**Pelvis S/N: EC3628**

**Tilt:**

**Head X 0.3**

**Y -0.4**

**Spine X 1.9**

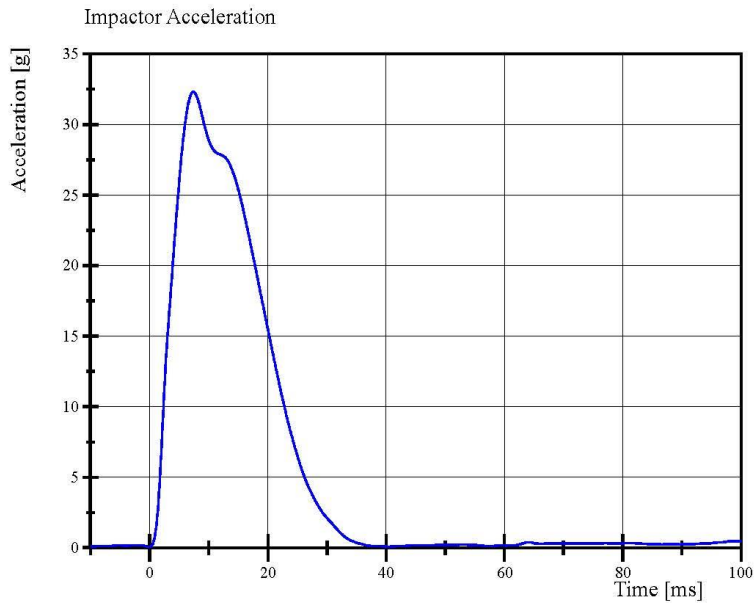
**Y 1.2**

**Pelvis X 0.3**

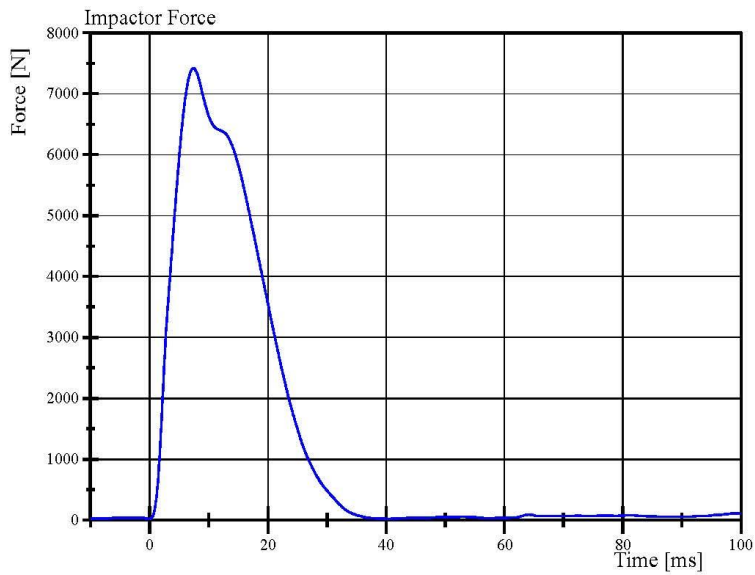
**Y 5.0**

# Transportation Research Center Inc.

Left Lateral Pelvis  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/20/2021



Filter Class: CFC\_180  
Max: 32.3 g at 7.4 ms  
Min: 0.1 g at -0.1 ms

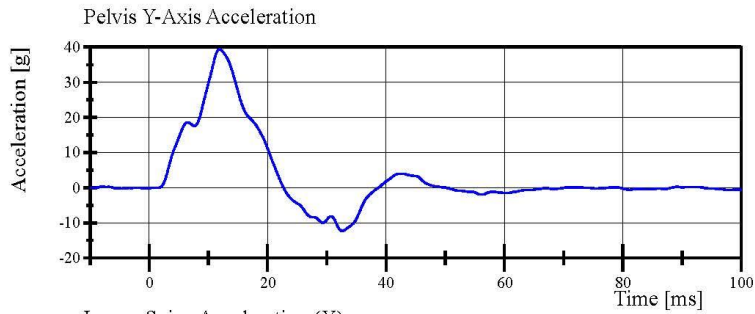


Filter Class: CFC\_180  
Max: 7,419.5 N at 7.4 ms  
Min: 17.4 N at -0.1 ms

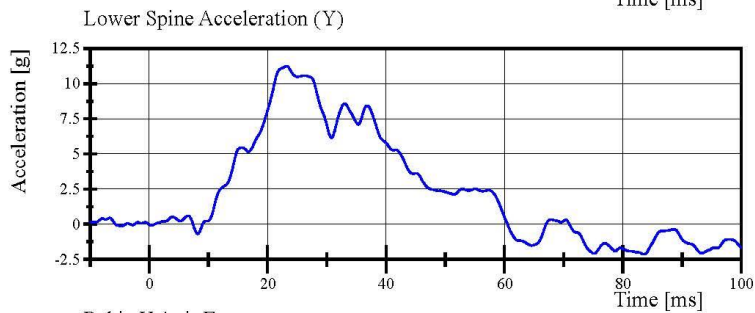


# Transportation Research Center Inc.

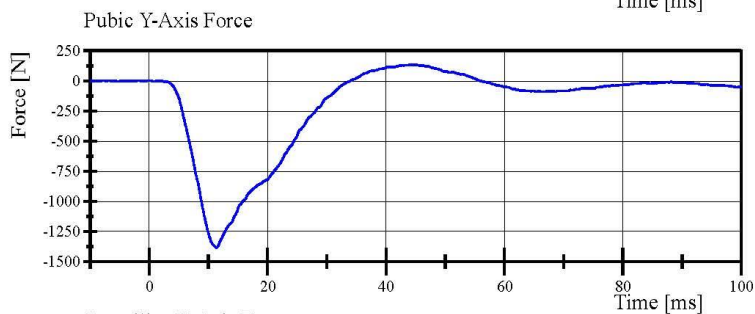
Left Lateral Pelvis  
WorldSID 50th Serial No. EB8888 Certification No. 6-1  
Test Date: 1/20/2021



