Final Report Number: NCAP-TRC-16-004

New Car Assessment Program (NCAP)

Frontal Barrier Impact Test

General Motors LLC

2016 Chevrolet Malibu

NHTSA Number: M20160106

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

Report Date: March 23, 2016

FINAL REPORT

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

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Prepared By: Impact Laboratory Project Operations Group

Approved By: Melinda Lackey

Approval Date: March 23, 2016

FINAL REPORT ACCEPTANCE BY OCWS:

_____

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

Date _____

_____

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

Date _____

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16. Abstract

A 56.0 km/h NCAP Frontal Impact Test was conducted on a 2016 Chevrolet Malibu, 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 February 03, 2016.

The impact velocity was 56.29 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 503 millimeters at crush zone 4 at right side. The test vehicle's performance is as follows:

	Driver ATD			Passenger ATD		
Measurement Description	Units	Threshold	Result	Units	Threshold	Result
Head Injury Criteria (HIC_{15})	NA	700	173	NA	700	376
Maximum Chest Compression	mm	63	-19.3	mm	52	-14.6
3ms Chest Clip	Gs	60	39.7	Gs	60	38.4
Nij	NA	1	0.23	NA	1	0.38
Neck Tension	Newtons	4170	976.8	Newtons	2620	771.5
Neck Compression	Newtons	4000	-130.0	Newtons	2520	-274.0
Left Femur Force	Newtons	10000	-829.3	Newtons	6800	-770.8
Right Femur Force	Newtons	10000	-680.8	Newtons	6800	-872.8

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 e-mail: tis@nhtsa.dot.gov FAX: 202-493-2833

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1: PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-12-D-00257. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

This 56 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Front NCAP Laboratory Test Procedure dated October 2015.

SUMMARY

A 2016 Chevrolet Malibu impacted the barrier wall at a velocity of 56.29 km/h. The test was performed at Transportation Research Center, Inc. on February 03, 2016. 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 load cells, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were also on the driver's and the passenger's lap belts to measure dummy 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 100 channels of data were recorded on an on-board data acquisition system. The 288 barrier channels of data were recorded on an off-board high resolution barrier data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

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

The maximum static crush of the vehicle was 503 mm and both the driver and passenger side doors remained closed during the impact event and were operable after the impact.

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

The occupant data is summarized below:

ATD Position	**HIC_{15}**	**Nij**	**Neck Tension (N)**	**Neck Compression (N)**	**3 ms Chest Clip (Gs)**	**Chest Disp. (mm)**	**Left Femur (N)**	**Right Femur (N)**
Driver (50^{th} Male)	173	0.23	976.8	-130.0	39.7	-19.3	-829.3	-680.8
Passenger (5^{th} Female)	376	0.38	771.5	-274.0	38.4	-14.6	-770.8	-872.8

2: OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

TEST VEHICLE INFORMATION

NHTSA No.	M20160106
Model Year	2016
Make	Chevrolet
Model	Malibu
Body Style	Passenger Car
VIN	1G1ZB5ST7GF185685
Body Color	Butte Red Metallic
Odometer Reading (km/mi)	14.0
Engine Displacement (L)	1.5
Type/No. Cylinders	Straight/4
Engine Placement	Front/Transverse
Transmission Type	Automatic
Transmission Speeds	6
Overdrive	Yes
Final Drive	FWD
Roof Rack	No
Sunroof/T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

TEST VEHICLE OPTIONS

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

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	12/15

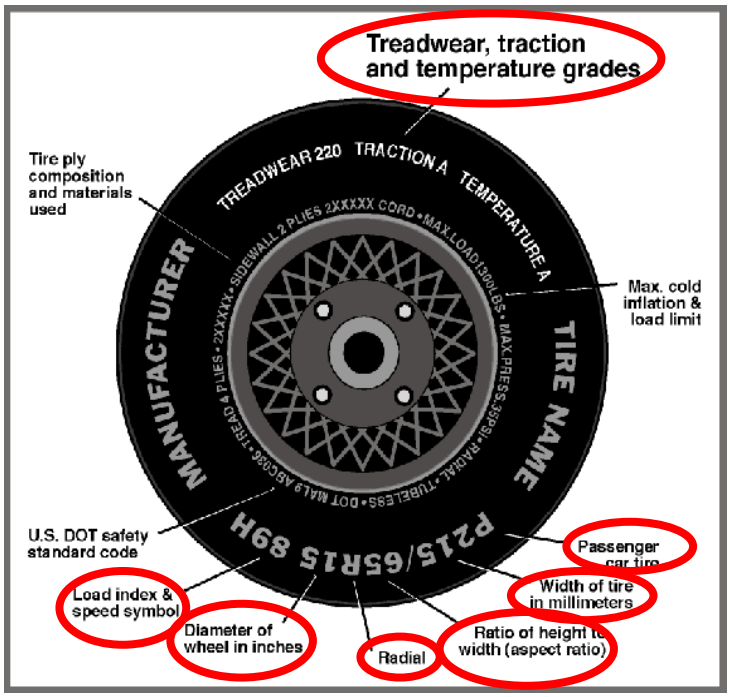
GVWR (kg)	1835.0 (4045 lbs)
GAWR Front (kg)	952.0 (2099 lbs)
GAWR Rear (kg)	883.0 (1947 lbs)

VEHICLE SEATING AND WEIGHT CAPACITY

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Contoured Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				408
Cargo Wt. (RCLW) (kg)				67.8

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

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold / Test Pressure (kPa)	240	240
Recommended Tire Size	P205/65R16	P205/65R16
Tire Size on Vehicle	P205/65R16	P205/65R16
Tire Manufacturer	Firestone	Firestone
Tire Model	FT140	FT140
Treadwear	560	560
Traction Grade	A	A
Temperature Grade	A	A
Tire Plies Sidewall	1	1
Tire Plies Body	4	4
Load Index/Speed Symbol	94H	94H
Tire Material	Polyester, Steel, Nylon	Polyester, Steel, Nylon
DOT Safety Code Right	8X84 FT0 4815	8X84 FT0 4815
DOT Safety Code Left	8X84 FT0 4815	8X84 FT0 4815

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	437.6	291.6		464.0	364.4	
Right	kg	410.6	266.2		438.6	341.2	
Ratio	%	60.3	39.7		56.1	43.9	
Totals	kg	848.2	557.8	1406.0	902.6	705.6	1608.2

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1406.0
Weight of 1 P572E ATD & 1 P572O ATD	kg	139.3
Rated Cargo/Luggage Weight (RCLW)	kg	67.8
Vehicle Target Weight (TVTW)	kg	1613.1

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front)
As Delivered	mm	707	720	728	736	1125
As Tested	mm	695	708	697	699	1244
Post Test	mm	763	760	704	690	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2835
Total Vehicle Length at Left Side	mm	4670
Total Vehicle Length at Centerline	mm	4910
Total Vehicle Length at Right Side	mm	4663
Weight of Ballast in Cargo Area	kg	0.0
Weight of Vehicle Components Removed	kg	42.8
Amount of Stoddard Solvent in Fuel Tank	liters	45.8

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT: Rear door glass, speakers, door panels, tail lights, OSRV mirrors, rear fascia, trunk lid.

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4910
2	Total Width	1850
3	Bumper Top Height	550
4	Bumper Bottom Height	453
5	Longitudinal Member Top Height	532
6	Distance Between Longitudinal Members	910
7	Longitudinal Member Width	85
8	Engine Top Height	837
9	Engine Bottom Height	195
10	Engine and Gearbox Width	800
11	Front Bumper-Engine Distance	480
12	Front Shock Absorber Fixing Height	889
13	Bonnet Leading Edge Height	822
14	Front Shock Absorber Fixing Width	1200
15	Front Bumper – Front Axle Distance	945
16	Front Axle – A-Pillar Distance	555
17	A-Pillar – B-Pillar Distance	1120
18	B-Pillar – Rear Axle Distance	1165
19	B-Pillar – C-Pillar Distance	1010
20	Roof Sill Bottom Height	1287
21	Roof Sill Top Height	1358
22	Floor Sill Bottom Height	313
23	Floor Sill Top Height	355

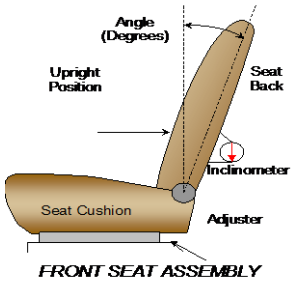
DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

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. Inclinometer measurement at the top of the backrest at the seat centerline, according to Form 1 attachment.



	Degree
Driver Seat back angle:	13.3
Passenger Seat back angle:	19.4

SEAT FORE/AFT POSITIONS

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

Driver: Mid position, Positioned according to Form 1

Passenger: Full forward, Positioned according to Form 1

	Total Fore/Aft Travel	Placed in Position No.
Driver Seat	310 (53)	20
Passenger Seat	238 (49)	1, full forward

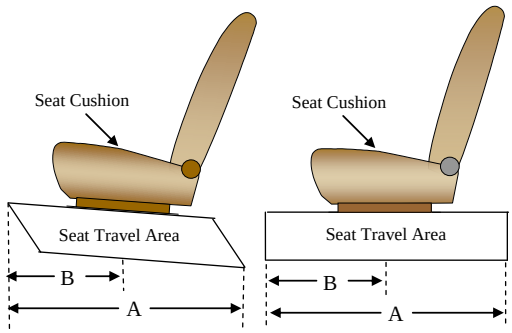
SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages.

Driver: Uppermost, Positioned according to Form 1

Passenger: Uppermost, Positioned according to Form 1.

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



DATA SHEET NO. 2 (CONTINUED)

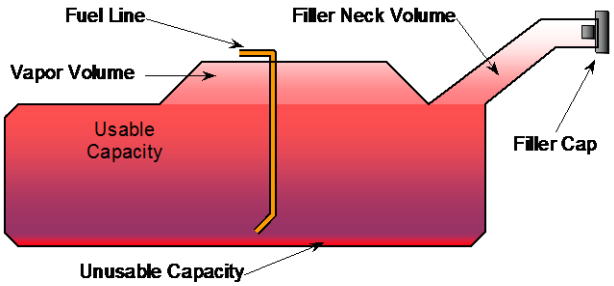
SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	49.2
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	45.8
Actual Amount of Solvent Used	45.8
1/3 of Usable Capacity	16.4

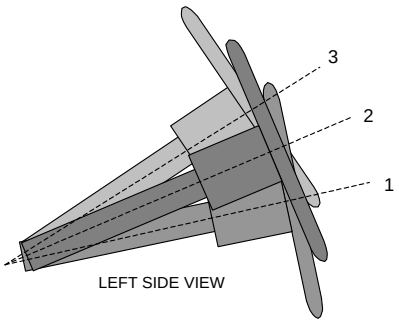
The vehicle is equipped with an electric fuel pump. The electric fuel pump runs for 3 seconds after ignition is switched on. If the engine does not run, the fuel pump stops. If there is a crash signal, it will also stop running.



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



STEERING COLUMN ASSEMBLY

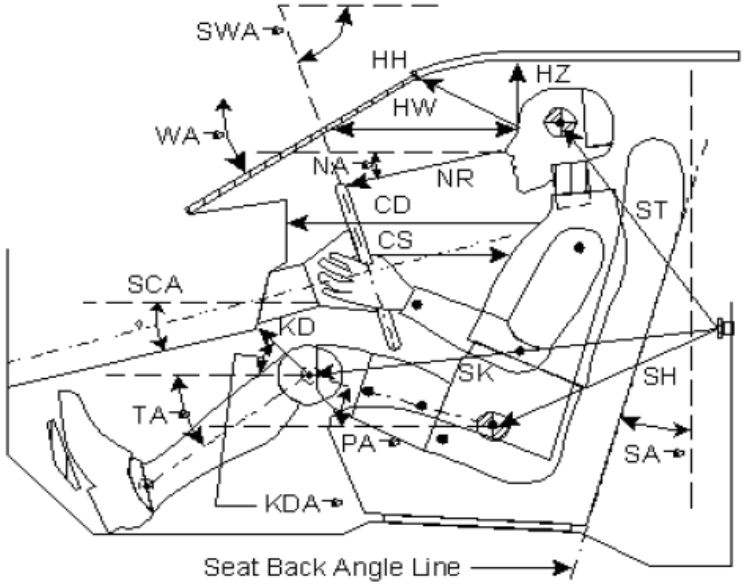
STEERING COLUMN POSITIONS

	Degrees	Fore/Aft Position (mm)
Lowermost Position No. 1	70.2	300
Geometric Center Position No. 2	67.8	300
Uppermost Position No. 3	65.4	300
Telescoping Steering Wheel Travel		60
Test Position	67.8	330

DATA SHEET NO. 3

DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

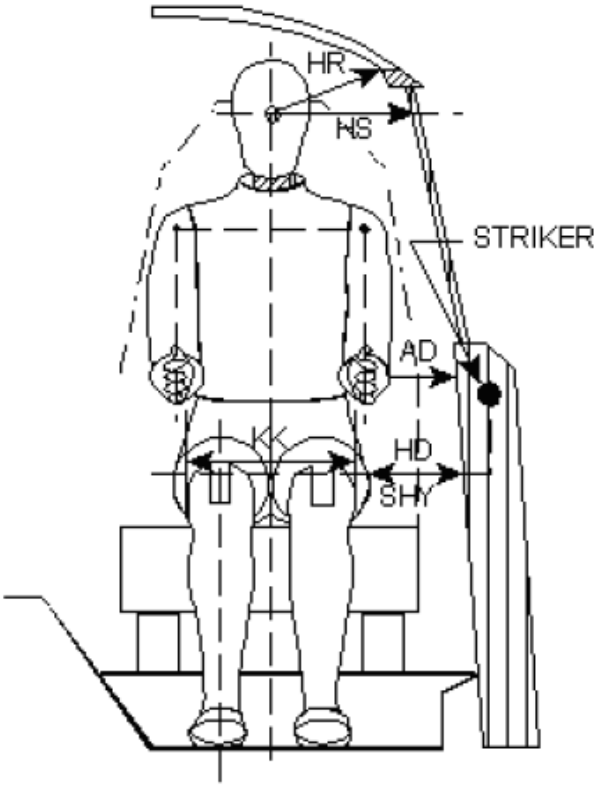


Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (º)	Length (mm)	Angle (º)
WAº	Windshield Angle		25.4		
SWAº	Steering Wheel Angle		67.8		
SCAº	Steering Column Angle		22.2		
SAº	Seat Back Angle (on headrest post)		13.3		19.4
HZ	Head to Roof (Z)	236		243	
HH	Head to Header	421		363	
HW	Head to Windshield	772		773	
NR	Nose to Rim	450	4.0		
CD	Chest to Dash	579		492	
CS	Chest to Steering Hub	377			
RA	Rim to Abdomen	251			
KDL	Left Knee to Dash	236	27.5	155	41.0
KDR	Right Knee to Dash	225	27.5	154	35.0
PAº	Pelvic Angle		23.8		21.2
TAº	Tibia Angle		36.3		52.4
SK	Striker to Knee	547	8.5	664	8.4
ST	Striker to Head	452	86.0	430	67.7
SH	Striker to H-Point	269	51.4	502	27.8

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

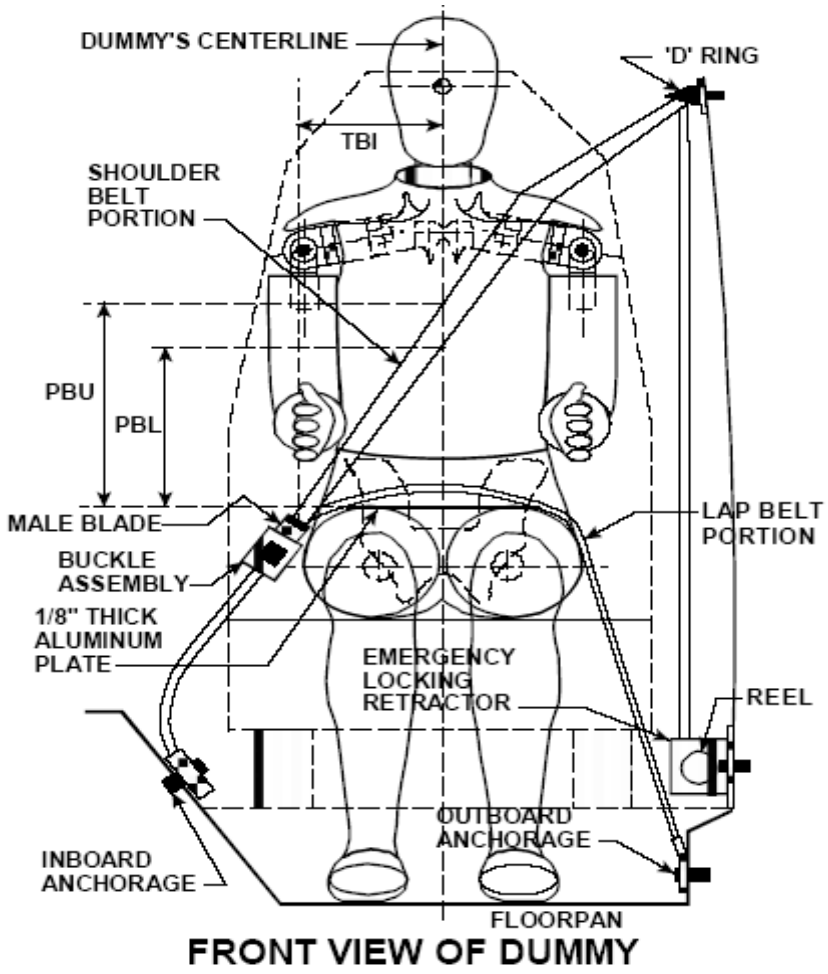


Code	Measurement Description	Driver	Passenger
AD	Arm to Door	118	97
HD	H-Point to Door	145	179
HR	Head to Side Header	230	274
HS	Head to Side Window	364	409
KK	Knee to Knee	345	165
SHY	Striker to H-Point (Y Direction)	234	265
AA	Ankle to Ankle	350	165

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU – Top surface of reference to belt upper edge	mm	386	342
PBL – Top surface of reference to belt lower edge	mm	297	257

BELT LENGTH DATA

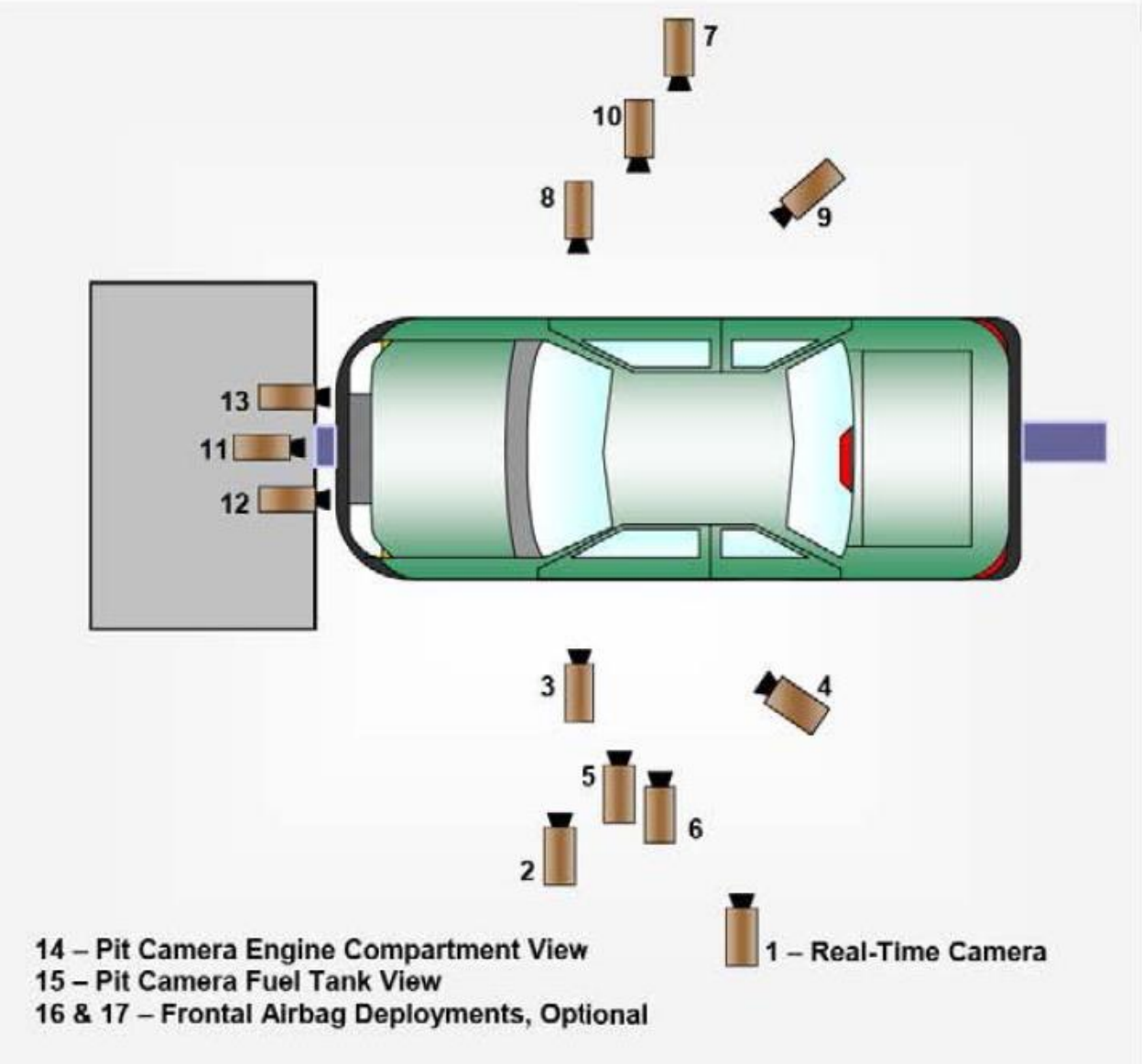
Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	840	917
Lap belt length as measured on ATD	mm	515	627
Remainder of belt on reel	mm	1050	1046
Total belt length for continuous webbing systems	mm	2405	2590

DATA SHEET NO. 6

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle:	2016 Chevrolet Malibu	NHTSA No.:	M20160106
Test Program:	NCAP Frontal Impact	Test Date:	2/3/16

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

CAMERA LOCATIONS

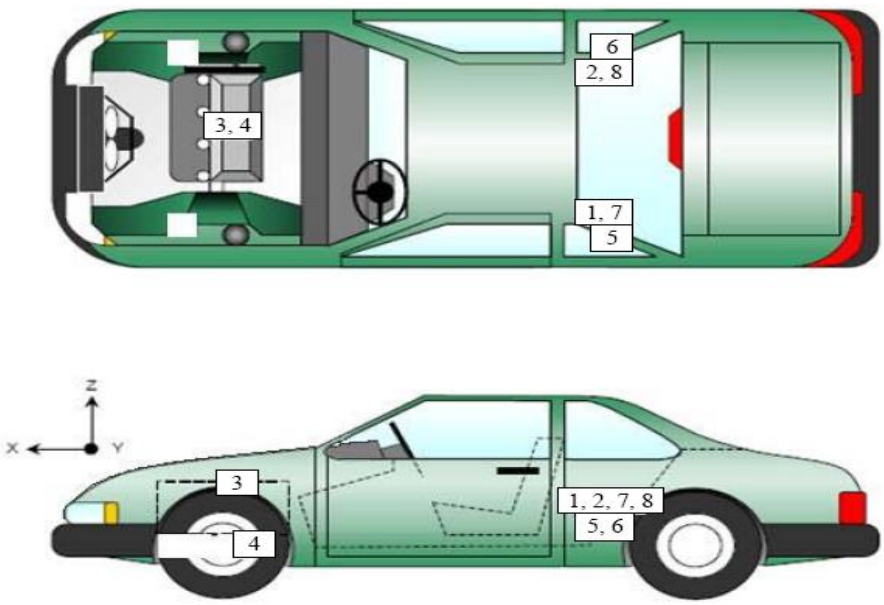
No.	Camera View	Location (mm)			Lens (mm)	Frame Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-1163	-5745	-1493	Zoom	30
2	Driver Close-Up	-1640	-5993	-1364	Zoom	1000
3	Left Front Half	-1191	-5481	-1180	25	1000
4	Left Angle	-3847	-2368	-2022	25	1000
5	Steering Column - Top	-1809	-5964	-2273	50	1000
6	Steering Column – Bottom	-1787	-5681	-1341	50	1000
7	Right Overall	-2499	6407	-1195	20	1000
8	Passenger Close-Up	-1562	5707	-1194	50	1000
9	Right Front Half	-4047	2942	-2131	25	1000
10	Right Angle	-1299	5270	-1188	25	1000
11	Windshield	-154	-20	-2639	12.5	1000
12	Driver Windshield	-199	-503	-2662	25	1000
13	Passenger Windshield	-174	322	-2671	25	1000
14	Pit Front	-470	-25	3095	Zoom	1000
15	Pit Rear	-3000	45	3090	Zoom	1000
16	Onboard Driver Airbag (Optional)	N/A	N/A	N/A	12.5	1000
17	Onboard Passenger Airbag (Optional)	N/A	N/A	N/A	12.5	1000

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

DATA SHEET NO. 7

VEHICLE ACCELEROMETER DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Camera View	Location (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	1910	-360	-409
2	Right Rear Accelerometer – X Direction	1910	335	-412
3	Engine Top X	4231	117	-573
4	Engine Bottom X	4026	215	-193
5	Left Rear Accelerometer – Z Direction	1910	-360	-409
6	Right Rear Accelerometer – Z Direction	1910	355	-412
7	Left Rear Accelerometer – X Direction Redundant	1910	-292	-409
8	Right Rear Accelerometer- X Direction Redundant	1910	283	-412

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

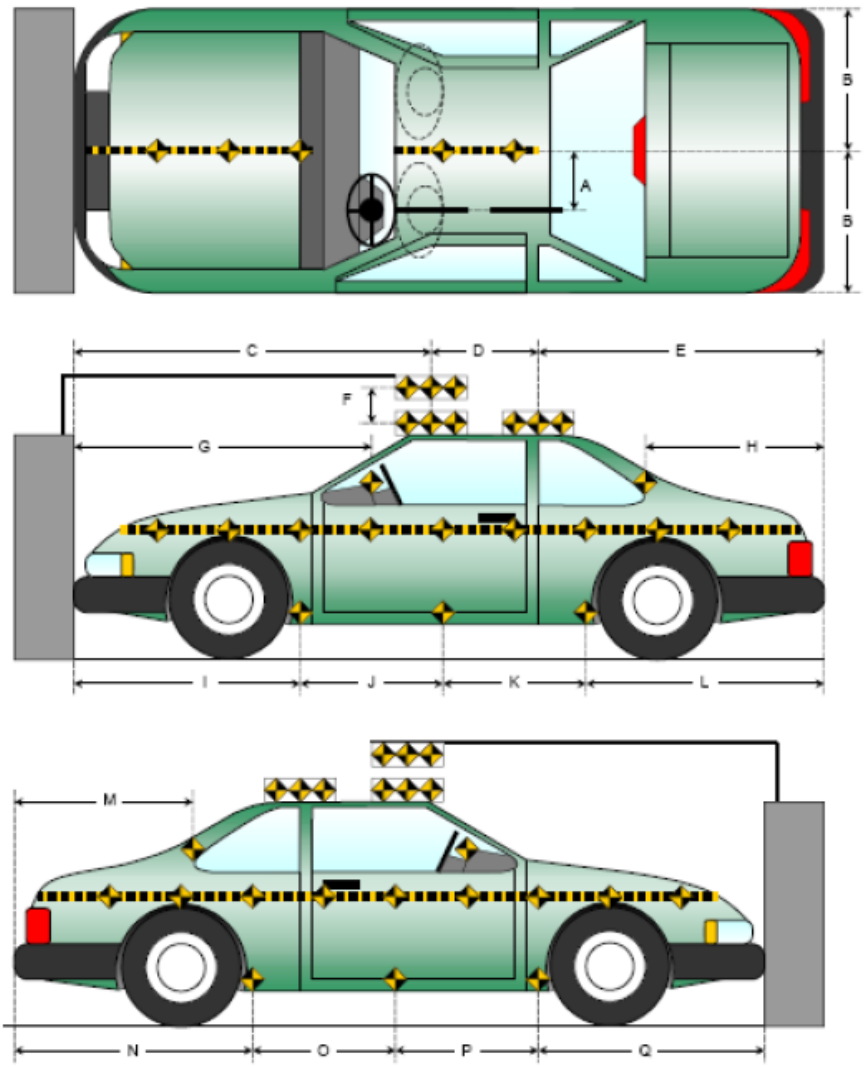
DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

Item	Value
A	330
B	925
C	2770
D	627
E	1802
F	286
G	1774
H	1386
I	1664
J	984
K	940
L	1572
M	1380
N	1571
O	964
P	965
Q	1660

All units in millimeters



DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

Centerline

A-16	A-15	A-14	A-13	A-12	A-11	A-10	A-09	A-08	A-07	A-06	A-05	A-04	A-03	A-02	A-01
B-16	B-15	B-14	B-13	B-12	B-11	B-10	B-09	B-08	B-07	B-06	B-05	B-04	B-03	B-02	B-01
C-16	C-15	C-14	C-13	C-12	C-11	C-10	C-09	C-08	C-07	C-06	C-05	C-04	C-03	C-02	C-01
D-16	D-15	D-14	D-13	D-12	D-11	D-10	D-09	D-08	D-07	D-06	D-05	D-04	D-03	D-02	D-01
E-16	E-15	E-14	E-13	E-12	E-11	E-10	E-09	E-08	E-07	E-06	E-05	E-04	E-03	E-02	E-01
F-16	F-15	F-14	F-13	F-12	F-11	F-10	F-09	F-08	F-07	F-06	F-05	F-04	F-03	F-02	F-01
G-16	G-15	G-14	G-13	G-12	G-11	G-10	G-09	G-08	G-07	G-06	G-05	G-04	G-03	G-02	G-01
H-16	H-15	H-14	H-13	H-12	H-11	H-10	H-09	H-08	H-07	H-06	H-05	H-04	H-03	H-02	H-01
I-16	I-15	I-14	I-13	I-12	I-11	I-10	I-09	I-08	I-07	I-06	I-05	I-04	I-03	I-02	I-01
J-16	J-15	J-14	J-13	J-12	J-11	J-10	J-09	J-08	J-07	J-06	J-05	J-04	J-03	J-02	J-01
K-16	K-15	K-14	K-13	K-12	K-11	K-10	K-09	K-08	K-07	K-06	K-05	K-04	K-03	K-02	K-01

DATA SHEET NO. 10

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

INSTRUMENTATION

Instrumentation	Number of Channels Collected
Driver Dummy Accelerometers	44
Passenger Dummy Accelerometers	44
Vehicle Structure Accelerometers	8
Total	100

CAMERA COVERAGE

Type of Camera	Number Used in this Test
High-Speed Vehicle Onboard	2
High-Speed Offboard	14
Real-Time Panning	1
Total	17

DATA SHEET NO. 11

POST-TEST OBSERVATIONS

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

TEST DUMMY INFORMATION AND CONTACT LOCATIONS

Description	Driver	Passenger
Dummy Type / Serial No.	Hybrid III 50th/ 037	Hybrid III 5th/ 426
Head Contact	Airbag, Headrest	Airbag, Headrest
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	Locked	Locked
Front Door Opening	Remained closed & latched, operational	Remained closed & latched, operational
Rear Door Opening	Remained closed & latched, operational	Remained closed & latched, operational
Seat Track Shift (mm)	None	None
Seat Back Failure	None	None

POST-TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	None
Window Damage	None
Other Notable Effects	None

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	935
Center	mm	881
Right Side	mm	911
Average	mm	909

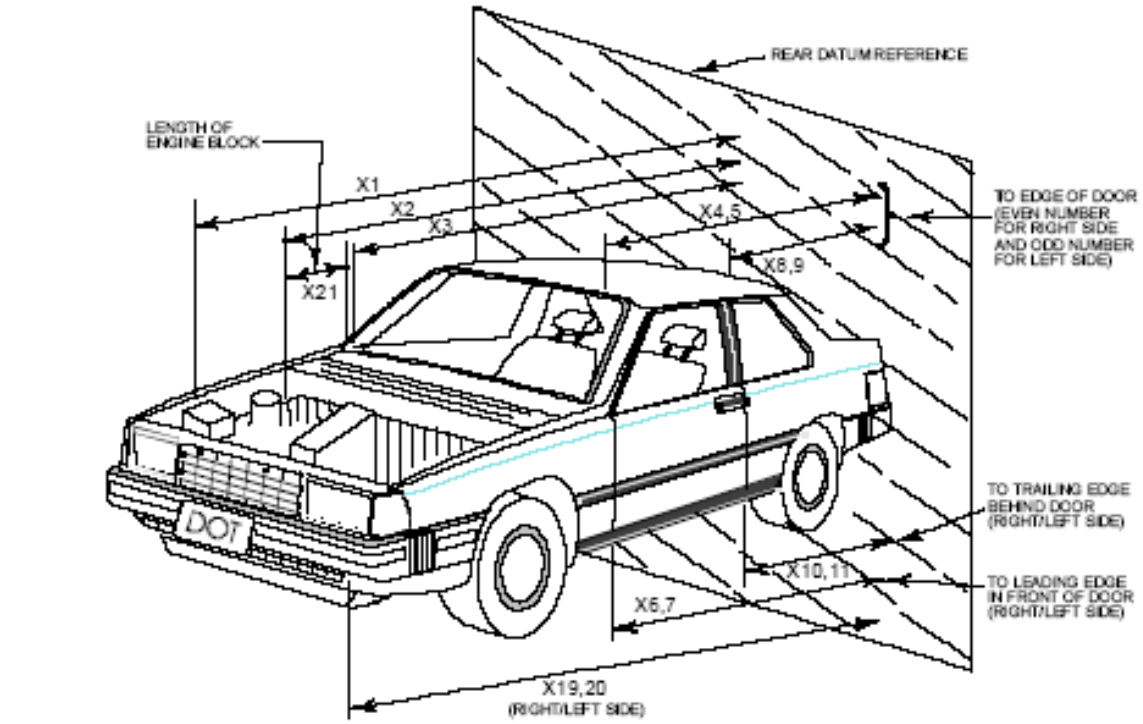
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

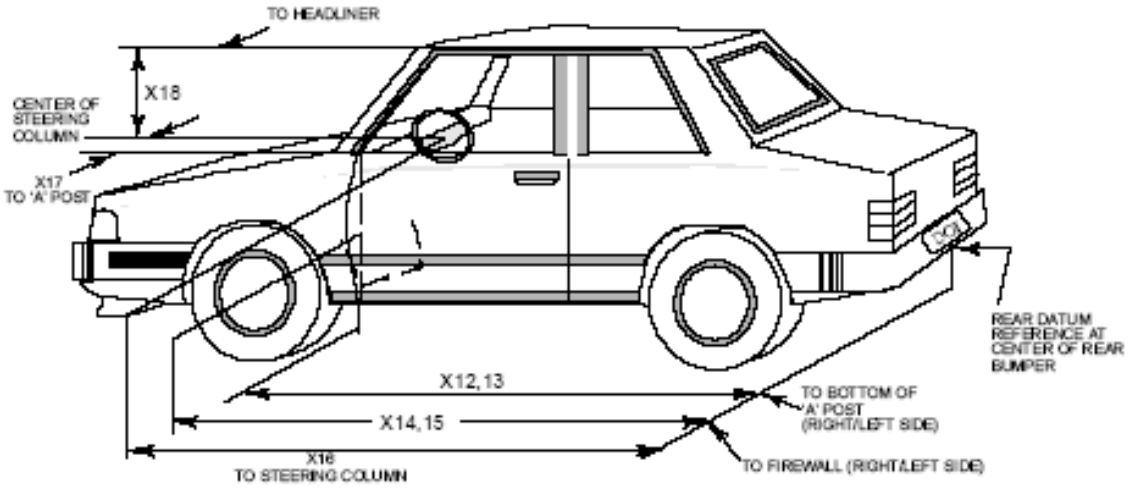
Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Side Curtain Airbag	Yes	Yes	Yes	Yes
Torso/Pelvis Airbag	Yes	No	Yes	No
Pelvis Airbag	No	N/A	No	N/A
Knee Airbag	Yes	Yes	Yes	Yes
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt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

DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle:	2016 Chevrolet Malibu	NHTSA No.:	M20160106
Test Program:	NCAP Frontal Impact	Test Date:	2/3/16





DATA SHEET NO. 12 (CONTINUED)

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4910	4422	488
2	Rear Surface of Vehicle (RSOV) to Front of Engine	4265	4221	44
3	RSOV to Firewall	3815	3815	0
4	RSOV to Upper Leading Edge of Right Door	3427	3438	-11
5	RSOV to Upper Leading Edge of Left Door	3446	3440	6
6	RSOV to Lower Leading Edge of Right Door	3403	3411	-8
7	RSOV to Lower Leading Edge of Left Door	3308	3319	-11
8	RSOV to Upper Trailing Edge of Right Door	2295	2303	-8
9	RSOV to Upper Trailing Edge of Left Door	2310	2306	4
10	RSOV to Lower Trailing Edge of Right Door	2326	2340	-14
11	RSOV to Lower Trailing Edge of Left Door	2331	2350	-19
12	RSOV to Bottom of “A” Post-of Right Side	3408	3410	-2
13	RSOV to Bottom of “A” Post-of Left Side	3412	3404	8
14	RSOV to Firewall, Right Side	3798	3985	-7
15	RSOV to Firewall, Left Side	3974	3959	15
16	RSOV to Steering Column	2911	3055	-144
17	Center of Steering Column to “A” Post	347	340	7
18	Center of Steering Column to Headliner	438	442	-4
19	RSOV to Right Side of Front Bumper	4663	4380	283
20	RSOV to Left Side of Front Bumper	4670	4380	290
21	Length of Engine Block	580	580	0
RD	RSOV to Right Side of Dash Panel	3162	3168	-6
CD	RSOV to Center of Dash Panel	3167	3153	14
LD	RSOV to Left Side of Dash Panel	3168	3178	-10

All Dimensions in mm

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

VEHICLE INFORMATION

VIN: 1G1ZB5ST7GF185685 Wheelbase: 2835
Vehicle Size Category: Passenger Car Test Weight (kg): 1608.2

ACCELEROMETER DATA

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

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

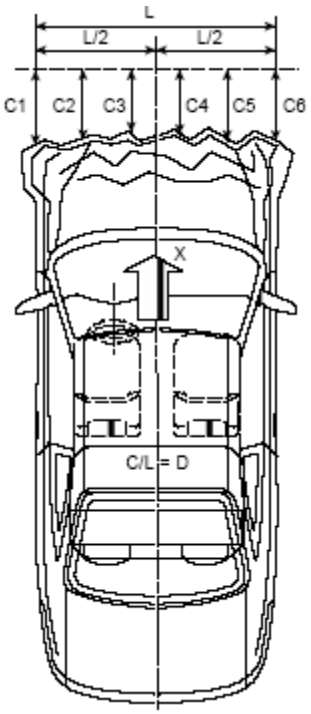
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.29

Velocity Change (km/h): 88.5

Time of Separation (ms): 95



CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Centerline
Damage Region Length (mm): 1524
Impact Mode: Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4670	4380	290
C2	Crush zone 2 at left side	mm	4831	4353	478
C3	Crush zone 3 at left side	mm	4890	4394	496
C4	Crush zone 4 at right side	mm	4891	4388	503
C5	Crush zone 5 at right side	mm	4821	4365	456
C6	Crush zone 6 at right side	mm	4663	4380	283
L	C1 to C6	mm	1524	1526	-2

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

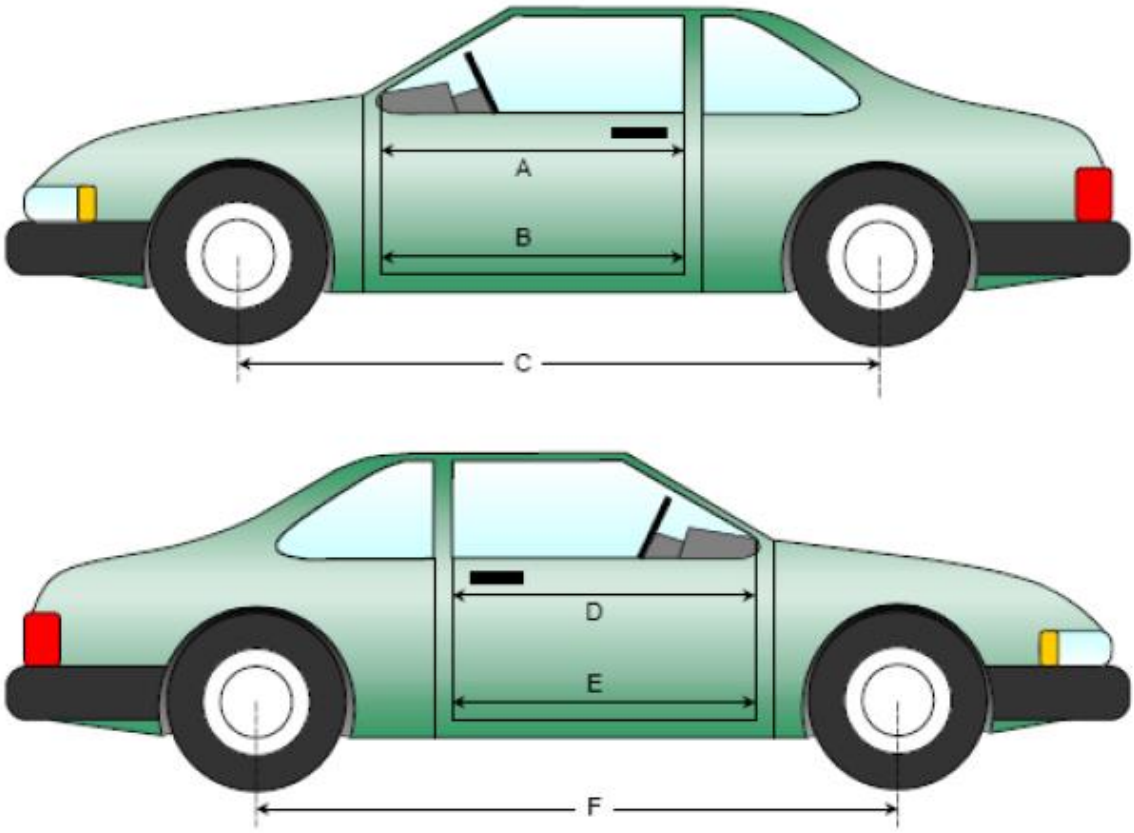
Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

DOOR OPENING WIDTH

No.	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1060	1060	0
B	Left Side Lower	mm	915	915	0
C	Right Side Upper	mm	1060	1060	0
D	Right Side Lower	mm	915	915	0

WHEELBASE MEASUREMENTS

No.	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2835	2740	95
F	Right Side Wheelbase	mm	2835	2790	45



DATA SHEET NO. 14 (CONTINUED)

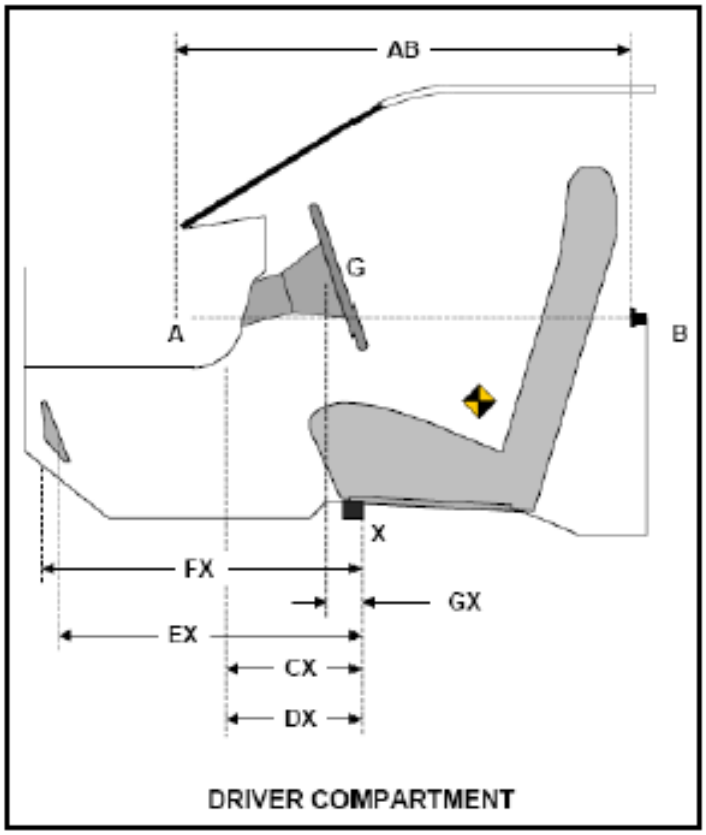
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	1060	1060	0
CX	Left Knee Bolster to X	mm	290	297	-7
DX	Right Knee Bolster to X	mm	298	305	-7
EX	Brake Pedal to X	mm	560	547	13
FX	Foot Rest to X	mm	580	574	6
GX	Center of Steering Column Wheel Hub to X	mm	65	140	-75

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

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

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

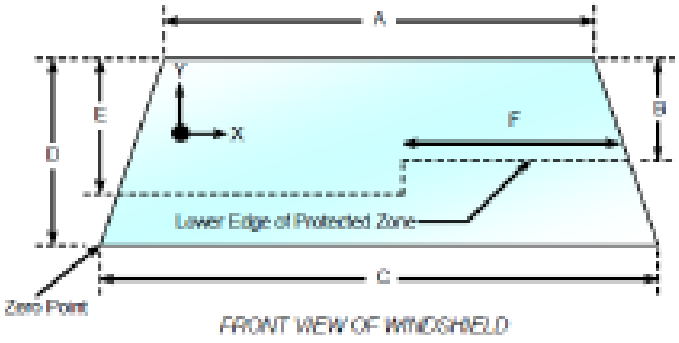
Please provide windshield mounting details.

The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicle not equipped with occupant passive restraint and 50% for each side of the windshield for vehicle which are equipped with occupant passive restraints.
Temperature of windshield molding during test: 21° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	1983	1983	100
Right Side	1983	1983	100
Total	3966	3966	100

Item	Units	Value
A	mm	1270
B	mm	570
C	mm	1556
D	mm	820
E	mm	558
F	mm	483



AREAS OF PROTECTED ZONE FAILURES

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

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

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

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

DATA SHEET NO. 15 (CONTINUED)

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

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

FMVSS 301 FUEL SYSTEM INTEGRTY POST IMPACT DATA

Temperature at Time of Impact: 21.1°C Test Time: 15:46

Stoddard Solvent Spillage Measurements

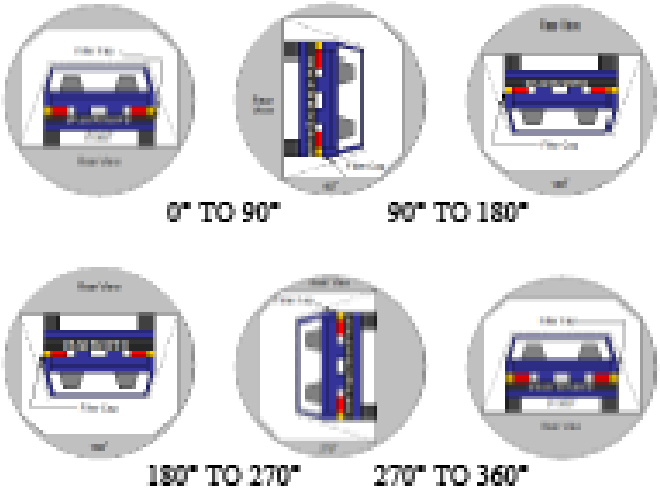
A	From impact until vehicle motion ceases: (maximum allowable – 1 oz.)	0 oz.
B	For the 5-minute period after motion ceases: (maximum allowable – 5 oz.)	0 oz.
C	For the following 25 minutes: (maximum allowable – 1 oz./minutes)	0 oz.
D	Spillage: None	

DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16

1. The specified fixture rollover rate for each 90º of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard Solvent spillage:
None



SOLVENT COLLECTION TIME TABLE IN SECONDS

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

FMVSS 301 SPILLAGE TABLE

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

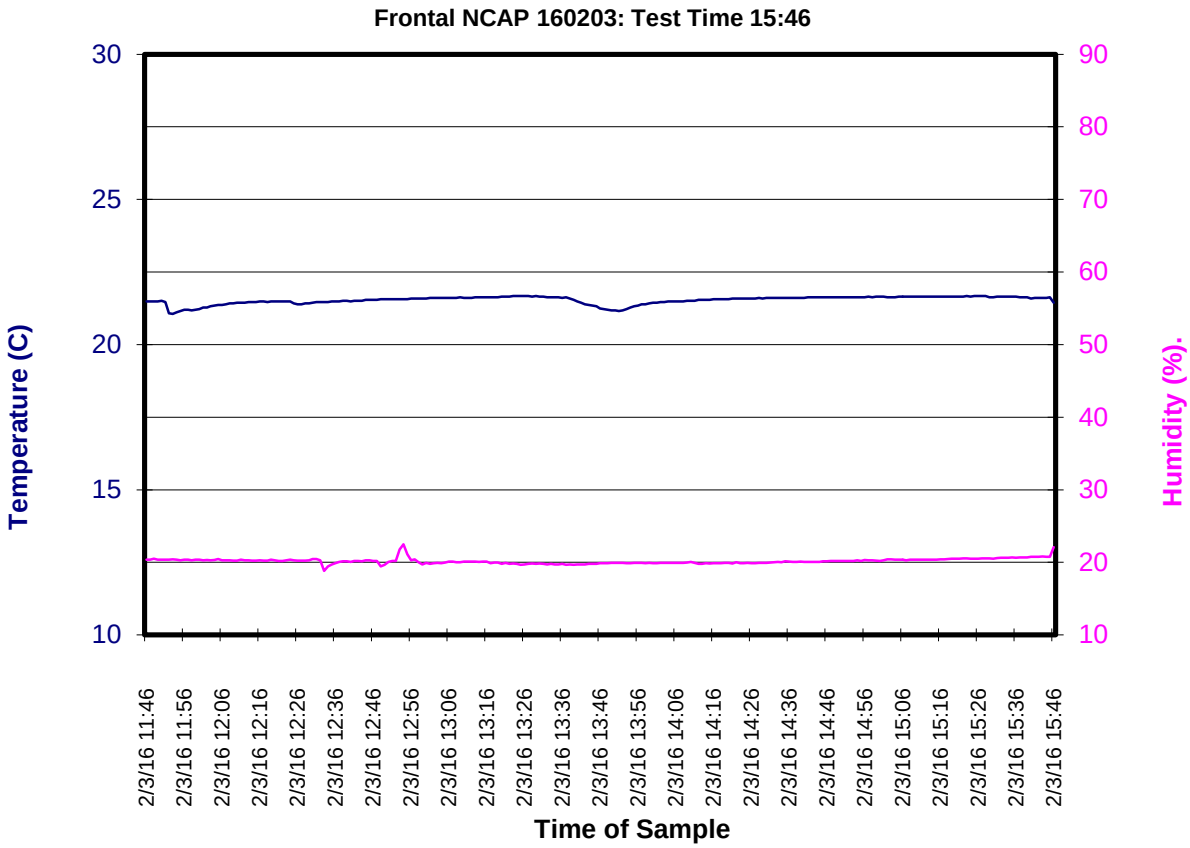
SOLVENT SPILLAGE LOCATION TABLE

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

DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2016 Chevrolet Malibu NHTSA No.: M20160106
Test Program: NCAP Frontal Impact Test Date: 2/3/16



APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS (CONTINUED)

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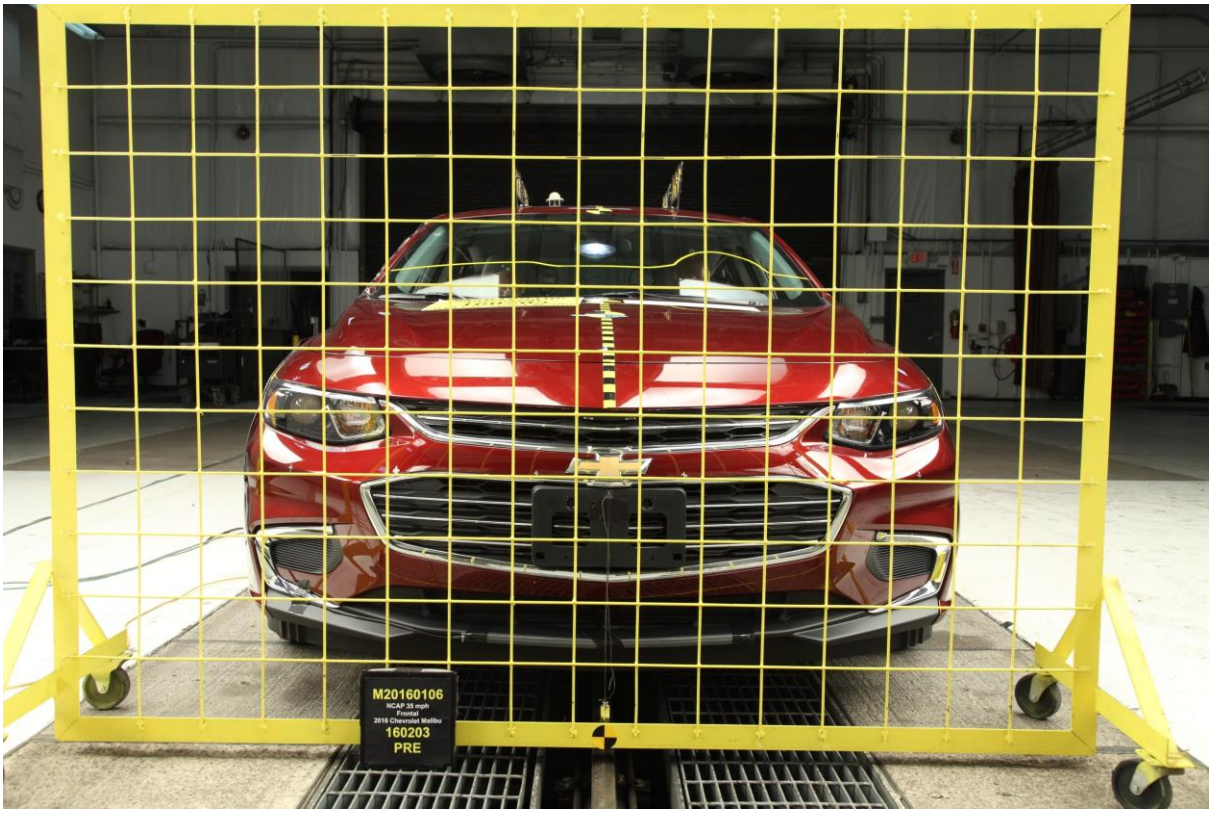
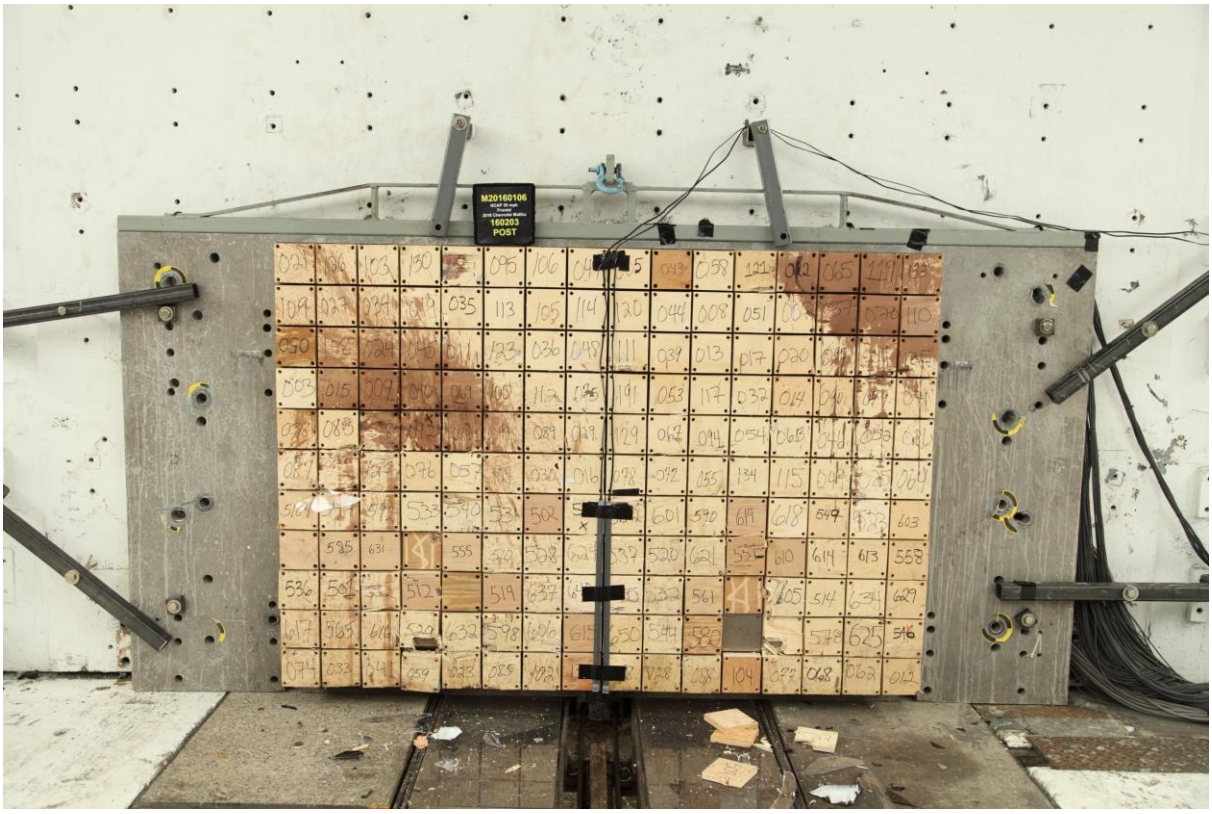


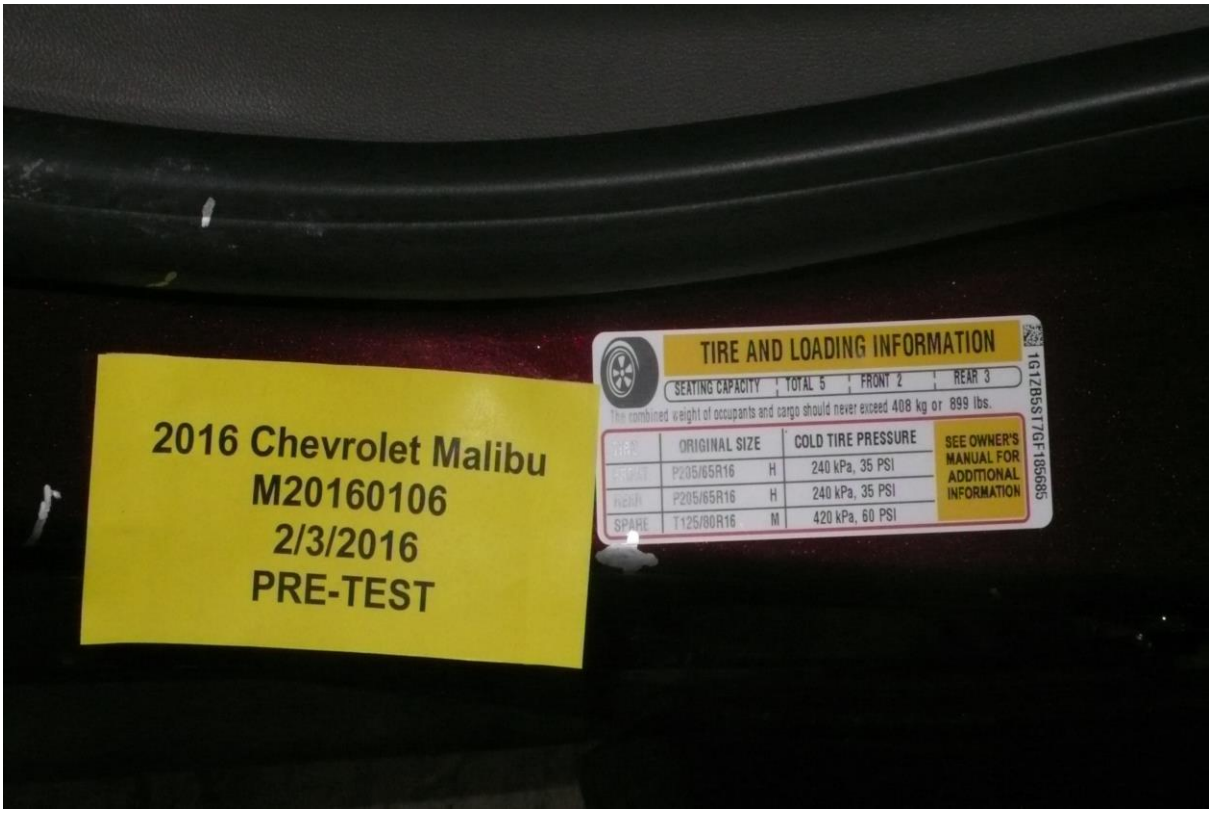
001 Load Cell Location

002 Pre-Test Load Cell Wall



003 Post-Test Load Cell Wall

004 Manufacturer's Label



005 Tire Placard

006 2016 Chrysler 300 4-Door Sedan Frontal As Delivered

007 Left Rear 3-4 View, as Received

008 Pre-Test Front View of Test Vehicle[1]

[1] Pre-test placards say "2014 Chevrolet Malibu" rather than "2016 Chevrolet Malibu." Photos were not retaken per COTR.

009 Post-Test Front View of Test Vehicle

010 Pre-Test Left View of Test Vehicle[1]

[1] Pre-test placards say "2014 Chevrolet Malibu" rather than "2016 Chevrolet Malibu." Photos were not retaken per COTR.

011 Post-Test Left View of Test Vehicle

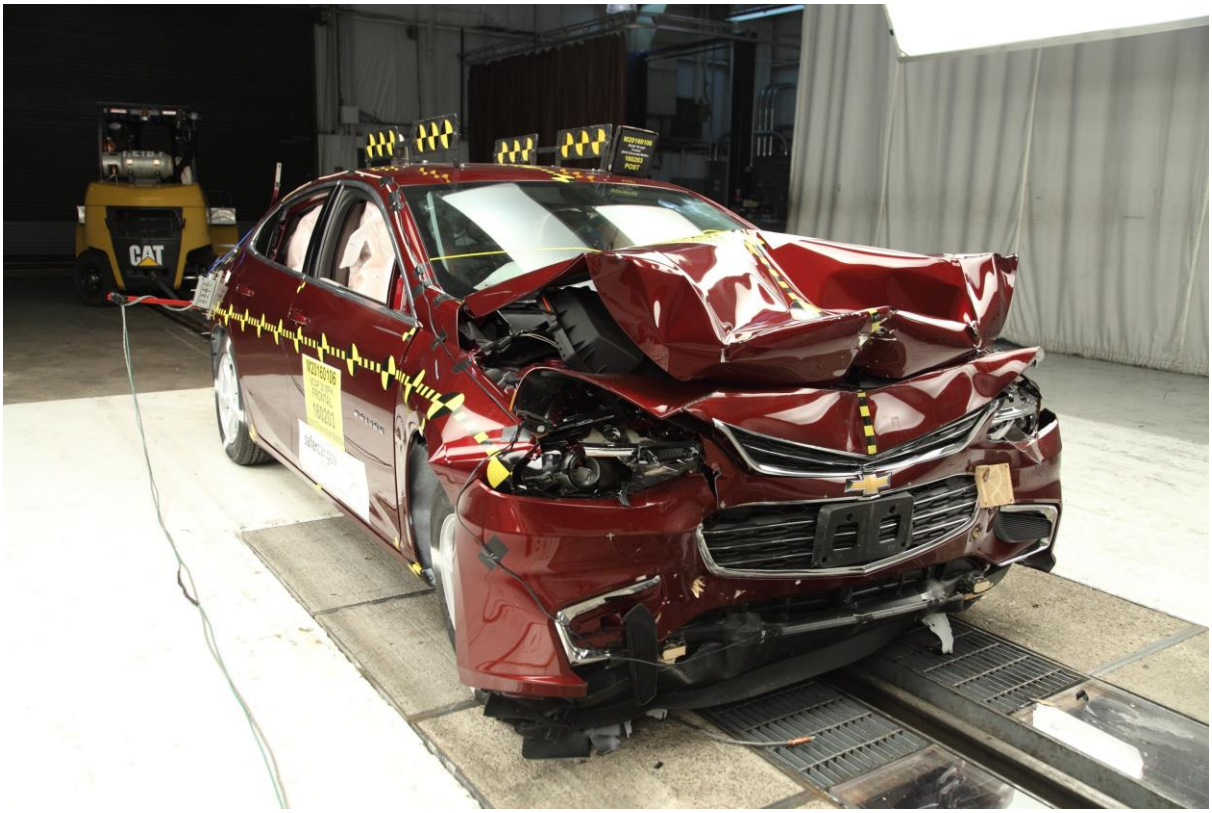
012 Pre-Test Right View of Test Vehicle[1]

[1] Pre-test placards say "2014 Chevrolet Malibu" rather than "2016 Chevrolet Malibu." Photos were not retaken per COTR.

013 Post-Test Right View of Test Vehicle

014 Pre-Test Right Front 3-4 View[1]

[1] Pre-test placards say "2014 Chevrolet Malibu" rather than "2016 Chevrolet Malibu." Photos were not retaken per COTR.



015 Post-Test Right Front 3-4 View

016 Pre-Test Left Rear 3-4 View[1]

[1] Pre-test placards say "2014 Chevrolet Malibu" rather than "2016 Chevrolet Malibu." Photos were not retaken per COTR.

017 Post-Test Left Rear 3-4 View

018 Pre-Test Windshield View

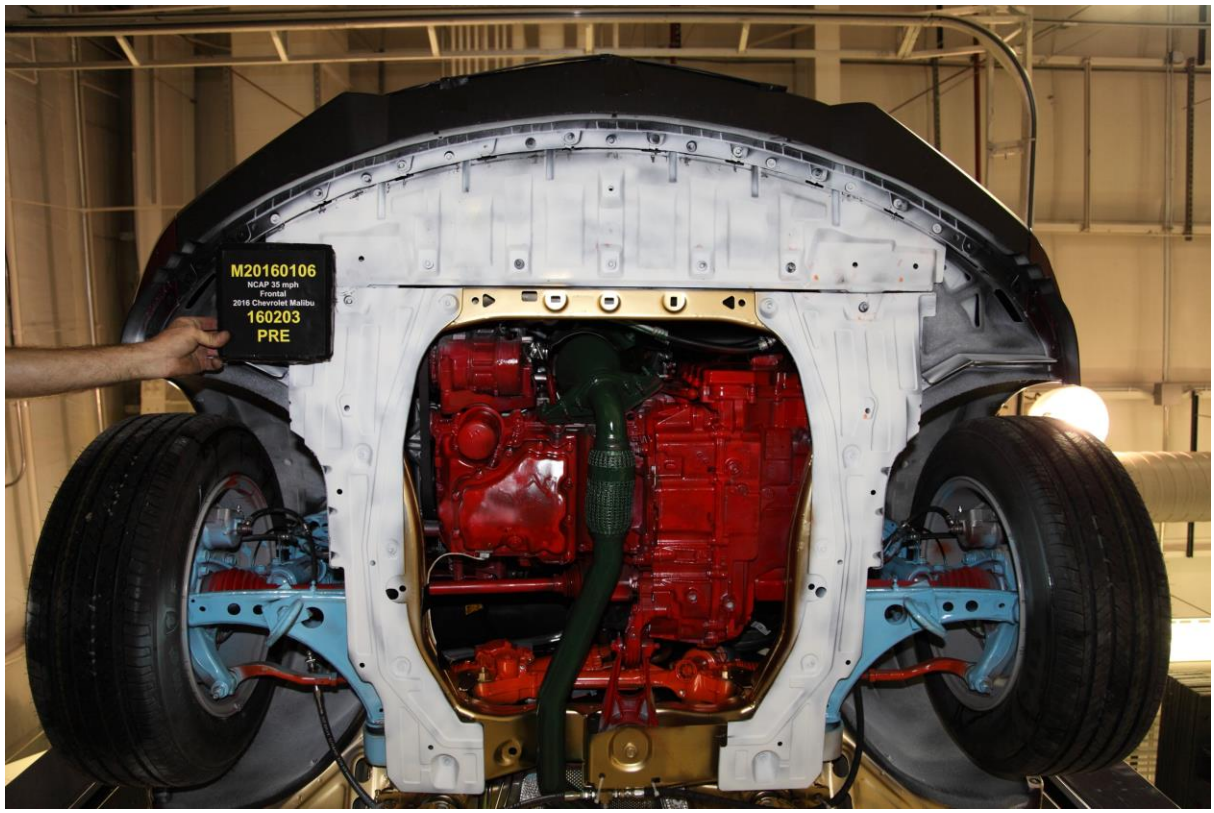
019 Post-Test Windshield View

020 Pre-Test Engine Compartment View

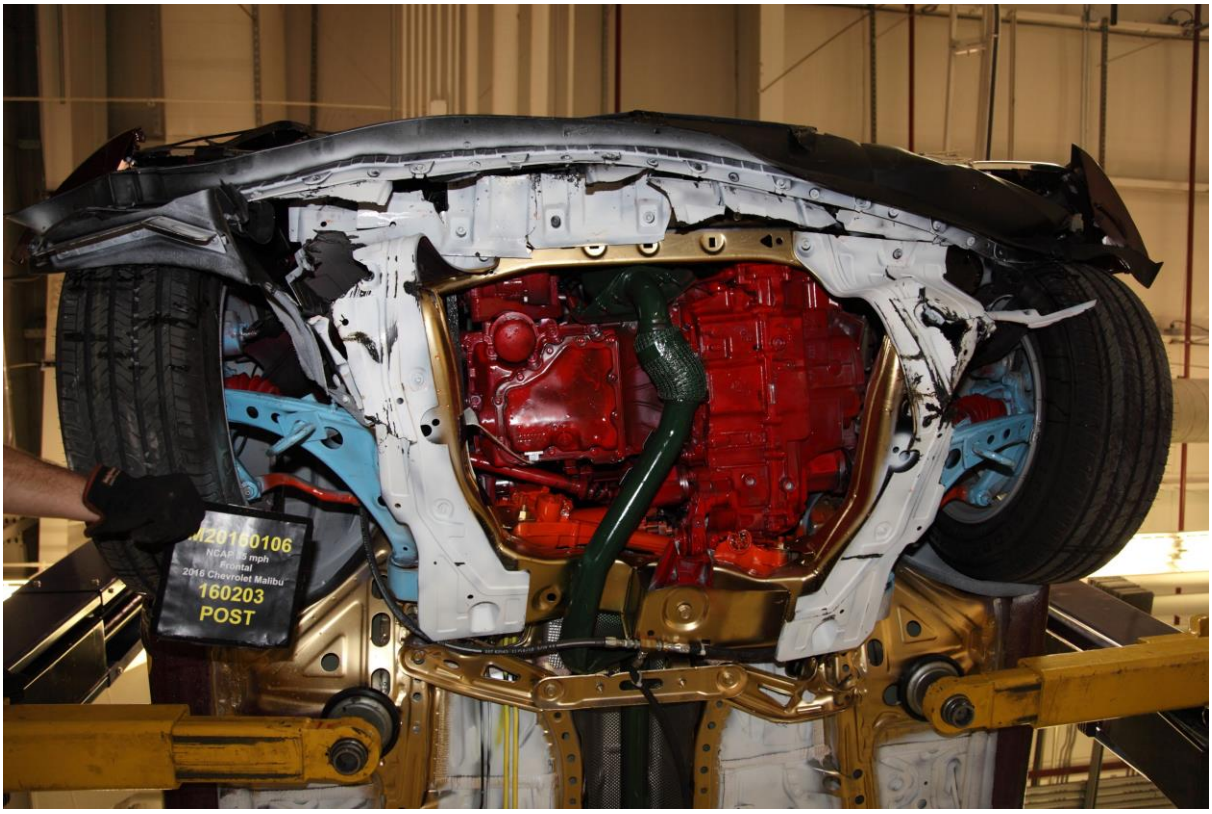
021 Post-Test Engine Compartment View

022 Pre-Test Fuel Filler Cap View

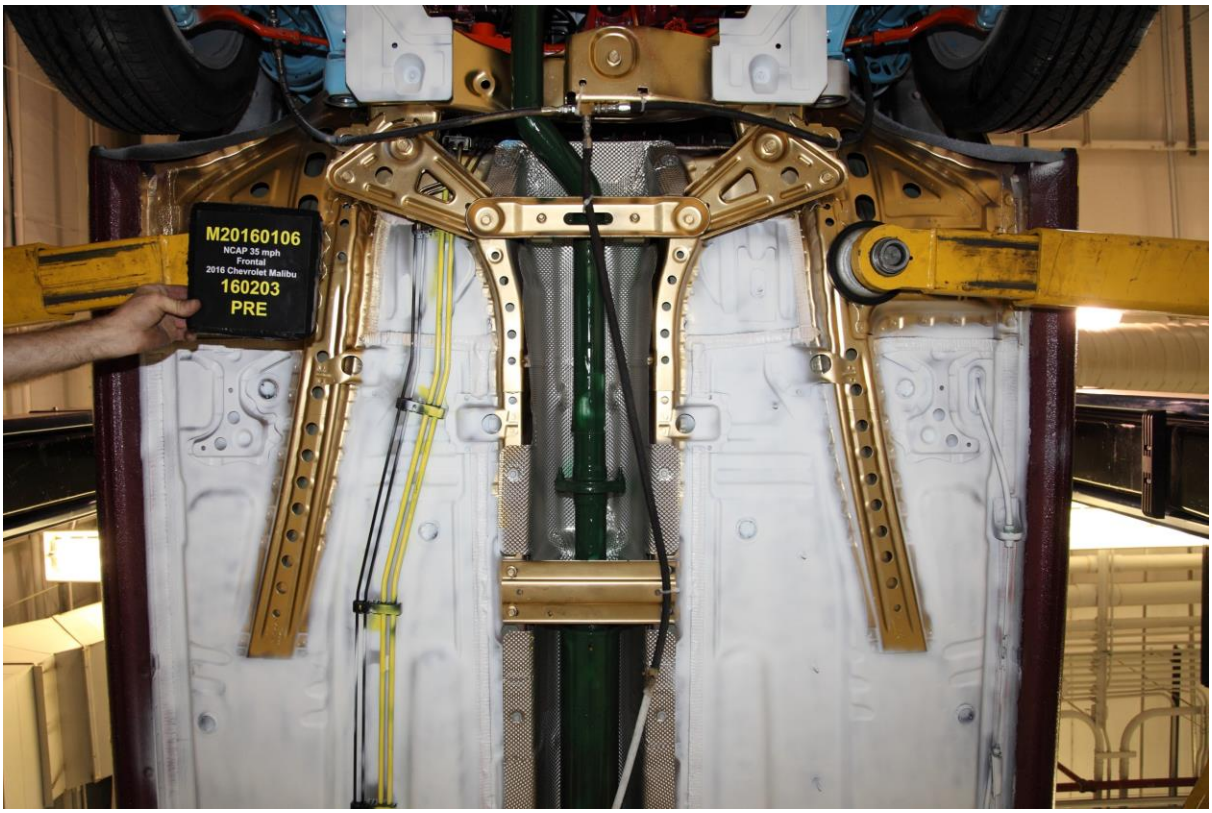
023 Post-Test Fuel Filler Cap View



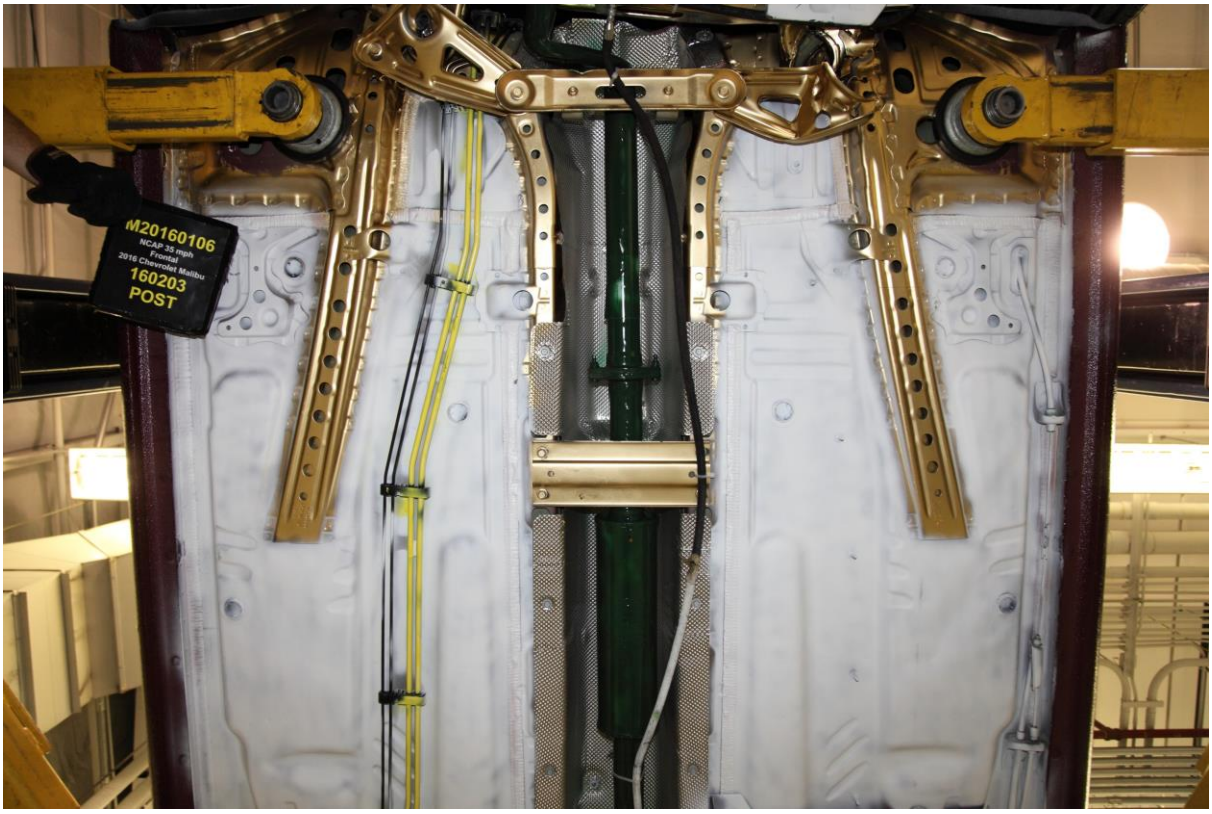
024 Pre-Test Front Underbody View



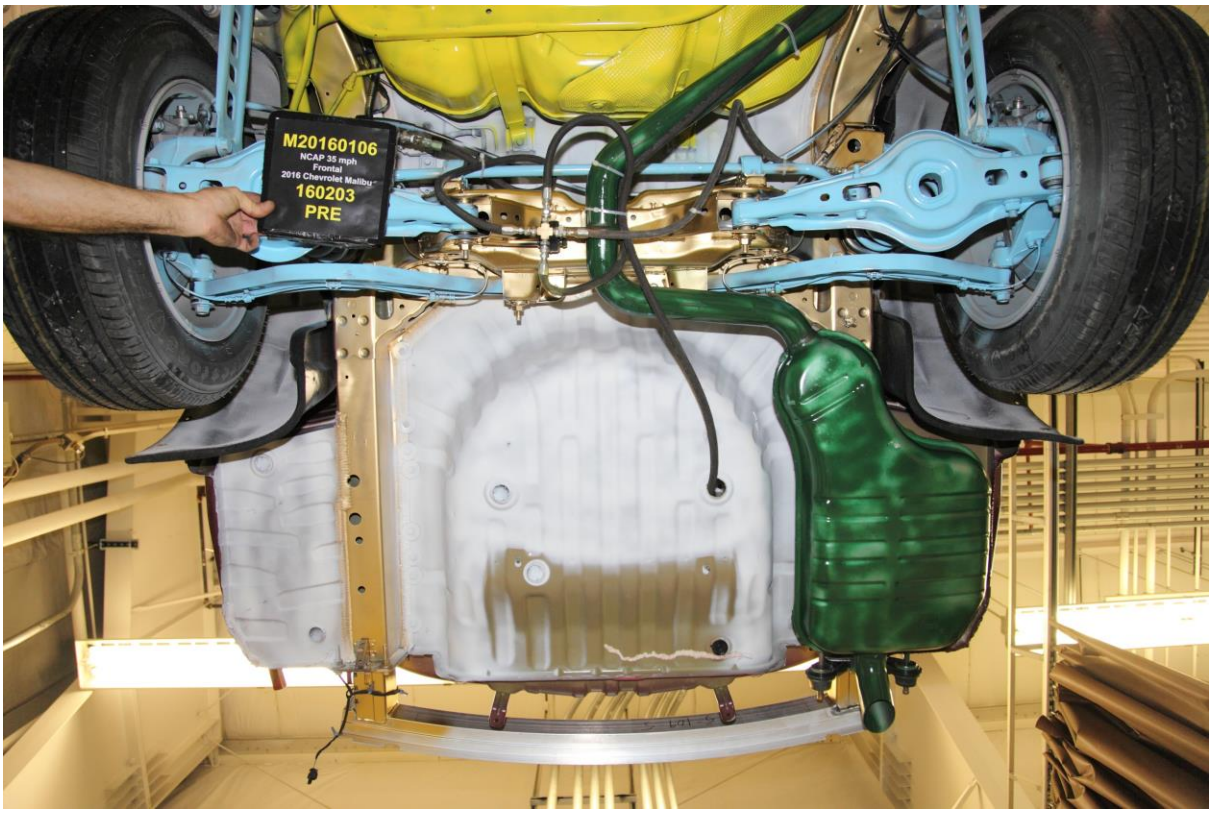
025 Post-Test Front Underbody View



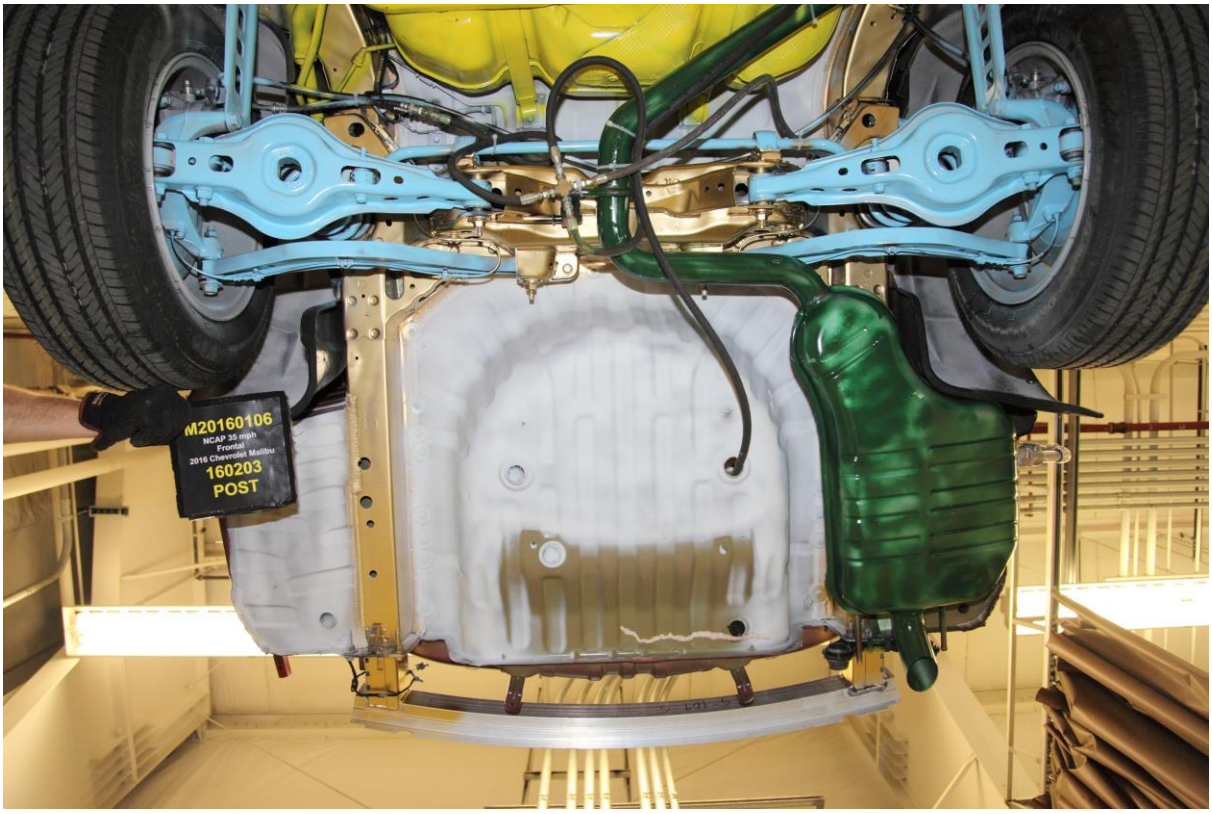
025a Pre-Test Mid Underbody View



025b Post-Test Mid Underbody View



026 Pre-Test Rear Underbody View

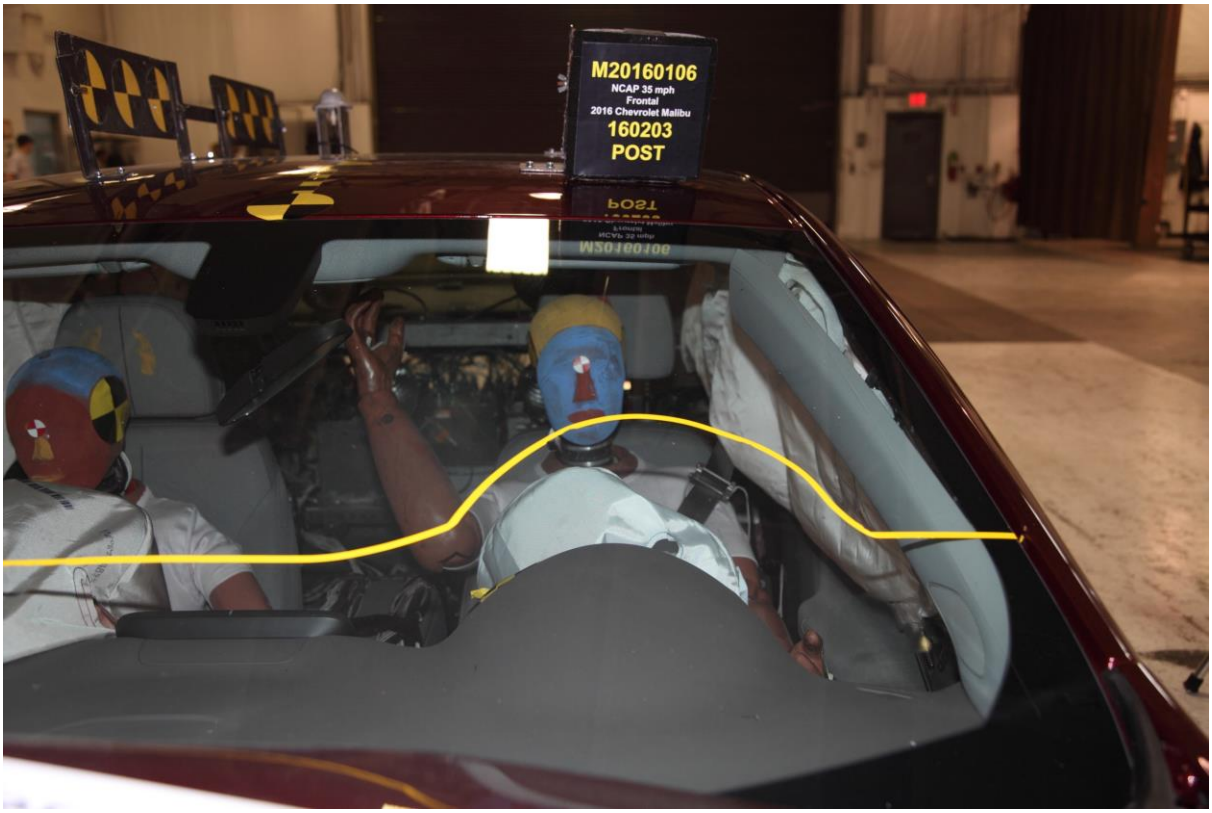


027 Post-Test Rear Underbody View

028 Pre-Test Dummy Cable Routing

029 Post-Test Dummy Cable Routing

030 Pre-Test Driver Dummy Front View



031 Post-Test Driver Dummy Front View

032 Pre-Test Driver Dummy Window View

033 Post-Test Driver Dummy Window View

034 Pre-Test Driver Dummy and Vehicle Interior View

035 Post-Test Driver Dummy and Vehicle Interior View

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

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

038 Pre-Test View of Belt Anchorage for Driver Dummy

039 Post-Test View of Belt Anchorage for Driver Dummy

040 Pre-Test Driver Dummy Feet

041 Post-Test Driver Dummy Feet

042 Pre-Test Driver's Side Knee Bolster

043 Post-Test Driver's Side Knee Bolster

044 Pre-Test Driver's Side Floorpan

045 Post-Test Driver's Side Floorpan

046 Post-Test Driver Dummy Face

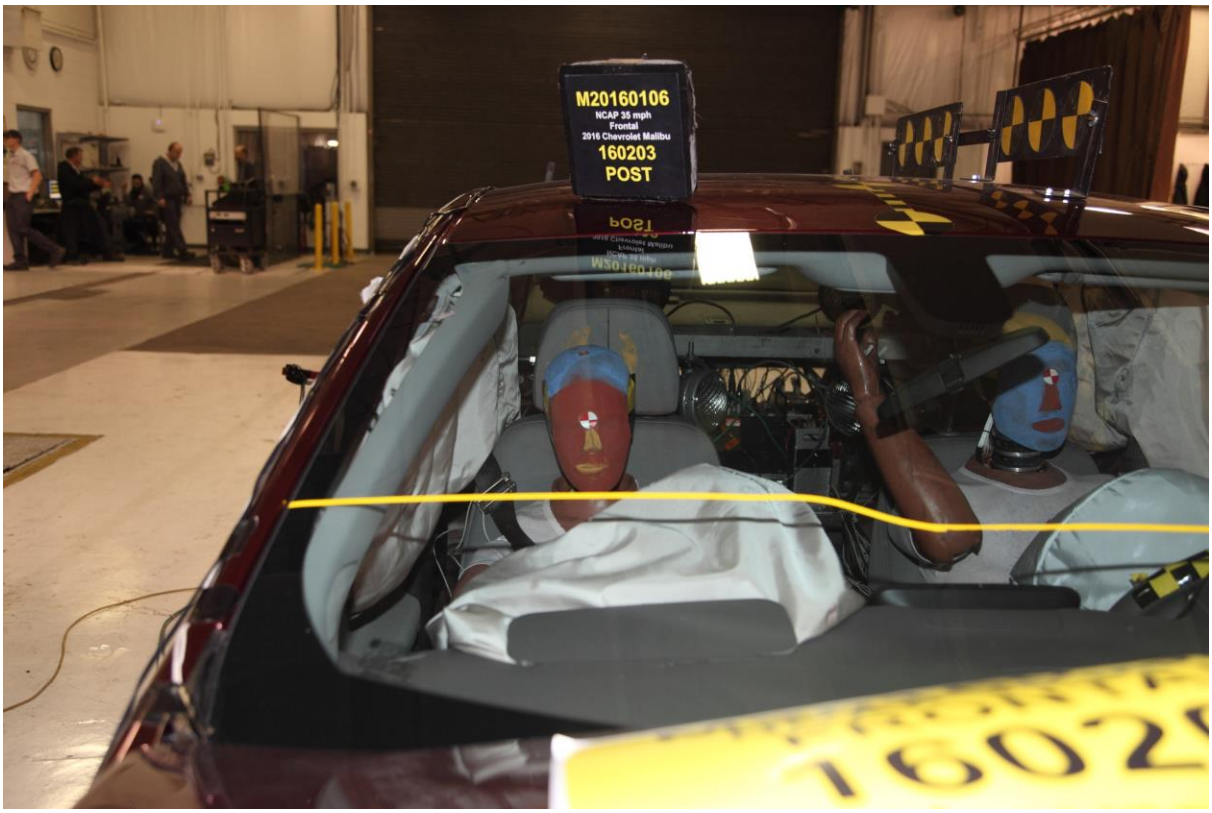
047 Post-Test Driver Dummy Contact With Airbag

048 Post-Test Driver Dummy Contact With Headrest

049 Pre-Test View of the Steering Wheel

050 Post-Test View of the Steering Wheel

051 Pre-Test Passenger Dummy Front View



052 Post-Test Passenger Dummy Front View

053 Pre-Test Passenger Dummy Window View

054 Post-Test Passenger Dummy Window View

055 Pre-Test Passenger Dummy and Vehicle Interior View

056 Post-Test Passenger Dummy and Vehicle Interior View

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

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

059 Pre-Test View of Belt Anchorage for Passenger Dummy

060 Post-Test View of Belt Anchorage for Passenger Dummy

061 Pre-Test Passenger Dummy Feet

062 Post-Test Passenger Dummy Feet

063 Pre-Test Passenger's Side Knee Bolster

064 Post-Test Passenger's Side Knee Bolster

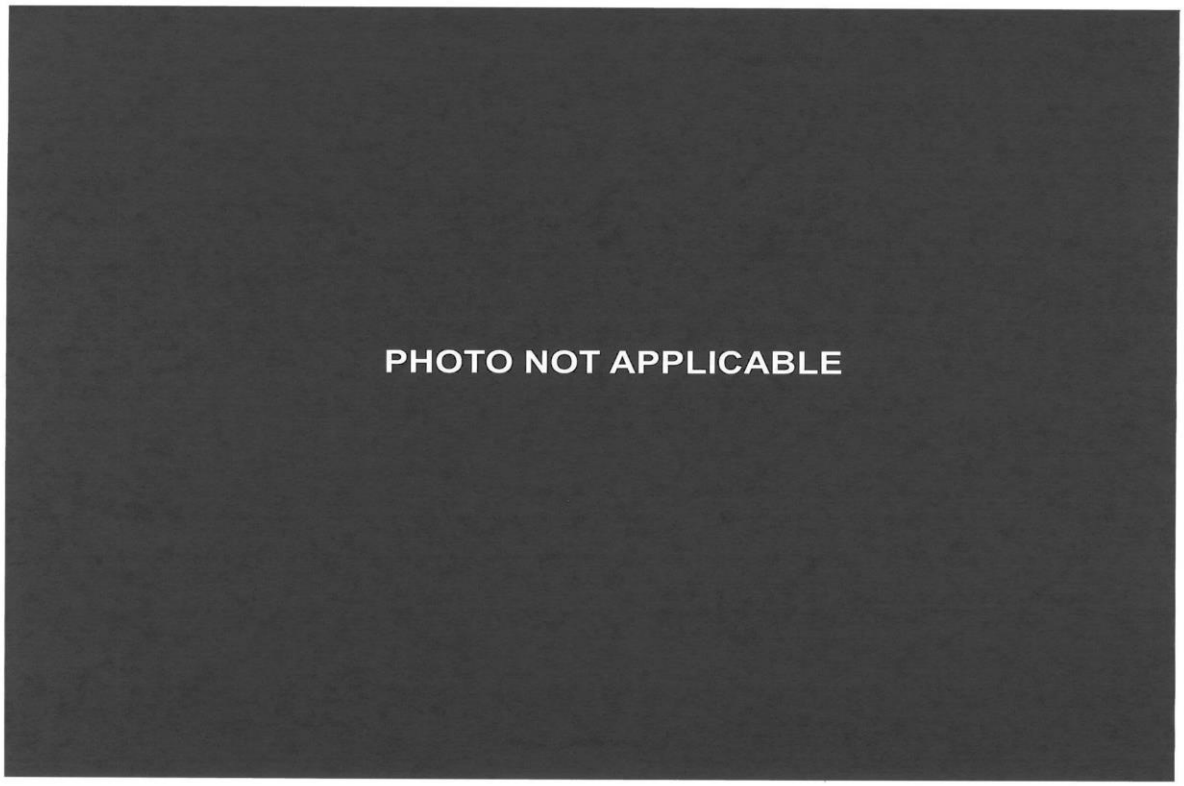
065 Pre-Test Passenger's Side Floorpan

066 Post-Test Passenger's Side Floorpan

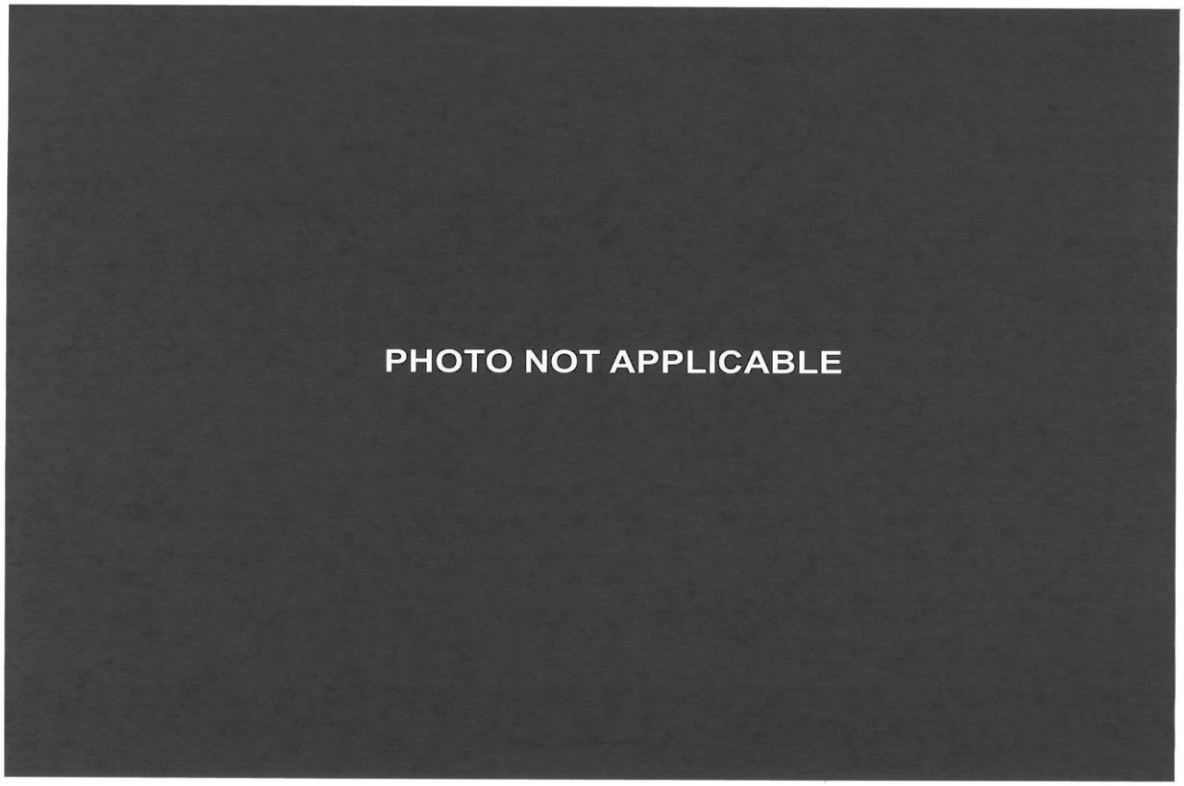
067 Post-Test Passenger Dummy Face

068 Post-Test Passenger Dummy Contact With Airbag

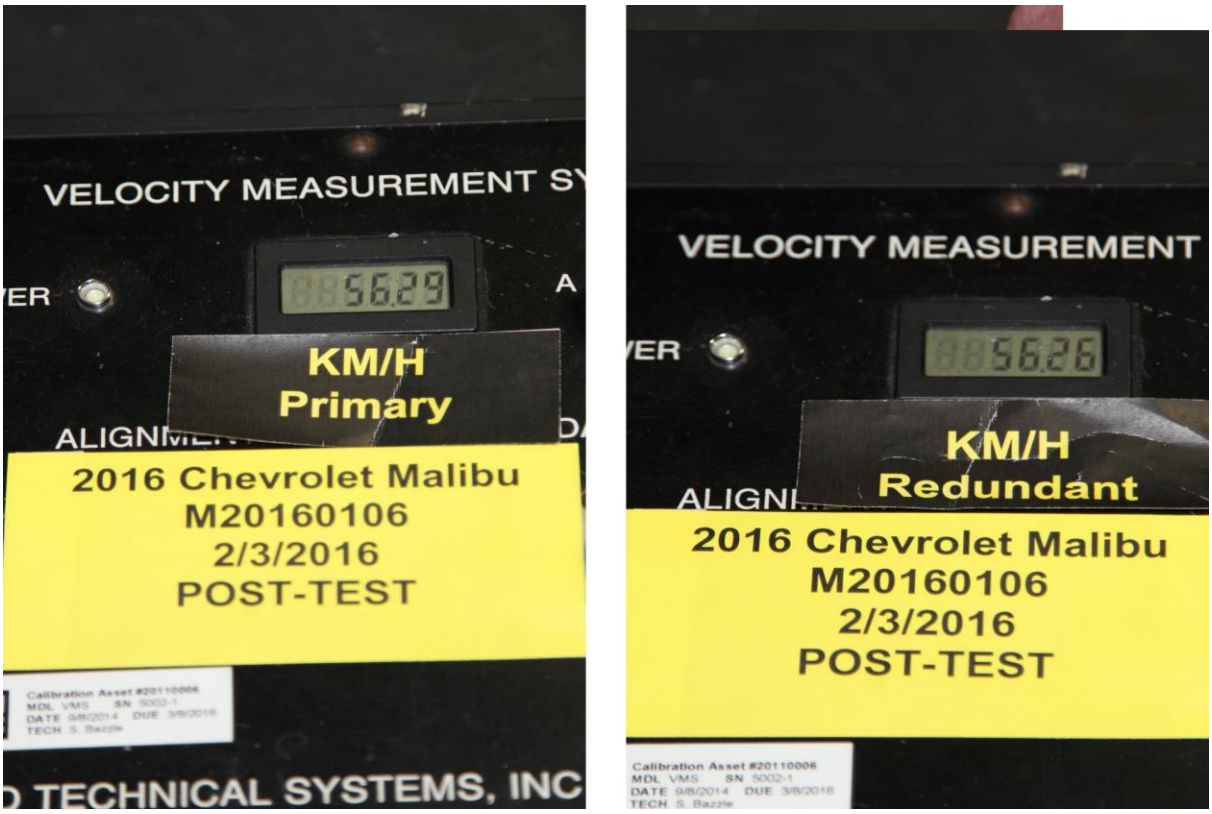
069 Post Test Passenger Dummy Contact With Headrest



070 Photograph of Ballast Installed in Vehicle

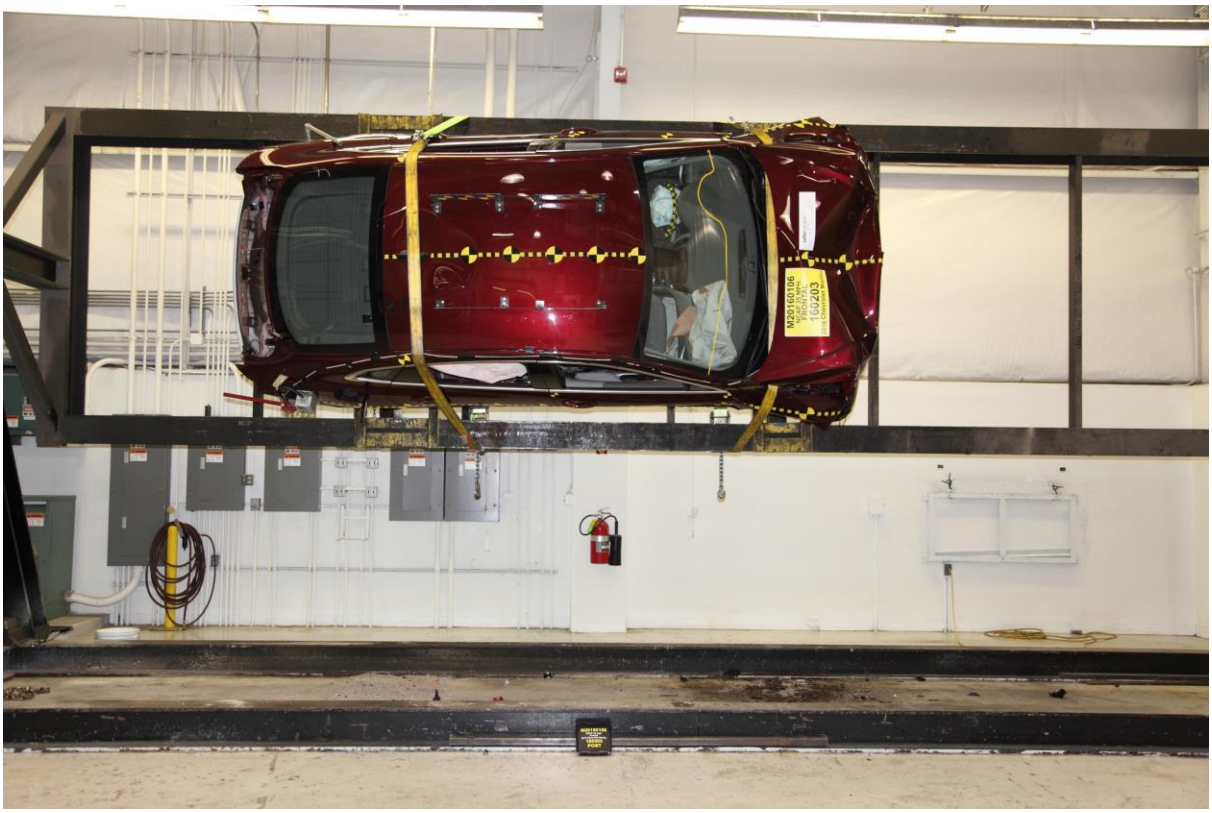


071 Post-Test Stoddard Spillage Location View

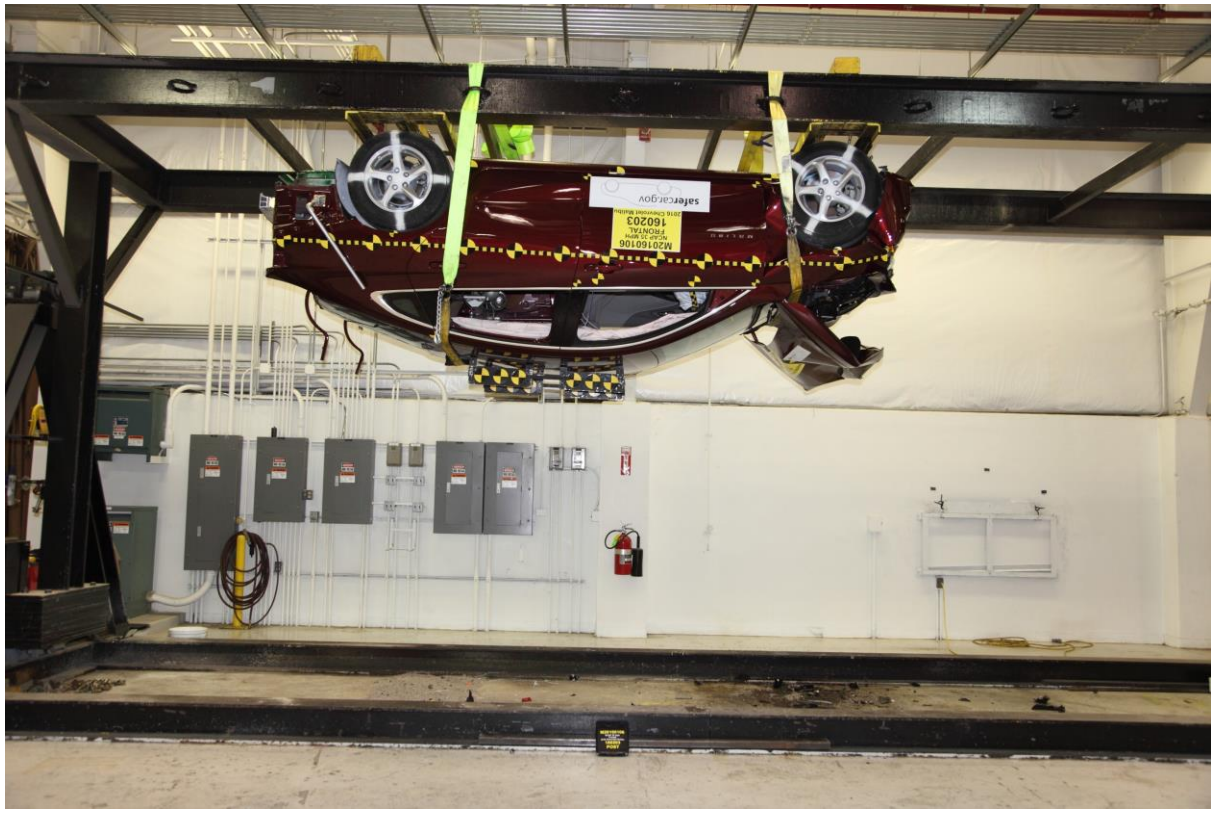


072 Post-Test Speed Trap Readout

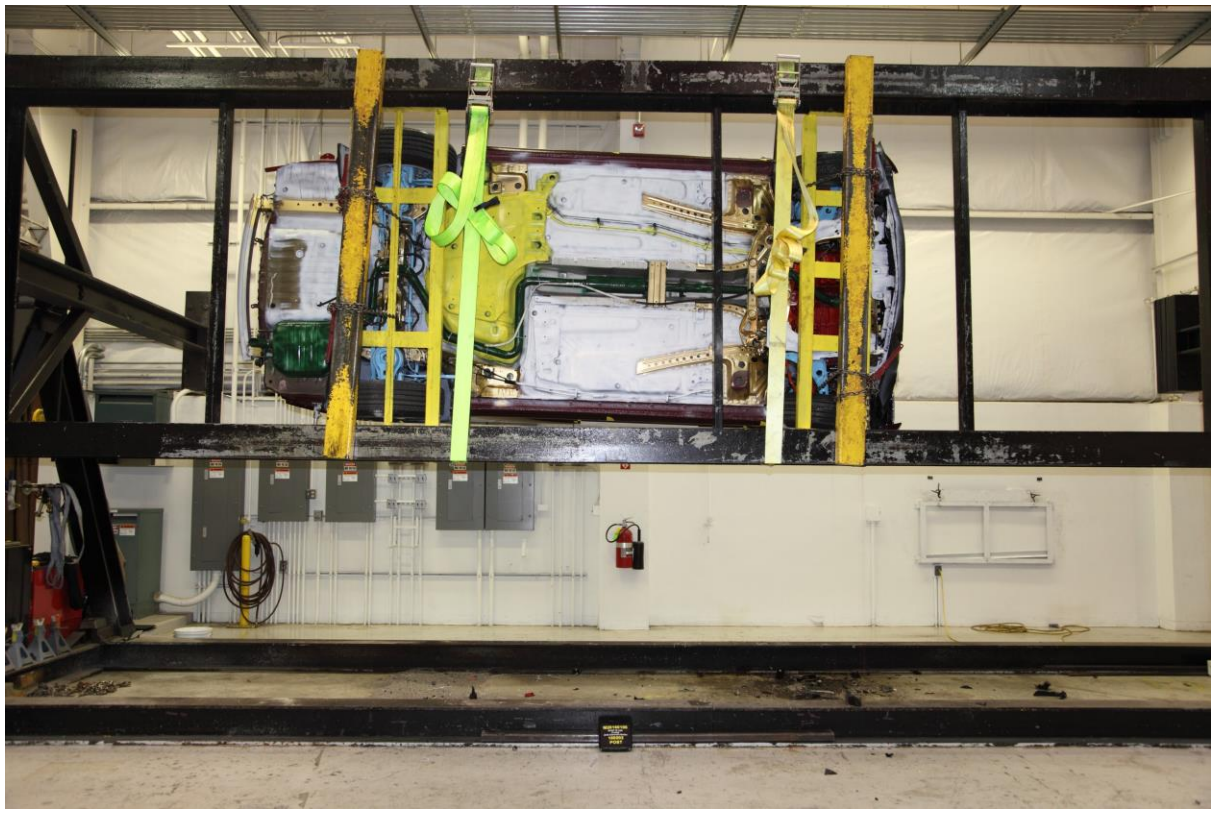
073 Vehicle at 0º on Static Rollover Device



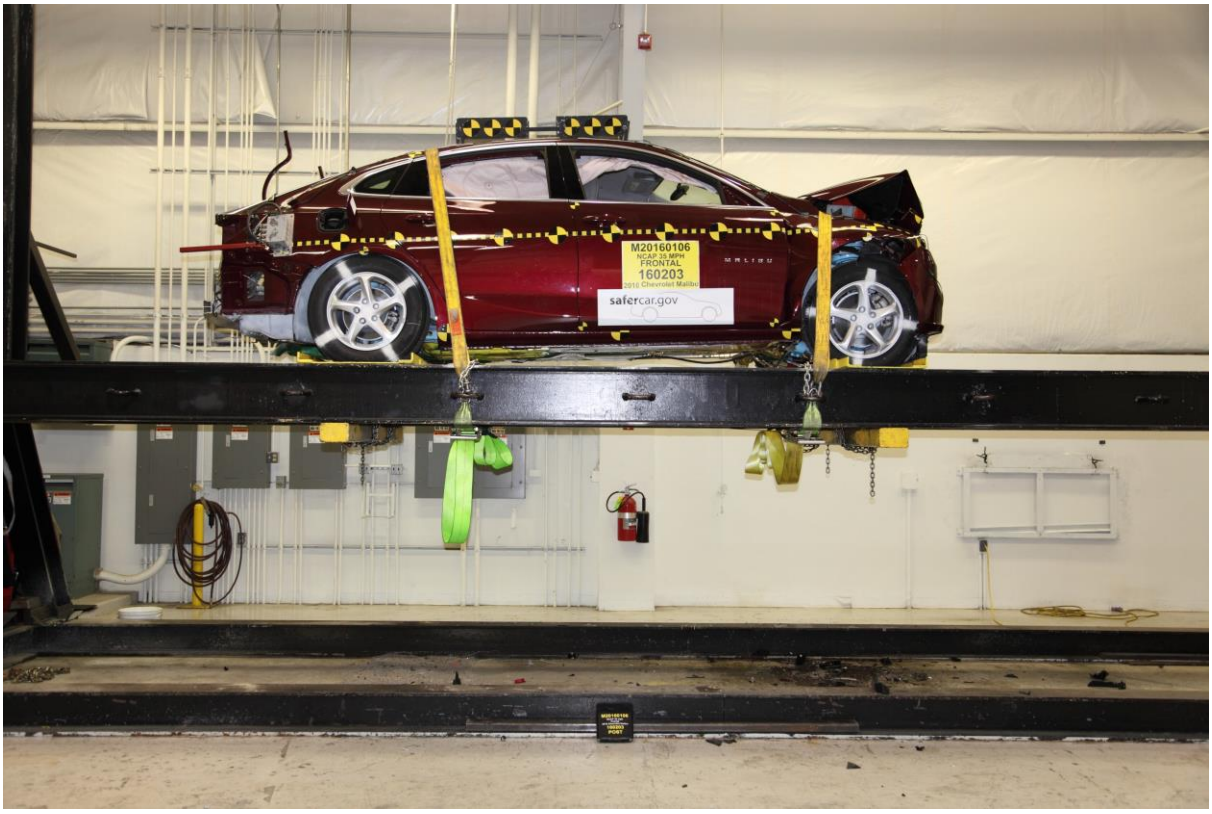
074 Vehicle at 90º on Static Rollover Device



075 Vehicle at 180º on Static Rollover Device

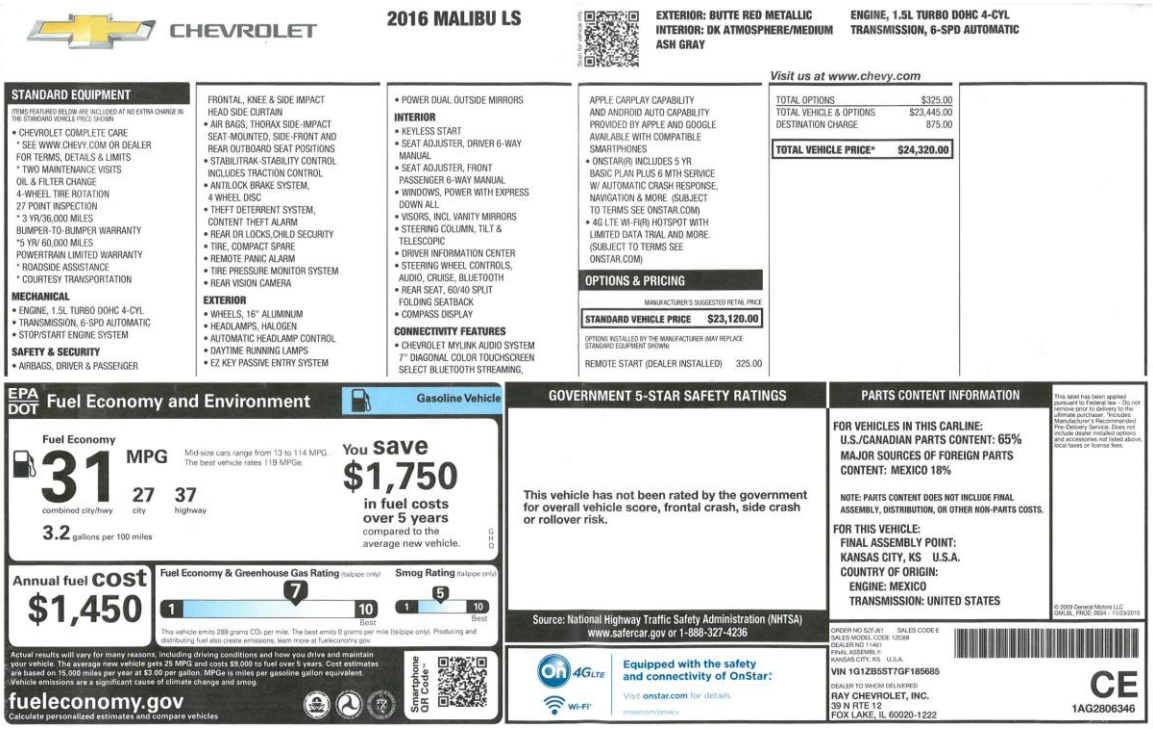


076 Vehicle at 270º on Static Rollover Device



077 Vehicle at 360º on Static Rollover Device

078 2016 Chrysler 300 4-Door Sedan Frontal Impact Event



079 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 Acceleration
Driver Pelvis Y Acceleration
Driver Pelvis Z Acceleration
Driver Left Femur Force Redundant
Driver Right Femur Force Redundant
Driver Left Upper Tibia Moment X
Driver Left Upper Tibia Moment Y
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Driver Shoulder Belt Force
Driver Lap Belt Force
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 Femur Force Redundant
Passenger Right Femur Force Redundant
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Shoulder Belt Force
Passenger Lap Belt Force
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember X Redundant
Right Rear Seat Crossmember X Redundant
Vehicle Engine Top X
Vehicle Engine Bottom X
Load Cell Barrier Forces and Moments

NHTSA

Test Date: 02/03/2016

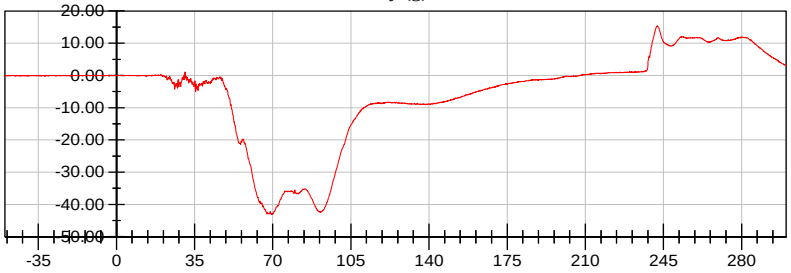
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

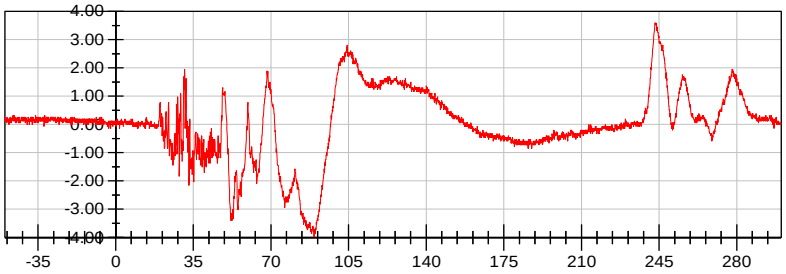
15.39 g at 242.24 ms

<Min>

-43.11 g at 69.68 ms

CFC_1000

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



<Max>

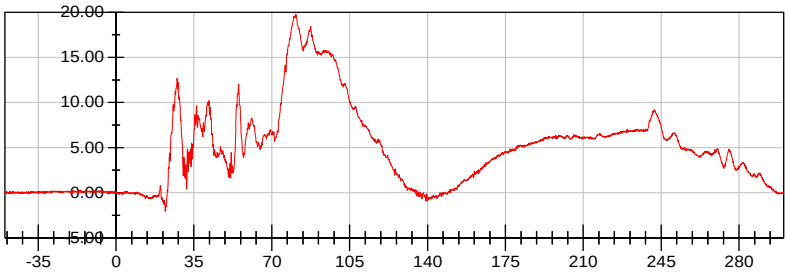
3.59 g at 243.04 ms

<Min>

-3.99 g at 89.44 ms

CFC_1000

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



<Max>

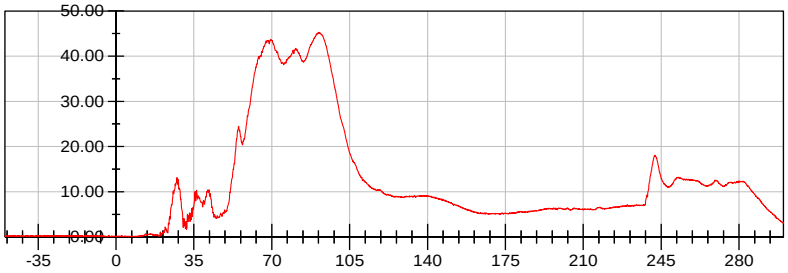
19.77 g at 80.80 ms

<Min>

-2.06 g at 22.16 ms

CFC_1000

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



<Max>

45.27 g at 90.96 ms

<Min>

0.03 g at 0.48 ms

CFC_1000

NHTSA

Test Date: 02/03/2016

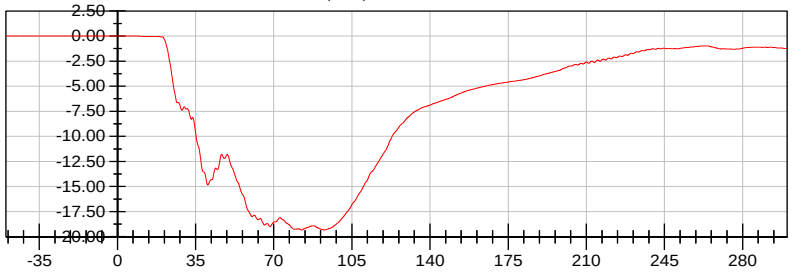
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

0.01 mm at -13.36 ms

<Min>

-19.33 mm at 82.48 ms

CFC_600

NHTSA

Test Date: 02/03/2016

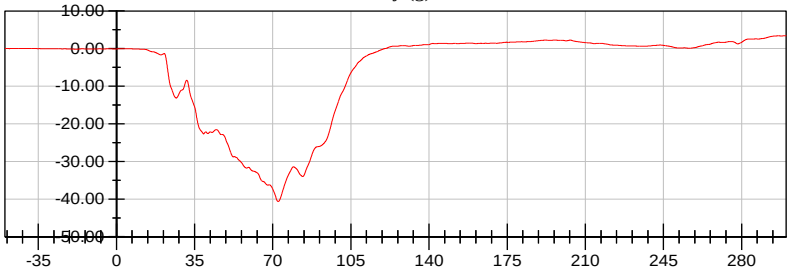
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

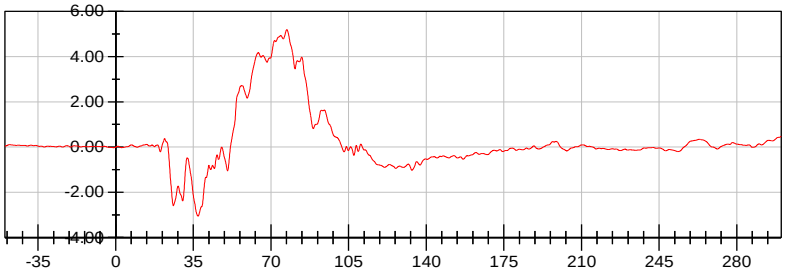
3.42 g at 300.00 ms

<Min>

-40.66 g at 72.40 ms

CFC_180

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



<Max>

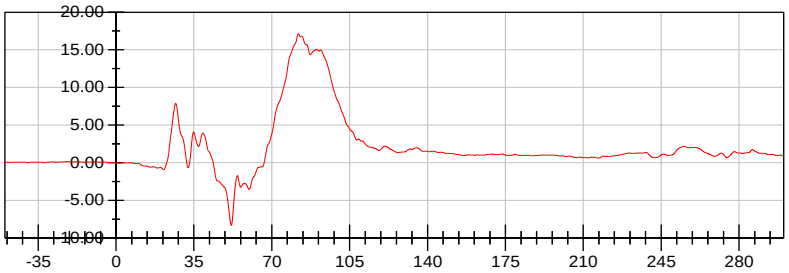
5.20 g at 77.20 ms

<Min>

-3.05 g at 37.12 ms

CFC_180

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



<Max>

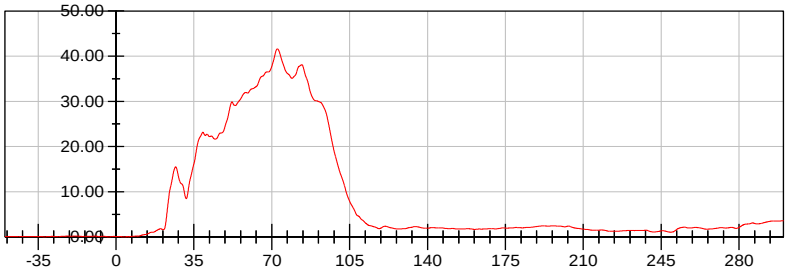
17.13 g at 81.92 ms

<Min>

-8.32 g at 51.84 ms

CFC_180

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



<Max>

41.61 g at 72.56 ms

<Min>

0.01 g at -32.16 ms

CFC_180

NHTSA

Test Date: 02/03/2016

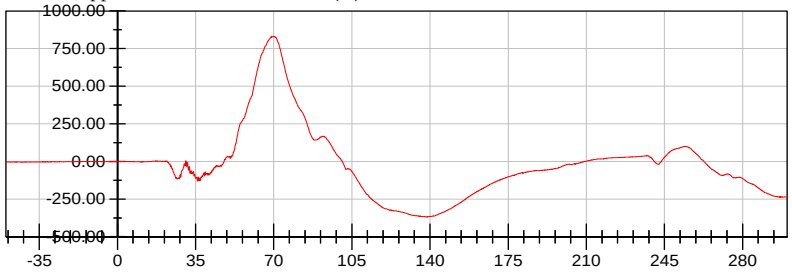
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

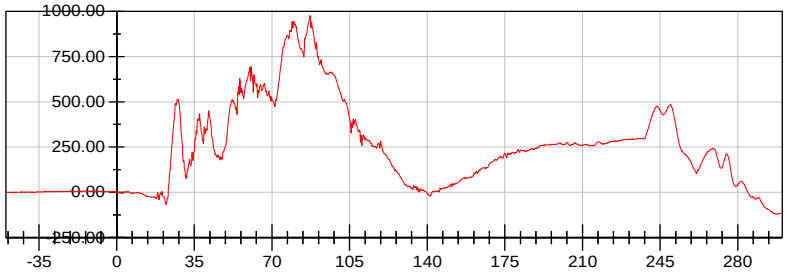
830.87 N at 69.92 ms

<Min>

-368.75 N at 137.92 ms

CFC_1000

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



<Max>

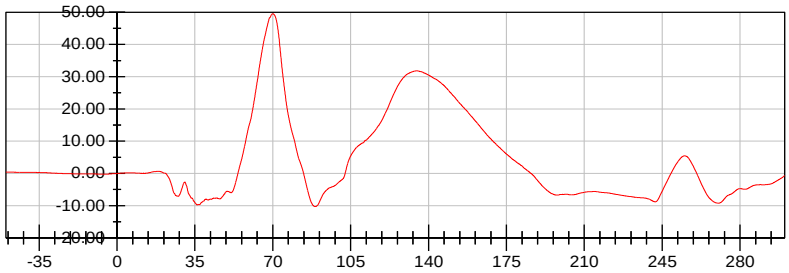
976.84 N at 87.20 ms

<Min>

-121.01 N at 297.52 ms

CFC_1000

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



<Max>

49.51 Nm at 69.92 ms

<Min>

-10.29 Nm at 88.96 ms

CFC_600

2016 Chevrolet Malibu NCAP 35 mph Frontal Impact

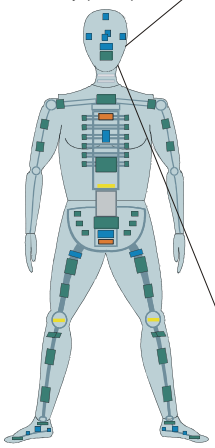
Neck Injury Predictor (NIJ)

Date: 02/03/2016
Time: 15:46

Customer: NHTSA
Test Number: M20160106

TRC Inc. Test Lab: CTF
Test Number: 160203

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



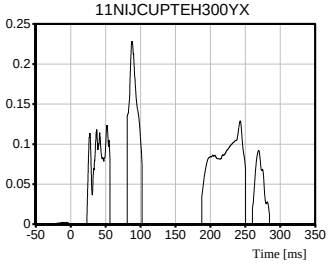
Dummy:HIII 50th Male
Seating Position:
Driver

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

11TMONUP00H3MOYX

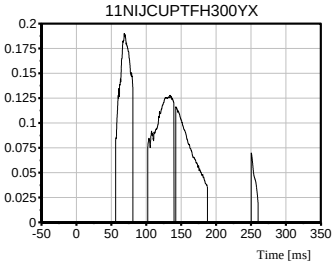
11NECKUP00H3FOZA

11NIJCUPTEH300YX



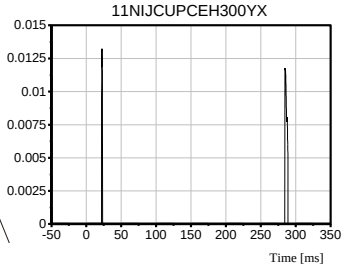
Max [NTE] 0.2280 at 87.20 ms

11NIJCUPTFH300YX



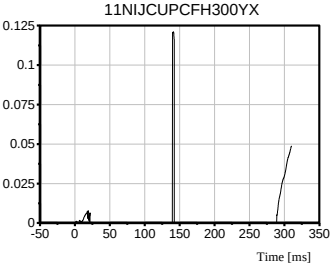
Max [NTF] 0.1900 at 68.56 ms

11NIJCUPCEH300YX



Max [NCE] 0.0132 at 22.40 ms

11NIJCUPCFH300YX



Max [NCF] 0.1210 at 140.96 ms

NHTSA

Test Date: 02/03/2016

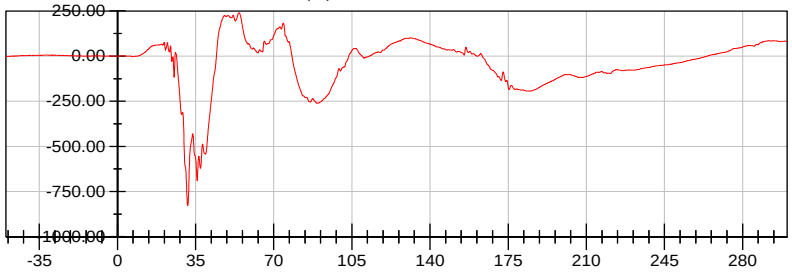
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

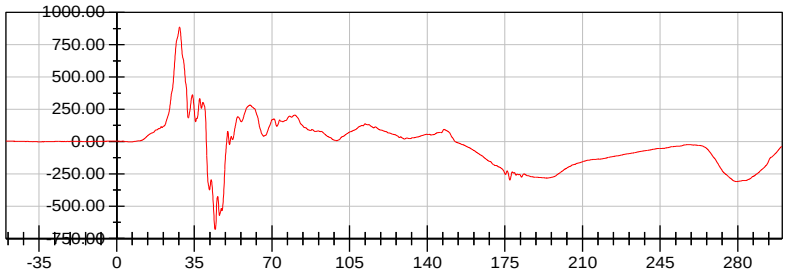
239.65 N at 54.40 ms

<Min>

-829.29 N at 31.44 ms

CFC_600

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



<Max>

887.44 N at 28.32 ms

<Min>

-680.78 N at 44.32 ms

CFC_600

NHTSA

Test Date: 02/03/2016

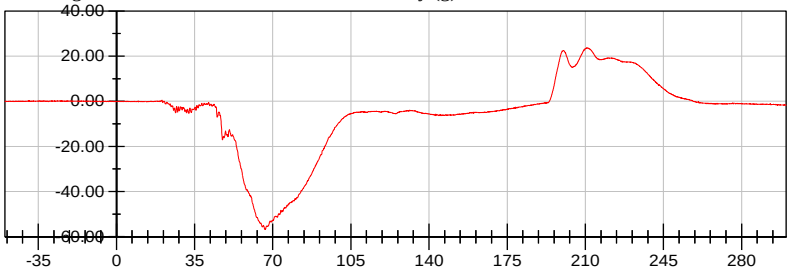
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

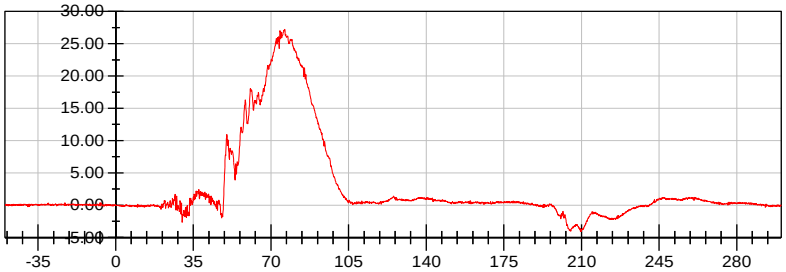
23.68 g at 210.80 ms

<Min>

-56.83 g at 66.64 ms

CFC_1000

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



<Max>

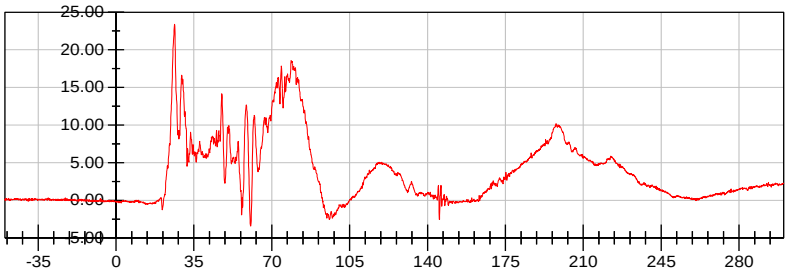
27.22 g at 76.16 ms

<Min>

-4.08 g at 209.52 ms

CFC_1000

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



<Max>

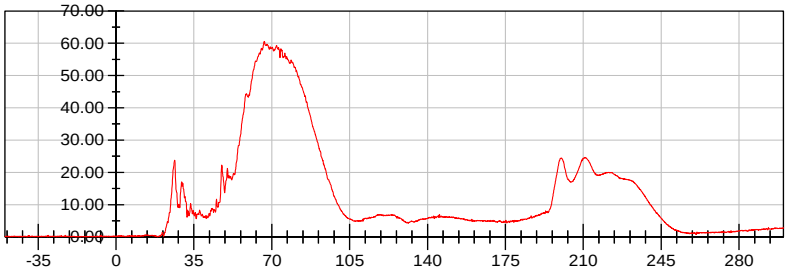
23.38 g at 26.24 ms

<Min>

-3.42 g at 60.48 ms

CFC_1000

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



<Max>

60.60 g at 66.64 ms

<Min>

0.03 g at -47.84 ms

CFC_1000

NHTSA

Test Date: 02/03/2016

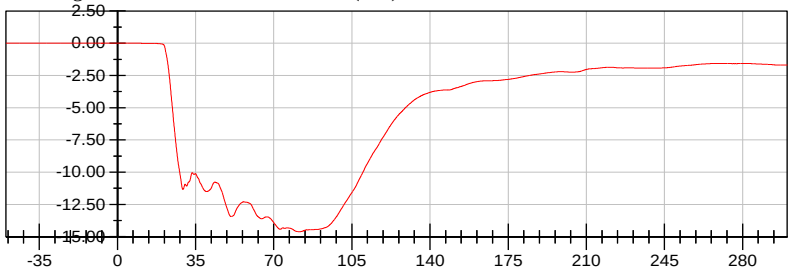
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

0.00 mm at -39.60 ms

<Min>

-14.62 mm at 81.20 ms

CFC_600

NHTSA

Test Date: 02/03/2016

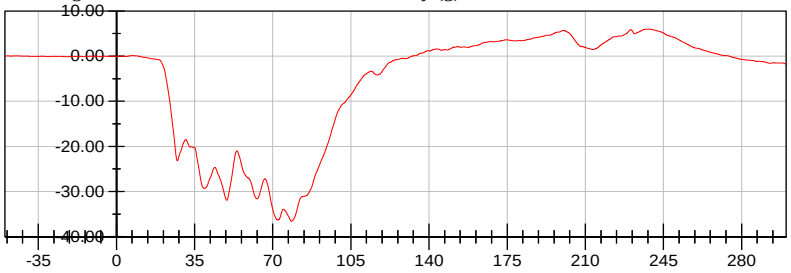
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

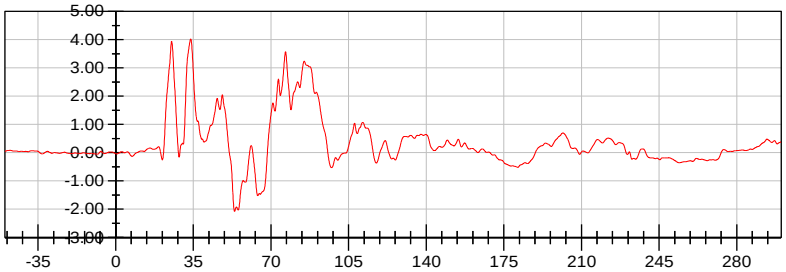
5.99 g at 237.92 ms

<Min>

-36.62 g at 78.40 ms

CFC_180

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



<Max>

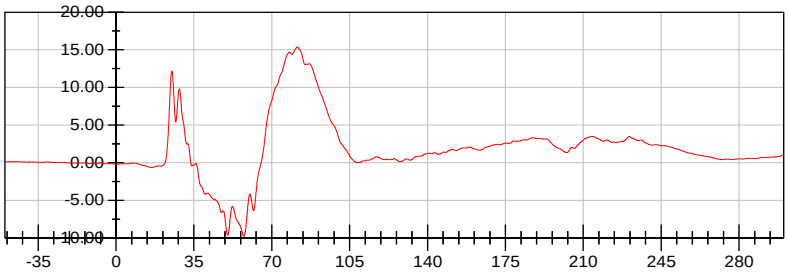
4.02 g at 33.84 ms

<Min>

-2.08 g at 53.60 ms

CFC_180

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



<Max>

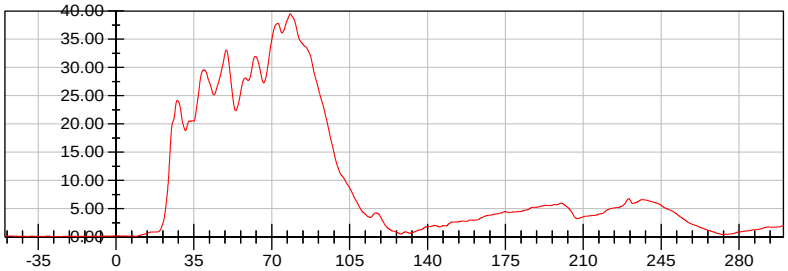
15.38 g at 81.52 ms

<Min>

-9.76 g at 57.44 ms

CFC_180

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



<Max>

39.48 g at 78.32 ms

<Min>

0.06 g at -25.44 ms

CFC_180

NHTSA

Test Date: 02/03/2016

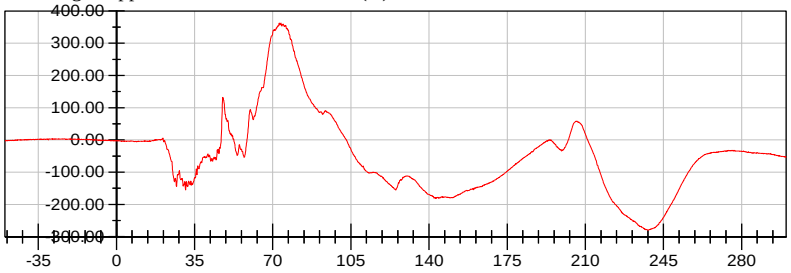
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

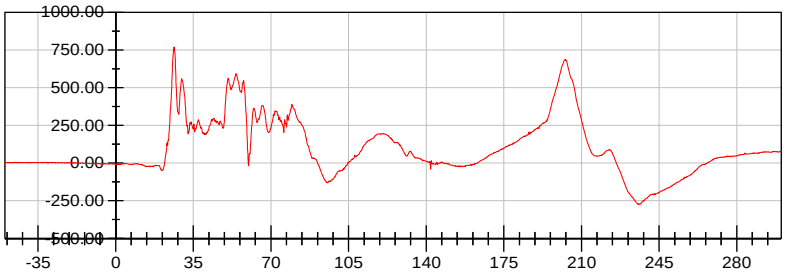
362.73 N at 73.68 ms

<Min>

-280.13 N at 237.92 ms

CFC_1000

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



<Max>

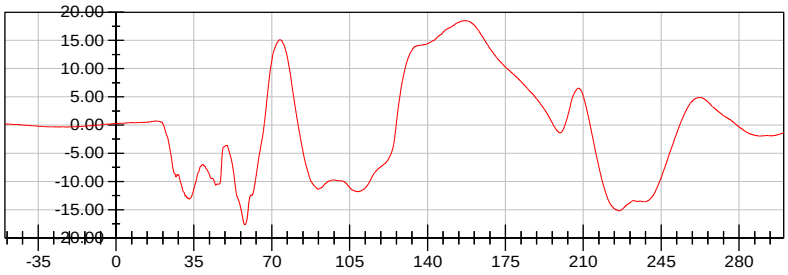
771.49 N at 26.32 ms

<Min>

-273.99 N at 236.00 ms

CFC_1000

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



<Max>

18.50 Nm at 156.80 ms

<Min>

-17.64 Nm at 57.92 ms

CFC_600

2016 Chevrolet Malibu NCAP 35 mph Frontal Impact

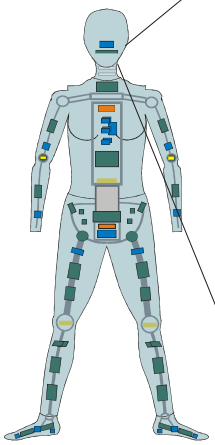
Neck Injury Predictor (NIJ)

Date: 02/03/2016
Time: 15:46

Customer: NHTSA
Test Number: M20160106

TRC Inc. Test Lab: CTF
Test Number: 160203

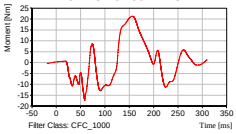
Test Orientation = Frontal
Fzc(Tension) = 4287
Fzc(Compression) = 3880
Myc(Extension) = 67
Myc(Flexion) = 155



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

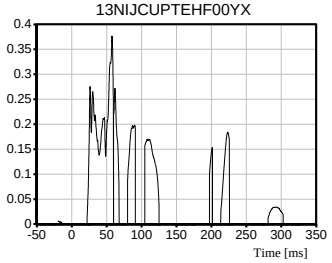
NIJ Source Code: (Fz/Fzc)+(My/Myc)

13TMONUP00HFMOYX



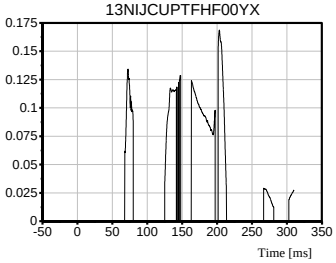
13NECKUP00HFFOZA

13NIJCUPTEHF00YX



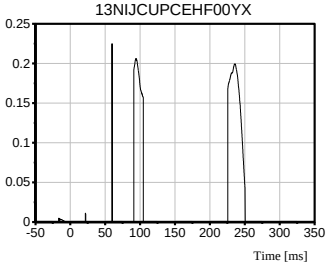
Max [NTE] 0.3770 at 57.76 ms

13NIJCUPTFHF00YX



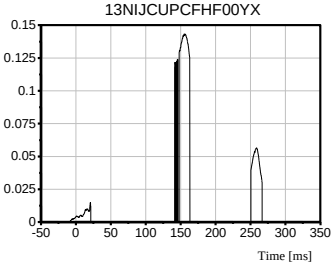
Max [NTF] 0.1686 at 203.20 ms

13NIJCUPCEHF00YX



Max [NCE] 0.2249 at 59.84 ms

13NIJCUPCFHF00YX



Max [NCF] 0.1433 at 155.20 ms

NHTSA

Test Date: 02/03/2016

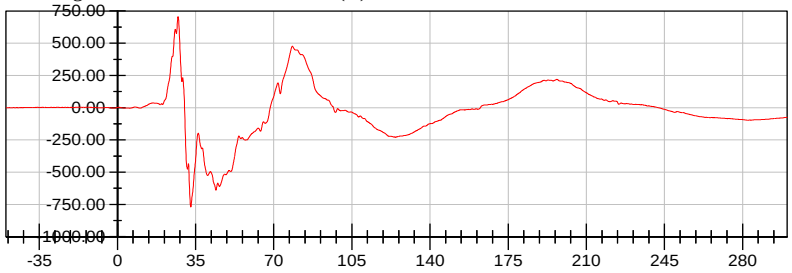
Test Lab: CTF

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

Test Number: 160203 (M20160106)

Position #2 Hybrid III Small Adult Female (426)

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



<Max>

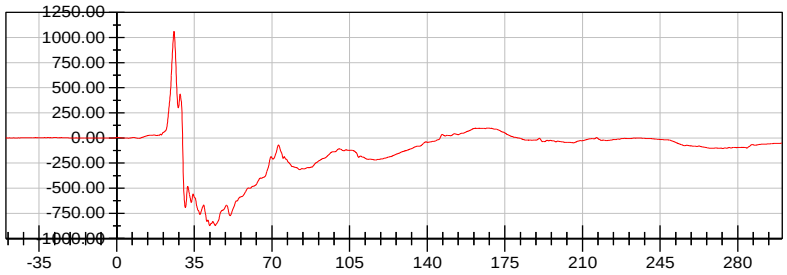
705.48 N at 27.12 ms

<Min>

-770.82 N at 32.88 ms

CFC_600

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



<Max>

1,060.60 N at 25.84 ms

<Min>

-872.78 N at 41.92 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. 33

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	881	Yes
B	Shoulder Pivot Height	505.5 - 520.7	517	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	151	Yes
G	Back Of Elbow To Wrist Pivot	289.6 - 304.8	295	Yes
H	Skull Cap To Backline	40.6 - 45.7	45	Yes
I	Shoulder-Elbow Length	330.2 - 345.4	340	Yes
J	Elbow Rest Height	190.5 - 210.8	201	Yes
K	Buttock Knee Length	579.1 - 604.5	599	Yes
L	Popliteal Height	429.3 - 454.7	440	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	226	Yes
P	Foot Length	251.5 - 266.7	264	Yes
V	Shoulder Breadth	421.6 - 436.9	429	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	865	Yes
AA	Location For Chest Circumference	429.3 - 434.3	430	Yes
BB	Location For Waist Circumference	226.1 - 231.1	230	Yes

Comments:

Technician

Approved

Revised 8/10/12

Transportation Research Center Inc.

Front Head Drop
HIII 50th Serial No. 037 Certification No. 33-1
Test Date: 1/29/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	271.3 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-7.3 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

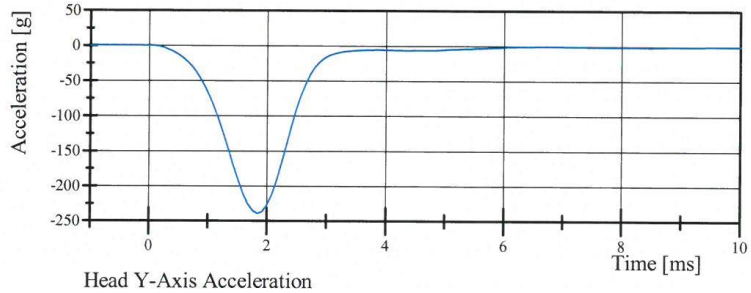
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

01.29.2016 13:14:28 614

Transportation Research Center Inc.

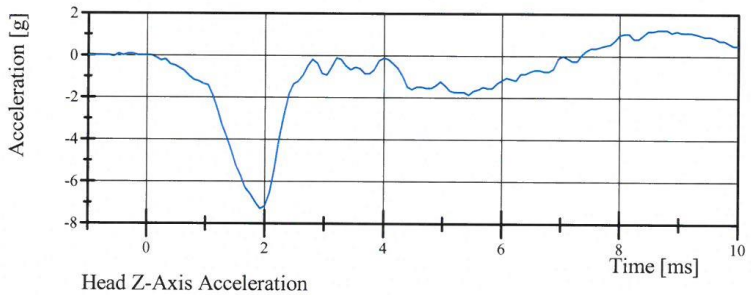
Front Head Drop
HIII 50th Serial No. 037 Certification No. 33-1
Test Date: 1/29/2016

Head X-Axis Acceleration



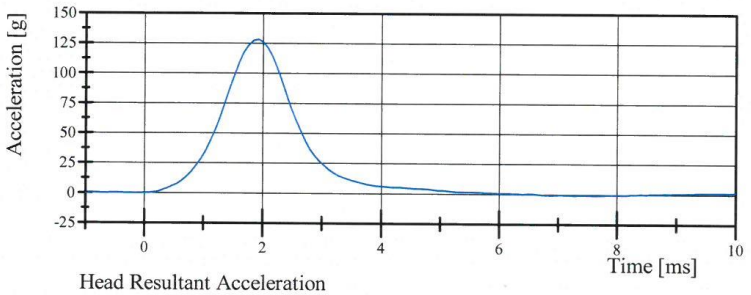
Filter Class: CFC_1000
Max: 0.1 g at -0.6 ms
Min: -239.5 g at 1.8 ms

Head Y-Axis Acceleration



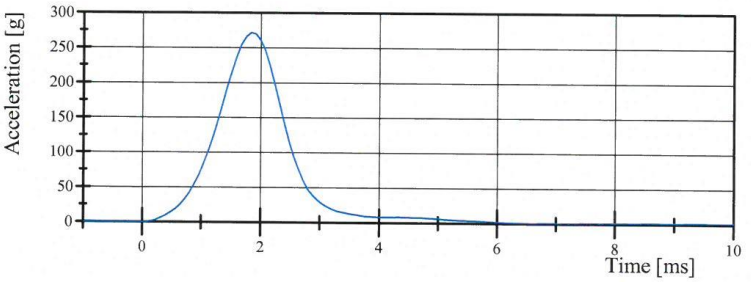
Filter Class: CFC_1000
Max: 1.2 g at 8.6 ms
Min: -7.3 g at 1.9 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 128.1 g at 1.9 ms
Min: -0.9 g at 6.9 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 271.3 g at 1.8 ms
Min: 0.0 g at -0.8 ms

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

01.29.2016 13:14:36 614

Transportation Research Center Inc.

Neck Flexion
HIII 50th Serial No. 037 Certification No. 33-1
Test Date: 1/30/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.934 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	38.5 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-26.99 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-18.32 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-12.51 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-13.09 g	Yes
Total Head D-Plane Rotation Peak	(-64) - (-78) °	-68.1 °	Yes
Time of Peak	57 - 64 ms	58.6 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	119.6 ms	Yes
Total Neck Occipital Condyles Moment Peak	88 - 108 N·m	100.5 N·m	Yes
Time of Peak	47 - 58 ms	51.6 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	100.5 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

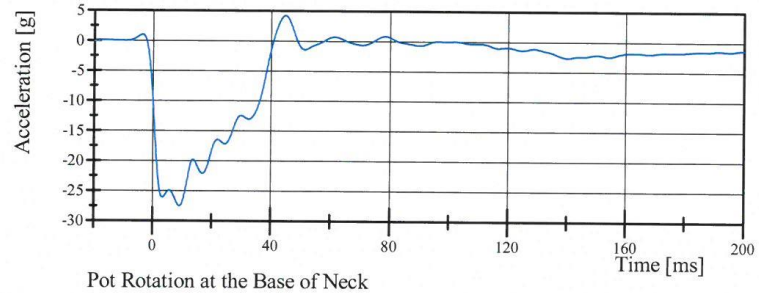
Specification Source: CFR49 Part 572 Subpart E with Polarity in accordance with J211

01.30.2016 07:23:15 2948

Transportation Research Center Inc.

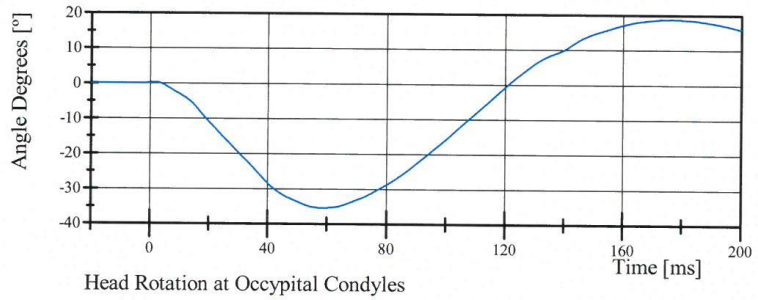
Neck Flexion
HIII 50th Serial No. 037 Certification No. 33-1
Test Date: 1/30/2016

Pendulum Acceleration



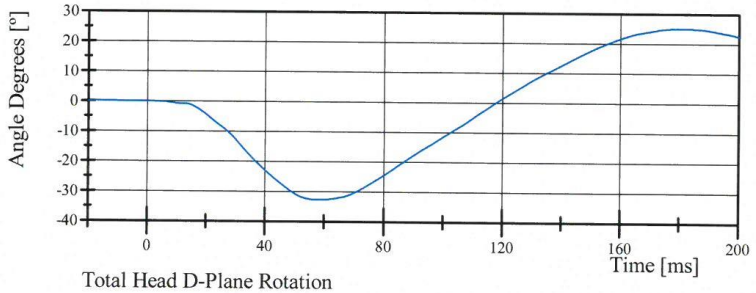
Filter Class: CFC_60
Max: 4.2 g at 44.8 ms
Min: -27.6 g at 9.1 ms

Pot Rotation at the Base of Neck



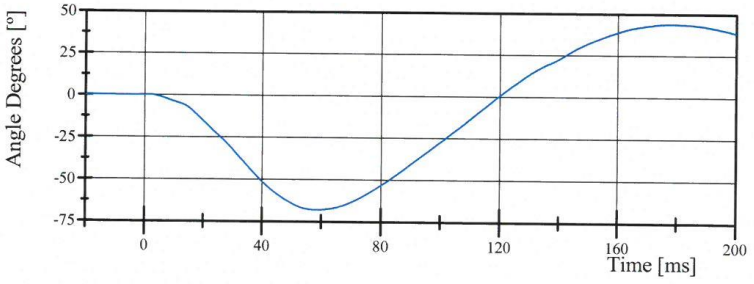
Filter Class: CFC_60
Max: 18.9 ° at 176.4 ms
Min: -35.4 ° at 58.6 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 25.2 ° at 180.2 ms
Min: -32.7 ° at 58.4 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 44.0 ° at 178.2 ms
Min: -68.1 ° at 58.6 ms

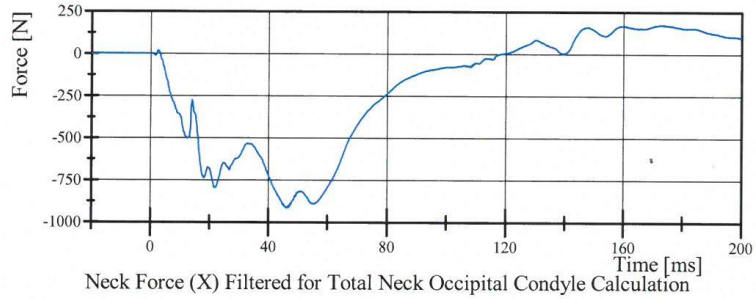
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

01.30.2016 07:23:22 2948

Transportation Research Center Inc.

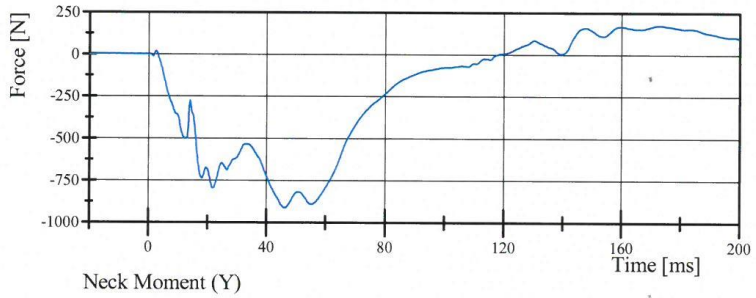
Neck Flexion
HIII 50th Serial No. 037 Certification No. 33-1
Test Date: 1/30/2016

Neck Force (X)



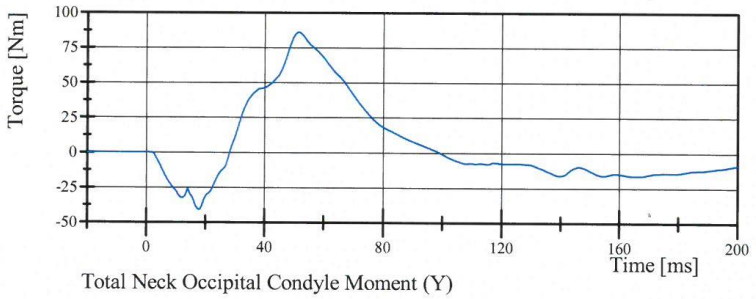
Filter Class: CFC_1000
Max: 174.8 N at 172.6 ms
Min: -915.1 N at 46.2 ms

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



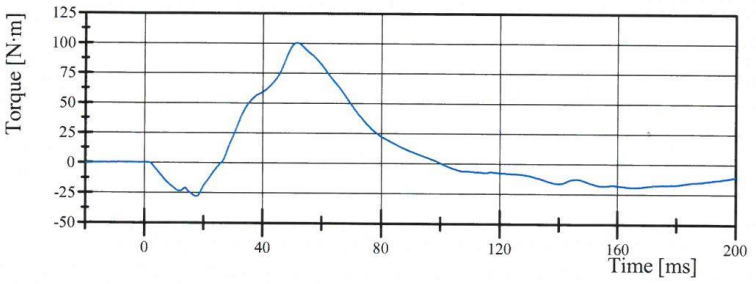
Filter Class: CFC_600
Max: 174.5 N at 172.6 ms
Min: -913.5 N at 46.1 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 86.0 Nm at 51.5 ms
Min: -41.0 Nm at 17.8 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 100.5 N·m at 51.6 ms
Min: -28.1 N·m at 17.7 ms

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

01.30.2016 07:23:23 2948

Transportation Research Center Inc.

Neck Extension
HIII 50th Serial No. 037 Certification No. 33-7
Test Date: 2/1/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-6.016 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	41.7 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	20.26 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	15.91 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	12.76 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	12.76 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 °	93.5 °	Yes
Time of Peak	72 - 82 ms	78.1 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	-75.3 N·m	Yes
Time of Peak	65 - 79 ms	73.6 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	147.0 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

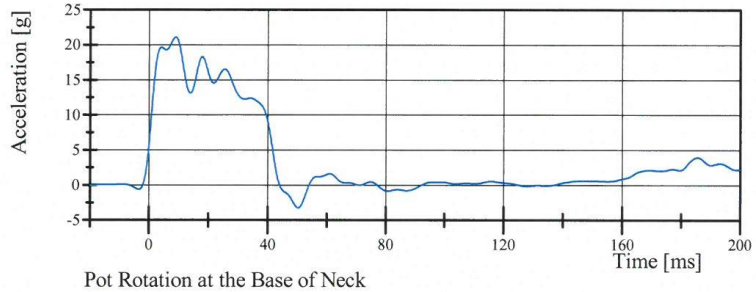
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.01.2016 06:08:21 3019

Transportation Research Center Inc.

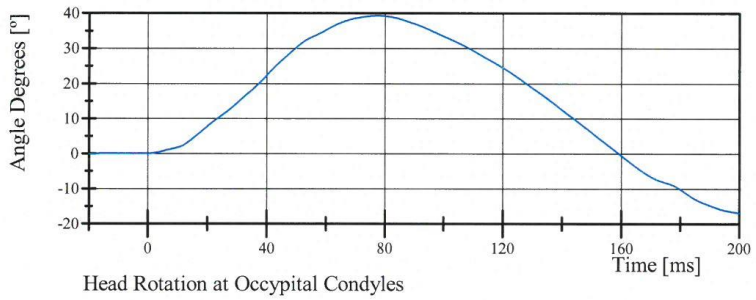
Neck Extension
HIII 50th Serial No. 037 Certification No. 33-7
Test Date: 2/1/2016

Pendulum Acceleration



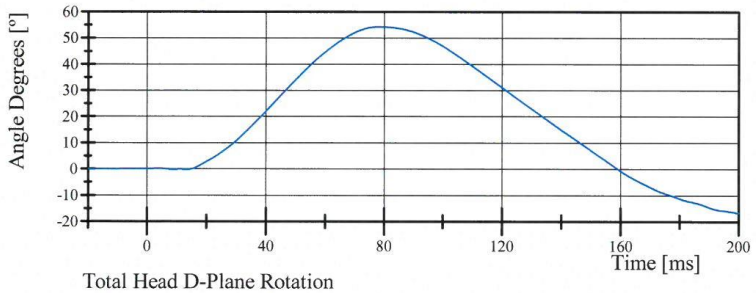
Filter Class: CFC_60
Max: 21.0 g at 9.0 ms
Min: -3.3 g at 50.3 ms

Pot Rotation at the Base of Neck



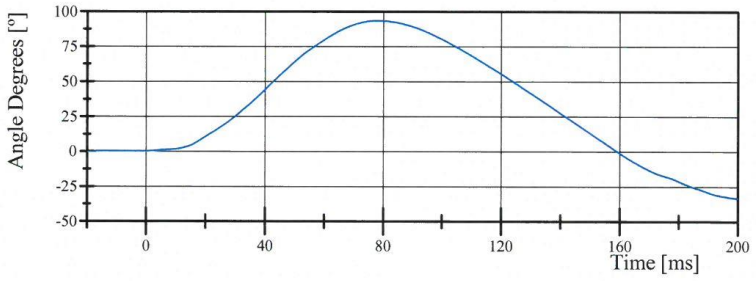
Filter Class: CFC_60
Max: 39.2 ° at 77.5 ms
Min: -16.9 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 54.3 ° at 78.6 ms
Min: -16.6 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 93.5 ° at 78.1 ms
Min: -33.5 ° at 200.0 ms

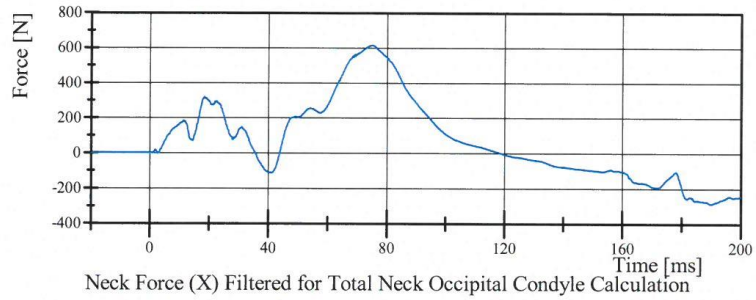
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.01.2016 06:08:28 3019

Transportation Research Center Inc.

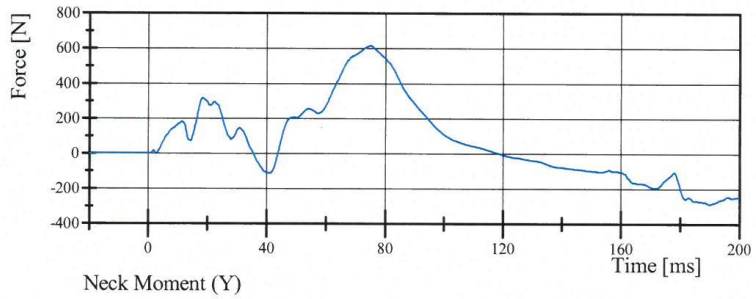
Neck Extension
HIII 50th Serial No. 037 Certification No. 33-7
Test Date: 2/1/2016

Neck Force (X)



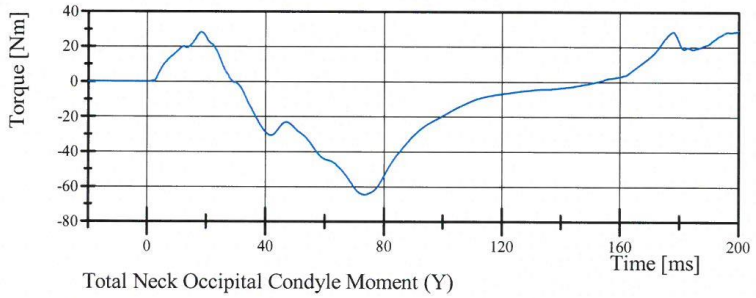
Filter Class: CFC_1000
Max: 614.4 N at 74.9 ms
Min: -286.3 N at 190.1 ms

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



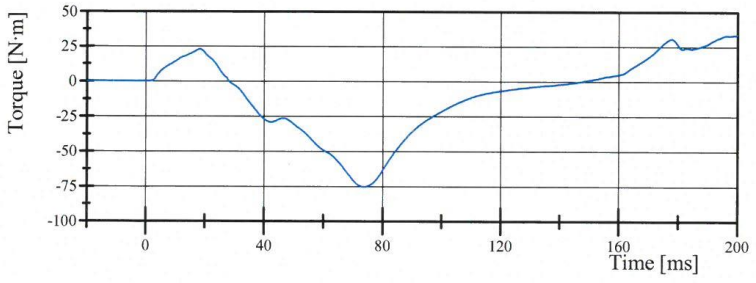
Filter Class: CFC_600
Max: 614.3 N at 75.0 ms
Min: -285.7 N at 190.1 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 29.4 Nm at 200.0 ms
Min: -64.6 Nm at 73.5 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 33.7 N·m at 200.0 ms
Min: -75.3 N·m at 73.6 ms

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

02.01.2016 06:08:29 3019

Transportation Research Center Inc.

Front Thorax
HIII 50th Serial No. 037 Certification No. 33-1
Test Date: 2/1/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.642 m/s	Yes
Probe Force Peak	(-5,160) - (-5,893) N	-5,559.3 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-69.64 mm	Yes
Internal Hysteresis	65 - 85 %	72.2 %	Yes

Test meets specifications.

Comments:

Technician

Approved

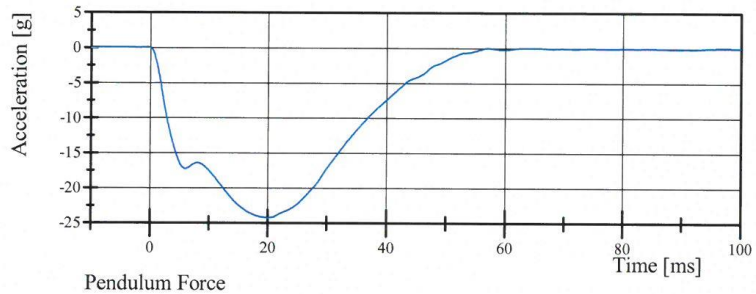
Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

02.01.2016 06:43:36 439

Transportation Research Center Inc.

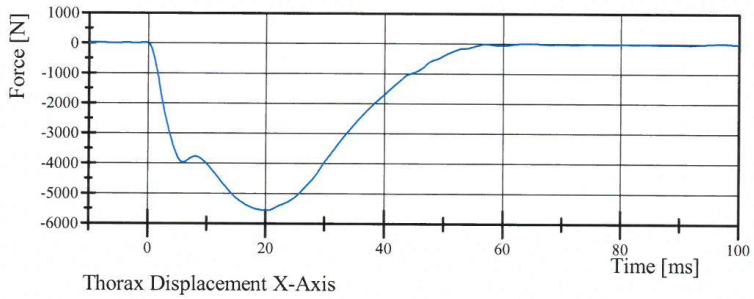
Front Thorax
HIII 50th Serial No. 037 Certification No. 33-1
Test Date: 2/1/2016

Pendulum Acceleration



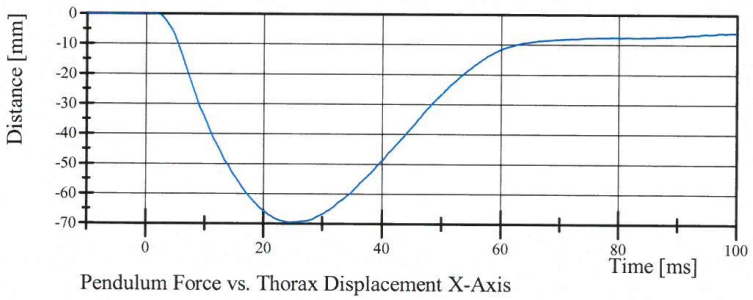
Filter Class: CFC_180
Max: 0.1 g at 96.7 ms
Min: -24.3 g at 20.2 ms

Pendulum Force



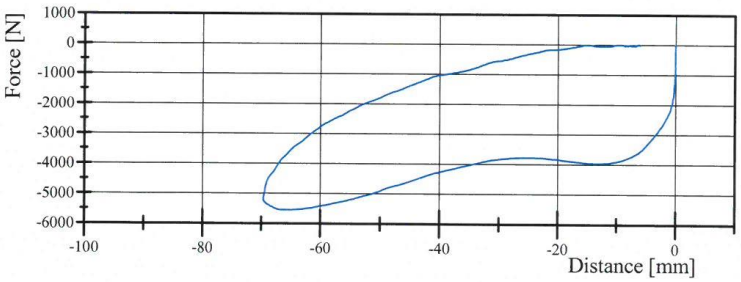
Filter Class: CFC_180
Max: 15.2 N at 96.7 ms
Min: -5,559.3 N at 20.2 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -6.6 ms
Min: -69.6 mm at 24.6 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 15.2 N at -6.2 mm
Min: -5,559.3 N at -66.1 mm

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

02.01.2016 06:43:43 439

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 33-3
Test Date: 1/29/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	42 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.114 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,669.68 N	Yes

Test meets specifications.

Comments:

Technician

Approved

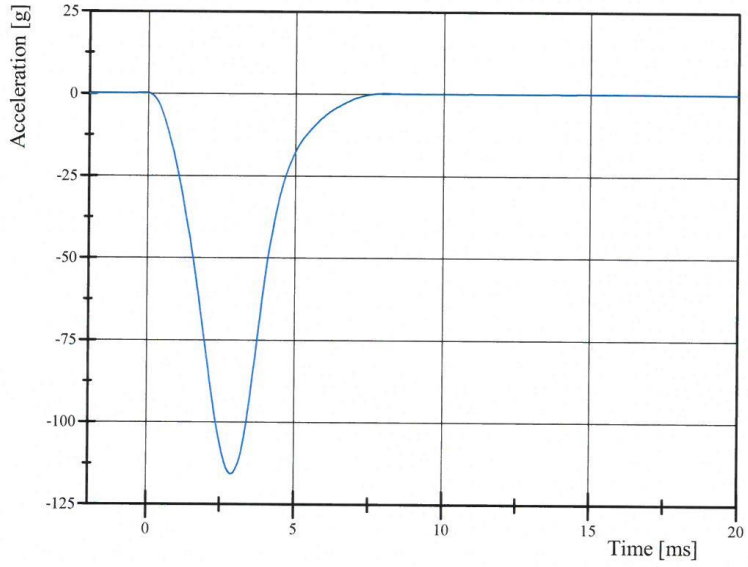
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.01.2016 06:48:24 1771

Transportation Research Center Inc.

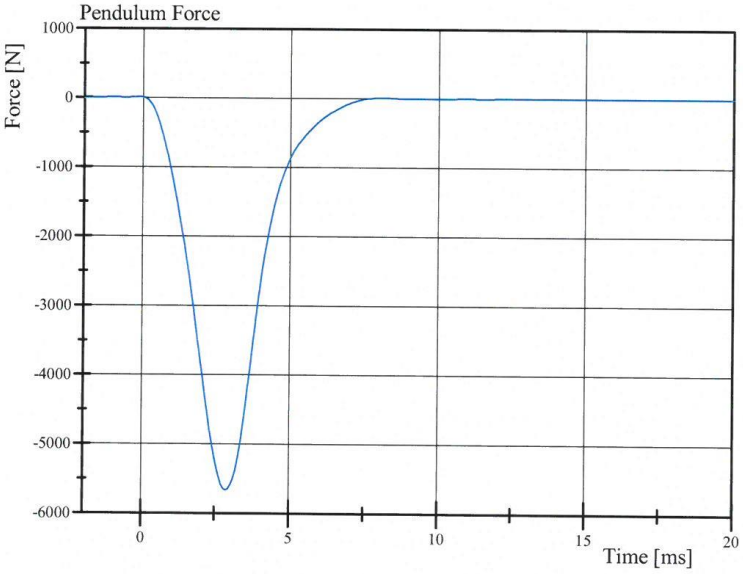
Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 33-3
Test Date: 1/29/2016

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.2 g at 8.1 ms
Min: -115.9 g at 2.9 ms

Pendulum Force



Filter Class: CFC_600
Max: 7.3 N at 8.1 ms
Min: -5,669.7 N at 2.9 ms

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

02.01.2016 06:48:31 1771

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 33-2
Test Date: 1/29/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.114 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,686.69 N	Yes

Test meets specifications.

Comments:

Technician

Approved

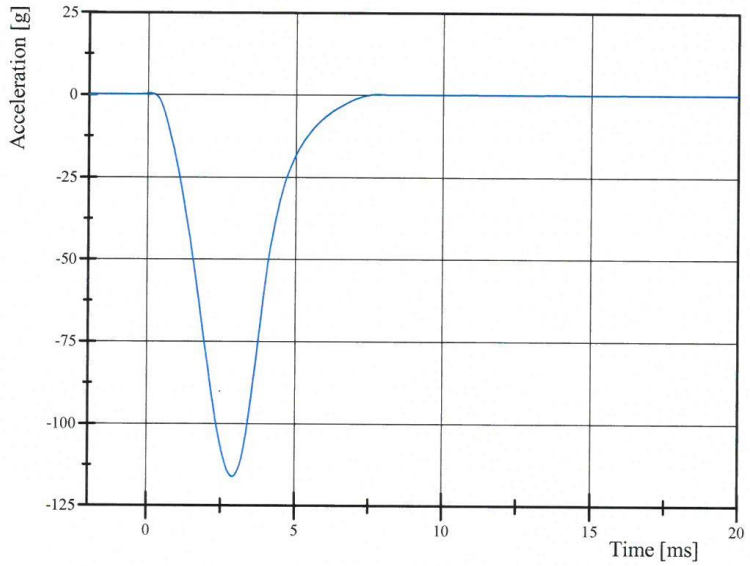
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

01.29.2016 12:52:05 1770

Transportation Research Center Inc.

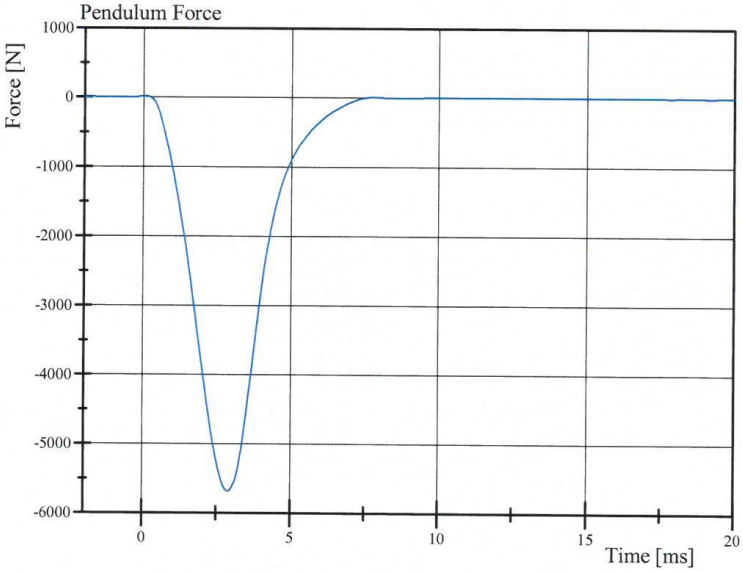
Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 33-2
Test Date: 1/29/2016

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.2 g at 0.1 ms
Min: -116.2 g at 2.9 ms

Pendulum Force



Filter Class: CFC_600
Max: 10.9 N at 0.1 ms
Min: -5,686.7 N at 2.9 ms

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

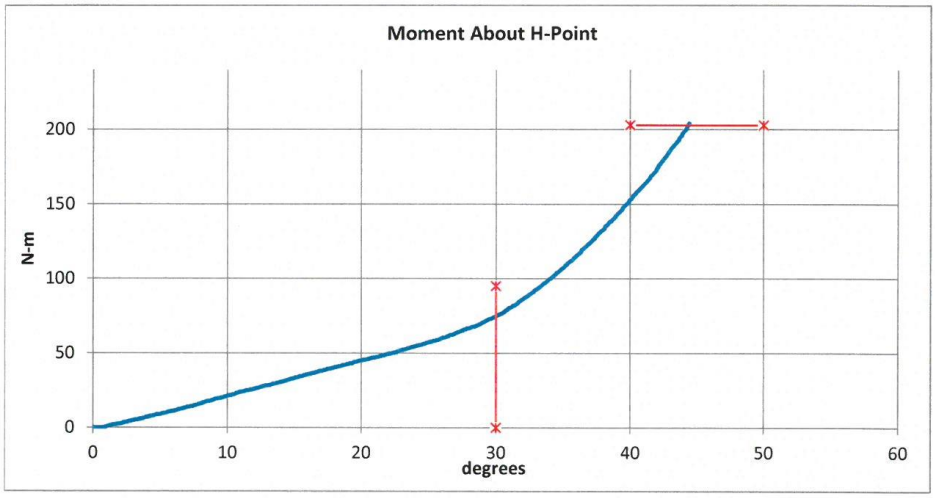
01.29.2016 12:52:12 1770

Transportation Research Center Inc.

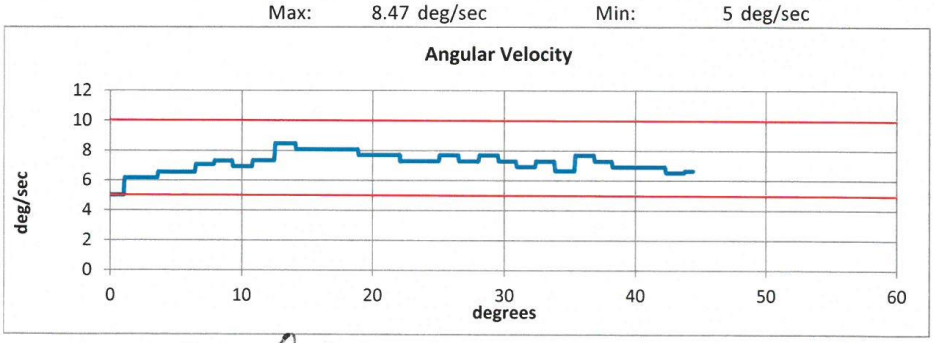
Hybrid III 50th Male Hip Range of Motion

Serial Number:	37	Date:	29-Jan-2016
Test Number:	1	Time:	10:44
Comments:			

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.3	°C	Pass
Humidity	10	-	70	38	%	Pass
Moment at 30°	0	≤	94.9	75.05	N-m	Pass
Angle at 203 Nm	40	-	50	44.45	deg	Pass
Average Velocity	5	-	10	7.17	deg/sec	Pass



Max: 8.47 deg/sec Min: 5 deg/sec



Technician

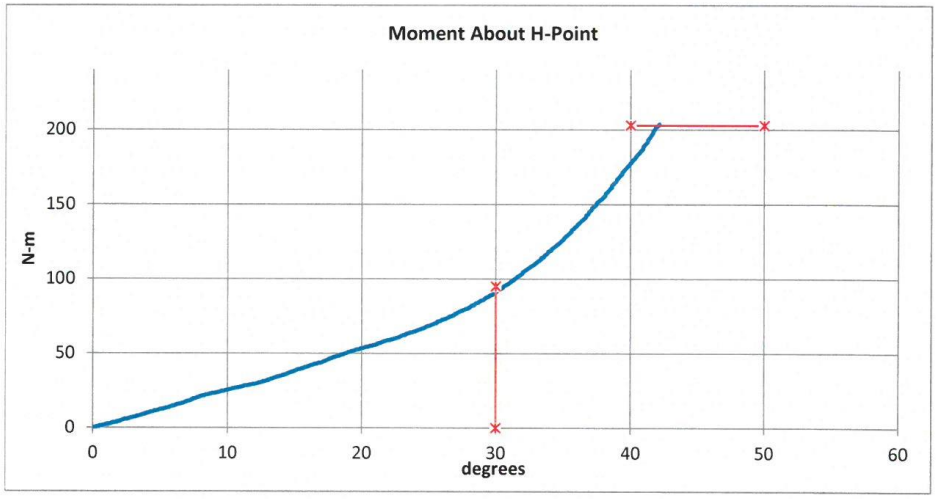
Approved

Transportation Research Center Inc.

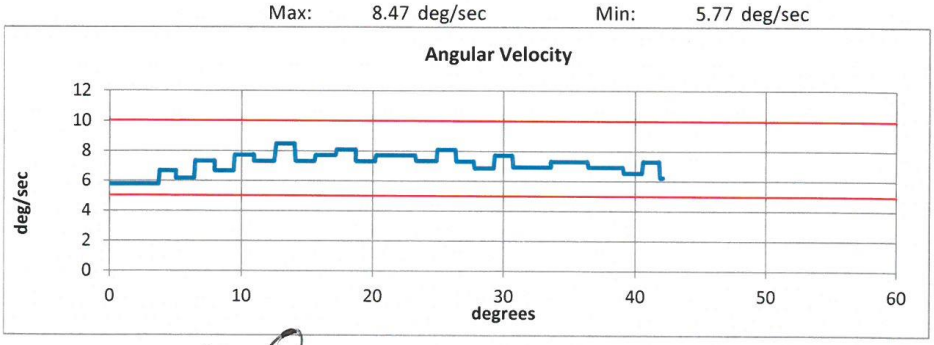
Hybrid III 50th Male Hip Range of Motion

Serial Number:	37	Date:	29-Jan-2016
Test Number:	1	Time:	11:46
Comments:			

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.5	°C	Pass
Humidity	10	-	70	37	%	Pass
Moment at 30°	0	≤	94.9	91.49	N-m	Pass
Angle at 203 Nm	40	-	50	42.14	deg	Pass
Average Velocity	5	-	10	7.13	deg/sec	Pass



Max: 8.47 deg/sec Min: 5.77 deg/sec



Technician

Approved

Post-Test Calibration Sheets

Driver S/N 037

Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 34

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	881	Yes
B	Shoulder Pivot Height	505.5 - 520.7	517	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	151	Yes
G	Back Of Elbow To Wrist Pivot	289.6 - 304.8	295	Yes
H	Skull Cap To Backline	40.6 - 45.7	45	Yes
I	Shoulder-Elbow Length	330.2 - 345.4	340	Yes
J	Elbow Rest Height	190.5 - 210.8	201	Yes
K	Buttock Knee Length	579.1 - 604.5	599	Yes
L	Popliteal Height	429.3 - 454.7	440	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	226	Yes
P	Foot Length	251.5 - 266.7	264	Yes
V	Shoulder Breadth	421.6 - 436.9	429	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	865	Yes
AA	Location For Chest Circumference	429.3 - 434.3	430	Yes
BB	Location For Waist Circumference	226.1 - 231.1	230	Yes

Comments:

Technician

Approved

Revised 8/10/12

Transportation Research Center Inc.

Front Head Drop
HIII 50th Serial No. 037 Certification No. 34-5
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	33 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	231.3 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-8.5 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

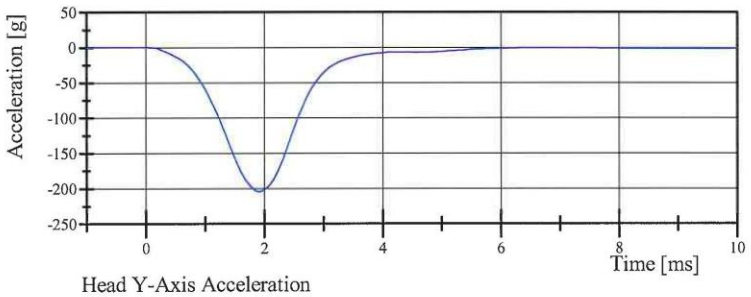
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.04.2016 19:45:10 614

Transportation Research Center Inc.

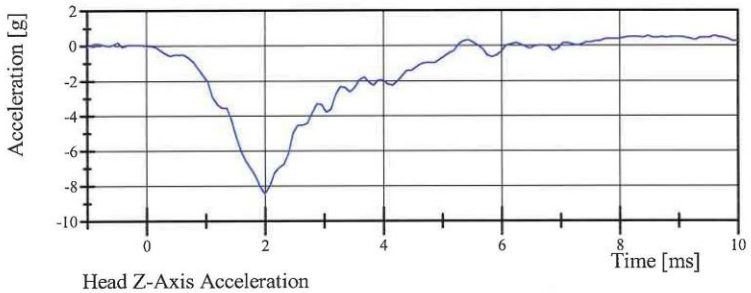
Front Head Drop
HIII 50th Serial No. 037 Certification No. 34-5
Test Date: 2/4/2016

Head X-Axis Acceleration



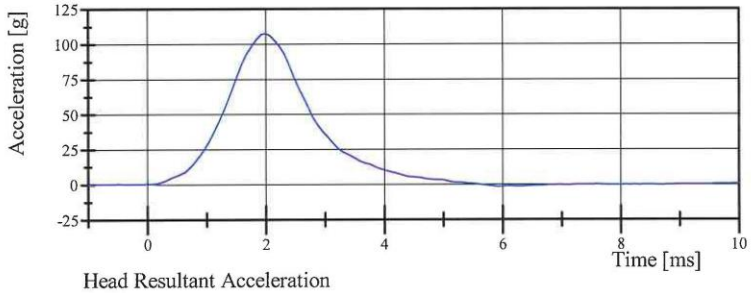
Filter Class: CFC_1000
Max: 0.1 g at -0.7 ms
Min: -205.0 g at 1.9 ms

Head Y-Axis Acceleration



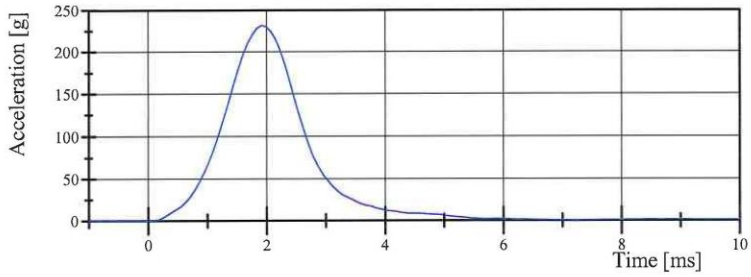
Filter Class: CFC_1000
Max: 0.6 g at 8.5 ms
Min: -8.5 g at 2.0 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 107.8 g at 2.0 ms
Min: -1.7 g at 5.9 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 231.3 g at 1.9 ms
Min: 0.0 g at -0.2 ms

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

02.04.2016 19:45:18 614

Transportation Research Center Inc.

Neck Flexion
HIII 50th Serial No. 037 Certification No. 34-2
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.934 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	39.1 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-23.27 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-20.45 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-15.47 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-15.47 g	Yes
Total Head D-Plane Rotation			
Peak	(-64) - (-78) °	-70.6 °	Yes
Time of Peak	57 - 64 ms	60.1 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	122.4 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	88 - 108 N·m	98.4 N·m	Yes
Time of Peak	47 - 58 ms	52.5 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	102.7 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

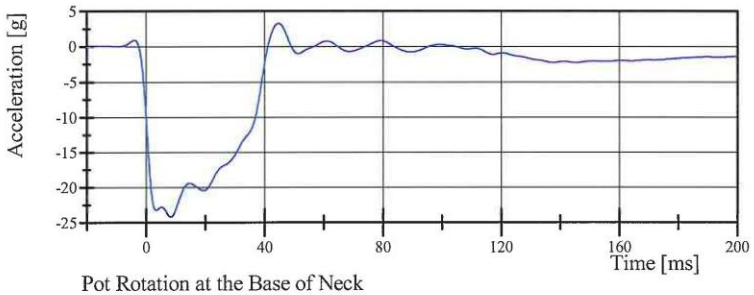
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.04.2016 12:08:05 2949

Transportation Research Center Inc.

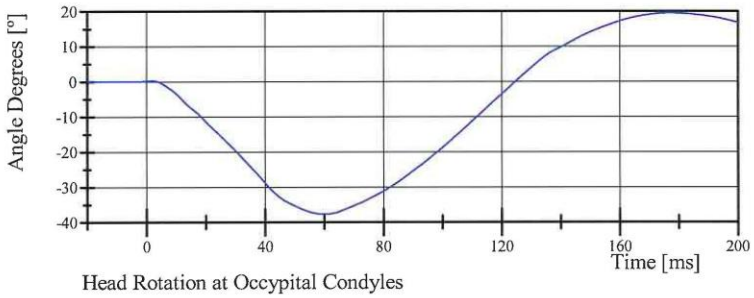
Neck Flexion
HIII 50th Serial No. 037 Certification No. 34-2
Test Date: 2/4/2016

Pendulum Acceleration



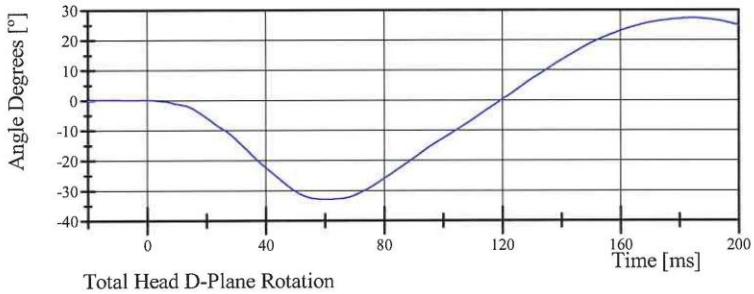
Filter Class: CFC_60
Max: 3.3 g at 44.7 ms
Min: -24.3 g at 8.4 ms

Pot Rotation at the Base of Neck



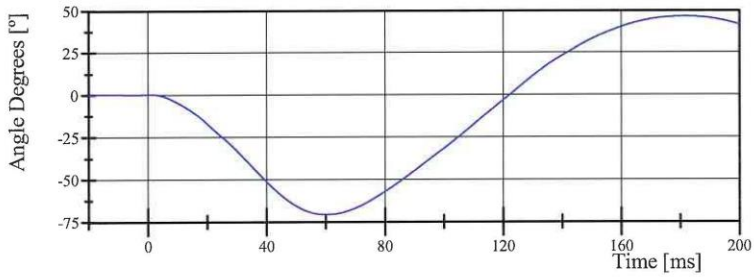
Filter Class: CFC_60
Max: 19.5 ° at 177.0 ms
Min: -37.7 ° at 59.9 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 27.3 ° at 184.4 ms
Min: -33.0 ° at 60.2 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 46.6 ° at 181.9 ms
Min: -70.6 ° at 60.1 ms

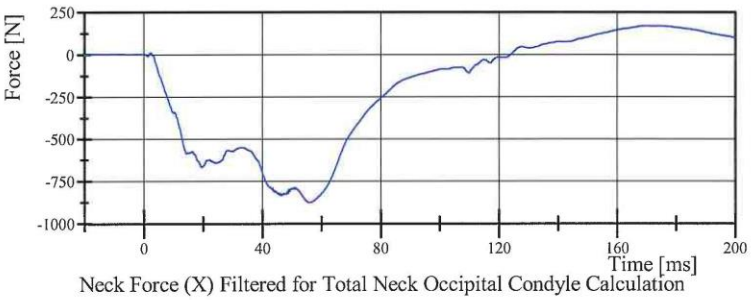
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.04.2016 12:08:11 2949

Transportation Research Center Inc.

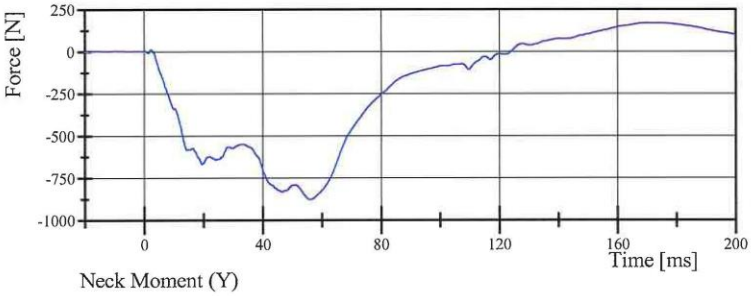
Neck Flexion
HIII 50th Serial No. 037 Certification No. 34-2
Test Date: 2/4/2016

Neck Force (X)



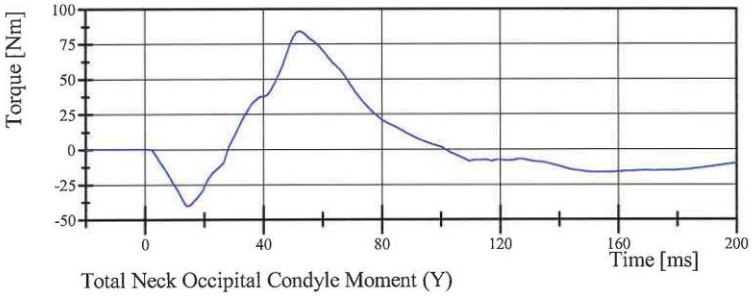
Filter Class: CFC_1000
Max: 171.1 N at 169.6 ms
Min: -877.8 N at 55.7 ms

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



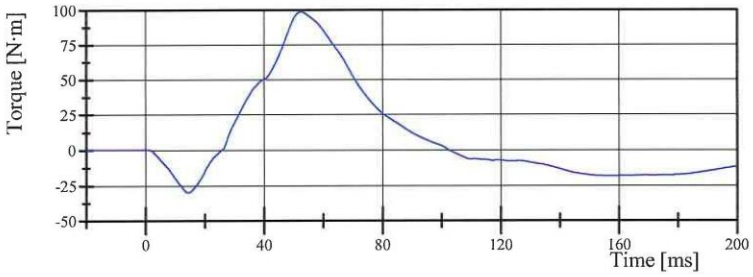
Filter Class: CFC_600
Max: 170.9 N at 170.3 ms
Min: -877.6 N at 55.8 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 84.1 Nm at 52.3 ms
Min: -40.6 Nm at 14.5 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Consta
Max: 98.4 N·m at 52.5 ms
Min: -30.2 N·m at 14.5 ms

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

02.04.2016 12:08:12 2949

Transportation Research Center Inc.

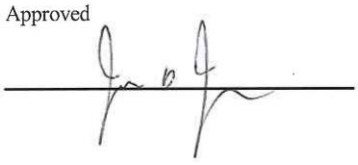
Neck Extension
HIII 50th Serial No. 037 Certification No. 34-2
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	31 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-6.011 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	39.0 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	20.06 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	17.71 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	14.34 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	14.34 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 °	92.7 °	Yes
Time of Peak	72 - 82 ms	76.2 ms	Yes
Total Head D-Plane Rotation Decay to 0°	147 - 174 ms	157.2 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	(-53) - (-80) N·m	-76.1 N·m	Yes
Time of Peak	65 - 79 ms	71.2 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	146.8 ms	Yes

Test meets specifications.

Comments:

Technician 

Approved 

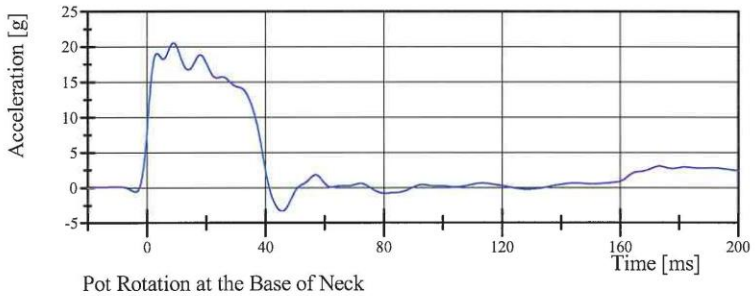
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.04.2016 13:55:32 3025

Transportation Research Center Inc.

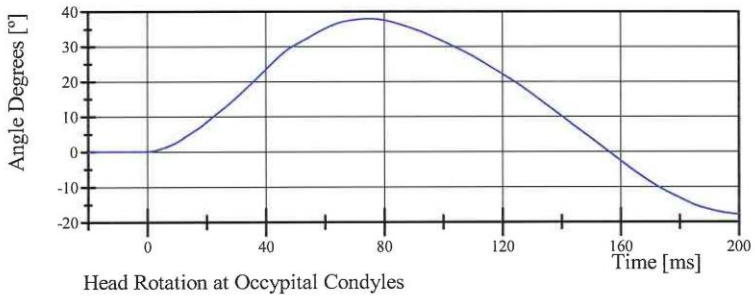
Neck Extension
HIII 50th Serial No. 037 Certification No. 34-2
Test Date: 2/4/2016

Pendulum Acceleration



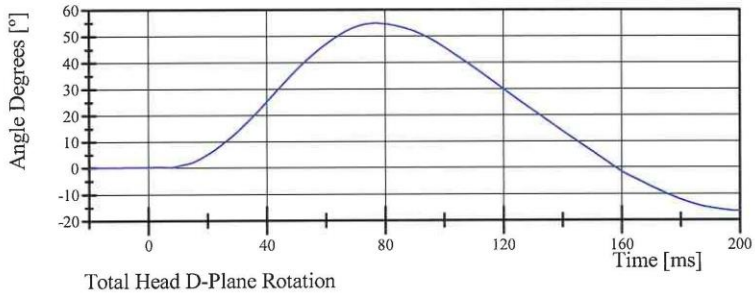
Filter Class: CFC_60
Max: 20.5 g at 9.0 ms
Min: -3.4 g at 45.7 ms

Pot Rotation at the Base of Neck



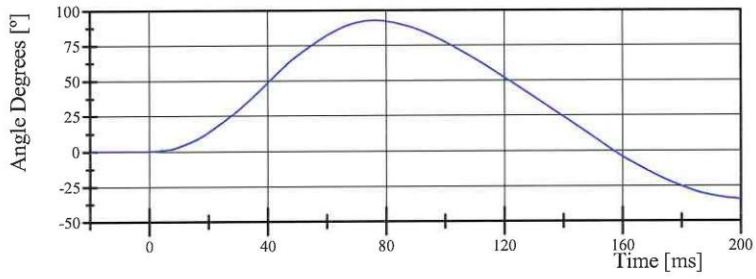
Filter Class: CFC_60
Max: 37.9 ° at 75.0 ms
Min: -17.7 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 54.9 ° at 77.0 ms
Min: -16.6 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 92.7 ° at 76.2 ms
Min: -34.3 ° at 200.0 ms

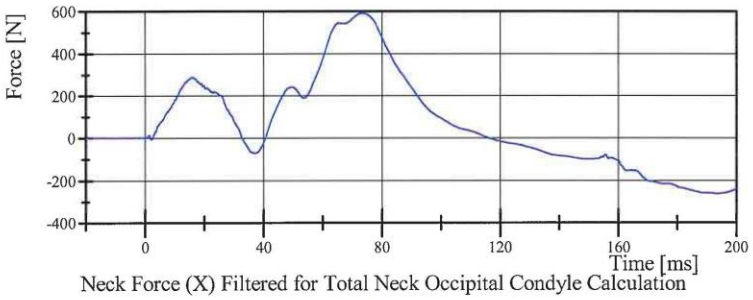
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.04.2016 13:55:46 3025

Transportation Research Center Inc.

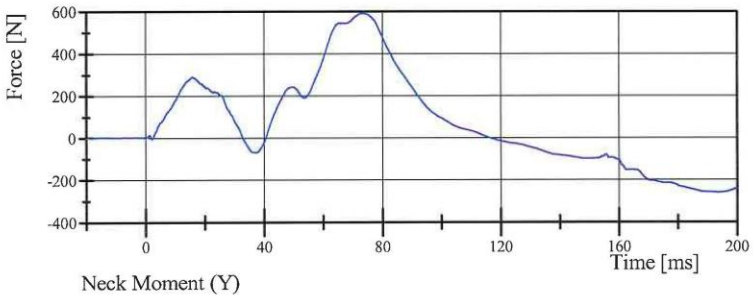
Neck Extension
HIII 50th Serial No. 037 Certification No. 34-2
Test Date: 2/4/2016

Neck Force (X)



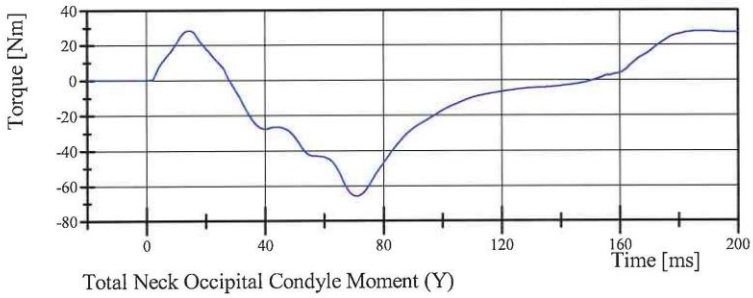
Filter Class: CFC_1000
Max: 590.3 N at 72.7 ms
Min: -260.9 N at 193.4 ms

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



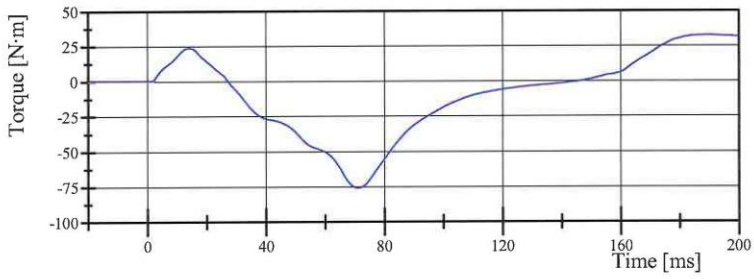
Filter Class: CFC_600
Max: 590.2 N at 72.8 ms
Min: -260.8 N at 193.6 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 28.2 Nm at 14.5 ms
Min: -65.8 Nm at 71.0 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constar
Max: 32.5 N·m at 189.3 ms
Min: -76.1 N·m at 71.2 ms

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

02.04.2016 13:55:47 3025

Transportation Research Center Inc.

Front Thorax
HIII 50th Serial No. 037 Certification No. 34-1
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.708 m/s	Yes
Probe Force Peak	(-5,160) - (-5,893) N	-5,633.8 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-71.77 mm	Yes
Internal Hysteresis	65 - 85 %	71.2 %	Yes

Test meets specifications.

Comments:

Technician

Approved

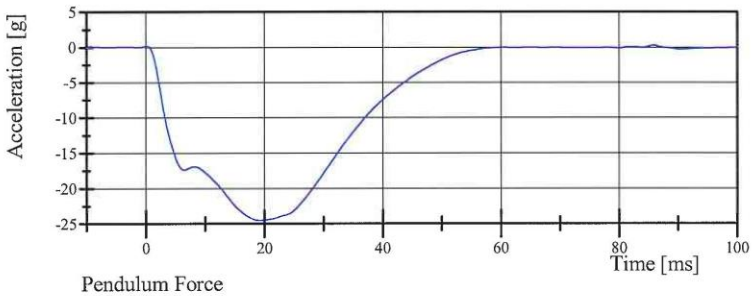
Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

02.04.2016 21:33:20 397

Transportation Research Center Inc.

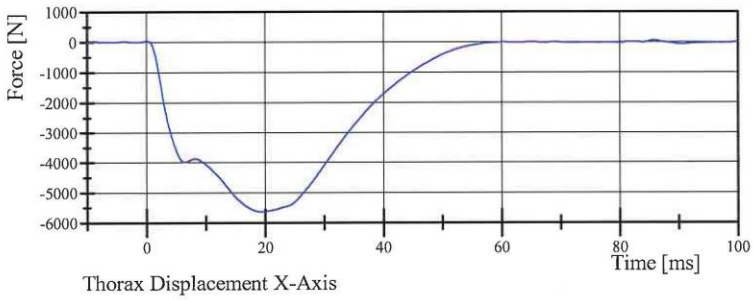
Front Thorax
HIII 50th Serial No. 037 Certification No. 34-1
Test Date: 2/4/2016

Pendulum Acceleration



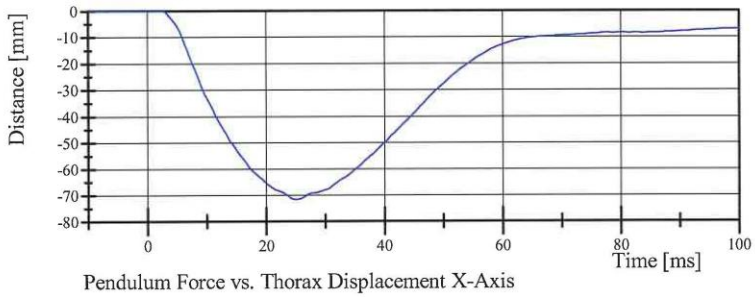
Filter Class: CFC_180
Max: 0.3 g at 85.8 ms
Min: -24.6 g at 19.2 ms

Pendulum Force



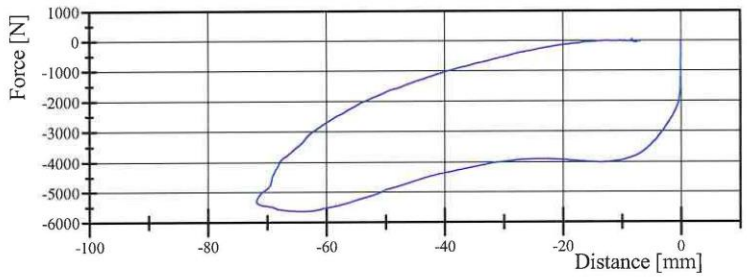
Filter Class: CFC_180
Max: 68.6 N at 85.8 ms
Min: -5,633.8 N at 19.2 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -3.7 ms
Min: -71.8 mm at 25.0 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 68.6 N at -8.3 mm
Min: -5,633.8 N at -63.8 mm

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

02.04.2016 21:33:26 397

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 34-1
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.097 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,568.98 N	Yes

Test meets specifications.

Comments:

Technician

Approved

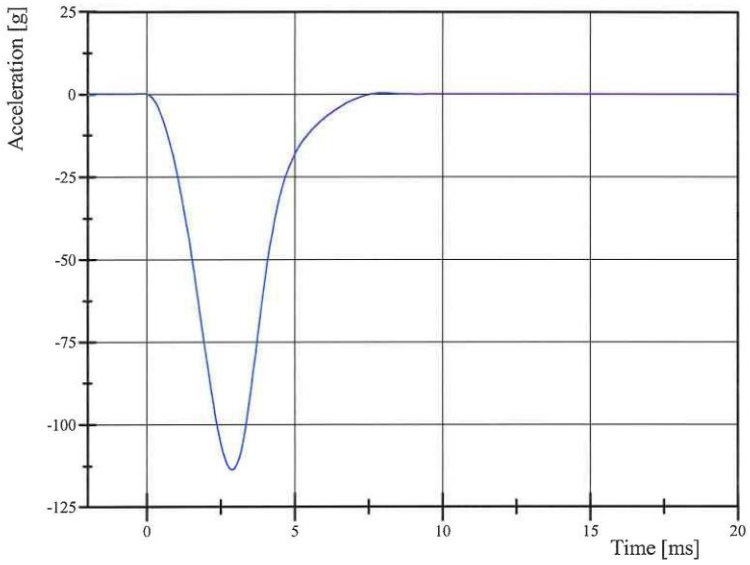
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.04.2016 07:59:42 1763

Transportation Research Center Inc.

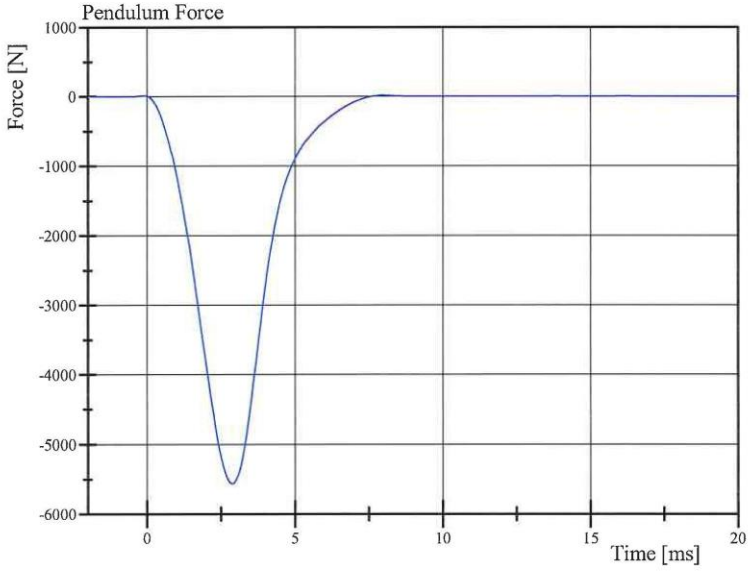
Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 34-1
Test Date: 2/4/2016

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.4 g at 8.0 ms
Min: -113.8 g at 2.9 ms

Pendulum Force



Filter Class: CFC_600
Max: 18.2 N at 8.0 ms
Min: -5,569.0 N at 2.9 ms

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

02.04.2016 07:59:50 1763

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 34-1
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	31 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.097 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,587.55 N	Yes

Test meets specifications.

Comments:

Technician

Approved

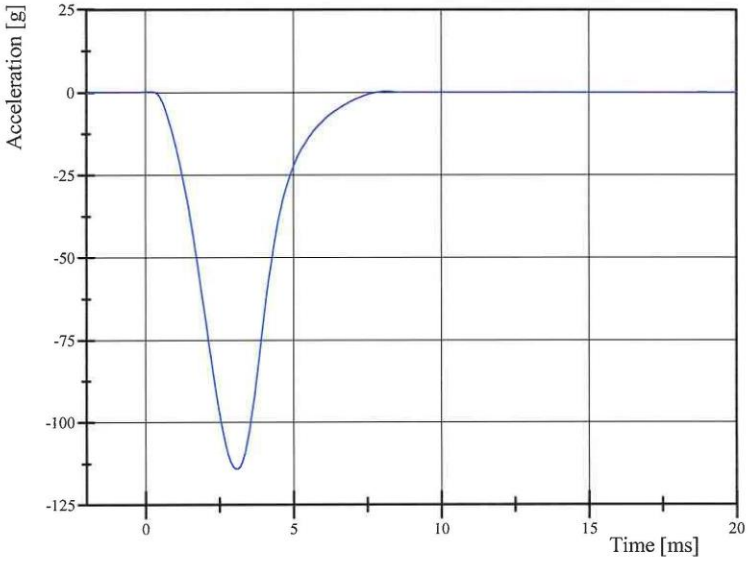
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

02.04.2016 08:11:32 1759

Transportation Research Center Inc.

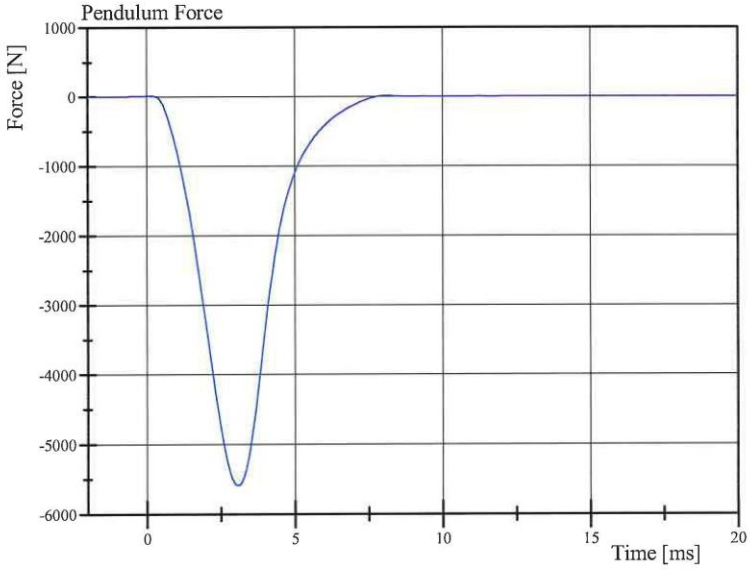
Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 34-1
Test Date: 2/4/2016

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.3 g at 8.2 ms
Min: -114.2 g at 3.1 ms

Pendulum Force



Filter Class: CFC_600
Max: 15.3 N at 8.2 ms
Min: -5,587.6 N at 3.1 ms

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

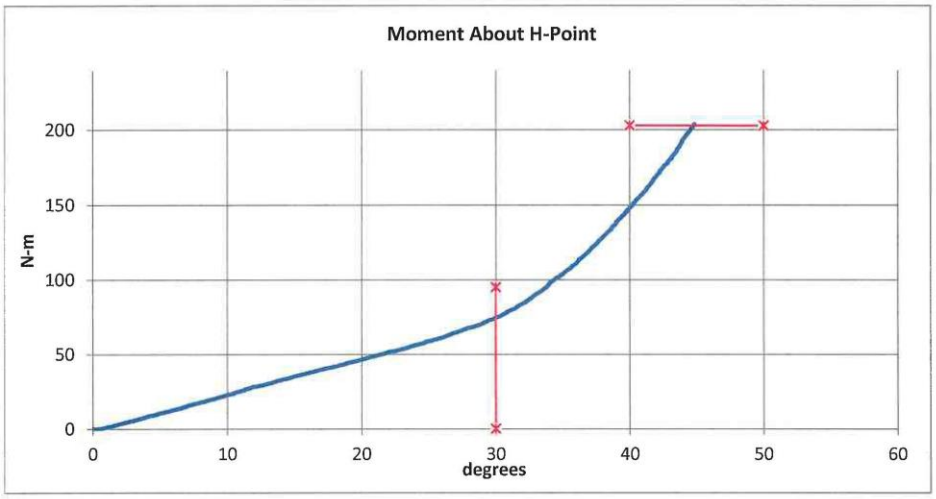
02.04.2016 08:11:39 1759

Transportation Research Center Inc.

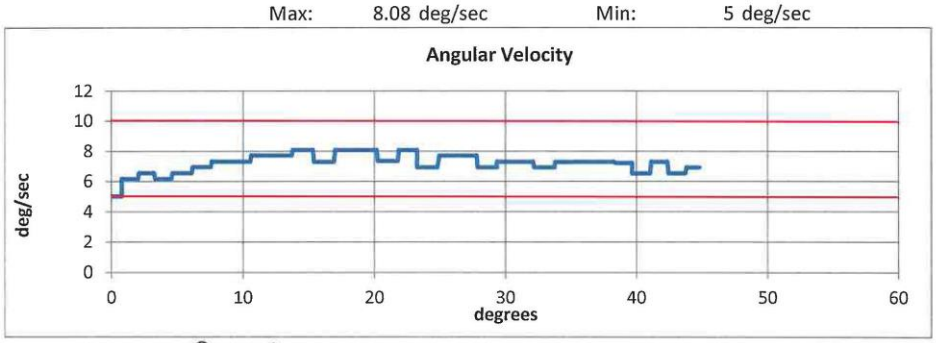
Hybrid III 50th Male Hip Range of Motion

Serial Number:	37	Date:	04-Feb-2016
Test Number:	1	Time:	7:33
Comments:	Left		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.7	°C	Pass
Humidity	10	-	70	31	%	Pass
Moment at 30°	0	≤	94.9	74.75	N-m	Pass
Angle at 203 Nm	40	-	50	44.83	deg	Pass
Average Velocity	5	-	10	7.17	deg/sec	Pass



Max: 8.08 deg/sec Min: 5 deg/sec



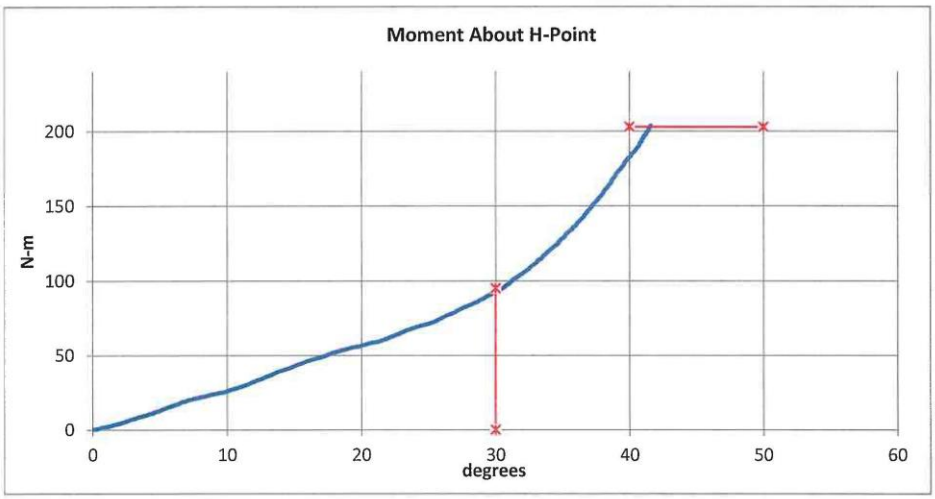
Technician _____ Approved _____

Transportation Research Center Inc.

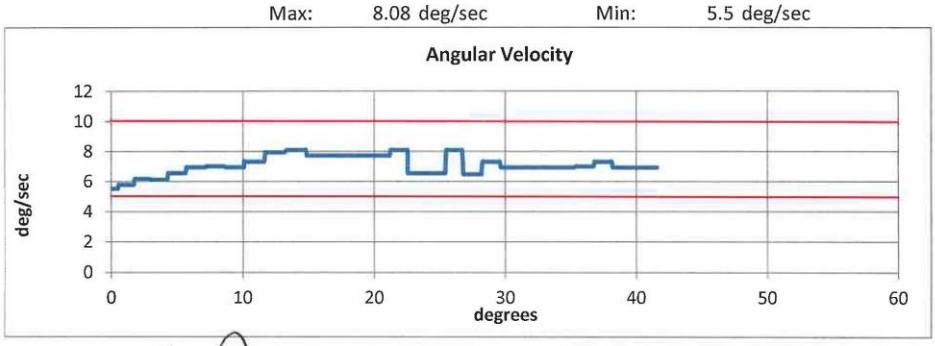
Hybrid III 50th Male Hip Range of Motion

Serial Number:	37	Date:	04-Feb-2016
Test Number:	1	Time:	8:52
Comments:	Right		

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.6	°C	Pass
Humidity	10	-	70	32	%	Pass
Moment at 30°	0	≤	94.9	92.99	N-m	Pass
Angle at 203 Nm	40	-	50	41.6	deg	Pass
Average Velocity	5	-	10	7.06	deg/sec	Pass



Max: 8.08 deg/sec Min: 5.5 deg/sec



Technician

Approved

Pre-Test Calibration Sheets

Front Passenger S/N 426

Transportation Research Center Inc.
572O HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 34

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	774.7 - 800.1	780	Yes
B	Shoulder Pivot Height	431.8 - 457.2	441	Yes
C	Hip Pivot Height	81.3 - 86.3	84	Yes
D	Hip Pivot from Backline	144.8 - 149.8	145	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	78	Yes
F	Thigh Clearance	119.4 - 134.6	129	Yes
G	Back of Elbow to Wrist Pivot	243.9 - 259.1	251	Yes
H	Head Back to Backline	43.2 - 48.2	45	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	534	Yes
L	Popliteal Height	355.6 - 376.0	369	Yes
M	Knee Pivot Height	393.7 - 419.1	411	Yes
N	Buttock Popliteal Length	414.0 - 439.4	432	Yes
O	Chest Depth without Jacket	175.3 - 190.5	183	Yes
P	Foot Length	218.5 - 233.7	223	Yes
R	Buttock to Knee Pivot Length	457.2 - 482.6	473	Yes
S	Head Breadth	137.1 - 147.3	140	Yes
T	Head Depth	177.8 - 188.0	181	Yes
U	Hip Breadth	299.7 - 314.9	306	Yes
V	Shoulder Breadth	350.5 - 365.7	357	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	866	Yes
Z	Waist Circumference	759.5 - 789.9	774	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 8/10/12

Transportation Research Center Inc.

Front Head Drop
HIII 5th Serial No. 426 Certification No. 34-1
Test Date: 1/12/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	280.0 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-4.7 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

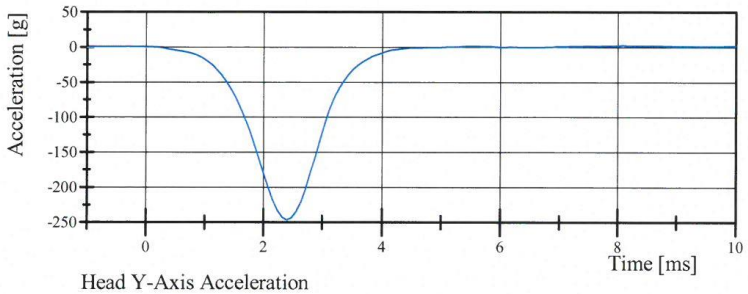
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 09:37:12 609

Transportation Research Center Inc.

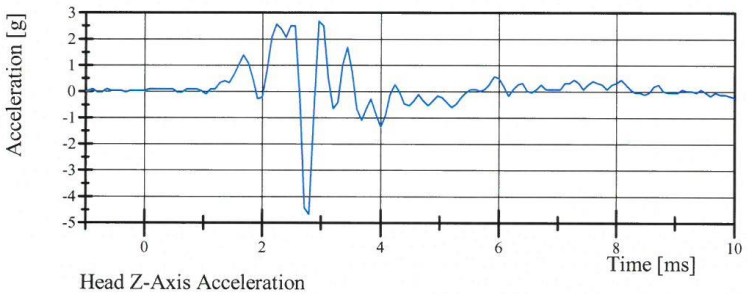
Front Head Drop
HIII 5th Serial No. 426 Certification No. 34-1
Test Date: 1/12/2016

Head X-Axis Acceleration



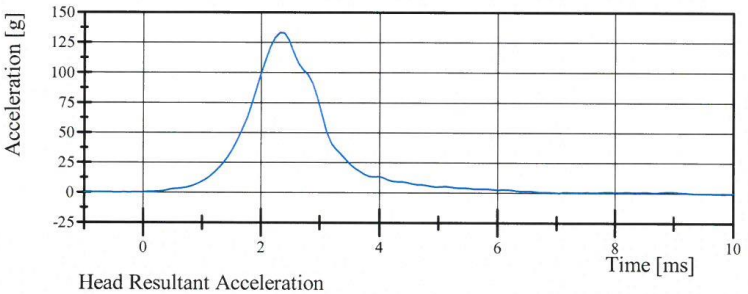
Filter Class: CFC_1000
Max: 2.0 g at 8.1 ms
Min: -246.6 g at 2.4 ms

Head Y-Axis Acceleration



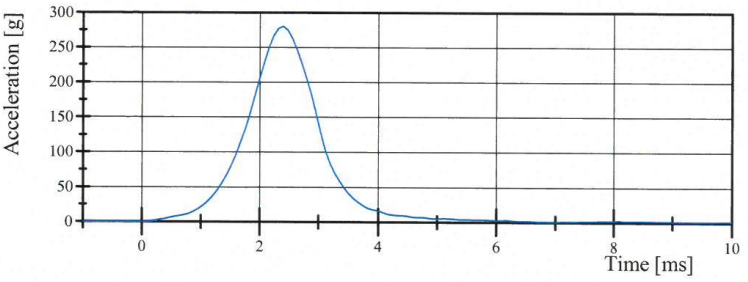
Filter Class: CFC_1000
Max: 2.7 g at 3.0 ms
Min: -4.7 g at 2.8 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 133.1 g at 2.3 ms
Min: -0.6 g at 9.8 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 280.0 g at 2.4 ms
Min: 0.0 g at -1.0 ms

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

01.12.2016 09:37:19 609

Transportation Research Center Inc.

Neck Flexion
HIII 5th Serial No. 426 Certification No. 34-2
Test Date: 1/12/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	7.111 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	(-2.1) - (-2.5) m/s	-2.37 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	(-4.0) - (-5.0) m/s	-4.65 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.66 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-78.6 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	73.4 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	86.1 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

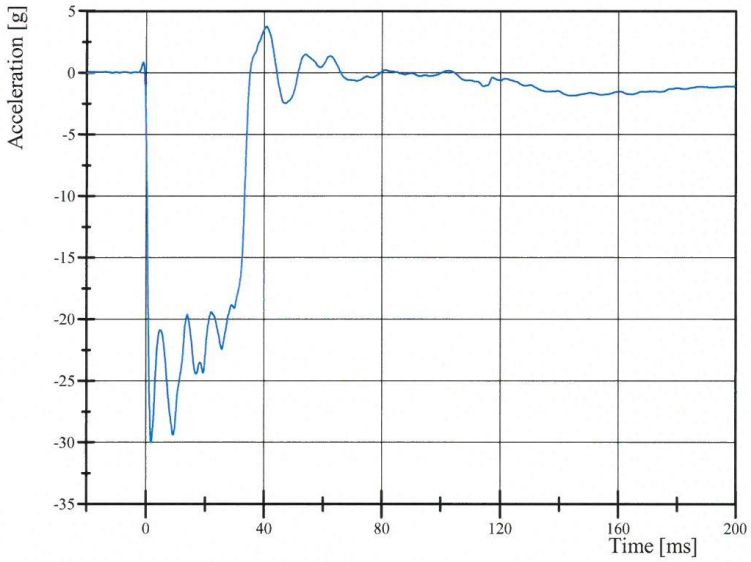
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 11:06:04 1706

Transportation Research Center Inc.

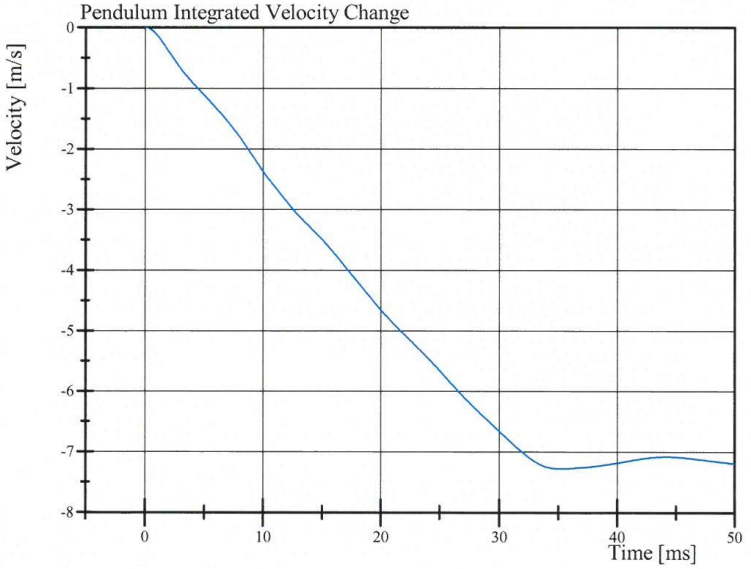
Neck Flexion
HIII 5th Serial No. 426 Certification No. 34-2
Test Date: 1/12/2016

Pendulum Acceleration



Filter Class: CFC_180
Max: 3.7 g at 40.9 ms
Min: -30.1 g at 1.9 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -7.3 m/s at 35.2 ms

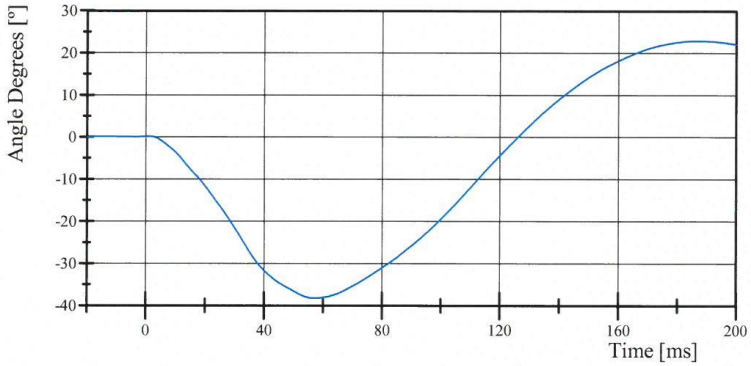
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 11:06:12 1706

Transportation Research Center Inc.

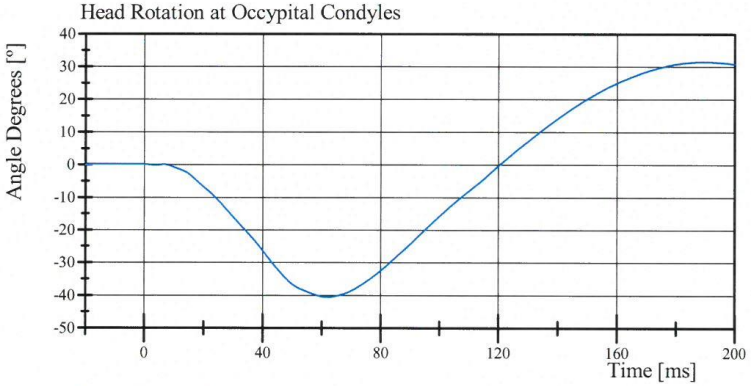
Neck Flexion
HIII 5th Serial No. 426 Certification No. 34-2
Test Date: 1/12/2016

Pot Rotation at the Base of Neck



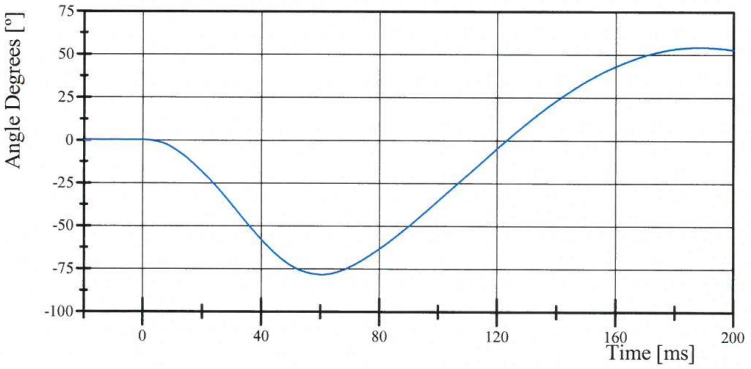
Filter Class: CFC_60
Max: 22.8 ° at 186.6 ms
Min: -38.3 ° at 57.2 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 31.5 ° at 189.4 ms
Min: -40.6 ° at 61.9 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 54.4 ° at 188.4 ms
Min: -78.6 ° at 60.7 ms

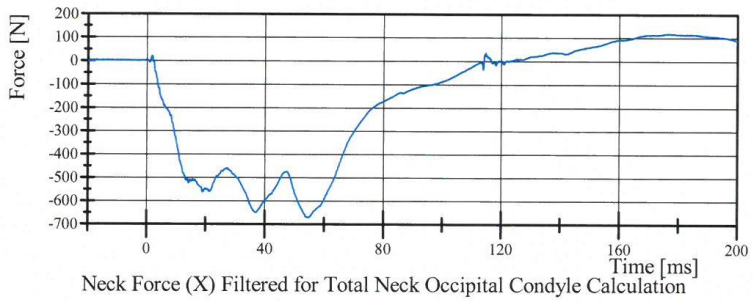
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 11:06:13 1706

Transportation Research Center Inc.

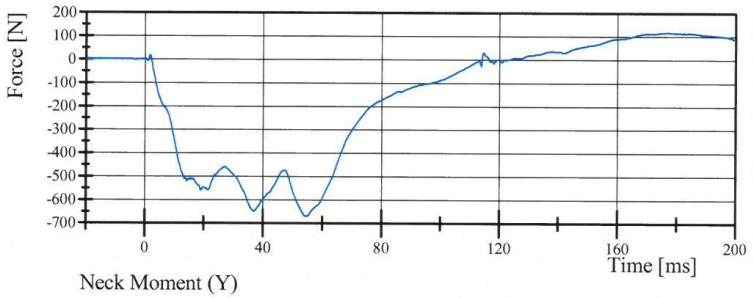
Neck Flexion
HIII 5th Serial No. 426 Certification No. 34-2
Test Date: 1/12/2016

Neck Force (X)



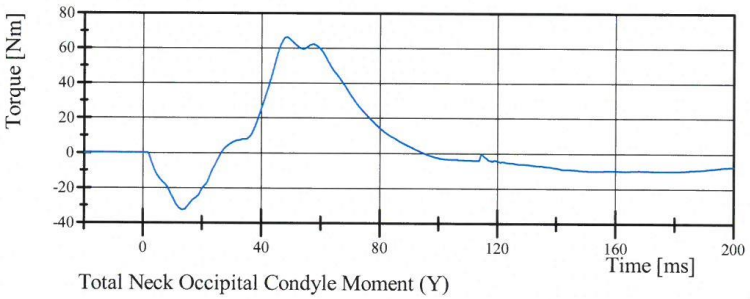
Filter Class: CFC_1000
Max: 119.1 N at 176.6 ms
Min: -670.7 N at 54.9 ms

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



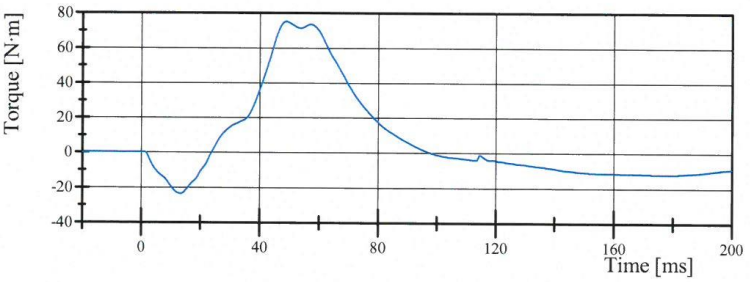
Filter Class: CFC_600
Max: 118.4 N at 176.6 ms
Min: -670.4 N at 54.9 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 66.1 Nm at 48.5 ms
Min: -32.8 Nm at 13.4 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Consta
Max: 75.0 N·m at 48.9 ms
Min: -23.7 N·m at 13.4 ms

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

01.12.2016 11:06:13 1706

Transportation Research Center Inc.

Neck Extension
HIII 5th Serial No. 426 Certification No. 34-1
Test Date: 1/12/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	37 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.133 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.88 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.76 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	5.54 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	103.3 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-59.0 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	103.6 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

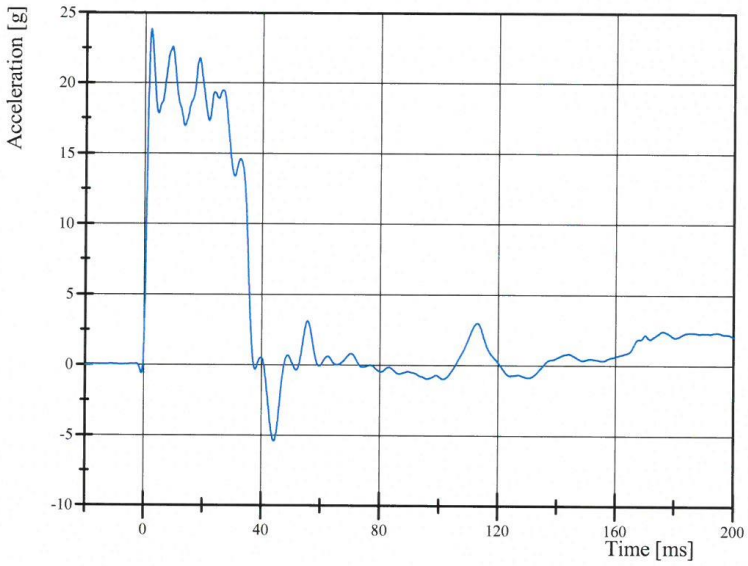
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 11:44:14 1823

Transportation Research Center Inc.

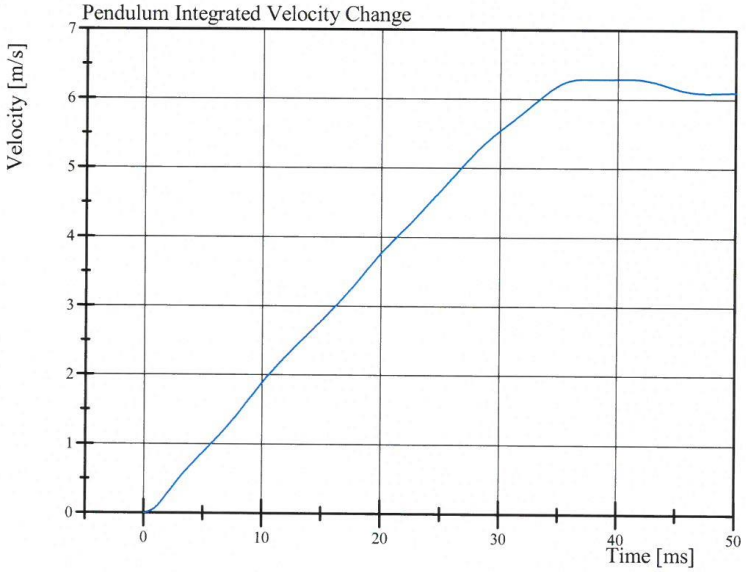
Neck Extension
HIII 5th Serial No. 426 Certification No. 34-1
Test Date: 1/12/2016

Pendulum Acceleration



Filter Class: CFC_180
Max: 23.8 g at 2.2 ms
Min: -5.4 g at 44.3 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 6.3 m/s at 40.8 ms
Min: 0.0 m/s at 0.0 ms

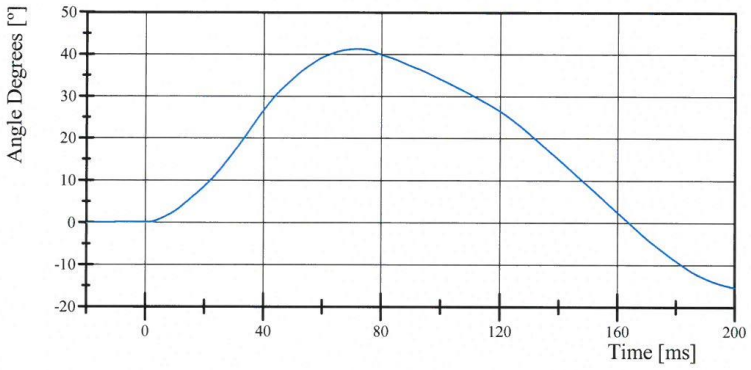
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 11:44:23 1823

Transportation Research Center Inc.

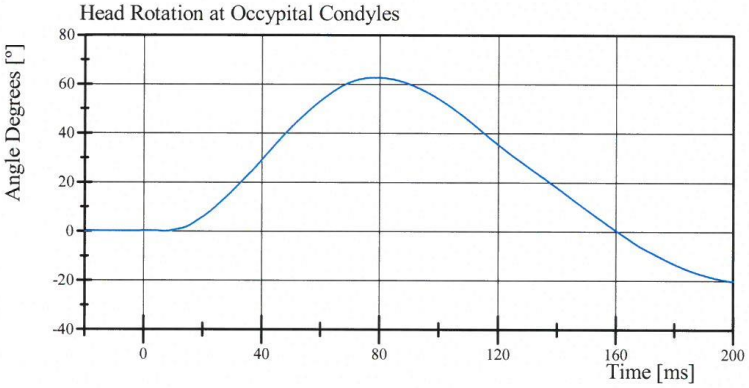
Neck Extension
HIII 5th Serial No. 426 Certification No. 34-1
Test Date: 1/12/2016

Pot Rotation at the Base of Neck



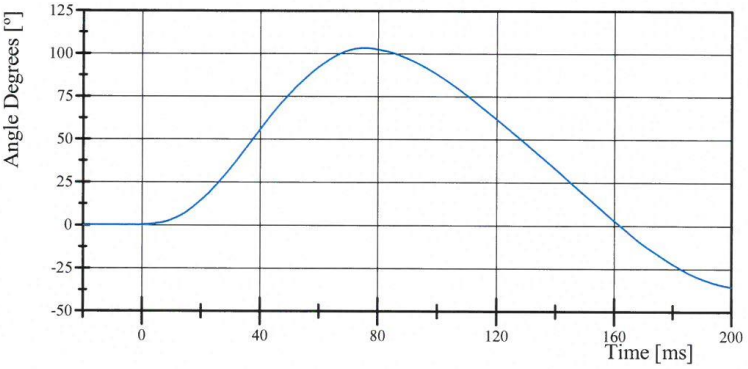
Filter Class: CFC_60
Max: 41.2 ° at 72.0 ms
Min: -15.3 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 62.6 ° at 78.8 ms
Min: -20.2 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 103.3 ° at 75.7 ms
Min: -35.5 ° at 200.0 ms

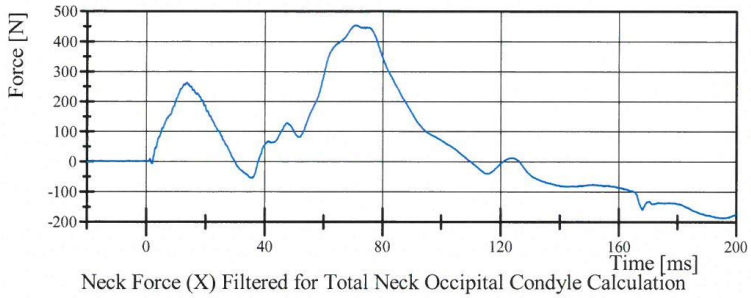
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 11:44:23 1823

Transportation Research Center Inc.

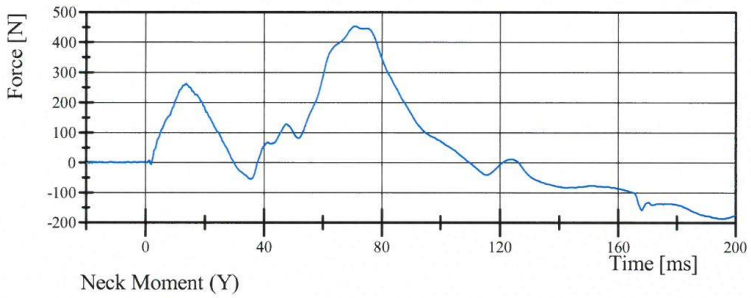
Neck Extension
HIII 5th Serial No. 426 Certification No. 34-1
Test Date: 1/12/2016

Neck Force (X)



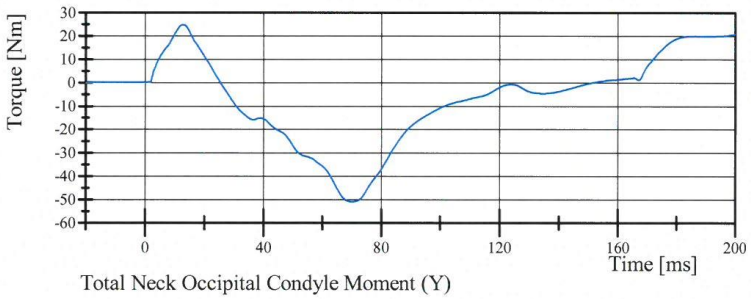
Filter Class: CFC_1000
Max: 453.2 N at 70.7 ms
Min: -186.4 N at 195.7 ms

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



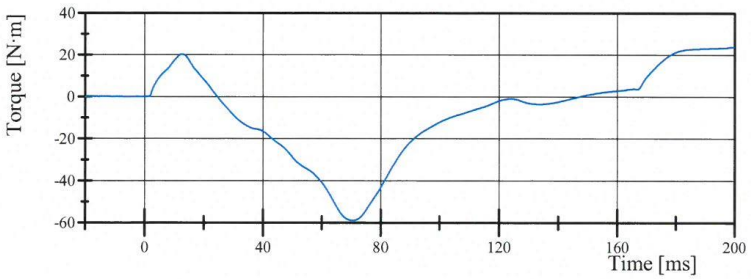
Filter Class: CFC_600
Max: 452.8 N at 70.8 ms
Min: -186.0 N at 195.6 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 24.7 Nm at 12.7 ms
Min: -51.0 Nm at 70.2 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Constai
Max: 23.9 N·m at 200.0 ms
Min: -59.0 N·m at 70.6 ms

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

01.12.2016 11:44:24 1823

Transportation Research Center Inc.

Front Thorax
HIII 5th Serial No. 426 Certification No. 34-9
Test Date: 1/14/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	36 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.604 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,354.3 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	>= (-4,600) N	-4,357.2 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-52.0 mm	Yes
Internal Hysteresis	69 - 85 %	74.9 %	Yes

Test meets specifications.

Comments:

Technician

Approved

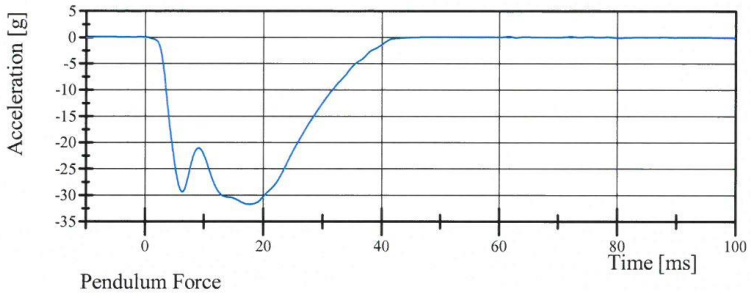
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.14.2016 10:37:03 439

Transportation Research Center Inc.

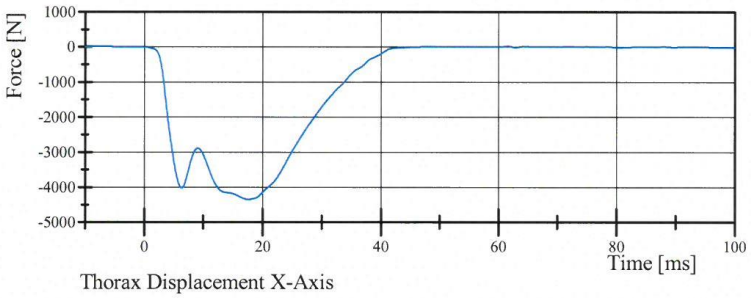
Front Thorax
HIII 5th Serial No. 426 Certification No. 34-9
Test Date: 1/14/2016

Pendulum Acceleration



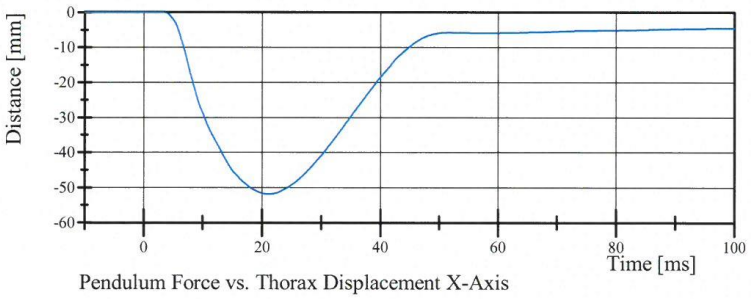
Filter Class: CFC_180
Max: 0.1 g at 61.6 ms
Min: -31.8 g at 17.7 ms

Pendulum Force



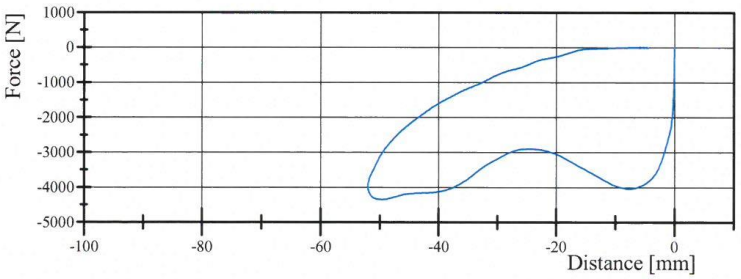
Filter Class: CFC_180
Max: 18.7 N at 61.6 ms
Min: -4,357.2 N at 17.7 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -6.6 ms
Min: -52.0 mm at 21.2 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 18.7 N at -5.9 mm
Min: -4,357.2 N at -49.7 mm

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

01.14.2016 10:37:12 439

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 34-1
Test Date: 1/12/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 ºC	21.7 ºC	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.095 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,581.1 N	Yes

Test meets specifications.

Comments:

Technician

Approved

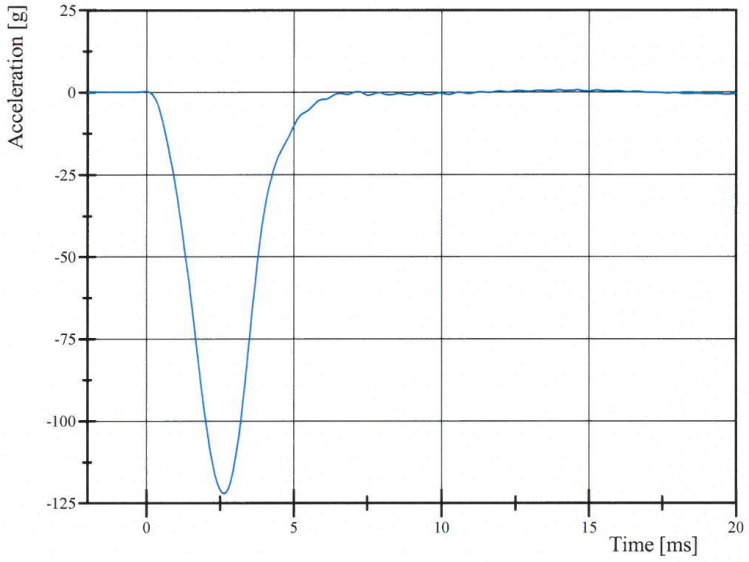
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 12:46:26 1827

Transportation Research Center Inc.

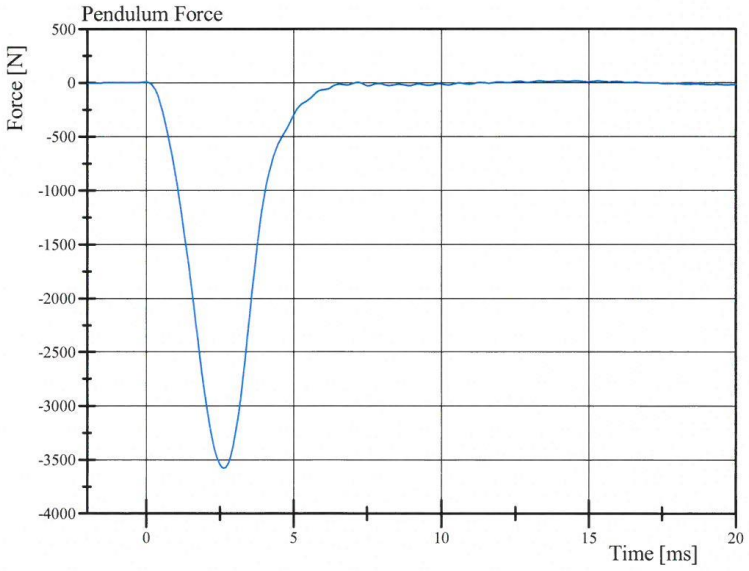
Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 34-1
Test Date: 1/12/2016

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.7 g at 14.6 ms
Min: -122.1 g at 2.6 ms

Pendulum Force



Filter Class: CFC_600
Max: 20.5 N at 14.6 ms
Min: -3,581.1 N at 2.6 ms

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

01.12.2016 12:46:46 1827

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 34-4
Test Date: 1/12/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 ºC	21.6 ºC	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.114 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,759.0 N	Yes

Test meets specifications.

Comments:

Technician

Approved

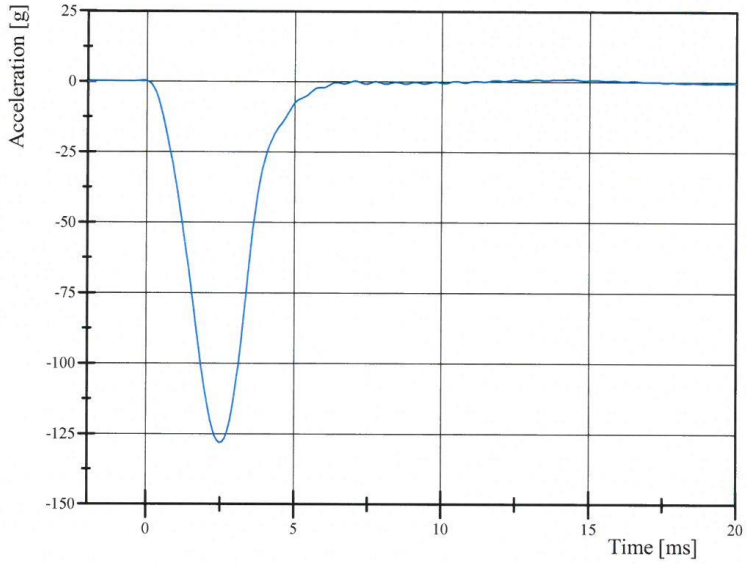
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

01.12.2016 14:34:21 1804

Transportation Research Center Inc.

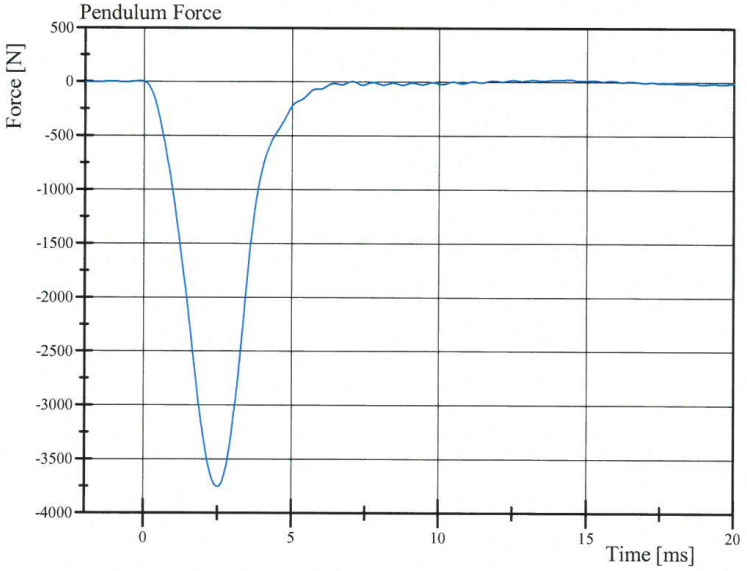
Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 34-4
Test Date: 1/12/2016

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.9 g at 14.4 ms
Min: -128.2 g at 2.5 ms

Pendulum Force



Filter Class: CFC_600
Max: 26.1 N at 14.4 ms
Min: -3,759.0 N at 2.5 ms

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

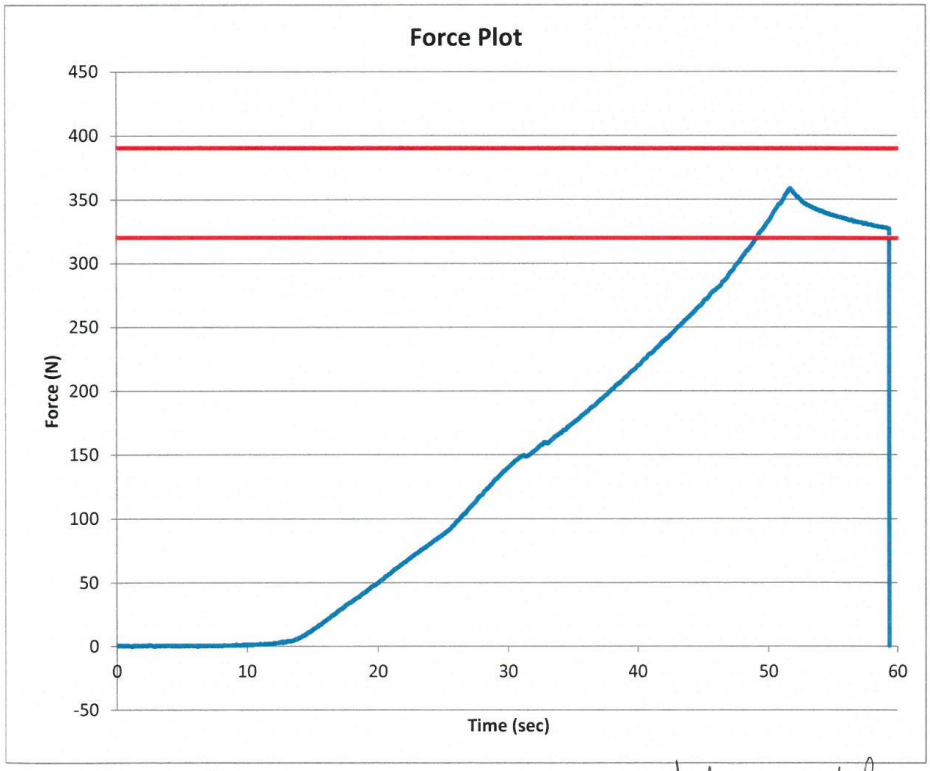
01.12.2016 14:34:28 1804

Transportation Research Center Inc.

Hybrid III Small Female Torso Flexion

Serial Number:	426	Date:	1/12/2016
Test Number:	1	Time:	9:16
Comments:			

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.3	°C	Pass
Humidity	10	-	70	39	%	Pass
Average Angular Velocity	0.5	-	1.5	0.77	deg/sec	Pass
Initial Angle	0	-	20	15.21	deg	Pass
Peak Force at 45.21°	320	-	390	358.72	N	Pass
Final Angle	-8	-	8	5.36	deg	Pass



Technician

Approved

Post-Test Calibration Sheets

Front Passenger S/N 426

Transportation Research Center Inc.
572O HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 35

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	774.7 - 800.1	780	Yes
B	Shoulder Pivot Height	431.8 - 457.2	441	Yes
C	Hip Pivot Height	81.3 - 86.3	84	Yes
D	Hip Pivot from Backline	144.8 - 149.8	145	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	78	Yes
F	Thigh Clearance	119.4 - 134.6	129	Yes
G	Back of Elbow to Wrist Pivot	243.9 - 259.1	251	Yes
H	Head Back to Backline	43.2 - 48.2	45	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	534	Yes
L	Popliteal Height	355.6 - 376.0	369	Yes
M	Knee Pivot Height	393.7 - 419.1	411	Yes
N	Buttock Popliteal Length	414.0 - 439.4	432	Yes
O	Chest Depth without Jacket	175.3 - 190.5	183	Yes
P	Foot Length	218.5 - 233.7	223	Yes
R	Buttock to Knee Pivot Length	457.2 - 482.6	473	Yes
S	Head Breadth	137.1 - 147.3	140	Yes
T	Head Depth	177.8 - 188.0	181	Yes
U	Hip Breadth	299.7 - 314.9	306	Yes
V	Shoulder Breadth	350.5 - 365.7	357	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	866	Yes
Z	Waist Circumference	759.5 - 789.9	774	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 8/10/12

Transportation Research Center Inc.

Front Head Drop
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	284.0 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	2.4 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

Test meets specifications.

Comments:

Technician

Approved

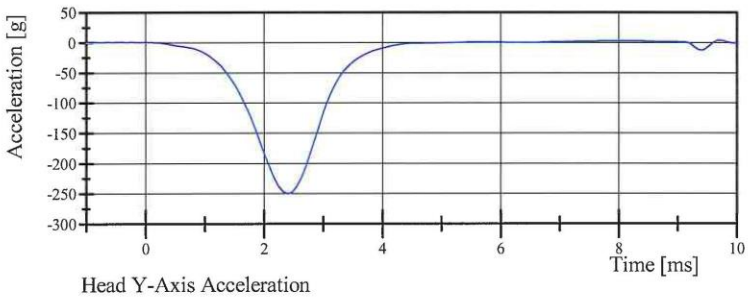
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 07:53:43 609

Transportation Research Center Inc.

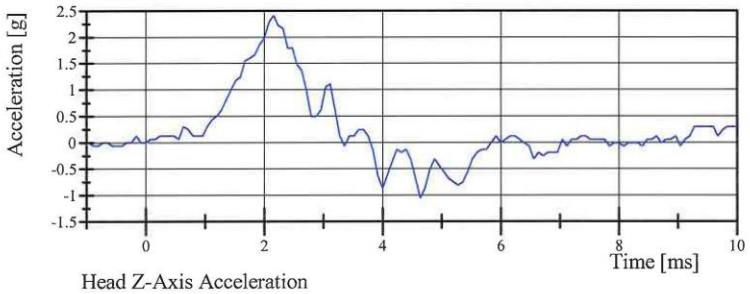
Front Head Drop
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Head X-Axis Acceleration



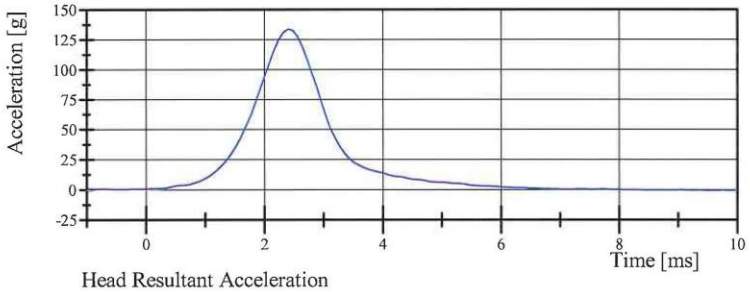
Filter Class: CFC_1000
Max: 4.0 g at 9.7 ms
Min: -250.7 g at 2.4 ms

Head Y-Axis Acceleration



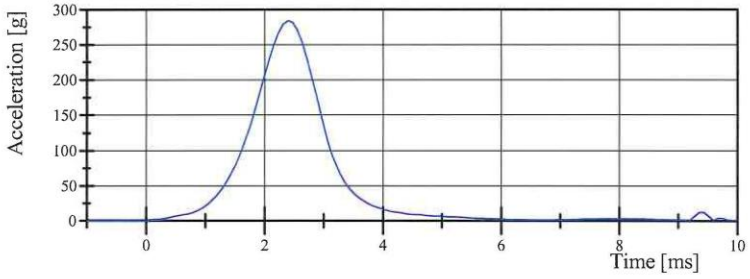
Filter Class: CFC_1000
Max: 2.4 g at 2.2 ms
Min: -1.1 g at 4.6 ms

Head Z-Axis Acceleration



Filter Class: CFC_1000
Max: 133.4 g at 2.4 ms
Min: -0.6 g at 9.3 ms

Head Resultant Acceleration



Filter Class: CFC_1000
Max: 284.0 g at 2.4 ms
Min: 0.0 g at -0.7 ms

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

02.04.2016 07:53:52 609

Transportation Research Center Inc.

Neck Flexion
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	7.121 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	(-2.1) - (-2.5) m/s	-2.47 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	(-4.0) - (-5.0) m/s	-4.83 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.85 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-83.2 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	77.4 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	86.2 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

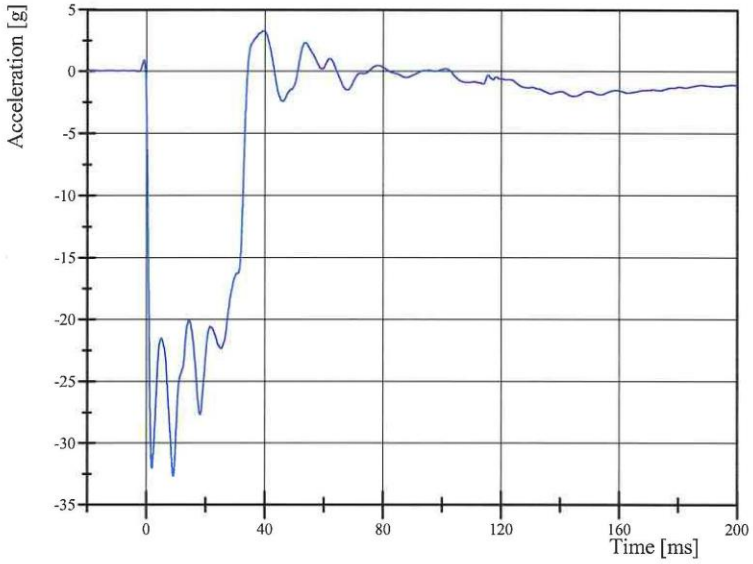
Specification Source: CFR49 Part 572 Subpart O with Polarity in accordance with J211

02.04.2016 09:20:43 1700

Transportation Research Center Inc.

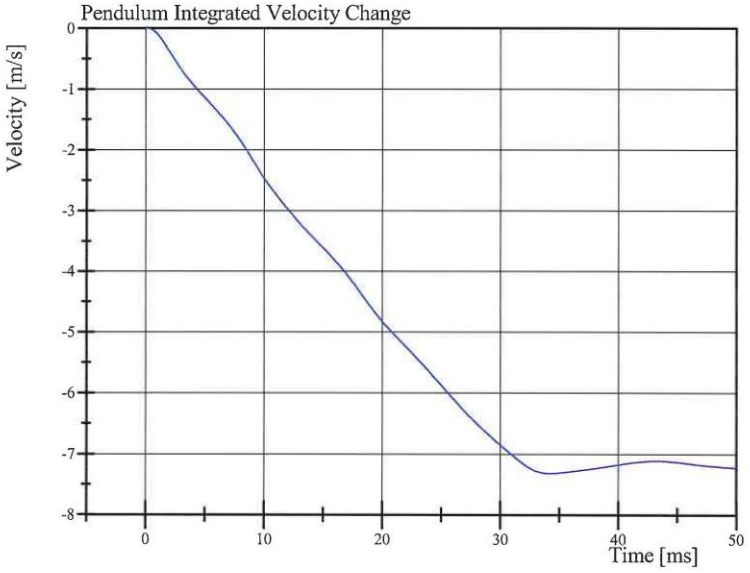
Neck Flexion
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Pendulum Acceleration



Filter Class: CFC_180
Max: 3.2 g at 39.5 ms
Min: -32.7 g at 9.2 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 0.0 m/s at 0.0 ms
Min: -7.3 m/s at 34.2 ms

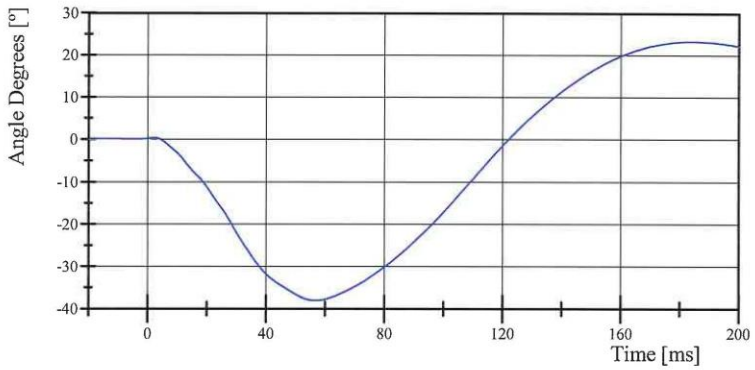
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 09:20:52 1700

Transportation Research Center Inc.

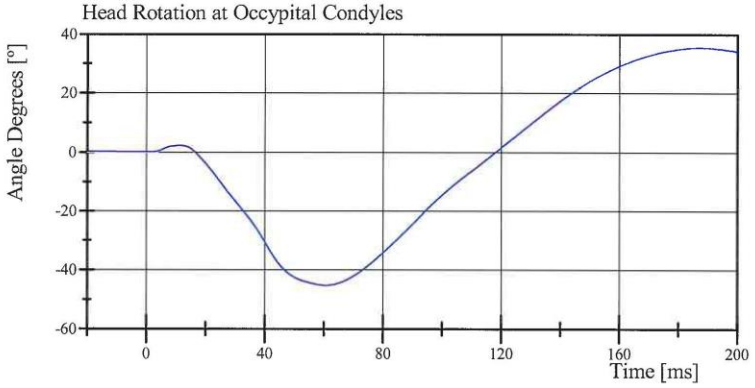
Neck Flexion
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Pot Rotation at the Base of Neck



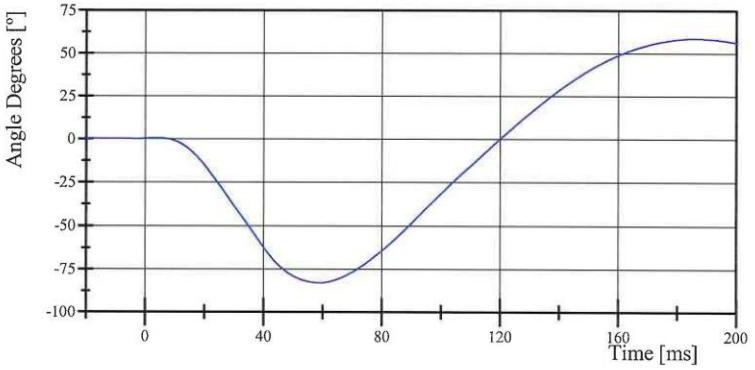
Filter Class: CFC_60
Max: 23.3 ° at 183.8 ms
Min: -38.1 ° at 56.7 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 35.5 ° at 187.0 ms
Min: -45.3 ° at 60.7 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 58.7 ° at 185.5 ms
Min: -83.2 ° at 59.0 ms

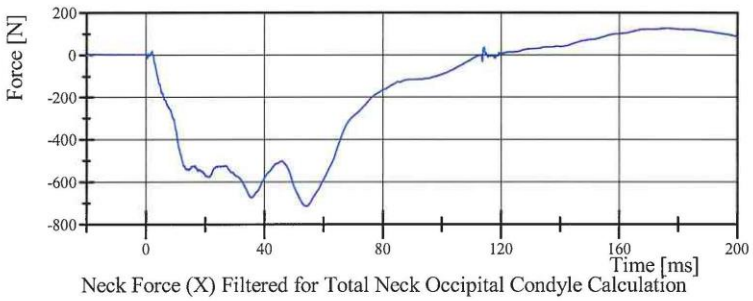
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 09:20:52 1700

Transportation Research Center Inc.

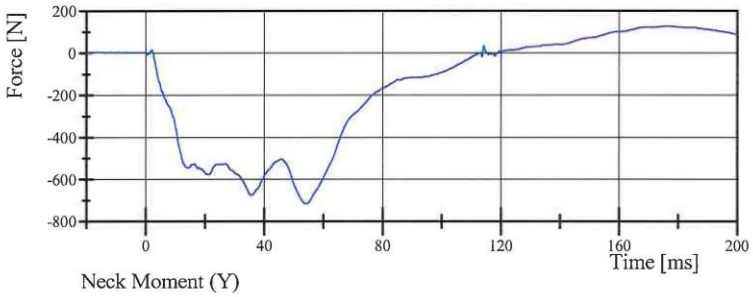
Neck Flexion
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Neck Force (X)



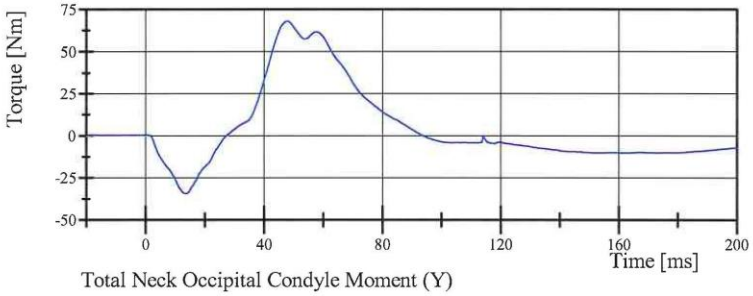
Filter Class: CFC_1000
Max: 127.5 N at 176.8 ms
Min: -716.2 N at 54.3 ms

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



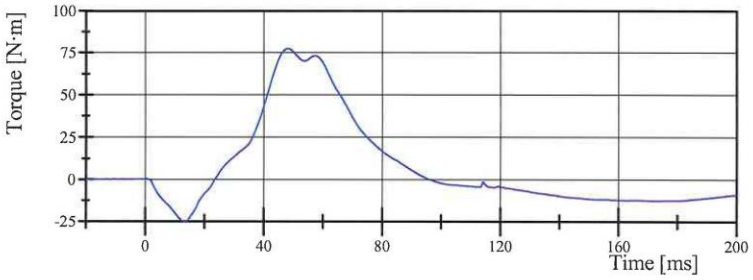
Filter Class: CFC_600
Max: 127.1 N at 176.8 ms
Min: -715.9 N at 54.3 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 67.8 Nm at 48.0 ms
Min: -34.6 Nm at 13.6 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Consta
Max: 77.4 N·m at 48.2 ms
Min: -25.0 N·m at 13.5 ms

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

02.04.2016 09:20:53 1700

Transportation Research Center Inc.

Neck Extension
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	33 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.156 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.82 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.74 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	5.45 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	112.1 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-60.1 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	103.7 ms	Yes

Test meets specifications.

Comments:

Technician

Approved

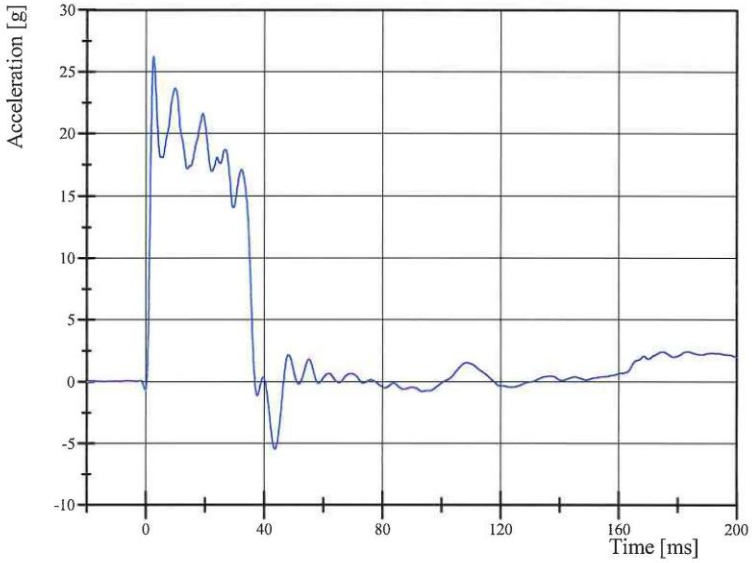
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 10:02:09 3002

Transportation Research Center Inc.

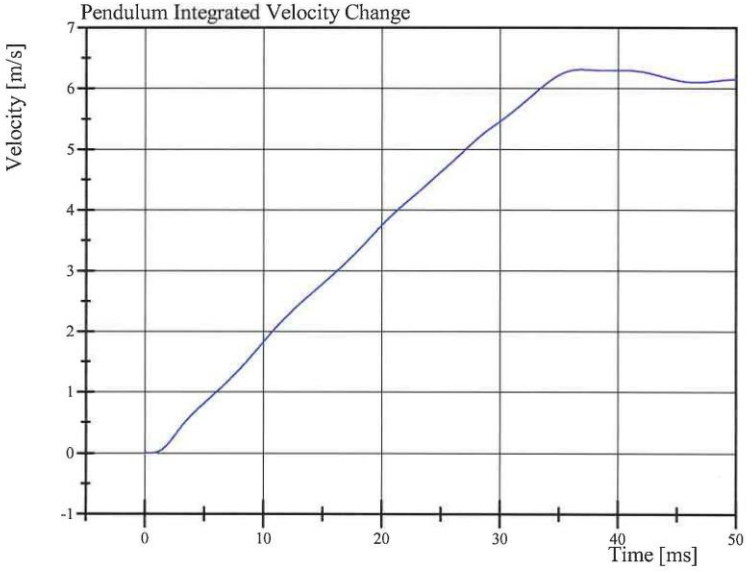
Neck Extension
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Pendulum Acceleration



Filter Class: CFC_180
Max: 26.2 g at 2.6 ms
Min: -5.5 g at 43.7 ms

Pendulum Integrated Velocity Change



Filter Class: CFC_180
Max: 6.3 m/s at 36.9 ms
Min: -0.0 m/s at 0.4 ms

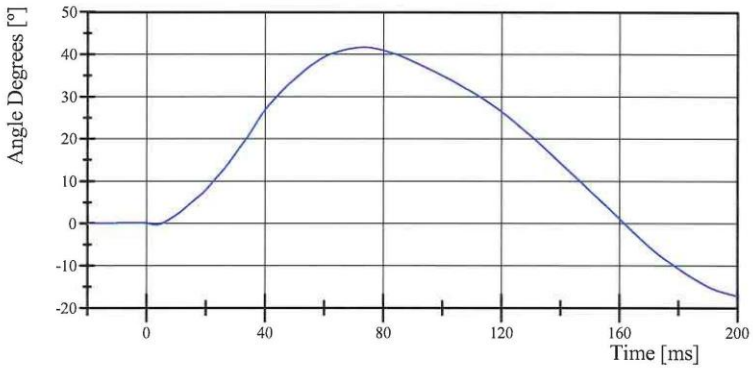
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 10:02:17 3002

Transportation Research Center Inc.

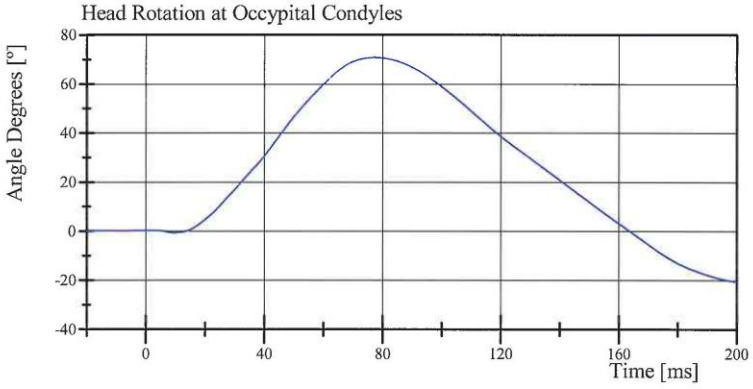
Neck Extension
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Pot Rotation at the Base of Neck



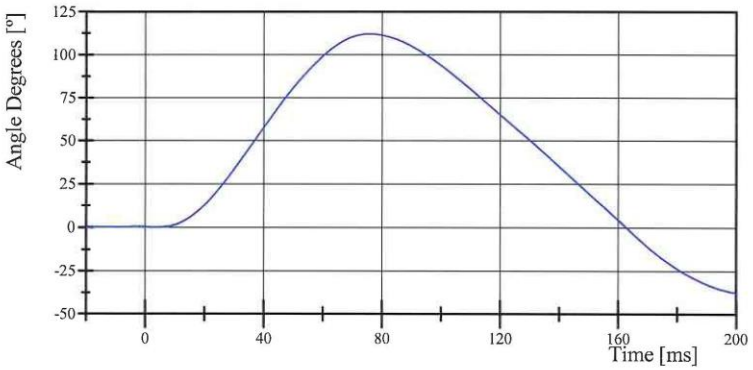
Filter Class: CFC_60
Max: 41.6 ° at 73.4 ms
Min: -17.1 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 70.7 ° at 77.2 ms
Min: -20.5 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 112.1 ° at 75.8 ms
Min: -37.6 ° at 200.0 ms

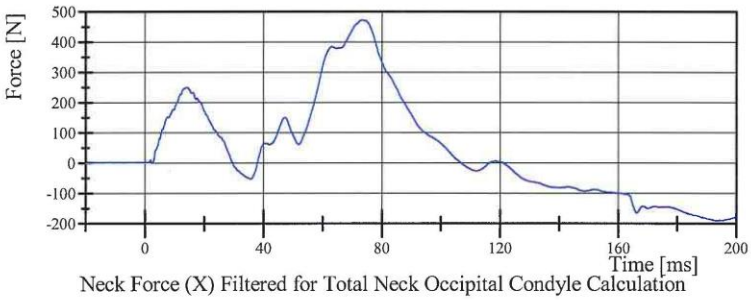
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 10:02:18 3002

Transportation Research Center Inc.

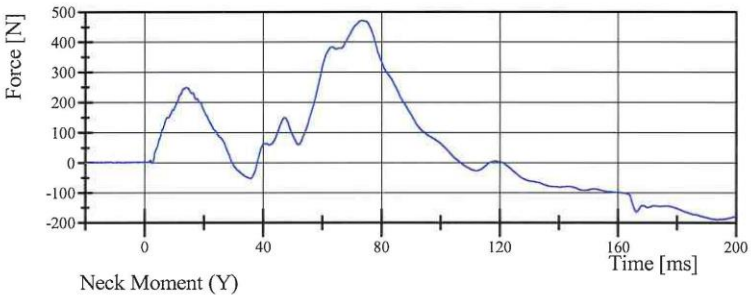
Neck Extension
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Neck Force (X)



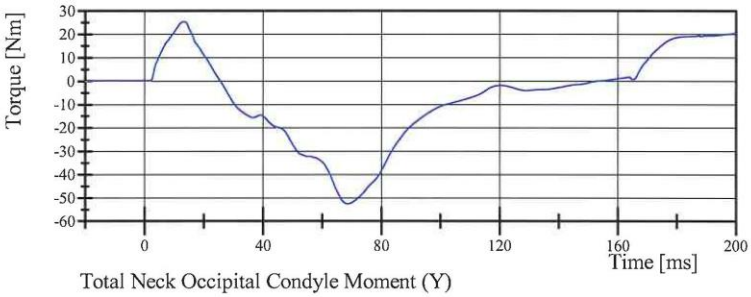
Filter Class: CFC_1000
Max: 471.4 N at 73.1 ms
Min: -190.1 N at 193.6 ms

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



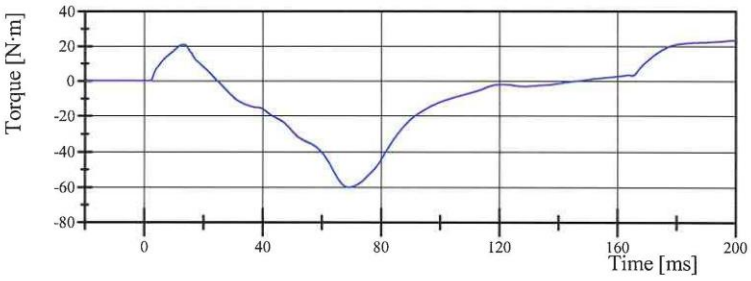
Filter Class: CFC_600
Max: 471.1 N at 73.2 ms
Min: -189.5 N at 193.6 ms

Neck Moment (Y)



Filter Class: CFC_600
Max: 25.2 Nm at 13.1 ms
Min: -52.7 Nm at 68.9 ms

Total Neck Occipital Condyle Moment (Y)



Filter Class: Without_(Consta
Max: 23.6 N·m at 200.0 ms
Min: -60.1 N·m at 69.1 ms

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

02.04.2016 10:02:18 3002

Transportation Research Center Inc.

Front Thorax
HIII 5th Serial No. 426 Certification No. 35-4
Test Date: 2/4/2016

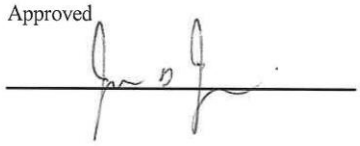
Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	30 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.603 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,390.6 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	>= (-4,600) N	-4,366.9 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-53.0 mm	Yes
Internal Hysteresis	69 - 85 %	75.0 %	Yes

Test meets specifications.

Comments:

Technician

Approved



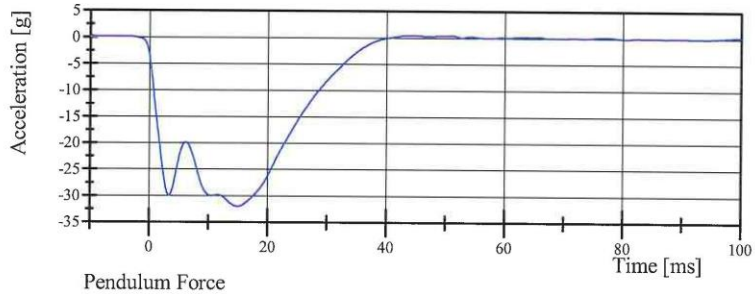
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 20:17:33 429

Transportation Research Center Inc.

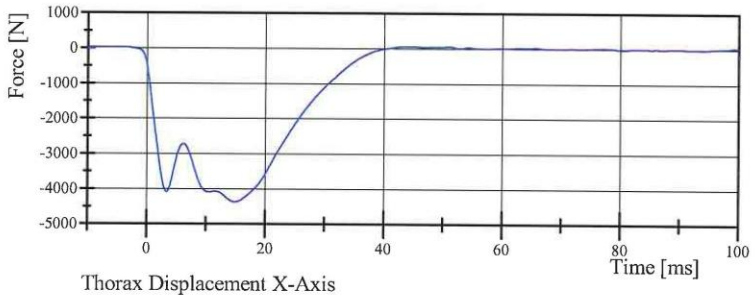
Front Thorax
HIII 5th Serial No. 426 Certification No. 35-4
Test Date: 2/4/2016

Pendulum Acceleration



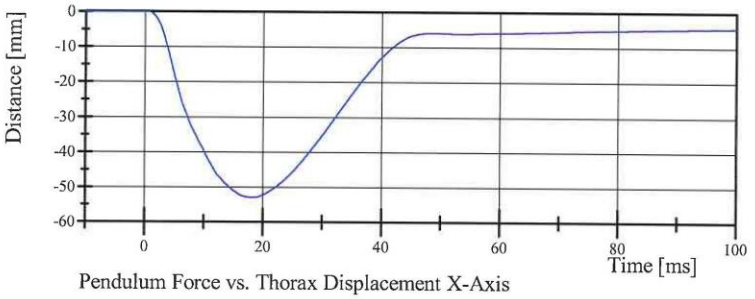
Filter Class: CFC_180
Max: 0.4 g at 51.0 ms
Min: -32.0 g at 15.0 ms

Pendulum Force



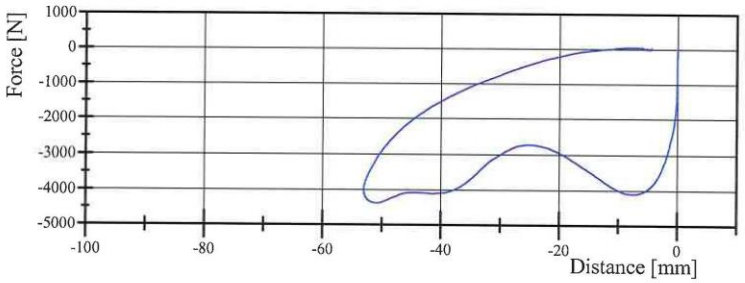
Filter Class: CFC_180
Max: 57.3 N at 51.0 ms
Min: -4,390.6 N at 15.0 ms

Thorax Displacement X-Axis



Filter Class: CFC_600
Max: 0.0 mm at -5.8 ms
Min: -53.0 mm at 18.1 ms

Pendulum Force vs. Thorax Displacement X-Axis



Filter Class: CFC_180
Max: 57.3 N at -6.1 mm
Min: -4,390.6 N at -50.9 mm

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

02.04.2016 20:18:01 429

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 35-3
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	33 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.087 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,781.0 N	Yes

Test meets specifications.

Comments:

Technician

Approved

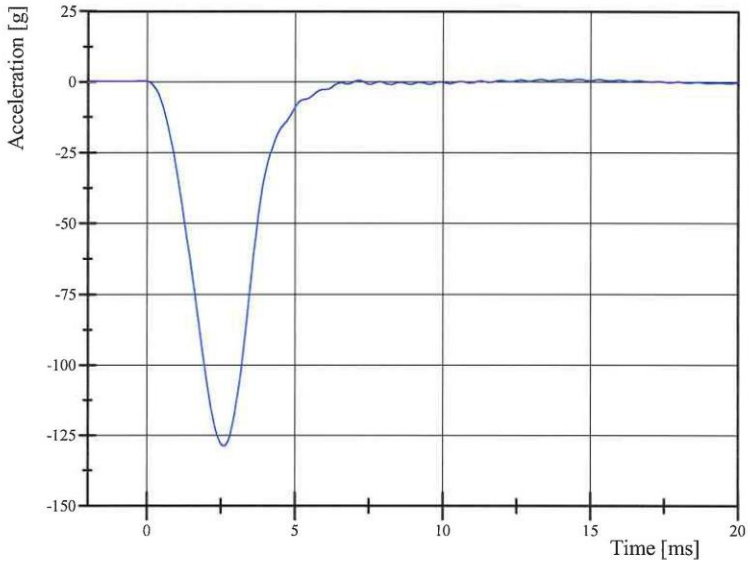
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 11:56:45 2215

Transportation Research Center Inc.

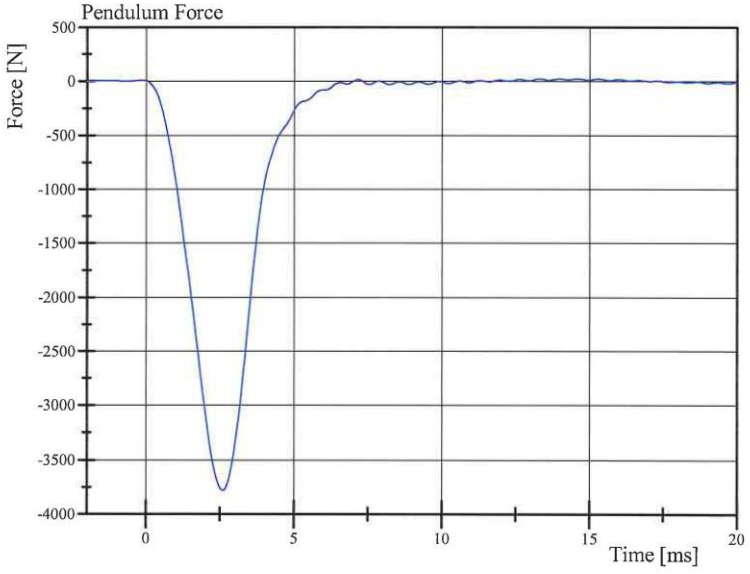
Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 35-3
Test Date: 2/4/2016

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.8 g at 14.6 ms
Min: -128.9 g at 2.6 ms

Pendulum Force



Filter Class: CFC_600
Max: 24.0 N at 14.6 ms
Min: -3,781.0 N at 2.6 ms

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

02.04.2016 11:57:21 2215

Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.092 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,926.1 N	Yes

Test meets specifications.

Comments:

Technician

Approved

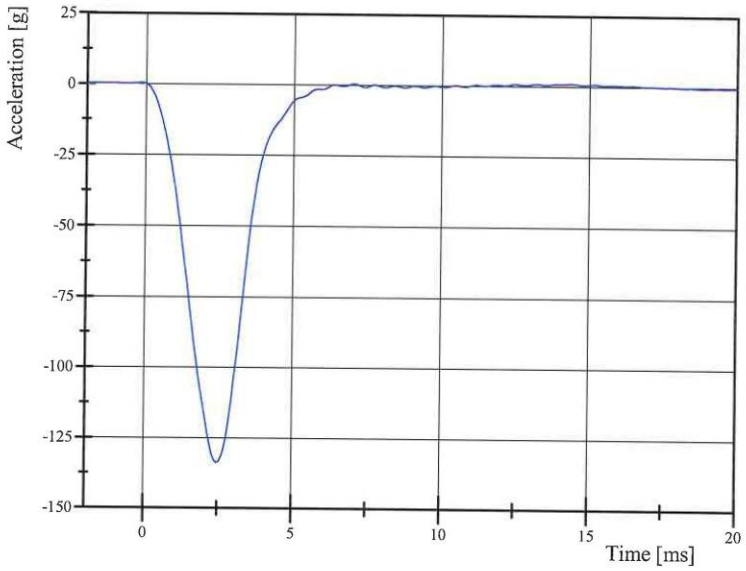
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

02.04.2016 11:18:35 2212

Transportation Research Center Inc.

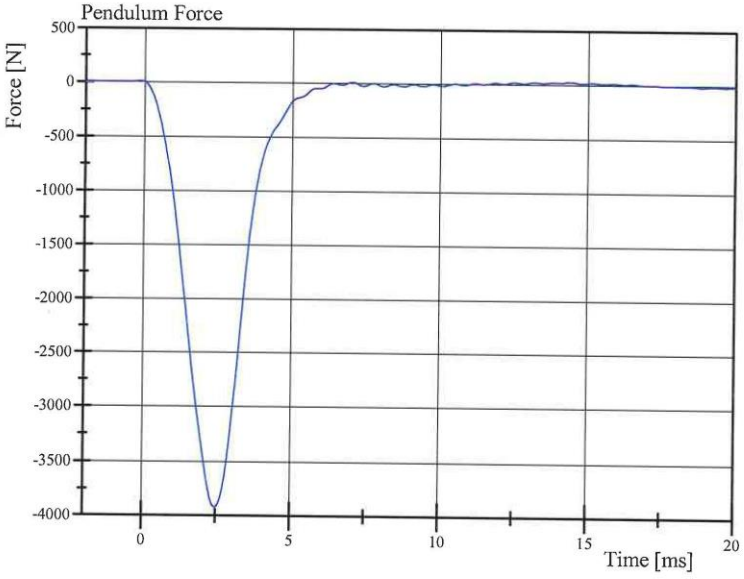
Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 35-1
Test Date: 2/4/2016

Pendulum Acceleration



Filter Class: CFC_600
Max: 0.9 g at 14.4 ms
Min: -133.9 g at 2.5 ms

Pendulum Force



Filter Class: CFC_600
Max: 26.8 N at 14.4 ms
Min: -3,926.1 N at 2.5 ms

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

02.04.2016 11:18:54 2212

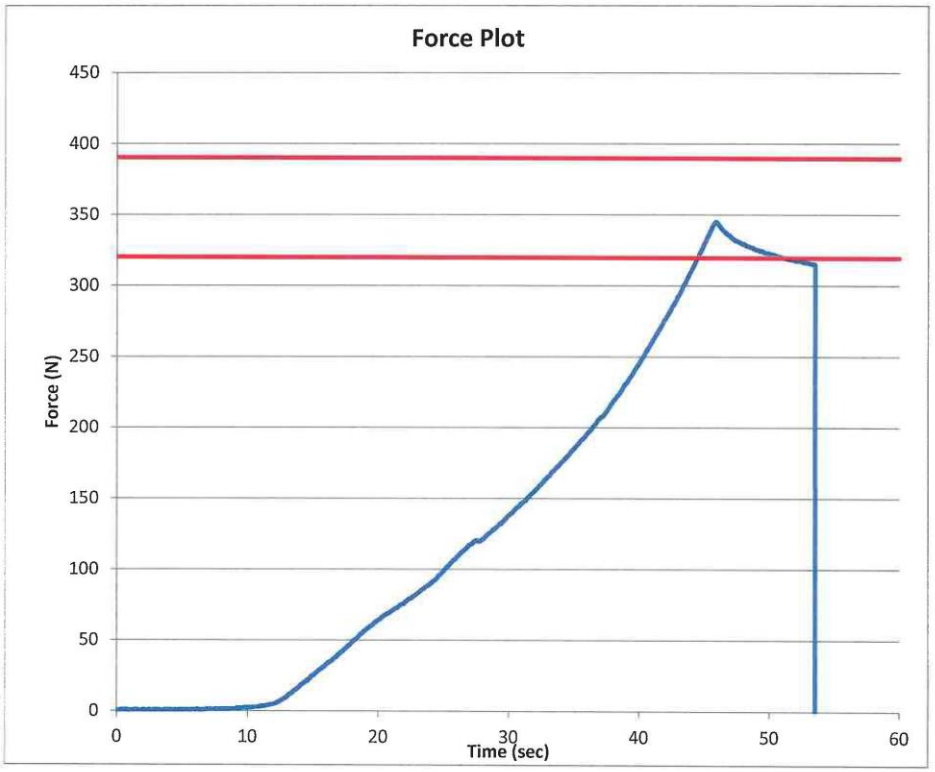
Transportation Research Center Inc.

Hybrid III Small Female Torso Flexion

Serial Number:	426	Date:	2/5/2016
Test Number:	2	Time:	7:22

Comments:

TEST PARAMETER	SPECIFICATION			TEST RESULTS		
Temperature	18.9	-	25.6	21.4	°C	Pass
Humidity	10	-	70	31	%	Pass
Average Angular Velocity	0.5	-	1.5	0.87	deg/sec	Pass
Initial Angle	0	-	20	15.31	deg	Pass
Peak Force at 45.21°	320	-	390	345.34	N	Pass
Final Angle	-8	-	8	4.74	deg	Pass



Technician

Approved