

REPORT NUMBER TR-P28001-19-NC

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

**HYUNDAI MOTOR MANUFACTURING
2009 HYUNDAI SONATA
4-DOOR SEDAN**

NHTSA NUMBER: M90501

**Prepared By:
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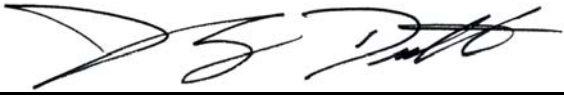
MAY 6, 2008

FINAL REPORT

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Date of Acceptance

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15. Supplementary Notes During this test, external interference from an external source resulted in the seatbelt unlatching during the event. As this occurrence is not indicative of real-world performance, the driver injury readings recorded during this test may not be indicative of real-world performance.																												
16. Abstract An experimental 35 mph (56.3 km/h) frontal barrier impact test was conducted on the subject 2009 Hyundai Sonata 4-Door Sedan at KARCO Engineering, LLC, in Adelanto, CA, on May 6, 2008. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and footwell intrusion performance. The impact velocity was 56.37 km/h. The ambient temperature at the barrier at the time of the crash was 26.7 degrees Celsius. The vehicle's maximum post static crush was 525 mm at DPD 4, to the right of the vehicle's centerline. The test vehicle was equipped with a 3-point continuous belt system and a second generation airbag at both front outboard positions. With respect to FMVSS 208 'Occupant Crash Protection', the occupant injury criteria summary is as follows:																												
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Measurement Description</th> <th style="text-align: center;">Units</th> <th style="text-align: center;">Threshold</th> <th style="text-align: center;">Driver ATD</th> <th style="text-align: center;">Passenger ATD</th> </tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC)</td> <td style="text-align: center;">N/A</td> <td style="text-align: center;">1000</td> <td style="text-align: center;">361.4</td> <td style="text-align: center;">360.9</td> </tr> <tr> <td>Max. Chest Accel. (3 msec. Chest Clip)</td> <td style="text-align: center;">G's</td> <td style="text-align: center;">60</td> <td style="text-align: center;">67.3</td> <td style="text-align: center;">42.7</td> </tr> <tr> <td>Left Femur Force</td> <td style="text-align: center;">Newtons</td> <td style="text-align: center;">10008</td> <td style="text-align: center;">-8493.2</td> <td style="text-align: center;">-2846.6</td> </tr> <tr> <td>Right Femur Force</td> <td style="text-align: center;">Newtons</td> <td style="text-align: center;">10008</td> <td style="text-align: center;">-9556.3</td> <td style="text-align: center;">-1979.5</td> </tr> </tbody> </table>		Measurement Description	Units	Threshold	Driver ATD	Passenger ATD	Head Injury Criteria (HIC)	N/A	1000	361.4	360.9	Max. Chest Accel. (3 msec. Chest Clip)	G's	60	67.3	42.7	Left Femur Force	Newtons	10008	-8493.2	-2846.6	Right Femur Force	Newtons	10008	-9556.3	-1979.5	17. Key Words 56.3 km/h NCAP Frontal Impact Test New Car Assesment Program (NCAP) 2009 Hyundai Sonata 4-Door Sedan NHTSA No. M90501	
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SECTION 1
PURPOSE AND SUMMARY OF TEST M90501

1.1 PURPOSE

This 35 mph (56.3 km/h) frontal barrier impact test is part of the New Car Assessment Program (NCAP) sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-06-D-00027. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 30 mph (48.3 km/h) requirements.

The 35 mph (56.3 km/h) frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) New Car Assessment Program (NCAP) Laboratory Indicant Test Procedure, dated July 2005. Data was obtained indicant of FMVSS 208 "Occupant Crash Protection", FMVSS 212, "Windshield Retention", FMVSS 219, "Windshield Zone Intrusion (Partial)", and FMVSS 301 "Fuel System Integrity", performance. Procedures for receiving, inspection, testing and reporting of test results are described in the test procedures and are not repeated in this report.

1.2 SUMMARY

A load cell barrier consisting of 36 load cells was impacted by a 2009 Hyundai Sonata 4-Door Sedan at a velocity of 56.37 km/h. The test was performed at KARCO Engineering, LLC on May 6, 2008

Three (3) real-time and fourteen (14) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet number 14 (page number 24) of 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 (primary and redundant), chest (primary and redundant) and pelvis triaxial accelerometers, chest displacement potentiometers, six-axis upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were placed on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. Shoulder belt spool-off was measured for the driver and passenger dummies. The driver (position 1) ATD (Serial No.034) and the right-front passenger (position 2) ATD (Serial No. 035) were calibrated one test prior to this test.

One hundred and thirty-two (132) channels of data were recorded using a TDAS data acquisition system. Appendix A contains Pre and Post-Test Photographs, Appendix B contains the Dummy Response data traces, and Appendix C contains the Dummy Calibration data.

There was 100% windshield retention and no intrusion into the protected zone of the windshield during impact.. 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 525 mm at DPD 4, to the right of the vehicle's centerline. Both the driver and passenger side doors remained closed and latched during the impact event, and were operable after the impact.

The driver's visible contact points were as follows: The driver ATD's head, chest, and abdomen contacted the airbag. The head also contacted the headrest. Both knees contacted the bolster.

The passenger's visible contact points were as follows: The passenger ATD's head, chest, and abdomen contacted the airbag. The head also contacted the headrest. Both knees contacted the glovebox.

Occupant injury data is contained in table below.

OCCUPANT DATA SUMMARY

ATD Position	HIC 36	3 msec Chest Clip	Chest Defl. (mm)	Left Femur (N)	Right Femur (N)
Driver	361.4	67.3	-29.3	-8493.2	-9556.3
Passenger	360.9	42.7	-26.5	-2846.6	-1979.5

Additional data plots for this test are available in the research and development section of the NHTSA website. The website can be found at: www.NHTSA.Dot.Gov

SECTION 2

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan NHTSA No.: M90501
Test Program: NHTSA 35mph NCAP Test Date: 5/6/08

CONVERSION FACTORS USED IN THIS REPORT*

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.573
Pressure	Tire Pressures	lbf/in ²	kPa	7.0
Volume	Liquid	gal	liter	3.785
Temperature	General Use	°F	°C	$=(tf - 32)/1.8$
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf/ft	Nm	1.355

* Based on the Recommended Practice in SAE J916, May 85

DATA SHEET NO. 1
CRASH TEST SUMMARY

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
Test Program: NHTSA 35mph NCAP

NHTSA No.: M90501
Test Date: 5/6/08

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/h	56.37
Test Weight	kg	1714
Impact Angle	degrees	0
Average Rebound	mm	919
Maximum Static Crush	mm	525

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door Opening	Remained closed and latched, opened without tools	Remained closed and latched, opened without tools
Rear Door Opening	Remained closed and latched, opened without tools	Remained closed and latched, opened without tools
Seat Track Shift (mm)	None	None
Seatback Failure	No	No

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type/Serial No.	50% Male Hybrid III No.034	50% Male Hybrid III No. 035
Head Contact	Airbag, Headrest	Airbag, Headrest
Chest Contact	Airbag	Airbag
Abdomen Contact	Airbag	Airbag
Left Knee Contact	Bolster	Glovebox
Right Knee Contact	Bolster	Glovebox

MOVIE COVERAGE

Cameras	Standard	Additional
High Speed	16	0
Real Time	1	2
Total	15	2

DATA CHANNELS

Driver ATD Sensors	40
Passenger ATD Sensors	40
Belt Assessment Sensors	8
Vehicle Structure Accelerometers	8
Rigid Barrier Load Cells	36
Total	132

DATA SHEET NO. 2**GENERAL TEST AND VEHICLE PARAMETER DATA**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	M90501
Make	Hyundai
Model	Sonata
Body Style	4-Door Sedan
VIN No.	5NPET46CX9H403151
Color	Khaki
Delivery Date	05/02/08
Odometer (Miles)	119.0
Dealer	Victorville Hyundai
Transmission	4-Speed Automatic
Final Drive	Front
Type/No. of Cylinders	Inline 4
Engine Displ. (L)	2.4
Engine Placement	Transverse
Roof Rack	No
Sunroof/T-top	No
Tinted Glass	No
Traction Control	Yes
Power Brakes	Yes
Front Disc	Yes
Rear Disc	Yes

Anti-Lock Brakes	Yes
All Wheel Drive	No
Power Steering	Yes
Driver Front Airbag	Yes
Driver Side Torso Airbag	Yes
Driver Side Head Airbag	No
Driver Curtain Airbag	No
Pass. Front Airbag	Yes
Pass. Side Torso Airbag	Yes
Pass. Head Airbag	Yes
Pass. Curtain Airbag	No
Pre-Tensioners	Yes
Load Limiters	Yes
Bucket Seats	Yes
Air Conditioning	Yes
AM/FM CD	Yes
Tilt Steering	Yes
Automatic Door Locks	No
Power Windows	Yes
Power Seats	No
Other	N/A

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

N/A

DATA FROM MANUFACTURER'S LABEL

Manufactured By	HYUNDAI MOTOR MANUFACTURING
Date of Manufacture	Jan-08

GVWR (kg)	1950
GAWR Front (kg)	1140
GAWR Rear (kg)	970

VEHICLE SEATING CAPACITY AND WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Weight (VCW) (kg)				390
Cargo Weight (RCLW) (kg)				50

DATA SHEET NO. 2...(CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

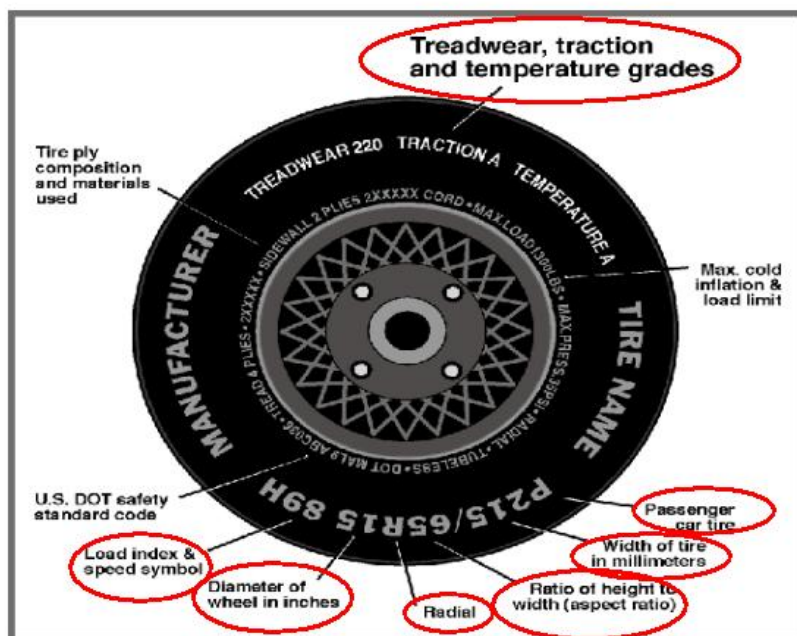
Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08

Collect year, make, model, VIN, items circled in red, and tire manufacturer and tire name.



TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kPa)	308	308
Cold Tire Pressure (kPa)	220	220
Recommended Tire Size	P215/60R16	P215/60R16
Tire Size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Michelin	Michelin
Treadwear	440	440
Traction	A	A
Temperature Grades	A	A
Tire Plies - Sidewall	1 Polyester	1 Polyester
Tire Plies - Body	1 Polyester + 1 Polyamide + 2 Steel	1 Polyester + 1 Polyamide + 2 Steel
Load Index/Speed Symbol	94V	94V
Tire Material	Polyester, Polyamide, Steel	Polyester, Polyamide, Steel
DOT Safety Code Right	M349 KTJX 0108	M349 KTJX 0108
DOT Safety Code Left	M349 KTJX 0108	M349 KTJX 0108

DATA SHEET NO. 2...(CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan NHTSA No.: M90501
 Test Program: NHTSA 35mph NCAP Test Date: 5/6/08

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	468	303	771	491	377	868
Right	kg	451	299	750	479	367	846
Ratio	%	60.4	39.6	100.0	56.6	43.4	100.0
Totals	kg	919	602	1521	970	744	1714

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1521
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Weight (RCLW)	kg	50
Calculated Target Vehicle Test Weight (TVTW)	kg	1723

TEST VEHICLE ATTITUDE AND CG

	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	705	710	707	715	1079
As Tested	mm	698	702	672	682	1183

Vehicle Wheel Base (mm) 2725
 Weight of Ballast Secured in Cargo Area (kg) 0
 Weight of Items Removed (kg) 70
 Vehicle Components Removed: Trunk Lid, Tail Lights, Trunk Carpeting, Portion of Exhaust, & Spare Tire w/Tools

*Ballast weight does not include cameras, instrumentation or brake abort system.

FUEL SYSTEM DATA

Fuel System Capacity from Owner's Manual (L) 66.99
 Actual Test Volume with Entire Fuel System Filled (L) 62.30
 Test Fluid Type Stoddard Solvent
 Kinematic Viscosity as per ASTM Standard D484-71 Red
 Is Vehicle Fuel Pump Electric or Mechanical? Electrical
 If electric, does pump operate with the ignition switch "ON" & engine "OFF"? Yes
 Fuel System Particulars Electric fuel pump. Activated when electrical system is activated.
Fuel pump will run for 3 seconds when ignition is in "on" position.

DATA SHEET NO. 3
POST-TEST IMPACT DATA

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

NHTSA No.: M90501
 Test Date: 5/6/08

SPEED TRAP DATA

Measured Paramater	Units	Requirement	Value
Trap No. 1 Velocity	km/h	55.1 to 57.12	56.37
Trap No. 2 Velocity	km/h	55.1 to 57.12	56.34

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4567	4270	297
Center	mm	4790	4270	520
Right Side	mm	4568	4220	348

VEHICLE REBOUND FROM BARRIER

Measured Paramater	Units	Value
Left Side	mm	938
Center	mm	880
Right Side	mm	940
Average	mm	919

DATA SHEET NO. 4

TEST VEHICLE INFORMATION

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

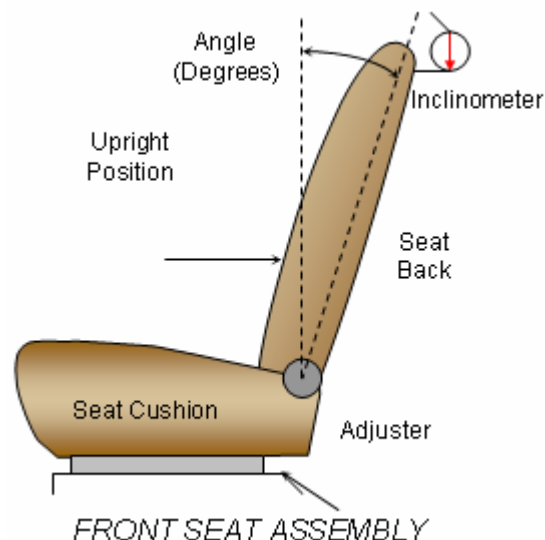
NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08

NOMINAL DESIGN RIDING POSITION

The driver and passenger seat backs are positioned to the manufacturer's designated angle. The procedure is as follows: Seat back angle was measured at the headrest, using a digital inclinometer.



SEAT BACK ANGLES

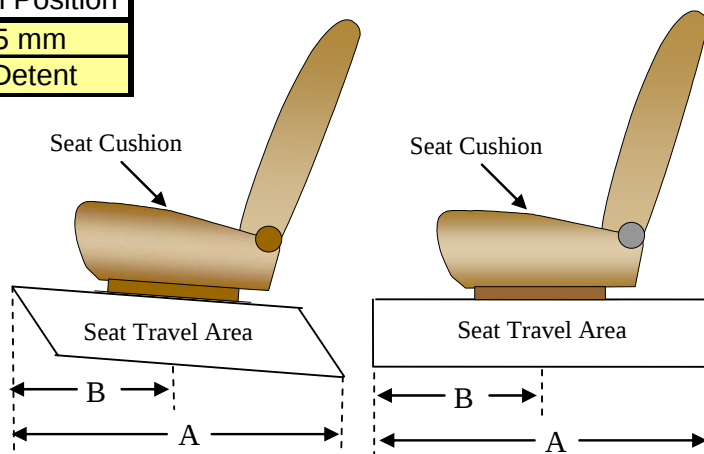
Position	Degrees
Driver w/ Seated Dummy	10.8 @ Headrest
Passenger w/ Seated Dummy	10.8 @ Headrest

SEAT FORE/AFT POSITIONS

The total seat travel was measured from forward most position to rearmost position. The seat was set at the longitudinal mid position. There were vertical adjustments on the driver seat that was equipped with the vehicle. There were no adjustments on the passenger seat. The driver seat was placed in the lowermost position.

SEAT FORE/AFT POSITIONING

Position	Total Fore/Aft Travel	Placed in Position
Driver Seat	267 mm	133.5 mm
Passenger Seat	25 Detents	13th Detent



SEAT BELT ANCHORAGE

Position number one (1) is the uppermost position.

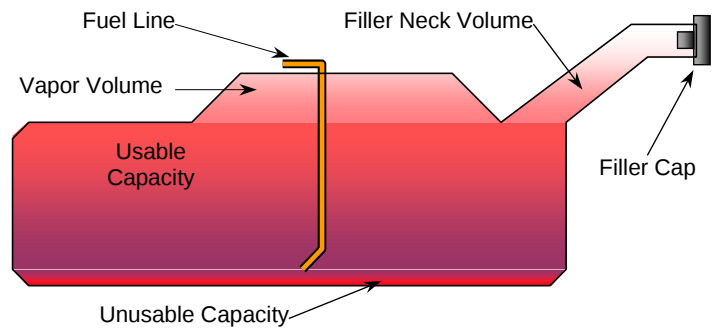
SEAT BELT ANCHORAGE POSITIONING

	Total Number of Positions	Placed in Position
Driver Seat	4	2
Passenger Seat	4	2

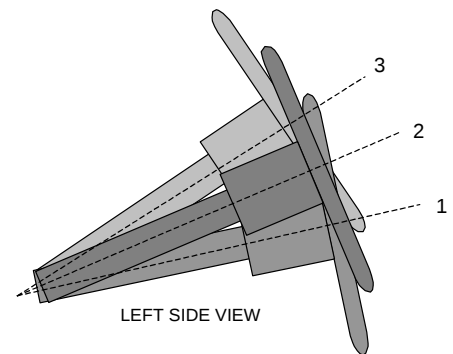
DATA SHEET NO. 4...(CONTINUED)**TEST VEHICLE INFORMATION**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08**FUEL TANK CAPACITY**

	Liters
Usable Capacity of Standard Tank	66.99
Usable Capacity of Optional Tank	
Usable Capacity Used for FMVSS 301	61.62 to 62.98
Actual Amount of Solvent Used	62.30

The test vehicle is equipped with an electric fuel pump. The fuel pump will operate for approximately two (2) seconds with the ignition in the "ON" position, after which the fuel pump automatically shuts off. The fuel filler door is located on the left rear fender. The standard fuel tank occupies the area under the rear passenger seat.

