

REPORT NUMBER: NCAP-MGA-2008-021

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

**MAZDA MOTOR CORPORATION
2009 MAZDA6 SEDAN SPORT
NHTSA NUMBER: M95400**

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



Test Date: August 27, 2008

Final Report Date: October 10, 2008

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**

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16. Abstract A frontal barrier impact was conducted on a 2009 Mazda6 Sedan Sport at MGA Research Corporation on August 27, 2008. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and foot well intrusion performance. The impact velocity was 56.5 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 571 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 border="1" style="width: 100%; margin-top: 10px; border-collapse: collapse;"> <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 (HIC)</td> <td>N/A</td> <td>1000</td> <td>359</td> <td>455</td> </tr> <tr> <td>Max. Thorax Accel. (3ms Clip)</td> <td>G's</td> <td>60</td> <td>37</td> <td>40</td> </tr> <tr> <td>Left Femur Force</td> <td>Newton</td> <td>10009</td> <td>-2194</td> <td>-3572</td> </tr> <tr> <td>Right Femur Force</td> <td>Newton</td> <td>10009</td> <td>-3389</td> <td>-3523</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)	N/A	1000	359	455	Max. Thorax Accel. (3ms Clip)	G's	60	37	40	Left Femur Force	Newton	10009	-2194	-3572	Right Femur Force	Newton	10009	-3389	-3523
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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 2009 Mazda6 Sedan Sport at a velocity of 56.5 kph. The test was performed at MGA Research Corporation on August 27, 2008. 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 102 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 571 mm and both the driver and passenger side doors 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	359	60.4	96.4	37	60.4	63.4	-24	-2194	-3389
Passenger	455	64.4	100.4	40	79.6	82.6	-24	-3572	-3523

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 Pelvis X after 80 msec.

Passenger Pelvis Y after 80 msec.

Passenger Pelvis Z after 80 msec.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2009 Mazda6 Sedan Sport
Test Program: 35mph Frontal Impact

NHTSA No.: M95400
Test Date: 8/27/2008

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were unlocked	Doors were 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	Door remained closed and latched; Door opened without tools	Door remained closed and latched; Door opened without tools
Seat Track Shift (mm)	0	0
Seat Back Failure	None	None
Glazing Damage	Windshield cracked	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	490
Center	mm	450
Right Side	mm	498
Average	mm	479

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	920	930
Lap belt length as measured on ATD	mm	830	710
Remainder of belt on reel	mm	1500	1610
Total belt length for continuous webbing systems	mm	3250	3250

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

TEST VEHICLE INFORMATION

Manufacturer	Mazda
Model	6
Body Style	Sedan Sport
NHTSA No.	M95400
VIN	1YVHP81A095M01997
Color	Sangria Red
Delivery Date	8/7/08
Odometer Reading (mile)	15
Dealer	Morries Mazda
Transmission	Automatic
Final Drive	Front
Number of Cylinders	4
Engine Displacement (L)	2.5
Engine Placement	Lateral
Automatic Door Lock (ADL)	No
Owners Manual Details Instructions on Disabling ADLs	N/A
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Rear Passenger Side Curtain Airbag	Yes
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	Auto Alliance International, Inc. for Mazda Motor Corporation
Date of Manufacture	06/08

GVWR (kg)	1996
GAWR Front (kg)	1066
GAWR Rear (kg)	934

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				385
Cargo Wt. (RCLW) (kg)				45

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

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	454.1	299.4		497.6	357.9	
Right	kg	449.5	298.0		485.8	353.3	
Ratio	%	60.2	39.8		58.0	42.0	
Totals	kg	903.6	597.4	1501.0	983.4	711.2	1694.6

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1501.0
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	45
Calculated Vehicle Target Weight (TVTW)	kg	1702.0

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	727	723	735	732	1109
As Tested	mm	703	704	707	706	1170
Post Test	mm	772	769	723	691	

Vehicle Wheelbase (mm): 2787
 Weight of Ballast secured in cargo area (kg): 0

Vehicle Components Removed: Trunk carpet, right rear taillight, rear floor mats

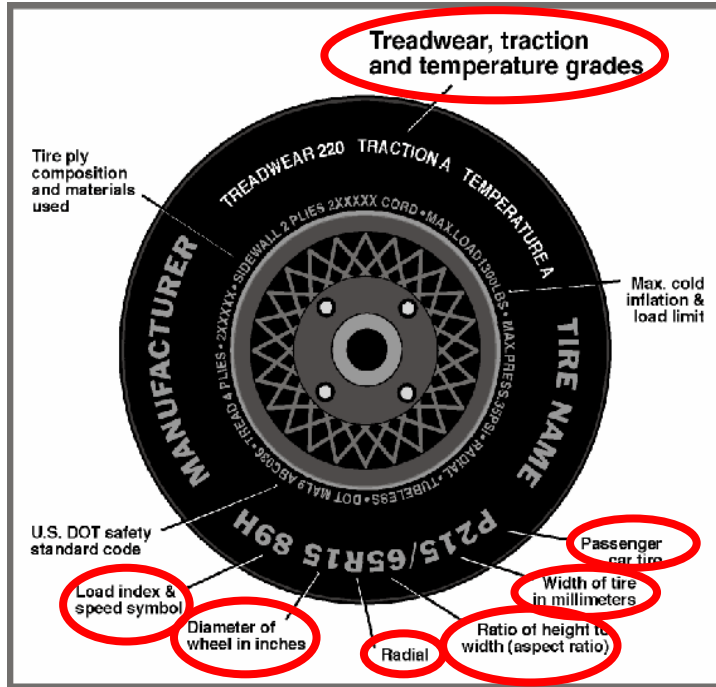
Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008



DATA FROM TIRE AND TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	220	220
Recommended Tire Size	P205/65R16	P205/65R16
Tire Size on Vehicle	P205/65R16	P205/65R16
Tire Manufacturer	Michelin	Michelin
Tire Name	Energy MXV4	Energy MXV4
Tire Type	Passenger	Passenger
Tire Width (mm)	205	205
Ratio of Height to Width (aspect ratio)	65	65
Radial	R	R
Wheel Diameter	16	16
Load Index & Speed Symbol	94H	94H
Treadwear	440	440
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 4 **TEST VEHICLE INFORMATION**

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

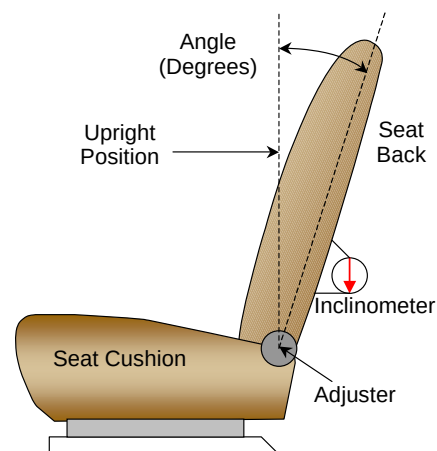
NHTSA No.: M95400
 Test Date: 8/27/2008

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: Set at 9th detent out of 22 detents total with the forward-most detent defined as 0).

Driver seat back angle: 9th detent (1st as 0)

Passenger seat back angle: 9th detent (1st as 0)



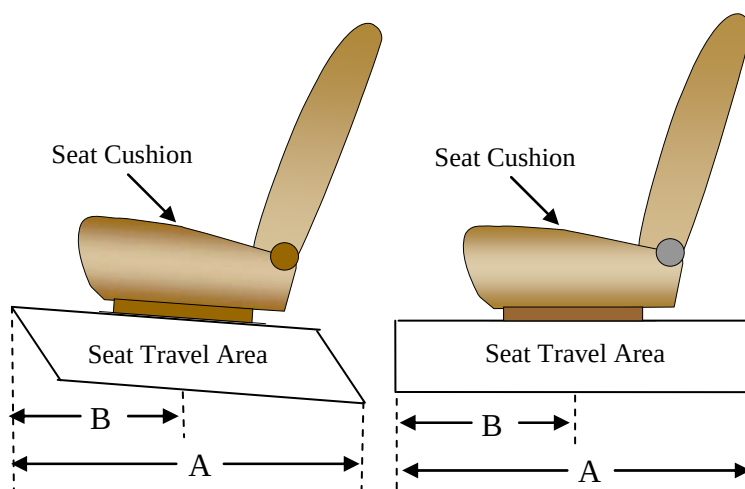
FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	24 detents	11 th detent (1 st forward-most as 0)
Passenger Seat	24 detents	12 th detent (1 st forward-most as 0)

ADJUSTABLE D-RING POSITION

The driver and passenger D-rings were set in position 1 with the uppermost as 0.



DATA SHEET NO. 4...(CONTINUED)

TEST VEHICLE INFORMATION

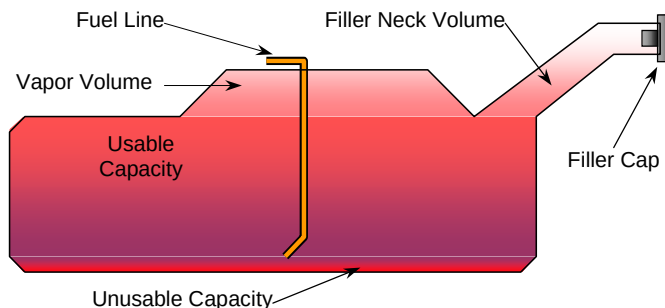
Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	70.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	64.4 to 65.8
Actual Amount of Solvent used	65.1
1/3 of Usable Capacity	23.3

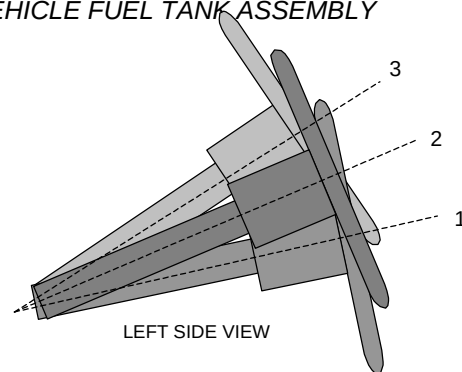
The test vehicle is equipped with an electric fuel pump. The fuel pump operates when starter or engine is activated.



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

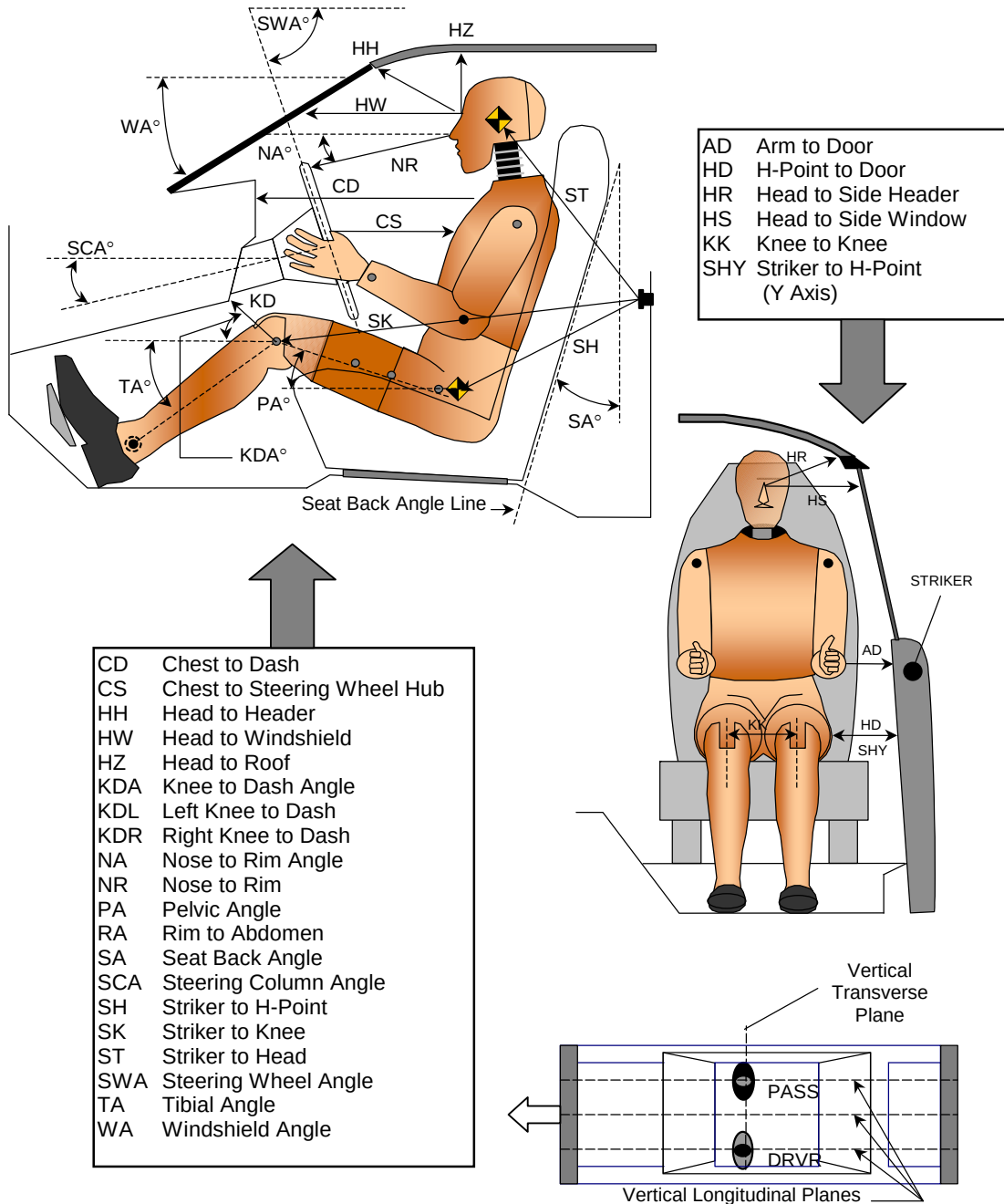
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		21.0
Geometric center position No. 2		23.4
Uppermost position No. 3		26.5

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

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

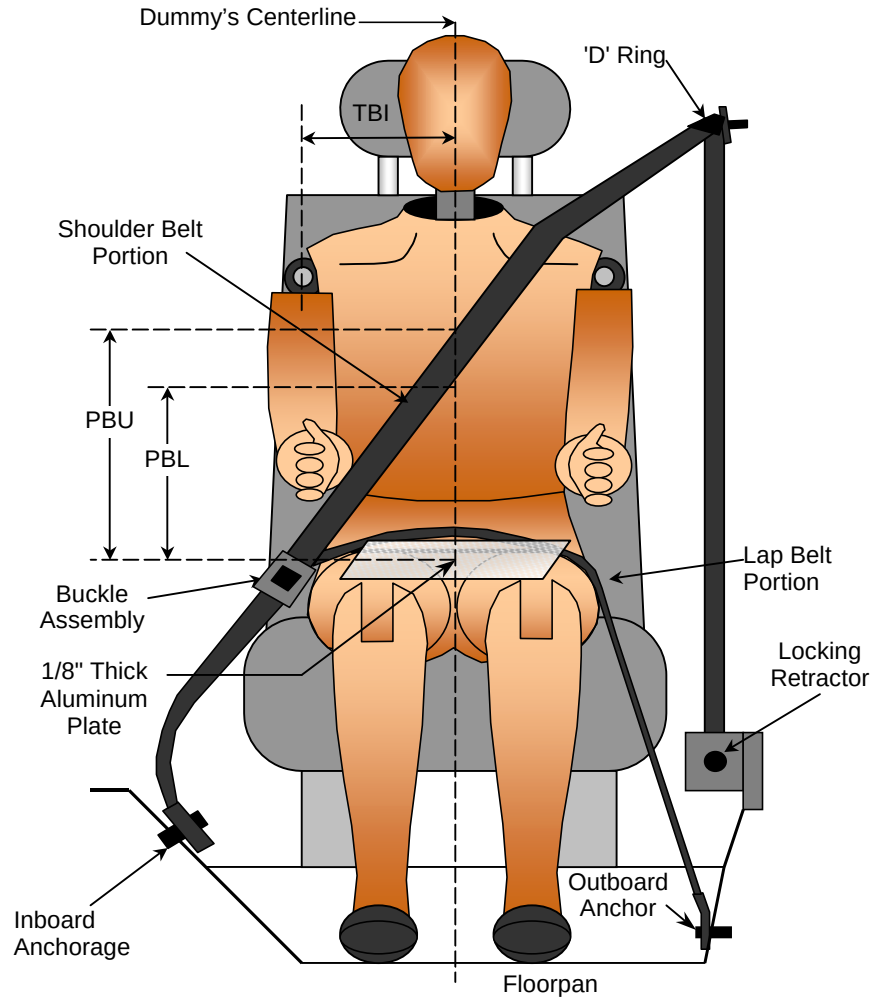
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		20.9		
SWA	Steering Wheel Angle		66.3		
SCA	Steering Column Angle		23.4		
SA	Seat Back Angle (headrest post)		10.3		10.6
HZ	Head to Roof (Z)	174	90	150	90
HH	Head to Header	288	30.8	311	24.3
HW	Head to Windshield	603	0	564	0
HR	Head to Side Header (Y)	200		183	
NR	Nose to Rim	382	7.6		
CD	Chest to Dash	492		540	
CS	Chest to Steering Hub	282	1.0		
RA	Rim to Abdomen	176	0		
KDL	Left Knee to Dash	144	25.2	123	
KDR	Right Knee to Dash	103		142	27.4
PA	Pelvic Angle		23.9		23.8
TA	Tibia Angle		44.4		41.6
KK	Knee to Knee (Y)	310		271	
SK	Striker to Knee	653	97.5	647	96.3
ST	Striker to Head	473	19.3	477	17.8
SH	Striker to H-Point	322	123.8	314	121.4
SHY	Striker to H-Point (Y)	299		298	
HS	Head to Side Window	327		314	
HD	H-Point to Door (Y)	161		146	
AD	Arm to Door (Y)	113		141	
AA	Ankle to Ankle	300		211	

DATA SHEET NO. 6
SEAT BELT POSITIONING DATA

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008



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

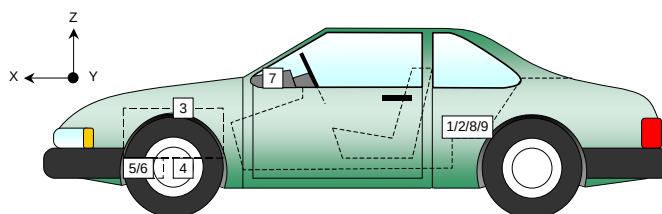
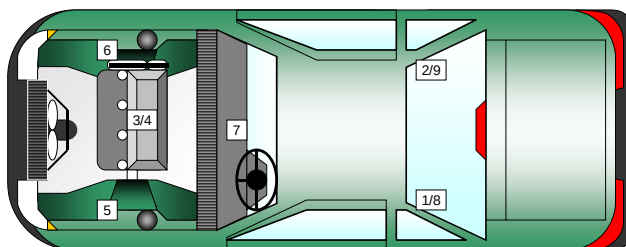
Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1912	-385	352
2	Right Rear X-Member X	1912	317	352
3	Engine Top X	4025	0	845
4	Engine Bottom X	4089	12	218
5	Left Brake Caliper X	4047	-729	255
6	Right Brake Caliper X	4047	729	255
7	Instrument Panel X			
8	Left Rear X-Member Z	1912	-385	352
9	Right Rear X-Member Z	1912	317	352

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: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

Windshield Mounting Details:

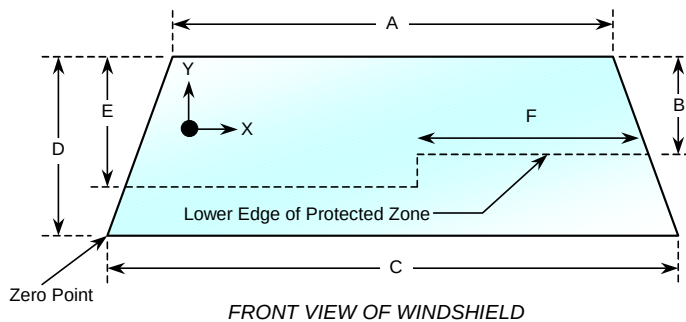
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2154	2154	100
Right Side	2154	2154	100
Total	4308	4308	100



Item	Units	Value
A	mm	1148
B	mm	494
C	mm	1400
D	mm	880
E	mm	564
F	mm	508

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: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

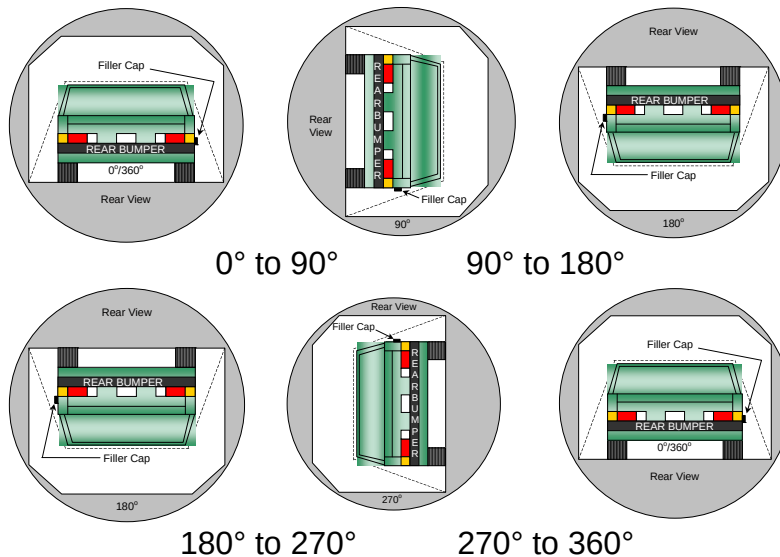
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 10:35 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°	126	300	0
90° to 180°	115	300	0
180° to 270°	110	300	0
270° to 360°	117	300	0

DATA SHEET NO. 10
VEHICLE MEASUREMENTS

Test Vehicle: 2009 Mazda6 Sedan Sport
Test Program: 35mph Frontal Impact

NHTSA No.: M95400
Test Date: 8/27/2008

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4870	4299	571
2	RSOV to front of engine	mm	4377	4084	293
3	RSOV to firewall centerline	mm	3754	3720	34
4	RSOV to leading edge of right door	mm	3394	3395	-1
5	RSOV to leading edge of left door	mm	3397	3410	-13
6	RSOV to lower leading edge of right door	mm	3400	3380	20
7	RSOV to lower leading edge of left door	mm	3393	3384	9
8	RSOV to upper leading edge of right door	mm	2212	2220	-8
9	RSOV to upper leading edge of left door	mm	2212	2235	-23
10	RSOV to lower trailing edge of right door	mm	2274	2260	14
11	RSOV to lower trailing edge of left door	mm	2272	2263	9
12	RSOV to bottom of right 'A' pillar	mm	3359	3341	18
13	RSOV to bottom of left 'A' pillar	mm	3357	3336	21
14	RSOV to firewall on right side	mm	3733	3697	36
15	RSOV to firewall on left side	mm	3764	3726	38
16	RSOV to steering column	mm	2899	2924	-25
17	Center of steering column to left 'A' pillar	mm	369	330	39
18	Center of steering column to headlining	mm	441	410	31
19	RSOV to right side of front bumper	mm	4660	4201	459
20	RSOV to left side of front bumper	mm	4663	4215	448
21	Length of engine block	mm	450	450	0
RD	RSOV to right side of dash panel	mm	3171	3170	1
CD	RSOV to center of dash panel	mm	3142	3133	9
LD	RSOV to left side of dash panel	mm	3173	3150	23

DATA SHEET NO. 10... (continued)

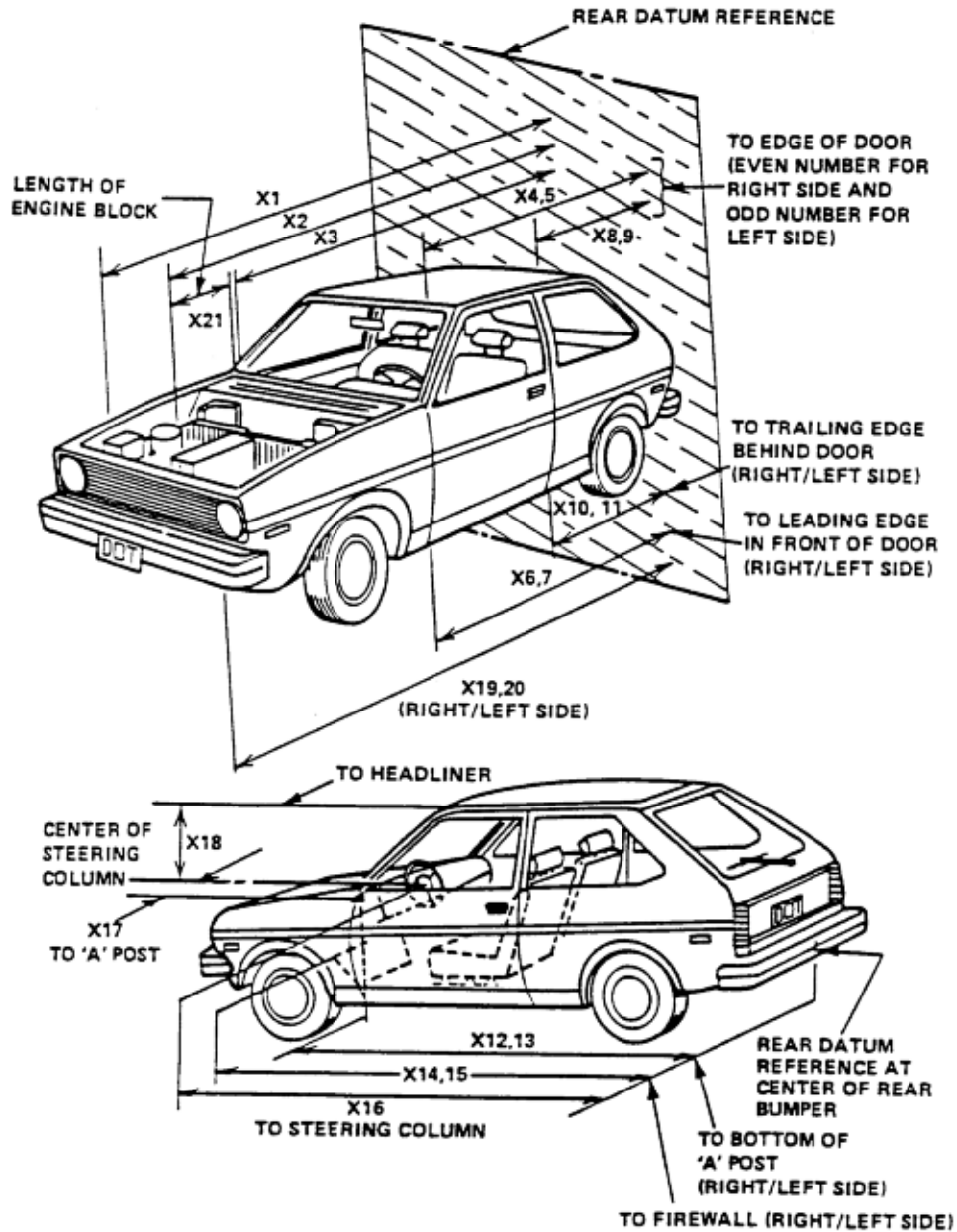
VEHICLE MEASUREMENTS

Test Vehicle: 2009 Mazda6 Sedan Sport

NHTSA No.: M95400

Test Program: 35mph Frontal Impact

Test Date: 8/27/2008



DATA SHEET NO. 10... (continued)**VEHICLE MEASUREMENTS**Test Vehicle: 2009 Mazda6 Sedan SportTest Program: 35mph Frontal ImpactNHTSA No.: M95400Test Date: 8/27/2008**Target Vehicle Structural Measurement**

	Elements	Pre-Test (mm)
1	Total Length	4870
2	Total Width	1840
3	Bumper Top Height	510
4	Bumper Bottom Height	426
5	Longitudinal Member Top Height	566
6	Distance between Longitudinal Members	1085
7	Longitudinal Member Width	82
8	Engine Top Height	842
9	Engine Bottom Height	213
10	Engine and gearbox width	857
11	Front bumper-engine distance	479
12	Front shock absorber fixing height	897
13	Bonnet leading edge height	752
14	Front shock absorber fixing width	990
15	Front bumper – front axle distance	992
16	Front axle – a pillar distance	431
17	A-pillar – B-pillar distance	1189
18	B-Pillar – rear axle distance	1170
19	B-pillar – C-pillar distance	998
20	Roof sill bottom height	1396
21	Roof sill top height	1438
22	Floor sill bottom height	217
23	Floor sill top height	306

DATA SHEET NO. 11
CAMERA LOCATIONS

Test Vehicle: 2009 Mazda6 Sedan Sport
Test Program: 35mph Frontal Impact

NHTSA No.: M95400
Test Date: 8/27/2008

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1120	-5000	1100	24	1000
3	Steering Column Top	705	-5320	1265	25	1000
4	Steering Column Bottom	705	-5320	870	25	1000
5	Driver Close-up	1395	-5740	1470	35	1000
6	Driver Angle	5610	-5370	2120	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	2020	6320	1258	24	1000
10	Right Passenger Half	1270	5125	1140	24	1000
11	Right Close-up	1505	5680	1480	35	1000
12	Right Angle	5840	4850	2060	50	1000
13	Windshield	-285	0	2860	12.5	1000
14	Top Driver	-135	-470	2180	24	1000
15	Top Passenger	-110	420	2180	24	1000
16	Pit Front	1100	0	-3150	24	1000
17	Pit Rear	3400	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.

