

REPORT NUMBER: NCAP-KAR-18-012

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

**FORD MOTOR CO.
2018 FORD MUSTANG 2-DOOR COUPE**

NHTSA NUMBER: M20180214

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



JANUARY 23, 2018

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 2018 Ford Mustang 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 09, 2018. The impact velocity of the vehicle was 56.31 km/h and the ambient temperature at the barrier face at the time of impact was 11.1°C. The target vehicle's post-test maximum crush was 360 mm at the vehicle's centerline. The test vehicle's performance is as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <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>161.4</td> <td>700</td> <td>125.1</td> </tr> <tr> <td>Maximum Chest Compression</td> <td>mm</td> <td>63</td> <td>-17</td> <td>52</td> <td>-16</td> </tr> <tr> <td>Nij</td> <td>N/A</td> <td>1</td> <td>0.23</td> <td>1</td> <td>0.23</td> </tr> <tr> <td>Neck Tension</td> <td>N</td> <td>4170</td> <td>923.9</td> <td>2620</td> <td>762.9</td> </tr> <tr> <td>Neck Compression</td> <td>N</td> <td>4000</td> <td>-136.8</td> <td>2520</td> <td>-531.2</td> </tr> <tr> <td>Left Femur Force</td> <td>N</td> <td>10000</td> <td>-1466.3</td> <td>6800</td> <td>-210.2</td> </tr> <tr> <td>Right Femur Force</td> <td>N</td> <td>10000</td> <td>-2234.1</td> <td>6800</td> <td>-57.2</td> </tr> </tbody> </table>				Measurement Description	Units	Driver ATD		Passenger ATD		Threshold	Result	Threshold	Result	Head Injury Criteria (HIC ₁₅)	N/A	700	161.4	700	125.1	Maximum Chest Compression	mm	63	-17	52	-16	Nij	N/A	1	0.23	1	0.23	Neck Tension	N	4170	923.9	2620	762.9	Neck Compression	N	4000	-136.8	2520	-531.2	Left Femur Force	N	10000	-1466.3	6800	-210.2	Right Femur Force	N	10000	-2234.1	6800	-57.2
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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	Purpose and Summary of Test	1
2	Occupant and Vehicle Information / Data Sheets	3
<u>Data Sheet No.</u>		<u>Page No.</u>
1	General Test and Vehicle Parameter Data	4
2	Seat Adjustment, Fuel System, and Steering Wheel Data	8
3	Dummy Longitudinal Clearance Dimensions	10
4	Dummy Lateral Clearance Dimensions	11
5	Seat Belt Positioning Data	12
6	High-Speed Camera Locations and Data	13
7	Vehicle Accelerometer Locations	15
8	Photographic Reference Target Locations	16
9	Load Cell Locations on Fixed Barrier	17
10	Test Vehicle Camera and Instrumentation Summary	18
11	Post-Test Observations	19
12	Vehicle Profile Measurements	20
13	Accident Investigation Division Data	22
14	Vehicle Intrusion Measurements	23
15	Summary of FMVSS 212, 219 (Partial), and 301 Data	25
16	FMVSS 301 Static Rollover Results	27
17	Dummy / Vehicle Temperature Stabilization Chart	28
<u>Appendix</u>		<u>Page No.</u>
A	Photographs	A
B	Dummy Response Data Traces	B
C	ATD Calibration and Performance Verification Data	C

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 2018 Ford Mustang 2-door coupe at a velocity of 56.31 km/h. The test was performed at KARCO Engineering, LLC. on January 9, 2018. 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 360 mm at 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 bolster.

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)	161.4	61.7	76.7	-17	0.23	923.9	-136.8	-1466.3	-2234.1
Passenger (5th)	125.1	54.9	69.9	-16	0.23	762.9	-531.2	-210.2	-57.2

SECTION 2

OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

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: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA Number	M20180214
Model Year	2018
Make	Ford
Model	Mustang
Body Style	2-Door Coupe
VIN	1FA6P8TH3J5103140
Body Color	Kona Blue Metallic
Odometer Reading (km / mi)	159 / 99
Engine Displacement (L)	2.3
Type / No. of Cylinders	Inline 4
Engine Placement	Longitudinal
Transmission Type	Automatic
Transmission Speeds	10
Overdrive	Yes
Final Drive	RWD
Roof Rack	No
Sunroof / T-Top	No
Running Boards	No
Tilt Steering Wheel	Yes
Power Seats	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADLs)	Yes

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?

No

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Co.
Date of Manufacture	Oct-17

GVWR (kg)	2050
GAWR Front (kg)	1016
GAWR Rear (kg)	1061

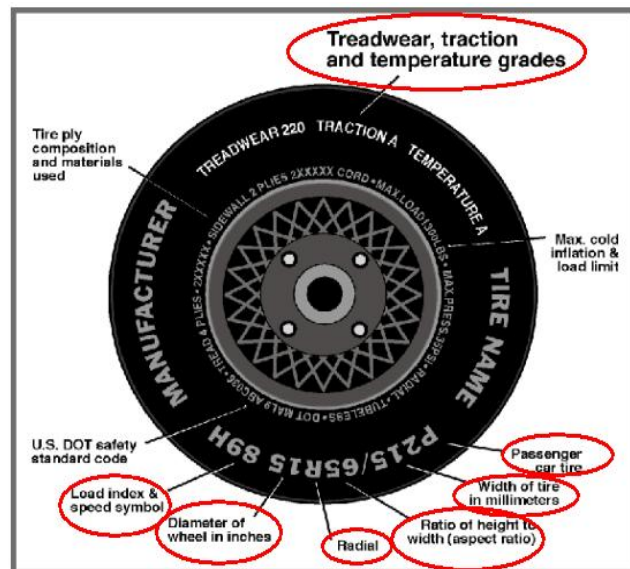
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Designated Seating Capacity	2	2		4
Capacity Weight (VCW) (kg)				303.0
DSC x 68.04 (kg)				272.2
Cargo Weight (RCLW) (kg)				30.8

DATA SHEET NO. 1 ... (CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle:	2018 Ford Mustang 2-Door Coupe	NHTSA No.:	M20180214
Test Program:	56.3 km/h Frontal Impact NCAP Test	Test Date:	01/09/18



VEHICLE TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	220	220
Recommended Tire Size	P235/55/R17	P235/55/R17
Tire Size on Vehicle	P235/55/R17	P235/55/R17
Tire Manufacturer	Hankook	Hankook
Tire Model	Ventus S1 Noble ²	Ventus S1 Noble ²
Treadwear	700	700
Traction	B	B
Temperature Grades	A	A
Tire Plies Sidewall	2 Polyester	2 Polyester
Tire Plies Body	2 Steel, 2 Polyester, 2 Nylon	2 Steel, 2 Polyester, 2 Nylon
Load Index / Speed Symbol	99H	99H
Tire Material	Steel, Polyester, Nylon	Steel, Polyester, Nylon
DOT Safety Code Left	T73F 1A H 0117	T73F 1A H 0117
DOT Safety Code Right	T73F 1A H 0117	T73F 1A H 0117

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

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	408.5	367.5		437.0	447.5	
Right	kg	454.0	367.0		456.0	421.5	
Ratio	%	54.0%	46.0%	100.0%	50.7%	49.3%	100.0%
Total	kg	862.5	734.5	1597.0	893.0	869.0	1762.0

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value	
Total Delivered Weight (UVW)	kg	1597.0	A
Weight of 1 P572E ATD & 1 P572O ATD	kg	141.0	B
Rated Cargo/Luggage Weight (RCLW)	kg	30.8	C
Calculated Vehicle Target Weight (TVTW)	kg	1768.8	A+B+C

TEST VEHICLE ATTITUDES

Condition	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	733	737	737	732	1251
As Tested	mm	727	724	719	714	1341
Post-Test	mm	749	743	712	722	

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Total Vehicle Wheel Base	mm	2720
Total Vehicle Length at Left Side	mm	4090
Total Vehicle Length at Centerline	mm	4773
Total Vehicle Length at Right Side	mm	4085
Weight of Ballast in Cargo Area	kg	73.0
Weight of Vehicle Components Removed	kg	42.0
Amount of Stoddard Solvent in Fuel Tank	L	54.58

VEHICLE COMPONENTS REMOVED TO MEET TEST WEIGHT:

Tail Lights (4.0 kg), Rear Trim (3.5 kg), Rear Seat Assembly (14.0 kg), Rear Bumper Fascia
 (7.5 kg), Rear Plastic Trim (1.5 kg), Rear Bumper Beam (7.5 kg), Outboard Mirrors (1.5 kg),
 Rear Speakers (2.5 kg)

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

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

TARGET VEHICLE STRUCTURAL MEASUREMENTS

No.	Description	Pre-Test
1	Total Length	4773
2	Total Width	1865
3	Bumper Top Height	620
4	Bumper Bottom Height	250
5	Longitudinal Member Top Height	510
6	Distance Between Longitudinal Members	760
7	Longitudinal Member Width	65
8	Engine Top Height	920
9	Engine Bottom Height	172
10	Engine and Gearbox Width	560
11	Front Bumper to Engine Distance	725
12	Front Shock Absorber Fixing Height	890
13	Bonnet Leading Edge Height	777
14	Front Shock Absorber Fixing Width	1125
15	Front Bumper to Front Axle Distance	945
16	Front Axle to A-Pillar Distance	740
17	A-Pillar to B-Pillar Distance	1220
18	B-Pillar to Rear Axle Distance	820
19	B-Pillar to C-Pillar Distance	N/A
20	Roof Sill Bottom Height	1223
21	Roof Sill Top Height	1330
22	Floor Sill Bottom Height	250
23	Floor Sill Top Height	325

All measurements in millimeters.

DATA SHEET NO. 2

SEAT ADJUSTMENT, FUEL SYSTEM, AND STEERING WHEEL DATA

Test Vehicle: 2018 Ford Mustang 2-Door Coupe

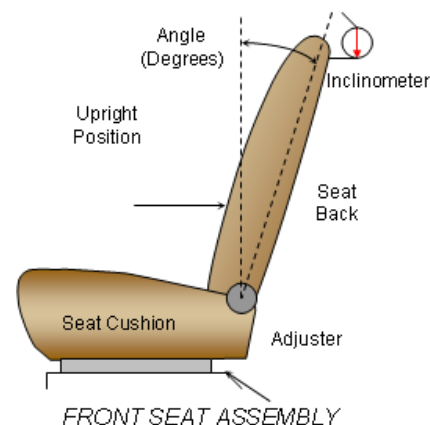
NHTSA No.: M20180214

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/09/18

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 at the headrest post.

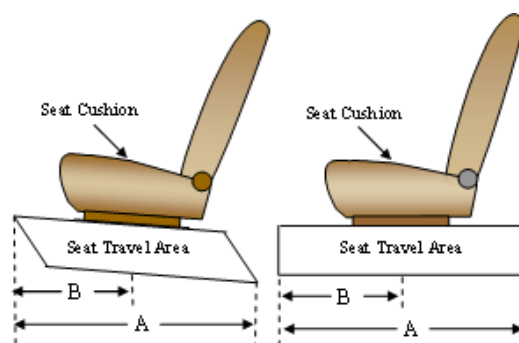


SEAT BACK ANGLE

Seating Position	Degrees
Driver Seat Back Angle	2.9
Passenger Seat Back Angle	0.4

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	310 mm	157 mm
Passenger Seat	255 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 "M2," and position M1. 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

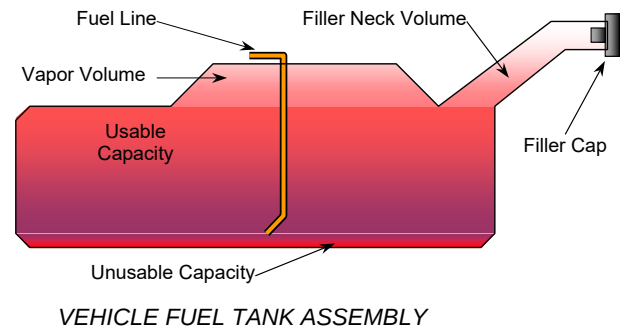
Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

FUEL TANK CAPACITY

Description	Liters
Usable Capacity of "Standard Tank"	58.67
Usable Capacity of "Optional Tank"	N/A
92 - 94% of Usable Capacity	53.98 to 55.15
Actual Amount of Stoddard Solvent Used	54.58
1/3 of Usable Capacity	19.56

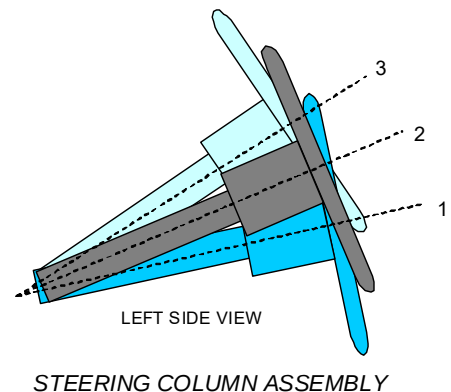
FUEL PUMP

The vehicle is equipped with an electric fuel pump. The fuel pump operates when the starter or engine is activated. The pump operates for two seconds after ignition switch is turned ON. After that the pump operates only while the engine is running unless the pump is disabled by the Restraint Control Module.



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.



STEERING COLUMN POSITIONING

	Degrees	Fore-Aft Position (mm)
Lowermost Position, No. 1	17.9	90
Geometric Center Position, No. 2	20.7	113
Uppermost Position, No. 3	23.5	135
Telescoping Steering Wheel Travel		45
Test Position	20.7	113

DATA SHEET NO. 3

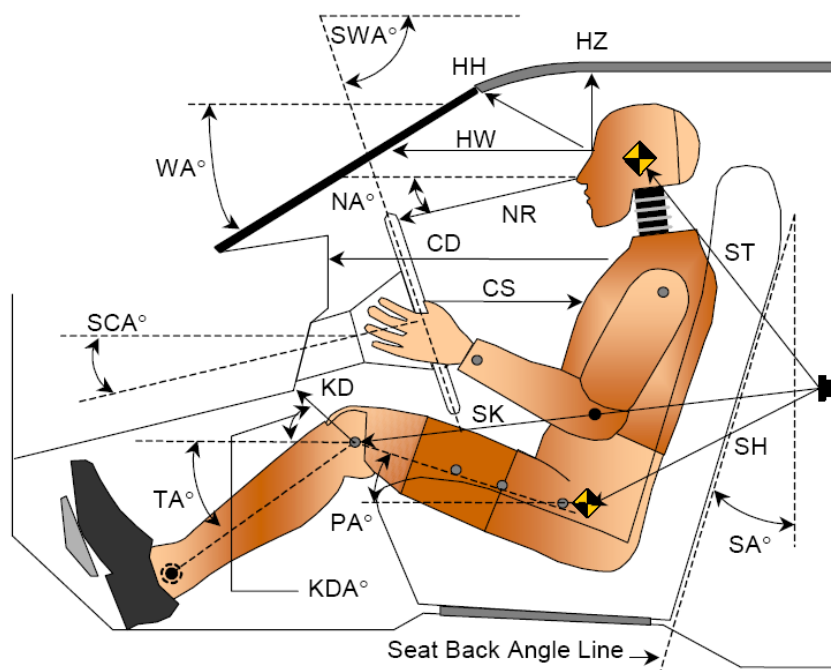
DUMMY LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2018 Ford Mustang 2-Door Coupe

NHTSA No.: M20180214

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/09/18



LEFT SIDE VIEW

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA°	Windshield Angle		26.1		
SWA°	Steering Wheel Angle		20.7		
SCA°	Steering Column Angle		69.3		
SA°	Seat Back Angle (On Headrest Post)		2.9		0.4
HZ	Head to Roof	196	90.0	213	90.0
HH	Head to Header	326	23.4	285	58.1
HW	Head to Windshield	623	0.0	608	0.0
NR	Nose to Rim	342	7.6	394	3.4
CD	Chest to Dash	537	11.3	406	7.2
CS	Chest to Steering Hub	297	2.7		
RA	Rim to Abdomen	173	0.0		
KDL	Left Knee to Dash	235	5.9	130	32.2
KDR	Right Knee to Dash	188	31.6	164	27.6
PA°	Pelvic Angle		23.6		22.2
TA°	Tibia Angle		36.7		32.4
SK	Striker to Knee	829	5.7	918	6.9
ST	Striker to Head	537	50.3	573	35.6
SH	Striker to H-Point	517	26.9	635	22.0

DATA SHEET NO. 4

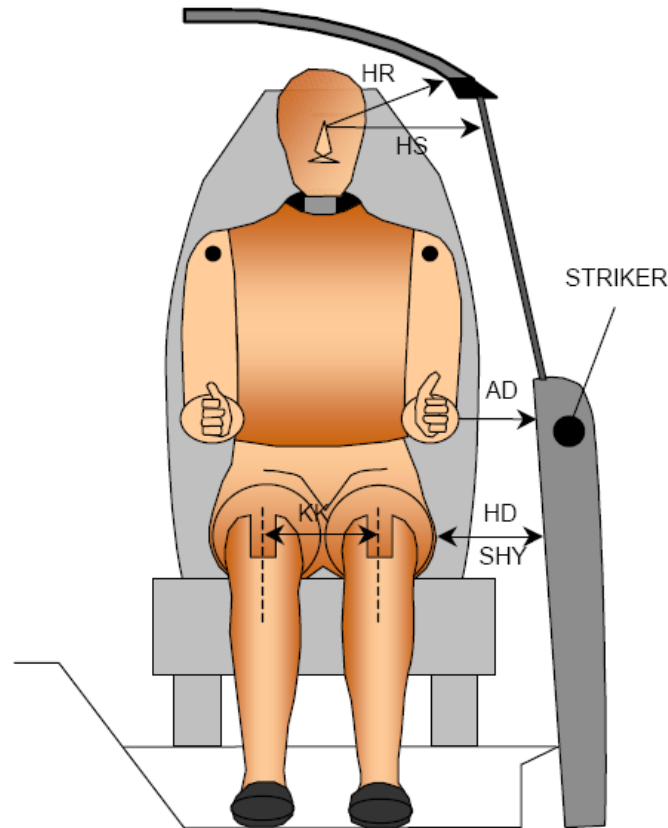
DUMMY LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2018 Ford Mustang 2-Door Coupe

NHTSA No.: M20180214

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/09/18



Code	Description	Driver (mm)	Passenger (mm)
AD	Arm to Door	108	99
HD	H-Point to Door	147	241
HR	Head to Side Header	211	260
HS	Head to Side Window	335	378
KK	Knee to Knee	297	170
SHY	Striker to H-Point (Y-Direction)	236	265
AA	Ankle to Ankle	298	200

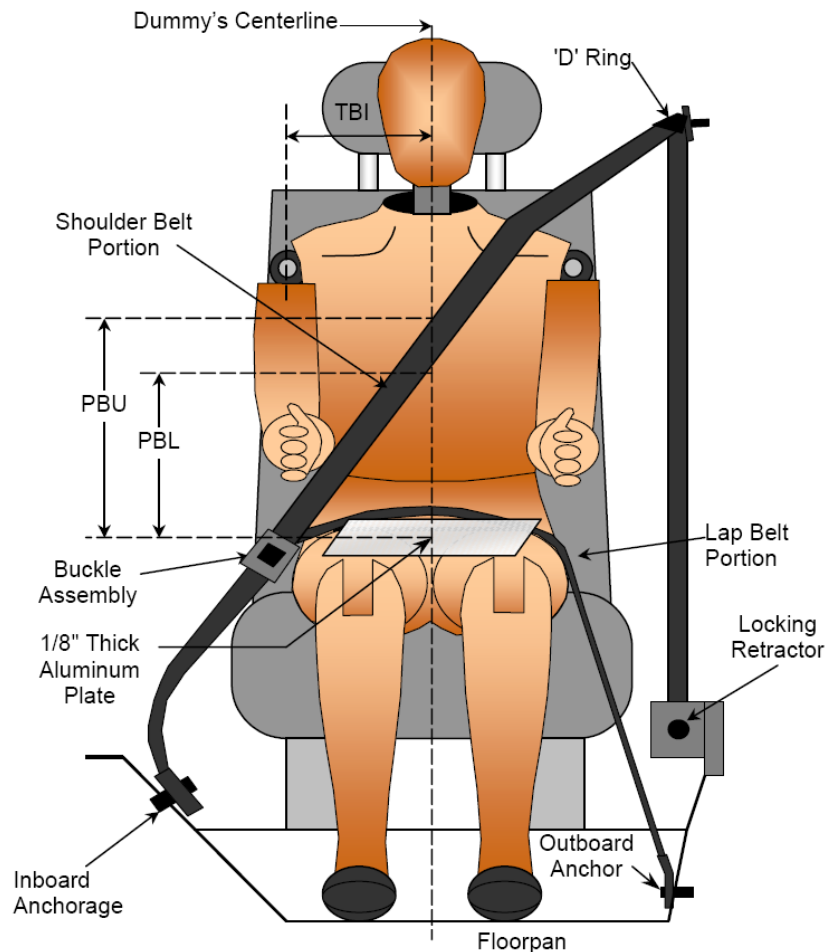
DATA SHEET NO. 5
SEAT BELT POSITIONING DATA

Test Vehicle: 2018 Ford Mustang 2-Door Coupe

NHTSA No.: M20180214

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/09/18



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	290	260
PBL	Top Surface of Aluminum Plate to Belt Lower Edge	mm	210	180

BELT LENGTH DATA

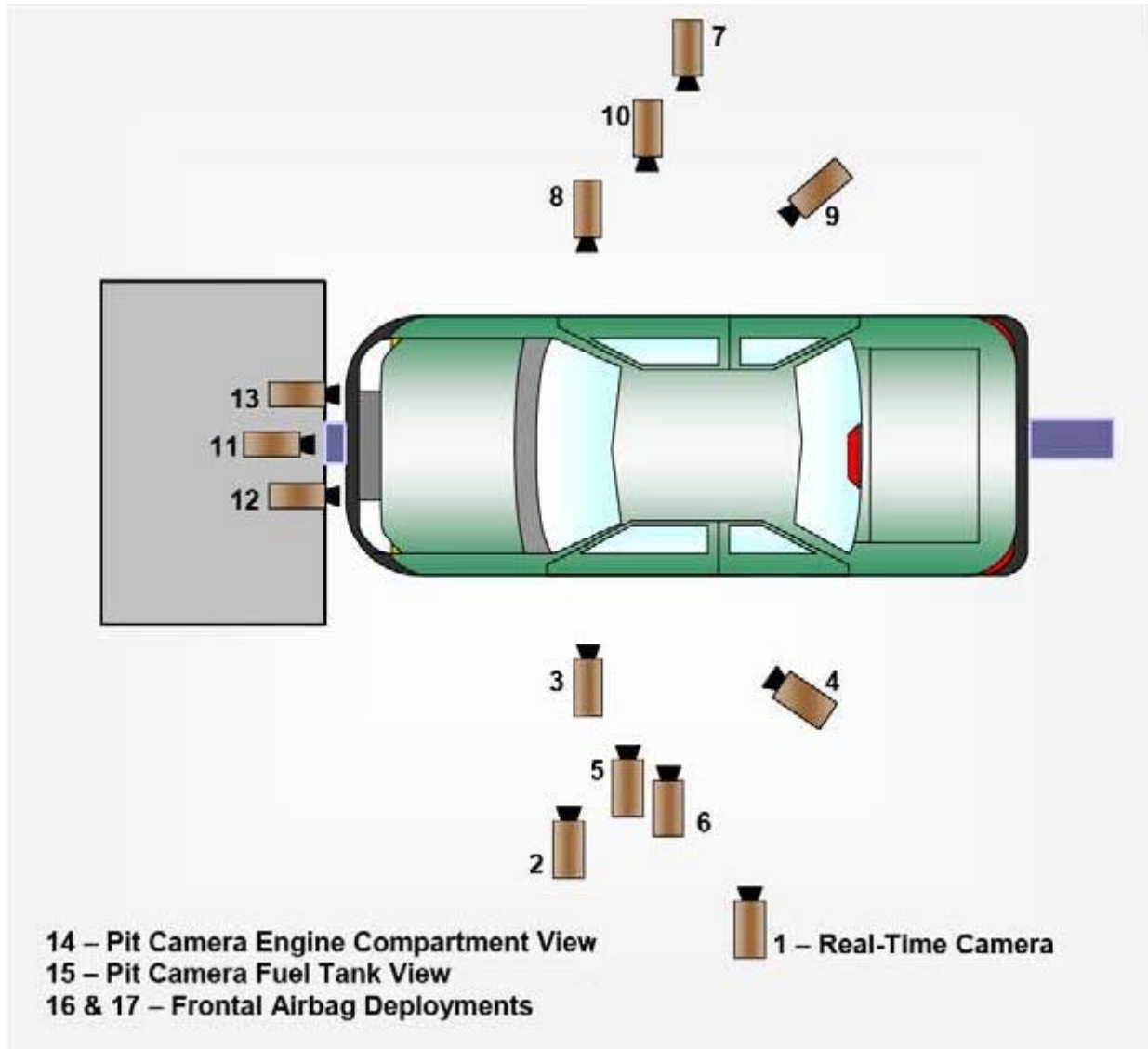
Measurement Description	Units	Driver	Passenger
Shoulder Belt Length as Measured on ATD	mm	1052	1080
Lap Belt Length as Measured on ATD	mm	640	695
Remainder of Belt on Reel	mm	890	980
Total Belt Length for Continuous Webbing Systems	mm	2582	2755

DATA SHEET NO. 6

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

CAMERA POSITIONS FOR FRONTAL IMPACTS



DATA SHEET NO. 6 ... (CONTINUED)

HIGH-SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

CAMERA LOCATIONS

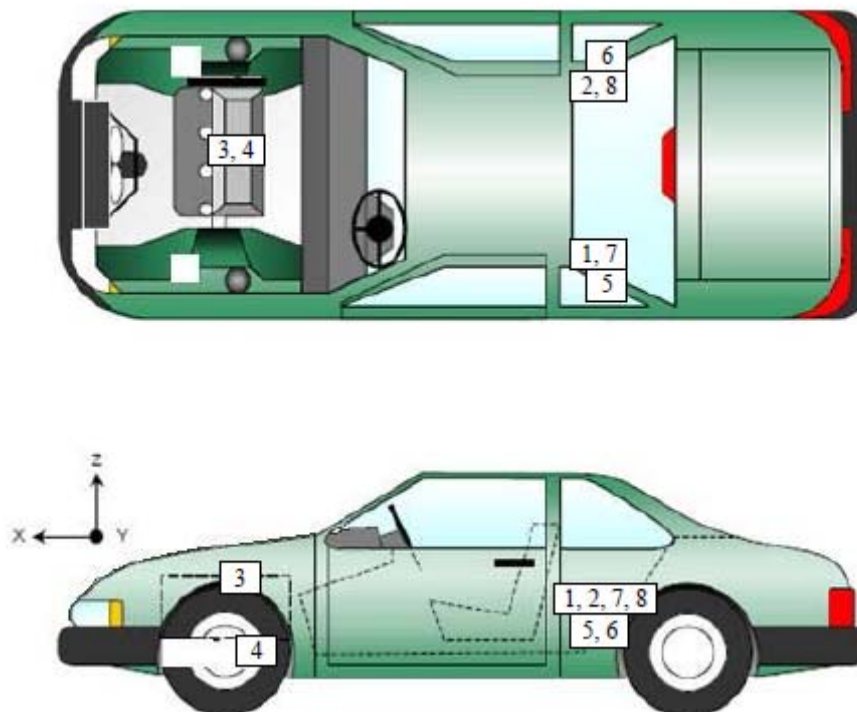
No.	Description	Location (mm)			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Overall	-11412	-8150	-1484		30
2	Driver Close-Up	-2590	-7950	-1371	50	1000
3	Left Front Half	-1701	-6197	-1701	35	1000
4	Left Angle	-6696	-10308	-3211	105	1000
5	Steering Column - Top	-1966	-10412	-3688	35	1000
6	Steering Column - Bottom	-1972	-10412	-3379	35	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	35	1000
10	Right Angle	-6217	9516	-4830	85	1000
11	Windshield	-354	0	-5749	24	1000
12	Driver Windshield	297	-366	-2460	20	1000
13	Passenger Windshield	297	366	-2460	20	1000
14	Pit Front	-756	0	1495	20	1000
15	Pit Rear	-3398	0	1495	14	1000
16	Onboard Driver Airbag (Optional)	-2300	350	-1150	8	1000
17	Onboard Passenger Airbag (Optional)	-2300	-350	-1150	8	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: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18



VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Description	Location		
		X	Y	Z
1	Left Rear Accelerometer X-Direction	1800	-690	-330
2	Right Rear Accelerometer X-Direction	1800	690	-330
3	Engine Top X	3300	30	-850
4	Engine Bottom X	3900	-400	-160
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	1800	-690	-330
8	Right Rear Accelerometer X-Direction Redundant	1800	690	-330

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

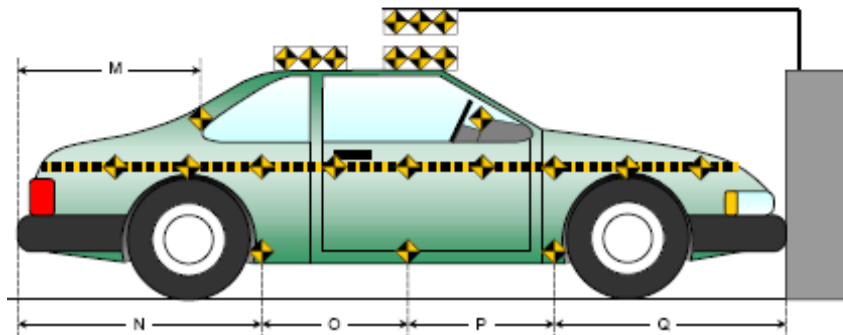
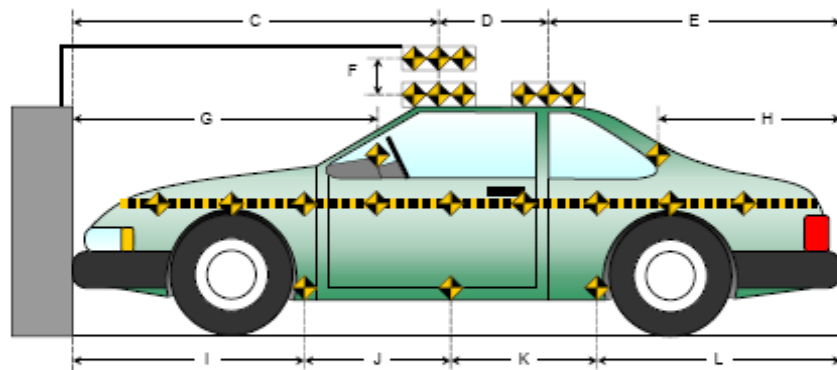
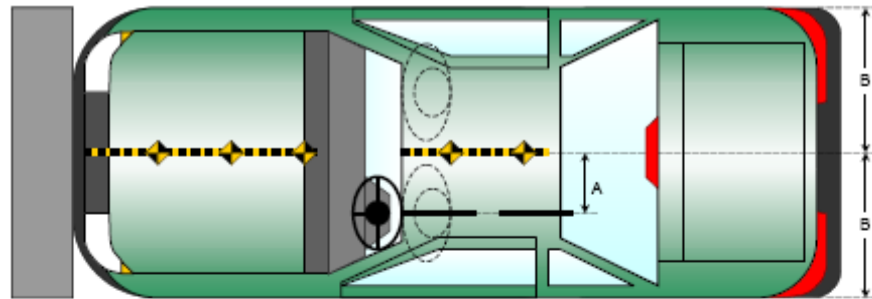
Test Vehicle: 2018 Ford Mustang 2-Door Coupe

NHTSA No.: M20180214

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/09/18

Item	Value
A	420
B	933
C	2445
D	610
E	1718
F	305
G	2010
H	1020
I	1425
J	900
K	900
L	1550
M	1019
N	1550
O	900
P	900
Q	1425



All measurements in millimeters.

DATA SHEET NO. 9

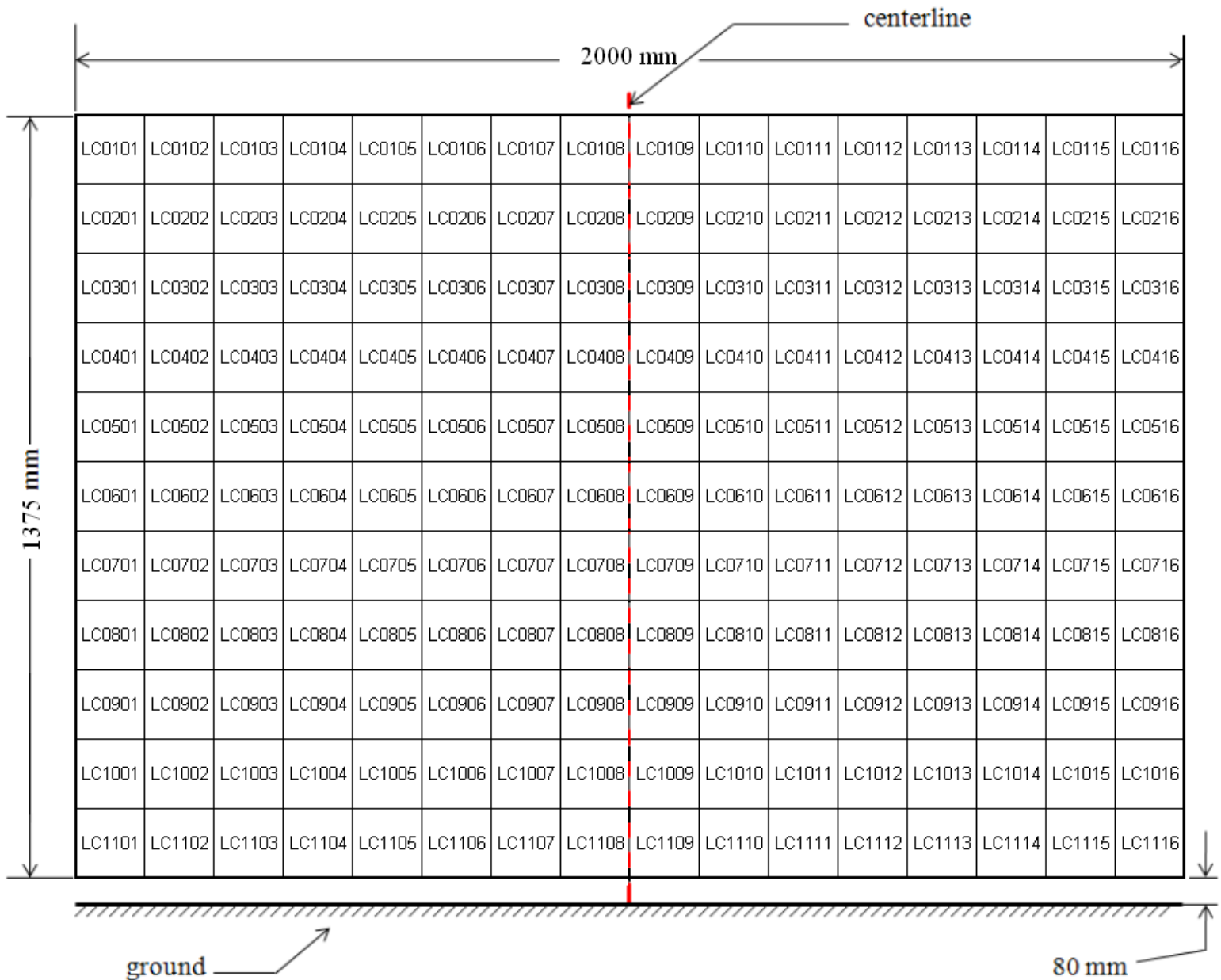
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2018 Ford Mustang 2-Door Coupe

NHTSA No.: M20180214

Test Program: 56.3 km/h Frontal Impact NCAP Test

Test Date: 01/09/18



DATA SHEET NO. 10

TEST VEHICLE CAMERA AND INSTRUMENTATION SUMMARY

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

INSTRUMENTATION

Driver Dummy Accelerometers	47
Passenger Dummy Accelerometers	47
Vehicle Structure Accelerometers	8
Seat Belt Load Cells	4
Load Cell Barrier	528
Total	634

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: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

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 Bolster
Right Knee Contact	Knee Airbag	Knee Bolster

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)	0	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	760
Center	mm	692
Right Side	mm	791
Average	mm	748

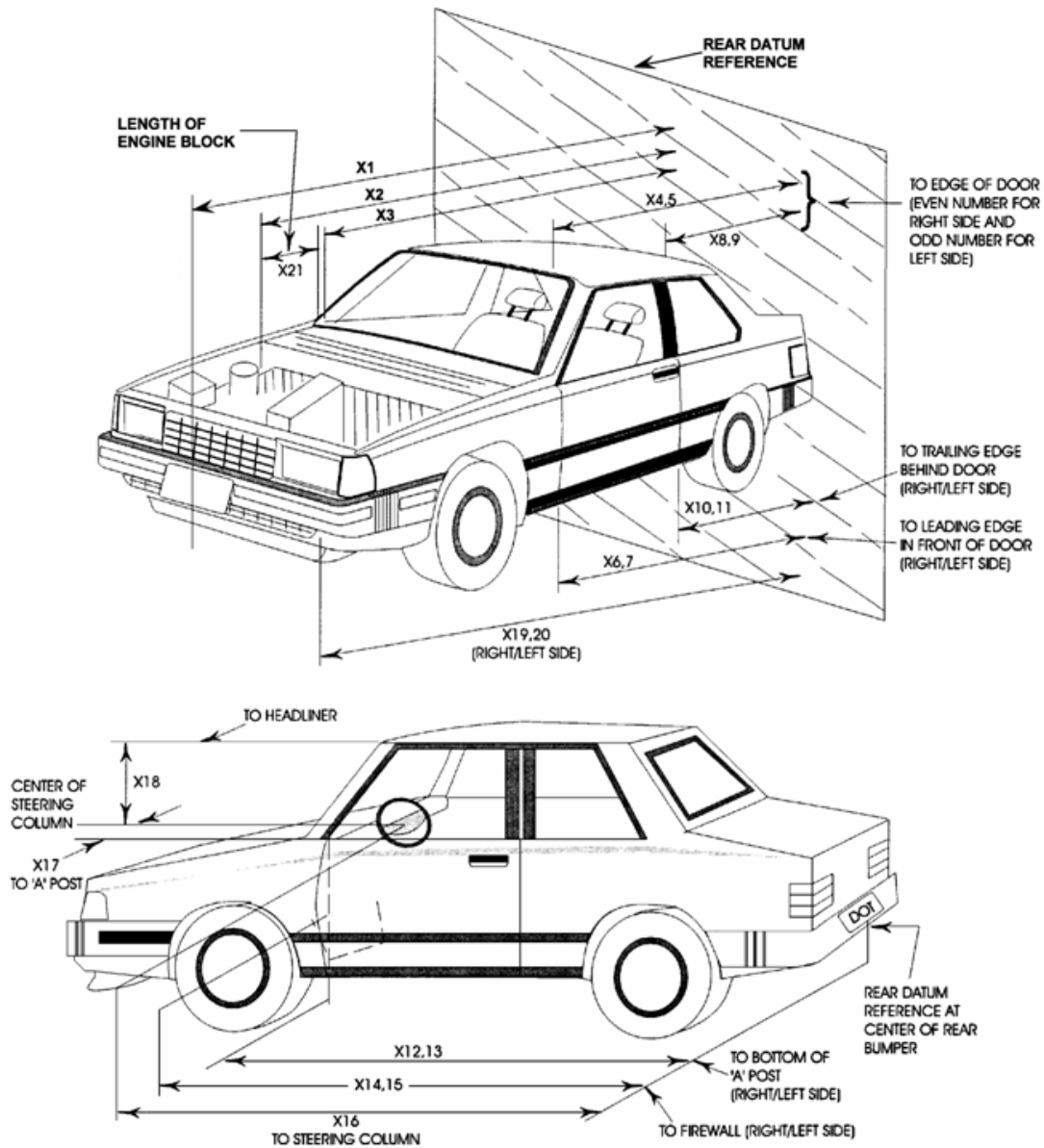
SUPPLEMENTAL RESTRAINT SYSTEM INFORMATION

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	No
Seat Belt Pretensioner	Yes	Yes	Yes	Yes
Seat Belt Load Limiter	Yes	Yes	Yes	Yes

*Passenger knee airbag is not designed to deploy in a full frontal impact w/ belted 5% dummy

DATA SHEET NO. 12
VEHICLE PROFILE MEASUREMENTS

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18



DATA SHEET NO. 12 ... (CONTINUED)**VEHICLE PROFILE MEASUREMENTS**Test Vehicle: 2018 Ford Mustang 2-Door CoupeNHTSA No.: M20180214Test Program: 56.3 km/h Frontal Impact NCAP TestTest Date: 01/09/18

No.	Description	Pre-Test	Post-Test	Difference
1	Total Length of Vehicle at Centerline	4773	4413	-360
2	Rear Surface of Vehicle to Front of Engine	4048	3969	-79
3	RSOV to Firewall	3428	3364	-64
4	RSOV to Upper Leading Edge of Right Door	3113	3105	-8
5	RSOV to Upper Leading Edge of Left Door	3110	3115	5
6	RSOV to Lower Leading Edge of Right Door	3090	3073	-17
7	RSOV to Lower Leading Edge of Left Door	3088	3077	-11
8	RSOV to Upper Trailing Edge of Right Door	1710	1700	-10
9	RSOV to Upper Trailing Edge of Left Door	1709	1715	6
10	RSOV to Lower Trailing Edge of Right Door	1860	1855	-5
11	RSOV to Lower Trailing Edge of Left Door	1858	1855	-3
12	RSOV to Bottom of A-Pillar, Right Side	3004	3003	-1
13	RSOV to Bottom of A-Pillar, Left Side	2999	3001	2
14	RSOV to Firewall, Right Side	3641	3604	-37
15	RSOV to Firewall, Left Side	3408	3335	-73
16	RSOV to Steering Column	2520	2695	175
17	Center of Steering Column to A-Pillar	415	410	-5
18	Center of Steering Column to Headliner	415	410	-5
19	RSOV to Right Side of Front Bumper	4085	3995	-90
20	RSOV to Left Side of Front Bumper	4090	3960	-130
21	Length of Engine Block	525	525	0
RD	RSOV to Right Side of Dash Panel	2825	2840	15
CD	RSOV to Center of Dash Panel	2720	2740	20
LD	RSOV to Left Side of Dash Panel	2775	2820	45

All measurements in millimeters.

