Final Report Number: NCAP-TRC-20-001

New Car Assessment Program (NCAP)

Frontal Barrier Impact Test

KIA MOTORS CORPORATION

2020 Kia Soul 5-DR SUV

NHTSA Number: M20204212

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

Report Date: April 6, 2020

FINAL REPORT

Prepared For:
U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Standards
1200 New Jersey Ave, SE Room W43-410
Washington, DC 20590

Notice

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Prepared By: ILO Project Operations Group

Approved By: John Shultz

Approval Date: April 6, 2020

FINAL REPORT ACCEPTANCE BY OCWS:

_____

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

Date _____

_____

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

Date _____

Technical Report Documentation Page

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Draft Report of NEW CAR ASSESSMENT PROGRAM Frontal Impact Testing of a 2020 Kia Soul 5-DR SUV NHTSA No. M20204212	April 6, 2020
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9. Performing Organization Name and Address Transportation Research Center Inc. 10820 State Route 347 East Liberty, OH 43319-0367	10. Work Unit No. (TRAIS) 11. Contract or Grant No. 693JJ919D000007
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15. Supplemental Notes

16. Abstract

A 56.0 km/h NCAP Frontal Impact Test was conducted on a 2020 Kia Soul 5-DR SUV, in accordance with the specifications the Office of Crashworthiness Standards Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing. This test was conducted to obtain data related to FMVSS Nos. 208, 212, 219 (partial), and 301 performance. The test was conducted at the Transportation Research Center Inc. in East Liberty, Ohio on October 28, 2019.

The impact velocity was 56.44 km/h, and the ambient temperature at the barrier face at the time of impact was 21.3° C. The target vehicle post-test maximum crush was 480 millimeters at crush zone 3 at left side. The test vehicle's performance is as follows:

	Driver ATD			Passenger ATD		
Measurement Description	Units	Threshold	Result	Units	Threshold	Result
Head Injury Criteria (HIC_{15})	NA	700	253	NA	700	324
Maximum Chest Compression	mm	63	-25.1	mm	52	-16.8
3ms Chest Clip	Gs	60	43.6	Gs	60	52.2
Nij	NA	1	0.26	NA	1	0.39
Neck Tension	Newtons	4170	748.0	Newtons	2620	712.8
Neck Compression	Newtons	4000	-167.0	Newtons	2520	-382.3
Left Femur Force	Newtons	10000	-217.2	Newtons	6800	-1052.9
Right Femur Force	Newtons	10000	-1270.2	Newtons	6800	-684.1

17. Key Words	18. Distribution Statement
56.3 km/h (35 mph) Full Frontal Rigid Barrier Impact Test New Car Assessment Program (NCAP)	Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division 1200 New Jersey Ave, SE Washington, DC 20590

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1: PURPOSE AND SUMMARY OF THE TEST

PURPOSE

This 56 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. 693JJ919D000007. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

This 56 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Test Procedure or NCAP Full Frontal Rigid Barrier Impact Testing dated May 2018.

SUMMARY

A load cell barrier consisting of 288 load cells was impacted by a 2020 Kia Soul 5-DR SUV at a velocity of 56.44 km/h. The test was performed at Transportation Research Center, Inc. on October 28, 2019. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and 16 high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in this report.

One Part 572E 50th percentile male anthropomorphic test device (ATD) was placed in the driver seating position and one Part 572O 5th percentile female ATD was placed in the right-front passenger position according to dummy placement instructions specified in the Laboratory Procedure for NCAP Full Frontal Rigid Barrier Impact Testing.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, femur load cells, and lower leg instrumentation.

The driver (position 1) ATD (Serial No. 037), and the right-front passenger (position 2) ATD (Serial No. EB7513) were qualified prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 102 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100.0 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard solvent leakage (or electrolyte spillage) after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 480 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

The driver's visible contact points were as follows: front airbag, headrest and knee bolster. The passenger's visible contact points were as follows: front airbag, headrest and glove box.

The occupant data is summarized below:

ATD Position	HIC_{15}	Nij	Neck Tension (N)	Neck Compression (N)	3 ms Chest Clip (Gs)	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver (50^{th} Male)	253	0.26	748.0	-167.0	43.6	-25.1	-217.2	-1270.2
Passenger (5^{th} Female)	324	0.39	712.8	-382.3	52.2	-16.8	-1052.9	-684.1

TEST COMMENTS:

Engine Bottom X; Channel failed at 36.0 ms

Driver head ARS X; Channel failed

2.2 REPORT AREA 2: DATA SHEETS

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

TEST VEHICLE INFORMATION

NHTSA No.	M20204212
Model Year	2020
Make	Kia
Model	Soul
Body Style	MPV
VIN	KNDJ23AU5L7071269
Body Color	Mars Orange
Odometer Reading (km/mi)	18 mi
Engine Displacement (L)	2.0
Type/No. Cylinders	Gas/4
Engine Placement	Front/Transverse
Transmission Type	Automatic
Transmission Speeds	CVT
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
Automatic Door Locks (ADLs)	Yes

TEST VEHICLE OPTIONS

Traction Control System (TCS)	Yes
Power Steering	Yes
Power Window Auto-Reverse	No
Driver Frontal 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
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	No
Driver Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other:	No

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

DATA FROM CERTIFICATION LABEL

Manufactured by	KIA MOTORS CORPORATION
Date of Manufacture	05/19

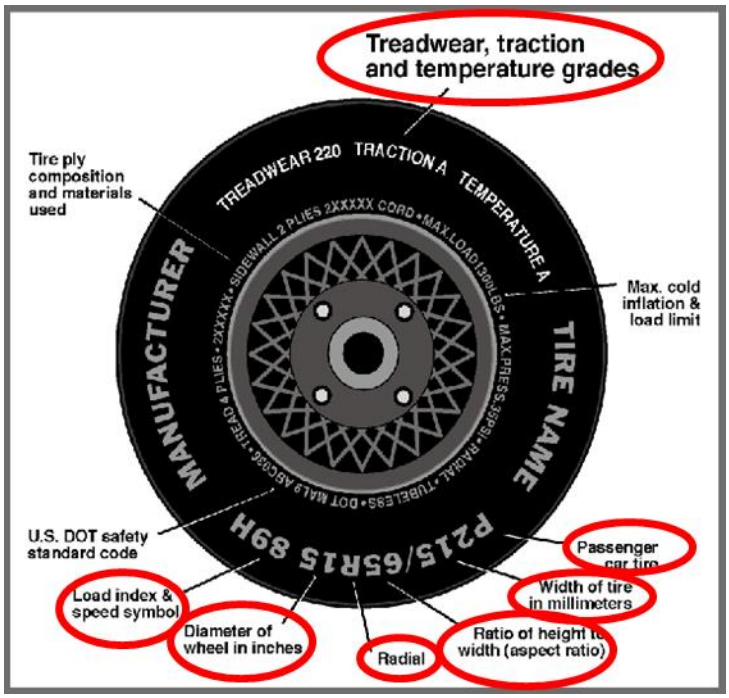
GVWR (LB)	4023
GAWR Front (LB)	2315
GAWR Rear (LB)	2094

VEHICLE SEATING AND WEIGHT CAPACITY

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				390.0
Cargo Wt. (RCLW) (kg)				49.8

DATA SHEET NO. 1 - GENERAL TEST AND VEHICLE PARAMETER DATA (CONT'D)

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold / Test Pressure (kPa)	230	230
Recommended Tire Size	205/60R16	205/60R16
Tire Size on Vehicle	205/60R16	205/60R16
Tire Manufacturer	Hankook	Hankook
Tire Model	Kinergy GT	Kinergy GT
Treadwear	500	500
Traction Grade	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1	1
Tire Plies Body	4	4
Load Index/Speed Symbol	92H	92H
Tire Material	Steel/Polyester/Nylon	Steel/Polyester/Nylon
DOT Safety Code Right	1T79X 1B H0 1919	1T79X 1B H0 1919
DOT Safety Code Left	1T79X 1B H0 2019	1T79X 1B H0 2019

DATA SHEET NO. 1 - GENERAL TEST AND VEHICLE PARAMETER DATA (CONT'D)

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	409.0	256.6		447.6	316.4	
Right	kg	393.8	251.8		418.4	312.6	
Ratio	%	61.2	38.8		57.9	42.1	
Totals	kg	802.8	508.4	1311.2	866.0	629.0	1495.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1311.2
Weight of 1 P572E ATD & 1 P572O ATD	kg	139.3
Rated Cargo/Luggage Weight (RCLW)	kg	49.8
Vehicle Target Weight (TVTW)	kg	1500.3

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front)
As Delivered	mm	715	718	723	723	1008
As Tested	mm	694	702	692	690	1094
Post Test	mm	730	721	686	685	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2600
Total Vehicle Length at Left Side	mm	3920
Total Vehicle Length at Centerline	mm	4170
Total Vehicle Length at Right Side	mm	3920
Weight of Ballast in Cargo Area	kg	0.0
Weight of Vehicle Components Removed	kg	42.0
Amount of Stoddard Solvent in Fuel Tank	liters	50.3

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT: Rear door interior panels, rear door glass and motors, rear door seals, rear speakers, rear wiper and motor, tail lights, rear seat belts, rear fascia and bumper beam, rear hatch interior trim and miscellaneous rear trim parts.

DATA SHEET NO. 1 - GENERAL TEST AND VEHICLE PARAMETER DATA (CONT'D)

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

TARGET VEHICLE STRUCTURAL MEASUREMENT

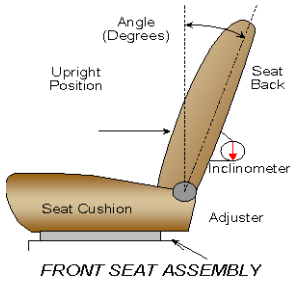
	Elements	Pre-Test (mm)
1	Total Length	4170
2	Total Width	1810
3	Bumper Top Height	550
4	Bumper Bottom Height	430
5	Longitudinal Member Top Height	550
6	Distance Between Longitudinal Members	890
7	Longitudinal Member Width	65
8	Engine Top Height	900
9	Engine Bottom Height	230
10	Engine and Gearbox Width	860
11	Front Bumper-Engine Distance	422
12	Front Shock Absorber Fixing Height	900
13	Bonnet Leading Edge Height	925
14	Front Shock Absorber Fixing Width	1180
15	Front Bumper – Front Axle Distance	840
16	Front Axle – A-Pillar Distance	504
17	A-Pillar – B-Pillar Distance	1035
18	B-Pillar – Rear Axle Distance	1055
19	B-Pillar – C-Pillar Distance	970
20	Roof Sill Bottom Height	1446
21	Roof Sill Top Height	1505
22	Floor Sill Bottom Height	376
23	Floor Sill Top Height	424

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

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

NORMAL DESIGN RIDING POSITION

For adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable



	Degree
Driver Seat back angle:	1.3
Passenger Seat back angle:	1.5

SEAT FORE/AFT POSITIONS

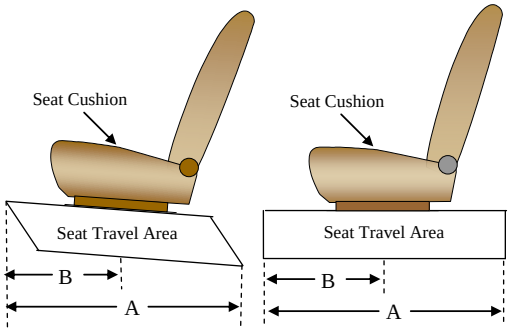
Describe the method of determining seat fore/aft positions.
Driver: Mid position, Positioned according to Form 1
Passenger: Full forward, Positioned according to Form 1

	Total Fore/Aft Travel	Placed in Position No.
Driver Seat	284 mm / 60 detents	142 mm / 24th detent
Passenger Seat	220 mm / 55 detents	0 mm / 1st detent

SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages.
Driver: Uppermost, Positioned according to Form 1
Passenger: Uppermost, Positioned according to Form 1

	Total No. of Positions	Placed in Position No.
Driver Seat	3	1, Uppermost
Passenger Seat	3	1, Uppermost



DATA SHEET NO. 2 - SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA (CONT'D)

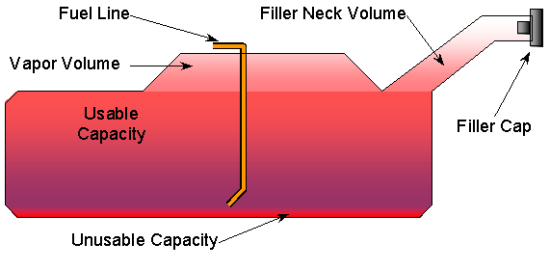
Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	54.0
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	50.3
Actual Amount of Solvent Used	50.3
1/3 of Usable Capacity	18.0

Describe the fuel system - what type of fuel pump, details about how it operates, etc.

Fuel pump will operate when engine system is normally operating

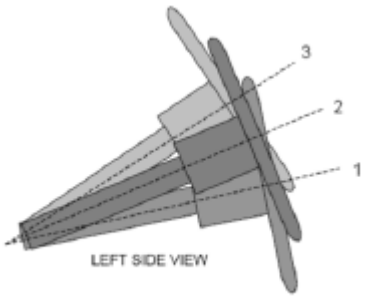


VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. Describe how this measurement was taken.

Steel square was placed across the rim of the steering wheel, an inclinometer was placed on plate and the angle was measured. Telescope travel was measured full in and full out and set at the midpoint.



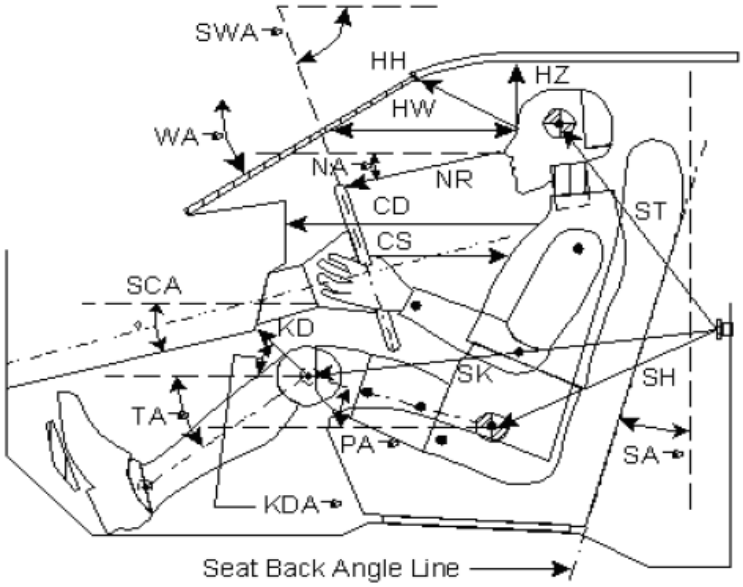
STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

	Degrees	Fore/Aft Position (mm)
Lowermost Position No. 1	24.6	0
Geometric Center Position No. 2	27.0	23
Uppermost Position No. 3	29.3	46
Telescoping Steering Wheel Travel		46
Test Position	27.0	23

DATA SHEET NO. 3 - DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

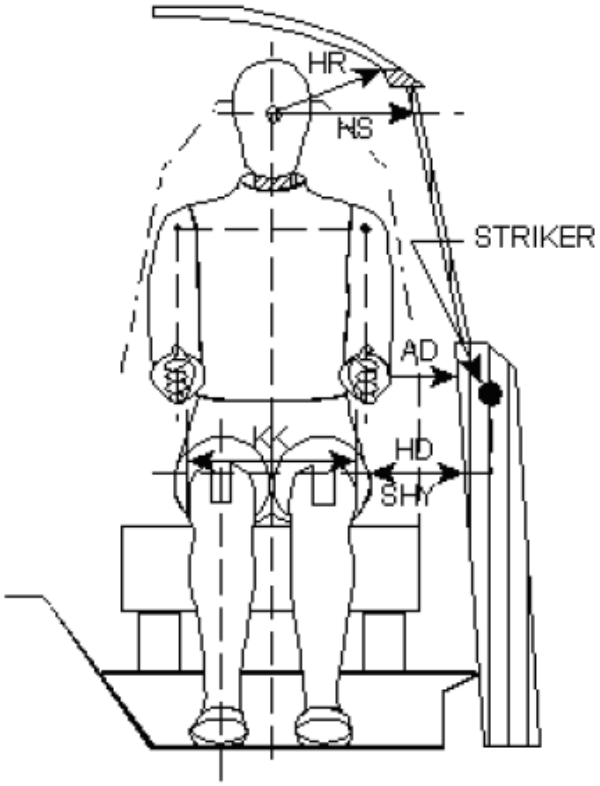
Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019



Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WAº	Windshield Angle		33.5		
SWAº	Steering Wheel Angle		63.0		
SCAº	Steering Column Angle		27.0		
SAº	Seat Back Angle (on head rest post)		1.3		1.5
HZ	Head to Roof (Z)	226		240	
HH	Head to Header	449		430	
HW	Head to Windshield	684		721	
NR	Nose to Rim	418	10.1		
CD	Chest to Dash	547		461	
CS	Chest to Steering Hub	323			
RA	Rim to Abdomen	203			
KDL	Left Knee to Dash	184	16.3	148	31.3
KDR	Right Knee to Dash	178	15.9	153	30.5
PAº	Pelvic Angle		22.9		21.4
TAº	Tibia Angle		46.0		51.3
SK	Striker to Knee	604	11.3	651	16.6
ST	Striker to Head	450	-76.5	381	64.4
SH	Striker to H-Point	315	51.0	376	35.7

DATA SHEET NO. 4 - DUMMY LATERAL CLEARANCE DIMENSIONS

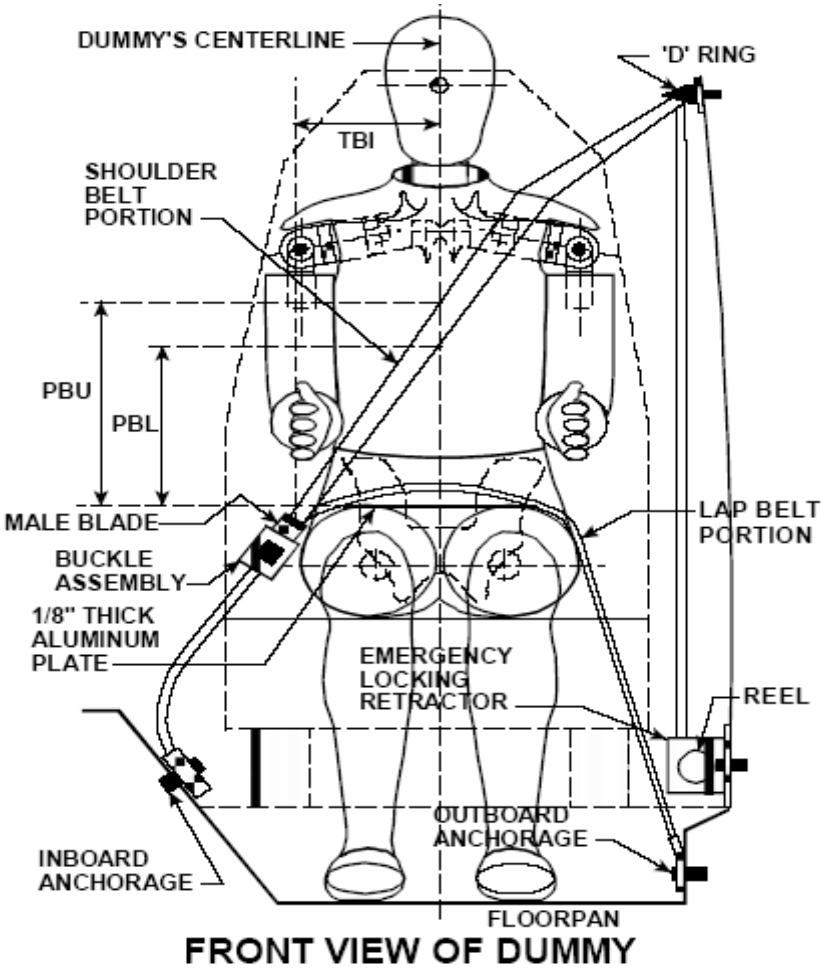
Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019



Code	Measurement Description	Driver	Passenger
AD	Arm to Door	125	93
HD	H-Point to Door	142	193
HR	Head to Side Header	231	300
HS	Head to Side Window	338	380
KK	Knee to Knee	328	170
SHY	Striker to H-Point (Y Direction)	230	271
AA	Ankle to Ankle	320	182

DATA SHEET NO. 5 - SEAT BELT POSITIONING DATA

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU – Top surface of reference to belt upper edge	mm	331	278
PBL – Top surface of reference to belt lower edge	mm	260	200

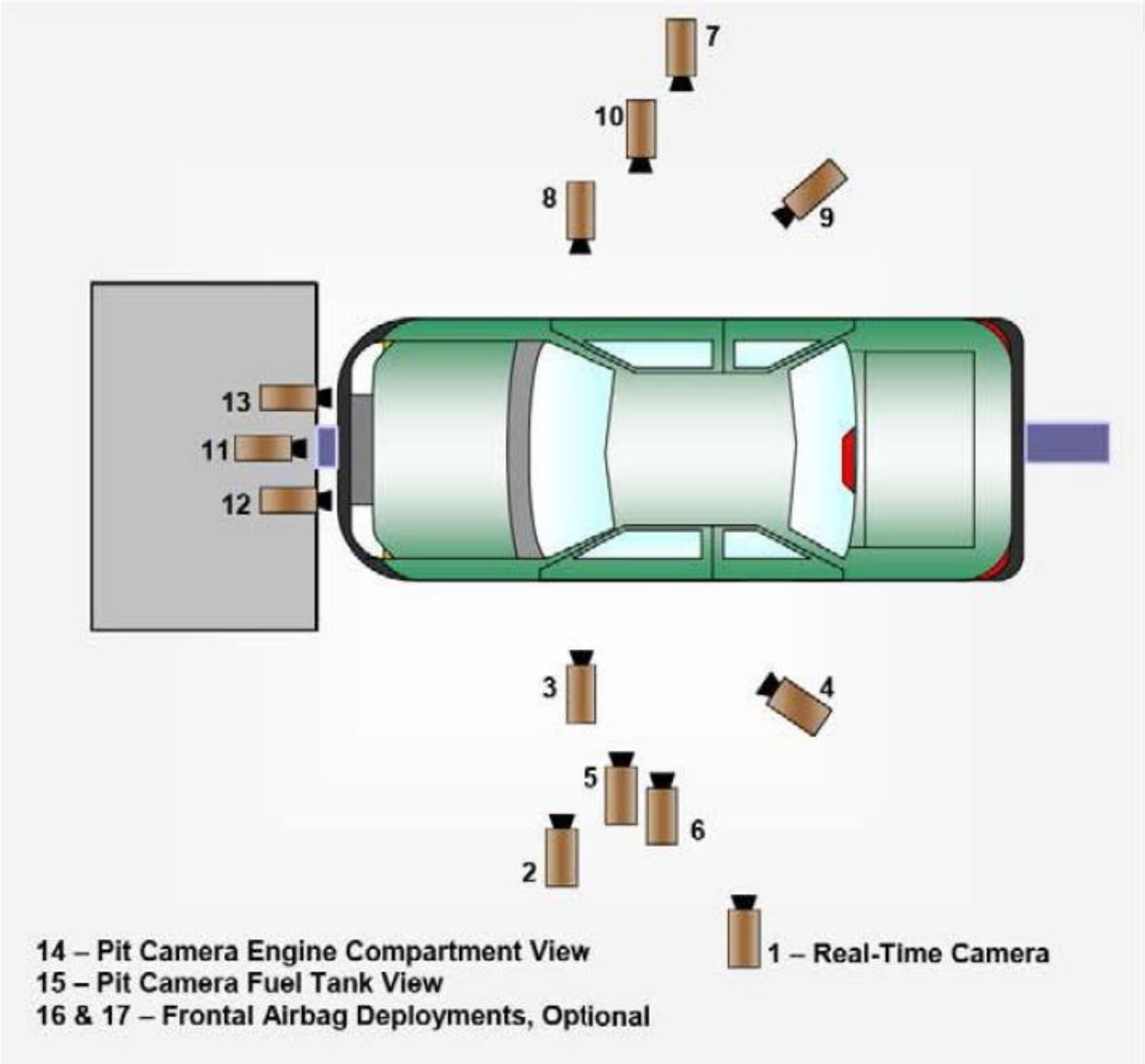
BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	890	932
Lap belt length as measured on ATD	mm	645	940
Remainder of belt on reel	mm	875	718
Total belt length for continuous webbing systems	mm	2410	2590

DATA SHEET NO. 6 - HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 - HIGH SPEED CAMERA LOCATIONS AND DATA (CONT'D)

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

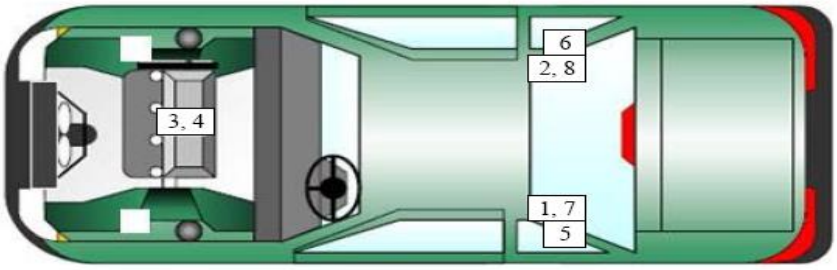
CAMERA LOCATIONS

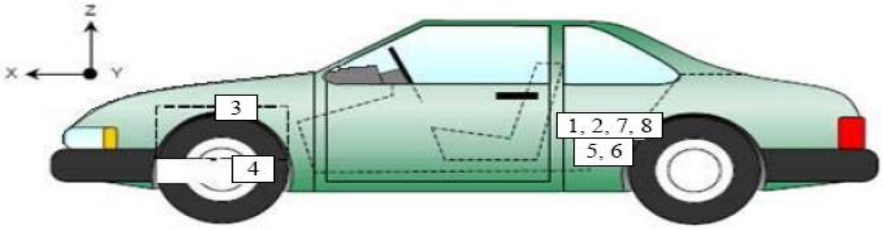
No.	Camera View	Location (mm)			Lens (mm)	Frame Speed (fps)
		X	Y	Z		
1	REAL-TIME LEFT OVERALL	-3378	-6167	-1639	Zoom	30
2	LEFT OVERALL	-2273	-6316	-1833	50	1000
3	DRIVER CLOSE-UP	-1713	-5954	-1622	50	1000
4	LEFT FRONT HALF	-710	-4646	-1376	28	1000
5	LEFT ANGLE	-3592	-2305	-1909	25	1000
6	STEERING COLUMN	-1923	-6115	-1786	20	1000
7	RIGHT OVERALL	-2026	5009	-1742	20	1000
8	PASSENGER CLOSE-UP	-1845	4647	-1514	50	1000
9	RIGHT FRONT HALF	-1431	4474	-1475	25	1000
10	RIGHT ANGLE	-3355	2318	-1957	25	1000
11	WINDSHIELD	0	0	-2588	12.5	1000
12	DRIVER WINDSHIELD	0	-443	-2588	20	1000
13	PASSENGER WINDSHIELD	0	411	-2588	20	1000
14	PIT FRONT	-418	0	3208	28	1000
15	PIT REAR	-2646	0	3156	12.5	1000
16	DRIVER ONBOARD				12.5	1000
17	PASSENGER ONBOARD				12.5	1000

Reference Points: +X – forward of impact plane
+Y – right of monorail center
+Z – into ground

DATA SHEET NO. 7 - VEHICLE ACCELEROMETER DATA

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019





VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1450	-230	-554
2	Right Rear Accelerometer – X Direction	1450	235	-556
3	Engine Top X	3482	-20	-848
4	Engine Bottom X	3420	-140	-283
5	Left Rear Accelerometer – Z Direction	1450	-230	-559
6	Right Rear Accelerometer – Z Direction	1450	235	-560
7	Left Rear Accelerometer – X Direction Redundant	1450	-205	-554
8	Right Rear Accelerometer- X Direction Redundant	1450	210	-556

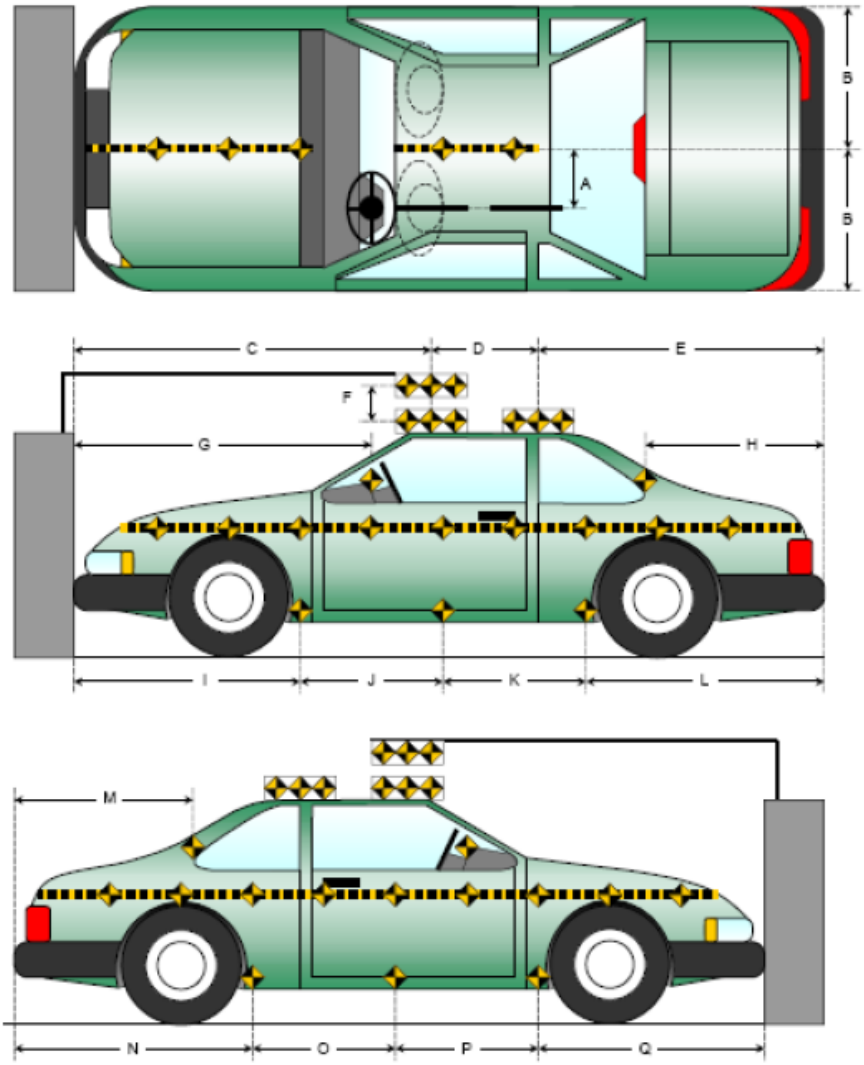
Reference Points: X – Rear Surface of Vehicle (+ forward)
Y – Vehicle Centerline (+ to right)
Z – Ground Plane (+ down)

DATA SHEET NO. 8 - PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

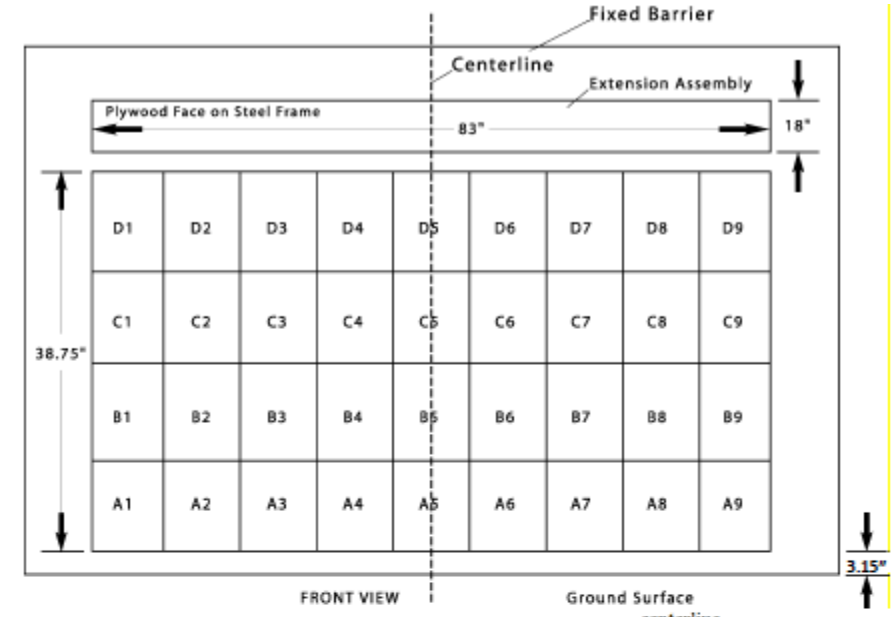
Item	Value
A	380
B	905
C	2200
D	600
E	1400
F	244
G	1571
H	1005
I	1293
J	860
K	850
L	1165
M	1011
N	1175
O	807
P	902
Q	1288

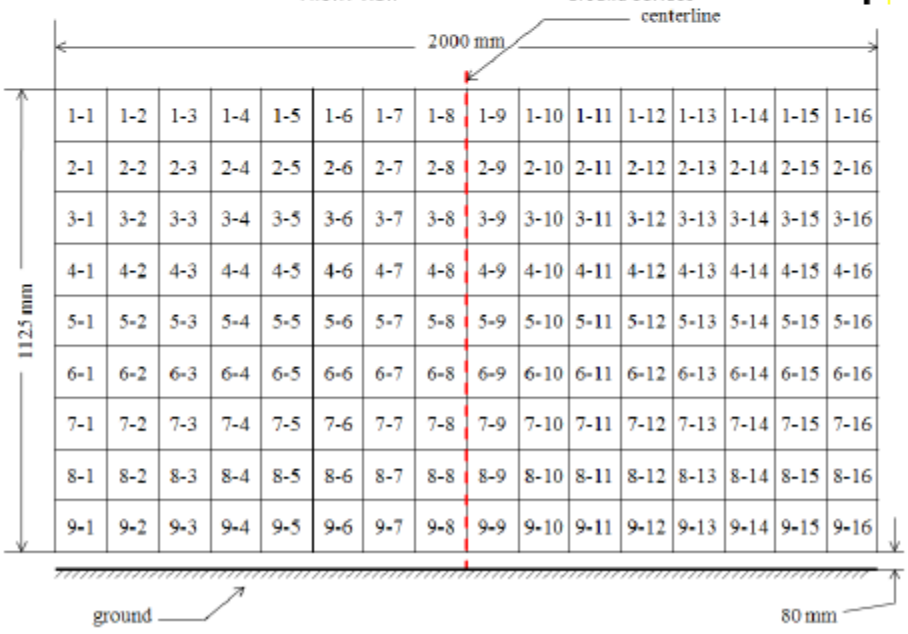
All units in millimeters



DATA SHEET NO. 9 - LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019





DATA SHEET NO. 10 - TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	8
Total	102

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time Panning	2
Total	18

DATA SHEET NO. 11 - POST-TEST OBSERVATIONS

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	Hybrid III 50th / 037	Hybrid III 5th / EB7513
Head Contact	Frontal Airbag and Head Restraint	Frontal Airbag and Head Restraint
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Bolster	Glove Box
Right Knee Contact	Knee Bolster	Glove Box

DOOR OPENING, TRUNK OPENING, AND SEAT TRACK INFORMATION

Description	Driver	Passenger	Other
Locked/Unlocked Doors**	Unlocked	Unlocked	
Front Door Opening**	No	No	
Rear Door Opening**	No	No	
Trunk/Hatch/Tailgate Opening**			No
Seat Track Shift (mm) **	No	No	
Seat Back Movement from Initial Position**	No	No	

**NOTE: Indicate "No", "N/A, or "Yes", and if "Yes", describe

POST- OTHER VEHICLE POST-TEST OBSERVATIONS

Critical Areas of Performance	Observations
Windshield Damage	Slight damage from wiper motor
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

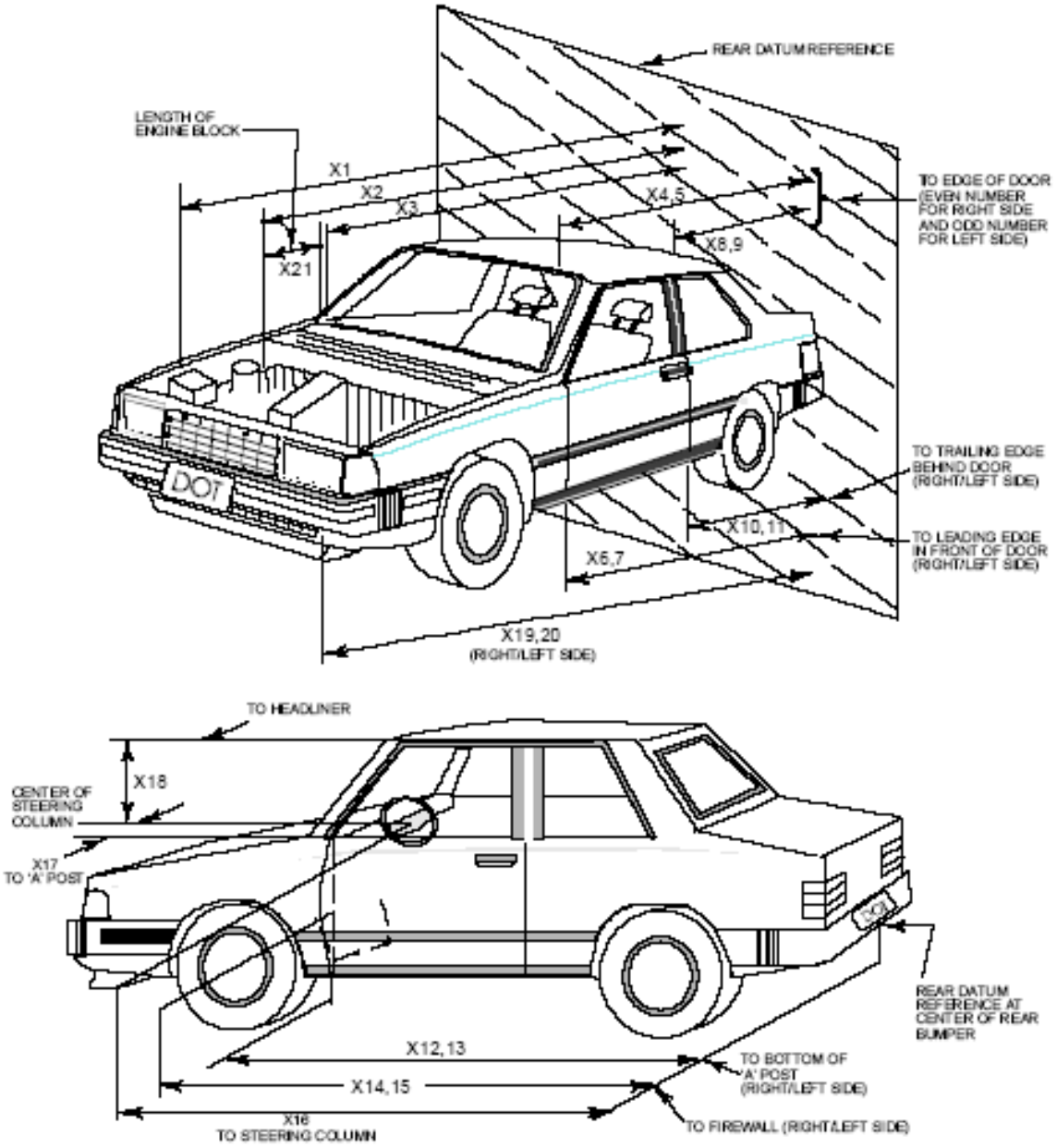
Measured Parameter	Units	Value
Left Side	mm	2092
Center	mm	2125
Right Side	mm	2085
Average	mm	2101

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Torso/Pelvis Side Airbag	Yes	No	Yes	No
Curtain Side Airbag	Yes	No	Yes	No
Knee Airbag	No	N/A	No	N/A
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes
Seat Belt Buckle Pretensioner	No	N/A	No	N/A
Other	No	N/A	No	N/A

DATA SHEET NO. 12 - VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019



DATA SHEET NO. 12 - VEHICLE PROFILE MEASUREMENTS (CONT'D)

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4170	3700	470
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3748	3540	208
3	RSOV to Firewall	3260	3235	25
4	RSOV to Upper Leading Edge of Right Door	2835	2838	-3
5	RSOV to Upper Leading Edge of Left Door	2843	2845	-2
6	RSOV to Lower Leading Edge of Right Door	2812	2810	2
7	RSOV to Lower Leading Edge of Left Door	2810	2814	-4
8	RSOV to Upper Trailing Edge of Right Door	1810	1808	2
9	RSOV to Upper Trailing Edge of Left Door	1808	1808	0
10	RSOV to Lower Trailing Edge of Right Door	1823	1820	3
11	RSOV to Lower Trailing Edge of Left Door	1818	1820	-2
12	RSOV to Bottom of "A" Post-of Right Side	2825	2823	2
13	RSOV to Bottom of "A" Post-of Left Side	2825	2825	0
14	RSOV to Firewall, Right Side	3366	3345	21
15	RSOV to Firewall, Left Side	3366	3345	21
16	RSOV to Steering Column	2406	2444	-38
17	Center of Steering Column to "A" Post	300	330	-30
18	Center of Steering Column to Headliner	475	495	-20
19	RSOV to Right Side of Front Bumper	3920	3655	265
20	RSOV to Left Side of Front Bumper	3920	3660	260
21	Length of Engine Block	500	500	0
RD	RSOV to Right Side of Dash Panel	2608	2607	1
CD	RSOV to Center of Dash Panel	2591	2594	-3
LD	RSOV to Left Side of Dash Panel	2605	2603	2

All Dimensions in mm

DATA SHEET NO. 13 - ACCIDENT INVESTIGATION DIVISION DATA

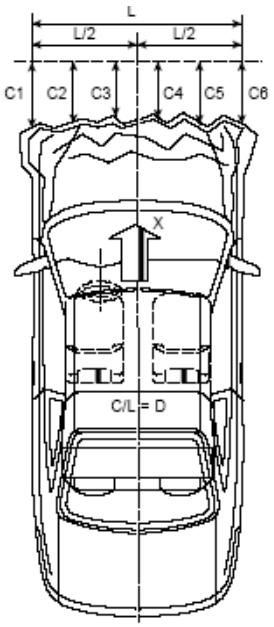
Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

VEHICLE INFORMATION

VIN: KNDJ23AU5L7071269 Wheelbase: 2600
Vehicle Size Category: SUV Test Weight (kg): 1495.0

ACCELEROMETER DATA

Accelerometer Locations: As listed on Page 15 of this report.
Cal. Procedure/Interval: TRC procedure / 6 month interval
Integration Algorithm: Trapezoidal
Linearity: > 99%
Impact Velocity (km/h): 56.44
Velocity Change (km/h): 65.72
Time of Separation (ms): 147



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Centerline
Damage Region Length (mm): 1728
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	3920	3655	265
C2	Crush zone 2 at left side	mm	4100	3690	410
C3	Crush zone 3 at left side	mm	4170	3690	480
C4	Crush zone 4 at right side	mm	4170	3698	472
C5	Crush zone 5 at right side	mm	4100	3693	407
C6	Crush zone 6 at right side	mm	3920	3660	260
L	C1 to C6	mm	1728	1180	548

DATA SHEET NO. 14 - VEHICLE INTRUSION MEASUREMENTS

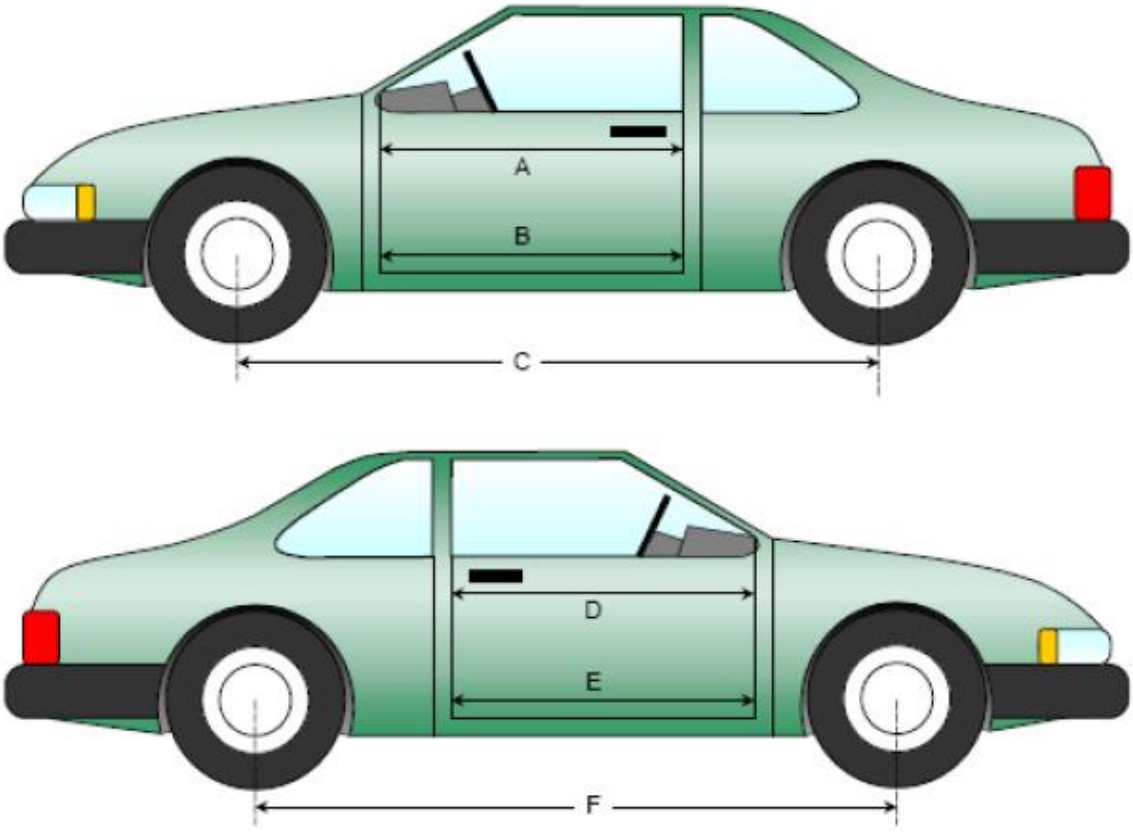
Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

DOOR OPENING WIDTH

No.	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	945	945	0
B	Left Side Lower	mm	860	860	0
D	Right Side Upper	mm	945	945	0
E	Right Side Lower	mm	860	860	0

WHEELBASE MEASUREMENTS

No.	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2600	2553	47
F	Right Side Wheelbase	mm	2600	2553	47



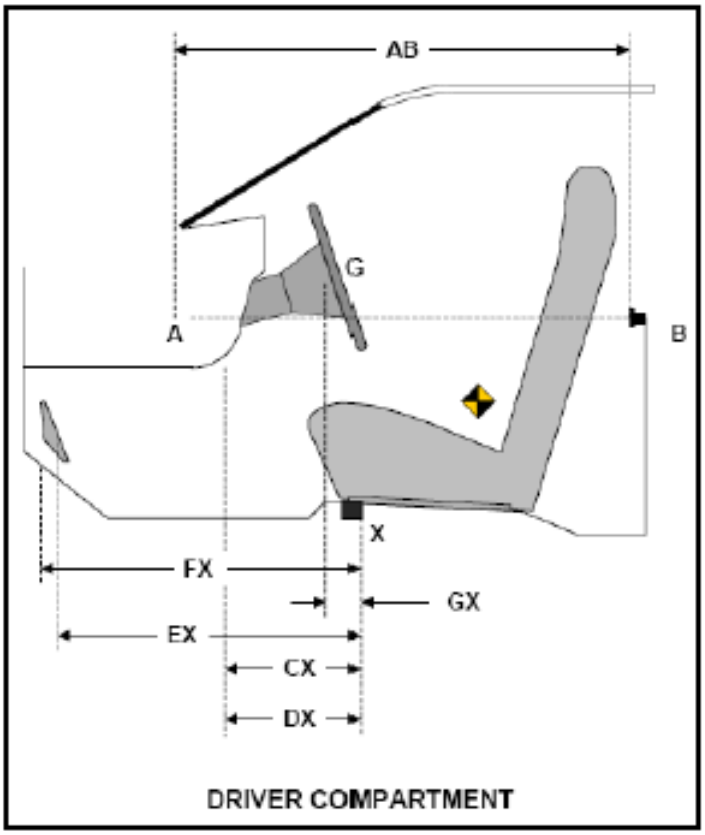
DATA SHEET NO. 14 - VEHICLE INTRUSION MEASUREMENTS (CONT'D)

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	935	950	-15
CX	Left Knee Bolster to X	mm	250	250	0
DX	Right Knee Bolster to X	mm	250	255	-5
EX	Brake Pedal to X	mm	525	510	15
FX	Foot Rest to X	mm	532	500	32
GX	Center of Steering Column Wheel Hub to X	mm	57	108	-51

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15 - SUMMARY OF INDICANT FMVSS 212 AND FMVSS 219 (PARTIAL) DATA

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

Please provide windshield mounting details.

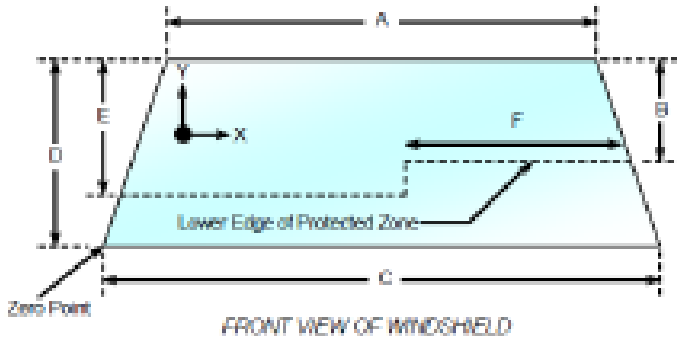
The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicle not equipped with occupant passive restraint and 50% for each side of the windshield for vehicle which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.3°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2170	2170	100.0
Right Side	2170	2170	100.0
Total	4340	4340	100.0

Item	Units	Value
A	mm	1240
B	mm	490
C	mm	1550
D	mm	775
E	mm	443
F	mm	505



FRONT VIEW OF WINDSHIELD

AREAS OF PROTECTED ZONE FAILURES

A. Provide coordinates of the area that the protected zone was penetrated more than .25 inches by a vehicle component other than one that is normally in contact with the windshield.

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

B. The inner surface of the windshield was penetrated by the hood support beneath the protected zone.

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

DATA SHEET NO. 16 - FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

FMVSS 301 FUEL SYSTEM INTEGRTY POST IMPACT DATA

Temperature at Time of Impact: 21.3°C Test Time: 15:50

Stoddard Solvent Spillage Measurements

A From impact until vehicle motion ceases: 0 oz.
(maximum allowable – 1 oz.)

B For the 5-minute period after motion ceases: 0 oz.
(maximum allowable – 5 oz.)

C For the following 25 minutes: 0 oz.
(maximum allowable – 1 oz./minutes)

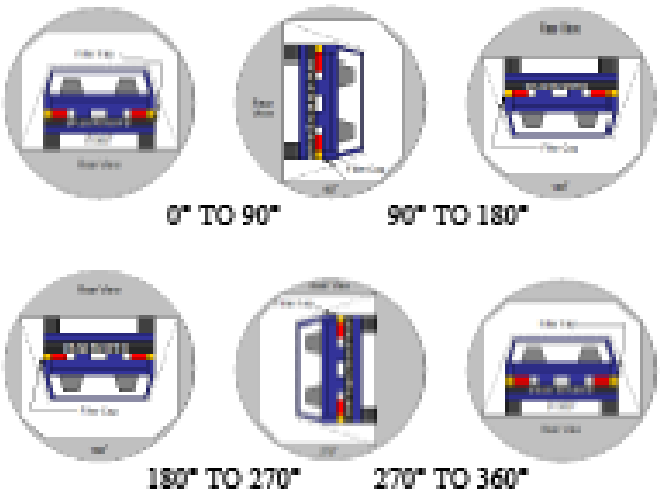
D Spillage: None

DATA SHEET NO. 16 - FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS (CONT'D)

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019

1. The specified fixture rollover rate for each 90º of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage:

None



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0º to 90º	90	330	420
90º to 180º	90	330	840
180º to 270º	90	330	1260
270º to 360º	90	330	1480

FMVSS 301 SPILLAGE TABLE

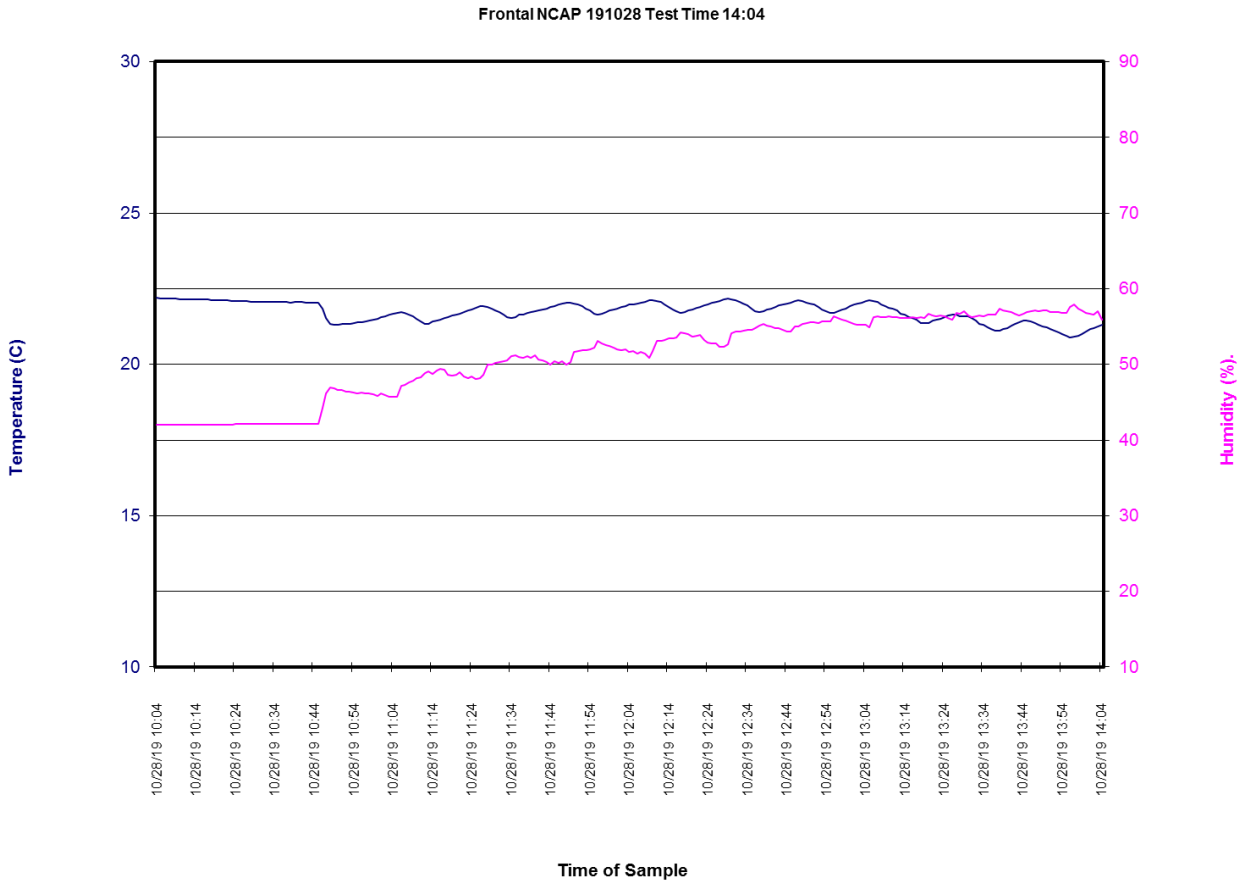
Test Phase	First 5 Minutes	Sixth Minute	Seventh Minute	Eighth Minute
0º to 90º	0	0	0	N/A
90º to 180º	0	0	0	N/A
180º to 270º	0	0	0	N/A
270º to 360º	0	0	0	N/A

SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17 - DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2020 Kia Soul 5-DR SUV NHTSA No.: M20204212
Test Program: NCAP Frontal Impact Test Date: 10/28/2019



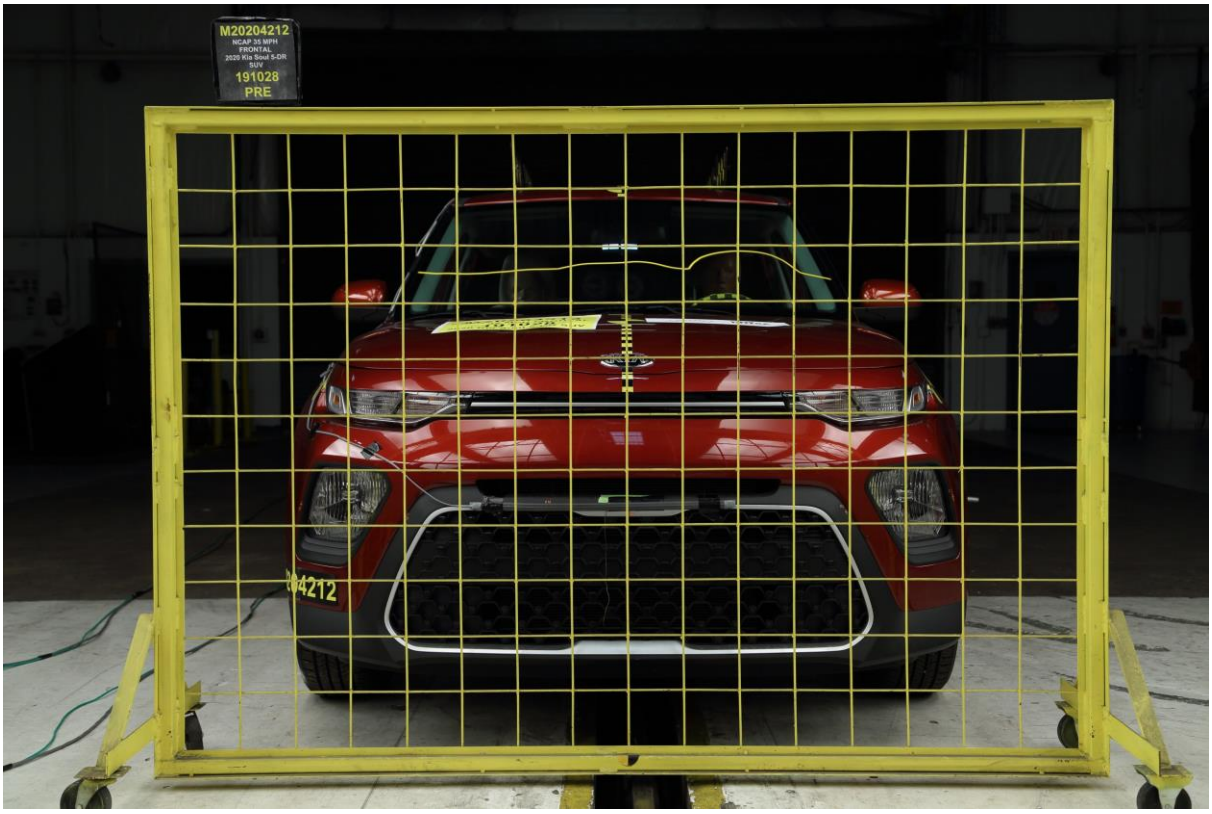
APPENDIX A

PHOTOGRAPHS

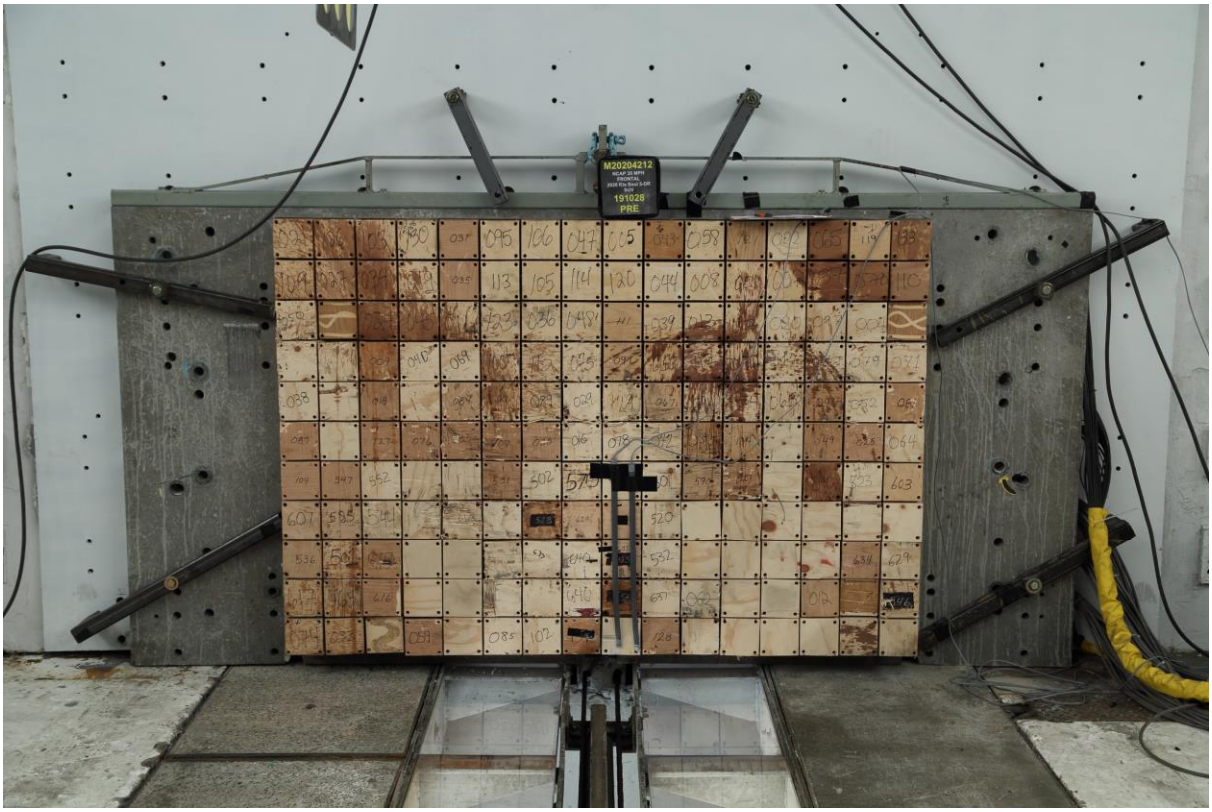
TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS (CONTINUED)

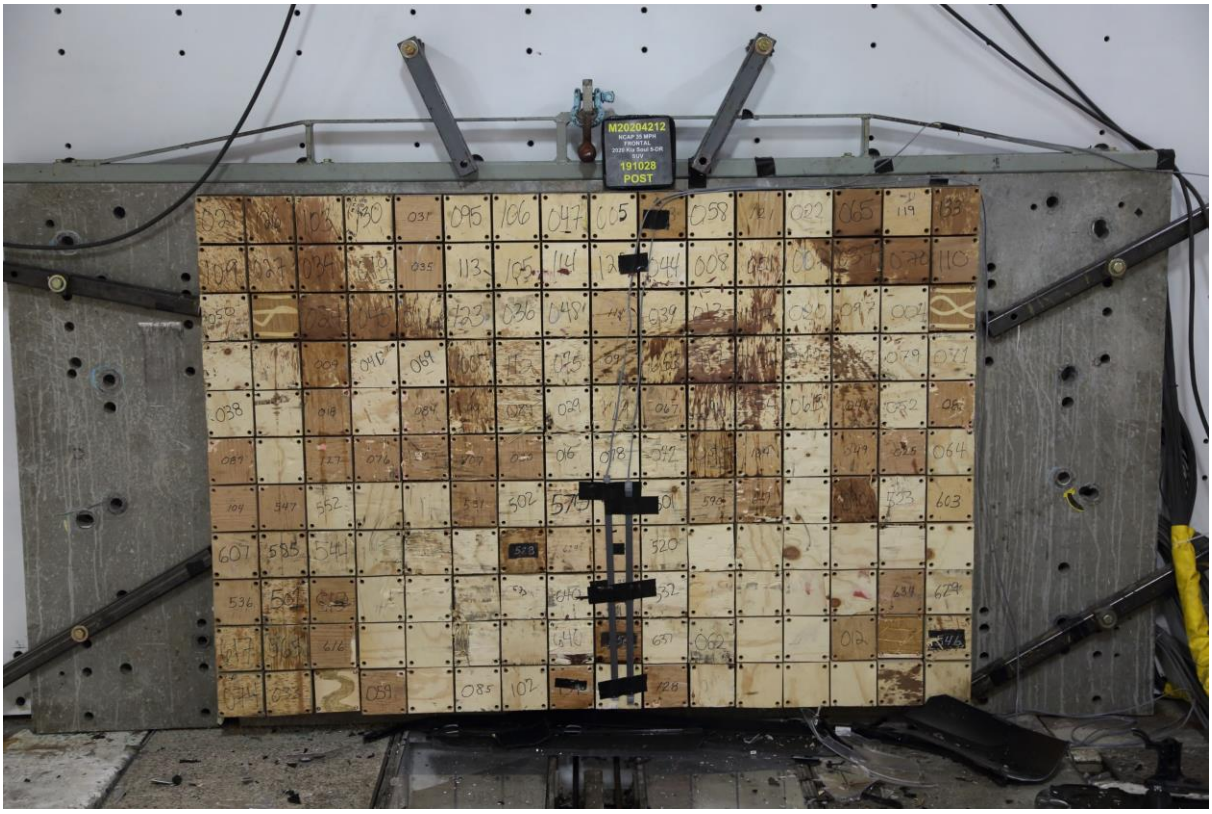
TABLE OF PHOTOGRAPHS (CONTINUED)



001 Load Cell Location



002 Pre-Test Load Cell Wall



003 Post-Test Load Cell Wall

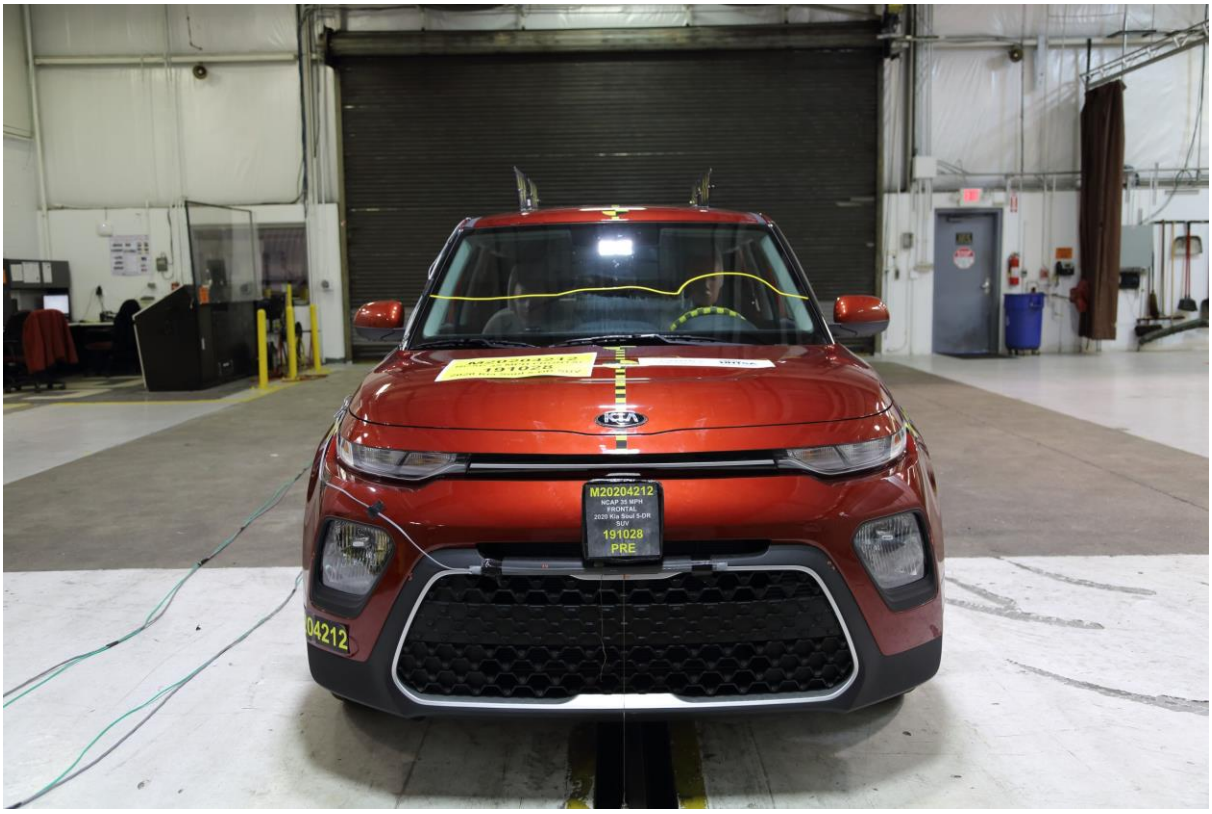
004 Manufacturer's Label

005 Tire Placard

Intentionally Left Blank

006 2020 Kia Soul 5-DR SUV Frontal As Delivered

007 Left Rear 3-4 View, as Received



008 Pre-Test Front View of Test Vehicle

009 Post-Test Front View of Test Vehicle

010 Pre-Test Left View of Test Vehicle

011 Post-Test Left View of Test Vehicle

012 Pre-Test Right View of Test Vehicle

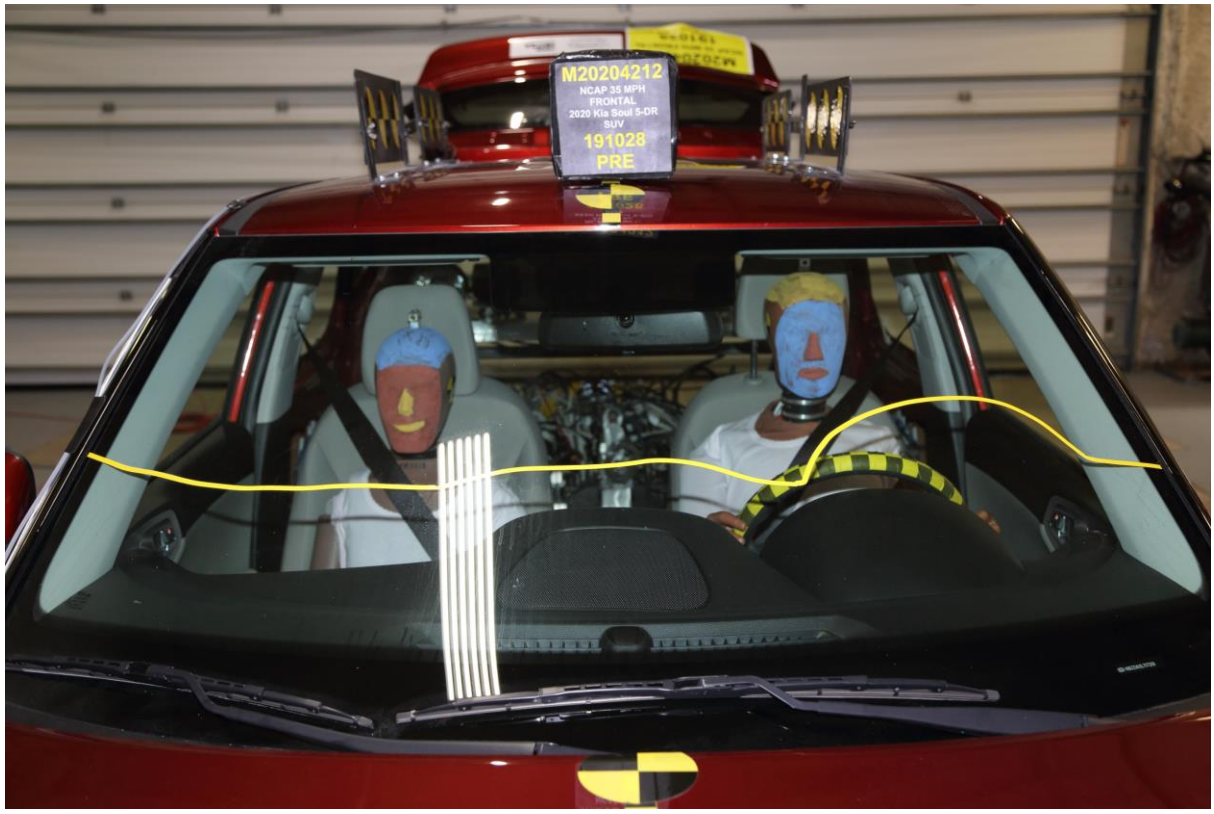
013 Post-Test Right View of Test Vehicle

