

REPORT NUMBER: NCAP-KAR-17-009

**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**DAIMLER AG
2017 SMART FORTWO 2-DOOR COUPE**

NHTSA NUMBER: O20174300

**PREPARED BY:
KARCO ENGINEERING, LLC.
9270 HOLLY ROAD
ADELANTO, CA 92301**



JANUARY 30, 2017

FINAL REPORT

**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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		14. Sponsoring Agency Code NRM-110																																																					
15. Supplementary Notes																																																							
16. Abstract A 56.3 km/h NCAP Frontal Impact Test was conducted on a 2017 Smart Fortwo 2-door coupe 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 footwell intrusion performance. The test was conducted at the KARCO Engineering, LLC. facility in Adelanto, California on January 16, 2017. The impact velocity of the vehicle was 56.19 km/h and the ambient temperature at the barrier face at the time of impact was 13.0°C. The target vehicle's post-test maximum crush was 287 mm at DPD 4 on the right side of the vehicle's centerline. The test vehicle's performance is as follows: <table border="1"> <thead> <tr> <th rowspan="2">Measurement Description</th> <th rowspan="2">Units</th> <th colspan="2">Driver ATD</th> <th colspan="2">Passenger ATD</th> </tr> <tr> <th>Threshold</th> <th>Result</th> <th>Threshold</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₁₅)</td> <td>N/A</td> <td>700</td> <td>374.5</td> <td>700</td> <td>139.0</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-13</td> <td>52</td> <td>-18</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.40</td> <td>1</td> <td>0.45</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>1769.2</td> <td>2620</td> <td>870.1</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>-372.3</td> <td>2520</td> <td>-230.0</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10000</td> <td>-1486.3</td> <td>6800</td> <td>-1417.6</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10000</td> <td>-2584.0</td> <td>6800</td> <td>-2445.9</td> </tr> </tbody> </table>				Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	374.5	700	139.0	Maximum Chest Compression	mm	63	-13	52	-18	Nij	N/A	1	0.40	1	0.45	Neck Tension	N	4170	1769.2	2620	870.1	Neck Compression	N	4000	-372.3	2520	-230.0	Left Femur Force	N	10000	-1486.3	6800	-1417.6	Right Femur Force	N	10000	-2584.0	6800	-2445.9
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SECTION 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 number DTNH22-12-D-00259. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for consumer information purposes.

The 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards Frontal NCAP Laboratory Test Procedure, dated October 2015.

SUMMARY

A load cell barrier consisting of 176 load cells was impacted by a 2017 Smart Fortwo 2-door coupe at a velocity of 56.19 km/h. The test was performed at KARCO Engineering, LLC. on January 16, 2017. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A of this report.

Three (3) real-time cameras and sixteen (16) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet 6 of 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 seating 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 force transducers, right / left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 360) and the right-front passenger (position 2) ATD (Serial No. 141) were calibrated prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C of this report.

The 106 channels of dummy and vehicle response data were recorded on an on-board data acquisition system. Appendix B contains the dummy response data traces.

There was 100% windshield retention and no intrusion into the protected zone of the windshield during the event.

The maximum static crush was 287 mm at DPD 4 on the right side of the vehicle's centerline. 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: The driver ATD's head contacted the frontal airbag and headrest. The upper torso contacted the frontal airbag. Both the left and right knees contacted the knee airbag.

The passenger's visible contact points were as follows: The passenger ATD's head contacted the frontal airbag and headrest. The upper torso contacted the frontal airbag. Both the left and right knees contacted the knee airbag.

The occupant data is summarized below:

ATD Position	HIC ₁₅	T ¹ (ms)	T ² (ms)	Chest Disp. (mm)	Nij	Neck Tension (N)	Neck Comp. (N)	Left Femur (N)	Right Femur (N)
Driver (50th)	374.5	56.4	71.4	-13	0.40	1769.2	-372.3	-1486.3	-2584.0
Passenger (5th)	139.0	44.9	59.9	-18	0.45	870.1	-230.0	-1417.6	-2445.9

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in ²	kPa	6.895
Temperature	General Use	°F	°C	$=(T_f - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	O20174300
Model Year	2017
Make	Smart
Model	Fortwo
Body Style	2-Door Coupe
VIN	WMEFJ5DA4HK173979
Body Color	Lava Orange Metallic
Odometer Reading (km / mi)	24 / 15
Engine Displacement (L)	0.9
Type / No. of Cylinders	Inline 3
Engine Placement	Rear Transverse
Transmission Type	Automatic
Transmission Speeds	5
Overdrive	Yes
Final Drive	RWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	No
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

Traction Control System	Yes
Power Steering	Yes
Power Window Auto-Reverse	Yes
Driver Frontal Airbag	Yes
Driver Curtain Airbag	Yes
Driver Head/Torso Airbag	No
Driver Torso Airbag	No
Driver Torso/Pelvis Airbag	Yes
Driver Pelvis Airbag	No
Driver Knee Airbag	Yes
Front Pass. Frontal Airbag	Yes
Front Pass. Curtain Airbag	Yes
Front Pass. Head/Torso Airbag	No
Front Pass. Torso Airbag	No
Front Pass. Torso/Pelvis Airbag	Yes
Front Pass. Pelvis Airbag	No
Front Pass. Knee Airbag	Yes
Driver Seat Belt Pretensioner	Yes
Driver Load Limiter	Yes
Front Pass. Seat Belt Pretensioner	Yes
Front Pass. Load Limiter	Yes
Other Safety Restraint	No

Does Owner's Manual provide instructions to turn off automatic door locks?

Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Daimler AG
Date of Manufacture	Nov-16

GVWR (kg)	1235
GAWR Front (kg)	540
GAWR Rear (kg)	750

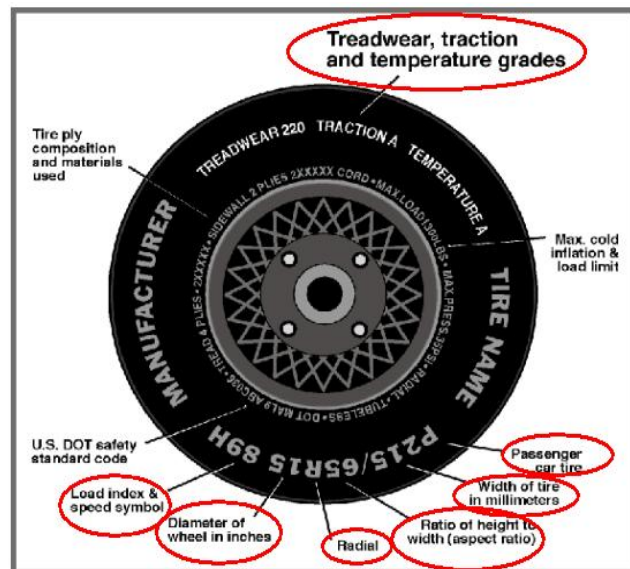
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total	
Type of Seats	Bucket				
Designated Seating Capacity	2			2	
Capacity Weight (VCW) (kg)				211.0	A
DSC x 68.04 (kg)				136.1	B
Cargo Weight (RCLW) (kg)				74.9	A-B

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2017 Smart Fortwo 2-Door Coupe	NHTSA No.:	O20174300
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	01/16/17



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	200	250
Recommended Tire Size	165/65R15	185/60R15
Tire Size on Vehicle	165/65R15	185/60R15
Tire Manufacturer	Continental	Continental
Tire Model	Pro Contact TX	Pro Contact TX
Treadwear	540	540
Traction	A	A
Temperature Grades	B	B
Tire Plies Sidewall	1 Polyester	1 Polyester
Tire Plies Body	1 Polyester, 2 Steel, 1 Polyamide	1 Polyester, 2 Steel, 1 Polyamide
Load Index / Speed Symbol	81T	84T
Tire Material	Polyester, Steel, Polyamide	Polyester, Steel, Polyamide
DOT Safety Code Left	CN30 WBPD 3816	CN90 WBNY 4016
DOT Safety Code Right	CN30 WBPD 3816	CN90 WBNY 4016

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

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	218.5	265.0		240.5	354.0	
Right	kg	212.0	271.5		236.0	344.0	
Ratio	%	44.5%	55.5%	100.0%	40.6%	59.4%	100.0%
Total	kg	430.5	536.5	967.0	476.5	698.0	1174.5

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	967.0	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	74.9	C
Calculated Vehicle Target Weight (TVTW)	kg	1182.9	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	662	657	670	670	1042
As Tested	mm	641	641	635	639	1116
Post-Test	mm	686	584	631	635	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	1878
Total Vehicle Length at Left Side	mm	2400
Total Vehicle Length at Centerline	mm	2762
Total Vehicle Length at Right Side	mm	2405
Weight of Ballast in Cargo Area	kg	94.0
Weight of Vehicle Components Removed	kg	32.5

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Rear Bumper Fascia (4.0 kg), Rear Tail Lights (3.0 kg), 2 Outboard Mirrors (2.0 kg), Rear Window (6.5 kg), Tailgate (9.5 kg), Trunk Trim (7.5 kg)

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

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test
1	Total Length	2762
2	Total Width	1665
3	Bumper Top Height	530
4	Bumper Bottom Height	420
5	Longitudinal Member Top Height	560
6	Distance Between Longitudinal Members	560
7	Longitudinal Member Width	70
8	Engine Top Height	680
9	Engine Bottom Height	158
10	Engine and Gearbox Width	353
11	Front Bumper to Engine Distance	145
12	Front Shock Absorber Fixing Height	777
13	Bonnet Leading Edge Height	778
14	Front Shock Absorber Fixing Width	1086
15	Front Bumper to Front Axle Distance	492
16	Front Axle to A-Pillar Distance	410
17	A-Pillar to B-Pillar Distance	1253
18	B-Pillar to Rear Axle Distance	220
19	B-Pillar to C-Pillar Distance	N/A
20	Roof Sill Bottom Height	1400
21	Roof Sill Top Height	1508
22	Floor Sill Bottom Height	199
23	Floor Sill Top Height	345

All measurements in millimeters.

DATA SHEET NO. 2

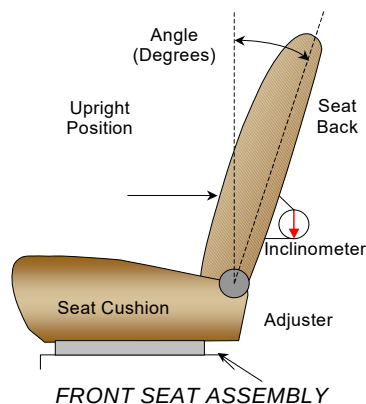
SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56.3 km/h Frontal Impact NCAP Test

NHTSA No.: O20174300
 Test Date: 01/16/17

NOMINAL DESIGN RIDING POSITION

The procedure for the driver is as follows: the seat back is set to the manufacturer's designated angle. The procedure for the passenger is as follows: the seat back is set to position the transverse instrumentation platform of the dummy's head at $0^\circ \pm 0.5^\circ$. Seat back angle is measured from the side airbag cover.

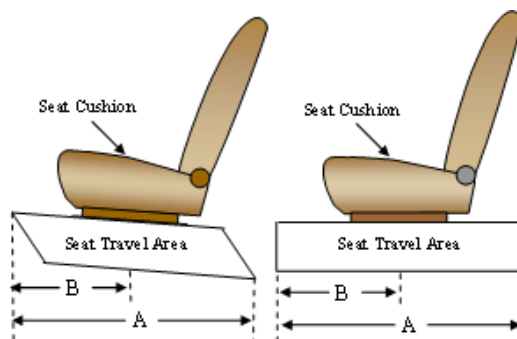


SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	64.0
Passenger Seat Back Angle	72.3

SEAT FORE / AFT POSITIONING

The total seat travel is measured from the forward most possible position to the rear most possible position. The driver's seat is set to the middle of the fore-aft travel. The passenger's seat is set to the forward most position where the ATD will not contact any interior panels.



SEAT FORE/AFT POSITIONS

Seating Position	Total Fore-Aft Travel	Placed in Position
Driver Seat	260 mm	130 mm
Passenger Seat	222 mm	0 mm

SEAT BELT UPPER ANCHORAGE

The seat belt upper anchorage is positioned to the manufacturer's design position for a 50th percentile adult male ATD for the driver, and a 5th percentile adult female ATD for the passenger. Position "H" is the uppermost position, followed by position "M". Position "L" is the lowermost position.

SEAT BELT UPPER ANCHORAGES

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

DATA SHEET NO. 2 ... (CONTINUED)

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

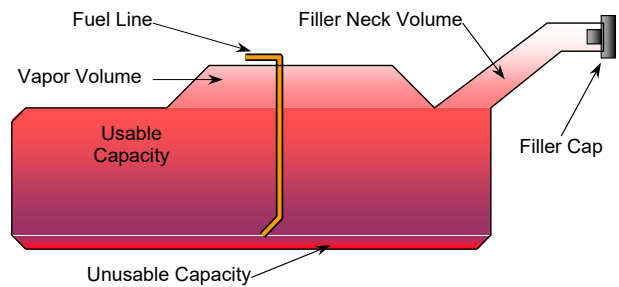
Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	34.07
Usable Capacity of "Optional Tank"	N/A
92 - 94% of Usable Capacity	31.34 to 32.02
Actual Amount of Stoddard Solvent Used	31.68
1/3 of Usable Capacity	11.36

FUEL PUMP

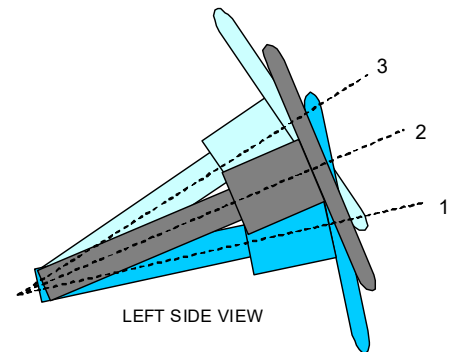
The vehicle is equipped with an electronic fuel pump. The fuel pump operates when the key is turned to position 2.



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. A digital inclinometer is used to measure a plate which is placed across the rim of the steering wheel for angular measurements. A tape measure is used to measure telescoping steering wheel travel. The steering column equipped in this vehicle is fixed.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	N/A	Fixed
Geometric Center Position, No. 2	23.0	Fixed
Uppermost Position, No. 3	N/A	Fixed
Telescoping Steering Wheel Travel		Fixed
Test Position	23.0	Fixed

DATA SHEET NO. 3

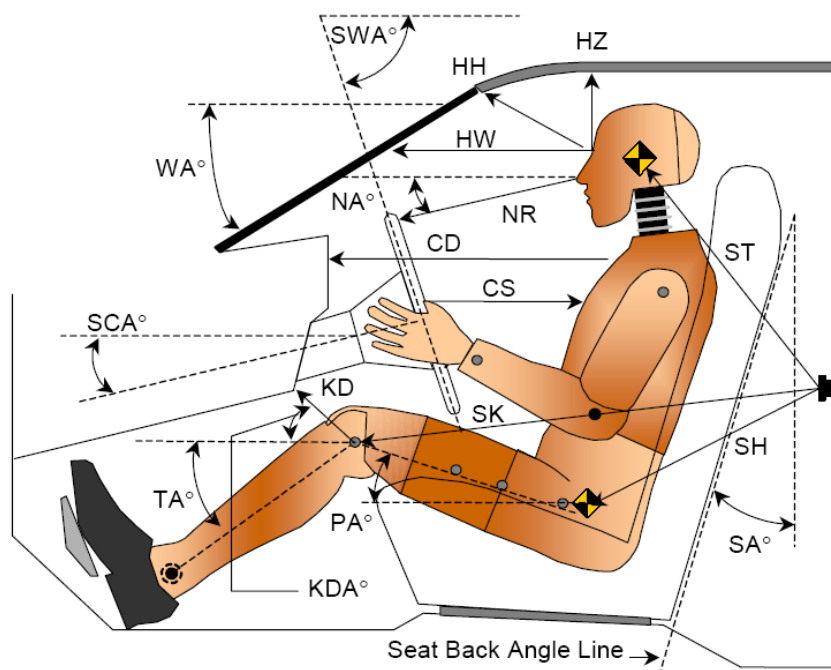
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe

NHTSA No.: O20174300

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/16/17



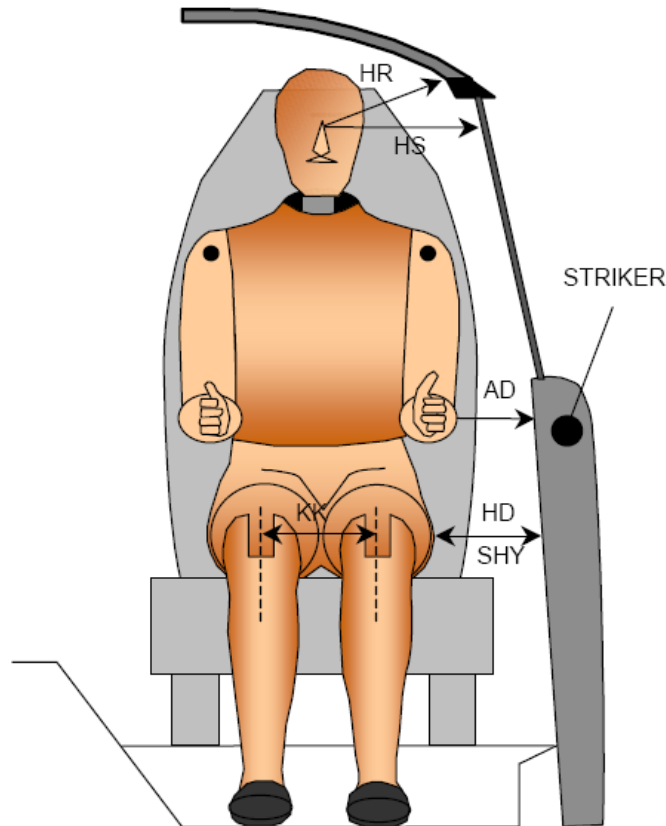
LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		34.4		
SWA°	Steering Wheel Angle		67.0		
SCA°	Steering Column Angle		23.0		
SA°	Seat Back Angle (On Headrest Post)		64.0		72.3
HZ	Head to Roof	255	90.0	294	90.0
HH	Head to Header	497	20.3	398	33.5
HW	Head to Windshield	709	0.0	659	0.0
NR	Nose to Rim	402	7.5	479	32.9
CD	Chest to Dash	548	14.5	412	10.0
CS	Chest to Steering Hub	313	1.9		
RA	Rim to Abdomen	215	0.0		
KDL	Left Knee to Dash	187	32.7	140	21.6
KDR	Right Knee to Dash	189	10.9	121	30.4
PA°	Pelvic Angle		24.2		22.1
TA°	Tibia Angle		56.1		45.5
SK	Striker to Knee	777	1.6	881	4.4
ST	Striker to Head	550	58.3	584	41.6
SH	Striker to H-Point	461	24.7	582	16.7

DATA SHEET NO. 4

DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle:	2017 Smart Fortwo 2-Door Coupe	NHTSA No.:	O20174300
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	01/16/17

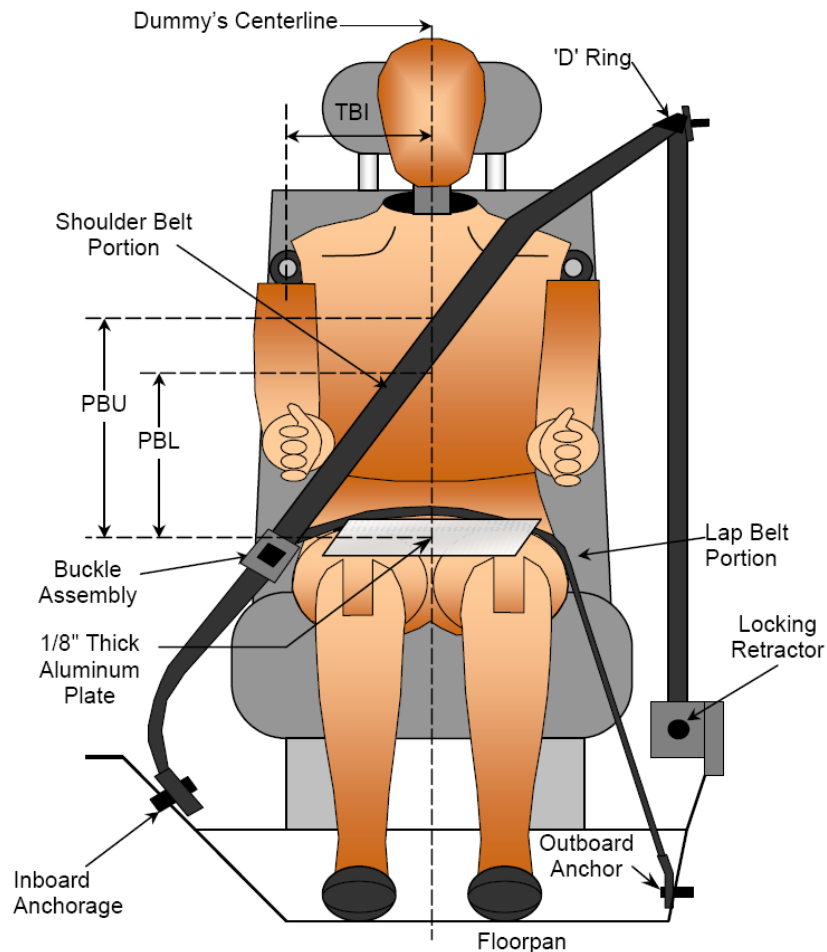


Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	127	88
HD	H-Point to Door	129	169
HR	Head to Side Header	236	272
HS	Head to Side Window	325	346
KK	Knee to Knee	309	226
SHY	Striker to H-Point (Y-Direction)	102	239
AA	Ankle to Ankle	296	170

DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56.3 km/h Frontal Impact NCAP Test

NHTSA No.: O20174300
 Test Date: 01/16/17



FRONT VIEW OF DUMMY

SEAT BELT POSITIONING MEASUREMENTS

Code	Measurement Description	Units	Driver	Passenger
PBU	Top Surface of Aluminum Plate to Belt Upper Edge	mm	323	266
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	252	185

BELT LENGTH DATA

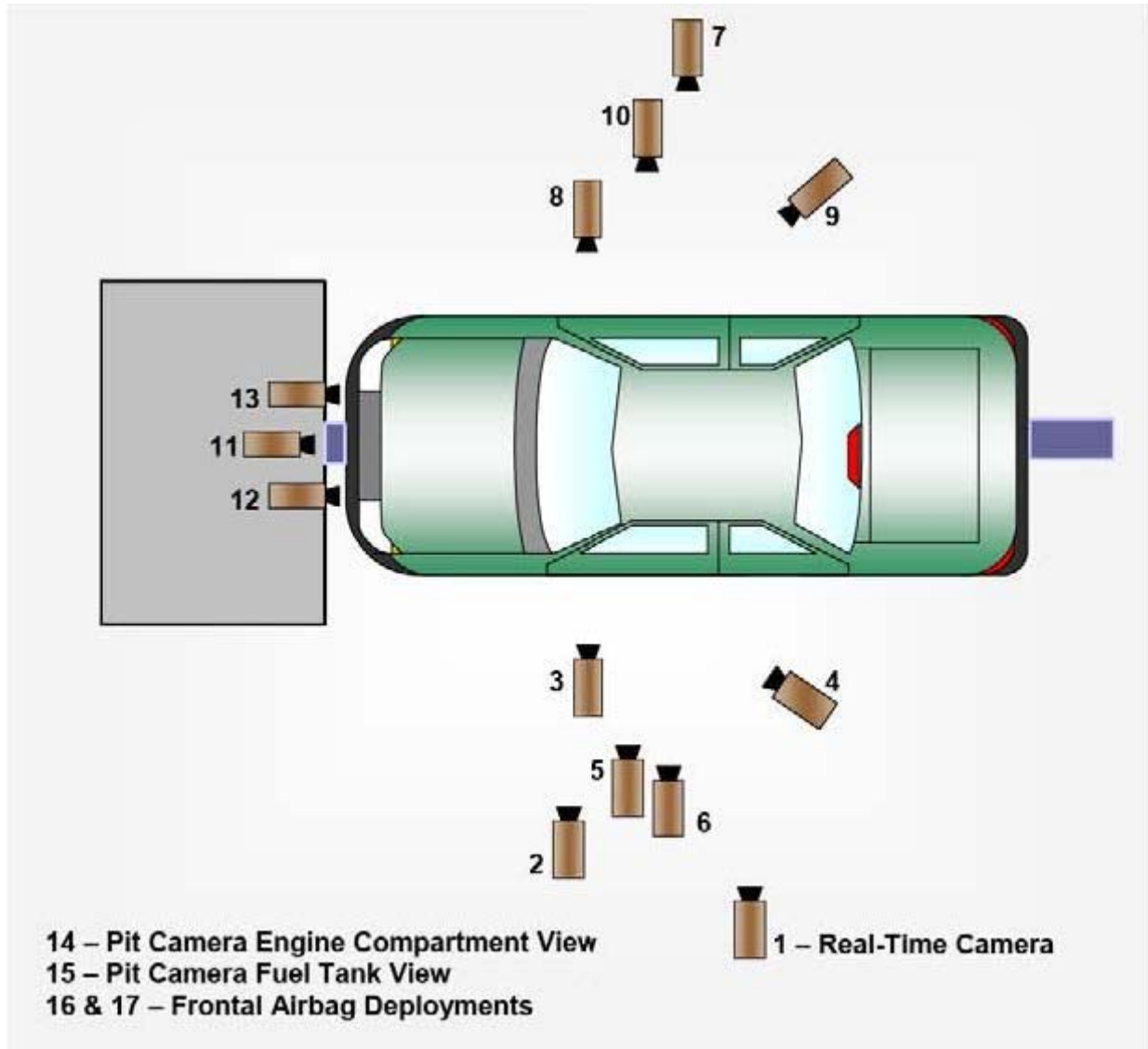
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	1030	1150
Lap Belt Length as Measured on ATD	mm	668	741
Remainder of Belt on Reel	mm	1142	708
Total Belt Length for Continuous Webbing Systems	mm	2840	2599

DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 ... (CONTINUED)

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

CAMERA LOCATIONS

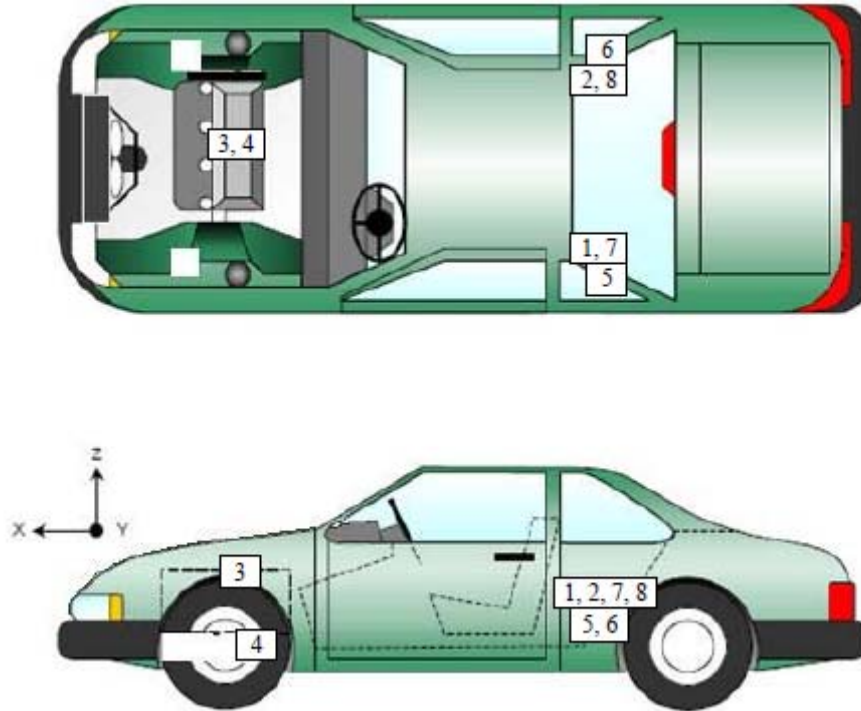
No.	Description	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-11412	-8150	-1484		30
2	Driver Close-Up	-2590	-7950	-1371	24	1000
3	Left Front Half	-1701	-6197	-1701	50	1000
4	Left Angle	-6696	-10308	-3211	ZOOM	1000
5	Steering Column - Top	-1966	-10412	-3688	50	1000
6	Steering Column - Bottom	-1972	-10412	-3379	50	1000
7	Right Overall	-2336	7569	-1012	24	1000
8	Passenger Close-Up	-1733	7581	-1408	50	1000
9	Right Front Half	-1600	8214	-1811	ZOOM	1000
10	Right Angle	-6217	9516	-4830	ZOOM	1000
11	Windshield	-354	0	-5749	12	1000
12	Driver Windshield	297	-366	-2460	12	1000
13	Passenger Windshield	297	366	-2460	24	1000
14	Pit Front	-756	0	1495	20	1000
15	Pit Rear	-3398	0	1495	14	1000
16	Onboard Driver Airbag (Optional)	-2280	-310	-1420	9	1000
17	Onboard Passenger Airbag (Optional)	-2280	310	-1420	9	1000
18	Real-Time Left View of Impact					
19	Real-Time Right View of Impact					

Coordinates: +X = forward impact plane
 +Y = right of monorail center
 +Z = into ground

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Accelerometer X-Direction	1344	-625	-414
2	Right Rear Accelerometer X-Direction	1344	625	-414
3	Engine Top X	497	68	-712
4	Engine Bottom X	672	46	-178
5	Left Rear Accelerometer Z-Direction	N/A	N/A	N/A
6	Right Rear Accelerometer Z-Direction	N/A	N/A	N/A
7	Left Rear Accelerometer X-Direction Redundant	1344	-625	-414
8	Right Rear Accelerometer X-Direction Redundant	1344	625	-414

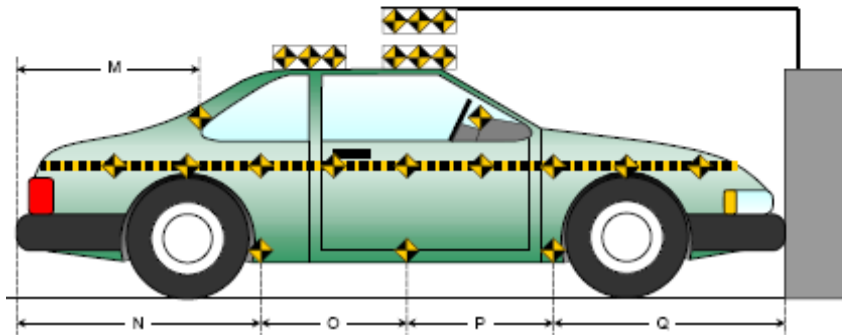
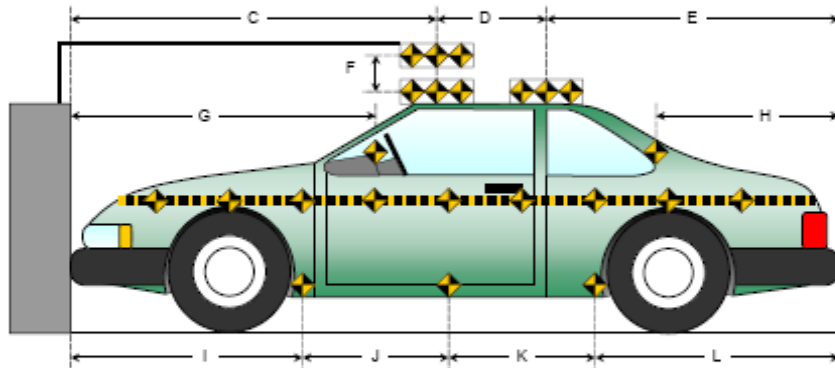
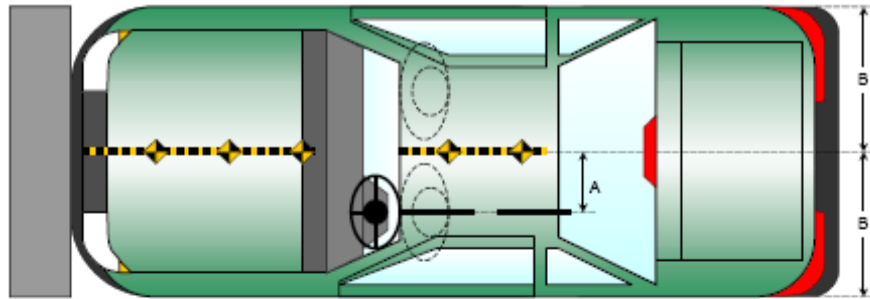
Reference Points:
 X – Rear Surface of Vehicle (+ forward)
 Y – Vehicle Centerline (+ to right)
 Z – Ground Plane (+ down)

DATA SHEET NO. 8

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

Item	Value
A	315
B	833
C	1530
D	608
E	624
F	305
G	1110
H	550
I	898
J	529
K	529
L	807
M	540
N	812
O	529
P	529
Q	893

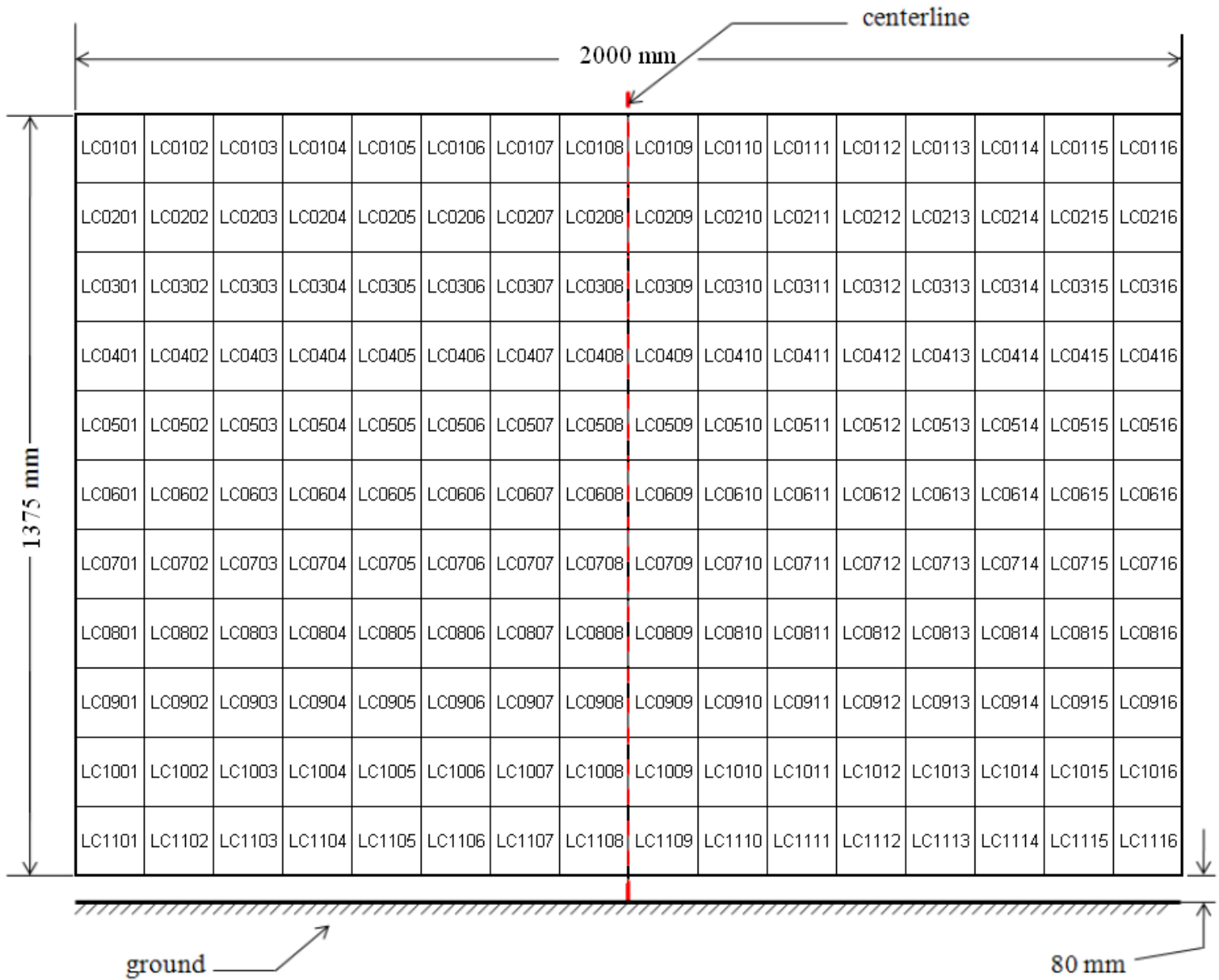


All measurements in millimeters.

DATA SHEET NO. 9

LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17



DATA SHEET NO. 10**TEST VEHICLE CAMERA AND INSTRUMENTATION SUMMARY**

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

INSTRUMENTATION

Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	6
Seat Belt Load Cells	4
Load Cell Barrier	528
Total	632

CAMERA COVERAGE

High-Speed Vehicle On Board	2
High-Speed Off Board	14
Real Time	3
Total	19

DATA SHEET NO. 11
POST-TEST OBSERVATIONS

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

TEST DUMMY INFORMATION AND CONTACT

Description	Driver	Passenger
Dummy Type/Serial No.	P572E 50th Percentile Male ATD / 360	P572O 5th Percentile Female ATD / 141
Head Contact	Frontal Airbag, Headrest	Frontal Airbag, Headrest
Upper Torso Contact	Frontal Airbag	Frontal Airbag
Lower Torso Contact	None	None
Left Knee Contact	Knee Airbag	Knee Airbag
Right Knee Contact	Knee Airbag	Knee Airbag

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked / Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Remained closed and latched, operational	Remained closed and latched, operational
Rear Door Opening	N/A	N/A
Seat Track Shift (mm)	7	0
Seat Back Failure	None	None
Glazing Damage	Yes	Yes

POST TEST STRUCTURAL OBSERVATIONS

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

VEHICLE REBOUND FROM BARRIER

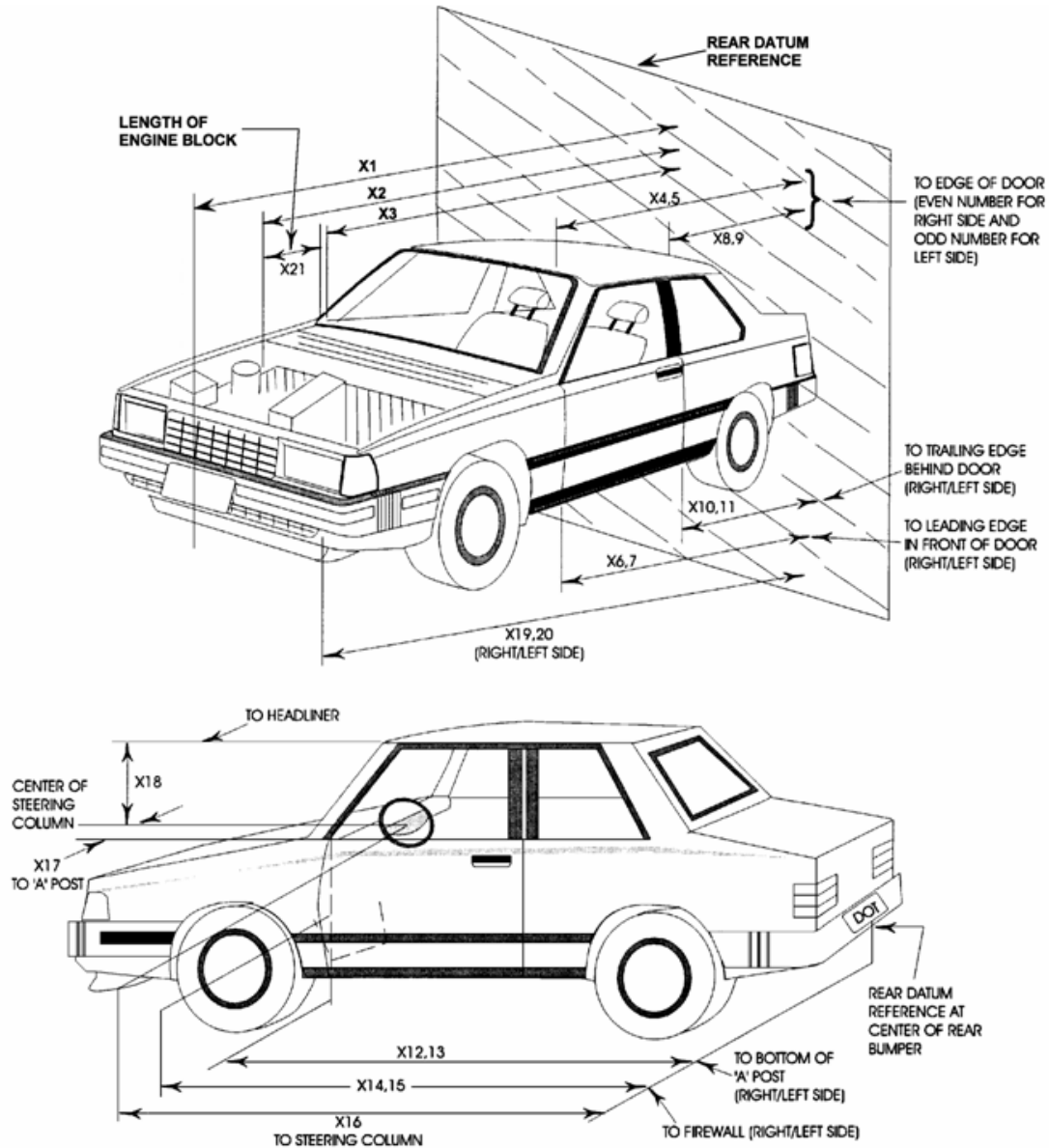
Measured Parameter	Units	Value
Left Side	mm	1099
Center	mm	1142
Right Side	mm	1310
Average	mm	1184

SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17



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

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	2762	2507	-255
2	Rear Surface of Vehicle to Front of Engine	145	145	0
3	RSOV to Firewall	2182	2063	-119
4	RSOV to Upper Leading Edge of Right Door	1930	1918	-12
5	RSOV to Upper Leading Edge of Left Door	1934	1908	-26
6	RSOV to Lower Leading Edge of Right Door	1840	1833	-7
7	RSOV to Lower Leading Edge of Left Door	1855	1848	-7
8	RSOV to Upper Trailing Edge of Right Door	597	585	-12
9	RSOV to Upper Trailing Edge of Left Door	605	561	-44
10	RSOV to Lower Trailing Edge of Right Door	935	918	-17
11	RSOV to Lower Trailing Edge of Left Door	945	931	-14
12	RSOV to Bottom of A-Pillar, Right Side	1881	1863	-18
13	RSOV to Bottom of A-Pillar, Left Side	1808	1838	30
14	RSOV to Firewall, Right Side	2194	2068	-126
15	RSOV to Firewall, Left Side	2141	2038	-103
16	RSOV to Steering Column	1510	1508	-2
17	Center of Steering Column to A-Pillar	395	483	88
18	Center of Steering Column to Headliner	455	470	15
19	RSOV to Right Side of Front Bumper	2405	2158	-247
20	RSOV to Left Side of Front Bumper	2400	2398	-2
21	Length of Engine Block	550	550	0
RD	RSOV to Right Side of Dash Panel	1726	1704	-22
CD	RSOV to Center of Dash Panel	1634	1493	-141
LD	RSOV to Left Side of Dash Panel	1768	1698	-70

All measurements in millimeters.

DATA SHEET NO. 13**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

VEHICLE INFORMATION

VIN: WMEFJ5DA4HK173979 Wheelbase (mm): 1878
Vehicle Size Category: Passenger Car Test Weight (kg): 1174.5

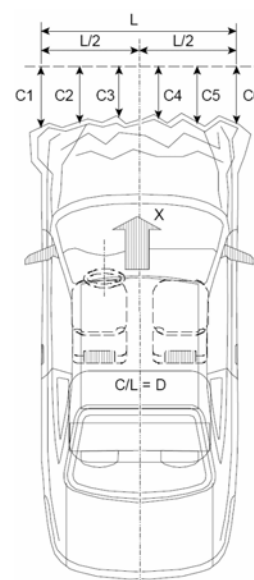
ACCELEROMETER DATA

Accelerometer Locations: Left Rear Crossmember
Cal. Procedure/Interval: Vibration Test / 6 months
Integration Algorithm: NHTSA Standard
Impact Velocity (km/h): 56.19
Velocity Change (km/h): 66.7
Time of Separation (msec): 49.6

Linearity: Good

CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1507
Impact Mode: Full Frontal



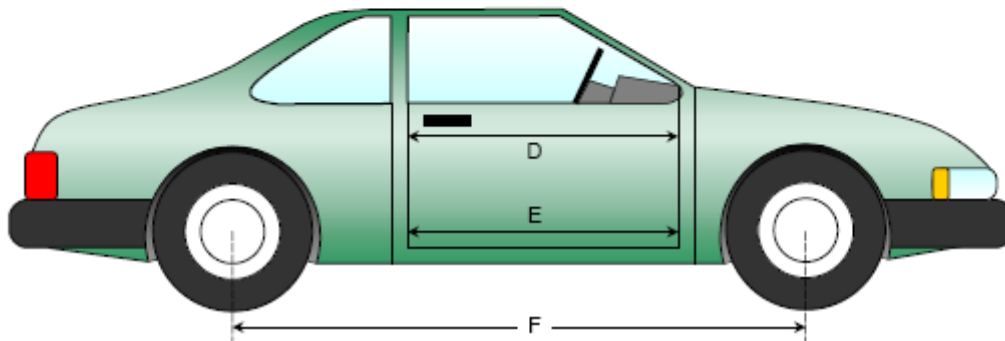
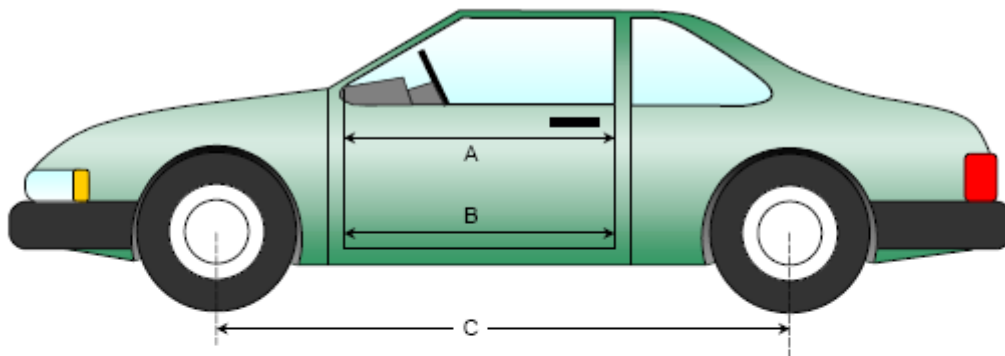
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	186	234	48
C2	Crush Zone 2 at Left Side	mm	86	310	224
C3	Crush Zone 3 at Left Side	mm	53	324	271
C4	Crush Zone 4 at Right Side	mm	53	340	287
C5	Crush Zone 5 at Right Side	mm	87	365	278
C6	Crush Zone 6 at Right Side	mm	185	414	229
L	C1 to C6	mm	1507		

DATA SHEET NO. 14**VEHICLE INTRUSION MEASUREMENTS**Test Vehicle: 2017 Smart Fortwo 2-Door CoupeNHTSA No.: O20174300Test Program: 56.3 km/h Frontal Impact NCAP TestTest Date: 01/16/17**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1253	1246	7
B	Left Side Lower	mm	1037	1038	-1
D	Right Side Upper	mm	1234	1224	10
E	Right Side Lower	mm	980	973	7

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	1878	1800	78
F	Right Side Wheelbase	mm	1878	1805	73



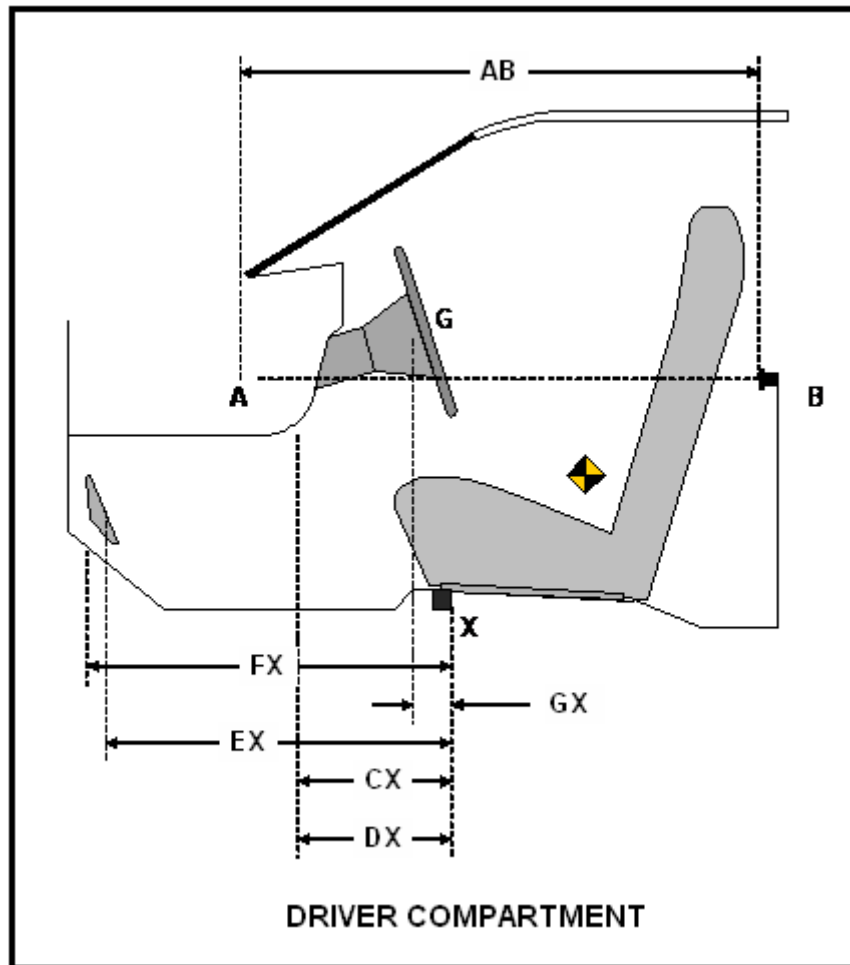
DATA SHEET NO. 14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	1176	1172	4
CX	Left Knee Bolster to X	mm	388	376	12
DX	Right Knee Bolster to X	mm	375	380	-5
EX	Brake Pedal to X	mm	581	610	-29
FX	Foot Rest to X	mm	555	533	22
GX	Center of Steering Wheel Hub to X	mm	155	180	-25

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

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

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

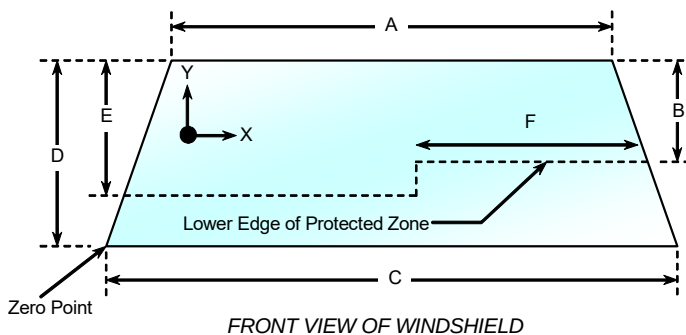
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with plastic molding and rubber cement.

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

Temperature of windshield molding during test: 21.3° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	1974.5	1974.5	100.0%
Right Side	1974.5	1974.5	100.0%
Total	3949	3949	100.0%



Item	Units	Value
A	mm	1064
B	mm	360
C	mm	1355
D	mm	765
E	mm	470
F	mm	440

AREAS OF PROTECTED ZONE FAILURES

- A. Provide Coordinates of the area that the protected zone was penetrated more than 0.25 inches by a vehicle component other than one that is normally in contact with the windshield.

X	Y

- 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

DATA SHEET NO. 15 ... (CONTINUED)

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

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 13.0° C Test Time: 2:13 PM

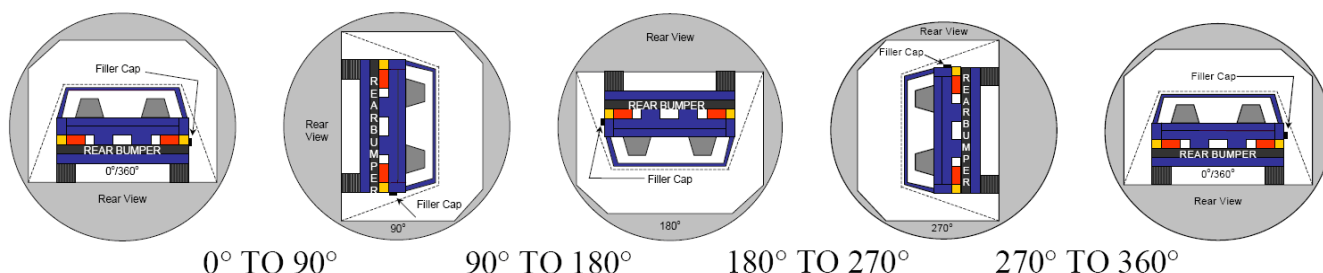
Stoddard Solvent Spillage Measurements

- 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./minute)
- D. Spillage: There was no Stoddard solvent spillage.

DATA SHEET NO. 16

FMVSS 301 STATIC ROLLOVER RESULTS

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17



1. The specified fixture rollover rate for each 90° of rotation is 60 to 180 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. Details of Stoddard solvent spillage: There was no Stoddard solvent spillage.

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	86	300	386
90° To 180°	80	300	380
180° To 270°	78	300	378
270° To 360°	83	300	383

FMVSS 301 SPILLAGE TABLE

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

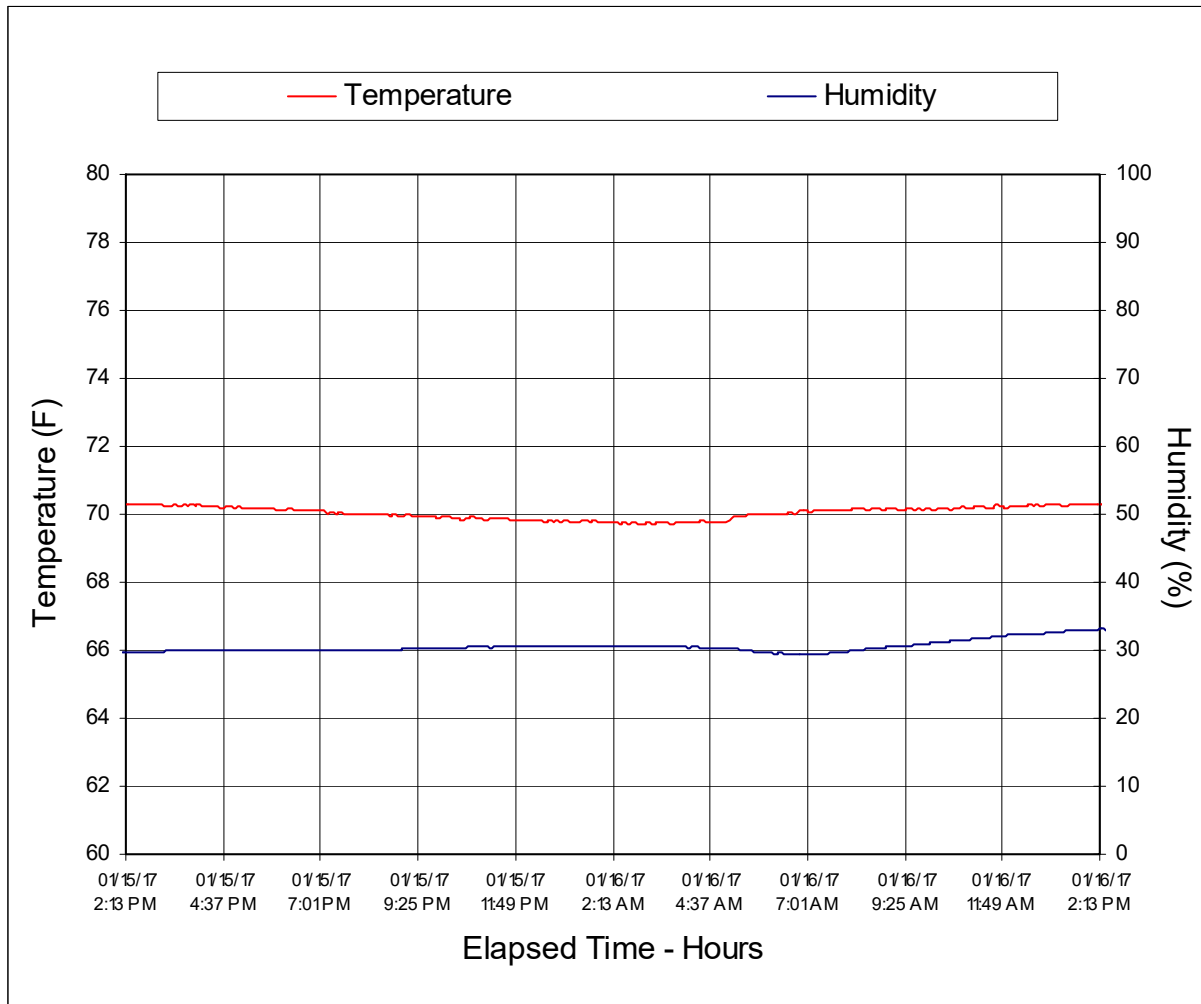
SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° To 90°	
90° To 180°	
180° To 270°	
270° To 360°	

DATA SHEET NO. 17

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe NHTSA No.: O20174300
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/16/17



APPENDIX A
PHOTOGRAPHS

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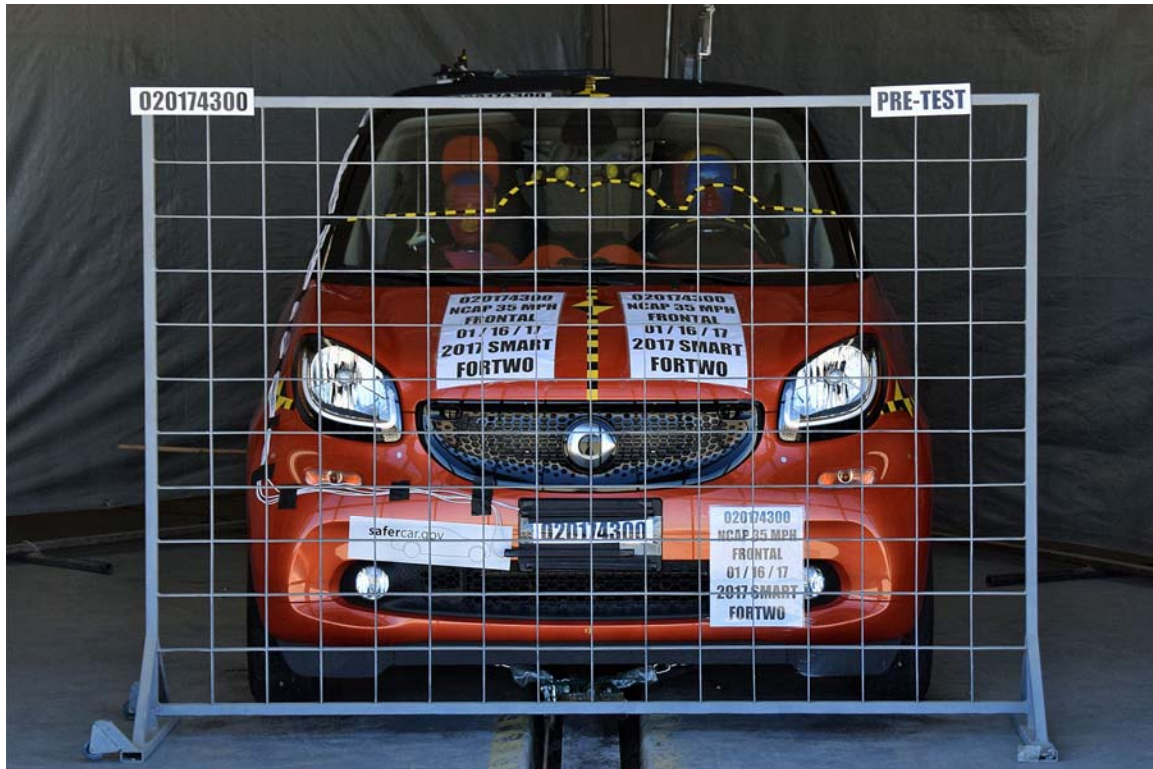


FIGURE 1. Load Cell Location



FIGURE 2. Pre-Test Load Cell Wall



FIGURE 3. Post-Test Load Cell Wall



FIGURE 4. Manufacturer's Label

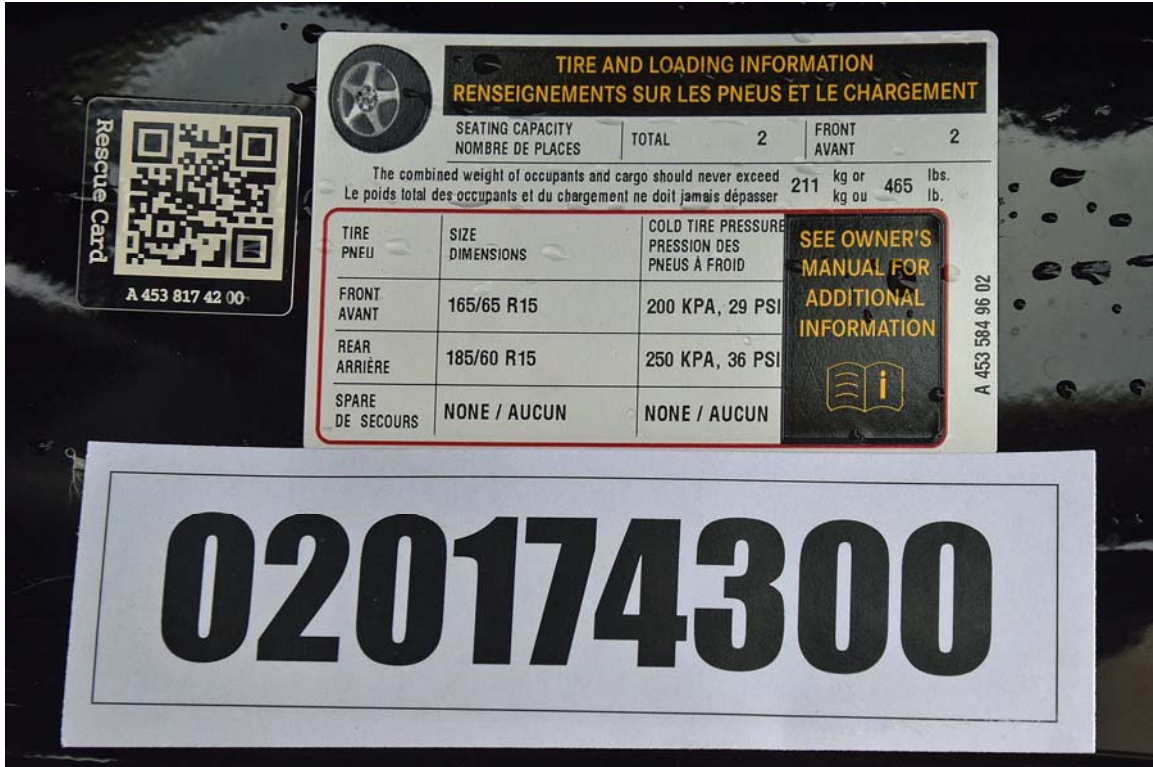


FIGURE 5. Tire Placard



FIGURE 6. 2017 Smart Fortwo Frontal as Delivered



FIGURE 7. Left Rear $\frac{3}{4}$ View, as Received



FIGURE 8. Pre-Test Front View of Test Vehicle



FIGURE 9. Post-Test Front View of Test Vehicle



FIGURE 10. Pre-Test Left View of Test Vehicle



FIGURE 11. Post-Test Left View of Test Vehicle



FIGURE 12. Pre-Test Right View of Test Vehicle



FIGURE 13. Post-Test Right View of Test Vehicle



FIGURE 14. Pre-Test Right Front $\frac{3}{4}$ View



FIGURE 15. Post-Test Right Front $\frac{3}{4}$ View



FIGURE 16. Pre-Test Left Rear $\frac{3}{4}$ View



FIGURE 17. Post-Test Left Rear $\frac{3}{4}$ View



FIGURE 18. Pre-Test Windshield View



FIGURE 19. Post-Test Windshield View



FIGURE 20. Pre-Test Engine Compartment View



FIGURE 21. Post-Test Engine Compartment View



FIGURE 22. Pre-Test Fuel Filler Cap View



FIGURE 23. Post-Test Fuel Filler Cap View



FIGURE 24. Pre-Test Front Underbody View



FIGURE 25. Post-Test Front Underbody View



FIGURE 26. Pre-Test Rear Underbody View

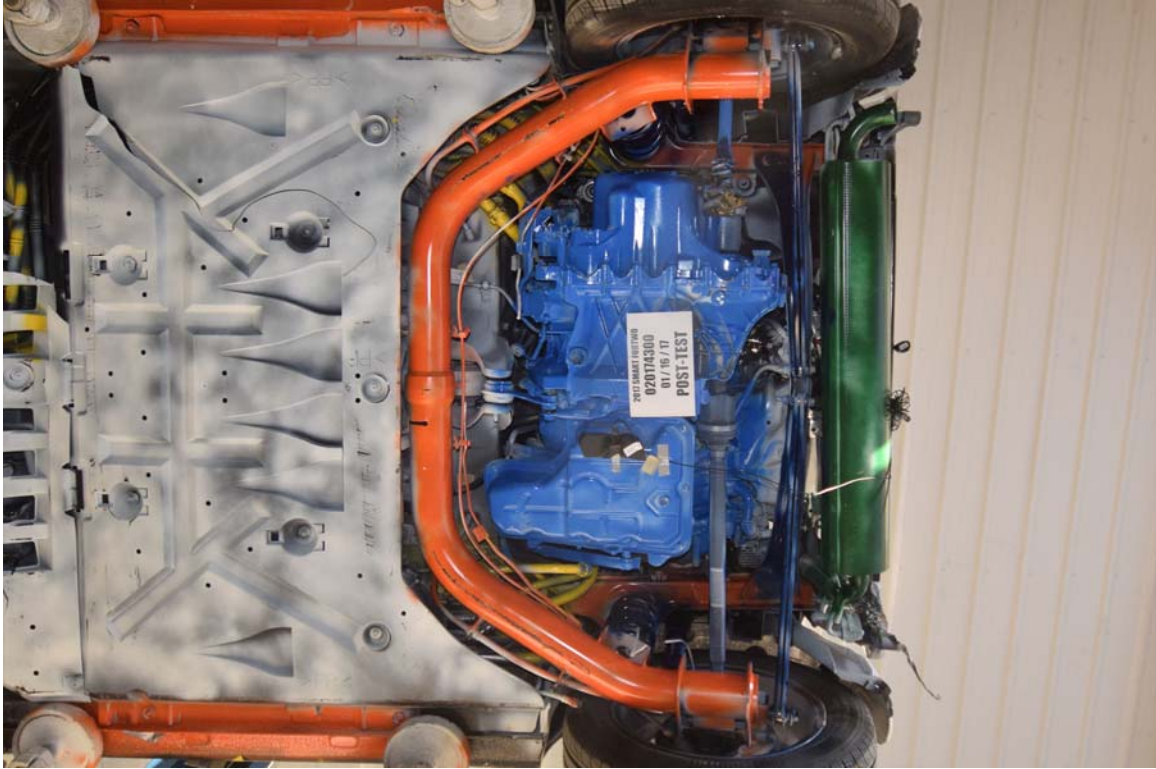


FIGURE 27. Post-Test Rear Underbody View

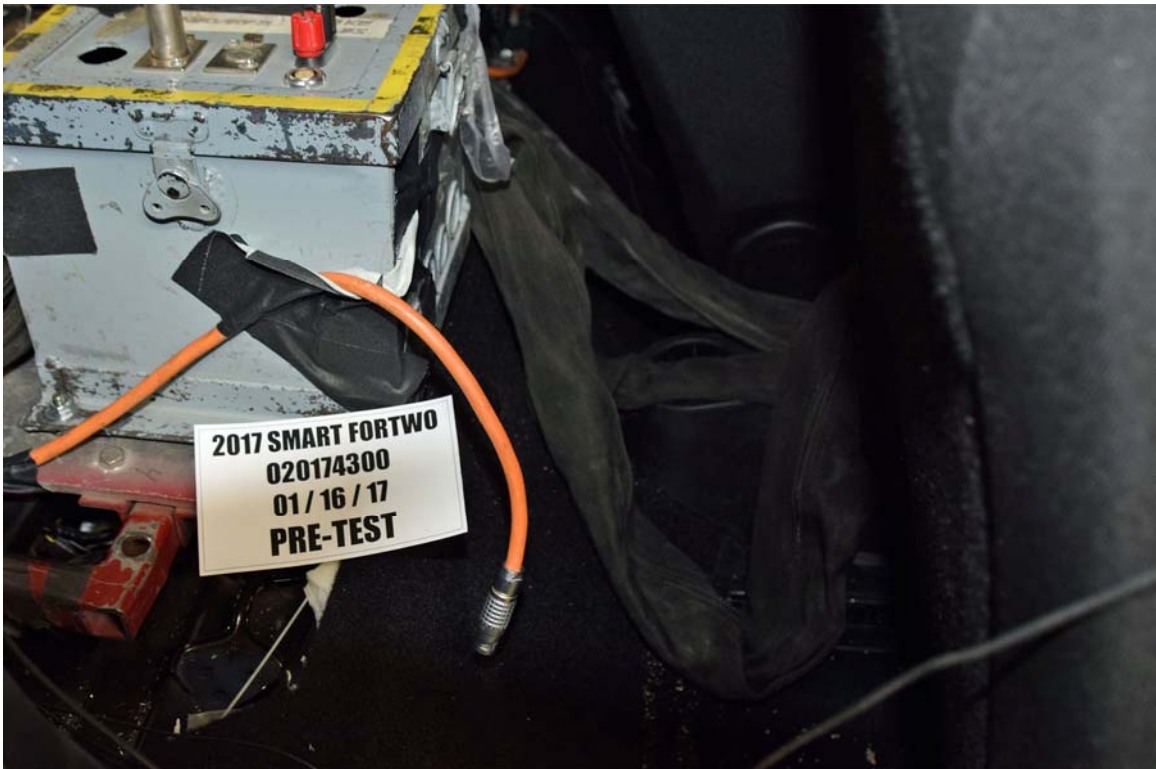


FIGURE 28. Pre-Test Dummy Cable Routing



FIGURE 29. Post-Test Dummy Cable Routing



FIGURE 30. Pre-Test Driver Dummy Front View



FIGURE 31. Post-Test Driver Dummy Front View



FIGURE 32. Pre-Test Driver Dummy Window View



FIGURE 33. Post-Test Driver Dummy Window View



FIGURE 34. Pre-Test Driver Dummy and Vehicle Interior View



FIGURE 35. Post-Test Driver Dummy and Vehicle Interior View



FIGURE 36. Pre-Test Driver's Seat Fore-Aft Markings



FIGURE 37. Post-Test Driver's Seat Fore-Aft Markings



FIGURE 38. Pre-Test View of Belt Anchorage for Driver Dummy



FIGURE 39. Post-Test View of Belt Anchorage for Driver Dummy



FIGURE 40. Pre-Test Driver Dummy Feet



FIGURE 41. Post-Test Driver Dummy Feet



FIGURE 42. Pre-Test Driver's Side Knee Bolster



FIGURE 43. Post-Test Driver's Side Knee Bolster



FIGURE 44. Pre-Test Driver's Side Floorpan



FIGURE 45. Post-Test Driver's Side Floorpan



FIGURE 46. Post-Test Driver Dummy Face

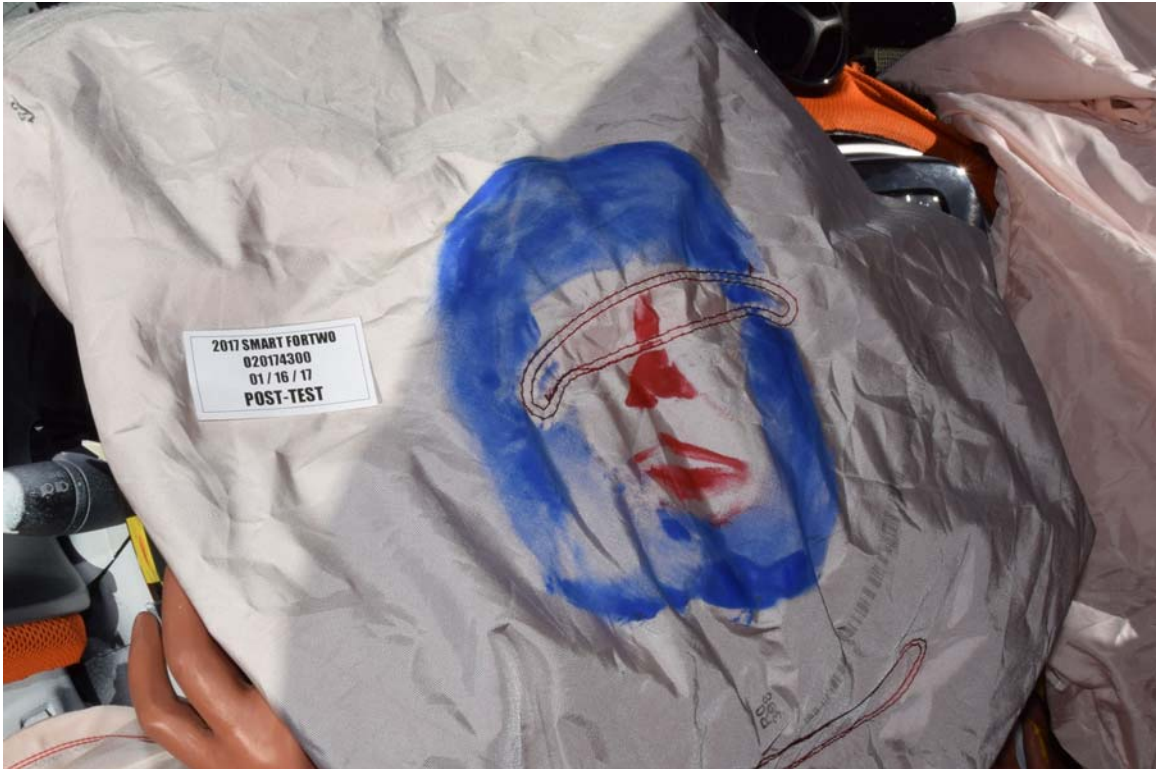


FIGURE 47. Post-Test Driver Dummy Contact with Airbag



FIGURE 48. Post-Test Driver Dummy Contact with Headrest



FIGURE 48a. Post-Test Driver Dummy Contact with Knee Airbag



FIGURE 49. Pre-Test View of the Steering Wheel



FIGURE 50. Post-Test View of the Steering Wheel



FIGURE 51. Pre-Test Passenger Dummy Front View



FIGURE 52. Post-Test Passenger Dummy Front View



FIGURE 53. Pre-Test Passenger Dummy Window View



FIGURE 54. Post-Test Passenger Dummy Window View



FIGURE 55. Pre-Test Passenger Dummy and Vehicle Interior View



FIGURE 56. Post-Test Passenger Dummy and Vehicle Interior View



FIGURE 57. Pre-Test Passenger's Seat Fore-Aft Markings



FIGURE 58. Post-Test Passenger's Seat Fore-Aft Markings



FIGURE 59. Pre-Test View of Belt Anchorage for Passenger Dummy



FIGURE 60. Post-Test View of Belt Anchorage for Passenger Dummy



FIGURE 61. Pre-Test Passenger Dummy Feet



FIGURE 62. Post-Test Passenger Dummy Feet



FIGURE 63. Pre-Test Passenger's Side Knee Bolster



FIGURE 64. Post-Test Passenger's Side Knee Bolster



FIGURE 65. Pre-Test Passenger's Side Floorpan



FIGURE 66. Post-Test Passenger's Side Floorpan



FIGURE 67. Post-Test Passenger Dummy Face



FIGURE 68. Post-Test Passenger Dummy Contact with Airbag



FIGURE 69. Post-Test Passenger Dummy Contact with Headrest



FIGURE 69a. Post-Test Passenger Dummy Contact with Knee Airbag

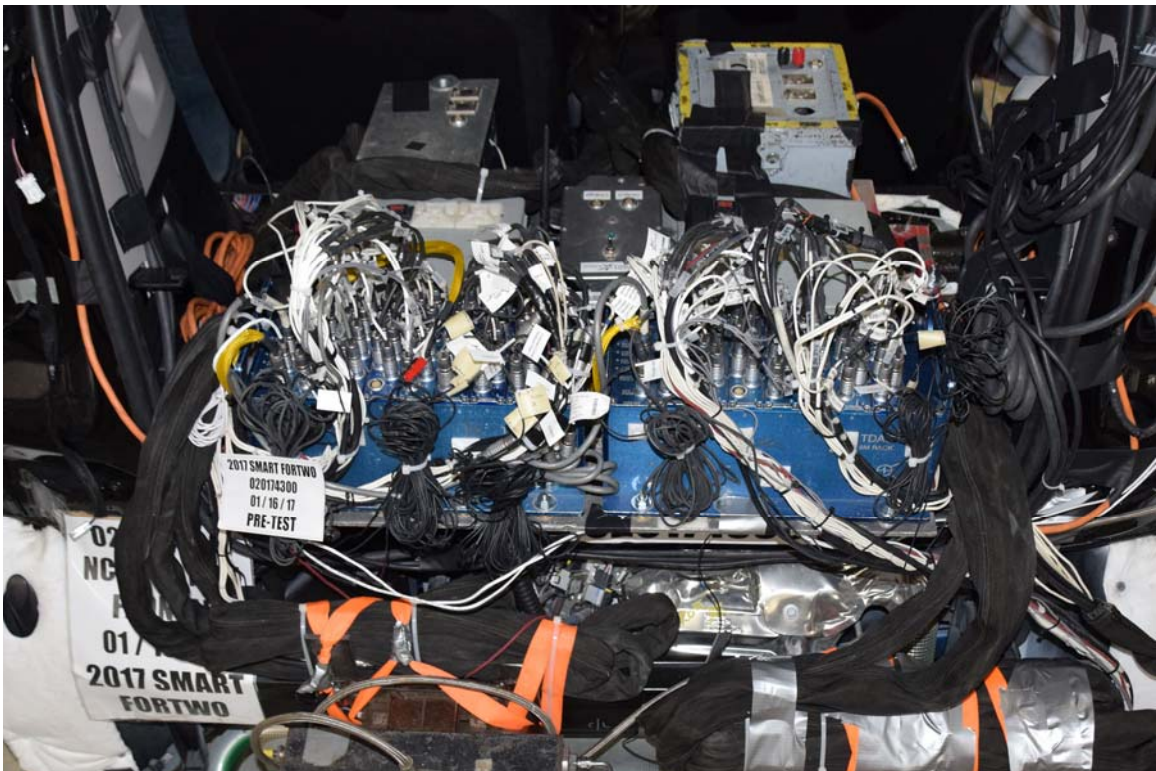


FIGURE 70. Photograph of Ballast Installed in Vehicle

Photograph Not Applicable

No Stoddard Solvent Spillage

FIGURE 71. Post-Test Stoddard Solvent Spillage Location View



FIGURE 72. Post-Test Speed Trap Read-Out



FIGURE 73. Vehicle at 0° on Static Rollover Device



FIGURE 74. Vehicle at 90° on Static Rollover Device



FIGURE 75. Vehicle at 180° on Static Rollover Device

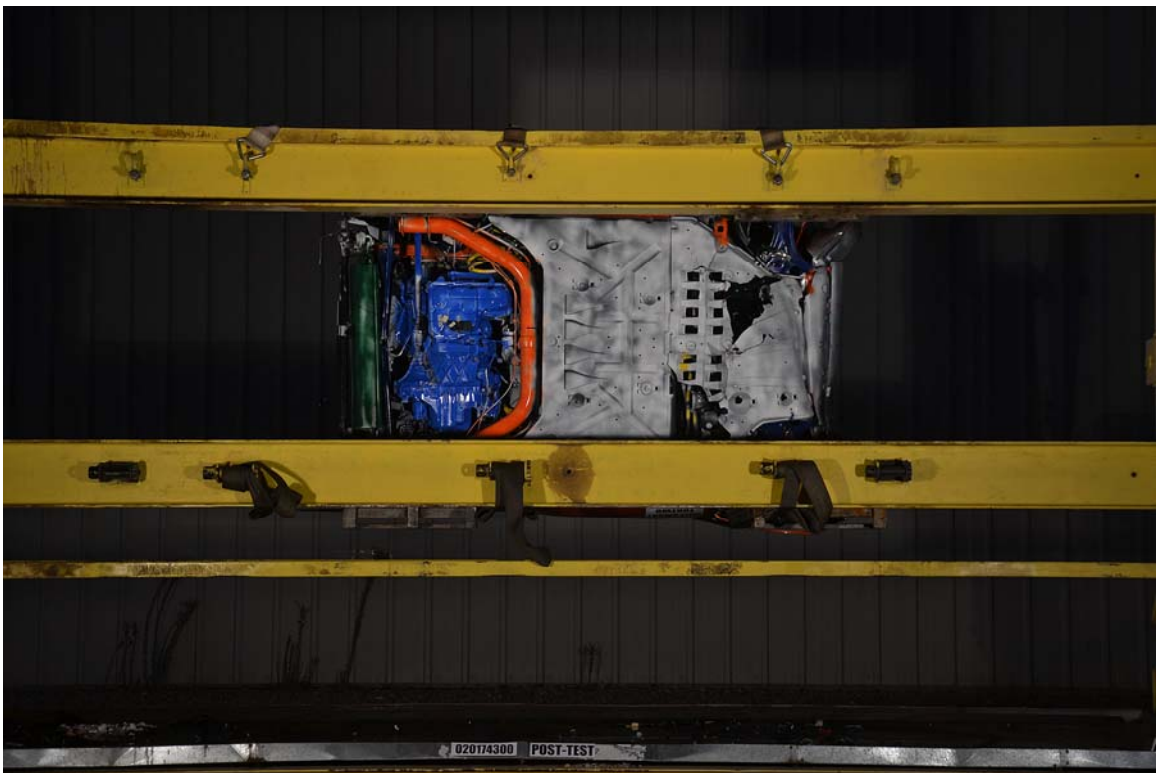


FIGURE 76. Vehicle at 270° on Static Rollover Device



FIGURE 77. Vehicle at 360° on Static Rollover Device



FIGURE 78. 2017 Smart Fortwo Frontal Impact Event

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

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1	Driver Head Acceleration X Primary	B-1
2	Driver Head Acceleration Y Primary	B-1
3	Driver Head Acceleration Z Primary	B-1
4	Driver Head Resultant Acceleration Primary	B-1
5	Driver Chest X Deflection	B-2
6	Driver Chest Acceleration X Primary	B-3
7	Driver Chest Acceleration Y Primary	B-3
8	Driver Chest Acceleration Z Primary	B-3
9	Driver Chest Resultant Acceleration Primary	B-3
10	Driver Upper Neck Force X	B-4
11	Driver Upper Neck Force Z	B-4
12	Driver Upper Neck Moment Y	B-4
13	Driver Nij	B-4
14	Driver Left Femur Force Z	B-5
15	Driver Right Femur Force Z	B-5
16	Passenger Head Acceleration X Primary	B-6
17	Passenger Head Acceleration Y Primary	B-6
18	Passenger Head Acceleration Z Primary	B-6
19	Passenger Head Resultant Acceleration Primary	B-6
20	Passenger Chest X Deflection	B-7
21	Passenger Chest Acceleration X Primary	B-8
22	Passenger Chest Acceleration Y Primary	B-8
23	Passenger Chest Acceleration Z Primary	B-8
24	Passenger Chest Resultant Acceleration Primary	B-8
25	Passenger Upper Neck Force X	B-9
26	Passenger Upper Neck Force Z	B-9
27	Passenger Upper Neck Moment Y	B-9
28	Passenger Nij	B-9
29	Passenger Left Femur Force Z	B-10
30	Passenger Right Femur Force Z	B-10

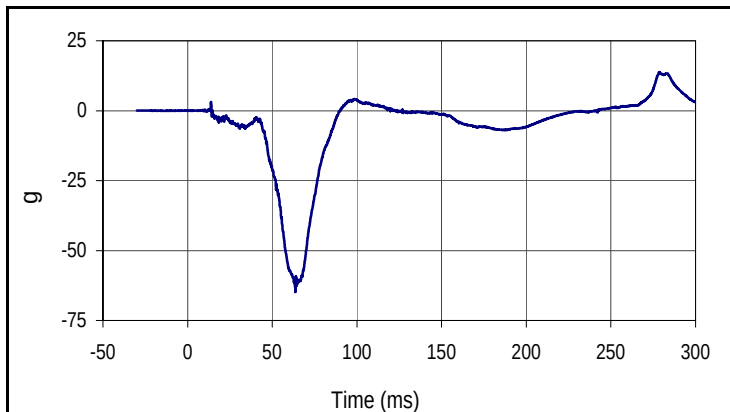
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

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

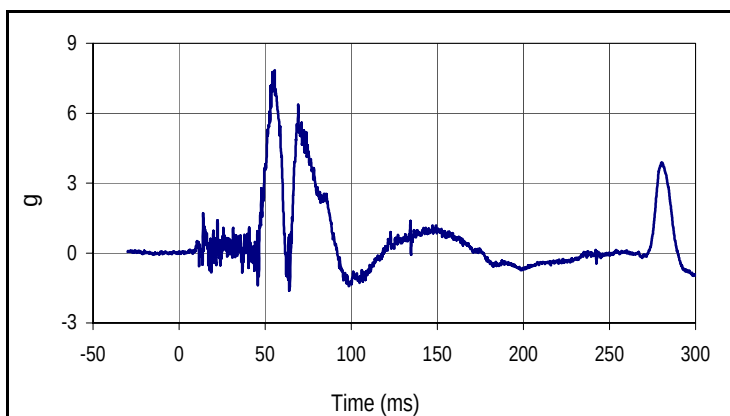
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Left Femur Force Redundant
Passenger Right Femur Force Redundant
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia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

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

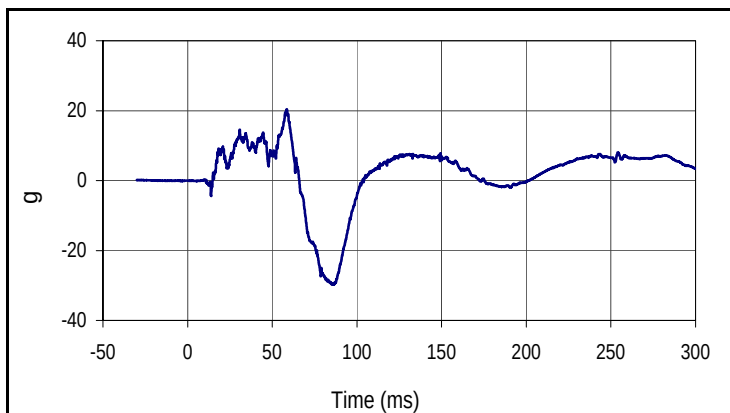
NHTSA No.: O20174300
 Test Date: 1/16/17



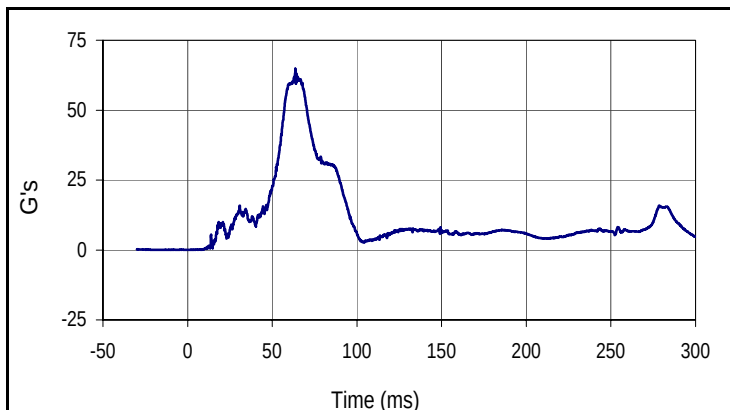
Curve Description			
Driver Head Acceleration X Primary			
Plot No.		SAE Class	Units
001		1000	g
Max	Time	Min	Time
13.7	278.6	-64.8	63.6



Curve Description			
Driver Head Acceleration Y Primary			
Plot No.		SAE Class	Units
002		1000	g
Max	Time	Min	Time
7.9	55.5	-1.6	63.9



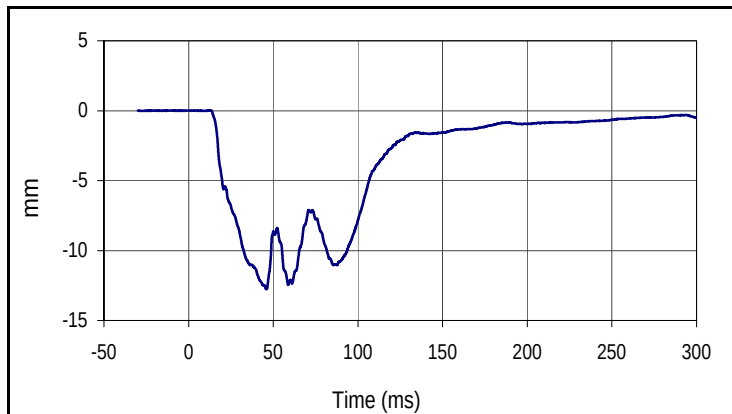
Curve Description			
Driver Head Acceleration Z Primary			
Plot No.		SAE Class	Units
003		1000	g
Max	Time	Min	Time
20.4	58.6	-29.8	85.9



Curve Description			
Driver Head Resultant Acceleration Primary			
Plot No.		SAE Class	Units
004		1000	G's
Max	Time	Min	Time
64.8	63.6	0.0	1.5

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

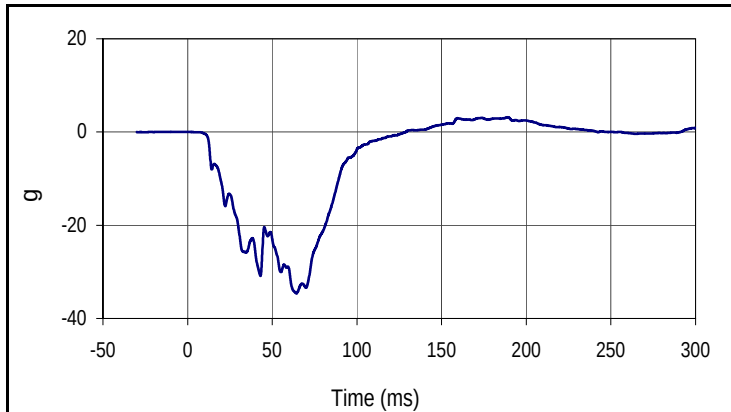
NHTSA No.: O20174300
 Test Date: 1/16/17



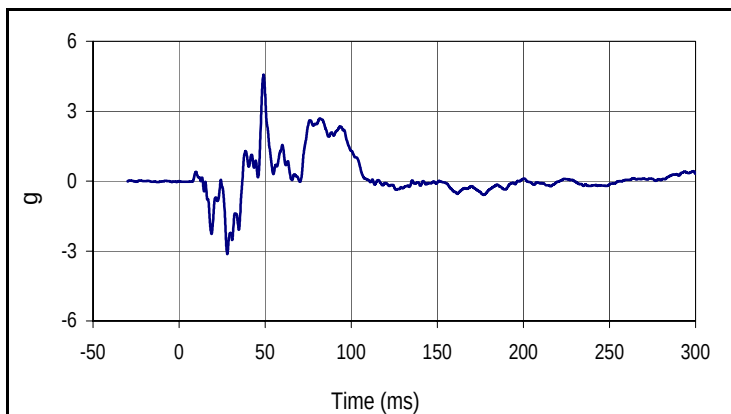
Curve Description			
Driver Chest Deflection			
Plot No.		SAE Class	Units
005		600	mm
Max	Time	Min	Time
0.0	11.9	-12.8	46.1

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

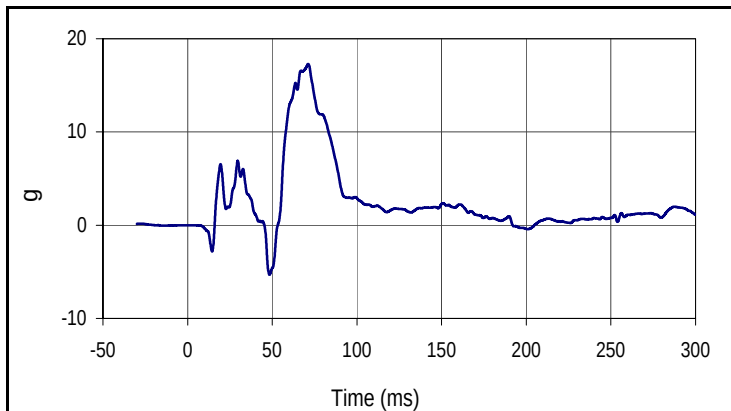
NHTSA No.: O20174300
 Test Date: 1/16/17



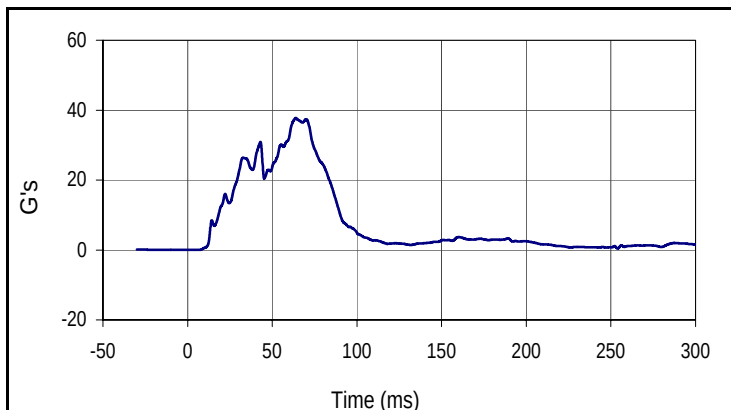
Curve Description			
Driver Chest Acceleration X Primary			
Plot No.		SAE Class	Units
006		180	g
Max	Time	Min	Time
3.2	189.2	-34.6	64.2



Curve Description			
Driver Chest Acceleration Y Primary			
Plot No.		SAE Class	Units
007		180	g
Max	Time	Min	Time
4.6	49.1	-3.1	28.0



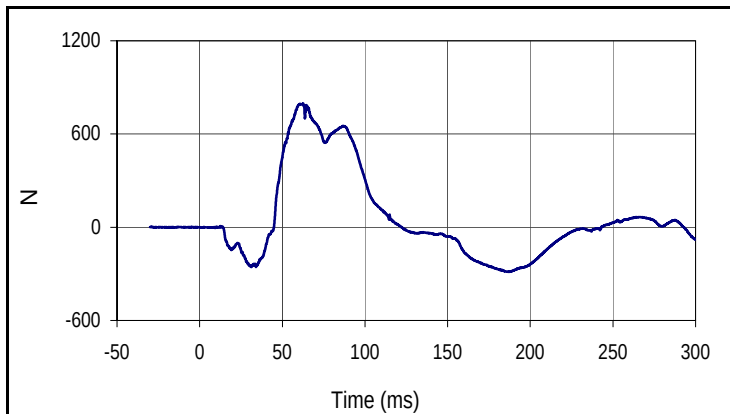
Curve Description			
Driver Chest Acceleration Z Primary			
Plot No.		SAE Class	Units
008		180	g
Max	Time	Min	Time
17.3	71.3	-5.3	48.4



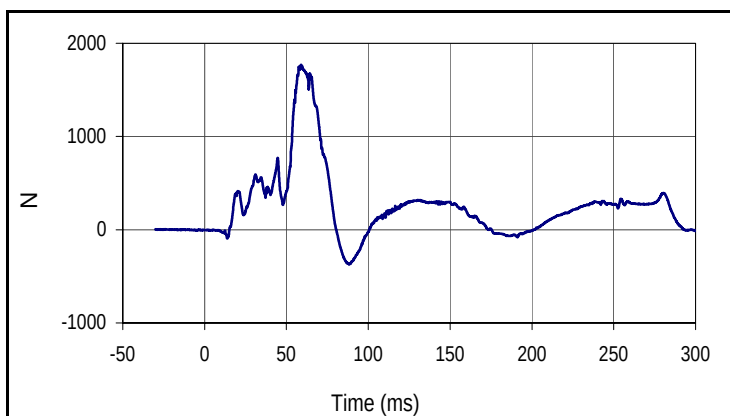
Curve Description			
Driver Chest Resultant Acceleration Primary			
Plot No.		SAE Class	Units
009		180	G's
Max	Time	Min	Time
37.8	64.0	0.0	0.0

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

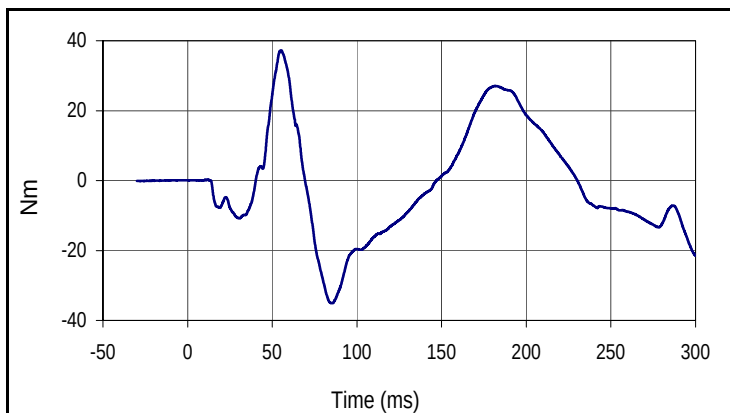
NHTSA No.: O20174300
 Test Date: 1/16/17



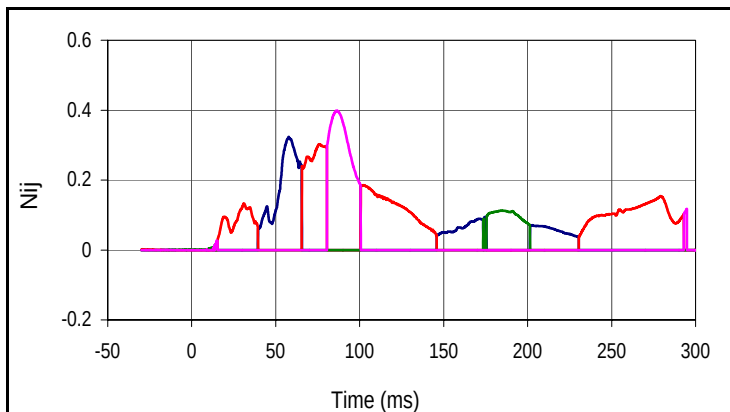
Curve Description			
Driver Upper Neck Force X			
Plot No.		SAE Class	Units
010		1000	N
Max	Time	Min	Time
796.2	62.6	-287.9	186.6



Curve Description			
Driver Upper Neck Force Z			
Plot No.		SAE Class	Units
011		1000	N
Max	Time	Min	Time
1769.2	59.0	-372.3	88.4



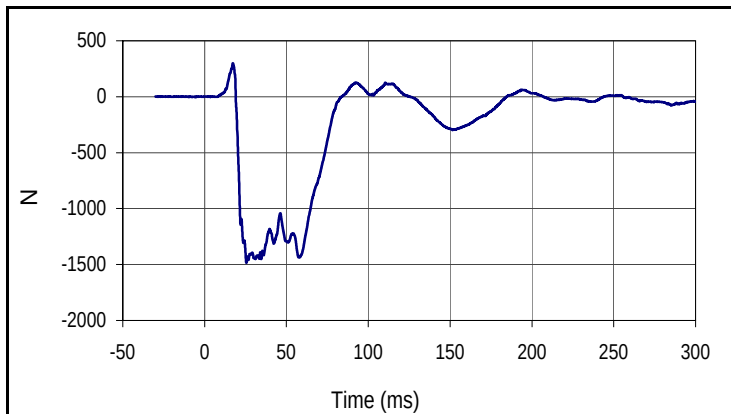
Curve Description			
Driver Upper Neck Moment Y			
Plot No.		SAE Class	Units
012		600	Nm
Max	Time	Min	Time
37.3	55.1	-35.1	85.6



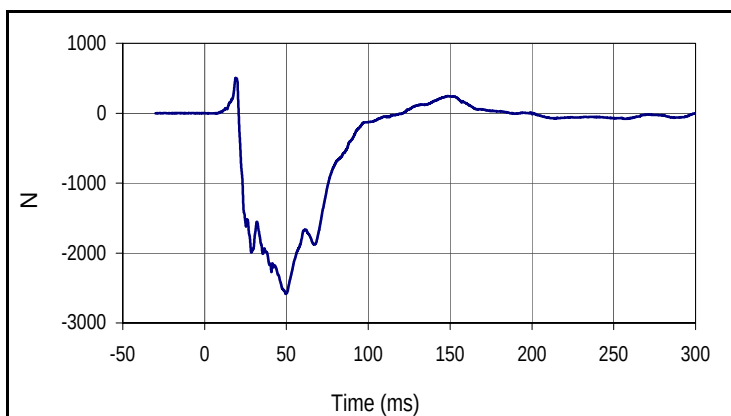
Curve Description		
Driver Nij		
Units	Max	Time
Ntf	0.32	57.7
Units	Max	Time
Nte	0.30	76.0
Units	Max	Time
Ncf	0.11	184.7
Units	Max	Time
Nce	0.40	86.2

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

NHTSA No.: O20174300
 Test Date: 1/16/17



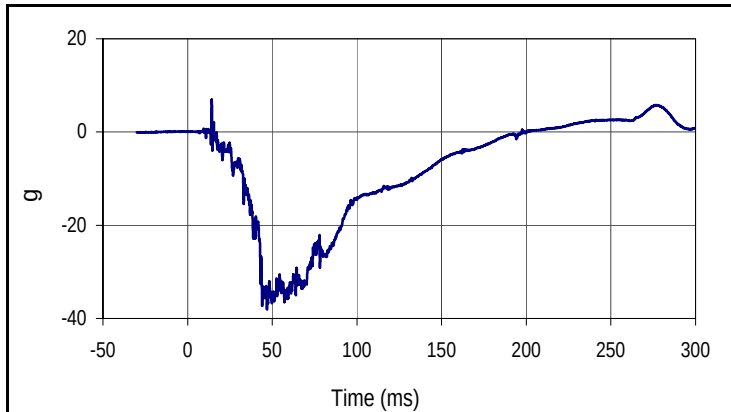
Curve Description			
Driver Left Femur Force Z			
Plot No.		SAE Class	Units
014		600	N
Max	Time	Min	Time
300.6	17.3	-1486.3	25.5



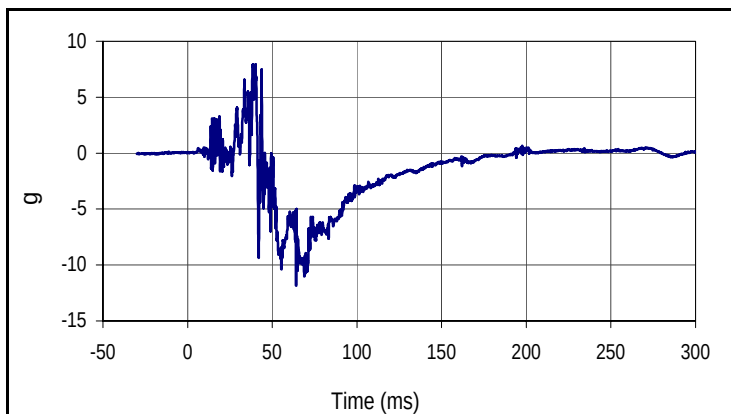
Curve Description			
Driver Right Femur Force Z			
Plot No.		SAE Class	Units
015		600	N
Max	Time	Min	Time
503.9	19.1	-2584.0	49.6

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

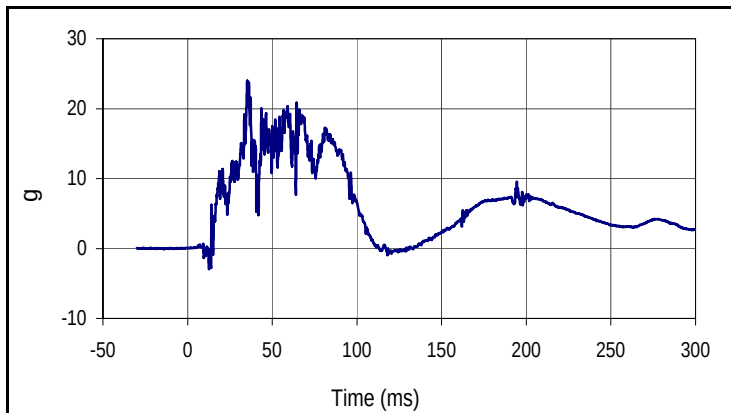
NHTSA No.: O20174300
 Test Date: 1/16/17



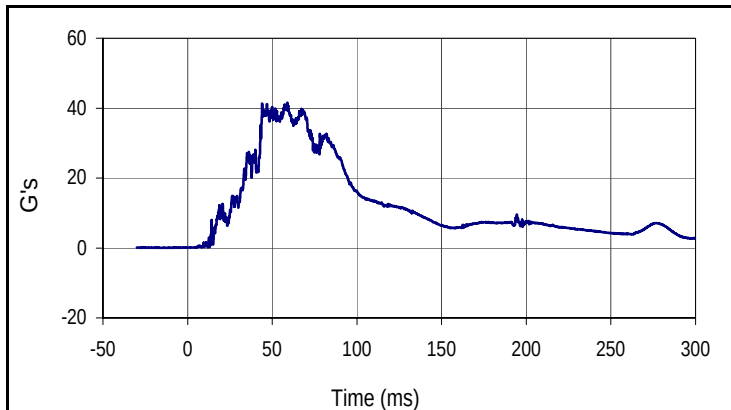
Curve Description			
Passenger Head Acceleration X Primary			
Plot No.		SAE Class	Units
016		1000	g
Max	Time	Min	Time
6.9	14.3	-38.1	46.9



Curve Description			
Passenger Head Acceleration Y Primary			
Plot No.		SAE Class	Units
017		1000	g
Max	Time	Min	Time
7.9	40.1	-11.9	64.1



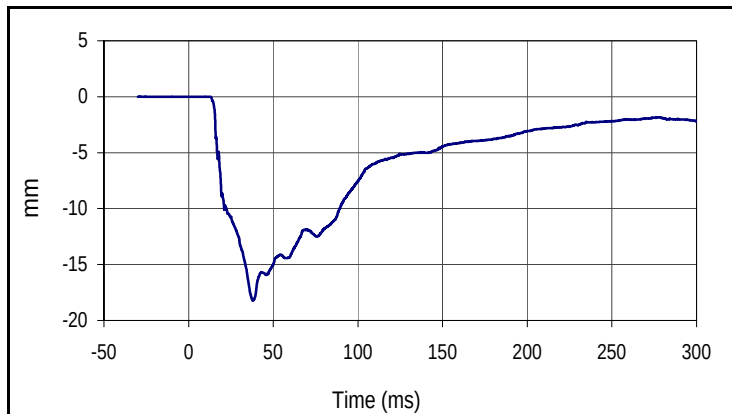
Curve Description			
Passenger Head Acceleration Z Primary			
Plot No.		SAE Class	Units
018		1000	g
Max	Time	Min	Time
24.0	35.2	-3.0	12.7



Curve Description			
Passenger Head Resultant Acceleration Primary			
Plot No.		SAE Class	Units
019		1000	G's
Max	Time	Min	Time
41.5	58.9	0.1	1.7

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

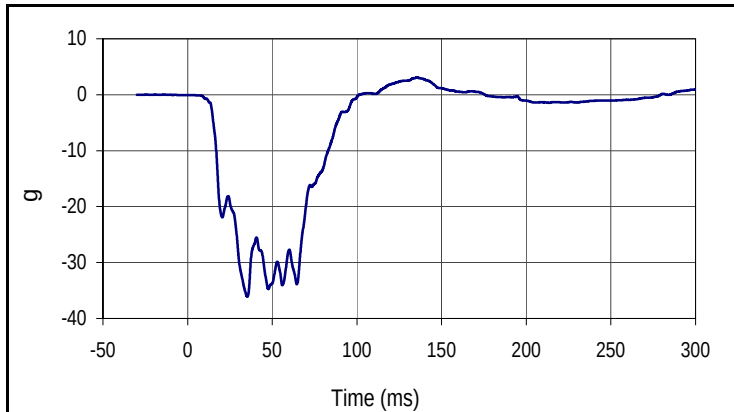
NHTSA No.: O20174300
 Test Date: 1/16/17



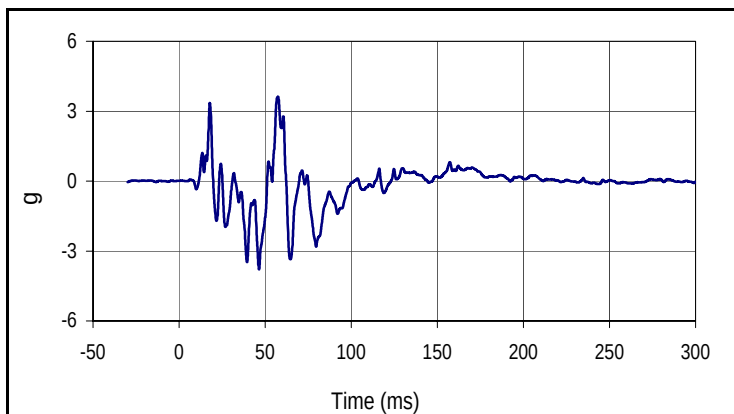
Curve Description			
Passenger Chest Deflection			
Plot No.		SAE Class	Units
020		600	mm
Max	Time	Min	Time
0.0	7.5	-18.2	38.0

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

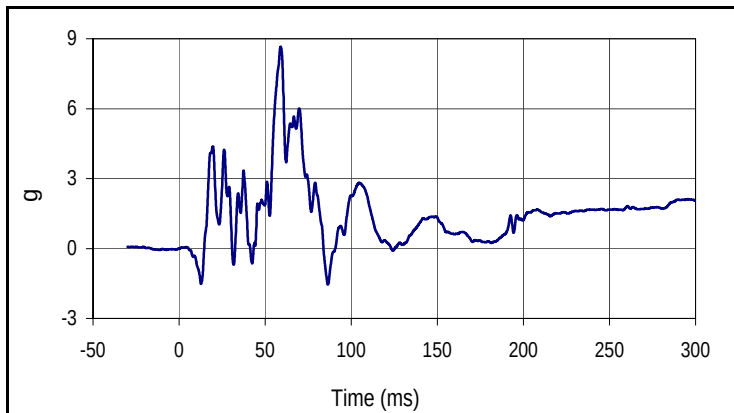
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 Test Date: 1/16/17



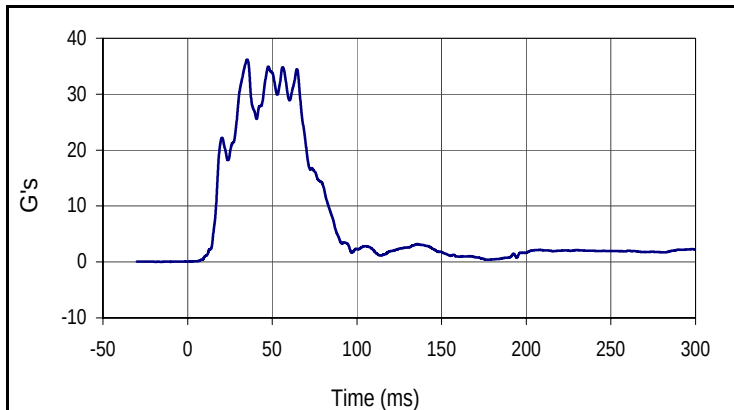
Curve Description			
Passenger Chest Acceleration X Primary			
Plot No.		SAE Class	Units
021		180	g
Max	Time	Min	Time
3.1	135.5	-36.1	35.3



Curve Description			
Passenger Chest Acceleration Y Primary			
Plot No.		SAE Class	Units
022		180	g
Max	Time	Min	Time
3.6	57.5	-3.8	46.4



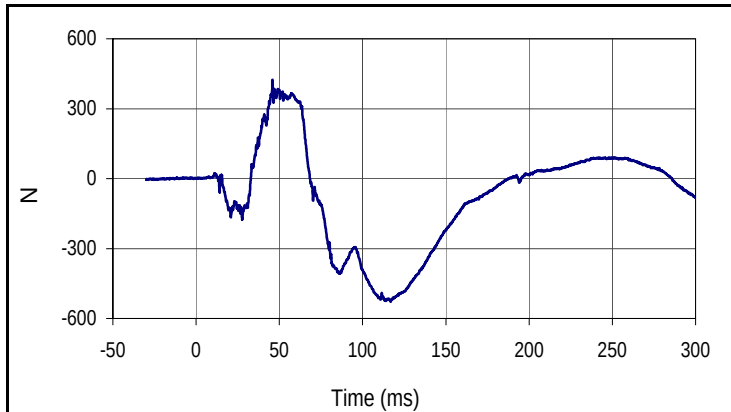
Curve Description			
Passenger Chest Acceleration Z Primary			
Plot No.		SAE Class	Units
023		180	g
Max	Time	Min	Time
8.7	59.0	-1.5	86.5



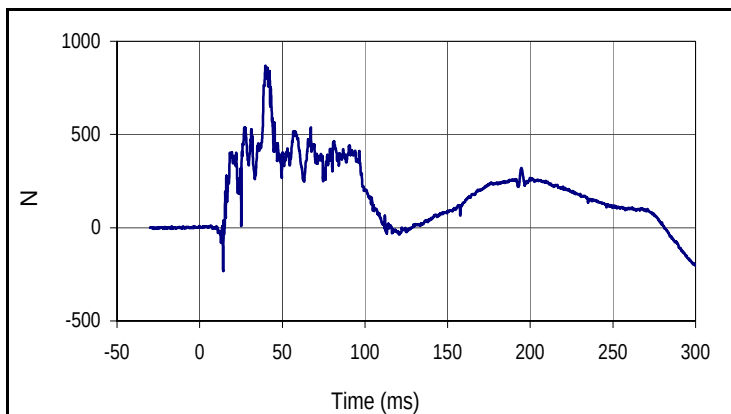
Curve Description			
Passenger Chest Resultant Acceleration Primary			
Plot No.		SAE Class	Units
024		180	G's
Max	Time	Min	Time
36.2	35.3	0.1	0.4

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

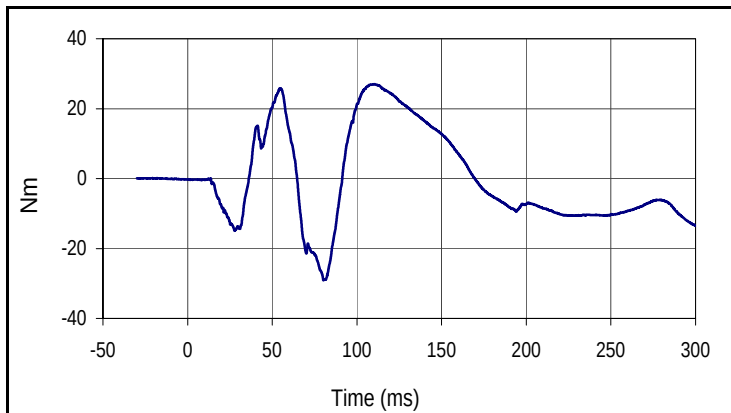
NHTSA No.: O20174300
 Test Date: 1/16/17



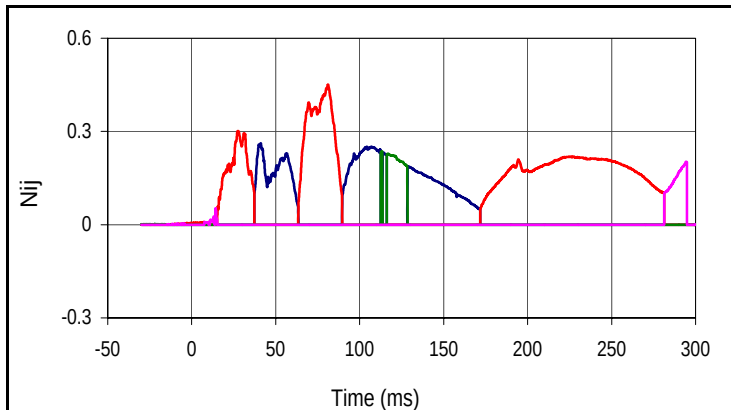
Curve Description			
Passenger Upper Neck Force X			
Plot No.		SAE Class	Units
025		1000	N
Max	Time	Min	Time
423.8	45.9	-526.7	116.9



Curve Description			
Passenger Upper Neck Force Z			
Plot No.		SAE Class	Units
026		1000	N
Max	Time	Min	Time
870.1	39.8	-230.0	14.2



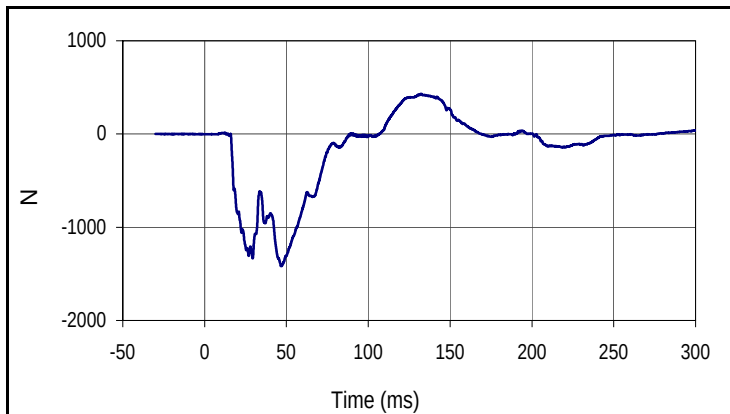
Curve Description			
Passenger Upper Neck Moment Y			
Plot No.		SAE Class	Units
027		600	Nm
Max	Time	Min	Time
27.0	110.7	-29.1	80.3



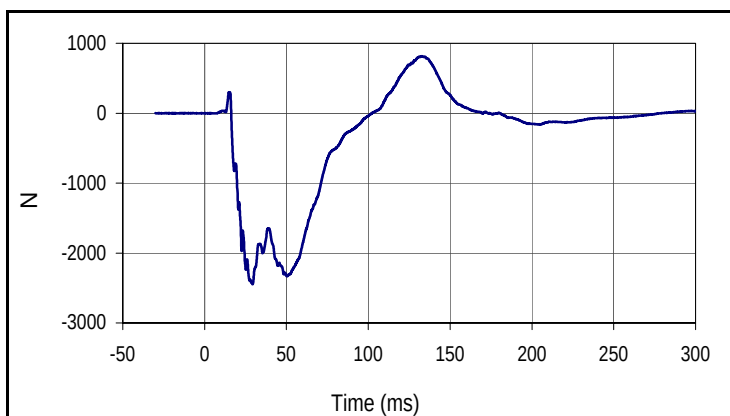
Curve Description		
Passenger Nij		
Units	Max	Time
Ntf	0.26	41.1
Nte	0.45	81.1
Ncf	0.24	113.3
Nce	0.20	294.4

Test Vehicle: 2017 Smart Fortwo 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

NHTSA No.: O20174300
 Test Date: 1/16/17



Curve Description			
Passenger Left Femur Force Z			
Plot No.		SAE Class	Units
029		600	N
Max	Time	Min	Time
431.7	132.3	-1417.6	46.9



Curve Description			
Passenger Right Femur Force Z			
Plot No.		SAE Class	Units
030		600	N
Max	Time	Min	Time
814.9	132.9	-2445.9	29.2

APPENDIX C
ATD CALIBRATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
PRE-TEST / ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Test Program: Hybrid III 50th Percentile Male Dummy Damage ChecklistTest Date: 1/13/17ATD Serial No.: 360Test I.D.: N/A

Dummy Item	Inspect for	Comments	Damaged	OK
Entire Dummy	Perform general cleaning			X
Outer Skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer Leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

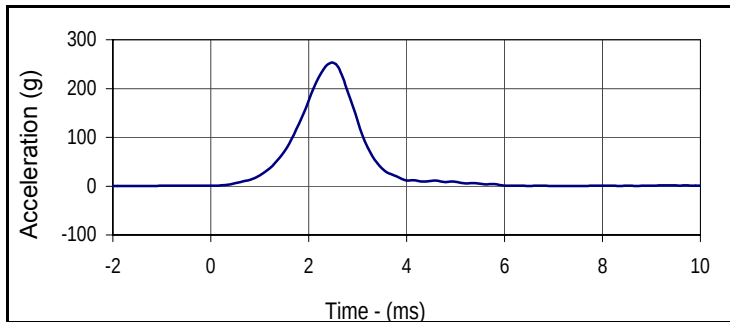
Describe the repair on or replacement of parts:

Test Program: Hybrid III 50th Percentile Male External MeasurementsTest Date: 1/13/17ATD Serial No.: 360Test I.D.: N/A

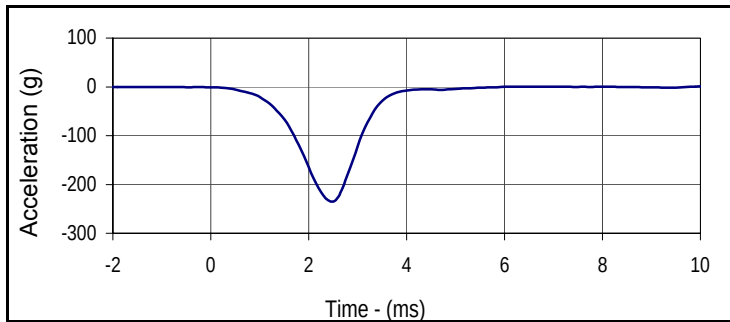
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	29.5	Pass
A - Total sitting height	mm	879 to 889	886	Pass
B - Shoulder pivot height	mm	505 to 521	510	Pass
C - H point height	mm	84 to 89	86	Pass
D - H point location from backline	mm	135 to 140	139	Pass
E - Shoulder pivot from backline	mm	84 to 94	91	Pass
F - Thigh clearance	mm	140 to 155	147	Pass
G - Back of elbow to wrist pivot	mm	290 to 305	298	Pass
H - Head back to backline	mm	41 to 46	44	Pass
I - Shoulder to elbow length	mm	330 to 345	337	Pass
J - Elbow rest height	mm	190 to 211	205	Pass
K - Buttock to knee length	mm	579 to 604	587	Pass
L - Popliteal length	mm	429 to 455	437	Pass
M - Knee pivot height	mm	485 to 500	495	Pass
N - Buttock popliteal length	mm	452 to 477	473	Pass
O - Chest depth without jacket	mm	213 to 229	227	Pass
P - Foot length	mm	251 to 267	263	Pass
V - Shoulder breadth	mm	422 to 437	436	Pass
W - Foot breadth	mm	91 to 107	99	Pass
Y - Chest circumference (with chest jacket)	mm	970 to 1001	982	Pass
Z - Waist circumference	mm	836 to 866	865	Pass
AA - Location for chest circumference	mm	429 to 434	431	Pass
BB - Location for waist circumference	mm	226 to 231	231	Pass
Overall Test Results			Pass	

Test Program: Hybrid III 50th Percentile Male Head Drop TestTest Date: 1/13/17ATD Serial No.: 360Test I.D.: M360HD027

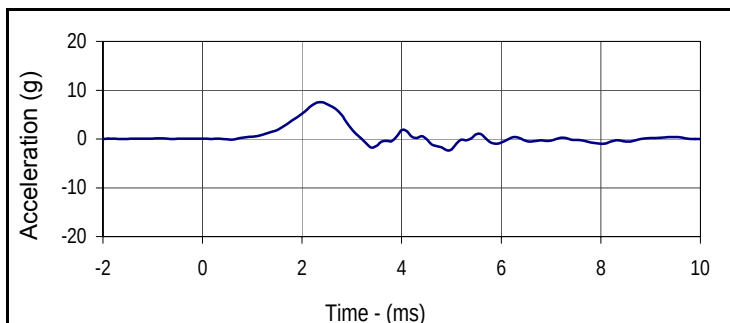
Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	402	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.6	Pass
	Min	°C		21.3	Pass
Humidity During Soak	Max	%	10.0 to 70.0	24.9	Pass
	Min	%		24.6	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.5	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	24.6	Pass
Peak Resultant Acceleration		g	225.0 to 275.0	252.9	Pass
Peak Lateral Acceleration		g	≤15.0	7.6	Pass
Oscillations After Main Pulse		%	<10% of peak Res. Acceleration	3.0	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Overall Test Results				Pass	



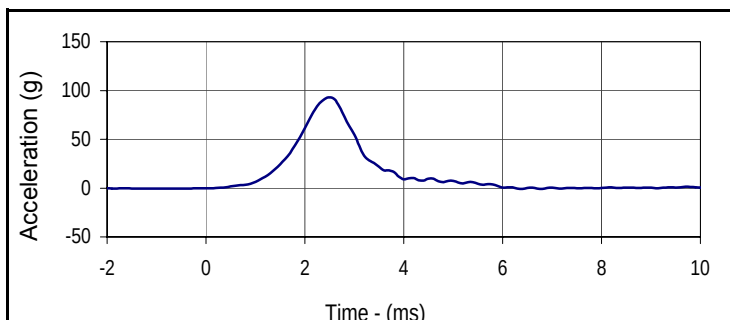
Curve Description			
Head Resultant			
Plot No.	Type	SAE Class	Units
001	RES	1000	g
Max	Time	Min	Time
252.9	2.5	0.1	23.3



Curve Description			
Head X			
Plot No.	Type	SAE Class	Units
002	FIL	1000	g
Max	Time	Min	Time
0.8	10.1	-235.0	2.5



Curve Description			
Head Y			
Plot No.	Type	SAE Class	Units
003	FIL	1000	g
Max	Time	Min	Time
7.6	2.4	-2.3	4.9



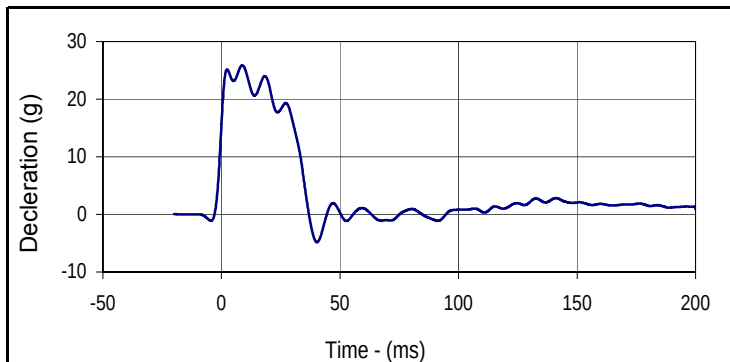
Curve Description			
Head Z			
Plot No.	Type	SAE Class	Units
004	FIL	1000	g
Max	Time	Min	Time
93.0	2.5	-2.0	14.6

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 ATD Serial No.: 360

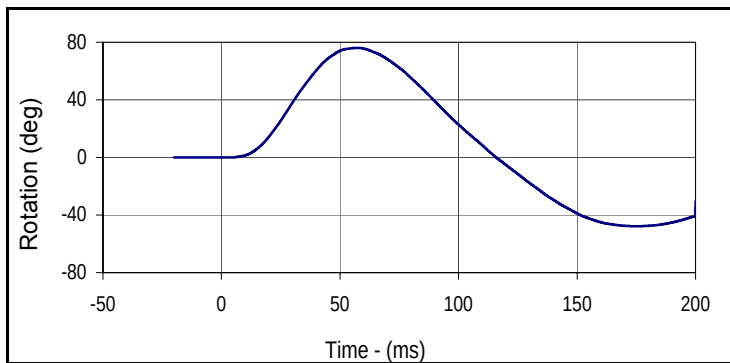
Test Date: 1/13/17
 Test I.D.: M360NF027



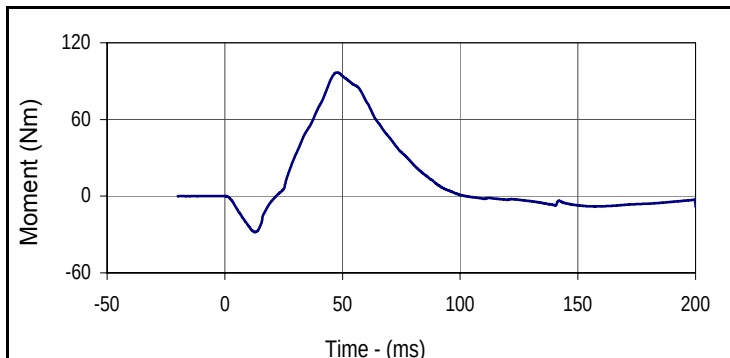
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	467	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.6	Pass
	Min	°C		21.3	Pass
Humidity During Soak	Max	%	10.0 to 70.0	24.9	Pass
	Min	%		24.6	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.5	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	24.6	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.93	Pass
Pendulum Deceleration	10 Msec.	g	22.5 to 27.5	25.2	Pass
	20 Msec.	g	17.6 to 22.6	22.6	Pass
	30 Msec.	g	12.5 to 18.5	16.2	Pass
Peak Pendulum Decel. after 30 Msec.		g	≤ 29.0	16.2	Pass
Deceleration Decay, Time to Cross 5 G's		ms	34.0 to 42.0	35.1	Pass
Maximum "D" Plane Rotation	Max	deg	64.0 to 78.0	76.1	Pass
	Time	ms	57.0 to 64.0	57.2	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		ms	113.0 to 128.0	115.9	Pass
Moment About Occ. Condyle	Max	Nm	88.1 to 108.5	96.8	Pass
	Time	ms	47.0 to 58.0	47.7	Pass
Positive Moment Decay, Time To Zero Crossing		ms	97.0 to 107.0	102.3	Pass
Overall Test Results				Pass	



Curve Description			
Pendulum Deceleration			
Plot No.	Type	SAE Class	Units
001	FIL	60	g
Max	Time	Min	Time
25.9	8.7	-4.8	40.3



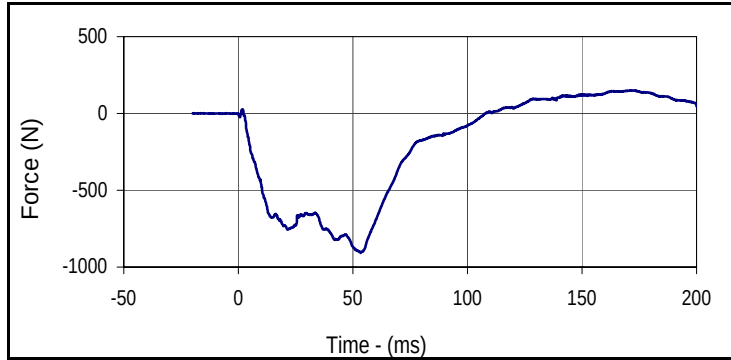
Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	deg
Max	Time	Min	Time
76.1	57.2	-47.8	175.3



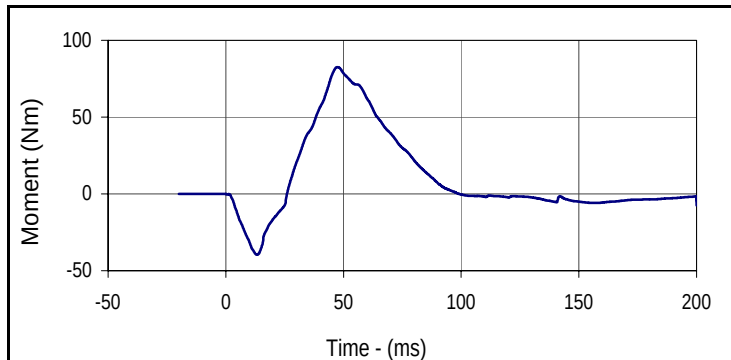
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
96.8	47.7	-28.1	12.8

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 ATD Serial No.: 360

Test Date: 1/13/17
 Test I.D.: M360NF027



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
150.8	172.7	-907.4	53.4



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
82.5	47.3	-39.6	13.1

Test Program: Hybrid III 50th Percentile Male Neck Extension Test

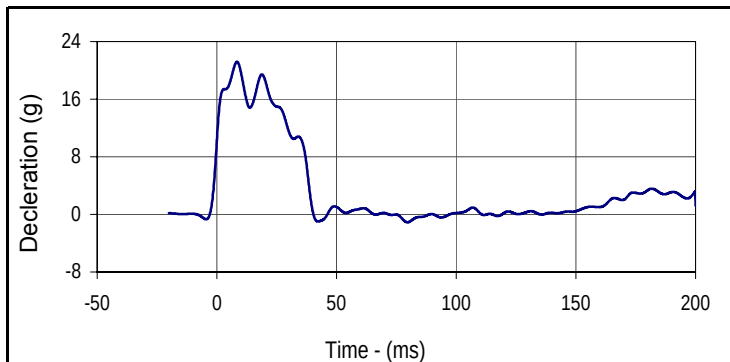
Test Date: 1/13/17

ATD Serial No.: 360

Test I.D.: M360NE027



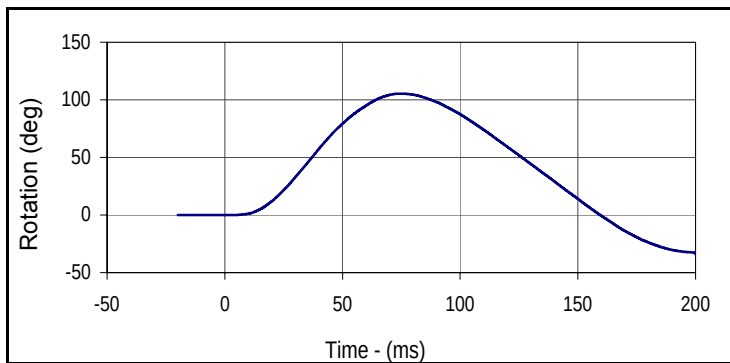
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	512	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.6	Pass
	Min	°C		21.3	Pass
Humidity During Soak	Max	%	10.0 to 70.0	24.9	Pass
	Min	%		24.6	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	24.7	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.03	Pass
Pendulum Deceleration	10 Msec.	g	17.2 to 21.2	19.8	Pass
	20 Msec.	g	14.0 to 19.0	18.8	Pass
	30 Msec.	g	11.0 to 16.0	11.6	Pass
Peak Pendulum Decel. after 30 Msec.		g	≤ 22.0	11.6	Pass
Deceleration Decay, Time to Cross 5 G's		ms	38.0 to 46.0	38.2	Pass
Maximum "D" Plane Rotation	Max	deg	81.0 to 106.0	105.3	Pass
	Time	ms	72.0 to 82.0	74.6	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		ms	147.0 to 174.0	159.5	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to -79.9	-66.1	Pass
	Time	ms	65.0 to 79.0	69.2	Pass
Positive Moment Decay, Time To Zero Crossing		ms	120.0 to 148.0	141.2	Pass
Overall Test Results				Pass	



Curve Description

Pendulum Deceleration

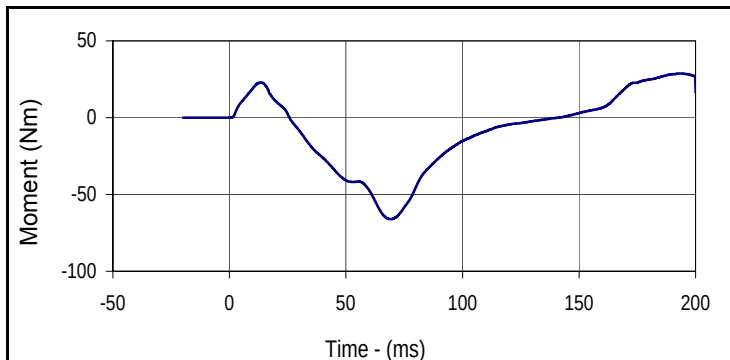
Plot No.	Type	SAE Class	Units
001	FIL	60	g
Max	Time	Min	Time
21.2	8.4	-1.1	79.7



Curve Description

"D" Plane Rotation

Plot No.	Type	SAE Class	Units
002	FIL	60	deg
Max	Time	Min	Time
105.3	74.6	-34.3	200.0



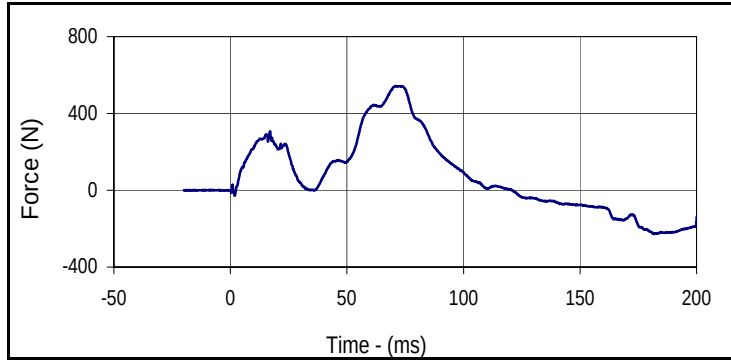
Curve Description

Moment About Occipital Condyle

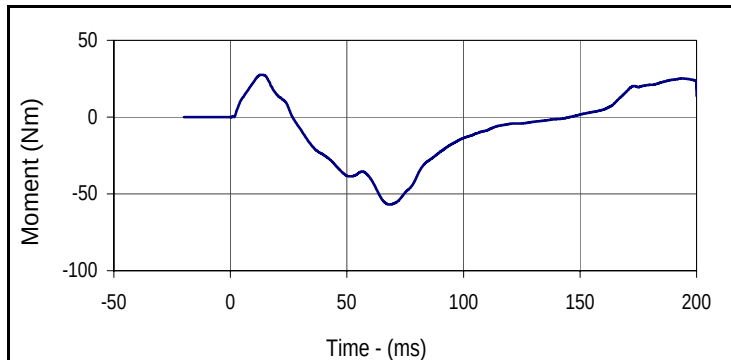
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
28.8	193.2	-66.1	69.2

Test Program: Hybrid III 50th Percentile Male Neck Extension Test
 ATD Serial No.: 360

Test Date: 1/13/17
 Test I.D.: M360NE027



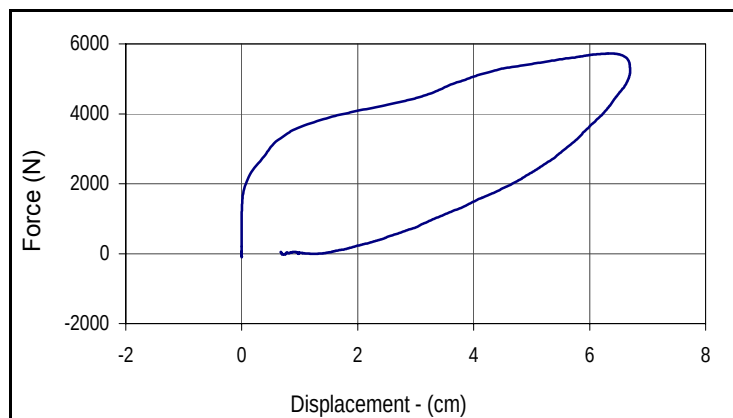
Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
542.6	70.9	-227.5	181.7



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
27.6	13.1	-56.9	68.3

Test Program: Hybrid III 50th Percentile Male Thorax Impact TestTest Date: 1/13/17ATD Serial No.: 360Test I.D.: M360CH027

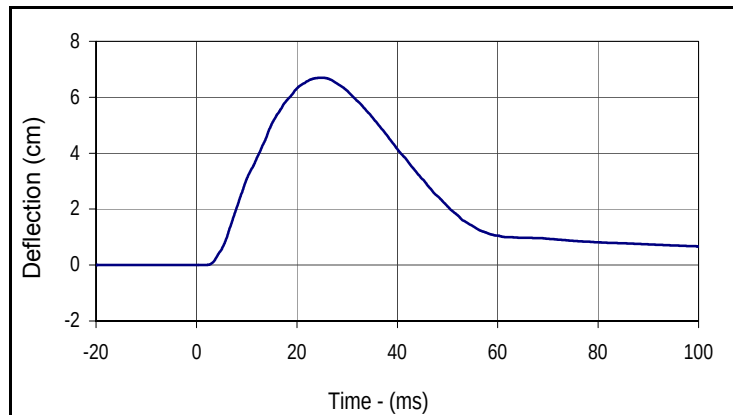
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	587	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.6	Pass
	Min	°C		21.3	Pass
Humidity During Soak	Max	%	10.0 to 70.0	24.9	Pass
	Min	%		24.6	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	24.8	Pass
Probe Velocity		m/s	6.58 to 6.82	6.78	Pass
Peak Probe Force		N	5159 to 5893	5724	Pass
Peak Sternum Deflection		cm	6.35 to 7.26	6.70	Pass
Internal Hysteresis		%	69 to 85	69.1	Pass
Overall Test Results				Pass	



Curve Description

Probe Force vs. Chest Deflection

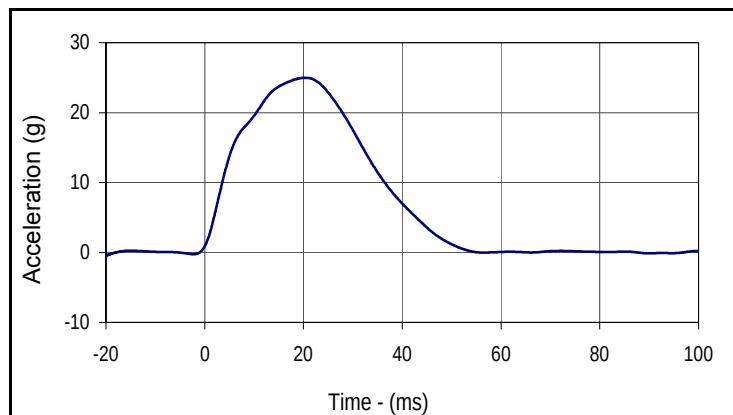
Plot No.	Type	SAE Class	Hysteresis
001	FIL	600	69.1
Peak Probe Force		Peak Chest Deflection	
5724		6.70	



Curve Description

Chest Deflection

Plot No.	Type	SAE Class	Units
002	FIL	600	cm
Max	Time	Min	Time
6.7	25.1	0.0	-15.9



Curve Description

Impactor Acceleration

Plot No.	Type	SAE Class	Units
003	FIL	600	g
Max	Time	Min	Time
25.0	20.3	-0.5	-20.0

Test Program: Hybrid III 50th Percentile Male Knee Impact Test
 ATD Serial No.: 360

Test Date: 1/13/17
 Test I.D.: M360LK027, M360RK027

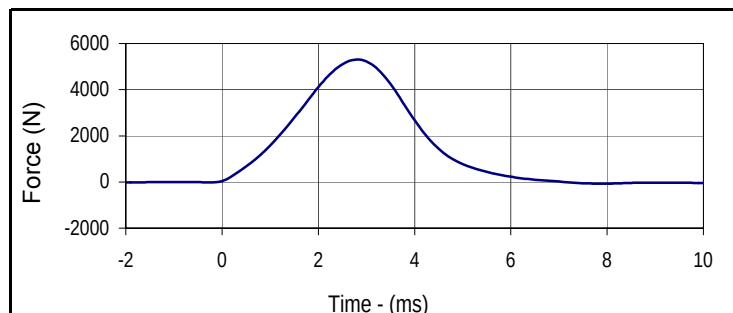


Left Knee

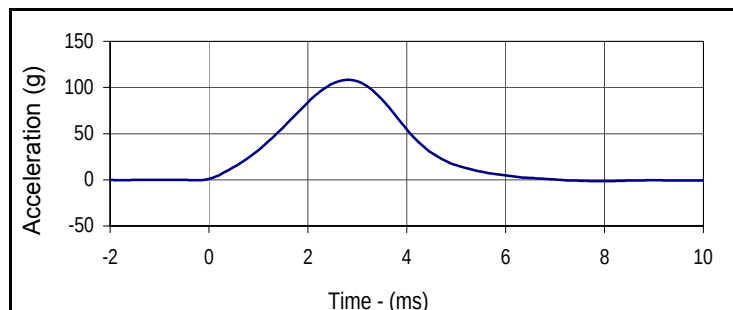
Tested Parameter		Units	Specification	Result	Pass/Fail
Knee Assembly Soak Time		Minutes	≥240	642	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.6	Pass
	Min	°C		21.3	Pass
Humidity During Soak	Max	%	10.0 to 70.0	24.9	Pass
	Min	%		24.6	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	24.9	Pass
Pendulum Velocity at T=0		m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force		N	4715 to 5782	5306	Pass
Overall Test Results					Pass

Right Knee

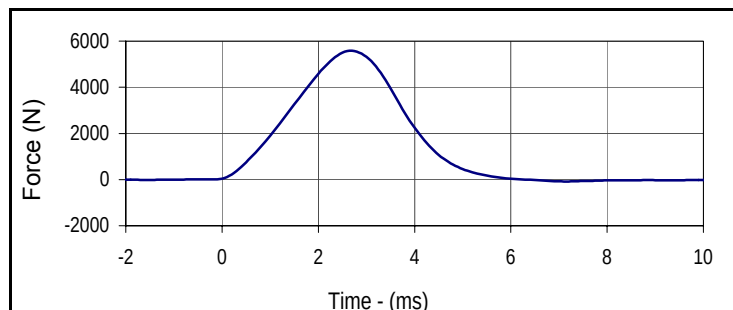
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5582	Pass
Overall Test Results				Pass



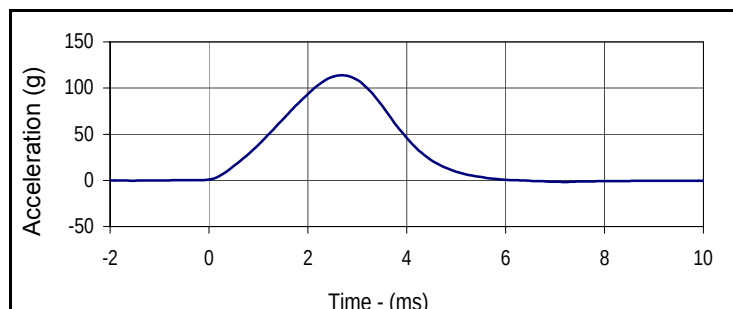
Curve Description			
Left Knee Probe Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	N
Max	Time	Min	Time
5305.9	2.8	-78.9	7.9



Curve Description			
Left Knee Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	600	g
Max	Time	Min	Time
108.4	2.8	-1.6	7.9



Curve Description			
Right Knee Probe Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	N
Max	Time	Min	Time
5581.6	2.7	-81.9	7.2



Curve Description			
Right Knee Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	600	g
Max	Time	Min	Time
114.1	2.7	-1.7	7.2

Test Program: Hybrid III 50th Percentile Male Hip Joint-Femur Flexion Test
 ATD Serial No.: 360

Test Date: 1/13/17
 Test I.D.: M360LF027, M360RF027

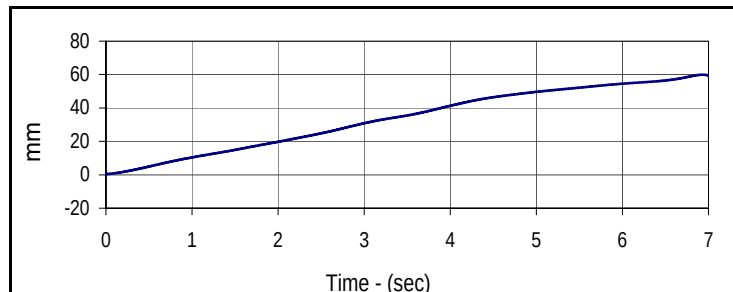


Left Hip Joint-Femur Results

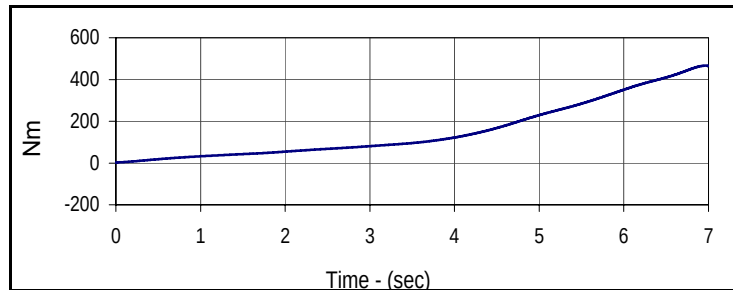
Tested Parameter	Units	Specification	Result	Pass/Fail
Hip Joint-Femur Assembly Soak Time	Minutes	≥240	717	Pass
Temperature During Soak	Max	18.9 to 25.6	21.6	Pass
	Min		21.3	Pass
Humidity During Soak	Max	10.0 to 70.0	24.9	Pass
	Min		24.6	Pass
Laboratory Temperature During Test	°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test	%	10.0 to 70.0	24.9	Pass
Rotation Rate	deg/sec	5 to 10	8.6	Pass
Femur Torque at 30°	Nm	≤ 95	76.6	Pass
Rotation at 203 Nm	Degrees	40.0 to 50.0	47.9	Pass
Overall Test Results			Pass	

Right Hip Joint-Femur Results

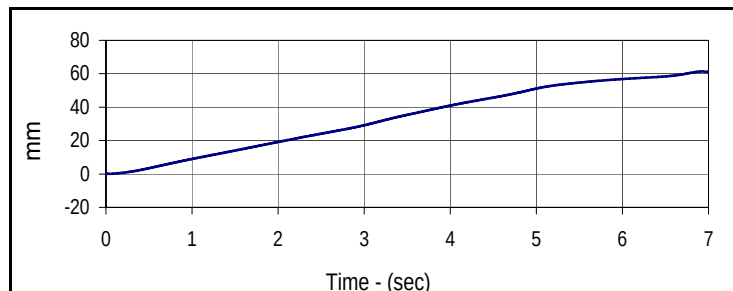
Rotation Rate	deg/sec	5 to 10	8.9	Pass
Femur Torque at 30°	Nm	≤ 95	87.2	Pass
Rotation at 203 Nm	Degrees	40.0 to 50.0	45.7	Pass
Overall Test Results			Pass	



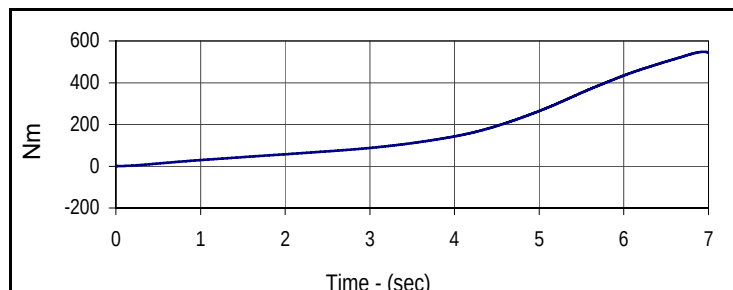
Curve Description			
Left Hip-Femur Rotation			
Plot No.	Type	SAE Class	Units
001	FIL	60	mm
Max	Time	Min	Time
59.9	6.9	0.4	0.0



Curve Description			
Left Femur Torque			
Plot No.	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
466.2	7.0	0.4	0.0



Curve Description			
Right Hip-Femur Rotation			
Plot No.	Type	SAE Class	Units
003	FIL	60	mm
Max	Time	Min	Time
61.4	6.9	0.4	0.0



Curve Description			
Right Femur Torque			
Plot No.	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
547.8	6.9	0.4	0.0

Test Program: Hybrid III 5th Percentile Female Dummy Damage Checklist

Test Date: 1/10/17

ATD Serial No.: 141

Test I.D.: N/A



Dummy Item	Inspect for	Comments	Damaged	OK
Entire Dummy	Perform general cleaning			X
Outer Skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer Leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

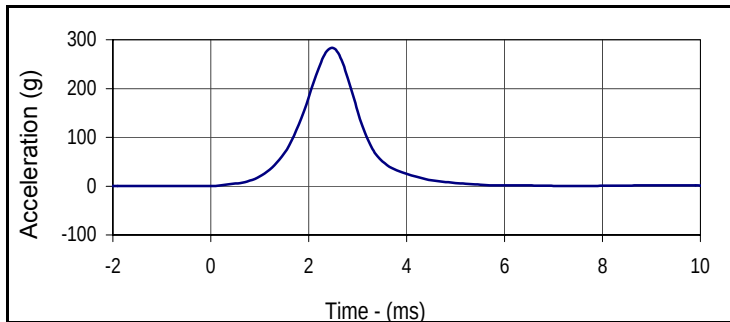
Describe the repair on or replacement of parts:

Test Program: Hybrid III 5th Percentile Female External MeasurementsTest Date: 1/10/17ATD Serial No.: 141Test I.D.: N/A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	20.91	Pass
Laboratory Relative Humidity	%	10 to 70	28.1	Pass
A - Total sitting height	mm	774.7 to 800.1	786	Pass
B - Shoulder pivot height	mm	431.8 to 457.2	450	Pass
C - H point height	mm	81.3 to 86.3	85	Pass
D - H point location from backline	mm	144.8 to 149.8	146	Pass
E - Shoulder pivot from backline	mm	68.6 to 83.8	77	Pass
F - Thigh clearance	mm	119.4 to 134.6	126	Pass
G - Back of elbow to wrist pivot	mm	243.9 to 259.1	250	Pass
H - Head back to backline	mm	40.7 to 45.7	44	Pass
I - Shoulder to elbow length	mm	276.8 to 297.2	285	Pass
J - Elbow rest height	mm	182.8 to 203.2	198	Pass
K - Buttock to knee length	mm	520.7 to 546.1	531	Pass
L - Popliteal length	mm	355.6 to 376.0	371	Pass
M - Knee pivot height	mm	393.7 to 419.1	402	Pass
N - Buttock popliteal length	mm	414.0 to 439.4	420	Pass
O - Chest depth without jacket	mm	175.3 to 190.5	186	Pass
P - Foot length	mm	218.5 to 233.7	221	Pass
R - Buttock to Knee Pivot Length	mm	457.2 to 482.6	473	Pass
S - Head Breadth	mm	137.1 to 147.3	144	Pass
T - Head Depth	mm	177.8 to 188.0	180	Pass
U - Hip Breadth	mm	299.7 to 314.9	302	Pass
V - Shoulder breadth	mm	350.5 to 365.7	359	Pass
W - Foot breadth	mm	78.8 to 94.0	90	Pass
X - Head circumference	mm	528.3 to 548.7	541	Pass
Y - Chest circumference (with chest jacket)	mm	850.8 to 881.3	864	Pass
Z - Waist circumference	mm	759.5 to 789.9	766	Pass
AA - Location for chest circumference	mm	299.7 to 309.9	300	Pass
BB - Location for waist circumference	mm	160.1 to 170.2	164	Pass
Overall Test Results				Pass

Test Program: Hybrid III 5th Percentile Female Head Drop TestTest Date: 1/10/17ATD Serial No.: 141Test I.D.: F141HD080

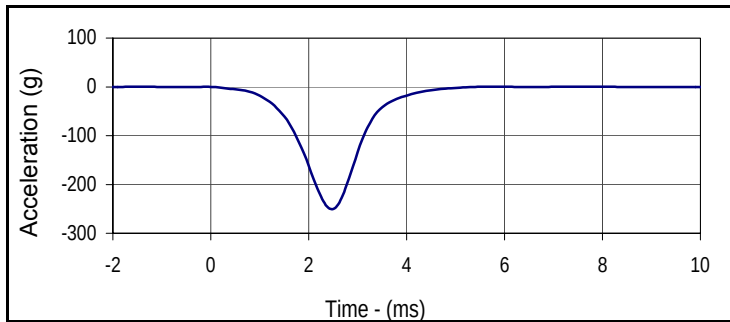
Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	339	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.0	Pass
	Min	°C		20.9	Pass
Humidity During Soak	Max	%	10.0 to 70.0	28.2	Pass
	Min	%		28.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	20.9	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	28.1	Pass
Peak Resultant Acceleration		g	250.0 to 300.0	283.0	Pass
Peak Lateral Acceleration		g	≤15.0	5.6	Pass
Oscillations After Main Pulse		%	<10% of peak Res. Acceleration	4.6	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Overall Test Results				Pass	



Curve Description

Head Resultant

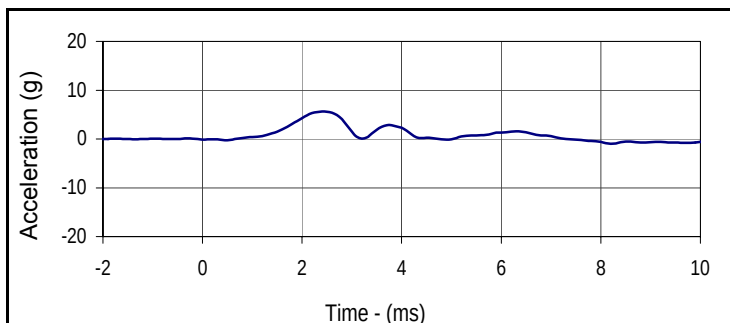
Plot No.	Type	SAE Class	Units
001	RES	1000	g
Max	Time	Min	Time
283.0	2.5	0.2	55.8



Curve Description

Head X

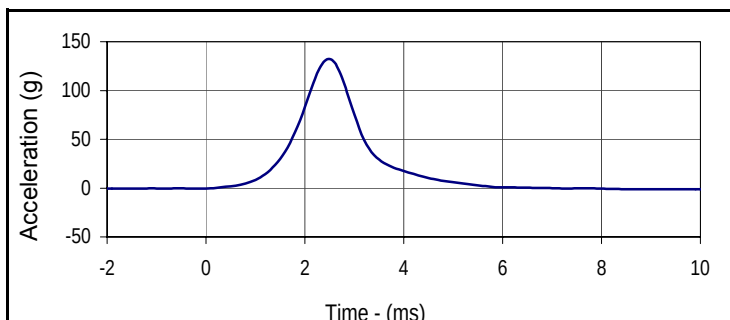
Plot No.	Type	SAE Class	Units
002	FIL	1000	g
Max	Time	Min	Time
0.4	5.8	-250.0	2.5



Curve Description

Head Y

Plot No.	Type	SAE Class	Units
003	FIL	1000	g
Max	Time	Min	Time
5.6	2.4	-1.0	8.2



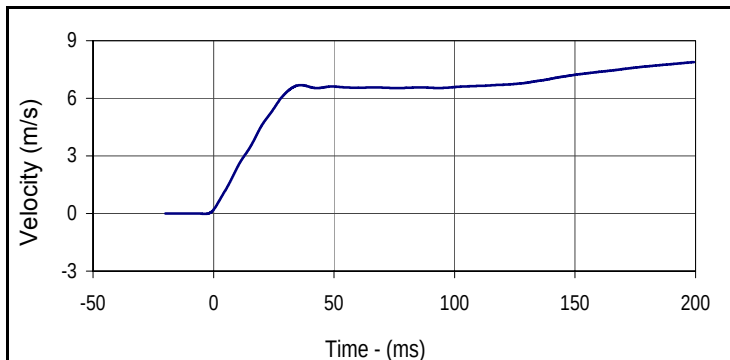
Curve Description

Head Z

Plot No.	Type	SAE Class	Units
004	FIL	1000	g
Max	Time	Min	Time
132.4	2.5	-1.2	8.7

Test Program: Hybrid III 5th Percentile Female Neck Flexion TestTest Date: 1/10/17ATD Serial No.: 141Test I.D.: F141NF080

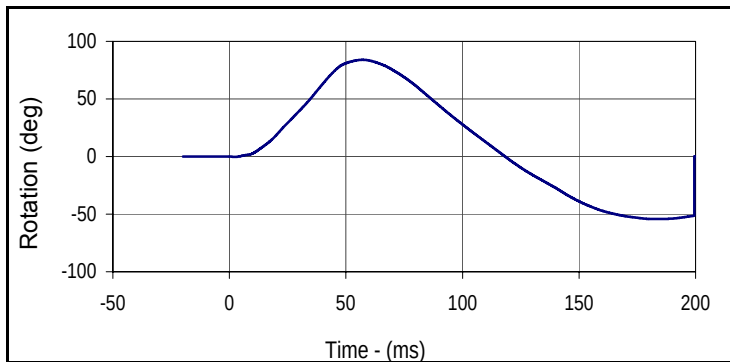
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	404	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.0	Pass
	Min	°C		20.9	Pass
Humidity During Soak	Max	%	10.0 to 70.0	28.2	Pass
	Min	%		28.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	20.9	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	28.2	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.00	Pass
Pendulum Deceleration	10 Msec.	m/s	2.1 to 2.5	2.4	Pass
	20 Msec.	m/s	4.0 to 5.0	4.6	Pass
	30 Msec.	m/s	5.8 to 7.0	6.3	Pass
"D" Plane Rotation	Max	deg	77.0 to 91.0	84.0	Pass
Peak Moment in Rotation	Max	Nm	69.0 to 83.0	75.0	Pass
Positive Moment Decay, Time To 10 Nm		ms	80.0 to 100.0	82.1	Pass
Overall Test Results				Pass	



Curve Description

Pendulum Velocity

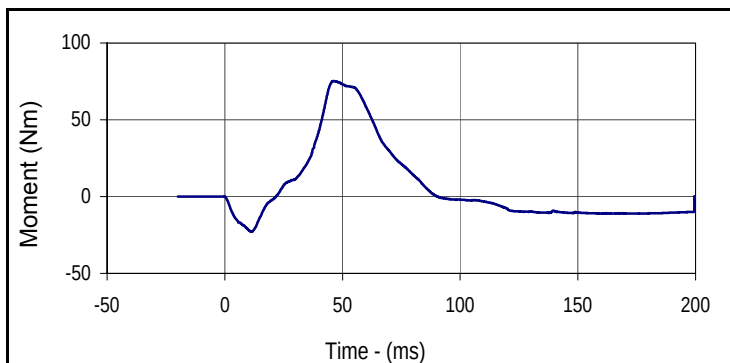
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
7.9	199.9	0.0	-2.9



Curve Description

"D" Plane Rotation

Plot No.	Type	SAE Class	Units
002	FIL	60	deg
Max	Time	Min	Time
84.0	57.2	-54.3	183.9



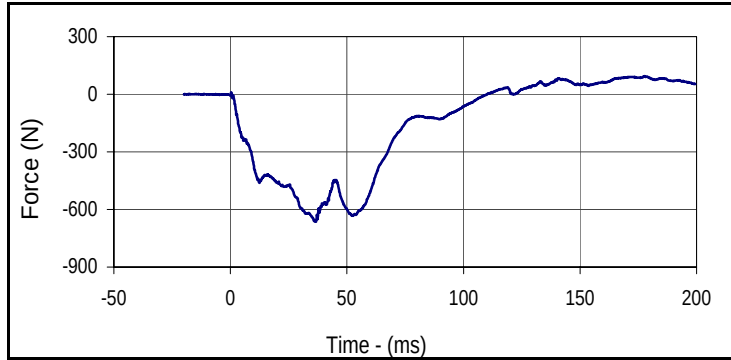
Curve Description

Moment About Occipital Condyle

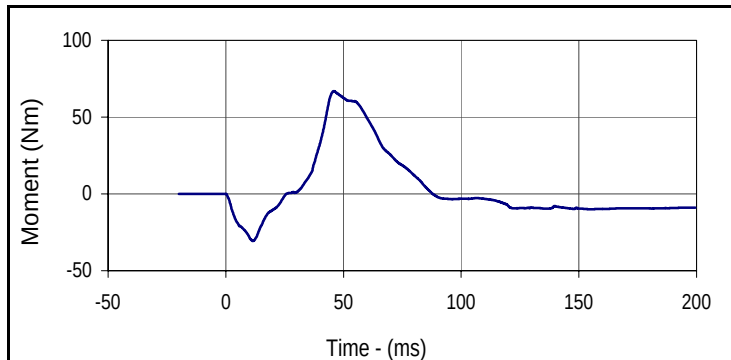
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
75.2	46.6	-22.9	11.3

Test Program: Hybrid III 5th Percentile Female Neck Flexion Test
 ATD Serial No.: 141

Test Date: 1/10/17
 Test I.D.: F141NF080



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
94.3	178.3	-663.8	36.7



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
67.0	46.3	-30.6	11.9

Test Program: Hybrid III 5th Percentile Female Neck Extension Test

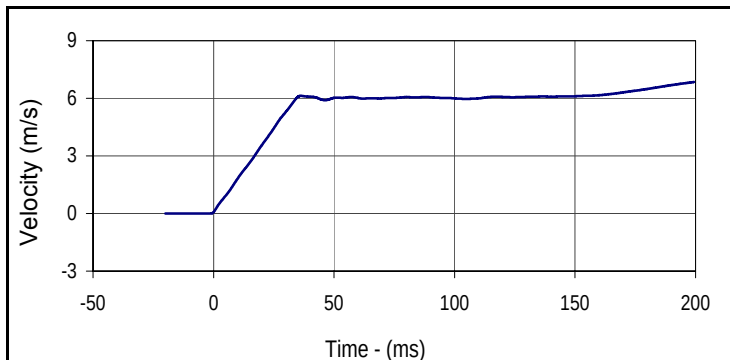
Test Date: 1/10/17

ATD Serial No.: 141

Test I.D.: F141NE080



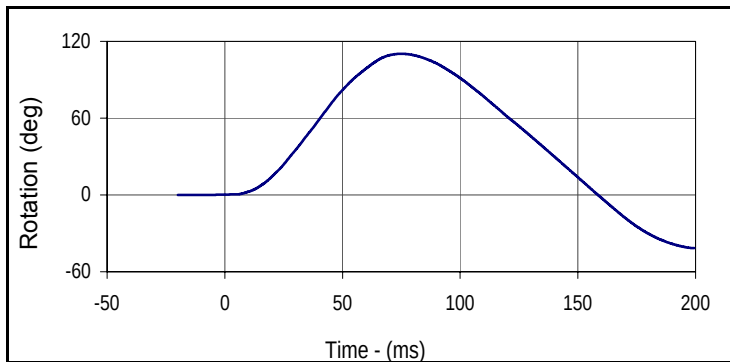
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	449	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.0	Pass
	Min	°C		20.9	Pass
Humidity During Soak	Max	%	10.0 to 70.0	28.2	Pass
	Min	%		28.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	20.9	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	28.2	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.02	Pass
Pendulum Deceleration	10 Msec.	m/s	1.5 to 1.9	1.8	Pass
	20 Msec.	m/s	3.1 to 3.9	3.6	Pass
	30 Msec.	m/s	4.6 to 5.6	5.3	Pass
"D" Plane Rotation	Max	deg	99.0 to 114.0	110.3	Pass
Peak Moment in Rotation	Max	Nm	-53.0 to -65.0	-58.6	Pass
Positive Moment Decay, Time To -10 Nm		ms	94.0 to 114.0	106.3	Pass
Overall Test Results				Pass	



Curve Description

Pendulum Velocity

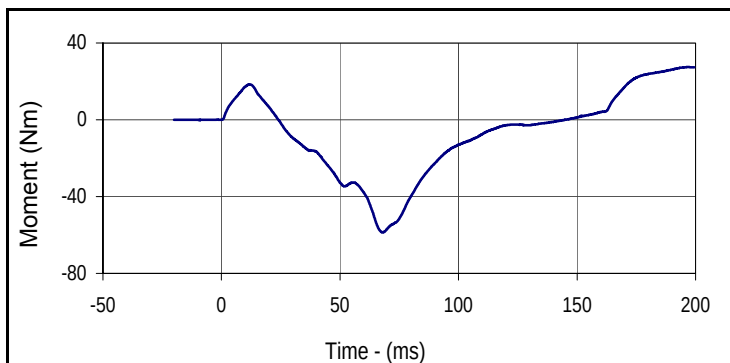
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
6.8	199.4	0.0	-1.4



Curve Description

"D" Plane Rotation

Plot No.	Type	SAE Class	Units
002	FIL	60	deg
Max	Time	Min	Time
110.3	74.9	-41.6	199.4



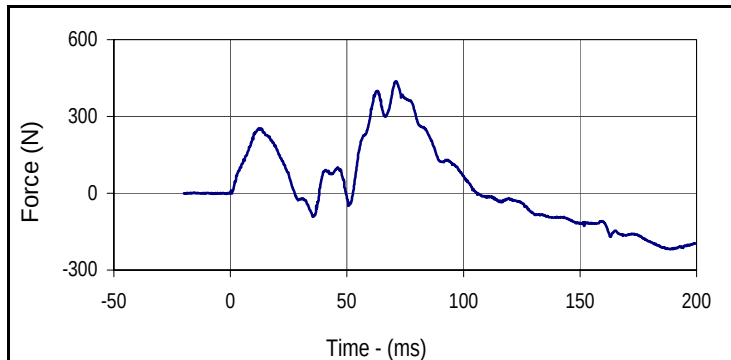
Curve Description

Moment About Occipital Condyle

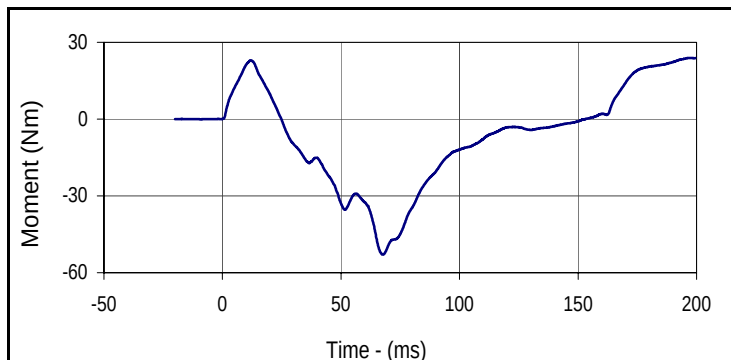
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
27.5	197.0	-58.6	68.0

Test Program: Hybrid III 5th Percentile Female Neck Extension Test
 ATD Serial No.: 141

Test Date: 1/10/17
 Test I.D.: F141NE080



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
436.9	71.1	-219.3	188.9



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
23.9	197.0	-52.9	67.6

Test Program: Hybrid III 5th Percentile Female Thorax Impact Test

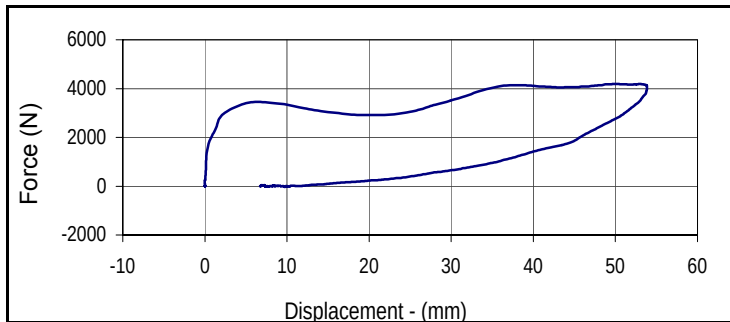
Test Date: 1/10/17

ATD Serial No.: 141

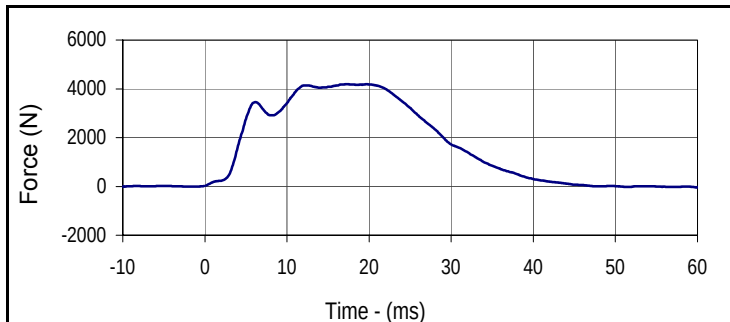
Test I.D.: F141CH080



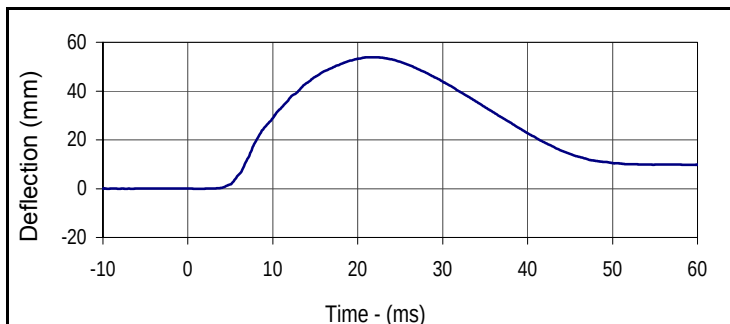
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	524	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.0	Pass
	Min	°C		20.9	Pass
Humidity During Soak	Max	%	10.0 to 70.0	28.2	Pass
	Min	%		28.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	20.9	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	28.1	Pass
Probe Velocity		m/s	6.59 to 6.83	6.60	Pass
Peak Chest Deflection		mm	50.0 to 58.0	53.9	Pass
Peak Force Between 50 and 58 MM		N	3900 to 4400	4190	Pass
Peak Force Between 18 and 50 MM		N	≤4600	4190	Pass
Internal Hysteresis		%	69 to 85	75.0	Pass
Overall Test Results					Pass



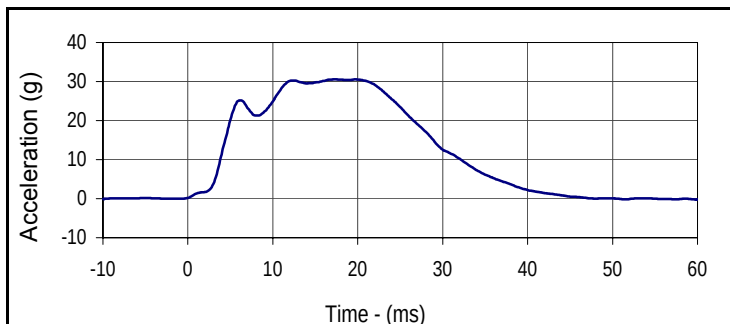
Curve Description			
Probe Force vs. Chest Deflection			
Plot No.	Type	SAE Class	Hysteresis
001	FIL	180	75.0
Peak Probe Force		Peak Chest Deflection	
4190.2		53.9	



Curve Description			
Probe Force			
Plot No.	Type	SAE Class	Units
002	FIL	180	N
Max	Time	Min	Time
4190.2	17.3	-29.4	59.8



Curve Description			
Chest Deflection			
Plot No.	Type	SAE Class	Units
003	FIL	600	mm
Max	Time	Min	Time
53.9	21.4	0.0	1.0



Curve Description			
Impactor Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	180	g
Max	Time	Min	Time
30.6	17.3	-0.2	59.8

Test Program: Hybrid III 5th Percentile Female Knee Impact Test

Test Date: 1/10/17

ATD Serial No.: 141

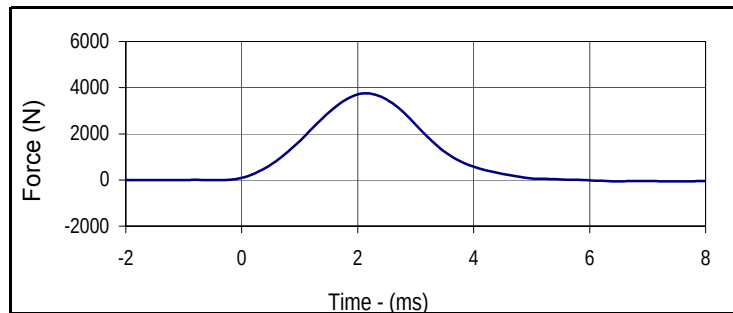
Test I.D.: F141LK080, F141RK080

**Left Knee**

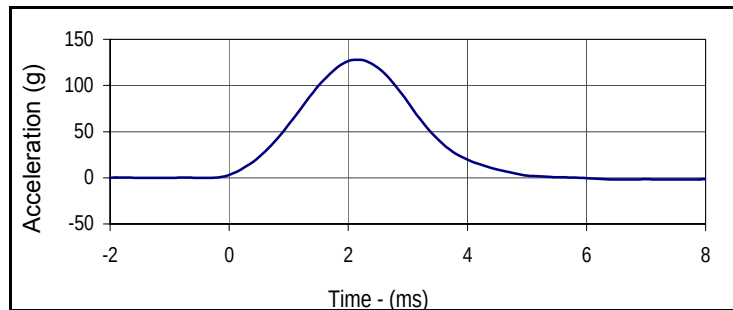
Tested Parameter		Units	Specification	Result	Pass/Fail
Knee Assembly Soak Time		Minutes	≥240	579	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.0	Pass
	Min	°C		20.9	Pass
Humidity During Soak	Max	%	10.0 to 70.0	28.2	Pass
	Min	%		28.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	20.9	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	28.1	Pass
Pendulum Velocity at T=0		m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force		N	3450 to 4060	3749	Pass
Overall Test Results					Pass

Right Knee

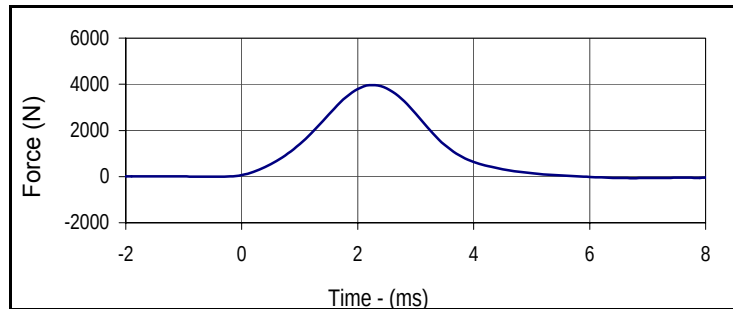
Pendulum Velocity at T=0		m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force		N	3450 to 4060	3964	Pass
Overall Test Results					Pass

**Curve Description****Left Knee Probe Force**

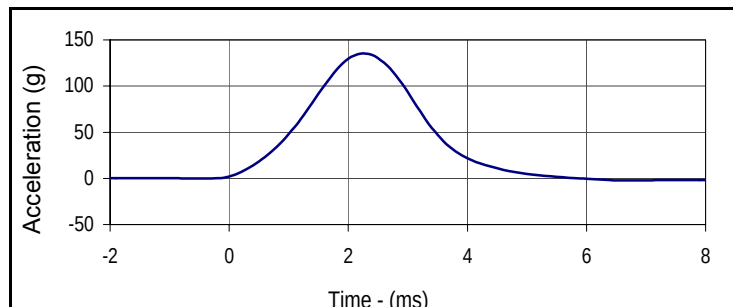
Plot No.	Type	SAE Class	Units
001	FIL	600	N
Max	Time	Min	Time
3749.3	2.1	-4802.9	39.6

**Curve Description****Left Knee Acceleration**

Plot No.	Type	SAE Class	Units
002	FIL	600	g
Max	Time	Min	Time
127.9	2.1	-163.9	39.6

**Curve Description****Right Knee Probe Force**

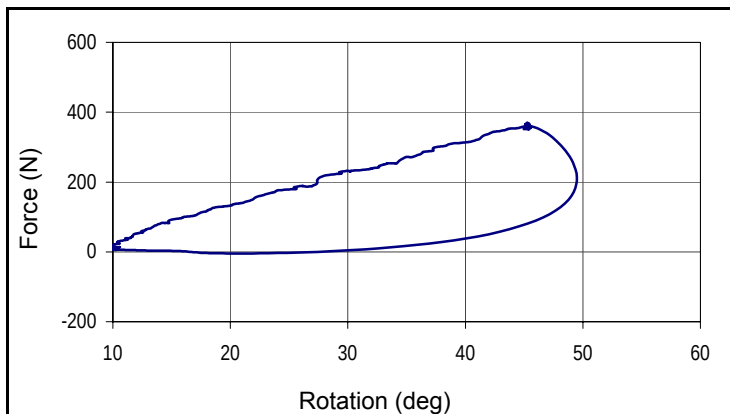
Plot No.	Type	SAE Class	Units
003	FIL	600	N
Max	Time	Min	Time
3963.8	2.3	-66.1	6.7

**Curve Description****Right Knee Acceleration**

Plot No.	Type	SAE Class	Units
004	FIL	600	g
Max	Time	Min	Time
135.2	2.3	-2.3	6.7

Test Program: Hybrid III 5th Percentile Female Torso Flexion TestTest Date: 1/10/17ATD Serial No.: 141Test I.D.: TF080

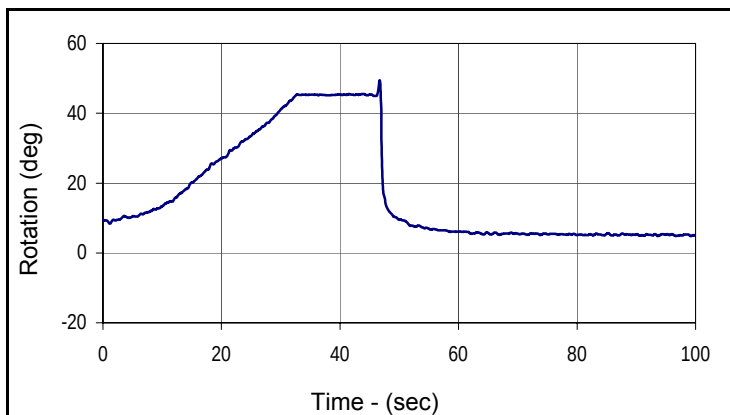
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	654	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.0	Pass
	Min	°C		20.9	Pass
Humidity During Soak	Max	%	10.0 to 70.0	28.2	Pass
	Min	%		28.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.0	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	28.0	Pass
Initial Reference Plane Angle		deg	≤ 20	9.4	Pass
Peak Force at 45° +/-0.5°		N	320.0 to 390.0	369.9	Pass
Torso Rotation Rate		deg/s	0.5 to 1.5	1.1	Pass
Final Reference Plane Angle		deg	+/-8	5.1	Pass
Overall Test Results				Pass	



Curve Description

Force vs Torso Rotation

Plot No.	Type	Filter Freq
001	FIL	1 Hz
Peak Force		Peak Rotation
369.9		49.5



Curve Description

Torso Rotation

Plot No.	Type	Filter Freq	Units
002	FIL	1 Hz	deg
Max	Time	Min	Time
49.5	46.7	4.8	99.2

APPENDIX C
POST-TEST / ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA

Test Program: Hybrid III 50th Percentile Male Dummy Damage Checklist
 ATD Serial No.: 360

Test Date: 1/17/17
 Test I.D.: N/A



Dummy Item	Inspect for	Comments	Damaged	OK
Entire Dummy	Perform general cleaning			X
Outer Skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer Leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

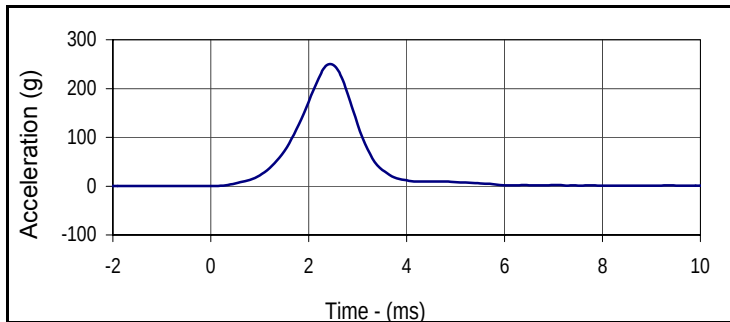
Describe the repair on or replacement of parts:

Test Program: Hybrid III 50th Percentile Male External MeasurementsTest Date: 1/17/17ATD Serial No.: 360Test I.D.: N/A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	29.5	Pass
A - Total sitting height	mm	879 to 889	886	Pass
B - Shoulder pivot height	mm	505 to 521	510	Pass
C - H point height	mm	84 to 89	86	Pass
D - H point location from backline	mm	135 to 140	139	Pass
E - Shoulder pivot from backline	mm	84 to 94	91	Pass
F - Thigh clearance	mm	140 to 155	147	Pass
G - Back of elbow to wrist pivot	mm	290 to 305	298	Pass
H - Head back to backline	mm	41 to 46	44	Pass
I - Shoulder to elbow length	mm	330 to 345	337	Pass
J - Elbow rest height	mm	190 to 211	205	Pass
K - Buttock to knee length	mm	579 to 604	587	Pass
L - Popliteal length	mm	429 to 455	437	Pass
M - Knee pivot height	mm	485 to 500	495	Pass
N - Buttock popliteal length	mm	452 to 477	473	Pass
O - Chest depth without jacket	mm	213 to 229	227	Pass
P - Foot length	mm	251 to 267	263	Pass
V - Shoulder breadth	mm	422 to 437	436	Pass
W - Foot breadth	mm	91 to 107	99	Pass
Y - Chest circumference (with chest jacket)	mm	970 to 1001	982	Pass
Z - Waist circumference	mm	836 to 866	865	Pass
AA - Location for chest circumference	mm	429 to 434	431	Pass
BB - Location for waist circumference	mm	226 to 231	231	Pass
Overall Test Results			Pass	

Test Program: Hybrid III 50th Percentile Male Head Drop TestTest Date: 1/17/17ATD Serial No.: 360Test I.D.: M360HD028

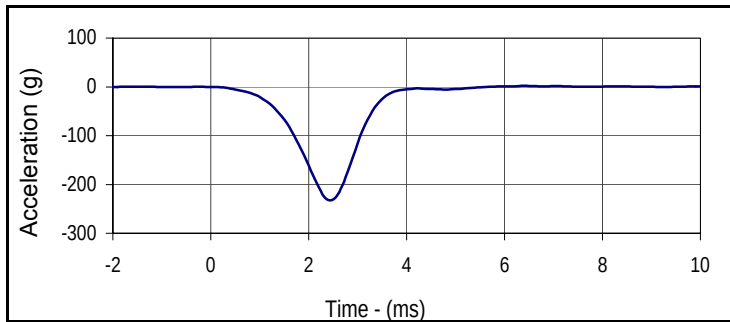
Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	399	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.2	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.4	Pass
	Min	%		44.8	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.1	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.0	Pass
Peak Resultant Acceleration		g	225.0 to 275.0	249.7	Pass
Peak Lateral Acceleration		g	≤15.0	3.7	Pass
Oscillations After Main Pulse		%	<10% of peak Res. Acceleration	5.0	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Overall Test Results				Pass	



Curve Description

Head Resultant

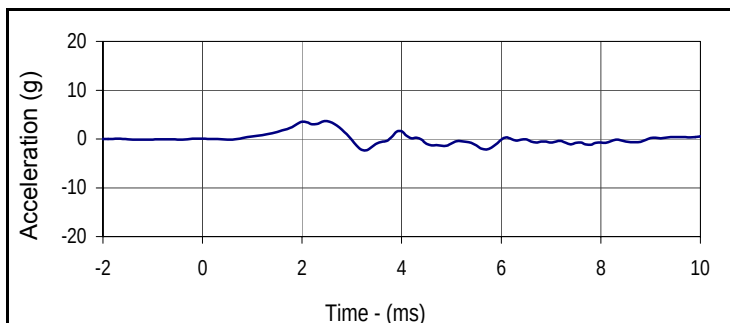
Plot No.	Type	SAE Class	Units
001	RES	1000	g
Max	Time	Min	Time
249.7	2.4	0.1	-0.2



Curve Description

Head X

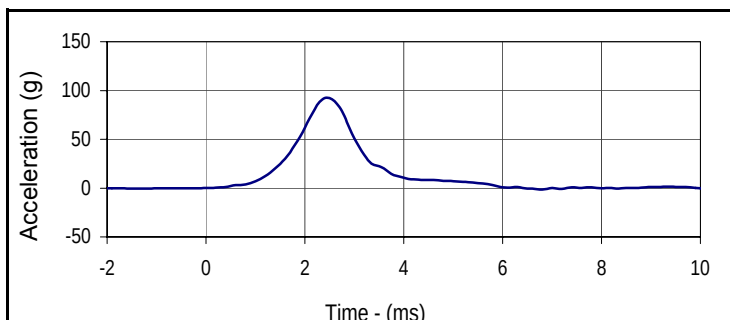
Plot No.	Type	SAE Class	Units
002	FIL	1000	g
Max	Time	Min	Time
2.0	6.4	-232.1	2.4



Curve Description

Head Y

Plot No.	Type	SAE Class	Units
003	FIL	1000	g
Max	Time	Min	Time
3.7	2.5	-2.3	3.3



Curve Description

Head Z

Plot No.	Type	SAE Class	Units
004	FIL	1000	g
Max	Time	Min	Time
92.3	2.5	-1.9	15.1

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test

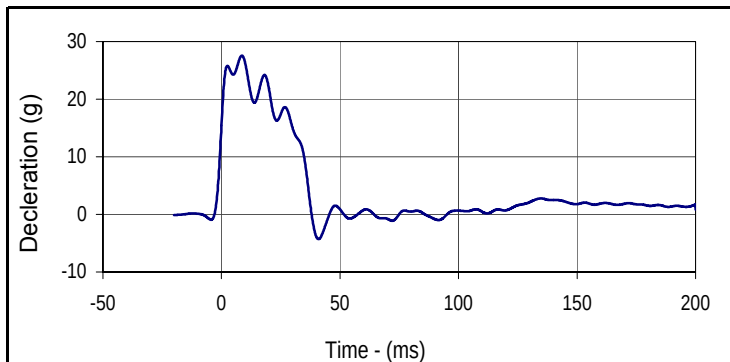
Test Date: 1/17/17

ATD Serial No.: 360

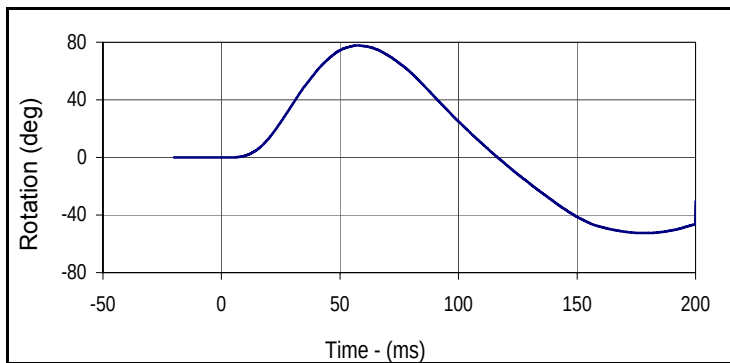
Test I.D.: M360NF028



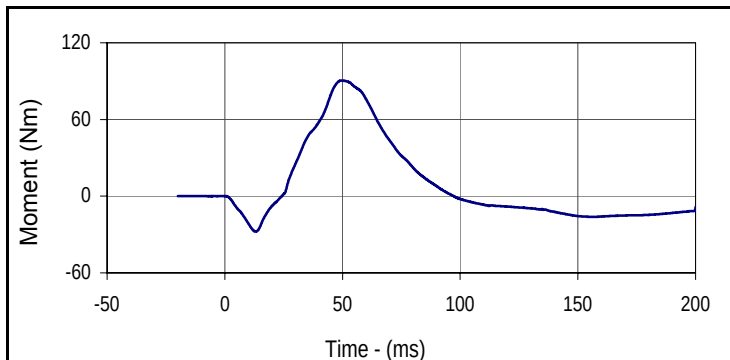
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	464	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.2	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.4	Pass
	Min	%		44.8	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.2	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.90	Pass
Pendulum Deceleration	10 Msec.	g	22.5 to 27.5	26.3	Pass
	20 Msec.	g	17.6 to 22.6	21.9	Pass
	30 Msec.	g	12.5 to 18.5	15.0	Pass
Peak Pendulum Decel. after 30 Msec.		g	≤ 29.0	15.0	Pass
Deceleration Decay, Time to Cross 5 G's		ms	34.0 to 42.0	36.5	Pass
Maximum "D" Plane Rotation	Max	deg	64.0 to 78.0	77.8	Pass
	Time	ms	57.0 to 64.0	57.3	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		ms	113.0 to 128.0	116.5	Pass
Moment About Occ. Condyle	Max	Nm	88.1 to 108.5	90.5	Pass
	Time	ms	47.0 to 58.0	49.5	Pass
Positive Moment Decay, Time To Zero Crossing		ms	97.0 to 107.0	97.3	Pass
Overall Test Results				Pass	



Curve Description			
Pendulum Deceleration			
Plot No.	Type	SAE Class	Units
001	FIL	60	g
Max	Time	Min	Time
27.6	8.6	-4.3	40.9



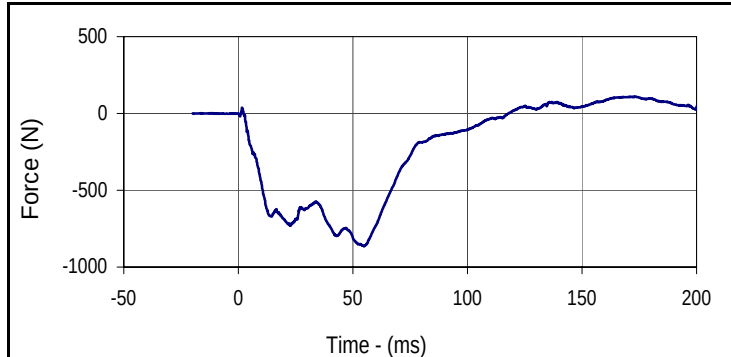
Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	deg
Max	Time	Min	Time
77.8	57.3	-52.5	178.1



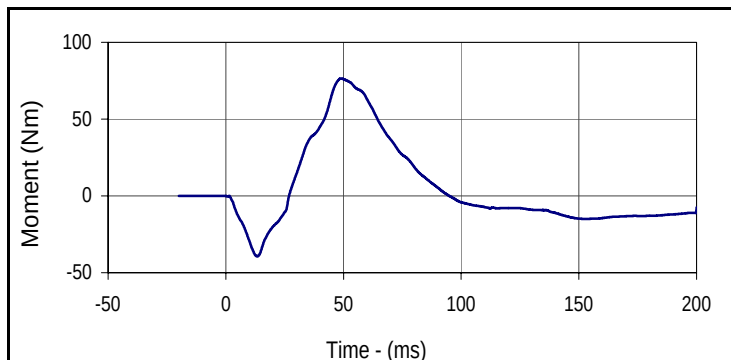
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
90.5	49.5	-27.6	13.3

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 ATD Serial No.: 360

Test Date: 1/17/17
 Test I.D.: M360NF028



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
109.9	173.4	-864.1	54.8



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
76.6	49.2	-39.4	13.3

Test Program: Hybrid III 50th Percentile Male Neck Extension Test

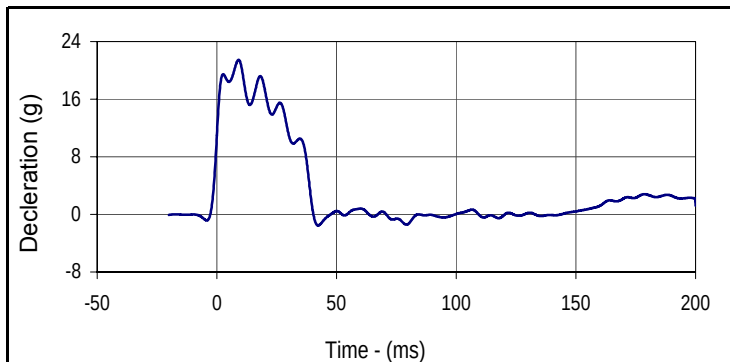
Test Date: 1/17/17

ATD Serial No.: 360

Test I.D.: M360NE028



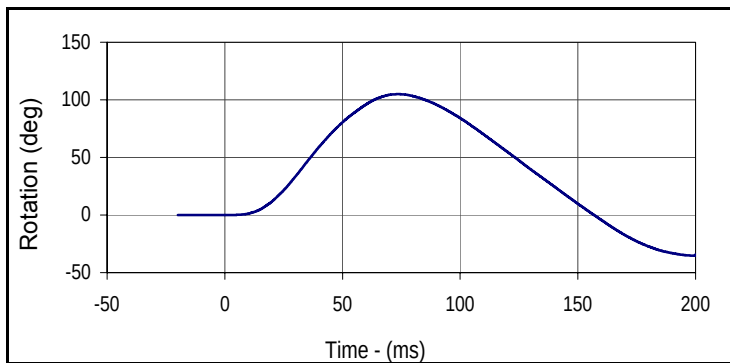
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	509	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.2	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.4	Pass
	Min	%		44.8	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.4	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.11	Pass
Pendulum Deceleration	10 Msec.	g	17.2 to 21.2	20.8	Pass
	20 Msec.	g	14.0 to 19.0	17.4	Pass
	30 Msec.	g	11.0 to 16.0	11.1	Pass
Peak Pendulum Decel. after 30 Msec.		g	≤ 22.0	11.1	Pass
Deceleration Decay, Time to Cross 5 G's		ms	38.0 to 46.0	38.4	Pass
Maximum "D" Plane Rotation	Max	deg	81.0 to 106.0	104.9	Pass
	Time	ms	72.0 to 82.0	73.7	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		ms	147.0 to 174.0	156.9	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to -79.9	-66.3	Pass
	Time	ms	65.0 to 79.0	67.7	Pass
Positive Moment Decay, Time To Zero Crossing		ms	120.0 to 148.0	138.5	Pass
Overall Test Results				Pass	



Curve Description

Pendulum Deceleration

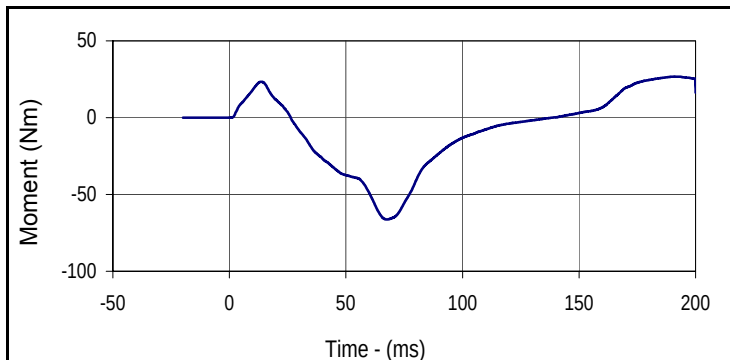
Plot No.	Type	SAE Class	Units
001	FIL	60	g
Max	Time	Min	Time
21.5	9.1	-1.5	42.3



Curve Description

"D" Plane Rotation

Plot No.	Type	SAE Class	Units
002	FIL	60	deg
Max	Time	Min	Time
104.9	73.7	-35.2	199.9



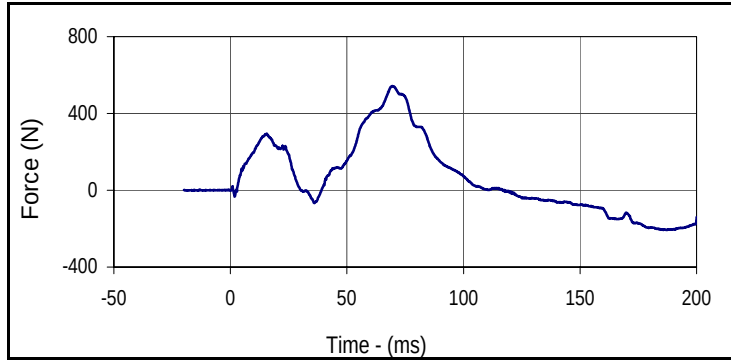
Curve Description

Moment About Occipital Condyle

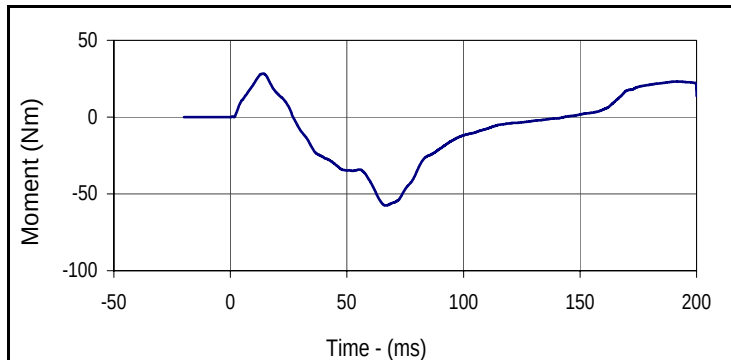
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
26.8	190.9	-66.3	67.7

Test Program: Hybrid III 50th Percentile Male Neck Extension Test
 ATD Serial No.: 360

Test Date: 1/17/17
 Test I.D.: M360NE028



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
543.2	69.5	-206.9	185.7



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
28.3	14.0	-57.5	66.9

Test Program: Hybrid III 50th Percentile Male Thorax Impact Test

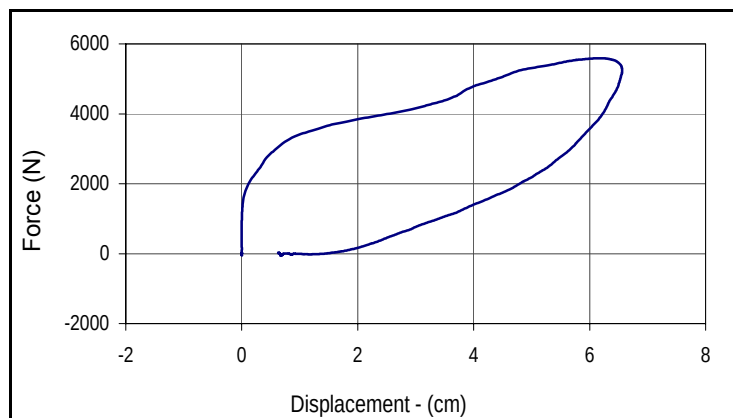
Test Date: 1/17/17

ATD Serial No.: 360

Test I.D.: M360CH028



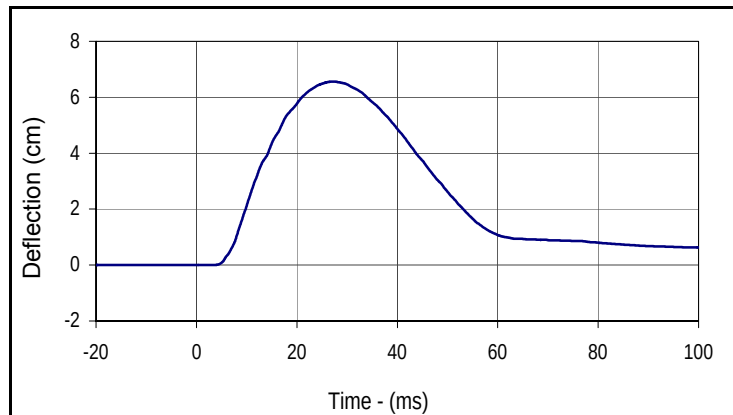
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	584	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.2	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.4	Pass
	Min	%		44.8	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.4	Pass
Probe Velocity		m/s	6.58 to 6.82	6.66	Pass
Peak Probe Force		N	5159 to 5893	5591	Pass
Peak Sternum Deflection		cm	6.35 to 7.26	6.56	Pass
Internal Hysteresis		%	69 to 85	70.1	Pass
Overall Test Results				Pass	



Curve Description

Probe Force vs. Chest Deflection

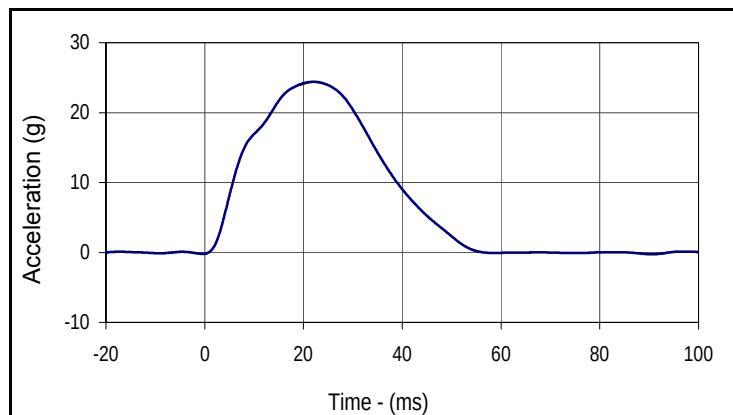
Plot No.	Type	SAE Class	Hysteresis
001	FIL	600	70.1
Peak Probe Force		Peak Chest Deflection	
5591		6.56	



Curve Description

Chest Deflection

Plot No.	Type	SAE Class	Units
002	FIL	600	cm
Max	Time	Min	Time
6.6	27.3	0.0	3.2



Curve Description

Impactor Acceleration

Plot No.	Type	SAE Class	Units
003	FIL	600	g
Max	Time	Min	Time
24.4	22.1	-0.3	90.5

Test Program: Hybrid III 50th Percentile Male Knee Impact Test
 ATD Serial No.: 360

Test Date: 1/17/17
 Test I.D.: M360LK028 , M360RK028

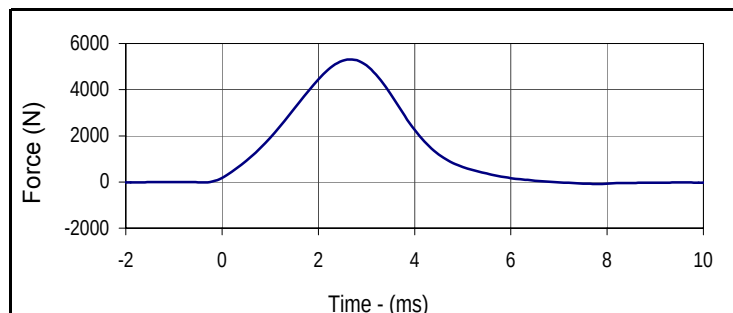


Left Knee

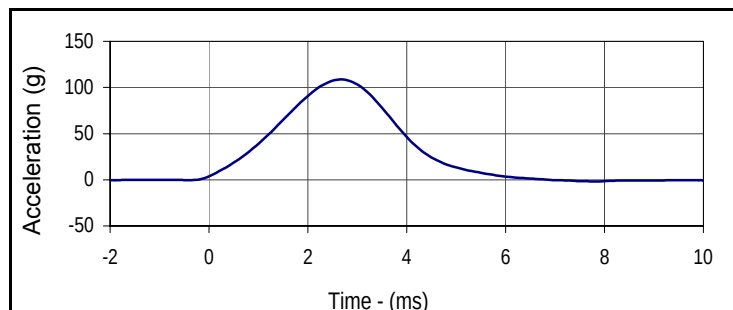
Tested Parameter		Units	Specification	Result	Pass/Fail
Knee Assembly Soak Time		Minutes	≥240	639	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.2	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.4	Pass
	Min	%		44.8	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.1	Pass
Pendulum Velocity at T=0		m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force		N	4715 to 5782	5313	Pass
Overall Test Results					Pass

Right Knee

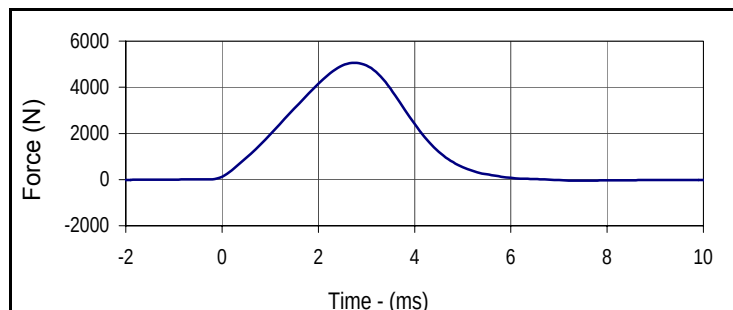
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	N	4715 to 5782	5058	Pass
Overall Test Results				Pass



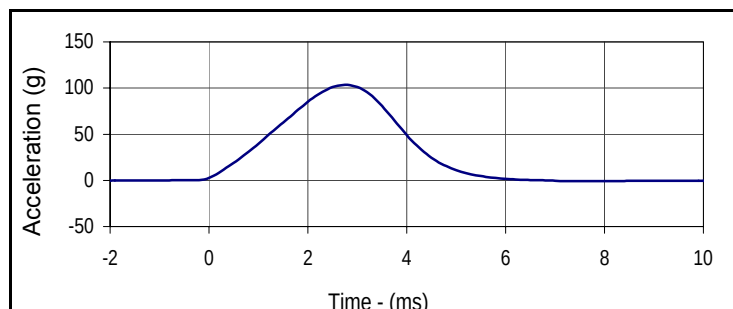
Curve Description			
Left Knee Probe Force			
Plot No.	Type	SAE Class	Units
001	FIL	600	N
Max	Time	Min	Time
5312.8	2.7	-86.4	7.8



Curve Description			
Left Knee Acceleration			
Plot No.	Type	SAE Class	Units
002	FIL	600	g
Max	Time	Min	Time
108.6	2.7	-1.8	7.8



Curve Description			
Right Knee Probe Force			
Plot No.	Type	SAE Class	Units
003	FIL	600	N
Max	Time	Min	Time
5058.2	2.8	-43.7	7.3



Curve Description			
Right Knee Acceleration			
Plot No.	Type	SAE Class	Units
004	FIL	600	g
Max	Time	Min	Time
103.4	2.8	-0.9	7.3

Test Program: Hybrid III 50th Percentile Male Hip Joint-Femur Flexion Test
 ATD Serial No.: 360

Test Date: 1/17/17
 Test I.D.: M360LF028, M360RF028

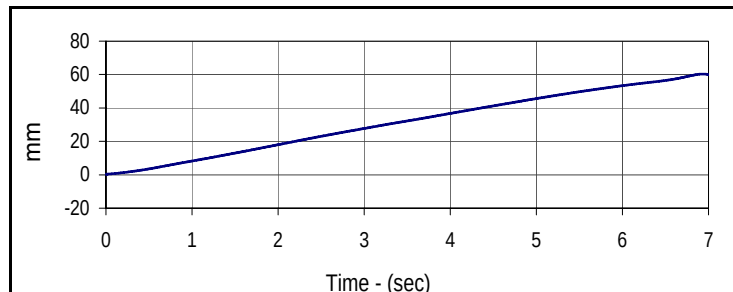


Left Hip Joint-Femur Results

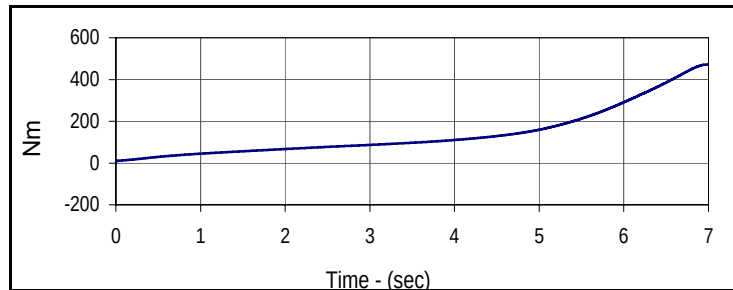
Tested Parameter		Units	Specification	Result	Pass/Fail
Hip Joint-Femur Assembly Soak Time		Minutes	≥240	714	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.2	Pass
	Min	°C		21.1	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.4	Pass
	Min	%		44.8	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.3	Pass
Rotation Rate		deg/sec	5 to 10	8.7	Pass
Femur Torque at 30°		Nm	≤ 95	90.0	Pass
Rotation at 203 Nm		Degrees	40.0 to 50.0	48.5	Pass
Overall Test Results				Pass	

Right Hip Joint-Femur Results

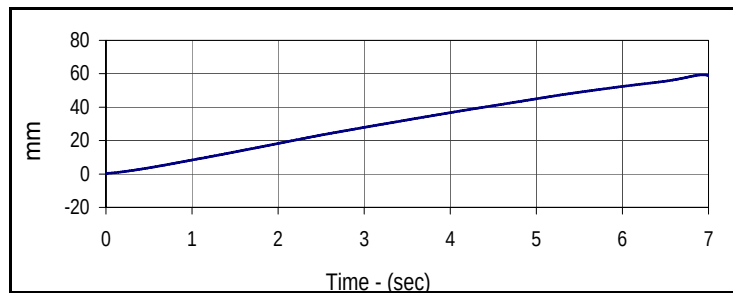
Rotation Rate		deg/sec	5 to 10	8.6	Pass
Femur Torque at 30°		Nm	≤ 95	94.1	Pass
Rotation at 203 Nm		Degrees	40.0 to 50.0	44.3	Pass
Overall Test Results				Pass	



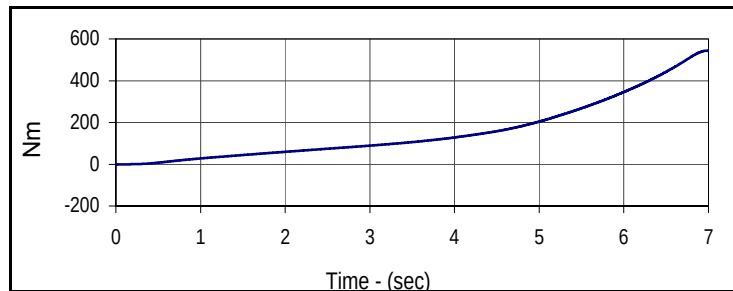
Curve Description			
Left Hip-Femur Rotation			
Plot No.	Type	SAE Class	Units
001	FIL	60	mm
Max	Time	Min	Time
60.3	6.9	0.3	0.0



Curve Description			
Left Femur Torque			
Plot No.	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
471.6	7.0	0.3	0.0



Curve Description			
Right Hip-Femur Rotation			
Plot No.	Type	SAE Class	Units
003	FIL	60	mm
Max	Time	Min	Time
59.4	6.9	0.3	0.0



Curve Description			
Right Femur Torque			
Plot No.	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
543.7	7.0	0.3	0.0

Test Program: Hybrid III 5th Percentile Female Dummy Damage Checklist

Test Date: 1/18/17

ATD Serial No.: 141

Test I.D.: N/A



Dummy Item	Inspect for	Comments	Damaged	OK
Entire Dummy	Perform general cleaning			X
Outer Skin	Gashes, rips, cracks			X
Head	Ballast secure			X
	General appearance			X
Neck	Broken or cracked rubber			X
	Upper neck bracket firmly attached to the lower neck bracket			X
	Looseness at the condyle joint			X
	Nodding blocks cracked or out of position			X
Spine	Broken or cracks in rubber			X
Ribs	Broken or bent ribs			X
	Broken or bent rib supports			X
	Damping material separated or cracked			X
	Rubber bumpers in place			X
Chest Displacement Assembly	Bent shaft			X
	Slider arm riding in track			X
Transducer Leads	Torn cables			X
Accelerometer Mountings	Head mounting secure			X
	Chest mounting secure			X
Knees	Skin condition			X
	Insert (do not remove)			X
	Casting			X
Limbs	Normal movement and adjustment			X
Knee Sliders	Wires intact			X
	Rubber returned to "at rest" position			X
Pelvis	Broken			X
Other				X

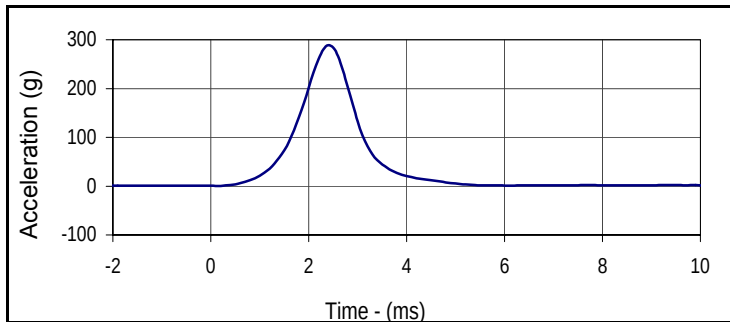
Describe the repair on or replacement of parts:

Test Program: Hybrid III 5th Percentile Female External MeasurementsTest Date: 1/18/17ATD Serial No.: 141Test I.D.: N/A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.24	Pass
Laboratory Relative Humidity	%	10 to 70	45.4	Pass
A - Total sitting height	mm	774.7 to 800.1	786	Pass
B - Shoulder pivot height	mm	431.8 to 457.2	450	Pass
C - H point height	mm	81.3 to 86.3	85	Pass
D - H point location from backline	mm	144.8 to 149.8	146	Pass
E - Shoulder pivot from backline	mm	68.6 to 83.8	77	Pass
F - Thigh clearance	mm	119.4 to 134.6	126	Pass
G - Back of elbow to wrist pivot	mm	243.9 to 259.1	250	Pass
H - Head back to backline	mm	40.7 to 45.7	44	Pass
I - Shoulder to elbow length	mm	276.8 to 297.2	285	Pass
J - Elbow rest height	mm	182.8 to 203.2	198	Pass
K - Buttock to knee length	mm	520.7 to 546.1	531	Pass
L - Popliteal length	mm	355.6 to 376.0	371	Pass
M - Knee pivot height	mm	393.7 to 419.1	402	Pass
N - Buttock popliteal length	mm	414.0 to 439.4	420	Pass
O - Chest depth without jacket	mm	175.3 to 190.5	186	Pass
P - Foot length	mm	218.5 to 233.7	221	Pass
R - Buttock to Knee Pivot Length	mm	457.2 to 482.6	473	Pass
S - Head Breadth	mm	137.1 to 147.3	144	Pass
T - Head Depth	mm	177.8 to 188.0	180	Pass
U - Hip Breadth	mm	299.7 to 314.9	302	Pass
V - Shoulder breadth	mm	350.5 to 365.7	359	Pass
W - Foot breadth	mm	78.8 to 94.0	90	Pass
X - Head circumference	mm	528.3 to 548.7	541	Pass
Y - Chest circumference (with chest jacket)	mm	850.8 to 881.3	864	Pass
Z - Waist circumference	mm	759.5 to 789.9	766	Pass
AA - Location for chest circumference	mm	299.7 to 309.9	300	Pass
BB - Location for waist circumference	mm	160.1 to 170.2	164	Pass
Overall Test Results				Pass

Test Program: Hybrid III 5th Percentile Female Head Drop TestTest Date: 1/18/17ATD Serial No.: 141Test I.D.: F141HD081

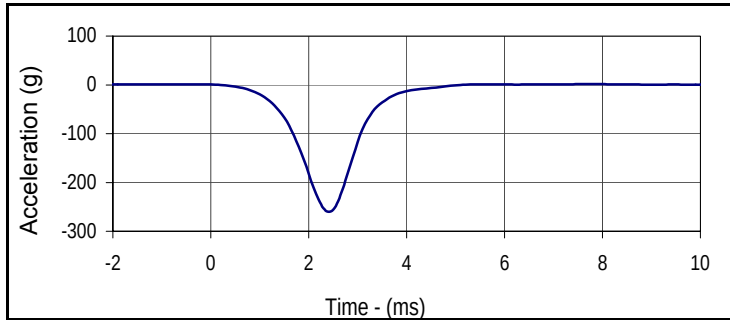
Tested Parameter		Units	Specification	Result	Pass/Fail
Head Assembly Soak Time		Minutes	≥240	471	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.4	Pass
	Min	°C		21.2	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.7	Pass
	Min	%		45.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.6	Pass
Peak Resultant Acceleration		g	250.0 to 300.0	289.0	Pass
Peak Lateral Acceleration		g	≤15.0	3.1	Pass
Oscillations After Main Pulse		%	<10% of peak Res. Acceleration	9.4	Pass
Is Acceleration Unimodal?		Yes/No	Yes	Yes	Pass
Overall Test Results				Pass	



Curve Description

Head Resultant

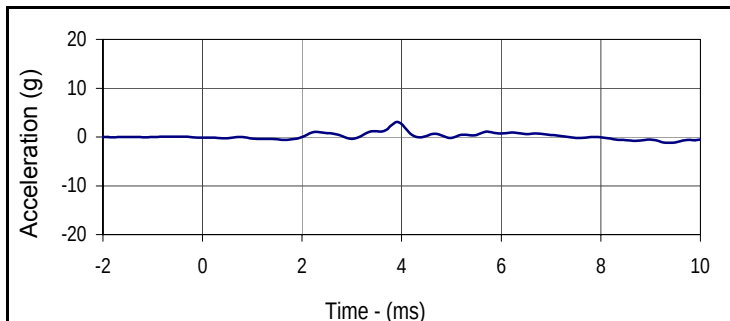
Plot No.	Type	SAE Class	Units
001	RES	1000	g
Max	Time	Min	Time
289.0	2.4	0.1	16.9



Curve Description

Head X

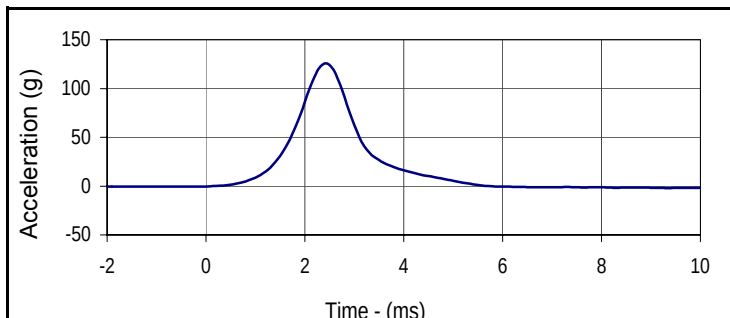
Plot No.	Type	SAE Class	Units
002	FIL	1000	g
Max	Time	Min	Time
1.6	7.7	-260.2	2.4



Curve Description

Head Y

Plot No.	Type	SAE Class	Units
003	FIL	1000	g
Max	Time	Min	Time
3.1	3.9	-1.2	9.4



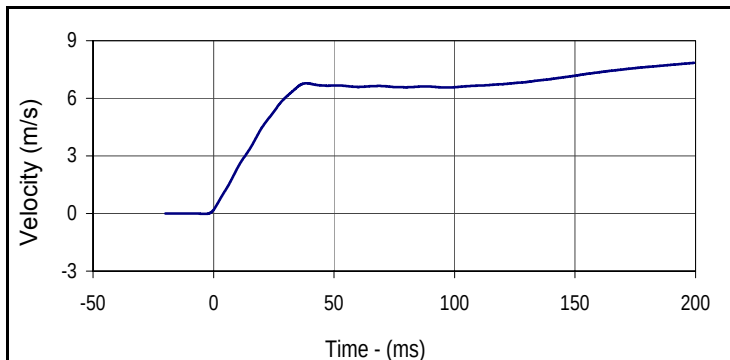
Curve Description

Head Z

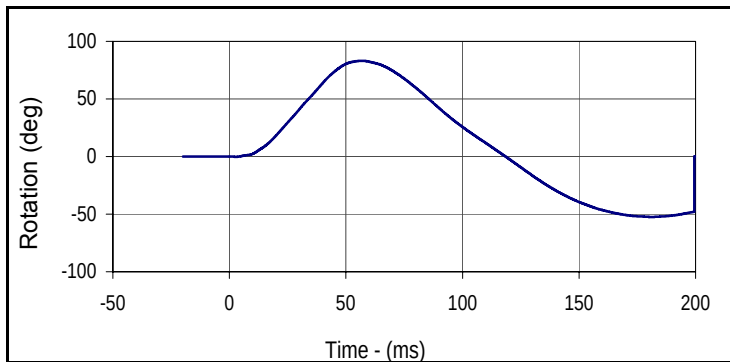
Plot No.	Type	SAE Class	Units
004	FIL	1000	g
Max	Time	Min	Time
125.7	2.4	-2.1	9.3

Test Program: Hybrid III 5th Percentile Female Neck Flexion TestTest Date: 1/18/17ATD Serial No.: 141Test I.D.: F141NF081

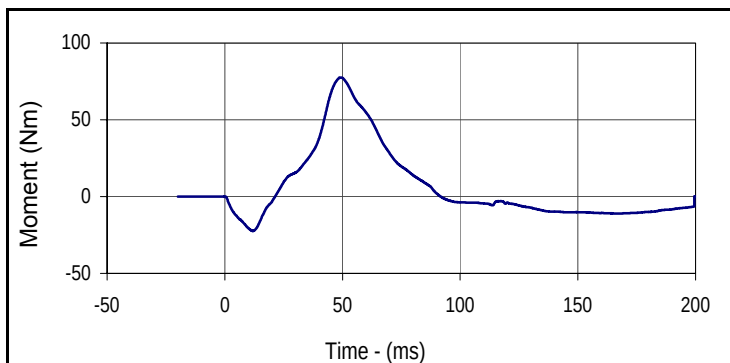
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	536	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.4	Pass
	Min	°C		21.2	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.7	Pass
	Min	%		45.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.7	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.92	Pass
Pendulum Deceleration	10 Msec.	m/s	2.1 to 2.5	2.4	Pass
	20 Msec.	m/s	4.0 to 5.0	4.5	Pass
	30 Msec.	m/s	5.8 to 7.0	6.1	Pass
"D" Plane Rotation	Max	deg	77.0 to 91.0	83.1	Pass
Peak Moment in Rotation	Max	Nm	69.0 to 83.0	77.6	Pass
Positive Moment Decay, Time To 10 Nm		ms	80.0 to 100.0	82.4	Pass
Overall Test Results					Pass



Curve Description			
Pendulum Velocity			
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
7.8	199.9	0.0	-2.9



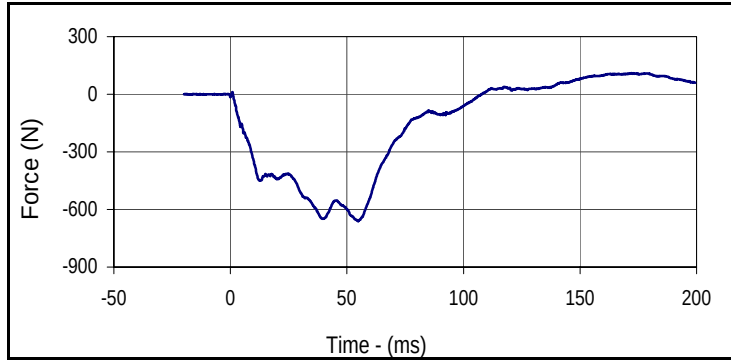
Curve Description			
"D" Plane Rotation			
Plot No.	Type	SAE Class	Units
002	FIL	60	deg
Max	Time	Min	Time
83.1	56.9	-52.4	181.2



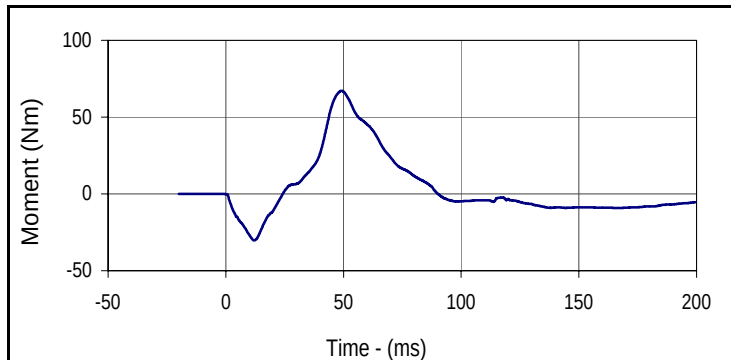
Curve Description			
Moment About Occipital Condyle			
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
77.6	49.2	-22.4	11.9

Test Program: Hybrid III 5th Percentile Female Neck Flexion Test
 ATD Serial No.: 141

Test Date: 1/18/17
 Test I.D.: F141NF081



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
109.8	172.5	-661.5	55.3



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
67.1	49.7	-30.3	12.6

Test Program: Hybrid III 5th Percentile Female Neck Extension Test

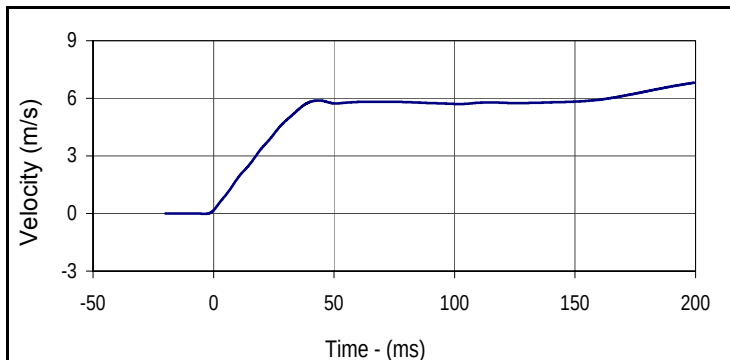
Test Date: 1/18/17

ATD Serial No.: 141

Test I.D.: F141NE081



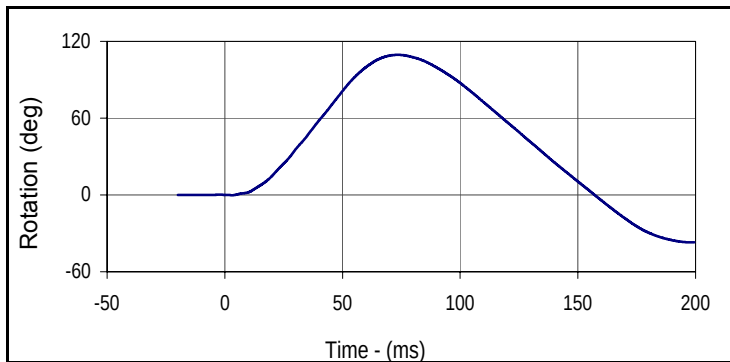
Tested Parameter		Units	Specification	Result	Pass/Fail
Neck Assembly Soak Time		Minutes	≥240	581	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.4	Pass
	Min	°C		21.2	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.7	Pass
	Min	%		45.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.7	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.01	Pass
Pendulum Deceleration	10 Msec.	m/s	1.5 to 1.9	1.8	Pass
	20 Msec.	m/s	3.1 to 3.9	3.4	Pass
	30 Msec.	m/s	4.6 to 5.6	4.8	Pass
"D" Plane Rotation	Max	deg	99.0 to 114.0	109.5	Pass
Peak Moment in Rotation	Max	Nm	-53.0 to -65.0	-55.6	Pass
Positive Moment Decay, Time To -10 Nm		ms	94.0 to 114.0	101.2	Pass
Overall Test Results					Pass



Curve Description

Pendulum Velocity

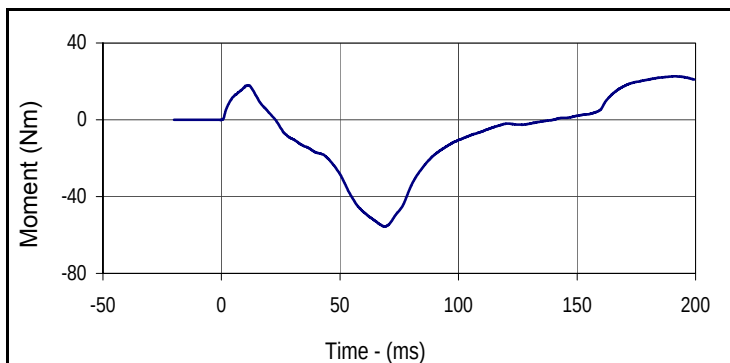
Plot No.	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
6.8	199.4	0.0	-3.5



Curve Description

"D" Plane Rotation

Plot No.	Type	SAE Class	Units
002	FIL	60	deg
Max	Time	Min	Time
109.5	73.5	-37.1	199.4



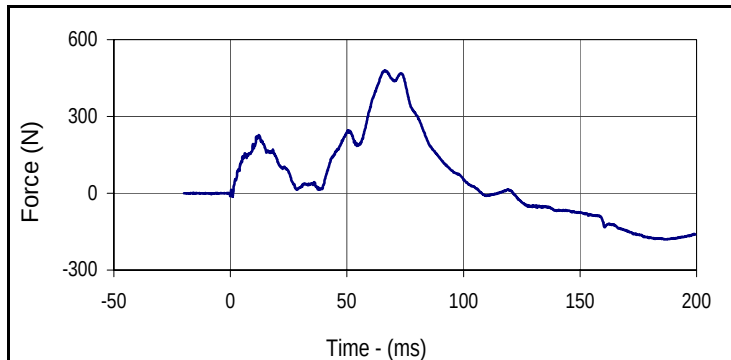
Curve Description

Moment About Occipital Condyle

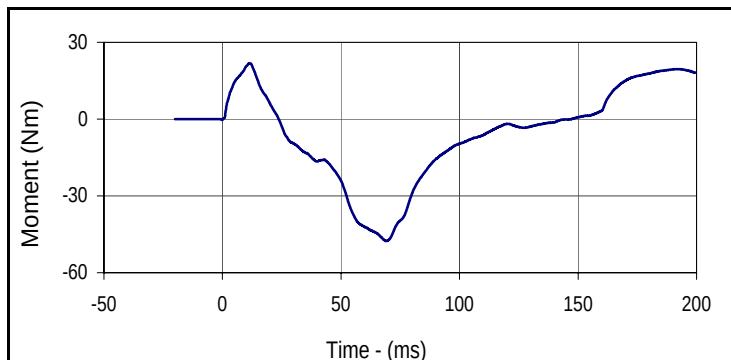
Plot No.	Type	SAE Class	Units
003	FIL	600	Nm
Max	Time	Min	Time
22.7	191.9	-55.6	68.9

Test Program: Hybrid III 5th Percentile Female Neck Extension Test
 ATD Serial No.: 141

Test Date: 1/18/17
 Test I.D.: F141NE081



Curve Description			
Neck Force X			
Plot No.	Type	SAE Class	Units
004	FIL	1000	N
Max	Time	Min	Time
479.7	66.4	-180.4	187.3



Curve Description			
Neck Moment Y			
Plot No.	Type	SAE Class	Units
005	FIL	600	Nm
Max	Time	Min	Time
21.8	11.6	-47.6	69.0

Test Program: Hybrid III 5th Percentile Female Thorax Impact Test

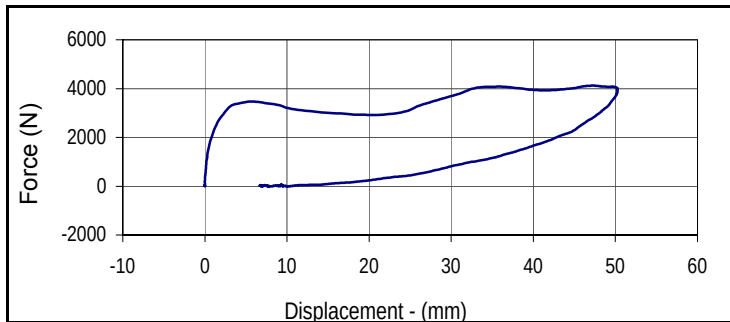
Test Date: 1/18/17

ATD Serial No.: 141

Test I.D.: F141CH081



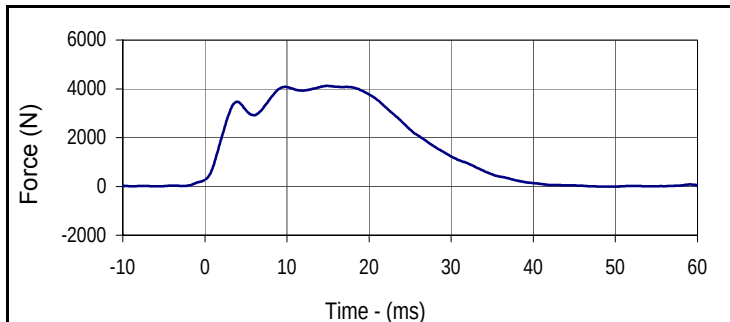
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	656	Pass
Temperature During Soak	Max	°C	20.6 to 22.2	21.4	Pass
	Min	°C		21.2	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.7	Pass
	Min	%		45.0	Pass
Laboratory Temperature During Test		°C	20.6 to 22.2	21.4	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.7	Pass
Probe Velocity		m/s	6.59 to 6.83	6.71	Pass
Peak Chest Deflection		mm	50.0 to 58.0	50.3	Pass
Peak Force Between 50 and 58 MM		N	3900 to 4400	4120	Pass
Peak Force Between 18 and 50 MM		N	≤4600	3864	Pass
Internal Hysteresis		%	69 to 85	75.2	Pass
Overall Test Results					Pass



Curve Description

Probe Force vs. Chest Deflection

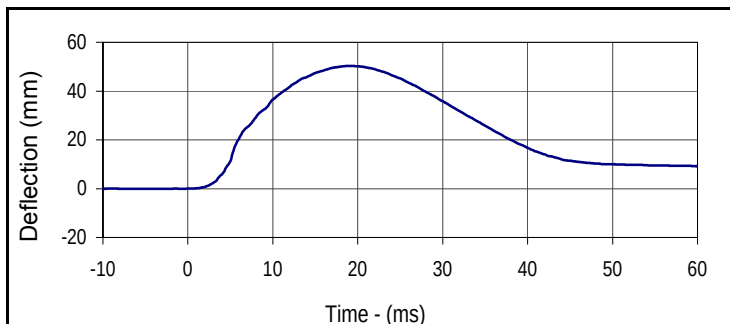
Plot No.	Type	SAE Class	Hysteresis
001	FIL	180	75.2
Peak Probe Force		Peak Chest Deflection	
4119.7		50.3	



Curve Description

Probe Force

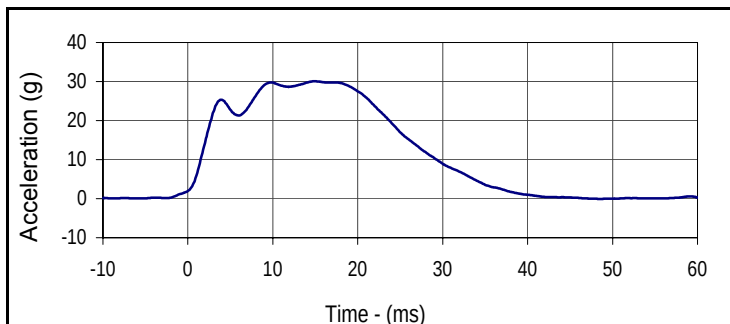
Plot No.	Type	SAE Class	Units
002	FIL	180	N
Max	Time	Min	Time
4119.7	14.9	-15.5	79.9



Curve Description

Chest Deflection

Plot No.	Type	SAE Class	Units
003	FIL	600	mm
Max	Time	Min	Time
50.3	19.4	0.0	-0.6



Curve Description

Impactor Acceleration

Plot No.	Type	SAE Class	Units
004	FIL	180	g
Max	Time	Min	Time
30.1	14.9	-0.1	79.9

Test Program: Hybrid III 5th Percentile Female Knee Impact Test

Test Date: 1/18/17

ATD Serial No.: 141

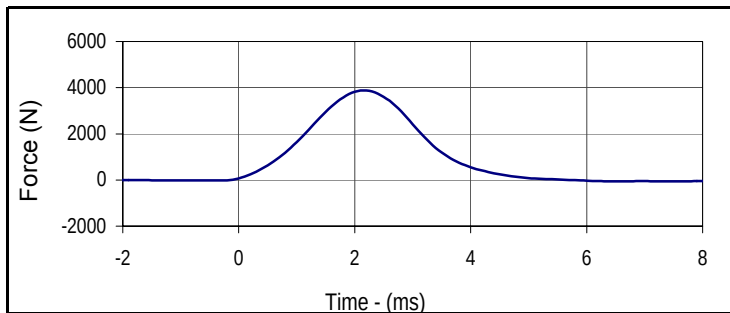
Test I.D.: F141LK081, F141RK081

**Left Knee**

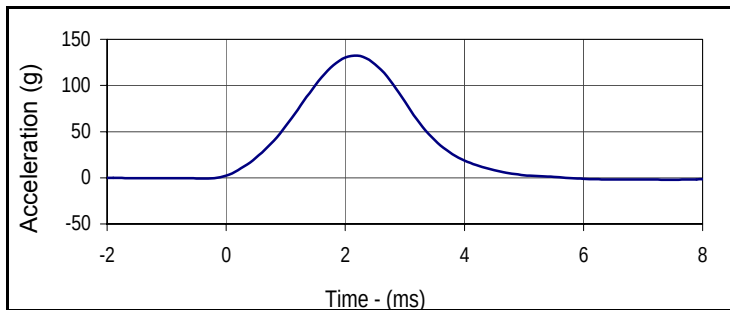
Tested Parameter		Units	Specification	Result	Pass/Fail
Knee Assembly Soak Time		Minutes	≥240	711	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.4	Pass
	Min	°C		21.2	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.7	Pass
	Min	%		45.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.3	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.1	Pass
Pendulum Velocity at T=0		m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force		N	3450 to 4060	3878	Pass
Overall Test Results					Pass

Right Knee

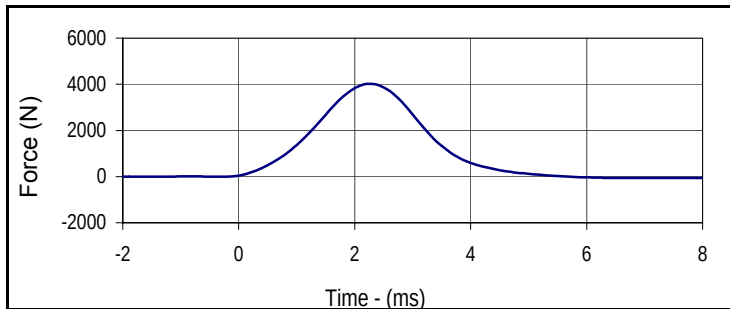
Pendulum Velocity at T=0		m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force		N	3450 to 4060	4019	Pass
Overall Test Results					Pass

**Curve Description****Left Knee Probe Force**

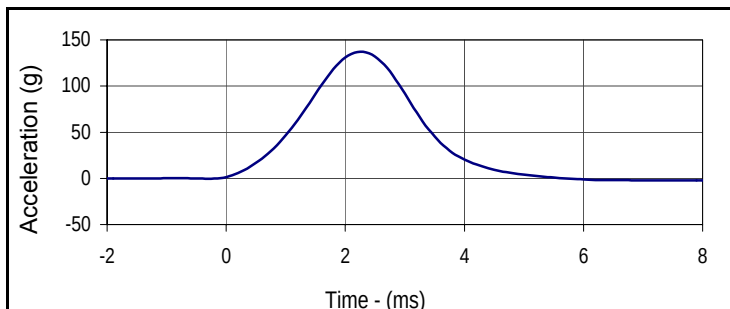
Plot No.	Type	SAE Class	Units
001	FIL	600	N
Max	Time	Min	Time
3878.2	2.2	-5195.4	70.3

**Curve Description****Left Knee Acceleration**

Plot No.	Type	SAE Class	Units
002	FIL	600	g
Max	Time	Min	Time
132.3	2.2	-177.2	70.3

**Curve Description****Right Knee Probe Force**

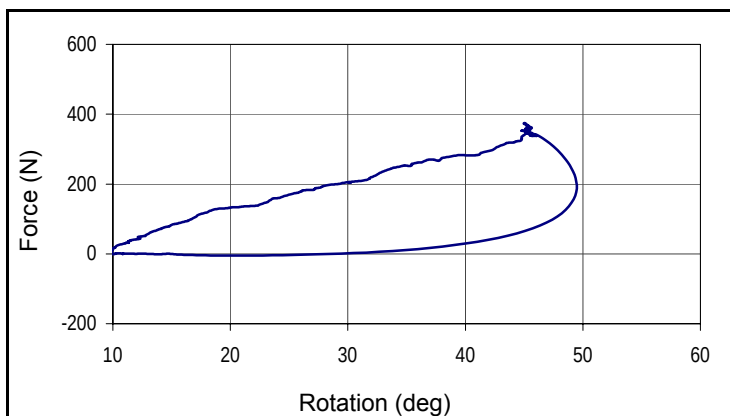
Plot No.	Type	SAE Class	Units
003	FIL	600	N
Max	Time	Min	Time
4019.1	2.3	-63.6	7.6

**Curve Description****Right Knee Acceleration**

Plot No.	Type	SAE Class	Units
004	FIL	600	g
Max	Time	Min	Time
137.1	2.3	-2.2	7.6

Test Program: Hybrid III 5th Percentile Female Torso Flexion TestTest Date: 1/18/17ATD Serial No.: 141Test I.D.: TF081

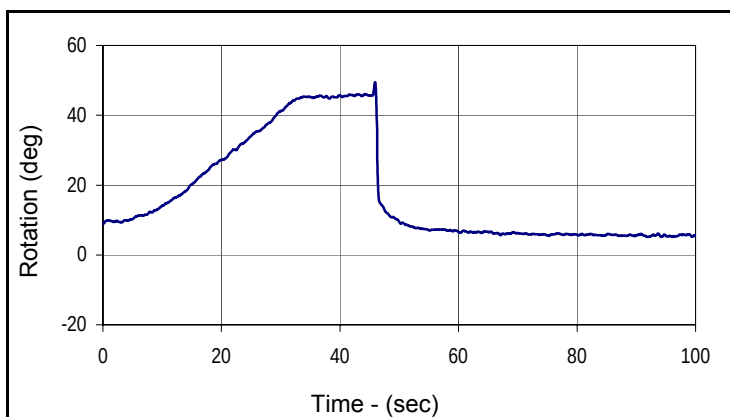
Tested Parameter		Units	Specification	Result	Pass/Fail
Dummy Soak Time		Minutes	≥240	786	Pass
Temperature During Soak	Max	°C	18.9 to 25.6	21.4	Pass
	Min	°C		21.2	Pass
Humidity During Soak	Max	%	10.0 to 70.0	45.7	Pass
	Min	%		45.0	Pass
Laboratory Temperature During Test		°C	18.9 to 25.6	21.2	Pass
Laboratory Humidity During Test		%	10.0 to 70.0	45.0	Pass
Initial Reference Plane Angle		deg	≤ 20	9.0	Pass
Peak Force at 45° +/-0.5°		N	320.0 to 390.0	374.2	Pass
Torso Rotation Rate		deg/s	0.5 to 1.5	1.1	Pass
Final Reference Plane Angle		deg	+/-8	5.4	Pass
Overall Test Results				Pass	



Curve Description

Force vs Torso Rotation

Plot No.	Type	Filter Freq
001	FIL	1 Hz
Peak Force		Peak Rotation
374.2		49.4



Curve Description

Torso Rotation

Plot No.	Type	Filter Freq	Units
002	FIL	1 Hz	deg
Max	Time	Min	Time
49.4	46.0	5.2	94.2