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

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

VEHICLE INFORMATION

VIN: 1FA6P8TH3J5103140 Wheelbase (mm): 2720
Vehicle Size Category: Passenger Car Test Weight (kg): 1762.0

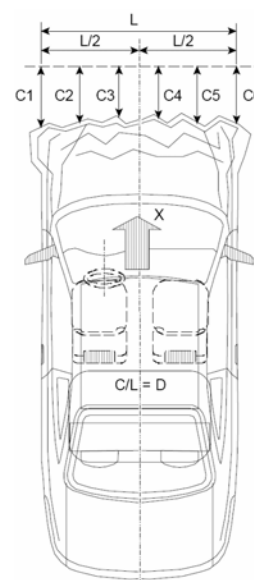
ACCELEROMETER DATA

Accelerometer Locations: Left Rear Crossmember
Cal. Procedure/Interval: Vibration Test / 6 months
Integration Algorithm: NHTSA Standard
Impact Velocity (km/h): 56.31
Velocity Change (km/h): 65.4
Time of Separation (msec): 79.6

Linearity: Good

CRUSH PROFILE

Collision Deformation Classification: 12FDEW2
Midpoint of Damage: Vehicle Centerline
Damage Region Length (mm): 1665
Impact Mode: Full Frontal



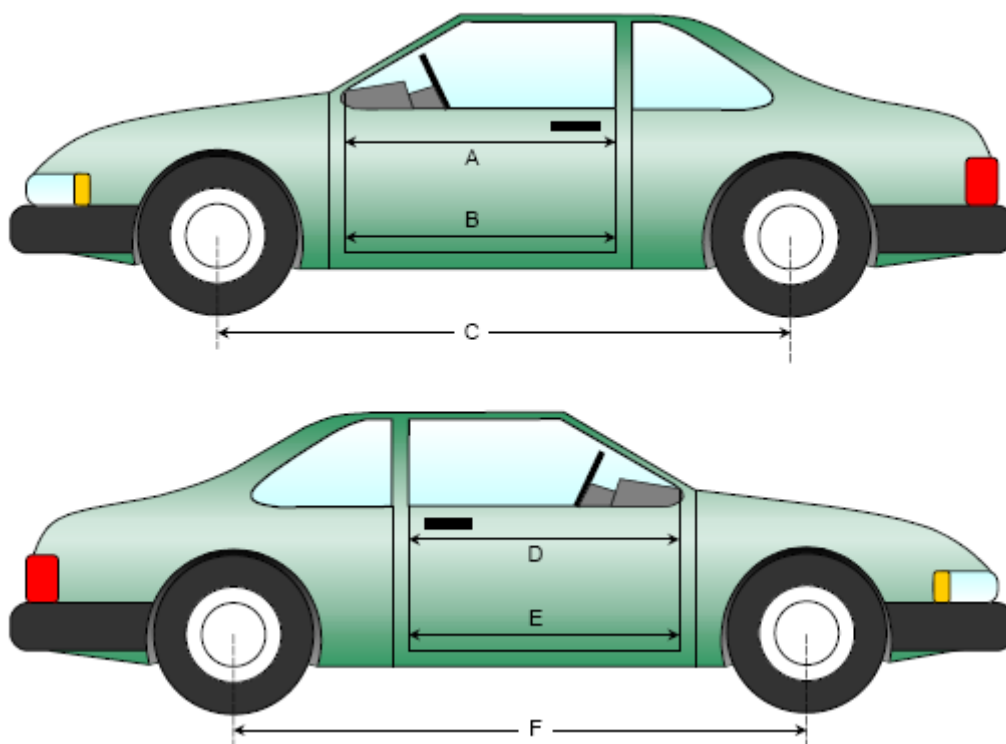
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush Zone 1 at Left Side	mm	382	520	138
C2	Crush Zone 2 at Left Side	mm	100	410	310
C3	Crush Zone 3 at Left Side	mm	23	360	337
C4	Crush Zone 4 at Right Side	mm	23	365	342
C5	Crush Zone 5 at Right Side	mm	100	395	295
C6	Crush Zone 6 at Right Side	mm	382	510	128
L	C1 to C6	mm	1665		

DATA SHEET NO. 14**VEHICLE INTRUSION MEASUREMENTS**Test Vehicle: 2018 Ford Mustang 2-Door CoupeNHTSA No.: M20180214Test Program: 56.3 km/h Frontal Impact NCAP TestTest Date: 01/09/18**DOOR OPENING WIDTH**

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1220	1221	-1
B	Left Side Lower	mm	1096	1096	0
D	Right Side Upper	mm	1223	1221	2
E	Right Side Lower	mm	1051	1061	-10

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2720	2595	125
F	Right Side Wheelbase	mm	2720	2595	125



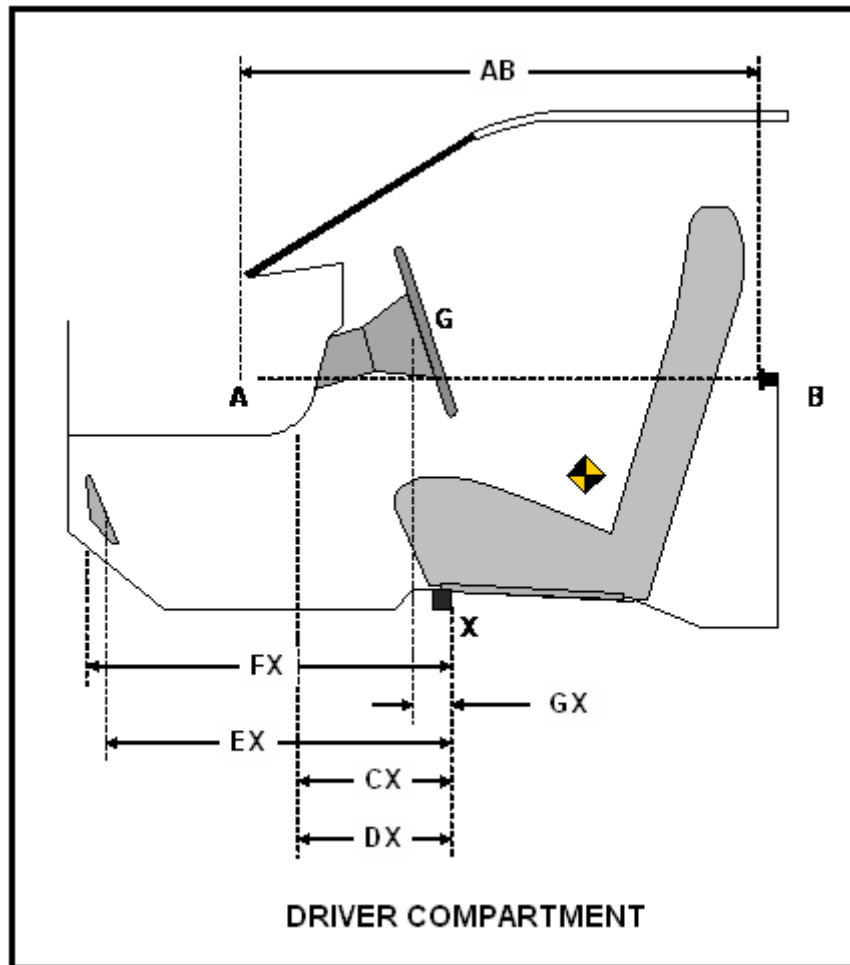
DATA SHEET NO. 14 ... (CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	1086	1081	5
CX	Left Knee Bolster to X	mm	350	390	-40
DX	Right Knee Bolster to X	mm	320	355	-35
EX	Brake Pedal to X	mm	560	555	5
FX	Foot Rest to X	mm	630	605	25
GX	Center of Steering Wheel Hub to X	mm	75	65	10

X = Front of Seat Track (Stationary)



DATA SHEET NO. 15

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

Test Vehicle: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214

Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

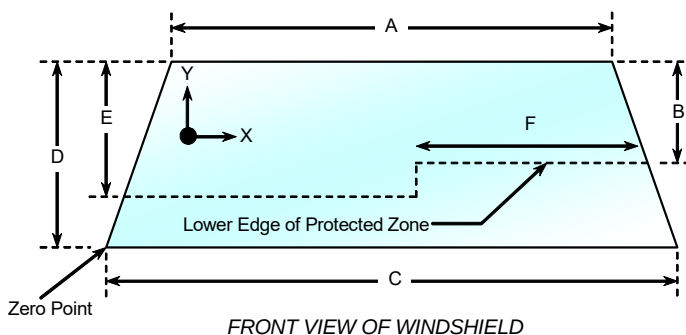
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber cement.

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: 21.1° C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% Retention
Left Side	2203	2203	100.0%
Right Side	2203	2203	100.0%
Total	4406	4406	100.0%



Item	Units	Value
A	mm	1246
B	mm	330
C	mm	1540
D	mm	810
E	mm	330
F	mm	590

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: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 11.1° C Test Time: 1:30 PM

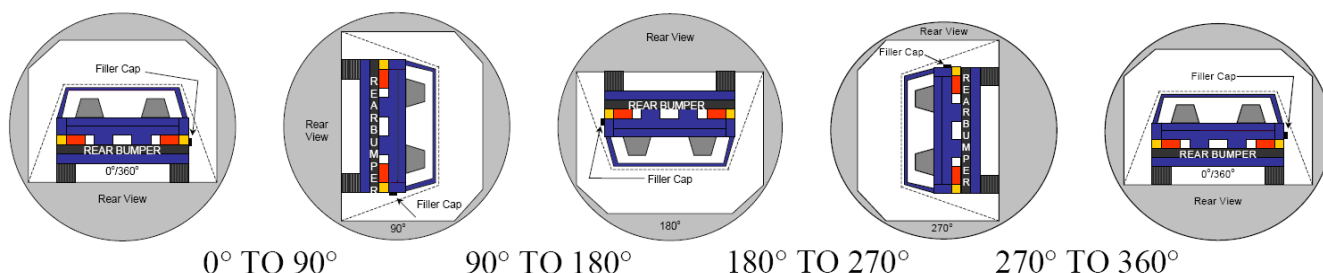
Stoddard Solvent Spillage Measurements

- 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: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
 Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18



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°	81	300	381
180° To 270°	75	300	375
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			

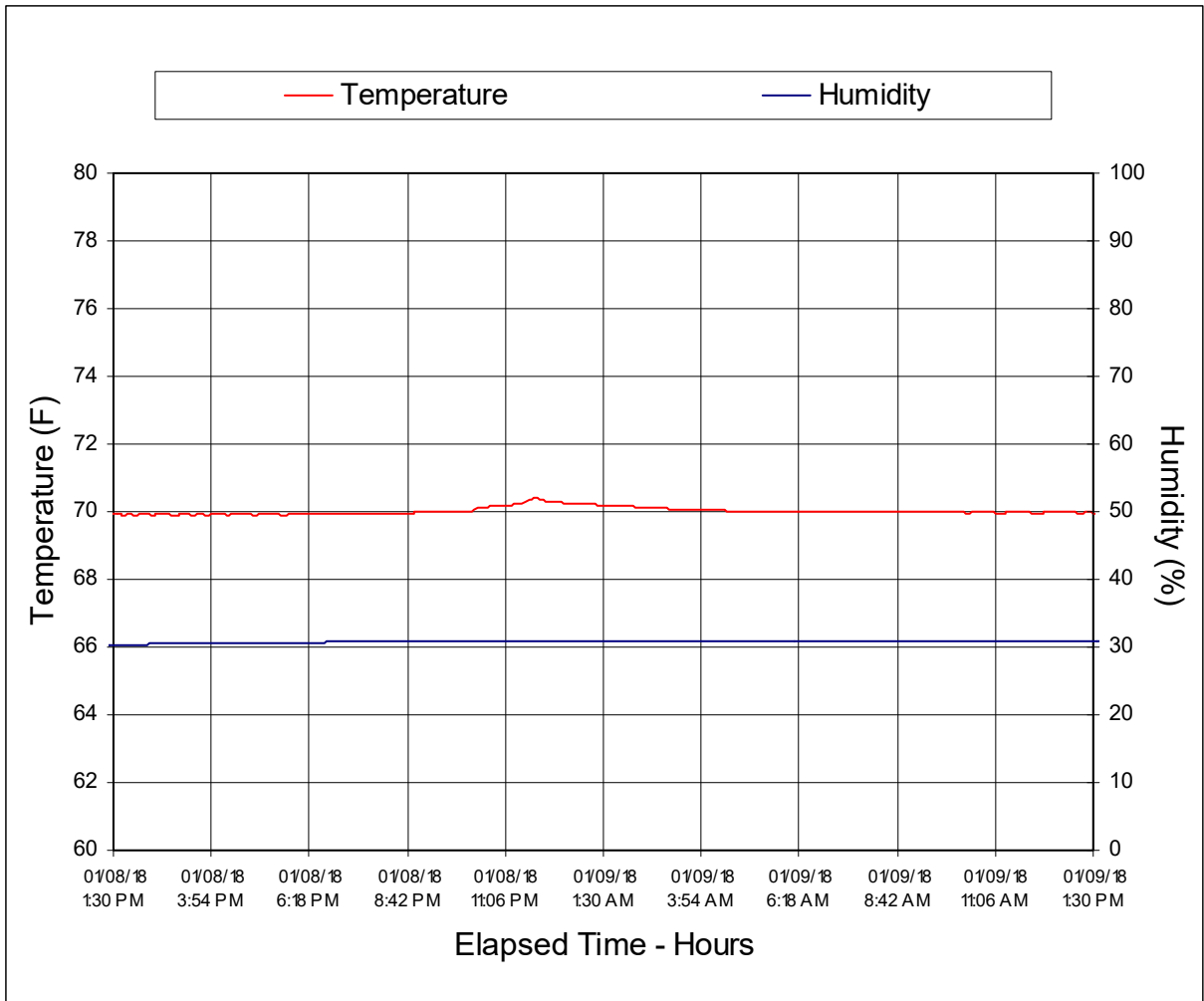
SOLVENT SPILLAGE LOCATION TABLE

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: 2018 Ford Mustang 2-Door Coupe NHTSA No.: M20180214
Test Program: 56.3 km/h Frontal Impact NCAP Test Test Date: 01/09/18



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure		Page
1	Load Cell Location	A-1
2	Pre-Test Load Cell Wall	A-1
3	Post-Test Load Cell Wall	A-2
4	Manufacturer's Label	A-2
5	Tire Placard	A-3
6	2018 Ford Mustang Frontal as Delivered	A-3
7	Left Rear $\frac{3}{4}$ View, as Received	A-4
8	Pre-Test Front View of Test Vehicle	A-4
9	Post-Test Front View of Test Vehicle	A-5
10	Pre-Test Left View of Test Vehicle	A-5
11	Post-Test Left View of Test Vehicle	A-6
12	Pre-Test Right View of Test Vehicle	A-6
13	Post-Test Right View of Test Vehicle	A-7
14	Pre-Test Right Front $\frac{3}{4}$ View	A-7
15	Post-Test Right Front $\frac{3}{4}$ View	A-8
16	Pre-Test Left Rear $\frac{3}{4}$ View	A-8
17	Post-Test Left Rear $\frac{3}{4}$ View	A-9
18	Pre-Test Windshield View	A-9
19	Post-Test Windshield View	A-10
20	Pre-Test Engine Compartment View	A-10
21	Post-Test Engine Compartment View	A-11
22	Pre-Test Fuel Filler Cap View	A-11
23	Post-Test Fuel Filler Cap View	A-12
24	Pre-Test Front Underbody View	A-12
25	Post-Test Front Underbody View	A-13
26	Pre-Test Rear Underbody View	A-13
27	Post-Test Rear Underbody View	A-14
28	Pre-Test Dummy Cable Routing	A-14
29	Post-Test Dummy Cable Routing	A-15
30	Pre-Test Driver Dummy Front View	A-15
31	Post-Test Driver Dummy Front View	A-16
32	Pre-Test Driver Dummy Window View	A-16
33	Post-Test Driver Dummy Window View	A-17
34	Pre-Test Driver Dummy and Vehicle Interior View	A-17
35	Post-Test Driver Dummy and Vehicle Interior View	A-18
36	Pre-Test Driver's Seat Fore-Aft Markings	A-18

TABLE OF PHOTOGRAPHS ... (CONTINUED)

Figure		Page
37	Post-Test Driver's Seat Fore-Aft Markings	A-19
38	Pre-Test View of Belt Anchorage for Driver Dummy	A-19
39	Post-Test View of Belt Anchorage for Driver Dummy	A-20
40	Pre-Test Driver Dummy Feet	A-20
41	Post-Test Driver Dummy Feet	A-21
42	Pre-Test Driver's Side Knee Bolster	A-21
43	Post-Test Driver's Side Knee Bolster	A-22
44	Pre-Test Driver's Side Floorpan	A-22
45	Post-Test Driver's Side Floorpan	A-23
46	Post-Test Driver Dummy Face	A-23
47	Post-Test Driver Dummy Contact with Airbag	A-24
48	Post-Test Driver Dummy Contact with Headrest	A-24
48a	Post-Test Driver Dummy Contact with Knee Airbag	A-25
49	Pre-Test View of the Steering Wheel	A-25
50	Post-Test View of the Steering Wheel	A-26
51	Pre-Test Passenger Dummy Front View	A-26
52	Post-Test Passenger Dummy Front View	A-27
53	Pre-Test Passenger Dummy Window View	A-27
54	Post-Test Passenger Dummy Window View	A-28
55	Pre-Test Passenger Dummy and Vehicle Interior View	A-28
56	Post-Test Passenger Dummy and Vehicle Interior View	A-29
57	Pre-Test Passenger's Seat Fore-Aft Markings	A-29
58	Post-Test Passenger's Seat Fore-Aft Markings	A-30
59	Pre-Test View of Belt Anchorage for Passenger Dummy	A-30
60	Post-Test View of Belt Anchorage for Passenger Dummy	A-31
61	Pre-Test Passenger Dummy Feet	A-31
62	Post-Test Passenger Dummy Feet	A-32
63	Pre-Test Passenger's Side Knee Bolster	A-32
64	Post-Test Passenger's Side Knee Bolster	A-33
65	Pre-Test Passenger's Side Floorpan	A-33
66	Post-Test Passenger's Side Floorpan	A-34
67	Post-Test Passenger Dummy Face	A-34
68	Post-Test Passenger Dummy Contact with Airbag	A-35
69	Post-Test Passenger Dummy Contact with Headrest	A-35
69a	Post-Test Passenger Dummy Contact with Knee Bolster	A-36
70	Photograph of Ballast Installed in Vehicle	A-36

TABLE OF PHOTOGRAPHS ... (CONTINUED)

Figure		Page
71	Post-Test Stoddard Solvent Spillage Location View	A-37
72	Post-Test Speed Trap Read-Out	A-37
73	Vehicle at 0° on Static Rollover Device	A-38
74	Vehicle at 90° on Static Rollover Device	A-38
75	Vehicle at 180° on Static Rollover Device	A-39
76	Vehicle at 270° on Static Rollover Device	A-39
77	Vehicle at 360° on Static Rollover Device	A-40
78	2018 Ford Mustang Frontal Impact Event	A-40
79	Monroney Label Photograph	A-41

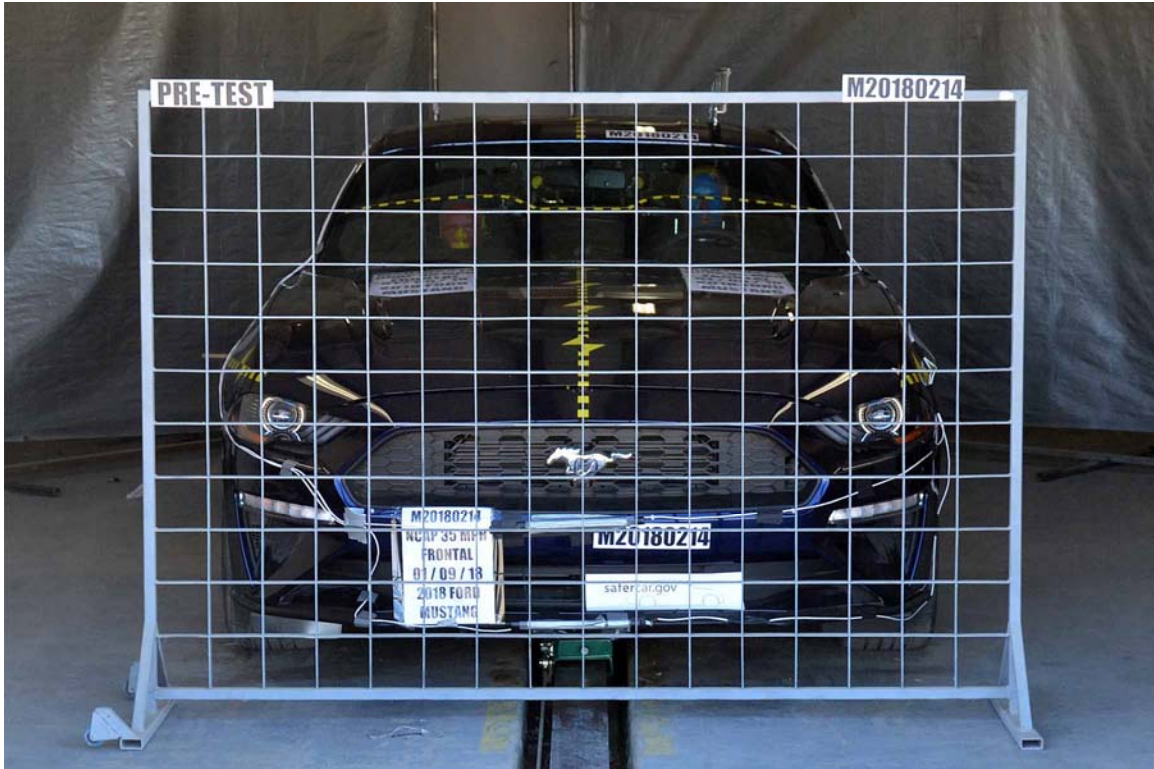


FIGURE 1. Load Cell Location

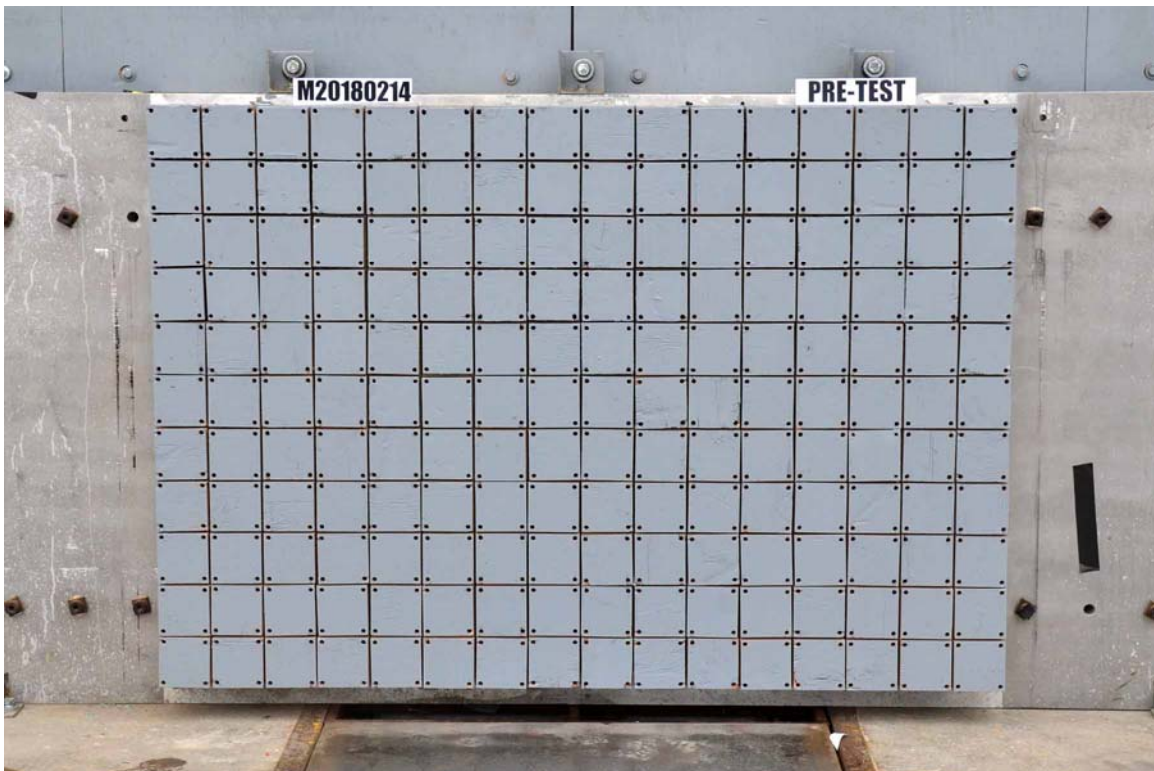


FIGURE 2. Pre-Test Load Cell Wall



FIGURE 3. Post-Test Load Cell Wall



FIGURE 4. Manufacturer's Label

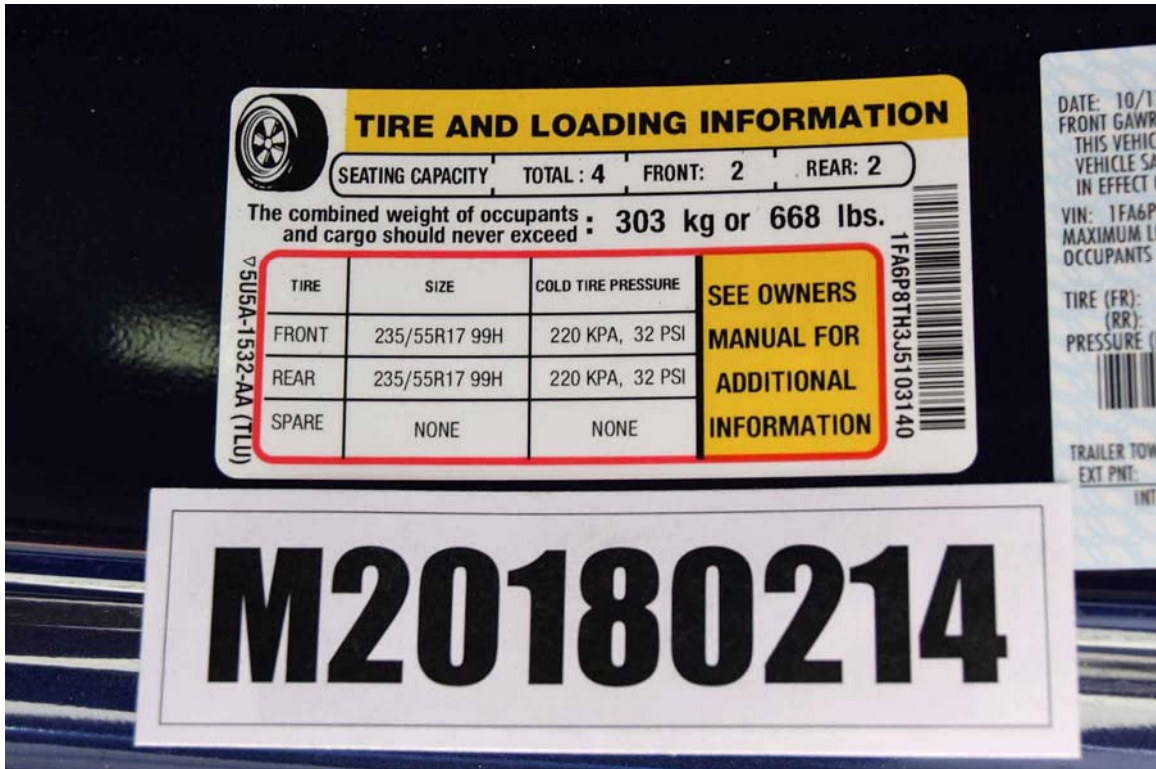


FIGURE 5. Tire Placard



FIGURE 6. 2018 Ford Mustang 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 ¾ 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

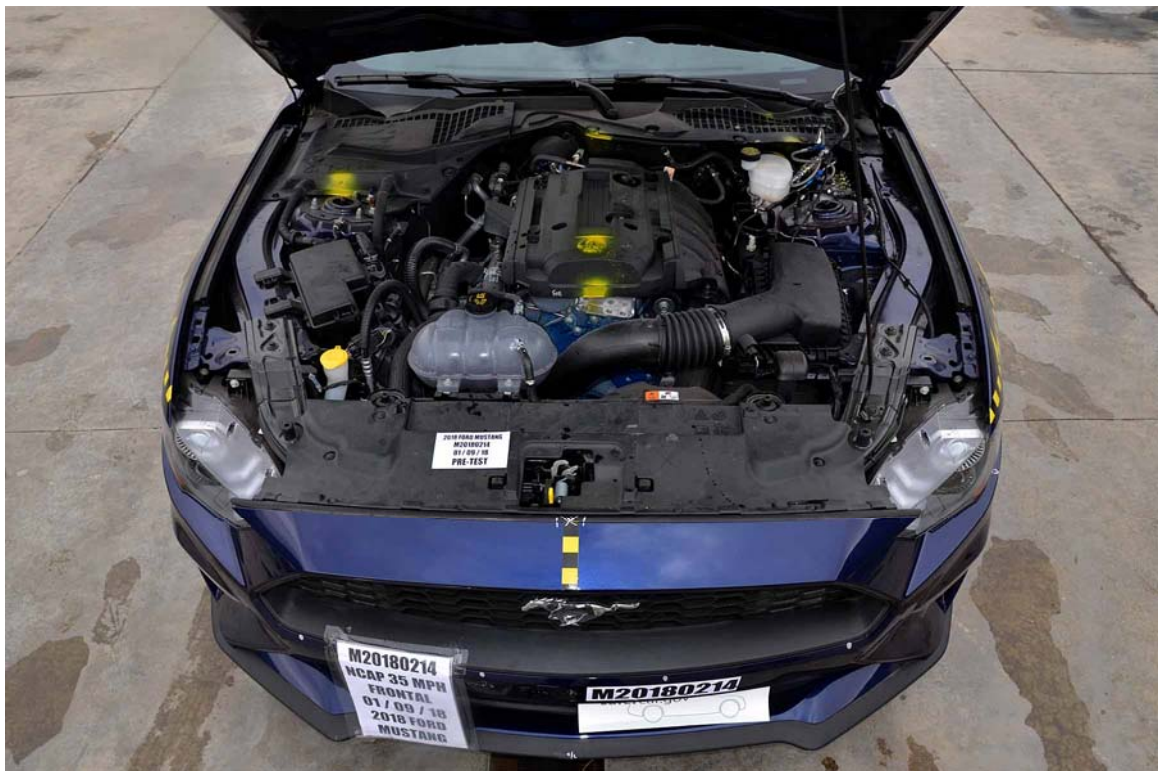


FIGURE 20. Pre-Test Engine Compartment View



FIGURE 21. Post-Test Engine Compartment View



FIGURE 22. Pre-Test Fuel Filler Cap View



FIGURE 23. Post-Test Fuel Filler Cap View

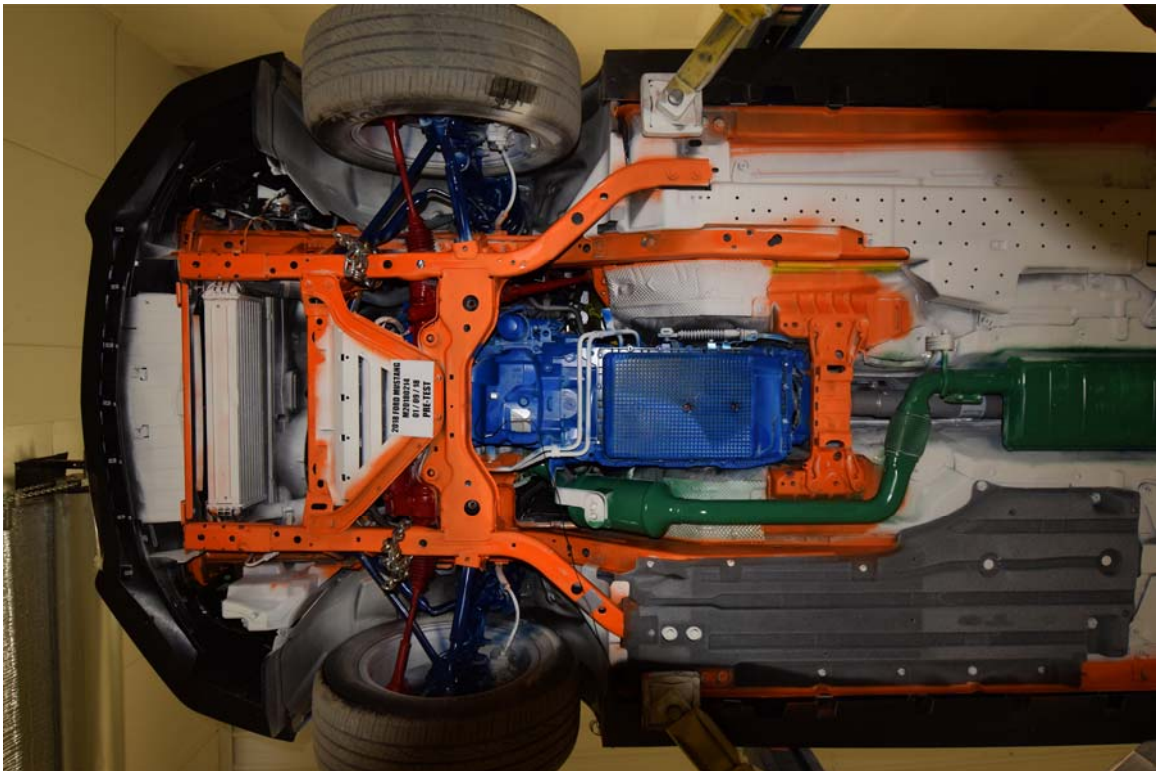


FIGURE 24. Pre-Test Front Underbody View

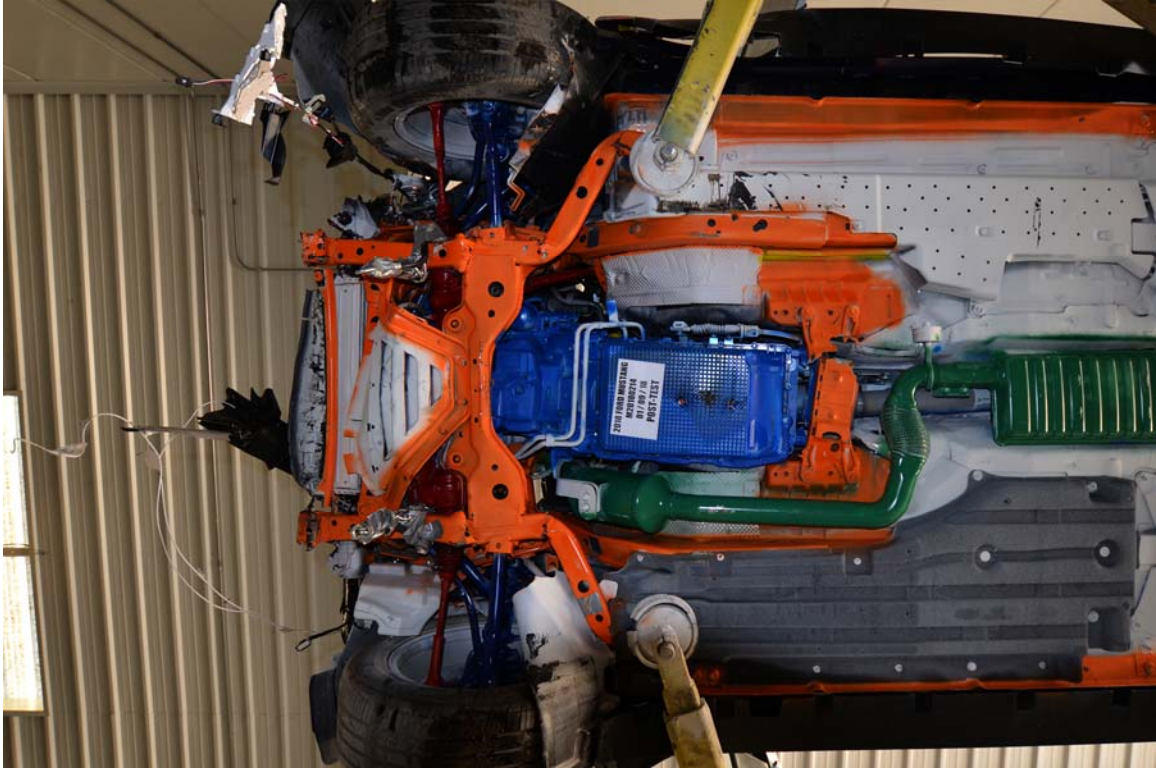


FIGURE 25. Post-Test Front Underbody View



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

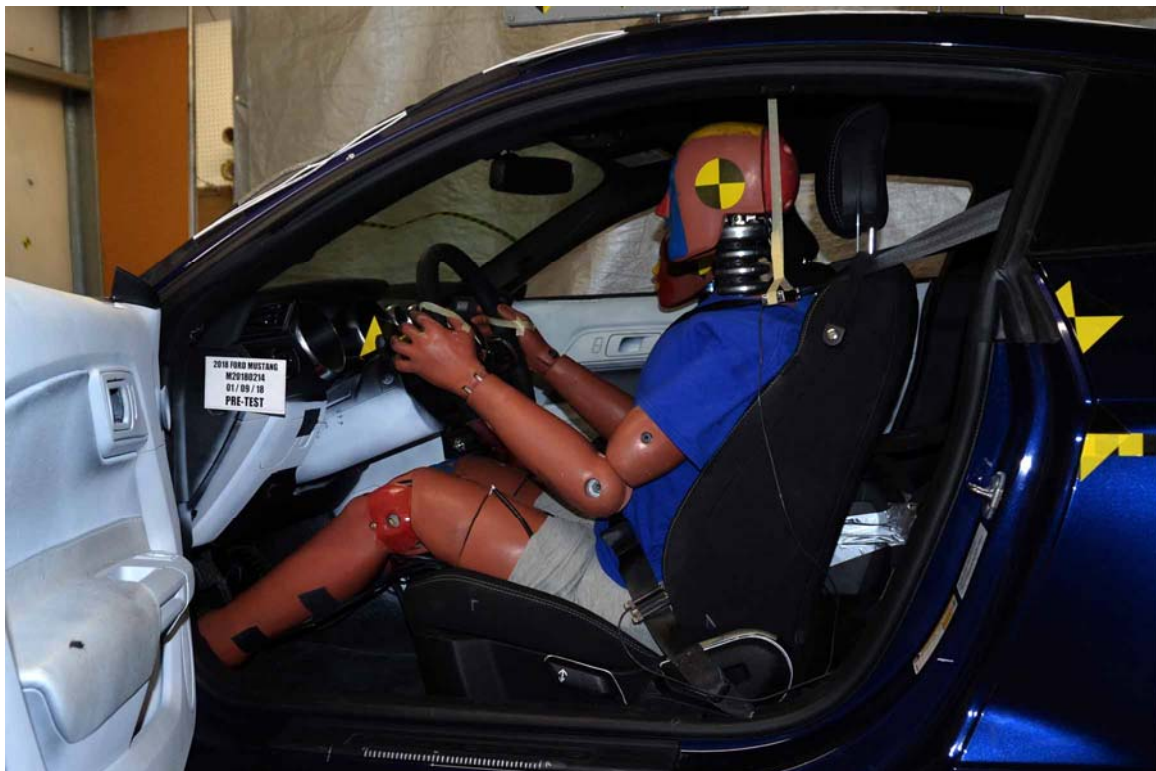


FIGURE 34. Pre-Test Driver Dummy and Vehicle Interior View



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 Bolster

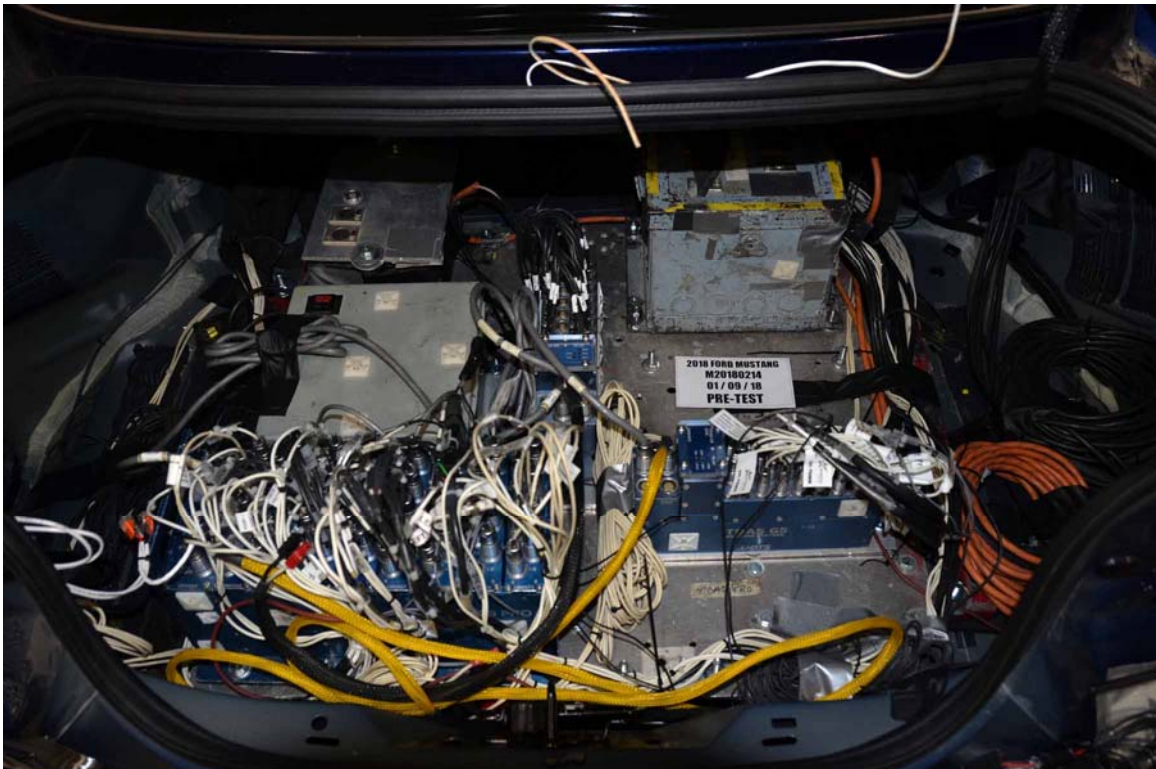


FIGURE 70. Photograph of Ballast Installed in Vehicle

Photograph Not Applicable

No Stoddard Solvent Spillage

FIGURE 71. Post-Test Stoddard Solvent Spillage Location View



FIGURE 72. Post-Test Speed Trap Read-Out

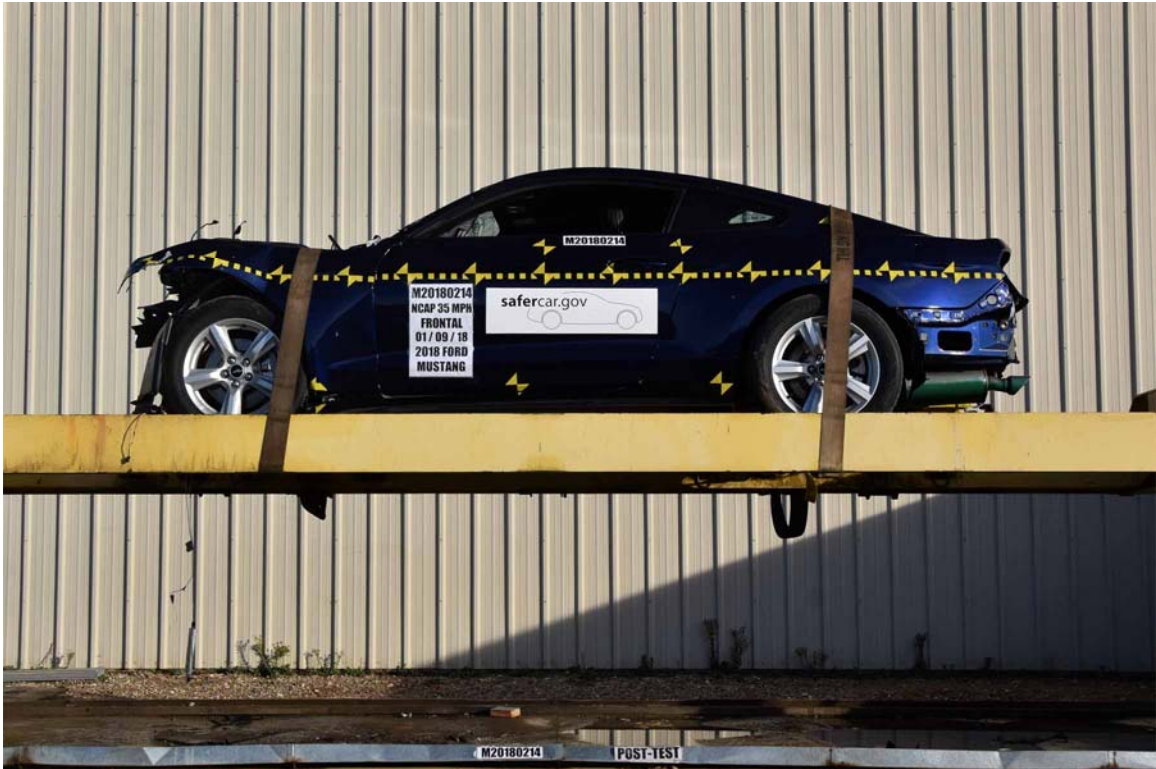


FIGURE 73. Vehicle at 0° on Static Rollover Device

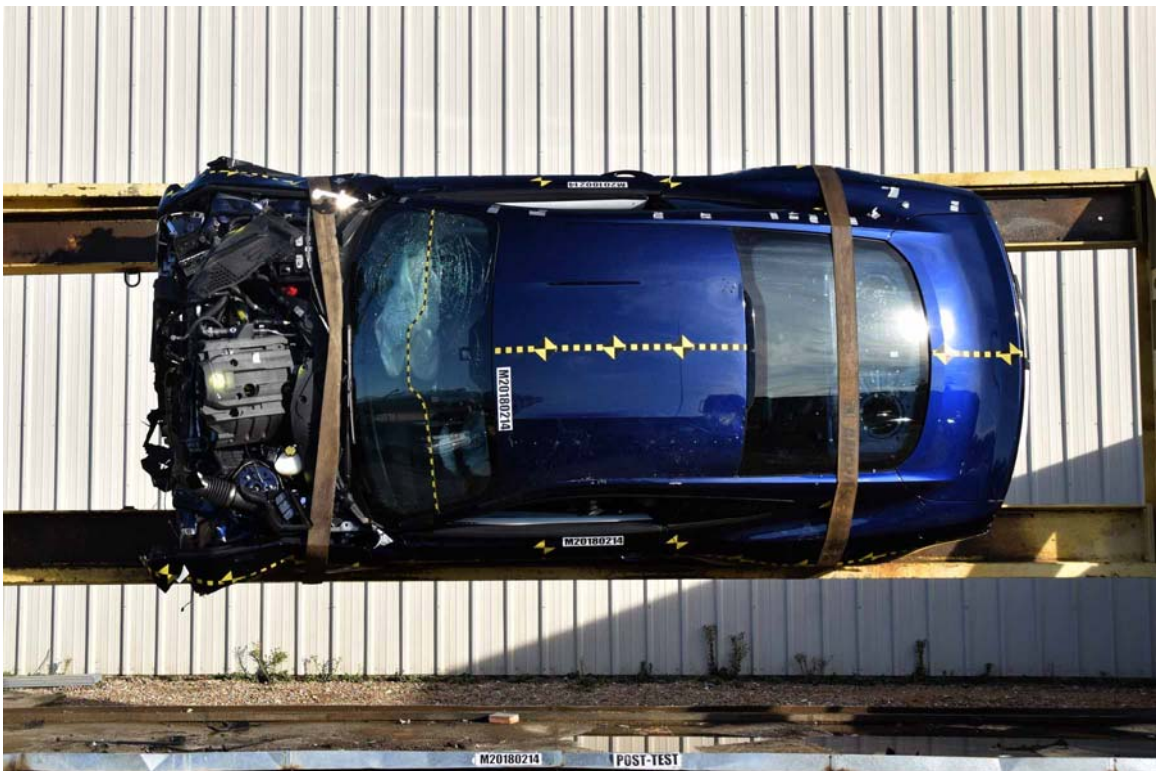


FIGURE 74. Vehicle at 90° on Static Rollover Device

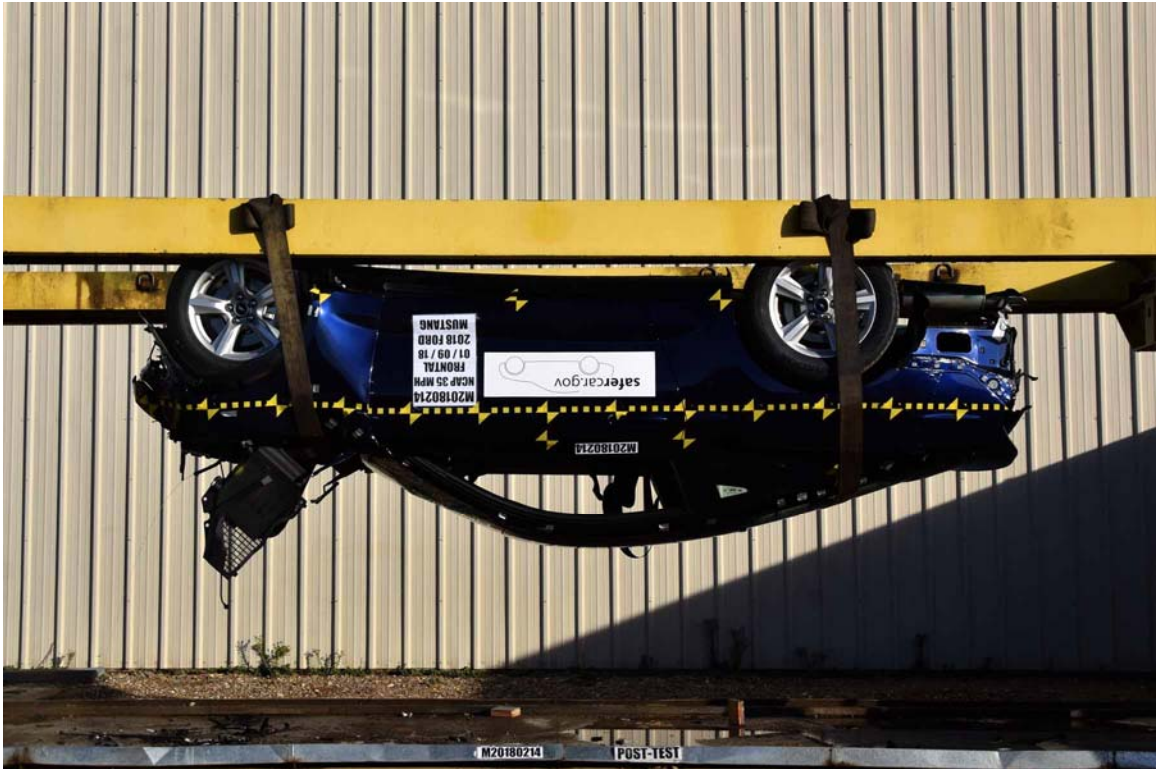


FIGURE 75. Vehicle at 180° on Static Rollover Device

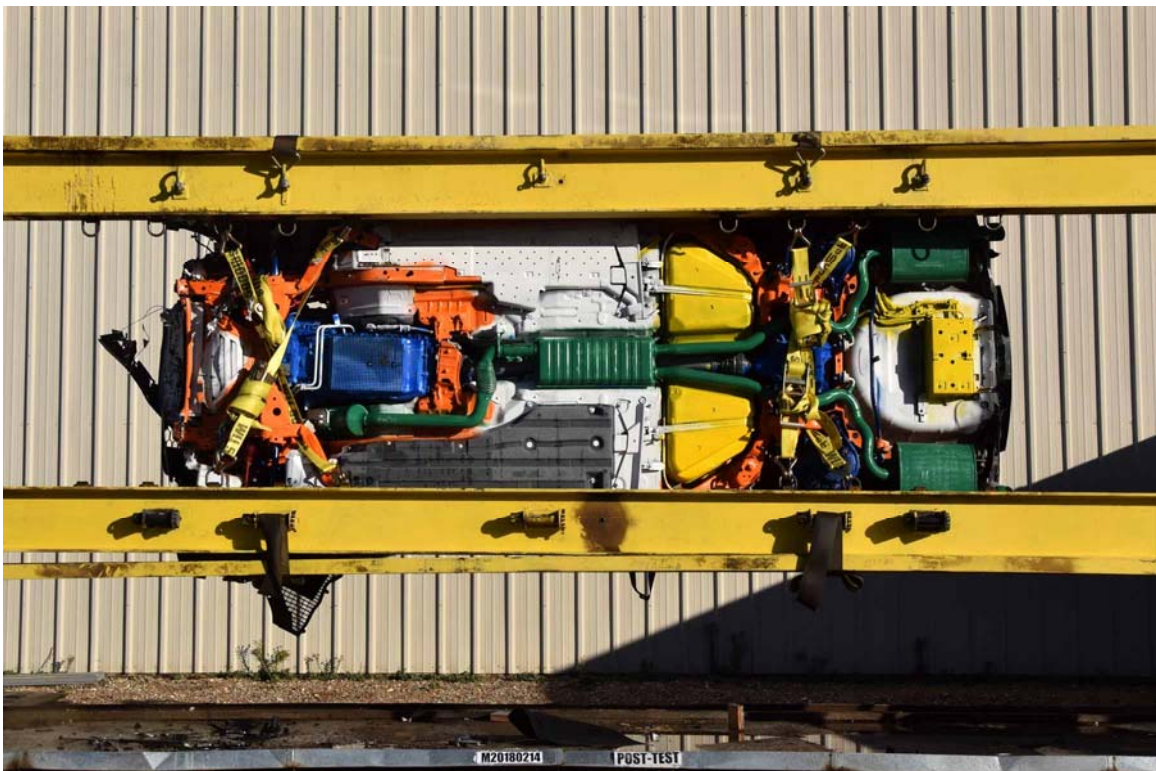


FIGURE 76. Vehicle at 270° on Static Rollover Device

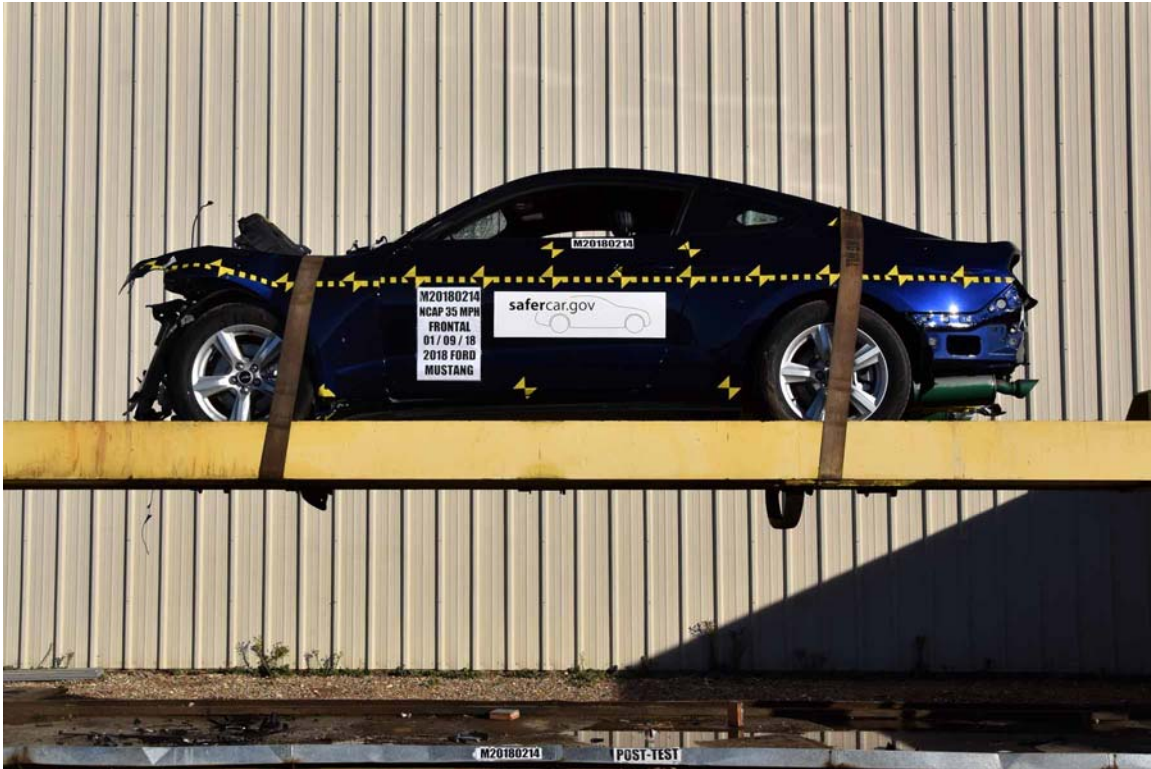


FIGURE 77. Vehicle at 360° on Static Rollover Device



FIGURE 78. 2018 Ford Mustang Frontal Impact Event

APPENDIX B
DUMMY RESPONSE DATA TRACES

TABLE OF DATA PLOTS

Plot		Page
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

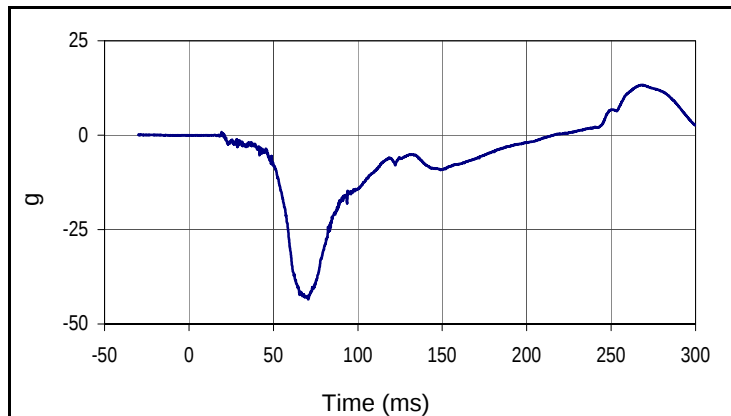
The following additional dummy and vehicle response data can be found in the R&D section of the NHTSA website at www.nhtsa.dot.gov

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

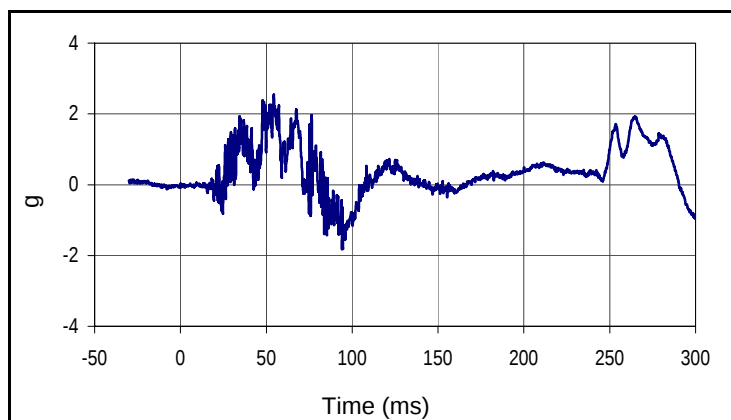
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Left Femur Force Redundant
Passenger Right Femur Force Redundant
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Left Upper Tibia Force Z
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia 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: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

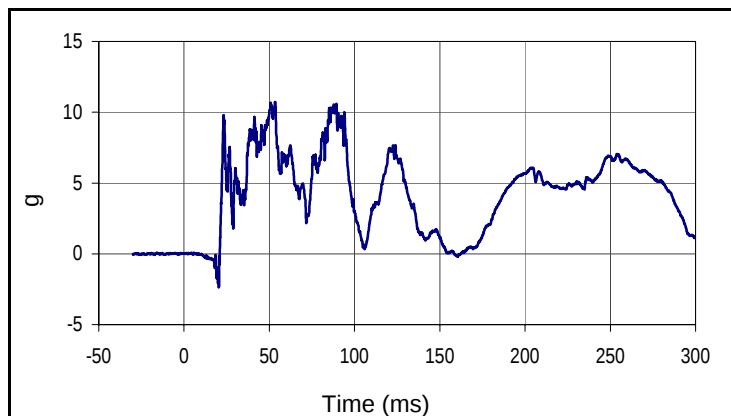
NHTSA No.: M20180214
 Test Date: 1/9/18



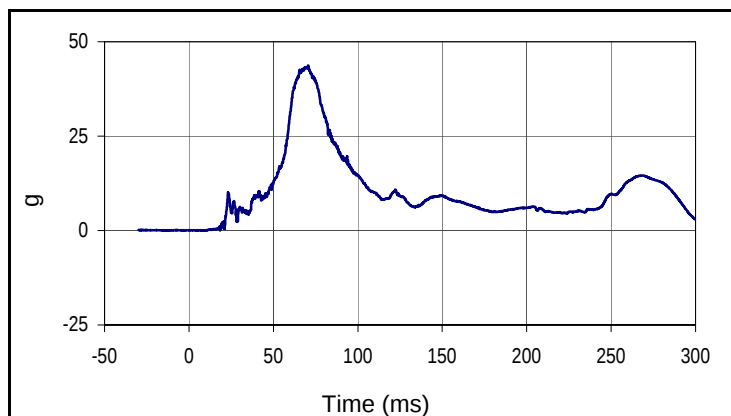
Curve Description			
Driver Head Acceleration X Primary			
Plot No.		SAE Class	Units
001		1000	g
Max	Time	Min	Time
13.3	267.8	-43.5	70.6



Curve Description			
Driver Head Acceleration Y Primary			
Plot No.		SAE Class	Units
002		1000	g
Max	Time	Min	Time
2.5	54.3	-1.8	94.1



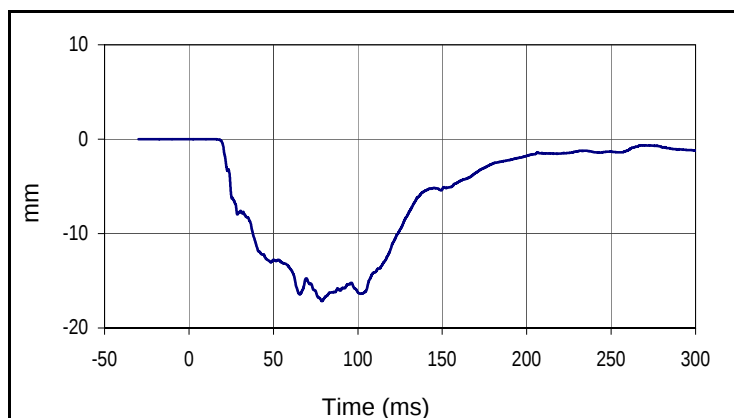
Curve Description			
Driver Head Acceleration Z Primary			
Plot No.		SAE Class	Units
003		1000	g
Max	Time	Min	Time
10.7	53.4	-2.3	20.4



Curve Description			
Driver Head Resultant Acceleration Primary			
Plot No.		SAE Class	Units
004		1000	g
Max	Time	Min	Time
43.7	70.6	0.0	10.2

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

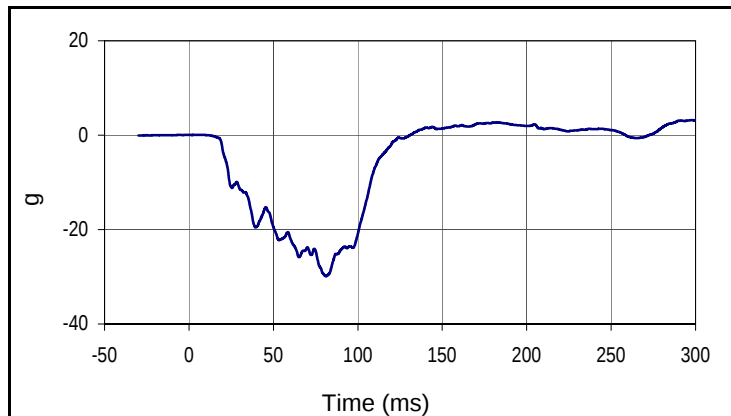
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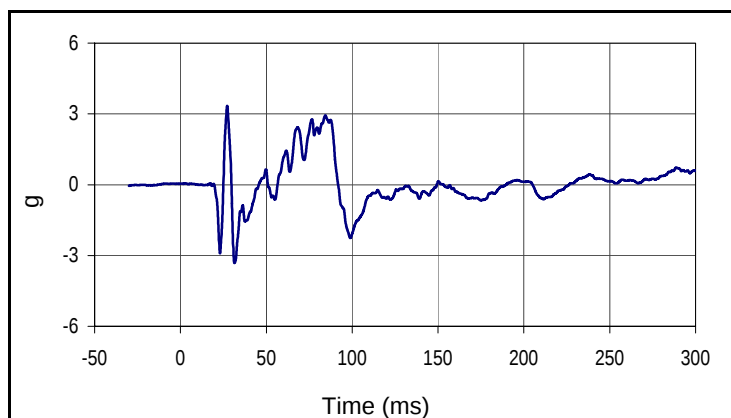
Curve Description			
Driver Chest Deflection			
Plot No.		SAE Class	Units
005		600	mm
Max	Time	Min	Time
0.0	12.7	-17.2	78.8

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

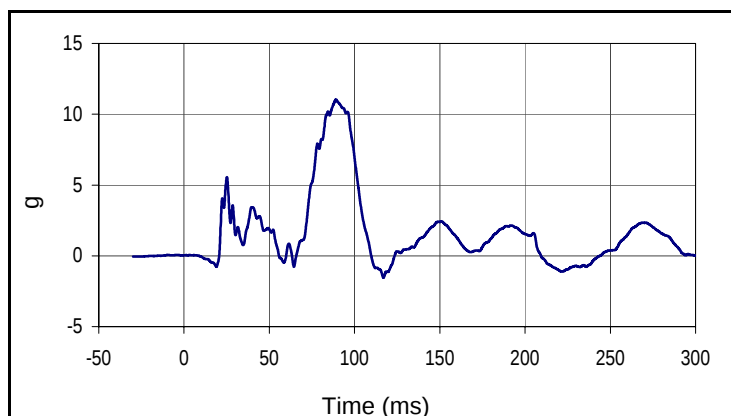
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 Test Date: 1/9/18



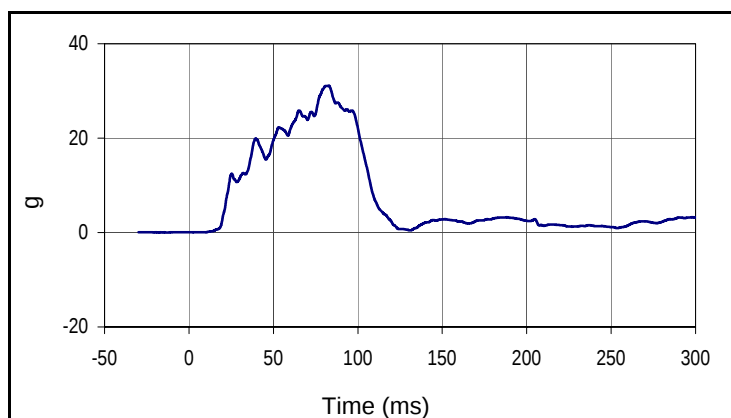
Curve Description			
Driver Chest Acceleration X Primary			
Plot No.		SAE Class	Units
006		180	g
Max	Time	Min	Time
3.2	298.1	-29.9	81.1



Curve Description			
Driver Chest Acceleration Y Primary			
Plot No.		SAE Class	Units
007		180	g
Max	Time	Min	Time
3.3	27.2	-3.3	31.5



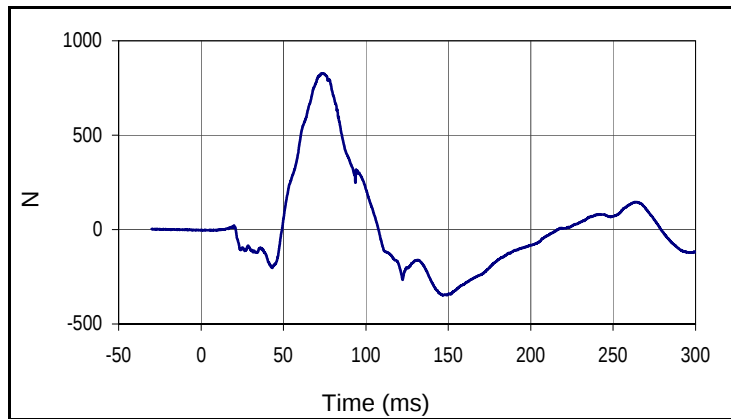
Curve Description			
Driver Chest Acceleration Z Primary			
Plot No.		SAE Class	Units
008		180	g
Max	Time	Min	Time
11.0	89.1	-1.5	117.0



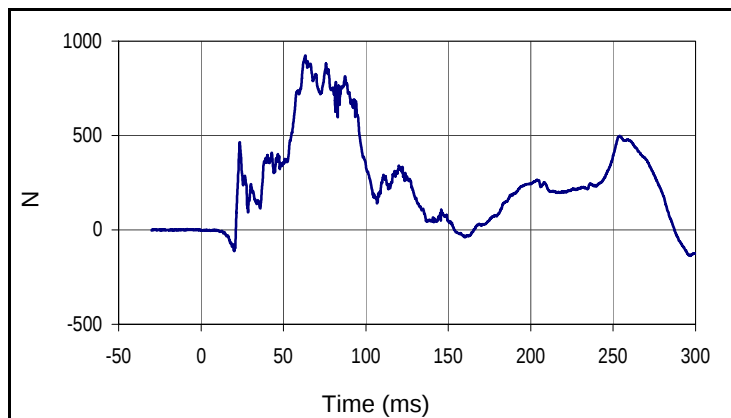
Curve Description			
Driver Chest Resultant Acceleration Primary			
Plot No.		SAE Class	Units
009		180	g
Max	Time	Min	Time
31.1	82.8	0.1	9.6

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

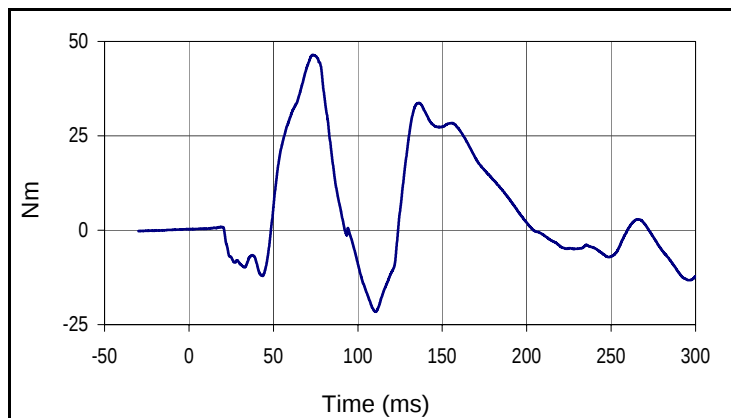
NHTSA No.: M20180214
 Test Date: 1/9/18



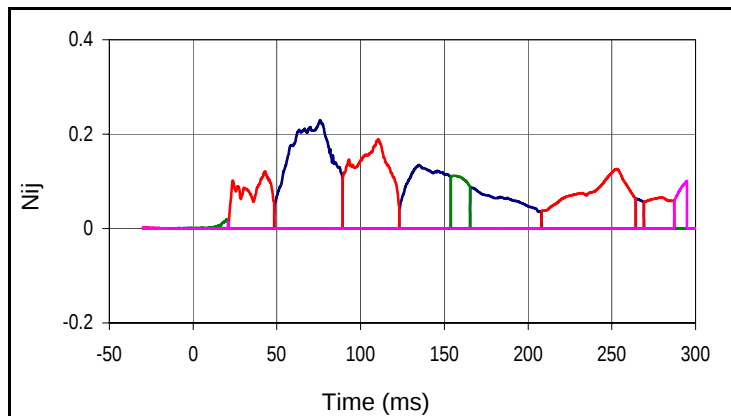
Curve Description			
Driver Upper Neck Force X			
Plot No.		SAE Class	Units
010		1000	N
Max	Time	Min	Time
826.9	74.6	-348.8	146.7



Curve Description			
Driver Upper Neck Force Z			
Plot No.		SAE Class	Units
011		1000	N
Max	Time	Min	Time
923.9	63.2	-136.8	296.8



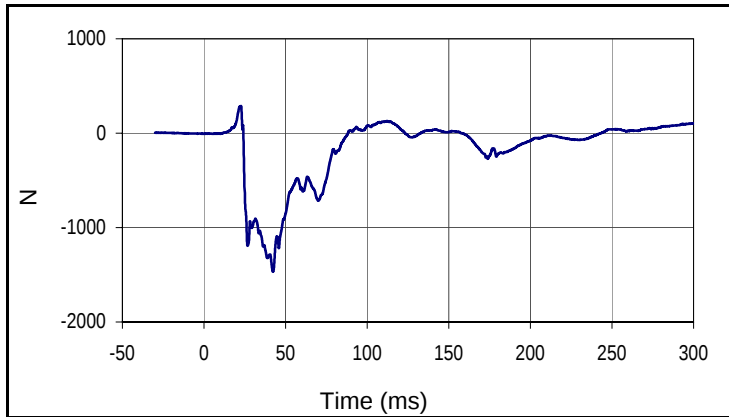
Curve Description			
Driver Upper Neck Moment Y			
Plot No.		SAE Class	Units
012		600	Nm
Max	Time	Min	Time
46.4	73.2	-21.6	110.6



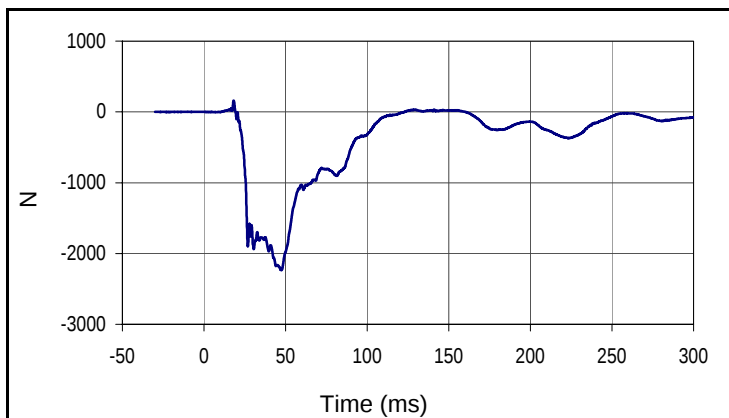
Curve Description		
Driver Nij		
Units	Max	Time
Ntf	0.23	75.9
Units	Max	Time
Nte	0.19	110.7
Units	Max	Time
Ncf	0.11	156.4
Units	Max	Time
Nce	0.10	294.8

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

NHTSA No.: M20180214
 Test Date: 1/9/18



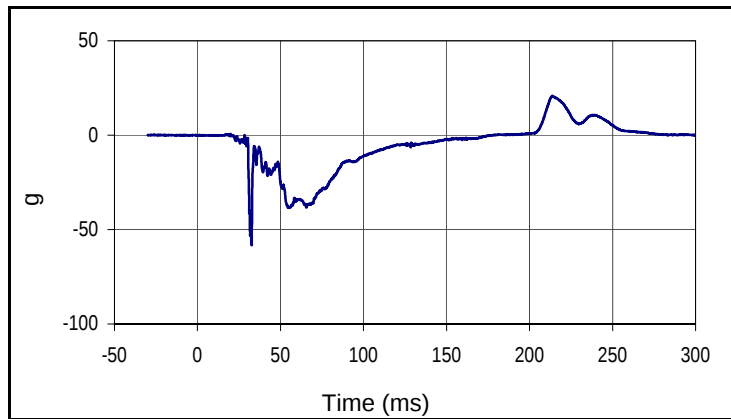
Curve Description			
Driver Left Femur Force Z			
Plot No.		SAE Class	Units
014		600	N
Max	Time	Min	Time
287.7	22.7	-1466.3	42.2



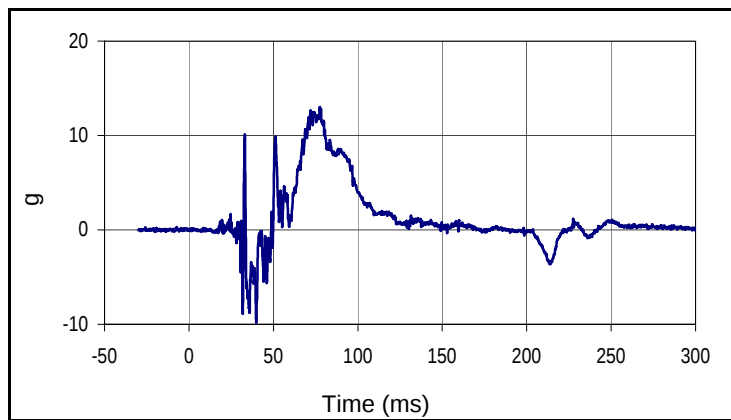
Curve Description			
Driver Right Femur Force Z			
Plot No.		SAE Class	Units
015		600	N
Max	Time	Min	Time
160.4	18.2	-2234.1	47.5

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

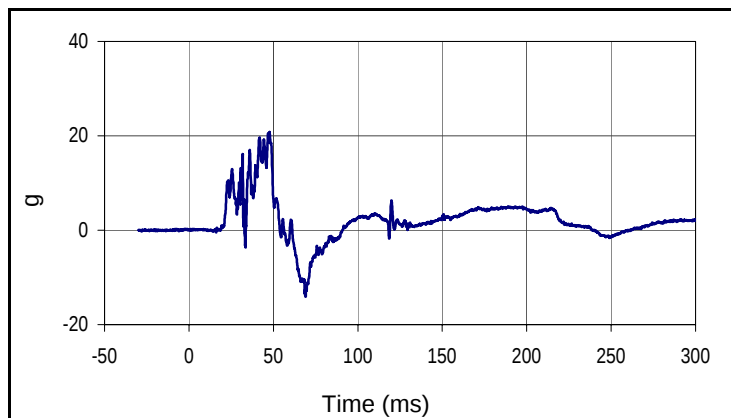
NHTSA No.: M20180214
 Test Date: 1/9/18



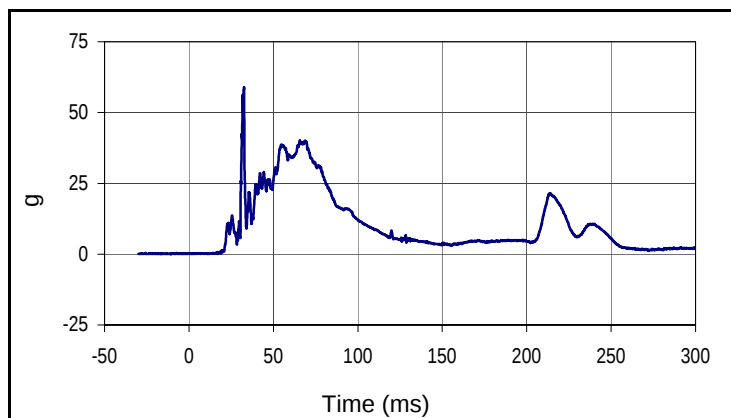
Curve Description			
Passenger Head Acceleration X Primary			
Plot No.		SAE Class	Units
016		1000	g
Max	Time	Min	Time
20.8	213.7	-58.3	32.6



Curve Description			
Passenger Head Acceleration Y Primary			
Plot No.		SAE Class	Units
017		1000	g
Max	Time	Min	Time
13.0	77.5	-9.8	39.9



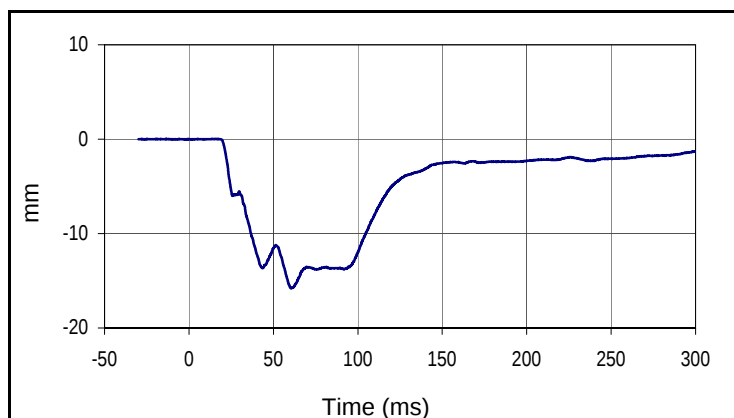
Curve Description			
Passenger Head Acceleration Z Primary			
Plot No.		SAE Class	Units
018		1000	g
Max	Time	Min	Time
20.8	47.7	-14.1	69.0



Curve Description			
Passenger Head Resultant Acceleration Primary			
Plot No.		SAE Class	Units
019		1000	g
Max	Time	Min	Time
58.9	32.6	0.0	4.0

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

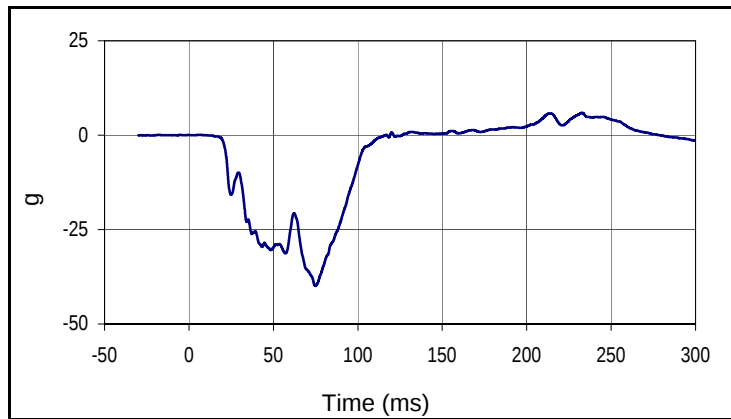
NHTSA No.: M20180214
 Test Date: 1/9/18



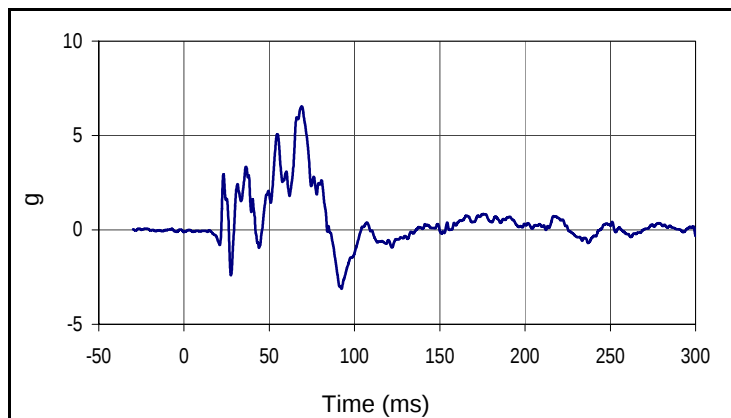
Curve Description			
Passenger Chest Deflection			
Plot No.		SAE Class	Units
020		600	mm
Max	Time	Min	Time
0.0	17.2	-15.8	60.4

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

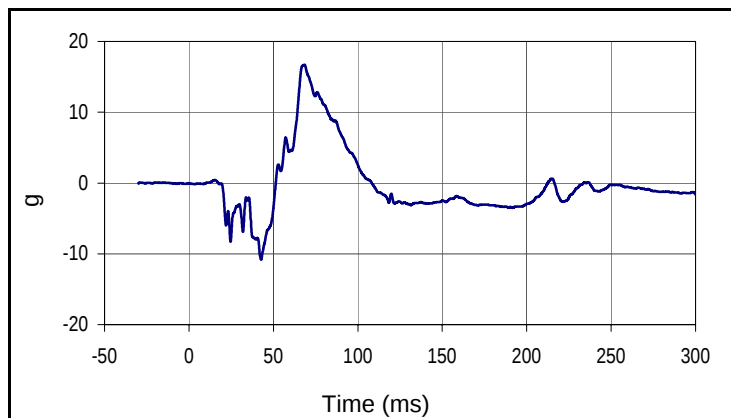
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 Test Date: 1/9/18



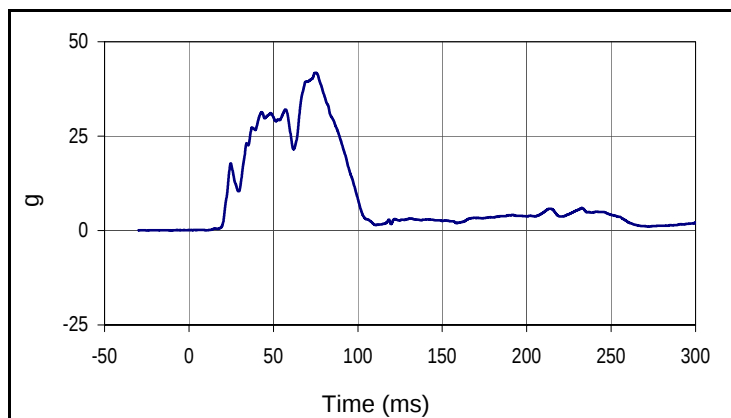
Curve Description			
Passenger Chest Acceleration X Primary			
Plot No.		SAE Class	Units
021		180	g
Max	Time	Min	Time
6.0	232.7	-39.9	74.8



Curve Description			
Passenger Chest Acceleration Y Primary			
Plot No.		SAE Class	Units
022		180	g
Max	Time	Min	Time
6.5	69.0	-3.1	92.4



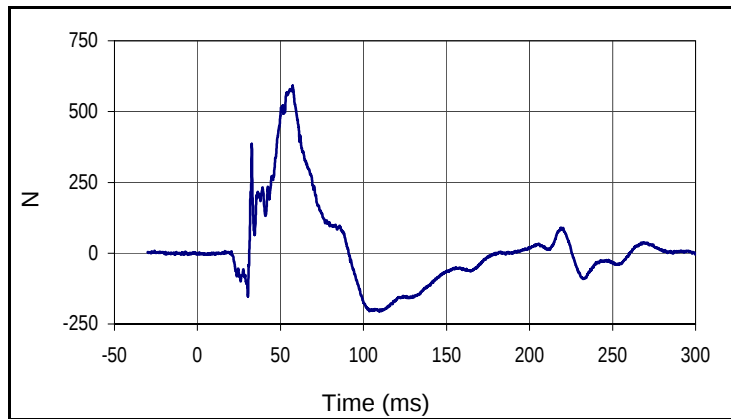
Curve Description			
Passenger Chest Acceleration Z Primary			
Plot No.		SAE Class	Units
023		180	g
Max	Time	Min	Time
16.7	68.5	-10.8	42.8



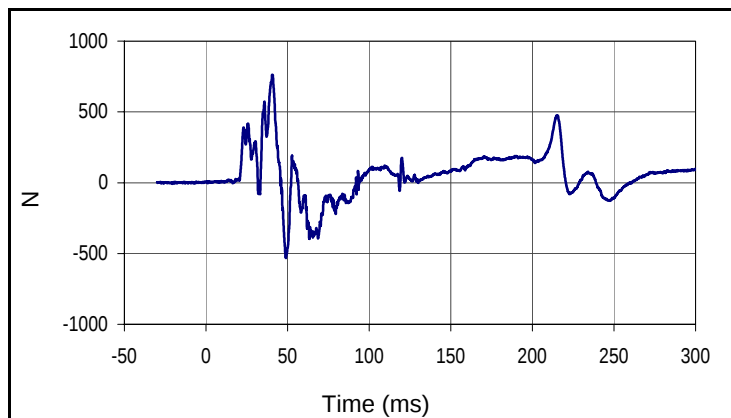
Curve Description			
Passenger Chest Resultant Acceleration Primary			
Plot No.		SAE Class	Units
024		180	g
Max	Time	Min	Time
41.8	74.9	0.1	10.1

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

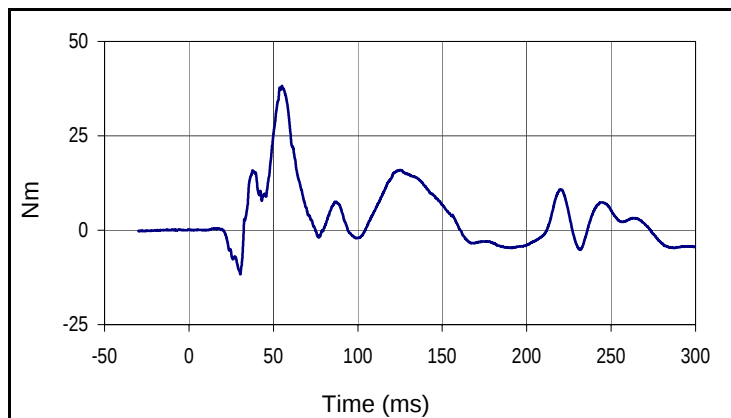
NHTSA No.: M20180214
 Test Date: 1/9/18



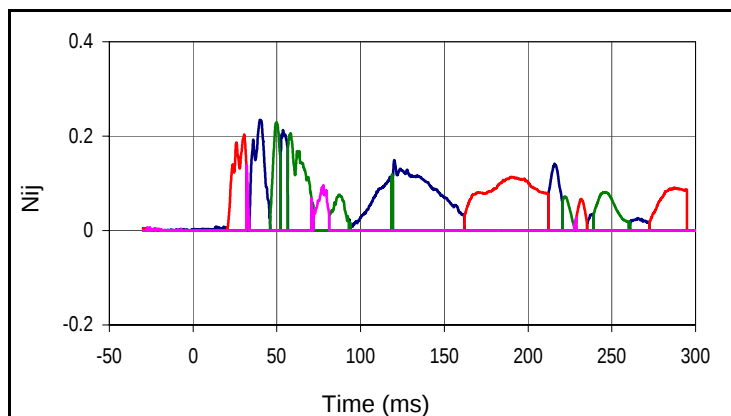
Curve Description			
Passenger Upper Neck Force X			
Plot No.		SAE Class	Units
025		1000	N
Max	Time	Min	Time
591.9	57.4	-206.7	109.5



Curve Description			
Passenger Upper Neck Force Z			
Plot No.		SAE Class	Units
026		1000	N
Max	Time	Min	Time
762.9	40.6	-531.2	49.0



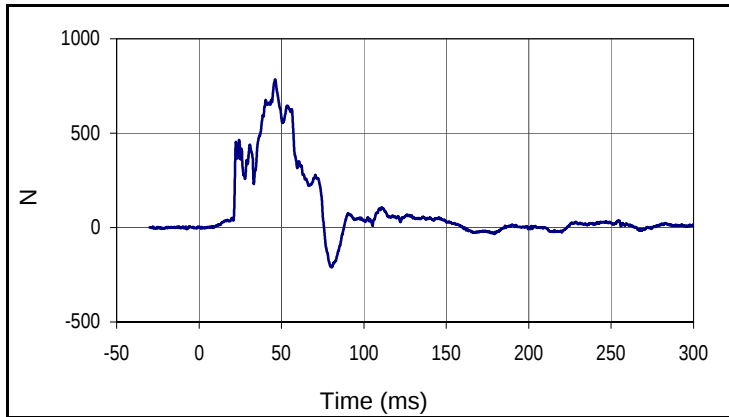
Curve Description			
Passenger Upper Neck Moment Y			
Plot No.		SAE Class	Units
027		600	Nm
Max	Time	Min	Time
38.2	55.0	-11.7	30.4



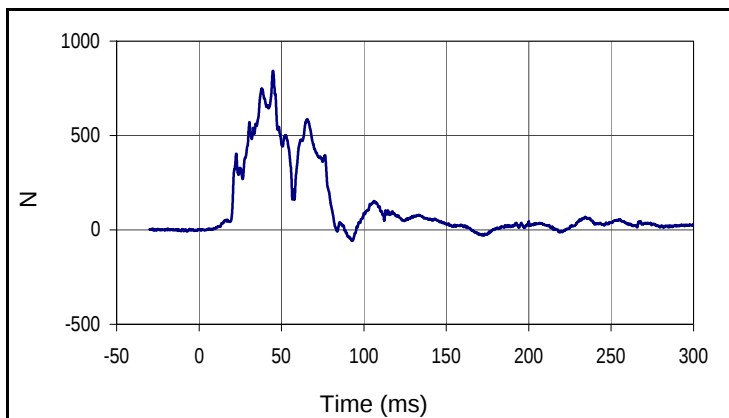
Curve Description		
Passenger Nij		
Units	Max	Time
Ntf	0.23	39.9
Units	Max	Time
Nte	0.20	30.6
Units	Max	Time
Ncf	0.23	49.8
Units	Max	Time
Nce	0.14	32.0

Test Vehicle: 2018 Ford Mustang 2-Door Coupe
 Test Program: 56 km/h Frontal Impact NCAP Test

NHTSA No.: M20180214
 Test Date: 1/9/18



Curve Description			
Passenger Left Femur Force Z			
Plot No.		SAE Class	Units
029		600	N
Max	Time	Min	Time
785.2	46.1	-210.2	80.6



Curve Description			
Passenger Right Femur Force Z			
Plot No.		SAE Class	Units
030		600	N
Max	Time	Min	Time
842.0	44.9	-57.2	92.7

APPENDIX C
ATD CALIBRATION AND PERFORMANCE VERIFICATION DATA

APPENDIX C
PRE-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA



**Hybrid III 50th Percentile Male
ATD Damage Checklist**

ATD Serial No.: 360

Test Date: 2017-12-16

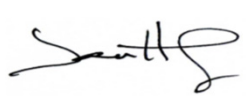
Dummy Item	Inspect for	Comments	Damage	Okay
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ.	Bent shaft			✓
Assembly	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer	Head mounting secure			✓
Mounting	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed	Pelvis Ax data anomaly	✗	

Describe any repairs or replacement of parts or other findings:

The Pelvis Ax responded correctly until late in the event. Post-test troubleshooting could not

isolate the issue to a wire or connection. The accelerometer is replaced and the suspect

accelerometer is quarantined

Technician: 

Approved By: 

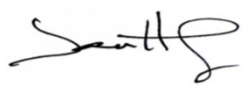


Hybrid III 50th Percentile Male
External Measurements

ATD Serial No.: 360

Test Date: 2017-12-18

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	29	Pass
A - Total sitting height	mm	879	889	886	Pass
B - Shoulder pivot height	mm	505	521	509	Pass
C - 'H' point height	mm	84	89	88	Pass
D - 'H' point location from backline	mm	135	140	138	Pass
E - Shoulder pivot from backline	mm	84	94	92	Pass
F - Thigh clearance	mm	140	155	152	Pass
G - Back of elbow to wrist pivot	mm	290	305	302	Pass
H - Head back to backline	mm	41	46	44	Pass
I - Shoulder to elbow length	mm	330	345	336	Pass
J - Elbow rest height	mm	190	211	204	Pass
K - Buttock to knee length	mm	579	604	596	Pass
L - Popliteal length	mm	429	455	434	Pass
M - Knee pivot height	mm	485	500	495	Pass
N - Buttock popliteal length	mm	452	477	473	Pass
O - Chest depth without jacket	mm	213	229	218	Pass
P - Foot length	mm	251	267	260	Pass
V - Shoulder breadth	mm	422	437	432	Pass
W - Foot breadth	mm	91	107	101	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	978	Pass
Z - Waist circum.	mm	836	866	844	Pass
AA - Location for chest circum.	mm	429	434	431	Pass
BB - Location for waist circum.	mm	226	231	231	Pass
Overall Test Results				Pass	

Technician: 

Approved By: 



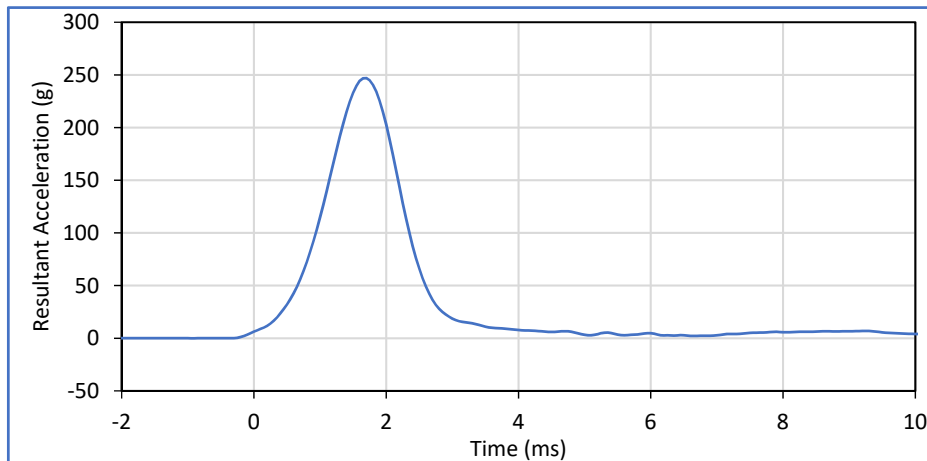
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Hybrid III 50th Percentile Male Head Drop

ATD Serial No.: 360

Test Date: 2017-12-17

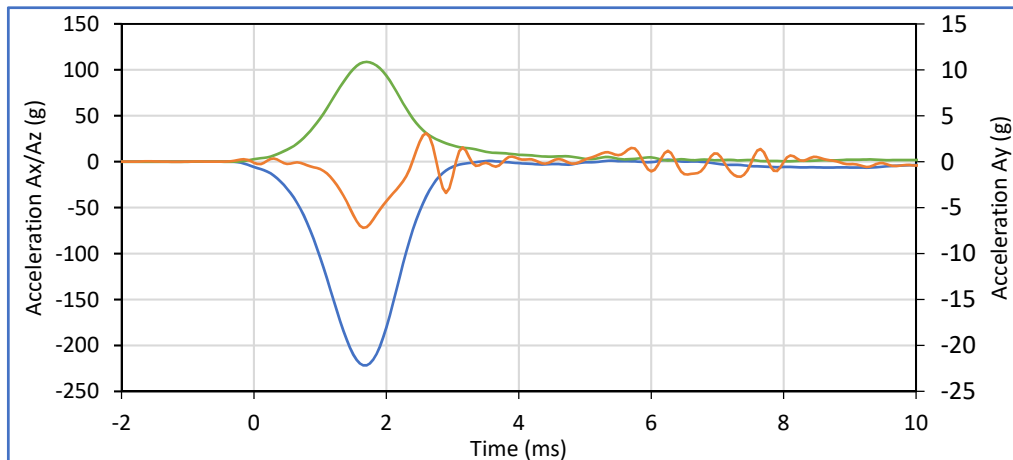
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	20.7	Pass
Laboratory Humidity	%	10	70	26	Pass
Peak Resultant Acceleration	g	225.0	275.0	247.0	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-7.2	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.8	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Head Acceleration Resultant

Max:247.0@1.7 / Min:2.2@6.7

SAE Class 1000



Head Ax

Max:2.2@6.3 / Min:-221.6@1.7

SAE Class 1000

Head Ay

Max:3.1@2.6 / Min:-7.2@1.7

SAE Class 1000

Head Az

Max:108.8@1.7 / Min:0.3@8.1

SAE Class 1000

Technician: Tyler Furman

Approved By: P. Pungit

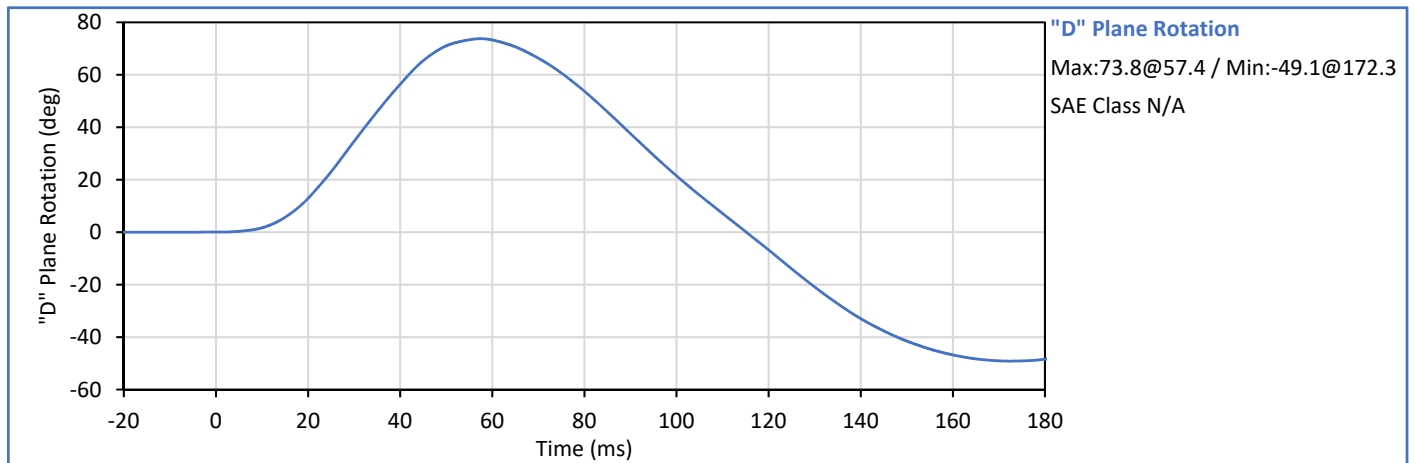
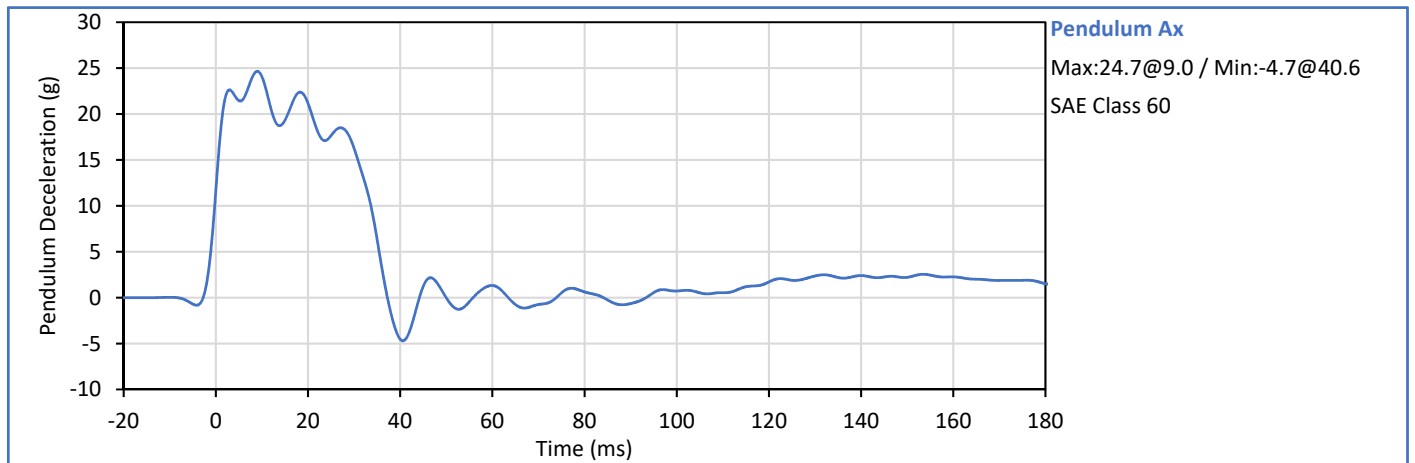


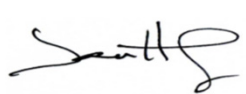
Hybrid III 50th Percentile Male Neck Flexion Test

ATD Serial No.: 360

Test Date: 2017-12-17

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	21	Pass
Pendulum Velocity	m/s	6.89	7.13	7.02	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	24.1	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	21.2	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	16.2	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	16.2	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	35.5	Pass
"D" Plane Rotation peak	deg	64.0	78.0	73.8	Pass
	ms	57.0	64.0	57.4	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	115.2	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	93.7	Pass
	ms	47.0	58.0	47.7	Pass
Moment Decay, Peak to Zero	deg	97.0	107.0	99.9	Pass
Overall Test Results				Pass	



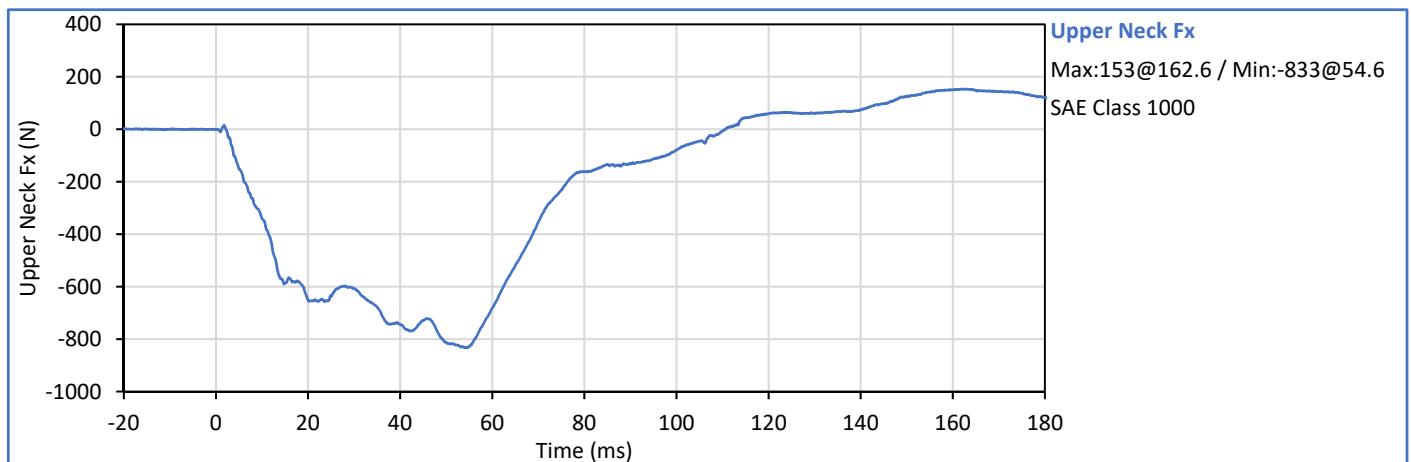
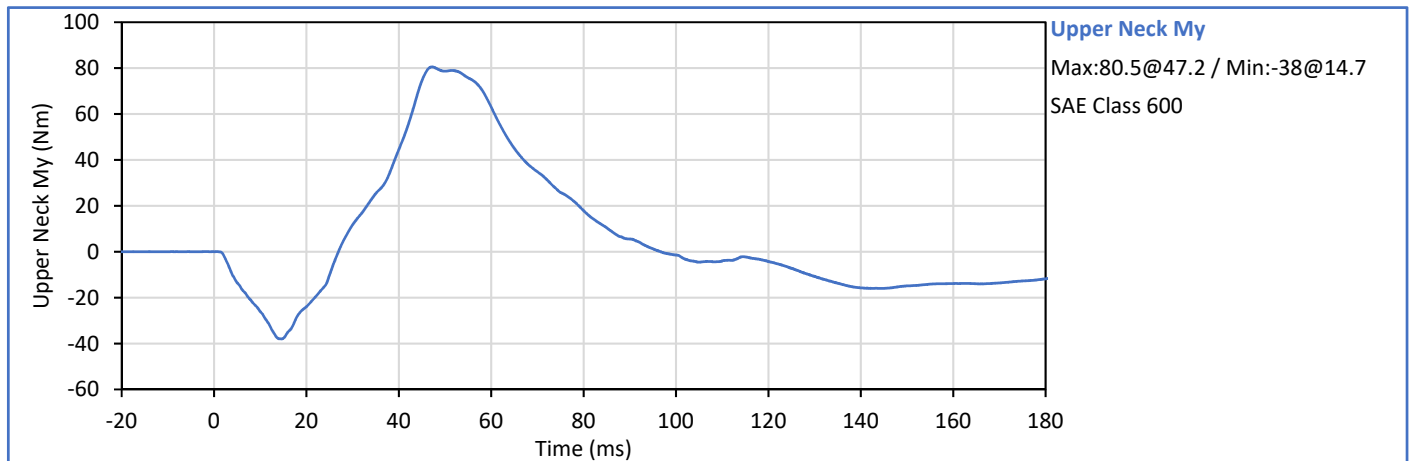
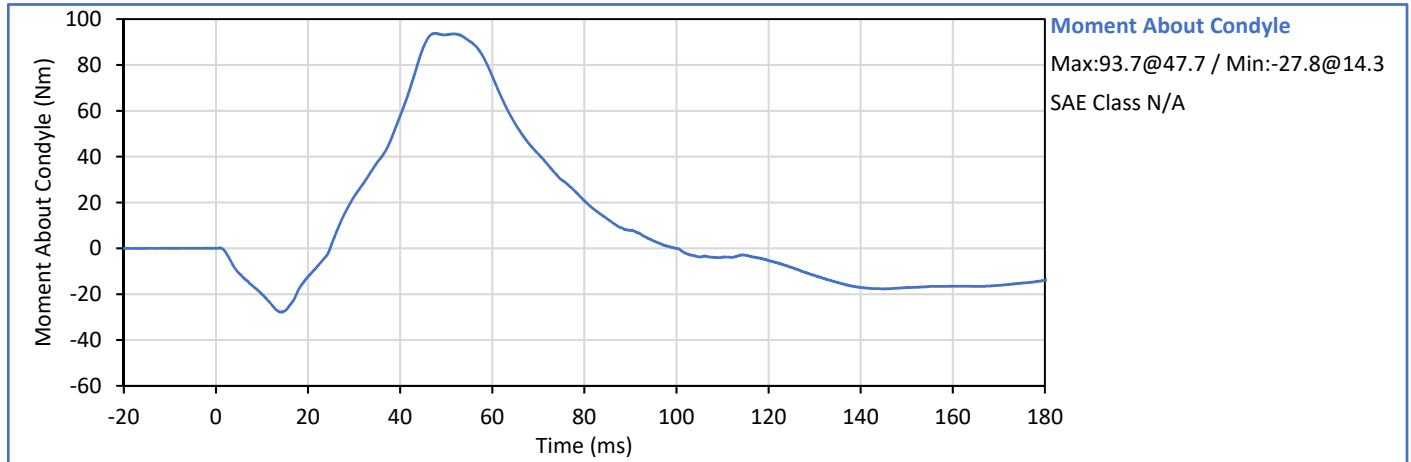
Technician: 

Approved By: 



ATD Serial No.: 360

Test Date: 2017-12-17



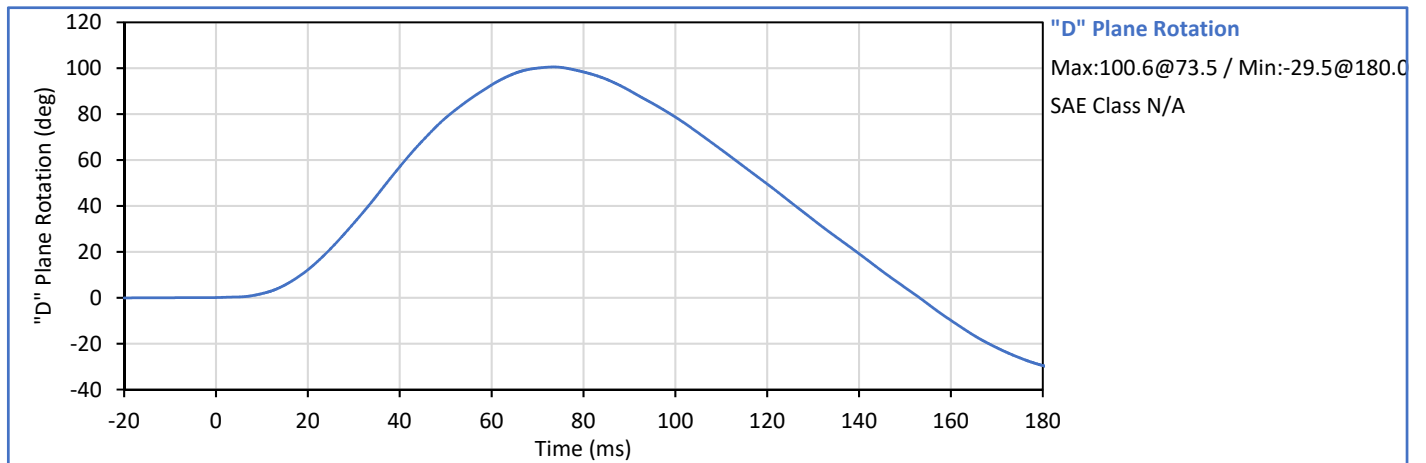
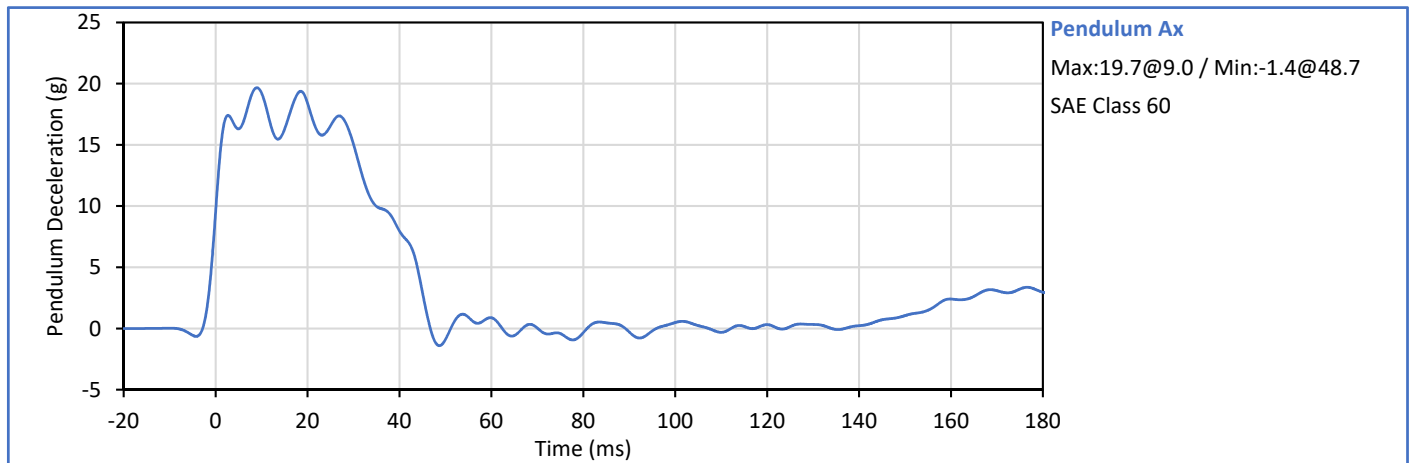


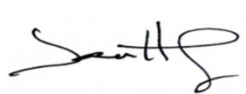
Hybrid III 50th Percentile Male Neck Extension Test

ATD Serial No.: 360

Test Date: 2017-12-17

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	24	Pass
Pendulum Velocity	m/s	5.94	6.19	6.02	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	19.2	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.4	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	15.0	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	15.0	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	44.0	Pass
"D" Plane Rotation peak	deg	81.0	106.0	100.6	Pass
	ms	72.0	82.0	73.5	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	153.3	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-72.7	Pass
	ms	65.0	79.0	67.0	Pass
Moment Decay, Peak to Zero	deg	120.0	148.0	132.2	Pass
Overall Test Results				Pass	Pass



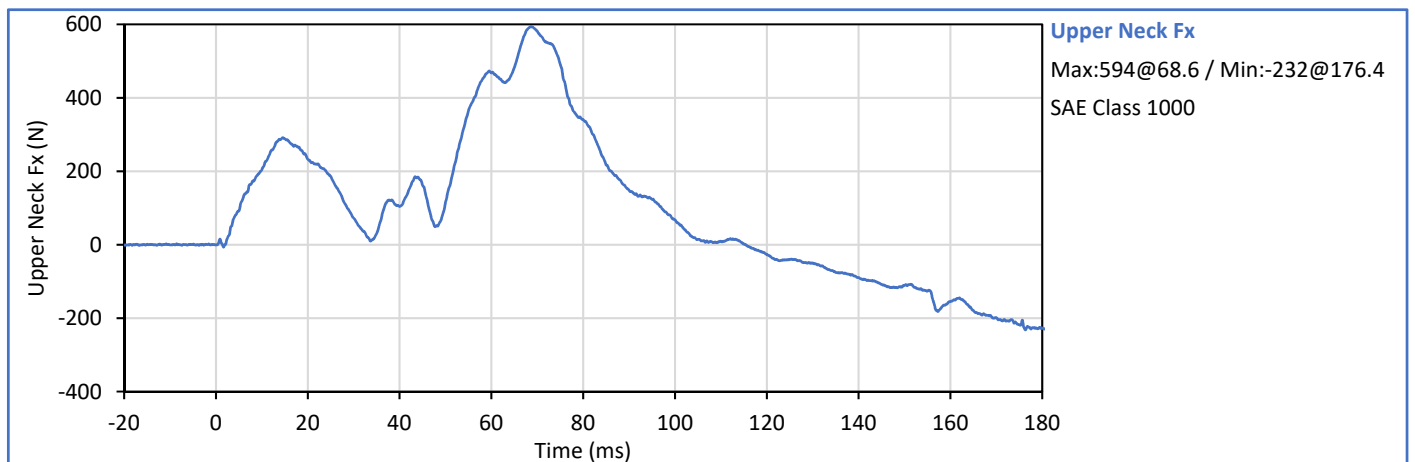
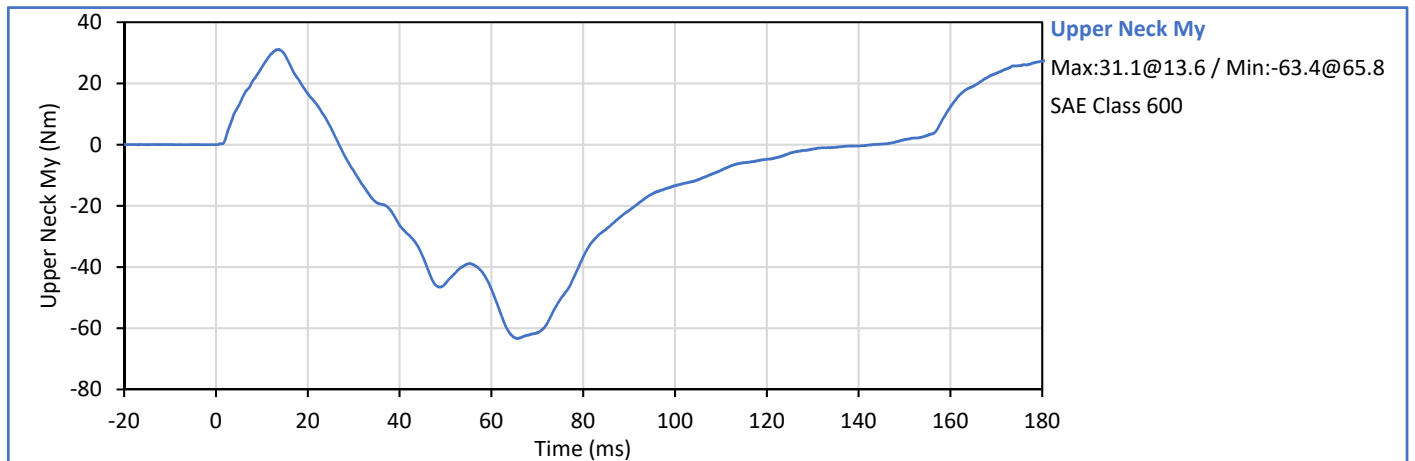
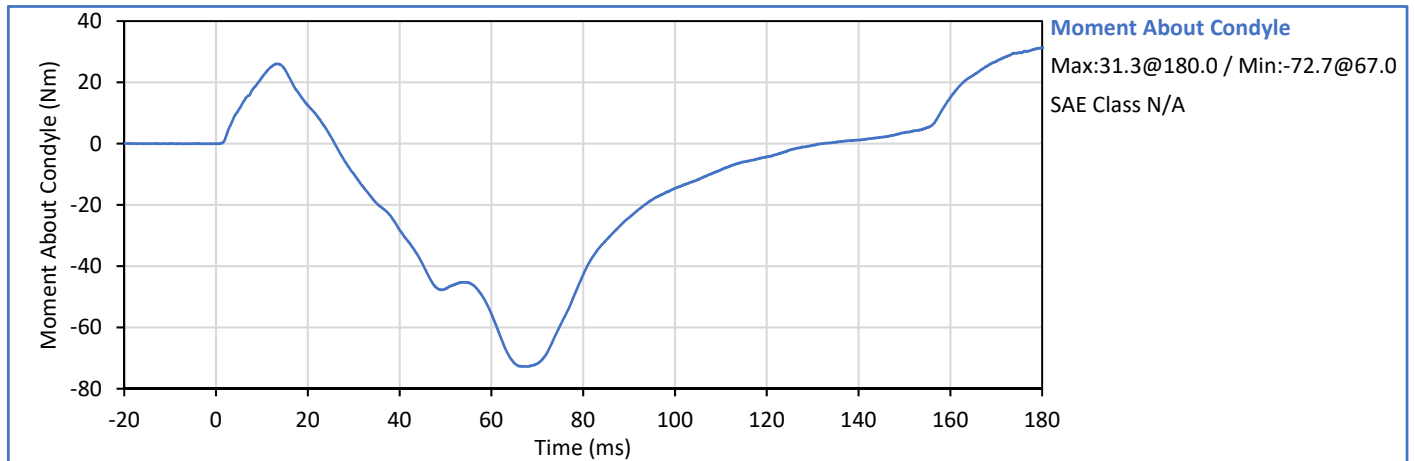
Technician: 

Approved By: 



ATD Serial No.: 360

Test Date: 2017-12-17





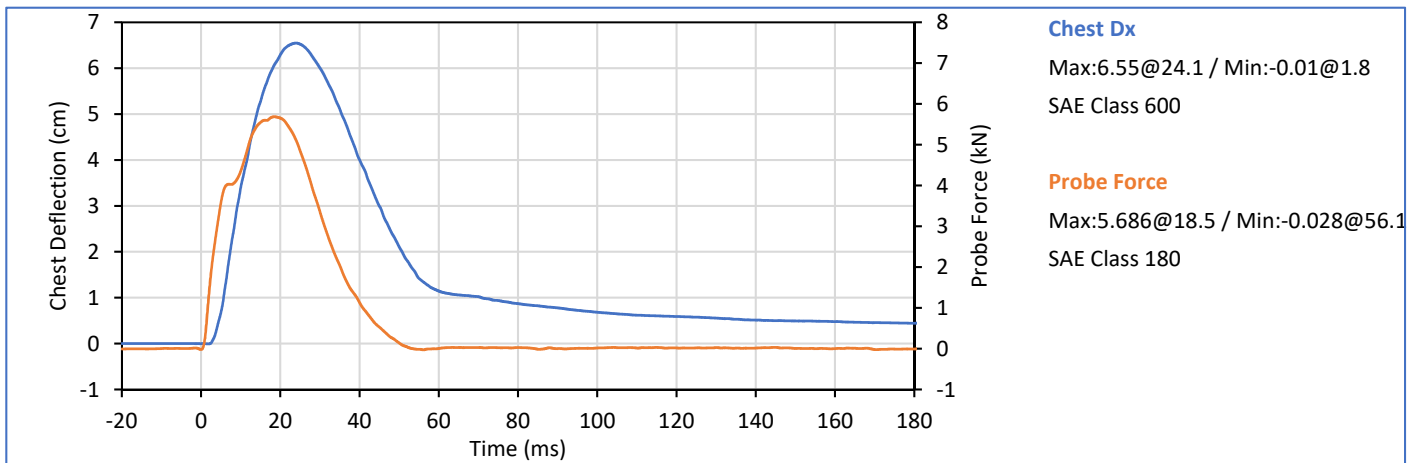
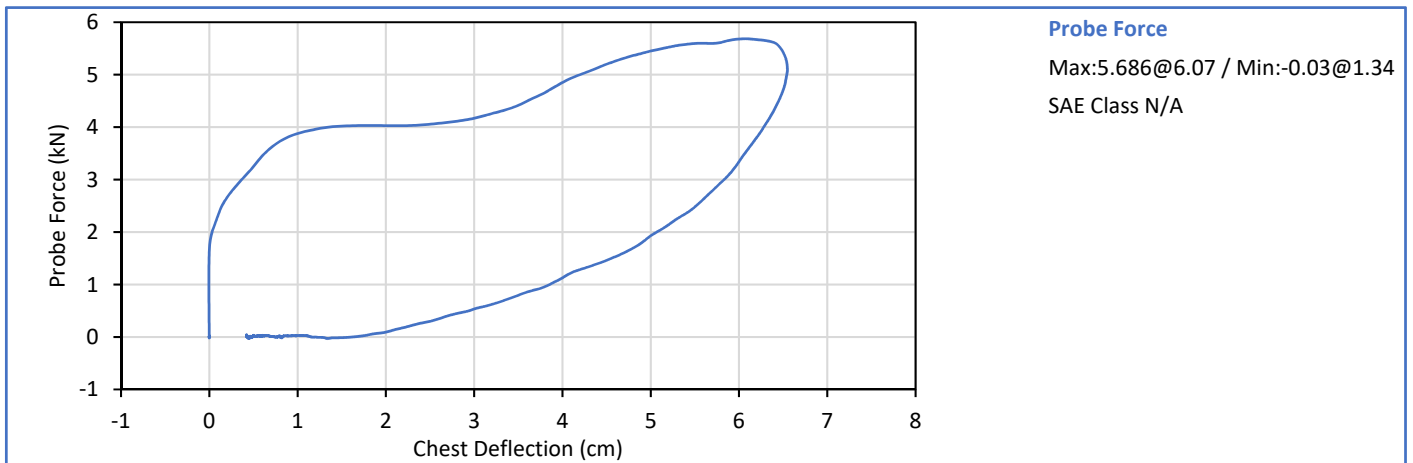
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Hybrid III 50th Percentile Male Thorax Impact

ATD Serial No.: 360

Test Date: 2017-12-16

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	20	Pass
Probe Velocity	m/s	6.58	6.82	6.74	Pass
Peak Chest Deflection	cm	6.35	7.26	6.55	Pass
Peak Probe Force	kN	5.159	5.893	5.686	Pass
Internal Hysteresis	%	69.0	85.0	75.1	Pass
Overall Test Results					Pass



Technician: Smith

Approved By: Plum



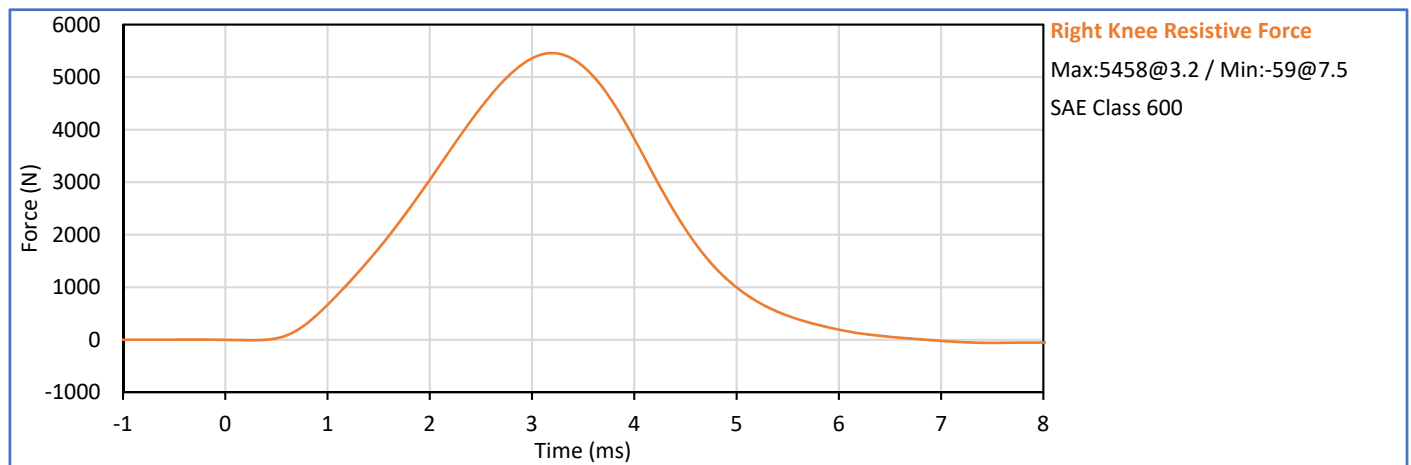
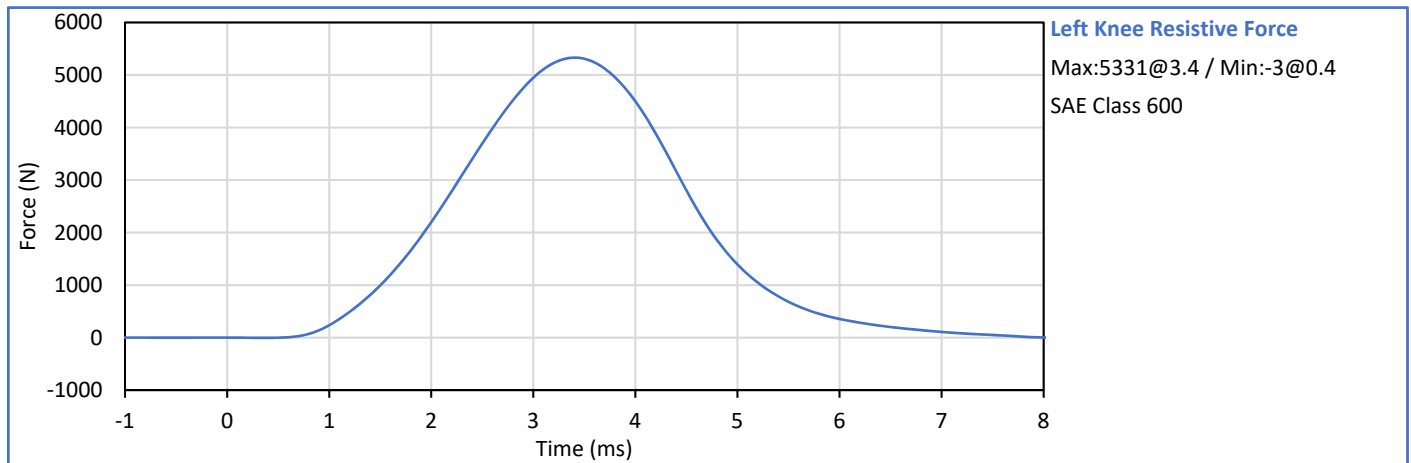
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Hybrid III 50th Percentile Male Knee Impact (Left/Right)

ATD Serial No.: 360

Test Date: 2017-12-17

Tested Parameter		Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature		°C	18.9	25.6	21.1	Pass
Laboratory Humidity		%	10	70	21	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.071	Pass
	Peak Resistive Force	N	4715	5782	5331	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.074	Pass
	Peak Resistive Force	N	4715	5782	5458	Pass
Overall Test Results						Pass



Technician: Tyler Furman

Approved By: P. Ruggito

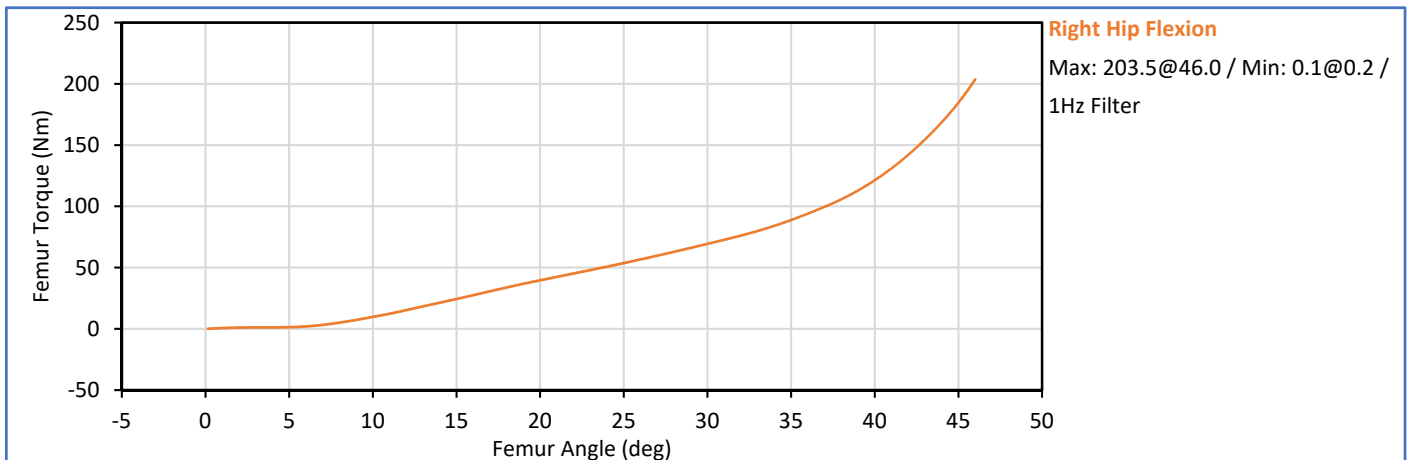
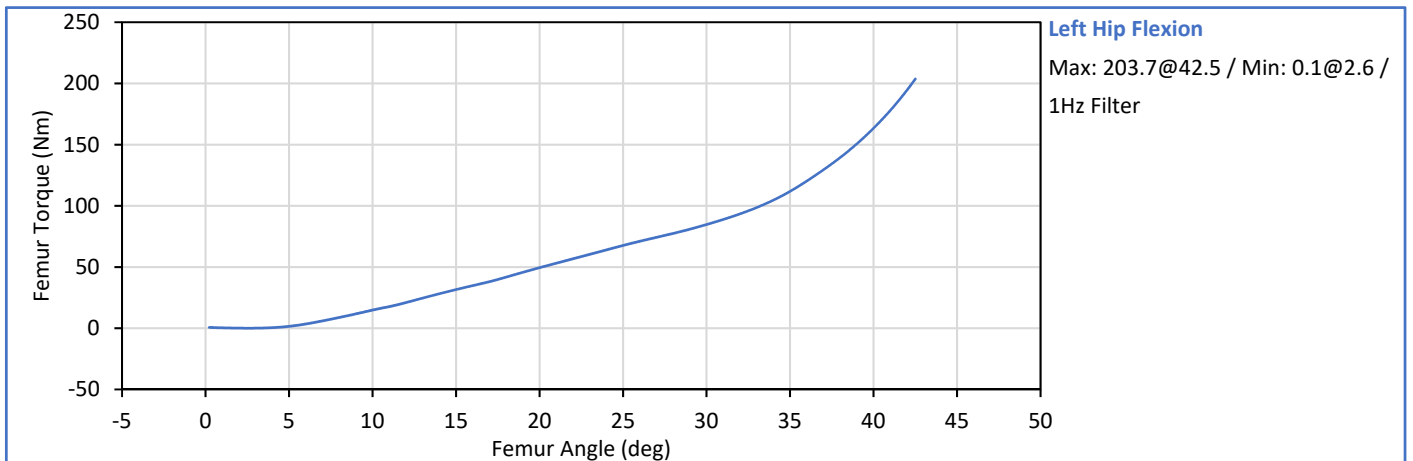


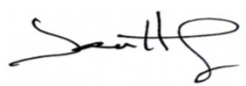
Hybrid III 50th Percentile Male
Hip Flexion (Left/Right)

ATD Serial No.: 360

Test Date: 2017-12-17

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.1	Pass
	Laboratory Humidity	%	10	70	21	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	6.1	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	84.8	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	42.5	Pass
Right Hip	Right Hip Rotation Rate	deg/s	5.0	10.0	6.1	Pass
	Right Femur Torque at 30°	Nm	0.0	95.0	69.4	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	46.0	Pass
Overall Test Results						Pass



Technician: 

Approved By: 



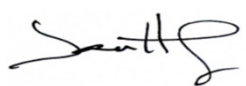
**Hybrid III 5th Percentile Female
ATD Damage Checklist**

ATD Serial No.: 141

Test Date: 2017-11-30

Dummy Item	Inspect for	Comments	Damage	Okay
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ.	Bent shaft			✓
Assembly	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer	Head mounting secure			✓
Mounting	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:

Technician: 

Approved By: 

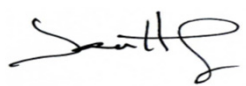


**Hybrid III 5th Percentile Female
External Measurements**

ATD Serial No.: 141

Test Date: 2017-11-30

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Relative Humidity	%	10	70	22	Pass
A - Total sitting height	mm	775	800	784	Pass
B - Shoulder pivot height	mm	432	457	454	Pass
C - 'H' point height	mm	81	86	84	Pass
D - 'H' point location from backline	mm	145	150	148	Pass
E - Shoulder pivot from backline	mm	69	84	80	Pass
F - Thigh clearance	mm	119	135	126	Pass
G - Back of elbow to wrist pivot	mm	244	259	248	Pass
H - Head back to backline	mm	41	46	43	Pass
I - Shoulder to elbow length	mm	277	297	281	Pass
J - Elbow rest height	mm	183	203	190	Pass
K - Buttock to knee length	mm	521	546	533	Pass
L - Popliteal length	mm	356	376	366	Pass
M - Knee pivot height	mm	394	419	401	Pass
N - Buttock popliteal length	mm	414	439	426	Pass
O - Chest depth without jacket	mm	175	191	185	Pass
P - Foot length	mm	219	234	231	Pass
R - Buttock to Knee Pivot Length	mm	457	483	473	Pass
S - Head Breadth	mm	137	147	145	Pass
T - Head Depth	mm	178	188	185	Pass
U - Hip Breadth	mm	300	315	305	Pass
V - Shoulder breadth	mm	351	366	358	Pass
W - Foot breadth	mm	79	94	84	Pass
X - Head circum.	mm	528	549	542	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	872	Pass
Z - Waist circum.	mm	760	790	769	Pass
AA - Location for chest circum.	mm	300	310	304	Pass
BB - Location for waist circum.	mm	160	170	164	Pass
Overall Test Results				Pass	

Technician: 

Approved By: 

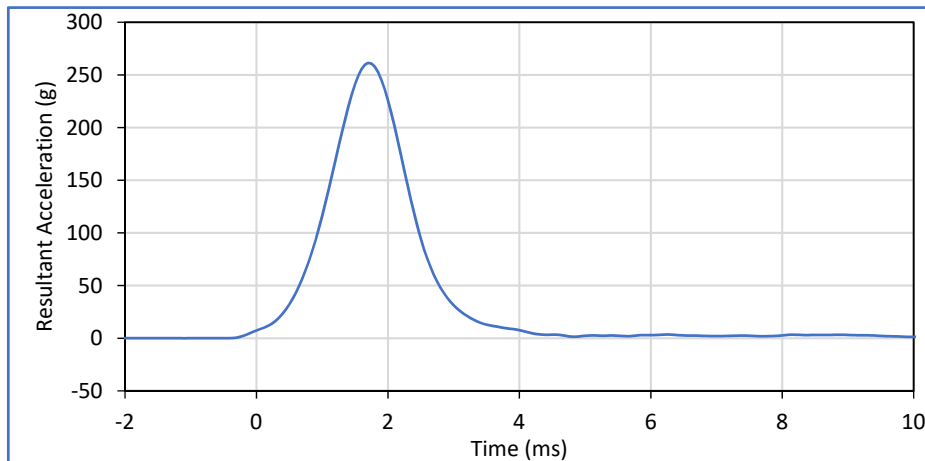


Hybrid III 5th Percentile Female
Head Drop

ATD Serial No.: 141

Test Date: 2017-11-27

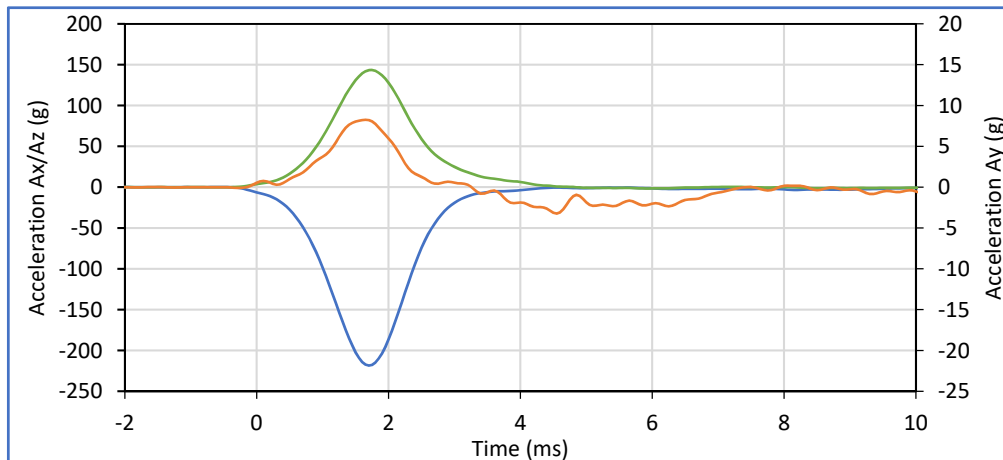
Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	25	Pass
Peak Resultant Acceleration	g	250.0	300.0	261.4	Pass
Peak Lateral Acceleration	g	-15.0	15.0	8.3	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	



Head Acceleration Resultant

Max:261.4@1.7 / Min:1.3@10.0

SAE Class 1000



Head Ax

Max:-0.5@4.6 / Min:-218.4@1.7

SAE Class 1000

Head Ay

Max:8.3@1.7 / Min:-3.2@4.6

SAE Class 1000

Head Az

Max:143.6@1.8 / Min:-1.6@5.9

SAE Class 1000

Technician: Smith

Approved By: Wep

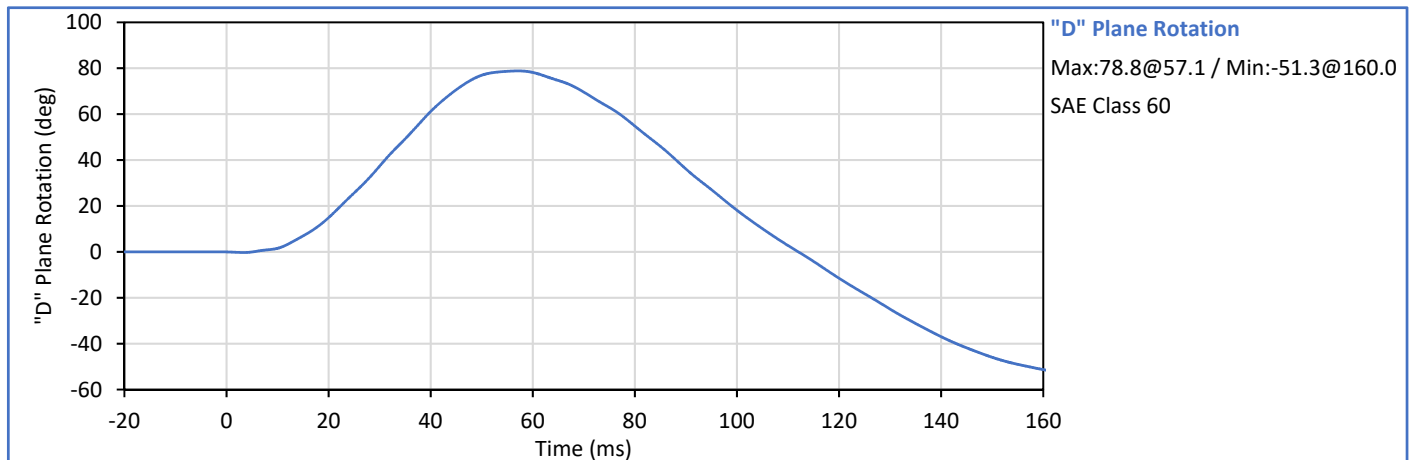
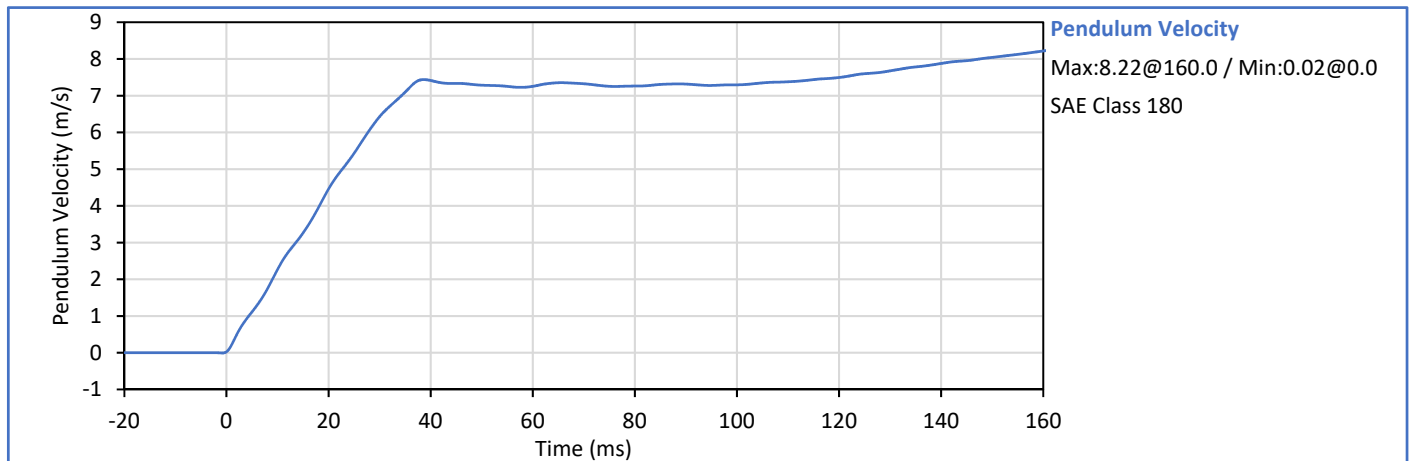


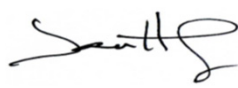
**Hybrid III 5th Percentile Female
Neck Flexion Test**

ATD Serial No.: 141

Test Date: 2017-12-01

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	6.89	7.13	7.10	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.27	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.46	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.43	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	78.8	Pass
Peak Moment in Rotation	Nm	69.0	83.0	81.2	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	83.6	Pass
Overall Test Results					Pass

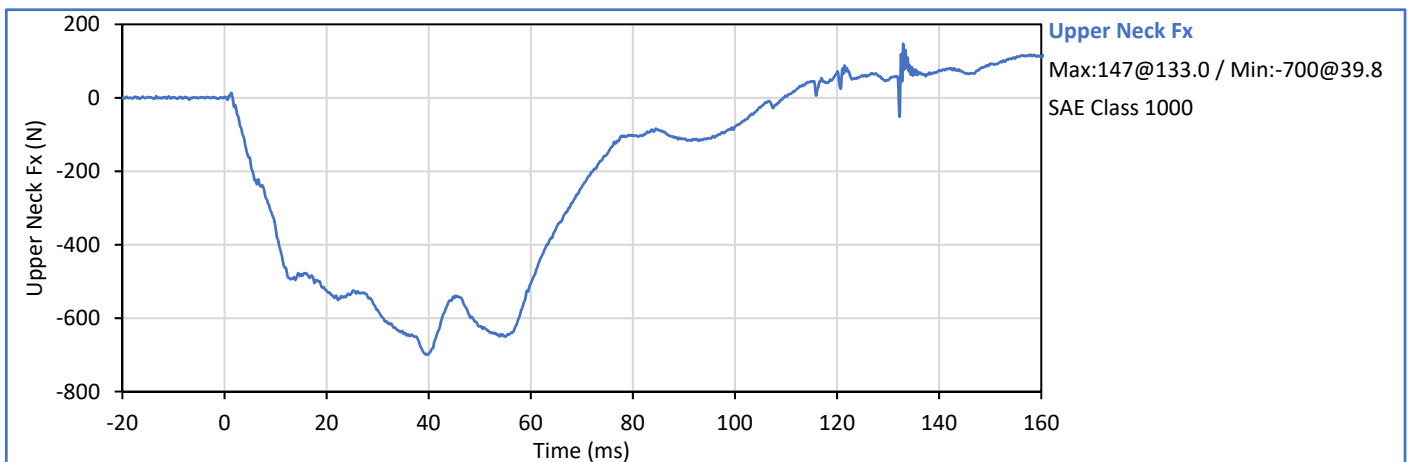
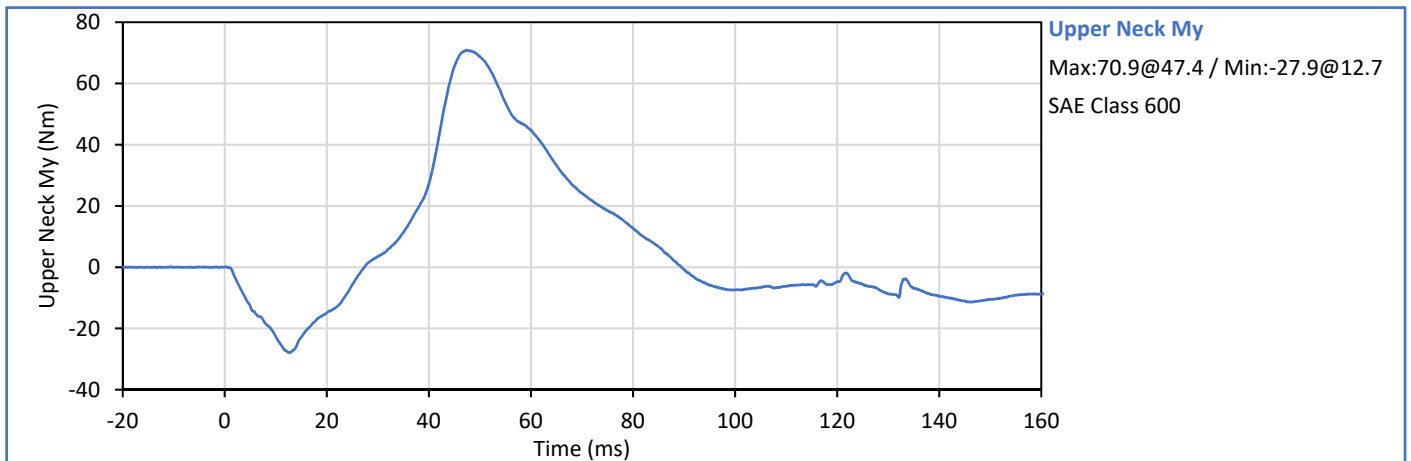
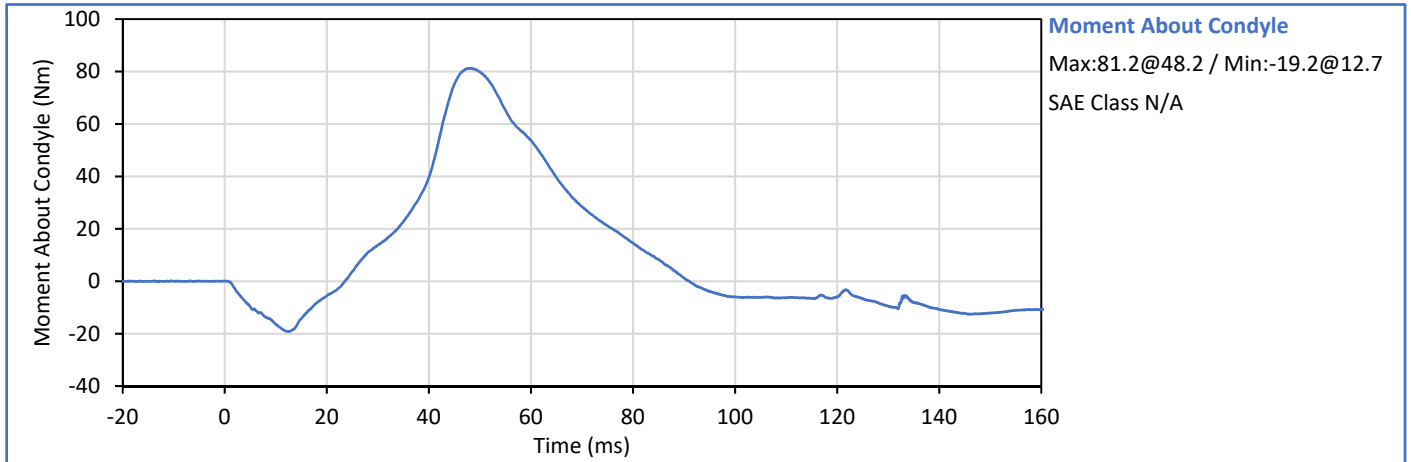


Technician: 

Approved By: 

ATD Serial No.: 141

Test Date: 2017-12-01



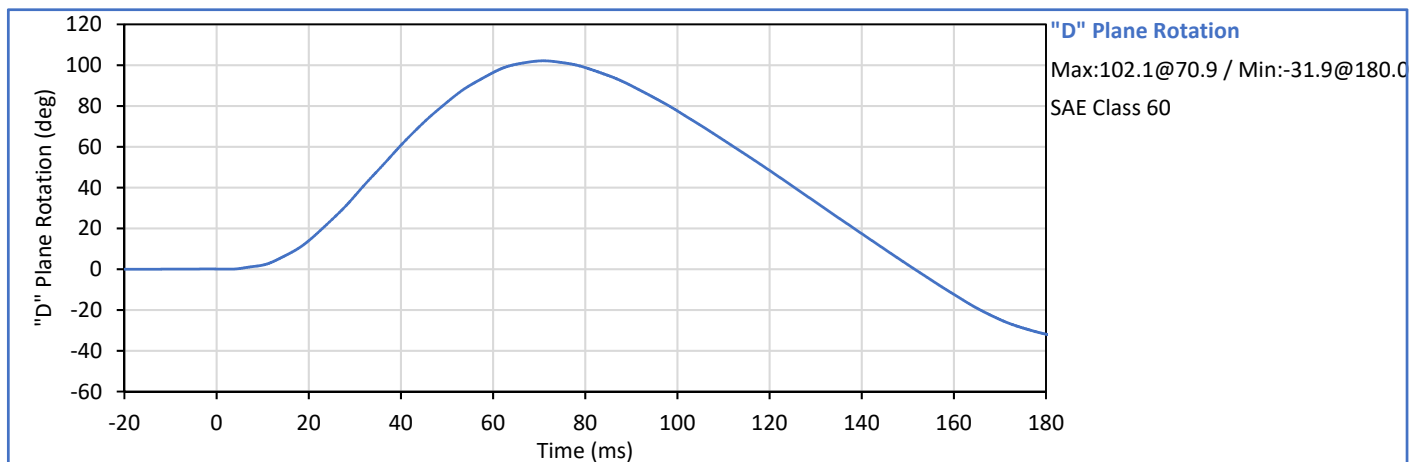
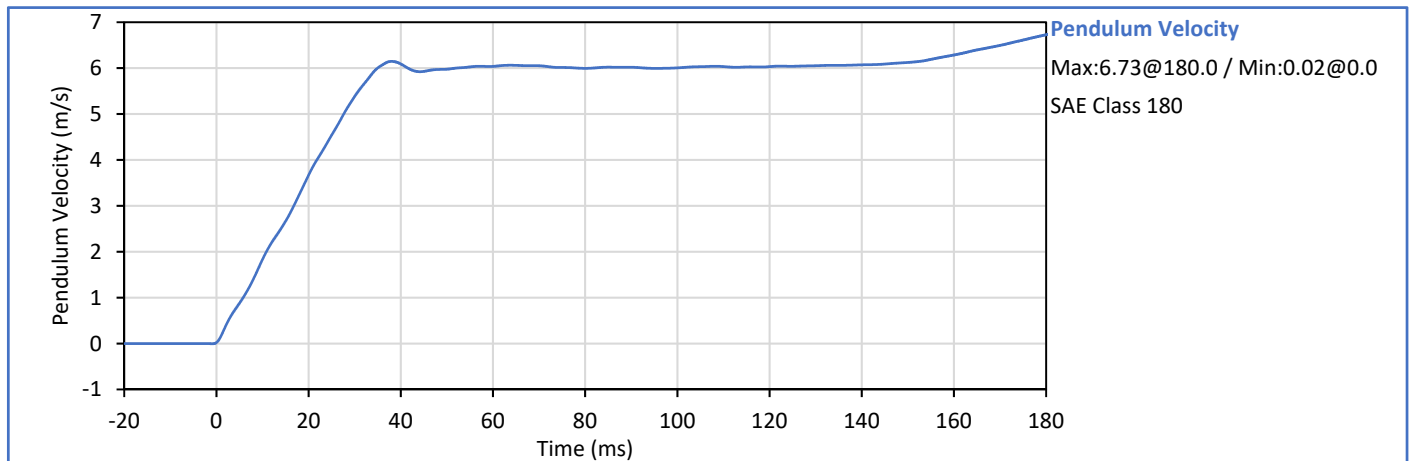


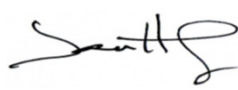
Hybrid III 5th Percentile Female
Neck Extension Test

ATD Serial No.: 141

Test Date: 2017-11-30

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	20	Pass
Pendulum Velocity	m/s	5.95	6.19	6.10	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.83	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.67	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.38	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	102.1	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-55.1	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	97.7	Pass
Overall Test Results					Pass



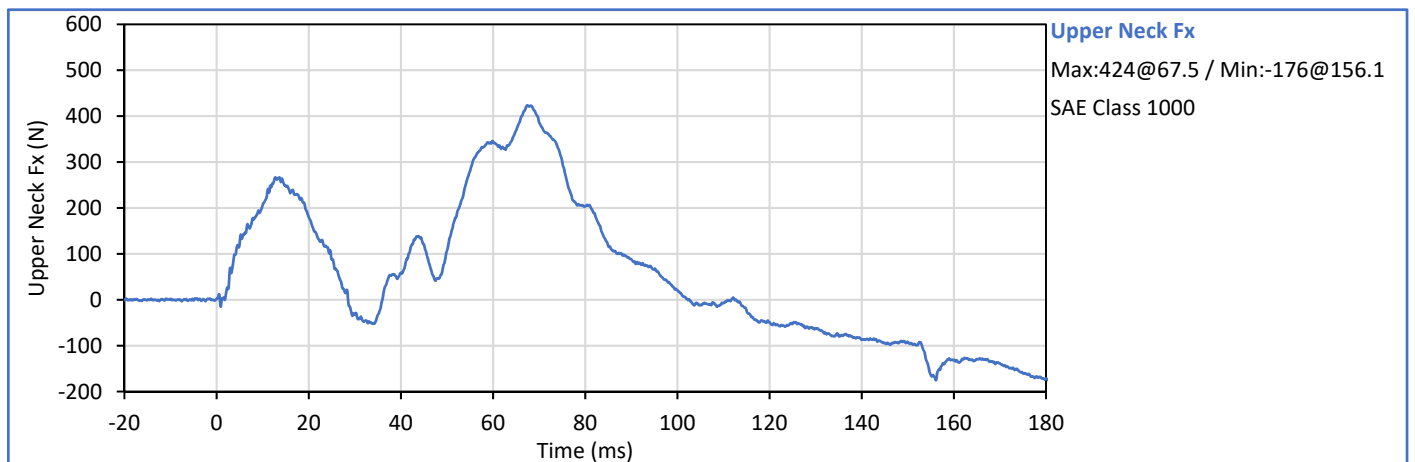
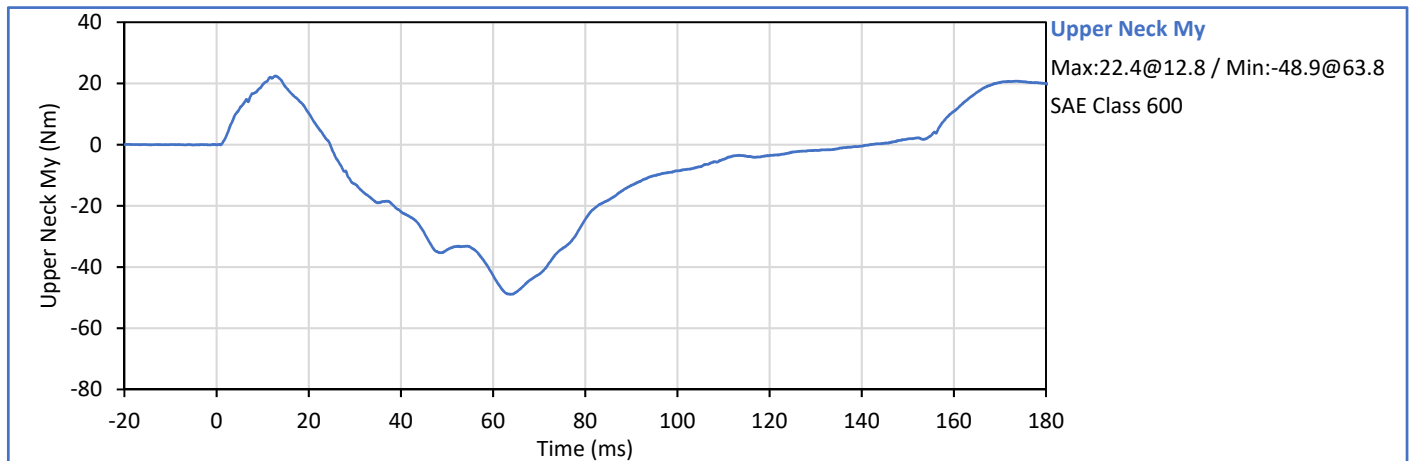
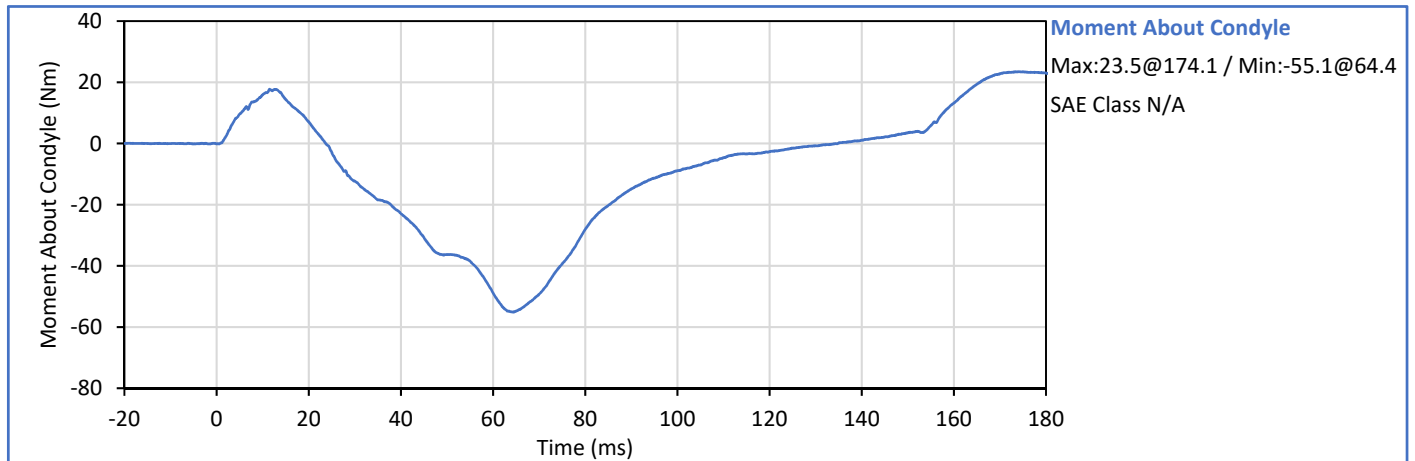
Technician: 

Approved By: 



ATD Serial No.: 141

Test Date: 2017-11-30



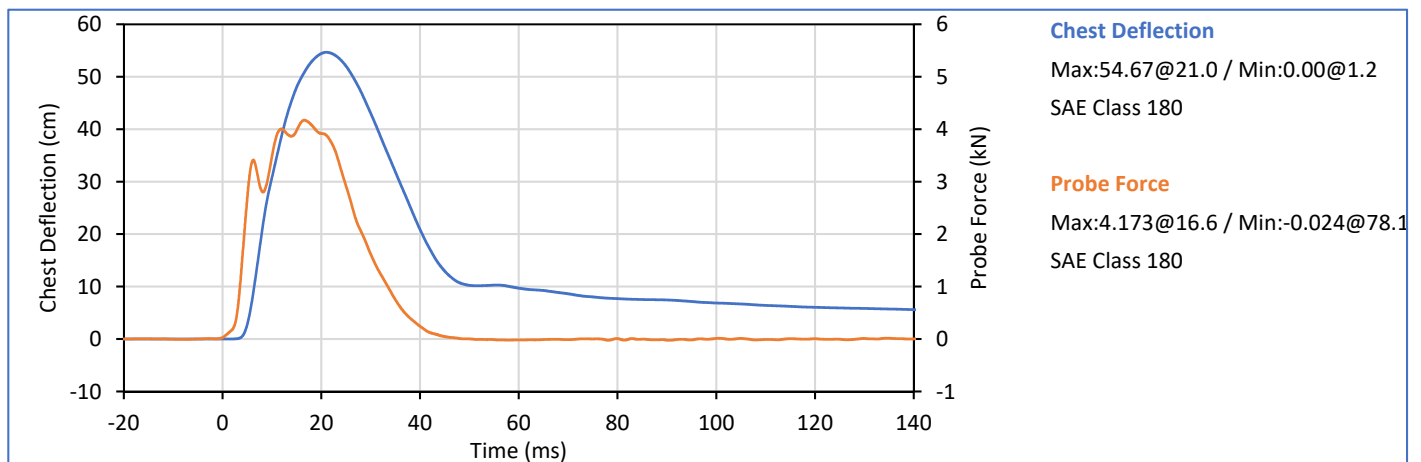
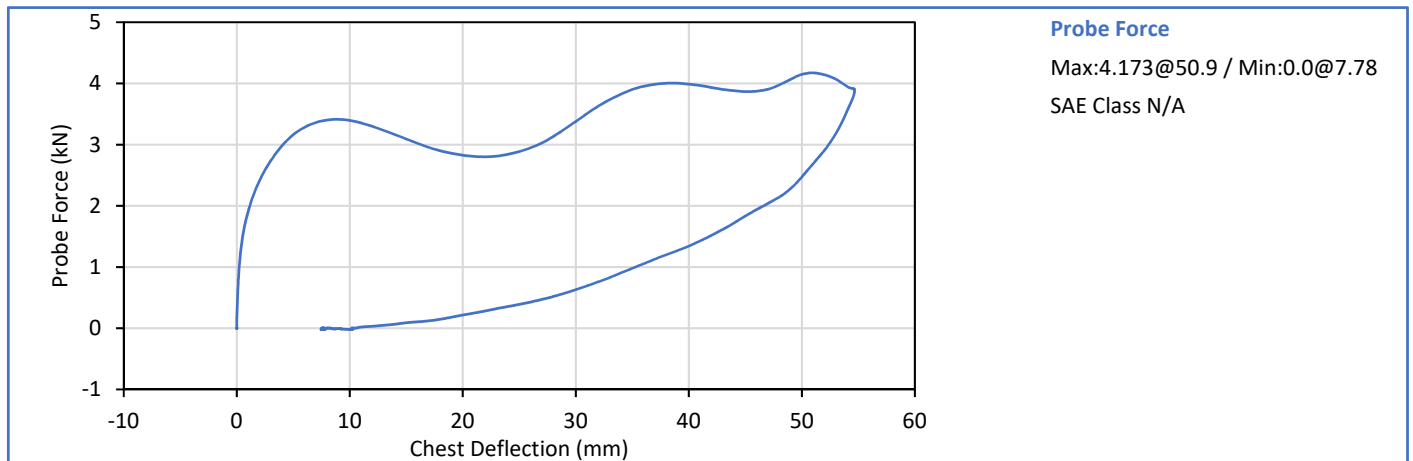


Hybrid III 5th Percentile Female
Thorax Impact

ATD Serial No.: 141

Test Date: 2017-11-30

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.0	Pass
Laboratory Humidity	%	10	70	21	Pass
Probe Velocity	m/s	6.59	6.83	6.67	Pass
Peak Chest Deflection	mm	50.0	58.0	54.7	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.173	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	4.150	Pass
Internal Hysteresis	%	69.0	85.0	74.6	Pass
Overall Test Results				Pass	Pass



Technician: Smith

Approved By: Wep



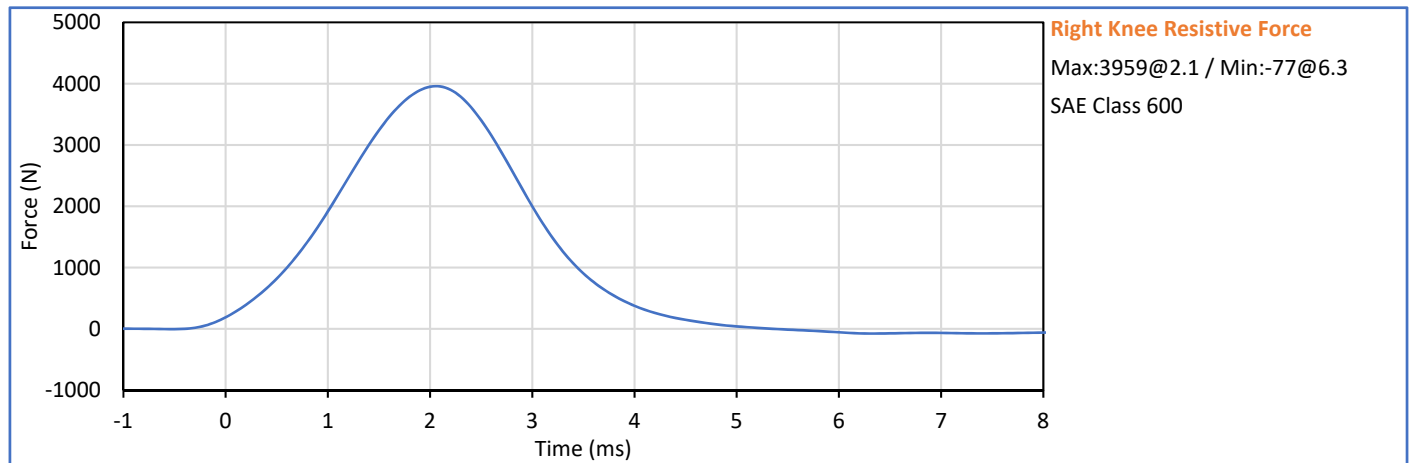
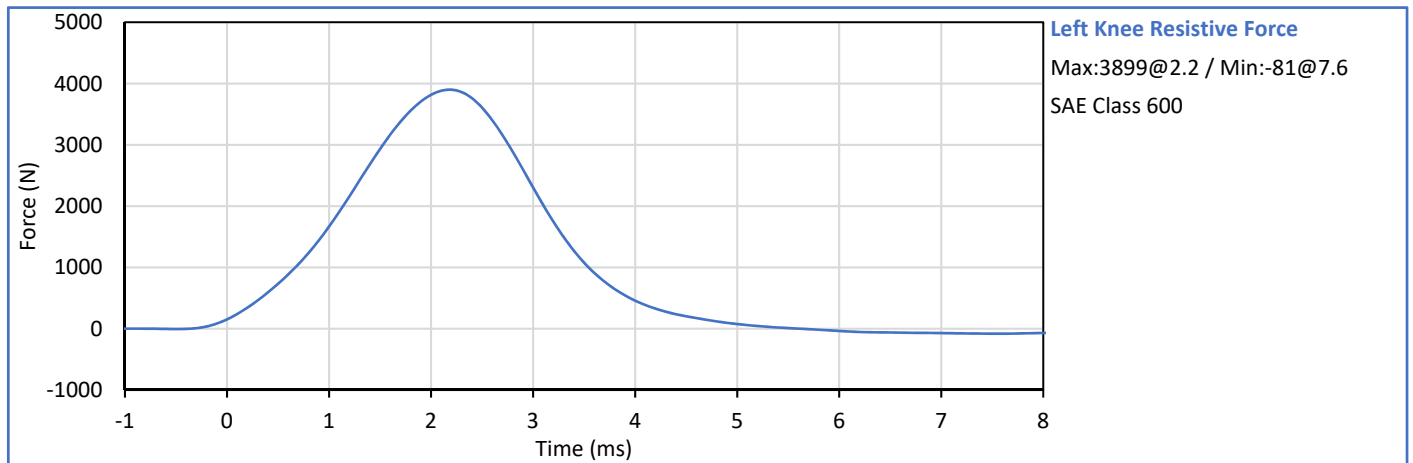
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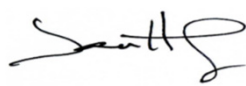
Hybrid III 5th Percentile Female Knee Impact (Left/Right)

ATD Serial No.: 141

Test Date: 2017-11-28

Tested Parameter		Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature		°C	18.9	25.6	21.1	Pass
Laboratory Humidity		%	10	70	22	Pass
Left Knee	Probe Velocity	m/s	2.070	2.130	2.113	Pass
	Peak Resistive Force	N	3450	4060	3899	Pass
Right Knee	Probe Velocity	m/s	2.070	2.130	2.121	Pass
	Peak Resistive Force	N	3450	4060	3959	Pass
Overall Test Results						Pass



Technician: 

Approved By: 

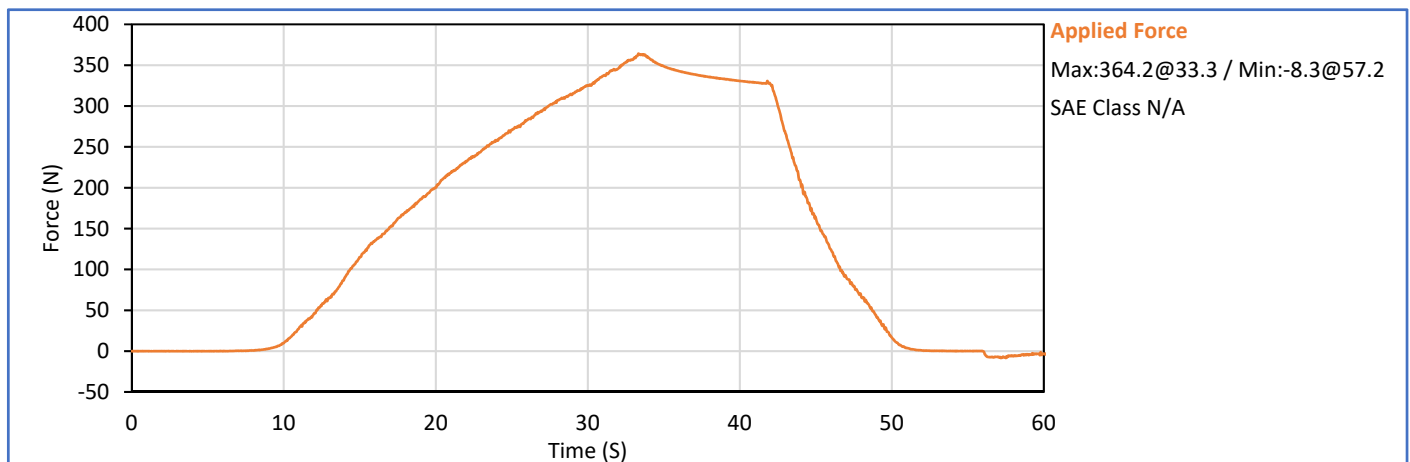
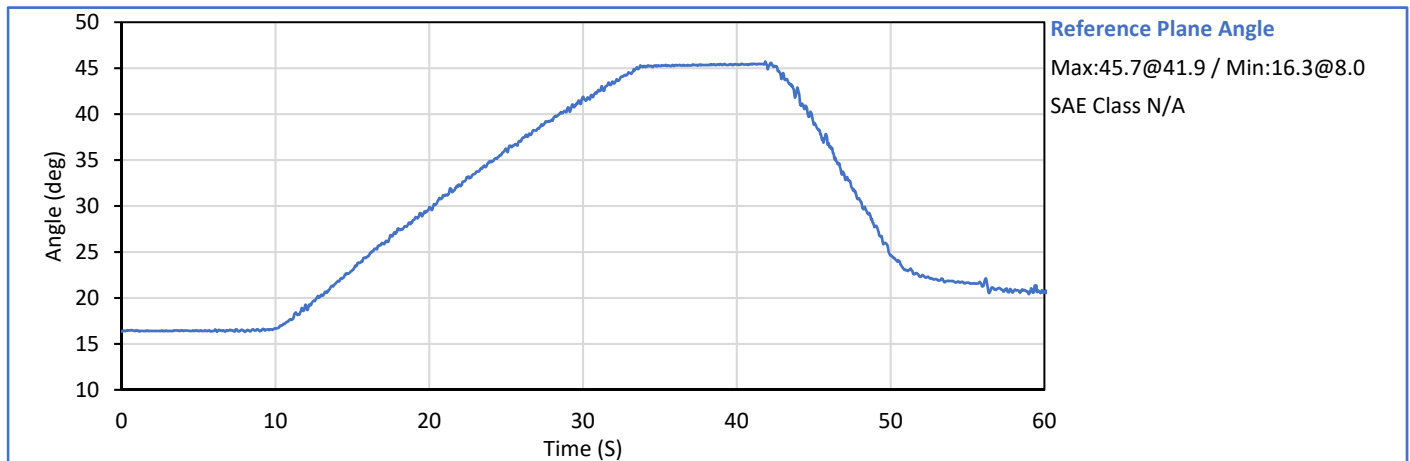


**Hybrid III 5th Percentile Female
Torso Flexion Test**

ATD Serial No.: 141

Test Date: 2017-11-30

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	20	Pass
Orientation Angle	deg	0.0	20.0	14.5	Pass
Test Initial Angle	deg	11.0	19.0	16.4	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	363.0	Pass
Torso Flexion Rate	deg/s	0.50	1.50	1.23	Pass
Final Reference Plane Angle	deg	-8.0	8.0	4.1	Pass
Overall Test Results				Pass	Pass



Technician: Smith

Approved By: Wep

APPENDIX C
POST-TEST ATD CONFIGURATION AND PERFORMANCE VERIFICATION DATA



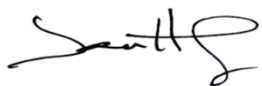
**Hybrid III 50th Percentile Male
ATD Damage Checklist**

ATD Serial No.: 360

Test Date: 2018-01-11

Dummy Item	Inspect for	Comments	Damage	Okay
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ.	Bent shaft			✓
Assembly	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer	Head mounting secure			✓
Mounting	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:

Technician: 
J. Hernandez

Approved By: 
P. Puzzuto



Hybrid III 50th Percentile Male
External Measurements

ATD Serial No.: 360

Test Date: 2018-01-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	22	Pass
A - Total sitting height	mm	879	889	886	Pass
B - Shoulder pivot height	mm	505	521	512	Pass
C - 'H' point height	mm	84	89	87	Pass
D - 'H' point location from backline	mm	135	140	137	Pass
E - Shoulder pivot from backline	mm	84	94	90	Pass
F - Thigh clearance	mm	140	155	148	Pass
G - Back of elbow to wrist pivot	mm	290	305	294	Pass
H - Head back to backline	mm	41	46	45	Pass
I - Shoulder to elbow length	mm	330	345	337	Pass
J - Elbow rest height	mm	190	211	205	Pass
K - Buttock to knee length	mm	579	604	599	Pass
L - Popliteal length	mm	429	455	438	Pass
M - Knee pivot height	mm	485	500	496	Pass
N - Buttock popliteal length	mm	452	477	463	Pass
O - Chest depth without jacket	mm	213	229	220	Pass
P - Foot length	mm	251	267	263	Pass
V - Shoulder breadth	mm	422	437	431	Pass
W - Foot breadth	mm	91	107	102	Pass
Y - Chest circum. (w/chest jacket)	mm	970	1001	988	Pass
Z - Waist circum.	mm	836	866	849	Pass
AA - Location for chest circum.	mm	429	434	433	Pass
BB - Location for waist circum.	mm	226	231	230	Pass
			Overall Test Results		Pass

Technician: _____

J. Hernandez

Approved By: _____

P. Puzzuto



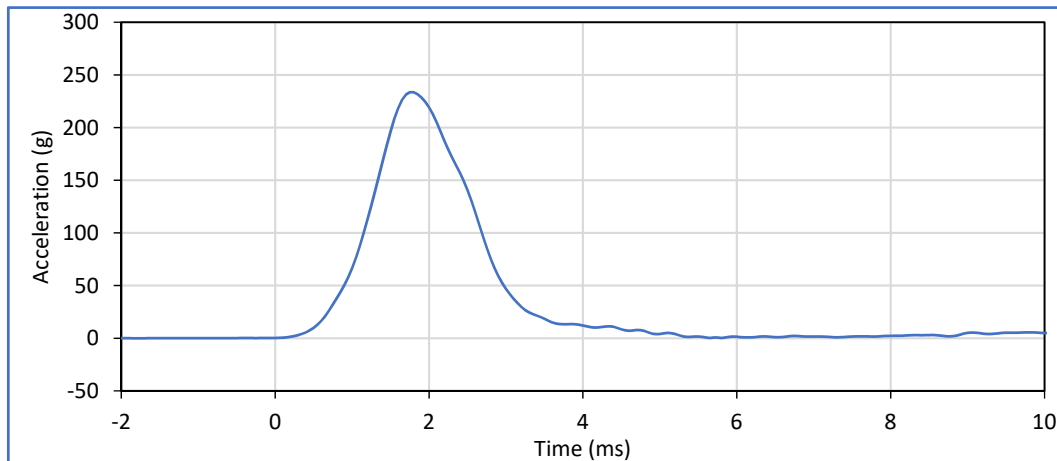
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Hybrid III 50th Percentile Male Head Drop

ATD Serial No.: 360

Test Date: 2018-01-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	33	Pass
Peak Resultant Acceleration	g	225.0	275.0	233.6	Pass
Peak Lateral Acceleration	g	-15.0	15.0	10.0	Pass
Oscillations After Main Pulse	%	0.0	10.0	2.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results	Pass	

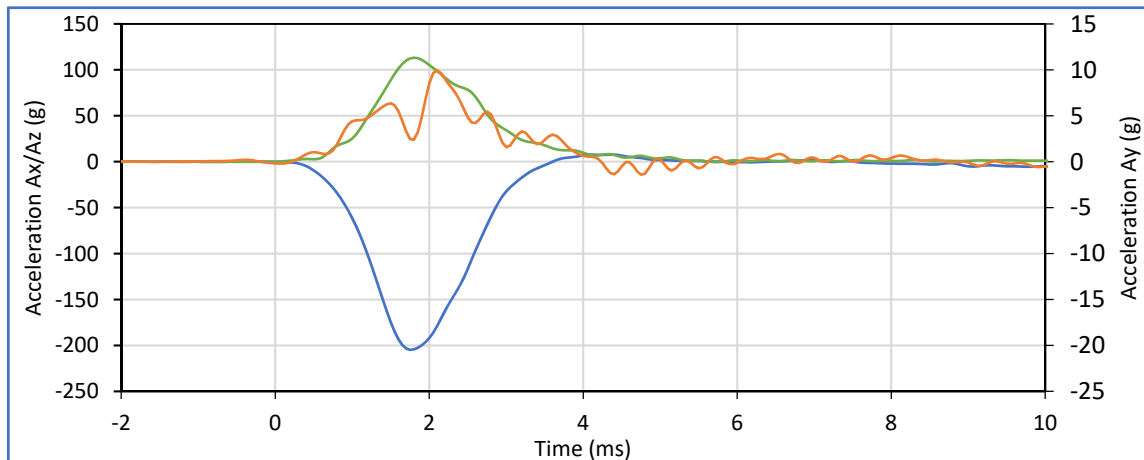


Head Resultant

Max:233.6@1.8

Min:0.3@5.8

SAE Class 1000



Head Ax

Max:7.8@4.4

Min:-204.7@1.8

SAE Class 1000

Head Ay

Max:10.0@2.1

Min:-1.4@4.8

SAE Class 1000

Head Az

Max:113.3@1.8

Min:-0.4@5.8

SAE Class 1000

Technician: T. Lowman

Approved By: P. Puzzuto

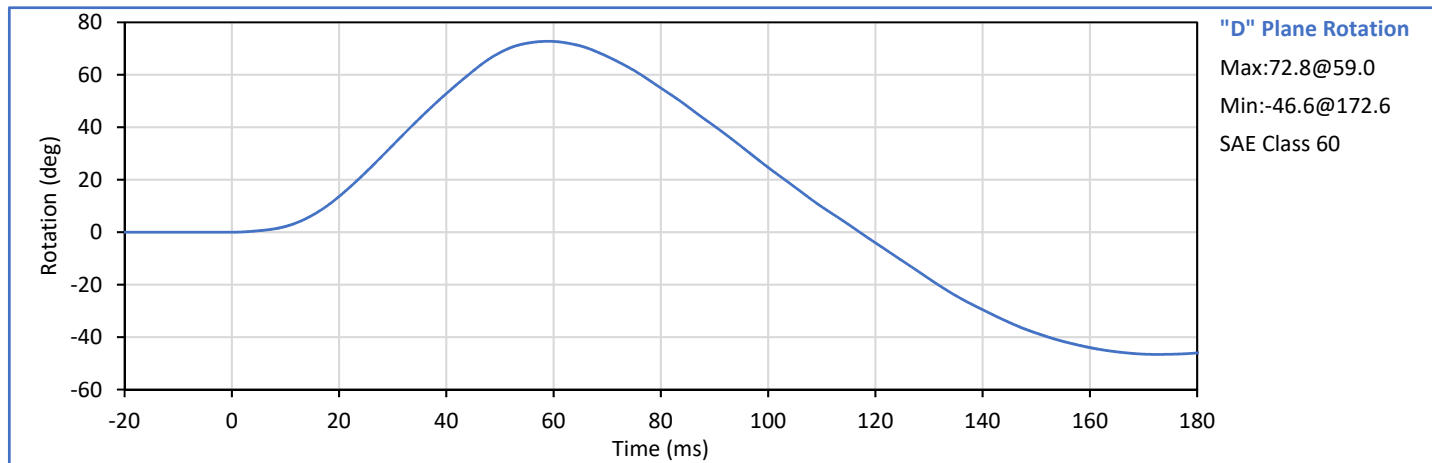
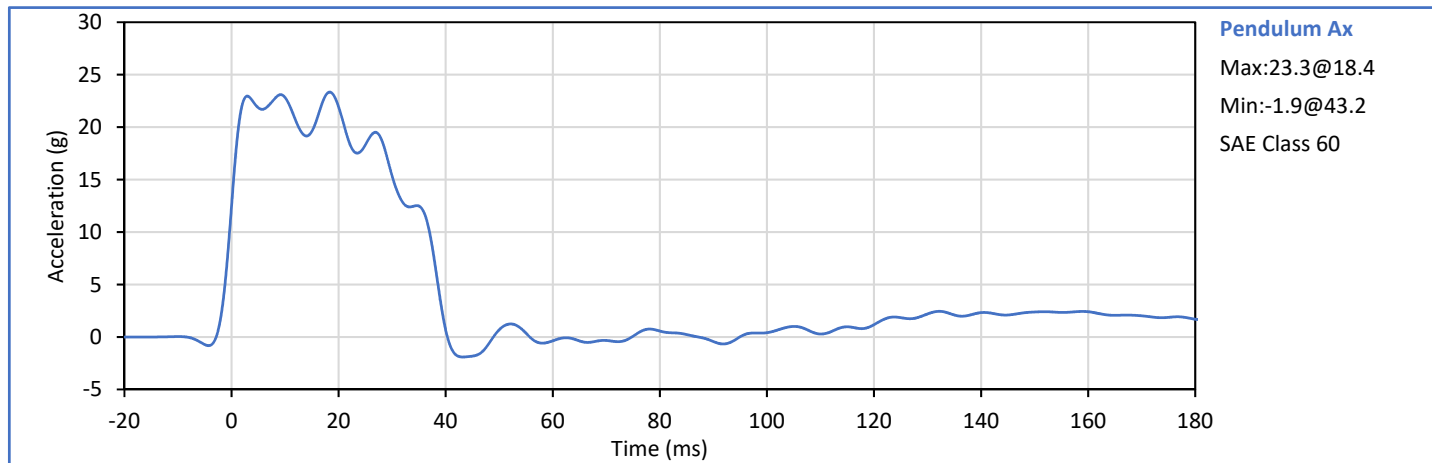


Hybrid III 50th Percentile Male Neck Flexion Test

ATD Serial No.: 360

Test Date: 2018-01-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Humidity	%	10	70	33	Pass
Pendulum Velocity	m/s	6.89	7.13	6.96	Pass
Pendulum Deceleration at 10 ms	g	22.5	27.5	22.8	Pass
Pendulum Deceleration at 20 ms	g	17.6	22.6	21.9	Pass
Pendulum Deceleration at 30 ms	g	12.5	18.5	15.3	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	29.0	15.3	Pass
Deceleration Decay to Cross 5 g	ms	34.0	42.0	38.6	Pass
"D" Plane Rotation peak	deg	64.0	78.0	72.8	Pass
	ms	57.0	64.0	59.0	Pass
"D" Plane Rotation Decay To Zero	ms	113.0	128.0	117.1	Pass
Moment About Occipital Condyle	Nm	88.1	108.5	90.8	Pass
	ms	47.0	58.0	52.1	Pass
Moment Decay, Peak to Zero	deg	97.0	107.0	98.0	Pass
Overall Test Results					Pass



Technician: J. Hernandez

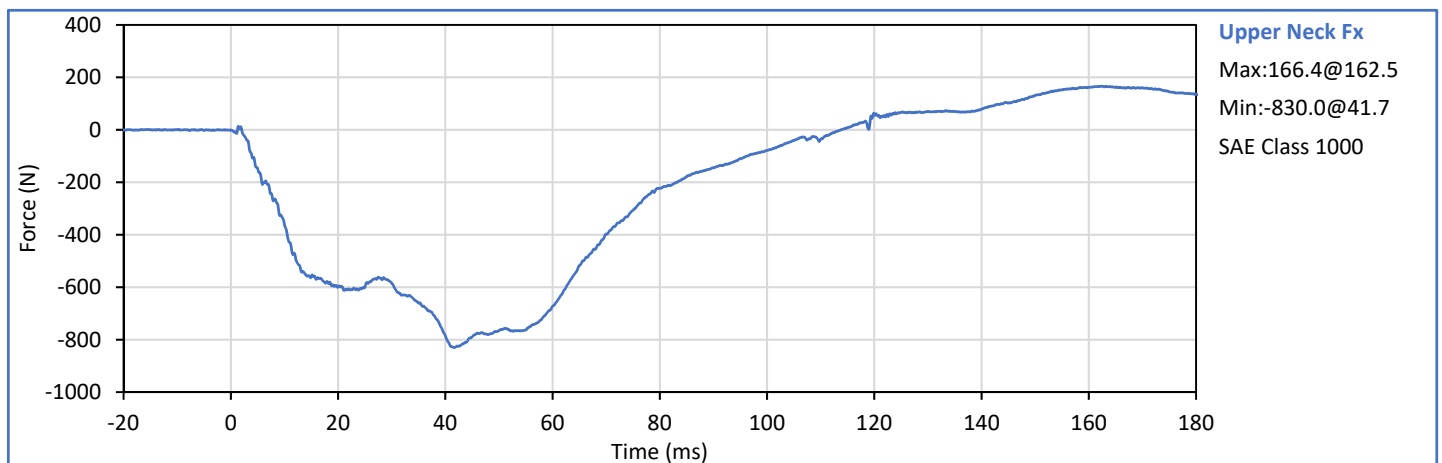
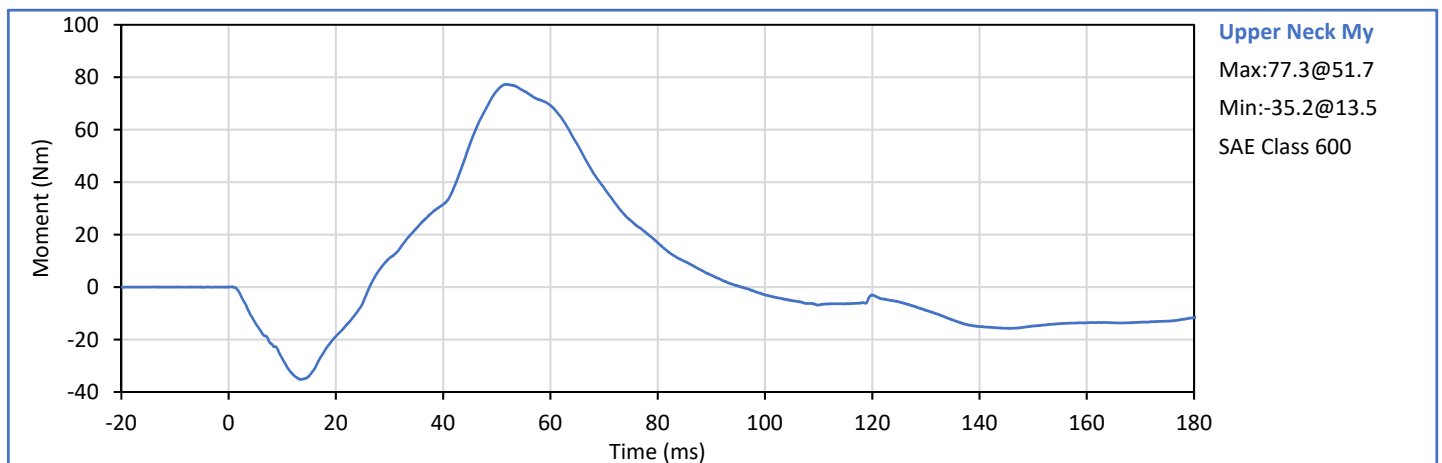
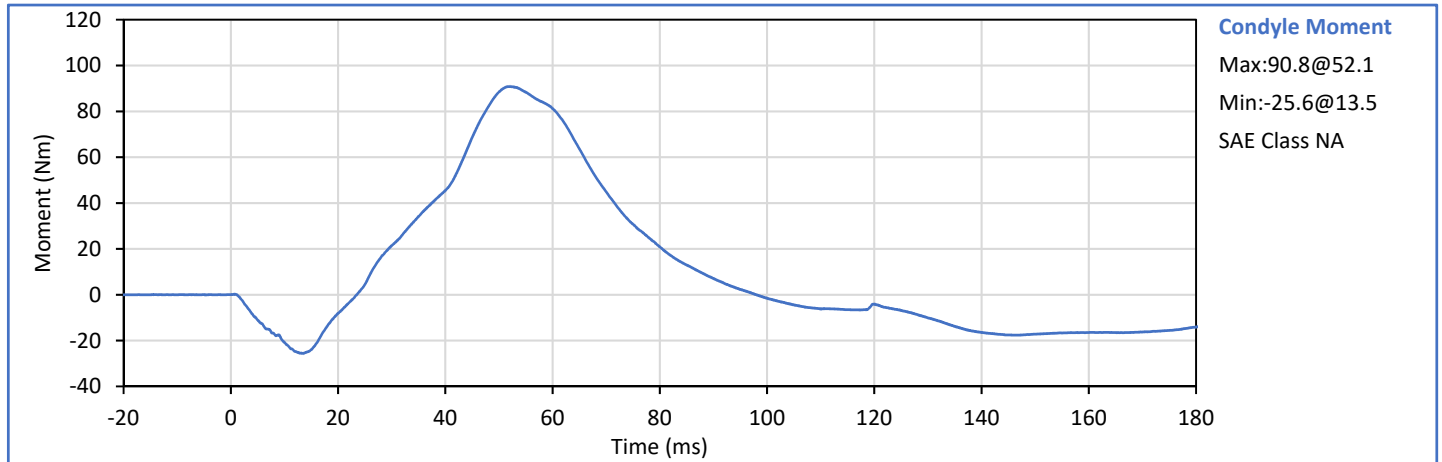
Approved By: P. Puzzuto



Hybrid III 50th Percentile Male Neck Flexion Test

ATD Serial No.: 360

Test Date: 2018-01-10



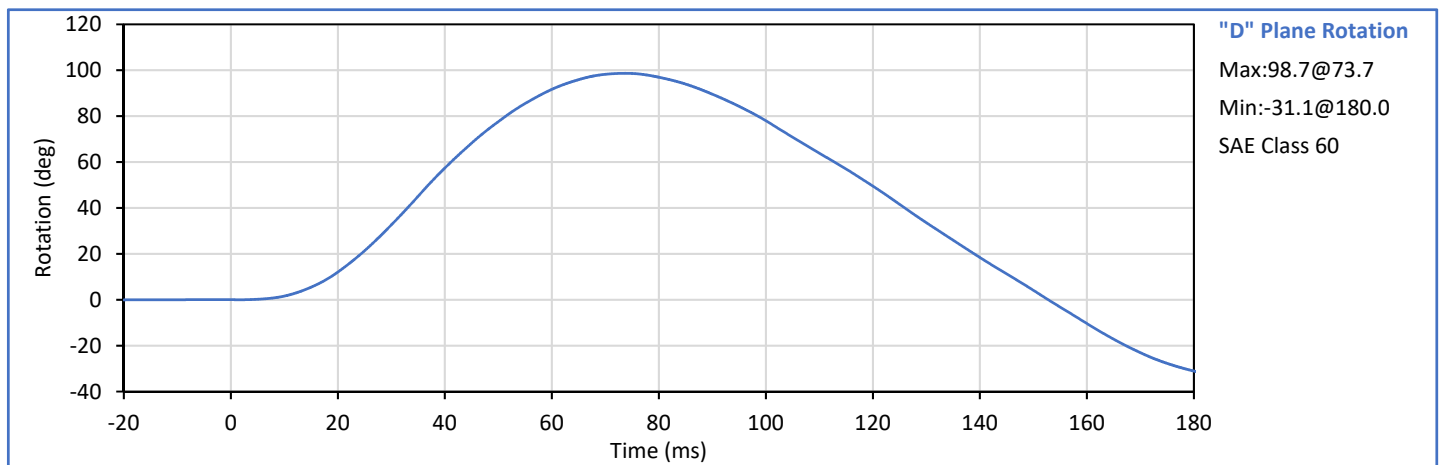
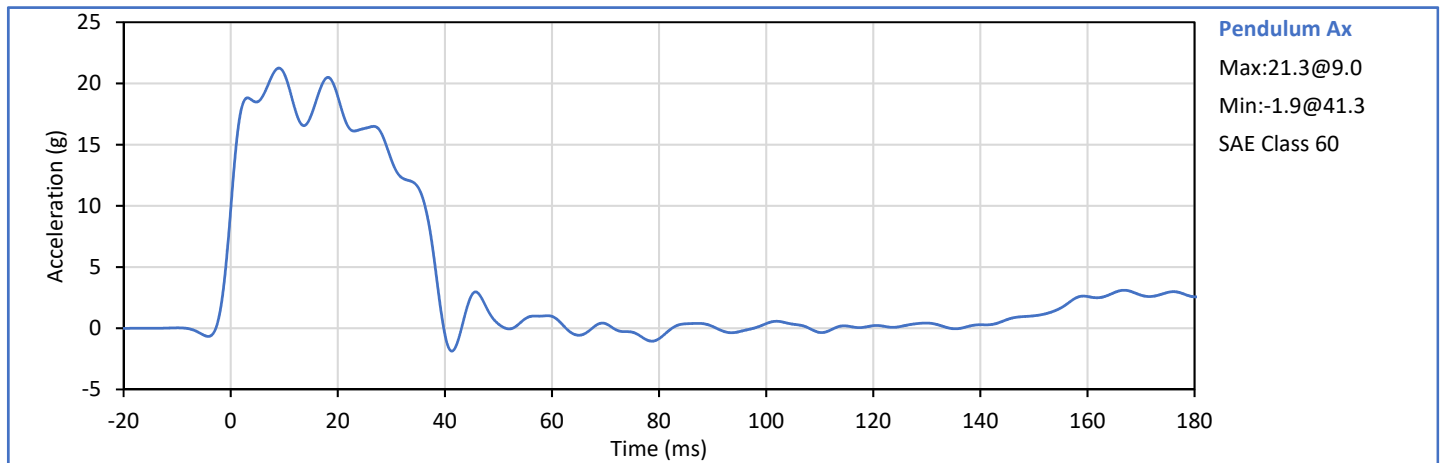


Hybrid III 50th Percentile Male Neck Extension Test

ATD Serial No.: 360

Test Date: 2018-01-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	34	Pass
Pendulum Velocity	m/s	5.94	6.19	5.94	Pass
Pendulum Deceleration at 10 ms	g	17.2	21.2	20.8	Pass
Pendulum Deceleration at 20 ms	g	14.0	19.0	18.9	Pass
Pendulum Deceleration at 30 ms	g	11.0	16.0	13.8	Pass
Peak Pendulum Decel. after 30 ms	g	0.0	22.0	13.8	Pass
Deceleration Decay to Cross 5 g	ms	38.0	46.0	38.2	Pass
"D" Plane Rotation peak	deg	81.0	106.0	98.7	Pass
	ms	72.0	82.0	73.7	Pass
"D" Plane Rotation Decay To Zero	ms	147.0	174.0	152.8	Pass
Moment About Occipital Condyle	Nm	-79.9	-52.9	-68.0	Pass
	ms	65.0	79.0	68.3	Pass
Moment Decay, Peak to Zero	deg	120.0	148.0	133.4	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto

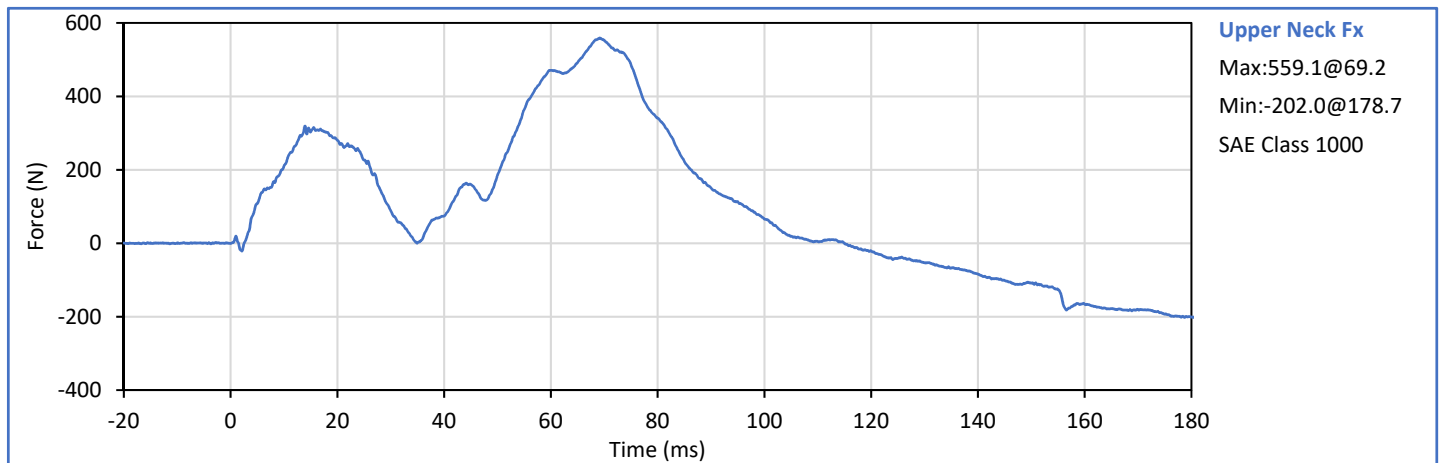
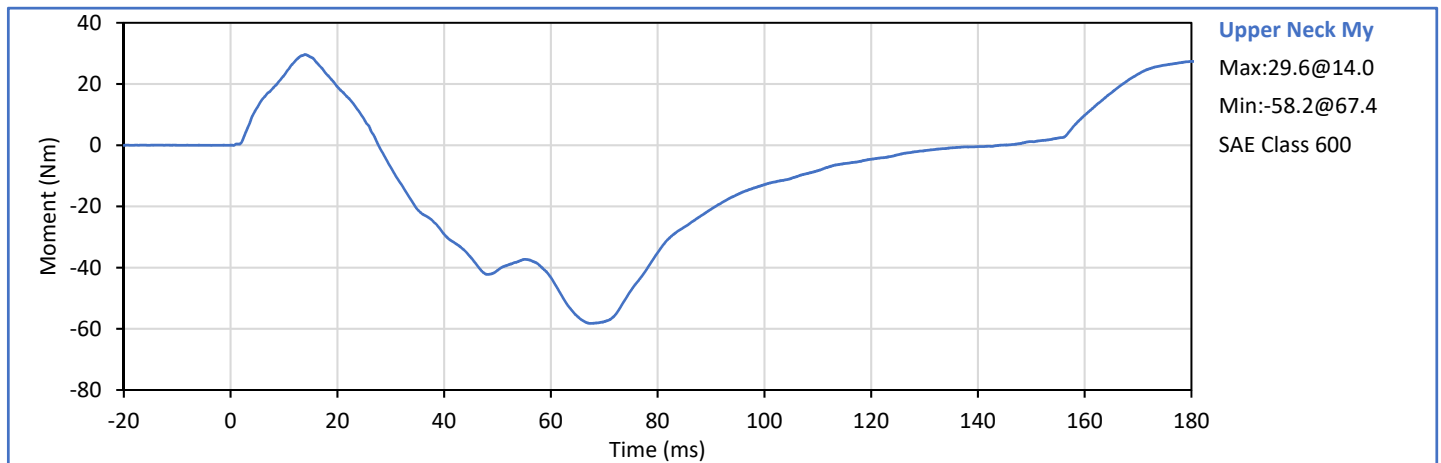
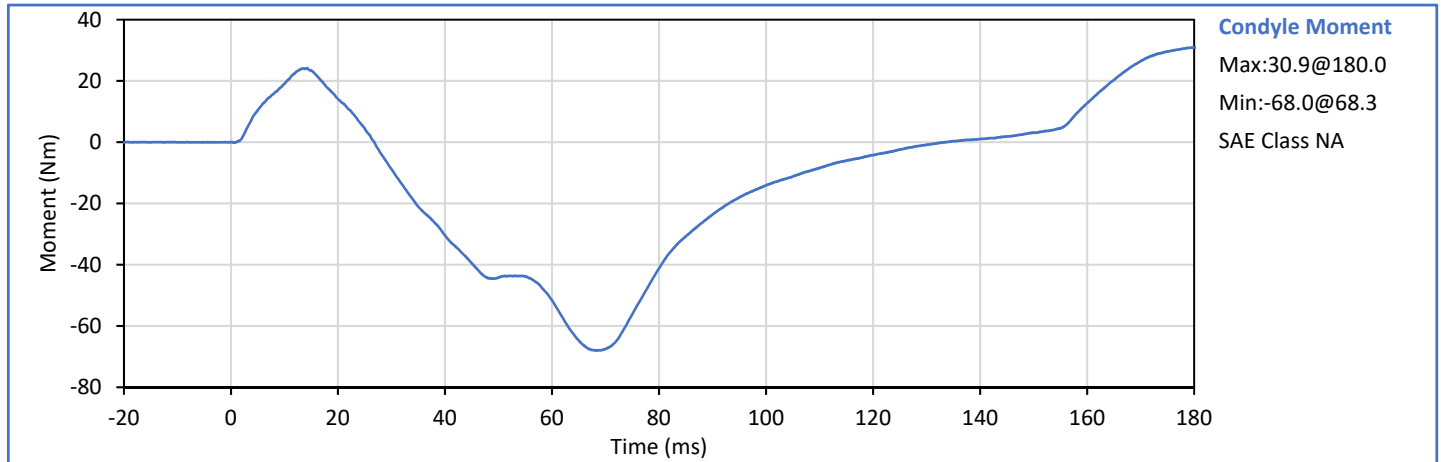


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Hybrid III 50th Percentile Male Neck Extension Test

ATD Serial No.: 360

Test Date: 2018-01-10





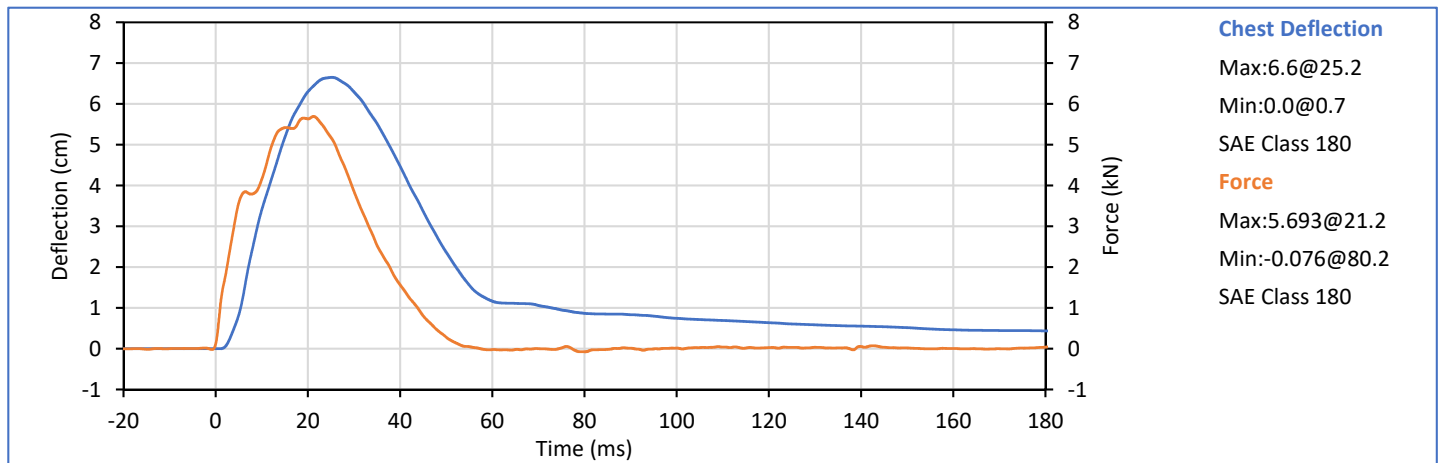
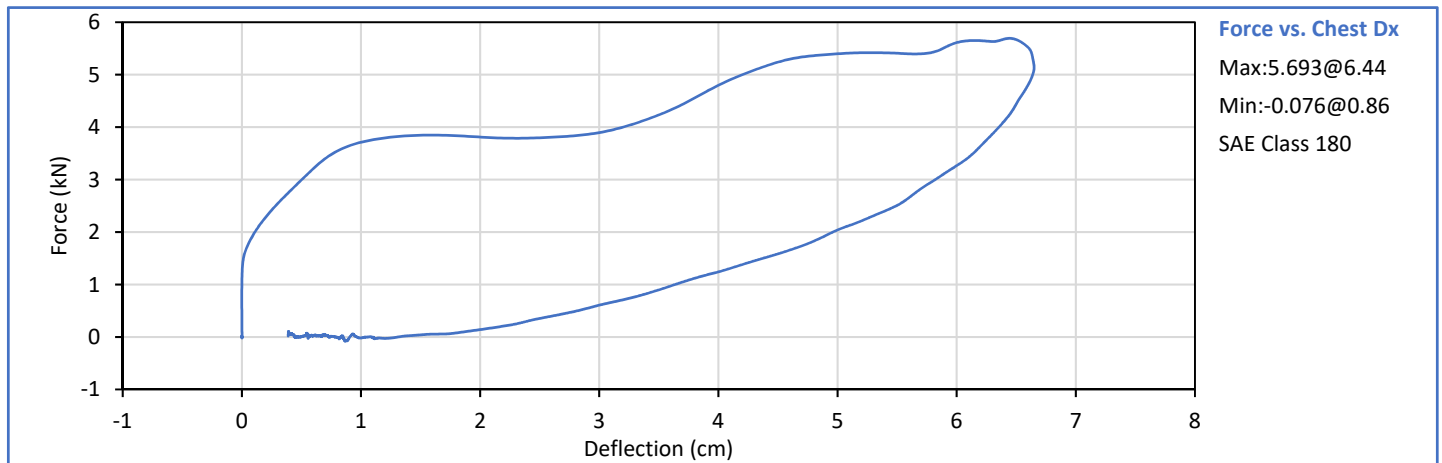
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Hybrid III 50th Percentile Male Thorax Impact

ATD Serial No.: 360

Test Date: 2018-01-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.6	Pass
Laboratory Humidity	%	10	70	36	Pass
Probe Velocity	m/s	6.58	6.82	6.72	Pass
Peak Chest Deflection	cm	6.35	7.26	6.65	Pass
Peak Probe Force	kN	5.159	5.893	5.693	Pass
Internal Hysteresis	%	69.0	85.0	72.2	Pass
Overall Test Results					Pass



Technician: J. Hernandez

Approved By: P. Puzzuto



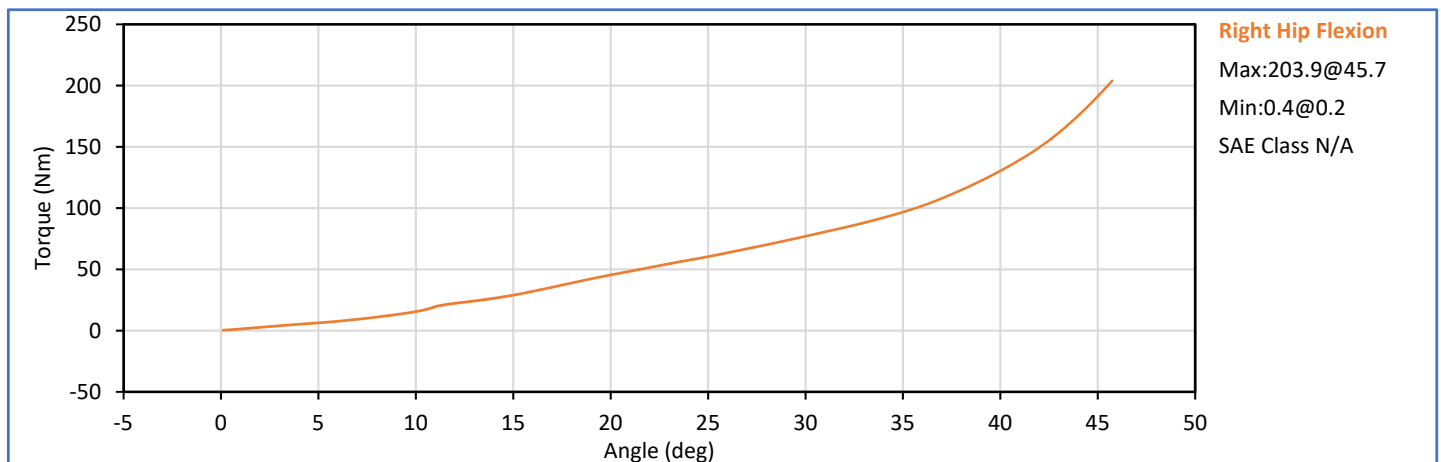
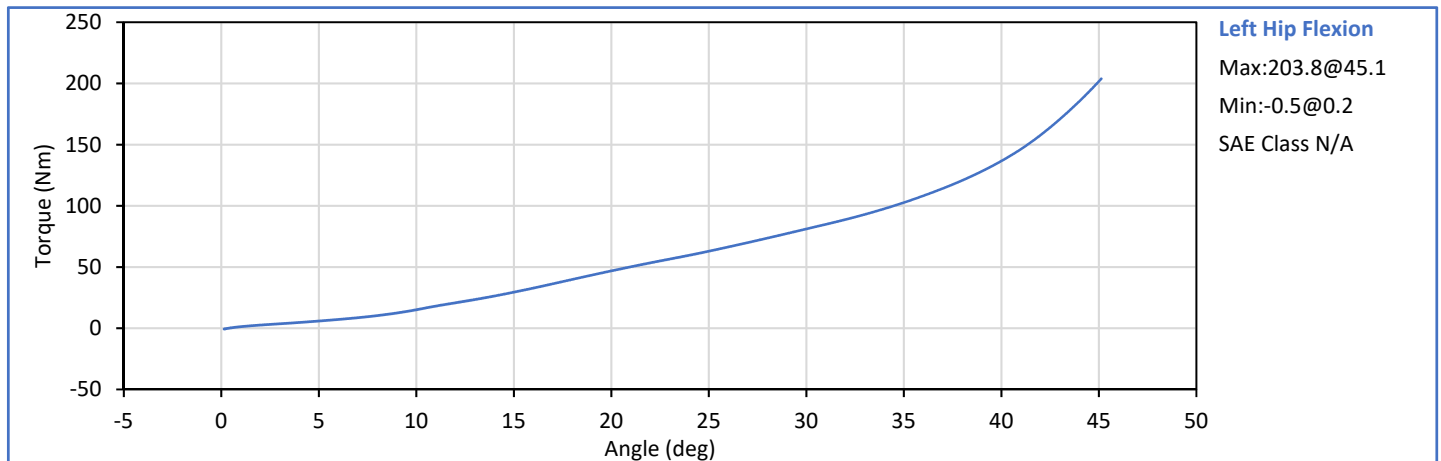
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Hybrid III 50th Percentile Male Hip Flexion (Left/Right)

ATD Serial No.: 360

Test Date: 2018-01-10

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.4	Pass
	Laboratory Humidity	%	10	70	35	Pass
Left Hip	Left Hip Rotation Rate	deg/s	5.0	10.0	6.0	Pass
	Left Femur Torque at 30°	Nm	0.0	95.0	81.2	Pass
	Left Hip Rotation at 203 Nm	deg	40.0	50.0	45.1	Pass
Right Hip	Right Hip Rotation Rate	deg/s	5.0	10.0	6.0	Pass
	Right Femur Torque at 30°	Nm	0.0	95.0	77.1	Pass
	Right Hip Rotation at 203 Nm	deg	40.0	50.0	45.7	Pass
Overall Test Results						Pass



Technician: J. Hernandez

Approved By: P. Puzzuto



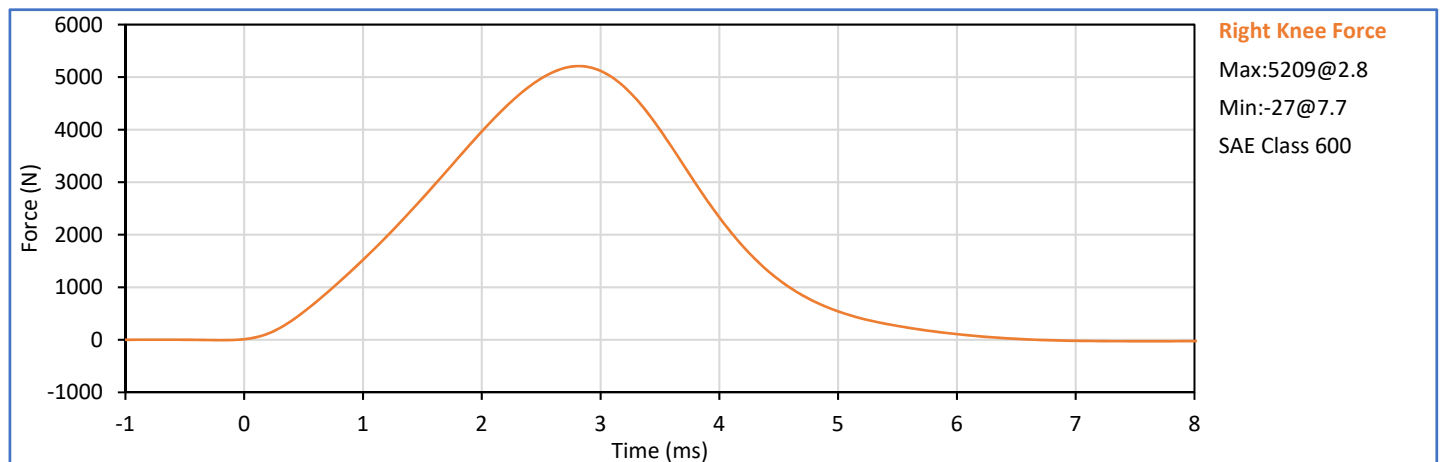
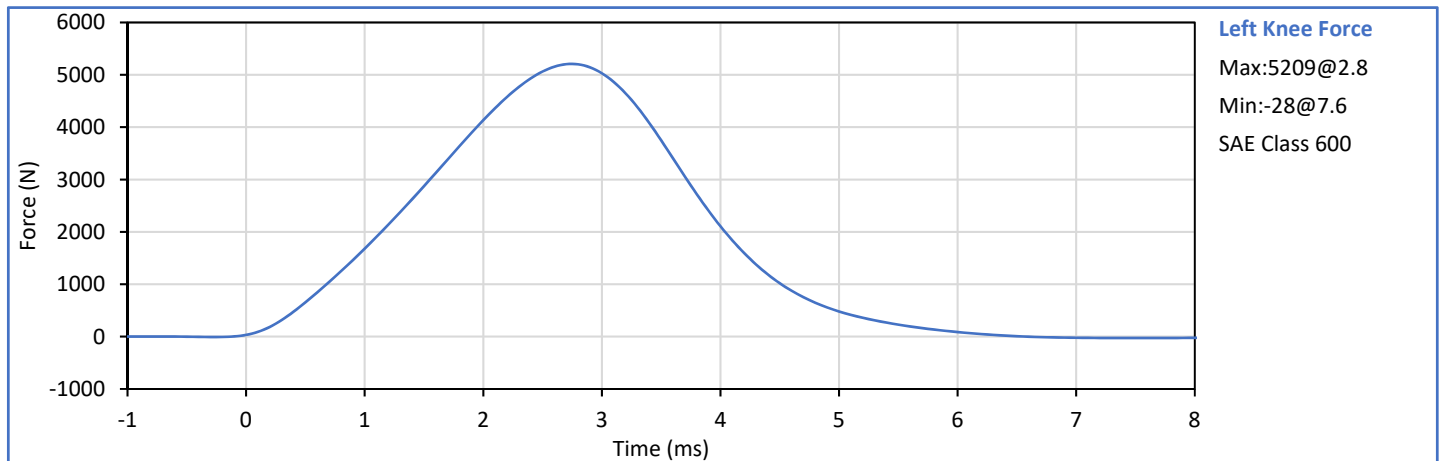
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Hybrid III 50th Percentile Male Knee Impact (Left/Right)

ATD Serial No.: 360

Test Date: 2018-01-10

	Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
	Laboratory Temperature	°C	18.9	25.6	21.6	Pass
	Laboratory Humidity	%	10	70	36	Pass
Left	Probe Velocity	m/s	2.070	2.130	2.071	Pass
Knee	Peak Resistive Force	N	4715	5782	5209	Pass
Right	Probe Velocity	m/s	2.070	2.130	2.074	Pass
Knee	Peak Resistive Force	N	4715	5782	5209	Pass
Overall Test Results						Pass



Technician: T. Lowman

Approved By: P. Puzzuto



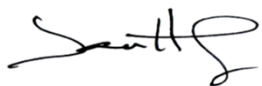
Hybrid III 5th Percentile Female Damage Checklist

ATD Serial No.: 141

Test Date: 2018-01-11

Dummy Item	Inspect for	Comments	Damage	Okay
Entire ATD	Perform general cleaning			✓
Outer Skin	Gashes, rips, cracks			✓
Head	Ballast secure			✓
	General appearance			✓
Neck bracket	Upper neck firmly attached to lower bracket			✓
Neck	Broken or cracked rubber			✓
	Looseness at the condyle joint			✓
Nodding block	Cracked or out of position			✓
Lumbar Spine	Broken or cracked rubber			✓
Ribs	Broken or bent ribs			✓
	Broken or bent rib supports			✓
	Damping material separated or cracked			✓
	Rubber bumpers in place			✓
Chest Displ.	Bent shaft			✓
Assembly	Slider arm riding in track			✓
Sensors	Check cables for cuts, tears			✓
	Check for damaged insulation			✓
Accelerometer	Head mounting secure			✓
Mounting	Chest mounting secure			✓
Knees	Skin condition			✓
	Insert (do not remove)			✓
	Casting			✓
Limbs	Normal movement and adjustment			✓
Knee Sliders	Wires intact			✓
	Rubber returned to "resting" position			✓
Pelvis	Broken			✓
Other	Describe below as needed			✓

Describe any repairs or replacement of parts or other findings:

Technician: 
J. Hernandez

Approved By: 
P. Puzzuto



**Hybrid III 5th Percentile Female
External Measurements**

ATD Serial No.: 141

Test Date: 2018-01-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.1	Pass
Laboratory Relative Humidity	%	10	70	22	Pass
A - Total sitting height	mm	775	800	788	Pass
B - Shoulder pivot height	mm	432	457	453	Pass
C - 'H' point height	mm	81	86	86	Pass
D - 'H' point location from backline	mm	145	150	148	Pass
E - Shoulder pivot from backline	mm	69	84	78	Pass
F - Thigh clearance	mm	119	135	128	Pass
G - Back of elbow to wrist pivot	mm	244	259	254	Pass
H - Head back to backline	mm	41	46	43	Pass
I - Shoulder to elbow length	mm	277	297	287	Pass
J - Elbow rest height	mm	183	203	197	Pass
K - Buttock to knee length	mm	521	546	531	Pass
L - Popliteal length	mm	356	376	367	Pass
M - Knee pivot height	mm	394	419	407	Pass
N - Buttock popliteal length	mm	414	439	428	Pass
O - Chest depth without jacket	mm	175	191	183	Pass
P - Foot length	mm	219	234	231	Pass
R - Buttock to Knee Pivot Length	mm	457	483	473	Pass
S - Head Breadth	mm	137	147	144	Pass
T - Head Depth	mm	178	188	184	Pass
U - Hip Breadth	mm	300	315	308	Pass
V - Shoulder breadth	mm	351	366	360	Pass
W - Foot breadth	mm	79	94	88	Pass
X - Head circum.	mm	528	549	535	Pass
Y - Chest circum. (w/chest jacket)	mm	851	881	868	Pass
Z - Waist circum.	mm	760	790	776	Pass
AA - Location for chest circum.	mm	300	310	306	Pass
BB - Location for waist circum.	mm	160	170	168	Pass
			Overall Test Results		Pass

Technician: _____

J. Hernandez

Approved By: _____

P. Puzzuto



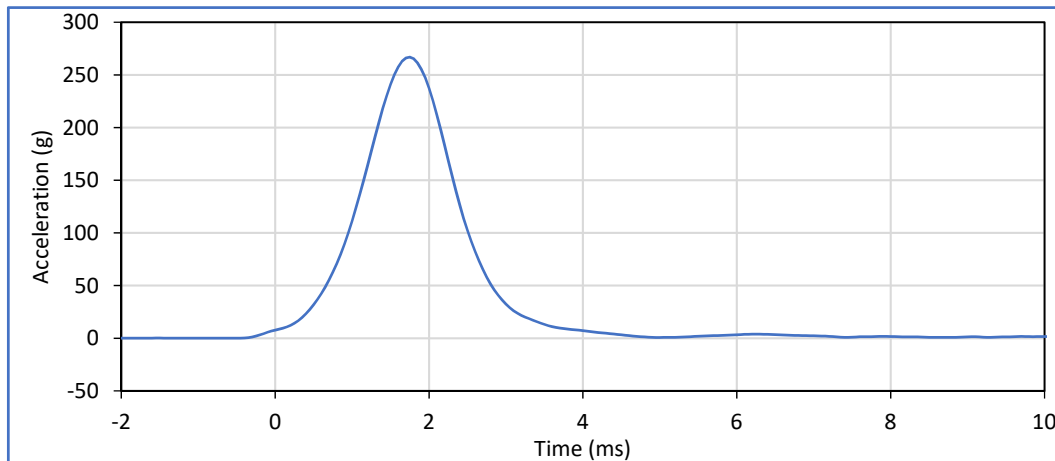
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Hybrid III 5th Percentile Female Head Drop

ATD Serial No.: 141

Test Date: 2018-01-11

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.1	Pass
Laboratory Humidity	%	10	70	22	Pass
Peak Resultant Acceleration	g	250.0	300.0	266.9	Pass
Peak Lateral Acceleration	g	-15.0	15.0	-12.1	Pass
Oscillations After Main Pulse	%	0.0	10.0	1.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes		Yes	Pass
			Overall Test Results		Pass

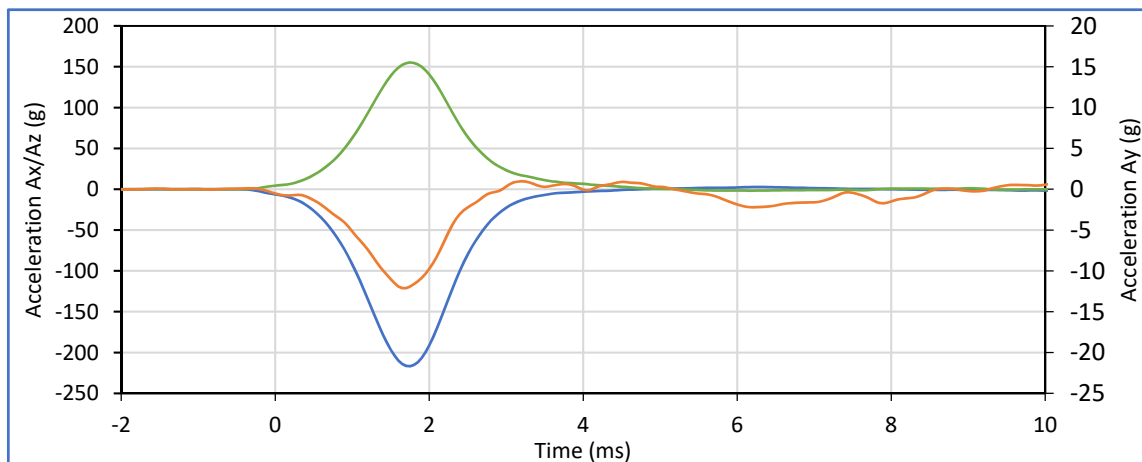


Head Resultant

Max:266.9@1.8

Min:0.8@5.0

SAE Class 1000



Head Ax

Max:2.7@6.3

Min:-216.8@1.8

SAE Class 1000

Head Ay

Max:1.0@3.2

Min:-12.1@1.7

SAE Class 1000

Head Az

Max:155.3@1.8

Min:-1.7@6.2

SAE Class 1000

Technician:

T. Lowman

Approved By:

P. Puzzuto

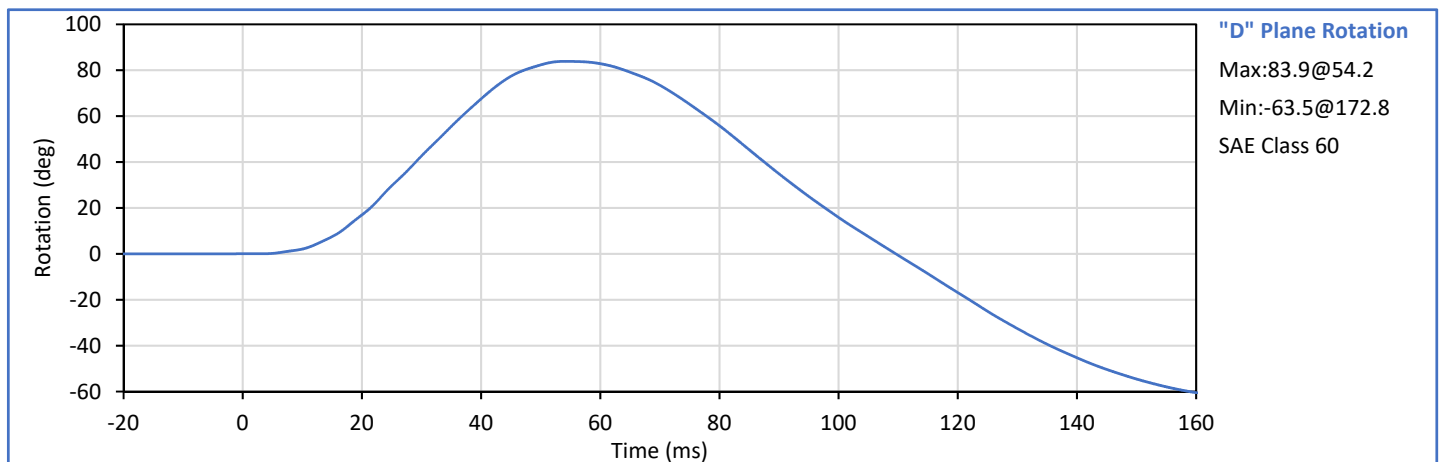
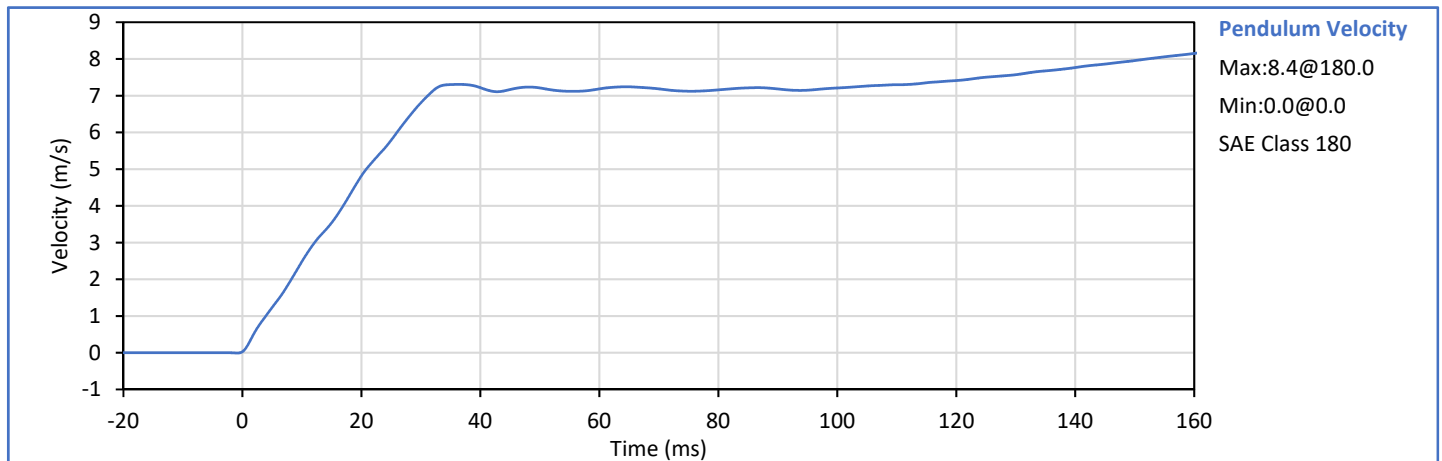


Hybrid III 5th Percentile Female Neck Flexion Test

ATD Serial No.: 141

Test Date: 2018-01-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	6.89	7.13	6.98	Pass
Pendulum Velocity at 10 ms	m/s	2.10	2.50	2.48	Pass
Pendulum Velocity at 20 ms	m/s	4.00	5.00	4.82	Pass
Pendulum Velocity at 30 ms	m/s	5.80	7.00	6.81	Pass
Peak "D" Plane Rotation	deg	77.0	91.0	83.9	Pass
Peak Moment in Rotation	Nm	69.0	83.0	78.5	Pass
Positive Moment Decay to 10 Nm	ms	80.0	100.0	81.9	Pass
Overall Test Results				Pass	Pass

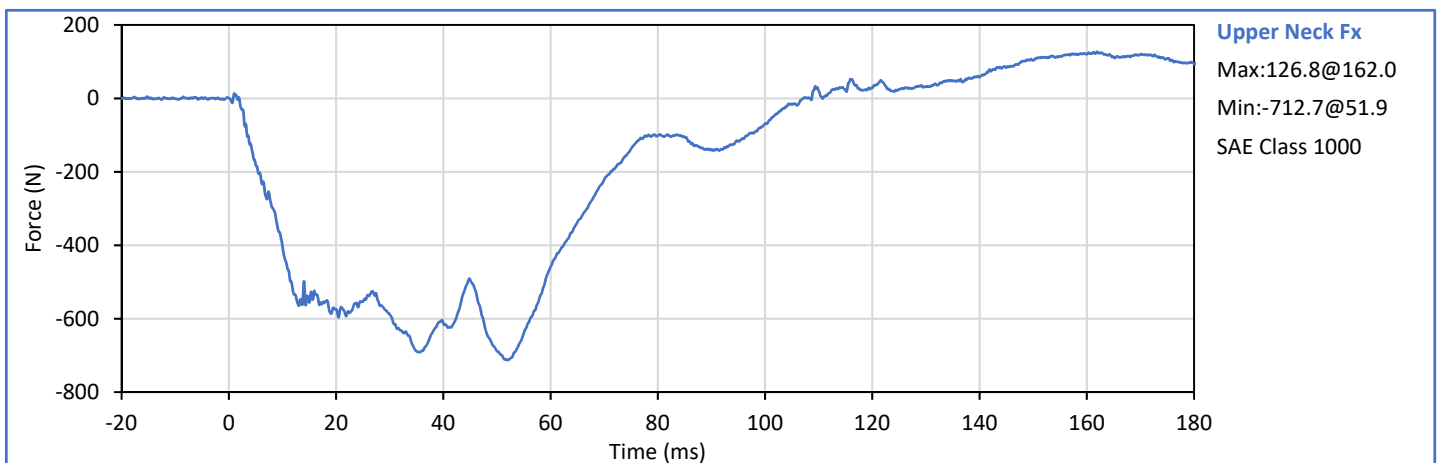
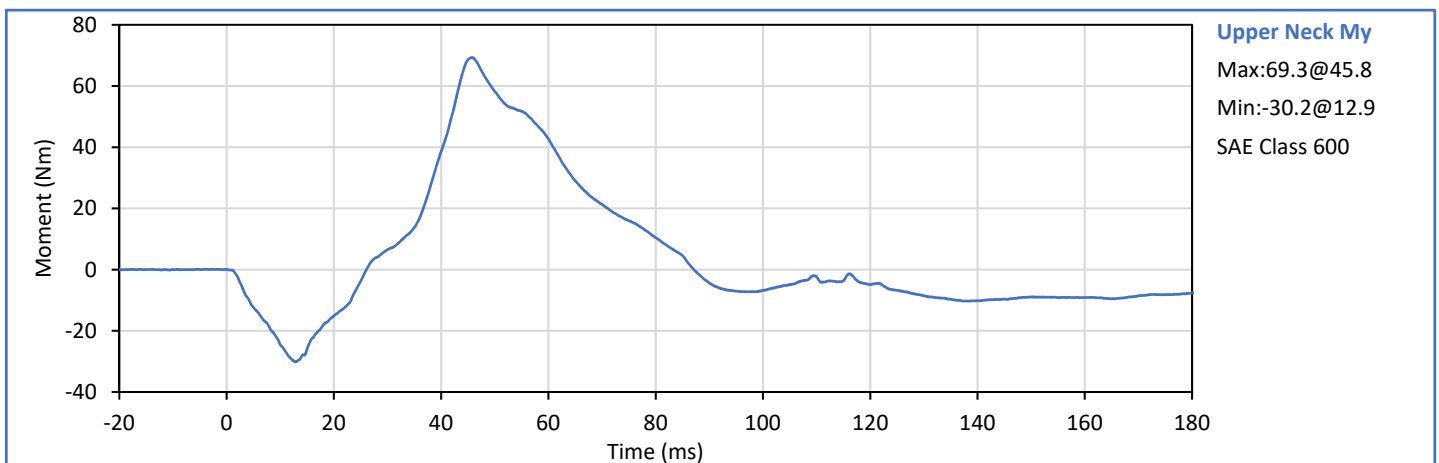
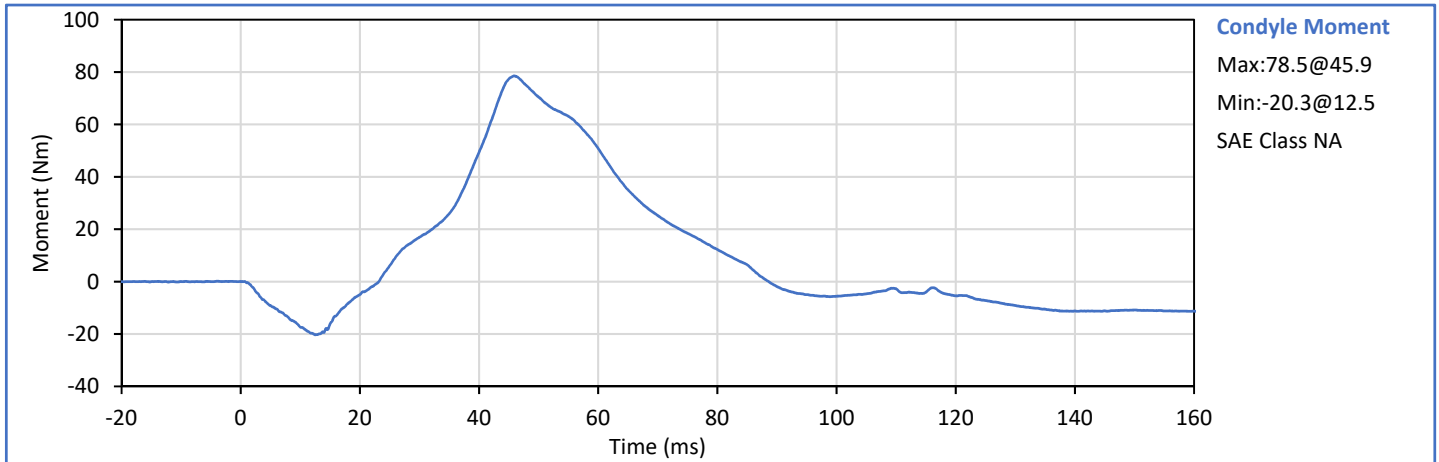


Technician: J. Hernandez

Approved By: P. Puzzuto

ATD Serial No.: 141

Test Date: 2018-01-10



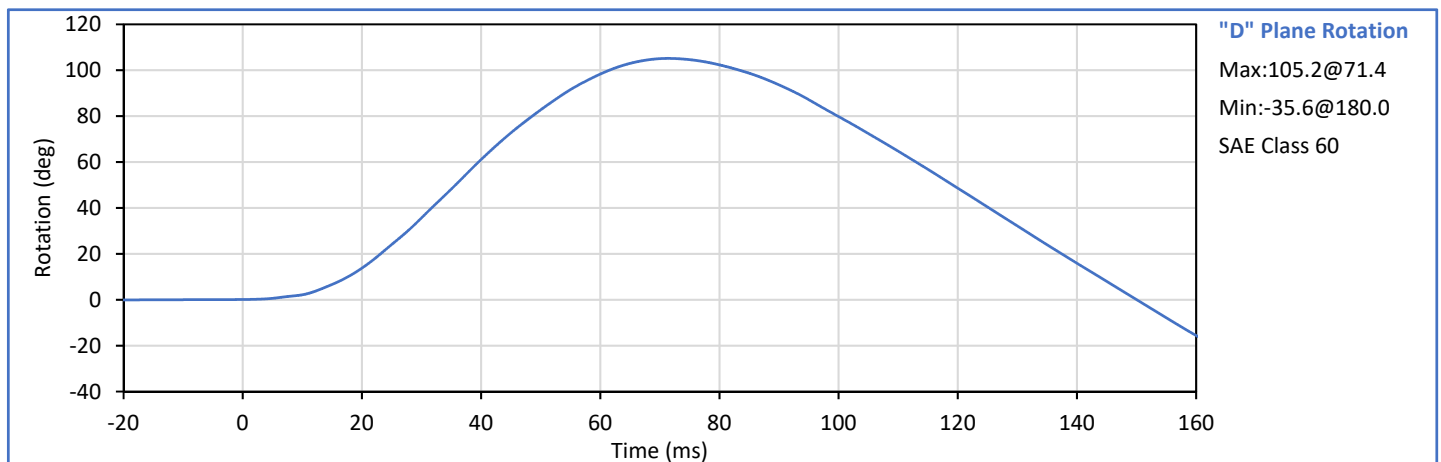
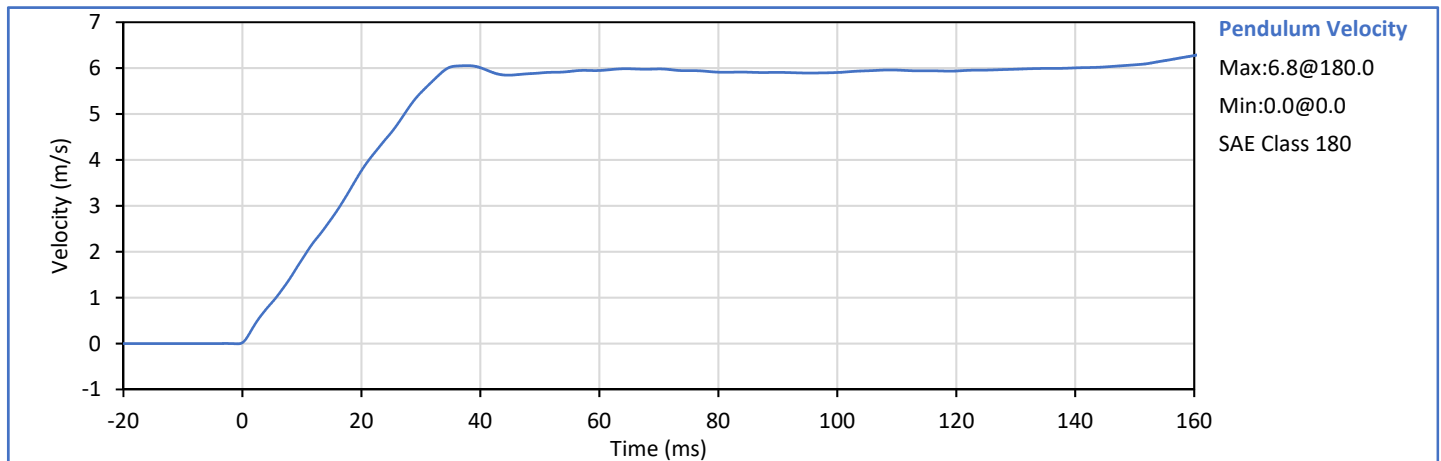


**Hybrid III 5th Percentile Female
Neck Extension Test**

ATD Serial No.: 141

Test Date: 2018-01-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.4	Pass
Laboratory Humidity	%	10	70	22	Pass
Pendulum Velocity	m/s	5.95	6.19	6.01	Pass
Pendulum Velocity at 10 ms	m/s	1.50	1.90	1.83	Pass
Pendulum Velocity at 20 ms	m/s	3.10	3.90	3.77	Pass
Pendulum Velocity at 30 ms	m/s	4.60	5.60	5.47	Pass
Peak "D" Plane Rotation	deg	99.0	114.0	105.2	Pass
Peak Moment in Rotation	Nm	-65.0	-53.0	-59.6	Pass
Negative Moment Decay to -10 Nm	ms	94.0	114.0	98.2	Pass
Overall Test Results					Pass



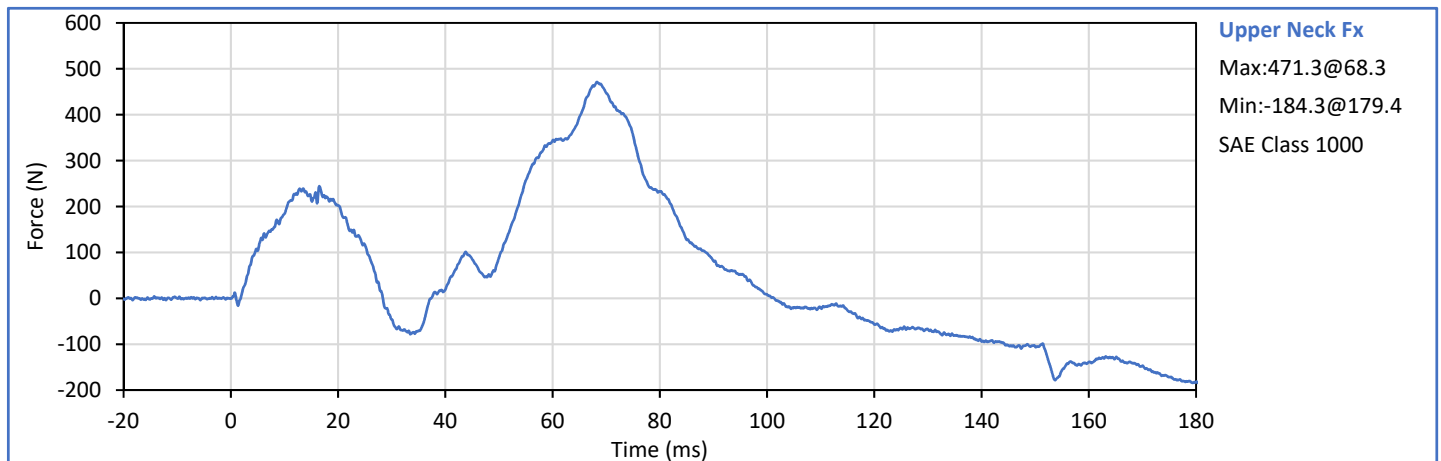
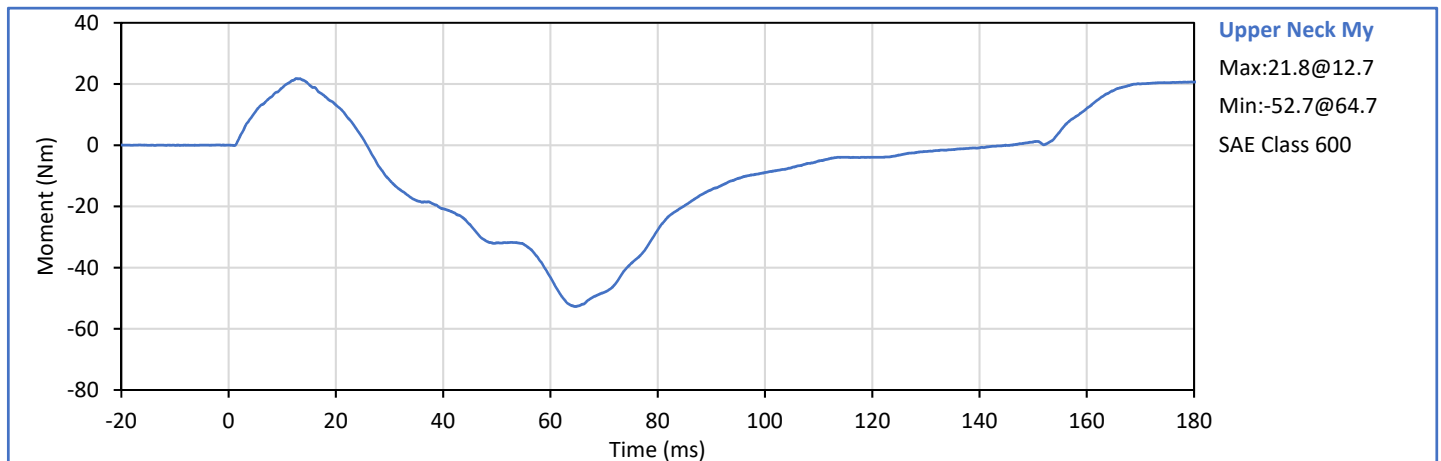
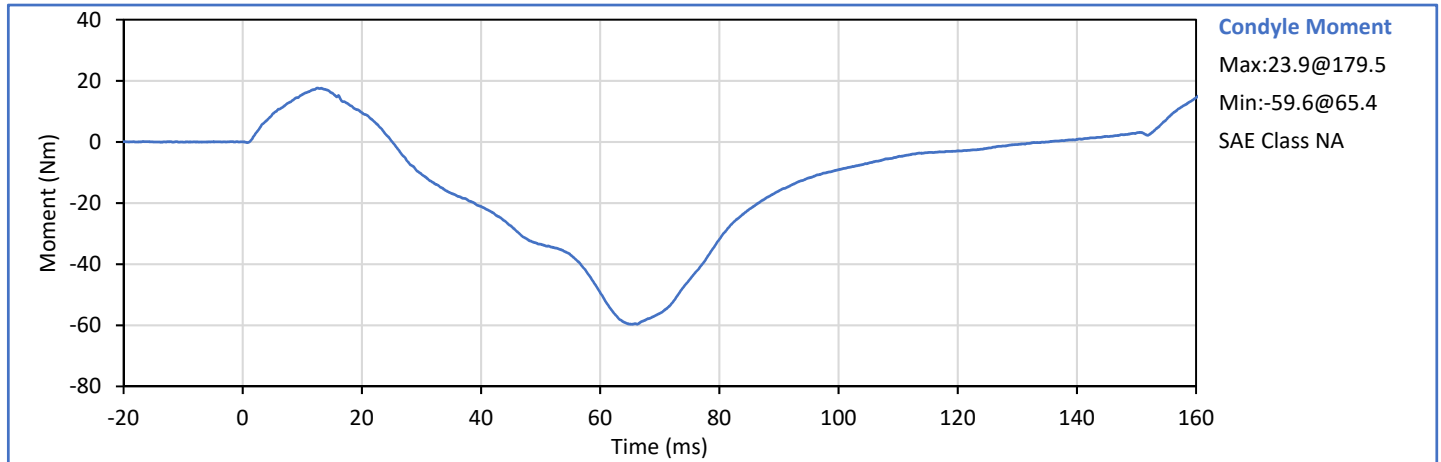
Technician: J. Hernandez

Approved By: P. Puzzuto



ATD Serial No.: 141

Test Date: 2018-01-10





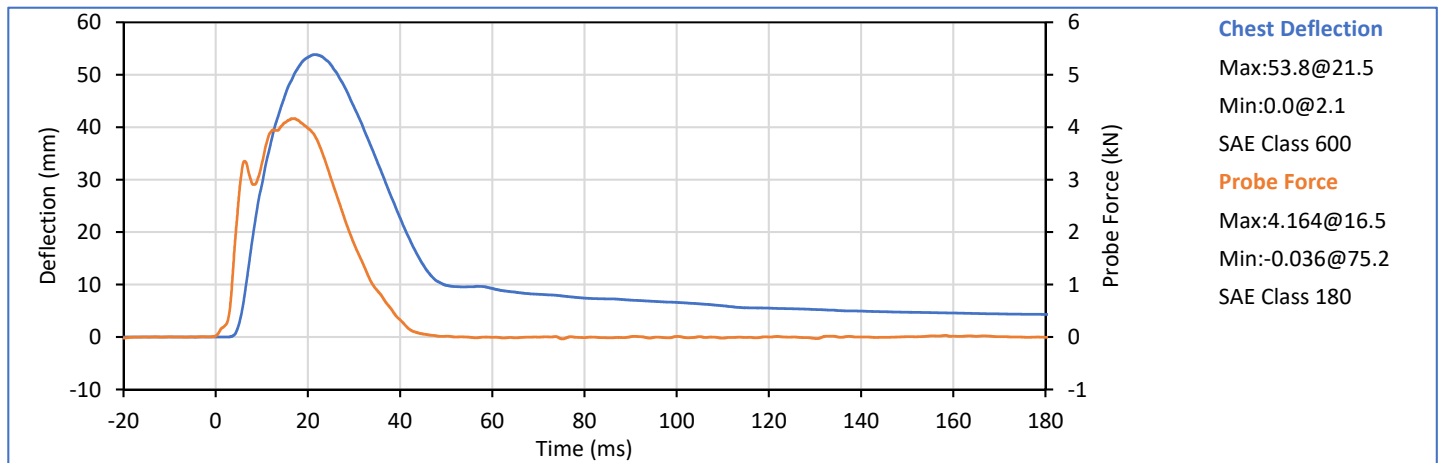
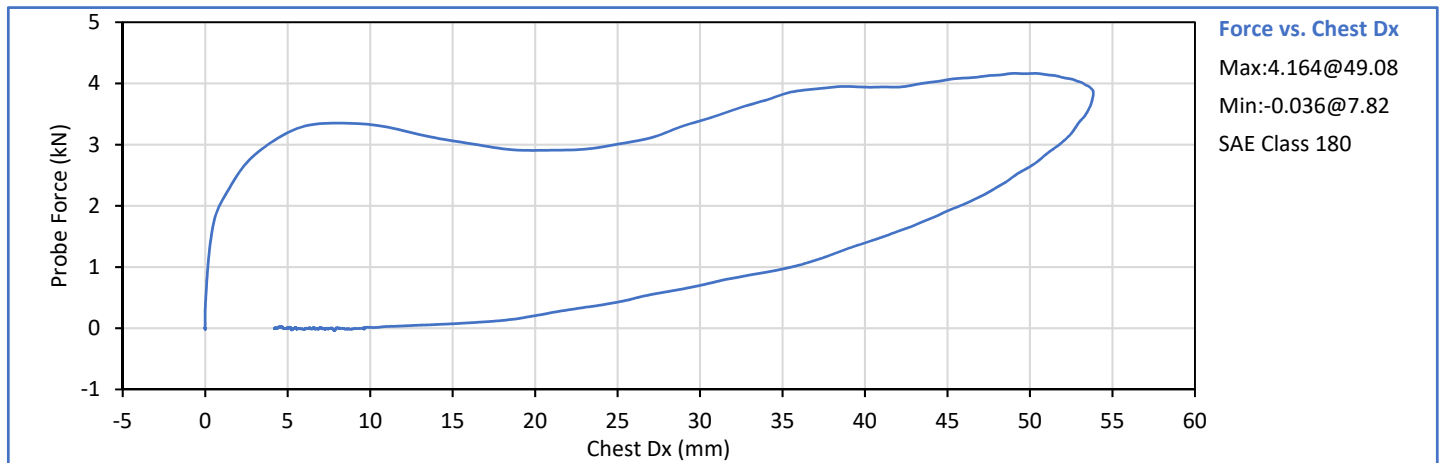
9270 Holly Road, Adelanto, CA 92301
Tel: +1 760 246 1672 Fax: +1 760 246 8112
Info@karco.com www.karco.com

Hybrid III 5th Percentile Female Thorax Impact

ATD Serial No.: 141

Test Date: 2018-01-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	20.6	22.2	21.2	Pass
Laboratory Humidity	%	10	70	33	Pass
Probe Velocity	m/s	6.59	6.83	6.70	Pass
Peak Chest Deflection	mm	50.0	58.0	53.8	Pass
Peak Probe Force, 50 and 58 mm	kN	3.900	4.400	4.164	Pass
Peak Probe Force, 18 and 50 mm	kN	0.000	4.600	4.164	Pass
Internal Hysteresis	%	69.0	85.0	74.7	Pass
Overall Test Results				Pass	



Technician: J. Hernandez

Approved By: P. Puzzuto



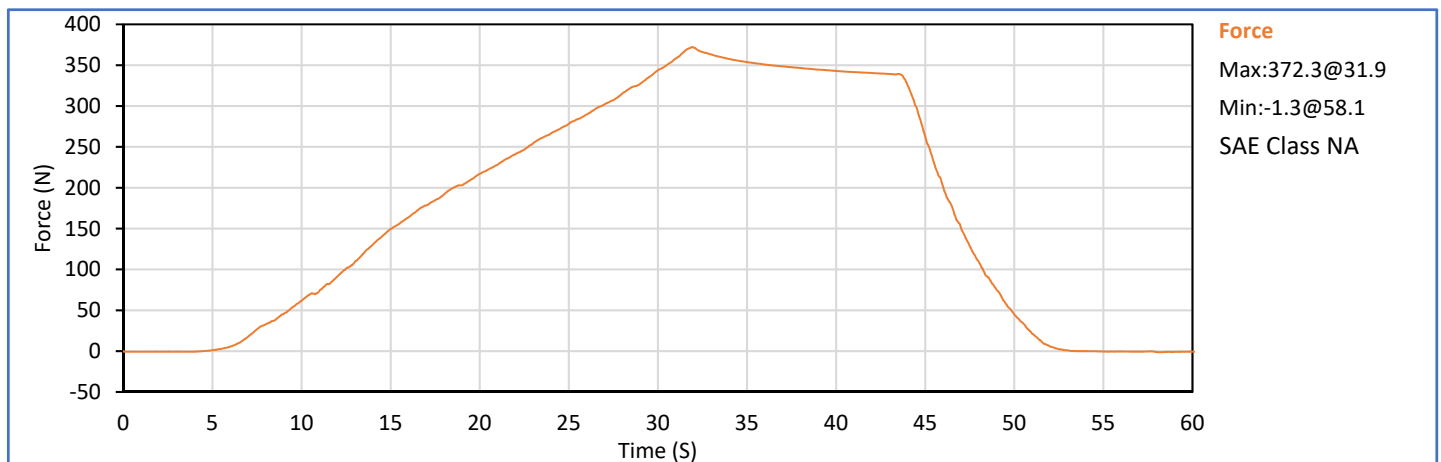
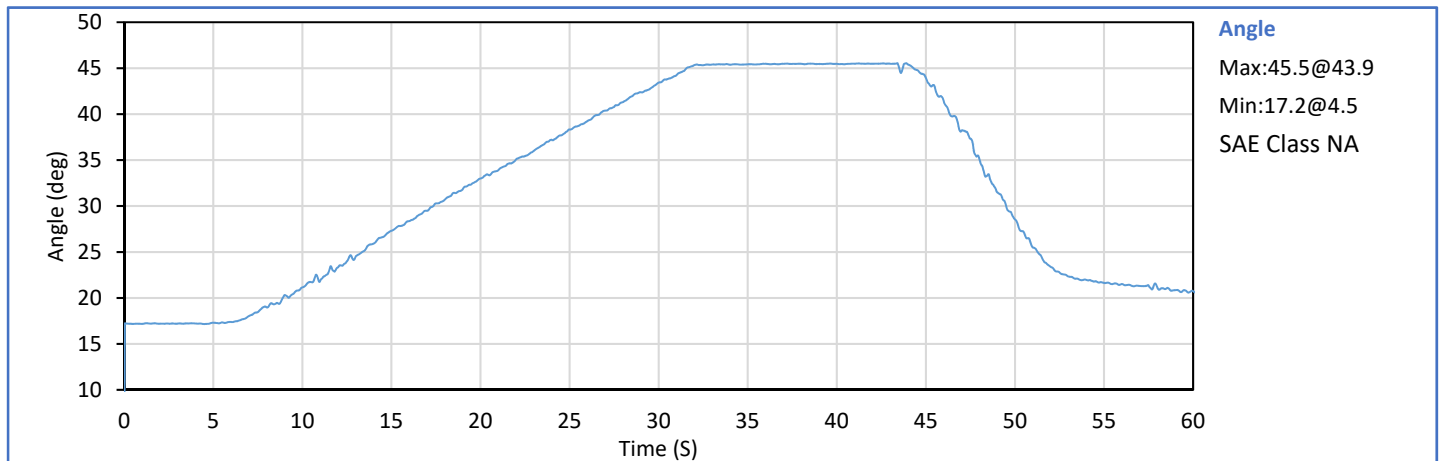
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Info@karco.com www.karco.com

Hybrid III 5th Percentile Female Torso Flexion Test

ATD Serial No.: 141

Test Date: 2018-01-10

Tested Parameter	Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature	°C	18.9	25.6	21.6	Pass
Laboratory Humidity	%	10	70	34	Pass
Orientation Angle	deg	0.0	20.0	15.1	Pass
Test Initial Angle	deg	11.0	19.0	17.2	Pass
Peak Force at 45° (+/-0.5°)	N	320.0	390.0	368.1	Pass
Torso Flexion Rate	deg/s	0.50	1.50	1.10	Pass
Final Reference Plane Angle	deg	-8.0	8.0	2.3	Pass
Overall Test Results				Pass	Pass



Technician: J. Hernandez

Approved By: P. Puzzuto



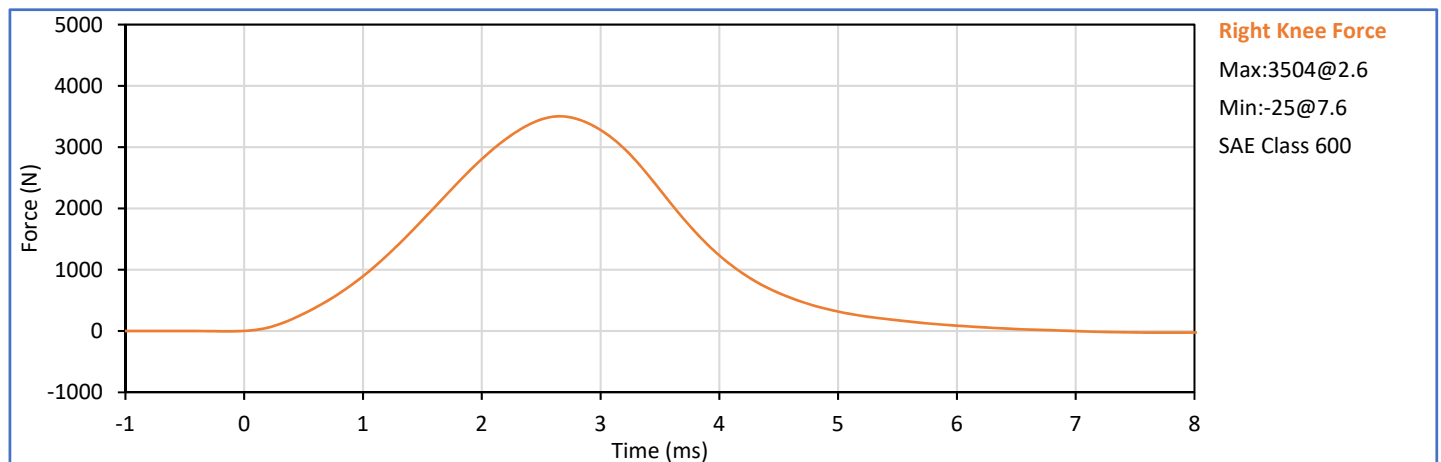
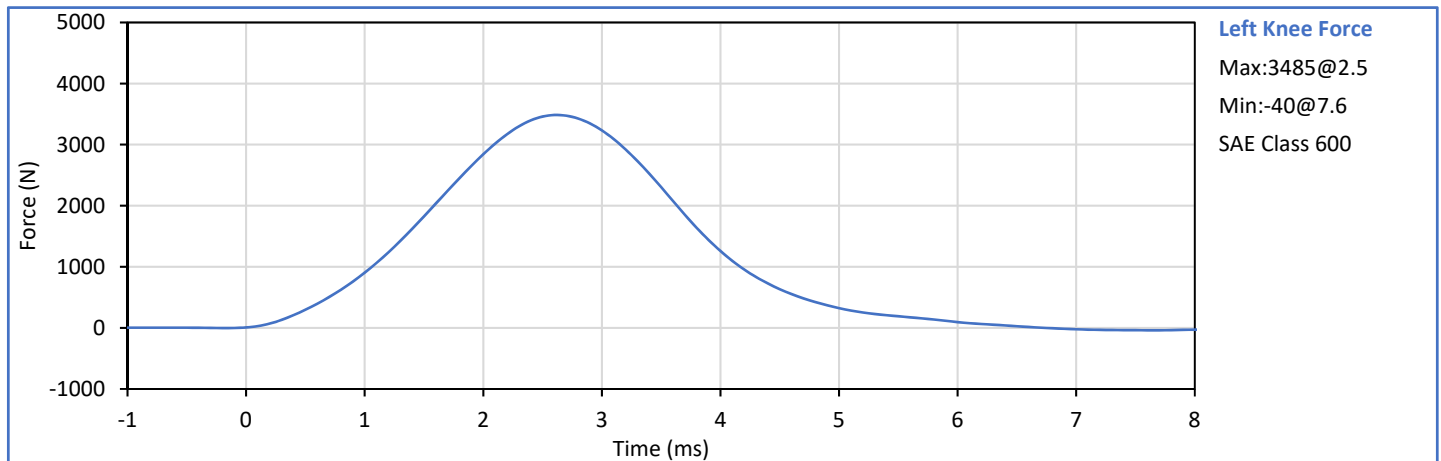
9270 Holly Road, Adelanto, CA 92301
Tel: +1 760 246 1672 Fax: +1 760 246 8112
Info@karco.com www.karco.com

Hybrid III 5th Percentile Female Knee Impact (Left/Right)

ATD Serial No.: 141

Test Date: 2018-01-11

Tested Parameter		Units	Spec. Low	Spec. High	Result	Pass/Fail
Laboratory Temperature		°C	18.9	25.6	21.1	Pass
Laboratory Humidity		%	10	70	22	Pass
Left	Probe Velocity	m/s	2.070	2.130	2.120	Pass
Knee	Peak Resistive Force	N	3450	4060	3485	Pass
Right	Probe Velocity	m/s	2.070	2.130	2.122	Pass
Knee	Peak Resistive Force	N	3450	4060	3504	Pass
Overall Test Results						Pass



Technician: T. Lowman

Approved By: P. Puzzuto