

Final Report Number: NCAP-TRC-19-003

**New Car Assessment Program (NCAP)
Frontal Barrier Impact Test**

**BAYERISCHE MOTOREN WERKE AG
2019 BMW X5 5-DR SUV
NHTSA Number: M20194103**

**PREPARED BY:
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Report Date: March 13, 2019

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**

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Prepared By: ILO Project Operations Group

Approved By: John Shultz

Approval Date: March 13, 2019

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 _____

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16. Abstract																																																																											
<p>A 56.0 km/h NCAP Frontal Impact Test was conducted on a 2019 BMW X5 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 January 7, 2019.</p> <p>The impact velocity was 56.34 km/h, and the ambient temperature at the barrier face at the time of impact was 21.2° C. The target vehicle post-test maximum crush was 410 millimeters at Crush zone 3 at left side. The test vehicle's performance is as follows:</p>																																																																											
<table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th colspan="3">Driver ATD</th> <th colspan="3">Passenger ATD</th> </tr> <tr> <th>Units</th> <th>Threshold</th> <th>Result</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>NA</td> <td>700</td> <td>209</td> <td>NA</td> <td>700</td> <td>342</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-32.8</td> <td>mm</td> <td>52</td> <td>-19.3</td> </tr> <tr> <td>3ms Chest Clip</td> <td>Gs</td> <td>60</td> <td>48.6</td> <td>Gs</td> <td>60</td> <td>44.2</td> </tr> <tr> <td>Nij</td> <td>NA</td> <td>1</td> <td>0.34</td> <td>NA</td> <td>1</td> <td>0.35</td> </tr> <tr> <td>Neck Tension</td> <td>Newtons</td> <td>4170</td> <td>1367.9</td> <td>Newtons</td> <td>2620</td> <td>978.5</td> </tr> <tr> <td>Neck Compression</td> <td>Newtons</td> <td>4000</td> <td>-499.0</td> <td>Newtons</td> <td>2520</td> <td>-406.8</td> </tr> <tr> <td>Left Femur Force</td> <td>Newtons</td> <td>10000</td> <td>-2827.8</td> <td>Newtons</td> <td>6800</td> <td>-2345.6</td> </tr> <tr> <td>Right Femur Force</td> <td>Newtons</td> <td>10000</td> <td>-2596.2</td> <td>Newtons</td> <td>6800</td> <td>-1857.6</td> </tr> </tbody> </table>							Measurement Description	Driver ATD			Passenger ATD			Units	Threshold	Result	Units	Threshold	Result	Head Injury Criteria (HIC ₁₅)	NA	700	209	NA	700	342	Maximum Chest Compression	mm	63	-32.8	mm	52	-19.3	3ms Chest Clip	Gs	60	48.6	Gs	60	44.2	Nij	NA	1	0.34	NA	1	0.35	Neck Tension	Newtons	4170	1367.9	Newtons	2620	978.5	Neck Compression	Newtons	4000	-499.0	Newtons	2520	-406.8	Left Femur Force	Newtons	10000	-2827.8	Newtons	6800	-2345.6	Right Femur Force	Newtons	10000	-2596.2	Newtons	6800	-1857.6
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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. DTNH22-12-D-00257. 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 2019 BMW X5 5-DR SUV at a velocity of 56.34 km/h. The test was performed at Transportation Research Center, Inc. on January 7, 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. 426) were qualified prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 106 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 410 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 airbag. The passenger's visible contact points were as follows: front airbag, headrest and knee airbag.

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)	209	0.34	1367.9	-499.0	48.6	-32.8	-2827.8	-2596.2
Passenger (5 th Female)	342	0.35	978.5	-406.8	44.2	-19.3	-2345.6	-1857.6

TEST COMMENTS:

The images have 5-DR Hatchback instead of SUV

Driver Left Upper Tibia Z Force data is questionable throughout

Passenger Head Y primary data failed at 56 ms

Passenger Chest X primary data failed at 56 ms

Passenger Shoulder Belt Force data failed at 76 ms

2.2 REPORT AREA 2: DATA SHEETS

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

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

TEST VEHICLE INFORMATION

NHTSA No.	M20194103
Model Year	2019
Make	BMW
Model	X5
Body Style	MPV
VIN	5UXCR6C52KLK87127
Body Color	Artic Grey Metallic
Odometer Reading (km/mi)	29 mi
Engine Displacement (L)	3.0
Type/No. Cylinders	Gas/6
Engine Placement	Front Longitudinal
Transmission Type	Automatic
Transmission Speeds	8
Overdrive	Yes
Final Drive	AWD
Roof Rack	No
Sunroof/T-Top	Yes
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	Yes
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	Yes
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	Yes
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	Yes
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	BAYERISCHE MOTOREN WERKE AG	GVWR (kg)	2795 (6162 lbs)
Date of Manufacture	11/18	GAWR Front (kg)	1325 (2921 lbs)
		GAWR Rear (kg)	1640 (3616 lbs)

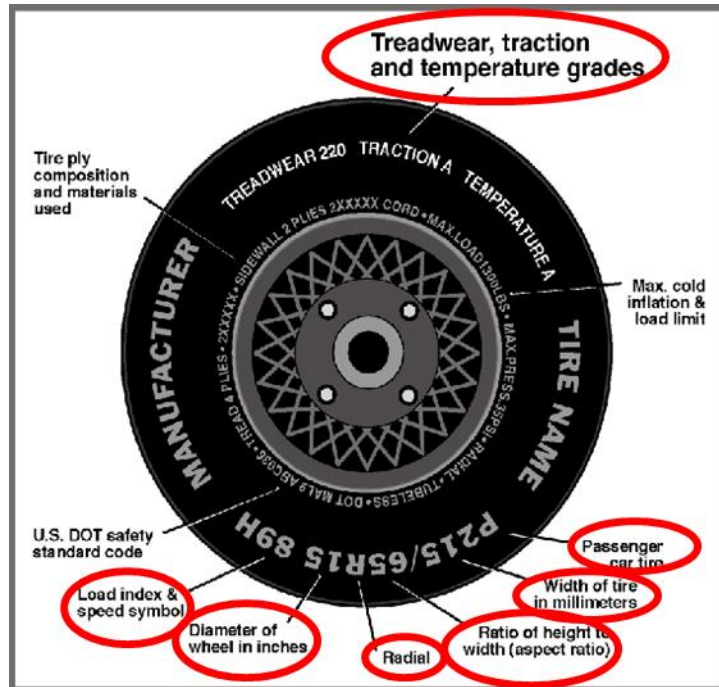
VEHICLE SEATING AND WEIGHT CAPACITY

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench	N/A	
Number of Occupants	2	2	N/A	5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				44.8

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

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	340	340
Cold / Test Pressure (kPa)	230	280
Recommended Tire Size	265/50R19 XL	265/50R19 XL
Tire Size on Vehicle	265/50R19	265/50R19
Tire Manufacturer	Pirelli	Pirelli
Tire Model	Scorpion	Scorpion
Treadwear	500	500
Traction Grade	A	A
Temperature Grade	A	A
Tire Plies Sidewall	2	2
Tire Plies Body	5	5
Load Index/Speed Symbol	110H	110H
Tire Material	Rayon/Steel/Polyamide	Rayon/Steel/Polyamide
DOT Safety Code Right	UN PE X118 3818	UN PE X118 3818
DOT Safety Code Left	UN PE X118 3718	UN PE X118 3818

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

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	524.8	550.2		569.0	600.4	
Right	kg	537.8	536.4		559.4	599.0	
Ratio	%	49.4	50.6		48.5	51.5	
Totals	kg	1062.6	1086.6	2149.2	1128.4	1199.4	2327.8

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2149.2
Weight of 1 P572E ATD & 1 P572O ATD	kg	139.3
Rated Cargo/Luggage Weight (RCLW)	kg	44.8
Vehicle Target Weight (TVTW)	kg	2333.3

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front)
As Delivered	mm	824	825	821	827	1502
As Tested	mm	810	817	809	811	1530
Post Test	mm	870	900	807	816	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2970
Total Vehicle Length at Left Side	mm	4775
Total Vehicle Length at Centerline	mm	4910
Total Vehicle Length at Right Side	mm	4775
Weight of Ballast in Cargo Area	kg	0.0
Weight of Vehicle Components Removed	kg	27.2
Amount of Stoddard Solvent in Fuel Tank	liters	20.4

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT: Rear fascia and bumper beam, tail lights, left rear door panel and miscellaneous plastic trim at rear of vehicle.

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

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4910
2	Total Width	2000
3	Bumper Top Height	560
4	Bumper Bottom Height	460
5	Longitudinal Member Top Height	622
6	Distance Between Longitudinal Members	860
7	Longitudinal Member Width	65
8	Engine Top Height	950
9	Engine Bottom Height	270
10	Engine and Gearbox Width	550
11	Front Bumper-Engine Distance	572
12	Front Shock Absorber Fixing Height	955
13	Bonnet Leading Edge Height	910
14	Front Shock Absorber Fixing Width	950
15	Front Bumper – Front Axle Distance	870
16	Front Axle – A-Pillar Distance	780
17	A-Pillar – B-Pillar Distance	1055
18	B-Pillar – Rear Axle Distance	1146
19	B-Pillar – C-Pillar Distance	930
20	Roof Sill Bottom Height	1659
21	Roof Sill Top Height	1766
22	Floor Sill Bottom Height	445
23	Floor Sill Top Height	510

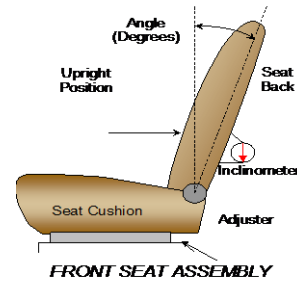
DATA SHEET NO. 2 - SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

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:	19.0
Passenger Seat back angle:	18.4

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	281	140.5
Passenger Seat	220	0

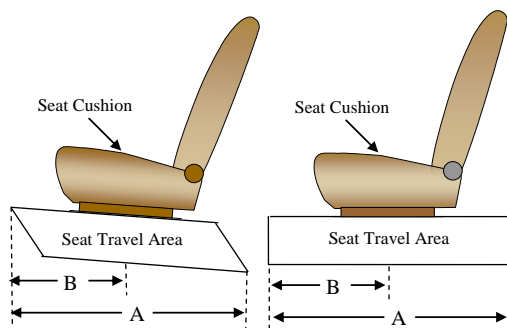
SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages..

Driver: Fixed

Passenger: Fixed

	Total No. of Positions	Placed in Position No.
Driver Seat	Fixed	Fixed
Passenger Seat	Fixed	Fixed



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

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

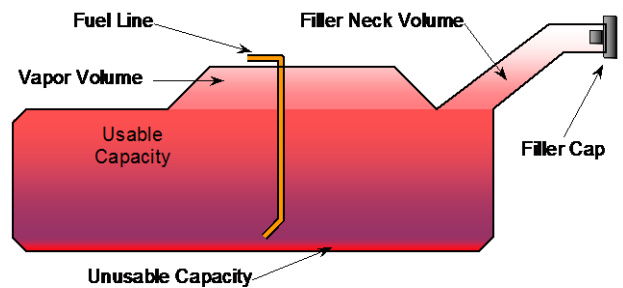
NHTSA No.: M20194103
 Test Date: 1/7/2019

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	82.9
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	77.2
Actual Amount of Solvent Used	77.2
1/3 of Usable Capacity	27.6

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

Fuel pump starts when ignition is on. The fuel pump will operate for 5 seconds. After pressure has been built up the fuel pump switches to sleep mode until the engine will be started or the pressure decreases.

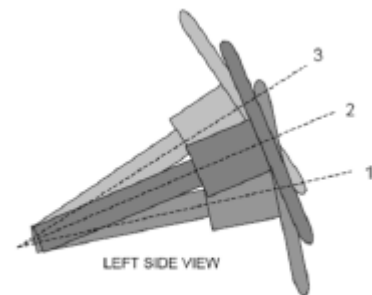


VEHICLE FUEL TANK ASSEMBLY

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	29.1	0
Geometric Center Position No. 2	30.5	31
Uppermost Position No. 3	32.0	62
Telescoping Steering Wheel Travel		62
Test Position	30.5	31

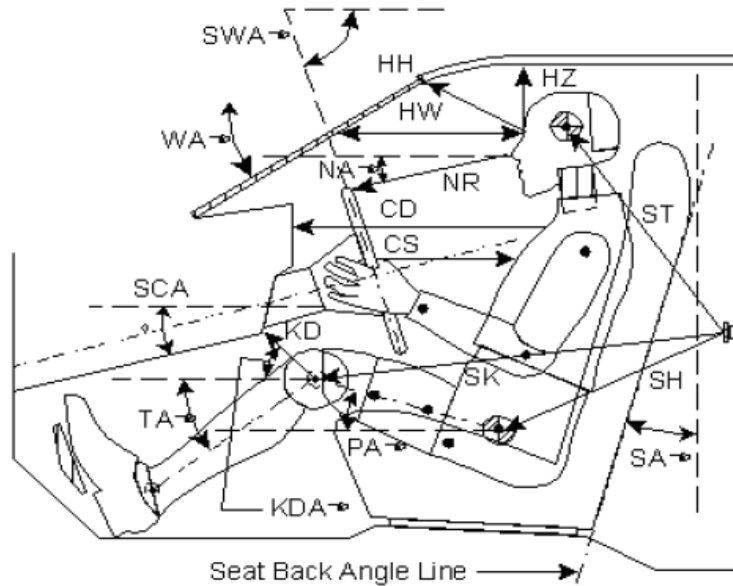
DATA SHEET NO. 3 - DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 BMW X5 5-DR SUV

NHTSA No.: M20194103

Test Program: NCAP Frontal Impact

Test Date: 1/7/2019



Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		32.7		
SWA°	Steering Wheel Angle		30.5		
SCA°	Steering Column Angle		59.5		
SA°	Seat Back Angle (on head rest post)		19.0		18.4
HZ	Head to Roof (Z)	227		245	
HH	Head to Header	462		382	
HW	Head to Windshield	712		676	
NR	Nose to Rim	423	5.0		
CD	Chest to Dash	556		407	
CS	Chest to Steering Hub	345			
RA	Rim to Abdomen	228			
KDL	Left Knee to Dash	202	24.5	127	32.7
KDR	Right Knee to Dash	203	23.5	137	31.0
PA°	Pelvic Angle		23.6		19.5
TA°	Tibia Angle		48.4		66.0
SK	Striker to Knee	524	9.2	594	9.1
ST	Striker to Head	462	86.2	423	72.1
SH	Striker to H-Point	246	56.1	288	29.2

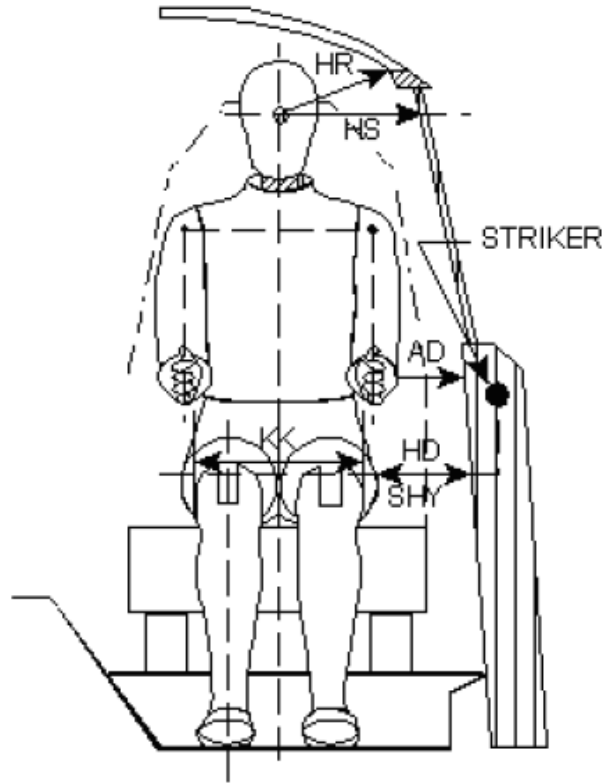
DATA SHEET NO. 4 - DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2019 BMW X5 5-DR SUV

NHTSA No.: M20194103

Test Program: NCAP Frontal Impact

Test Date: 1/7/2019

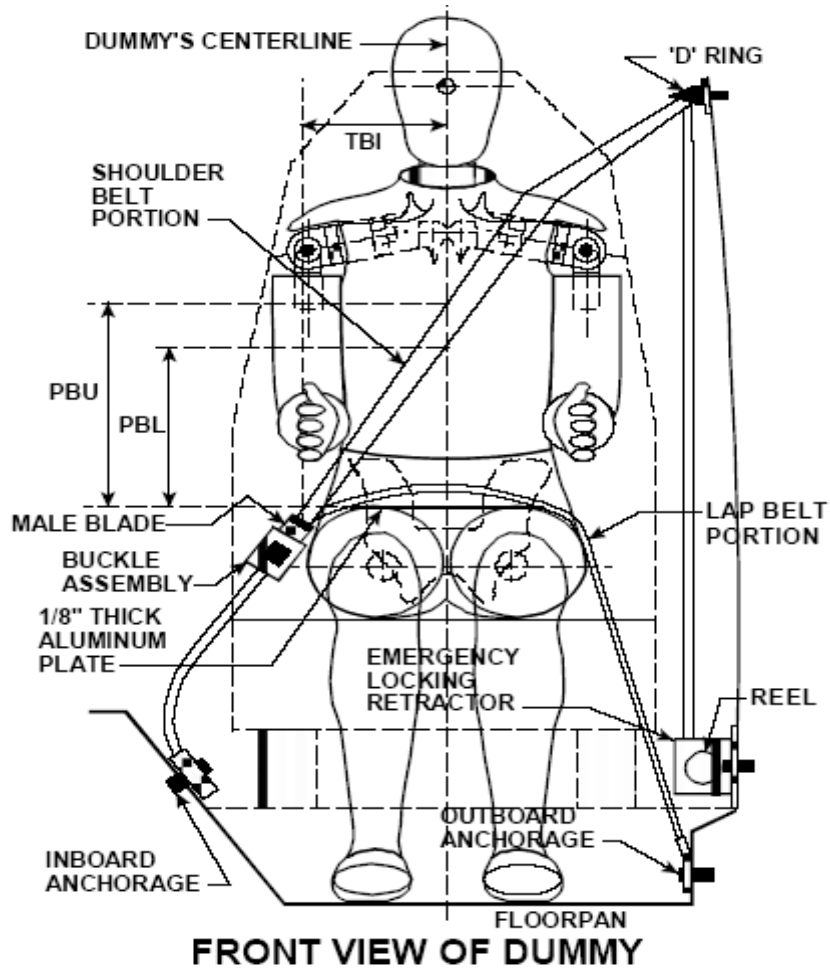


Code	Measurement Description	Driver	Passenger
AD	Arm to Door	46	101
HD	H-Point to Door	152	177
HR	Head to Side Header	241	263
HS	Head to Side Window	368	385
KK	Knee to Knee	309	170
SHY	Striker to H-Point (Y Direction)	243	267
AA	Ankle to Ankle	326	160

DATA SHEET NO. 5 - SEAT BELT POSITIONING DATA

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU – Top surface of reference to belt upper edge	mm	370	312
PBL – Top surface of reference to belt lower edge	mm	286	220

BELT LENGTH DATA

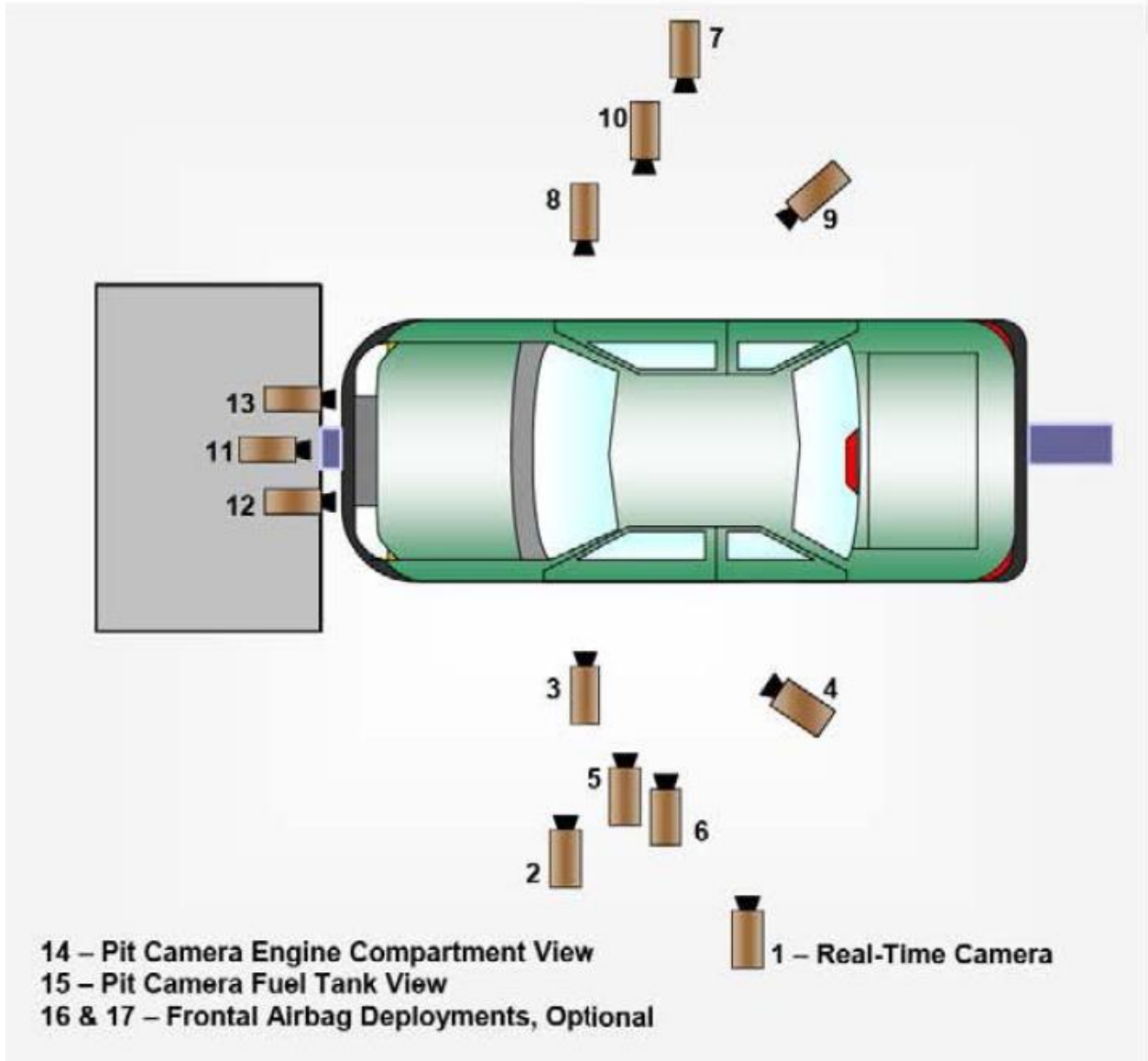
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	873	945
Lap belt length as measured on ATD	mm	570	571
Remainder of belt on reel	mm	1197	1154
Total belt length for continuous webbing systems	mm	2640	2670

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

Test Vehicle: 2019 BMW X5 5-DR SUV
Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
Test Date: 1/7/2019

CAMERA POSITIONS FOR FRONTAL IMPACTS



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

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

CAMERA LOCATIONS

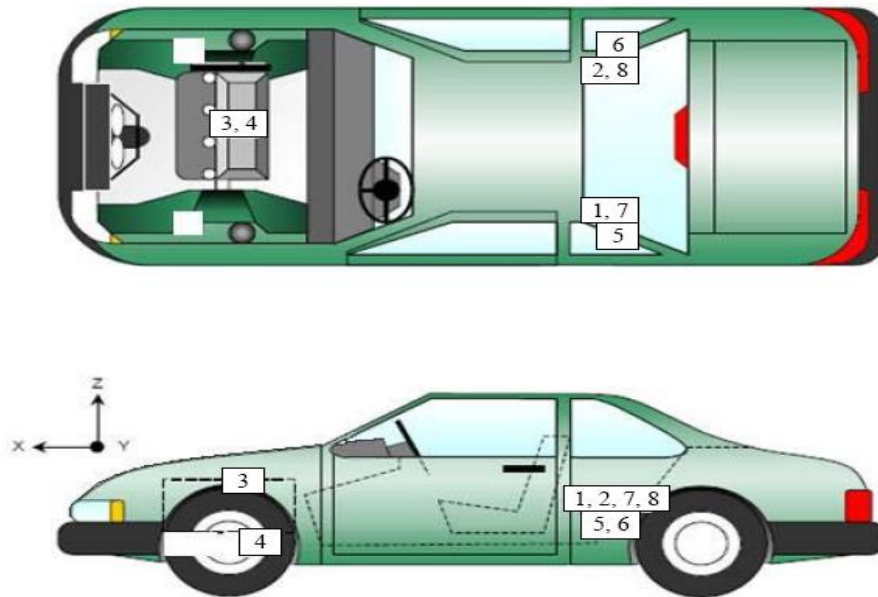
No.	Camera View	Location (mm)			Lens (mm)	Frame Speed (fps)
		X	Y	Z		
1	REAL-TIME LEFT OVERALL	1359	-6074	-1216	Zoom	30
2	LEFT OVERALL	2687	-6079	-1372	20	1000
3	DRIVER CLOSE-UP	1593	-6130	-1341	50	1000
4	LEFT FRONT HALF	1025	-5332	-1340	25	1000
5	LEFT ANGLE	4240	-2774	-1960	25	1000
6	STEERING COLUMN	2077	-6087	-2132	50	1000
7	RIGHT OVERALL	2360	6405	-1216	20	1000
8	PASSENGER CLOSE-UP	1496	5732	-1432	50	1000
9	RIGHT FRONT HALF	1188	5350	-1248	25	1000
10	RIGHT ANGLE	4291	2591	-1961	28	1000
11	WINDSHIELD	0	0	-2611	12.5	1000
12	DRIVER WINDSHIELD	0	-466	-2611	25	1000
13	PASSENGER WINDSHIELD	0	390	-2611	25	1000
14	PIT FRONT	538	0	3179	25	1000
15	PIT REAR	3479	0	3179	12.5	1000
16	DRIVER ONBOARD				25	1000
17	PASSENGER ONBOARD				25	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: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1885	505	-558
2	Right Rear Accelerometer – X Direction	1885	505	-550
3	Engine Top X	3810	20	-1022
4	Engine Bottom X	3735	-70	-230
5	Left Rear Accelerometer – Z Direction	1885	505	-553
6	Right Rear Accelerometer – Z Direction	1885	505	-550
7	Left Rear Accelerometer – X Direction Redundant	1885	455	-553
8	Right Rear Accelerometer- X Direction Redundant	1885	455	-550

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

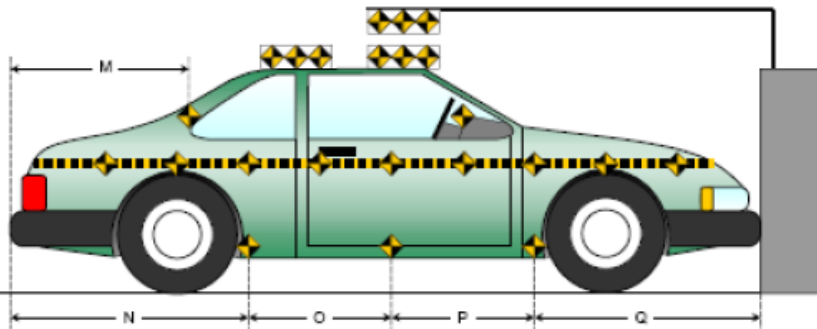
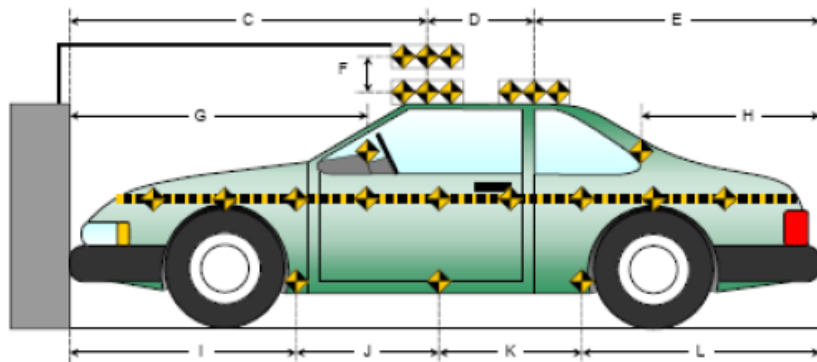
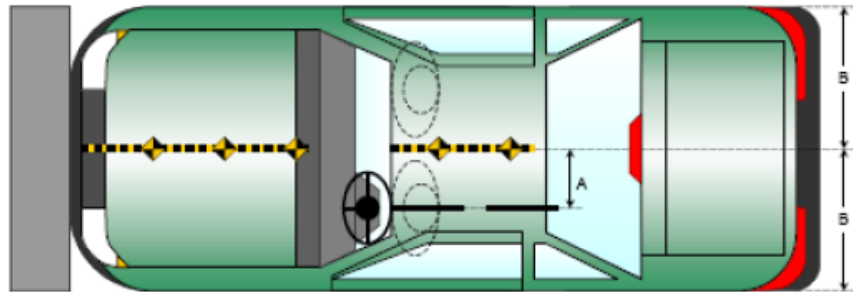
DATA SHEET NO. 8 - PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

Item	Value
A	510
B	1000
C	2504
D	600
E	1810
F	284
G	2745
H	1320
I	1380
J	963
K	1000
L	1575
M	1322
N	1585
O	995
P	970
Q	1365

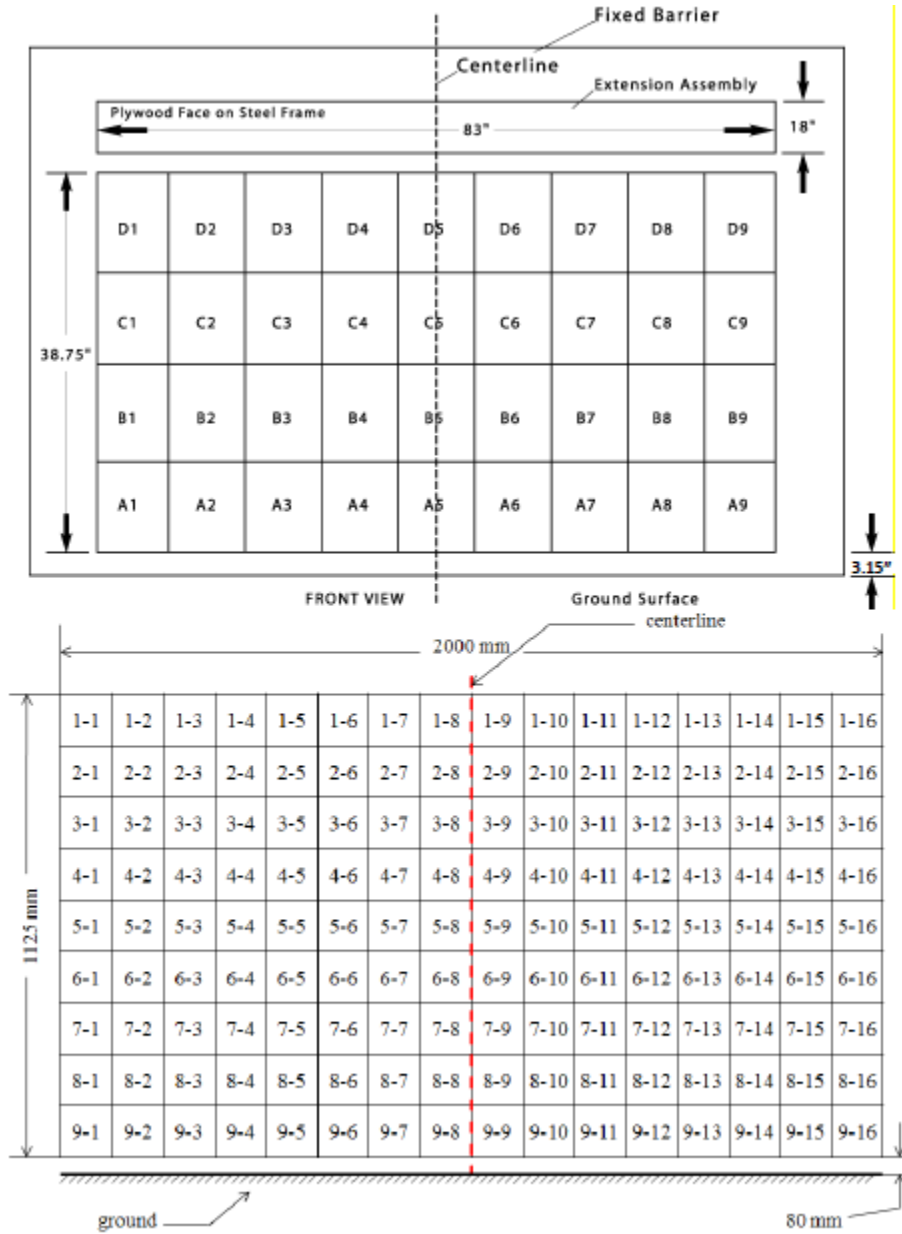
All units in millimeters



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

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019



DATA SHEET NO. 10 - TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2019 BMW X5 5-DR SUV
Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
Test Date: 1/7/2019

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: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	Hybrid III 50th / 037	Hybrid III 5th / 426
Head Contact	Airbag and Head Restraint	Airbag and Head Restraint
Upper Torso Contact	Airbag	Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

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	Small crack at lower right corner
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1132
Center	mm	1082
Right Side	mm	1007
Average	mm	1074

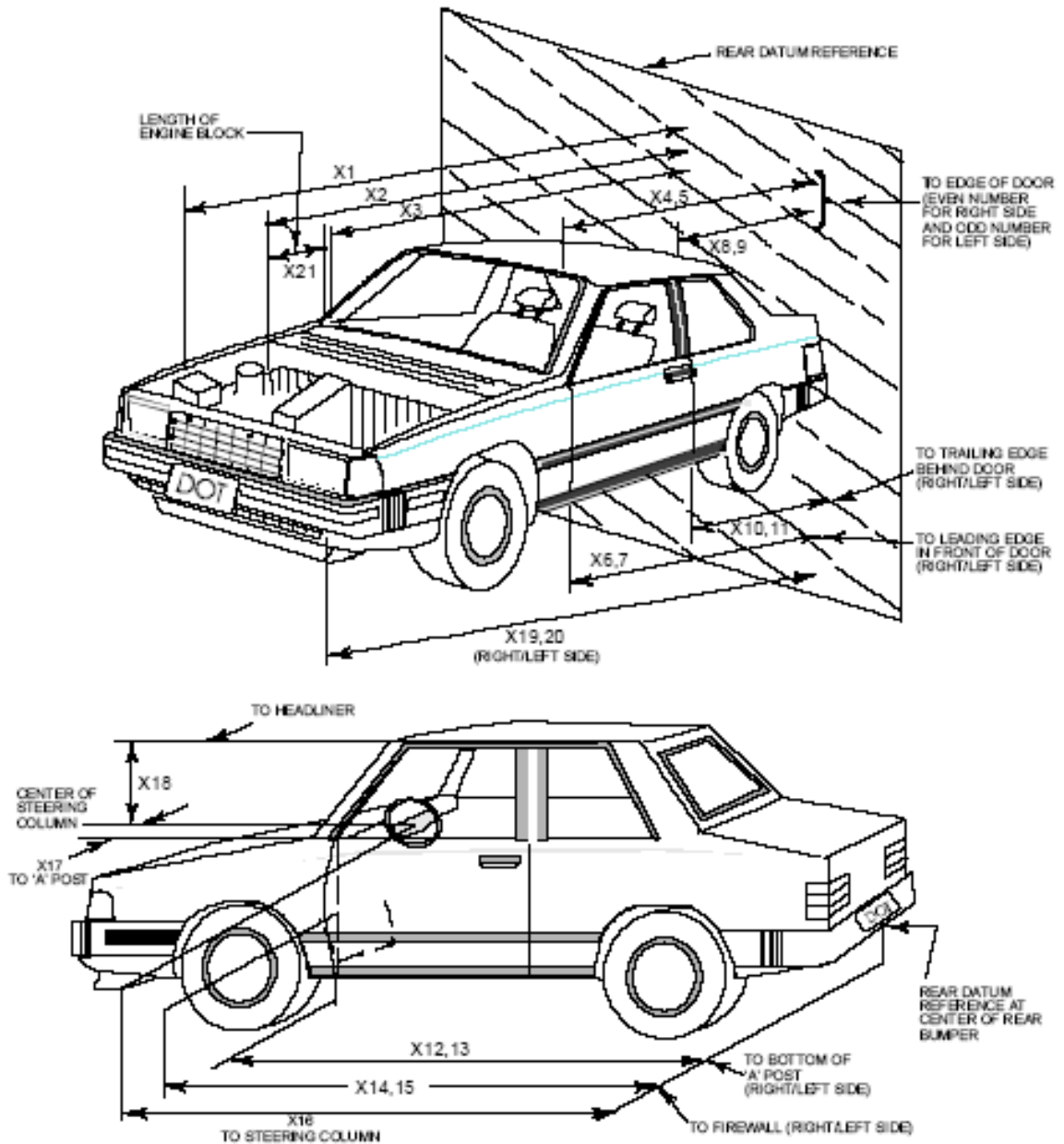
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	Yes	Yes	Yes	Yes
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	No	No	No

DATA SHEET NO. 12 - VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019



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

Test Vehicle: 2019 BMW X5 5-DR SUV

NHTSA No.: M20194103

Test Program: NCAP Frontal Impact

Test Date: 1/7/2019

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4910	4515	395
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4245	3914	331
3	RSOV to Firewall	3680	3665	15
4	RSOV to Upper Leading Edge of Right Door	3350	3350	0
5	RSOV to Upper Leading Edge of Left Door	3345	3350	-5
6	RSOV to Lower Leading Edge of Right Door	3355	3365	-10
7	RSOV to Lower Leading Edge of Left Door	3345	3365	-20
8	RSOV to Upper Trailing Edge of Right Door	2272	2271	1
9	RSOV to Upper Trailing Edge of Left Door	2269	2273	-4
10	RSOV to Lower Trailing Edge of Right Door	2300	2310	-10
11	RSOV to Lower Trailing Edge of Left Door	2290	2311	-21
12	RSOV to Bottom of "A" Post-of Right Side	3275	3275	0
13	RSOV to Bottom of "A" Post-of Left Side	3280	3279	1
14	RSOV to Firewall, Right Side	3945	3915	30
15	RSOV to Firewall, Left Side	3950	3914	36
16	RSOV to Steering Column	1985	1860	125
17	Center of Steering Column to "A" Post	330	345	-15
18	Center of Steering Column to Headliner	420	464	-44
19	RSOV to Right Side of Front Bumper	4775	4530	245
20	RSOV to Left Side of Front Bumper	4775	4610	165
21	Length of Engine Block	500	500	0
RD	RSOV to Right Side of Dash Panel	3085	3080	5
CD	RSOV to Center of Dash Panel	3185	3167	18
LD	RSOV to Left Side of Dash Panel	3090	3092	-2

