

Final Report Number: NCAP-TRC-13-006

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

**Fuji Heavy Industries LTD.
2013 Subaru Impreza Station Wagon**

NHTSA Number: MD5501

**PREPARED BY:
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Report Date: March 21, 2013

FINAL REPORT

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

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Approval Date: March 21, 2013

FINAL REPORT ACCEPTANCE BY OCWS:

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

Date _____

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

Date _____

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16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2013 Subaru Impreza Station Wagon 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 March 07, 2013 The impact velocity was 56.10 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 555 millimeters at vehicle centerline. The test vehicle's performance is as follows: <table border="1" data-bbox="230 1125 1411 1577"> <thead> <tr> <th></th> <th colspan="3">Driver ATD</th> <th colspan="3">Passenger ATD</th> </tr> <tr> <th>Measurement Description</th> <th>Units</th> <th>Threshold</th> <th>Result</th> <th>Units</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>NA</td> <td>700</td> <td>199</td> <td>NA</td> <td>700</td> <td>191</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-21.4</td> <td>mm</td> <td>52</td> <td>-18.6</td> </tr> <tr> <td>3ms Chest Clip</td> <td>Gs</td> <td>60</td> <td>43.9</td> <td>Gs</td> <td>60</td> <td>46.9</td> </tr> <tr> <td>Nij</td> <td>NA</td> <td>1</td> <td>0.286</td> <td>NA</td> <td>1</td> <td>0.415</td> </tr> <tr> <td>Neck Tension</td> <td>Newtons</td> <td>4170</td> <td>1221.0</td> <td>Newtons</td> <td>2620</td> <td>956.1</td> </tr> <tr> <td>Neck Compression</td> <td>Newtons</td> <td>4000</td> <td>-155.4</td> <td>Newtons</td> <td>2520</td> <td>-111.5</td> </tr> <tr> <td>Left Femur Force</td> <td>Newtons</td> <td>10008</td> <td>-1484.3</td> <td>Newtons</td> <td>6805</td> <td>-2153.1</td> </tr> <tr> <td>Right Femur Force</td> <td>Newtons</td> <td>10008</td> <td>-3011.7</td> <td>Newtons</td> <td>6805</td> <td>-1562.0</td> </tr> </tbody> </table>								Driver ATD			Passenger ATD			Measurement Description	Units	Threshold	Result	Units	Threshold	Result	Head Injury Criteria (HIC ₁₅)	NA	700	199	NA	700	191	Maximum Chest Compression	mm	63	-21.4	mm	52	-18.6	3ms Chest Clip	Gs	60	43.9	Gs	60	46.9	Nij	NA	1	0.286	NA	1	0.415	Neck Tension	Newtons	4170	1221.0	Newtons	2620	956.1	Neck Compression	Newtons	4000	-155.4	Newtons	2520	-111.5	Left Femur Force	Newtons	10008	-1484.3	Newtons	6805	-2153.1	Right Femur Force	Newtons	10008	-3011.7	Newtons	6805	-1562.0
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1: PURPOSE AND SUMMARY OF TEST

PURPOSE

This 56.3 km/h frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-12-D-00257. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

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

SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2013 Subaru Impreza Station Wagon at a velocity of 56.10 km/h. The test was performed at Transportation Research Center, Inc. on March 07, 2013. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

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

The driver (position 1) ATD (Serial No. 37) and the right-front passenger (position 2) ATD (Serial No. 426) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 132 channels of data were recorded on an on-board data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

There was 100.0 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 555 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 glove box.

The occupant data is summarized below:

ATD Position	HIC₁₅	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)	199	0.286	1221.0	-155.4	43.9	-21.4	-1484.3	-3011.7
Passenger (5 th Female)	191	0.415	956.1	-111.5	46.9	-18.6	-2153.1	-1562.0

2: OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

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

Test Vehicle: 2013 Subaru Impreza Station Wagon
 Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
 Test Date: 03/07/13

TEST VEHICLE INFORMATION

NHTSA No.	MD5501
Model Year	2013
Make	Subaru
Model	Impreza
Body Style	Station Wagon
VIN	JF1GPAC66DG826841
Body Color	Blue
Odometer Reading (km/mi)	8.9 Mi.
Engine Displacement (L)	2.0
Type/No. Cylinders	4
Engine Placement	Transverse
Transmission Type	Standard
Transmission Speeds	5
Overdrive	No
Final Drive	AWD
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)	No

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	No
Driver Pretensioner	Yes
Driver Load Limiter	No
Front Pass. Pretensioner	Yes
Front Pass. Load Limiter	No
Other	N/A

Does owner's manual provide instructions to turn off automatic door locks?

No

DATA FROM CERTIFICATION LABEL

Manufactured by	Fuji Heavy Industries LTD
Date of Manufacture	12/12

GVWR (kg)	1950
GAWR Front (kg)	900
GAWR Rear (kg)	1000

VEHICLE SEATING AND WEIGHT CAPACITY

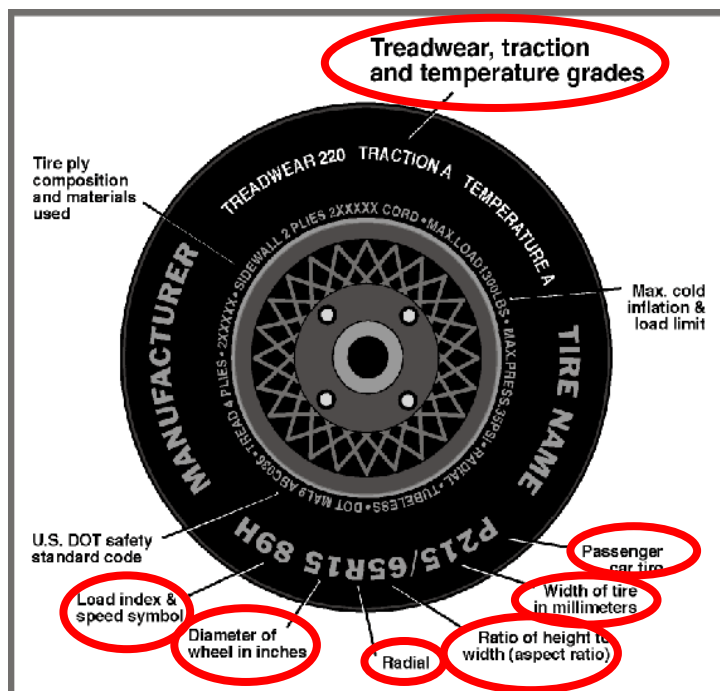
Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	N/A	
Number of Occupants	2	3	N/A	5
Capacity Wt. (VCW) (kg)				408.0
Cargo Wt. (RCLW) (kg)				67.8

DATA SHEET NO. 1 (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2013 Subaru Impreza Station Wagon
 Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
 Test Date: 03/07/13



DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold / Test Pressure (kPa)	230	220
Recommended Tire Size	P205/55R16	P205/55R16
Tire Size on Vehicle	P205/55R16	P205/55R16
Tire Manufacturer	Yokohama	Yokohama
Tire Model	AVID S 30	AVID S 30
Treadwear	320	320
Traction Grade	B	B
Temperature Grade	A	A
Tire Plies Sidewall	1 PLY	1 PLY
Tire Plies Body	4 PLY	4 PLY
Load Index/Speed Symbol	89V	89V
Tire Material	Polyester-Steel-Nylon	Polyester-Steel-Nylon
DOT Safety Code Right	FD8K-PEM 4912	FD8K-PEM 4912
DOT Safety Code Left	FD8K-PEM 4912	FD8K-PEM 4912

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

Test Vehicle: 2013 Subaru Impreza Station Wagon NHTSA No.: MD5501
 Test Program: NCAP Frontal Impact Test Date: 03/07/13

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	398.4	279.6		445.6	331.8	
Right	kg	382.8	269.0		418.2	336.0	
Ratio	%	58.7	41.3		56.4	43.6	
Totals	kg	781.2	548.6	1329.8	863.8	667.8	1531.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1329.8
Weight of 1 P572E ATD & 1 P572O ATD	kg	139.3
Rated Cargo/Luggage Weight (RCLW)	kg	67.8
Vehicle Target Weight (TVTW)	kg	1536.9

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	683	688	673	683	1093
As Tested	mm	670	673	655	661	1155
Post Test	mm	675	654	654	630	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2650
Total Vehicle Length at Left Side	mm	4232
Total Vehicle Length at Centerline	mm	4417
Total Vehicle Length at Right Side	mm	4237
Weight of Ballast in Cargo Area	kg	0
Weight of Vehicle Components Removed	kg	53
Amount of Stoddard Solvent in Fuel Tank	liters	51.1

LIST OF COMPONENTS REMOVED TO MEET TEST WEIGHT:

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

Test Vehicle: 2013 Subaru Impreza Station Wagon NHTSA No.: MD5501
Test Program: NCAP Frontal Impact Test Date: 03/07/13

TARGET VEHICLE STRUCTURAL MEASUREMENT

	Elements	Pre-Test (mm)
1	Total Length	4417
2	Total Width	1745
3	Bumper Top Height	496
4	Bumper Bottom Height	412
5	Longitudinal Member Top Height	494
6	Distance Between Longitudinal Members	925
7	Longitudinal Member Width	65
8	Engine Top Height	825
9	Engine Bottom Height	195
10	Engine and Gearbox Width	700
11	Front Bumper-Engine Distance	450
12	Front Shock Absorber Fixing Height	825
13	Bonnet Leading Edge Height	740
14	Front Shock Absorber Fixing Width	1120
15	Front Bumper – Front Axle Distance	930
16	Front Axle – A-Pillar Distance	502
17	A-Pillar – B-Pillar Distance	1100
18	B-Pillar – Rear Axle Distance	1077
19	B-Pillar – C-Pillar Distance	954
20	Roof Sill Bottom Height	1282
21	Roof Sill Top Height	1345
22	Floor Sill Bottom Height	262
23	Floor Sill Top Height	331

DATA SHEET NO. 2

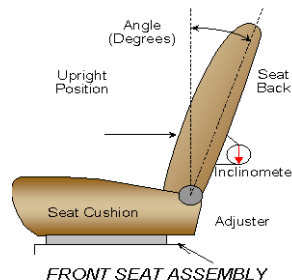
SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

Test Vehicle: 2013 Subaru Impreza Station Wagon
 Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
 Test Date: 03/07/13

NORMAL DESIGN RIDING POSITION

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



	Degree
Driver Seat back angle:	1.6
Passenger Seat back angle:	-1.4

SEAT FORE/AFT POSITIONS

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

Driver: Mid position

Passenger: Full forward

	Total Fore/Aft Travel	Placed in Position No.
Driver Seat	280	10
Passenger Seat	240	12

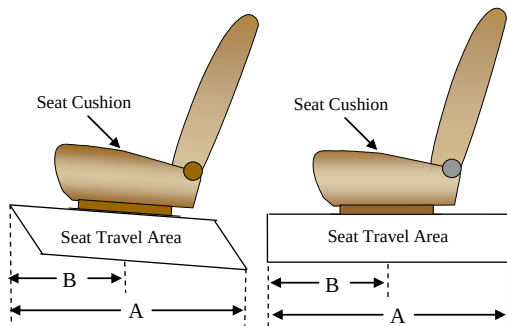
SEAT BELT UPPER ANCHORAGE

Describe the method of positioning seat belt upper anchorages.

Driver: Mid position

Passenger: Full forward

	Total No. of Positions	Placed in Position No.
Driver Seat	4	1
Passenger Seat	4	0



DATA SHEET NO. 2 (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM AND STEERING WHEEL DATA

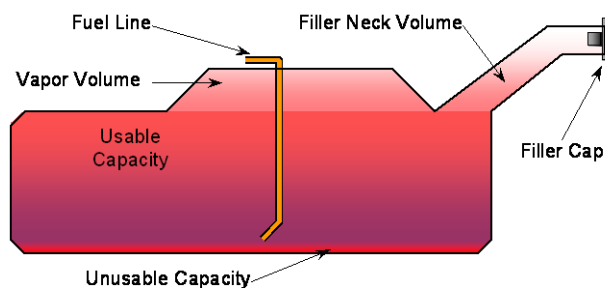
Test Vehicle: 2013 Subaru Impreza Station Wagon
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NHTSA No.: MD5501
 Test Date: 03/07/13

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	54.9
Usable Capacity of "Optional Tank"	N/A
92%-94% of Usable Capacity	50.5 – 51.6
Actual Amount of Solvent Used	51.1
1/3 of Usable Capacity	18.3

The test vehicle is equipped with an electric fuel pump. The fuel pump operates a few seconds after the ignition switch is turned ON. After that, pump operates only while engine is running.

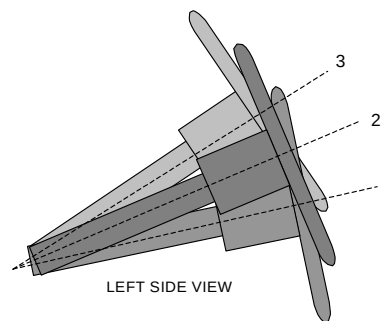


VEHICLE FUEL TANK ASSEMBLY

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

STEERING COLUMN POSITIONS



STEERING COLUMN ASSEMBLY

	Degrees	Fore/Aft Position (mm)
Lowermost Position No. 1	21.9	20
Geometric Center Position No. 2	23.5	20
Uppermost Position No. 3	25.0	20
Telescoping Steering Wheel Travel	N/A	40
Test Position	23.5	20

DATA SHEET NO. 3

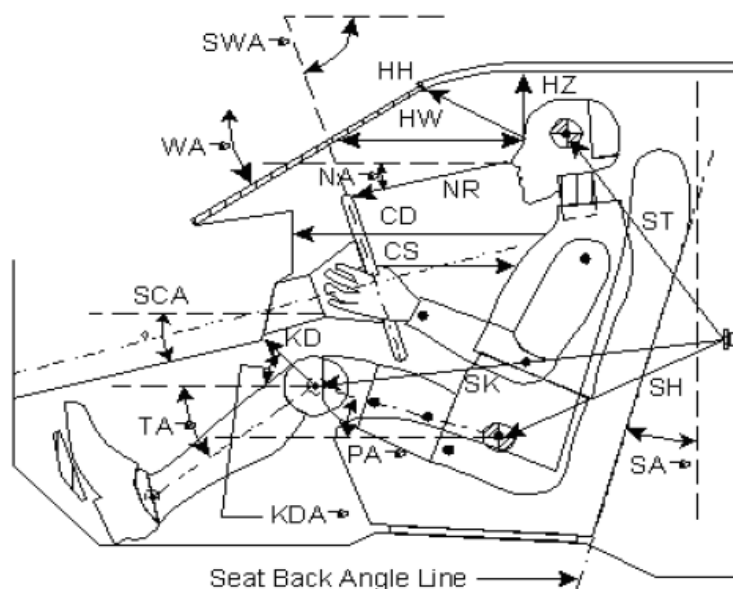
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2013 Subaru Impreza Station Wagon

NHTSA No.: MD5501

Test Program: NCAP Frontal Impact

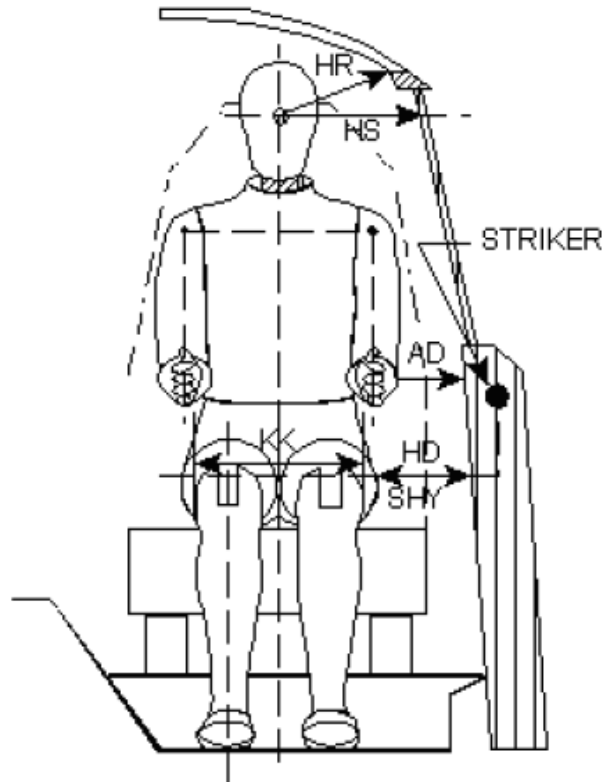
Test Date: 03/07/13



Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.8		
SWA°	Steering Wheel Angle		66.9		
SCA°	Steering Column Angle		23.1		
SA°	Seat Back Angle (on headrest post)		1.6		-1.4
HZ	Head to Roof (Z)	211	90.0	233	90.0
HH	Head to Header	334	33.0	303	50.0
HW	Head to Windshield	643	0.0	683	0.0
NR	Nose to Rim	356	9.5		
CD	Chest to Dash	527		449	
CS	Chest to Steering Hub	291	1.9		
RA	Rim to Abdomen	177	0.0		
KDL	Left Knee to Dash	172	23.0	101	38.0
KDR	Right Knee to Dash	164	27.4	119	38.0
PA°	Pelvic Angle		25.0		21.7
TA°	Tibia Angle		44.5		48.5
SK	Striker to Knee	613	11.2	720	8.3
ST	Striker to Head	438	-75.5	419	-61.0
SH	Striker to H-Point	328	45.5	403	24.0

DUMMY LATERAL CLEARANCE DIMENSIONS

NHTSA No.: MD5501
Test Date: 03/07/13



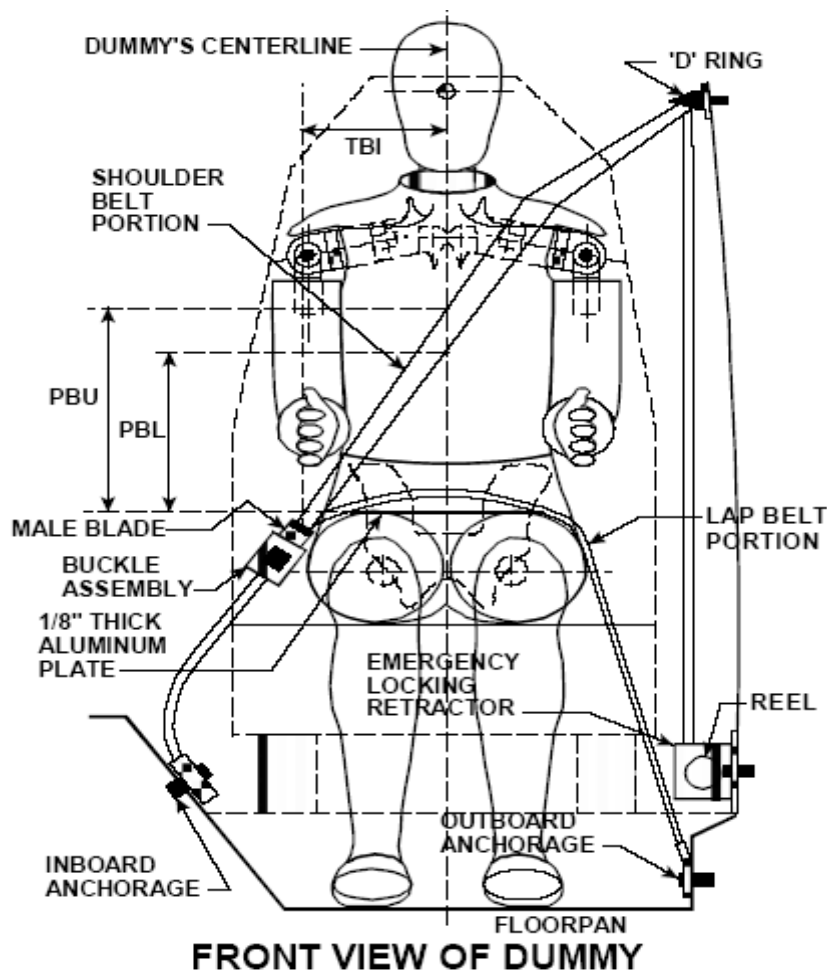
Code	Measurement Description	Driver	Passenger
AD	Arm to Door	140	96
HD	H-Point to Door	144	194
HR	Head to Side Header	248	266
HS	Head to Side Window	355	373
KK	Knee to Knee	300	167
SHY	Striker to H-Point (Y Direction)	142	173
AA	Ankle to Ankle	293	169

DATA SHEET NO. 5

SEAT BELT POSITIONING DATA

Test Vehicle: 2013 Subaru Impreza Station Wagon
 Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
 Test Date: 03/07/13



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU – Top surface of reference to belt upper edge	mm	363	316
PBL – Top surface of reference to belt lower edge	mm	281	223

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	855	930
Lap belt length as measured on ATD	mm	780	915
Remainder of belt on reel	mm	1060	830
Total belt length for continuous webbing systems	mm	2695	2675

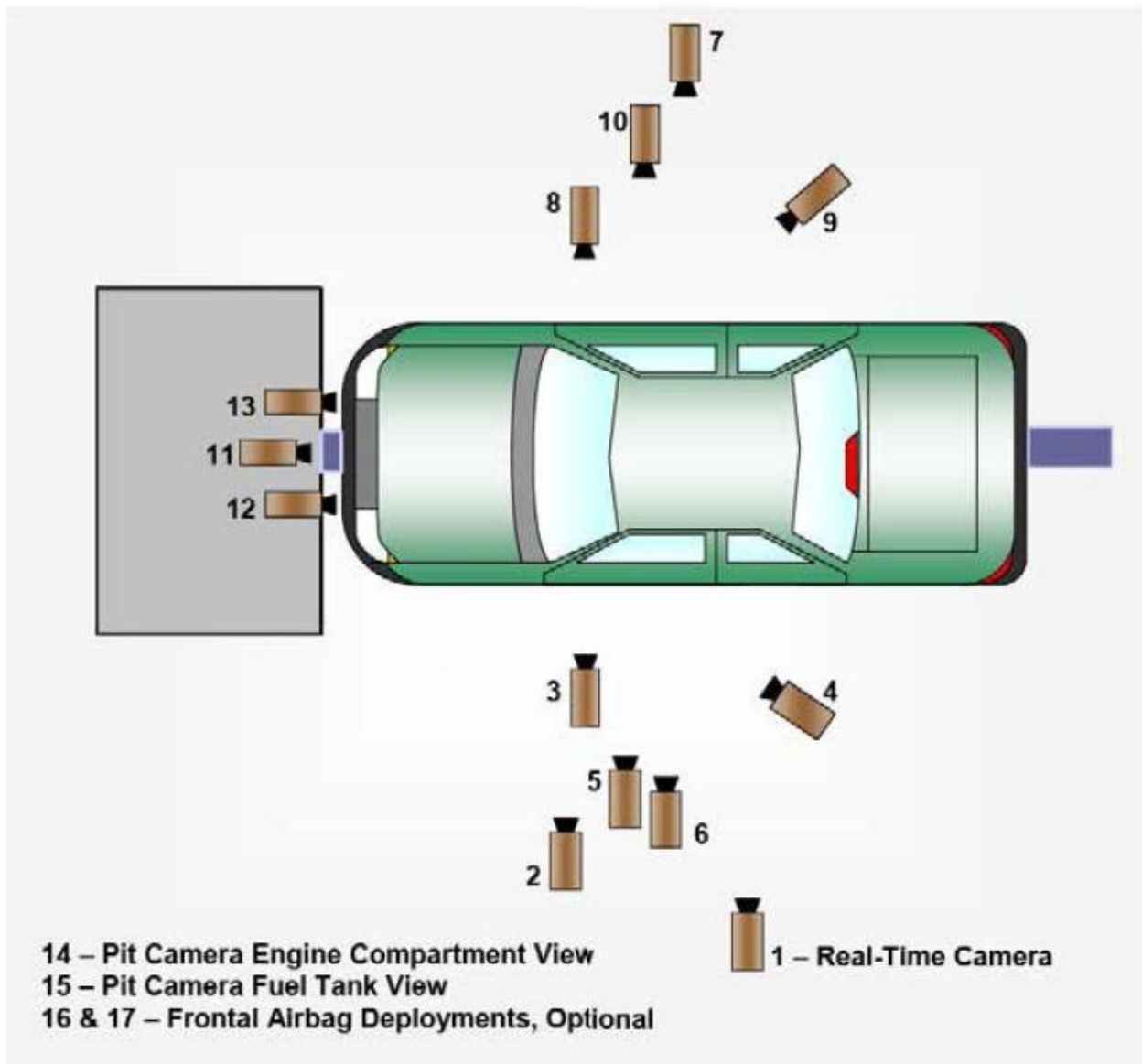
DATA SHEET NO. 6

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2013 Subaru Impreza Station Wagon
Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
Test Date: 03/07/13

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 (CONTINUED)**HIGH SPEED CAMERA LOCATIONS AND DATA**Test Vehicle: 2013 Subaru Impreza Station WagonNHTSA No.: MD5501Test Program: NCAP Frontal ImpactTest Date: 03/07/13**CAMERA LOCATIONS**

No.	Camera View	Location (mm)			Lens (mm)	Frame Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-187	-6487	-846	Zoom	30
2	Driver Close-Up	1115	-5107	-1337	50	1000
3	Left Front Half	907	-5088	-1180	25	1000
4	Left Angle	3916	-2042	-1616	16	1000
5	Steering Column - Top	1701	-4341	-1778	25	1000
6	Steering Column – Bottom	1905	-4314	-1006	25	1000
7	Right Overall	1630	4887	-1178	25	1000
8	Passenger Close-Up	1186	5136	-1204	50	1000
9	Right Front Half	2170	5315	-998	12.5	1000
10	Right Angle	4025	2385	-1647	25	1000
11	Windshield	76	0	-2553	8.5	1000
12	Driver Windshield	76	-410	-2574	16	1000
13	Passenger Windshield	76	410	-2553	16	1000
14	Pit Front	2118	0	2984	16	1000
15	Pit Rear	641	0	2884	8.5	1000
16	Onboard Driver Airbag (Optional)	NA	NA	NA	8.5	1000
17	Onboard Passenger Airbag (Optional)	NA	NA	NA	8.5	1000

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

DATA SHEET NO. 7

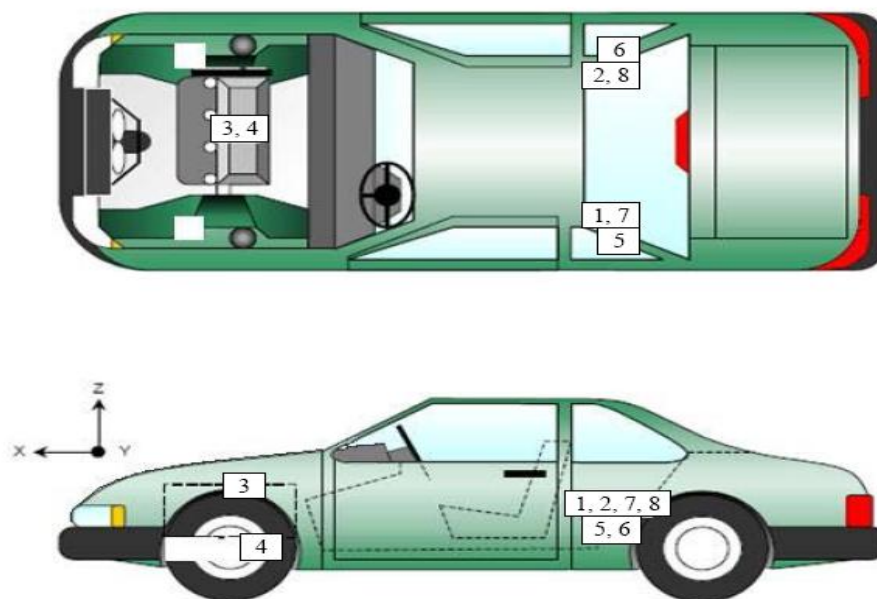
VEHICLE ACCELEROMETER DATA

Test Vehicle: 2013 Subaru Impreza Station Wagon

NHTSA No.: MD5501

Test Program: NCAP Frontal Impact

Test Date: 03/07/13



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Camera View	Location (mm)		
		X	Y	Z
1	Left Rear Accelerometer – X Direction	2050	-560	325
2	Right Rear Accelerometer – X Direction	2050	600	321
3	Engine Top X	4225	-10	600
4	Engine Bottom X	3860	85	213
5	Left Rear Accelerometer – Z Direction	2050	-480	321
6	Right Rear Accelerometer – Z Direction	2050	520	312

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

DATA SHEET NO. 8

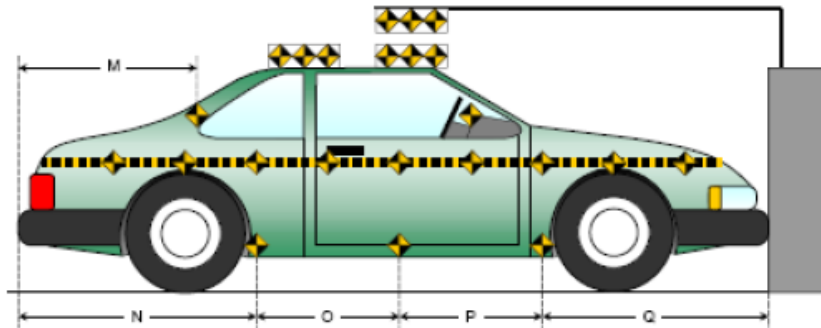
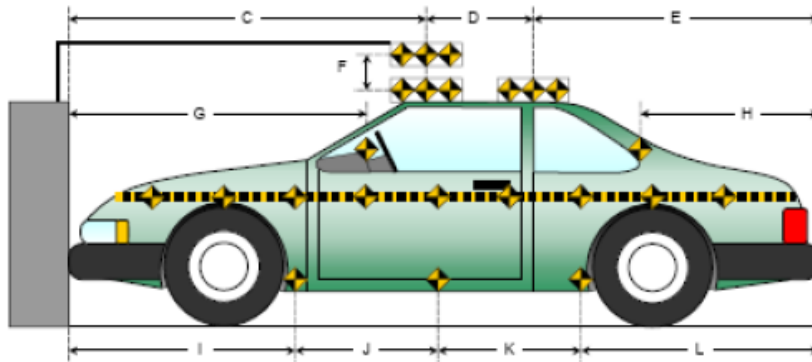
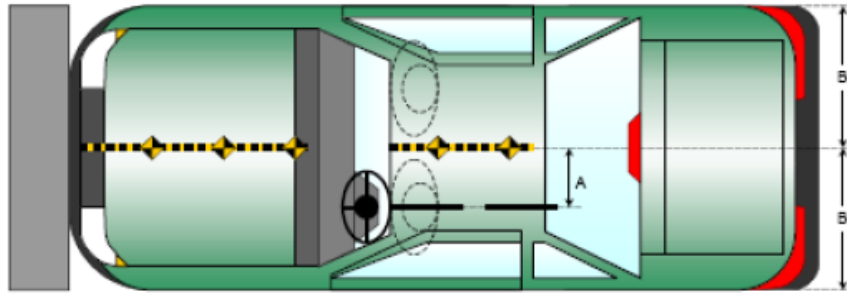
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2013 Subaru Impreza Station Wagon
 Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
 Test Date: 03/07/13

Item	Value
A	360
B	610
C	2412
D	610
E	1421
F	ND
G	1719
H	937
I	1188
J	898
K	880
L	1267
M	929
N	1420
O	878
P	905
Q	1196

All units in millimeters

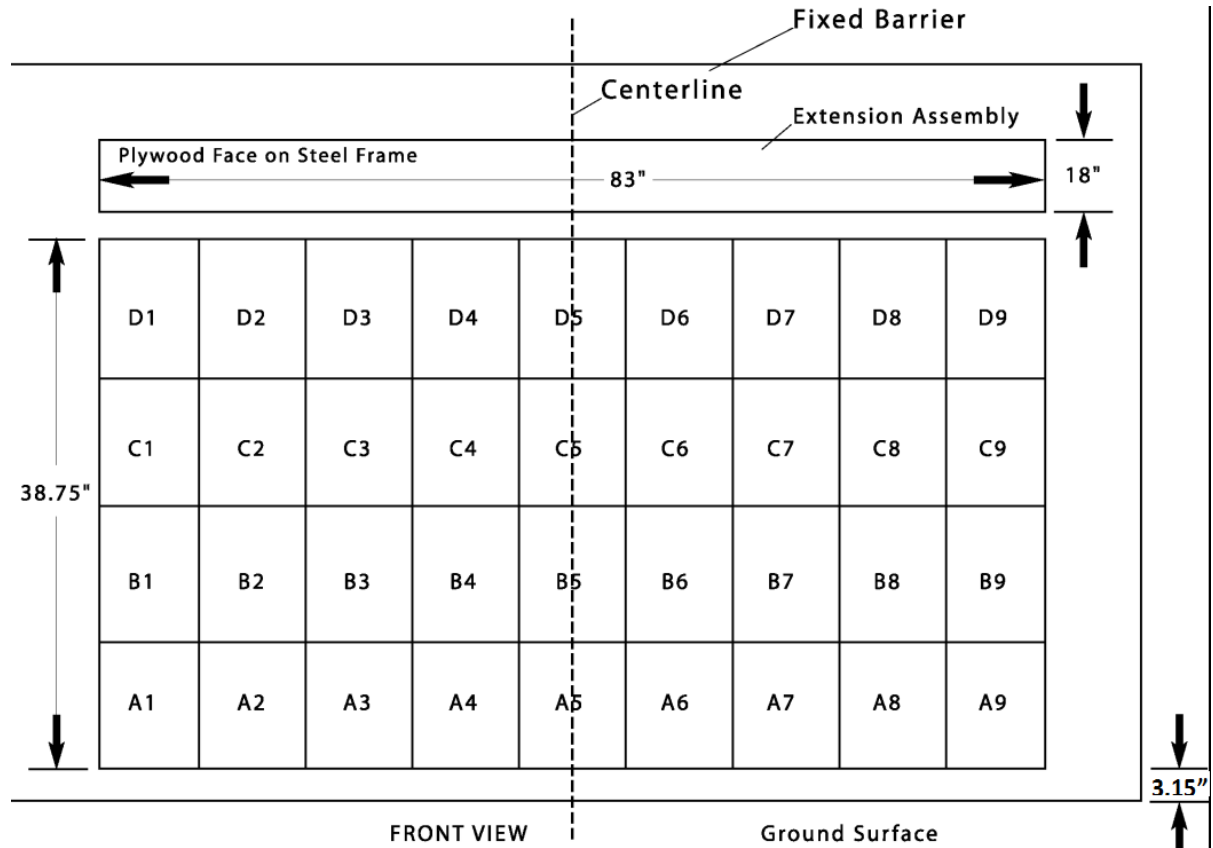


DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2013 Subaru Impreza Station Wagon
 Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
 Test Date: 03/07/13



DATA SHEET NO. 10

TEST VEHICLE SUMMARY OF RESULTS

Test Vehicle: 2013 Subaru Impreza Station Wagon NHTSA No.: MD5501
Test Program: NCAP Frontal Impact Test Date: 03/07/13

INSTRUMENTATION

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

CAMERA COVERAGE

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

DATA SHEET NO. 11**POST-TEST OBSERVATIONS**Test Vehicle: 2013 Subaru Impreza Station WagonNHTSA No.: MD5501Test Program: NCAP Frontal ImpactTest Date: 03/07/13**TEST DUMMY INFORMATION AND CONTACT LOCATIONS**

Description	Driver	Passenger
Dummy Type / Serial No.	Hybrid III 50th/ 037	Hybrid III 5th/ 426
Head Contact	Front Airbag, headrest	Front Airbag, headrest
Upper Torso Contact	Front Airbag	Front Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Glove box
Right Knee Contact	Knee Airbag	Glove box

DOOR OPENING AND SEAT TRACK INFORMATION

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

VEHICLE REBOUND FROM BARRIER

Measured Parameters	Units	Value
Left Side	mm	790
Center	mm	805
Right Side	mm	795
Average	mm	797

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

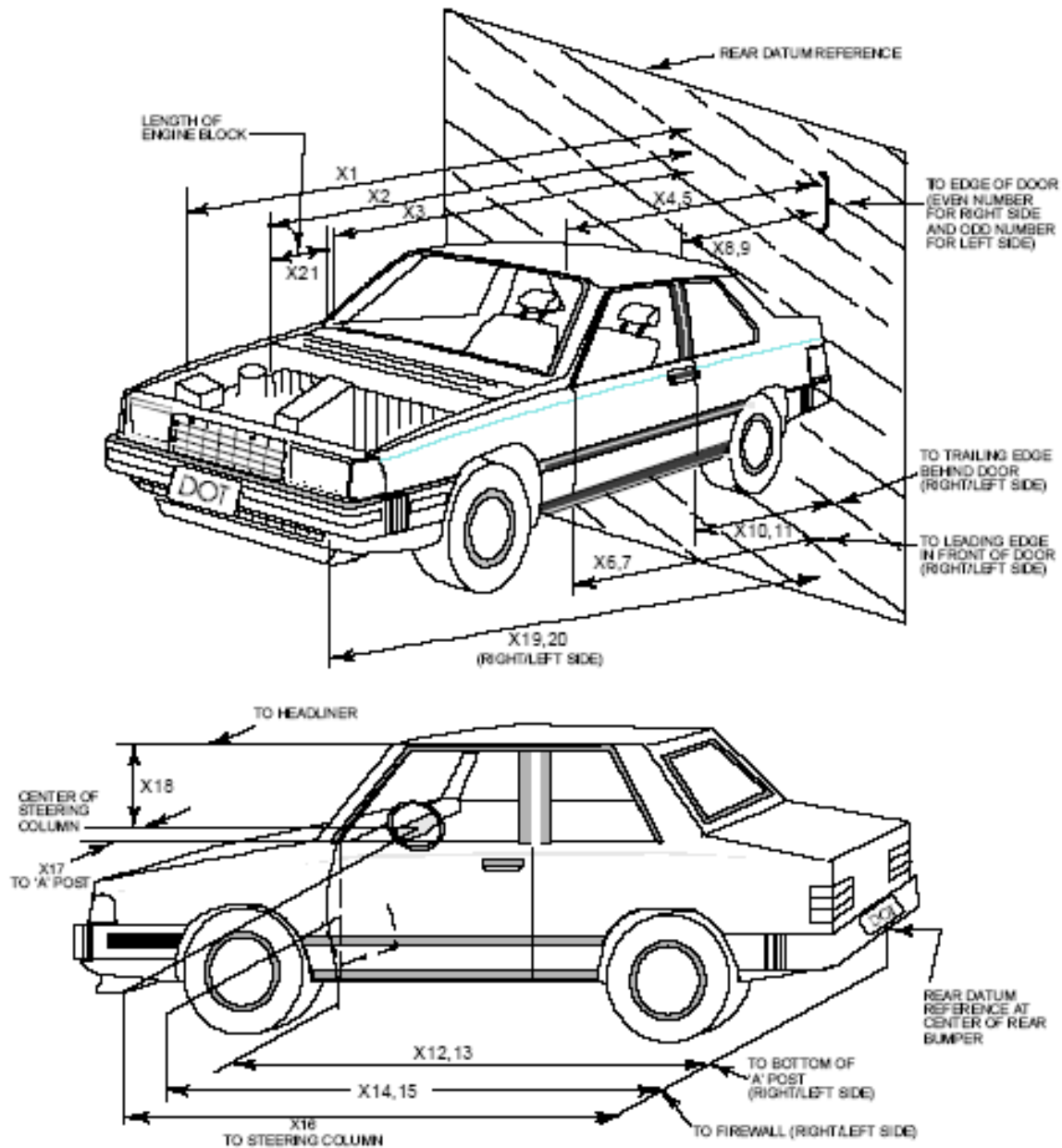
Restraint Type	Driver (Occupant 1)		Passenger (Occupant 2)	
	Installed	Deployed	Installed	Deployed
Front Airbag	Yes	Yes	Yes	Yes
Knee Airbag	Yes	Yes	No	N/A
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	No	NA	No	NA
Side Curtain Airbag	Yes	No	Yes	No
Side Torso/Pelvis Airbag	Yes	No	Yes	No

DATA SHEET NO. 12

VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2013 Subaru Impreza Station Wagon
Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
Test Date: 03/07/13



DATA SHEET NO. 12 (CONTINUED)**VEHICLE PROFILE MEASUREMENTS**

Test Vehicle: 2013 Subaru Impreza Station Wagon
Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
Test Date: 03/07/13

No.	Measurement Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4417	3862	555
2	Rear Surface of Vehicle (RSOV) to Front of Engine	3952	3717	235
3	RSOV to Firewall	3324	3317	7
4	RSOV to Upper Leading Edge of Right Door	2975	2984	-9
5	RSOV to Upper Leading Edge of Left Door	2980	2975	5
6	RSOV to Lower Leading Edge of Right Door	2927	2917	10
7	RSOV to Lower Leading Edge of Left Door	2927	2912	15
8	RSOV to Upper Trailing Edge of Right Door	1902	1910	-8
9	RSOV to Upper Trailing Edge of Left Door	1908	1907	1
10	RSOV to Lower Trailing Edge of Right Door	1917	1907	10
11	RSOV to Lower Trailing Edge of Left Door	1922	1912	10
12	RSOV to Bottom of "A" Post-of Right Side	2982	2987	-5
13	RSOV to Bottom of "A" Post-of Left Side	2982	2982	0
14	RSOV to Firewall, Right Side	3314	3312	2
15	RSOV to Firewall, Left Side	3314	3314	0
16	RSOV to Steering Column	2512	2562	-50
17	Center of Steering Column to "A" Post	330	340	-10
18	Center of Steering Column to Headliner	430	430	0
19	RSOV to Right Side of Front Bumper	4237	3892	345
20	RSOV to Left Side of Front Bumper	4232	3907	325
21	Length of Engine Block	700	700	0
RD	RSOV to Right Side of Dash Panel	2837	2832	5
CD	RSOV to Center of Dash Panel	2837	2837	0
LD	RSOV to Left Side of Dash Panel	2832	2837	-5

All Dimensions in mm

DATA SHEET NO. 13

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2013 Subaru Impreza Station Wagon
Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
Test Date: 03/07/13

VEHICLE INFORMATION

VIN: JF1GPAC66DG826841
Vehicle Size Category: SW

Wheelbase: 2650
Test Weight (kg): 1531.6

ACCELEROMETER DATA

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

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

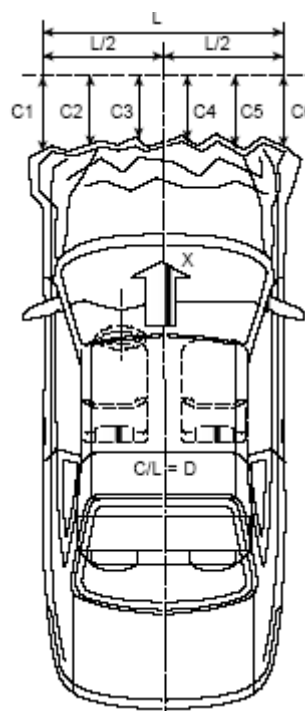
Integration Algorithm: Trapezoidal

Linearity: > 99%

Impact Velocity (km/h): 56.10

Velocity Change (km/h): 64.1

Time of Separation (ms): 88



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	4232	3907	325
C2	Crush zone 1 at left side	mm	4387	3902	485
C3	Crush zone 1 at left side	mm	4417	3882	535
C4	Crush zone 1 at right side	mm	4417	3867	550
C5	Crush zone 1 at right side	mm	4387	3867	520
C6	Crush zone 1 at right side	mm	4237	3992	345
L	C1 to C6	mm	1524		

DATA SHEET NO. 14

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Subaru Impreza Station Wagon
 Test Program: NCAP Frontal Impact

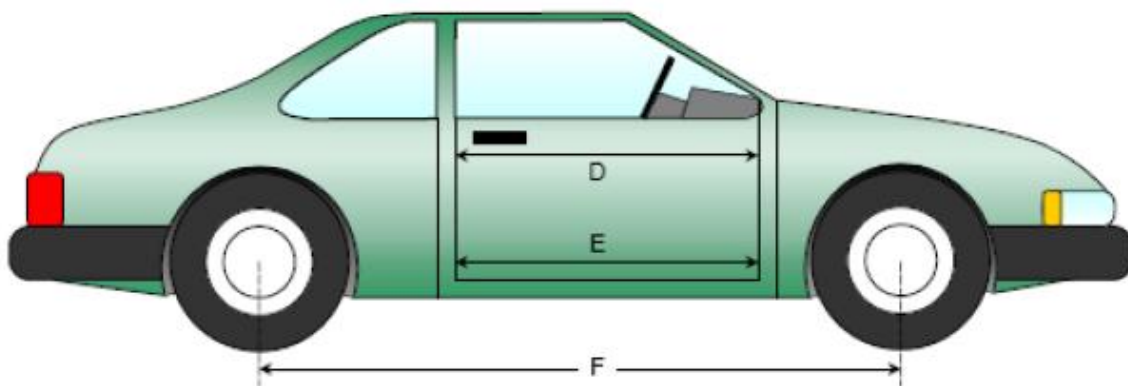
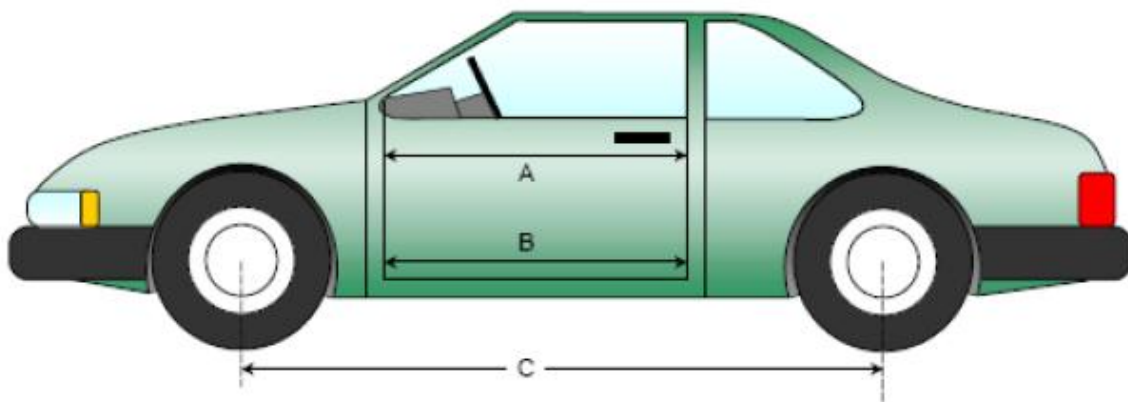
NHTSA No.: MD5501
 Test Date: 03/07/13

DOOR OPENING WIDTH

No.	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1035	1035	0
B	Left Side Lower	mm	850	850	0
C	Right Side Upper	mm	1033	1033	0
D	Right Side Lower	mm	870	850	20

WHEELBASE MEASUREMENTS

No.	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2650	2630	20
F	Right Side Wheelbase	mm	2650	2640	10



DATA SHEET NO. 14 (CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2013 Subaru Impreza Station Wagon

NHTSA No.: MD5501

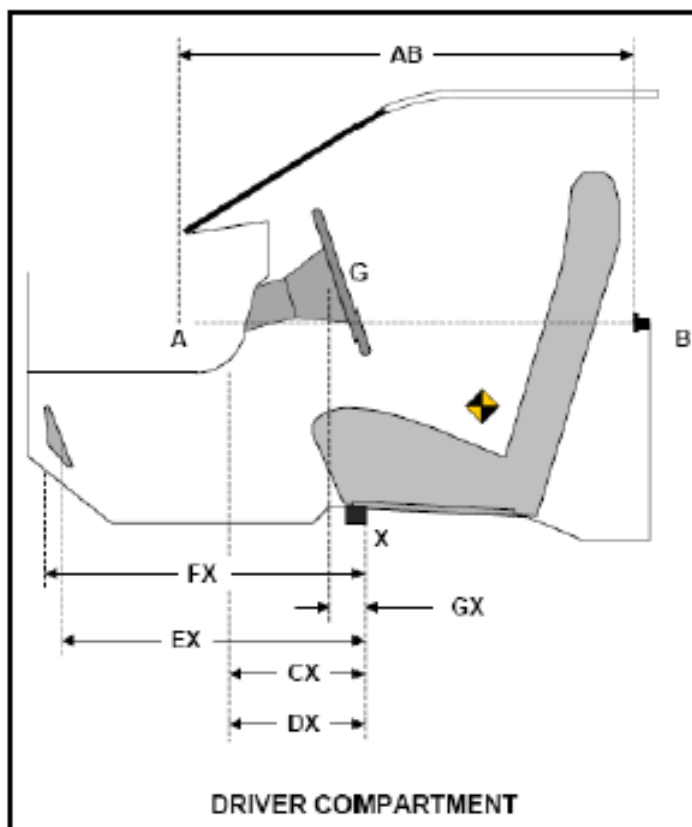
Test Program: NCAP Frontal Impact

Test Date: 03/07/13

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	1033	1033	0
CX	Left Knee Bolster to X	mm	280	305	-25
DX	Right Knee Bolster to X	mm	265	300	-35
EX	Brake Pedal to X	mm	530	540	-10
FX	Foot Rest to X	mm	585	580	5
GX	Center of Steering Column Wheel Hub to X	mm	60	150	-90

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

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

Test Vehicle: 2013 Subaru Impreza Station Wagon
 Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
 Test Date: 03/07/13

Please provide windshield mounting details.

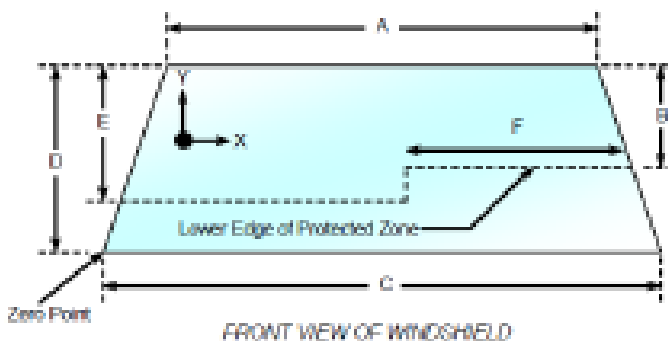
The standard requires that the post-test retention measurement be a minimum of 75% of the pre-test total periphery measurement for vehicle not equipped with occupant passive restraint and 50% for each side of the windshield for vehicle which are equipped with occupant passive restraints.

Temperature of windshield molding during test:

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	870.0	870.0	100
Right Side	880.0	880.0	100
Total	1750.0	1750.0	100

Item	Units	Value
A	mm	1220
B	mm	583
C	mm	1465
D	mm	883
E	mm	585
F	mm	140



AREAS OF PROTECTED ZONE FAILURES

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

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

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

X	Y
NA	NA
NA	NA
NA	NA
NA	NA

DATA SHEET NO. 15 (CONTINUED)

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

Test Vehicle: 2013 Subaru Impreza Station Wagon NHTSA No.: MD5501
Test Program: NCAP Frontal Impact Test Date: 03/07/13

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: _____ Test Time: _____

Stoddard Solvent Spillage Measurements

- A From impact until vehicle motion ceases: 0 oz.
(maximum allowable – 1 oz.)
- B For the 5-minute period after motion ceases: 0 oz.
(maximum allowable – 5 oz.)
- C For the following 25 minutes: 0 oz.
(maximum allowable – 1 oz./minutes)
- D Spillage: 0

DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2013 Subaru Impreza Station Wagon

NHTSA No.: MD5501

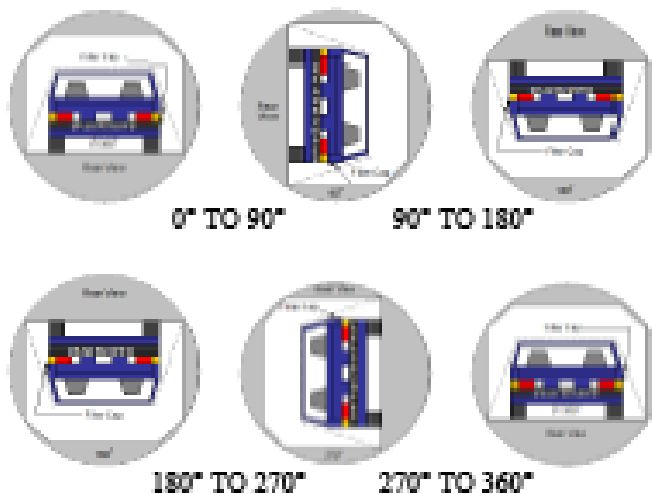
Test Program: NCAP Frontal Impact

Test Date: 03/07/13

1. The specified fixture rollover rate for each 90° of rotation is 50 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).

3. Details of Stoddard Solvent spillage:

None



SOLVENT COLLECTION TIME TABLE IN SECONDS

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

FMVSS 301 SPILLAGE TABLE

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

SOLVENT SPILLAGE LOCATION TABLE

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

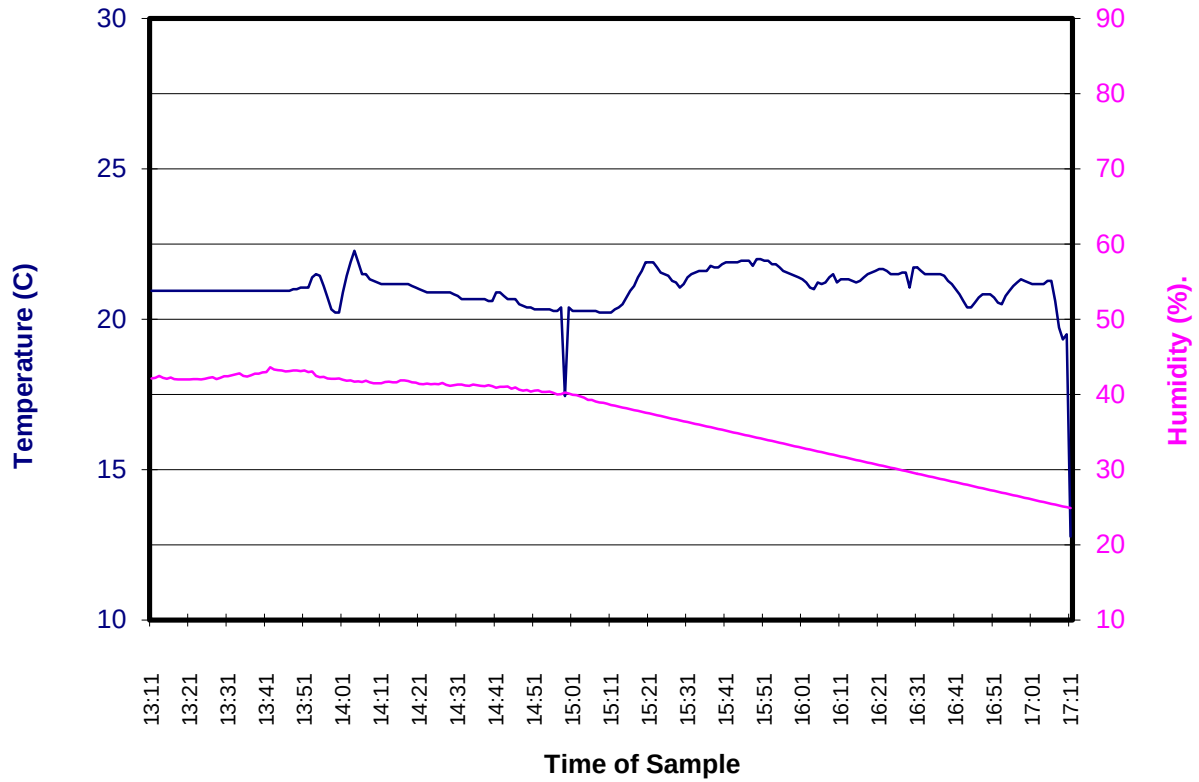
DATA SHEET NO. 17

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2013 Subaru Impreza Station Wagon
Test Program: NCAP Frontal Impact

NHTSA No.: MD5501
Test Date: 03/07/13

Frontal NCAP 130307: Test Time 17:11



APPENDIX A
PHOTOGRAPHS

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32	Post-Test Driver Dummy Window View	A-20
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001 Load Cell Location



002 Load Cell Wall



003 Manufacturer's Label



004 Tire Placard



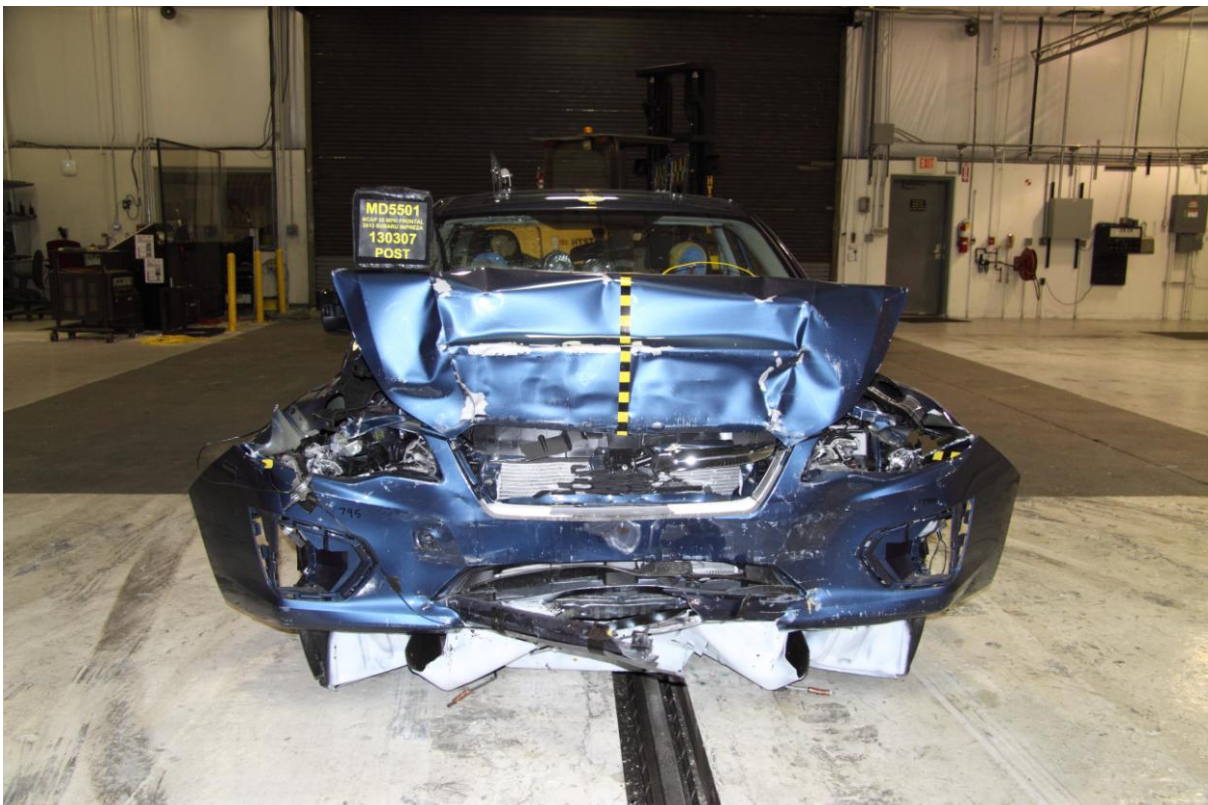
005 2013 Subaru Impreza Station Wagon Frontal As Delivered



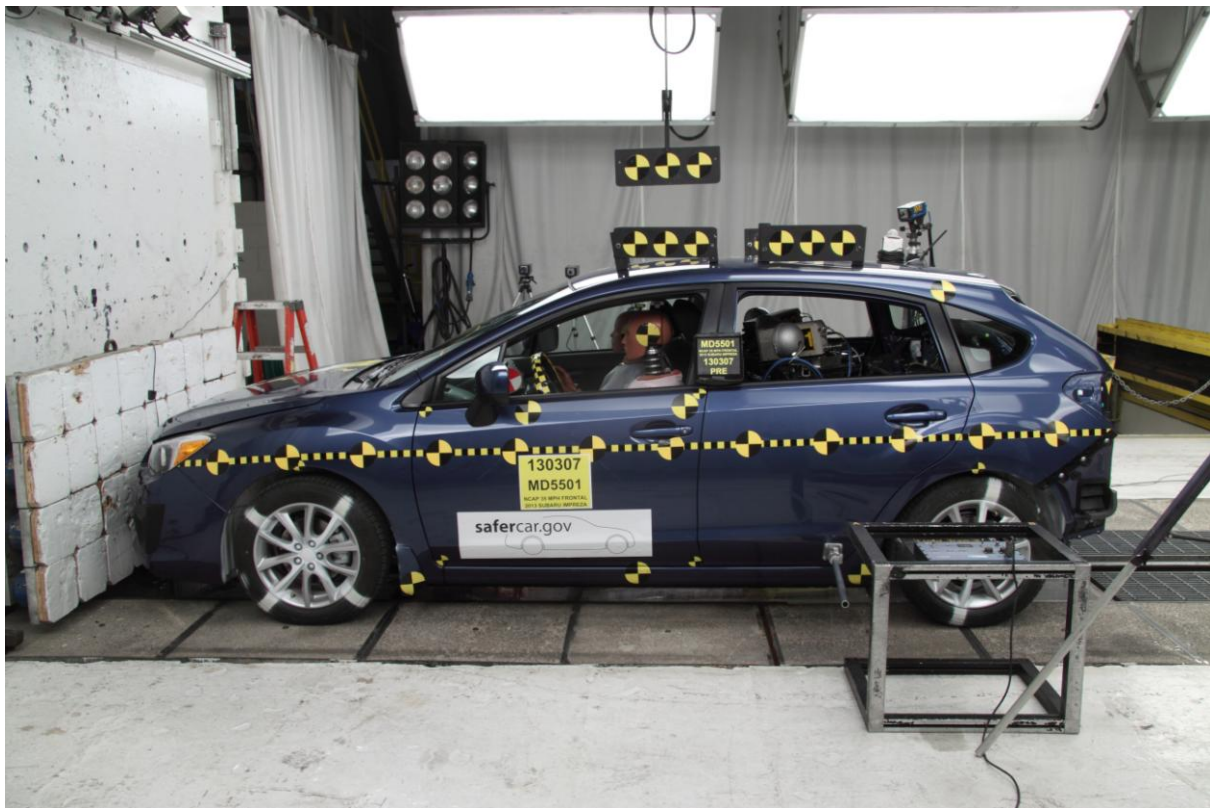
006 Left Rear 3-4 View, as Received



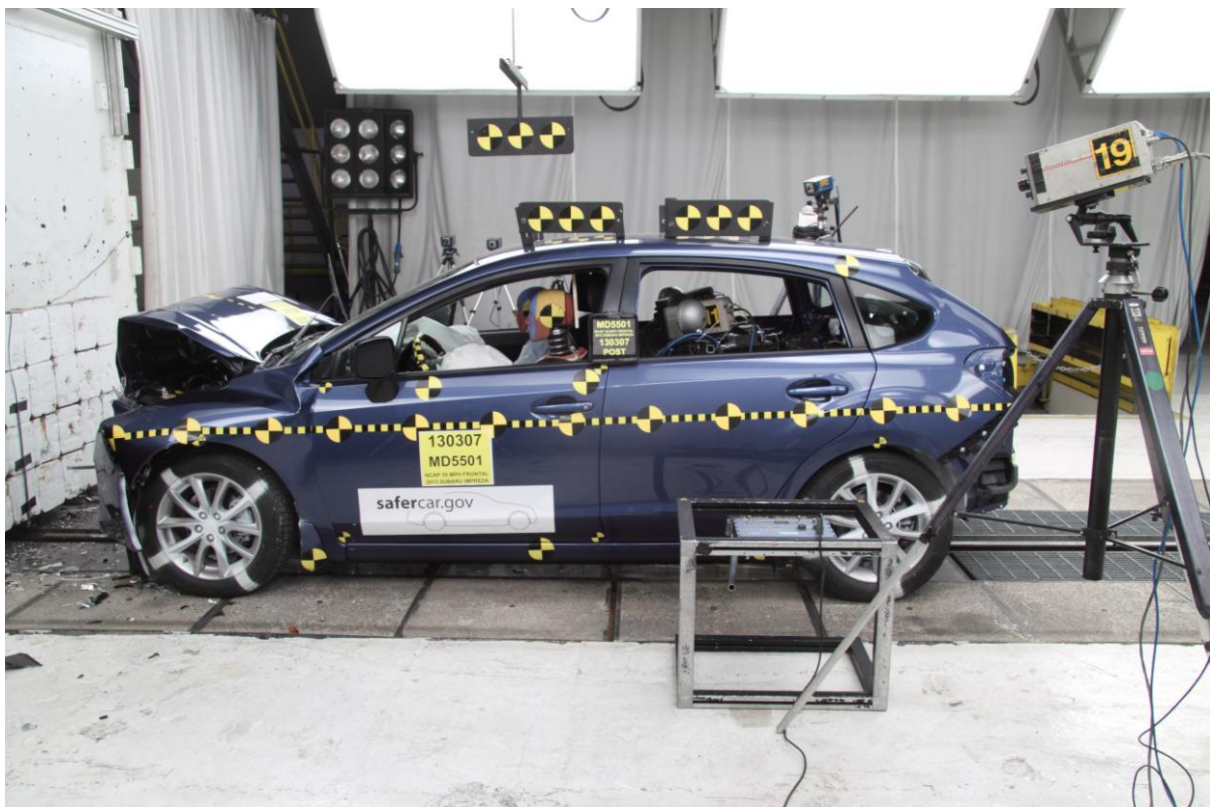
007 Pre-Test Front View of Test Vehicle



008 Post-Test Front View of Test Vehicle



009 Pre-Test Left View of Test Vehicle



010 Post-Test Left View of Test Vehicle



011 Pre-Test Right View of Test Vehicle



012 Post-Test Right View of Test Vehicle



013 Pre-Test Right Front 3-4 View



014 Post-Test Right Front 3-4 View



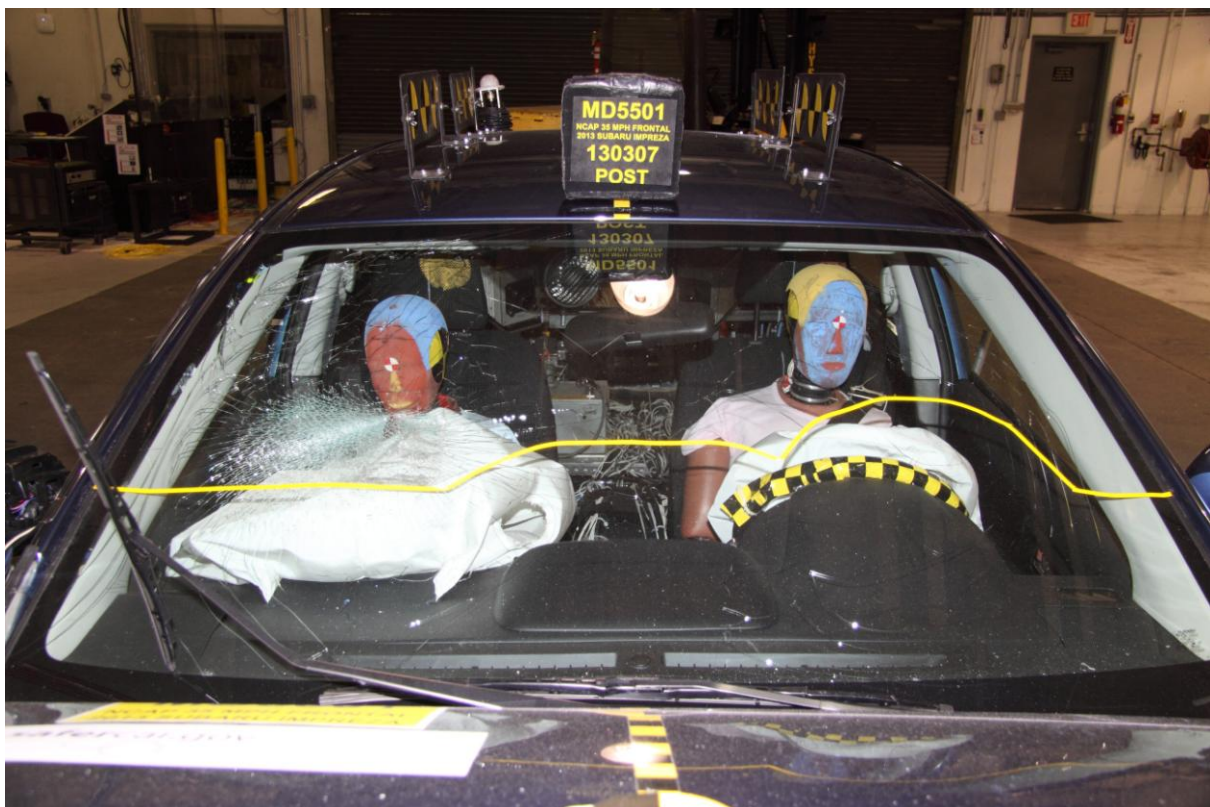
015 Pre-Test Left Rear 3-4 View



016 Post-Test Left Rear 3-4 View



017 Pre-Test Windshield View



018 Post-Test Windshield View



019 Pre-Test Engine Compartment View



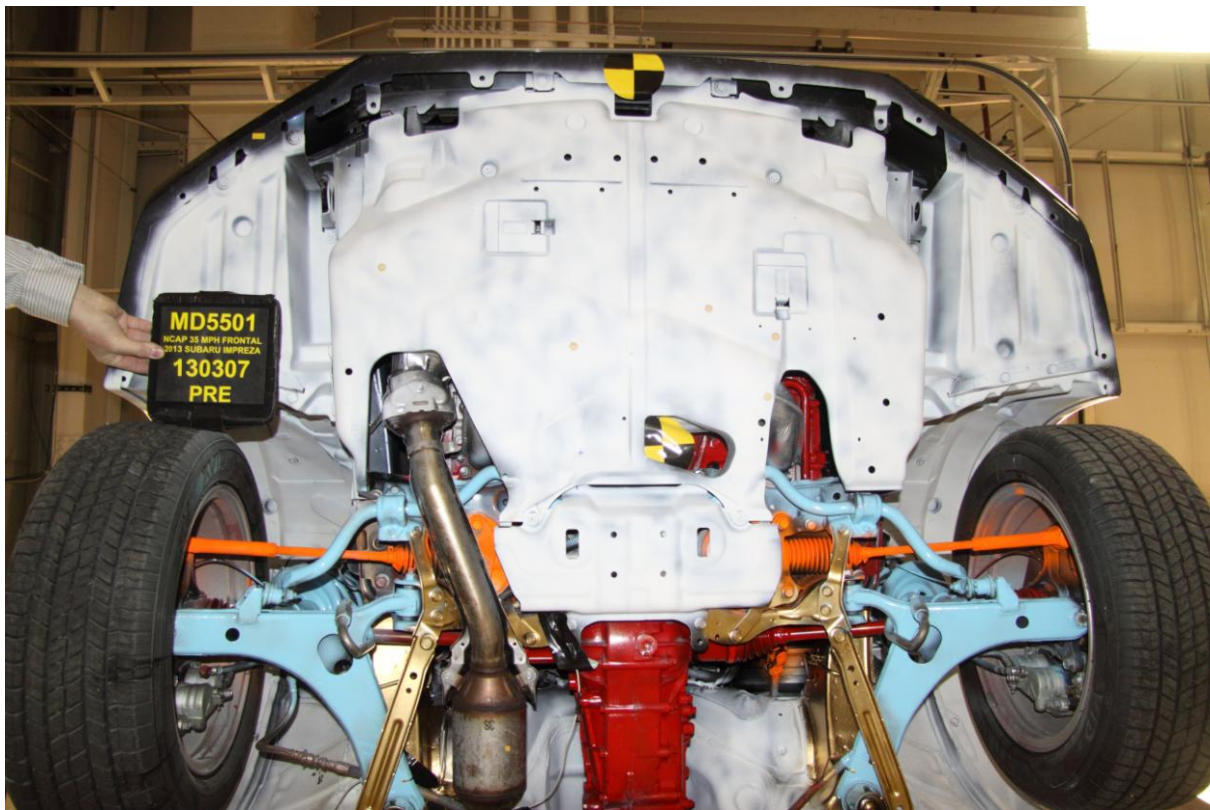
020 Post-Test Engine Compartment View



021 Pre-Test Fuel Filler Cap View



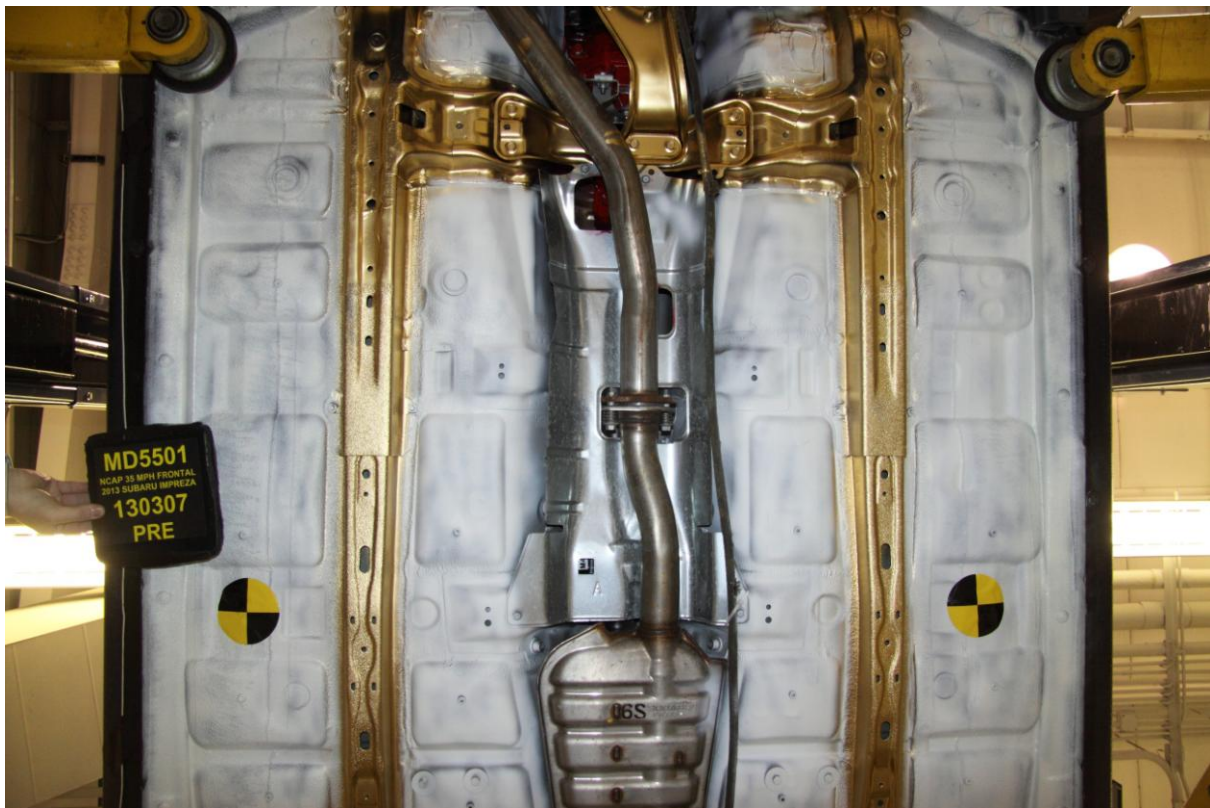
022 Post-Test Fuel Filler Cap View



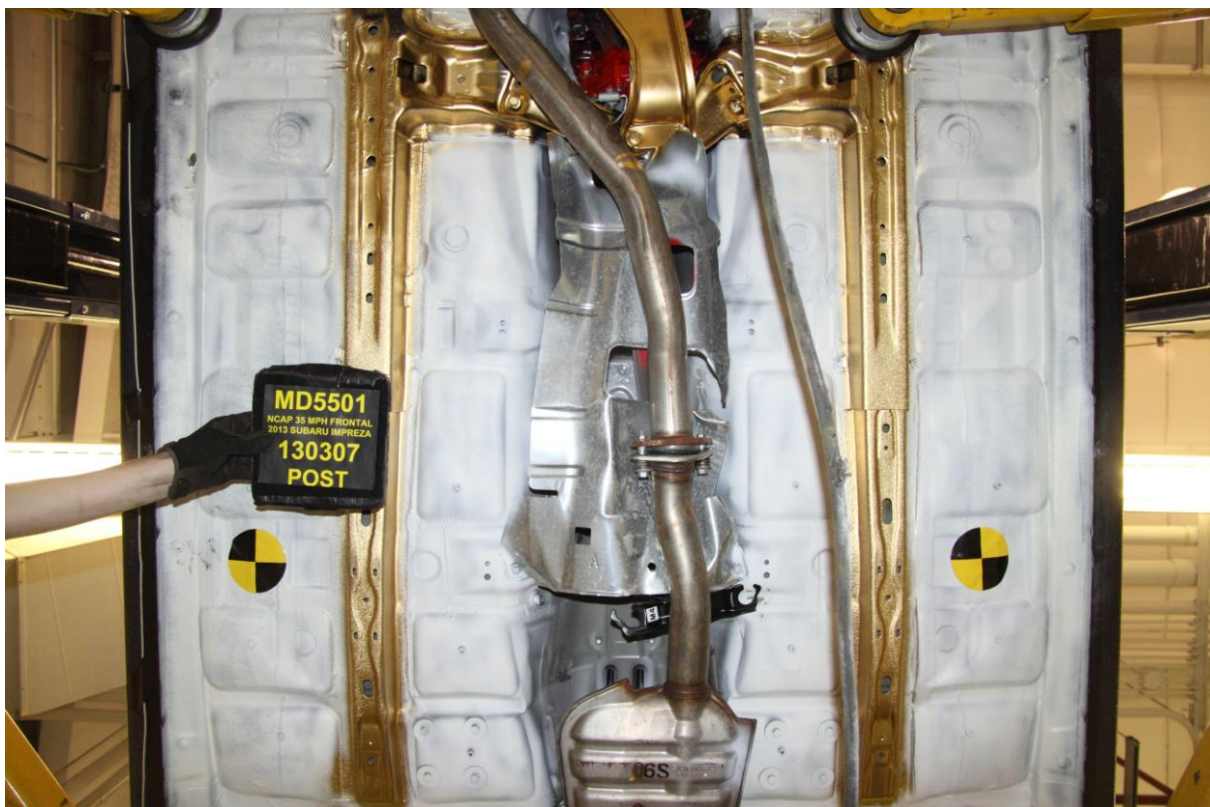
023 Pre-Test Front Underbody View



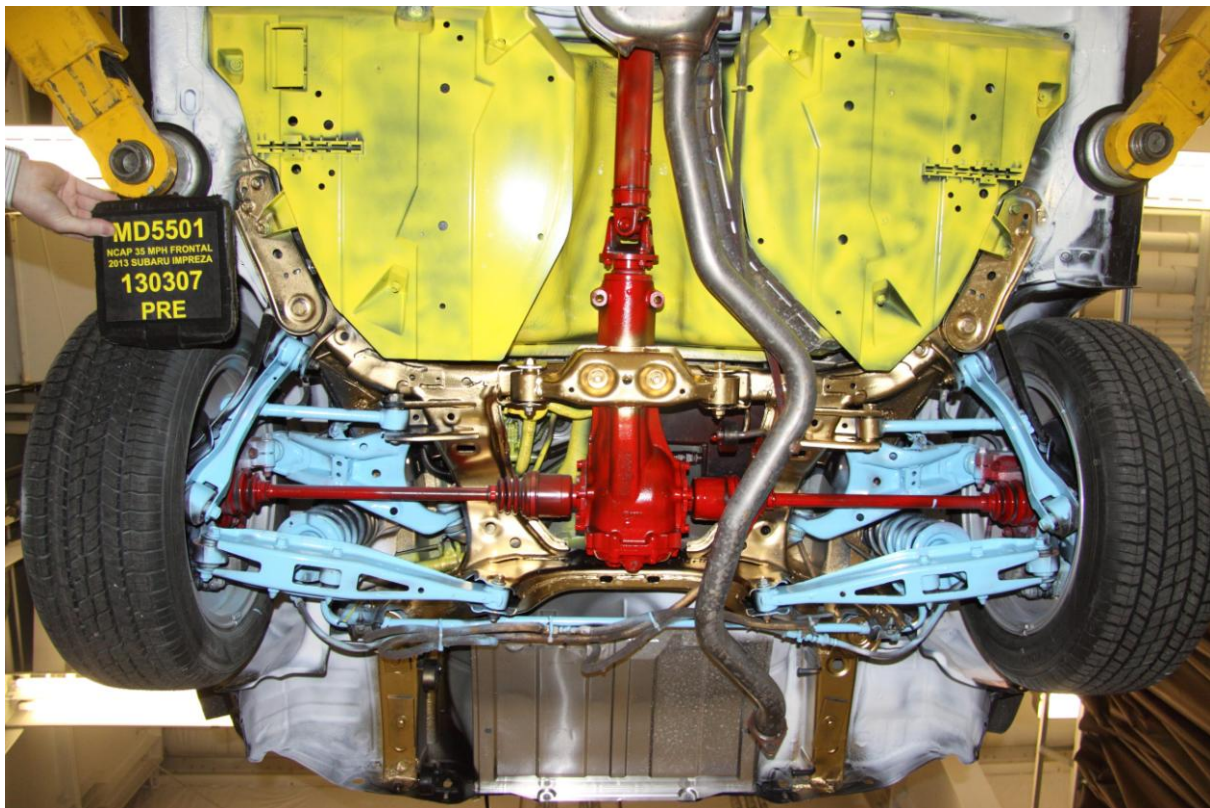
024 Post-Test Front Underbody View



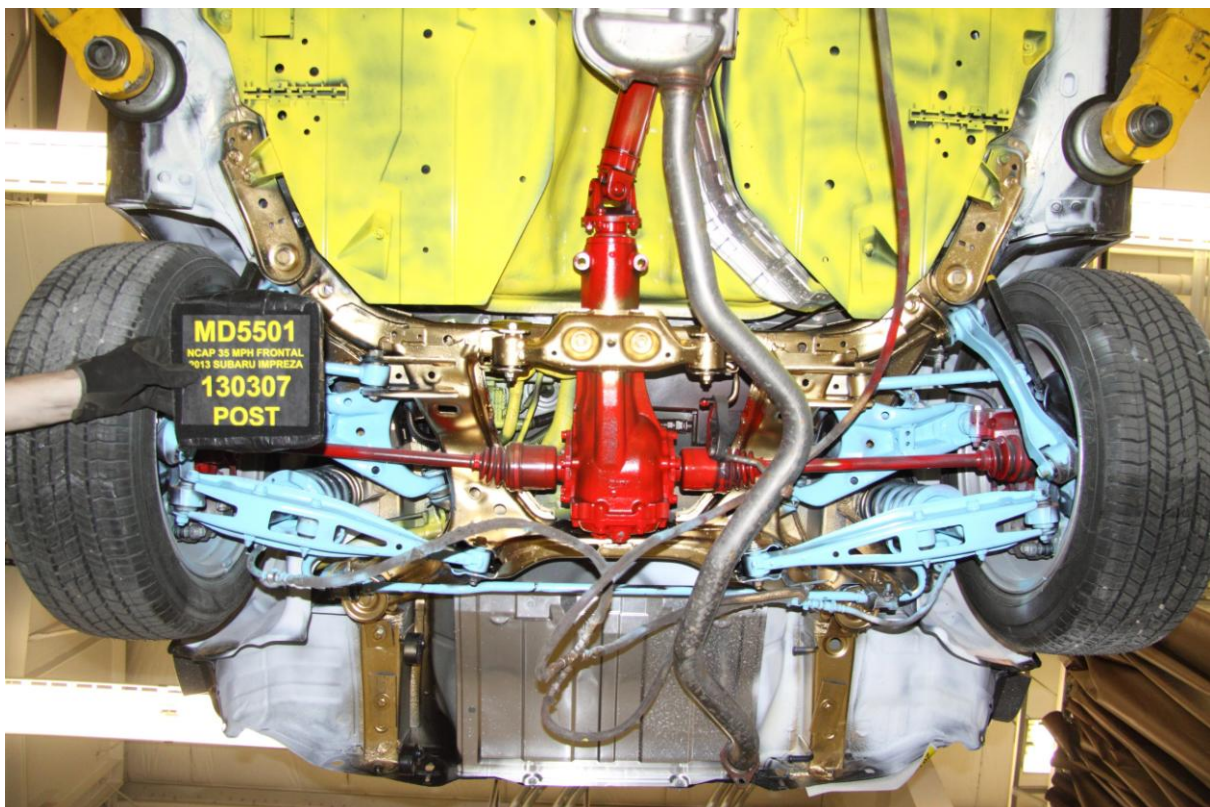
024a Pre-Test Mid Underbody View



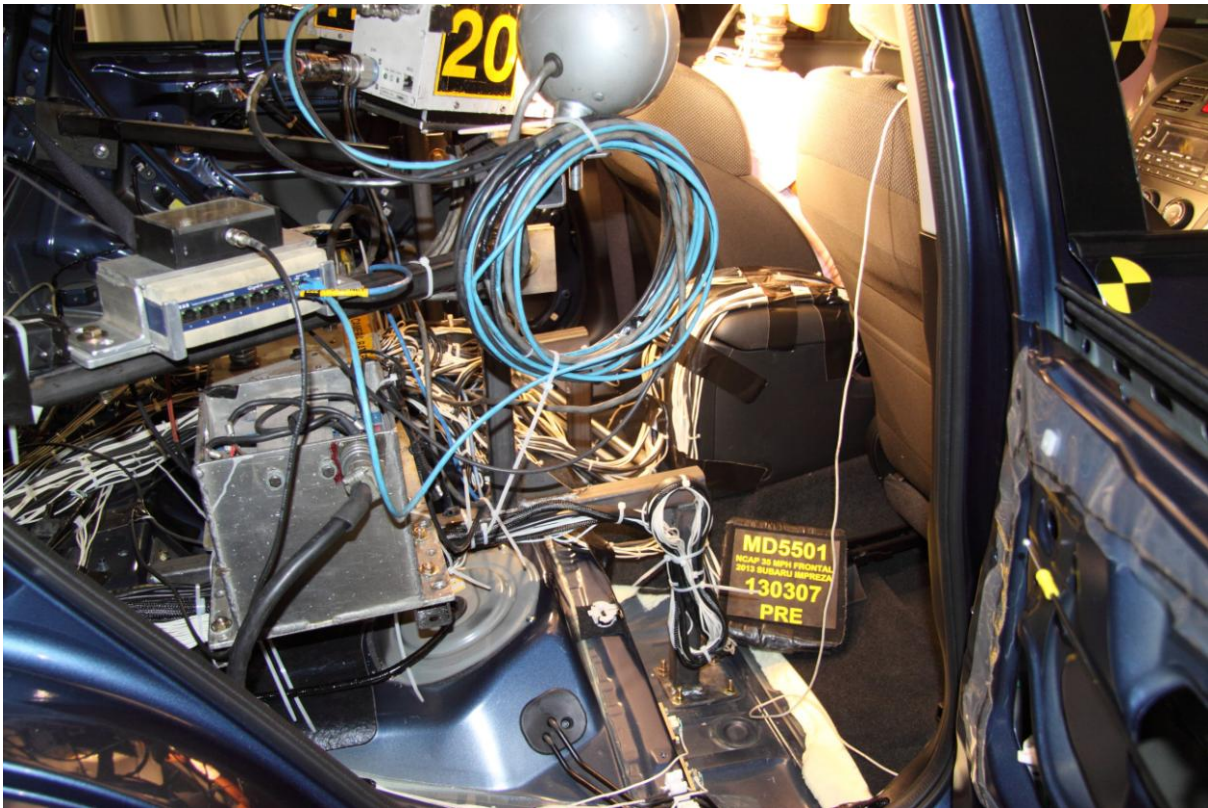
024b Post-Test Mid Underbody View



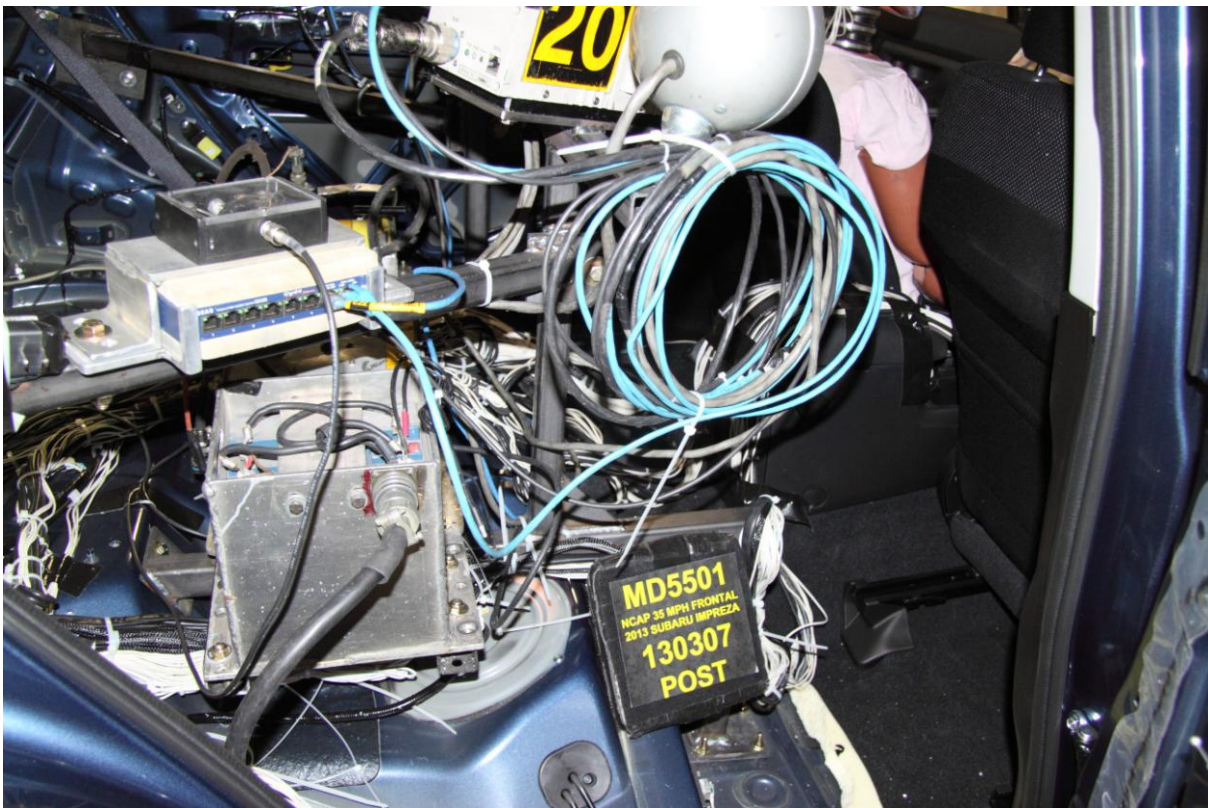
025 Pre-Test Rear Underbody View



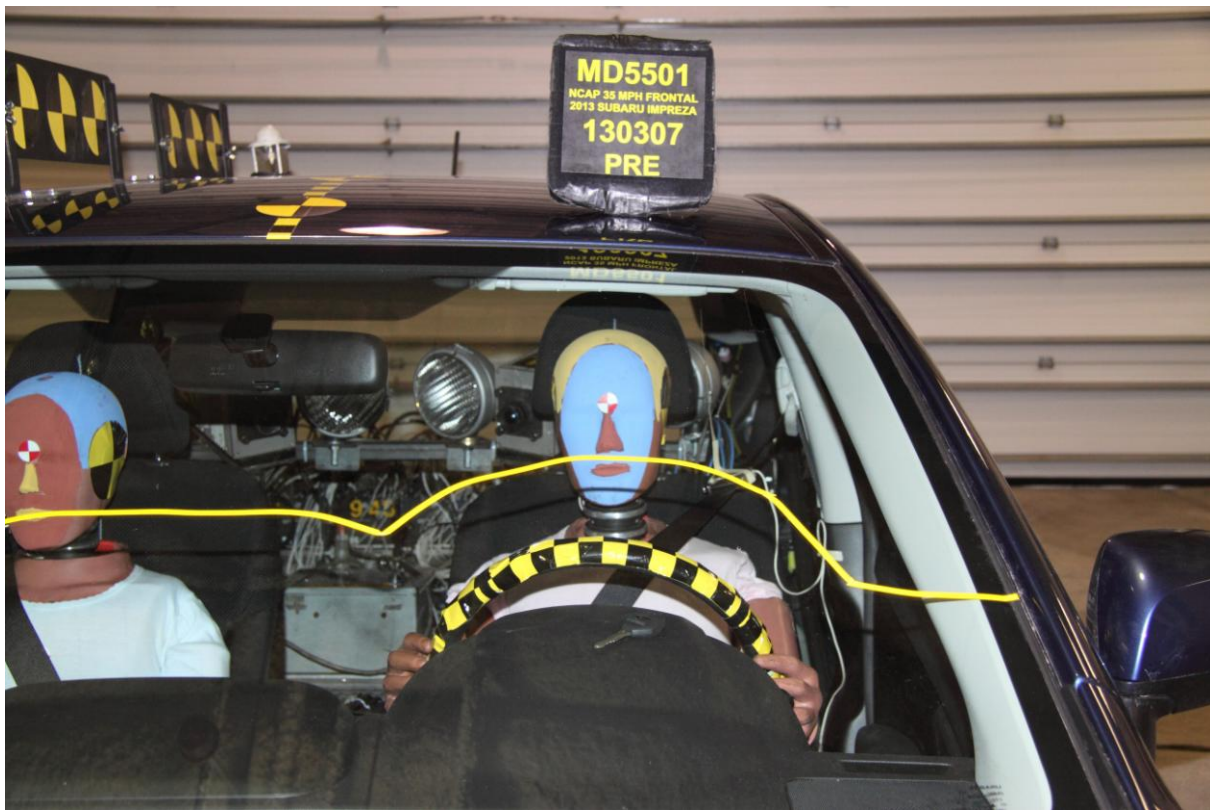
026 Post-Test Rear Underbody View



027 Pre-Test Dummy Cable Routing



028 Post-Test Dummy Cable Routing



029 Pre-Test Driver Dummy Front View



030 Post-Test Driver Dummy Front View



031 Pre-Test Driver Dummy Window View



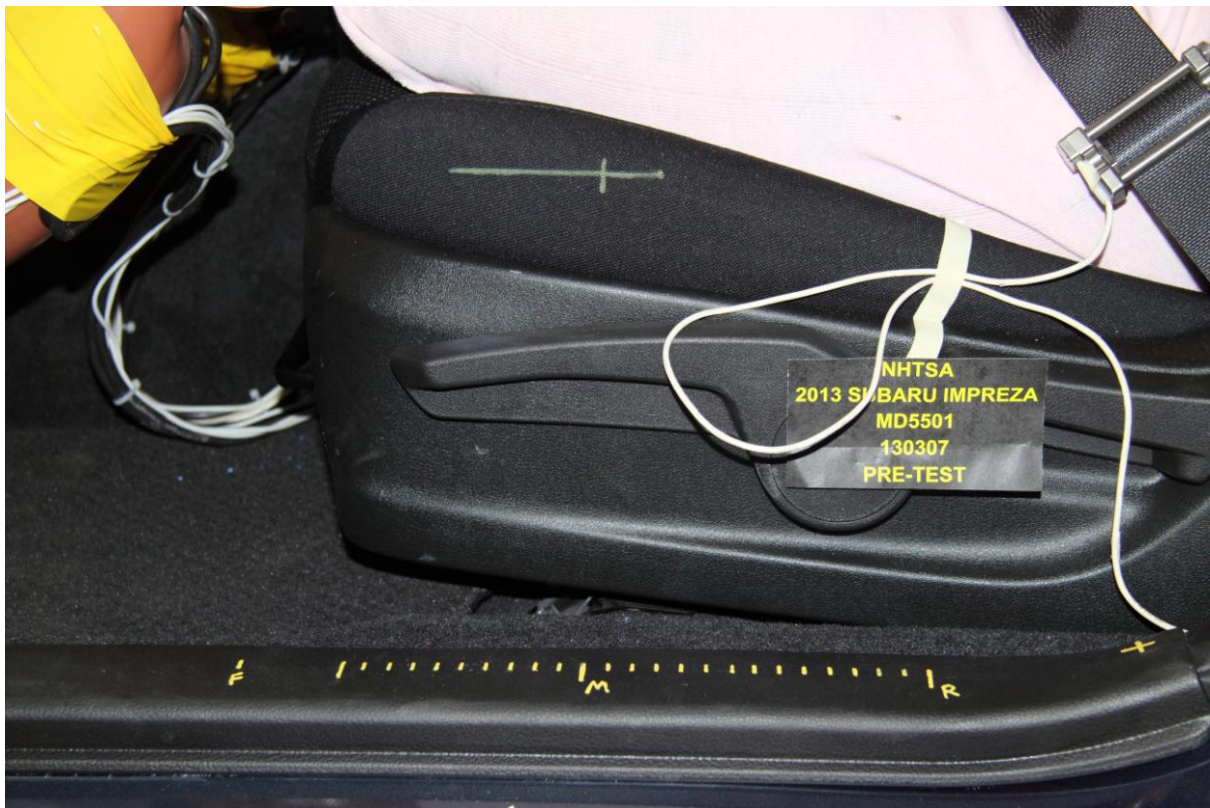
032 Post-Test Driver Dummy Window View



033 Pre-Test Driver Dummy and Vehicle Interior View



034 Post-Test Driver Dummy and Vehicle Interior View



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



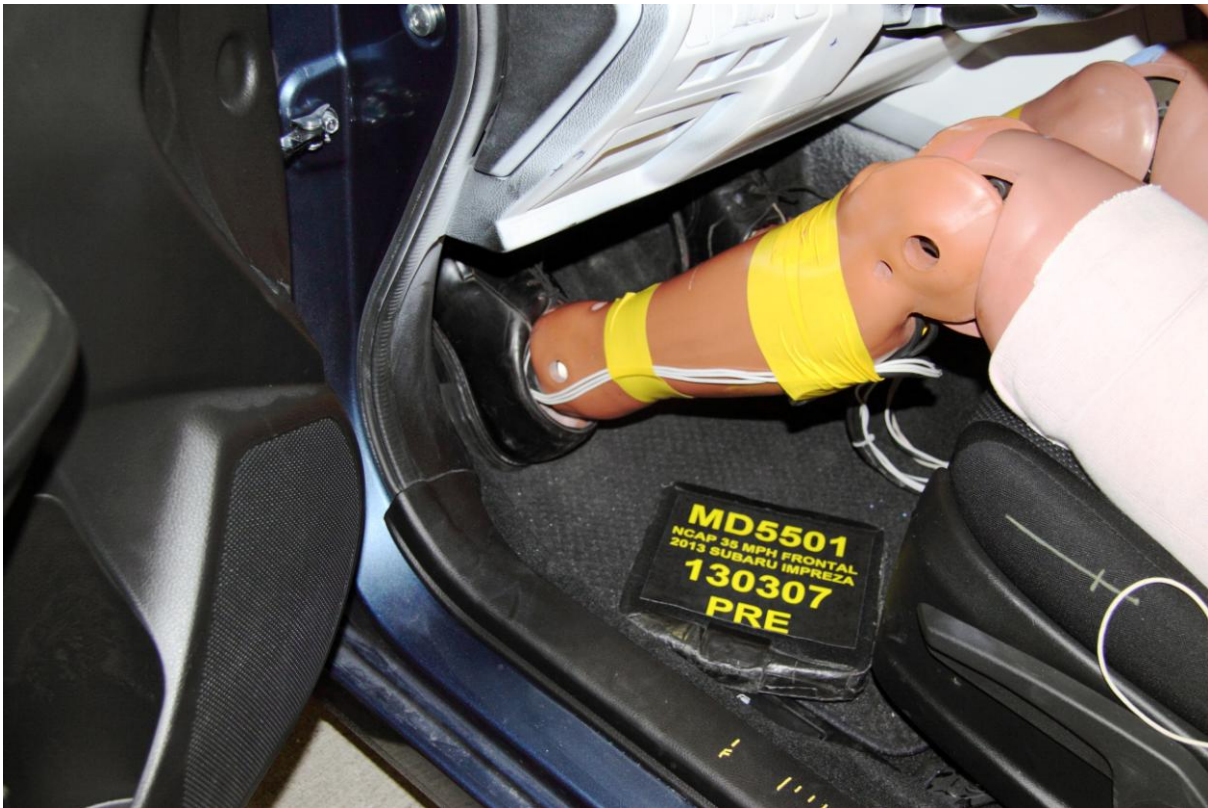
036 Post-Test Driver's Seat Fore-Aft Markings



037 Pre-Test View of Belt Anchorage for Driver Dummy



038 Post-Test View of Belt Anchorage for Driver Dummy



039 Pre-Test Driver Dummy Feet



040 Post-Test Driver Dummy Feet



041 Pre-Test Driver's Side Knee Bolster



042 Post-Test Driver's Side Knee Bolster



043 Pre-Test Driver's Side Floorpan



044 Post-Test Driver's Side Floorpan



045 Post-Test Driver Dummy Face



046 Post-Test Driver Dummy Contact With Airbag



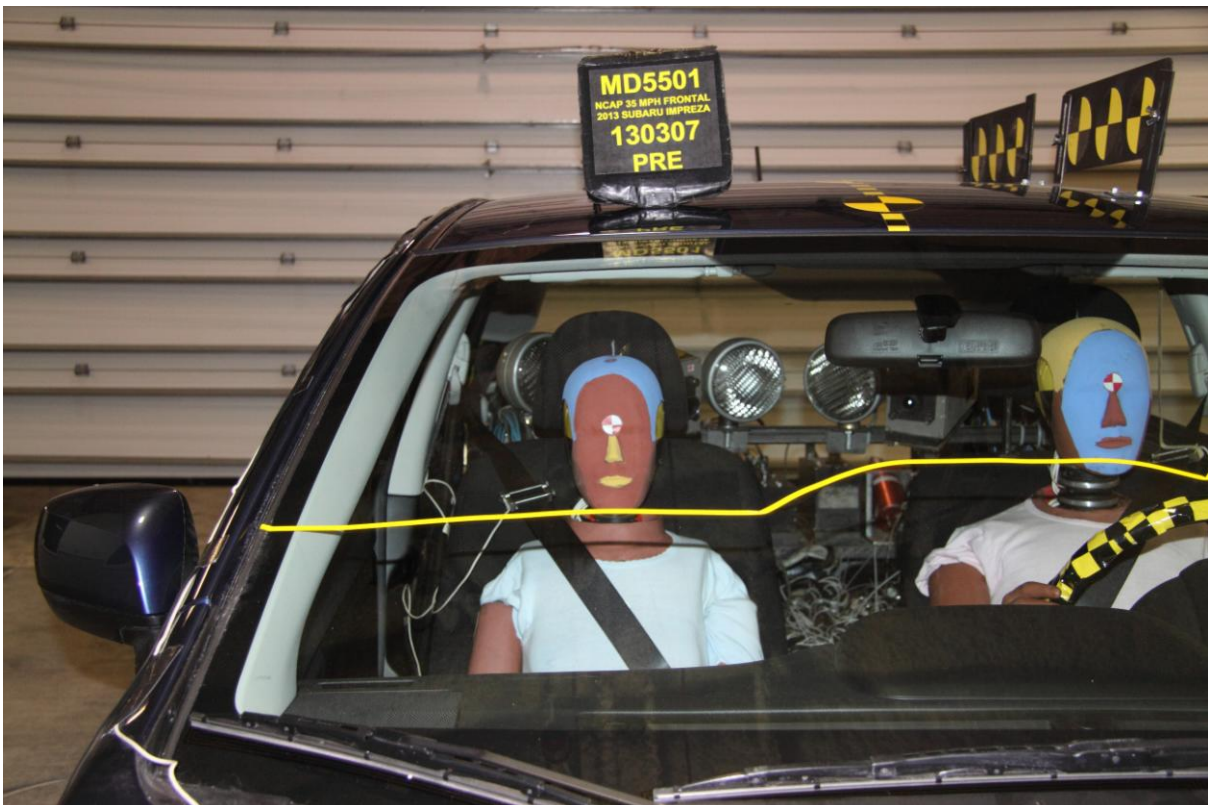
047 Post-Test Driver Dummy Contact With Headrest



048 Pre-Test View of the Steering Wheel



049 Post-Test View of the Steering Wheel



050 Pre-Test Passenger Dummy Front View



051 Post-Test Passenger Dummy Front View



052 Pre-Test Passenger Dummy Window View



053 Post-Test Passenger Dummy Window View



054 Pre-Test Passenger Dummy and Vehicle Interior View



055 Post-Test Passenger Dummy and Vehicle Interior View



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



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



058 Pre-Test View of Belt Anchorage for Passenger Dummy



059 Post-Test View of Belt Anchorage for Passenger Dummy



060 Pre-Test Passenger Dummy Feet



061 Post-Test Passenger Dummy Feet



062 Pre-Test Passenger's Side Knee Bolster



063 Post-Test Passenger's Side Knee Bolster



064 Pre-Test Passenger's Side Floorpan



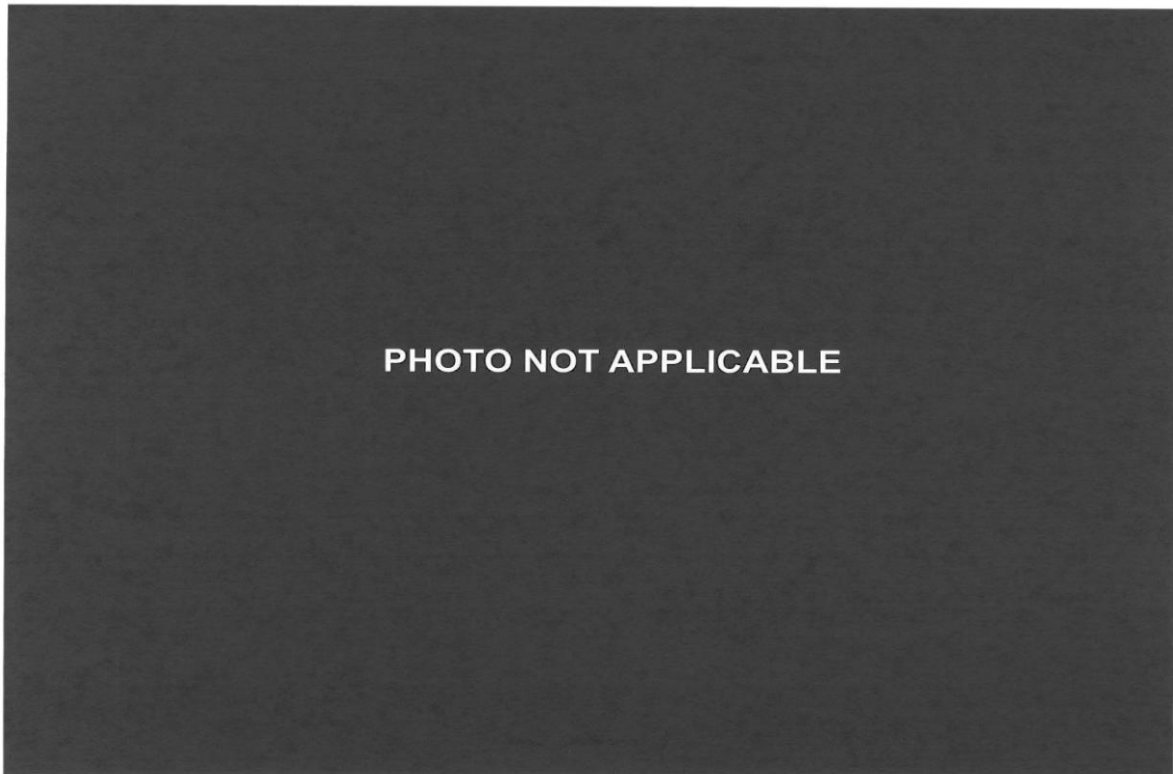
065 Post-Test Passenger's Side Floorpan



066 Post-Test Passenger Dummy Contact With Headrest



066a Post-Test Passenger Dummy Contact With Airbag



067 Photograph of Ballast Installed in Vehicle

PHOTO NOT APPLICABLE

068 Post-Test Stoddard Solvent Spillage Location View



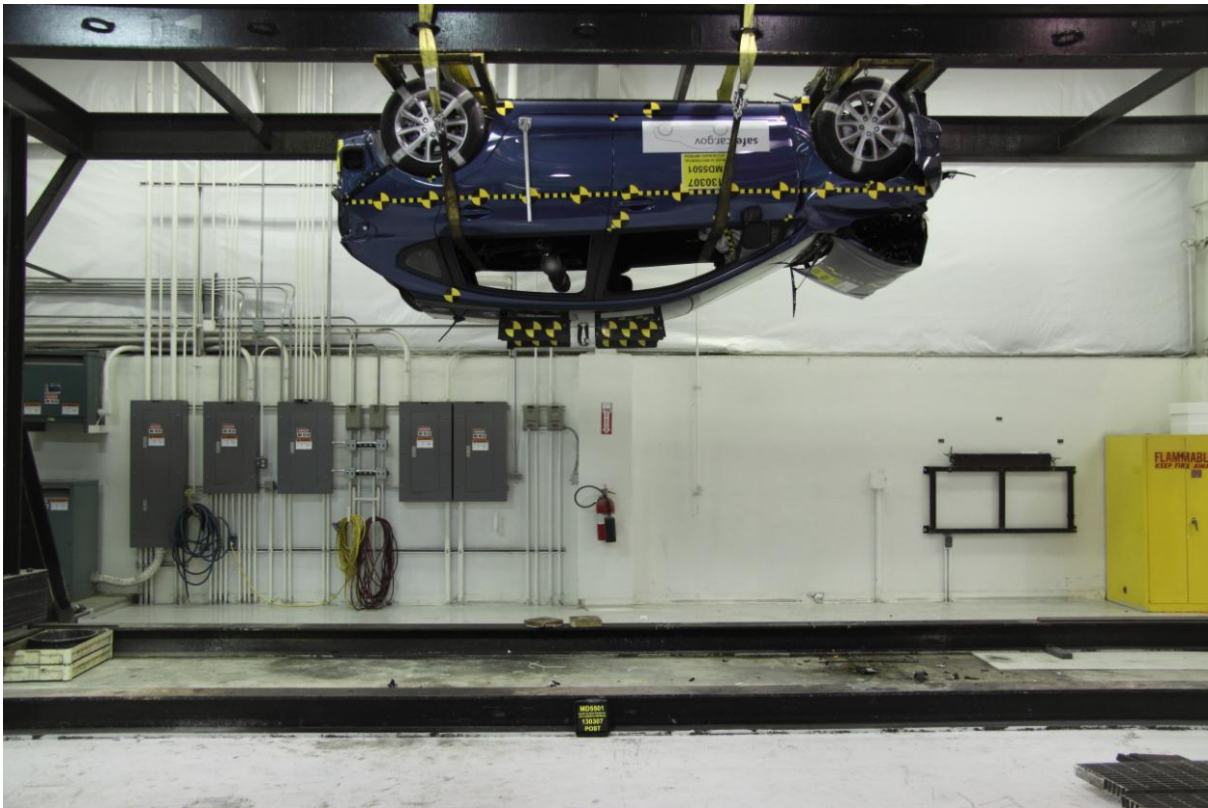
069 Post-Test Speed Trap Read-out



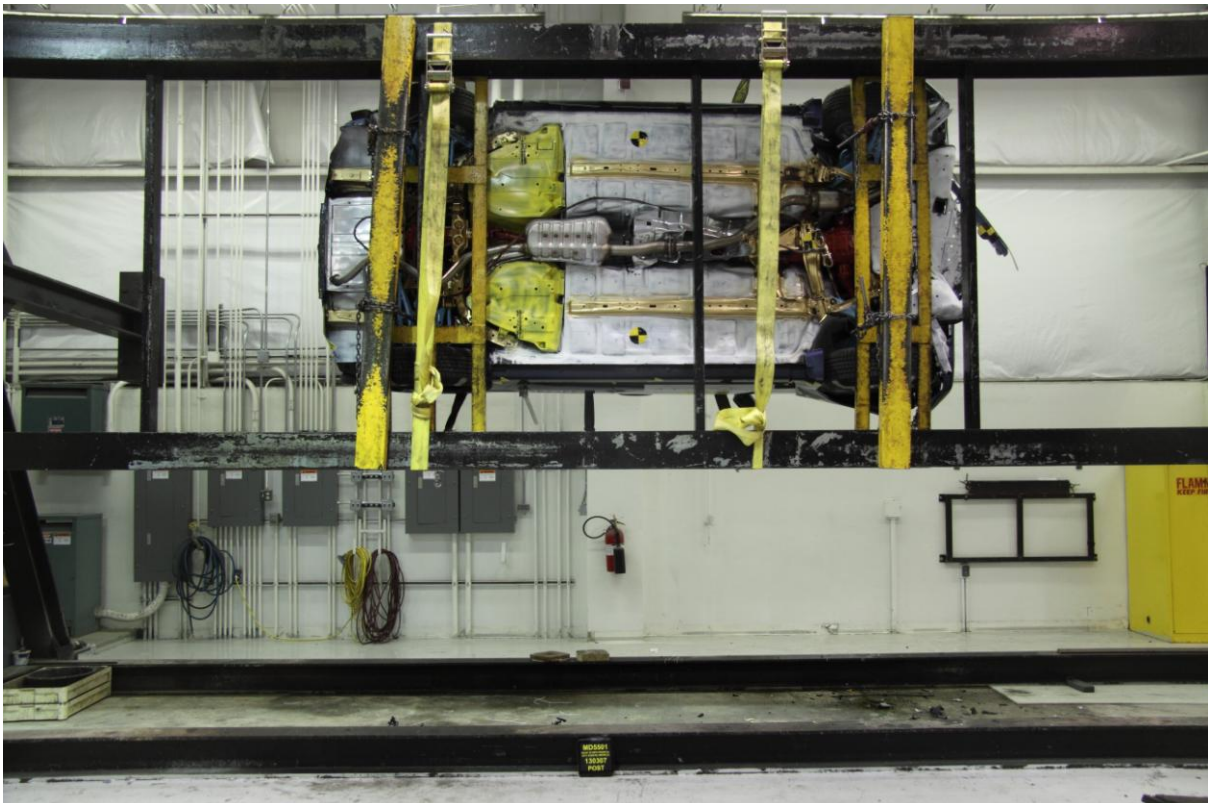
070 Vehicle at 0° on Static Rollover Device



071 Vehicle at 90° on Static Rollover Device



072 Vehicle at 180° on Static Rollover Device



073 Vehicle at 270° on Static Rollover Device



074 Vehicle at 360° on Static Rollover Device



No. 075 2013 Subaru Impreza Station Wagon Frontal Impact Event



VIN: JF1GPAC66DG826841

Model/Code: 2013 Subaru Impreza 2.0i Premium / DLC

Exterior Color: Marine Blue Pearl

Port / Assembly: Vancouver, WA

Deliver by / Carrier: Truck / 601-601981

SHIP TO: 070590

WILDE SUBARU

1710 HWY 164

WAUKESHA, WI 53186

SOLD TO: 070590

WILDE SUBARU

1710 HWY 164

WAUKESHA, WI 53186





STANDARD EQUIPMENT

SAFETY

Symmetrical All-Wheel Drive (AWD)

Vehicle Dynamics Control (VDC)

Subaru Advanced Frontal Air Bag System

Front Seat Side-Impact Airbags

Side-Curtain Airbags

Driver's Knee Airbag

Safety Pedal System

4-Wheel Disc Brakes w/Brake Assist

Anti-Lock Braking System (ABS)

Electronic Brake-Force Distribution

Tire Pressure Monitoring System (TPMS)

Ring-Shape Reinforcement Frame Design

Anti-Theft Alarm & Immobilizer System

Daytime Running Lights (DRL)

PERFORMANCE AND EXTERIOR

2.0L Horizontally-Opposed DOHC Engine

Four Wheel Independent Suspension

Variable Intermittent Windshield Wipers

Wheels: 16-Inch Aluminum-Alloy

COMFORT, CONVENIENCE AND INTERIOR

Air Conditioning w/Air Filtration System

AM/FM/CD Audio System w/ Aux Input Jack

Steering Wheel Mounted Audio Controls

Bluetooth Hands-Free Phone Connectivity

USB Port with iPod Connectivity

Cruise Control, Tilt/Telescopic Steering

Power Door Locks & Dual Power Mirrors

Remote Keyless Entry System

Power Windows w/Driver's Auto Up/Down

Height Adjustable Driver's Seat

Tilt-Adjustable Front Seat Headrests

60/40 Split Fold-Down Rear Seatback

Multi-Function Trip Computer

Dual Map Lights

LIMITED WARRANTY/ROADSIDE ASSISTANCE

3 Years / 36,000 Miles Basic

5 Years / 60,000 Miles Powertrain

5 Yrs/Unlimited Mileage Rust Perforation

3 Yrs / 36,000 24/7 Roadside Assistance

See Owner Info Kit/Warranty For Details

OPTIONAL EQUIPMENT AND OTHER ITEMS

Manufacturer's Suggested Retail Price \$20,295.00

Option Package: 01 - STANDARD PACKAGE

Full Tank of Gas INCLD

All Weather Floor Mats \$72.00

Cargo Tray 5d \$72.00

Partial Zero Emission (Pzev)

Super-Ultra Low Emission Veh

Pzev Certified Where Required

Pzev Warranty State Specific

Splash Guards Blue \$147.00

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score Not Rated

Based on the combined ratings of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Frontal Crash	Driver Passenger	Not Rated
Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.		
Side Crash	Front seat Rear seat	Not Rated
Based on the risk of injury in a side impact.		
Rollover		★★★★★
Based on the risk of rollover in a single-vehicle crash.		

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

Scan this code to learn more about this model or visit eubaru.com/learnmore



JF1GPAC66DG826841

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EPA DOT Fuel Economy and Environment Gasoline Vehicle

Fuel Economy **28** MPG

25 33
city highway

3.6 gallons per 100 miles

Annual fuel cost **\$1,900**

Fuel Economy & Greenhouse Gas Rating Smog Rating

1 7 10 10
Best

This vehicle emits 311 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also produce emissions, from more air conditioning.

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 23 MPG and costs \$11,600 to fuel over 5 years. Cost estimates and emissions are a significant source of climate change and smog.

fuel economy.gov
Calculate personalized estimates and compare vehicles

PART CONTENTS INFORMATION

FOR VEHICLES IN THIS COUNTRY:

U.S./CANADIAN PARTS CONTENT: 0%

MAJOR SOURCES OF FOREIGN PARTS

CONTENT: JAPAN 90%

Note: Parts content does not include final assembly, distribution, or customer service costs.

FOR THIS VEHICLE:

FINAL ASSEMBLY POINT: OTA GUNMA, JAPAN

COUNTRY OF ORIGIN:

ENGINE: JAPAN

TRANSMISSION: JAPAN

Destination and Delivery \$770.00

Total Suggested Retail Price **\$21,356.00**

ADDED SECURITY

Subaru

Always Insist on Genuine Subaru Products

- Added Security* protects your investment
- Mechanical and Maintenance plans available
- Coverage up to 100,000 miles
- Genuine Subaru replacement parts
- Towing & Rental car benefits
- Trip Interruption and Tire Hazard benefits available
- Transferable

THE ONLY EXTENDED SERVICE PLAN BACKED AND ENDORSED BY SUBARU FOR OVER 30 YEARS!

076 Monroney Label Photograph

APPENDIX B
VEHICLE AND DUMMY RESPONSE DATA PLOTS

TABLE OF DATA PLOTS

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

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

Driver Head Acceleration X Redundant
Driver Head Acceleration Y Redundant
Driver Head Acceleration Z Redundant
Driver Upper Neck Force Y

Driver Upper Neck Moment X
Driver Upper Neck Moment Z
Driver Chest X Acceleration Redundant
Driver Chest Y Acceleration Redundant
Driver Chest Z Acceleration Redundant
Driver Pelvis X
Driver Pelvis Y
Driver Pelvis Z
Driver Left Upper Tibia Moment X
Driver Left Upper Tibia Moment Y
Driver Left Upper Tibia Force Z
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Upper Tibia Moment X
Driver Right Upper Tibia Moment Y
Driver Right Upper Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Driver Shoulder Belt Force
Driver Lap Belt Force
Passenger Head Acceleration X Redundant
Passenger Head Acceleration Y Redundant
Passenger Head Acceleration Z Redundant
Passenger Upper Neck Force Y
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Z
Passenger Chest X Acceleration Redundant
Passenger Chest Y Acceleration Redundant
Passenger Chest Z Acceleration Redundant
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Left Upper Tibia Moment X

Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Shoulder Belt Force
Passenger Lap Belt Force
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Left Rear Seat Crossmember X Redundant
Right Rear Seat Crossmember X Redundant
Vehicle Engine Top X
Vehicle Engine Bottom X
BARRIER LOAD A1
BARRIER LOAD A2
BARRIER LOAD A3
BARRIER LOAD A4
BARRIER LOAD A5
BARRIER LOAD A6
BARRIER LOAD A7
BARRIER LOAD A8
BARRIER LOAD A9
BARRIER LOAD B1
BARRIER LOAD B2
BARRIER LOAD B3
BARRIER LOAD B4
BARRIER LOAD B5

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

NHTSA

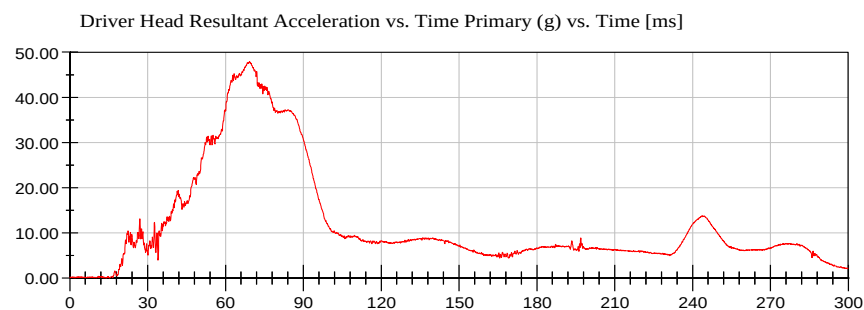
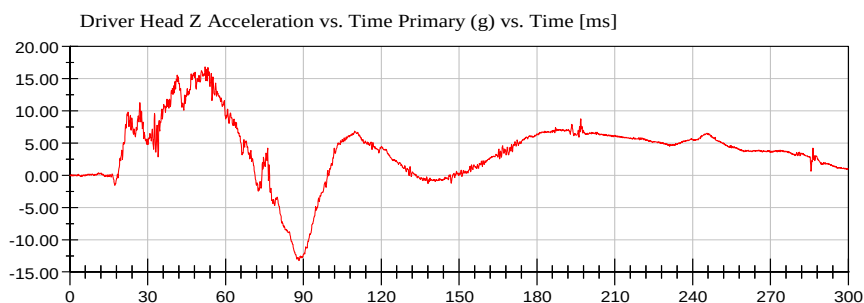
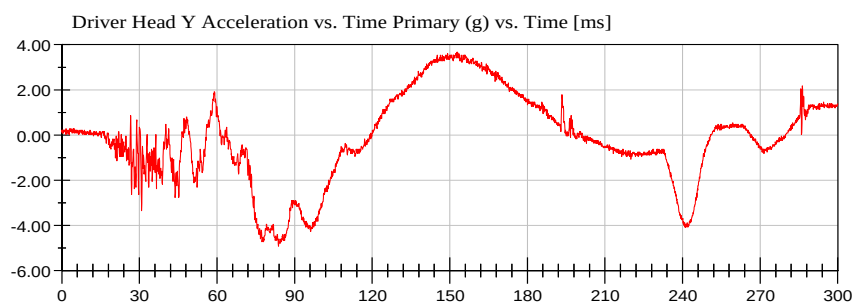
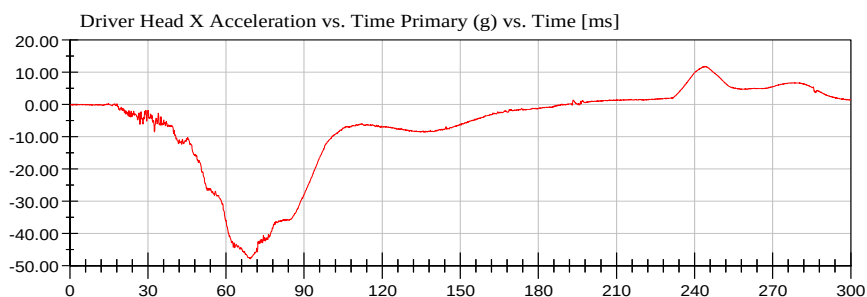
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)



NHTSA

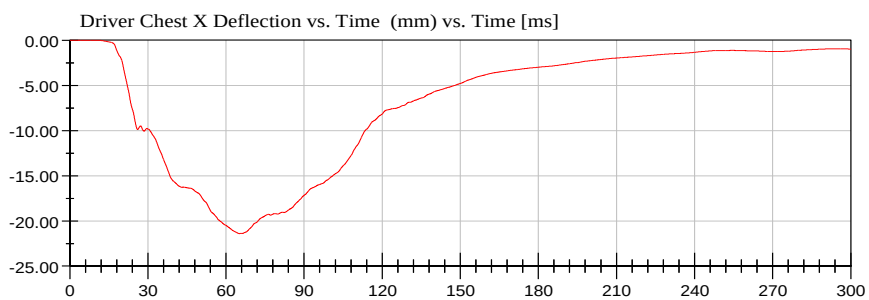
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)



<Max>

0.00 mm at 3.52 ms

<Min>

-21.40 mm at 65.20 ms

CFC_600



NHTSA

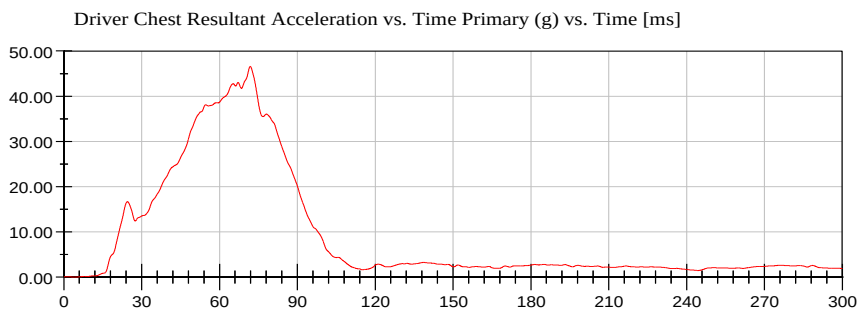
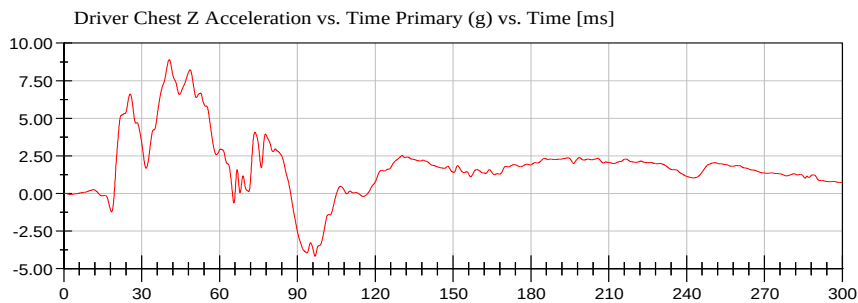
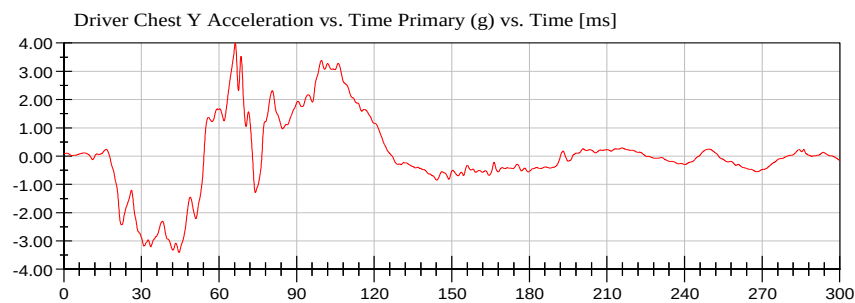
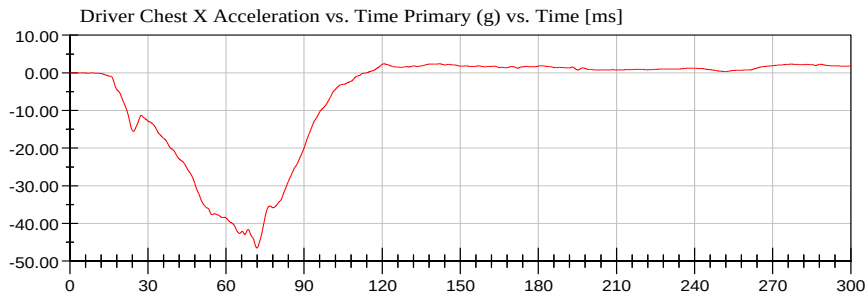
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)



NHTSA

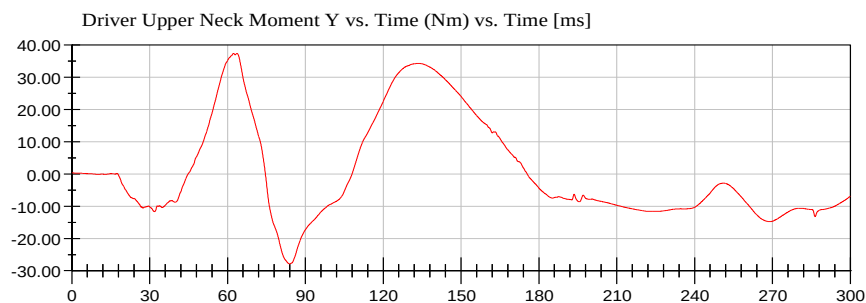
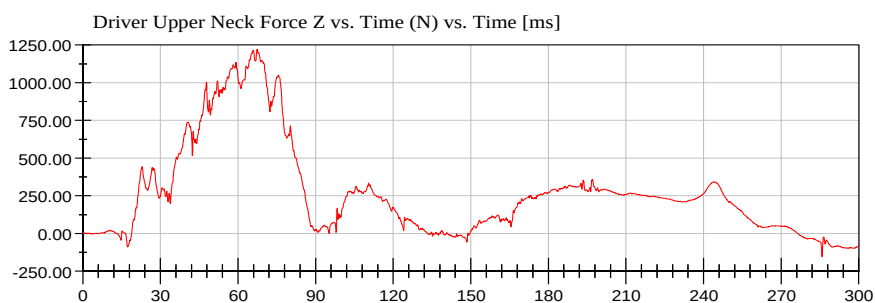
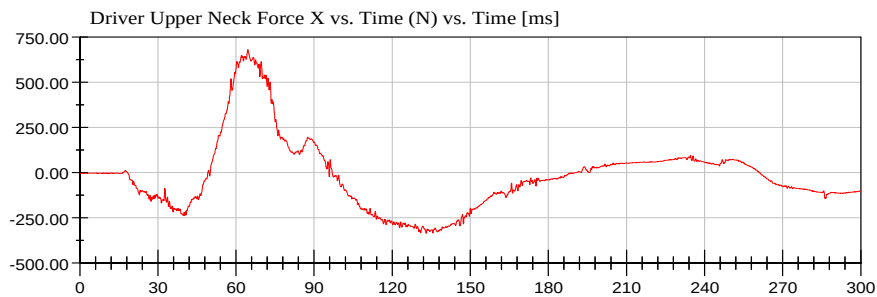
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)





2013 Subaru Impreza Hatchback into Load Cell Barrier

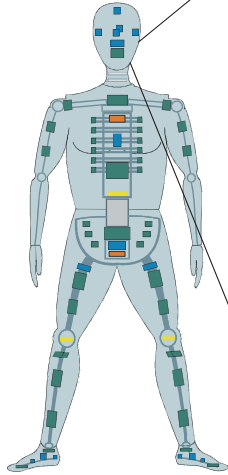
Date: 03/07/2013
Time: 17:21

Neck Injury Predictor (NIJ)

Customer: NHTSA

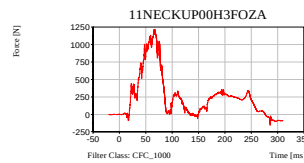
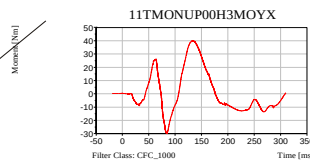
Test Number: MD5501

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

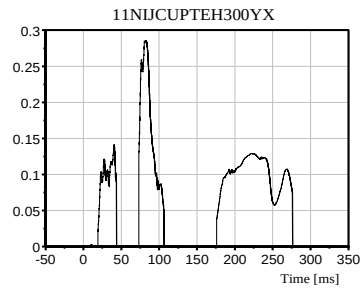


Dummy: HIII 50th Male
Seating Position:
Driver

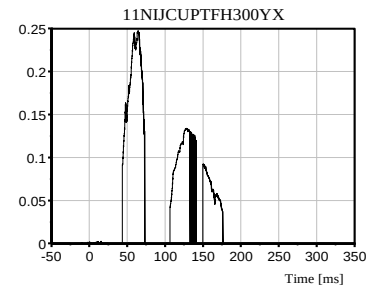
NIJ Source Code: (Fz/Fzc)+(Myc/Myc)



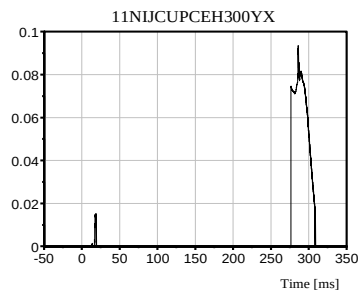
TRC Inc. Test Lab: CTF
Test Number: 130307



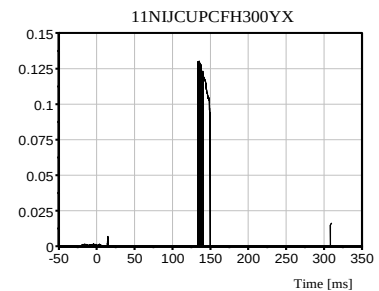
Max [NTE] 0.2858 at 82.64 ms



Max [NTF] 0.2474 at 64.32 ms



Max [NCE] 0.0935 at 285.84 ms



Max [NCF] 0.1305 at 135.20 ms

NHTSA

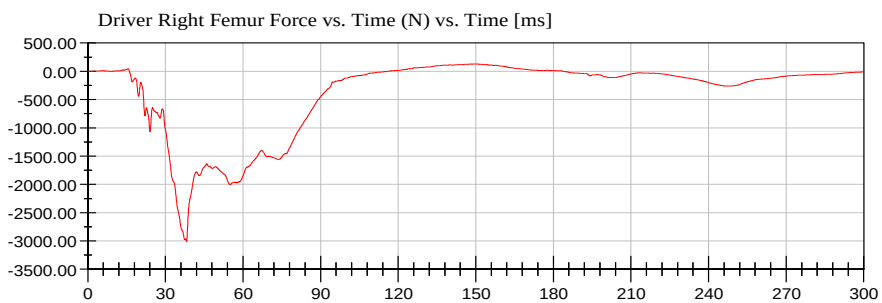
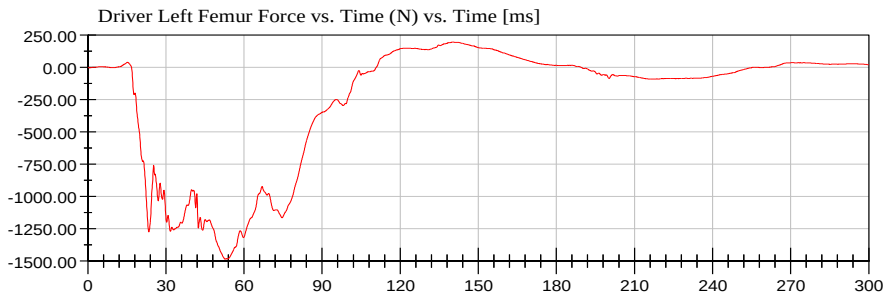
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)



NHTSA

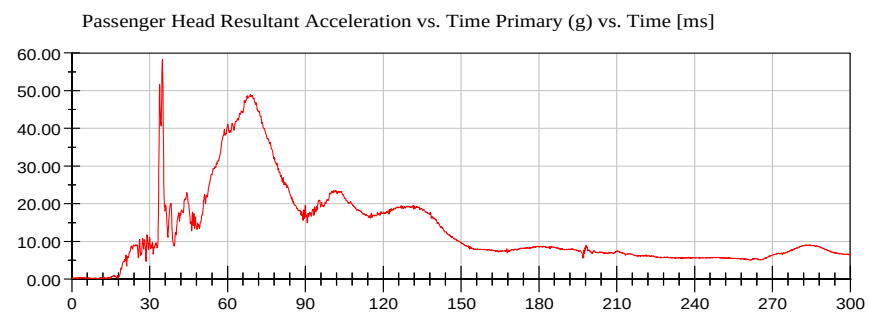
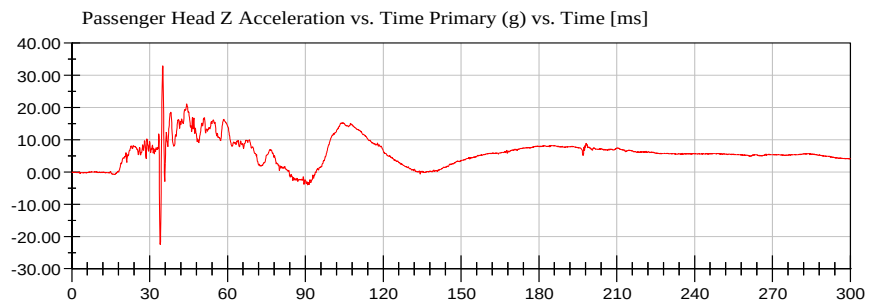
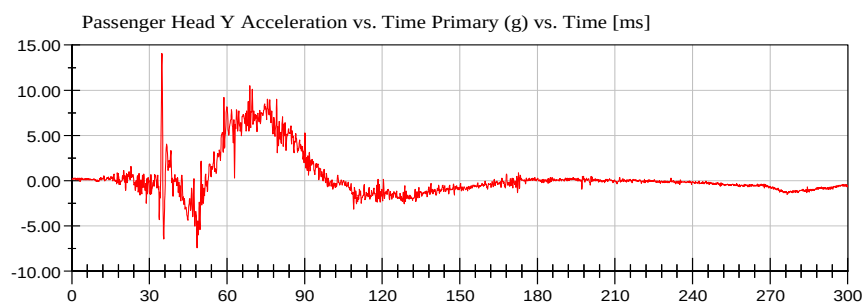
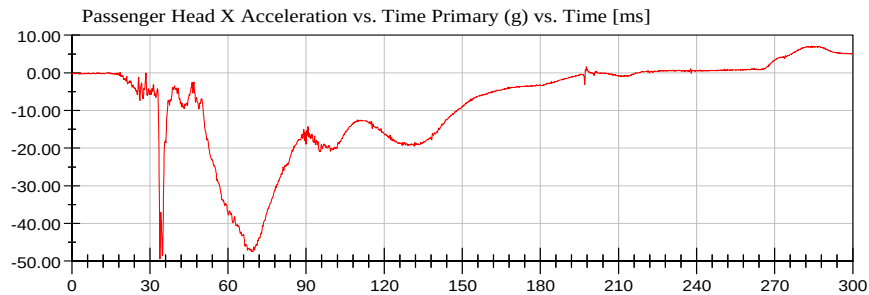
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)



NHTSA

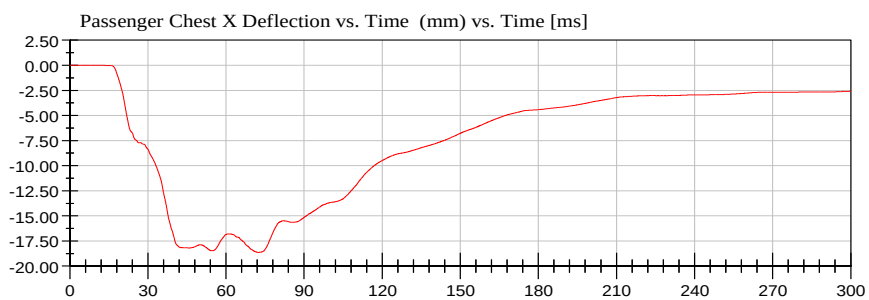
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)



<Max>

0.00 mm at 9.12 ms

<Min>

-18.64 mm at 72.24 ms

CFC_600



NHTSA

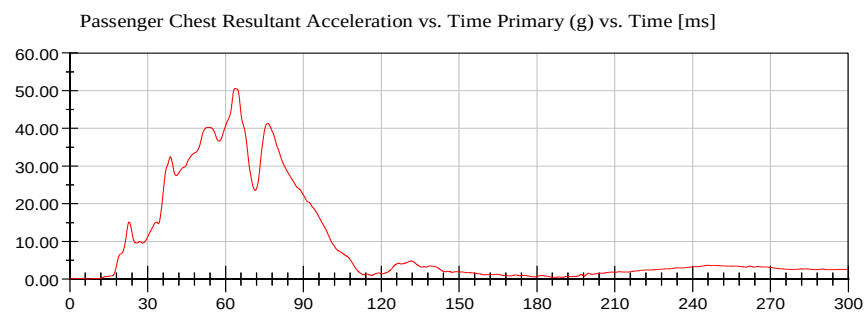
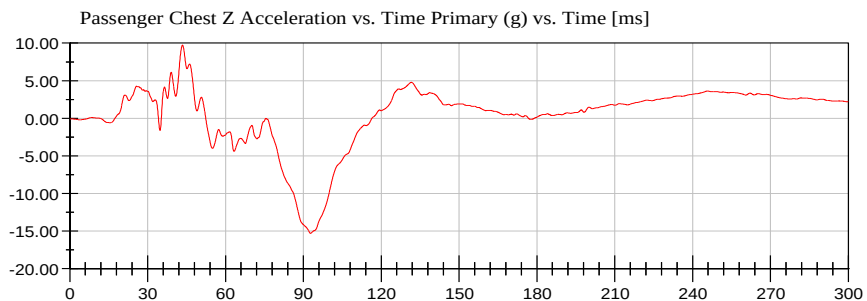
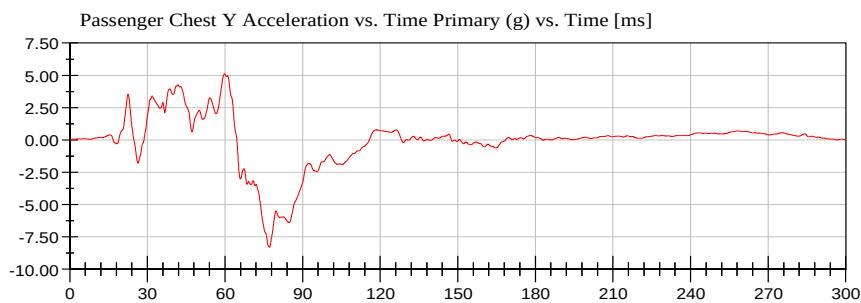
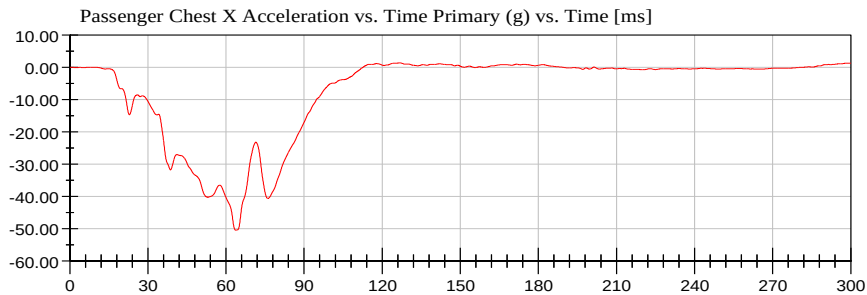
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)



NHTSA

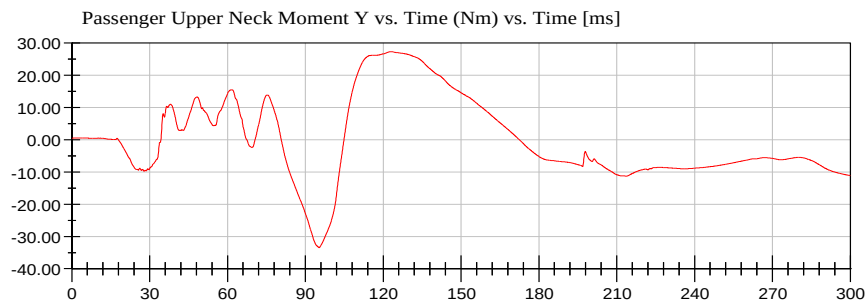
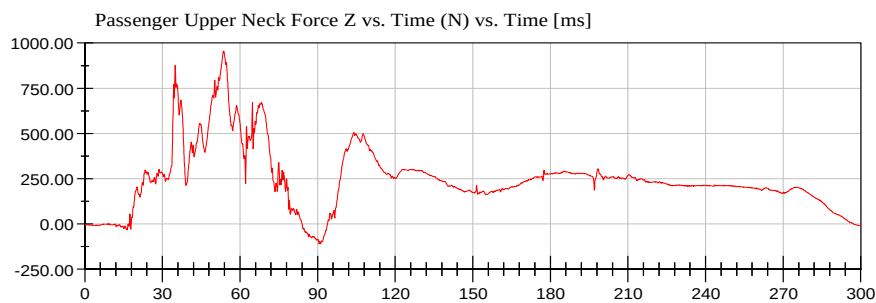
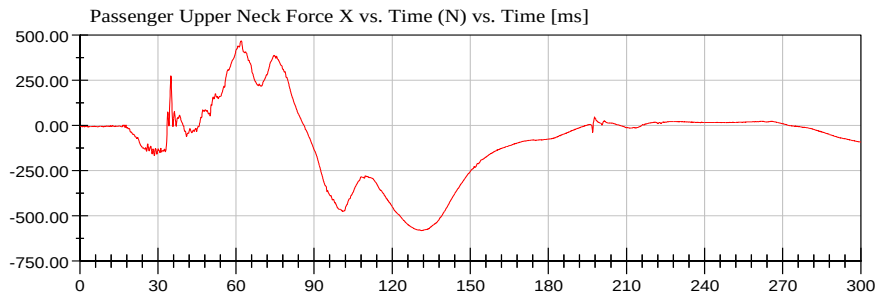
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)





2013 Subaru Impreza Hatchback into Load Cell Barrier

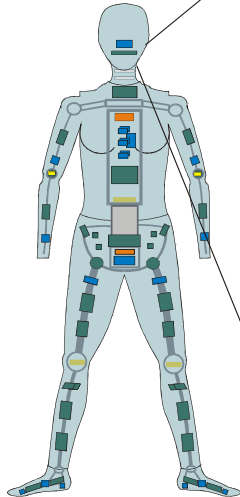
Date: 03/07/2013
Time: 17:21

Neck Injury Predictor (NIJ)

Customer: NHTSA

Test Number: MD5501

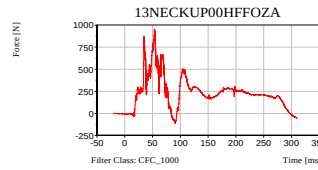
Test Orientation = Frontal
Fzc(Tension) = 4287
Fzc(Compression) = 3880
Myc(Extension) = 67
Myc(Flexion) = 155



Dummy: HIII 5th Female
Seating Position:

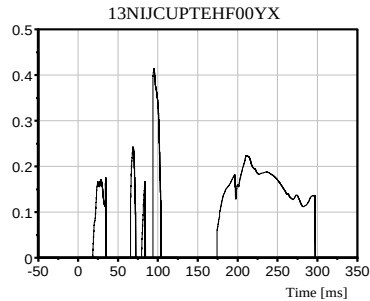
Right Front Passenger

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

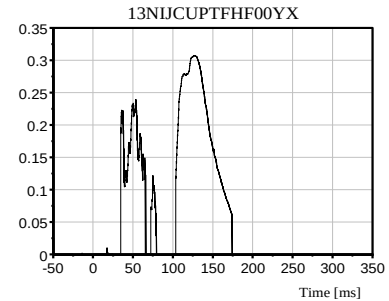


TRC Inc. Test Lab: CTF

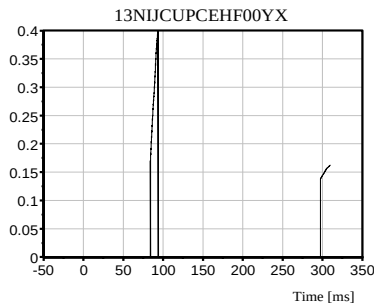
Test Number: 130307



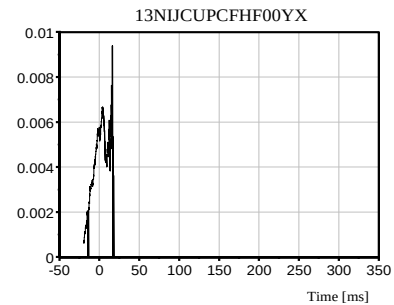
Max [NTE] 0.4147 at 94.88 ms



Max [NTF] 0.3073 at 127.04 ms



Max [NCE] 0.3991 at 93.44 ms



Max [NCF] 0.0094 at 16.24 ms

NHTSA

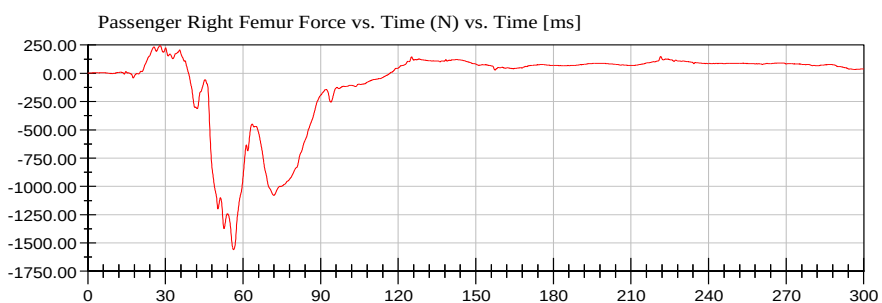
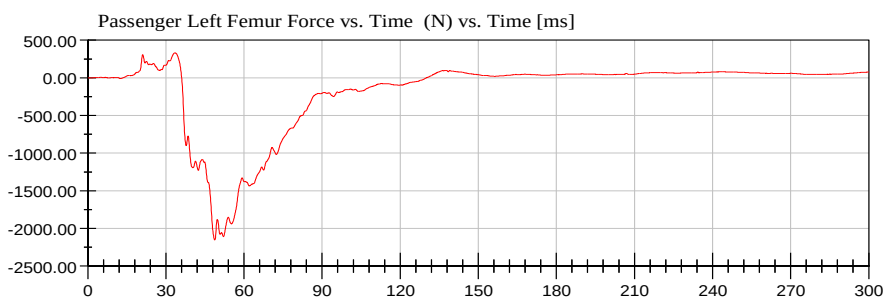
Test Lab: CTF

Test Number: 130307 (MD5501)

Test Date: 03/07/2013

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

Position #2 Hybrid III Small Adult Female (426)



APPENDIX C
DUMMY CALIBRATION AND PERFORMANCE VERIFICATION

Pre-Test Calibration Sheets
Driver S/N 037

**Transportation Research Center
Inc.**

ATD Calibration Report

for

NHTSA

**HIII 50th Serial No. 037
Calibration No. 15**



Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 15-1

Test Date: 3/1/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	246.4 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-4.3 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

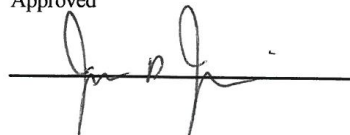
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 06:35:45 612

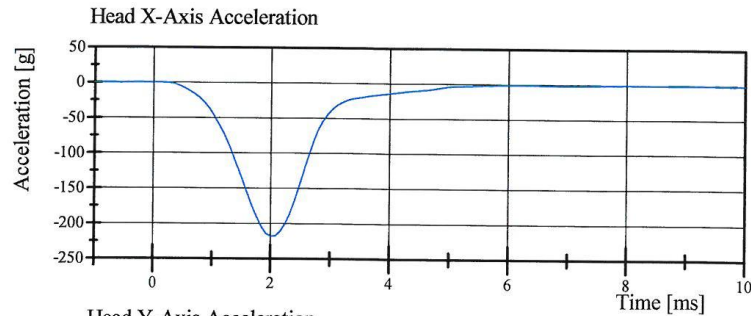


Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 15-1

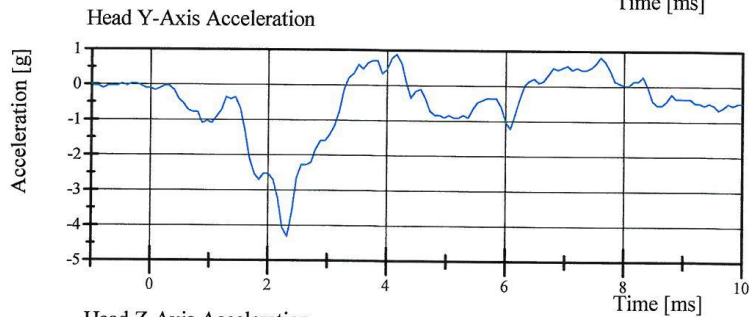
Test Date: 3/1/2013



Filter Class: CFC_1000

Max: 0.1 g at 0.0 ms

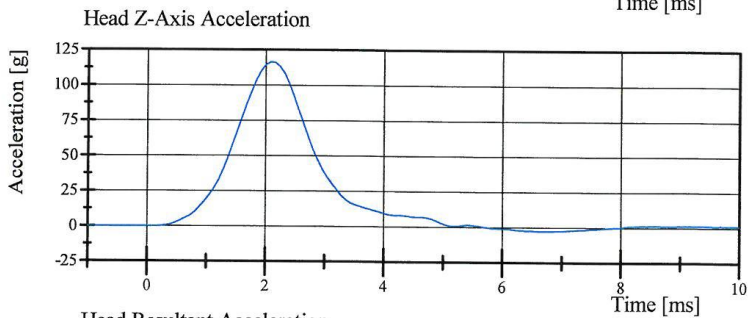
Min: -218.1 g at 2.0 ms



Filter Class: CFC_1000

Max: 0.9 g at 4.2 ms

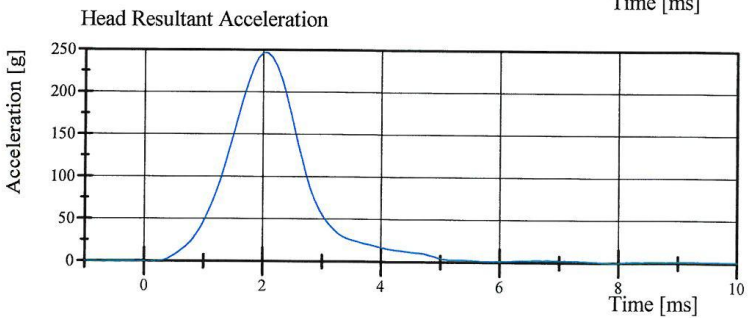
Min: -4.3 g at 2.3 ms



Filter Class: CFC_1000

Max: 116.5 g at 2.1 ms

Min: -2.6 g at 6.6 ms



Filter Class: CFC_1000

Max: 246.4 g at 2.1 ms

Min: 0.0 g at -0.2 ms

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

03.19.2013 06:35:52 612



Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 15-1

Test Date: 3/1/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.970 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	36.2 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-24.89 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-21.72 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-16.66 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-16.66 g	Yes
Total Head D-Plane Rotation Peak	(-64) - (-78) °	-72.3 °	Yes
Time of Peak	57 - 64 ms	59.4 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	118.6 ms	Yes
Total Neck Occipital Condyles Moment Peak	88 - 108 N·m	105.9 N·m	Yes
Time of Peak	47 - 58 ms	49.2 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	97.4 ms	Yes

Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 06:37:17 2942

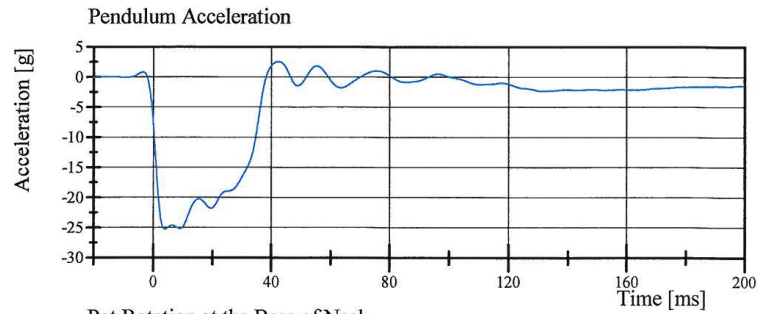


Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 15-1

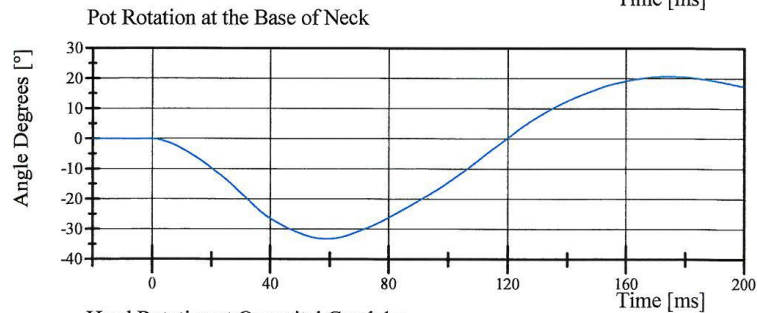
Test Date: 3/1/2013



Filter Class: CFC_60

Max: 2.6 g at 42.4 ms

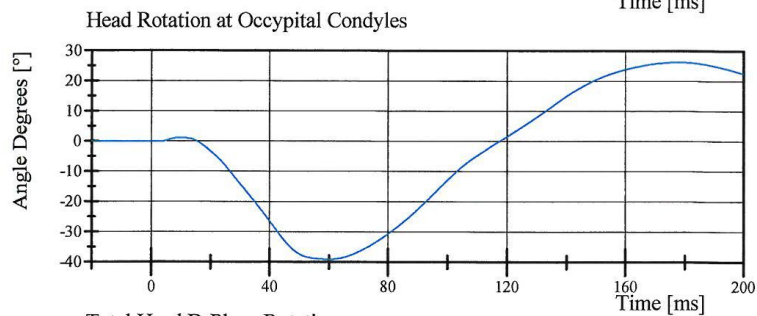
Min: -25.2 g at 4.0 ms



Filter Class: CFC_60

Max: 20.8 ° at 174.1 ms

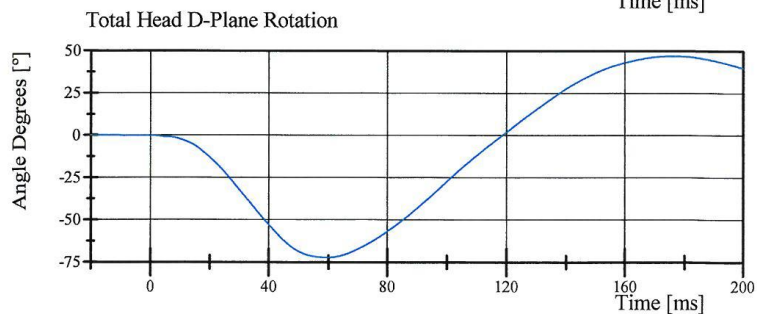
Min: -33.2 ° at 59.0 ms



Filter Class: CFC_60

Max: 26.4 ° at 177.6 ms

Min: -39.1 ° at 59.9 ms



Filter Class: CFC_60

Max: 47.1 ° at 175.9 ms

Min: -72.3 ° at 59.4 ms

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

03.19.2013 06:37:24 2942

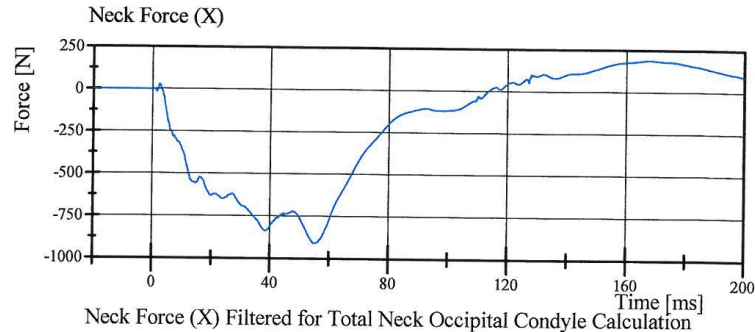


Transportation Research Center Inc.

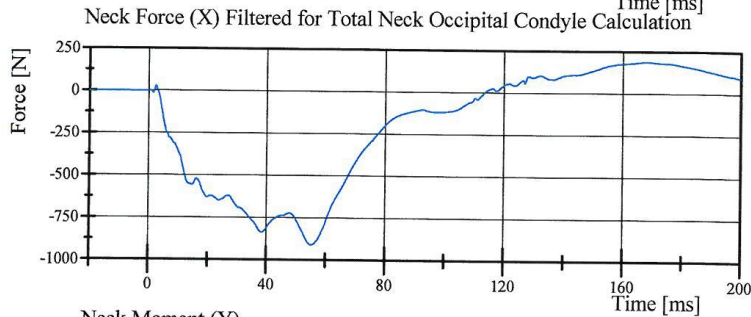
Neck Flexion

HIII 50th Serial No. 037 Certification No. 15-1

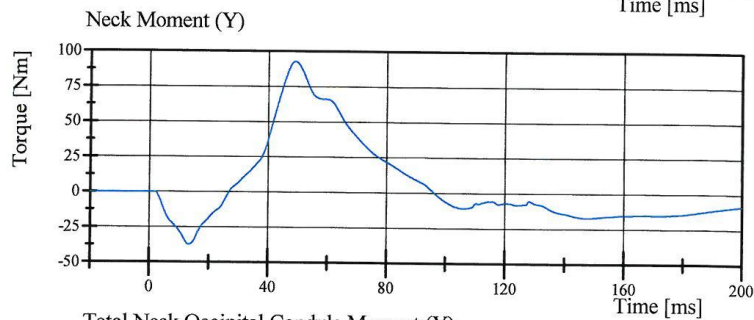
Test Date: 3/1/2013



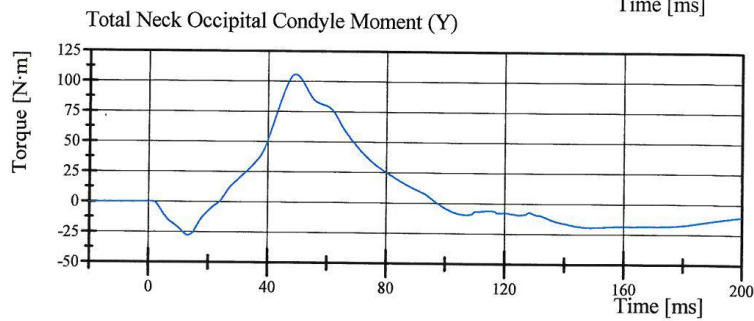
Filter Class: CFC_1000
Max: 190.4 N at 168.0 ms
Min: -909.2 N at 55.0 ms



Filter Class: CFC_600
Max: 189.9 N at 168.1 ms
Min: -909.3 N at 55.1 ms



Filter Class: CFC_600
Max: 92.9 Nm at 49.1 ms
Min: -37.2 Nm at 13.4 ms



Filter Class: Without_(Consta
Max: 105.9 N·m at 49.2 ms
Min: -27.6 N·m at 13.3 ms

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

03.19.2013 06:37:25 2942



Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 15-1

Test Date: 3/1/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.3 °C	Yes
Relative Humidity	10 - 70 %	35 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-5.969 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	42.7 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	17.48 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	15.47 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	13.36 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	13.36 g	Yes
Total Head D-Plane Rotation Peak	81 - 106 °	93.4 °	Yes
Time of Peak	72 - 82 ms	77.8 ms	Yes
Total Head D-Plane Rotation Decay to 0°	147 - 174 ms	159.7 ms	Yes
Total Neck Occipital Condyles Moment Peak	(-53) - (-80) N·m	-65.3 N·m	Yes
Time of Peak	65 - 79 ms	72.6 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	120 - 148 ms	144.7 ms	Yes

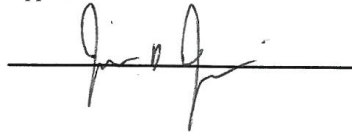
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 06:39:03 3029

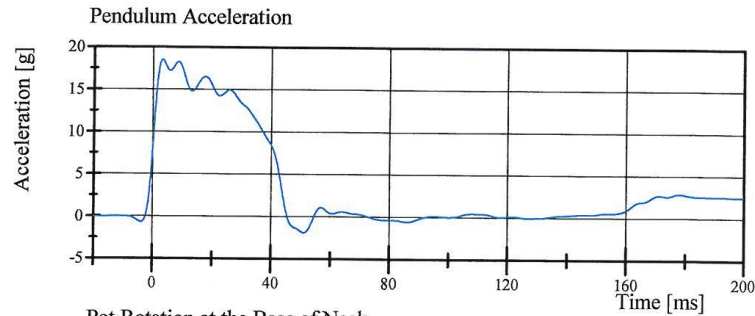


Transportation Research Center Inc.

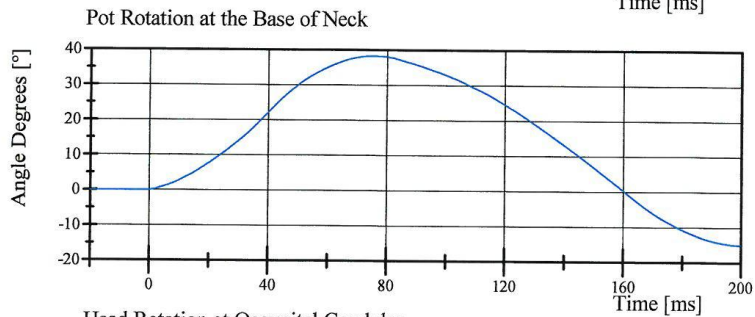
Neck Extension

HIII 50th Serial No. 037 Certification No. 15-1

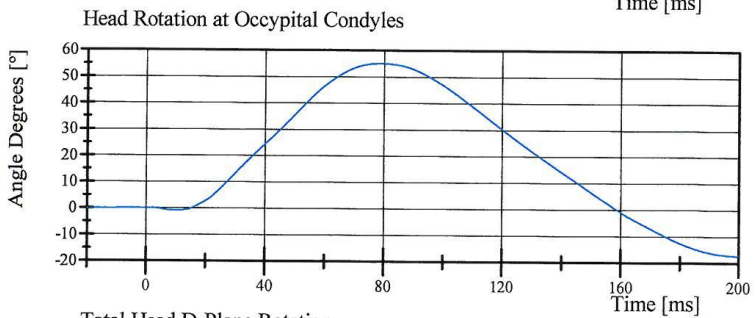
Test Date: 3/1/2013



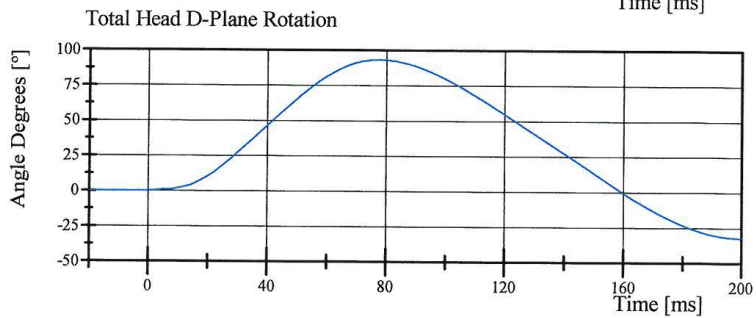
Filter Class: CFC_60
Max: 18.5 g at 3.2 ms
Min: -1.9 g at 51.1 ms



Filter Class: CFC_60
Max: 38.3 ° at 75.8 ms
Min: -14.9 ° at 200.0 ms



Filter Class: CFC_60
Max: 55.1 ° at 78.8 ms
Min: -17.2 ° at 200.0 ms



Filter Class: CFC_60
Max: 93.4 ° at 77.8 ms
Min: -32.1 ° at 200.0 ms

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

03.19.2013 06:39:10 3029

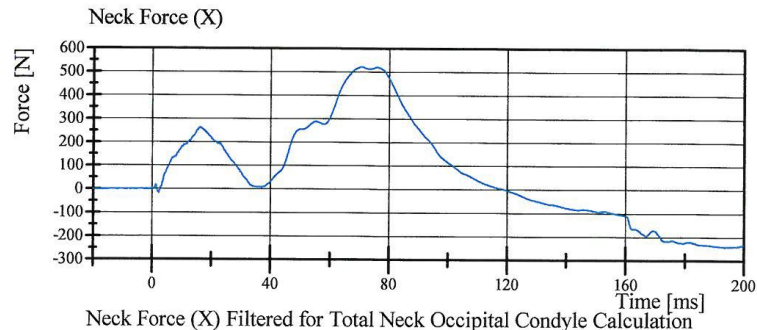


Transportation Research Center Inc.

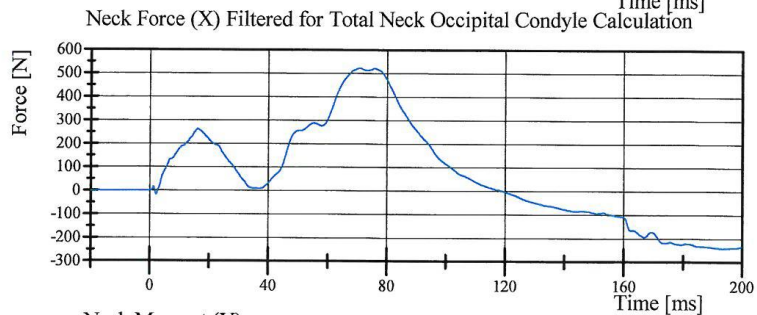
Neck Extension

HIII 50th Serial No. 037 Certification No. 15-1

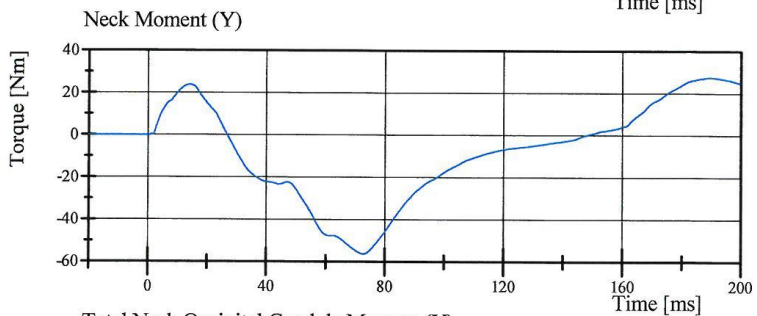
Test Date: 3/1/2013



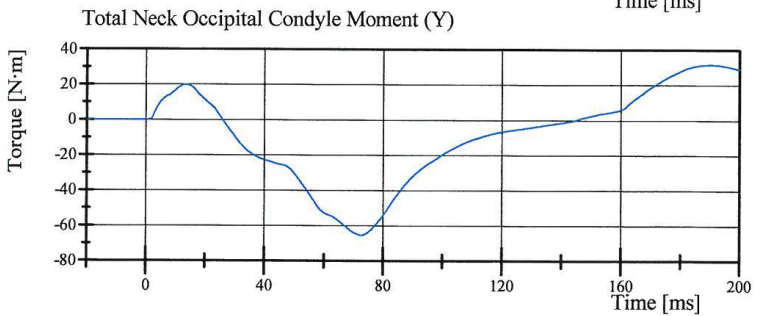
Filter Class: CFC_1000
Max: 522.2 N at 70.3 ms
Min: -241.9 N at 194.0 ms



Filter Class: CFC_600
Max: 522.0 N at 70.4 ms
Min: -241.5 N at 193.9 ms



Filter Class: CFC_600
Max: 27.6 Nm at 189.9 ms
Min: -56.2 Nm at 72.6 ms



Filter Class: Without_(Consta
Max: 31.8 N·m at 190.5 ms
Min: -65.3 N·m at 72.6 ms

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

03.19.2013 06:39:11 3029



Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 15-2

Test Date: 3/4/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.633 m/s	Yes
Probe Force Peak	(-5,160) - (-5,893) N	-5,733.3 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-66.74 mm	Yes
Internal Hysteresis	65 - 85 %	73.9 %	Yes

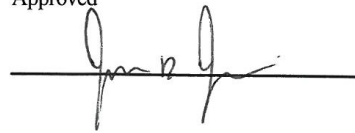
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 06:41:06 392

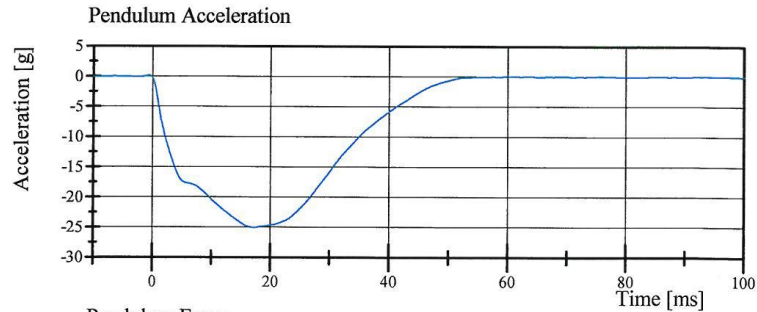


Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 15-2

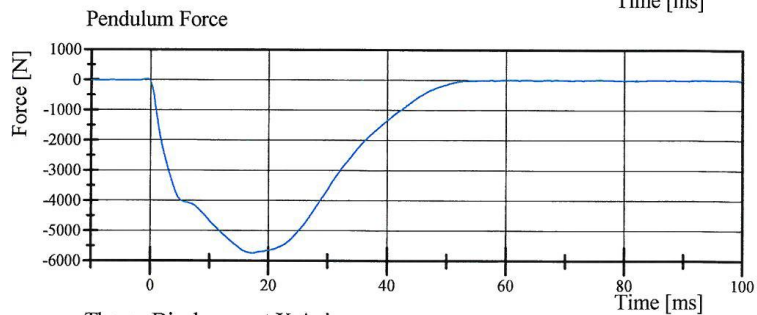
Test Date: 3/4/2013



Filter Class: CFC_180

Max: 0.2 g at -0.6 ms

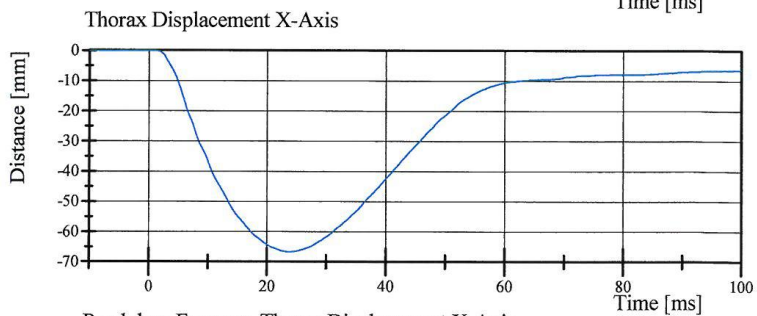
Min: -25.0 g at 17.3 ms



Filter Class: CFC_180

Max: 38.6 N at -0.6 ms

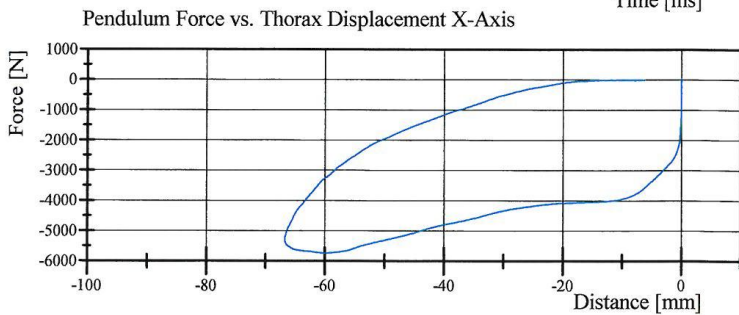
Min: -5,733.3 N at 17.3 ms



Filter Class: CFC_600

Max: 0.0 mm at -8.2 ms

Min: -66.7 mm at 23.8 ms



Filter Class: CFC_180

Max: 38.6 N at -0.0 mm

Min: -5,733.3 N at -60.0 mm

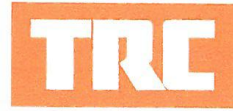
Specification Source: CFR49 Part 572 Subpart P
with Polarity in accordance with J211

03.19.2013 06:41:13 392



Transportation Research Center Inc.

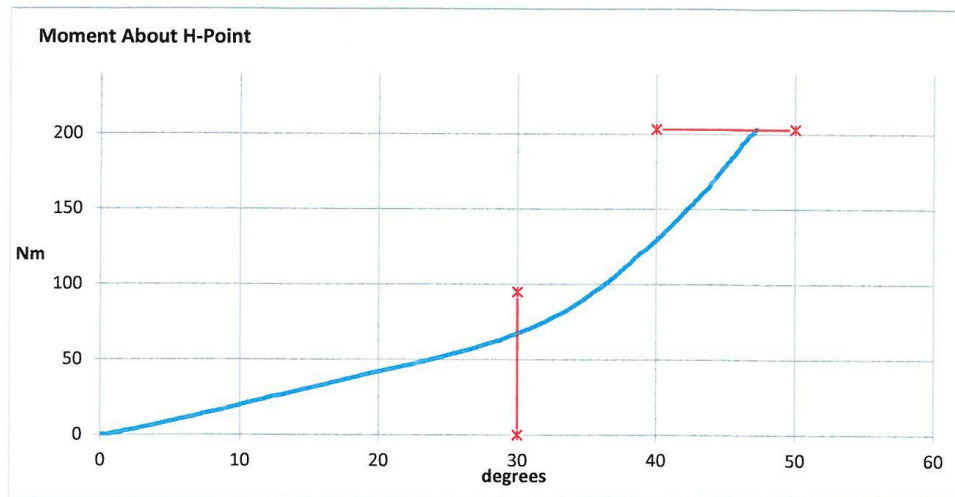
Hybrid III 50th Male Hip Range of Motion



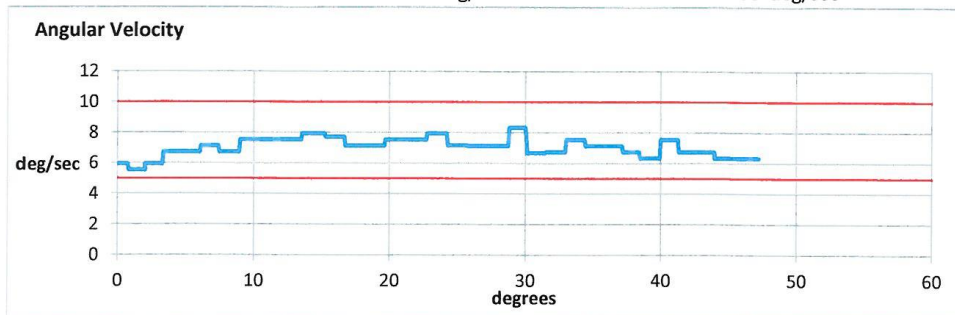
Serial Number: 37
Test Number: 1
Comments: Left

Date: 01-Mar-2013
Time: 8:16

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.2 °C Pass
Humidity	10 - 70	33 % Pass
Moment at 30°	0 ≤ 94.9	67.99 Nm Pass
Angle at 203 Nm	40 - 50	47.21 deg Pass
Average Velocity	5 - 10	7.03 deg/sec Pass



Max: 8.33 deg/sec Min: 5.55 deg/sec



Technician

Approved

Transportation Research Center Inc.

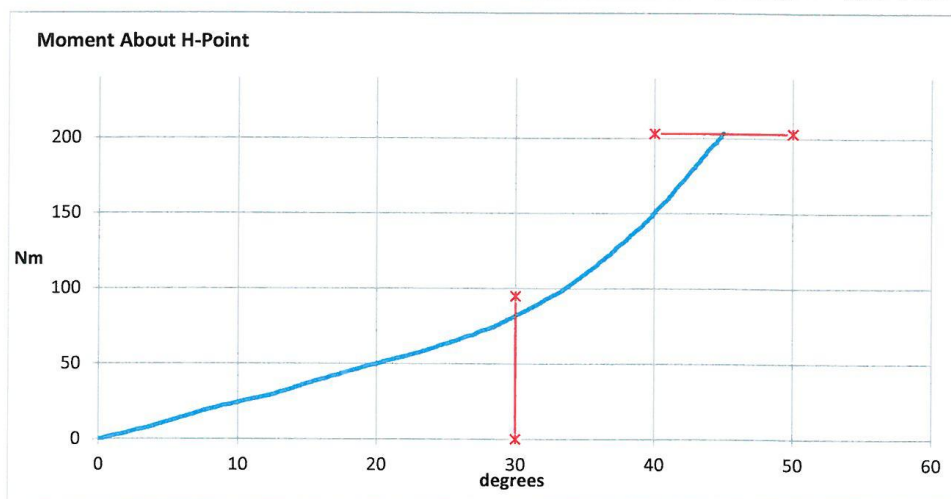
Hybrid III 50th Male Hip Range of Motion



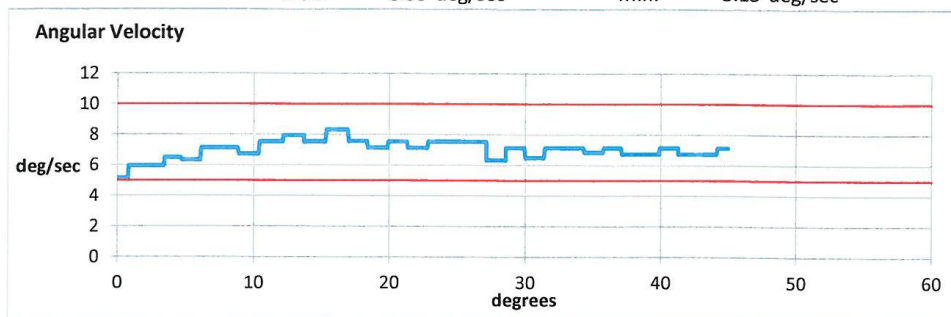
Serial Number: 37
Test Number: 1
Comments: Right

Date: 01-Mar-2013
Time: 8:49

TEST PARAMETER	SPECIFICATION		TEST RESULTS		
Temperature	18.9	- 25.6	21.4 °C	Pass	
Humidity	10	- 70	33 %	Pass	
Moment at 30°	0	≤ 94.9	82.58 Nm	Pass	
Angle at 203 Nm	40	- 50	44.99 deg	Pass	
Average Velocity	5	- 10	7 deg/sec	Pass	



Max: 8.33 deg/sec Min: 5.15 deg/sec



Technician

Approved

Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 15-1
Test Date: 3/1/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.110 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,756.75 N	Yes

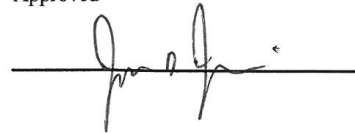
Test meets specifications.

Comments:

Technician



Approved



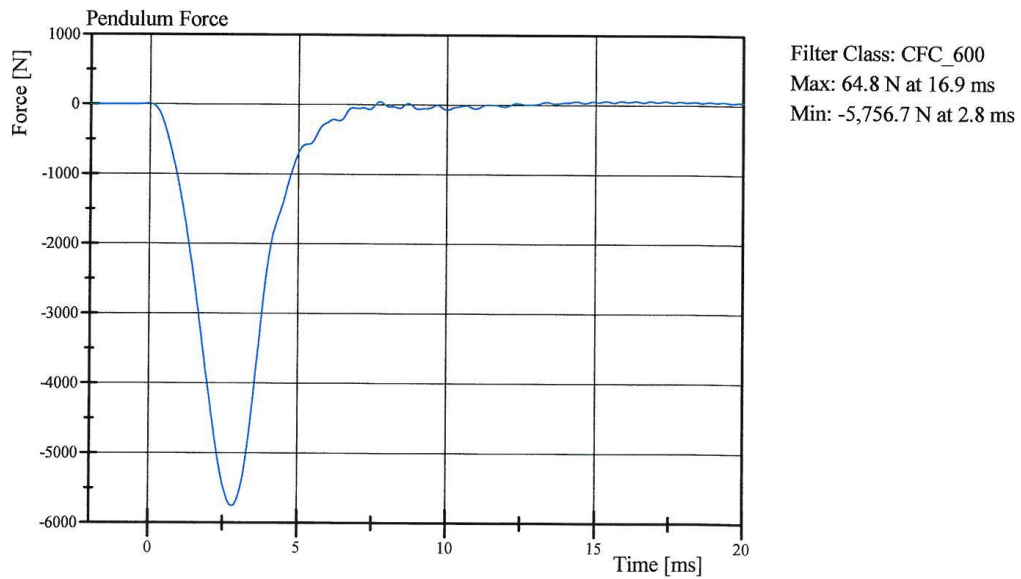
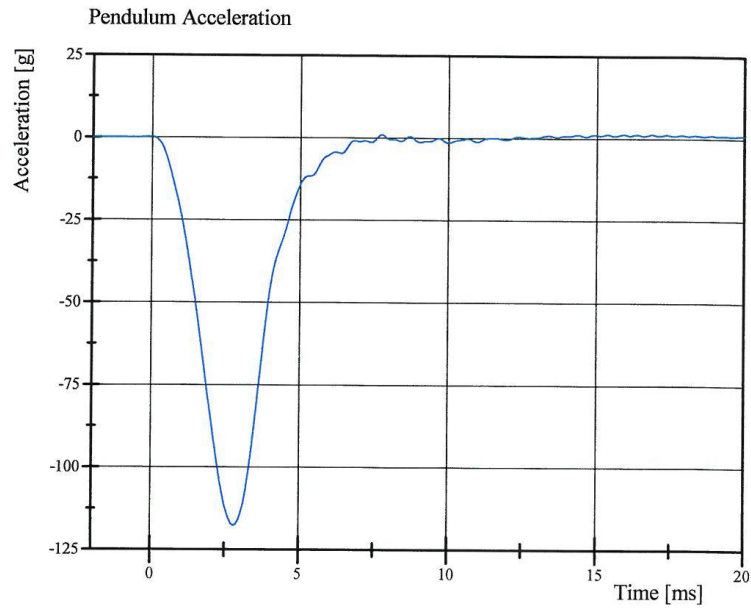
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

03.19.2013 06:42:39 1895



Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 15-1
Test Date: 3/1/2013



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

03.19.2013 06:42:46 1895



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 15-1
Test Date: 3/1/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.112 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,576.11 N	Yes

Test meets specifications.

Comments:

Technician



Approved



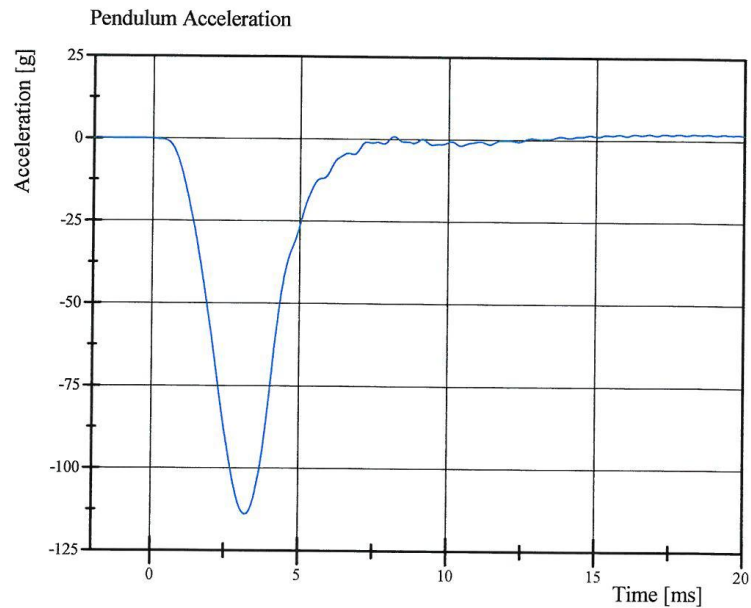
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

03.19.2013 06:44:08 1888

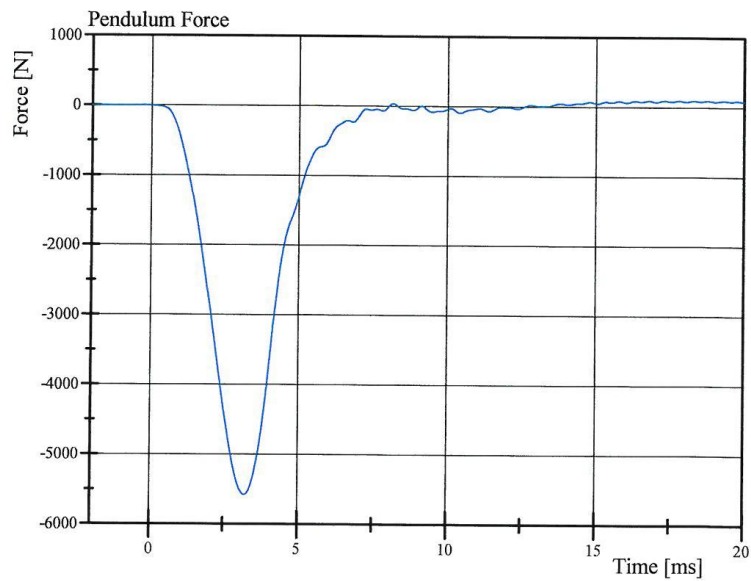


Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 15-1
Test Date: 3/1/2013



Filter Class: CFC_600
Max: 2.0 g at 17.3 ms
Min: -114.0 g at 3.2 ms



Filter Class: CFC_600
Max: 99.1 N at 17.3 ms
Min: -5,576.1 N at 3.2 ms

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

03.19.2013 06:44:16 1888

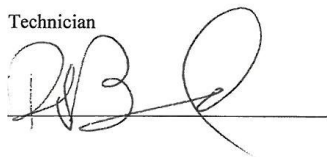


Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 15

Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	882	Yes
B	Shoulder Pivot Height	505.5 - 520.7	520	Yes
C	H-Point Height	83.8 - 88.9	85	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	294	Yes
H	Skull Cap To Backline	40.6 - 45.7	45	Yes
I	Shoulder-Elbow Length	330.2 - 345.4	339	Yes
J	Elbow Rest Height	190.5 - 210.8	198	Yes
K	Buttock Knee Length	579.1 - 604.5	600	Yes
L	Popliteal Height	429.3 - 454.7	441	Yes
M	Knee Pivot Height	485.1 - 500.4	495	Yes
N	Buttock Popliteal Length	452.1 - 477.5	470	Yes
O	Chest Depth	213.4 - 228.6	225	Yes
P	Foot Length	251.5 - 266.7	264	Yes
V	Shoulder Breadth	421.6 - 436.9	427	Yes
W	Foot Breadth	91.4 - 106.7	97	Yes
Y	Chest Circumference	970.3 - 1000.8	986	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

Driver S/N 037

Post-Test Calibration Sheets

**Transportation Research Center
Inc.**

ATD Calibration Report

for

NHTSA

**HIII 50th Serial No. 037
Calibration No. 16**



Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 16-1

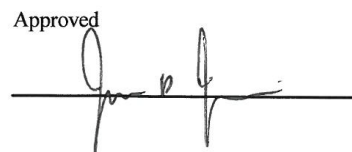
Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	27 %	Yes
Peak Head Resultant Acceleration	225 - 275 g	253.9 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-2.7 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 E
with Polarity in accordance with J211

03.19.2013 06:50:51 614

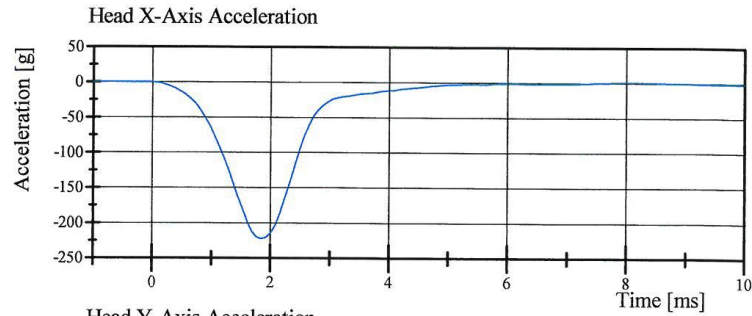


Transportation Research Center Inc.

Front Head Drop

HIII 50th Serial No. 037 Certification No. 16-1

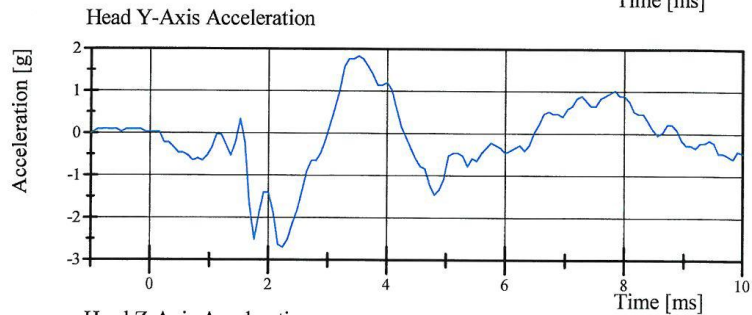
Test Date: 3/8/2013



Filter Class: CFC_1000

Max: 1.1 g at 8.0 ms

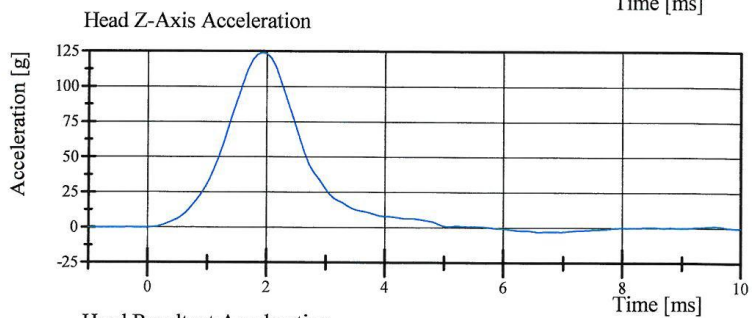
Min: -222.2 g at 1.8 ms



Filter Class: CFC_1000

Max: 1.8 g at 3.5 ms

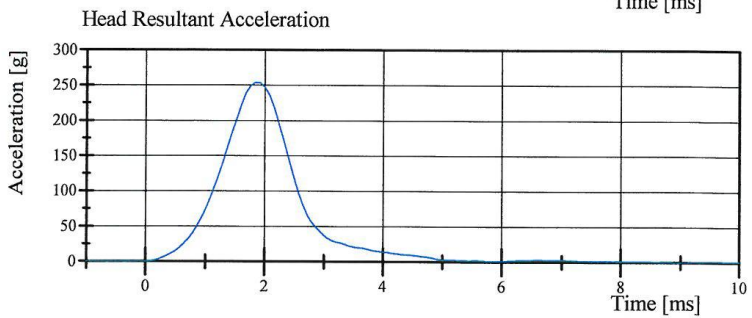
Min: -2.7 g at 2.2 ms



Filter Class: CFC_1000

Max: 124.3 g at 1.9 ms

Min: -2.8 g at 6.6 ms



Filter Class: CFC_1000

Max: 253.9 g at 1.8 ms

Min: 0.1 g at -1.0 ms

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

03.19.2013 06:50:57 614



Transportation Research Center Inc.

Neck Flexion

HIII 50th Serial No. 037 Certification No. 16-1

Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.977 m/s	Yes
Pendulum Acceleration Decay Crossing -5g	34 - 42 ms	37.4 ms	Yes
Pendulum Acceleration at 10ms	(-22.5) - (-27.5) g	-25.29 g	Yes
Pendulum Acceleration at 20ms	(-17.6) - (-22.6) g	-20.36 g	Yes
Pendulum Acceleration at 30ms	(-12.5) - (-18.5) g	-14.61 g	Yes
Pendulum Acceleration > 30ms	>= (-29.0) g	-14.61 g	Yes
Total Head D-Plane Rotation Peak	(-64) - (-78) °	-67.5 °	Yes
Time of Peak	57 - 64 ms	59.0 ms	Yes
Total Head D-Plane Rotation Decay to 0°	113 - 128 ms	116.2 ms	Yes
Total Neck Occipital Condyles Moment Peak	88 - 108 N·m	104.6 N·m	Yes
Time of Peak	47 - 58 ms	50.0 ms	Yes
Total Neck Occipital Condyles Moment Decay to 0 N·m	97 - 107 ms	97.4 ms	Yes

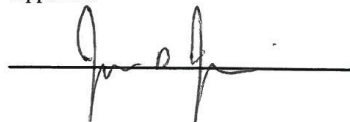
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 06:52:34 2946

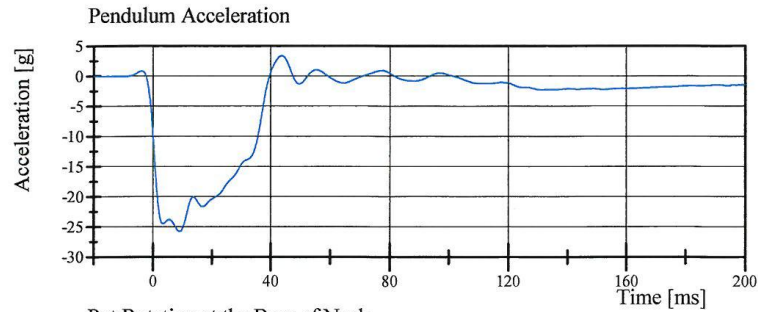


Transportation Research Center Inc.

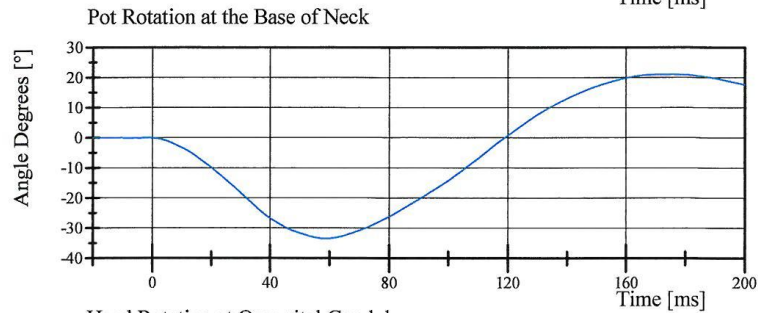
Neck Flexion

HIII 50th Serial No. 037 Certification No. 16-1

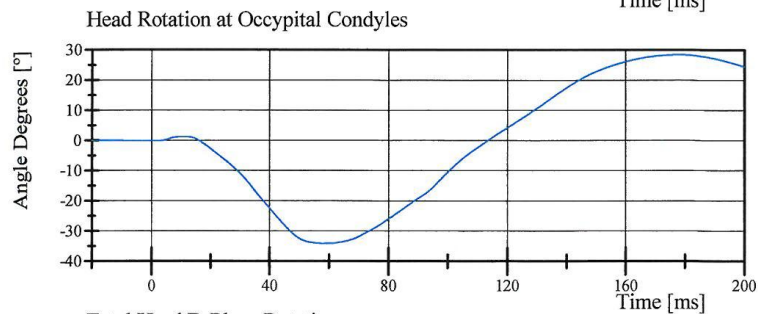
Test Date: 3/8/2013



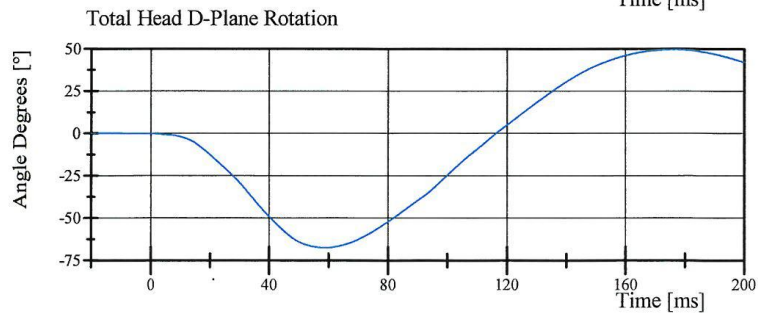
Filter Class: CFC_60
Max: 3.4 g at 43.8 ms
Min: -25.7 g at 9.1 ms



Filter Class: CFC_60
Max: 21.2 ° at 173.5 ms
Min: -33.4 ° at 58.7 ms



Filter Class: CFC_60
Max: 28.5 ° at 178.1 ms
Min: -34.1 ° at 59.4 ms



Filter Class: CFC_60
Max: 49.7 ° at 176.4 ms
Min: -67.5 ° at 59.0 ms

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

03.19.2013 06:52:42 2946

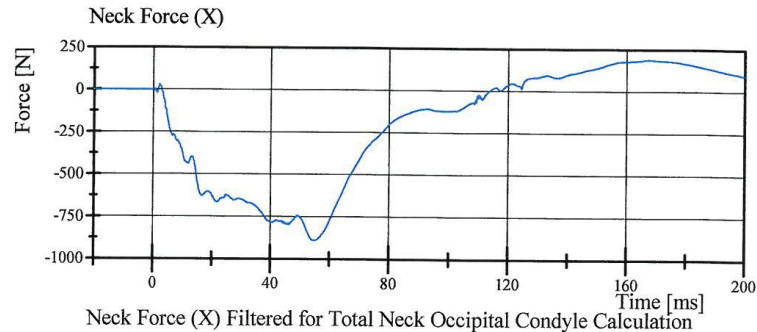


Transportation Research Center Inc.

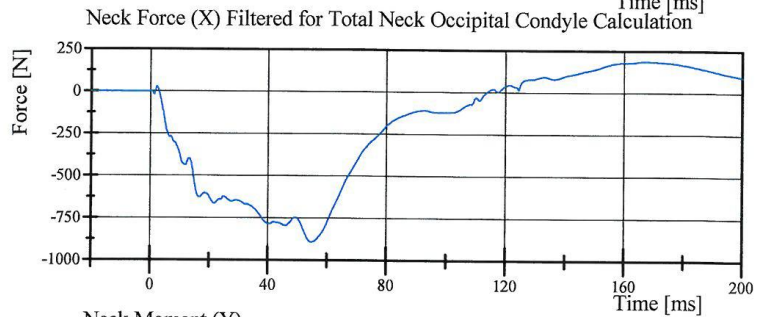
Neck Flexion

HIII 50th Serial No. 037 Certification No. 16-1

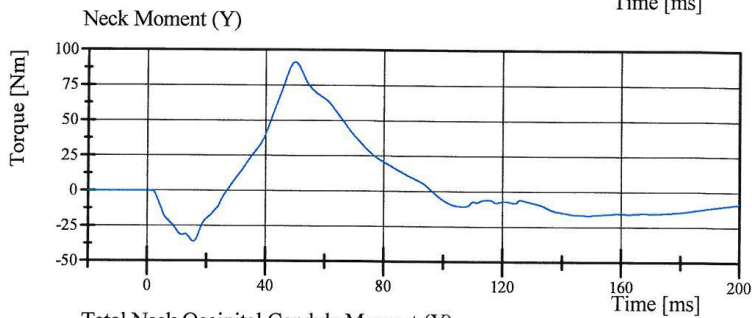
Test Date: 3/8/2013



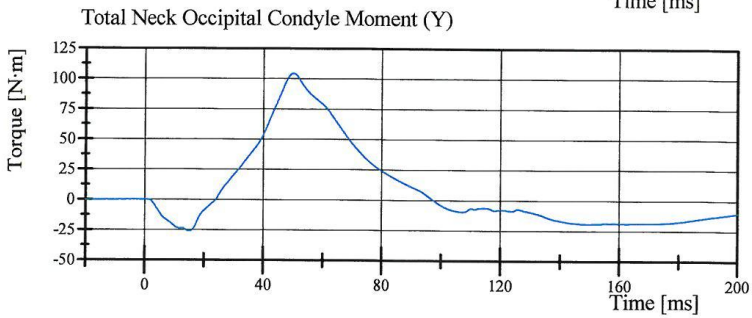
Filter Class: CFC_1000
Max: 189.8 N at 166.8 ms
Min: -889.9 N at 54.6 ms



Filter Class: CFC_600
Max: 189.6 N at 167.4 ms
Min: -889.8 N at 54.6 ms



Filter Class: CFC_600
Max: 91.4 Nm at 49.9 ms
Min: -36.1 Nm at 15.6 ms



Filter Class: Without (Consta
Max: 104.6 N·m at 50.0 ms
Min: -25.9 N·m at 15.0 ms

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

03.19.2013 06:52:43 2946



Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 16-1

Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Pendulum Velocity	(-5.95) - (-6.18) m/s	-5.964 m/s	Yes
Pendulum Acceleration Decay Crossing 5g	38 - 46 ms	41.8 ms	Yes
Pendulum Acceleration at 10ms	17.2 - 21.2 g	18.78 g	Yes
Pendulum Acceleration at 20ms	14.0 - 19.0 g	15.83 g	Yes
Pendulum Acceleration at 30ms	11.0 - 16.0 g	12.48 g	Yes
Pendulum Acceleration > 30ms	<= 22.0 g	13.04 g	Yes
Total Head D-Plane Rotation			
Peak	81 - 106 °	94.4 °	Yes
Time of Peak	72 - 82 ms	77.0 ms	Yes
Total Head D-Plane Rotation			
Decay to 0°	147 - 174 ms	157.4 ms	Yes
Total Neck Occipital Condyles Moment			
Peak	(-53) - (-80) N·m	-68.0 N·m	Yes
Time of Peak	65 - 79 ms	71.0 ms	Yes
Total Neck Occipital Condyles Moment			
Decay to 0 N·m	120 - 148 ms	143.5 ms	Yes

Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 06:56:20 3026

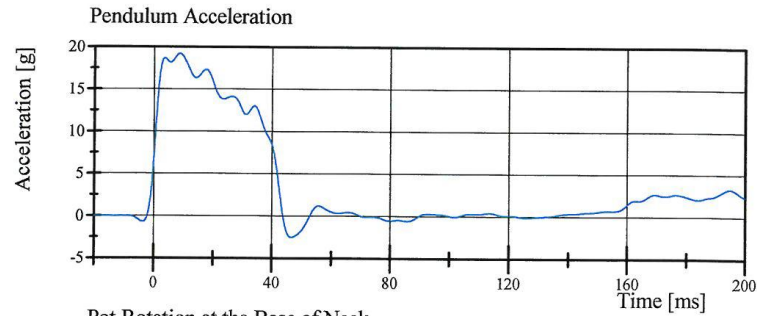


Transportation Research Center Inc.

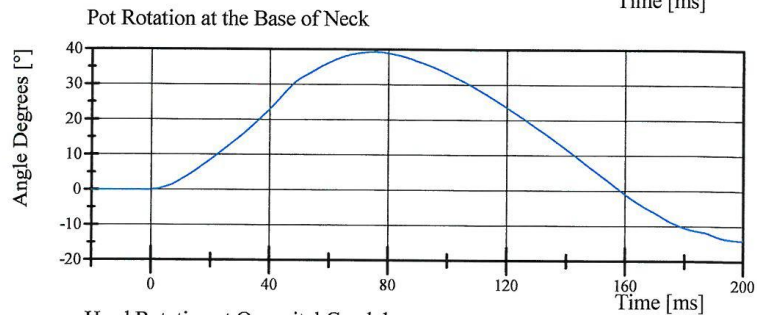
Neck Extension

HIII 50th Serial No. 037 Certification No. 16-1

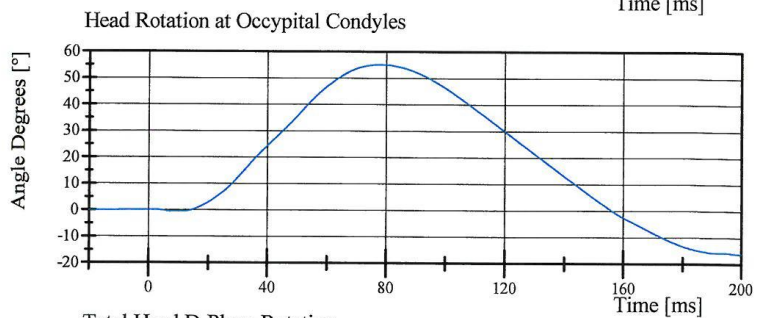
Test Date: 3/8/2013



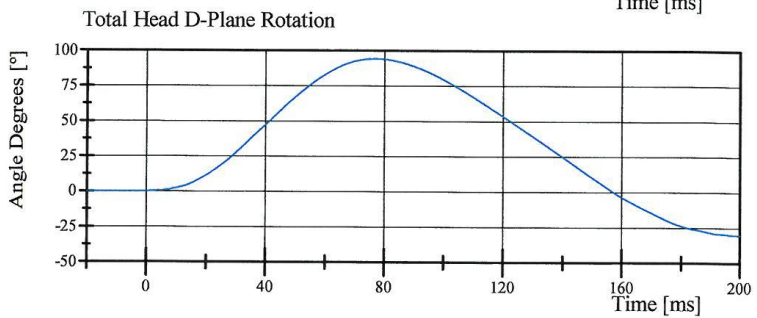
Filter Class: CFC_60
Max: 19.2 g at 8.6 ms
Min: -2.5 g at 46.6 ms



Filter Class: CFC_60
Max: 39.3 ° at 75.8 ms
Min: -13.9 ° at 199.4 ms



Filter Class: CFC_60
Max: 55.2 ° at 78.3 ms
Min: -16.2 ° at 200.0 ms



Filter Class: CFC_60
Max: 94.4 ° at 77.0 ms
Min: -30.1 ° at 200.0 ms

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

03.19.2013 06:56:27 3026

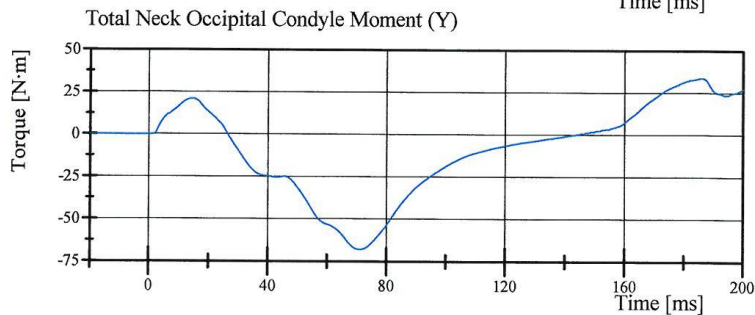
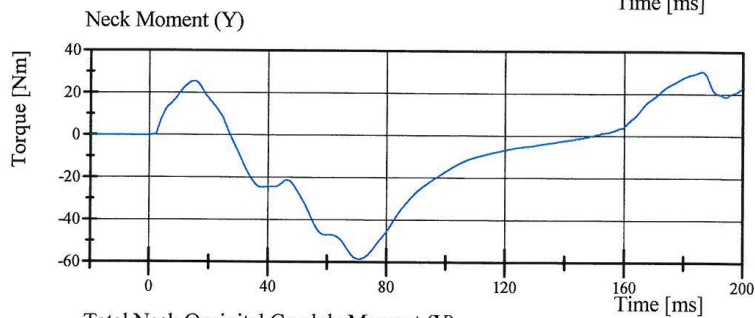
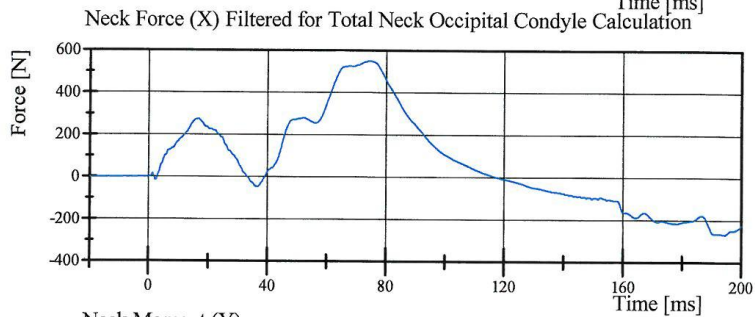
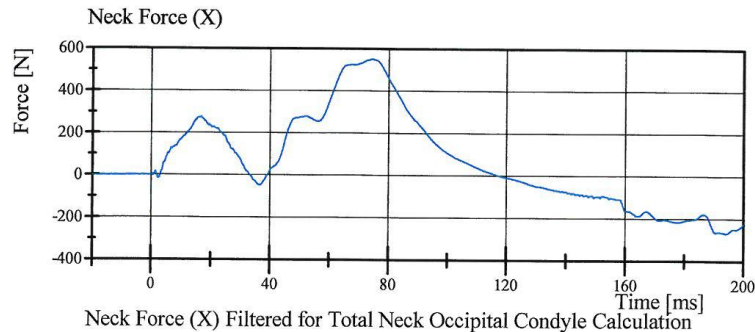


Transportation Research Center Inc.

Neck Extension

HIII 50th Serial No. 037 Certification No. 16-1

Test Date: 3/8/2013



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

03.19.2013 06:56:27 3026



Transportation Research Center Inc.

Front Thorax

HIII 50th Serial No. 037 Certification No. 16-3

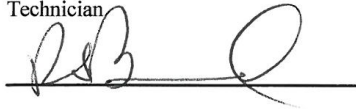
Test Date: 3/11/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	40 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.638 m/s	Yes
Probe Force Peak	(-5,160) - (-5,893) N	-5,641.3 N	Yes
Maximum Chest Compression	(-63.5) - (-72.6) mm	-68.20 mm	Yes
Internal Hysteresis	65 - 85 %	73.3 %	Yes

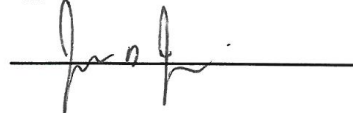
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 06:57:59 382

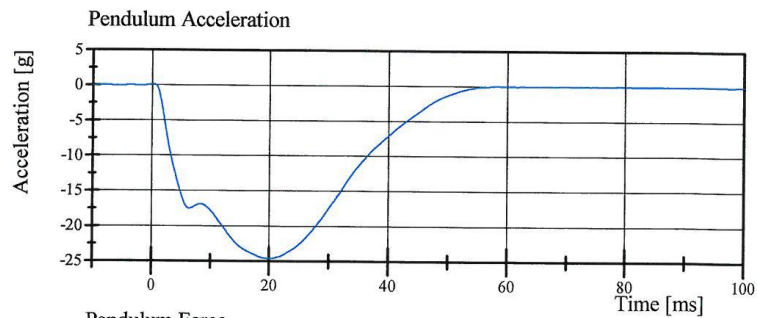


Transportation Research Center Inc.

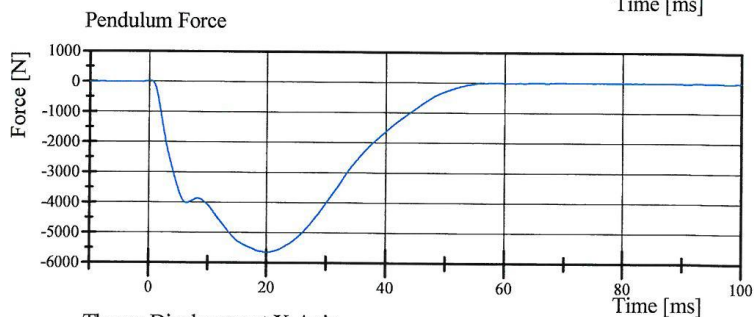
Front Thorax

HIII 50th Serial No. 037 Certification No. 16-3

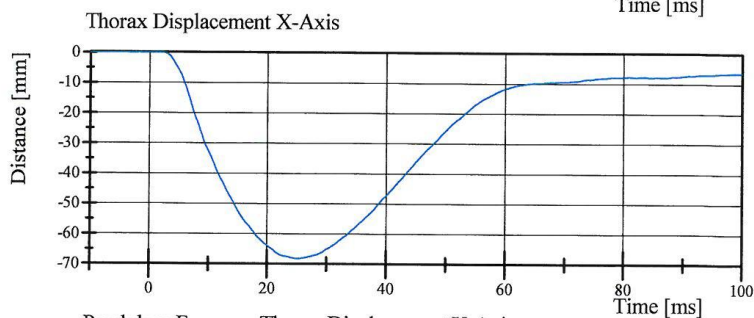
Test Date: 3/11/2013



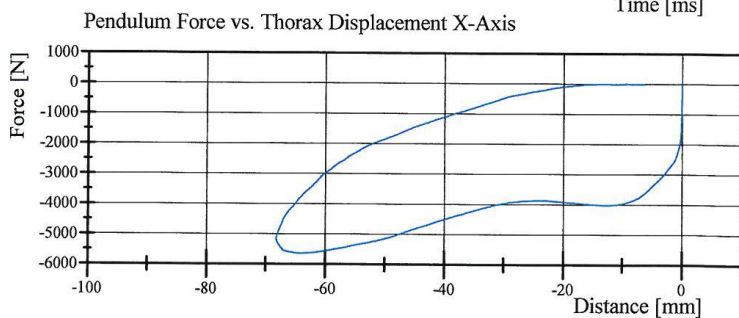
Filter Class: CFC_180
Max: 0.1 g at 0.2 ms
Min: -24.6 g at 20.1 ms



Filter Class: CFC_180
Max: 30.8 N at 0.2 ms
Min: -5,641.3 N at 20.1 ms



Filter Class: CFC_600
Max: 0.0 mm at -2.3 ms
Min: -68.2 mm at 25.2 ms



Filter Class: CFC_180
Max: 30.8 N at -0.0 mm
Min: -5,641.3 N at -64.0 mm

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

03.19.2013 06:58:08 382



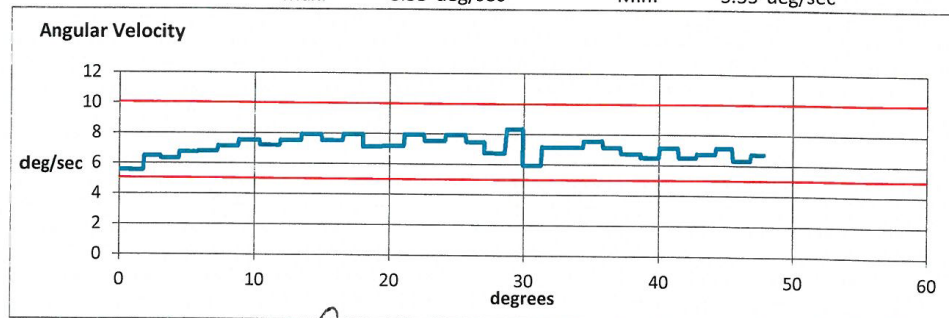
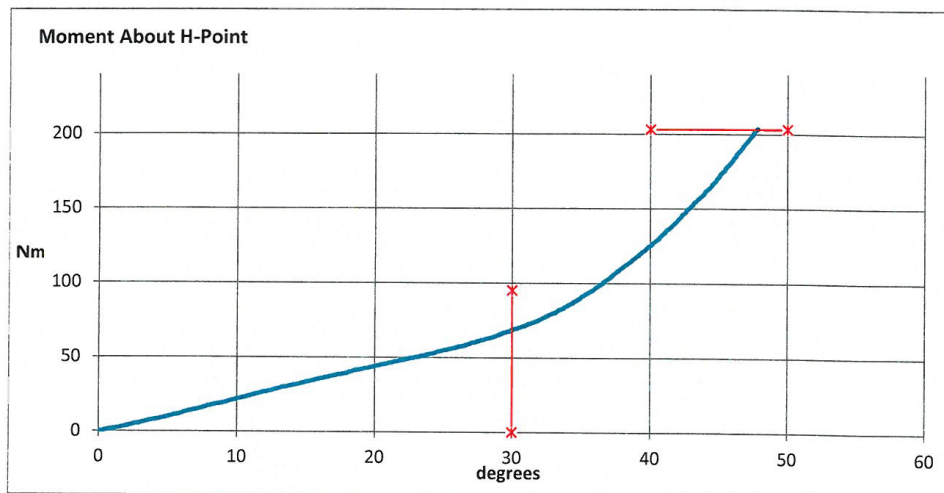
Transportation Research Center Inc.

Hybrid III 50th Male Hip Range of Motion



Serial Number: 37 Date: 08-Mar-2013
 Test Number: 1 Time: 7:45
 Comments: left

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.8 °C Pass
Humidity	10 - 70	30 % Pass
Moment at 30°	0 ≤ 94.9	68.82 Nm Pass
Angle at 203 Nm	40 - 50	47.84 deg Pass
Average Velocity	5 - 10	7.06 deg/sec Pass



Technician

Approved

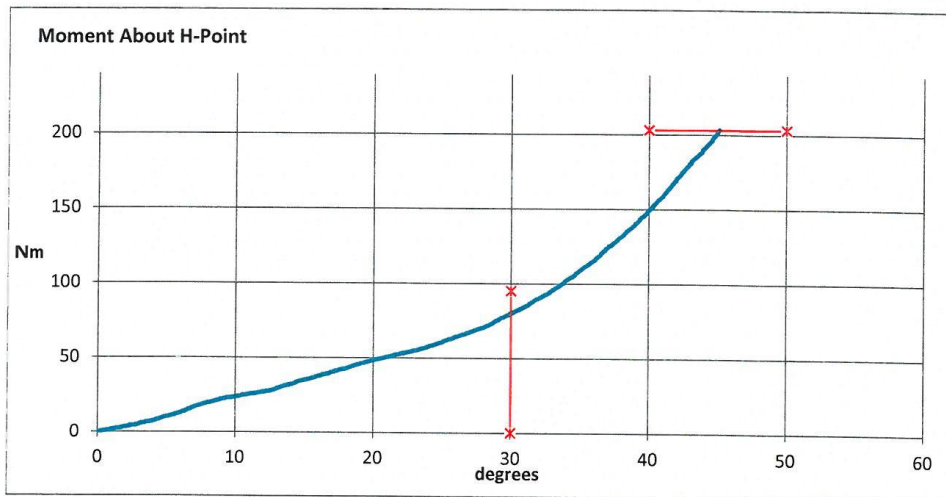
Transportation Research Center Inc.

Hybrid III 50th Male Hip Range of Motion

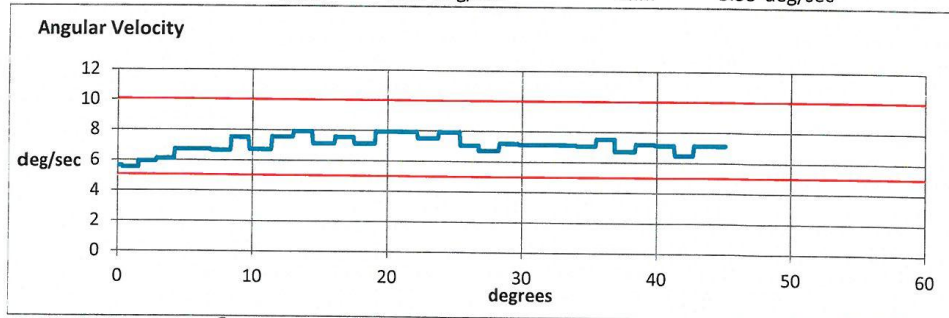


Serial Number: 37 Date: 08-Mar-2013
 Test Number: 1 Time: 8:21
 Comments: Right

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	18.9 - 25.6	21.4 °C Pass
Humidity	10 - 70	27 % Pass
Moment at 30°	0 ≤ 94.9	80.38 Nm Pass
Angle at 203 Nm	40 - 50	45.14 deg Pass
Average Velocity	5 - 10	7.07 deg/sec Pass



Max: 7.93 deg/sec Min: 5.55 deg/sec



Technician

[Signature]

Approved

[Signature]

Transportation Research Center Inc.

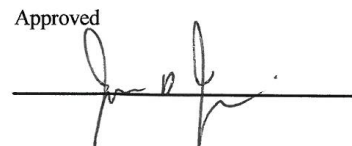
Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 16-1
Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.2 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.130 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,531.84 N	Yes

Test meets specifications.

Comments:

Technician


Approved


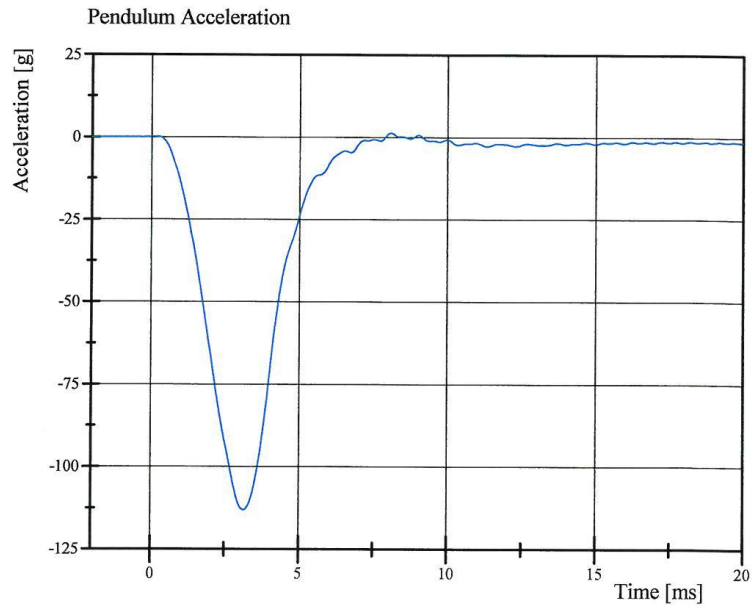
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

03.19.2013 06:59:51 1726

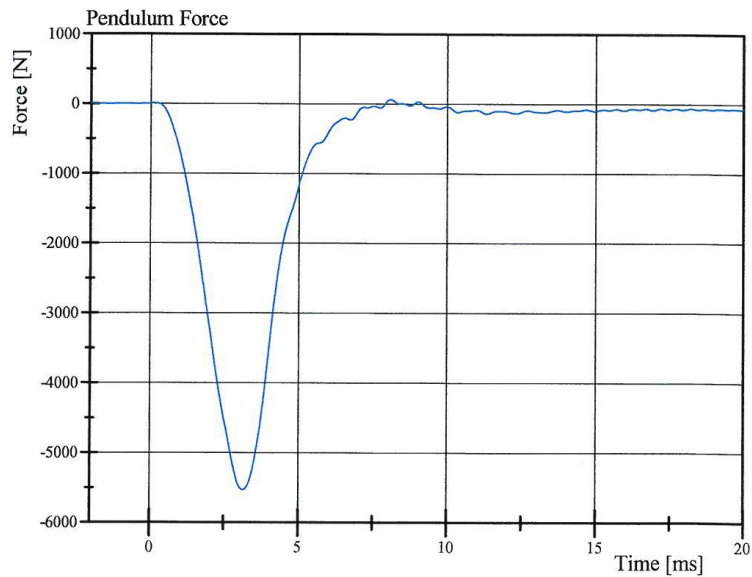


Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 16-1
Test Date: 3/8/2013



Filter Class: CFC_600
Max: 1.3 g at 8.1 ms
Min: -113.1 g at 3.1 ms



Filter Class: CFC_600
Max: 65.7 N at 8.1 ms
Min: -5,531.8 N at 3.1 ms

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

03.19.2013 06:59:58 1726



Transportation Research Center Inc.

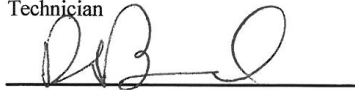
Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 16-2
Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.122 m/s	Yes
Peak Femur Force	(-4,715.2) - (-5,782.6) N	-5,690.27 N	Yes

Test meets specifications.

Comments:

Technician



Approved



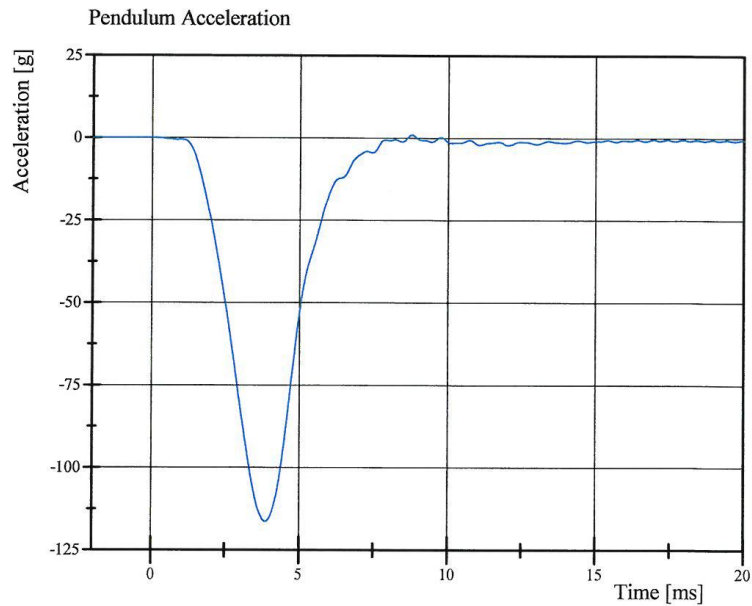
Specification Source: CFR49 Part 572 Subpart E
with Polarity in accordance with J211

03.19.2013 07:01:10 1723

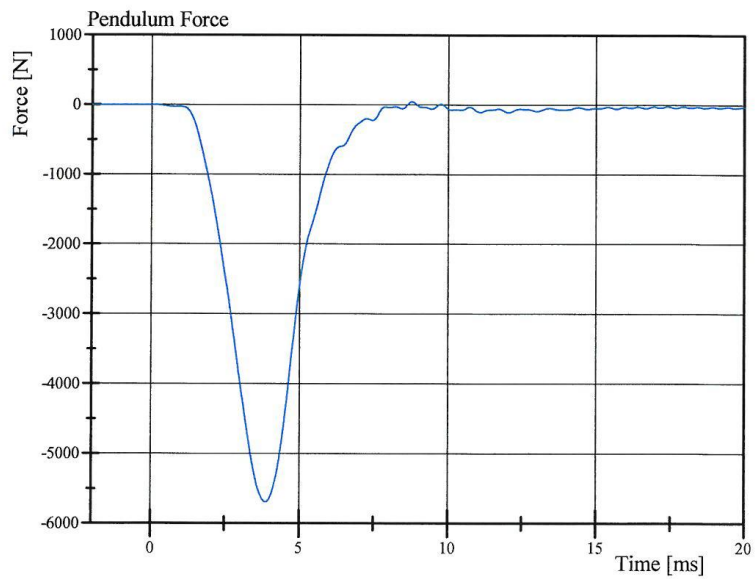


Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 50th Serial No. 037 Certification No. 16-2
Test Date: 3/8/2013



Filter Class: CFC_600
Max: 1.0 g at 8.8 ms
Min: -116.3 g at 3.8 ms



Filter Class: CFC_600
Max: 48.5 N at 8.8 ms
Min: -5,690.3 N at 3.8 ms

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

03.19.2013 07:01:16 1723



Transportation Research Center Inc.
572E HIII 50th Male Dummy
External Dimensions
Serial No. 037
Calibration No. 16

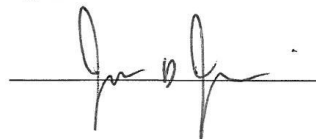
Symbol	Description	Specification	Results	Pass
		mm	mm	
A	Total Sitting Height	878.8 - 889.0	885	Yes
B	Shoulder Pivot Height	505.5 - 520.7	520	Yes
C	H-Point Height	83.8 - 88.9	85	Yes
D	H-Point From Seatback	134.6 - 139.7	138	Yes
E	Shoulder Pivot From Backline	83.8 - 94.0	92	Yes
F	Thigh Clearance	139.7 - 154.9	151	Yes
G	Back Of Elbow To Wrist Pivot	289.6 - 304.8	294	Yes
H	Skull Cap To Backline	40.6 - 45.7	45	Yes
I	Shoulder-Elbow Length	330.2 - 345.4	339	Yes
J	Elbow Rest Height	190.5 - 210.8	199	Yes
K	Buttock Knee Length	579.1 - 604.5	600	Yes
L	Popliteal Height	429.3 - 454.7	441	Yes
M	Knee Pivot Height	485.1 - 500.4	495	Yes
N	Buttock Popliteal Length	452.1 - 477.5	470	Yes
O	Chest Depth	213.4 - 228.6	225	Yes
P	Foot Length	251.5 - 266.7	264	Yes
V	Shoulder Breadth	421.6 - 436.9	427	Yes
W	Foot Breadth	91.4 - 106.7	97	Yes
Y	Chest Circumference	970.3 - 1000.8	986	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

Pre-Test Calibration Sheets
Front Passenger S/N 426

Transportation Research Center Inc.

ATD Calibration Report

for

NHTSA

HIII 5th Serial No. 426
Calibration No. 17



Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 17-1

Test Date: 3/4/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	34 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	251.2 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-3.5 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

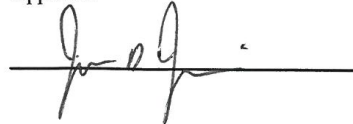
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:22:34 610

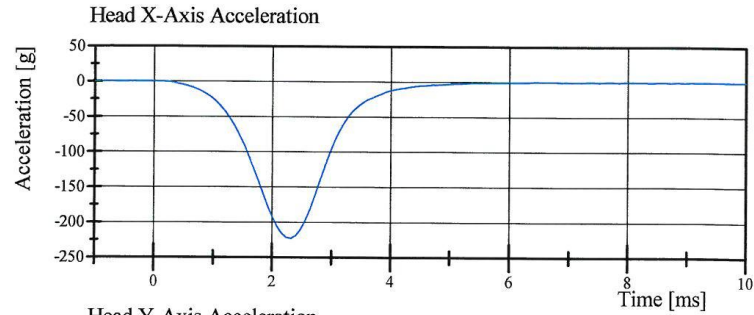


Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 17-1

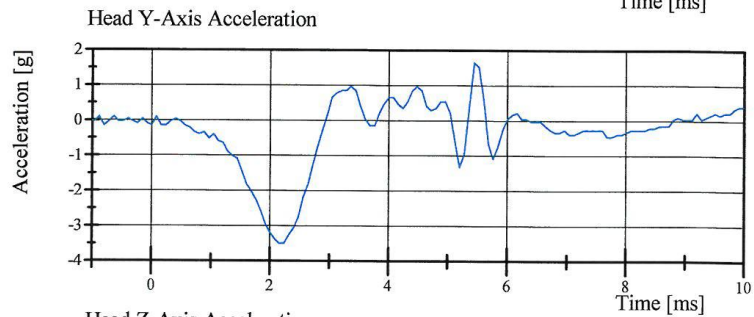
Test Date: 3/4/2013



Filter Class: CFC_1000

Max: 0.1 g at 9.8 ms

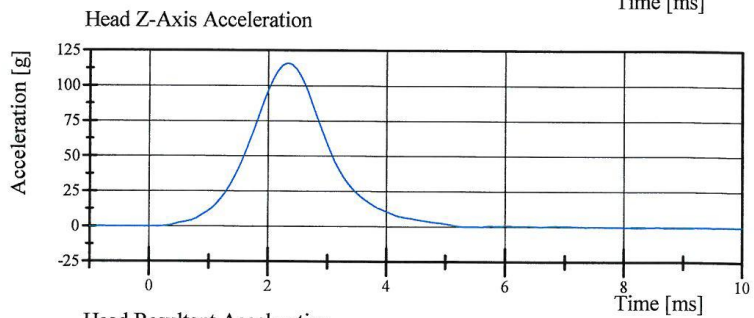
Min: -222.7 g at 2.3 ms



Filter Class: CFC_1000

Max: 1.7 g at 5.4 ms

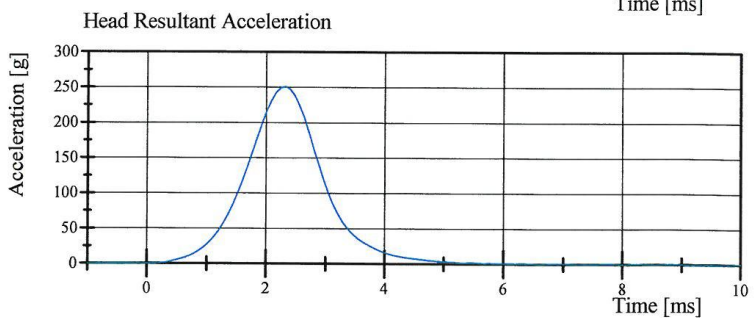
Min: -3.5 g at 2.2 ms



Filter Class: CFC_1000

Max: 116.1 g at 2.3 ms

Min: -0.4 g at 8.8 ms



Filter Class: CFC_1000

Max: 251.2 g at 2.3 ms

Min: 0.0 g at -0.4 ms

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

03.19.2013 07:22:49 610



Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 17-7

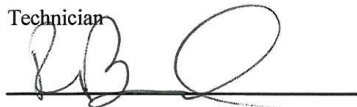
Test Date: 3/4/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.6 °C	Yes
Relative Humidity	10 - 70 %	27 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.975 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	-4.78 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.82 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-78.8 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	69.3 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	86.8 ms	Yes

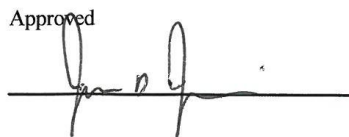
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:26:47 1709

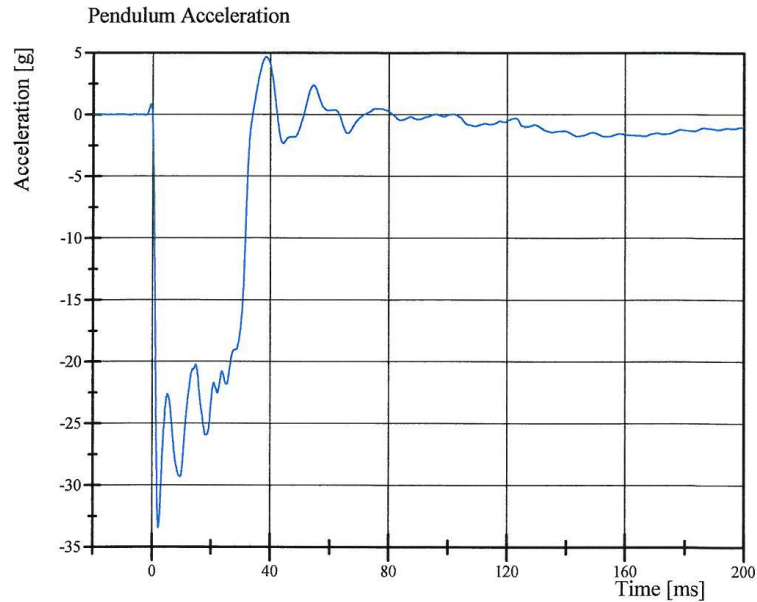


Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 17-7

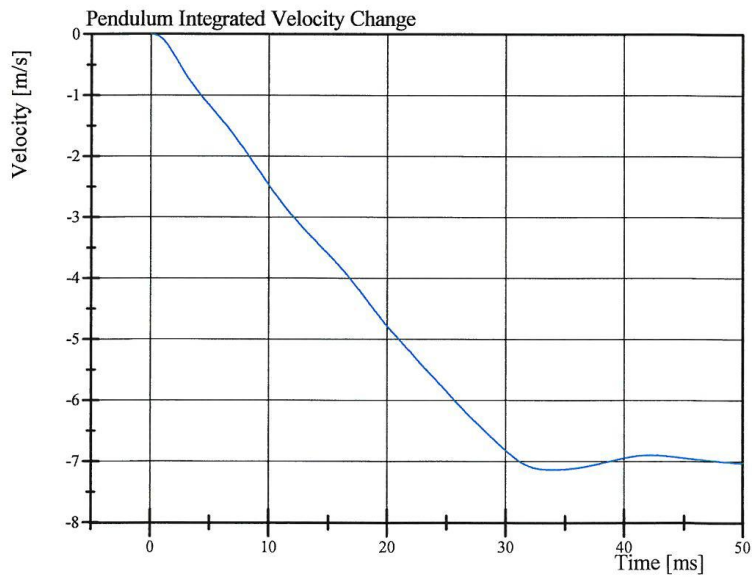
Test Date: 3/4/2013



Filter Class: CFC_180

Max: 4.7 g at 38.5 ms

Min: -33.4 g at 2.2 ms



Filter Class: CFC_180

Max: 0.0 m/s at 0.0 ms

Min: -7.1 m/s at 34.0 ms

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

03.19.2013 07:26:54 1709

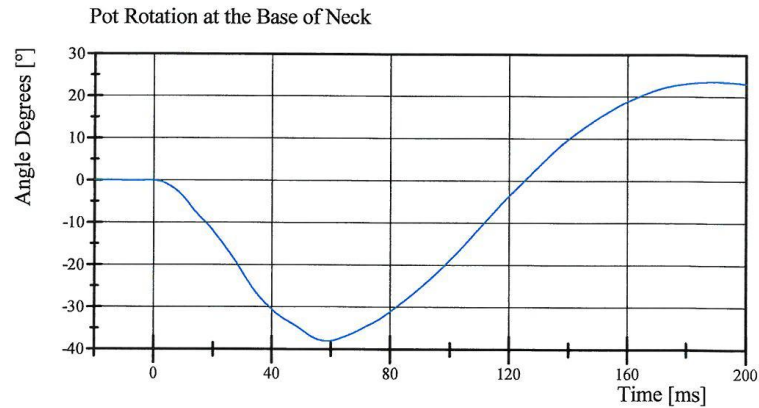


Transportation Research Center Inc.

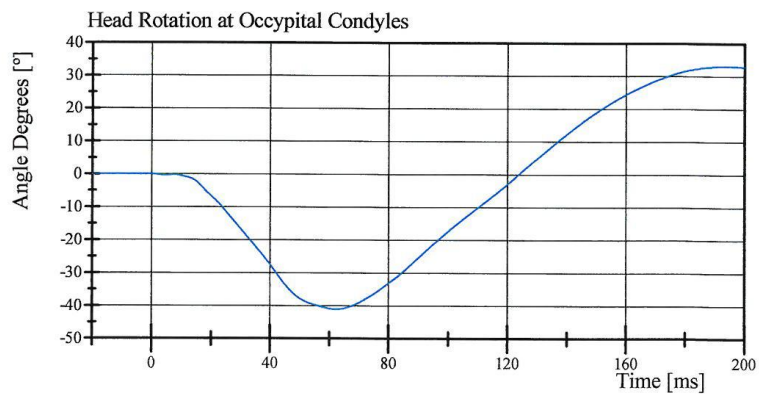
Neck Flexion

HIII 5th Serial No. 426 Certification No. 17-7

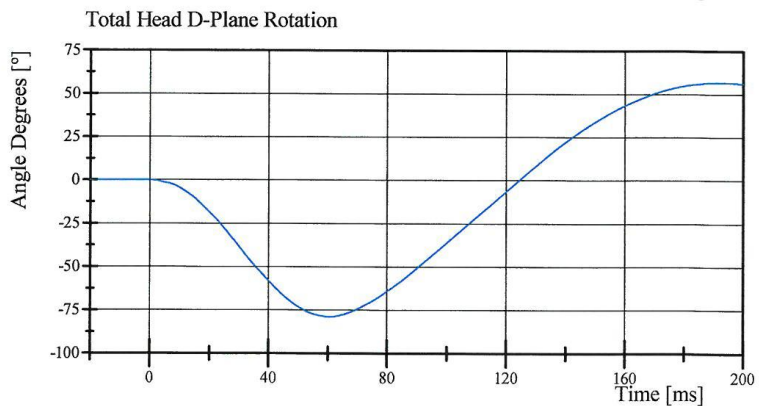
Test Date: 3/4/2013



Filter Class: CFC_60
Max: 23.6 ° at 189.5 ms
Min: -38.0 ° at 58.9 ms



Filter Class: CFC_60
Max: 33.2 ° at 193.9 ms
Min: -41.1 ° at 62.3 ms



Filter Class: CFC_60
Max: 56.7 ° at 191.9 ms
Min: -78.8 ° at 60.7 ms

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

03.19.2013 07:26:54 1709

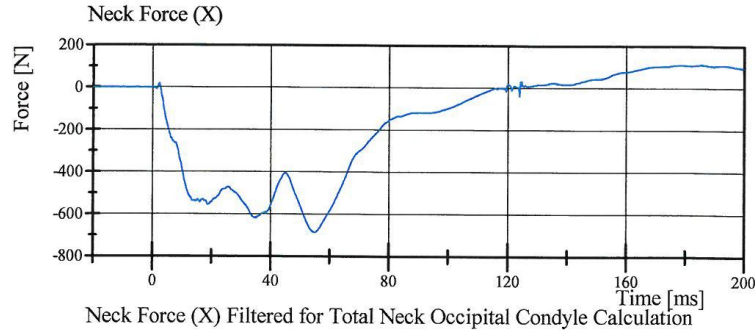


Transportation Research Center Inc.

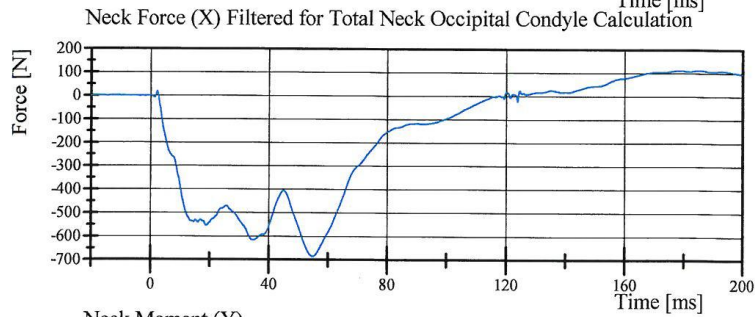
Neck Flexion

HIII 5th Serial No. 426 Certification No. 17-7

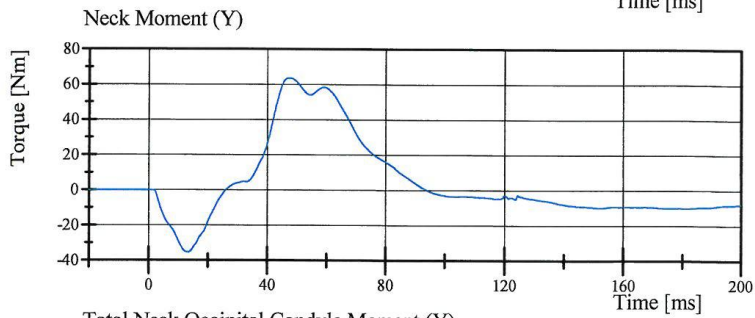
Test Date: 3/4/2013



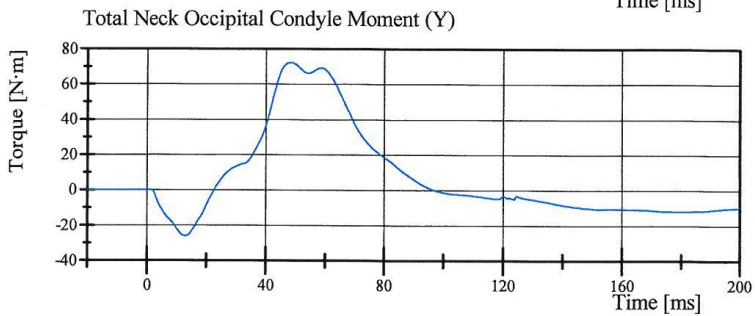
Filter Class: CFC_1000
Max: 114.2 N at 185.5 ms
Min: -686.0 N at 54.8 ms



Filter Class: CFC_600
Max: 113.7 N at 185.5 ms
Min: -685.5 N at 54.9 ms



Filter Class: CFC_600
Max: 63.7 Nm at 47.2 ms
Min: -35.4 Nm at 13.4 ms



Filter Class: Without (Consta
Max: 72.3 N·m at 48.4 ms
Min: -26.0 N·m at 13.1 ms

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

03.19.2013 07:26:55 1709



Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 17-1

Test Date: 3/4/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	32 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.049 m/s	Yes
Pendulum Integrated Velocity Change at 10ms	1.5 - 1.9 m/s	1.89 m/s	Yes
Pendulum Integrated Velocity Change at 20ms	3.1 - 3.9 m/s	3.66 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	5.28 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	108.9 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-57.6 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	103.8 ms	Yes

Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:30:49 1837

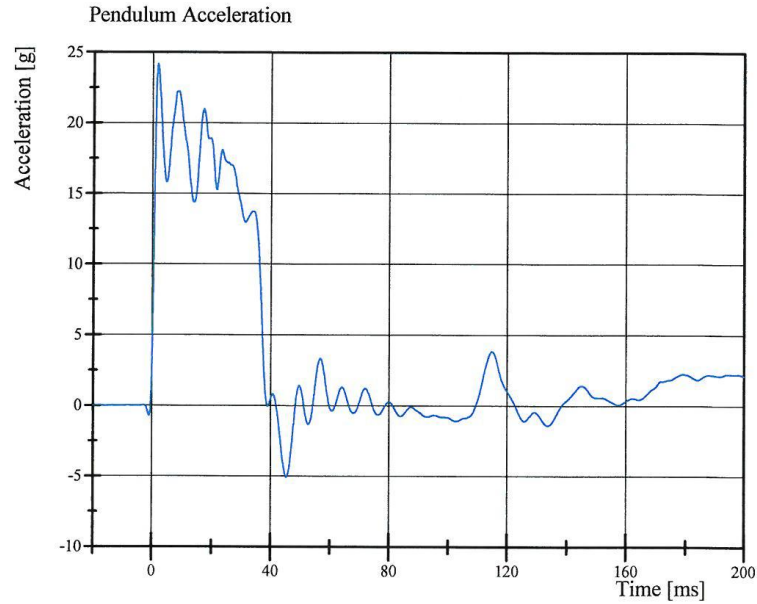


Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 17-1

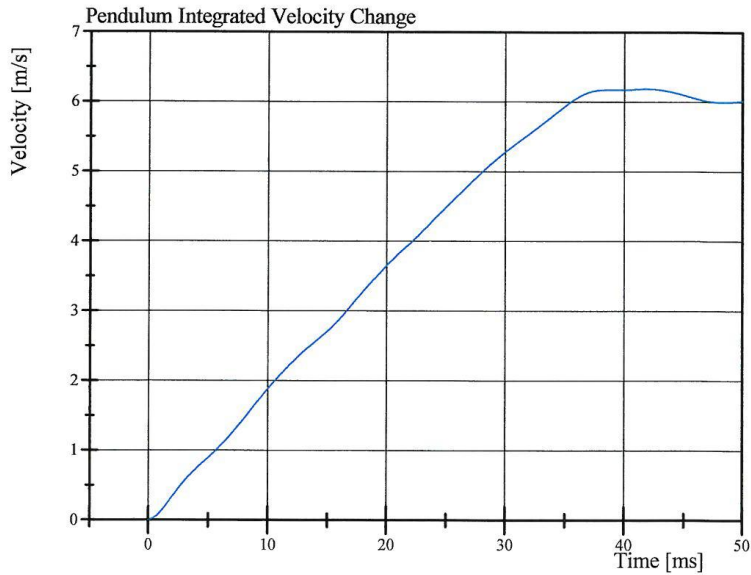
Test Date: 3/4/2013



Filter Class: CFC_180

Max: 24.2 g at 1.8 ms

Min: -5.1 g at 45.3 ms



Filter Class: CFC_180

Max: 6.2 m/s at 41.8 ms

Min: 0.0 m/s at 0.0 ms

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

03.19.2013 07:30:55 1837



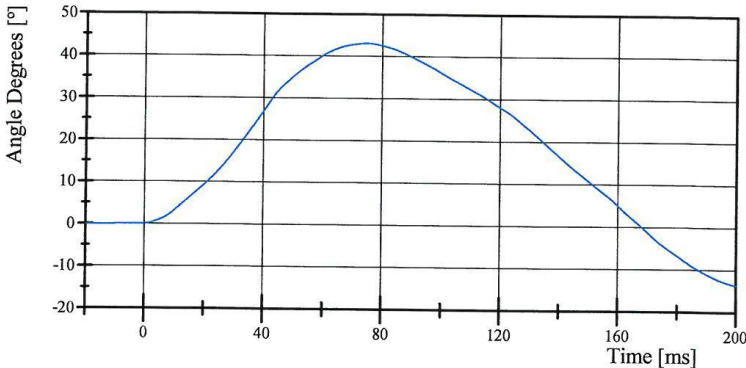
Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 17-1

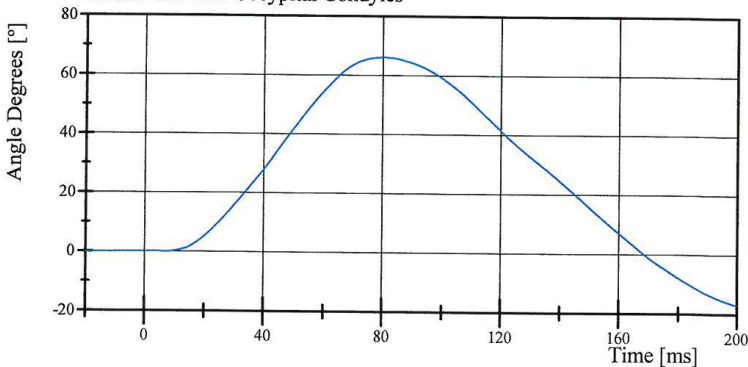
Test Date: 3/4/2013

Pot Rotation at the Base of Neck



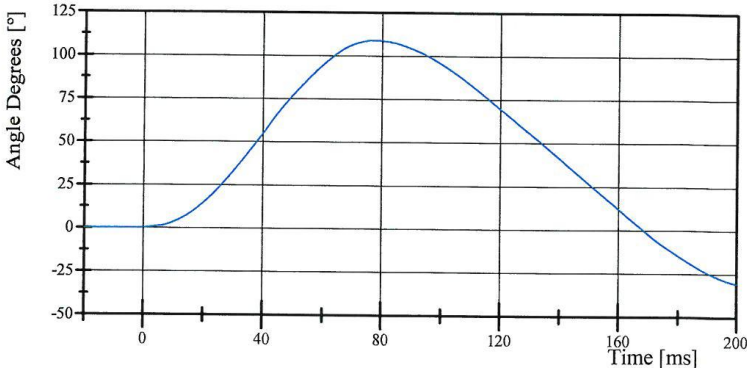
Filter Class: CFC_60
Max: 43.1 ° at 74.9 ms
Min: -13.6 ° at 200.0 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 66.1 ° at 80.2 ms
Min: -16.9 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 108.9 ° at 77.4 ms
Min: -30.5 ° at 200.0 ms

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

03.19.2013 07:30:56 1837

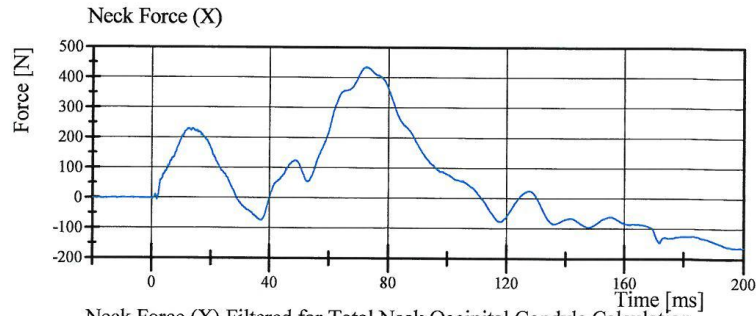


Transportation Research Center Inc.

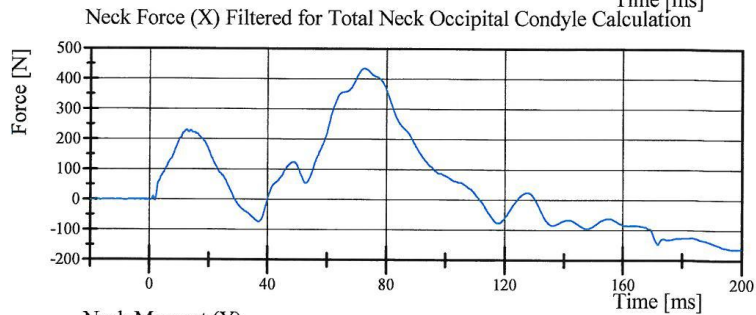
Neck Extension

HIII 5th Serial No. 426 Certification No. 17-1

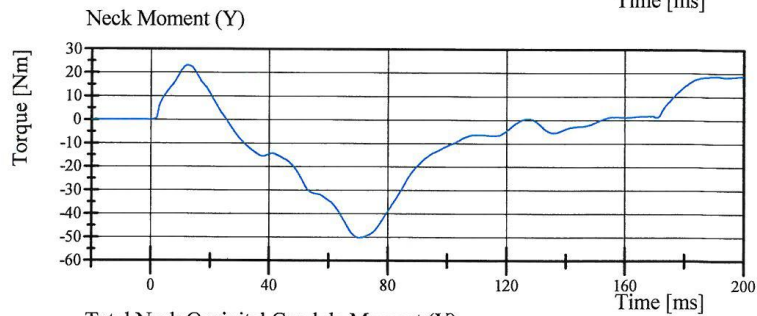
Test Date: 3/4/2013



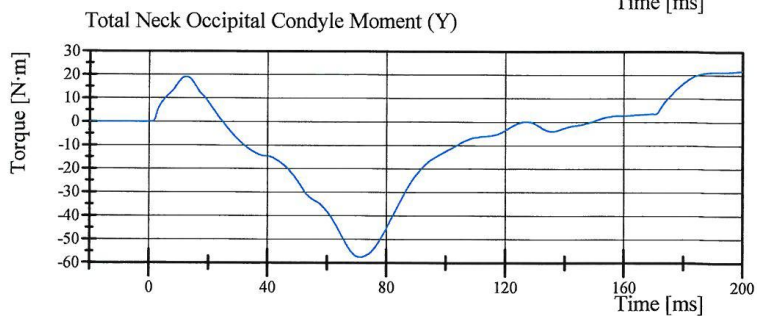
Filter Class: CFC_1000
Max: 435.7 N at 72.6 ms
Min: -163.4 N at 198.5 ms



Filter Class: CFC_600
Max: 435.0 N at 72.5 ms
Min: -163.0 N at 198.4 ms



Filter Class: CFC_600
Max: 23.2 Nm at 12.4 ms
Min: -50.1 Nm at 70.5 ms



Filter Class: Without (Consta
Max: 21.8 N·m at 200.0 ms
Min: -57.6 N·m at 71.3 ms

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

03.19.2013 07:30:56 1837



Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 17-5

Test Date: 3/5/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.761 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,293.9 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	$\geq$ (-4,600) N	-4,056.4 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-55.6 mm	Yes
Internal Hysteresis	69 - 85 %	73.3 %	Yes

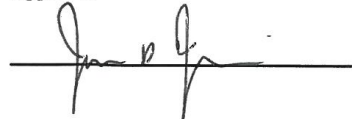
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:29:11 370

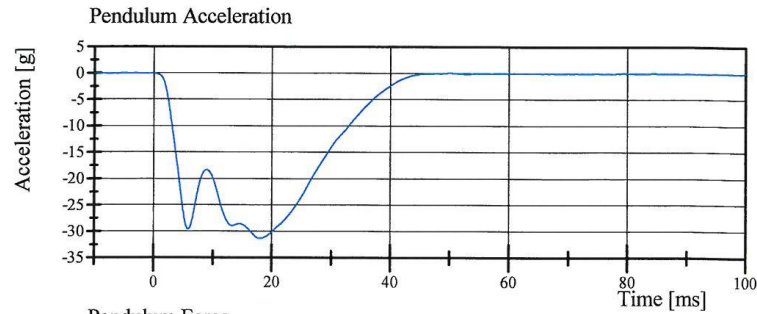


Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 17-5

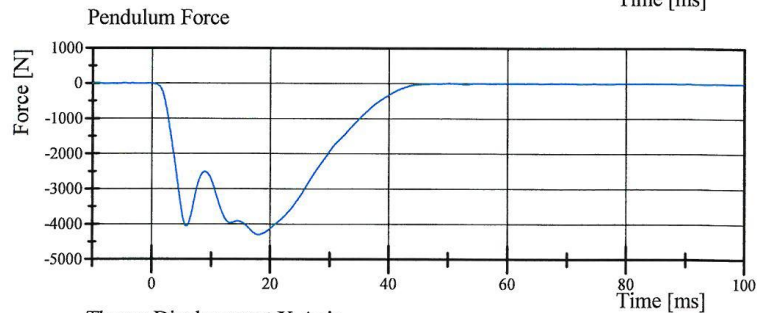
Test Date: 3/5/2013



Filter Class: CFC_180

Max: 0.1 g at 50.0 ms

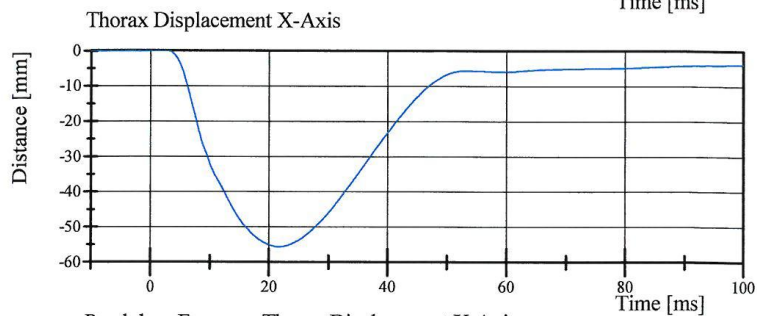
Min: -31.3 g at 18.0 ms



Filter Class: CFC_180

Max: 7.2 N at 50.0 ms

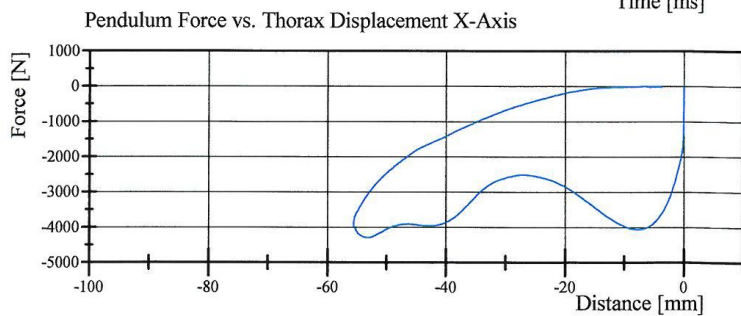
Min: -4,293.9 N at 18.0 ms



Filter Class: CFC_600

Max: 0.0 mm at -9.2 ms

Min: -55.6 mm at 21.5 ms



Filter Class: CFC_180

Max: 7.2 N at -6.6 mm

Min: -4,293.9 N at -53.1 mm

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

03.19.2013 07:29:19 370



TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III SMALL FEMALE

CAL DATE: 01-Mar-13

TRC, INC. TEST NO: TOFL-01 572 O SN426 TORSO FLEX CAL 17

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TIME		1000
TEMPERATURE	20.6 – 22.2° C	21.6 ° C
RELATIVE HUMIDITY	10 – 70 %	30 %
INITIAL ANGLE OF UNSUPPORTED DUMMY <u>START ANGLE</u>	<= 20° REFERENCED TO VERTICAL	15.0 °
DIFFERENCE BETWEEN <u>RETURN</u> <u>ANGLE</u> & INTIAL ANGLE	+/- 8 ° OF INTIAL ANGLE	5.5 °
MAXIMUM FORCE AT 45 DEG. DURING 10 SECOND PERIOD	320 – 390 N	377.9 N
RATE	0.5° - 1.5 °/sec	0.98°/sec

TEST MEETS SPECIFICATIONS

Comments:

TECHNICIAN



Transportation Research Center Inc.

Left Knee Femur Response Test

HIII 5th Serial No. 426 Certification No. 17-2

Test Date: 3/1/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.119 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,536.6 N	Yes

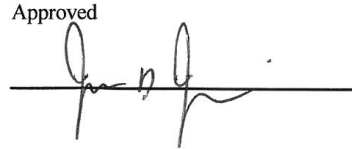
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:32:57 1691

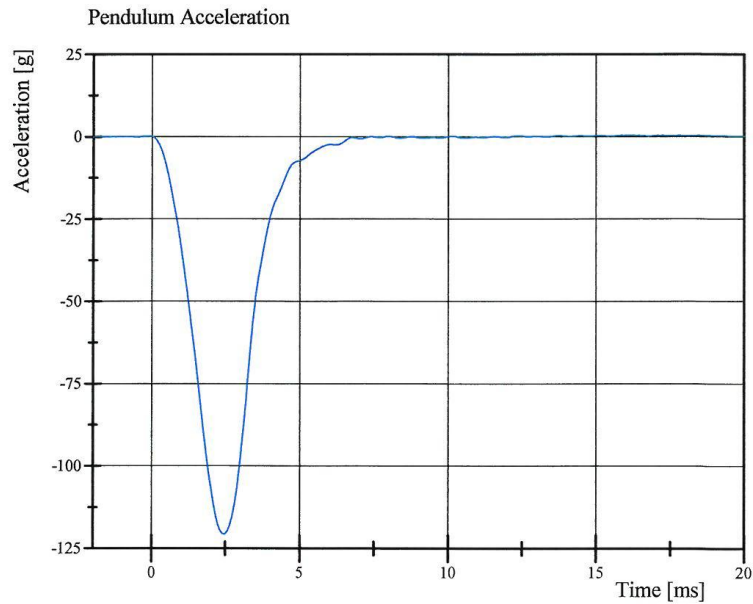


Transportation Research Center Inc.

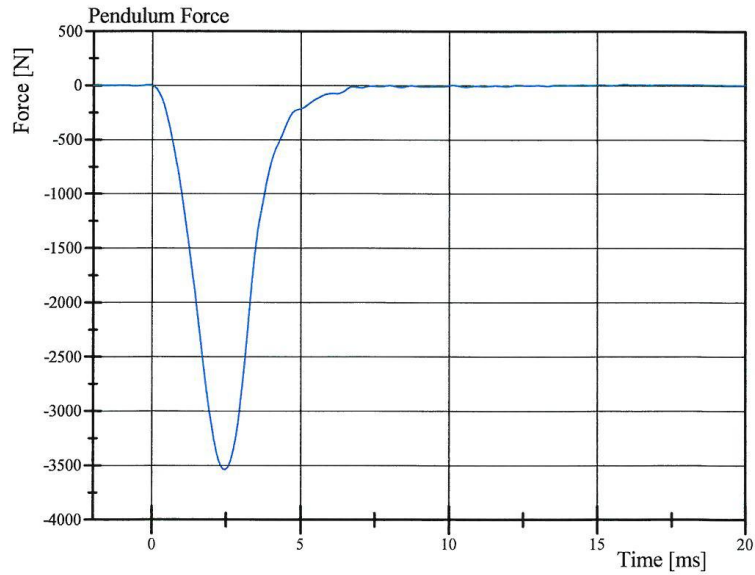
Left Knee Femur Response Test

HIII 5th Serial No. 426 Certification No. 17-2

Test Date: 3/1/2013



Filter Class: CFC_600
Max: 0.4 g at 15.9 ms
Min: -120.6 g at 2.5 ms



Filter Class: CFC_600
Max: 10.8 N at 15.9 ms
Min: -3,536.6 N at 2.5 ms

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

03.19.2013 07:33:10 1691



Transportation Research Center Inc.

Right Knee Femur Response Test

HIII 5th Serial No. 426 Certification No. 17-2

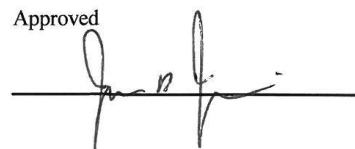
Test Date: 3/4/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.0 °C	Yes
Relative Humidity	10 - 70 %	27 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.127 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,681.2 N	Yes

Test meets specifications.

Comments:

Technician


Approved


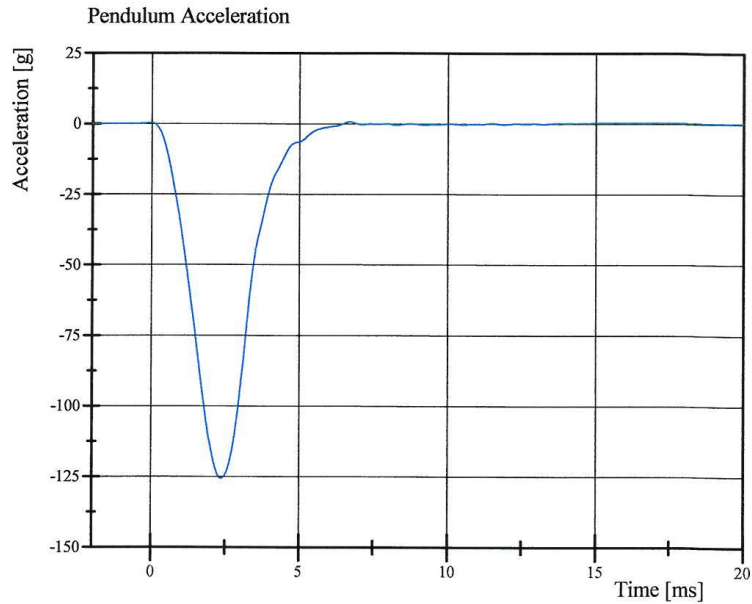
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

03.19.2013 07:34:33 1679

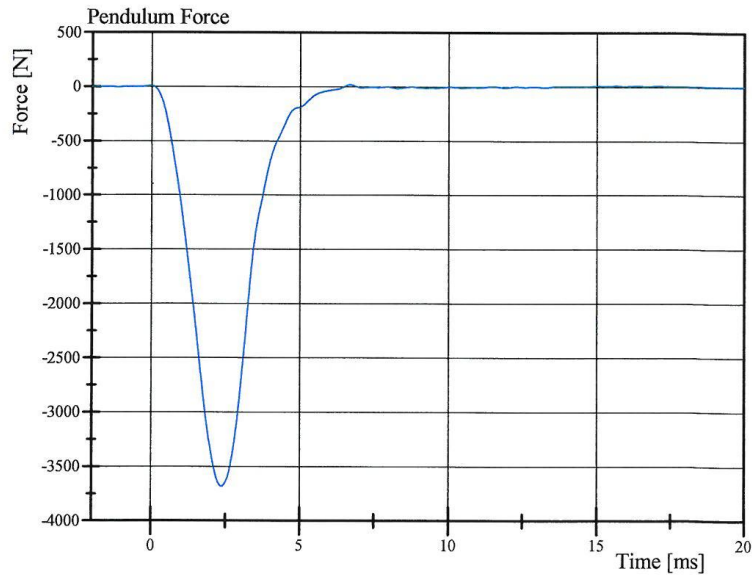


Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 17-2
Test Date: 3/4/2013



Filter Class: CFC_600
Max: 0.7 g at 6.7 ms
Min: -125.5 g at 2.4 ms



Filter Class: CFC_600
Max: 19.9 N at 6.7 ms
Min: -3,681.2 N at 2.4 ms

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

03.19.2013 07:34:47 1679



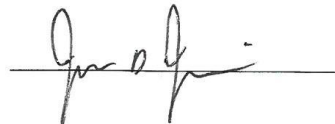
Transportation Research Center Inc.
5720 HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 16

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	445	Yes
C	Hip Pivot Height	81.3 - 86.3	85	Yes
D	Hip Pivot from Backline	144.8 - 149.8	147	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	79	Yes
F	Thigh Clearance	119.4 - 134.6	128	Yes
G	Back of Elbow to Wrist Pivot	243.9 - 259.1	249	Yes
H	Head Back to Backline	43.2 - 48.2	45	Yes
I	Shoulder to Elbow Length	276.8 - 297.2	283	Yes
J	Elbow Rest Height	182.8 - 203.2	195	Yes
K	Buttock Knee Length	520.7 - 546.1	535	Yes
L	Popliteal Height	355.6 - 376.0	369	Yes
M	Knee Pivot Height	393.7 - 419.1	413	Yes
N	Buttock Popliteal Length	414.0 - 439.4	436	Yes
O	Chest Depth without Jacket	175.3 - 190.5	184	Yes
P	Foot Length	218.5 - 233.7	222	Yes
R	Buttock to Knee Pivot Length	457.2 - 482.6	475	Yes
S	Head Breadth	137.1 - 147.3	140	Yes
T	Head Depth	177.8 - 188.0	182	Yes
U	Hip Breadth	299.7 - 314.9	306	Yes
V	Shoulder Breadth	350.5 - 365.7	358	Yes
W	Foot Breadth	78.8 - 94.0	83	Yes
X	Head Circumference	528.3 - 548.7	538	Yes
Y	Chest Circumference with Jacket	850.9 - 881.3	867	Yes
Z	Waist Circumference	759.5 - 789.9	773	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



Passenger S/N 426

Post-Test Calibration Sheets

Transportation Research Center Inc.

ATD Calibration Report

for

NHTSA

**HIII 5th Serial No. 426
Calibration No. 18**



Transportation Research Center Inc.
P.O. Box B-67
10820 St. Rt. 347
East Liberty, OH 43319-0367

Transportation Research Center Inc.

Front Head Drop

HIII 5th Serial No. 426 Certification No. 18-2

Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.5 °C	21.7 °C	Yes
Relative Humidity	10 - 70 %	27 %	Yes
Peak Head Resultant Acceleration	250 - 300 g	250.1 g	Yes
Peak Head Lateral Acceleration	(-15) - 15 g	-3.2 g	Yes
Is Acceleration Curve Unimodal within 10% of Peak?	Yes	Yes	Yes

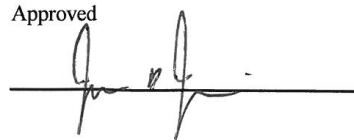
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:41:40 612

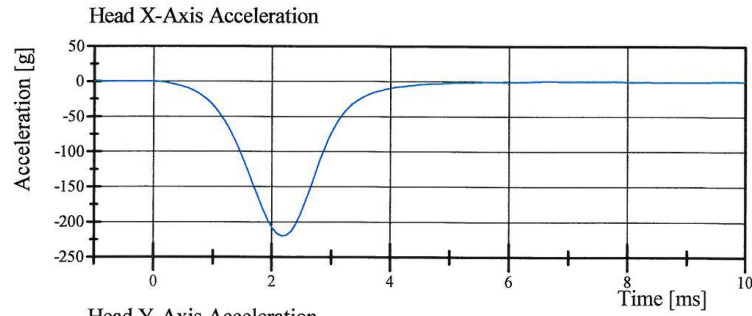


Transportation Research Center Inc.

Front Head Drop

HIH 5th Serial No. 426 Certification No. 18-2

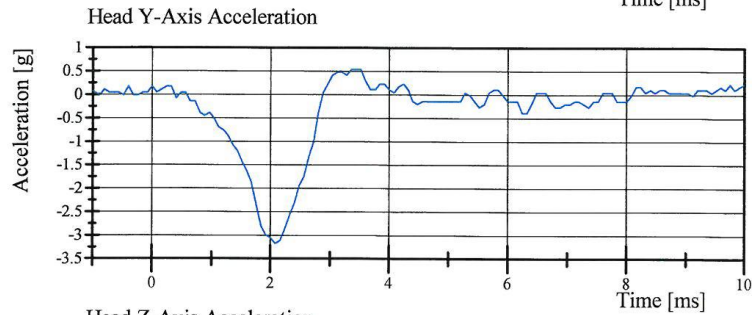
Test Date: 3/8/2013



Filter Class: CFC_1000

Max: 0.5 g at 6.6 ms

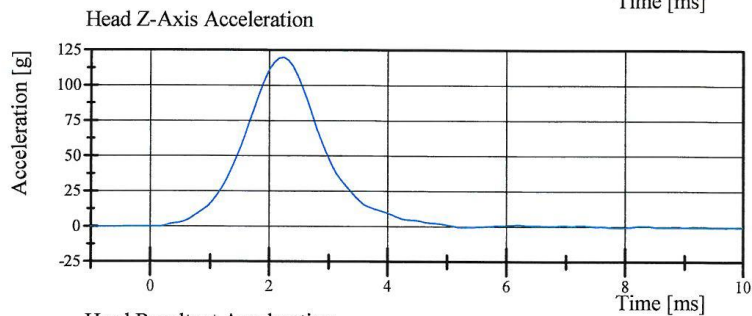
Min: -219.8 g at 2.2 ms



Filter Class: CFC_1000

Max: 0.5 g at 3.4 ms

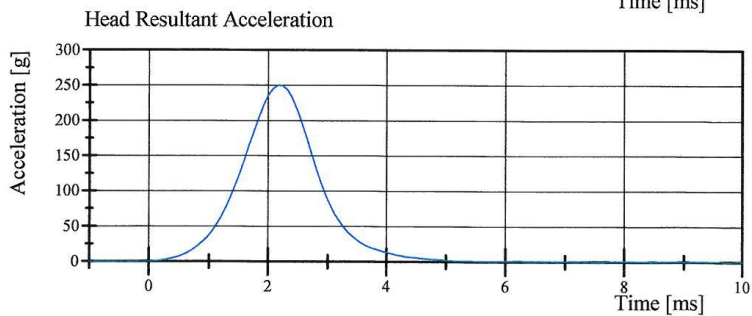
Min: -3.2 g at 2.1 ms



Filter Class: CFC_1000

Max: 120.0 g at 2.2 ms

Min: -0.7 g at 7.9 ms



Filter Class: CFC_1000

Max: 250.1 g at 2.2 ms

Min: 0.0 g at -0.5 ms

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

03.19.2013 07:41:47 612



Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 18-1

Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.1 °C	Yes
Relative Humidity	10 - 70 %	30 %	Yes
Pendulum Velocity	6.89 - 7.13 m/s	6.939 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	-4.88 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	(-5.8) - (-7.0) m/s	-6.90 m/s	Yes
Total Head D-Plane Rotation	(-77) - (-91) °	-81.8 °	Yes
Total Neck Occipital Condyles Moment Between -77° and -91° Rotation	69 - 83 N·m	69.3 N·m	Yes
Total Neck Occipital Condyles Moment Decay to 10 N·m	80 - 100 ms	86.1 ms	Yes

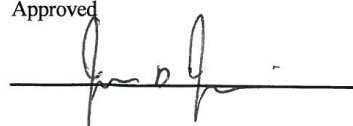
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:43:24 1718

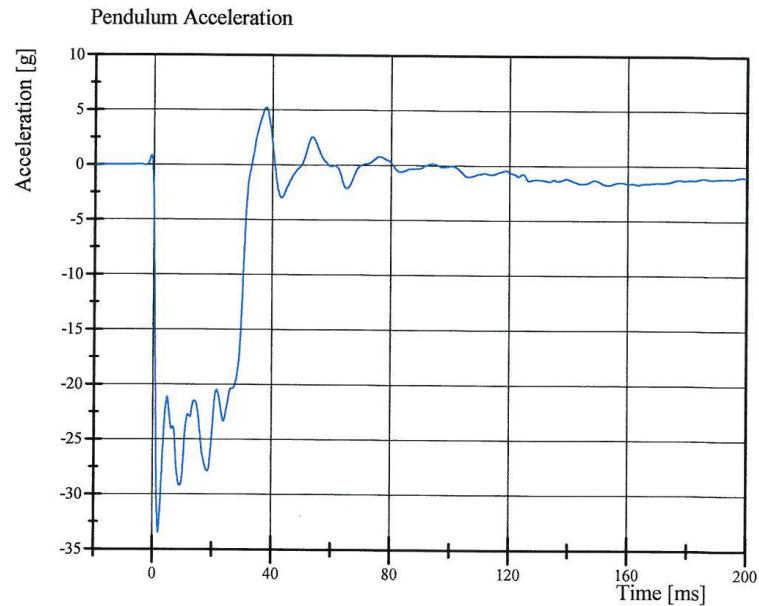


Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 18-1

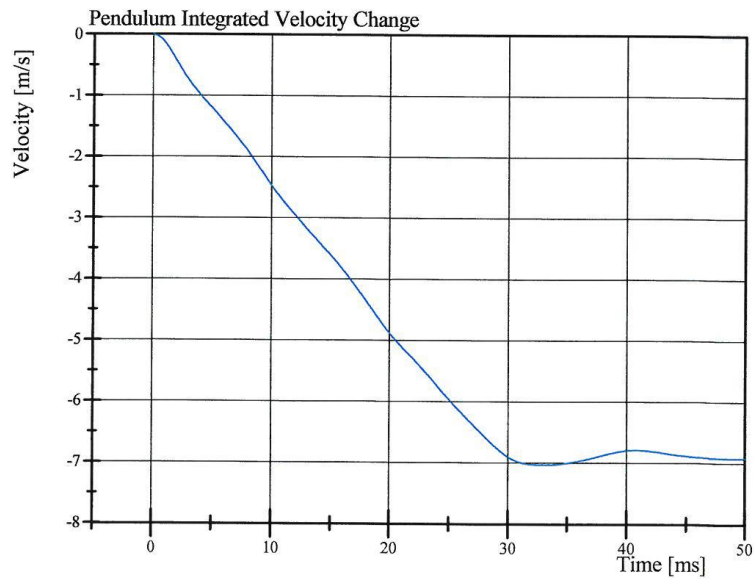
Test Date: 3/8/2013



Filter Class: CFC_180

Max: 5.2 g at 37.8 ms

Min: -33.5 g at 2.0 ms



Filter Class: CFC_180

Max: 0.0 m/s at 0.0 ms

Min: -7.0 m/s at 33.1 ms

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

03.19.2013 07:43:30 1718



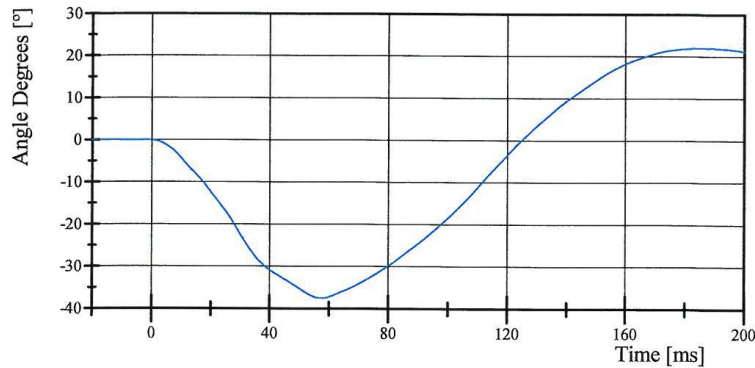
Transportation Research Center Inc.

Neck Flexion

HIII 5th Serial No. 426 Certification No. 18-1

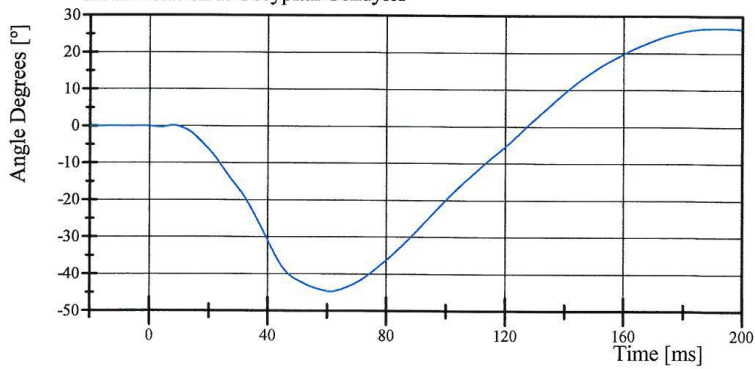
Test Date: 3/8/2013

Pot Rotation at the Base of Neck



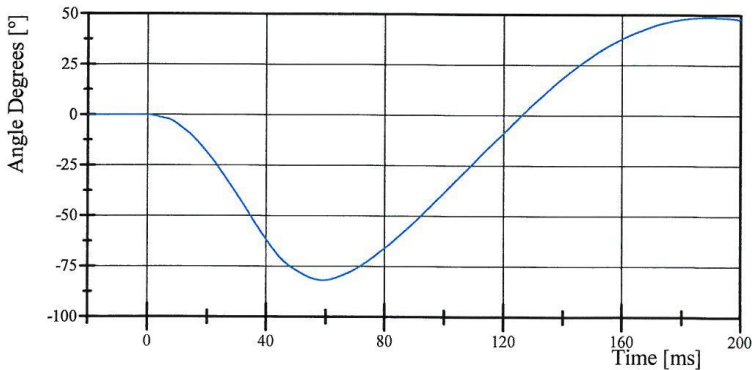
Filter Class: CFC_60
Max: 22.1 ° at 186.1 ms
Min: -37.5 ° at 57.4 ms

Head Rotation at Occypital Condyles



Filter Class: CFC_60
Max: 26.9 ° at 192.1 ms
Min: -44.7 ° at 61.2 ms

Total Head D-Plane Rotation



Filter Class: CFC_60
Max: 48.8 ° at 189.3 ms
Min: -81.8 ° at 59.4 ms

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

03.19.2013 07:43:31 1718

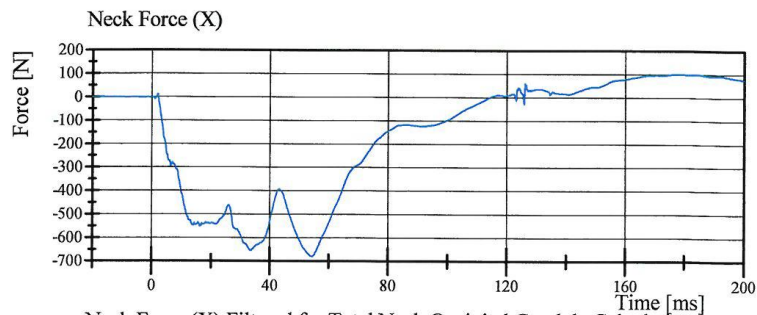


Transportation Research Center Inc.

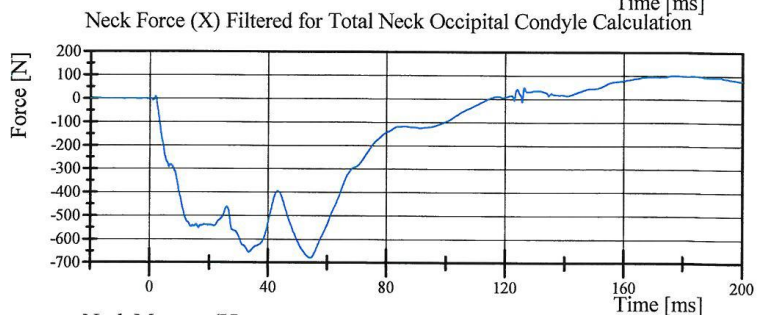
Neck Flexion

HIII 5th Serial No. 426 Certification No. 18-1

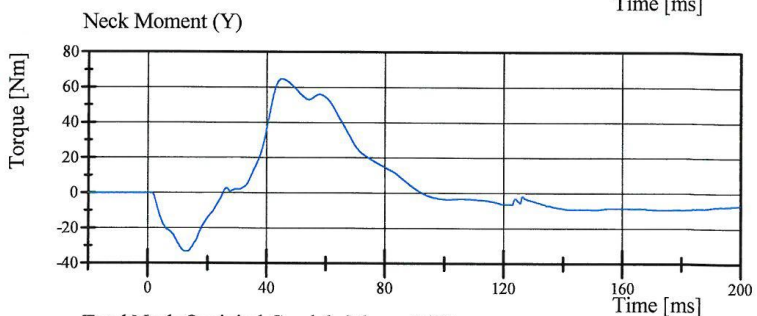
Test Date: 3/8/2013



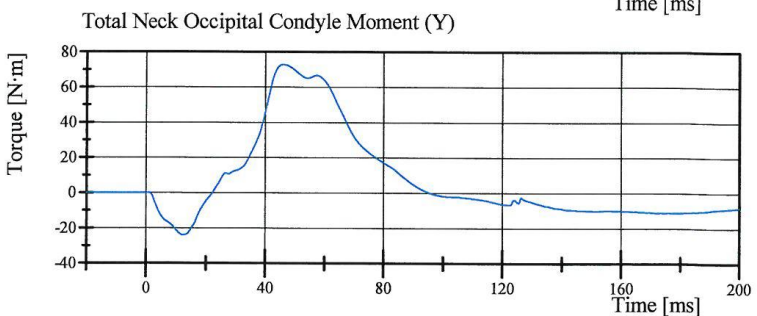
Filter Class: CFC_1000
Max: 102.5 N at 177.0 ms
Min: -679.7 N at 54.4 ms



Filter Class: CFC_600
Max: 102.0 N at 177.0 ms
Min: -679.0 N at 54.4 ms



Filter Class: CFC_600
Max: 64.7 Nm at 45.2 ms
Min: -33.2 Nm at 12.6 ms



Filter Class: Without (Consta
Max: 72.9 N·m at 46.1 ms
Min: -23.9 N·m at 12.5 ms

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

03.19.2013 07:43:32 1718



Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 18-2

Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
Pendulum Velocity	(-5.95) - (-6.19) m/s	-6.052 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	3.49 m/s	Yes
Pendulum Integrated Velocity Change at 30ms	4.6 - 5.6 m/s	5.08 m/s	Yes
Total Head D-Plane Rotation	99 - 114 °	107.9 °	Yes
Total Neck Occipital Condyles Moment Between 99° and 114° Rotation	(-53) - (-65) N·m	-57.9 N·m	Yes
Total Neck Occipital Condyles Moment Decay to -10 N·m	94 - 114 ms	103.8 ms	Yes

Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:45:52 1838

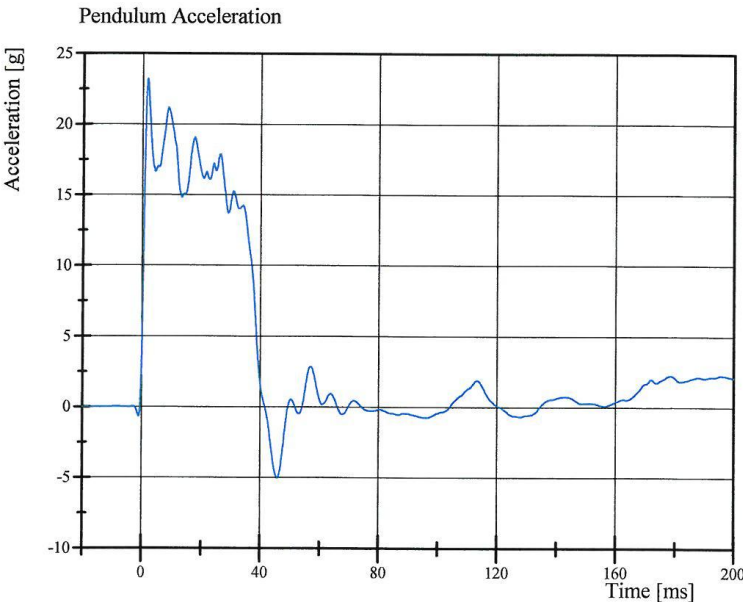


Transportation Research Center Inc.

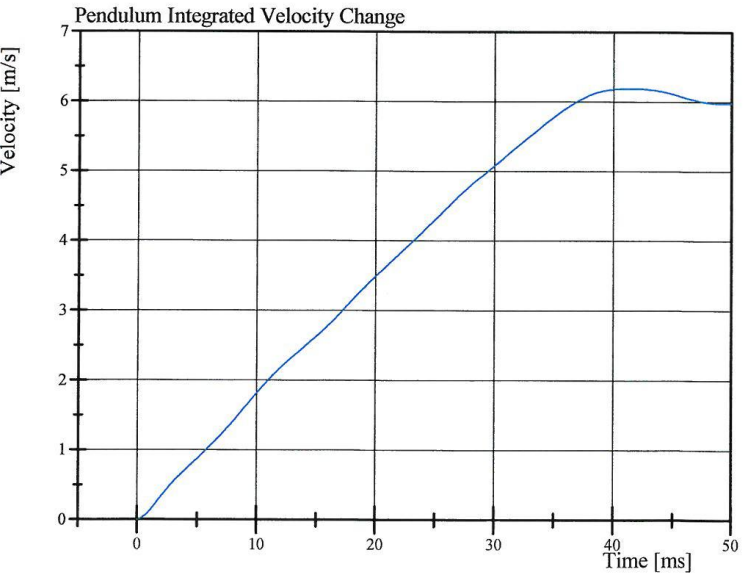
Neck Extension

HIII 5th Serial No. 426 Certification No. 18-2

Test Date: 3/8/2013



Filter Class: CFC_180
Max: 23.2 g at 1.8 ms
Min: -5.0 g at 45.8 ms



Filter Class: CFC_180
Max: 6.2 m/s at 41.6 ms
Min: 0.0 m/s at 0.0 ms

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

03.19.2013 07:45:58 1838



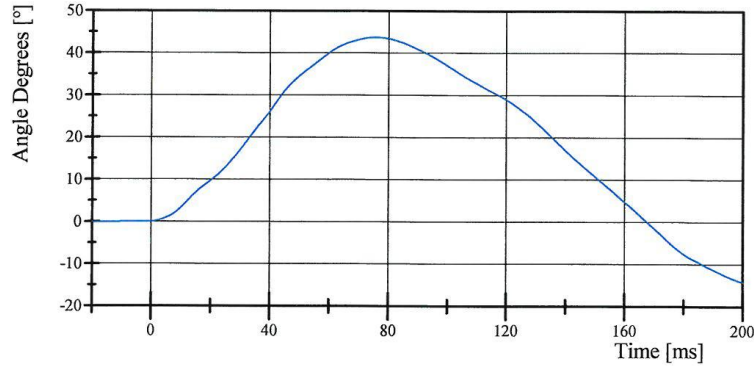
Transportation Research Center Inc.

Neck Extension

HIII 5th Serial No. 426 Certification No. 18-2

Test Date: 3/8/2013

Pot Rotation at the Base of Neck

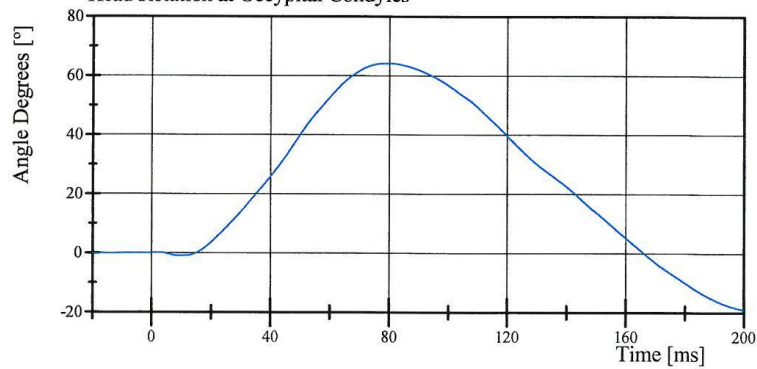


Filter Class: CFC_60

Max: 43.7 ° at 75.5 ms

Min: -14.2 ° at 200.0 ms

Head Rotation at Occypital Condyles

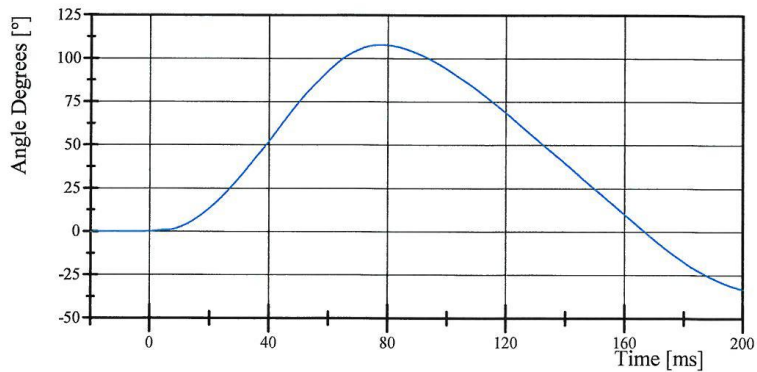


Filter Class: CFC_60

Max: 64.3 ° at 79.3 ms

Min: -19.0 ° at 200.0 ms

Total Head D-Plane Rotation



Filter Class: CFC_60

Max: 107.9 ° at 77.7 ms

Min: -33.2 ° at 200.0 ms

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

03.19.2013 07:45:59 1838

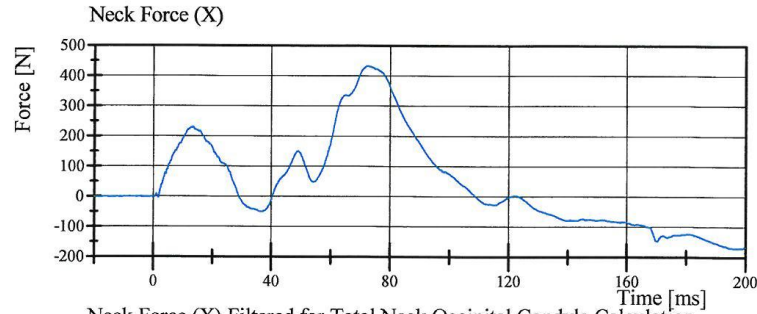


Transportation Research Center Inc.

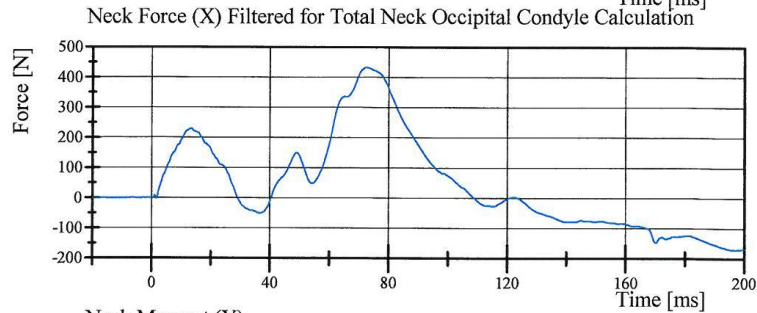
Neck Extension

HIII 5th Serial No. 426 Certification No. 18-2

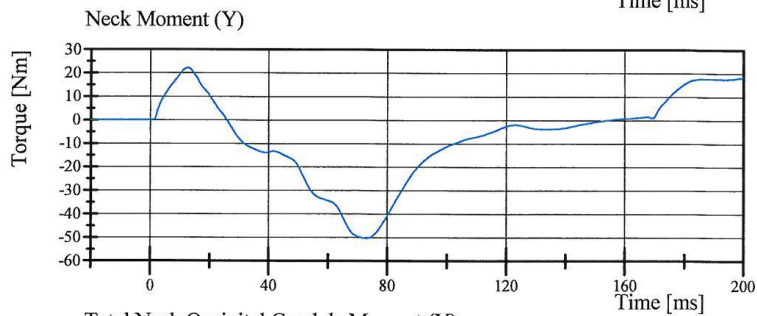
Test Date: 3/8/2013



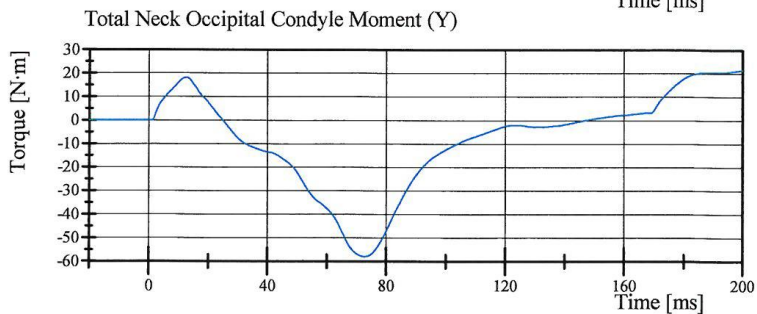
Filter Class: CFC_1000
Max: 433.6 N at 72.9 ms
Min: -170.0 N at 196.9 ms



Filter Class: CFC_600
Max: 433.1 N at 72.7 ms
Min: -169.8 N at 196.9 ms



Filter Class: CFC_600
Max: 22.2 Nm at 12.7 ms
Min: -50.3 Nm at 73.1 ms



Filter Class: Without (Consta
Max: 21.5 N·m at 200.0 ms
Min: -57.9 N·m at 72.9 ms

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

03.19.2013 07:46:00 1838



Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 18-4

Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	20.6 - 22.2 °C	20.9 °C	Yes
Relative Humidity	10 - 70 %	28 %	Yes
Probe Velocity	6.59 - 6.83 m/s	6.716 m/s	Yes
Probe Force Peak Between 50.0 mm and 58.0 mm Chest Deflection	(-3,900) - (-4,400) N	-4,243.9 N	Yes
Probe Force Peak Between 18.0 mm and 50.0 mm Chest Deflection	$\geq$ (-4,600) N	-4,127.5 N	Yes
Maximum Chest Compression	(-50) - (-58) mm	-55.4 mm	Yes
Internal Hysteresis	69 - 85 %	73.3 %	Yes

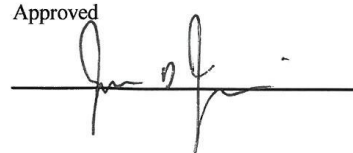
Test meets specifications.

Comments:

Technician



Approved



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

03.19.2013 07:49:31 384

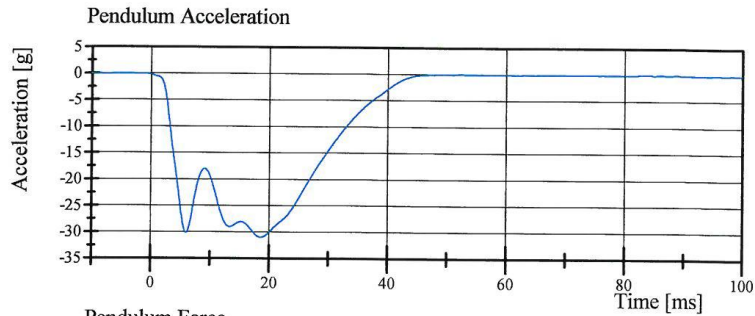


Transportation Research Center Inc.

Front Thorax

HIII 5th Serial No. 426 Certification No. 18-4

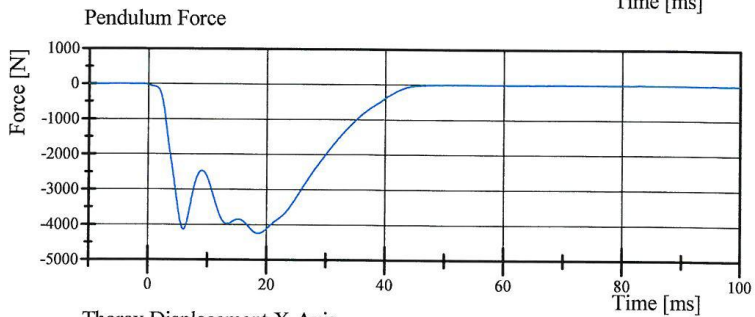
Test Date: 3/8/2013



Filter Class: CFC_180

Max: 0.1 g at 83.0 ms

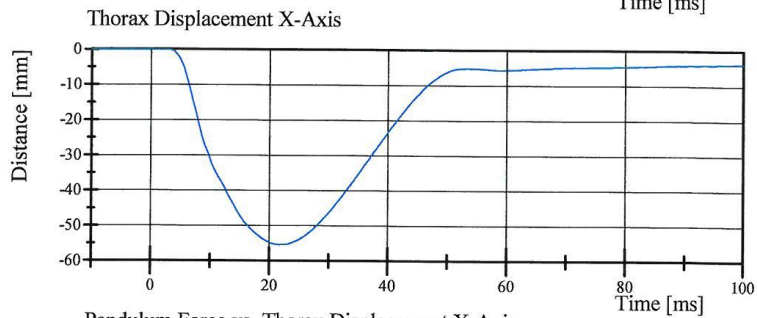
Min: -31.0 g at 18.6 ms



Filter Class: CFC_180

Max: 7.3 N at 83.0 ms

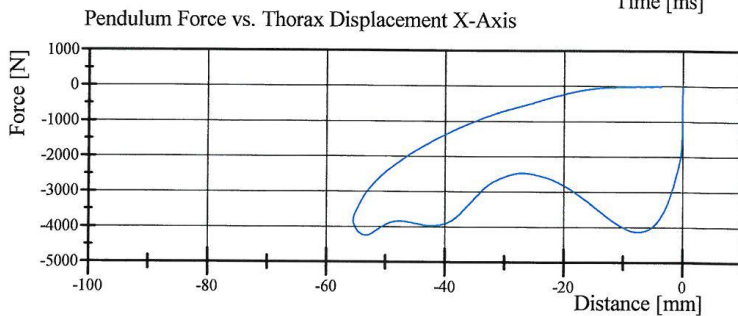
Min: -4,243.9 N at 18.6 ms



Filter Class: CFC_600

Max: 0.0 mm at -7.1 ms

Min: -55.4 mm at 21.9 ms



Filter Class: CFC_180

Max: 7.3 N at -4.4 mm

Min: -4,243.9 N at -53.3 mm

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

03.19.2013 07:49:38 384



TRANSPORTATION RESEARCH CENTER INC.

TORSO FLEXION TEST

HYBRID III SMALL FEMALE

CAL DATE: 08-Mar-13

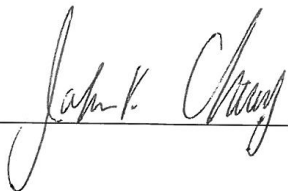
TRC, INC. TEST NO: TOFL-01 572 O SN426 TORSO FLEX CAL 18

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TIME		826
TEMPERATURE	20.6 – 22.2° C	20.9 ° C
RELATIVE HUMIDITY	10 – 70 %	35 %
INITIAL ANGLE OF UNSUPPORTED DUMMY <u>START ANGLE</u>	<= 20° REFERENCED TO VERTICAL	14.6 °
DIFFERENCE BETWEEN <u>RETURN</u> <u>ANGLE</u> & INTIAL ANGLE	+/- 8 ° OF INTIAL ANGLE	5.8 °
MAXIMUM FORCE AT 45 DEG. DURING 10 SECOND PERIOD	320 – 390 N	389.4 N
RATE	0.5° - 1.5 °/sec	.98°/sec

TEST MEETS SPECIFICATIONS

Comments:

TECHNICIAN



Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 18-1
Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.5 °C	Yes
Relative Humidity	10 - 70 %	30 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.125 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,909.9 N	Yes

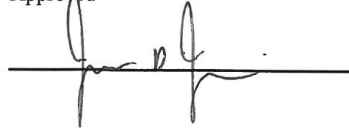
Test meets specifications.

Comments:

Technician



Approved



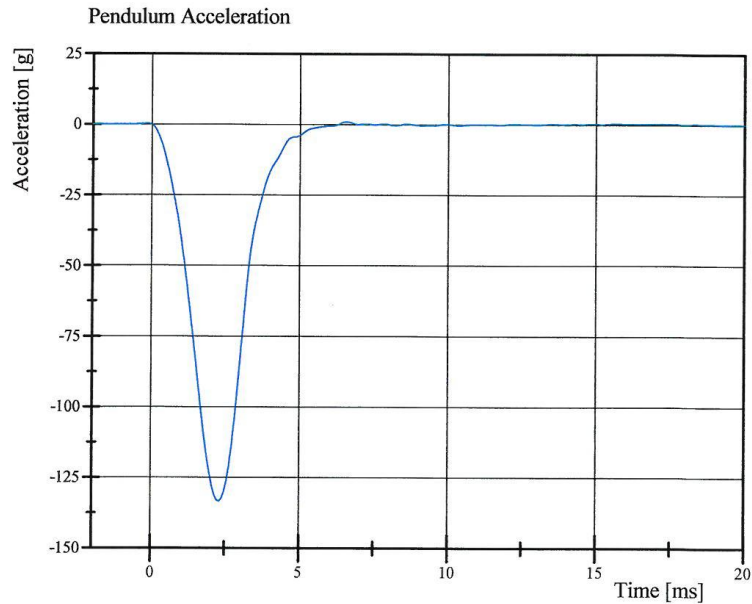
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

03.19.2013 07:51:22 1689

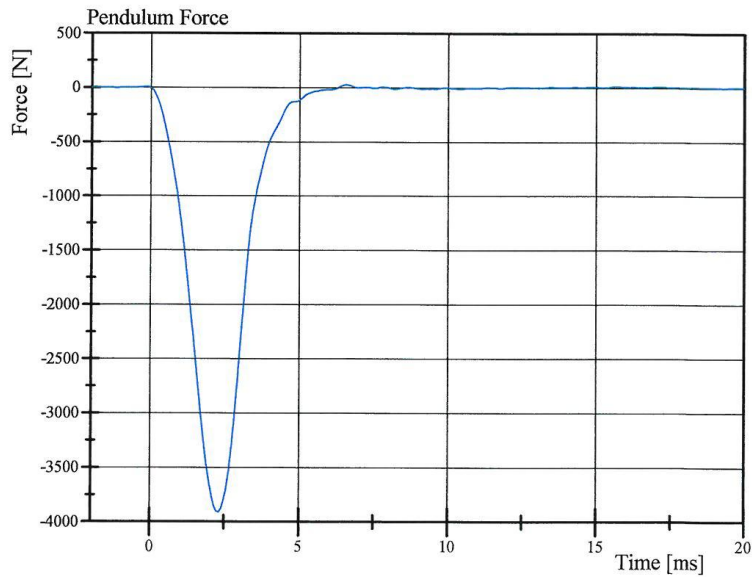


Transportation Research Center Inc.

Left Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 18-1
Test Date: 3/8/2013



Filter Class: CFC_600
Max: 0.9 g at 6.6 ms
Min: -133.3 g at 2.3 ms



Filter Class: CFC_600
Max: 27.7 N at 6.6 ms
Min: -3,909.9 N at 2.3 ms

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

03.19.2013 07:51:37 1689



Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 18-1
Test Date: 3/8/2013

Test Parameter	Specification	Test Results	Pass
Temperature	18.9 - 25.6 °C	21.4 °C	Yes
Relative Humidity	10 - 70 %	29 %	Yes
Probe Velocity	2.08 - 2.13 m/s	2.123 m/s	Yes
Peak Femur Force	(-3,450) - (-4,060) N	-3,652.5 N	Yes

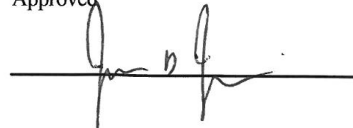
Test meets specifications.

Comments:

Technician



Approved



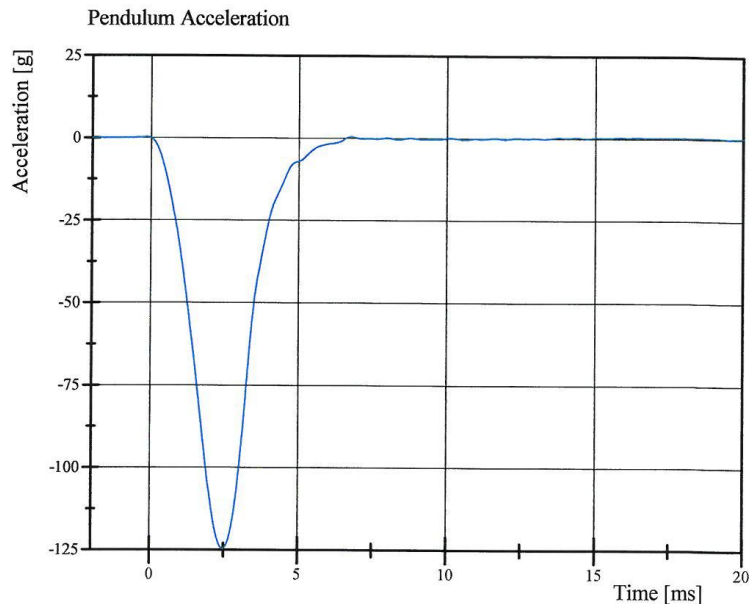
Specification Source: CFR49 Part 572 Subpart O
with Polarity in accordance with J211

03.19.2013 07:53:54 1687

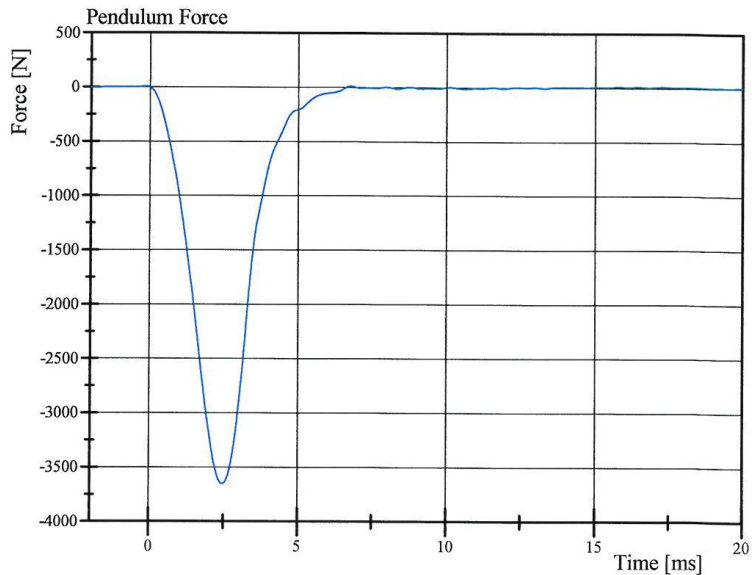


Transportation Research Center Inc.

Right Knee Femur Response Test
HIII 5th Serial No. 426 Certification No. 18-1
Test Date: 3/8/2013



Filter Class: CFC_600
Max: 0.4 g at 6.8 ms
Min: -124.6 g at 2.5 ms



Filter Class: CFC_600
Max: 12.0 N at 6.8 ms
Min: -3,652.5 N at 2.5 ms

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

03.19.2013 07:54:00 1687



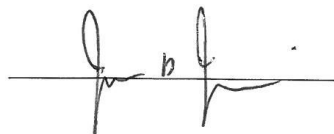
Transportation Research Center Inc.
5720 HIII 5th Dummy
External Dimensions
Serial No. 426 Calibration No. 16

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	444	Yes
C	Hip Pivot Height	81.3 - 86.3	85	Yes
D	Hip Pivot from Backline	144.8 - 149.8	147	Yes
E	Shoulder Pivot from Backline	68.6 - 83.8	78	Yes
F	Thigh Clearance	119.4 - 134.6	128	Yes
G	Back of Elbow to Wrist Pivot	243.9 - 259.1	249	Yes
H	Head Back to Backline	43.2 - 48.2	45	Yes
I	Shoulder to Elbow Length	276.8 - 297.2	283	Yes
J	Elbow Rest Height	182.8 - 203.2	194	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	412	Yes
N	Buttock Popliteal Length	414.0 - 439.4	436	Yes
O	Chest Depth without Jacket	175.3 - 190.5	183	Yes
P	Foot Length	218.5 - 233.7	222	Yes
R	Buttock to Knee Pivot Length	457.2 - 482.6	474	Yes
S	Head Breadth	137.1 - 147.3	140	Yes
T	Head Depth	177.8 - 188.0	182	Yes
U	Hip Breadth	299.7 - 314.9	306	Yes
V	Shoulder Breadth	350.5 - 365.7	359	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	867	Yes
Z	Waist Circumference	759.5 - 789.9	773	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

