

REPORT NUMBER: NCAP-MGA-2010-004

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

**HYUNDAI MOTOR COMPANY
2010 HYUNDAI GENESIS 2-DR COUPE
NHTSA NUMBER: MA0519**

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



Test Date: September 18, 2009

Final Report Date: October 16, 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**

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Technical Report Documentation Page

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16. Abstract A frontal barrier impact was conducted on a 2010 Hyundai Genesis 2-Dr Coupe at MGA Research Corporation on September 18, 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 56.6 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 515 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 (HIC₃₆)</td> <td>N/A</td> <td>1000</td> <td>558</td> <td>325</td> </tr> <tr> <td>Max. Thorax Accel. (3ms Clip)</td> <td>G's</td> <td>60</td> <td>40</td> <td>48</td> </tr> <tr> <td>Left Femur Force</td> <td>Newton</td> <td>10009</td> <td>-1362</td> <td>-1534</td> </tr> <tr> <td>Right Femur Force</td> <td>Newton</td> <td>10009</td> <td>-4158</td> <td>-718</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	558	325	Max. Thorax Accel. (3ms Clip)	G's	60	40	48	Left Femur Force	Newton	10009	-1362	-1534	Right Femur Force	Newton	10009	-4158	-718
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TABLE OF CONTENTS

<u>Section</u>		<u>Page No</u>
1	Purpose and Summary of the Test	1
2	Occupant and Vehicle Information / Data Sheets	3

<u>Data Sheet No.</u>		<u>Page No.</u>
1	Crash Test Summary	3
2	General Test and Vehicle Parameter Data	4
3	Test Vehicle Tire Information	6
4	Test Vehicle Information	7
5	Dummy Positioning in Vehicle	9
6	Seat Belt Positioning Data	11
7	Vehicle Accelerometer Locations	12
8	Summary of FMVSS 212 and FMVSS 219 (Partial) Data	13
9	Summary of FMVSS 301 Data	14
10	Vehicle Measurements	15
11	Camera Locations	18
12	Photographic Reference Target Locations	20
13	Vehicle Intrusion Measurements	21
14	Load Cell Locations on Fixed Barrier	24
15	Accident Investigation Division Data	25
16	Dummy/Vehicle Temperature Stabilization Chart	26

<u>Appendix</u>		
A	Photographs	A
B	Dummy Response Data Traces	B
C	Dummy Calibration Data	C

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 Hyundai Genesis 2-Dr Coupe at a velocity of 56.6 kph. The test was performed at MGA Research Corporation on September 18, 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. 066) and right-front passenger (position 2) ATD (Serial No. 065) 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 515 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 and headliner. The driver's knees contacted the steering column. The passenger's head and chest contacted the airbag. The passenger's head also contacted the headrest and headliner. The passenger's knees contacted the glove box and frontal airbag.

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	558	48.5	84.5	40	48.0	51.0	-23	-1362	-4158
Passenger	325	57.5	93.5	48	64.3	69.0	-27	-1534	-718

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

TEST NOTES

There was no valid data collected for:
Driver Right Ankle Z after 80 msec.

SECTION 2
OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2010 Hyundai Genesis Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
Test Date: 9/18/2009

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Doors were locked	Doors were locked
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	Windshield Cracked	

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	543
Center	mm	542
Right Side	mm	498
Average	mm	528

BELT LENGTH DATA

Measurement Description	Units	Driver	Passenger
Shoulder belt length as measured on ATD	mm	1020	1030
Lap belt length as measured on ATD	mm	810	810
Remainder of belt on reel	mm	1655	1645
Total belt length for continuous webbing systems	mm	3485	3485

DATA SHEET NO. 2
GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

TEST VEHICLE INFORMATION

Manufacturer	Hyundai
Model	Genesis
Body Style	Coupe
NHTSA No.	MA0519
VIN	KMHHT6KD3AU016471
Color	Karussell White
Delivery Date	9/8/2009
Odometer Reading (mile)	17 miles
Dealer	Northtown Hyundai
Transmission	Manual
Final Drive	Rear
Number of Cylinders	4
Engine Displacement (L)	2.0
Engine Placement	Longitudinal
Automatic Door Lock (ADL)	Yes
Owners Manual Details Instructions on Disabling ADLs	No
Bucket Seats	Yes

TEST VEHICLE OPTIONS

Front Airbag	Yes
Driver Side Curtain Airbag	Yes
Driver Side Torso Airbag	Yes
Driver Knee Airbag	No
Passenger Side Curtain Airbag	Yes
Passenger Side Torso Airbag	Yes
Passenger Knee 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	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Hyundai Motor Company
Date of Manufacture	JUN/12/09

GVWR (kg)	1930
GAWR Front (kg)	1000
GAWR Rear (kg)	1050

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket		
Number of Occupants	2	2		4
Capacity Wt. (VCW) (kg)				322
Cargo Wt. (RCLW) (kg)				50

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

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	406.4	354.7		438.2	420.9	
Right	kg	414.2	346.1		441.8	418.2	
Ratio	%	53.9	46.1		51.2	48.8	
Totals	kg	820.6	700.8	1521.4	880.0	839.1	1719.1

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1521.4
Weight of 2 P572E ATDs	kg	156.0
Rated Cargo/Luggage Weight (RCLW)	kg	50
Calculated Vehicle Target Weight (TVTW)	kg	1727.4

TEST VEHICLE ATTITUDES AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	694	693	717	719	1299
As Tested	mm	687	686	694	695	1376
Post Test	mm	748	771	696	702	

Vehicle Wheelbase (mm): 2820

Weight of Ballast secured in trunk (kg): 31.8

Vehicle Components Removed: Trunk carpet, right rear tail light, spare tire, jack

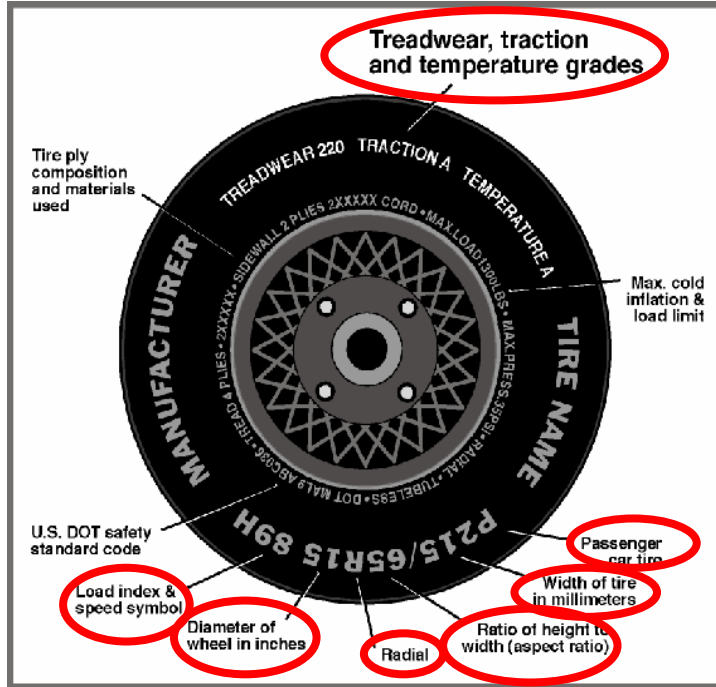
Ballast weight does not include instrumentation and data acquisition system.

DATA SHEET NO. 3

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009



DATA FROM TIRE AND TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	240	240
Recommended Tire Size	225/45R18	245/45R18
Tire Size on Vehicle	225/45R18	245/45R18
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Potenza	Potenza
Tire Type	P	P
Tire Width (mm)	225	245
Ratio of Height to Width (aspect ratio)	45	45
Radial	R	R
Wheel Diameter	18	18
Load Index & Speed Symbol	91V	96V
Treadwear	260	260
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 4
TEST VEHICLE INFORMATION

Test Vehicle: 2010 Hyundai Genesis Coupe
Test Program: 35mph Frontal Impact

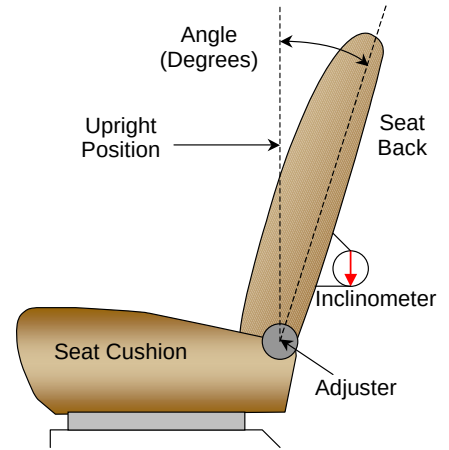
NHTSA No.: MA0519
Test Date: 9/18/2009

NORMAL DESIGN RIDING POSITION

The driver and passenger seat back is positioned to the manufacturer's designated angle. The procedure is as follows: For the driver and front passenger seat, set seat back at 14 degrees using headrest pole angle.

Driver seat back angle: 14.3° on headrest post

Passenger seat back angle: 14.7° on headrest post

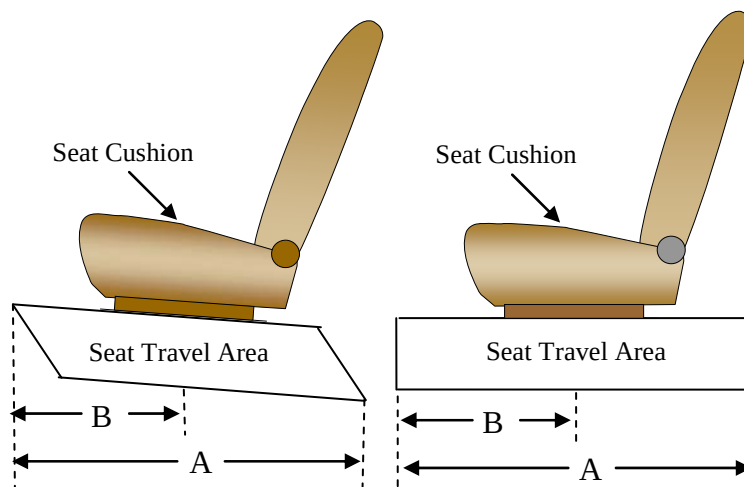


SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	248 mm	124 mm from forward-most
Passenger Seat	22 detents	11 th detent (forward-most as 0)

ADJUSTABLE D-RING POSITION

The driver and passenger D-rings were not adjustable.



DATA SHEET NO. 4...(CONTINUED)

TEST VEHICLE INFORMATION

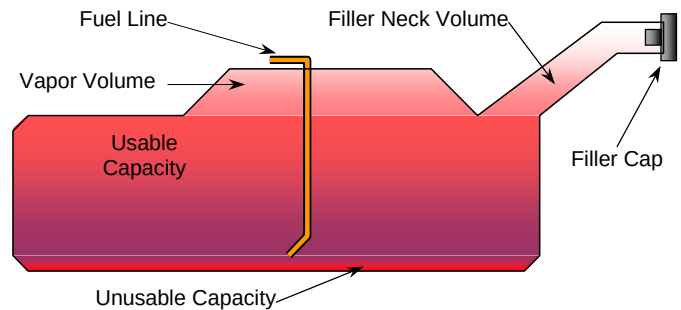
Test Vehicle: 2010 Hyundai Genesis Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
Test Date: 9/18/2009

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	64.3
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	59.2 to 60.4
Actual Amount of Solvent used	59.8
1/3 of Usable Capacity	21.4

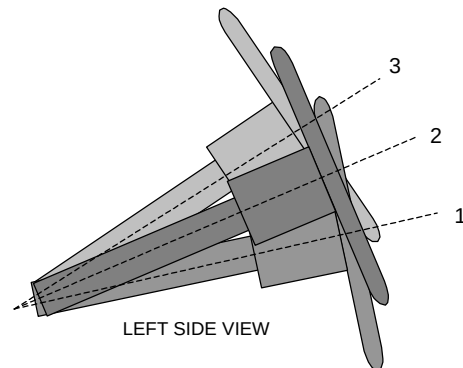
The test vehicle is equipped with an electric fuel pump. Fuel pump will operate when engine system is normally operating.



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

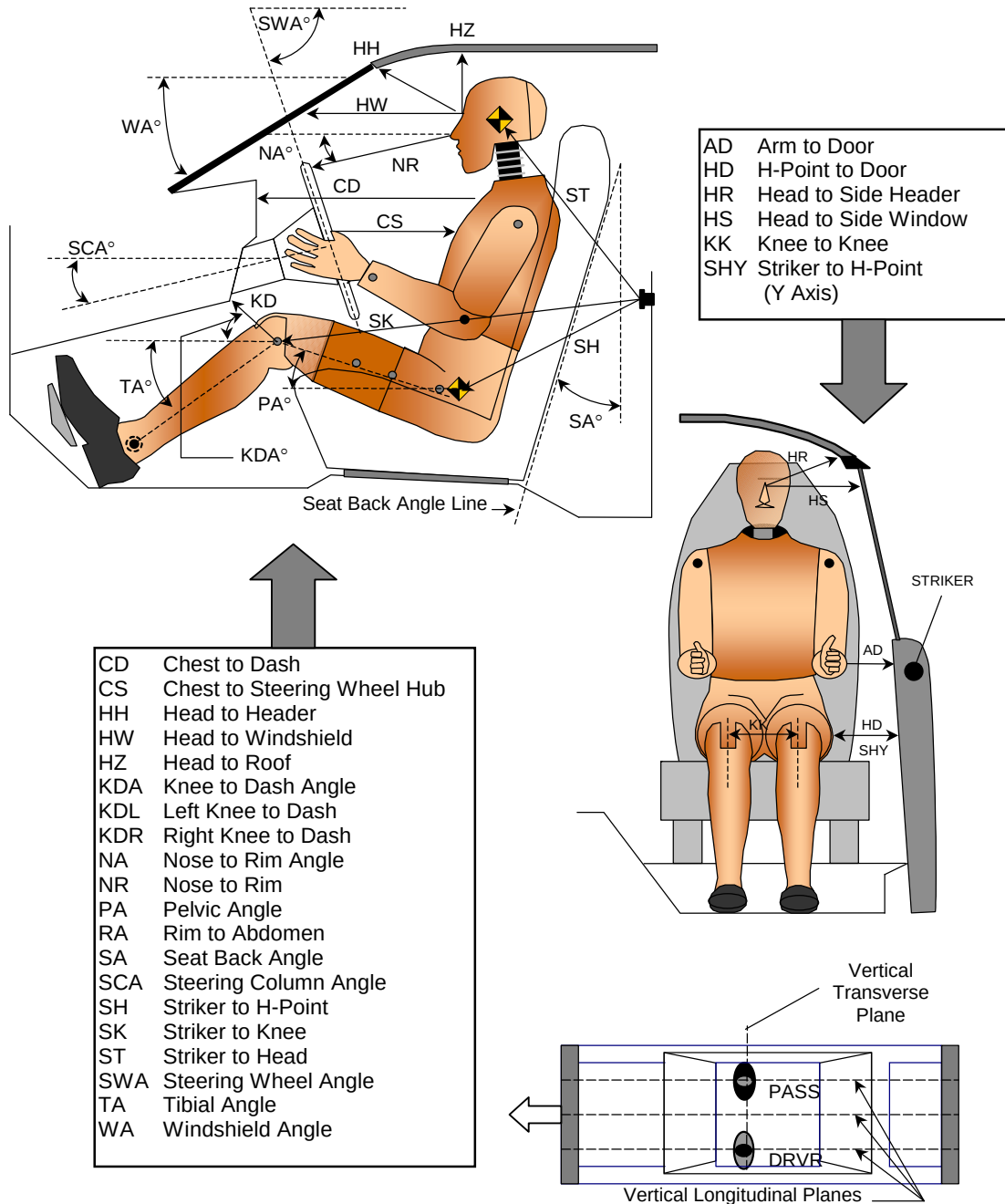
	Fore/Aft Position (mm)	Degrees
Lowermost position No. 1		67.8
Geometric center position No. 2		69.9
Uppermost position No. 3		72.0

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

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS



DATA SHEET NO. 5... (CONTINUED)

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

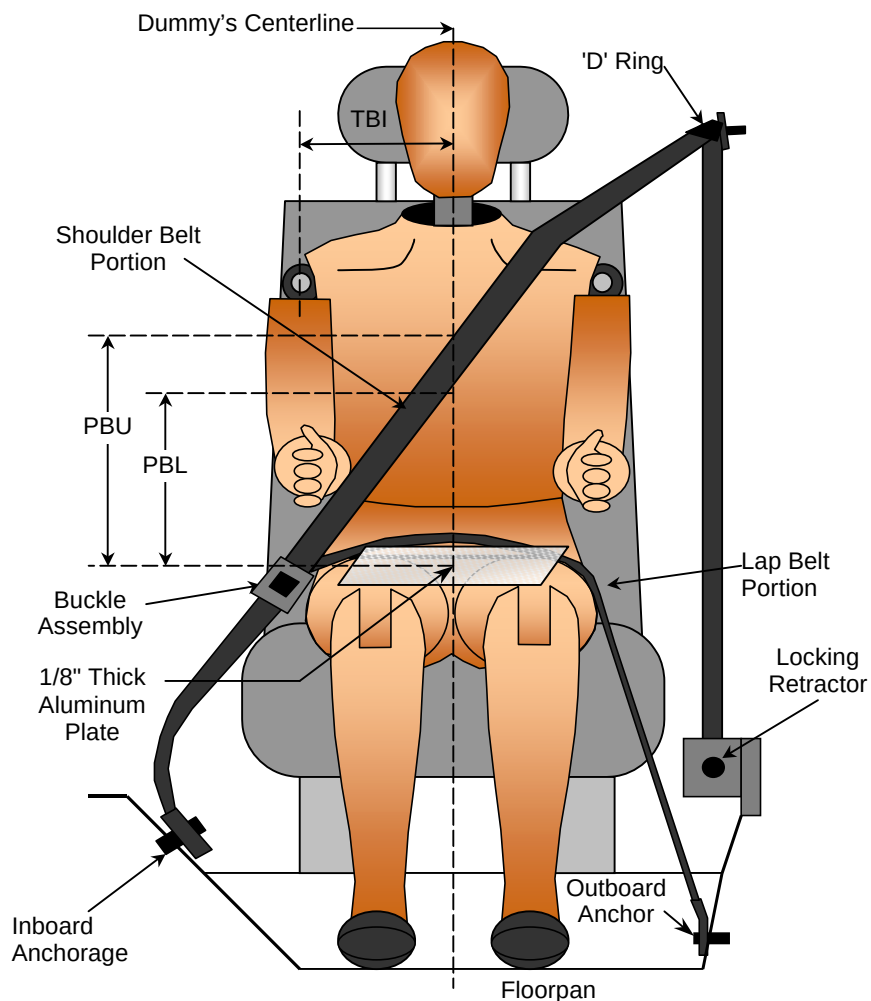
TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield Angle		27.2		
SWA	Steering Wheel Angle		69.9		
SCA	Steering Column Angle		20.1		
SA	Seat Back Angle (headrest post)		14.3		14.7
HZ	Head to Roof (Z)	165	90	150	90
HH	Head to Header	392	18.2	374	18.5
HW	Head to Windshield	664	0	675	0
HR	Head to Side Header (Y)	218		210	
NR	Nose to Rim	403	9.6		
CD	Chest to Dash	537		603	
CS	Chest to Steering Hub	325	2.1		
RA	Rim to Abdomen	215	0		
KDL	Left Knee to Dash	245	18.1	227	
KDR	Right Knee to Dash	230		250	28.7
PA	Pelvic Angle		24.8		23.1
TA	Tibia Angle		33.5		31.5
KK	Knee to Knee (Y)	310		270	
SK	Striker to Knee	891	103.7	885	103.5
ST	Striker to Head	481	43.1	499	41.6
SH	Striker to H-Point	562	120.7	555	121.0
SHY	Striker to H-Point (Y)	290		292	
HS	Head to Side Window	334		340	
HD	H-Point to Door (Y)	153		154	
AD	Arm to Door (Y)	118		57	
AA	Ankle to Ankle	335		246	

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

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009



SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
PBU - Top surface of reference to belt upper edge	mm	330	345
PBL - To surface of reference to belt lower edge	mm	255	255

DATA SHEET NO. 7
VEHICLE ACCELEROMETER LOCATIONS

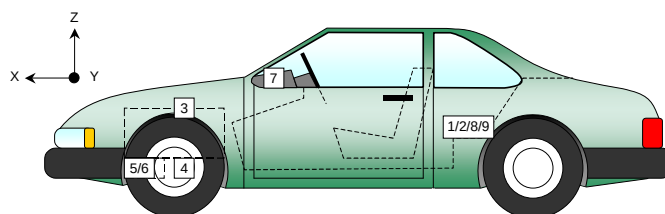
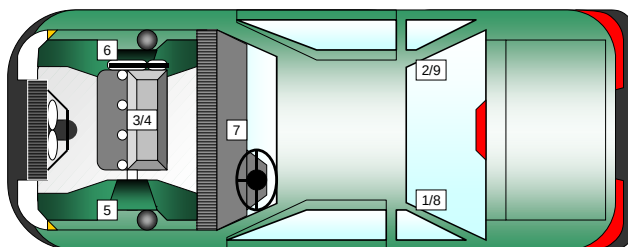
Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurements (mm)		
		X	Y	Z
1	Left Rear X-Member X	1774	-370	-394
2	Right Rear X-Member X	1774	370	-394
3	Engine Top X	3992	0	-830
4	Engine Bottom X	3902	0	-155
5	Left Brake Caliper X	3619	-699	-236
6	Right Brake Caliper X	3619	699	-236
7	Instrument Panel X			
8	Left Rear X-Member Z	1774	-370	-394
9	Right Rear X-Member Z	1774	370	-394

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



DATA SHEET NO. 8

SUMMARY OF FMVSS 212 AND FMVSS 219 (Partial) DATA

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

Windshield Mounting Details:

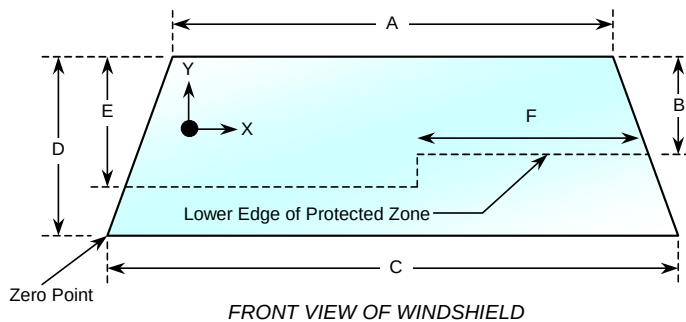
Windshield glass is secured to the vehicle frame with a rubber trim and glue.

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	2132	2132	100
Right Side	2132	2132	100
Total	4264	4264	100



Item	Units	Value
A	mm	1226
B	mm	475
C	mm	1546
D	mm	746
E	mm	488
F	mm	520

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 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

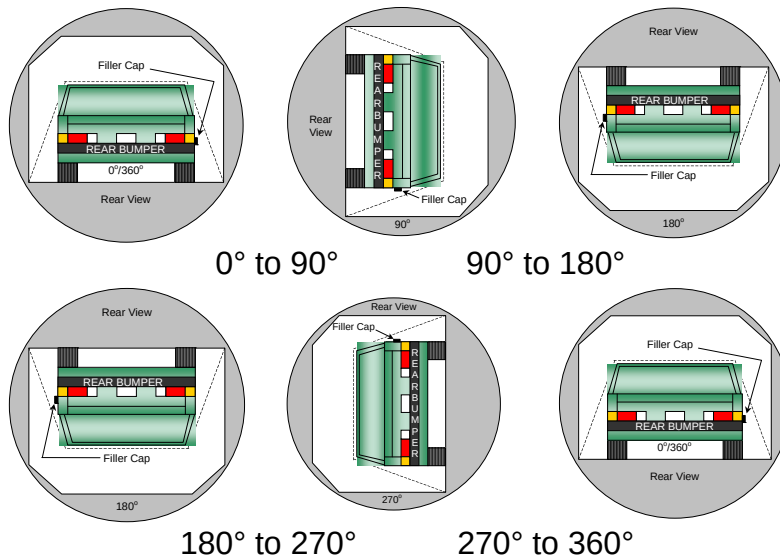
FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Temperature at Time of Impact: 21° C Test Time: 10:25 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°	118	300	0
90° to 180°	115	300	0
180° to 270°	113	300	0
270° to 360°	117	300	0

DATA SHEET NO. 10
VEHICLE MEASUREMENTS

Test Vehicle: 2010 Hyundai Genesis Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
Test Date: 9/18/2009

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4574	4059	515
2	RSOV to front of engine	mm	4033	3870	163
3	RSOV to firewall centerline	mm	3454	3385	69
4	RSOV to leading edge of right door	mm	3057	3075	-18
5	RSOV to leading edge of left door	mm	3053	3068	-15
6	RSOV to lower leading edge of right door	mm	3045	3034	11
7	RSOV to lower leading edge of left door	mm	3038	3029	9
8	RSOV to upper leading edge of right door	mm	1777	1792	-15
9	RSOV to upper leading edge of left door	mm	1773	1791	-18
10	RSOV to lower trailing edge of right door	mm	1807	1799	8
11	RSOV to lower trailing edge of left door	mm	1808	1799	9
12	RSOV to bottom of right 'A' pillar	mm	3055	3042	13
13	RSOV to bottom of left 'A' pillar	mm	3059	3051	8
14	RSOV to firewall on right side	mm	3305	3284	21
15	RSOV to firewall on left side	mm	3363	3348	15
16	RSOV to steering column	mm	2587	2540	47
17	Center of steering column to left 'A' pillar	mm	394	375	19
18	Center of steering column to headlining	mm	410	392	18
19	RSOV to right side of front bumper	mm	4424	4031	393
20	RSOV to left side of front bumper	mm	4424	4019	405
21	Length of engine block	mm	480	480	0
RD	RSOV to right side of dash panel	mm	2804	2811	-7
CD	RSOV to center of dash panel	mm	2800	2762	38
LD	RSOV to left side of dash panel	mm	2824	2806	18

DATA SHEET NO. 10... (continued)

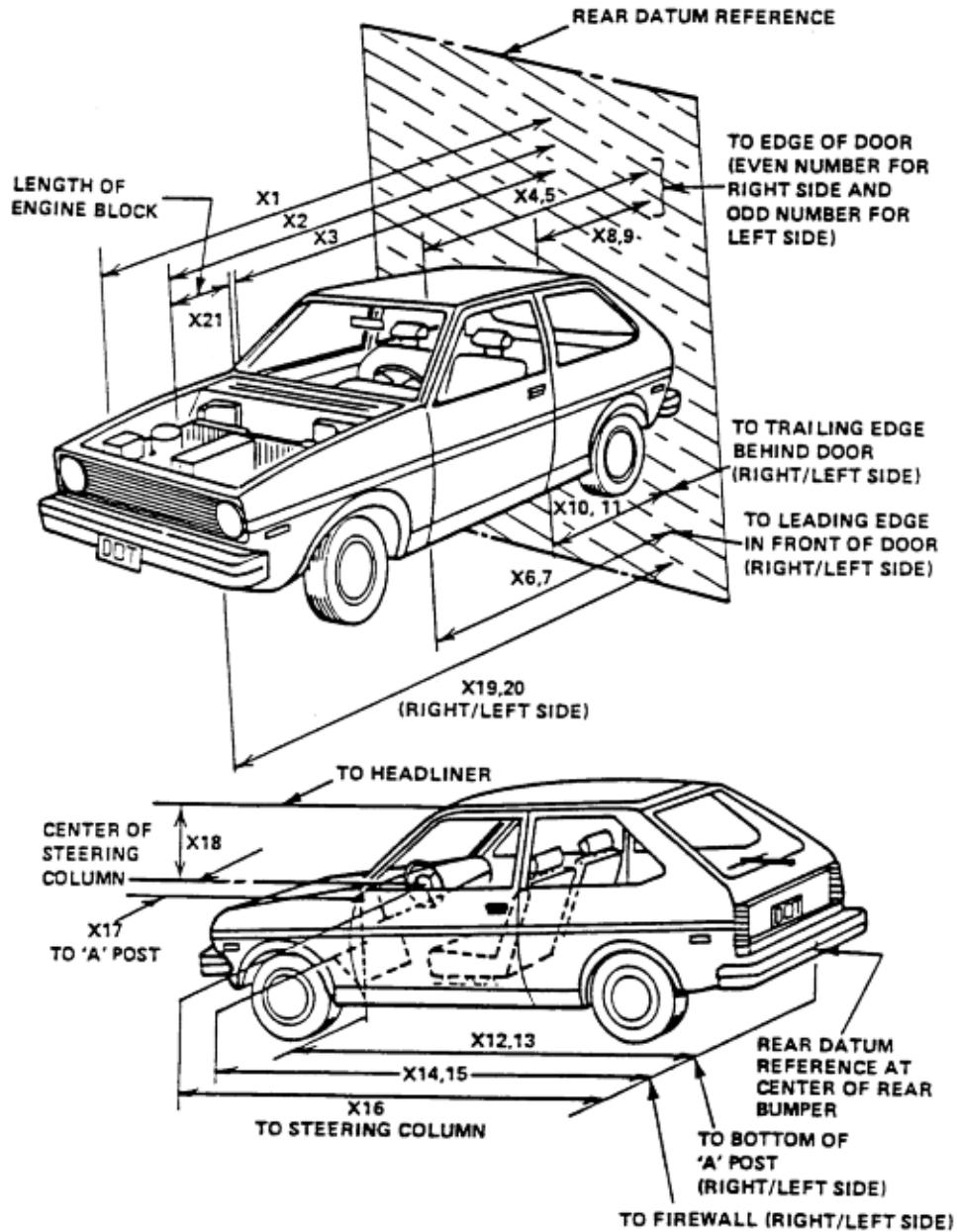
VEHICLE MEASUREMENTS

Test Vehicle: 2010 Hyundai Genesis Coupe

NHTSA No.: MA0519

Test Program: 35mph Frontal Impact

Test Date: 9/18/2009



DATA SHEET NO. 10... (continued)**VEHICLE MEASUREMENTS**Test Vehicle: 2010 Hyundai Genesis CoupeNHTSA No.: MA0519Test Program: 35mph Frontal ImpactTest Date: 9/18/2009**Target Vehicle Structural Measurement**

	Elements	Pre-Test (mm)
1	Total Length	4574
2	Total Width	1832
3	Bumper Top Height	515
4	Bumper Bottom Height	368
5	Longitudinal Member Top Height	468
6	Distance between Longitudinal Members	927
7	Longitudinal Member Width	66
8	Engine Top Height	831
9	Engine Bottom Height	148
10	Engine and gearbox width	673
11	Front bumper-engine distance	514
12	Front shock absorber fixing height	864
13	Bonnet leading edge height	657
14	Front shock absorber fixing width	1208
15	Front bumper – front axle distance	829
16	Front axle – a pillar distance	626
17	A-pillar – B-pillar distance	1370
18	B-Pillar – rear axle distance	795
19	B-pillar – C-pillar distance	609
20	Roof sill bottom height	1263
21	Roof sill top height	1363
22	Floor sill bottom height	182
23	Floor sill top height	333

DATA SHEET NO. 11
CAMERA LOCATIONS

Test Vehicle: 2010 Hyundai Genesis Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
Test Date: 9/18/2009

No.	Camera View	Location (mm) *			Lens (mm)	Speed (fps)
		X	Y	Z		
1	Real-Time Left Side View				13	24
2	Left Front View	1070	-5265	-1025	24	1000
3	Steering Column Top	845	-5630	-1320	25	1000
4	Steering Column Bottom	830	-5590	-850	25	1000
5	Driver Close-up	1460	-6370	-1440	35	1000
6	Driver Angle	5110	-5100	-1860	50	1000
7	On board Driver Side					
8	On board Passenger Side					
9	Right Overall	2090	6710	-1190	20	1000
10	Right Passenger Half	1100	5230	-1090	24	1000
11	Right Close-up	1510	6375	-1310	35	1000
12	Right Angle	5115	5130	-1860	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	1250	0	3150	24	1000
17	Pit Rear	3020	0	3150	24	1000

***COORDINATES:**

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

Cameras 7 & 8 were not used for this test.

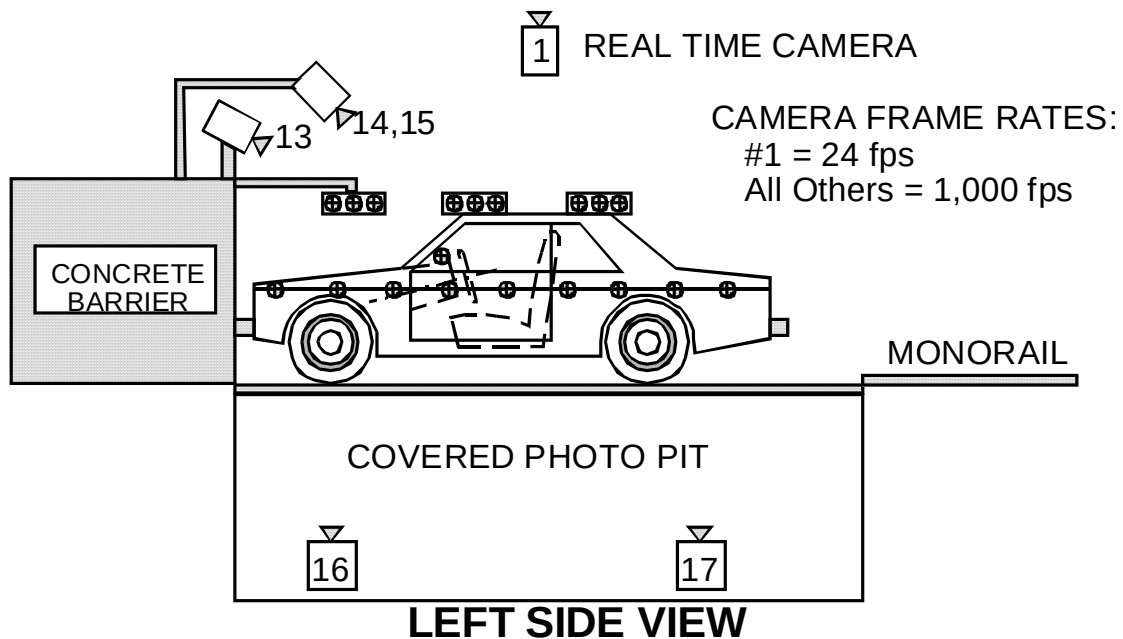
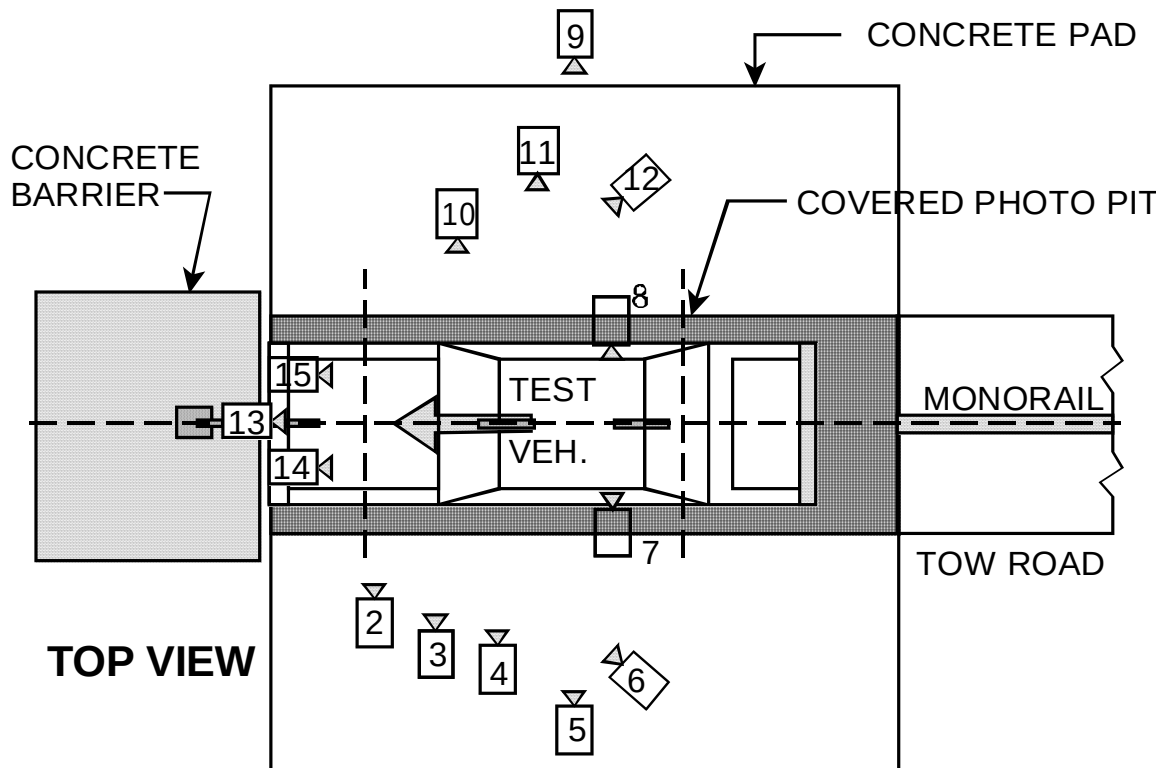
DATA SHEET NO. 11... (continued)

CAMERA LOCATIONS

Test Vehicle: 2010 Hyundai Genesis Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
Test Date: 9/18/2009

CAMERA POSITIONS FOR FRONTAL IMPACTS

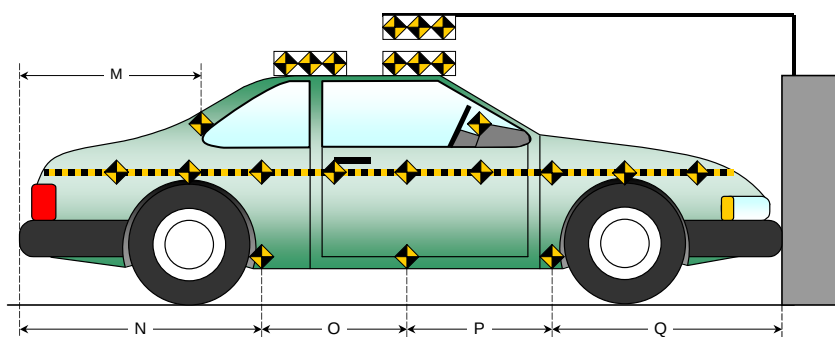
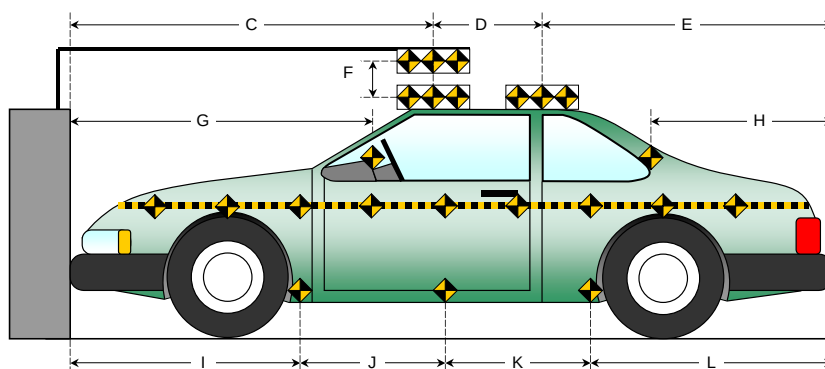
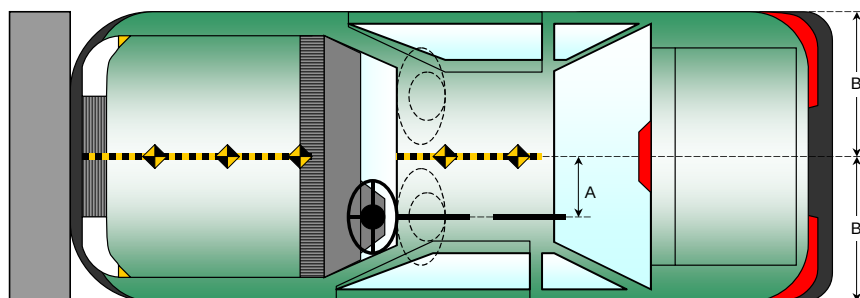


DATA SHEET NO. 12
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

Item	Value
A	375
B	914
C	2465
D	550
E	1559
F	121
G	
H	1074
I	1261
J	980
K	980
L	1353
M	1070
N	1358
O	985
P	976
Q	1255



DATA SHEET NO. 13
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

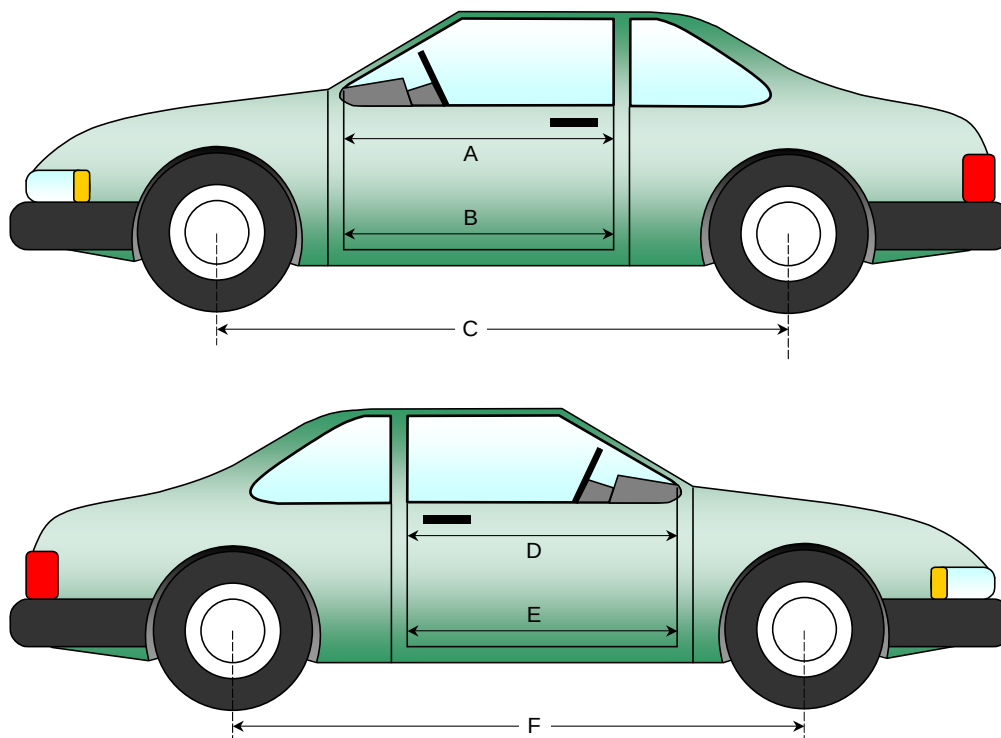
NHTSA No.: MA0519
 Test Date: 9/18/2009

DOOR OPENING WIDTH

Item	Description	Units	Pre-Test	Post-Test	Difference
A	Left Side Upper	mm	1292	1289	3
B	Left Side Lower	mm	1117	1113	4
D	Right Side Upper	mm	1292	1290	2
E	Right Side Lower	mm	1122	1122	0

WHEELBASE MEASUREMENTS

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2820	2797	23
F	Right Side Wheelbase	mm	2820	2743	77



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

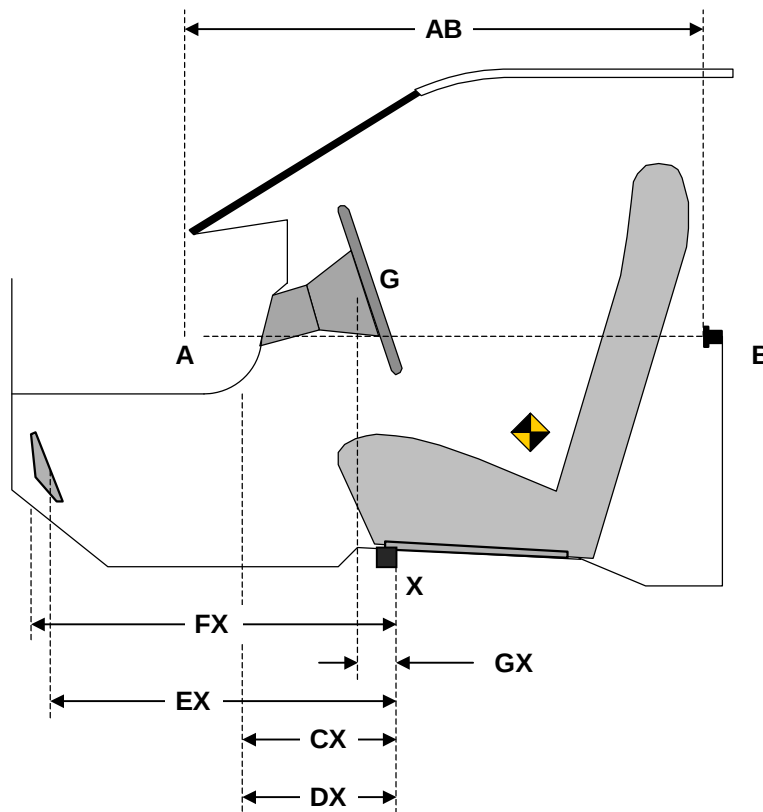
Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

DRIVER COMPARTMENT INTRUSION

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside window jam)	mm	1031	1029	2
CX	Left Knee Bolster to X	mm	342	351	-9
DX	Right Knee Bolster to X	mm	324	327	-3
EX	Brake Pedal to X	mm	580	481	99
FX	Foot Rest to X	mm	608	604	4
GX	Center of Steering Column Wheel Hub to X	mm	30	49	-19

X = Front of Seat Track (stationary)

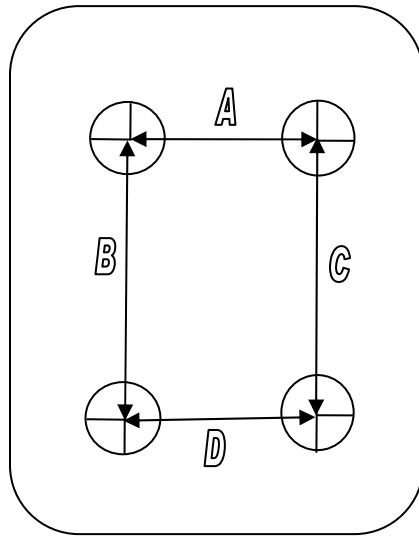


DRIVER COMPARTMENT

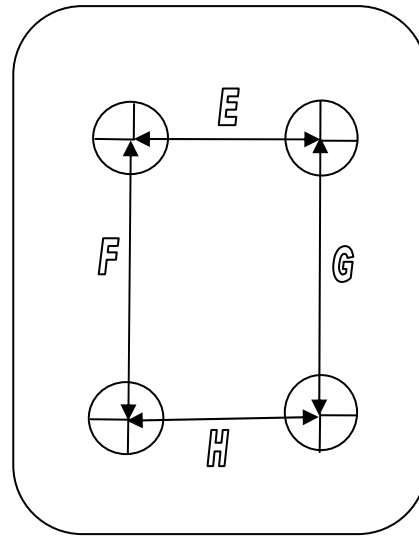
DATA SHEET NO. 13... (continued)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009



Driver



Passenger

UNDERBODY FLOORBOARD DEFORMATION

Measurement	Pre-Test	Post-Test	Difference
A	255	255	0
B	255	255	0
C	255	255	0
D	255	255	0
E	255	255	0
F	255	255	0
G	255	255	0
H	255	255	0

DATA SHEET NO. 14

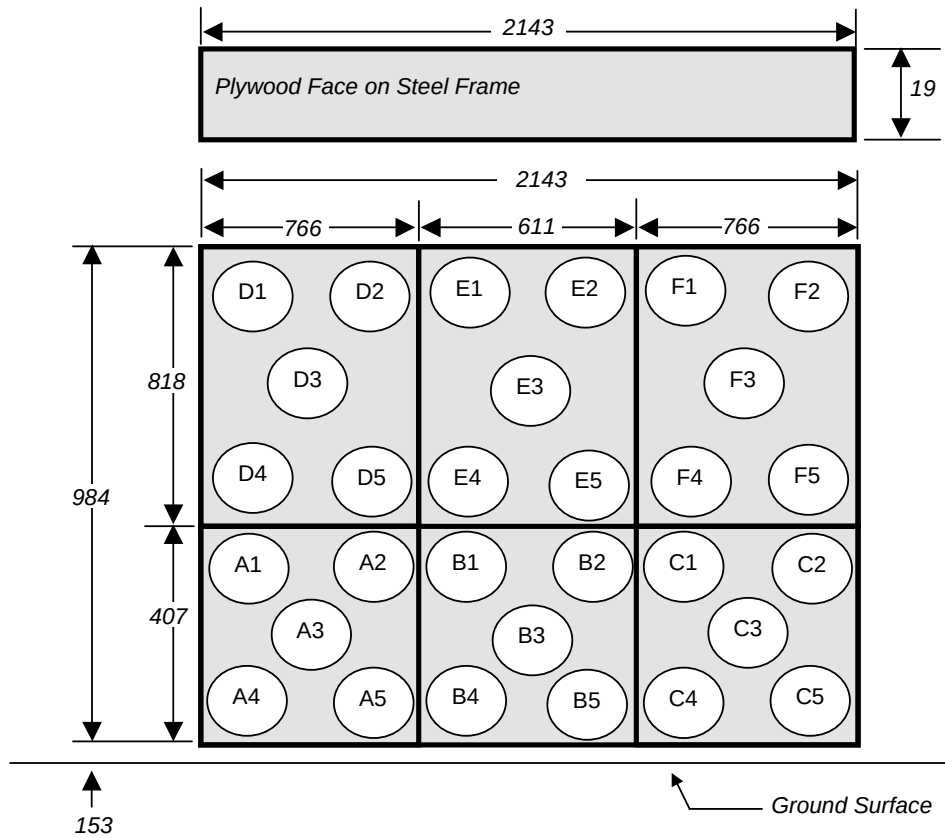
LOAD CELL LOCATIONS ON FIXED BARRIER

Test Vehicle: 2010 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

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 Hyundai Genesis Coupe
 Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
 Test Date: 9/18/2009

VEHICLE INFORMATION

VIN: KMHHT6KD3AU016471 Wheelbase (mm): 2820
 Vehicle Size Category: Coupe Test Weight (kg): 1719.1

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): 56.6
 Velocity Change (km/h): 62.0 Time of Separation (msec): 102

CRUSH PROFILE

Collision Deformation Classification: Frontal Midpoint of Damage: Centerline
 Damage Region Length (mm): 1165 Impact Mode: Frontal

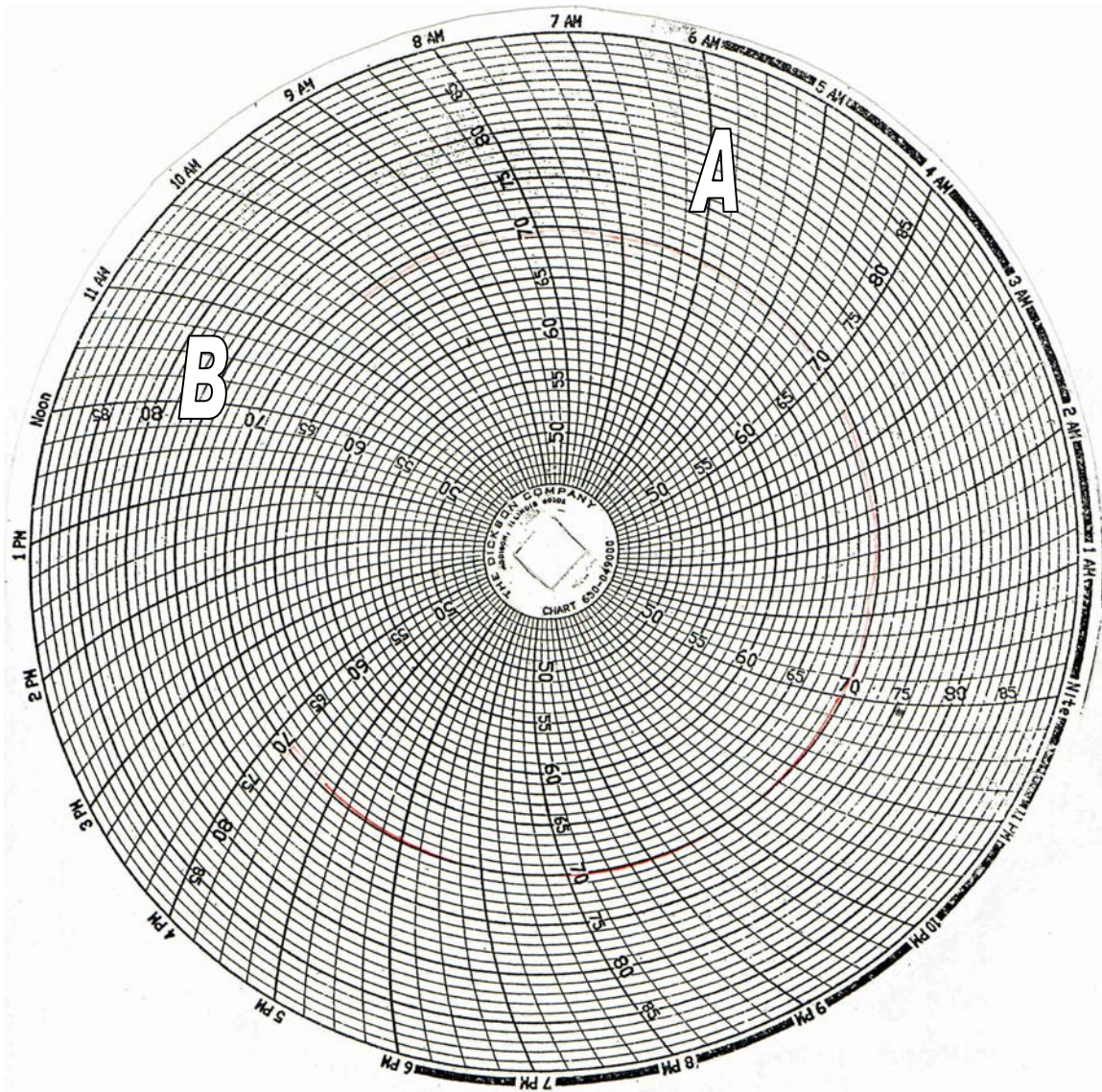
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	4424	4019	405
C2	Crush zone 2 at left side	mm	4514	4061	453
C3	Crush zone 3 at left side	mm	4565	4072	493
C4	Crush zone 4 at right side	mm	4565	4062	503
C5	Crush zone 5 at right side	mm	4514	4059	455
C6	Crush zone 6 at right side	mm	4424	4031	393
L	C1 TO C6	mm	1377	1206	171

DATA SHEET NO. 16

DUMMY / VEHICLE TEMPERATURE STABILIZATION CHART

Test Vehicle: 2010 Hyundai Genesis Coupe
Test Program: 35mph Frontal Impact

NHTSA No.: MA0519
Test Date: 9/18/2009



A = Dummies installed in vehicle at 6:00 am

B = Test conducted at 10:25 am

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

		<u>Page No.</u>
Photo No. 1.	Load Cell Location	A-1
Photo No. 2.	Manufacturer's Label	A-2
Photo No. 3.	Tire Placard	A-2
Photo No. 4.	Right Front $\frac{3}{4}$ View, As Received	A-3
Photo No. 5.	Left Rear $\frac{3}{4}$ View, As Received	A-3
Photo No. 6.	Pre-Test Front View	A-4
Photo No. 7.	Post-Test Front View	A-4
Photo No. 8.	Pre-Test Left Side View	A-5
Photo No. 9.	Post-Test Left Side View	A-5
Photo No. 10.	Pre-Test Right Side View	A-6
Photo No. 11.	Post-Test Right Side View	A-6
Photo No. 12.	Pre-Test Right Front $\frac{3}{4}$ View	A-7
Photo No. 13.	Post-Test Right Front $\frac{3}{4}$ View	A-7
Photo No. 14.	Pre-Test Left Rear $\frac{3}{4}$ View	A-8
Photo No. 15.	Post-Test Left Rear $\frac{3}{4}$ View	A-8
Photo No. 16.	Pre-Test Left Side $\frac{3}{4}$ View of Doors	A-9
Photo No. 17.	Post-Test Left Side $\frac{3}{4}$ View of Doors After Impact	A-9
Photo No. 18.	Pre-Test Right Side $\frac{3}{4}$ View of Doors	A-10
Photo No. 19.	Post-Test Right Side $\frac{3}{4}$ View of Doors After Impact	A-10
Photo No. 20.	Pre-Test Windshield View	A-11
Photo No. 21.	Post-Test Windshield View	A-11
Photo No. 22.	Pre-Test Engine Compartment View	A-12
Photo No. 23.	Post-Test Engine Compartment View	A-12
Photo No. 24.	Pre-Test Fuel Cap View	A-13
Photo No. 25.	Post-Test Fuel Cap View	A-13
Photo No. 26.	Pre-Test Front Underbody View	A-14
Photo No. 27.	Post-Test Front Underbody View	A-14

		<u>Page No.</u>
Photo No. 28.	Pre-Test Mid Underbody View	A-15
Photo No. 29.	Post-Test Mid Underbody View	A-15
Photo No. 30.	Pre-Test Rear Underbody View	A-16
Photo No. 31.	Post-Test Rear Underbody View	A-16
Photo No. 32.	Pre-Test Driver Dummy Front View (Head Position)	A-17
Photo No. 33.	Post-Test Driver Dummy Front View (Head Position)	A-17
Photo No. 34.	Pre-Test Driver Dummy (Through Window)	A-18
Photo No. 35.	Post-Test Driver Dummy (Through Window)	A-18
Photo No. 36.	Pre-Test Driver Dummy Feet	A-19
Photo No. 37.	Post-Test Driver Dummy Feet	A-19
Photo No. 38.	Pre-Test Driver Side Knee Bolster	A-20
Photo No. 39.	Post-Test Driver Side Knee Bolster	A-20
Photo No. 40.	Pre-Test Driver Side Floor Pan	A-21
Photo No. 41.	Post-Test Driver Side Floor Pan	A-21
Photo No. 42.	Post-Test Driver Dummy Head Contact	A-22
Photo No. 43.	Post-Test Driver Dummy Left Knee Contact View	A-22
Photo No. 44.	Post-Test Driver Dummy Right Knee Contact View	A-23
Photo No. 45.	Post-Test Driver Dummy Airbag Contact	A-23
Photo No. 46.	Pre-Test Passenger Dummy Front View (Head Position)	A-24
Photo No. 47.	Post-Test Passenger Dummy Front View (Head Position)	A-24
Photo No. 48.	Pre-Test Passenger Dummy (Through Window)	A-25
Photo No. 49.	Post-Test Passenger Dummy (Through Window)	A-25
Photo No. 50.	Pre-Test Passenger Dummy (Door Open)	A-26
Photo No. 51.	Post-Test Passenger Dummy (Door Open)	A-26
Photo No. 52.	Pre-Test Passenger Dummy Feet	A-27
Photo No. 53.	Post-Test Passenger Dummy Feet	A-27
Photo No. 54.	Pre-Test Passenger Side Glove Box	A-28
Photo No. 55.	Post-Test Passenger Side Glove Box	A-28

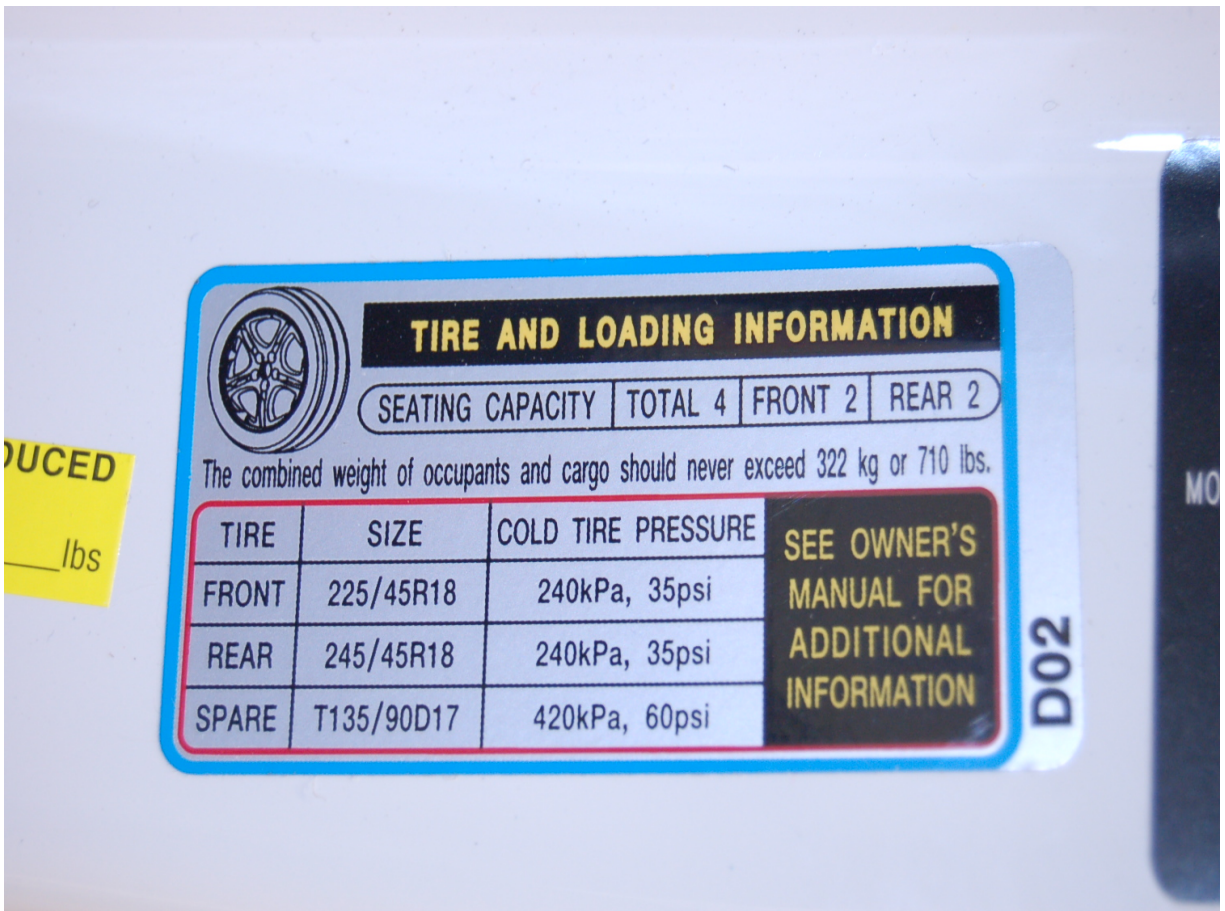
		<u>Page No.</u>
Photo No. 56.	Pre-Test Passenger Side Floor Pan	A-29
Photo No. 57.	Post-Test Passenger Side Floor Pan	A-29
Photo No. 58.	Post-Test Passenger Dummy Head Contact	A-30
Photo No. 59.	Post-Test Passenger Dummy Knee Contact	A-30
Photo No. 60.	Post-Test Passenger Dummy Knee Contact w/AB	A-31
Photo No. 61.	Post-Test Passenger Dummy Airbag Contact	A-31
Photo No. 62.	Rollover 90 Degrees	A-32
Photo No. 63.	Rollover 180 Degrees	A-32
Photo No. 64.	Rollover 270 Degrees	A-33
Photo No. 65.	Rollover 360 Degrees	A-33
Photo No. 66.	Vehicle Impact	A-34



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 3/4 View



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



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



Pre-Test Windshield View



Post-Test Windshield View



Pre-Test Engine Compartment View



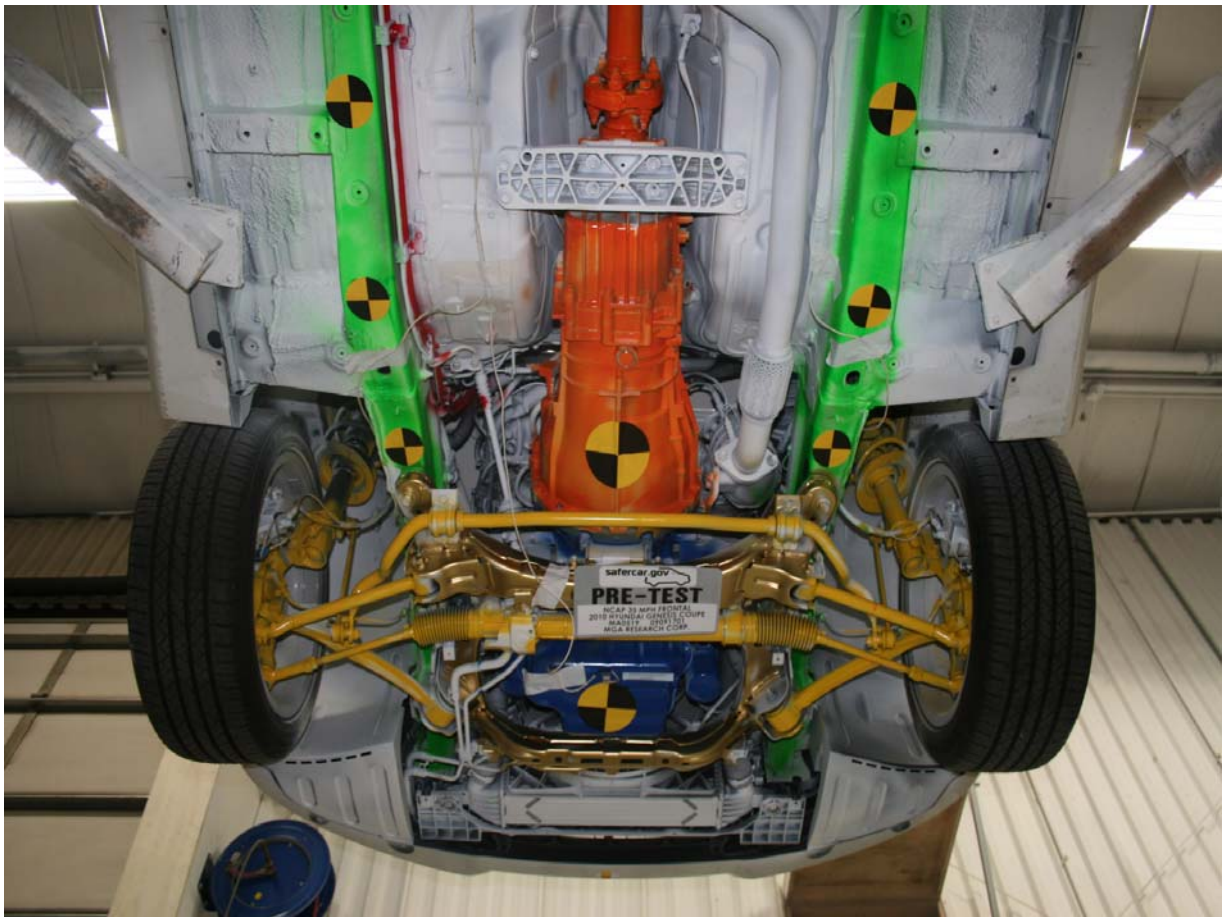
Post-Test Engine Compartment View



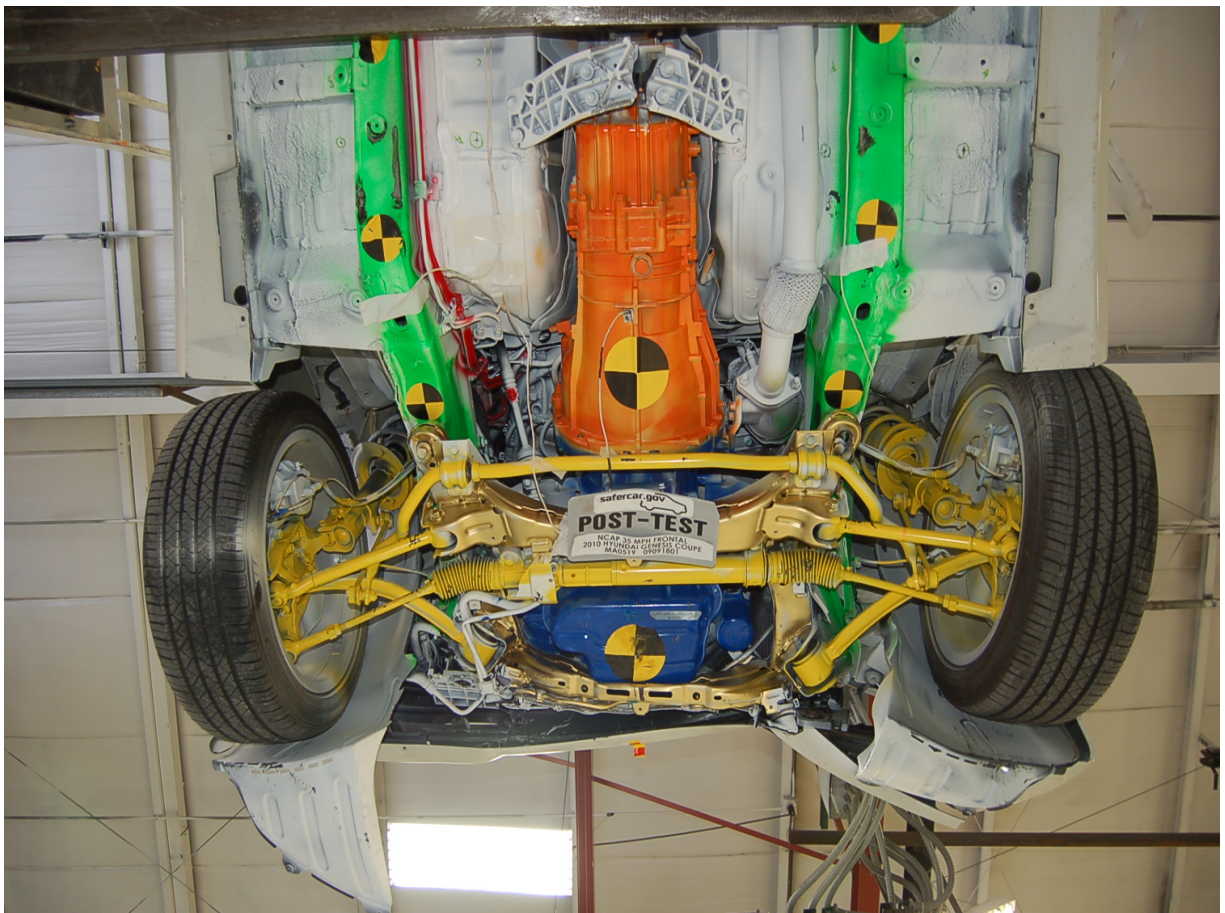
Pre-Test Fuel Cap View



Post-Test Fuel Cap View



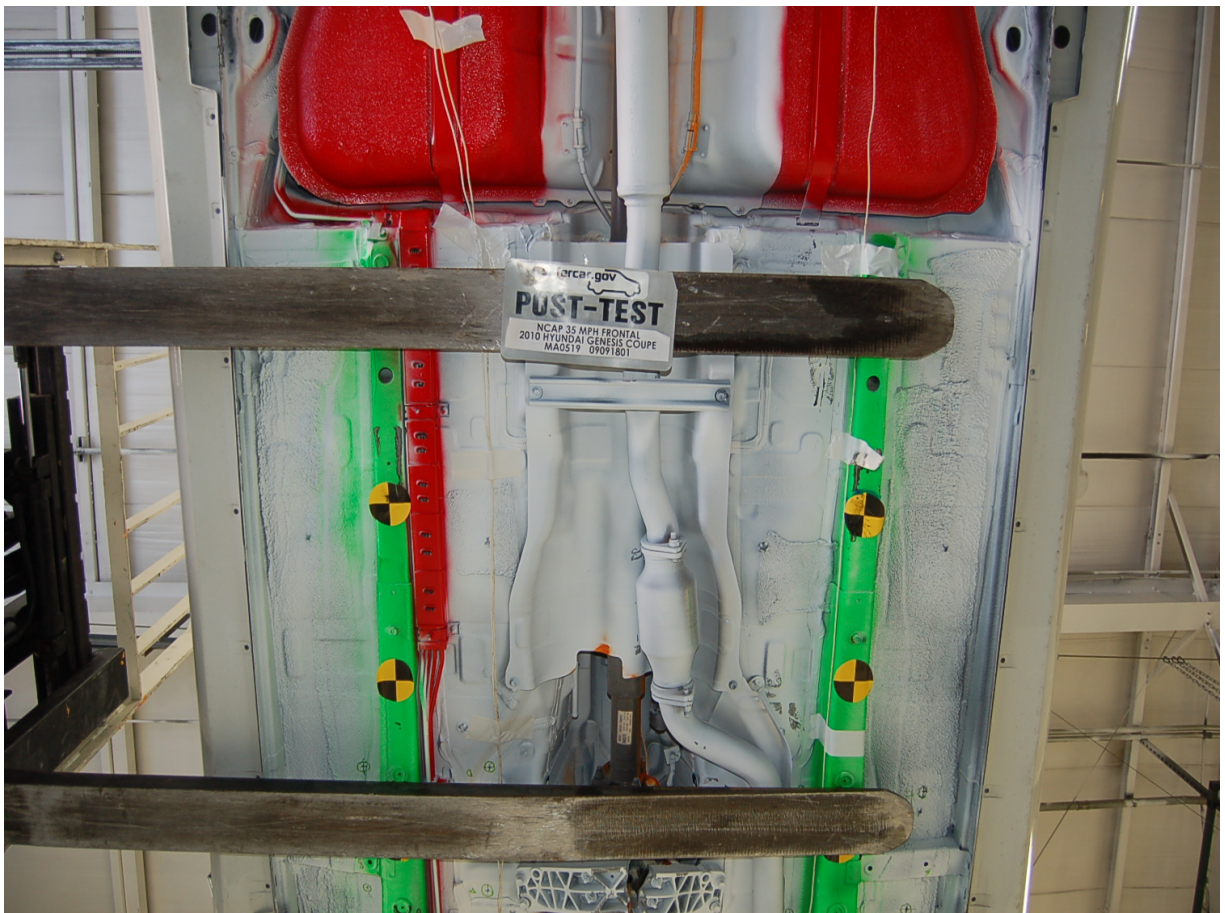
Pre-Test Front Underbody View



Post-Test Front Underbody View



Pre-Test Mid Underbody View



Post-Test Mid 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)



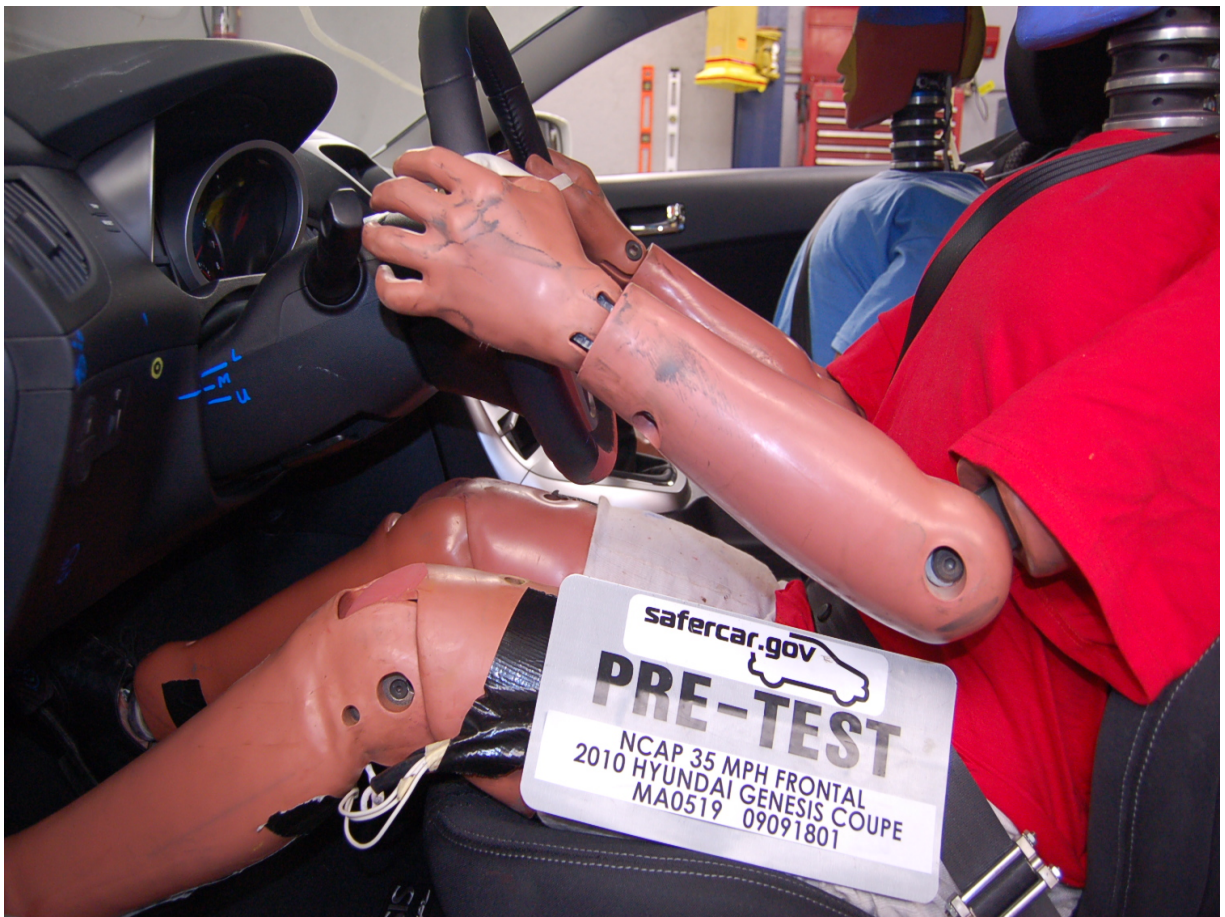
Post-Test Driver Dummy (Through Window)



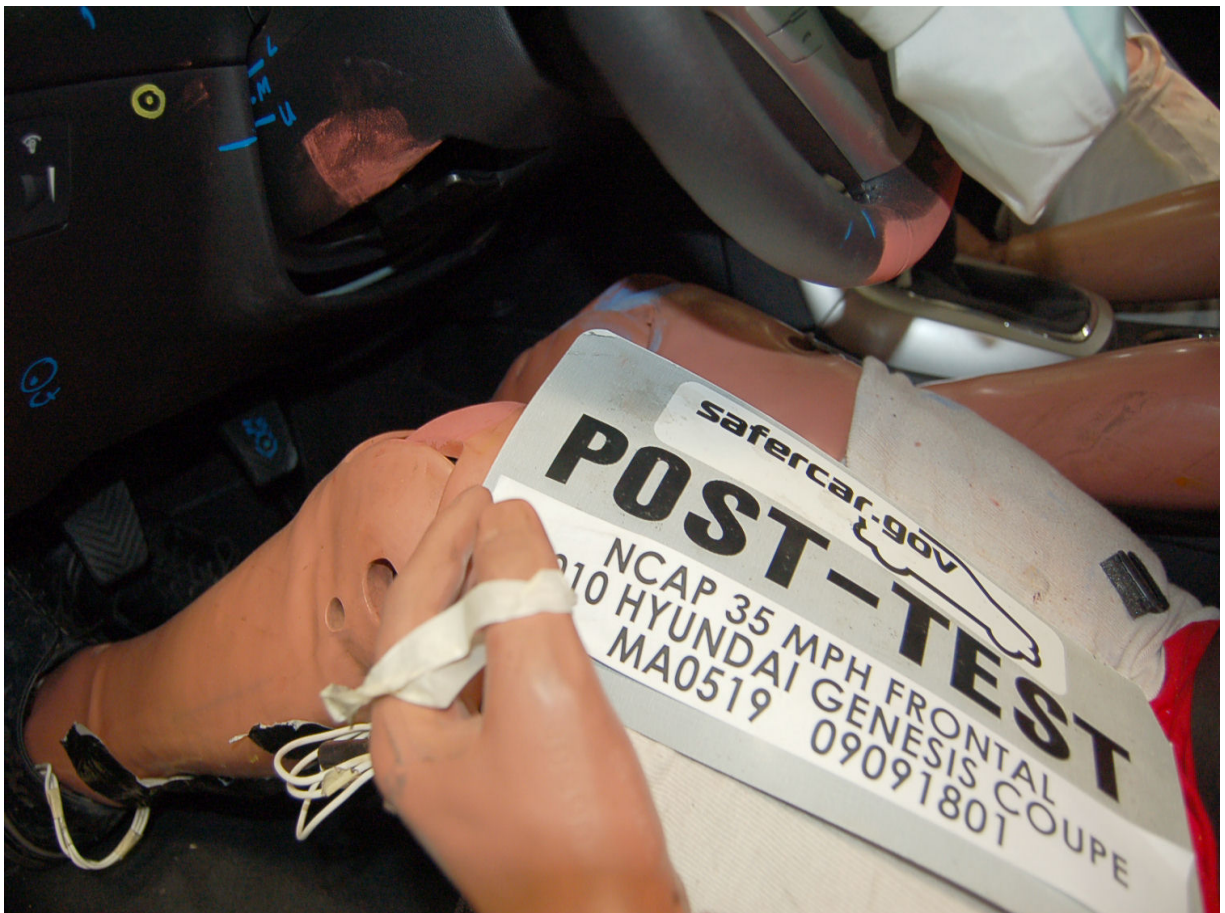
Pre-Test Driver Dummy Feet



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 View



Post-Test Driver Dummy Right Knee Contact View



Post-Test Driver Dummy Airbag Contact



Pre-Test Passenger Dummy Front View (Head Position)



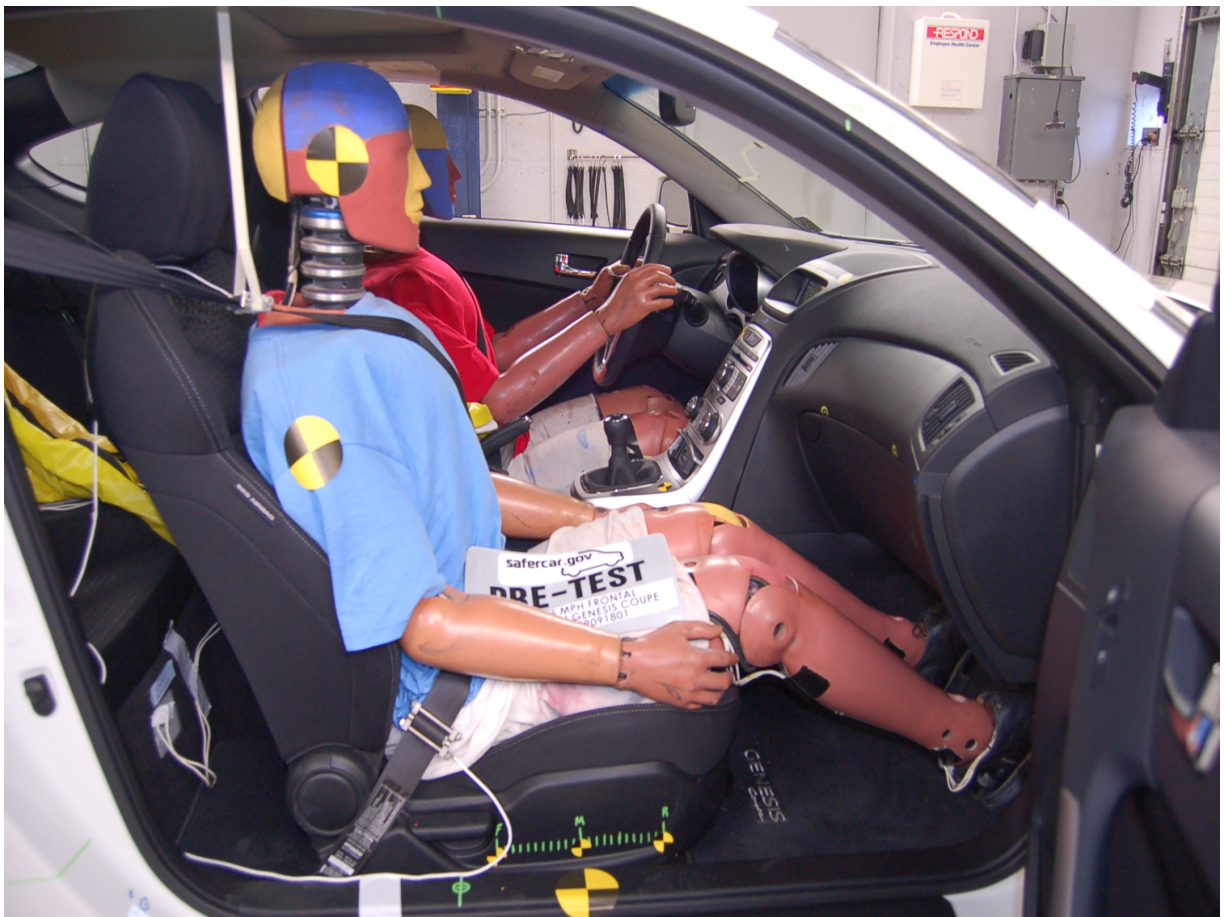
Post-Test Passenger Dummy Front View (Head Position)



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



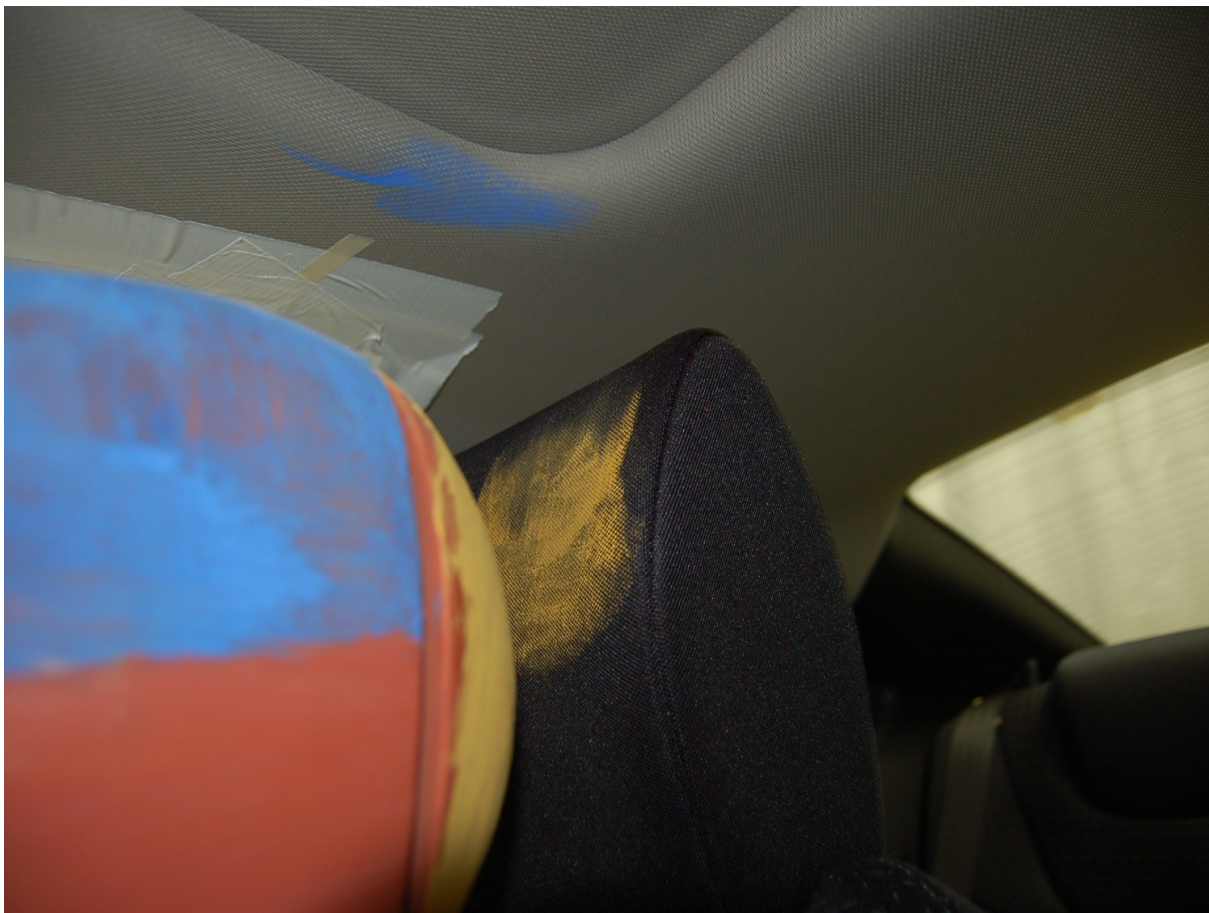
Post-Test Passenger Side Glove Box



Pre-Test Passenger Side Floor Pan



Post-Test Passenger Side Floor Pan



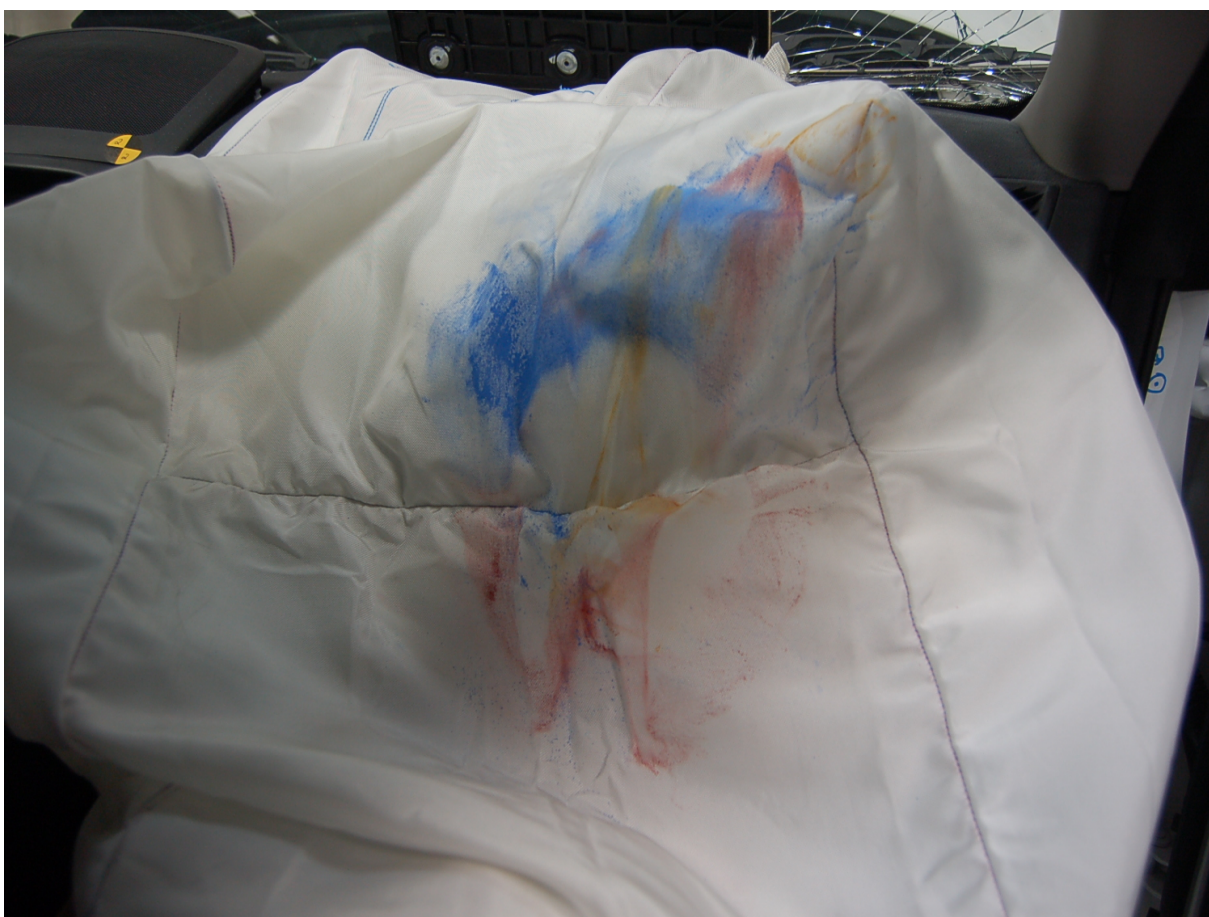
Post-Test Passenger Dummy Head Contact



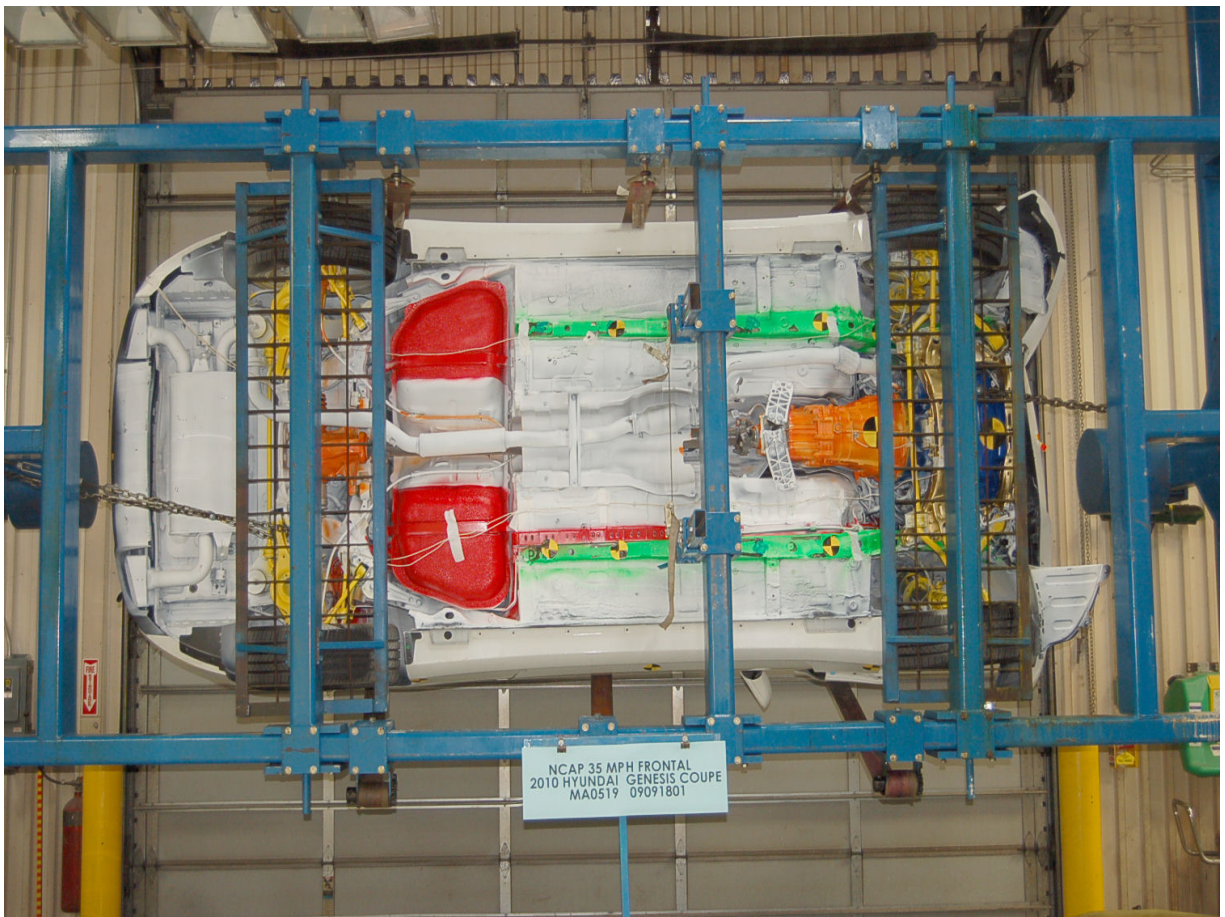
Post-Test Passenger Dummy Knee Contact



Post-Test Passenger Dummy Knee Contact w/AB



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

TABLE OF DATA PLOTS

Page No.

List of Data Plots Provided in the Test Report

Figure No. 1.	Driver Head X Acceleration vs. Time	B-1
Figure No. 2.	Driver Head Y Acceleration vs. Time	B-1
Figure No. 3.	Driver Head Z Acceleration vs. Time	B-1
Figure No. 4.	Driver Head Resultant Acceleration vs. Time	B-1
Figure No. 5.	Driver Head X Velocity vs. Time	B-2
Figure No. 6.	Driver Head Y Velocity vs. Time	B-2
Figure No. 7.	Driver Head Z Velocity vs. Time	B-2
Figure No. 8.	Driver Chest X Acceleration vs. Time	B-3
Figure No. 9.	Driver Chest Y Acceleration vs. Time	B-3
Figure No. 10.	Driver Chest Z Acceleration vs. Time	B-3
Figure No. 11.	Driver Chest Resultant Acceleration vs. Time	B-3
Figure No. 12.	Driver Chest X Velocity vs. Time	B-4
Figure No. 13.	Driver Chest Y Velocity vs. Time	B-4
Figure No. 14.	Driver Chest Z Velocity vs. Time	B-4
Figure No. 15.	Driver Left Femur Force vs. Time	B-5
Figure No. 16.	Driver Right Femur Force vs. Time	B-5
Figure No. 17.	Passenger Head X Acceleration vs. Time	B-6
Figure No. 18.	Passenger Head Y Acceleration vs. Time	B-6
Figure No. 19.	Passenger Head Z Acceleration vs. Time	B-6
Figure No. 20.	Passenger Head Resultant Acceleration vs. Time	B-6
Figure No. 21.	Passenger Head X Velocity vs. Time	B-7
Figure No. 22.	Passenger Head Y Velocity vs. Time	B-7
Figure No. 23.	Passenger Head Z Velocity vs. Time	B-7
Figure No. 24.	Passenger Chest X Acceleration vs. Time	B-8
Figure No. 25.	Passenger Chest Y Acceleration vs. Time	B-8
Figure No. 26.	Passenger Chest Z Acceleration vs. Time	B-8
Figure No. 27.	Passenger Chest Resultant Acceleration vs. Time	B-8
Figure No. 28.	Passenger Chest X Velocity vs. Time	B-9

Figure No. 29.	Passenger Chest Y Velocity vs. Time	B-9
Figure No. 30.	Passenger Chest Z Velocity vs. Time	B-9
Figure No. 31.	Passenger Left Femur Force vs. Time	B-10
Figure No. 32.	Passenger Right Femur Force vs. Time	B-10

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

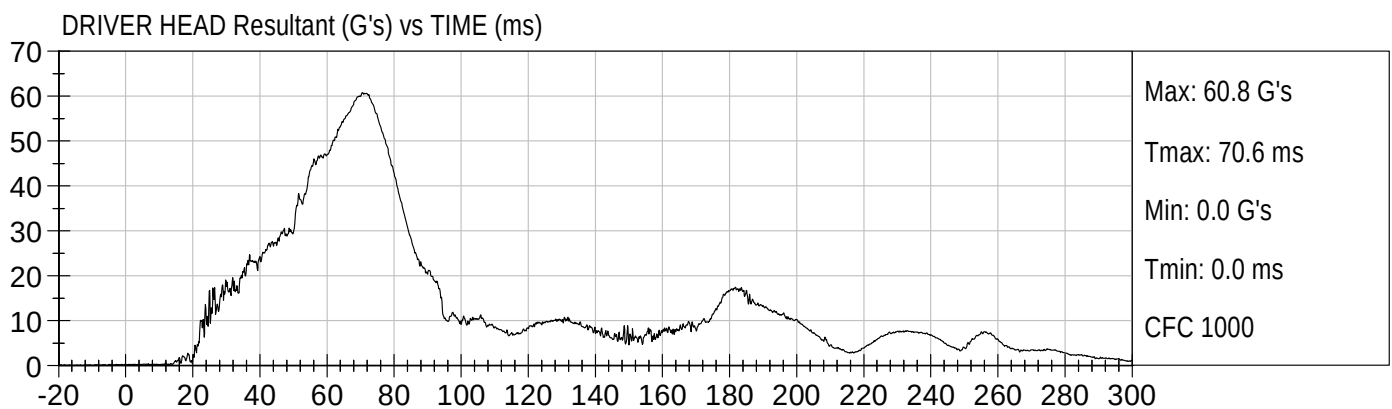
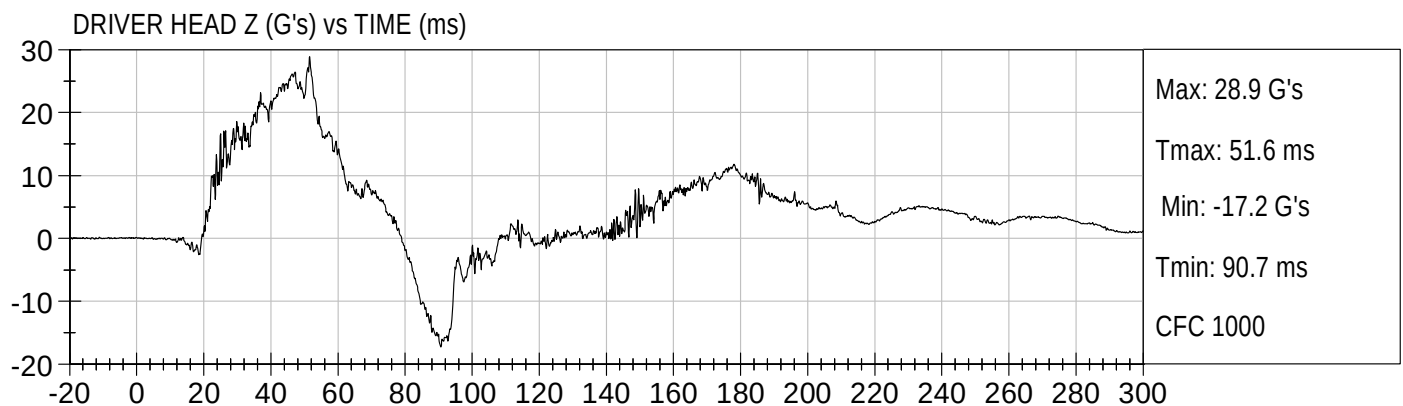
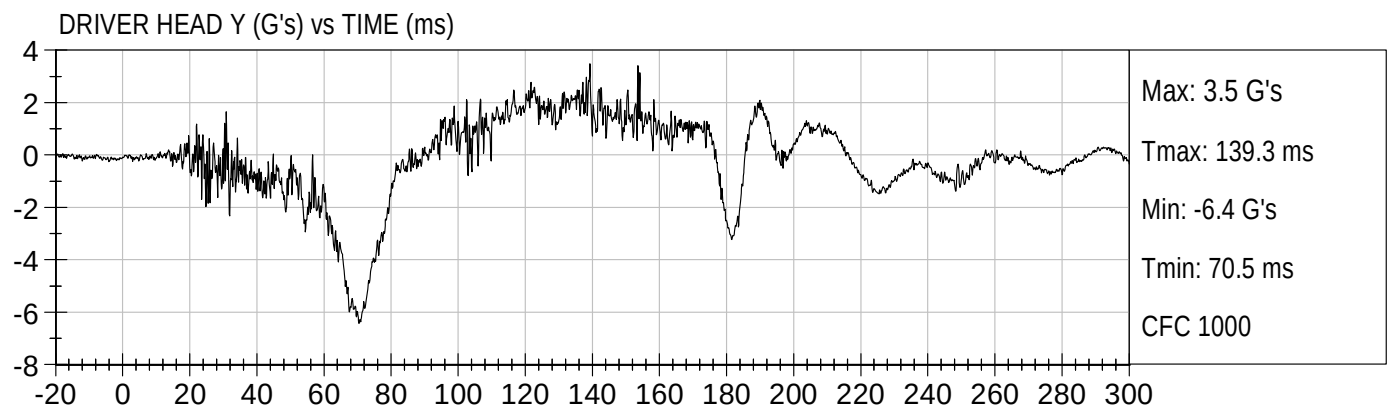
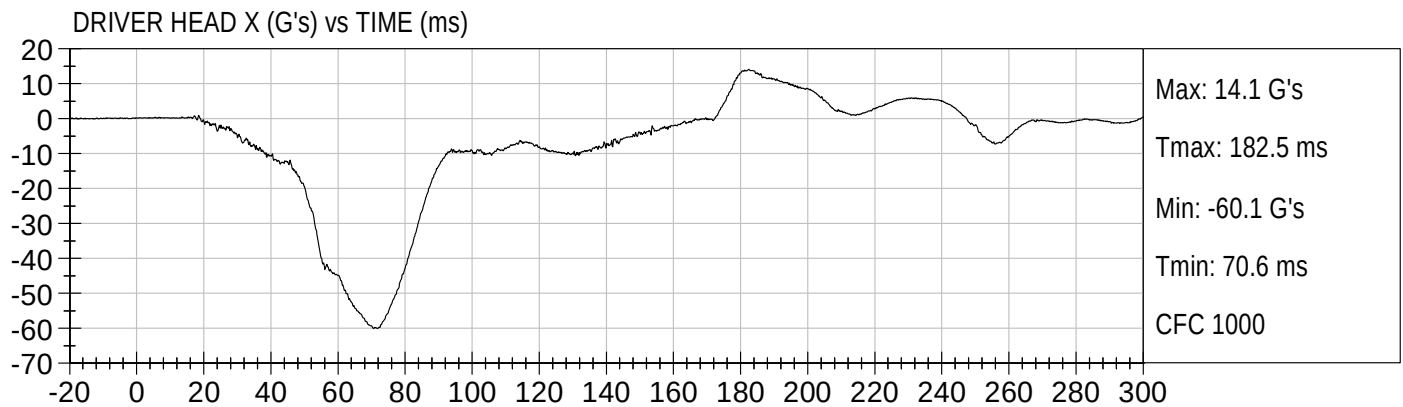
Driver Right Upper Tibia Moment X

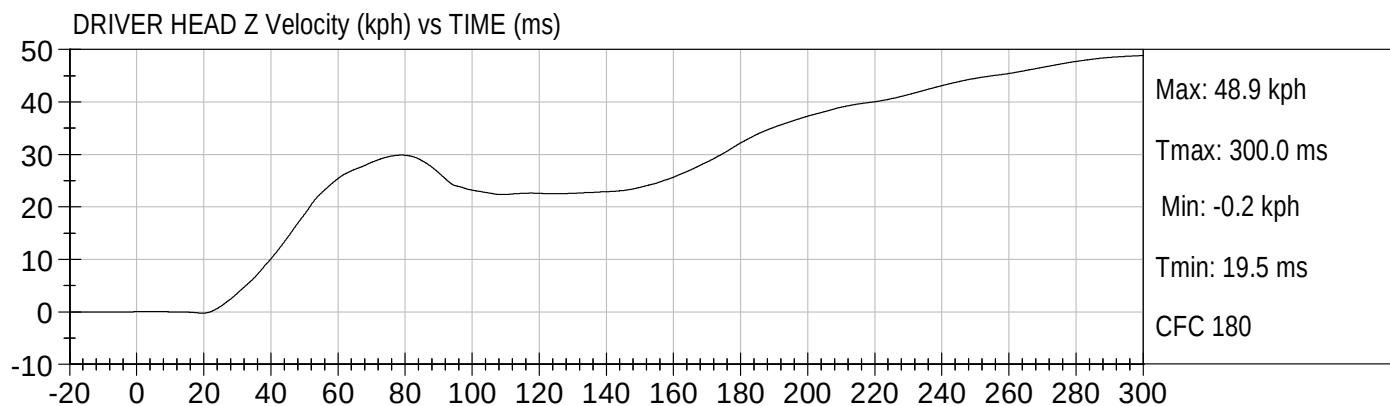
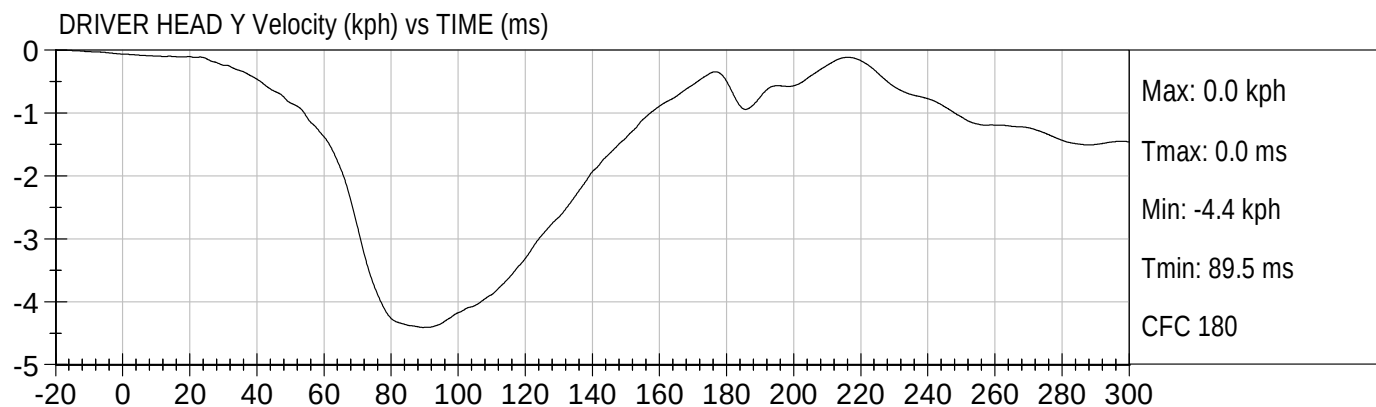
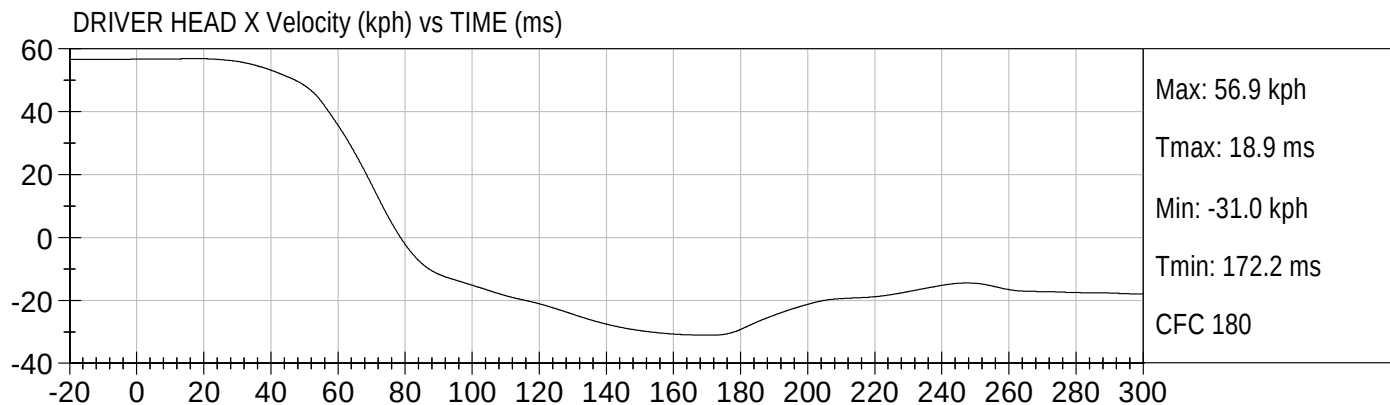
Driver Right Upper Tibia Moment Y

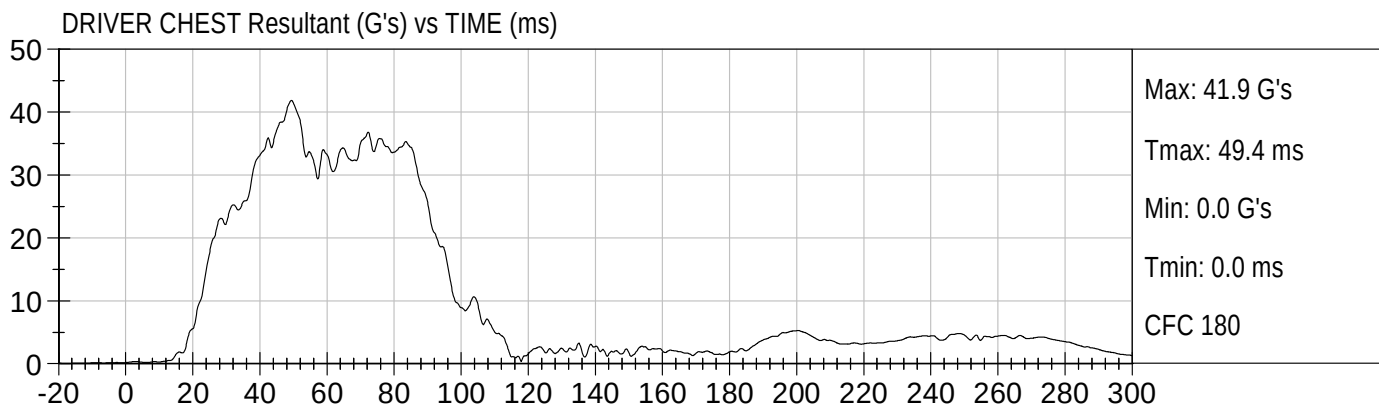
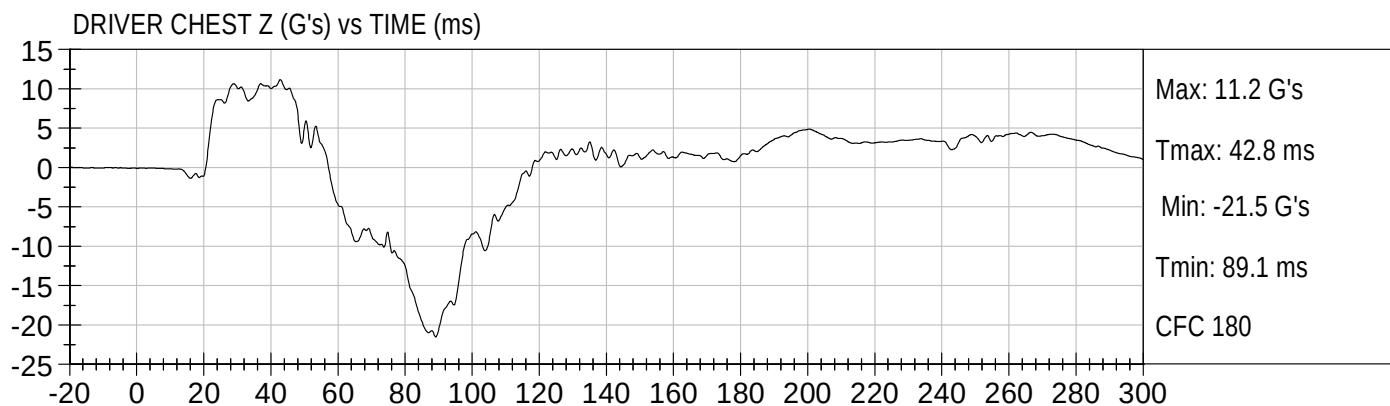
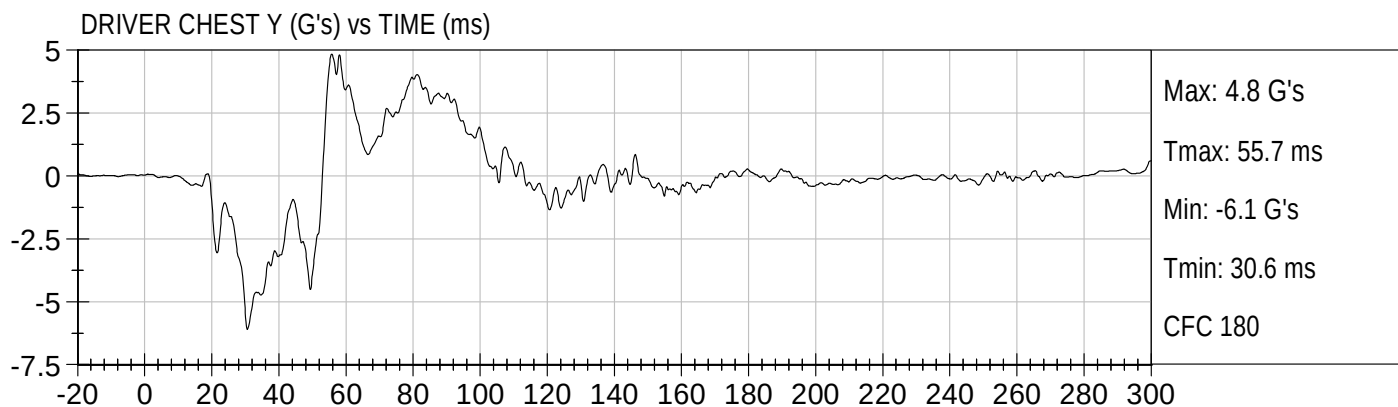
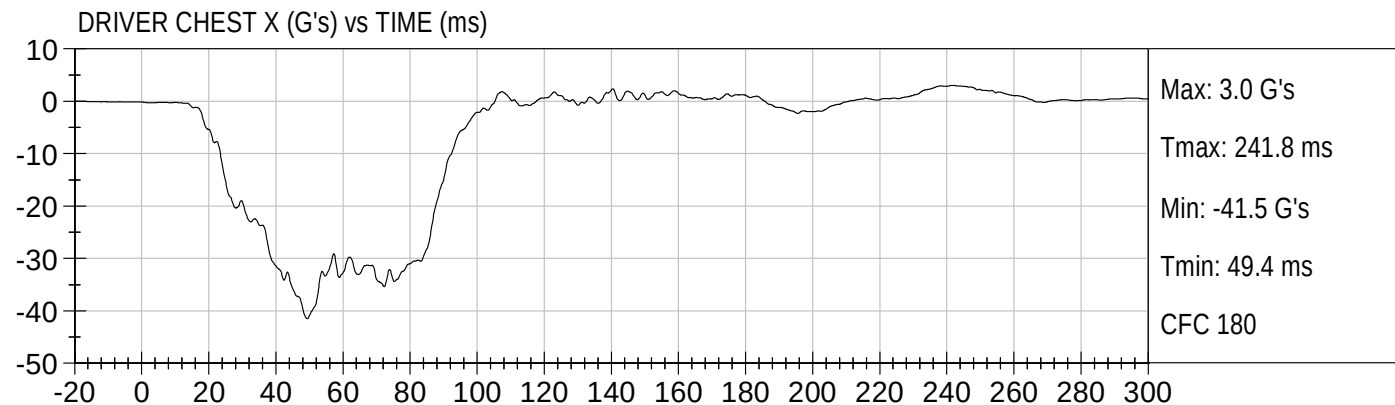
Driver Right Upper Tibia Force Z

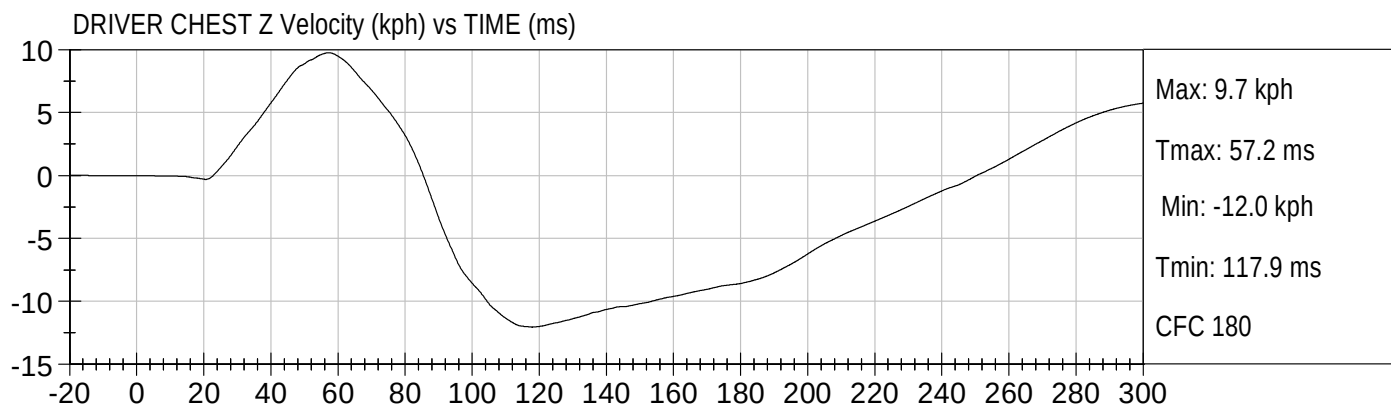
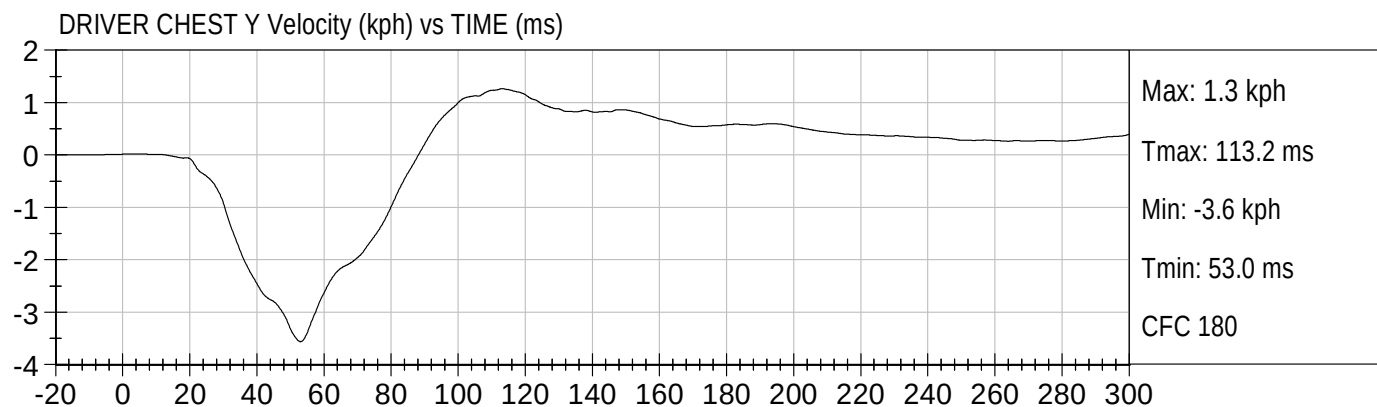
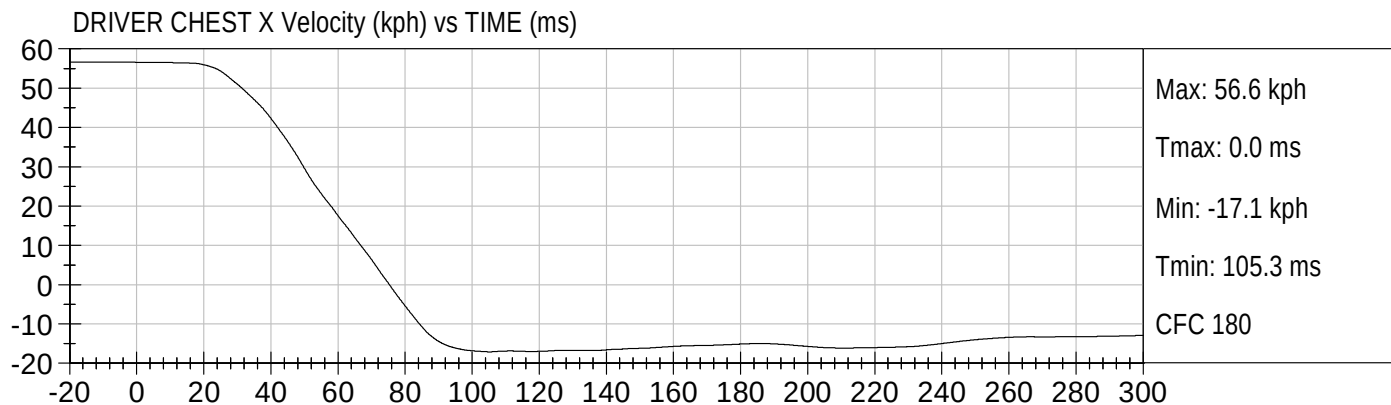
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Fore Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Right Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Passenger Head X Redundant
Passenger Head Y Redundant
Passenger 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

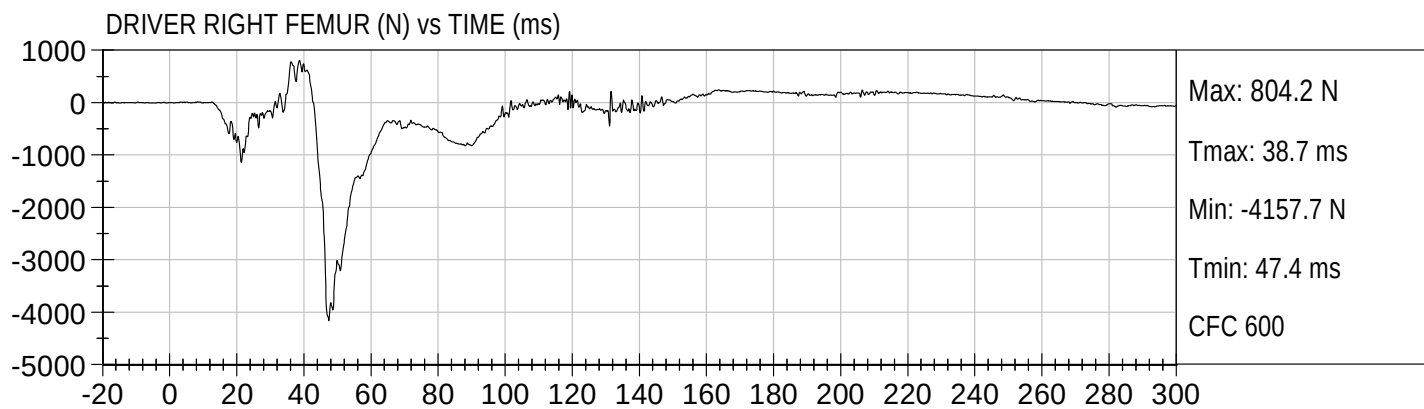
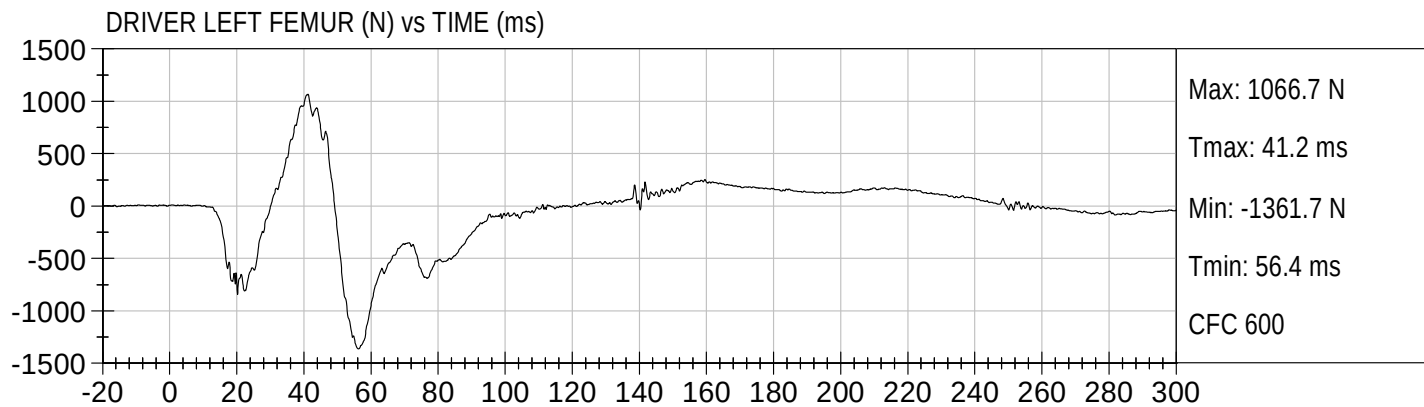
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Right Upper Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Fore Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger 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

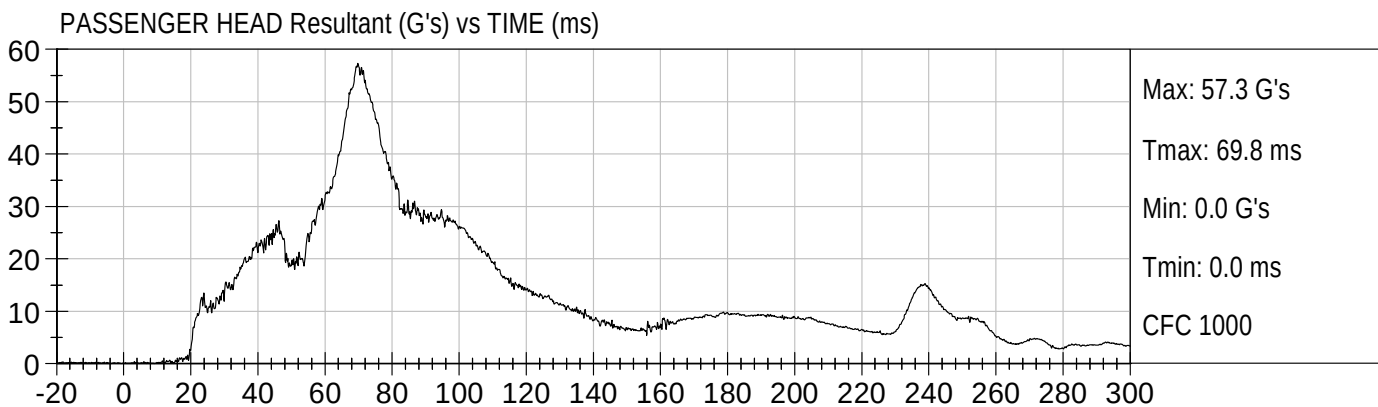
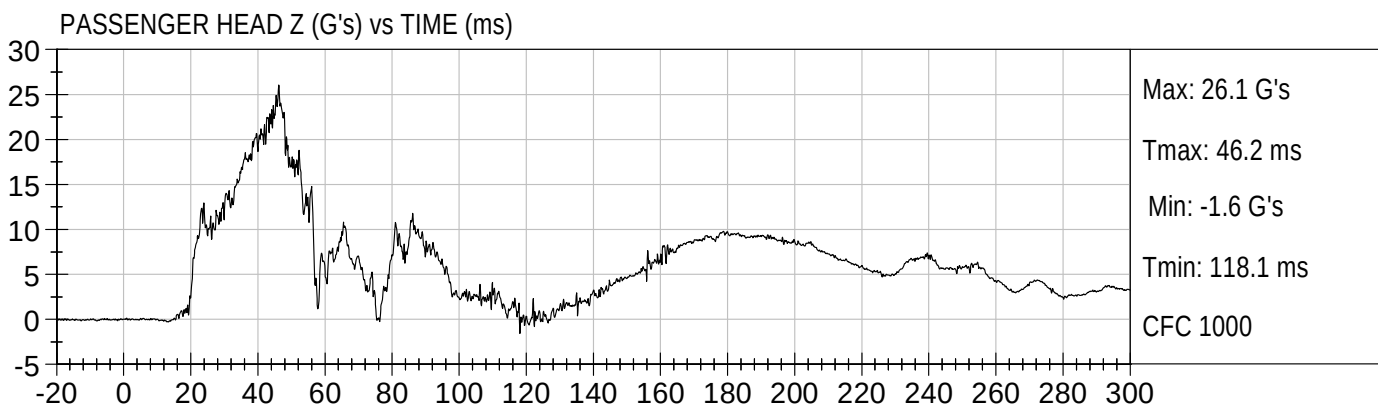
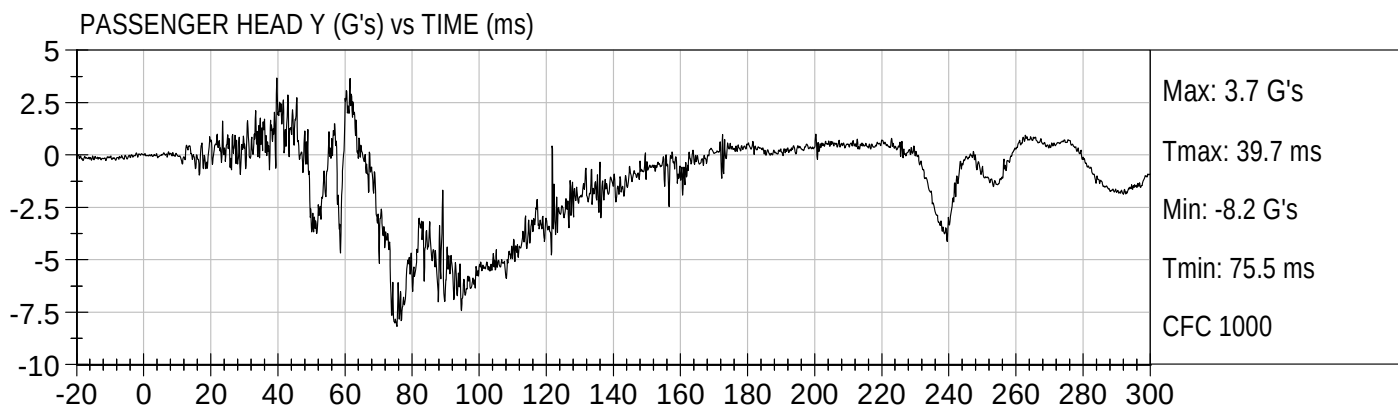
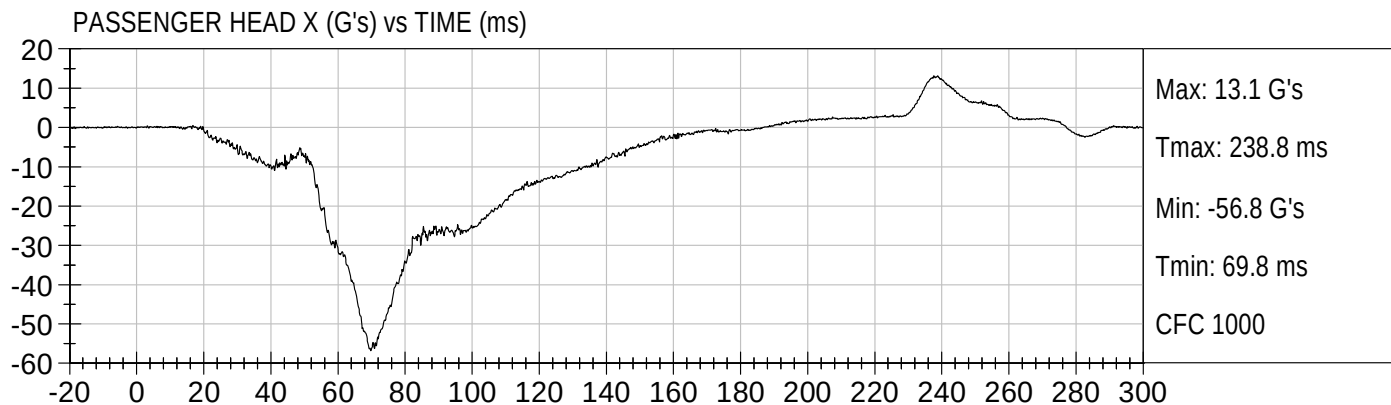


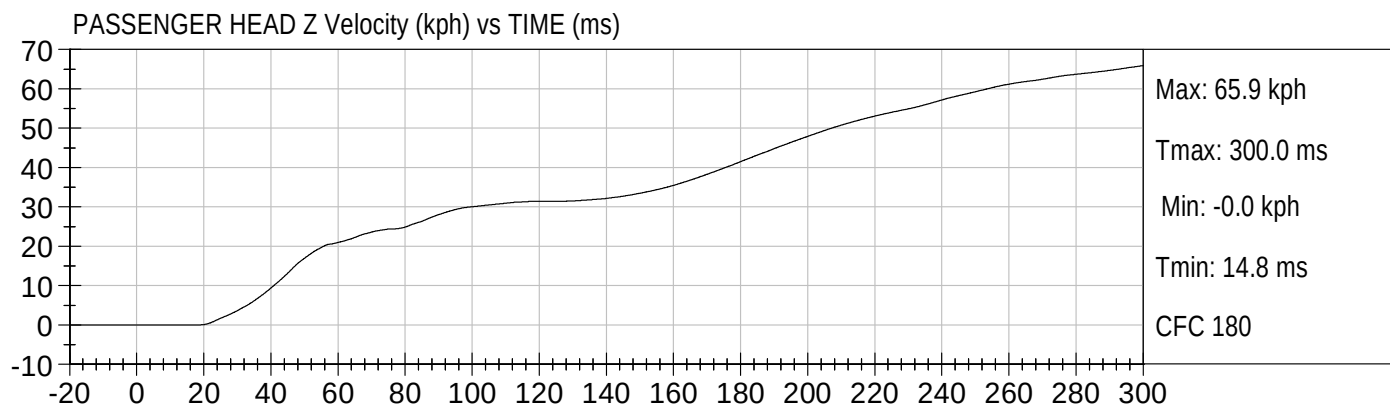
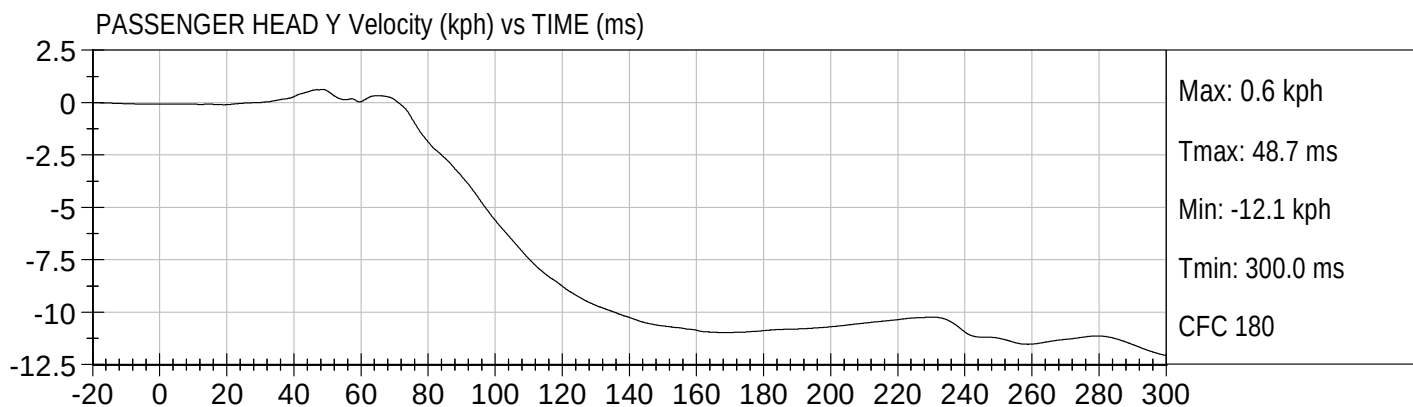
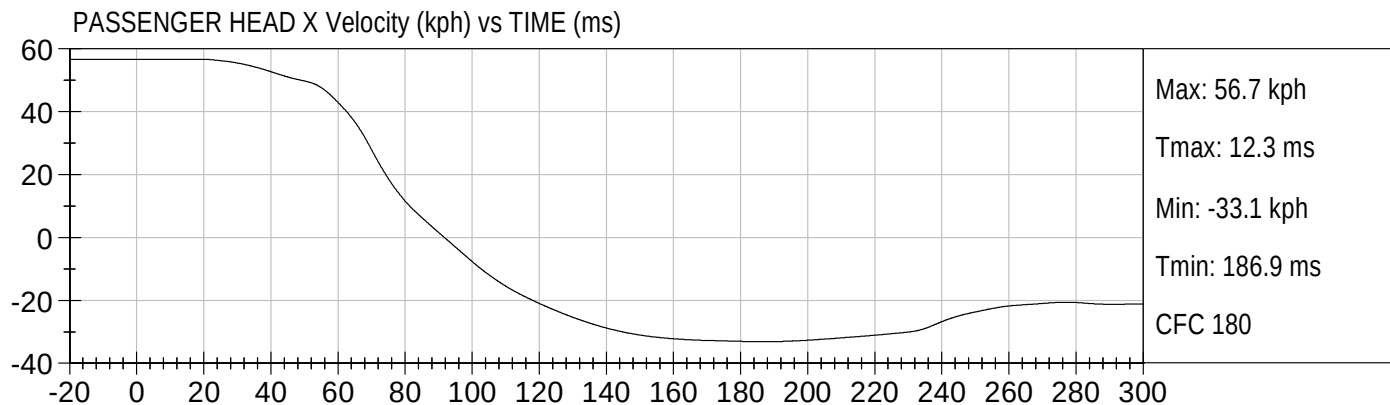


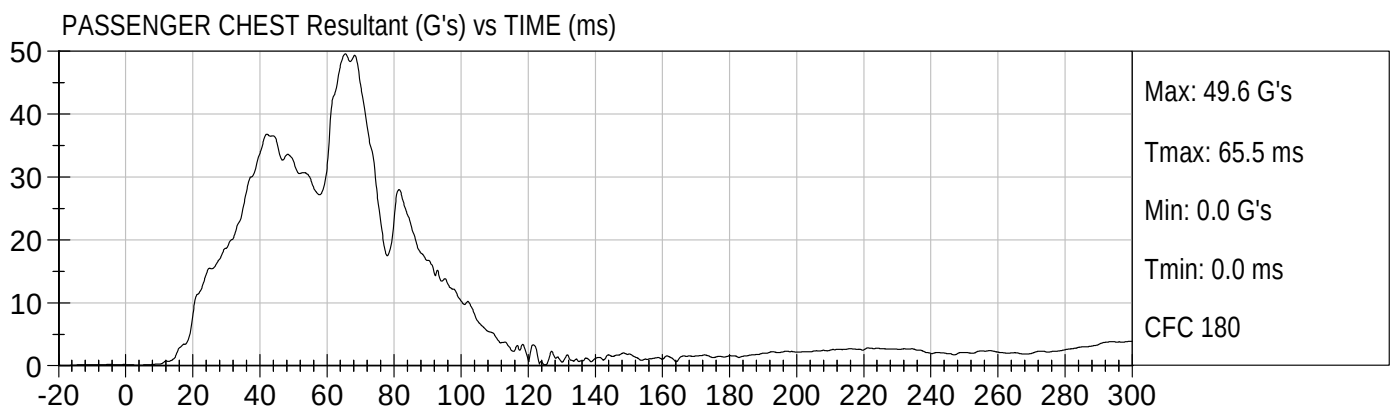
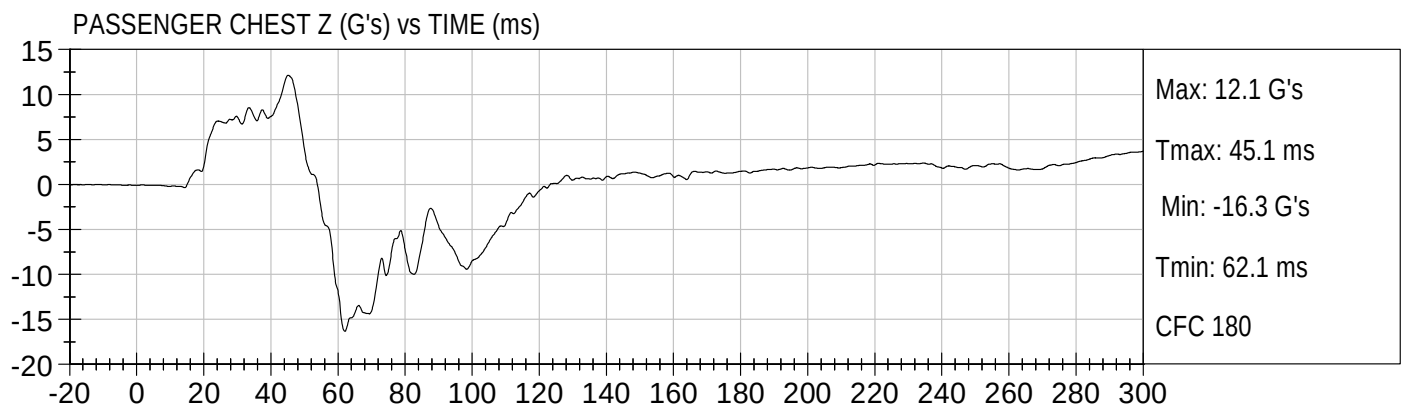
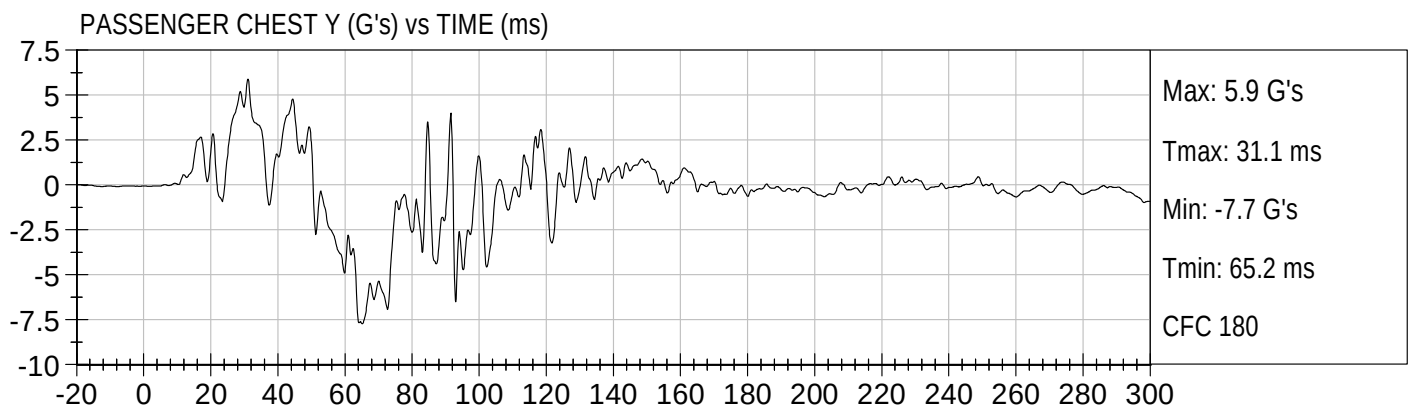
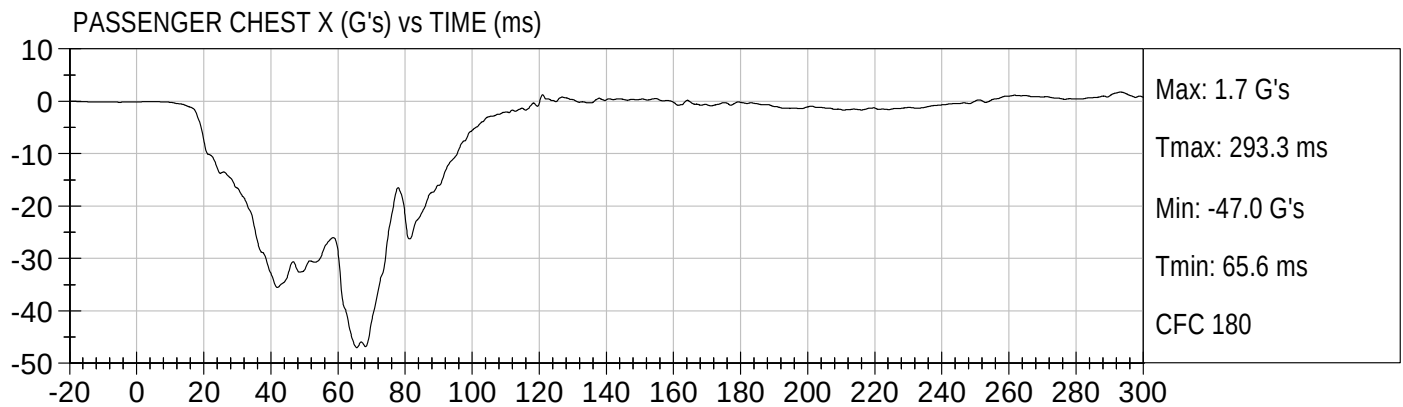


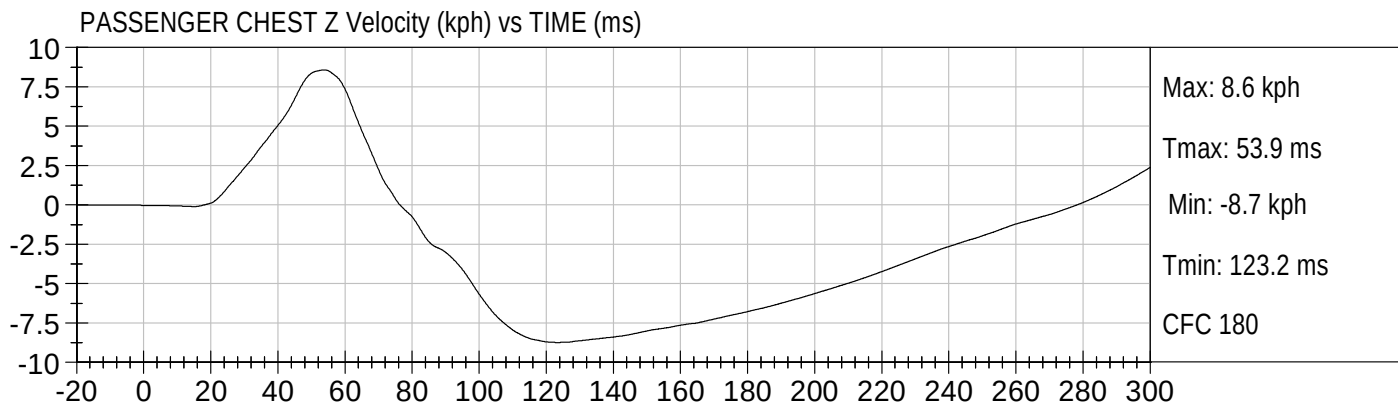
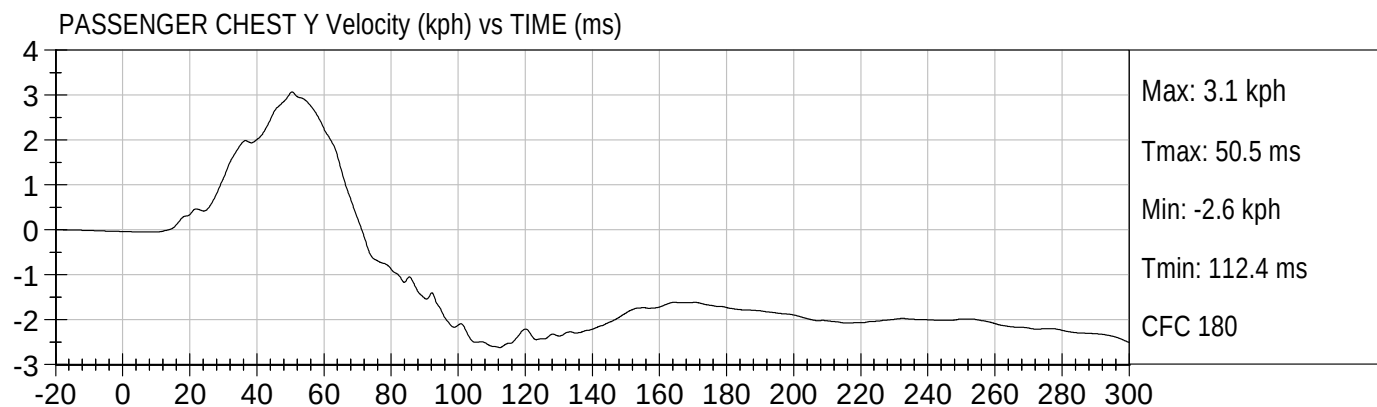
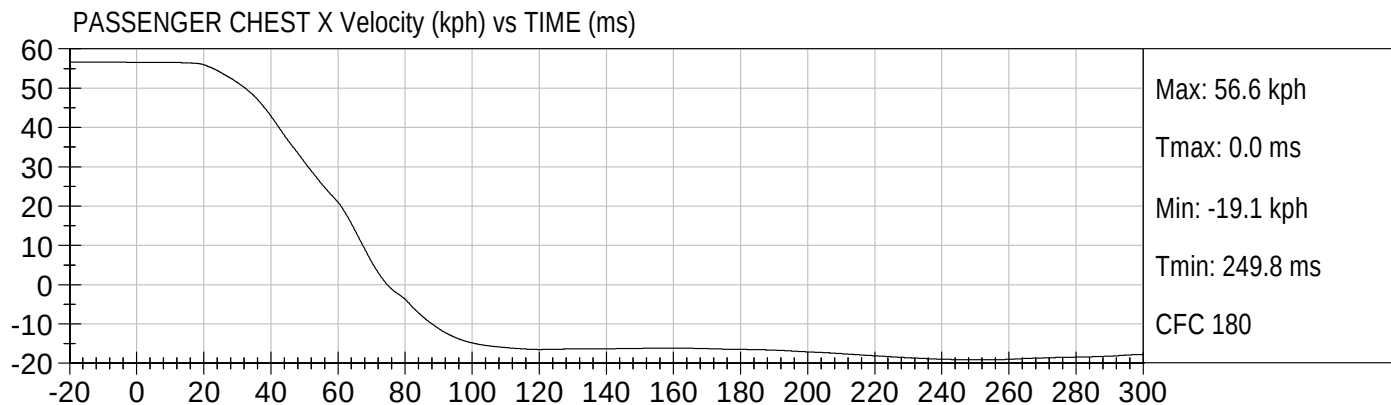


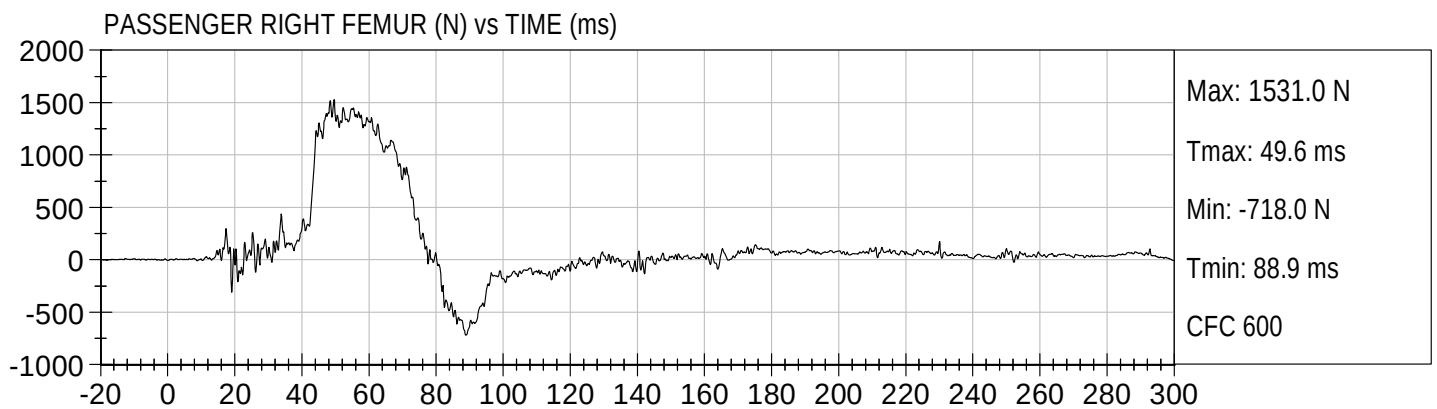
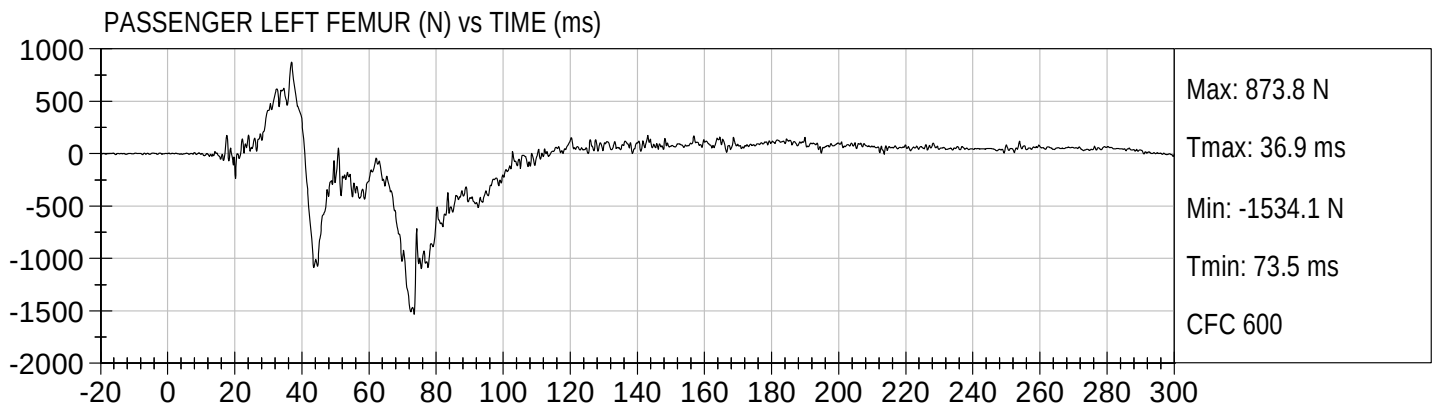












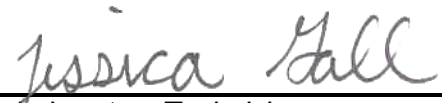
APPENDIX C
DUMMY CALIBRATION DATA

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

ATD Serial No: 066

Test ID: D091641

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	225 - 275	229	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	11.6	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

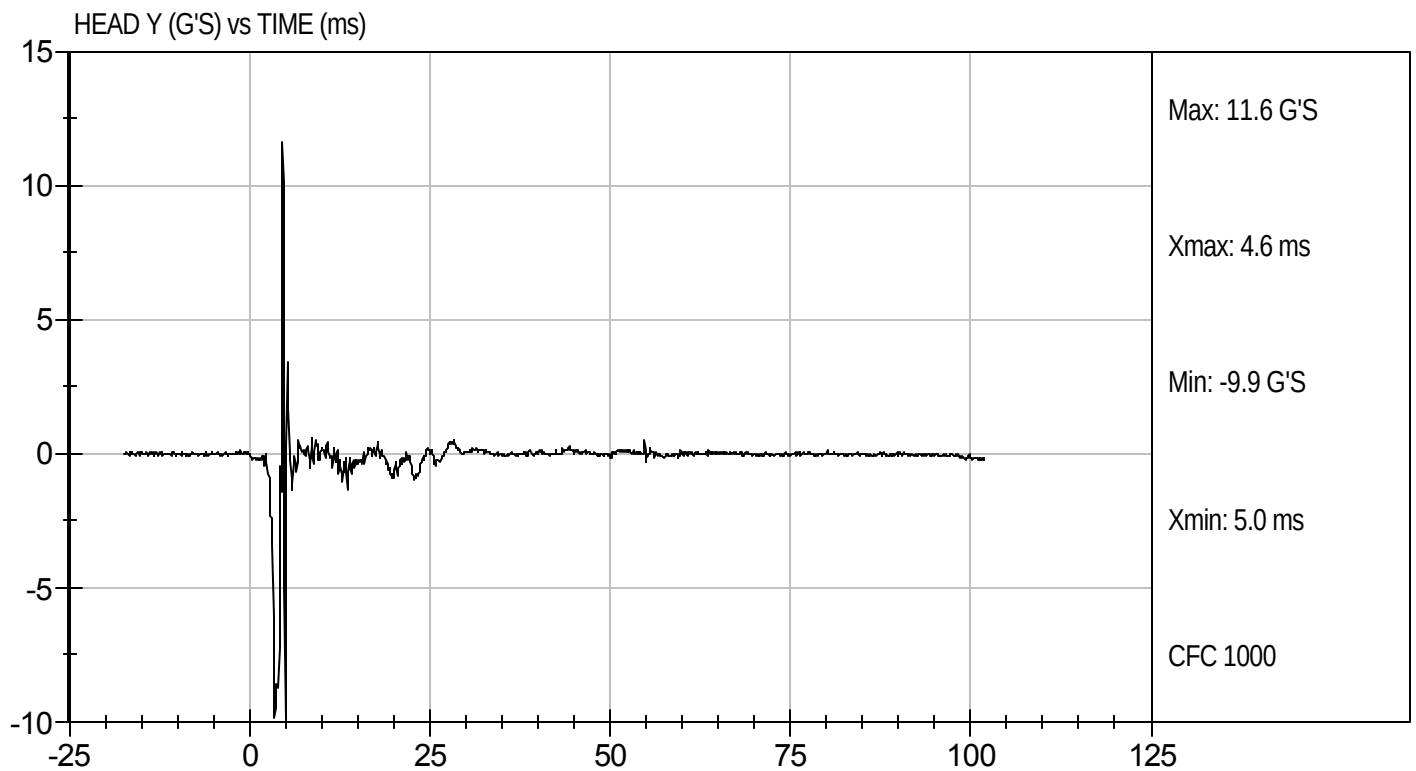
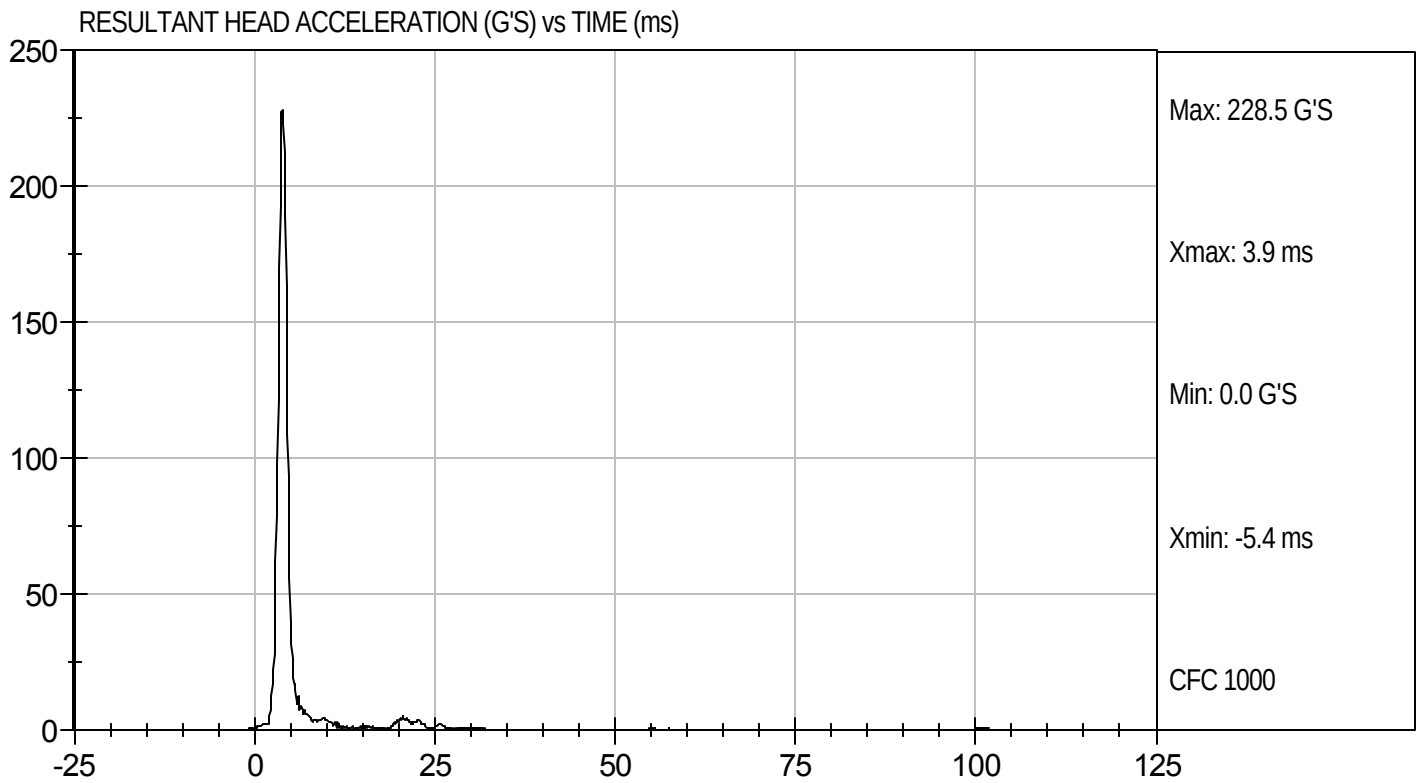
6/30/09
Test Date


Approved By



Test Desc: Head Drop
Component ID: D091641

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s

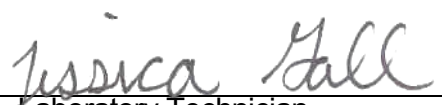


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D091642

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.18	Pass
	20 msec	G's	17.60 to 22.60	19.84	Pass
	30 msec	G's	12.50 to 18.50	13.93	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	13.90	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	34.6	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	71.2	Pass
	Time	msec	57.0 to 64.0	57.3	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.2	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	103.4	Pass
	Time	msec	47.0 to 58.0	47.7	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	100.8	Pass
Overall Test Results					Pass


 Laboratory Technician

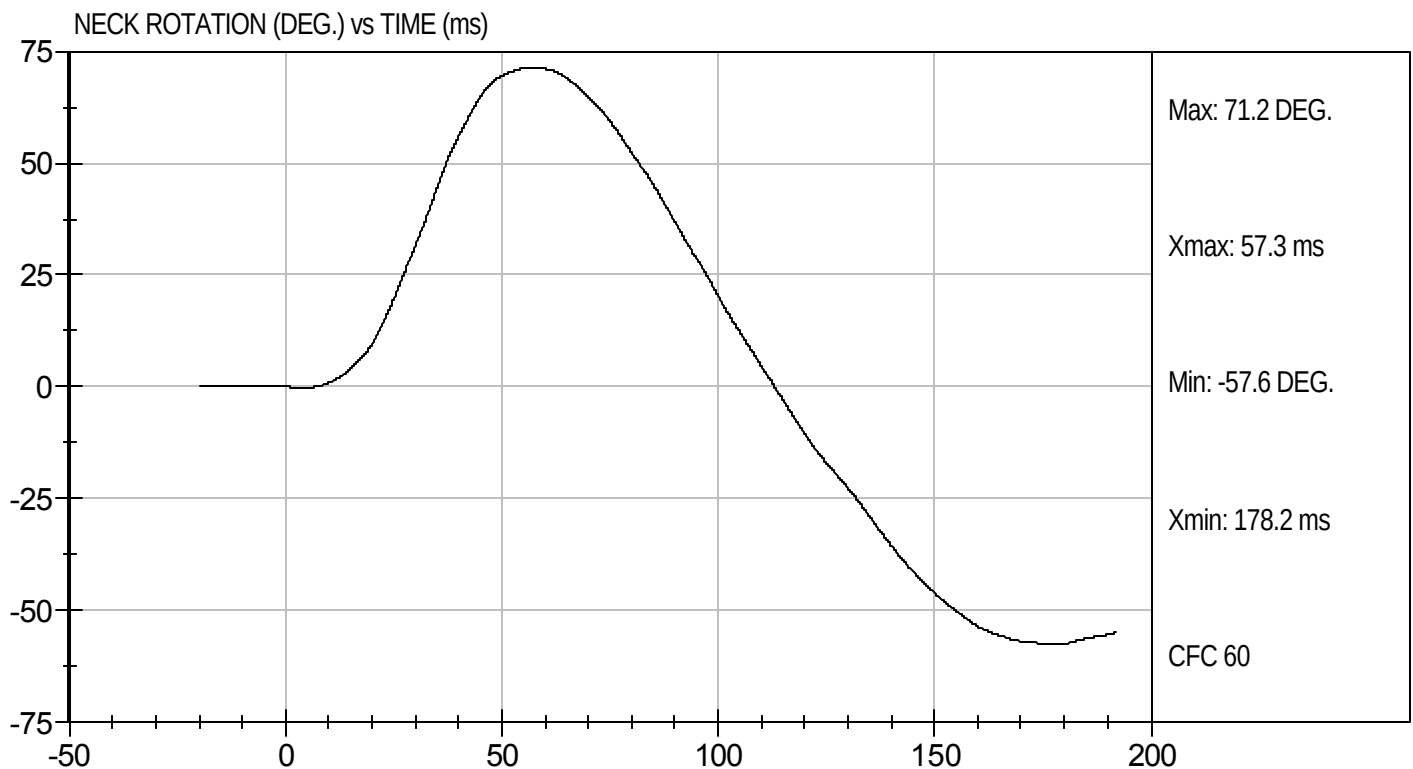
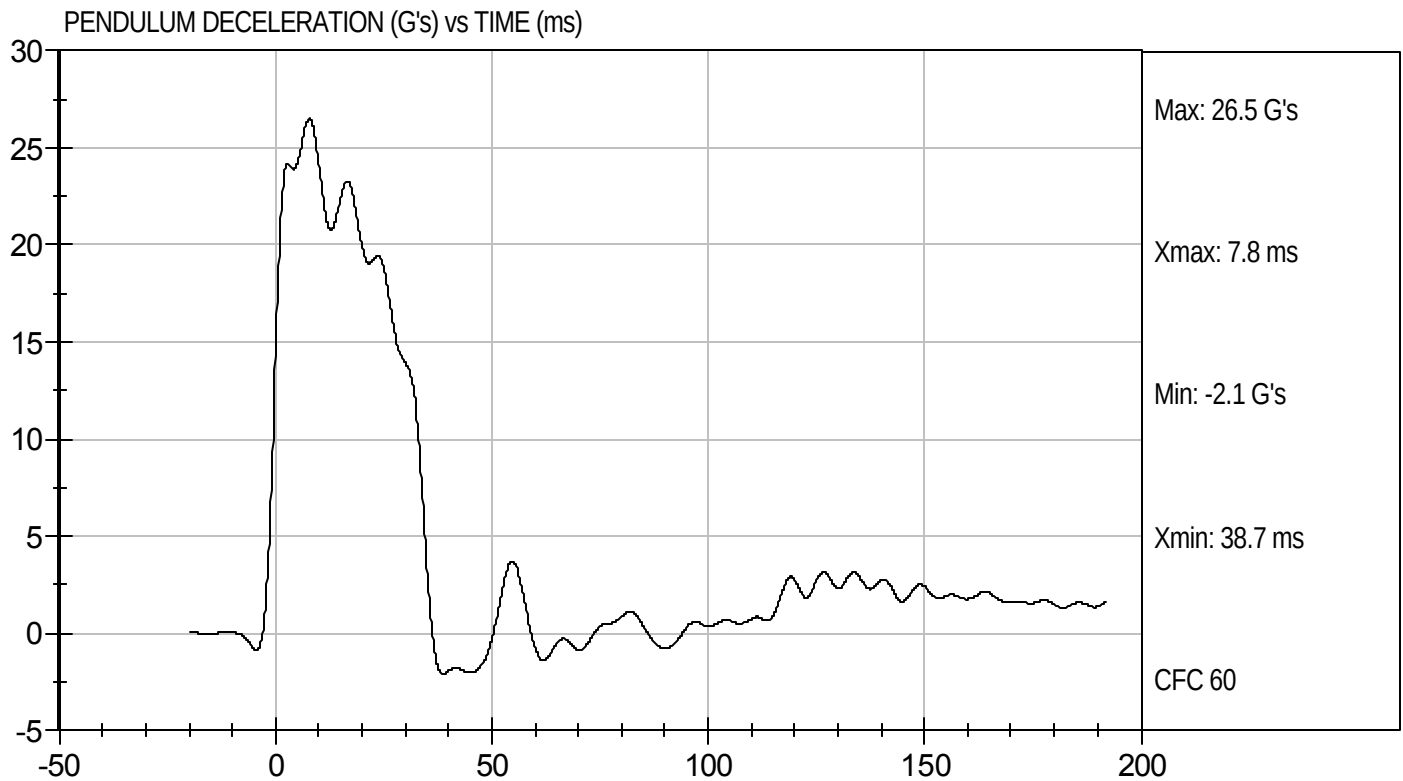
6/30/09
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D091642

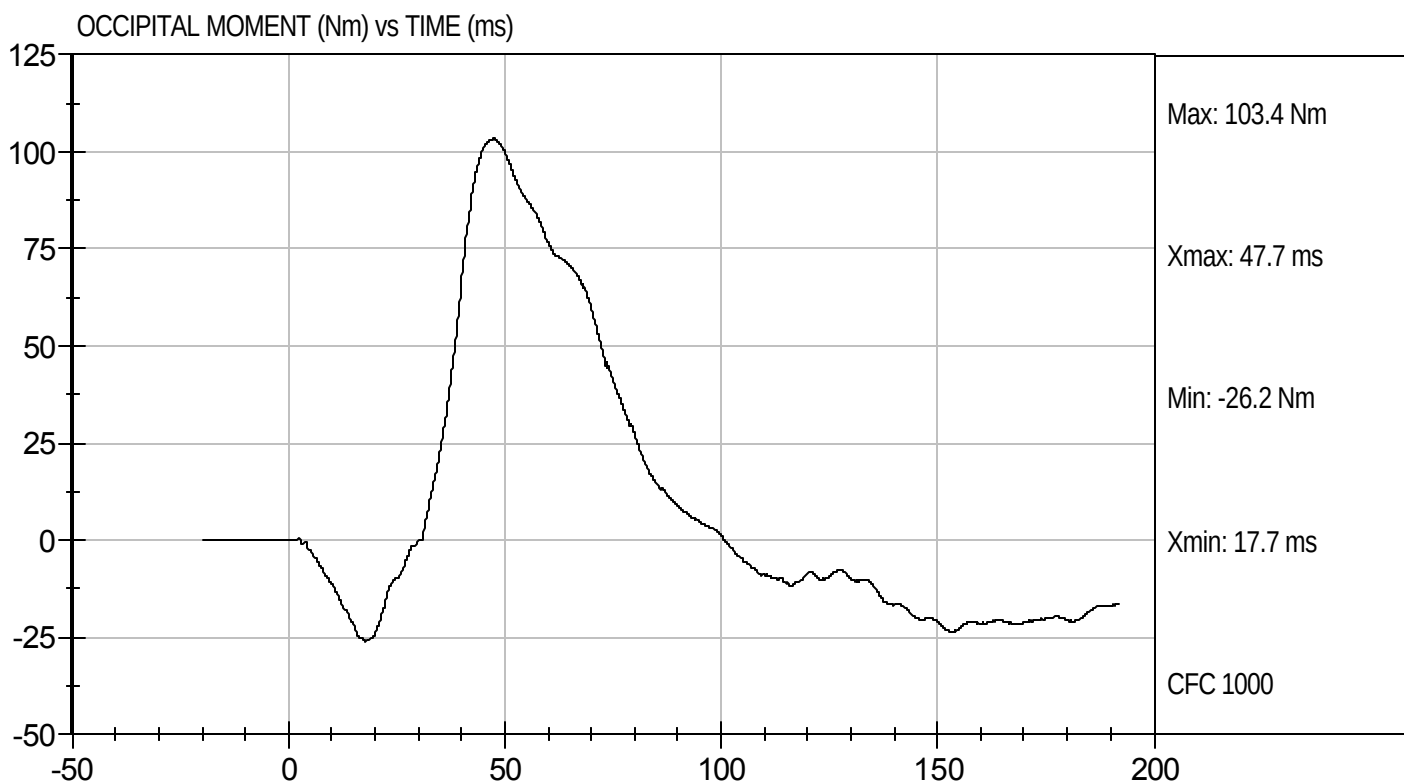
Test Date: 6/30/09
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D091642

Test Date: 6/30/09
Velocity: 23.15 ft/s, 7.06 m/s



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

ATD Serial No: 066

Test I.D: D091643

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	19.52	Pass
	20 msec	G's	14.00 to 19.00	17.44	Pass
	30 msec	G's	11.00 to 16.00	15.27	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	15.23	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.9	Pass
	Time	msec	72.0 to 82.0	77.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	156.0	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-68.1	Pass
	Time	msec	65.0 to 79.0	68.2	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	146.0	Pass
Overall Test Results					Pass


 Laboratory Technician

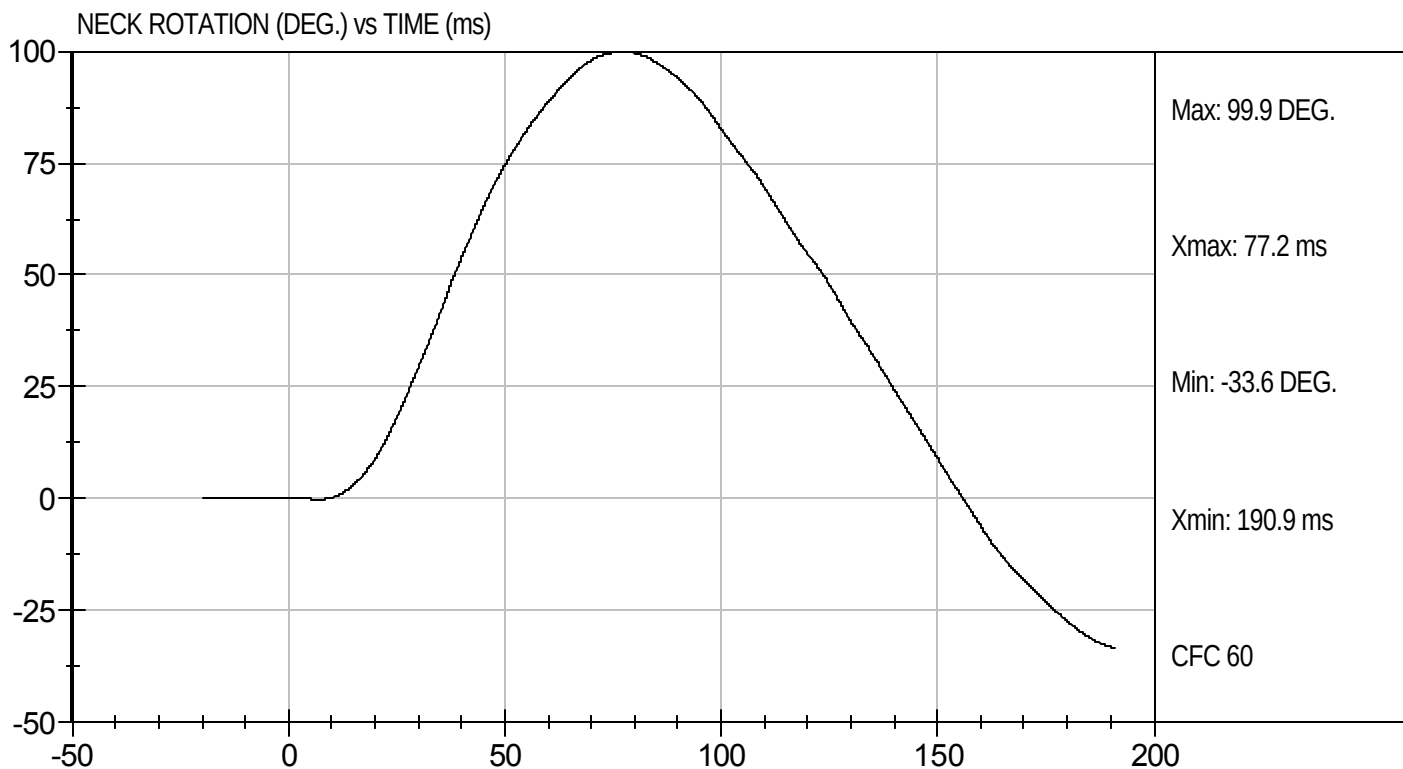
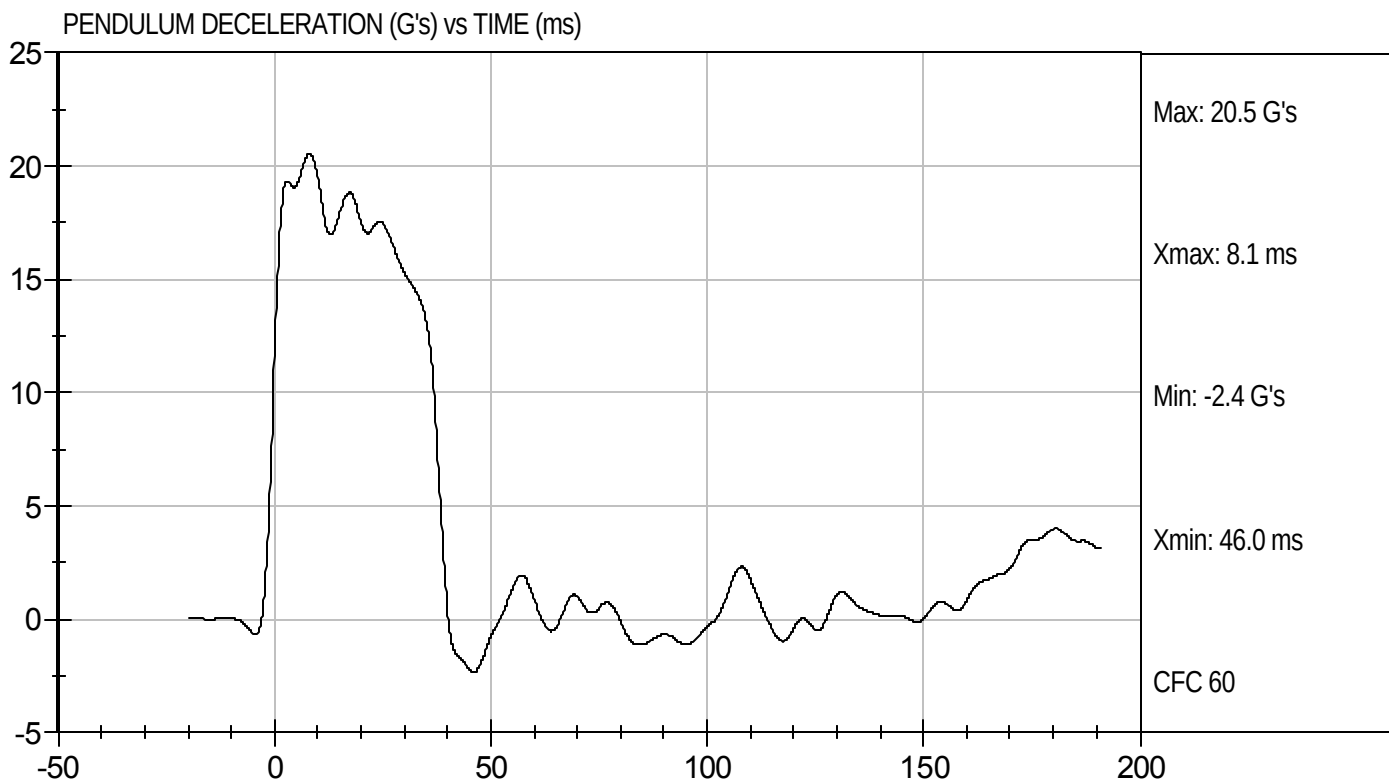
6/30/09
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D091643

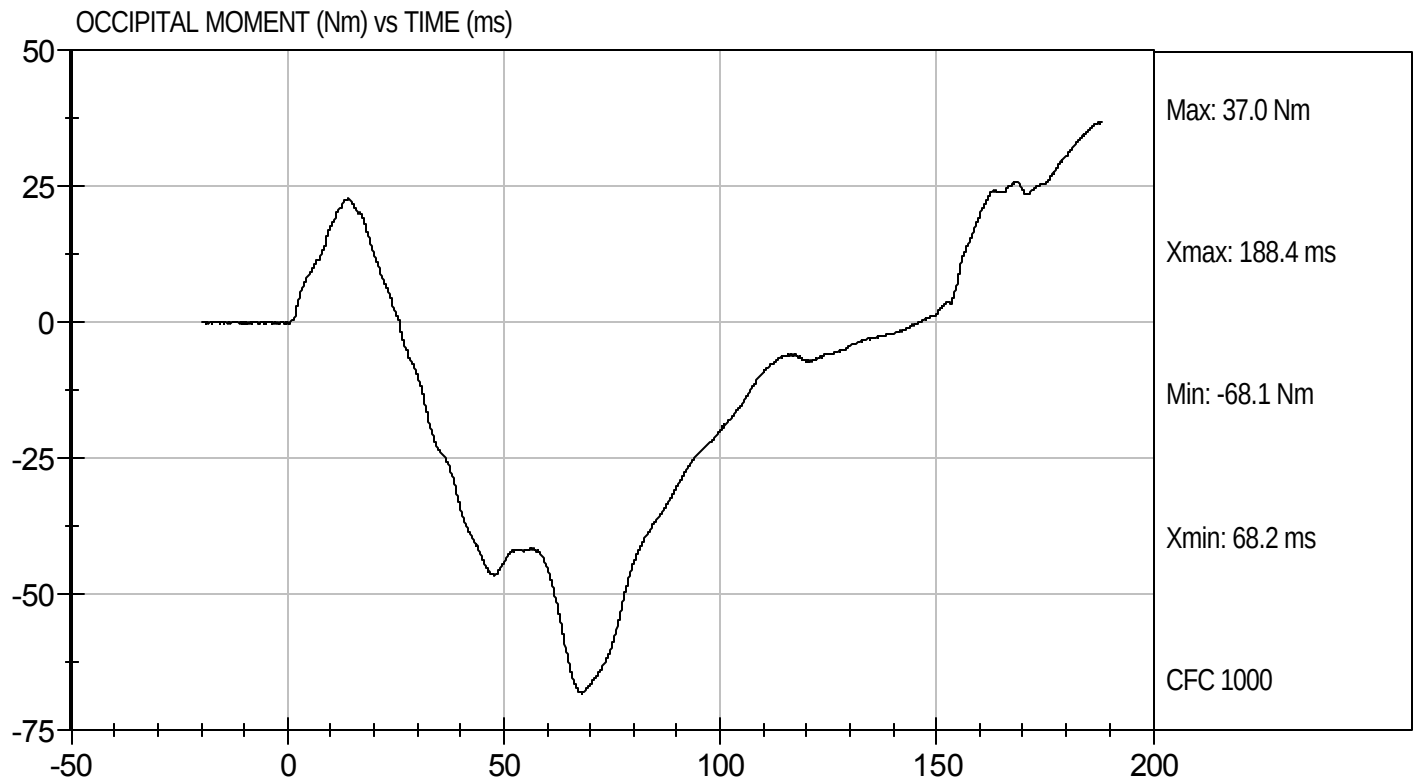
Test Date: 6/30/09
Velocity: 20.20 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D091643

Test Date: 6/30/09
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: D091644

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,415	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.52	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

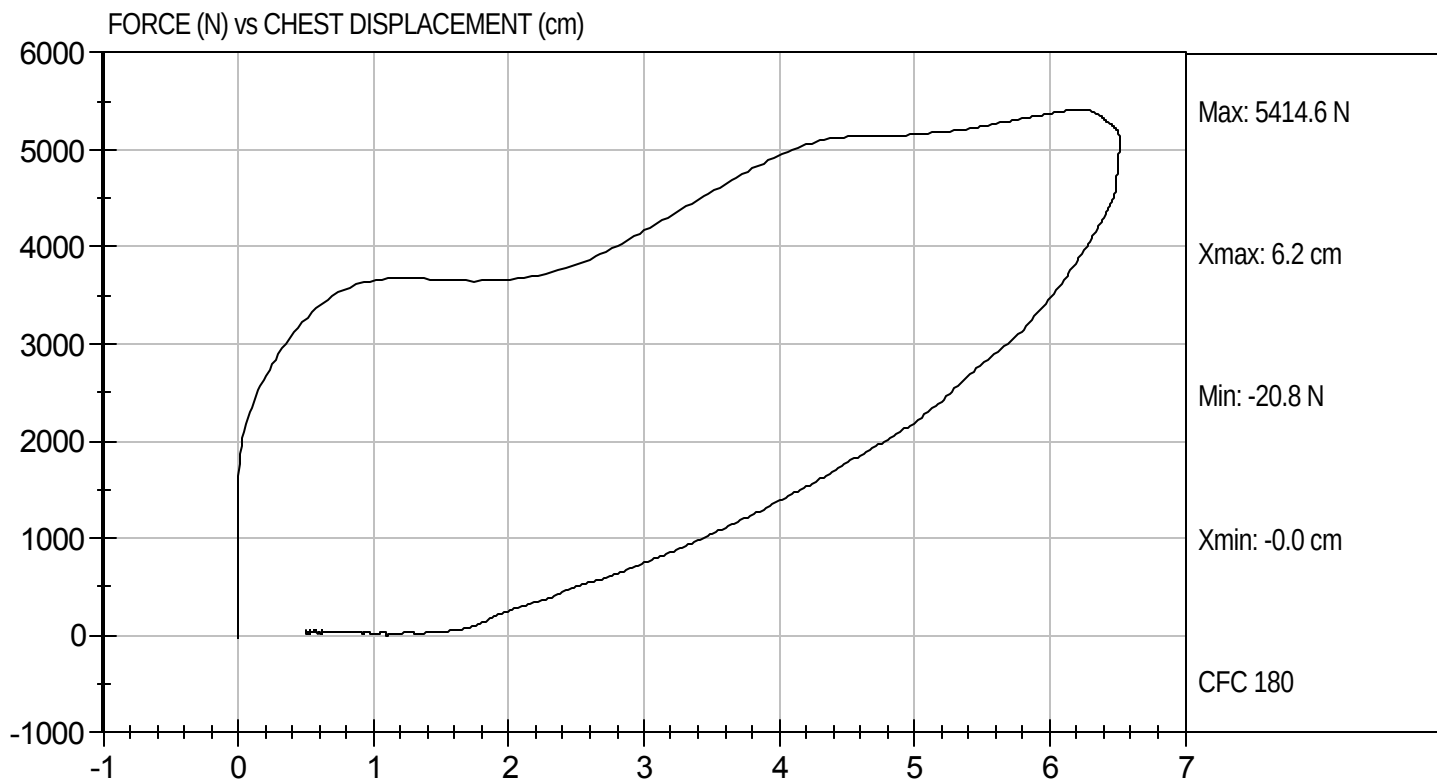
7/1/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D091644

Test Date: 7/1/09
Velocity: 21.93 ft/s, 6.68 m/s



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

ATD Serial No: 066

Test I.D: D091645

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	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,430	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

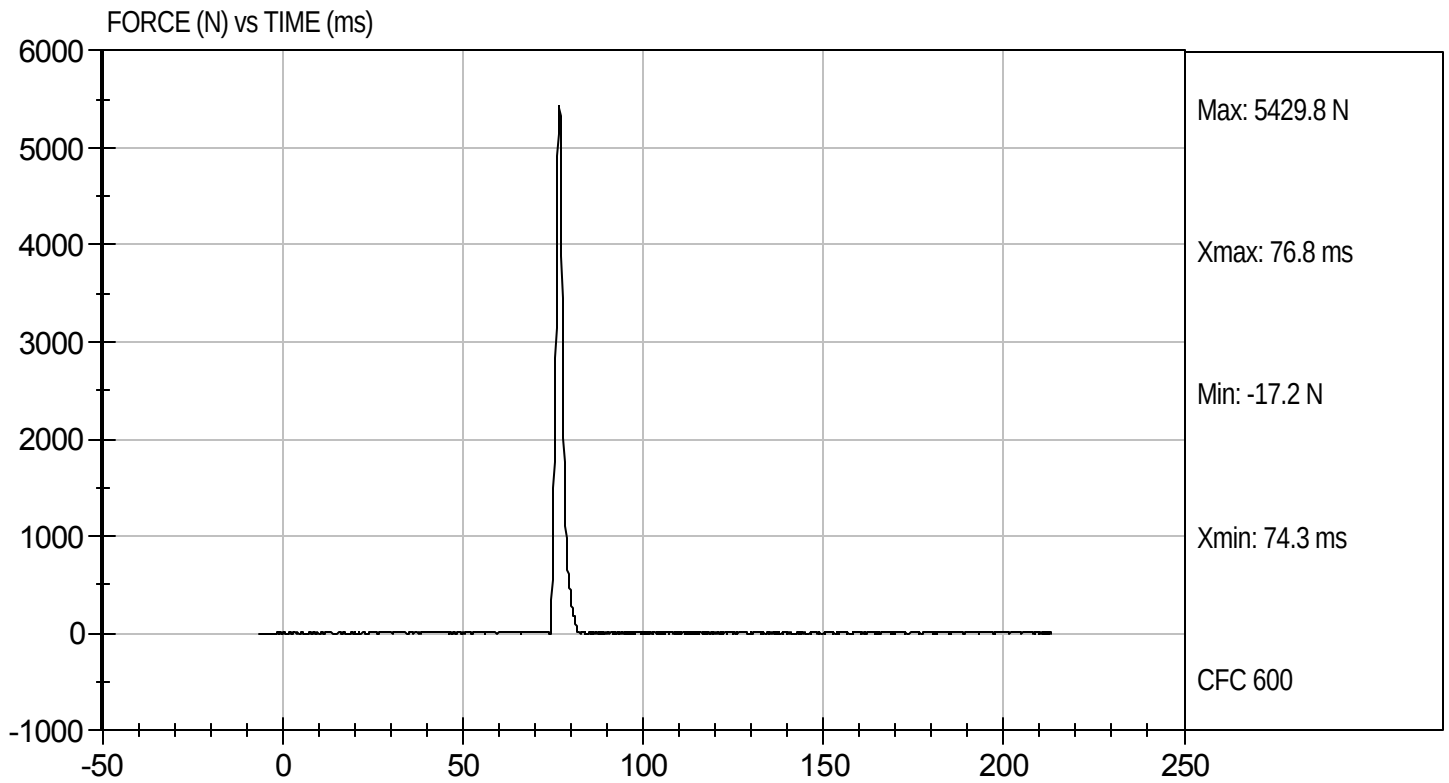
6/30/09
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D091645

Test Date: 6/30/09
Velocity: 6.97 ft/s, 2.12 m/s

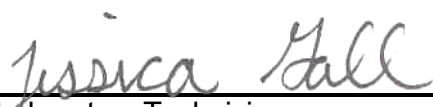


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 066

Test I.D: D091646

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	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5,073	Pass
Overall Test Results				Pass



Laboratory Technician

6/30/09

Test Date

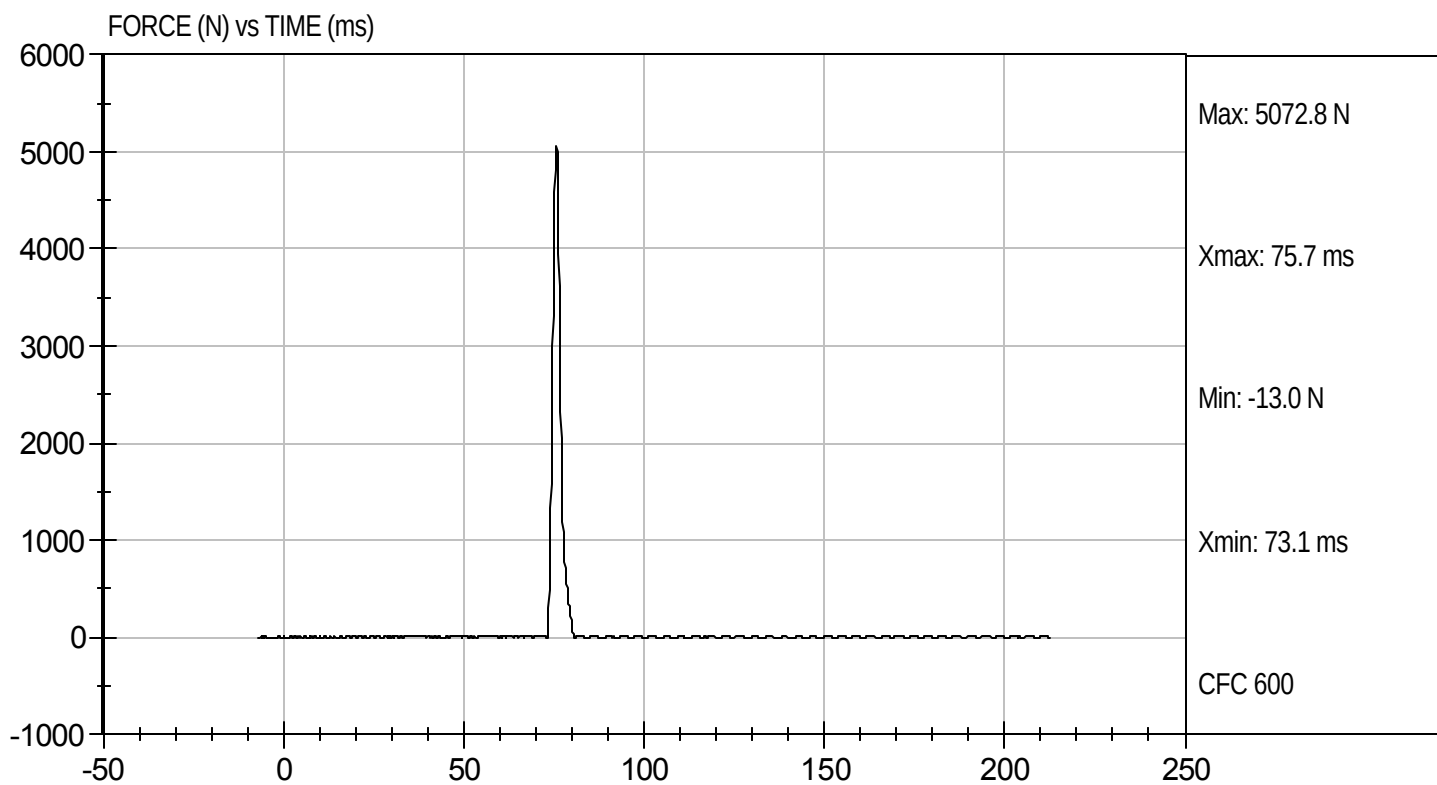


Approved By



Test Desc: Left Knee
Component ID: D091646

Test Date: 6/30/09
Velocity: 6.97 ft/s, 2.12 m/s



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

ATD Serial No: 066

Test I.D: D091640

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	22.2	22.2	Pass
Laboratory Relative Humidity	%	10 to 70	44	44	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	80.9	88.7	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	42	41	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

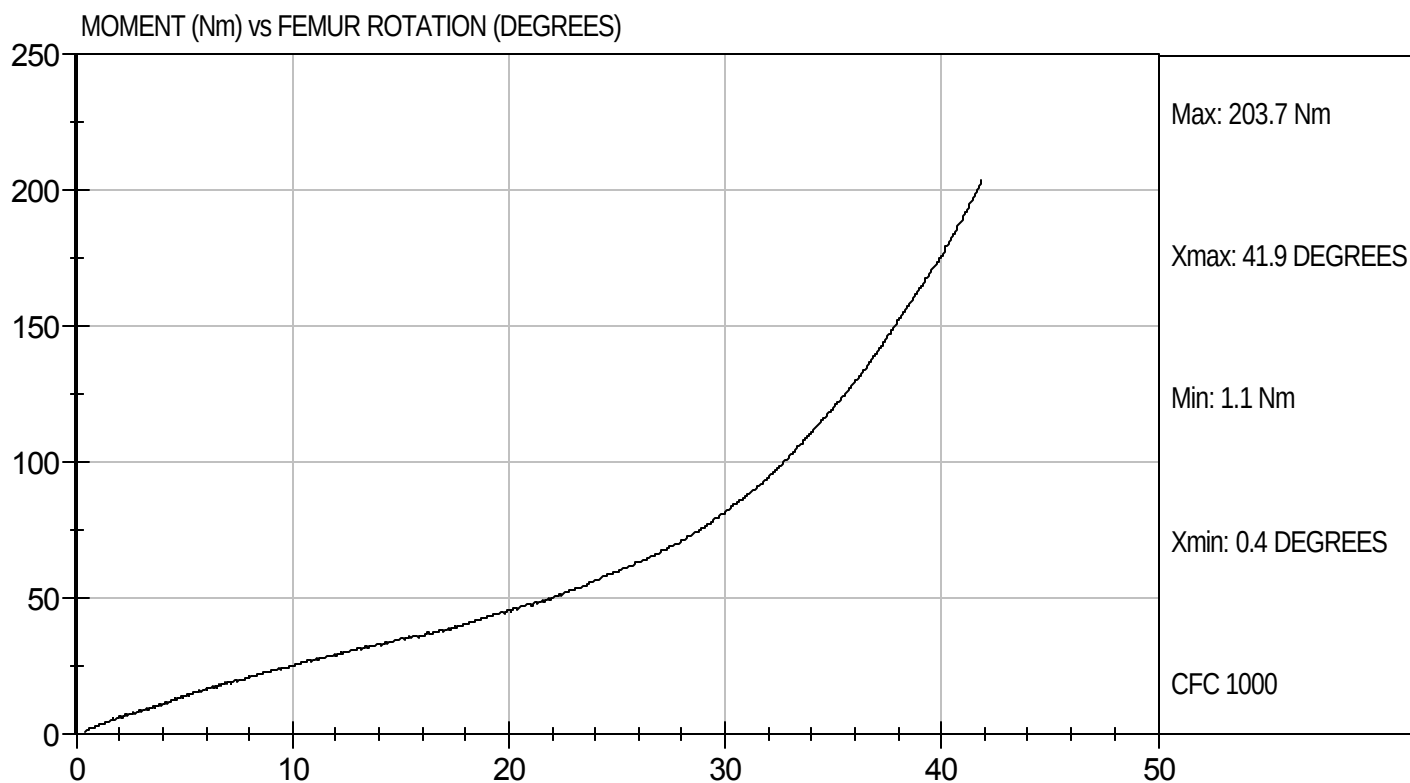
6/30/09
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D091649

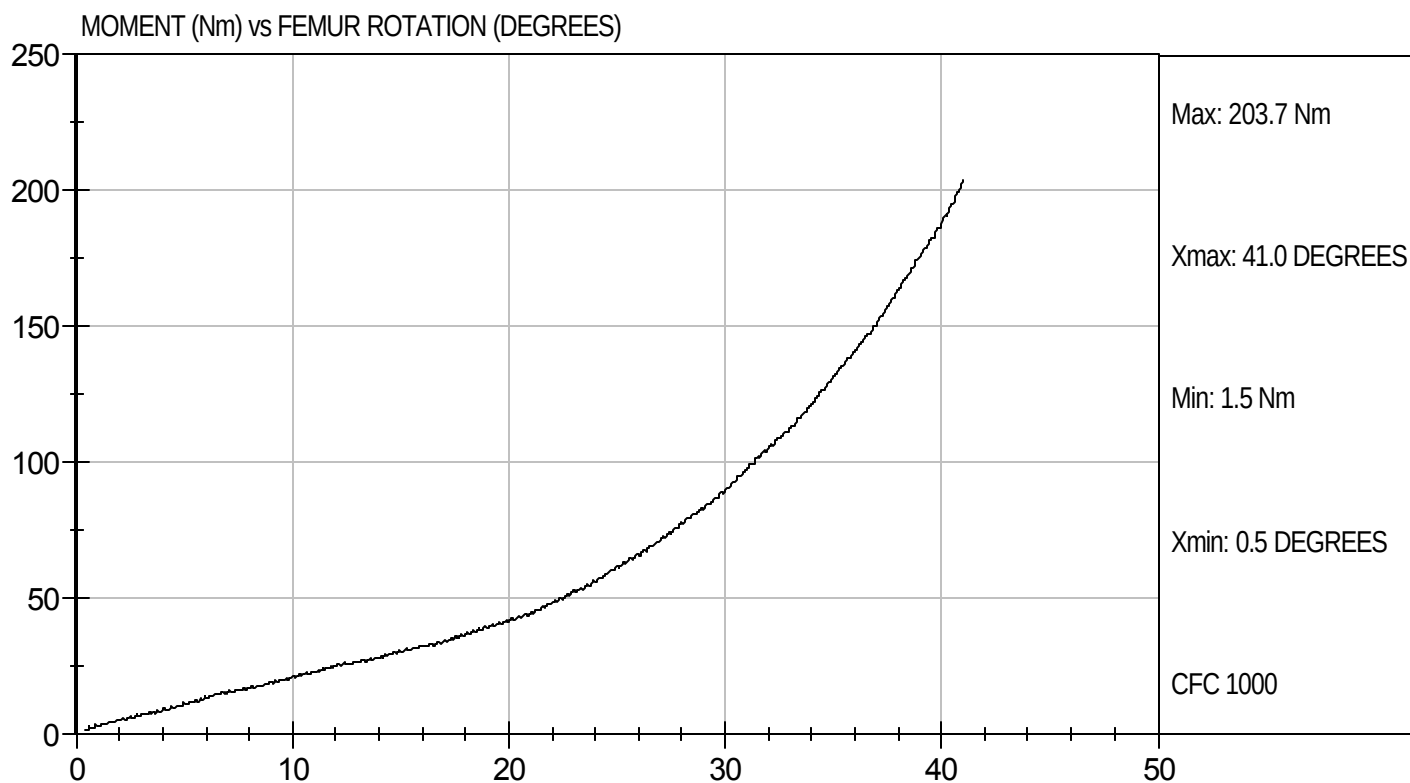
Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D091640

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s

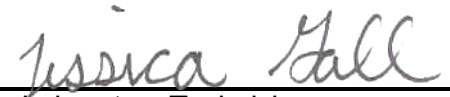


MGA RESEARCH CORPORATION
HEAD DROP TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test ID: D091631

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	18.9 - 25.6	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	49	Pass
Peak Resultant Acceleration	G's	225 - 275	229	Pass
Peak Lateral Acceleration	G's	<= +/- 15.0	9.0	Pass
Unimodal	N/A	Yes	Yes	Pass
Oscillations	N/A	within 10% of peak	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

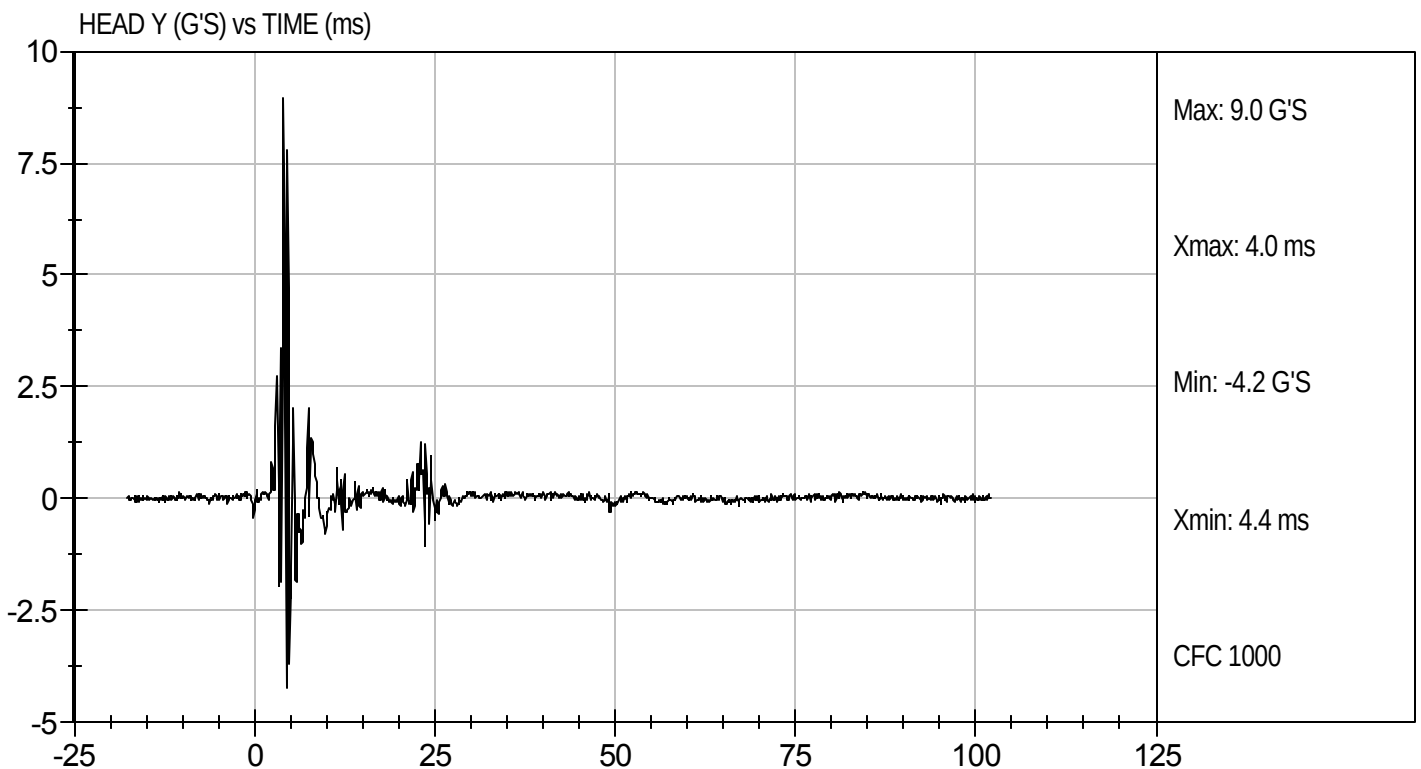
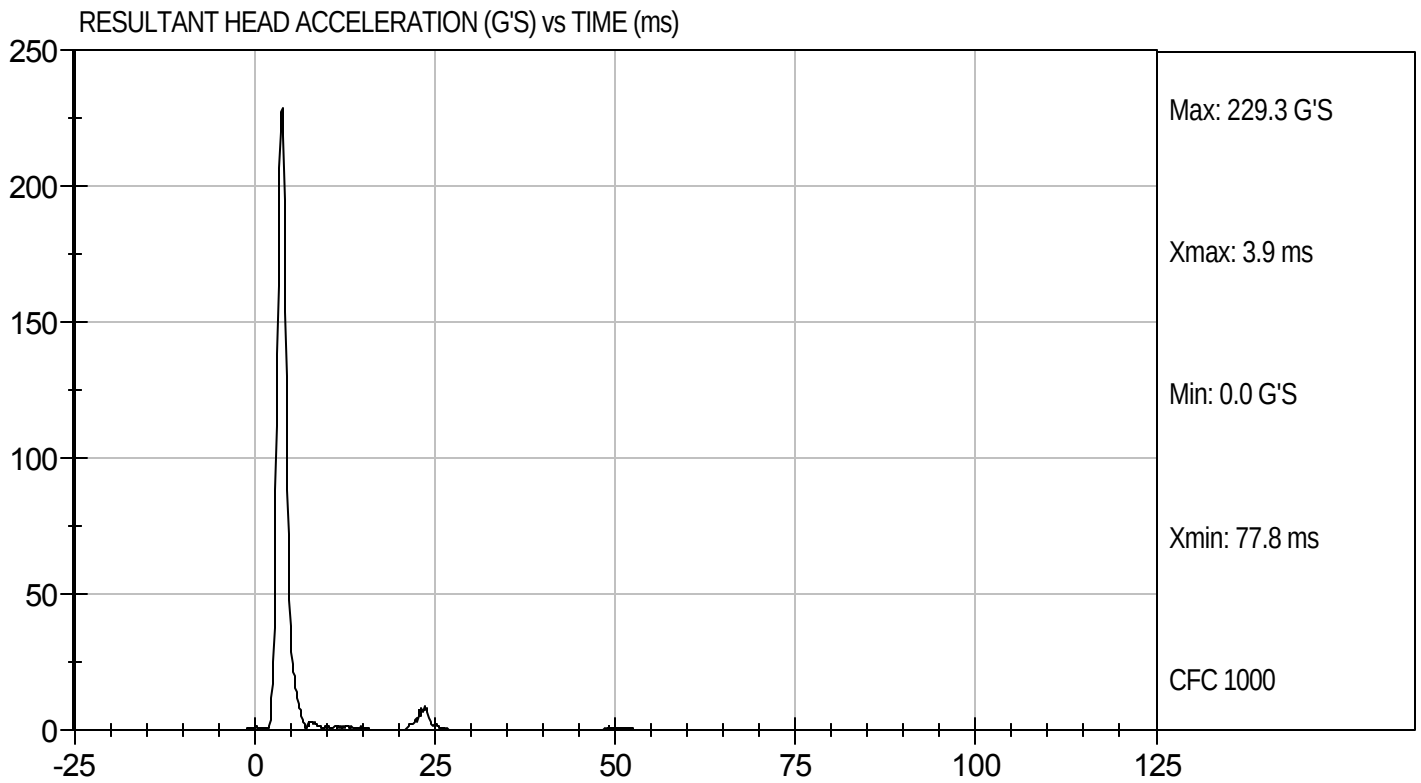
6/30/09
Test Date


Approved By



Test Desc: Head Drop
Component ID: D091631

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s

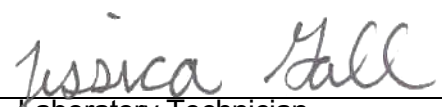


MGA RESEARCH CORPORATION
NECK FLEXION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D091632

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.06	Pass
Pendulum Deceleration	10 msec	G's	22.50 to 27.50	24.58	Pass
	20 msec	G's	17.60 to 22.60	20.96	Pass
	30 msec	G's	12.50 to 18.50	14.55	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 29.0	14.47	Pass
Deceleration Decay Time to Cross 5 G's		msec	34.0 to 42.0	34.9	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	68.2	Pass
	Time	msec	57.0 to 64.0	57.2	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	113.0 to 128.0	113.5	Pass
Moment About Occipital Condyle	Maximum	N m	88.1 to 108.5	97.6	Pass
	Time	msec	47.0 to 58.0	47.4	Pass
Positive Moment Decay Time To Zero Crossing		msec	97.0 to 107.0	98.0	Pass
Overall Test Results					Pass


 Laboratory Technician

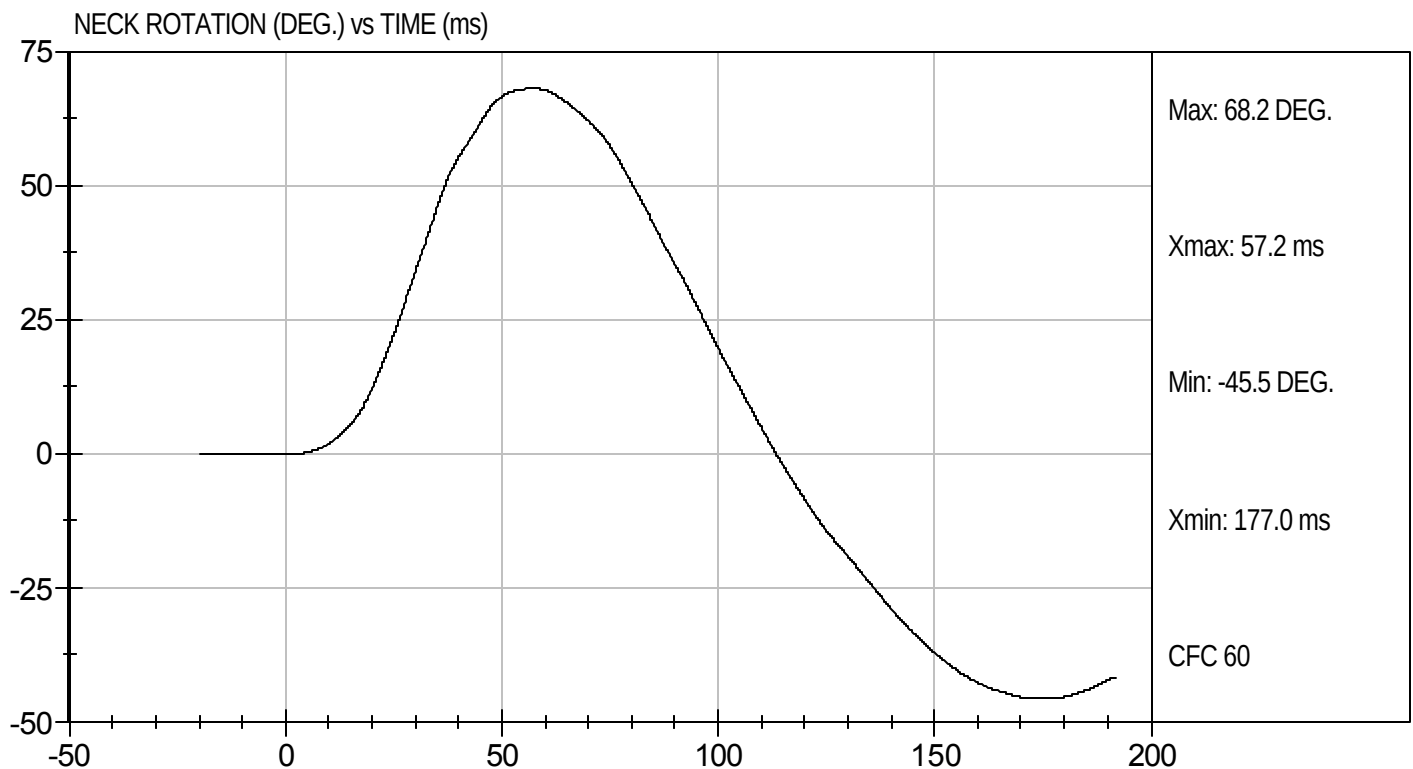
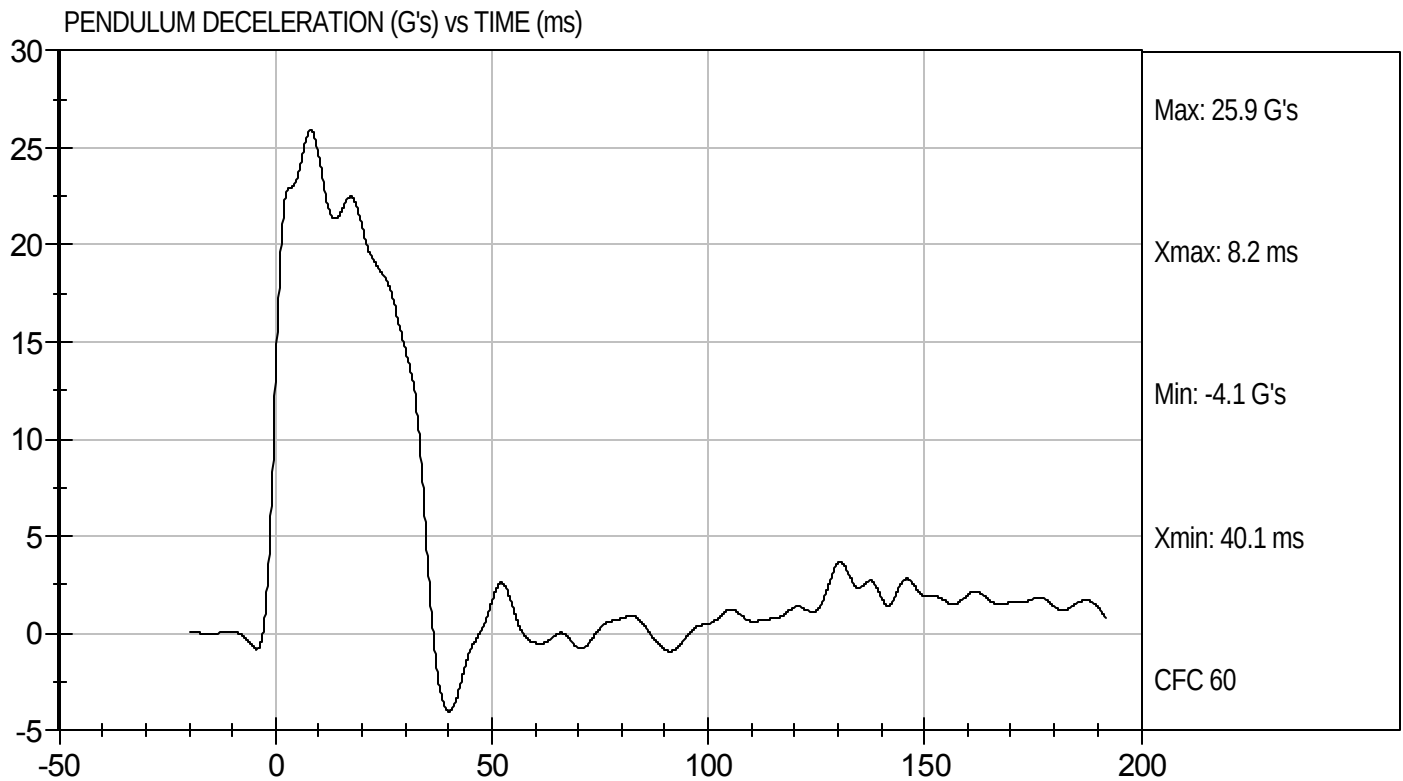
6/30/09
 Test Date


 Approved By



Test Desc: Neck Flexion
Component ID: D091632

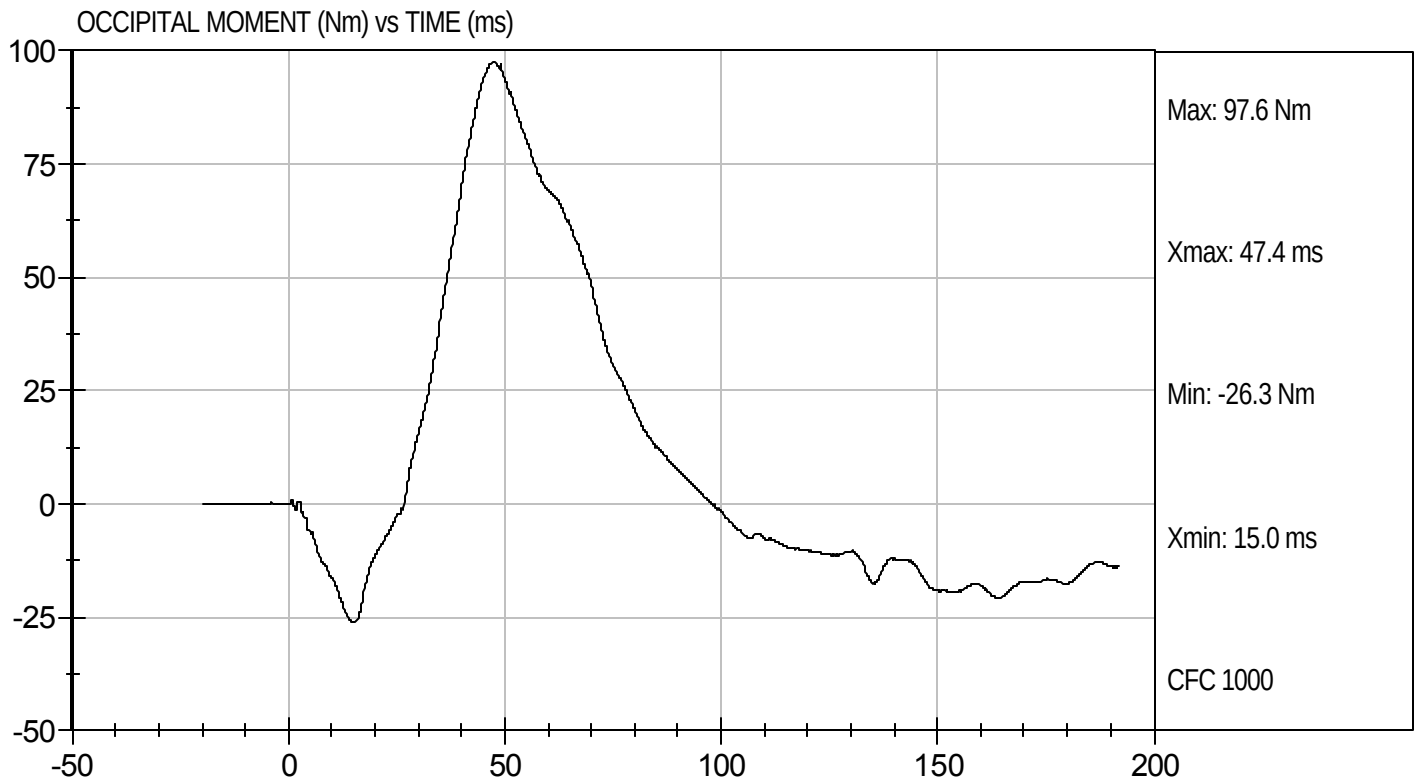
Test Date: 6/30/09
Velocity: 23.15 ft/s, 7.06 m/s





Test Desc: Neck Flexion
Component ID: D091632

Test Date: 6/30/09
Velocity: 23.15 ft/s, 7.06 m/s

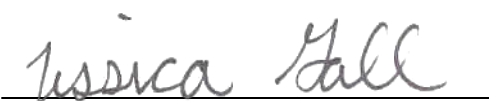


MGA RESEARCH CORPORATION
NECK EXTENSION TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D091633

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity		%	10 to 70	48	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.16	Pass
Pendulum Deceleration	10 msec	G's	17.20 to 21.20	18.09	Pass
	20 msec	G's	14.00 to 19.00	16.23	Pass
	30 msec	G's	11.00 to 16.00	14.67	Pass
Peak Pendulum Deceleration After 30 msec		G's	<= 22.0	14.61	Pass
Deceleration Decay Time to Cross 5 G's		msec	38.0 to 46.0	38.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	96.9	Pass
	Time	msec	72.0 to 82.0	76.1	Pass
"D" Plane Rotation Decay Time To Zero Crossing		msec	147.0 to 174.0	158.5	Pass
Moment About Occipital Condyle	Maximum	N m	-52.9 to -79.9	-68.0	Pass
	Time	msec	65.0 to 79.0	70.5	Pass
Negative Moment Decay Time To Zero Crossing		msec	120.0 to 148.0	143.5	Pass
Overall Test Results					Pass


 Laboratory Technician

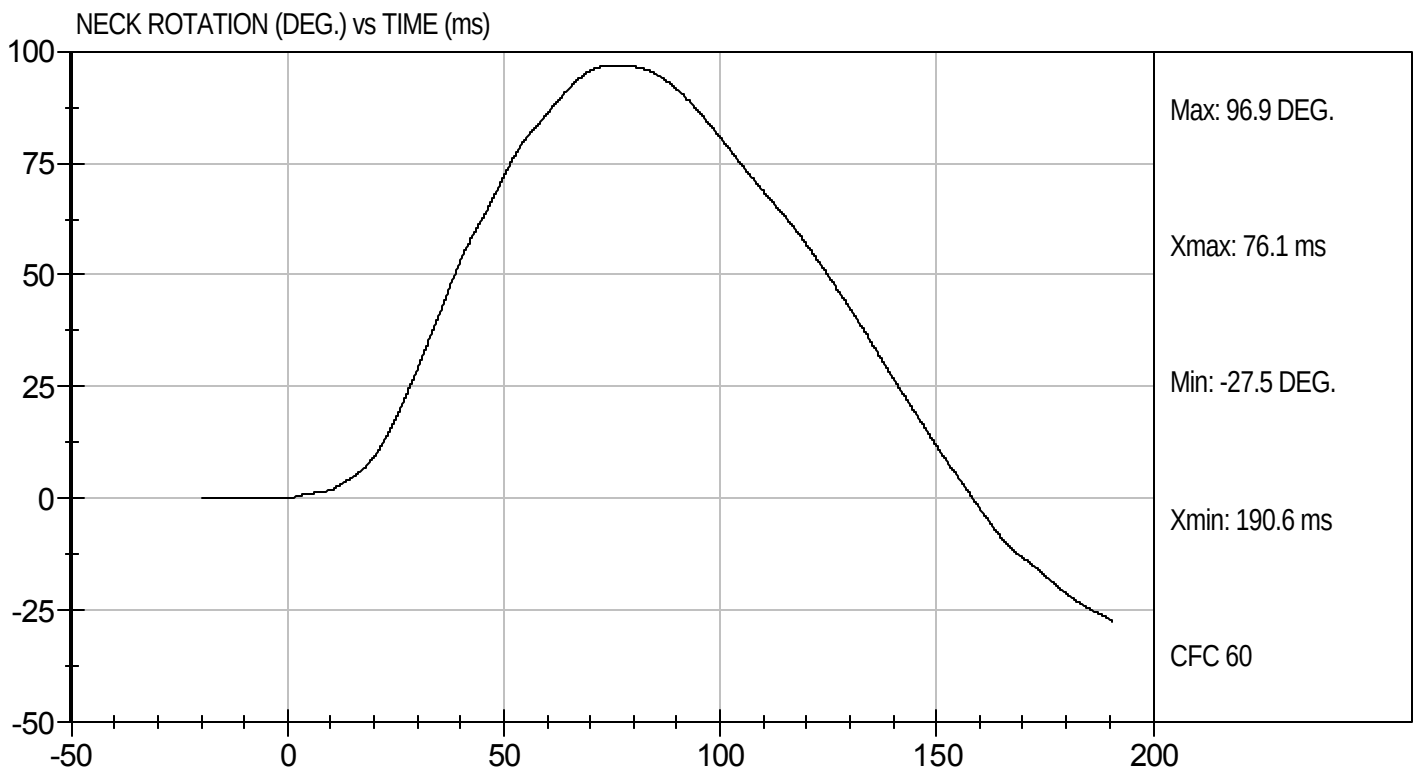
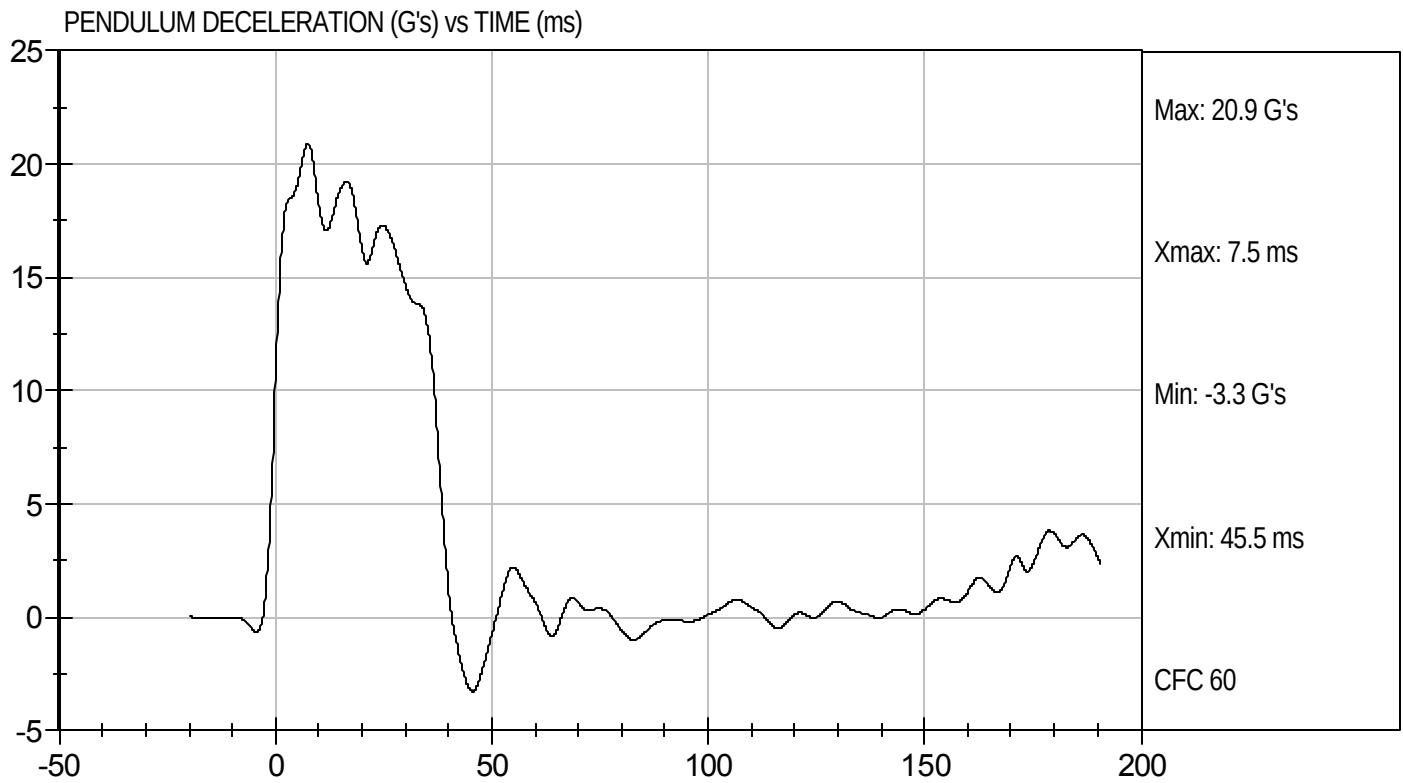
6/30/09
 Test Date


 Approved By



Test Desc: Neck Extension
Component ID: D091633

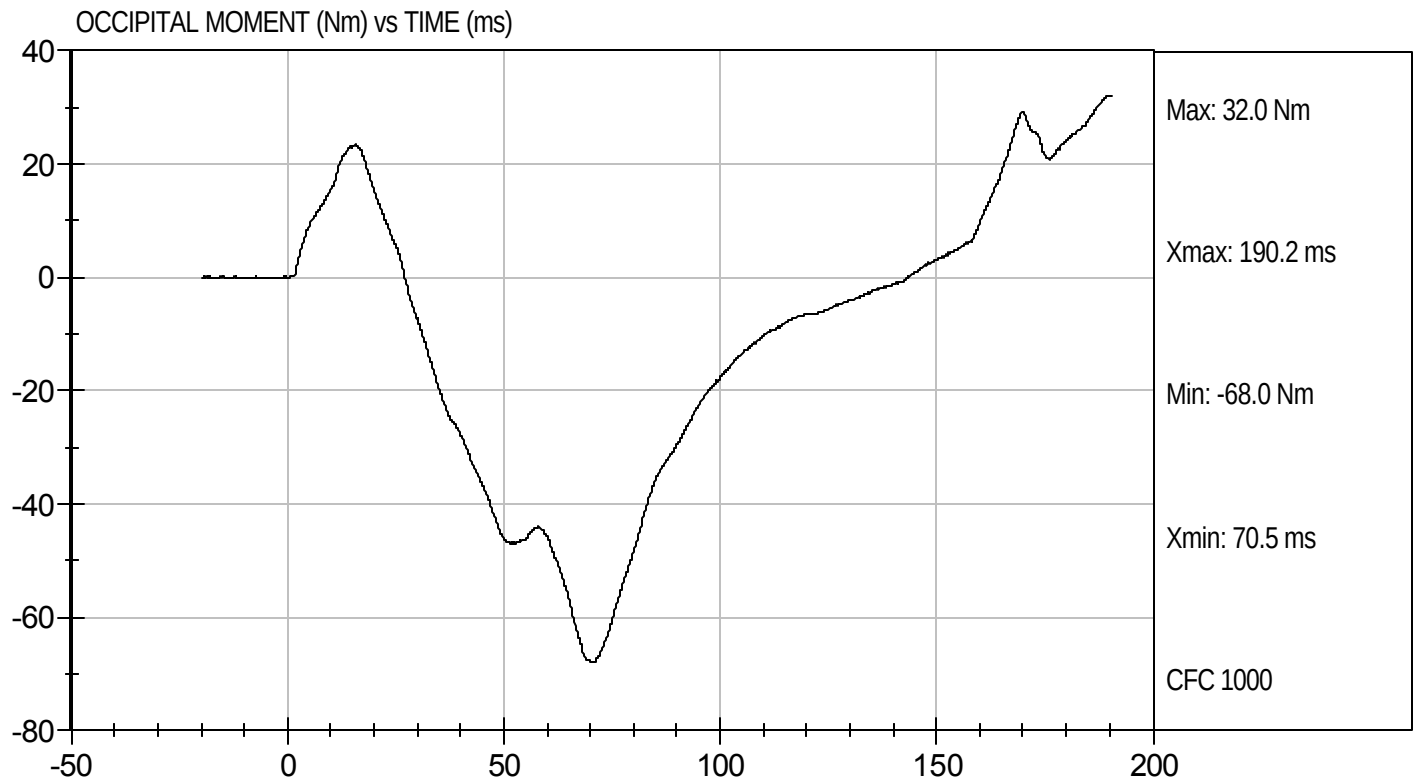
Test Date: 6/30/09
Velocity: 20.20 ft/s, 6.16 m/s





Test Desc: Neck Extension
Component ID: D091633

Test Date: 6/30/09
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: D091634

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	deg C	20.6 to 22.2	21.4	Pass
Laboratory Relative Humidity	%	10 to 70	51	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	N	5159 to 5893	5,392	Pass
Peak Sternum Displacement	cm	6.35 to 7.26	6.89	Pass
Internal Hysteresis	%	69 to 85	71	Pass
Overall Test Results			Pass	


Laboratory Technician

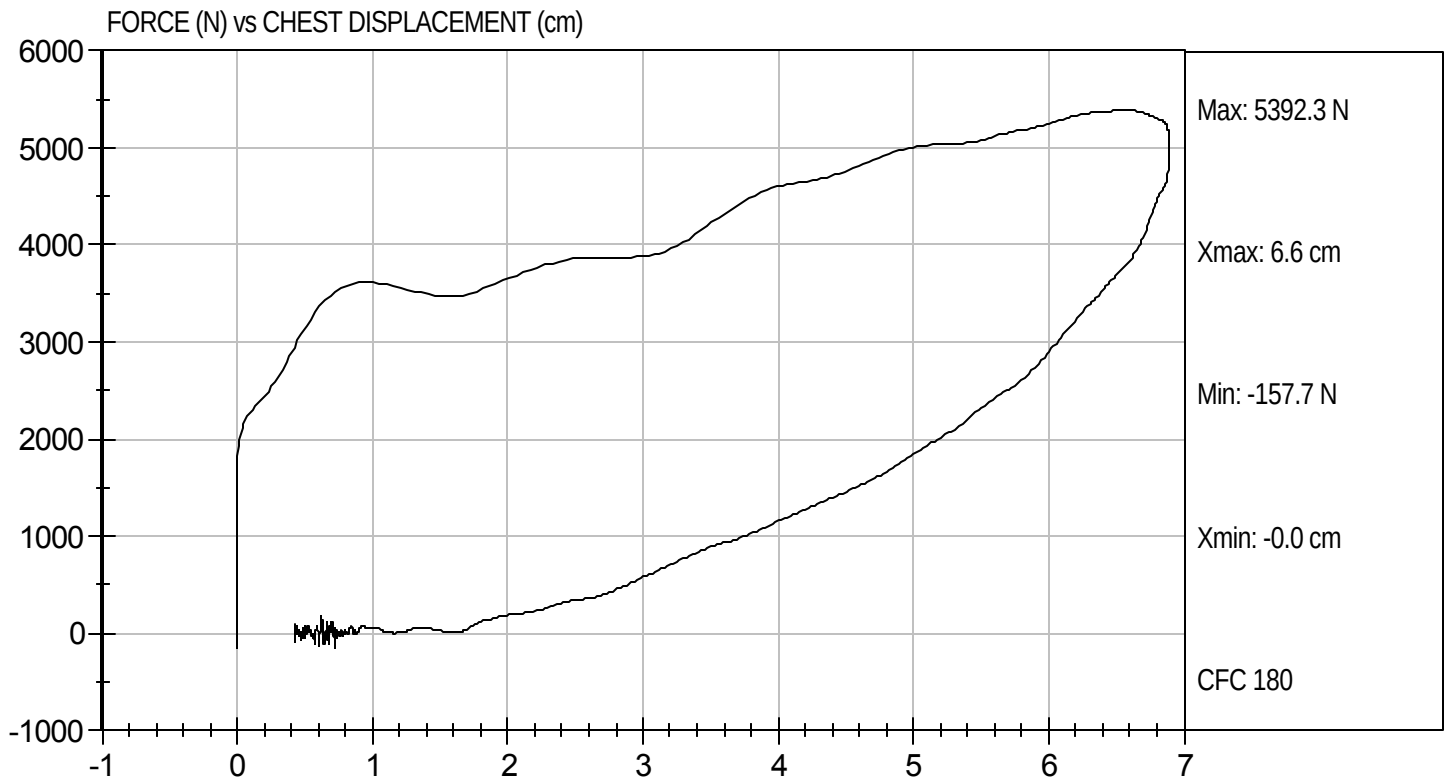
7/1/09
Test Date


Approved By



Test Desc: Thorax Impact
Component ID: D091634

Test Date: 7/1/09
Velocity: 21.93 ft/s, 6.68 m/s



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

ATD Serial No: 065

Test I.D: D091635

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	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5,328	Pass
Overall Test Results				Pass

Jessica Hall
Laboratory Technician

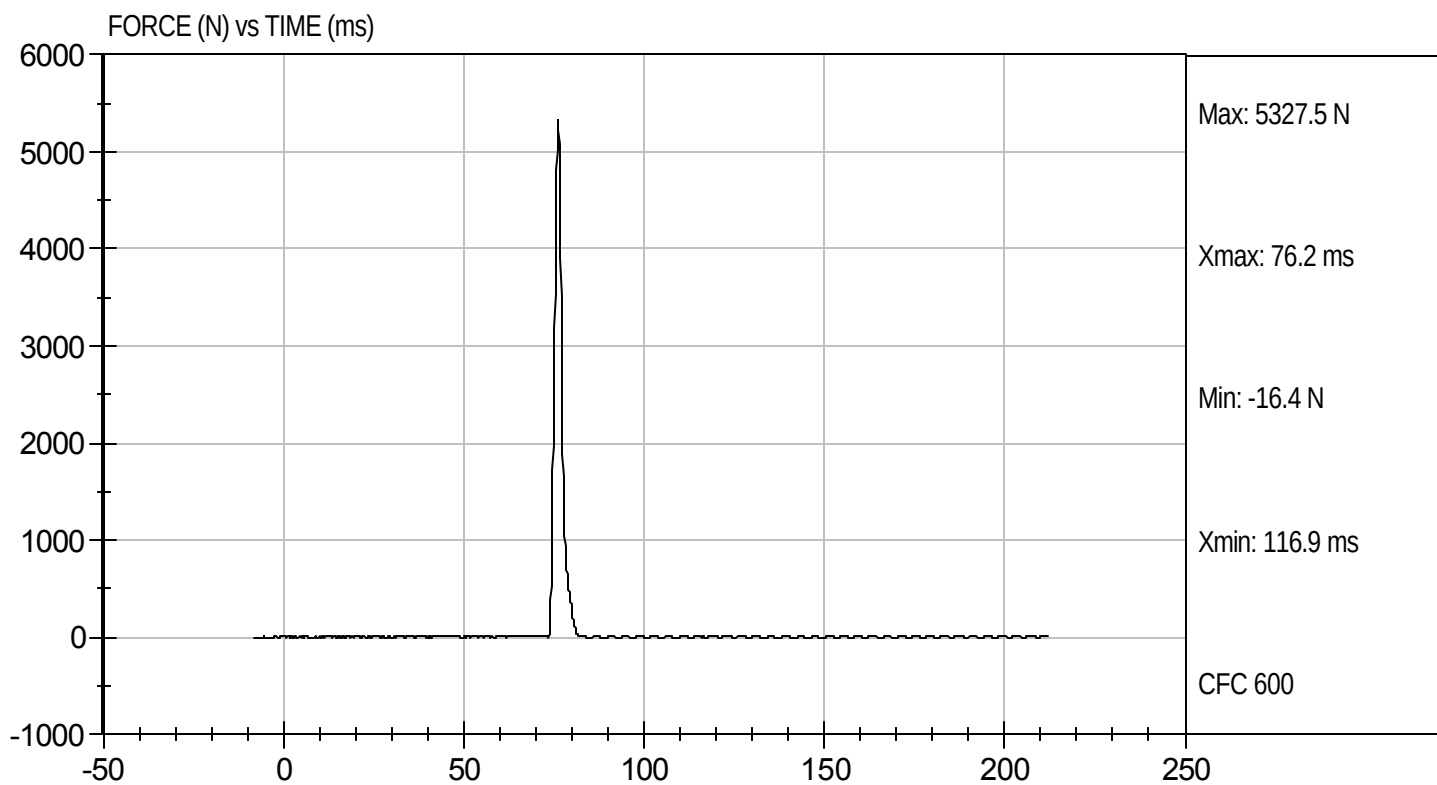
6/30/09
Test Date

David Winkelbauer
Approved By



Test Desc: Right Knee
Component ID: D091635

Test Date: 6/30/09
Velocity: 6.80 ft/s, 2.07 m/s

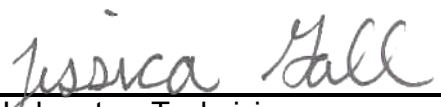


MGA RESEARCH CORPORATION
LEFT KNEE IMPACT TEST
HYBRID III 50TH PERCENTILE MALE

ATD Serial No: 065

Test I.D: D091636

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	48	Pass
Probe Velocity	m/sec	2.07 to 2.13	2.09	Pass
Peak Probe Force	Newtons	4715 to 5782	5,452	Pass
Overall Test Results				Pass



Laboratory Technician

6/30/09

Test Date

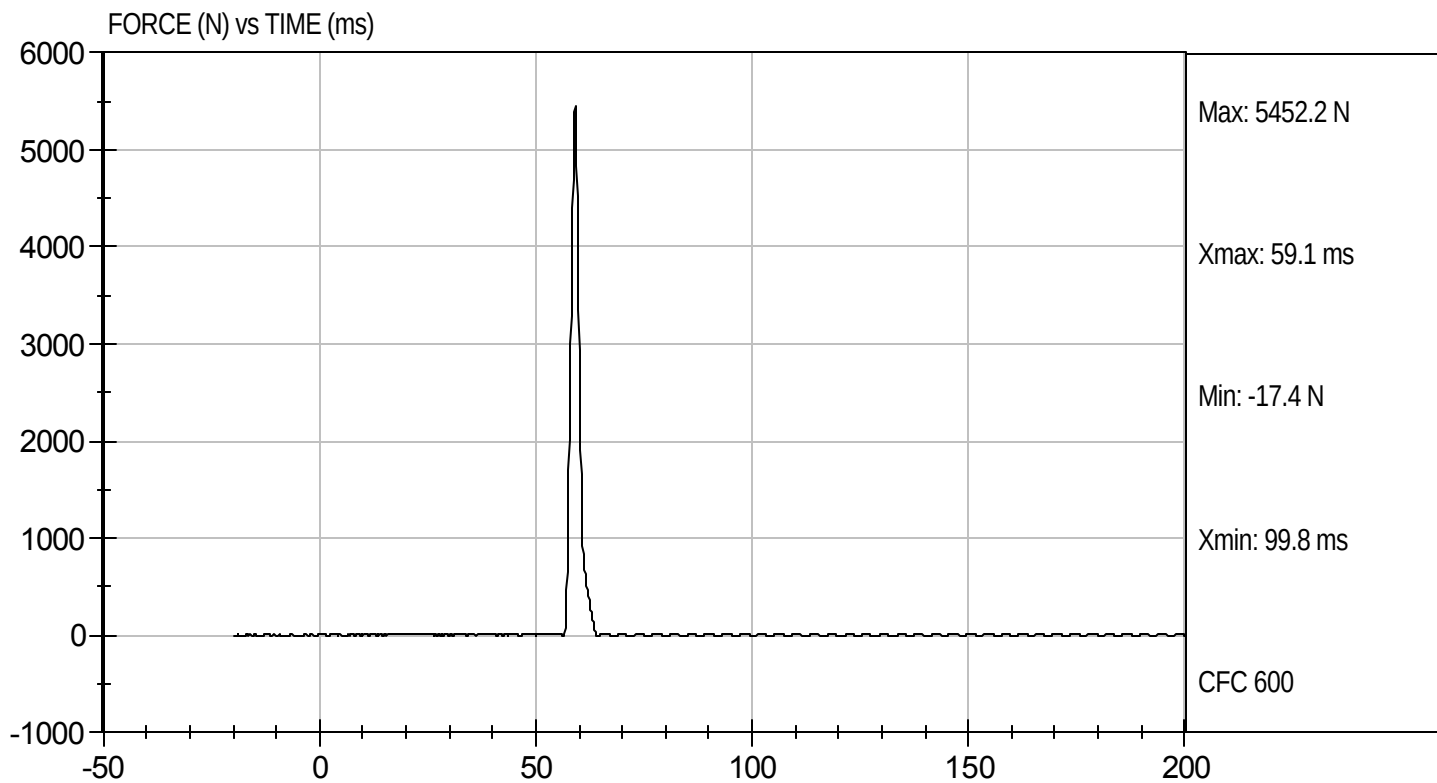


Approved By



Test Desc: Left Knee
Component ID: D091636

Test Date: 6/30/09
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: D091630

Tested Parameter	Units	Specification	Result		Pass/Fail
			Right	Left	
Laboratory Temperature	deg C	18.9 to 25.6	21.9	21.9	Pass
Laboratory Relative Humidity	%	10 to 70	50	50	Pass
Rotation Rate	deg/sec	5 -10	8	8	Pass
30 Degrees	Nm	94.9 Nm Max	59.4	57.3	Pass
150 ft-lbf / 203.4 Nm	Deg	40- 50 Degree Max Rotation	43	42	Pass
Overall Test Results					Pass

Jessica Hall
Laboratory Technician

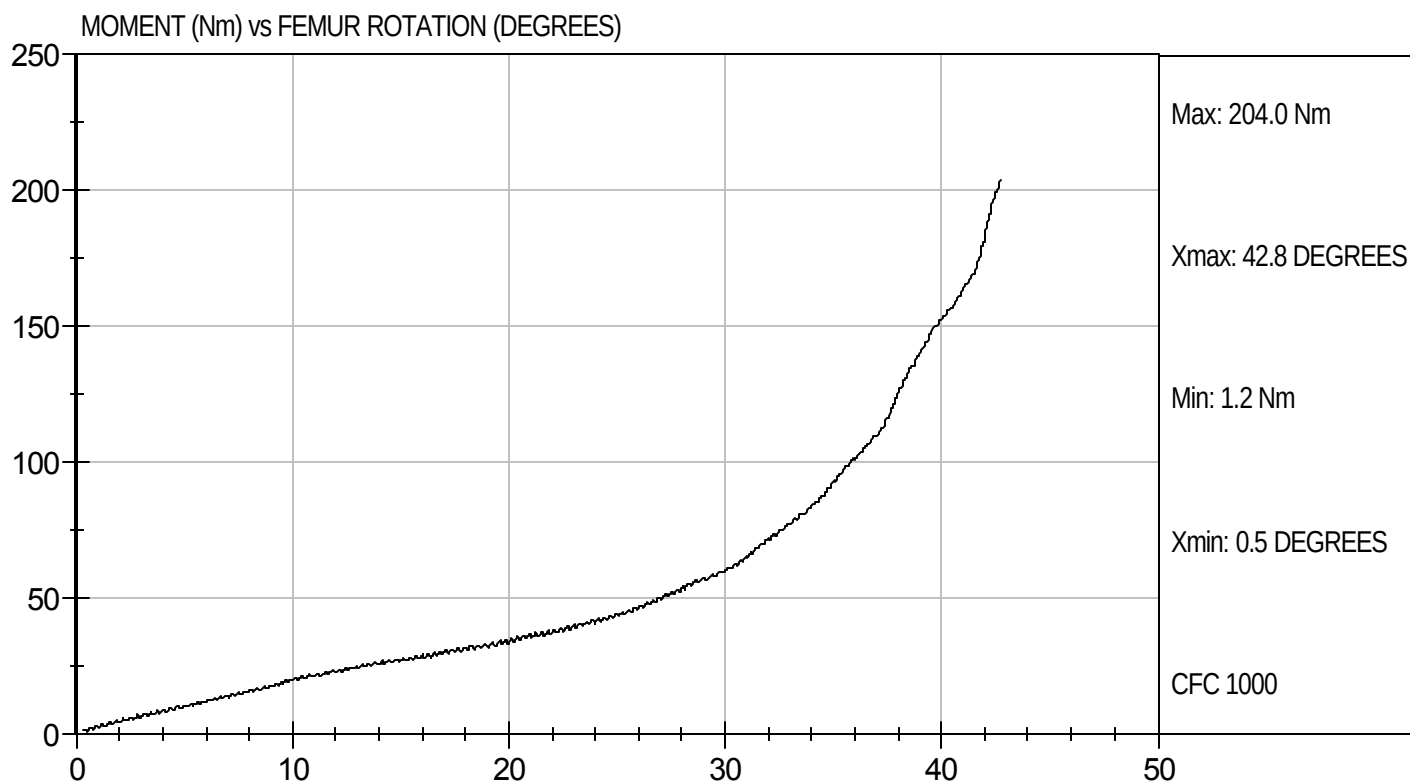
6/30/09
Test Date

David Winkelbauer
Approved By



Test Desc: Hip Femur Flexion
Component ID: D091639

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s





Test Desc: Hip Femur Flexion
Component ID: D091630

Test Date: 6/30/09
Velocity: 0 ft/s, 0.00 m/s