All Dimensions in mm

DATA SHEET NO. 13 - ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

VEHICLE INFORMATION

VIN: 5UXCR6C52KLK87127
 Vehicle Size Category: MPV

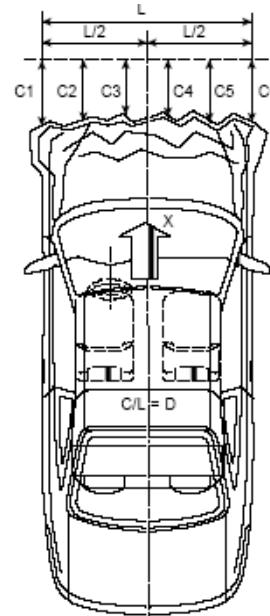
Wheelbase: 2970
 Test Weight (kg): 2327.8

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): 56.34
 Velocity Change (km/h): 65.93
 Time of Separation (ms): 165

CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
 Midpoint of Damage: Centerline
 Damage Region Length (mm): 1219
 Impact Mode: Frontal



No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4775	4530	245
C2	Crush zone 2 at left side	mm	4870	4470	400
C3	Crush zone 3 at left side	mm	4905	4495	410
C4	Crush zone 4 at right side	mm	4905	4540	365
C5	Crush zone 5 at right side	mm	4865	4550	315
C6	Crush zone 6 at right side	mm	4775	4610	165
L	C1 to C6	mm	1524	1541	-17

DATA SHEET NO. 14 - VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2019 BMW X5 5-DR SUV

NHTSA No.: M20194103

Test Program: NCAP Frontal Impact

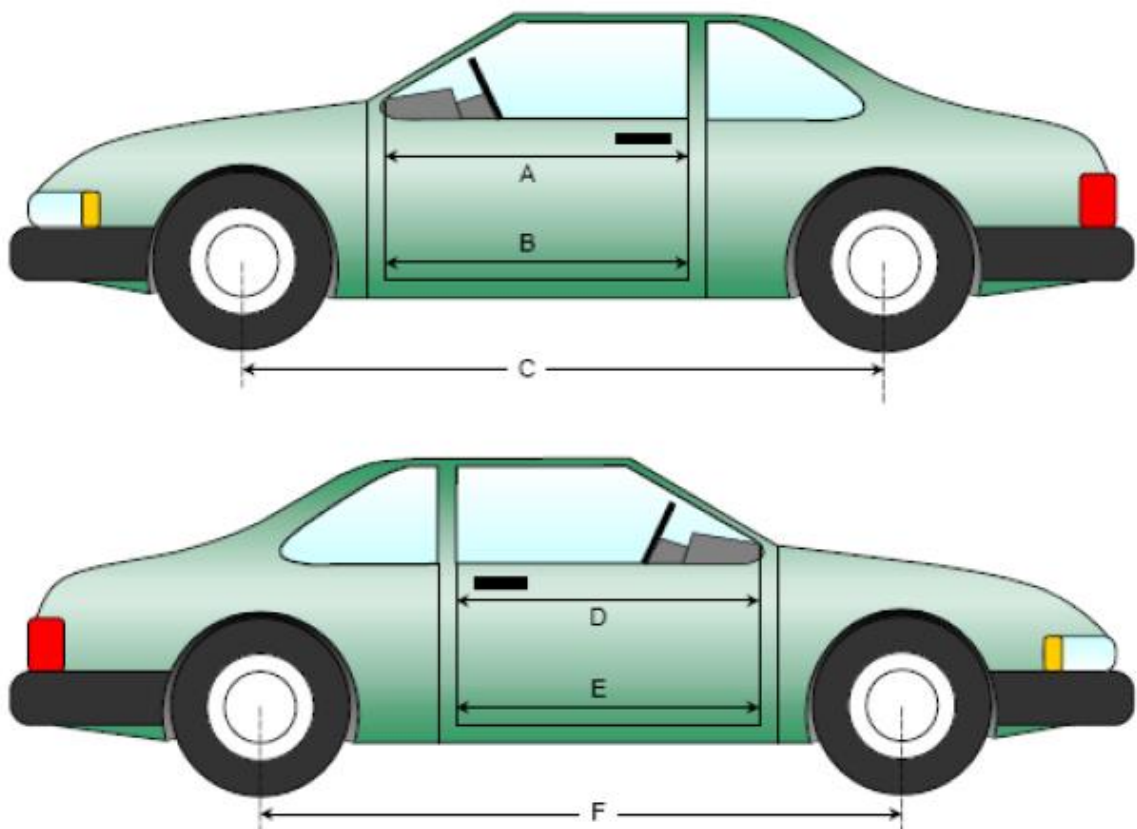
Test Date: 1/7/2019

DOOR OPENING WIDTH

No.	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	975	980	-5
B	Left Side Lower	mm	885	885	0
C	Right Side Upper	mm	970	970	0
D	Right Side Lower	mm	885	885	0

WHEELBASE MEASUREMENTS

No.	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2970	2875	95
F	Right Side Wheelbase	mm	2970	2880	90



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

Test Vehicle: 2019 BMW X5 5-DR SUV

NHTSA No.: M20194103

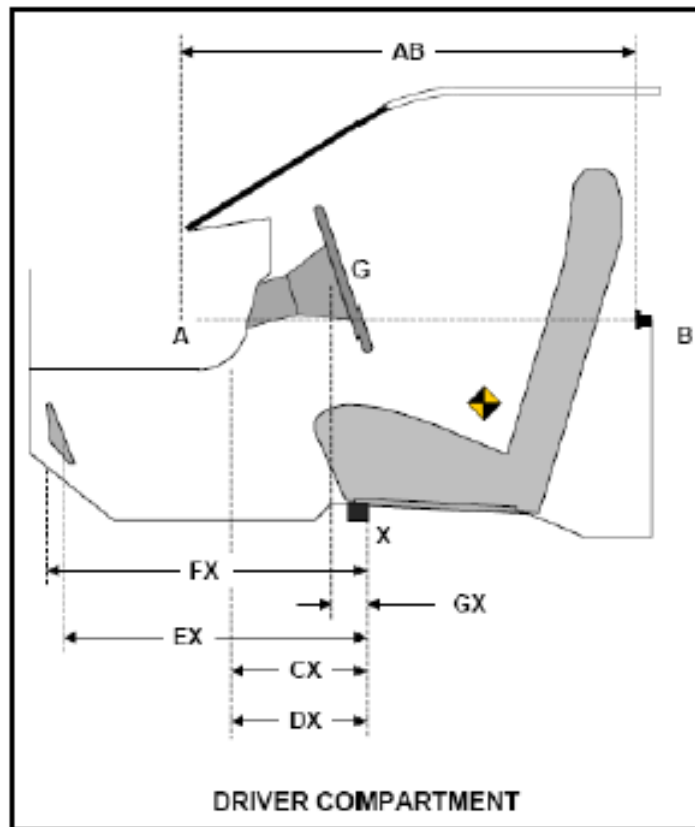
Test Program: NCAP Frontal Impact

Test Date: 1/7/2019

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	965	965	0
CX	Left Knee Bolster to X	mm	300	300	0
DX	Right Knee Bolster to X	mm	300	278	22
EX	Brake Pedal to X	mm	595	500	95
FX	Foot Rest to X	mm	555	585	-30
GX	Center of Steering Column Wheel Hub to X	mm	300	177	123

X = Front of Seat Track (Stationary)



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

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

Please provide windshield mounting details.

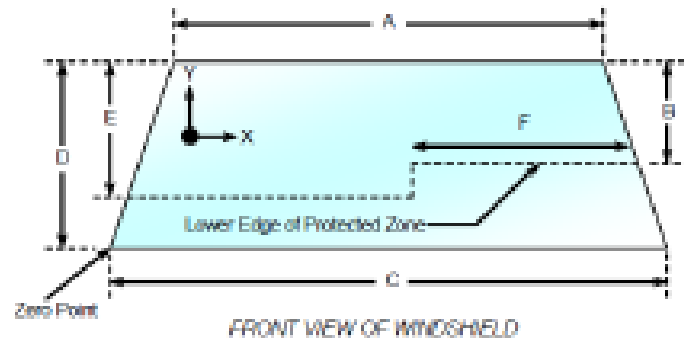
The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicle not equipped with occupant passive restraint and 50% for each side of the windshield for vehicle which are equipped with occupant passive restraints.

Temperature of windshield molding during test: 21.2°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2295	2295	100.0
Right Side	2295	2295	100.0
Total	4590	4590	100.0

Item	Units	Value
A	mm	1260
B	mm	425
C	mm	1620
D	mm	855
E	mm	508
F	mm	595



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: 2019 BMW X5 5-DR SUV
Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
Test Date: 1/7/2019

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21.2°C

Test Time: 20:28

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

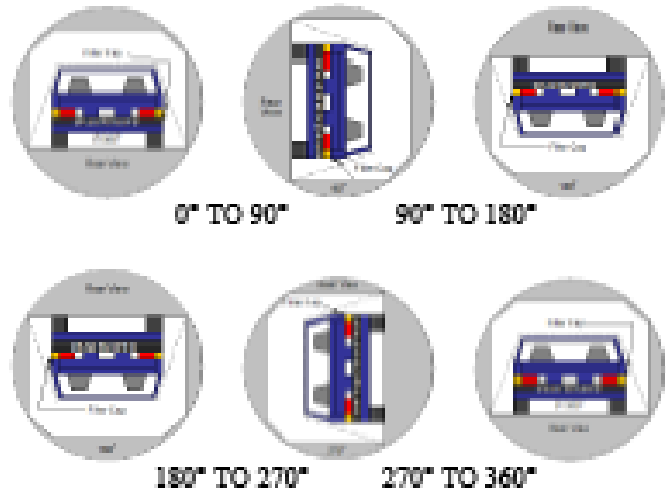
DATA SHEET NO. 16 - FMVSS 301 BARRIER IMPACT AND STATIC ROLLOVER RESULTS (CONT'D)

Test Vehicle: 2019 BMW X5 5-DR SUV
 Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
 Test Date: 1/7/2019

1. The specified fixture rollover rate for each 90° 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
0° to 90°	90	330	420
90° to 180°	90	330	840
180° to 270°	90	330	1260
270° to 360°	90	330	1480

FMVSS 301 SPILLAGE TABLE

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

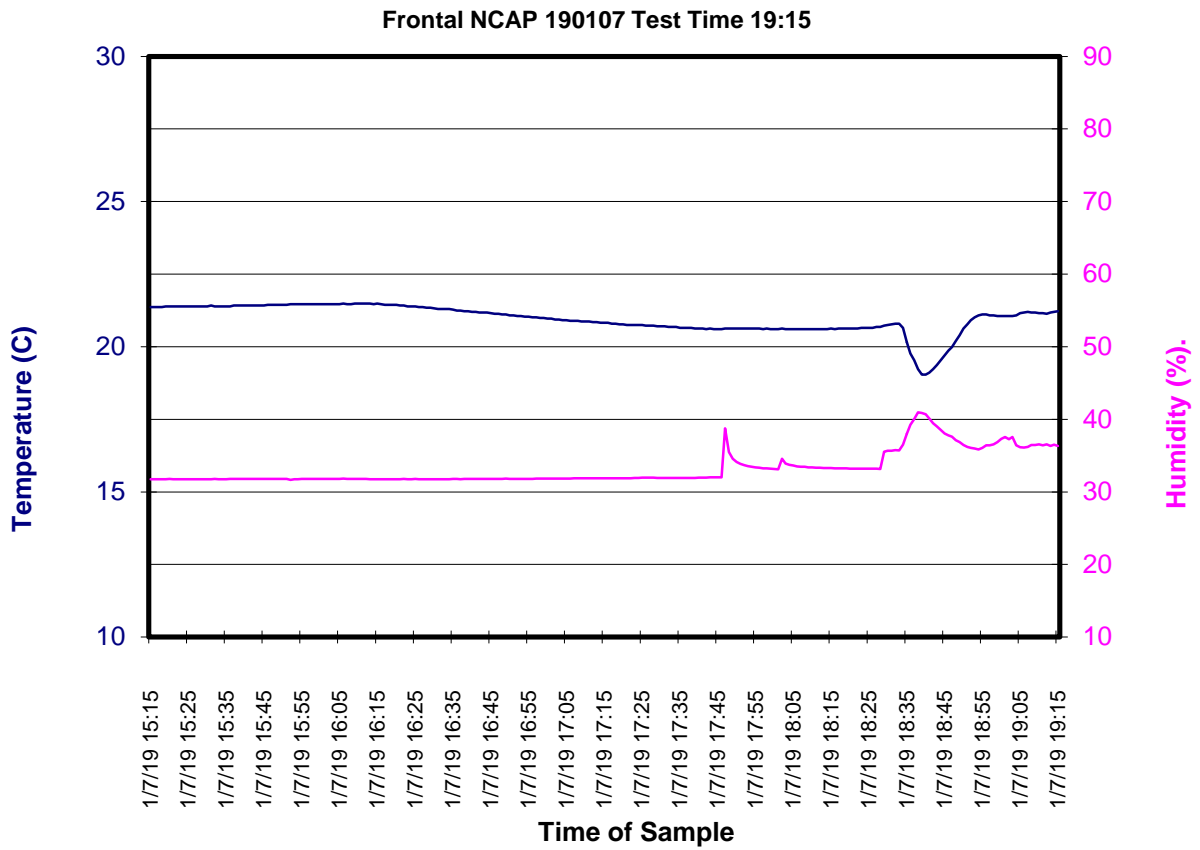
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17 - DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2019 BMW X5 5-DR SUV
Test Program: NCAP Frontal Impact

NHTSA No.: M20194103
Test Date: 1/7/2019



APPENDIX A
PHOTOGRAPHS

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5	Tire Placard	A-7
6	2019 BMW X5 5-DR SUV Frontal As Delivered	A-8
7	Right Rear 3-4 View, as Received	A-8
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34	Pre-Test Driver Dummy and Vehicle Interior View	A-23
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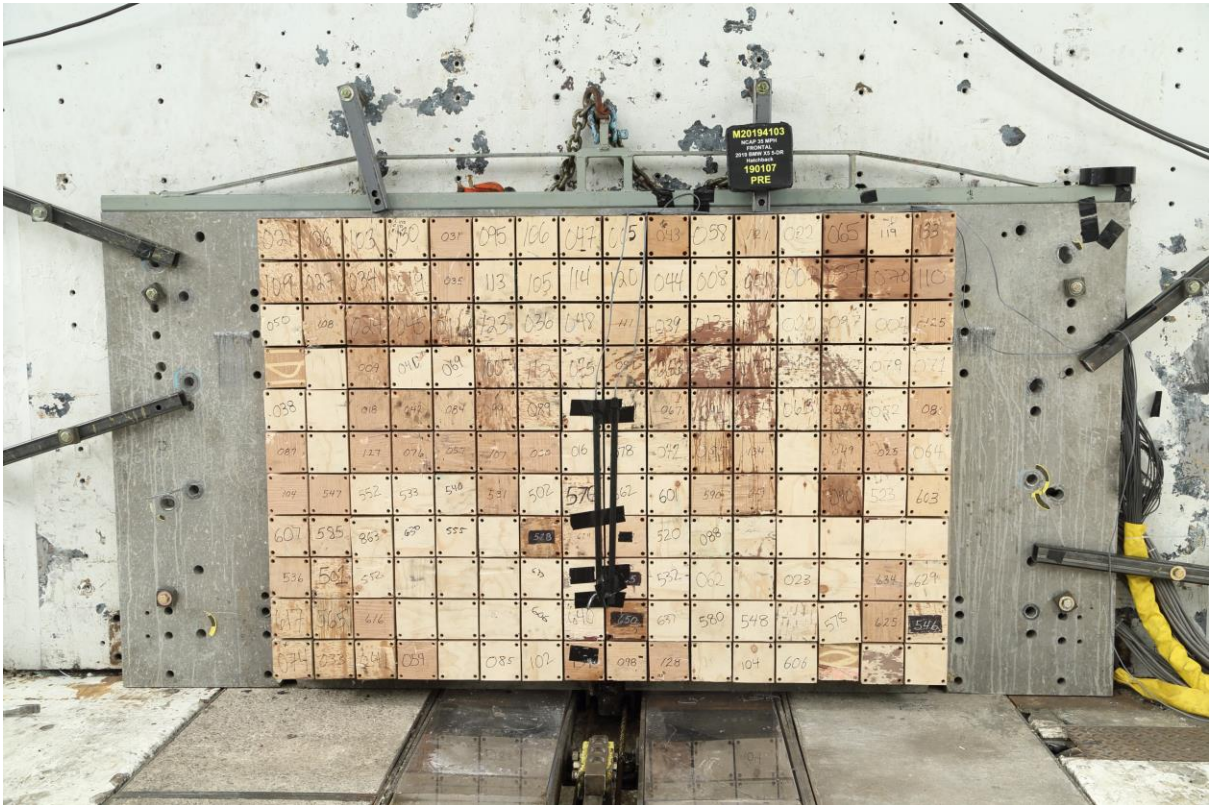
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38	Pre-Test View of Belt Anchorage for Driver Dummy	A-25
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40	Pre-Test View of Belt Buckle and Latch Plate for Driver Dummy	A-26
41	Post-Test View of Belt Buckle and Latch Plate for Driver Dummy	A-26
42	Pre-Test Driver Dummy Feet	A-27
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44	Pre-Test Driver's Side Knee Bolster	A-28
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61	Pre-Test View of Belt Anchorage for Passenger Dummy	A-37
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67	Pre-Test Passenger Side Knee Bolster	A-40
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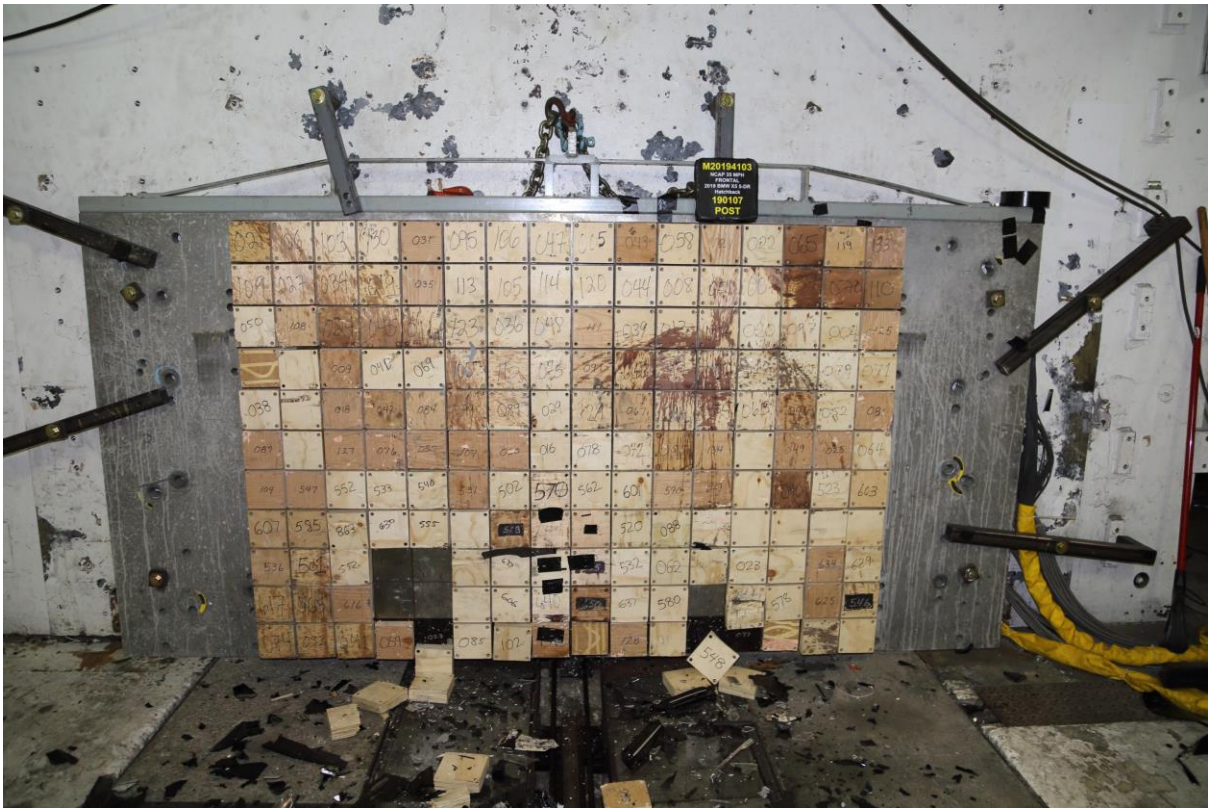
No.	Description	Page
69	Pre-Test Passenger Side Floorpan	A-41
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71	Post-Test Passenger Dummy Face	A-42
72	Post-Test Passenger Dummy Contact with Airbag	A-42
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83	Monroney Label Photograph	A-48



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 2019 BMW X5 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



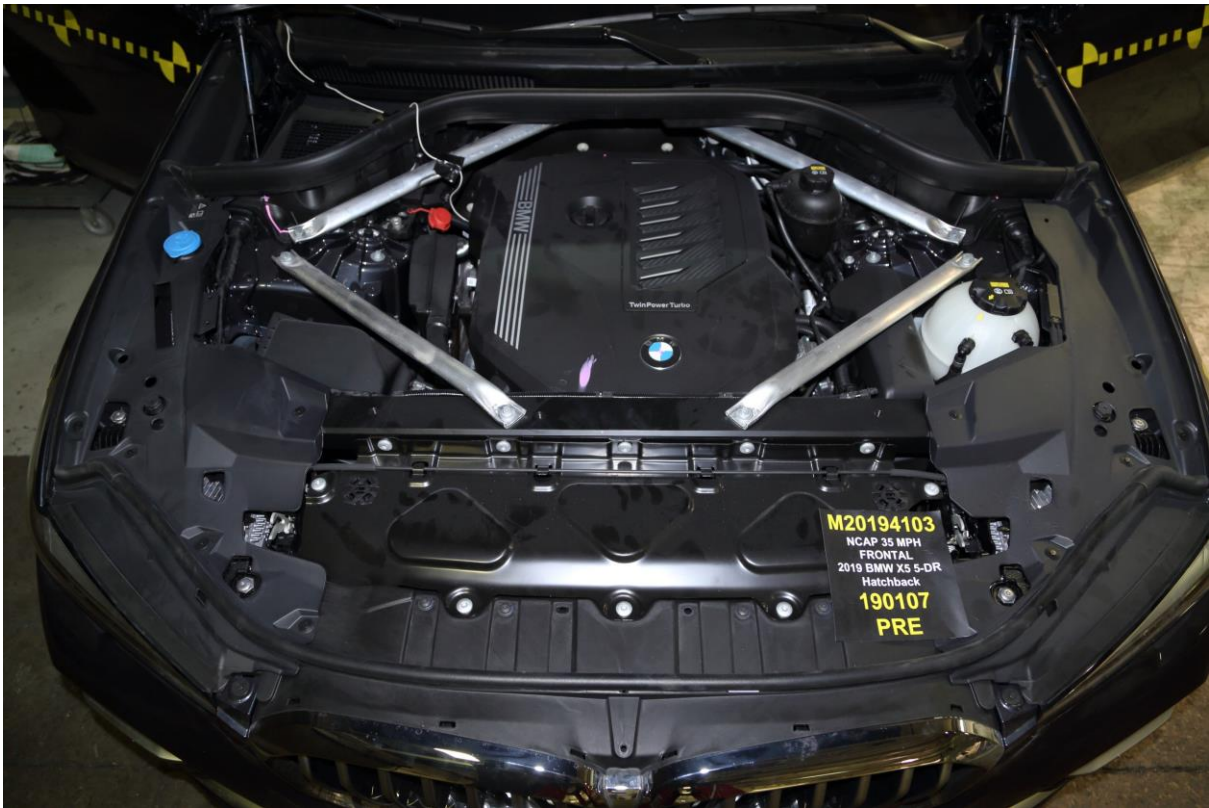
017 Post-Test Left Rear 3-4 View



018 Pre-Test Windshield View



019 Post-Test Windshield View



020 Pre-Test Engine Compartment View



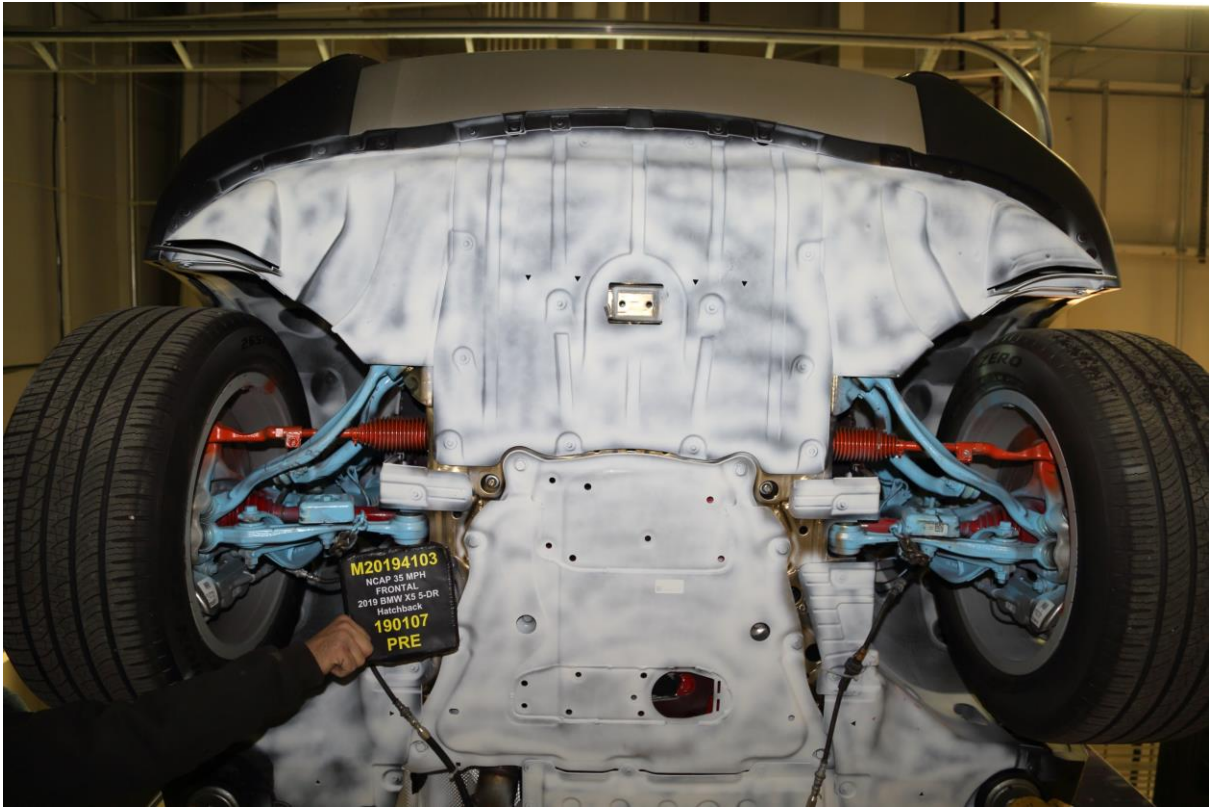
021 Post-Test Engine Compartment View



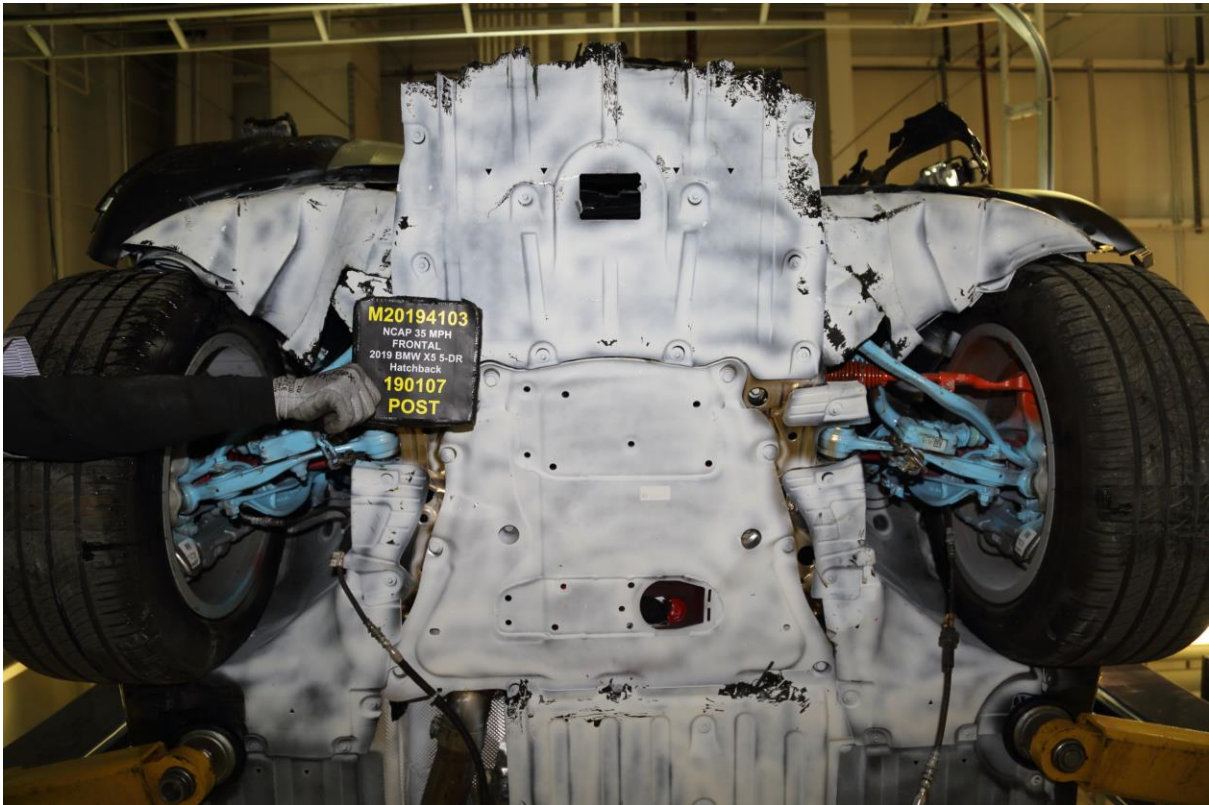
022 Pre-Test Fuel Filler Cap View



023 Post-Test Fuel Filler Cap View



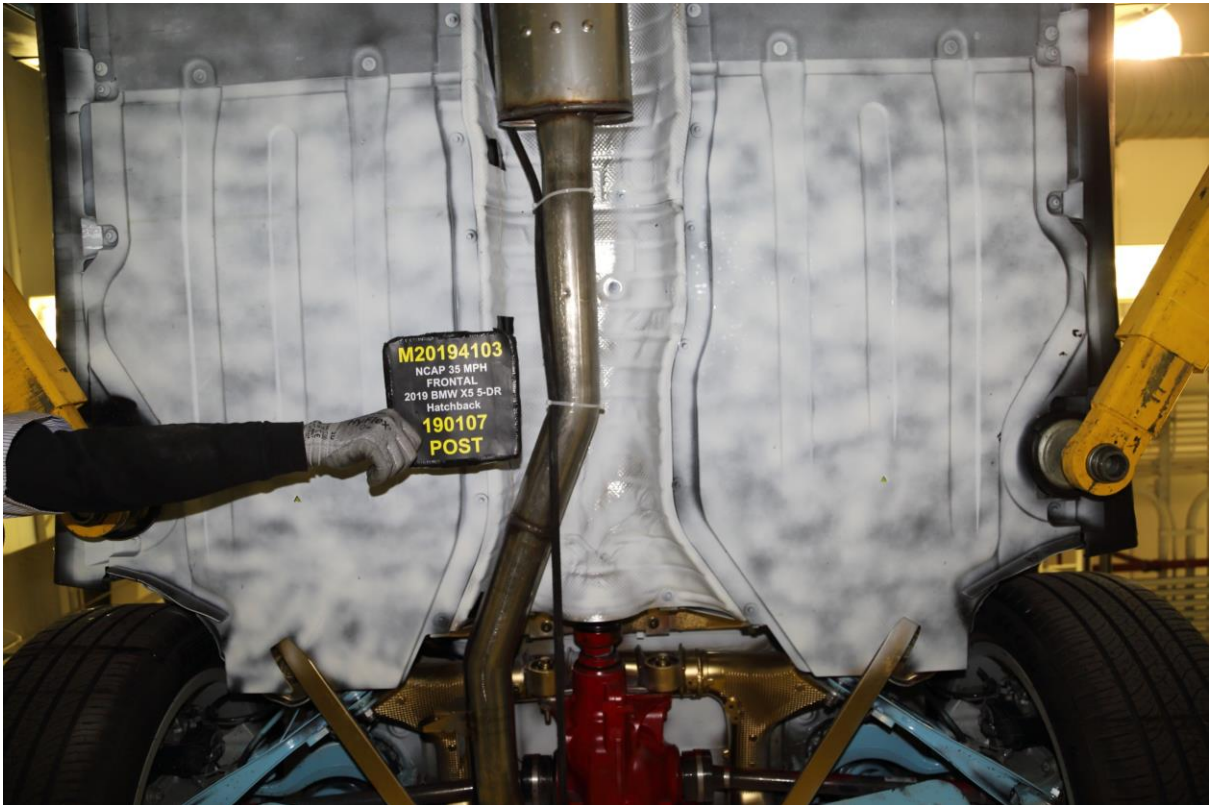
024 Pre-Test Front Underbody View



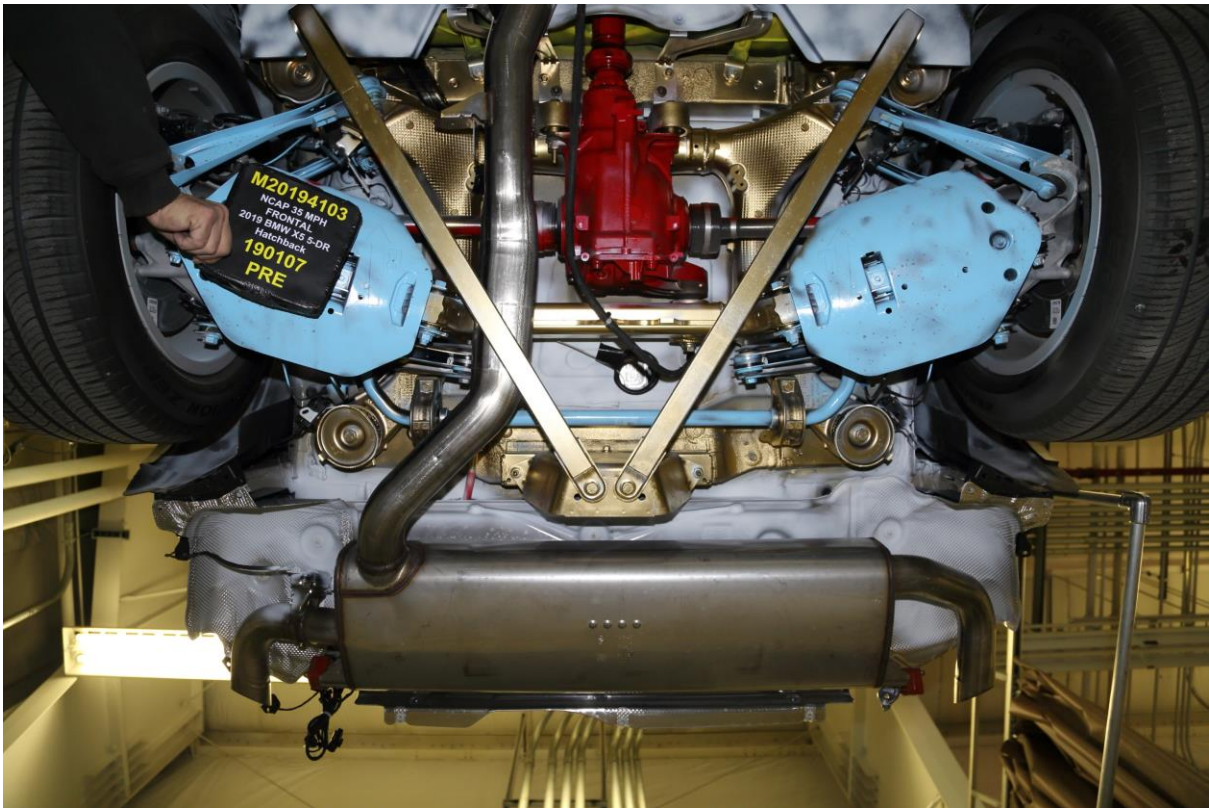
025 Post-Test Front Underbody View



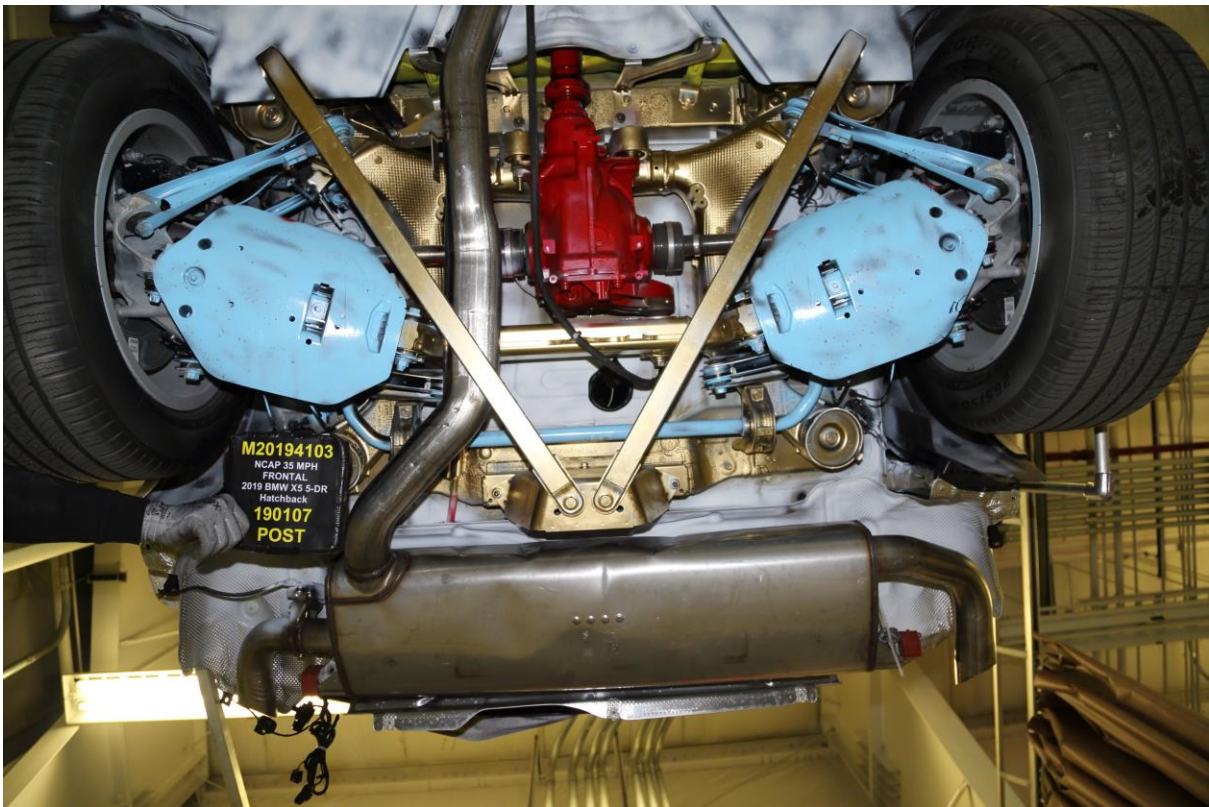
025a Pre-Test Mid Underbody View



025b Post-Test Mid Underbody View



026 Pre-Test Rear Underbody View



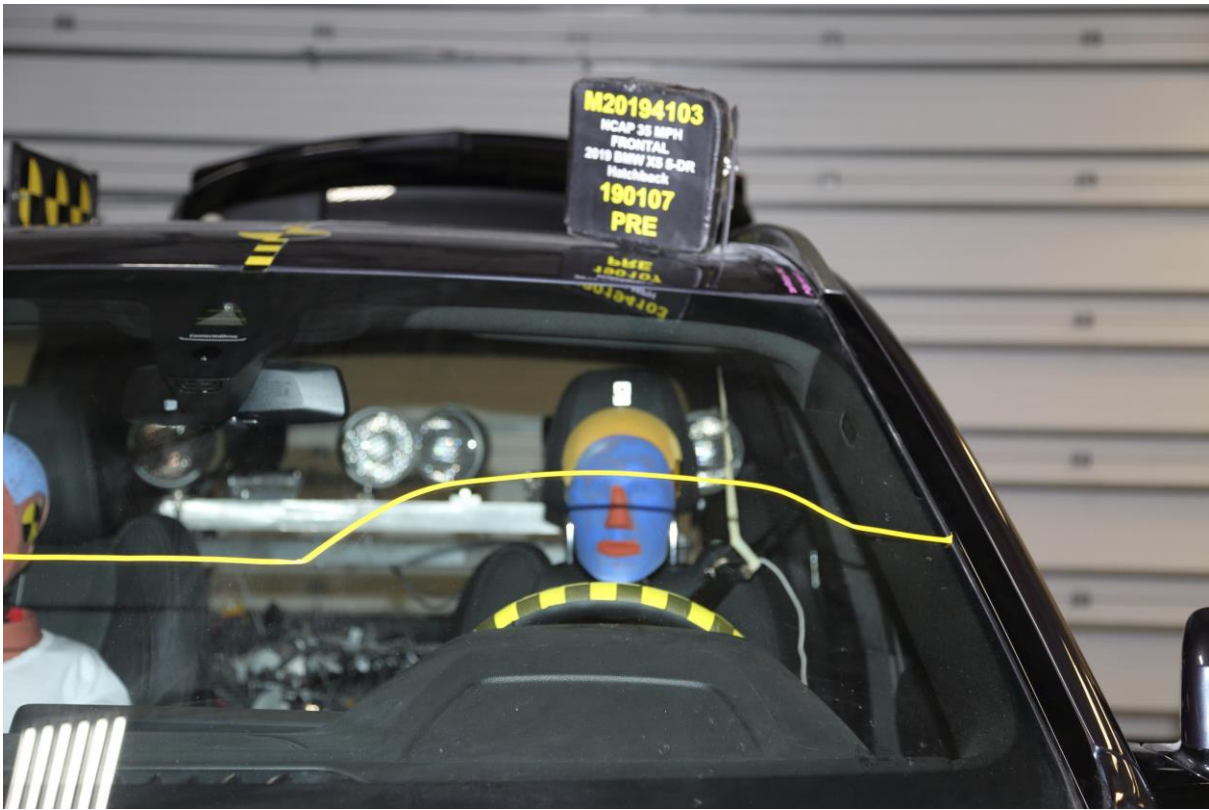
027 Post-Test Rear Underbody View



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



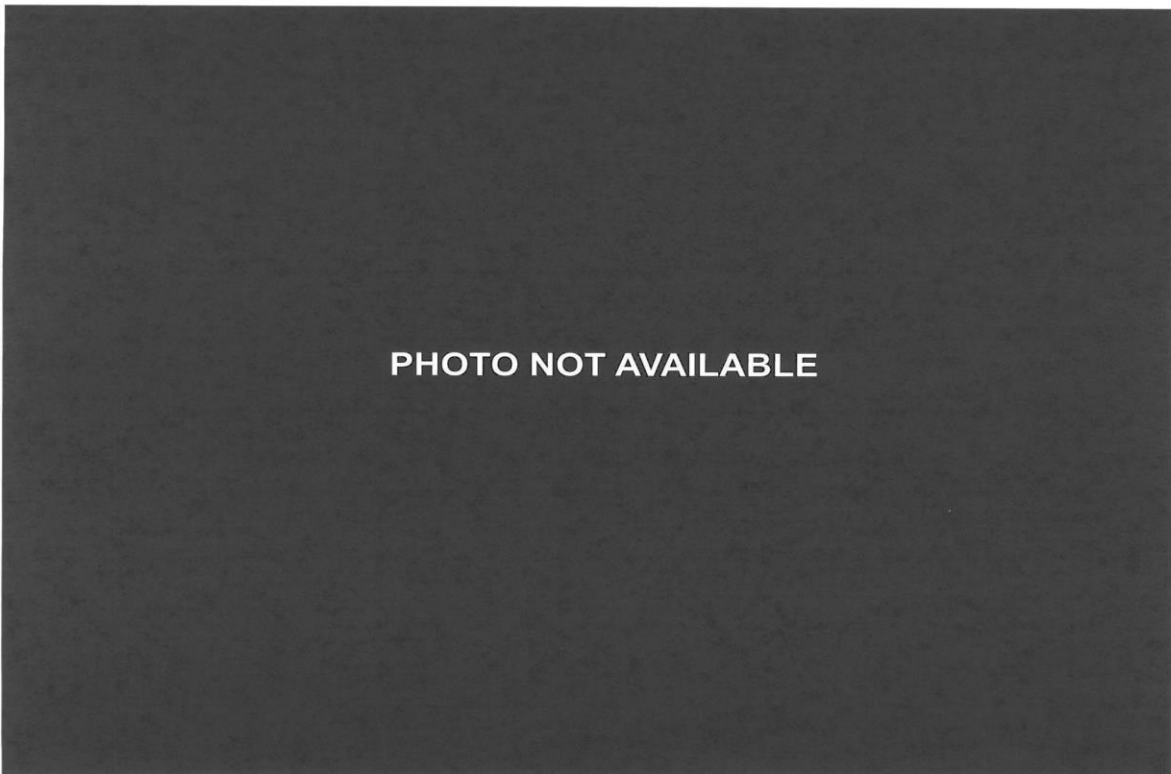
038 Pre-Test View of Belt Anchorage for Driver Dummy



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

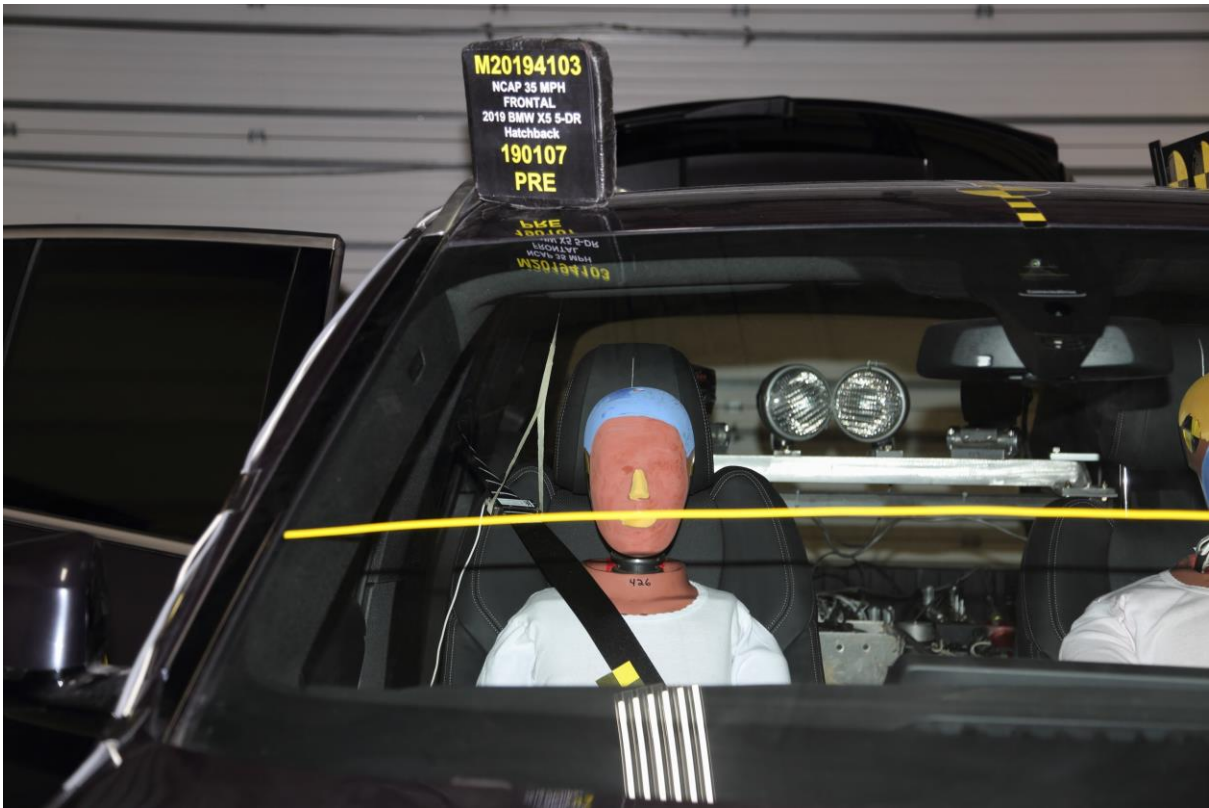
Intentionally Left Blank



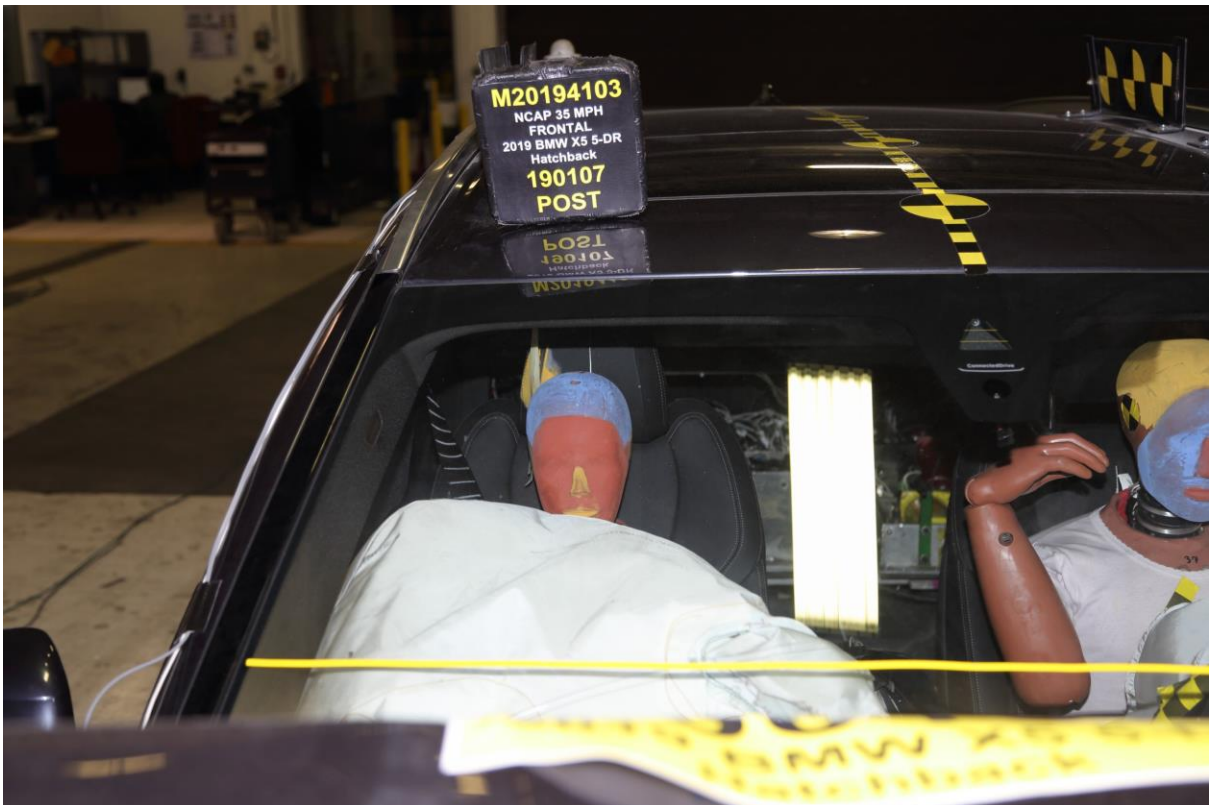
051 Pre-Test View of the Steering Wheel



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



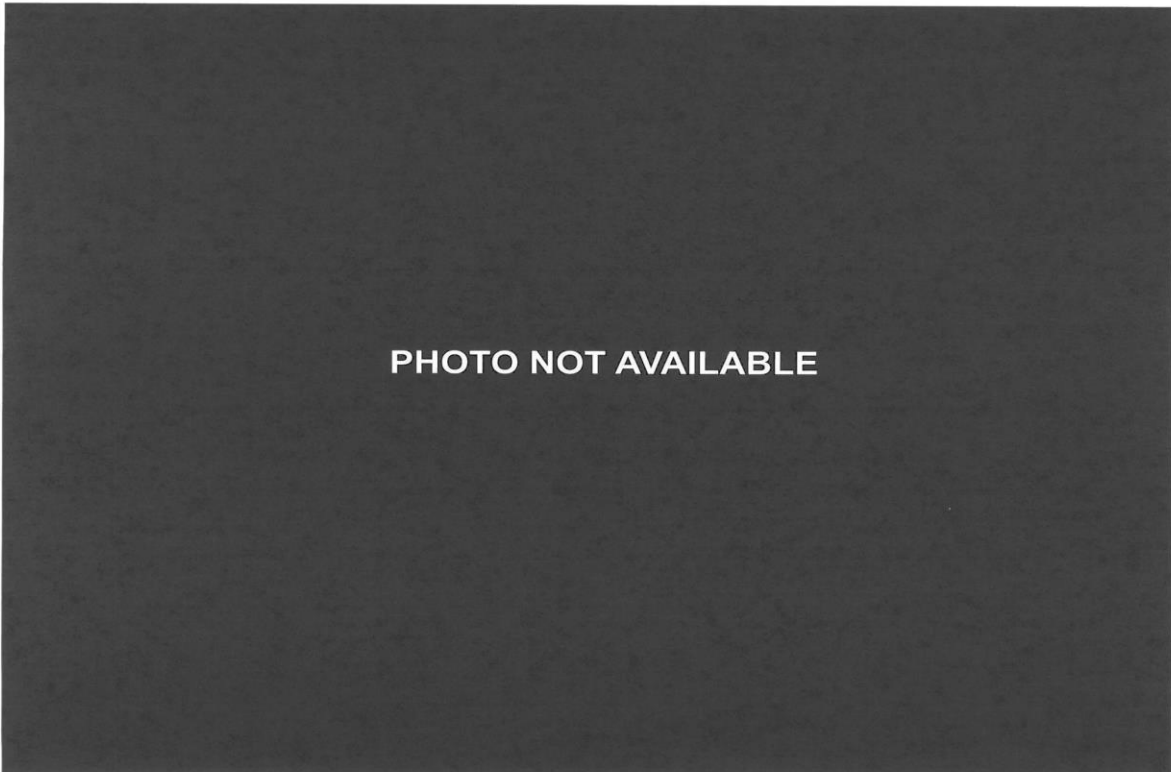
061 Pre-Test View of Belt Anchorage for Passenger Dummy



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



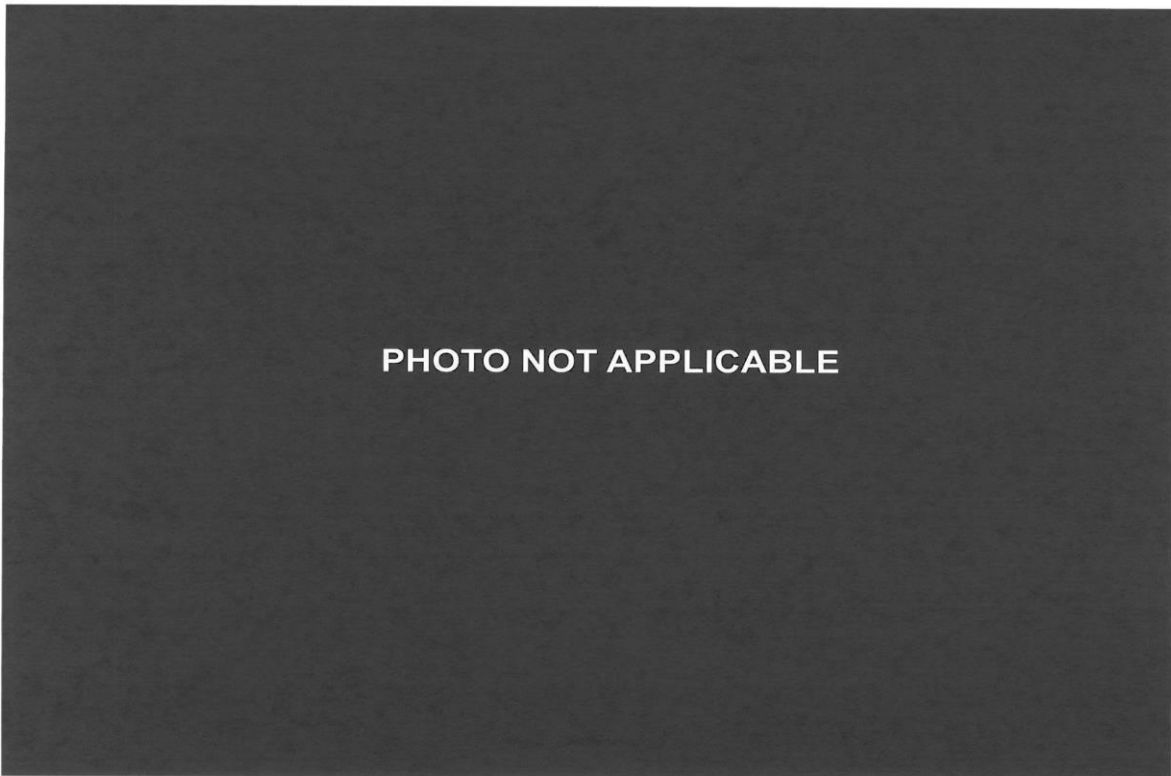
071 Post-Test Passenger Dummy Face



072 Post-Test Passenger Dummy Contact with Airbag



073 Post-Test Passenger Dummy Contact with Headrest



074 Photograph of Ballast Installed in Vehicle

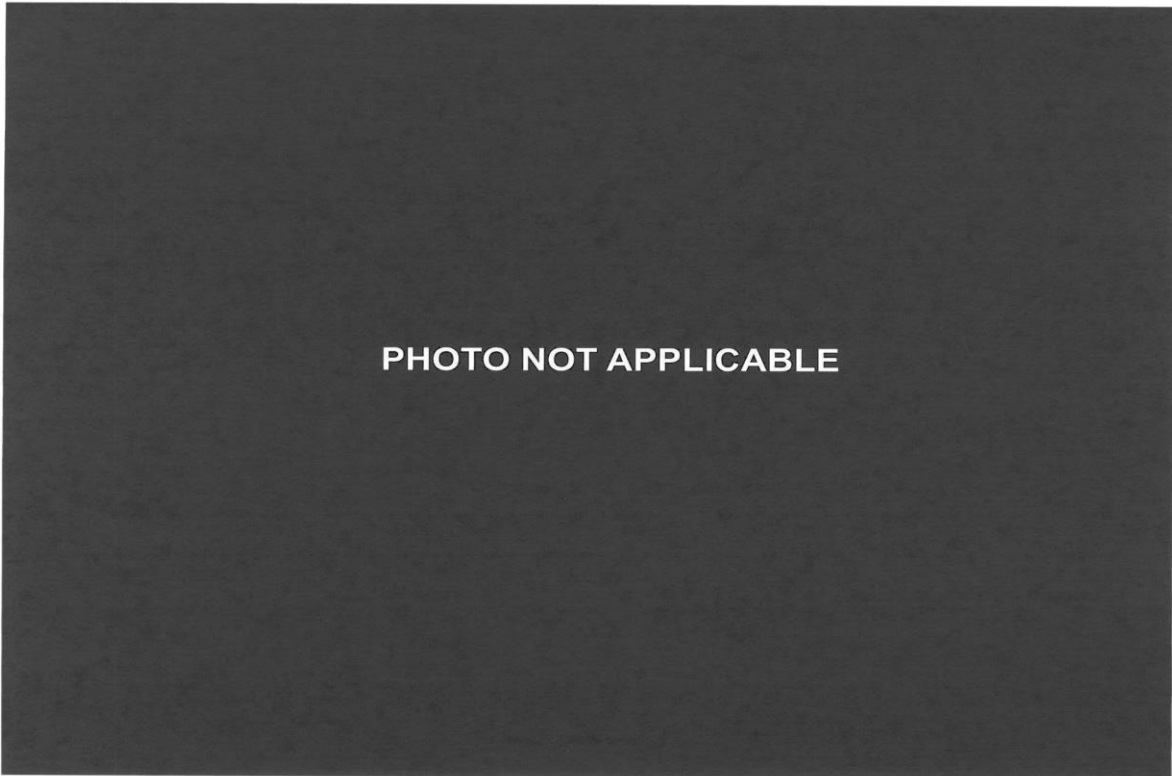
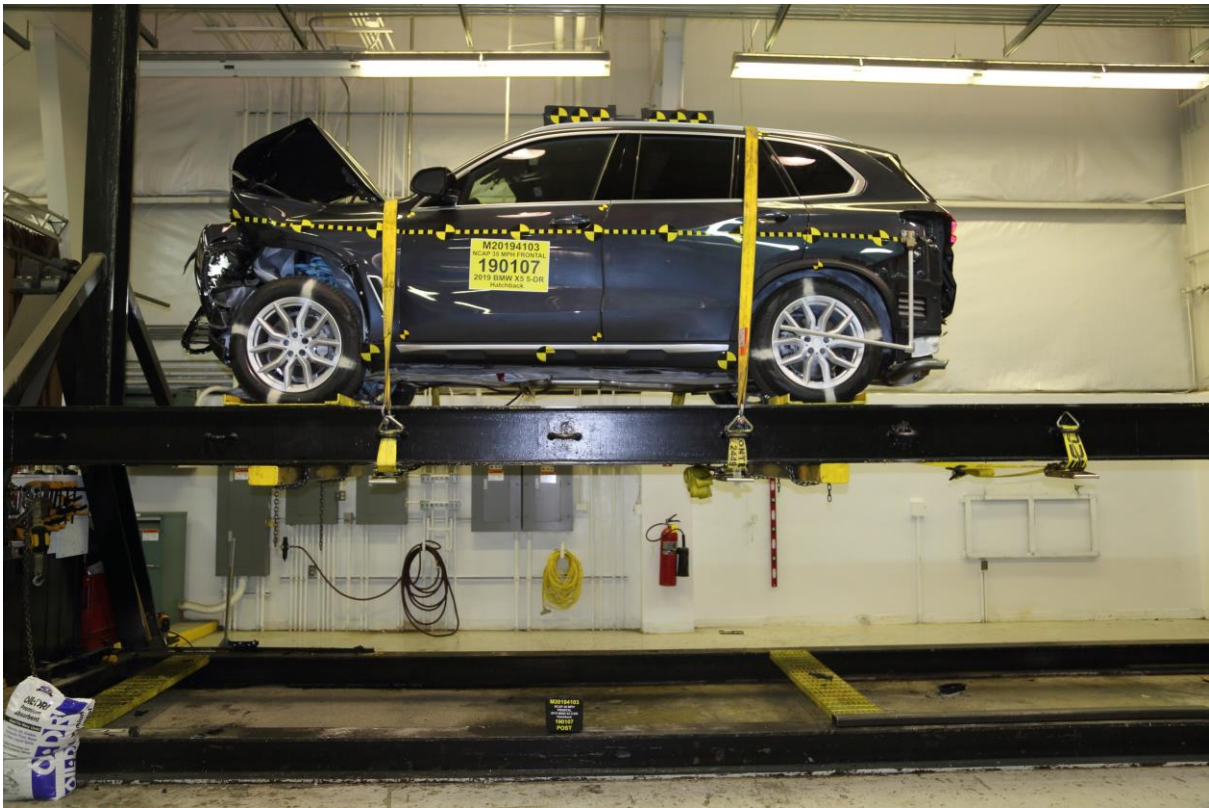


PHOTO NOT APPLICABLE

075 Post-Test Stoddard Spillage Location View



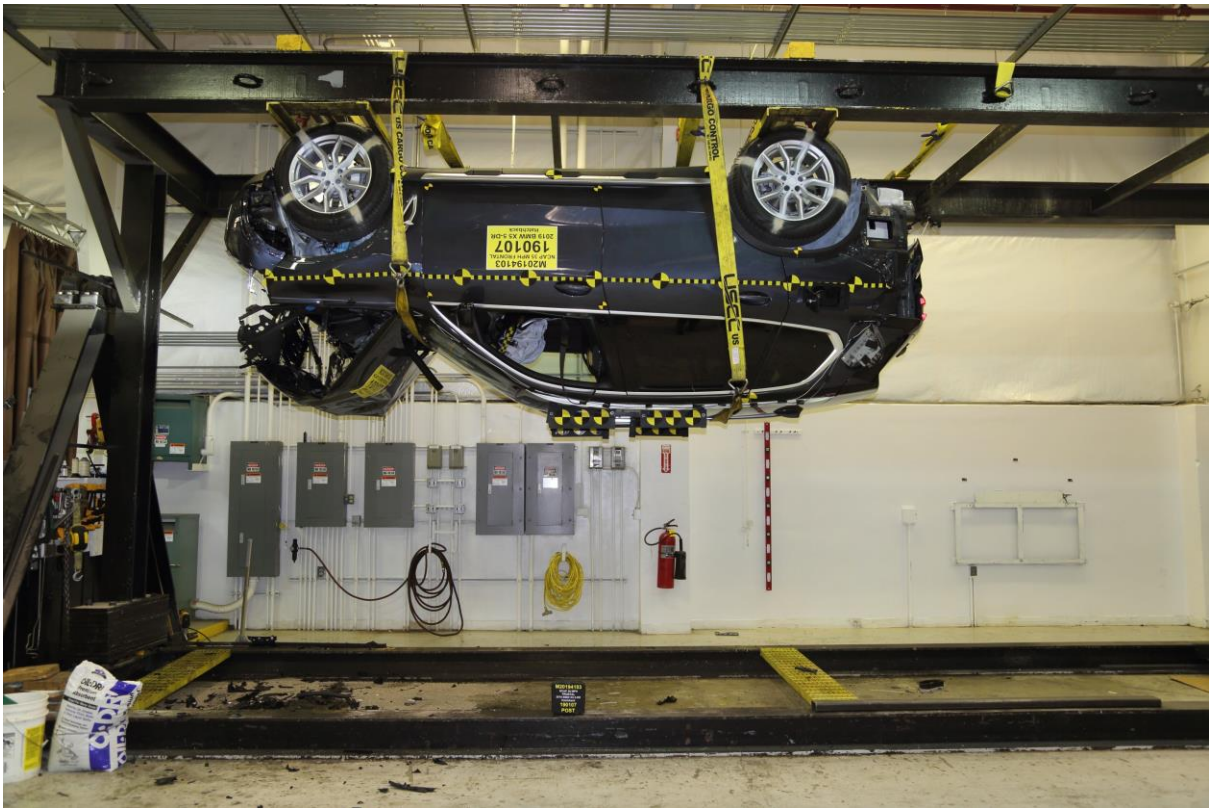
076 Post-Test Speed Trap Read out



077 Vehicle at 0° on Static Rollover Device



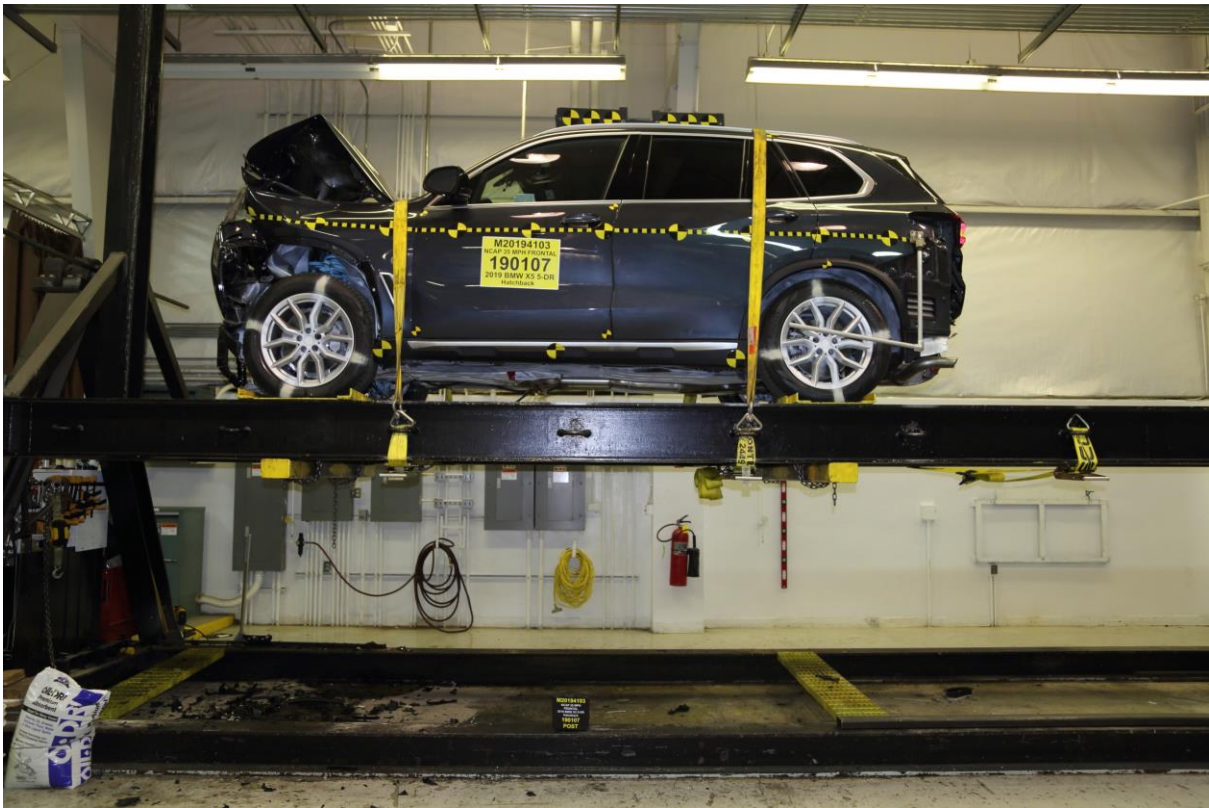
078 Vehicle at 90° on Static Rollover Device



079 Vehicle at 180° on Static Rollover Device



080 Vehicle at 270° on Static Rollover Device



081 Vehicle at 360° on Static Rollover Device



082 2019 BMW X5 5-DR SUV Frontal Impact Event

The Ultimate Driving Machine®

2019 BMW X5 xDrive40i



Options and Additional Charges	Price
Manufacturer's Suggested Retail Price	\$ 60,700.00
<small>(Optional equipment may supersede standard equipment; check with your authorized BMW center.)</small>	
Arctic Gray Metallic	\$ 550.00
Black Vernasca Leather	\$ 1,450.00
Convenience Package	\$ 1,150.00
<small>- Comfort Access keyless entry - 4-zone climate control - Snow/ice floes w/ 1 year sub.</small>	
Parking Assistance Package	\$ 700.00
<small>- Parking Assistant Plus - Rear view camera</small>	
Leather Upholstery Credit	\$ -1,450.00
Region Spec	\$ -190.00
Gesture Control Option Credit	Included
Park Distance Control	Included
Remote Engine Start	\$ 300.00
19" wheel 734 w/ air	Included
Sport Automatic Transmission	Included
Sport leather steering wheel	Included
Runtflat tires	Included
Roof rails in Satin Aluminum	Included
Satin aluminum exterior trim	Included
Universal garage-door opener	Included
Travel and Comfort System	Included
Htd Fr Seats Armrests / S Whl	\$ 250.00
FineLine Brown Wood Trim	Included
Auto dimming driver ext mirror	Included
Ambient Lighting	Included
Panoramic moonroof	Included
Power Front Seats	Included
Sport seats	Included
Lumbar support	Included
Automatic High Beams	Included
Active Protection	Included
Decoding for no-dazzle high bm	Included
Active Driving Assistant	Included
Active Guard	Included
LED Fog Lights	Included
Adaptive LED Headlights	Included
Apple CarPlay Compatibility	Included
Connected Package Pro	Included
Live Cockpit Pro (incl. Nav)	\$ 190.00
Gesture Control	Included
CD Player Prep	\$ 955.00
Antirattle headliner	Included
Refrigerant	Included
Destination Charge	\$ 995.00
Total Suggested Retail Price	\$ 64,645.00

Standard Features
Performance and efficiency
- 3.0-liter BMW TwinPower Turbo inline 6-cylinder, 24-valve engine with variable valve control (Double VANOS) and Valvetronic and high-precision direct injection
- Driving Dynamics Control with ECO PRO, COMFORT, and SPORT modes
- 8-speed Sport Automatic transmission with Sport and Manual shift modes and steering wheel-mounted paddle shifters and Launch Control
Handling, ride and braking
- Dynamic Stability Control (DSC) including Brake Fade Compensation, Start-off Assistant, Brake Drying, and Brake Stand-by features, with Dynamic Traction Control (DTC) and Dynamic Brake Control
- 4-wheel ventilated disc brakes with anti-lock braking system (ABS), Dynamic Brake Control (DBC), brake-pad wear indicators and cornering brake control
Exterior
- xDrive all-wheel-drive system
- Adaptive LED Headlights, LED fog lights
- Power-folding, heated side mirrors
Interior seating and trim
- Heated 16-way power front sport seats including 4-way lumbar support and driver's seat memory
Audio system
- HiFi Sound System with HD Radio
Instrumentation and controls
- Apple CarPlay Compatibility with 1-year trial
- BMW Live Cockpit featuring Navigator with Drive 7.0, 12.3" touchscreen, 12.3" digital instrument cluster, natural voice control, and Traffic and On-Street Parking Info (select markets)
Comfort and convenience
- Remote Software Upgrade capable
- Panoramic moonroof
- Rain-sensing windshield wipers with adjustable speed and automatic wadlight control
- Power tailgate
- Park Distance Control, front and rear, and Rear-view Camera
Safety and security
- Front and rear Head Protection System (HPS) with side-impact airbags
- Active Driving Assistant including Front Collision Warning, Lane Departure Warning, and Active Blind Spot Detection
Warranty
- 4-year/50,000-mile New Vehicle Limited Warranty for Passenger Cars and Light Trucks 2019 Models
- 10-year Unlimited Mileage Rust Perforation Limited Warranty
- 4-year Unlimited Mileage Roadside Assistance Program

PARTS CONTENT INFORMATION	
For Vehicles in this Car Line:	US/Canadian Parts Content: 25%
Major Source of Foreign Parts Content:	GERMANY: 50%
	MEXICO: 15%
<small>Note: Parts content does not include final assembly, distribution, or other non-parts costs.</small>	
For this Vehicle:	Final Assembly Point: SPARTANBURG, SC, USA
Country of Origin:	AUSTRIA
Engine:	GERMANY
Transmission:	GERMANY

BMW Ultimate Care™

\$0 Maintenance Program
For the first 3 years or 36,000 miles, whichever comes first on scheduled maintenance*

Your Maintenance Costs:

Engine Oil Services: \$0 Air Filter: \$0
Cabin Microfilter: \$0 Spark Plugs: \$0
Vehicle Checks: \$0 Brake Fluid: \$0

*Coverage is not transferable to subsequent purchasers, owners or lessees. Please see bmwusa.com/mpdisclaimer or ask your authorized BMW center for details.

EPA DOT Fuel Economy and Environment

22 MPG
combined city/hwy

20 city 26 highway

4.5 gallons per 100 miles

You spend

\$3,250
more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost

\$2,050

This vehicle emits 394 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and combining fuel also create emissions; learn more at fueleconomy.gov

Fuel Economy & Greenhouse Gas Rating

4 (Best)

This vehicle emits 394 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and combining fuel also create emissions; learn more at fueleconomy.gov

GOVERNMENT 5-STAR SAFETY RATINGS		
Overall Vehicle Score	Not Rated	
<small>Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.</small>		
Frontal Crash	Driver Passenger	Not Rated
<small>Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.</small>		
Side Crash	Front seat Rear seat	Not Rated
<small>Based on the risk of injury in a side impact.</small>		
Rollover	Not Rated	
<small>Based on the risk of rollover in a single-vehicle crash.</small>		
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		

This vehicle is equipped with a front bumper that has been tested at an impact speed of 2.5 miles per hour and a rear bumper that has been tested at an impact speed of 2.5 miles per hour, and has sustained no damage to the vehicle's body and minimal damage to the bumper and attachment hardware. Minimal damage to the bumper means damage that can be repaired with the use of common repair materials and without replacing any parts. The stronger the bumper, the less likely the car will require repair after a low-speed collision.

