

REPORT NUMBER TR-P28001-18-NC

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

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

NHTSA NUMBER: M90500

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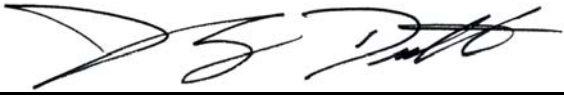
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FINAL REPORT

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16. Abstract A 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 April 8, 2008. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and footwell intrusion performance. The impact velocity was 56.08 km/h. The ambient temperature at the barrier at the time of the crash was 16.7 degrees Celsius. The vehicle's maximum post static crush was 375 mm at 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:					
Measurement Description		Units	Threshold	Driver ATD	Passenger ATD
Head Injury Criteria (HIC)		N/A	1000	247.4	347.3
Max. Chest Accel. (3 msec. Chest Clip)		G's	60	41.2	45.9
Left Femur Force		Newtons	10008	-4662.5	-3795.7
Right Femur Force		Newtons	10008	-3665.6	-2167.2
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SECTION 1
PURPOSE AND SUMMARY OF TEST M90500

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 56.08 km/h. The test was performed at KARCO Engineering, LLC on April 8, 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.035) and the right-front passenger (position 2) ATD (Serial No. 034) 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 375 mm at 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	247.4	41.2	-29.3	-4662.5	-3665.6
Passenger	347.3	45.9	-25.6	-3795.7	-2167.2

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.: M90500
Test Program: NHTSA 35mph NCAP Test Date: 4/8/08

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.: M90500
Test Date: 4/8/08

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/h	56.08
Test Weight	kg	1718
Impact Angle	degrees	0
Average Rebound	mm	895
Maximum Static Crush	mm	375

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.035	50% Male Hybrid III No. 034
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.: M90500Test Program: NHTSA 35mph NCAPTest Date: 4/8/08**TEST VEHICLE INFORMATION AND OPTIONS**

NHTSA No.	M90500
Make	Hyundai
Model	Sonata
Body Style	4-Door Sedan
VIN No.	5NPET46C19H408058
Color	Slate Blue
Delivery Date	04/02/08
Odometer (Miles)	20.0
Dealer	Victorville Hyundai
Transmission	5-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	Yes
Driver Curtain Airbag	Yes
Pass. Front Airbag	Yes
Pass. Side Torso Airbag	Yes
Pass. Head Airbag	Yes
Pass. Curtain Airbag	Yes
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	Bench	
Number of Occupants	2	3	0	5
Capacity Weight (VCW) (kg)				390
Cargo Weight (RCLW) (kg)				50

DATA SHEET NO. 2...(CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

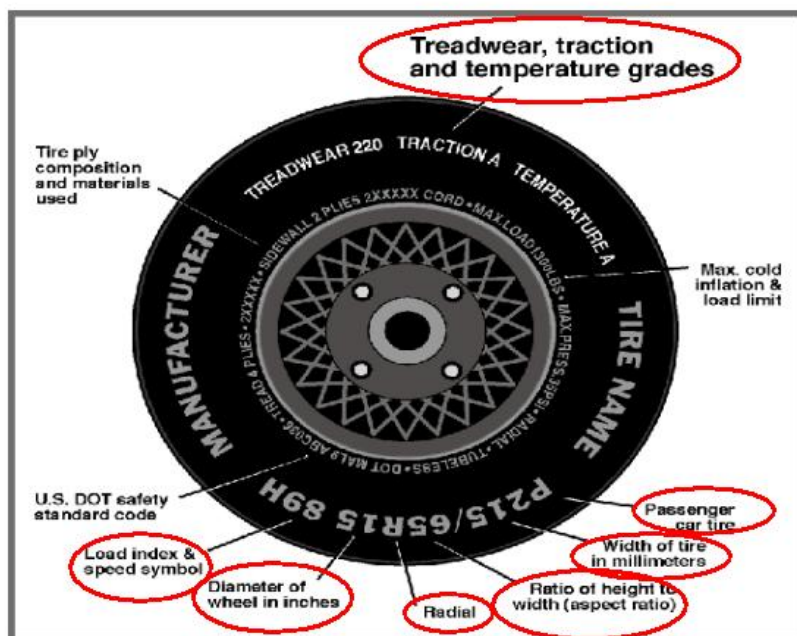
Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

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	M3B9 UJXX 4807
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.: M90500
 Test Program: NHTSA 35mph NCAP Test Date: 4/8/08

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	475	306	781	499	386	885
Right	kg	449	292	741	474	359	833
Ratio	%	60.7	39.3	100.0	56.6	43.4	100.0
Totals	kg	924	598	1522	973	745	1718

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1522
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Weight (RCLW)	kg	50
Calculated Target Vehicle Test Weight (TVTW)	kg	1724

TEST VEHICLE ATTITUDE AND CG

	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	710	715	714	714	1070
As Tested	mm	700	704	675	679	1182

Vehicle Wheel Base (mm) 2723
 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) 62.31
 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

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

SPEED TRAP DATA

Measured Paramater	Units	Requirement	Value
Trap No. 1 Velocity	km/h	55.1 to 57.12	56.08
Trap No. 2 Velocity	km/h	55.1 to 57.12	56.05

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4565	4275	290
Center	mm	4785	4410	375
Right Side	mm	4565	4325	240

VEHICLE REBOUND FROM BARRIER

Measured Paramater	Units	Value
Left Side	mm	870
Center	mm	840
Right Side	mm	895
Average	mm	868

DATA SHEET NO. 4

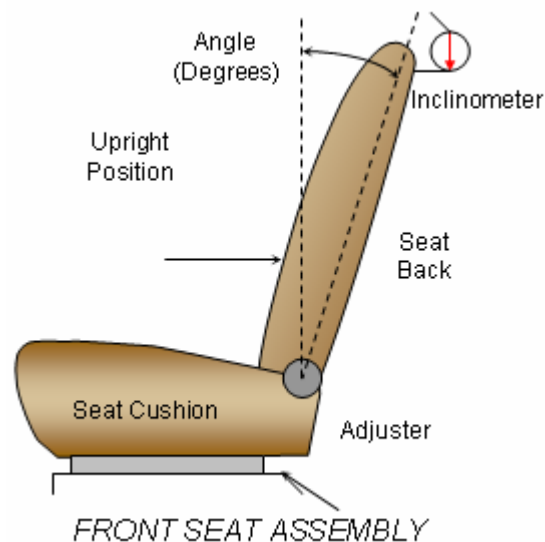
TEST VEHICLE INFORMATION

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

NHTSA No.: M90500
 Test Date: 4/8/08

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

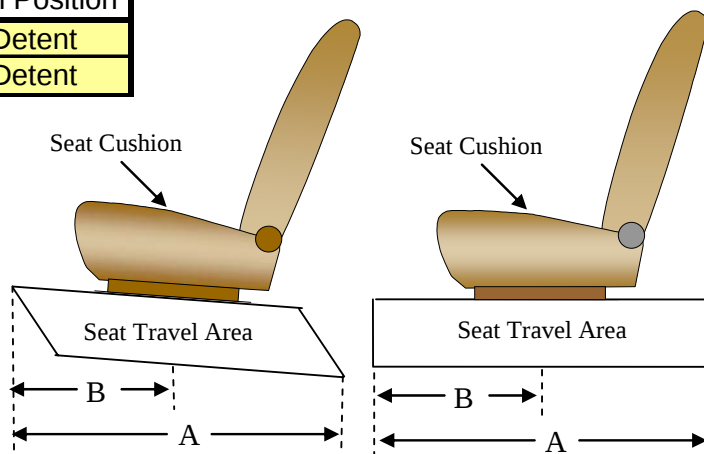
Position	Degrees
Driver w/ Seated Dummy	10.8 @ Headrest
Passenger w/ Seated Dummy	10.8 @ Headrest

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	25 Detents	13th Detent
Passenger Seat	25 Detents	13th Detent



SEAT BELT ANCHORAGE

Position number one (1) is the uppermost position.

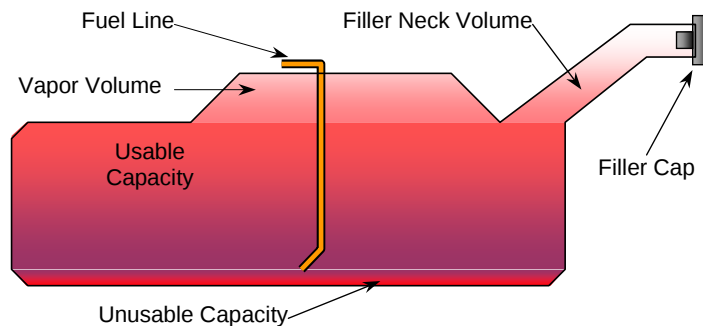
SEAT BELT ANCHORAGE POSITIONING

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

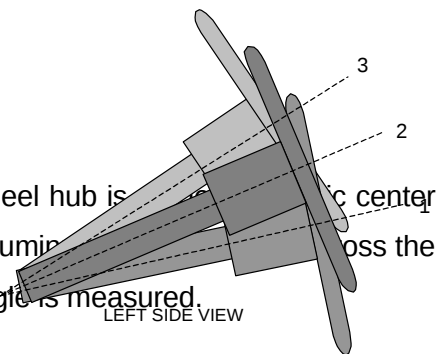
DATA SHEET NO. 4...(CONTINUED)**TEST VEHICLE INFORMATION**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90500Test Program: NHTSA 35mph NCAPTest Date: 4/8/08**FUEL TANK CAPACITY**

	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	62.31

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 attached to 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	17.3	N/A
Geometric Center - Position No. 2	24.5	N/A
Uppermost - Position No. 3	31.6	N/A

DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield angle		25.4		
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)	205	90.0	200	90.0
HH	Head to header	322		341	
HW	Head to windshield	620		570	
HR	Head to side header (Y)	278		278	
NR	Nost to rim	391	8.5		
CD	Chest to dash	558		563	
CS	Chest to steering hub	295			
RA	Rim to abdomen	179			
KDL	Left knee to dash	185	0.0	155	
KDR	Right knee to dash	175		190	0.0
PA	Pelvic angle		23.5		21.7
TA	Tibia Angle		42.2		43.2
KK	Knee to knee	283		275	
SK	Striker to outboard knee	642	15.3	655	14.6
ST	Striker to head	405	78.0	410	83.0
SH	Striker to H-Point	332	47.0	322	35.0
SHY	Striker to H-Point (Y)	242		240	
HS	Head to side window	342		332	
HD	H-Point to door	152		112	
AD	Arm to door	43		80	

DATA SHEET NO. 5...(CONTINUED)

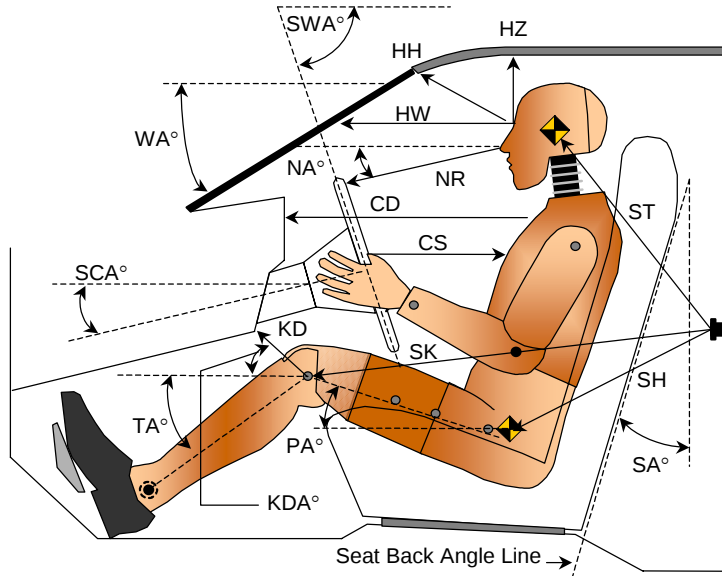
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

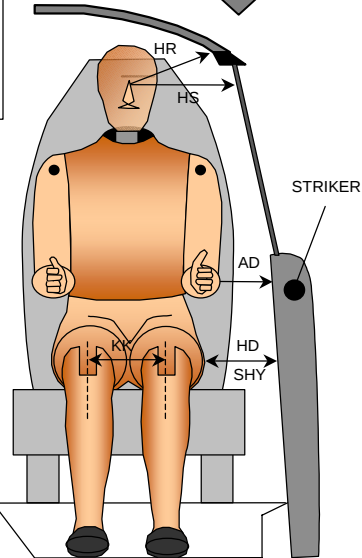
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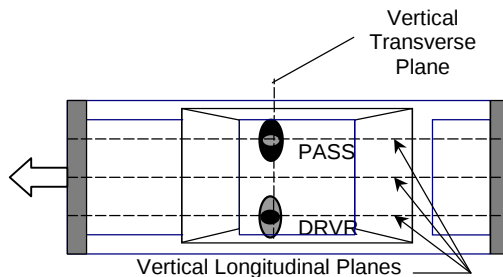
Test Date: 4/8/08



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

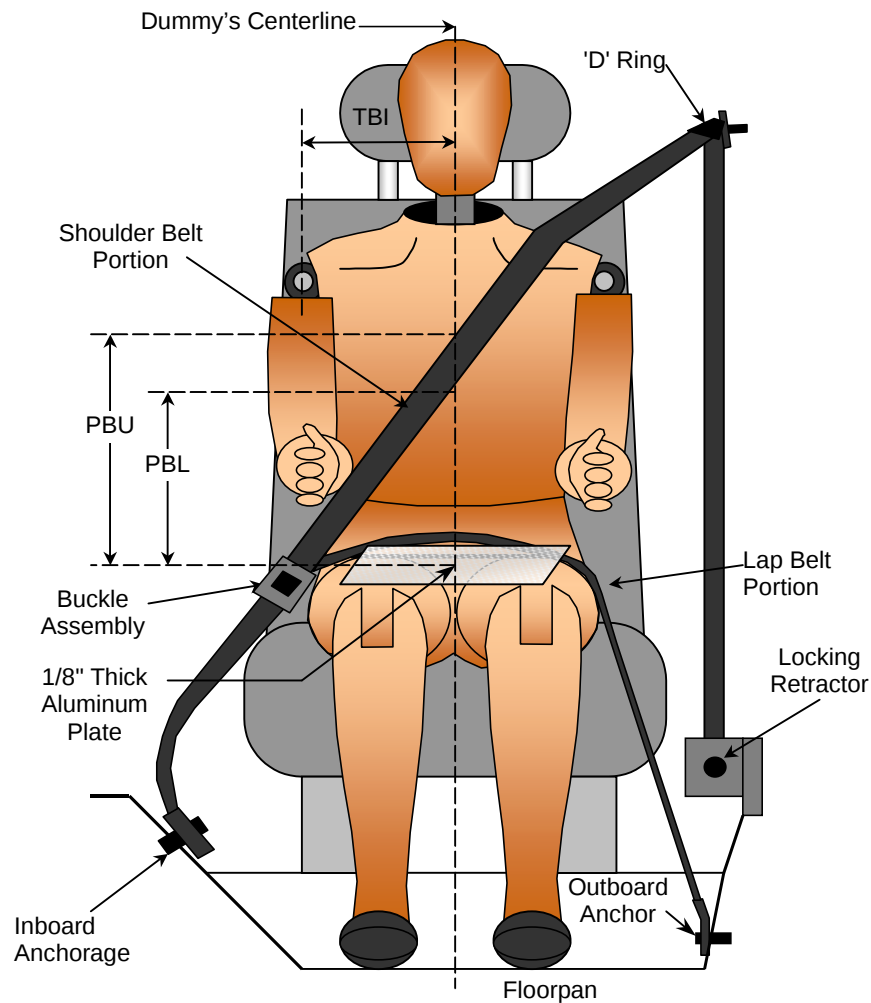
SEAT BELT POSITIONING DATA

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08



SEAT BELT POSITIONING MEASUREMENTS

Measured Parameter	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	220	275
PBU - Top Surface of Reference to Belt Upper Edge	mm	305	350
PBL - Top Surface of Reference to Belt Lower Edge	mm	240	285
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.: M90500Test Program: NHTSA 35mph NCAPTest Date: 4/8/08**VEHICLE ACCELEROMETER PRE-TEST LOCATIONS**

No.	Accelerometer Location	Measurement (mm)		
		X	Y	Z
1	Left Rear X-Member	1955	-685	340
2	Right Rear X-Member	1960	685	340
3	Engine Top	4155	165	790
4	Engine Bottom	4060	385	170
5	Left Brake Caliper	3720	-710	340
6	Right Brake Caliper	3720	710	340
7	Instrument Panel			
8	Left Rear X-Member (Z-Axis)	1955	-685	340
9	Right Rear X-Member (Z-Axis)	1960	685	340

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 Sedan NHTSA No.: M90500
 Test Program: NHTSA 35mph NCAP Test Date: 4/8/08

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
Retractor Reel to D-Ring	mm	800	800
Shoulder Belt Length as Measured on ATD	mm	855	855
Lap Belt Length as Measured on ATD	mm	750	748
Remainder of Belt on Reel	mm	760	760
Total Belt Length for Continuous Webbing Systems	mm	3165	3163

SHOULDER BELT SPOOL-OFF DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	154	160
As determined electronically	mm	185.3	261.6

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

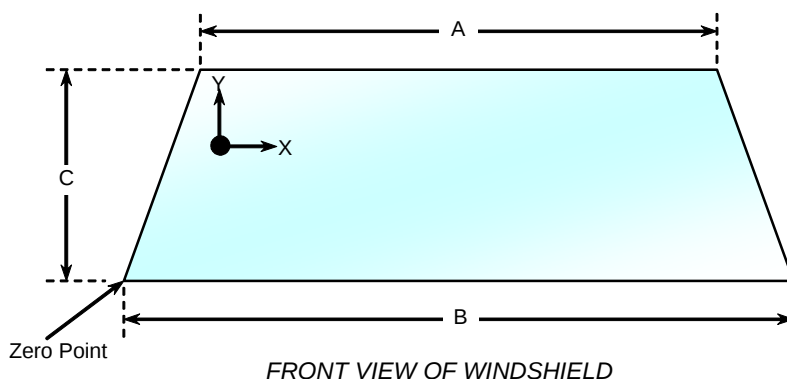
DATA SHEET NO. 9**SUMMARY OF FMVSS 212 DATA**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90500Test Program: NHTSA 35mph NCAPTest Date: 4/8/08