014 Pre-Test Right Front 3-4 View

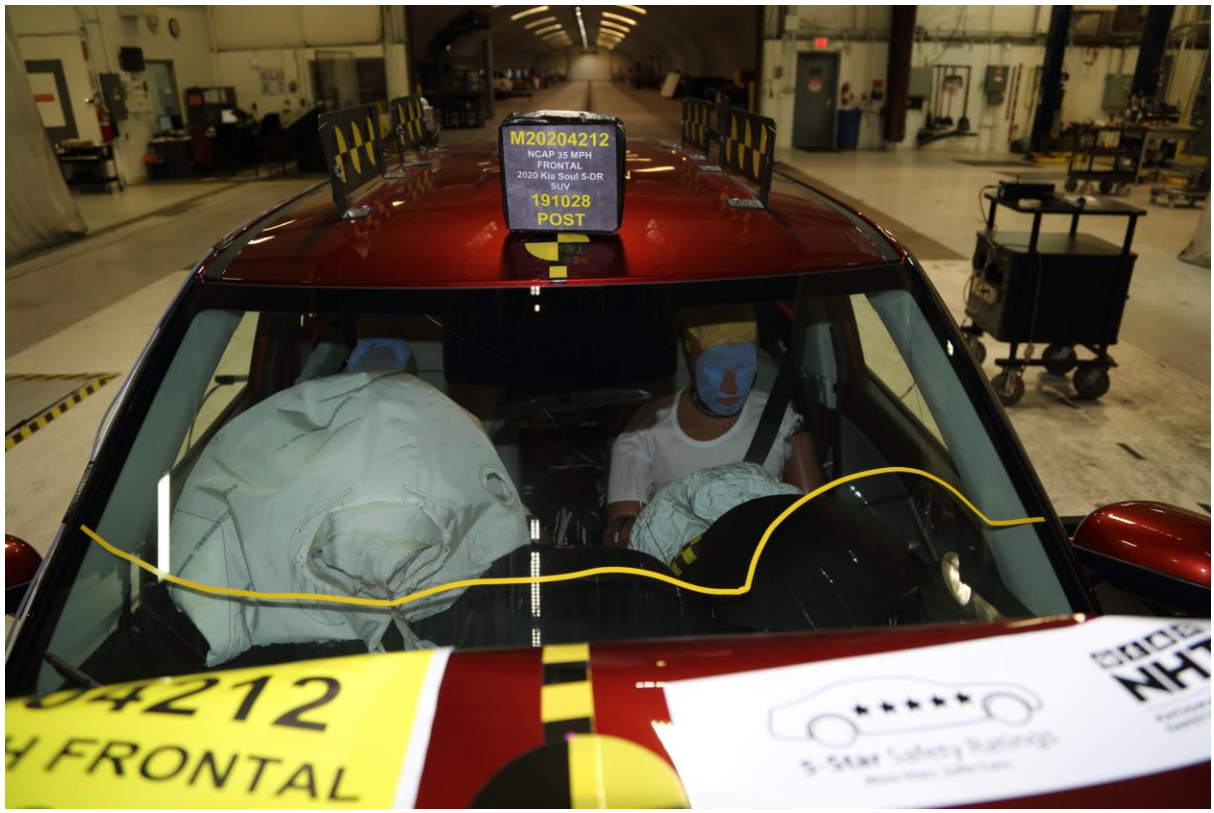
015 Post-Test Right Front 3-4 View

016 Pre-Test Left Rear 3-4 View

017 Post-Test Left Rear 3-4 View



018 Pre-Test Windshield View



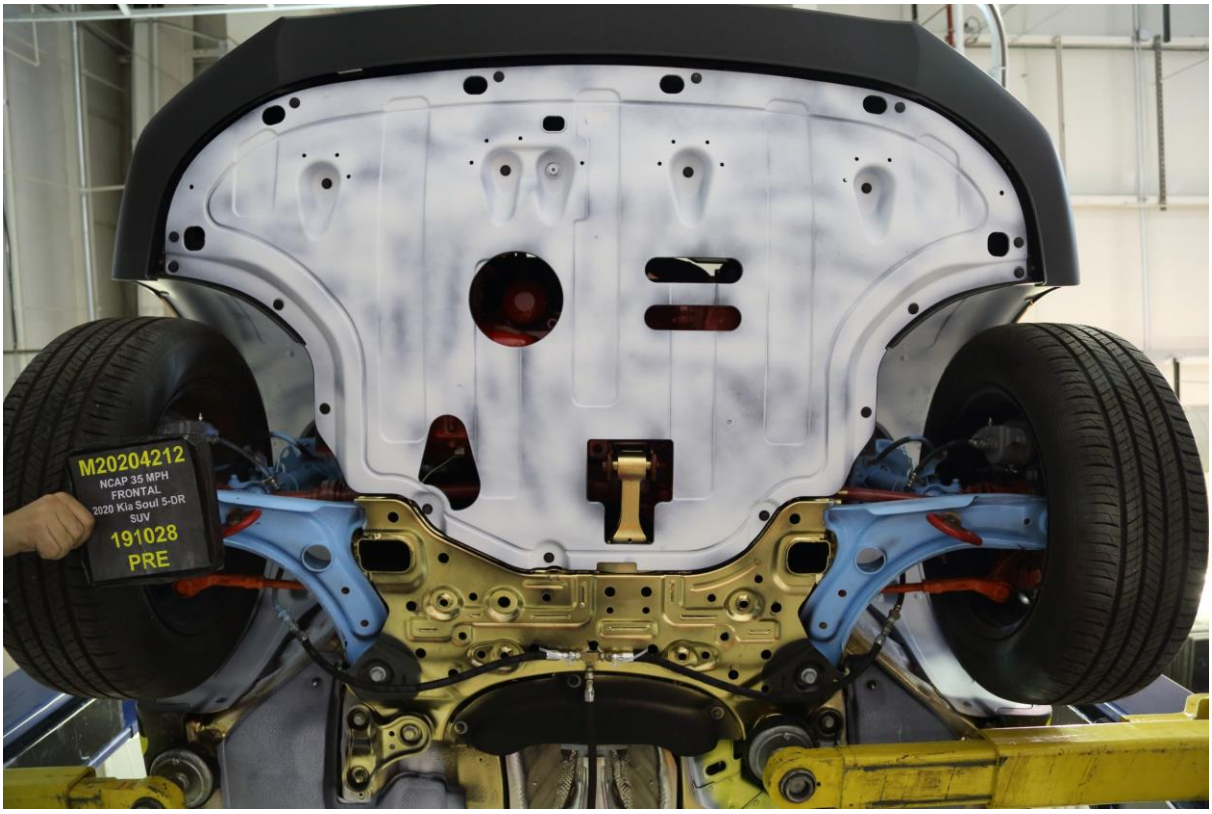
019 Post-Test Windshield View

020 Pre-Test Engine Compartment View

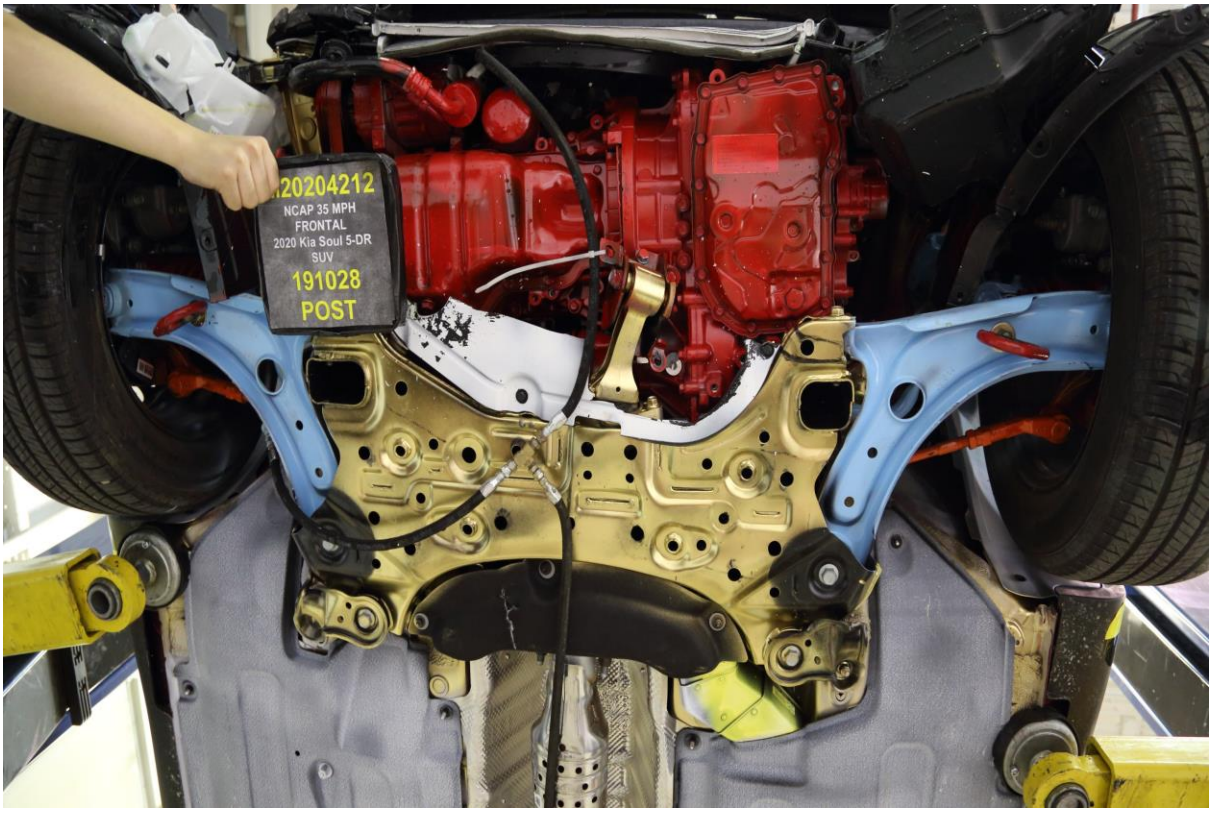
021 Post-Test Engine Compartment View

022 Pre-Test Fuel Filler Cap View

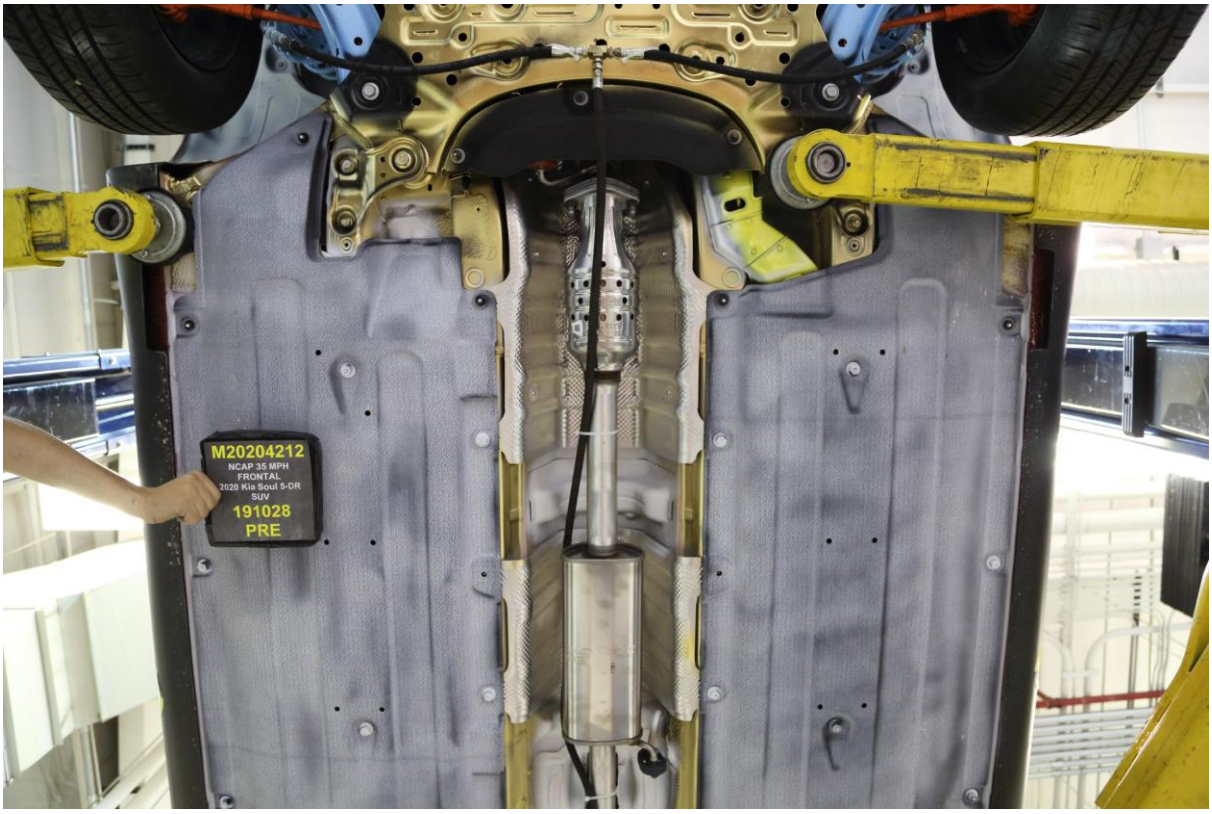
023 Post-Test Fuel Filler Cap View



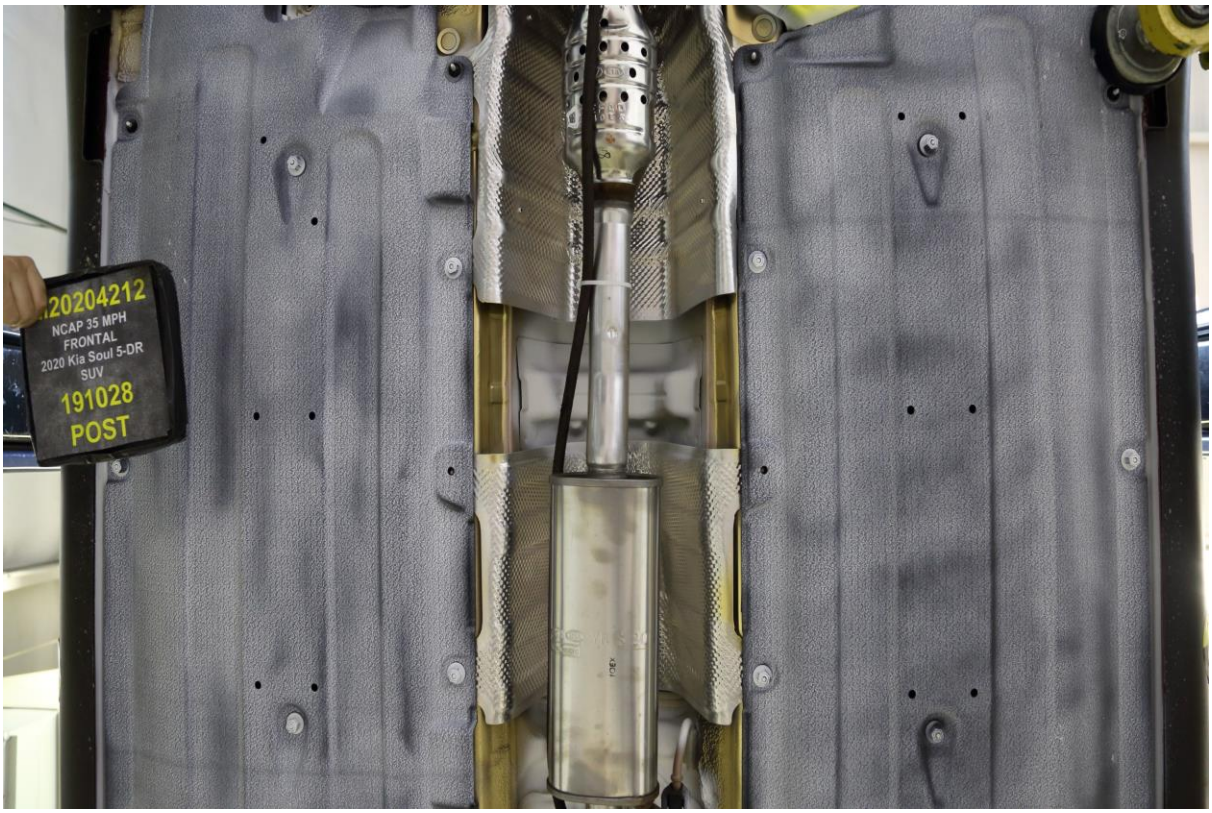
024 Pre-Test Front Underbody View



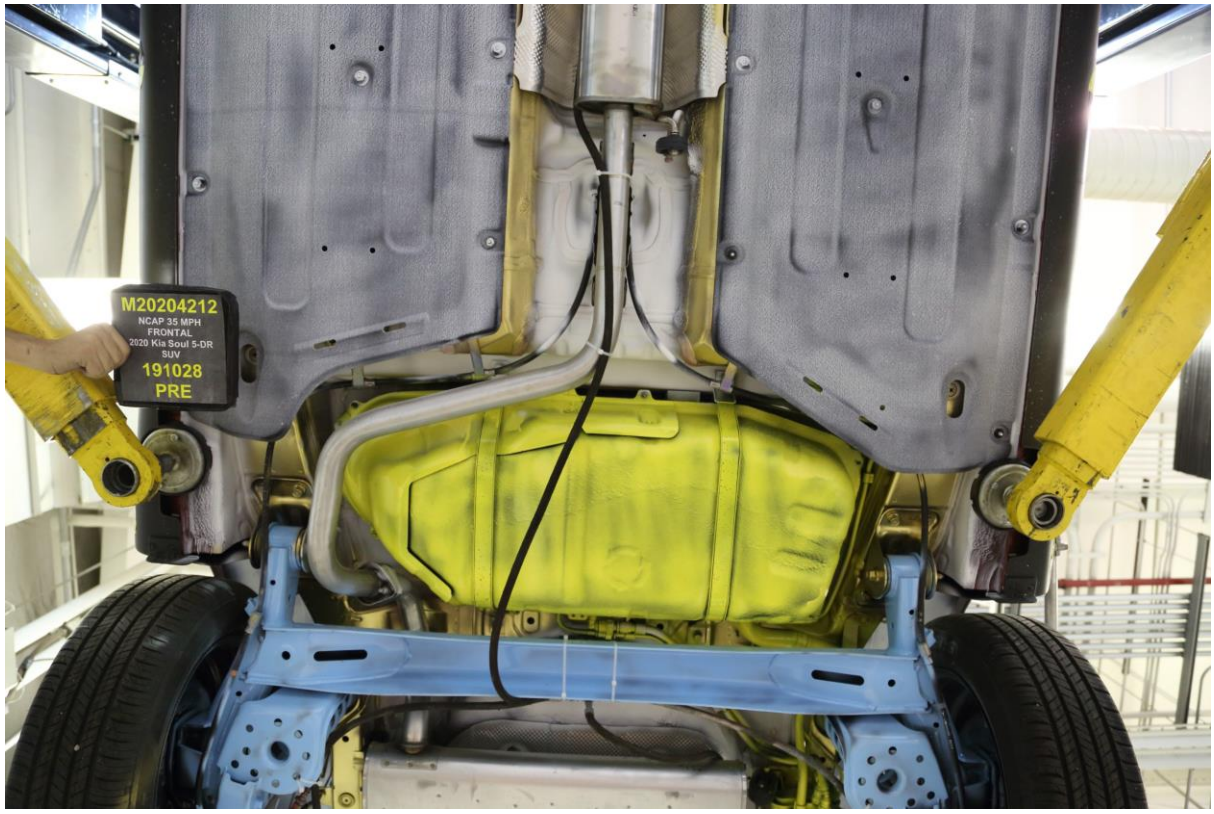
025 Post-Test Front Underbody View



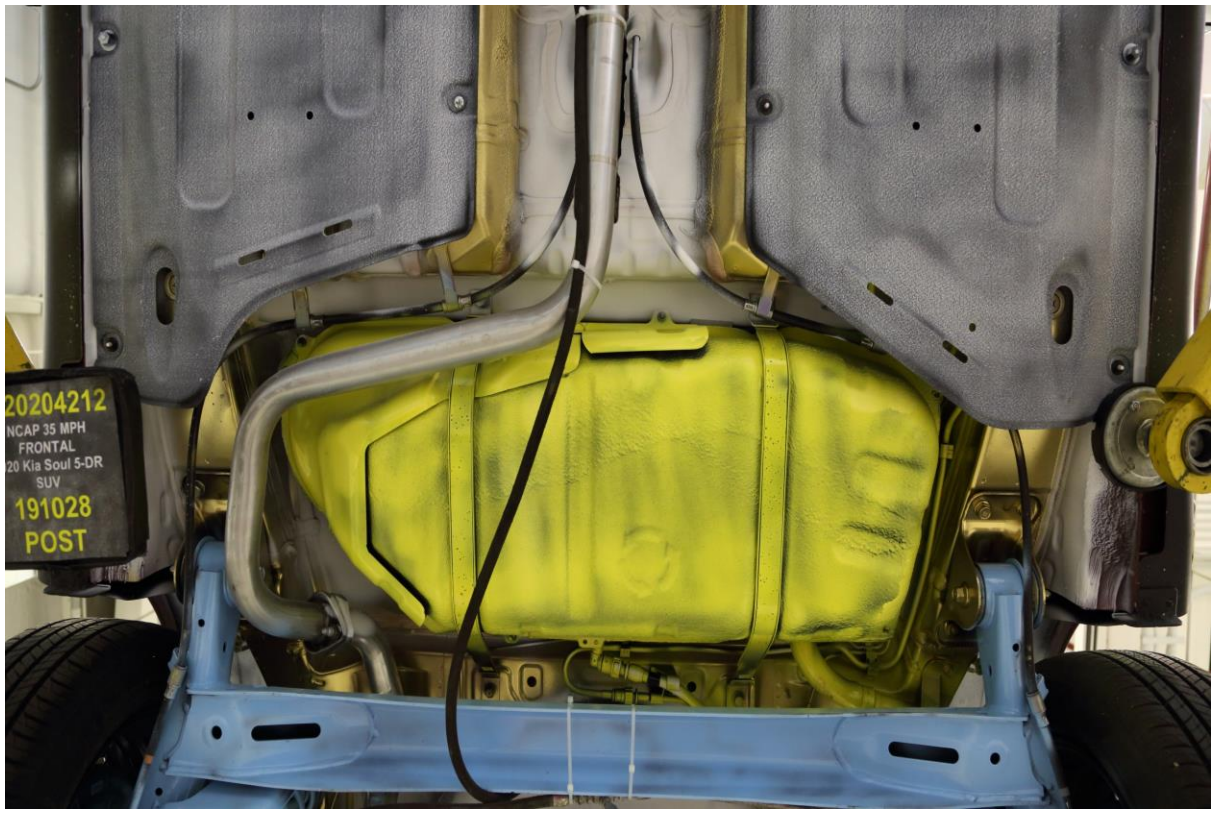
025a Pre-Test Mid Front Underbody View



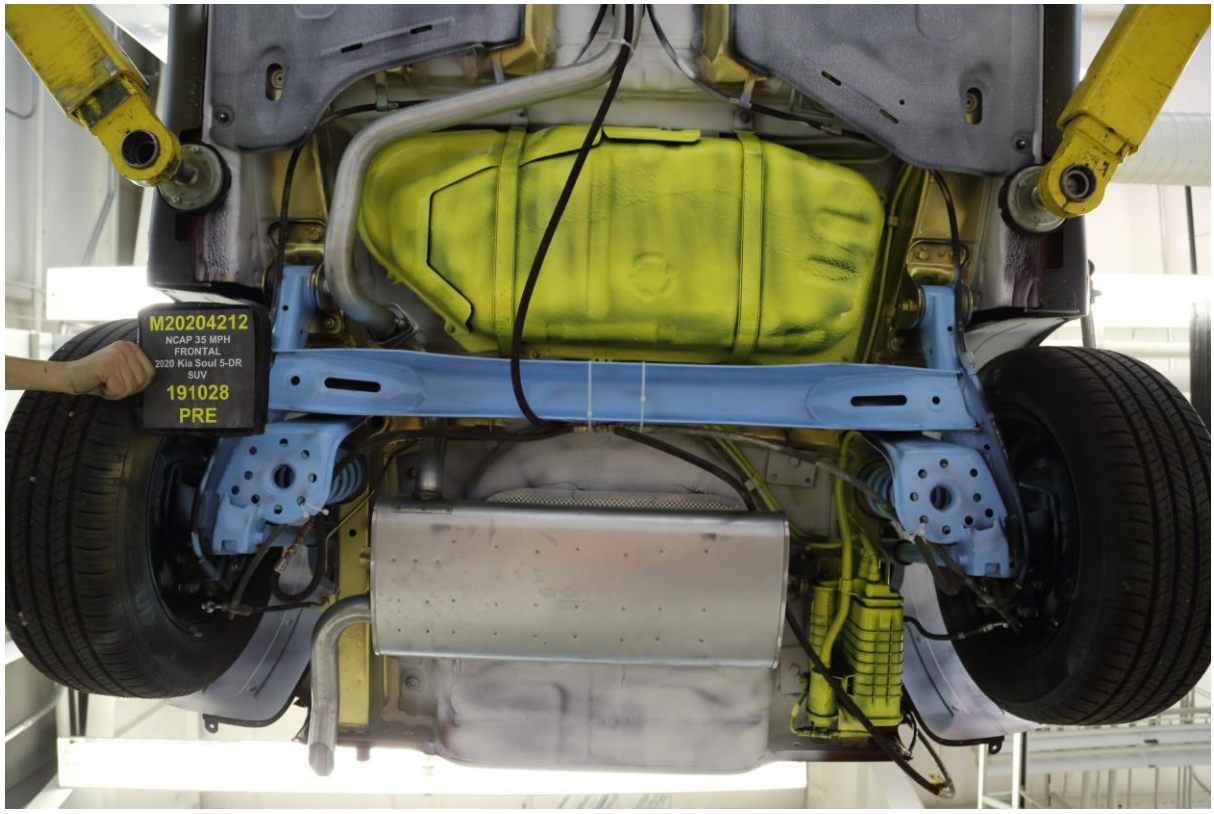
025b Post-Test Mid Front Underbody View



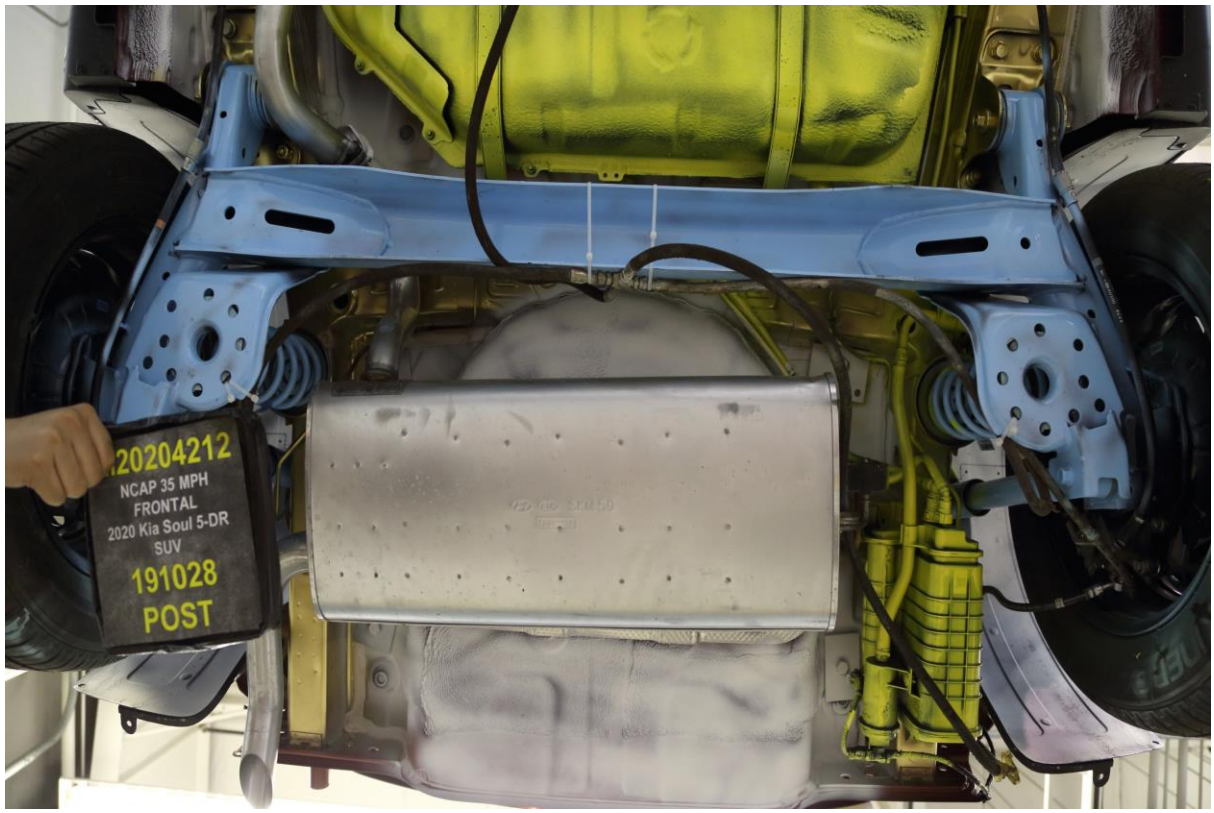
025c Pre-Test Mid Rear Underbody View



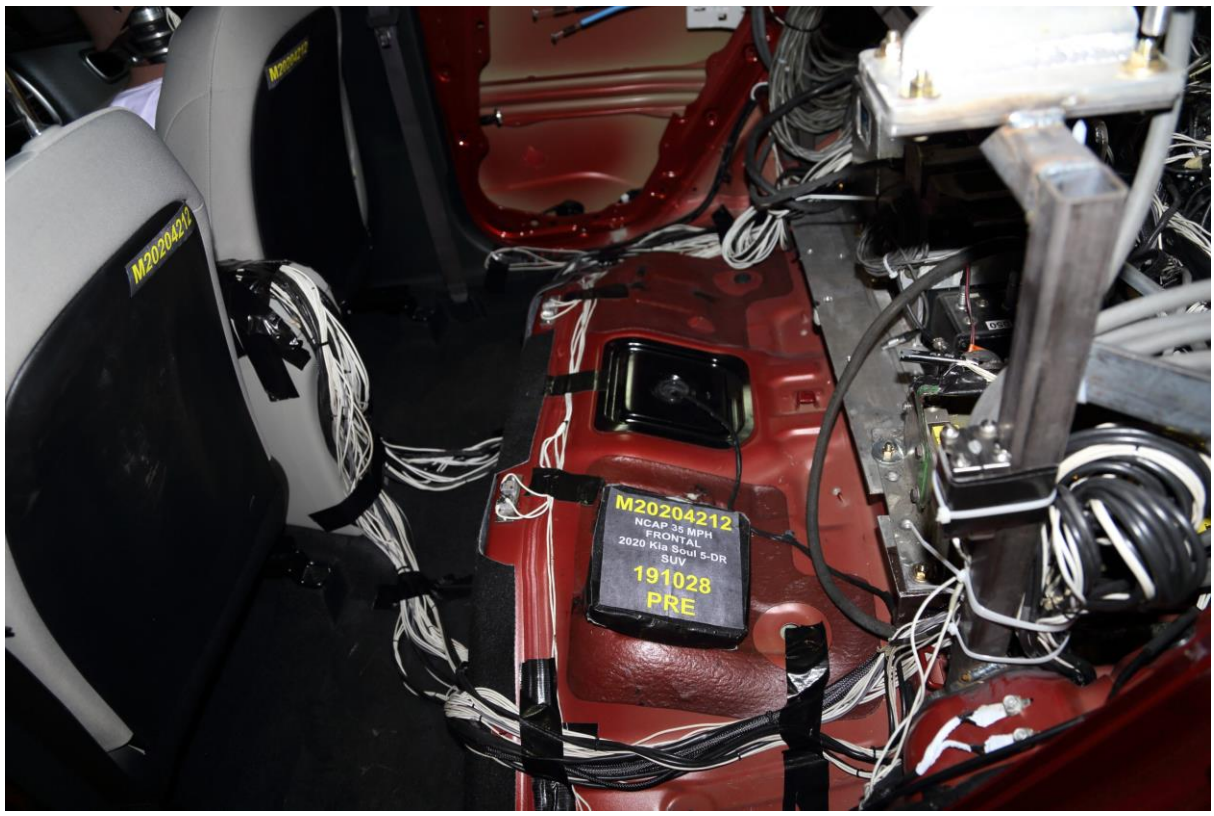
025d Post-Test Mid Rear Underbody View



026 Pre-Test Rear Underbody View

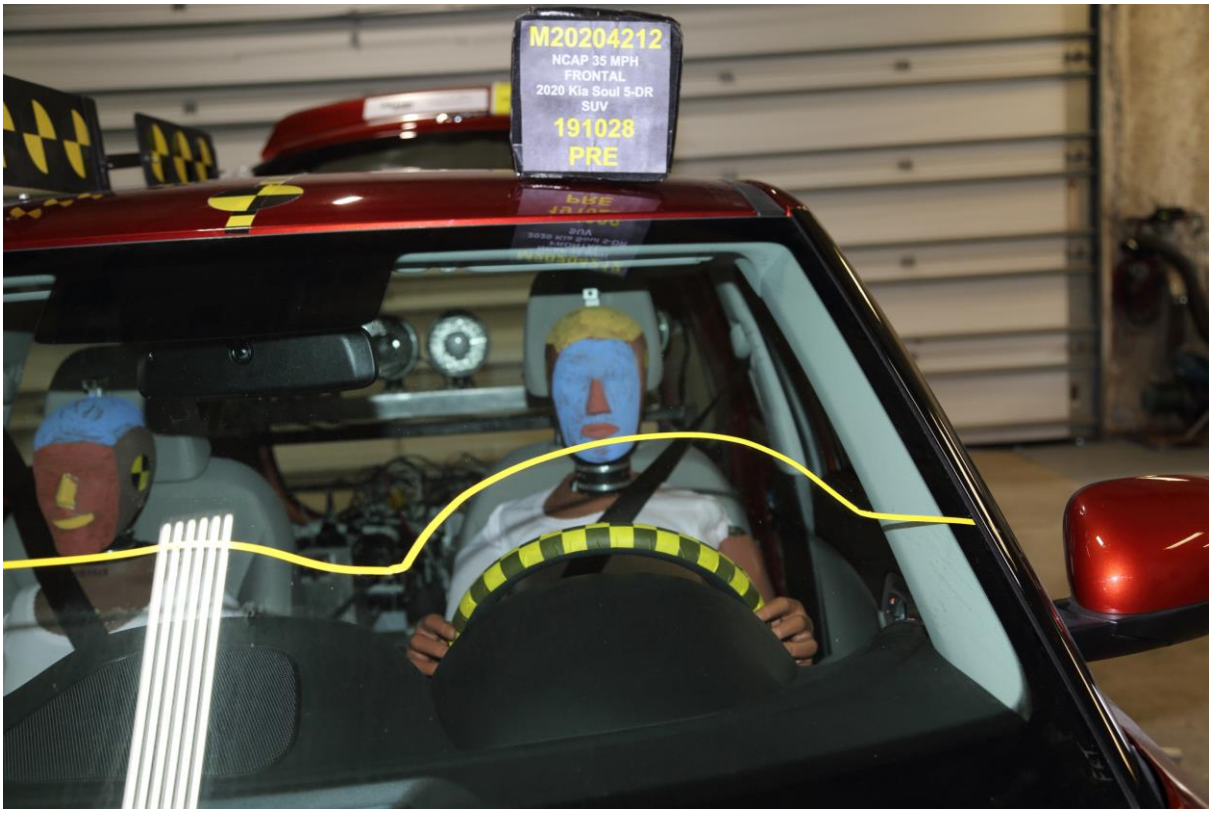


027 Post-Test Rear Underbody View

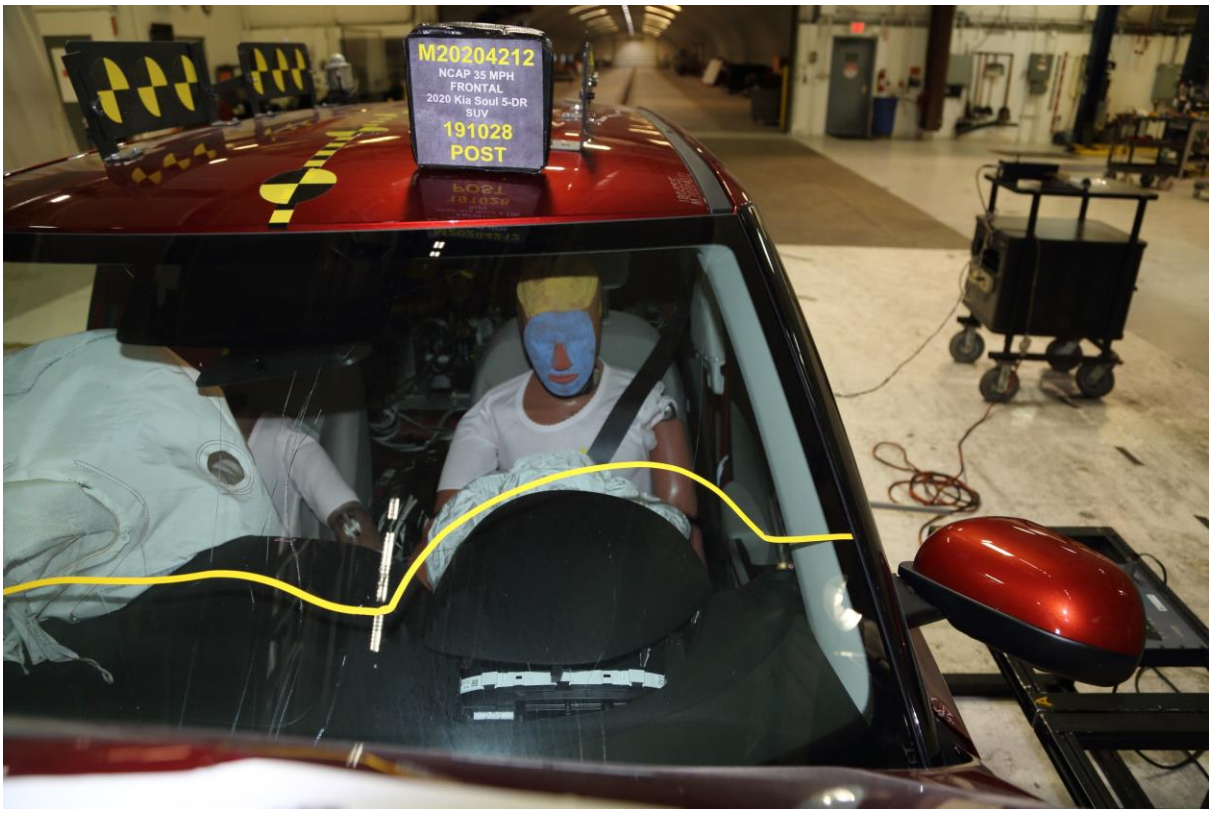


028 Pre-Test Dummy Cable Routing

029 Post-Test Dummy Cable Routing



030 Pre-Test Driver Dummy Front View



031 Post-Test Driver Dummy Front View

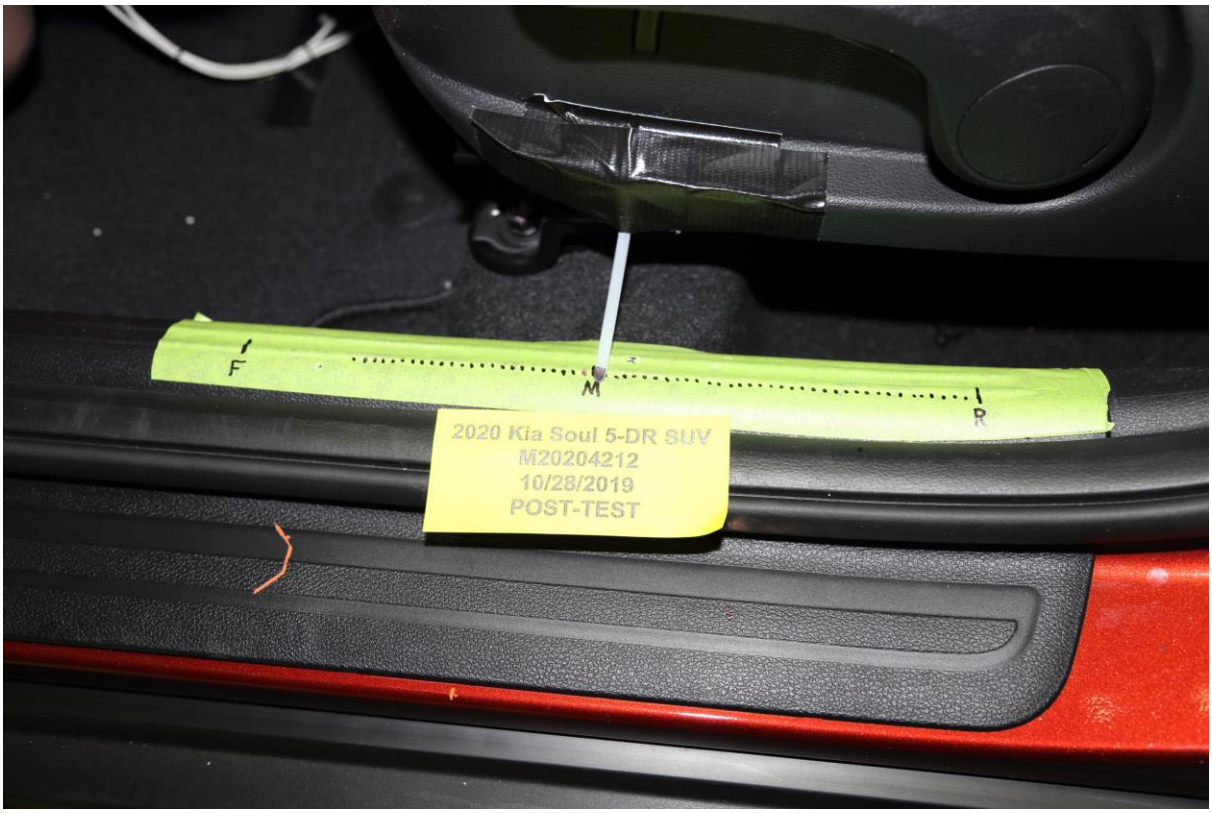
032 Pre-Test Driver Dummy Window View

033 Post-Test Driver Dummy Window View

034 Pre-Test Driver Dummy and Vehicle Interior View

035 Post-Test Driver Dummy and Vehicle Interior View

036 Pre-Test Driver's Seat Fore-Aft Markings



037 Post-Test Driver's Seat Fore-Aft Markings

038 Pre-Test View of Belt Anchorage for Driver Dummy

039 Post-Test View of Belt Anchorage for Driver Dummy

040 Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy

041 Post-Test View of Belt Buckle and Latch Plate for Driver Dummy

042 Pre-Test Driver Dummy Feet

043 Post-Test Driver Dummy Feet

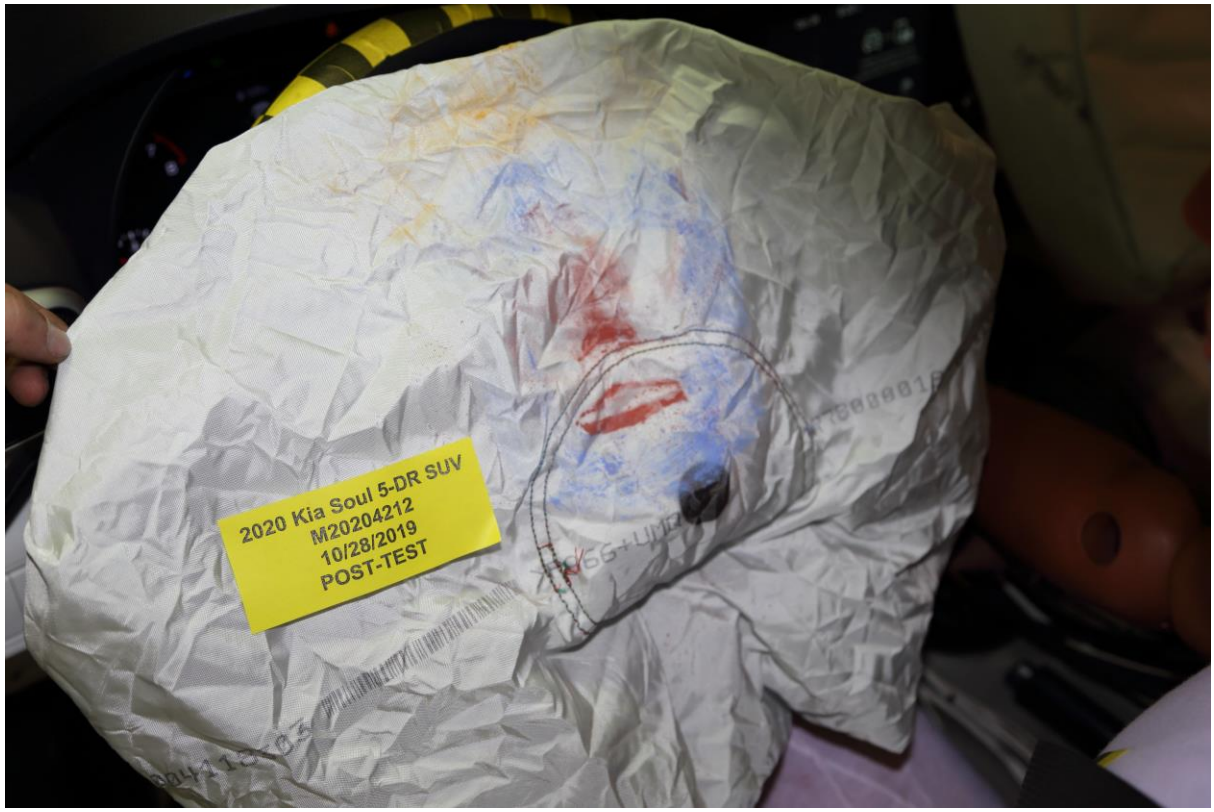
044 Pre-Test Driver's Side Knee Bolster

045 Post-Test Driver's Side Knee Bolster

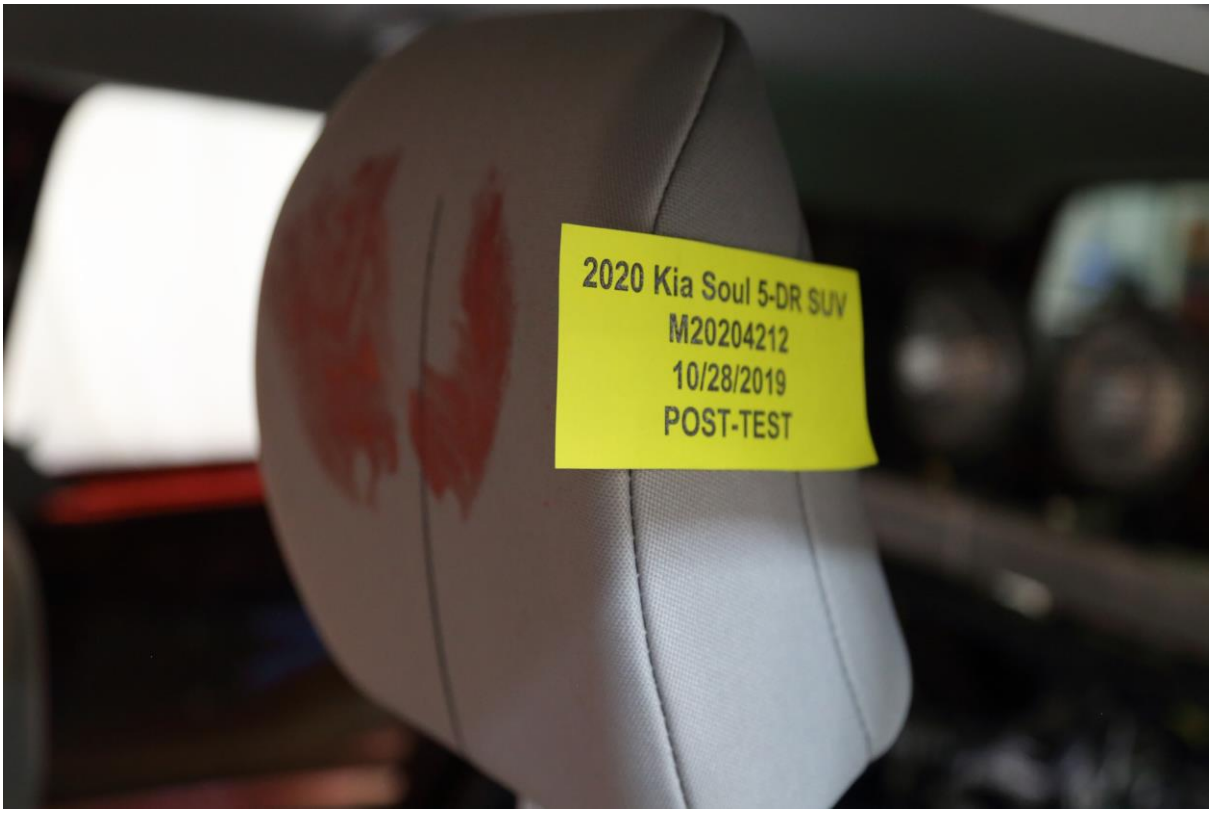
046 Pre-Test Driver's Side Floorpan

047 Post-Test Driver's Side Floorpan

048 Post-Test Driver Dummy Face



049 Post-Test Driver Dummy Contact with Airbag



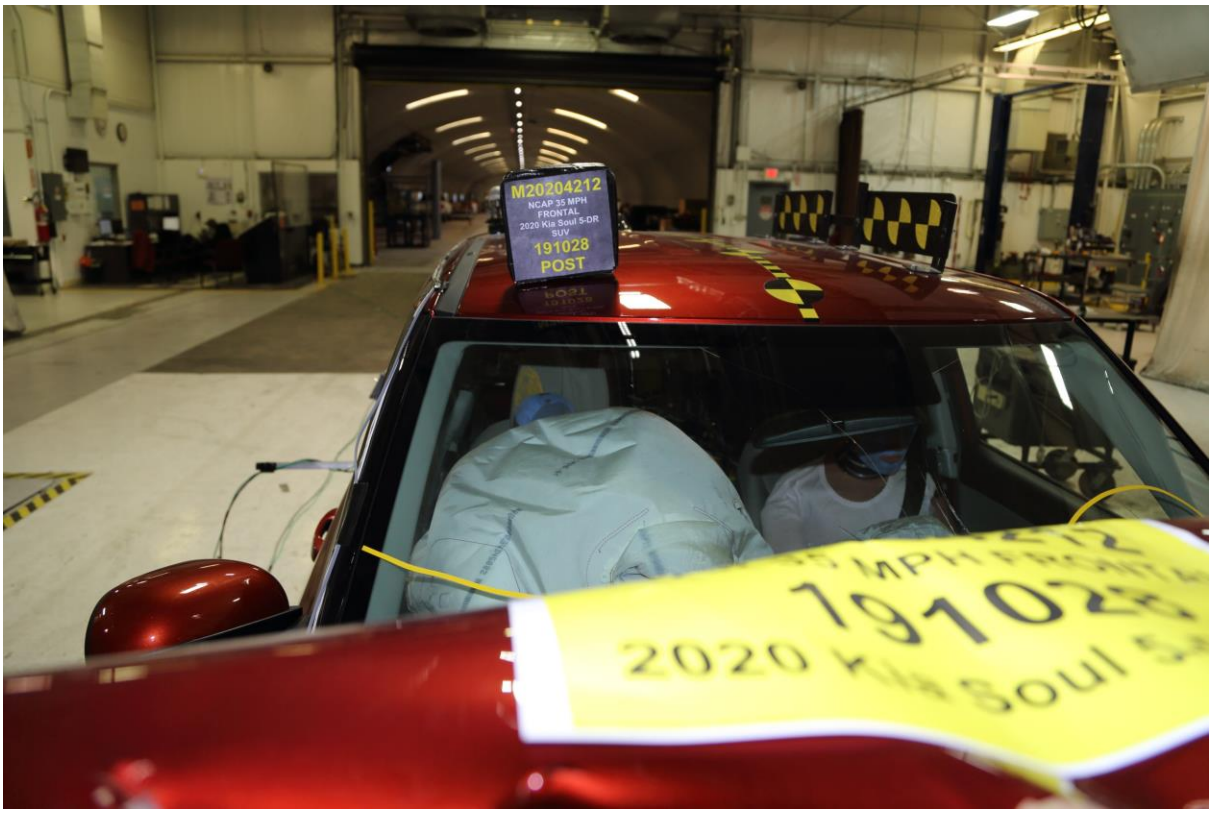
050 Post-Test Driver Dummy Contact with Headrest

Intentionally Left Blank

051 Pre-Test View of the Steering Wheel

052 Post-Test View of the Steering Wheel

053 Pre-Test Passenger Dummy Front View

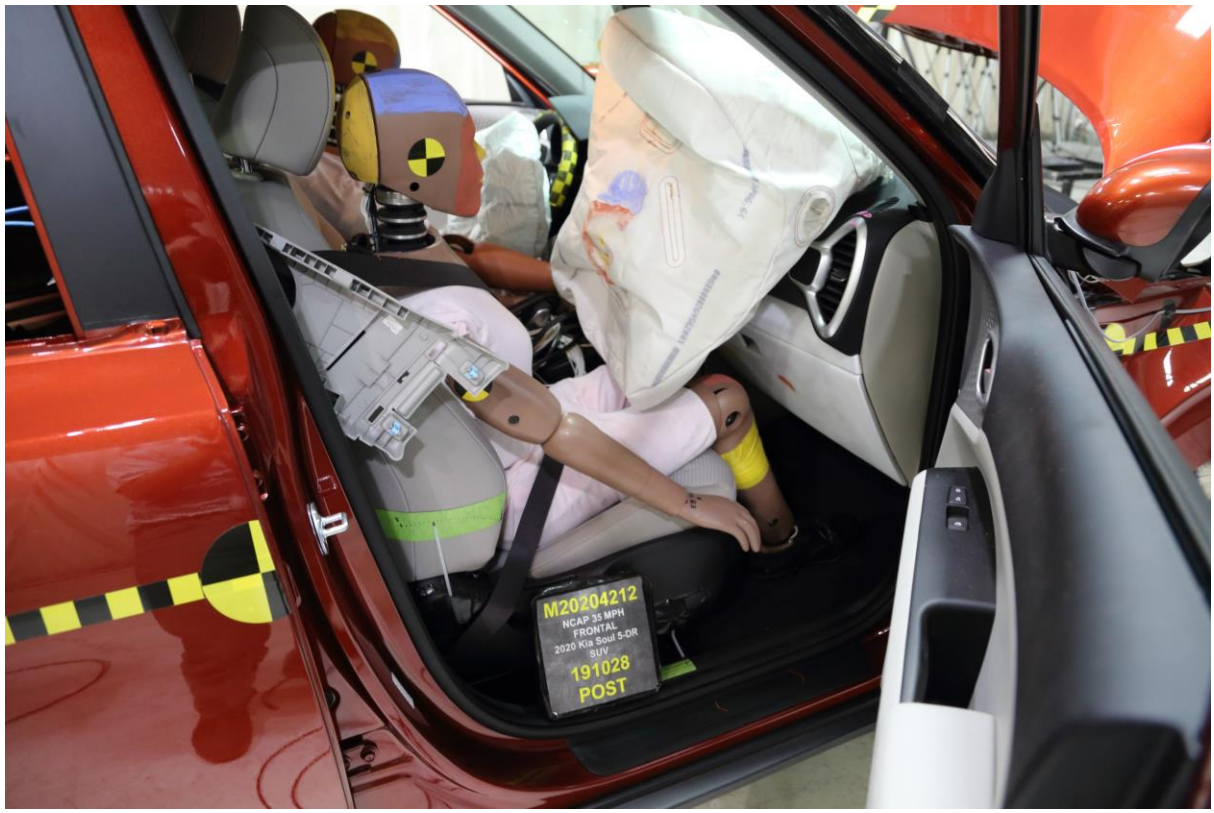


054 Post-Test Passenger Dummy Front View

055 Pre-Test Passenger Dummy Window View

056 Post-Test Passenger Dummy Window View

057 Pre-Test Passenger Dummy and Vehicle Interior View



058 Post-Test Passenger Dummy and Vehicle Interior View

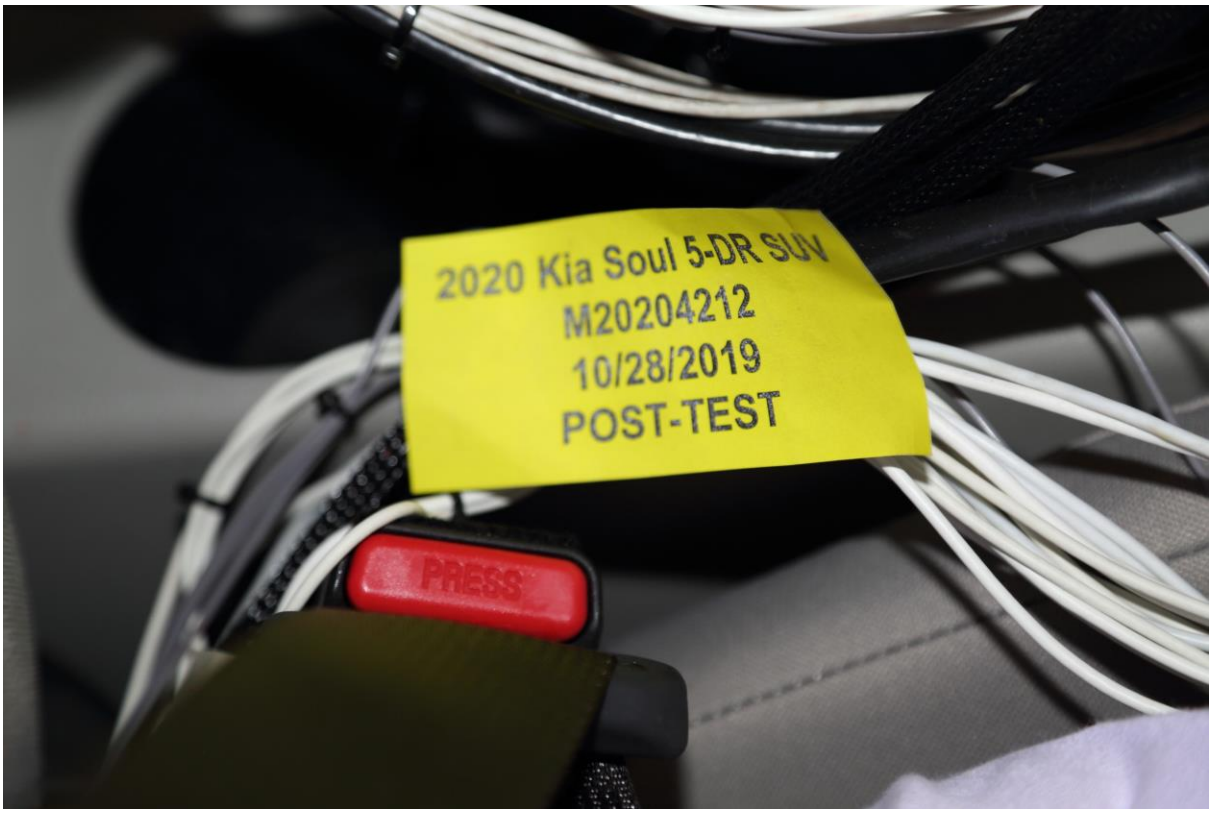
059 Pre-Test Passenger's Seat Fore-Aft Markings