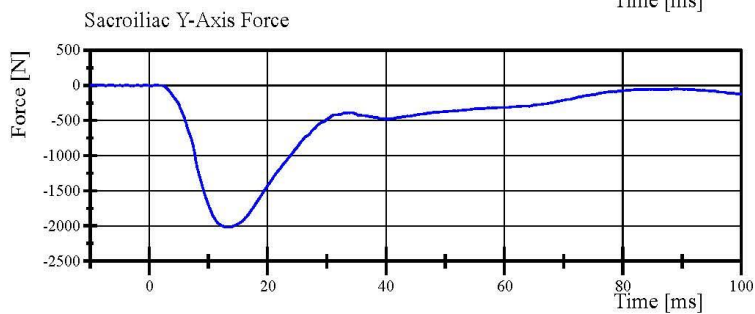
Filter Class: CFC\_180  
Max: 39.4 g at 11.9 ms  
Min: -12.3 g at 32.7 ms



Filter Class: CFC\_180  
Max: 11.2 g at 23.2 ms  
Min: -2.1 g at 83.6 ms



Filter Class: CFC\_600  
Max: 133.8 N at 44.9 ms  
Min: -1,384.5 N at 11.4 ms



Filter Class: CFC\_600  
Max: 5.9 N at -8.0 ms  
Min: -2,018.9 N at 13.3 ms

**APPENDIX D**  
**TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION DATA**

**TABLE 1 – Dummy Instrumentation (WorldSID-50M with RibEye™)**

		WorldSID-50M S/N EB8888		
		Serial Number	Manufacturer	Calibration Date
Head Accelerometers (g)	X	12324-1	Endevco	22-Jul-2020
	Y	12324-3	Endevco	22-Jul-2020
	Z	12324-2	Endevco	22-Jul-2020
Head Angular Rates Sensors (deg/sec)	X	ARS12047	DTS	4-Aug-2020
	Y	ARS15094	DTS	4-Aug-2020
	Z	ARS11060	DTS	4-Aug-2020
Upper Neck Force (N)	X	DO9753	Humanetics	21-Jul-2020
	Y	DO9753	Humanetics	21-Jul-2020
	Z	DO9753	Humanetics	21-Jul-2020
Upper Neck Moment (Nm)	X	DO9753	Humanetics	21-Jul-2020
	Y	DO9753	Humanetics	21-Jul-2020
	Z	DO9753	Humanetics	21-Jul-2020
Lower Neck Force (N)	X	EB8143	Humanetics	21-Jul-2020
	Y	EB8143	Humanetics	21-Jul-2020
	Z	EB8143	Humanetics	21-Jul-2020
Lower Neck Moment (Nm)	X	EB8143	Humanetics	21-Jul-2020
	Y	EB8143	Humanetics	21-Jul-2020
	Z	EB8143	Humanetics	21-Jul-2020
Shoulder Force (N)	X	EC1630	Humanetics	21-Jul-2020
	Y	EC1630	Humanetics	21-Jul-2020
	Z	EC1630	Humanetics	21-Jul-2020
Upper Spine Accelerometers (T1) (g)	X	12037-3	Endevco	21-Jul-2020
	Y	12037-2	Endevco	21-Jul-2020
	Z	12037-1	Endevco	21-Jul-2020
Middle Spine Accelerometers (T4) (g)	X	12352-3	Endevco	21-Jul-2020
	Y	12352-2	Endevco	21-Jul-2020
	Z	12352-1	Endevco	21-Jul-2020
Lower Spine Accelerometers (T12) (g)	X	12375-3	Endevco	22-Jul-2020
	Y	12375-2	Endevco	22-Jul-2020
	Z	12375-1	Endevco	22-Jul-2020
Pubic Symphysis Force (N)	Y	EC4386	Humanetics	21-Jul-2020
Sacro-Iliac Left Force (N)	X	EG4066	Humanetics	21-Jul-2020
	Y	EG4066	Humanetics	21-Jul-2020
	Z	EG4066	Humanetics	21-Jul-2020
Sacro-Iliac Left Moment (Nm)	X	EG4066	Humanetics	21-Jul-2020
	Y	EG4066	Humanetics	21-Jul-2020
	Z	EG4066	Humanetics	21-Jul-2020

**TABLE 1 – Dummy Instrumentation (WorldSID-50M with RibEye™) (CONTINUED)**

		WorldSID-50M S/N EB8888		
		Serial Number	Manufacturer	Calibration Date
Sacro-Iliac Right Force (N)	X	EG4066	Humanetics	21-Jul-2020
	Y	EG4066	Humanetics	21-Jul-2020
	Z	EG4066	Humanetics	21-Jul-2020
Sacro-Iliac Right Moment (Nm)	X	EG4066	Humanetics	21-Jul-2020
	Y	EG4066	Humanetics	21-Jul-2020
	Z	EG4066	Humanetics	21-Jul-2020
Lumbar Force (N)	X	EC2349	Humanetics	21-Jul-2020
	Y	EC2349	Humanetics	21-Jul-2020
	Z	EC2349	Humanetics	21-Jul-2020
Lumbar Moment (Nm)	X	EC2349	Humanetics	21-Jul-2020
	Y	EC2349	Humanetics	21-Jul-2020
	Z	EC2349	Humanetics	21-Jul-2020
Pelvis Accelerometers (g)	X	11905-3	Endevco	22-Jul-2020
	Y	11905-2	Endevco	22-Jul-2020
	Z	11905-1	Endevco	22-Jul-2020
Left Femur Force (N)	X	EA4925TPS	Humanetics	29-Jul-2020
	Y	EA4925TPS	Humanetics	29-Jul-2020
	Z	EA4925TPS	Humanetics	29-Jul-2020
Left Femur Moment (Nm)	X	EA4925TPS	Humanetics	29-Jul-2020
	Y	EA4925TPS	Humanetics	29-Jul-2020
	Z	EA4925TPS	Humanetics	29-Jul-2020
Left Femoral Neck Force (N)	X	EB6234T	Humanetics	21-Jul-2020
	Y	EB6234T	Humanetics	21-Jul-2020
	Z	EB6234T	Humanetics	21-Jul-2020
Driver Left Outer Knee Force (N)	Y	93	Humanetics	21-Jul-2020
Driver Left Inner Knee Force (N)	Y	95	Humanetics	21-Jul-2020

