Final Report Number: NCAP-TRC-13-001

New Car Assessment Program (NCAP)
Frontal Barrier Impact Test

General Motors LLC
2013 Buick Verano 4-Door Sedan
NHTSA Number: MD0105

Prepared By:
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10820 State Route 347
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Report Date: January 3, 2013

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

Prepared By: Mickey Benavides

Approved By: Margaret Susan

Approval Date: January 3, 2013

FINAL REPORT ACCEPTANCE BY OCWS:

_____

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

Date _____

_____

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

Date _____

Technical Report Documentation Page

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Final Report of New Car Assessment Program Frontal Impact Testing of a 2013 Buick Verano 4-Door Sedan NHTSA No. MD0105	January 3, 2013
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15. Supplemental Notes

16. Abstract

A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2013 Buick Verano 4-door Sedan in accordance with the specifications of the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301 and foot well intrusion performance. This test was conducted at the Transportation Research Center Inc. in East Liberty, Ohio on October 3, 2012

The impact velocity was 56.2 km/h, and the ambient temperature at the barrier face at the time of impact was 21° C. The target vehicle post-test maximum crush was 548 millimeters at 378 mm to the left of the vehicle longitudinal centerline. The test vehicle's performance is as follows:

	Driver ATD			Passenger ATD		
Measurement Description	Units	Threshold	Result	Units	Threshold	Result
Head Injury Criteria (HIC_{15})	NA	700	156	NA	700	382
Maximum Chest Compression	mm	63	18	mm	52	13
Nij	NA	1	.25	NA	1	.21
Neck Tension	N	4170	-492	N	2620	-334
Neck Compression	N	4000	121	N	2520	413
Left Femur Force	N	10008	-211	N	6805	-225
Right Femur Force	N	10008	-489	N	6805	-560

17. Key Words	18. Distribution Statement
35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP)	Copies of this report are available from: National Highway Traffic Safety Administration Technical Information Services Division, NPO-411 1200 New Jersey Ave, SE Washington, DC 20590 Email: tis@nhtsa.dot.gov FAX: 202-493-2833

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. Number of Pages	22. Price
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1: PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 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 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure, dated September 2012.

SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2013 Buick Verano 4-Door Sedan, at a velocity of 56.2 km/h. The test was performed at Transportation Research Center, Inc. on October 3, 2012. 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 Frontal NCAP Laboratory Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver and passenger lap and shoulder belts to measure dummy torso and pelvic section loading.

The driver (position 1) ATD (Serial No. 037) and the right-front passenger (position 2) ATD (Serial No. 426) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 132 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 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 548 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: Airbag, Head Restraint, and Knee Airbag. The passenger's visible contact points were as follows: Airbag, Head Restraint, 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)	156	.25	492	121	42.4	18	211	489
Passenger (5^{th} Female)	382	.21	334	413	38.7	13	225	560

2: OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

NHTSA No.	MD0105
Model Year	2013
Make	Buick
Model	Verano
Body Style	4-Door Sedan
VIN	IG4PP5SK2D4100715
Body Color	Blue
Odometer Reading (miles)	9
Engine Displacement (L)	2.4
Number of Cylinders	4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	No
Final Drive	Front
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADL)	Yes

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

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

DATA FROM CERTIFICATION LABEL

Manufactured by	General Motors LLC
Date of Manufacture	8/12

GVWR (kg)	1978
GAWR Front (kg)	1061
GAWR Rear (kg)	917

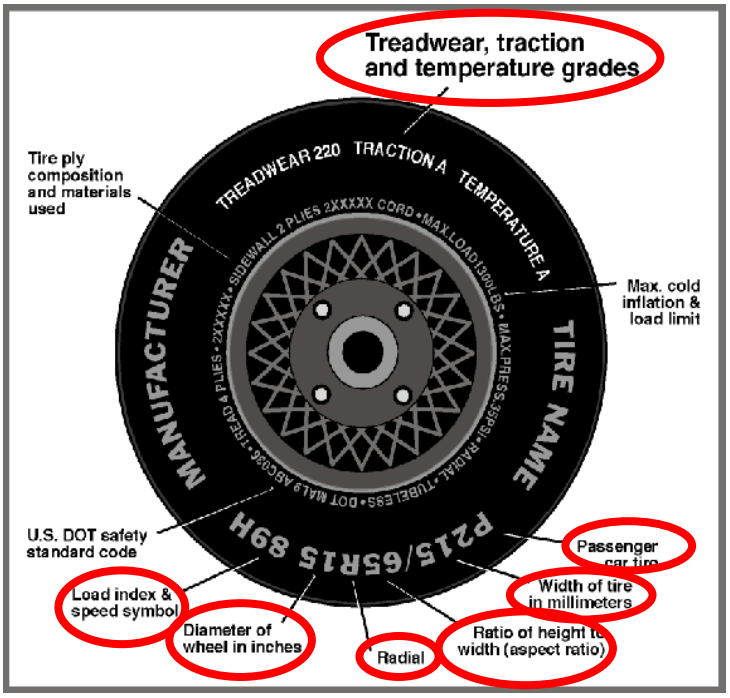
VEHICLE SEATING AND WEIGHT CAPACITY

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				400
Cargo Wt. (RCLW) (kg)				59.80

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold / Test Pressure (kPa)	220	220
Recommended Tire Size	P235/45R18	P235/45R18
Tire Size on Vehicle	P235/45R18	P235/45R18
Tire Manufacturer	Continental	Continental
Tire Model	Conti Pro Contact	Conti Pro Contact
Treadwear	500	500
Traction Grade	AA	AA
Temperature Grade	AA	AA
Tire Plies Sidewall	ND	ND
Tire Plies Body	ND	ND
Load Index/Speed Symbol	94H	94H
Tire Material	Rubber	Rubber
DOT Safety Code Right	ND	ND
DOT Safety Code Left	ND	ND

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	486.2	307.0		520.0	379.2	
Right	kg	461.6	299.4		478.6	370.4	
Ratio	%	61.0	39.0		57.1	42.9	
Totals	kg	947.8	606.4	1554.2	998.6	749.6	1748.2

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1554.2
Weight of 1 P572E ATD & 1 P572O ATD	kg	139.3
Rated Cargo/Luggage Weight (RCLW)	kg	59.8
Vehicle Target Weight (TVTW)	kg	1753.3

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	702	705	705	710	1047.6
As Tested	mm	696	699	678	682	1151.3
Post Test	mm	698	745	655	684	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2685
Total Vehicle Length at Left Side	mm	4483
Total Vehicle Length at Centerline	mm	4668
Total Vehicle Length at Right Side	mm	4483
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	28.8
Amount of Stoddard Solvent in Fuel Tank	liters	54.9

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

Tail lights, rear windows, rear door panels, power window motors, rear door speakers, rear fascia, trunk lid liner, left outside rear view mirror, rear door seals, and rear bumper impact absorber.

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4668
2	Total Width	1790
3	Bumper Top Height	ND
4	Bumper Bottom Height	ND
5	Longitudinal Member Top Height	ND
6	Distance Between Longitudinal Members	ND
7	Longitudinal Member Width	ND
8	Engine Top Height	ND
9	Engine Bottom Height	ND
10	Engine and Gearbox Width	ND
11	Front Bumper-Engine Distance	575
12	Front Shock Absorber Fixing Height	ND
13	Bonnet Leading Edge Height	ND
14	Front Shock Absorber Fixing Width	ND
15	Front Bumper – Front Axle Distance	715
16	Front Axle – A-Pillar Distance	410
17	A-Pillar – B-Pillar Distance	978
18	B-Pillar – Rear Axle Distance	1215
19	B-Pillar – C-Pillar Distance	ND
20	Roof Sill Bottom Height	ND
21	Roof Sill Top Height	ND
22	Floor Sill Bottom Height	690
23	Floor Sill Top Height	ND

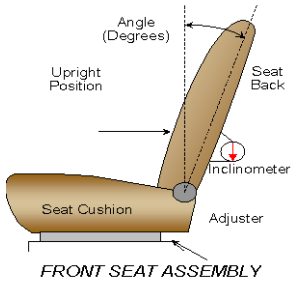
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

NORMAL DESIGN RIDING POSITION

For adjustable driver and passenger seat back. 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:	8.4
Passenger Seat back angle:	3.2

SEAT FORE/AFT POSITIONS

Describe the method used of determining seat for/aft positions.

Driver: 20 of 53 notches
Passenger: 0 of 50 notches

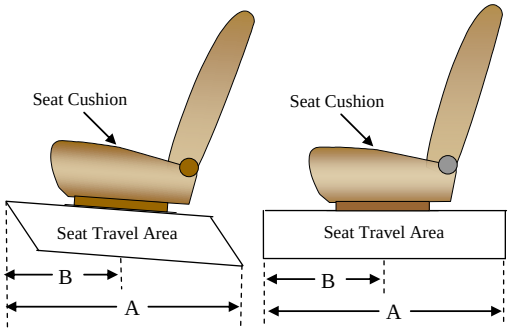
	Total Fore/Aft Travel	Placed in Position No.
Driver Seat	53	Mid of full travel
Passenger Seat	50	Full forward

SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages.

Driver: 1 of 5
Passenger: 1 of 5

	Total No. of Positions	Placed in Position No.
Driver Seat	5	1
Passenger Seat	5	1



DATA SHEET NO. 2 (CONTINUED)

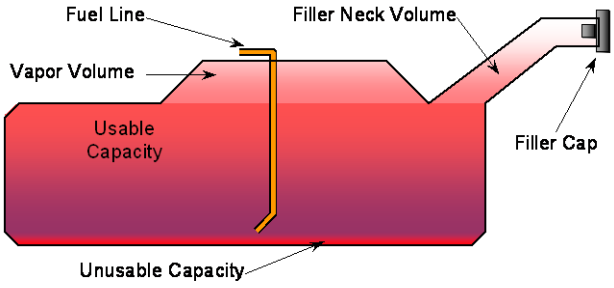
SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	15.6
Usable Capacity of "Optional" Tank	NA
92%-94% of Usable Capacity	95
Actual Amount of Solvent used	54.9
1/3 of Usable Capacity	19.7

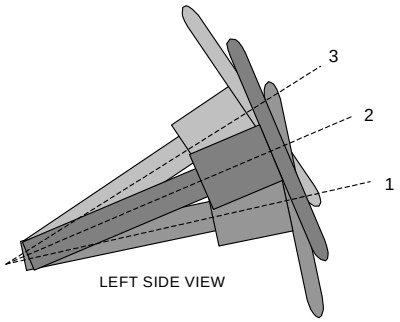
The test vehicle is equipped with an electric fuel pump. The fuel pump operates for approximately two seconds after the ignition is placed in the "ON" position, after which the fuel pump automatically shuts off. The fuel filler door is located on the left rear fender. The standard fuel tank occupies the area under the rear seat.



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. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

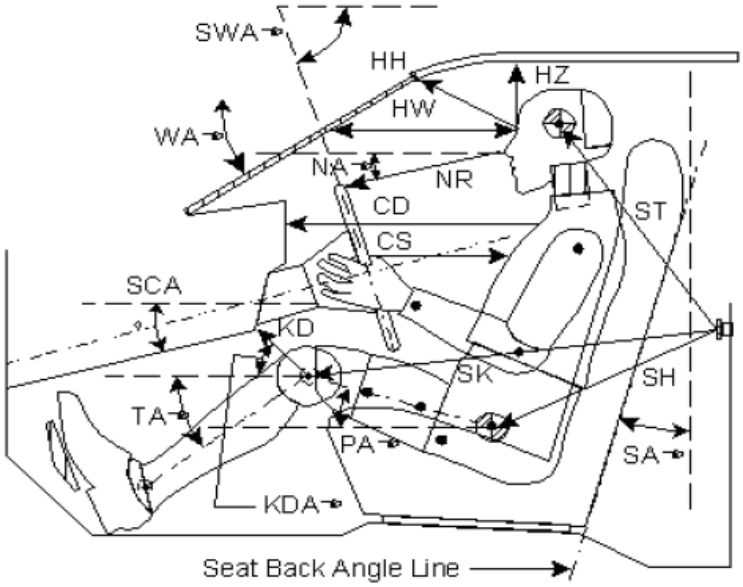
STEERING COLUMN POSITIONS

	Degrees	Fore/Aft Position, mm
Lowermost Position No. 1	70.7	NA
Geometric Center Position No. 2	68.7	NA
Uppermost Position No. 3	66.8	NA
Telescoping Steering Wheel Travel	200	NA
Test Position	68.7	NA

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

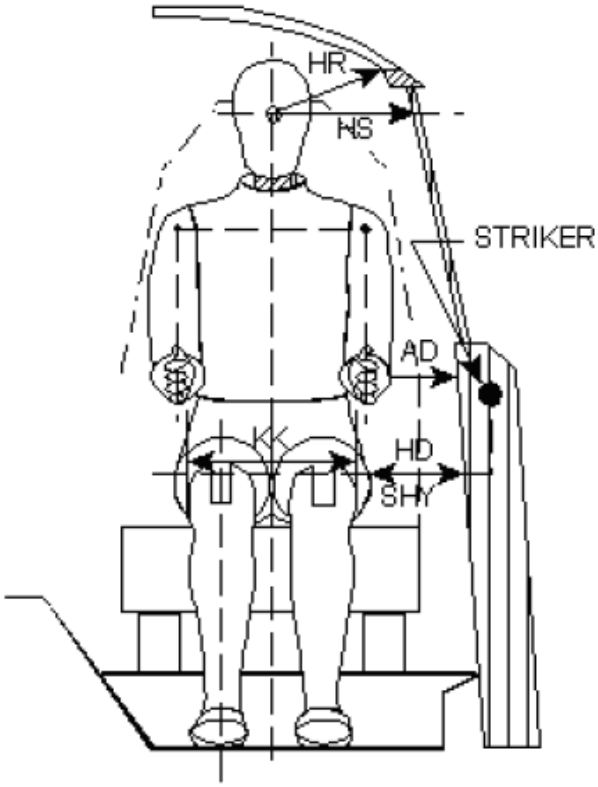


Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (º)	Length (mm)	Angle (º)
WAº	Windshield Angle		25.6		
SWAº	Steering Wheel Angle		68.8		
SCAº	Steering Column Angle		21.2		
SAº	Seat Back Angle (on headrest post)		8.4		3.2
HZ	Head to Roof (Z)	226		235	
HH	Head to Header	455		361	
HW	Head to Windshield	828		776	
NR	Nose to Rim	411	5.7		
CD	Chest to Dash	583		449	
CS	Chest to Steering Hub	330			
RA	Rim to Abdomen	233			
KDL	Left Knee to Dash	228	31.6	127	
KDR	Right Knee to Dash	193		147	31
PAº	Pelvic Angle		23.5		21.6
TAº	Tibia Angle		38.1		51
SK	Striker to Knee	511	4.6	630	3.1
ST	Striker to Head	439	-89	439	-69
SH	Striker to H-Point	297	57.7	349	26.4

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

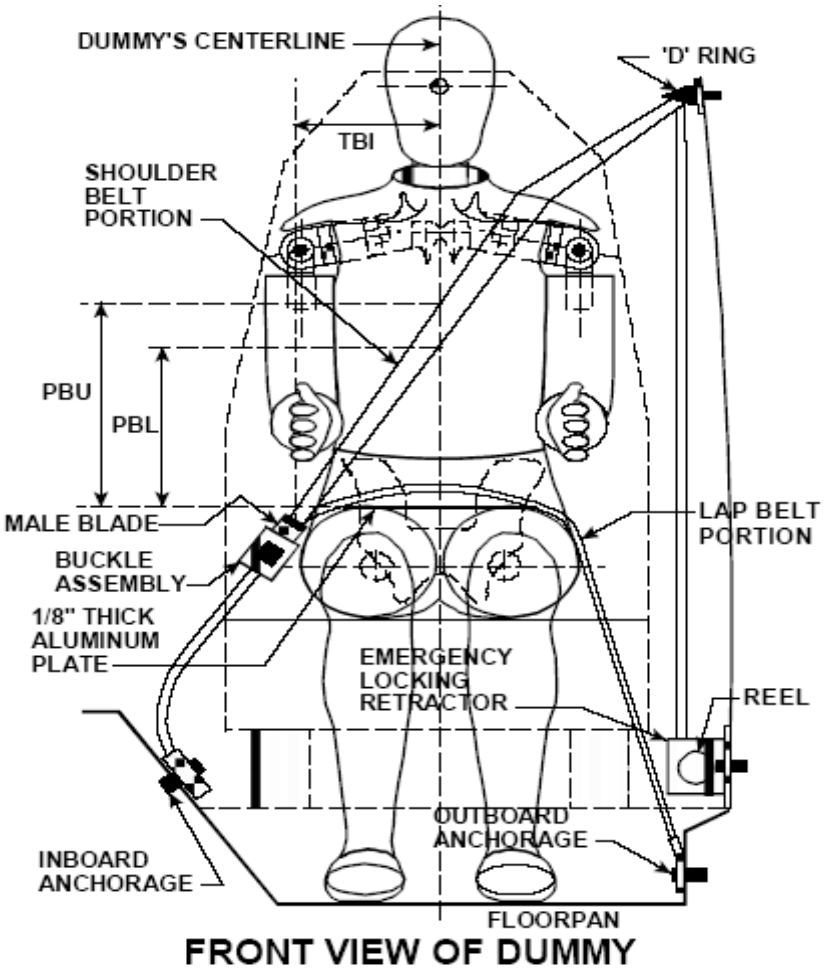


Code	Measurement Description	Driver	Passenger
AD	Arm to Door	100	170
HD	H-Point to Door	173	184
HR	Head to Side Header	222	252
HS	Head to Side Window	320	350
KK	Knee to Knee	286	167
SHY	Striker to H-Point (Y Direction)	127	155
AA	Ankle to Ankle	ND	ND

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU – Top surface of reference to belt upper edge	mm	342	252
PBL – Top surface of reference to belt lower edge	mm	261	165

BELT LENGTH DATA

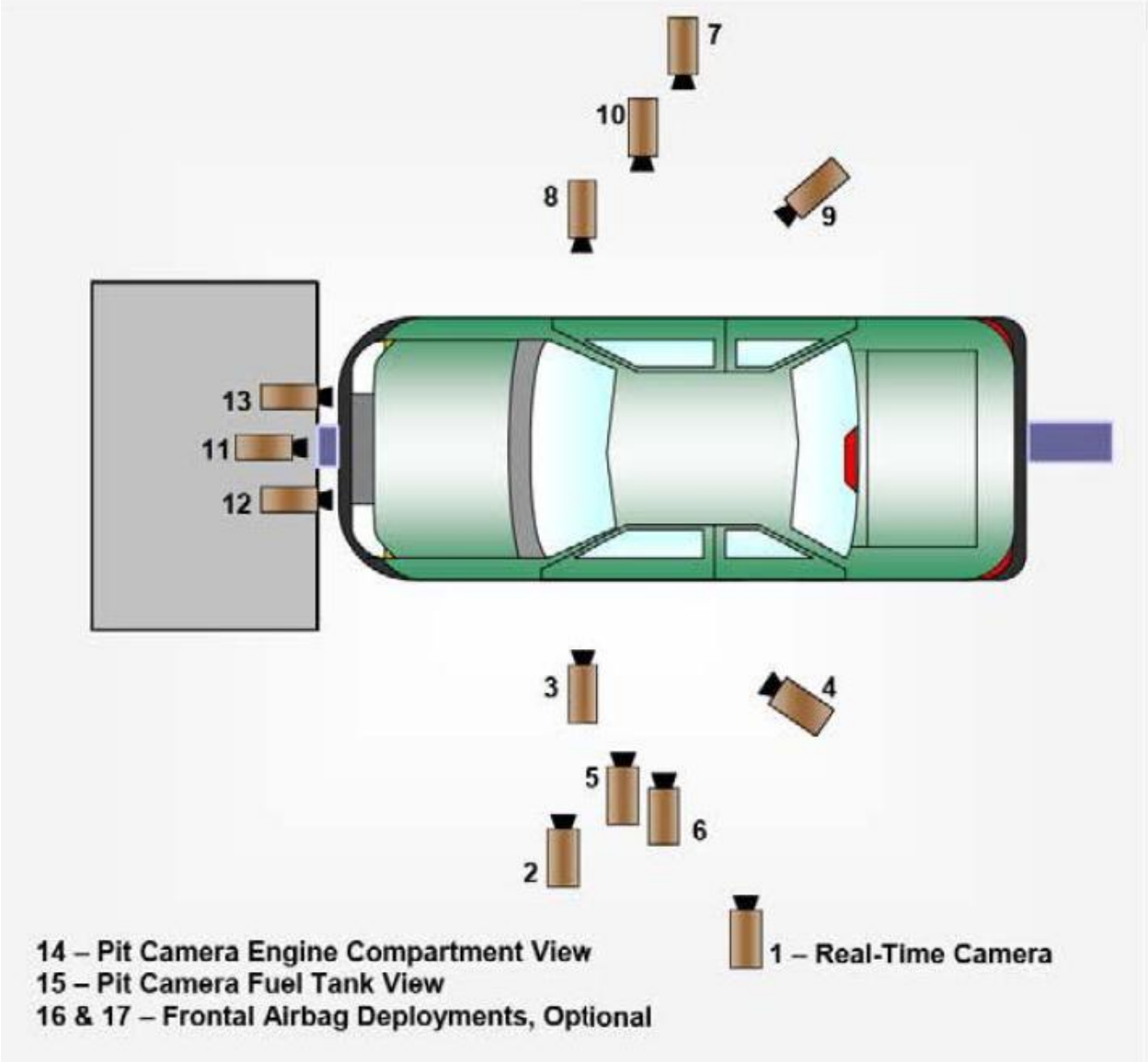
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	822	890
Lap belt length as measured on ATD	mm	638	695
Remainder of belt on reel	mm	1015	1150
Total belt length for continuous webbing systems	mm	2475	2735

DATA SHEET NO. 6

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle:	2013 Buick Verano	NHTSA No.:	MD0105
Test Program:	NCAP Frontal Impact	Test Date:	10/03/12

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

CAMERA LOCATIONS

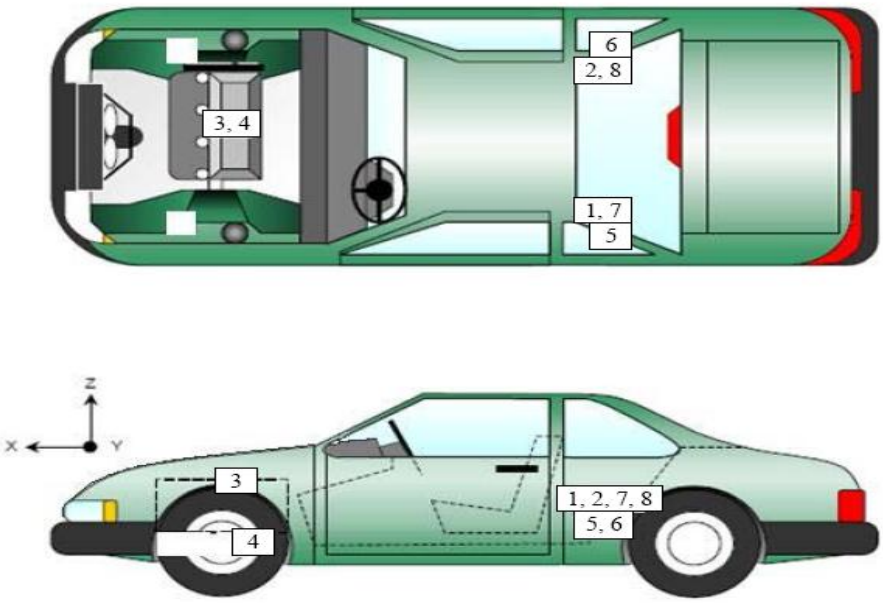
No.	Camera View	Location (mm)			Lens (mm)	Frame Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	0	-6958	-1173	zoom	30
2	Driver Close-Up	1090	-5466	-1355	50	1000
3	Left Front Half	1410	-5772	-1411	25	1000
4	Left Angle	4369	-3491	-1923	25	1000
5	Steering Column – Top	1762	-5102	-1575	25	1000
6	Steering Column – Bottom	1772	-4807	-1133	25	1000
7	Right Overall	1690	5081	-1243	12.5	1000
8	Passenger Close-Up	1160	5516	-1283	50	1000
9	Right Front Half	1270	5245	-1270	25	1000
10	Right Angle	4572	2955	-1765	25	1000
11	Windshield	65	0	-2540	16	1000
12	Driver Windshield	65	-350	2535	8.5	1000
13	Passenger Windshield	65	350	-2535	16	1000
14	Pit Front	317	25	3186	ND	1000
15	Pit Rear	2136	100	3101	16	1000
16	Onboard Driver Airbag (Optional)	2885	127	940	6	1000
17	Onboard Passenger Airbag (Optional)	2885	-83	-940	6	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: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Location (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2142	-330	466
2	Right Rear Accelerometer – X Direction	2142	330	466
3	Engine Top X	4180	130	915
4	Engine Bottom X	4115	230	203
5	Left Rear Accelerometer – Z Direction	2142	-185	466
6	Right Rear Accelerometer – Z Direction	2142	185	466

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

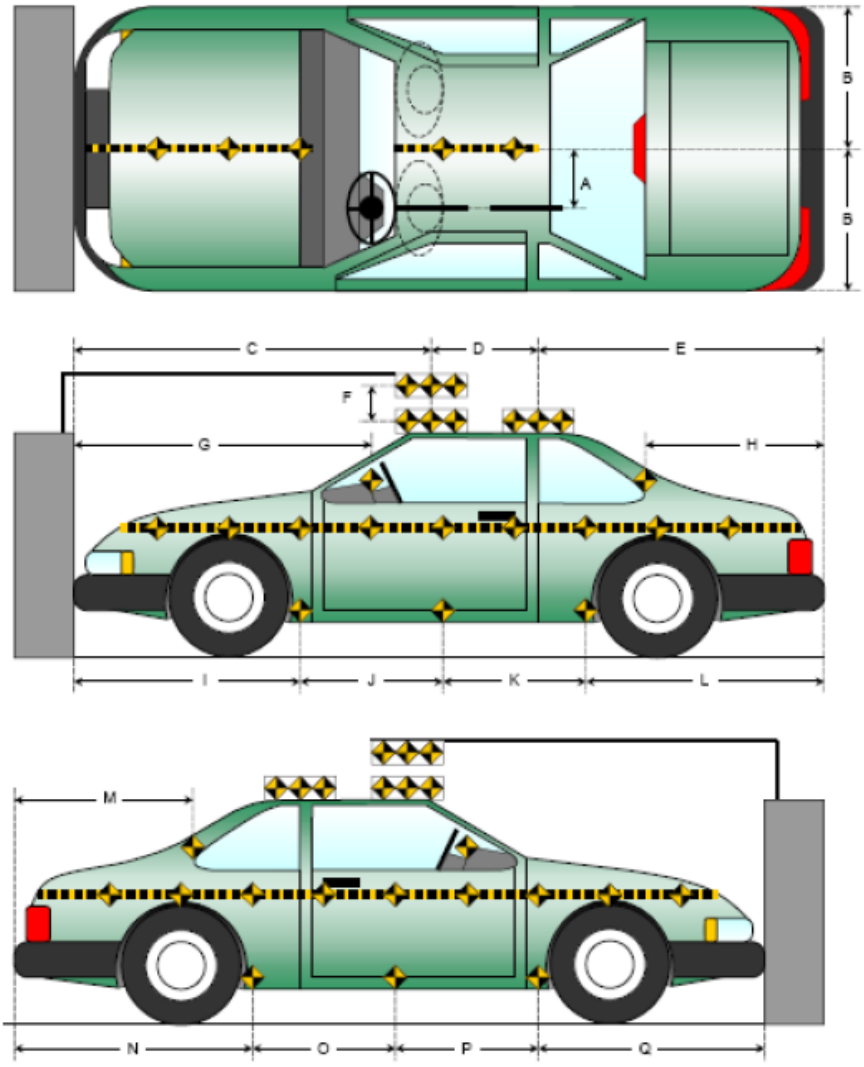
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

Item	Value
A	350
B	578
C	610
D	610
E	550
F	1178
G	915
H	905
I	-320
J	1235
K	595
L	1738
M	549
N	-315
O	910
P	905
Q	1733

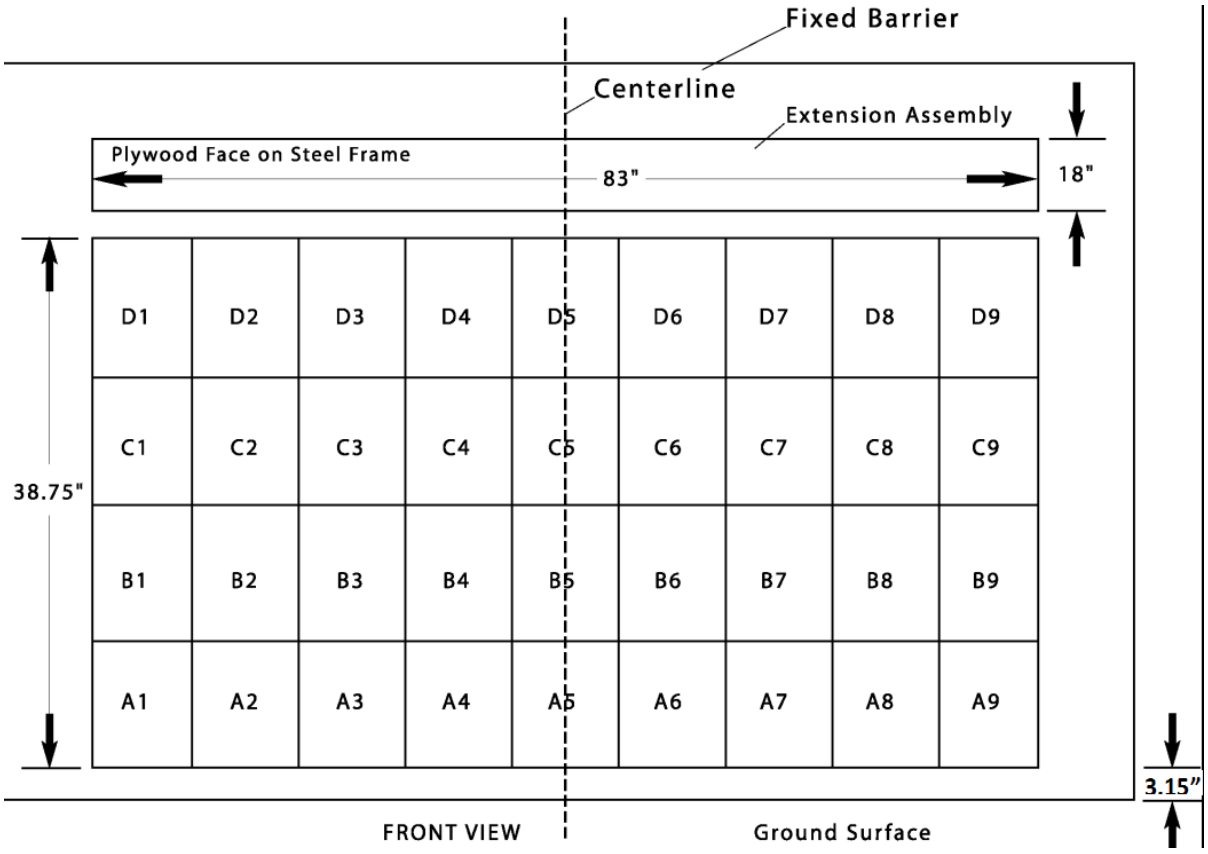
All units in millimeters



DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12



DATA SHEET NO. 10

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	42
Passenger Dummy Accelerometers	42
Vehicle Structure Accelerometers	8
Total	92

CAMERA COVERAGE

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

DATA SHEET NO. 11

POST-TEST OBSERVATIONS

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

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

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Front	Rear
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed and latched	Closed and latched
Rear Door Opening	Closed and latched	Closed and latched
Seat Track Shift (mm)	None	None
Seat Back Failure	None	None
Glazing Damage	None	None

VEHICLE REBOUND FROM BARRIER

Measured Parameters	Units	Value
Left Side	mm	773
Center	mm	533
Right Side	mm	773
Average	mm	693

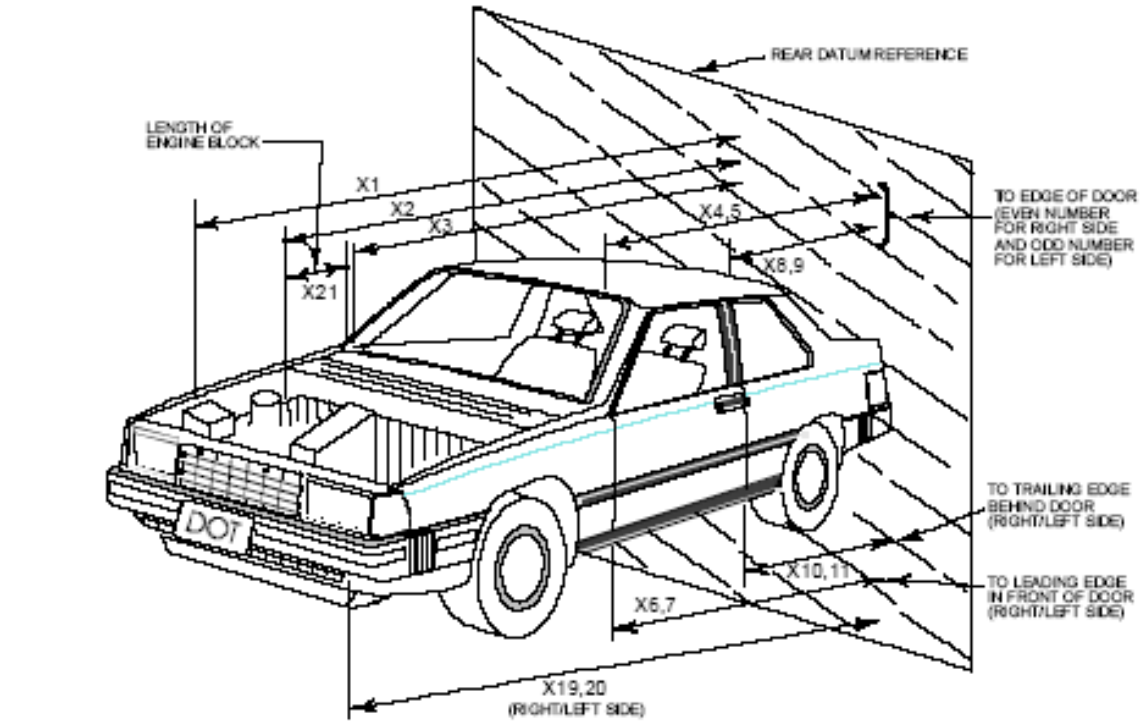
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

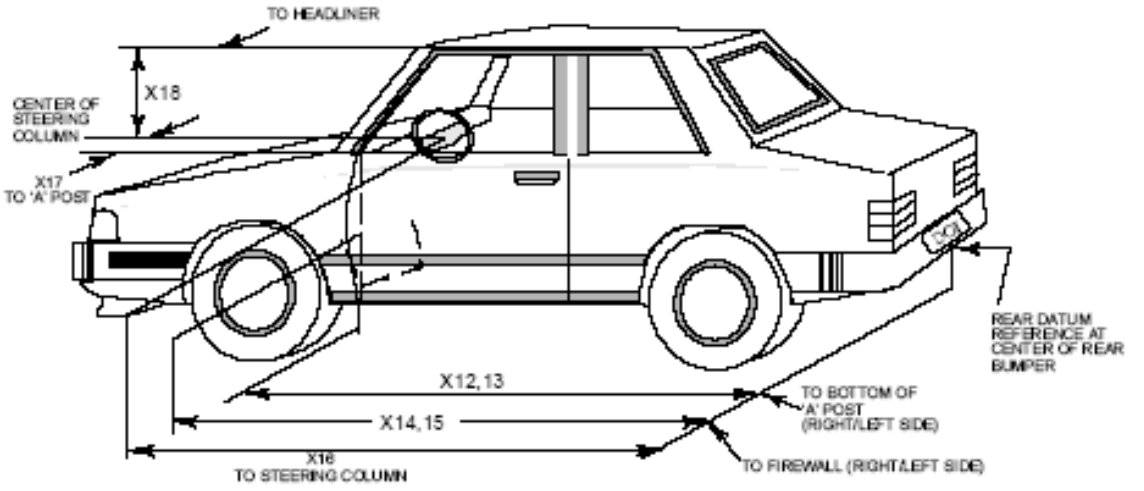
Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Curtain Airbag	Yes	No	Yes	No
Side Torso/Pelvis Airbag	Yes	No	Yes	No
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes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

DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2013 Buick Verano	NHTSA No.:	MD0105
Test Program:	NCAP Frontal Impact	Test Date:	10/03/12





DATA SHEET NO. 12 (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4668	4310	358
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3920	3660	260
3	RSOV to Firewall	3648	3590	58
4	RSOV to Upper Lead Edge of Right Door	3123	3110	13
5	RSOV to Upper Lead Edge of Left Door	3128	3972	-844
6	RSOV to Lower Leading Edge of Right Door	3123	3105	18
7	RSOV to Lower Leading Edge of Left Door	3128	3110	18
8	RSOV to Upper Trailing Edge of Right Door	2126	2115	11
9	RSOV to Upper Trailing Edge of Left Door	2132	2106	26
10	RSOV to Lower Trailing Edge of Right Door	2148	2132	16
11	RSOV to Lower Trailing Edge of Left Door	2156	2134	22
12	RSOV to Bottom of "A" Post-of Right Side	3128	3110	18
13	RSOV to Bottom of "A" Post-of Left Side	3133	3105	28
14	RSOV to Firewall, Right Side	3698	3675	23
15	RSOV to Firewall, Left Side	3698	3625	73
16	RSOV to Steering Column	2756	2755	1
17	Center of Steering Column to "A" Post	300	310	-10
18	Center of Steering Column to Headliner	425	475	-50
19	RSOV to Right Side of Front Bumper	4483	4235	248
20	RSOV to Left Side of Front Bumper	4483	4215	268
21	Length of Engine Block	820	820	0
RD	RSOV to Right Side of Dash Panel	2953	2935	18
CD	RSOV to Center of Dash Panel	3023	2990	33
LD	RSOV to Left Side of Dash Panel	2958	2940	18

All Dimensions in mm

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

VEHICLE INFORMATION

VIN: IG4PP5SK2D4100715 Wheelbase: 2685
Vehicle Size Category: Midsize Test Weight (kg): 1748.2

ACCELEROMETER DATA

Accelerometer Locations: As listed on Page 15 of this report.

Cal. Procedure/Interval: TRC procedure / 6 month interval

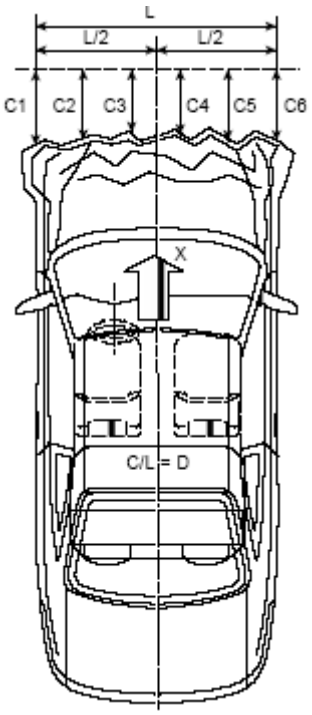
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.2

Velocity Change (km/h): 63.1

Time of Separation (ms): 94.4



CRUSH PROFILE

Collision Deformation Classification: 12FDEW3

Midpoint of Damage: Centerline

Damage Region Length (mm): 1260

Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	**Crush zone 1 at left side**	mm	4483	4215	268
C2	**Crush zone 2 at left side**	mm	4613	4192	421
C3	**Crush zone 3 at left side**	mm	4653	4302	351
C4	**Crush zone 4 at right side**	mm	4653	4310	343
C5	**Crush zone 5 at right side**	mm	4613	4285	328
C6	**Crush zone 6 at right side**	mm	4483	4235	248
L	**C1 to C6**	mm	1260		

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

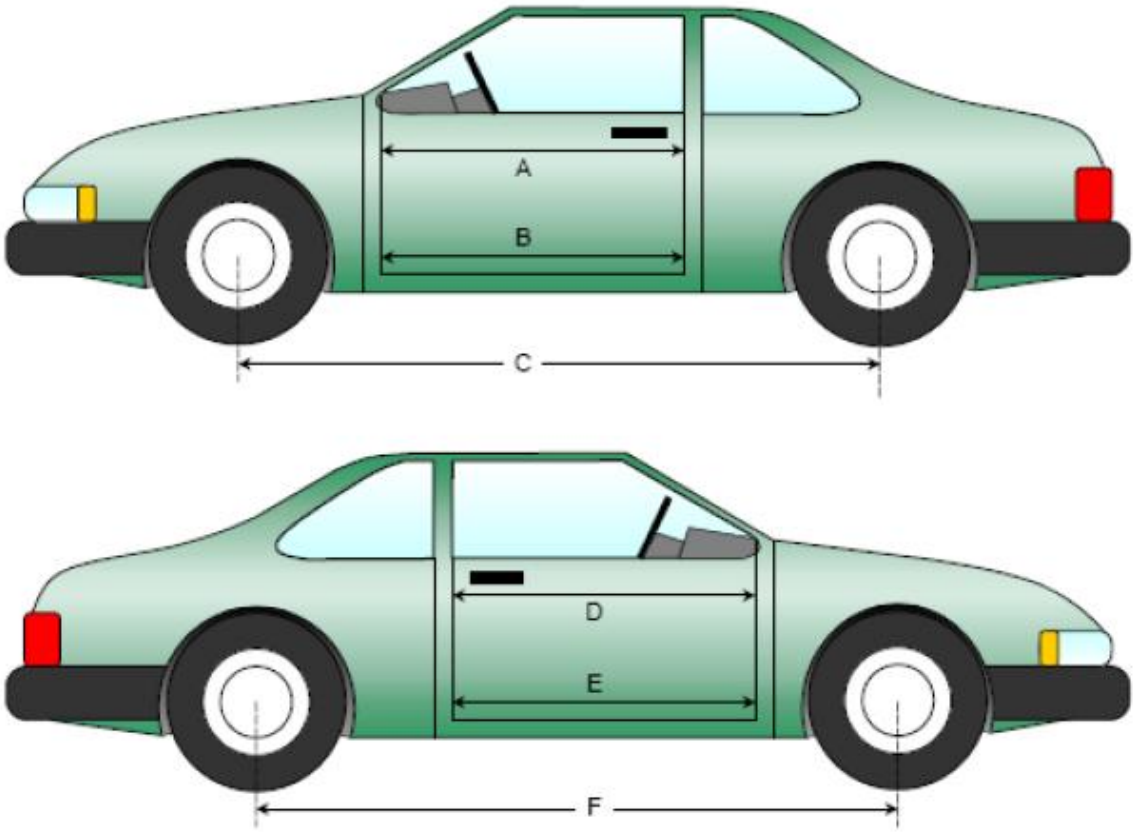
Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

DOOR OPENING WIDTH

No.	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	942	950	-8
B	Left Side Lower	mm	818	810	8
C	Right Side Upper	mm	942	940	2
D	Right Side Lower	mm	820	820	0

WHEELBASE MEASUREMENTS

No.	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2685	2605	80
F	Right Side Wheelbase	mm	2685	2635	50



DATA SHEET NO. 14 (CONTINUED)

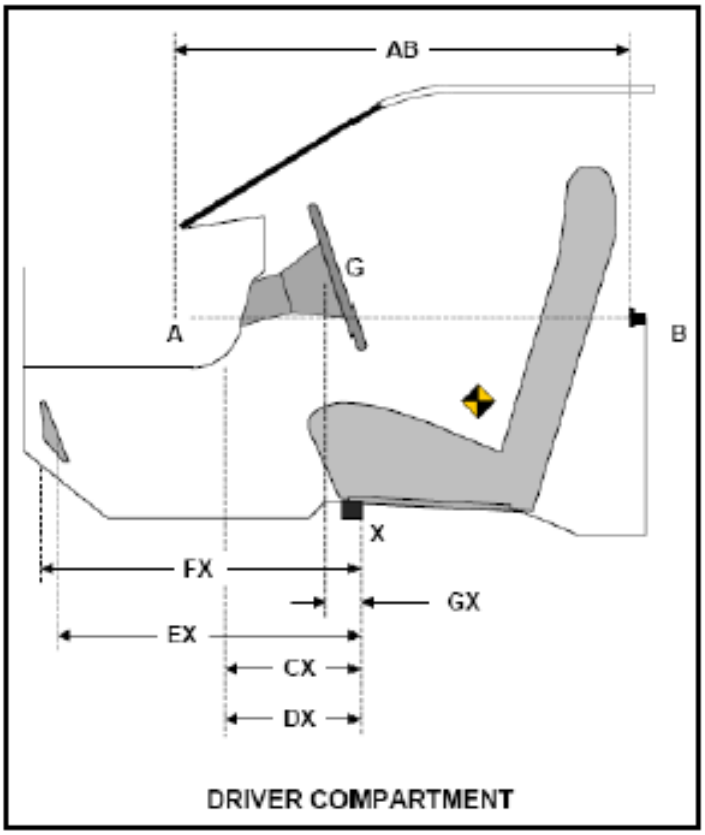
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	945	945	0
CX	Left Knee Bolster to X	mm	255	242	13
DX	Right Knee Bolster to X	mm	245	235	10
EX	Brake Pedal to X	mm	540	582	-42
FX	Foot Rest to X	mm	590	590	0
GX	Center of Steering Column Wheel Hub to X	mm	90	133	-43

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

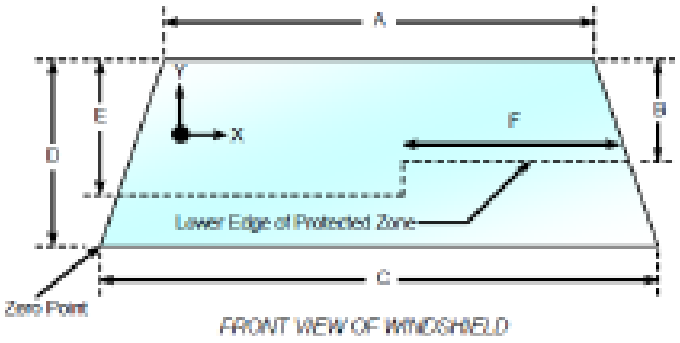
Please provide windshield mounting details.

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:

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2090	2090	100
Right Side	2090	2090	100
Total	4180	4180	100

Item	Units	Value
A	mm	1100
B	mm	505
C	mm	1420
D	mm	830
E	mm	495
F	mm	420



FRONT VIEW OF WINDSHIELD

AREAS OF PROTECTED ZONE FAILURES

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

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

DATA SHEET NO. 15 (CONTINUED)

SUMMARY OF FMVSS 212, 219 (PARTIAL), AND 301 DATA

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

FMVSS 301 FUEL SYSTEM INTEGRTY POST IMPACT DATA

Temperature at Time of Impact: Test Time:

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)

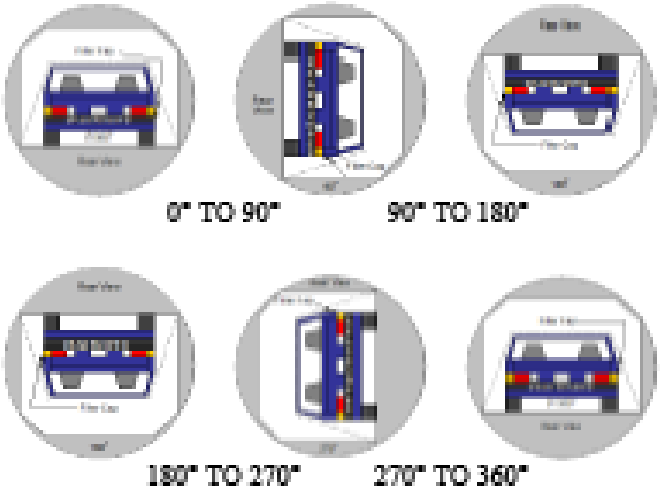
D Spillage: None

DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12

1. The specified fixture rollover rate for each 90º of rotation is 50 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage:
None



SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0º to 90º	120	300	420
90º to 180º	120	300	420
180º to 270º	120	300	420
270º to 360º	120	300	420

FMVSS 301 SPILLAGE TABLE

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

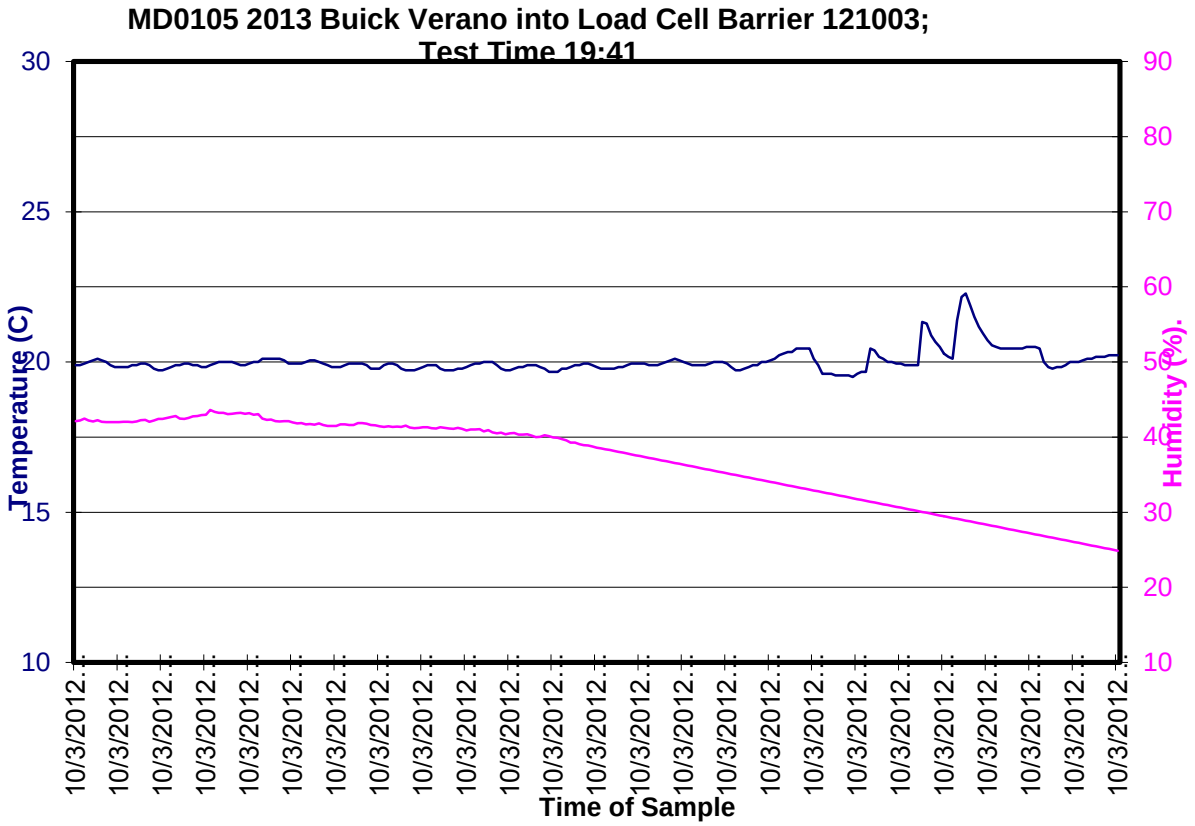
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2013 Buick Verano NHTSA No.: MD0105
Test Program: NCAP Frontal Impact Test Date: 10/03/12



APPENDIX A

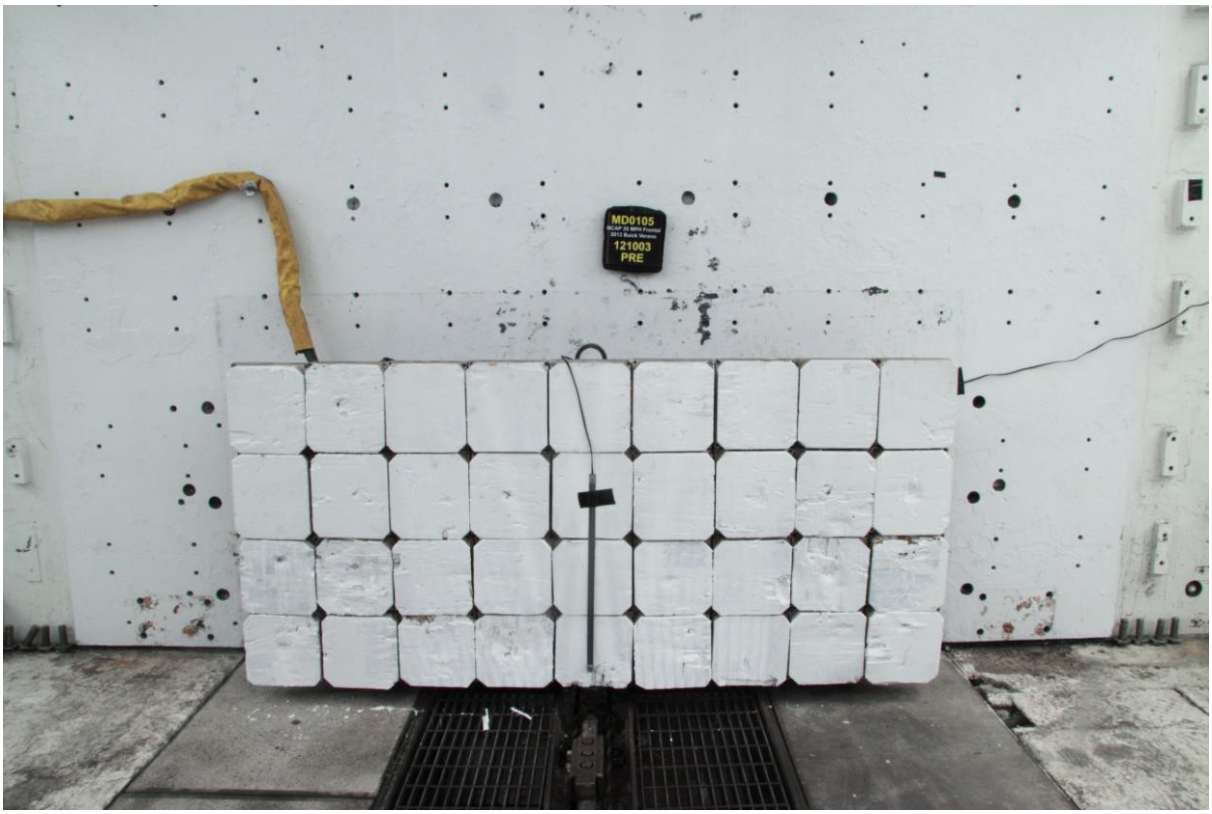
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS (CONTINUED)

TABLE OF PHOTOGRAPHS (CONTINUED)

001 Load Cell Location



002 Load Cell Wall

003 Manufacturer's Label

004 Tire Placard

005 2013 Buick Verano Frontal As Delivered

006 Left Rear 3-4 View, as Received

007 Pre-test Front View of Test Vehicle

008 Post-test Front View of Test Vehicle

009 Pre-test Left View of Test Vehicle

010 Post-test Left View of Test Vehicle

011 Pre-test Right View of Test Vehicle

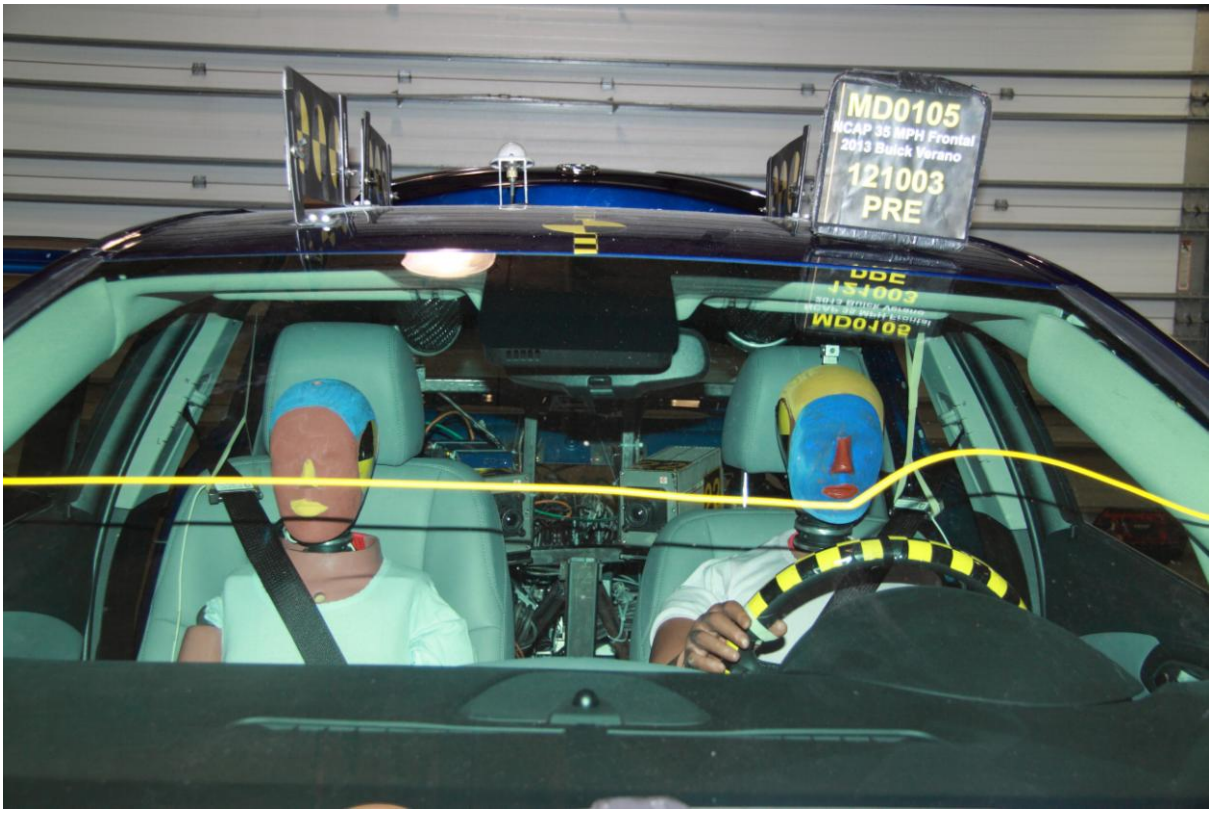
012 Post-test Right View of Test Vehicle

013 Pre-test Right Front 3-4 View

014 Post-test Right Front 3-4 View

015 Pre-test Left Rear 3-4 View

016 Post-test Left Rear 3-4 View

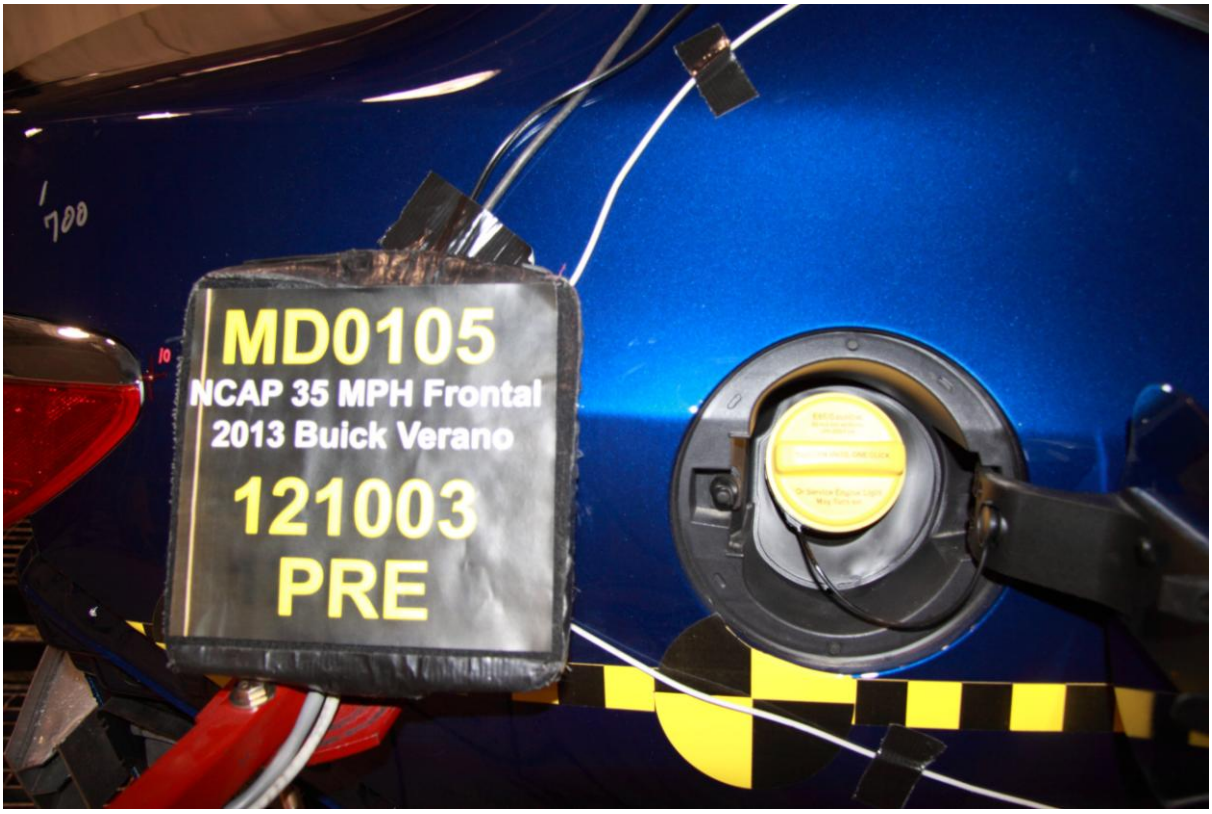


017 Pre-test Windshield View

018 Post-test Windshield View

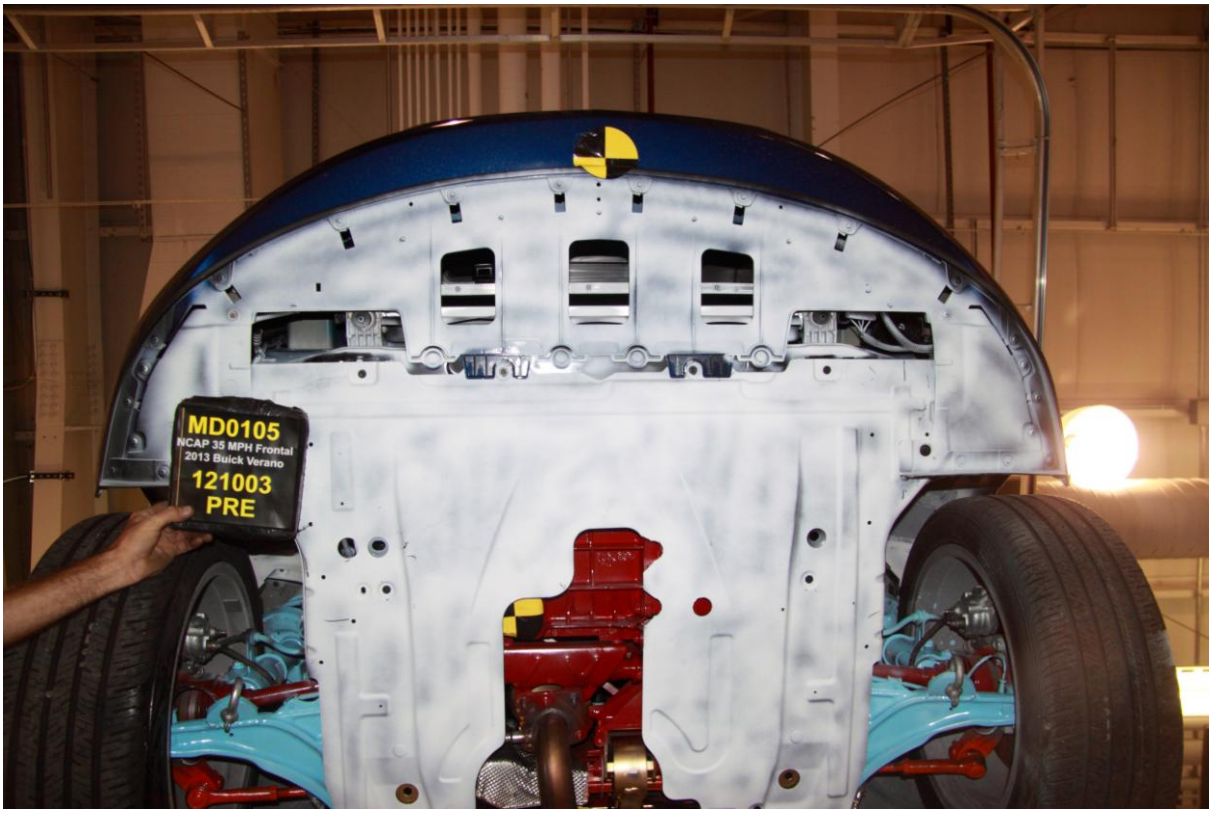
019 Pre-test Engine Compartment View

020 Post-test Engine Compartment View

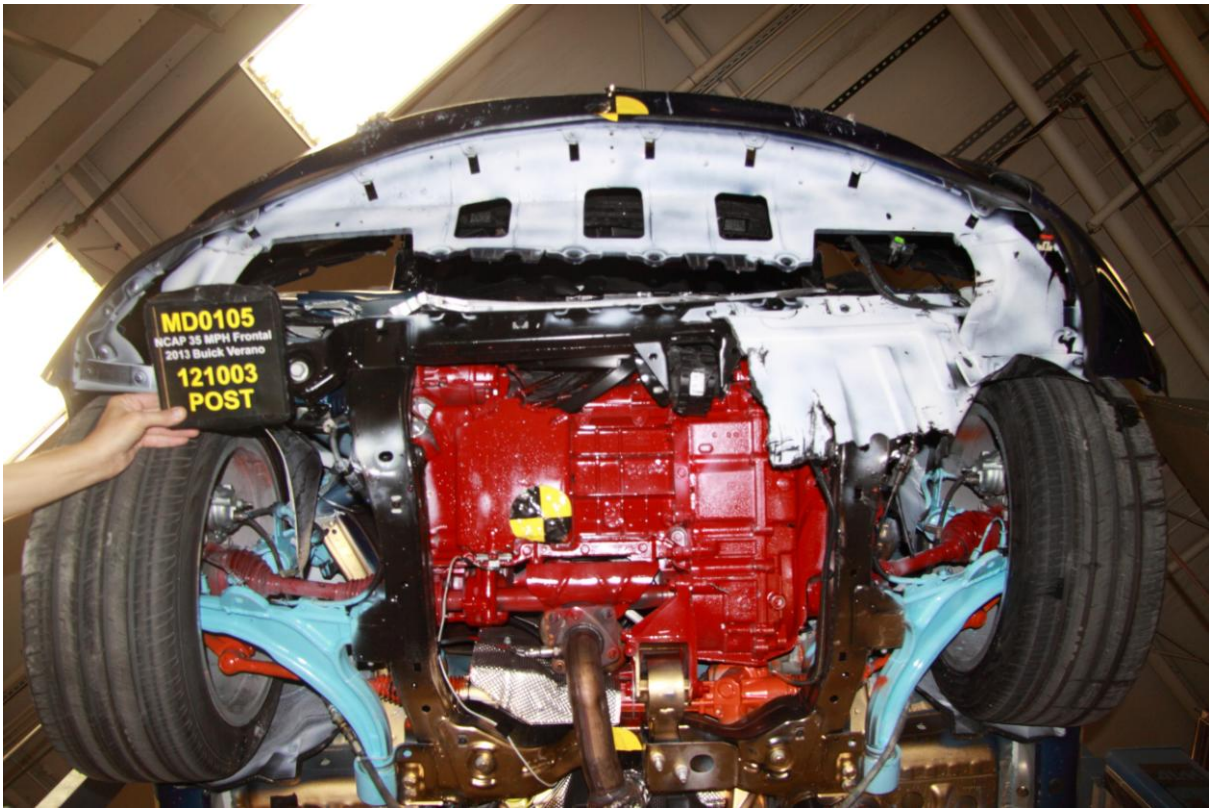


021 Pre-test Fuel Filler Cap View

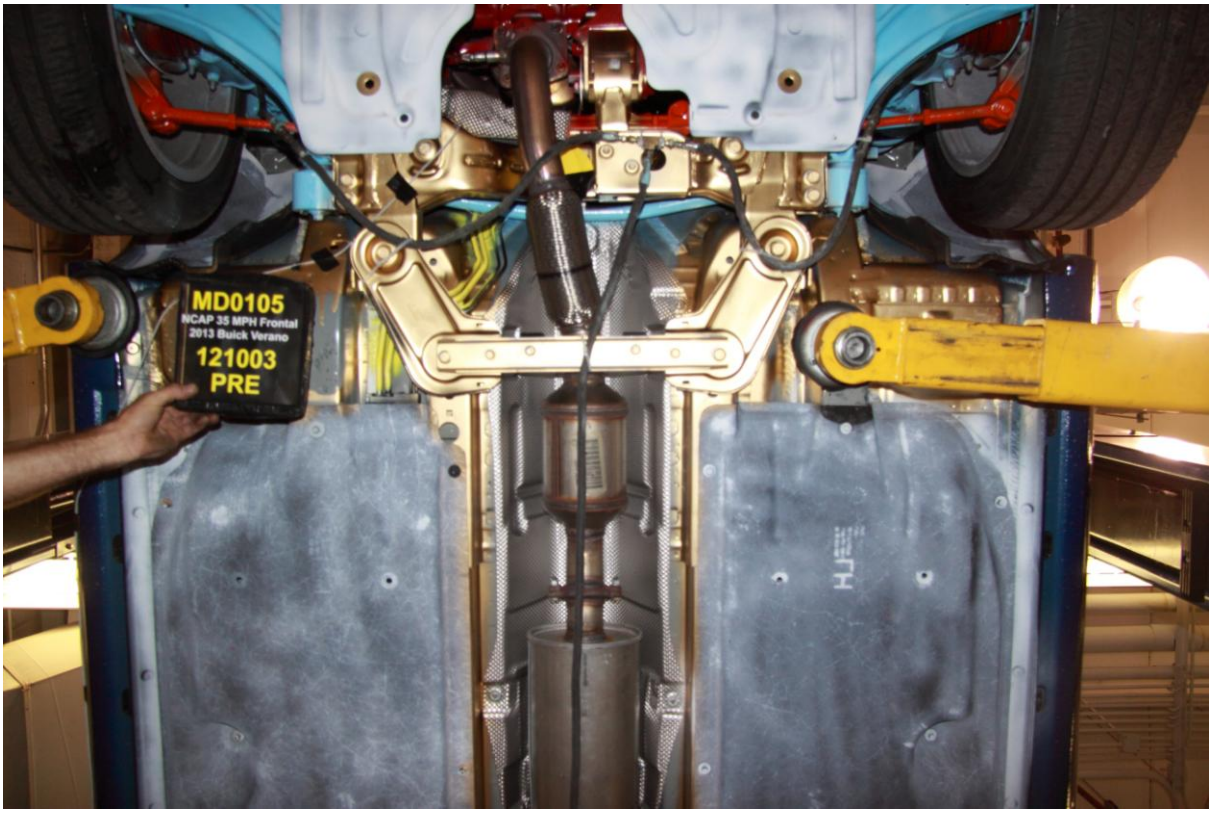
022 Post-test Fuel Filler Cap View



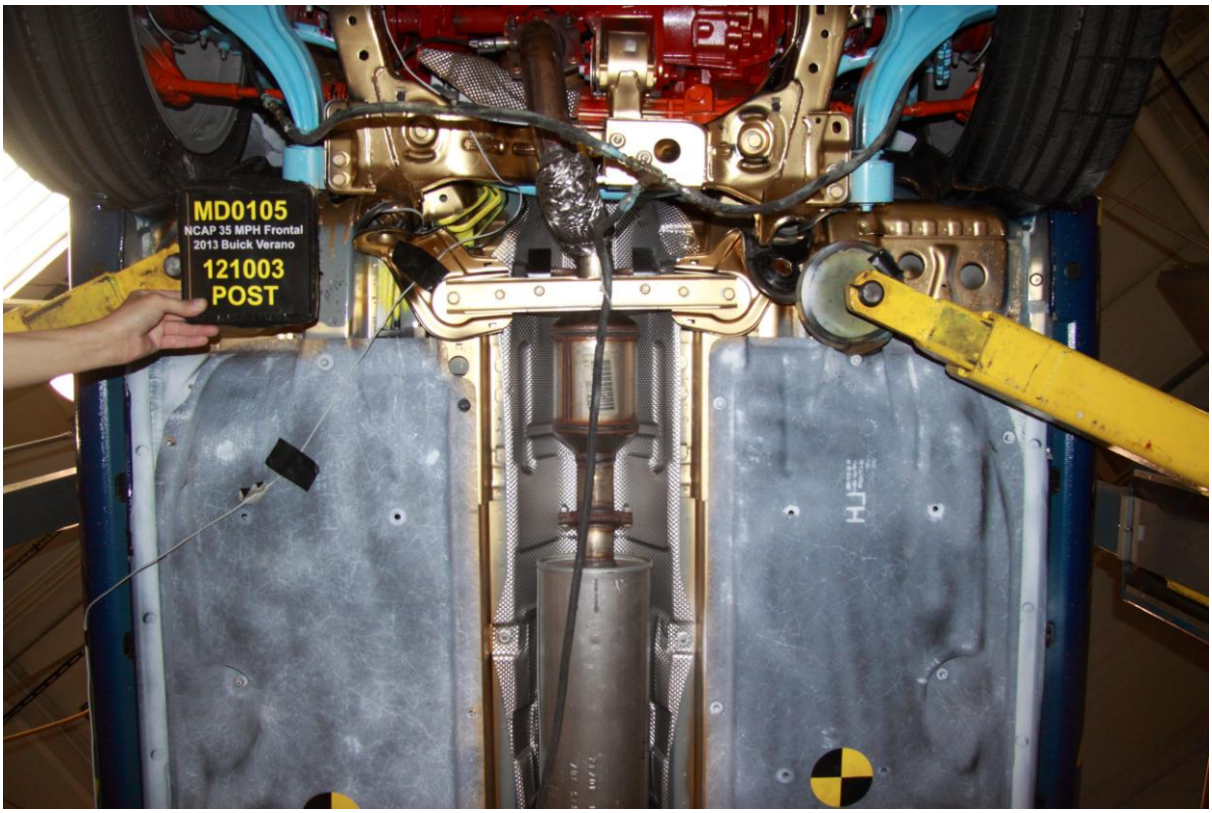
023 Pre-test Front Underbody View



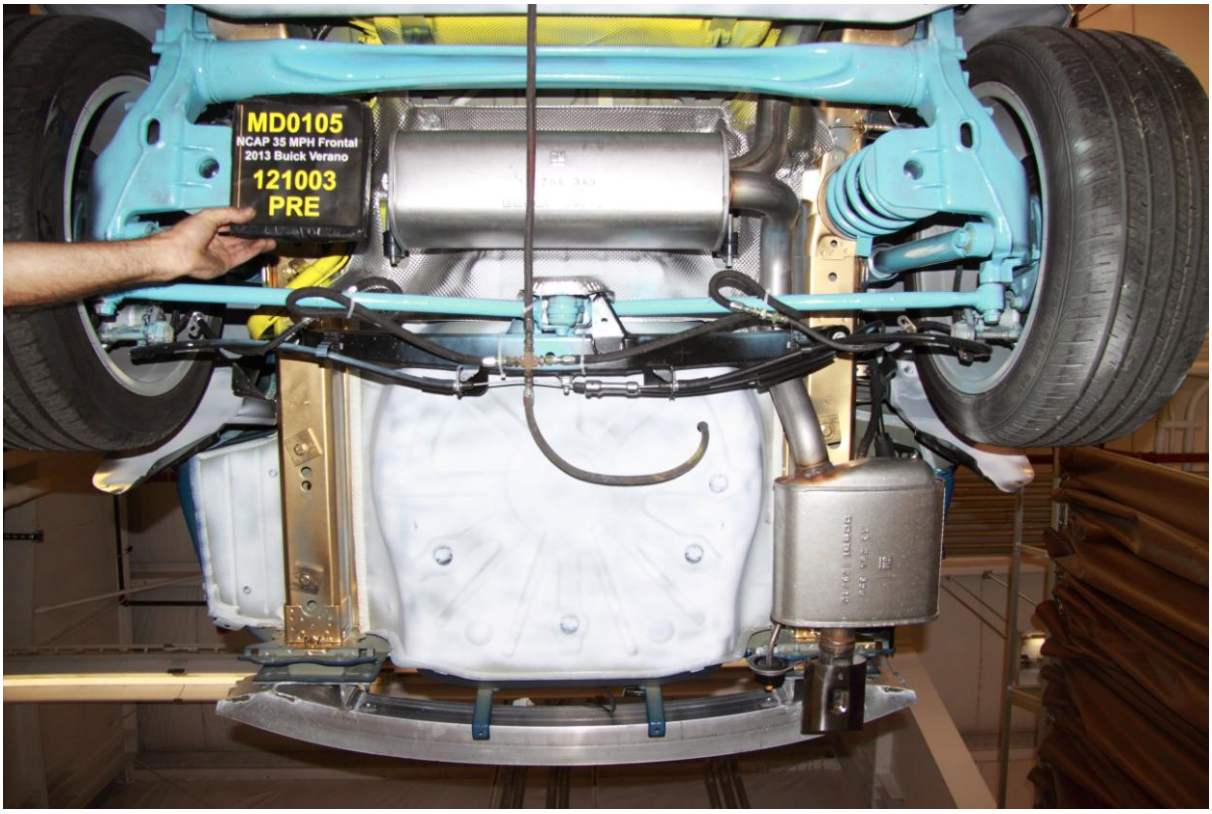
024 Post-test Front Underbody View



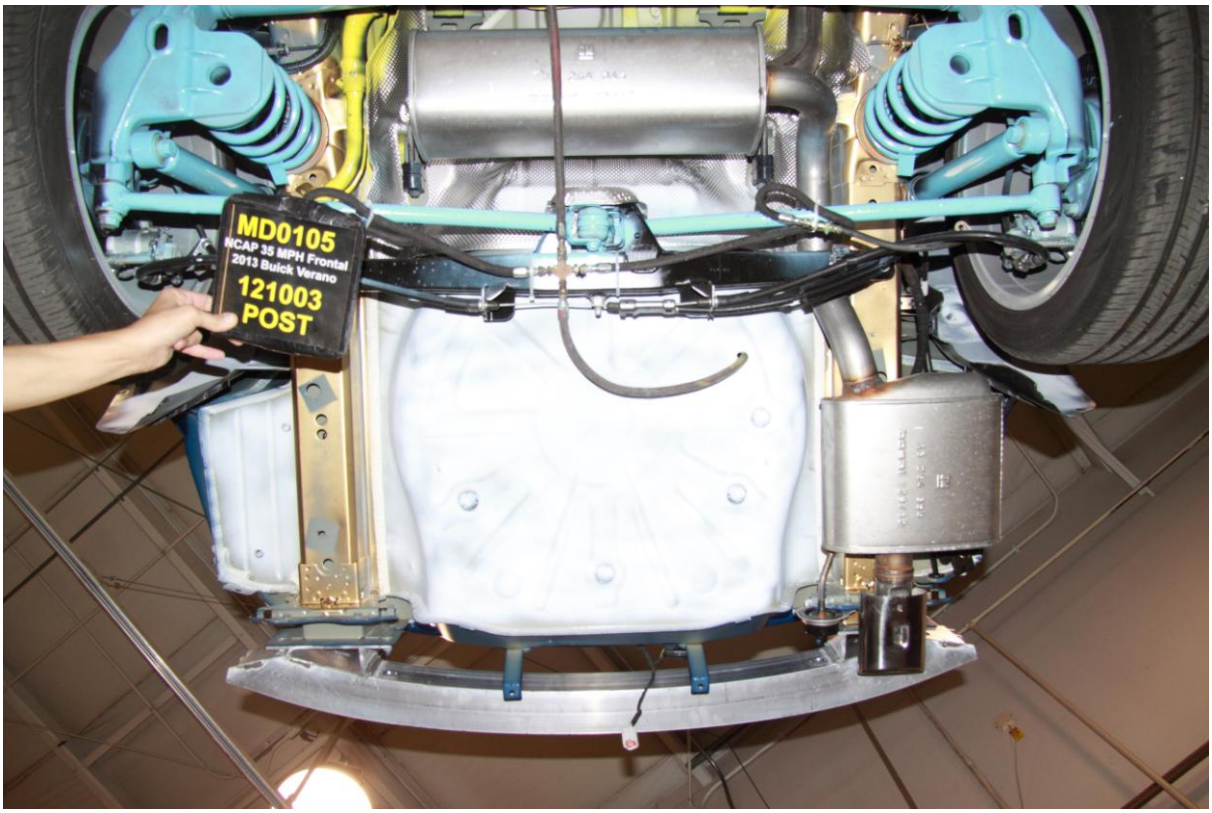
025 Pre-Test Underbody Mid



026 Post-Test Underbody Mid

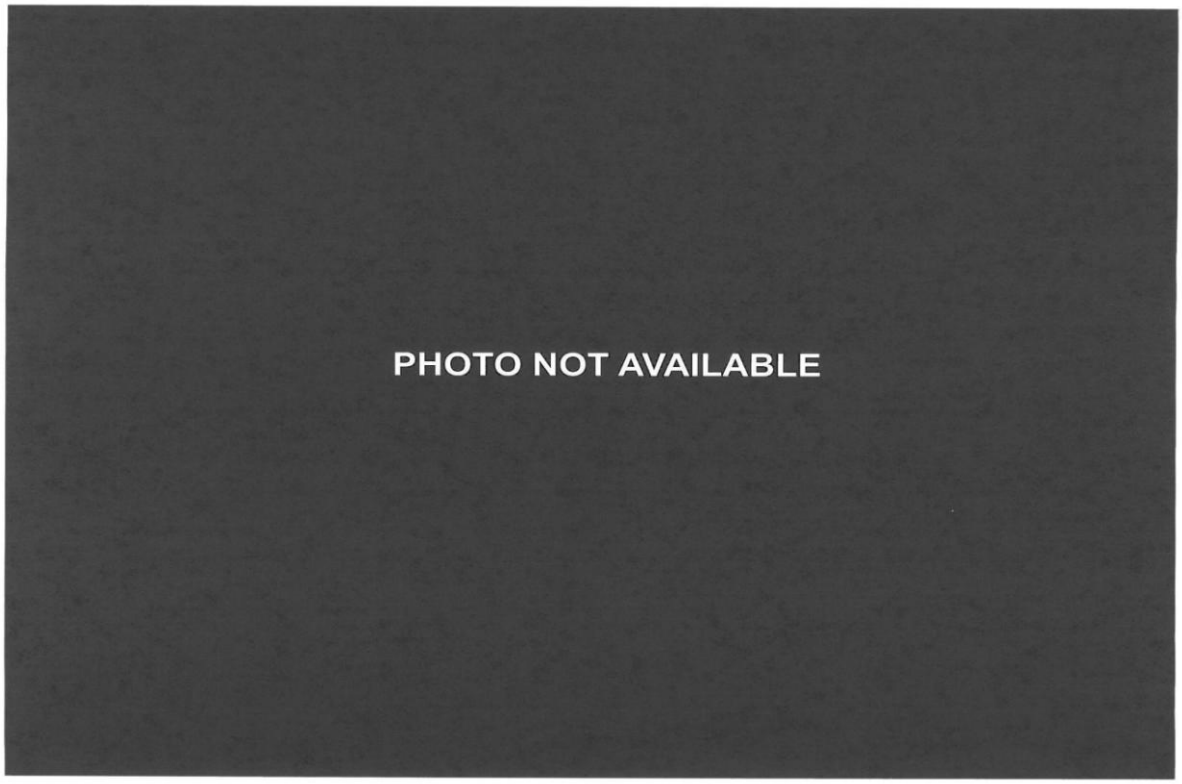


027 Pre-test Rear Underbody View



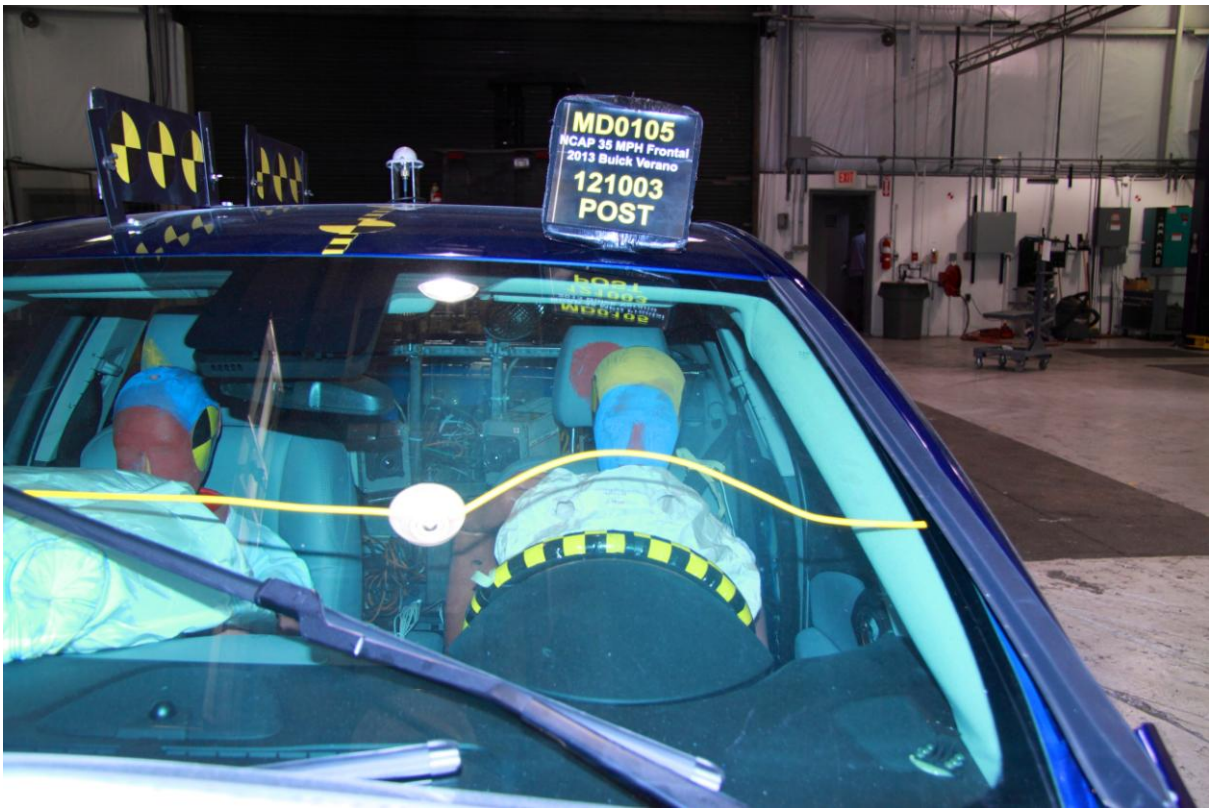
028 Post-test Rear Underbody View

029 Pre-test Dummy Cable Routing

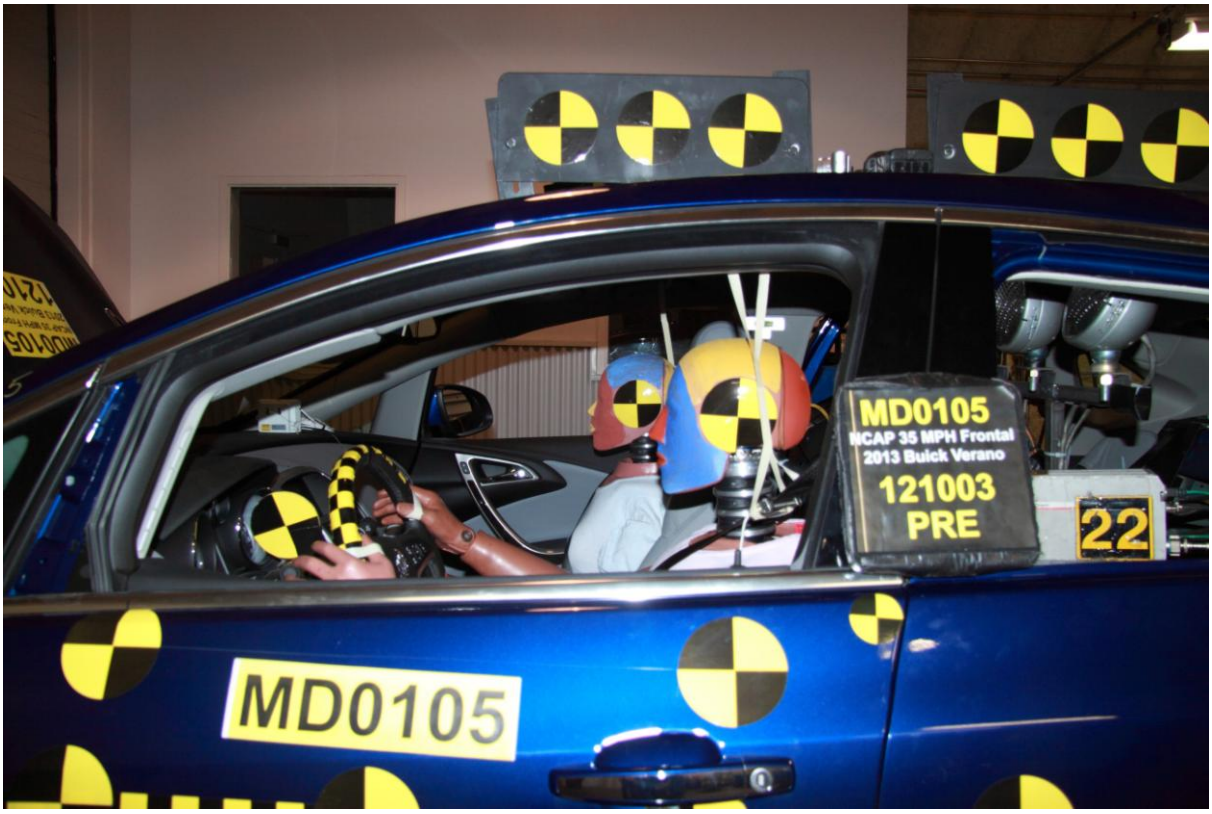


030 Post-test Dummy Cable Routing

031 Pre-test Driver Dummy Front View



032 Post-test Driver Dummy Front View



033 Pre-test Driver Dummy Window View

034 Post-test Driver Dummy Window View

035 Pre-test Driver Dummy and Vehicle Interior View

036 Post-test Driver Dummy and Vehicle Interior View

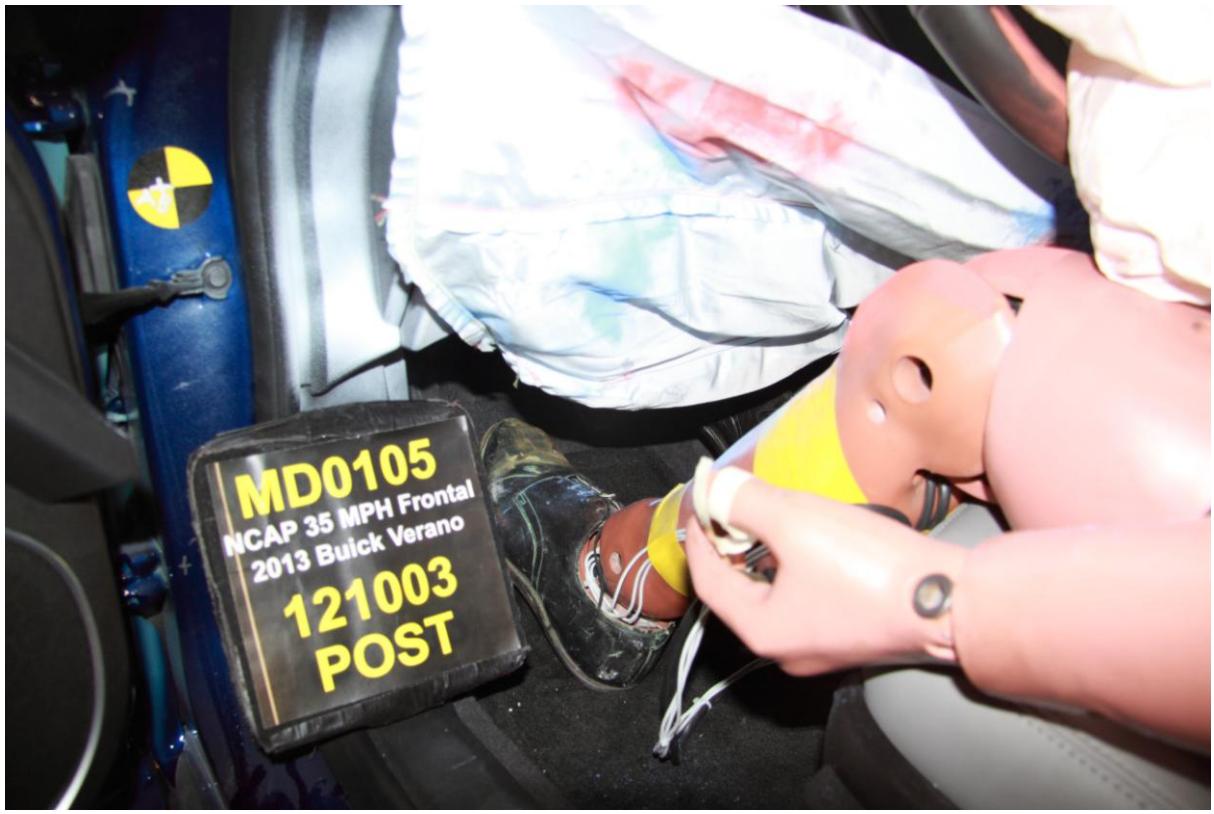
037 Pre-test Driver's Seat Fore-Aft Markings

038 Post-test Driver's Seat Fore-Aft Markings

039 Pre-Test View of Belt Anchorage for Driver Dummy

040 Post-Test View of Belt Anchorage for Driver Dummy

041 Pre-test Driver Dummy Feet



042 Post-test Driver Dummy Feet

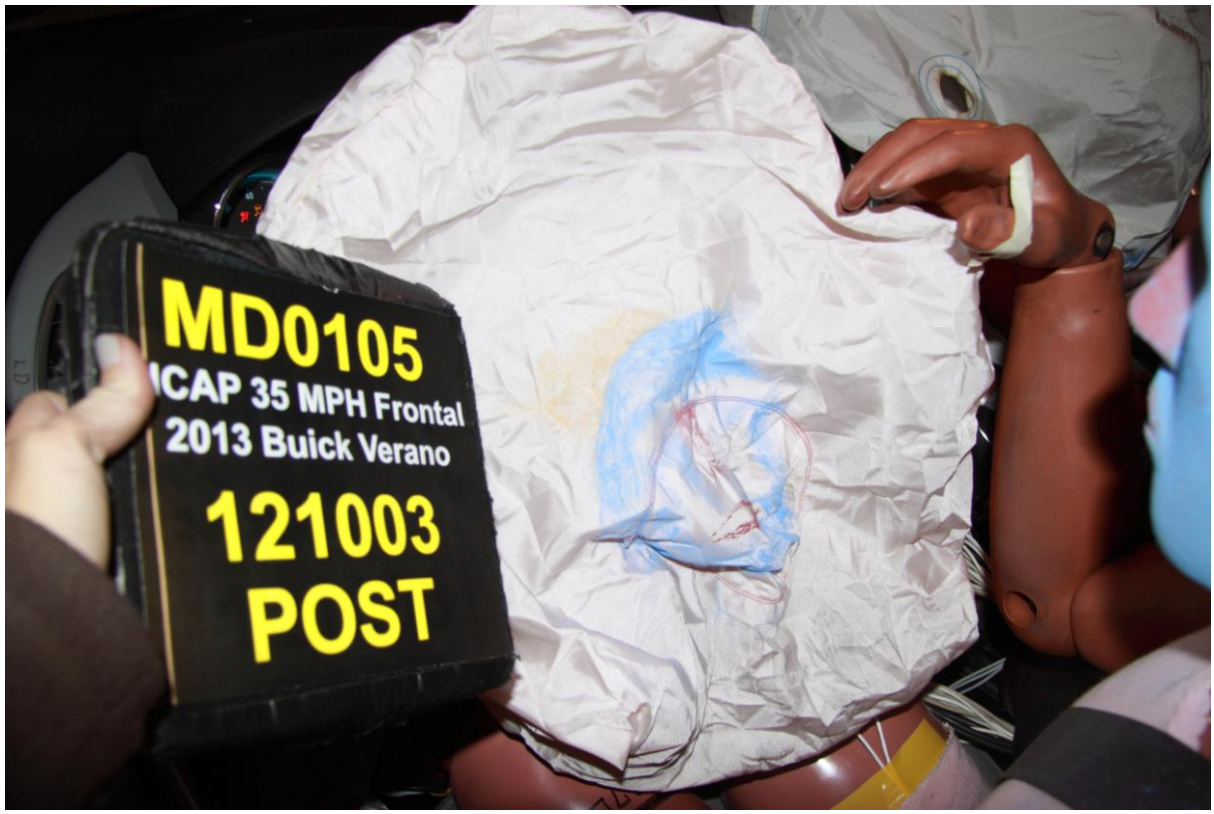
043 Pre-test Driver's Side Knee Bolster

044 Post-test Driver's Side Knee Bolster

045 Pre-test Driver's Side Floorpan

046 Post-test Driver's Side Floorpan

047 Post-Test Driver Dummy Face

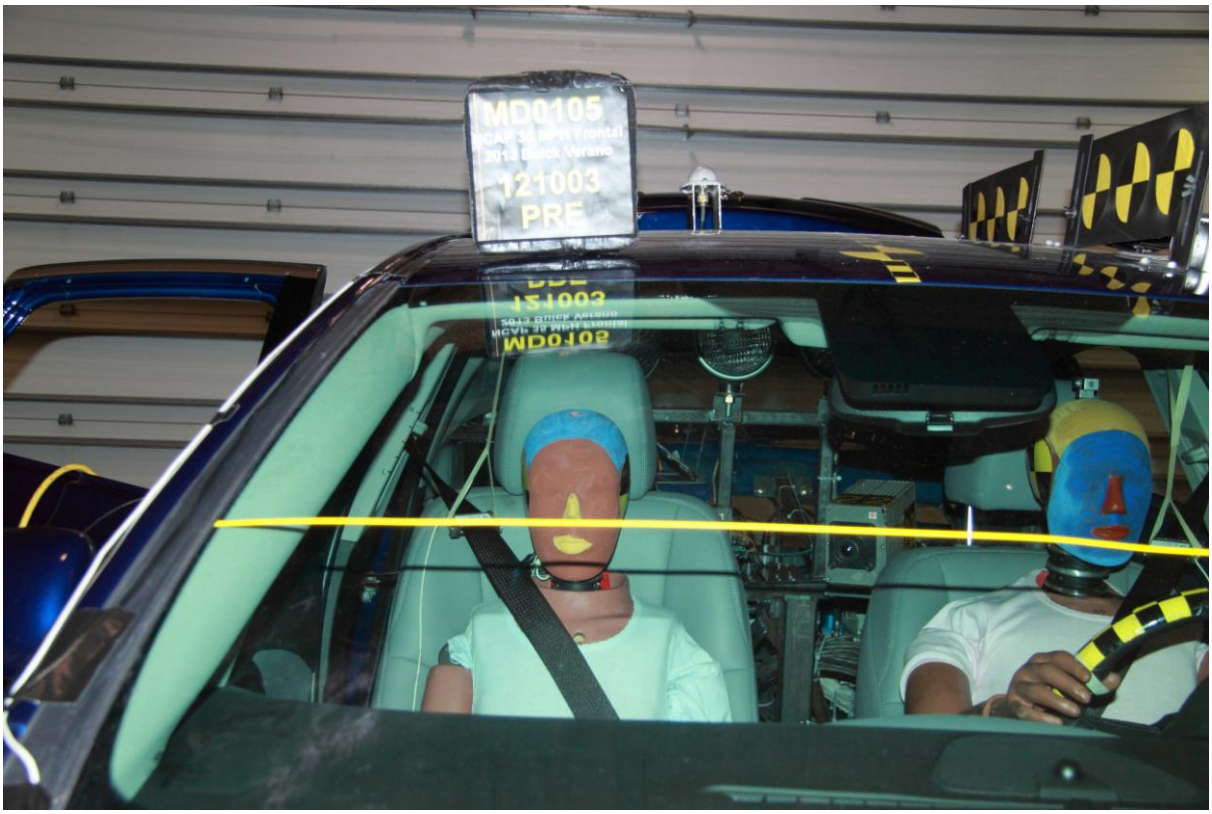


048 Post-test Driver Dummy Contact With Airbag

049 Post-test Driver Dummy Contact With Headrest

050 Pre-test View of the Steering Wheel

051 Post-test View of the Steering Wheel



052 Pre-test Passenger Dummy Front View

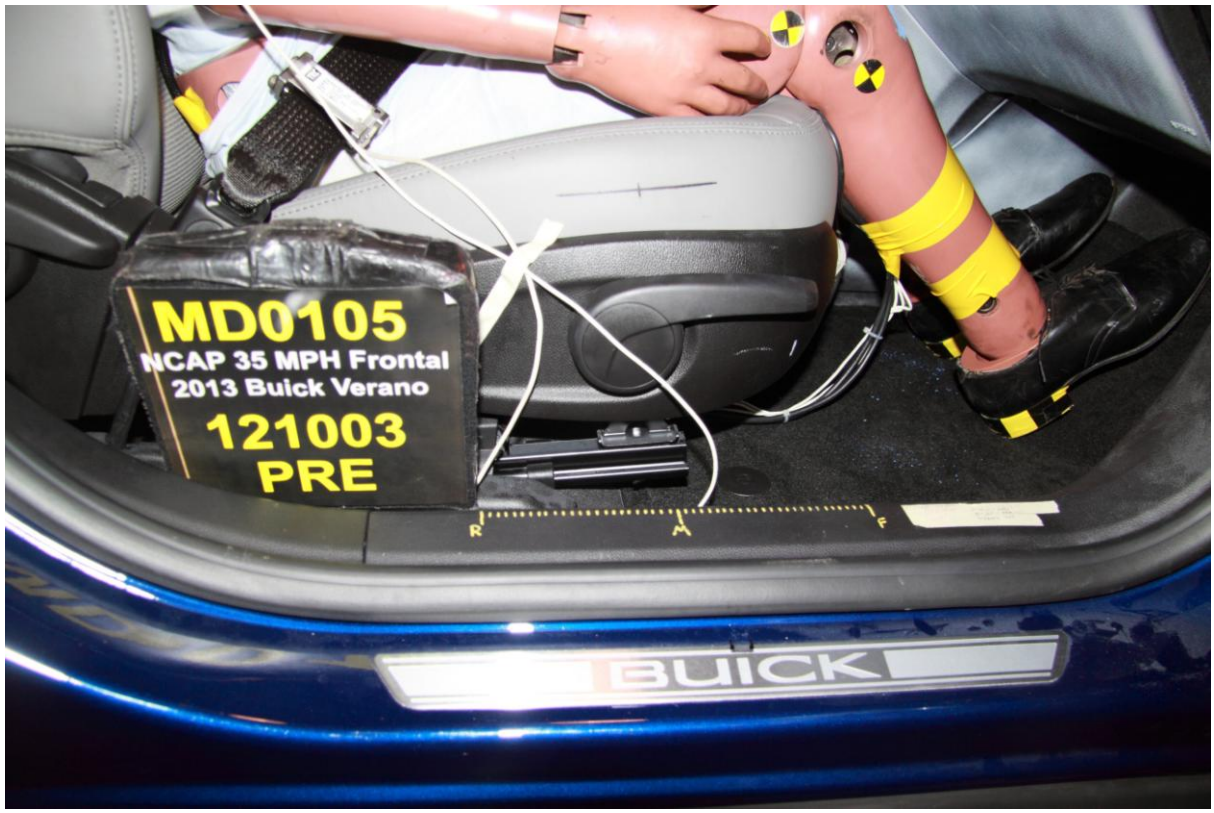
053 Post-test Passenger Dummy Front View

054 Pre-test Passenger Dummy Window View

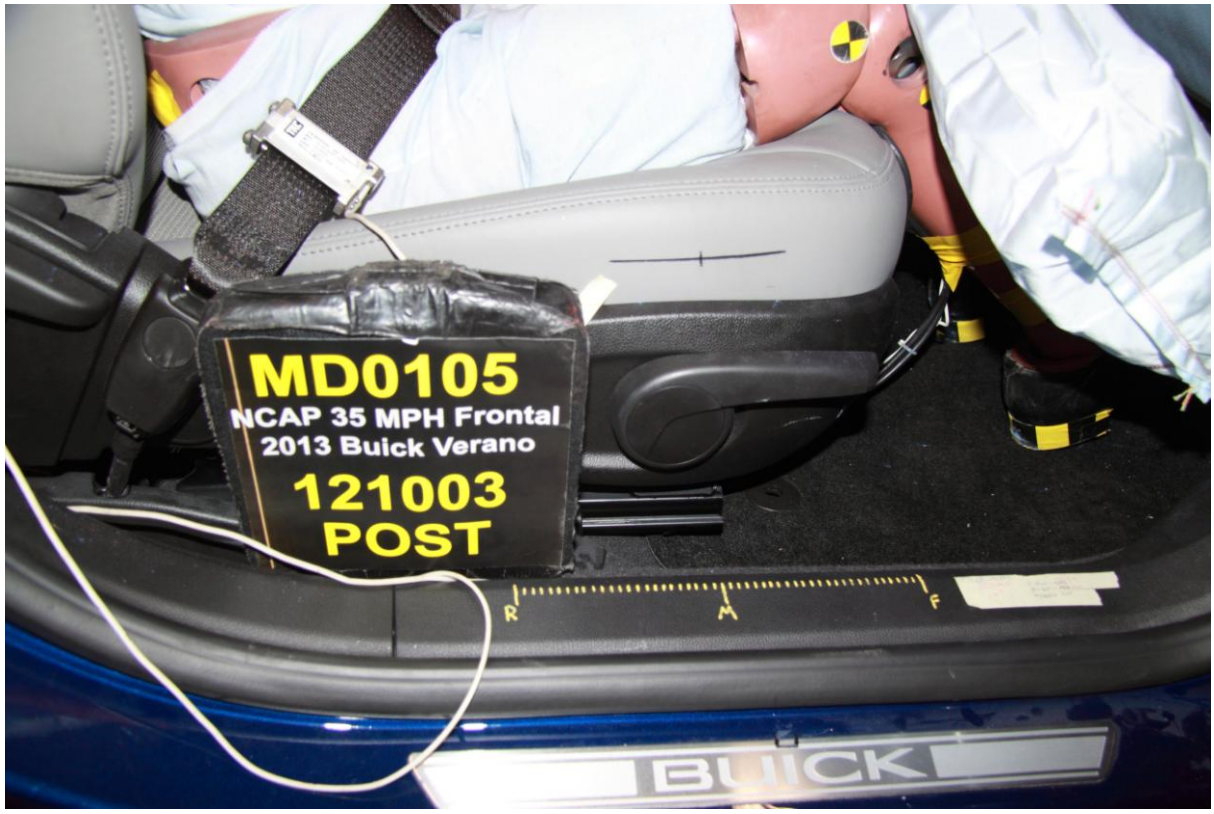
055 Post-test Passenger Dummy Window View

056 Pre-test Passenger Dummy and Vehicle Interior View

057 Post-test Passenger Dummy and Vehicle Interior View



058 Pre-test Passenger's Seat Fore-Aft Markings

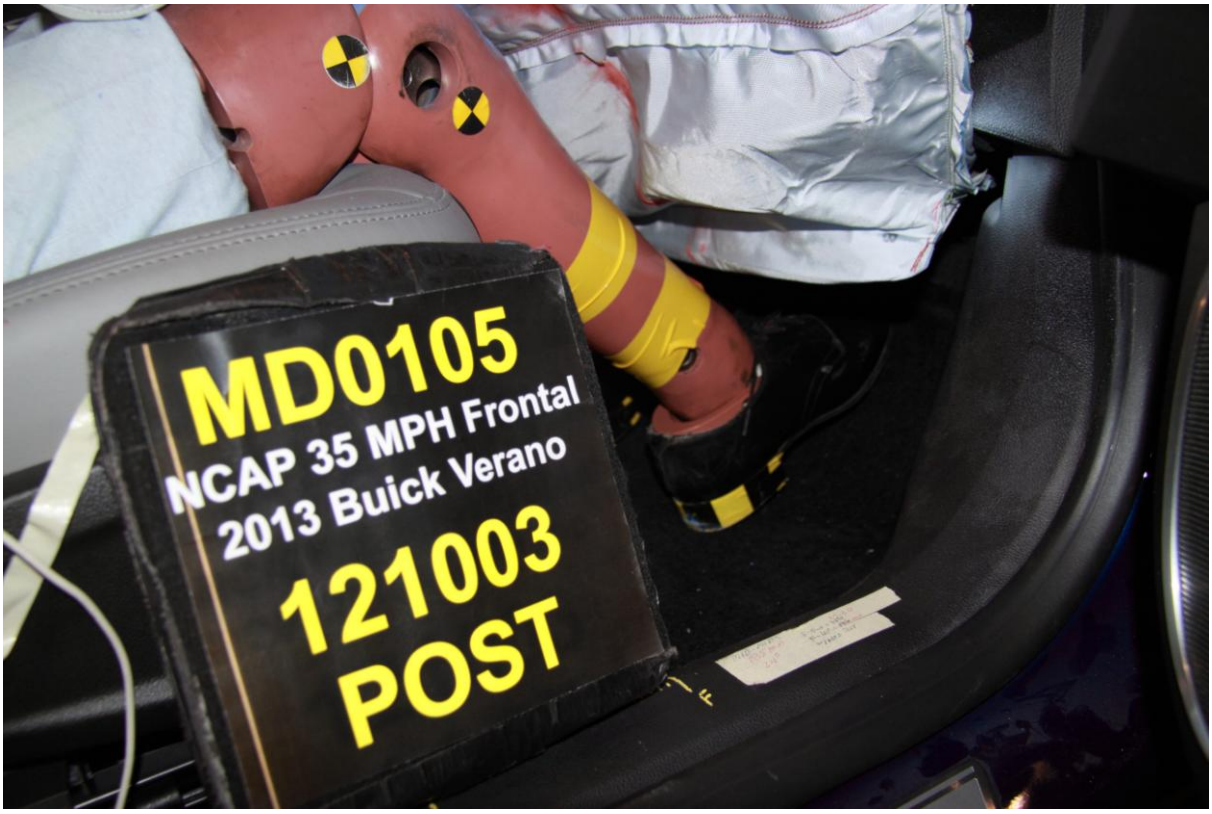


059 Post-test Passenger's Seat Fore-Aft Markings

060 Pre-Test View of Belt Anchorage for Passenger Dummy

061 Post-Test View of Belt Anchorage for Passenger Dummy

062 Pre-test Passenger Dummy Feet



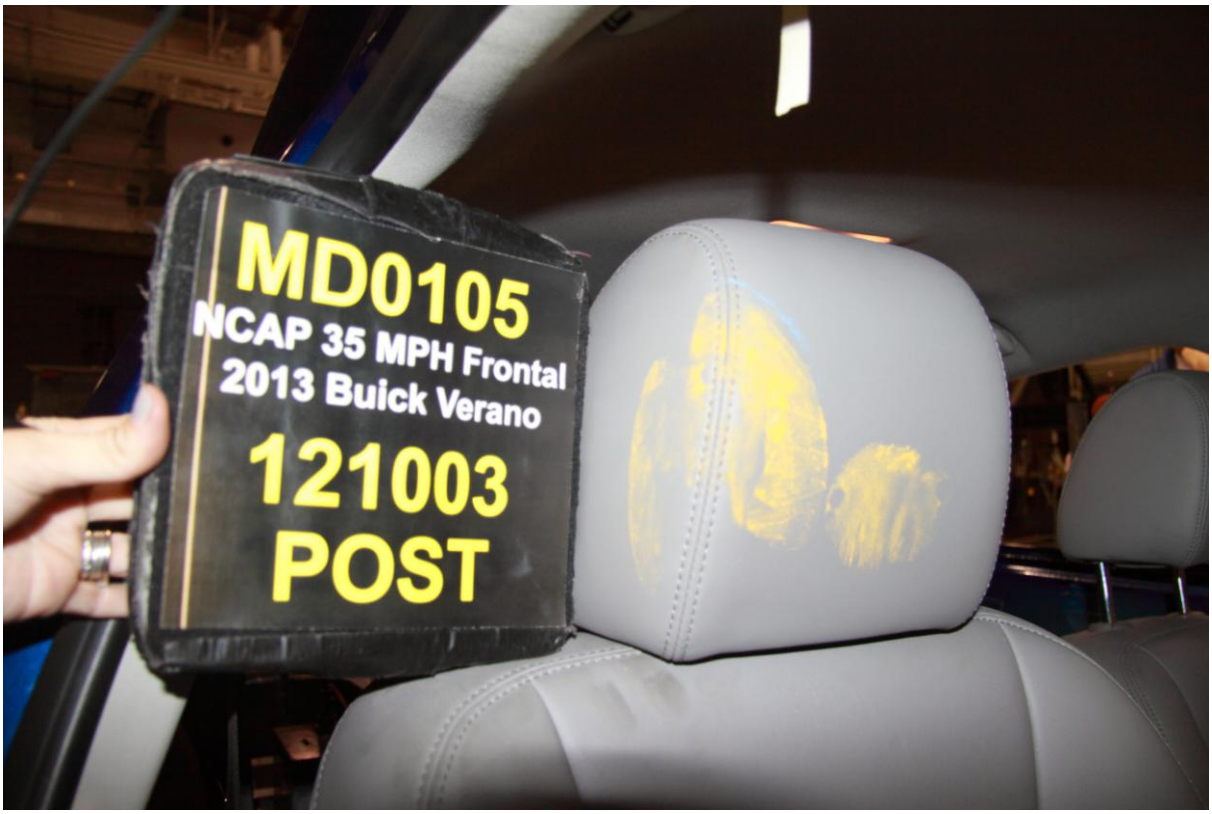
063 Post-test Passenger Dummy Feet

064 Pre-test Passenger's Side Knee Bolster

065 Post-test Passenger's Side Knee Bolster

066 Pre-test Passenger's Side Floorpan

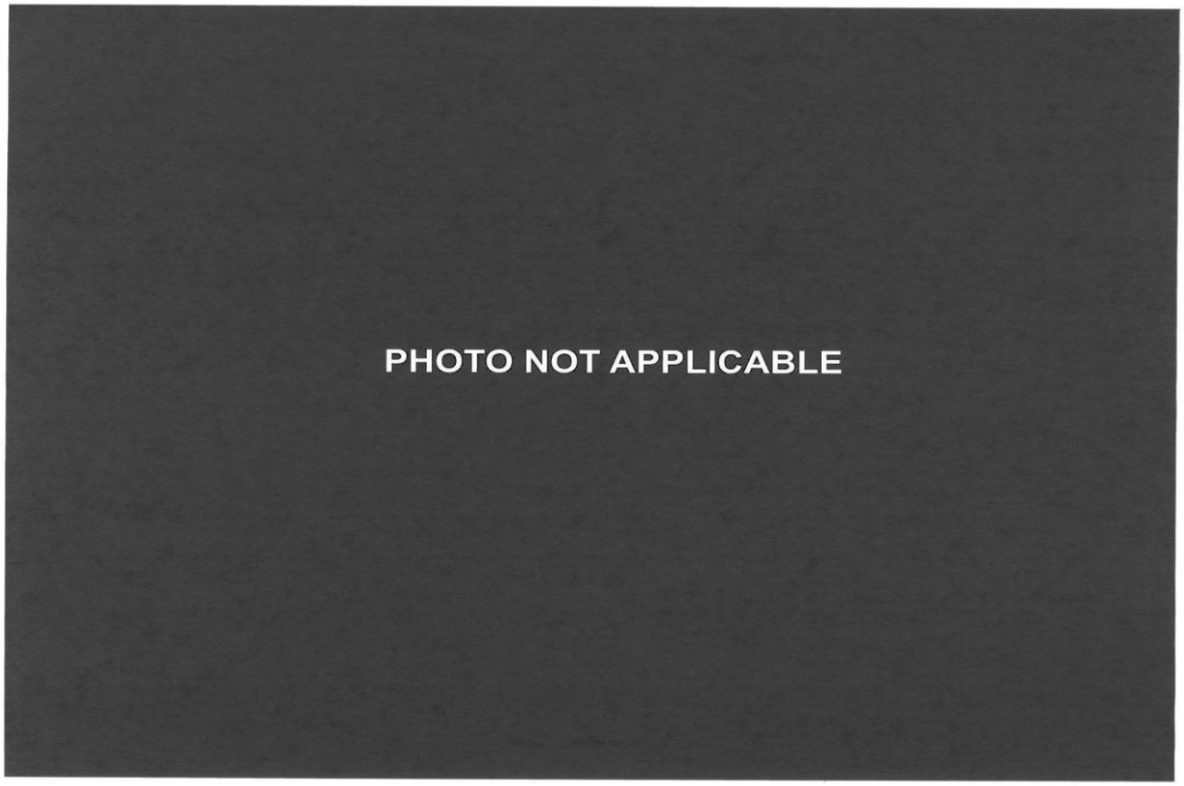
067 Post-test Passenger's Side Floorpan



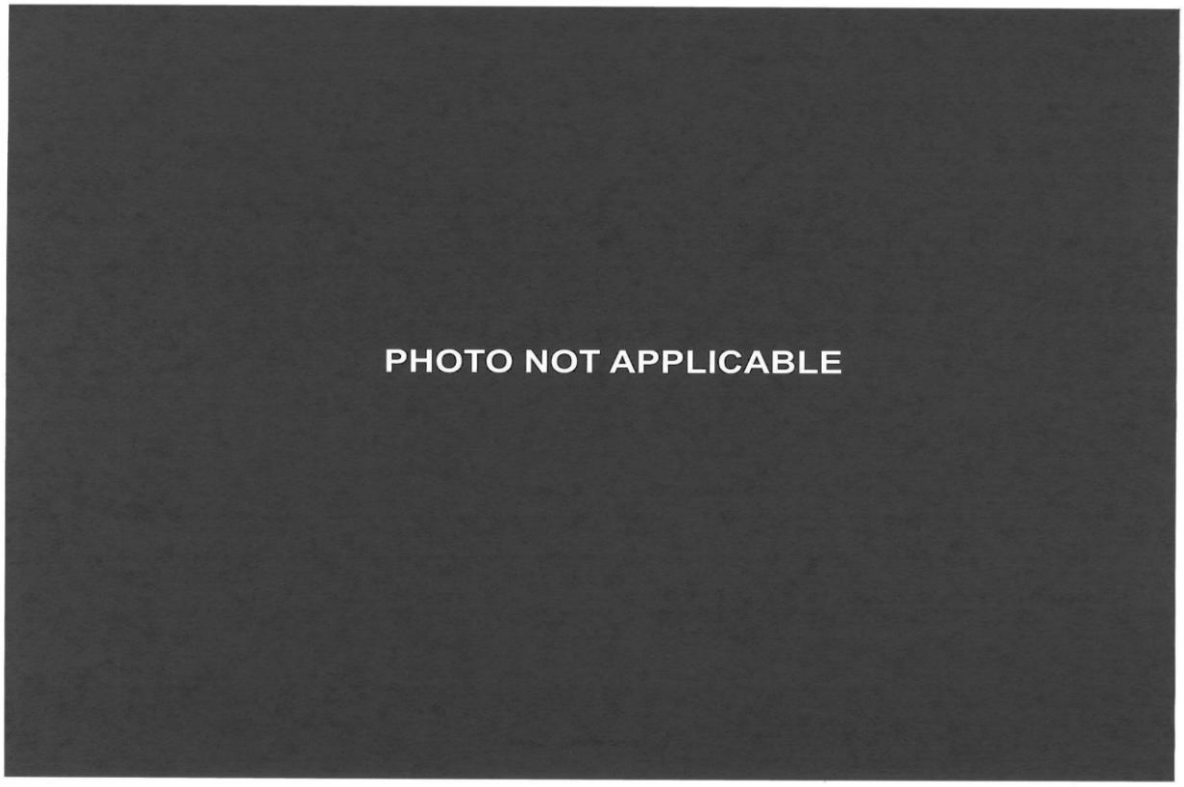
068 Post-test Passenger Dummy Contact With Headrest

068a Post-test Passenger Dummy Contact With Front Dashboard Airbag

068b Post-test Passenger Dummy Contact With Knee Bolster Airbag



069 Photograph of ballast installed in vehicle

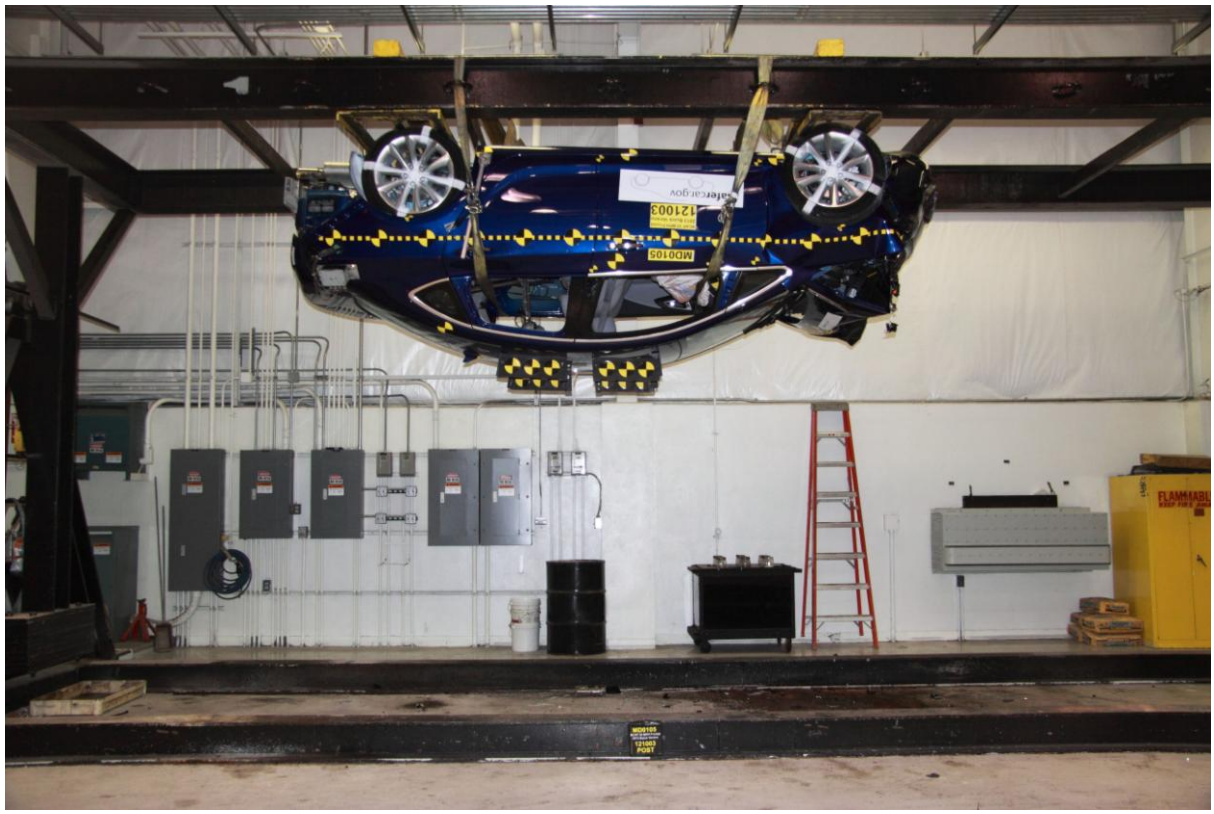


070 Post-test Stoddard solvent spillage location view, if required

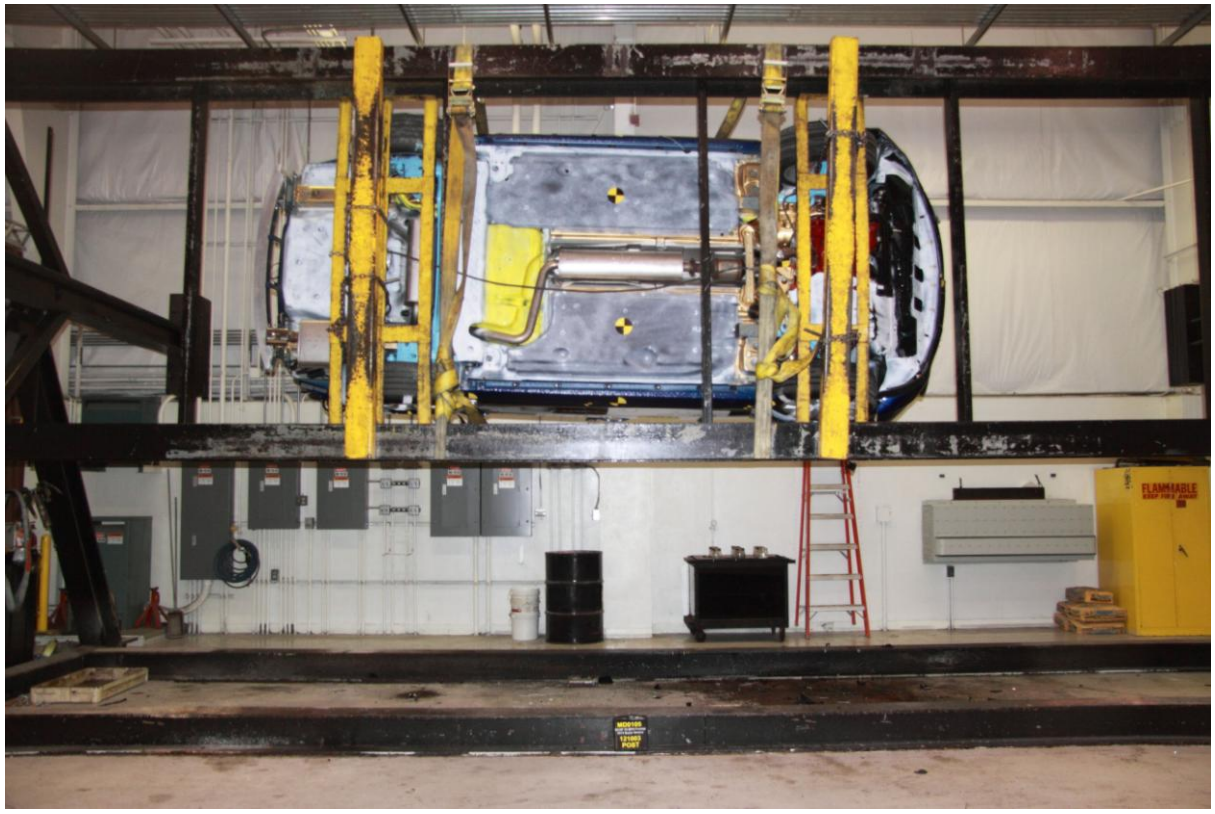
071 Post-test Speed Trap Read-out

072 Vehicle at 0º on Static Rollover Device

073 Vehicle at 90º on Static Rollover Device



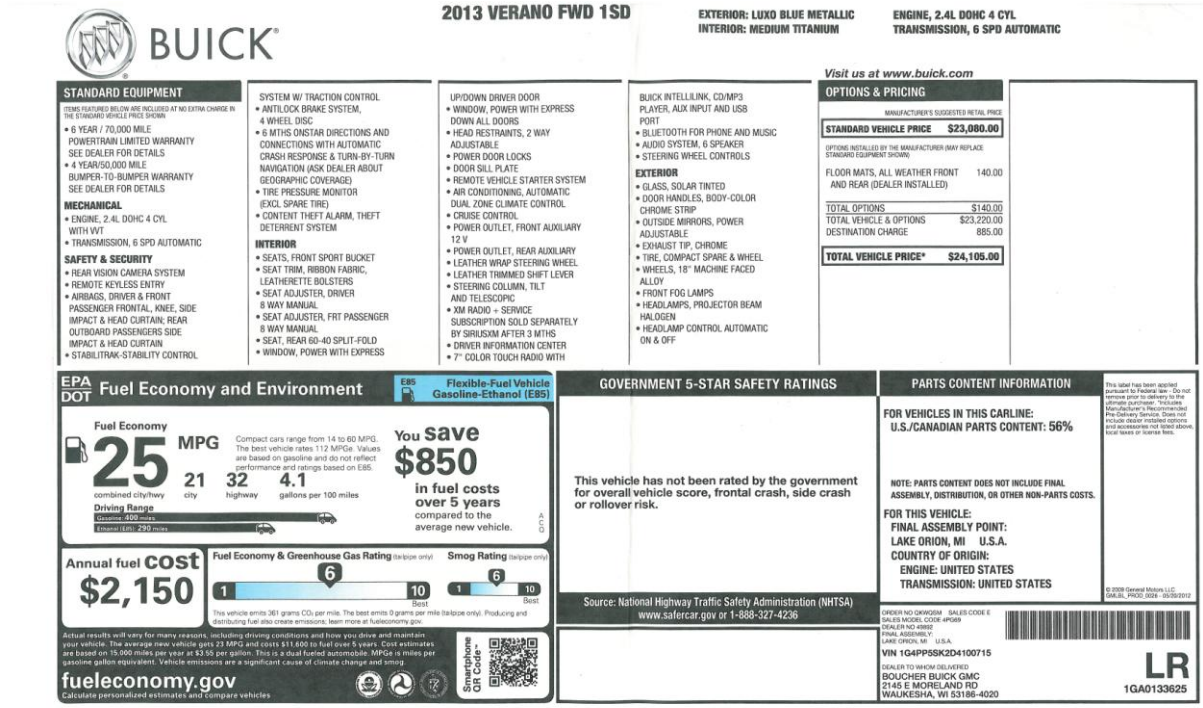
074 Vehicle at 180º on Static Rollover Device



075 Vehicle at 270º on Static Rollover Device

076 Vehicle at 360º on Static Rollover Device

077 2013 Buick Verano Frontal Impact Event



078 Monroney Label Photograph

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

The following additional dummy and vehicle response data can be found in the R & D section of the NHTSA website at: www.nhtsa.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 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
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 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
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
BARRIER LOAD A1
BARRIER LOAD A2
BARRIER LOAD A3
BARRIER LOAD A4
BARRIER LOAD A5
BARRIER LOAD A6
BARRIER LOAD A7
BARRIER LOAD A8
BARRIER LOAD A9
BARRIER LOAD B1
BARRIER LOAD B2
BARRIER LOAD B3
BARRIER LOAD B4
BARRIER LOAD B5

BARRIER LOAD B6
BARRIER LOAD B7
BARRIER LOAD B8
BARRIER LOAD B9
BARRIER LOAD C1
BARRIER LOAD C2
BARRIER LOAD C3
BARRIER LOAD C4
BARRIER LOAD C5
BARRIER LOAD C6
BARRIER LOAD C7
BARRIER LOAD C8
BARRIER LOAD C9
BARRIER LOAD D1
BARRIER LOAD D2
BARRIER LOAD D3
BARRIER LOAD D4
BARRIER LOAD D5
BARRIER LOAD D6
BARRIER LOAD D7
BARRIER LOAD D8
BARRIER LOAD D9

NHTSA

Test Date: 10/03/2012

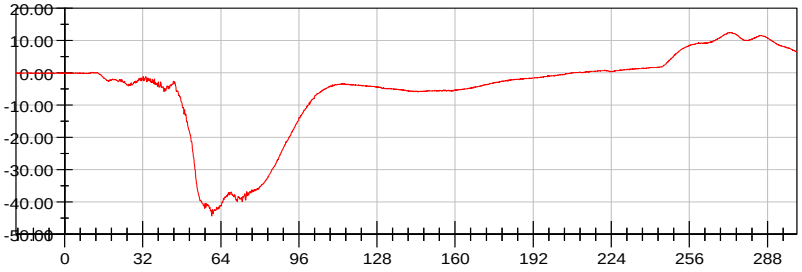
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

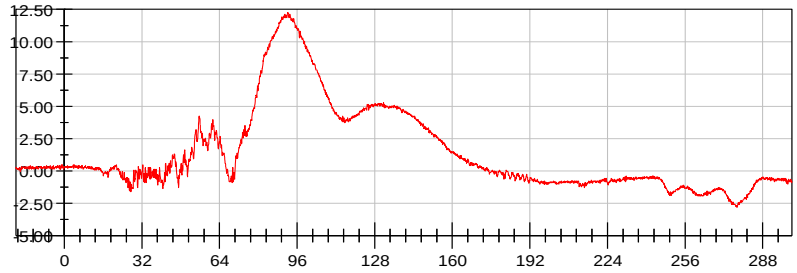
12.53 g at 272.88 ms

<Min>

-44.29 g at 60.24 ms

CFC_1000

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



<Max>

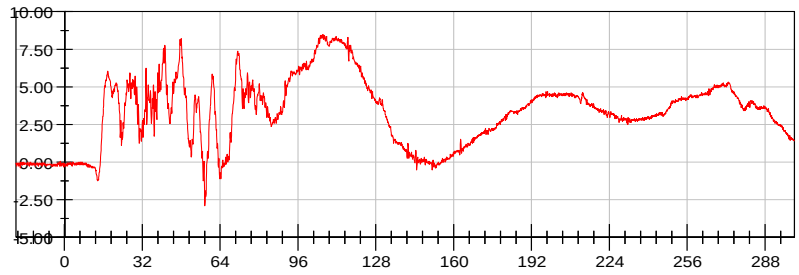
12.24 g at 92.08 ms

<Min>

-2.80 g at 277.20 ms

CFC_1000

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



<Max>

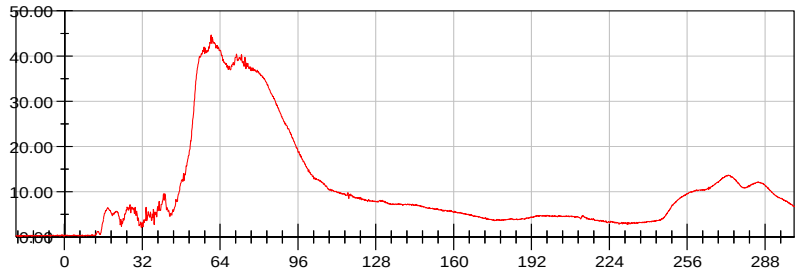
8.49 g at 106.24 ms

<Min>

-2.89 g at 57.68 ms

CFC_1000

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



<Max>

44.63 g at 60.32 ms

<Min>

0.07 g at -18.00 ms

CFC_1000

NHTSA

Test Date: 10/03/2012

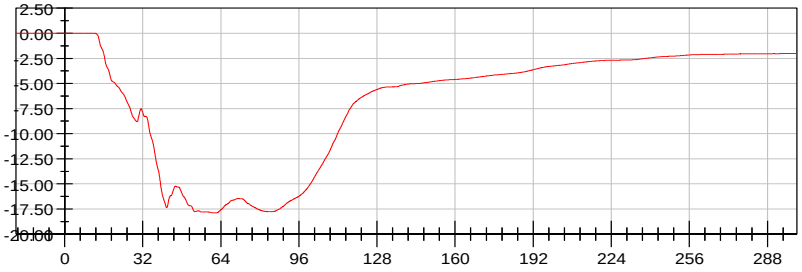
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

0.00 mm at -13.36 ms

<Min>

-17.89 mm at 60.80 ms

CFC_600

NHTSA

Test Date: 10/03/2012

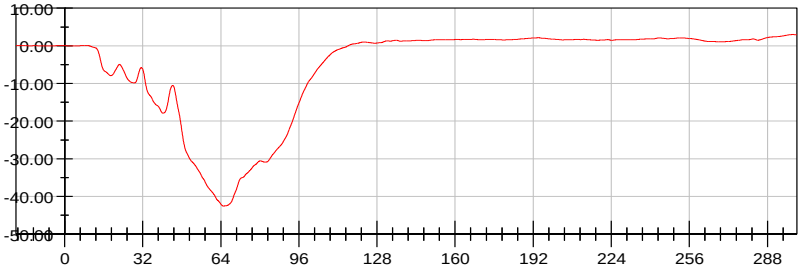
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

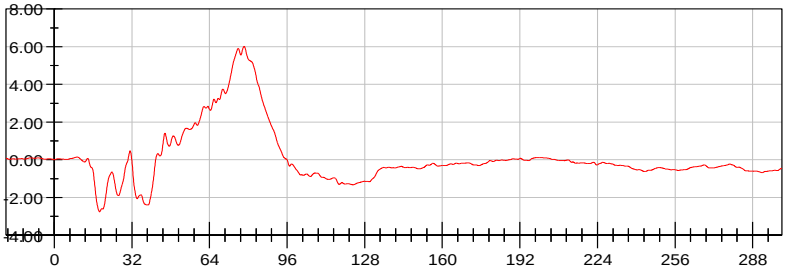
3.01 g at 298.32 ms

<Min>

-42.58 g at 65.04 ms

CFC_180

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



<Max>

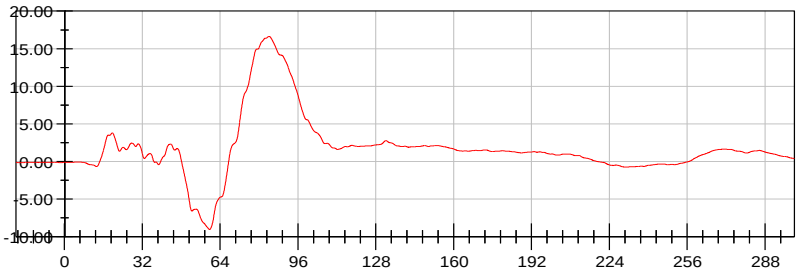
6.01 g at 78.24 ms

<Min>

-2.77 g at 18.64 ms

CFC_180

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



<Max>

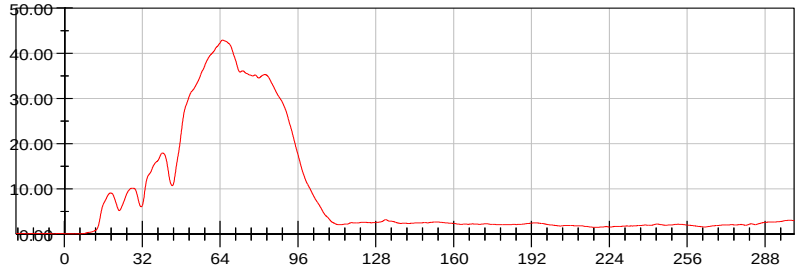
16.64 g at 84.08 ms

<Min>

-9.04 g at 59.68 ms

CFC_180

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



<Max>

42.91 g at 65.04 ms

<Min>

0.09 g at 5.68 ms

CFC_180

NHTSA

Test Date: 10/03/2012

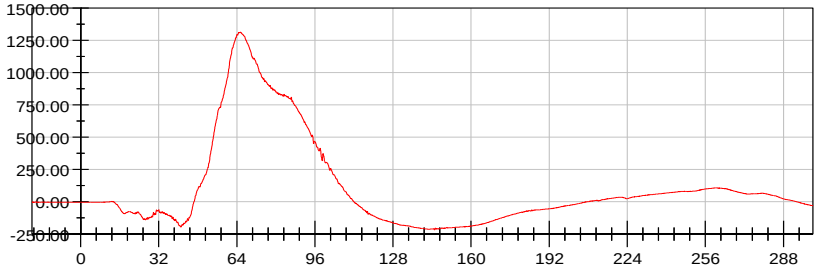
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

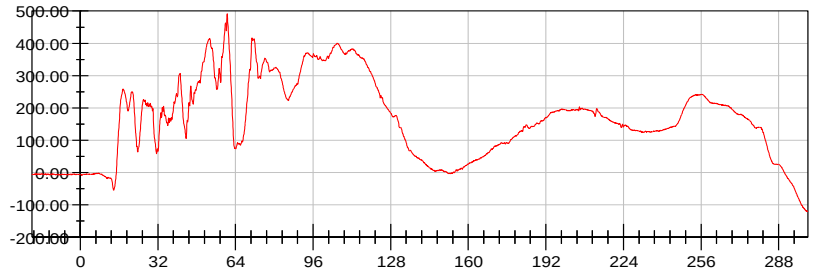
1,315.13 N at 65.44 ms

<Min>

-217.97 N at 144.96 ms

CFC_1000

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



<Max>

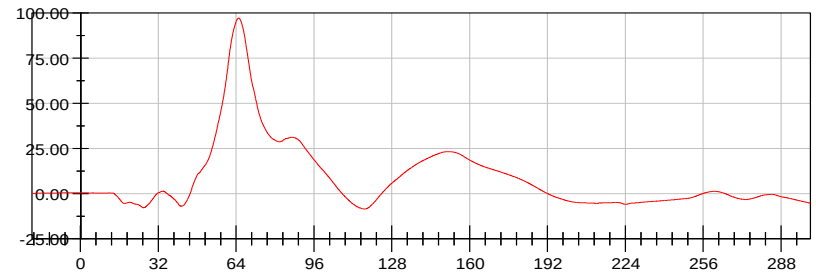
491.60 N at 60.56 ms

<Min>

-121.23 N at 299.84 ms

CFC_1000

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



<Max>

97.27 Nm at 65.04 ms

<Min>

-8.52 Nm at 116.80 ms

CFC_600

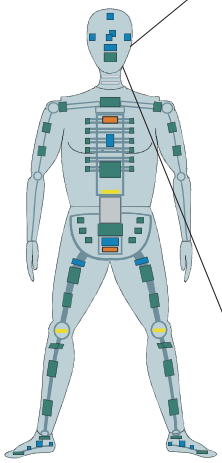
2013 Buick Verano into Load Cell Barrier

Neck Injury Predictor (NIJ)

Date: 10/03/2012
Time: 19:47

Customer: NHTSA
Test Number: MD0105

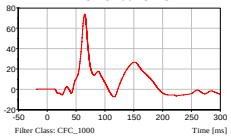
Test Orientation = Frontal
Fzc(Tension) = 6806
Fzc(Compression) = 6160
Myc(Extension) = 135
Myc(Flexion) = 310



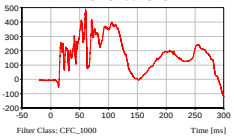
Dummy:HIII 50th Male
Seating Position:
Driver

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

11TMONUP00H3MOYX

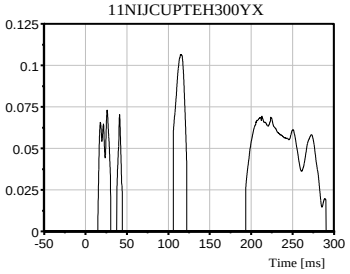


11NECKUP00H3FOZA



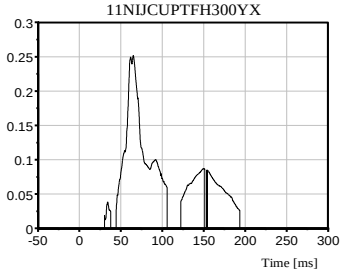
TRC Inc. Test Lab: CTF
Test Number: 121003

11NIJCUPTEH300YX



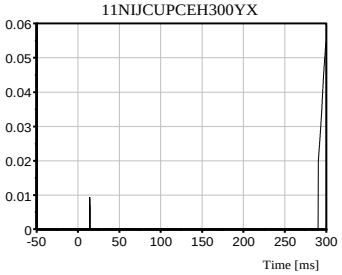
Max [NTE] 0.1065 at 114.88 ms

11NIJCUPTFH300YX



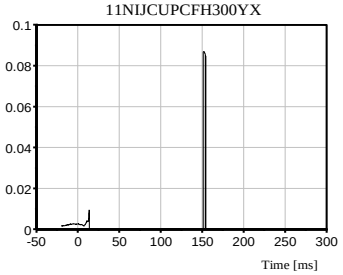
Max [NTF] 0.2517 at 65.04 ms

11NIJCUPCEH300YX



Max [NCE] 0.0548 at 300.00 ms

11NIJCUPCFH300YX



Max [NCF] 0.0870 at 151.84 ms

NHTSA

Test Date: 10/03/2012

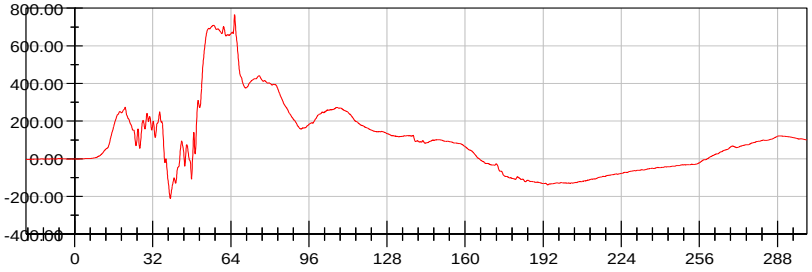
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

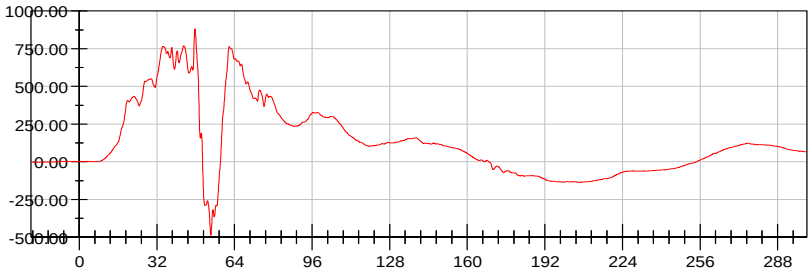
764.75 N at 65.52 ms

<Min>

-211.23 N at 39.20 ms

CFC_600

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



<Max>

882.19 N at 47.68 ms

<Min>

-488.74 N at 54.24 ms

CFC_600

NHTSA

Test Date: 10/03/2012

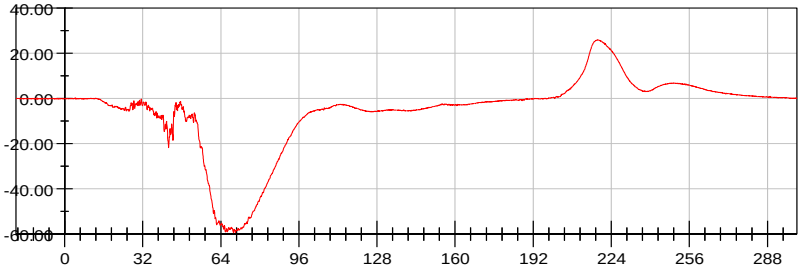
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

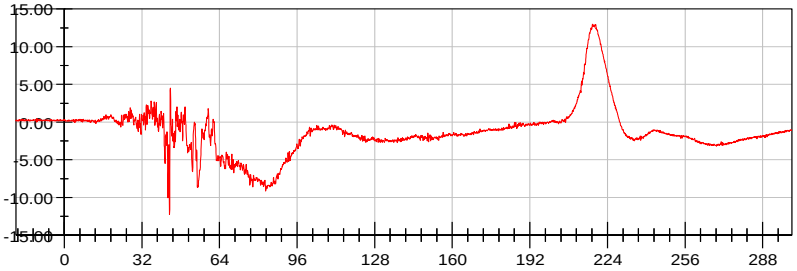
26.02 g at 218.40 ms

<Min>

-59.38 g at 69.20 ms

CFC_1000

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



<Max>

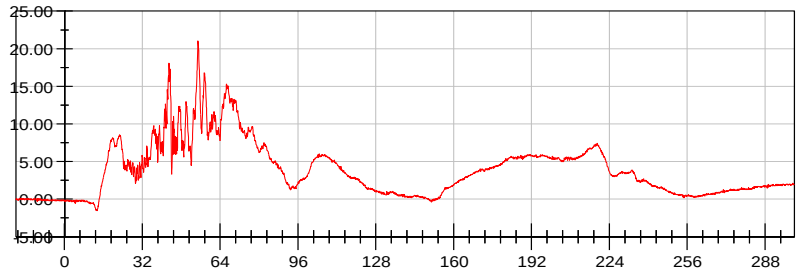
13.00 g at 217.84 ms

<Min>

-12.30 g at 43.36 ms

CFC_1000

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



<Max>

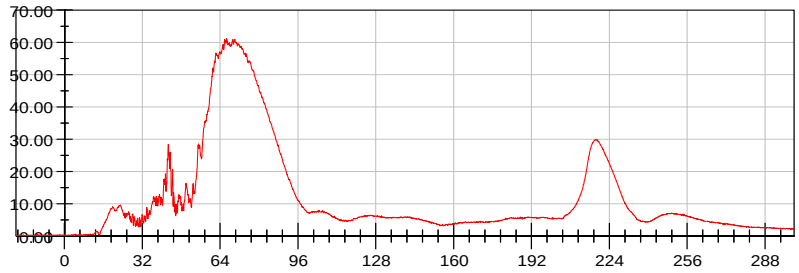
21.05 g at 54.88 ms

<Min>

-1.56 g at 13.44 ms

CFC_1000

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



<Max>

61.15 g at 66.64 ms

<Min>

0.13 g at -19.92 ms

CFC_1000

NHTSA

Test Date: 10/03/2012

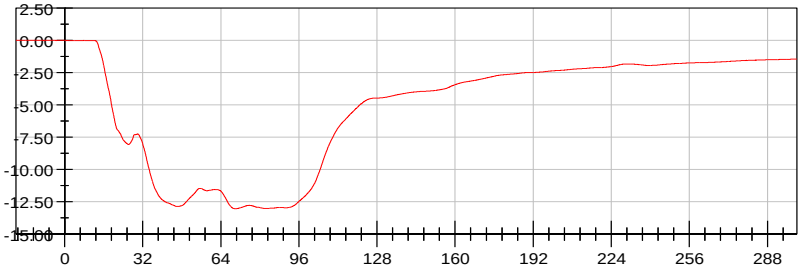
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

0.00 mm at -18.56 ms

<Min>

-13.03 mm at 70.16 ms

CFC_600

NHTSA

Test Date: 10/03/2012

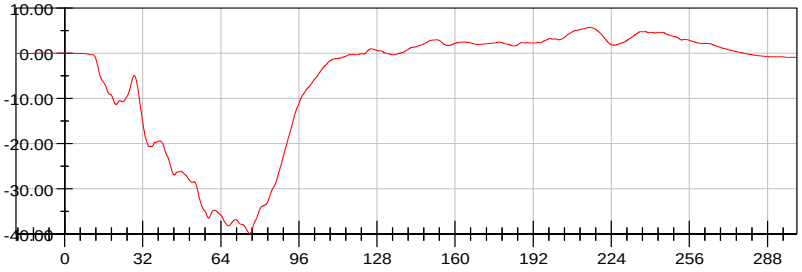
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

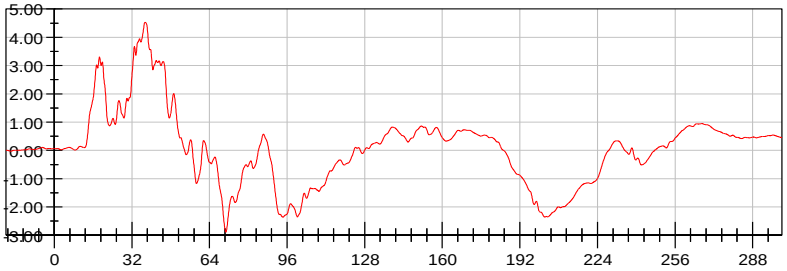
5.74 g at 215.12 ms

<Min>

-39.88 g at 75.84 ms

CFC_180

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



<Max>

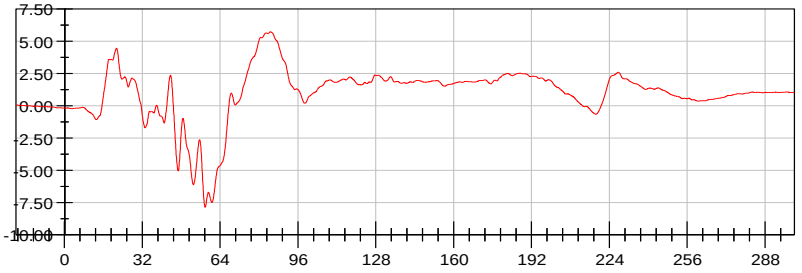
4.53 g at 37.44 ms

<Min>

-2.90 g at 70.72 ms

CFC_180

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



<Max>

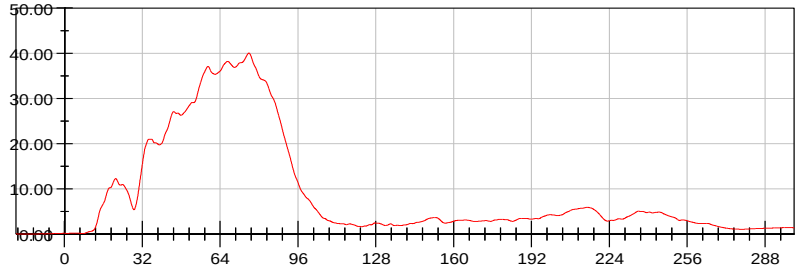
5.73 g at 84.64 ms

<Min>

-7.88 g at 57.84 ms

CFC_180

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



<Max>

40.02 g at 75.84 ms

<Min>

0.01 g at -15.92 ms

CFC_180

NHTSA

Test Date: 10/03/2012

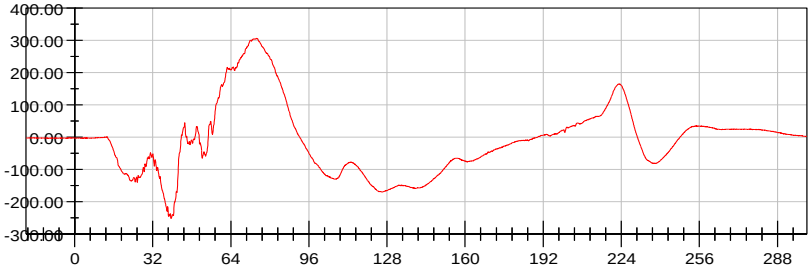
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

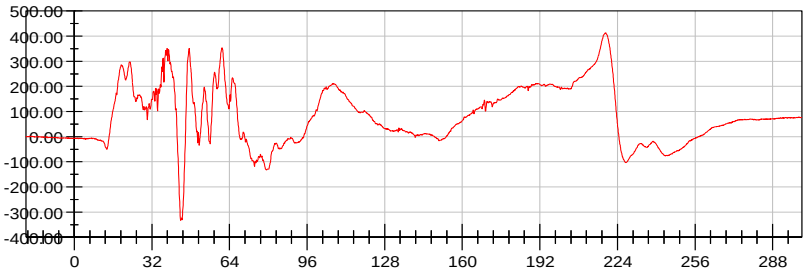
306.51 N at 74.48 ms

<Min>

-251.71 N at 39.52 ms

CFC_1000

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



<Max>

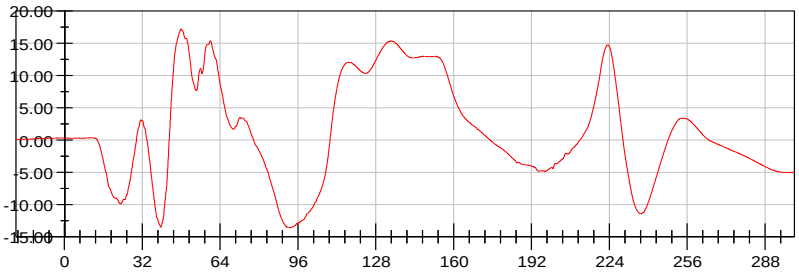
412.77 N at 219.04 ms

<Min>

-334.17 N at 43.84 ms

CFC_1000

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



<Max>

17.23 Nm at 47.92 ms

<Min>

-13.62 Nm at 92.64 ms

CFC_600

2013 Buick Verano into Load Cell Barrier

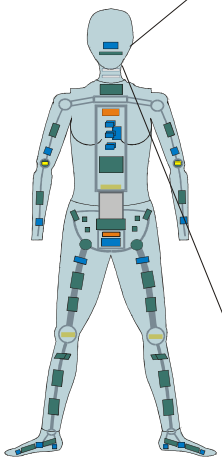
Neck Injury Predictor (NIJ)

Date: 10/03/2012
Time: 19:47

Customer: NHTSA
Test Number: MD0105

TRC Inc. Test Lab: CTF
Test Number: 121003

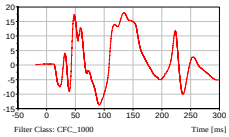
Test Orientation = Frontal
Fzc(Tension) = 4287
Fzc(Compression) = 3880
Myc(Extension) = 67
Myc(Flexion) = 155



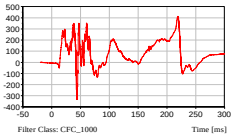
Dummy:HIII 5th Female
Seating Position:
Right Front Passenger

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

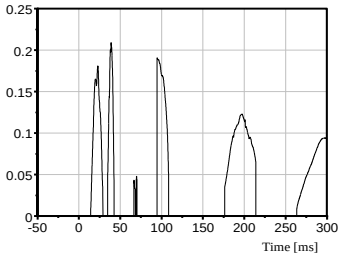
13TMONUP00HFMOYX



13NECKUP00HFFOZA

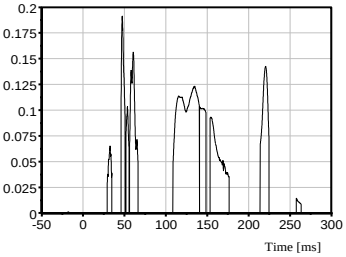


13NIJCUPTEHF00YX



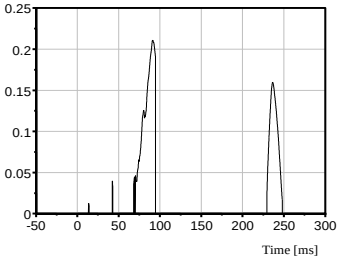
Max [NTE] 0.2092 at 39.04 ms

13NIJCUPTFHF00YX



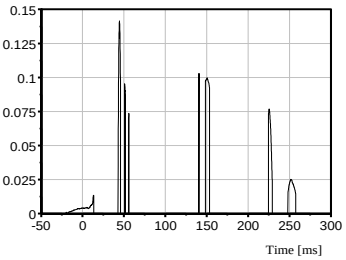
Max [NTF] 0.1914 at 47.36 ms

13NIJCUPCEHF00YX



Max [NCE] 0.2107 at 91.04 ms

13NIJCUPCFHF00YX



Max [NCF] 0.1413 at 44.64 ms

NHTSA

Test Date: 10/03/2012

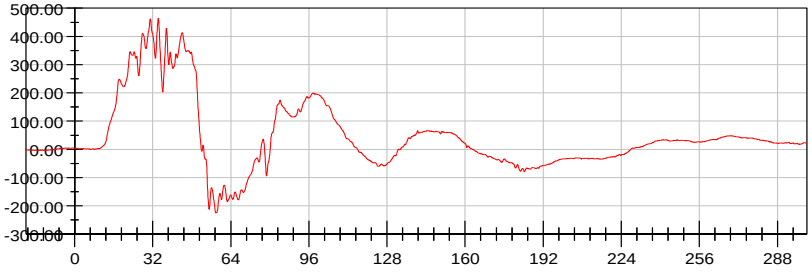
Test Lab: CTF

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

Test Number: 121003 (MD0105)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

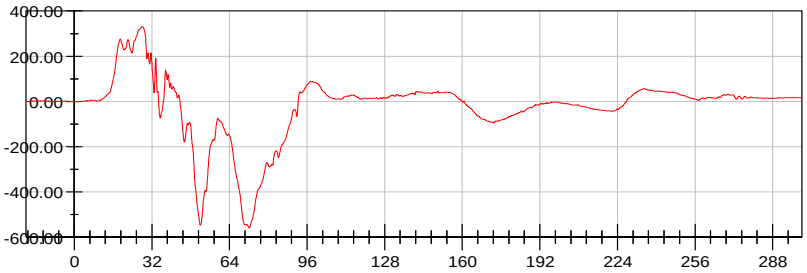
463.90 N at 34.32 ms

<Min>

-224.60 N at 57.92 ms

CFC_600

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



<Max>

332.77 N at 27.92 ms

<Min>

-560.10 N at 72.08 ms

CFC_600

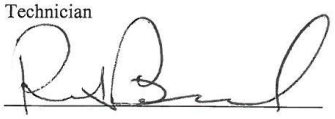
APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION

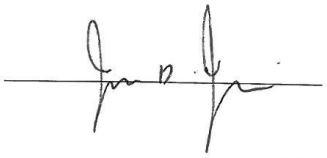
Pre-Test Calibration Sheets
Driver S/N 037

Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 08

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	886	Yes
B	Shoulder Pivot Height	505.5 - 520.7	519	Yes
C	H-Point Height	83.8 - 88.9	86	Yes
D	H-Point From Seatback	134.6 - 139.7	138	Yes
E	Shoulder Pivot From Backline	83.8 - 94.0	92	Yes
F	Thigh Clearance	139.7 - 154.9	152	Yes
G	Back Of Elbow To Wrist Pivot	289.6 - 304.8	293	Yes
H	Skull Cap To Backline	40.6 - 45.7	45	Yes
I	Shoulder-Elbow Length	330.2 - 345.4	339	Yes
J	Elbow Rest Height	190.5 - 210.8	200	Yes
K	Buttock Knee Length	579.1 - 604.5	600	Yes
L	Popliteal Height	429.3 - 454.7	441	Yes
M	Knee Pivot Height	485.1 - 500.4	495	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	430	Yes
W	Foot Breadth	91.4 - 106.7	97	Yes
Y	Chest Circumference	970.3 - 1000.8	988	Yes
Z	Waist Circumference	835.7 - 866.1	863	Yes
AA	Location For Chest Circumference	429.3 - 434.3	431	Yes
BB	Location For Waist Circumference	226.1 - 231.1	230	Yes

Comments:

Technician 

Approved 

Revised 3/13/3003

Transportation Research Center Inc.

Front Head Drop
HIII 50th Serial No. 037 Certification No. 8-1
Test Date: 9/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	239.6 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	3.0 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

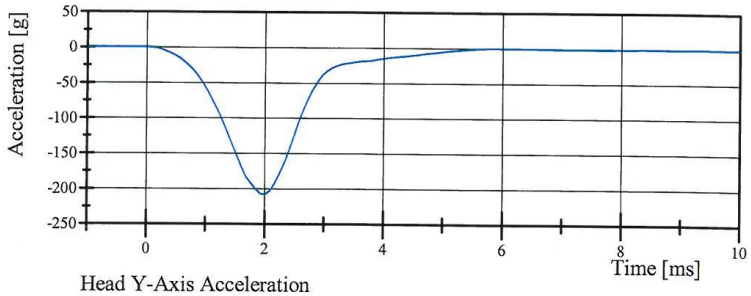
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.11.2012 11:00:34 614

Transportation Research Center Inc.

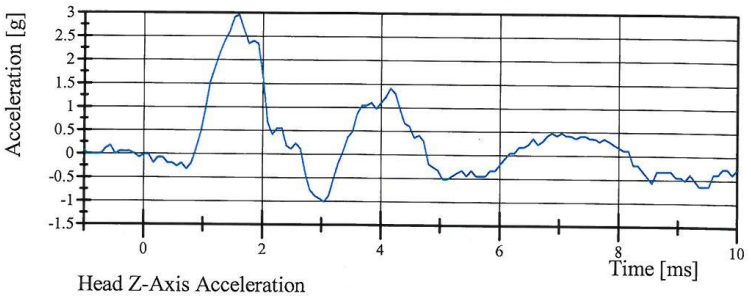
Front Head Drop
HIII 50th Serial No. 037 Certification No. 8-1
Test Date: 9/11/2012

Head X-Axis Acceleration



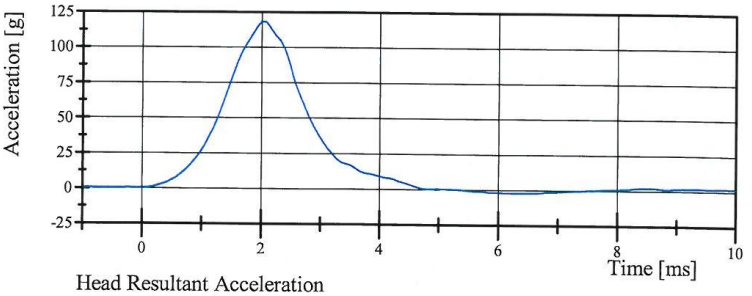
Filter Class: CFC_1000
Max: 0.1 gn at -0.2 ms
Min: -208.4 gn at 2.0 ms

Head Y-Axis Acceleration



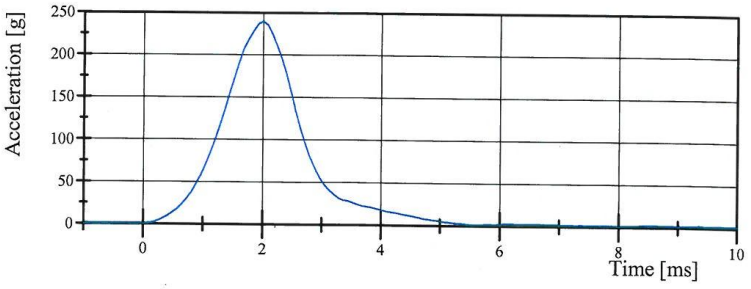
Filter Class: CFC_1000
Max: 3.0 gn at 1.6 ms
Min: -1.0 gn at 3.0 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 118.2 gn at 2.0 ms
Min: -2.3 gn at 6.2 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 239.6 gn at 2.0 ms
Min: 0.0 gn at -0.2 ms

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

09.11.2012 11:00:49 614

Transportation Research Center Inc.

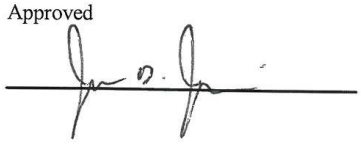
Neck Flexion
HIII 50th Serial No. 037 Certification No. 8-1
Test Date: 9/11/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	46 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.938 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	36.0 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-24.04 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-20.98 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-16.77 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-16.77 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) °	-68.7 °	Yes
Time of Peak	57 - 64 ms	58.3 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	115.4 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88 - 108 N·m	105.2 N·m	Yes
Time of Peak	47 - 58 ms	48.9 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	97.4 ms	Yes

Test meets specifications.

Comments:

Technician 

Approved 

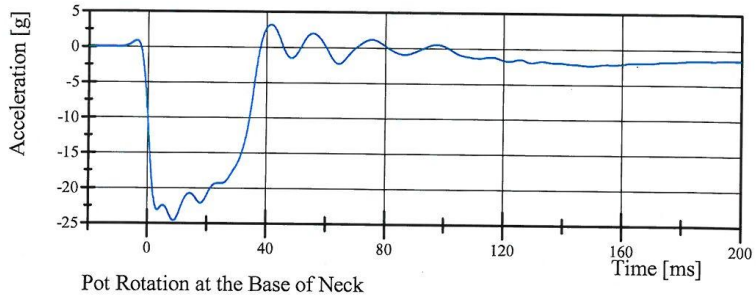
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.11.2012 15:40:20 1722

Transportation Research Center Inc.

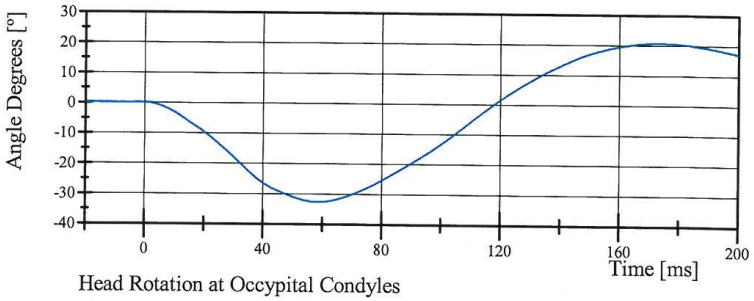
Neck Flexion
HIII 50th Serial No. 037 Certification No. 8-1
Test Date: 9/11/2012

Pendulum Acceleration



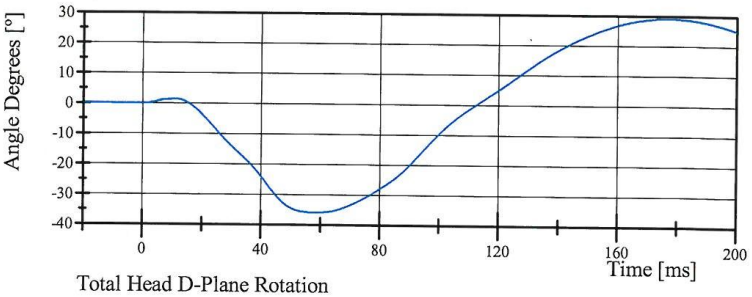
Filter Class: CFC_60
Max: 3.2 gn at 41.5 ms
Min: -24.6 gn at 8.8 ms

Pot Rotation at the Base of Neck



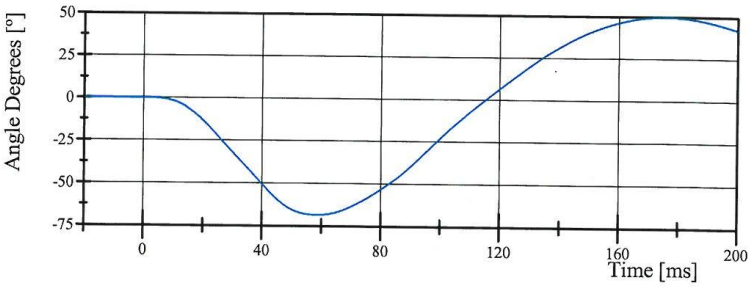
Filter Class: CFC_60
Max: 20.7 ° at 172.9 ms
Min: -32.7 ° at 58.3 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 29.1 ° at 176.9 ms
Min: -36.0 ° at 58.4 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 49.8 ° at 175.6 ms
Min: -68.7 ° at 58.3 ms

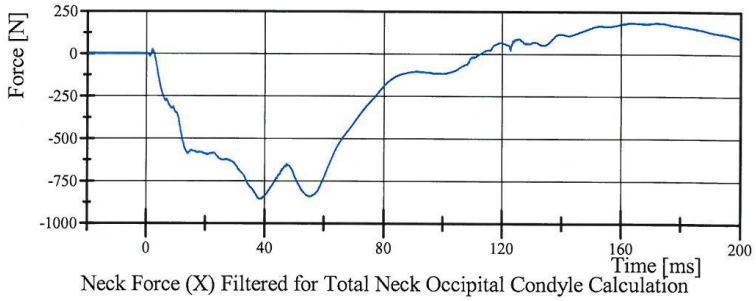
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.11.2012 15:40:27 1722

Transportation Research Center Inc.

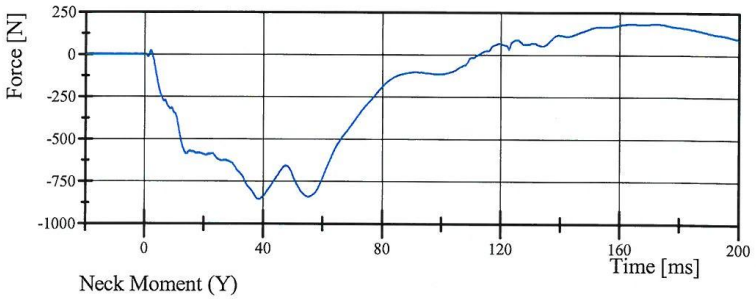
Neck Flexion
HIII 50th Serial No. 037 Certification No. 8-1
Test Date: 9/11/2012

Neck Force (X)



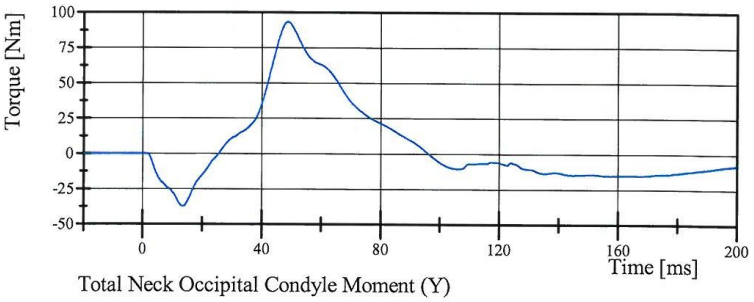
Filter Class: CFC_1000
Max: 185.0 N at 172.6 ms
Min: -857.1 N at 38.3 ms

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



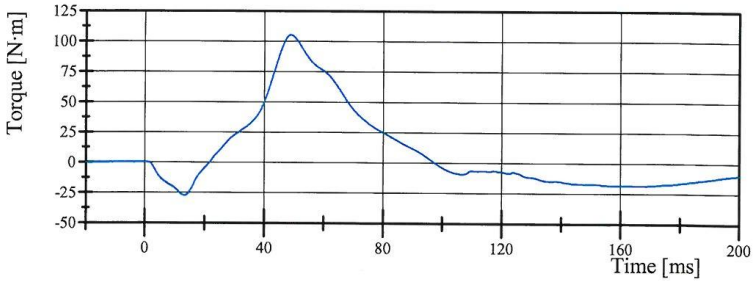
Filter Class: CFC_600
Max: 184.5 N at 171.6 ms
Min: -857.0 N at 38.4 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 93.2 Nm at 48.7 ms
Min: -37.5 Nm at 13.5 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 105.2 N·m at 48.9 ms
Min: -27.3 N·m at 13.3 ms

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

09.11.2012 15:40:28 1722

Transportation Research Center Inc.

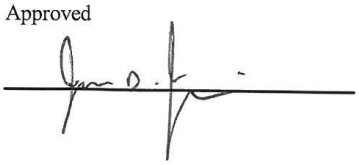
Neck Extension
HIII 50th Serial No. 037 Certification No. 8-2
Test Date: 9/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-5.984 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	42.2 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	18.06 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	16.06 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	12.81 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	12.81 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 °	96.7 °	Yes
Time of Peak	72 - 82 ms	77.5 ms	Yes
Total Head D-Plane Rotation Decay to 0°	147 - 174 ms	159.3 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	(-53) - (-80) N·m	-68.3 N·m	Yes
Time of Peak	65 - 79 ms	72.4 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	144.6 ms	Yes

Test meets specifications.

Comments:

Technician 

Approved 

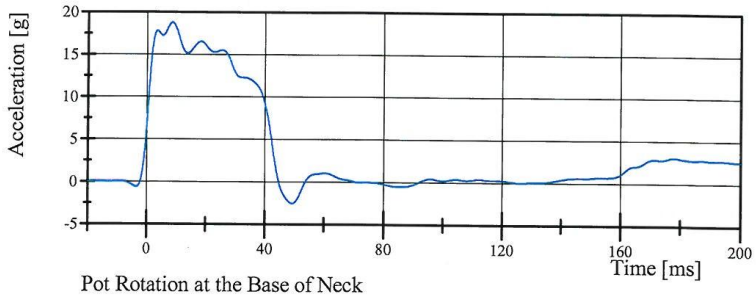
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.12.2012 08:18:26 1844

Transportation Research Center Inc.

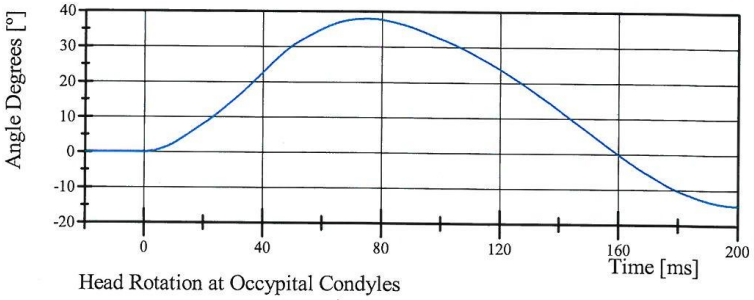
Neck Extension
HIII 50th Serial No. 037 Certification No. 8-2
Test Date: 9/12/2012

Pendulum Acceleration



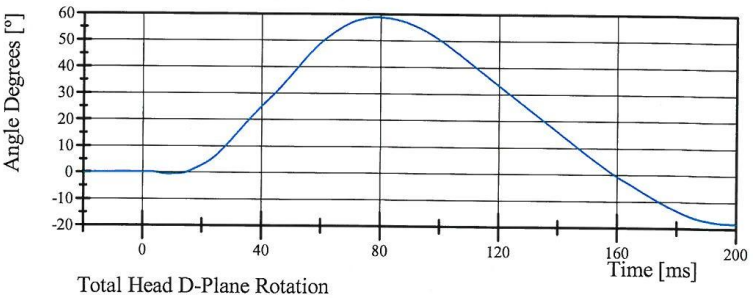
Filter Class: CFC_60
Max: 18.8 gn at 8.6 ms
Min: -2.6 gn at 49.3 ms

Pot Rotation at the Base of Neck



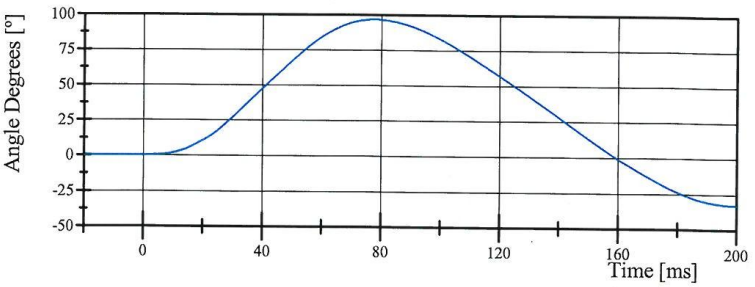
Filter Class: CFC_60
Max: 38.0 ° at 76.0 ms
Min: -14.5 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 58.8 ° at 78.4 ms
Min: -18.2 ° at 199.6 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 96.7 ° at 77.5 ms
Min: -32.7 ° at 200.0 ms

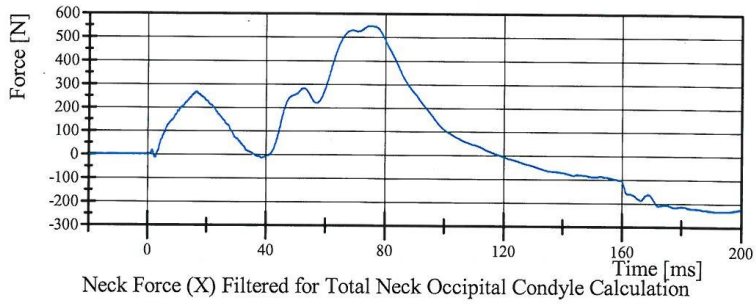
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.12.2012 08:18:34 1844

Transportation Research Center Inc.

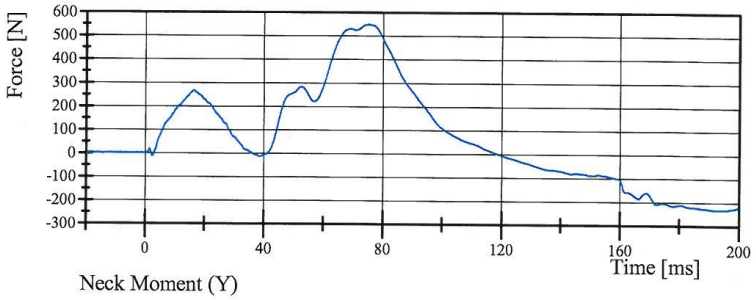
Neck Extension
HIII 50th Serial No. 037 Certification No. 8-2
Test Date: 9/12/2012

Neck Force (X)



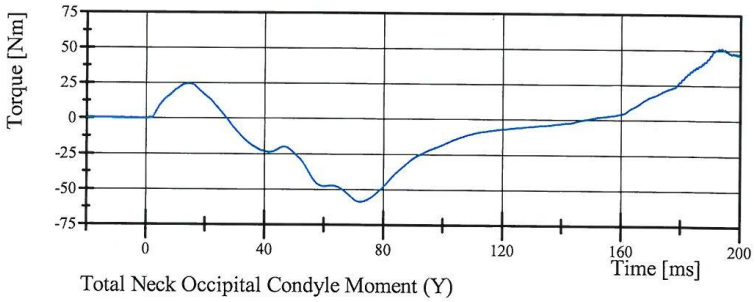
Filter Class: CFC_1000
Max: 549.3 N at 74.9 ms
Min: -233.6 N at 192.4 ms

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



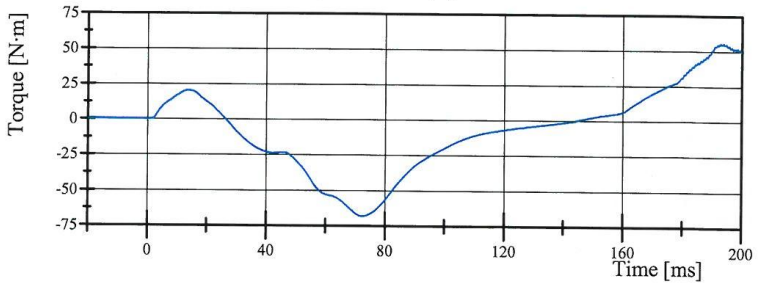
Filter Class: CFC_600
Max: 549.1 N at 75.1 ms
Min: -233.2 N at 192.5 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 51.3 Nm at 193.9 ms
Min: -58.9 Nm at 72.2 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 55.4 N·m at 193.9 ms
Min: -68.3 N·m at 72.4 ms

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

09.12.2012 08:18:35 1844

Transportation Research Center Inc.

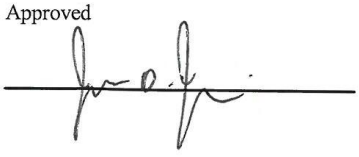
Front Thorax
HIII 50th Serial No. 037 Certification No. 8-1
Test Date: 9/12/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	48 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.675 m/s	Yes
Probe Force Peak	(-5,160) - (-5,893) N	-5,569.3 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-67.47 mm	Yes
Internal Hysteresis	65 - 85 %	76.4 %	Yes

Test meets specifications.

Comments:

Technician 

Approved 

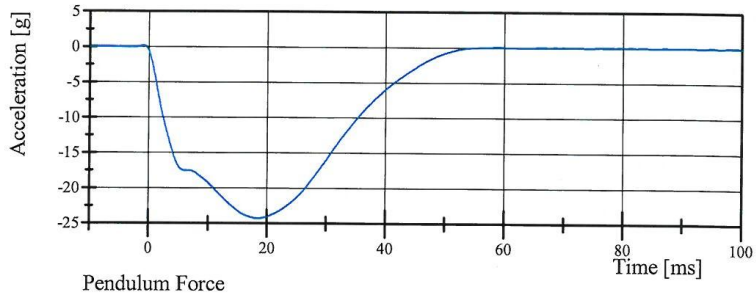
Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

09.12.2012 09:26:54 400

Transportation Research Center Inc.

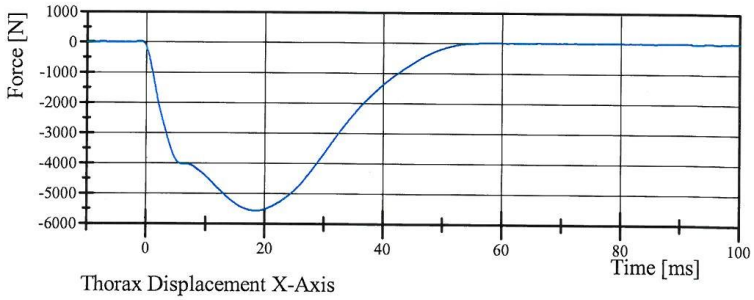
Front Thorax
HIII 50th Serial No. 037 Certification No. 8-1
Test Date: 9/12/2012

Pendulum Acceleration



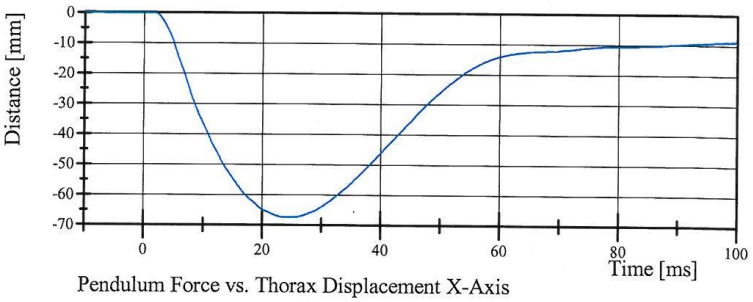
Filter Class: CFC_180
Max: 0.1 gn at -1.0 ms
Min: -24.3 gn at 18.6 ms

Pendulum Force



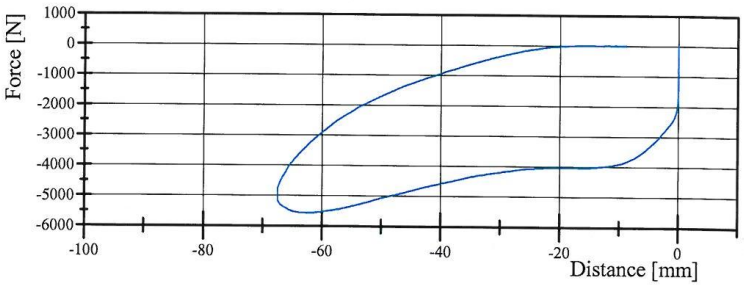
Filter Class: CFC_180
Max: 20.3 N at -1.0 ms
Min: -5,569.3 N at 18.6 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -3.8 ms
Min: -67.5 mm at 25.3 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 20.3 N at -0.0 mm
Min: -5,569.3 N at -62.7 mm

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

09.12.2012 09:27:01 400

Transportation Research Center Inc

Hybrid III Hip Range of Motion

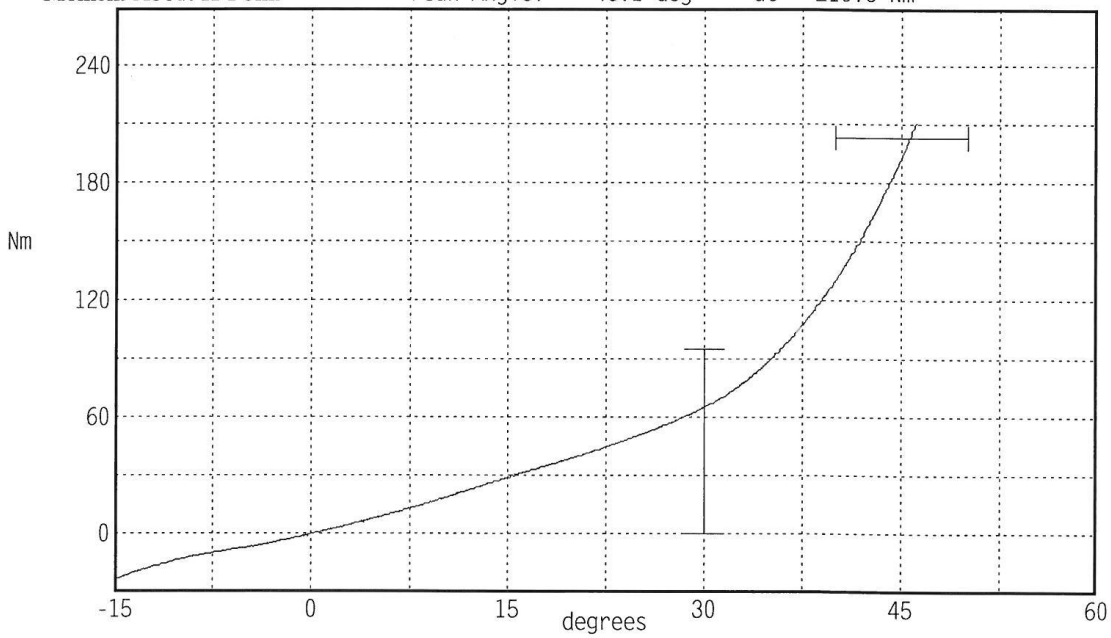
Serial Number: 037L
Test Number: 037C08
Comments:

Date: 09/11/2012
Time: 08:46

TEST PARAMETER	SPECIFICATION	TEST RESULTS		
Temperature	18.9 - 25.6	21.6	°C	Pass
Humidity	10 - 70	48	%	Pass
Moment at 30 deg	<= 94.9	65.4	Nm	Pass
Angle at 203 Nm	40.0 - 50.0	45.7	deg	Pass
Average Velocity	5.0 - 10.0	7.5	deg/sec	Pass

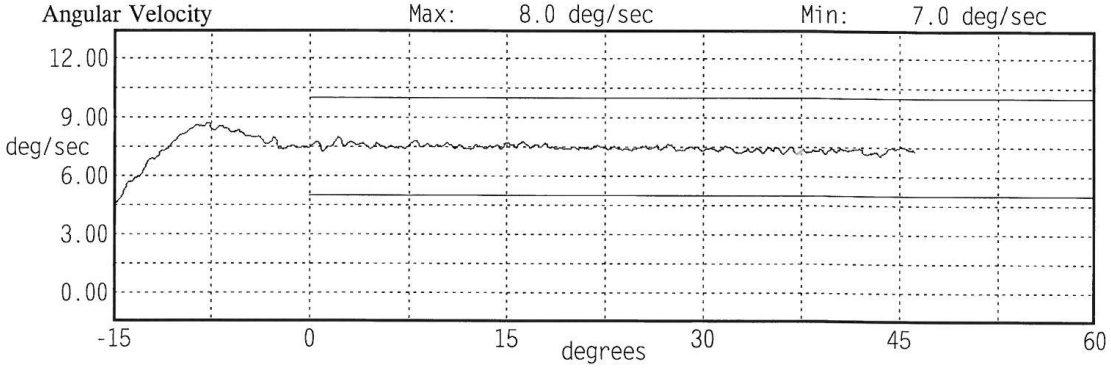
Moment About H-Point

Peak Moment: 210.6 Nm at 46.1 deg
Peak Angle: 46.1 deg at 210.6 Nm



Angular Velocity

Max: 8.0 deg/sec Min: 7.0 deg/sec



Transportation Research Center Inc

Hybrid III Hip Range of Motion

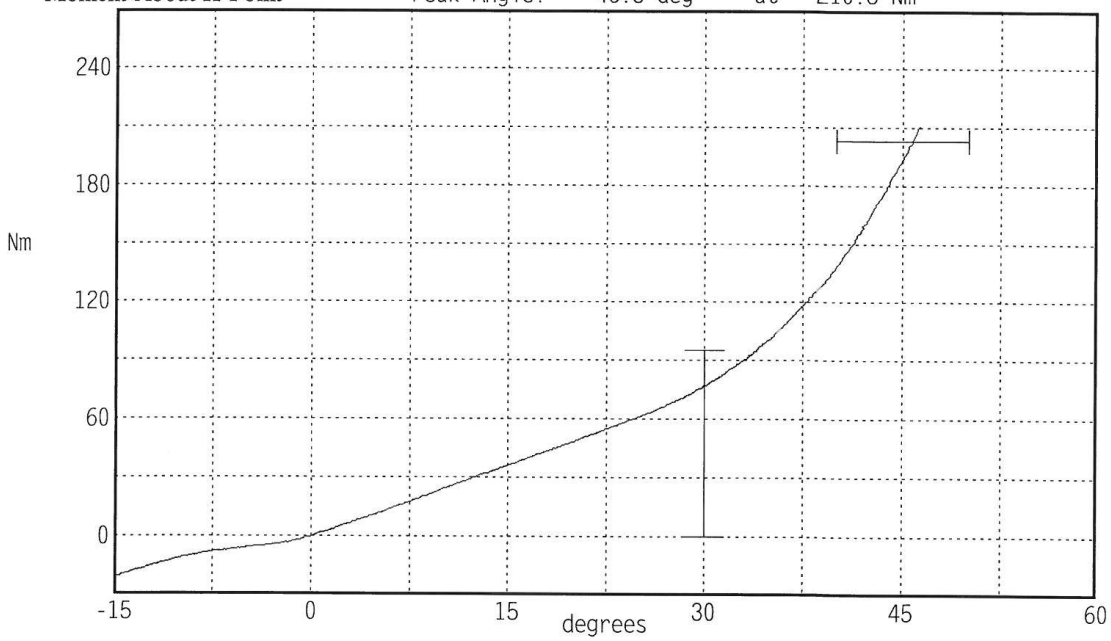
Serial Number: 037R
Test Number: 037C08
Comments:

Date: 09/11/2012
Time: 09:24

TEST PARAMETER	SPECIFICATION	TEST RESULTS		
Temperature	18.9 - 25.6	21.1	°C	Pass
Humidity	10 - 70	47	%	Pass
Moment at 30 deg	<= 94.9	77.1	Nm	Pass
Angle at 203 Nm	40.0 - 50.0	45.8	deg	Pass
Average Velocity	5.0 - 10.0	7.4	deg/sec	Pass

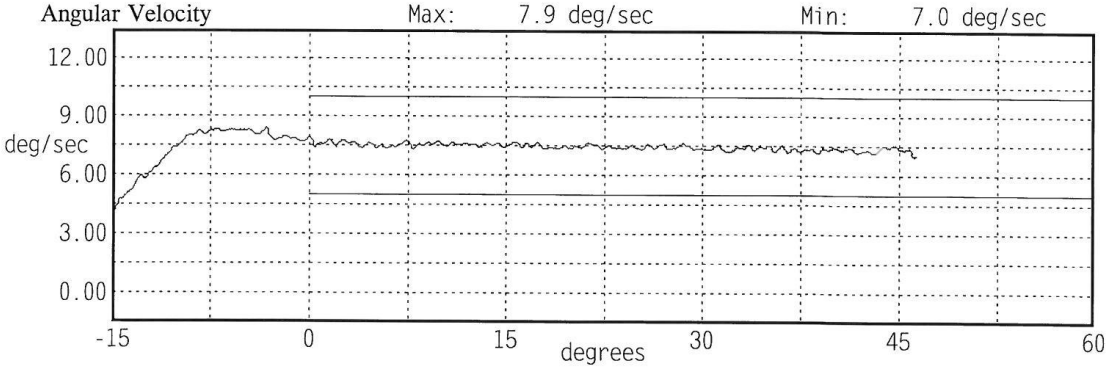
Moment About H-Point

Peak Moment: 210.3 Nm at 46.3 deg
Peak Angle: 46.3 deg at 210.3 Nm



Angular Velocity

Max: 7.9 deg/sec Min: 7.0 deg/sec



Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 8-2
Test Date: 9/13/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	61 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.096 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,477.32 N	Yes

Test meets specifications.

Comments:

Technician

Approved

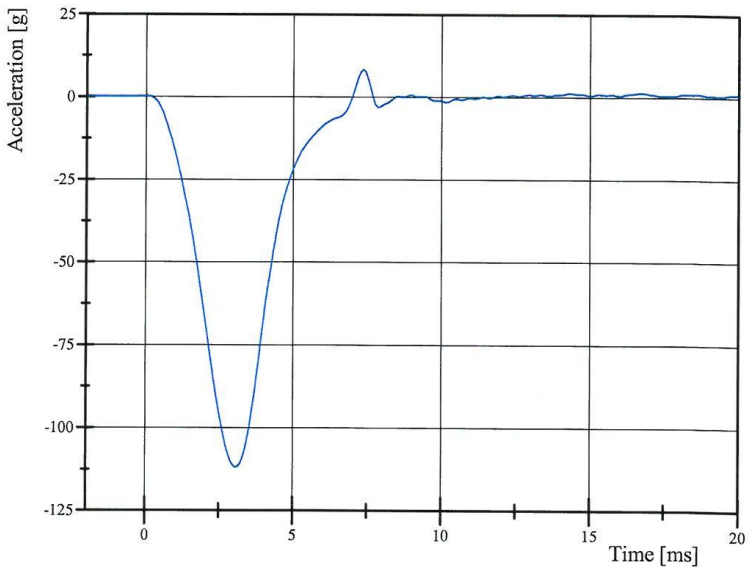
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.13.2012 13:45:23 1826

Transportation Research Center Inc.

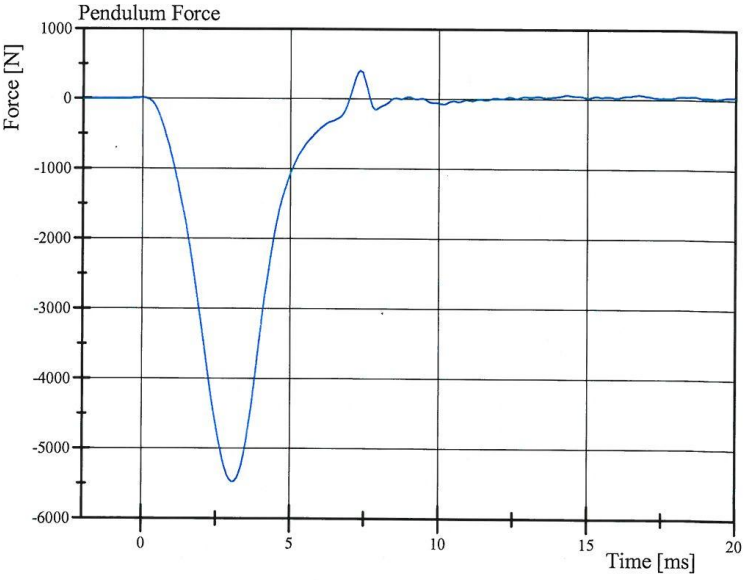
Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 8-2
Test Date: 9/13/2012

Pendulum Acceleration



Filter Class: CFC_600
Max: 8.2 gn at 7.4 ms
Min: -111.9 gn at 3.0 ms

Pendulum Force



Filter Class: CFC_600
Max: 402.8 N at 7.4 ms
Min: -5,477.3 N at 3.0 ms

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

09.13.2012 13:45:30 1826

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 8-2
Test Date: 9/13/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	62 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.095 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,407.22 N	Yes

Test meets specifications.

Comments:

Technician

Approved

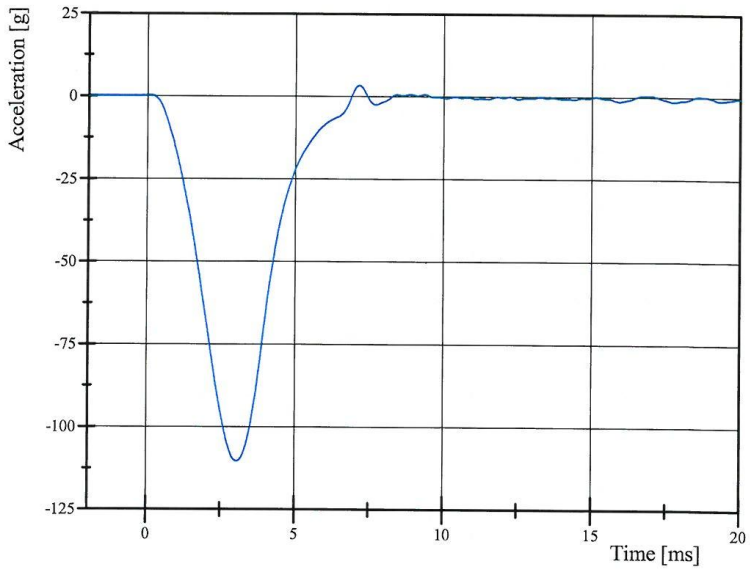
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

09.13.2012 13:49:59 1826

Transportation Research Center Inc.

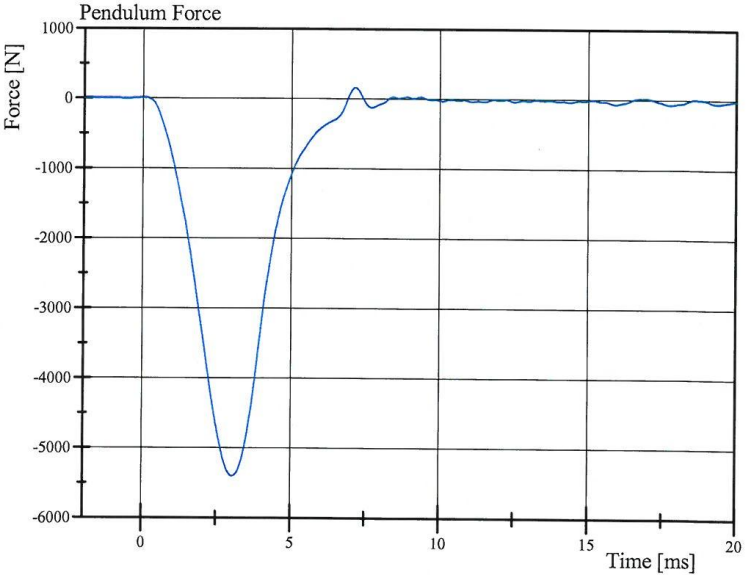
Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 8-2
Test Date: 9/13/2012

Pendulum Acceleration



Filter Class: CFC_600
Max: 3.3 gn at 7.1 ms
Min: -110.5 gn at 3.0 ms

Pendulum Force



Filter Class: CFC_600
Max: 159.8 N at 7.1 ms
Min: -5,407.2 N at 3.0 ms

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

09.13.2012 13:50:05 1826

Driver S/N 037

Post-Test Calibration Sheets

Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 09

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	885	Yes
B	Shoulder Pivot Height	505.5 - 520.7	518	Yes
C	H-Point Height	83.8 - 88.9	86	Yes
D	H-Point From Seatback	134.6 - 139.7	138	Yes
E	Shoulder Pivot From Backline	83.8 - 94.0	92	Yes
F	Thigh Clearance	139.7 - 154.9	152	Yes
G	Back Of Elbow To Wrist Pivot	289.6 - 304.8	294	Yes
H	Skull Cap To Backline	40.6 - 45.7	45	Yes
I	Shoulder-Elbow Length	330.2 - 345.4	339	Yes
J	Elbow Rest Height	190.5 - 210.8	200	Yes
K	Buttock Knee Length	579.1 - 604.5	600	Yes
L	Popliteal Height	429.3 - 454.7	441	Yes
M	Knee Pivot Height	485.1 - 500.4	495	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	430	Yes
W	Foot Breadth	91.4 - 106.7	97	Yes
Y	Chest Circumference	970.3 - 1000.8	990	Yes
Z	Waist Circumference	835.7 - 866.1	863	Yes
AA	Location For Chest Circumference	429.3 - 434.3	431	Yes
BB	Location For Waist Circumference	226.1 - 231.1	230	Yes

Comments:

Technician

Approved

Revised 3/13/3003

Transportation Research Center Inc.

Front Head Drop
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/4/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	56 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	249.9 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	8.4 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

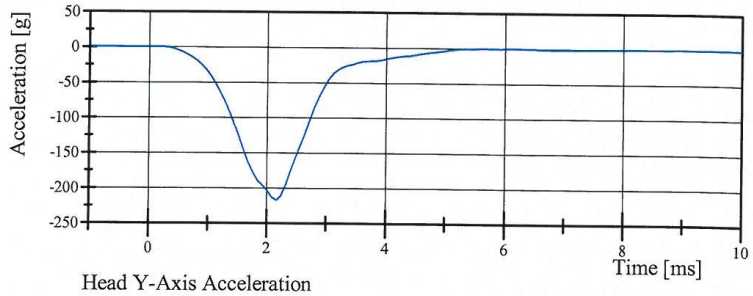
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.04.2012 13:40:44 611

Transportation Research Center Inc.

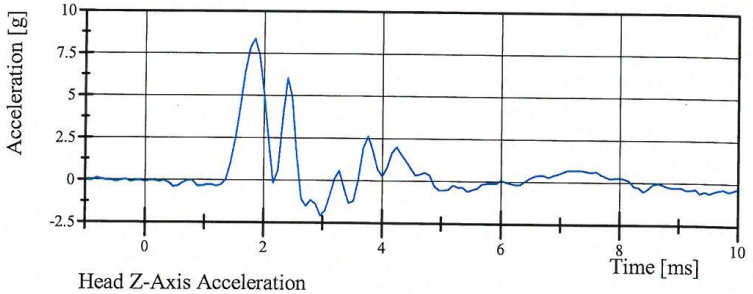
Front Head Drop
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/4/2012

Head X-Axis Acceleration



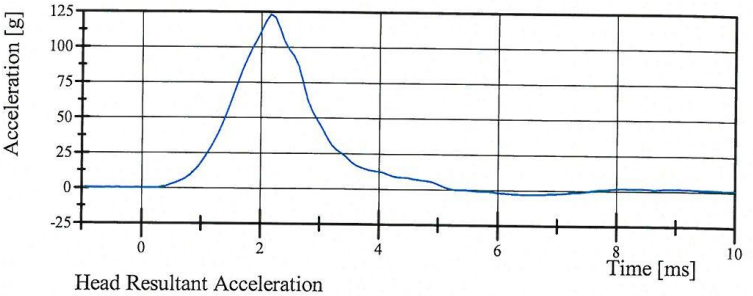
Filter Class: CFC_1000
Max: 0.2 gn at 6.2 ms
Min: -217.4 gn at 2.2 ms

Head Y-Axis Acceleration



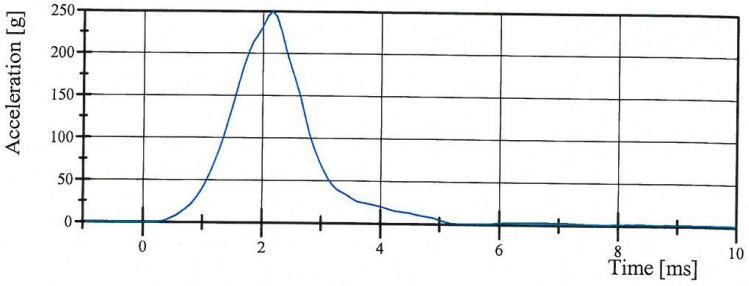
Filter Class: CFC_1000
Max: 8.4 gn at 1.8 ms
Min: -2.1 gn at 3.0 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 123.2 gn at 2.2 ms
Min: -3.0 gn at 6.5 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 249.9 gn at 2.2 ms
Min: 0.0 gn at -0.2 ms

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

10.04.2012 13:40:51 611

Transportation Research Center Inc.

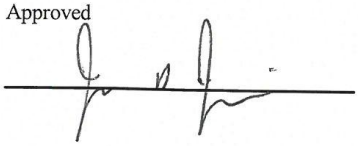
Neck Flexion
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/5/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	55 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.941 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	37.3 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-23.81 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-21.73 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-17.10 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-17.10 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) °	-73.4 °	Yes
Time of Peak	57 - 64 ms	59.2 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	121.0 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88 - 108 N·m	106.3 N·m	Yes
Time of Peak	47 - 58 ms	49.8 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	97.8 ms	Yes

Test meets specifications.

Comments:

Technician 

Approved 

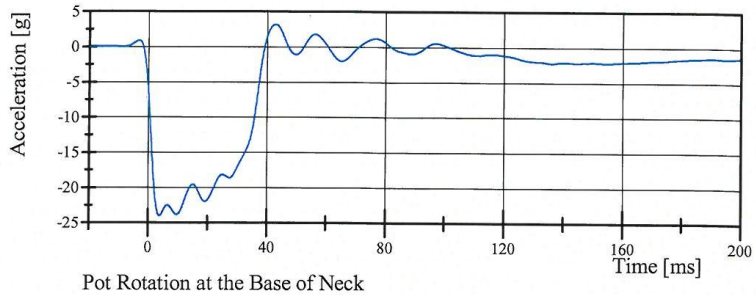
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.05.2012 07:56:06 2942

Transportation Research Center Inc.

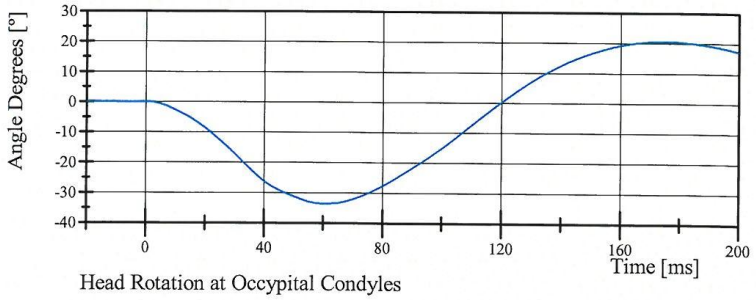
Neck Flexion
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/5/2012

Pendulum Acceleration



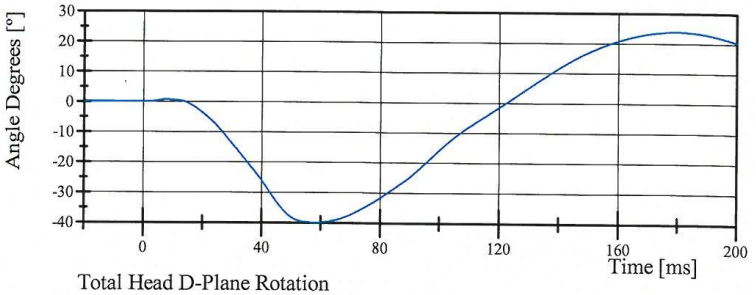
Filter Class: CFC_60
Max: 3.1 gn at 42.7 ms
Min: -24.0 gn at 3.9 ms

Pot Rotation at the Base of Neck



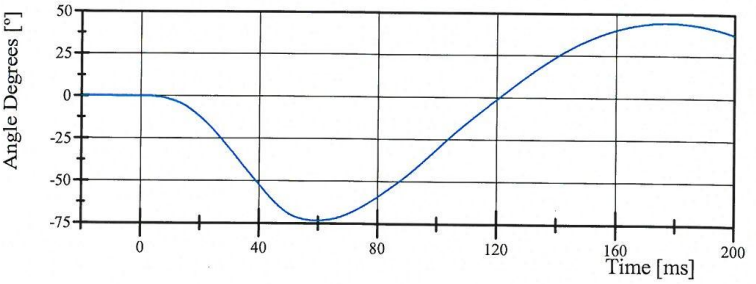
Filter Class: CFC_60
Max: 20.7 ° at 173.9 ms
Min: -33.5 ° at 60.3 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 23.9 ° at 179.2 ms
Min: -39.9 ° at 58.2 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 44.5 ° at 177.4 ms
Min: -73.4 ° at 59.2 ms

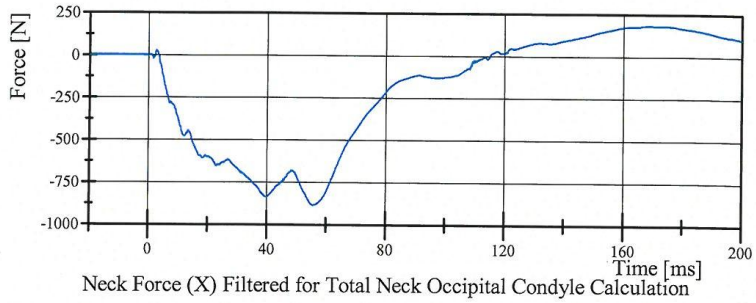
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.05.2012 07:56:13 2942

Transportation Research Center Inc.

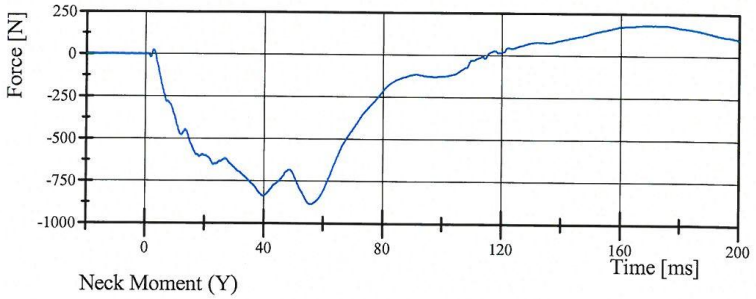
Neck Flexion
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/5/2012

Neck Force (X)



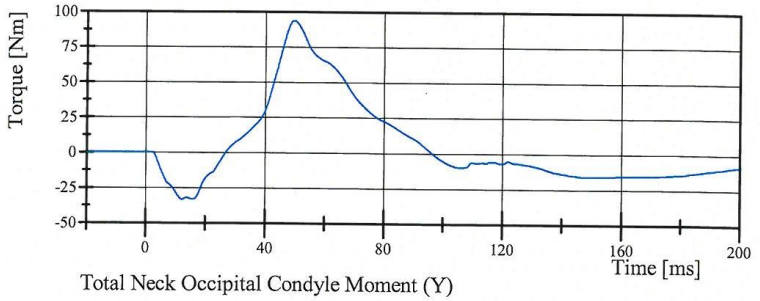
Filter Class: CFC_1000
Max: 183.8 N at 168.8 ms
Min: -885.6 N at 55.6 ms

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



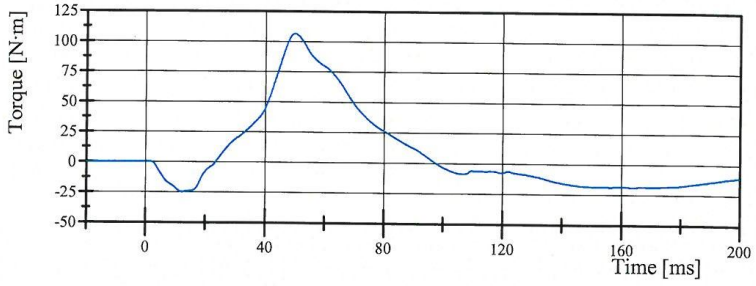
Filter Class: CFC_600
Max: 183.4 N at 168.9 ms
Min: -885.1 N at 55.7 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 93.9 Nm at 49.6 ms
Min: -33.5 Nm at 12.2 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 106.3 N·m at 49.8 ms
Min: -25.0 N·m at 12.3 ms

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

10.05.2012 07:56:13 2942

Transportation Research Center Inc.

Neck Extension
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/5/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	58 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-5.969 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	41.2 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	19.65 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	15.40 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	14.05 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	14.05 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 °	93.2 °	Yes
Time of Peak	72 - 82 ms	77.1 ms	Yes
Total Head D-Plane Rotation Decay to 0°	147 - 174 ms	157.0 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	(-53) - (-80) N·m	-71.1 N·m	Yes
Time of Peak	65 - 79 ms	71.8 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	143.8 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

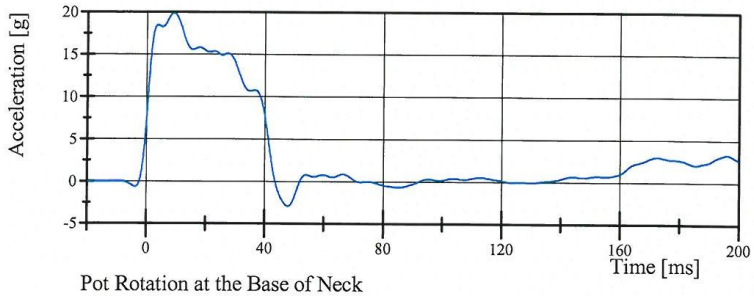
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.05.2012 08:32:56 3028

Transportation Research Center Inc.

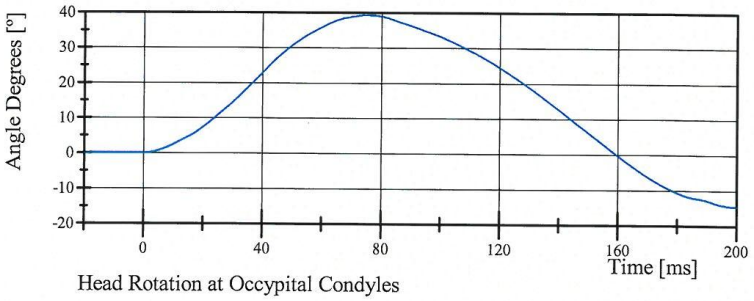
Neck Extension
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/5/2012

Pendulum Acceleration



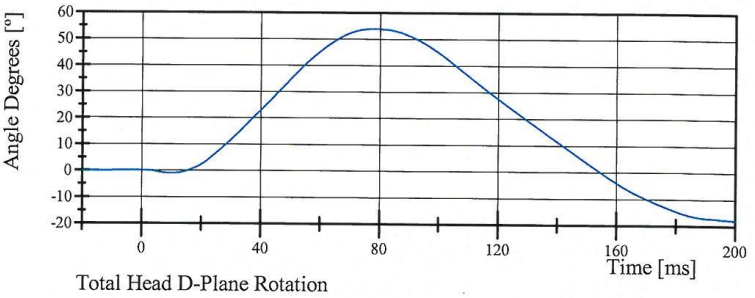
Filter Class: CFC_60
Max: 19.9 gn at 9.0 ms
Min: -2.9 gn at 47.9 ms

Pot Rotation at the Base of Neck



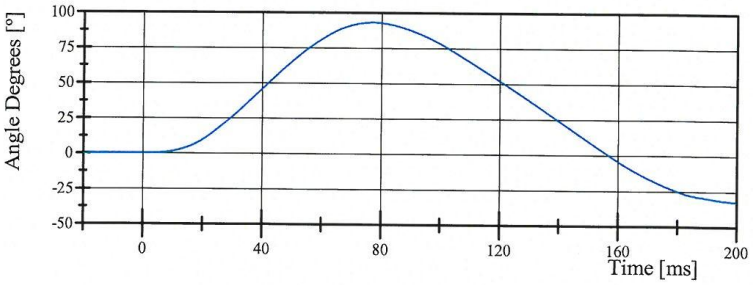
Filter Class: CFC_60
Max: 39.3 ° at 75.8 ms
Min: -14.6 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 53.9 ° at 78.2 ms
Min: -17.9 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 93.2 ° at 77.1 ms
Min: -32.5 ° at 200.0 ms

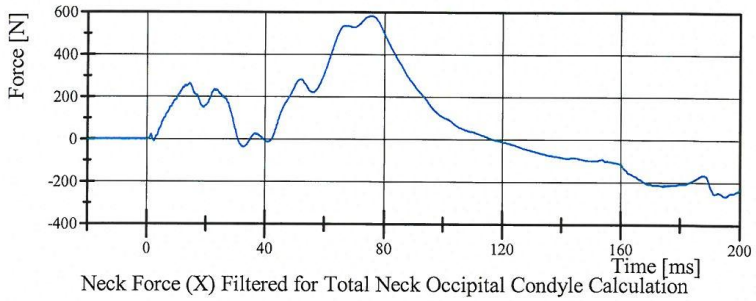
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.05.2012 08:33:05 3028

Transportation Research Center Inc.

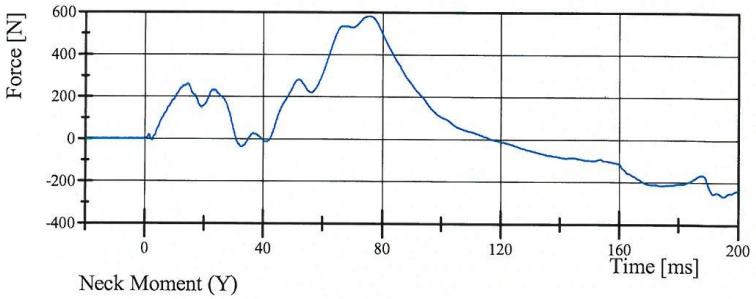
Neck Extension
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/5/2012

Neck Force (X)



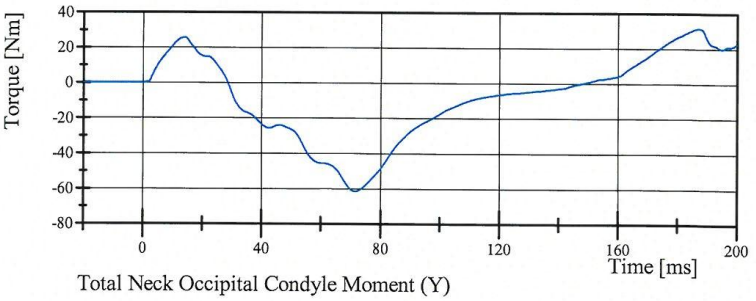
Filter Class: CFC_1000
Max: 583.2 N at 75.4 ms
Min: -264.5 N at 194.9 ms

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



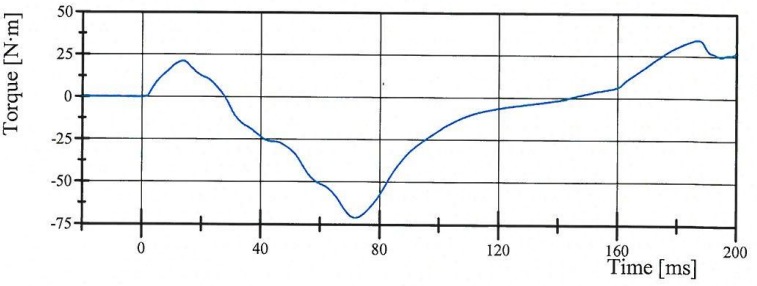
Filter Class: CFC_600
Max: 583.0 N at 75.6 ms
Min: -264.0 N at 194.9 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 31.5 Nm at 187.2 ms
Min: -61.5 Nm at 71.5 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Consta
Max: 34.5 N·m at 187.0 ms
Min: -71.1 N·m at 71.8 ms

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

10.05.2012 08:33:06 3028

Transportation Research Center Inc.

Front Thorax
HIII 50th Serial No. 037 Certification No. 9-3
Test Date: 10/9/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.670 m/s	Yes
Probe Force Peak	(-5,160) - (-5,893) N	-5,862.3 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-66.52 mm	Yes
Internal Hysteresis	65 - 85 %	74.1 %	Yes

Test meets specifications.

Comments:

Technician

Approved

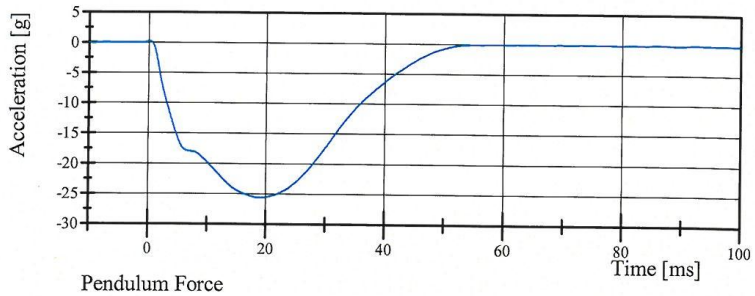
Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

10.09.2012 12:32:35 383

Transportation Research Center Inc.

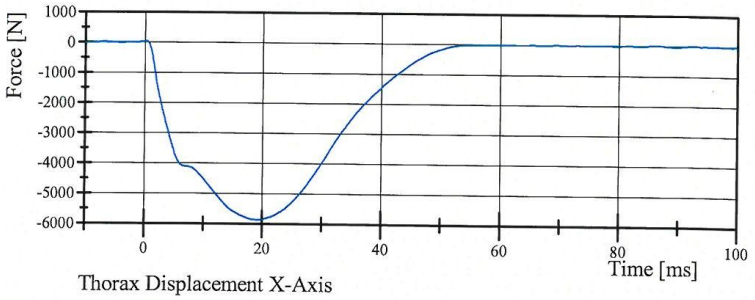
Front Thorax
HIII 50th Serial No. 037 Certification No. 9-3
Test Date: 10/9/2012

Pendulum Acceleration



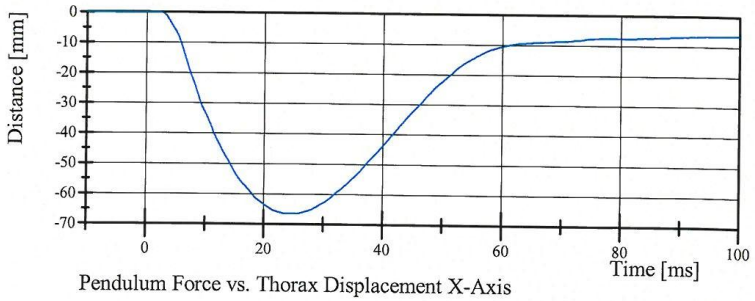
Filter Class: CFC_180
Max: 0.2 gn at 0.1 ms
Min: -25.6 gn at 19.4 ms

Pendulum Force



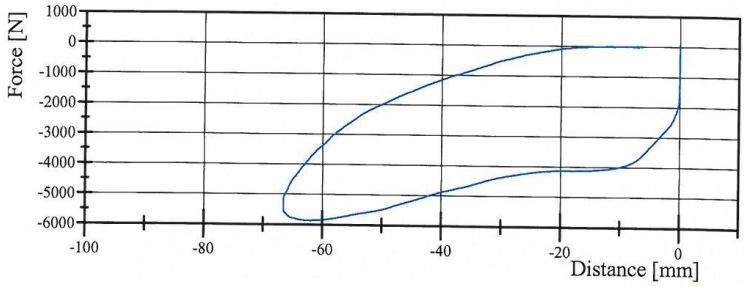
Filter Class: CFC_180
Max: 38.3 N at 0.1 ms
Min: -5,862.3 N at 19.4 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -2.4 ms
Min: -66.5 mm at 23.5 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 38.3 N at -0.0 mm
Min: -5,862.3 N at -62.6 mm

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

10.09.2012 12:32:43 383

Transportation Research Center Inc

Hybrid III Hip Range of Motion

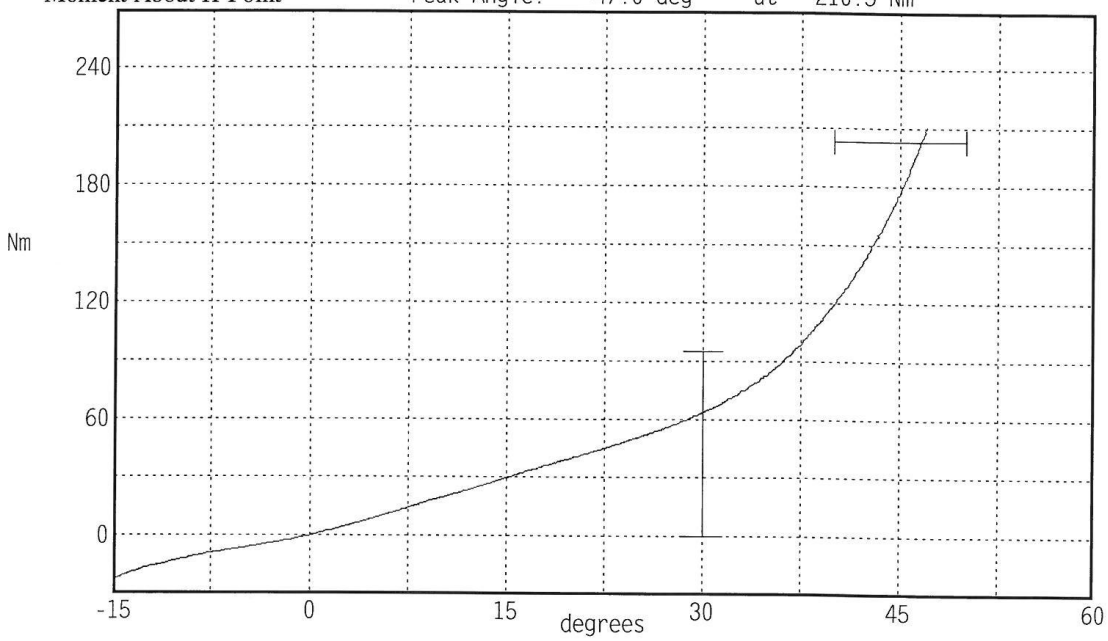
Serial Number: 037L
Test Number: 037C09
Comments:

Date: 10/04/2012
Time: 14:34

TEST PARAMETER	SPECIFICATION	TEST RESULTS		
Temperature	18.9 - 25.6	21.5	°C	Pass
Humidity	10 - 70	56	%	Pass
Moment at 30 deg	<= 94.9	63.8	Nm	Pass
Angle at 203 Nm	40.0 - 50.0	46.6	deg	Pass
Average Velocity	5.0 - 10.0	7.4	deg/sec	Pass

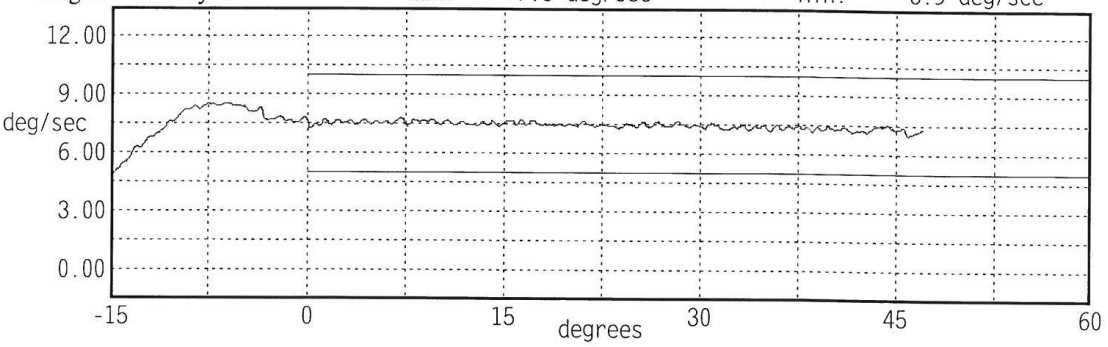
Moment About H-Point

Peak Moment: 210.5 Nm at 47.0 deg
Peak Angle: 47.0 deg at 210.5 Nm



Angular Velocity

Max: 7.8 deg/sec Min: 6.9 deg/sec



Transportation Research Center Inc

Hybrid III Hip Range of Motion

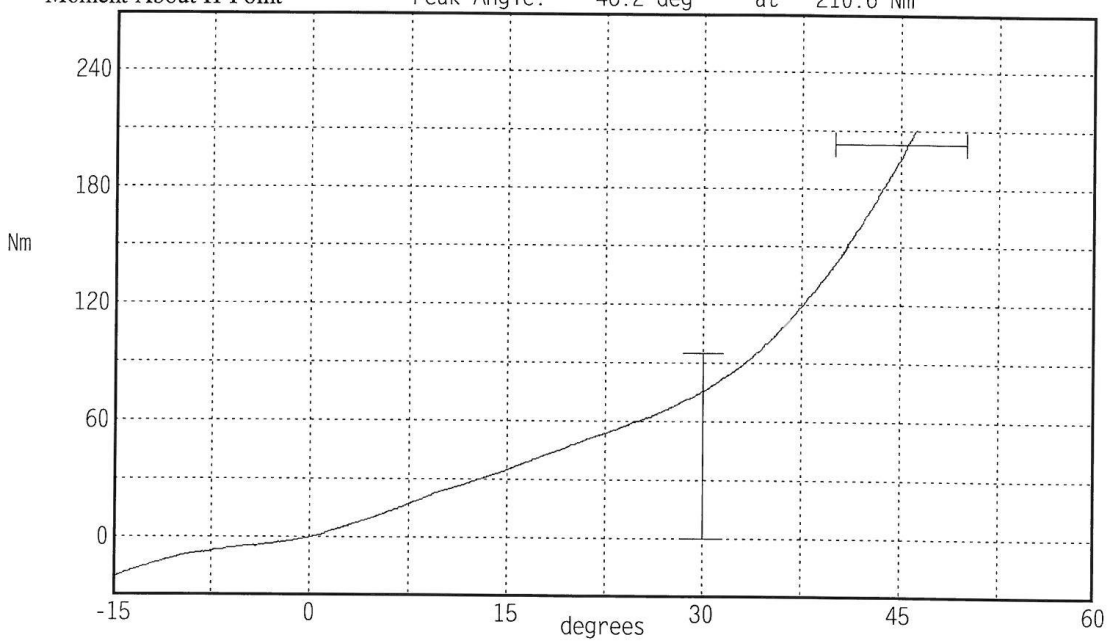
Serial Number: 037R
Test Number: 037C09
Comments:

Date: 10/04/2012
Time: 13:32

TEST PARAMETER	SPECIFICATION	TEST RESULTS		
Temperature	18.9 - 25.6	21.0	°C	Pass
Humidity	10 - 70	53	%	Pass
Moment at 30 deg	<= 94.9	75.4	Nm	Pass
Angle at 203 Nm	40.0 - 50.0	45.6	deg	Pass
Average Velocity	5.0 - 10.0	7.4	deg/sec	Pass

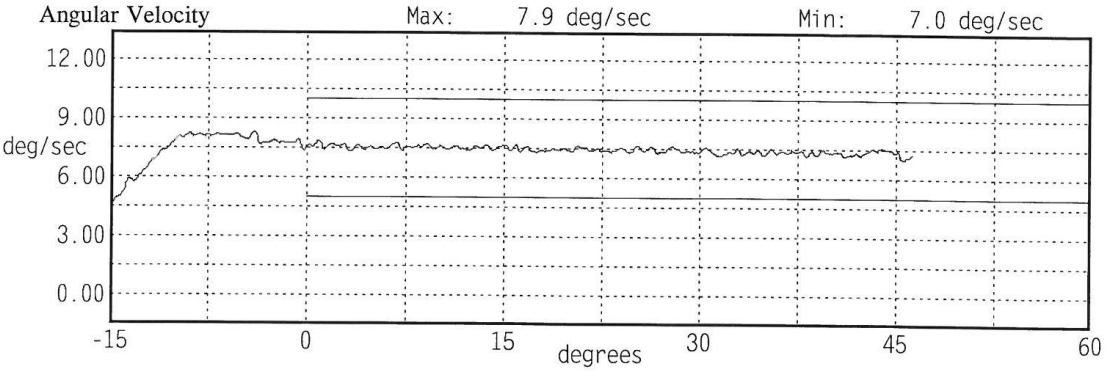
Moment About H-Point

Peak Moment: 210.6 Nm at 46.2 deg
Peak Angle: 46.2 deg at 210.6 Nm



Angular Velocity

Max: 7.9 deg/sec Min: 7.0 deg/sec



Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/4/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	53 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.109 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,715.35 N	Yes

Test meets specifications.

Comments:

Technician

Approved

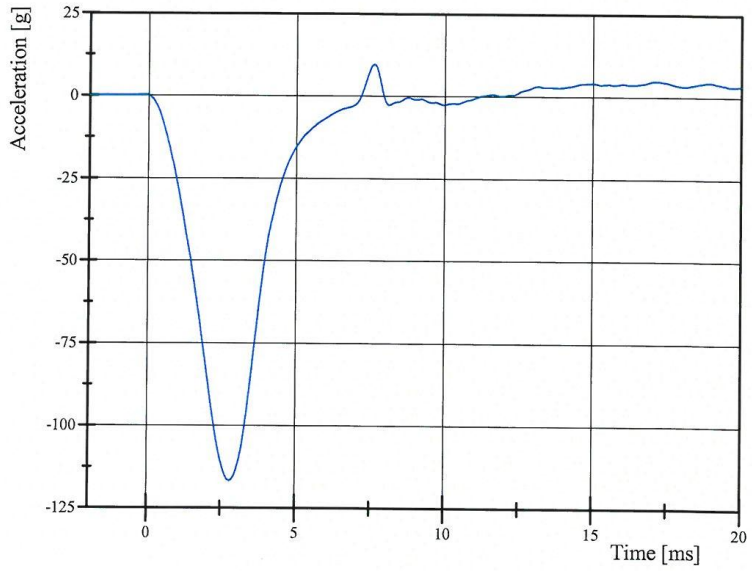
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.04.2012 13:44:28 1690

Transportation Research Center Inc.

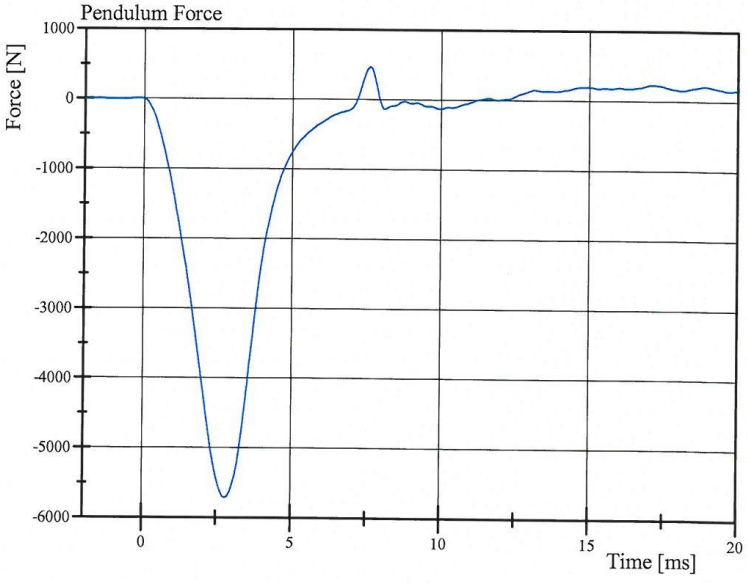
Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/4/2012

Pendulum Acceleration



Filter Class: CFC_600
Max: 9.7 gn at 7.6 ms
Min: -116.8 gn at 2.8 ms

Pendulum Force



Filter Class: CFC_600
Max: 472.3 N at 7.6 ms
Min: -5,715.4 N at 2.8 ms

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

10.04.2012 13:44:35 1690

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/4/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	53 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.110 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,599.19 N	Yes

Test meets specifications.

Comments:

Technician

Approved

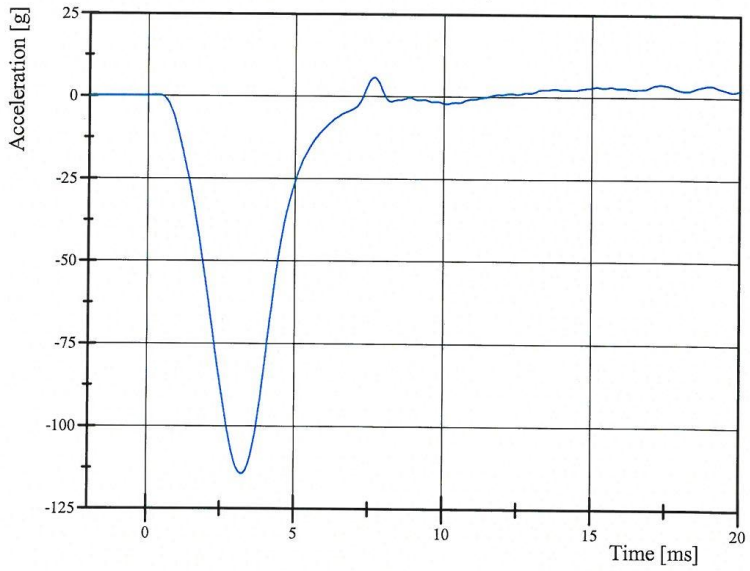
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

10.04.2012 13:45:30 1686

Transportation Research Center Inc.

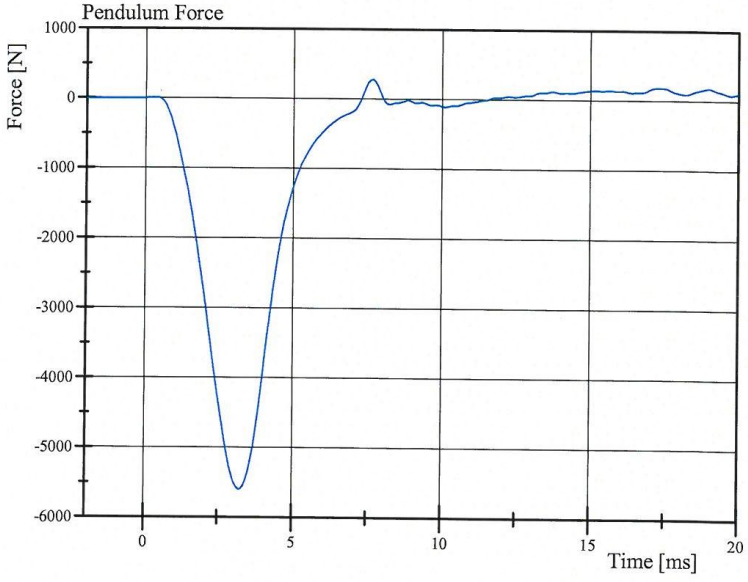
Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 9-1
Test Date: 10/4/2012

Pendulum Acceleration



Filter Class: CFC_600
Max: 5.8 gn at 7.7 ms
Min: -114.4 gn at 3.2 ms

Pendulum Force



Filter Class: CFC_600
Max: 282.4 N at 7.7 ms
Min: -5,599.2 N at 3.2 ms

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

10.04.2012 13:45:37 1686

Pre-Test Calibration Sheets
Front Passenger S/N 426

Transportation Research Center Inc.
572O HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 10

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	774.7 - 800.1	784	Yes
B	Shoulder Pivot Height	431.8 - 457.2	446	Yes
C	Hip Pivot Height	81.3 - 86.3	85	Yes
D	Hip Pivot from Backline	144.8 - 149.8	148	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	81	Yes
F	Thigh Clearance	119.4 - 134.6	126	Yes
G	Back of Elbow to Wrist Pivot	243.9 - 259.1	251	Yes
H	Head Back to Backline	43.2 - 48.2	46	Yes
I	Shoulder to Elbow Length	276.8 - 297.2	283	Yes
J	Elbow Rest Height	182.8 - 203.2	197	Yes
K	Buttock Knee Length	520.7 - 546.1	535	Yes
L	Popliteal Height	355.6 - 376.0	371	Yes
M	Knee Pivot Height	393.7 - 419.1	417	Yes
N	Buttock Popliteal Length	414.0 - 439.4	436	Yes
O	Chest Depth without Jacket	175.3 - 190.5	187	Yes
P	Foot Length	218.5 - 233.7	221	Yes
R	Buttock to Knee Pivot Length	457.2 - 482.6	475	Yes
S	Head Breadth	137.1 - 147.3	140	Yes
T	Head Depth	177.8 - 188.0	182	Yes
U	Hip Breadth	299.7 - 314.9	305	Yes
V	Shoulder Breadth	350.5 - 365.7	361	Yes
W	Foot Breadth	78.8 - 94.0	83	Yes
X	Head Circumference	528.3 - 548.7	539	Yes
Y	Chest Circumference with Jacket	850.9 - 881.3	864	Yes
Z	Waist Circumference	759.5 - 789.9	770	Yes
AA	Reference Location for Chest Circumference	332.7 - 358.1	345	Yes
BB	Reference Location for Waist Circumference	160.0 - 170.2	165	Yes

Technician

Approved

Revised 3/19/3003

Transportation Research Center Inc.

Front Head Drop
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	20.8 °C	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	265.2 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	6.7 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

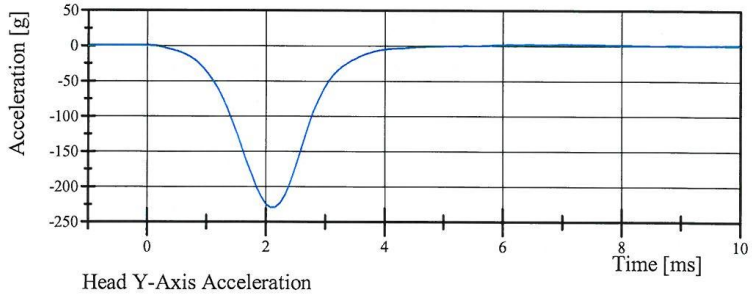
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

09.29.2012 08:56:34 612

Transportation Research Center Inc.

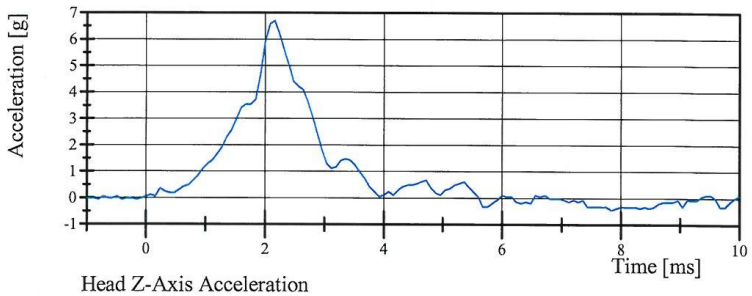
Front Head Drop
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Head X-Axis Acceleration



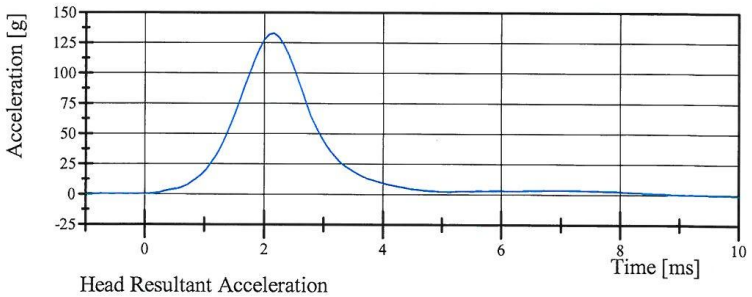
Filter Class: CFC_1000
Max: 1.8 gn at 7.4 ms
Min: -230.1 gn at 2.1 ms

Head Y-Axis Acceleration



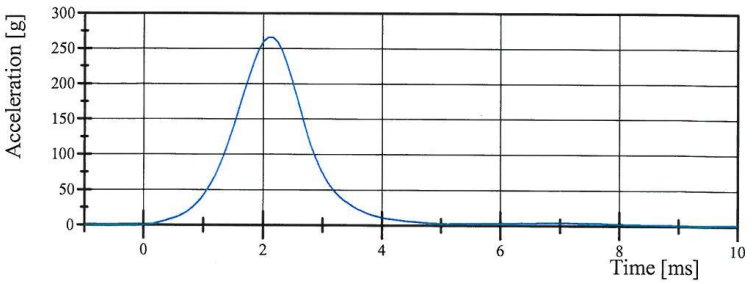
Filter Class: CFC_1000
Max: 6.7 gn at 2.2 ms
Min: -0.5 gn at 7.8 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 132.9 gn at 2.2 ms
Min: -1.0 gn at 9.9 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 265.2 gn at 2.1 ms
Min: 0.0 gn at -1.0 ms

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

09.29.2012 08:56:47 612

Transportation Research Center Inc.

Neck Flexion
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	43 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.973 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	(-2.1) - (-2.5) m/s	-2.26 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	(-4.0) - (-5.0) m/s	-4.34 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.25 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-77.8 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	72.8 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	85.7 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

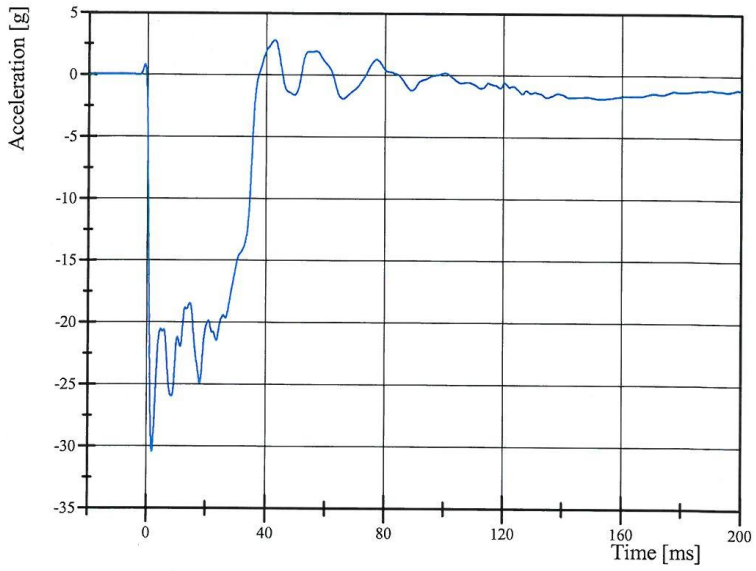
Specification Source: CFR49 Part 572 Subpart O with Polarity in accordance with J211

09.29.2012 09:47:48 1717

Transportation Research Center Inc.

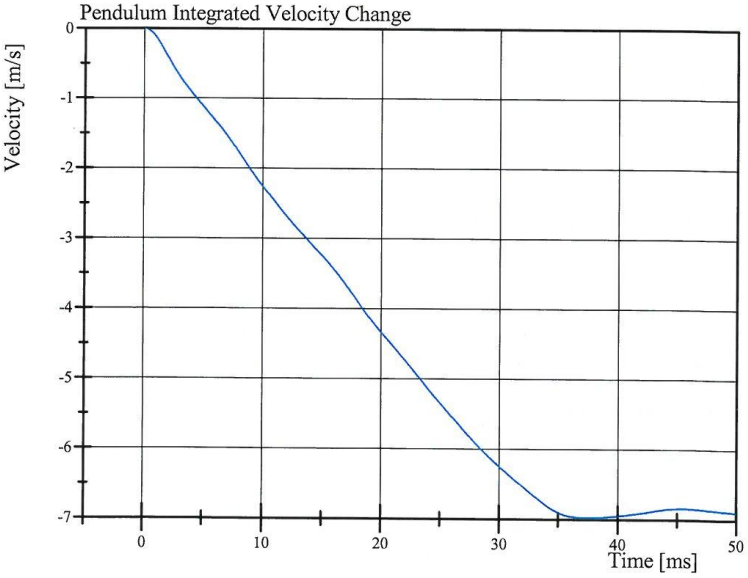
Neck Flexion
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Pendulum Acceleration



Filter Class: CFC_180
Max: 2.8 gn at 42.8 ms
Min: -30.4 gn at 1.9 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -7.0 m/s at 37.5 ms

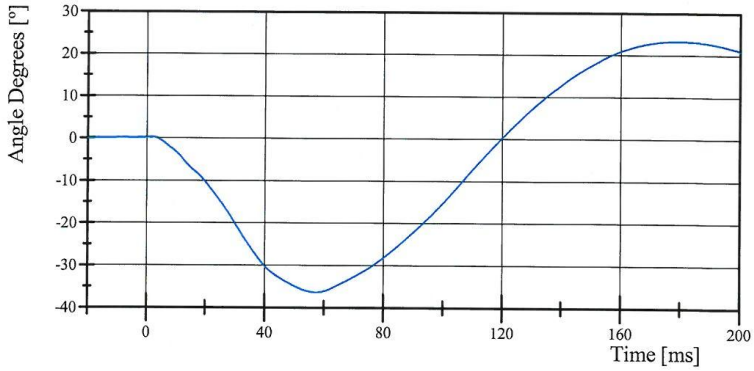
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

09.29.2012 09:47:57 1717

Transportation Research Center Inc.

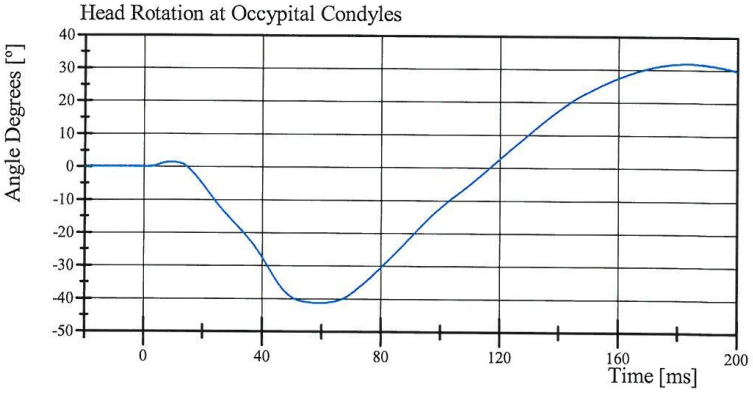
Neck Flexion
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Pot Rotation at the Base of Neck



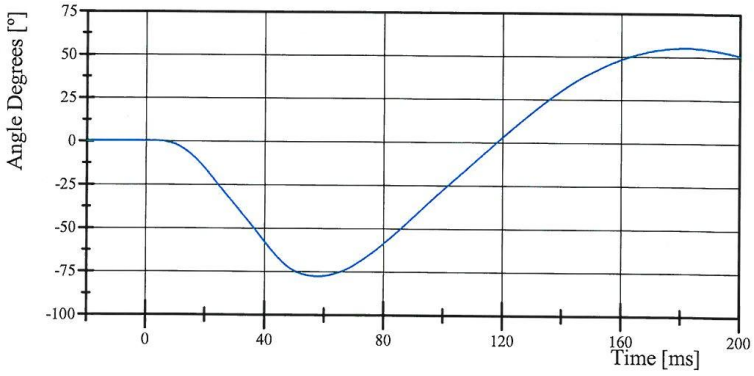
Filter Class: CFC_60
Max: 23.2 ° at 178.8 ms
Min: -36.5 ° at 57.3 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 31.9 ° at 183.1 ms
Min: -41.4 ° at 59.2 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 55.0 ° at 182.0 ms
Min: -77.8 ° at 58.0 ms

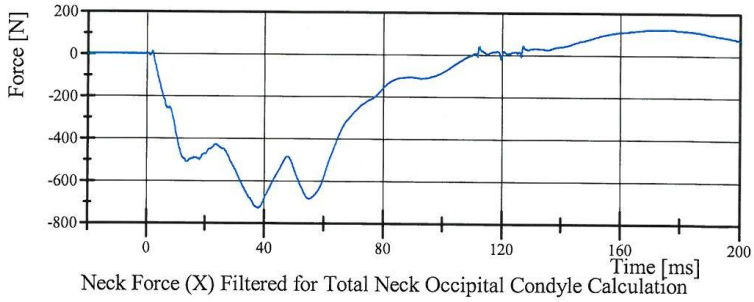
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

09.29.2012 09:47:58 1717

Transportation Research Center Inc.

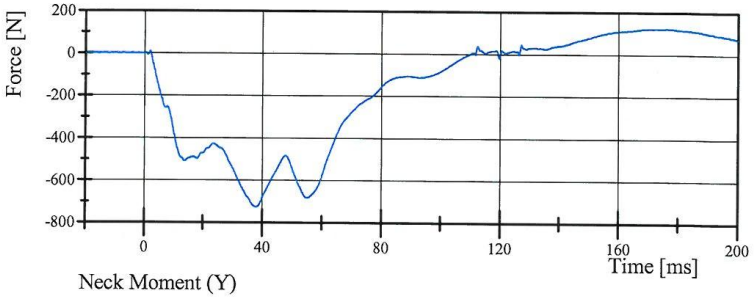
Neck Flexion
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Neck Force (X)



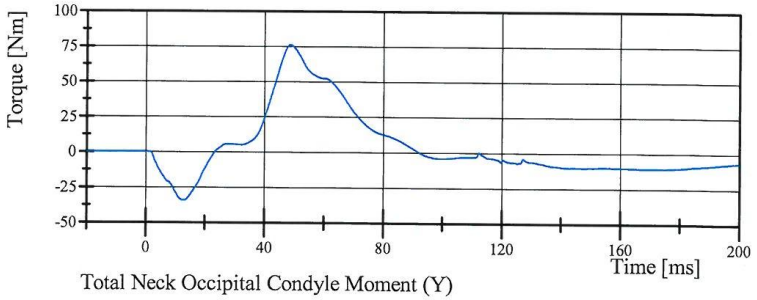
Filter Class: CFC_1000
Max: 123.4 N at 176.2 ms
Min: -727.4 N at 37.6 ms

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



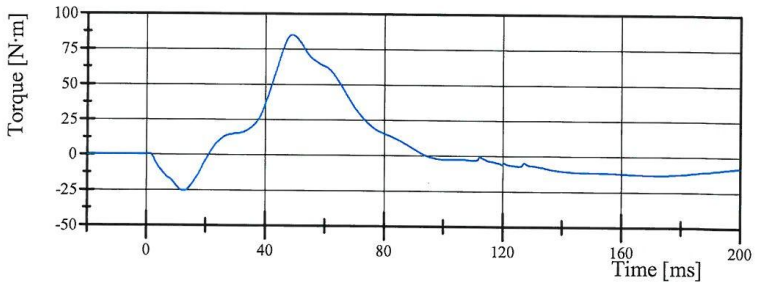
Filter Class: CFC_600
Max: 123.1 N at 176.2 ms
Min: -727.4 N at 37.9 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 75.9 Nm at 48.7 ms
Min: -34.4 Nm at 13.4 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 84.8 N·m at 49.0 ms
Min: -25.6 N·m at 12.4 ms

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

09.29.2012 09:47:58 1717

Transportation Research Center Inc.

Neck Extension
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	43 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.049 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.72 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.47 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	5.02 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	106.4 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-53.3 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	104.9 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

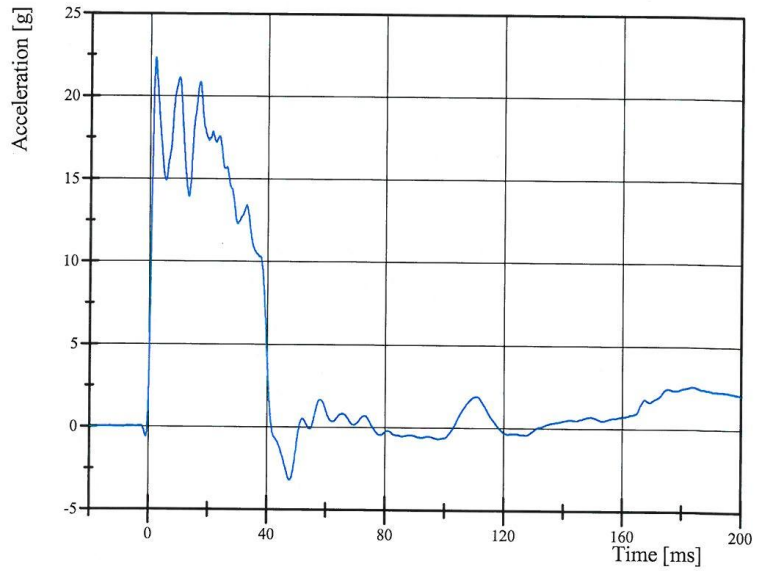
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

09.29.2012 10:20:24 1837

Transportation Research Center Inc.

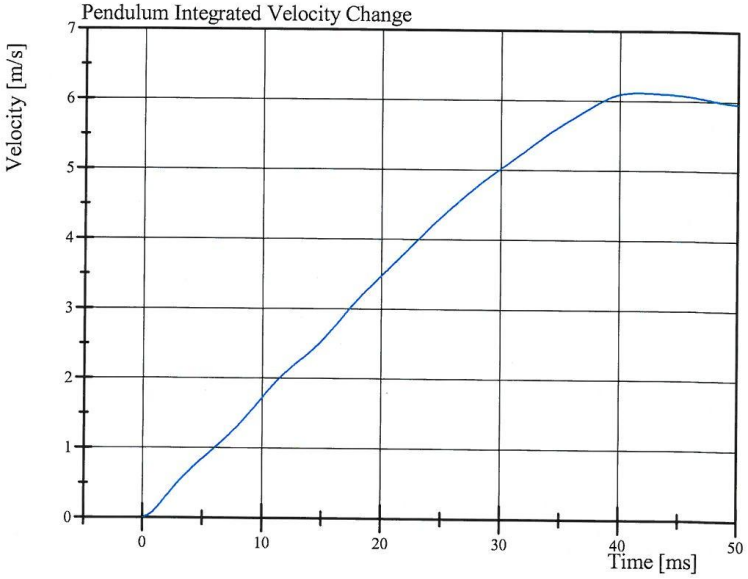
Neck Extension
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Pendulum Acceleration



Filter Class: CFC_180
Max: 22.3 gn at 1.9 ms
Min: -3.2 gn at 47.8 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 6.1 m/s at 41.5 ms
Min: 0.0 m/s at 0.0 ms

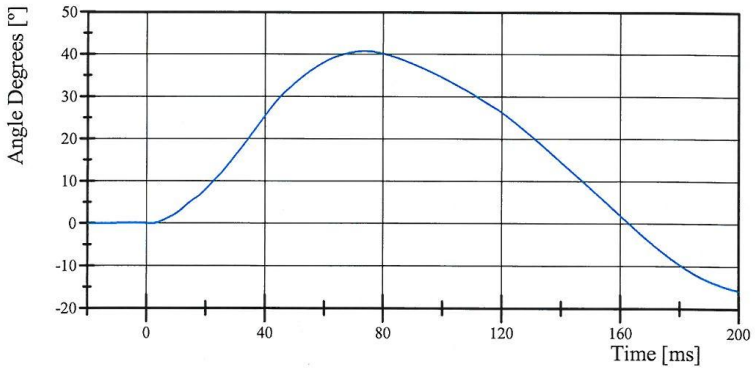
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

09.29.2012 10:20:34 1837

Transportation Research Center Inc.

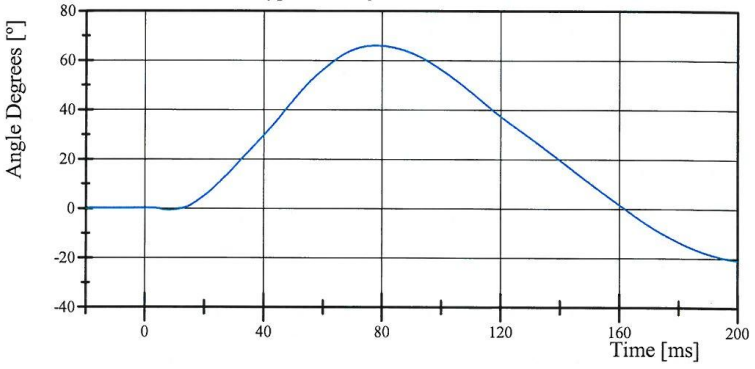
Neck Extension
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Pot Rotation at the Base of Neck



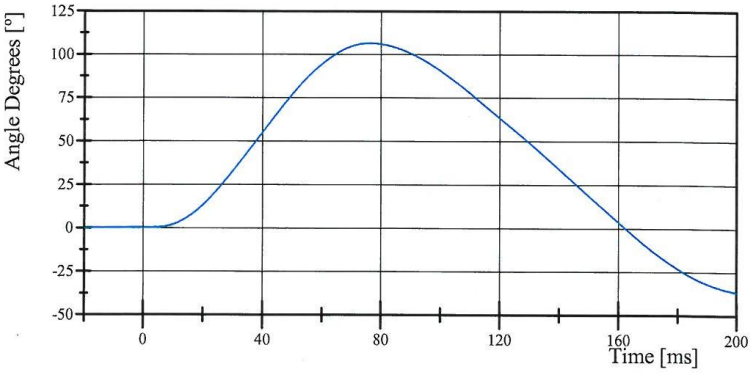
Filter Class: CFC_60
Max: 40.7 ° at 73.7 ms
Min: -15.7 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 65.9 ° at 77.8 ms
Min: -20.9 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 106.4 ° at 76.5 ms
Min: -36.6 ° at 200.0 ms

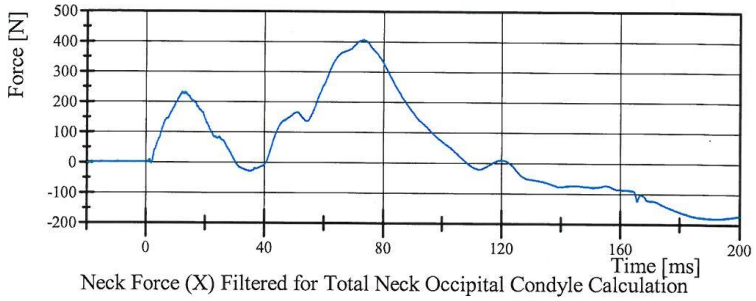
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

09.29.2012 10:20:36 1837

Transportation Research Center Inc.

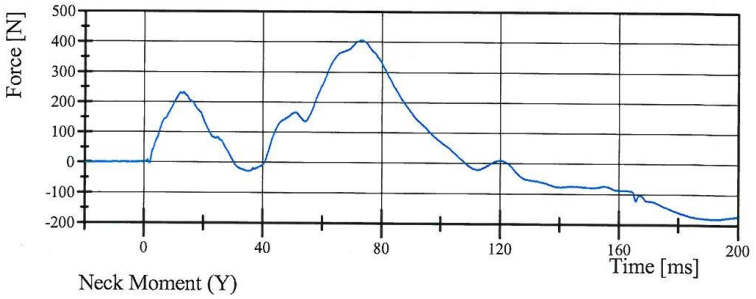
Neck Extension
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Neck Force (X)



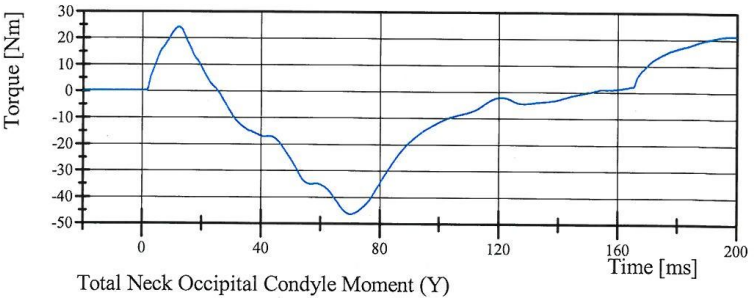
Filter Class: CFC_1000
Max: 406.1 N at 73.4 ms
Min: -181.8 N at 191.4 ms

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



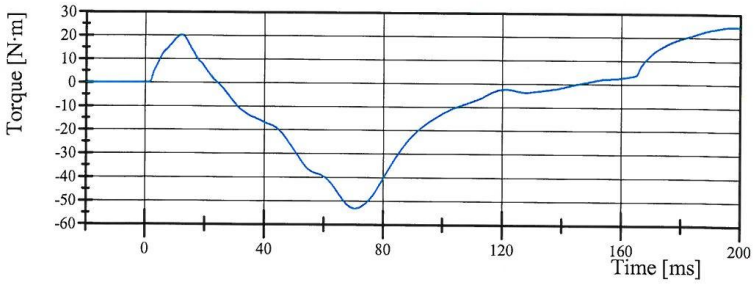
Filter Class: CFC_600
Max: 405.6 N at 73.3 ms
Min: -181.2 N at 191.3 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 24.1 Nm at 12.3 ms
Min: -46.4 Nm at 70.3 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 24.5 N·m at 198.2 ms
Min: -53.3 N·m at 70.5 ms

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

09.29.2012 10:20:37 1837

Transportation Research Center Inc.

Front Thorax
HIII 5th Serial No. 426 Certification No. 10-5
Test Date: 10/1/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.744 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,203.3 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	>= (-4,600) N	-4,485.4 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-55.9 mm	Yes
Internal Hysteresis	69 - 85 %	74.6 %	Yes

Test meets specifications.

Comments:

Technician

Approved

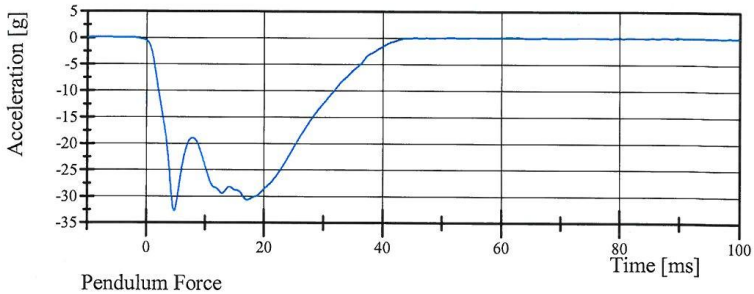
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.01.2012 13:01:19 399

Transportation Research Center Inc.

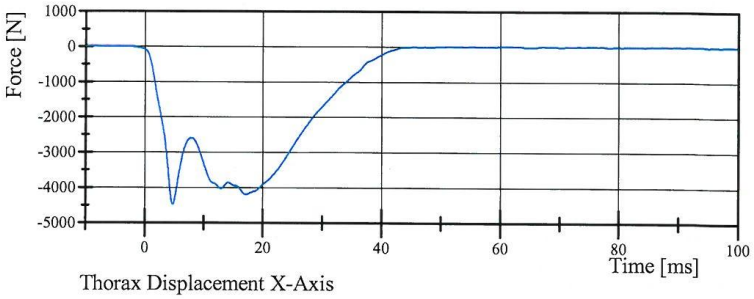
Front Thorax
HIII 5th Serial No. 426 Certification No. 10-5
Test Date: 10/1/2012

Pendulum Acceleration



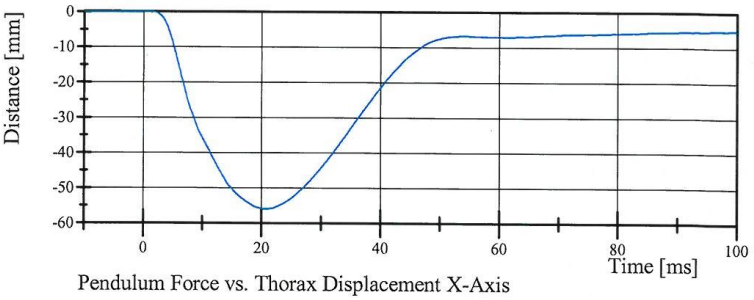
Filter Class: CFC_180
Max: 0.1 gn at 61.1 ms
Min: -32.7 gn at 4.7 ms

Pendulum Force



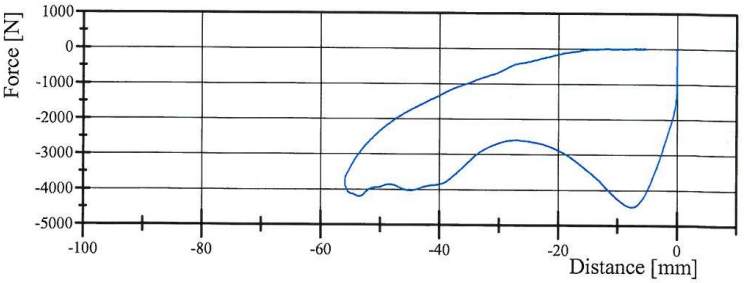
Filter Class: CFC_180
Max: 16.0 N at 61.1 ms
Min: -4,485.4 N at 4.7 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -4.0 ms
Min: -55.9 mm at 20.6 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 16.0 N at -7.1 mm
Min: -4,485.4 N at -7.4 mm

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

10.01.2012 13:01:34 399

TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III SMALL FEMALE

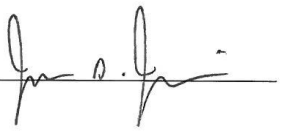
CAL DATE: 28-Sep-12

TRC, INC. **TEST NO: TOFL-01** **572 O SN426 TORSO FLEX CAL 10**

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TIME		1345
TEMPERATURE	20.6 – 22.2° C	21.3 ° C
RELATIVE HUMIDITY	10 – 70 %	48 %
INITIAL ANGLE OF UNSUPPORRTED DUMMY START ANGLE	<= 20° REFERENCED TO VERTICAL	15.0 °
DIFFERENCE BETWEEN RETURN ANGLE & INTIAL ANGLE	+/- 8 ° OF INTIAL ANGLE	5.3 °
MAXIMUM FORCE AT 45 DEG. DURING 10 SECOND PERIOD	320 – 390 N	332.5 N
RATE	0.5° - 1.5 °/sec	0.97°/sec

TEST MEETS SPECIFICATIONS

Comments:

TECHNICIAN 

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	43 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.125 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,590.5 N	Yes

Test meets specifications.

Comments:

Technician

Approved

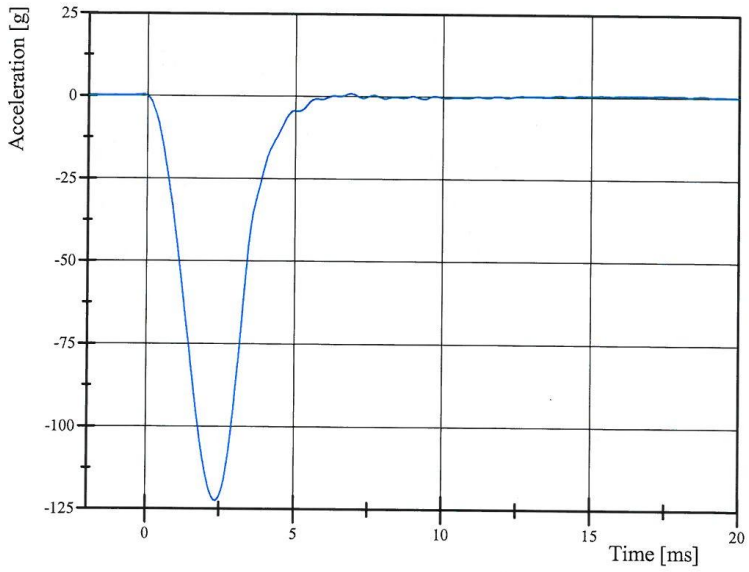
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

09.29.2012 09:06:45 1763

Transportation Research Center Inc.

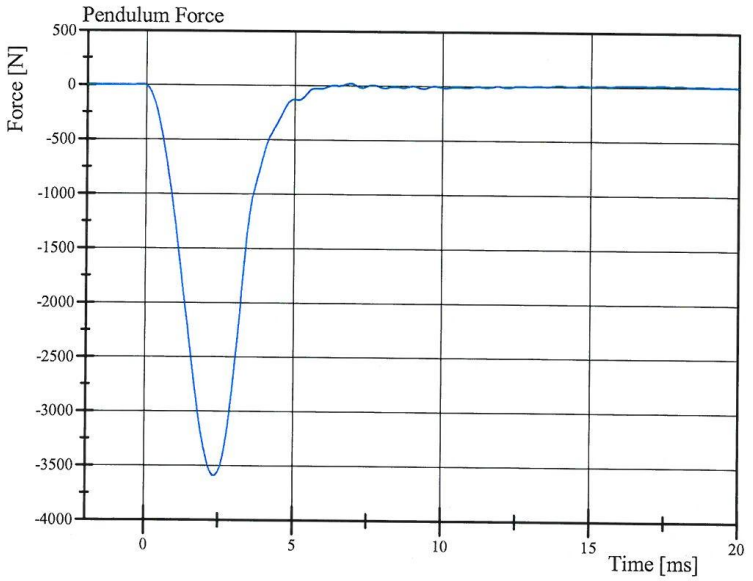
Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.8 gn at 6.9 ms
Min: -122.5 gn at 2.4 ms

Pendulum Force



Filter Class: CFC_600
Max: 23.1 N at 6.9 ms
Min: -3,590.5 N at 2.4 ms

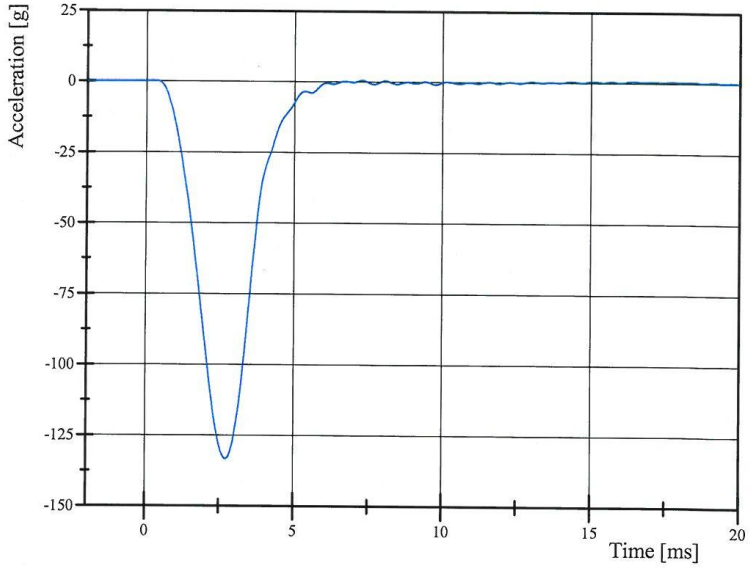
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

09.29.2012 09:07:18 1763

Transportation Research Center Inc.