060 Post-Test Passenger's Seat Fore-Aft Markings

061 Pre-Test View of Belt Anchorage for Passenger Dummy

062 Post-Test View of Belt Anchorage for Passenger Dummy

063 Pre-Test View of Belt Buckle and Latch Plate for Passenger Dummy



064 Post-Test View of Belt Buckle and Latch Plate for Passenger Dummy

065 Pre-Test Passenger Dummy Feet

066 Post-Test Passenger Dummy Feet

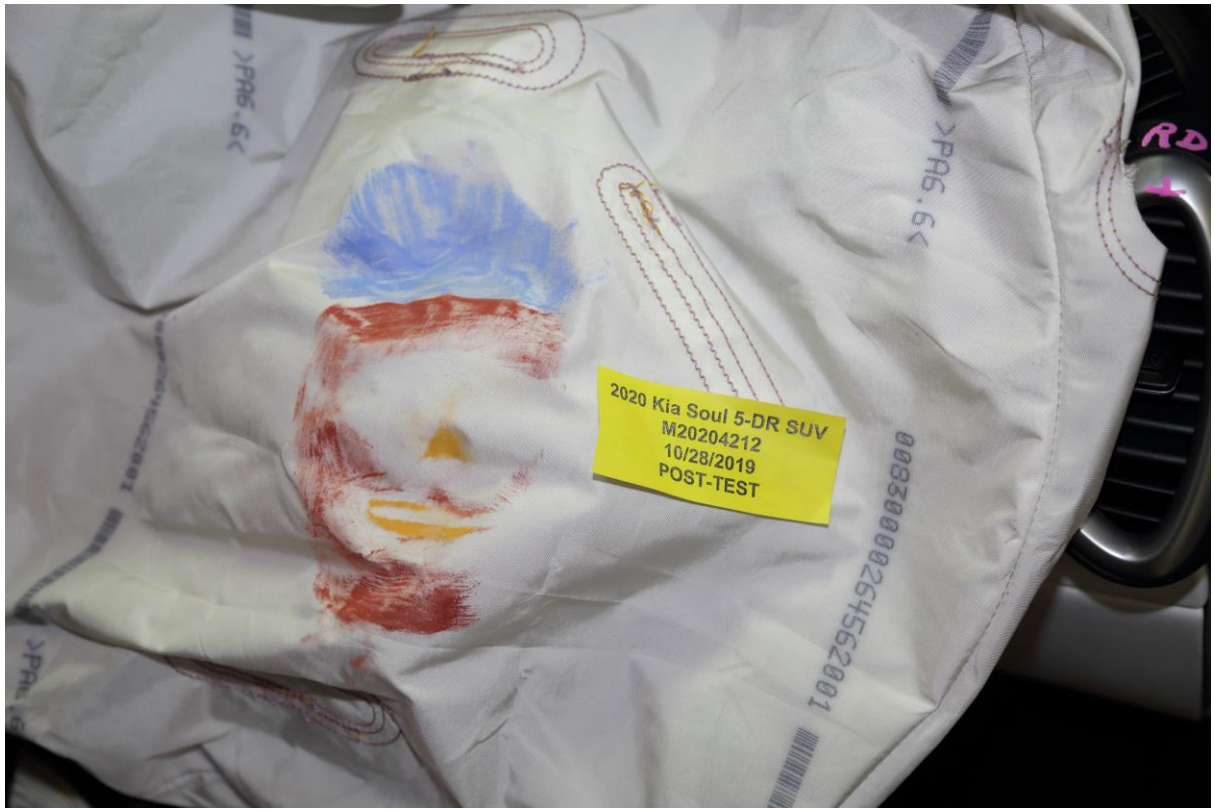
067 Pre-Test Passenger's Side Knee Bolster

068 Post-Test Passenger's Side Knee Bolster

069 Pre-Test Passenger's Side Floorpan

070 Post-Test Passenger's Side Floorpan

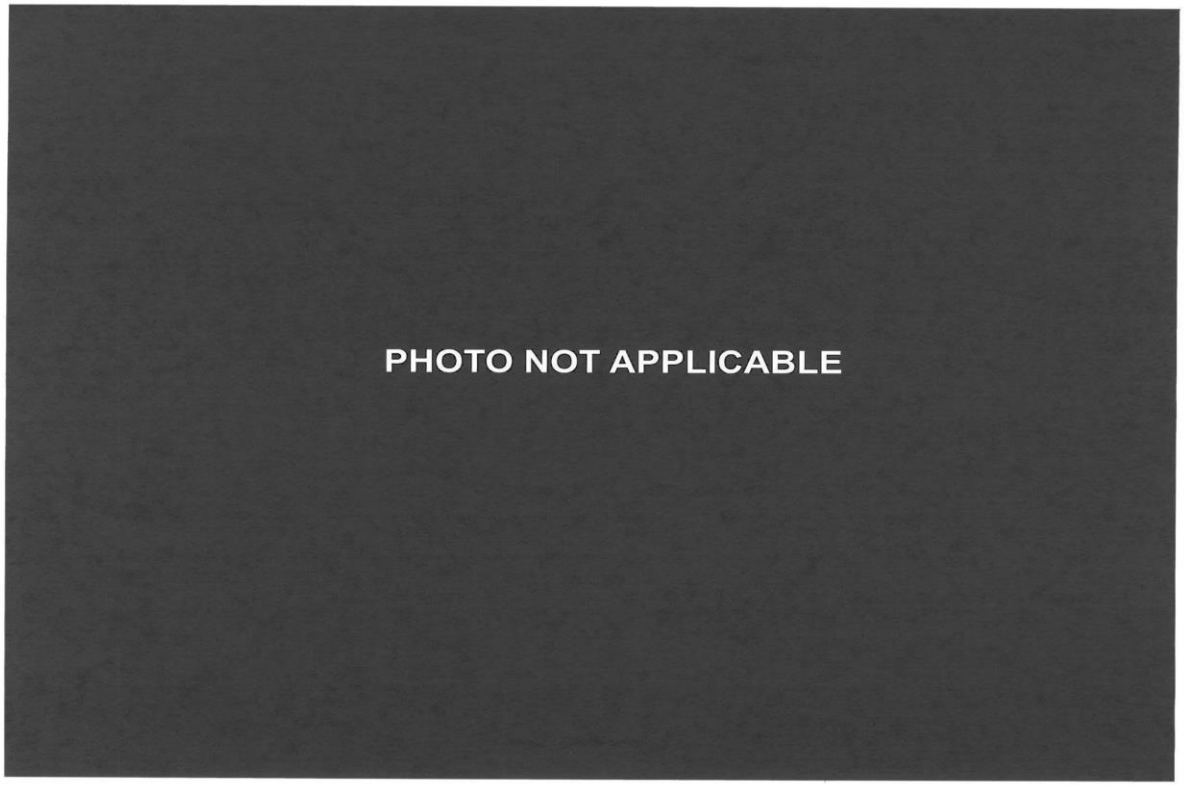
071 Post-Test Passenger Dummy Face



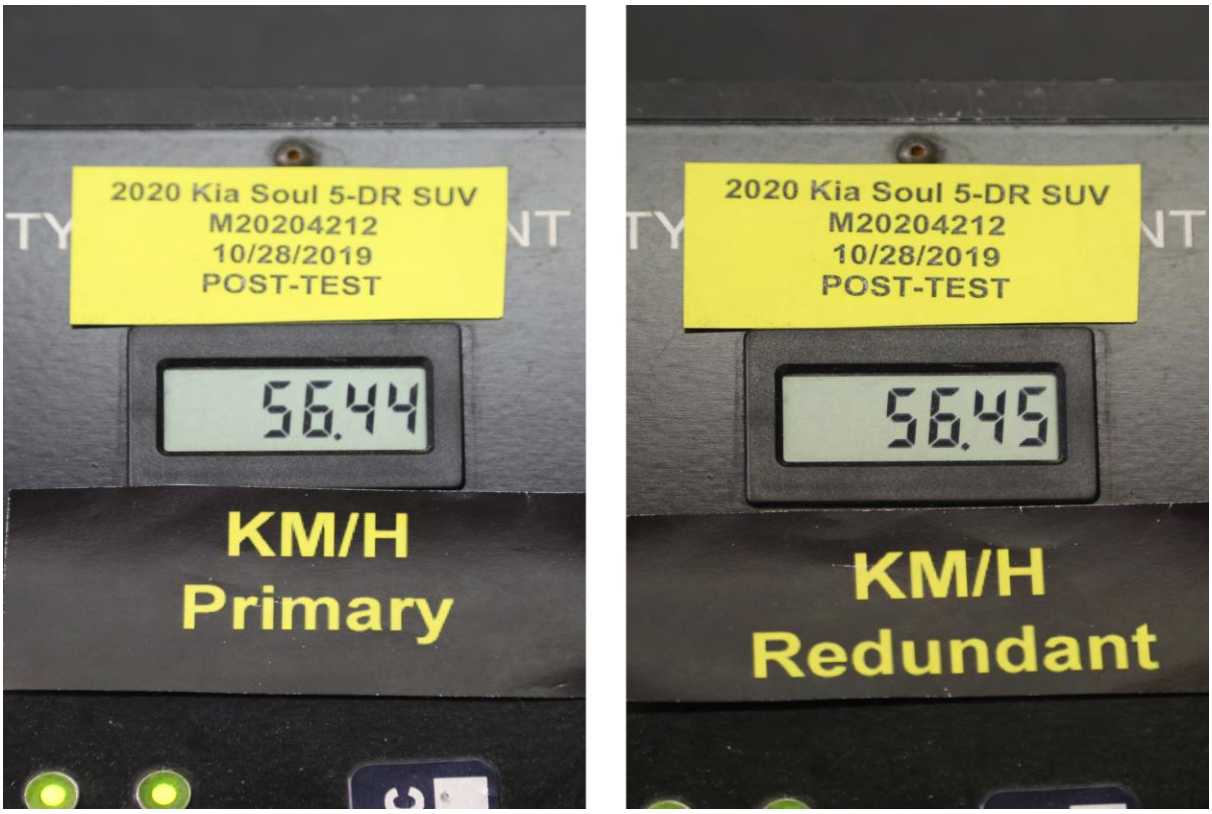
072 Post-Test Passenger Dummy Contact with Airbag

073 Post-Test Passenger Dummy Contact with Headrest

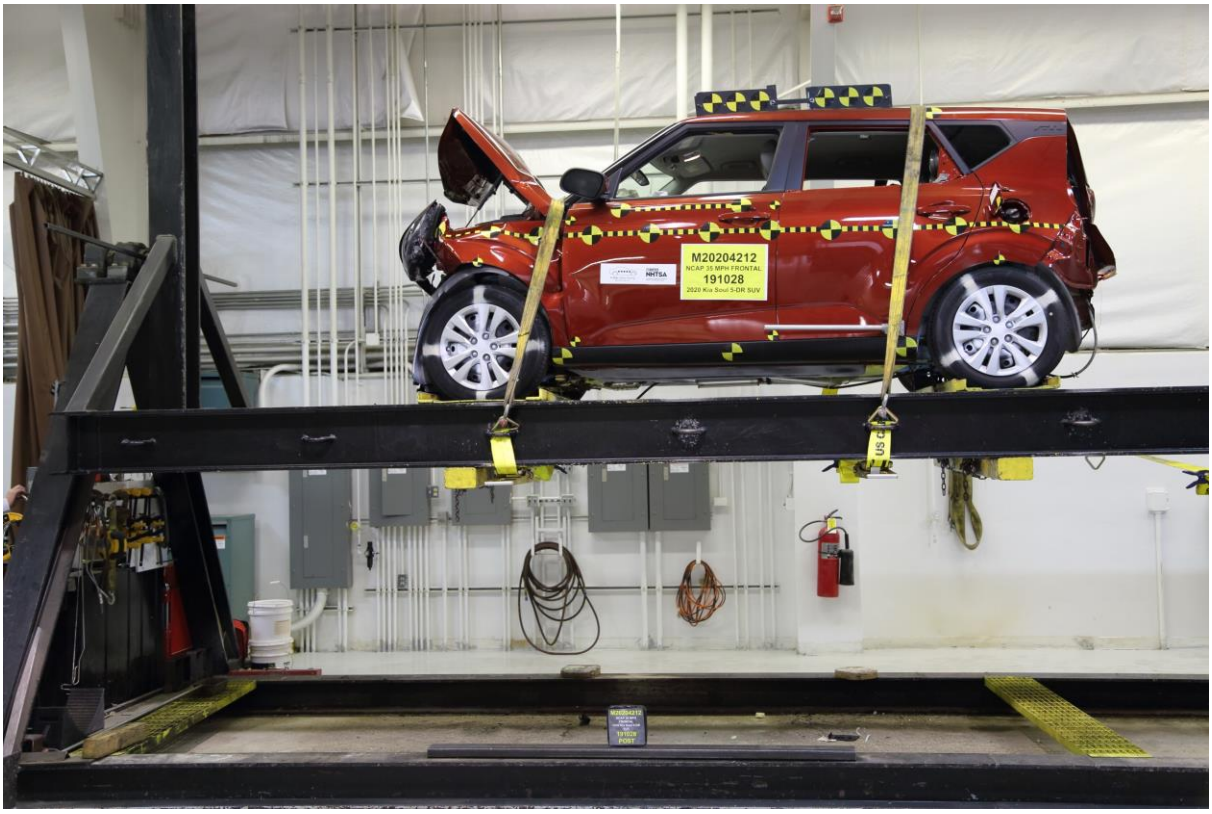
074 Photograph of Ballast Installed in Vehicle



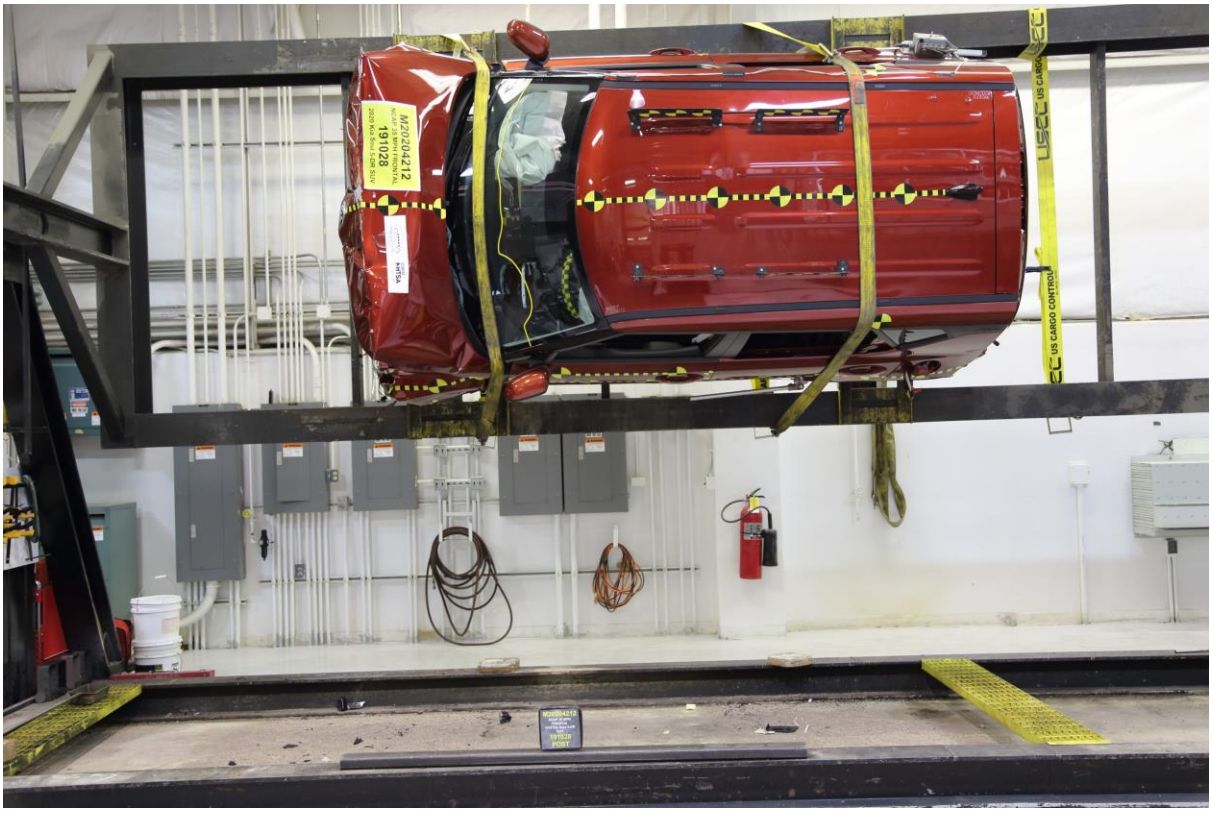
075 Post-Test Stoddard Spillage Location View



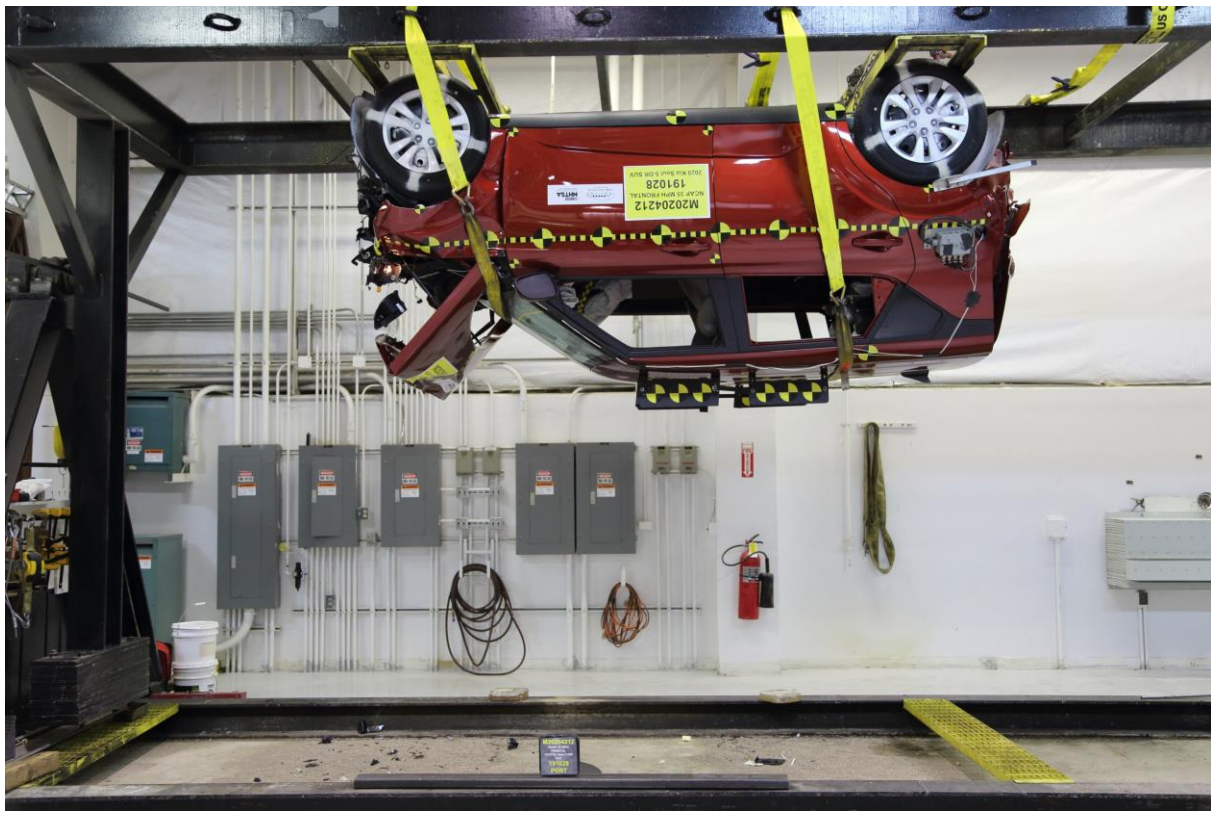
076 Post-Test Speed Trap Read out



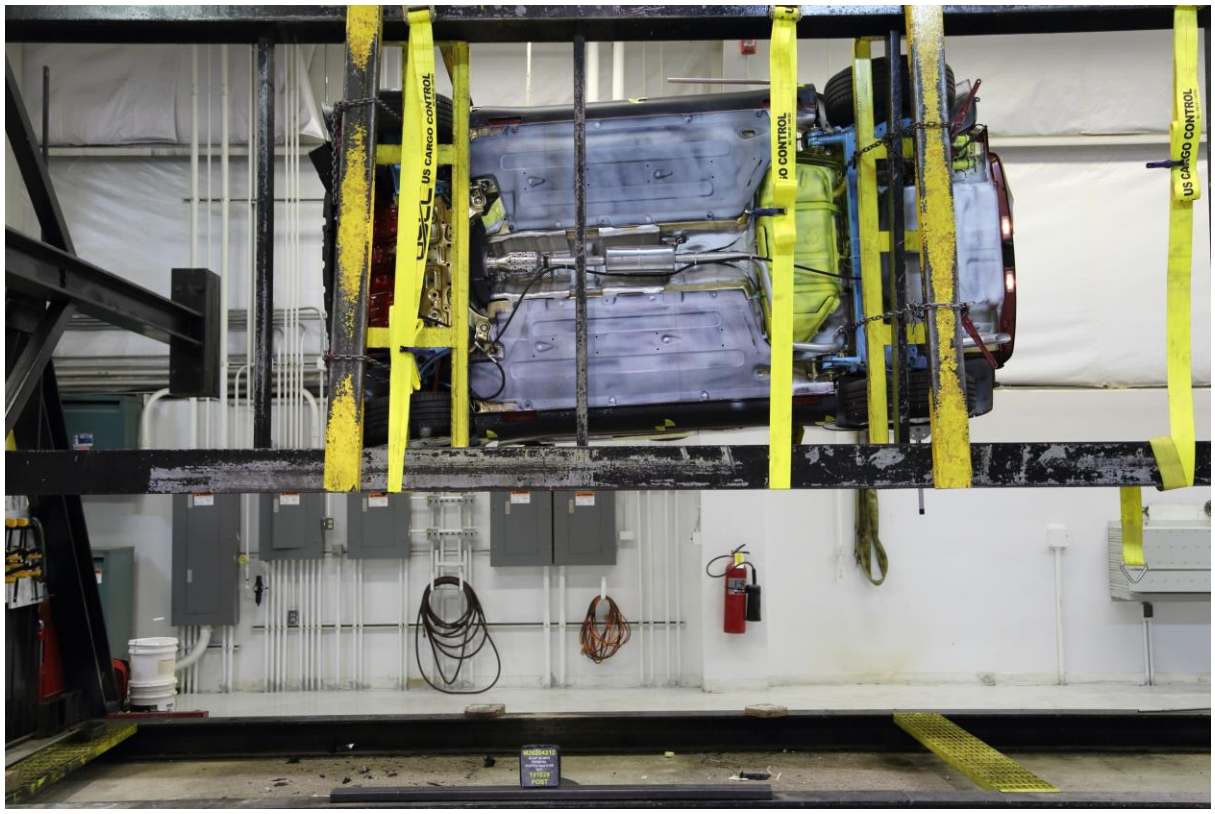
077 Vehicle at 0º on Static Rollover Device



078 Vehicle at 90º on Static Rollover Device



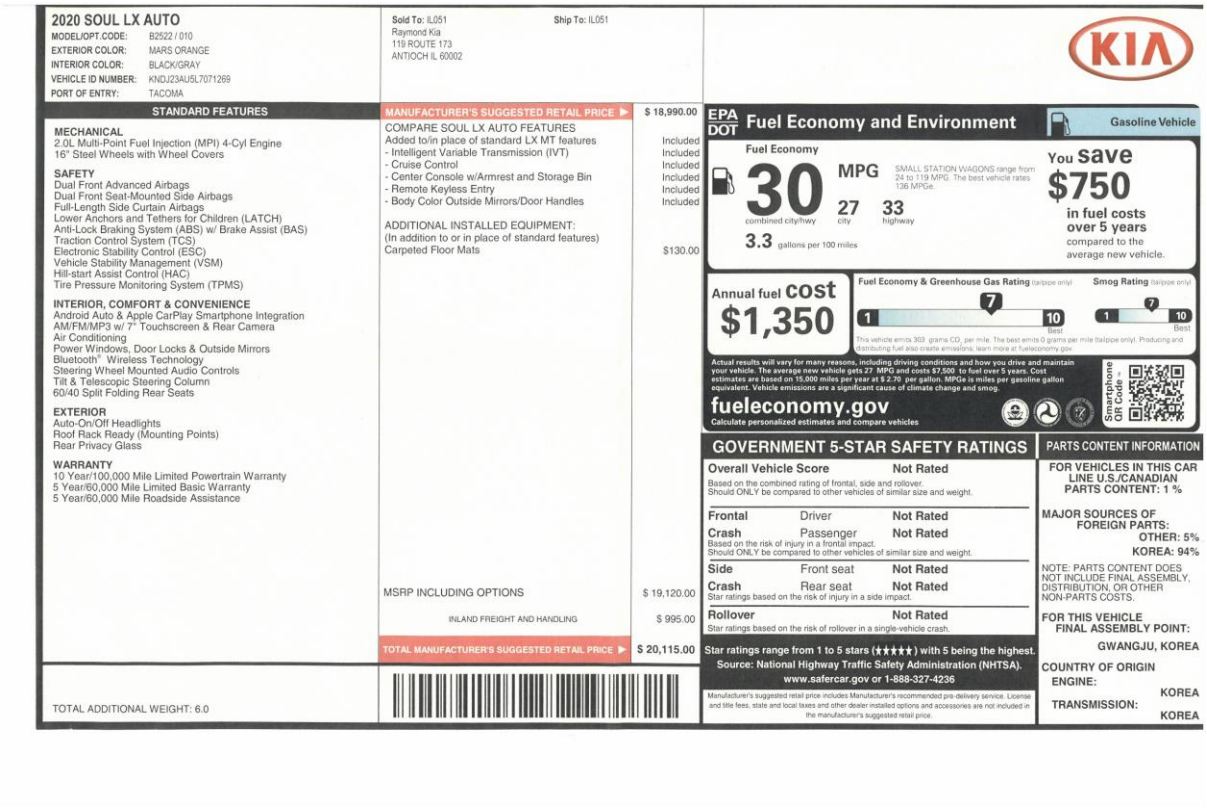
079 Vehicle at 180º on Static Rollover Device



080 Vehicle at 270º on Static Rollover Device

081 Vehicle at 360º on Static Rollover Device

082 22020 Kia Soul 5-DR SUV Frontal Impact Event



2020 SOUL LX AUTO
MODEL/OPT.CODE: B2522 / 010
EXTERIOR COLOR: MARS ORANGE
INTERIOR COLOR: BLACK/GRAY
VEHICLE ID NUMBER: KNDJ23AU5L7071269
PORT OF ENTRY: TACOMA

Sold To: IL051
Raymond Kia
119 ROUTE 173
ANTIOCH IL 60002

Ship To: IL051

KIA

STANDARD FEATURES

MECHANICAL
2.0L Multi-Point Fuel Injection (MPI) 4-Cyl Engine
16" Steel Wheels with Wheel Covers

SAFETY
Dual Front Advanced Airbags
Dual Front Seat-Mounted Side Airbags
Full-Length Side Curtain Airbags
Lower Anchors and Tethers for Children (LATCH)
Anti-Lock Braking System (ABS) w/ Brake Assist (BAS)
Traction Control System (TCS)
Electronic Stability Control (ESC)
Vehicle Stability Management (VSM)
Hill-start Assist Control (HAC)
Tire Pressure Monitoring System (TPMS)

INTERIOR, COMFORT & CONVENIENCE
Android Auto & Apple CarPlay Smartphone Integration
AM/FM/MP3 w/ 7" Touchscreen & Rear Camera
Air Conditioning
Power Windows, Door Locks & Outside Mirrors
Bluetooth® Wireless Technology
Steering Wheel Mounted Audio Controls
Tilt & Telescopic Steering Column
60/40 Split Folding Rear Seats

EXTERIOR
Auto-On/Off Headlights
Roof Rack Ready (Mounting Points)
Rear Privacy Glass

WARRANTY
10 Year/100,000 Mile Limited Powertrain Warranty
5 Year/60,000 Mile Limited Basic Warranty
5 Year/60,000 Mile Roadside Assistance

MANUFACTURER'S SUGGESTED RETAIL PRICE ▶	$ 18,990.00
COMPARE SOUL LX AUTO FEATURES	
Added to/in place of standard LX MT features	Included
- Intelligent Variable Transmission (IVT)	Included
- Cruise Control	Included
- Center Console w/Armrest and Storage Bin	Included
- Remote Keyless Entry	Included
- Body Color Outside Mirrors/Door Handles	Included
ADDITIONAL INSTALLED EQUIPMENT:	
(In addition to or in place of standard features)	
Carpeted Floor Mats	$130.00
MSRP INCLUDING OPTIONS	$ 19,120.00
INLAND FREIGHT AND HANDLING	$ 995.00
TOTAL MANUFACTURER'S SUGGESTED RETAIL PRICE ▶	$ 20,115.00

TOTAL ADDITIONAL WEIGHT: 6.0

EPA DOT Fuel Economy and Environment — Gasoline Vehicle

Fuel Economy
30 MPG combined city/hwy
27 city
33 highway
3.3 gallons per 100 miles
SMALL STATION WAGONS range from 24 to 119 MPG. The best vehicle rates 136 MPGe.

You save $750 in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost $1,350

Fuel Economy & Greenhouse Gas Rating (tailpipe only): 7 (1 Worst, 10 Best)
This vehicle emits 363 grams CO2 per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions, learn more at fueleconomy.gov.

Smog Rating (tailpipe only): 7 (1 Worst, 10 Best)

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

fueleconomy.gov
Calculate personalized estimates and compare vehicles

Smartphone QR Code

GOVERNMENT 5-STAR SAFETY RATINGS

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

Frontal Crash — Driver: Not Rated; Passenger: Not Rated
Based on the risk of injury in a frontal impact.
Should ONLY be compared to other vehicles of similar size and weight.

Side Crash — Front seat: Not Rated; Rear seat: Not Rated
Star ratings based on the risk of injury in a side impact.

Rollover: Not Rated
Star ratings based on the risk of rollover in a single-vehicle crash.

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.
Source: National Highway Traffic Safety Administration (NHTSA).
www.safercar.gov or 1-888-327-4236

Manufacturer's suggested retail price includes Manufacturer's recommended pre-delivery service. License and title fees, state and local taxes and other dealer-installed options and accessories are not included in the manufacturer's suggested retail price.

PARTS CONTENT INFORMATION

FOR VEHICLES IN THIS CAR LINE U.S./CANADIAN PARTS CONTENT: 1 %

MAJOR SOURCES OF FOREIGN PARTS:
OTHER: 5%
KOREA: 94%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

FOR THIS VEHICLE FINAL ASSEMBLY POINT:
GWANGJU, KOREA

COUNTRY OF ORIGIN
ENGINE: KOREA
TRANSMISSION: KOREA

083 Monroney Label Photograph

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

The following additional dummy and vehicle response data can be found in the R & D section of the NHTSA website at: www.nhtsa.gov.

Driver Head Acceleration X Redundant
Driver Head Acceleration Y Redundant
Driver Head Acceleration Z Redundant
Driver Upper Neck Force Y
Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration Redundant
Driver Pelvis X
Driver Pelvis Y
Driver Pelvis Z
Driver Pelvis Resultant
Driver Left Femur Redundant
Driver Right Femur Redundant
Driver Left Upper Tibia Moment X
Driver Left Upper Tibia Moment Y
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z

Driver Head Angular Velocity X
Driver Head Angular Velocity Y
Driver Head Angular Velocity Z
Passenger Head Acceleration X Redundant
Passenger Head Acceleration Y Redundant
Passenger Head Acceleration Z Redundant
Passenger Upper Neck Force Y
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Z
Passenger Chest X Acceleration Redundant
Passenger Chest Y Acceleration Redundant
Passenger Chest Z Acceleration Redundant
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Pelvis Resultant
Passenger Left Femur Redundant
Passenger Right Femur Redundant
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z

Passenger Head Angular Velocity X
Passenger Head Angular Velocity Y
Passenger Head Angular Velocity Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember X Redundant
Right Rear Seat Crossmember X Redundant
Vehicle Engine Top X
Vehicle Engine Bottom X
Load Cell Barrier Forces and Moments

NHTSA

Test Date: 10/28/2019

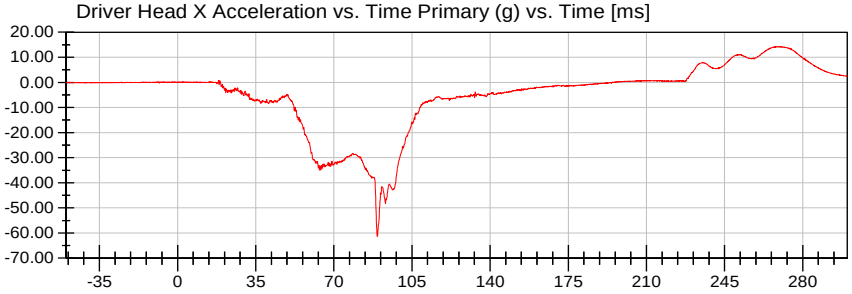
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

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



<Max>

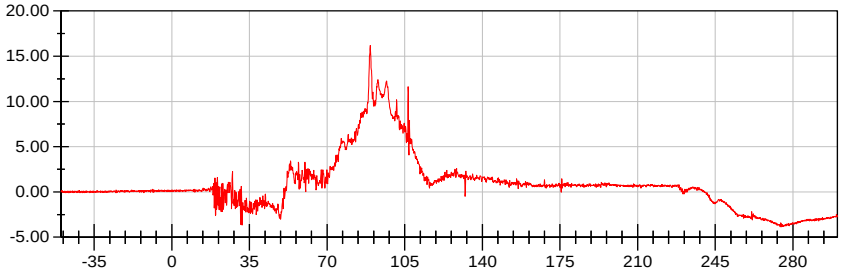
14.26 g at 269.84 ms

<Min>

-61.37 g at 89.44 ms

CFC_1000

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



<Max>

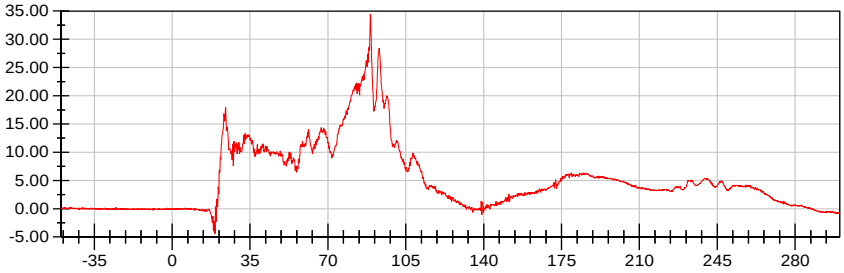
16.18 g at 89.44 ms

<Min>

-3.87 g at 274.32 ms

CFC_1000

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



<Max>

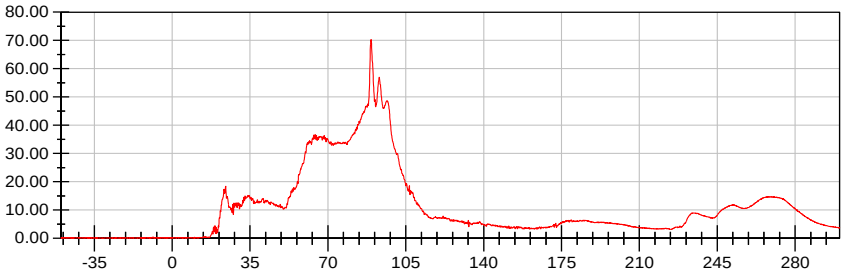
34.40 g at 89.04 ms

<Min>

-4.37 g at 19.28 ms

CFC_1000

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



<Max>

70.32 g at 89.36 ms

<Min>

0.03 g at -25.44 ms

CFC_1000

NHTSA

Test Date: 10/28/2019

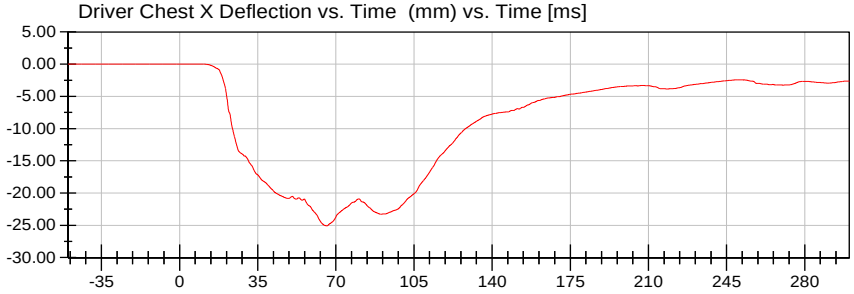
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

Driver Chest X Deflection vs. Time (mm) vs. Time [ms]



<Max>

0.02 mm at 8.48 ms

<Min>

-25.09 mm at 65.92 ms

CFC_600

NHTSA

Test Date: 10/28/2019

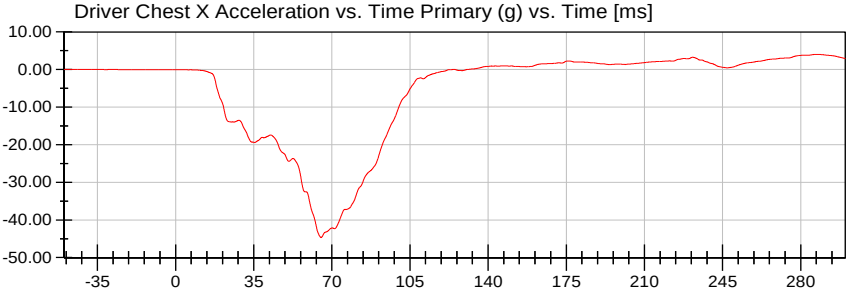
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

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



<Max>

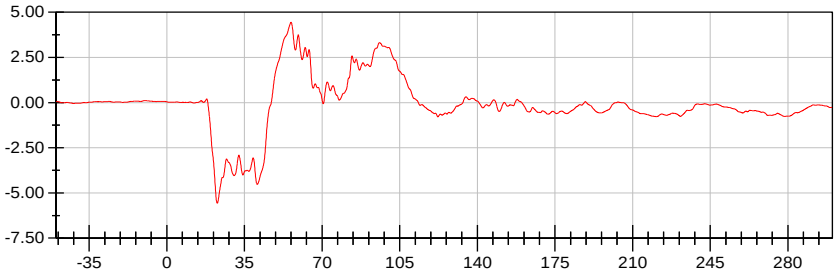
4.02 g at 286.88 ms

<Min>

-44.67 g at 65.20 ms

CFC_180

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



<Max>

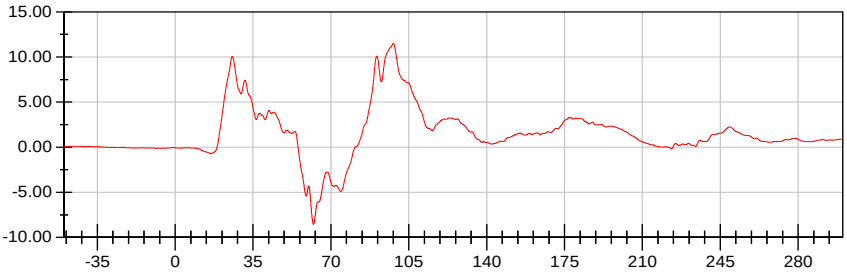
4.45 g at 56.00 ms

<Min>

-5.57 g at 22.80 ms

CFC_180

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



<Max>

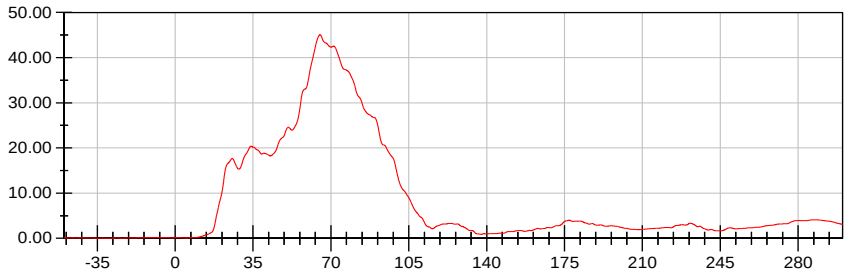
11.49 g at 98.00 ms

<Min>

-8.56 g at 62.16 ms

CFC_180

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



<Max>

45.08 g at 65.12 ms

<Min>

0.04 g at -23.68 ms

CFC_180

NHTSA

Test Date: 10/28/2019

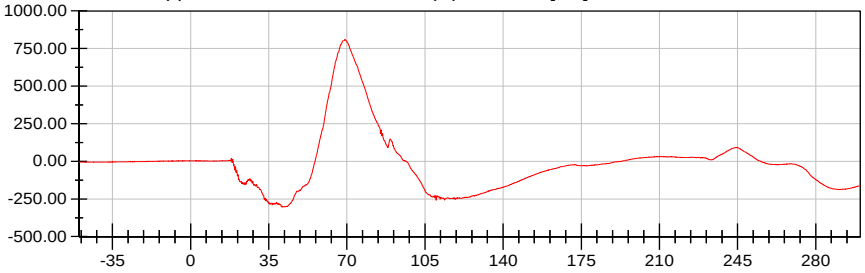
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

Driver Upper Neck Force X vs. Time (N) vs. Time [ms]



<Max>

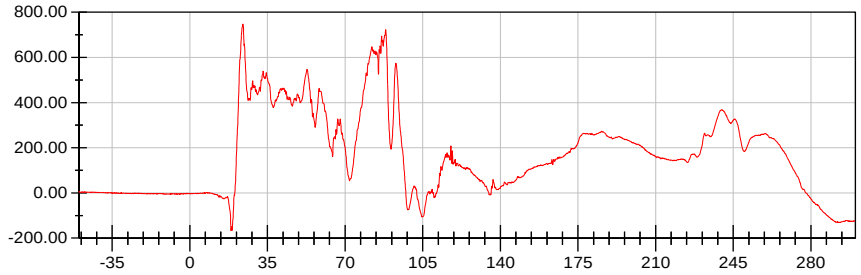
810.55 N at 69.12 ms

<Min>

-305.27 N at 41.28 ms

CFC_1000

Driver Upper Neck Force Z vs. Time (N) vs. Time [ms]



<Max>

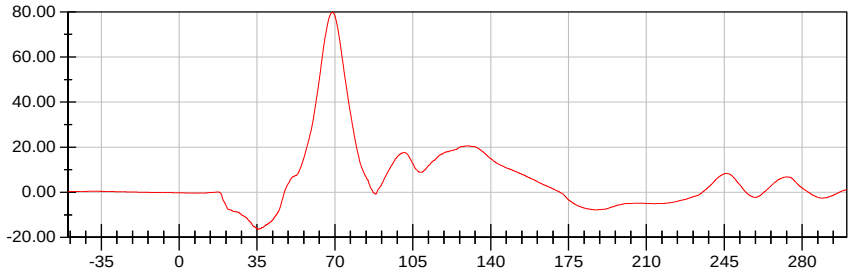
747.98 N at 23.92 ms

<Min>

-166.99 N at 18.64 ms

CFC_1000

Driver Upper Neck Moment Y vs. Time (Nm) vs. Time [ms]



<Max>

79.79 Nm at 68.88 ms

<Min>

-16.37 Nm at 35.76 ms

CFC_600

2020 Kia Soul 5-DR SUV NCAP 35 mph Frontal Impact

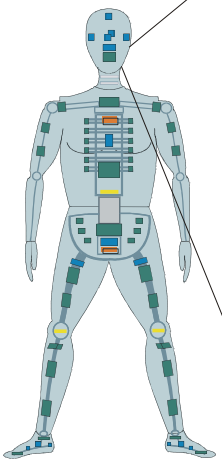
Neck Injury Predictor (NIJ)

Date: 10/28/2019
Time: 14:04

Customer: NHTSA
Test Number: M20204212

TRC Inc. Test Lab: CTF
Test Number: 191028

Test Orientation = Frontal
Fzc(Tension) = 6806
Fzc(Compression) = 6160
Myc(Extension) = 135
Myc(Flexion) = 310



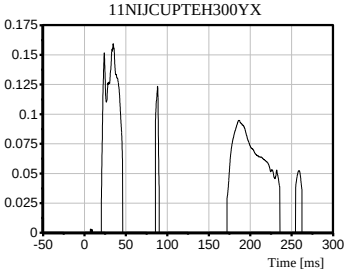
Dummy:HIII 50th Male
Seating Position:
Driver

NIJ Source Code: (Fz/Fzc)+(My/Myc)