**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**

	Degrees	Fore/Aft Position
Lowermost - Position No. 1	17.1	
Geometric Center - Position No. 2	24.2	
Uppermost - Position No. 3	31.3	

DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08

TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield angle		24.8		
SWA	Steering wheel angle		24.5		
SCA	Steering column angle		63.5		
SA	Seat Back angle		10.8 @ Headrest		10.8 @ Headrest
HZ	Head to roof (Z)	212	90.0	195	90.0
HH	Head to header	331		339	
HW	Head to windshield	596		570	
HR	Head to side header (Y)	264		269	
NR	Nose to rim	389	9.3		
CD	Chest to dash	561		574	
CS	Chest to steering hub	320			
RA	Rim to abdomen	180			
KDL	Left knee to dash	180	3.0	130	
KDR	Right knee to dash	135		165	40.8
PA	Pelvic angle		24.1		73.1
TA	Tibia Angle		48.5		39.0
KK	Knee to knee	305		275	
SK	Striker to outboard knee	645	10.7	667	11.5
ST	Striker to head	400	80.0	426	75.3
SH	Striker to H-Point	235	0.0	215	0.0
SHY	Striker to H-Point (Y)	246		230	
HS	Head to side window	333		330	
HD	H-Point to door	162		154	
AD	Arm to door	129		136	

DATA SHEET NO. 5...(CONTINUED)

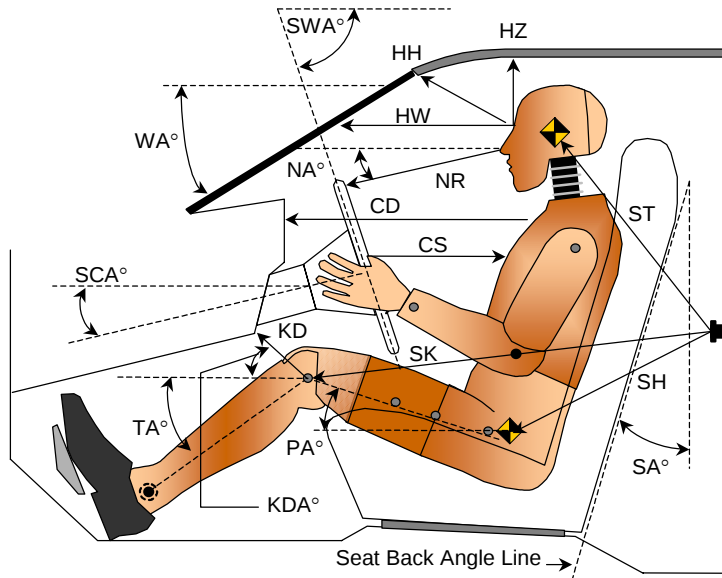
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

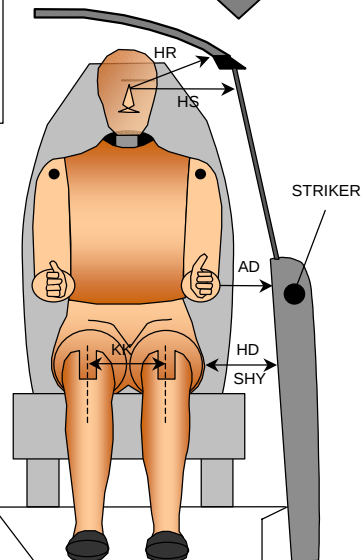
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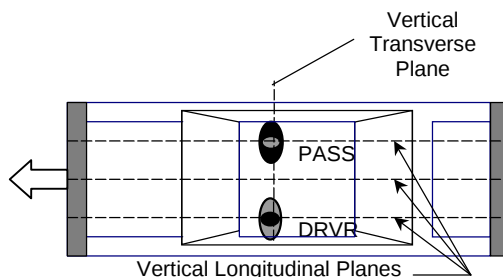
Test Date: 5/6/08



AD Arm to Door
HD H-Point to Door
HR Head to Side Header
HS Head to Side Window
KK Knee to Knee
SHY Striker to H-Point
(Y Axis)



CD Chest to Dash
CS Chest to Steering Wheel Hub
HH Head to Header
HW Head to Windshield
HZ Head to Roof
KDA Knee to Dash Angle
KDL Left Knee to Dash
KDR Right Knee to Dash
NA Nose to Rim Angle
NR Nose to Rim
PA Pelvic Angle
RA Rim to Abdomen
SA Seat Back Angle
SCA Steering Column Angle
SH Striker to H-Point
SK Striker to Knee
ST Striker to Head
SWA Steering Wheel Angle
TA Tibial Angle
WA Windshield Angle



DATA SHEET NO. 6

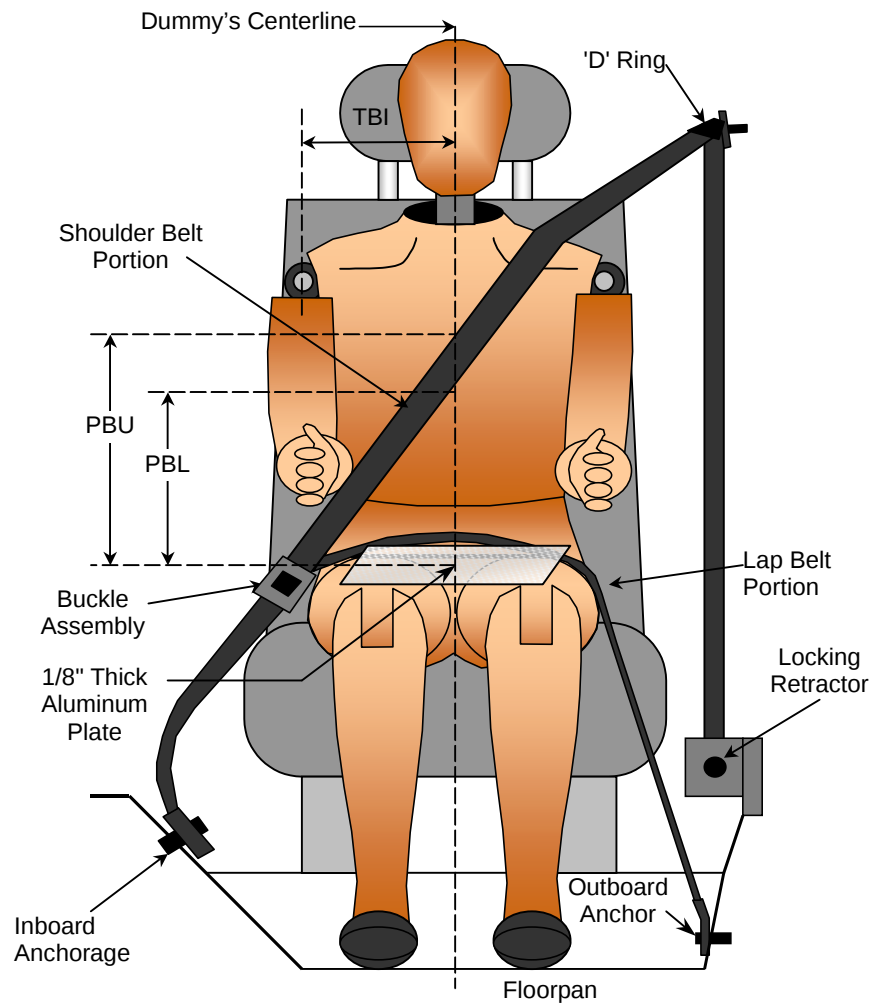
SEAT BELT POSITIONING DATA

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08



SEAT BELT POSITIONING MEASUREMENTS

Measured Parameter	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	225	215
PBU - Top Surface of Reference to Belt Upper Edge	mm	287	285
PBL - Top Surface of Reference to Belt Lower Edge	mm	222	220
Lap Belt Tension	Newtons	10	10
Shoulder Belt Tension	N/A	Retractor	Retractor

DATA SHEET NO. 7**VEHICLE ACCELEROMETER LOCATIONS**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

No.	Accelerometer Location	Measurement (mm)		
		X	Y	Z
1	Left Rear X-Member	1850	-710	355
2	Right Rear X-Member	1860	710	350
3	Engine Top	4055	280	830
4	Engine Bottom	3960	265	205
5	Left Brake Caliper	3660	-720	250
6	Right Brake Caliper	3660	720	250
7	Instrument Panel			
8	Left Rear X-Member (Z-Axis)	1850	-710	355
9	Right Rear X-Member (Z-Axis)	1860	710	350

Reference Planes: X=From Rear Surface of Vehicle, Y=Vehicle Centerline, Z=Ground Plane

1.) Instrument Panel no longer used by NHTSA.

DATA SHEET NO. 8**SEAT BELT ASSESSMENT TEST DATA**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08**SEAT BELT POSITIONING MEASUREMENTS**

Measurement Description	Units	Driver	Passenger
Retractor Reel to D-Ring	mm	745	738
Shoulder Belt Length as Measured on ATD	mm	900	887
Lap Belt Length as Measured on ATD	mm	852	848
Remainder of Belt on Reel	mm	727	800
Total Belt Length for Continuous Webbing Systems	mm	3224	3273

SHOULDER BELT SPOOL-OFF DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	*	*
As determined electronically	mm	*	*

* Not used during this test

BELT STRETCH DATA

Measurement Description	Units	Driver	Passenger
Electronically between belt load cell and D-Ring	mm/cm	*	*
Mechanically	mm/cm		

*Not used with shoulder belt pre-tensioner systems

DATA SHEET NO. 9**SUMMARY OF FMVSS 212 DATA**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08

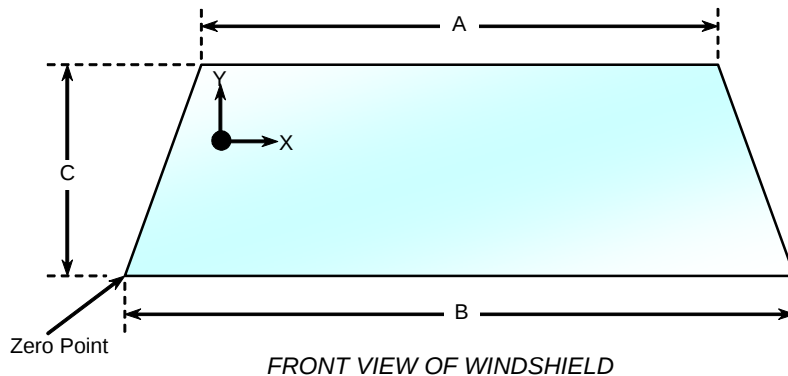
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber cement type adhesive. Plastic molding covers the windshield periphery.

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 that are equipped with occupant passive restraints.

Temperature of windshield molding during test: 26.7 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2185	2185	100.0
Right Side	2185	2185	100.0
Total	4370	4370	100.0

**WINDSHIELD DIMENSIONS**

Item	Units	Segment Length	Molding Width
A	mm	1180	5
B	mm	1510	80
C-Left	mm	840	20
C-Right	mm	840	20

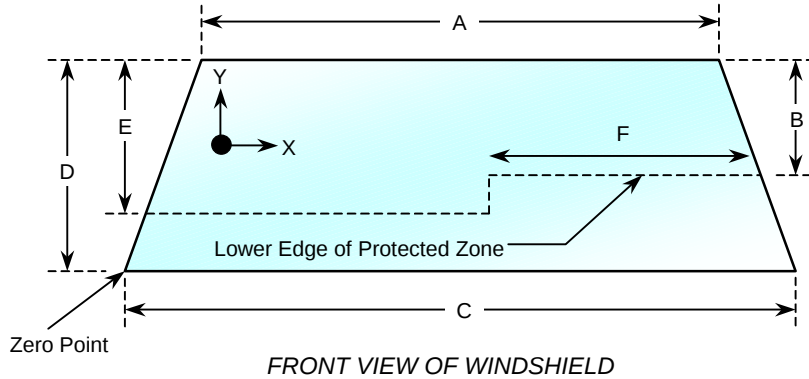
DATA SHEET NO. 10

WINDSHIELD ZONE INTRUSION FMVSS 219 DATA (PARTIAL)

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

NHTSA No.: M90501
 Test Date: 5/6/08

WINDSHIELD AND PROTECTED ZONE



Item	Units	Value
A	mm	1180
B	mm	410
C	mm	1510
D	mm	840
E	mm	560
F	mm	530

AREA OF PROTECTED ZONE FAILURES

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

X	Y

- B. Provide coordinates of the area beneath the protected zone that the inner surface of the windshield was penetrated by a vehicle component.

X	Y

DATA SHEET NO. 11

FMVSS 301 FUEL SYSTEM INTEGRITY POST-IMPACT DATA

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan NHTSA No.: M90501
Test Program: NHTSA 35mph NCAP Test Date: 5/6/08

Test Time: 10:42 AM Temperature: 26.7 ° C

STODDARD SOLVENT SPILLAGE MEASUREMENTS

- A. From impact until vehicle motion ceases: 0
(Maximum allowable = 1 ounce)
- B. For the 5 minute period after motion ceases: 0
(Maximum allowable = 5 ounces)
- C. For the following 25 minutes: 0
(Maximum allowable = 1 oz/minute)
- D. Spillage Details: No leakage occurred

DATA SHEET NO. 12

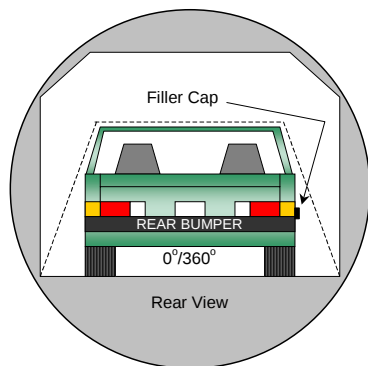
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

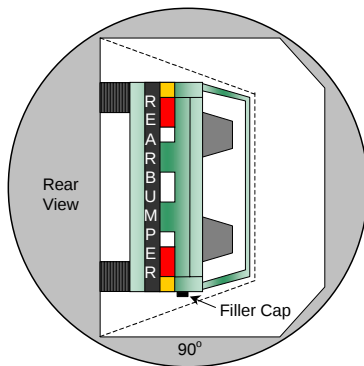
NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

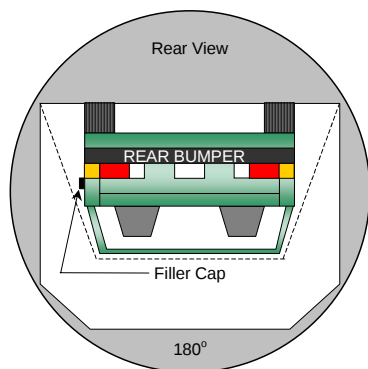
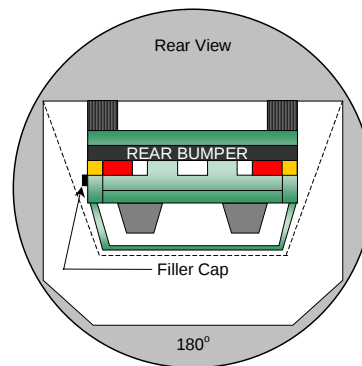
Test Date: 5/6/08



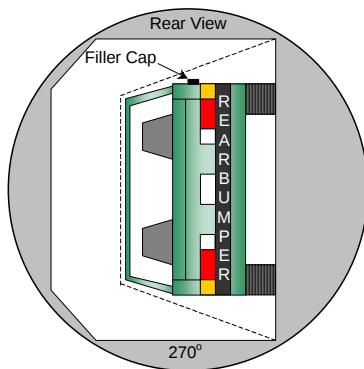
0° to 90°



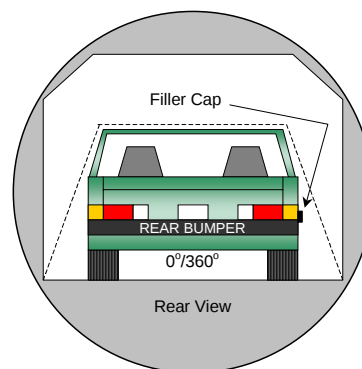
90° to 180°



180° to 270°



270° to 360°



1. The specified fixture rollover rate for each 90° of rotation is 60 to 120 seconds.
2. The position hold time at each position is 300 seconds (minimum).
3. No solvent leakage occurred during rollover.

DATA SHEET NO. 12...(CONTINUED)**FMVSS 301 STATIC ROLLOVER DATA**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	90	300	390
90° to 180°	91	301	392
180° to 270°	93	302	395
270° to 360°	91	303	394

FMVSS 301 SPILLAGE TABLE REQUIREMENT

First 5 Minutes	5.0
Sixth Minute	1.0
Seventh Minute	1.0
Eighth Minute	1.0

ACTUAL TEST VEHICLE SOLVENT SPILLAGE TABLE (OZ)

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

SOLVENT SPILLAGE LOCATION TABLE

Test Phase	Spillage Location
0° to 90°	None
90° to 180°	None
180° to 270°	None
270° to 360°	None

DATA SHEET NO. 13
VEHICLE MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
Test Program: NHTSA 35mph NCAP

NHTSA No.: M90501
Test Date: 5/6/08

VEHICLE MEASUREMENT TABLE

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Length of test vehicle at centerline	mm	4790	4270	-520
2	RSOV to front of engine	mm	4241	4085	-156
3	RSOV to firewall centerline	mm	3707	3690	-17
4	RSOV to upper leading edge of right door	mm	3327	3334	7
5	RSOV to upper leading edge of left door	mm	3322	3326	4
6	RSOV to lower leading edge of right door	mm	3286	3282	-4
7	RSOV to lower leading edge of left door	mm	3282	3274	-8
8	RSOV to upper trailing edge of right door	mm	2240	2250	10
9	RSOV to upper trailing edge of left door	mm	2238	2243	5
10	RSOV to lower trailing edge of right door	mm	2242	2235	-7
11	RSOV to lower trailing edge of left door	mm	2238	2227	-11
12	RSOV to bottom of right A-pillar	mm	3282	3280	-2
13	RSOV to bottom of left A-pillar	mm	3279	3274	-5
14	RSOV to firewall on right side	mm	3688	3645	-43
15	RSOV to firewall on left side	mm	3687	3665	-22
16	RSOV to steering column hub	mm	2851	2882	31
17	Center of steering column to left A-pillar, Y	mm	425	433	8
18	Center of steering column to headlining, Z	mm	425	408	-17
19	RSOV to right side of front bumper	mm	4568	4220	-348
20	RSOV to left side of front bumper	mm	4567	4270	-297
21	Length of engine block	mm	490	491	1
RD	RSOV to right side of dash panel	mm	3101	3107	6
CD	RSOV to center of dash panel	mm	3103	3090	-13
LD	RSOV to left side of dash panel	mm	3097	3101	4

DATA SHEET NO. 13...(CONTINUED)**VEHICLE STRUCTURAL MEASUREMENTS**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08**VEHICLE STRUCTURAL MEASUREMENT TABLE**

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length	mm	4790	4270	-520
2	Total width	mm	1805	1802	-3
3	Front bumper top height	mm	520	602	82
4	Front bumper bottom height	mm	370	450	80
5	Longitudinal member top height	mm	524	565	41
6	Longitudinal member bottom height	mm	398	465	67
7	Distance between longitudinal members	mm	928	1116	188
8	Longitudinal member width	mm	80	127	47
9	Engine top height	mm	795	860	65
10	Engine bottom height	mm	236	311	75
11	Engine and gearbox width	mm	500	500	0
12	Front bumper-engine distance	mm	545	163	-382
13	Front shock absorber height	mm	865	870	5
14	Front hood leading edge height	mm	715	857	142
15	Distance between front shock absorbers	mm	1023	975	-48
16	Front bumper-front axle distance	mm	965	480	-485
17	Front axle to A-pillar distance	mm	485	470	-15
18	A Pillar to B Pillar distance	mm	981	979	-2
19	B Pillar to rear axle distance	mm	1146	1148	2
20	B Pillar to C Pillar distance	mm	926	942	16
21	Roof sill bottom height	mm	1295	1295	0
22	Roof sill top height	mm	1449	1420	-29
23	Floor sill bottom height	mm	211	181	-30
24	Floor sill top height	mm	341	334	-7

DATA SHEET NO. 13...(CONTINUED)

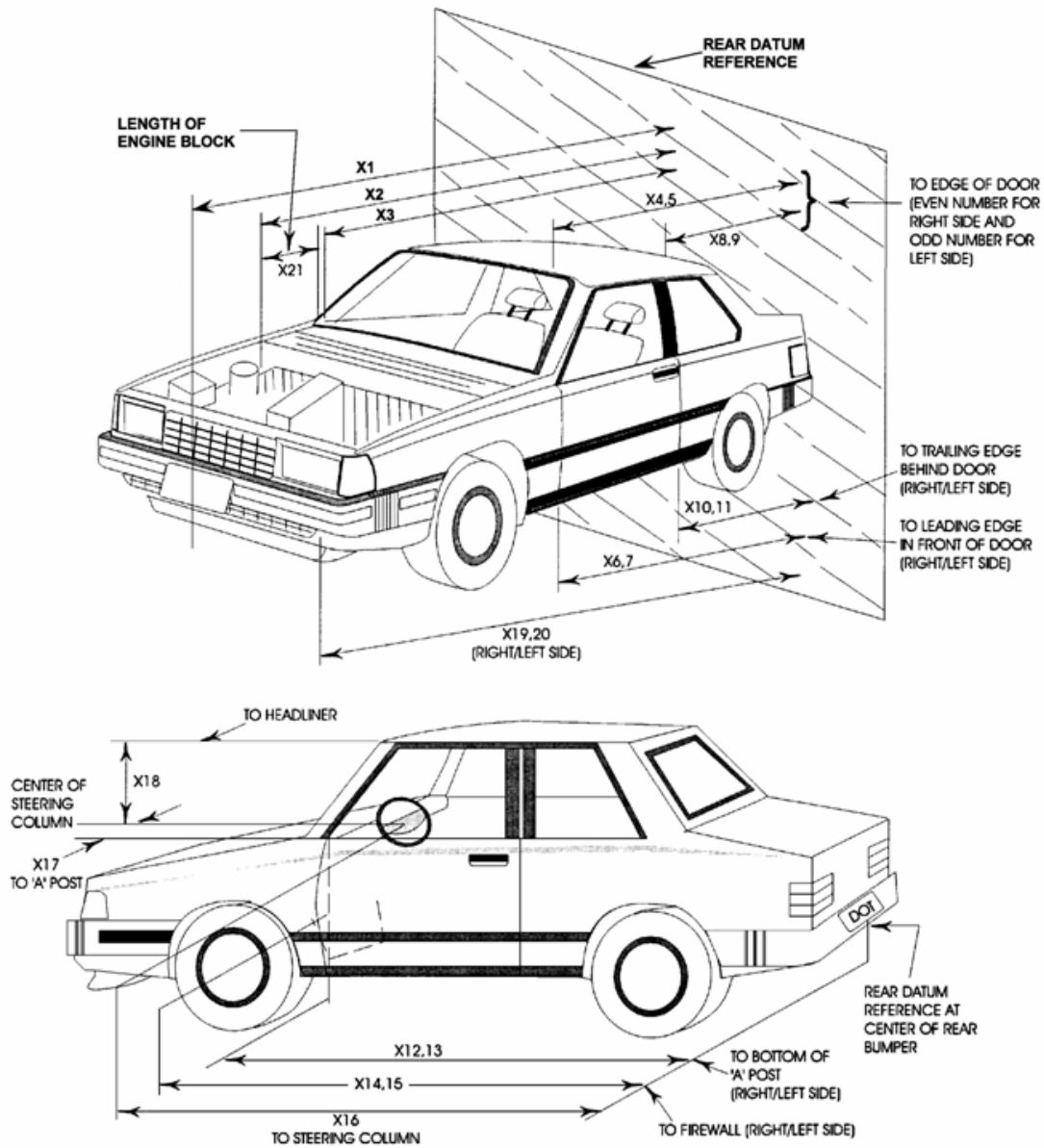
VEHICLE MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08



DATA SHEET NO. 14**CAMERA LOCATIONS**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08**VEHICLE CAMERA MEASUREMENT TABLE**

No.	Camera View	Location			Angle (deg)	Film Plane to Head	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Real Time Camera (Panning)	-11412	-8150	-1484	0			30
2	Overall Left Side	-2551	-8006	-1214	0	8105	20	1000
3	Closeup Left Side	-1745	-6477	-1308	0	7844	50	1000
4	Driver and Interior View	-6696	-5987	-1071	-17	15570	ZOOM	1000
5	Steering Column (Bottom)	-1972	-8184	-2879	-13	9453	35	1000
6	Steering Column (Top)	-1966	-8141	-3258	-13	9549	35	1000
7	Overall Right Side	-2453	6951	-942	0	7409	20	1000
8	Closeup Right Side	-1912	5869	-1257	0	7079	50	1000
9	Passenger and Interior View	-5136	9516	-2460	-10	10211	ZOOM	1000
10	Right Side View	-1582	7995	-1713	-6	7134	ZOOM	1000
11	Windshield View	-354	0	-5749	-90		24	1000
12	Driver Front View	363	-543	-2548	-34		25	1000
13	Passenger Front View	381	445	-2548	-34		25	1000
14	Pit View of Engine	-756	0	1495	90		12	1000
15	Pit View of Fuel Tank	-1418	0	1495	90		8	1000
16	Driver Side Dummy On-Board	-2903	230	358	-2	792	12	1000
17	Passenger Side Dummy On-Board	2903	-230	359	-2	792	12	1000
18	Real Time Driver	-1926	-8089	-1704	-1	-1704	-1	30
19	Real Time Passenger	-1433	8047	-1704	-1	-1704	-1	30

All measurements are made relative to the point of impact.

DATA SHEET NO. 15

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

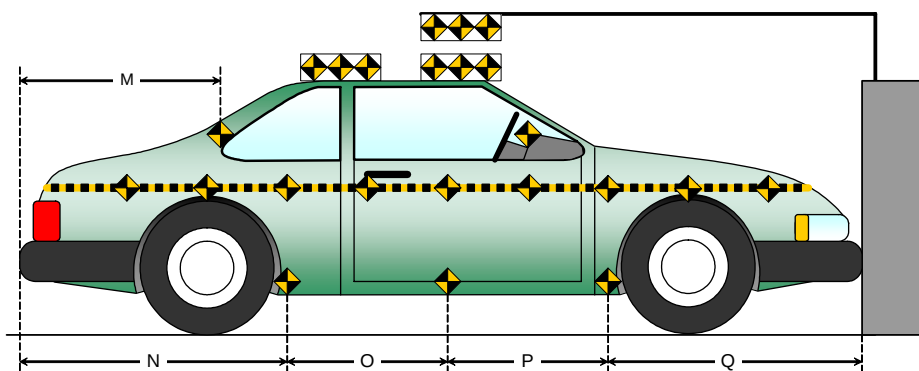
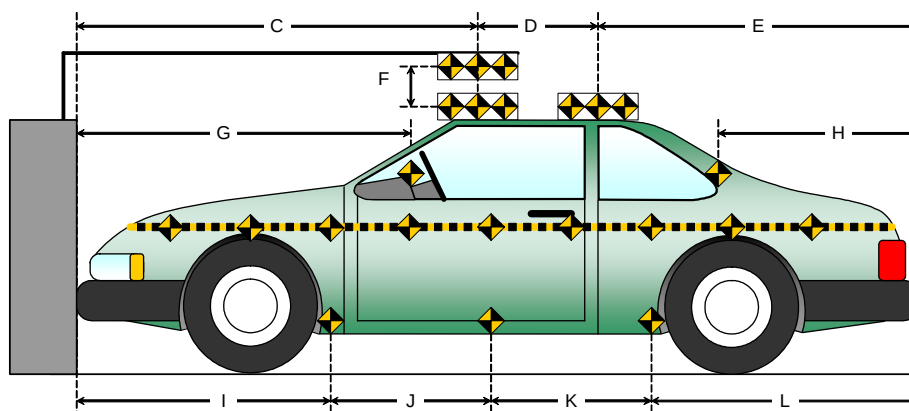
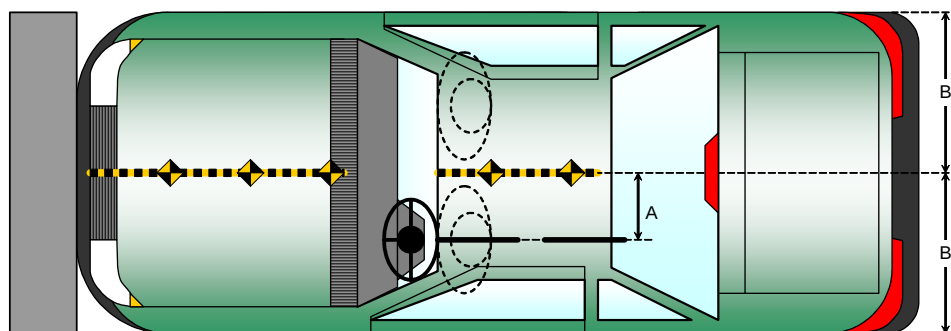
Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08

All Dimensions in Millimeters (mm)	
Item	Value
A	395
B	903
C	2365
D	615
E	1910
F	155
G	1745
H	1062
I	1415
J	908
K	908
L	1545
M	1098
N	1545
O	908
P	908
Q	1415

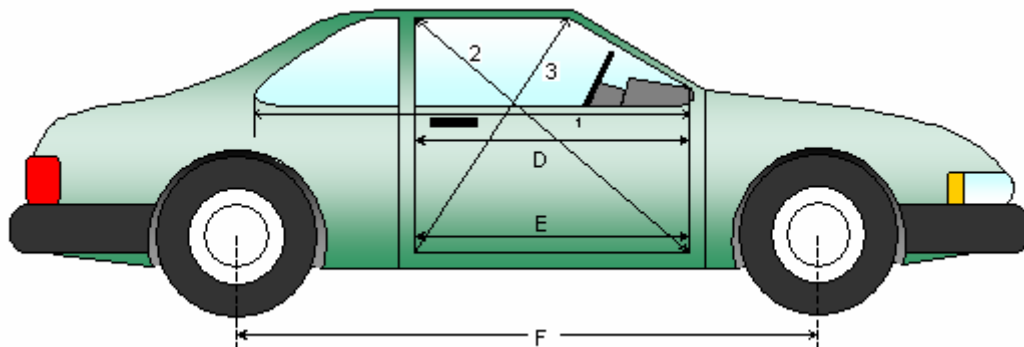
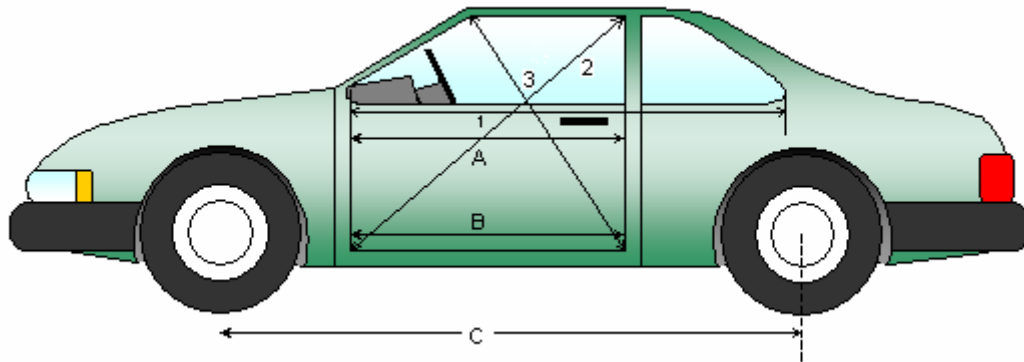


DATA SHEET NO. 16**VEHICLE INTRUSION MEASUREMENTS**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90501Test Program: NHTSA 35mph NCAPTest Date: 5/6/08**DOOR OPENING WIDTH TABLE**

Item	Description	Units	Pre-Test	Post-Test	Difference
1L	Left Side	mm	982	978	4
2L	Left Side (Diagonally)	mm	1458	1453	5
3L	Left Side (Diagonally)	mm	940	938	2
1R	Right Side	mm	976	980	-4
2R	Right Side (Diagonally)	mm	1457	1454	3
3R	Right Side (Diagonally)	mm	941	951	-10

WHEELBASE MEASUREMENT TABLE

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2725	2650	75
F	Right Side Wheelbase	mm	2725	2640	85



DATA SHEET NO. 16...(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

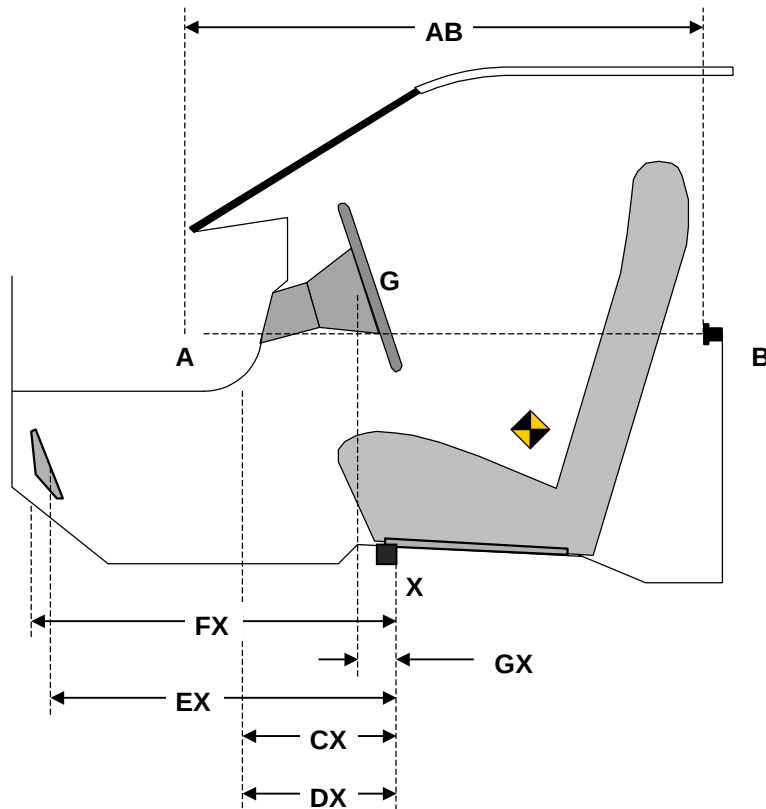
NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08

DRIVER COMPARTMENT INTRUSION TABLE

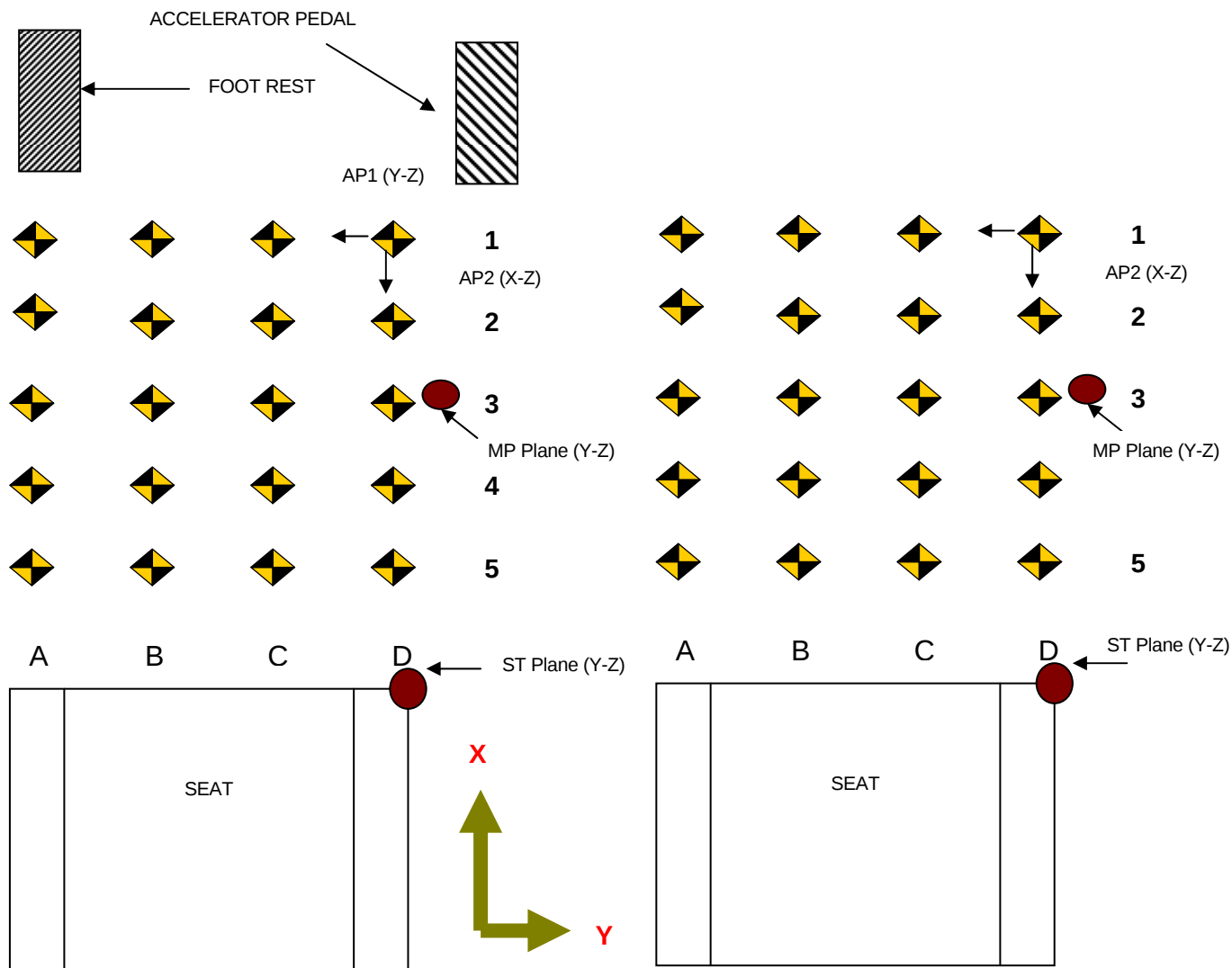
Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	982	978	4
CX	Left Knee Bolster to X	mm	288	270	18
DX	Right Knee Bolster to X	mm	290	266	24
EX	Brake Pedal to X	mm	595	530	65
FX	Foot Rest to X	mm	581	572	9
GX	Center of Steering Wheel Hub to X	mm	91	70	21



DATA SHEET NO. 16...(CONTINUED)
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

NHTSA No.: M90501
 Test Date: 5/6/08



- AP1:** Y-Z Plane passing through D1
- AP2:** X-Z Plane passing through D1
- AP3:** X-Y plane passing through D1
- MP:** Y-Z plane, halfway between the ST plane and AP1 plane
- CF Plane:** X-Z plane passes through center of footrest.
- BP Plane:** X-Z plane passes through center of brake pedal
- TP Plane:** Y-Z plane, intersection of BP Plane and the intersection of the toe pan and floorboard
- Column A:** intersection of vehicle and CF plane
- Column D:** Intersection of vehicle and AP2 plane
- Row 1:** intersection of the vehicle and the AP3 Plane
- Row 3:** intersection of the vehicle and TP plane
- Row 5:** intersection of the vehicle and MP plane
- Row 2:** evenly spaced between row 1 and 3
- Row 4:** evenly spaced between row 3 and 5

DATA SHEET NO. 16...(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08

All measurements in mm

DRIVER FLOORPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	660	708	701	704	634	665	636	640	26	43	65	64
2	577	601	597	588	564	571	548	530	13	30	49	58
3	481	471	466	457	469	446	426	398	12	25	40	59
4	331	325	318	310	322	303	281	260	9	22	37	50
5	175	172	165	161	171	158	147	122	4	14	18	39

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	37	163	299	442	57	194	326	464	-20	-31	-27	-22
2	32	156	300	444	56	183	322	466	-24	-27	-22	-22
3	27	156	295	437	46	172	310	444	-19	-16	-15	-7
4	22	150	290	428	33	154	293	422	-11	-4	-3	6
5	18	148	279	420	29	152	287	414	-11	-4	-8	6

DRIVER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-53	7	3	-6	-80	-37	-54	-57	27	44	57	51
2	57	85	85	82	39	55	39	34	18	30	46	48
3	109	105	104	96	96	91	76	48	13	14	28	48
4	124	105	111	94	101	105	95	46	23	0	16	48
5	121	101	108	107	97	99	107	56	24	2	1	51

DATA SHEET NO. 16...(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08

All measurements in mm

PASSENGER FLOORPAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	678	681	685	680	657	654	661	664	21	27	24	16
2	576	579	579	468	563	562	568	581	13	17	11	7
3	299	466	466	315	455	451	458	461	14	15	8	7
4	146	305	310	164	286	294	304	309	13	11	6	6
5	146	153	159	164	138	160	160	166	8	-7	-1	-2

PASSENGER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-444	-307	-160	-44	-427	-288	-149	-25	-17	-19	-11	-19
2	-444	-303	-155	-34	-428	-293	-142	-13	-16	-10	-13	-21
3	-440	-299	-153	-32	-425	-287	-137	-18	-15	-12	-16	-14
4	-431	-287	-149	-32	-414	-269	-132	-16	-17	-18	-17	-16
5	-422	-279	-144	-24	-407	-271	-134	-17	-15	-8	-10	-7

PASSENGER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	8	10	12	9	-16	-8	-9	-12	24	18	21	21
2	85	89	91	96	66	70	75	84	19	19	16	12
3	103	104	103	106	86	95	97	98	17	9	6	8
4	101	111	101	121	87	109	109	100	14	2	-8	21
5	114	108	99	117	98	125	102	104	16	-17	-3	13

DATA SHEET NO. 17

FIXED BARRIER LOAD CELL LOCATIONS

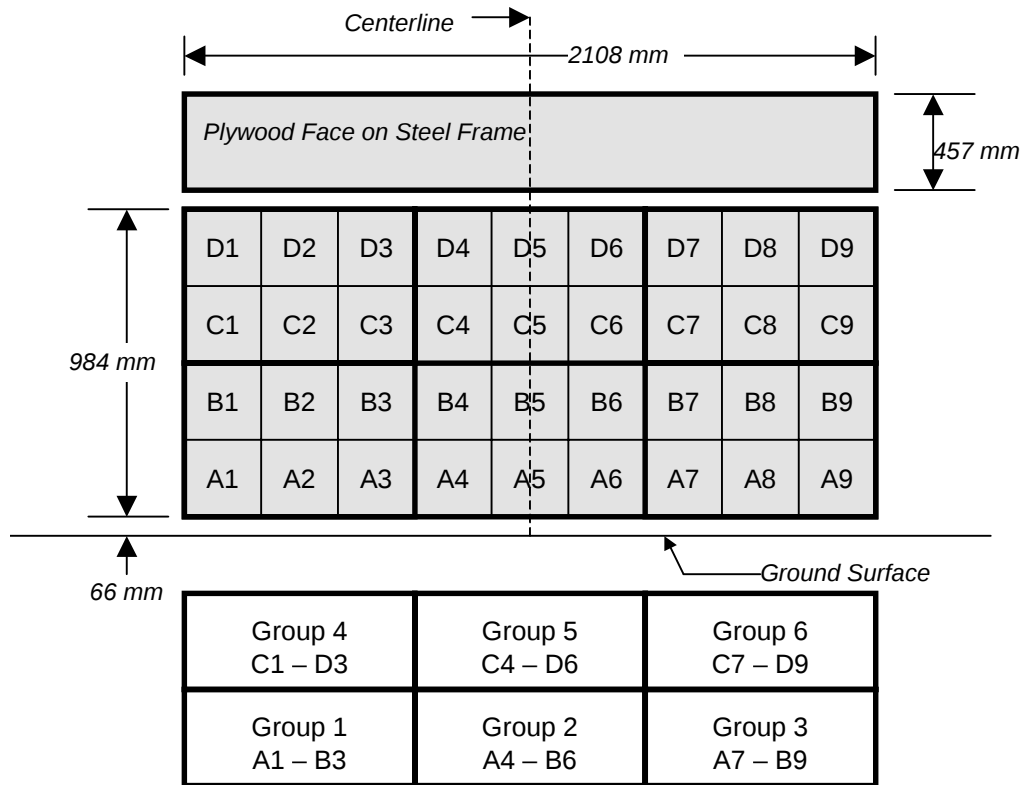
Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08

36 Load Cell Rigid Barrier (NHTSA Standard) Load Cell Locations on Fixed Barrier



6 Groups of 6 Load Cells Each

DATA SHEET NO. 18**ACCIDENT INVESTIGATION DIVISION DATA**

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan NHTSA No.: M90501
 Test Program: NHTSA 35mph NCAP Test Date: 5/6/08

VEHICLE INFORMATION

VIN: 5NPET46CX9H403151 Wheelbase (mm): 2725
 Vehicle Size Category: 4-Door Sedan Test Weight (kg): 1714