BMW of North America, LLC
Woodcliff Lake, NJ 07877

VPC Location: S. CAROLINA

Port of Entry: GREENVILLE-SPARTANBURG
Carrier: MOTOR CAR AUTO CARRIERS

Sold To: International Autos
2400 S 108th St
West Allis WI (414) 543-3000

Ship To: International Autos
2400 S 108th St
West Allis WI (414) 543-3000 53227-1904

VIN: 5UXCR6C52KLK87127

fueleconomy.gov Calculate personalized estimates and compare vehicles.

083 Monroney Label Photograph

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

No.	List of Data Plots Provided in the Test Report	Page
1	Driver Head X Acceleration vs. Time Primary	B-5
2	Driver Head Y Acceleration vs. Time Primary	B-5
3	Driver Head Z Acceleration vs. Time Primary	B-5
4	Driver Head Resultant Acceleration vs. Time Primary	B-5
5	Driver Chest X Deflection vs. Time	B-6
6	Driver Chest X Acceleration vs. Time Primary	B-7
7	Driver Chest Y Acceleration vs. Time Primary	B-7
8	Driver Chest Z Acceleration vs. Time Primary	B-7
9	Driver Chest Resultant Acceleration vs. Time Primary	B-7
10	Driver Upper Neck Force X vs. Time	B-8
11	Driver Upper Neck Force Z vs. Time	B-8
12	Driver Upper Neck Moment Y vs. Time	B-8
13	Driver Nij vs. Time	B-9
14	Driver Left Femur Force vs. Time	B-10
15	Driver Right Femur Force vs. Time	B-10
16	Passenger Head X Acceleration vs. Time Primary	B-11
17	Passenger Head Y Acceleration vs. Time Primary	B-11
18	Passenger Head Z Acceleration vs. Time Primary	B-11
19	Passenger Head Resultant Acceleration vs. Time Primary	B-11
20	Passenger Chest X Deflection vs. Time	B-12
21	Passenger Chest X Acceleration vs. Time Primary	B-13
22	Passenger Chest Y Acceleration vs. Time Primary	B-13
23	Passenger Chest Z Acceleration vs. Time Primary	B-13
24	Passenger Chest Resultant Acceleration vs. Time Primary	B-13
25	Passenger Upper Neck Force X vs. Time	B-14
26	Passenger Upper Neck Force Z vs. Time	B-14
27	Passenger Upper Neck Moment Y vs. Time	B-14
28	Passenger Nij vs. Time	B-15
29	Passenger Left Femur Force vs. Time	B-16
30	Passenger Right Femur Force vs. Time	B-16

The following additional dummy and vehicle response data can be found in the R & D section of the NHTSA website at: www.nhtsa.dot.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 Shoulder Belt Force
Driver Lap Belt Force

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 Shoulder Belt Force
Passenger Lap Belt Force

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

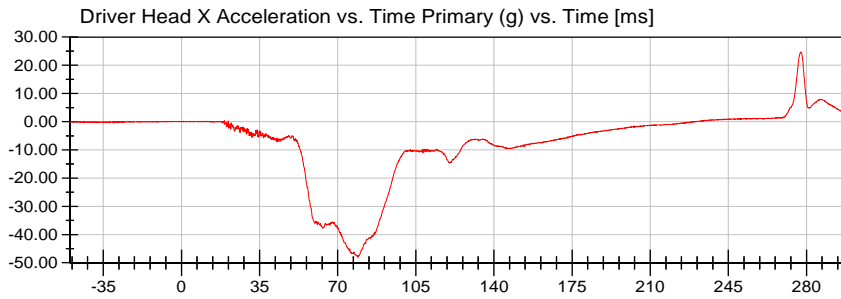
Test Lab: CTF

Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



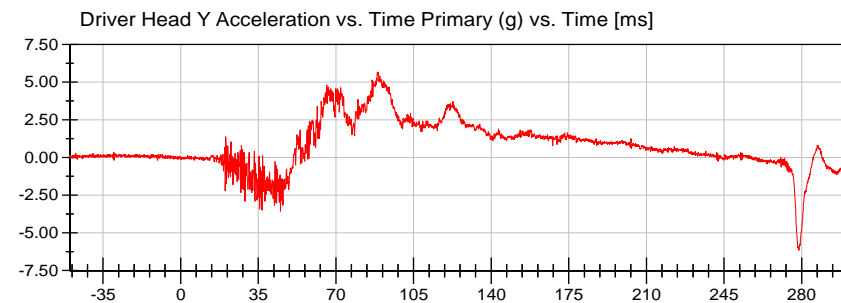
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24.72 g at 277.44 ms

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-48.02 g at 79.04 ms

CFC_1000



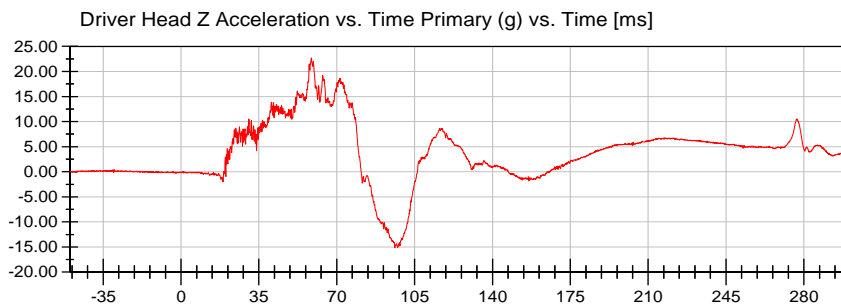
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5.67 g at 88.72 ms

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-6.15 g at 278.64 ms

CFC_1000



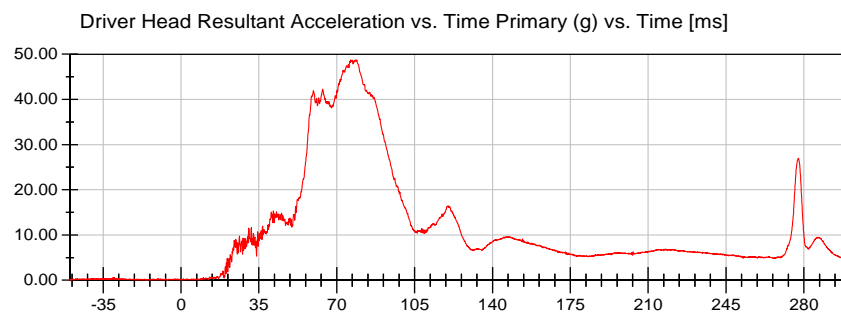
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22.69 g at 58.56 ms

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-15.14 g at 96.08 ms

CFC_1000



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48.75 g at 78.56 ms

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0.04 g at -49.60 ms

CFC_1000



NHTSA

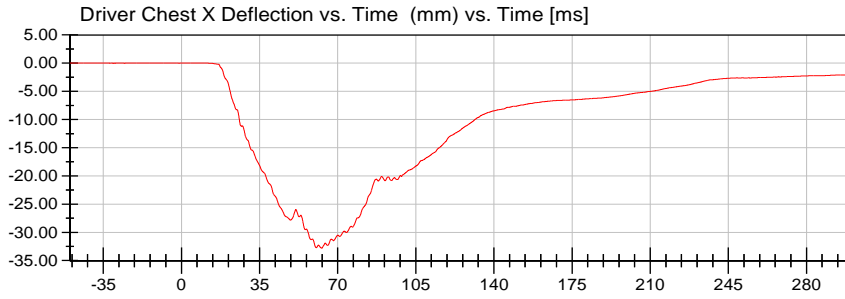
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Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



<Max>

0.01 mm at -46.88 ms

<Min>

-32.80 mm at 62.80 ms

CFC_600



NHTSA

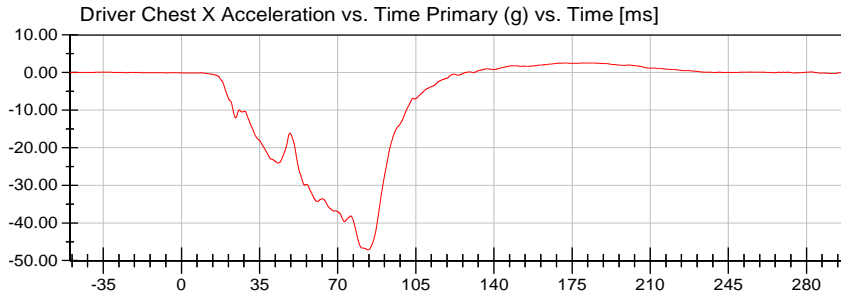
Test Lab: CTF

Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



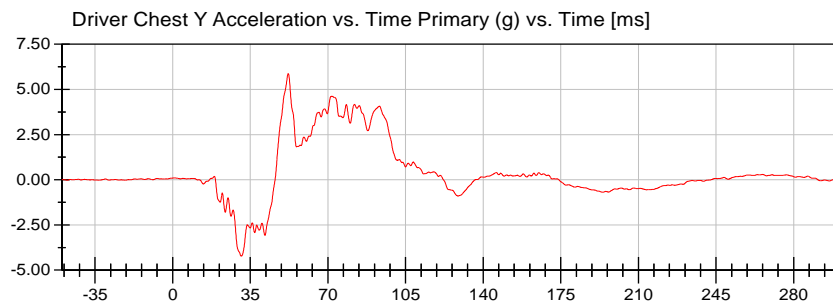
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2.55 g at 171.12 ms

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-47.16 g at 83.76 ms

CFC_180



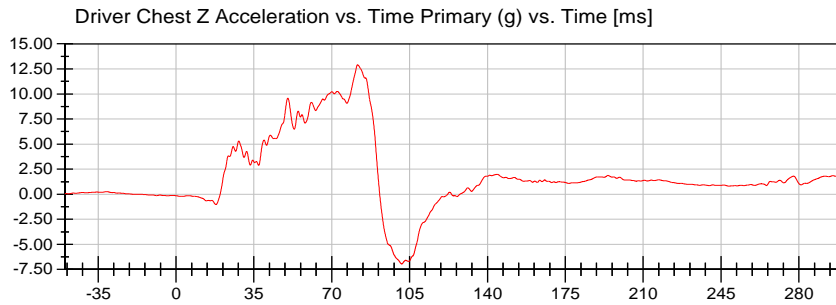
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-4.22 g at 30.96 ms

CFC_180



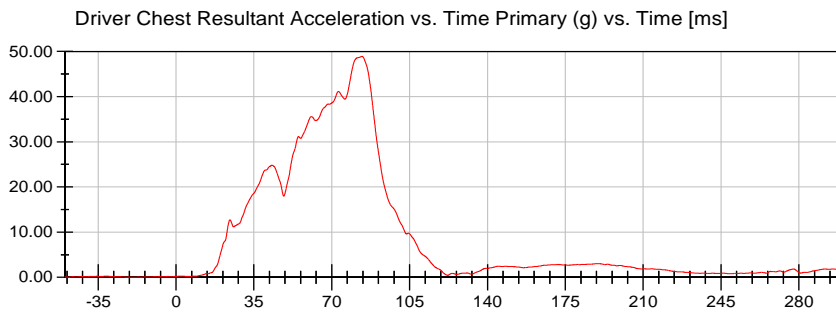
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12.91 g at 81.68 ms

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-6.96 g at 101.52 ms

CFC_180



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48.88 g at 83.60 ms

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0.01 g at -19.20 ms

CFC_180



NHTSA

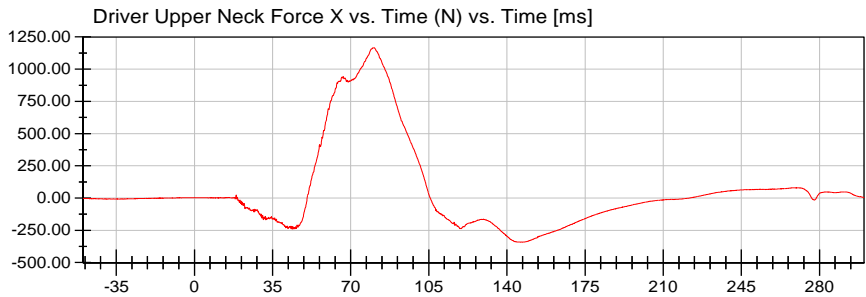
Test Lab: CTF

Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



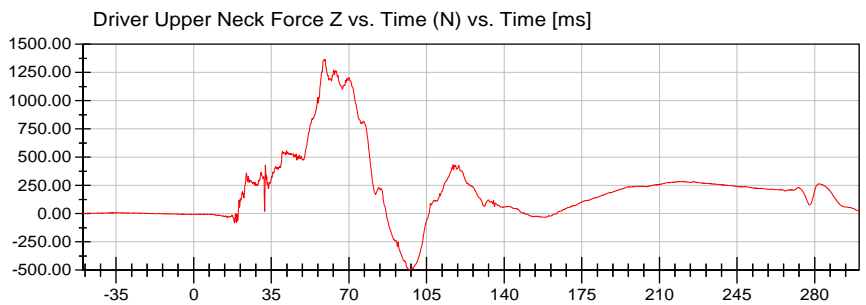
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1,166.86 N at 80.40 ms

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-342.87 N at 146.00 ms

CFC_1000



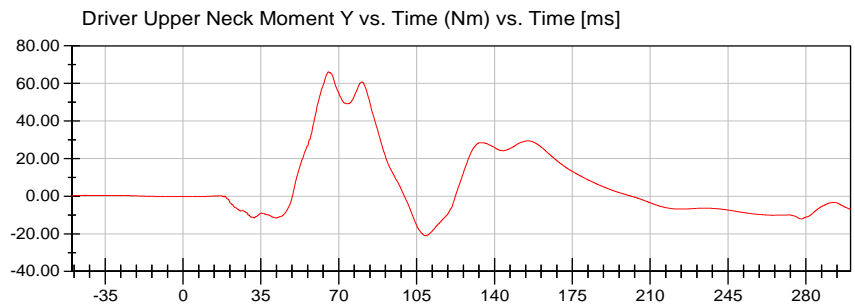
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1,367.87 N at 59.20 ms

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-498.99 N at 97.20 ms

CFC_1000



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66.19 Nm at 65.44 ms

<Min>

-20.98 Nm at 108.80 ms

CFC_600



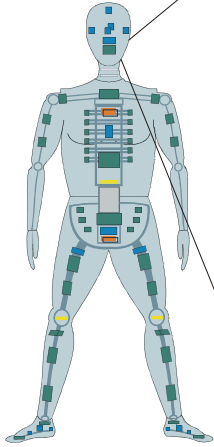


2019 BMW X5 5-DR SUV NCAP 35 mph Frontal Impact Neck Injury Predictor (NIJ)

Date: 01/07/2019
Time: 19:15

Customer: NHTSA
Test Number: M20194103

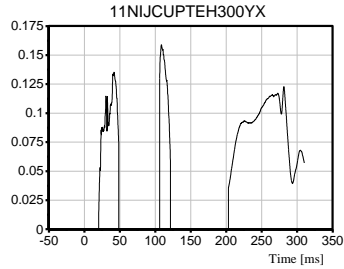
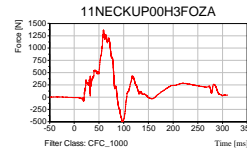
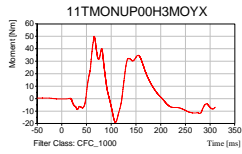
Test Orientation = Frontal
Fzc(Tension) = 6806
Fzc(Compression) = 6160
Myc(Extension) = 135
Myc(Flexion) = 310



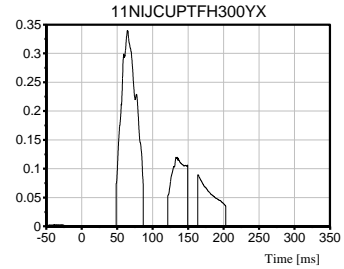
Dummy: HIII 50th Male
Seating Position:
Driver

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

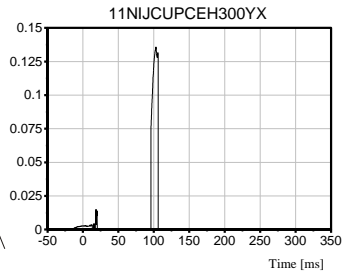
TRC Inc. Test Lab: CTF
Test Number: 190107



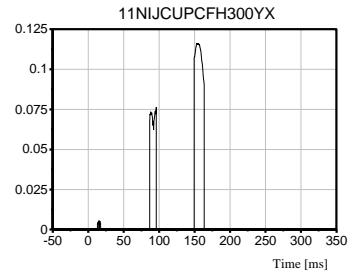
Max [NTE] 0.1588 at 108.56 ms



Max [NTF] 0.3396 at 64.32 ms



Max [NCE] 0.1357 at 103.04 ms



Max [NCF] 0.1162 at 154.48 ms

NHTSA

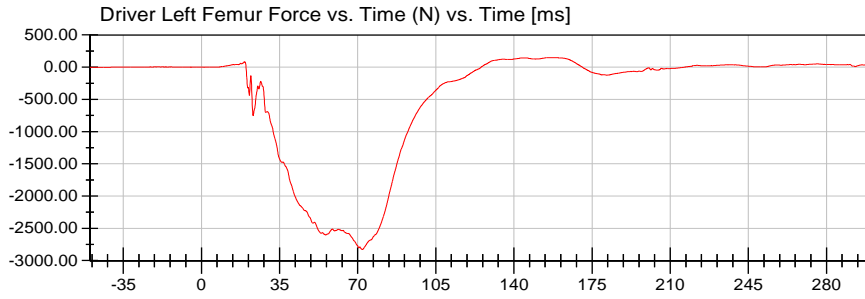
Test Lab: CTF

Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



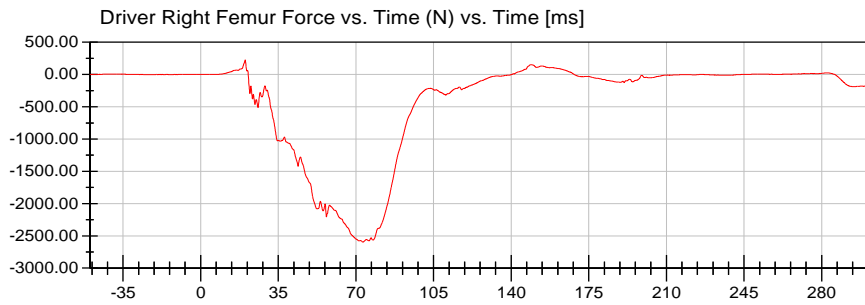
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147.66 N at 156.64 ms

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-2,827.81 N at 72.16 ms

CFC_600



<Max>

224.46 N at 20.08 ms

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-2,596.19 N at 73.20 ms

CFC_600



NHTSA

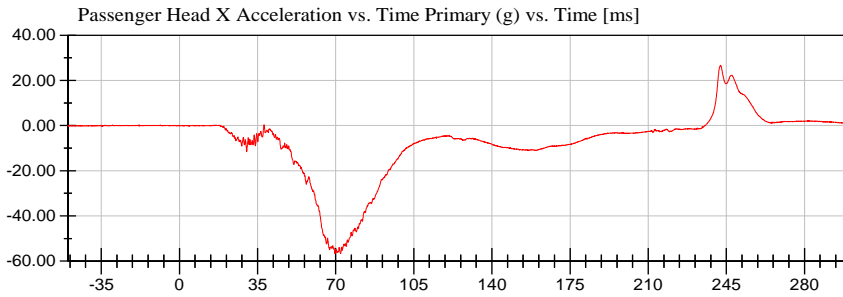
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Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



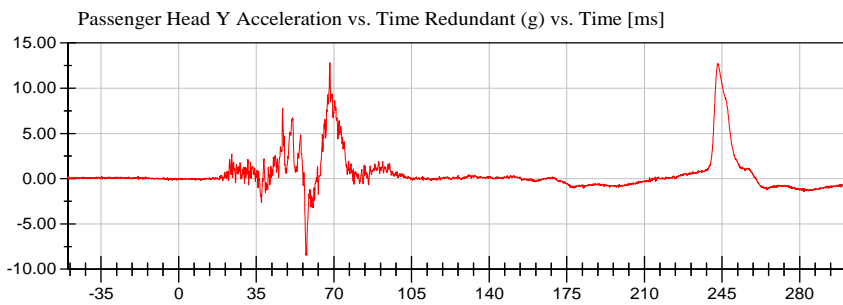
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26.65 g at 242.32 ms

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-56.70 g at 69.68 ms

CFC_1000



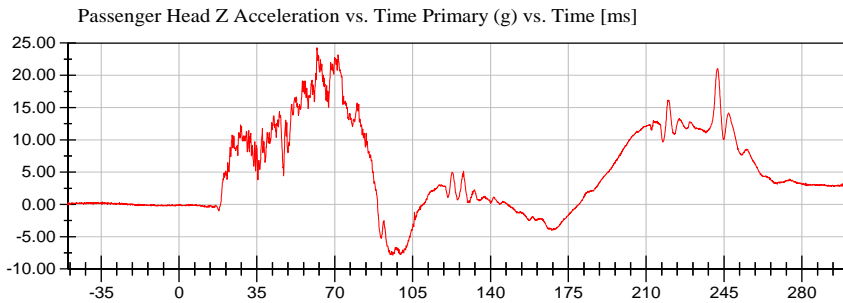
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-8.48 g at 57.68 ms

CFC_1000



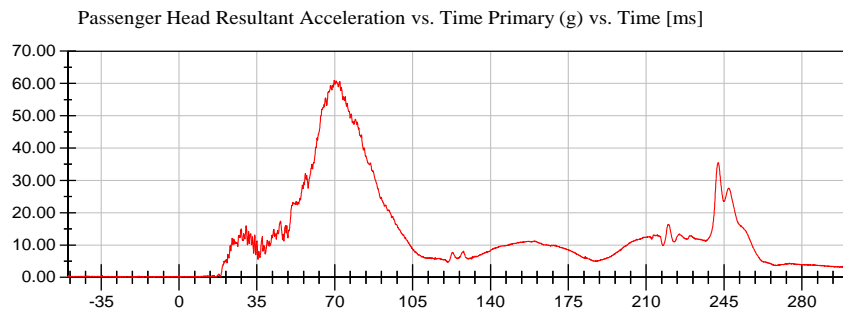
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24.27 g at 62.00 ms

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-7.86 g at 96.08 ms

CFC_1000



<Max>

60.98 g at 69.76 ms

<Min>

0.03 g at -11.76 ms

CFC_1000



NHTSA

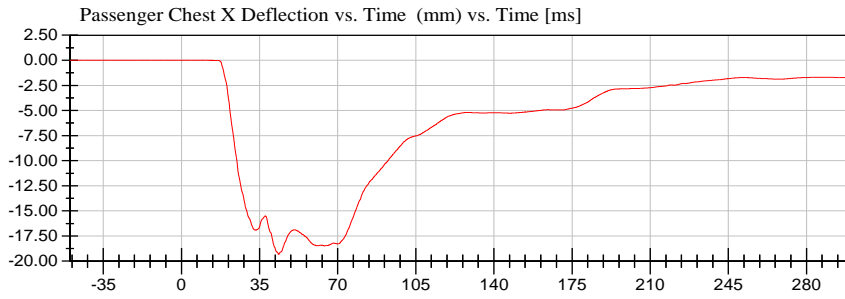
Test Lab: CTF

Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



<Max>

0.01 mm at -30.88 ms

<Min>

-19.33 mm at 43.60 ms

CFC_600



NHTSA

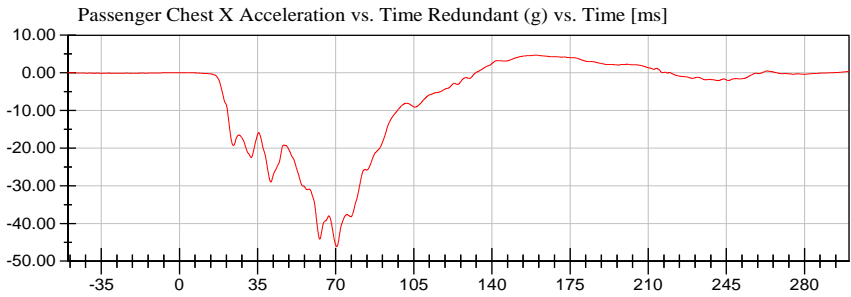
Test Lab: CTF

Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



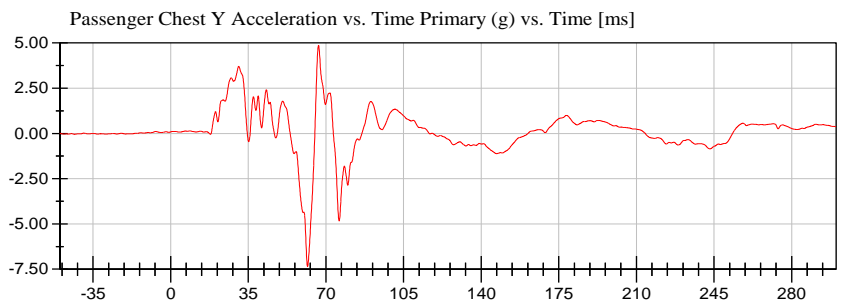
<Max>

4.69 g at 159.52 ms

<Min>

-46.15 g at 70.48 ms

CFC_180



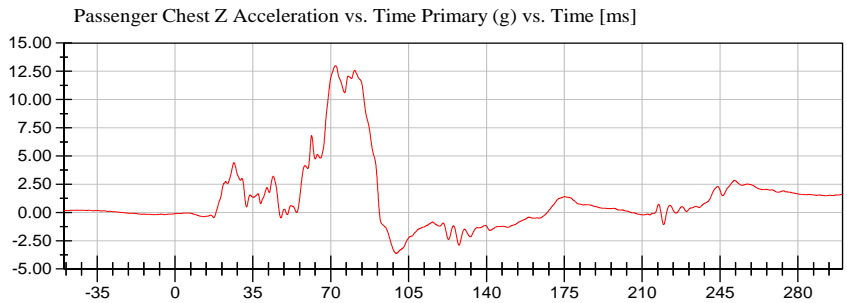
<Max>

4.87 g at 66.64 ms

<Min>

-7.35 g at 61.76 ms

CFC_180



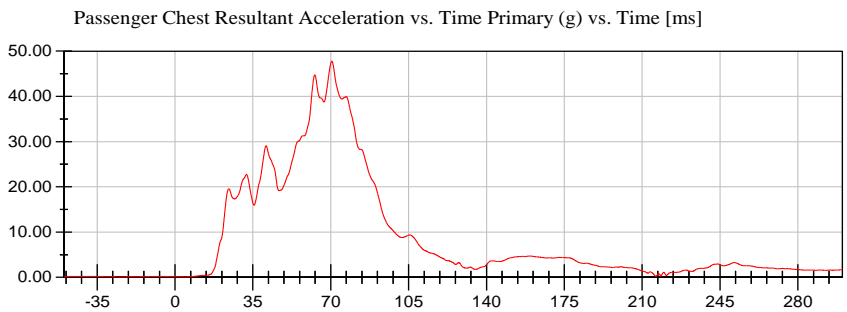
<Max>

12.99 g at 72.16 ms

<Min>

-3.61 g at 99.52 ms

CFC_180



<Max>

47.79 g at 70.48 ms

<Min>

0.07 g at -23.60 ms

CFC_180



NHTSA

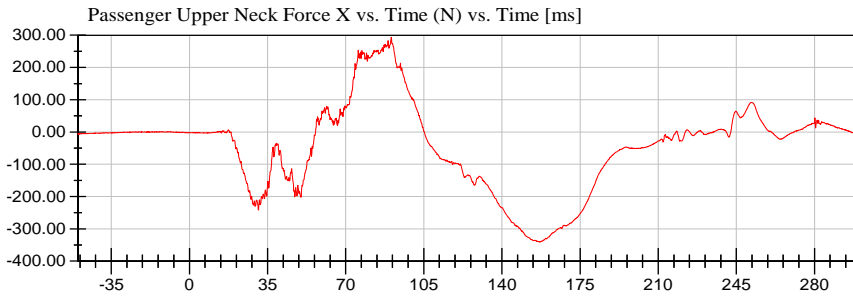
Test Lab: CTF

Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



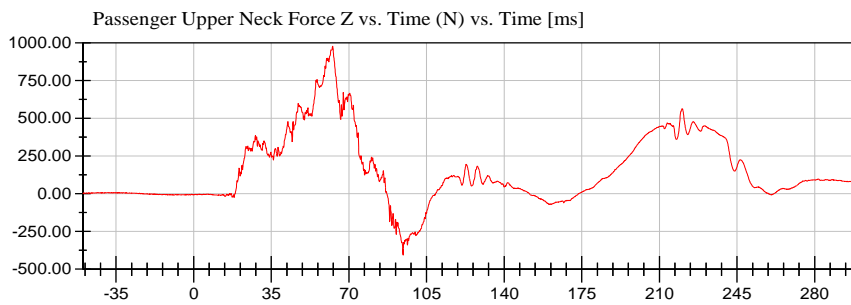
<Max>

293.59 N at 90.40 ms

<Min>

-340.85 N at 157.12 ms

CFC_1000



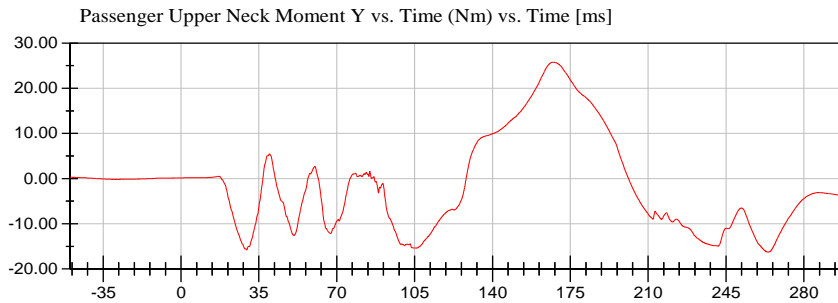
<Max>

978.51 N at 62.64 ms

<Min>

-406.84 N at 94.40 ms

CFC_1000



<Max>

25.77 Nm at 166.88 ms

<Min>

-16.27 Nm at 263.92 ms

CFC_600



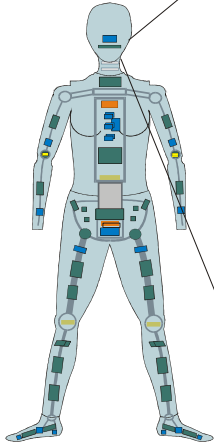


2019 BMW X5 5-DR SUV NCAP 35 mph Frontal Impact Neck Injury Predictor (NIJ)

Date: 01/07/2019
Time: 19:15

Customer: NHTSA
Test Number: M20194103

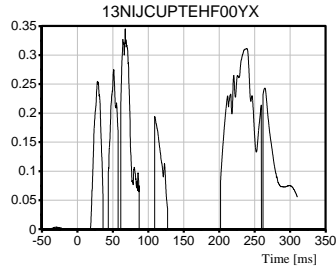
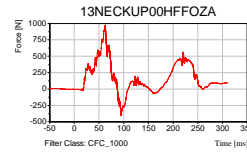
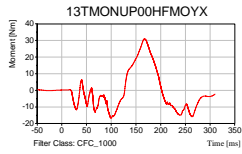
Test Orientation = Frontal
Fzc(Tension) = 4287
Fzc(Compression) = 3880
Myc(Extension) = 67
Myc(Flexion) = 155



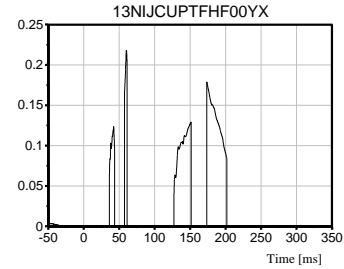
Dummy: HIII 5th Female
Seating Position:
Right Front Passenger

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

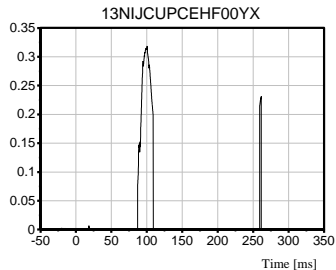
TRC Inc. Test Lab: CTF
Test Number: 190107



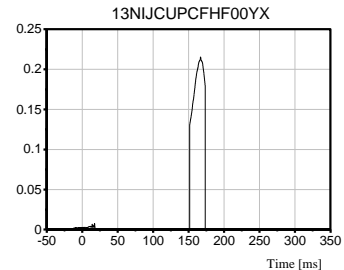
Max [NTE] 0.3451 at 67.52 ms



Max [NTF] 0.2178 at 60.08 ms



Max [NCE] 0.3180 at 100.40 ms



Max [NCF] 0.2155 at 166.88 ms

NHTSA

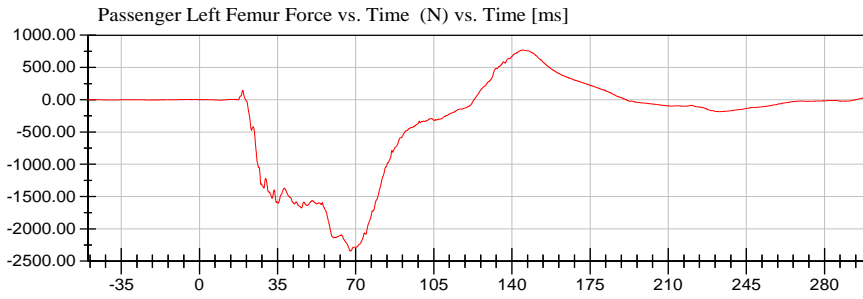
Test Lab: CTF

Test Number: 190107 (M20194103)

Test Date: 01/07/2019

Position #1 Hybrid III Mid-Sized Adult Male Dummy (37)

Position #2 Hybrid III Small Adult Female (426)



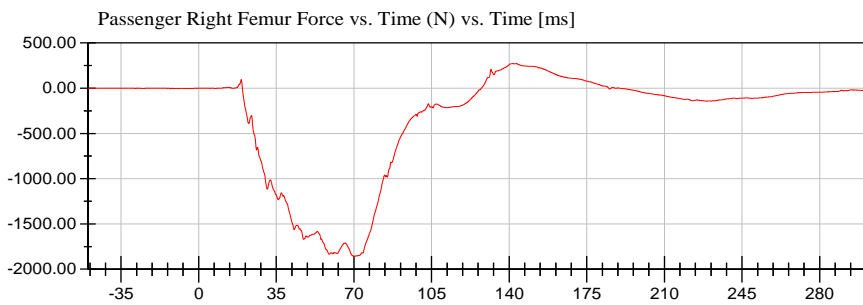
<Max>

768.98 N at 144.56 ms

<Min>

-2,345.62 N at 67.60 ms

CFC_600



<Max>

273.32 N at 143.36 ms

<Min>

-1,857.55 N at 70.32 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. 53

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	880	Yes
B	Shoulder Pivot Height	505.5 - 520.7	512	Yes
C	H-Point Height	83.8 - 88.9	86	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	146	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	225	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	990	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. 53-2
Test Date: 12/14/2018

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	274.6 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	4.6 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Condition: Used

Comments:

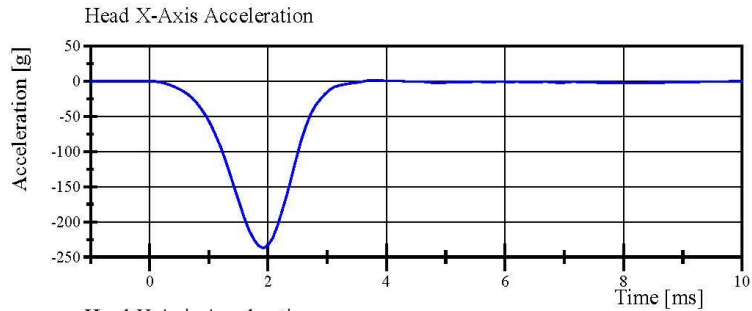
Head Skin S/N: N/A

Transportation Research Center Inc.

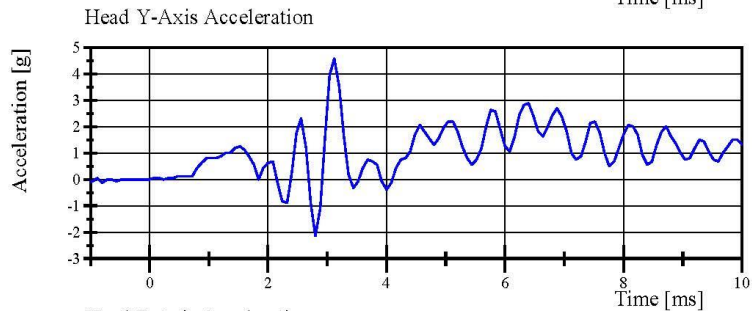
Front Head Drop

HIII 50th Serial No. 037 Certification No. 53-2

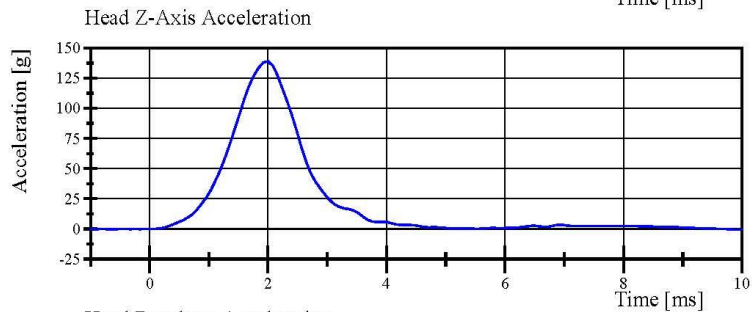
Test Date: 12/14/2018



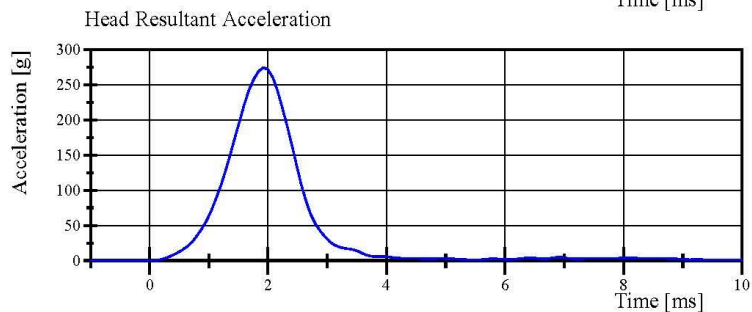
Filter Class: CFC_1000
Max: 2.0 g at 3.8 ms
Min: -237.4 g at 1.9 ms



Filter Class: CFC_1000
Max: 4.6 g at 3.1 ms
Min: -2.1 g at 2.8 ms



Filter Class: CFC_1000
Max: 139.0 g at 2.0 ms
Min: -0.3 g at 9.8 ms



Filter Class: CFC_1000
Max: 274.6 g at 1.9 ms
Min: 0.0 g at -0.5 ms

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

12.14.2018 10:29:29 613



Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 53-1

Test Date: 12/13/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.930 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	41.1 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-23.71 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-18.75 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-15.22 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-15.22 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) °	-69.4 °	Yes
Time of Peak	57 - 64 ms	59.9 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	119.6 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88.1 - 108.4 N·m	97.65 N·m	Yes
Time of Peak	47 - 58 ms	54.1 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	102.9 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

Page 11 of 27

12.13.2018 15:51:51 1866

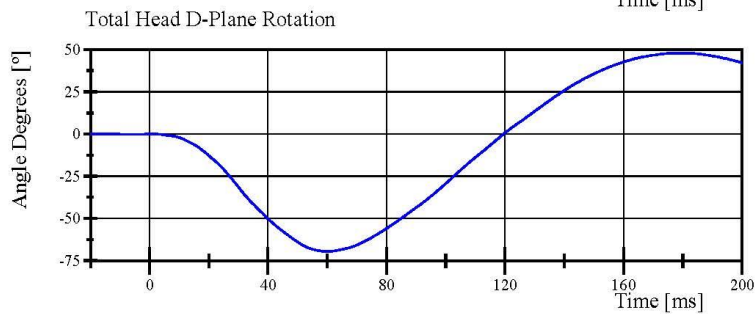
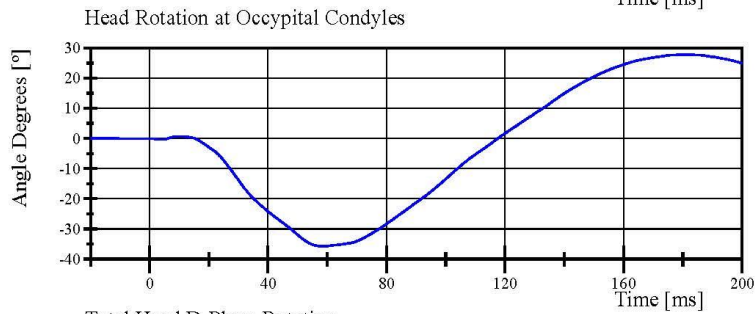
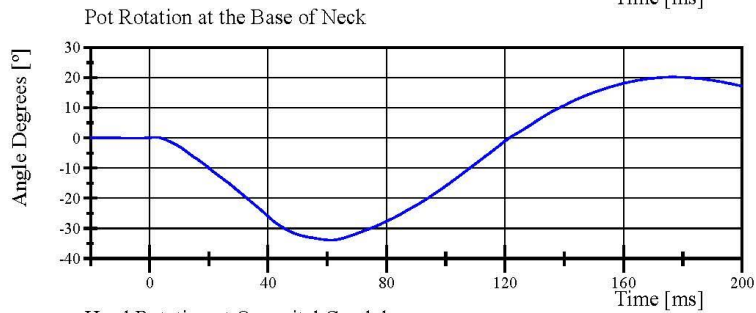
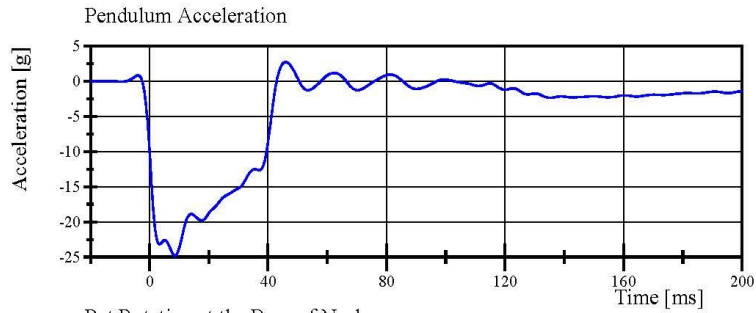


Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 53-1

Test Date: 12/13/2018



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

12.13.2018 15:53:34 1866

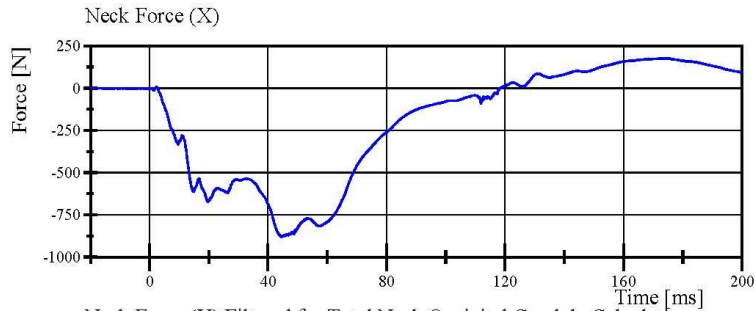


Transportation Research Center Inc.

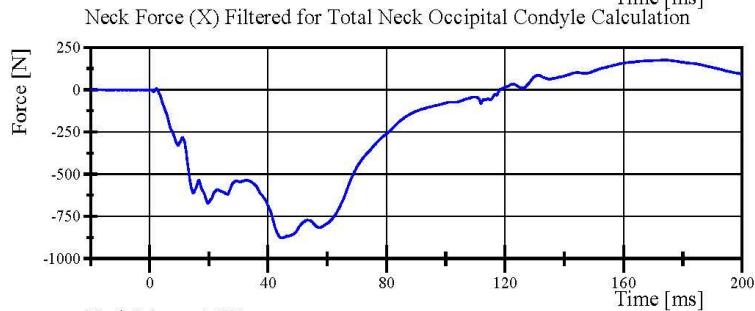
Neck Flexion

HIII 50th Serial No. 037 Certification No. 53-1

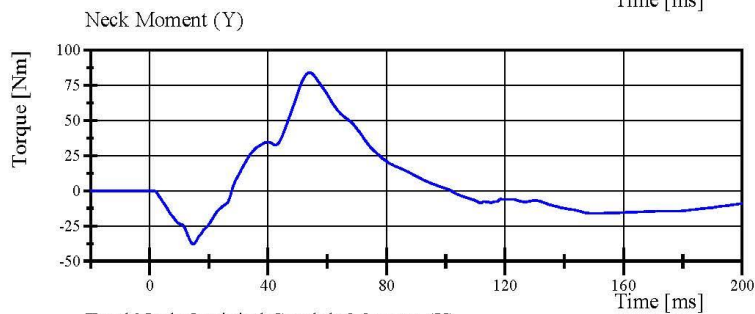
Test Date: 12/13/2018



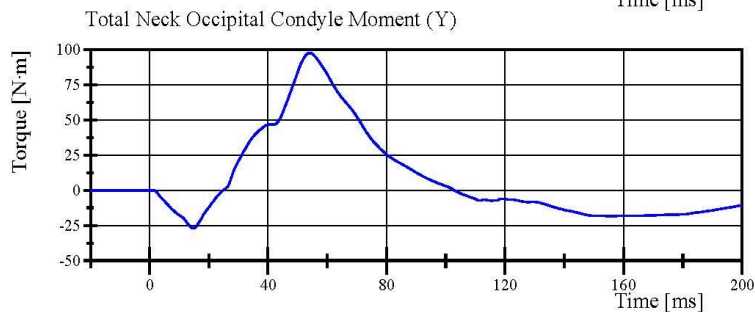
Filter Class: CFC_1000
Max: 176.2 N at 174.4 ms
Min: -879.6 N at 44.5 ms



Filter Class: CFC_600
Max: 175.9 N at 174.6 ms
Min: -878.4 N at 44.5 ms



Filter Class: CFC_600
Max: 84.0 Nm at 54.1 ms
Min: -37.8 Nm at 14.8 ms



Filter Class: Without_(Consta
Max: 97.6 N·m at 54.1 ms
Min: -27.0 N·m at 14.7 ms

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

12.13.2018 15:53:35 1866



Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 53-1

Test Date: 12/13/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.009 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	42.2 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	18.64 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	16.49 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	13.17 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	13.44 g	Yes
Total Head D-Plane Rotation Peak	81 - 106 °	95.3 °	Yes
Time of Peak	72 - 82 ms	79.0 ms	Yes
Total Head D-Plane Rotation Decay to 0°	147 - 174 ms	161.3 ms	Yes
Total Neck Occipital Condyles Moment Peak	(-52.9) - (-80) N·m	-65.58 N·m	Yes
Time of Peak	65 - 79 ms	73.1 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	147.9 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

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12.13.2018 16:22:00 2009

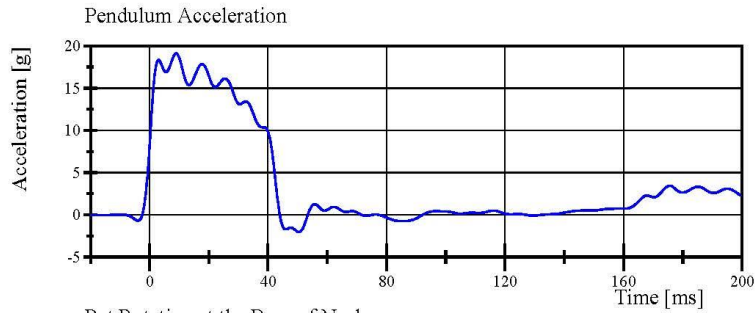


Transportation Research Center Inc.

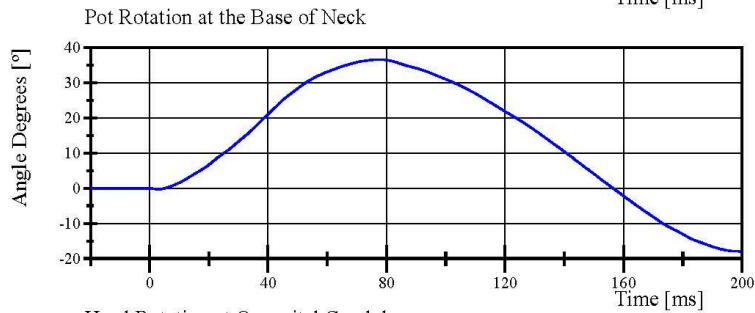
Neck Extension

HIII 50th Serial No. 037 Certification No. 53-1

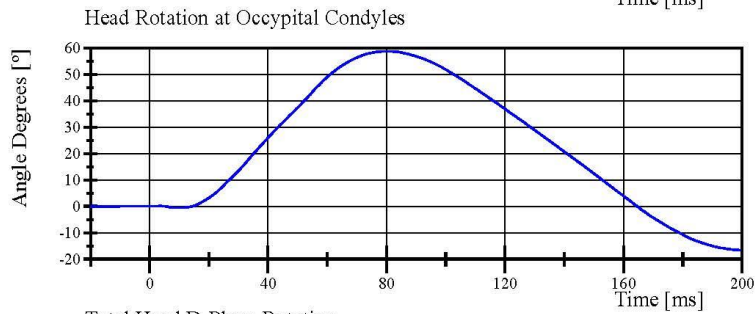
Test Date: 12/13/2018



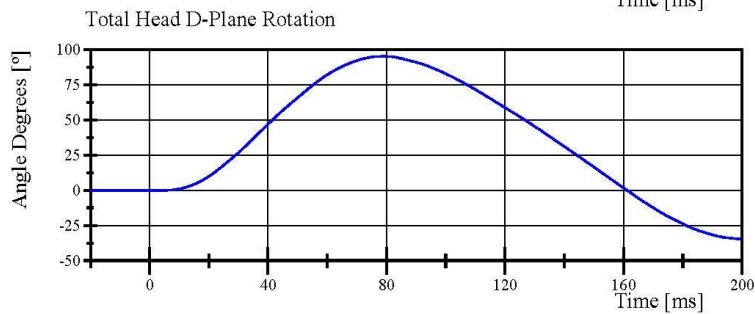
Filter Class: CFC_60
Max: 19.1 g at 9.0 ms
Min: -2.0 g at 50.4 ms



Filter Class: CFC_60
Max: 36.6 ° at 77.5 ms
Min: -18.0 ° at 199.6 ms



Filter Class: CFC_60
Max: 58.8 ° at 80.2 ms
Min: -16.7 ° at 199.6 ms



Filter Class: CFC_60
Max: 95.3 ° at 79.0 ms
Min: -34.7 ° at 199.6 ms

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

12.13.2018 16:22:26 2009

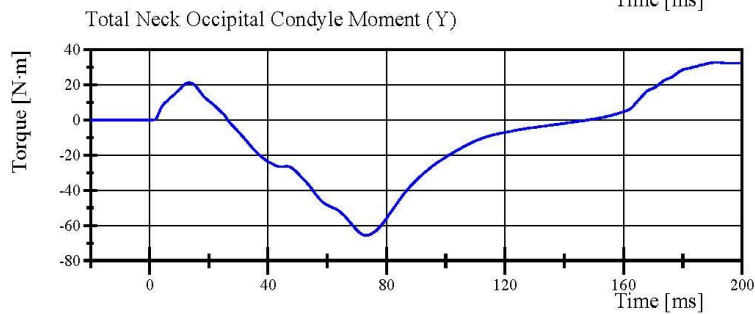
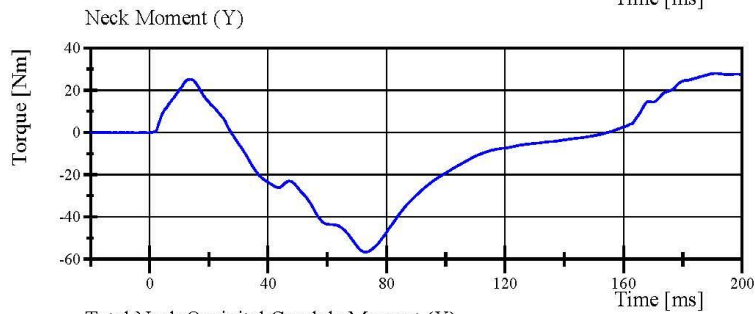
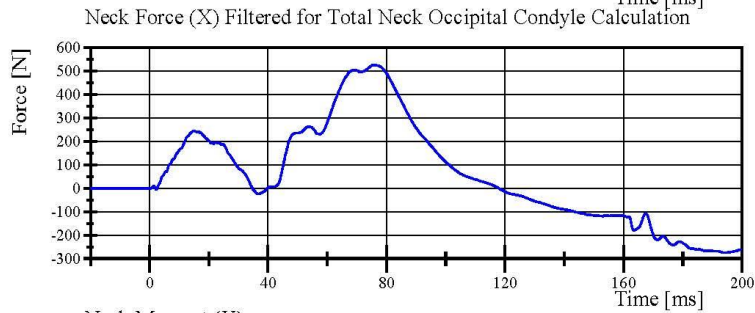
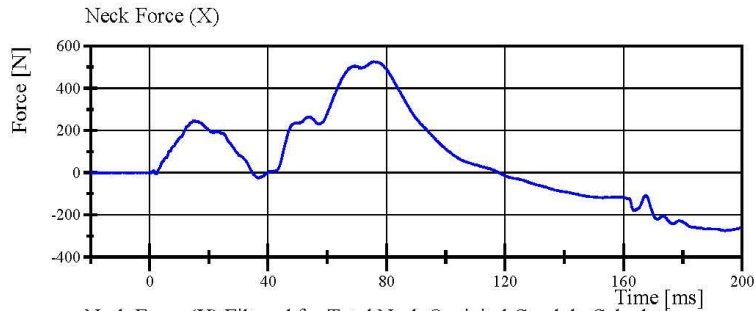


Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 53-1

Test Date: 12/13/2018



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

12.13.2018 16:22:27 2009



Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 53-1

Test Date: 12/14/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	41 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.646 m/s	Yes
Probe Force Peak	(-5,160) - (-5,894) N	-5,450.8 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-68.21 mm	Yes
Internal Hysteresis	69 - 85 %	75.2 %	Yes

Test meets specifications.

Condition: Used

Comments:

Jacket S/N: 2565

Rib #1 Assembly S/N: 178051-35 HI6550

Rib #2 Assembly S/N: 36 16526

Rib #3 Assembly S/N: 37 16543

Rib #4 Assembly S/N: 38 16538

Rib #5 Assembly S/N: 39 HI6530

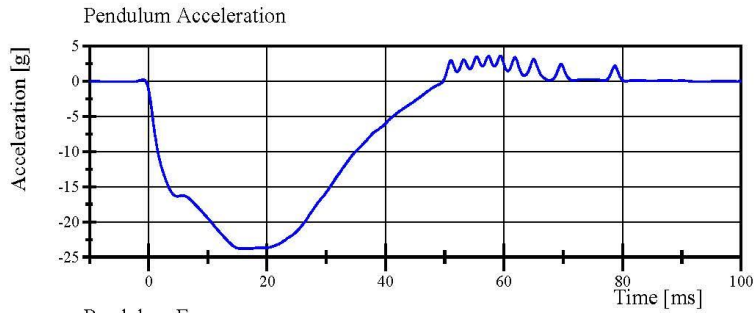
Rib #6 Assembly S/N: 40 16548

Transportation Research Center Inc.

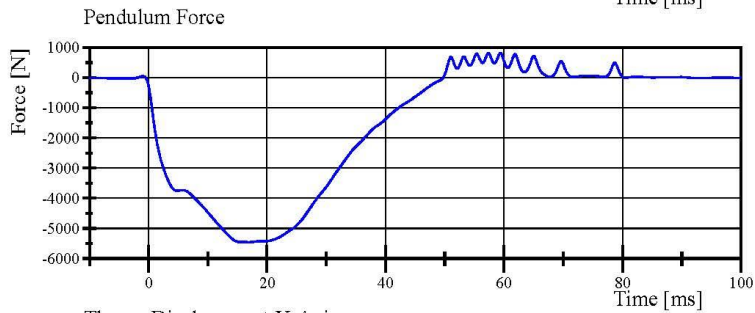
Front Thorax

HIII 50th Serial No. 037 Certification No. 53-1

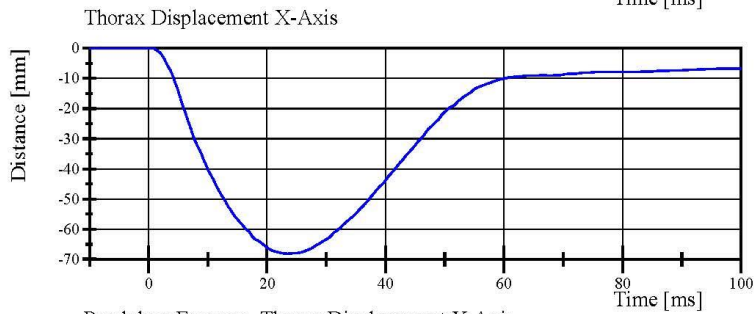
Test Date: 12/14/2018



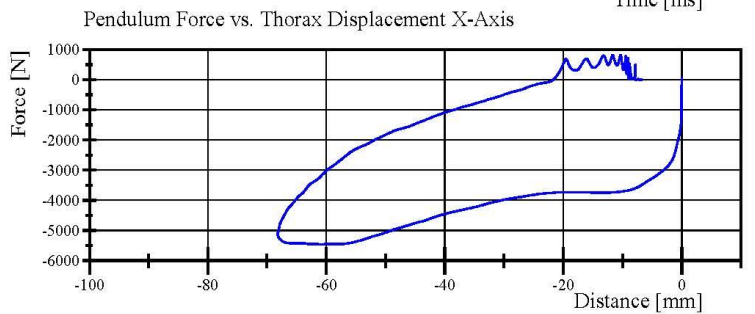
Filter Class: CFC_180
Max: 3.6 g at 59.4 ms
Min: -23.8 g at 16.9 ms



Filter Class: CFC_180
Max: 826.8 N at 59.4 ms
Min: -5,450.8 N at 16.9 ms



Filter Class: CFC_600
Max: 0.0 mm at -8.8 ms
Min: -68.2 mm at 23.5 ms



Filter Class: CFC_180
Max: 826.8 N at -10.3 mm
Min: -5,450.8 N at -60.7 mm

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

12.14.2018 11:46:44 395

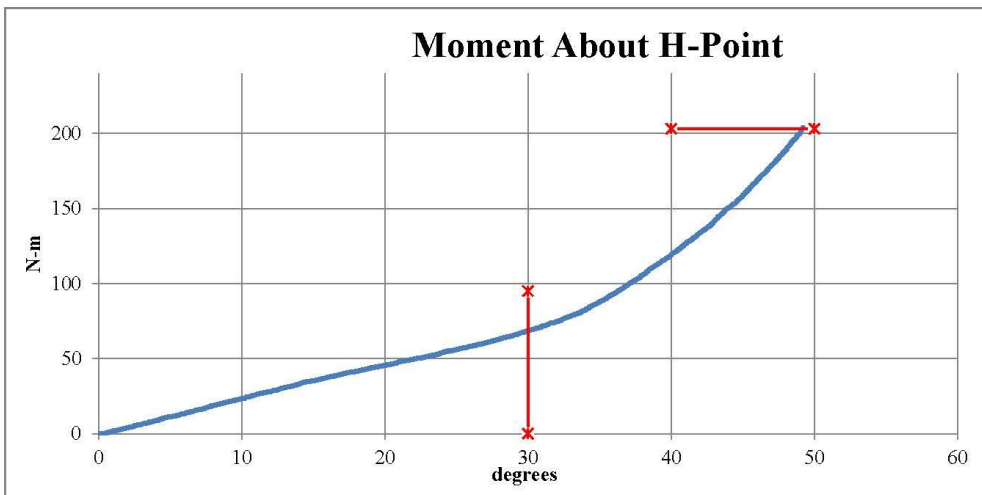


Transportation Research Center Inc.
Hybrid III 50th Male Hip Range of Motion

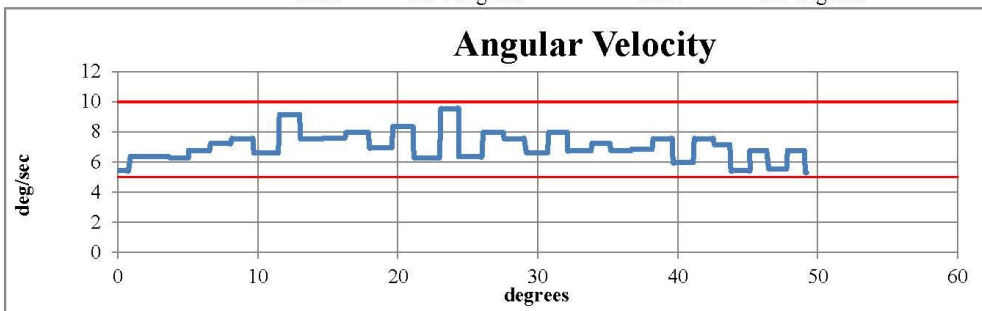


Serial Number: 037 Date: 14-Dec-2018
Side Tested: Left Hip Time: 7:37
Test Number: 1

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.8 °C Pass
Humidity	10 - 70	41 % Pass
Moment at 30°	0 ≤ 94.9	68.71 N-m Pass
Angle at 203 Nm	40 - 50	49.21 deg Pass
Average Velocity	5 - 10	7.06 deg/sec Pass



Max: 9.54 deg/sec Min: 5.3 deg/sec



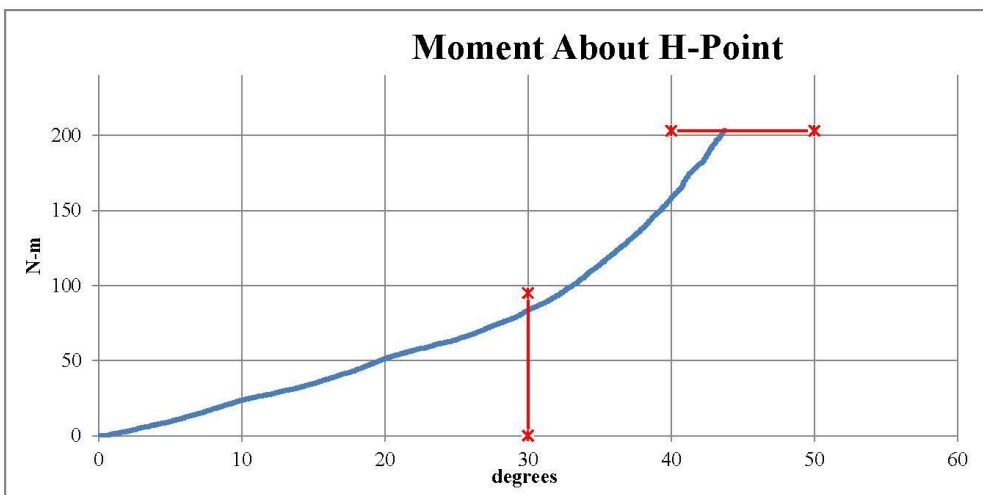
Comments:
Pelvis Skin S/N: N/A
Lumbar Spine S/N: 0551
Lumbar Cable S/N: N/A

Transportation Research Center Inc.
Hybrid III 50th Male Hip Range of Motion

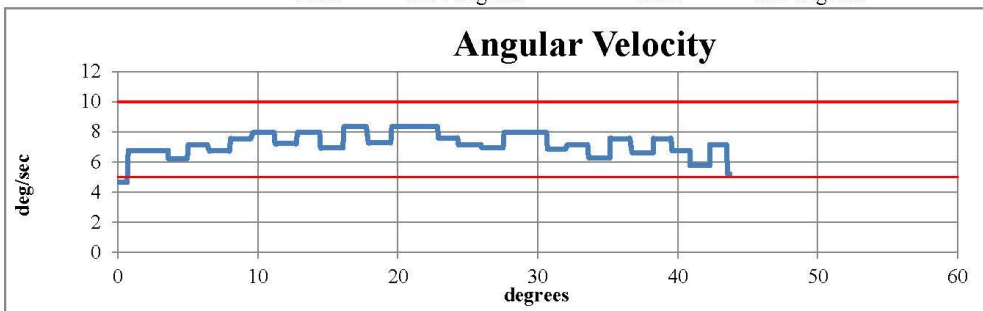


Serial Number: 037 Date: 14-Dec-2018
Side Tested: Right Hip Time: 9:11
Test Number: 1

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.8 °C Pass
Humidity	10 - 70	41 % Pass
Moment at 30°	0 ≤ 94.9	83.81 N-m Pass
Angle at 203 Nm	40 - 50	43.73 deg Pass
Average Velocity	5 - 10	7.18 deg/sec Pass



Max: 8.34 deg/sec Min: 4.64 deg/sec



Comments:
Pelvis Skin S/N: N/A
Lumbar Spine S/N: 0551
Lumbar Cable S/N: N/A

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 53-1
Test Date: 12/14/2018

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	38 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.121 m/s	Yes
Peak Femur Force	(-4,715) - (-5,782) N	-5,588.1 N	Yes

Test meets specifications.

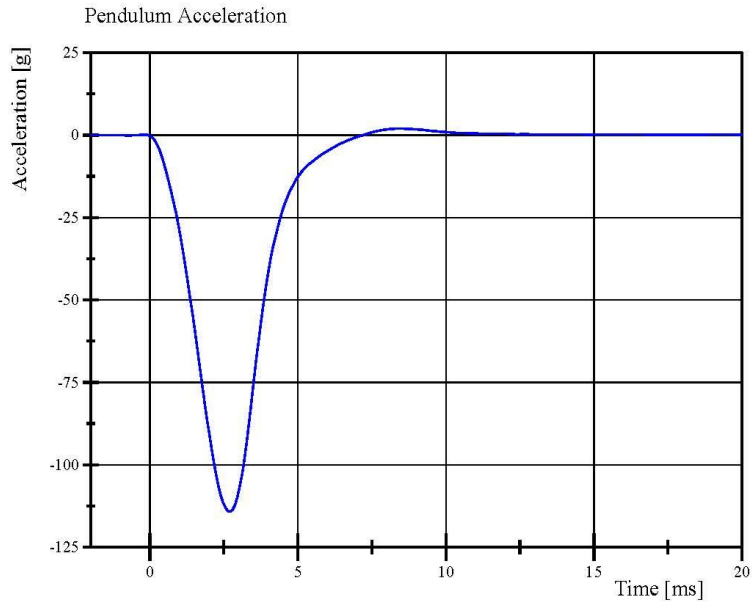
Condition: Used

Comments:

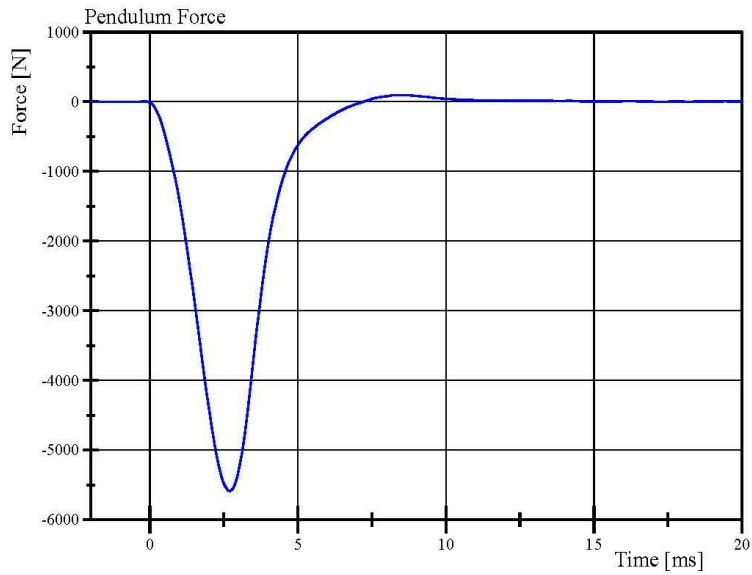
Knee Skin S/N: 2672

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 53-1
Test Date: 12/14/2018



Filter Class: CFC_600
Max: 2.0 g at 8.4 ms
Min: -114.2 g at 2.7 ms



Filter Class: CFC_600
Max: 98.5 N at 8.4 ms
Min: -5,588.1 N at 2.7 ms

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

12.14.2018 08:54:04 1727



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 53-1
Test Date: 12/14/2018

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.114 m/s	Yes
Peak Femur Force	(-4,715) - (-5,782) N	-5,554.9 N	Yes

Test meets specifications.

Condition: Used

Comments:

Knee Skin S/N: 3131

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

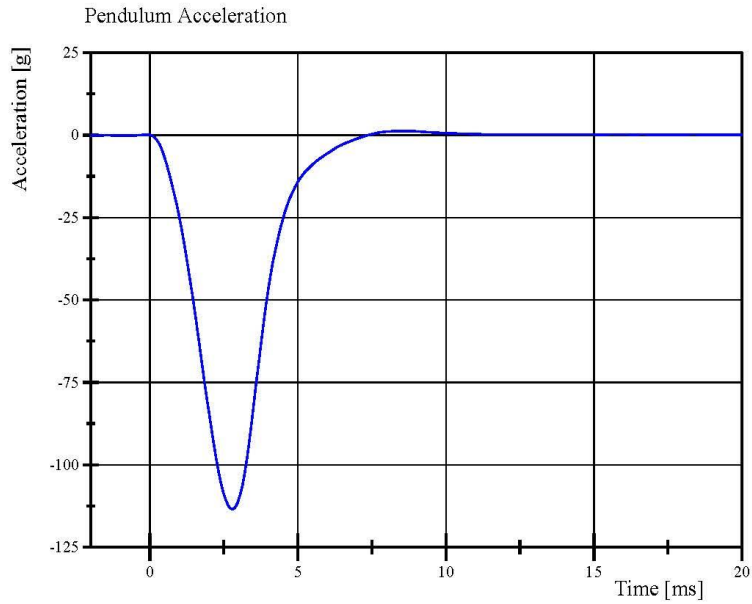
12.14.2018 09:00:18 1729



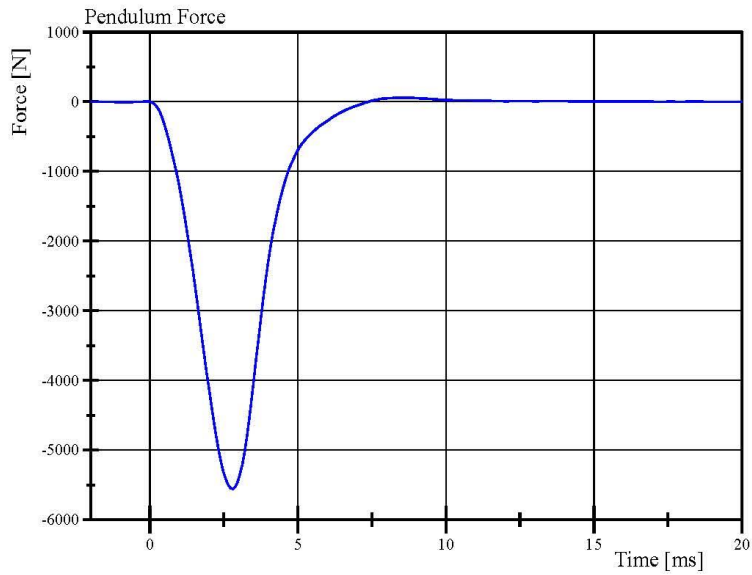
Page 23 of 27

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 53-1
Test Date: 12/14/2018



Filter Class: CFC_600
Max: 1.2 g at 8.5 ms
Min: -113.5 g at 2.8 ms



Filter Class: CFC_600
Max: 59.6 N at 8.5 ms
Min: -5,554.9 N at 2.8 ms

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

12.14.2018 09:01:03 1729



Post-Test Calibration Sheets

Front Passenger S/N 037

Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 54

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	880	Yes
B	Shoulder Pivot Height	505.5 - 520.7	511	Yes
C	H-Point Height	83.8 - 88.9	86	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	145	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	226	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. 54-1
Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	22.0 °C	Yes
Relative Humidity	10 - 70 %	45 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	232.8 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-9.6 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Condition: Used

Comments:

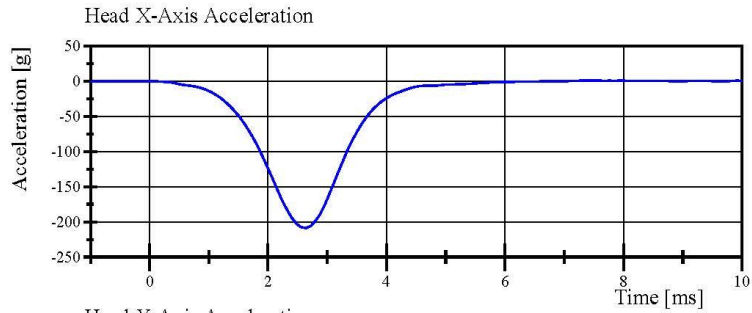
Head Skin S/N: N/A

Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 54-1

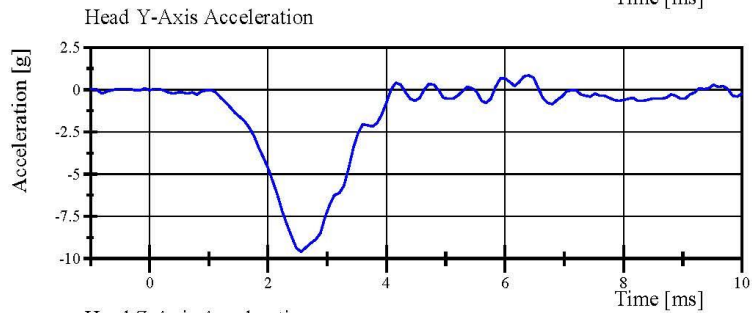
Test Date: 1/8/2019



Filter Class: CFC_1000

Max: 1.0 g at 7.4 ms

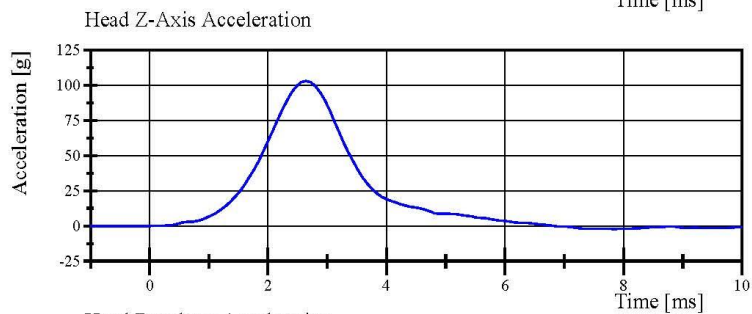
Min: -208.5 g at 2.6 ms



Filter Class: CFC_1000

Max: 0.9 g at 6.4 ms

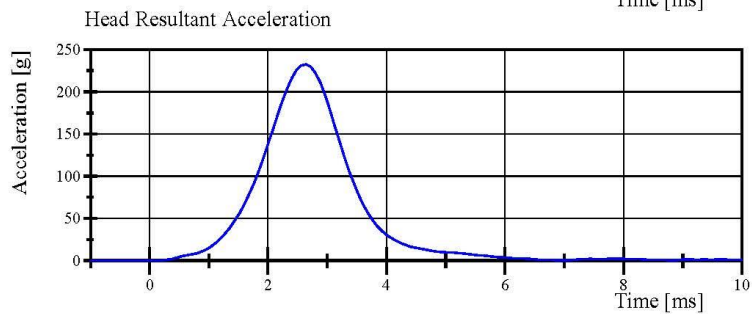
Min: -9.6 g at 2.6 ms



Filter Class: CFC_1000

Max: 103.0 g at 2.6 ms

Min: -2.1 g at 7.8 ms



Filter Class: CFC_1000

Max: 232.8 g at 2.6 ms

Min: 0.1 g at -0.9 ms

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

01.08.2019 07:32:608



Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 54-2

Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	45 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.934 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	39.7 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-25.46 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-20.46 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-14.50 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-14.50 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) °	-65.9 °	Yes
Time of Peak	57 - 64 ms	59.3 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	118.2 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88.1 - 108.4 N·m	99.37 N·m	Yes
Time of Peak	47 - 58 ms	52.7 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	102.2 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

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01.08.2019 10:44 1865

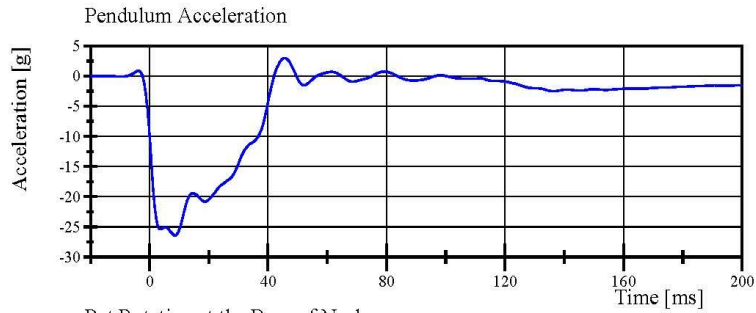


Transportation Research Center Inc.

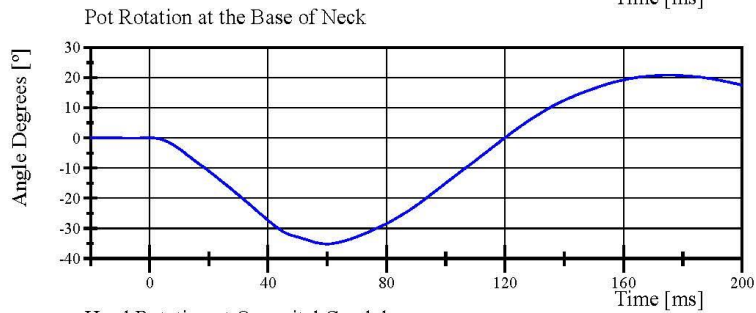
Neck Flexion

HIII 50th Serial No. 037 Certification No. 54-2

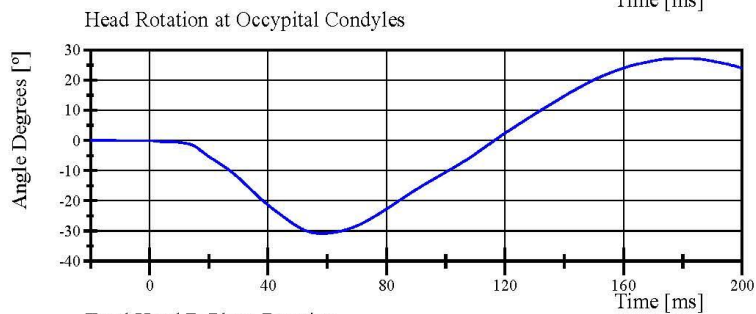
Test Date: 1/8/2019



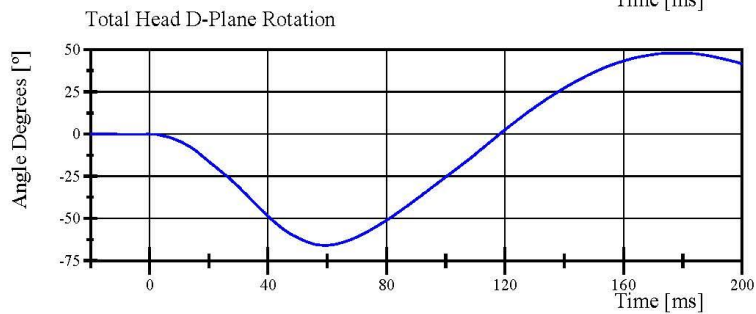
Filter Class: CFC_60
Max: 3.0 g at 45.6 ms
Min: -26.4 g at 8.6 ms



Filter Class: CFC_60
Max: 20.8 ° at 175.3 ms
Min: -35.1 ° at 60.0 ms



Filter Class: CFC_60
Max: 27.3 ° at 180.8 ms
Min: -30.9 ° at 58.1 ms



Filter Class: CFC_60
Max: 48.0 ° at 177.7 ms
Min: -65.9 ° at 59.3 ms

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

01.08.2019 10:44 1865

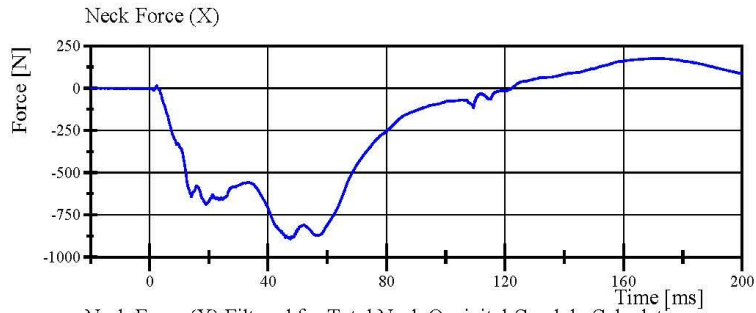


Transportation Research Center Inc.

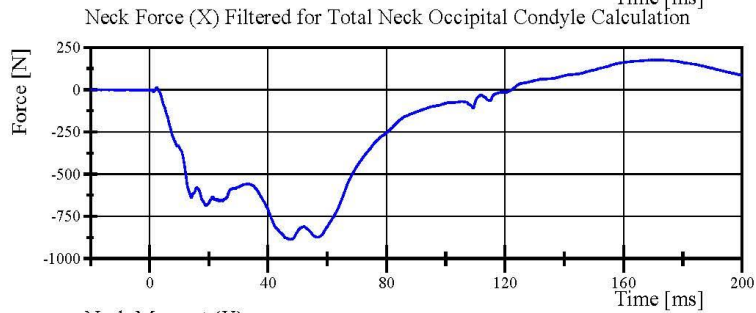
Neck Flexion

HIII 50th Serial No. 037 Certification No. 54-2

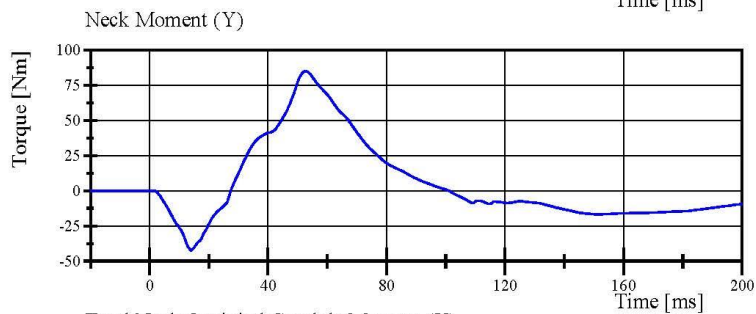
Test Date: 1/8/2019



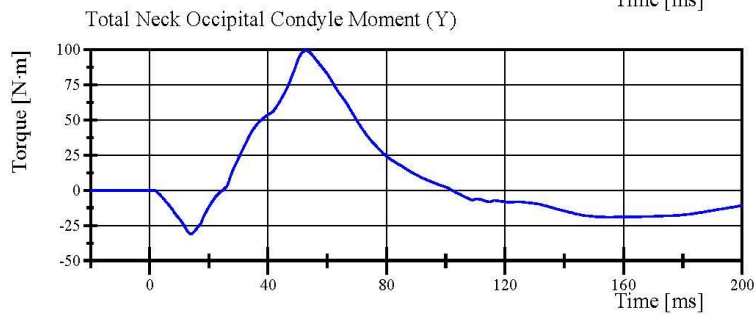
Filter Class: CFC_1000
Max: 176.6 N at 169.4 ms
Min: -891.8 N at 47.7 ms



Filter Class: CFC_600
Max: 176.0 N at 171.9 ms
Min: -887.2 N at 47.7 ms



Filter Class: CFC_600
Max: 85.0 Nm at 52.6 ms
Min: -42.3 Nm at 14.1 ms



Filter Class: Without_(Consta
Max: 99.4 N·m at 52.7 ms
Min: -31.0 N·m at 14.0 ms

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

01.08.2019 10:44 1865



Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 54-3

Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.003 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	39.3 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	20.20 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	17.66 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	13.96 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	14.15 g	Yes
Total Head D-Plane Rotation Peak	81 - 106 °	93.1 °	Yes
Time of Peak	72 - 82 ms	76.8 ms	Yes
Total Head D-Plane Rotation Decay to 0°	147 - 174 ms	158.7 ms	Yes
Total Neck Occipital Condyles Moment Peak	(-52.9) - (-80) N·m	-71.62 N·m	Yes
Time of Peak	65 - 79 ms	72.1 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	147.5 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

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01.08.2019 13:55 2010

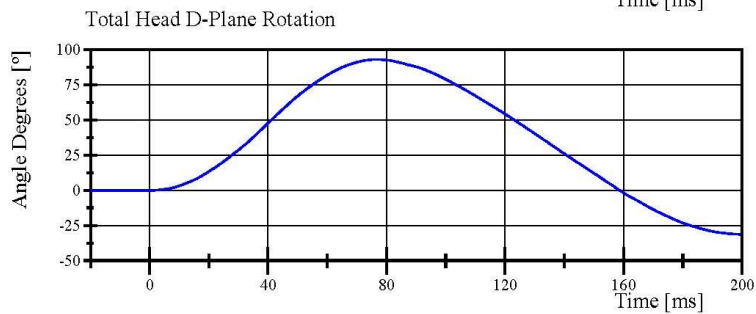
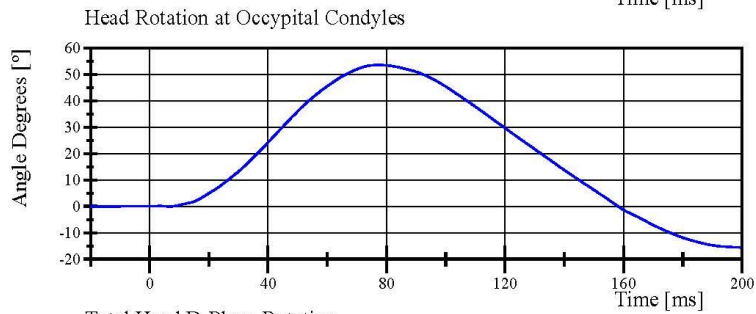
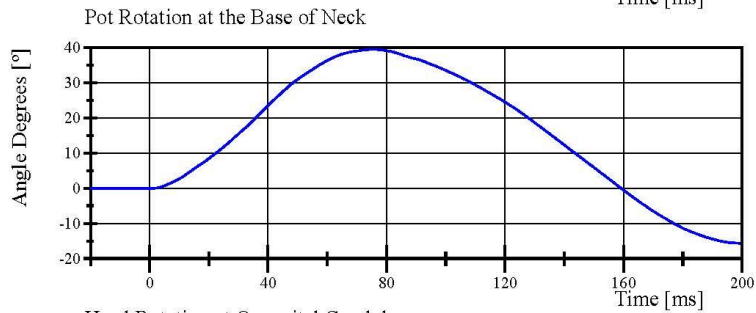
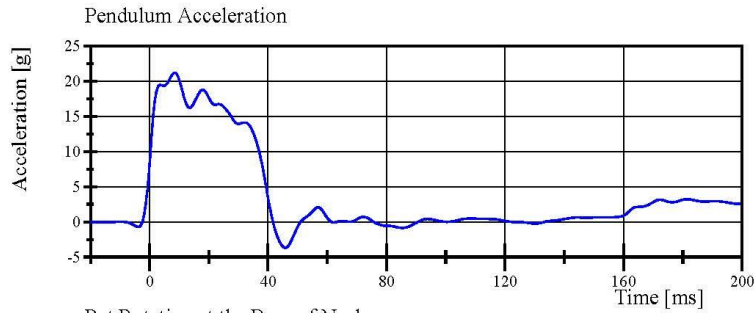


Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 54-3

Test Date: 1/8/2019



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

01.08.2019 13:55 2010

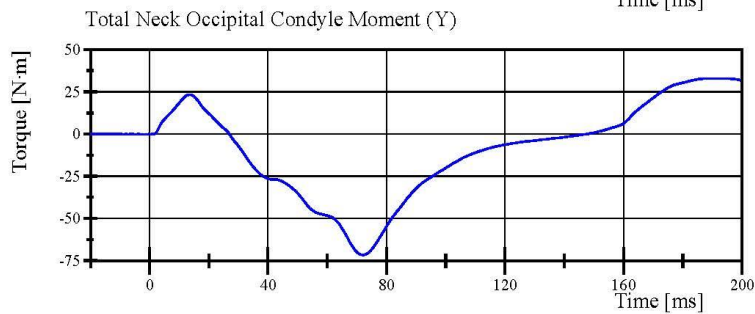
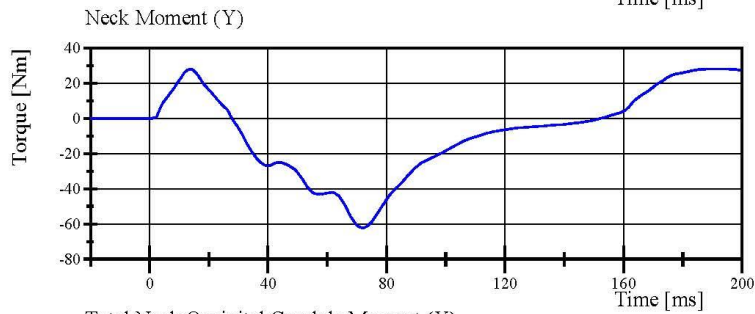
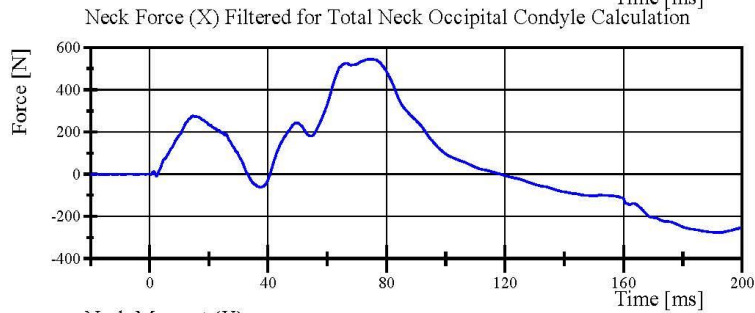
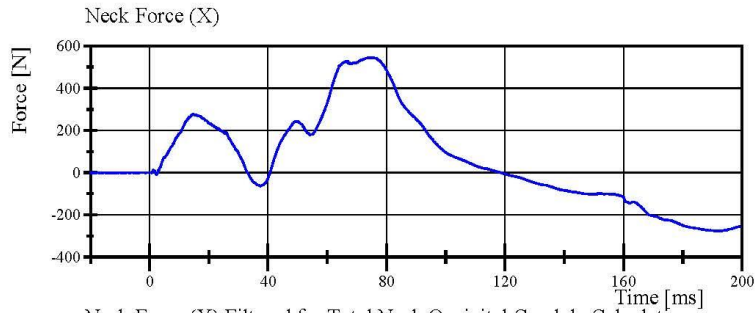


Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 54-3

Test Date: 1/8/2019



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

01.08.2019 13:55 2010



Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 54-1

Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	47 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.657 m/s	Yes
Probe Force Peak	(-5,160) - (-5,894) N	-5,372.3 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-72.42 mm	Yes
Internal Hysteresis	69 - 85 %	71.1 %	Yes

Test meets specifications.

Condition: Used

Comments:

Jacket S/N: 2565

Rib #1 Assembly S/N: 178051-35 HI6550

Rib #2 Assembly S/N: 36 16526

Rib #3 Assembly S/N: 37 16543

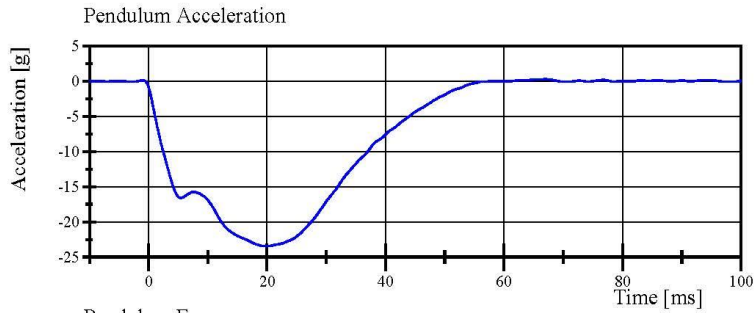
Rib #4 Assembly S/N: 38 16538

Rib #5 Assembly S/N: 39 HI6530

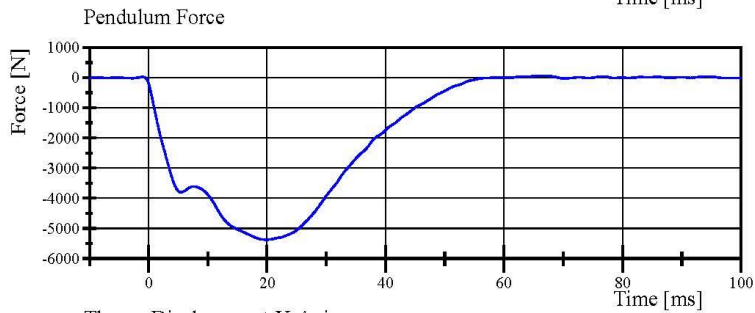
Rib #6 Assembly S/N: 40 16548

Transportation Research Center Inc.

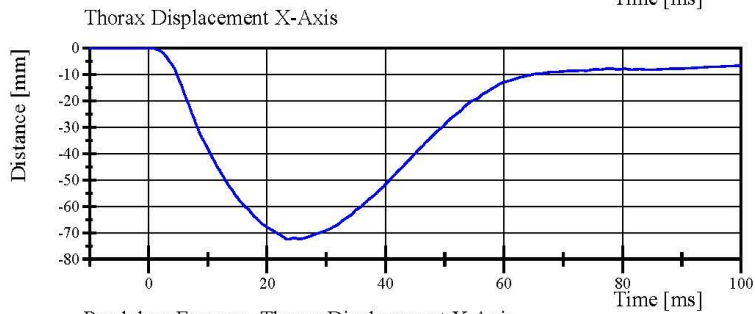
Front Thorax
HIII 50th Serial No. 037 Certification No. 54-1
Test Date: 1/8/2019



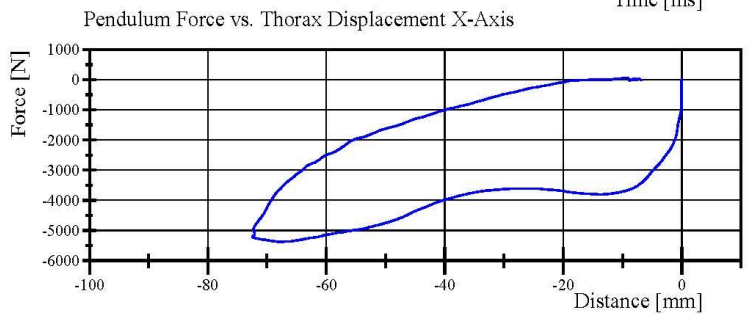
Filter Class: CFC_180
Max: 0.3 g at 67.0 ms
Min: -23.4 g at 19.8 ms



Filter Class: CFC_180
Max: 66.0 N at 67.0 ms
Min: -5,372.3 N at 19.8 ms



Filter Class: CFC_600
Max: 0.0 mm at -9.7 ms
Min: -72.4 mm at 23.5 ms



Filter Class: CFC_180
Max: 66.0 N at -9.4 mm
Min: -5,372.3 N at -67.7 mm

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

01.08.2019 07:39 434

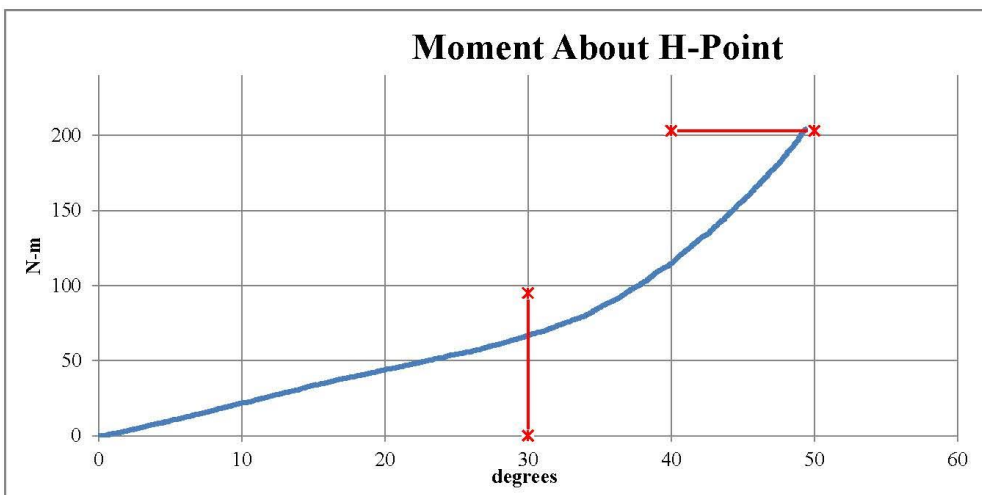


Transportation Research Center Inc.
Hybrid III 50th Male Hip Range of Motion

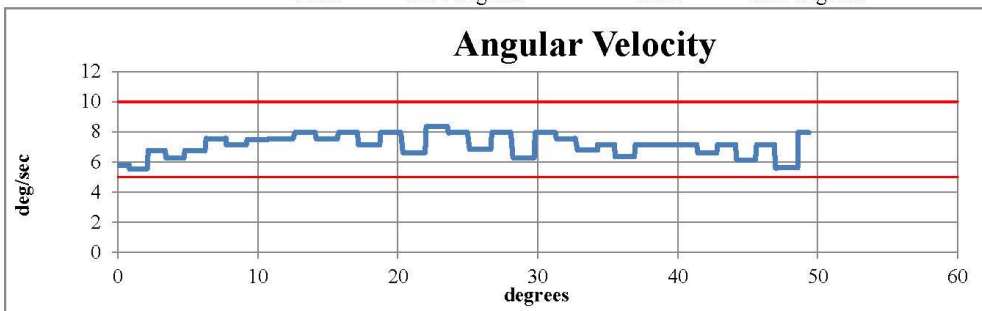


Serial Number: 037 Date: 08-Jan-2019
Side Tested: Left Hip Time: 13:25
Test Number: 1 Comments:

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.9 °C Pass
Humidity	10 - 70	40 % Pass
Moment at 30°	0 ≤ 94.9	66.93 N-m Pass
Angle at 203 Nm	40 - 50	49.37 deg Pass
Average Velocity	5 - 10	7.1 deg/sec Pass



Max: 8.34 deg/sec Min: 5.56 deg/sec



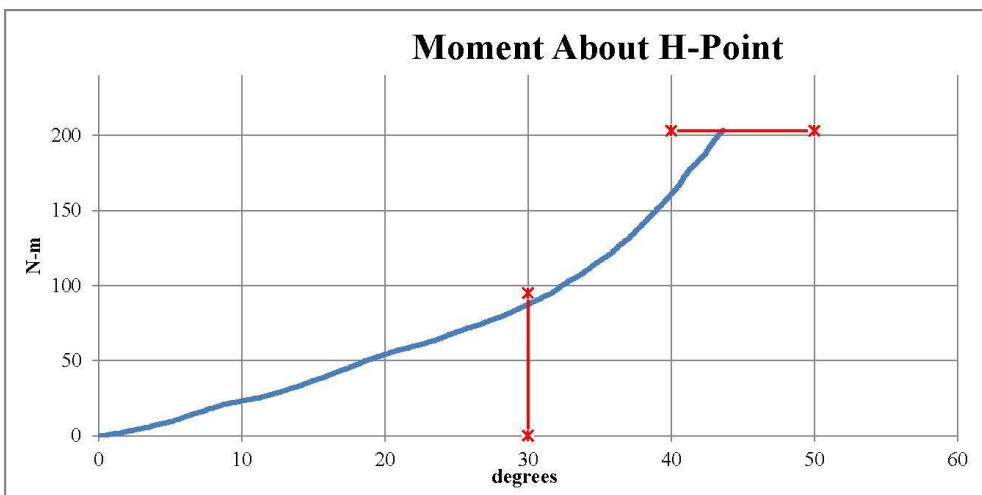
Comments:
Pelvis Skin S/N: N/A
Lumbar Spine S/N: 0551
Lumbar Cable S/N: N/A

Transportation Research Center Inc.
Hybrid III 50th Male Hip Range of Motion

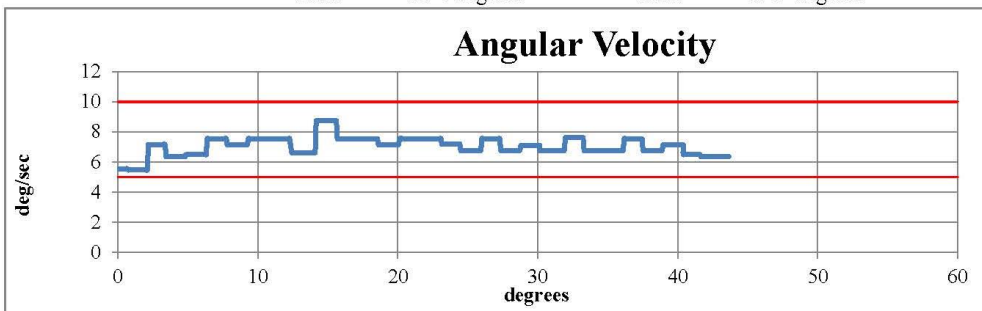


Serial Number: 037 Date: 08-Jan-2019
Side Tested: Right Hip Time: 14:31
Test Number: 1 Comments:

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.4 °C Pass
Humidity	10 - 70	42 % Pass
Moment at 30°	0 ≤ 94.9	87.66 N-m Pass
Angle at 203 Nm	40 - 50	43.65 deg Pass
Average Velocity	5 - 10	7.04 deg/sec Pass



Max: 8.74 deg/sec Min: 5.47 deg/sec



Comments:
Pelvis Skin S/N: N/A
Lumbar Spine S/N: 0551
Lumbar Cable S/N: N/A

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 54-1
Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	47 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.121 m/s	Yes
Peak Femur Force	(-4,715) - (-5,782) N	-5,600.7 N	Yes

Test meets specifications.

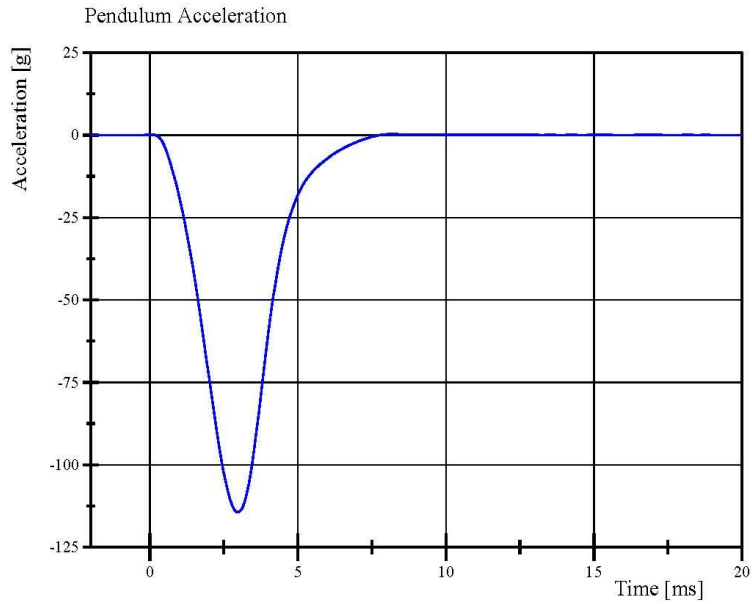
Condition: Used

Comments:

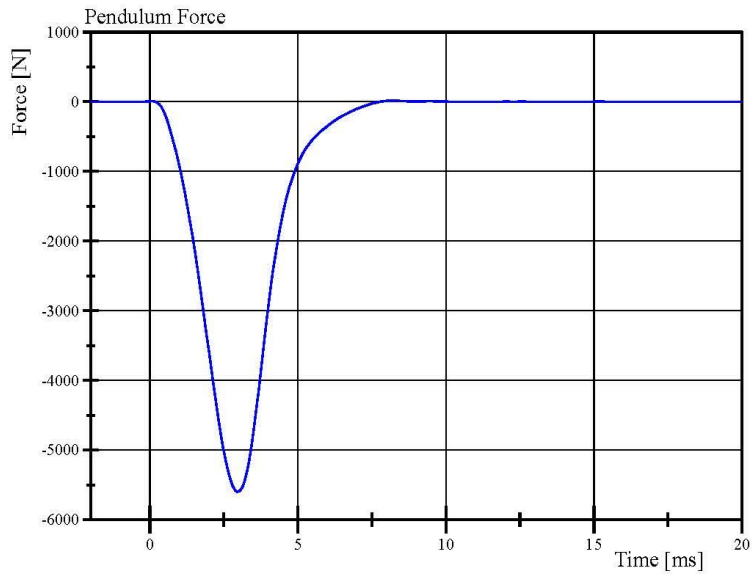
Knee Skin S/N: 2672

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 54-1
Test Date: 1/8/2019



Filter Class: CFC_600
Max: 0.3 g at 8.2 ms
Min: -114.5 g at 3.0 ms



Filter Class: CFC_600
Max: 16.8 N at 8.2 ms
Min: -5,600.7 N at 3.0 ms

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

01.08.2019 07:55 1743



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 54-1
Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	45 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.122 m/s	Yes
Peak Femur Force	(-4,715) - (-5,782) N	-5,446.8 N	Yes

Test meets specifications.

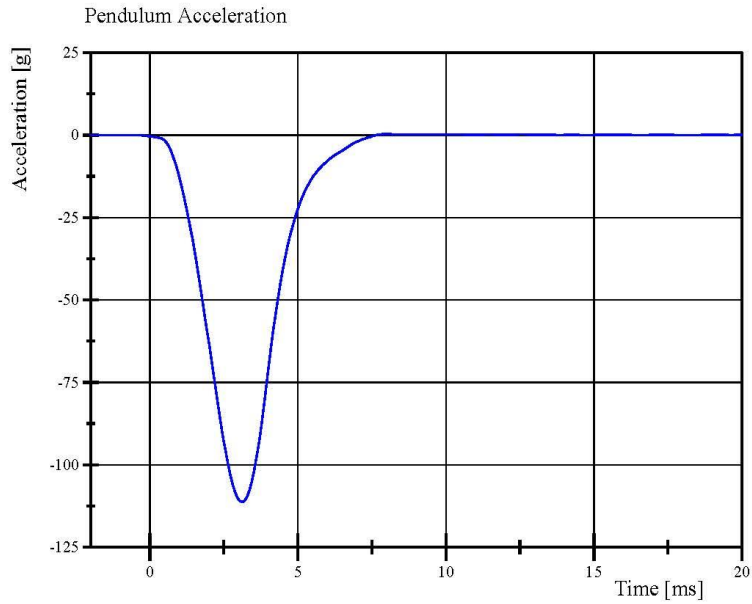
Condition: Used

Comments:

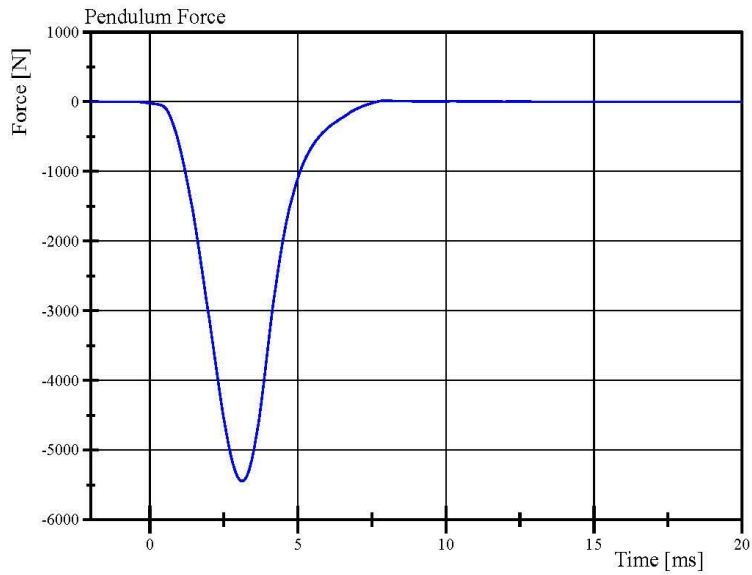
Knee Skin S/N: 3131

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 54-1
Test Date: 1/8/2019



Filter Class: CFC_600
Max: 0.3 g at 8.0 ms
Min: -111.3 g at 3.1 ms



Filter Class: CFC_600
Max: 16.5 N at 8.0 ms
Min: -5,446.8 N at 3.1 ms

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

01.08.2019 08:00 1738



Pre-Test Calibration Sheets

Front Passenger S/N 426

Transportation Research Center Inc.
5720 HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 47

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	774.7 - 800.1	781	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	147	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	250	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	196	Yes
K	Buttock Knee Length	520.7 - 546.1	534	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	429	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	870	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

Revised 8/10/12



Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 47-1

Test Date: 12/13/2018

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	281.3 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	3.1 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Condition: Used

Comments:

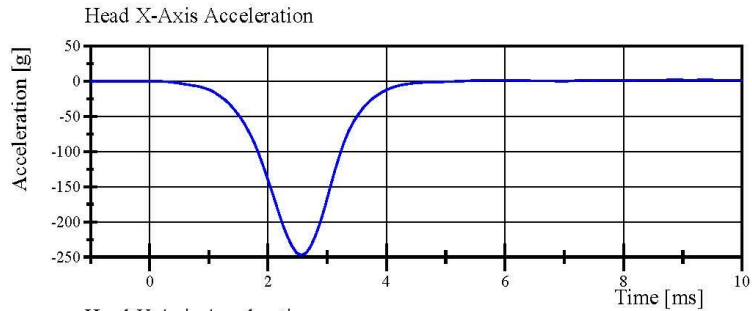
Head Skin S/N: 1348

Transportation Research Center Inc.

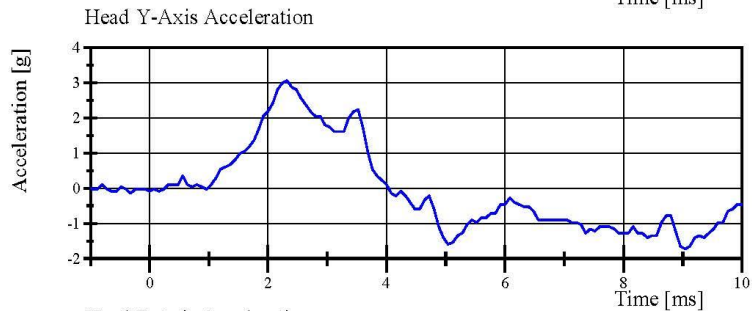
Front Head Drop

HIII 5th Serial No. 426 Certification No. 47-1

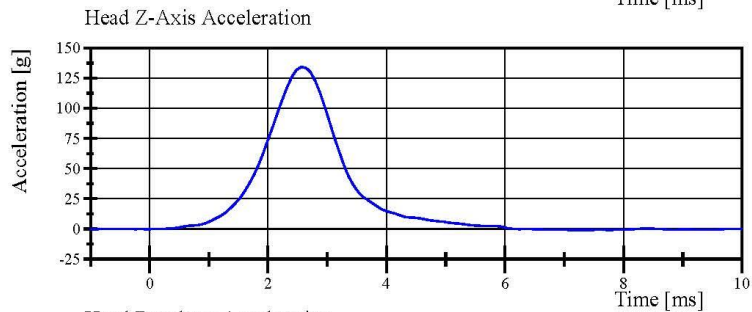
Test Date: 12/13/2018



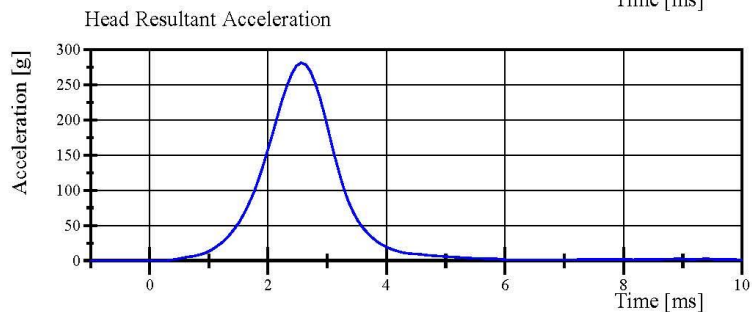
Filter Class: CFC_1000
Max: 2.4 g at 8.9 ms
Min: -247.2 g at 2.6 ms



Filter Class: CFC_1000
Max: 3.1 g at 2.3 ms
Min: -1.7 g at 9.0 ms



Filter Class: CFC_1000
Max: 134.3 g at 2.6 ms
Min: -0.9 g at 7.3 ms



Filter Class: CFC_1000
Max: 281.3 g at 2.6 ms
Min: 0.0 g at -0.2 ms

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

12.13.2018 11:31:56 607



Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 47-2

Test Date: 12/13/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	7.052 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	(-2.1) - (-2.5) m/s	-2.47 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	(-4.0) - (-5.0) m/s	-4.70 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.67 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-81.4 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	79.0 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	87.2 ms	Yes

Test meets specifications.

Condition: Used

Comments:

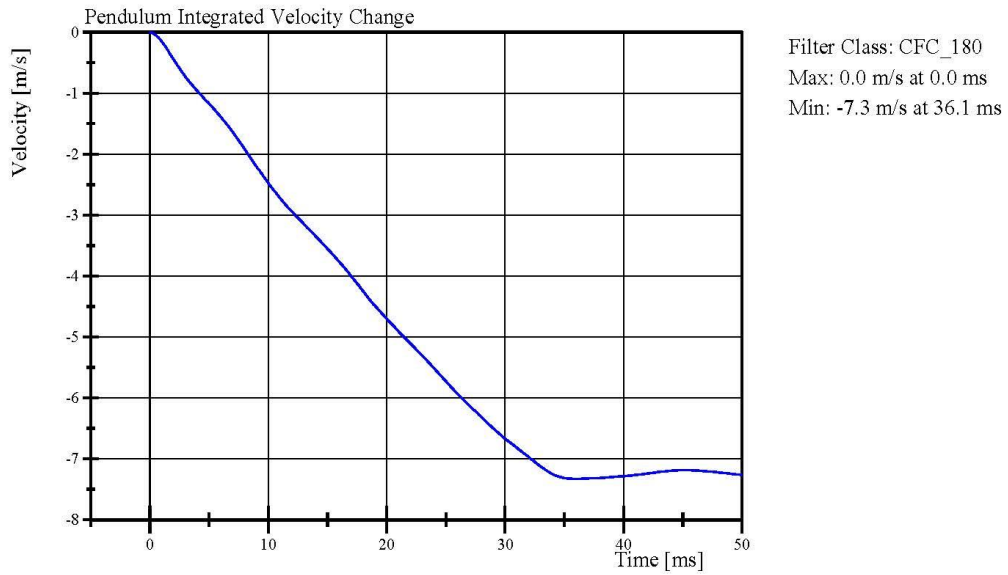
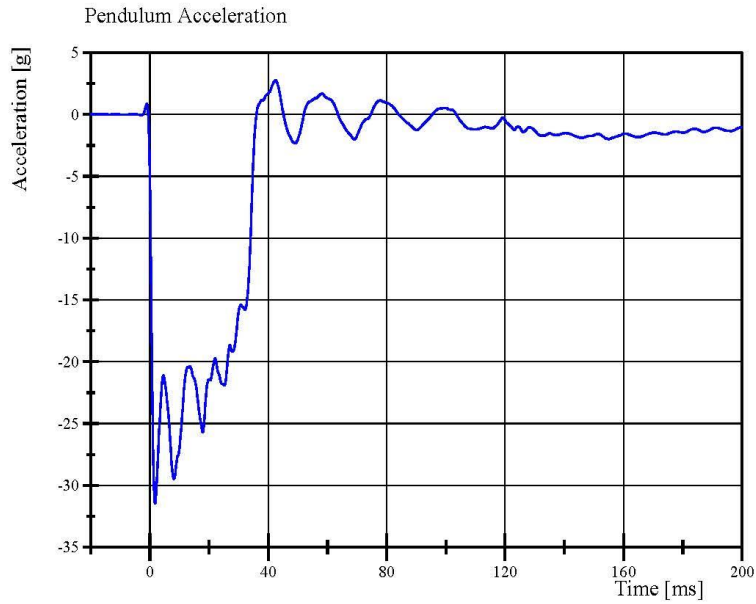
Neck S/N: DM2392

Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 47-2

Test Date: 12/13/2018



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

12.13.2018 09:51:00 1849



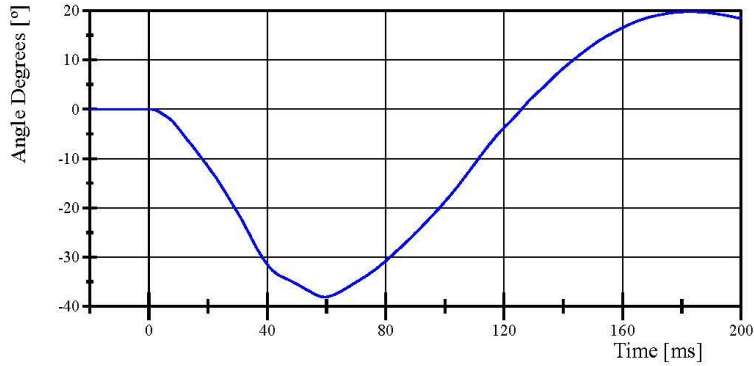
Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 47-2

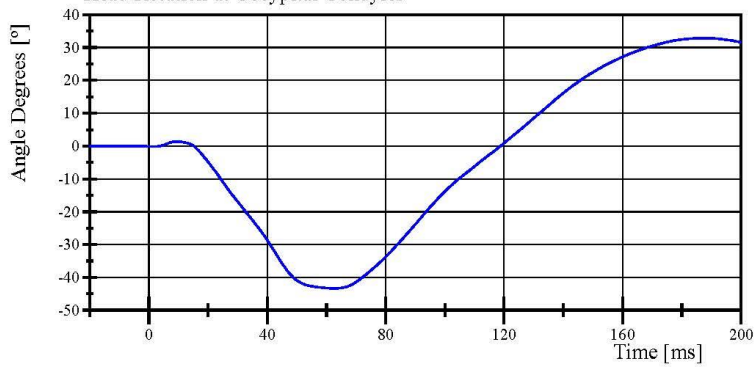
Test Date: 12/13/2018

Pot Rotation at the Base of Neck



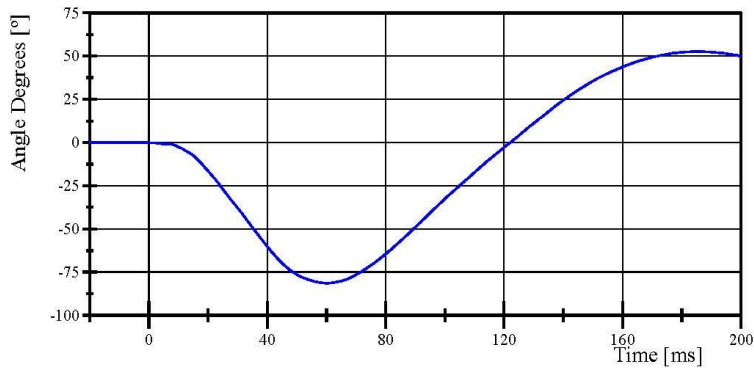
Filter Class: CFC_60
Max: 19.8 ° at 183.0 ms
Min: -38.1 ° at 59.5 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 32.8 ° at 188.0 ms
Min: -43.3 ° at 62.5 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 52.6 ° at 185.4 ms
Min: -81.4 ° at 60.1 ms

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

12.13.2018 09:51:01 1849

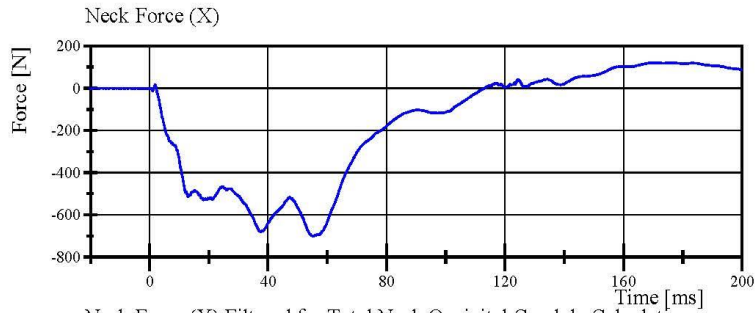


Transportation Research Center Inc.

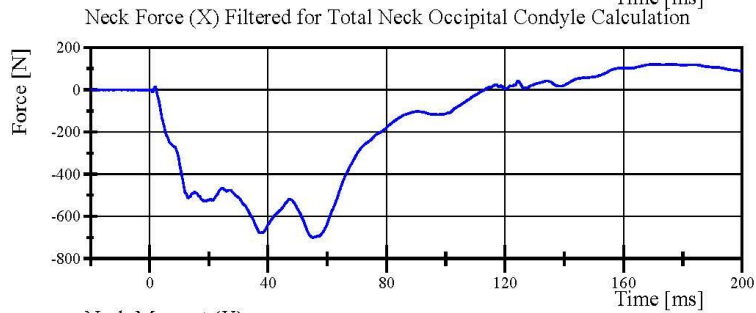
Neck Flexion

HIII 5th Serial No. 426 Certification No. 47-2

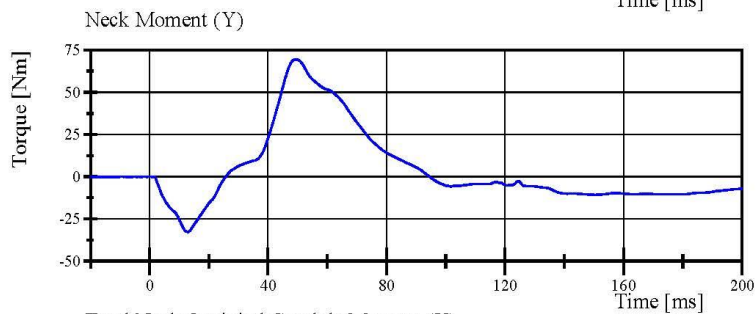
Test Date: 12/13/2018



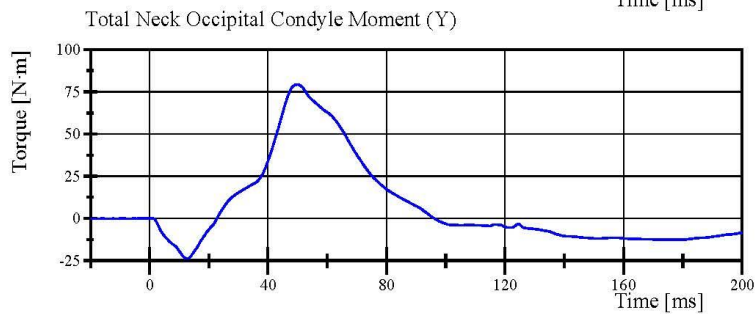
Filter Class: CFC_1000
Max: 122.5 N at 176.7 ms
Min: -699.5 N at 55.0 ms



Filter Class: CFC_600
Max: 121.4 N at 176.7 ms
Min: -699.4 N at 55.1 ms



Filter Class: CFC_600
Max: 69.5 Nm at 49.4 ms
Min: -32.7 Nm at 13.0 ms



Filter Class: Without_(Consta
Max: 79.3 N·m at 49.8 ms
Min: -23.6 N·m at 12.9 ms

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

12.13.2018 09:51:03 1849



Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 47-1

Test Date: 12/13/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.103 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.86 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.60 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	5.07 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	100.6 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-53.0 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	106.1 ms	Yes

Test meets specifications.

Condition: Used

Comments:

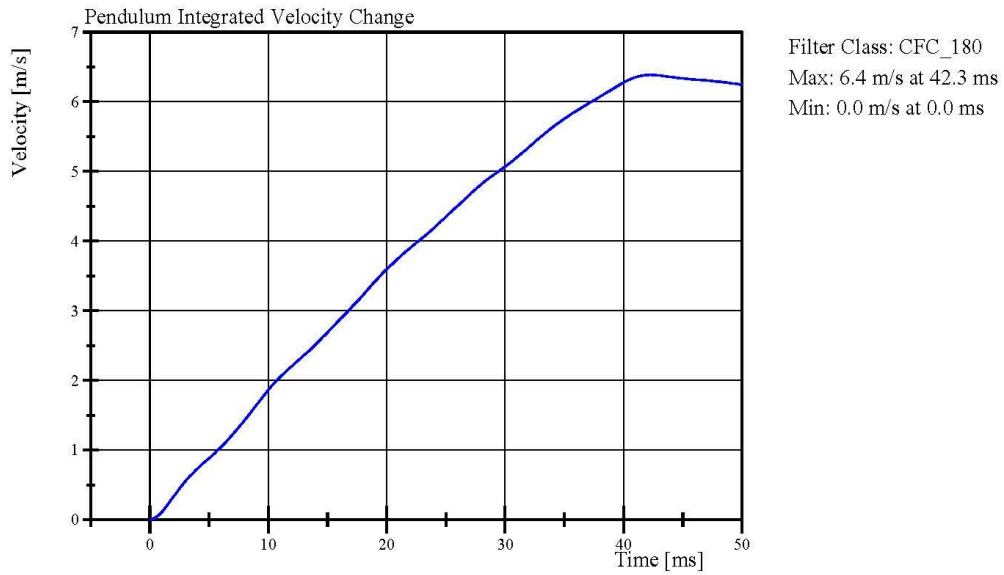
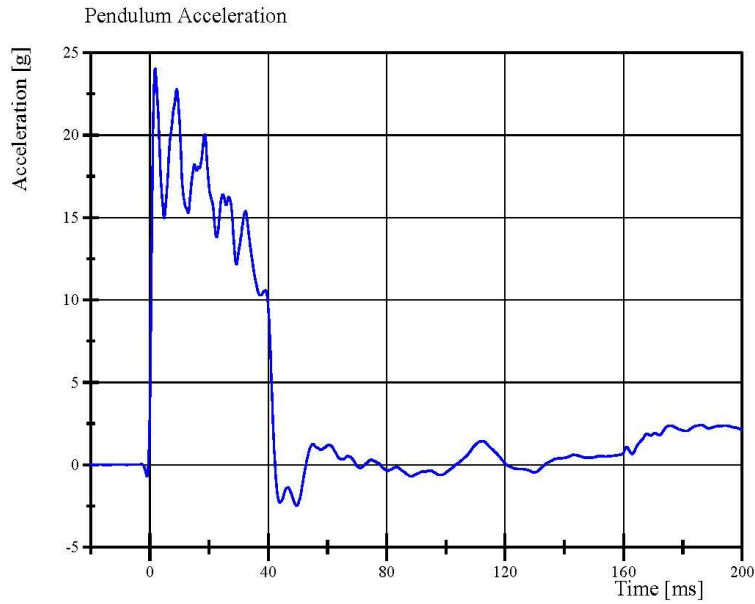
Neck S/N: DM2392

Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 47-1

Test Date: 12/13/2018



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

12.13.2018 10:27:14 1990



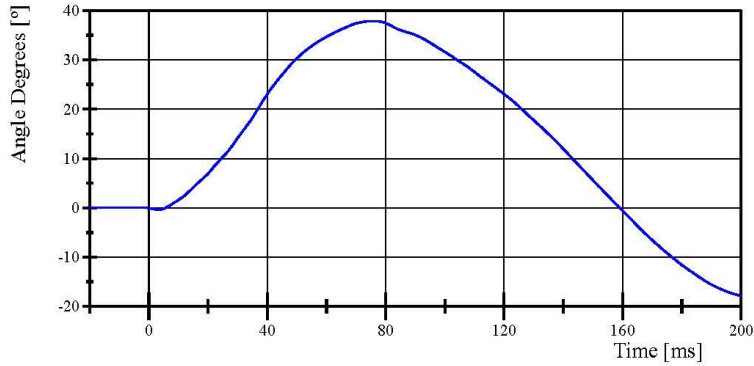
Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 47-1

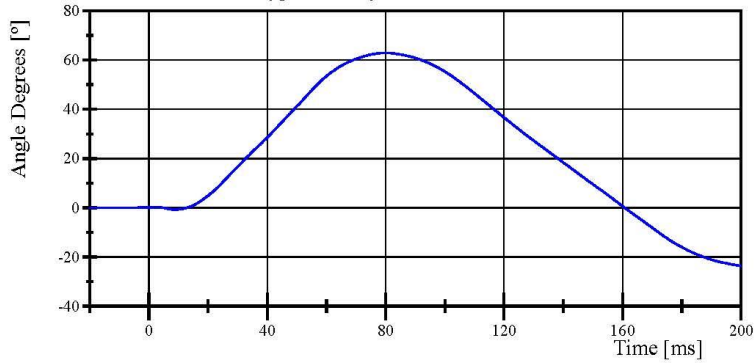
Test Date: 12/13/2018

Pot Rotation at the Base of Neck



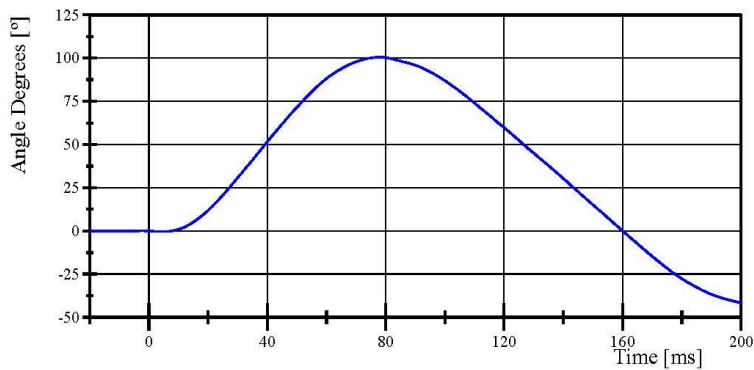
Filter Class: CFC_60
Max: 37.9 ° at 75.8 ms
Min: -17.9 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 62.8 ° at 80.0 ms
Min: -23.7 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 100.6 ° at 78.1 ms
Min: -41.6 ° at 200.0 ms

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

12.13.2018 10:27:15 1990

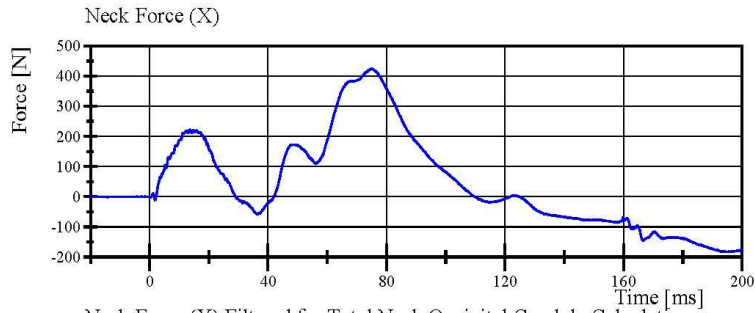


Transportation Research Center Inc.

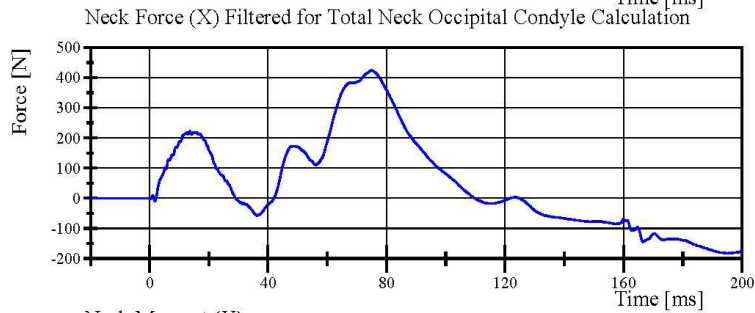
Neck Extension

HIII 5th Serial No. 426 Certification No. 47-1

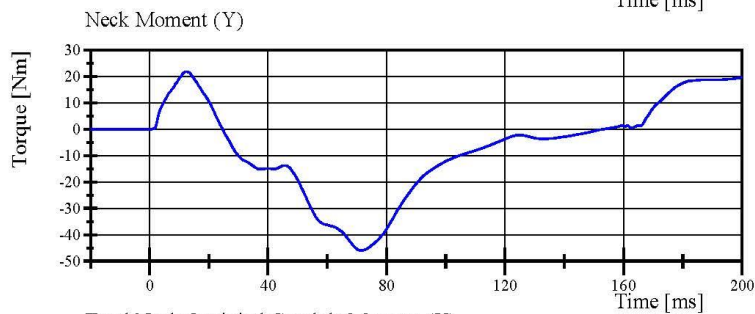
Test Date: 12/13/2018



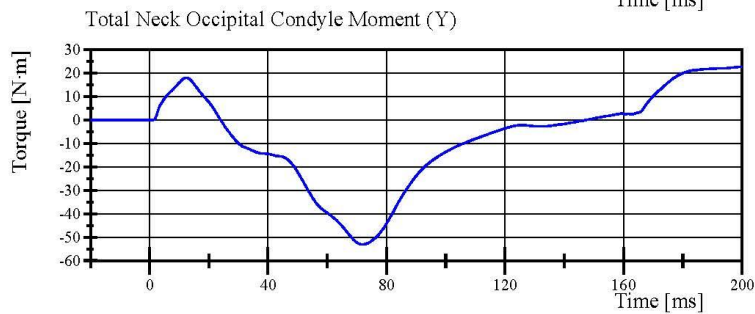
Filter Class: CFC_1000
Max: 425.2 N at 74.9 ms
Min: -182.8 N at 195.1 ms



Filter Class: CFC_600
Max: 424.6 N at 74.9 ms
Min: -182.6 N at 195.1 ms



Filter Class: CFC_600
Max: 21.9 Nm at 12.4 ms
Min: -46.0 Nm at 71.4 ms



Filter Class: Without_(Consta
Max: 22.7 N·m at 200.0 ms
Min: -53.0 N·m at 71.9 ms

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

12.13.2018 10:27:16 1990



Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 47-1

Test Date: 12/13/2018

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.815 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,266.7 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	>= (-4,600) N	-4,408.1 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-50.5 mm	Yes
Internal Hysteresis	69 - 85 %	75.4 %	Yes

Test meets specifications.

Condition: Used

Comments:

Jacket S/N: DG9935

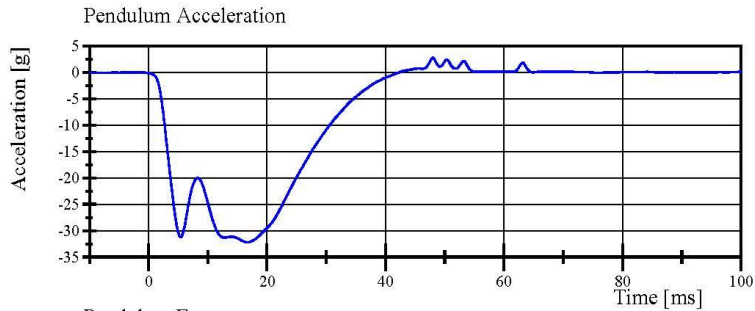
Rib Set S/N: DJ1164

Transportation Research Center Inc.

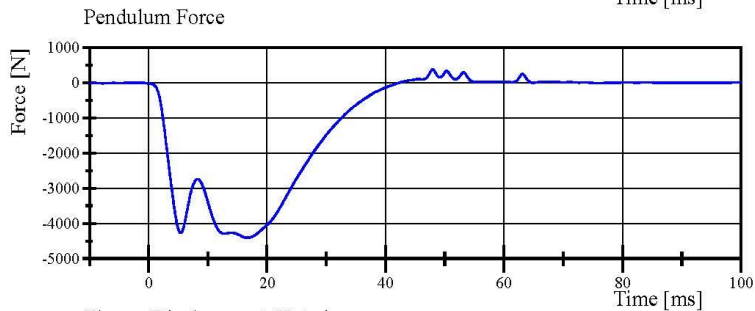
Front Thorax

HIII 5th Serial No. 426 Certification No. 47-1

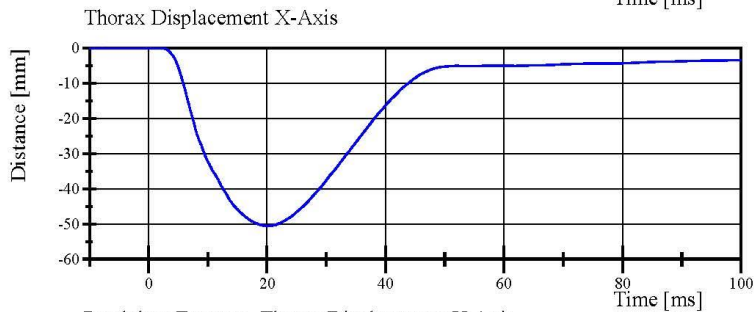
Test Date: 12/13/2018



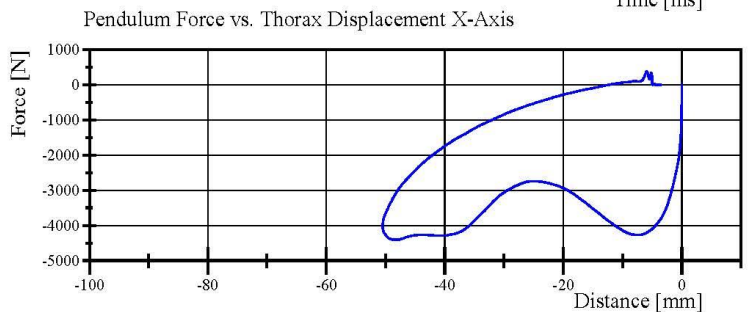
Filter Class: CFC_180
Max: 2.8 g at 48.0 ms
Min: -32.2 g at 16.6 ms



Filter Class: CFC_180
Max: 380.1 N at 48.0 ms
Min: -4,408.1 N at 16.6 ms



Filter Class: CFC_600
Max: 0.0 mm at -7.9 ms
Min: -50.5 mm at 20.1 ms



Filter Class: CFC_180
Max: 380.1 N at -5.9 mm
Min: -4,408.1 N at -48.3 mm

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

12.13.2018 08:20:27 410



Transportation Research Center Inc.

Hybrid III Small Female Torso Flexion

NHTSA

Serial Number: 426

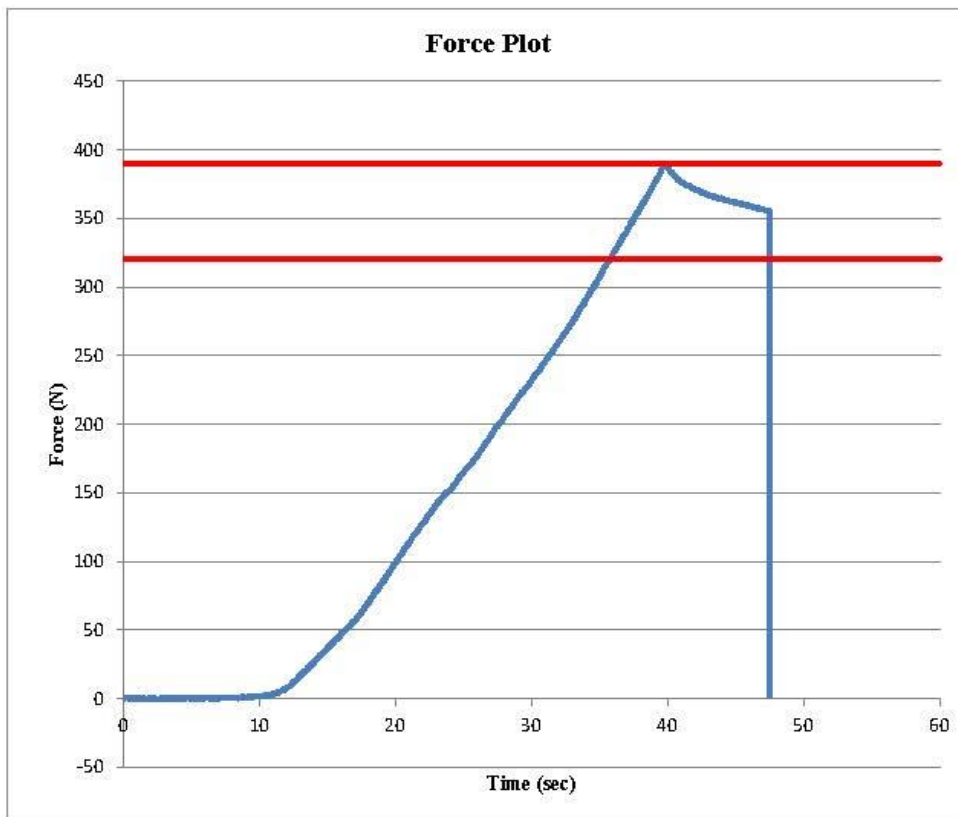
Date: 12/13/2018

Test Number: 1

Time: 8:21



TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.3 °C Pass
Humidity	10 - 70	41 % Pass
Average Angular Velocity	0.5 - 1.5	0.98 deg/sec Pass
Initial Angle	0 - 20	17.16 deg Pass
Peak Force at 45.31°	320 - 390	389.48 N Pass
Final Angle	-8 - 8	5.23 deg Pass



Comments:
Abdomen S/N: 1047
Pelvis S/N: 885
Lumbar S/N: N/A

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 47-1
Test Date: 12/12/2018

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.123 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,765.7 N	Yes

Test meets specifications.

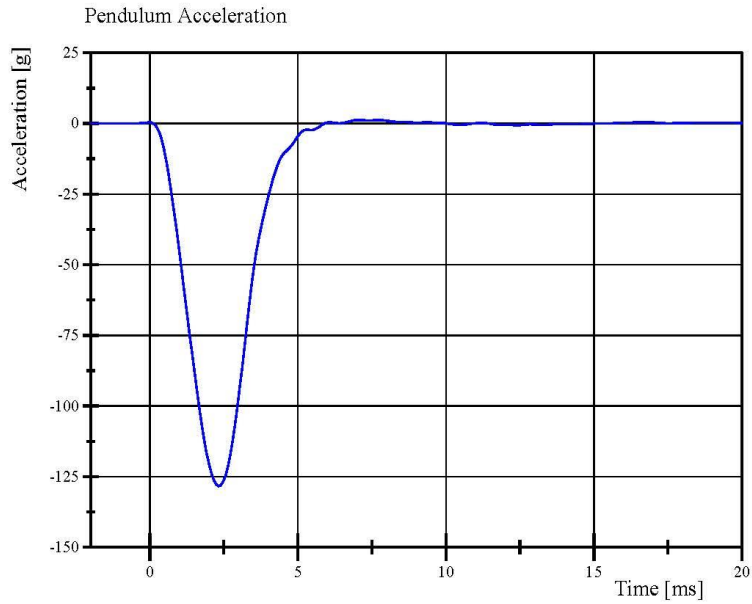
Condition: Used

Comments:

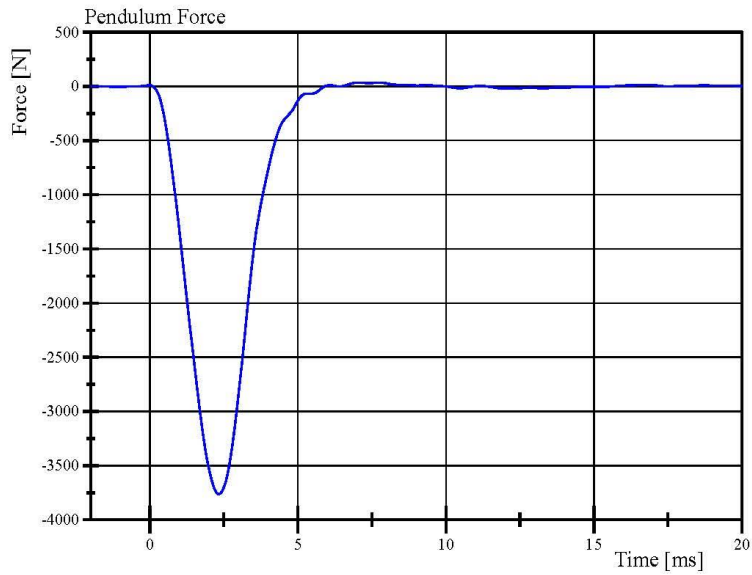
Knee Skin S/N: 1366

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 47-1
Test Date: 12/12/2018



Filter Class: CFC_600
Max: 1.2 g at 7.0 ms
Min: -128.4 g at 2.3 ms



Filter Class: CFC_600
Max: 34.6 N at 7.0 ms
Min: -3,765.7 N at 2.3 ms

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

12.12.2018 16:08:45 1780



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 47-1
Test Date: 12/12/2018

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.123 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,592.5 N	Yes

Test meets specifications.

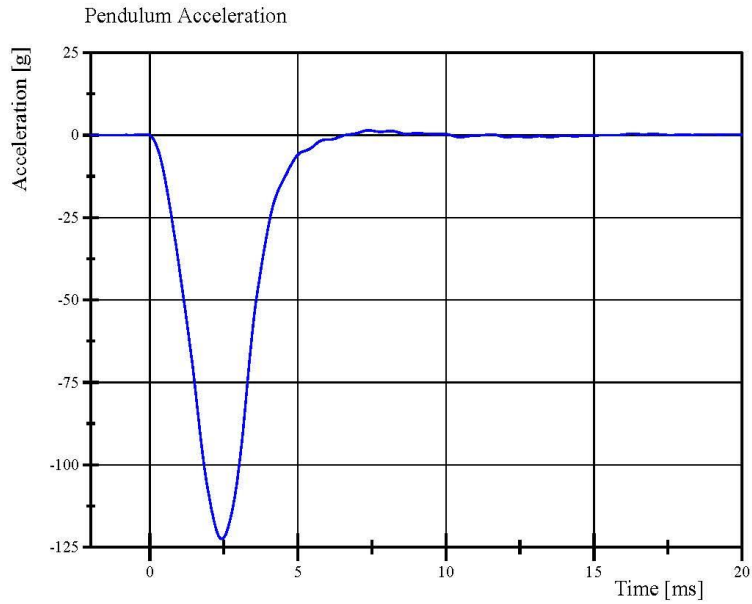
Condition: Used

Comments:

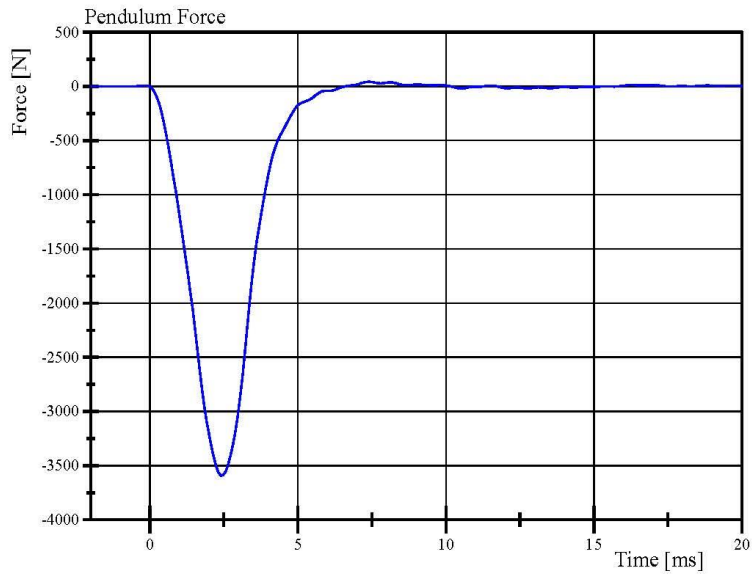
Knee Skin S/N: 1402

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 47-1
Test Date: 12/12/2018



Filter Class: CFC_600
Max: 1.4 g at 7.4 ms
Min: -122.5 g at 2.4 ms



Filter Class: CFC_600
Max: 42.2 N at 7.4 ms
Min: -3,592.5 N at 2.4 ms

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

12.12.2018 16:20:12 1782



Post-Test Calibration Sheets

Front Passenger S/N 426

Transportation Research Center Inc.
5720 HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 48

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	774.7 - 800.1	780	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	147	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	79	Yes
F	Thigh Clearance	119.4 - 134.6	129	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	534	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	429	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	870	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

Revised 8/10/12



Transportation Research Center Inc.

Front Head Drop
HIII 5th Serial No. 426 Certification No. 48-1
Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	47 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	283.6 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-1.8 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Condition: Used

Comments:

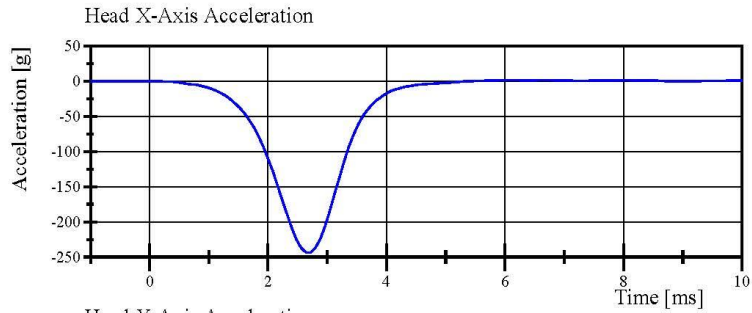
Head Skin S/N: 1348

Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 48-1

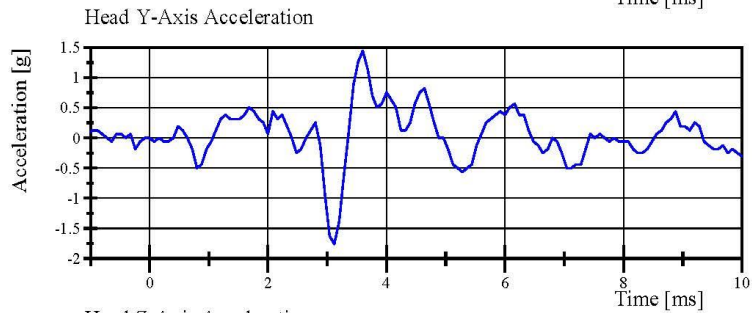
Test Date: 1/8/2019



Filter Class: CFC_1000

Max: 1.5 g at 6.0 ms

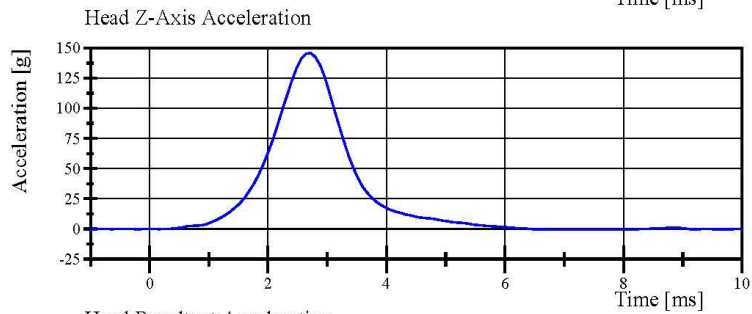
Min: -243.4 g at 2.6 ms



Filter Class: CFC_1000

Max: 1.4 g at 3.6 ms

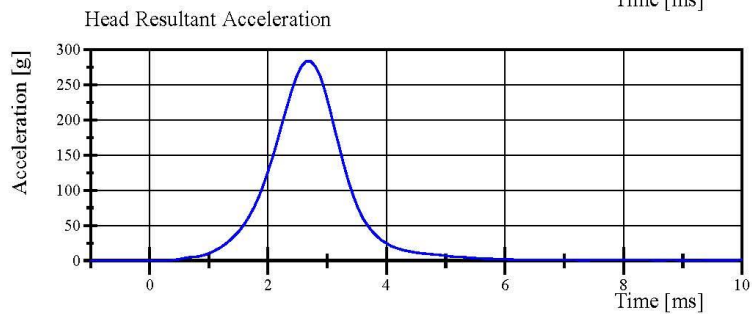
Min: -1.8 g at 3.1 ms



Filter Class: CFC_1000

Max: 145.9 g at 2.7 ms

Min: -0.7 g at 7.2 ms



Filter Class: CFC_1000

Max: 283.6 g at 2.7 ms

Min: 0.1 g at -0.4 ms

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

01.08.2019 09:56 606



Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 48-1

Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.9 °C	Yes
Relative Humidity	10 - 70 %	45 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	7.061 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	(-2.1) - (-2.5) m/s	-2.33 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	(-4.0) - (-5.0) m/s	-4.48 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.53 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-80.8 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	77.1 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	88.9 ms	Yes

Test meets specifications.

Condition: Used

Comments:

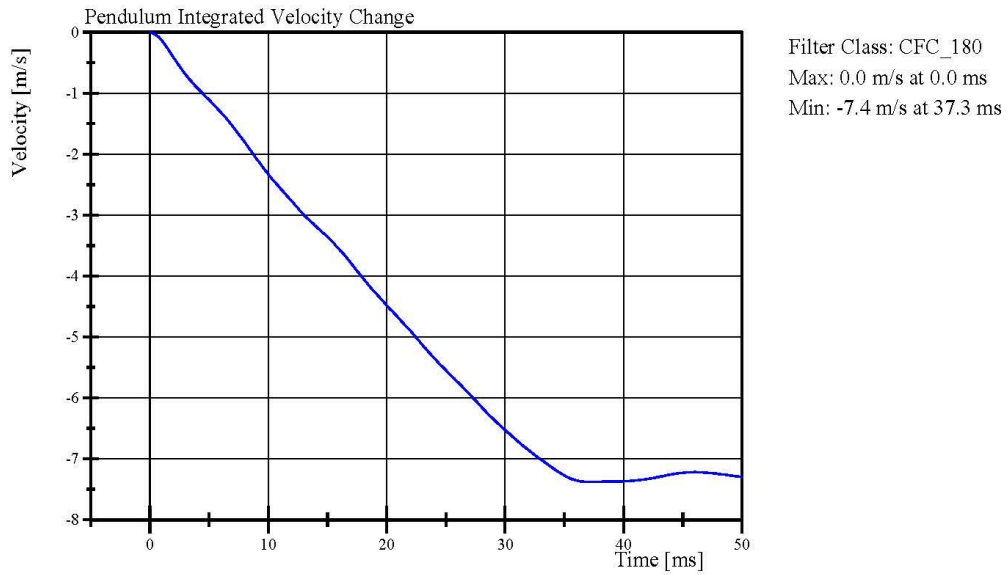
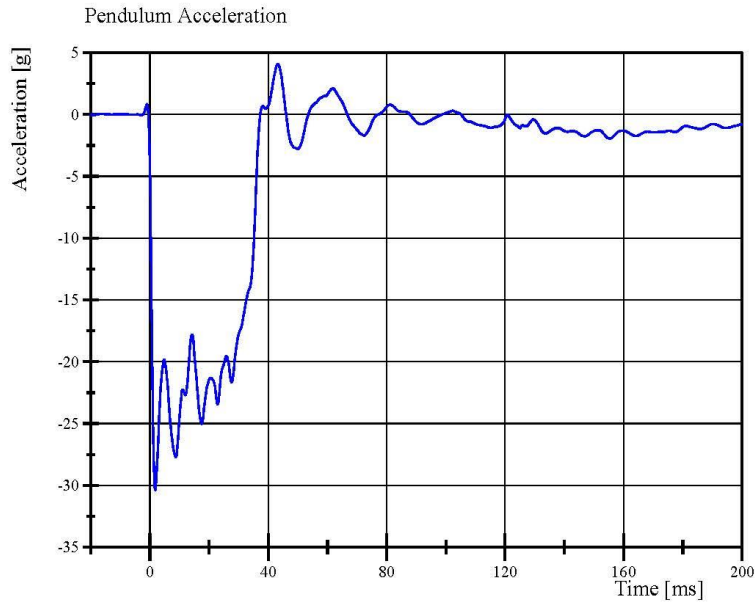
Neck S/N: DM2392

Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 48-1

Test Date: 1/8/2019



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

01.08.2019 08:10 1851



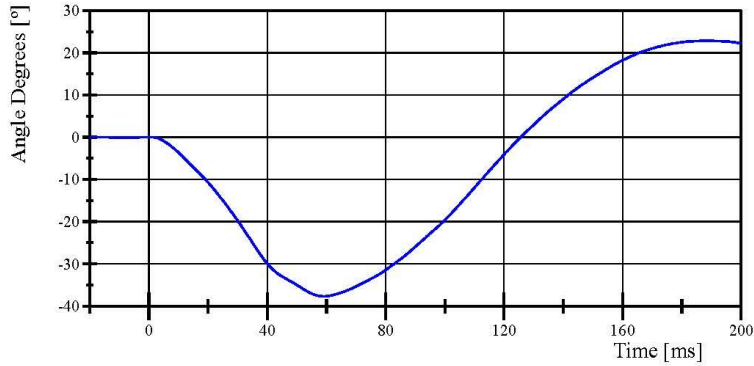
Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 48-1

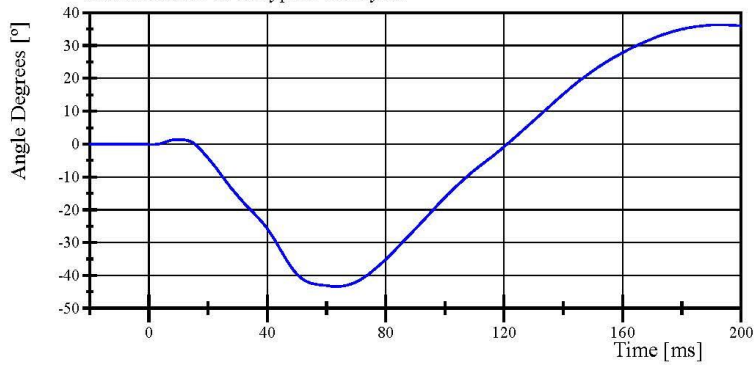
Test Date: 1/8/2019

Pot Rotation at the Base of Neck



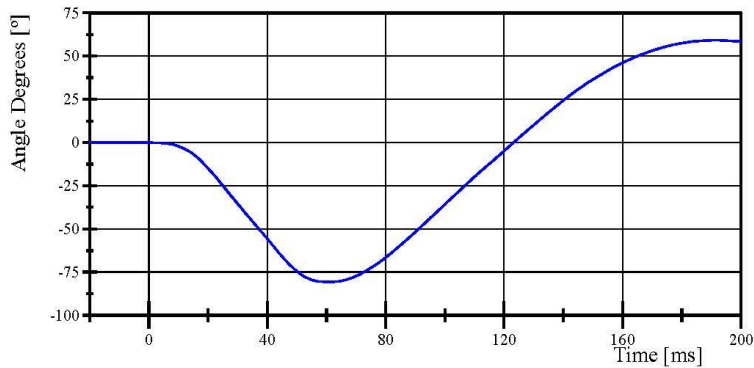
Filter Class: CFC_60
Max: 22.9 ° at 188.3 ms
Min: -37.7 ° at 59.1 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 36.3 ° at 192.5 ms
Min: -43.4 ° at 63.4 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 59.2 ° at 191.5 ms
Min: -80.8 ° at 60.9 ms

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

01.08.2019 08:10 1851

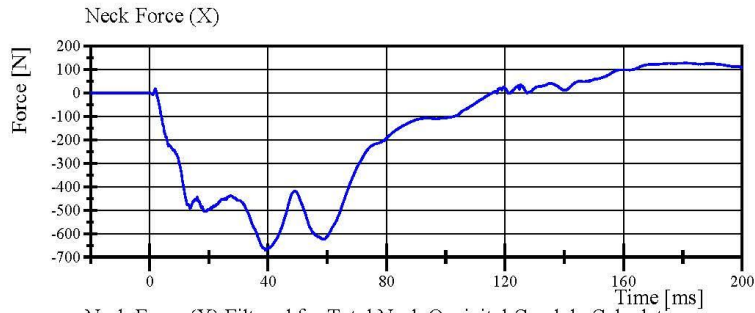


Transportation Research Center Inc.

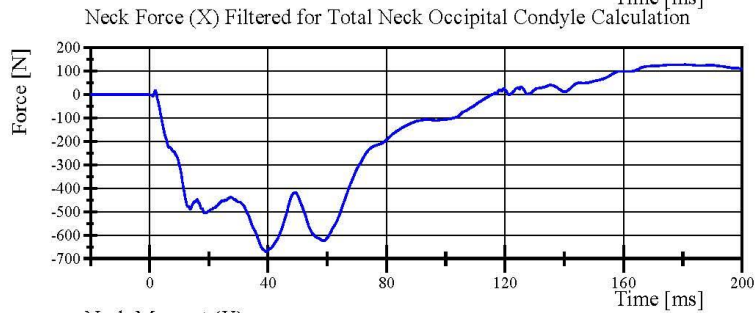
Neck Flexion

HIII 5th Serial No. 426 Certification No. 48-1

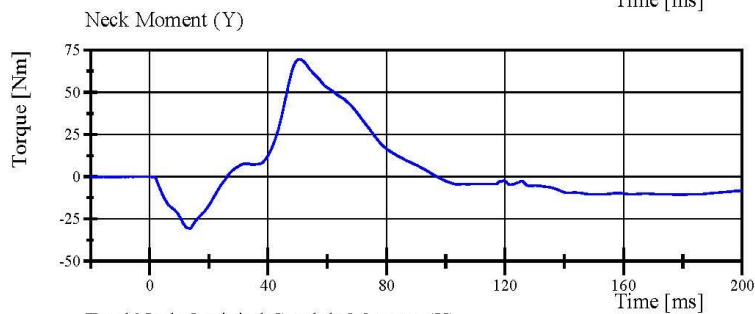
Test Date: 1/8/2019



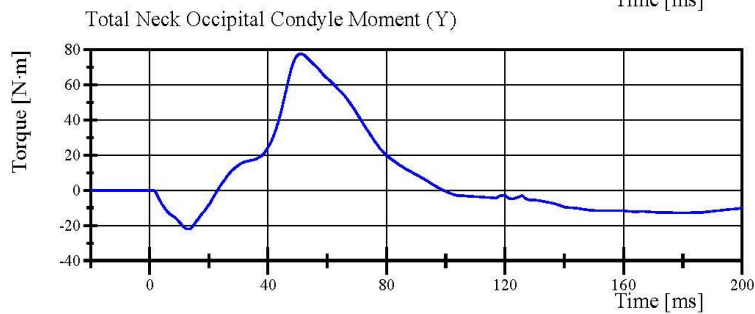
Filter Class: CFC_1000
Max: 128.4 N at 180.7 ms
Min: -669.4 N at 39.1 ms



Filter Class: CFC_600
Max: 128.1 N at 180.7 ms
Min: -669.2 N at 39.3 ms



Filter Class: CFC_600
Max: 69.6 Nm at 50.6 ms
Min: -30.7 Nm at 13.6 ms



Filter Class: Without_(Consta
Max: 77.6 N·m at 51.1 ms
Min: -22.0 N·m at 13.4 ms

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

01.08.2019 08:10 1851



Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 48-2

Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.106 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.81 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.43 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	4.95 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	110.9 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-53.7 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	108.6 ms	Yes

Test meets specifications.

Condition: Used

Comments:

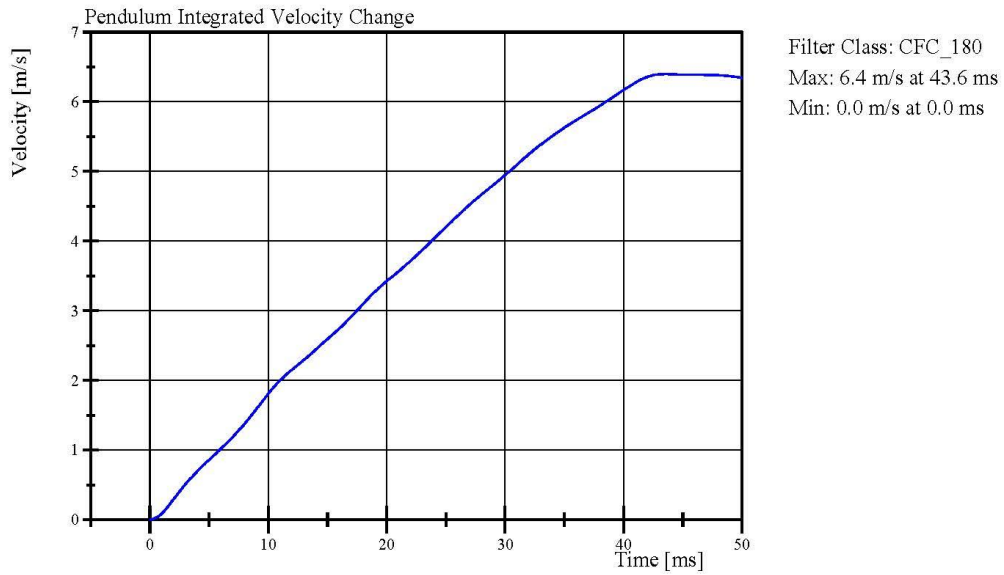
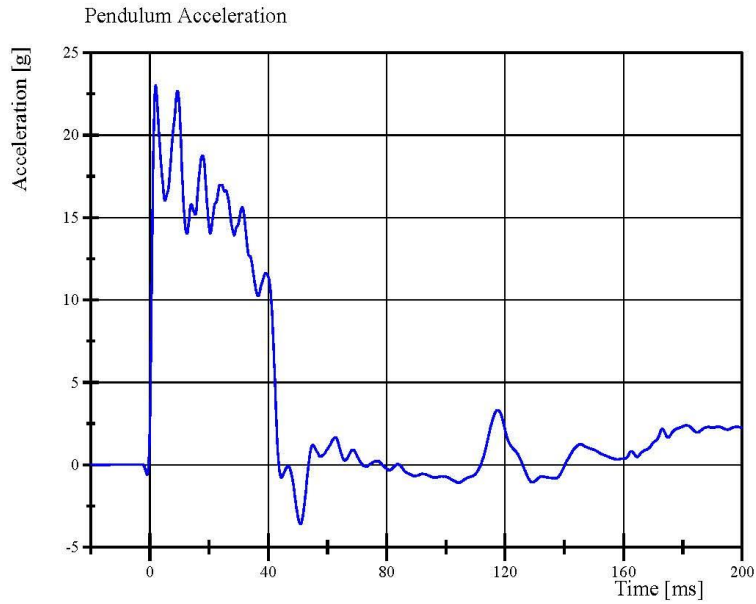
Neck S/N: DM2392

Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 48-2

Test Date: 1/8/2019



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

01.08.2019 09:27 1989



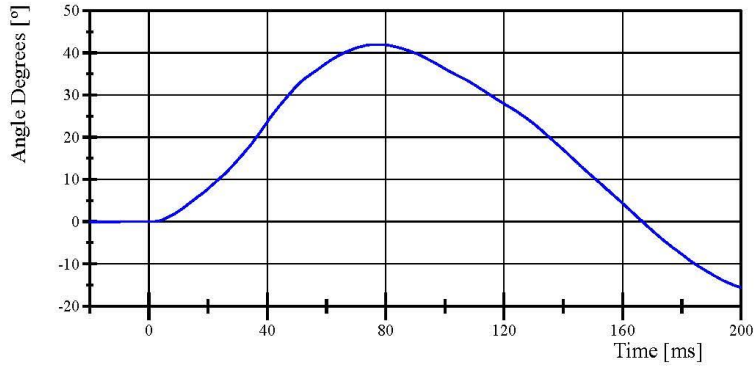
Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 48-2

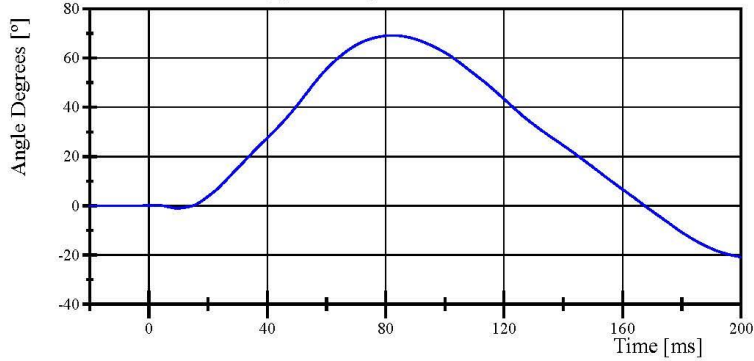
Test Date: 1/8/2019

Pot Rotation at the Base of Neck



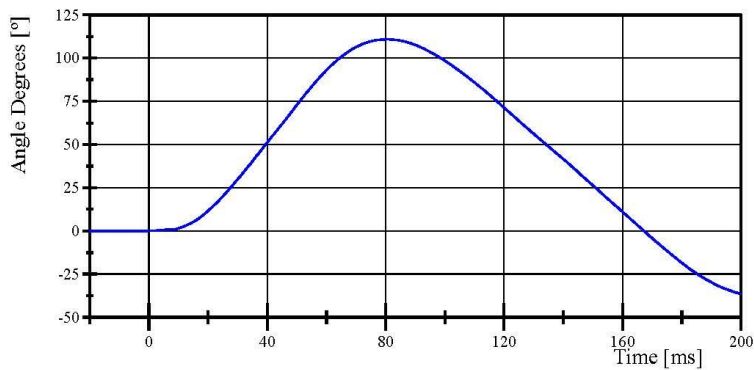
Filter Class: CFC_60
Max: 42.0 ° at 77.3 ms
Min: -15.6 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 69.1 ° at 82.3 ms
Min: -20.9 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 110.9 ° at 80.6 ms
Min: -36.5 ° at 200.0 ms

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

01.08.2019 09:27 1989

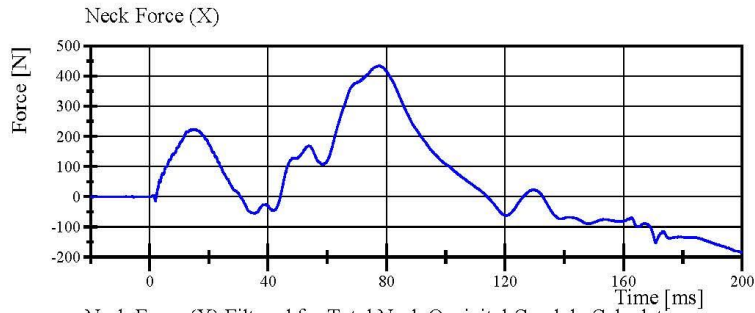


Transportation Research Center Inc.

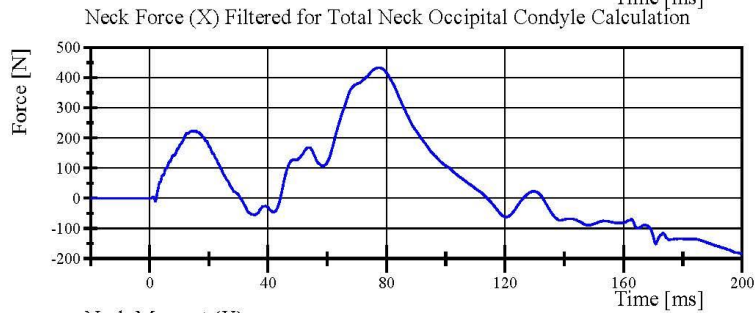
Neck Extension

HIII 5th Serial No. 426 Certification No. 48-2

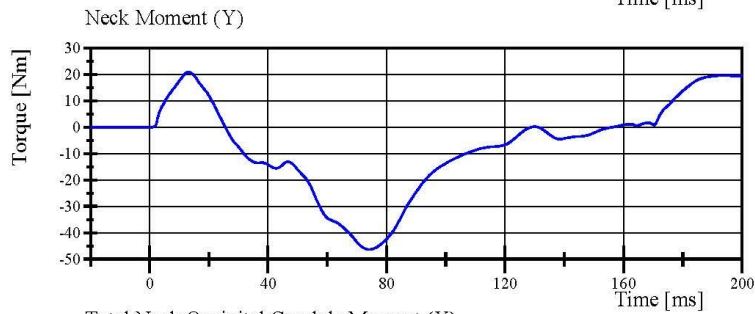
Test Date: 1/8/2019



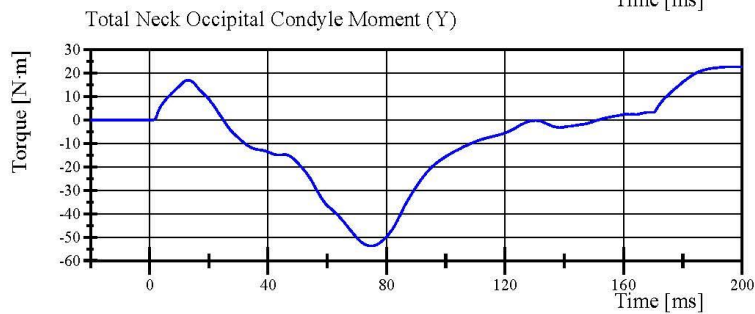
Filter Class: CFC_1000
Max: 434.0 N at 77.4 ms
Min: -183.5 N at 199.8 ms



Filter Class: CFC_600
Max: 433.6 N at 77.4 ms
Min: -183.2 N at 199.7 ms



Filter Class: CFC_600
Max: 20.8 Nm at 13.4 ms
Min: -46.3 Nm at 74.1 ms



Filter Class: Without_(Consta
Max: 22.7 N·m at 200.0 ms
Min: -53.7 N·m at 74.6 ms

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

01.08.2019 09:27 1989



Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 48-2

Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	39 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.733 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,343.9 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	>= (-4,600) N	-4,430.4 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-51.0 mm	Yes
Internal Hysteresis	69 - 85 %	74.6 %	Yes

Test meets specifications.

Condition: Used

Comments:

Jacket S/N: DG9935

Rib Set S/N: DJ1164

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

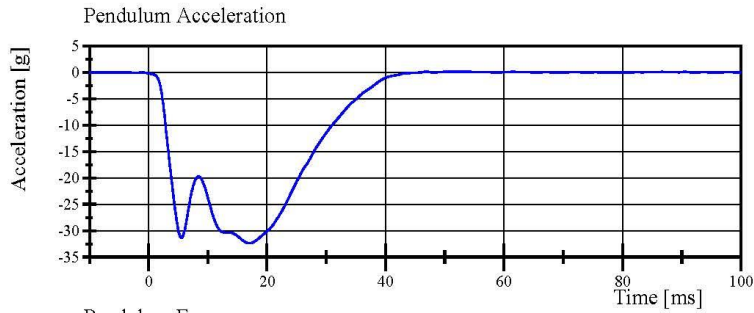
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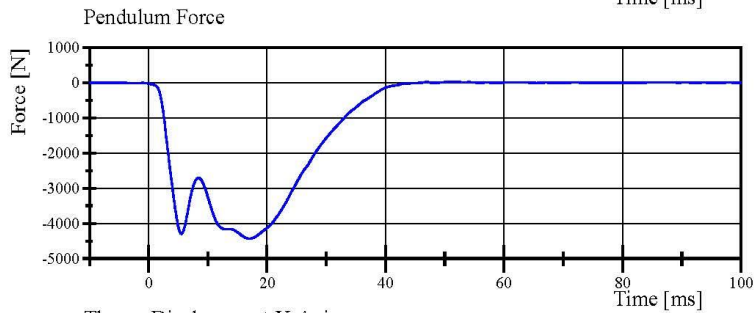


Transportation Research Center Inc.

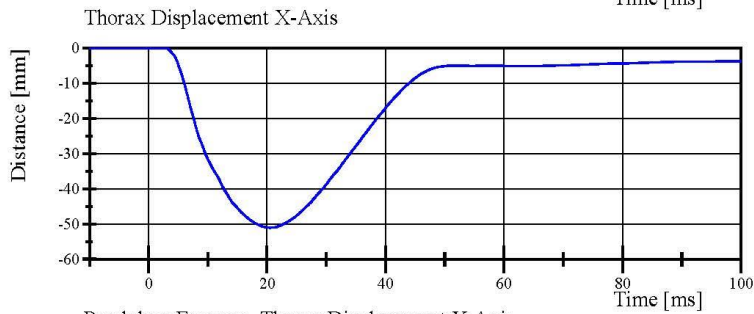
Front Thorax
HIII 5th Serial No. 426 Certification No. 48-2
Test Date: 1/8/2019



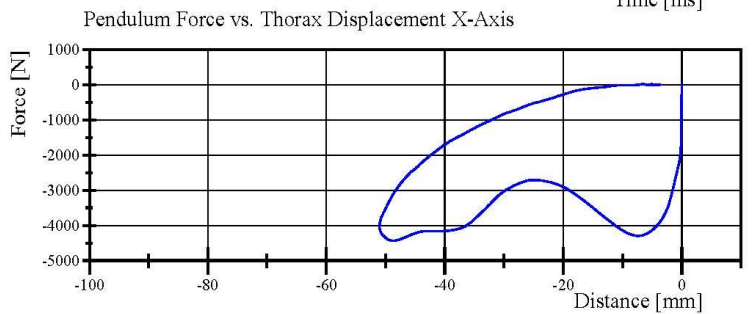
Filter Class: CFC_180
Max: 0.2 g at 50.6 ms
Min: -32.3 g at 17.0 ms



Filter Class: CFC_180
Max: 22.1 N at 50.6 ms
Min: -4,430.4 N at 17.0 ms



Filter Class: CFC_600
Max: 0.0 mm at -8.2 ms
Min: -51.0 mm at 20.6 ms



Filter Class: CFC_180
Max: 22.1 N at -5.0 mm
Min: -4,430.4 N at -48.7 mm

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

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Transportation Research Center Inc.

Hybrid III Small Female Torso Flexion

NHTSA

Serial Number: 426

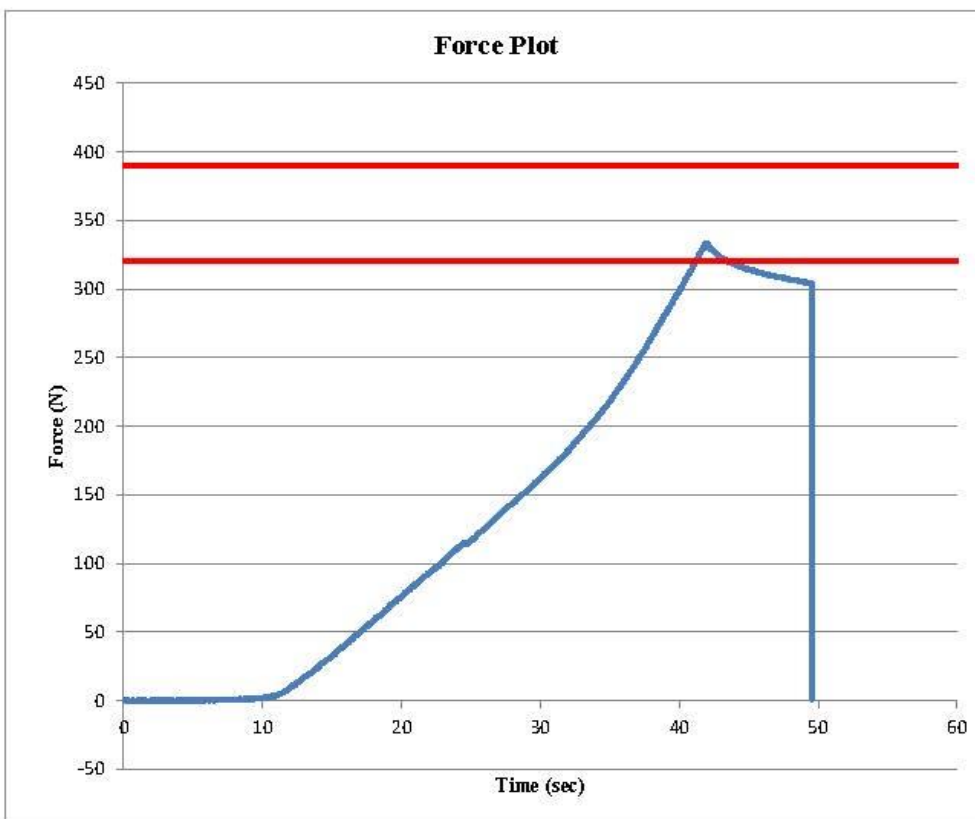
Date: 1/8/2019

Test Number: 1

Time: 12:59



TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.7 °C Pass
Humidity	10 - 70	47 % Pass
Average Angular Velocity	0.5 - 1.5	0.96 deg/sec Pass
Initial Angle	0 - 20	15.17 deg Pass
Peak Force at 45.21°	320 - 390	333.76 N Pass
Final Angle	-8 - 8	5.65 deg Pass



Comments:
Abdomen S/N: 1047
Pelvis S/N: 885
Lumbar S/N: N/A

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 48-1
Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	45 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.127 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,944.8 N	Yes

Test meets specifications.

Condition: Used

Comments:

Knee Skin S/N: 1366

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

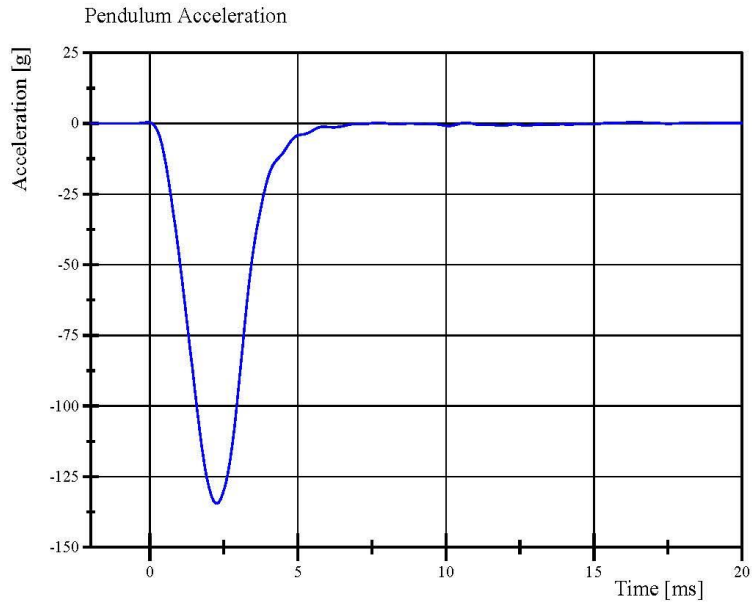
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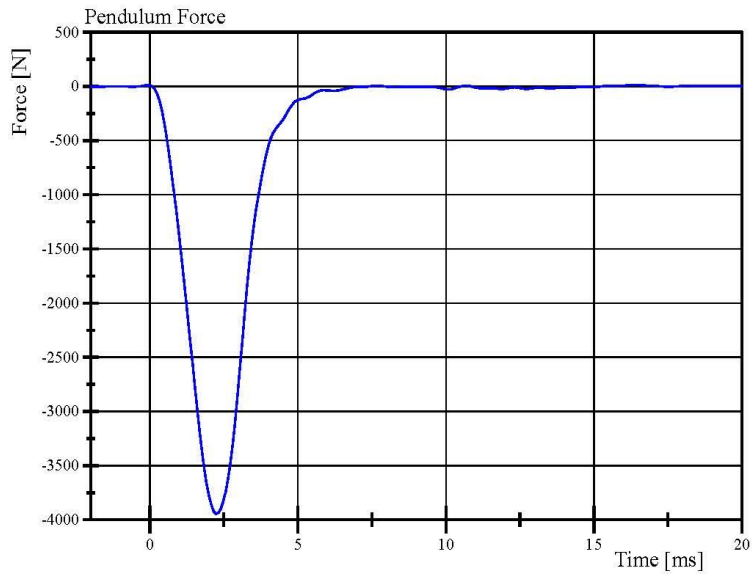


Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 48-1
Test Date: 1/8/2019



Filter Class: CFC_600
Max: 0.4 g at 16.3 ms
Min: -134.5 g at 2.2 ms



Filter Class: CFC_600
Max: 12.6 N at 16.3 ms
Min: -3,944.8 N at 2.2 ms

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

01.08.2019 08:25 1708



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 48-1
Test Date: 1/8/2019

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Probe Velocity	2.07 - 2.13 m/s	2.123 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,854.9 N	Yes

Test meets specifications.

Condition: Used

Comments:

Knee Skin S/N: 1402

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

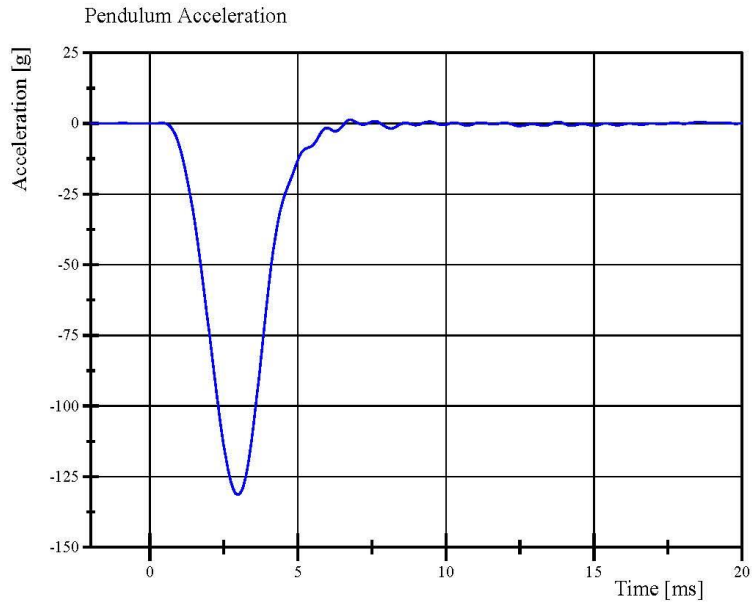
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01.08.2019 08:32 1698

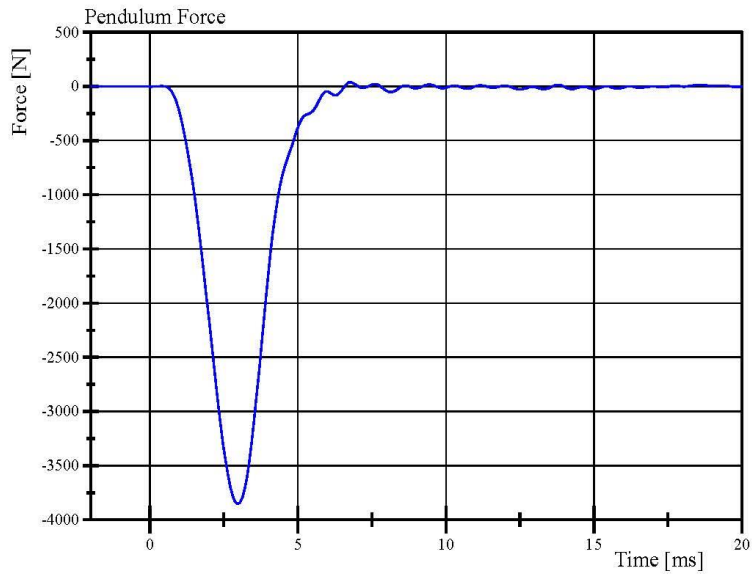


Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 48-1
Test Date: 1/8/2019



Filter Class: CFC_600
Max: 1.3 g at 6.8 ms
Min: -131.5 g at 3.0 ms



Filter Class: CFC_600
Max: 37.6 N at 6.8 ms
Min: -3,854.9 N at 3.0 ms

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

01.08.2019 08:32 1698



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	P94536	Endevco	19-Sep-2018		
		Y	P94650	Endevco	19-Sep-2018		
		Z	P94622	Endevco	19-Sep-2018		
	Redundant	X	P94431	Endevco	19-Sep-2018		
		Y	P94487	Endevco	19-Sep-2018		
		Z	P94645	Endevco	19-Sep-2018		
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	2-Apr-2018	
Chest Accelerometers	Primary	X	P87834	Endevco	19-Sep-2018		
		Y	P61255	Endevco	20-Sep-2018		
		Z	P45008	Endevco	20-Sep-2018		
	Redundant	X	P91177	Endevco	19-Sep-2018		
		Y	P94570	Endevco	20-Sep-2018		
		Z	P91172	Endevco	20-Sep-2018		
Chest Potentiometer			X	CST037	Servo	29-Mar-2018	
Pelvis Accelerometers			X	P91185	Endevco	19-Sep-2018	
			Y	P91876	Endevco	19-Sep-2018	
			Z	P91180	Endevco	19-Sep-2018	
Femur Load Cells	Left	Primary	Z	DI4215-FZ1	Denton	30-Mar-2018	
		Redundant	Z	DI4215-FZ2	Denton	30-Mar-2018	
	Right	Primary	Z	DI4216-FZ1	Denton	30-Mar-2018	
		Redundant	Z	DI4216-FZ2	Denton	30-Mar-2018	
Tibia Load Cells	Left	Upper	MX, MY, FZ	3643-94	Denton	30-Mar-2018	
		Lower	MX, MY, FZ	3644-370	Denton	2-Apr-2018	
	Right	Upper	MX, MY, FZ	3643-413	Denton	2-Apr-2018	
		Lower	MX, MY, FZ	3644-401	Denton	2-Apr-2018	
Foot Accelerometers	Left	Rear	X	P90848	Endevco	19-Sep-2018	
			Z	P91498	Endevco	19-Sep-2018	
		Front	Z	P90841	Endevco	19-Sep-2018	
	Right	Rear	X	P93467	Endevco	19-Sep-2018	
			Z	P97619	Endevco	19-Sep-2018	
		Front	Z	P94523	Endevco	19-Sep-2018	
Seat Belt Load Cells			Lap	N/A	X08013	Measurement Specialties	10-Jan-2018
			Shoulder	N/A	R141C4	Measurement Specialties	10-Jul-2018

TABLE 2 – Front Passenger Dummy Instrumentation

Instrumentation			Axis/Location	Hybrid III 5th S/N 426			
				Serial Number	Manufacturer	Calibration Date	
Head Accelerometers	Primary	X	P90285	Endevco	1-Oct-2018		
		Y	P90302	Endevco	1-Oct-2018		
		Z	P94534	Endevco	1-Oct-2018		
	Redundant	X	P89014	Endevco	1-Oct-2018		
		Y	P90855	Endevco	1-Oct-2018		
		Z	P94525	Endevco	1-Oct-2018		
Head Angular Rate Sensors			X	ARS14948	DTS	15-Oct-2018	
			Y	ARS14949	DTS	15-Oct-2018	
			Z	ARS14952	DTS	15-Oct-2018	
Upper Neck Load Cell			FX, FY, FZ, MX, MY, MZ	2207	Denton	1-Oct-2018	
Chest Accelerometers	Primary	X	P93543	Endevco	1-Oct-2018		
		Y	P93533	Endevco	1-Oct-2018		
		Z	P93402	Endevco	1-Oct-2018		
	Redundant	X	P91664	Endevco	1-Oct-2018		
		Y	P93546	Endevco	1-Oct-2018		
		Z	P93547	Endevco	1-Oct-2018		
Chest Potentiometer			X	CST426	Servo	1-Oct-2018	
Pelvis Accelerometers			X	P93514	Endevco	1-Oct-2018	
			Y	P87467	Endevco	1-Oct-2018	
			Z	P93766	Endevco	1-Oct-2018	
Femur Load Cells	Left	Primary	Z	DI4214-FZ1	Denton	1-Oct-2018	
		Redundant	Z	DI4214-FZ2	Denton	1-Oct-2018	
	Right	Primary	Z	DI4217-FZ1	Denton	1-Oct-2018	
		Redundant	Z	DI4217-FZ2	Denton	1-Oct-2018	
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	1-Oct-2018	
			Z	P91909	Endevco	1-Oct-2018	
		Front	Z	P97890	Endevco	4-Jan-2019	
	Right	Rear	X	P97640	Endevco	1-Oct-2018	
			Z	P91471	Endevco	1-Oct-2018	
		Front	Z	P91907	Endevco	1-Oct-2018	
Seat Belt Load Cells			Lap	N/A	R141CC	Measurement Specialties	10-Jul-2018
			Shoulder	N/A	R141C9	Measurement Specialties	10-Jul-2018

TABLE 3 – Vehicle Instrumentation

Instrumentation			Axis	Serial Number	Manufacturer	Calibration Date
Crossmember/Rear Seat Accelerometers	Left	Primary	X	P76171	Endevco	3-Aug-2018
			Z	P94561	Endevco	24-Oct-2018
	Right	Redundant	X	P94740	Endevco	24-Oct-2018
			Z	P73587	Endevco	24-Oct-2018
		Primary	X	P73587	Endevco	24-Oct-2018
			Z	P75713	Endevco	3-Aug-2018
Redundant	X	P73220	Endevco	24-Oct-2018		
	Z	P73220	Endevco	24-Oct-2018		
Engine Accelerometers	Top		X	P76114	Endevco	3-Aug-2018
	Bottom		X	P88038	Endevco	24-Oct-2018