11TMONUP00H3MOYX

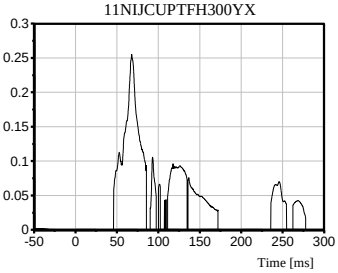
11NECKUP00H3FOZA

11NIJCUPTEH300YX



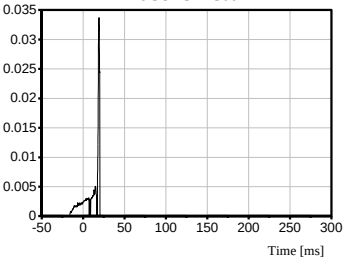
Max [NTE] 0.1592 at 34.56 ms

11NIJCUPTFH300YX



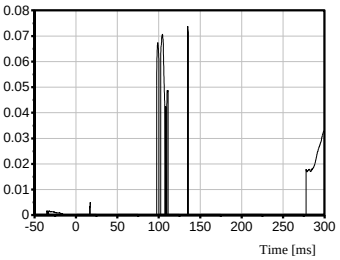
Max [NTF] 0.2552 at 67.92 ms

11NIJCUPCEH300YX



Max [NCE] 0.0337 at 19.28 ms

11NIJCUPCFH300YX



Max [NCF] 0.0737 at 134.96 ms

NHTSA

Test Date: 10/28/2019

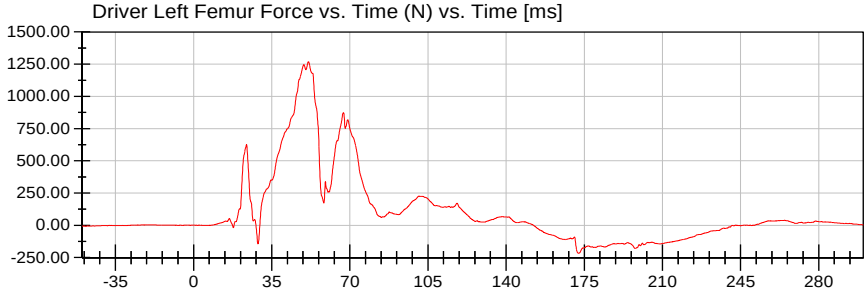
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

Driver Left Femur Force vs. Time (N) vs. Time [ms]



<Max>

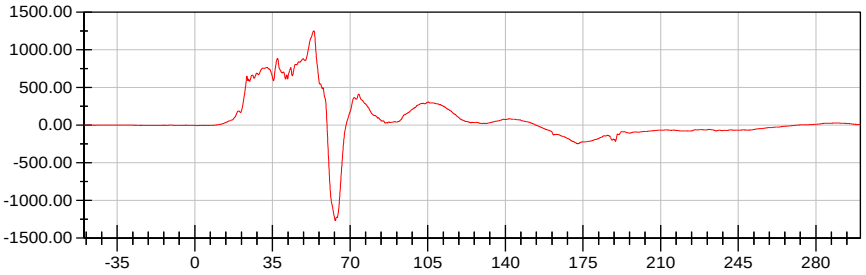
1,268.21 N at 51.44 ms

<Min>

-217.24 N at 172.48 ms

CFC_600

Driver Right Femur Force vs. Time (N) vs. Time [ms]



<Max>

1,252.48 N at 53.68 ms

<Min>

-1,270.24 N at 63.36 ms

CFC_600

NHTSA

Test Date: 10/28/2019

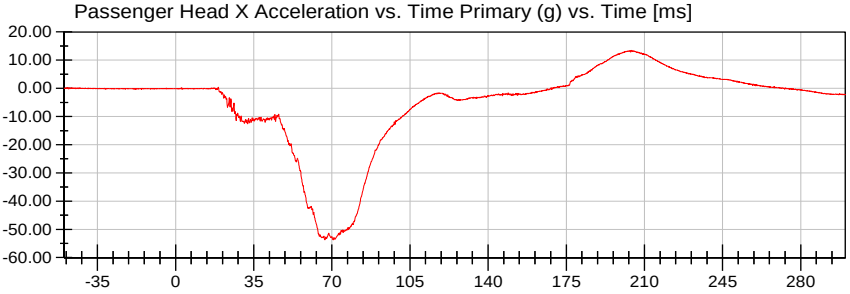
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

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



<Max>

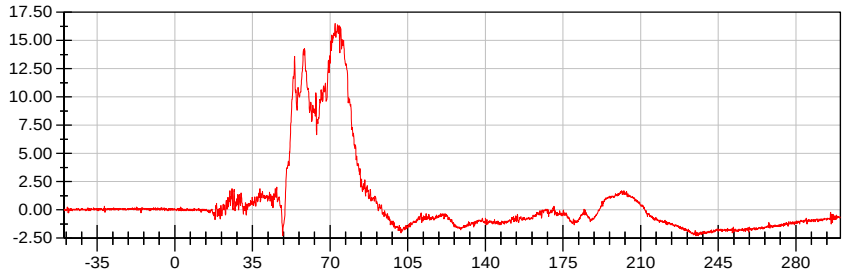
13.47 g at 204.24 ms

<Min>

-53.76 g at 70.64 ms

CFC_1000

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



<Max>

16.52 g at 72.32 ms

<Min>

-2.29 g at 48.64 ms

CFC_1000

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

<Max>

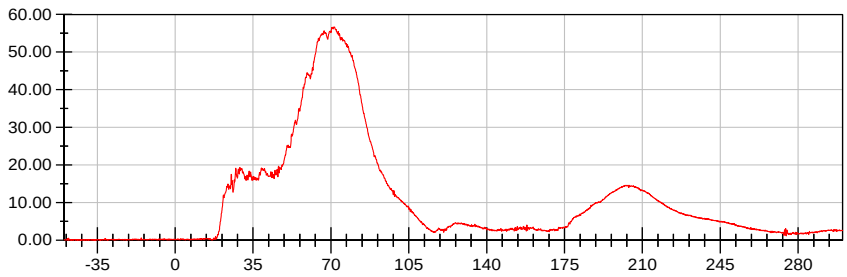
16.93 g at 55.52 ms

<Min>

-0.50 g at 13.52 ms

CFC_1000

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



<Max>

56.72 g at 71.44 ms

<Min>

0.03 g at -42.40 ms

CFC_1000

NHTSA

Test Date: 10/28/2019

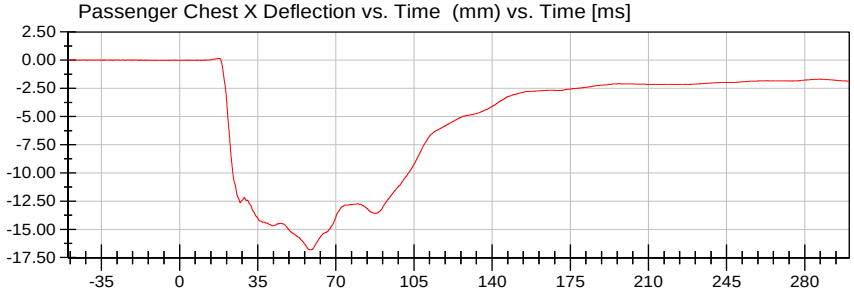
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

Passenger Chest X Deflection vs. Time (mm) vs. Time [ms]



<Max>

0.15 mm at 18.00 ms

<Min>

-16.82 mm at 58.72 ms

CFC_600

NHTSA

Test Date: 10/28/2019

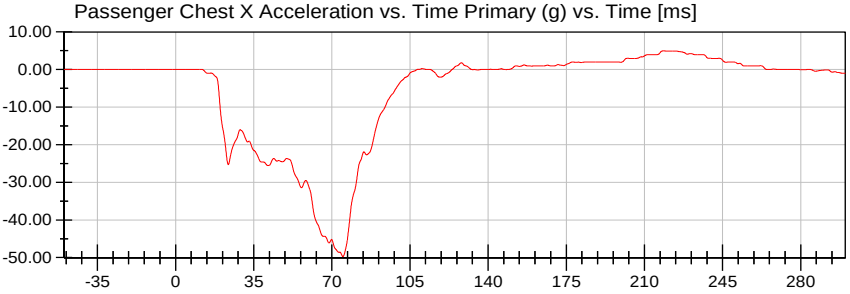
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

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



<Max>

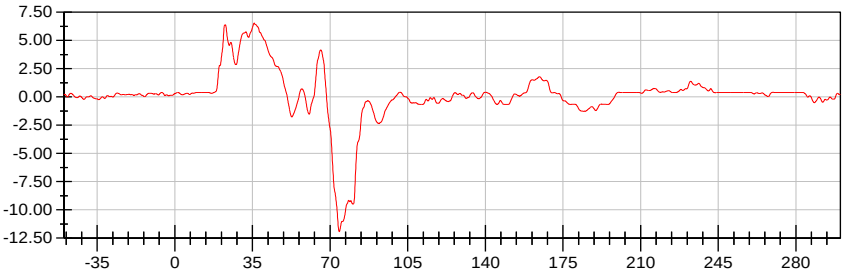
4.95 g at 218.40 ms

<Min>

-49.74 g at 74.96 ms

CFC_180

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



<Max>

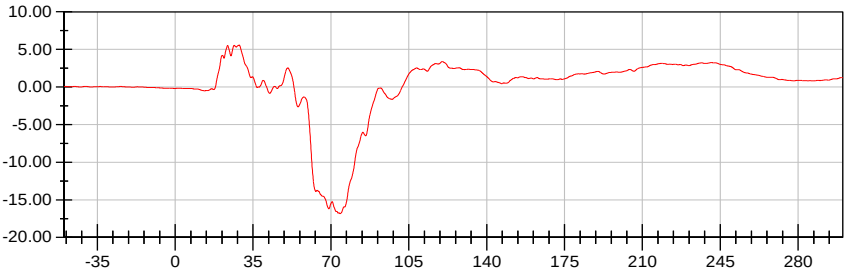
6.53 g at 35.76 ms

<Min>

-11.92 g at 74.16 ms

CFC_180

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



<Max>

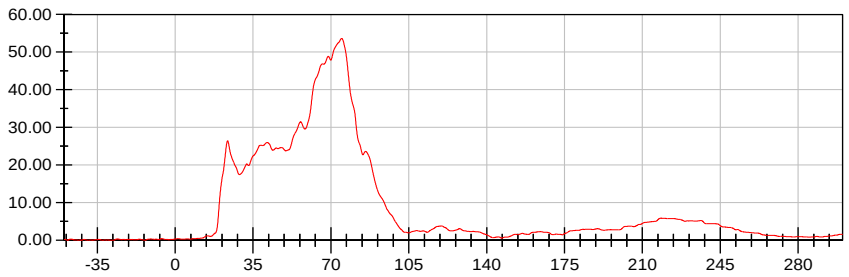
5.57 g at 28.80 ms

<Min>

-16.85 g at 74.16 ms

CFC_180

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



<Max>

53.64 g at 74.80 ms

<Min>

0.01 g at -28.08 ms

CFC_180

NHTSA

Test Date: 10/28/2019

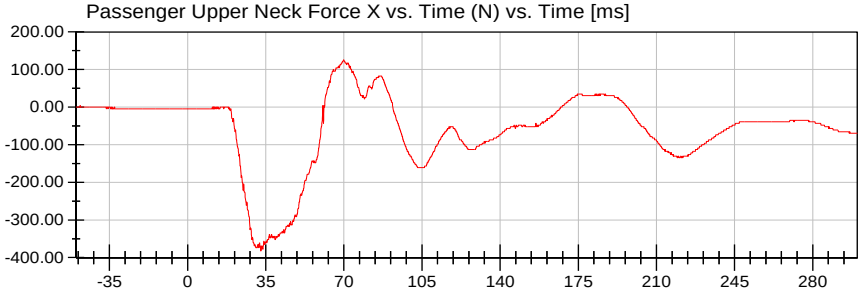
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

Passenger Upper Neck Force X vs. Time (N) vs. Time [ms]



<Max>

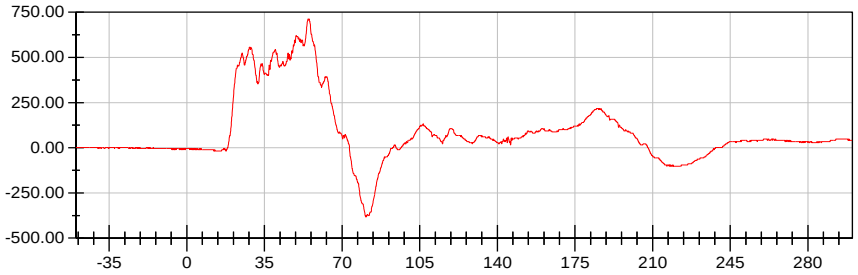
126.12 N at 69.84 ms

<Min>

-382.58 N at 32.88 ms

CFC_1000

Passenger Upper Neck Force Z vs. Time (N) vs. Time [ms]



<Max>

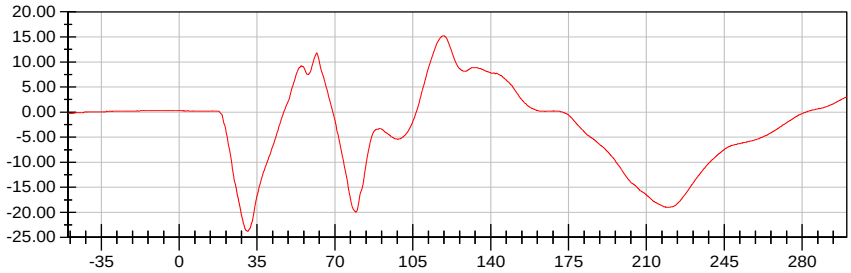
712.77 N at 54.64 ms

<Min>

-382.26 N at 80.56 ms

CFC_1000

Passenger Upper Neck Moment Y vs. Time (Nm) vs. Time [ms]



<Max>

15.21 Nm at 118.96 ms

<Min>

-23.76 Nm at 30.72 ms

CFC_600

2020 Kia Soul 5-DR SUV NCAP 35 mph Frontal Impact

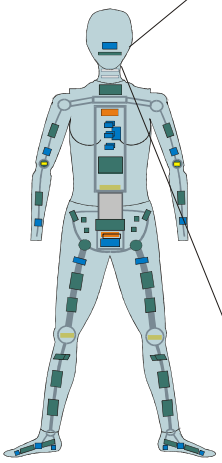
Neck Injury Predictor (NIJ)

Date: 10/28/2019
Time: 14:04

Customer: NHTSA
Test Number: M20204212

TRC Inc. Test Lab: CTF
Test Number: 191028

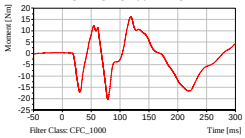
Test Orientation = Frontal
Fzc(Tension) = 4287
Fzc(Compression) = 3880
Myc(Extension) = 67
Myc(Flexion) = 155



Dummy:HIII 5th Female
Seating Position:
Right Front Passenger

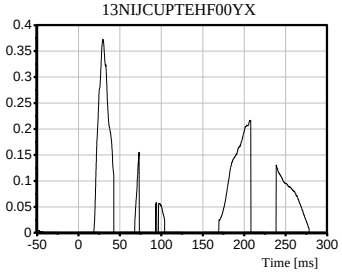
NIJ Source Code: (Fz/Fzc)+(My/Myc)

13TMONUP00HFMOYX



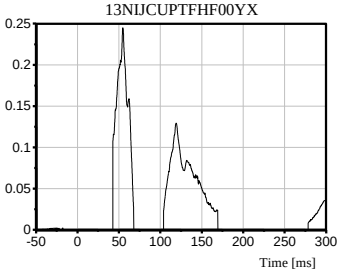
13NECKUP00HFFOZA

13NIJCUPTEHF00YX



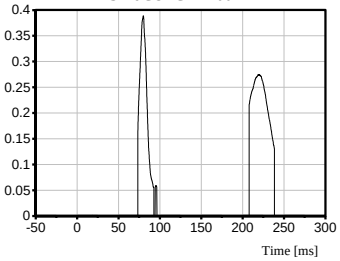
Max [NTE] 0.3730 at 29.36 ms

13NIJCUPTFHF00YX



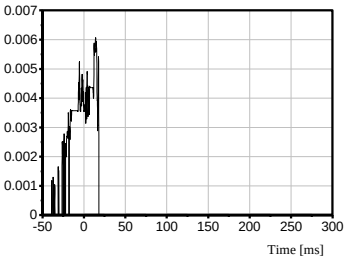
Max [NTF] 0.2449 at 54.72 ms

13NIJCUPCEHF00YX



Max [NCE] 0.3889 at 80.00 ms

13NIJCUPCFHF00YX



Max [NCF] 0.0061 at 14.16 ms

NHTSA

Test Date: 10/28/2019

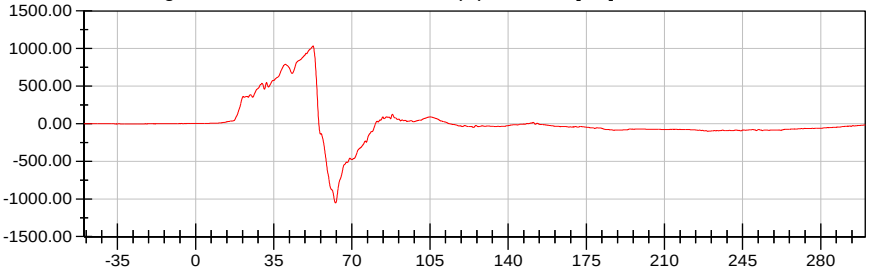
Test Lab: CTF

Position #1 Hybrid III Mid-Sized Adult Male Dummy (037)

Test Number: 191028 (M20204212)

Position #2 Hybrid III Small Adult Female (EB7513)

Passenger Left Femur Force vs. Time (N) vs. Time [ms]



<Max>

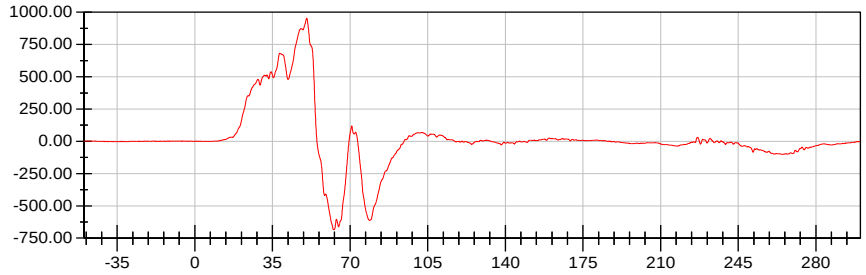
1,033.58 N at 52.64 ms

<Min>

-1,052.89 N at 62.64 ms

CFC_600

Passenger Right Femur Force vs. Time (N) vs. Time [ms]



<Max>

953.76 N at 50.48 ms

<Min>

-684.12 N at 62.56 ms

CFC_600

APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION

Pre-Test Calibration Sheets

Driver S/N 037

Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 62

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	882	Yes
B	Shoulder Pivot Height	505.5 - 520.7	511	Yes
C	H-Point Height	83.8 - 88.9	85	Yes
D	H-Point From Seatback	134.6 - 139.7	137	Yes
E	Shoulder Pivot From Backline	83.8 - 94.0	91	Yes
F	Thigh Clearance	139.7 - 154.9	148	Yes
G	Back Of Elbow To Wrist Pivot	289.6 - 304.8	295	Yes
H	Skull Cap To Backline	40.6 - 45.7	45	Yes
I	Shoulder-Elbow Length	330.2 - 345.4	337	Yes
J	Elbow Rest Height	190.5 - 210.8	199	Yes
K	Buttock Knee Length	579.1 - 604.5	601	Yes
L	Popliteal Height	429.3 - 454.7	440	Yes
M	Knee Pivot Height	485.1 - 500.4	494	Yes
N	Buttock Popliteal Length	452.1 - 477.5	470	Yes
O	Chest Depth	213.4 - 228.6	222	Yes
P	Foot Length	251.5 - 266.7	264	Yes
V	Shoulder Breadth	421.6 - 436.9	425	Yes
W	Foot Breadth	91.4 - 106.7	96	Yes
Y	Chest Circumference	970.3 - 1000.8	991	Yes
Z	Waist Circumference	835.7 - 866.1	865	Yes
AA	Location For Chest Circumference	429.3 - 434.3	432	Yes
BB	Location For Waist Circumference	226.1 - 231.1	229	Yes

Transportation Research Center Inc.

Front Head Drop
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	59 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	255.1 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	6.3 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	3.08 %	Yes

Test meets specifications.

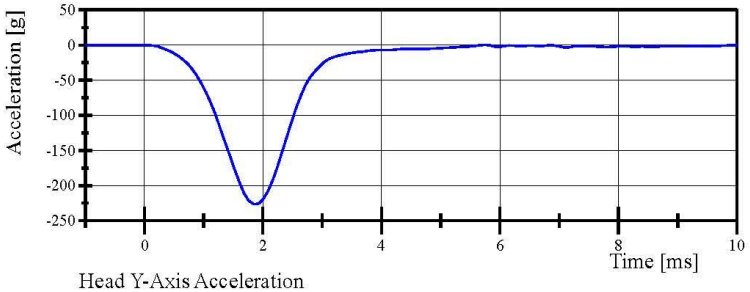
Condition: Used

Comments:
Head Skin S/N: N/A

Transportation Research Center Inc.

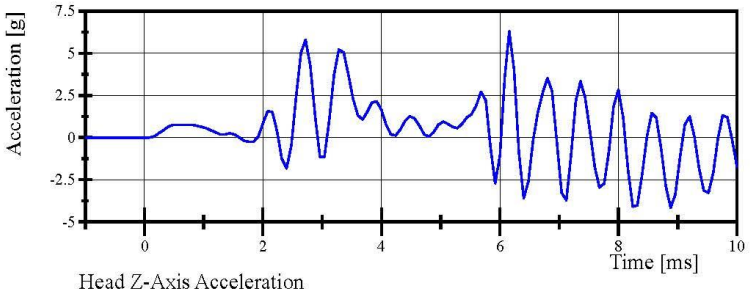
Front Head Drop
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/23/2019

Head X-Axis Acceleration



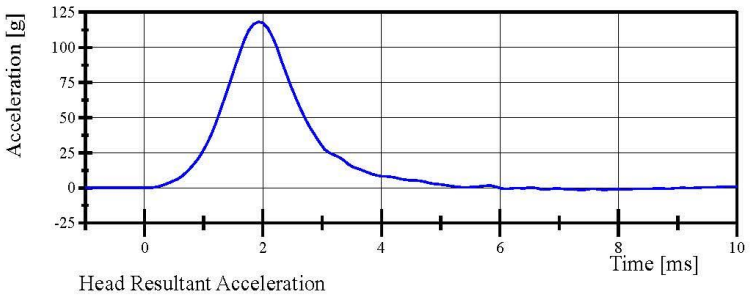
Filter Class: CFC_1000
Max: 0.5 g at 5.8 ms
Min: -226.5 g at 1.8 ms

Head Y-Axis Acceleration



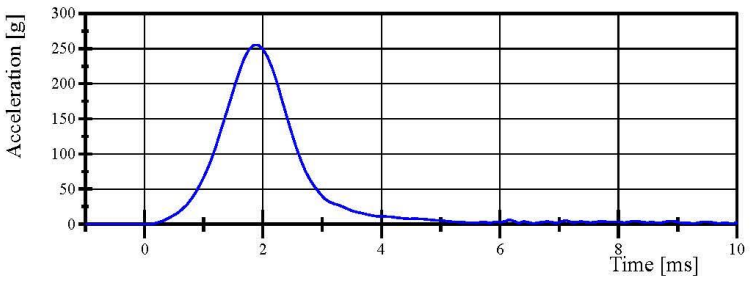
Filter Class: CFC_1000
Max: 6.3 g at 6.2 ms
Min: -4.2 g at 8.9 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 118.3 g at 1.9 ms
Min: -1.5 g at 7.4 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 255.1 g at 1.9 ms
Min: 0.0 g at -1.0 ms

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

09.23.2019 14:57:38 578

Transportation Research Center Inc.

Neck Flexion
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/24/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	51 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.905 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	38.8 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-25.02 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-20.09 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-17.53 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-17.53 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) °	-70.9 °	Yes
Time of Peak	57 - 64 ms	58.4 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	121.5 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88.1 - 108.4 N·m	101.71 N·m	Yes
Time of Peak	47 - 58 ms	51.8 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	100.8 ms	Yes

Test meets specifications.

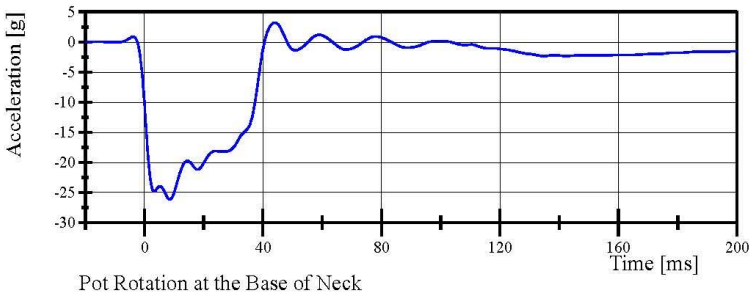
Condition: Used

Comments:
Neck S/N: 4728

Transportation Research Center Inc.

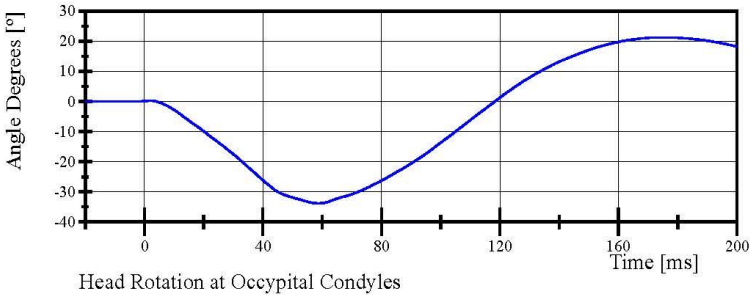
Neck Flexion
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/24/2019

Pendulum Acceleration



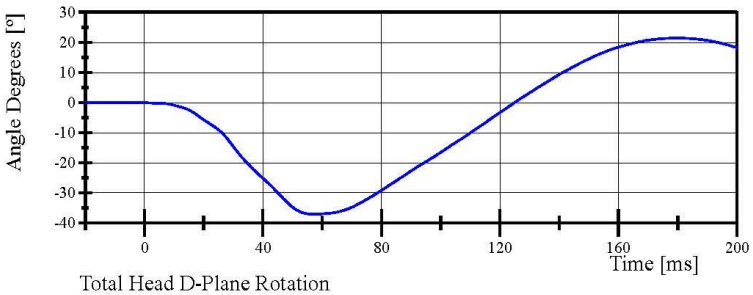
Filter Class: CFC_60
Max: 3.2 g at 44.0 ms
Min: -26.1 g at 8.6 ms

Pot Rotation at the Base of Neck



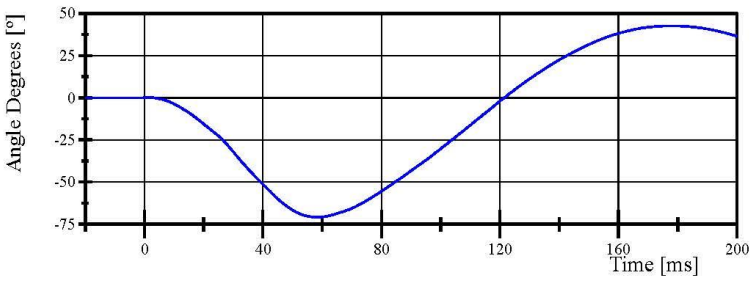
Filter Class: CFC_60
Max: 21.3 ° at 175.1 ms
Min: -33.9 ° at 58.8 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 21.5 ° at 179.9 ms
Min: -37.0 ° at 56.8 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 42.7 ° at 178.2 ms
Min: -70.9 ° at 58.4 ms

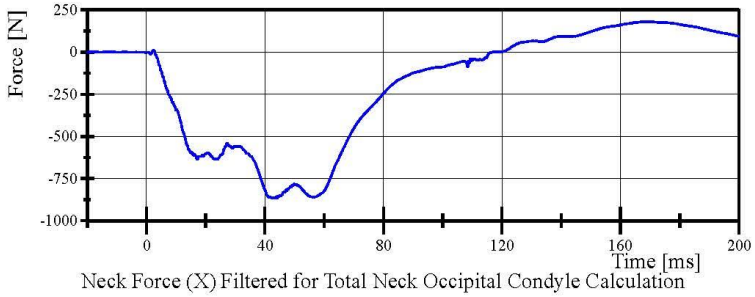
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.24.2019 07:31:04 1838

Transportation Research Center Inc.

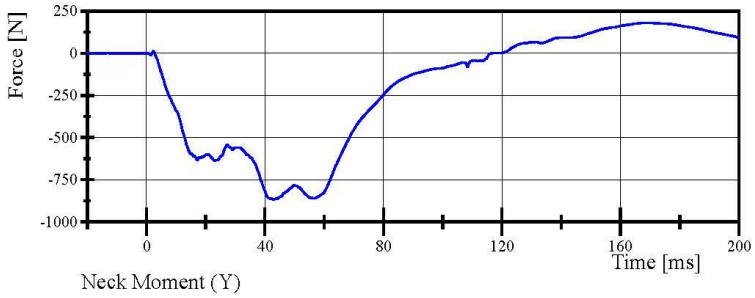
Neck Flexion
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/24/2019

Neck Force (X)



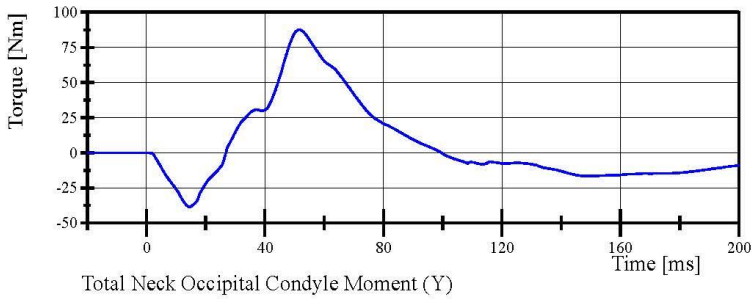
Filter Class: CFC_1000
Max: 180.2 N at 167.4 ms
Min: -866.0 N at 43.1 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



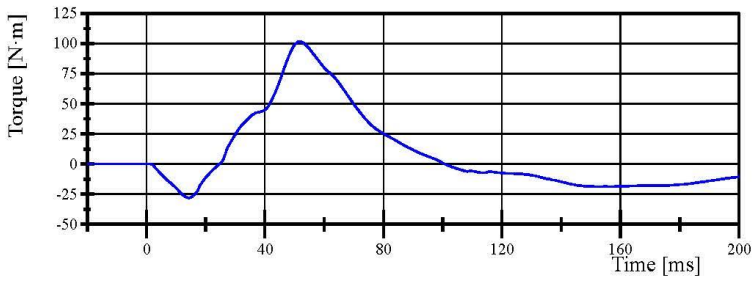
Filter Class: CFC_600
Max: 180.0 N at 167.8 ms
Min: -865.7 N at 43.0 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 87.6 Nm at 51.7 ms
Min: -38.4 Nm at 14.6 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 101.7 N·m at 51.8 ms
Min: -28.1 N·m at 14.3 ms

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

09.24.2019 07:31:04 1838

Transportation Research Center Inc.

Neck Extension
HIII 50th Serial No. 037 Certification No. 62-4
Test Date: 9/24/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-5.956 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	39.1 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	21.10 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	17.75 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	14.48 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	14.59 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 °	101.7 °	Yes
Time of Peak	72 - 82 ms	77.2 ms	Yes
Total Head D-Plane Rotation Decay to 0°	147 - 174 ms	159.5 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	(-52.9) - (-80) N·m	-74.31 N·m	Yes
Time of Peak	65 - 79 ms	72.0 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	147.8 ms	Yes

Test meets specifications.

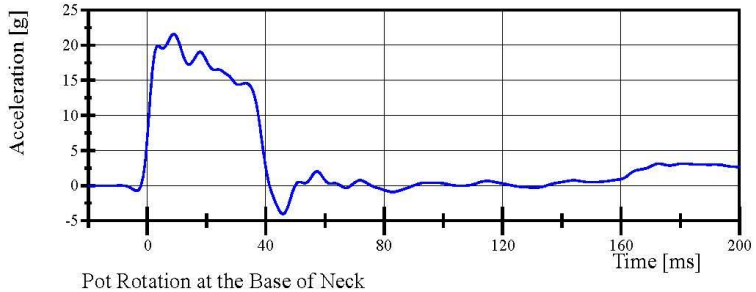
Condition: Used

Comments:
Neck S/N: 4728

Transportation Research Center Inc.

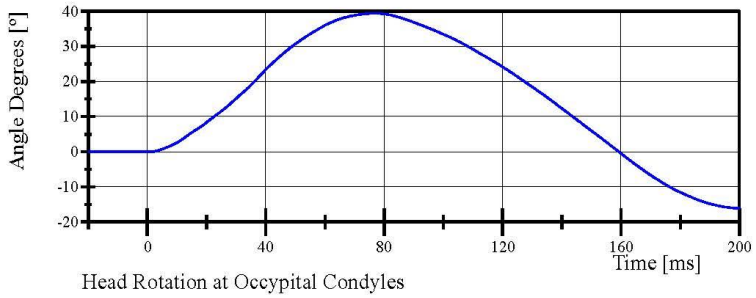
Neck Extension
HIII 50th Serial No. 037 Certification No. 62-4
Test Date: 9/24/2019

Pendulum Acceleration



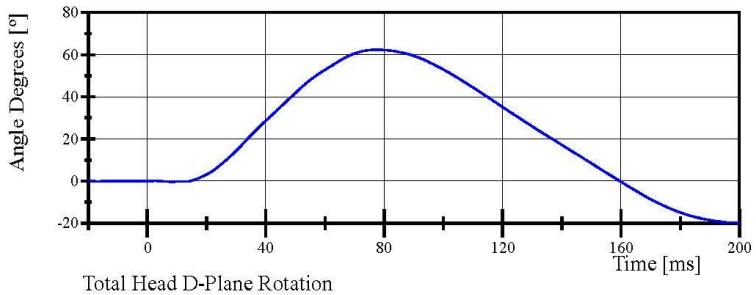
Filter Class: CFC_60
Max: 21.6 g at 8.9 ms
Min: -4.0 g at 45.8 ms

Pot Rotation at the Base of Neck



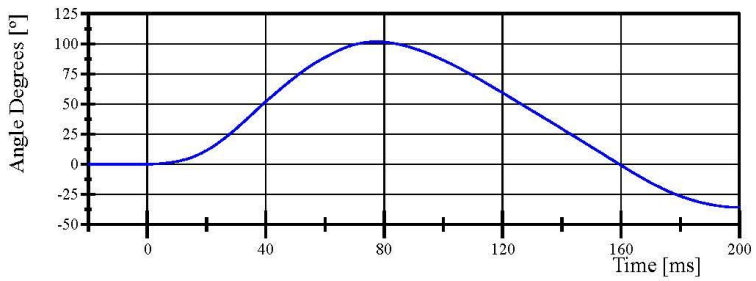
Filter Class: CFC_60
Max: 39.4 ° at 76.8 ms
Min: -16.1 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 62.3 ° at 77.5 ms
Min: -19.8 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 101.7 ° at 77.2 ms
Min: -35.9 ° at 200.0 ms

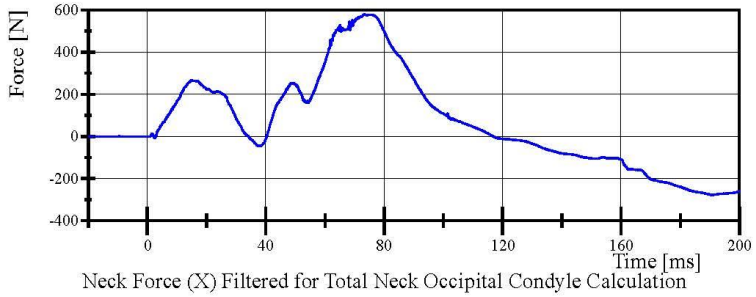
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.24.2019 13:34:34 1982

Transportation Research Center Inc.

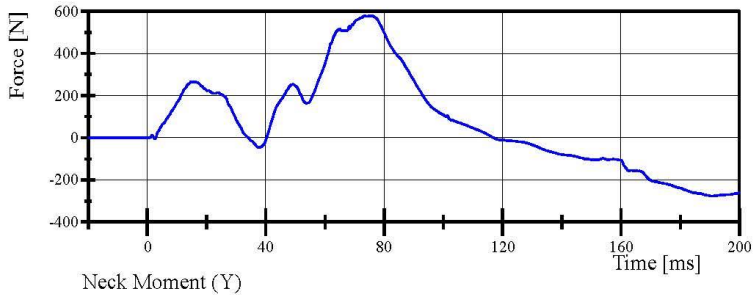
Neck Extension
HIII 50th Serial No. 037 Certification No. 62-4
Test Date: 9/24/2019

Neck Force (X)



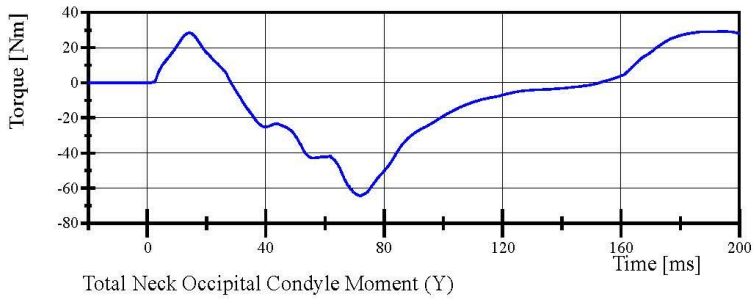
Filter Class: CFC_1000
Max: 579.1 N at 73.3 ms
Min: -276.5 N at 190.2 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



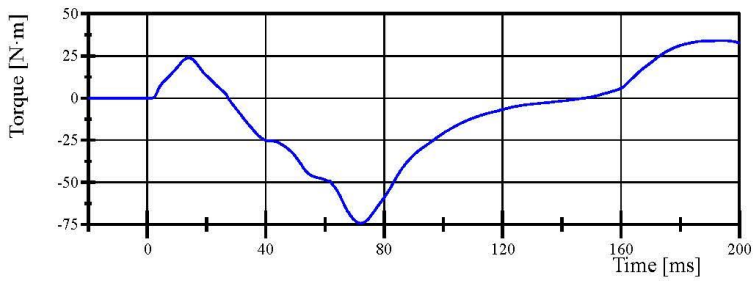
Filter Class: CFC_600
Max: 578.6 N at 73.4 ms
Min: -276.3 N at 190.7 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 29.3 Nm at 193.9 ms
Min: -64.3 Nm at 71.9 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 34.1 N·m at 194.0 ms
Min: -74.3 N·m at 72.0 ms

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

09.24.2019 13:34:35 1982

Transportation Research Center Inc.

Front Thorax
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/24/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.788 m/s	Yes
Probe Force Peak	(-5,160) - (-5,894) N	-5,496.0 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-66.52 mm	Yes
Internal Hysteresis	69 - 85 %	74.1 %	Yes

Test meets specifications.

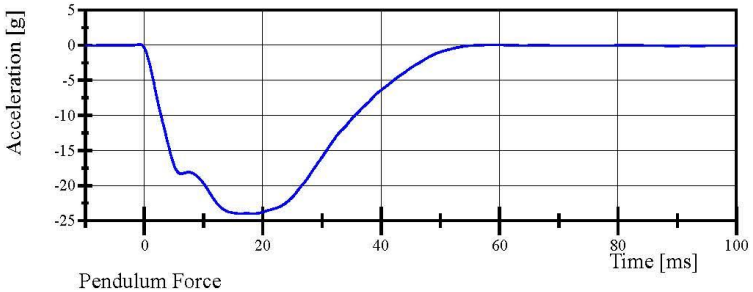
Condition: Used

Comments:
Jacket S/N: 2565
Rib Set S/N: 02033121A

Transportation Research Center Inc.

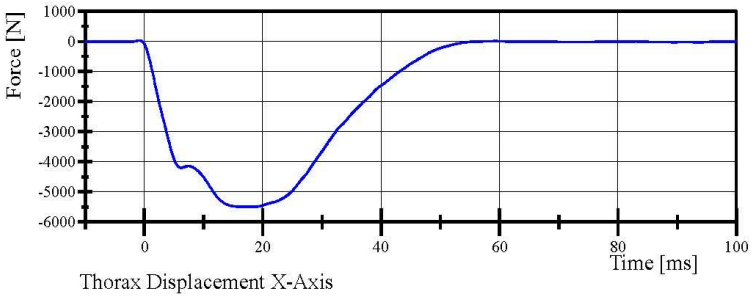
Front Thorax
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/24/2019

Pendulum Acceleration



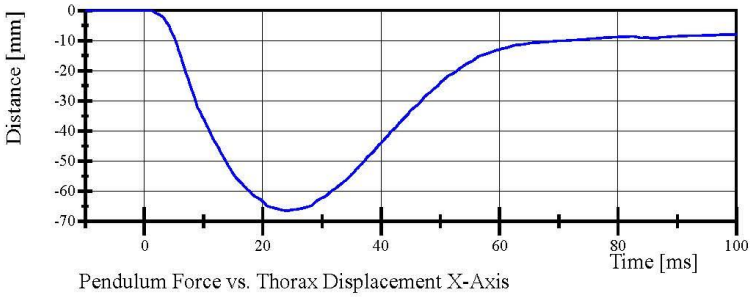
Filter Class: CFC_180
Max: 0.1 g at -0.8 ms
Min: -24.0 g at 18.4 ms

Pendulum Force



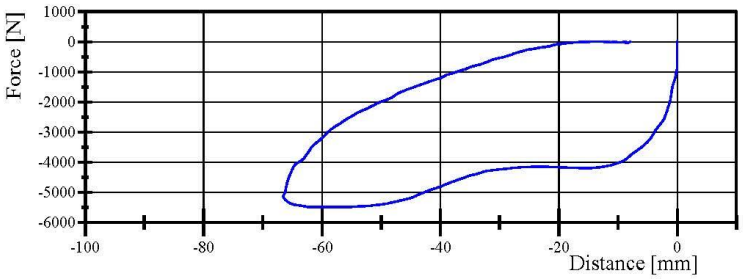
Filter Class: CFC_180
Max: 23.0 N at -0.8 ms
Min: -5,496.0 N at 18.4 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -9.4 ms
Min: -66.5 mm at 24.0 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 23.0 N at -0.0 mm
Min: -5,496.0 N at -61.3 mm

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

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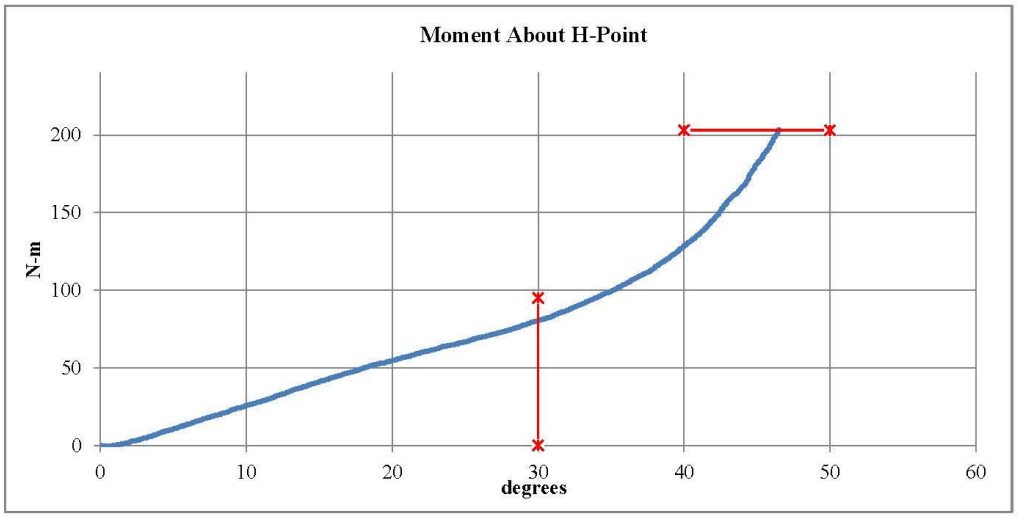
Transportation Research Center Inc.