**TABLE 1 – Dummy Instrumentation (WorldSID-50M with RibEye™) (CONTINUED)**

			WorldSID-50M S/N EB8888		
			Serial Number	Manufacturer	Calibration Date
Shoulder RibEye (mm)	Front	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Middle	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Rear	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
Thorax Rib 1 RibEye (mm)	Front	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Middle	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Rear	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
Thorax Rib 2 RibEye (mm)	Front	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Middle	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Rear	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
Thorax Rib 3 RibEye (mm)	Front	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Middle	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Rear	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020

**TABLE 1 – Dummy Instrumentation (WorldSID-50M with RibEye™) (CONTINUED)**

			WorldSID-50M S/N EB8888		
			Serial Number	Manufacturer	Calibration Date
Abdomen Rib 1 RibEye (mm)	Front	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Middle	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Rear	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
Abdomen Rib 2 RibEye (mm)	Front	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Middle	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020
	Rear	X	124	Boxboro Systems	7-Jul-2020
		Y	124	Boxboro Systems	7-Jul-2020
		Z	124	Boxboro Systems	7-Jul-2020

**TABLE 2 – VEHICLE INSTRUMENTATION**

<b>Vehicle Instrumentation</b>		<b>Serial Number</b>	<b>Manufacturer</b>	<b>Calibration Date</b>
Vehicle Center of Gravity (g)	X	P58537	ENDEVCO	20-Nov-2020
	Y	P74456	ENDEVCO	20-Nov-2020
	Z	P58494	ENDEVCO	20-Nov-2020
Vehicle Center of Gravity Angular Rate (deg/sec)	X	ARS6383	DTS	6-Jul-2020
	Y	ARS6461	DTS	6-Jul-2020
	Z	ARS6463	DTS	6-Jul-2020
Left Floor Sill (g)	Y	T16723	ENDEVCO	27-Aug-2020
Left A-Pillar Sill (g)	Y	T23795	ENDEVCO	17-Sep-2020
Left Lower A-Pillar (g)	Y	T23852	ENDEVCO	17-Sep-2020
Left Mid A-Pillar (g)	Y	P57192	ENDEVCO	27-Aug-2020
Left B-Pillar Sill (g)	Y	T23776	ENDEVCO	15-Sep-2020
Left Lower B-Pillar (g)	Y	T23855	ENDEVCO	23-Oct-2020
Left Mid B-Pillar (g)	Y	T23862	ENDEVCO	15-Sep-2020
Driver Seat Track at Dummy H-Point (g)	Y	T23778	ENDEVCO	24-Sep-2020
Engine Top (g)	X	P44288	ENDEVCO	23-Jun-2020
	Y	T11449	ENDEVCO	23-Jun-2020
Firewall Center (g)	Y	T16771	ENDEVCO	27-Aug-2020
Right Roof at Vertical Impact Reference Line (g)	Y	T16780	ENDEVCO	27-Aug-2020
Right Sill at Vertical Impact Reference Line (g)	X	P75115	ENDEVCO	20-Nov-2020
	Y	P33547	ENDEVCO	20-Nov-2020
	Z	P94567	ENDEVCO	20-Nov-2020
Right Sill at Rear Seat Acceleration (g)	X	T23807	ENDEVCO	15-Sep-2020
	Y	T23837	ENDEVCO	15-Sep-2020
	Z	T23797	ENDEVCO	11-Sep-2020
Rear Floorpan Behind Rear Axle at Centerline (g)	X	T23832	ENDEVCO	29-Sep-2020
Rear Floorpan Behind Rear Axle at Centerline (g)	Y	T23813	ENDEVCO	11-Sep-2020
Left Front Door Mid Centerline (g)	Y	P76114	ENDEVCO	20-Nov-2020
Left Front Door Mid Rear (g)	Y	P75713	ENDEVCO	20-Nov-2020
Left Front Door Upper Centerline (g)	Y	P76171	ENDEVCO	20-Nov-2020
Left Rear Door Mid Rear (g)	Y	T11841	ENDEVCO	20-Nov-2020
Left Rear Door Upper Centerline (g)	Y	T11815	ENDEVCO	20-Nov-2020
Rear Deck (g)	X	T23777	ENDEVCO	15-Sep-2020
	Y	T23815	ENDEVCO	11-Sep-2020
	Z	T23789	ENDEVCO	15-Sep-2020
Rear Deck Angular Rate (deg/sec)	X	ARS8001	DTS	6-Jul-2020
	Y	ARS8290	DTS	6-Jul-2020
	Z	ARS9185	DTS	6-Jul-2020

**TABLE 3 – POLE INSTRUMENTATION**

<b>Pole Instrumentation</b>	<b>Serial Number</b>	<b>Manufacturer</b>	<b>Calibration Date</b>
Pole Load Cell 1	DK7091S	Humanetics	12-Nov-2020
Pole Load Cell 2	DK7120S	Humanetics	12-Nov-2020
Pole Load Cell 3	DK7118S	Humanetics	12-Nov-2020
Pole Load Cell 4	DK7124S	Humanetics	12-Nov-2020
Pole Load Cell 5	DK7111S	Humanetics	12-Nov-2020
Pole Load Cell 6	DK7126S	Humanetics	12-Nov-2020
Pole Load Cell 7	DK7112S	Humanetics	12-Nov-2020
Pole Load Cell 8	DK7074S	Humanetics	12-Nov-2020

Sign Convention  
SAE J211 MAR95

Accelerometers:  
+X: Forward  
+Y: Rightward  
+Z: Downward

Potentiometers:  
+Chest longitudinal deflection: Outward  
+Chest lateral deflection: Rightward  
+Seat belt displacement: Outward  
+Seat belt extension: Elongation  
+Knee slider displacement: Distance between femur and tibia increased (in relation to a seated dummy)

Rotation potentiometers:  
+About the X-axis: Left foot-eversion  
Right foot-inversion  
+About the Y-axis: Left/right foot-dorsiflexion  
+About the Z-axis: Left foot-internal  
Right foot-external

Load cells:  
+Femur force: Tension  
+Seat belt force: Tension  
+Barrier force: Tension

Neck load cells:  
+X force: Head pushed rearward  
+Y force: Head pushed leftward  
+Z force: Head pulled upward (tension on neck)  
+X moment: Left ear rotating toward left shoulder  
+Y moment: Chin rotating toward chest  
+Z moment: Chin rotating toward left shoulder

Tibia load cells:  
+X force: Ankle forward, knee rearward  
+Y force: Ankle rightward, knee leftward  
+Z force: Tension  
+X moment: Bottom of tibia moving leftward  
+Y moment: Bottom of tibia moving rearward

Sign Convention (Continued)  
SAE J211 MAR95

<u>Lumbar load cells:</u>	+X force:	Chest rearward, pelvis forward
	+Y force:	Chest leftward, pelvis rightward
	+Z force:	Chest upward, pelvis downward
	+X moment:	Left shoulder toward left hip
	+Y moment:	Sternum toward front of legs
	+Z moment:	Right shoulder forward, left shoulder rearward

Frequency Response Classes  
SAE J211 MAR95

<u>Typical Test Measurements</u>	<u>Channel Class</u>
Vehicle Structural Accelerations for use in:	
Total vehicle comparison	60
Collision simulation input	60
Component analysis	600
Integration for velocity or displacement	180
Barrier Face Forces	60
Belt Restraint System Loads	60
Anthropomorphic Test Device	
Head accelerations (linear and angular)	1000
Neck	
Forces	1000
Moments	600
Thorax	
Spine accelerations	180
Rib accelerations	1000
Sternum accelerations	1000
Deflections	600
Lumbar	
Forces	1000
Moments	1000
Pelvis	
Accelerations	1000
Forces	1000
Moments	1000
Femur/Knee/Tibia/Ankle	
Forces	600
Moments	600
Displacements	180
Sled Accelerations	60
Steering Column Loads	600
Head Form Accelerations	1000

Channel Number	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
1	11HEADCG00WSACXP	Driver Head Acceleration (X)	1000	+	yes	2000
2	11HEADCG00WSACYP	Driver Head Acceleration (Y)	1000	+	yes	2000
3	11HEADCG00WSACZP	Driver Head Acceleration (Z)	1000	+	yes	2000
3A	11HEADCG00WSACRP	Driver Head Acceleration Resultant	1000			
4	11HEADCG00WSAVXP	Driver Head Angular Rate (X)	1000	+	yes	8000
5	11HEADCG00WSAVYP	Driver Head Angular Rate (Y)	1000	+	yes	8000
6	11HEADCG00WSAVZP	Driver Head Angular Rate (Z)	1000	+	yes	8000
7	11NECKUP00WSFOXP	Driver Upper Neck Force (X)	1000	+	yes	10000
8	11NECKUP00WSFOYP	Driver Upper Neck Force (Y)	1000	+	yes	10000
9	11NECKUP00WSFOZP	Driver Upper Neck Force (Z)	1000	+	yes	12000
10	11NECKUP00WSMOXP	Driver Upper Neck Moment (X)	600	+	yes	300
11	11NECKUP00WSMOYP	Driver Upper Neck Moment (Y)	600	+	yes	300
12	11NECKUP00WSMOZP	Driver Upper Neck Moment (Z)	600	+	yes	200
13	11NECKLO00WSFOXP	Driver Lower Neck Force (X)	1000	+	yes	10000
14	11NECKLO00WSFOYP	Driver Lower Neck Force (Y)	1000	+	yes	10000
15	11NECKLO00WSFOZP	Driver Lower Neck Force (Z)	1000	+	yes	12000
16	11NECKLO00WSMOXP	Driver Lower Neck Moment (X)	600	+	yes	300
17	11NECKLO00WSMOYP	Driver Lower Neck Moment (Y)	600	+	yes	300
18	11NECKLO00WSMOZP	Driver Lower Neck Moment (Z)	600	+	yes	200
19	11SHLDLE00WSFOXP	Driver Shoulder Force (X)	600	+	yes	5000
20	11SHLDLE00WSFOYP	Driver Shoulder Force (Y)	600	+	yes	10000
21	11SHLDLE00WSFOZP	Driver Shoulder Force (Z)	600	+	yes	5000
22	11SHRI01REWSDSX0	Driver Shoulder Rear Displacement (X)	0	+	no	60
23	11SHRI01REWSDSY0	Driver Shoulder Rear Displacement (Y)	0	+	no	60
24	11SHRI01REWSDSZ0	Driver Shoulder Rear Displacement (Z)	0	+	no	60
25	11SHRI01REWSDSLB	Driver Shoulder Rear Length Change	600	+	no	60
26	11SHRI01MIWSDSX0	Driver Shoulder Middle Displacement (X)	0	+	no	60
27	11SHRI01MIWSDSY0	Driver Shoulder Middle Displacement (Y)	0	+	no	60
28	11SHRI01MIWSDSZ0	Driver Shoulder Middle Displacement (Z)	0	+	no	60
29	11SHRI01MIWSDSLB	Driver Shoulder Middle Length Change	600	+	no	60
30	11SHRI01FRWSDSX0	Driver Shoulder Front Displacement (X)	0	+	no	60
31	11SHRI01FRWSDSY0	Driver Shoulder Front Displacement (Y)	0	+	no	60
32	11SHRI01FRWSDSZ0	Driver Shoulder Front Displacement (Z)	0	+	no	60
33	11SHRI01FRWSDSLB	Driver Shoulder Front Length Change	600	+	no	60

Channel Number	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
34	11TRRI01REWSDSX0	Driver Thorax Rib 1 Rear Displacement (X)	0	+	no	60
35	11TRRI01REWSDSY0	Driver Thorax Rib 1 Rear Displacement (Y)	0	+	no	60
36	11TRRI01REWSDSZ0	Driver Thorax Rib 1 Rear Displacement (Z)	0	+	no	60
37	11TRRI01REWSDSLB	Driver Thorax Rib 1 Rear Length Change	600	+	no	60
38	11TRRI01MIWSDSX0	Driver Thorax Rib 1 Middle Displacement (X)	0	+	no	60
39	11TRRI01MIWSDSY0	Driver Thorax Rib 1 Middle Displacement (Y)	0	+	no	60
40	11TRRI01MIWSDSZ0	Driver Thorax Rib 1 Middle Displacement (Z)	0	+	no	60
41	11TRRI01MIWSDSLB	Driver Thorax Rib 1 Middle Length Change	600	+	no	60
42	11TRRI01FRWSDSX0	Driver Thorax Rib 1 Front Displacement (X)	0	+	no	60
43	11TRRI01FRWSDSY0	Driver Thorax Rib 1 Front Displacement (Y)	0	+	no	60
44	11TRRI01FRWSDSZ0	Driver Thorax Rib 1 Front Displacement (Z)	0	+	no	60
45	11TRRI01FRWSDSLB	Driver Thorax Rib 1 Front Length Change	600	+	no	60
46	11TRRI02REWSDSX0	Driver Thorax Rib 2 Rear Displacement (X)	0	+	no	60
47	11TRRI02REWSDSY0	Driver Thorax Rib 2 Rear Displacement (Y)	0	+	no	60
48	11TRRI02REWSDSZ0	Driver Thorax Rib 2 Rear Displacement (Z)	0	+	no	60
49	11TRRI02REWSDSLB	Driver Thorax Rib 2 Rear Length Change	600	+	no	60
50	11TRRI02MIWSDSX0	Driver Thorax Rib 2 Middle Displacement (X)	0	+	no	60
51	11TRRI02MIWSDSY0	Driver Thorax Rib 2 Middle Displacement (Y)	0	+	no	60
52	11TRRI02MIWSDSZ0	Driver Thorax Rib 2 Middle Displacement (Z)	0	+	no	60
53	11TRRI02MIWSDSLB	Driver Thorax Rib 2 Middle Length Change	600	+	no	60
54	11TRRI02FRWSDSX0	Driver Thorax Rib 2 Front Displacement (X)	0	+	no	60
55	11TRRI02FRWSDSY0	Driver Thorax Rib 2 Front Displacement (Y)	0	+	no	60
56	11TRRI02FRWSDSZ0	Driver Thorax Rib 2 Front Displacement (Z)	0	+	no	60
57	11TRRI02FRWSDSLB	Driver Thorax Rib 2 Front Length Change	600	+	no	60

Channel Number	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
58	11TRRI03REWSDSX0	Driver Thorax Rib 3 Rear Displacement (X)	0	+	no	60
59	11TRRI03REWSDSY0	Driver Thorax Rib 3 Rear Displacement (Y)	0	+	no	60
60	11TRRI03REWSDSZ0	Driver Thorax Rib 3 Rear Displacement (Z)	0	+	no	60
61	11TRRI03REWSDSLB	Driver Thorax Rib 3 Rear Length Change	600	+	no	60
62	11TRRI03MIWSDSX0	Driver Thorax Rib 3 Middle Displacement (X)	0	+	no	60
63	11TRRI03MIWSDSY0	Driver Thorax Rib 3 Middle Displacement (Y)	0	+	no	60
64	11TRRI03MIWSDSZ0	Driver Thorax Rib 3 Middle Displacement (Z)	0	+	no	60
65	11TRRI03MIWSDSLB	Driver Thorax Rib 3 Middle Length Change	600	+	no	60
66	11TRRI03FRWSDSX0	Driver Thorax Rib 3 Front Displacement (X)	0	+	no	60
67	11TRRI03FRWSDSY0	Driver Thorax Rib 3 Front Displacement (Y)	0	+	no	60
68	11TRRI03FRWSDSZ0	Driver Thorax Rib 3 Front Displacement (Z)	0	+	no	60
69	11TRRI03FRWSDSLB	Driver Thorax Rib 3 Front Length Change	600	+	no	60
70	11ABRI01REWSDSX0	Driver Abdomen Rib 1 Rear Displacement (X)	0	+	no	60
71	11ABRI01REWSDSY0	Driver Abdomen Rib 1 Rear Displacement (Y)	0	+	no	60
72	11ABRI01REWSDSZ0	Driver Abdomen Rib 1 Rear Displacement (Z)	0	+	no	60
73	11ABRI01REWSDSLB	Driver Abdomen Rib 1 Rear Length Change	600	+	no	60
74	11ABRI01MIWSDSX0	Driver Abdomen Rib 1 Middle Displacement (X)	0	+	no	60
75	11ABRI01MIWSDSY0	Driver Abdomen Rib 1 Middle Displacement (Y)	0	+	no	60
76	11ABRI01MIWSDSZ0	Driver Abdomen Rib 1 Middle Displacement (Z)	0	+	no	60
77	11ABRI01MIWSDSLB	Driver Abdomen Rib 1 Middle Length Change	600	+	no	60
78	11ABRI01FRWSDSX0	Driver Abdomen Rib 1 Front Displacement (X)	0	+	no	60
79	11ABRI01FRWSDSY0	Driver Abdomen Rib 1 Front Displacement (Y)	0	+	no	60
80	11ABRI01FRWSDSZ0	Driver Abdomen Rib 1 Front Displacement (Z)	0	+	no	60
81	11ABRI01FRWSDSLB	Driver Abdomen Rib 1 Front Length Change	600	+	no	60