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: 16.7 °C**WINDSHIELD PERIPHERY MEASUREMENTS**

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2193	2193	100.0
Right Side	2193	2193	100.0
Total	4386	4386	100.0

**WINDSHIELD DIMENSIONS**

Item	Units	Segment Length	Molding Width
A	mm	1180	5
B	mm	1505	80
C-Left	mm	850	20
C-Right	mm	850	20

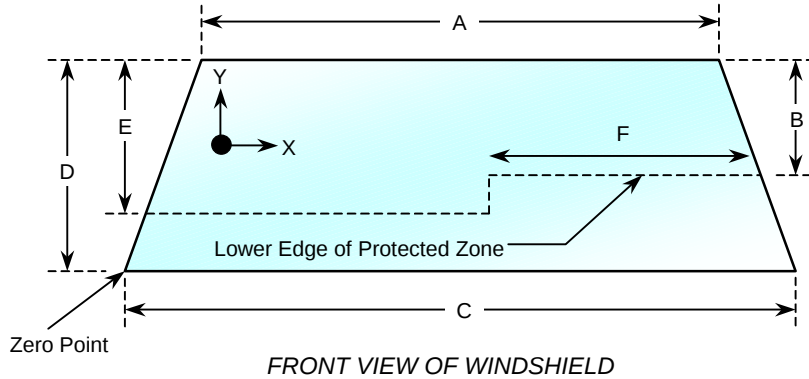
DATA SHEET NO. 10

WINDSHIELD ZONE INTRUSION FMVSS 219 DATA (PARTIAL)

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

NHTSA No.: M90500
 Test Date: 4/8/08

WINDSHIELD AND PROTECTED ZONE



Item	Units	Value
A	mm	1180
B	mm	540
C	mm	1505
D	mm	850
E	mm	550
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.: M90500
Test Program: NHTSA 35mph NCAP Test Date: 4/8/08

Test Time: 11:45 AM Temperature: 16.7 ° 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

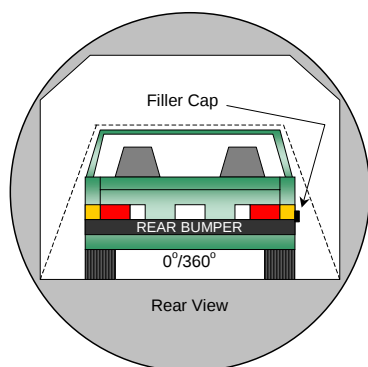
FMVSS 301 STATIC ROLLOVER DATA

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

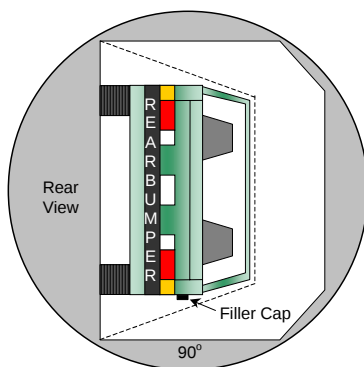
NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

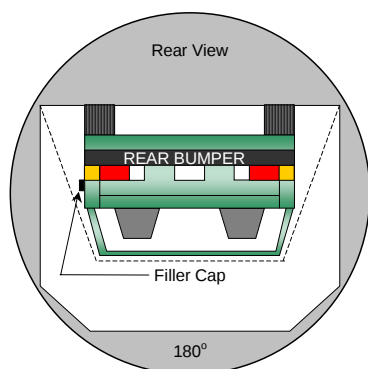
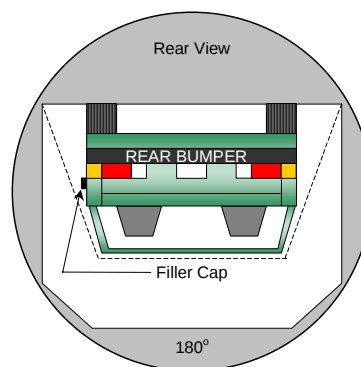
Test Date: 4/8/08



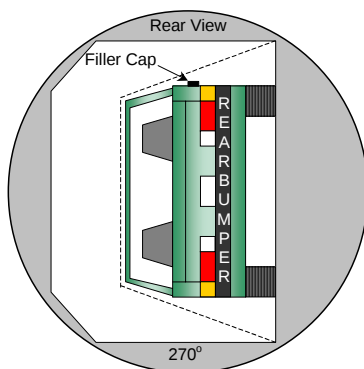
0° to 90°



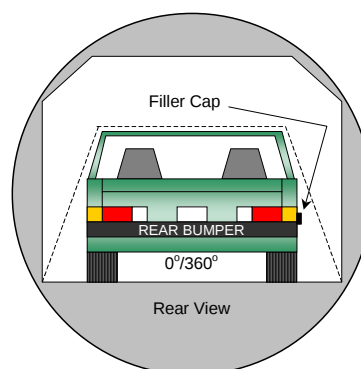
90° to 180°



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.: M90500Test Program: NHTSA 35mph NCAPTest Date: 4/8/08**SOLVENT COLLECTION TIME TABLE IN SECONDS**

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	90	301	391
90° to 180°	85	302	387
180° to 270°	87	302	389
270° to 360°	89	304	393

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.: M90500
Test Date: 4/8/08

VEHICLE MEASUREMENT TABLE

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Length of test vehicle at centerline	mm	4785	4410	-375
2	RSOV to front of engine	mm	4240	4040	-200
3	RSOV to firewall centerline	mm	3705	3690	-15
4	RSOV to upper leading edge of right door	mm	3327	3332	5
5	RSOV to upper leading edge of left door	mm	3320	3326	6
6	RSOV to lower leading edge of right door	mm	3285	3275	-10
7	RSOV to lower leading edge of left door	mm	3280	3274	-6
8	RSOV to upper trailing edge of right door	mm	2238	2247	9
9	RSOV to upper trailing edge of left door	mm	2237	2244	7
10	RSOV to lower trailing edge of right door	mm	2240	2230	-10
11	RSOV to lower trailing edge of left door	mm	2236	2230	-6
12	RSOV to bottom of right A-pillar	mm	3281	3286	5
13	RSOV to bottom of left A-pillar	mm	3276	3286	10
14	RSOV to firewall on right side	mm	3685	3625	-60
15	RSOV to firewall on left side	mm	3685	3642	-43
16	RSOV to steering column hub	mm	2855	2860	5
17	Center of steering column to left A-pillar, Y	mm	425	410	-15
18	Center of steering column to headlining, Z	mm	425	410	-15
19	RSOV to right side of front bumper	mm	4565	4325	-240
20	RSOV to left side of front bumper	mm	4565	4275	-290
21	Length of engine block	mm	490	490	0
RD	RSOV to right side of dash panel	mm	3100	3113	13
CD	RSOV to center of dash panel	mm	3105	3083	-22
LD	RSOV to left side of dash panel	mm	3095	3111	16

DATA SHEET NO. 13...(CONTINUED)

VEHICLE STRUCTURAL MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

VEHICLE STRUCTURAL MEASUREMENT TABLE

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length	mm	4785	4410	-375
2	Total width	mm	1820	1805	-15
3	Front bumper top height	mm	520	643	123
4	Front bumper bottom height	mm	373	485	112
5	Longitudinal member top height	mm	526	500	-26
6	Longitudinal member bottom height	mm	396	404	8
7	Distance between longitudinal members	mm	930	1020	90
8	Longitudinal member width	mm	80	90	10
9	Engine top height	mm	795	840	45
10	Engine bottom height	mm	236	216	-20
11	Engine and gearbox width	mm	500	500	0
12	Front bumper-engine distance	mm	545	380	-165
13	Front shock absorber height	mm	865	854	-11
14	Front hood leading edge height	mm	715	825	110
15	Distance between front shock absorbers	mm	1023	970	-53
16	Front bumper-front axle distance	mm	965	625	-340
17	Front axle to A-pillar distance	mm	485	450	-35
18	A Pillar to B Pillar distance	mm	981	976	-5
19	B Pillar to rear axle distance	mm	1146	1147	1
20	B Pillar to C Pillar distance	mm	926	926	0
21	Roof sill bottom height	mm	1300	1285	-15
22	Roof sill top height	mm	1450	1425	-25
23	Floor sill bottom height	mm	211	186	-25
24	Floor sill top height	mm	345	315	-30

DATA SHEET NO. 13...(CONTINUED)

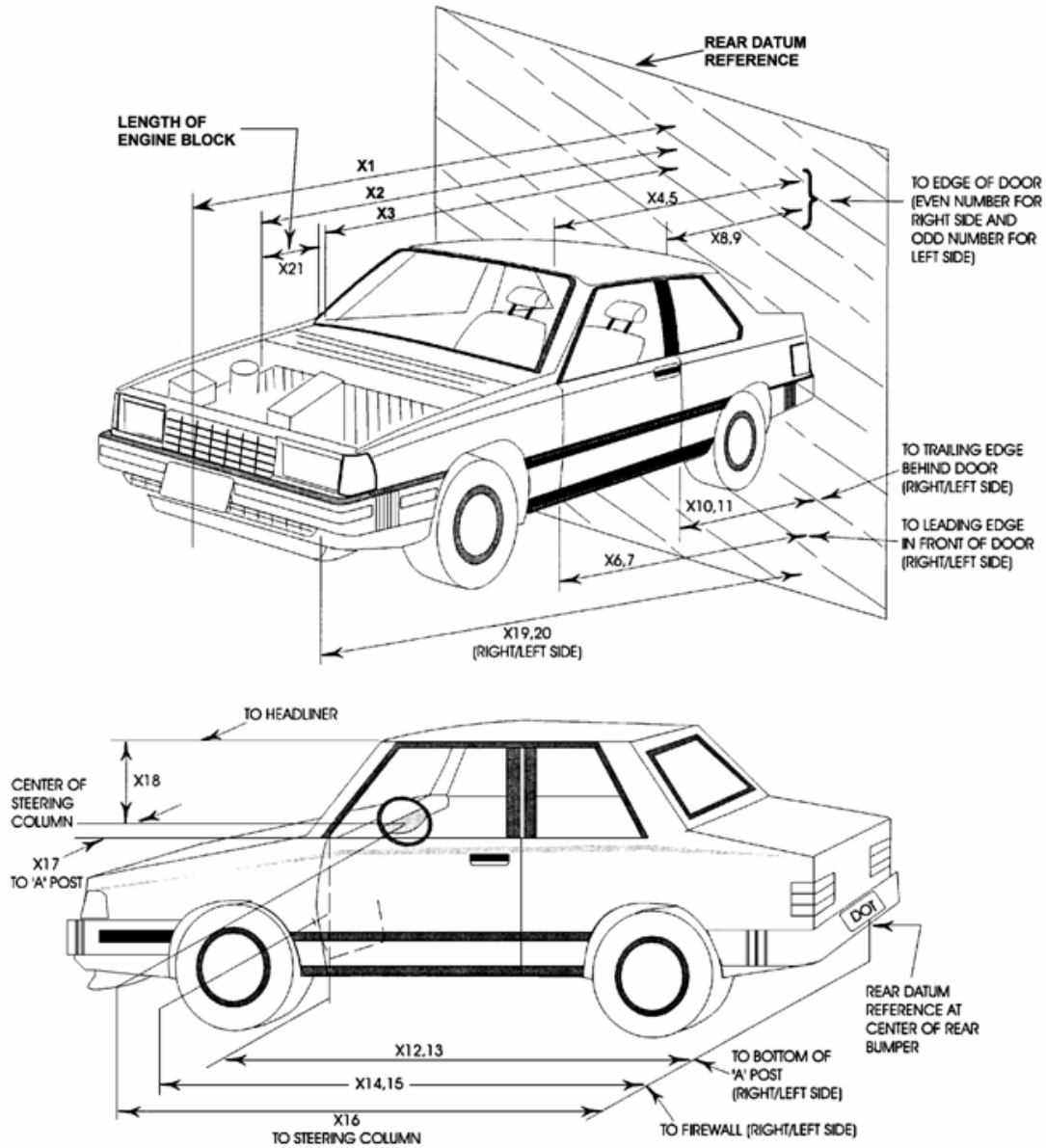
VEHICLE MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08



DATA SHEET NO. 14
CAMERA LOCATIONS

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

NHTSA No.: M90500
Test Date: 4/8/08

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	-2918	234	-1337	-2	779	12	1000
17	Passenger Side Dummy On-Board	-2918	-234	-1337	-2	765	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

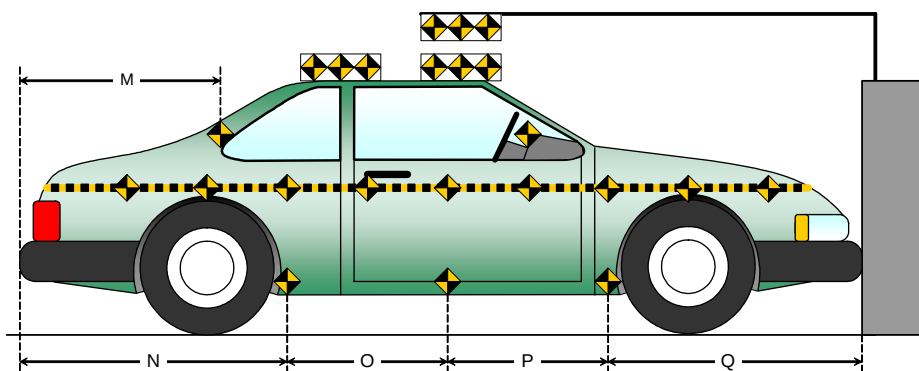
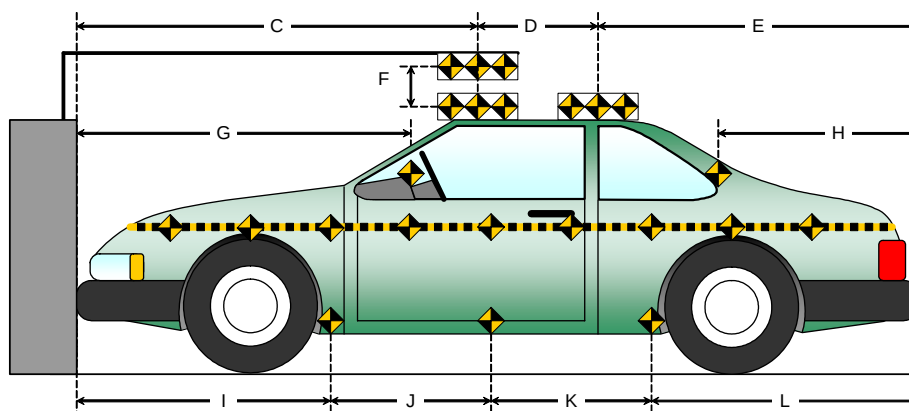
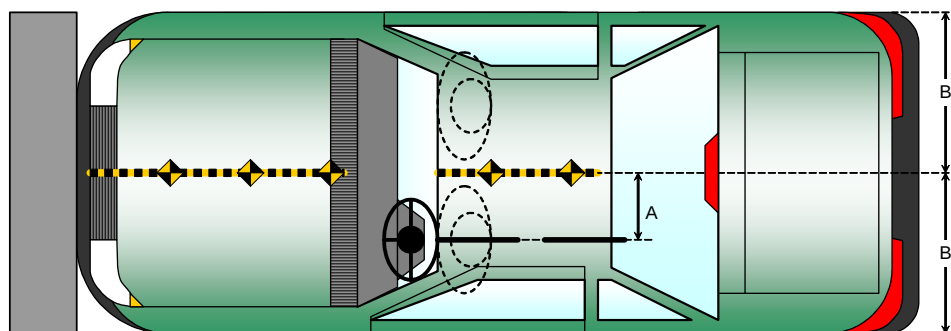
Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

All Dimensions in Millimeters (mm)	
Item	Value
A	393
B	910
C	2290
D	615
E	1965
F	155
G	1920
H	1015
I	1420
J	908
K	908
L	1555
M	1078
N	1550
O	908
P	908
Q	1415

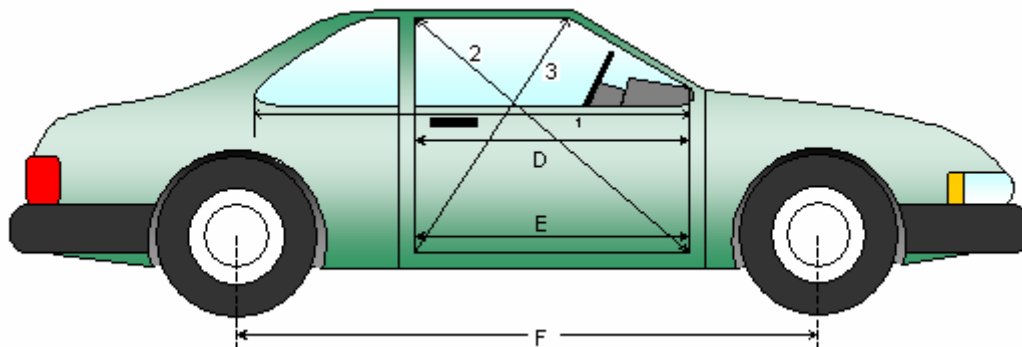
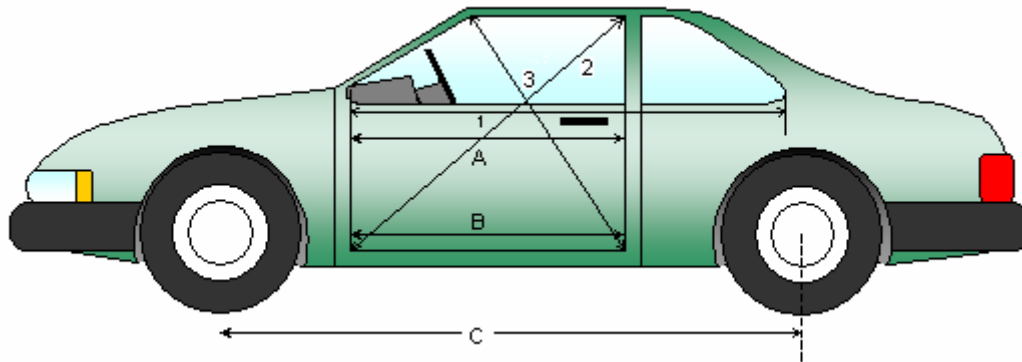