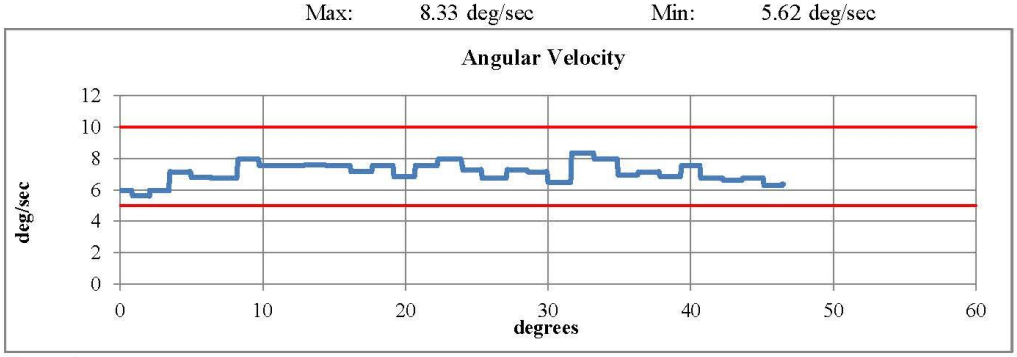
Hybrid III 50th Male Hip Range of Motion

Serial Number:	037	Date:	24-Sep-2019
Side Tested:	Left Hip	Time:	7:02
Test Number:	1		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.9	°C	Pass
Humidity	10	-	70	50	%	Pass
Moment at 30°	0	≤	94.9	80.78	N-m	Pass
Angle at 203 Nm	40	-	50	46.5	deg	Pass
Average Velocity	5	-	10	7.09	deg/sec	Pass



Max: 8.33 deg/sec Min: 5.62 deg/sec



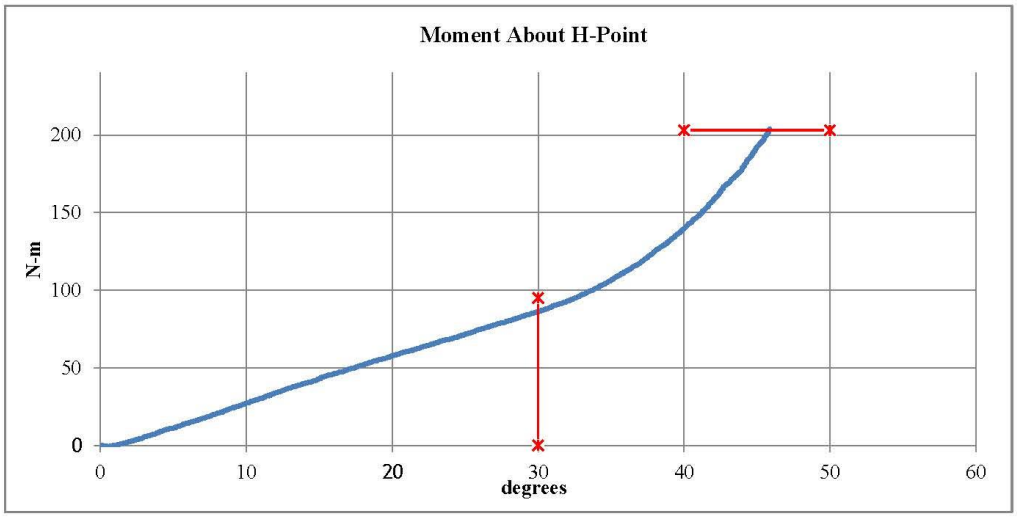
Comments:
Pelvis Skin S/N: EK3565

Transportation Research Center Inc.

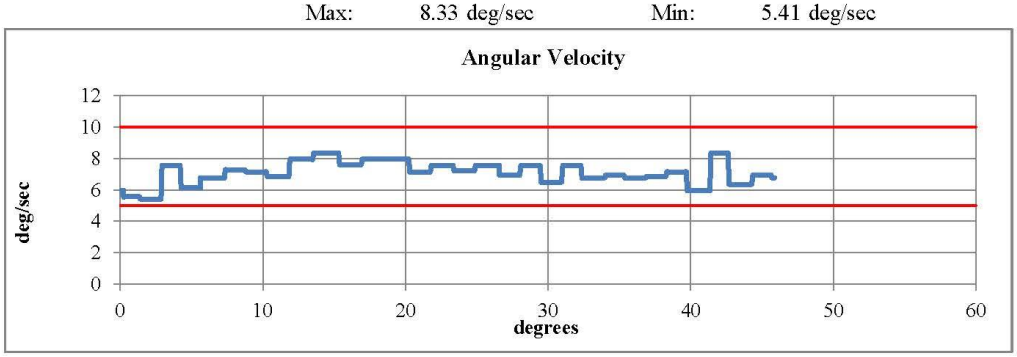
Hybrid III 50th Male Hip Range of Motion

Serial Number:	037	Date:	24-Sep-2019
Side Tested:	Right Hip	Time:	8:26
Test Number:	1		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.2	°C	Pass
Humidity	10	-	70	51	%	Pass
Moment at 30°	0	≤	94.9	86.42	N-m	Pass
Angle at 203 Nm	40	-	50	45.87	deg	Pass
Average Velocity	5	-	10	7.07	deg/sec	Pass



Max: 8.33 deg/sec Min: 5.41 deg/sec



Comments:
Pelvis Skin S/N: EK3565

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	59 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.086 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,605.53 N	Yes

Test meets specifications.

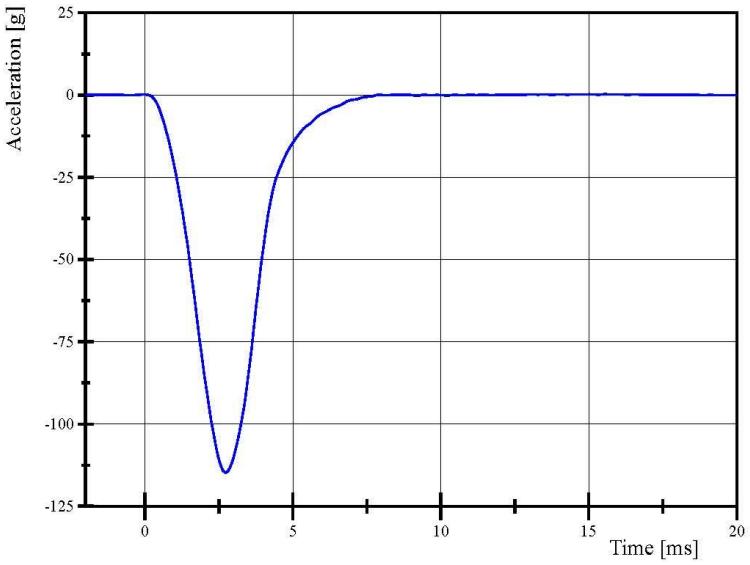
Condition: Used

Comments:
Knee Skin S/N: 2672

Transportation Research Center Inc.

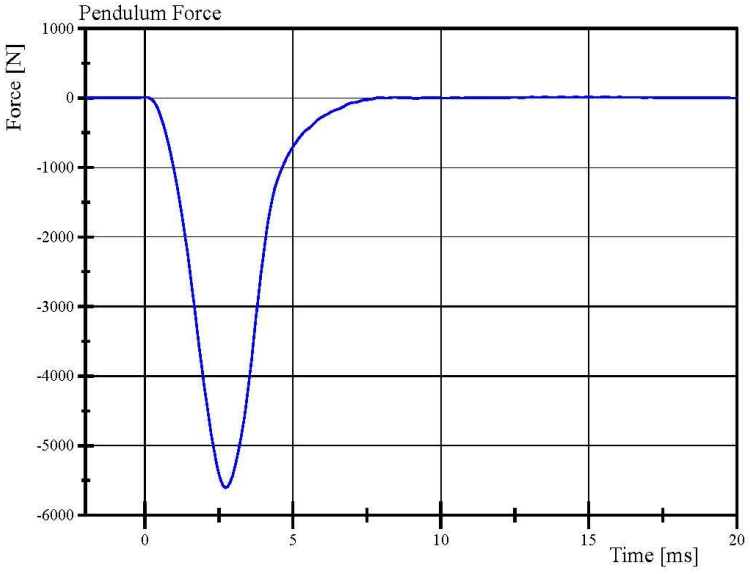
Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/23/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.2 g at 15.6 ms
Min: -114.8 g at 2.7 ms

Pendulum Force



Filter Class: CFC_600
Max: 10.9 N at 15.6 ms
Min: -5,605.5 N at 2.7 ms

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

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Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	60 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.089 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-4,895.84 N	Yes

Test meets specifications.

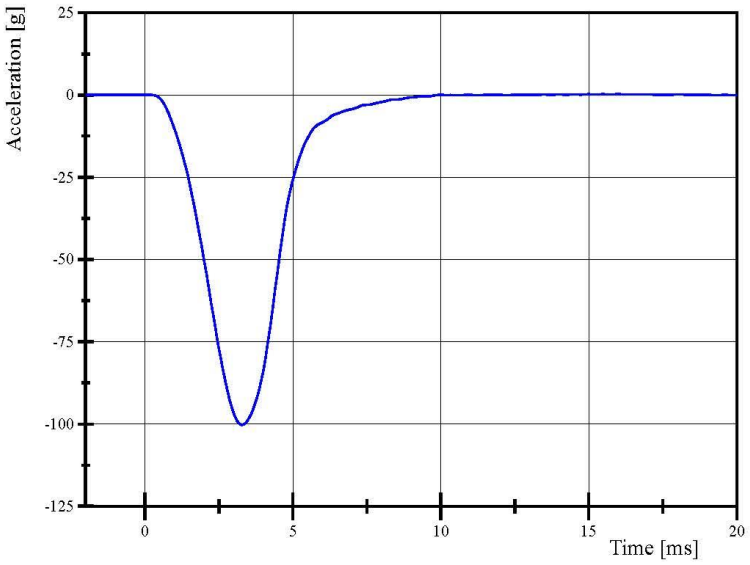
Condition: New

Comments:
Knee Skin S/N: 1248

Transportation Research Center Inc.

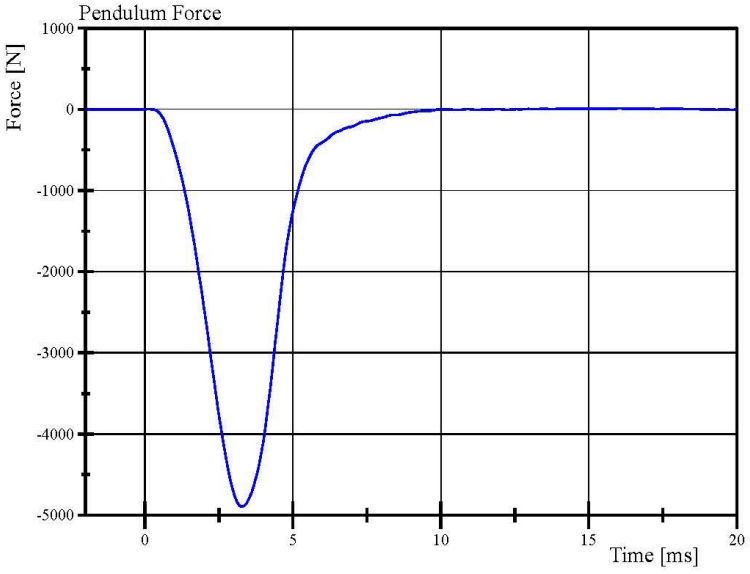
Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 62-1
Test Date: 9/23/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.2 g at 16.0 ms
Min: -100.2 g at 3.3 ms

Pendulum Force



Filter Class: CFC_600
Max: 12.0 N at 16.0 ms
Min: -4,895.8 N at 3.3 ms

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

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Post-Test Calibration Sheets

Driver S/N 037

Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 63

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	881	Yes
B	Shoulder Pivot Height	505.5 - 520.7	510	Yes
C	H-Point Height	83.8 - 88.9	85	Yes
D	H-Point From Seatback	134.6 - 139.7	137	Yes
E	Shoulder Pivot From Backline	83.8 - 94.0	91	Yes
F	Thigh Clearance	139.7 - 154.9	147	Yes
G	Back Of Elbow To Wrist Pivot	289.6 - 304.8	295	Yes
H	Skull Cap To Backline	40.6 - 45.7	45	Yes
I	Shoulder-Elbow Length	330.2 - 345.4	337	Yes
J	Elbow Rest Height	190.5 - 210.8	199	Yes
K	Buttock Knee Length	579.1 - 604.5	601	Yes
L	Popliteal Height	429.3 - 454.7	440	Yes
M	Knee Pivot Height	485.1 - 500.4	494	Yes
N	Buttock Popliteal Length	452.1 - 477.5	470	Yes
O	Chest Depth	213.4 - 228.6	223	Yes
P	Foot Length	251.5 - 266.7	264	Yes
V	Shoulder Breadth	421.6 - 436.9	425	Yes
W	Foot Breadth	91.4 - 106.7	96	Yes
Y	Chest Circumference	970.3 - 1000.8	992	Yes
Z	Waist Circumference	835.7 - 866.1	865	Yes
AA	Location For Chest Circumference	429.3 - 434.3	432	Yes
BB	Location For Waist Circumference	226.1 - 231.1	229	Yes

Revised 8/10/12

Transportation Research Center Inc.

Front Head Drop
HIII 50th Serial No. 037 Certification No. 63-2
Test Date: 10/29/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	263.7 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	9.1 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	3.61 %	Yes

Test meets specifications.

Condition: Used

Comments:
Head Skin S/N: N/A

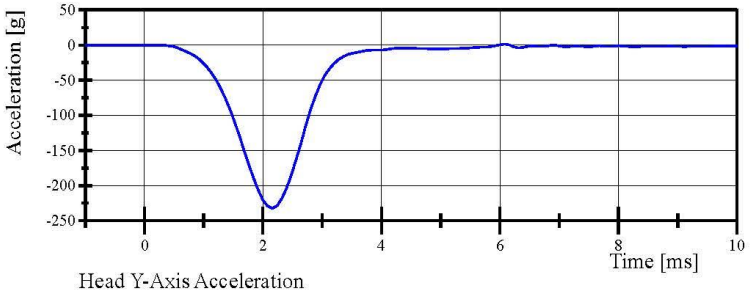
Specification Source: CFR49 Part 572 Subpart E with Polarity in accordance with J211

10.29.2019 14:53:46 575

Transportation Research Center Inc.

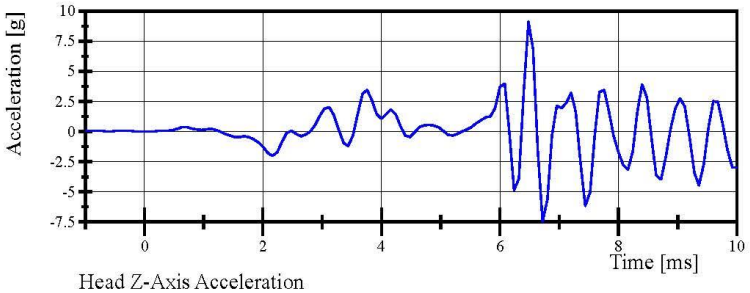
Front Head Drop
HIII 50th Serial No. 037 Certification No. 63-2
Test Date: 10/29/2019

Head X-Axis Acceleration



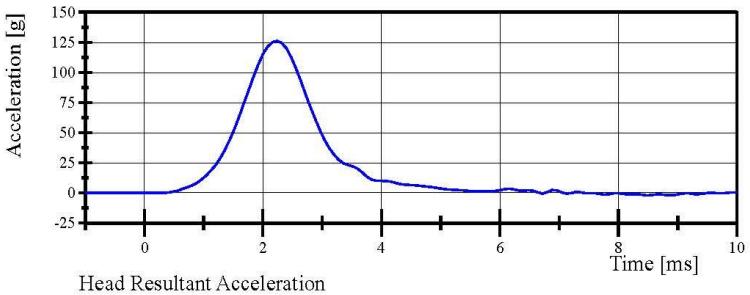
Filter Class: CFC_1000
Max: 1.2 g at 6.1 ms
Min: -232.1 g at 2.2 ms

Head Y-Axis Acceleration



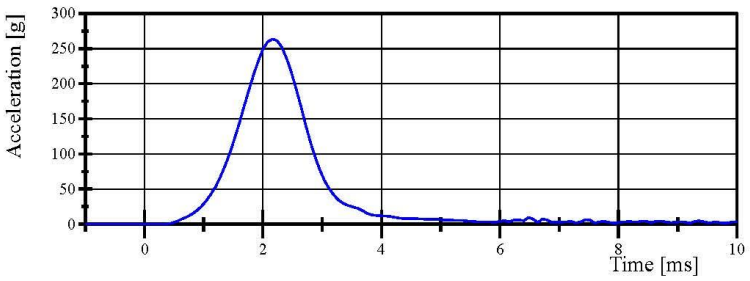
Filter Class: CFC_1000
Max: 9.1 g at 6.5 ms
Min: -7.5 g at 6.7 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 126.2 g at 2.2 ms
Min: -2.0 g at 8.5 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 263.7 g at 2.2 ms
Min: 0.0 g at -0.6 ms

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

10.29.2019 14:55:15 575

Transportation Research Center Inc.

Neck Flexion
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/31/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	57 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.920 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	37.3 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-25.17 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-21.78 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-15.52 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-15.52 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) °	-65.6 °	Yes
Time of Peak	57 - 64 ms	60.0 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	117.5 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88.1 - 108.4 N·m	101.48 N·m	Yes
Time of Peak	47 - 58 ms	50.4 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	99.9 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: 4728

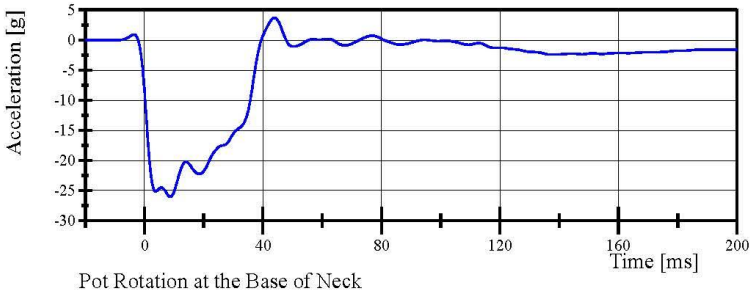
Specification Source: CFR49 Part 572 Subpart E with Polarity in accordance with J211

10.31.2019 08:09:17 1832

Transportation Research Center Inc.

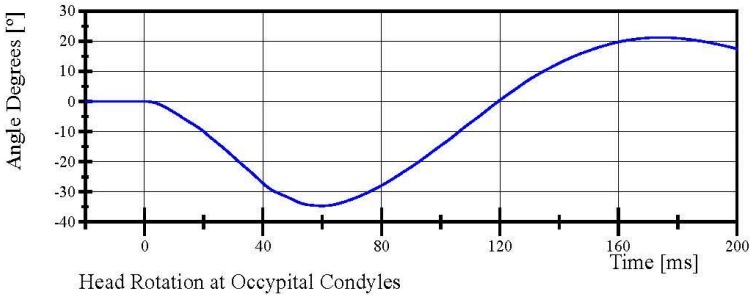
Neck Flexion
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/31/2019

Pendulum Acceleration



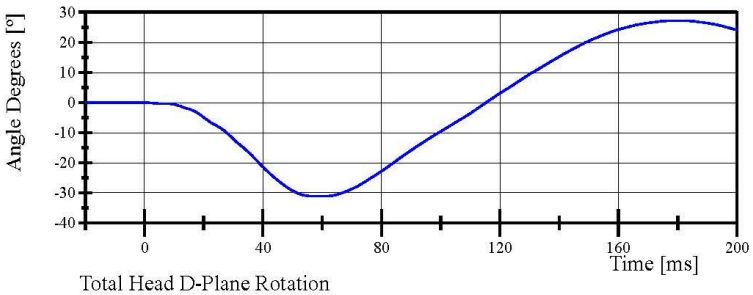
Filter Class: CFC_60
Max: 3.7 g at 43.9 ms
Min: -26.0 g at 8.7 ms

Pot Rotation at the Base of Neck



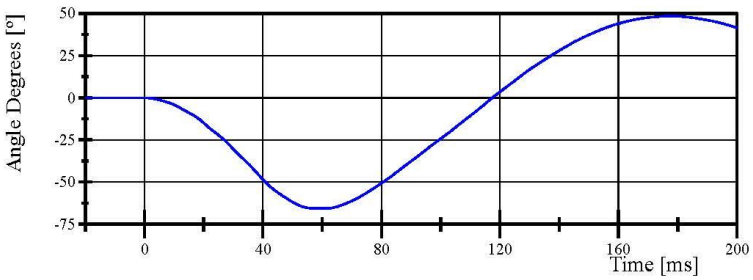
Filter Class: CFC_60
Max: 21.2 ° at 174.1 ms
Min: -34.6 ° at 59.9 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 27.3 ° at 180.0 ms
Min: -31.0 ° at 56.8 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 48.4 ° at 177.6 ms
Min: -65.6 ° at 60.0 ms

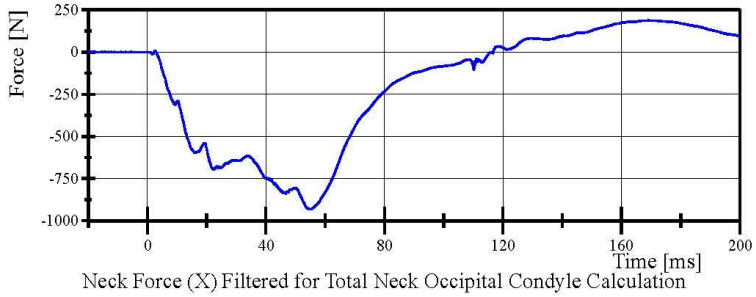
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.31.2019 08:09:46 1832

Transportation Research Center Inc.

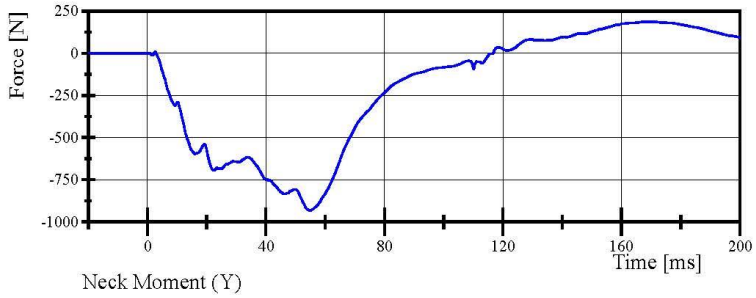
Neck Flexion
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/31/2019

Neck Force (X)



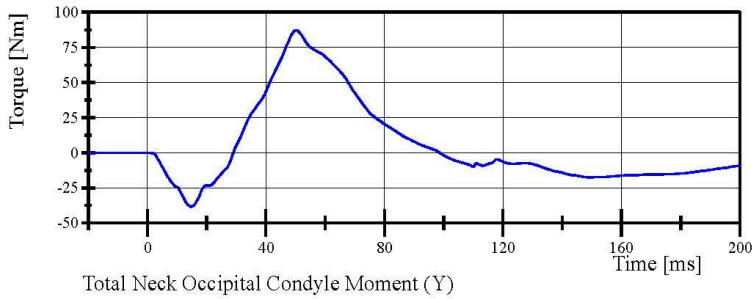
Filter Class: CFC_1000
Max: 188.2 N at 169.1 ms
Min: -933.3 N at 55.0 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



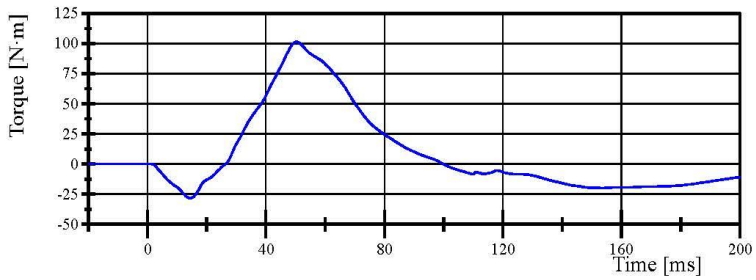
Filter Class: CFC_600
Max: 188.0 N at 169.2 ms
Min: -933.2 N at 55.0 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 87.1 Nm at 50.3 ms
Min: -38.3 Nm at 14.8 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 101.5 N·m at 50.4 ms
Min: -28.3 N·m at 14.6 ms

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

10.31.2019 08:09:47 1832

Transportation Research Center Inc.

Neck Extension
HIII 50th Serial No. 037 Certification No. 63-4
Test Date: 10/31/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	57 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-5.976 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	41.9 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	19.00 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	16.27 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	13.71 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	13.71 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 °	93.1 °	Yes
Time of Peak	72 - 82 ms	78.8 ms	Yes
Total Head D-Plane Rotation Decay to 0°	147 - 174 ms	160.5 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	(-52.9) - (-80) N·m	-69.23 N·m	Yes
Time of Peak	65 - 79 ms	71.9 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	147.4 ms	Yes

Test does not meet specifications.

Condition: Used

Comments:
Neck S/N: 4728

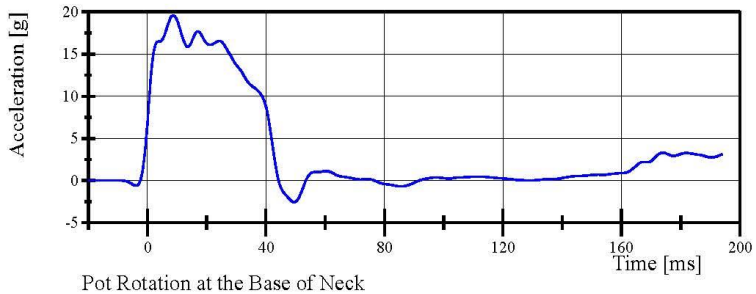
Specification Source: CFR49 Part 572 Subpart E with Polarity in accordance with J211

10.31.2019 13:44:06 2118

Transportation Research Center Inc.

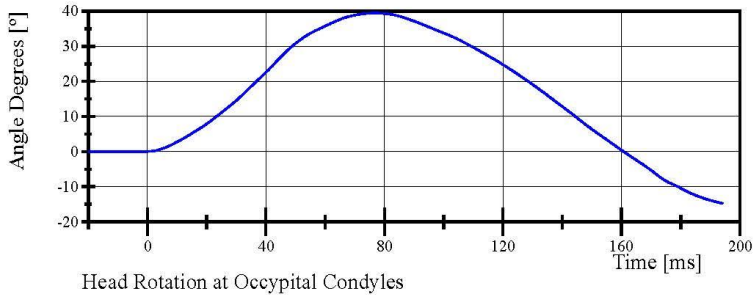
Neck Extension
HIII 50th Serial No. 037 Certification No. 63-4
Test Date: 10/31/2019

Pendulum Acceleration



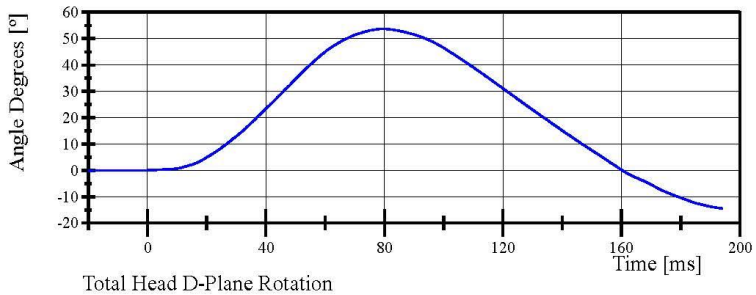
Filter Class: CFC_60
Max: 19.6 g at 8.7 ms
Min: -2.6 g at 49.5 ms

Pot Rotation at the Base of Neck



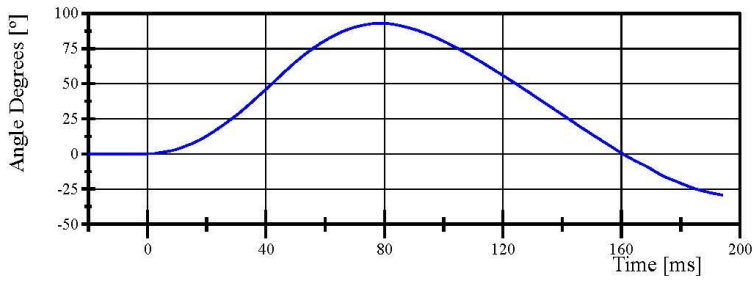
Filter Class: CFC_60
Max: 39.4 ° at 76.8 ms
Min: -14.8 ° at 194.1 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 53.7 ° at 79.4 ms
Min: -14.5 ° at 194.1 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 93.1 ° at 78.8 ms
Min: -29.3 ° at 194.1 ms

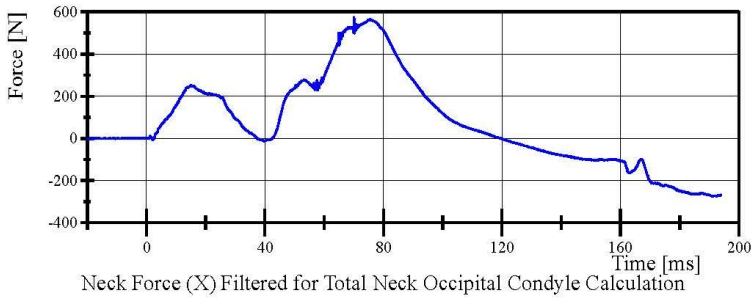
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.31.2019 13:45:33 2118

Transportation Research Center Inc.

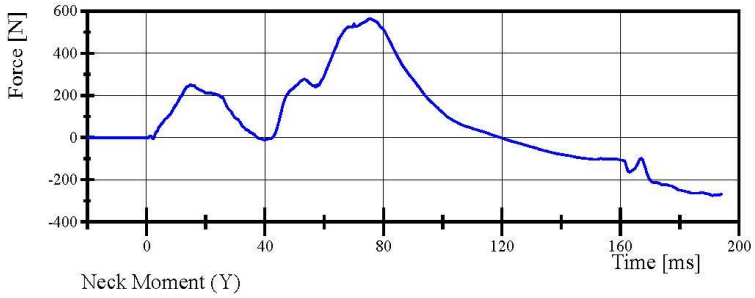
Neck Extension
HIII 50th Serial No. 037 Certification No. 63-4
Test Date: 10/31/2019

Neck Force (X)



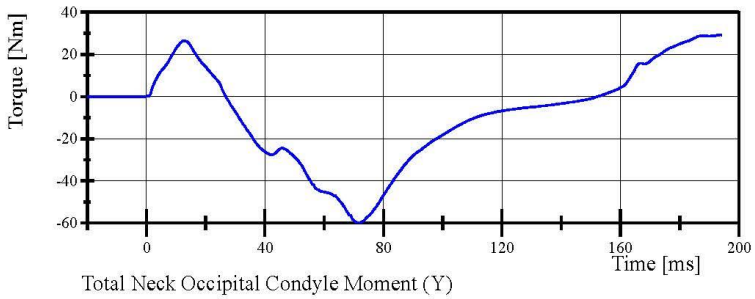
Filter Class: CFC_1000
Max: 574.0 N at 70.1 ms
Min: -275.8 N at 191.0 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



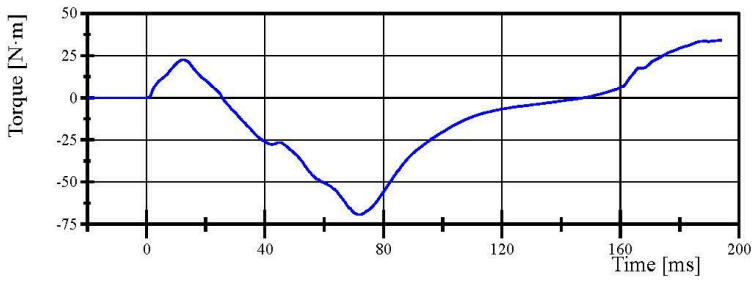
Filter Class: CFC_600
Max: 563.9 N at 75.5 ms
Min: -275.0 N at 191.0 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 29.3 Nm at 193.7 ms
Min: -59.8 Nm at 71.7 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 34.1 N·m at 193.6 ms
Min: -69.2 N·m at 71.9 ms

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

10.31.2019 13:45:33 2118

Transportation Research Center Inc.

Front Thorax
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/29/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	44 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.766 m/s	Yes
Probe Force Peak	(-5,160) - (-5,894) N	-5,571.5 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-68.27 mm	Yes
Internal Hysteresis	69 - 85 %	72.5 %	Yes

Test meets specifications.

Condition: Used

Comments:
Jacket S/N: 2565
Rib Set S/N: 02033121A

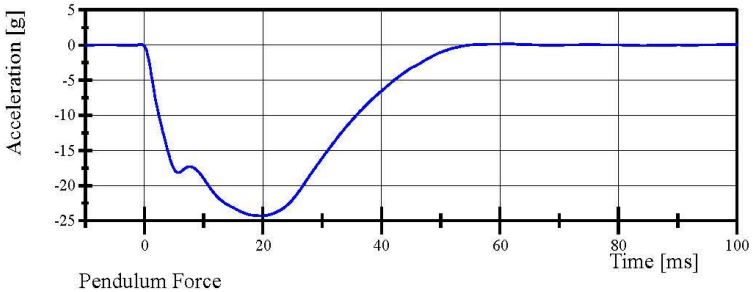
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.29.2019 07:29:00 389

Transportation Research Center Inc.

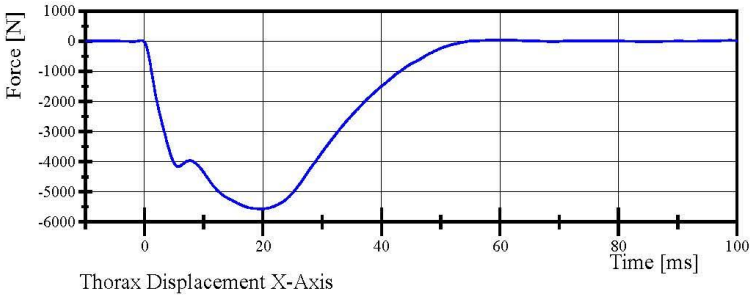
Front Thorax
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/29/2019

Pendulum Acceleration



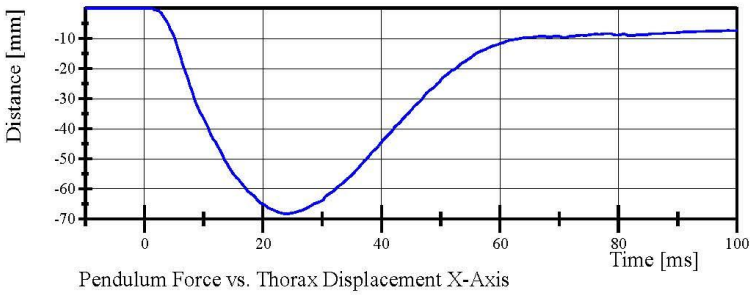
Filter Class: CFC_180
Max: 0.2 g at 61.4 ms
Min: -24.3 g at 19.7 ms

Pendulum Force



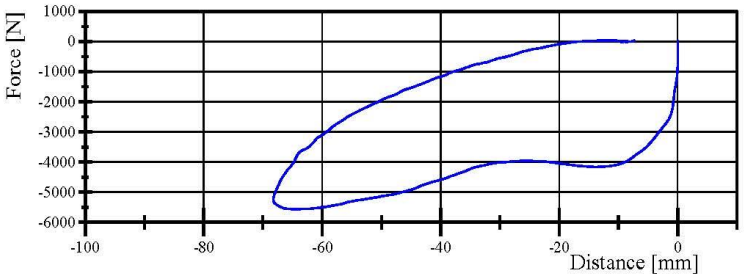
Filter Class: CFC_180
Max: 44.6 N at 61.4 ms
Min: -5,571.5 N at 19.7 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: -0.0 mm at -8.2 ms
Min: -68.3 mm at 24.0 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 44.6 N at -10.8 mm
Min: -5,571.5 N at -64.7 mm

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

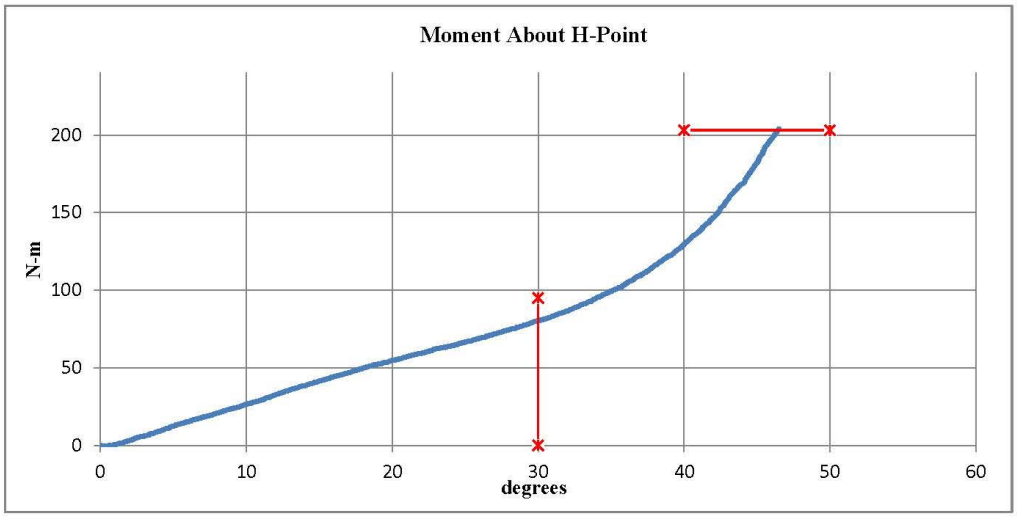
10.29.2019 07:29:33 389

Transportation Research Center Inc.

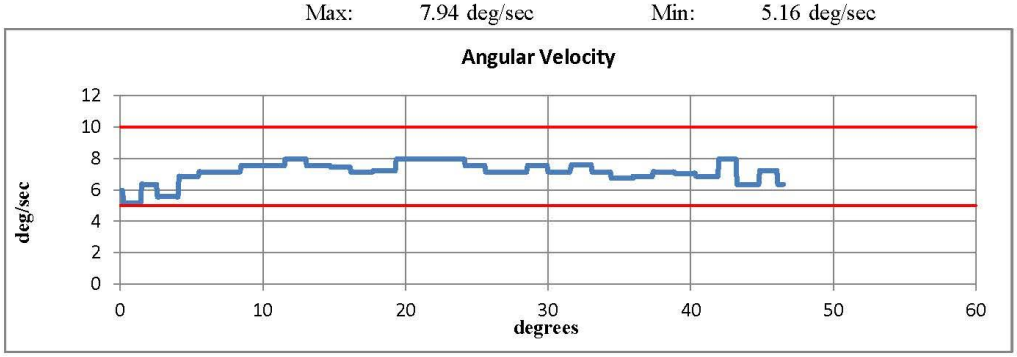
Hybrid III 50th Male Hip Range of Motion

Serial Number:	037	Date:	29-Oct-2019
Side Tested:	Left Hip	Time:	9:35
Test Number:	1		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.8	°C	Pass
Humidity	10	-	70	40	%	Pass
Moment at 30°	0	≤	94.9	80.48	N-m	Pass
Angle at 203 Nm	40	-	50	46.5	deg	Pass
Average Velocity	5	-	10	7.14	deg/sec	Pass



Max: 7.94 deg/sec Min: 5.16 deg/sec



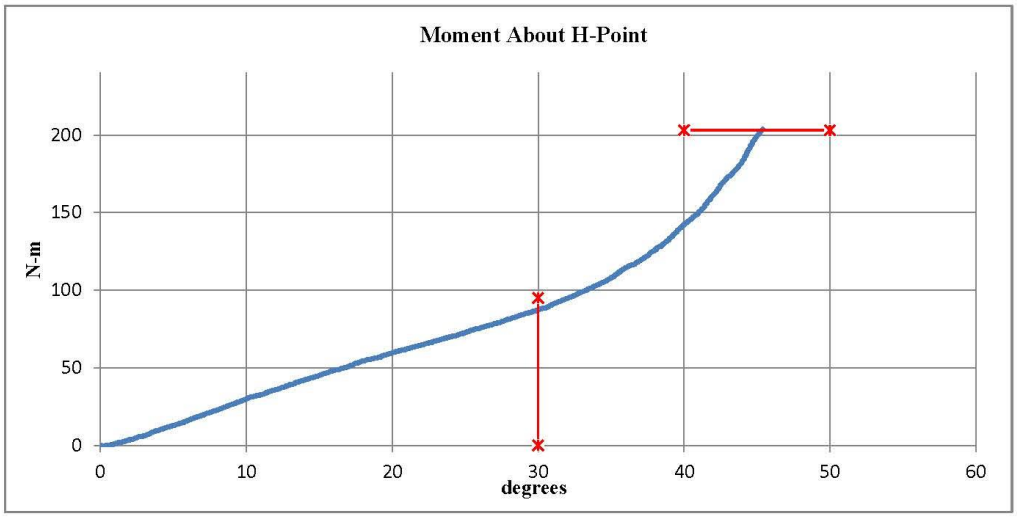
Comments:
Pelvis Skin S/N: EK3565

Transportation Research Center Inc.

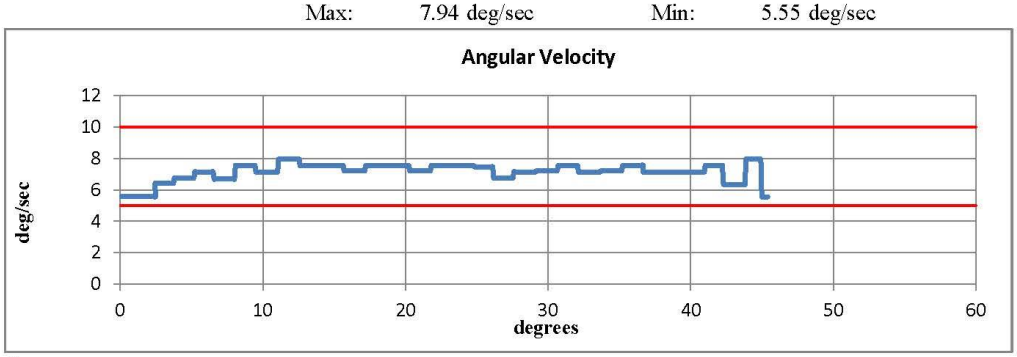
Hybrid III 50th Male Hip Range of Motion

Serial Number:	037	Date:	29-Oct-2019
Side Tested:	Right Hip	Time:	10:59
Test Number:	1		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.1	°C	Pass
Humidity	10	-	70	45	%	Pass
Moment at 30°	0	≤	94.9	87.61	N-m	Pass
Angle at 203 Nm	40	-	50	45.39	deg	Pass
Average Velocity	5	-	10	7.14	deg/sec	Pass



Max: 7.94 deg/sec Min: 5.55 deg/sec



Comments:
Pelvis Skin S/N: EK3565

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/29/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	44 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.102 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,639.99 N	Yes

Test meets specifications.

Condition: Used

Comments:
Knee Skin S/N: 2672

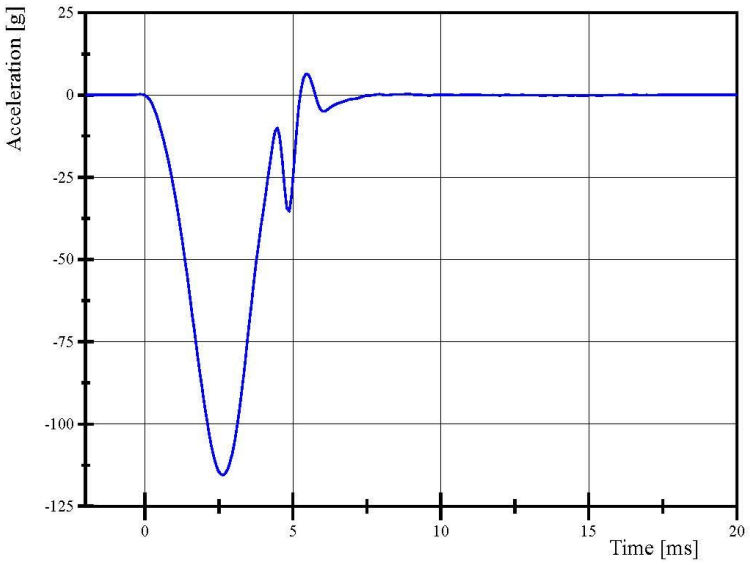
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.29.2019 07:48:23 1723

Transportation Research Center Inc.

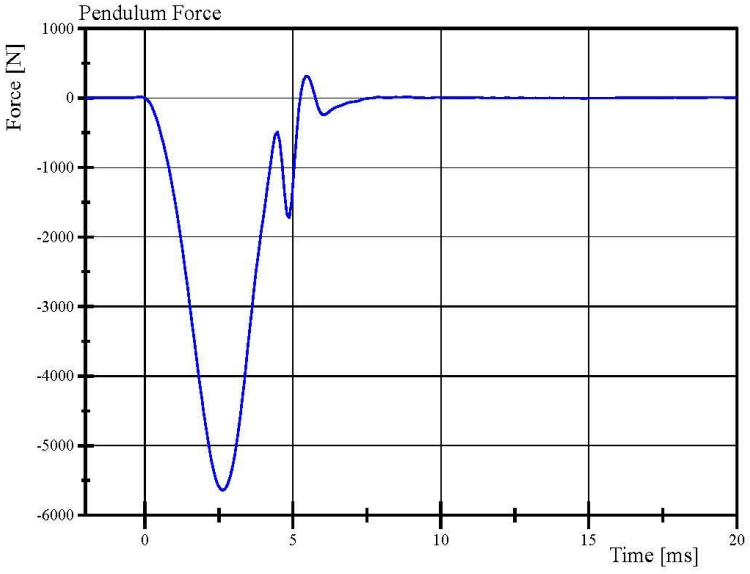
Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/29/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 6.4 g at 5.4 ms
Min: -115.5 g at 2.6 ms

Pendulum Force



Filter Class: CFC_600
Max: 312.3 N at 5.4 ms
Min: -5,640.0 N at 2.6 ms

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

10.29.2019 07:48:50 1723

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/29/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	43 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.102 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,571.17 N	Yes

Test meets specifications.

Condition: Used

Comments:
Knee Skin S/N: 1248

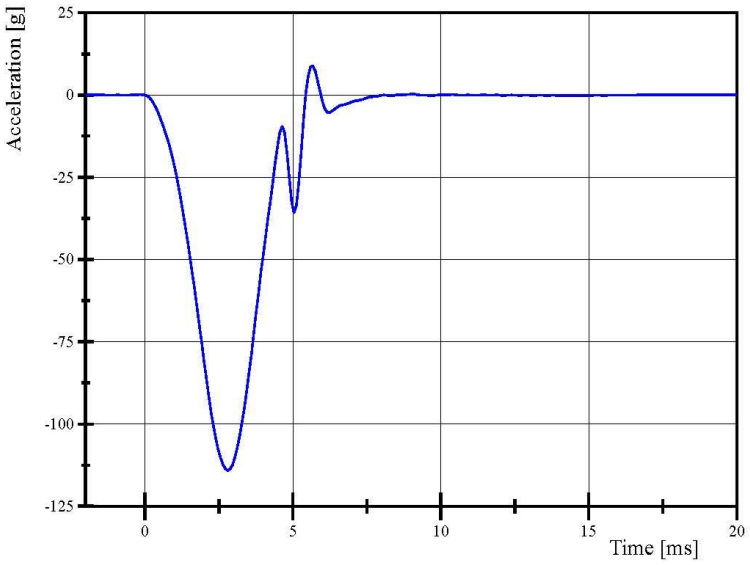
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.29.2019 07:52:41 1717

Transportation Research Center Inc.

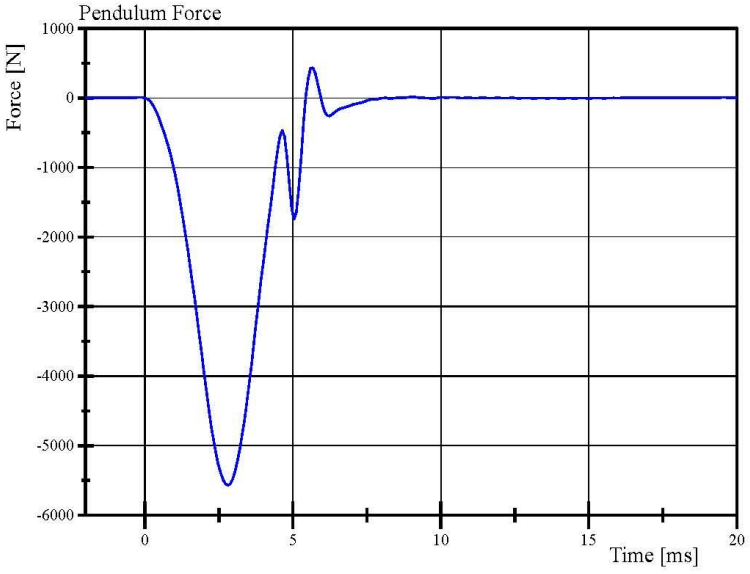
Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 63-1
Test Date: 10/29/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 8.8 g at 5.7 ms
Min: -114.1 g at 2.8 ms

Pendulum Force



Filter Class: CFC_600
Max: 429.8 N at 5.7 ms
Min: -5,571.2 N at 2.8 ms

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

10.29.2019 07:53:54 1717

Pre-Test Calibration Sheets

Front Passenger S/N EB7513

Transportation Research Center Inc.
572O HIII 5th Dummy
External Dimensions
Serial No. EB7513 Calibration No. 07

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	774.7 - 800.1	779	Yes
B	Shoulder Pivot Height	431.8 - 457.2	443	Yes
C	Hip Pivot Height	81.3 - 86.3	85	Yes
D	Hip Pivot from Backline	144.8 - 149.8	148	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	79	Yes
F	Thigh Clearance	119.4 - 134.6	130	Yes
G	Back of Elbow to Wrist Pivot	243.9 - 259.1	249	Yes
H	Head Back to Backline	43.2 - 48.2	45	Yes
I	Shoulder to Elbow Length	276.8 - 297.2	286	Yes
J	Elbow Rest Height	182.8 - 203.2	197	Yes
K	Buttock Knee Length	520.7 - 546.1	533	Yes
L	Popliteal Height	355.6 - 376.0	359	Yes
M	Knee Pivot Height	393.7 - 419.1	409	Yes
N	Buttock Popliteal Length	414.0 - 439.4	430	Yes
O	Chest Depth without Jacket	175.3 - 190.5	182	Yes
P	Foot Length	218.5 - 233.7	225	Yes
R	Buttock to Knee Pivot Length	457.2 - 482.6	473	Yes
S	Head Breadth	137.1 - 147.3	141	Yes
T	Head Depth	177.8 - 188.0	180	Yes
U	Hip Breadth	299.7 - 314.9	306	Yes
V	Shoulder Breadth	350.5 - 365.7	356	Yes
W	Foot Breadth	78.8 - 94.0	85	Yes
X	Head Circumference	528.3 - 548.7	539	Yes
Y	Chest Circumference with Jacket	850.9 - 881.3	867	Yes
Z	Waist Circumference	759.5 - 789.9	775	Yes
AA	Reference Location for Chest Circumference	332.7 - 358.1	345	Yes
BB	Reference Location for Waist Circumference	160.0 - 170.2	164	Yes

Transportation Research Center Inc.

Front Head Drop
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	262.9 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	4.7 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	1.92 %	Yes

Test meets specifications.

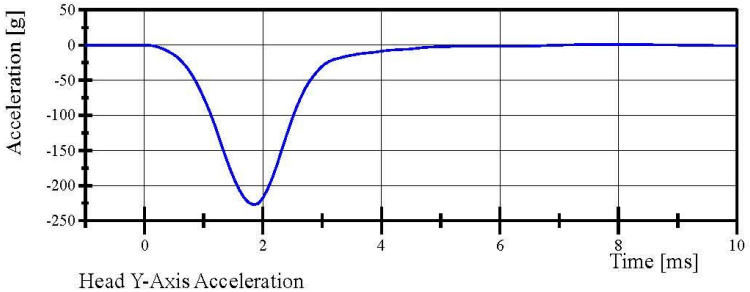
Condition: Used

Comments:
Head Skin S/N: EA8751

Transportation Research Center Inc.

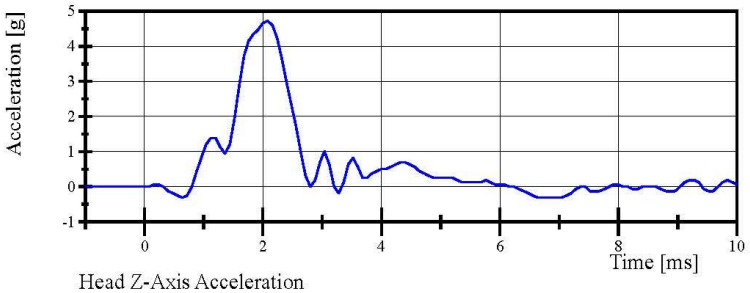
Front Head Drop
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Head X-Axis Acceleration



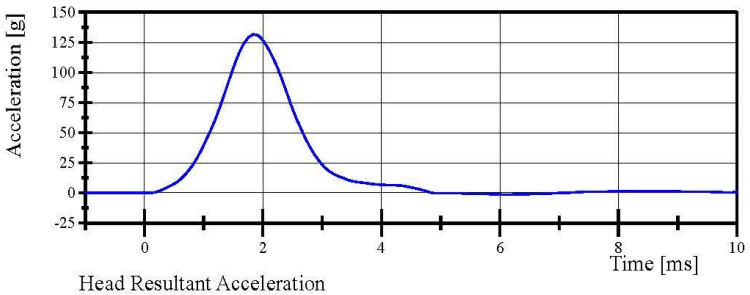
Filter Class: CFC_1000
Max: 1.1 g at 7.9 ms
Min: -227.5 g at 1.8 ms

Head Y-Axis Acceleration



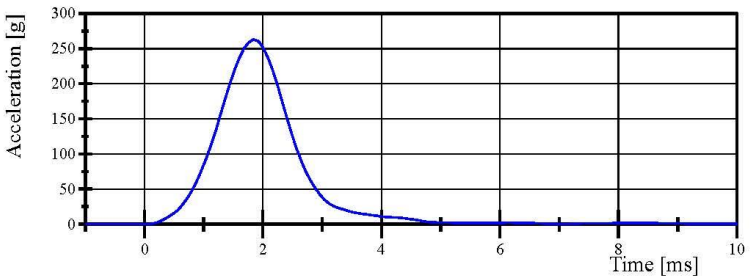
Filter Class: CFC_1000
Max: 4.7 g at 2.1 ms
Min: -0.3 g at 0.6 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 131.6 g at 1.8 ms
Min: -1.4 g at 6.2 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 262.9 g at 1.8 ms
Min: 0.0 g at -1.0 ms

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

10.23.2019 09:57:16 580

Transportation Research Center Inc.

Neck Flexion
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	7.064 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	(-2.1) - (-2.5) m/s	-2.22 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	(-4.0) - (-5.0) m/s	-4.31 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.14 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-80.7 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	78.7 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	90.3 ms	Yes

Test meets specifications.

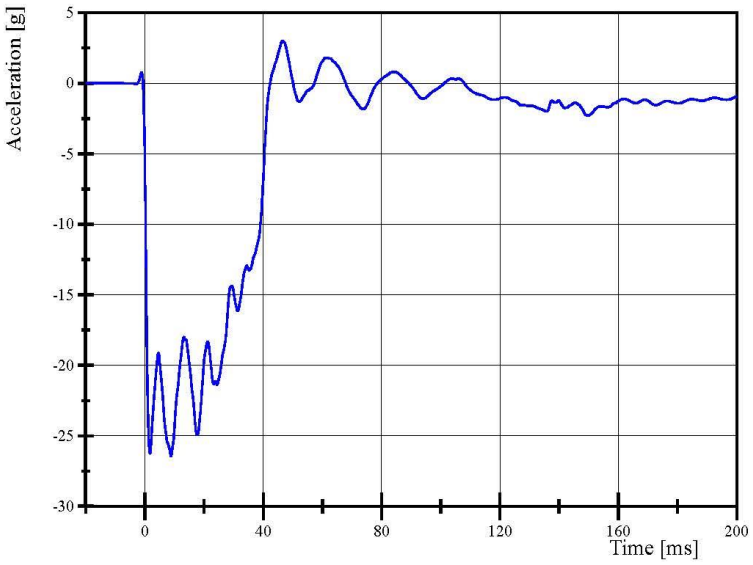
Condition: Used

Comments:
Neck S/N: EB6930

Transportation Research Center Inc.

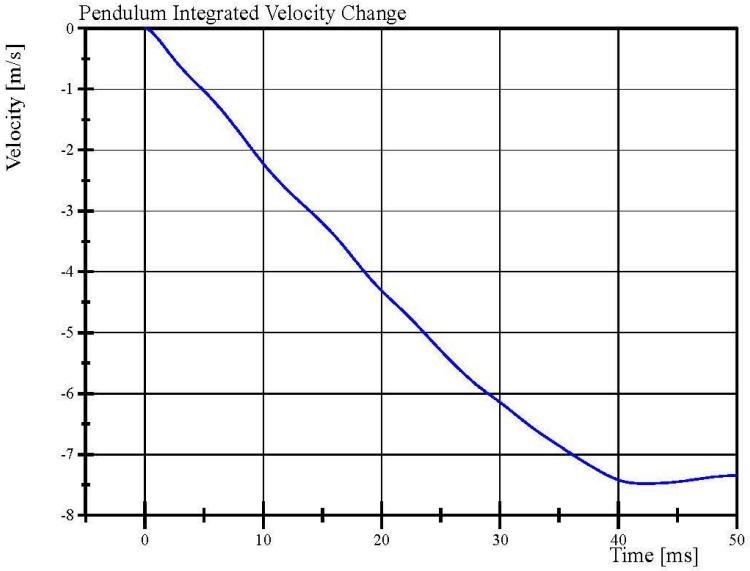
Neck Flexion
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Pendulum Acceleration



Filter Class: CFC_180
Max: 3.0 g at 46.5 ms
Min: -26.5 g at 8.9 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -7.5 m/s at 42.3 ms

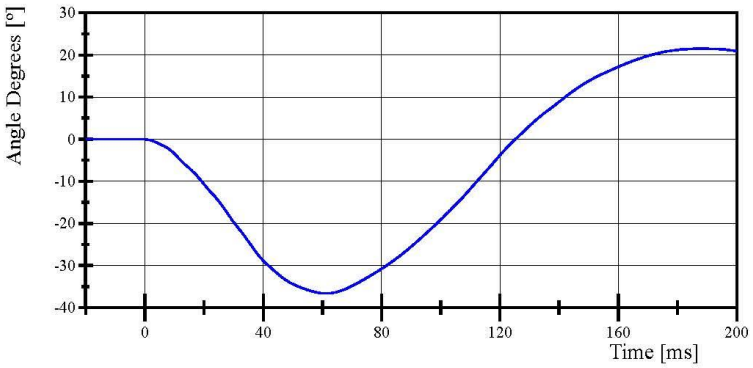
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.23.2019 11:01:18 1820

Transportation Research Center Inc.

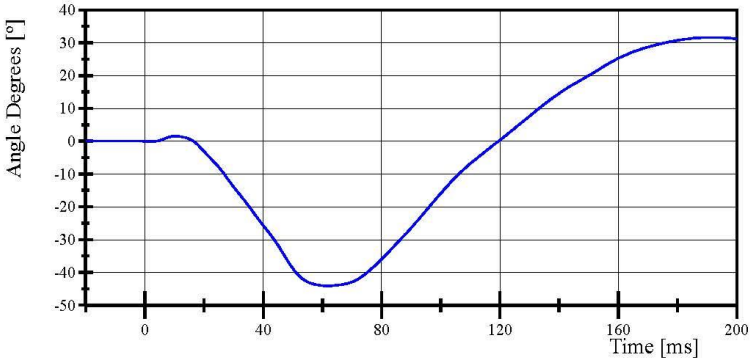
Neck Flexion
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Pot Rotation at the Base of Neck



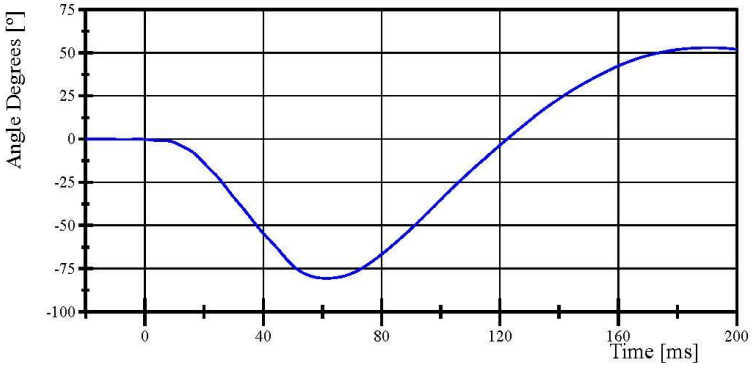
Filter Class: CFC_60
Max: 21.5 ° at 187.4 ms
Min: -36.6 ° at 61.2 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 31.7 ° at 191.7 ms
Min: -44.1 ° at 61.7 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 53.1 ° at 191.0 ms
Min: -80.7 ° at 61.4 ms

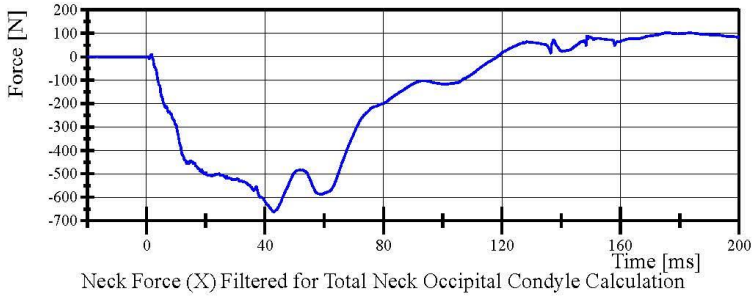
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.23.2019 11:01:18 1820

Transportation Research Center Inc.

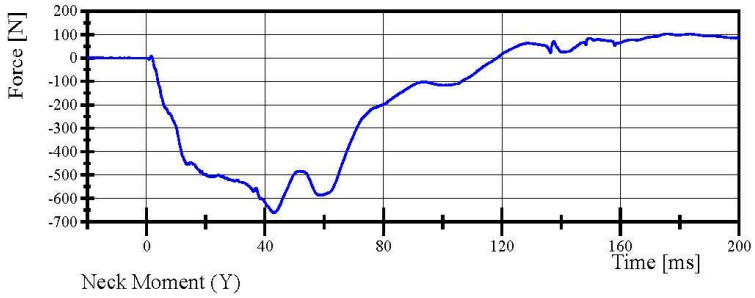
Neck Flexion
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Neck Force (X)



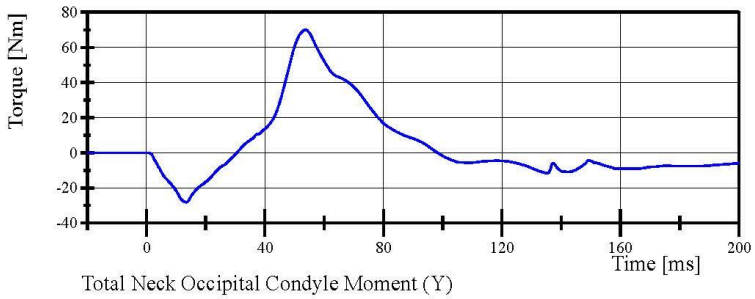
Filter Class: CFC_1000
Max: 102.6 N at 175.5 ms
Min: -662.4 N at 43.0 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



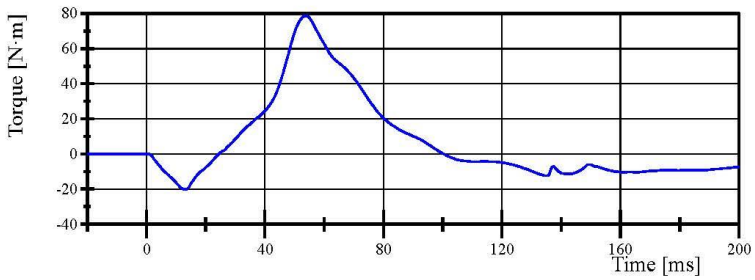
Filter Class: CFC_600
Max: 102.6 N at 175.8 ms
Min: -662.0 N at 43.0 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 70.0 Nm at 53.7 ms
Min: -28.1 Nm at 13.5 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 78.7 N·m at 53.8 ms
Min: -20.1 N·m at 13.0 ms

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

10.23.2019 11:01:19 1820

Transportation Research Center Inc.

Neck Extension
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.048 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.85 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.54 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	5.02 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	113.0 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-59.5 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	105.2 ms	Yes

Test meets specifications.

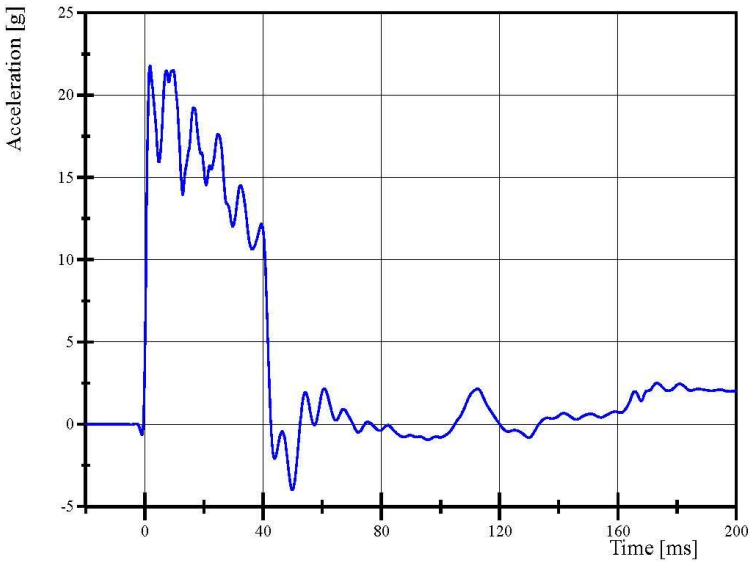
Condition: Used

Comments:
Neck S/N: EB6930

Transportation Research Center Inc.

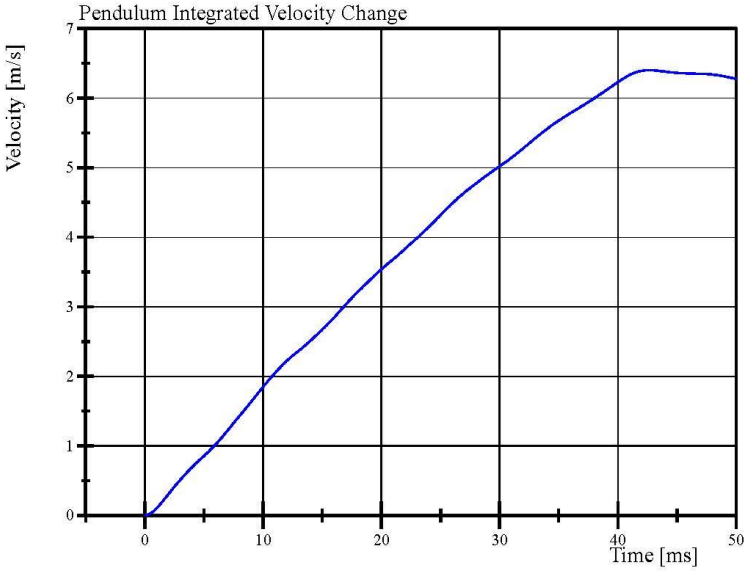
Neck Extension
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Pendulum Acceleration



Filter Class: CFC_180
Max: 21.8 g at 1.8 ms
Min: -4.0 g at 49.9 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 6.4 m/s at 42.7 ms
Min: 0.0 m/s at 0.0 ms

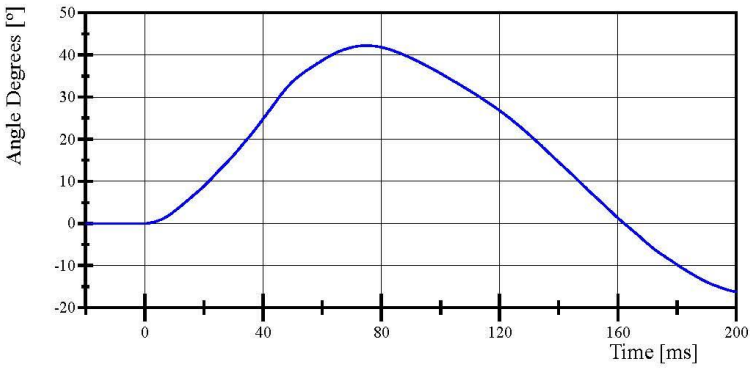
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.23.2019 11:52:24 1971

Transportation Research Center Inc.

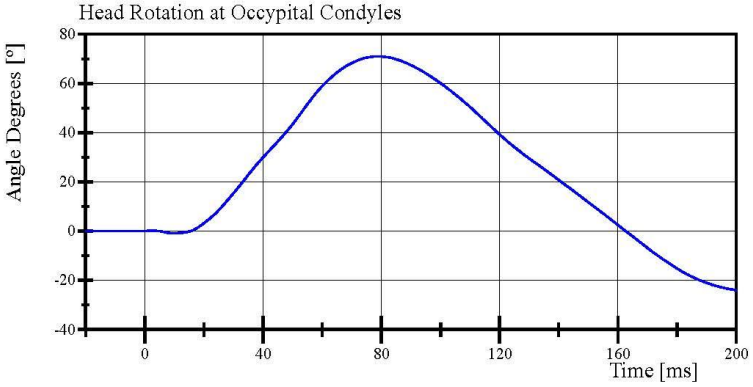
Neck Extension
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Pot Rotation at the Base of Neck



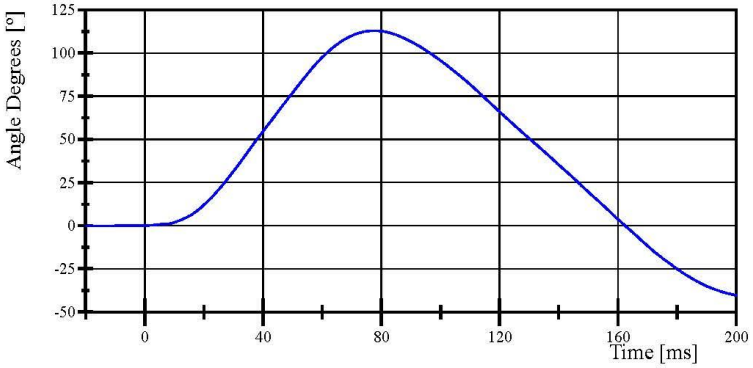
Filter Class: CFC_60
Max: 42.2 ° at 74.9 ms
Min: -16.2 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 71.0 ° at 78.8 ms
Min: -24.1 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 113.0 ° at 77.6 ms
Min: -40.3 ° at 200.0 ms

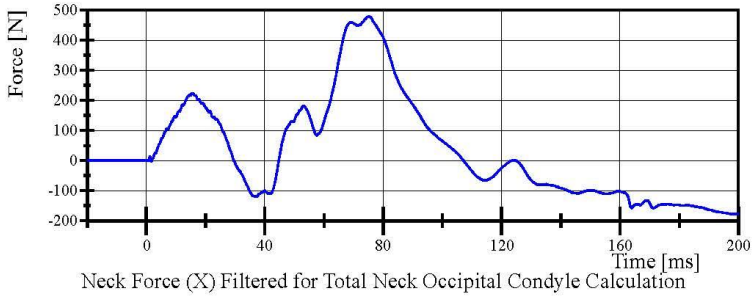
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.23.2019 11:52:24 1971

Transportation Research Center Inc.

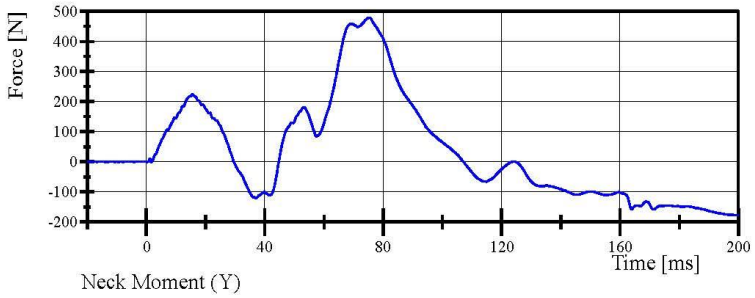
Neck Extension
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Neck Force (X)



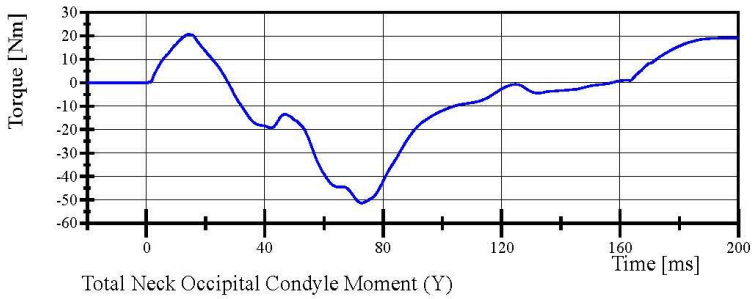
Filter Class: CFC_1000
Max: 478.5 N at 75.3 ms
Min: -177.2 N at 197.9 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



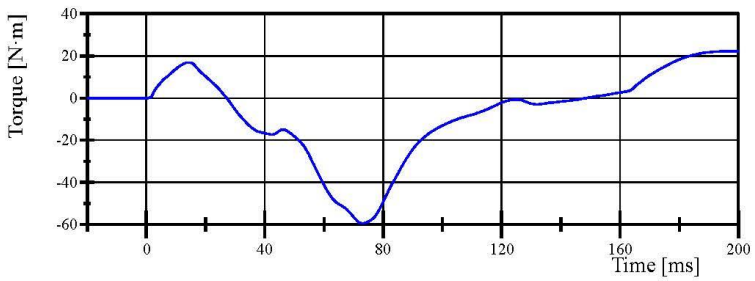
Filter Class: CFC_600
Max: 478.4 N at 75.3 ms
Min: -177.2 N at 199.6 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 20.7 Nm at 14.4 ms
Min: -51.3 Nm at 72.7 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 22.2 N·m at 199.7 ms
Min: -59.5 N·m at 73.0 ms

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

10.23.2019 11:52:24 1971

Transportation Research Center Inc.

Front Thorax
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.793 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,313.2 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	>= (-4,600) N	-4,316.0 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-52.7 mm	Yes
Internal Hysteresis	69 - 85 %	76.5 %	Yes

Test meets specifications.

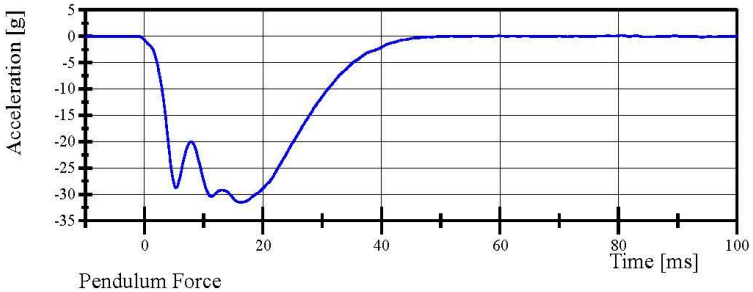
Condition: Used

Comments:
Jacket S/N: DZ8735
Rib Set S/N: EB7630

Transportation Research Center Inc.

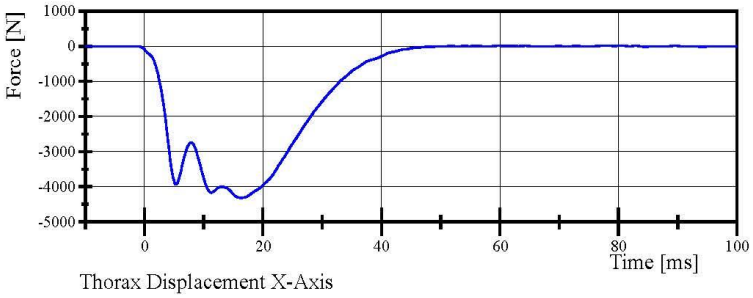
Front Thorax
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Pendulum Acceleration



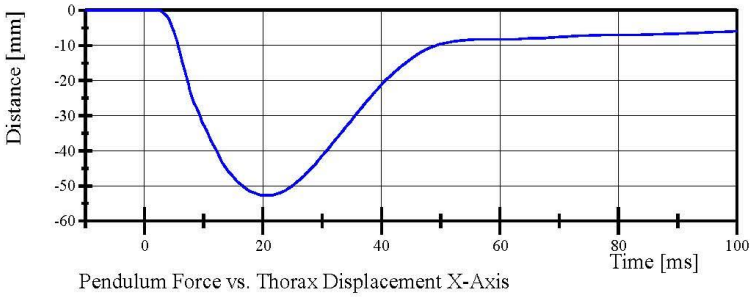
Filter Class: CFC_180
Max: 0.2 g at 80.6 ms
Min: -31.5 g at 16.2 ms

Pendulum Force



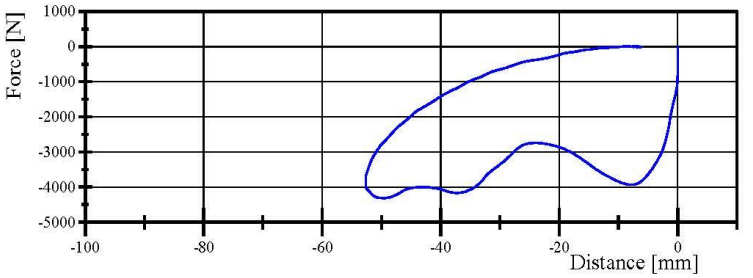
Filter Class: CFC_180
Max: 21.2 N at 80.6 ms
Min: -4,316.0 N at 16.2 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -1.3 ms
Min: -52.7 mm at 21.0 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 21.2 N at -7.0 mm
Min: -4,316.0 N at -49.5 mm

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

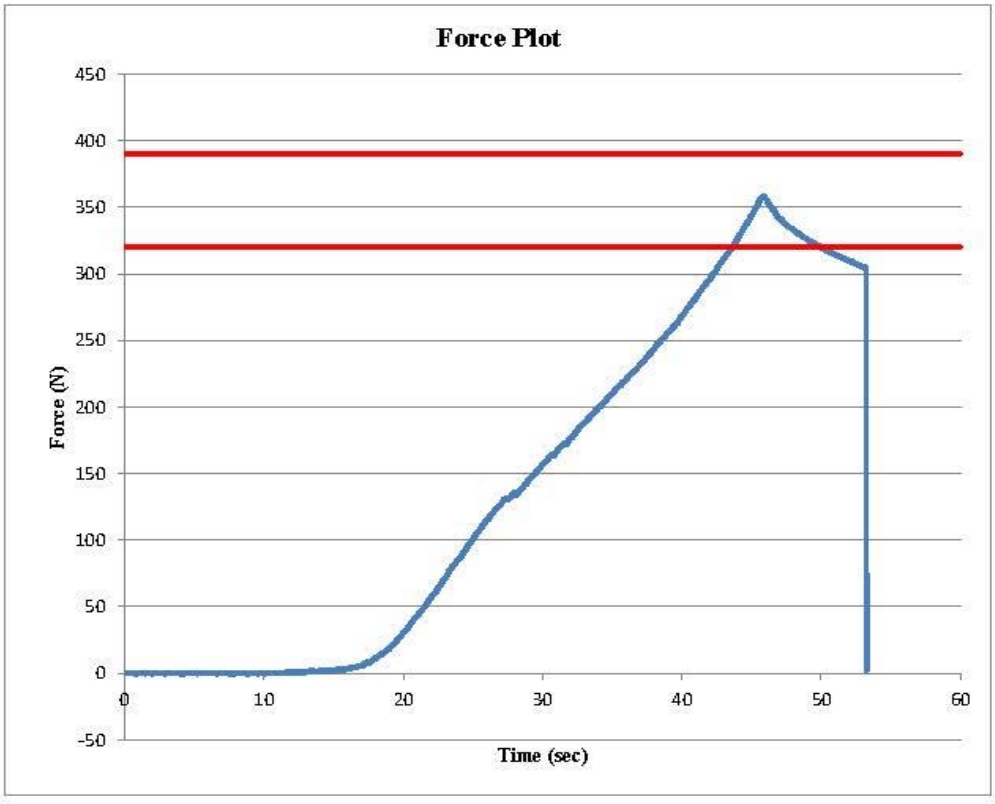
10.23.2019 06:49:03 386

Transportation Research Center Inc.

Hybrid III Small Female Torso Flexion

Customer:	NHTSA		
Serial Number:	EB7513	Date:	10/23/2019
Test Number:	1	Time:	13:37

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.4	°C	Pass
Humidity	10	-	70	36	%	Pass
Average Angular Velocity	0.5	-	1.5	1	deg/sec	Pass
Initial Angle	0	-	20	14.98	deg	Pass
Peak Force at 45.26°	320	-	390	357.87	N	Pass
Final Angle	-8	-	8	5.76	deg	Pass



Comments:
Abdomen S/N: EB8206
Lumbar S/N: N/A

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.090 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,522.0 N	Yes

Test meets specifications.

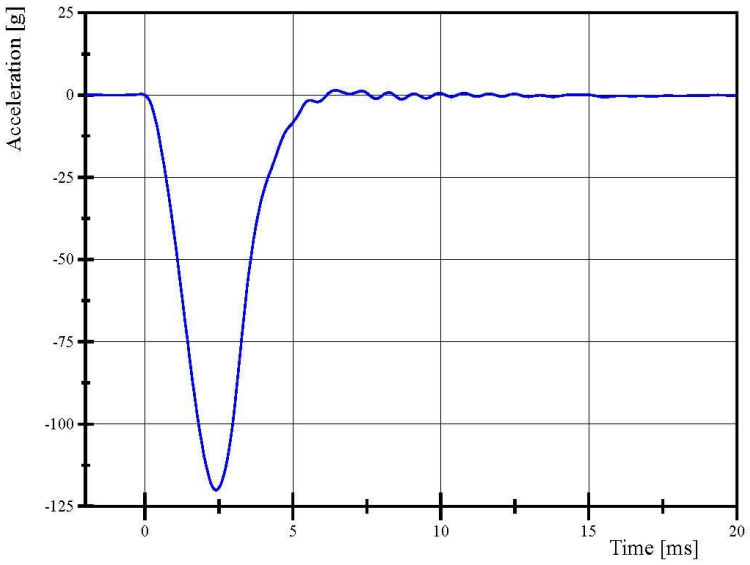
Condition: Used

Comments:
Knee Skin S/N: EB7773

Transportation Research Center Inc.

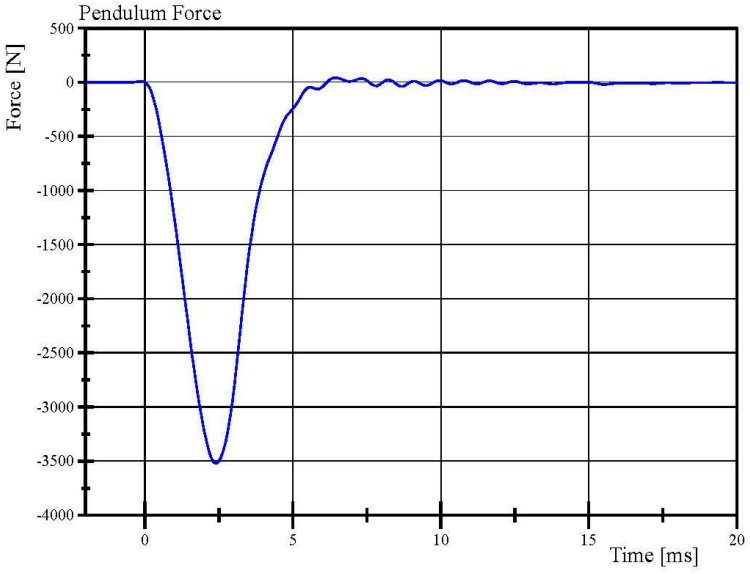
Left Knee Femur Response Test
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 1.4 g at 6.4 ms
Min: -120.1 g at 2.4 ms

Pendulum Force



Filter Class: CFC_600
Max: 41.7 N at 6.4 ms
Min: -3,522.0 N at 2.4 ms

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

10.23.2019 08:22:52 2062

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.092 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,595.5 N	Yes

Test meets specifications.

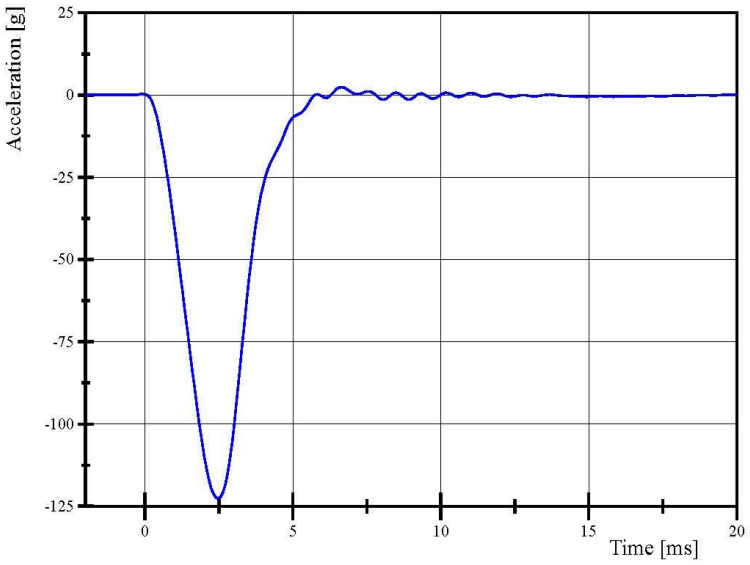
Condition: Used

Comments:
Knee Skin S/N: EB7550

Transportation Research Center Inc.

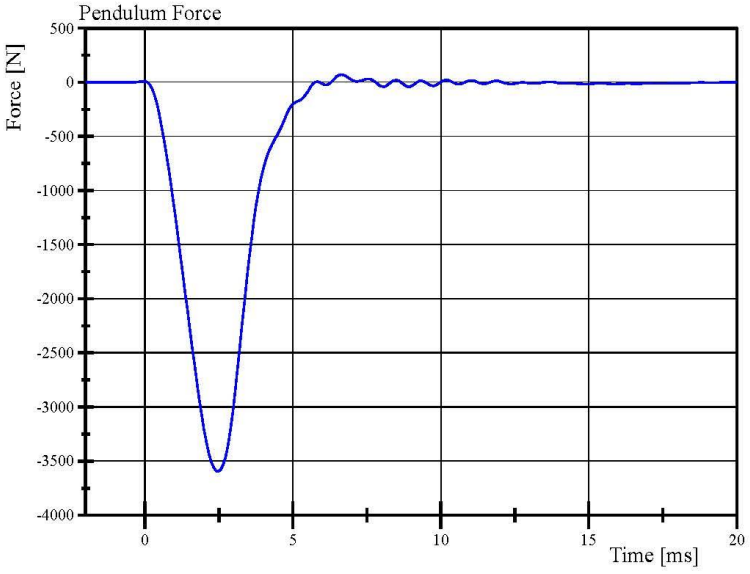
Right Knee Femur Response Test
HIII 5th Serial No. EB7513 Certification No. 7-1
Test Date: 10/23/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 2.4 g at 6.6 ms
Min: -122.6 g at 2.5 ms

Pendulum Force



Filter Class: CFC_600
Max: 71.2 N at 6.6 ms
Min: -3,595.5 N at 2.5 ms

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

10.23.2019 09:31:04 2059

Post-Test Calibration Sheets

Front Passenger S/N EB7513

Transportation Research Center Inc.
572O HIII 5th Dummy
External Dimensions
Serial No. EB7513 Calibration No. 08

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	774.7 - 800.1	779	Yes
B	Shoulder Pivot Height	431.8 - 457.2	443	Yes
C	Hip Pivot Height	81.3 - 86.3	85	Yes
D	Hip Pivot from Backline	144.8 - 149.8	148	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	79	Yes
F	Thigh Clearance	119.4 - 134.6	130	Yes
G	Back of Elbow to Wrist Pivot	243.9 - 259.1	249	Yes
H	Head Back to Backline	43.2 - 48.2	45	Yes
I	Shoulder to Elbow Length	276.8 - 297.2	286	Yes
J	Elbow Rest Height	182.8 - 203.2	197	Yes
K	Buttock Knee Length	520.7 - 546.1	533	Yes
L	Popliteal Height	355.6 - 376.0	359	Yes
M	Knee Pivot Height	393.7 - 419.1	409	Yes
N	Buttock Popliteal Length	414.0 - 439.4	430	Yes
O	Chest Depth without Jacket	175.3 - 190.5	182	Yes
P	Foot Length	218.5 - 233.7	225	Yes
R	Buttock to Knee Pivot Length	457.2 - 482.6	473	Yes
S	Head Breadth	137.1 - 147.3	141	Yes
T	Head Depth	177.8 - 188.0	180	Yes
U	Hip Breadth	299.7 - 314.9	306	Yes
V	Shoulder Breadth	350.5 - 365.7	356	Yes
W	Foot Breadth	78.8 - 94.0	85	Yes
X	Head Circumference	528.3 - 548.7	539	Yes
Y	Chest Circumference with Jacket	850.9 - 881.3	867	Yes
Z	Waist Circumference	759.5 - 789.9	775	Yes
AA	Reference Location for Chest Circumference	332.7 - 358.1	345	Yes
BB	Reference Location for Waist Circumference	160.0 - 170.2	164	Yes

Transportation Research Center Inc.