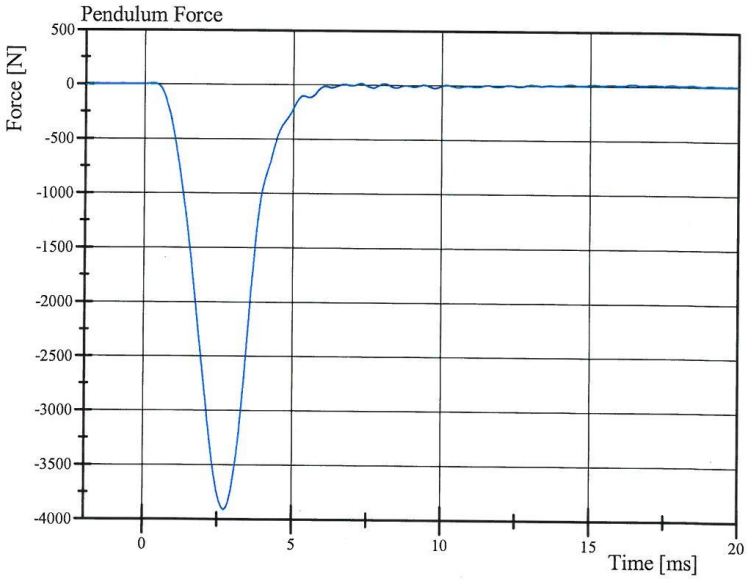
Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 10-1
Test Date: 9/29/2012

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.6 gn at 16.4 ms
Min: -133.4 gn at 2.7 ms

Pendulum Force



Filter Class: CFC_600
Max: 18.3 N at 16.4 ms
Min: -3,912.8 N at 2.7 ms

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

09.29.2012 10:36:46 1777

Passenger **S/N 426**

Post-Test Calibration Sheets

Transportation Research Center Inc.
572O HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 11

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	774.7 - 800.1	783	Yes
B	Shoulder Pivot Height	431.8 - 457.2	446	Yes
C	Hip Pivot Height	81.3 - 86.3	85	Yes
D	Hip Pivot from Backline	144.8 - 149.8	148	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	81	Yes
F	Thigh Clearance	119.4 - 134.6	127	Yes
G	Back of Elbow to Wrist Pivot	243.9 - 259.1	250	Yes
H	Head Back to Backline	43.2 - 48.2	46	Yes
I	Shoulder to Elbow Length	276.8 - 297.2	283	Yes
J	Elbow Rest Height	182.8 - 203.2	195	Yes
K	Buttock Knee Length	520.7 - 546.1	535	Yes
L	Popliteal Height	355.6 - 376.0	370	Yes
M	Knee Pivot Height	393.7 - 419.1	415	Yes
N	Buttock Popliteal Length	414.0 - 439.4	436	Yes
O	Chest Depth without Jacket	175.3 - 190.5	187	Yes
P	Foot Length	218.5 - 233.7	222	Yes
R	Buttock to Knee Pivot Length	457.2 - 482.6	475	Yes
S	Head Breadth	137.1 - 147.3	140	Yes
T	Head Depth	177.8 - 188.0	182	Yes
U	Hip Breadth	299.7 - 314.9	304	Yes
V	Shoulder Breadth	350.5 - 365.7	361	Yes
W	Foot Breadth	78.8 - 94.0	83	Yes
X	Head Circumference	528.3 - 548.7	539	Yes
Y	Chest Circumference with Jacket	850.9 - 881.3	864	Yes
Z	Waist Circumference	759.5 - 789.9	770	Yes
AA	Reference Location for Chest Circumference	332.7 - 358.1	345	Yes
BB	Reference Location for Waist Circumference	160.0 - 170.2	165	Yes

Technician

Approved

Revised 3/19/3003

Transportation Research Center Inc.

Front Head Drop
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	256.0 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.

Comments:

Technician

Approved

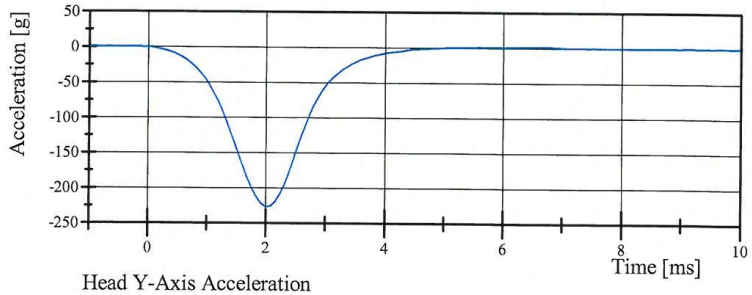
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 10:15:12 613

Transportation Research Center Inc.

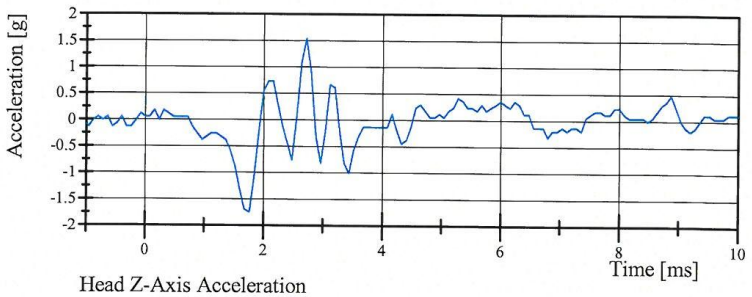
Front Head Drop
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Head X-Axis Acceleration



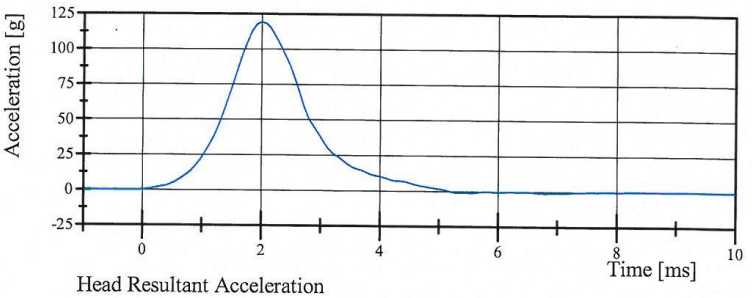
Filter Class: CFC_1000
Max: 1.6 gn at 6.6 ms
Min: -226.6 gn at 2.0 ms

Head Y-Axis Acceleration



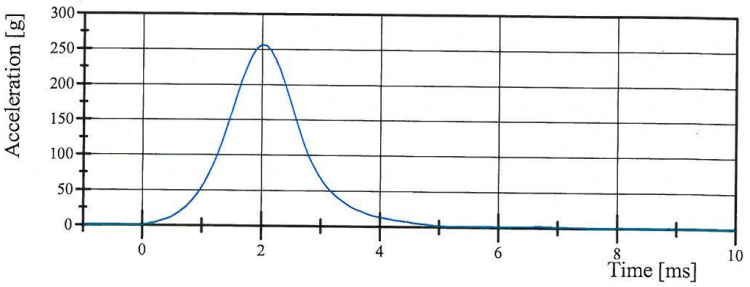
Filter Class: CFC_1000
Max: 1.5 gn at 2.7 ms
Min: -1.8 gn at 1.8 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 119.1 gn at 2.0 ms
Min: -1.0 gn at 6.8 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 256.0 gn at 2.0 ms
Min: 0.1 gn at -0.8 ms

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

10.08.2012 10:15:19 613

Transportation Research Center Inc.

Neck Flexion
HIII 5th Serial No. 426 Certification No. 11-3
Test Date: 10/8/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	25 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.920 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	(-2.1) - (-2.5) m/s	-2.35 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	(-4.0) - (-5.0) m/s	-4.72 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.79 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-77.6 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	70.7 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	83.0 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

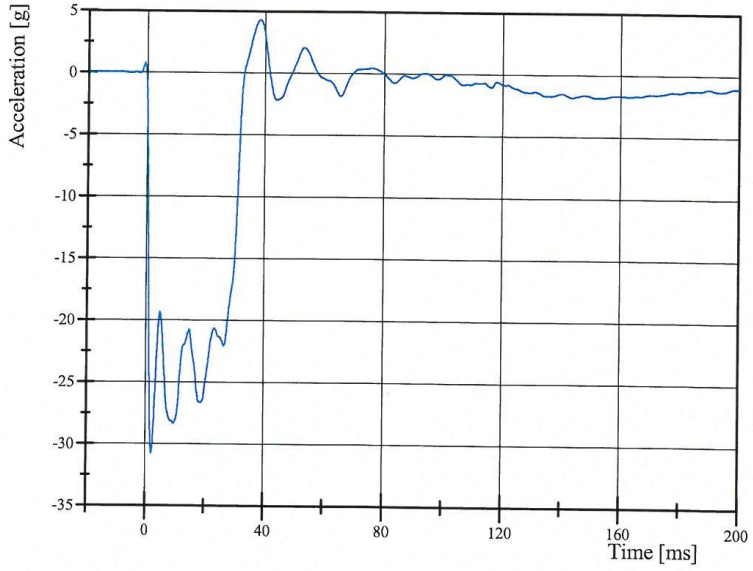
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 12:53:08 1717

Transportation Research Center Inc.

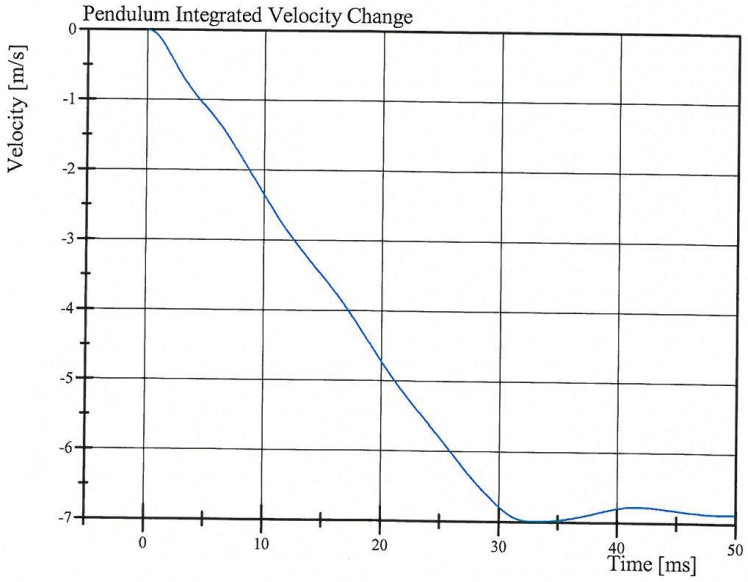
Neck Flexion
HIII 5th Serial No. 426 Certification No. 11-3
Test Date: 10/8/2012

Pendulum Acceleration



Filter Class: CFC_180
Max: 4.3 gn at 38.5 ms
Min: -30.8 gn at 2.2 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -7.0 m/s at 33.1 ms

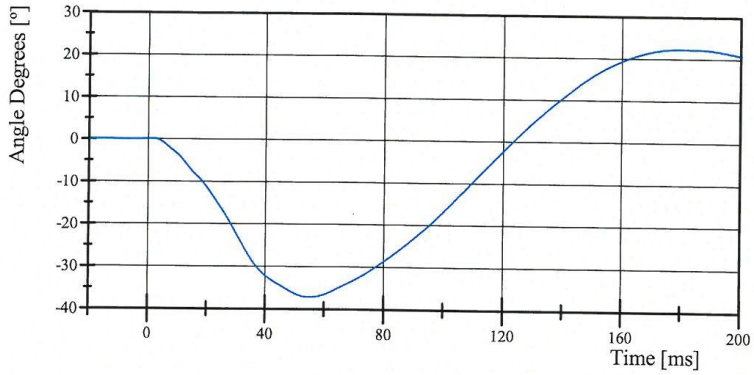
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 12:53:16 1717

Transportation Research Center Inc.

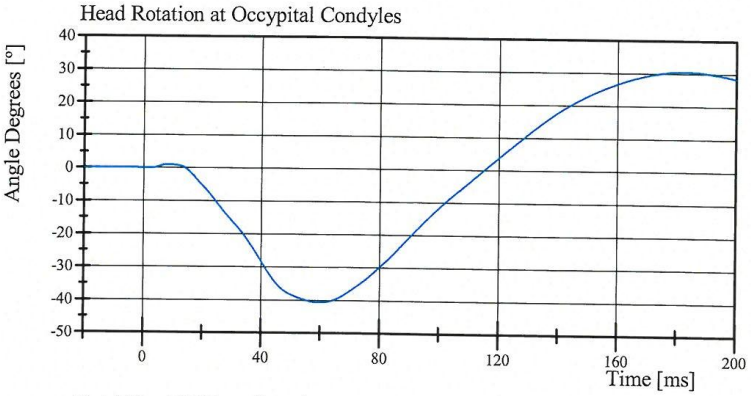
Neck Flexion
HIII 5th Serial No. 426 Certification No. 11-3
Test Date: 10/8/2012

Pot Rotation at the Base of Neck



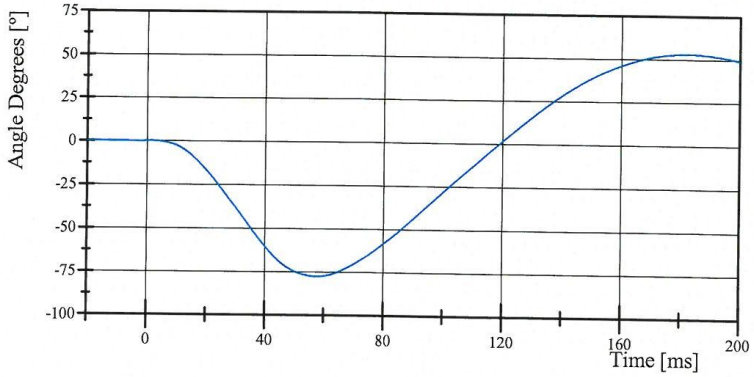
Filter Class: CFC_60
Max: 22.3 ° at 180.5 ms
Min: -37.2 ° at 55.1 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 30.6 ° at 182.4 ms
Min: -40.7 ° at 59.9 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 52.9 ° at 182.4 ms
Min: -77.6 ° at 57.7 ms

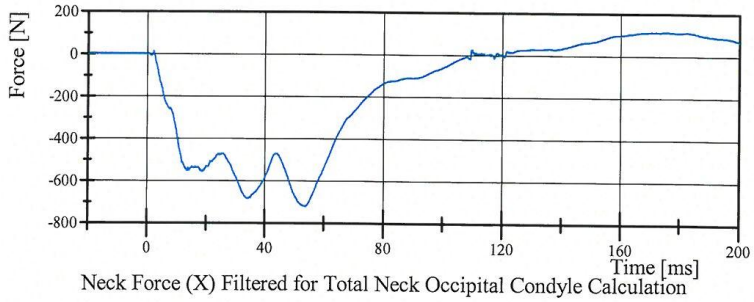
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 12:53:16 1717

Transportation Research Center Inc.

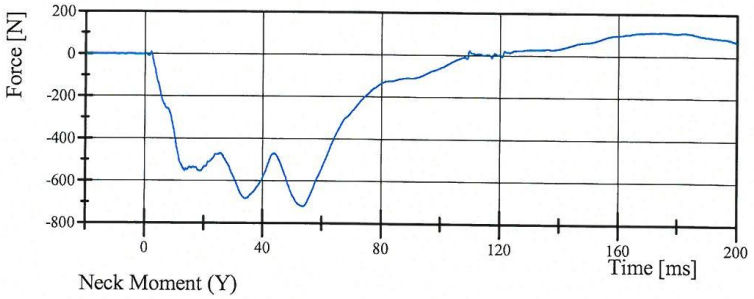
Neck Flexion
HIII 5th Serial No. 426 Certification No. 11-3
Test Date: 10/8/2012

Neck Force (X)



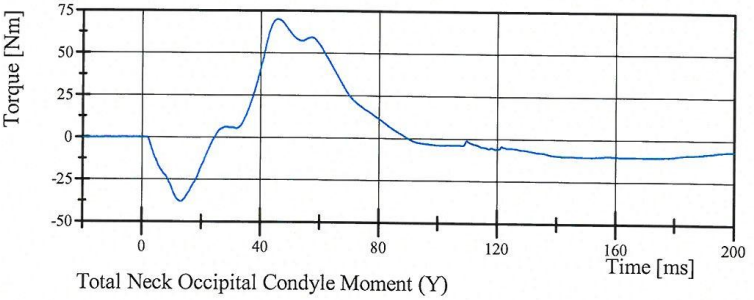
Filter Class: CFC_1000
Max: 113.9 N at 174.2 ms
Min: -720.6 N at 53.8 ms

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



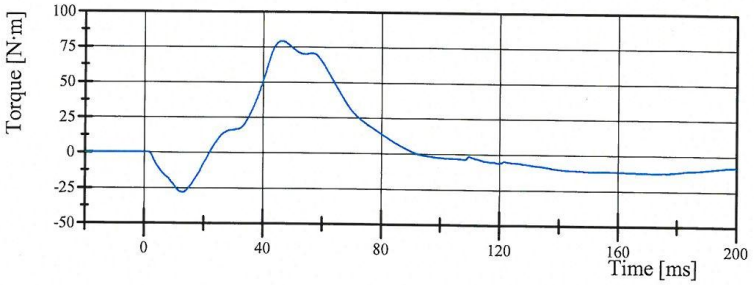
Filter Class: CFC_600
Max: 113.1 N at 176.2 ms
Min: -720.0 N at 53.8 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 70.0 Nm at 45.8 ms
Min: -38.1 Nm at 13.2 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 79.2 N·m at 46.3 ms
Min: -28.4 N·m at 13.0 ms

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

10.08.2012 12:53:17 1717

Transportation Research Center Inc.

Neck Extension
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.055 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.65 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.34 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	4.93 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	106.4 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-55.1 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	105.7 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

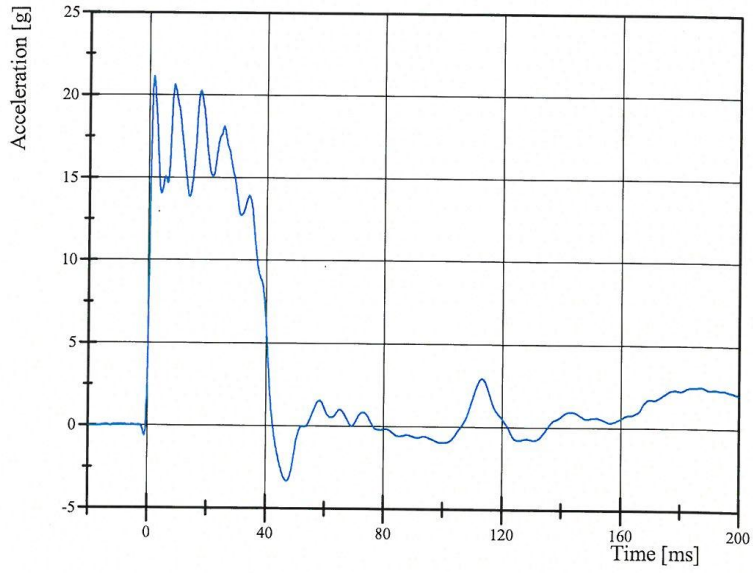
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 13:25:24 1839

Transportation Research Center Inc.

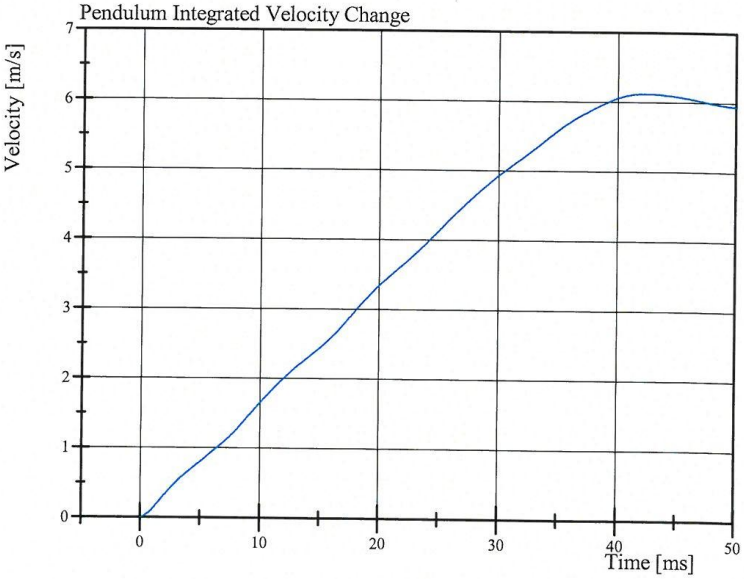
Neck Extension
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Pendulum Acceleration



Filter Class: CFC_180
Max: 21.1 gn at 1.7 ms
Min: -3.3 gn at 47.2 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 6.1 m/s at 42.4 ms
Min: 0.0 m/s at 0.0 ms

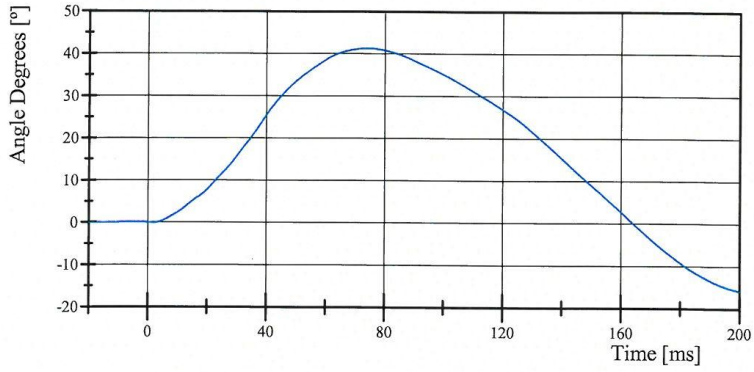
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 13:25:30 1839

Transportation Research Center Inc.

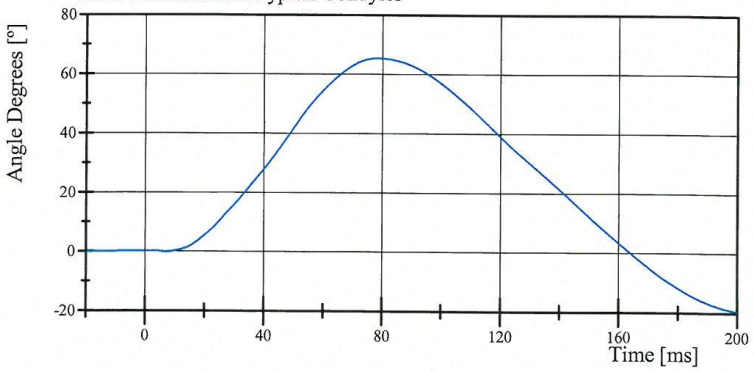
Neck Extension
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Pot Rotation at the Base of Neck



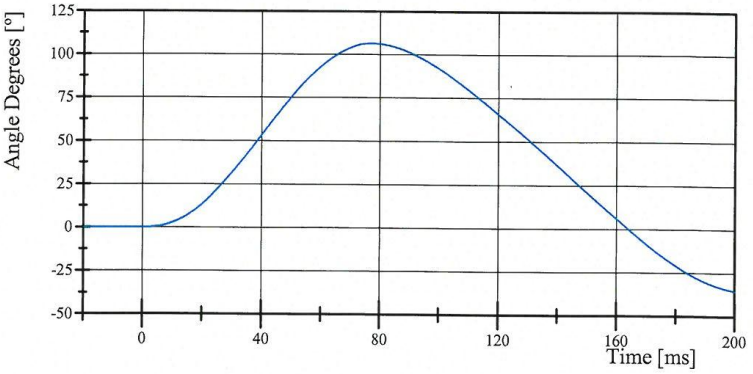
Filter Class: CFC_60
Max: 41.2 ° at 74.0 ms
Min: -15.8 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 65.4 ° at 78.7 ms
Min: -19.6 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 106.4 ° at 77.3 ms
Min: -35.4 ° at 200.0 ms

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

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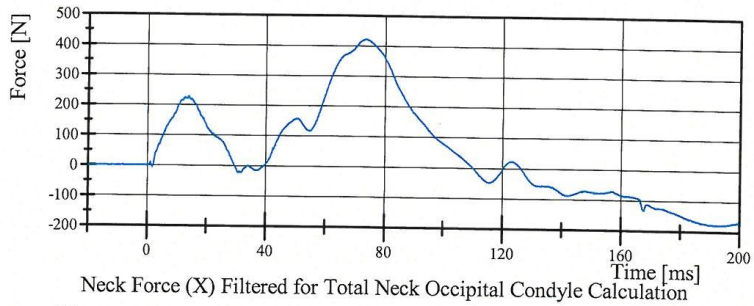
Transportation Research Center Inc.

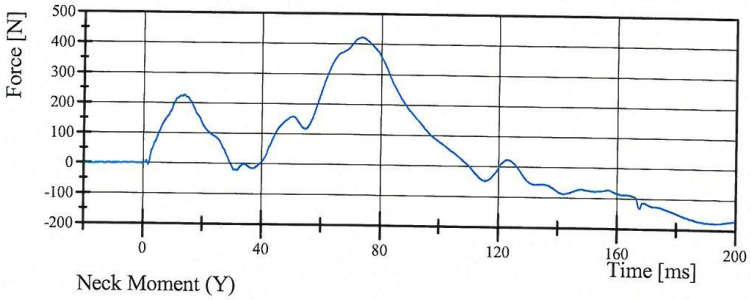
Neck Extension
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Neck Force (X)



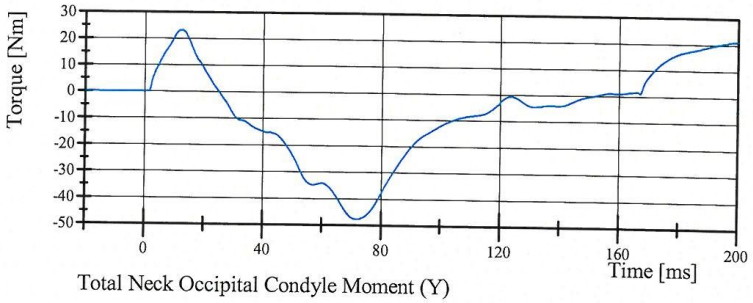
Filter Class: CFC_1000
Max: 422.5 N at 73.5 ms
Min: -178.4 N at 193.0 ms

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



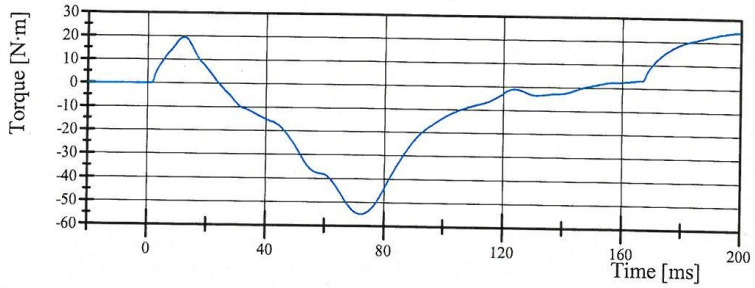
Filter Class: CFC_600
Max: 422.3 N at 73.5 ms
Min: -178.2 N at 193.1 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 23.3 Nm at 12.6 ms
Min: -47.7 Nm at 72.1 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 24.3 N·m at 199.6 ms
Min: -55.1 N·m at 72.4 ms

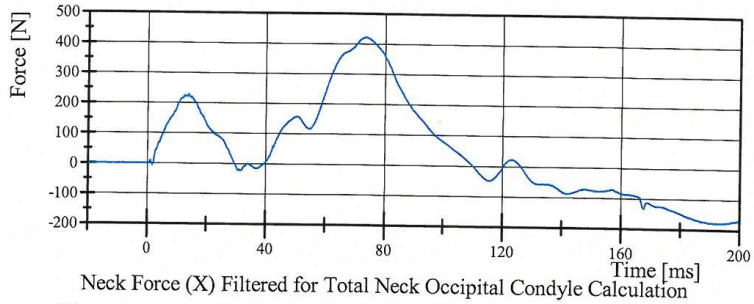
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 13:25:32 1839

Transportation Research Center Inc.

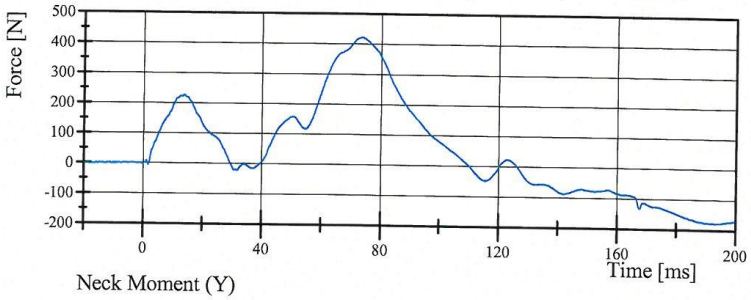
Neck Extension
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Neck Force (X)



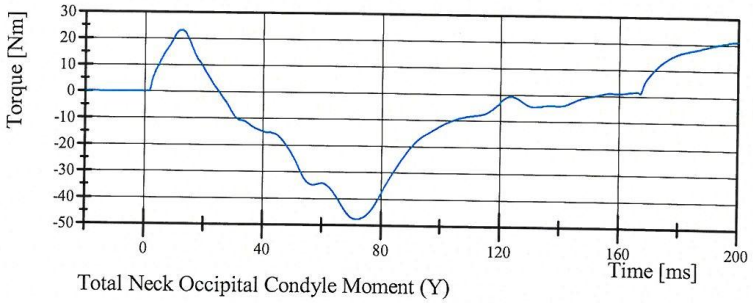
Filter Class: CFC_1000
Max: 422.5 N at 73.5 ms
Min: -178.4 N at 193.0 ms

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



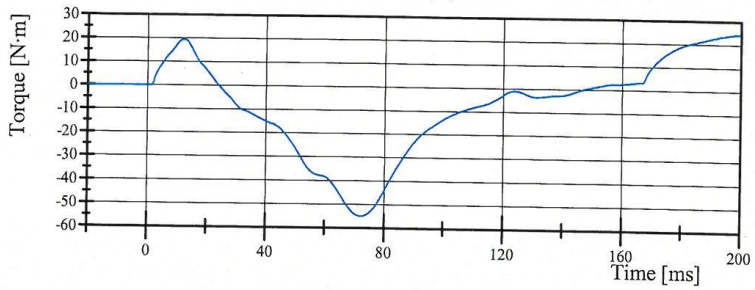
Filter Class: CFC_600
Max: 422.3 N at 73.5 ms
Min: -178.2 N at 193.1 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 23.3 Nm at 12.6 ms
Min: -47.7 Nm at 72.1 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 24.3 N·m at 199.6 ms
Min: -55.1 N·m at 72.4 ms

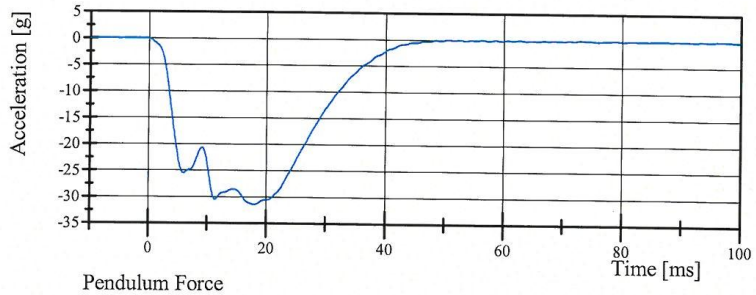
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 13:25:32 1839

Transportation Research Center Inc.

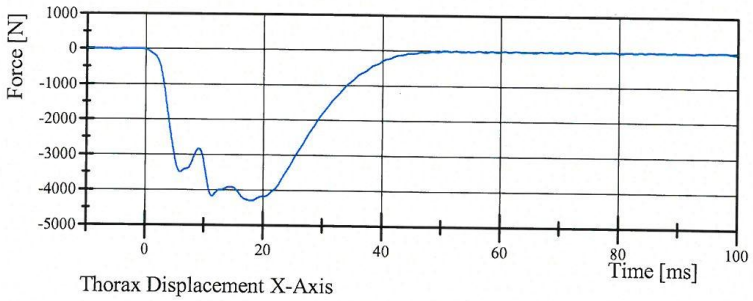
Front Thorax
HIII 5th Serial No. 426 Certification No. 11-2
Test Date: 10/8/2012

Pendulum Acceleration



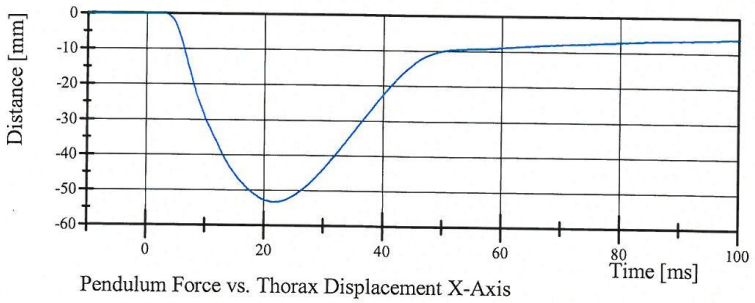
Filter Class: CFC_180
Max: 0.1 gn at 73.0 ms
Min: -31.4 gn at 18.0 ms

Pendulum Force



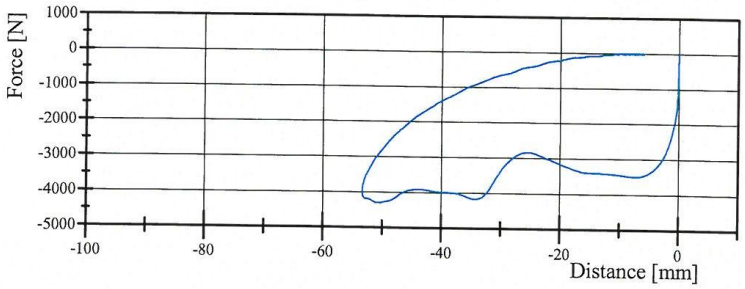
Filter Class: CFC_180
Max: 13.7 N at 73.0 ms
Min: -4,304.6 N at 18.0 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -4.6 ms
Min: -53.3 mm at 21.6 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 13.7 N at -7.7 mm
Min: -4,304.6 N at -50.7 mm

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

10.08.2012 15:19:18 407

TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III SMALL FEMALE

CAL DATE: 05-Oct-12

TRC, INC. **TEST NO: TOFL-01** **572 O SN426 TORSO FLEX CAL 11**

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TIME		1330
TEMPERATURE	20.6 – 22.2° C	21.2 ° C
RELATIVE HUMIDITY	10 – 70 %	53 %
INITIAL ANGLE OF UNSUPPORRTED DUMMY START ANGLE	<= 20° REFERENCED TO VERTICAL	17.0 °
DIFFERENCE BETWEEN RETURN ANGLE & INTIAL ANGLE	+/- 8 ° OF INTIAL ANGLE	5.2 °
MAXIMUM FORCE AT 45 DEG. DURING 10 SECOND PERIOD	320 – 390 N	388.8 N
RATE	0.5° - 1.5 °/sec	.97°/sec

TEST MEETS SPECIFICATIONS

Comments:

TECHNICIAN 

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.104 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,700.3 N	Yes

Test meets specifications.

Comments:

Technician

Approved

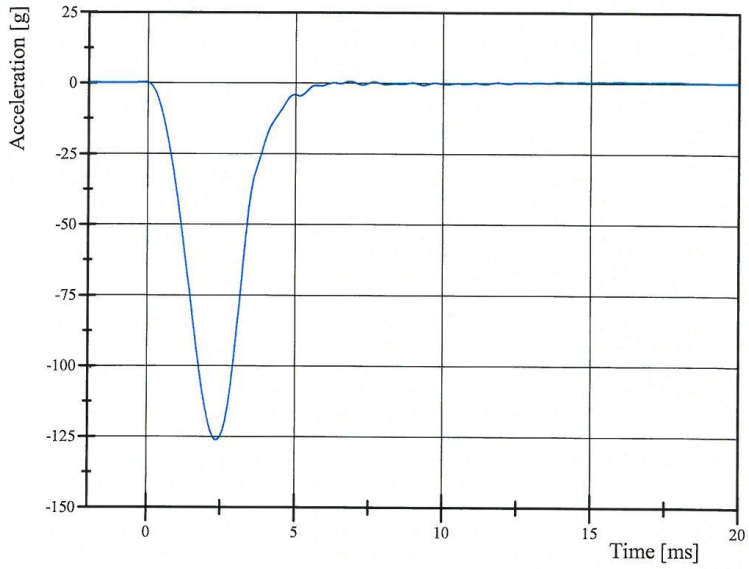
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 12:42:48 1787

Transportation Research Center Inc.

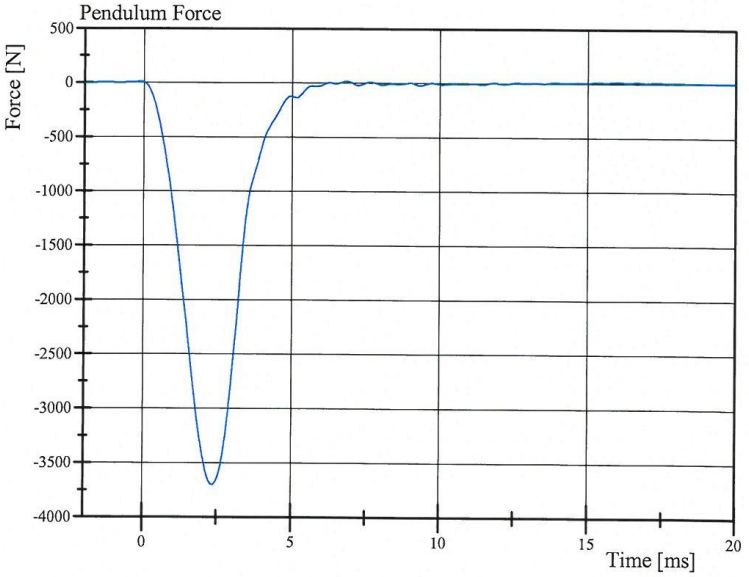
Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.5 gn at 6.9 ms
Min: -126.2 gn at 2.4 ms

Pendulum Force



Filter Class: CFC_600
Max: 15.9 N at 6.9 ms
Min: -3,700.3 N at 2.4 ms

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

10.08.2012 12:42:57 1787

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.8 °C	Yes
Relative Humidity	10 - 70 %	26 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.101 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,587.8 N	Yes

Test meets specifications.

Comments:

Technician

Approved

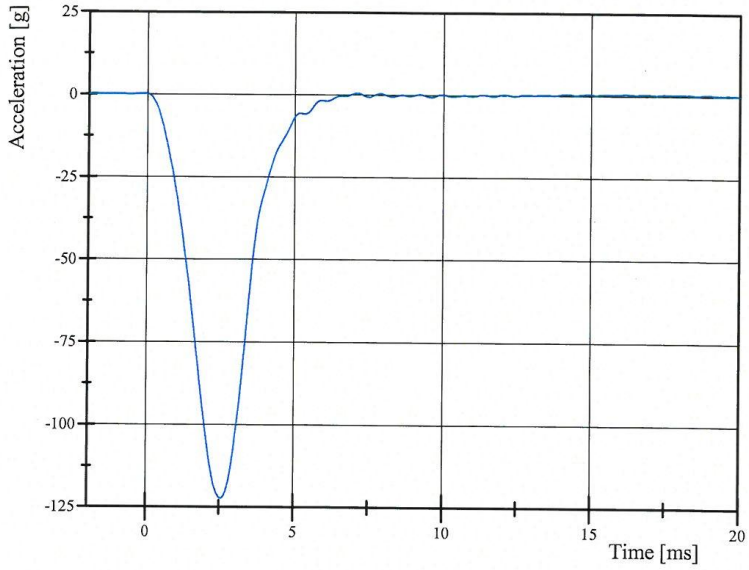
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

10.08.2012 12:46:36 1785

Transportation Research Center Inc.

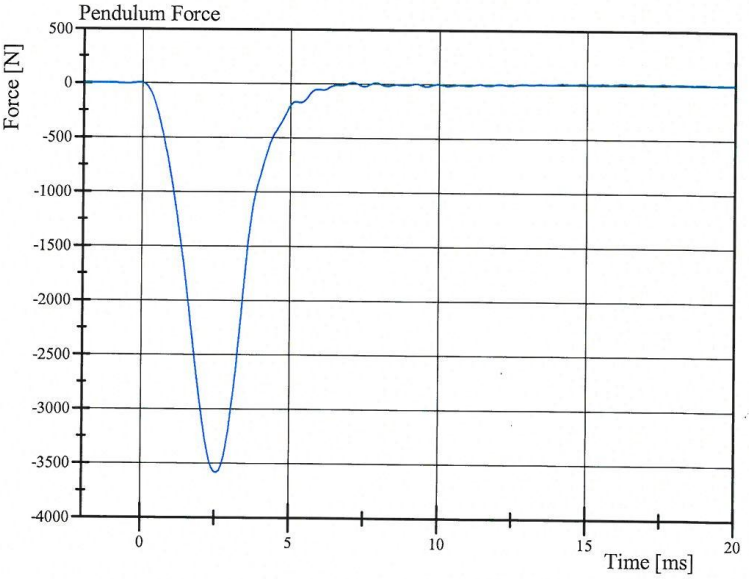
Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 11-1
Test Date: 10/8/2012

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.4 gn at 16.2 ms
Min: -122.4 gn at 2.6 ms

Pendulum Force



Filter Class: CFC_600
Max: 13.0 N at 16.2 ms
Min: -3,587.8 N at 2.6 ms

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

10.08.2012 12:46:43 1785