DATA SHEET NO. 16**VEHICLE INTRUSION MEASUREMENTS**Test Vehicle: 2009 Hyundai Sonata 4-Door SedanNHTSA No.: M90500Test Program: NHTSA 35mph NCAPTest Date: 4/8/08**DOOR OPENING WIDTH TABLE**

Item	Description	Units	Pre-Test	Post-Test	Difference
1L	Left Side	mm	981	976	5
2L	Left Side (Diagonally)	mm	1456	1456	0
3L	Left Side (Diagonally)	mm	939	950	-11
1R	Right Side	mm	976	976	0
2R	Right Side (Diagonally)	mm	1456	1456	0
3R	Right Side (Diagonally)	mm	941	946	-5

WHEELBASE MEASUREMENT TABLE

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2723	2660	63
F	Right Side Wheelbase	mm	2723	2654	69



DATA SHEET NO. 16...(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

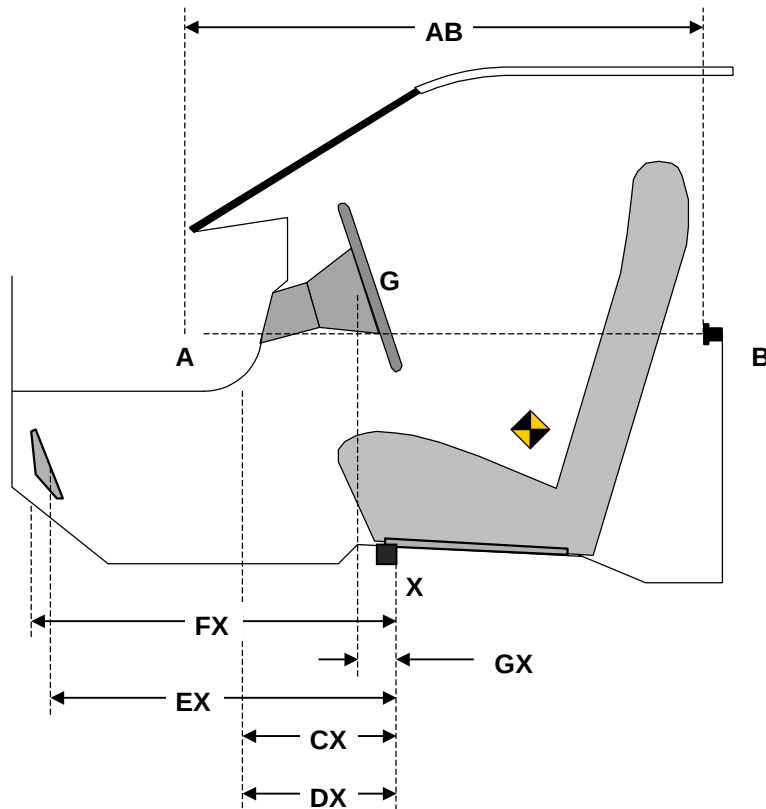
NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

DRIVER COMPARTMENT INTRUSION TABLE

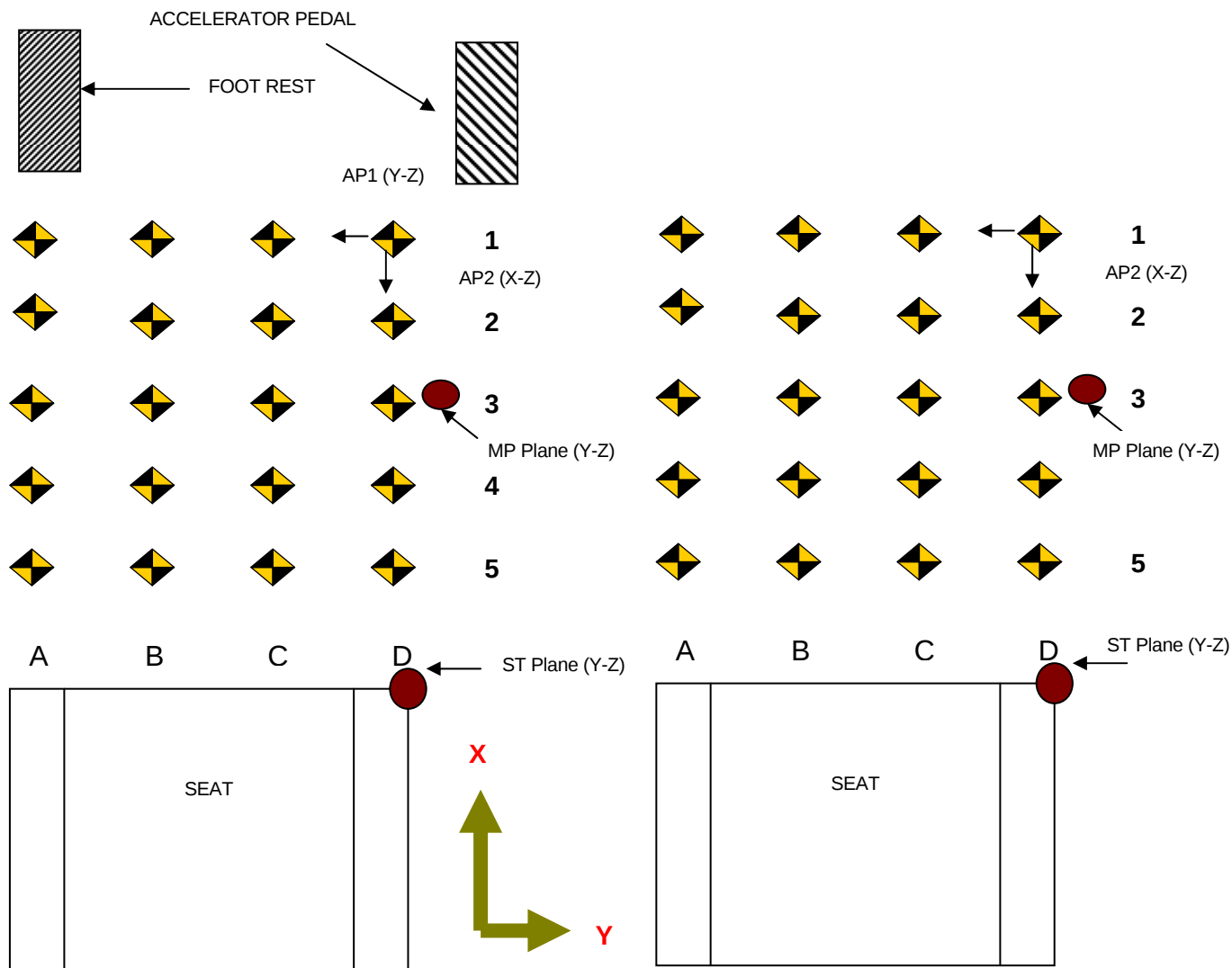
Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Window Jam)	mm	981	976	5
CX	Left Knee Bolster to X	mm	290	260	30
DX	Right Knee Bolster to X	mm	290	235	55
EX	Brake Pedal to X	mm	595	626	-31
FX	Foot Rest to X	mm	580	551	29
GX	Center of Steering Wheel Hub to X	mm	90	50	40



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

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

NHTSA No.: M90500
 Test Date: 4/8/08



- 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.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

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	649	687	675	663	630	663	647	656	19	24	28	7
2	592	615	608	599	581	595	586	591	11	20	22	8
3	532	525	517	511	519	508	506	505	13	17	11	6
4	414	407	399	393	392	389	390	387	22	18	9	6
5	296	292	285	275	274	275	274	274	22	17	11	1

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	64	192	321	462	20	152	281	416	44	40	40	46
2	62	188	313	463	24	153	279	423	38	35	34	40
3	60	182	307	455	27	150	277	420	33	32	30	35
4	50	176	300	441	24	151	276	415	26	25	24	26
5	44	166	288	427	26	148	269	411	18	18	19	16

DRIVER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-61	-2	-5	-4	-57	-8	-29	-24	-4	6	24	20
2	21	54	56	49	27	50	40	38	-6	4	16	11
3	95	93	91	86	96	92	89	81	-1	1	2	5
4	105	94	98	87	91	93	95	80	14	1	3	7
5	116	95	98	89	106	96	95	80	10	-1	3	9

DATA SHEET NO. 16...(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

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	719	712	706	676	693	681	672	644	26	31	34	32
2	639	636	629	533	614	608	598	596	25	28	31	28
3	437	546	543	421	526	520	514	505	28	26	29	28
4	321	431	424	300	411	405	397	393	26	26	27	28
5	321	315	307	300	295	291	280	272	26	24	27	28

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-361	-237	-114	26	-348	-225	-100	40	-13	-12	-14	-14
2	-369	-248	-120	25	-357	-235	-112	33	-12	-13	-8	-8
3	-379	-253	-125	16	-369	-240	-116	27	-10	-13	-9	-11
4	-382	-261	-137	6	-375	-250	-128	15	-7	-11	-9	-9
5	-384	-266	-142	-4	-378	-261	-138	0	-6	-5	-4	-4

PASSENGER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-7	2	2	0	-17	-6	-5	0	10	8	7	0
2	58	61	61	64	52	52	56	71	6	9	5	-7
3	97	98	98	100	91	92	95	96	6	6	3	4
4	96	104	99	108	91	99	97	93	5	5	2	15
5	96	107	103	119	92	102	101	109	4	5	2	10

DATA SHEET NO. 17

FIXED BARRIER LOAD CELL LOCATIONS

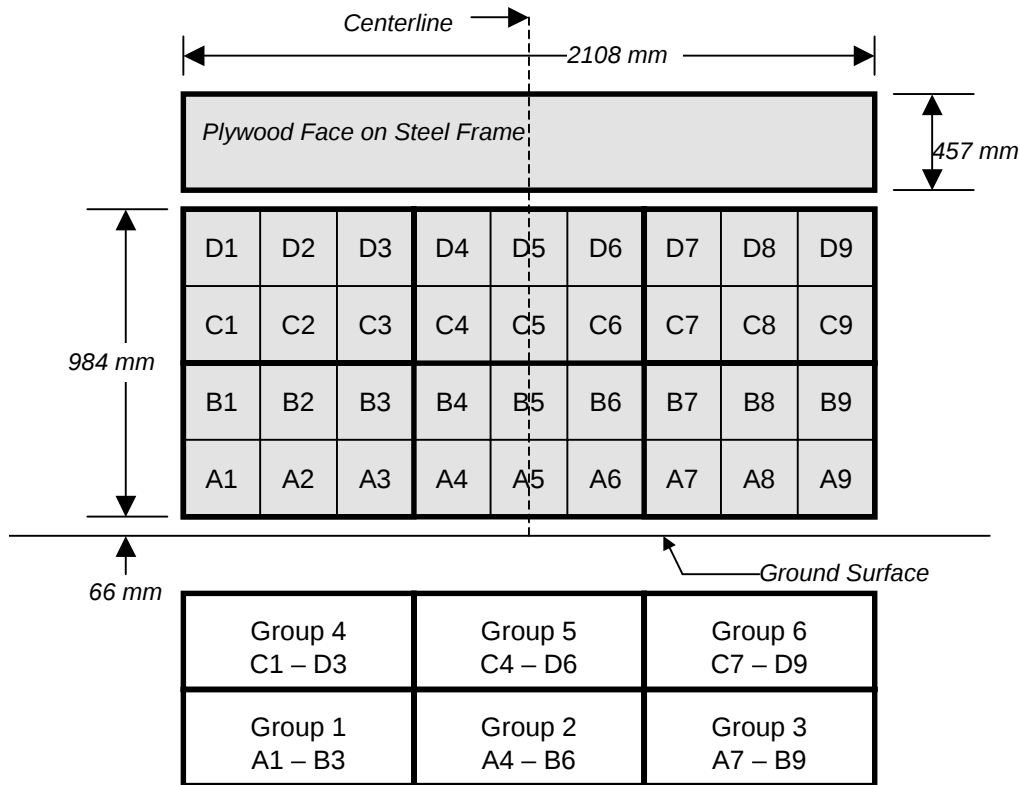
Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08

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.: M90500
 Test Program: NHTSA 35mph NCAP Test Date: 4/8/08

VEHICLE INFORMATION

VIN: 5NPET46C19H408058 Wheelbase (mm): 2723
 Vehicle Size Category: 4-Door Sedan Test Weight (kg): 1718

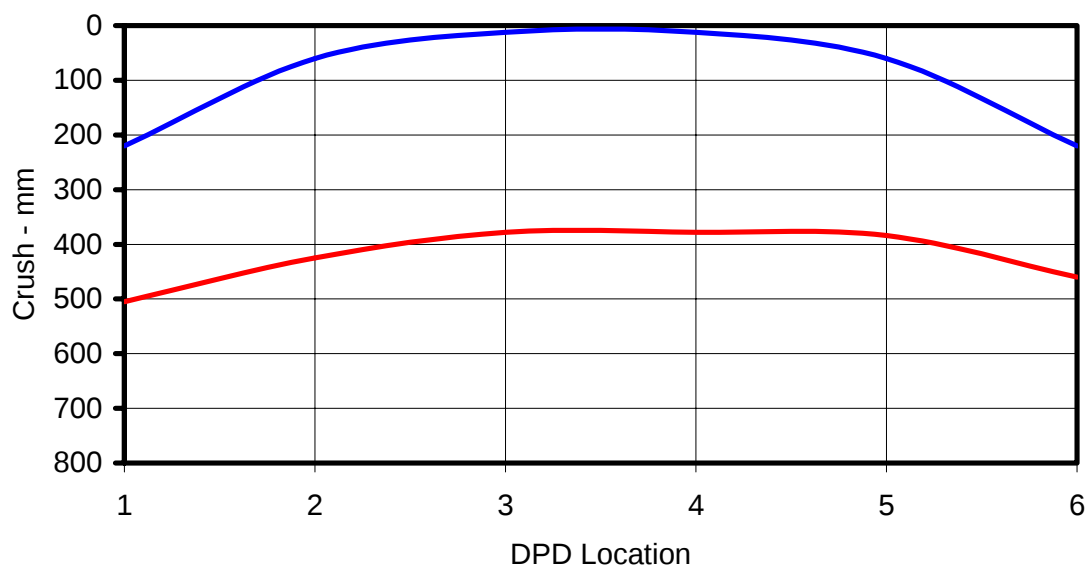
ACCELEROMETER DATA

Accelerometer Location: Left rear cross member
 Cal. Procedure/Interval: 6 months/drop test
 Integration Algorithm: NHTSA Standard Linearity: Good
 Impact Velocity (km/h): 56.08
 Velocity Change (km/h): 65.7 Time of Separation (msec): 64.8

CRUSH PROFILE

Collision Deformation Classification: 12FDEW6 Midpoint of Damage: Vehicle Centerline
 Damage Region Length: 1490 Impact Mode: Full frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side of vehicle	mm	220	505	-285
C2	Crush zone 2 on left side of vehicle	mm	60	425	-365
C3	Crush zone 3 on left side of vehicle	mm	12	378	-366
C4	Crush zone 4 on right side of vehicle	mm	12	378	-366
C5	Crush zone 5 on right side of vehicle	mm	60	384	-324
C6	Crush zone 6 at right side of vehicle	mm	220	460	-240



DATA SHEET NO. 19

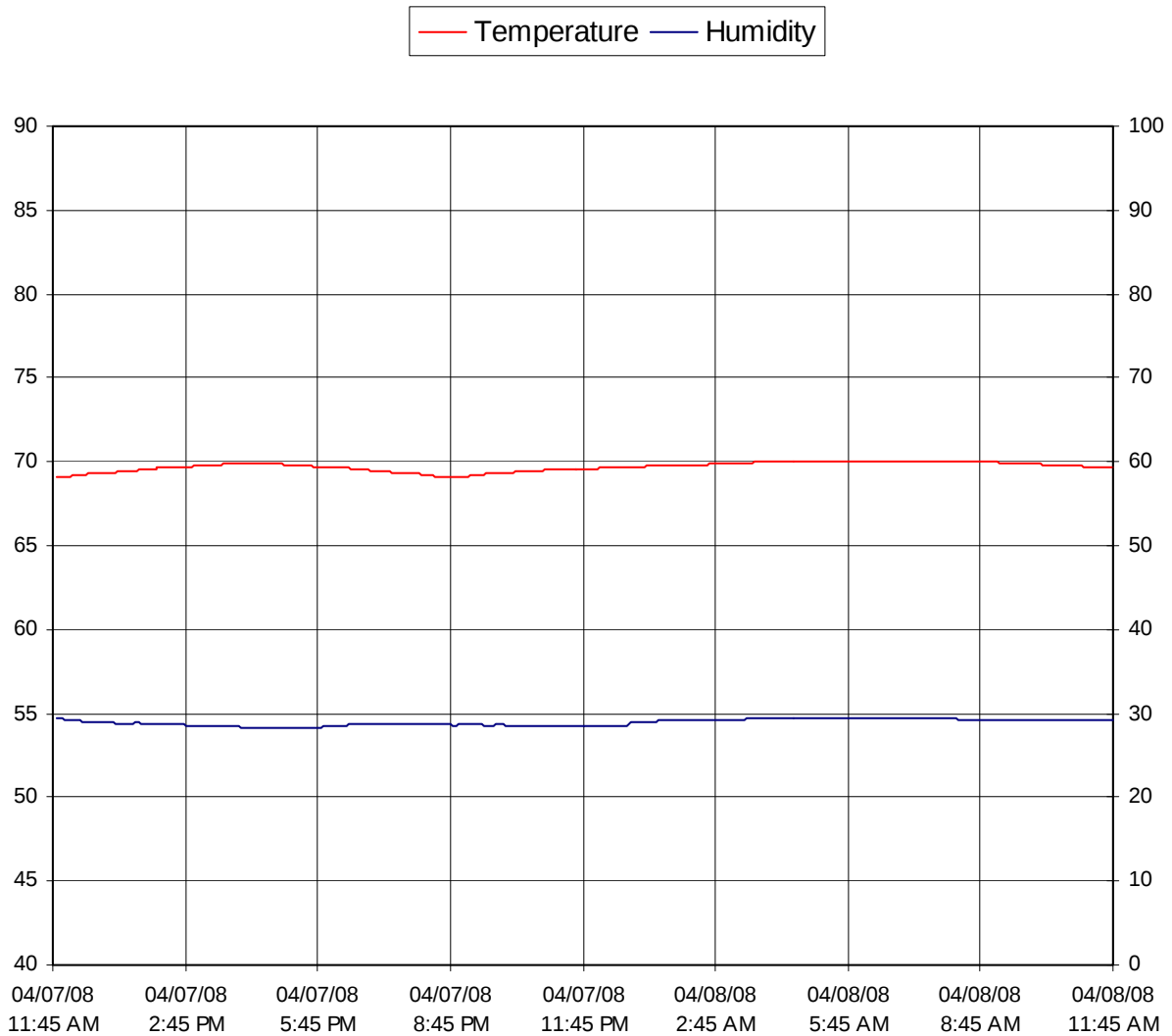
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan

NHTSA No.: M90500

Test Program: NHTSA 35mph NCAP

Test Date: 4/8/08



APPENDIX A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

Figure		Page
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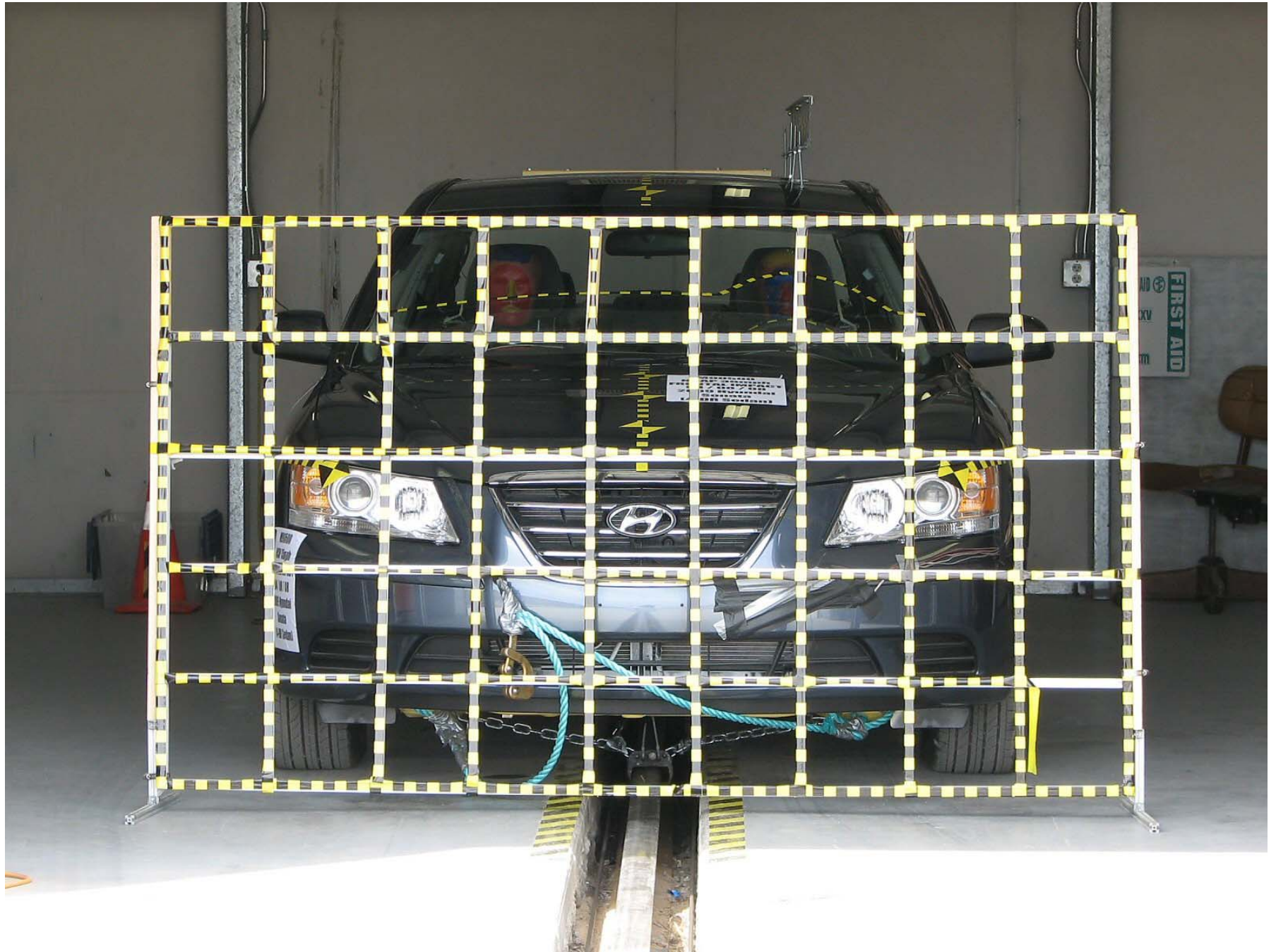


Figure A-1: Load Cell Location

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MANUFACTURED BY
HYUNDAI MOTOR MANUFACTURING ALABAMA, LLC

Jan/14/08

GVWR 4299 lbs

PAINT BF

GAWR

FRONT 2513 lbs

GAWR

REAR 2138 lbs

TRIM U7

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. 5NPET46C19H408058

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

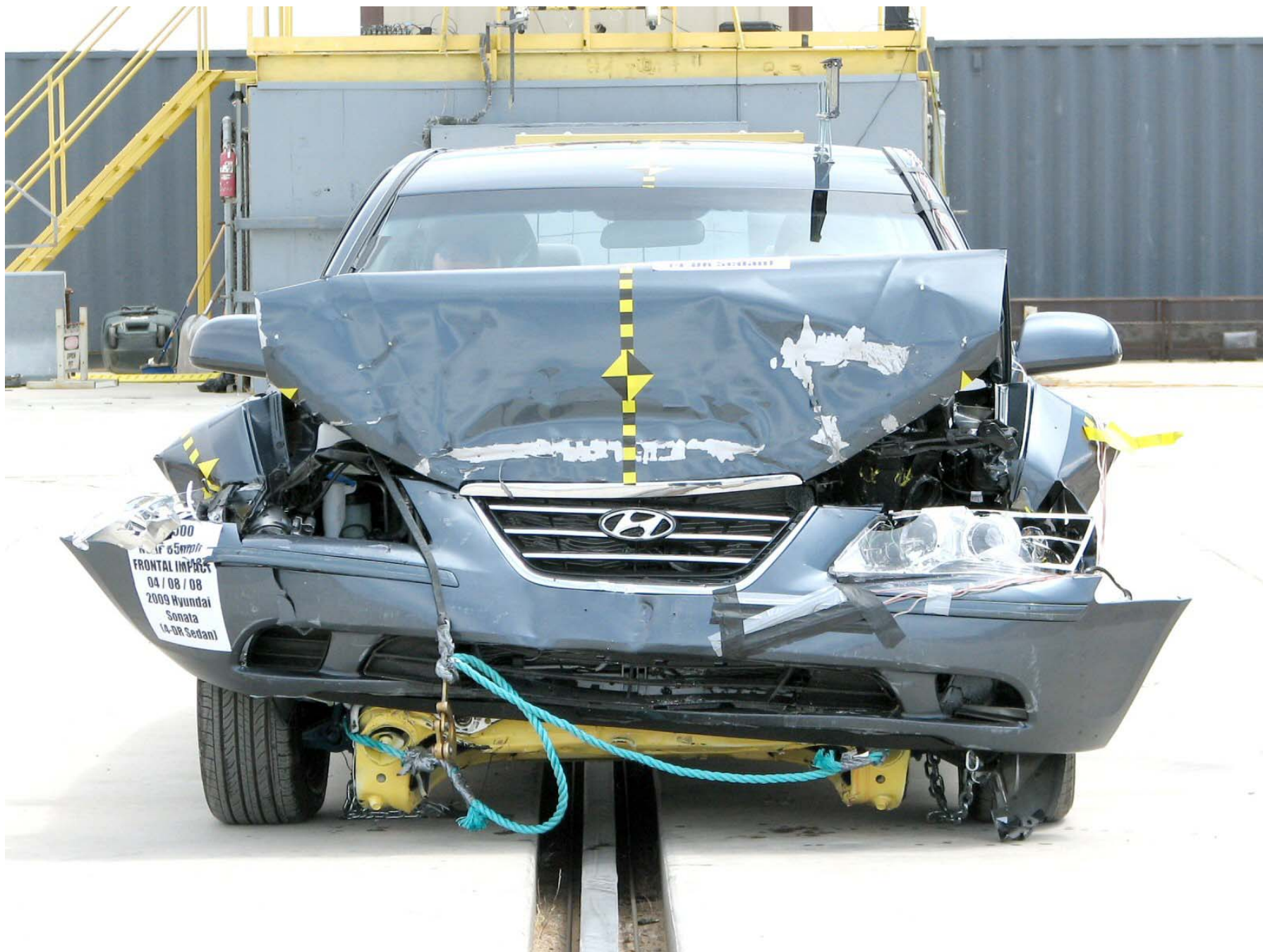


Figure A-7: Post-Test Front View (Vehicle Moved)