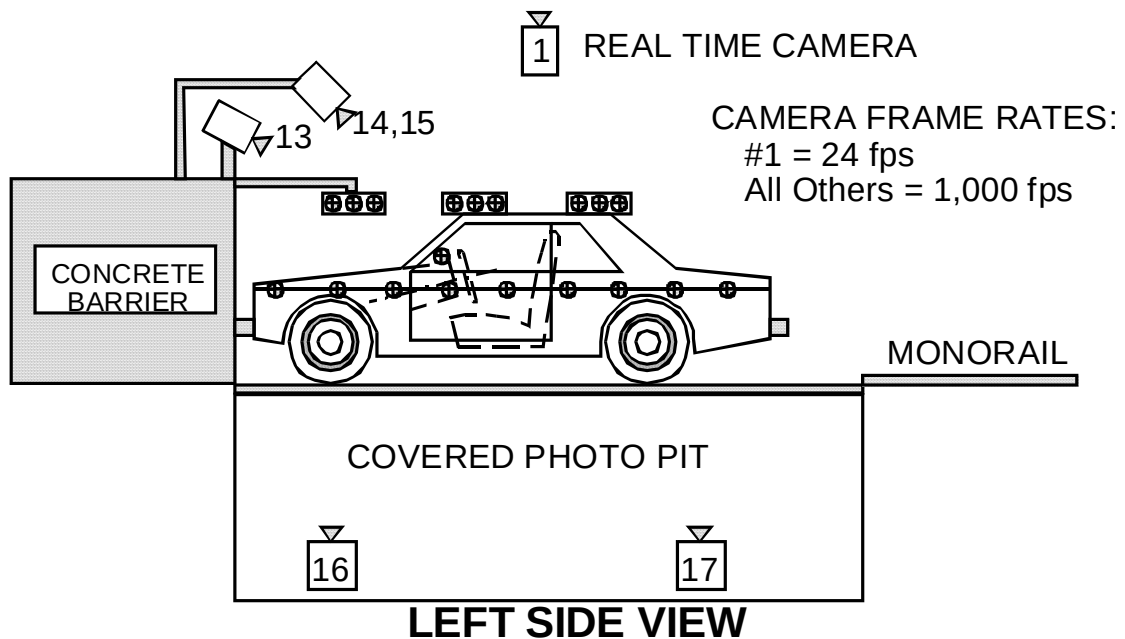
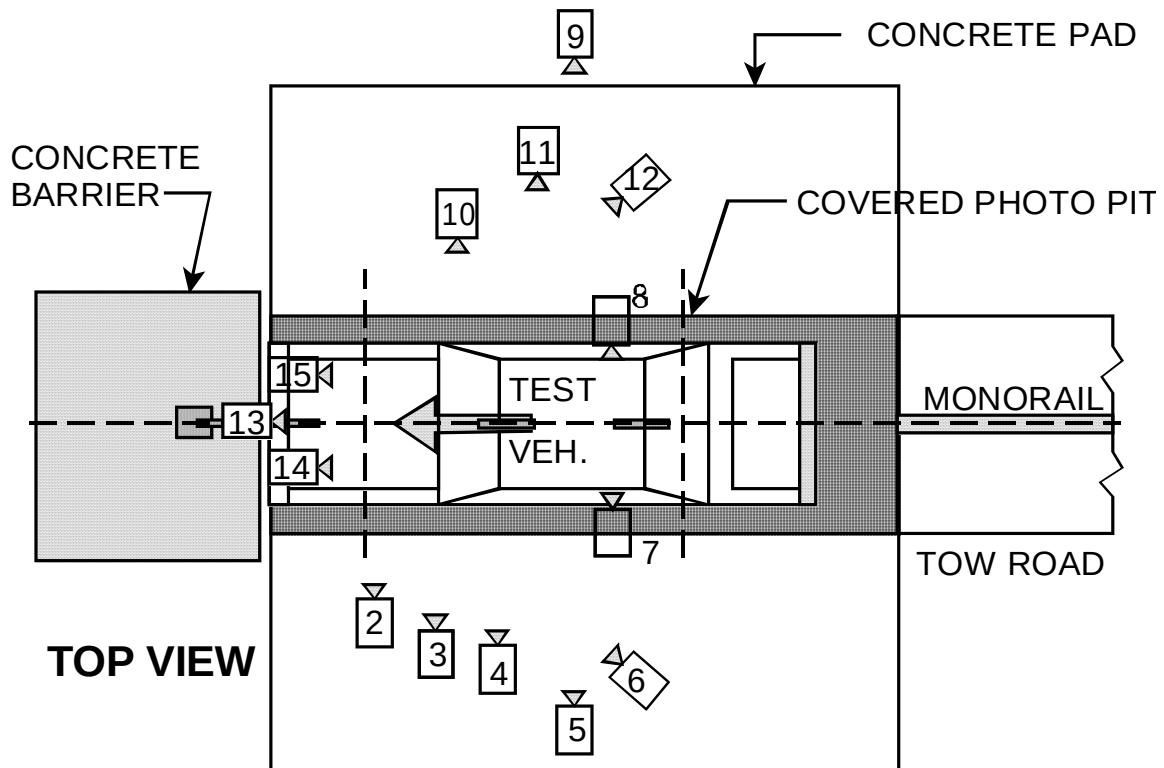
DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle: 2009 Mazda6 Sedan Sport
Test Program: 35mph Frontal Impact

NHTSA No.: M95400
Test Date: 8/27/2008

CAMERA POSITIONS FOR FRONTAL IMPACTS

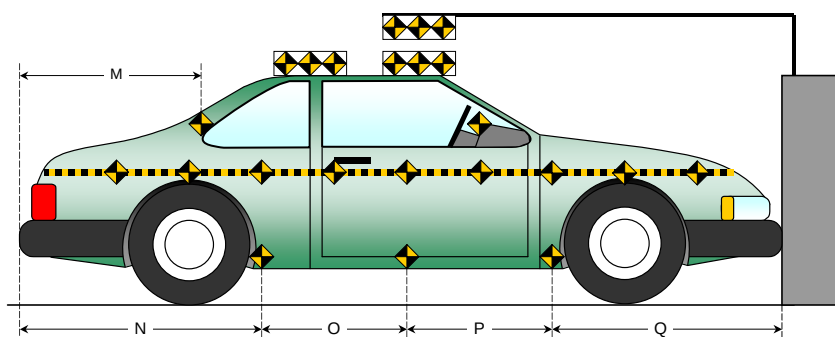
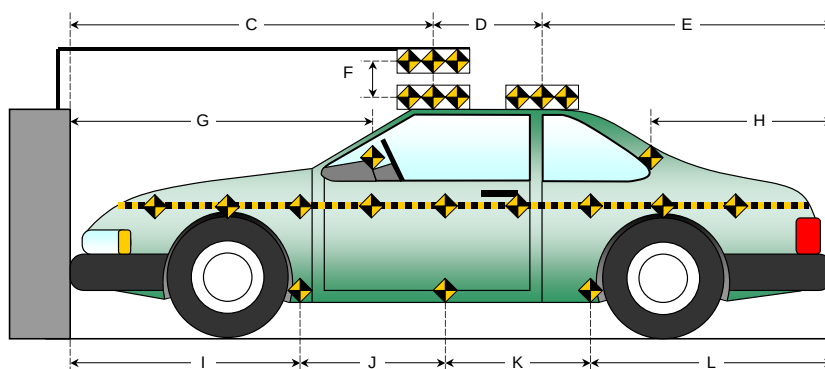
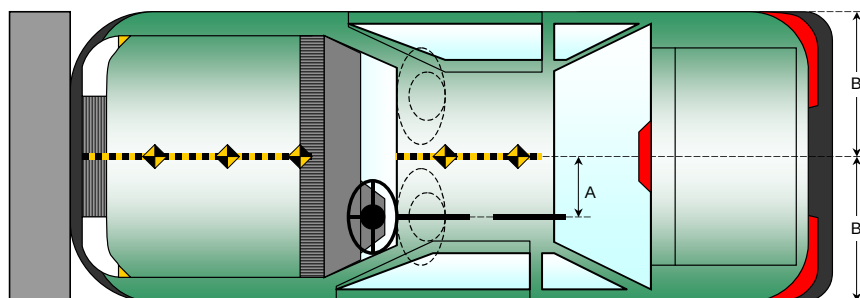


DATA SHEET NO. 12
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

Item	Value
A	371
B	920
C	2349
D	793
E	1728
F	48
G	
H	972
I	1424
J	963
K	961
L	1522
M	979
N	1516
O	965
P	964
Q	1425



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

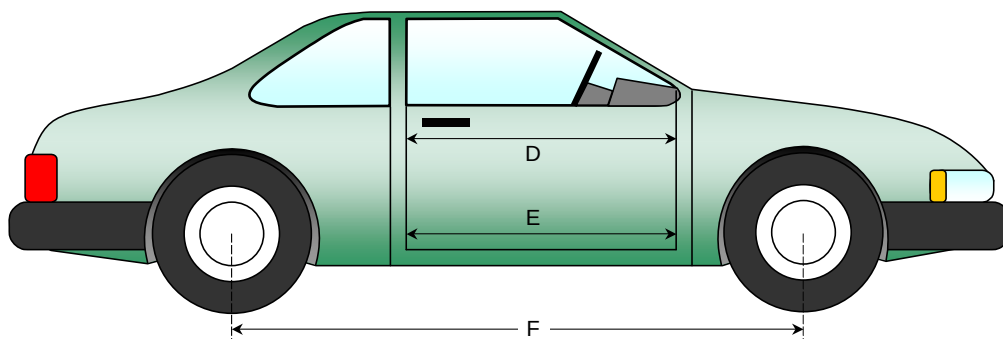
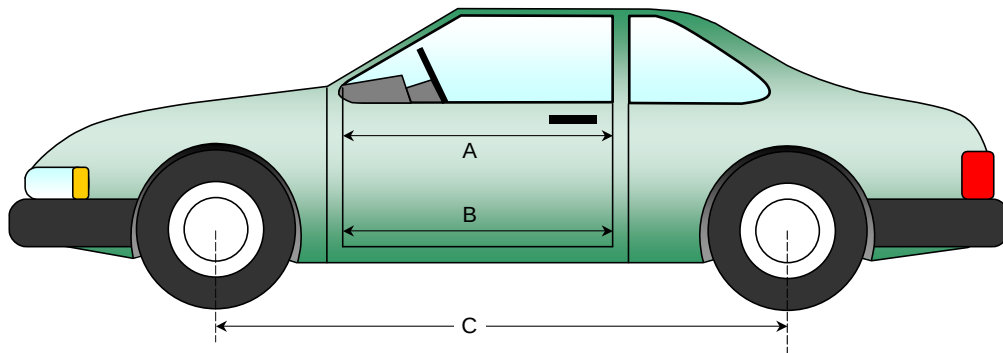
NHTSA No.: M95400
 Test Date: 8/27/2008

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1099	1095	4
B	Left Side Lower	mm	809	805	4
D	Right Side Upper	mm	1098	1095	3
E	Right Side Lower	mm	830	826	4

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2787	2733	54
F	Right Side Wheelbase	mm	2787	2732	55



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

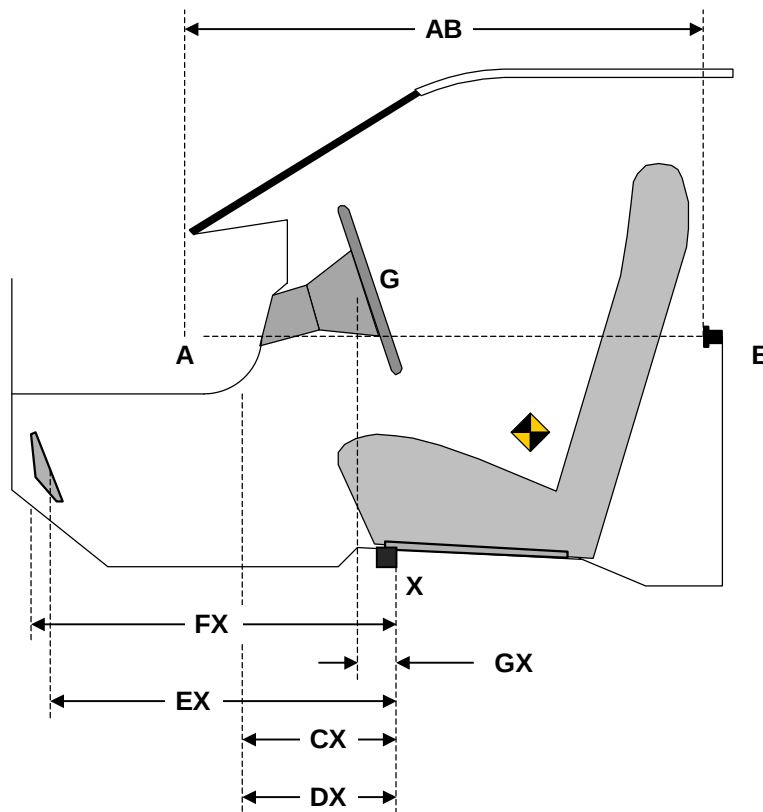
Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	812	812	0
CX	Left Knee Bolster to X	mm	361	359	2
DX	Right Knee Bolster to X	mm	350	351	-1
EX	Brake Pedal to X	mm	582	529	53
FX	Foot Rest to X	mm	610	596	14
GX	Center of Steering Column Wheel Hub to X	mm	64	90	-26

X = Front of Seat Track (stationary)

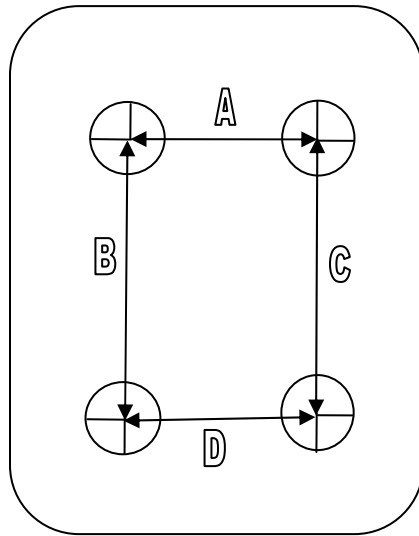


DRIVER COMPARTMENT

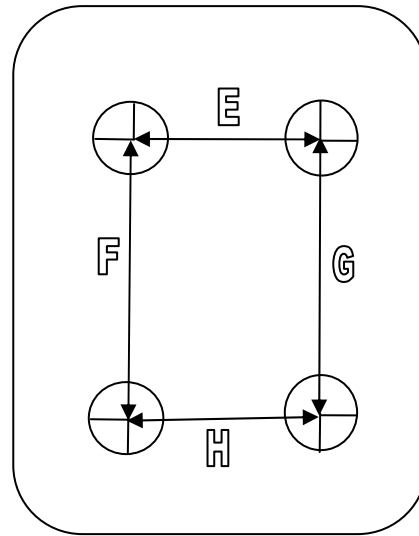
DATA SHEET NO. 13... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	230	231	-1
B	230	233	-3
C	230	232	-2
D	230	228	2
E	230	233	-3
F	230	228	2
G	230	241	-11
H	230	225	5

DATA SHEET NO. 14

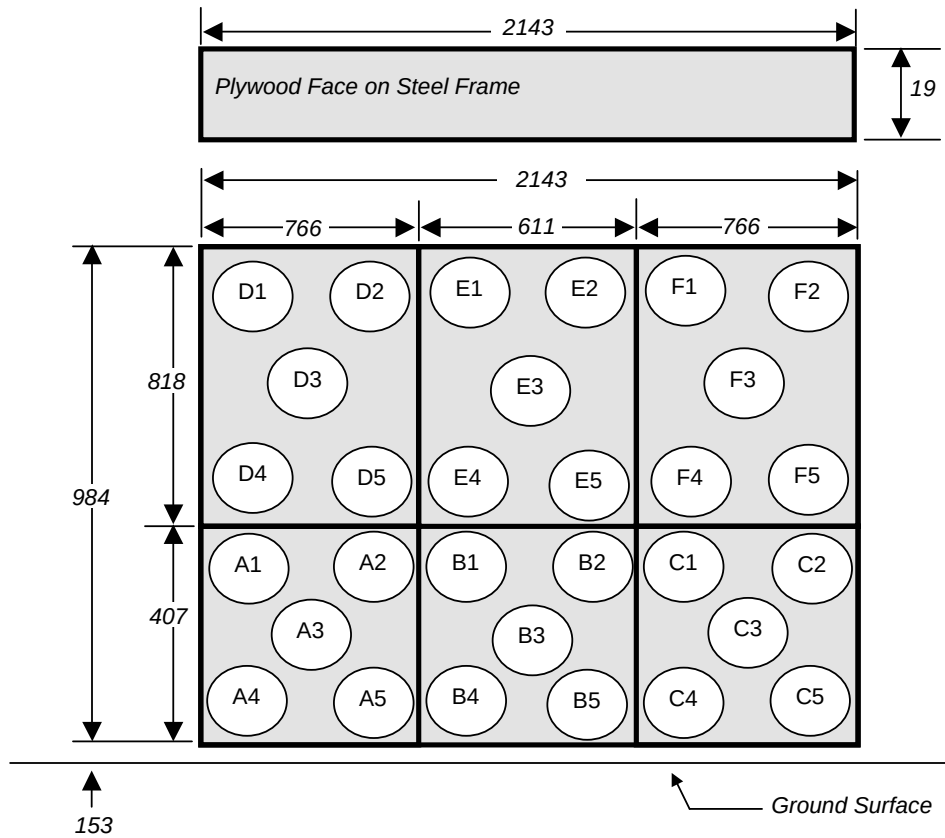
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2009 Mazda6 Sedan Sport
 Test Program: 35mph Frontal Impact

NHTSA No.: M95400
 Test Date: 8/27/2008

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: 2009 Mazda6 Sedan Sport NHTSA No.: M95400
 Test Program: 35mph Frontal Impact Test Date: 8/27/2008

VEHICLE INFORMATION

VIN: 1YVHP81A095M01997 Wheelbase (mm): 2787
 Vehicle Size Category: Sedan Test Weight (kg): 1694.6

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): 56.5
 Velocity Change (km/h): 63.1 Time of Separation (msec): 119

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
 Damage Region Length (mm): 1375 Impact Mode: Frontal

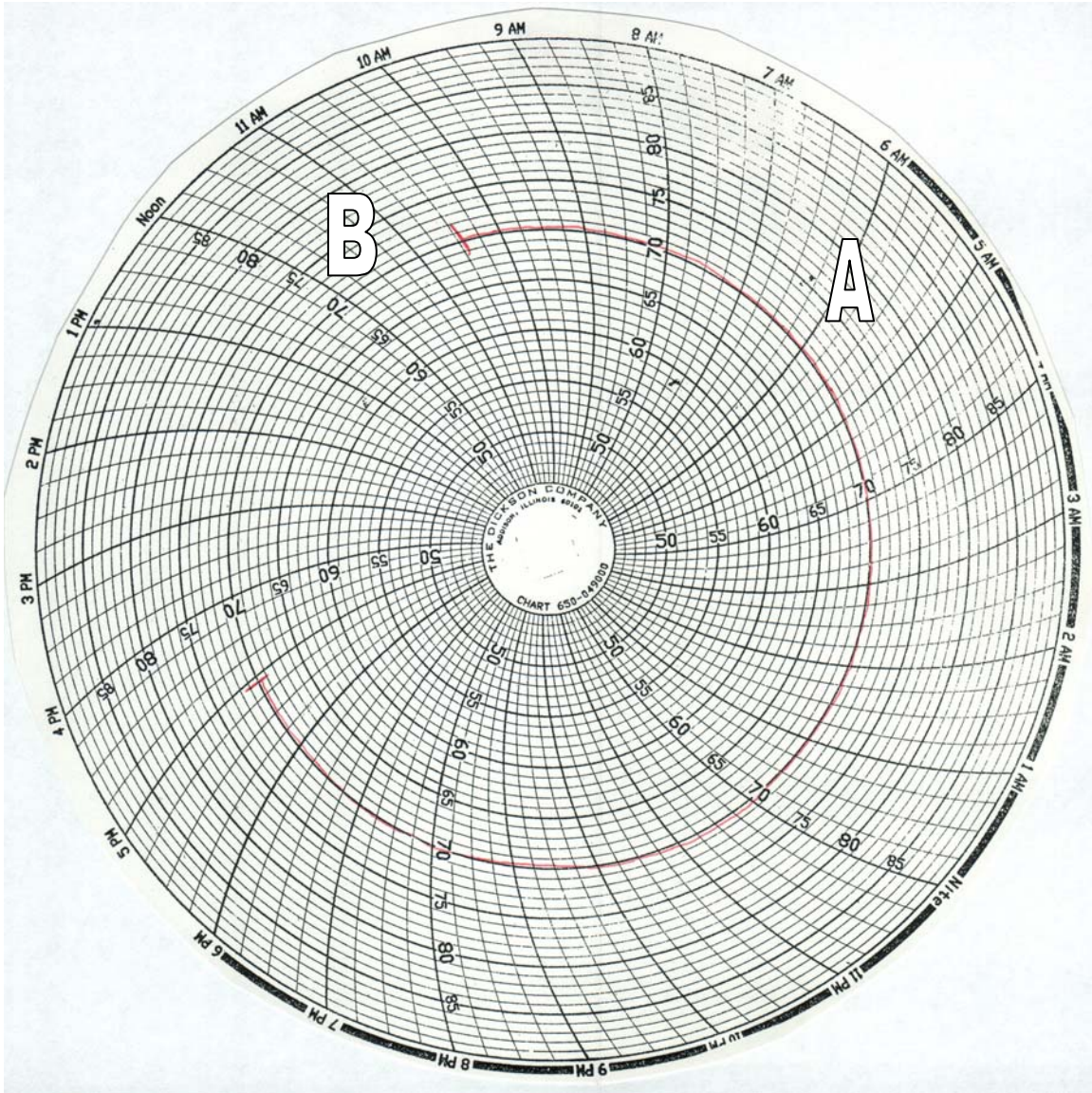
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4663	4215	448
C2	Crush zone 2 at left side	mm	4776	4264	512
C3	Crush zone 3 at left side	mm	4843	4281	562
C4	Crush zone 4 at right side	mm	4840	4275	565
C5	Crush zone 5 at right side	mm	4775	4237	538
C6	Crush zone 6 at right side	mm	4660	4201	459
L	C1 TO C6	mm	1375	1354	21

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2009 Mazda6 Sedan Sport
Test Program: 35mph Frontal Impact

NHTSA No.: M95400
Test Date: 8/27/2008



A = Dummies installed in vehicle at 6:00 am

B = Test conducted at 10:35 am

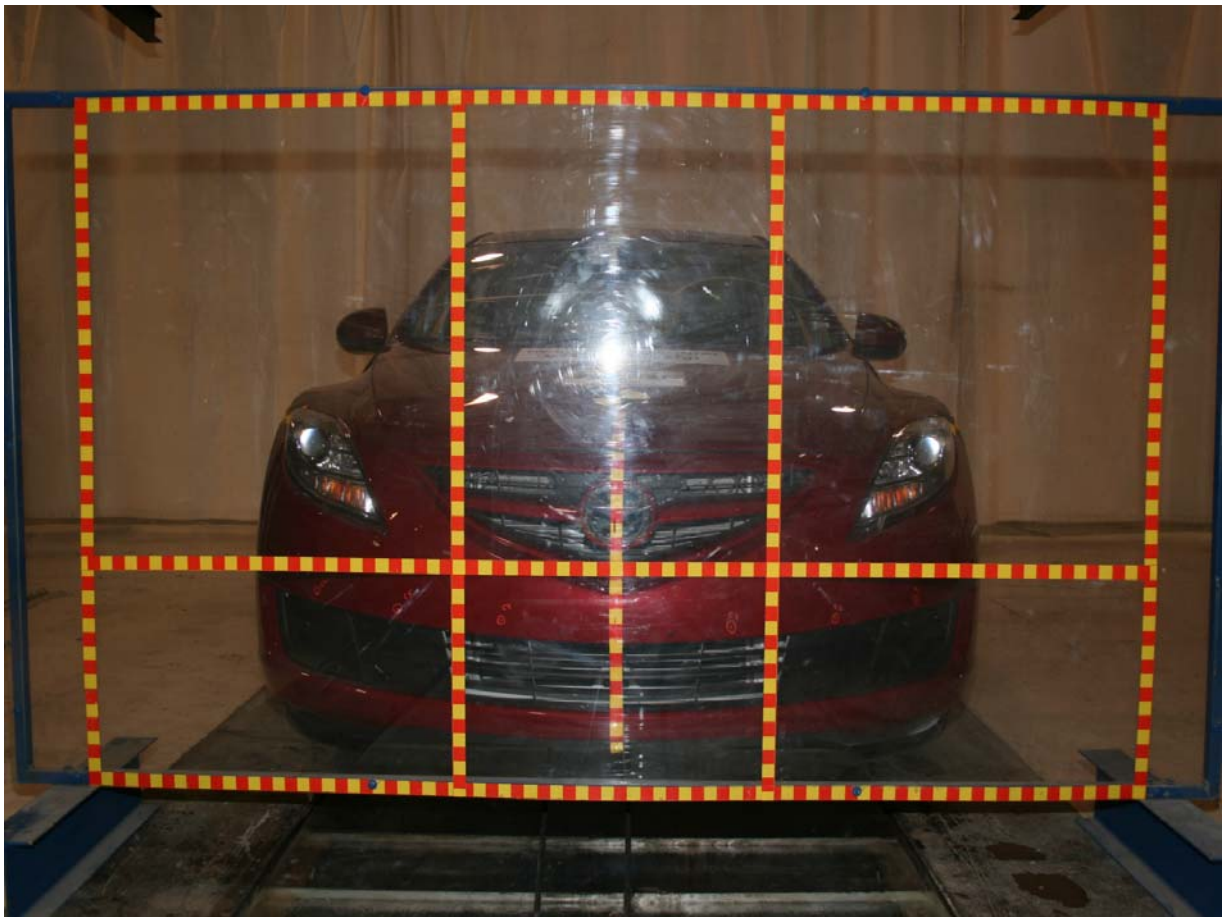
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Load Cell Location



Manufacturer's Label



Tire Placard



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



Right 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 $\frac{3}{4}$ View



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



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



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



Pre-Test Left Side $\frac{3}{4}$ View of Doors



Post-Test Left Side $\frac{3}{4}$ View of Doors After Impact



Pre-Test Right Side ¾ View of Doors



Post-Test Right Side ¾ View of Doors After Impact



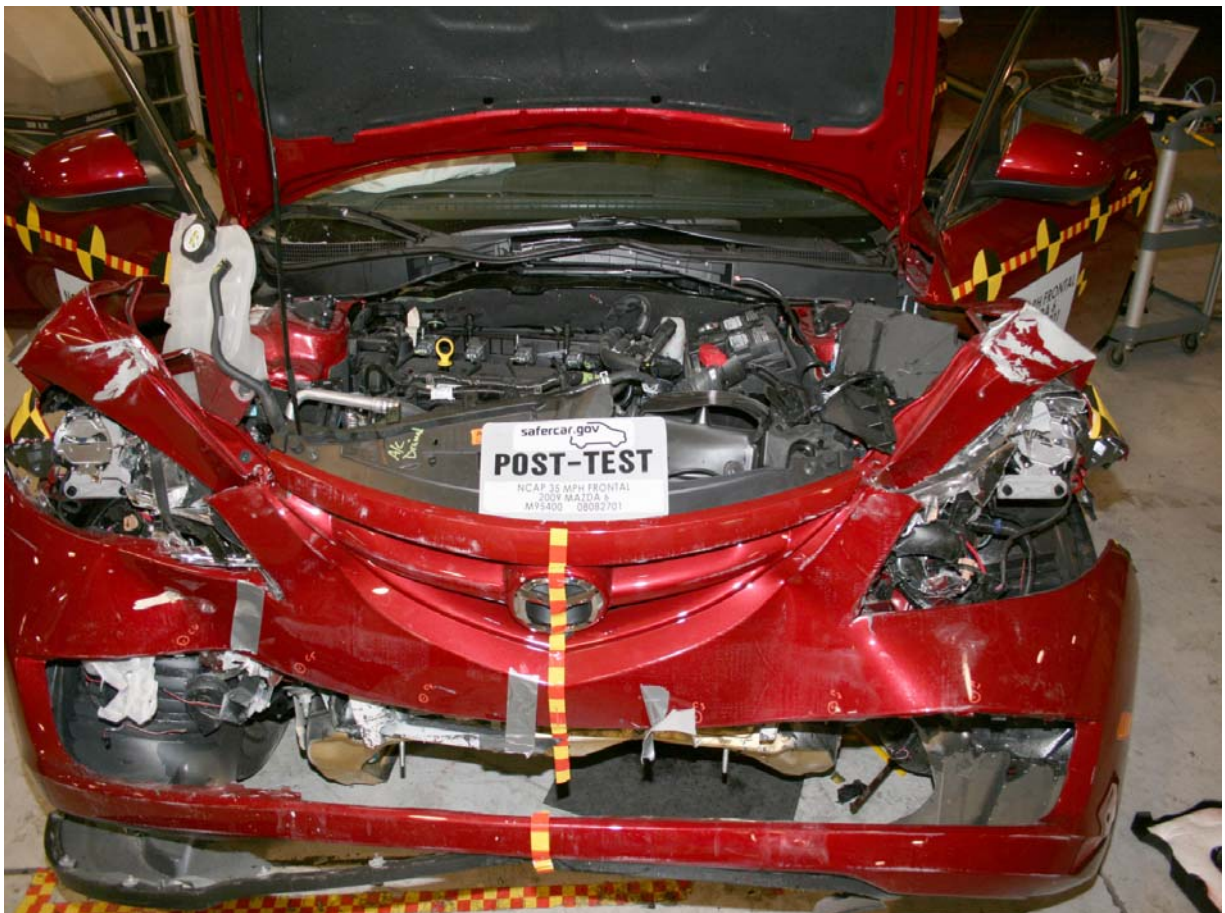
Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



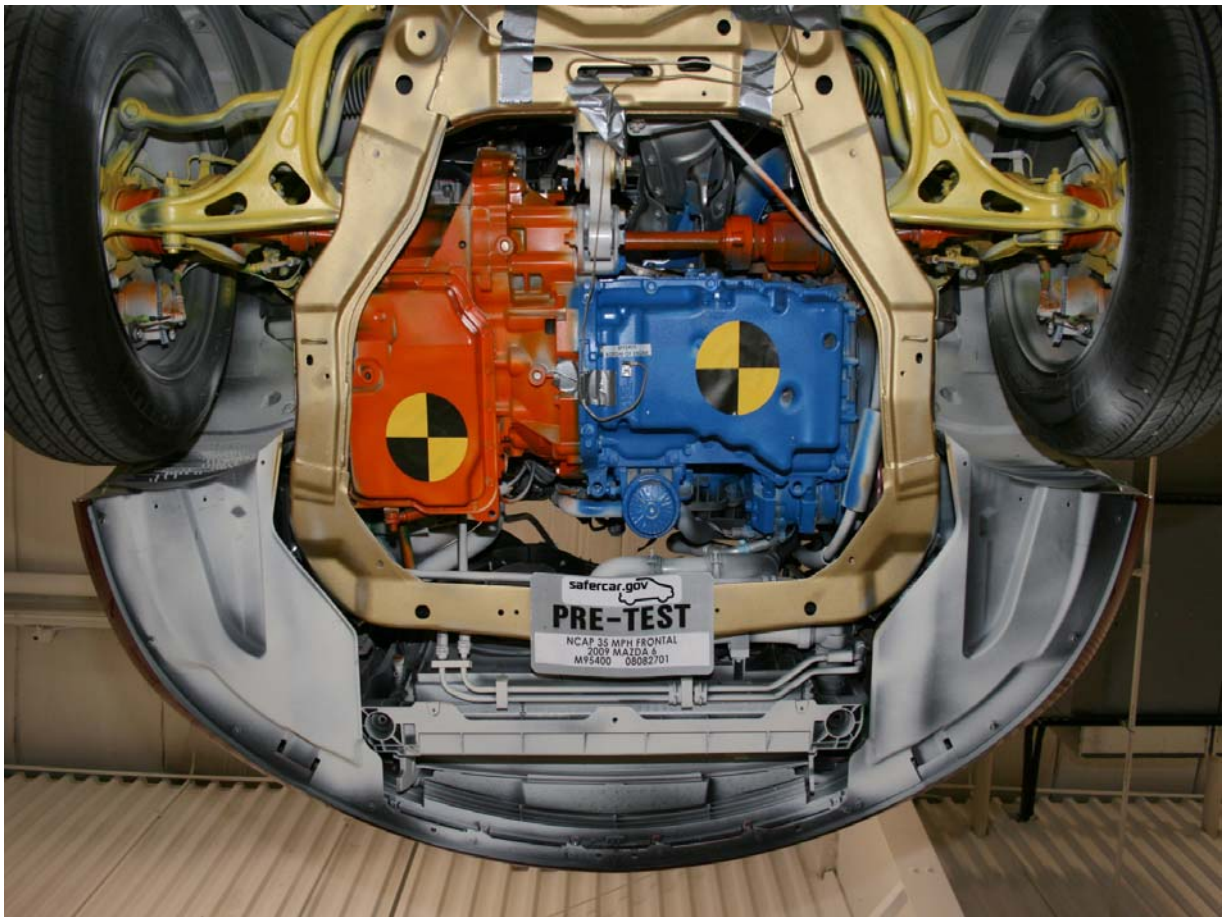
Post-Test Engine Compartment View



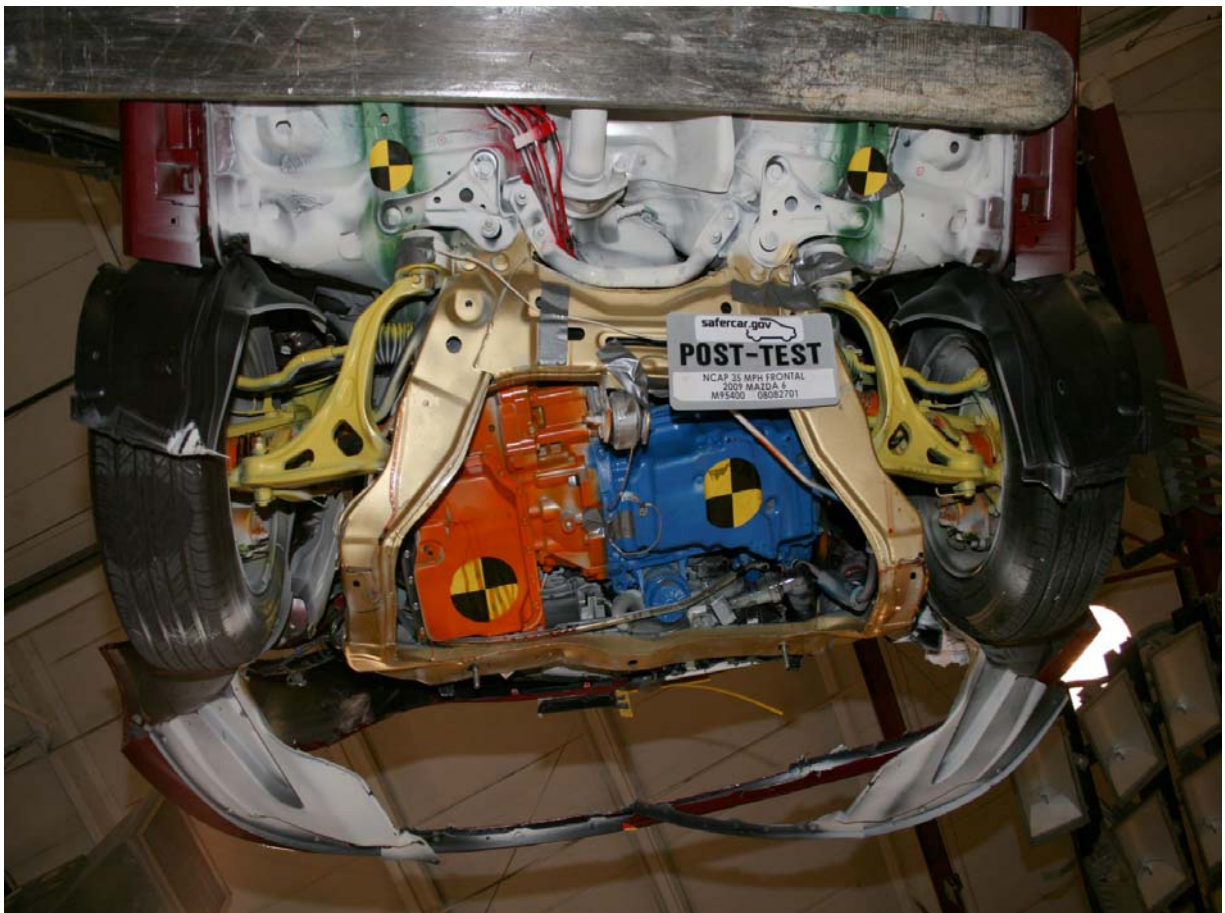
Pre-Test Fuel Cap View



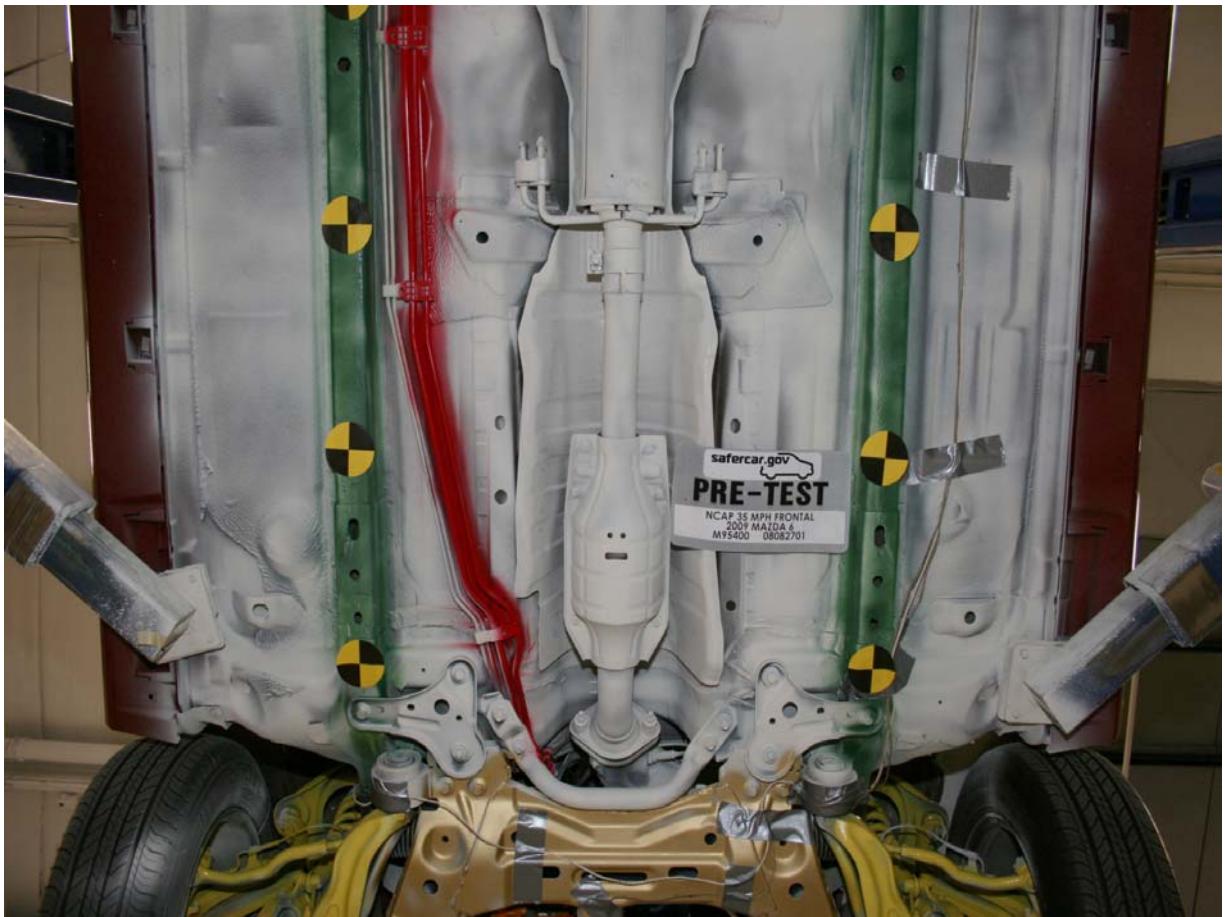
Post-Test Fuel Cap View



Pre-Test Front Underbody View



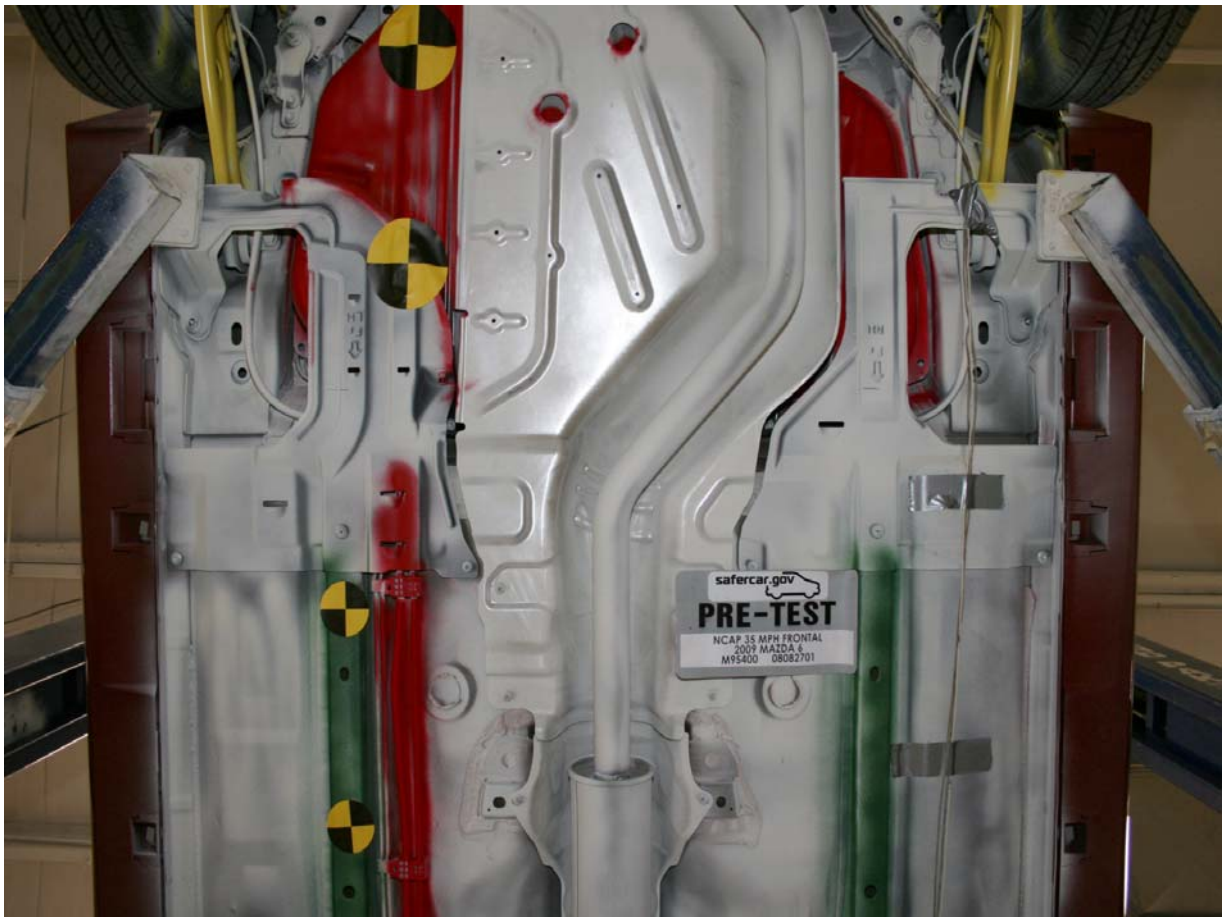
Post-Test Front Underbody View



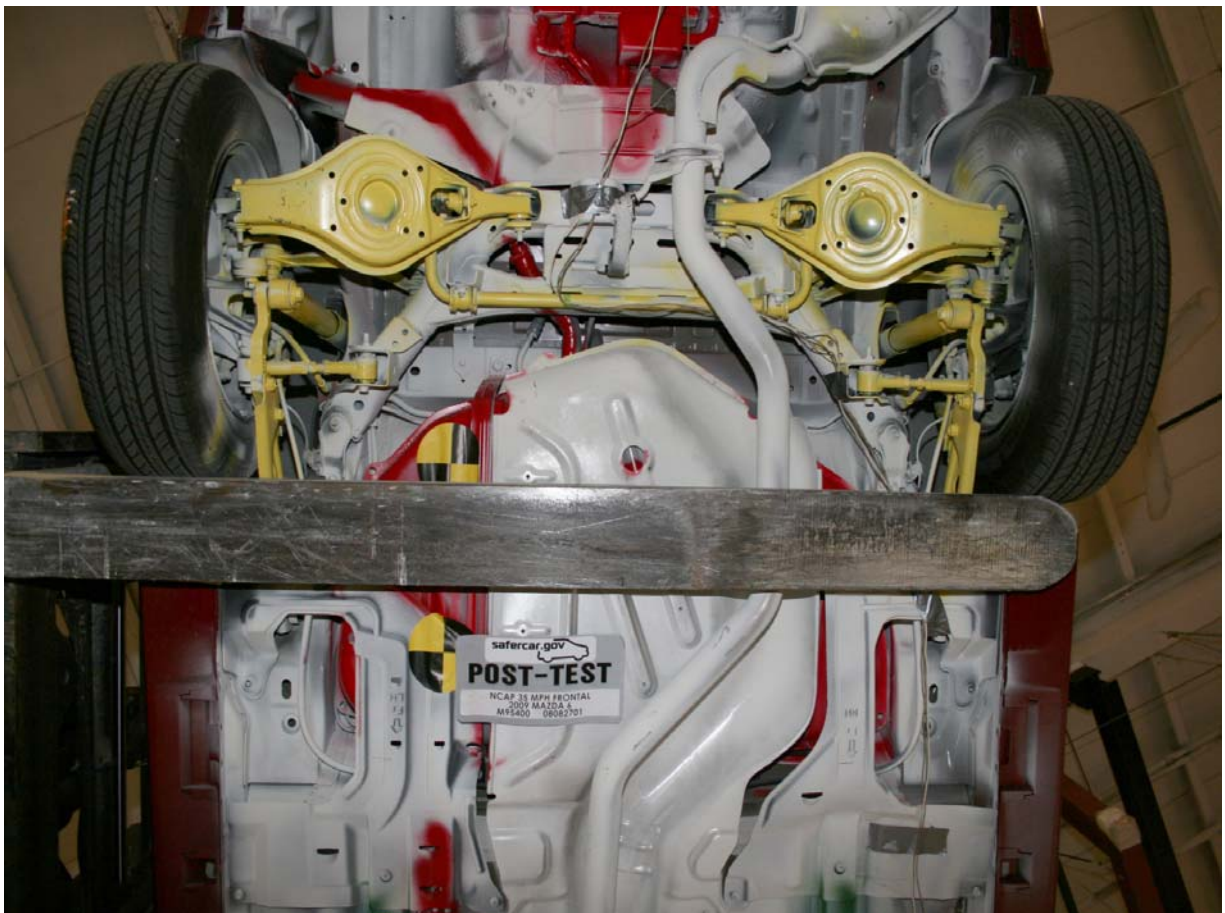
Pre-Test Mid Front Underbody View



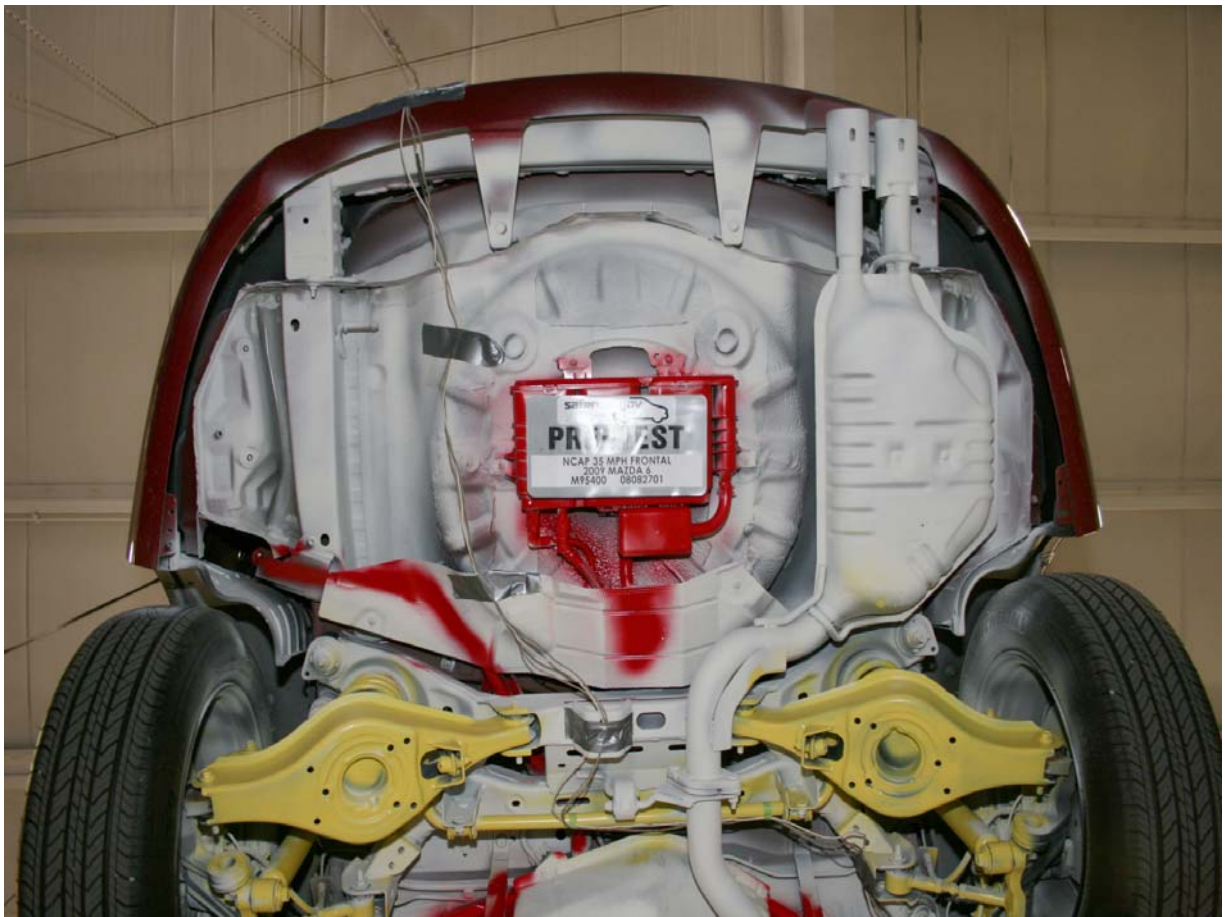
Post-Test Mid Front Underbody View



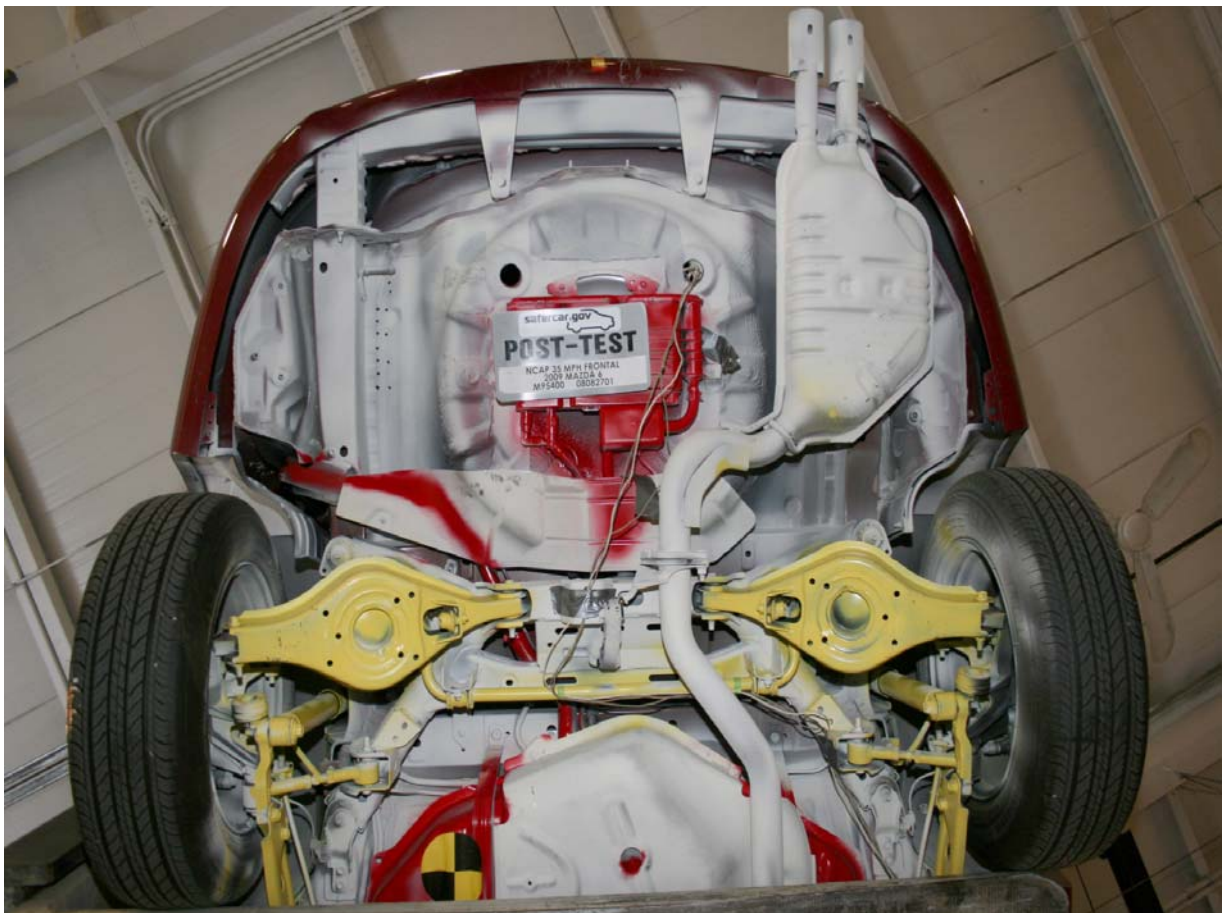
Pre-Test Mid Rear Underbody View



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)



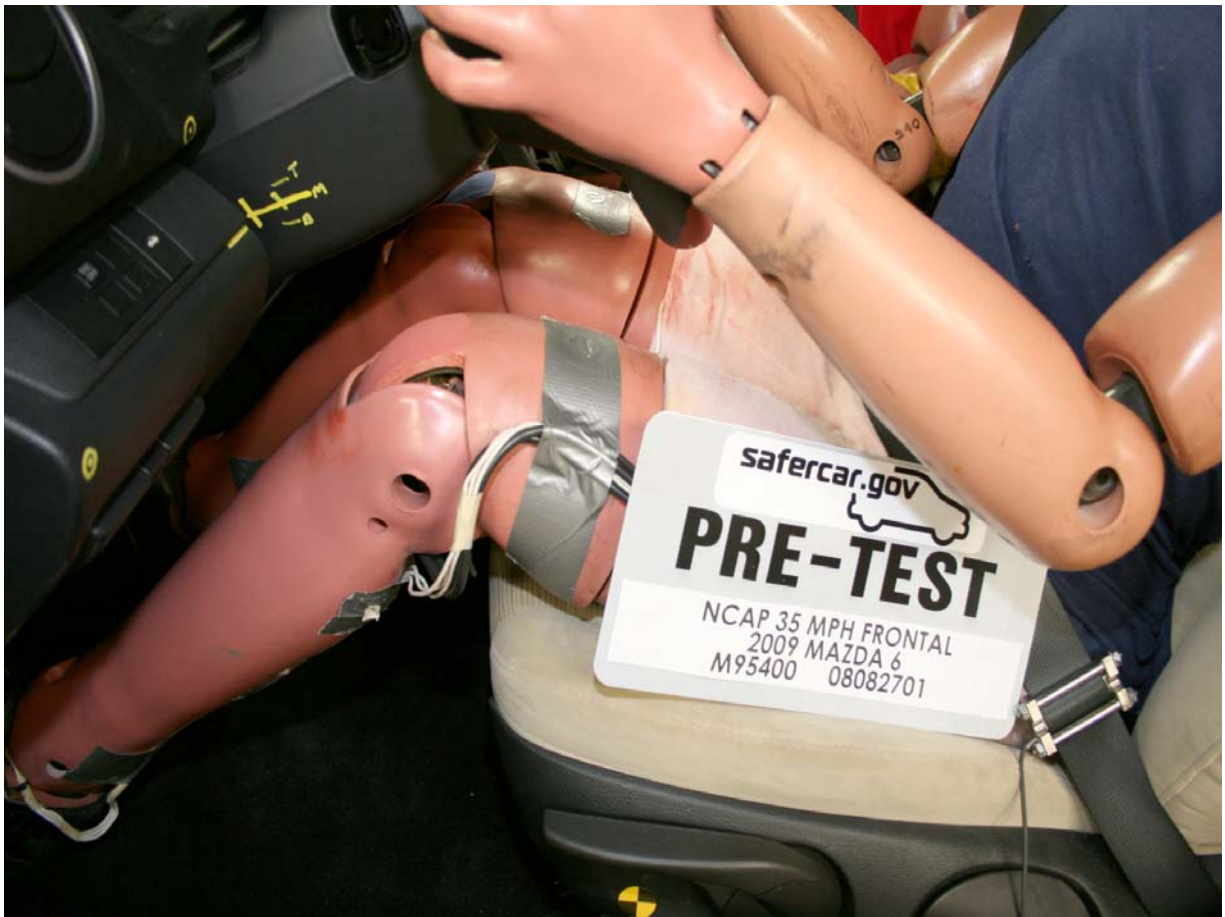
Post-Test Driver Dummy (Door Open)



Pre-Test Driver Dummy Feet



Post-Test Driver Dummy Feet



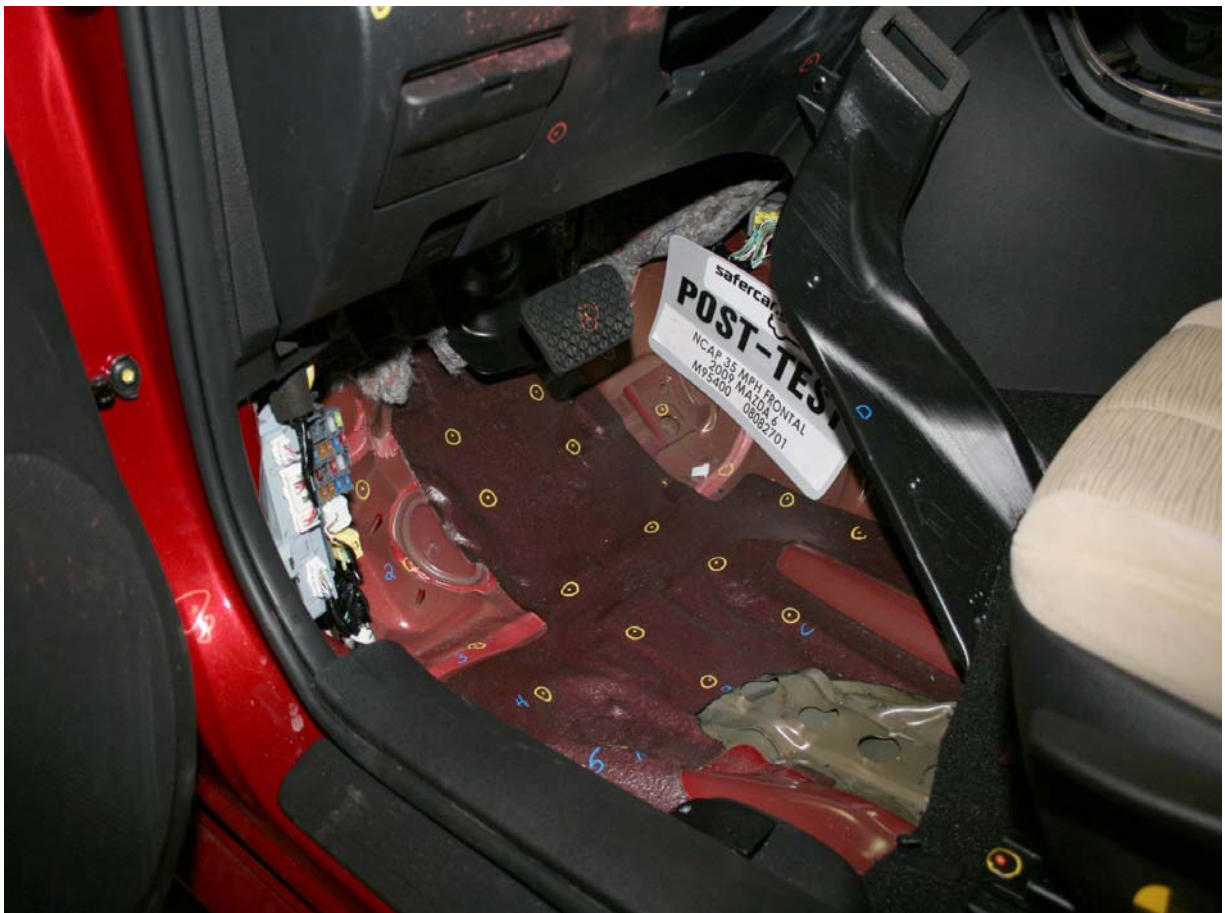
Pre-Test Driver Side Knee Bolster



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 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 Shoulder Belt Force

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 Shoulder Belt Force
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

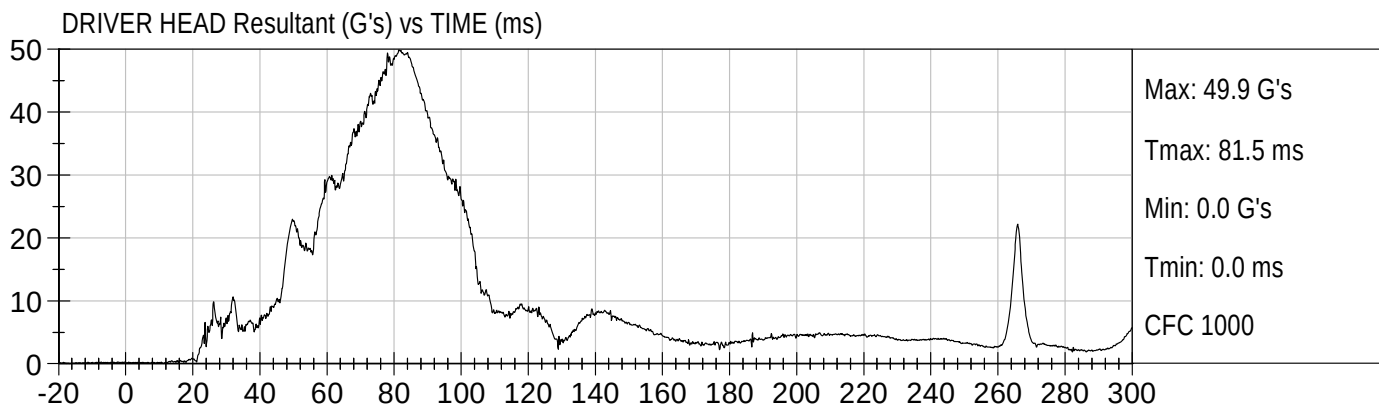
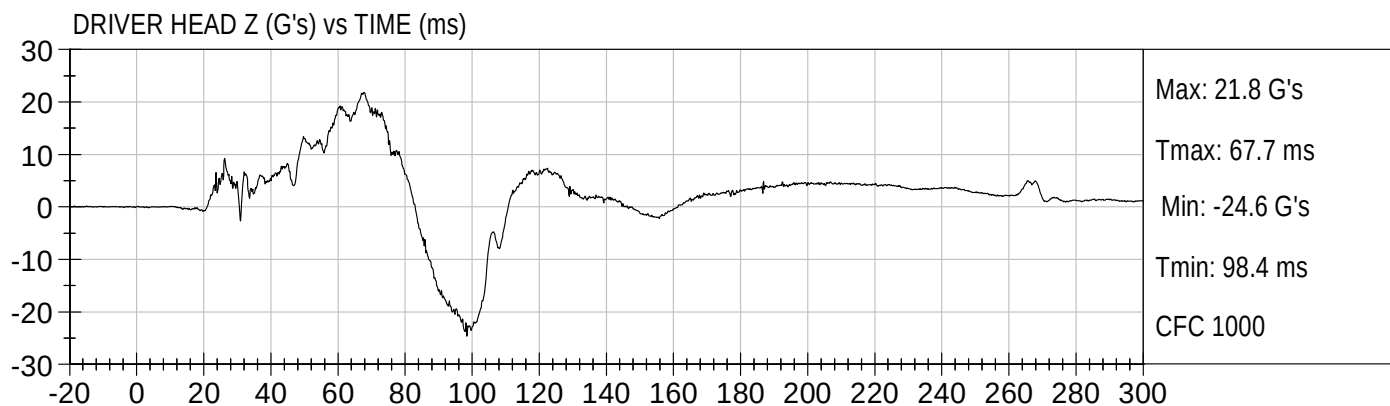
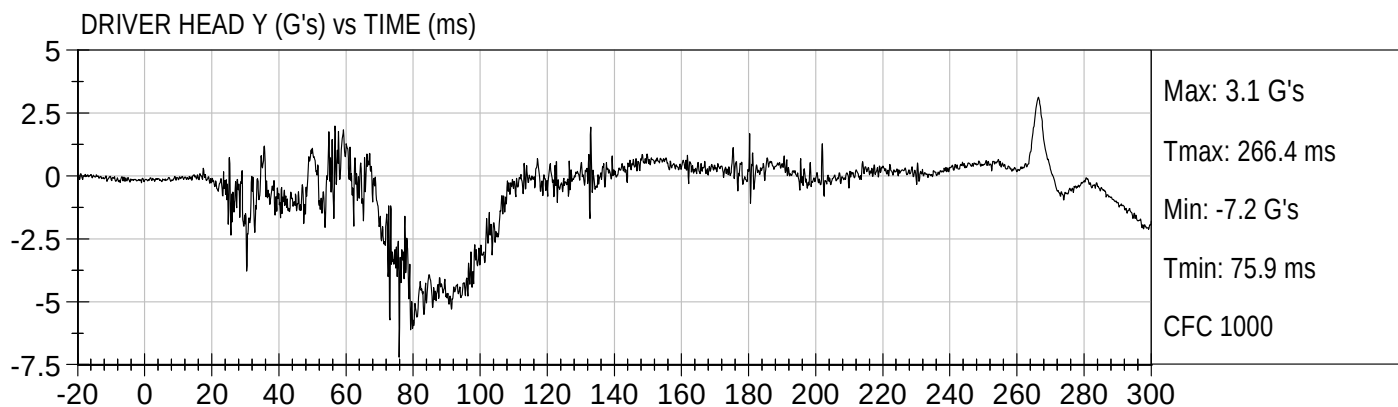
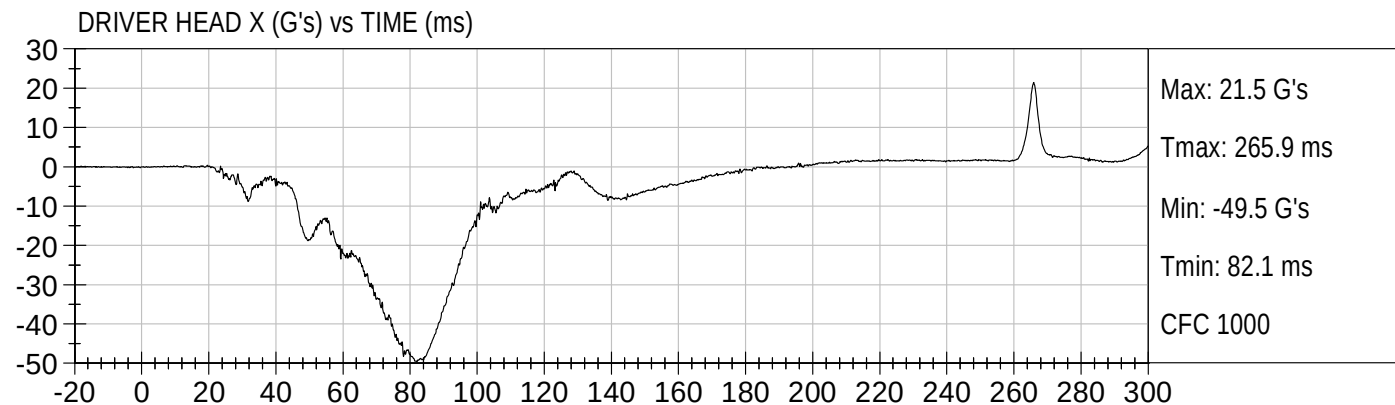
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger 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



NCAP FRONTAL
2009 MAZDA 6

M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)

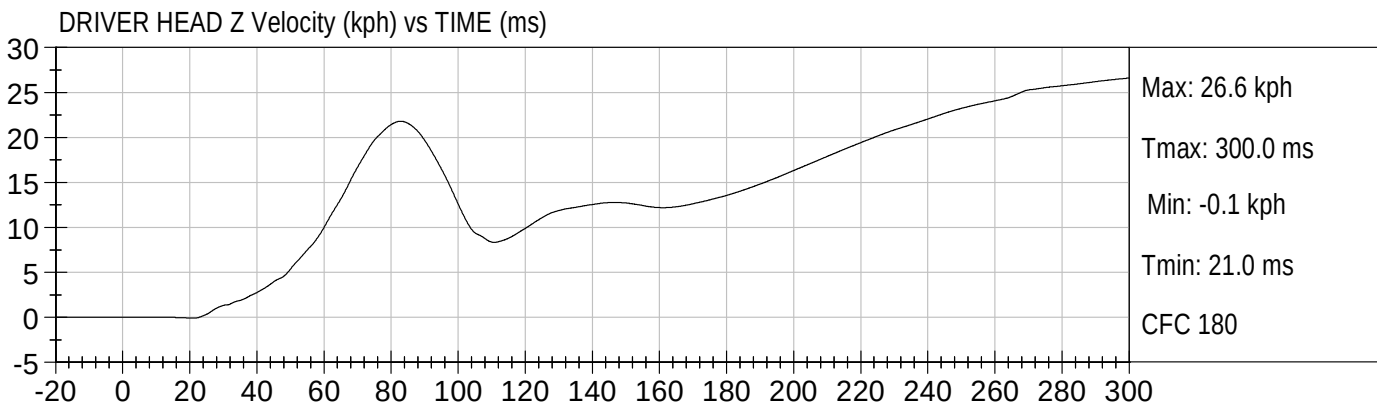
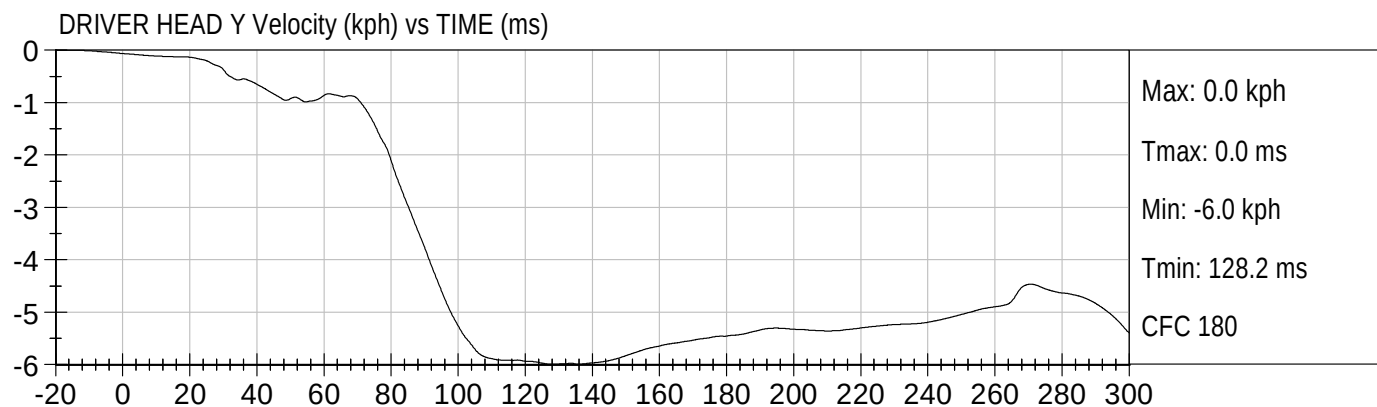
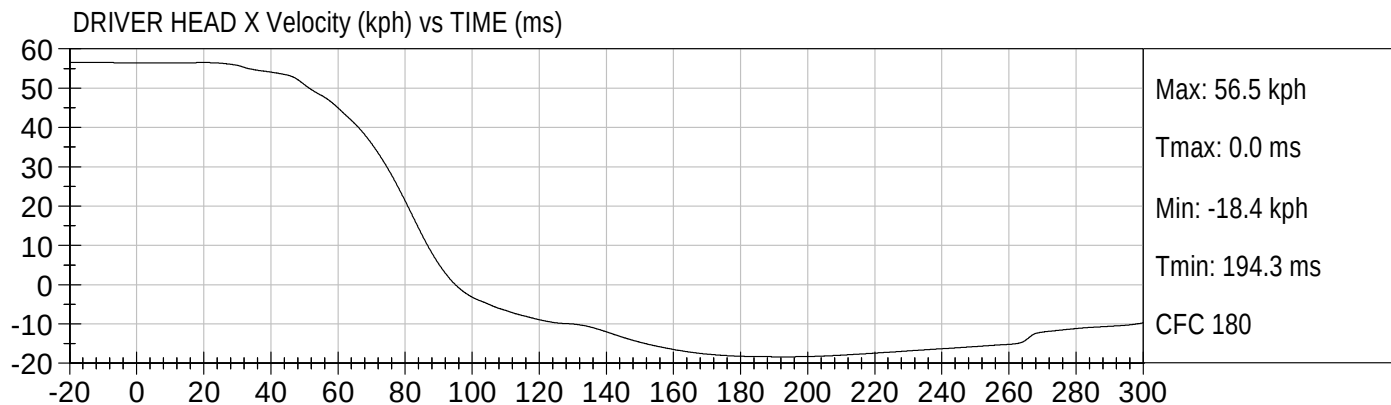




NCAP FRONTAL
2009 MAZDA 6

M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)

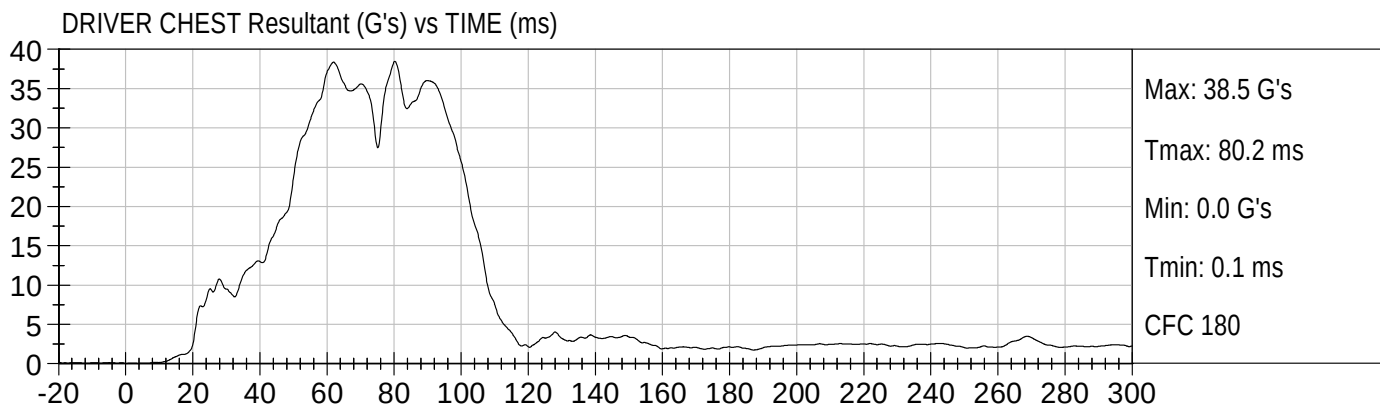
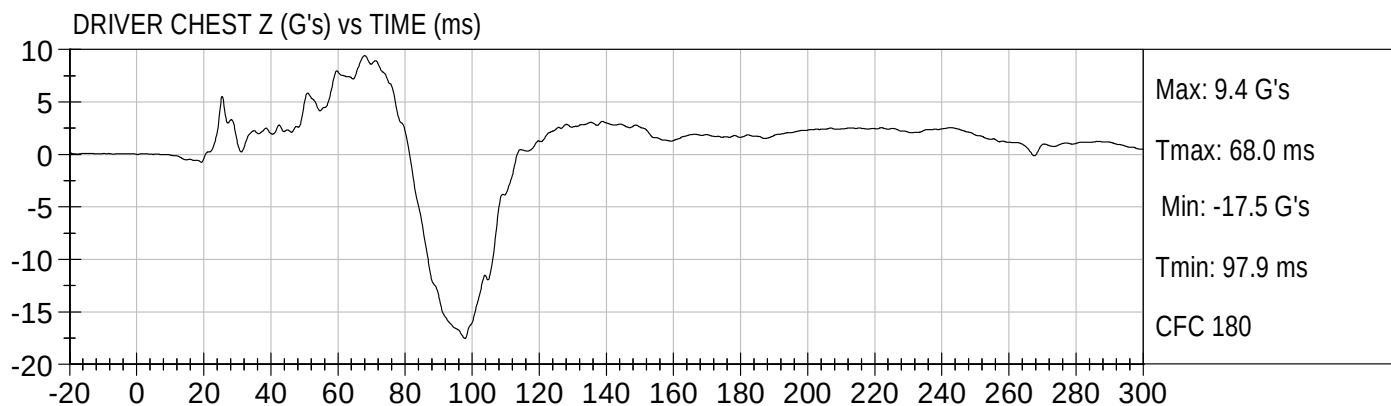
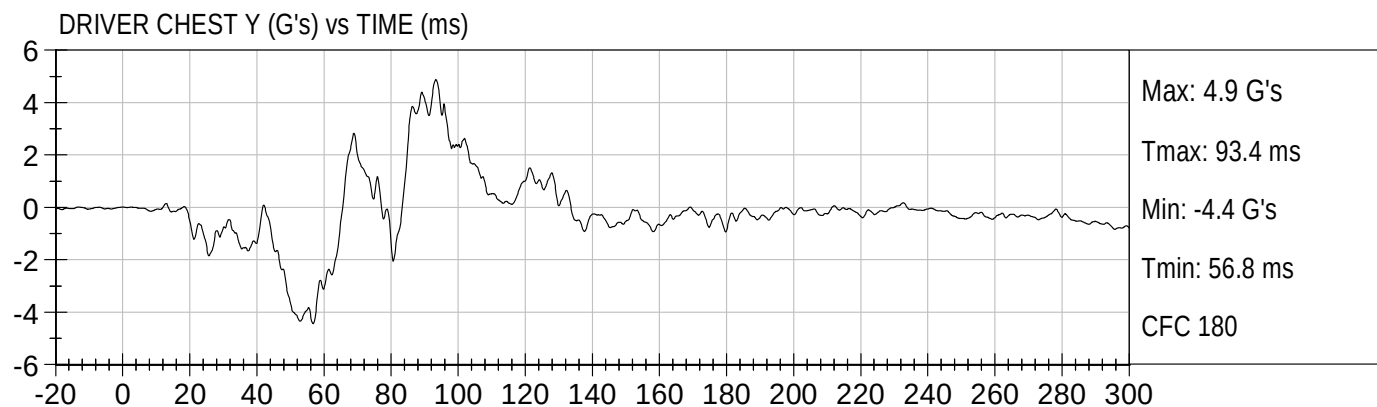
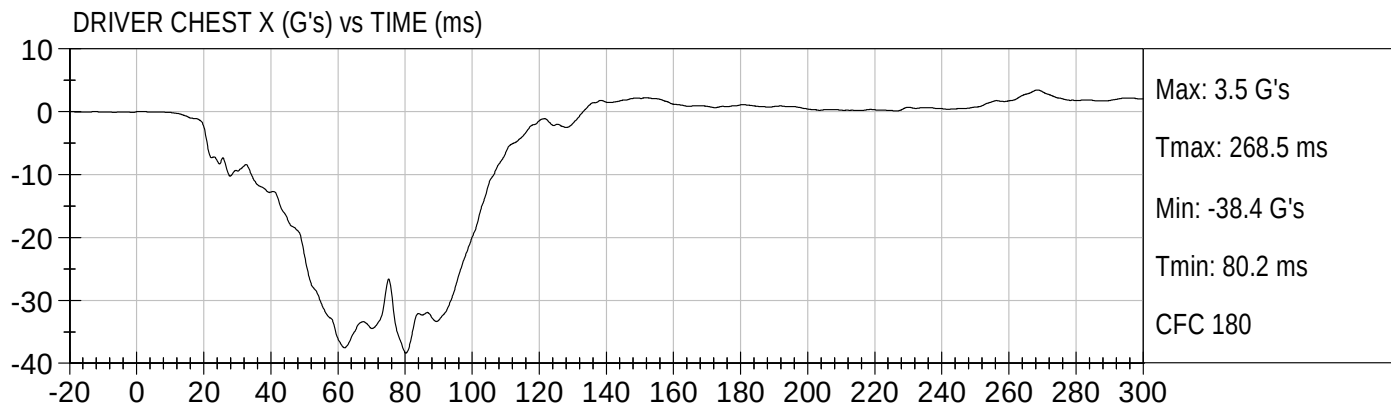




NCAP FRONTAL
2009 MAZDA 6

M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)



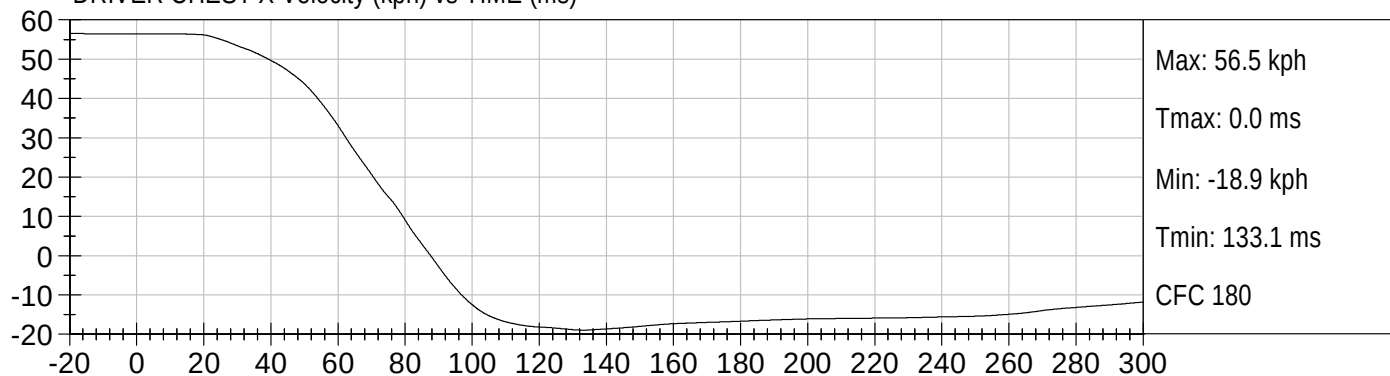


NCAP FRONTAL
2009 MAZDA 6

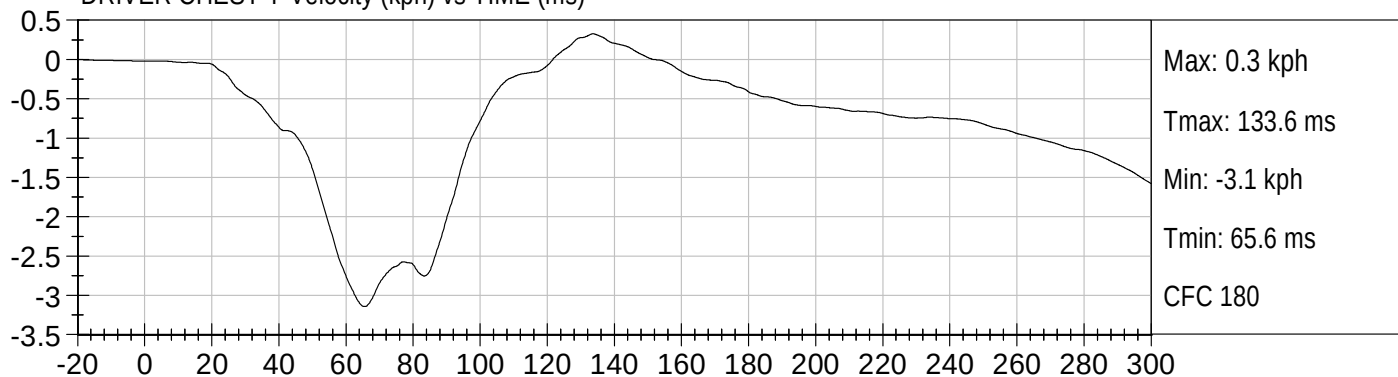
M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)

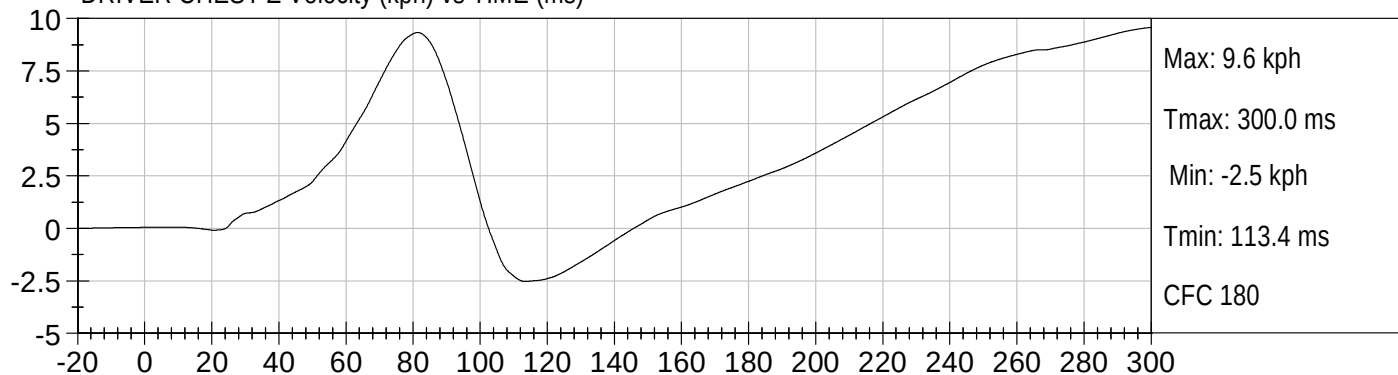
DRIVER CHEST X Velocity (kph) vs TIME (ms)



DRIVER CHEST Y Velocity (kph) vs TIME (ms)



DRIVER CHEST Z Velocity (kph) vs TIME (ms)

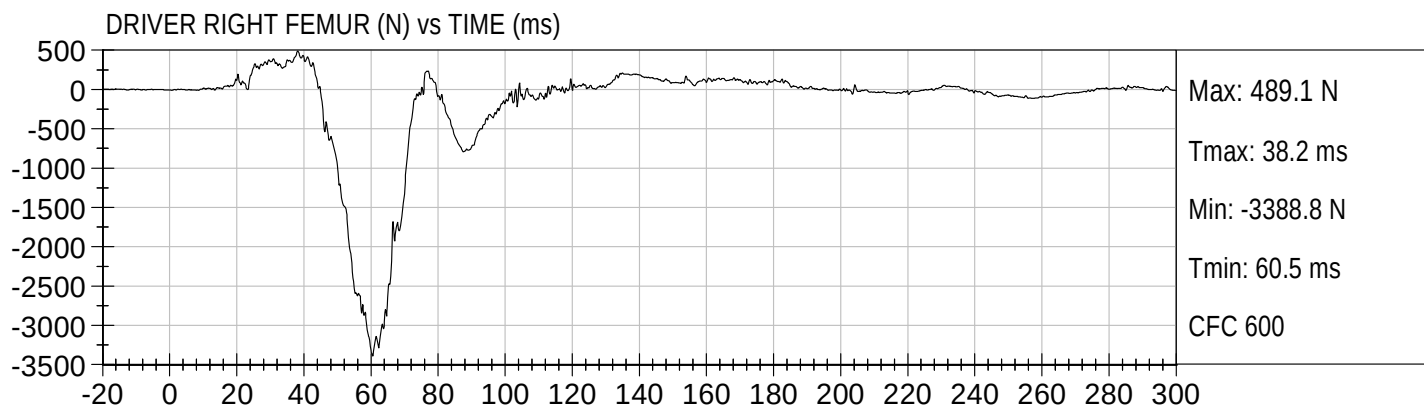
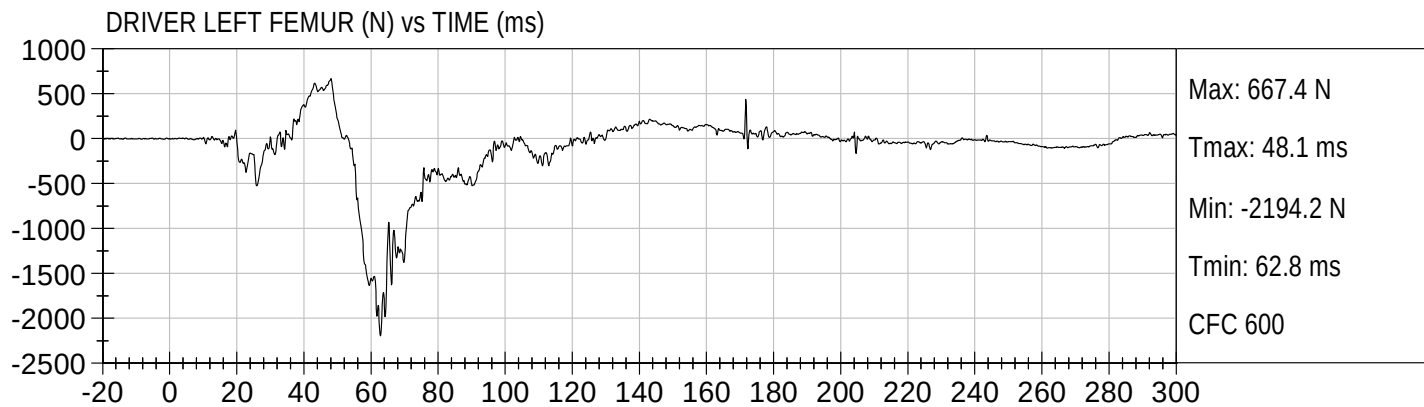




NCAP FRONTAL
2009 MAZDA 6

M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)



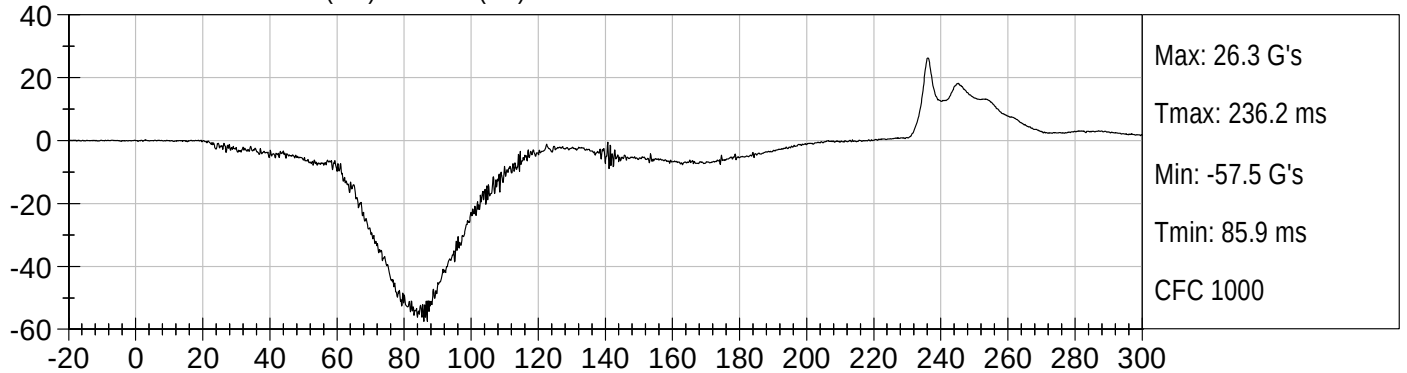


NCAP FRONTAL
2009 MAZDA 6

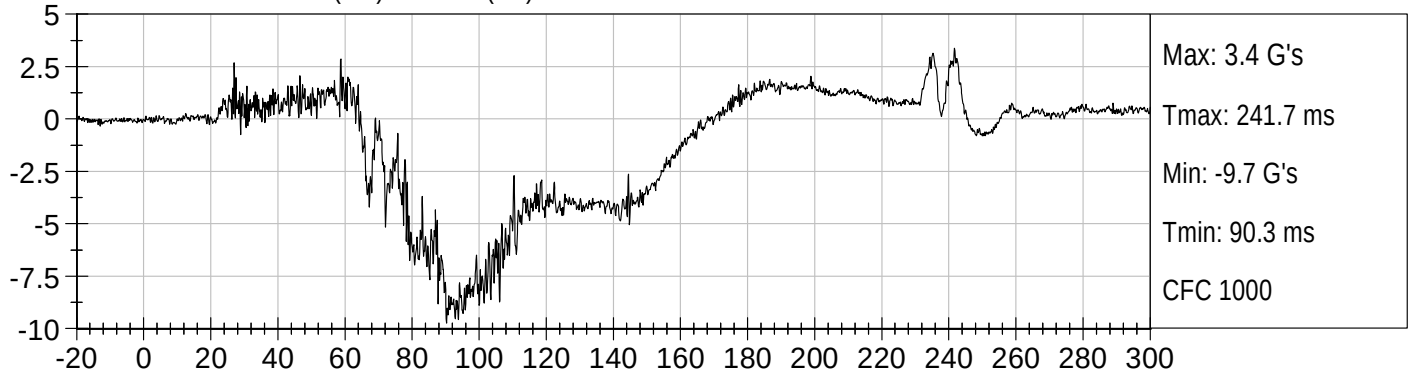
M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)

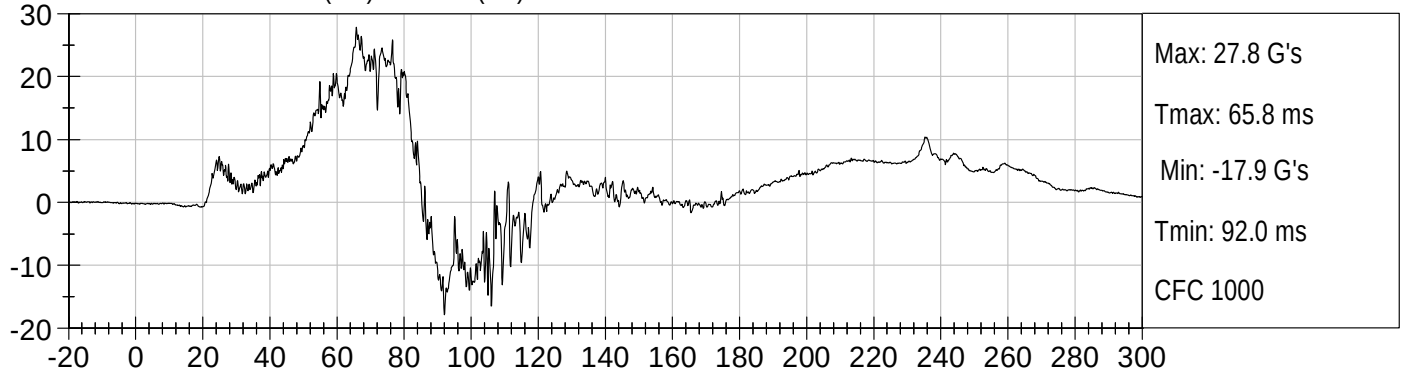
PASSENGER HEAD X (G's) vs TIME (ms)



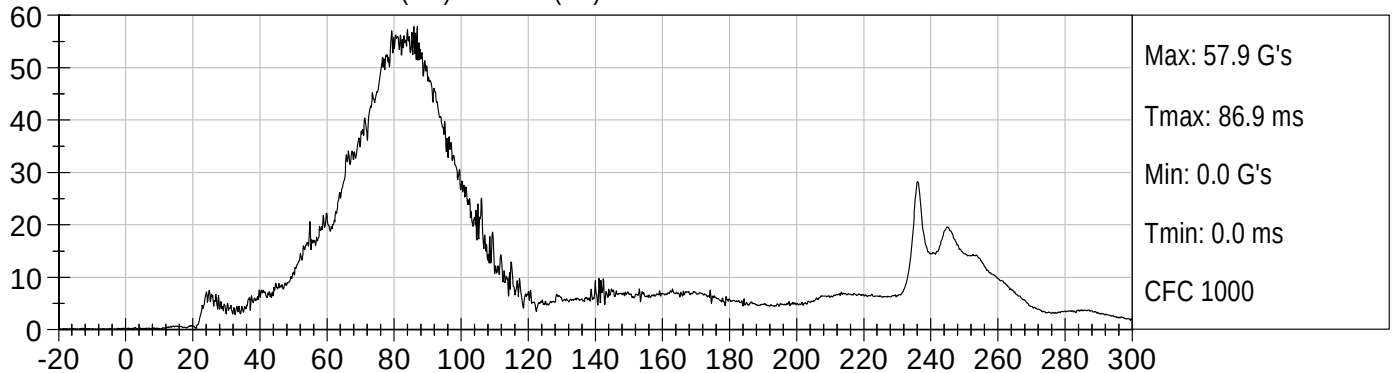
PASSENGER HEAD Y (G's) vs TIME (ms)



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



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



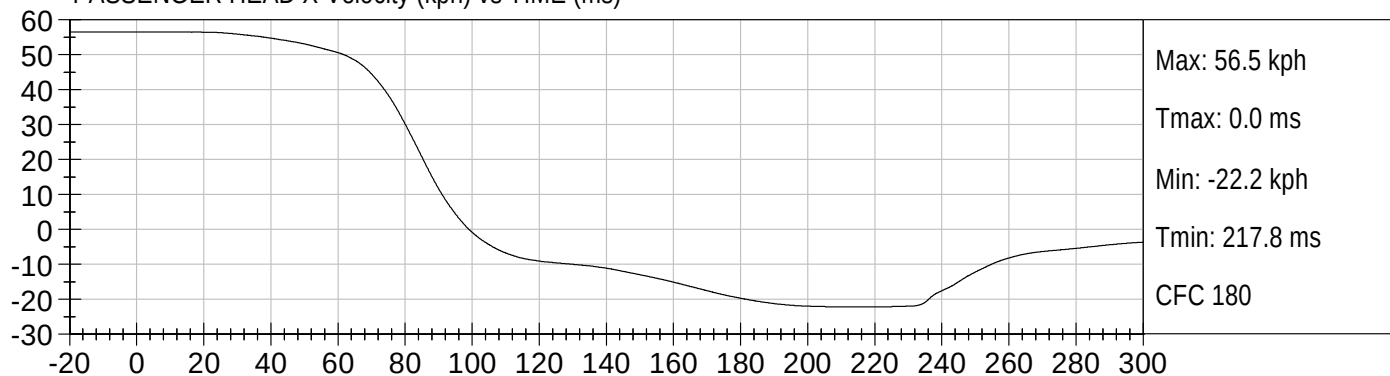


NCAP FRONTAL
2009 MAZDA 6

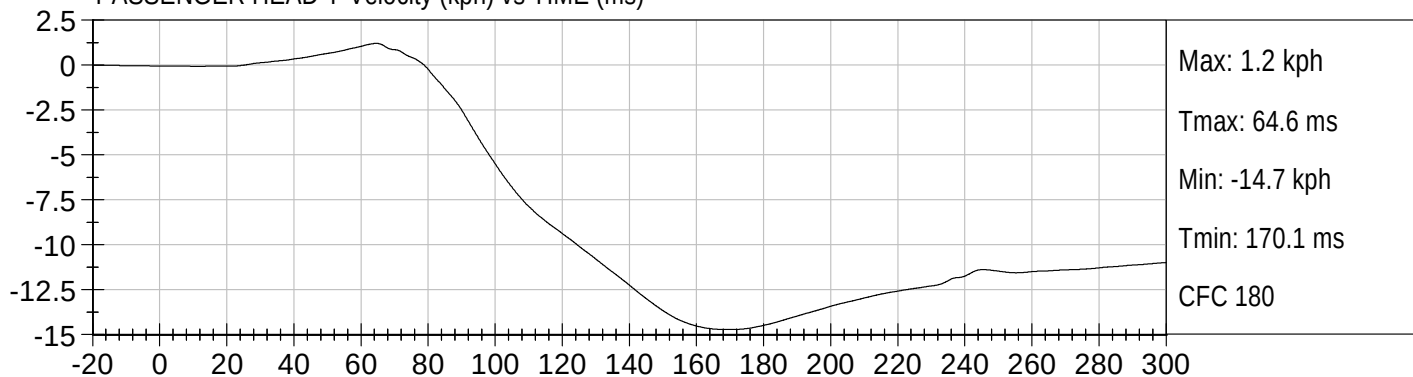
M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)

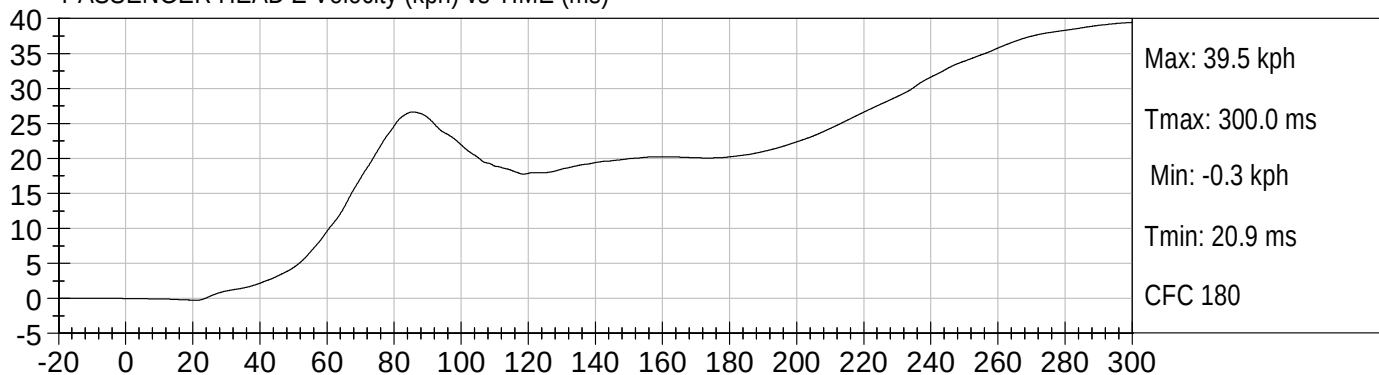
PASSENGER HEAD X Velocity (kph) vs TIME (ms)



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



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

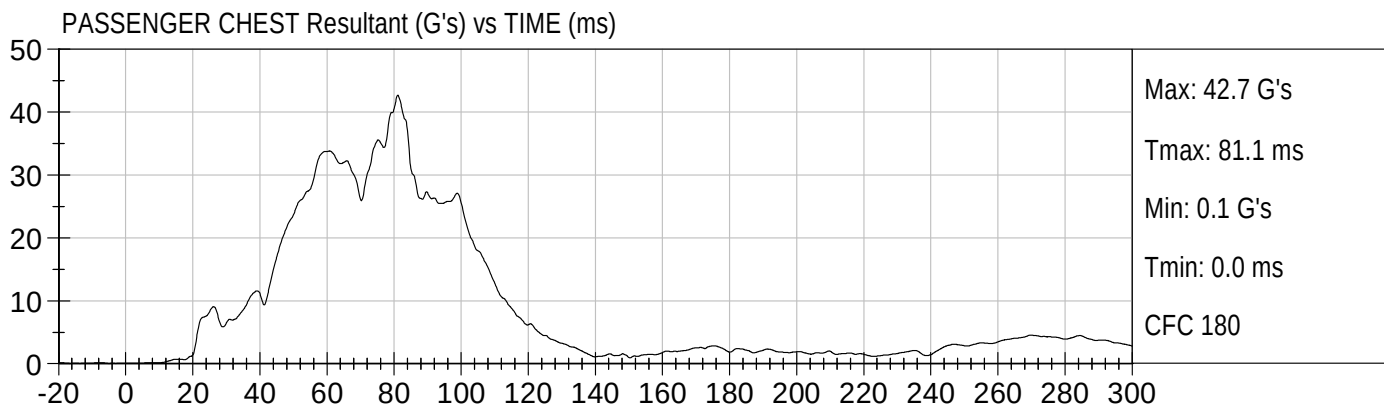
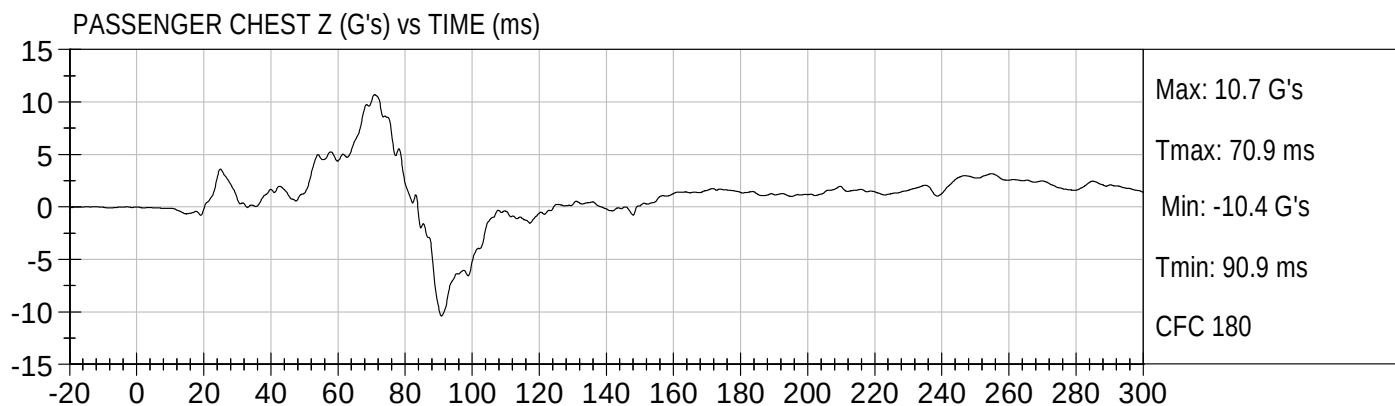
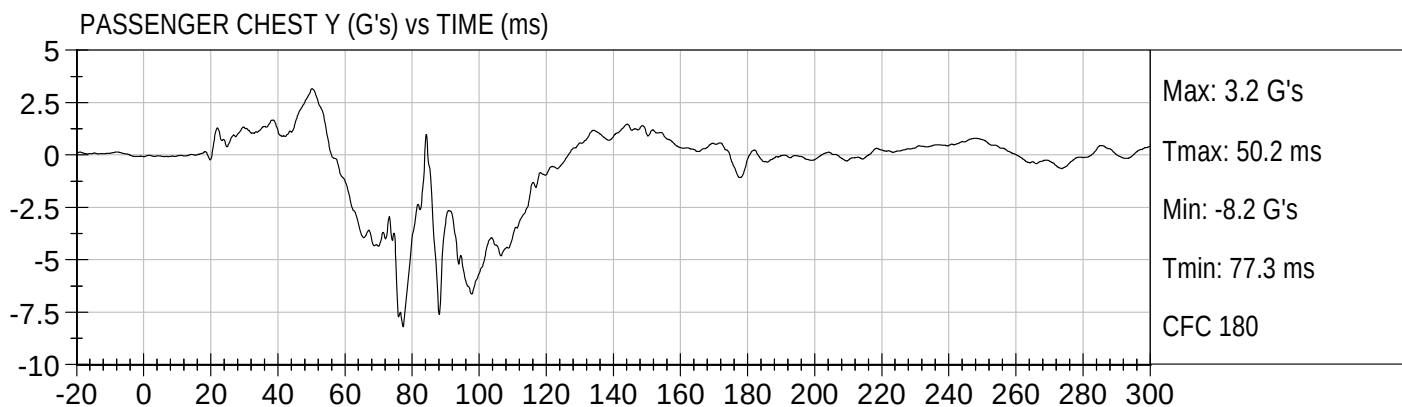
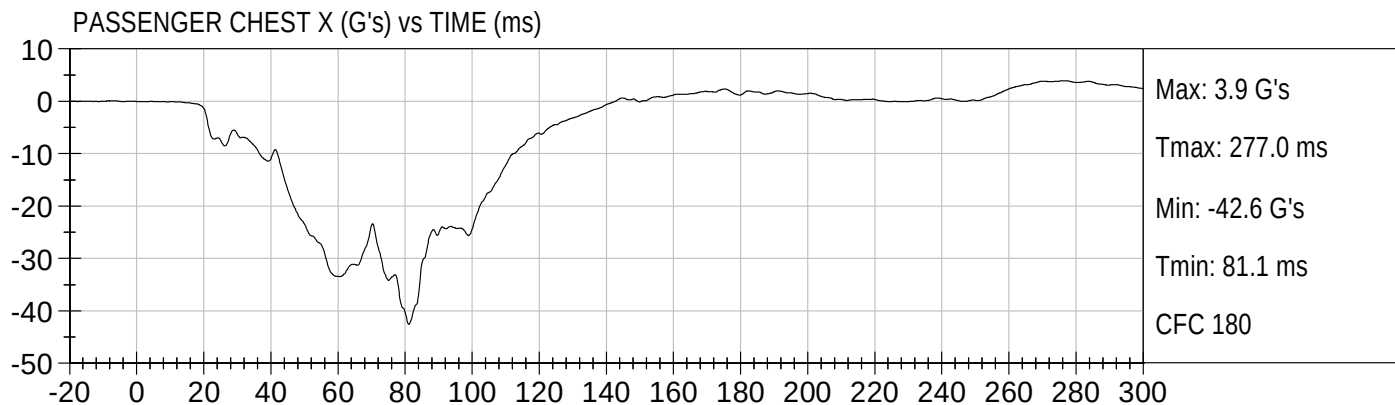




NCAP FRONTAL
2009 MAZDA 6

M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)



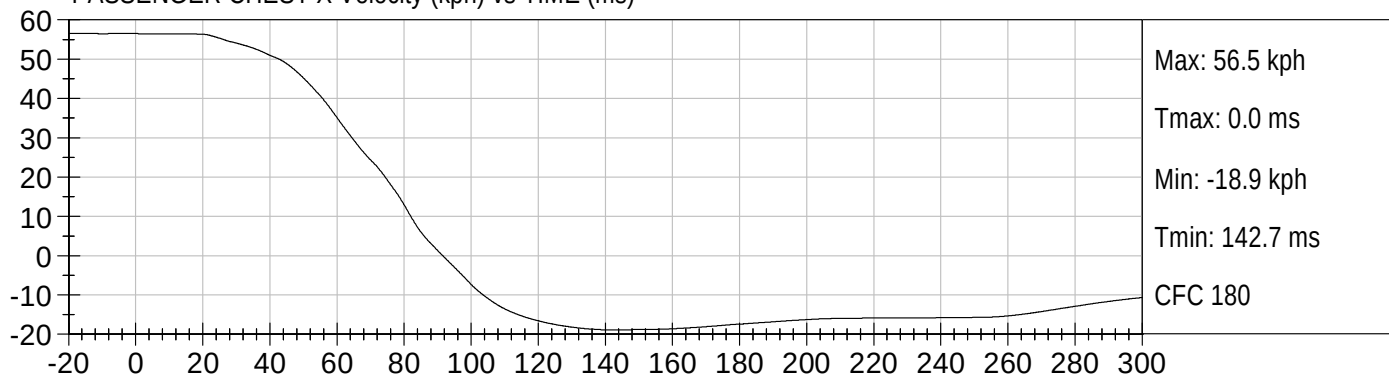


NCAP FRONTAL
2009 MAZDA 6

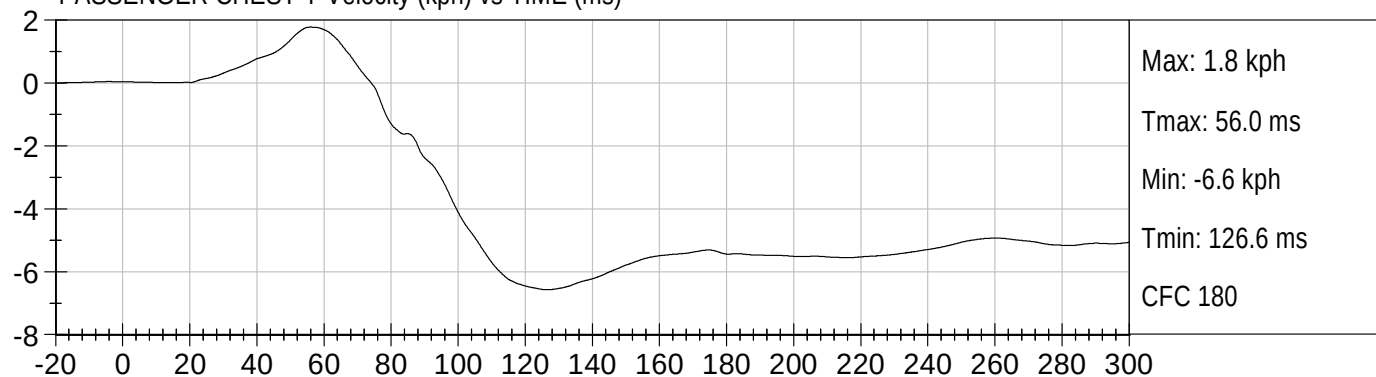
M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)

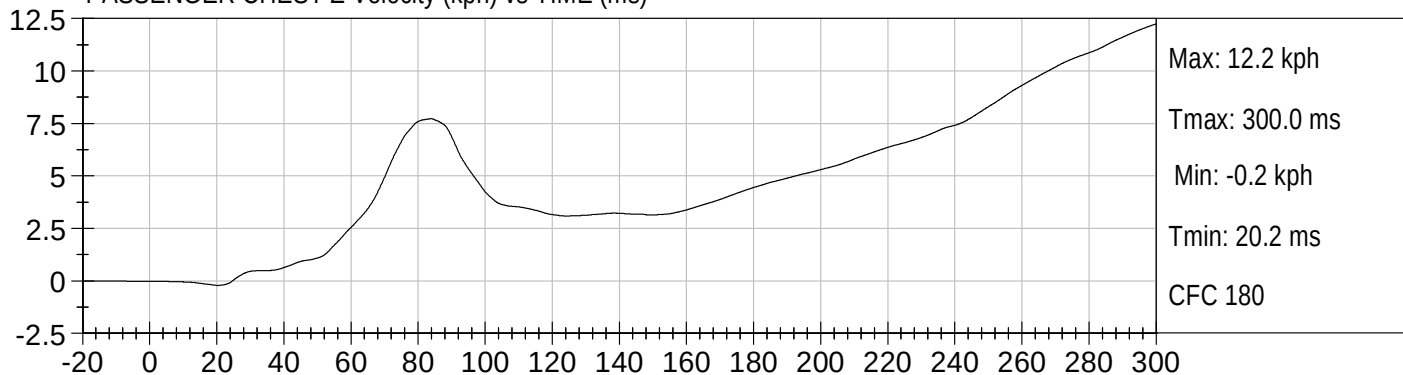
PASSENGER CHEST X Velocity (kph) vs TIME (ms)



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



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

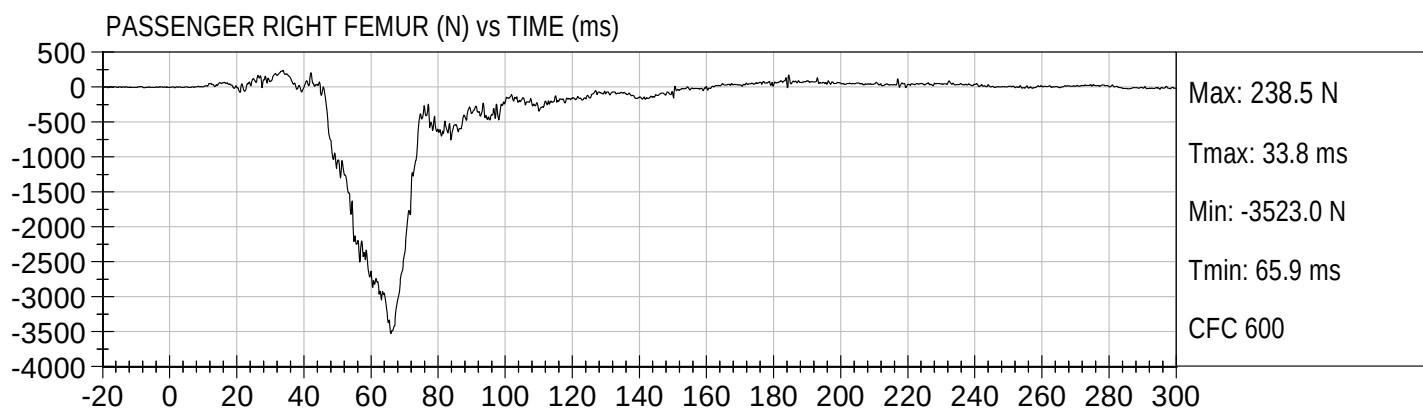
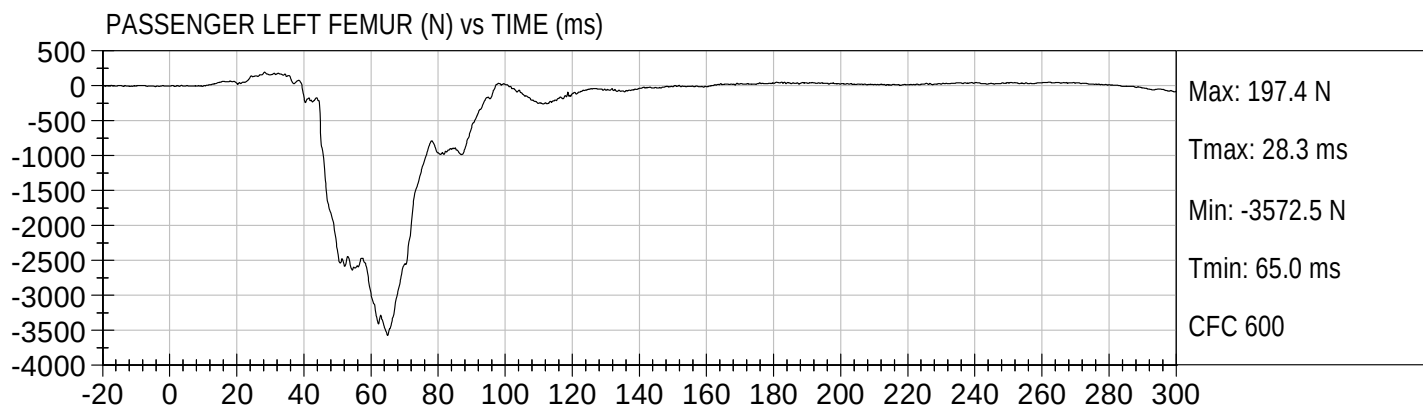




NCAP FRONTAL
2009 MAZDA 6

M95400

Test Date: 08/27/2008
Speed: 35.1 mph (56.5 km/h)



APPENDIX C
DUMMY CALIBRATION DATA

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

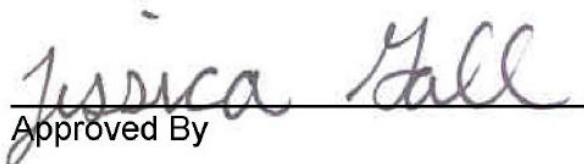
ATD Serial No: 065

Test ID: D082221

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	225 - 275	249	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	-2.2	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

8/6/08
Test Date

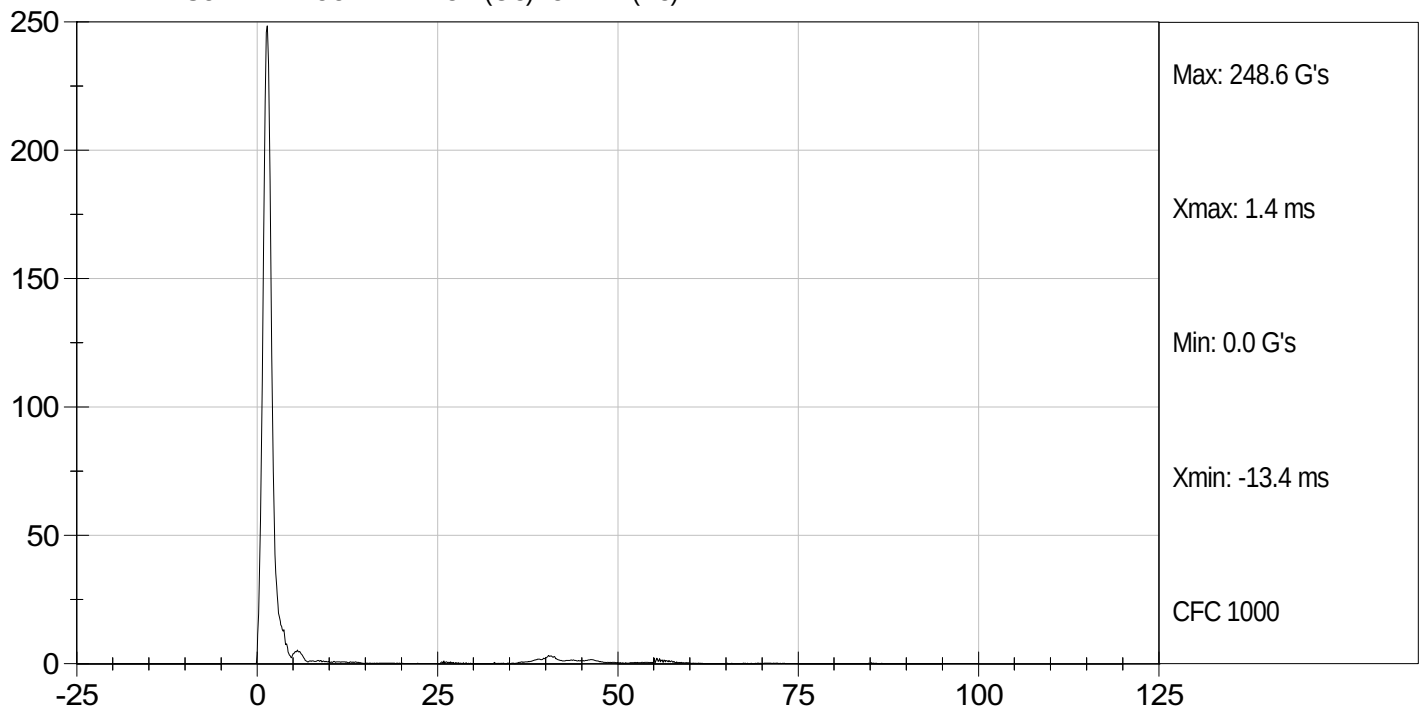

Approved By



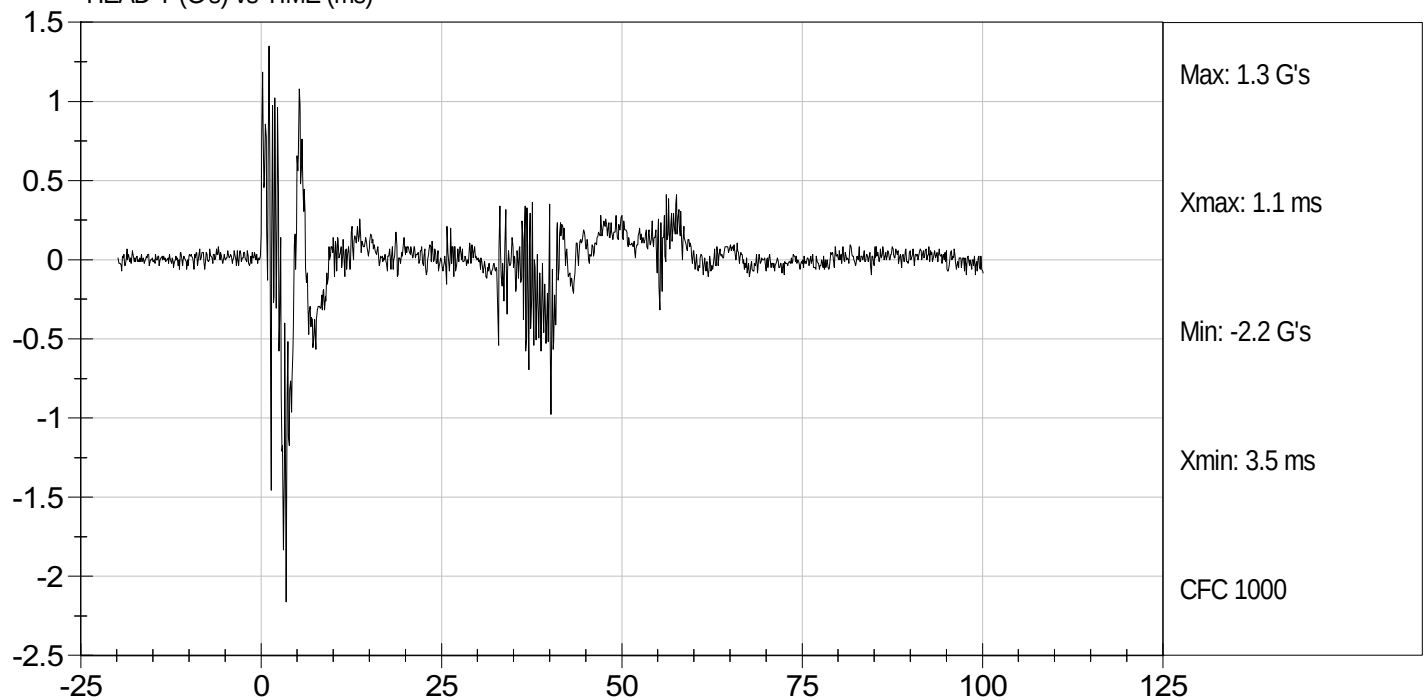
Test Desc: Head Drop
Component ID: D082221

Test Date: 8/6/08
Velocity: 0 ft/s, 0.00 m/s

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



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

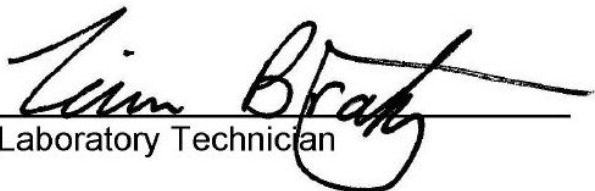


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

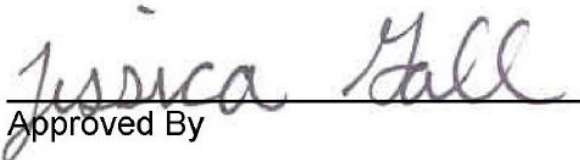
ATD Serial No: 065

Test I.D: D082222

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	25.48	Pass
	20 msec	G's	17.60 to 22.60	19.78	Pass
	30 msec	G's	12.50 to 18.50	17.97	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	17.83	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	35.3	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	69.9	Pass
	Time	msec	57.0 to 64.0	57.6	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	116.4	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	102.8	Pass
	Time	msec	47.0 to 58.0	47.0	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.0	Pass
Overall Test Results					Pass


 Laboratory Technician

8/6/08
 Test Date

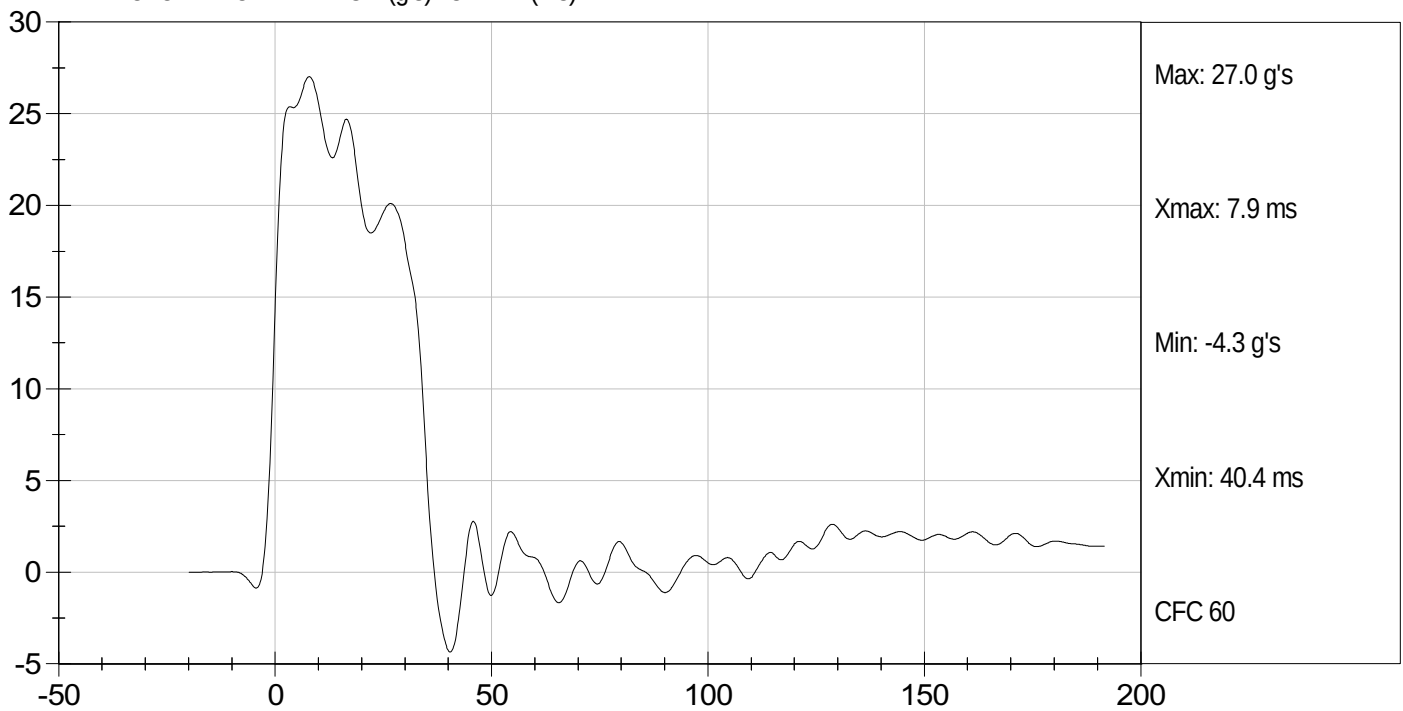

 Approved By



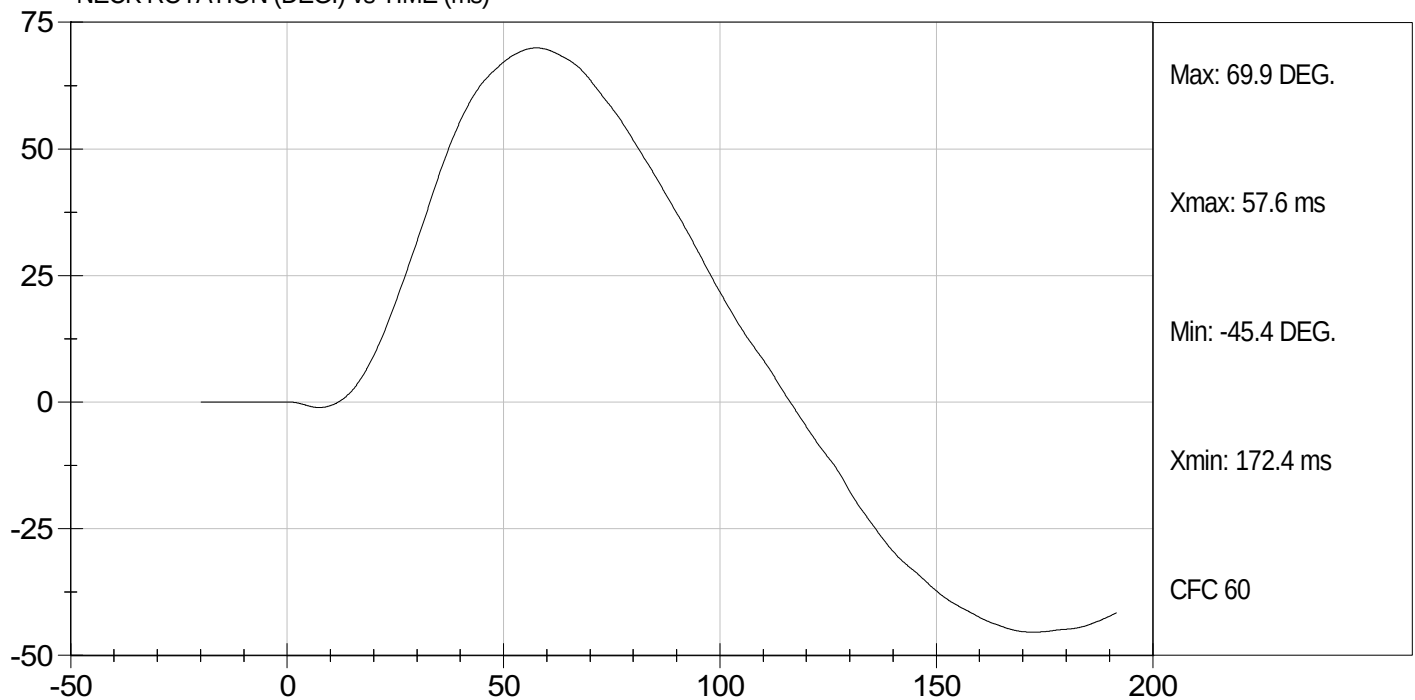
Test Desc: Neck Flexion
Component ID: D082222

Test Date: 8/6/08
Velocity: 23.15 ft/s, 7.06 m/s

PENDULUM DECELERATION (g's) vs TIME (ms)



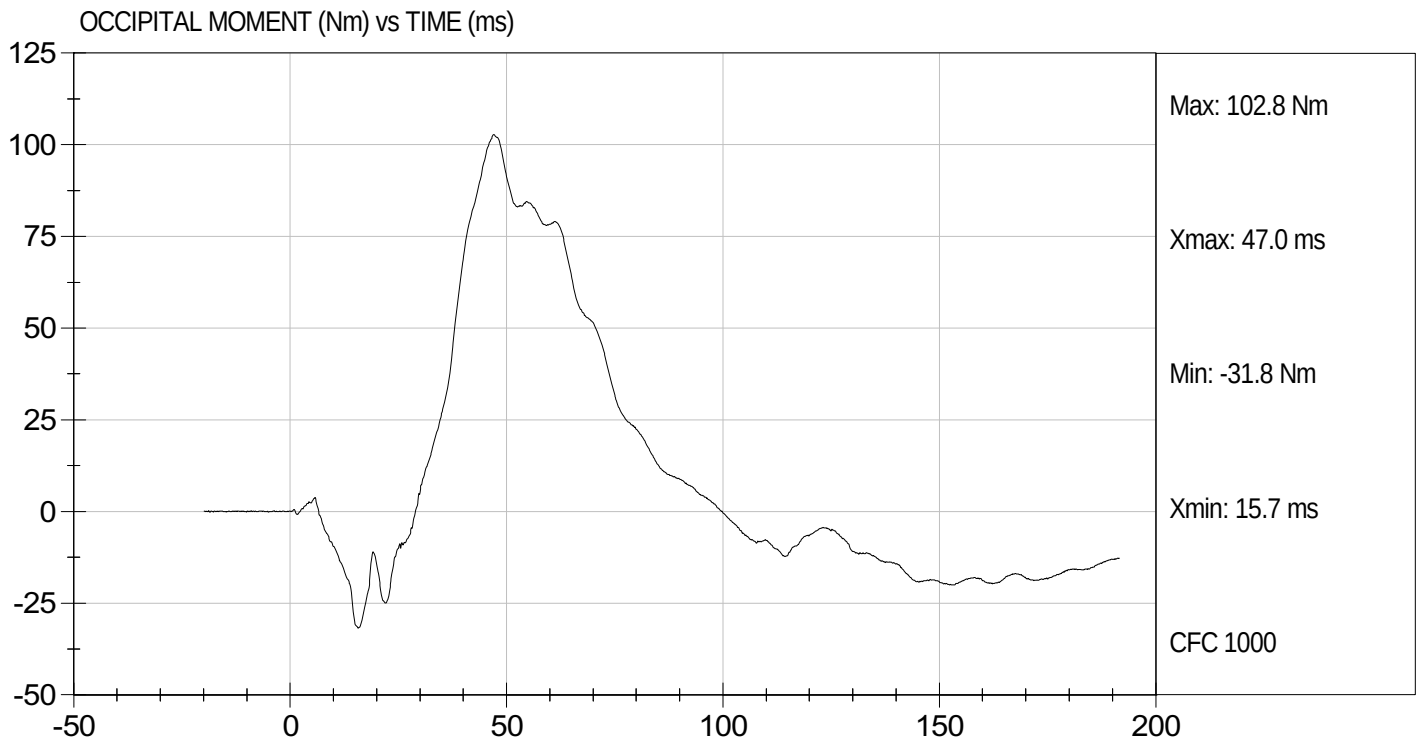
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D082222

Test Date: 8/6/08
Velocity: 23.15 ft/s, 7.06 m/s

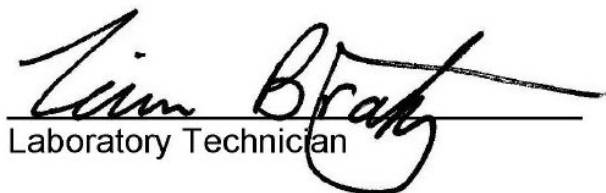


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

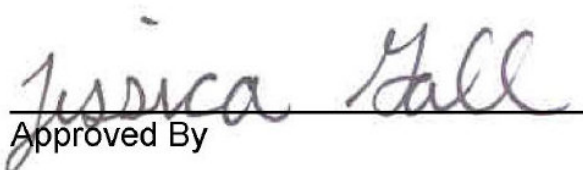
ATD Serial No: 065

Test I.D: D082223

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	20.18	Pass
	20 msec	G's	14.00 to 19.00	18.19	Pass
	30 msec	G's	11.00 to 16.00	15.91	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	17.62	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	39.1	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	94.8	Pass
	Time	msec	72.0 to 82.0	72.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	157.2	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-65.8	Pass
	Time	msec	65.0 to 79.0	67.1	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	133.3	Pass
Overall Test Results					Pass


Laboratory Technician

8/6/08
Test Date

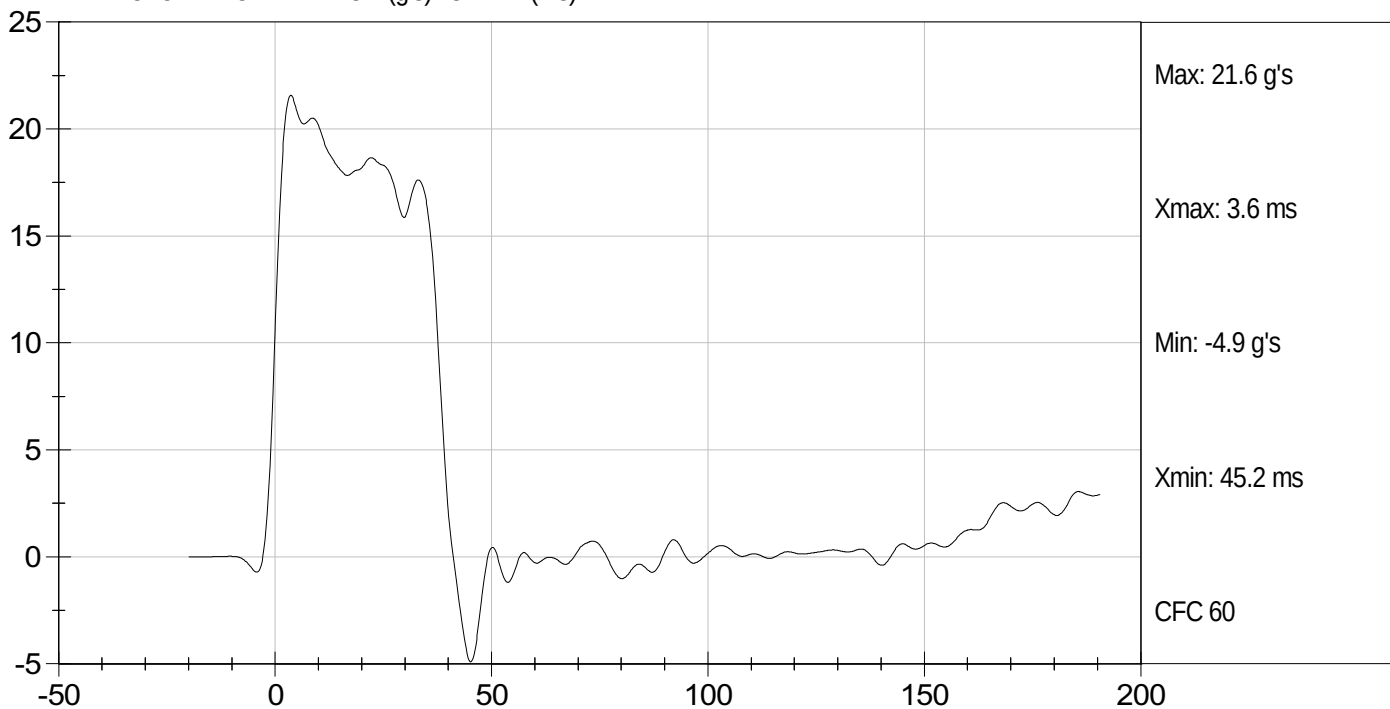

Approved By



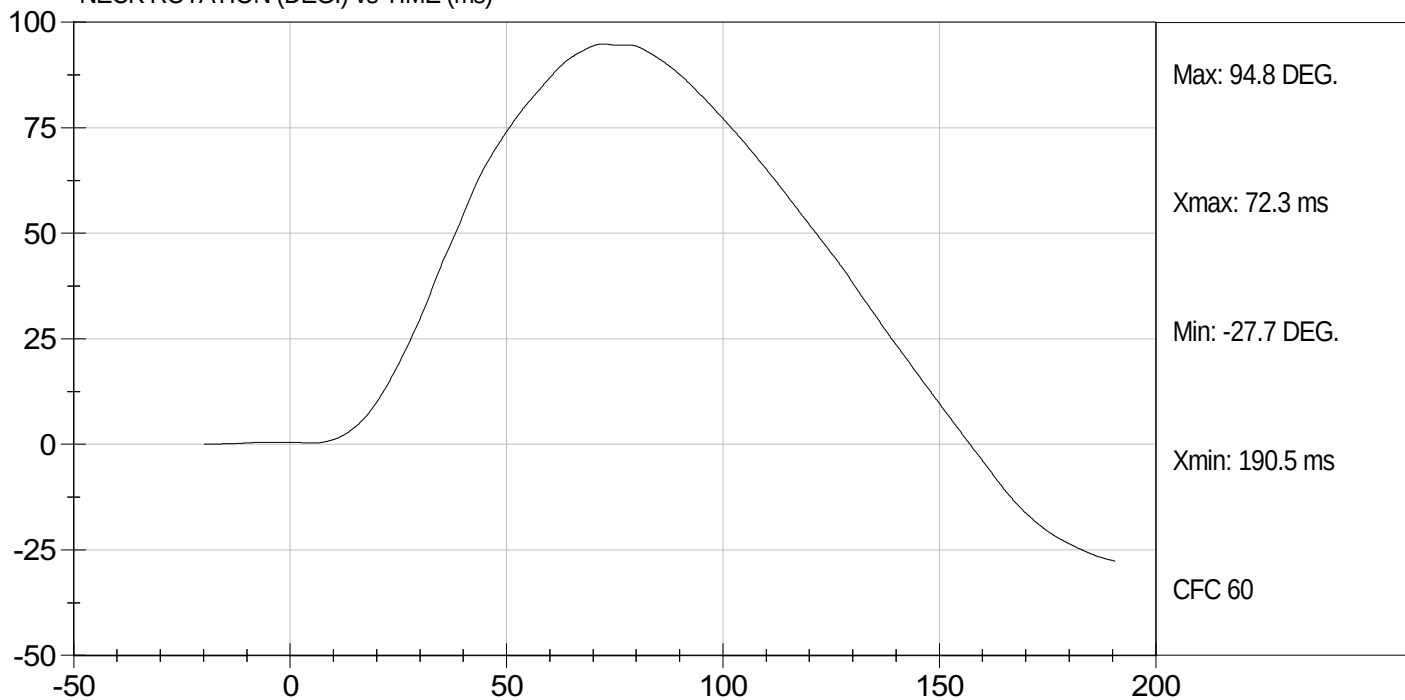
Test Desc: Neck Extension
Component ID: D082223

Test Date: 8/6/08
Velocity: 20.20 ft/s, 6.16 m/s

PENDULUM DECELERATION (g's) vs TIME (ms)



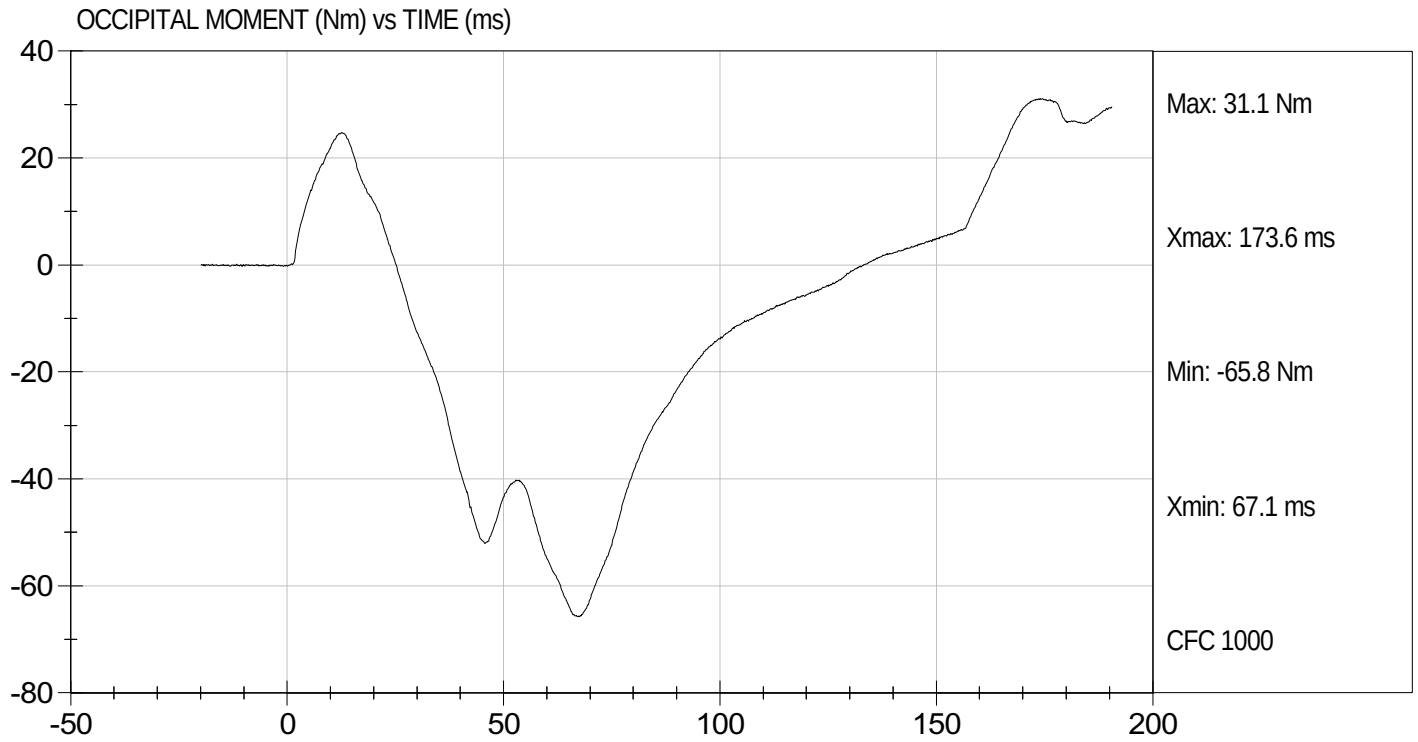
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Component ID: D082223

Test Date: 8/6/08
Velocity: 20.20 ft/s, 6.16 m/s

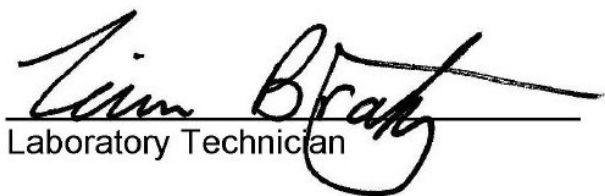


MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

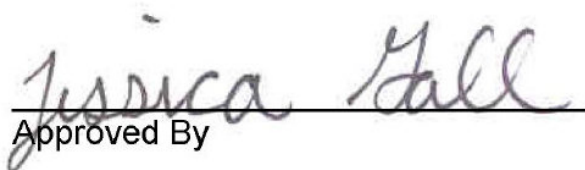
Test I.D: D082224

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,426	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.80	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results				Pass


Laboratory Technician

8/7/08

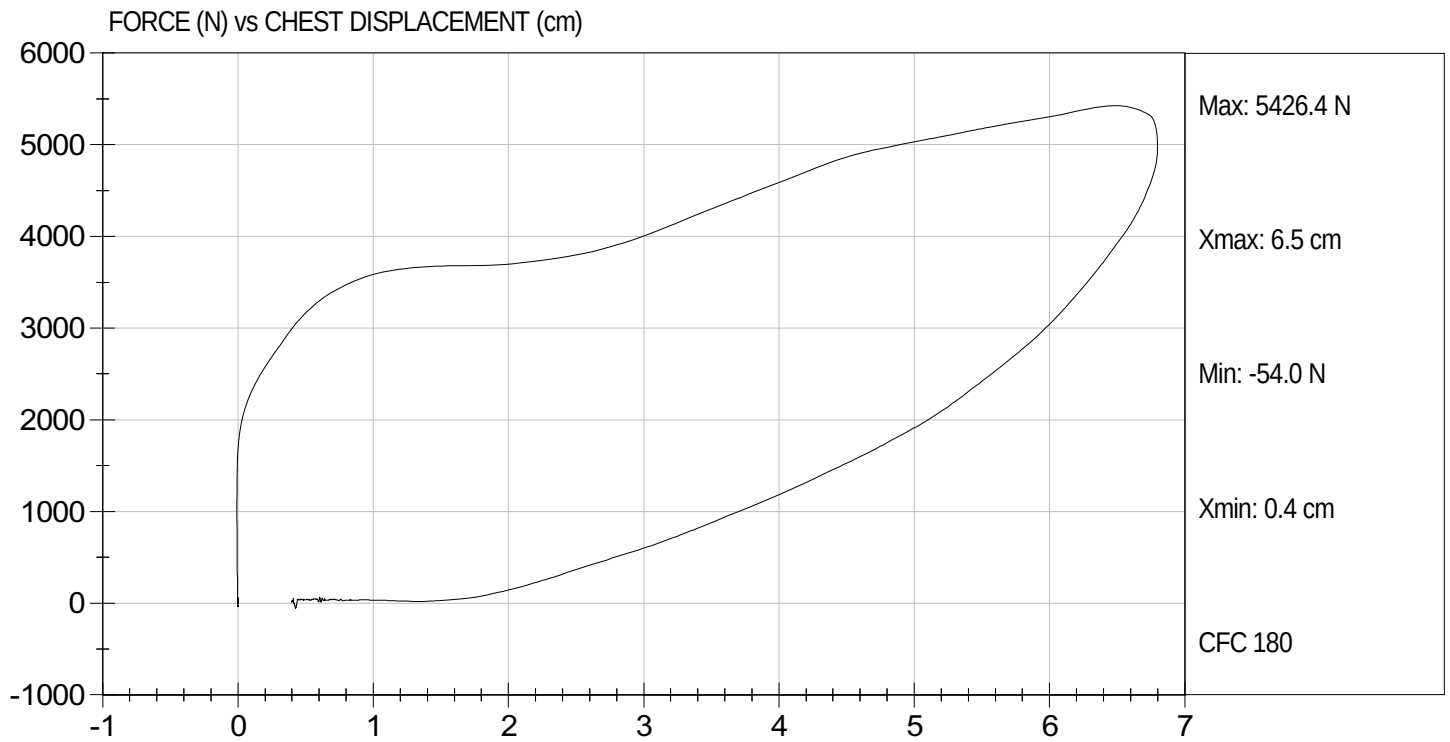
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D082224

Test Date: 8/7/08
Velocity: 22.22 ft/s, 6.77 m/s



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

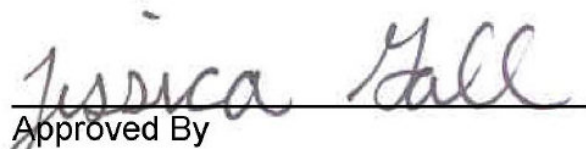
ATD Serial No: 065

Test I.D: D082225

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5,413	Pass
Overall Test Results				Pass


Laboratory Technician

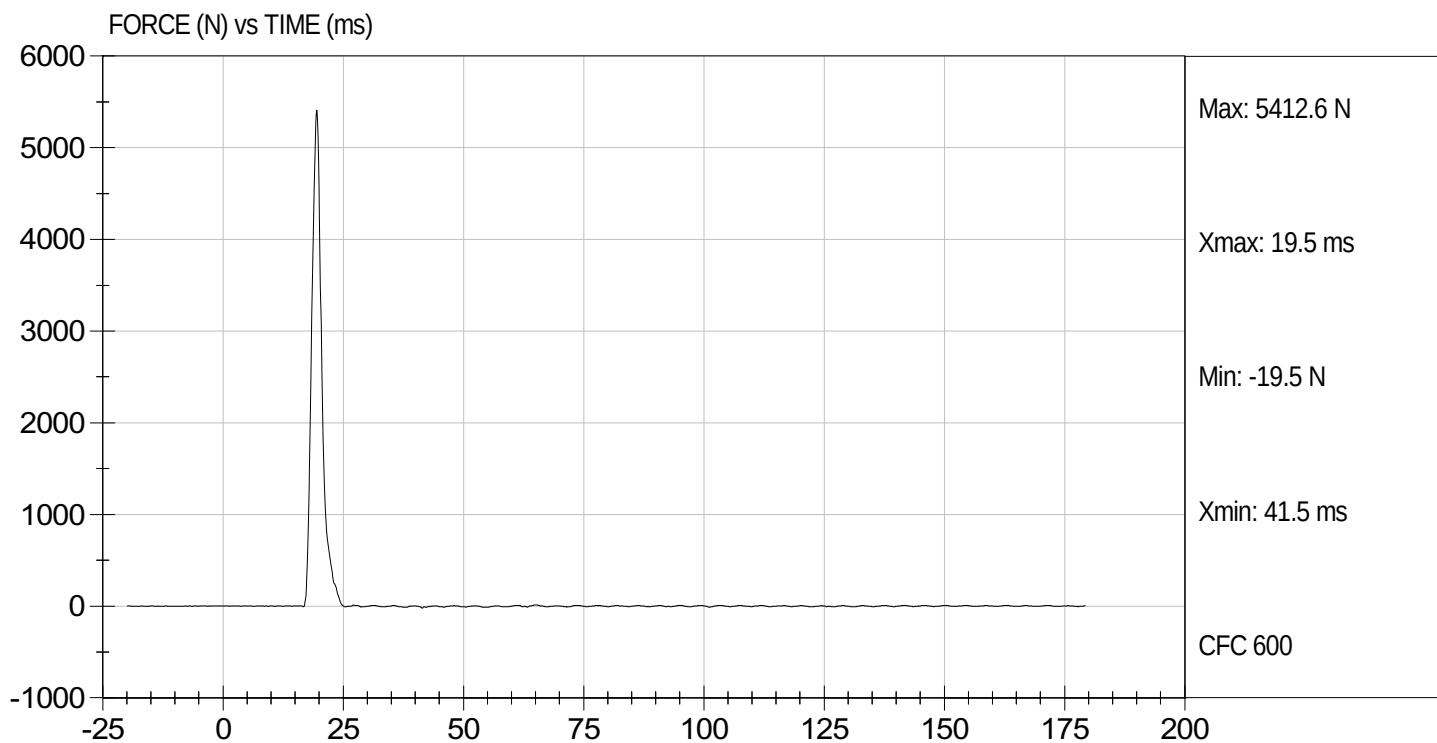
8/7/08
Test Date


Approved By



Test Desc: Right Knee
Component ID: D082225

Test Date: 8/7/08
Velocity: 6.92 ft/s, 2.11 m/s



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

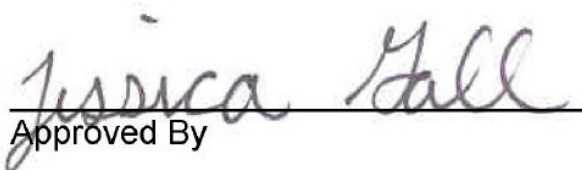
ATD Serial No: 065

Test I.D: D082226

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,667	Pass
Overall Test Results				Pass


Laboratory Technician

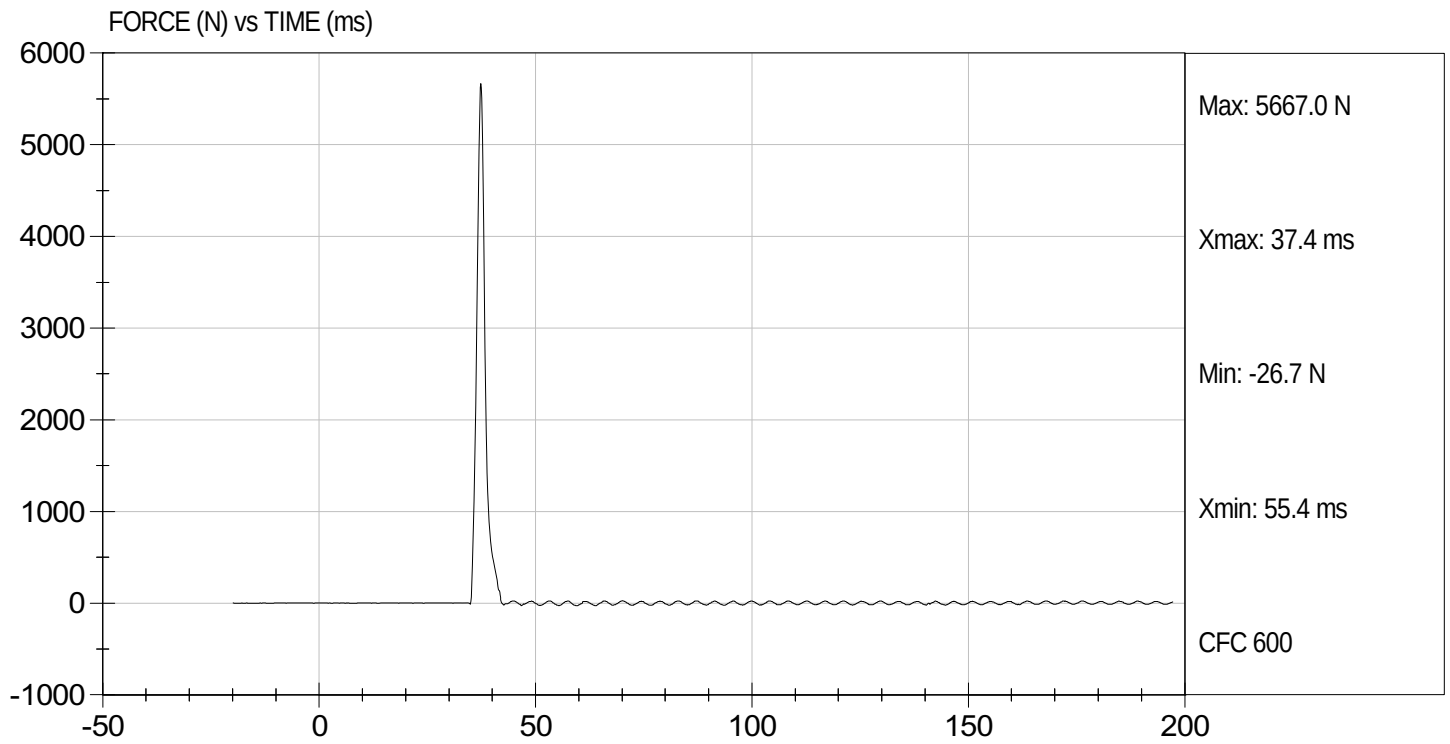
8/7/08
Test Date


Approved By



Test Desc: Left Knee
Component ID: D082226

Test Date: 8/7/08
Velocity: 6.86 ft/s, 2.09 m/s



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

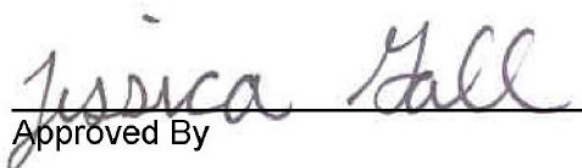
ATD Serial No: 065

Test I.D: D082220

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	38	38	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	56.4	54.6	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	44	43	Pass
Overall Test Results					Pass


Laboratory Technician

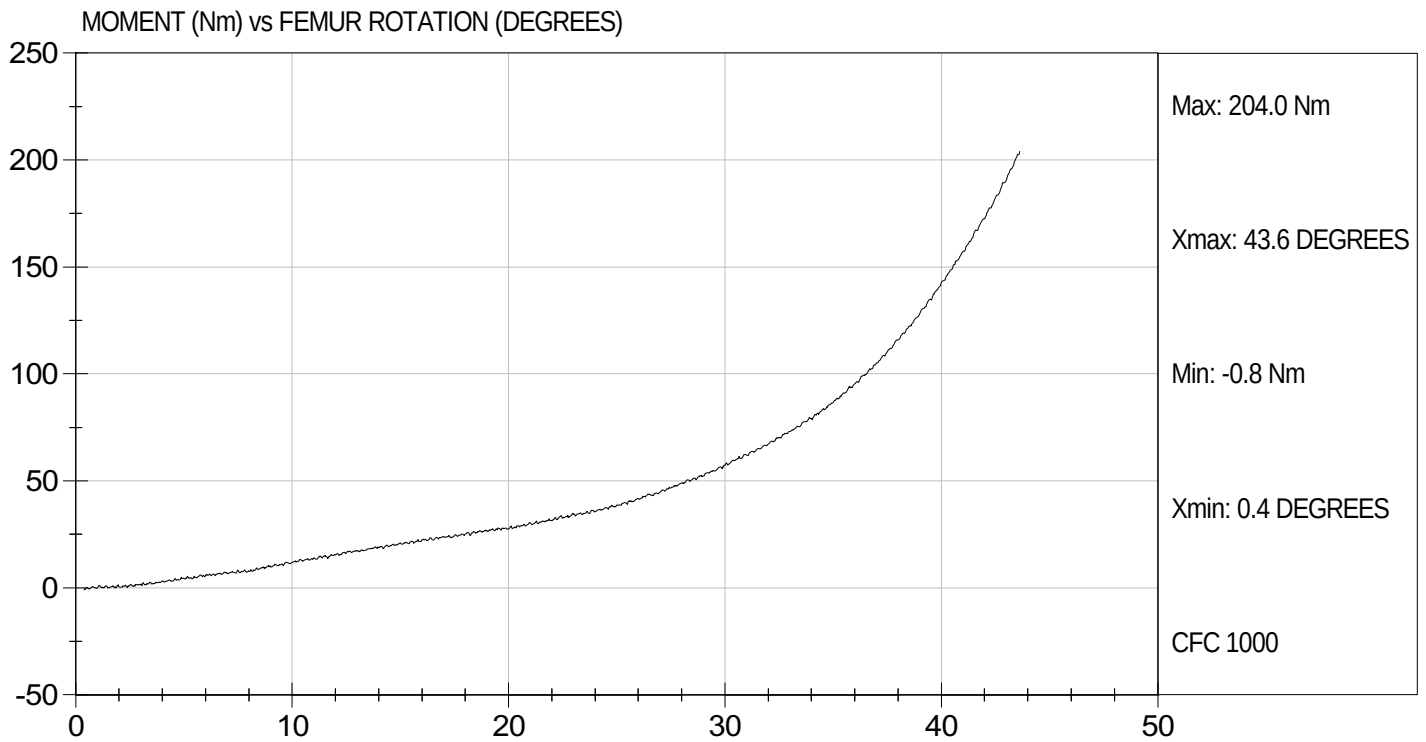
8/7/08
Test Date


Approved By



Test Desc: Hip Femur Flexion
Component ID: D082229

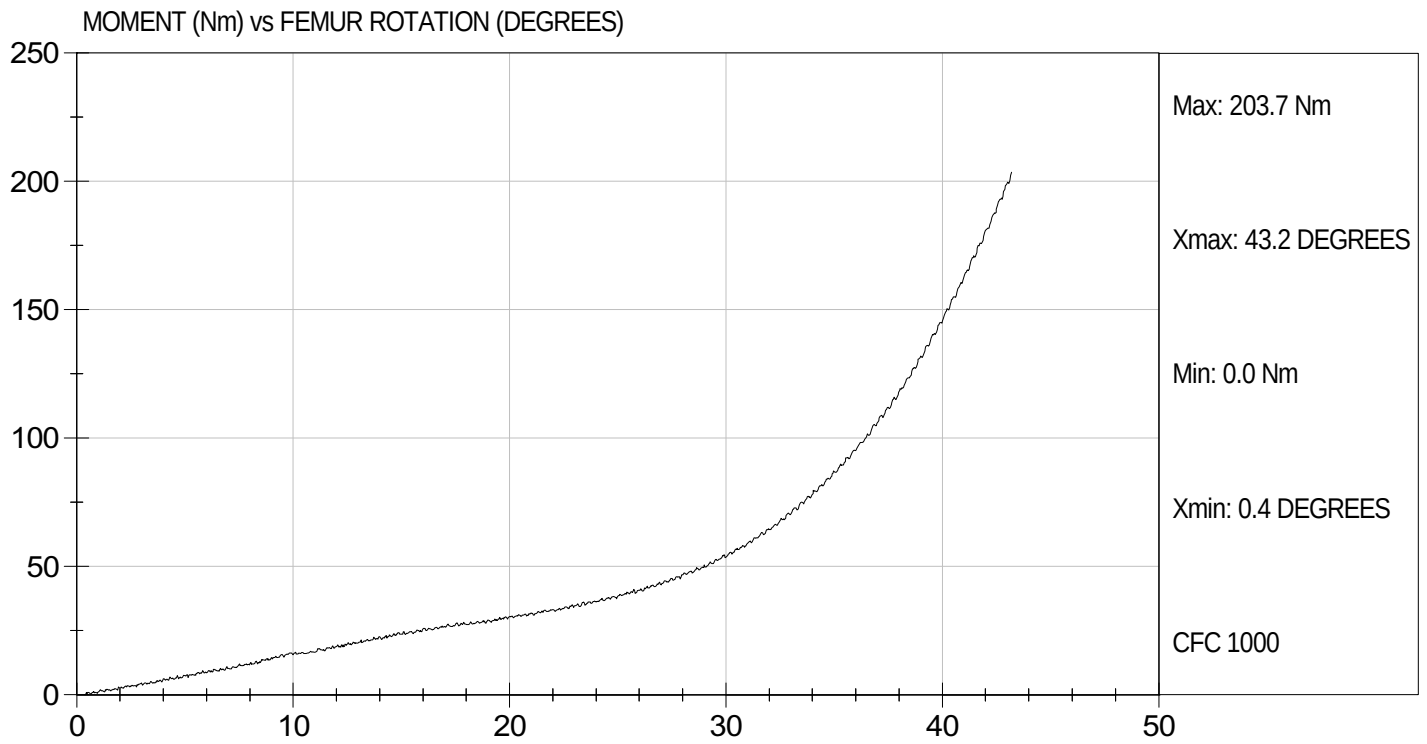
Test Date: 8/7/08
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D082220

Test Date: 8/7/08
Velocity: 0 ft/s, 0.00 m/s



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

ATD Serial No: 066

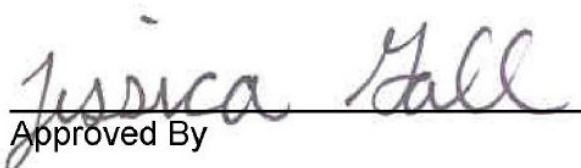
Test ID: D082231

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.0	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	225 - 275	237	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

8/6/08

Test Date

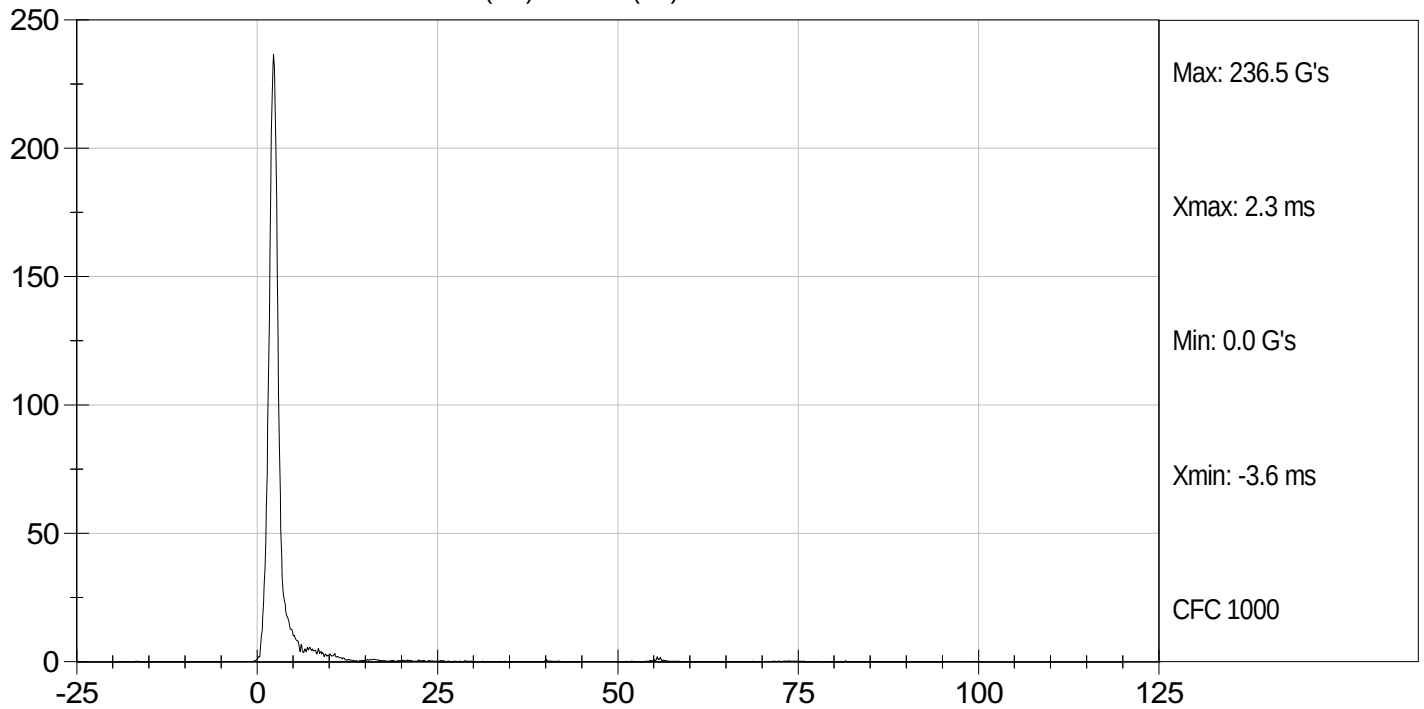

Approved By



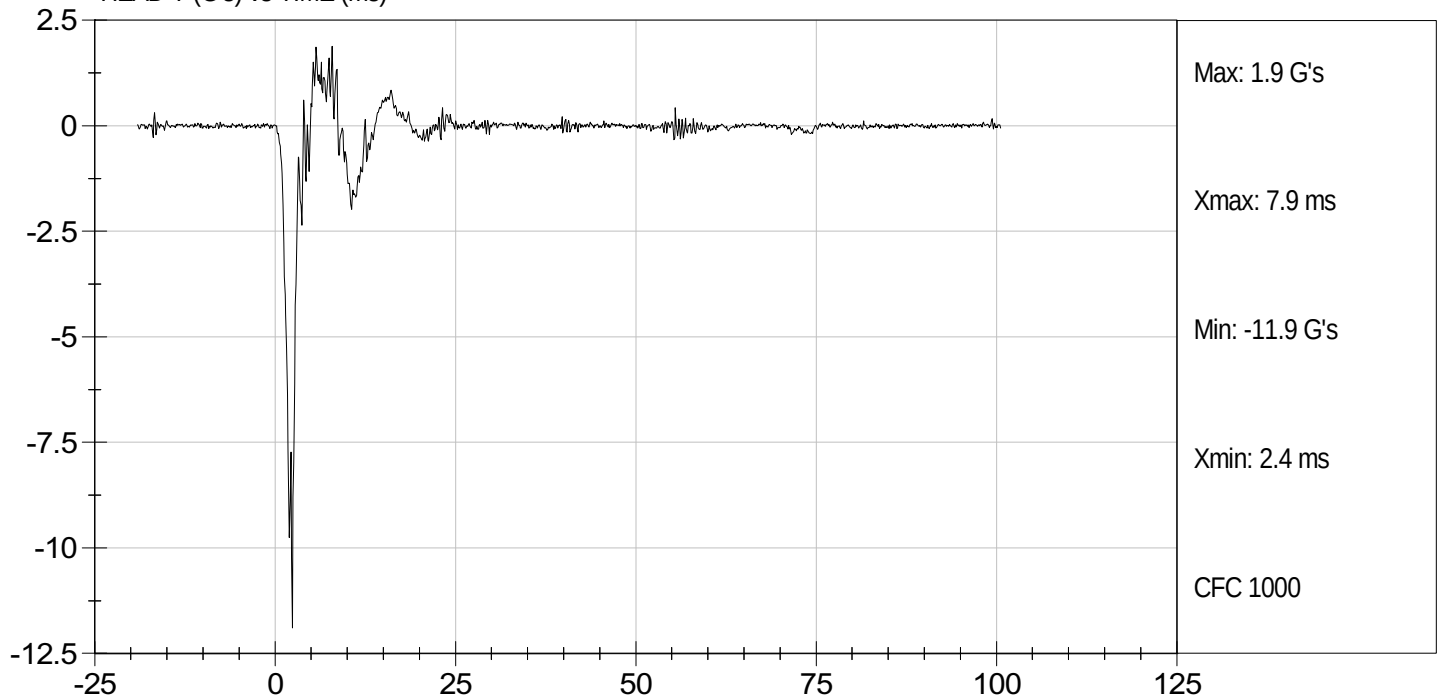
Test Desc: Head Drop
Component ID: D082231

Test Date: 8/6/08
Velocity: 0 ft/s, 0.00 m/s

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



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

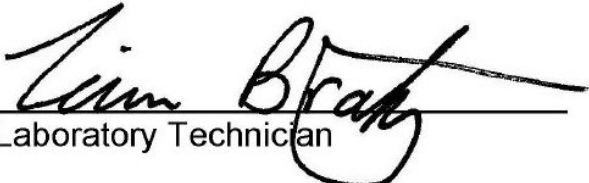


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

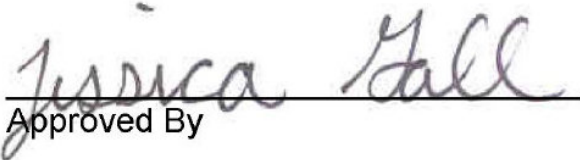
ATD Serial No: 066

Test I.D: D082232

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	26.25	Pass
	20 msec	G's	17.60 to 22.60	20.69	Pass
	30 msec	G's	12.50 to 18.50	17.23	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	17.28	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	34.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.9	Pass
	Time	msec	57.0 to 64.0	62.8	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.0	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	106.6	Pass
	Time	msec	47.0 to 58.0	47.3	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	102.6	Pass
Overall Test Results					Pass


 Laboratory Technician

8/6/08
 Test Date

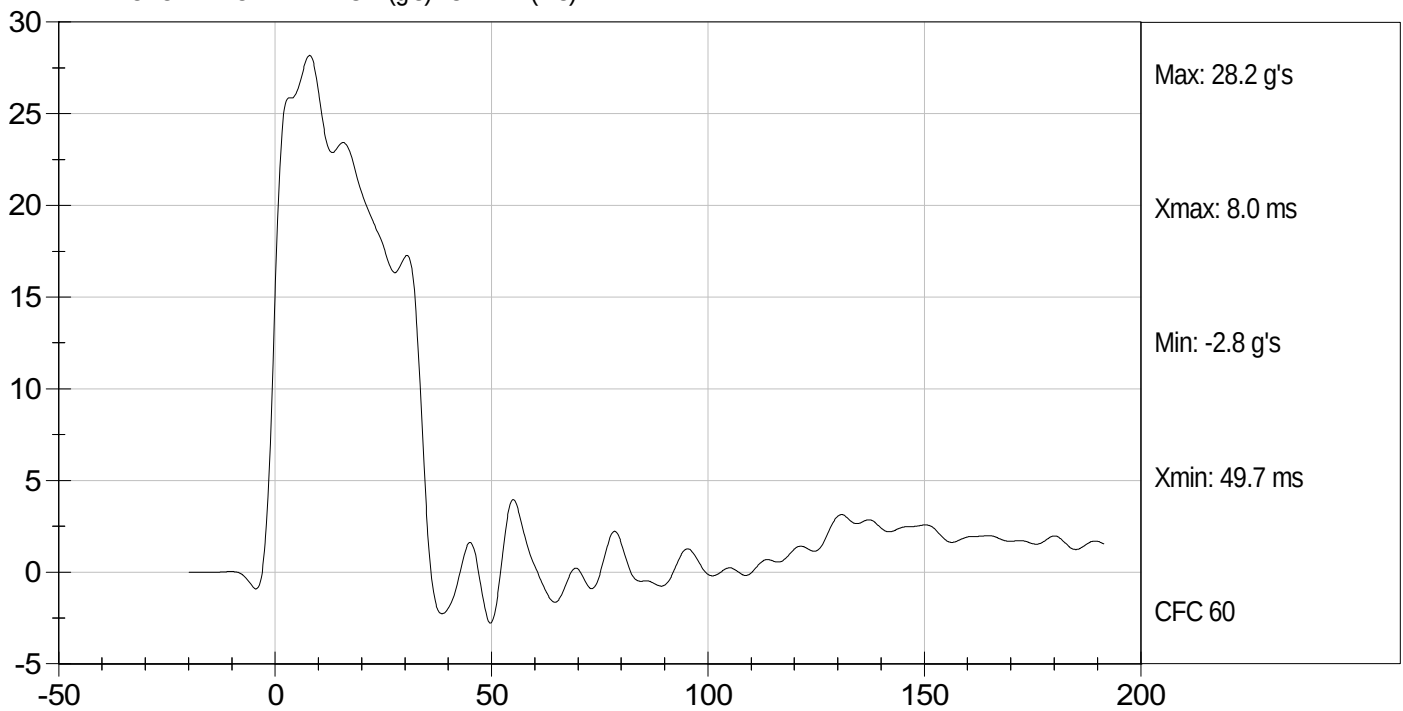

 Approved By



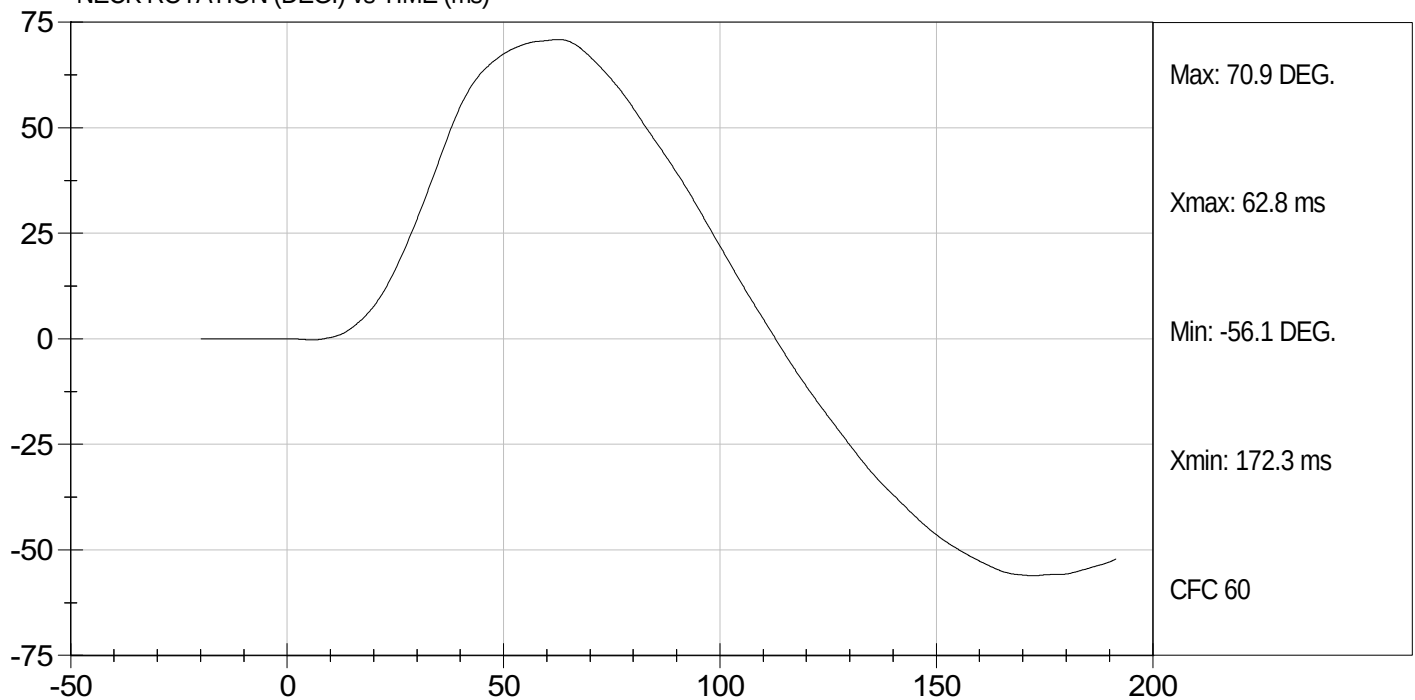
Test Desc: Neck Flexion
Component ID: D082232

Test Date: 8/6/08
Velocity: 22.83 ft/s, 6.96 m/s

PENDULUM DECELERATION (g's) vs TIME (ms)



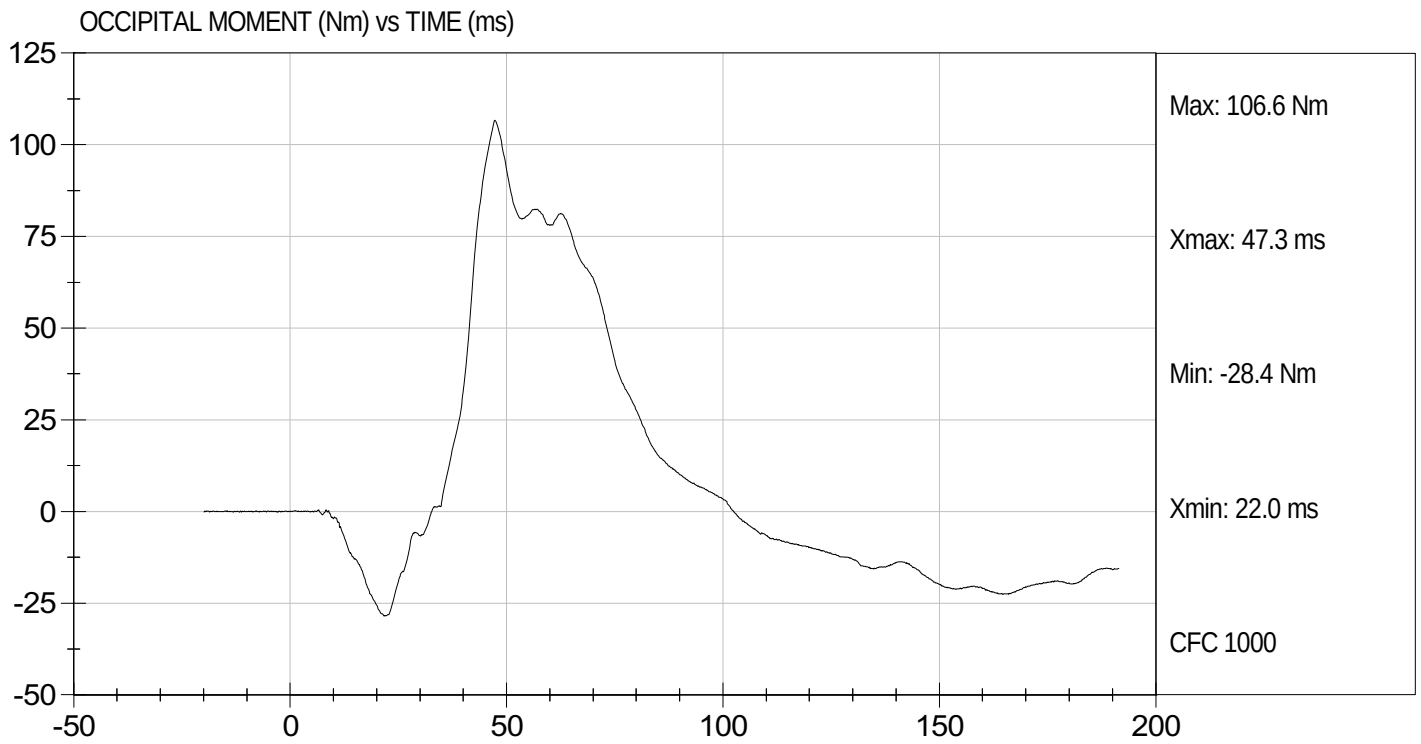
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Flexion
Component ID: D082232

Test Date: 8/6/08
Velocity: 22.83 ft/s, 6.96 m/s



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

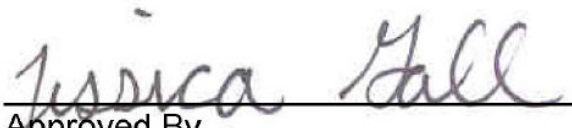
ATD Serial No: 066

Test I.D: D082233

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	20.8	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	20.41	Pass
	20 msec	G's	14.00 to 19.00	17.83	Pass
	30 msec	G's	11.00 to 16.00	14.81	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	15.72	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	98.3	Pass
	Time	msec	72.0 to 82.0	72.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	150.3	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-68.3	Pass
	Time	msec	65.0 to 79.0	68.7	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	139.0	Pass
Overall Test Results					Pass


 Laboratory Technician

8/7/08
 Test Date

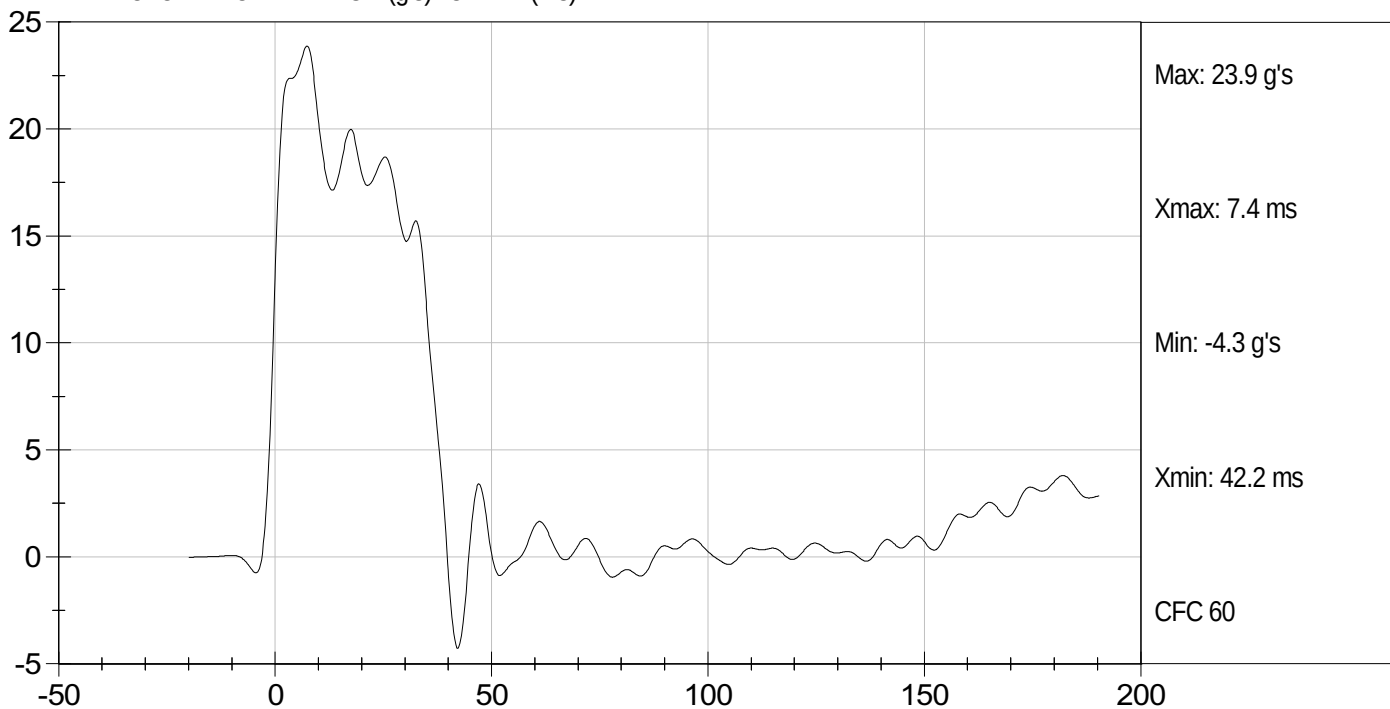

 Approved By



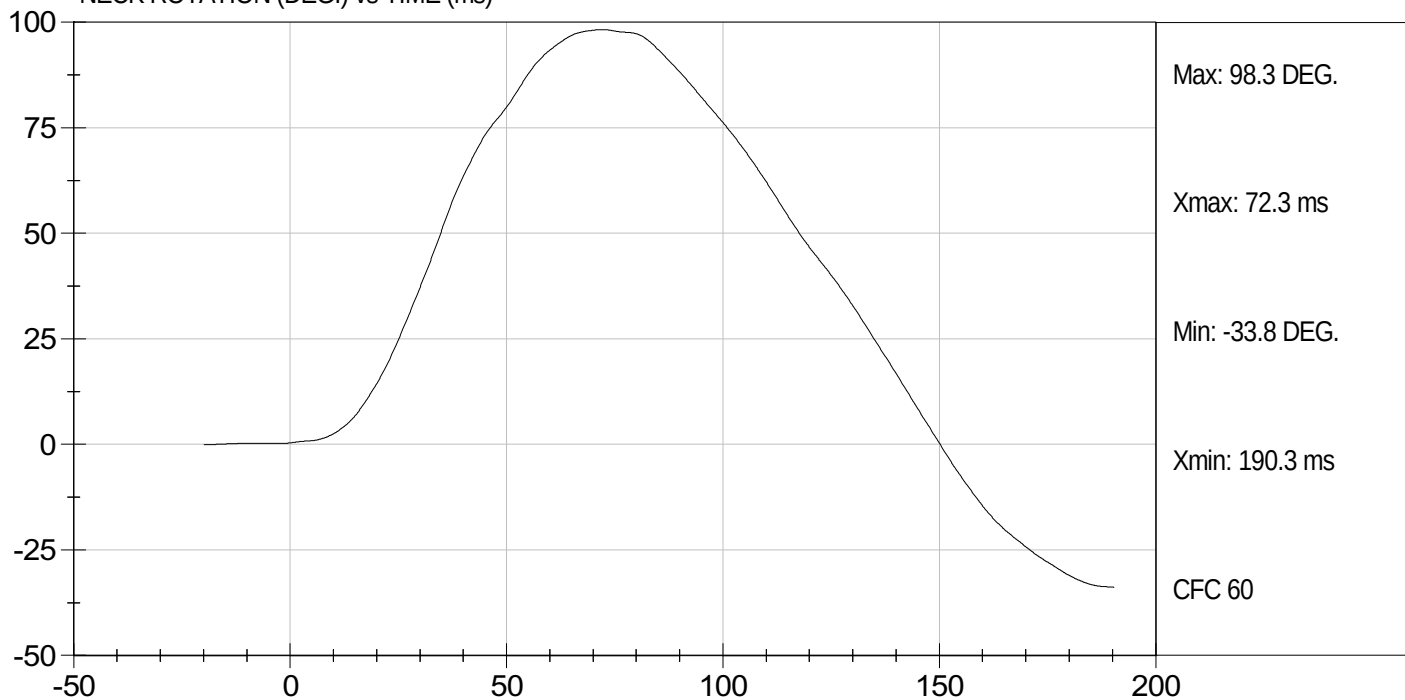
Test Desc: Neck Extension
Component ID: D082233

Test Date: 8/7/08
Velocity: 20.20 ft/s, 6.16 m/s

PENDULUM DECELERATION (g's) vs TIME (ms)



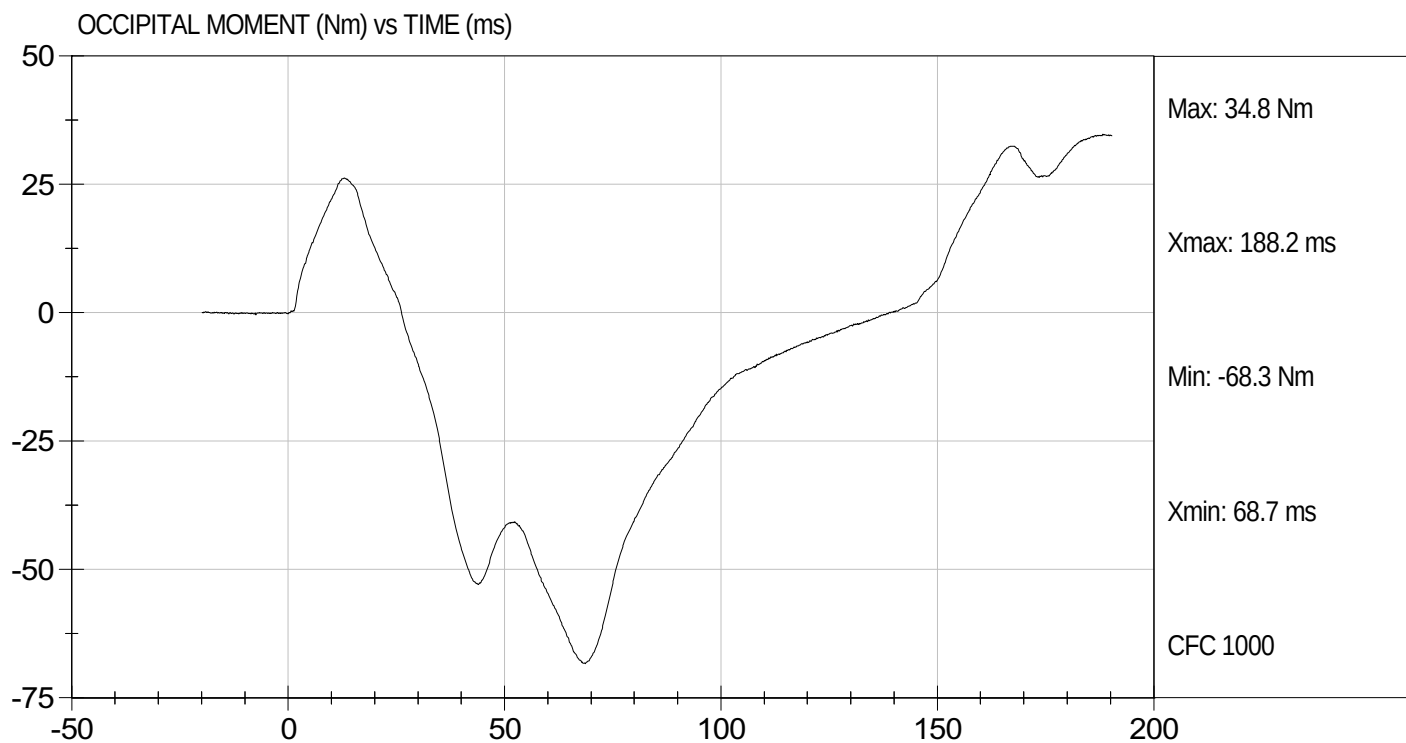
NECK ROTATION (DEG.) vs TIME (ms)





Test Desc: Neck Extension
Component ID: D082233

Test Date: 8/7/08
Velocity: 20.20 ft/s, 6.16 m/s



MGA RESEARCH CORPORATION
THORAX IMPACT
HYBRID III 50TH PERCENTILE MALE

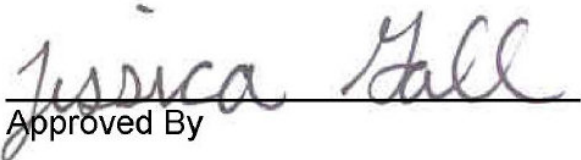
ATD Serial No: 066

Test I.D: D082234

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/s	6.58 to 6.82	6.77	Pass
Peak Probe Force	N	5159 to 5893	5,524	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.41	Pass
Internal Hysteresis	%	69 to 85	72	Pass
Overall Test Results			Pass	


Laboratory Technician

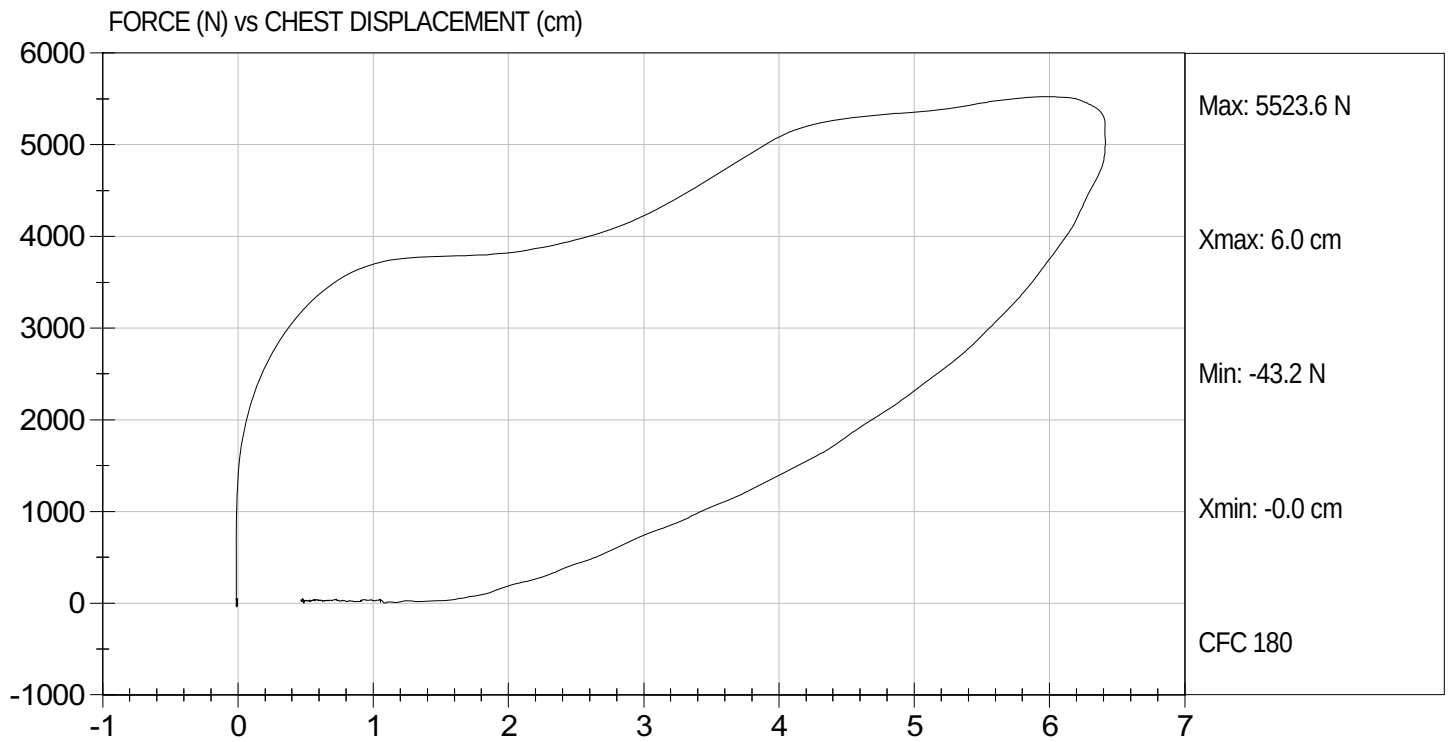
8/7/08
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D082234

Test Date: 8/7/08
Velocity: 22.22 ft/s, 6.77 m/s



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

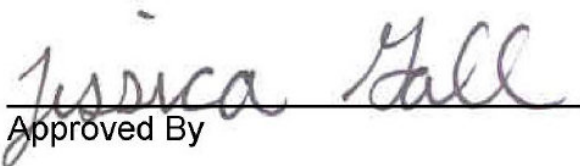
ATD Serial No: 066

Test I.D: D082235

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	20.7	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,099	Pass
Overall Test Results				Pass


Laboratory Technician

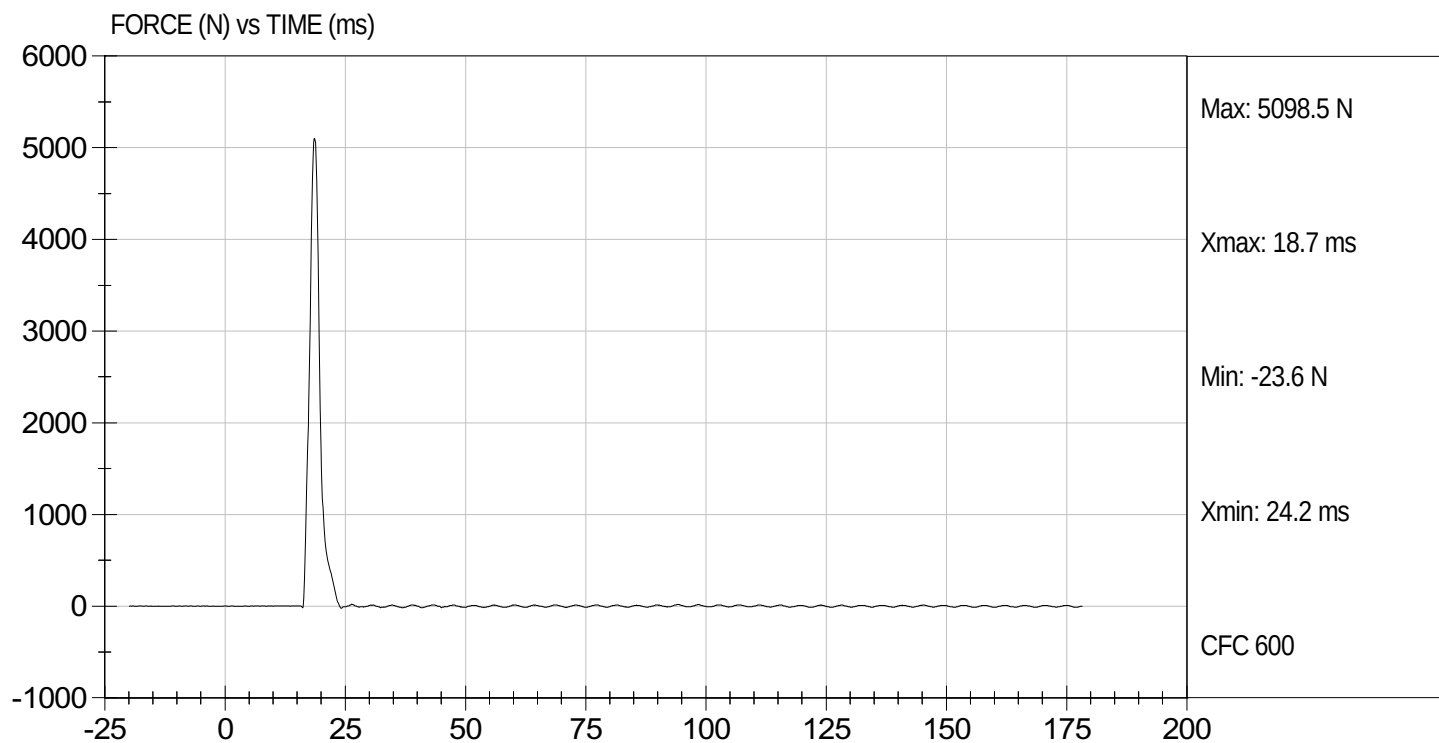
8/7/08
Test Date


Approved By



Test Desc: Right Knee
Component ID: D082235

Test Date: 8/7/08
Velocity: 6.86 ft/s, 2.09 m/s



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

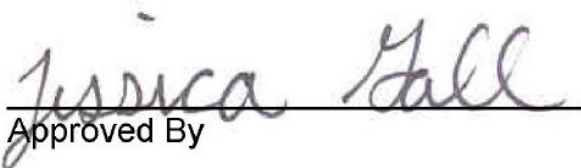
ATD Serial No: 066

Test I.D: D082236

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 to 25.5	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	38	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	4,908	Pass
Overall Test Results				Pass


Laboratory Technician

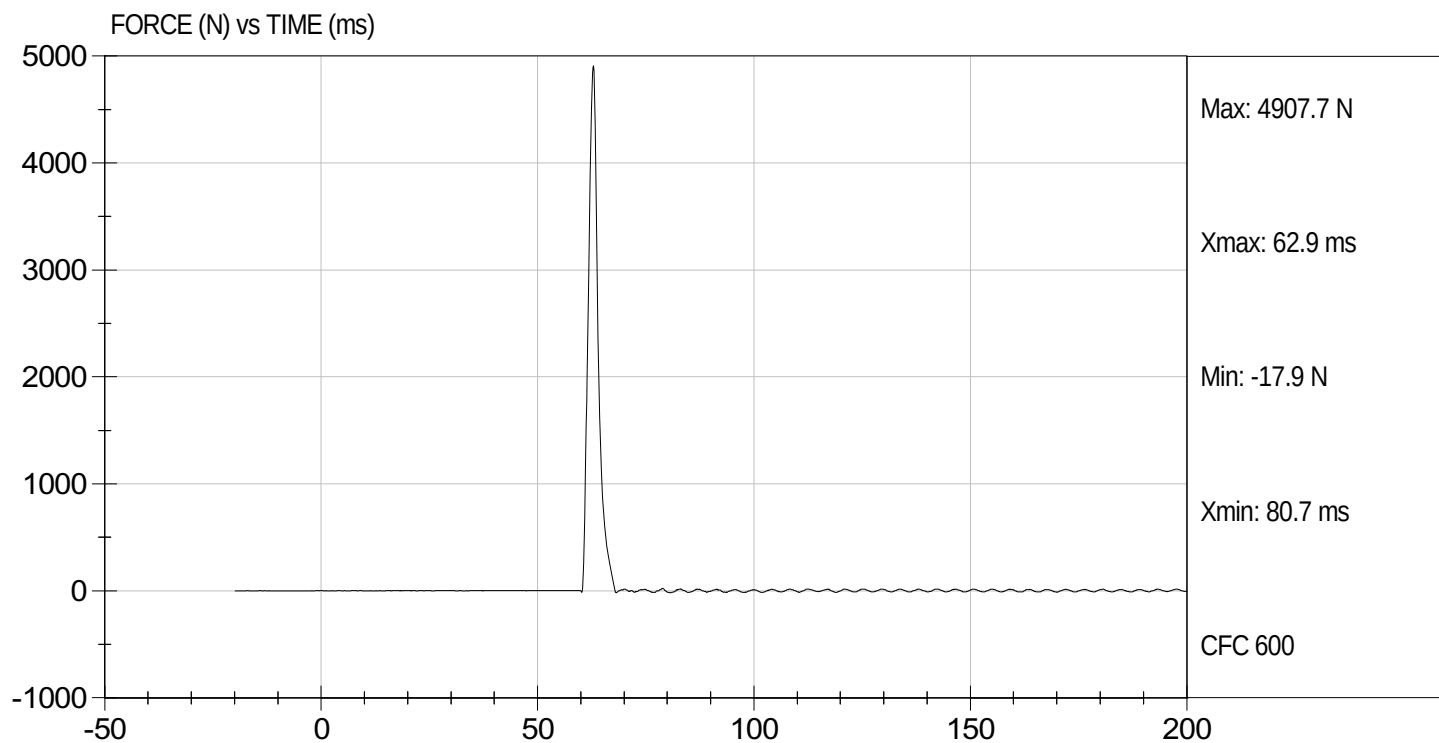
8/7/08
Test Date


Approved By



Test Desc: Left Knee
Component ID: D082236

Test Date: 8/7/08
Velocity: 6.89 ft/s, 2.10 m/s



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

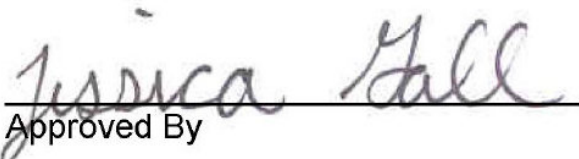
ATD Serial No: 066

Test I.D: D082230

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	38	38	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	83.5	84.9	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	40	41	Pass
Overall Test Results					Pass


 Laboratory Technician

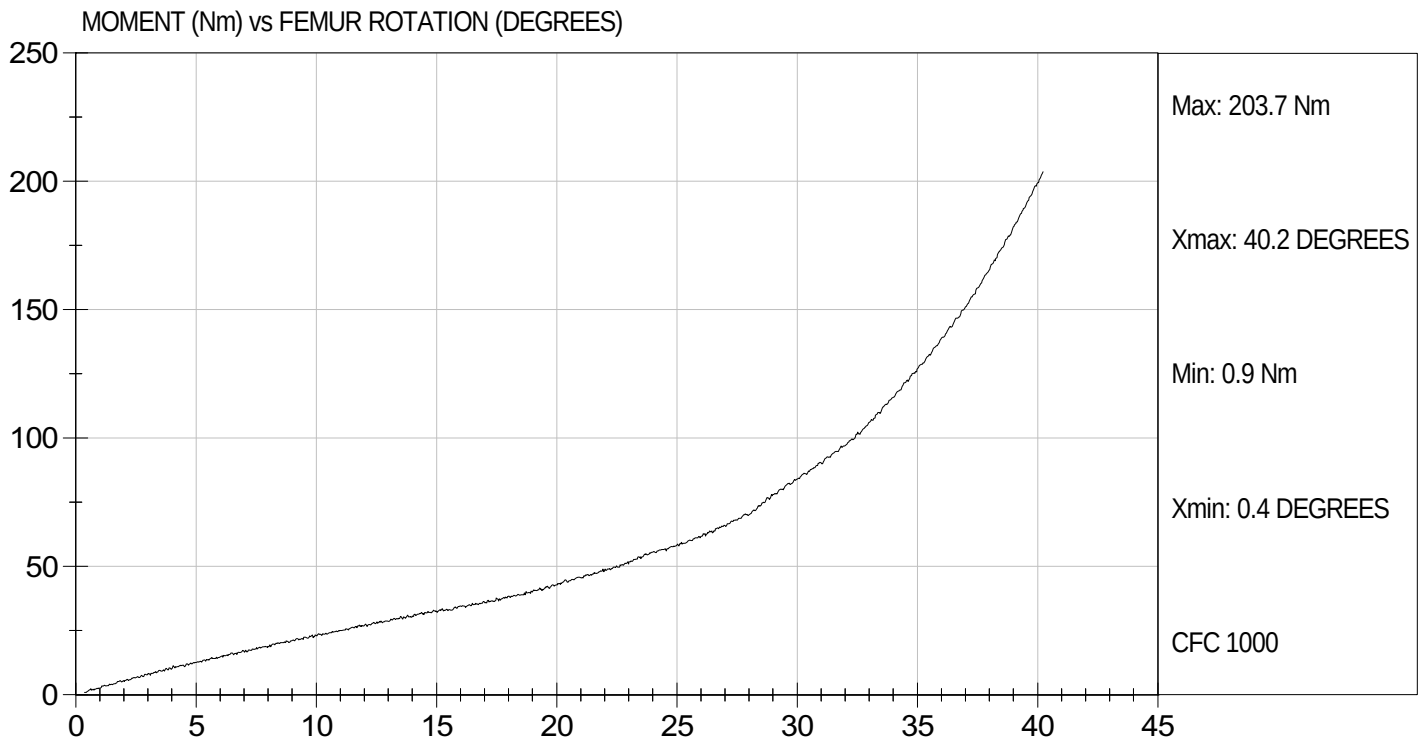
8/7/08
 Test Date


 Approved By



Test Desc: Hip Femur Flexion
Component ID: D082239

Test Date: 8/7/08
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D082230

Test Date: 8/7/08
Velocity: 0 ft/s, 0.00 m/s