Channel Number	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
82	11ABRI02REWSDSX0	Driver Abdomen Rib 2 Rear Displacement (X)	0	+	no	60
83	11ABRI02REWSDSY0	Driver Abdomen Rib 2 Rear Displacement (Y)	0	+	no	60
84	11ABRI02REWSDSZ0	Driver Abdomen Rib 2 Rear Displacement (Z)	0	+	no	60
85	11ABRI02REWSDSLB	Driver Abdomen Rib 2 Rear Length Change	600	+	no	60
86	11ABRI02MIWSDSX0	Driver Abdomen Rib 2 Middle Displacement (X)	0	+	no	60
87	11ABRI02MIWSDSY0	Driver Abdomen Rib 2 Middle Displacement (Y)	0	+	no	60
88	11ABRI02MIWSDSZ0	Driver Abdomen Rib 2 Middle Displacement (Z)	0	+	no	60
89	11ABRI02MIWSDSLB	Driver Abdomen Rib 2 Middle Length Change	600	+	no	60
90	11ABRI02FRWSDSX0	Driver Abdomen Rib 2 Front Displacement (X)	0	+	no	60
91	11ABRI02FRWSDSY0	Driver Abdomen Rib 2 Front Displacement (Y)	0	+	no	60
92	11ABRI02FRWSDSZ0	Driver Abdomen Rib 2 Front Displacement (Z)	0	+	no	60
93	11ABRI02FRWSDSLB	Driver Abdomen Rib 2 Front Length Change	600	+	no	60
94	11THSP0100WSACXP	Driver Spine T1 Acceleration (X)	180	+	yes	2000
95	11THSP0100WSACYP	Driver Spine T1 Acceleration (Y)	180	+	yes	2000
96	11THSP0100WSACZP	Driver Spine T1 Acceleration (Z)	180	+	yes	2000
96A	11THSP0100WSACRP	Driver Spine T1 Acceleration Resultant	180			
97	11THSP0400WSACXP	Driver Spine T4 Acceleration (X)	180	+	yes	2000
98	11THSP0400WSACYP	Driver Spine T4 Acceleration (Y)	180	+	yes	2000
99	11THSP0400WSACZP	Driver Spine T4 Acceleration (Z)	180	+	yes	2000
99A	11THSP0400WSACRP	Driver Spine T4 Acceleration Resultant	180			
100	11THSP1200WSACXP	Driver Spine T12 Acceleration (X)	180	+	yes	2000
101	11THSP1200WSACYP	Driver Spine T12 Acceleration (Y)	180	+	yes	2000
102	11THSP1200WSACZP	Driver Spine T12 Acceleration (Z)	180	+	yes	2000
102A	11THSP1200WSACRP	Driver Spine T12 Acceleration Resultant	180			
103	11PUBC0000WSFOYP	Driver Pubic Symphysis Force (Y)	600	+	yes	12000
104	11SACRLE00WSFOXP	Driver Sacro-iliac Left Force (X)	600	+	yes	6000
105	11SACRLE00WSFOYP	Driver Sacro-iliac Left Force (Y)	600	+	yes	12000
106	11SACRLE00WSFOZP	Driver Sacro-iliac Left Force (Z)	600	+	yes	6000
107	11SACRLE00WSMOXP	Driver Sacro-iliac Left Moment (X)	600	+	yes	800
108	11SACRLE00WSMOYP	Driver Sacro-iliac Left Moment (Y)	600	+	yes	400
109	11SACRLE00WSMOZP	Driver Sacro-iliac Left Moment (Z)	600	+	yes	400

Channel Number	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
110	11SACRRI00WSFOXP	Driver Sacro-iliac Right Force (X)	600	+	yes	6000
111	11SACRRI00WSFOYP	Driver Sacro-iliac Right Force (Y)	600	+	yes	12000
112	11SACRRI00WSFOZP	Driver Sacro-iliac Right Force (Z)	600	+	yes	6000
113	11SACRRI00WSMOXP	Driver Sacro-iliac Right Moment (X)	600	+	yes	800
114	11SACRRI00WSMOYP	Driver Sacro-iliac Right Moment (Y)	600	+	yes	400
115	11SACRRI00WSMOZP	Driver Sacro-iliac Right Moment (Z)	600	+	yes	400
116	11LUSP0000WSFOXP	Driver Lumbar Force (X)	600	+	yes	10000
117	11LUSP0000WSFOYP	Driver Lumbar Force (Y)	600	+	yes	10000
118	11LUSP0000WSFOZP	Driver Lumbar Force (Z)	600	+	yes	12000
119	11LUSP0000WSMOXP	Driver Lumbar Moment (X)	600	+	yes	300
120	11LUSP0000WSMOYP	Driver Lumbar Moment (Y)	600	+	yes	300
121	11LUSP0000WSMOZP	Driver Lumbar Moment (Z)	600	+	yes	200
122	11PELV0000WSACXP	Driver Pelvic Acceleration (X)	1000	+	yes	2000
123	11PELV0000WSACYP	Driver Pelvic Acceleration (Y)	1000	+	yes	2000
124	11PELV0000WSACZP	Driver Pelvic Acceleration (Z)	1000	+	yes	2000
124A	11PELV0000WSACRP	Driver Pelvic Acceleration Resultant	1000			
125	11FEMRLE00WSFOXP	Driver Left Femur Force (X)	600	+	yes	15000
126	11FEMRLE00WSFOYP	Driver Left Femur Force (Y)	600	+	yes	15000
127	11FEMRLE00WSFOZP	Driver Left Femur Force (Z)	600	+	yes	15000
128	11FEMRLE00WSMOXP	Driver Left Femur Moment (X)	600	+	yes	350
129	11FEMRLE00WSMOYP	Driver Left Femur Moment (Y)	600	+	yes	200
130	11FEMRLE00WSMOZP	Driver Left Femur Moment (Z)	600	+	yes	350
131	11FEACLE00WSFOXP	Driver Femoral Neck Force (X)	600	+	yes	10000
132	11FEACLE00WSFOYP	Driver Femoral Neck Force (Y)	600	+	yes	25000
133	11FEACLE00WSFOZP	Driver Femoral Neck Force (Z)	600	+	yes	10000
134	11KNEELE0UWSFOYP	Driver Left Outer Knee Force (Y)	600	+	yes	20000
135	11KNEELEINWSFOYP	Driver Left Inner Knee Force (Y)	600	+	yes	20000
136	11VEHCCG0000ACXA	Vehicle Center of Gravity Acceleration (X)	60	+	yes	2000
137	11VEHCCG0000ACYA	Vehicle Center of Gravity Acceleration (Y)	60	+	yes	2000
138	11VEHCCG0000ACZA	Vehicle Center of Gravity Acceleration (Z)	60	+	yes	2000
138A	11VEHCCG0000ACRA	Vehicle Center of Gravity Acceleration Resultant	60			
139	11VEHCCG0000AVXA	Vehicle Center of Gravity Angular Rate (X)	60	+	yes	8000
140	11VEHCCG0000AVYA	Vehicle Center of Gravity Angular Rate (Y)	60	+	yes	1500
141	11VEHCCG0000AVZA	Vehicle Center of Gravity Angular Rate (Z)	60	+	yes	8000
142	11VEHC00LO00ACYA	Left Floor Sill Acceleration (Y)	60	+	yes	2000
143	11APIL000000ACYA	Left A-Pillar Sill Acceleration (Y)	60	+	yes	2000
144	11APILLO0000ACYA	Left Lower A-Pillar Acceleration (Y)	60	+	yes	2000
145	11APILMI0000ACYA	Left Mid A-Pillar Acceleration (Y)	60	+	yes	2000

Channel Number	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
146	11BPIL000000ACYA	Left B-Pillar Sill Acceleration (Y)	60	+	yes	2000
147	11BPILLO0000ACYA	Left Lower B-Pillar Acceleration (Y)	60	+	yes	2000
148	11BPILMI0000ACYA	Left Mid B-Pillar Acceleration (Y)	60	+	yes	2000
149	11SETR000000ACYA	Driver Seat Track at Dummy H-Point Acceleration (Y)	60	+	yes	2000
150	11ENGNTTP0000ACXA	Engine Top Acceleration (X)	60	+	yes	2000
151	11ENGNTTP0000ACYA	Engine Top Acceleration (Y)	60	+	yes	2000
152	12FIRCX000000ACYA	Firewall Center Acceleration (Y)	60	+	yes	2000
153	13ROFR000000ACYA	Right Roof at Vertical Impact Reference Line Acceleration (Y)	60	+	yes	2000
154	13SILB000000ACXA	Right Sill at Vertical Impact Reference Line Acceleration (X)	60	+	yes	2000
155	13SILB000000ACYA	Right Sill at Vertical Impact Reference Line Acceleration (Y)	60	+	yes	2000
156	13SILB000000ACZA	Right Sill at Vertical Impact Reference Line Acceleration (Z)	60	+	yes	2000
156A	13SILB000000ACRA	Right Sill at Vertical Impact Reference Line Acceleration Resultant	60			
157	16SILB000000ACXA	Right Sill at Rear Seat Acceleration (X)	60	+	yes	2000
158	16SILB000000ACYA	Right Sill at Rear Seat Acceleration (Y)	60	+	yes	2000
159	16SILB000000ACZA	Right Sill at Rear Seat Acceleration (Z)	60	+	yes	2000
159A	16SILB000000ACRA	Right Sill at Rear Seat Acceleration Resultant	60			
160	11FORA000000ACXA	Rear Floorpan Behind Rear Axle at Centerline Acceleration (X)	60	+	yes	2000
161	11FORA000000ACYA	Rear Floorpan Behind Rear Axle at Centerline Acceleration (Y)	60	+	yes	2000
162	11DOORMIMI71ACYA	Left Front Door Mid Centerline Acceleration (Y)	60	+	yes	2000
163	11DOORMIRE71ACYA	Left Front Door Mid Rear Acceleration (Y)	60	+	yes	2000
164	11DOORMIUP71ACYA	Left Front Door Upper Centerline Acceleration (Y)	60	+	yes	2000
165	14DOORMIRE71ACYA	Left Rear Door Mid Rear Acceleration (Y)	60	+	yes	2000
166	14DOORMIUP71ACYA	Left Rear Door Upper Centerline Acceleration (Y)	60	+	yes	2000
167	10FORARD0000ACXA	Rear Deck Acceleration (X)	60	+	yes	2000
168	10FORARD0000ACYA	Rear Deck Acceleration (Y)	60	+	yes	2000
169	10FORARD0000ACZA	Rear Deck Acceleration (Z)	60	+	yes	2000
169A	10FORARD0000ACRA	Rear Deck Acceleration Resultant	60			
170	10FORARD0000AVXA	Rear Deck Angular Rate (X)	60	+	yes	8000
171	10FORARD0000AVYA	Rear Deck Angular Rate (Y)	60	+	yes	8000
172	10FORARD0000AVZA	Rear Deck Angular Rate (Z)	60	+	yes	8000