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

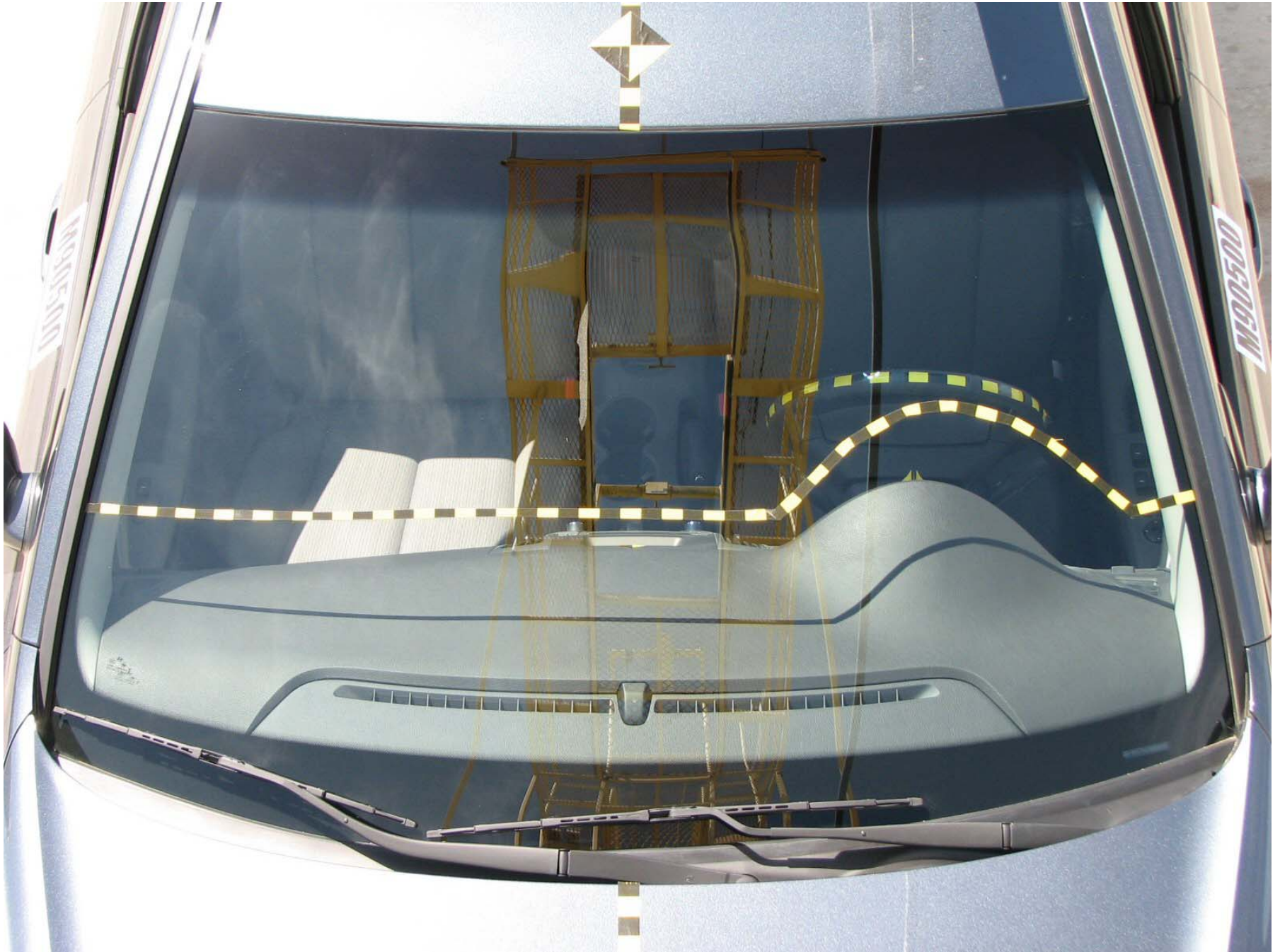


Figure A-18: Pre-Test Windshield

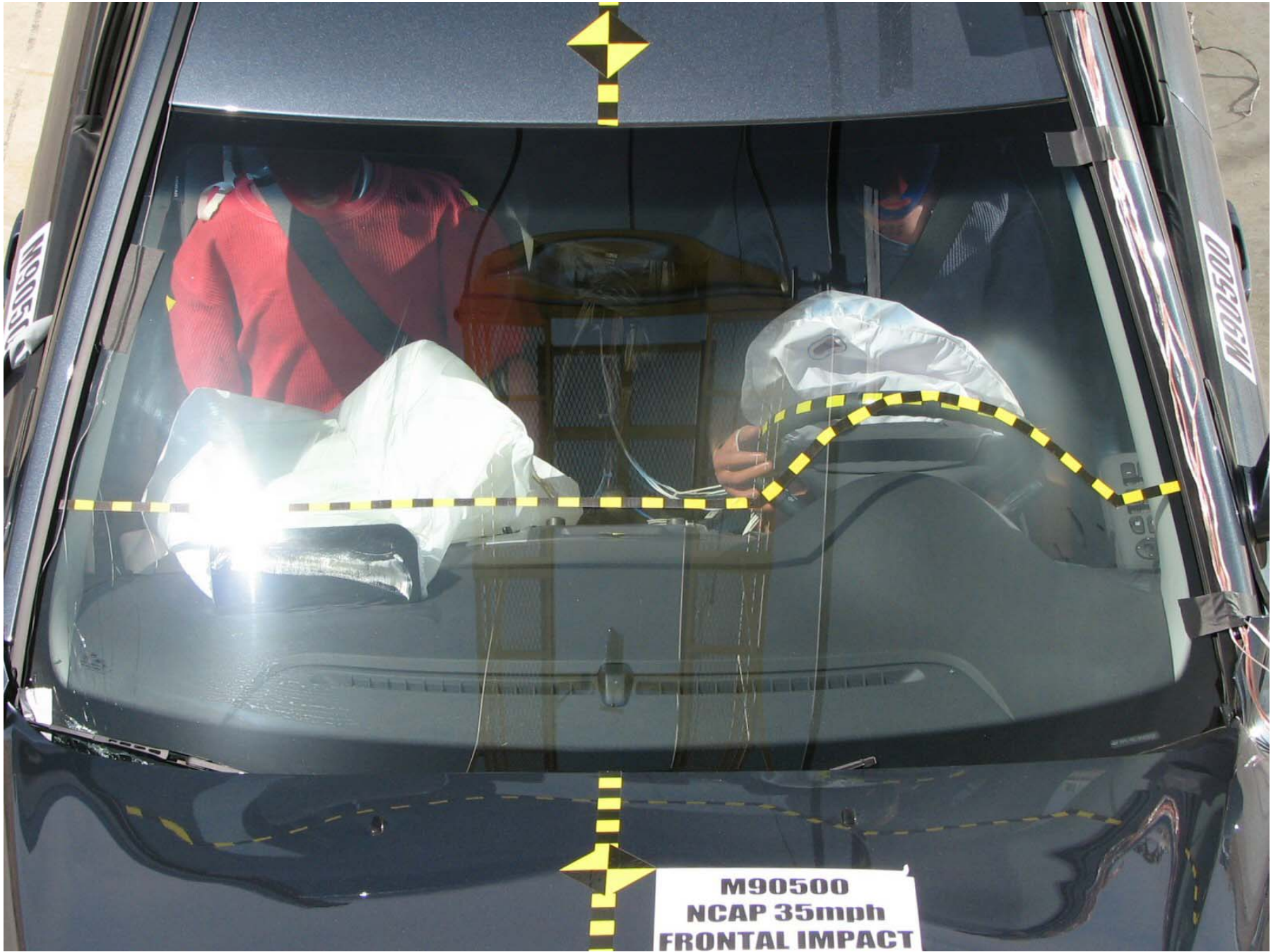


Figure A-19: Post-Test Windshield



Figure A-20: Pre-Test Engine Compartment



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



2009 Hyundai
Sonata
M90500
STODDARD SOLVENT ADDED
16.46 GALLONS
(62.3 LITERS)

Figure A-22: Pre-Test Fuel Cap



2009 Hyundai
Sonata
M90500
STODDARD SOLVENT ADDED
16.46 GALLONS
(62.3 LITERS)

Figure A-23: Post-Test Fuel Cap

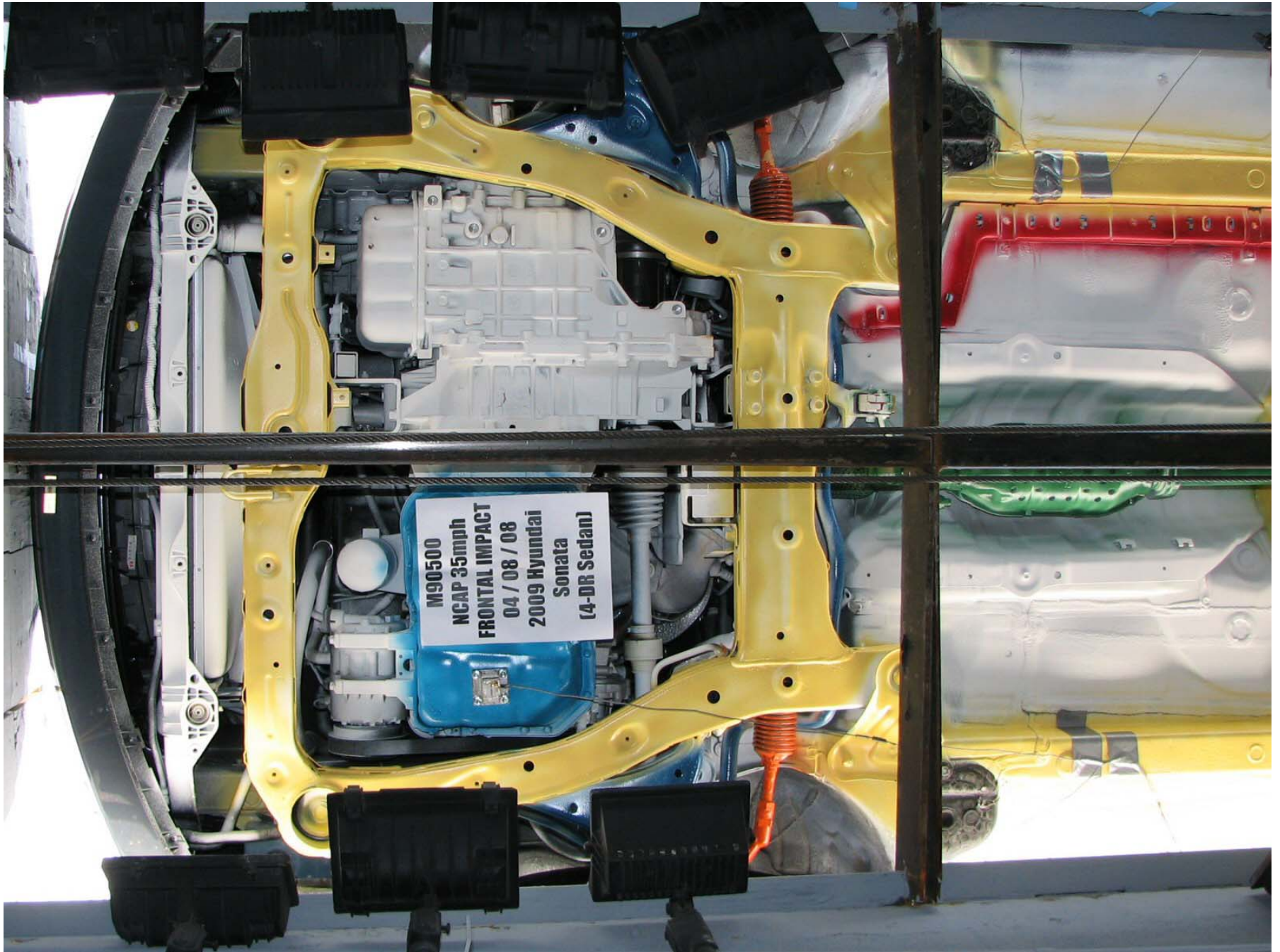


Figure A-24: Pre-Test Front Underbody

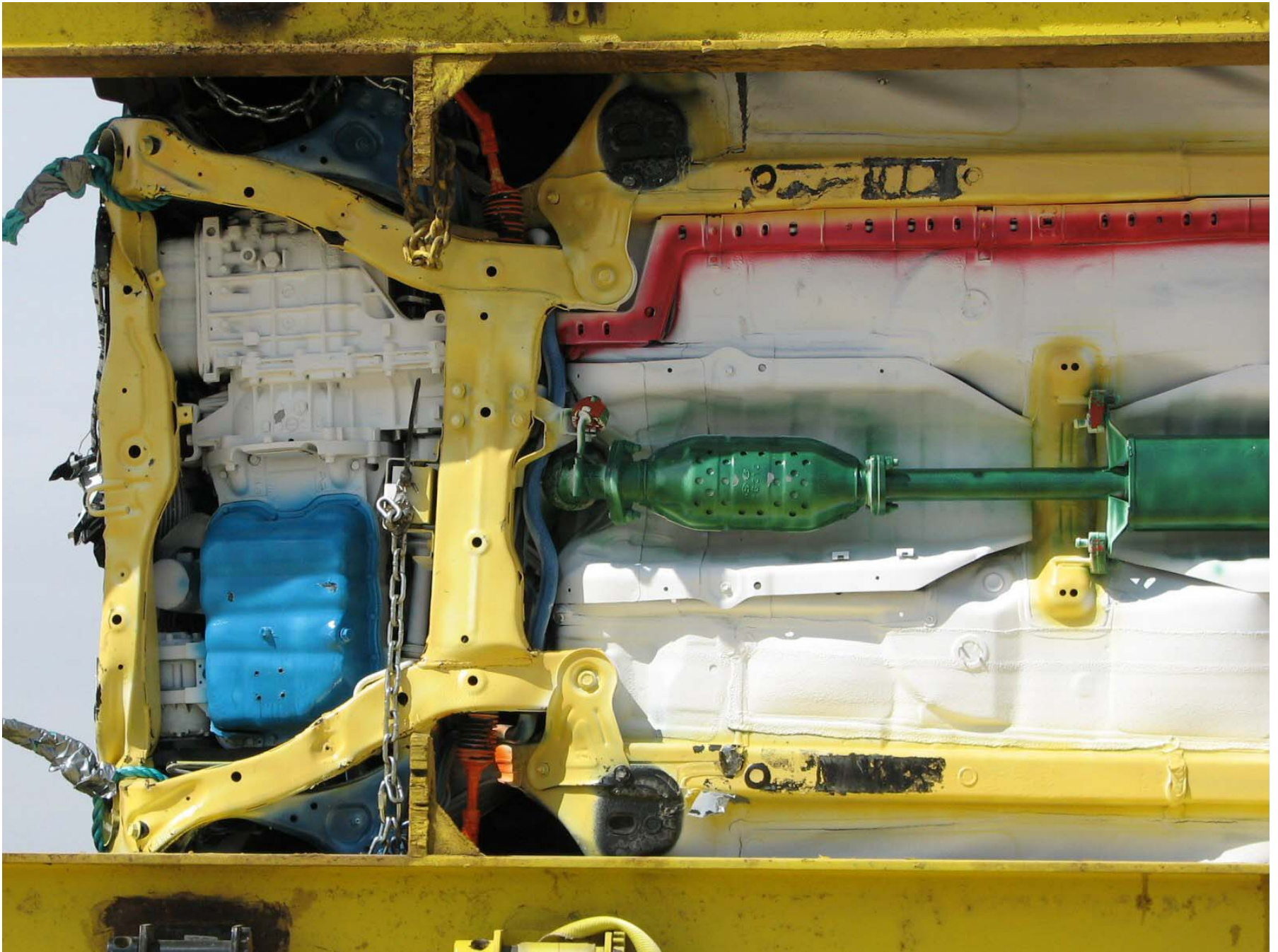


Figure A-25: Post-Test Front Underbody

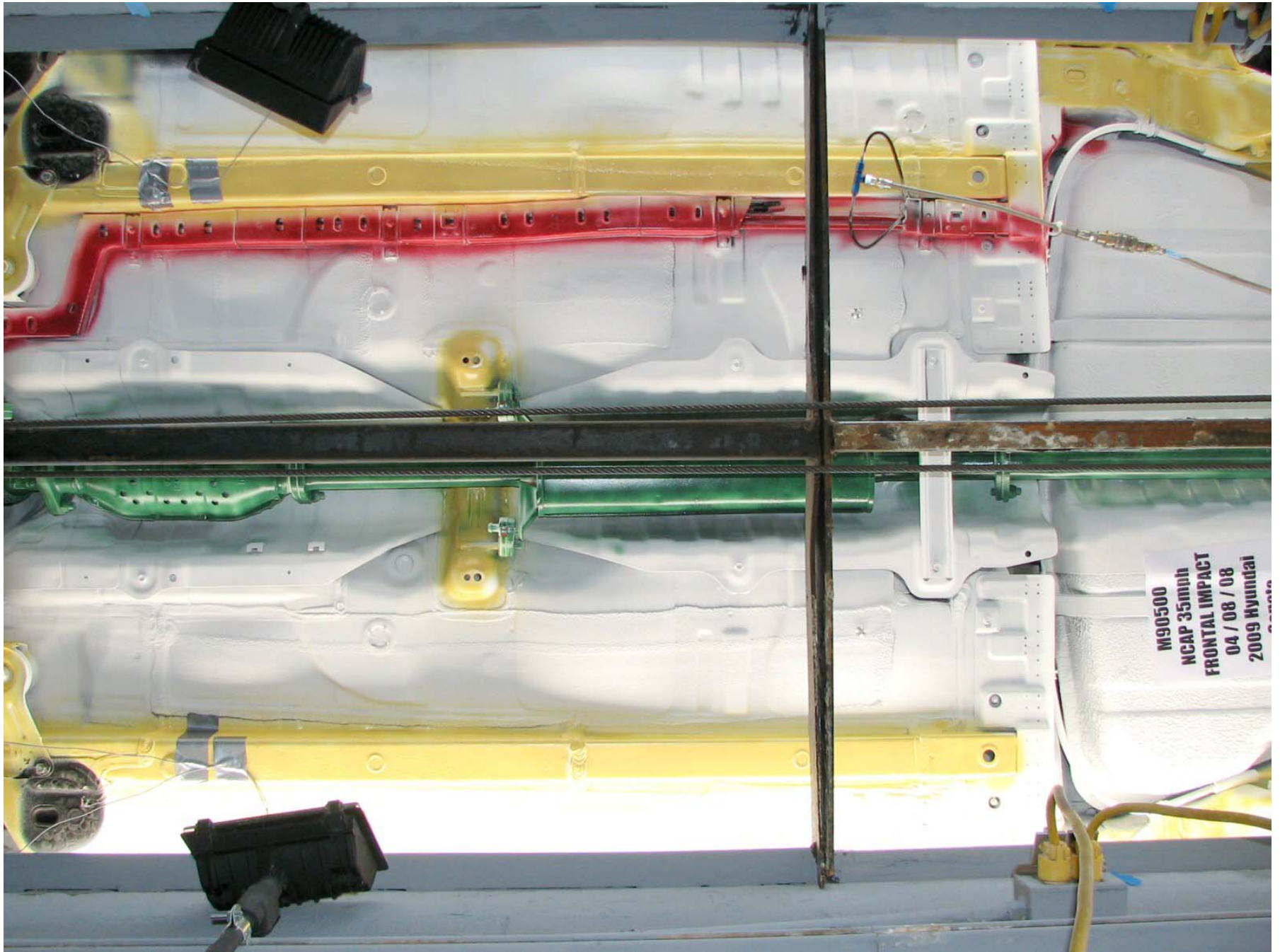


Figure A-26: Pre-Test Mid Underbody

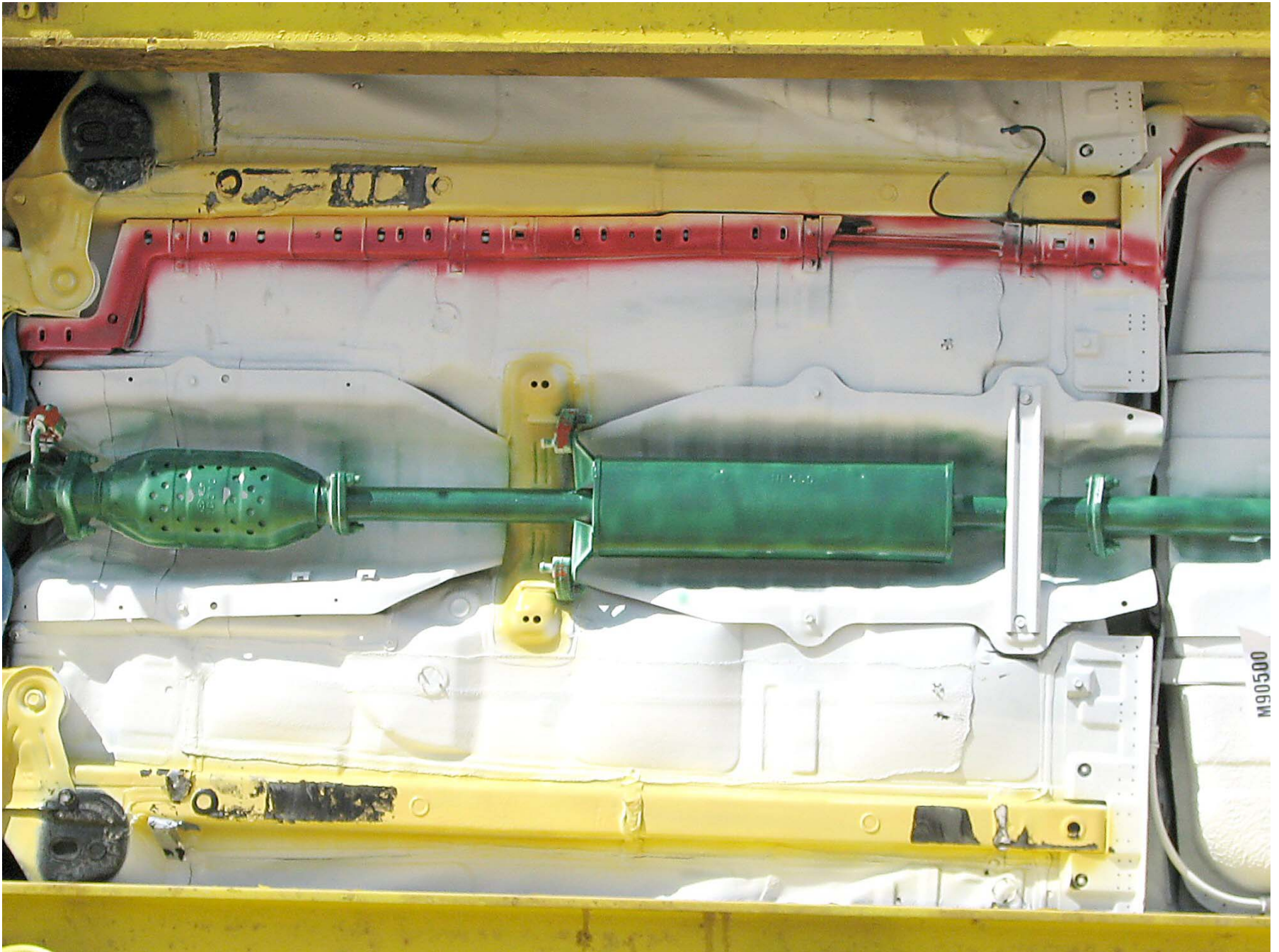


Figure A-27: Post-Test Mid Underbody

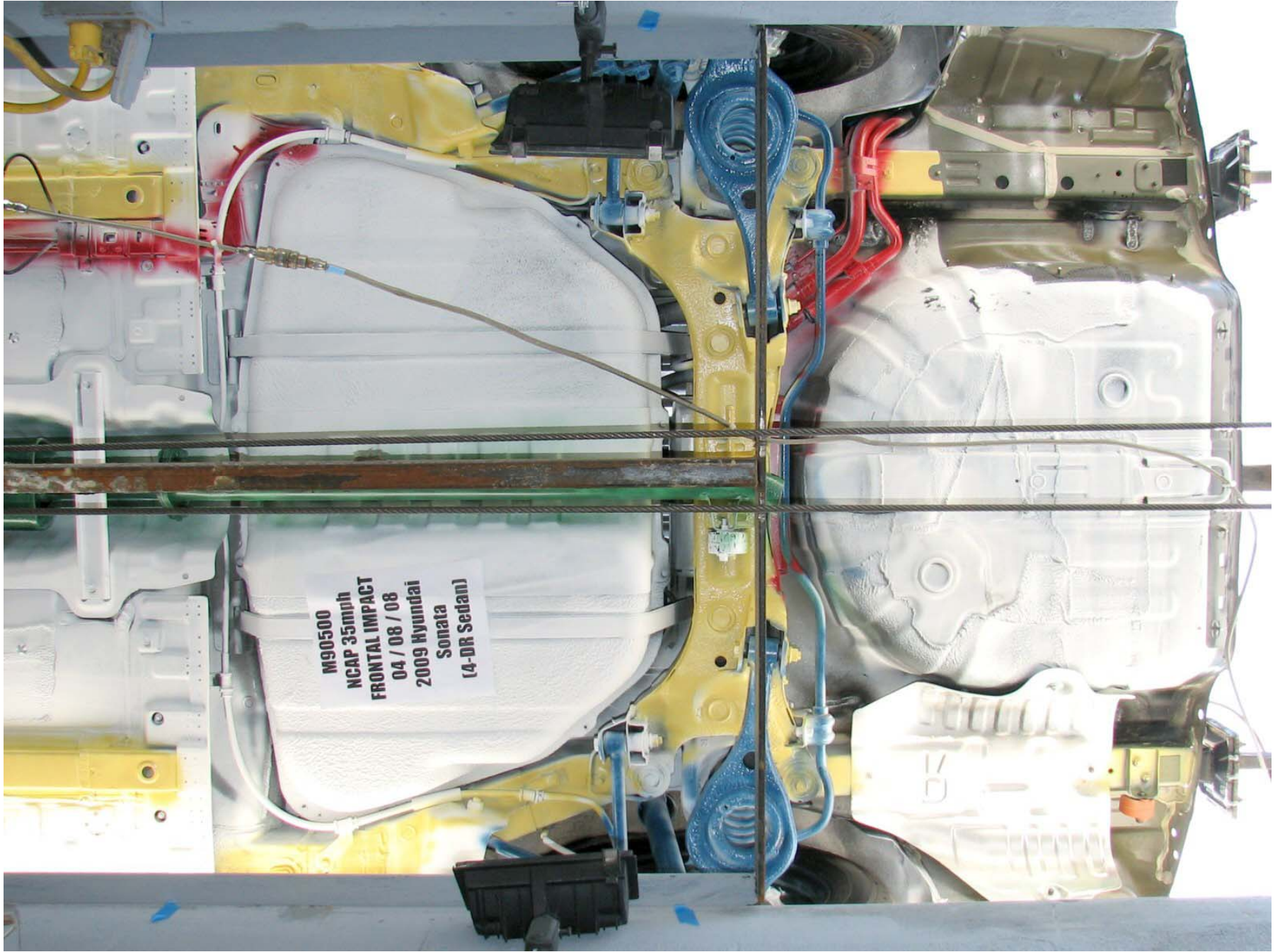


Figure A-28: Pre-Test Rear Underbody

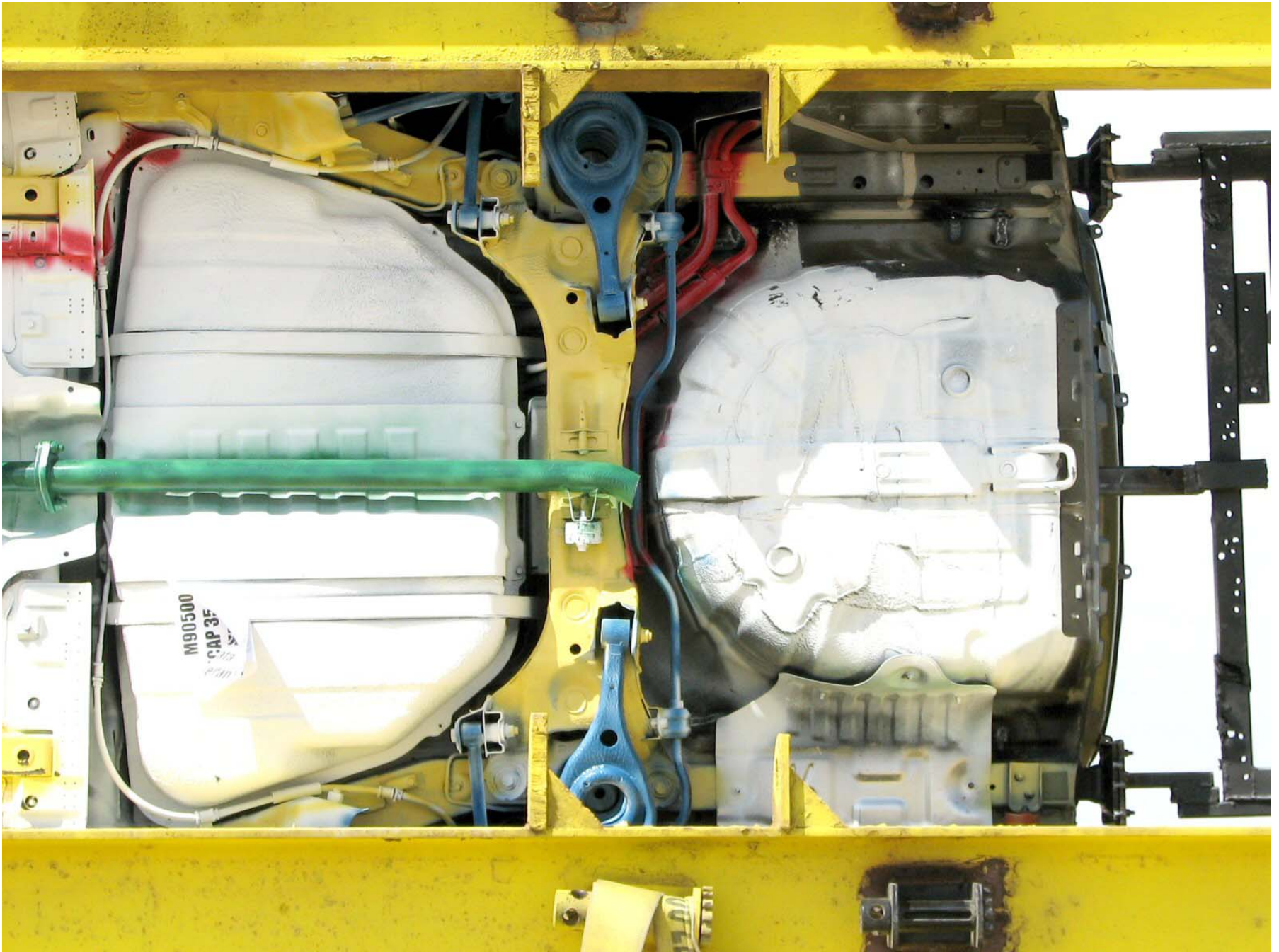


Figure A-29: Post-Test Rear Underbody



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

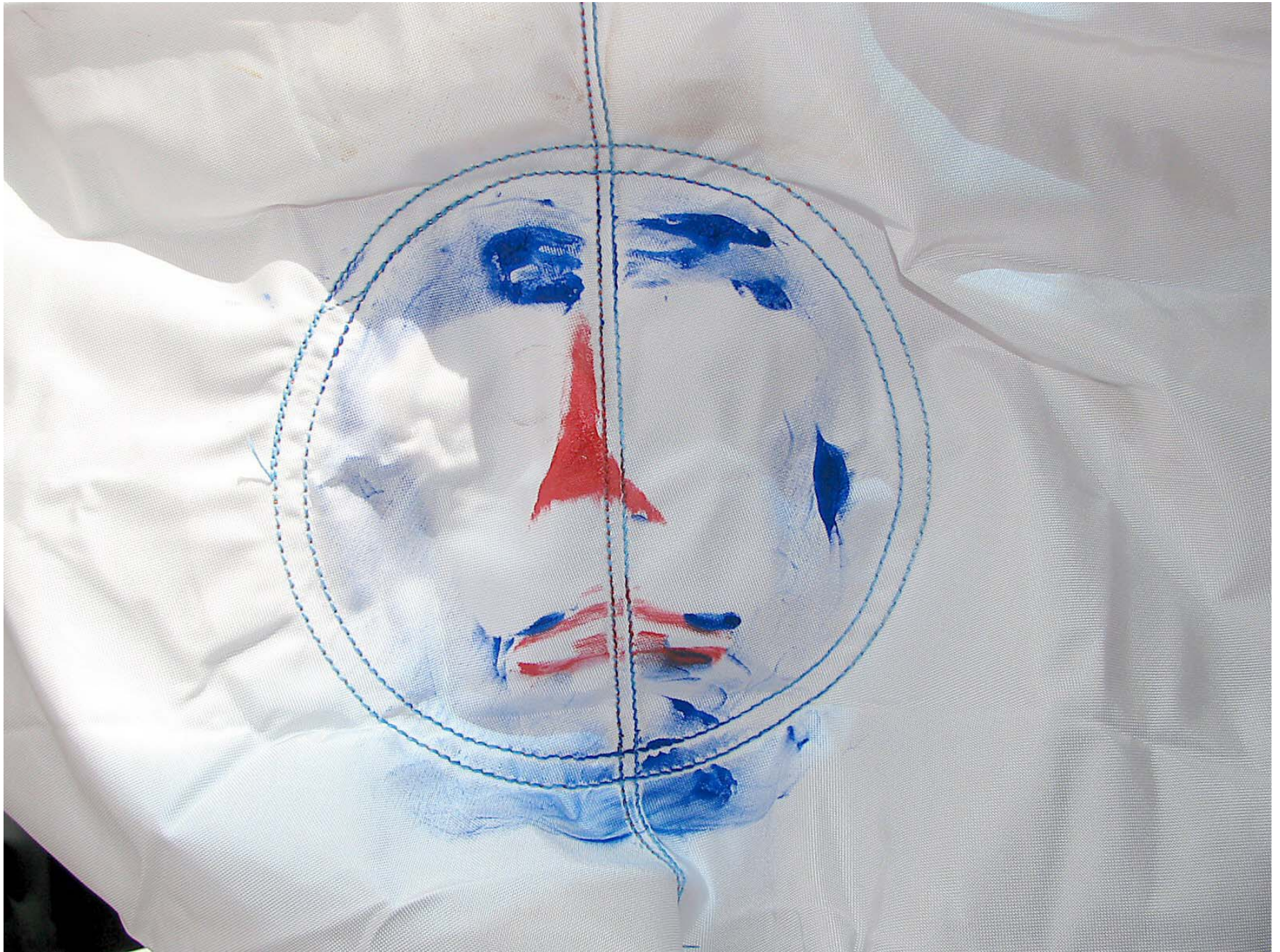


Figure A-43: Post-Test Driver Dummy Airbag Contact



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

**Photograph Not
Available**

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 Y	B-1
	Driver Head Primary Z	B-1
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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
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Passenger Chest Redundant X

LIST OF DATA PLOTS...(CONTINUED)

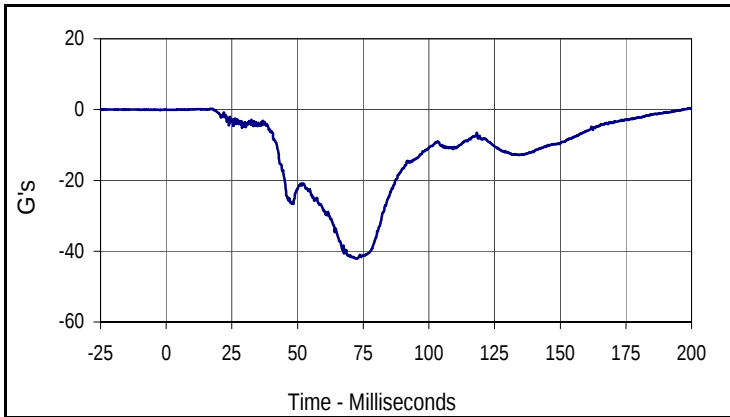
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Passenger Chest Redundant Z
Passenger Chest Resultant Redundant
Passenger Chest Redundant X Velocity
Passenger Chest Redundant X Displacement
Passenger Chest Displacement
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Passenger Pelvis Y
Passenger 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
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Vehicle Left Rear X Velocity

LIST OF DATA PLOTS...(CONTINUED)

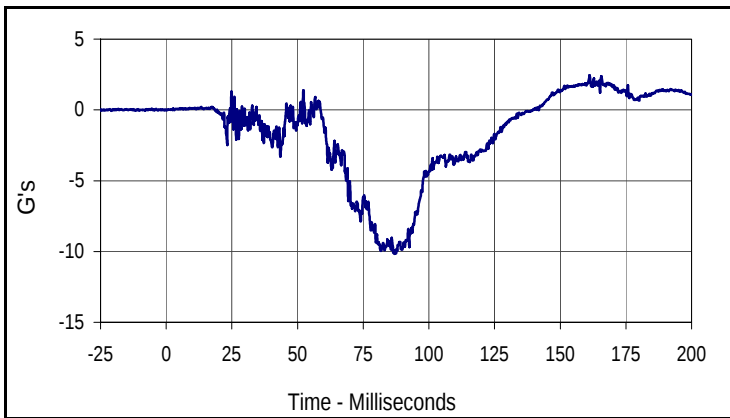
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Vehicle Right Rear X
Vehicle Right Rear X Velocity
Vehicle Right Rear X Displacement
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Vehicle Engine Top Velocity
Vehicle Engine Top Displacement
Vehicle Engine Bottom
Vehicle Engine Bottom Velocity
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

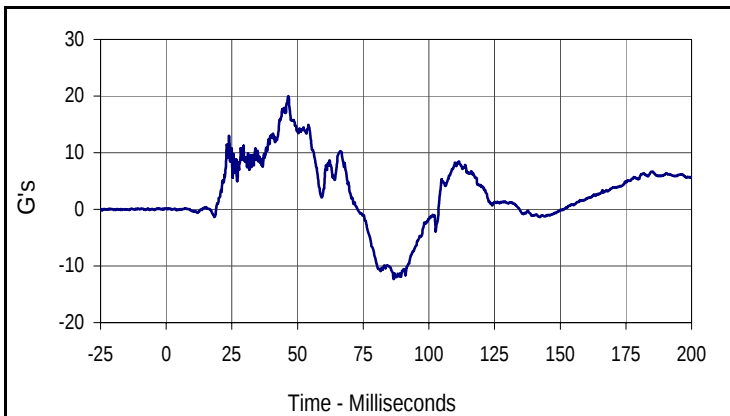
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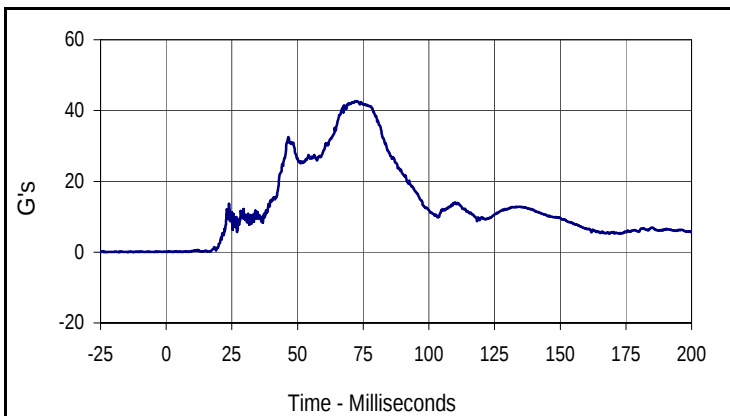
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Max	Time	Min	Time
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CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
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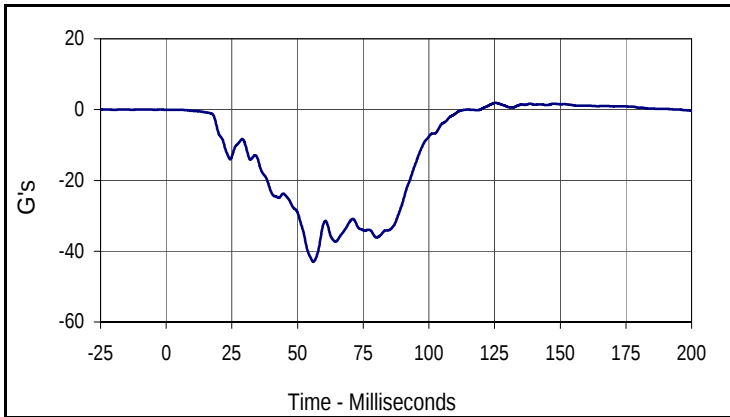
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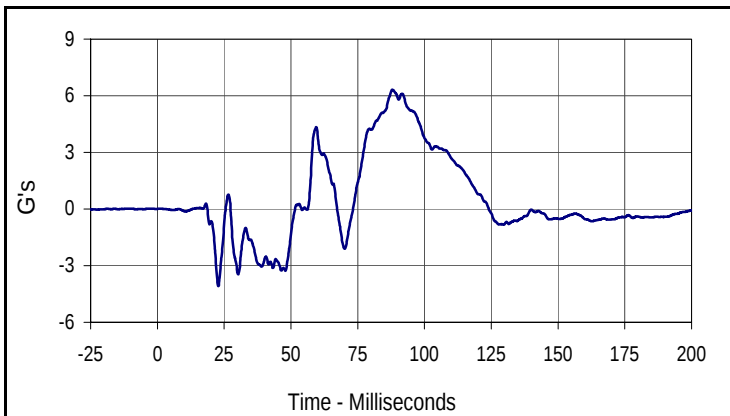
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Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

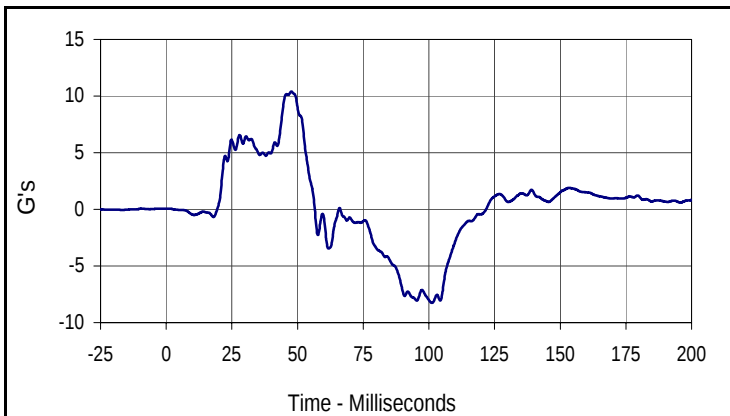
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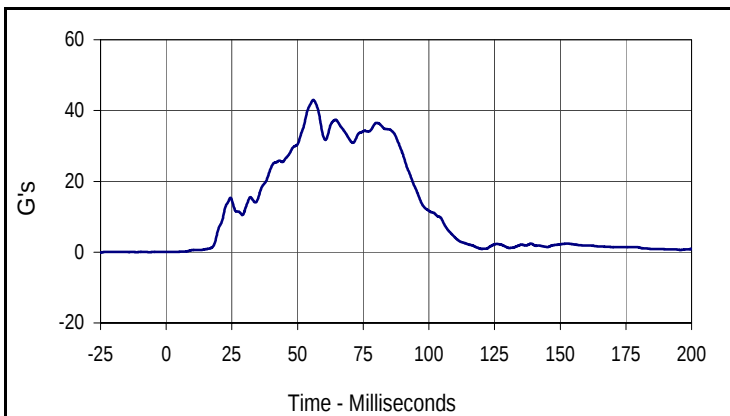
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005	FIL	180	G's
Max	Time	Min	Time
6.3	87.9	-4.1	22.8