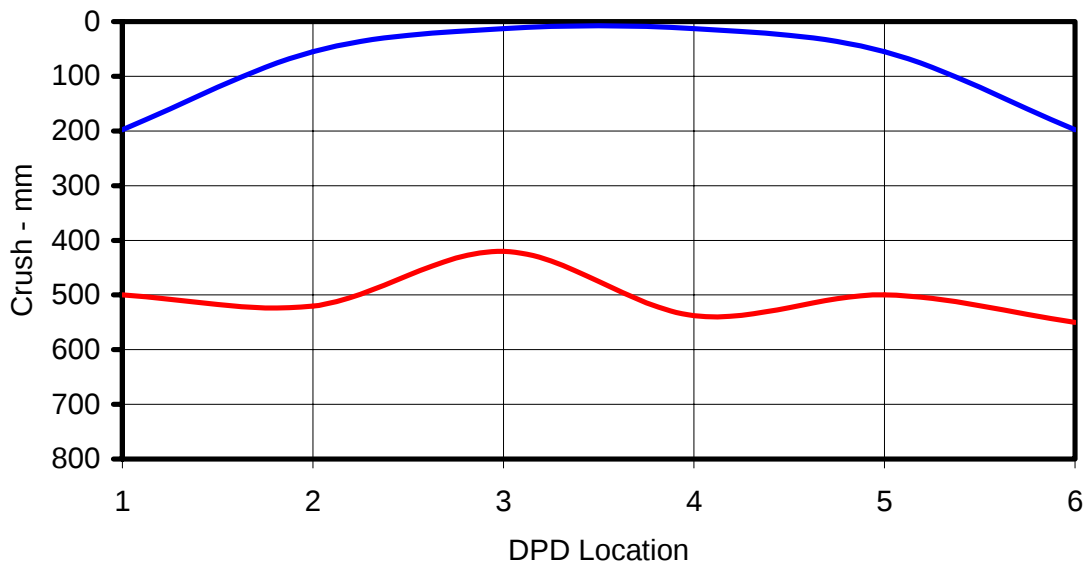
ACCELEROMETER DATA

Accelerometer Location: Left rear cross member
 Cal. Procedure/Interval: 6 months/drop test
 Integration Algorithm: NHTSA Standard Linearity: Good
 Impact Velocity (km/h): 56.37
 Velocity Change (km/h): 65 Time of Separation (msec): 63.8

CRUSH PROFILE

Collision Deformation Classification: 12FDEW6 Midpoint of Damage: Vehicle Centerline
 Damage Region Length: 1440 Impact Mode: Full frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side of vehicle	mm	198	500	-302
C2	Crush zone 2 on left side of vehicle	mm	55	520	-465
C3	Crush zone 3 on left side of vehicle	mm	13	420	-407
C4	Crush zone 4 on right side of vehicle	mm	13	538	-525
C5	Crush zone 5 on right side of vehicle	mm	55	500	-445
C6	Crush zone 6 at right side of vehicle	mm	198	550	-352



DATA SHEET NO. 19

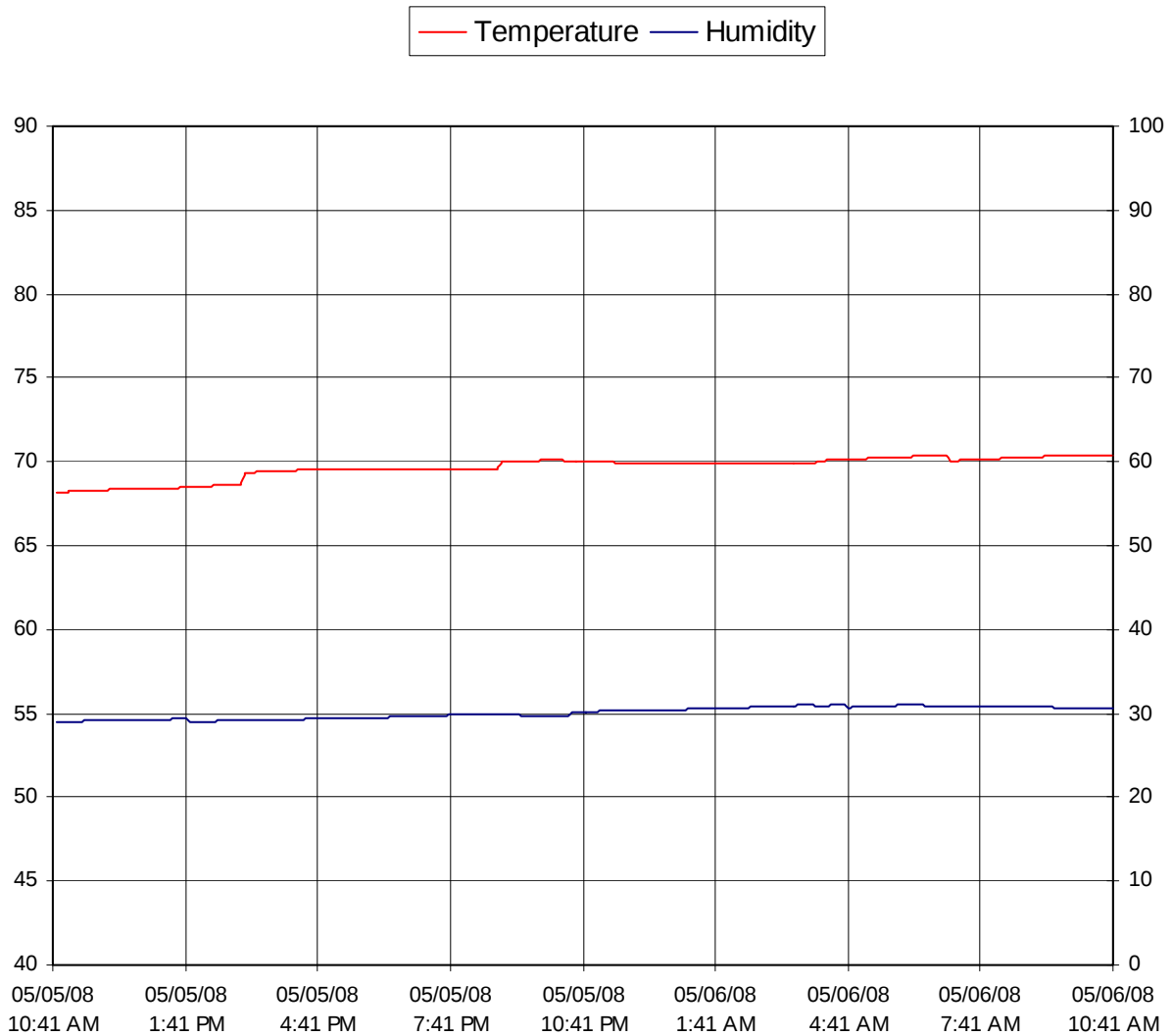
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90501

Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08



APPENDIX A
PHOTOGRAPHS

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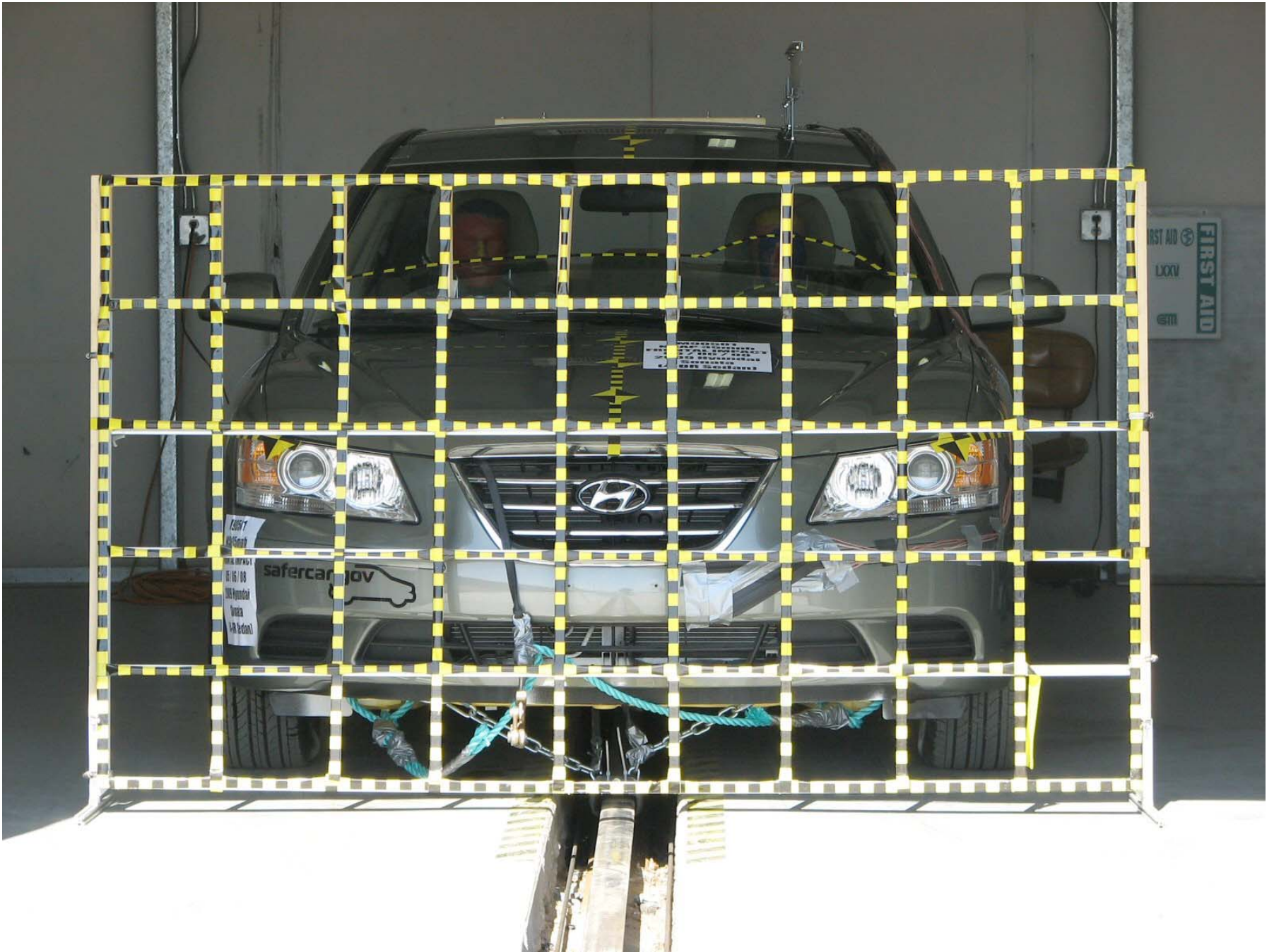


Figure A-1: Load Cell Location

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MANUFACTURED BY
HYUNDAI MOTOR MANUFACTURING ALABAMA, LLC

Jan/02/08

GVWR 4299 lbs

PAINT GP

GAWR
FRONT 2513 lbs

GAWR
REAR 2138 lbs

TRIM V2

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S.A. FEDERAL
MOTOR VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS
IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE

V.I.N 5NPET46CX9H403151

PASSENGER CAR



Figure A-2: Manufacturer's Label



TIRE AND LOADING INFORMATION

SEATING CAPACITY | TOTAL 5 | FRONT 2 | REAR 3

The combined weight of occupants and cargo should never exceed 390 kg or 860 lbs.

TIRE	SIZE	COLD TIRE PRESSURE
FRONT	P215/60R16	220KPA, 32PSI
REAR	P215/60R16	220KPA, 32PSI
SPARE	T125/80D16	420KPA, 60PSI

SEE OWNER'S
MANUAL FOR
ADDITIONAL
INFORMATION

F1

P215/60R16

Figure A-3: Tire Placard



Figure A-4: Right Front $\frac{3}{4}$ View, As Received



Figure A-5: Left Rear $\frac{3}{4}$ View, as Received



Figure A-6: Pre-Test Front View

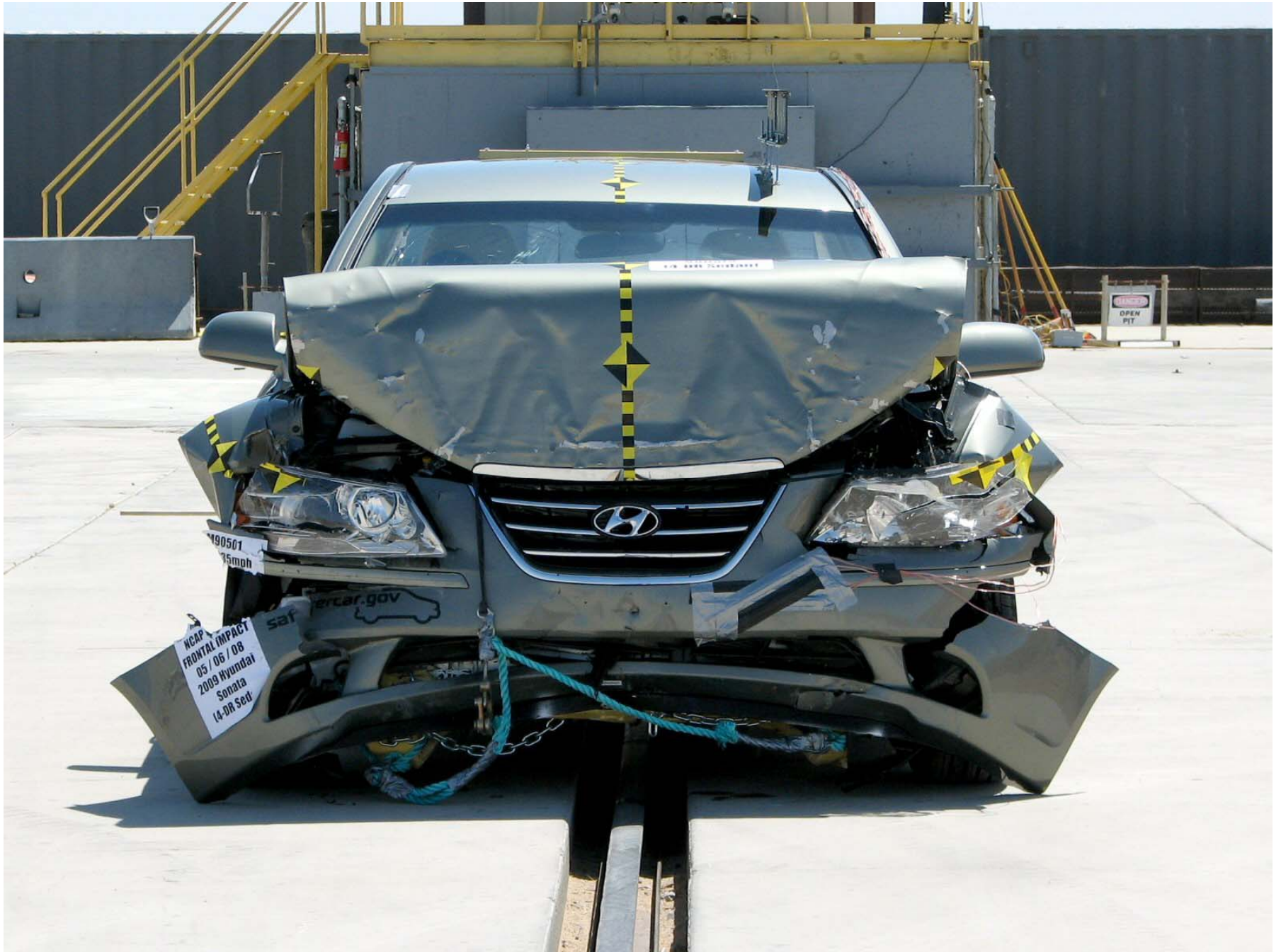


Figure A-7: Post-Test Front View (Vehicle Moved)



Figure A-8: Pre-Test Left Side View



Figure A-9: Post-Test Left Side View



Figure A-10: Pre-Test Right Side View



Figure A-11: Post-Test Right Side View



Figure A-12: Pre-Test Right Front ¾ View



Figure A-13: Post-Test Right Front ¾ View (Vehicle Moved)



Figure A-14: Pre-Test Left Rear $\frac{3}{4}$ View



Figure A-15: Post-Test Left Rear $\frac{3}{4}$ View



Figure A-16: Post-Test Left Side $\frac{3}{4}$ View of Doors After Impact



Figure A-17: Post-Test Right Side $\frac{3}{4}$ View of Doors After Impact

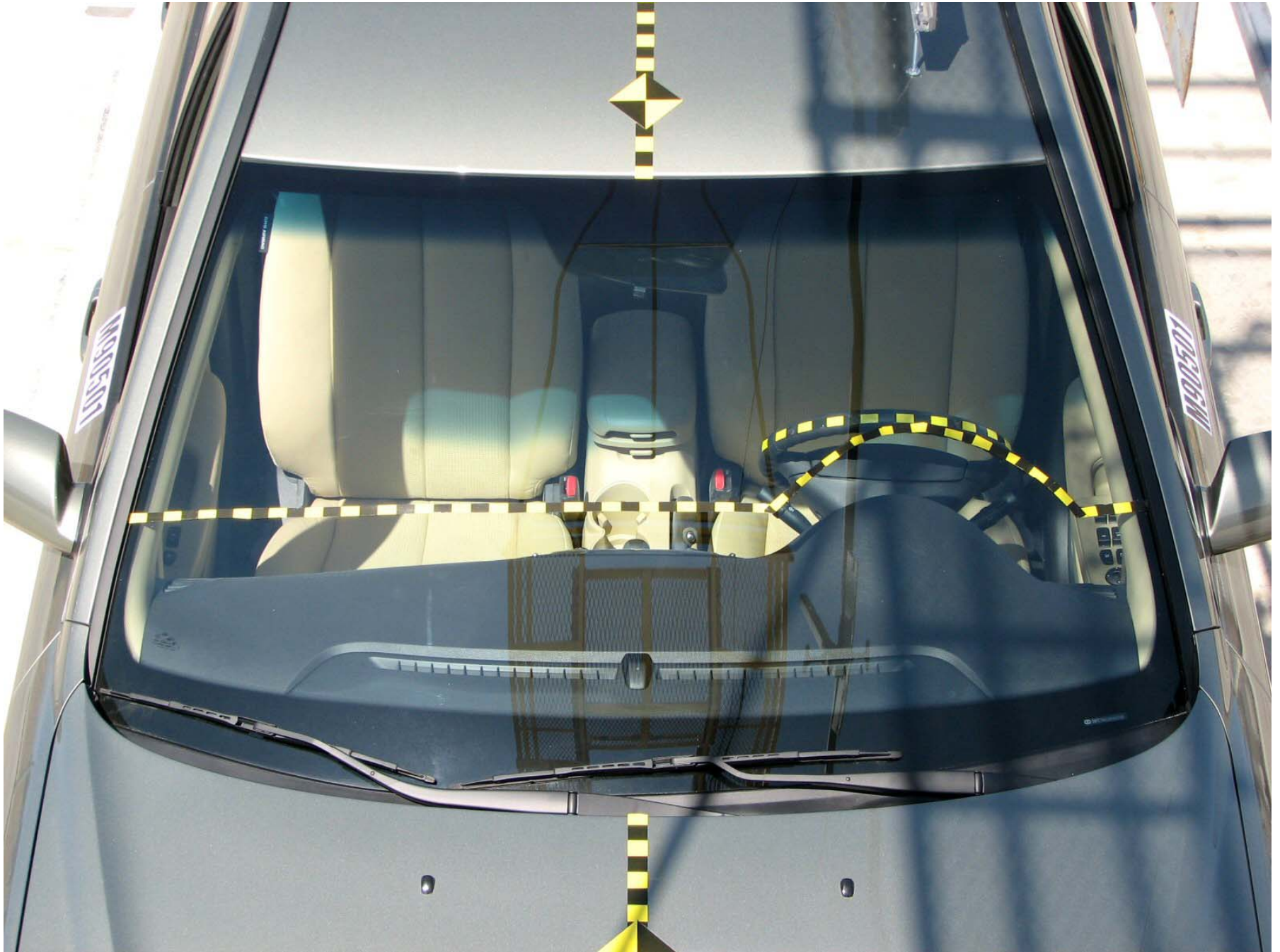


Figure A-18: Pre-Test Windshield



Figure A-19: Post-Test Windshield



Figure A-20: Pre-Test Engine Compartment



Figure A-21: Post-Test Engine Compartment (Vehicle Moved)