Channel Number	ISO mnemonic	Channel Title	Filter Class	Flip	Zero	Full Scale
173	11HEADCONT00VO00	Driver Head Contact	0	+	no	1
174	11SHOUCONT00VO00	Driver Shoulder Contact	0	+	no	1
175	11THORCONT00VO00	Driver Thorax Contact	0	+	no	1
176	11PELVCONT00VO00	Driver Pelvis Contact	0	+	no	1
177	K0FBAR010000FOXA	POLE LOAD CELL 1	60	+	yes	400000
178	K0FBAR020000FOXA	POLE LOAD CELL 2	60	+	yes	400000
179	K0FBAR030000FOXA	POLE LOAD CELL 3	60	+	yes	400000
180	K0FBAR040000FOXA	POLE LOAD CELL 4	60	+	yes	400000
181	K0FBAR050000FOXA	POLE LOAD CELL 5	60	+	yes	400000
182	K0FBAR060000FOXA	POLE LOAD CELL 6	60	+	yes	400000
183	K0FBAR070000FOXA	POLE LOAD CELL 7	60	+	yes	400000
184	K0FBAR080000FOXA	POLE LOAD CELL 8	60	+	yes	400000

**APPENDIX E**  
**SEATING PROCEDURE WORKSHEETS AND PLOTS**

## Driver WSID 50th Seating Worksheet

<b>Vehicle</b>	2020 Hyundai Veloster Hatchback	<b>Technician</b>	Postle & Xu
<b>VIN #</b>	KMHTG6AFXLU026869	<b>Position</b>	Driver
<b>ATD</b>	EB8888	<b>Date</b>	1/14/2021
<b>Test #</b>	210114		

<b>SCRL Angle</b>	Max	19.2	<b>WSID 50th Tilt Sensors</b>		<b>X</b>	<b>Y</b>	
	Min -	16.1		Head	0°±2	1.0	-2.1
	Difference	3.1					
	/2	1.55		T6	0°±2	1.6	-0.2
	Min +	1.55					
	Mid Angle	17.65		Pelvis	0°±2	0.4	2.2

<b>Seat Back Angle</b>	W/Level °	19.0	<b>HEAD REST POST</b>	
<b>Seat Pan Angle</b>	W/Level °	16.2	<b>ANGLE</b>	4.5
			<b>FINAL HEAD REST POST ANGLE</b>	4.5

<b>Pelvis Angle</b>	WSID 50th 0° +/-2.5°	Manual Inclinometer	41.1	Tilt Sensor	
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Collected Points			
Name	Meas X	Meas Y	Meas Z
SBU -	-33.772	2.303	-11.402
SBL -	-28.946	0.395	19.780
STRIKER -	0.000	0.000	0.000
FOSB -	695.135	192.959	459.878
FISB -	693.388	622.735	460.001
ROSB -	256.112	192.703	492.874
RISB -	256.983	623.395	492.155
PCP - (Pedal Center Point)	1308.208	605.365	320.017
RHP - (Right Heel Point)	1162.873	605.029	460.417
LHP - (Left Heel Point)	1162.961	240.779	464.928
SO -	753.825	424.540	-138.880
TS -	825.942	424.485	-305.572
BS -	693.470	422.528	10.906
SC1 -	984.322	324.151	-27.817
OSCAR H-POINT -	425.050	226.158	249.494
DR PROJECTED WSID H-POINT AT MID-POSITION -	445.000	180.323	229.000
DRIVER STP 15.27 MID-POSITION -	446.669	180.323	313.621
DRIVER STP STEP 18.6 TRIAL 1 -	412.299	199.740	232.343
DR PROJECTED WSID H-POINT STEP 18.6.2 TRIAL 1 -	417.000	179.431	230.000
DRIVER STP STEP 18.6 TRIAL 2 -	446.785	179.431	313.221
DR PROJECTED WSID H-POINT STEP 18.6.2 TRIAL 2 -	444.000	179.431	228.000
DRIVER STP STEP 18.6 TRIAL 3 -	444.000	179.431	228.000
DR PROJECTED WSID H-POINT STEP 18.6.2 TRIAL 3 -	444.000	179.431	228.000
RHDCG -	275.596	506.038	-426.627
3DLHCG -	295.406	351.805	-428.836
LHDCG -	272.354	349.116	-432.374
BON -	368.632	430.251	-430.372
TN -	364.930	429.771	-373.850
TC -	348.980	426.252	-304.628
SHLD R1 -	322.709	426.672	-202.994
THX R1 -	358.797	427.358	-129.059
THX R2 -	394.218	426.416	-63.742
THX R3 -	411.064	425.377	-16.944
ABD R1 -	430.421	430.740	39.496
ABD R2 -	448.539	430.587	85.882
TPS -	483.144	414.797	110.443
C1 -	347.060	422.382	-154.865
C2 -	356.901	424.464	-138.003
C3 -	436.278	428.413	10.364
SHT -			
E1 -	446.622	187.361	-29.308
P1 -	389.677	200.335	182.827
H-POINT -	445.053	199.892	230.546
H-POINT 2 -	444.319	206.667	230.560

OK -	820.855	174.337	93.976
IK -	828.236	641.731	94.529
OA -	1097.460	218.980	299.015
IA -	1156.735	546.414	345.795
OH -	1167.638	226.023	466.418
IH -	1153.761	577.417	461.499
OP -	46.248	343.534	-276.735
R -	369.408	430.355	-594.723
H -	746.863	430.471	-559.524
W1 -	1036.954	429.542	-431.247
W1 - Outside	1054.593	428.659	-431.344
W2 - Outside	1351.156	429.011	-274.487
D1 -	949.213	427.656	-276.018
D2 -	969.333	199.996	22.838
D3 -	952.495	642.645	93.097
HRP -	369.778	228.136	-502.115
HSP -	369.132	102.837	-429.416
ADP -	446.031	48.516	-29.284
HDP -	444.331	90.174	230.527

Calculated Measurements					
Name	Cal X	Cal Y	Cal Z	Cal 3D Distance	Deg
HZ -			164		
HH -				400	
HW -	668				
NR -				466	
CD -				614	
CS -	397				
CBS -	257				
IKD -				124	
OKD -				167	
HR -				214	
HS -		327			
AD -		139			
HD -		110			
HLHL -				352	
KK -				467	
SH -				540	
HRA -					4.5
H-POINT TOOL ANGLE -					40.8
TORSO ANGLE -					14.6
WINDSHIELD ANGLE -					62.1