Front Head Drop
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/29/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	267.1 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	10.3 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	< 10 %	1.18 %	Yes

Test meets specifications.

Condition: Used

Comments:
Head Skin S/N: EA8751

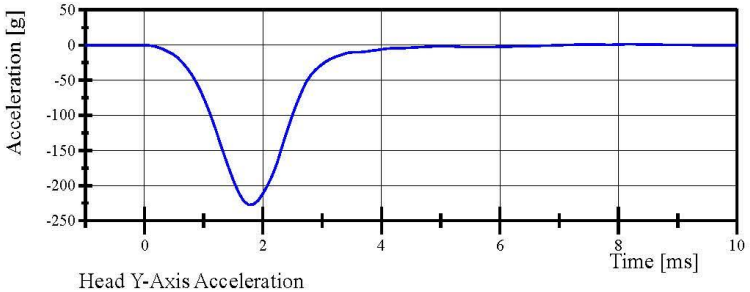
Specification Source: CFR49 Part 572 Subpart O with Polarity in accordance with J211

10.29.2019 15:16:17 580

Transportation Research Center Inc.

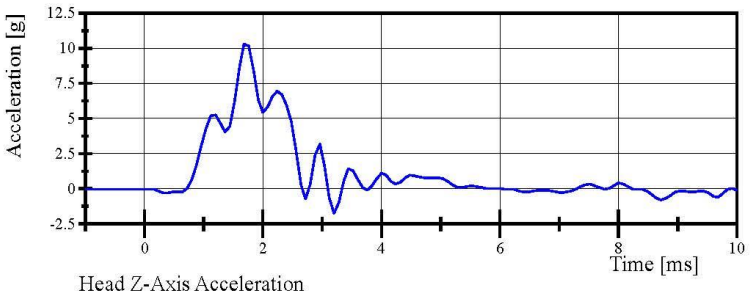
Front Head Drop
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/29/2019

Head X-Axis Acceleration



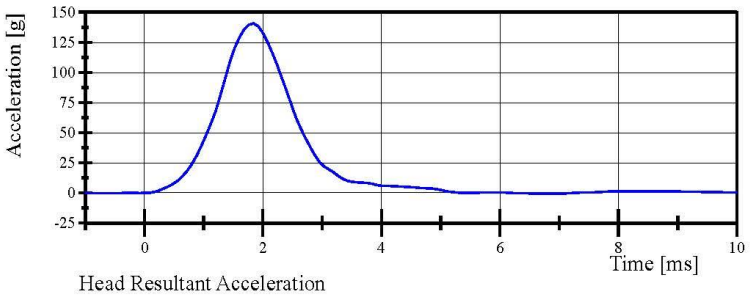
Filter Class: CFC_1000
Max: 1.3 g at 8.2 ms
Min: -227.5 g at 1.8 ms

Head Y-Axis Acceleration



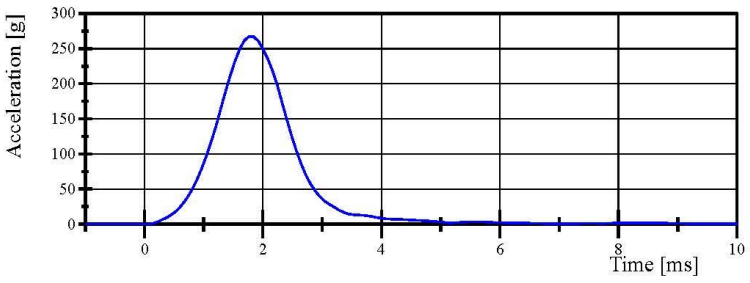
Filter Class: CFC_1000
Max: 10.3 g at 1.7 ms
Min: -1.7 g at 3.2 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 140.7 g at 1.8 ms
Min: -0.7 g at 6.7 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 267.1 g at 1.8 ms
Min: 0.0 g at -1.0 ms

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

10.29.2019 15:17:03 580

Transportation Research Center Inc.

Neck Flexion
HIII 5th Serial No. EB7513 Certification No. 8-3
Test Date: 10/31/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	58 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	7.076 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	(-2.1) - (-2.5) m/s	-2.13 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	(-4.0) - (-5.0) m/s	-4.16 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-5.98 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-83.3 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	76.6 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	91.5 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: EB6930

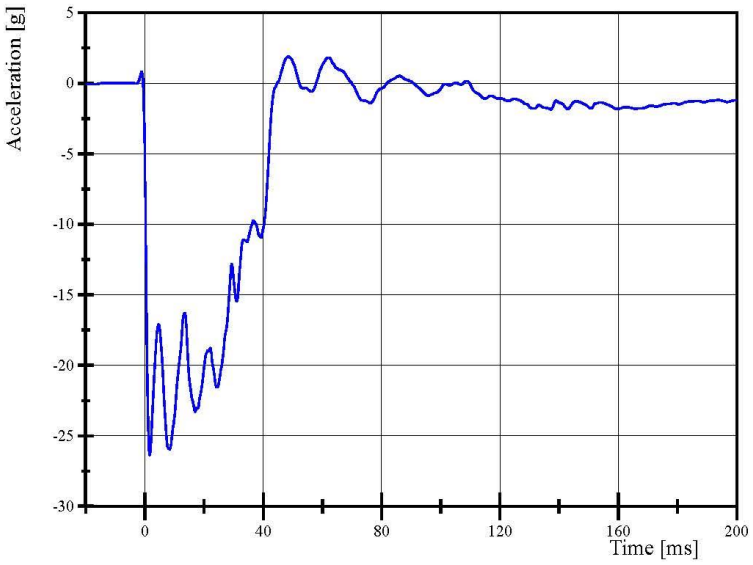
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.31.2019 10:09:10 1819

Transportation Research Center Inc.

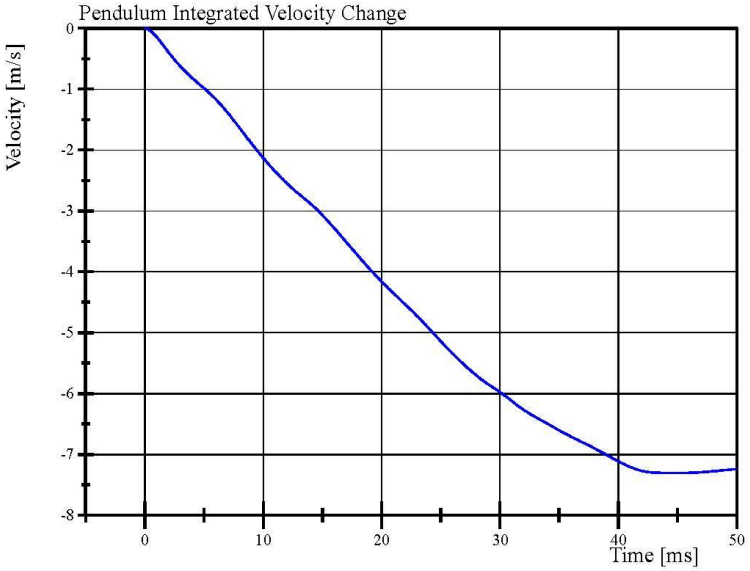
Neck Flexion
HIII 5th Serial No. EB7513 Certification No. 8-3
Test Date: 10/31/2019

Pendulum Acceleration



Filter Class: CFC_180
Max: 1.9 g at 48.5 ms
Min: -26.4 g at 1.6 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -7.3 m/s at 44.7 ms

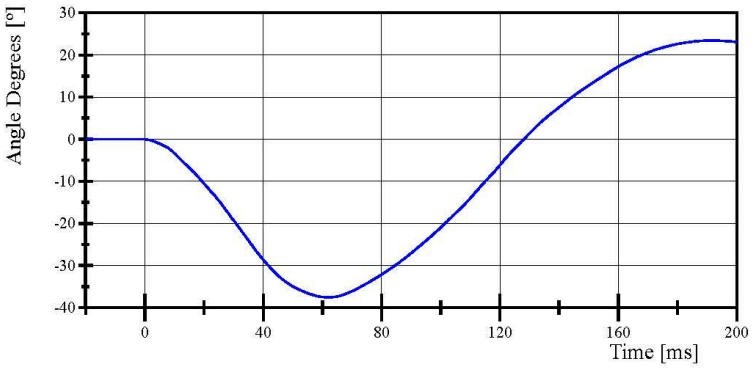
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.31.2019 10:10:12 1819

Transportation Research Center Inc.

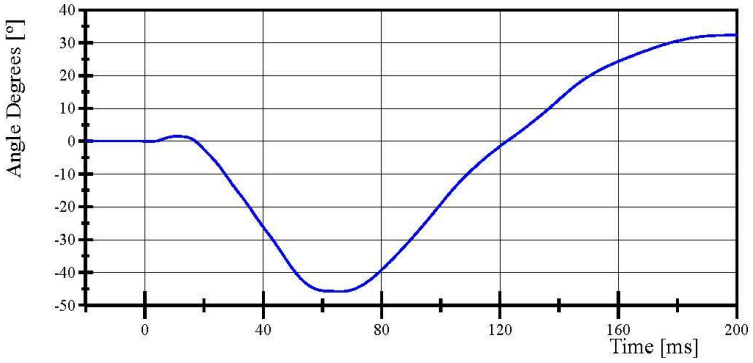
Neck Flexion
HIII 5th Serial No. EB7513 Certification No. 8-3
Test Date: 10/31/2019

Pot Rotation at the Base of Neck



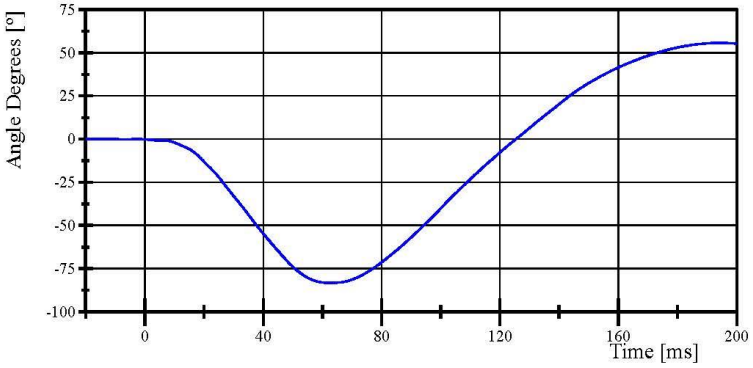
Filter Class: CFC_60
Max: 23.4 ° at 191.4 ms
Min: -37.6 ° at 62.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 32.4 ° at 198.2 ms
Min: -45.8 ° at 66.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 55.7 ° at 194.0 ms
Min: -83.3 ° at 62.6 ms

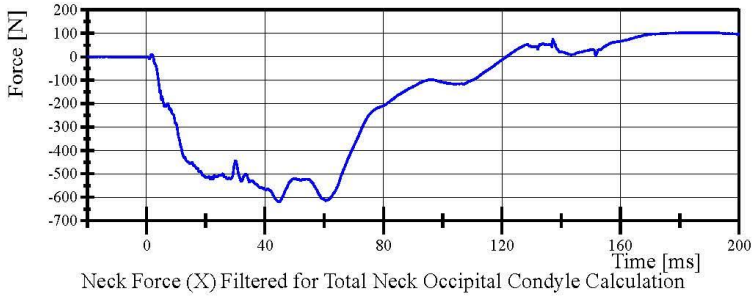
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.31.2019 10:10:12 1819

Transportation Research Center Inc.

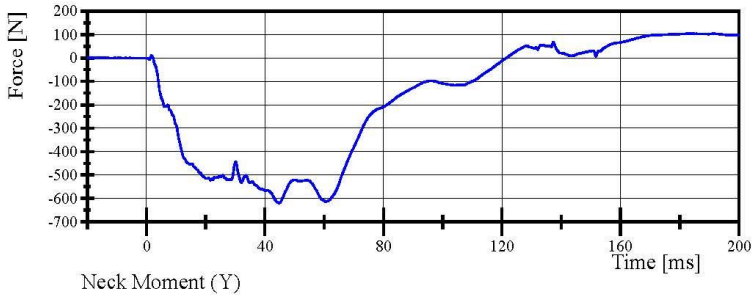
Neck Flexion
HIII 5th Serial No. EB7513 Certification No. 8-3
Test Date: 10/31/2019

Neck Force (X)



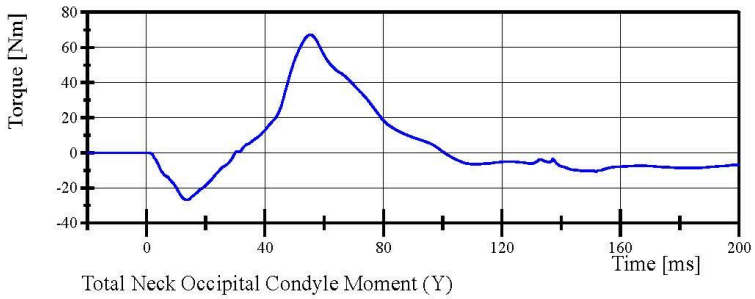
Filter Class: CFC_1000
Max: 104.0 N at 182.5 ms
Min: -618.8 N at 44.9 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



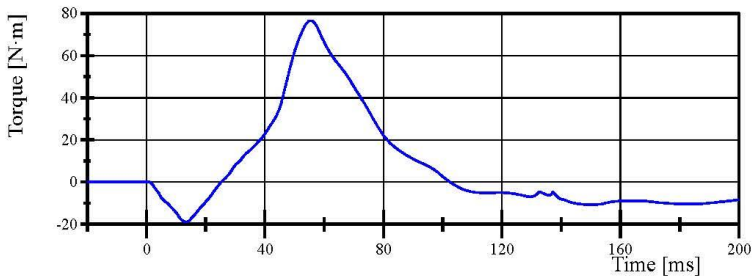
Filter Class: CFC_600
Max: 103.7 N at 182.6 ms
Min: -618.8 N at 44.8 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 67.3 Nm at 55.2 ms
Min: -26.8 Nm at 13.7 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 76.6 N·m at 55.4 ms
Min: -18.9 N·m at 13.5 ms

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

10.31.2019 10:10:12 1819

Transportation Research Center Inc.

Neck Extension
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/31/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	57 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.039 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.60 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.25 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	4.93 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	112.9 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-56.7 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	105.9 ms	Yes

Test meets specifications.

Condition: Used

Comments:
Neck S/N: EB6930

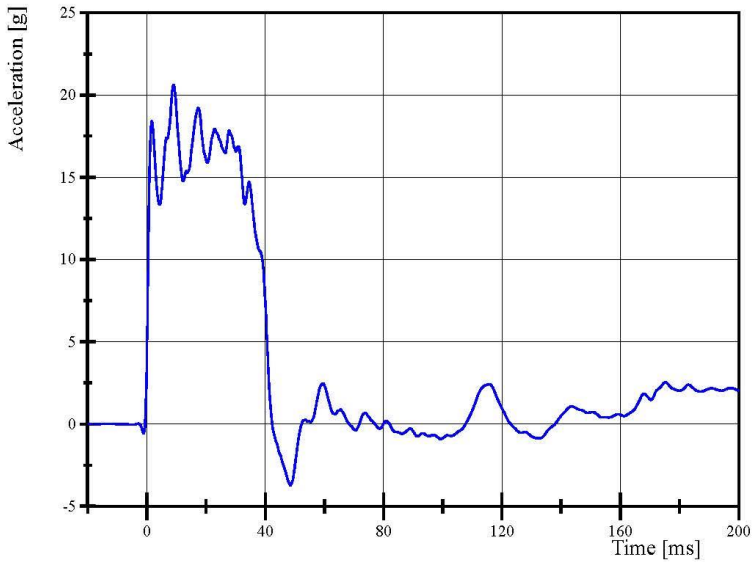
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.31.2019 09:07:09 1974

Transportation Research Center Inc.

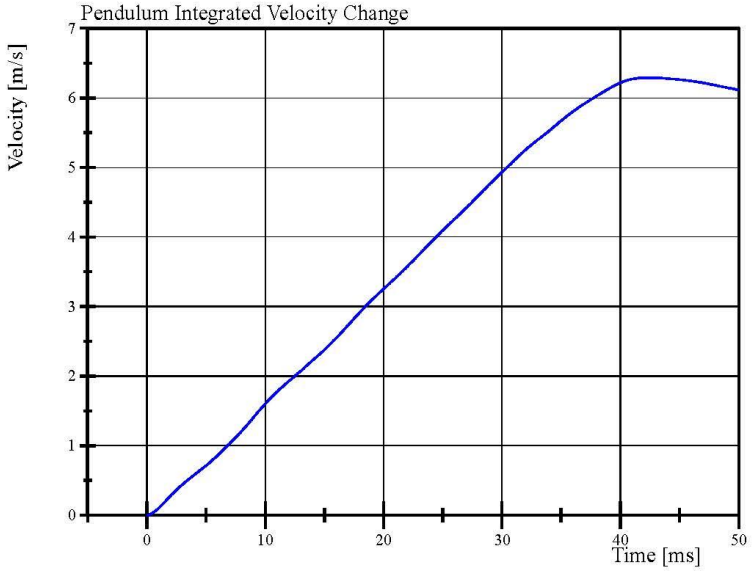
Neck Extension
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/31/2019

Pendulum Acceleration



Filter Class: CFC_180
Max: 20.6 g at 9.0 ms
Min: -3.7 g at 48.5 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 6.3 m/s at 42.4 ms
Min: 0.0 m/s at 0.0 ms

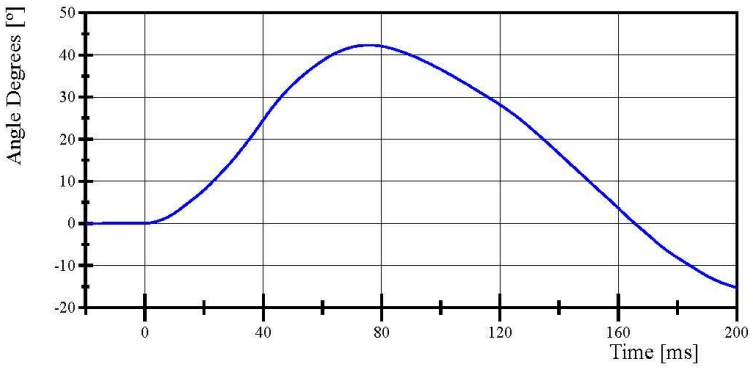
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.31.2019 09:07:57 1974

Transportation Research Center Inc.

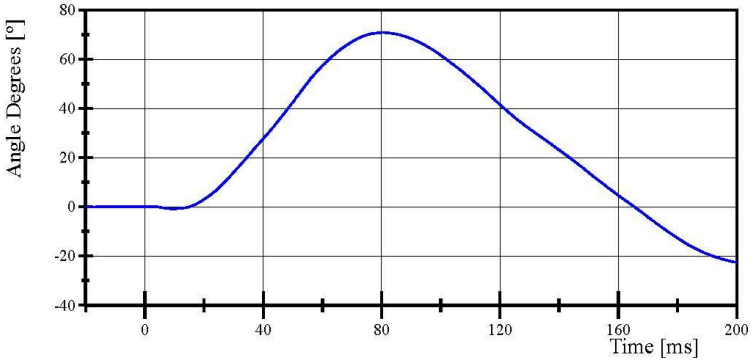
Neck Extension
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/31/2019

Pot Rotation at the Base of Neck



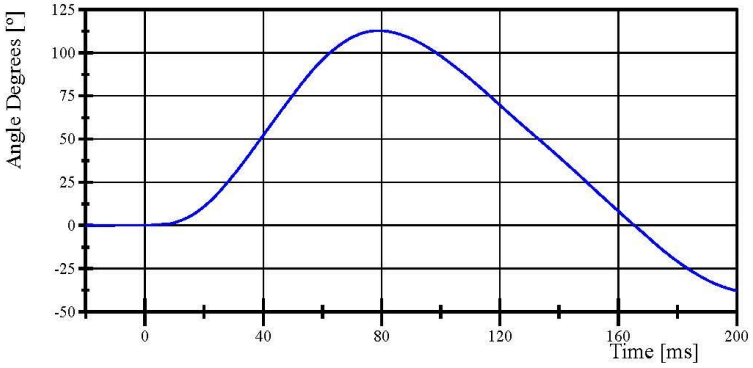
Filter Class: CFC_60
Max: 42.3 ° at 75.9 ms
Min: -15.2 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 70.8 ° at 80.6 ms
Min: -22.6 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 112.9 ° at 79.1 ms
Min: -37.8 ° at 200.0 ms

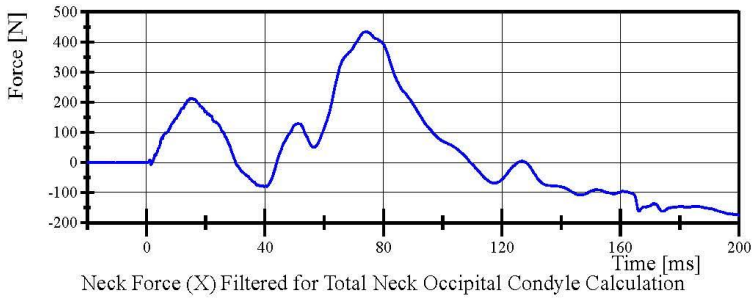
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.31.2019 09:08:00 1974

Transportation Research Center Inc.

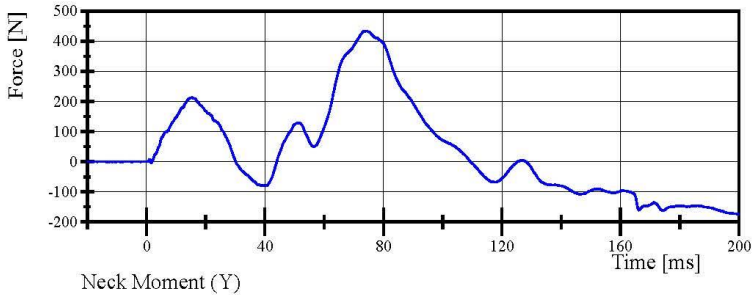
Neck Extension
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/31/2019

Neck Force (X)



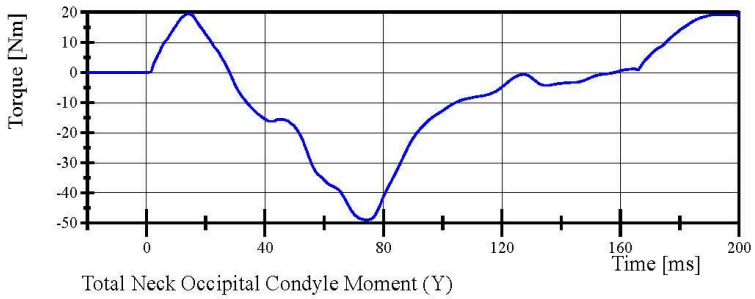
Filter Class: CFC_1000
Max: 433.7 N at 74.0 ms
Min: -175.2 N at 200.0 ms

Neck Force (X) Filtered for Total Neck Occipital Condyle Calculation



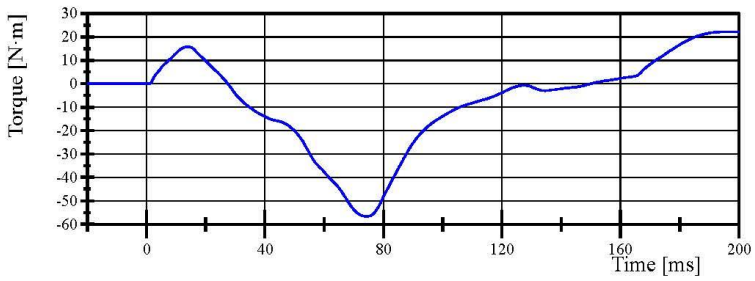
Filter Class: CFC_600
Max: 433.6 N at 74.2 ms
Min: -175.1 N at 200.0 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 19.5 Nm at 14.3 ms
Min: -49.0 Nm at 74.4 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 22.2 N·m at 198.3 ms
Min: -56.7 N·m at 74.4 ms

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

10.31.2019 09:08:02 1974

Transportation Research Center Inc.

Front Thorax
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/29/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	45 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.787 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,392.9 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	>= (-4,600) N	-4,392.9 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-53.0 mm	Yes
Internal Hysteresis	69 - 85 %	75.3 %	Yes

Test meets specifications.

Condition: Used

Comments:
Jacket S/N: DZ8735
Rib Set S/N: EB7630

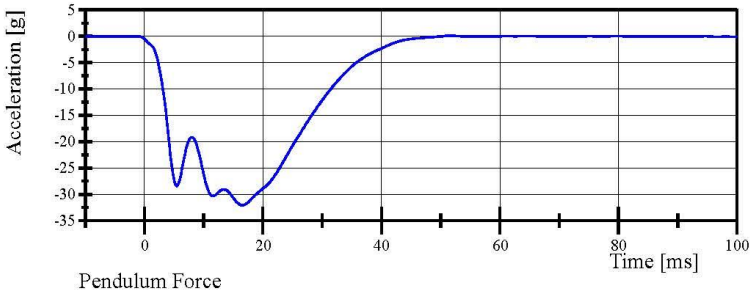
Specification Source: CFR49 Part 572 Subpart O with Polarity in accordance with J211

10.29.2019 08:05:39 433

Transportation Research Center Inc.

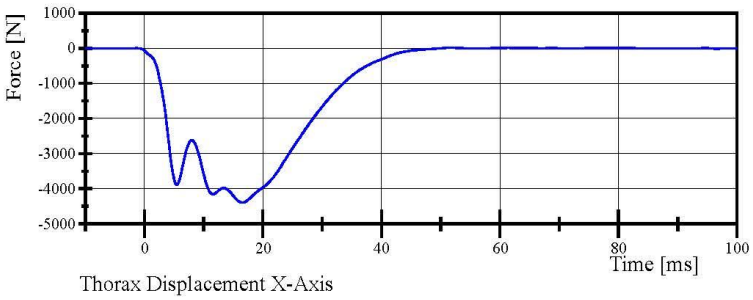
Front Thorax
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/29/2019

Pendulum Acceleration



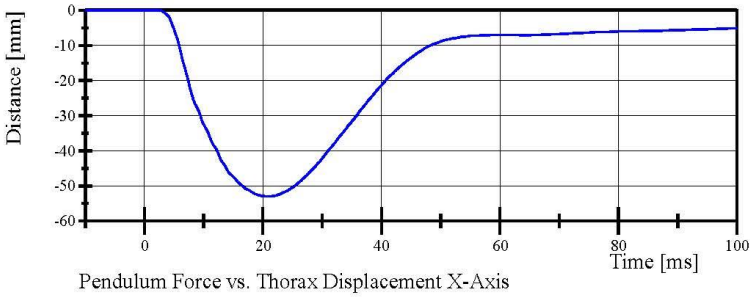
Filter Class: CFC_180
Max: 0.1 g at 51.6 ms
Min: -32.1 g at 16.6 ms

Pendulum Force



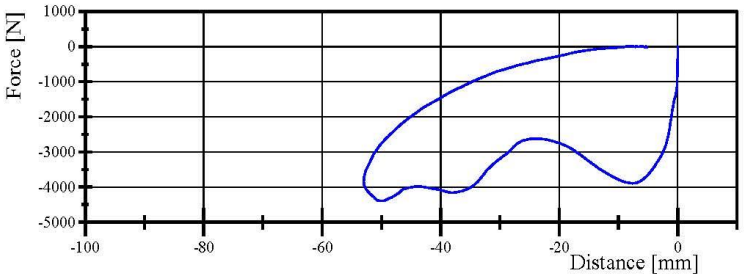
Filter Class: CFC_180
Max: 18.2 N at 51.6 ms
Min: -4,392.9 N at 16.6 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -9.4 ms
Min: -53.0 mm at 20.9 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 18.2 N at -8.2 mm
Min: -4,392.9 N at -50.0 mm

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

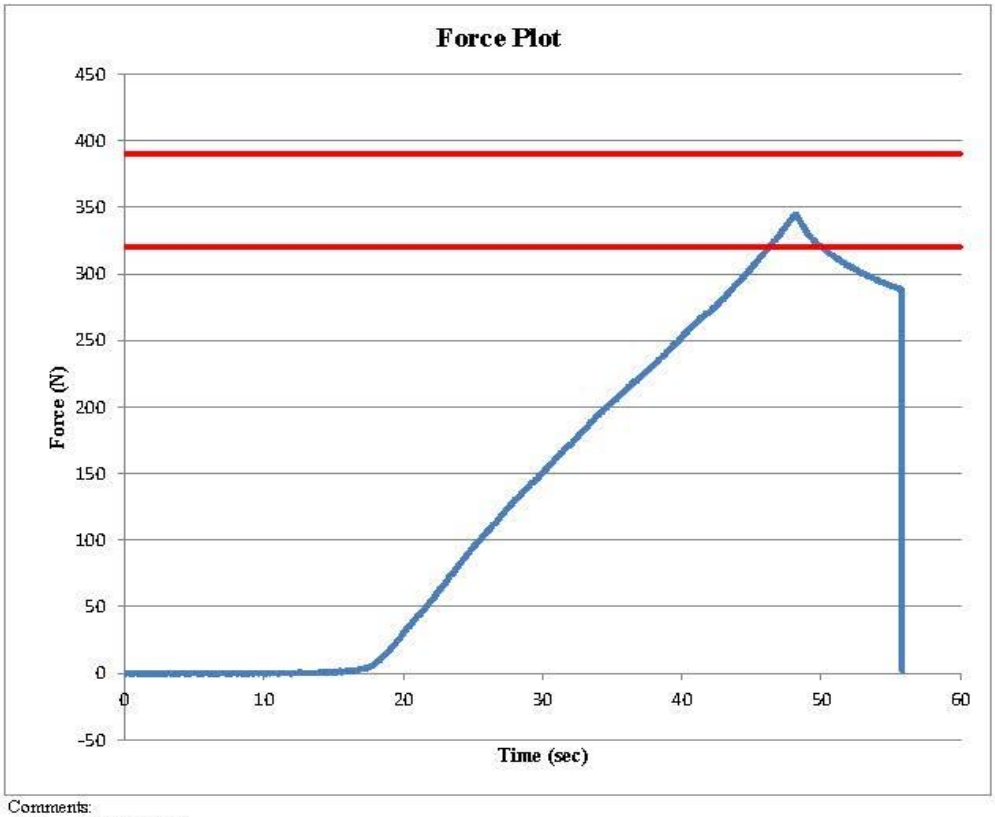
10.29.2019 08:06:10 433

Transportation Research Center Inc.

Hybrid III Small Female Torso Flexion

Customer:	NHTSA		
Serial Number:	EB7513	Date:	10/29/2019
Test Number:	1	Time:	10:01

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.2	°C	Pass
Humidity	10	-	70	45	%	Pass
Average Angular Velocity	0.5	-	1.5	1	deg/sec	Pass
Initial Angle	0	-	20	14.88	deg	Pass
Peak Force at 45.26°	320	-	390	344.48	N	Pass
Final Angle	-8	-	8	4.19	deg	Pass



Comments:
Abdomen S/N: EB8206
Lumbar S/N: N/A

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/29/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	44 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.076 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,560.0 N	Yes

Test meets specifications.

Condition: Used

Comments:
Knee Skin S/N: EB7773

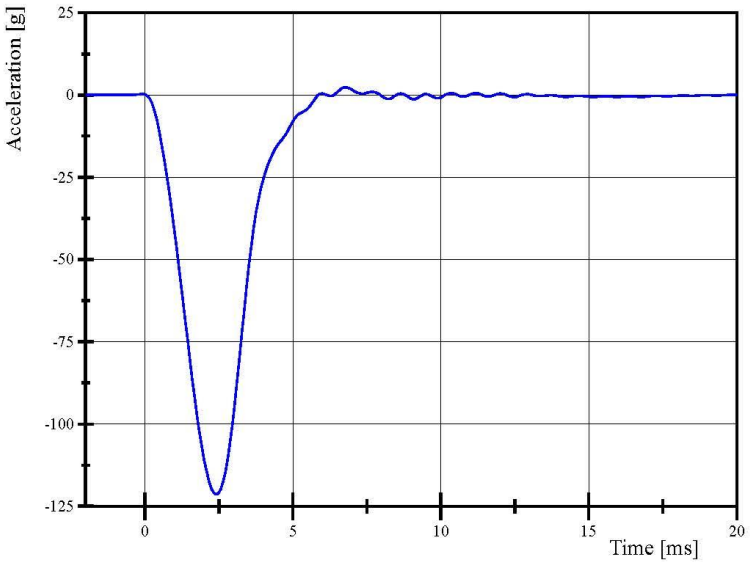
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.29.2019 07:35:29 2072

Transportation Research Center Inc.

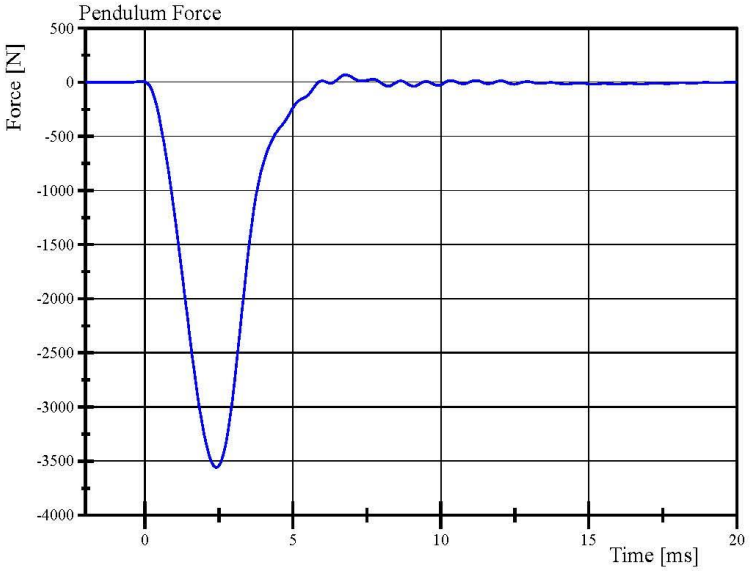
Left Knee Femur Response Test
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/29/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 2.4 g at 6.8 ms
Min: -121.4 g at 2.4 ms

Pendulum Force



Filter Class: CFC_600
Max: 69.6 N at 6.8 ms
Min: -3,560.0 N at 2.4 ms

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

10.29.2019 07:36:18 2072

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/29/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.088 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,702.5 N	Yes

Test meets specifications.

Condition: Used

Comments:
Knee Skin S/N: EB7550

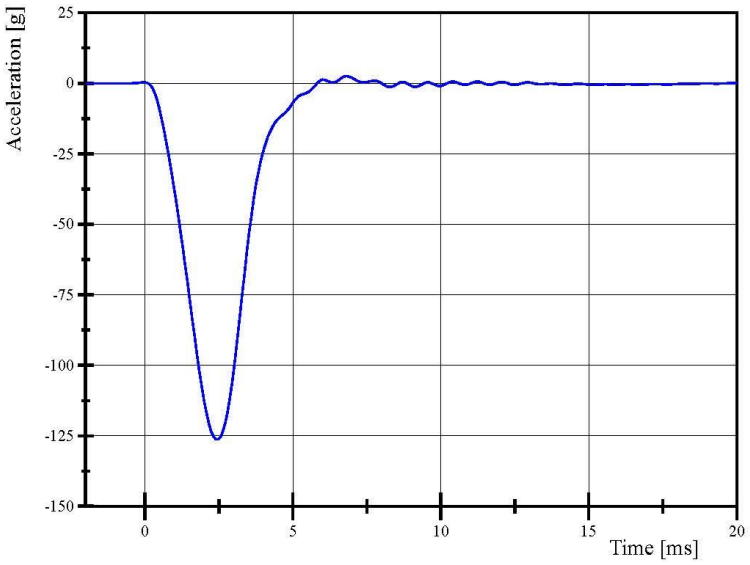
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.29.2019 07:40:20 1841

Transportation Research Center Inc.

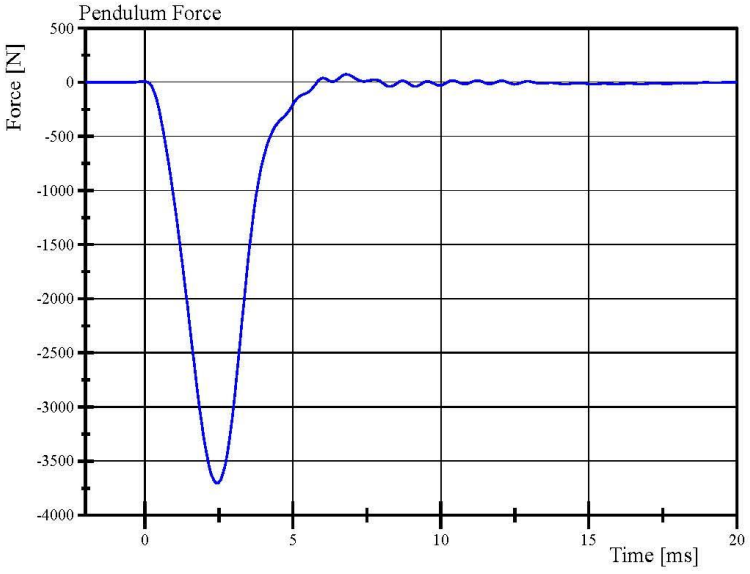
Right Knee Femur Response Test
HIII 5th Serial No. EB7513 Certification No. 8-1
Test Date: 10/29/2019

Pendulum Acceleration



Filter Class: CFC_600
Max: 2.5 g at 6.8 ms
Min: -126.3 g at 2.4 ms

Pendulum Force



Filter Class: CFC_600
Max: 74.5 N at 6.8 ms
Min: -3,702.5 N at 2.4 ms

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

10.29.2019 07:40:49 1841

APPENDIX D

TEST EQUIPMENT AND INSTRUMENTATION CALIBRATION

TABLE 1 – Driver Dummy Instrumentation

Instrumentation			Axis/Location	Hybrid III 50th S/N 037		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	T10650	Endevco	20-Aug-2019
			Y	P94650	Endevco	20-Aug-2019
			Z	P94622	Endevco	20-Aug-2019
		Redundant	X	P94431	Endevco	20-Aug-2019
			Y	P94487	Endevco	20-Aug-2019
			Z	P94645	Endevco	20-Aug-2019
Head Angular Rate Sensors			X	ARS14945	DTS	15-Oct-2018
			Y	ARS14946	DTS	15-Oct-2018
			Z	ARS14947	DTS	15-Oct-2018
Upper Neck Load Cell			FX, FY, FZ, MX, MY, MZ	2021	Humanetics	1-Mar-2019
Chest Accelerometers		Primary	X	P87834	Endevco	20-Aug-2019
			Y	P61255	Endevco	20-Aug-2019
			Z	P45008	Endevco	20-Aug-2019
		Redundant	X	P91177	Endevco	20-Aug-2019
			Y	P94570	Endevco	20-Aug-2019
			Z	P91172	Endevco	20-Aug-2019
Chest Potentiometer			X	CST037	Servo	5-Mar-2019
Pelvis Accelerometers			X	P91185	Endevco	19-Aug-2019
			Y	P91876	Endevco	19-Aug-2019
			Z	T11390	Endevco	19-Aug-2019
Femur Load Cells	Left	Primary	Z	DI4215-FZ1	Denton	1-Mar-2019
		Redundant	Z	DI4215-FZ2	Denton	1-Mar-2019
	Right	Primary	Z	DI4216-FZ1	Denton	1-Mar-2019
		Redundant	Z	DI4216-FZ2	Denton	1-Mar-2019
Tibia Load Cells	Left	Upper	MX, MY, FZ	3643-94	Denton	1-Mar-2019
		Lower	MX, MY, FZ	3644-370	Denton	1-Mar-2019
	Right	Upper	MX, MY, FZ	3643-413	Denton	1-Mar-2019
		Lower	MX, MY, FZ	3644-401	Denton	1-Mar-2019
Foot Accelerometers	Left	Rear	X	P90848	Endevco	20-Aug-2019
			Z	P91498	Endevco	20-Aug-2019
		Front	Z	P90841	Endevco	20-Aug-2019
	Right	Rear	X	P93467	Endevco	20-Aug-2019
			Z	P97619	Endevco	20-Aug-2019
		Front	Z	P94523	Endevco	20-Aug-2019
Seat Belt Load Cells		Lap	N/A	N/A	N/A	N/A
		Shoulder	N/A	N/A	N/A	N/A

TABLE 2 – Front Passenger Dummy Instrumentation

Instrumentation			Axis/Location	Hybrid III 5th S/N EB7513		
				Serial Number	Manufacturer	Calibration Date
Head Accelerometers		Primary	X	P44972	Endevco	22-Aug-2019
			Y	P80217	Endevco	12-Jun-2019
			Z	P69062	Endevco	21-Aug-2019
		Redundant	X	T11046	Endevco	22-Aug-2019
			Y	P97525	Endevco	22-Aug-2019
			Z	P73228	Endevco	22-Aug-2019
Head Angular Rate Sensors			X	ARS14944	DTS	15-Oct-2018
			Y	ARS14937	DTS	15-Oct-2018
			Z	ARS14938	DTS	15-Oct-2018
Upper Neck Load Cell			FX, FY, FZ, MX, MY, MZ	1634	Humanetics	27-Feb-2019
Chest Accelerometers		Primary	X	P80855	Endevco	21-Aug-2019
			Y	P97544	Endevco	22-Aug-2019
			Z	P57791	Endevco	12-Jun-2019
		Redundant	X	P73221	Endevco	21-Aug-2019
			Y	P69097	Endevco	21-Aug-2019
			Z	P69074	Endevco	21-Aug-2019
Chest Potentiometer			X	4223	Servo	21-Aug-2019
Pelvis Accelerometers			X	P91969	Endevco	22-Aug-2019
			Y	P91958	Endevco	22-Aug-2019
			Z	P80721	Endevco	22-Aug-2019
Femur Load Cells	Left	Primary	Z	DT0997-FZ1	Humanetics	27-Feb-2019
		Redundant	Z	DT0997-FZ2	Humanetics	27-Feb-2019
	Right	Primary	Z	DS4140-FZ1	Humanetics	27-Feb-2019
		Redundant	Z	DS4140-FZ2	Humanetics	27-Feb-2019
Tibia Load Cells	Left	Upper	MX, MY, FZ	3643-92	Denton	1-Oct-2018
		Lower	MX, MY, FZ	3644-92	Denton	1-Oct-2018
	Right	Upper	MX, MY, FZ	3643-484	Denton	1-Oct-2018
		Lower	MX, MY, FZ	3644-369	Denton	1-Oct-2018
Foot Accelerometers	Left	Rear	X	P90866	Endevco	21-Aug-2019
			Z	T11451	Endevco	21-Aug-2019
		Front	Z	P97890	Endevco	21-Aug-2019
	Right	Rear	X	P97640	Endevco	21-Aug-2019
			Z	P91471	Endevco	21-Aug-2019
		Front	Z	P91907	Endevco	21-Aug-2019
Seat Belt Load Cells		Lap	N/A	N/A	N/A	N/A
		Shoulder	N/A	N/A	N/A	N/A

TABLE 3 – Vehicle Instrumentation

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	T11856	Endevco	5-Sep-2019
			Z	P87822	Endevco	18-Jun-2019
		Redundant	X	P81065	Endevco	16-Jul-2019
	Right	Primary	X	T11885	Endevco	10-Sep-2019
			Z	T11827	Endevco	5-Sep-2019
		Redundant	X	P88460	Endevco	18-Jun-2019
Engine Accelerometers	Top		X	T11455	Endevco	5-Sep-2019
	Bottom		X	P94524	Endevco	18-Jun-2019