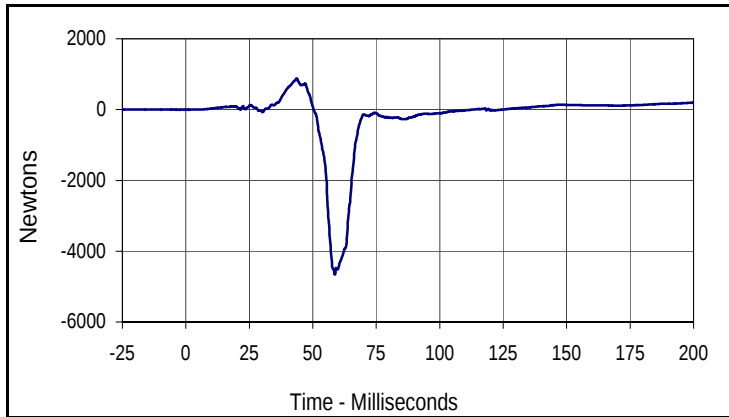
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Max	Time	Min	Time
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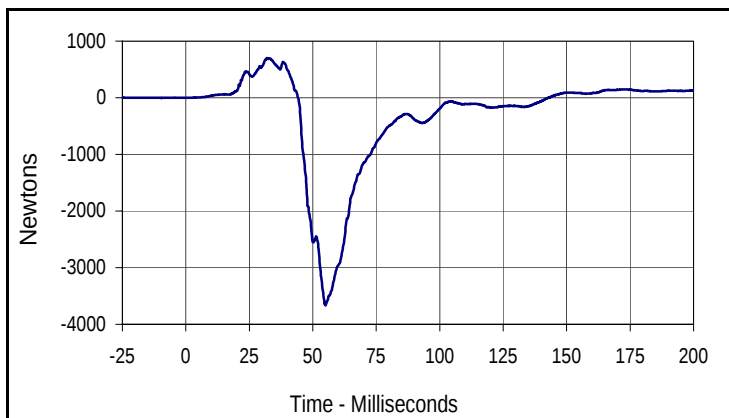
Curve Description			
Driver Chest Resultant Primary			
CURNO	Type	SAE Class	Units
004	RES	180	G's
Max	Time	Min	Time
43.0	56.0	0.0	2.7

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

Test Date: 4/8/08
 NHTSA No.: M90500



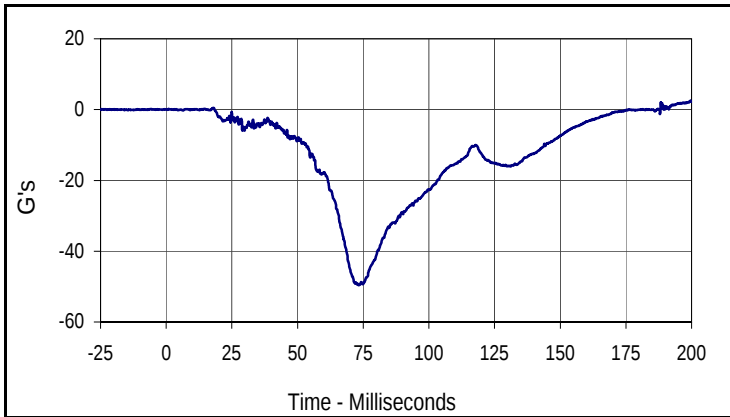
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Max	Time	Min	Time
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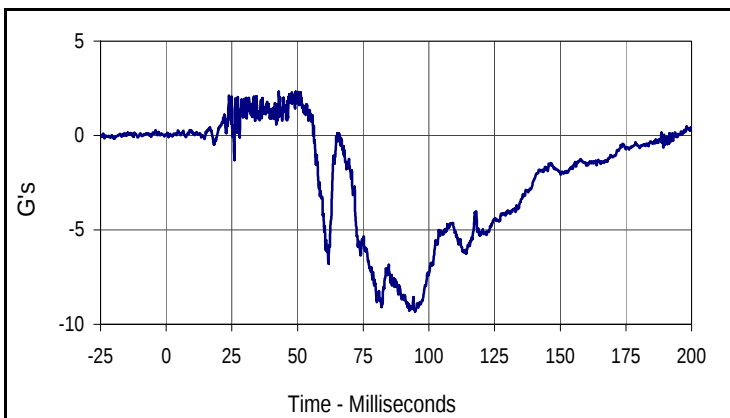
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Driver Right Femur Force Z			
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Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

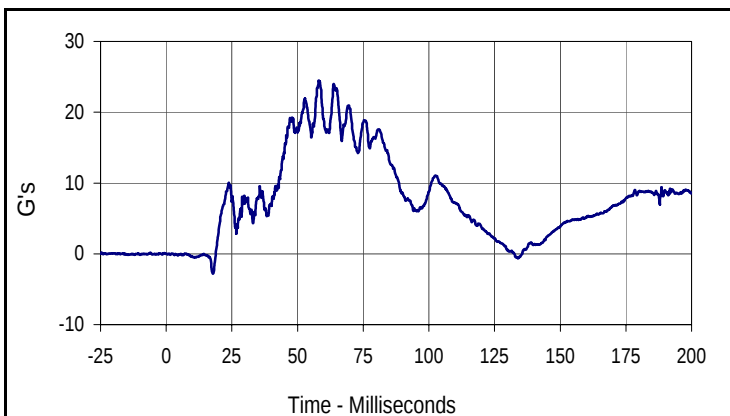
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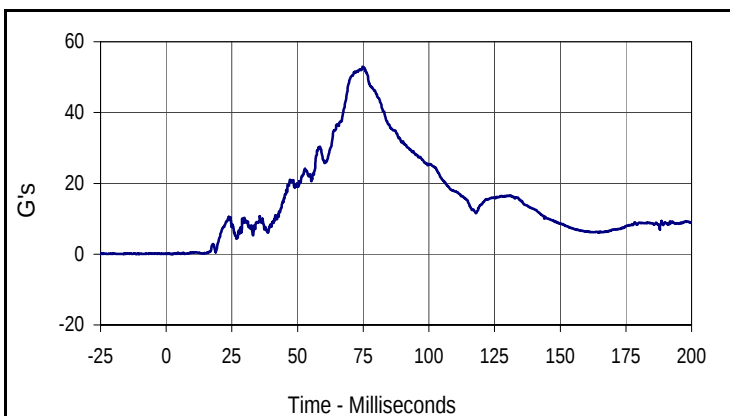
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Max	Time	Min	Time
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Curve Description			
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2.3	42.9	-9.3	94.8



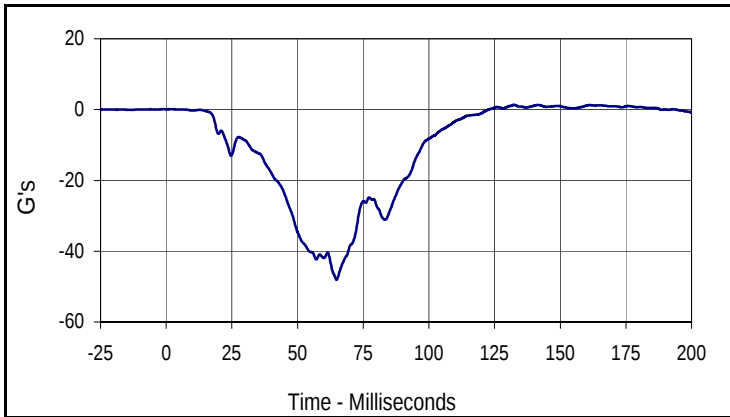
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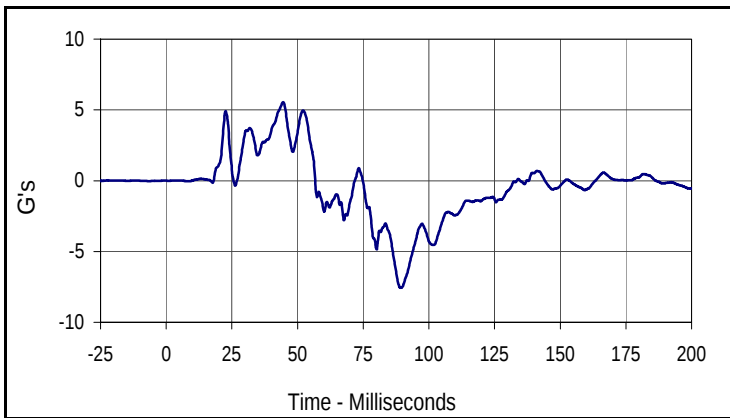
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Test Vehicle: 2009 Hyundai Sonata 4-Door Sedan
 Test Program: NHTSA 35mph NCAP

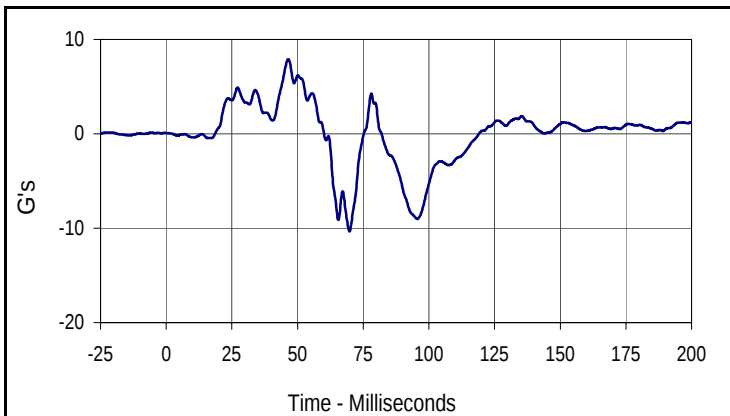
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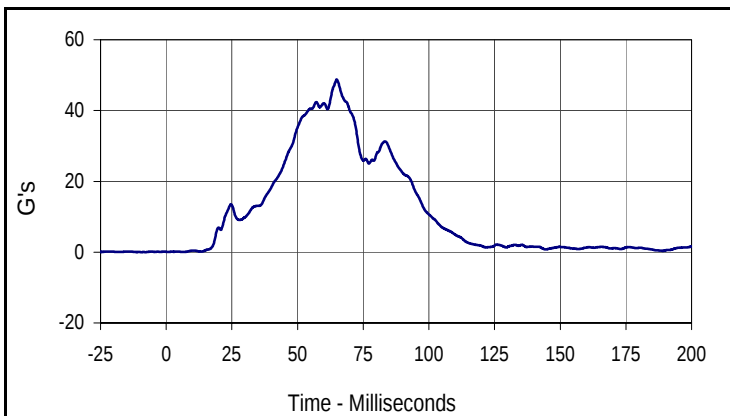
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Max	Time	Min	Time
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Curve Description			
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Max	Time	Min	Time
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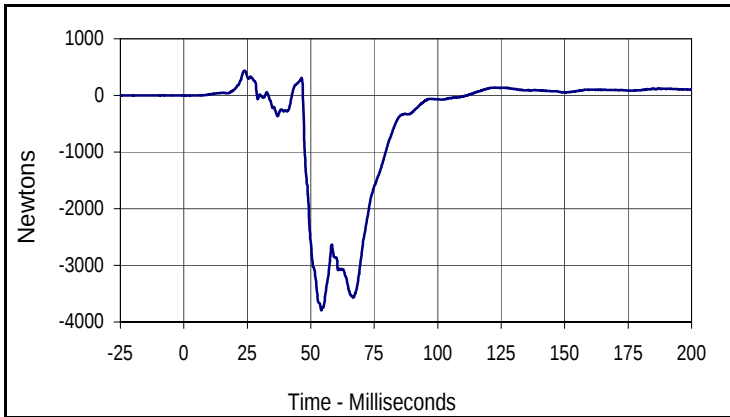
Curve Description			
Passenger Chest Primary Z			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
7.9	46.5	-10.3	69.8



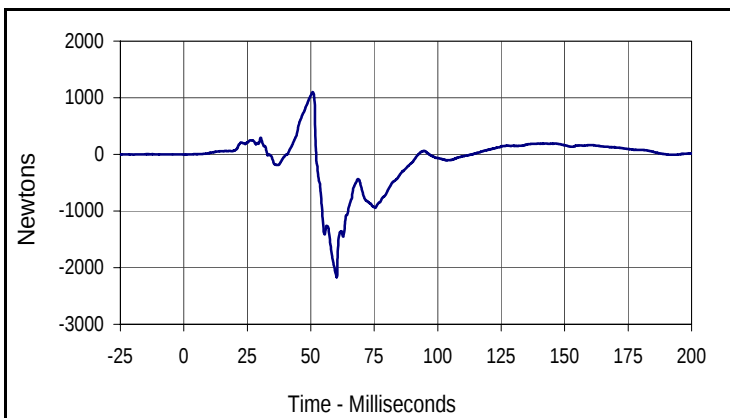
Curve Description			
Passenger Chest Resultant Primary			
CURNO	Type	SAE Class	Units
012	RES	180	G's
Max	Time	Min	Time
48.8	64.9	0.0	7.0

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

Test Date: 4/8/08
 NHTSA No.: M90500



Curve Description			
Passenger Left Femur Force Z			
CURNO	Type	SAE Class	Units
015	FIL	600	Newtons
Max	Time	Min	Time
436.6	23.9	-3795.7	54.2



Curve Description			
Passenger Right Femur Force Z			
CURNO	Type	SAE Class	Units
016	FIL	600	Newtons
Max	Time	Min	Time
1101.2	50.7	-2167.2	60.2

APPENDIX C
DUMMY CALIBRATION DATA

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

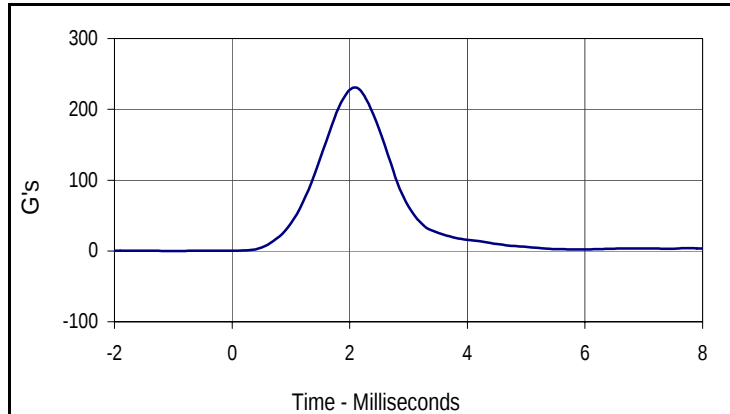
Test Date: 4/3/08

ATD Serial No.: 035

Test I.D.: HD04D



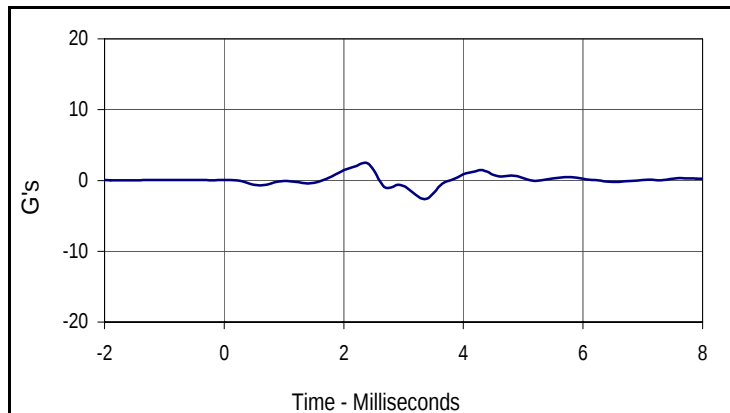
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	230.7	Pass
Peak Lateral Acceleration	G's	≤15.0	2.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall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

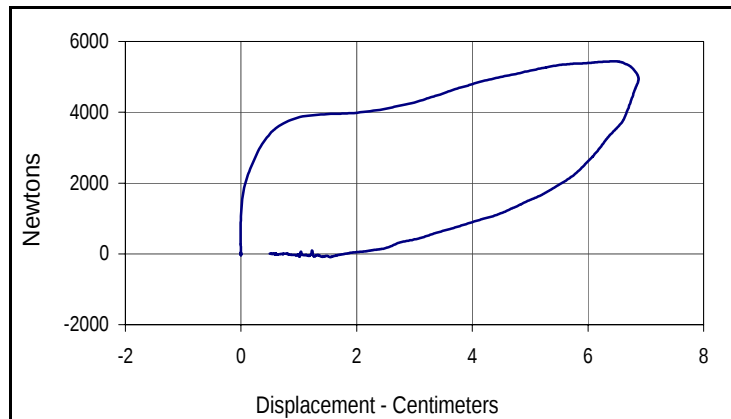
Test Date: 4/4/08

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



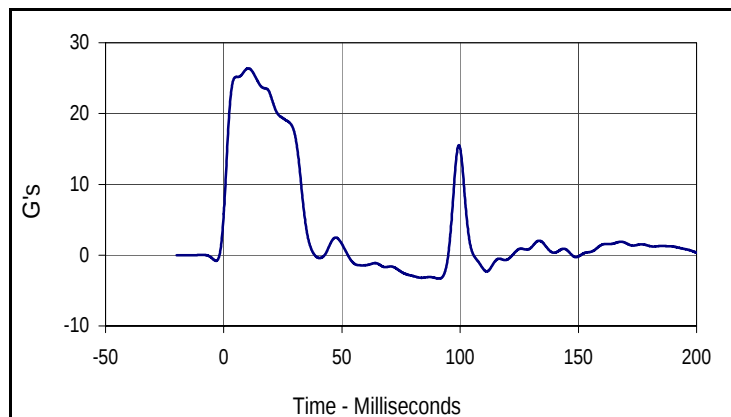
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysteresis
001	FIL	180	76.9
Peak Probe Force		Peak Chest Deflection	
5438		6.87	

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

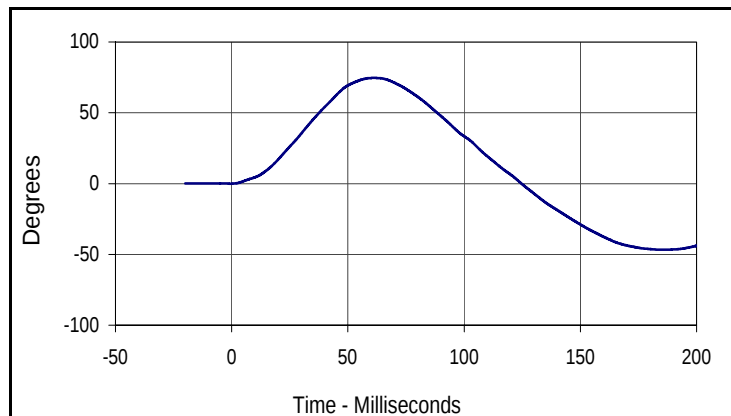
Test Date: 4/5/08
 Test I.D.: NF04D



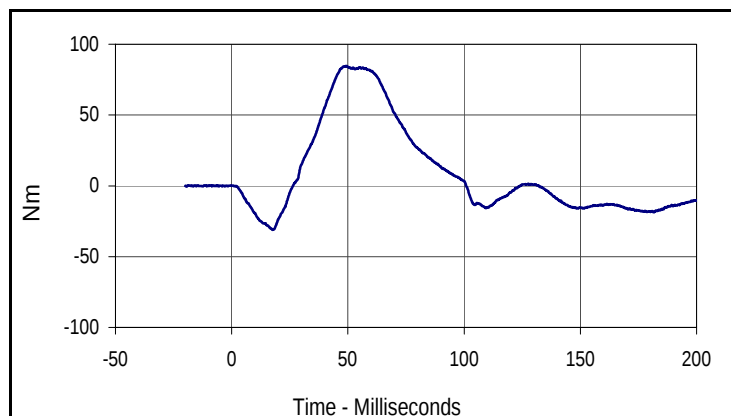
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	26.4	Pass
	20 Msec.	G's	17.6 to 22.6	22.4	Pass
	30 Msec.	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

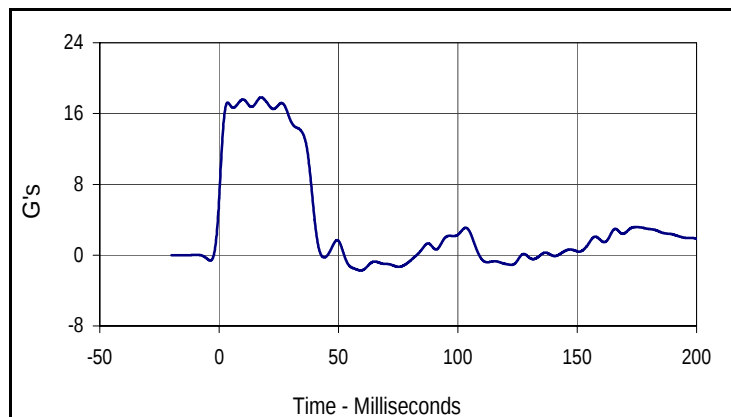
Test Date: 4/5/08

ATD Serial No.: 035

Test I.D.: NE04D



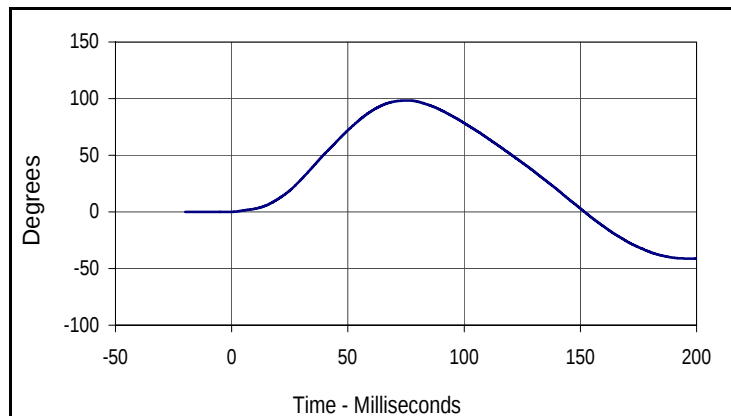
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.16	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.6	Pass
	20 Msec.	G's	14.0 to 19.0	17.3	Pass
	30 Msec.	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

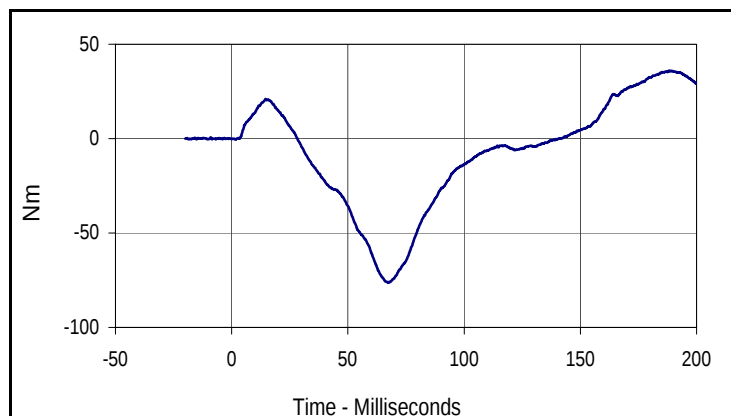
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
17.8	17.5	-1.7	59.2



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

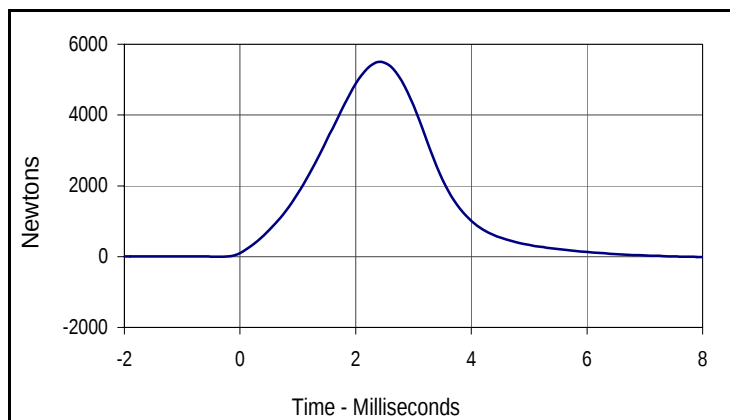
Test I.D.: LK04D , RK04D

**Left Knee**

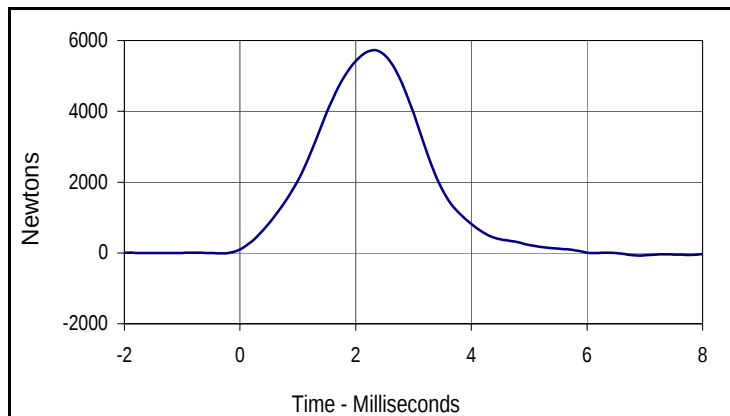
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5499	Pass
Overall Test Results				Pass

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: Hybrid III 50th Percentile Male Head Drop Test

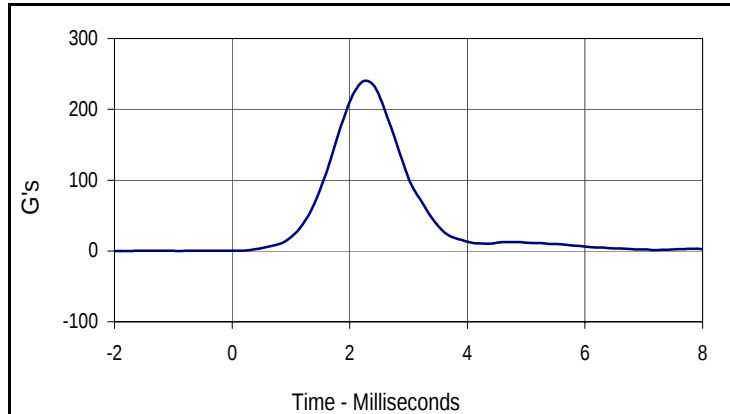
Test Date: 4/1/08

ATD Serial No.: 034

Test I.D.: HD04C



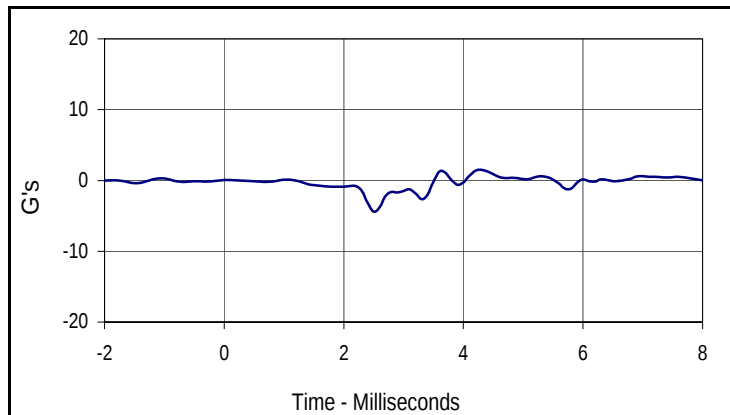
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	240.1	Pass
Peak Lateral Acceleration	G's	≤15.0	4.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall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

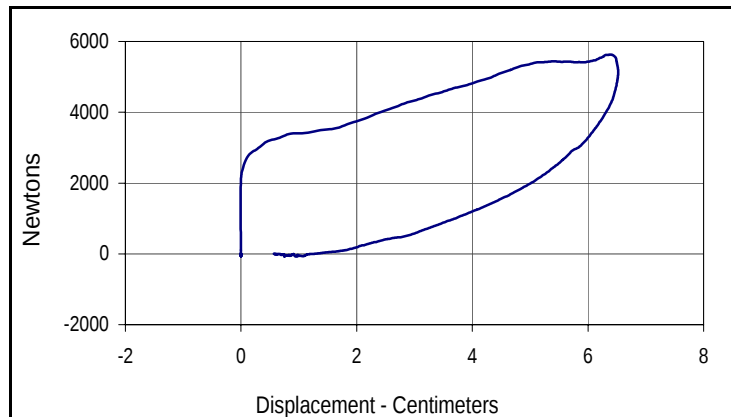
Test Date: 4/2/08

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



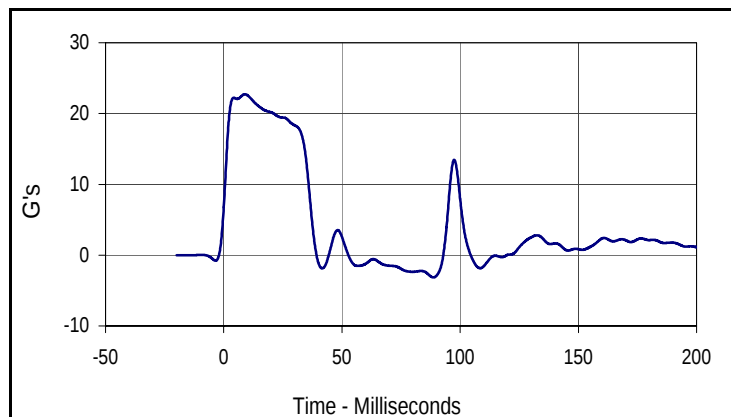
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysteresis
001	FIL	180	73.7
Peak Probe Force		Peak Chest Deflection	
5628		6.52	

Test Program: Hybrid III 50th Percentile Male Neck Flexion Test
 ATD Serial No.: 034

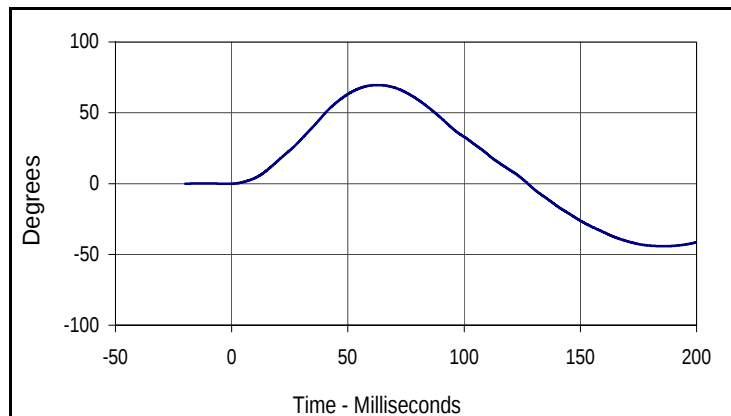
Test Date: 4/5/08
 Test I.D.: NF04C



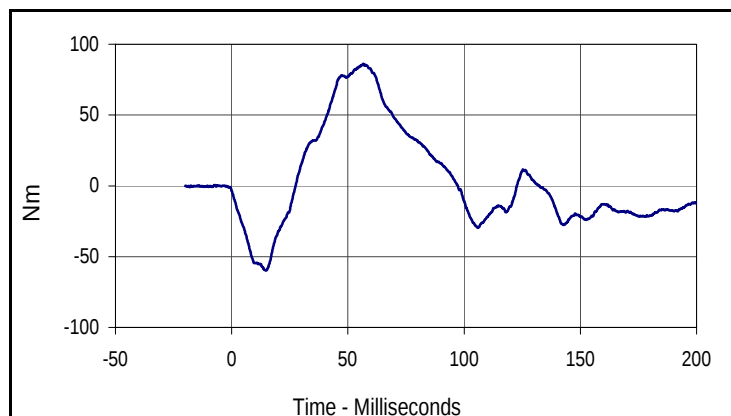
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	22.6	Pass
	20 Msec.	G's	17.6 to 22.6	20.2	Pass
	30 Msec.	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

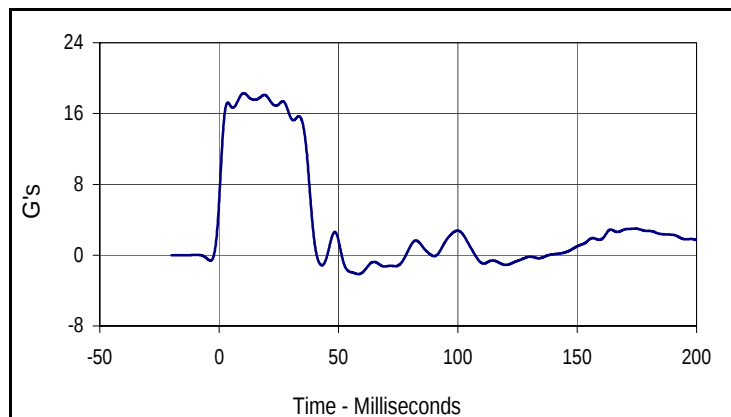
Test Date: 4/5/08

ATD Serial No.: 034

Test I.D.: NE04C



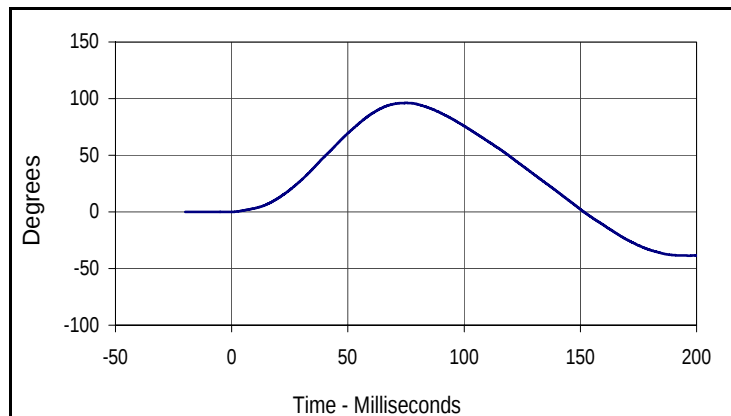
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.16	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.3	Pass
	20 Msec.	G's	14.0 to 19.0	18.0	Pass
	30 Msec.	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

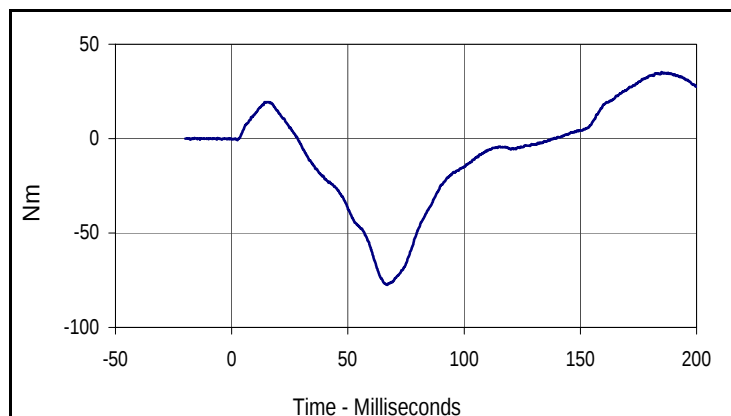
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
18.3	10.3	-2.1	58.4



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

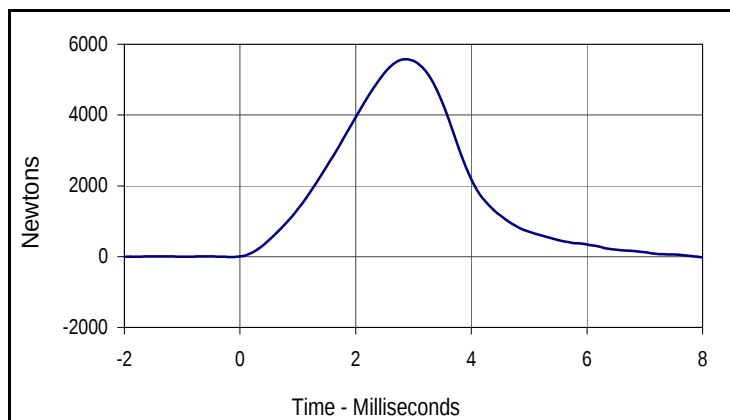
Test I.D.: LK04C , RK04C

**Left Knee**

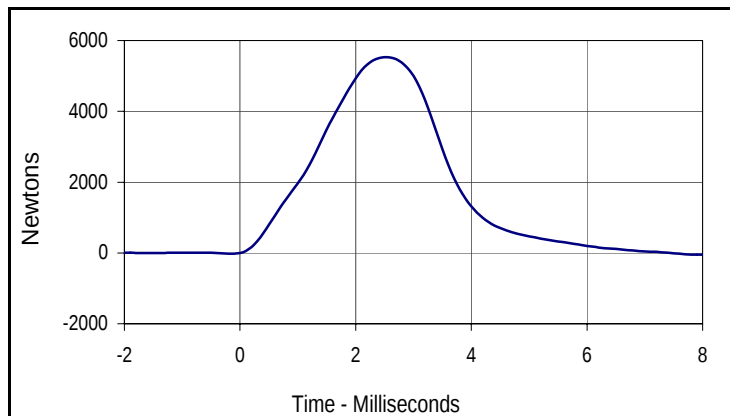
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5577	Pass
Overall Test Results				Pass

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: 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:

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:
