

REPORT NUMBER: NCAP-MGA-2009-005

**NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST**

**FORD MOTOR COMPANY
2010 FORD MUSTANG 2-DR COUPE
NHTSA NUMBER: MA0201**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



Test Date: April 27, 2009

Final Report Date: May 28, 2009

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
1200 NEW JERSEY AVENUE, SE, ROOM W43-410
WASHINGTON, D.C. 20590**

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-06-D-00028.

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Date: 5/28/09

Technical Report Documentation Page

1. Report No. NCAP-MGA-2009-005	2. Government Accession No.	3. Recipient's Catalog No.																										
4. Title and Subtitle Final Report of New Car Assessment Program Testing of a 2010 Ford Mustang 2-Dr Coupe NHTSA No.: MA0201		5. Report Date May 28, 2009																										
		6. Performing Organization Code MGA																										
7. Author(s) Joe Fleck, Project Engineer David Winkelbauer, Director of Operations		8. Performing Organization Report No. NCAP-MGA-2009-005																										
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		10. Work Unit No.																										
		11. Contract or Grant No. DTNH22-06-D-00028																										
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Rulemaking, Office of Crashworthiness Standards 1200 New Jersey Ave, SE, Room W43-410, NVS-111 Washington, D.C. 20590		13. Type of Report and Period Covered Final Report 4/27/2009 to 5/28/2009																										
		14. Sponsoring Agency Code NVS-111																										
15. Supplementary Notes																												
16. Abstract A frontal barrier impact was conducted on a 2010 Ford Mustang 2-Dr Coupe at MGA Research Corporation on April 27, 2009. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.2 km/h. The ambient temperature at the barrier face at the time of impact was 21 degrees Celsius. The vehicle's maximum post test static crush is 567 mm located at the vehicle's centerline. The test vehicle is equipped with a 3-point continuous belt system and an airbag in both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection", the occupant injury criteria summary is as follows: <table style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;"><u>Measurement Description</u></th> <th style="text-align: left;"><u>Units</u></th> <th style="text-align: left;"><u>Threshold</u></th> <th style="text-align: left;"><u>Driver ATD</u></th> <th style="text-align: left;"><u>Pass. ATD</u></th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>457</td> <td>379</td> </tr> <tr> <td>Max. Thorax Accel. (3ms Clip)</td> <td>G's</td> <td>60</td> <td>34</td> <td>40</td> </tr> <tr> <td>Left Femur Force</td> <td>Newton</td> <td>10009</td> <td>-2127</td> <td>-1697</td> </tr> <tr> <td>Right Femur Force</td> <td>Newton</td> <td>10009</td> <td>-2452</td> <td>-1584</td> </tr> </tbody> </table>				<u>Measurement Description</u>	<u>Units</u>	<u>Threshold</u>	<u>Driver ATD</u>	<u>Pass. ATD</u>	Head Injury Criteria (HIC ₃₆)	N/A	1000	457	379	Max. Thorax Accel. (3ms Clip)	G's	60	34	40	Left Femur Force	Newton	10009	-2127	-1697	Right Femur Force	Newton	10009	-2452	-1584
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19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 120	22. Price																									

Form DOT F1700.7 (8-72)

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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This 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 DTNH22-06-D-00028. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact in excess of the current 48.3 kph requirements.

SUMMARY

A load cell barrier was impacted by a 2010 Ford Mustang 2-Dr Coupe at a velocity of 56.2 kph. The test was performed at MGA Research Corporation on April 27, 2009. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head, chest and pelvis tri-axial accelerometers, chest displacement potentiometer, upper neck transducers, right/left femur load cells, and lower leg instrumentation. The driver (position 1) ATD (Serial No. 065) and right-front passenger (position 2) ATD (Serial No. 066) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 100 channels of data were recorded on an on-board data acquisition system. Appendix B contains the dummy head, chest, and femur response data traces.

There was 100 percent windshield retention and no intrusion into the protected zone of the windshield during the event. There was no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 567 mm and both the driver and passenger side door remained closed and latched during the impact event and were operable after the impact.

The driver's head and chest contacted the airbag. The driver's head also contacted the headrest. The driver's knees contacted the knee bolster. The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest. The passenger's knees contacted the glove box.

The occupant data is summarized below:

ATD position	HIC	T ¹	T ²	Clip (g)	T ¹	T ²	Chest Disp. (mm)	Left Femur (N)	Right Femur (N)
Driver	457	52.0	77.7	34	45.2	48.2	-24	-2127	-2452
Passenger	379	61.7	97.7	40	74.5	77.5	-21	-1697	-1584

The test data can be found on the NHTSA website at www.nhtsa.dot.gov.

TEST NOTES

There was no valid data collected for:
Passenger Chest Z Redundant

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
Test Date: 4/27/2009

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Door was unlocked	Door was unlocked
Front Door Opening	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Rear Door Opening		
Seat Track Shift (mm)	None	None
Seat Back Failure	None	None
Glazing Damage	None	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	1532
Center	mm	1591
Right Side	mm	1614
Average	mm	1579

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	1051	1045
Lap belt length as measured on ATD	mm	840	813
Remainder of belt on reel	mm	869	1022
Total belt length for continuous webbing systems	mm	2760	2880

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

TEST VEHICLE INFORMATION

Manufacturer	Ford
Model	Mustang
Body Style	Coupe
NHTSA No.	MA0201
VIN	1ZVBP8AN0A5100632
Color	Grabber Blue
Delivery Date	4/22/2009
Odometer Reading (mile)	188
Dealer	Boucher Fleet Group
Transmission	Automatic
Final Drive	Rear
Number of Cylinders	6
Engine Displacement (L)	4.0
Engine Placement	Longitudinal
Automatic Door Lock (ADL)	Yes
Owners Manual Details Instructions on Disabling ADLs	Yes
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Front Airbag	Yes
Driver Side Curtain Airbag	No
Driver Side Torso Airbag	Yes
Rear Passenger Side Curtain Airbag	No
Rear Passenger Side Torso Airbag	No
Force Limiter	Yes
Pretensioner	Yes
Power Steering	Yes
Power Door Locks	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Anti-lock Brakes	Yes
Traction Control	Yes
All Wheel Drive	No
Power Seats	No

DATA FROM CERTIFICATION LABEL

Manufactured By	Ford Motor Company
Date of Manufacture	03/09

GVWR (kg)	2059
GAWR Front (kg)	993
GAWR Rear (kg)	1070

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket		
Number of Occupants	2	2		4
Capacity Wt. (VCW) (kg)				326
Cargo Wt. (RCLW) (kg)				54

DATA SHEET NO. 2... (CONTINUED)
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	421.8	355.6		448.2	428.2	
Right	kg	425.1	361.1		452.2	437.7	
Ratio	%	54.2	45.8		51.0	49.0	
Totals	kg	846.9	716.7	1563.6	900.4	865.9	1766.3

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1563.6
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	54
Calculated Vehicle Target Weight (TVTW)	kg	1773.6

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	725	724	755	750	1246
As Tested	mm	714	711	726	719	1333
Post Test	mm	757	754	732	714	

Vehicle Wheelbase (mm): 2720

Weight of Ballast secured in trunk (kg): 6.8

Vehicle Components Removed: Spare tire, jack, cargo carpet, right rear tail light

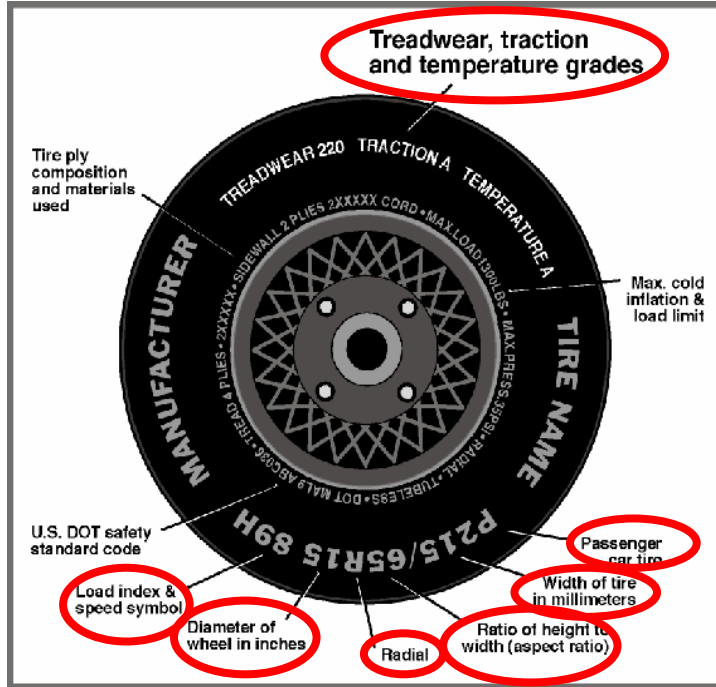
Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009



DATA FROM TIRE AND TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	220
Recommended Tire Size	P215/60R17	P215/60R17
Tire Size on Vehicle	P215/60R17	P215/60R17
Tire Manufacturer	BF Goodrich	BF Goodrich
Tire Name	Traction T/A	Traction T/A
Tire Type	Passenger	Passenger
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	60	60
Radial	R	R
Wheel Diameter	17	17
Load Index & Speed Symbol	95T	95T
Treadwear	620	620
Traction Grade	A	A
Temperature Grade	B	B

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
Test Program: 35mph Frontal Impact

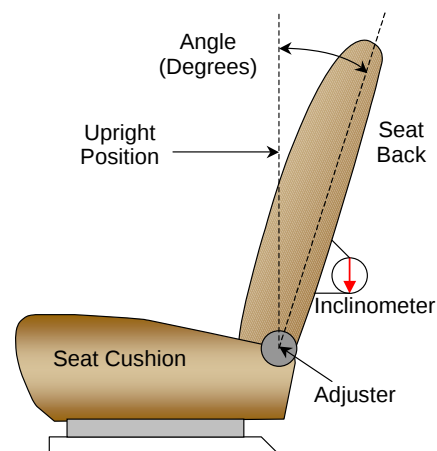
NHTSA No.: MA0201
Test Date: 4/27/2009

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Set the seat back angles at 13 degrees (measured from upright position and at headrest post).

Driver seat back angle: 13.7° on headrest post

Passenger seat back angle: 13.1° on headrest post



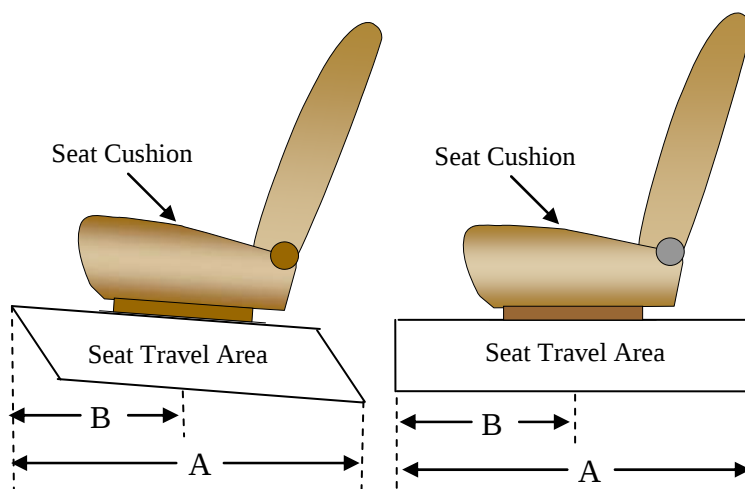
FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	260 mm	130 mm
Passenger Seat	238 mm	119 mm

ADJUSTABLE D-RING POSITION

The driver and passenger D-rings were non-adjustable.



DATA SHEET NO. 4...(CONTINUED)

TEST VEHICLE INFORMATION

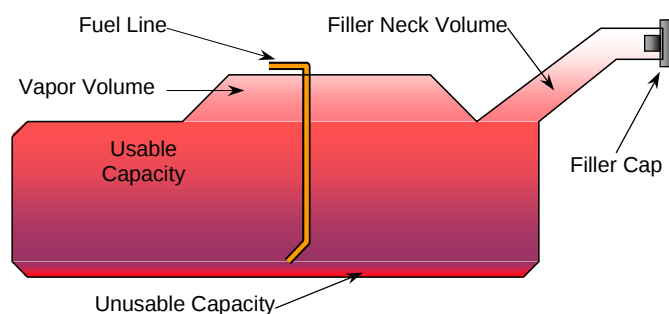
Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
Test Date: 4/27/2009

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	60.6
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	55.7 to 56.9
Actual Amount of Solvent used	56.4
1/3 of Usable Capacity	20.2

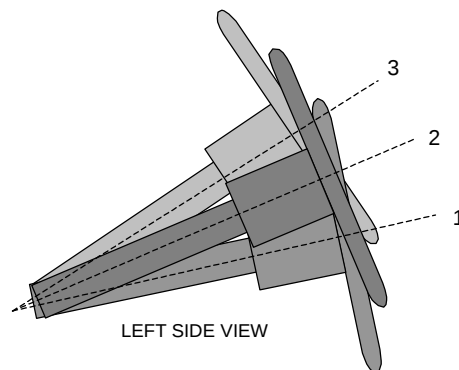
The test vehicle is equipped with an electric fuel pump. The electric fuel pump operates for 2 seconds to pressurize the fuel system following the actuation of the ignition. If no attempt has been made to start the engine within 2 seconds following ignition actuation, the fuel pump will shut off. The fuel pump operates continuously while the engine is running. If the engine stalls, the fuel pump is deactivated. Also, a fuel pump shut-off switch is provided, designed to stop fuel flow to the engine if the vehicle sustains an impact above a certain magnitude. The fuel pipe is on the left side.



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

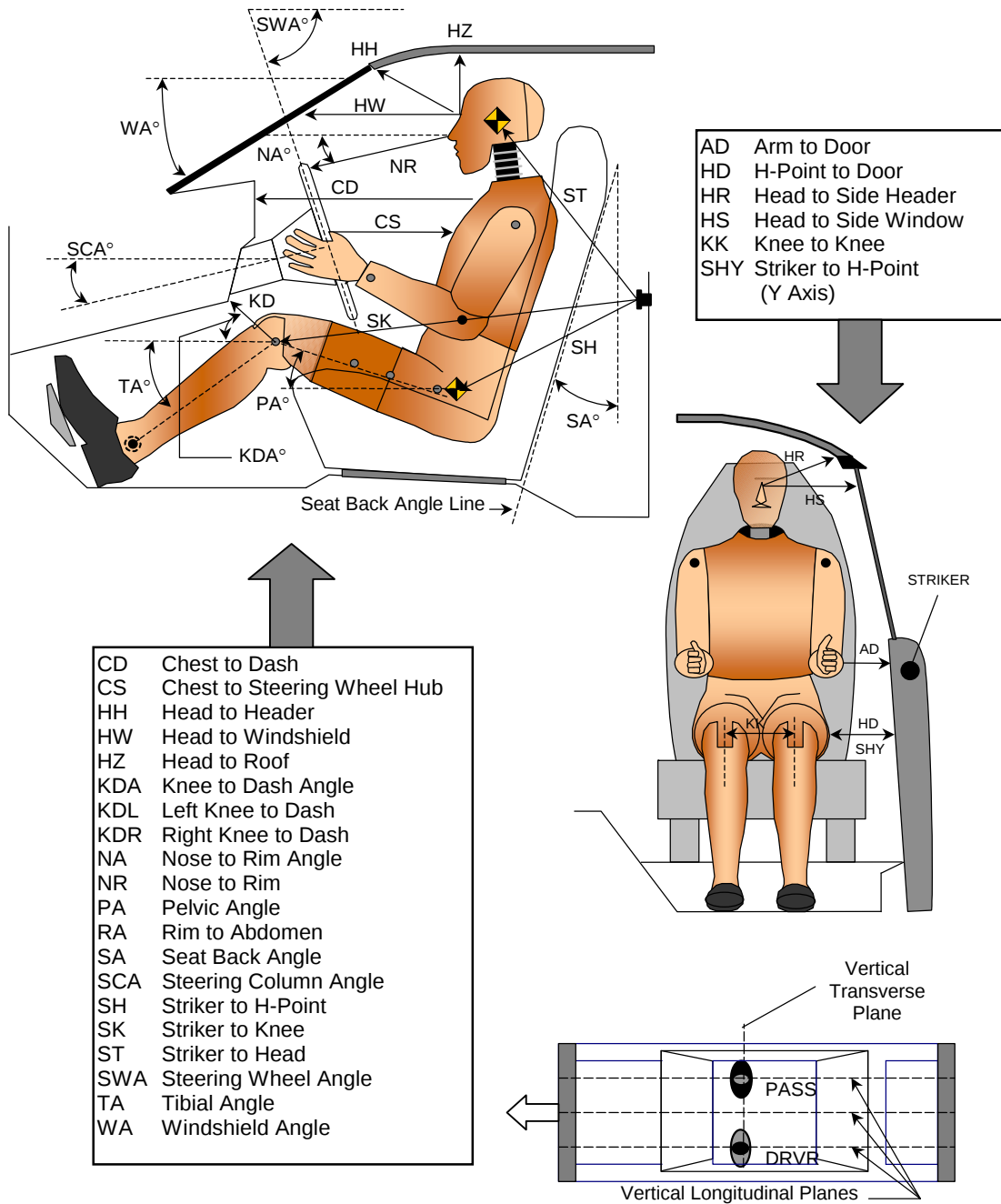
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		65.0
Geometric center position No. 2		67.3
Uppermost position No. 3		69.5

DATA SHEET NO. 5 **DUMMY POSITIONING IN VEHICLE**

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

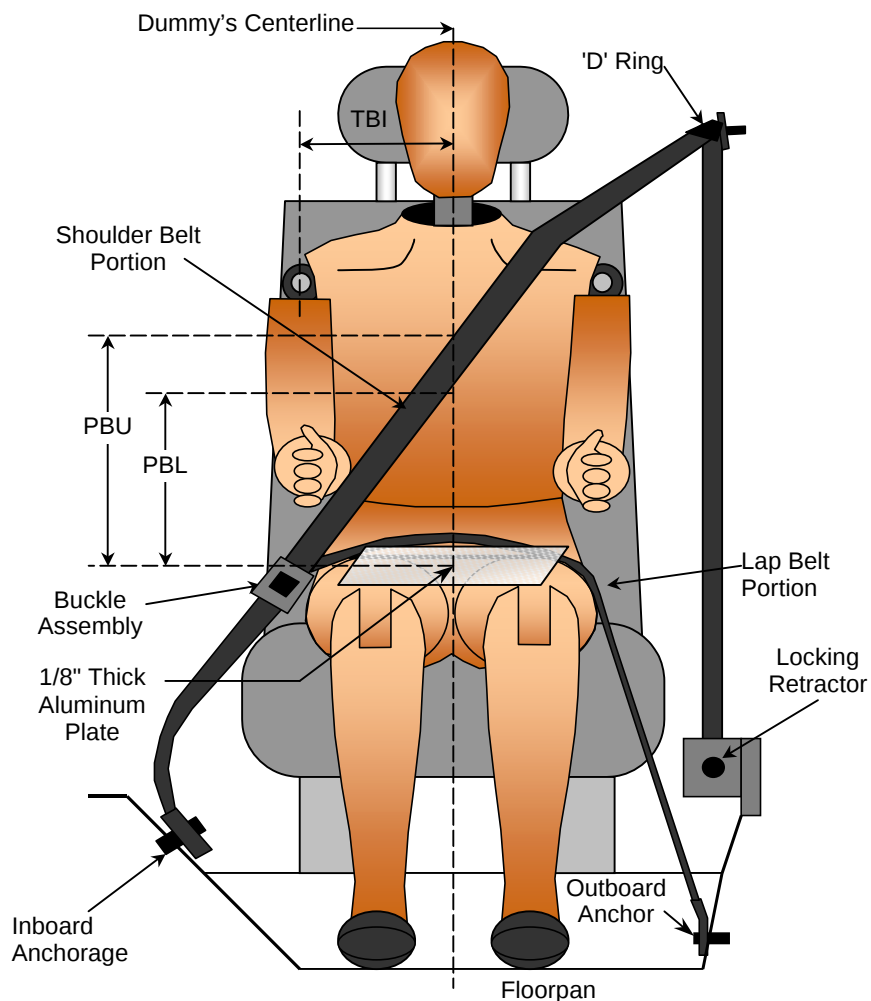
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		28.8		
SWA	Steering Wheel Angle		67.3		
SCA	Steering Column Angle		23.1		
SA	Seat Back Angle (headrest post)		13.7		13.1
HZ	Head to Roof (Z)	188	90	170	90
HH	Head to Header	364	18.4	369	17.6
HW	Head to Windshield	602	0	571	0
HR	Head to Side Header (Y)	216		219	
NR	Nose to Rim	380	6.9		
CD	Chest to Dash	536		481	
CS	Chest to Steering Hub	305	3.4		
RA	Rim to Abdomen	186	90		
KDL	Left Knee to Dash	125	39.4	150	
KDR	Right Knee to Dash	122		154	30.9
PA	Pelvic Angle		23.3		23.7
TA	Tibia Angle		45.4		38.9
KK	Knee to Knee (Y)	326		265	
SK	Striker to Knee	848	97.0	866	95.6
ST	Striker to Head	559	38.7	572	40.6
SH	Striker to H-Point	489	108.3	507	112.9
SHY	Striker to H-Point (Y)	312		295	
HS	Head to Side Window	346		344	
HD	H-Point to Door (Y)	184		141	
AD	Arm to Door (Y)	105		119	
AA	Ankle to Ankle	282		256	

DATA SHEET NO. 6 **SEAT BELT POSITIONING DATA**

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	320	320
PBL - To surface of reference to belt lower edge	mm	240	240

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

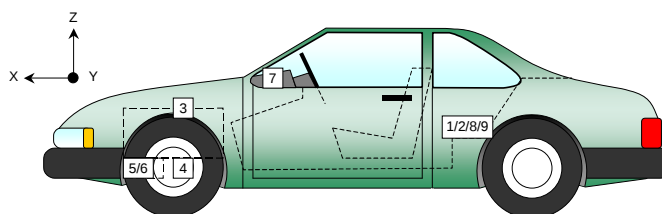
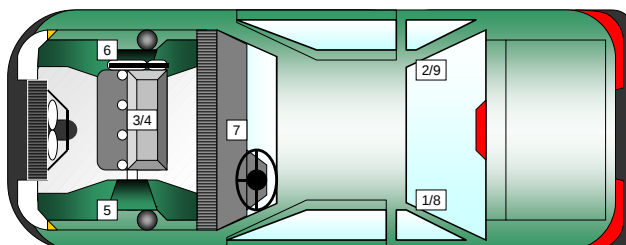
Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1853	-362	463
2	Right Rear X-Member X	1853	358	463
3	Engine Top X	3797	0	980
4	Engine Bottom X	3636	0	187
5	Left Brake Caliper X	3715	-706	235
6	Right Brake Caliper X	3715	706	235
7	Instrument Panel X			
8	Left Rear X-Member Z	1853	-362	463
9	Right Rear X-Member Z	1853	358	463

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



DATA SHEET NO. 8

SUMMARY OF FMVSS 212 AND FMVSS 219 (Partial) DATA

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

Windshield Mounting Details:

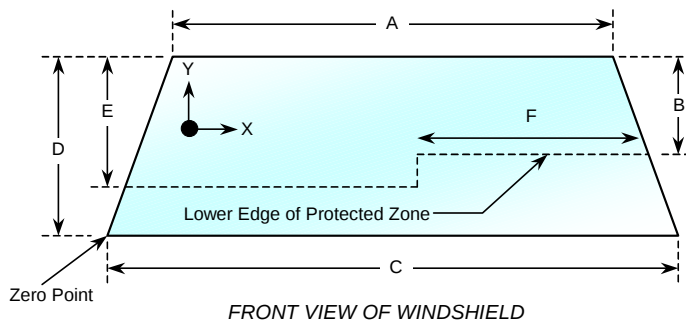
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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

Temperature of windshield molding during test: 21°C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2106	2106	100
Right Side	2106	2106	100
Total	4212	4212	100



Item	Units	Value
A	mm	1234
B	mm	320
C	mm	1544
D	mm	717
E	mm	335
F	mm	550

AREA OF PROTECTED ZONE FAILURES - NONE

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. **None**

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. **None**

X	Y

DATA SHEET NO. 9
SUMMARY OF FMVSS 301 DATA

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

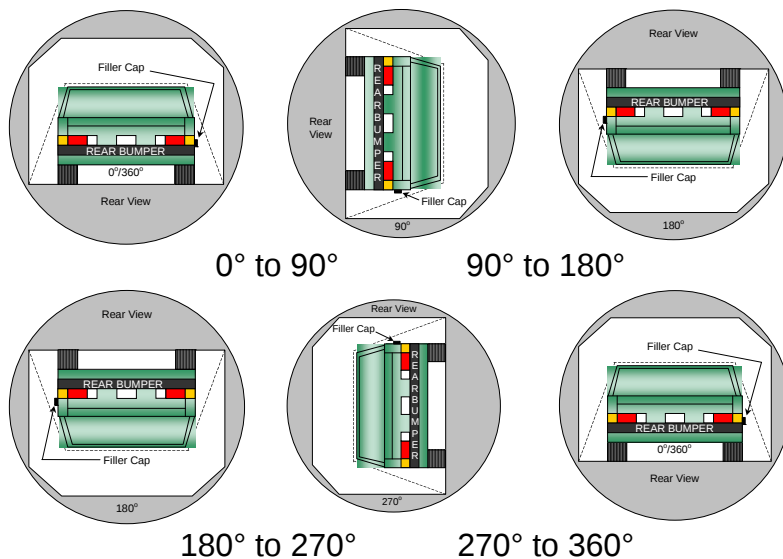
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 10:05 am

Stoddard Solvent Spillage Measurements

- A. From impact until vehicle motion ceases: 0 oz.
 (Maximum Allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: 0 oz.
 (Maximum Allowable = 5 ounces)
- C. For the following 25 minutes: 0 oz.
 (Maximum Allowable = 1 oz. /minute)
- D. Spillage: None

FMVSS 301 STATIC ROLLOVER DATA



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 locations:

None

Test Phase	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° to 90°	122	300	0
90° to 180°	116	300	0
180° to 270°	110	300	0
270° to 360°	116	300	0

DATA SHEET NO. 10
VEHICLE MEASUREMENTS

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
Test Date: 4/27/2009

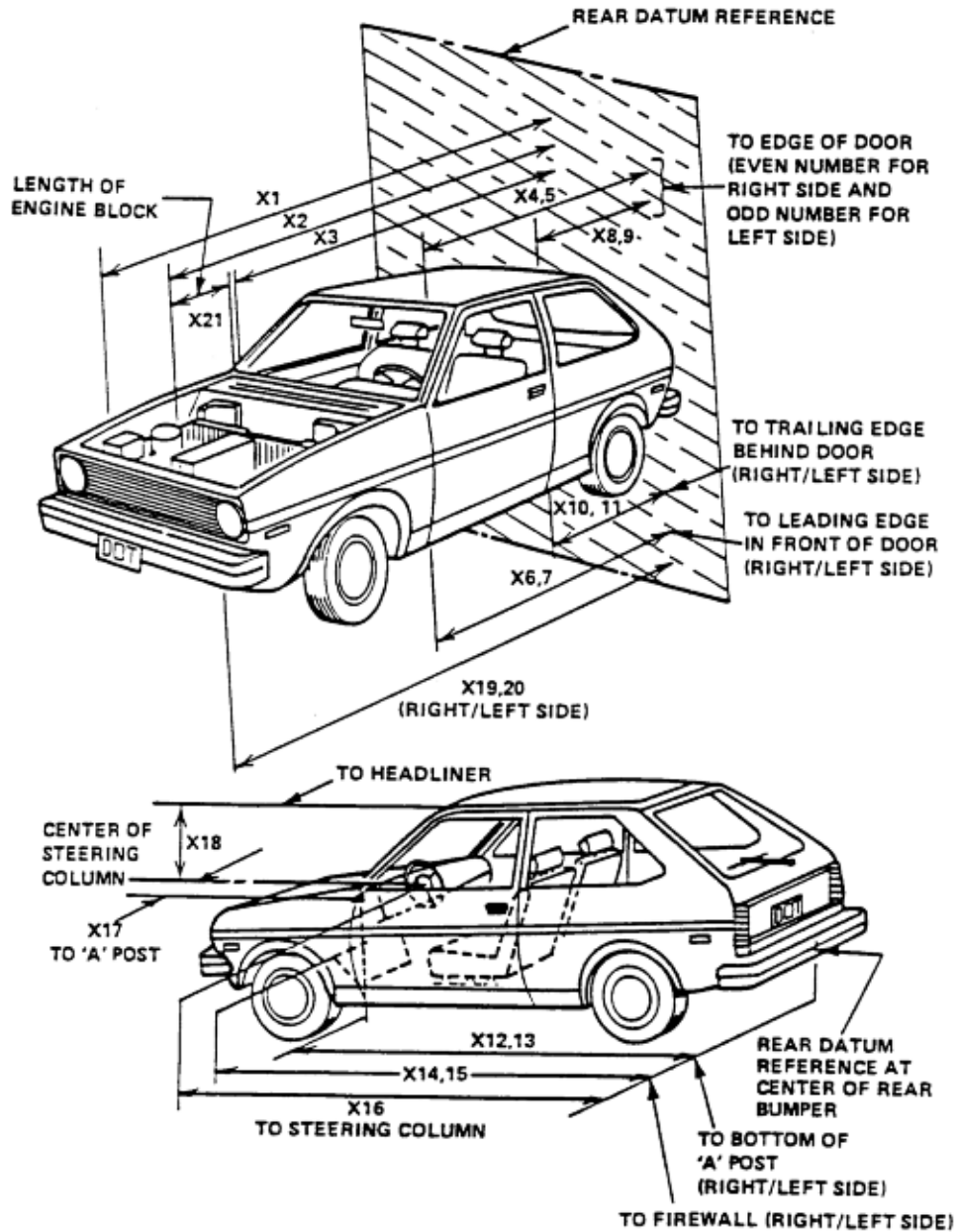
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4768	4201	567
2	RSOV to front of engine	mm	3963	3852	111
3	RSOV to firewall centerline	mm	3468	3352	116
4	RSOV to leading edge of right door	mm	3042	3050	-8
5	RSOV to leading edge of left door	mm	3042	3056	-14
6	RSOV to lower leading edge of right door	mm	3021	3019	2
7	RSOV to lower leading edge of left door	mm	3023	3015	8
8	RSOV to upper leading edge of right door	mm	1754	1758	-4
9	RSOV to upper leading edge of left door	mm	1757	1773	-16
10	RSOV to lower trailing edge of right door	mm	1907	1903	4
11	RSOV to lower trailing edge of left door	mm	1909	1901	8
12	RSOV to bottom of right 'A' pillar	mm	3019	3017	2
13	RSOV to bottom of left 'A' pillar	mm	3021	2999	22
14	RSOV to firewall on right side	mm	3377	3369	8
15	RSOV to firewall on left side	mm	3407	3410	-3
16	RSOV to steering column	mm	2606	2681	-75
17	Center of steering column to left 'A' pillar	mm	348	343	5
18	Center of steering column to headlining	mm	400	397	3
19	RSOV to right side of front bumper	mm	4635	4161	474
20	RSOV to left side of front bumper	mm	4634	4205	429
21	Length of engine block	mm	428	428	0
RD	RSOV to right side of dash panel	mm	2777	2770	7
CD	RSOV to center of dash panel	mm	2829	2888	-59
LD	RSOV to left side of dash panel	mm	2763	2779	-16

DATA SHEET NO. 10... (continued)

VEHICLE MEASUREMENTS

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
Test Date: 4/27/2009



DATA SHEET NO. 10... (continued)**VEHICLE MEASUREMENTS**Test Vehicle: 2010 Ford Mustang 2-Dr CoupeTest Program: 35mph Frontal ImpactNHTSA No.: MA0201Test Date: 4/27/2009**Target Vehicle Structural Measurement**

	Elements	Pre-Test (mm)
1	Total Length	4768
2	Total Width	1849
3	Bumper Top Height	519
4	Bumper Bottom Height	394
5	Longitudinal Member Top Height	509
6	Distance between Longitudinal Members	926
7	Longitudinal Member Width	82
8	Engine Top Height	974
9	Engine Bottom Height	193
10	Engine and gearbox width	534
11	Front bumper-engine distance	786
12	Front shock absorber fixing height	881
13	Bonnet leading edge height	763
14	Front shock absorber fixing width	1080
15	Front bumper – front axle distance	928
16	Front axle – a pillar distance	729
17	A-pillar – B-pillar distance	1324
18	B-Pillar – rear axle distance	658
19	B-pillar – C-pillar distance	717
20	Roof sill bottom height	1326
21	Roof sill top height	1371
22	Floor sill bottom height	283
23	Floor sill top height	359

DATA SHEET NO. 11
CAMERA LOCATIONS

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
Test Date: 4/27/2009

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1310	-5310	1090	24	1000
3	Steering Column Top	510	-5050	1110	25	1000
4	Steering Column Bottom	490	-5100	730	25	1000
5	Driver Close-up	1330	-6710	1240	35	1000
6	Driver Angle	6490	-5360	1930	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	2170	6380	1120	20	1000
10	Right Passenger Half	1330	5350	1120	24	1000
11	Right Close-up	1540	6560	1310	35	1000
12	Right Angle	6510	5080	1940	50	1000
13	Windshield	-285	0	2860	12.5	1000
14	Top Driver	-135	-470	2180	16	1000
15	Top Passenger	-110	420	2180	16	1000
16	Pit Front	1110	0	-3150	24	1000
17	Pit Rear	3410	0	-3150	24	1000

***COORDINATES:**

+X = forward of impact plane
+Y = right of monorail centerline
+Z = above ground level

Cameras 7 & 8 were not used for this test.

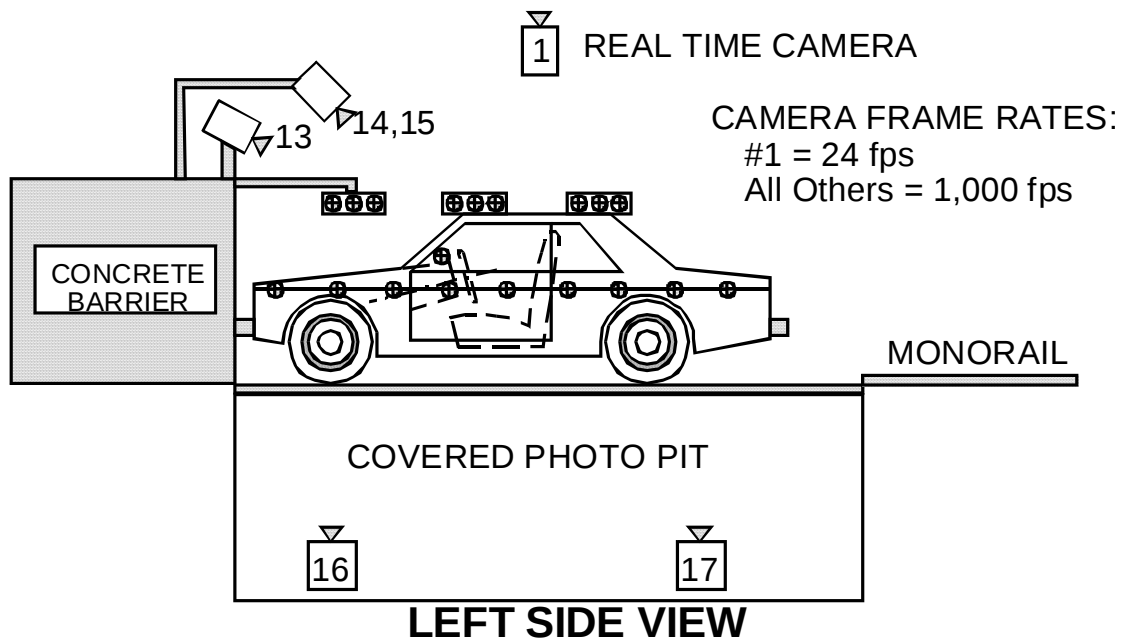
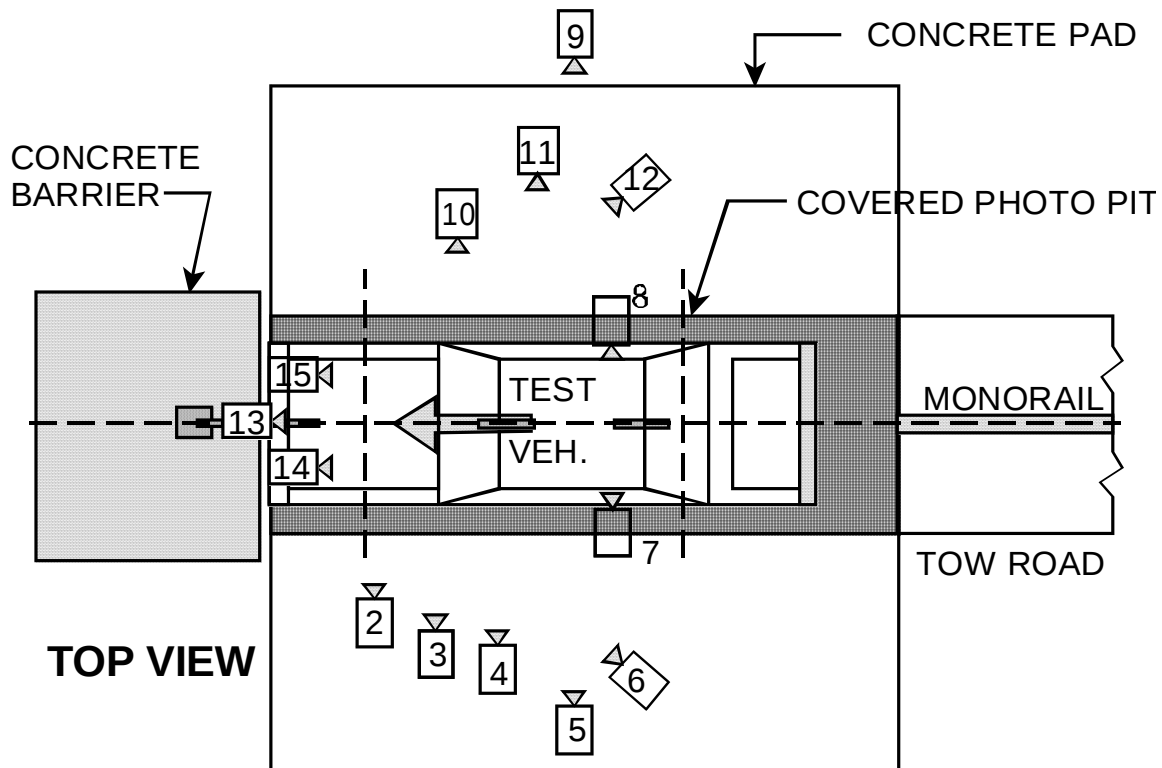
DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
Test Date: 4/27/2009

CAMERA POSITIONS FOR FRONTAL IMPACTS

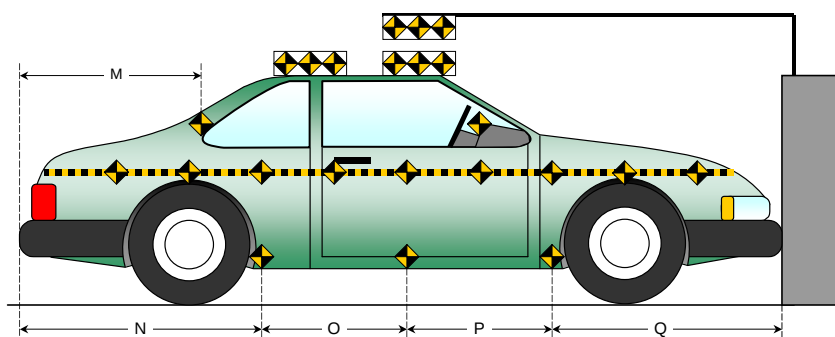
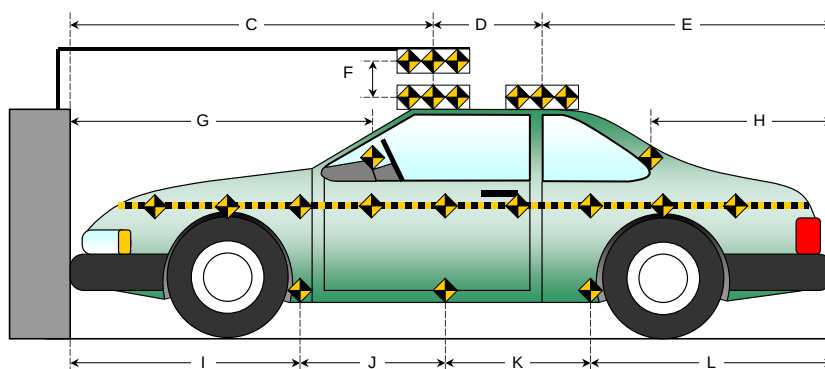
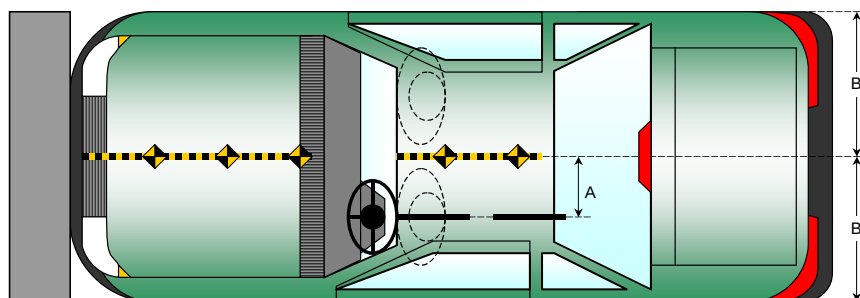


DATA SHEET NO. 12
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

Item	Value
A	370
B	921
C	2595
D	510
E	1663
F	202
G	
H	928
I	1411
J	897
K	897
L	1563
M	852
N	1564
O	895
P	895
Q	1414



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

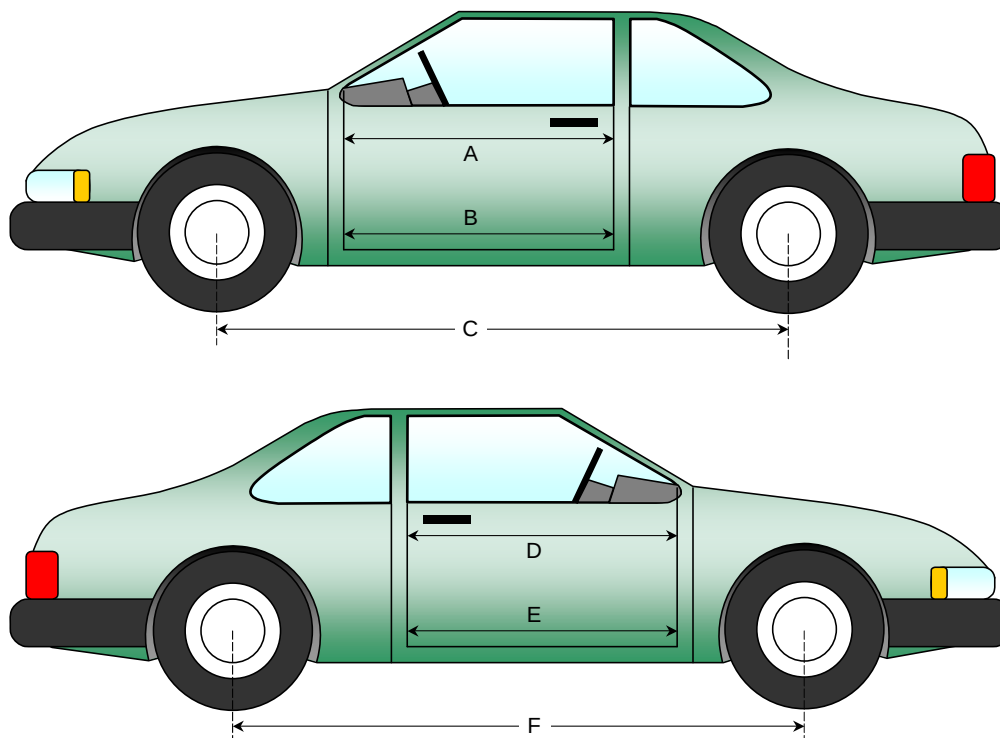
NHTSA No.: MA0201
 Test Date: 4/27/2009

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1218	1225	-7
B	Left Side Lower	mm	1054	1055	-1
D	Right Side Upper	mm	1218	1214	4
E	Right Side Lower	mm	1056	1053	3

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2720	2676	44
F	Right Side Wheelbase	mm	2720	2657	63



DATA SHEET NO. 13... (continued)
VEHICLE INTRUSION MEASUREMENTS

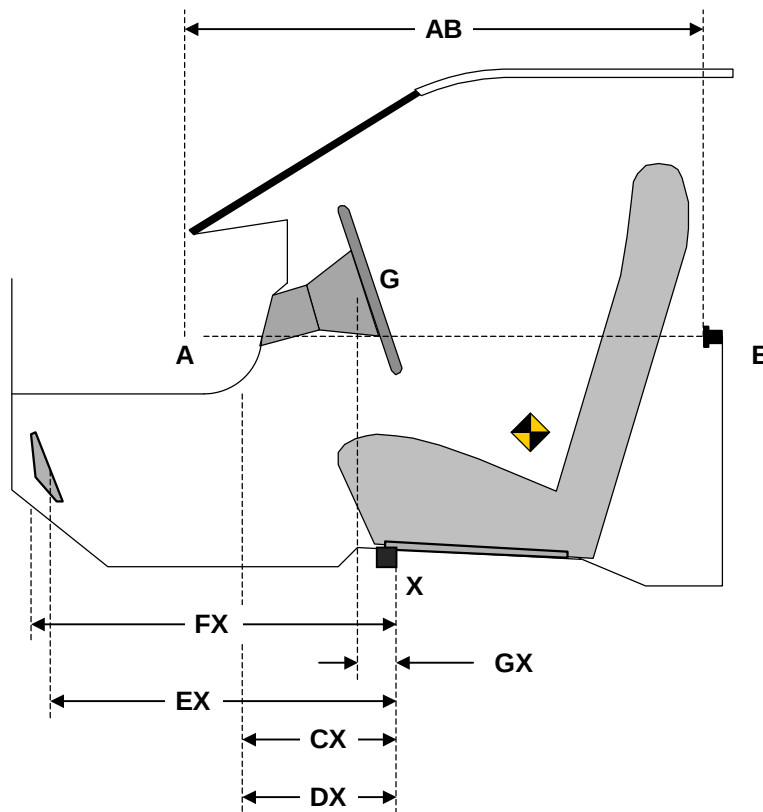
Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	1015	1012	3
CX	Left Knee Bolster to X	mm	220	225	-5
DX	Right Knee Bolster to X	mm	139	215	-76
EX	Brake Pedal to X	mm	576	560	16
FX	Foot Rest to X	mm	614	592	22
GX	Center of Steering Column Wheel Hub to X	mm	38	93	-55

X = Front of Seat Track (stationary)

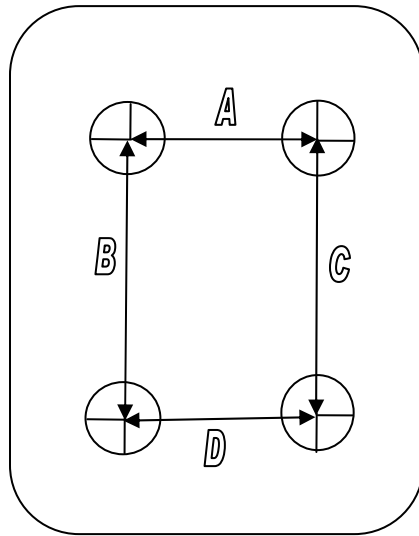


DRIVER COMPARTMENT

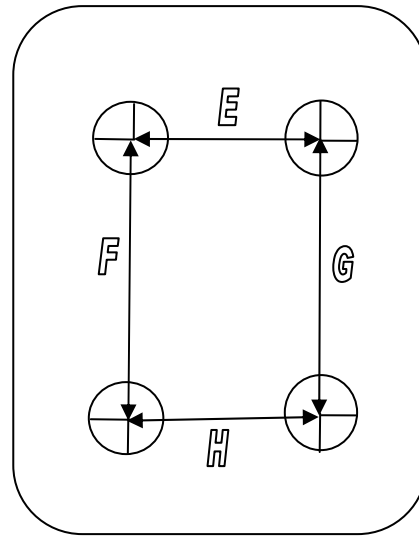
DATA SHEET NO. 13... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	444	435	9
B	428	428	0
C	477	485	-8
D	438	420	18
E	377	345	32
F	398	395	3
G	390	390	0
H	396	381	15

DATA SHEET NO. 14

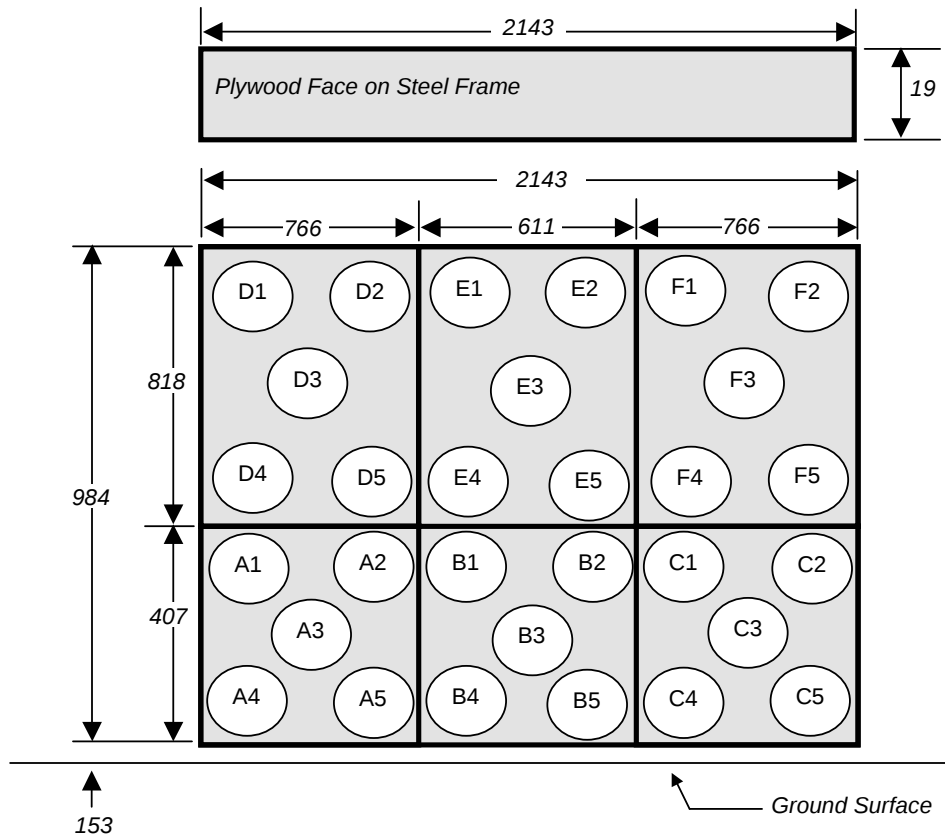
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

30 Load Cell Rigid Barrier

Load Cell Locations on Fixed Barrier



Group 4 D1-D5	Group 5 E1-E5	Group 6 F1-F5
Group 1 A1-A5	Group 2 B1-B5	Group 3 C1-C5

6 Groups of 5 Load Cells Each

DATA SHEET NO. 15
ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
 Test Date: 4/27/2009

VEHICLE INFORMATION

VIN: 1ZVBP8AN0A5100632 Wheelbase (mm): 2720
 Vehicle Size Category: Coupe Test Weight (kg): 1766.3

ACCELEROMETER DATA

Accelerometer Locations: As per measurements on Page 12
 Cal. Procedure/Interval: MGA procedure / 6 month
 Integration Algorithm: Trapezoidal Linearity: > 99%
 Impact Velocity (km/h): 56.2
 Velocity Change (km/h): 64.9 Time of Separation (msec): 110

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
 Damage Region Length (mm): 1193 Impact Mode: Frontal

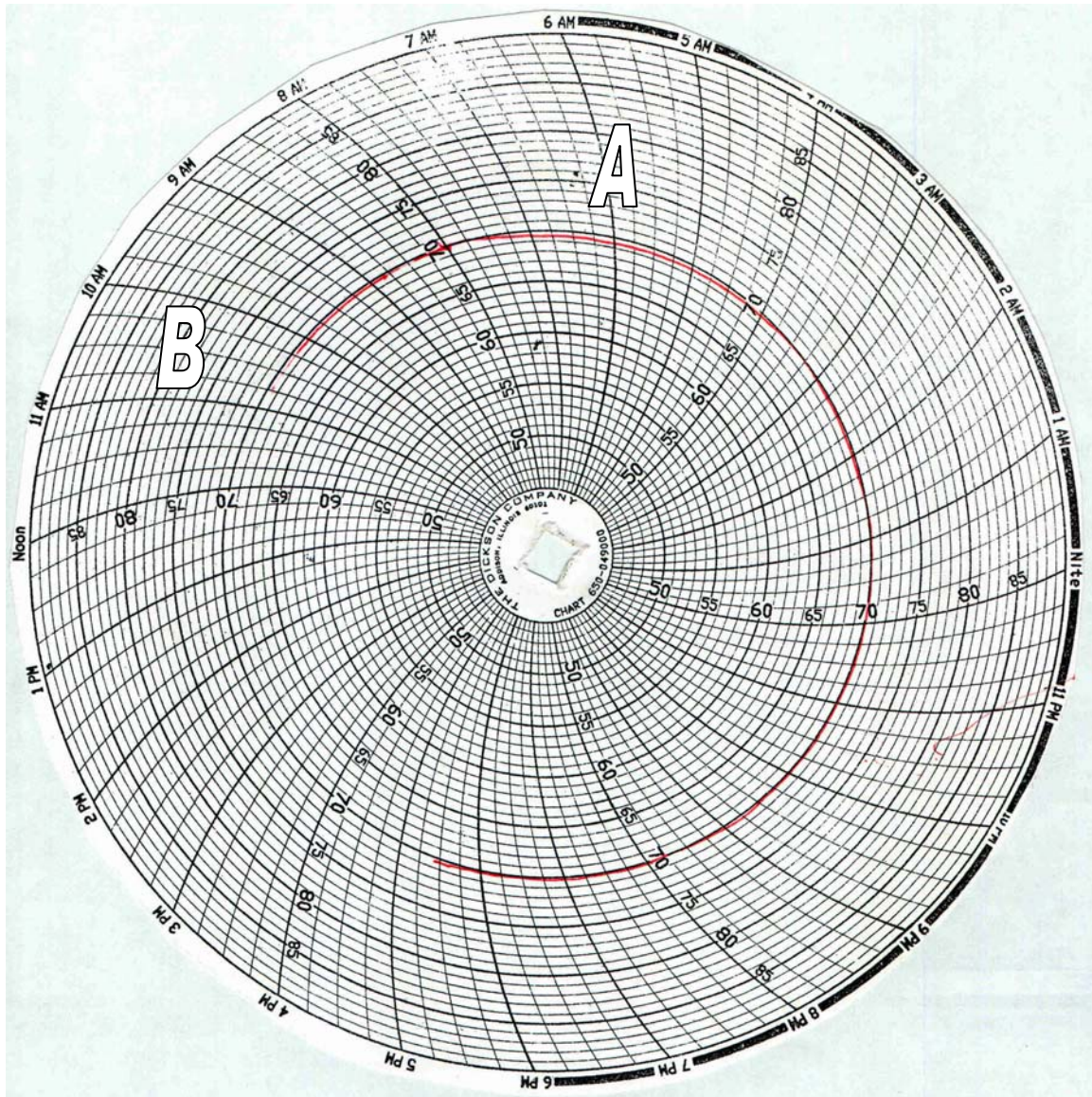
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4634	4265	369
C2	Crush zone 2 at left side	mm	4699	4180	519
C3	Crush zone 3 at left side	mm	4733	4191	542
C4	Crush zone 4 at right side	mm	4732	4188	544
C5	Crush zone 5 at right side	mm	4698	4170	528
C6	Crush zone 6 at right side	mm	4635	4161	474
L	C1 TO C6	mm	1193	1150	43

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2010 Ford Mustang 2-Dr Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0201
Test Date: 4/27/2009



A = Dummies installed in vehicle at 6:00 am

B = Test conducted at 10:05 am

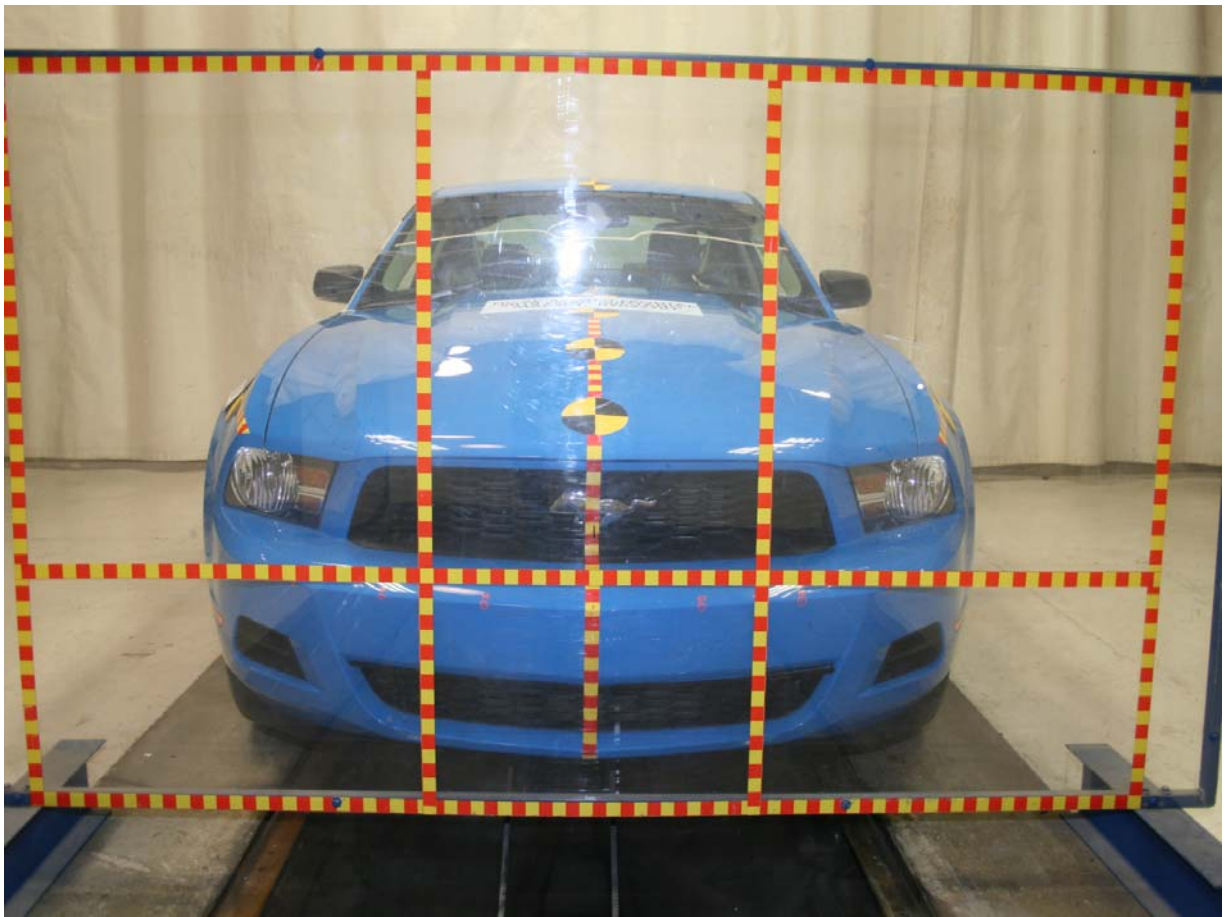
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PHOTOGRAPHS

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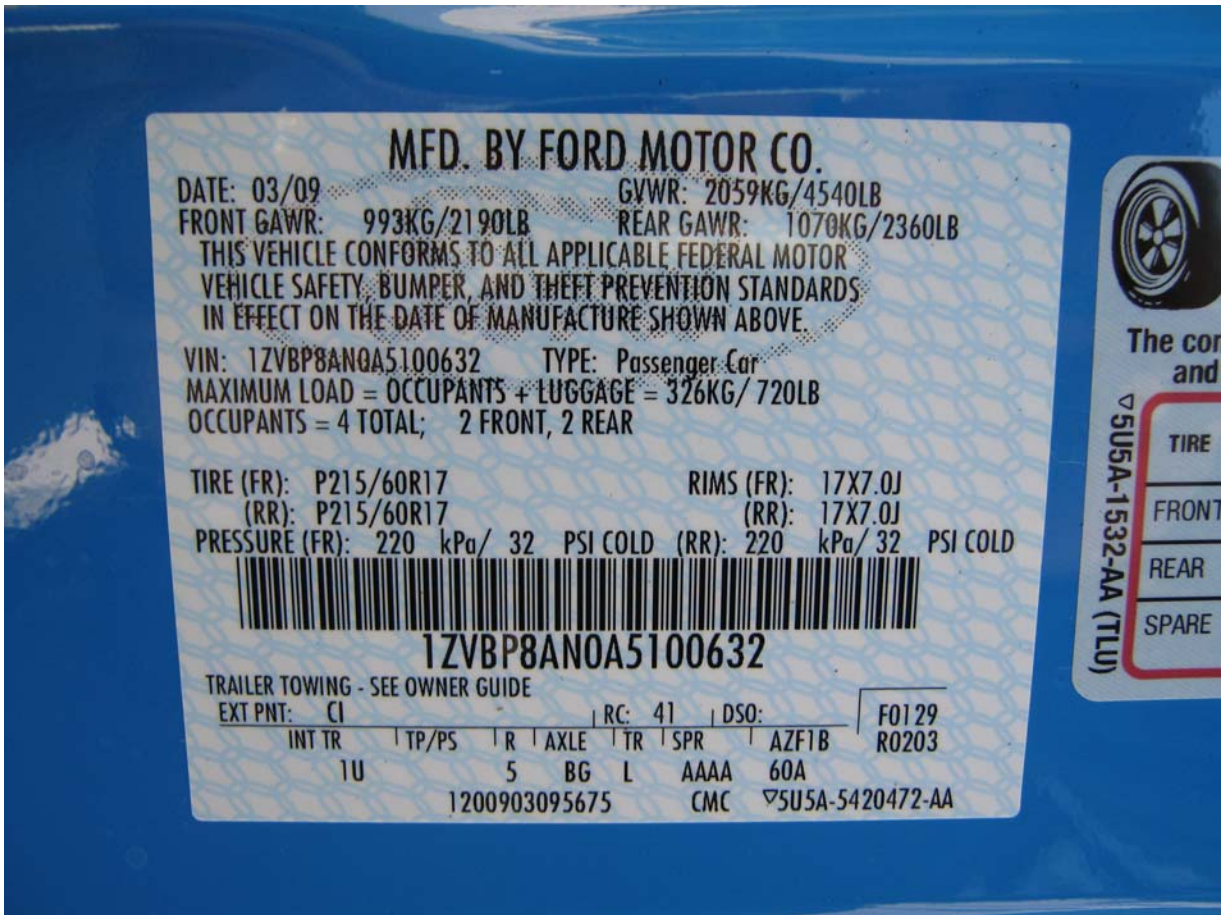
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Load Cell Location



Manufacturer's Label



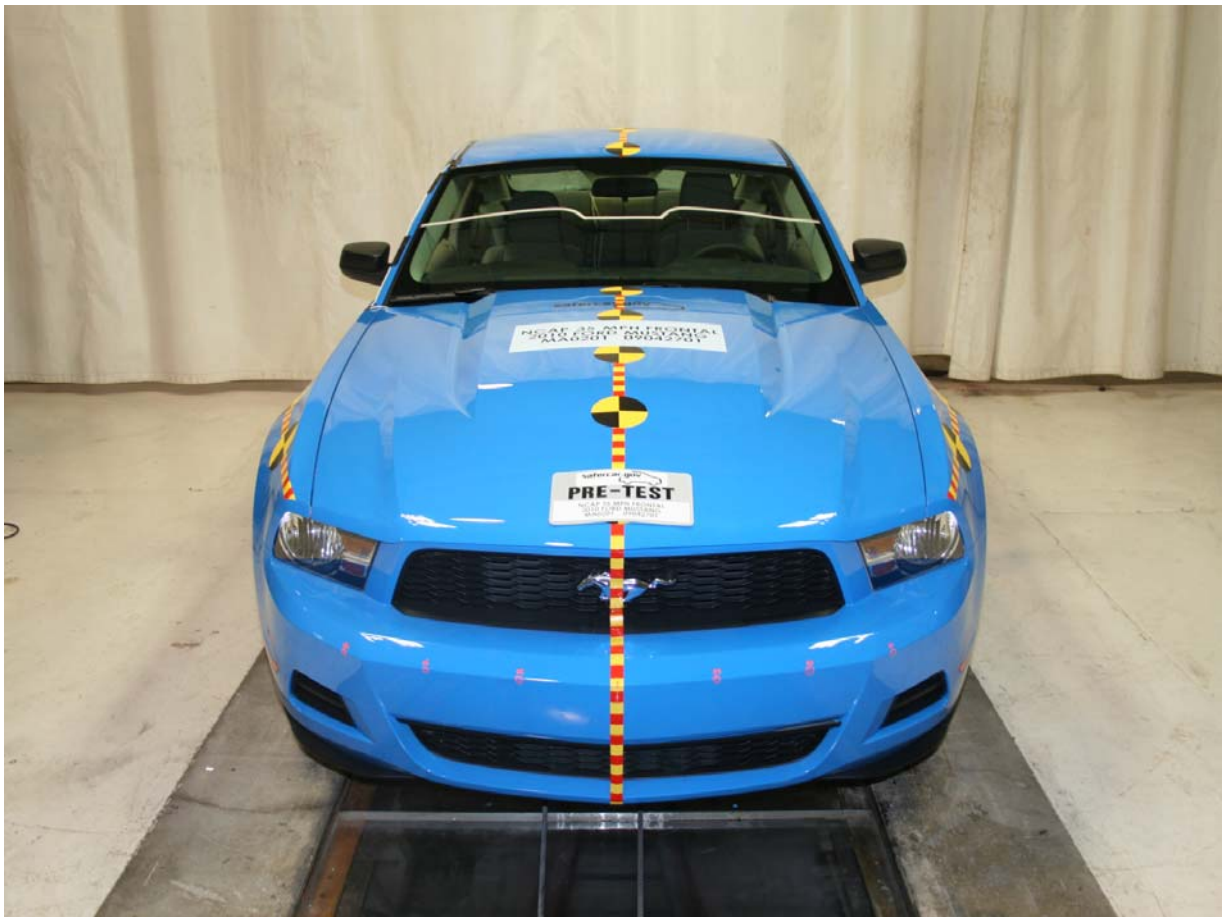
Tire Placard



Right Front $\frac{3}{4}$ View, As Received



Left Rear $\frac{3}{4}$ View, As Received



Pre-Test Front View



Post-Test Front View



Pre-Test Left Side View



Post-Test Left Side View



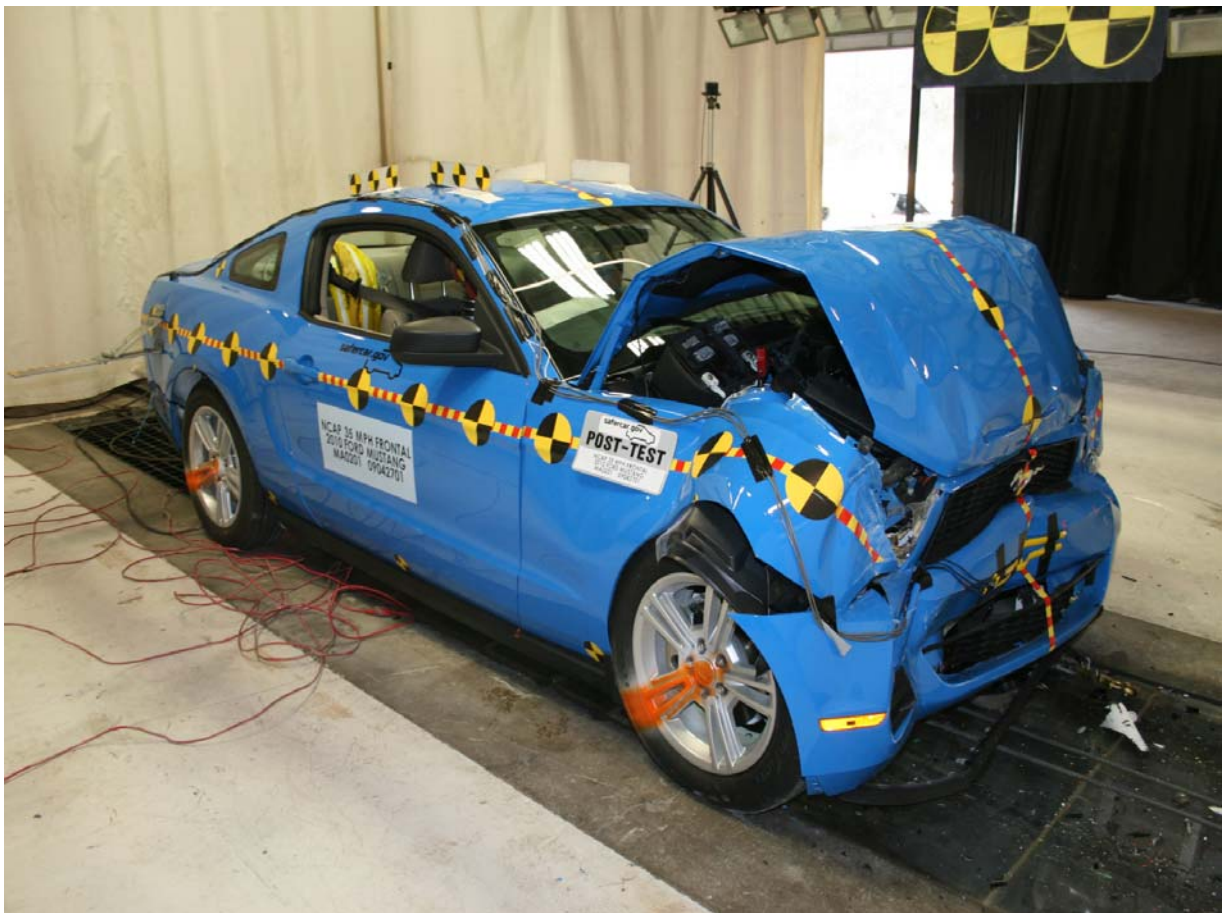
Pre-Test Right Side View



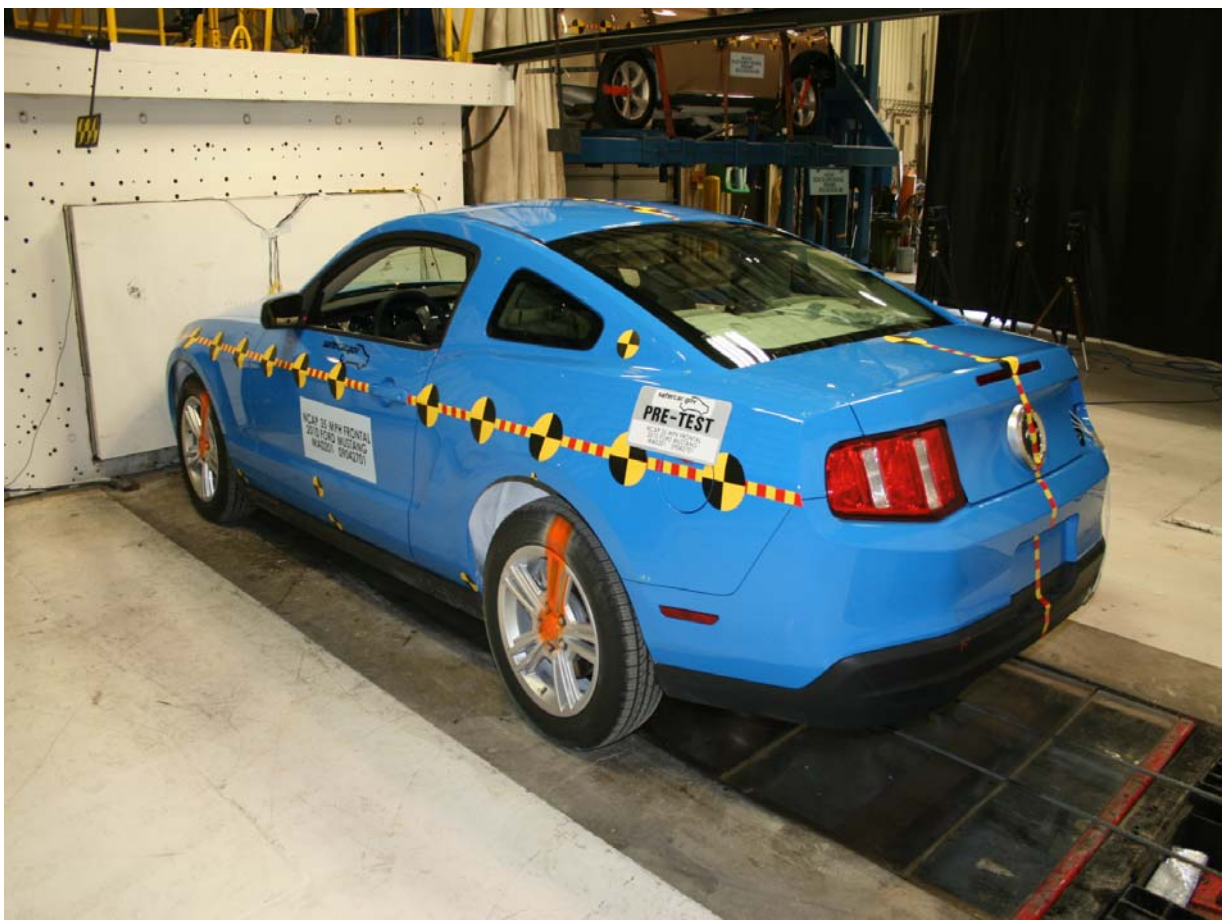
Post-Test Right Side View



Pre-Test Right Front ¾ View



Post-Test Right Front ¾ View



Pre-Test Left Rear 3/4 View



Post-Test Left Rear 3/4 View



Pre-Test Left Side 3/4 View of Doors



Post-Test Left Side 3/4 View of Doors After Impact



Pre-Test Right Side 3/4 View of Doors



Post-Test Right Side 3/4 View of Doors After Impact



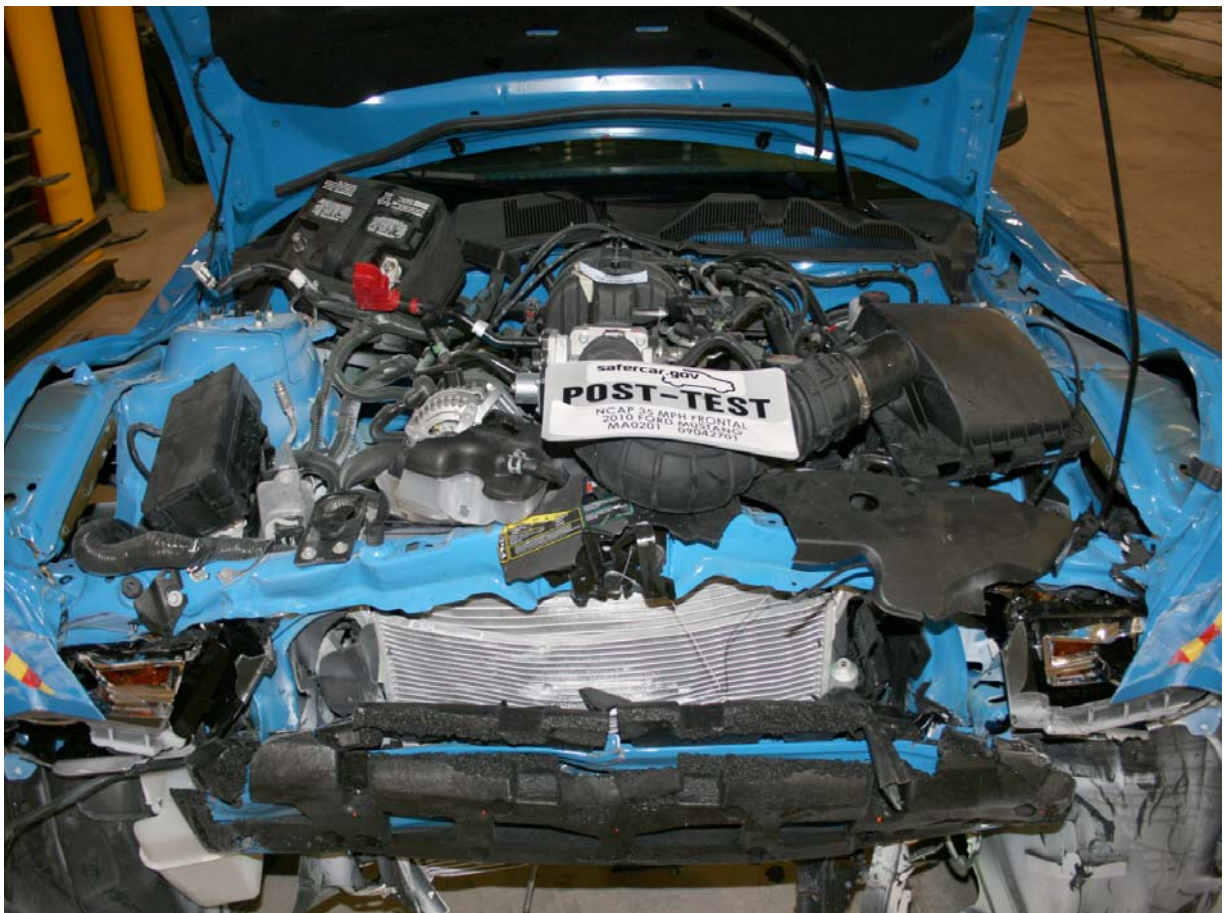
Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



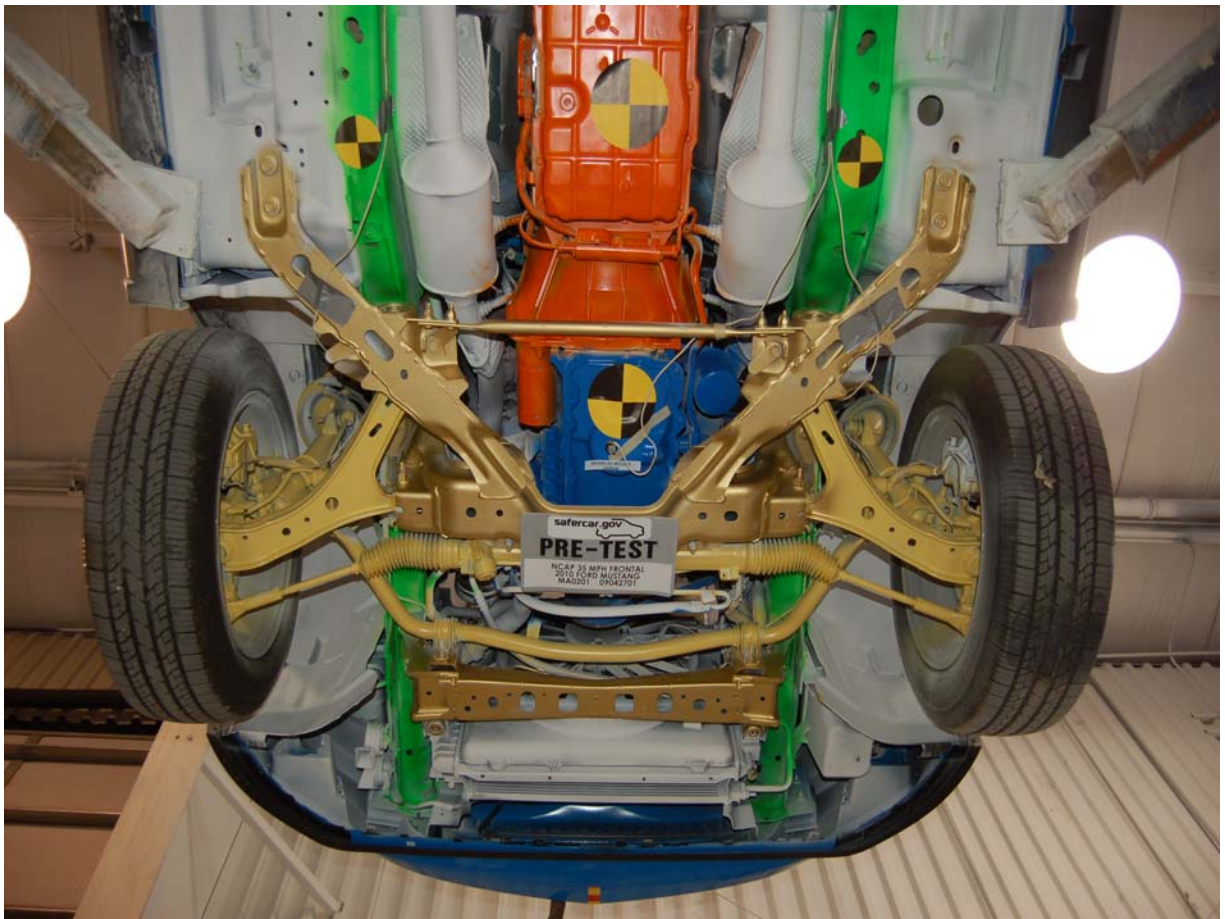
Post-Test Engine Compartment View



Pre-Test Fuel Cap View



Post-Test Fuel Cap View



Pre-Test Front Underbody View



Post-Test Front Underbody View



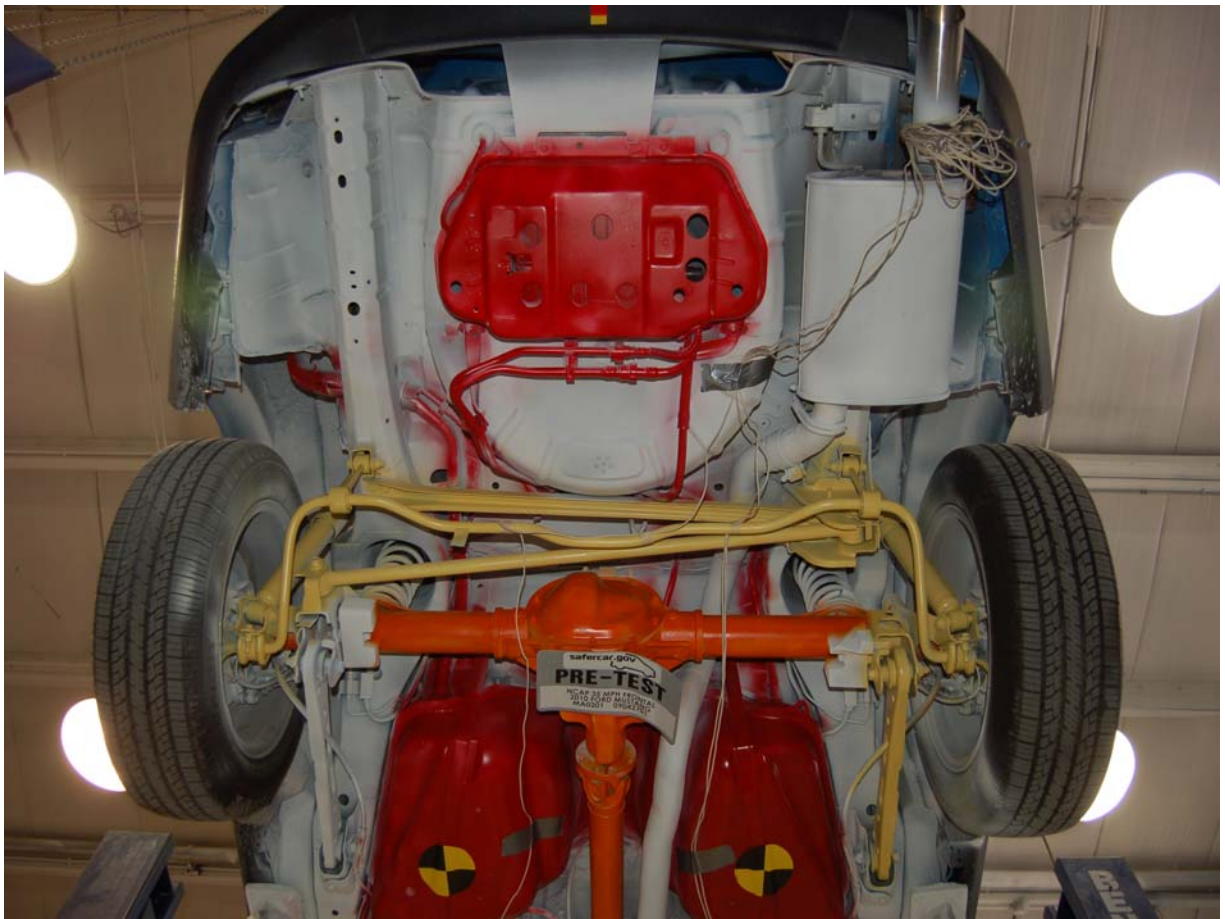
Pre-Test Mid Underbody View



Post-Test Mid Front Underbody View



Post-Test Mid Rear Underbody View



Pre-Test Rear Underbody View



Post-Test Rear Underbody View



Pre-Test Driver Dummy Front View (Head Position)



Post-Test Driver Dummy Front View (Head Position)



Pre-Test Driver Dummy (Through Window)



Post-Test Driver Dummy (Through Window)



Pre-Test Driver Dummy (Door Open)



Post-Test Driver Dummy (Door Open)



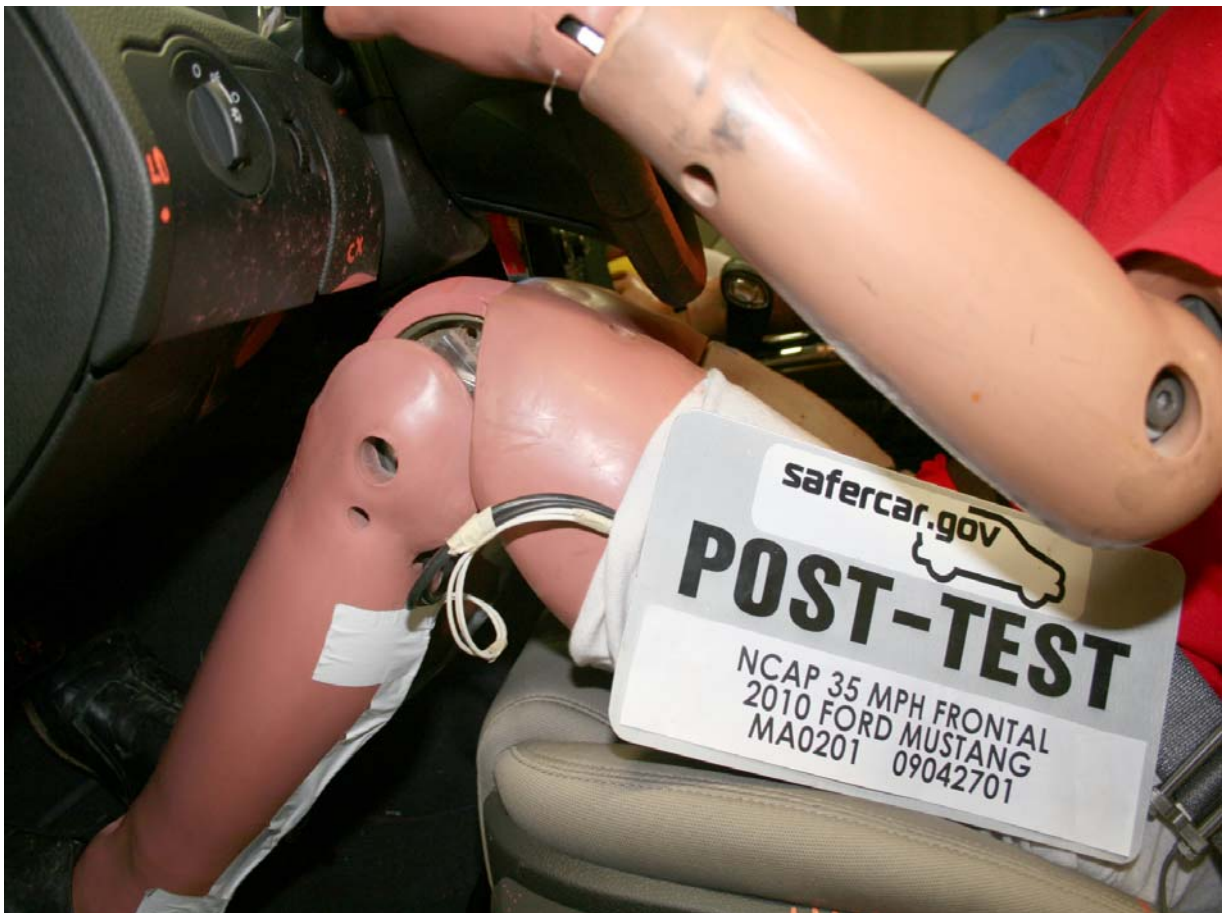
Pre-Test Driver Dummy Feet



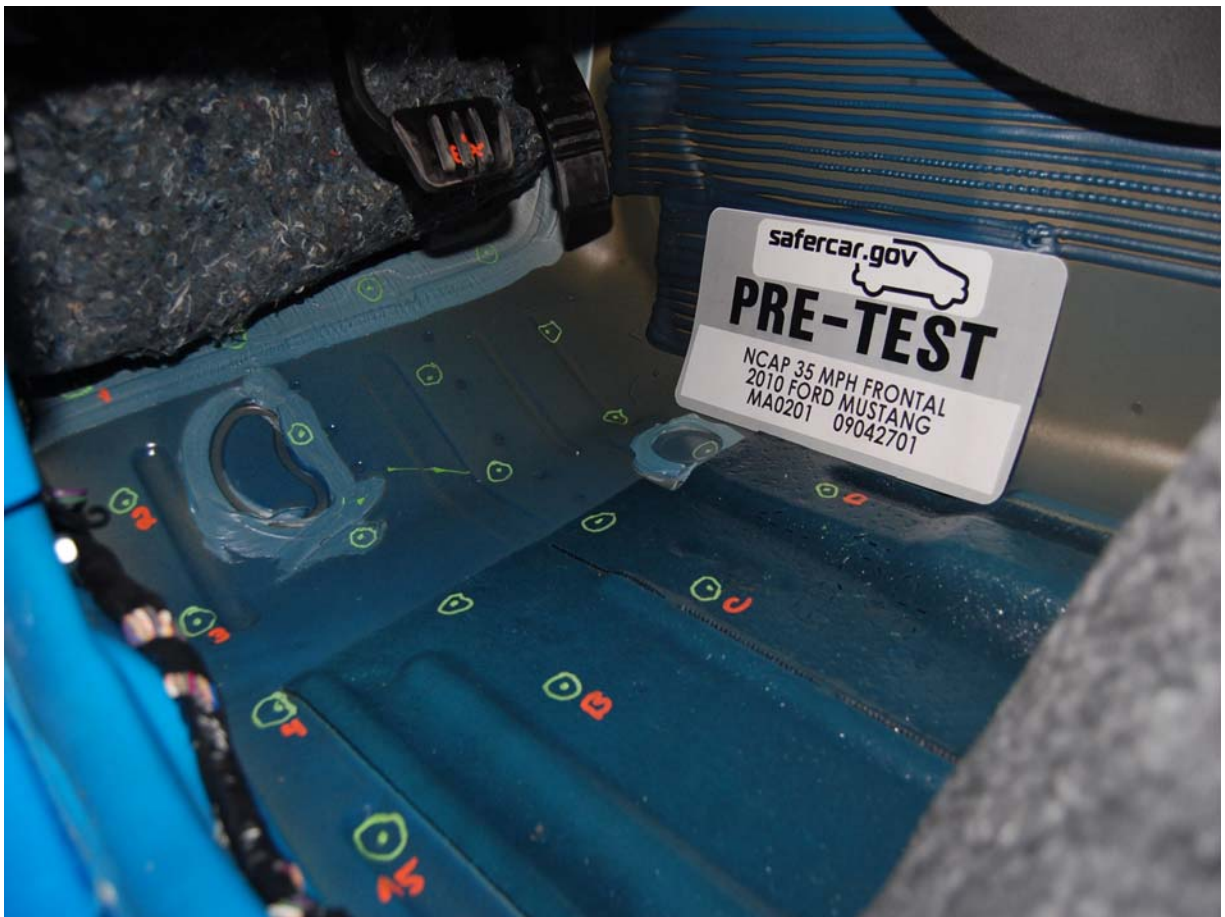
Post-Test Driver Dummy Feet



Pre-Test Driver Side Knee Bolster



Post-Test Driver Side Knee Bolster



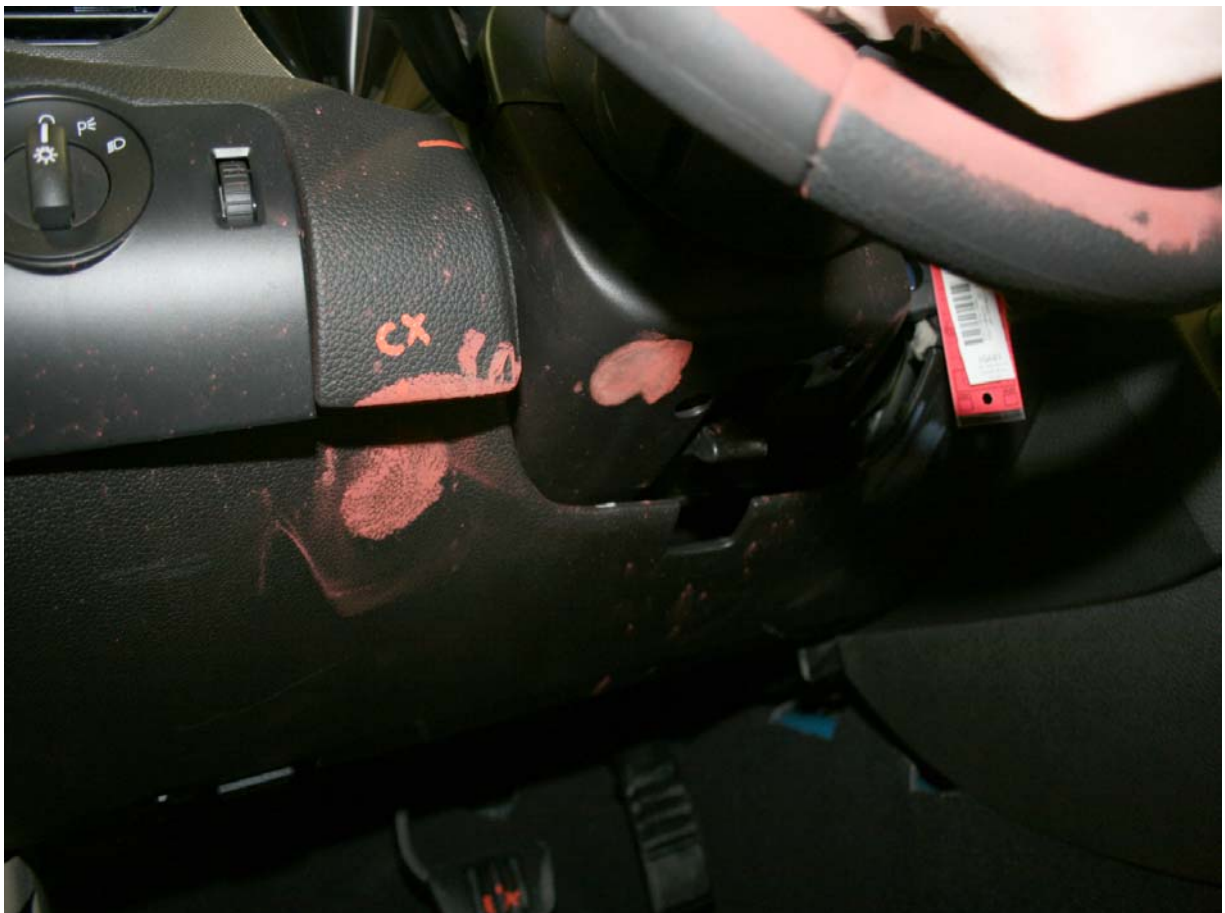
Pre-Test Driver Side Floor Pan



Post-Test Driver Side Floor Pan



Post-Test Driver Dummy Head Contact



Post-Test Driver Dummy Left Knee Contact



Post-Test Driver Dummy Right Knee Contact



Post-Test Driver Dummy Airbag Contact



Pre-Test Passenger Dummy Front View (Head Position)



Post-Test Passenger Dummy Front View (Head Position)



Pre-Test Passenger Dummy (Through Window)



Post-Test Passenger Dummy (Through Window)



Pre-Test Passenger Dummy (Door Open)



Post-Test Passenger Dummy (Door Open)



Pre-Test Passenger Dummy Feet



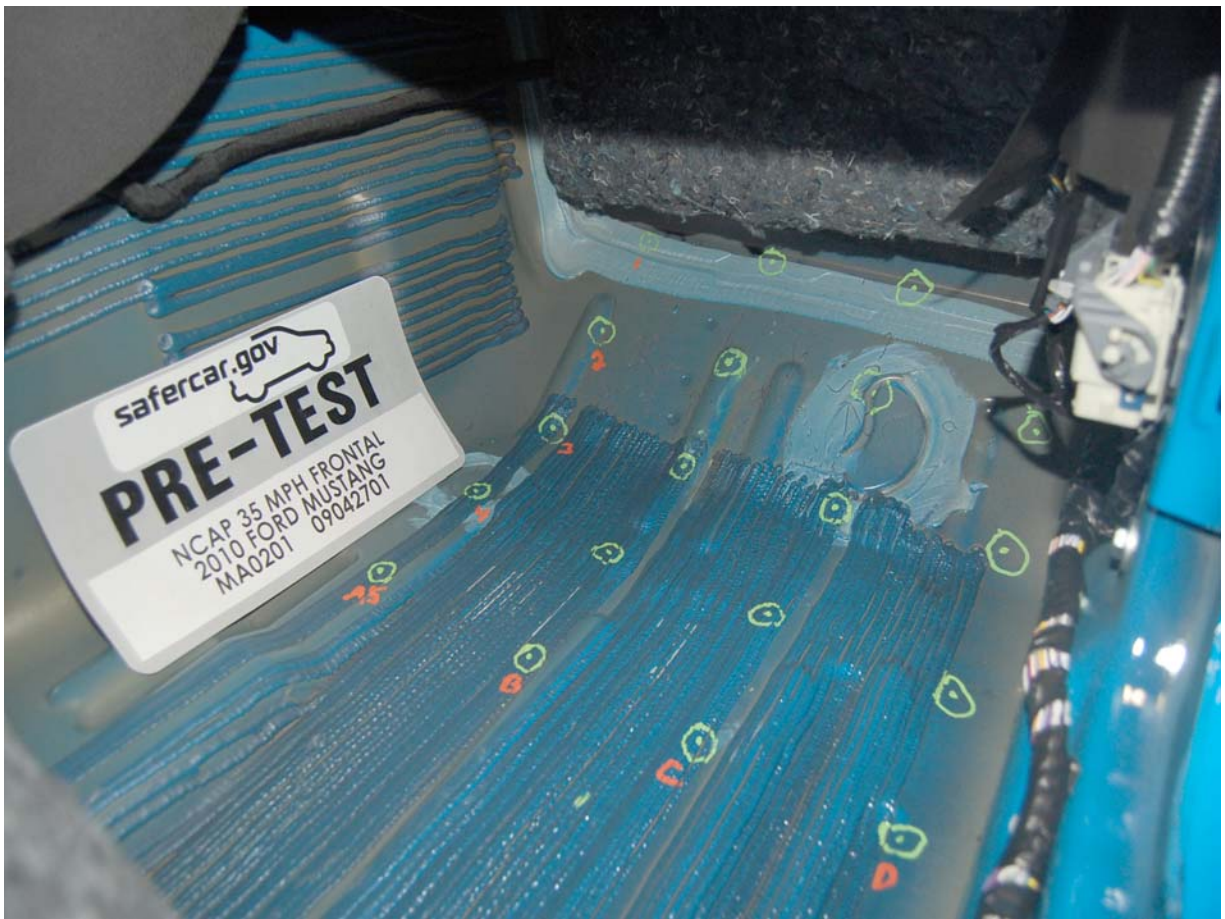
Post-Test Passenger Dummy Feet



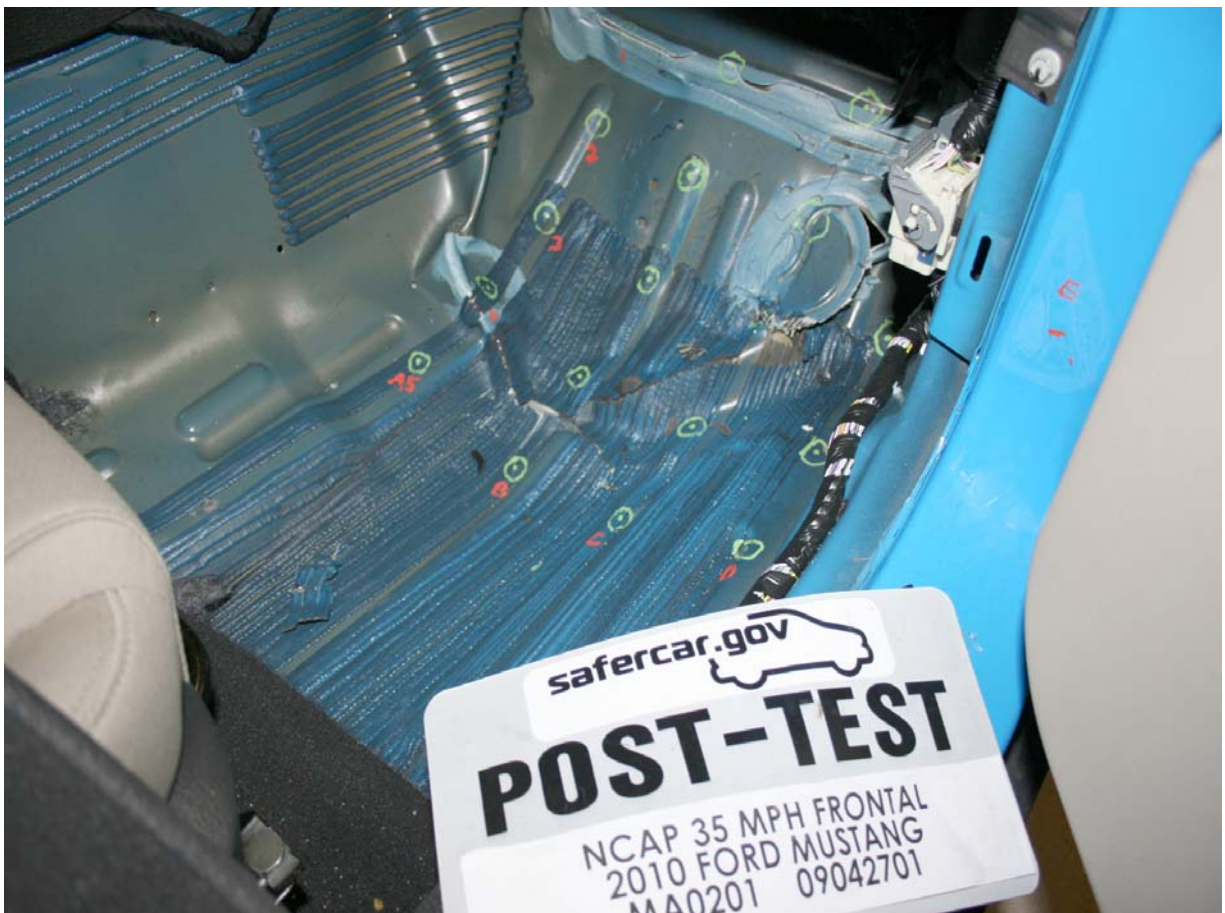
Pre-Test Passenger Side Glove Box



Post-Test Passenger Side Glove Box



Pre-Test Passenger Side Floor Pan



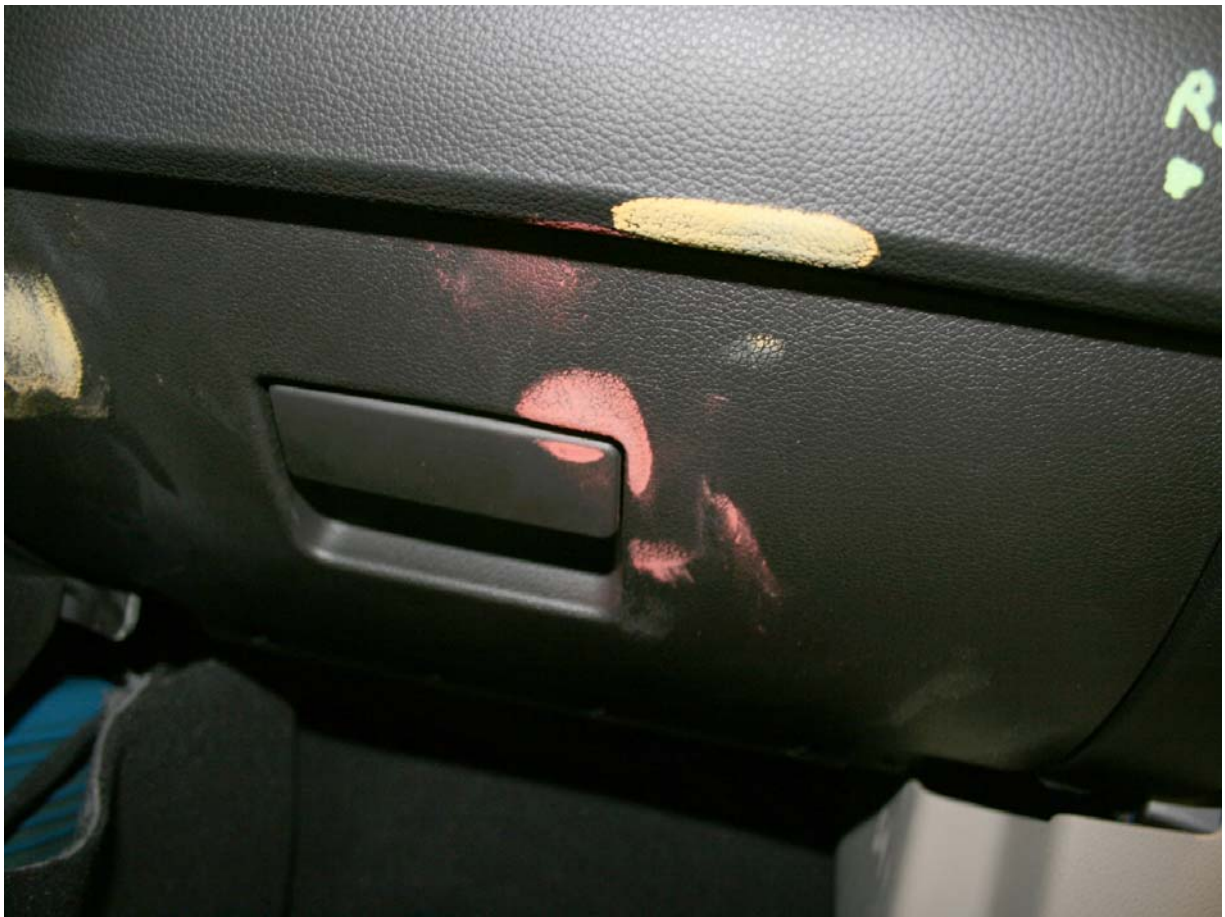
Post-Test Passenger Side Floor Pan



Post-Test Passenger Dummy Head Contact



Post-Test Passenger Dummy Left Knee Contact



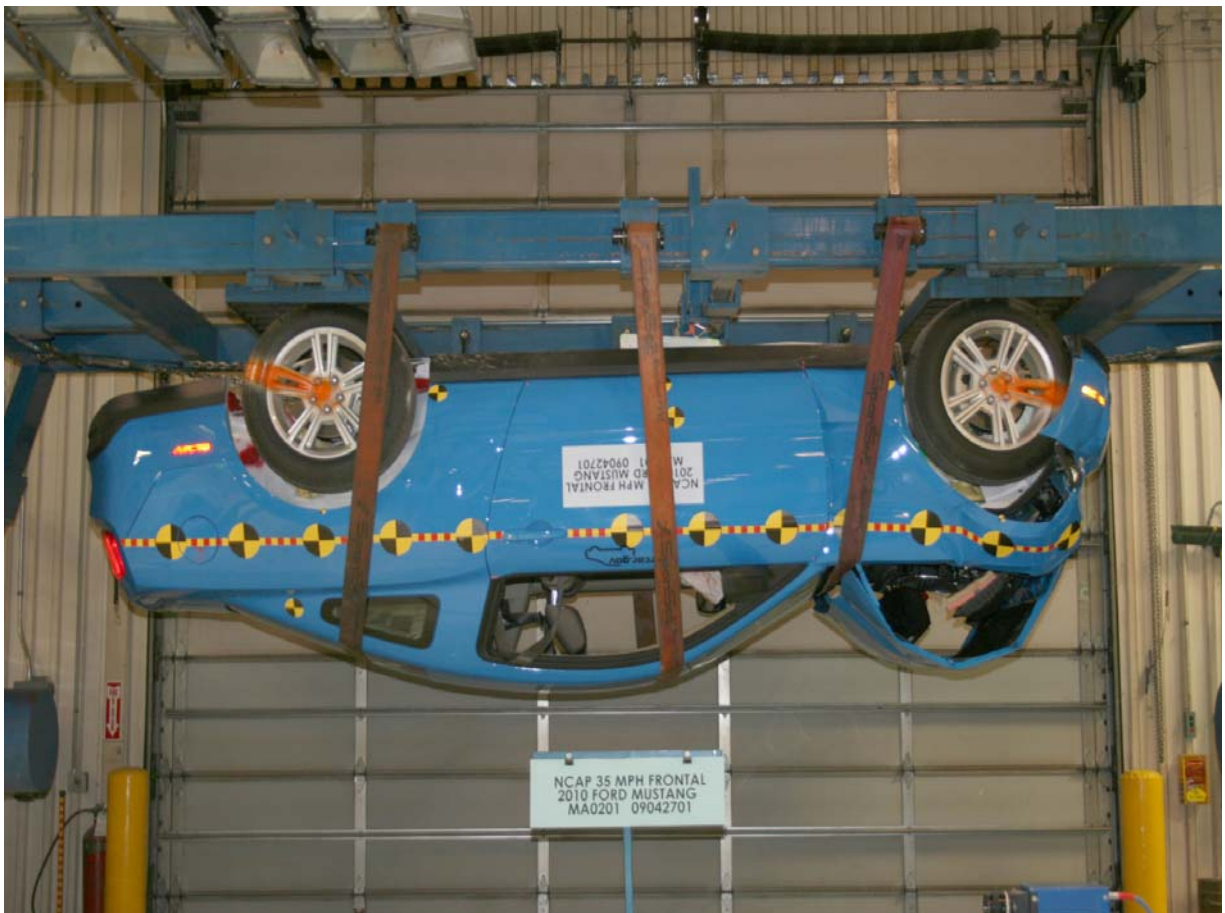
Post-Test Passenger Dummy Right Knee Contact



Post-Test Passenger Dummy Airbag Contact



Rollover 90 Degrees



Rollover 180 Degrees



Rollover 270 Degrees



Rollover 360 Degrees



Vehicle Impact

APPENDIX B
DUMMY RESPONSE DATA TRACES

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The following 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 Redundant

Driver Head Y Redundant

Driver Head Z Redundant

Driver Upper Neck Force X

Driver Upper Neck Force Y

Driver Upper Neck Force Z

Driver Upper Neck Moment X

Driver Upper Neck Moment Y

Driver Upper Neck Moment Z

Driver Chest X Redundant

Driver Chest Y Redundant

Driver Chest Z Redundant

Driver Chest Displacement

Driver Pelvis X

Driver Pelvis Y

Driver Pelvis Z

Driver Lap Belt Force

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
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger Head Z Redundant
Passenger Upper Neck Force X
Passenger Upper Neck Force Y
Passenger Upper Neck Force Z
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Y
Passenger Upper Neck Moment Z
Passenger Chest X Redundant
Passenger Chest Y Redundant
Passenger Chest Z Redundant
Passenger Chest Displacement
Passenger Pelvis X
Passenger Pelvis Y
Passenger Pelvis Z
Passenger Lap Belt Force
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

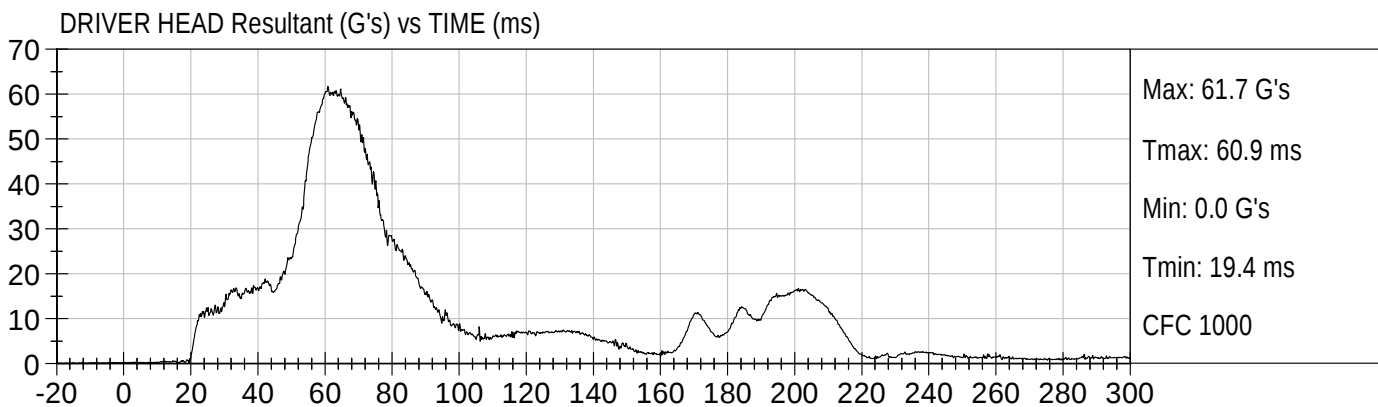
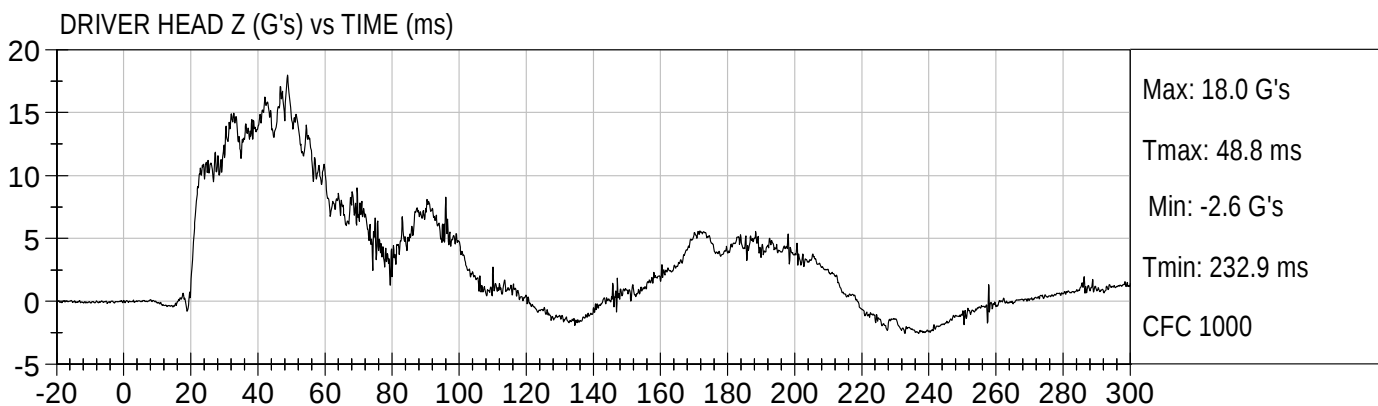
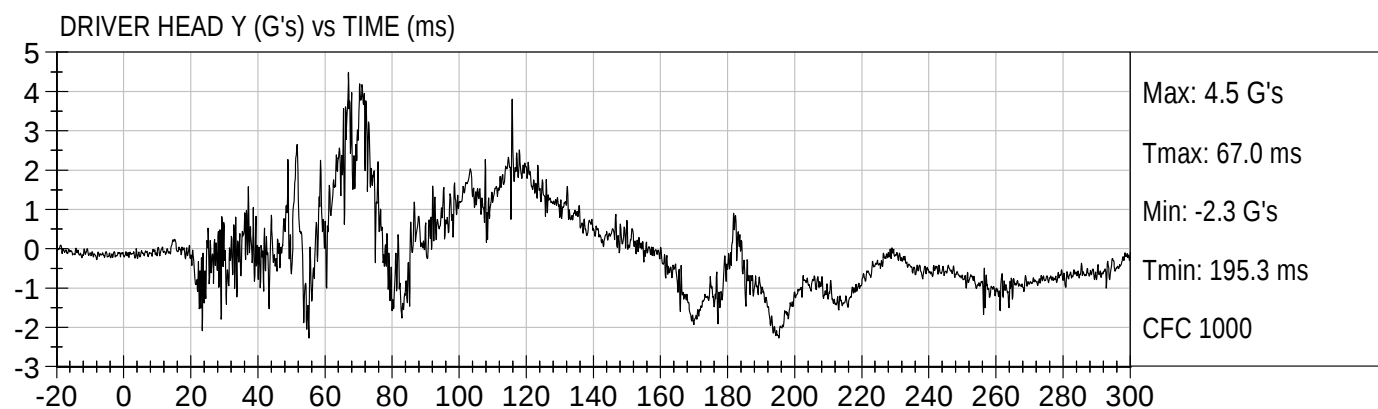
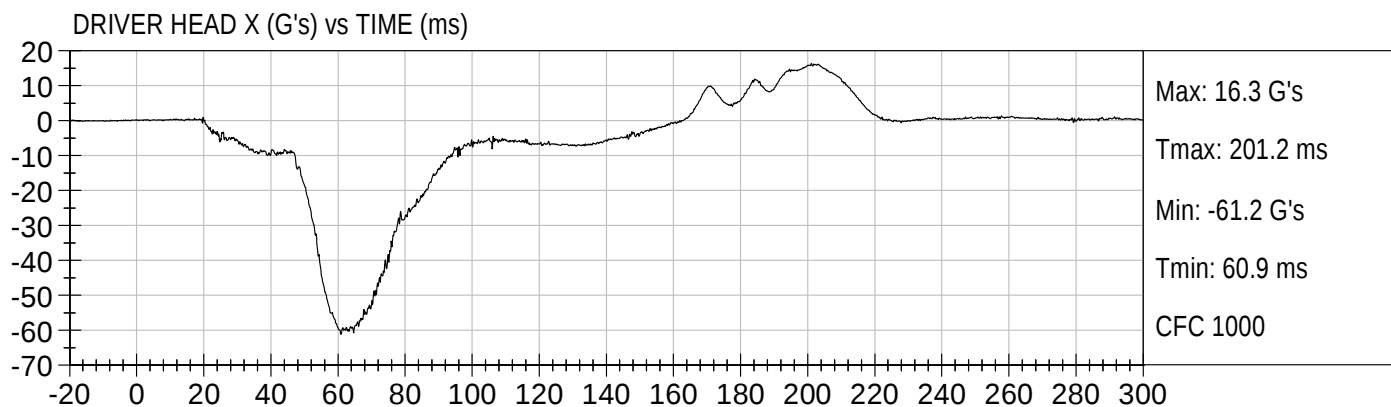
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Right Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Left Rear Seat Crossmember X
Left Rear Seat Crossmember Z
Right Rear Seat Crossmember X
Right Rear Seat Crossmember Z
Vehicle Engine Top X
Vehicle Engine Bottom X
Vehicle Left Brake Caliper X
Vehicle Right Brake Caliper X
Barrier Force – Upper Left
Barrier Force – Upper Center
Barrier Force – Upper Right
Barrier Force – Lower Left
Barrier Force – Lower Center
Barrier Force – Lower Right

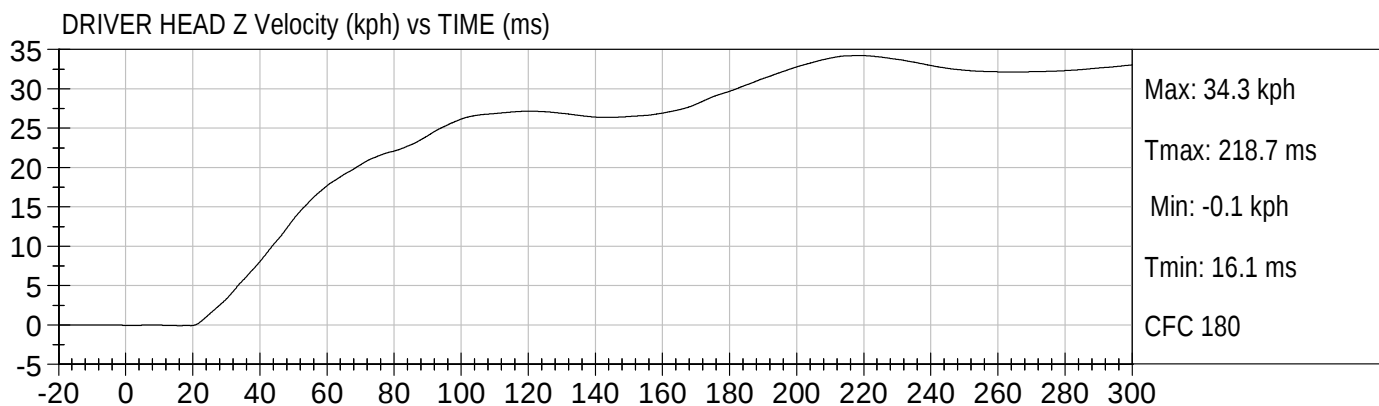
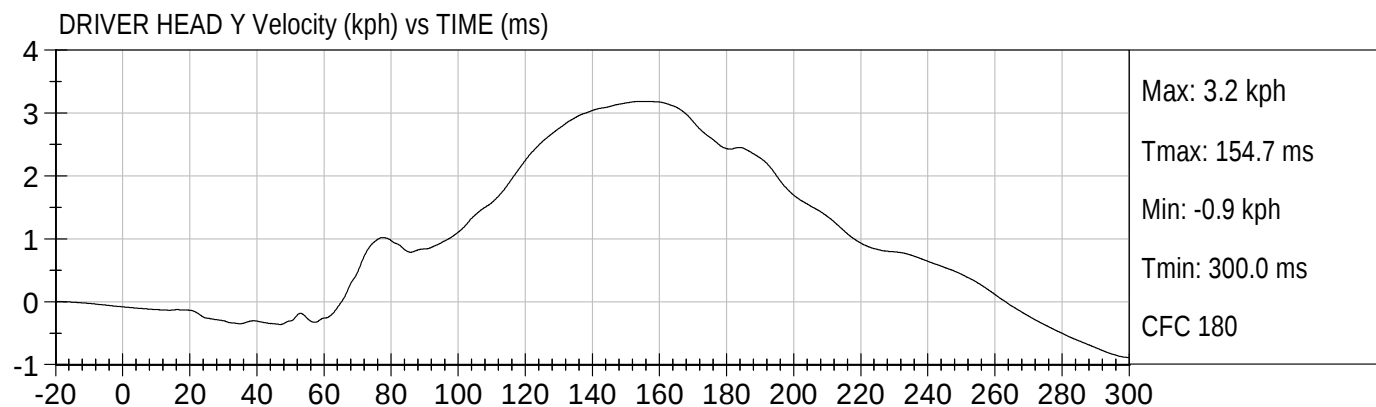
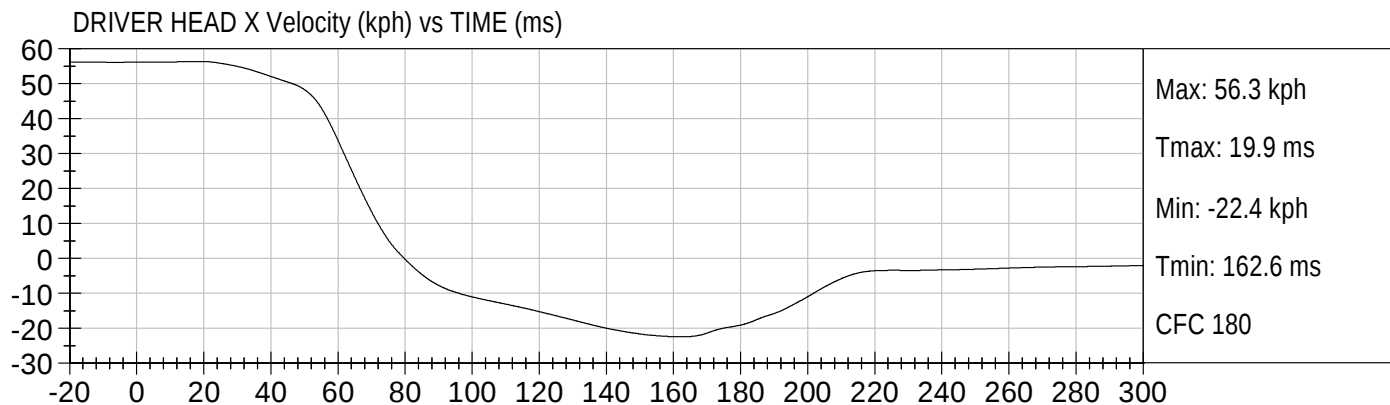


35 MPH NCAP FRONTAL
2010 FORD MUSTANG

MA0201

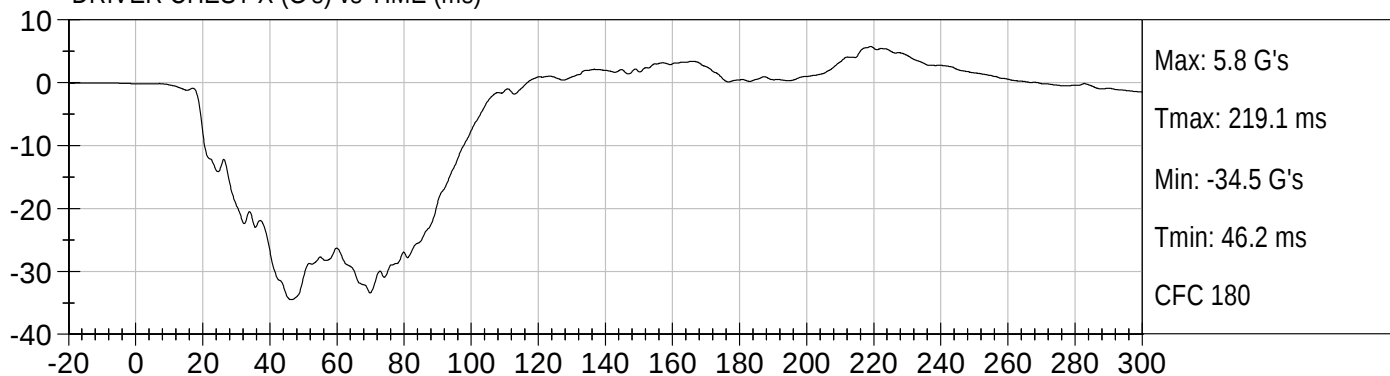
Test Date: 04/27/2009
Speed: 34.9 mph (56.2 km/h)



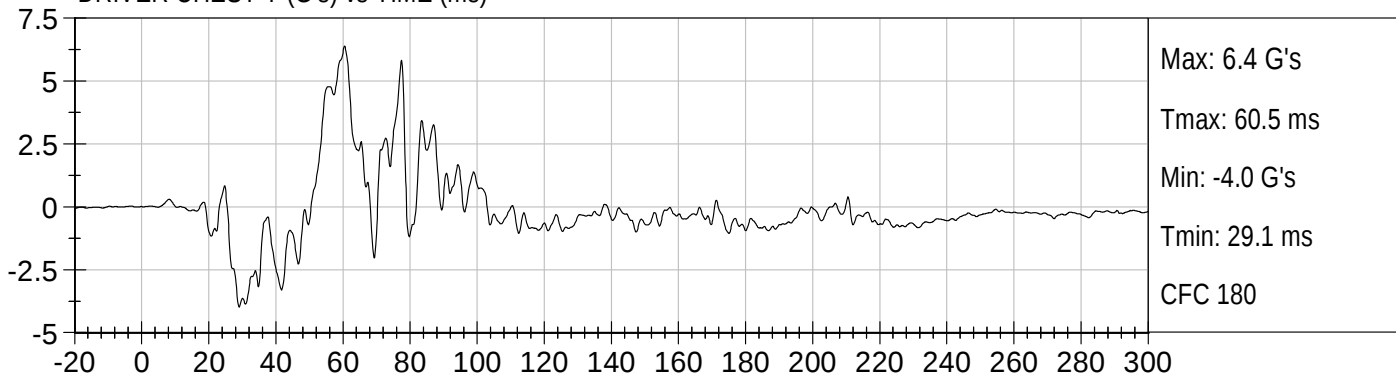




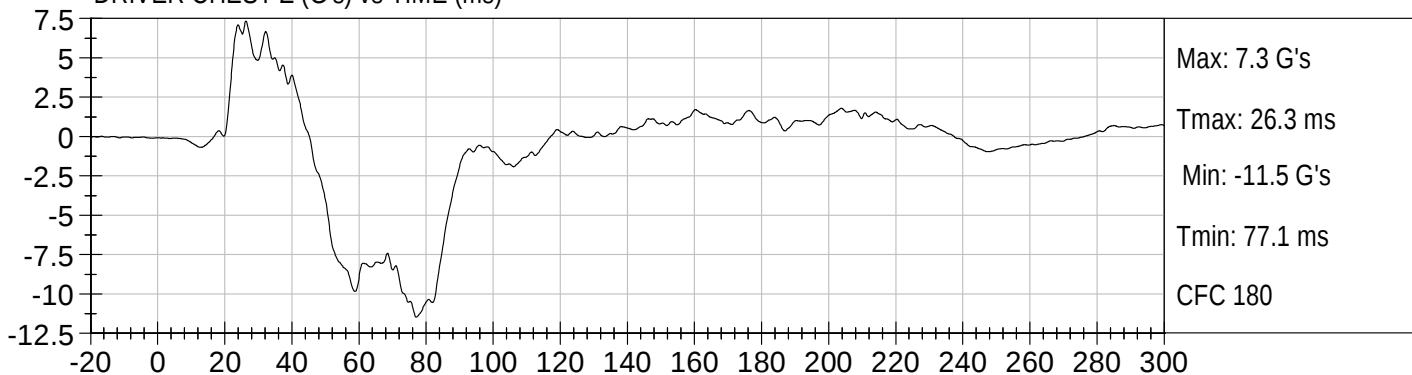
DRIVER CHEST X (G's) vs TIME (ms)



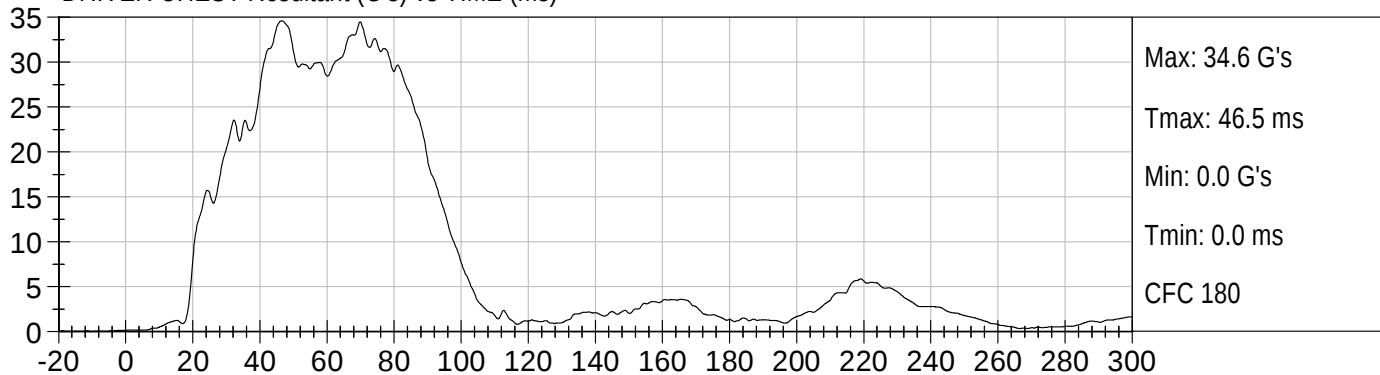
DRIVER CHEST Y (G's) vs TIME (ms)

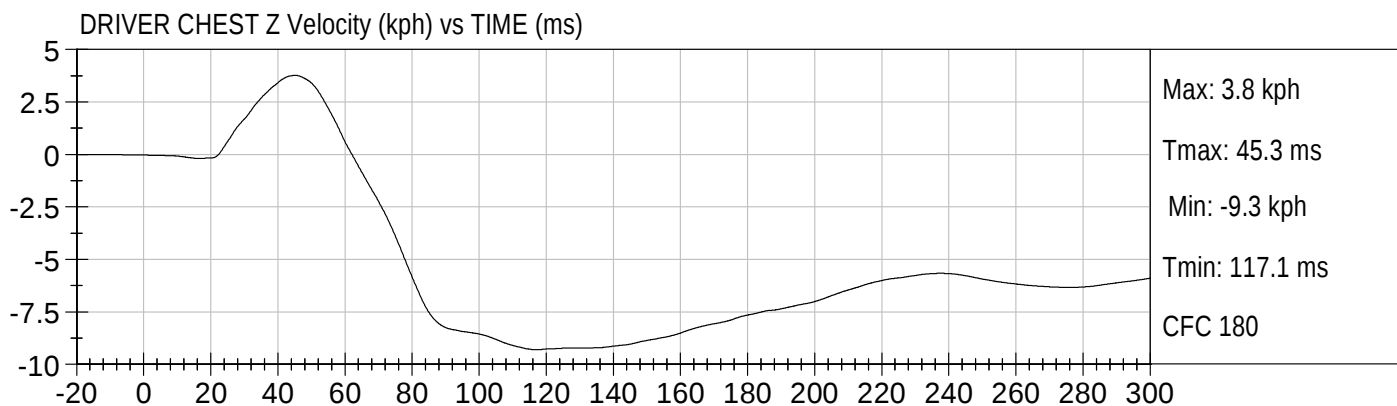
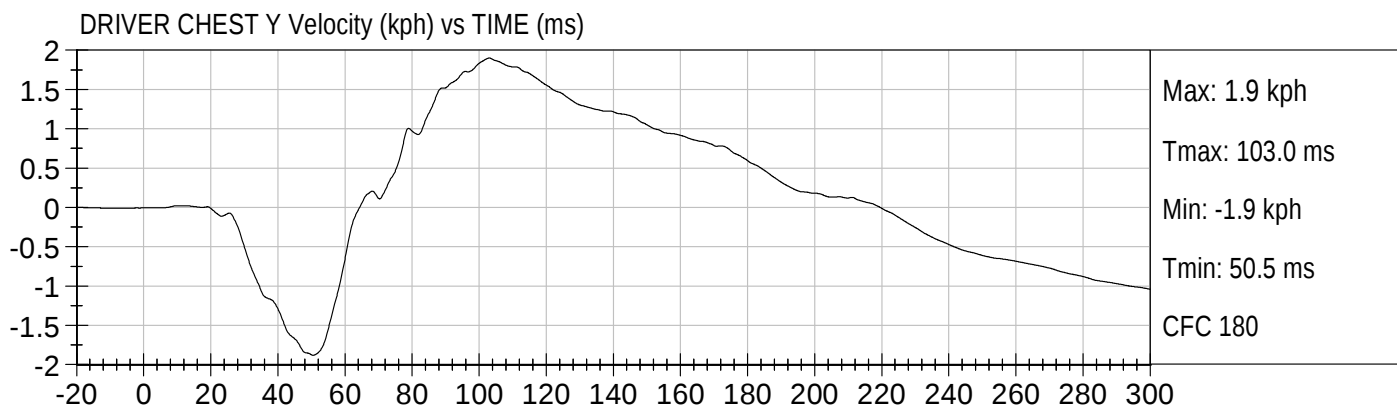
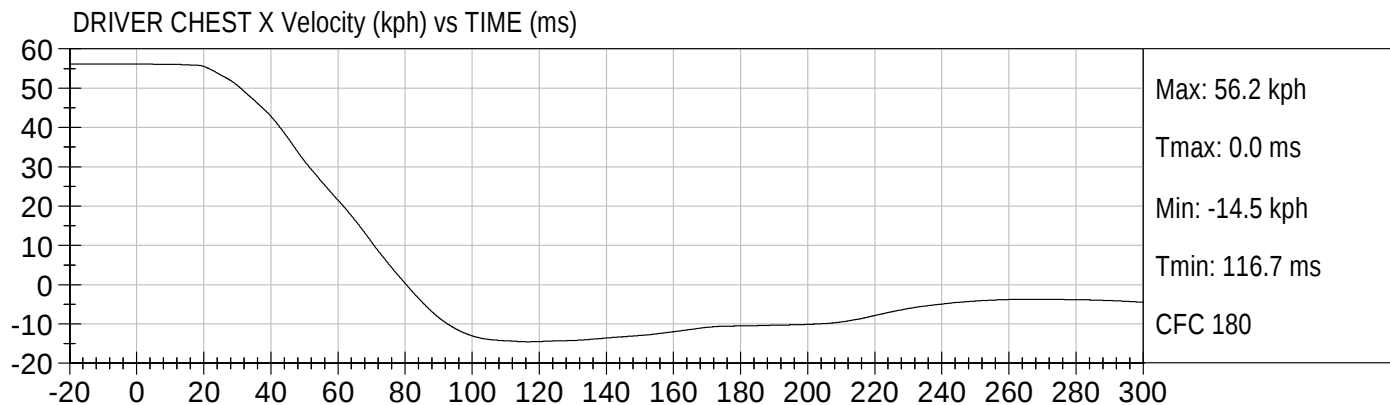


DRIVER CHEST Z (G's) vs TIME (ms)



DRIVER CHEST Resultant (G's) vs TIME (ms)



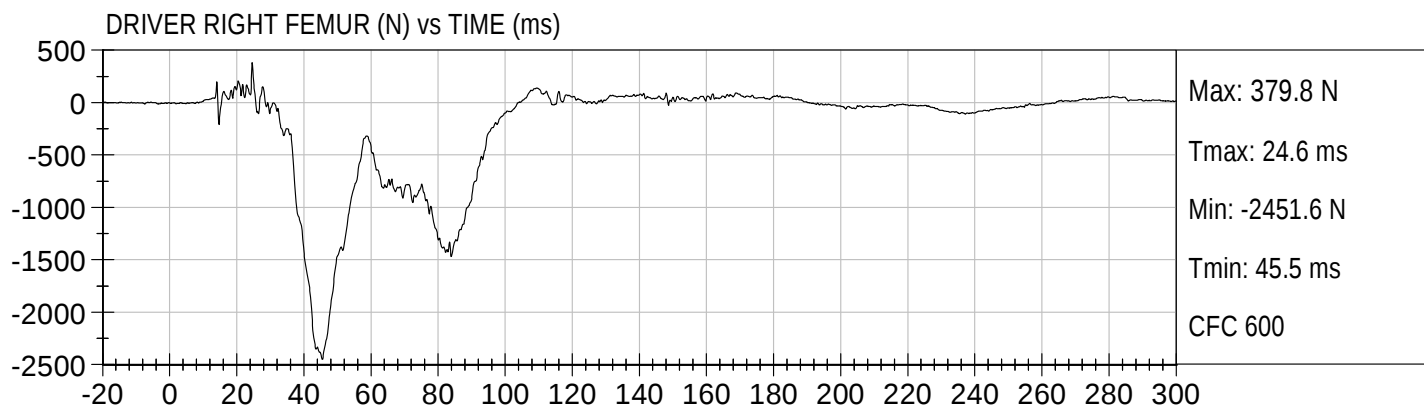
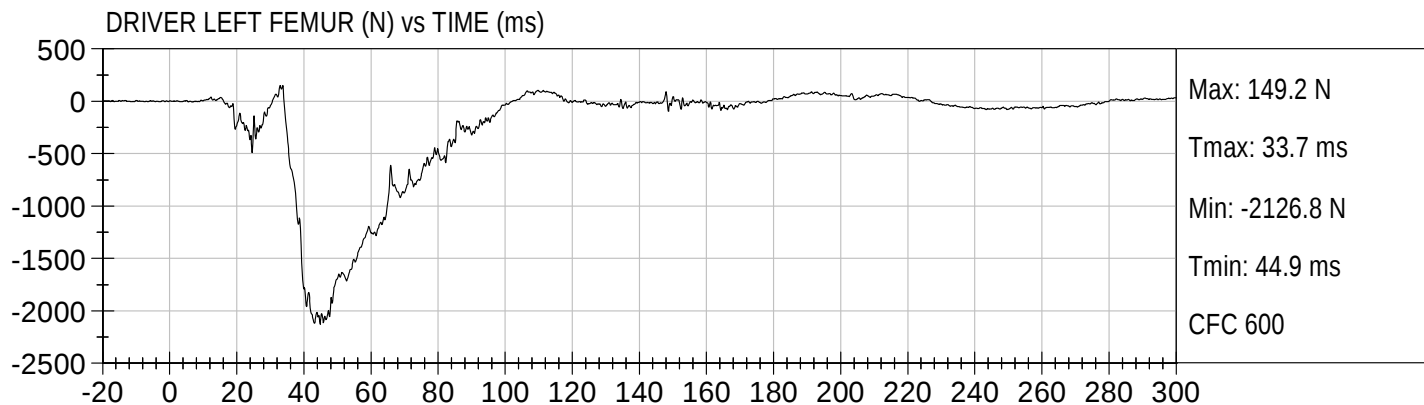




35 MPH NCAP FRONTAL
2010 FORD MUSTANG

MA0201

Test Date: 04/27/2009
Speed: 34.9 mph (56.2 km/h)



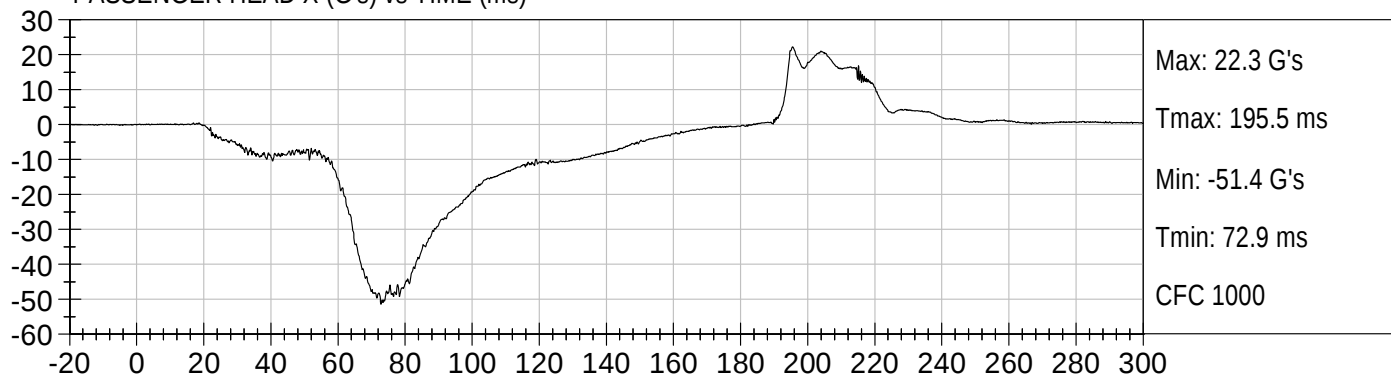


35 MPH NCAP FRONTAL
2010 FORD MUSTANG

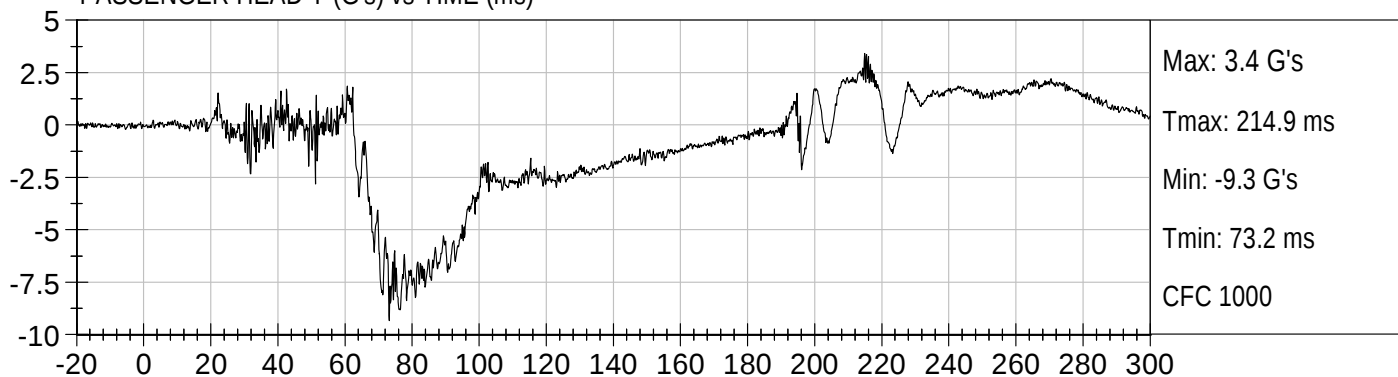
MA0201

Test Date: 04/27/2009
Speed: 34.9 mph (56.2 km/h)

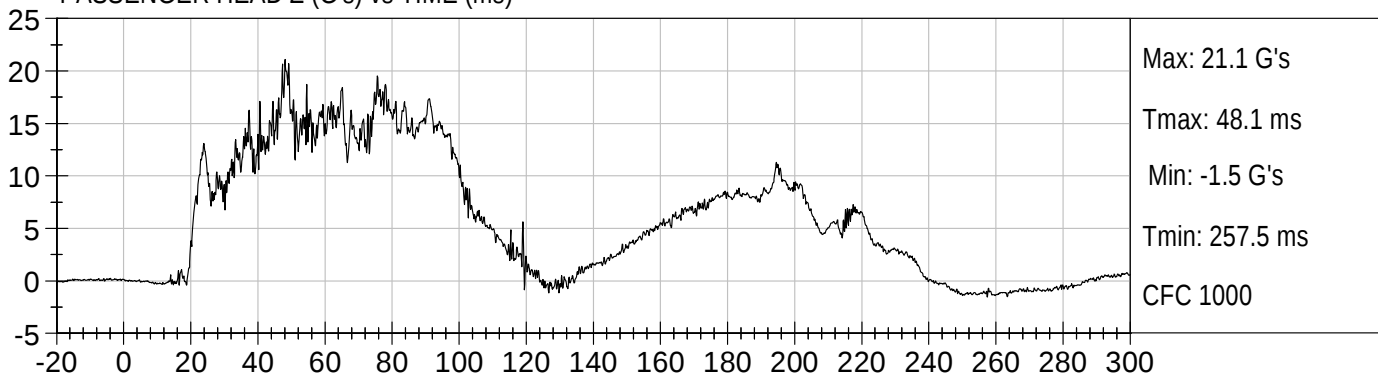
PASSENGER HEAD X (G's) vs TIME (ms)



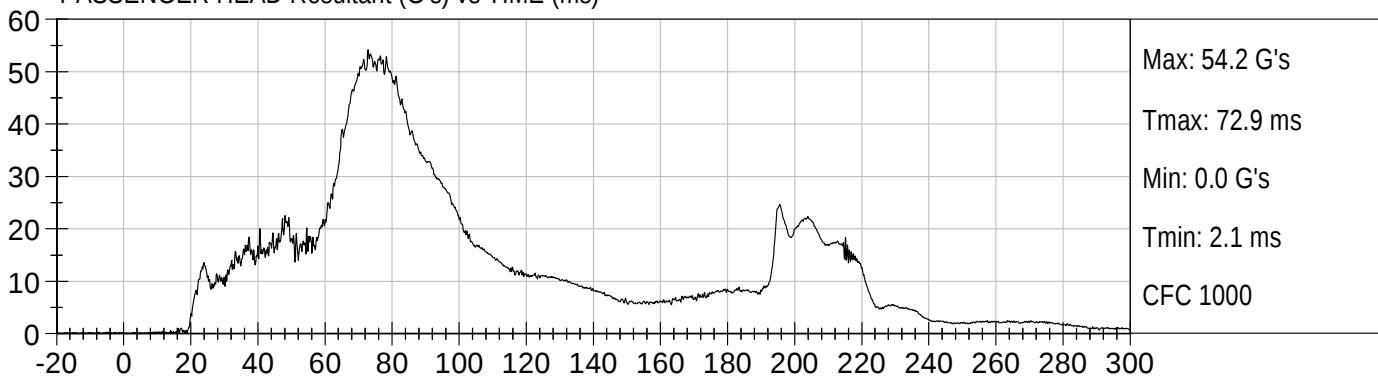
PASSENGER HEAD Y (G's) vs TIME (ms)



PASSENGER HEAD Z (G's) vs TIME (ms)



PASSENGER HEAD Resultant (G's) vs TIME (ms)



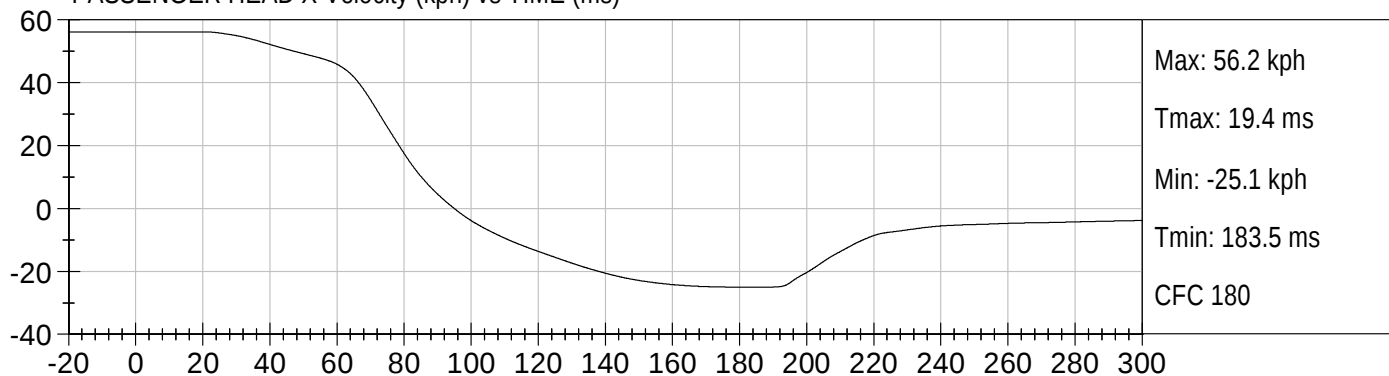


35 MPH NCAP FRONTAL
2010 FORD MUSTANG

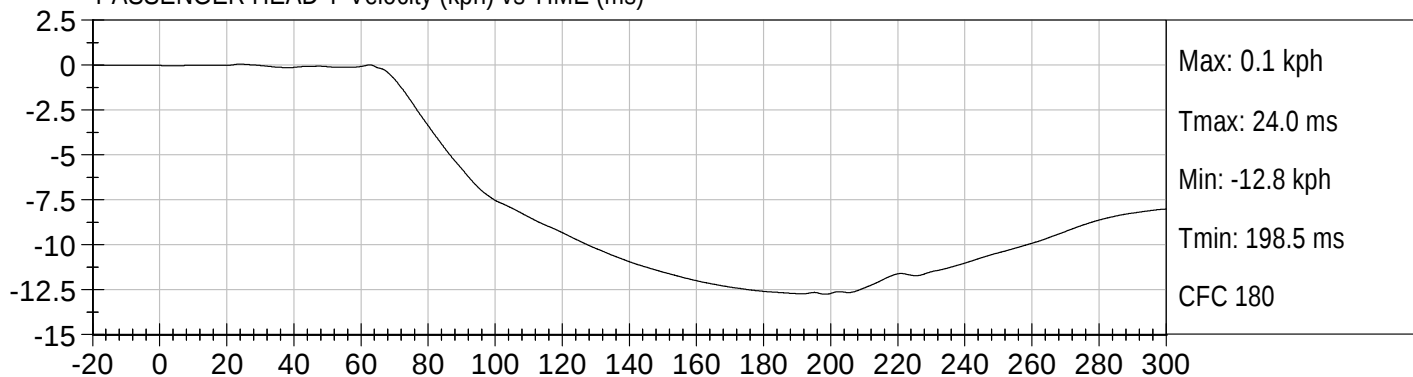
MA0201

Test Date: 04/27/2009
Speed: 34.9 mph (56.2 km/h)

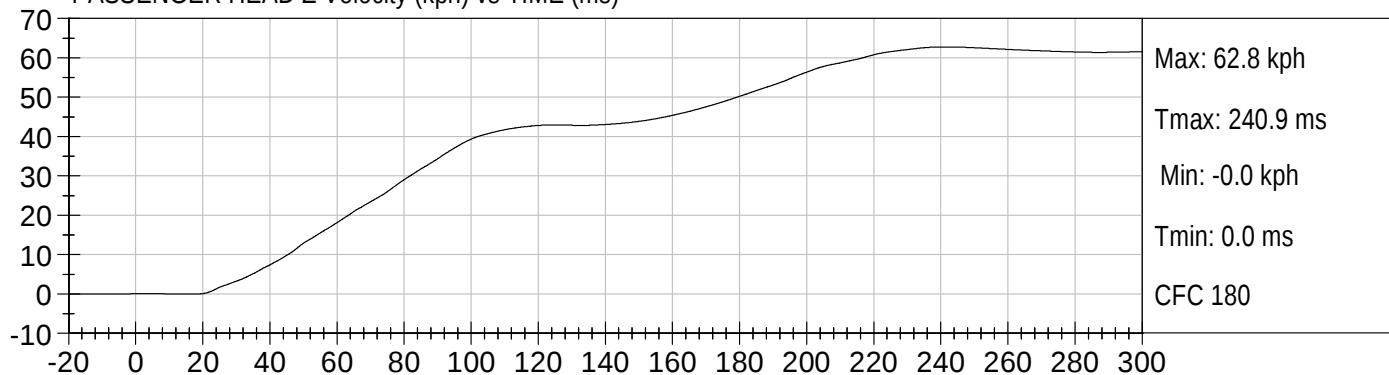
PASSENGER HEAD X Velocity (kph) vs TIME (ms)



PASSENGER HEAD Y Velocity (kph) vs TIME (ms)



PASSENGER HEAD Z Velocity (kph) vs TIME (ms)

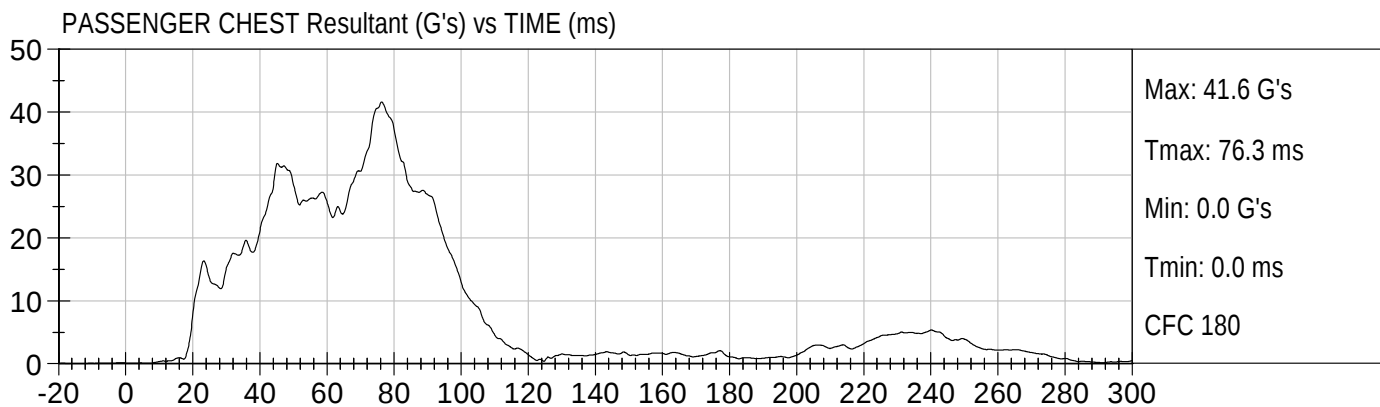
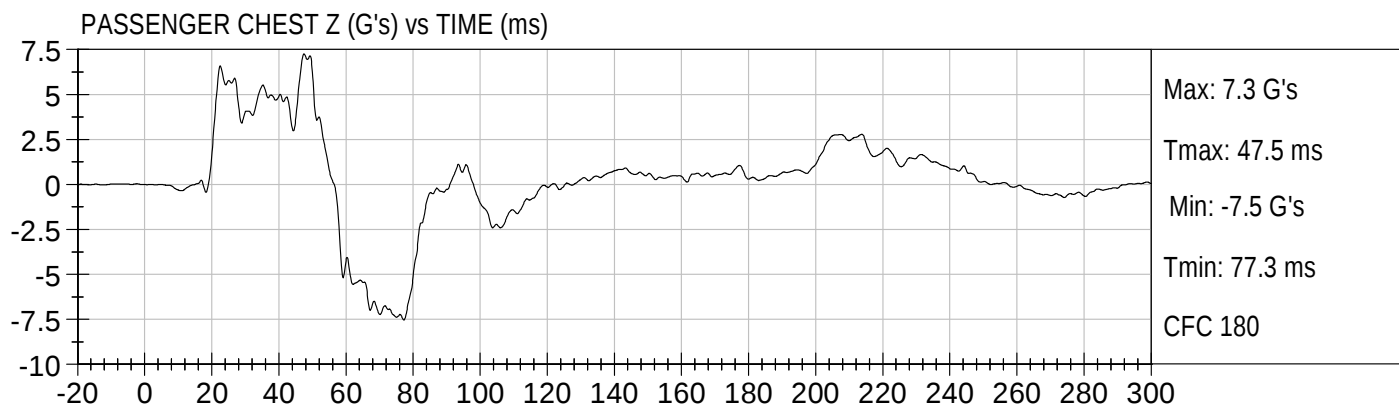
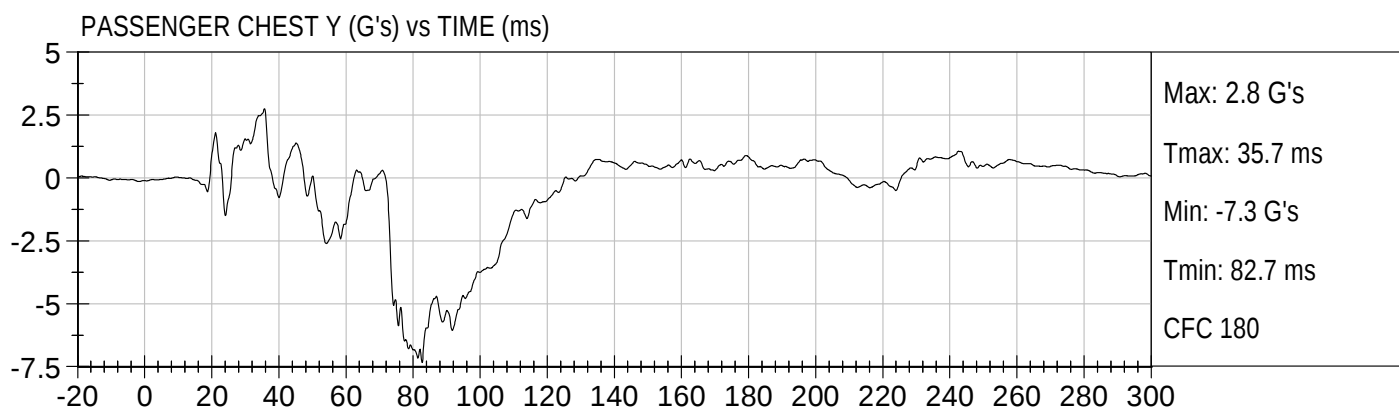
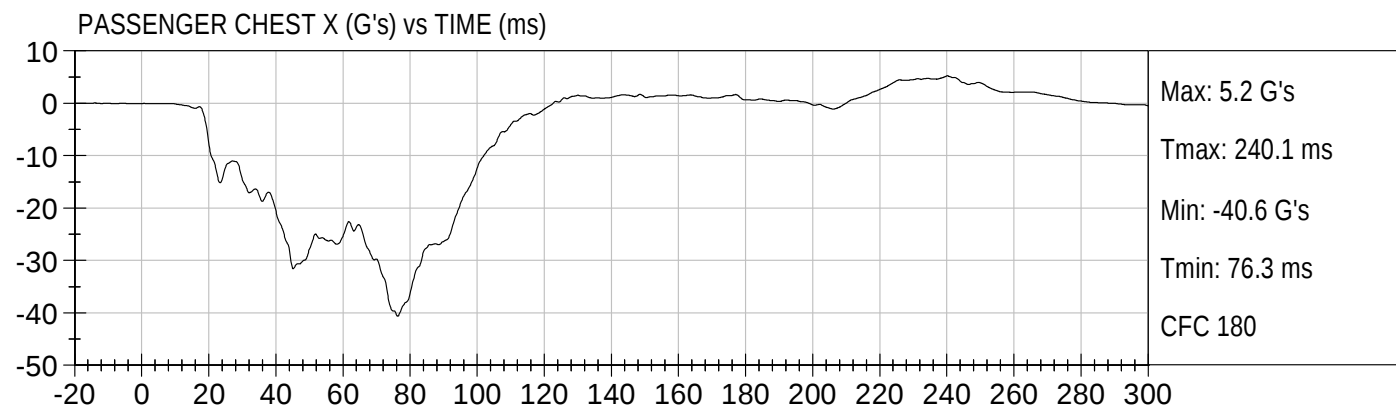


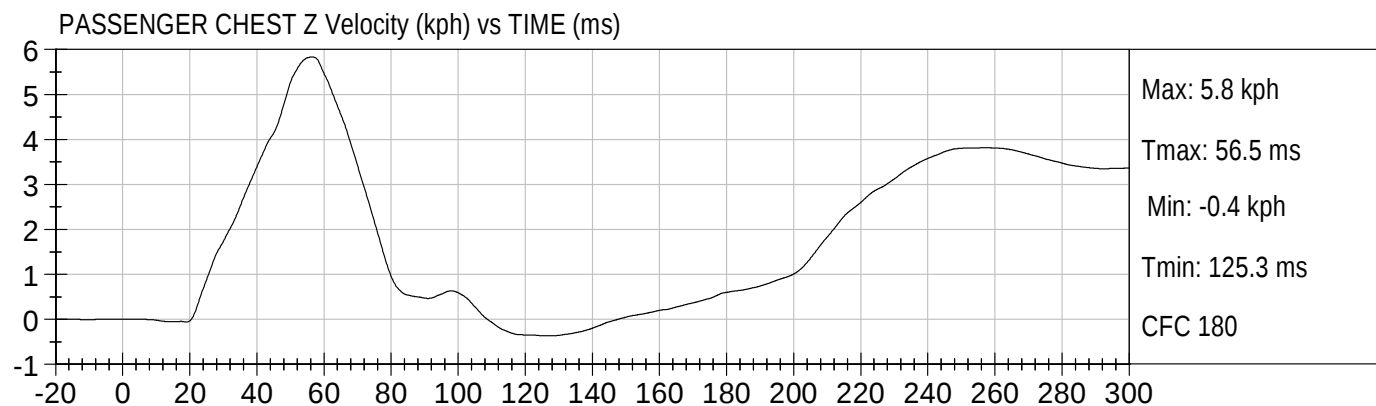
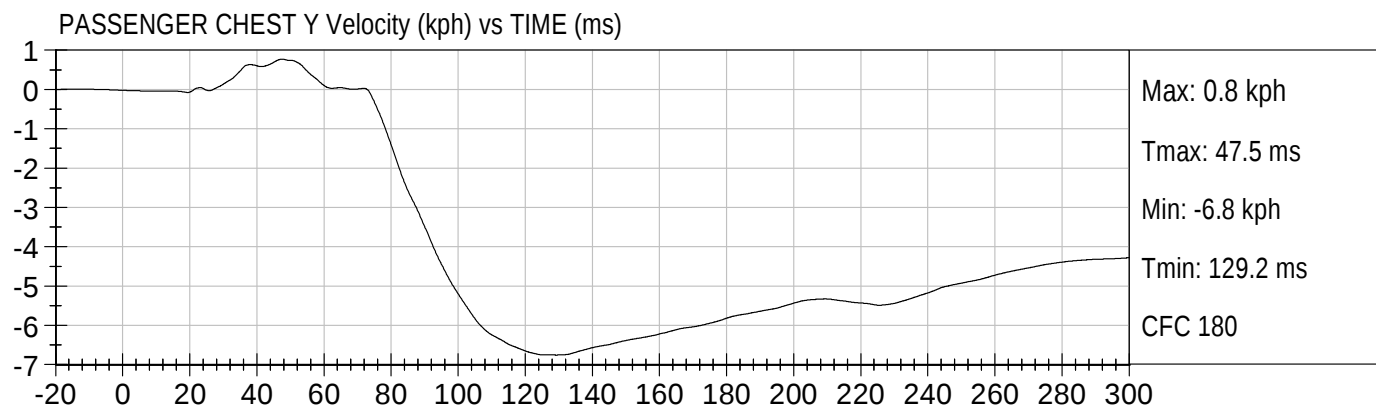
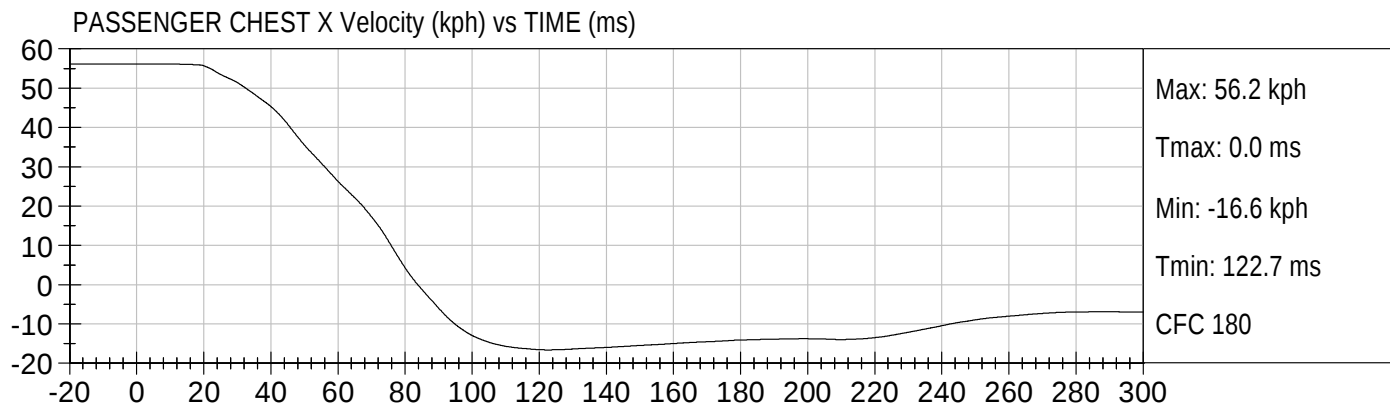


35 MPH NCAP FRONTAL
2010 FORD MUSTANG

MA0201

Test Date: 04/27/2009
Speed: 34.9 mph (56.2 km/h)



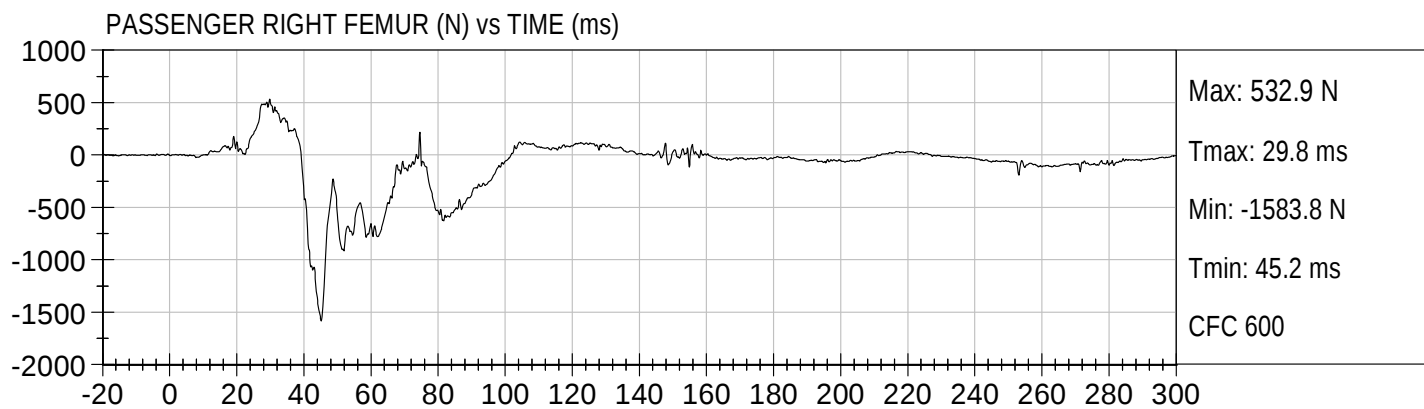
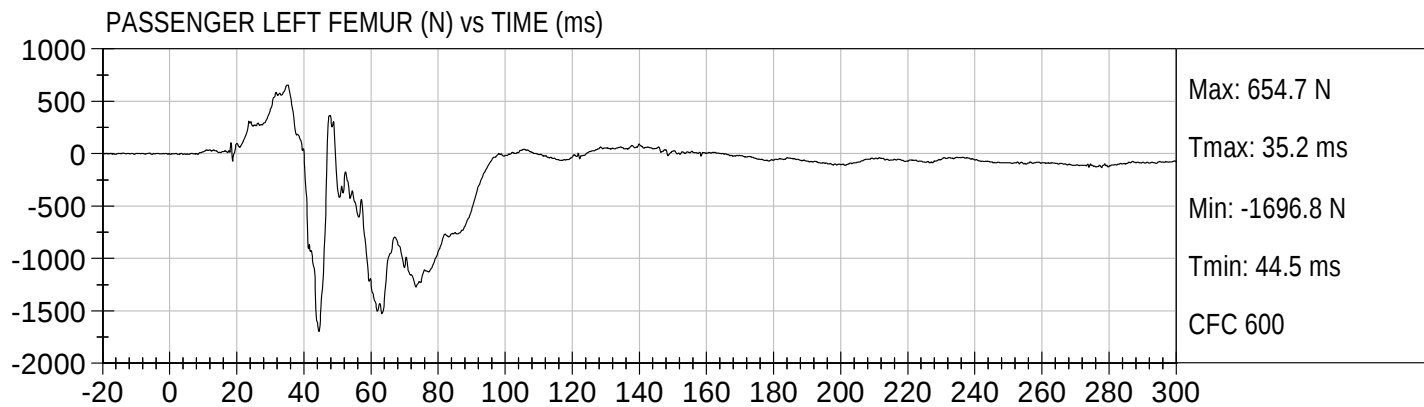




35 MPH NCAP FRONTAL
2010 FORD MUSTANG

MA0201

Test Date: 04/27/2009
Speed: 34.9 mph (56.2 km/h)



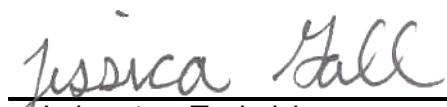
APPENDIX C
DUMMY CALIBRATION DATA

MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test ID: D09811

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	225 - 275	246	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	7.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

4/13/09
Test Date

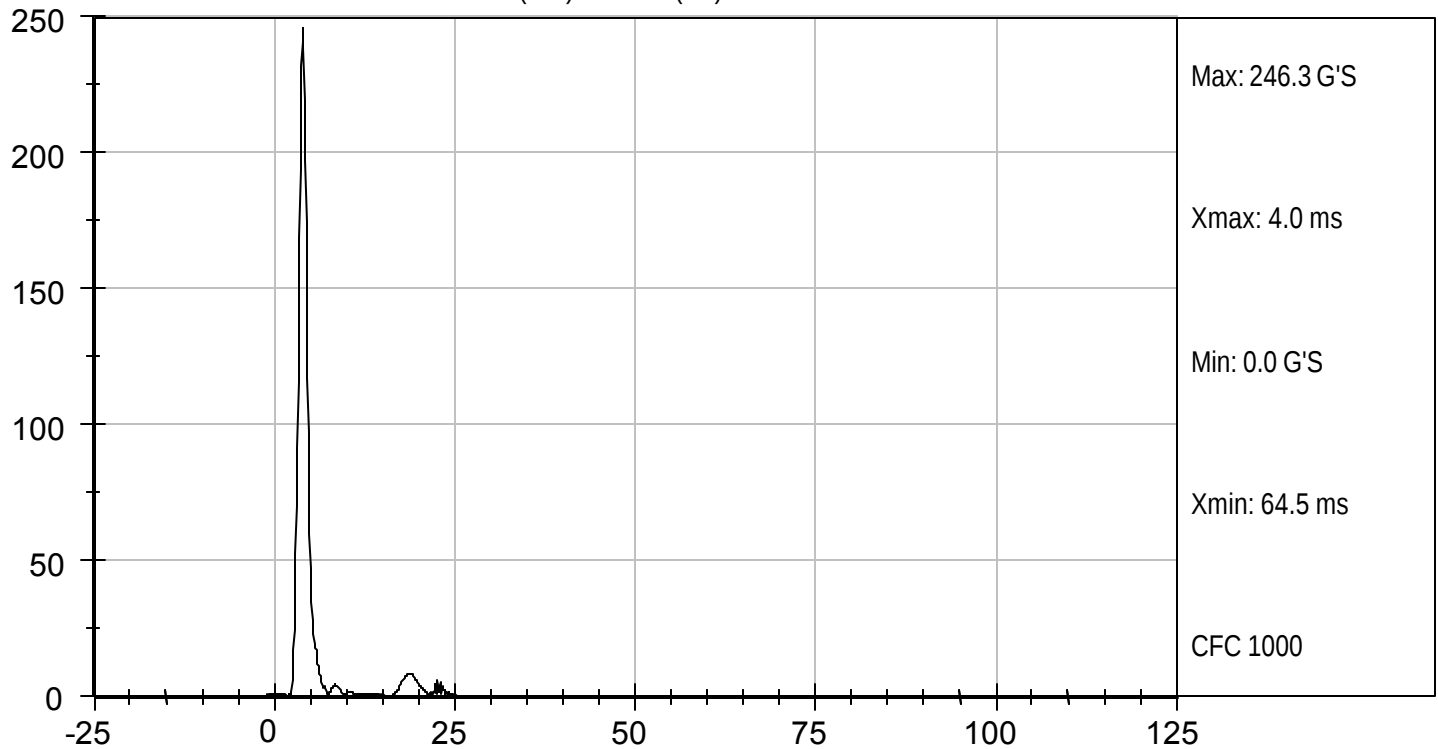

Approved By



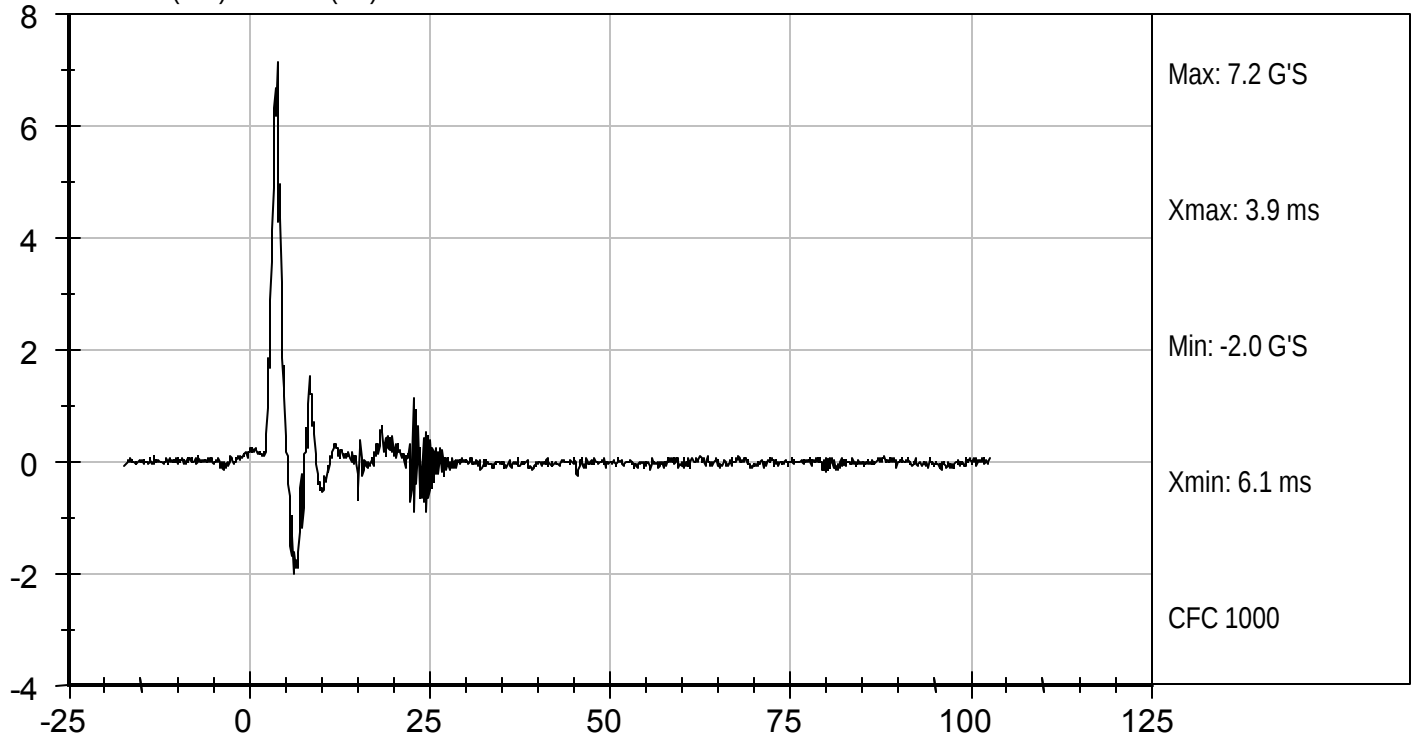
Test Desc: Head Drop
Component ID: D09811

Test Date: 4/13/09
Velocity: 0 ft/s, 0 m/s

RESULTANT HEAD ACCELERATION (G'S) vs TIME (ms)



HEAD Y (G'S) vs TIME (ms)

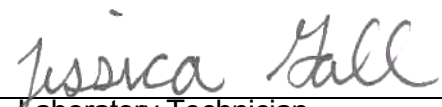


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D09812

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.3	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.95	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	25.91	Pass
	20 msec	G's	17.60 to 22.60	18.87	Pass
	30 msec	G's	12.50 to 18.50	14.30	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.21	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	37.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	66.8	Pass
	Time	msec	57.0 to 64.0	58.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	116.1	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	95.1	Pass
	Time	msec	47.0 to 58.0	50.6	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	99.6	Pass
Overall Test Results					Pass


 Laboratory Technician

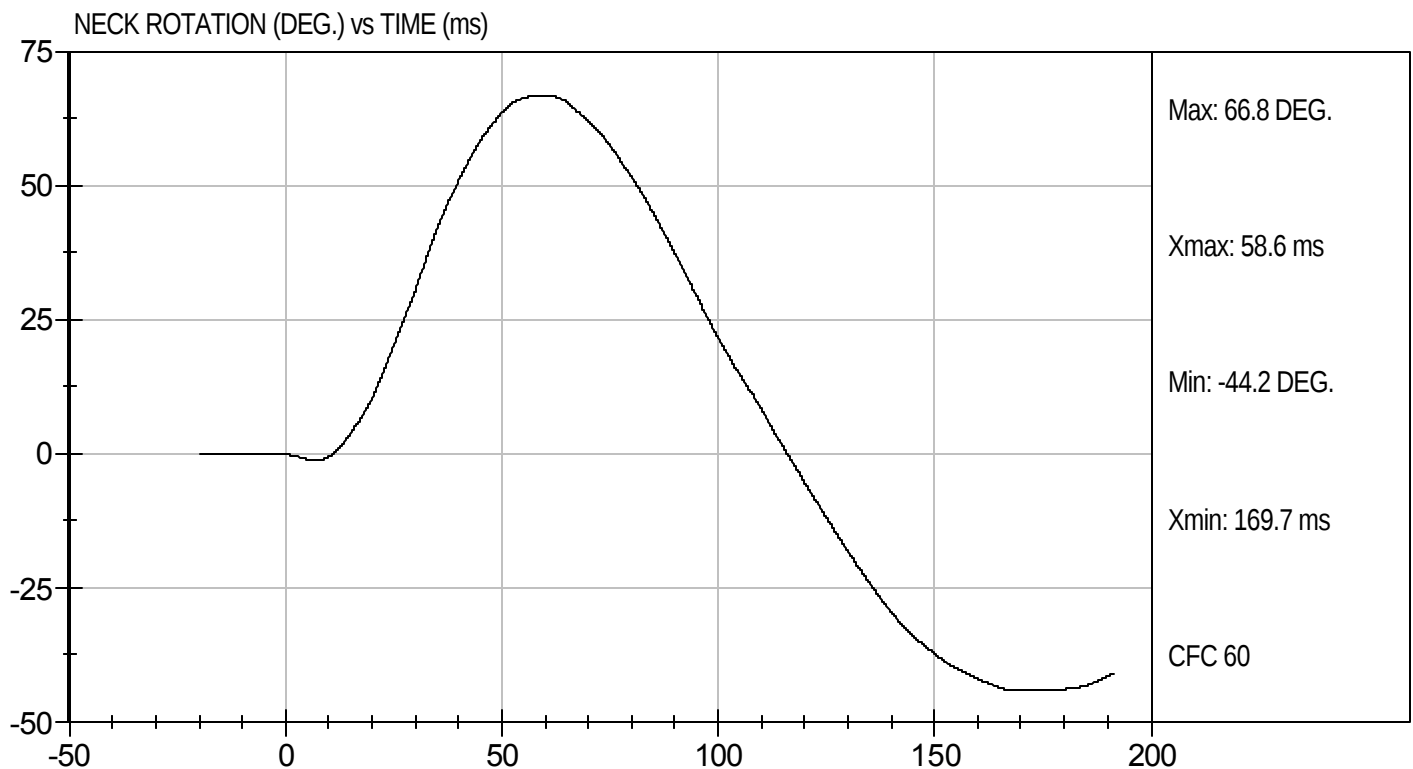
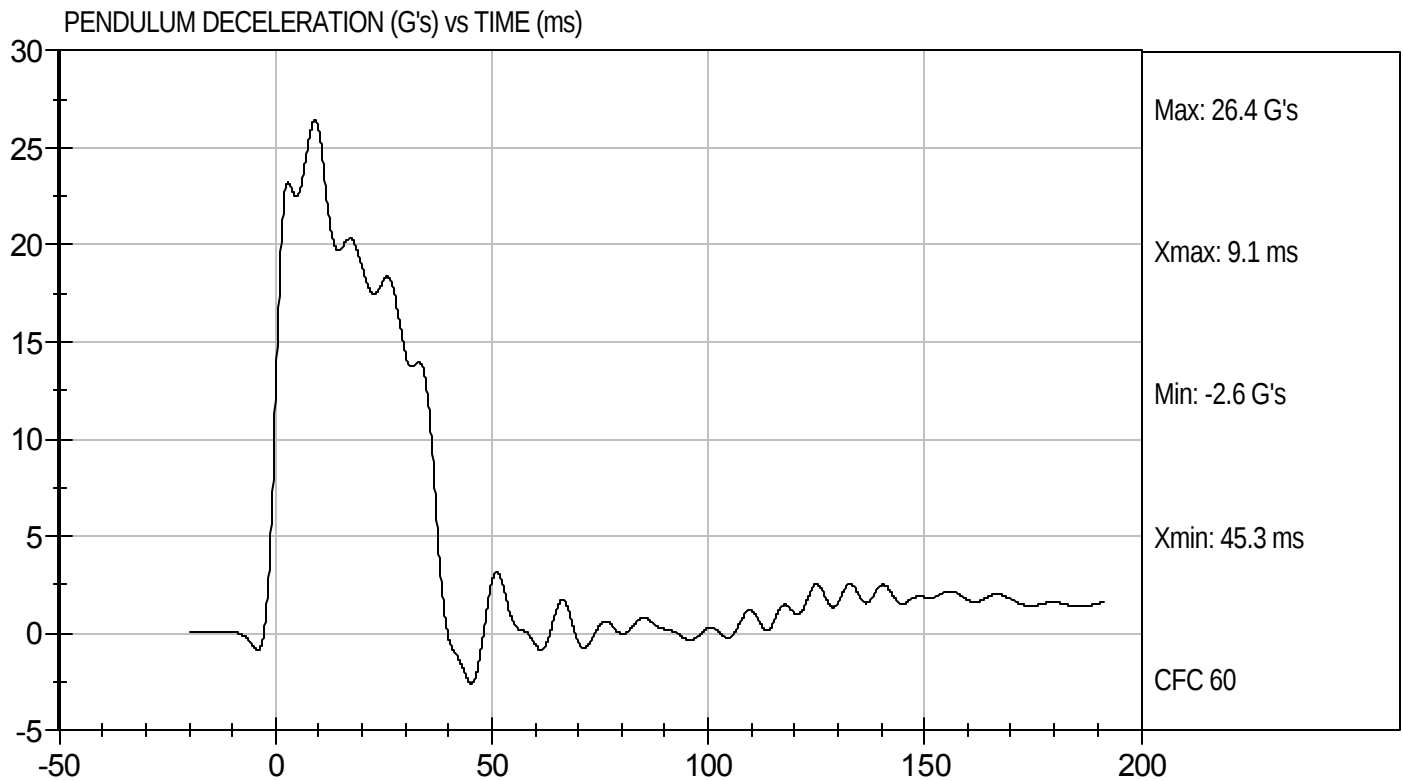
4/13/09
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D09812

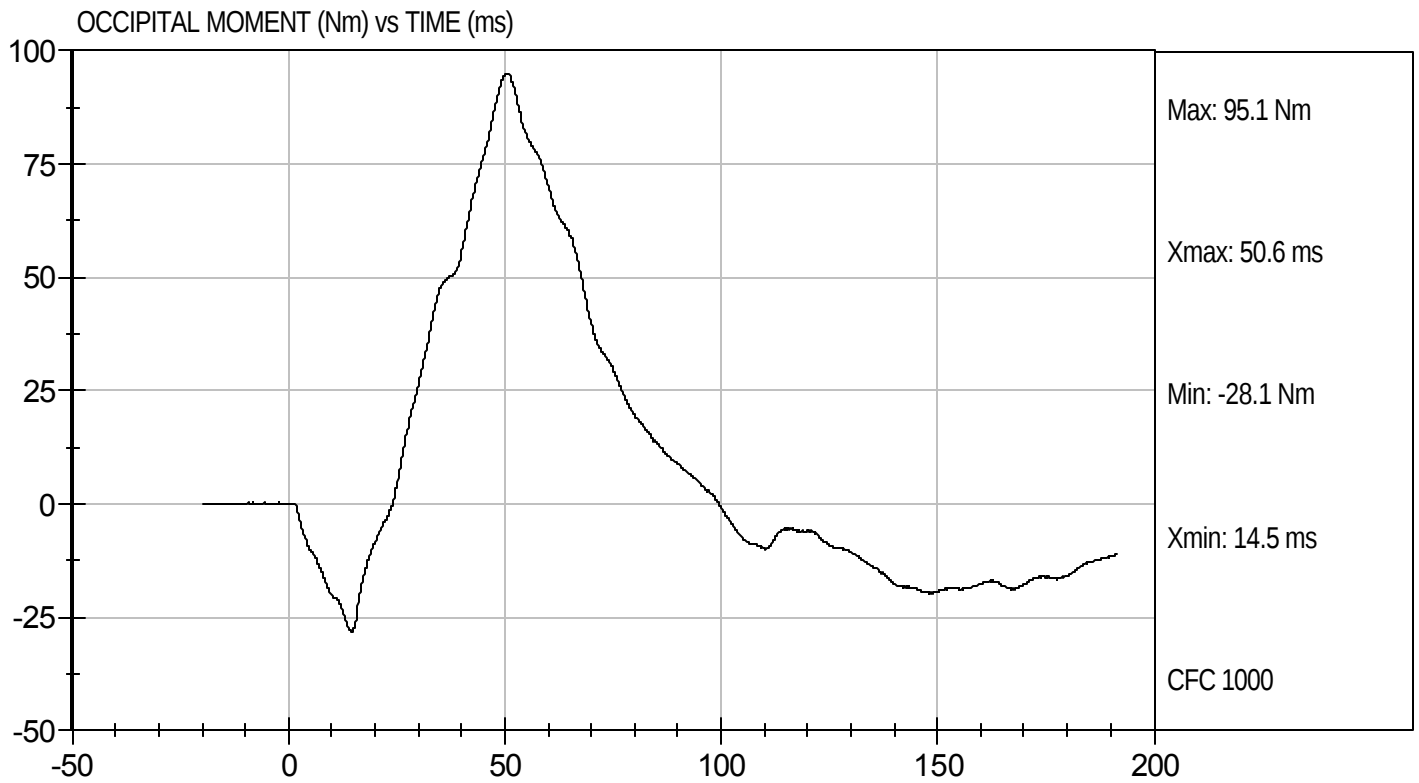
Test Date: 4/13/09
Velocity: 22.8 ft/s, 6.95 m/s





Test Desc: Neck Flexion
Component ID: D09812

Test Date: 4/13/09
Velocity: 22.8 ft/s, 6.95 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D09813

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.9	Pass
Laboratory Relative Humidity		%	10 to 70	26	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.19	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.38	Pass
	20 msec	G's	14.00 to 19.00	16.62	Pass
	30 msec	G's	11.00 to 16.00	14.50	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	14.50	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	92.8	Pass
	Time	msec	72.0 to 82.0	74.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	157.7	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-59.3	Pass
	Time	msec	65.0 to 79.0	69.8	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	141.3	Pass
Overall Test Results					Pass


 Laboratory Technician

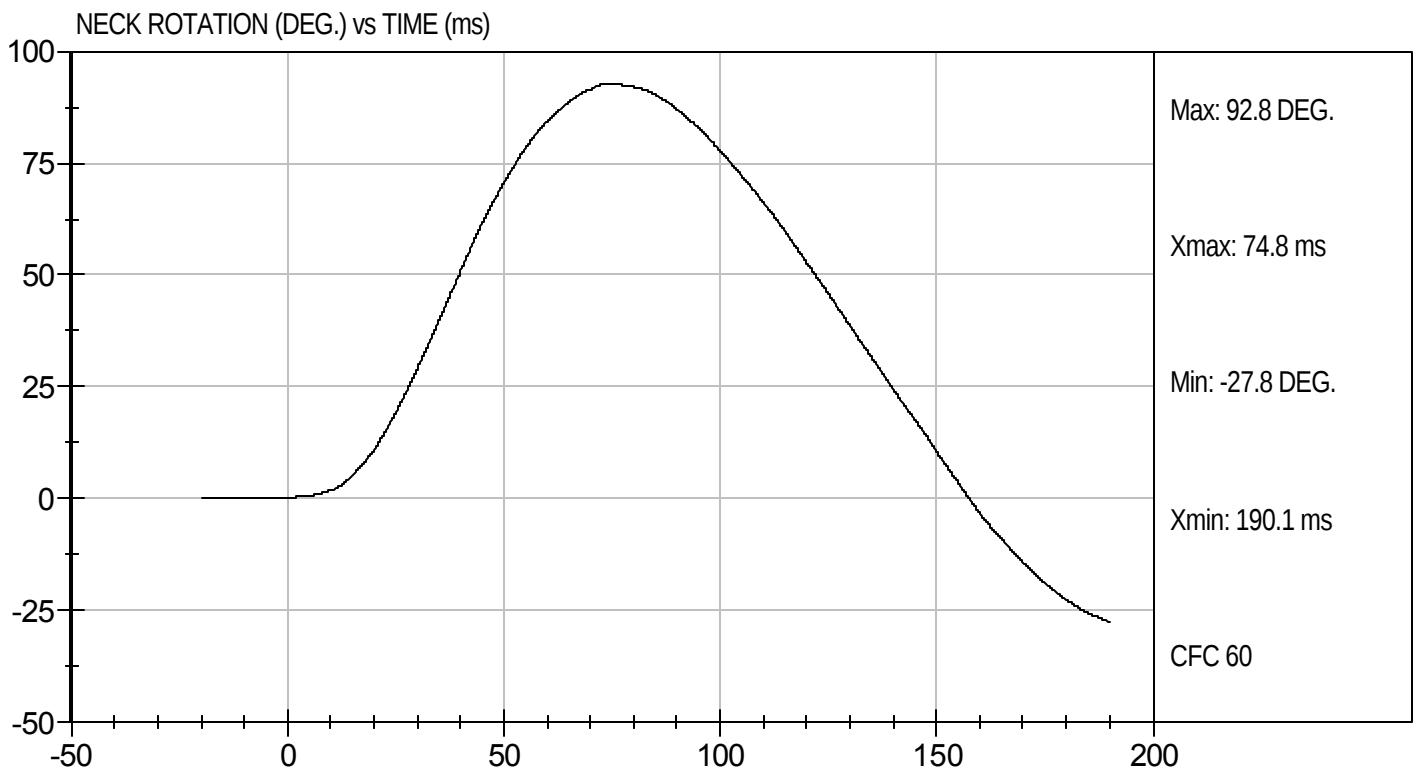
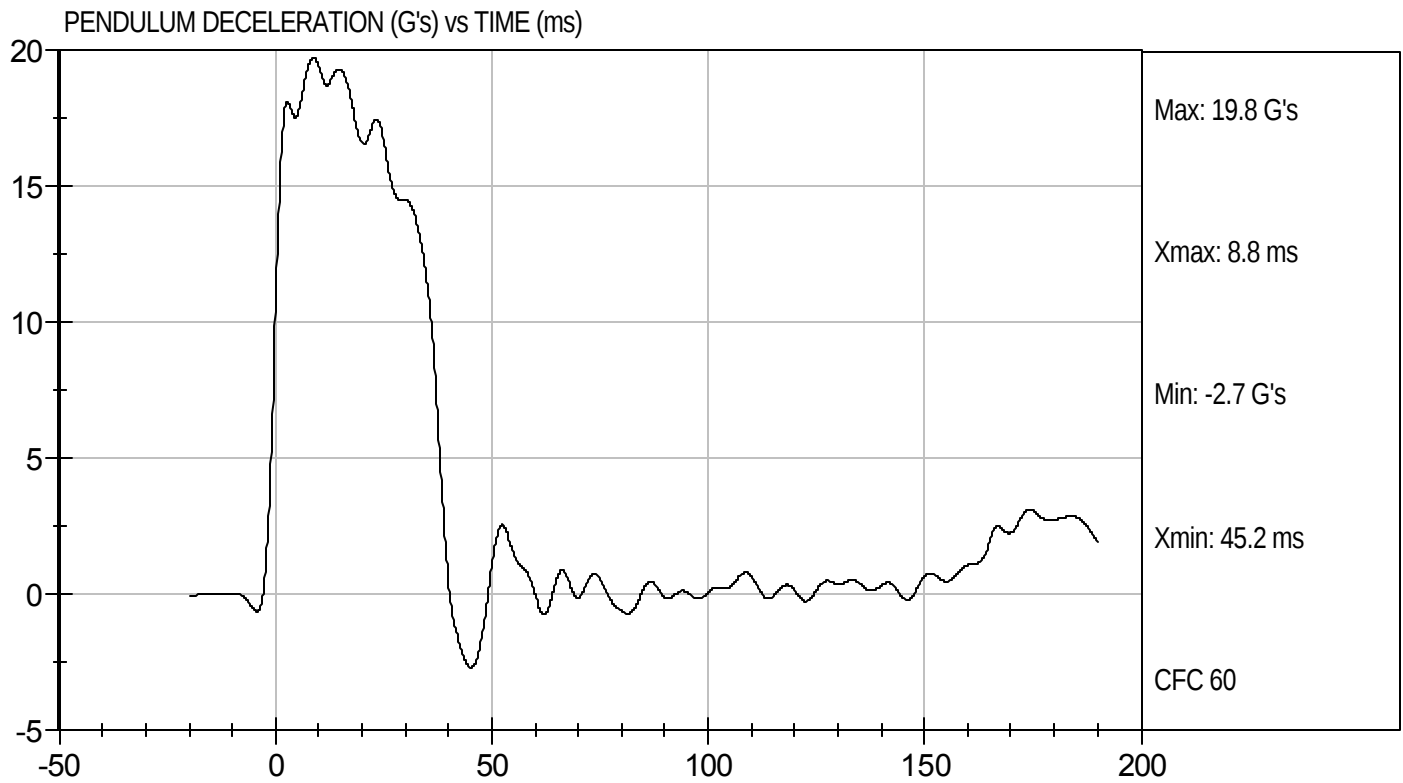
4/14/09
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D09813

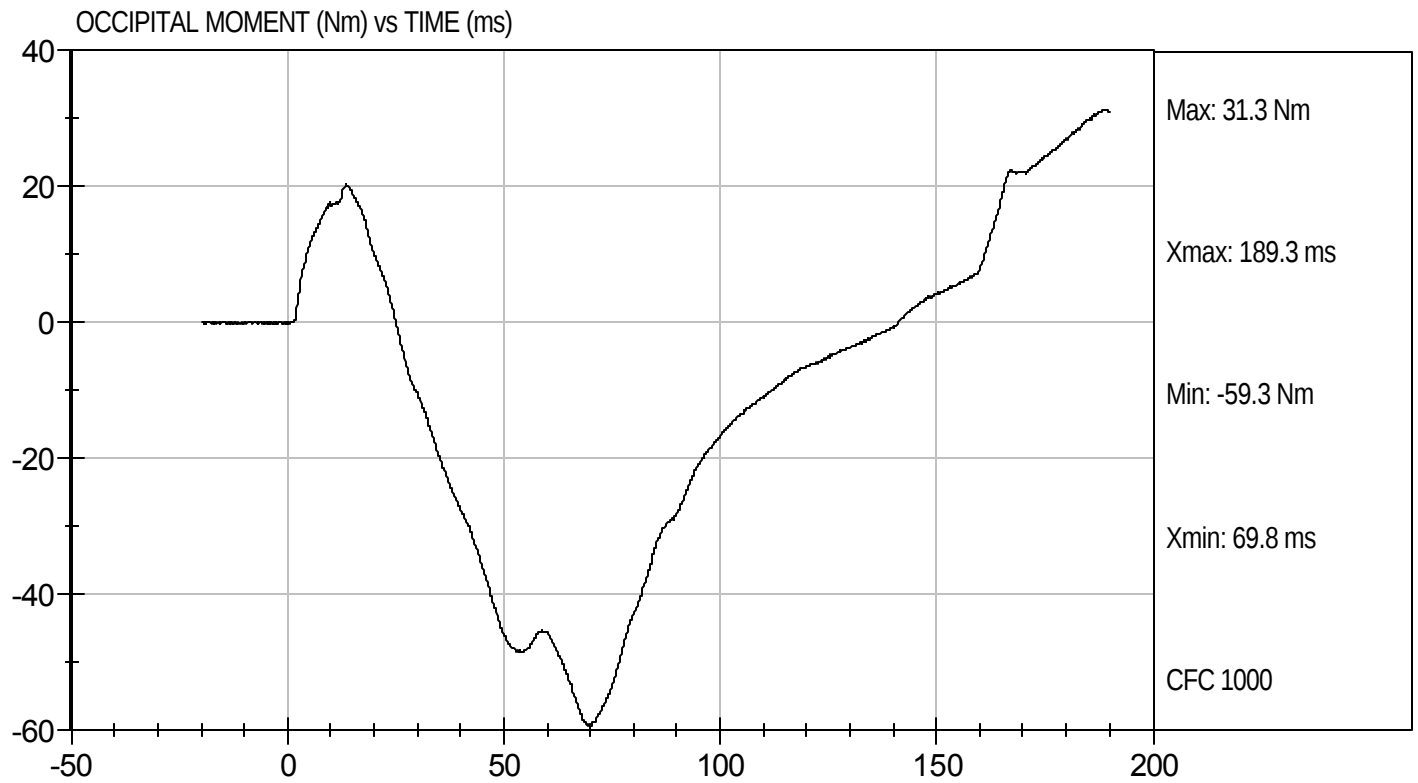
Test Date: 4/14/09
Velocity: 20.3 ft/s, 6.19 m/s





Test Desc: Neck Extension
Component ID: D09813

Test Date: 4/14/09
Velocity: 20.3 ft/s, 6.19 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D09814

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,359	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.69	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results			Pass	


Laboratory Technician

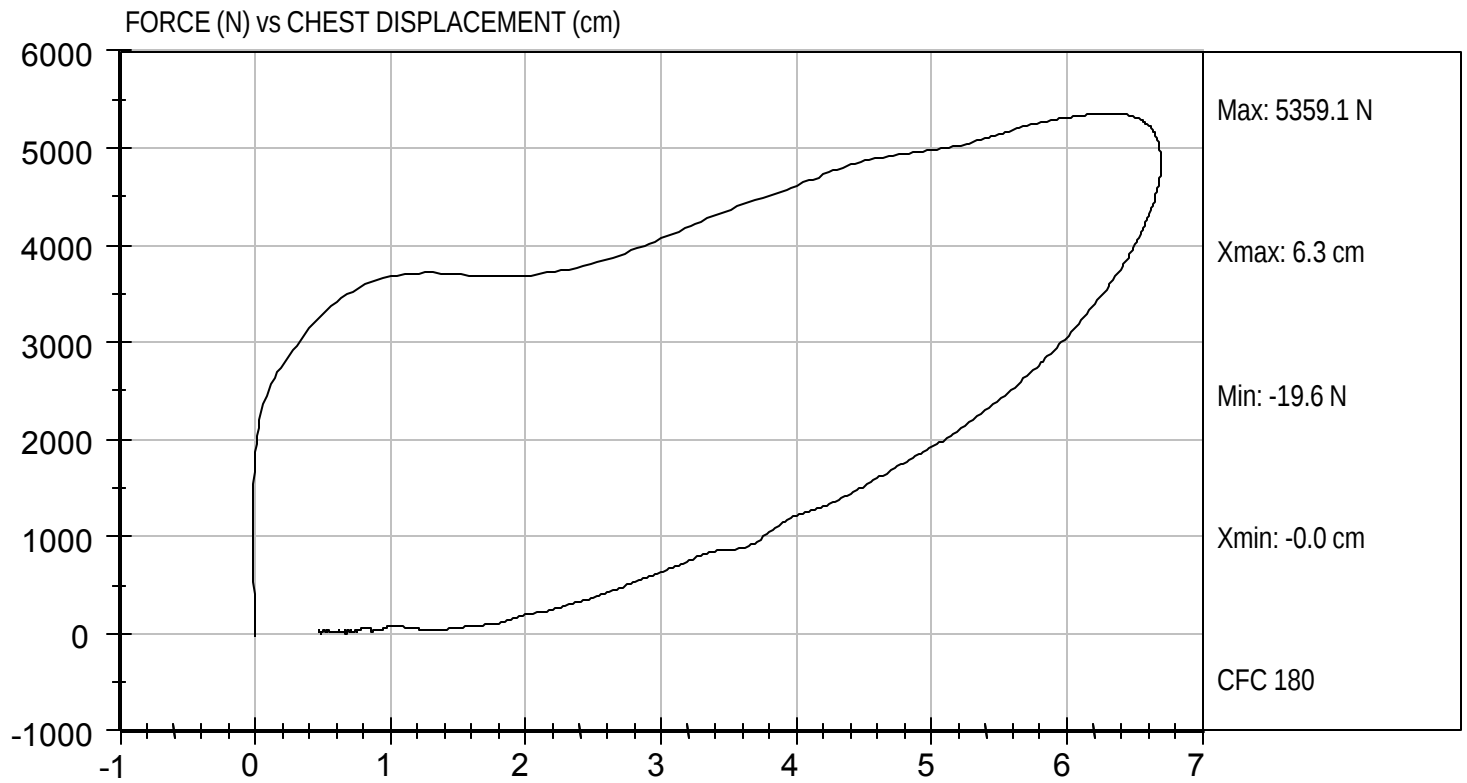
4/14/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D09814

Test Date: 4/14/09
Velocity: 22.2 ft/s, 6.77 m/s



MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D09815

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,233	Pass
Overall Test Results				Pass



Laboratory Technician

4/13/09

Test Date

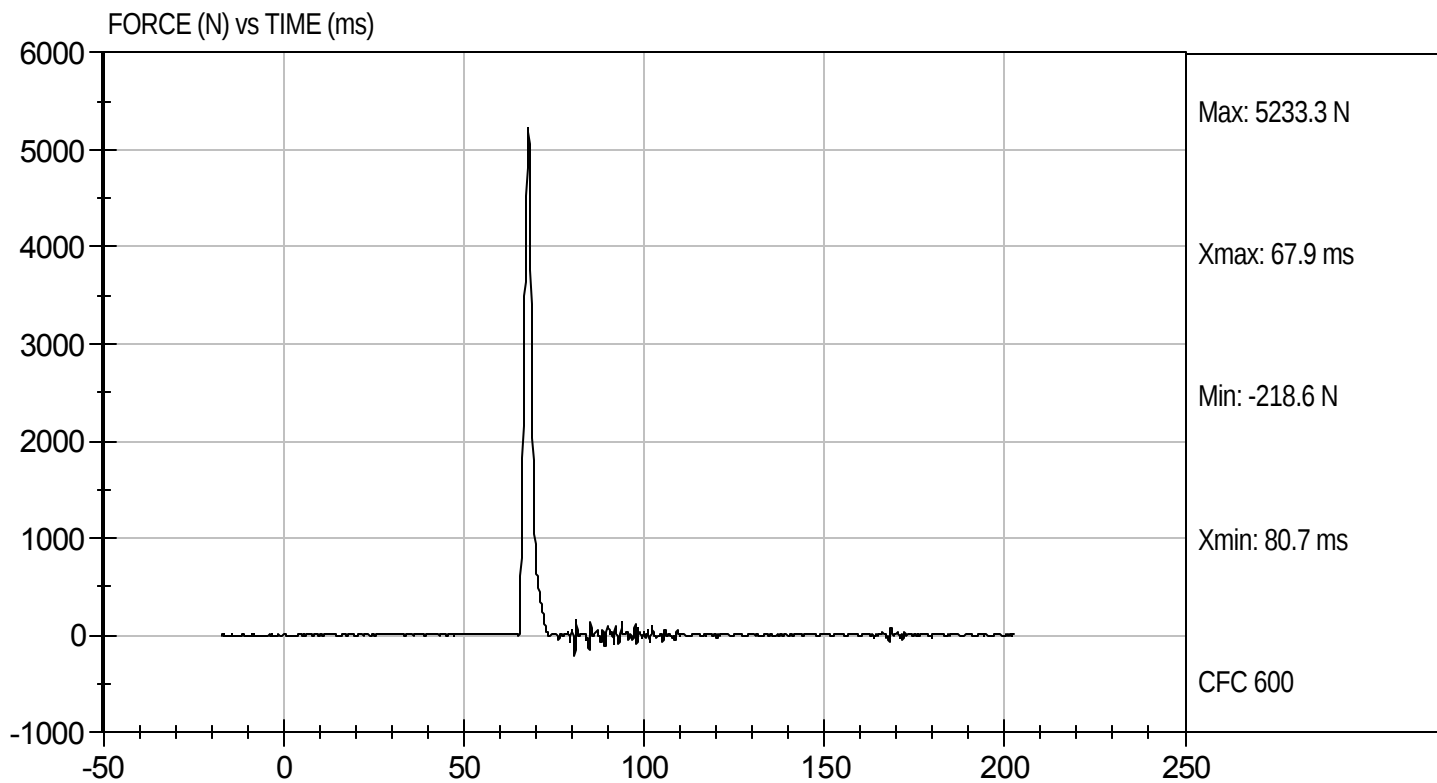


Approved By



Test Desc: Right Knee
Component ID: D09815

Test Date: 4/13/09
Velocity: 6.86 ft/s, 2.09 m/s

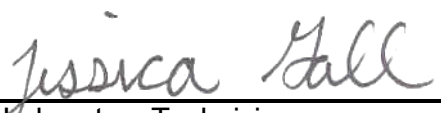


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D09816

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	26	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,262	Pass
Overall Test Results				Pass



Laboratory Technician

4/13/09

Test Date

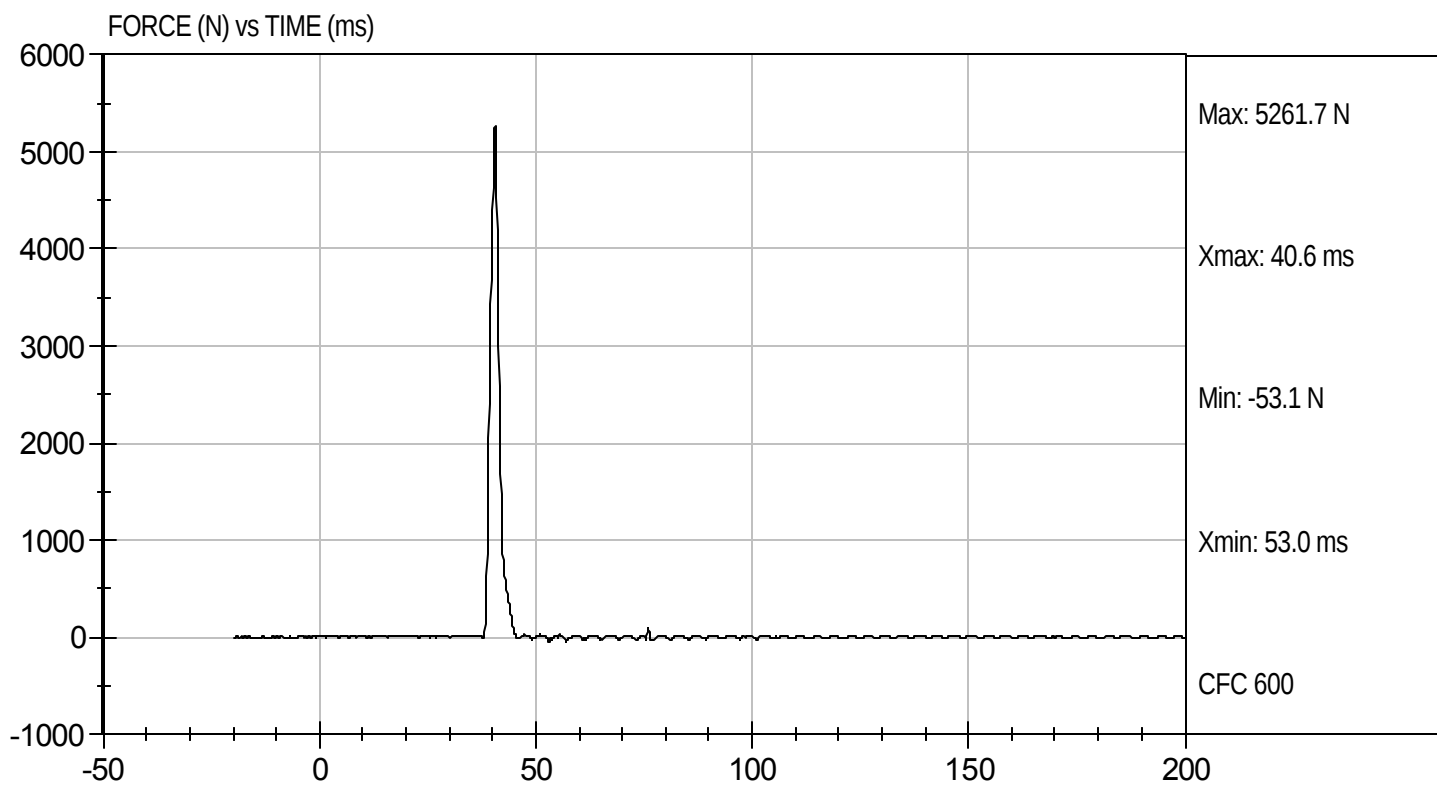


Approved By



Test Desc: Left Knee
Component ID: D09816

Test Date: 4/13/09
Velocity: 6.80 ft/s, 2.07 m/s

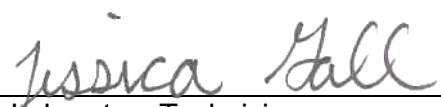


MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D09810

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.5	21.5	Pass
Laboratory Relative Humidity	%	10 to 70	27	27	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	59.5	54.8	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	42	Pass
Overall Test Results					Pass


 Laboratory Technician

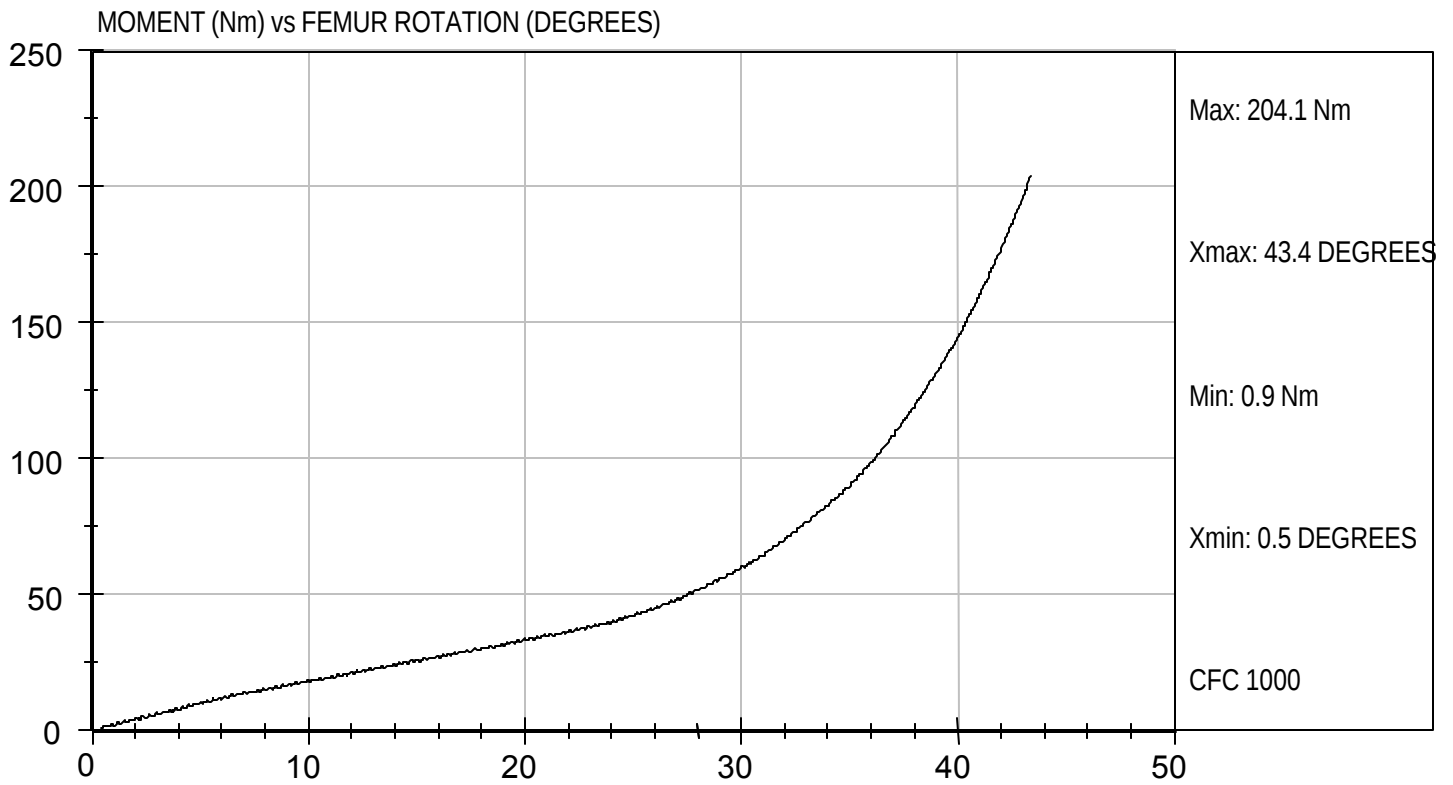
4/13/09
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D09819

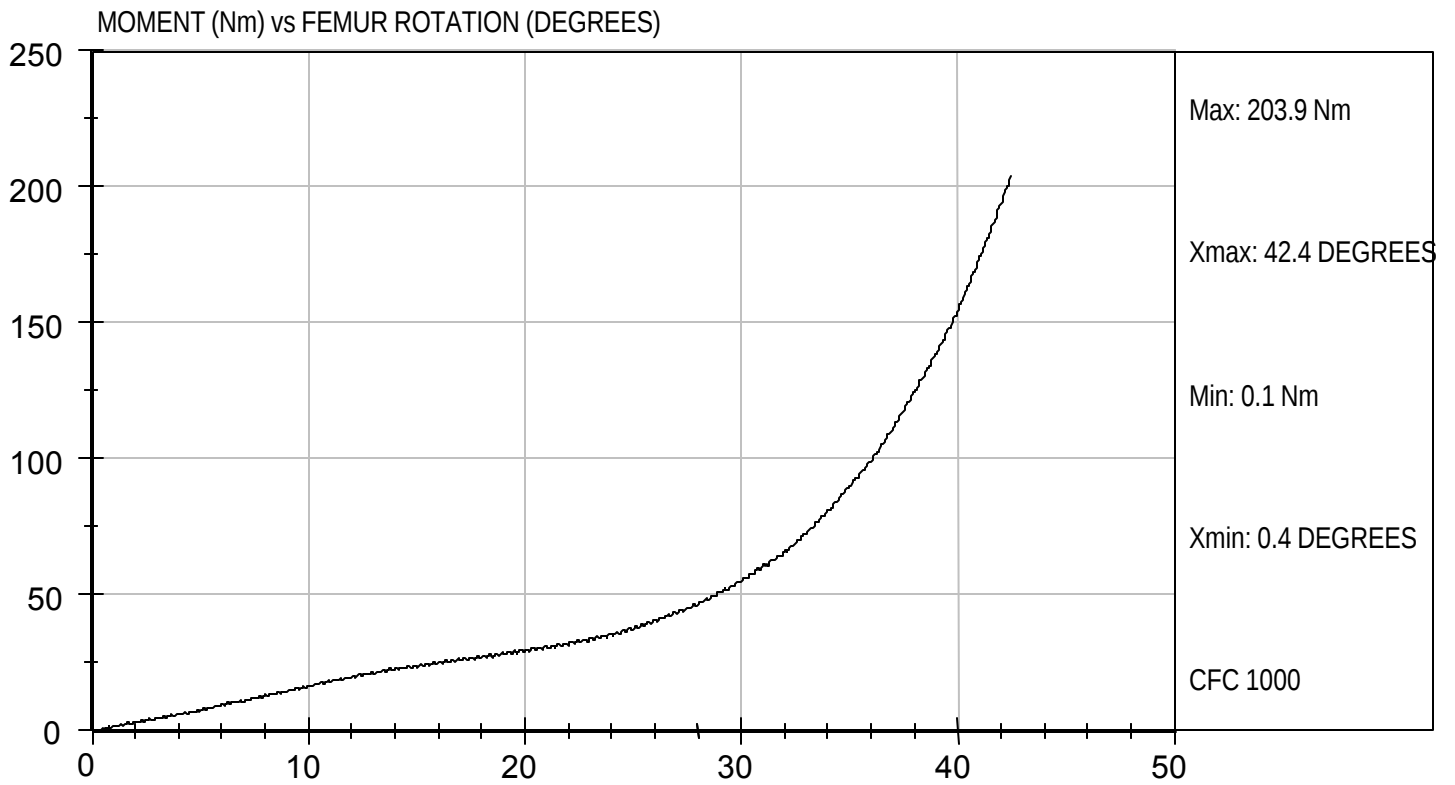
Test Date: 4/13/09
Velocity: 0 ft/s, 0 m/s





Test Desc: Hip Femur Flexion
Component ID: D09810

Test Date: 4/13/09
Velocity: 0 ft/s, 0 m/s

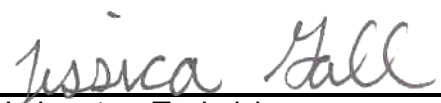


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test ID: D09821

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	24	Pass
Peak Resultant Acceleration	G's	225 - 275	240	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-11.9	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

4/13/09
Test Date

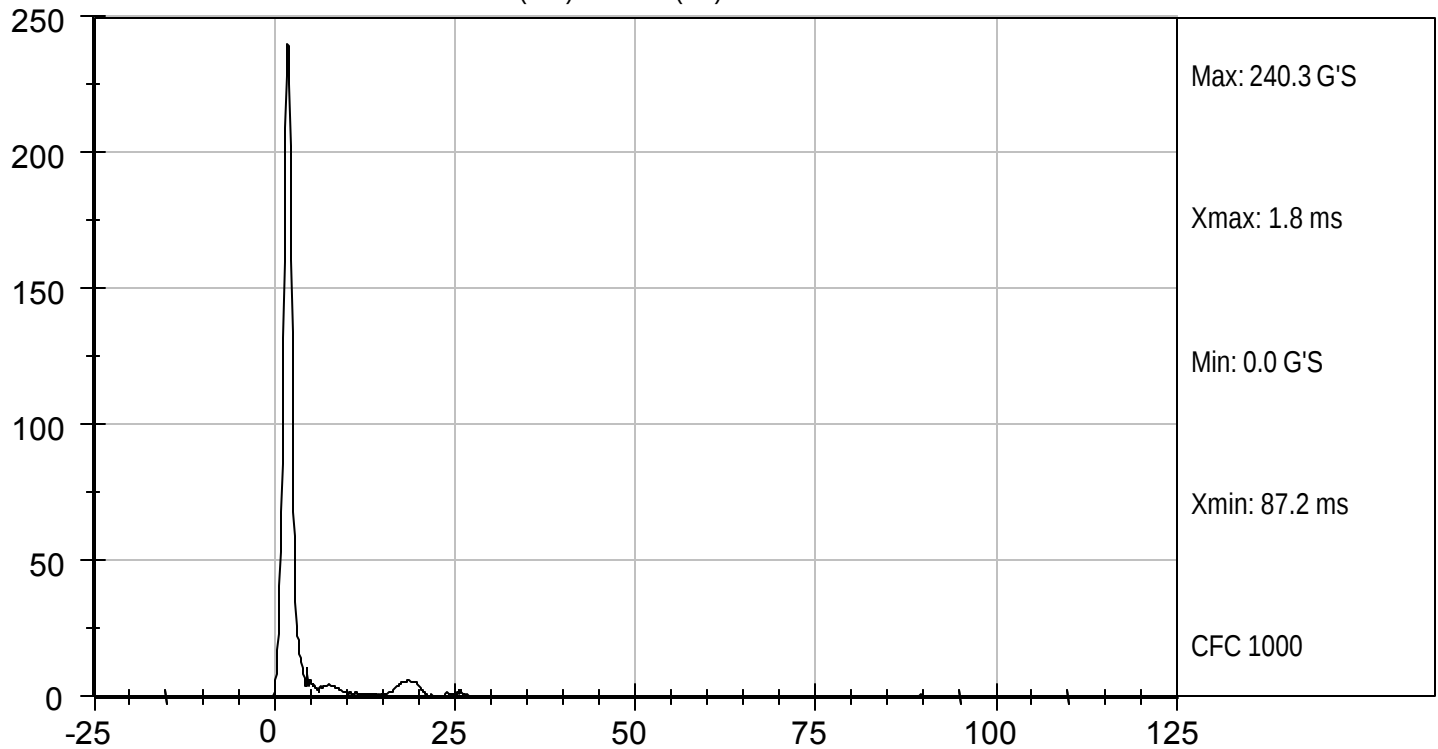

Approved By



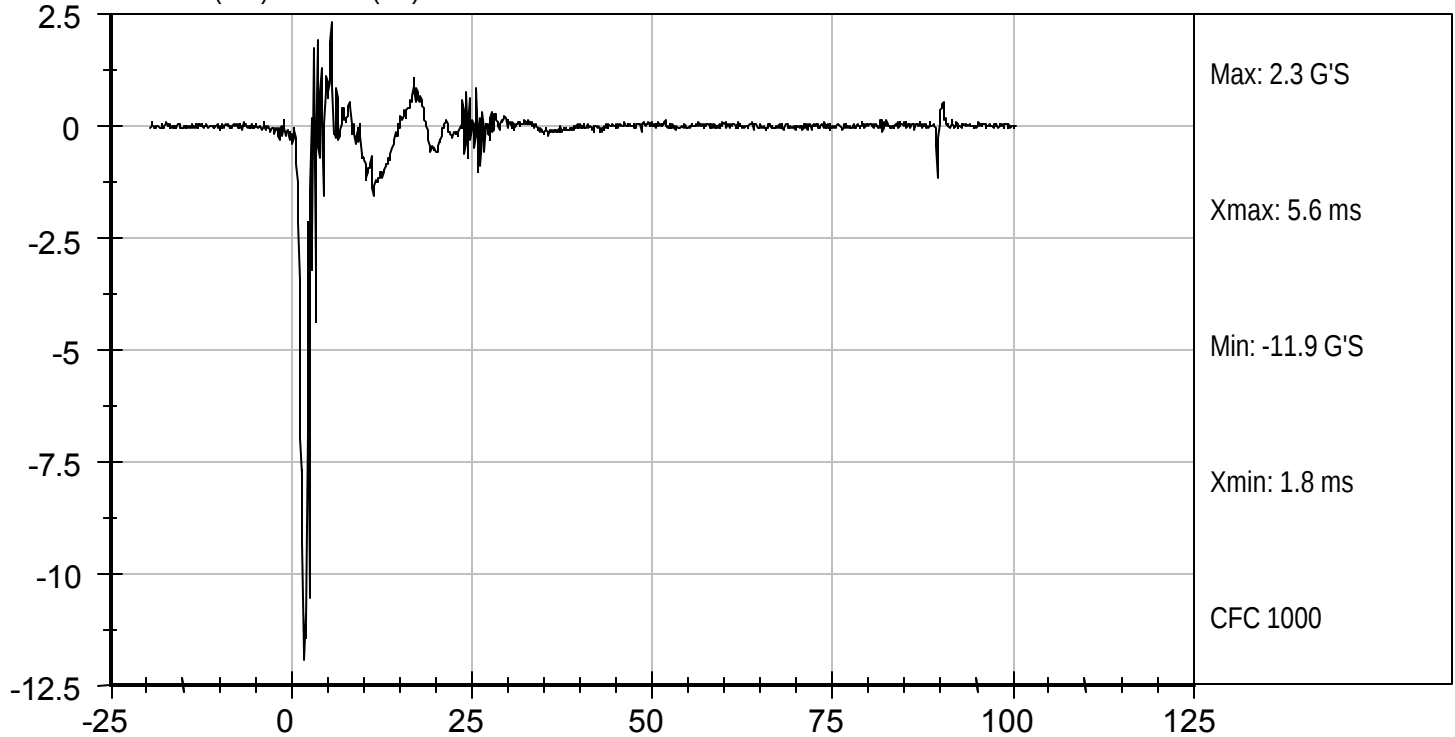
Test Desc: Head Drop
Component ID: D09821

Test Date: 4/13/09
Velocity: 0 ft/s, 0 m/s

RESULTANT HEAD ACCELERATION (G'S) vs TIME (ms)



HEAD Y (G'S) vs TIME (ms)



MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D09822

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.8	Pass
Laboratory Relative Humidity		%	10 to 70	27	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	22.52	Pass
	20 msec	G's	17.60 to 22.60	18.43	Pass
	30 msec	G's	12.50 to 18.50	15.03	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	15.3	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	40.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.9	Pass
	Time	msec	57.0 to 64.0	58.4	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.1	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	98.2	Pass
	Time	msec	47.0 to 58.0	53.1	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	99.9	Pass
Overall Test Results					Pass


 Laboratory Technician

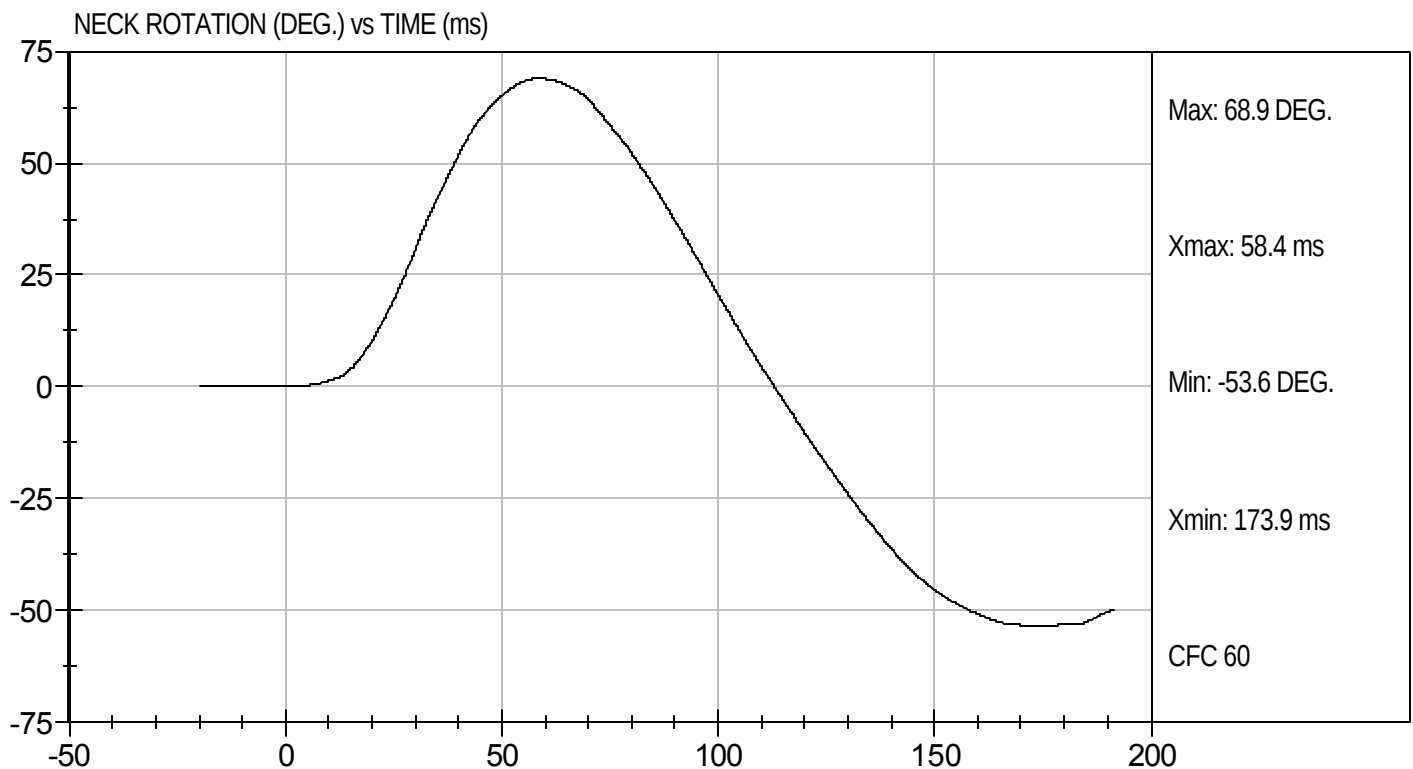
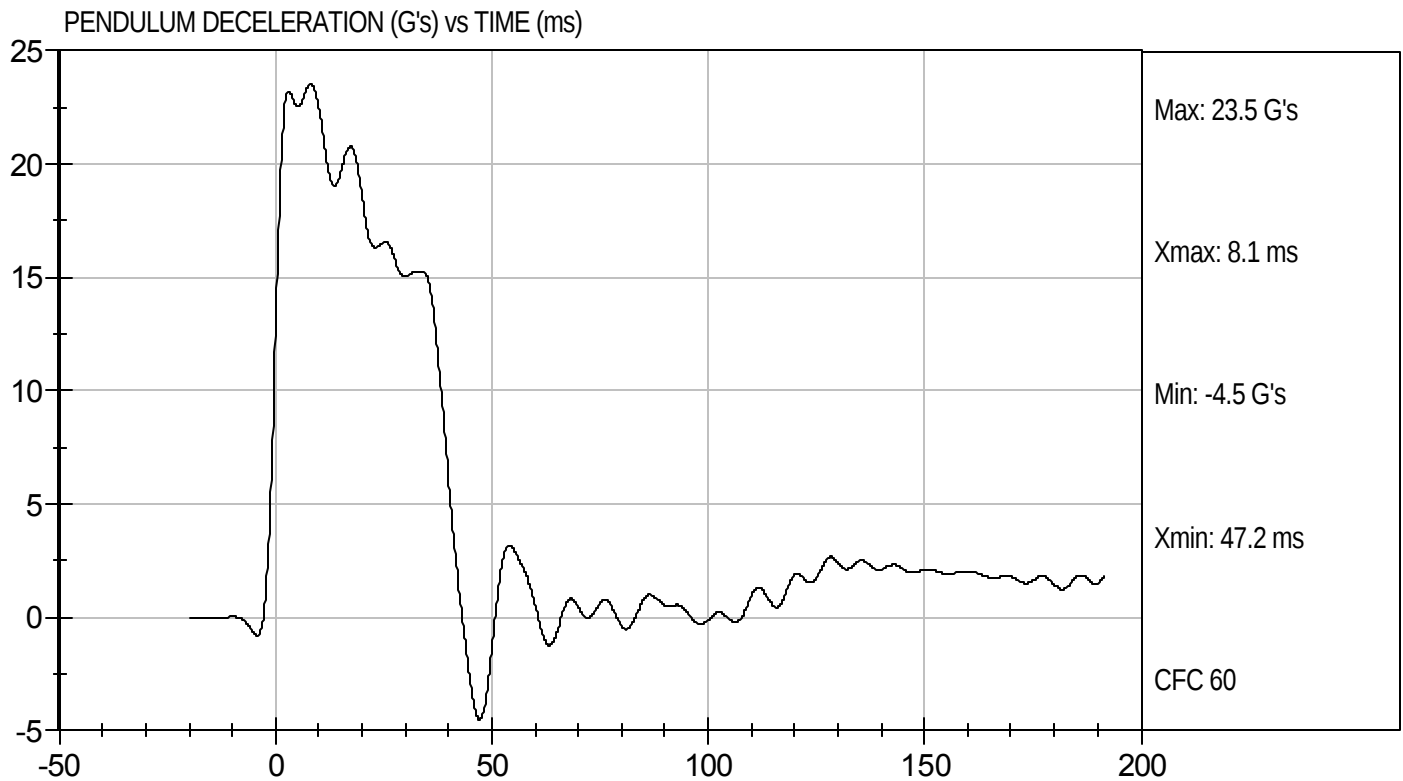
4/14/09
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D09822

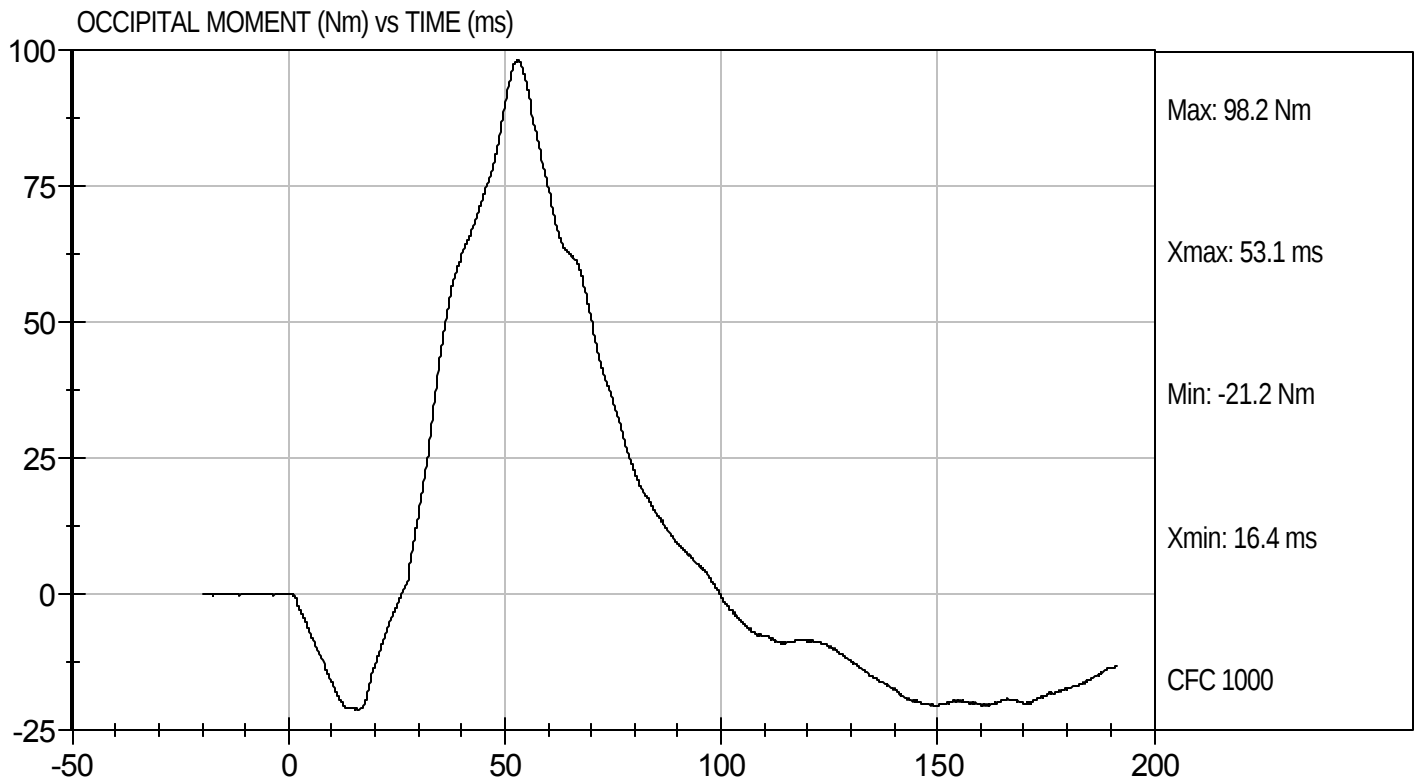
Test Date: 4/14/09
Velocity: 23.1 ft/s, 7.04 m/s





Test Desc: Neck Flexion
Component ID: D09822

Test Date: 4/14/09
Velocity: 23.1 ft/s, 7.04 m/s



MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D09823

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.5	Pass
Laboratory Relative Humidity		%	10 to 70	29	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.04	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	20.13	Pass
	20 msec	G's	14.00 to 19.00	14.97	Pass
	30 msec	G's	11.00 to 16.00	13.89	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	13.85	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	41.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	95.0	Pass
	Time	msec	72.0 to 82.0	76.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	156.1	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-58.9	Pass
	Time	msec	65.0 to 79.0	74.3	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	145.7	Pass
Overall Test Results					Pass


Laboratory Technician

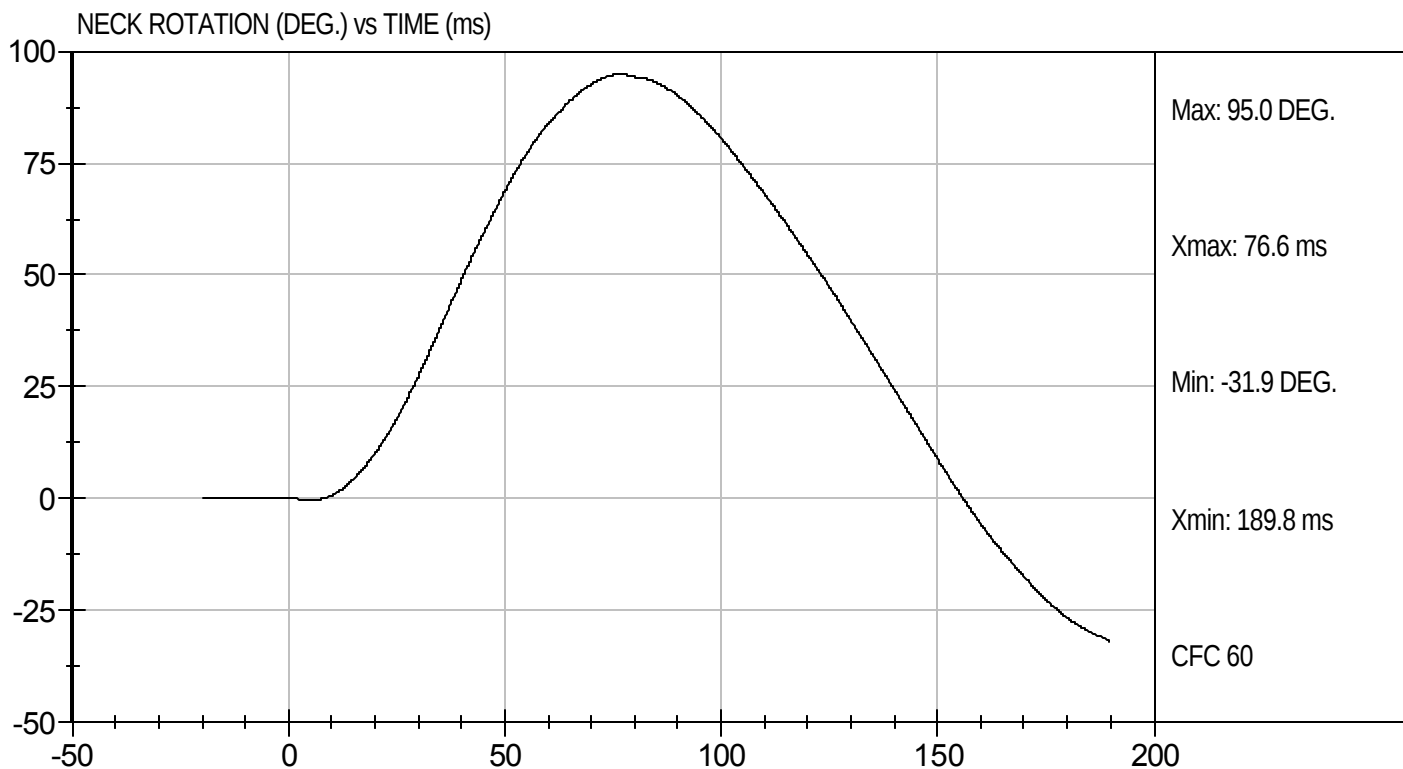
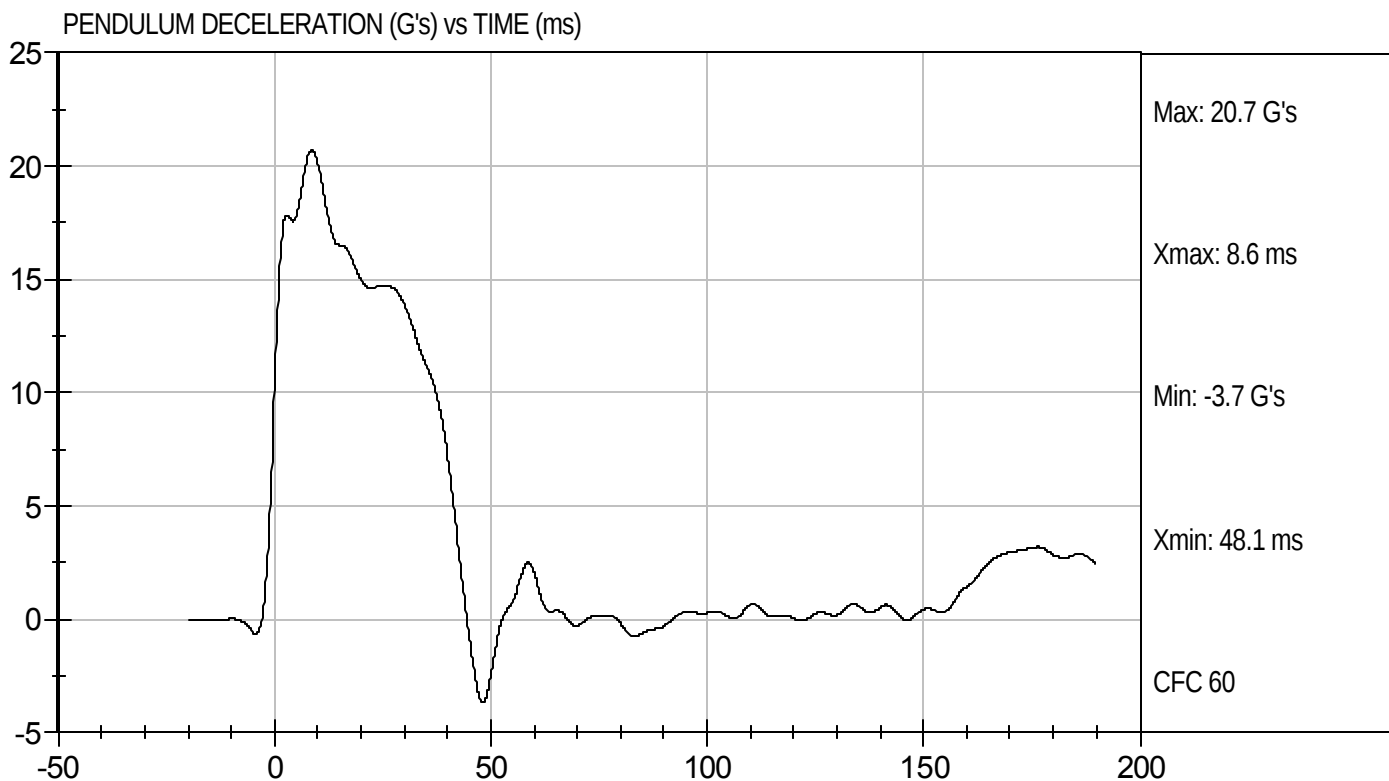
4/14/09
Test Date


Approved By



Test Desc: Neck Extension
Component ID: D09823

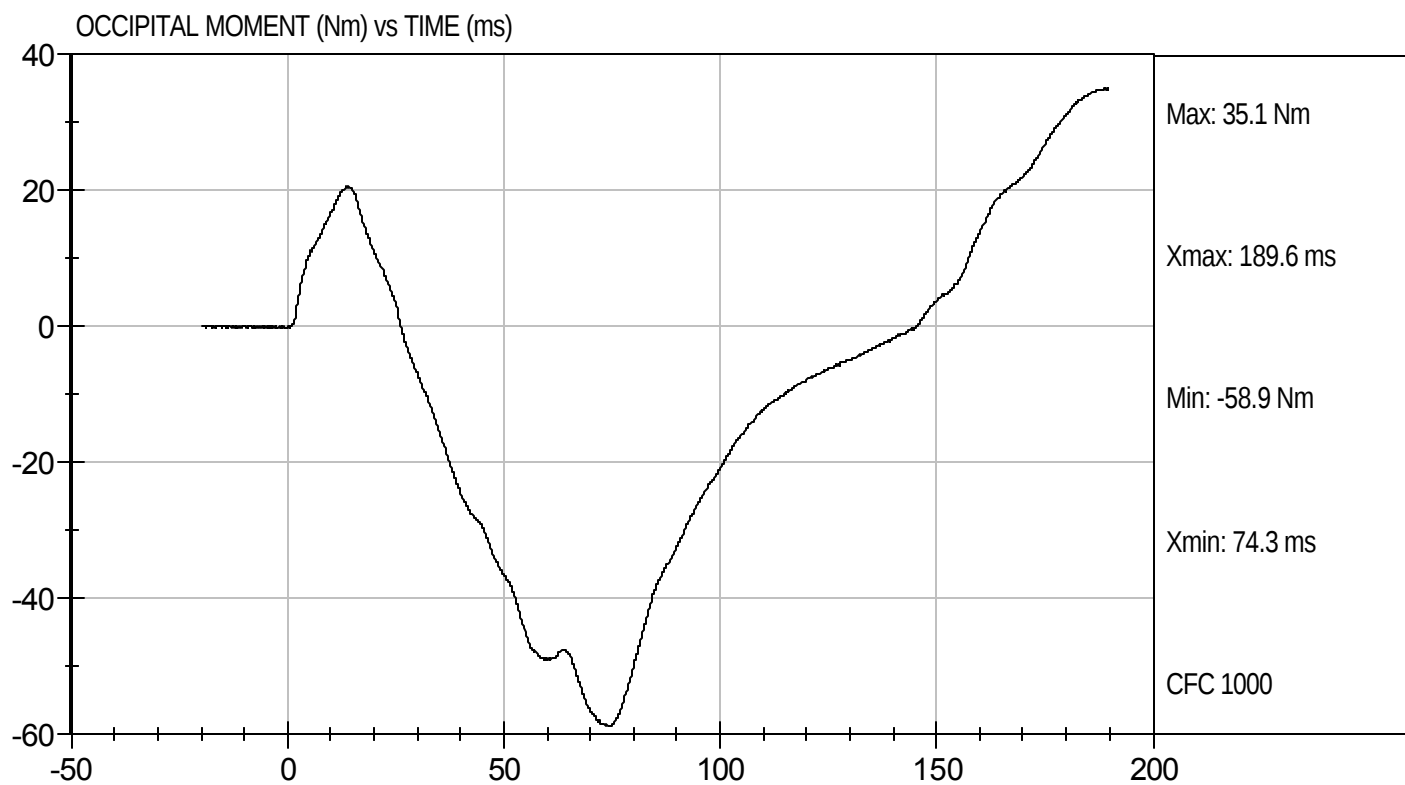
Test Date: 4/14/09
Velocity: 19.8 ft/s, 6.04 m/s





Test Desc: Neck Extension
Component ID: D09823

Test Date: 4/14/09
Velocity: 19.8 ft/s, 6.04 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D09824

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	22	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,409	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.41	Pass
Internal Hysteresis	%	69 to 85	70	Pass
Overall Test Results			Pass	


Laboratory Technician

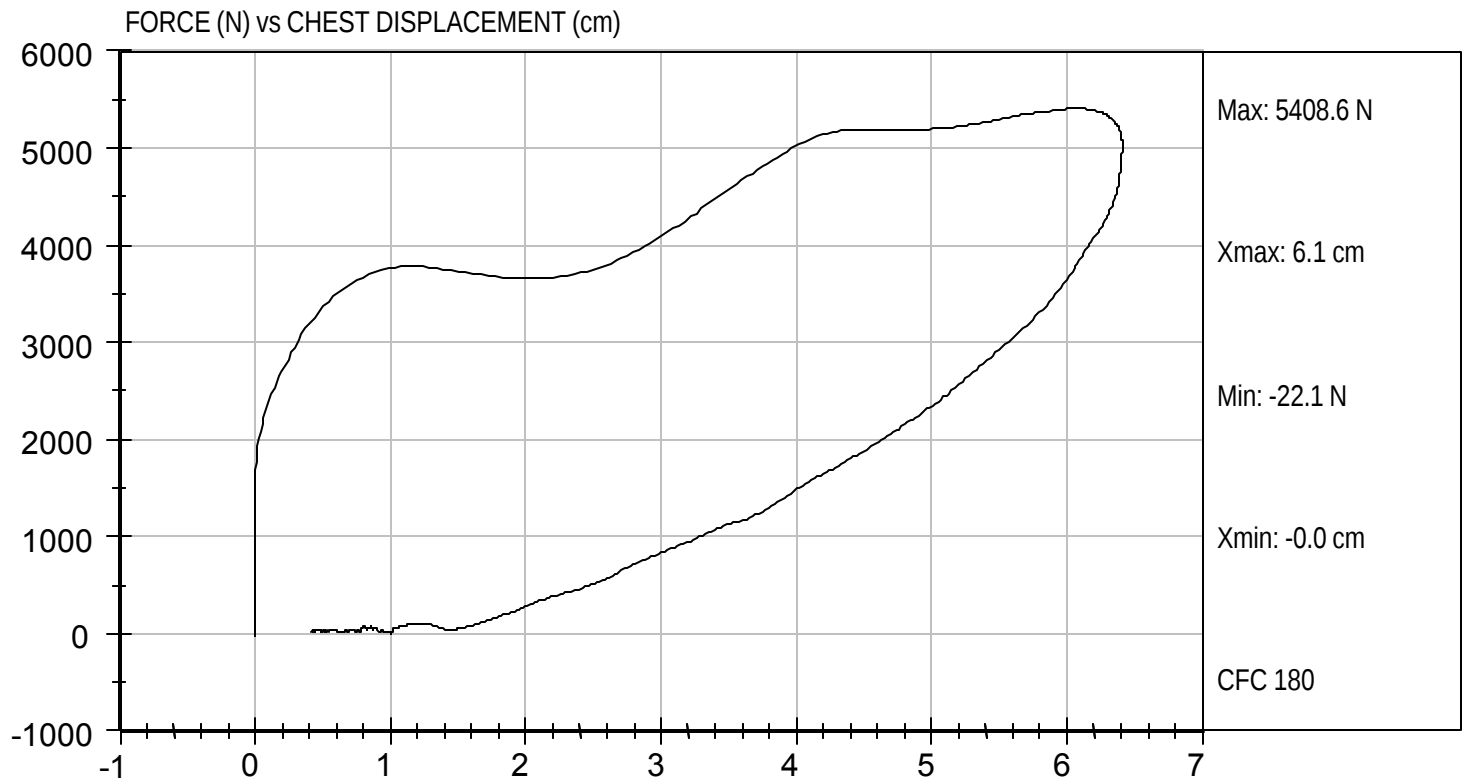
4/14/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D09824

Test Date: 4/14/09
Velocity: 22.2 ft/s, 6.77 m/s

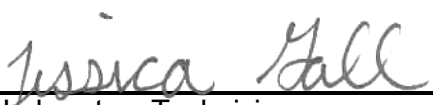


MGA RESEARCH CORPORATION
RIGHT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D09825

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.13	Pass
Peak Probe Force	Newtons	4715 to 5782	5,724	Pass
Overall Test Results				Pass



Laboratory Technician

4/13/09
Test Date

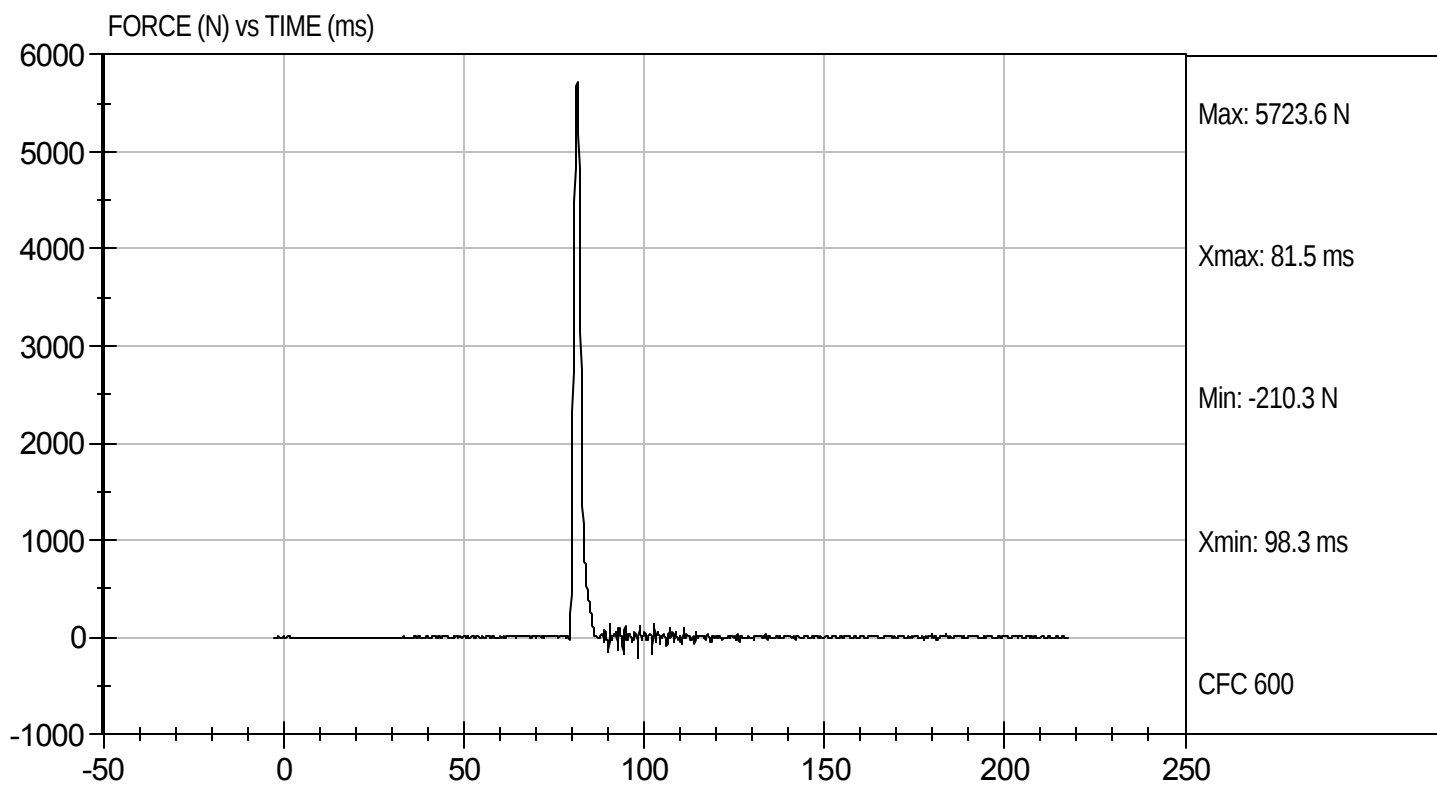


Approved By



Test Desc: Right Knee
Component ID: D09825

Test Date: 4/13/09
Velocity: 7.00 ft/s, 2.13 m/s

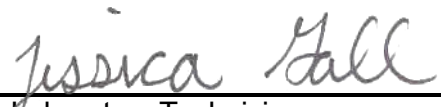


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D09826

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.6	Pass
Laboratory Relative Humidity	%	10 to 70	25	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,962	Pass
Overall Test Results			Pass	



Laboratory Technician

4/13/09
Test Date

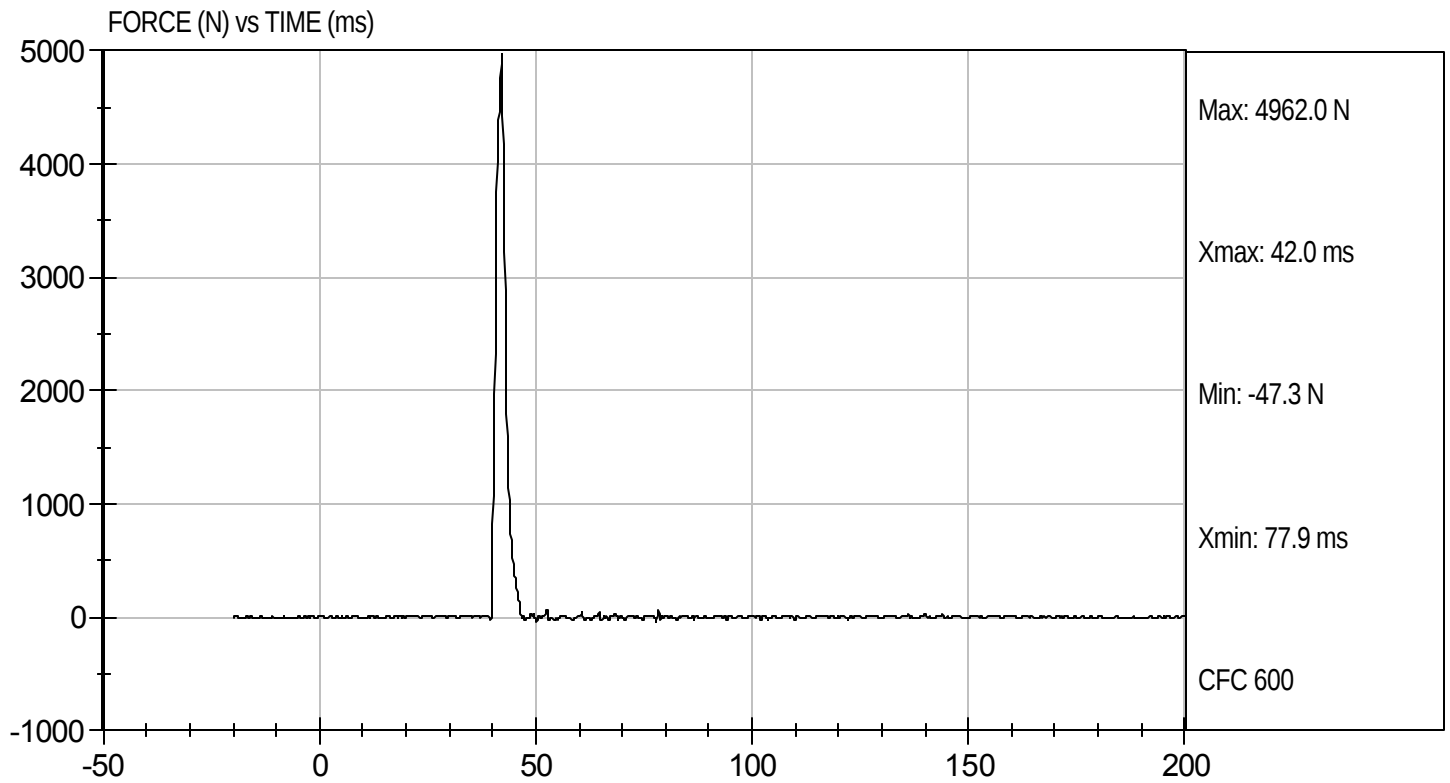


Approved By



Test Desc: Left Knee
Component ID: D09826

Test Date: 4/13/09
Velocity: 6.89 ft/s, 2.10 m/s

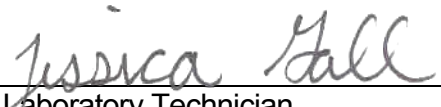


MGA RESEARCH CORPORATION
HIP-FEMUR FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D09820

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.3	21.3	Pass
Laboratory Relative Humidity	%	10 to 70	27	27	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	78.3	86.1	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	41	Pass
Overall Test Results					Pass


 Laboratory Technician

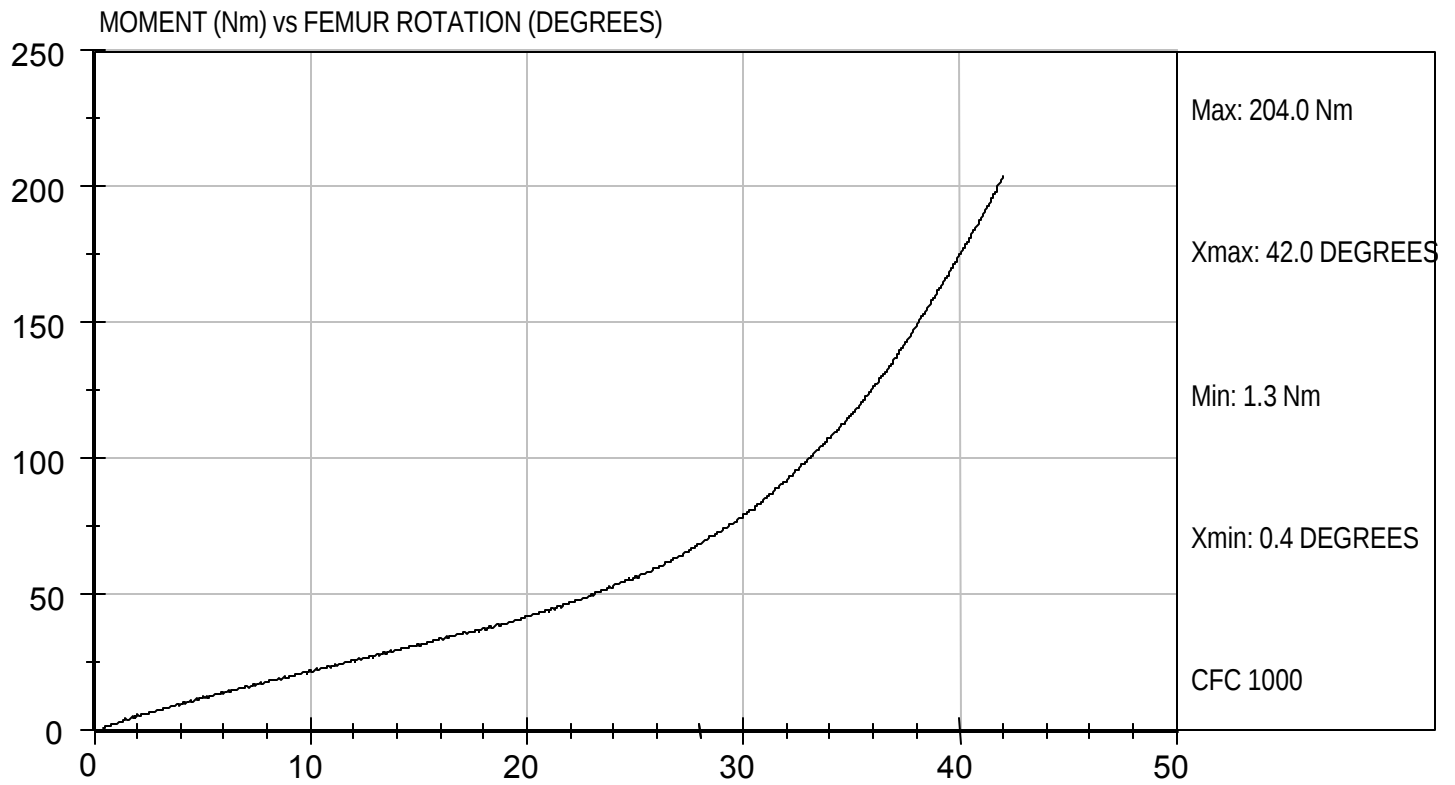
4/13/09
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D09829

Test Date: 4/13/09
Velocity: 0 ft/s, 0 m/s





Test Desc: Hip Femur Flexion
Component ID: D09820

Test Date: 4/13/09
Velocity: 0 ft/s, 0.00 m/s