Figure A-22: Pre-Test Fuel Cap



Figure A-23: Post-Test Fuel Cap

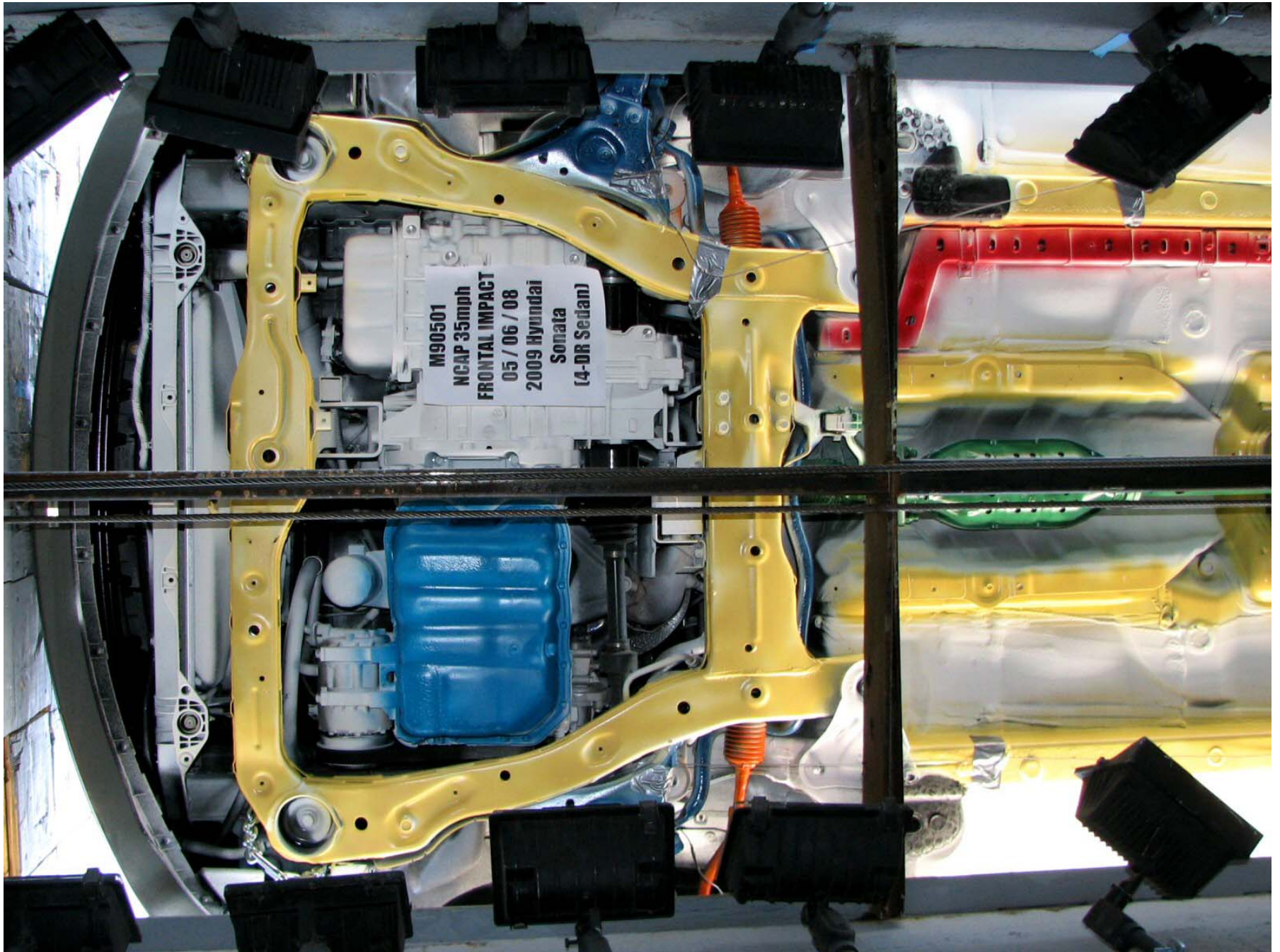


Figure A-24: Pre-Test Front Underbody

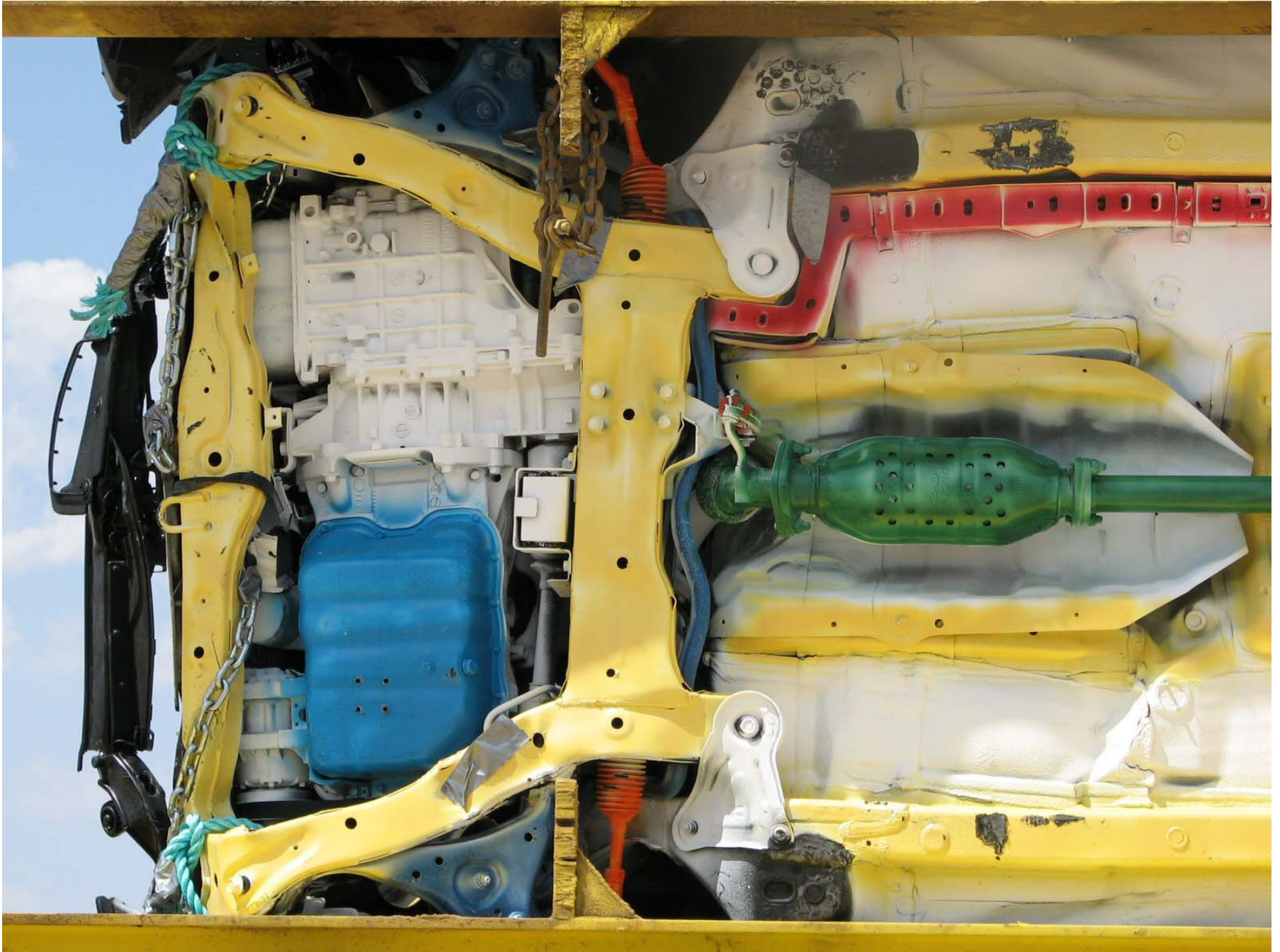


Figure A-25: Post-Test Front Underbody

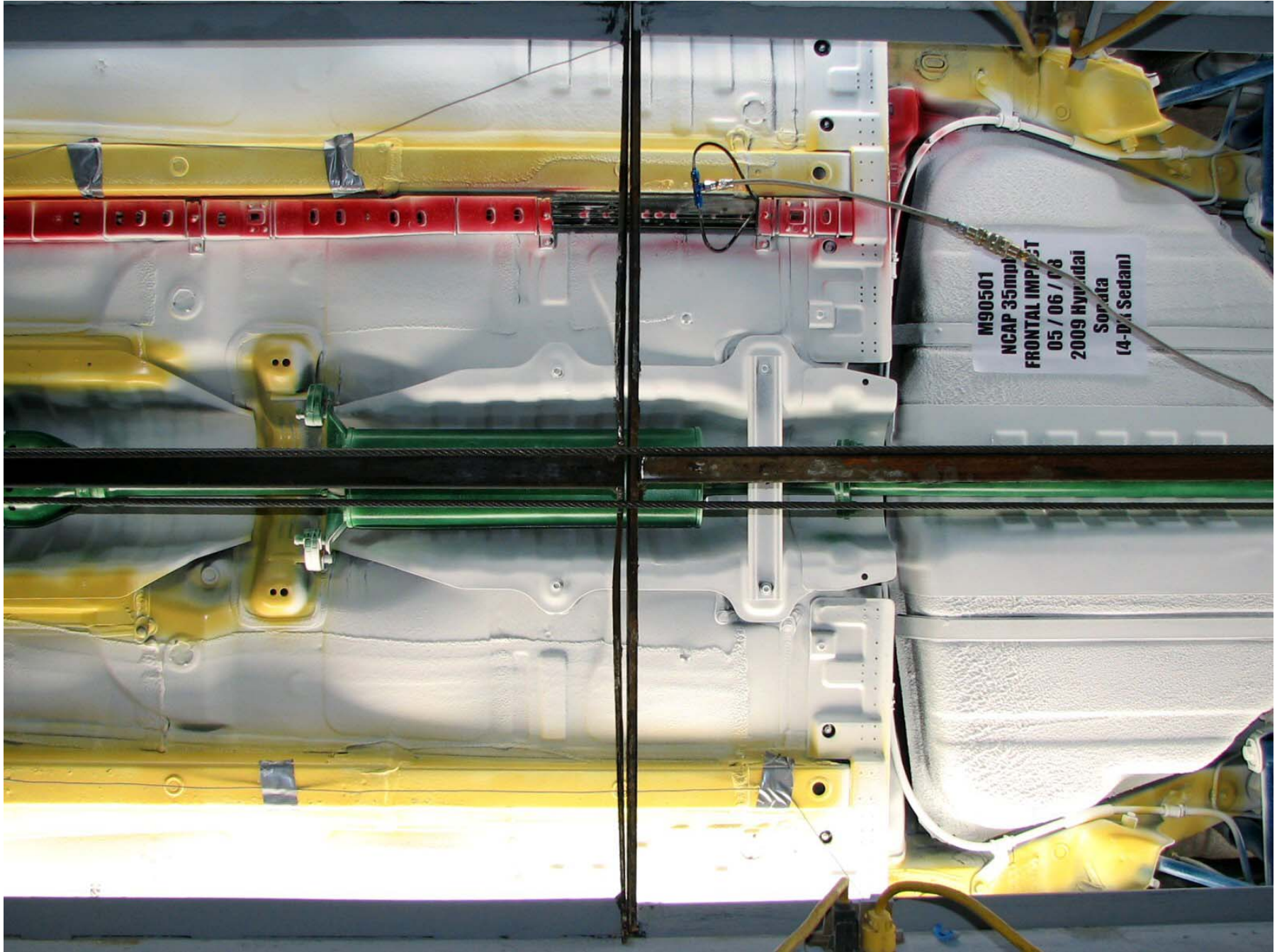


Figure A-26: Pre-Test Mid Underbody

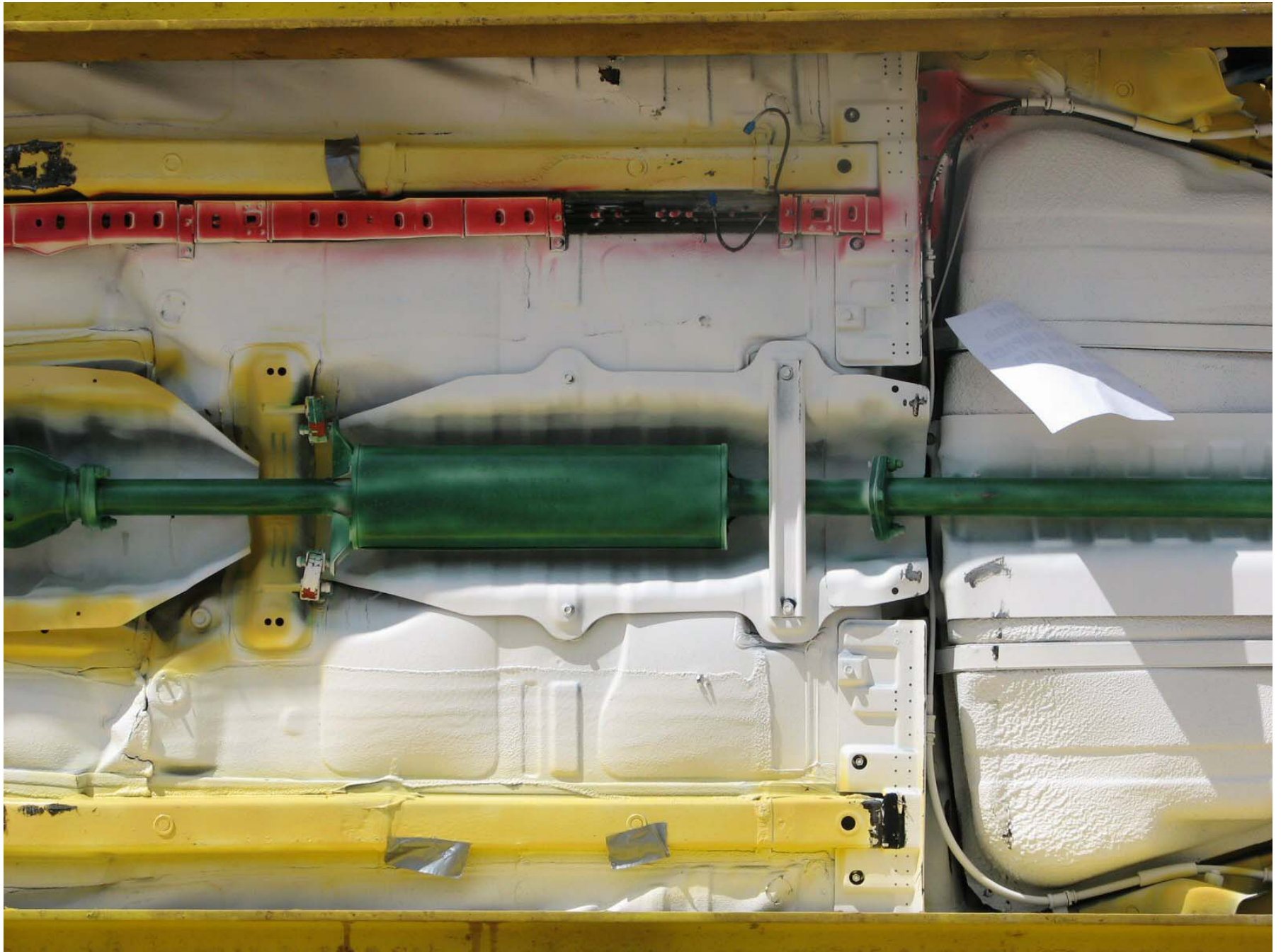


Figure A-27: Post-Test Mid Underbody

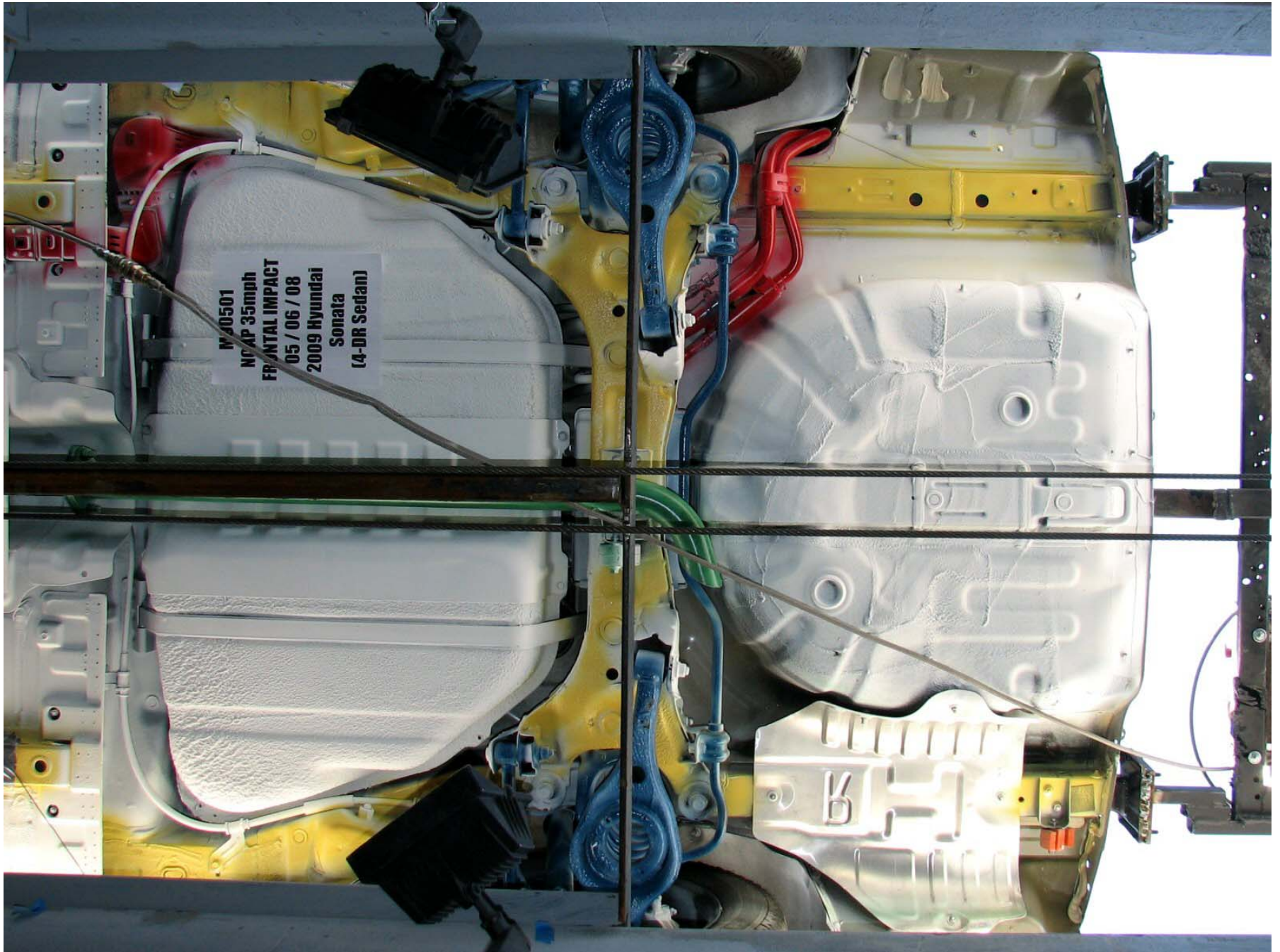


Figure A-28: Pre-Test Rear Underbody



Figure A-29: Post-Test Rear Underbody



Figure A-30: Pre-Test Driver Dummy Front View (Head Position)



Figure A-31: Post-Test Driver Dummy Front View (Head Position)



Figure A-32: Pre-Test Driver Dummy (Through Window)



Figure A-33: Post-Test Driver Dummy (Through Window)



Figure A-34: Pre-Test Driver Dummy (Door Open)



Figure A-35: Post-Test Driver Dummy (Door Open)



Figure A-36: Pre-Test Driver Dummy Feet



Figure A-37: Post-Test Driver Dummy Feet



Figure A-38: Pre-Test Driver Side Knee Bolster



Figure A-39: Post-Test Driver Side Knee Bolster



Figure A-40: Pre-Test Driver Side Floor Pan



Figure A-41: Post-Test Driver Side Floor Pan



Figure A-42: Post-Test Driver Dummy Head



Figure A-43: Post-Test Driver Dummy Airbag Contact



Figure A-44: Pre-Test Passenger Dummy Front View (Head Position)



Figure A-45: Post-Test Passenger Dummy Front View (Head Position)



Figure A-46: Pre-Test Passenger Dummy (Through Window)



Figure A-47: Post-Test Passenger Dummy (Through Window)



Figure A-48: Pre-Test Passenger Dummy (Door Open)



Figure A-49: Post-Test Passenger Dummy (Door Open)

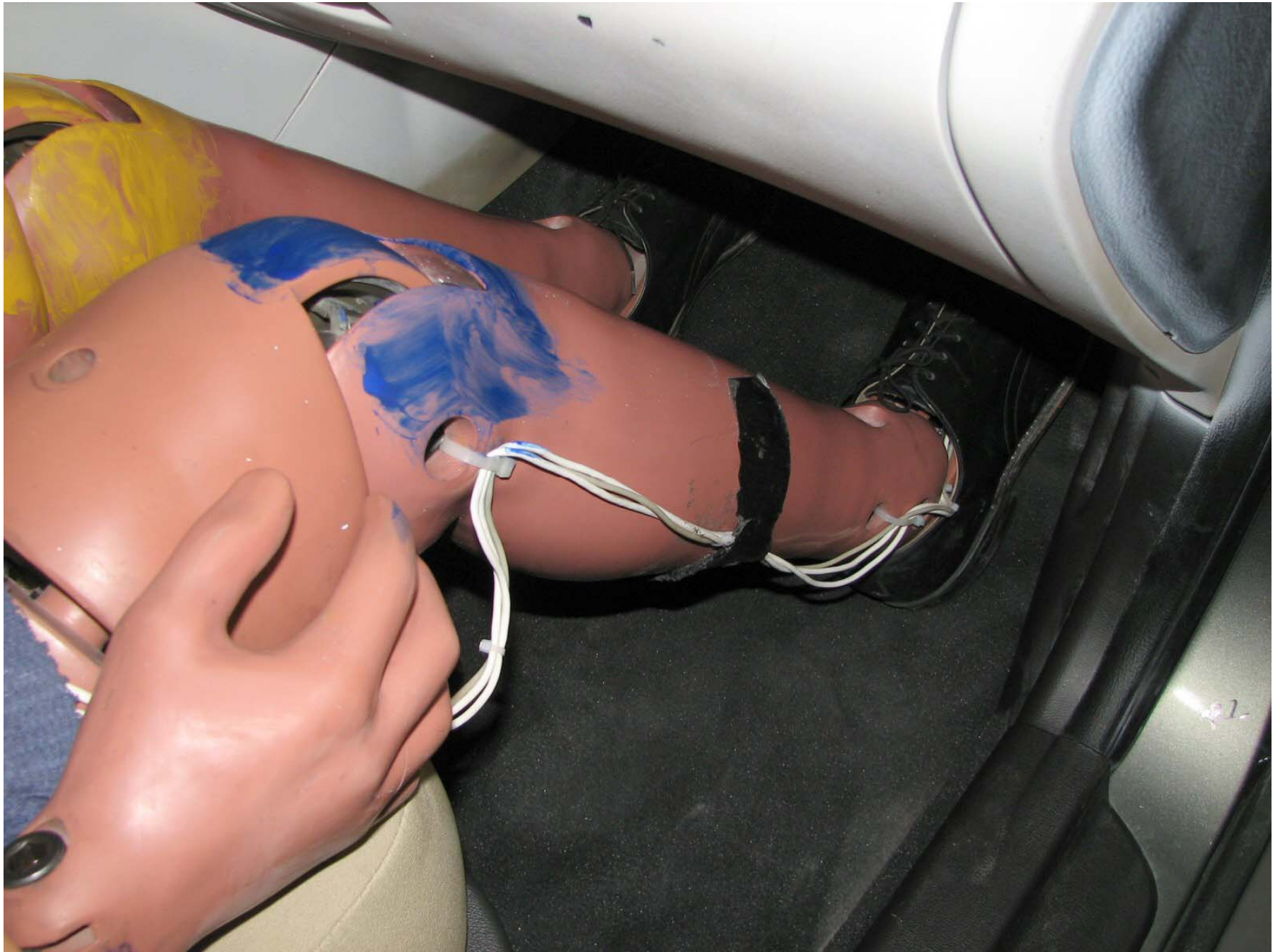


Figure A-50: Pre-Test Passenger Dummy Feet



Figure A-51: Post-Test Passenger Dummy Feet



Figure A-52: Pre-Test Passenger Side Glove Box



Figure A-53: Post-Test Passenger Side Glove Box



Figure A-54: Pre-Test Passenger Side Floor Pan



Figure A-55: Post-Test Passenger Side Floor Pan



Figure A-56: Post-Test Passenger Dummy Head



Figure A-57: Post-Test Passenger Dummy Airbag Contact



Figure A-58: Vehicle on Rollover Device (0°)



Figure A-59: Vehicle on Rollover Device (90°)



Figure A-60: Vehicle on Rollover Device (180°)

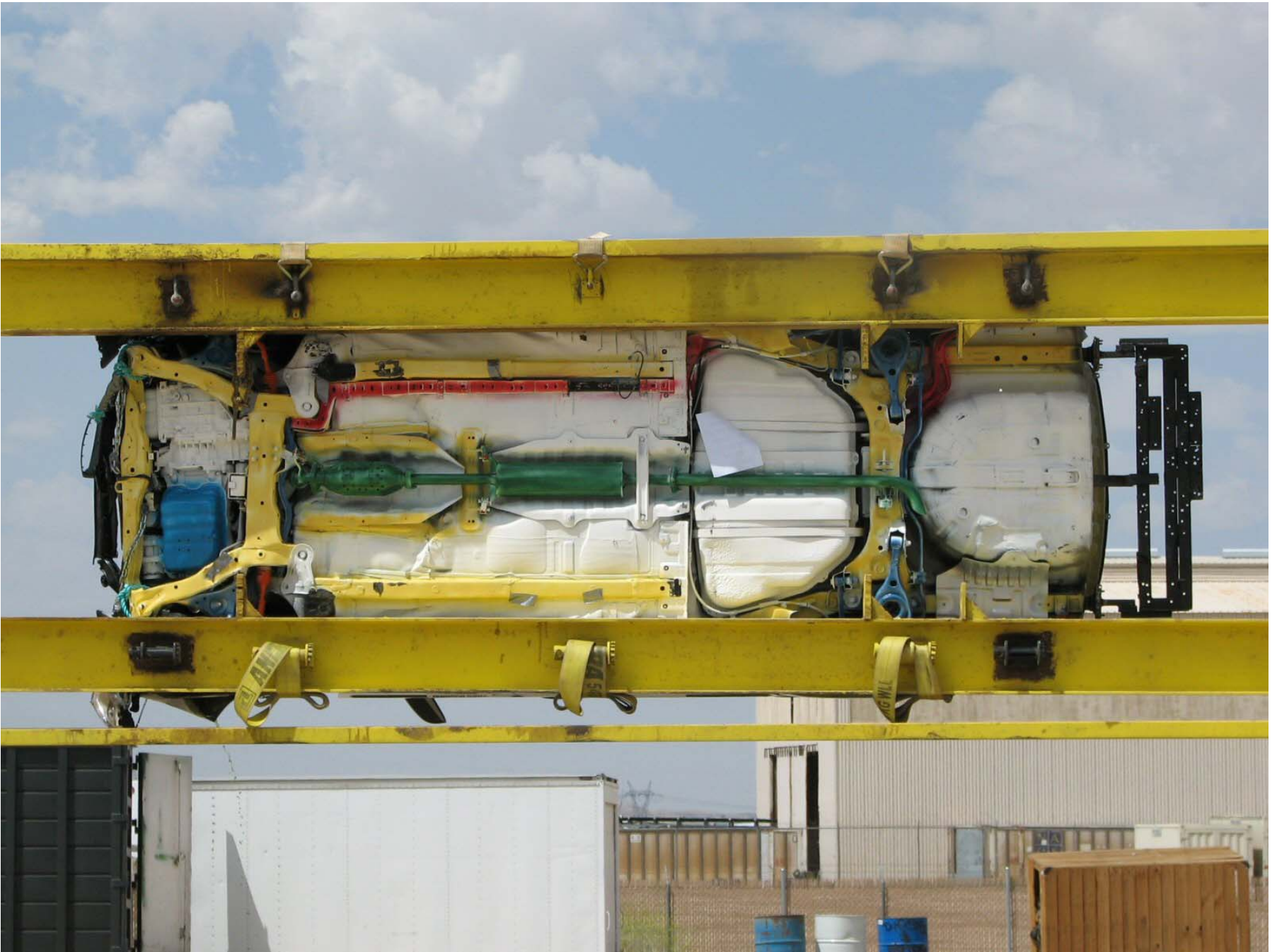


Figure A-61: Vehicle on Rollover Device (270°)



Figure A-62: Vehicle Impact

APPENDIX B

DATA PLOTS

LIST OF DATA PLOTS

Data Plot		Page
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	Driver Head Primary Z	B-1
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	Driver Right Femur Force Z	B-3
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	Passenger Right Femur Force Z	B-6

LIST OF DATA PLOTS...(CONTINUED)

The following additional data plots for this test can be obtained from the research and development section of the NHTSA website. The website can be found at www.NHTSA.dot.gov.

- Driver Head Primary X Velocity
- Driver Head Primary X Displacement
- Driver Head Redundant X
- Driver Head Redundant Y
- Driver Head Redundant Z
- Driver Head Resultant Redundant
- Driver Head Redundant X Velocity
- Driver Head Redundant X Displacement
- Driver Upper Neck Force X
- Driver Upper Neck Force Y
- Driver Upper Neck Force Z
- Driver Upper Neck Force Resultant
- Driver Upper Neck Moment X
- Driver Upper Neck Moment Y
- Driver Upper Neck Moment Z
- Driver Upper Neck Moment Resultant
- Driver Chest Primary X Velocity
- Driver Chest Primary X Displacement
- Driver Chest Redundant X
- Driver Chest Redundant Y
- Driver Chest Redundant Z
- Driver Chest Resultant Redundant
- Driver Chest Redundant X Velocity
- Driver Chest Redundant X Displacement
- Driver Chest Displacement
- Driver Pelvis X
- Driver Pelvis Y
- Driver Pelvis Z
- Driver Pelvis Resultant
- Driver Pelvis X Velocity
- Driver Pelvis X Displacement
- Driver Left Upper Tibia Moment X
- Driver Left Upper Tibia Moment Y
- Driver Right Upper Tibia Moment X

LIST OF DATA PLOTS...(CONTINUED)

Driver Right Upper Tibia Moment Y
Driver Left Lower Tibia Moment X
Driver Left Lower Tibia Moment Y
Driver Left Lower Tibia Force Z
Driver Right Lower Tibia Moment X
Driver Right Lower Tibia Moment Y
Driver Right Lower Tibia Force Z
Driver Left Foot Aft X
Driver Left Foot Aft Z
Driver Left Foot Fore Z
Driver Right Foot Aft X
Driver Right Foot Aft Z
Driver Right Foot Fore Z
Driver Lap Belt Force
Driver Shoulder Belt Force
Driver Shoulder Belt Pullout
Driver Shoulder Belt Elongation
Passenger Head Primary X Velocity
Passenger Head Primary X Displacement
Passenger Head Redundant X
Passenger Head Redundant Y
Passenger Head Redundant Z
Passenger Head Resultant Redundant
Passenger Head Redundant X Velocity
Passenger Head Redundant X Displacement
Passenger Upper Neck Force X
Passenger Upper Neck Force Y
Passenger Upper Neck Force Z
Passenger Upper Neck Force Resultant
Passenger Upper Neck Moment X
Passenger Upper Neck Moment Y
Passenger Upper Neck Moment Z
Passenger Upper Neck Moment Resultant
Passenger Chest Primary X Velocity
Passenger Chest Primary X Displacement
Passenger Chest Redundant X

LIST OF DATA PLOTS...(CONTINUED)

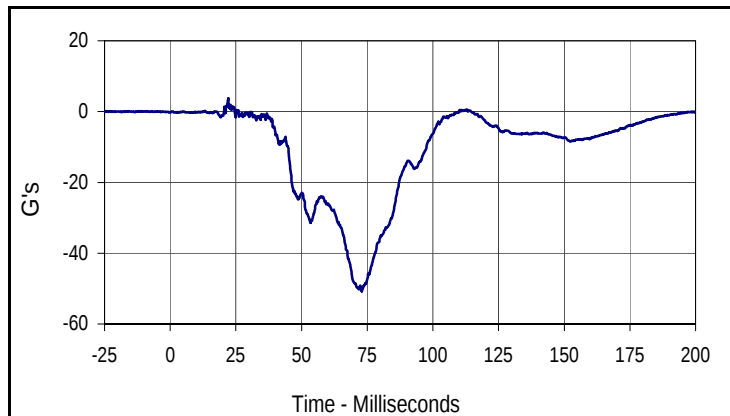
Passenger Chest Redundant Y
Passenger Chest Redundant Z
Passenger Chest Resultant Redundant
Passenger Chest Redundant X Velocity
Passenger Chest Redundant X Displacement
Passenger Chest Displacement
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Passenger Pelvis Y
Passenger Pelvis Z
Passenger Pelvis Resultant
Passenger Pelvis X Velocity
Passenger Pelvis X Displacement
Passenger Left Femur Force
Passenger Right Femur Force
Passenger Left Upper Tibia Moment X
Passenger Left Upper Tibia Moment Y
Passenger Right Upper Tibia Moment X
Passenger Right Upper Tibia Moment Y
Passenger Left Lower Tibia Moment X
Passenger Left Lower Tibia Moment Y
Passenger Left Lower Tibia Force Z
Passenger Right Lower Tibia Moment X
Passenger Right Lower Tibia Moment Y
Passenger Right Lower Tibia Force Z
Passenger Left Foot Aft X
Passenger Left Foot Aft Z
Passenger Left Foot Fore Z
Passenger Right Foot Aft X
Passenger Right Foot Aft Z
Passenger Right Foot Fore Z
Passenger Lap Belt Force
Passenger Shoulder Belt Force
Passenger Shoulder Belt Pullout
Passenger Shoulder Belt Elongation
Vehicle Left Rear X
Vehicle Left Rear X Velocity

LIST OF DATA PLOTS...(CONTINUED)

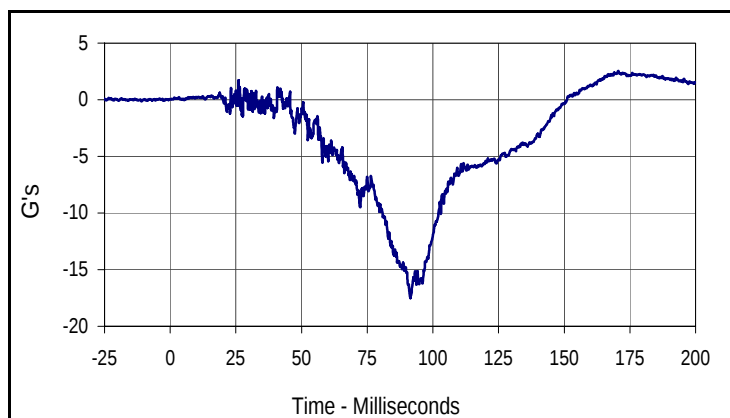
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Vehicle Right Rear X
Vehicle Right Rear X Velocity
Vehicle Right Rear X Displacement
Vehicle Engine Top
Vehicle Engine Top Velocity
Vehicle Engine Top Displacement
Vehicle Engine Bottom
Vehicle Engine Bottom Velocity
Vehicle Engine Bottom Displacement
Vehicle Left Brake Caliper
Vehicle Left Brake Caliper Velocity
Vehicle Left Brake Caliper Displacement
Vehicle Right Brake Caliper
Vehicle Right Brake Caliper Velocity
Vehicle Right Brake Caliper Displacement
Vehicle Instrument Panel
Vehicle Instrument Panel Velocity
Vehicle Instrument Panel Displacement
Vehicle Left Rear Z
Vehicle Left Rear Z Velocity
Vehicle Left Rear Z Displacement
Vehicle Right Rear Z
Vehicle Right Rear Z Velocity
Vehicle Right Rear Z Displacement

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

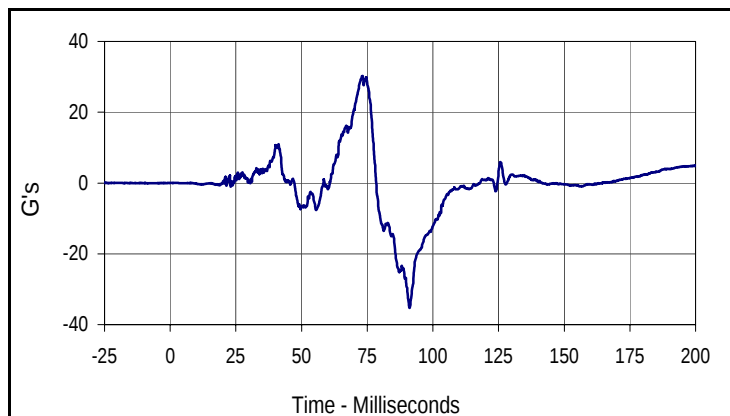
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 NHTSA No.: M90501



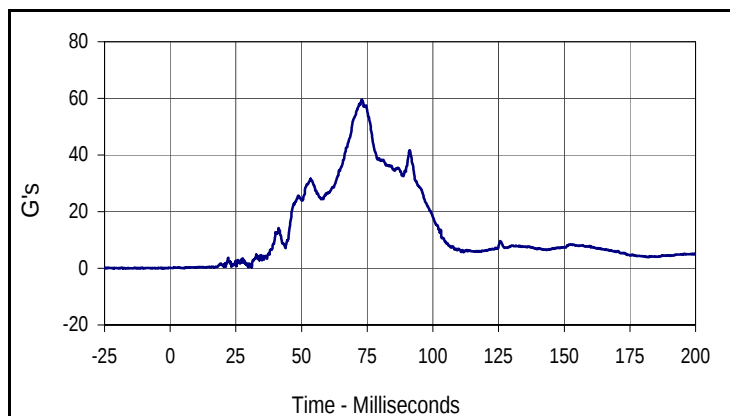
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Driver Head Primary X			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
3.7	22.1	-50.8	72.9



Curve Description			
Driver Head Primary Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.5	170.6	-17.5	91.4



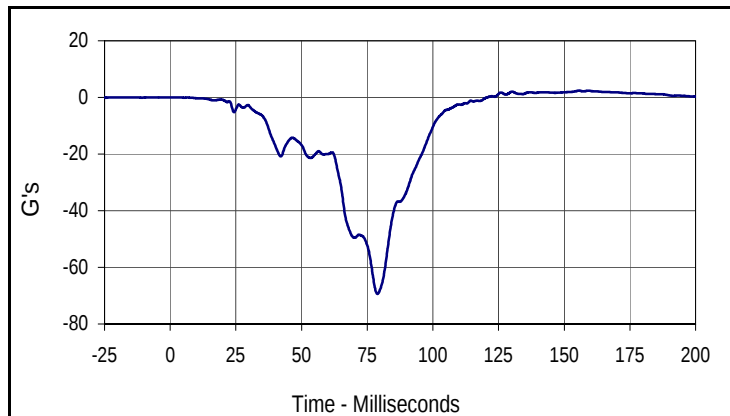
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Max	Time	Min	Time
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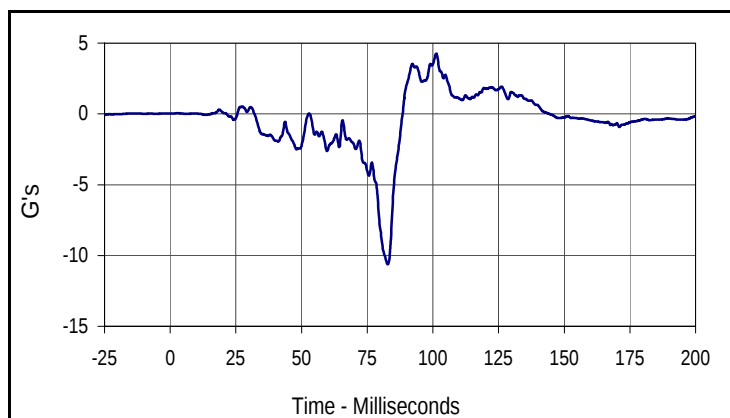
Curve Description			
Driver Head Resultant Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
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Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

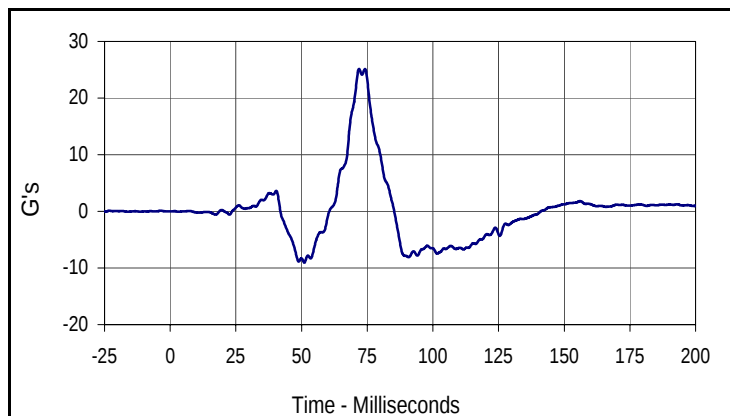
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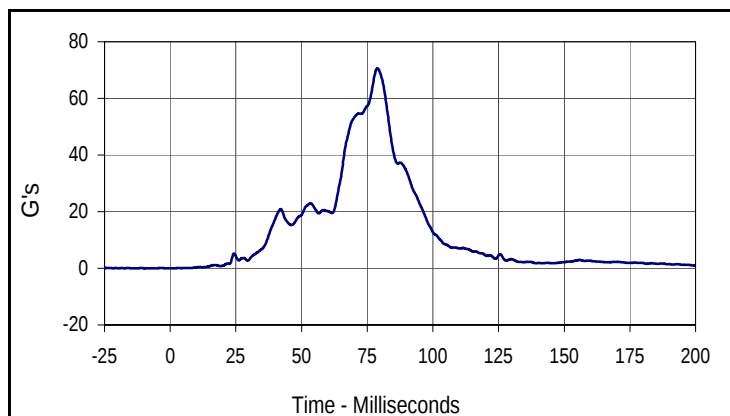
Curve Description			
Driver Chest Primary X			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
2.4	159.3	-69.3	78.9



Curve Description			
Driver Chest Primary Y			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
4.2	101.3	-10.6	82.8



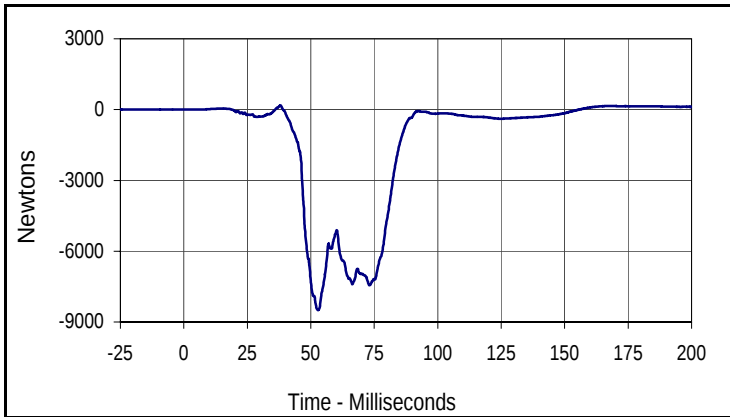
Curve Description			
Driver Chest Primary Z			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
25.2	71.9	-9.0	51.1



Curve Description			
Driver Chest Resultant Primary			
CURNO	Type	SAE Class	Units
004	RES	180	G's
Max	Time	Min	Time
70.6	78.9	0.0	1.0

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08
 NHTSA No.: M90501



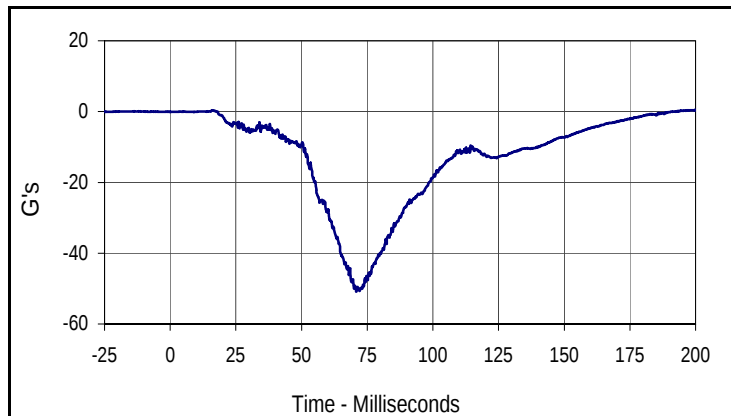
Curve Description			
Driver Left Femur Force Z			
CURNO	Type	SAE Class	Units
007	FIL	600	Newtons
Max	Time	Min	Time
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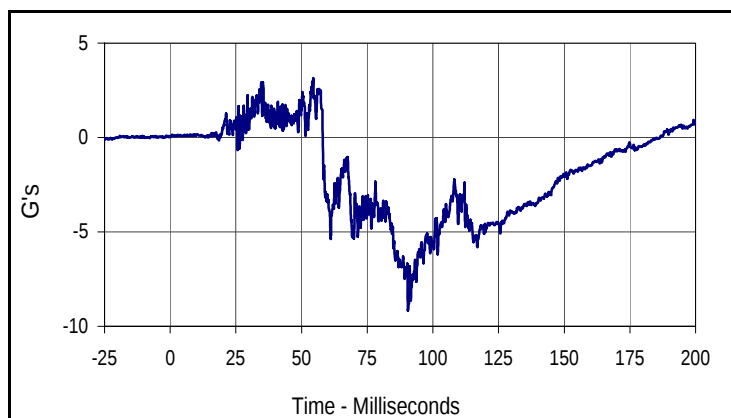
Curve Description			
Driver Right Femur Force Z			
CURNO	Type	SAE Class	Units
008	FIL	600	Newtons
Max	Time	Min	Time
306.3	33.9	-9556.3	69.1

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

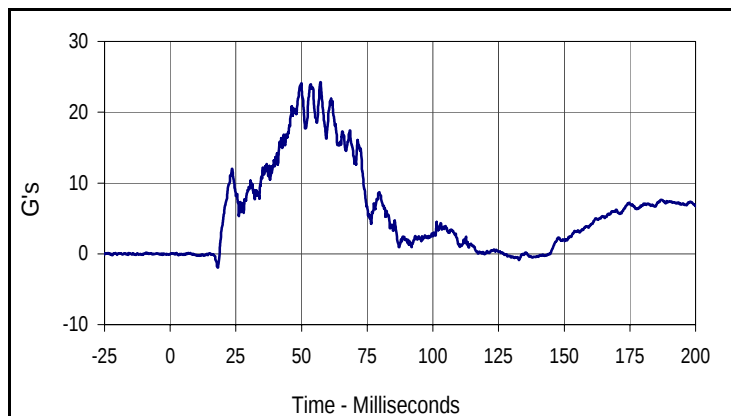
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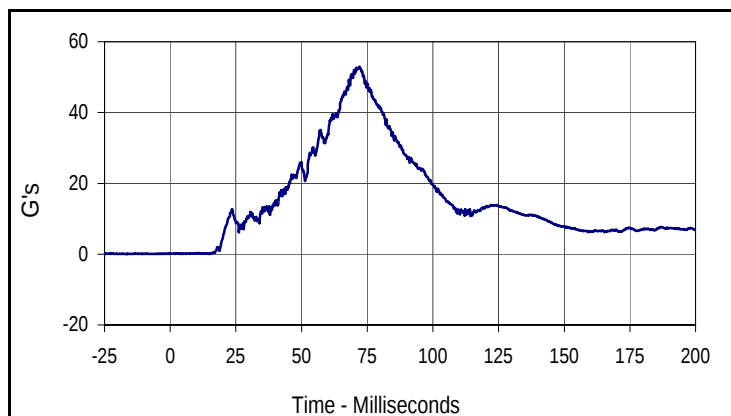
Curve Description			
Passenger Head Primary X			
CURNO	Type	SAE Class	Units
009	FIL	1000	G's
Max	Time	Min	Time
0.4	199.9	-50.9	70.9



Curve Description			
Passenger Head Primary Y			
CURNO	Type	SAE Class	Units
010	FIL	1000	G's
Max	Time	Min	Time
3.2	54.4	-9.2	90.5



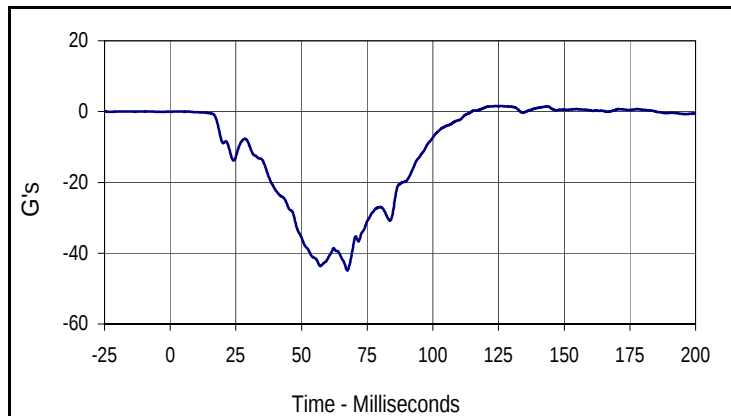
Curve Description			
Passenger Head Primary Z			
CURNO	Type	SAE Class	Units
011	FIL	1000	G's
Max	Time	Min	Time
24.2	57.2	-1.9	18.1



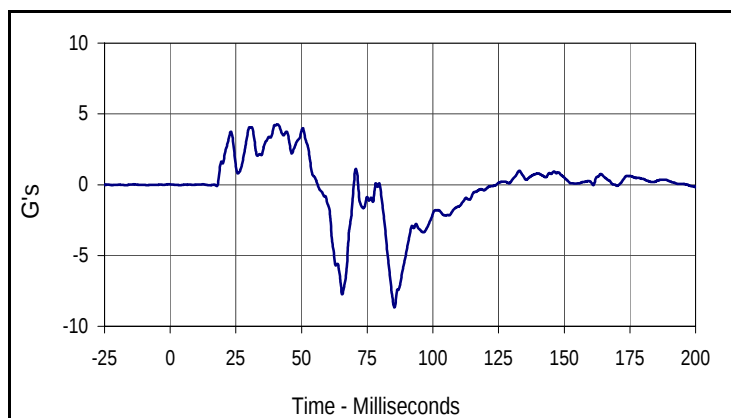
Curve Description			
Passenger Head Resultant Primary			
CURNO	Type	SAE Class	Units
009	RES	1000	G's
Max	Time	Min	Time
53.0	72.1	0.1	14.5

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

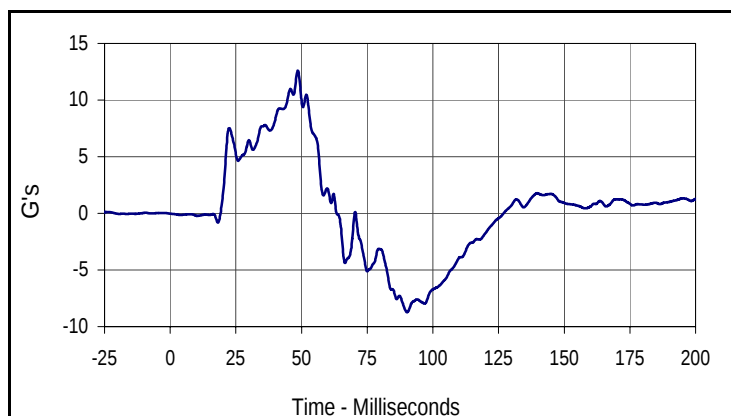
Test Date: 5/6/08
 NHTSA No.: M90501



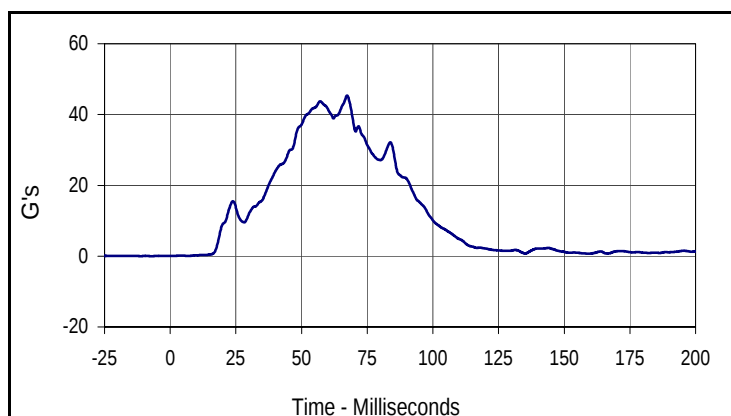
Curve Description			
Passenger Chest Primary X			
CURNO	Type	SAE Class	Units
012	FIL	180	G's
Max	Time	Min	Time
1.6	123.9	-44.9	67.4



Curve Description			
Passenger Chest Primary Y			
CURNO	Type	SAE Class	Units
013	FIL	180	G's
Max	Time	Min	Time
4.3	40.8	-8.7	85.4



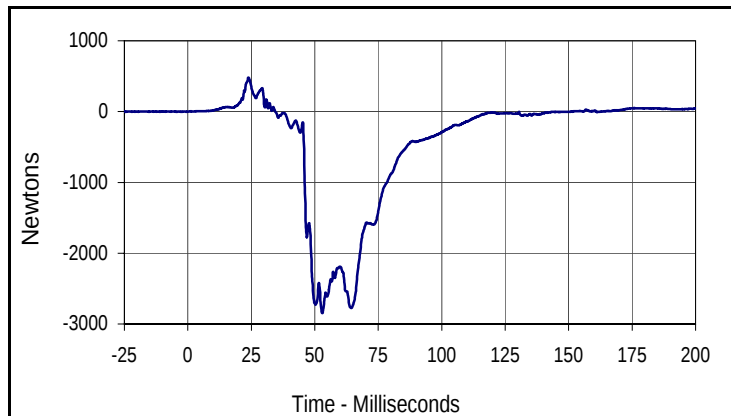
Curve Description			
Passenger Chest Primary Z			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
12.6	48.6	-8.7	90.2



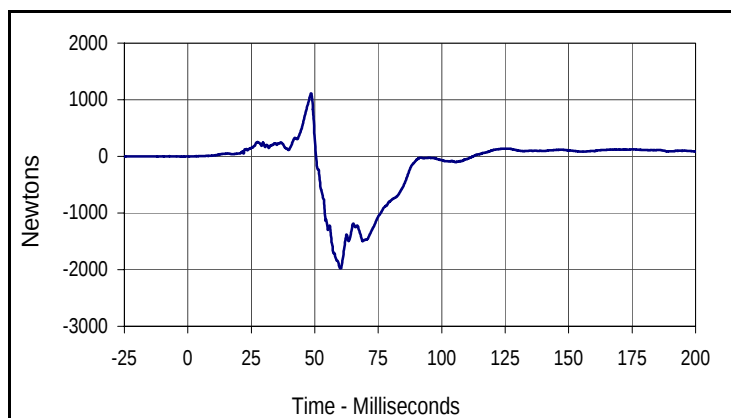
Curve Description			
Passenger Chest Resultant Primary			
CURNO	Type	SAE Class	Units
012	RES	180	G's
Max	Time	Min	Time
45.4	67.3	0.0	0.0

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

Test Date: 5/6/08
 NHTSA No.: M90501



Curve Description			
Passenger Left Femur Force Z			
CURNO	Type	SAE Class	Units
015	FIL	600	Newtons
Max	Time	Min	Time
482.1	23.9	-2846.6	52.9



Curve Description			
Passenger Right Femur Force Z			
CURNO	Type	SAE Class	Units
016	FIL	600	Newtons
Max	Time	Min	Time
1111.3	48.5	-1979.5	60.1

APPENDIX C
DUMMY CALIBRATION DATA

Test Program: Hybrid III 50th Percentile Male Head Drop Test

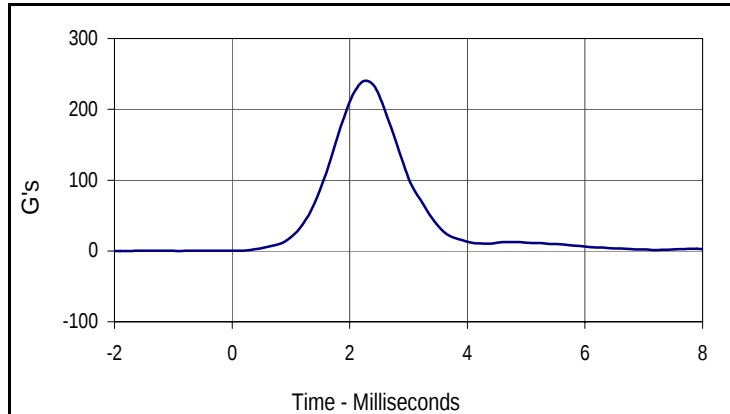
Test Date: 4/1/08

ATD Serial No.: 034

Test I.D.: HD04C



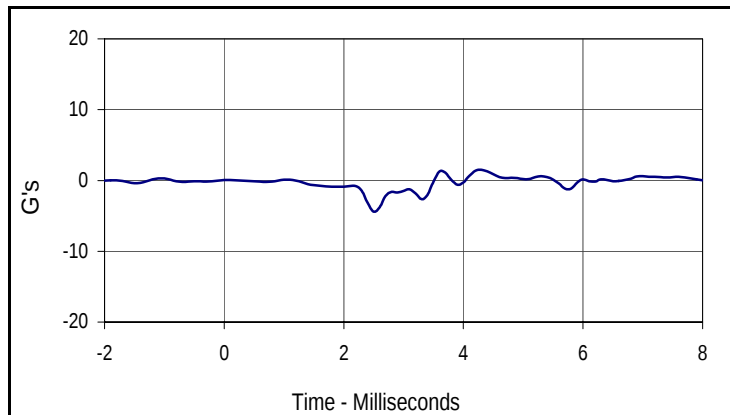
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	240.1	Pass
Peak Lateral Acceleration	G's	≤15.0	4.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



Curve Description

Head Resultant

CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
240.1	2.3	0.1	-1.9



Curve Description

Head Y

CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
1.5	4.3	-4.4	2.5

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

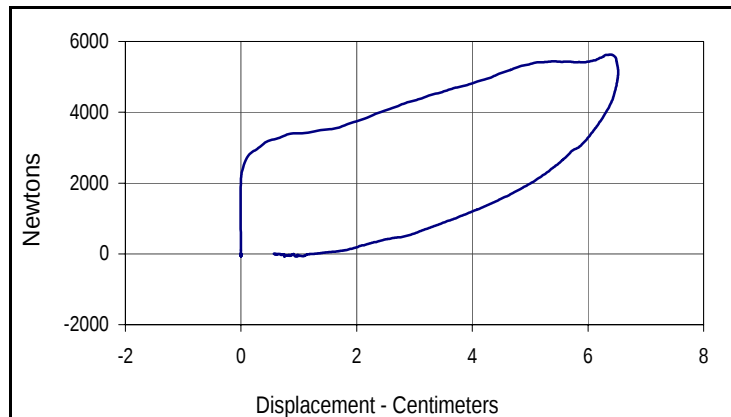
Test Date: 4/2/08

ATD Serial No.: 034

Test I.D.: CH04C



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.63	Pass
Peak Probe Force	Newtons	5159 to 5893	5628	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.52	Pass
Internal Hysteresis	%	69 to 85	73.7	Pass
Overall Test Results				Pass



Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysteresis
001	FIL	180	73.7
Peak Probe Force		Peak Chest Deflection	
5628		6.52	

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

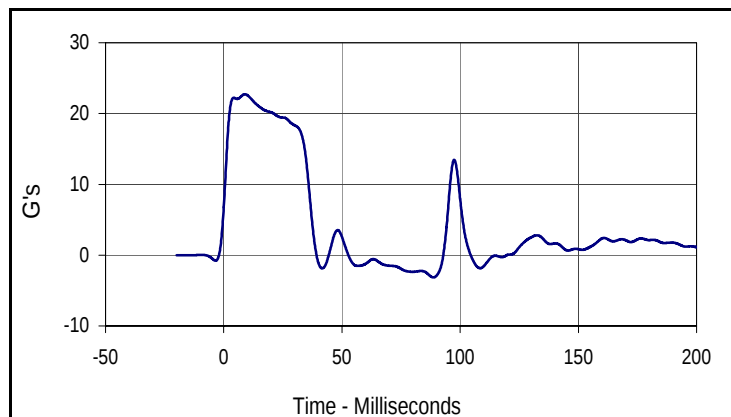
Test Date: 4/5/08

ATD Serial No.: 034

Test I.D.: NF04C



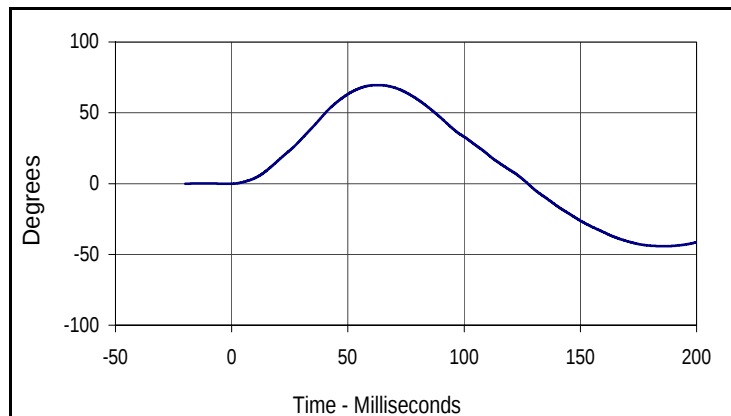
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	22.6	Pass
	20 Msec.	G's	17.6 to 22.6	20.2	Pass
	30 Msec.	G's	12.5 to 18.5	18.3	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	18.3	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	37.3	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	69.6	Pass
	Time	Msec.	57.0 to 64.0	62.7	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	127.4	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	86.2	Pass
	Time	Msec.	47.0 to 58.0	56.7	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	97.3	Pass
Overall Test Results					Pass



Curve Description

Pendulum Deceleration

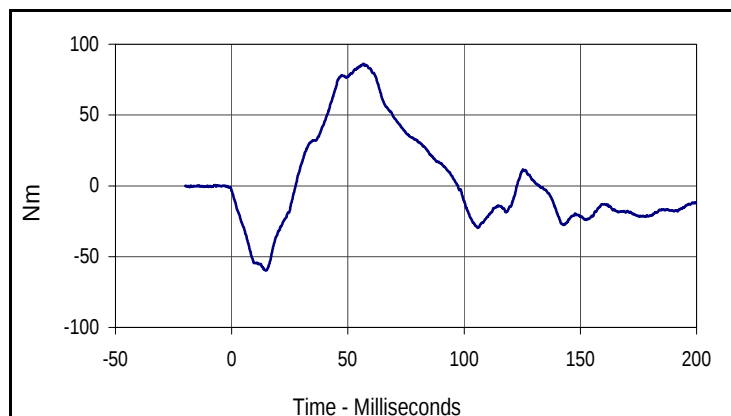
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
22.7	8.9	-3.1	88.7



Curve Description

"D" Plane Rotation

CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
69.6	62.7	-44.2	186.5



Curve Description

Moment About Occipital Condyle

CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
86.2	56.7	-59.7	14.9

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

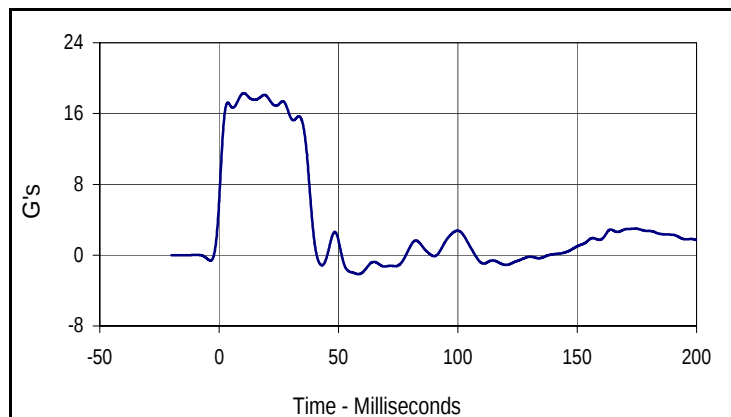
Test Date: 4/5/08

ATD Serial No.: 034

Test I.D.: NE04C



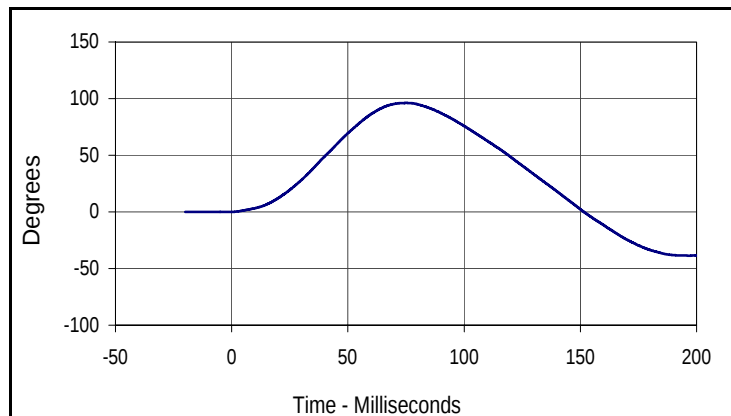
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.16	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.3	Pass
	20 Msec.	G's	14.0 to 19.0	18.0	Pass
	30 Msec.	G's	11.0 to 16.0	15.5	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	15.7	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	38.7	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	96.2	Pass
	Time	Msec.	72.0 to 82.0	75.1	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	151.6	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-77.4	Pass
	Time	Msec.	65.0 to 79.0	66.9	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	138.4	Pass
Overall Test Results					Pass



Curve Description

Pendulum Deceleration

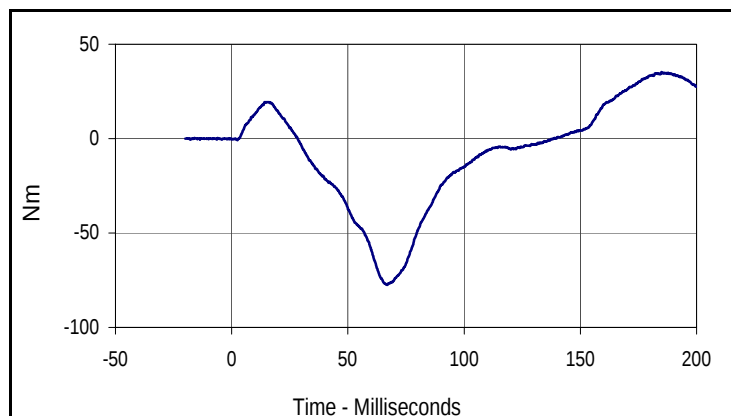
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
18.3	10.3	-2.1	58.4



Curve Description

"D" Plane Rotation

CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
96.2	75.1	-38.6	196.8



Curve Description

Moment About Occipital Condyle

CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
35.2	184.9	-77.4	66.9

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

Test Date: 4/3/08

ATD Serial No.: 034

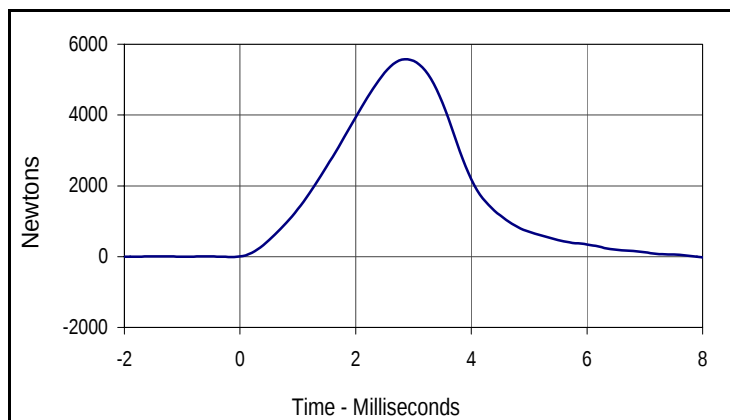
Test I.D.: LK04C , RK04C

**Left Knee**

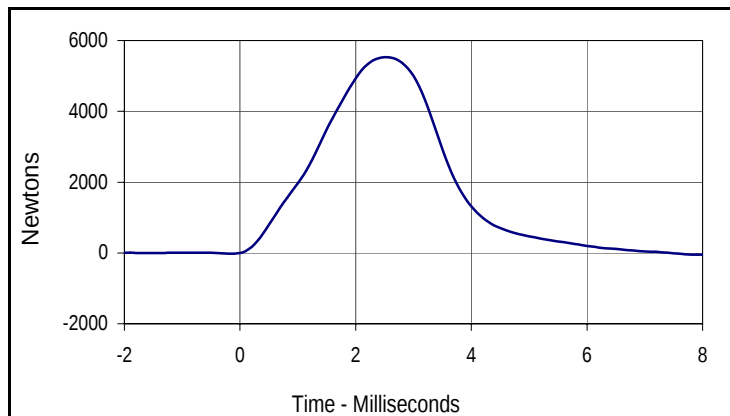
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5577	Pass
Overall Test Results				Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.13	Pass
Peak Probe Force	Newtons	4715 to 5782	5529	Pass
Overall Test Results				Pass

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

CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5576.7	2.9	-104.8	9.2

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

CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
5529.5	2.5	-97.7	8.7

Test Program: Hybrid III 50th Percentile Male External Measurements

Test Date: 4/3/08

ATD Serial No.: 034

Test I.D.: N/A



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	880	Pass
B - Shoulder pivot height	mm	505 to 521	518	Pass
C - "H" point height	mm	84 to 89	86	Pass
D - "H" point from seat back	mm	135 to 140	137	Pass
E - Shoulder pivot from back	mm	84 to 94	92	Pass
F - Thigh clearance	mm	140 to 155	150	Pass
G - Elbow back to wrist pivot	mm	290 to 305	298	Pass
H - Skull cap to back line	mm	41 to 46	45	Pass
I - Shoulder to elbow length	mm	330 to 345	341	Pass
J - Elbow rest height	mm	190 to 211	199	Pass
K - Buttock to knee length	mm	579 to 604	600	Pass
L - Popliteal length	mm	429 to 455	449	Pass
M - Knee pivot height	mm	485 to 500	492	Pass
N - Buttock popliteal length	mm	452 to 477	470	Pass
O - Chest depth	mm	213 to 229	219	Pass
P - Foot length	mm	251 to 267	260	Pass
V - Shoulder breadth	mm	422 to 437	428	Pass
W - Foot breadth	mm	91 to 107	100	Pass
Y - Chest circumference	mm	970 to 1001	991	Pass
Z - Waist circumference	mm	836 to 866	856	Pass
AA - Location for chest circumference	mm	429 to 434	430	Pass
BB - Location for waist circumference	mm	226 to 231	228	Pass
Overall Test Results				Pass

Test Program: Hybrid III 50th Percentile Male Head Drop Test

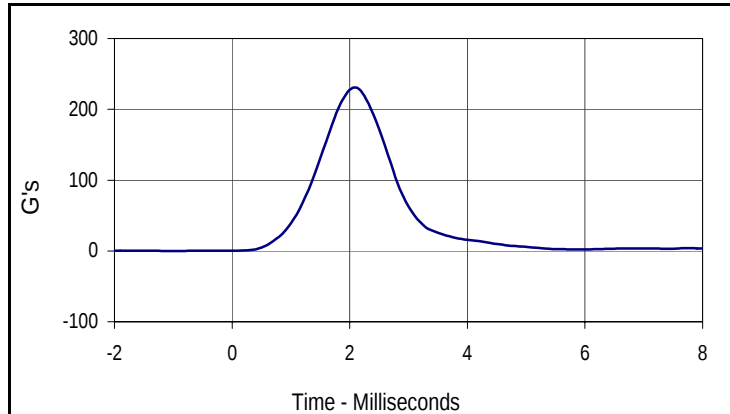
Test Date: 4/3/08

ATD Serial No.: 035

Test I.D.: HD04D



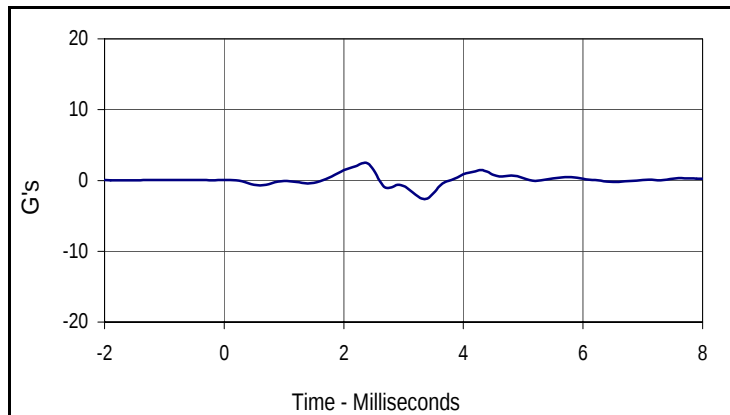
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	230.7	Pass
Peak Lateral Acceleration	G's	≤15.0	2.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass



Curve Description

Head Resultant

CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
230.7	2.1	0.1	-1.0



Curve Description

Head Y

CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
2.4	2.4	-2.6	3.4

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

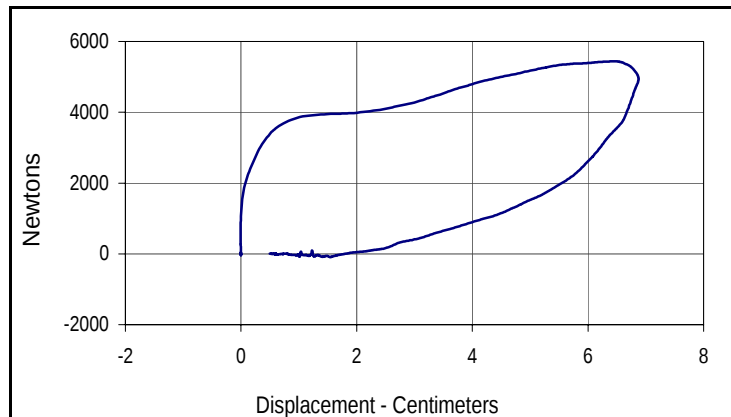
Test Date: 4/4/08

ATD Serial No.: 035

Test I.D.: CH04D



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	Newtons	5159 to 5893	5438	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.87	Pass
Internal Hysteresis	%	69 to 85	76.9	Pass
Overall Test Results			Pass	



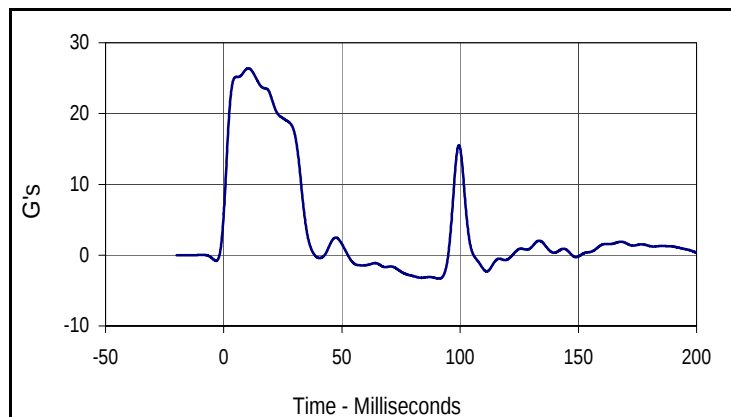
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysteresis
001	FIL	180	76.9
Peak Probe Force		Peak Chest Deflection	
5438		6.87	

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 ATD Serial No.: 035

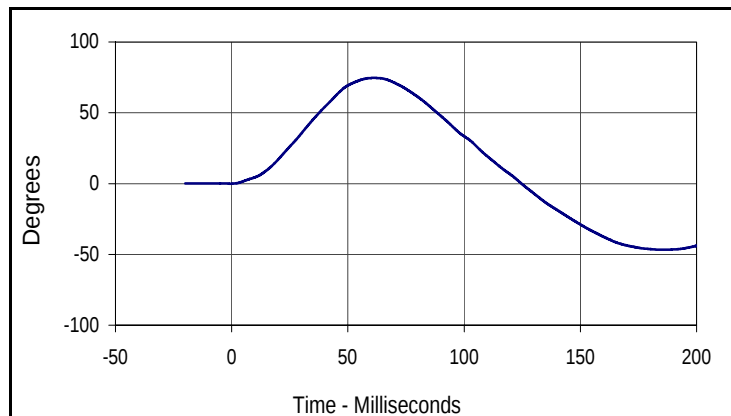
Test Date: 4/5/08
 Test I.D.: NF04D



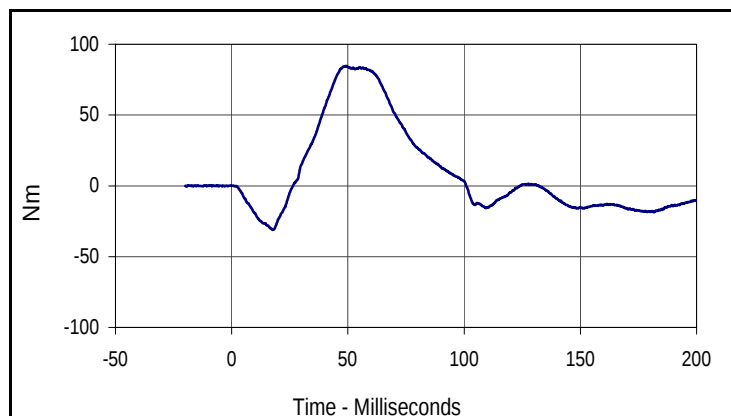
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	26.4	Pass
	20 Msec.	G's	17.6 to 22.6	22.4	Pass
	30 Msec.	G's	12.5 to 18.5	17.2	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.2	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	34.4	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	74.6	Pass
	Time	Msec.	57.0 to 64.0	61.1	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	124.7	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	84.6	Pass
	Time	Msec.	47.0 to 58.0	49.3	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	100.9	Pass
Overall Test Results					Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
26.4	10.4	-3.3	91.1



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
74.6	61.1	-46.8	185.1



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
84.6	49.3	-31.2	17.6

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

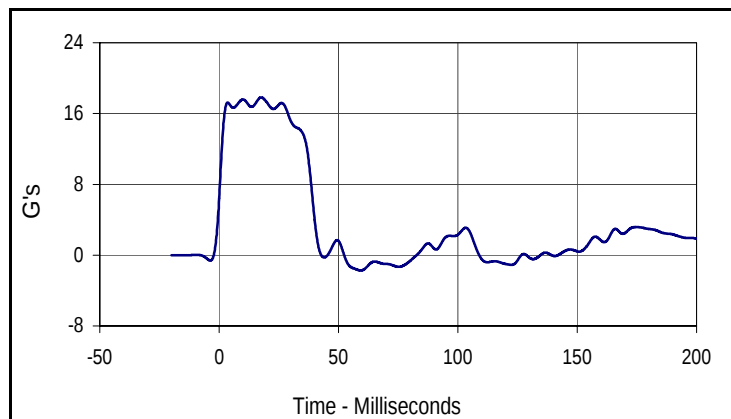
Test Date: 4/5/08

ATD Serial No.: 035

Test I.D.: NE04D



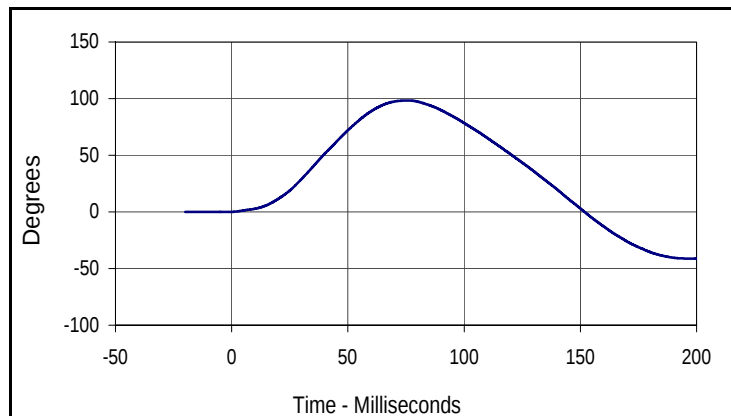
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.16	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.6	Pass
	20 Msec.	G's	14.0 to 19.0	17.3	Pass
	30 Msec.	G's	11.0 to 16.0	15.2	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	15.2	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	39.7	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	98.3	Pass
	Time	Msec.	72.0 to 82.0	75.6	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	151.8	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-76.2	Pass
	Time	Msec.	65.0 to 79.0	67.2	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	141.1	Pass
Overall Test Results					Pass



Curve Description

Pendulum Deceleration

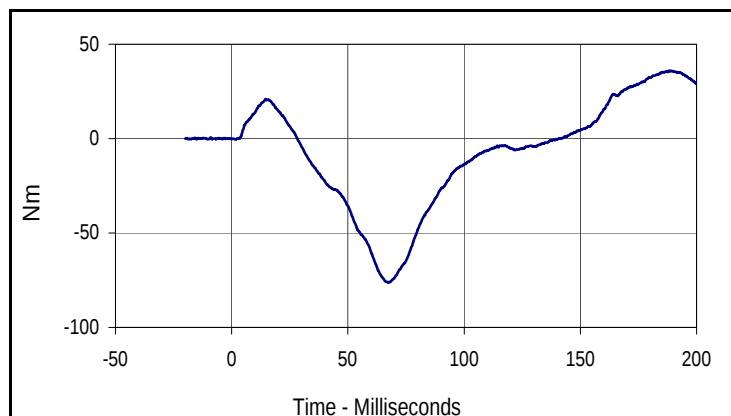
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
17.8	17.5	-1.7	59.2



Curve Description

"D" Plane Rotation

CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
98.3	75.6	-41.1	198.5



Curve Description

Moment About Occipital Condyle

CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
36.0	188.2	-76.2	67.2

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

Test Date: 4/3/08

ATD Serial No.: 035

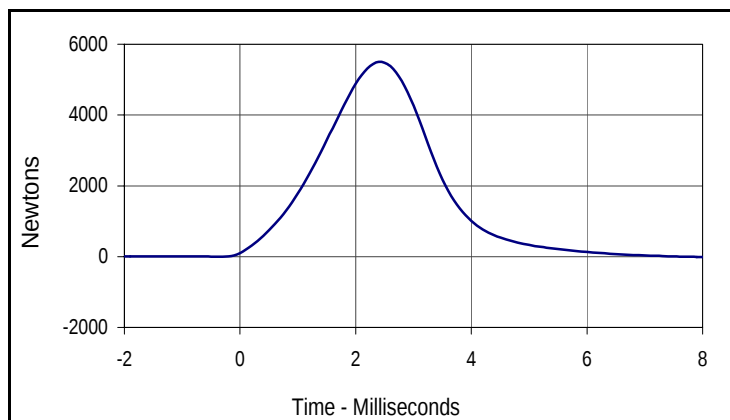
Test I.D.: LK04D , RK04D

**Left Knee**

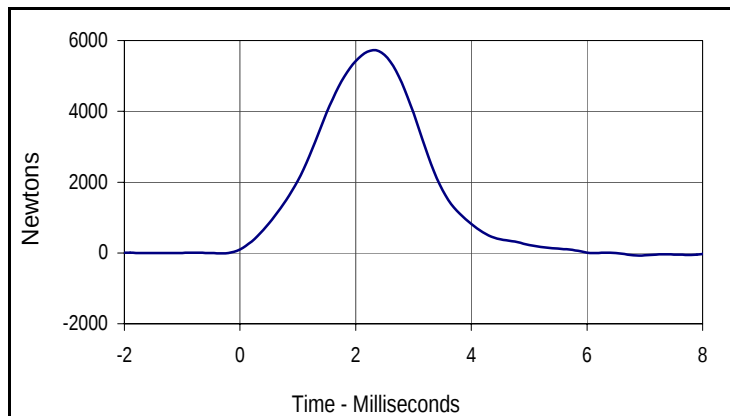
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5499	Pass
Overall Test Results				Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	5724	Pass
Overall Test Results				Pass

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

CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5498.7	2.4	-9.1	8.0

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

CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
5724.4	2.3	-73.3	6.9

Test Program: Hybrid III 50th Percentile Male External Measurements

Test Date: 4/3/08

ATD Serial No.: 035

Test I.D.: N/A



Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	882	Pass
B - Shoulder pivot height	mm	505 to 521	517	Pass
C - "H" point height	mm	84 to 89	87	Pass
D - "H" point from seat back	mm	135 to 140	136	Pass
E - Shoulder pivot from back	mm	84 to 94	91	Pass
F - Thigh clearance	mm	140 to 155	148	Pass
G - Elbow back to wrist pivot	mm	290 to 305	299	Pass
H - Skull cap to back line	mm	41 to 46	44	Pass
I - Shoulder to elbow length	mm	330 to 345	342	Pass
J - Elbow rest height	mm	190 to 211	198	Pass
K - Buttock to knee length	mm	579 to 604	598	Pass
L - Popliteal length	mm	429 to 455	446	Pass
M - Knee pivot height	mm	485 to 500	490	Pass
N - Buttock popliteal length	mm	452 to 477	472	Pass
O - Chest depth	mm	213 to 229	220	Pass
P - Foot length	mm	251 to 267	261	Pass
V - Shoulder breadth	mm	422 to 437	429	Pass
W - Foot breadth	mm	91 to 107	99	Pass
Y - Chest circumference	mm	970 to 1001	993	Pass
Z - Waist circumference	mm	836 to 866	858	Pass
AA - Location for chest circumference	mm	429 to 434	429	Pass
BB - Location for waist circumference	mm	226 to 231	229	Pass
Overall Test Results				Pass

Test Program: Dummy Damage Checklist
 ATD Serial No.: 034

Test Date: 4/1/08
 Test I.D.: N/A



GENERAL	DAMAGED	OK
Outer skin on entire dummy		X
Head ballast secure		X
Gashes, rips, general appearance, etc.		X
Neck-Broken or cracks in rubber		X
Check that upper neck bracket is firmly attached to lwr neck bracket		X
Three rubber bumpers in place		X
Spine- Broken or cracks in rubber		X
Check for looseness at the condyle joint		X
Nodding blocks- cracked or out of position		X
Ribs- Check all ribs and rib supports for damage (bent or broken)		X
Check damping material or separation or cracks		X
OTHER		
CHEST DISPLACEMENT ASSEMBLY		
Bent shaft		X
Slider arm riding correctly, in track		X
TRANSDUCER LEADS		
Torn cables		X
ACCELEROMETER MOUNTINGS		
Check for secure mounting		X
KNEES		
Check outer skin, insert and casting (without removing insert)		X
Knee sliders - Wires intact		X
Knee sliders- Rubber returned to "at rest position"		X
LIMBS		
Check for normal movement and adjustment		X
PELVIS		
Inspect for breakage, especially at iliac crest		X

Comments on repair or replacement parts:

Test Program: Dummy Damage Checklist
 ATD Serial No.: 035

Test Date: 4/1/08
 Test I.D.: N/A



GENERAL	DAMAGED	OK
Outer skin on entire dummy		X
Head ballast secure		X
Gashes, rips, general appearance, etc.		X
Neck-Broken or cracks in rubber		X
Check that upper neck bracket is firmly attached to lwr neck bracket		X
Three rubber bumpers in place		X
Spine- Broken or cracks in rubber		X
Check for looseness at the condyle joint		X
Nodding blocks- cracked or out of position		X
Ribs- Check all ribs and rib supports for damage (bent or broken)		X
Check damping material or separation or cracks		X
OTHER		
CHEST DISPLACEMENT ASSEMBLY		
Bent shaft		X
Slider arm riding correctly, in track		X
TRANSDUCER LEADS		
Torn cables		X
ACCELEROMETER MOUNTINGS		
Check for secure mounting		X
KNEES		
Check outer skin, insert and casting (without removing insert)		X
Knee sliders - Wires intact		X
Knee sliders- Rubber returned to "at rest position"		X
LIMBS		
Check for normal movement and adjustment		X
PELVIS		
Inspect for breakage, especially at iliac crest		X

Comments on repair or replacement parts:
