REPORT NUMBER TR-P28102-01-NC

NEW CAR ASSESMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

MAZDA MOTOR CORPORATION
2008 MAZDA5
5-DOOR PASSENGER CAR

NHTSA NUMBER: Z85400

Prepared By:
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JULY 9, 2008

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF CRASHWORTHINESS STANDARDS
RULEMAKING
MAIL CODE: NVS-111
1200 NEW JERSEY AVE SE, ROOM W43-410
WASHINGTON, D.C. 20590

This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-06-D-00027.

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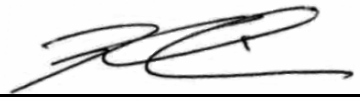
Prepared by:  Date: July 9, 2008

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Date of Acceptance

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipients Catalog No.
TR-P28102-01-NC		

4. Title and Subtitle	5. Report Date
Final Report of New Car Assessment Program Testing of a 2008 Mazda5 5-Door Passenger Car NHTSA No. Z85400	July 9, 2008
	6. Performing Organization Code KAR
7. Authors Mr. Kelsey A. Chiu, Project Engineer, KARCO Mr. Frank Richardson, Program Manager, KARCO	**8. Performing Organization Report No.** TR-P28102-01-NC
9. Performing Organization Name and Address Karco Engineering, LLC 9270 Holly Rd. Adelanto, CA, 92301	**10. Work Unit No.**
	11. Contract or Grant No. DTNH22-06-D-00027
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration Rulemaking Office of Crashworthiness Standards Mail Code NVS-111 1200 New Jersey Ave., SE, Room W43-410 Washington, D.C 20590	**13. Type of Report and Period Covered** Final Test Report
	14. Sponsoring Agency Code DOT/NHTSA/NRM/OCS

15. Supplementary Notes

16. Abstract

A 35 mph (56.3 km/h) frontal barrier impact test was conducted on the subject 2008 Mazda5 5-Door Passenger Car at KARCO Engineering, LLC, in Adelanto, CA, on July 9, 2008. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and footwell intrusion performance. The impact velocity was 56.03 km/h. The ambient temperature at the barrier at the time of the crash was 41.1 degrees Celsius. The vehicle's maximum post static crush was 560 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	249.4	437.5
Max. Chest Accel. (3 msec. Chest Clip)	G's	60	41.3	42.2
Left Femur Force	Newtons	10008	-4433.8	-3720.4
Right Femur Force	Newtons	10008	-3809.0	-3249.7

17. Key Words	18. Distribution Statement
56.3 km/h NCAP Frontal Impact Test New Car Assesment Program (NCAP) 2008 Mazda5 5-Door Passenger Car NHTSA No. Z85400	Copies of this report are available from: National Highway Traffic Safety Admin. NHTSA Technical Reference Division 1200 New Jersey Ave., SE, Room W43-410 Washington, DC 20590

19. Security Classification of this report	20. Security Classification of this page	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	129	

Form DOT F1700.7 (8-72)

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PURPOSE AND SUMMARY OF TEST Z85400

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 2008 Mazda 5 5-Door Passenger Car at a velocity of 56.03 km/h. The test was performed at KARCO Engineering, LLC on July 9, 2008

Three (3) real-time and sixteen (16) 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 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 560 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	249.4	41.3	-26.6	-4433.8	-3809.0
Passenger	437.5	42.2	-23.2	-3720.4	-3249.7

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

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

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	^oF	^oC	=(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: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/h	56.03
Test Weight	kg	1745
Impact Angle	degrees	0
Average Rebound	mm	527
Maximum Static Crush	mm	560

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 Acclerometers	8
Rigid Barrier Load Cells	36
Total	132

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	Z85400
Make	Mazda
Model	5
Body Style	5-Door Passenger Car
VIN No.	JM1CR29L080302816
Color	White
Delivery Date	06/23/08
Odometer (Miles)	88.0
Dealer	Redlands Mazda
Transmission	5-speed Automatic
Final Drive	Front
Type/No. of Cylinders	Inline 4
Engine Displ. (L)	2.3
Engine Placement	Transverse
Roof Rack	No
Sunroof/T-top	No
Tinted Glass	No
Traction Control	No
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	Yes
Pass. Front Airbag	Yes
Pass. Side Torso Airbag	Yes
Pass. Head Airbag	No
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	Mazda Motor Corporation
Date of Manufacture	Nov-07

GVWR (kg)	2116
GAWR Front (kg)	1046
GAWR Rear (kg)	1085

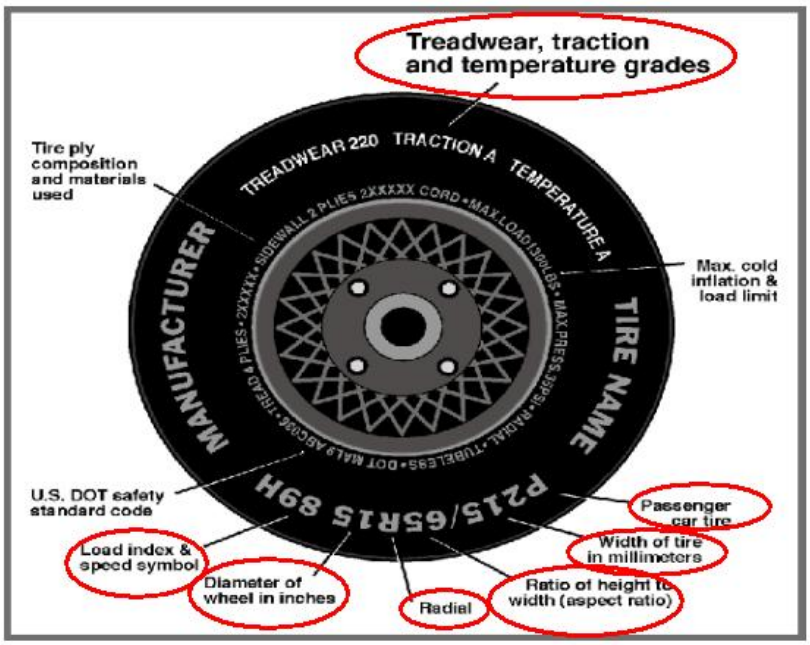
VEHICLE SEATING CAPACITY AND WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bucket	Bench	
Number of Occupants	2	2	2	6
Capacity Weight (VCW) (kg)				462
Cargo Weight (RCLW) (kg)				54

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

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



TIRE INFORMATION

Measured Paramater	Front	Rear
Max. Tire Pressure (kPa)	308	308
Cold Tire Pressure (kPa)	230	230
Recommended Tire Size	205/50R17	205/50R17
Tire Size on Vehicle	205/50R17	205/50R17
Tire Manufacturer	Toyo	Toyo
Treadwear	300	300
Traction	A	A
Temperature Grades	A	A
Tire Plies - Sidewall	3 Polyester	3 Polyester
Tire Plies - Body	2 Steel, 2 Polyester, 1 Nylon	2 Steel, 2 Polyester, 1 Nylon
Load Index/Speed Symbol	89V	89V
Tire Material	Steel, Polyester, Nylon	Steel, Polyester, Nylon
DOT Safety Code Right	N3H4 CC24107	N3H4 CC24107
DOT Safety Code Left	N3H4 CC24107	N3H4 CC24107

DATA SHEET NO. 2…(CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	439	348	787	476	403	879
Right	kg	439	318	757	478	388	866
Ratio	%	56.9	43.1	100.0	54.7	45.3	100.0
Totals	kg	878	666	1544	954	791	1745

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1544
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Weight (RCLW)	kg	54
Calculated Target Vehicle Test Weight (TVTW)	kg	1750

TEST VEHICLE ATTITUDE AND CG

	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	682	688	705	708	1183
As Tested	mm	665	666	676	680	1243

Vehicle Wheel Base (mm): 2745

Weight of Ballast Secured in Cargo Area (kg): 0

Weight of Items Removed (kg): 33

Vehicle Components Removed: Third row seat, rear carpeting, spare tire and tools

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

FUEL SYSTEM DATA

Fuel System Capacity from Owner's Manual (L): 59.80

Actual Test Volume with Entire Fuel System Filled (L): 55.26

Test Fluid Type: Stoddard Solvent

Kinematic Viscosity: as per ASTM Standard D484-71 Red

Is Vehicle Fuel Pump Electric or Mechanical? electric

If electric, does pump operate with the ignition switch "ON" & engine "OFF"? yes

Fuel System Particulars: The fuel pump operates when the starter or engine is activated.

DATA SHEET NO. 3

POST-TEST IMPACT DATA

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

SPEED TRAP DATA

Measured Paramater	Units	Requirement	Value
Trap No. 1 Velocity	km/h	55.1 to 57.12	56.03
Trap No. 2 Velocity	km/h	55.1 to 57.12	Failed

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4390	4125	265
Center	mm	4610	4050	560
Right Side	mm	4390	4128	262

VEHICLE REBOUND FROM BARRIER

Measured Paramater	Units	Value
Left Side	mm	490
Center	mm	540
Right Side	mm	550
Average	mm	527

DATA SHEET NO. 4

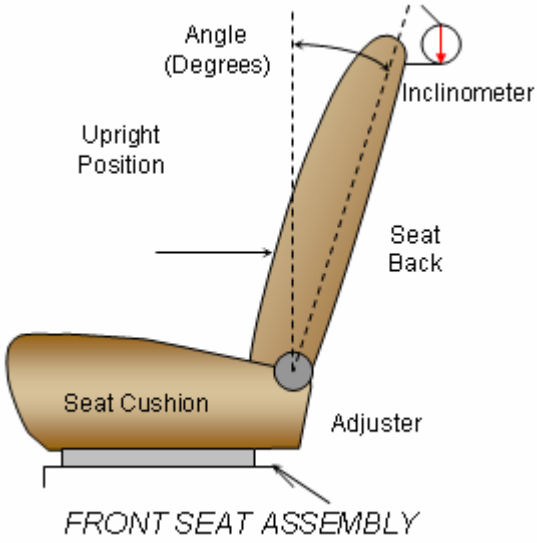
TEST VEHICLE INFORMATION

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

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

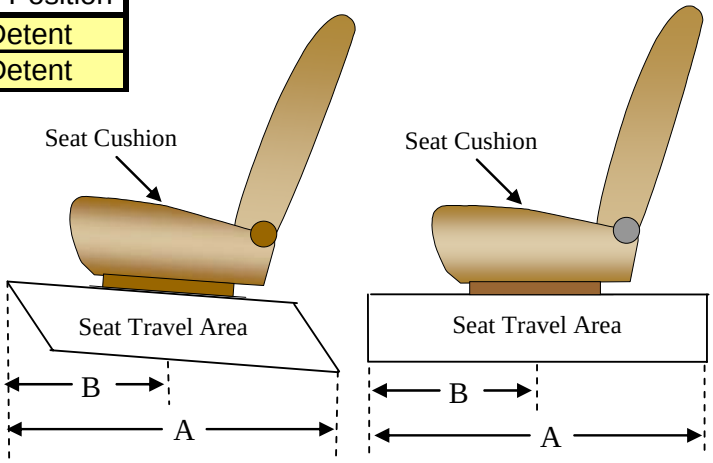
Position	Degrees
Driver w/ Seated Dummy	11.7 @ headrest
Passenger w/ Seated Dummy	9.5 @ headrest

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	10th 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	1
Passenger Seat	4	1

TEST VEHICLE INFORMATION

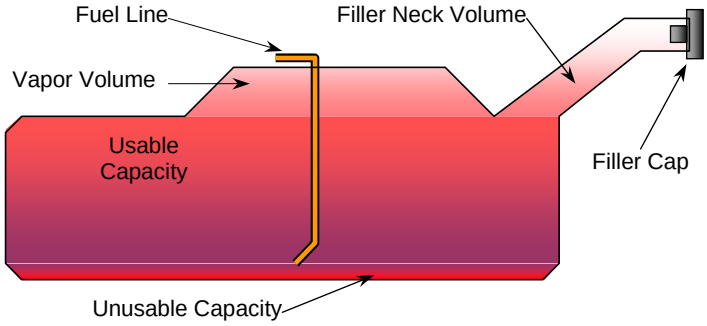
Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

FUEL TANK CAPACITY

	Liters
Usable Capacity of Standard Tank	56.81
Usable Capacity of Optional Tank	
Usable Capacity Used for FMVSS 301	55.09 to 56.21
Actual Amount of Solvent Used	55.26

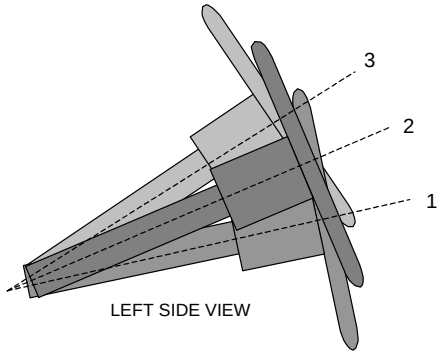
The test vehicle is equipped with an electric fuel pump. The fuel pump will operate for approximately two (2) seconds with the ignition in the "ON" position, after which the fuel pump automatically shuts off. The fuel filler door is located on the right rear fender. The standard fuel tank occupies the area Under second row 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	26.6	155
Geometric Center - Position No. 2	29.5	132
Uppermost - Position No. 3	32.5	104

DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Mazda 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

TEST DUMMY POSITION MEASUREMENTS

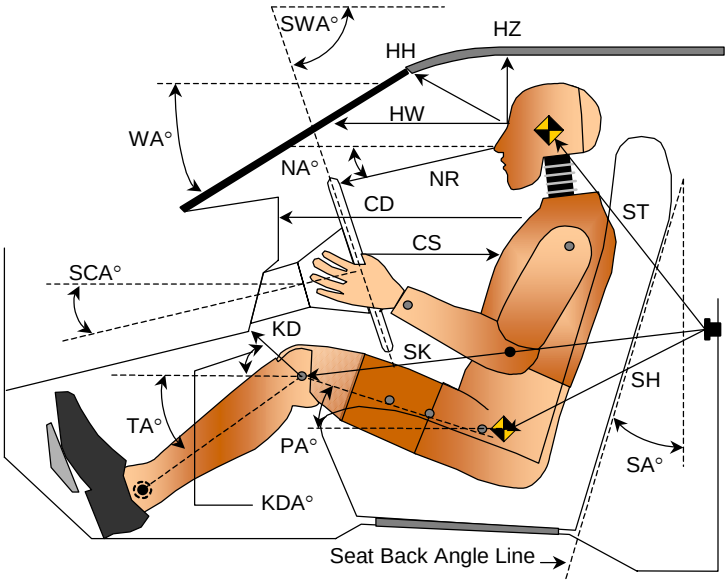
Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windshield angle		26.2		
SWA	Steering wheel angle		60.0		
SCA	Steering column angle		30.0		
SA	Seat Back angle		11.5 @ Headrest		9.5 @ Headrest
HZ	Head to roof (Z)	220	90.0	215	90.0
HH	Head to header	361		340	
HW	Head to windshield	648		670	
HR	Head to side header (Y)	305		310	
NR	Nost to rim	369	15.3		
CD	Chest to dash	505		462	
CS	Chest to steering hub	248			
RA	Rim to abdomen	146			
KDL	Left knee to dash	75	58.6	60	
KDR	Right knee to dash	80		70	64.1
PA	Pelvic angle		23.1		22.3
TA	Tibia Angle		54.1		53.7
KK	Knee to knee	310		275	
SK	Striker to outboard knee	644	2.0	664	5.4
ST	Striker to head	505	78.4	530	70.2
SH	Striker to H-Point	240	0.0	250	0.0
SHY	Striker to H-Point (Y)	145		126	
HS	Head to side window	342		350	
HD	H-Point to door	136		145	
AD	Arm to door	50		60	

DATA SHEET NO. 5…(CONTINUED)

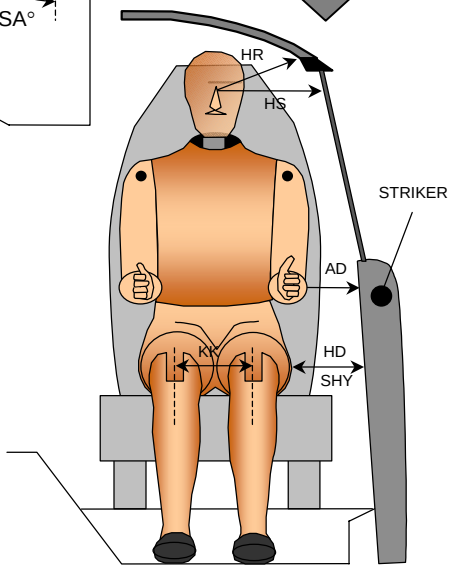
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

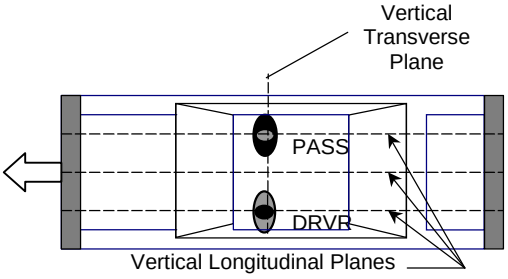
Test Program: NHTSA 35mph NCAP Test Date: 07/09/08



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

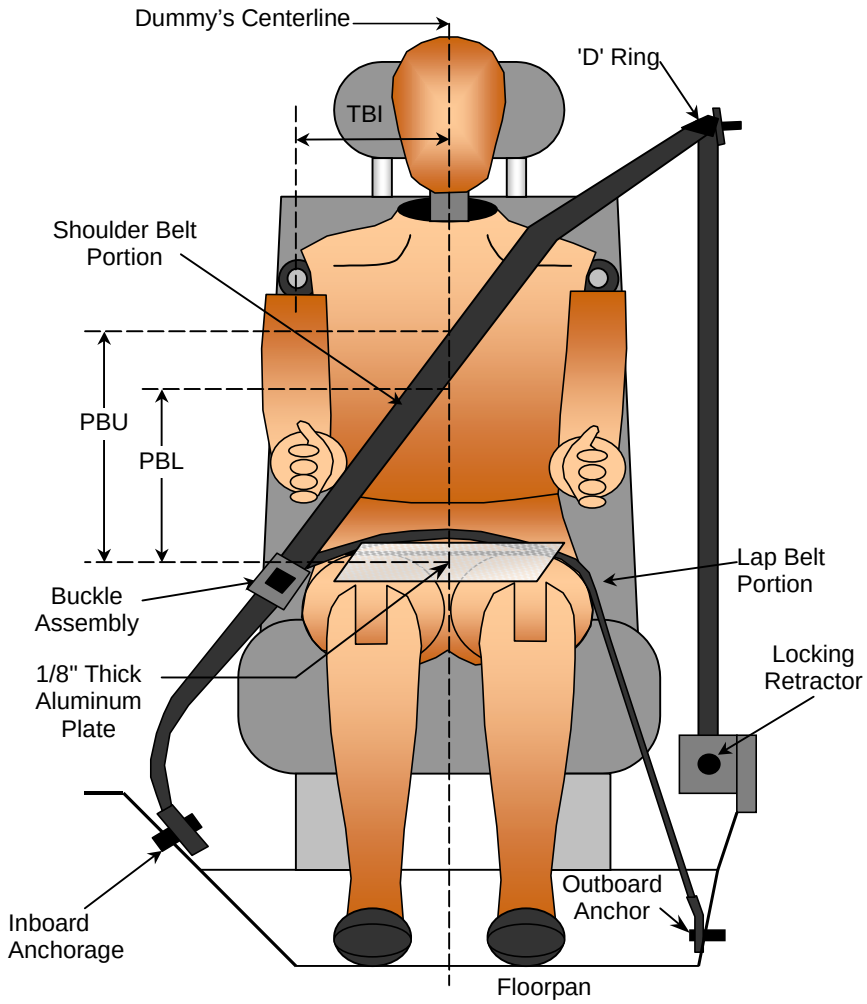


DATA SHEET NO. 6

SEAT BELT POSITIONING DATA

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08



SEAT BELT POSITIONING MEASUREMENTS

Measured Parameter	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	215	245
PBU - Top Surface of Reference to Belt Upper Edge	mm	345	350
PBL - Top Surface of Reference to Belt Lower Edge	mm	272	270
Lap Belt Tension	Newtons	10	10
Shoulder Belt Tension	N/A	Retractor	Retractor

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurement (mm)		
		X	Y	Z
1	Left Rear X-Member	1985	-720	355
2	Right Rear X-Member	1975	725	350
3	Engine Top	4050	170	690
4	Engine Bottom	3770	110	190
5	Left Brake Caliper	3815	-540	210
6	Right Brake Caliper	3810	540	205
7	Instrument Panel			[1]
8	Left Rear X-Member (Z-Axis)	1985	-720	355
9	Right Rear X-Member (Z-Axis)	1975	725	350

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

1.) Instrument Panel no longer used by NHTSA.

2.) Instrumentation not installed

DATA SHEET NO. 8

SEAT BELT ASSESSMENT TEST DATA

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
Retractor Reel to D-Ring	mm	785	785
Shoulder Belt Length as Measured on ATD	mm	903	920
Lap Belt Length as Measured on ATD	mm	874	625
Remainder of Belt on Reel	mm	744	932
Total Belt Length for Continuous Webbing Systems	mm	3306	3262

SHOULDER BELT SPOOL-OFF DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	80	120
As determined electronically	mm	45.2	122.3

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: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

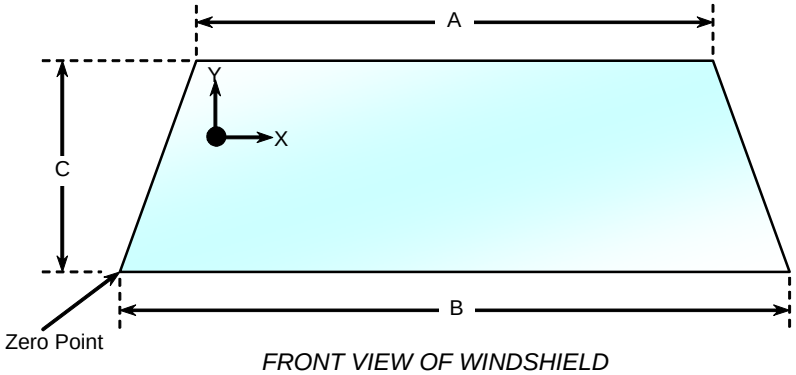
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with Rubber cement type adhesive. Plastic molding covers the windshield periphery.n/a

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: 41.1 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2211	2211	100.0
Right Side	2211	2211	100.0
Total	4422	4422	100.0



FRONT VIEW OF WINDSHIELD

WINDSHIELD DIMENSIONS

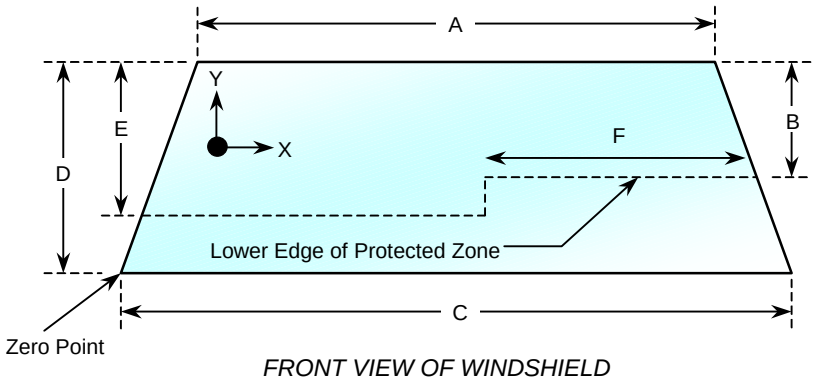
Item	Units	Segment Length	Molding Width
A	mm	1210	12
B	mm	1422	94
C-Left	mm	895	10
C-Right	mm	895	10

DATA SHEET NO. 10

WINDSHIELD ZONE INTRUSION FMVSS 219 DATA (PARTIAL)

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08



FRONT VIEW OF WINDSHIELD

WINDSHIELD AND PROTECTED ZONE

Item	Units	Value
A	mm	1210
B	mm	530
C	mm	1422
D	mm	895
E	mm	583
F	mm	465

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: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

Test Time: 3:33 PM Temperature: 41.1 ° C

STODDARD SOLVENT SPILLAGE MEASUREMENTS

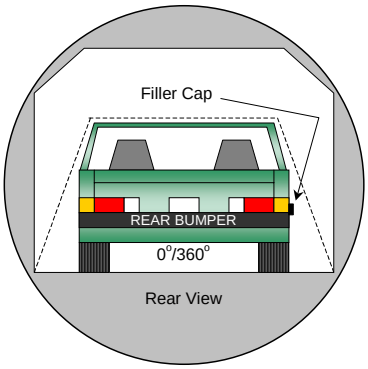
A.	From impact until vehicle motion ceases: (Maximum allowable = 1 ounce)	0
B.	For the 5 minute period after motion ceases: (Maximum allowable = 5 ounces)	0
C.	For the following 25 minutes: (Maximum allowable = 1 oz/minute)	0
D.	Spillage Details:	No leakage occurred.

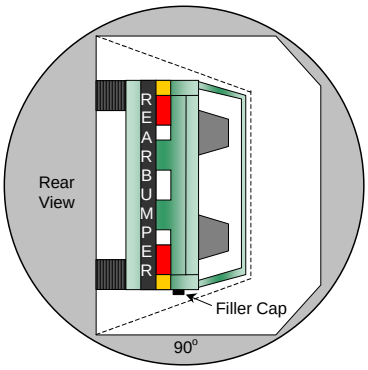
DATA SHEET NO. 12

FMVSS 301 STATIC ROLLOVER DATA

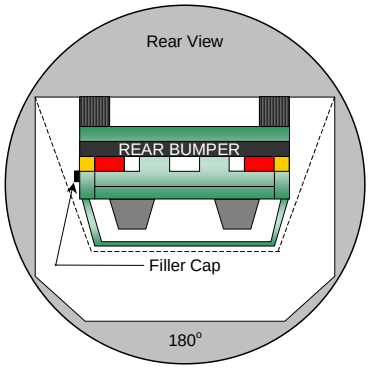
Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

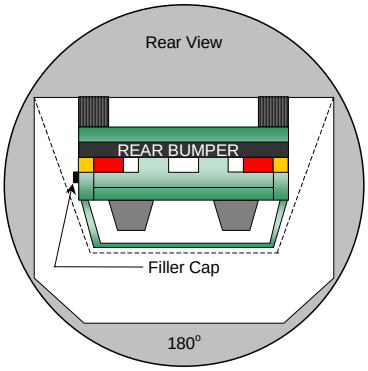




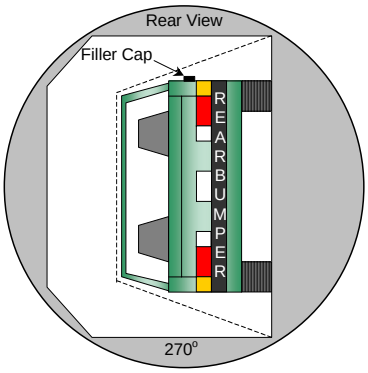
0° to 90°

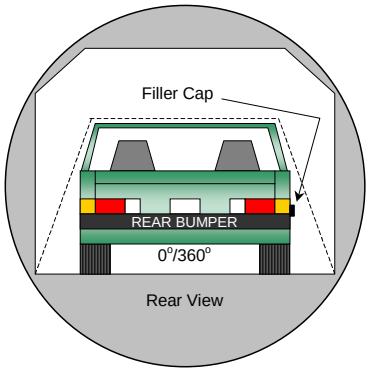


90° to 180°



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: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	80	325	405
90° to 180°	79	310	389
180° to 270°	77	315	392
270° to 360°	78	300	378

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: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

VEHICLE MEASUREMENT TABLE

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Length of test vehicle at centerline	mm	4610	4050	-560
2	RSOV to front of engine	mm	4160	3900	-260
3	RSOV to firewall centerline	mm	3645	3651	6
4	RSOV to upper leading edge of right door	mm	3222	3222	0
5	RSOV to upper leading edge of left door	mm	3225	3227	2
6	RSOV to lower leading edge of right door	mm	3168	3175	7
7	RSOV to lower leading edge of left door	mm	3174	3172	-2
8	RSOV to upper trailing edge of right door	mm	2149	2152	3
9	RSOV to upper trailing edge of left door	mm	2152	2155	3
10	RSOV to lower trailing edge of right door	mm	2234	2235	1
11	RSOV to lower trailing edge of left door	mm	2239	2241	2
12	RSOV to bottom of right A-pillar	mm	3206	3200	-6
13	RSOV to bottom of left A-pillar	mm	3206	3202	-4
14	RSOV to firewall on right side	mm	3660	3520	-140
15	RSOV to firewall on left side	mm	3660	3512	-148
16	RSOV to steering column hub	mm	2760	2930	170
17	Center of steering column to left A-pillar, Y	mm	410	415	5
18	Center of steering column to headlining, Z	mm	445	472	27
19	RSOV to right side of front bumper	mm	4390	4128	-262
20	RSOV to left side of front bumper	mm	4390	4125	-265
21	Length of engine block	mm	550	550	0
RD	RSOV to right side of dash panel	mm	2956	2947	-9
CD	RSOV to center of dash panel	mm	3000	2987	-13
LD	RSOV to left side of dash panel	mm	2961	2956	-5

DATA SHEET NO. 13…(CONTINUED)

VEHICLE STRUCTURAL MEASUREMENTS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

VEHICLE STRUCTURAL MEASUREMENT TABLE

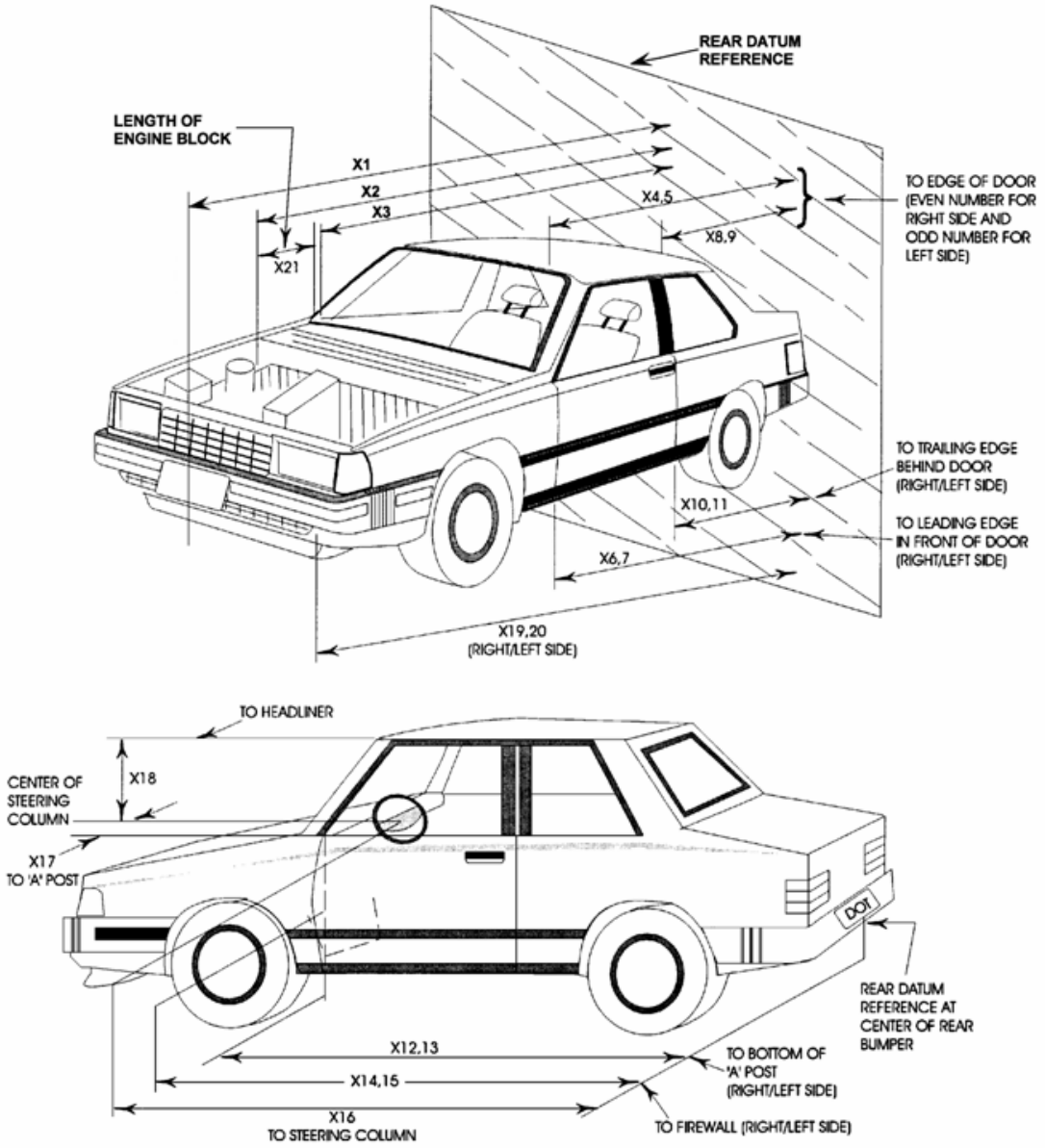
No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length	mm	4610	4050	-560
2	Total width	mm	1735	1733	-2
3	Front bumper top height	mm	615	560	-55
4	Front bumper bottom height	mm	461	310	-151
5	Longitudinal member top height	mm	601	580	-21
6	Longtidunal member bottom height	mm	496	454	-42
7	Distance between longitudinal members	mm	1000	970	-30
8	Longitudinal member width	mm	95	108	13
9	Engine top height	mm	810	755	-55
10	Engine bottom height	mm	156	114	-42
11	Engine and gearbox width	mm	565	565	0
12	Front bumper-engine distance	mm	450	266	-184
13	Front shock absorber height	mm	845	877	32
14	Front hood leading edge height	mm	750	781	31
15	Distance between front shock absorbers	mm	1135	1110	-25
16	Front bumper-front axle distance	mm	903	392	-511
17	Front axle to A-pillar distance	mm	495	420	-75
18	A Pillar to B Pillar distance	mm	978	973	-5
19	B Pillar to rear axle distance	mm	1270	1267	-3
20	B Pillar to C Pillar distance	mm	1031	1028	-3
21	Roof sill bottom height	mm	1475	1462	-13
22	Roof sill top height	mm	1565	1555	-10
23	Floor sill bottom height	mm	166	155	-11
24	Floor sill top height	mm	330	310	-20

DATA SHEET NO. 13…(CONTINUED)

VEHICLE MEASUREMENTS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08



DATA SHEET NO. 14

CAMERA LOCATIONS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

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	-2039	7541	-1222	0	8105	20	1000
3	Closeup Left Side	-1455	6246	-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	-2101	6345	-1003	0	7409	20	1000
8	Closeup Right Side	-1542	5926	-1247	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	-3398	0	1495	90		8	1000
16	Driver Side Dummy On-Board	-3210	215	-1540	-24	1100	12	1000
17	Passenger Side Dummy On-Board	-3210	-205	-1540	-25	1110	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.

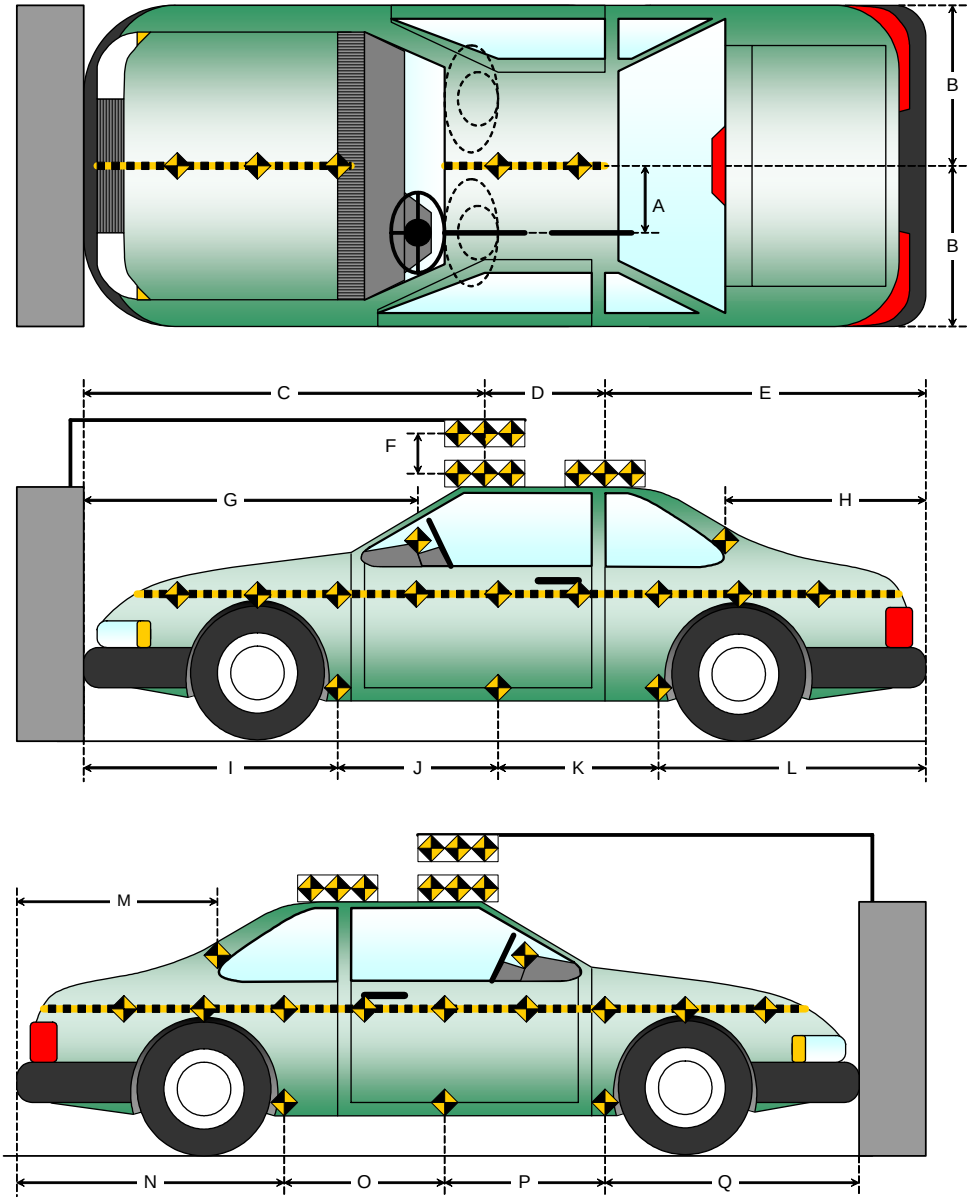
DATA SHEET NO. 15

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

All Dimensions in Millimeters (mm)	
Item	Value
A	365
B	868
C	2095
D	615
E	2018
F	155
G	2930
H	1017
I	1335
J	947
K	947
L	1368
M	1014
N	1369
O	947
P	947
Q	1340



DATA SHEET NO. 16

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

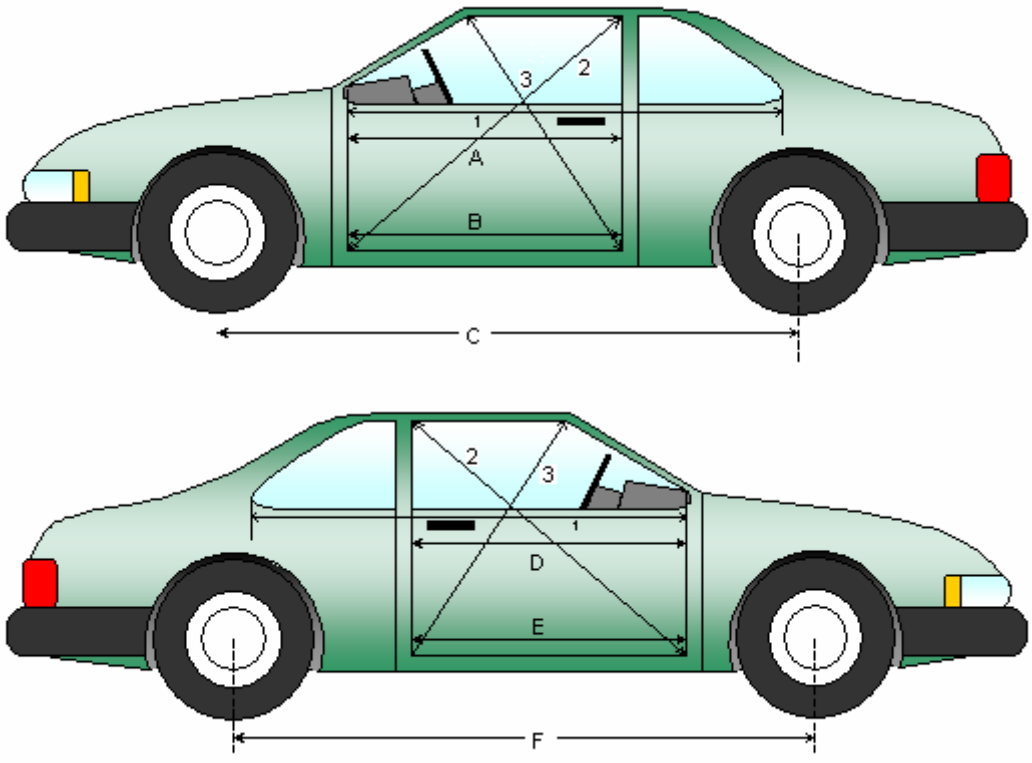
Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

DOOR OPENING WIDTH TABLE

Item	Description	Units	Pre-Test	Post-Test	Difference
1L	Left Side	mm	978	974	4
2L	Left Side (Diagonally)	mm	1495	1498	-3
3L	Left Side (Diagonally)	mm	1050	1042	8
1R	Right Side	mm	980	976	4
2R	Right Side (Diagonally)	mm	1000	1002	-2
3R	Right Side (Diagonally)	mm	1495	1498	-3

WHEELBASE MEASURMENT TABLE

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2745	2657	88
F	Right Side Wheelbase	mm	2745	2665	80



DATA SHEET NO. 16…(CONTINUED)

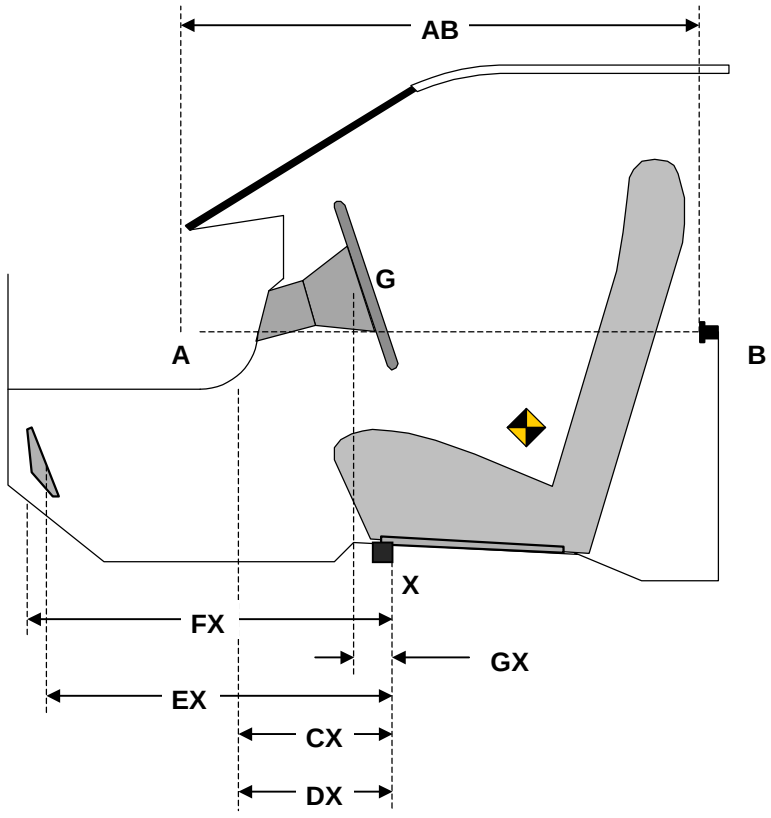
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

DRIVER COMPARTMENT INTRUSION TABLE

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Windown Jam)	mm	978	974	4
CX	Left Knee Bolster to X	mm	150	156	-6
DX	Right Knee Bolster to X	mm	150	153	-3
EX	Brake Pedal to X	mm	511	497	14
FX	Foot Rest to X	mm	520	508	12
GX	Center of Steering Wheel Hub to X	mm	50	102	-52

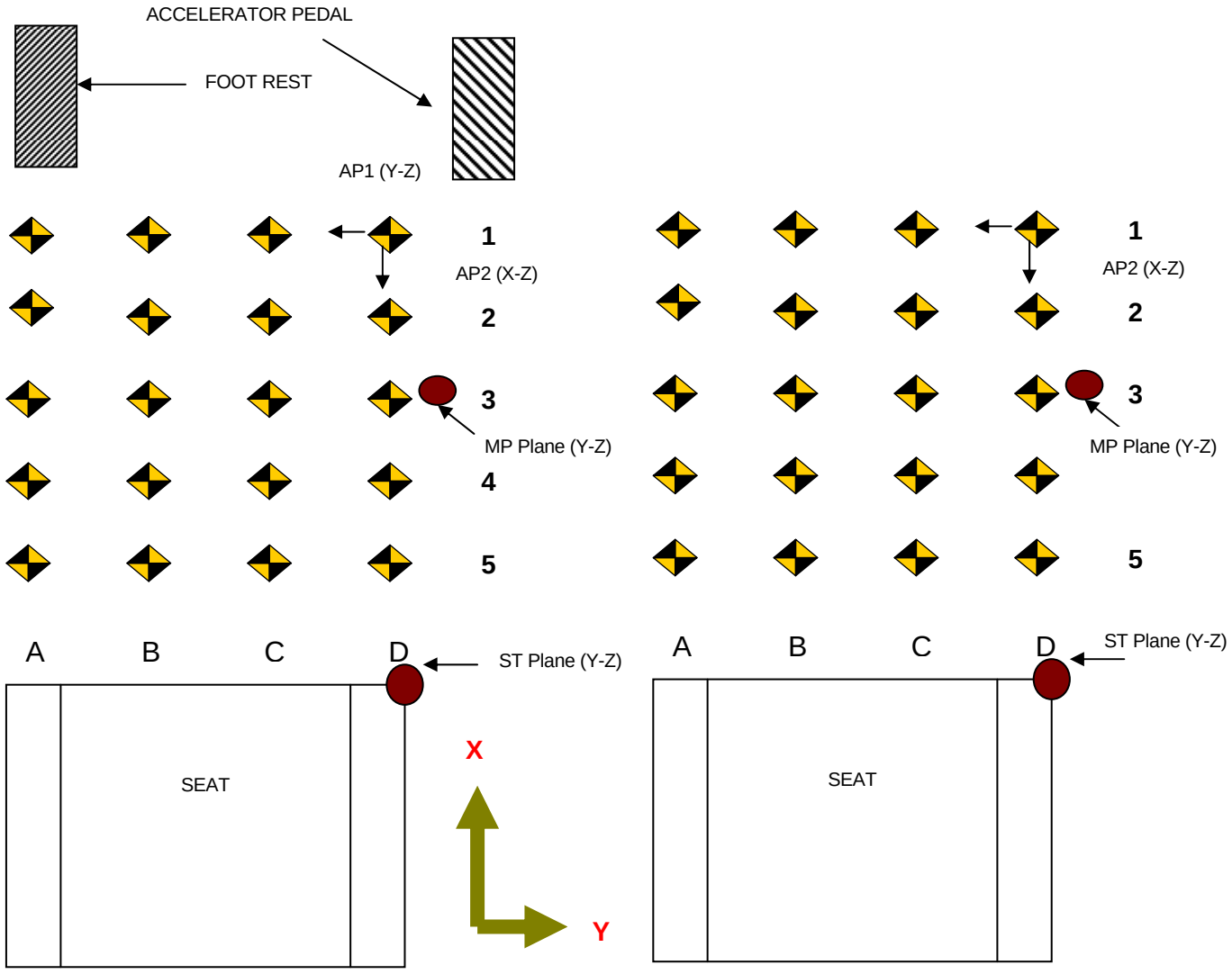


DATA SHEET NO. 16…(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08



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: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

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	626	684	668	666	614	675	645	633	12	9	23	33
2	564	581	582	585	563	576	573	569	1	5	9	16
3	483	483	479	481	487	481	474	468	-4	2	5	13
4	345	345	341	341	353	346	336	332	-8	-1	5	9
5	201	204	208	215	207	204	203	206	-6	0	5	9

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	0	120	228	376	38	159	259	402	-38	-39	-31	-26
2	0	116	231	382	27	142	258	408	-27	-26	-27	-26
3	3	116	227	377	27	141	251	401	-24	-25	-24	-24
4	3	121	224	375	21	138	242	394	-18	-17	-18	-19
5	5	120	220	371	15	132	232	386	-10	-12	-12	-15

DRIVER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-46	7	-14	-14	-70	-16	-36	-48	24	23	22	34
2	42	49	50	45	27	39	36	40	15	10	14	5
3	77	75	78	71	64	61	68	68	13	14	10	3
4	77	76	72	71	64	65	61	66	13	11	11	5
5	80	80	76	72	64	65	66	66	16	15	10	6

DATA SHEET NO. 16…(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

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	637	647	672	638	622	626	652	624	15	21	20	14
2	555	567	574	490	550	560	573	565	5	7	1	9
3	319	464	472	341	446	462	469	481	3	2	3	9
4	192	328	332	207	316	327	331	339	3	1	1	2
5	192	196	202	207	190	195	203	207	2	1	-1	0

PASSENGER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-410	-242	-160	-32	-404	-234	-160	-33	-6	-8	0	1
2	-403	-247	-148	-31	-402	-242	-142	-24	-1	-5	-6	-7
3	-397	-238	-143	-19	-397	-235	-140	-21	0	-3	-3	2
4	-388	-233	-134	-17	-387	-231	-132	-15	-1	-2	-2	-2
5	-384	-231	-125	-14	-383	-231	-128	-12	-1	0	3	-2

PASSENGER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	6	-1	17	-32	4	-4	10	-42	2	3	7	10
2	63	64	55	33	81	78	74	27	-18	-14	-19	6
3	79	84	80	80	105	91	83	79	-26	-7	-3	1
4	79	78	80	79	104	88	84	80	-25	-10	-4	-1
5	80	80	83	82	98	92	93	77	-18	-12	-10	5

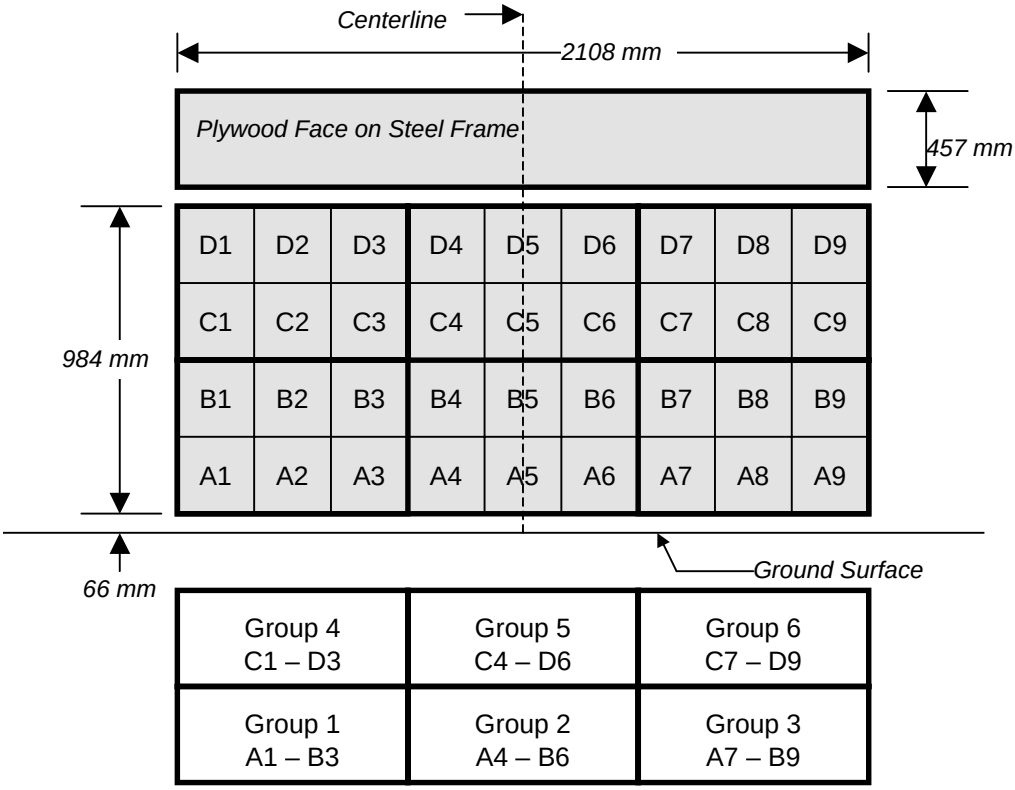
DATA SHEET NO. 17

FIXED BARRIER LOAD CELL LOCATIONS

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

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: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08

VEHICLE INFORMATION

VIN: JM1CR29L080302816 Wheelbase (mm): 2745

Vehicle Size Category: 5-Door Passenger Car Test Weight (kg): 1745

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): 56.03

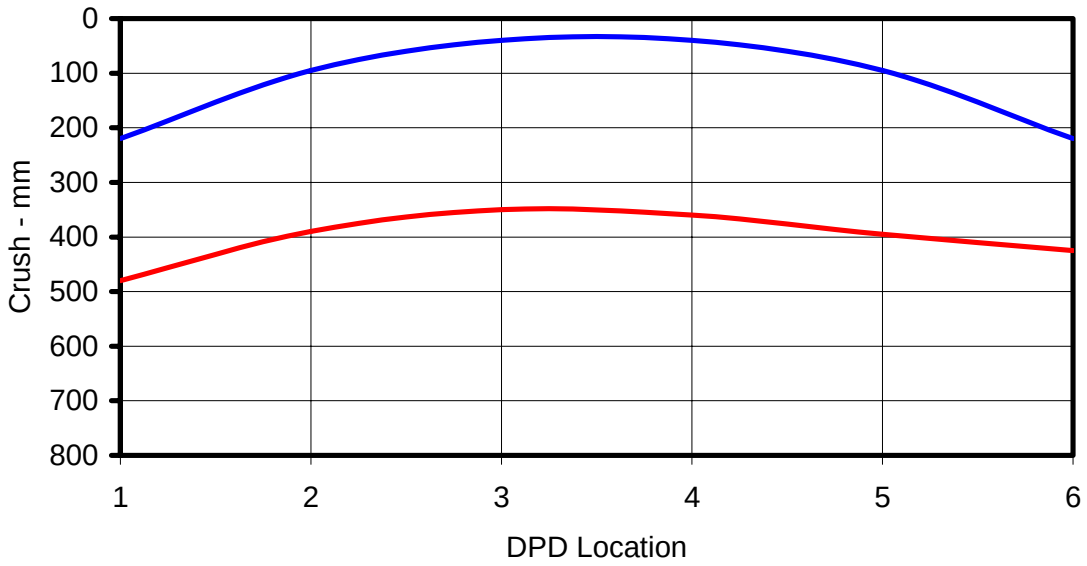
Velocity Change (km/h): 64.5 Time of Separation (msec): 72.9

CRUSH PROFILE

Collision Deformation Classification: 12FDEW6 Midpoint of Damage: Vehicle Centerline

Damage Region Length: 1735 Impact Mode: Full frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side of vehicle	mm	220	480	-260
C2	Crush zone 2 on left side of vehicle	mm	95	390	-295
C3	Crush zone 3 on left side of vehicle	mm	40	350	-310
C4	Crush zone 4 on right side of vehicle	mm	40	360	-320
C5	Crush zone 5 on right side of vehicle	mm	95	395	-300
C6	Crush zone 6 at right side of vehicle	mm	220	425	-205

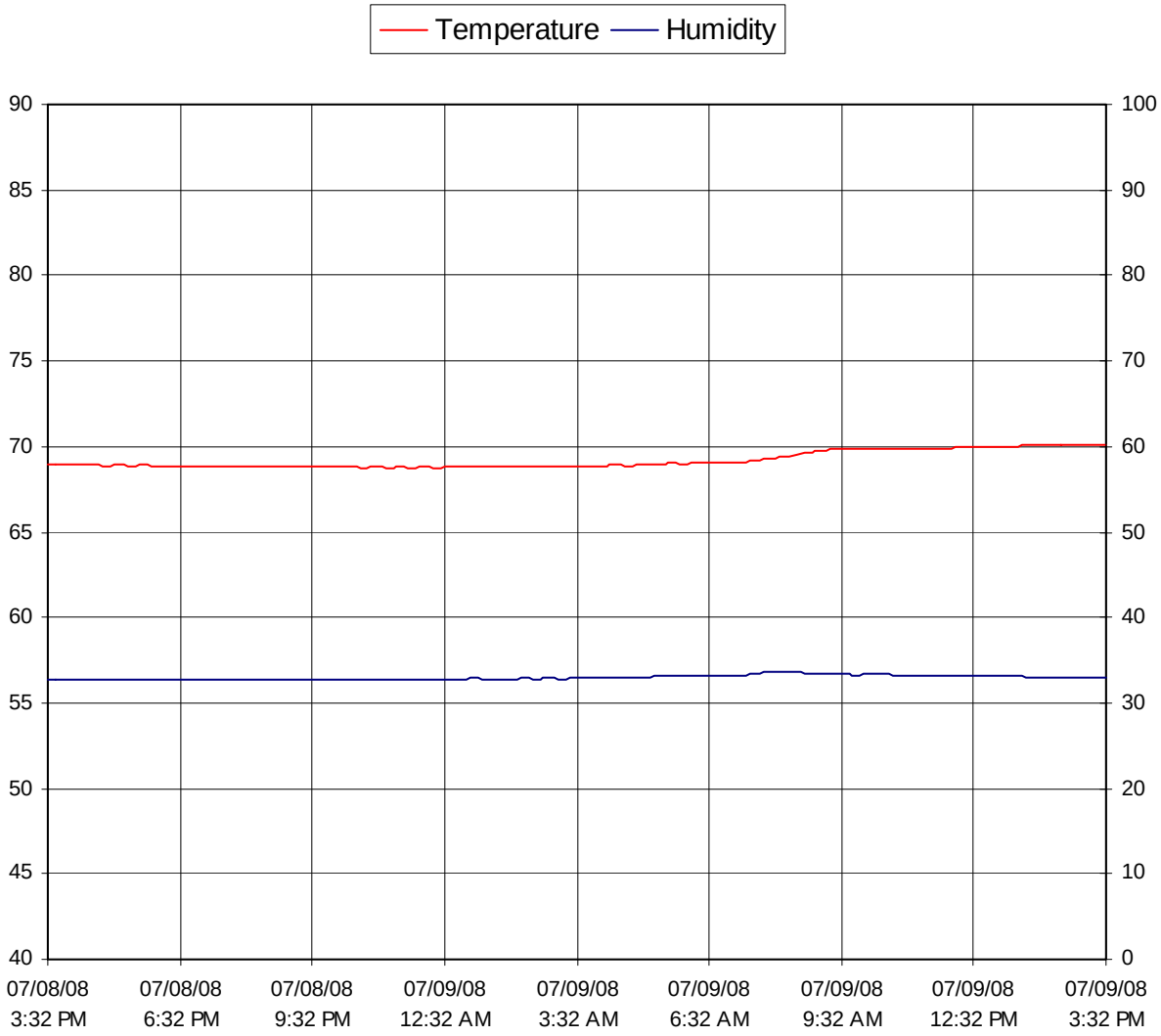


DATA SHEET NO. 19

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2008 Mazda5 5-Door Passenger Car NHTSA No.: Z85400

Test Program: NHTSA 35mph NCAP Test Date: 07/09/08



APPENDIX A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

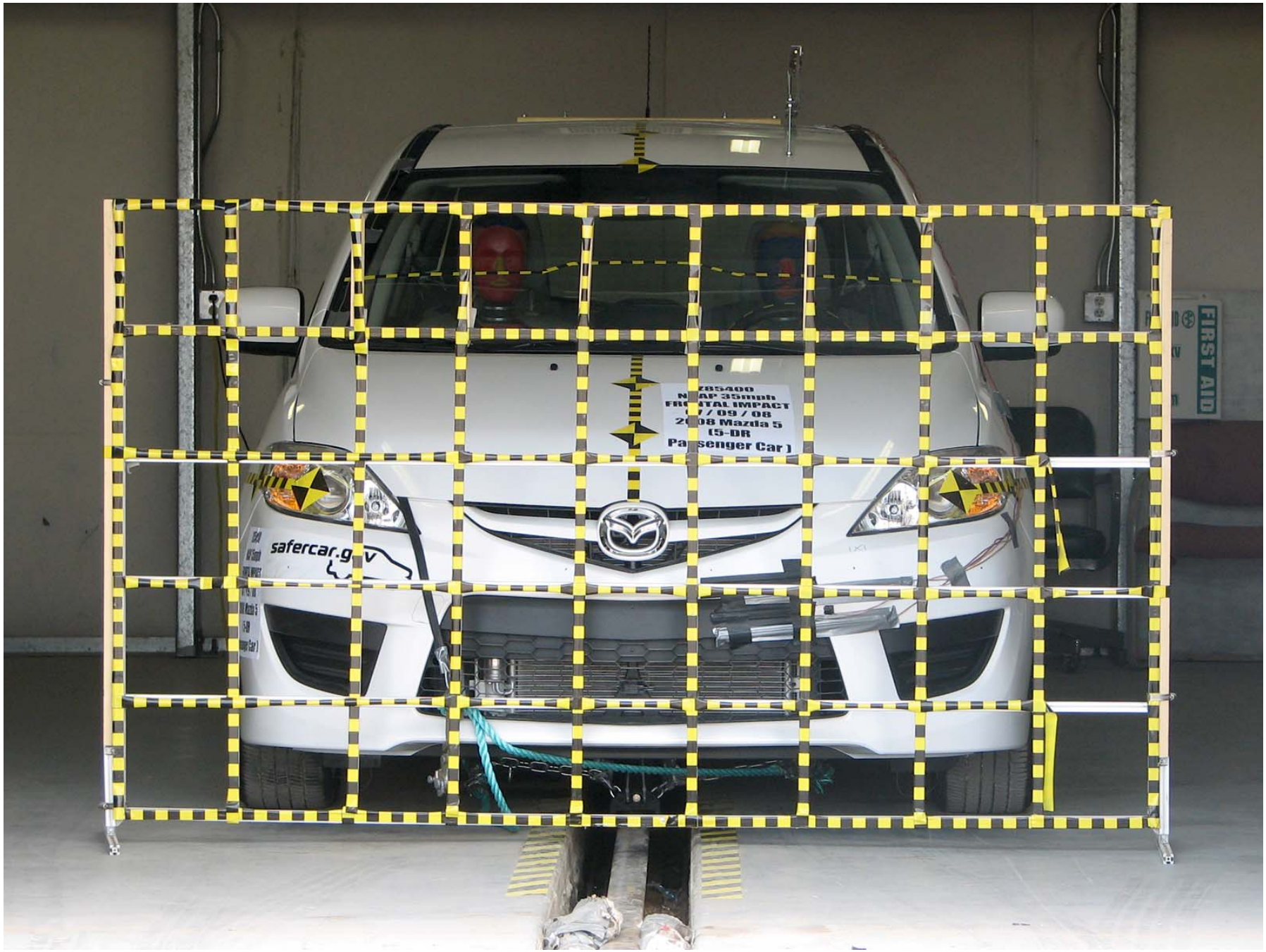


Figure A-1: Load Cell Location

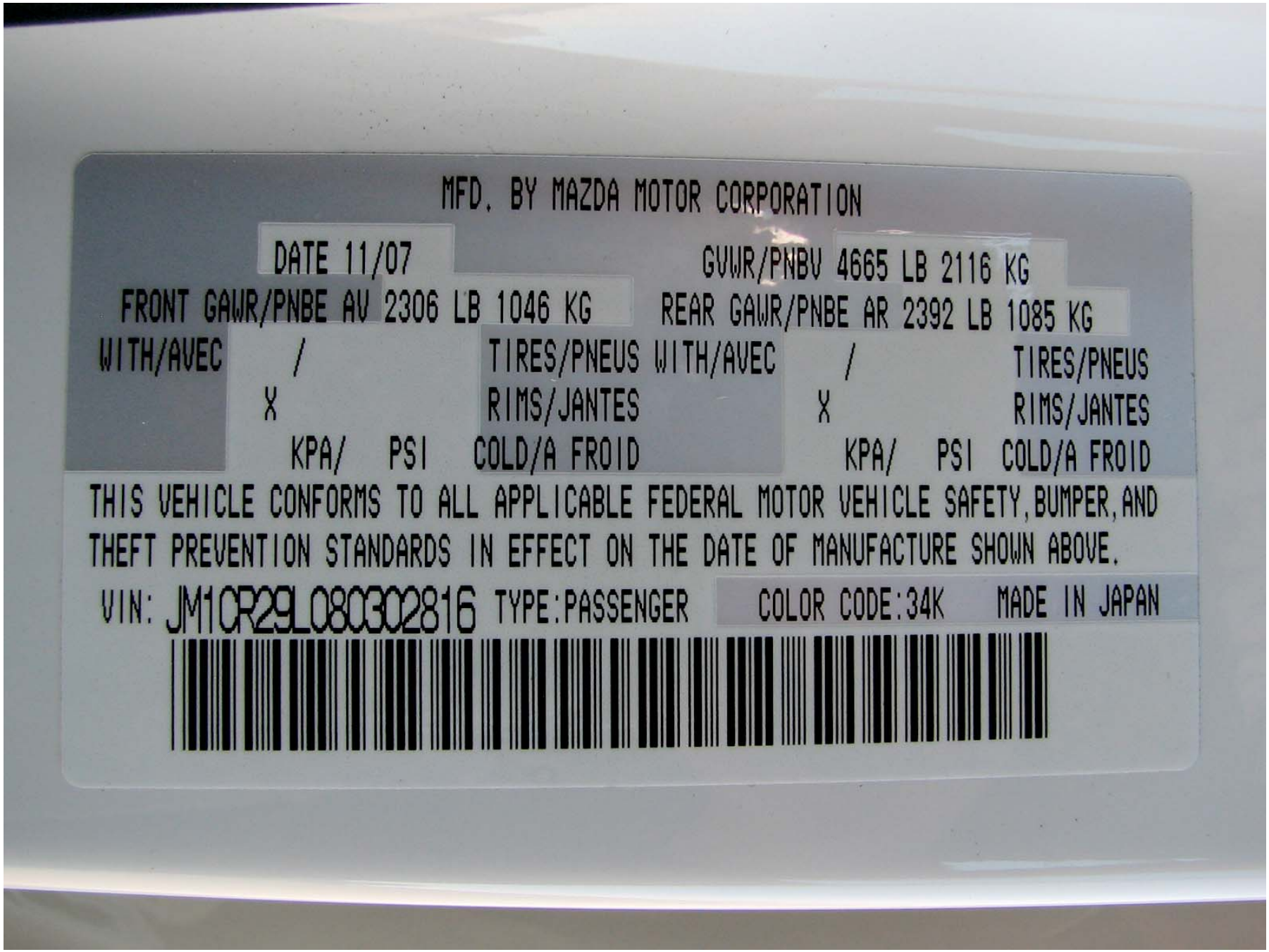


Figure A-2: Manufacturer's Label

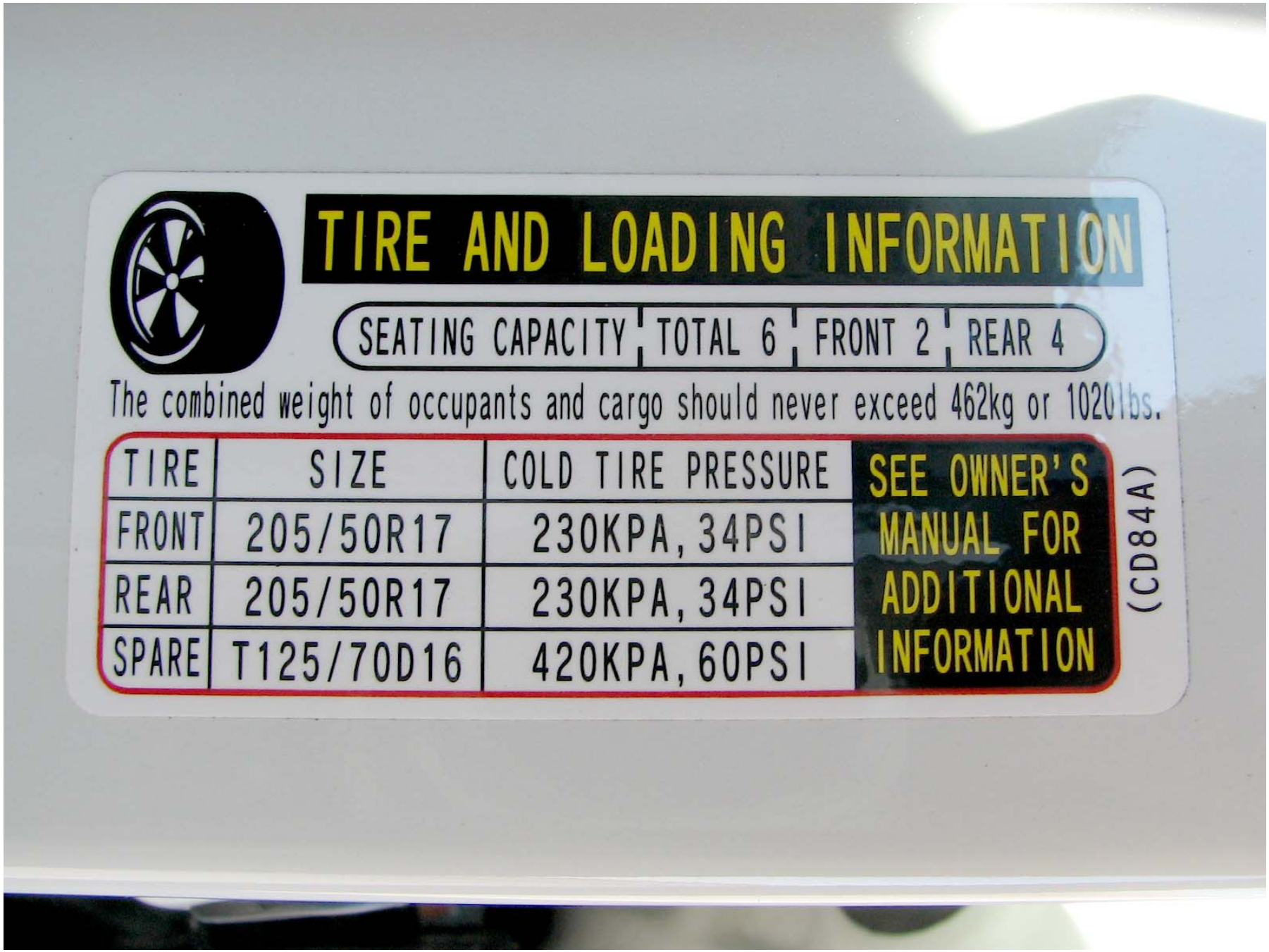


Figure A-3: Tire Placard

Figure A-4: Right Front ¾ View, As Received

Figure A-5: Left Rear ¾ View, as Received

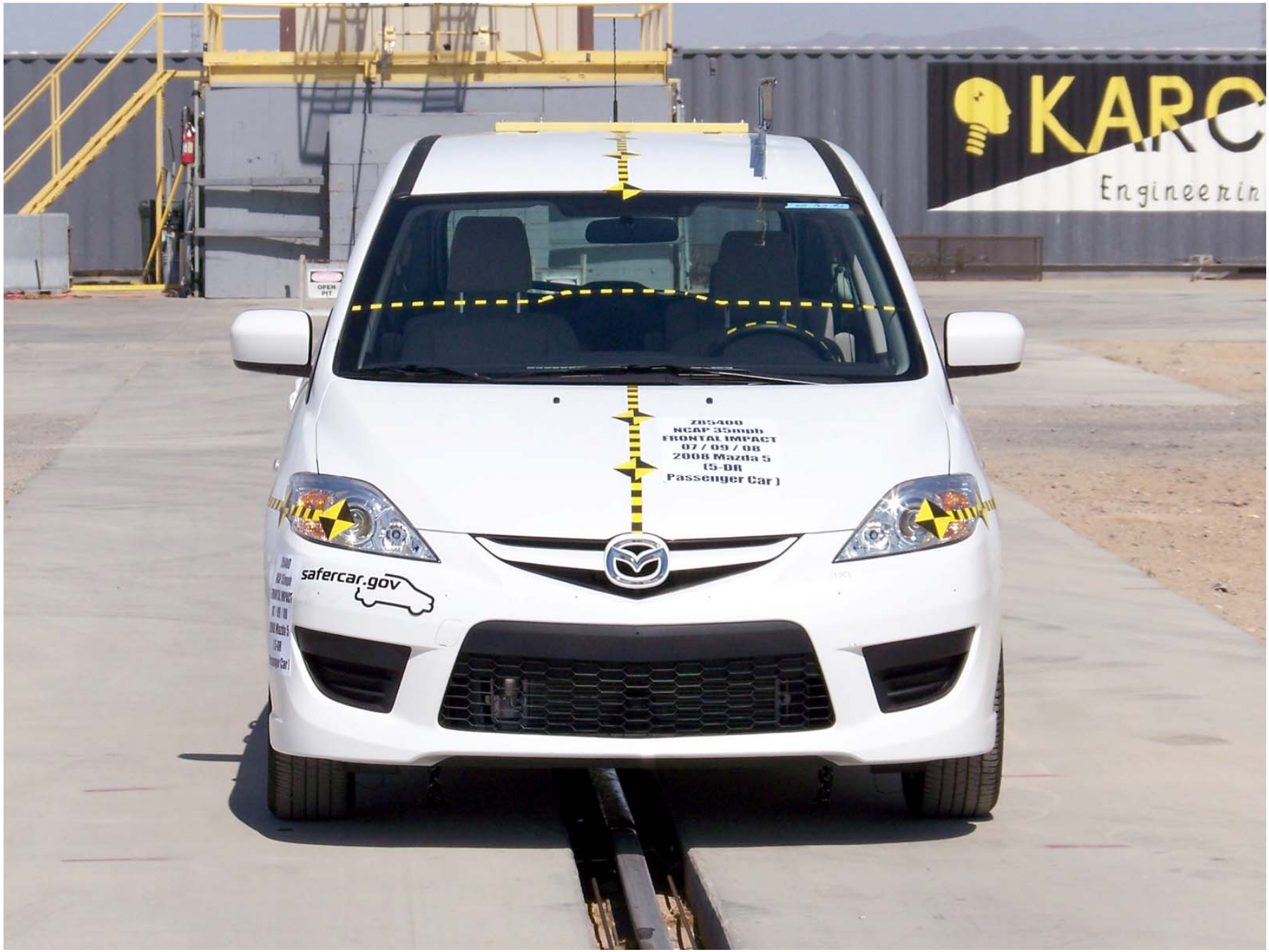


Figure A-6: Pre-Test Front View

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 ¾ View

Figure A-15: Post-Test Left Rear ¾ View

Figure A-16: Post-Test Left Side ¾ View of Doors After Impact

Figure A-17: Post-Test Right Side ¾ View of Doors After Impact

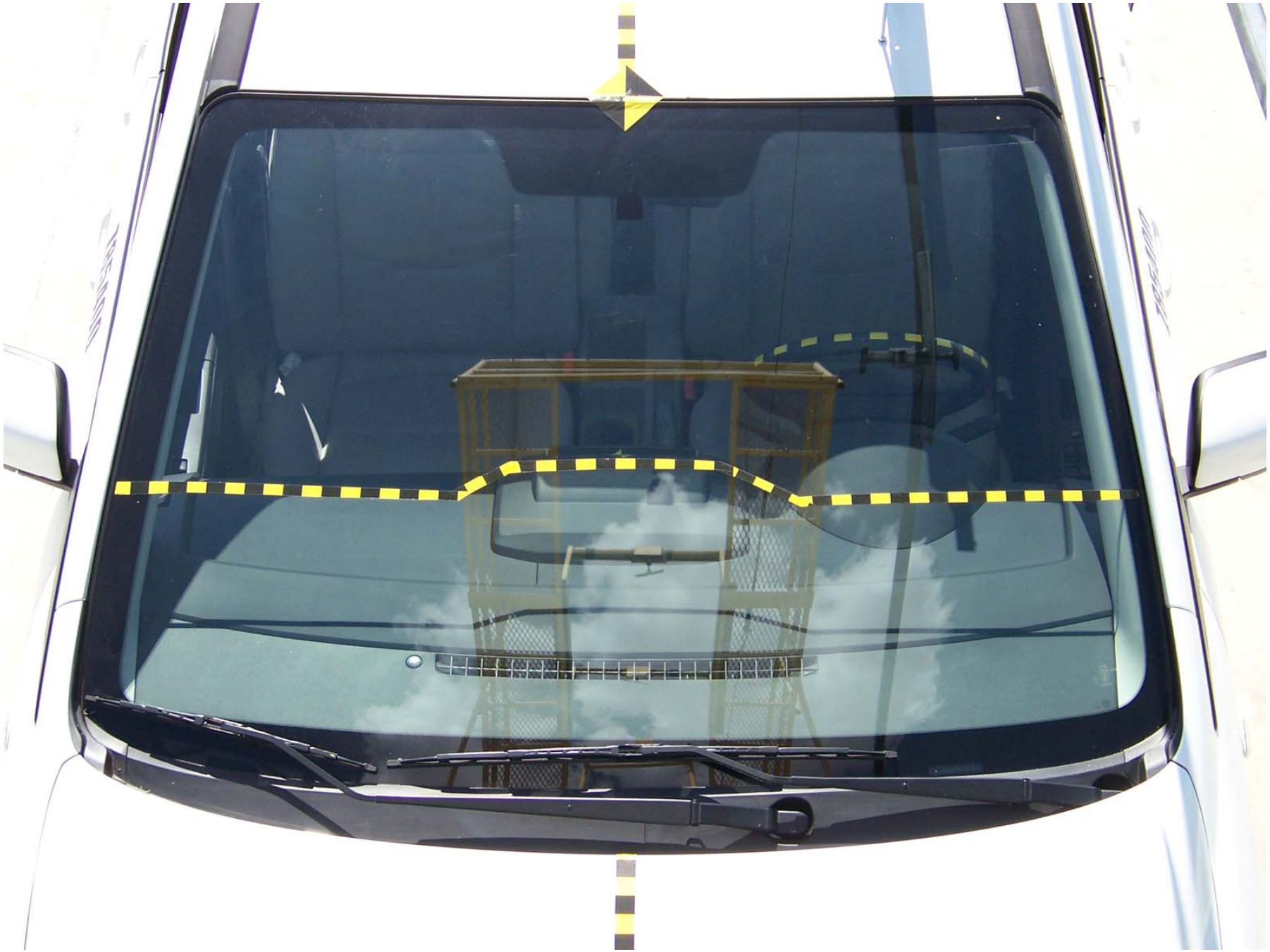


Figure A-18: Pre-Test Windshield

Figure A-19: Post-Test Windshield

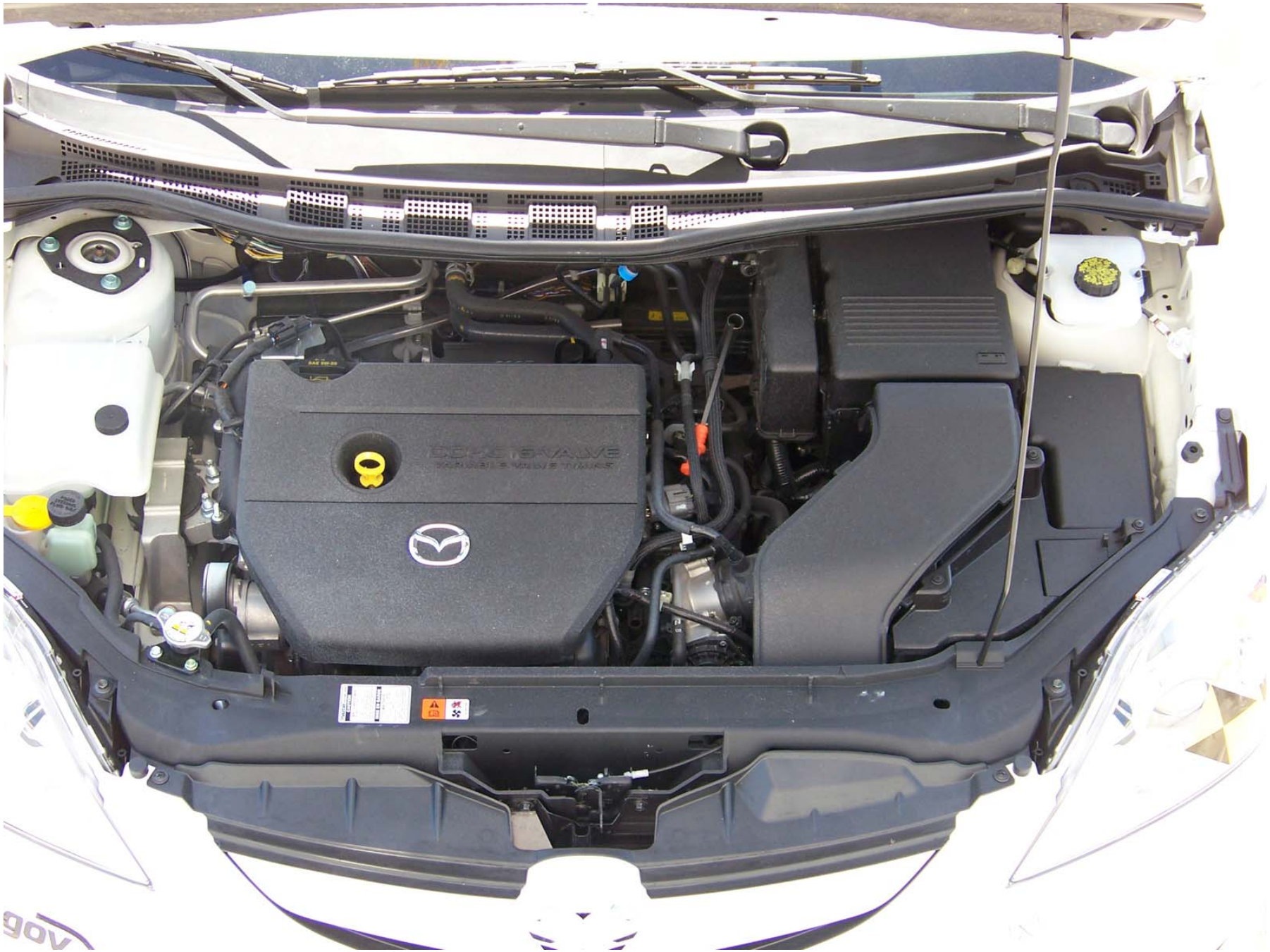


Figure A-20: Pre-Test Engine Compartment

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

Figure A-22: Pre-Test Fuel Cap

Figure A-23: Post-Test Fuel Cap

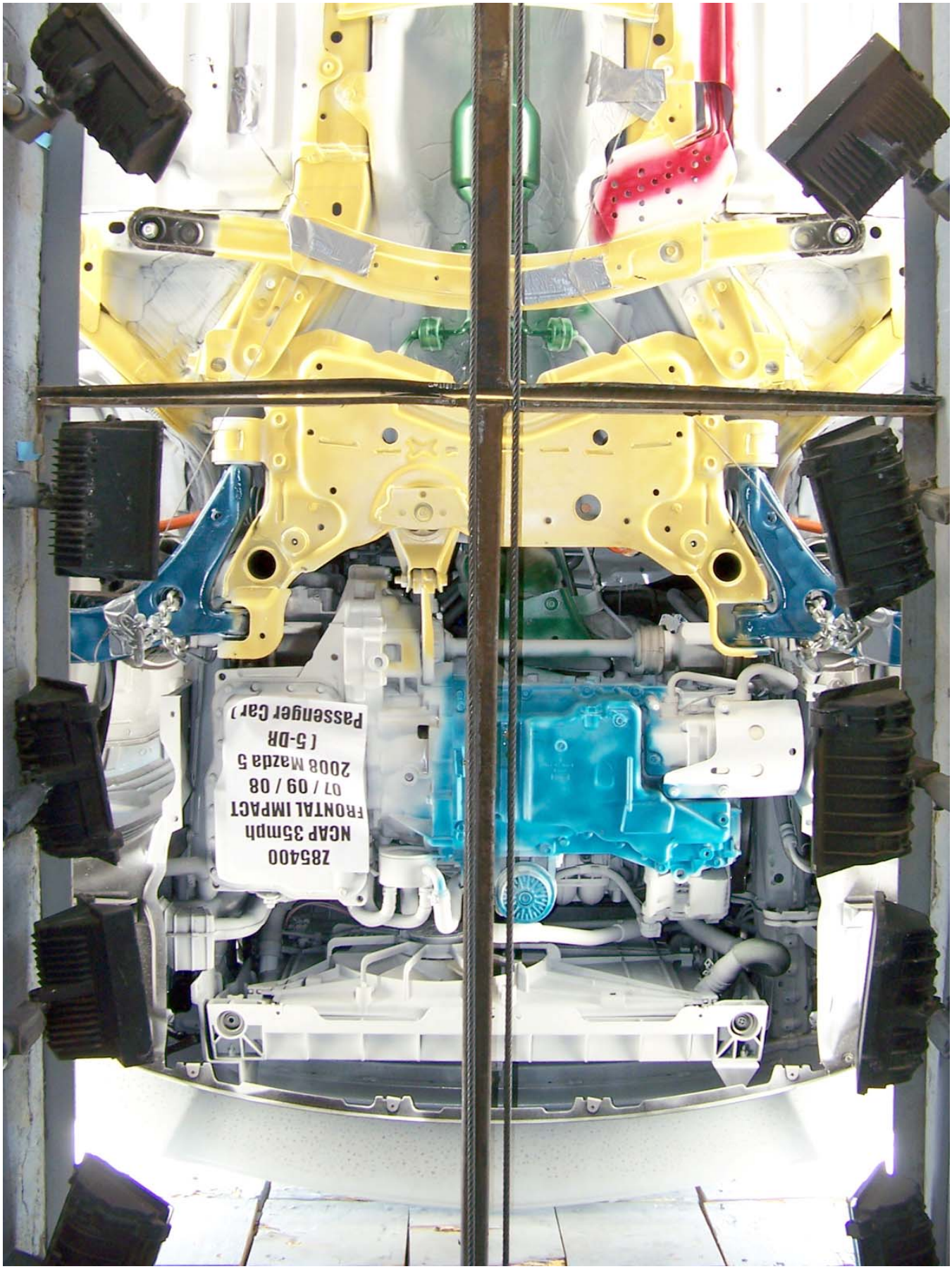


Figure A-24: Pre-Test Front Underbody

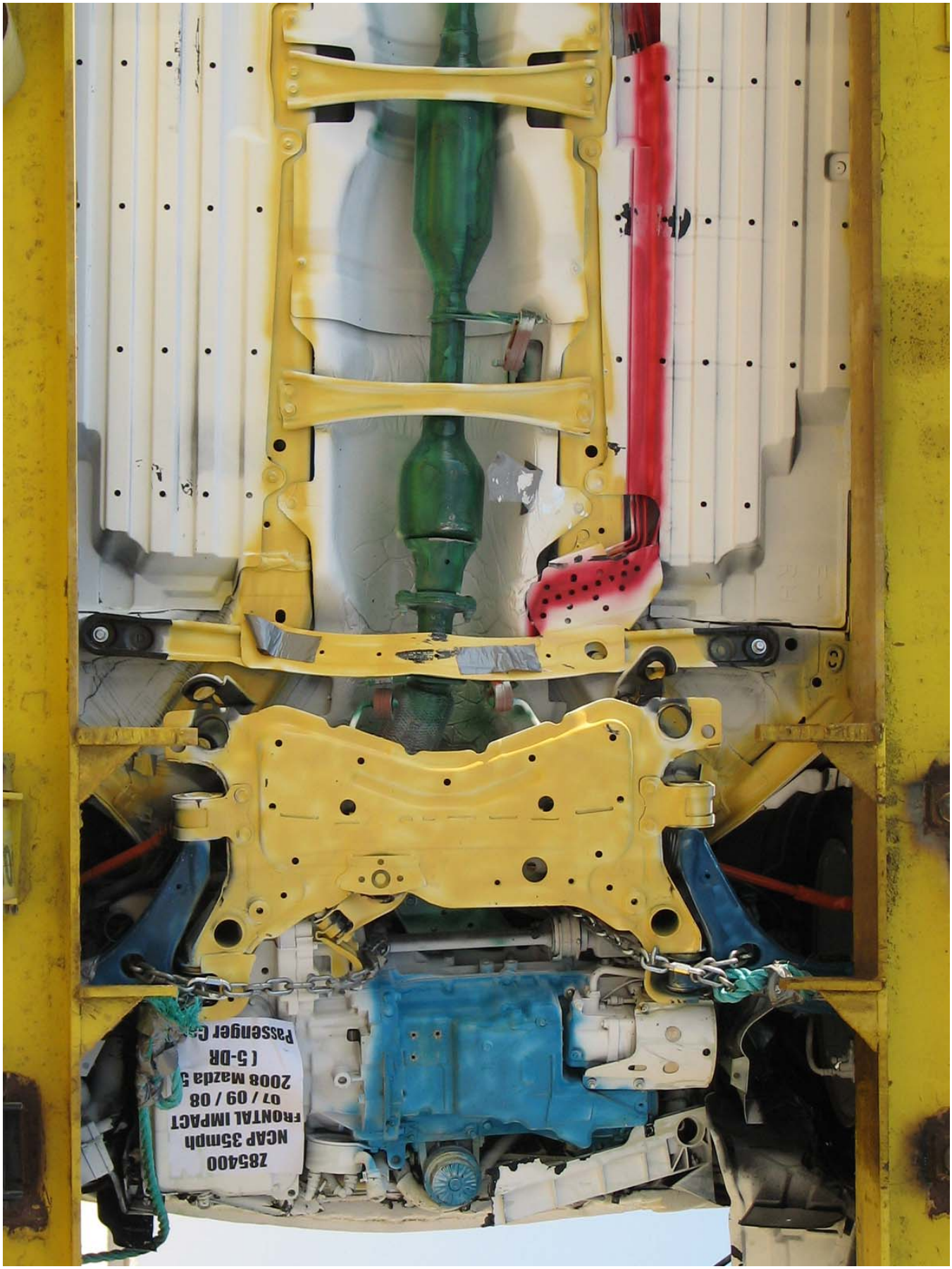


Figure A-25: Post-Test Front Underbody

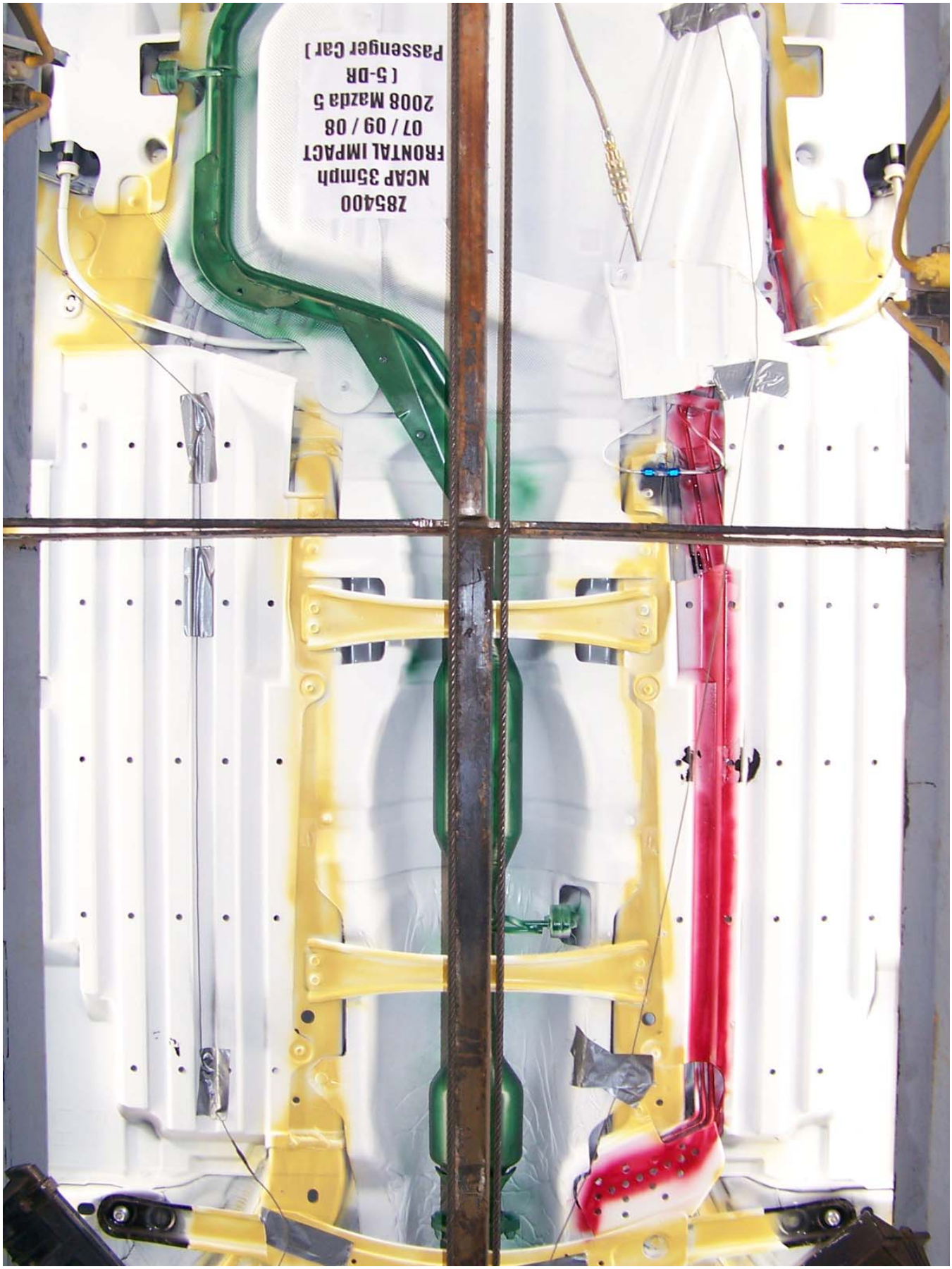


Figure A-26: Pre-Test Mid Underbody

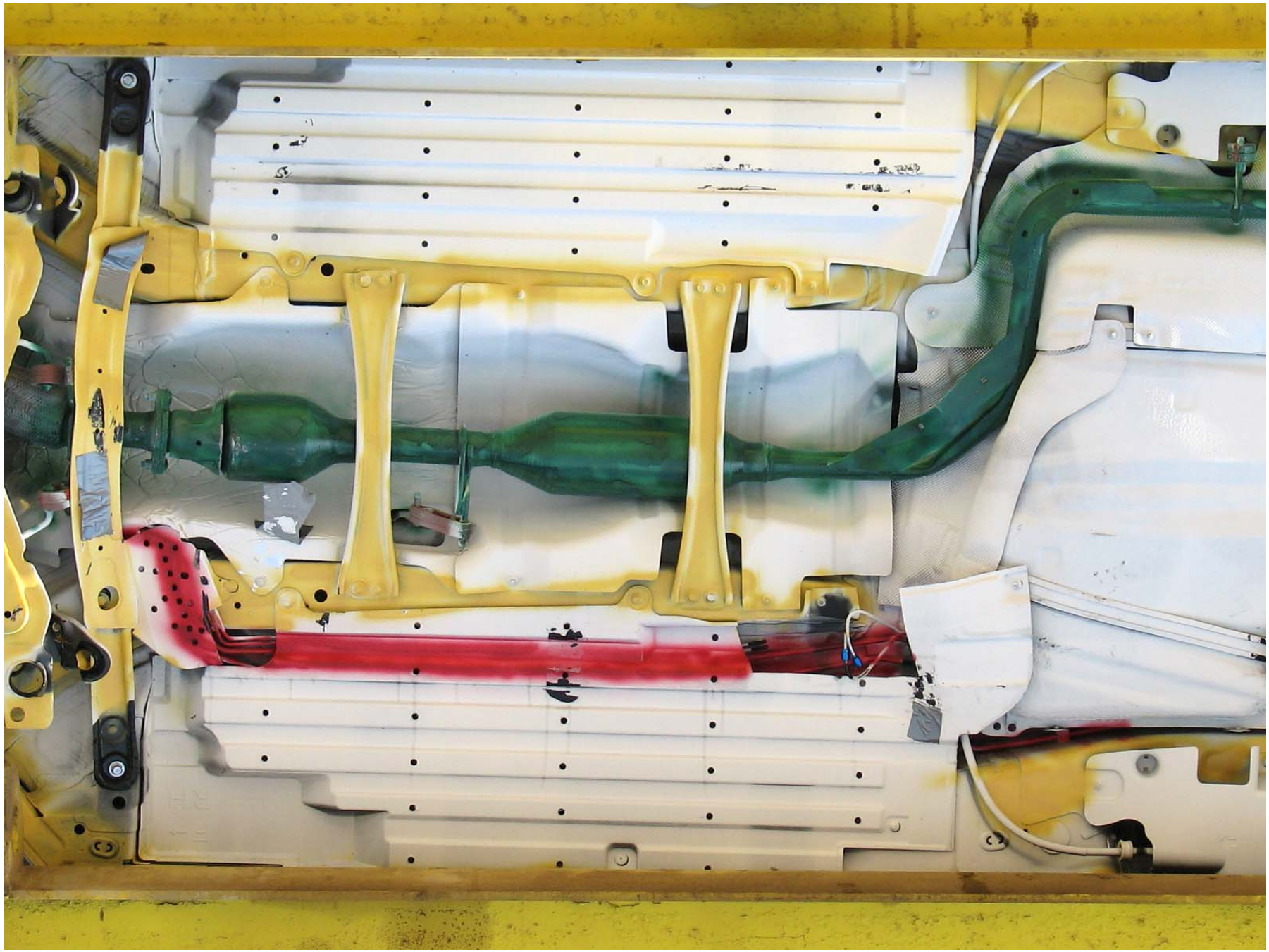


Figure A-27: Post-Test Mid Underbody

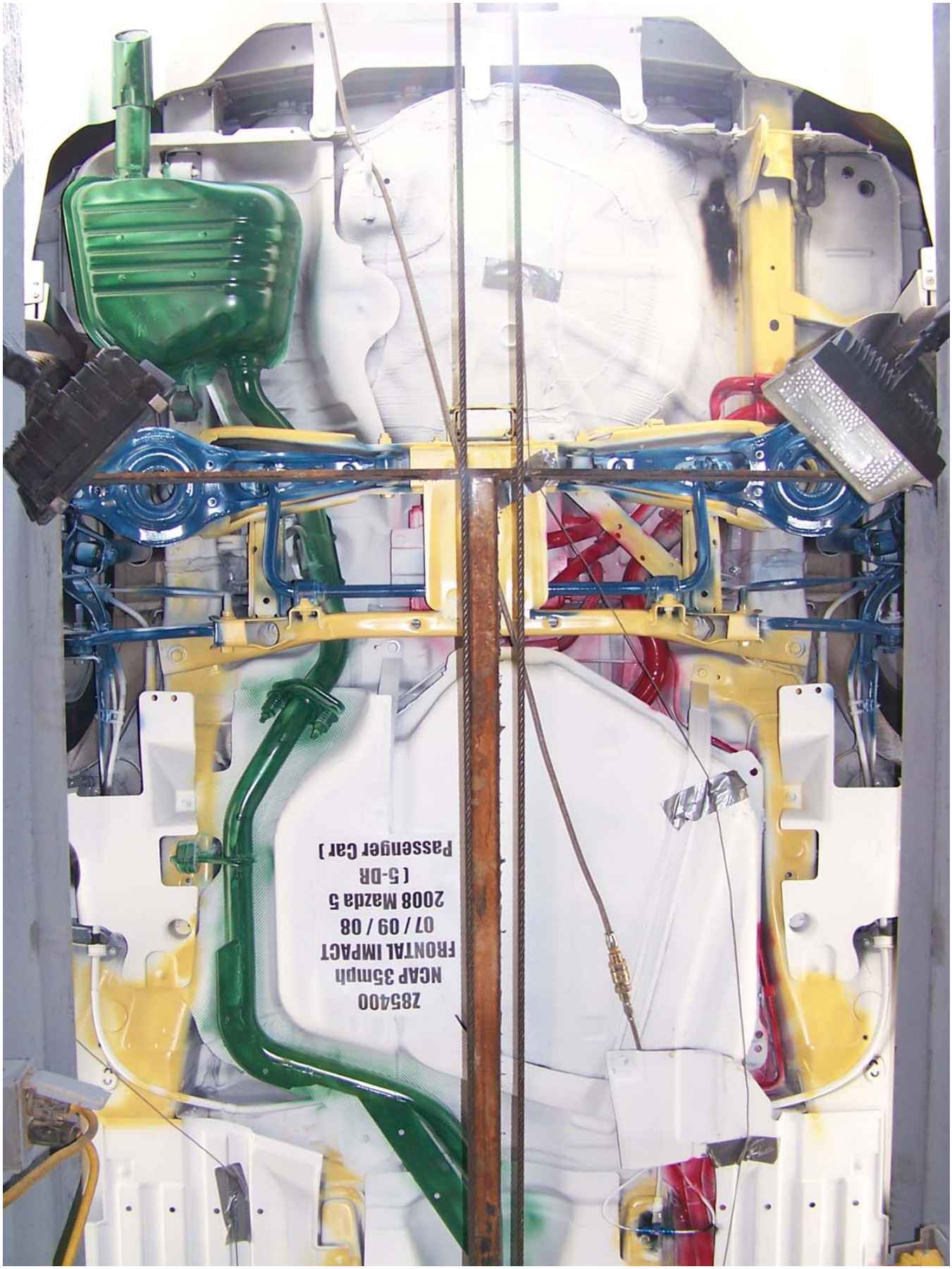


Figure A-28: Pre-Test Rear Underbody

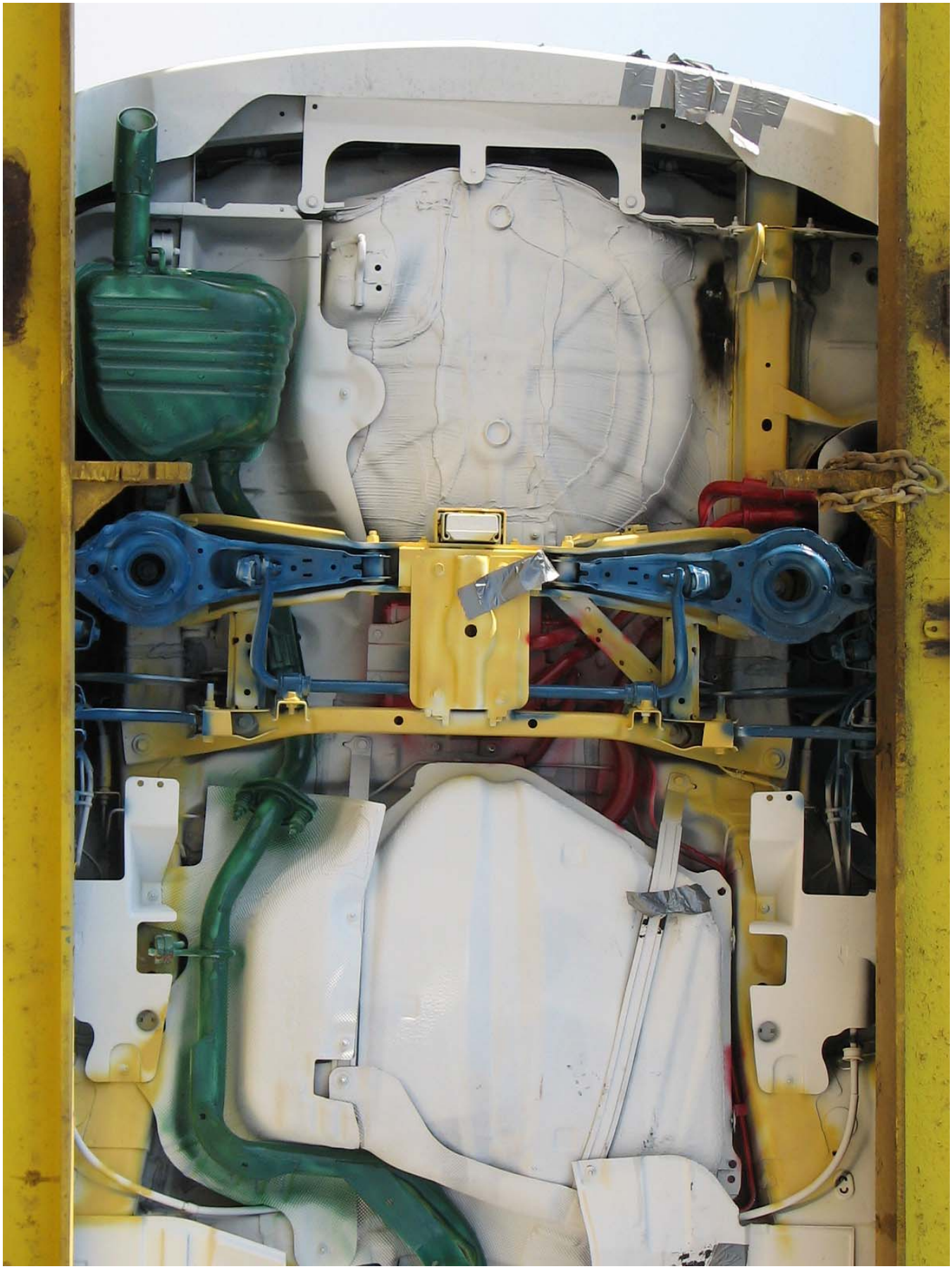


Figure A-29: Post-Test Rear Underbody

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

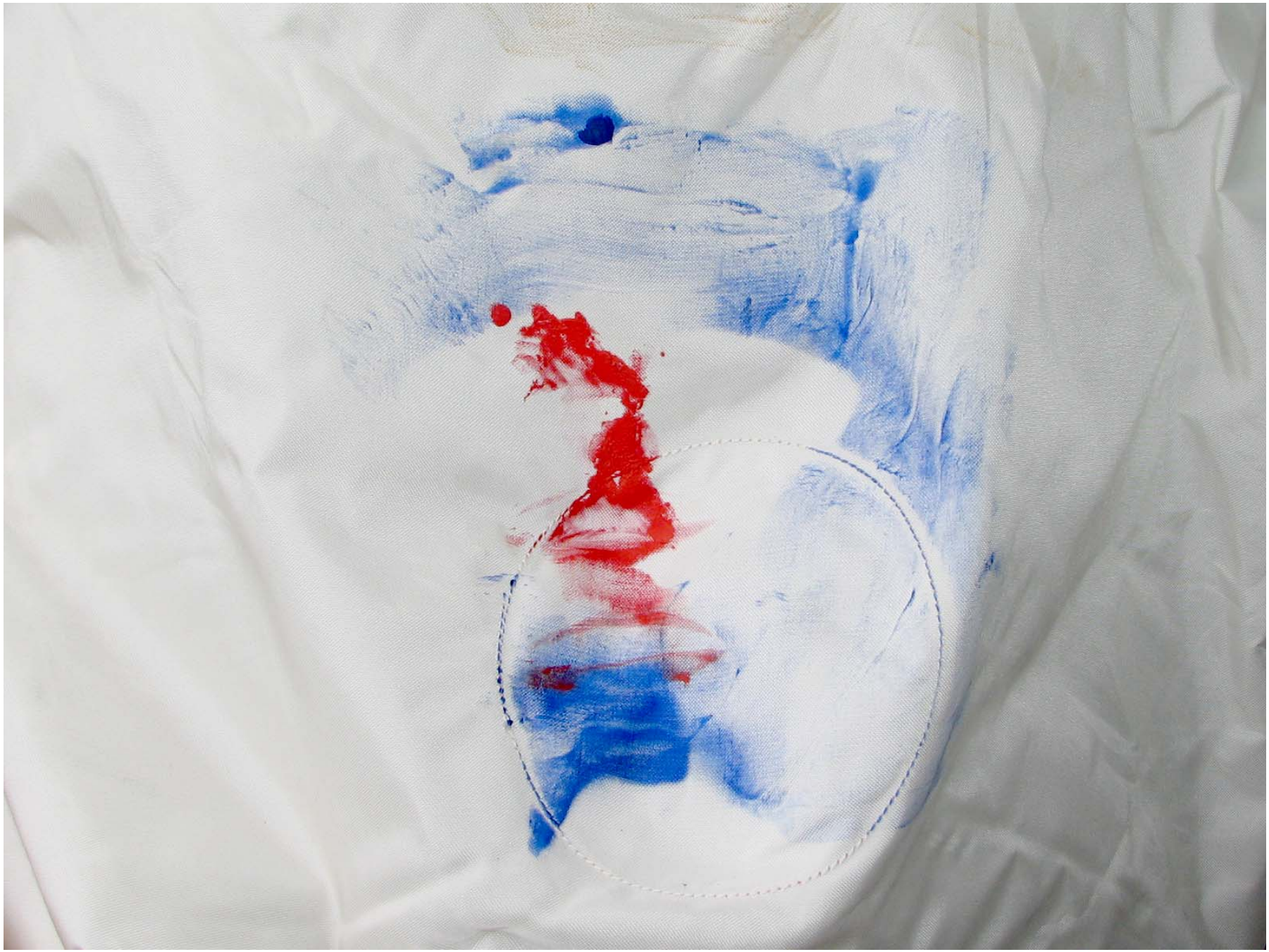


Figure A-43: Post-Test Driver Dummy Airbag Contact

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

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

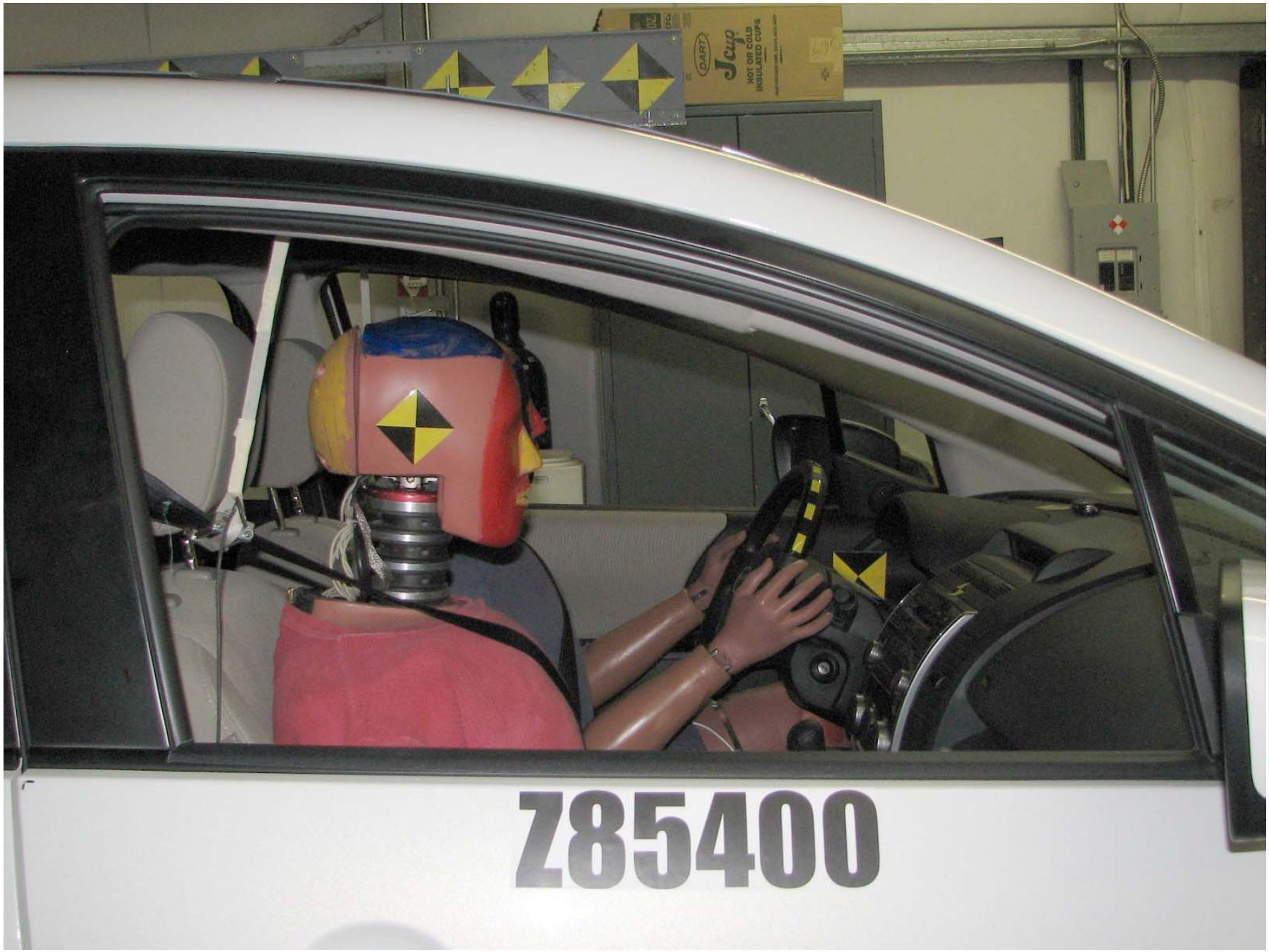


Figure A-46: Pre-Test Passenger Dummy (Through Window)

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)

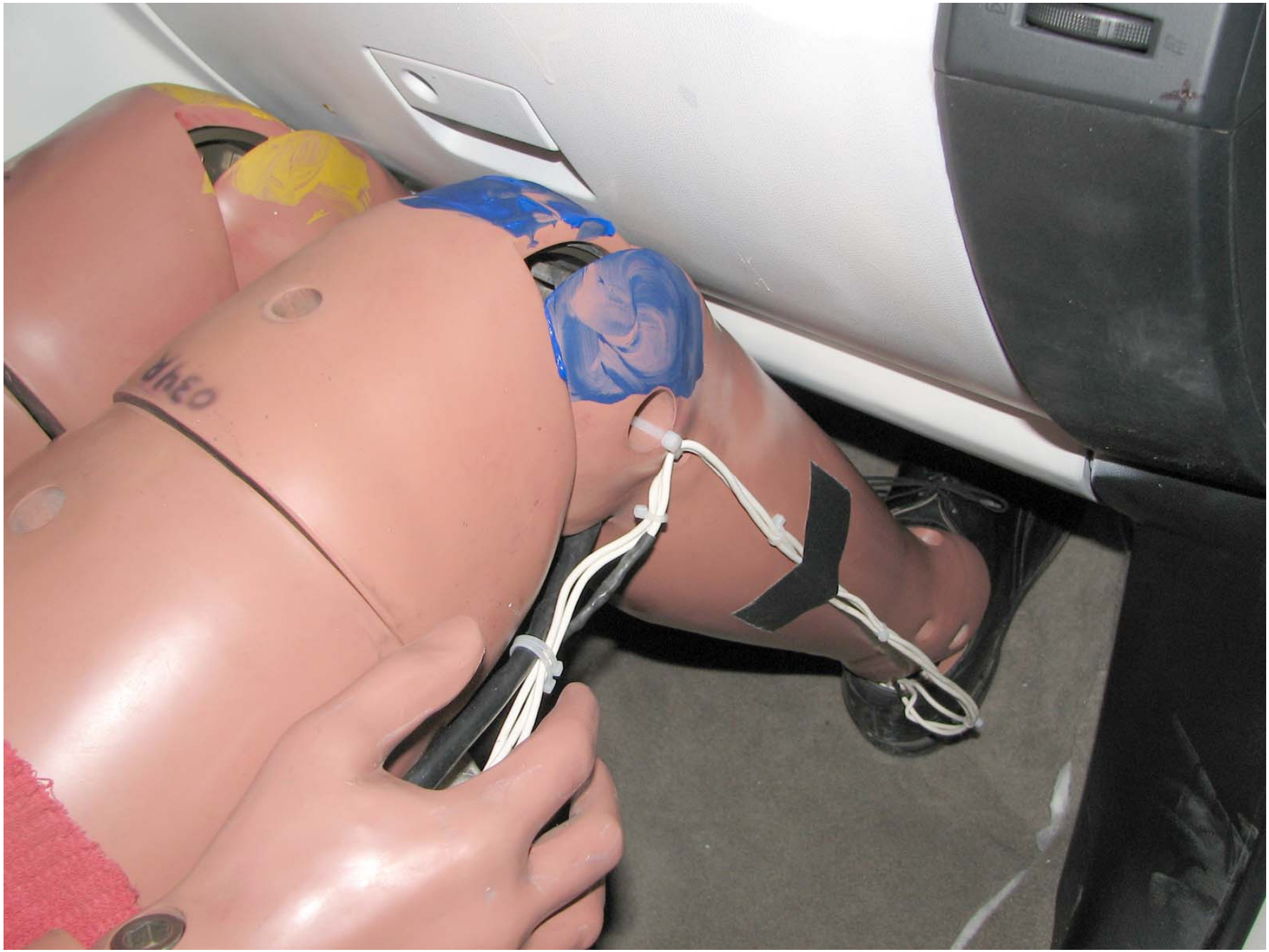


Figure A-50: Pre-Test Passenger Dummy Feet

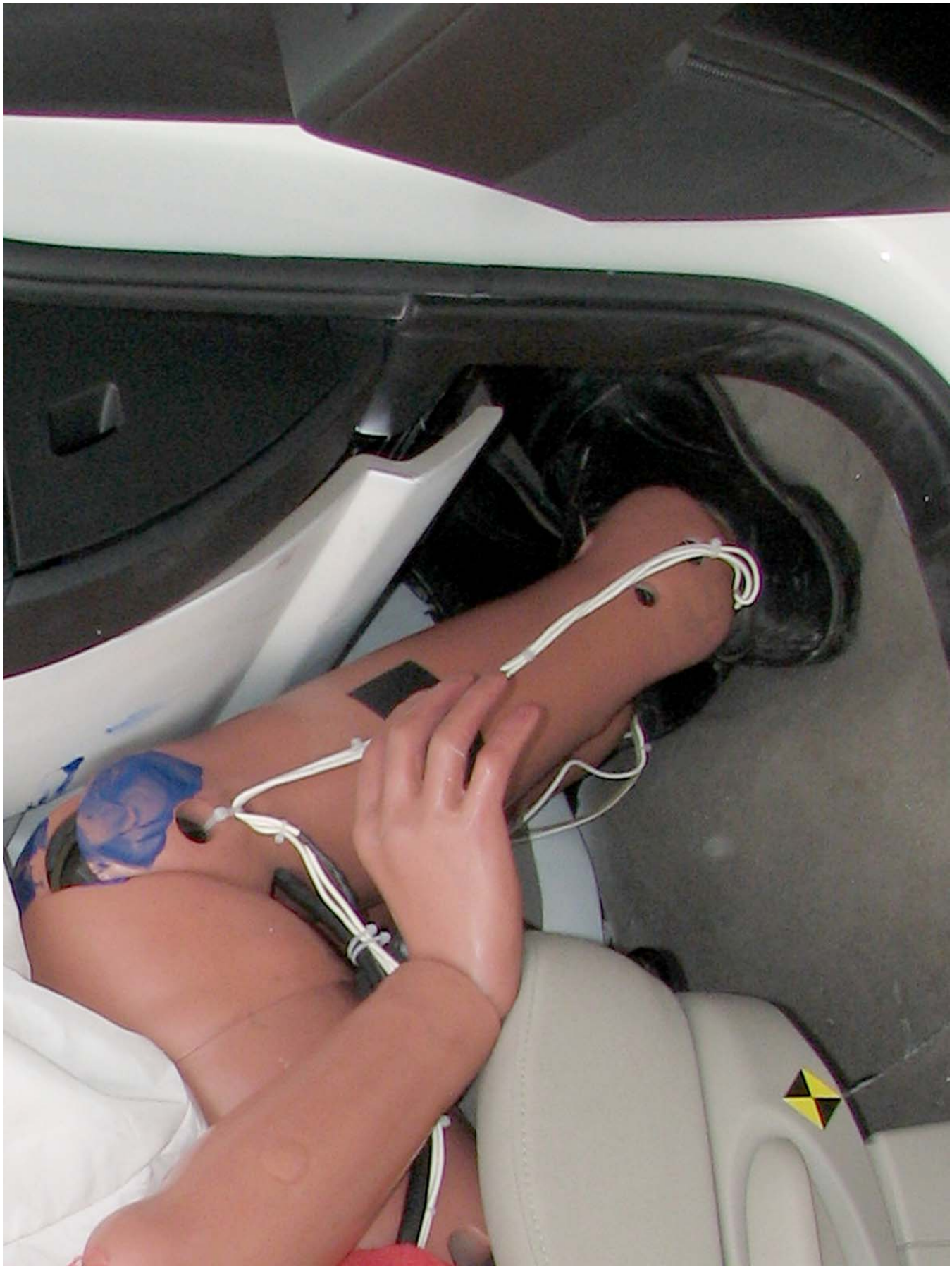


Figure A-51: Post-Test Passenger Dummy Feet

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

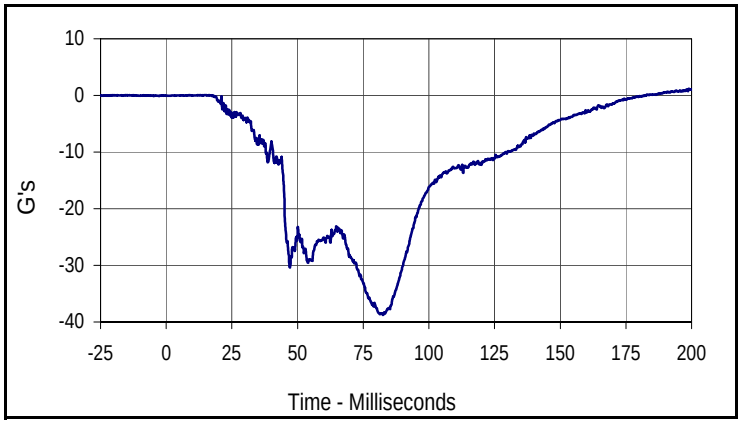
APPENDIX B
DATA PLOTS

LIST OF DATA PLOTS

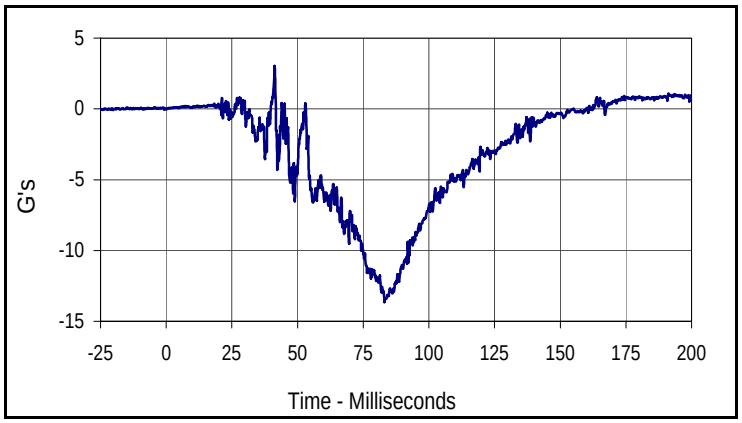
The following additional data plots for this test can be obtained from the research and development section of the NHTSA website. The website can be found at www.NHTSA.dot.gov.

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

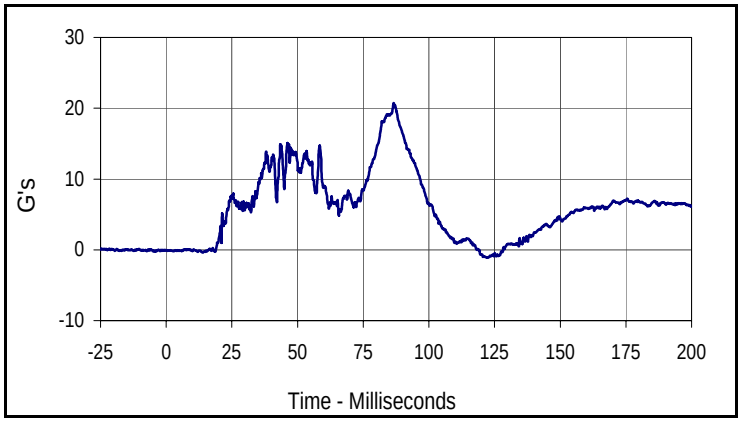
Test Vehicle:	2008 Mazda 5 5-Door Passenger Car	Test Date:	7/9/08
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	Z85400



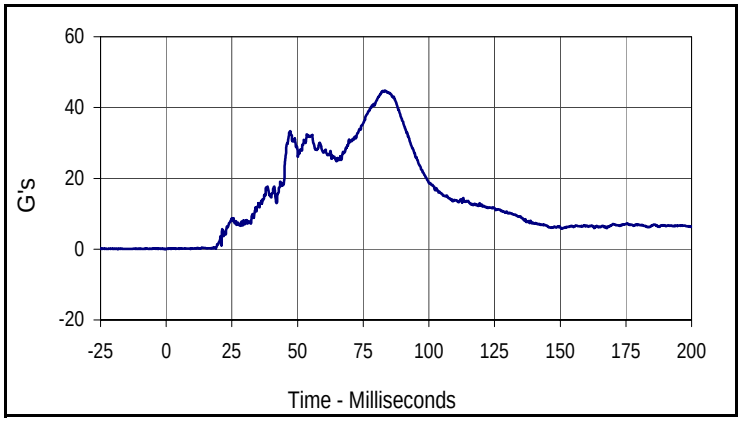
Curve Description			
Driver Head Primary X			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
1.2	198.9	-38.7	82.5



Curve Description			
Driver Head Primary Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
3.0	41.3	-13.6	83.1

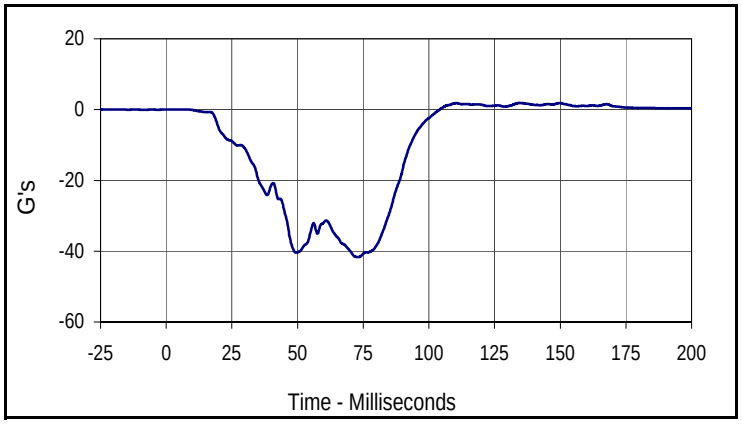


Curve Description			
Driver Head Primary Z			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
20.7	86.6	-1.1	122.7

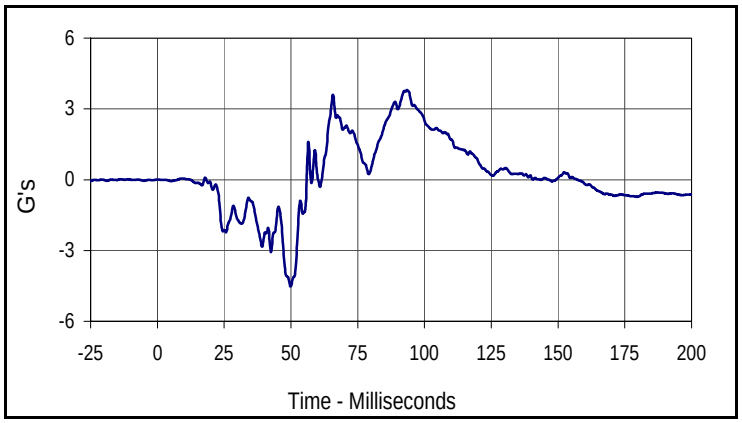


Curve Description			
Driver Head Resultant Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
44.8	83.3	0.0	0.2

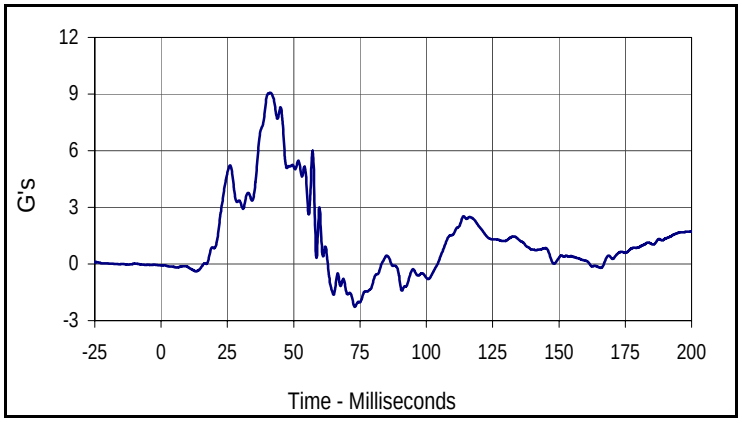
Test Vehicle:	2008 Mazda 5 5-Door Passenger Car	Test Date:	7/9/08
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	Z85400



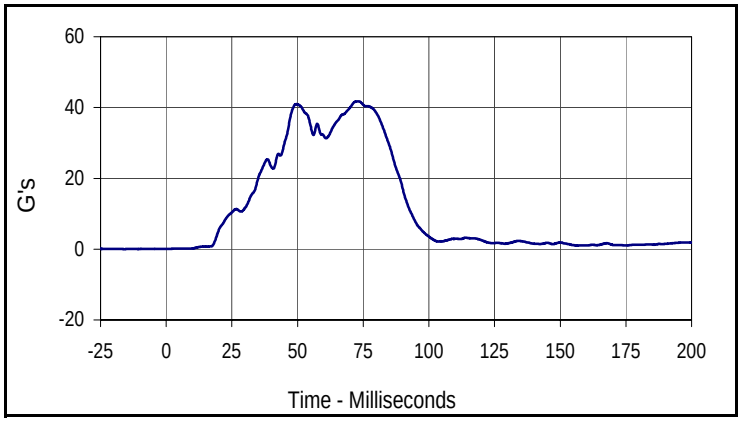
Curve Description			
Driver Chest Primary X			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
1.9	134.5	-41.7	72.6



Curve Description			
Driver Chest Primary Y			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
3.8	93.5	-4.5	49.9

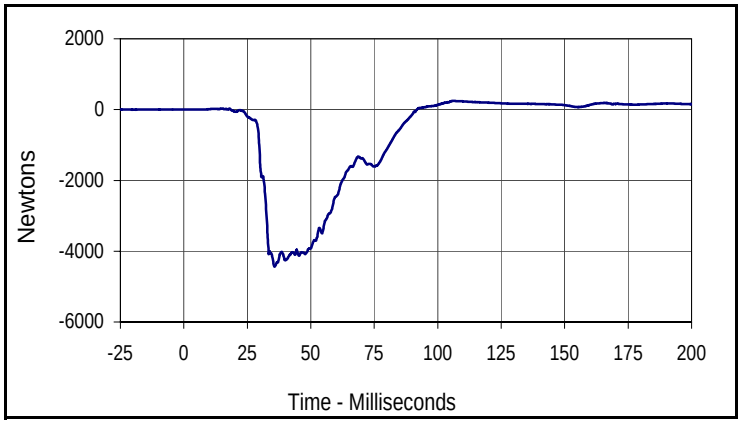


Curve Description			
Driver Chest Primary Z			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
9.1	41.2	-2.3	73.0

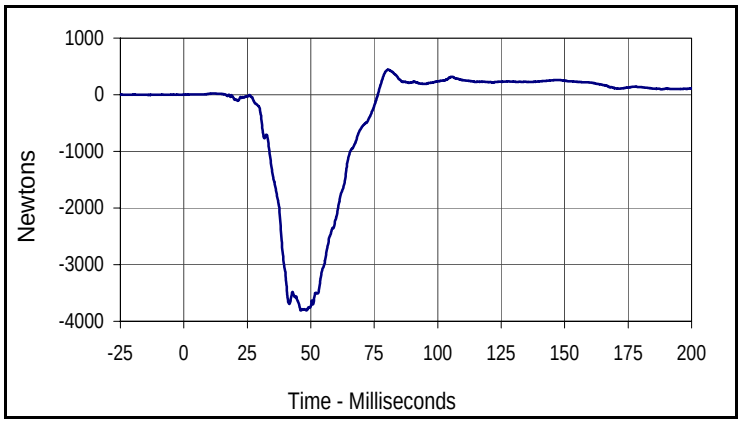


Curve Description			
Driver Chest Resultant Primary			
CURNO	Type	SAE Class	Units
004	RES	180	G's
Max	Time	Min	Time
41.8	72.8	0.1	1.2

Test Vehicle:	2008 Mazda 5 5-Door Passenger Car	Test Date:	7/9/08
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	Z85400

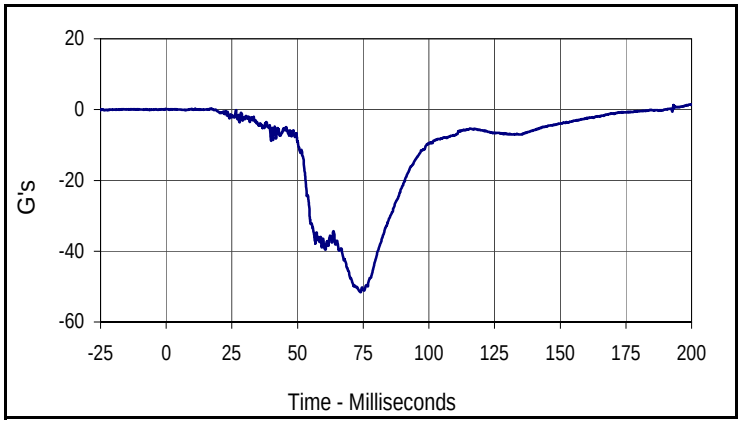


Curve Description			
Driver Left Femur Force Z			
CURNO	Type	SAE Class	Units
007	FIL	600	Newtons
Max	Time	Min	Time
247.3	106.1	-4433.8	35.7

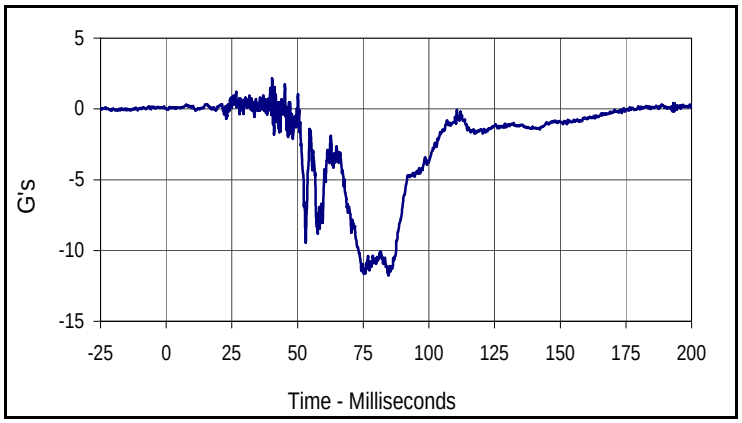


Curve Description			
Driver Right Femur Force Z			
CURNO	Type	SAE Class	Units
008	FIL	600	Newtons
Max	Time	Min	Time
443.9	80.5	-3809.0	46.1

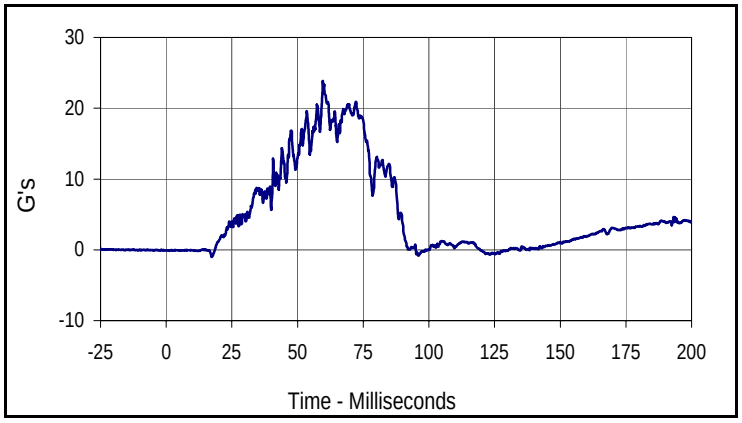
Test Vehicle:	2008 Mazda 5 5-Door Passenger Car	Test Date:	7/9/08
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	Z85400



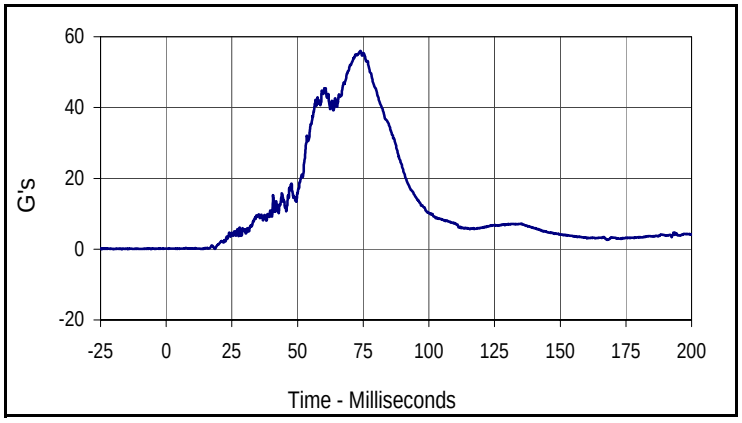
Curve Description			
Passenger Head Primary X			
CURNO	Type	SAE Class	Units
009	FIL	1000	G's
Max	Time	Min	Time
1.4	199.6	-51.6	73.9



Curve Description			
Passenger Head Primary Y			
CURNO	Type	SAE Class	Units
010	FIL	1000	G's
Max	Time	Min	Time
2.1	40.3	-11.8	84.6

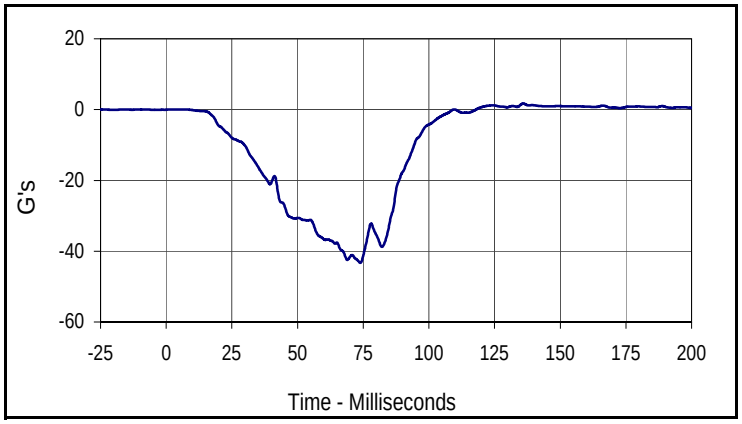


Curve Description			
Passenger Head Primary Z			
CURNO	Type	SAE Class	Units
011	FIL	1000	G's
Max	Time	Min	Time
23.9	59.6	-1.0	17.4

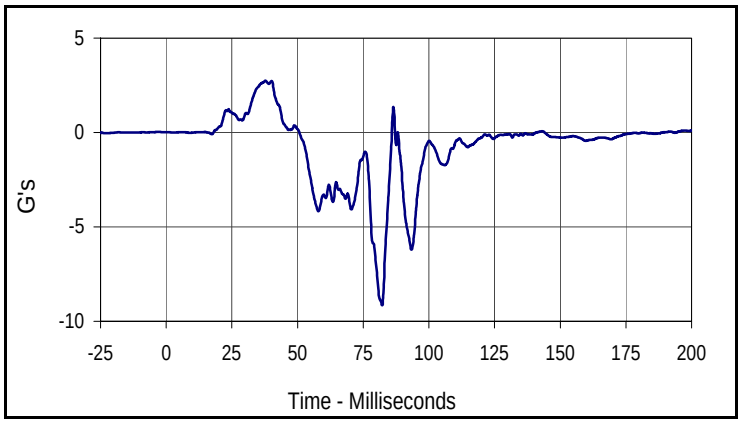


Curve Description			
Passenger Head Resultant Primary			
CURNO	Type	SAE Class	Units
009	RES	1000	G's
Max	Time	Min	Time
56.0	73.9	0.1	13.6

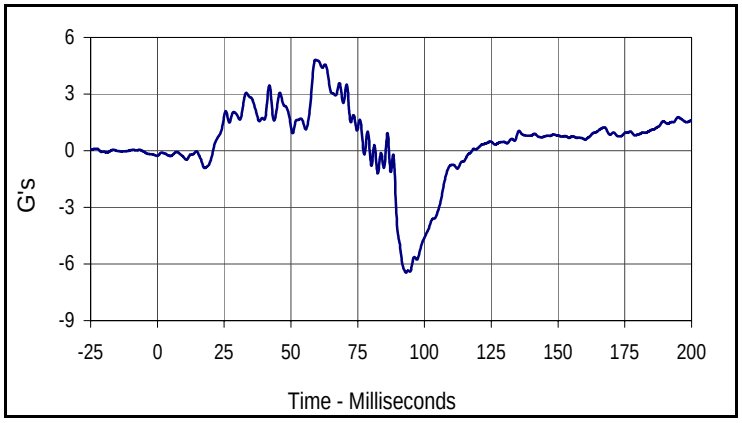
Test Vehicle:	2008 Mazda 5 5-Door Passenger Car	Test Date:	7/9/08
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	Z85400



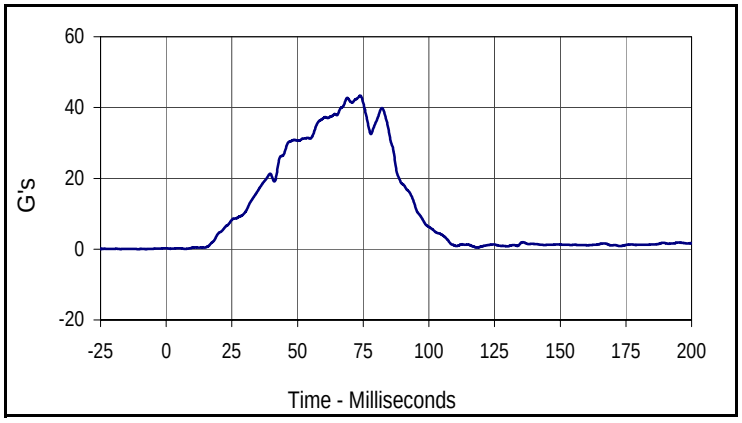
Curve Description			
Passenger Chest Primary X			
CURNO	Type	SAE Class	Units
012	FIL	180	G's
Max	Time	Min	Time
1.7	135.9	-43.3	73.9



Curve Description			
Passenger Chest Primary Y			
CURNO	Type	SAE Class	Units
013	FIL	180	G's
Max	Time	Min	Time
2.7	37.8	-9.2	82.2

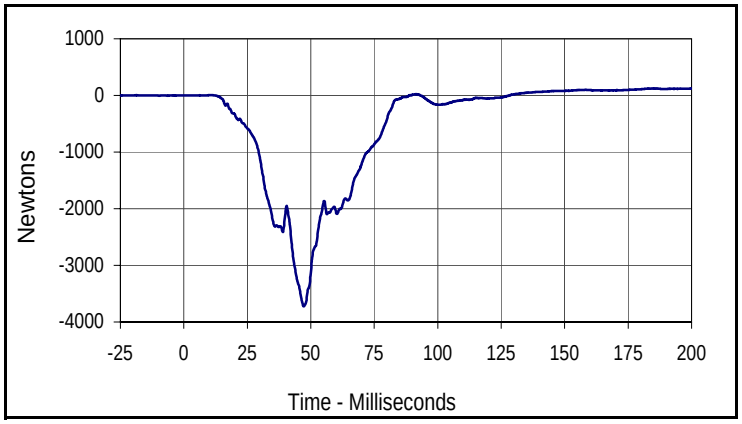


Curve Description			
Passenger Chest Primary Z			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
4.8	59.2	-6.5	93.1

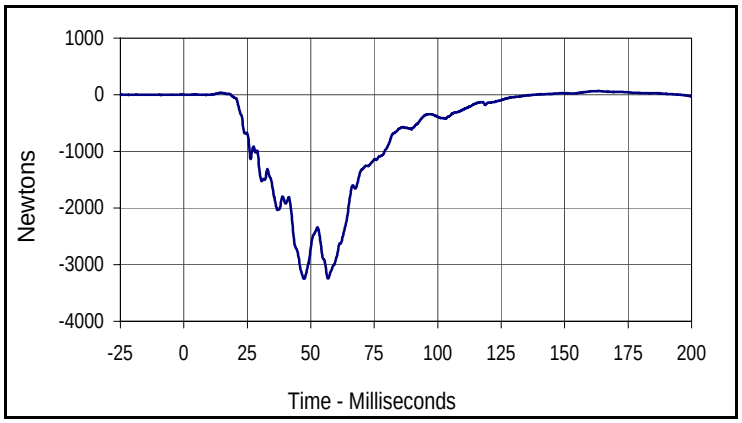


Curve Description			
Passenger Chest Resultant Primary			
CURNO	Type	SAE Class	Units
012	RES	180	G's
Max	Time	Min	Time
43.3	73.8	0.1	7.4

Test Vehicle:	2008 Mazda 5 5-Door Passenger Car	Test Date:	7/9/08
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	Z85400



Curve Description			
Passenger Left Femur Force Z			
CURNO	Type	SAE Class	Units
015	FIL	600	Newtons
Max	Time	Min	Time
123.2	186.5	-3720.4	47.2

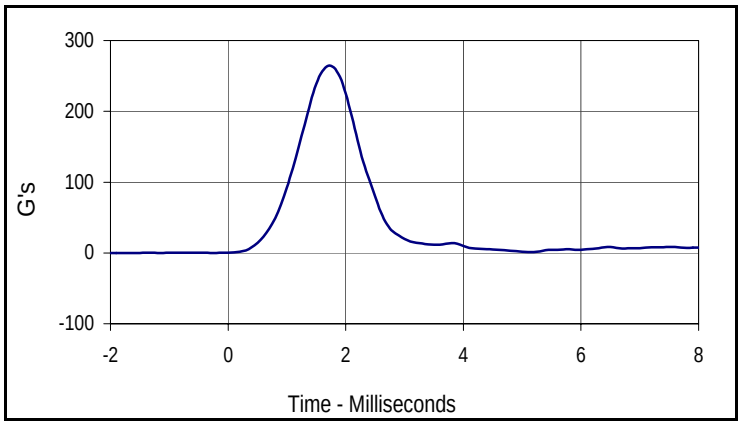


Curve Description			
Passenger Right Femur Force Z			
CURNO	Type	SAE Class	Units
016	FIL	600	Newtons
Max	Time	Min	Time
65.7	163.3	-3249.7	47.3

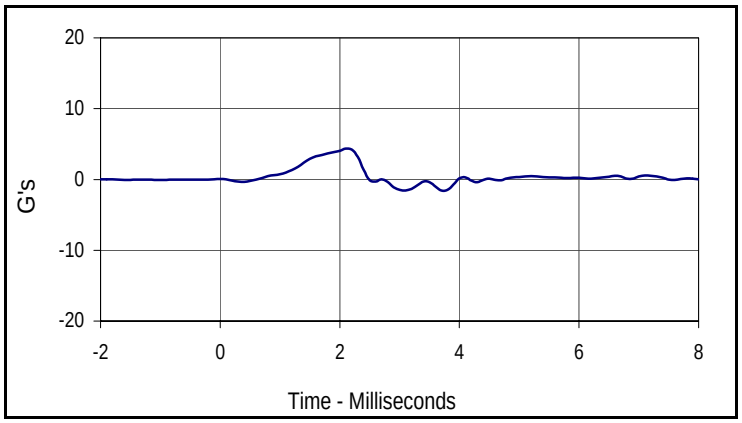
APPENDIX C
DUMMY CALIBRATION DATA

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	6/30/08
ATD Serial No.:	035	Test I.D.:	HD06G

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	264.3	Pass
Peak Lateral Acceleration	G's	≤15.0	4.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass



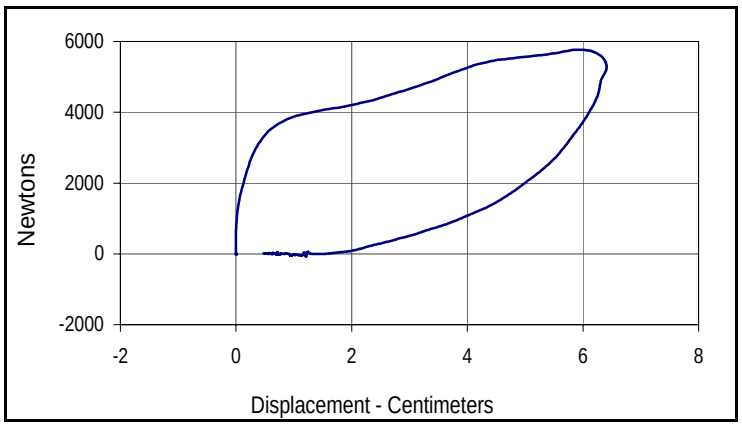
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
264.3	1.7	0.0	-0.2



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.3	2.1	-1.5	3.7

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	6/30/08
ATD Serial No.:	035	Test I.D.:	CH06G

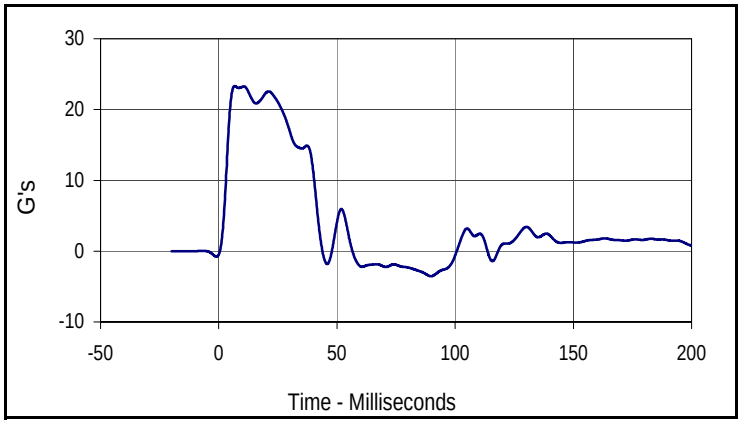
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.70	Pass
Peak Probe Force	Newtons	5159 to 5893	5763	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.41	Pass
Internal Hysterysis	%	69 to 85	76.2	Pass
		Overall Test Results		Pass



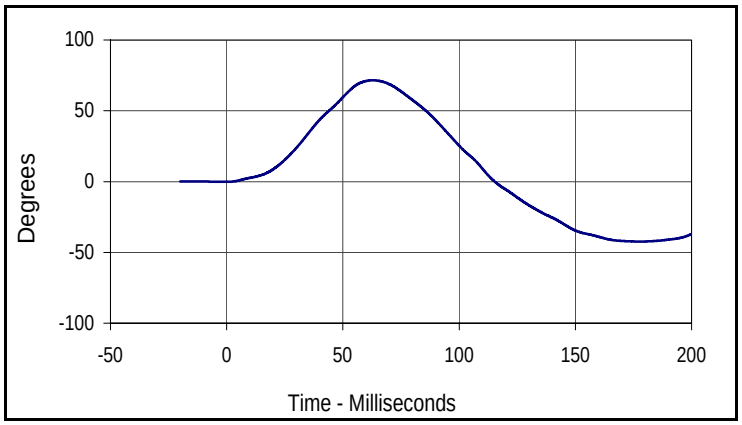
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	76.2
Peak Probe Force		Peak Chest Deflection	
5763		6.41	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	7/1/08
ATD Serial No.:	035	Test I.D.:	NF06G

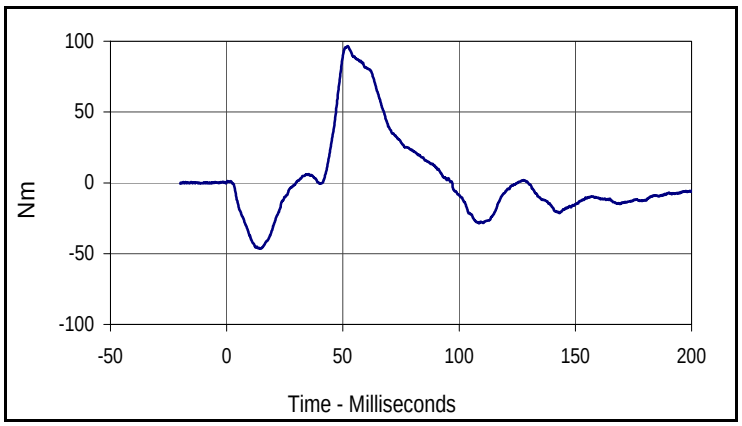
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	23.2	Pass
	20 Msec.	G's	17.6 to 22.6	22.4	Pass
	30 Msec.	G's	12.5 to 18.5	17.0	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.0	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	41.9	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	71.6	Pass
	Time	Msec.	57.0 to 64.0	62.8	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	115.3	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	96.5	Pass
	Time	Msec.	47.0 to 58.0	52.1	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	97.0	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
23.3	6.7	-3.5	89.8



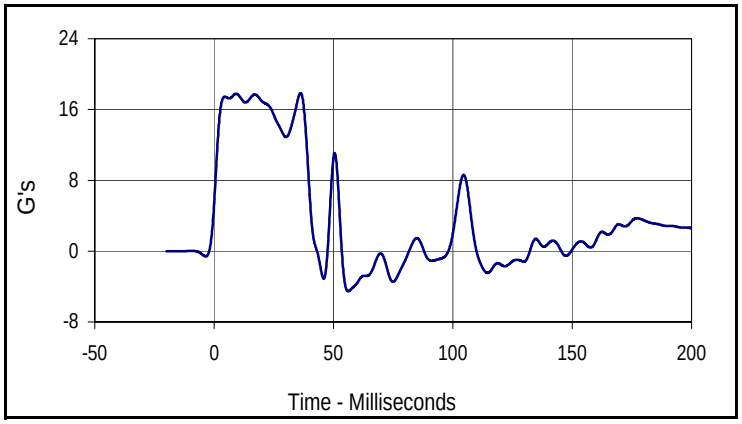
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
71.6	62.8	-42.3	178.6



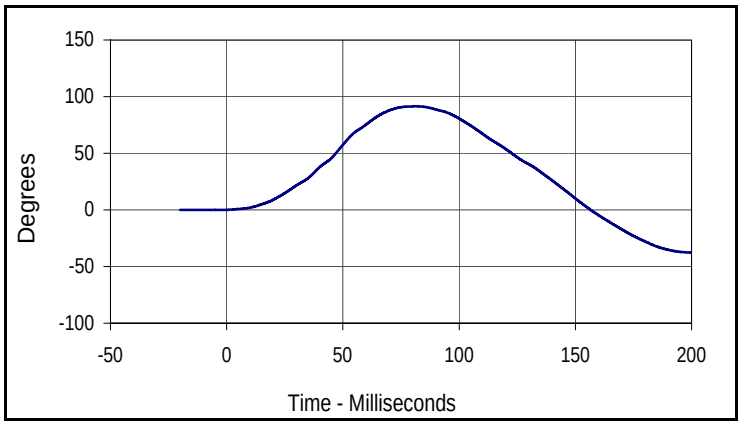
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
96.5	52.1	-46.4	14.7

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	7/1/08
ATD Serial No.:	035	Test I.D.:	NE06G

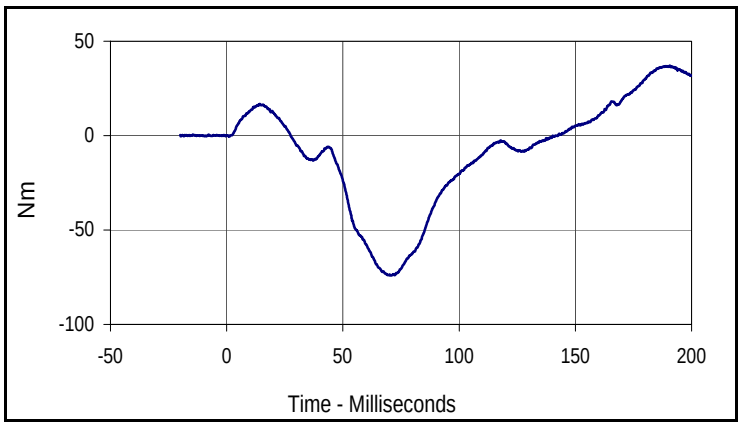
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.16	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.7	Pass
	20 Msec.	G's	14.0 to 19.0	16.9	Pass
	30 Msec.	G's	11.0 to 16.0	12.9	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	17.9	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	40.4	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	91.4	Pass
	Time	Msec.	72.0 to 82.0	81.4	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	156.6	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-74.1	Pass
	Time	Msec.	65.0 to 79.0	70.5	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	142.7	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
17.9	36.2	-4.5	56.1



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
91.4	81.4	-37.7	200.0



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
37.1	190.6	-74.1	70.5

Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	6/30/08
ATD Serial No.:	035	Test I.D.:	LK06G , RK06G

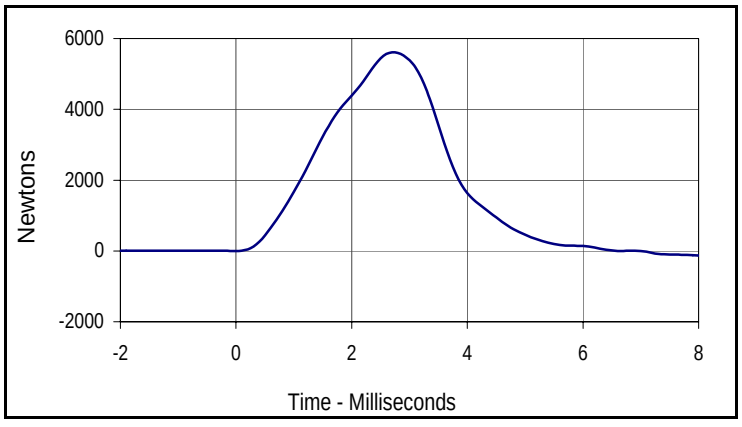
Left Knee

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	5774	Pass
		Overall Test Results		Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.10	Pass
Peak Probe Force	Newtons	4715 to 5782	5612	Pass
		Overall Test Results		Pass

Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5774.4	2.6	-148.0	10.0



Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
5611.7	2.7	-180.6	10.0

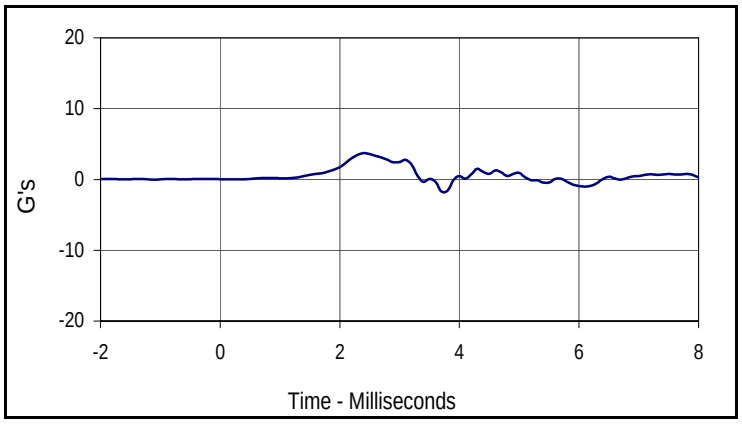
Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	6/30/08
ATD Serial No.:	035	Test I.D.:	N/A

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	884	Pass
B - Shoulder pivot height	mm	505 to 521	519	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	90	Pass
F - Thigh clearance	mm	140 to 155	144	Pass
G - Elbow back to wrist pivot	mm	290 to 305	293	Pass
H - Skull cap to back line	mm	41 to 46	43	Pass
I - Shoulder to elbow length	mm	330 to 345	340	Pass
J - Elbow rest height	mm	190 to 211	198	Pass
K - Buttock to knee length	mm	579 to 604	598	Pass
L - Poplipteal length	mm	429 to 455	450	Pass
M - Knee pivot height	mm	485 to 500	491	Pass
N - Buttock poplipteal length	mm	452 to 477	471	Pass
O - Chest depth	mm	213 to 229	218	Pass
P - Foot length	mm	251 to 267	260	Pass
V - Shoulder breadth	mm	422 to 437	431	Pass
W - Foot breadth	mm	91 to 107	101	Pass
Y - Chest circumference	mm	970 to 1001	992	Pass
Z - Waist circumference	mm	836 to 866	863	Pass
AA - Location for chest circumference	mm	429 to 434	432	Pass
BB - Location for waist circumference	mm	226 to 231	231	Pass
		Overall Test Results		Pass

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	6/28/08
ATD Serial No.:	034	Test I.D.:	HD06R

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	251.0	Pass
Peak Lateral Acceleration	G's	≤15.0	3.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

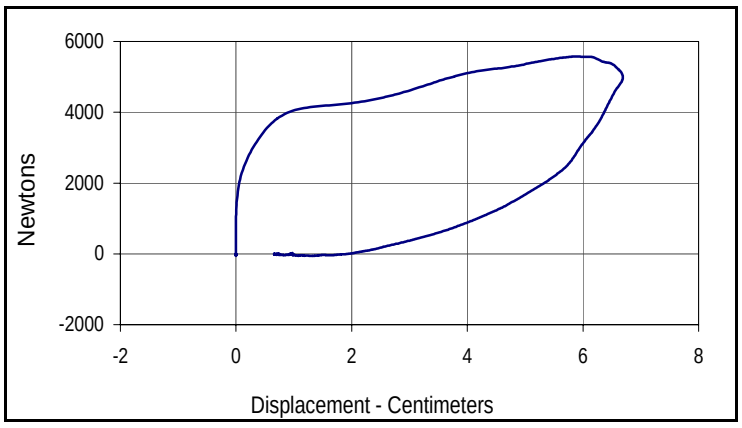
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
251.0	2.6	0.0	-1.7



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
3.7	2.4	-1.7	3.7

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	6/30/08
ATD Serial No.:	034	Test I.D.:	CH06F

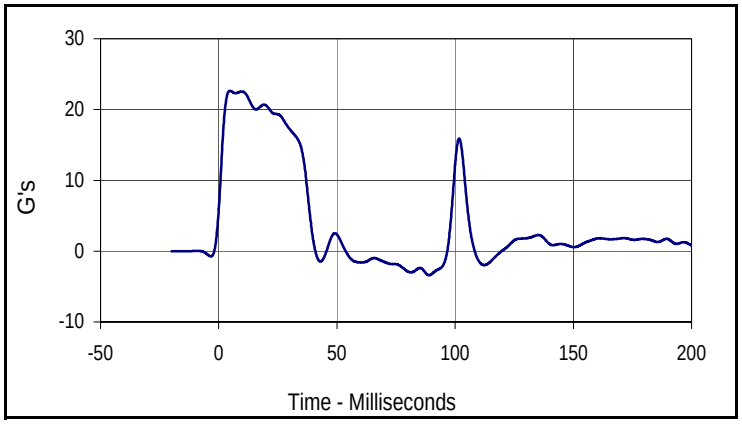
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.69	Pass
Peak Probe Force	Newtons	5159 to 5893	5574	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.69	Pass
Internal Hysterysis	%	69 to 85	77.5	Pass
		Overall Test Results		Pass



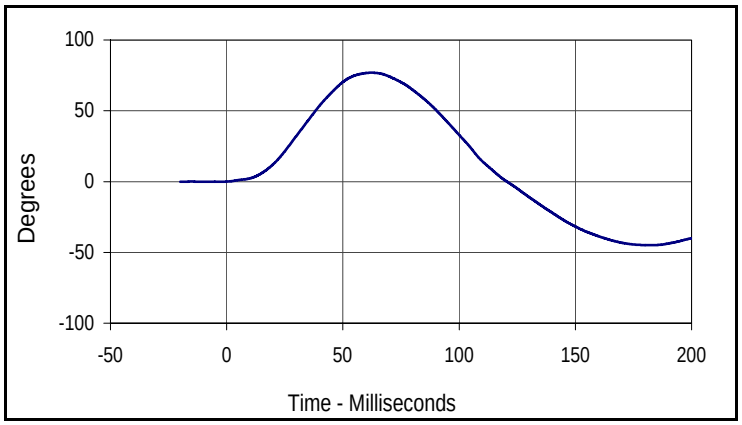
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	77.5
Peak Probe Force		Peak Chest Deflection	
5574		6.69	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	7/1/08
ATD Serial No.:	034	Test I.D.:	NF06F

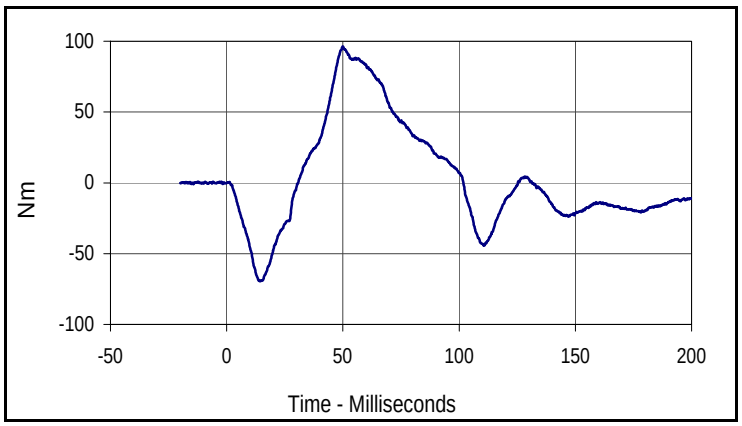
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.04	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	22.5	Pass
	20 Msec.	G's	17.6 to 22.6	20.6	Pass
	30 Msec.	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	38.6	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	76.9	Pass
	Time	Msec.	57.0 to 64.0	62.3	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	120.6	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	96.4	Pass
	Time	Msec.	47.0 to 58.0	49.9	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	101.9	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
22.6	4.7	-3.4	88.9



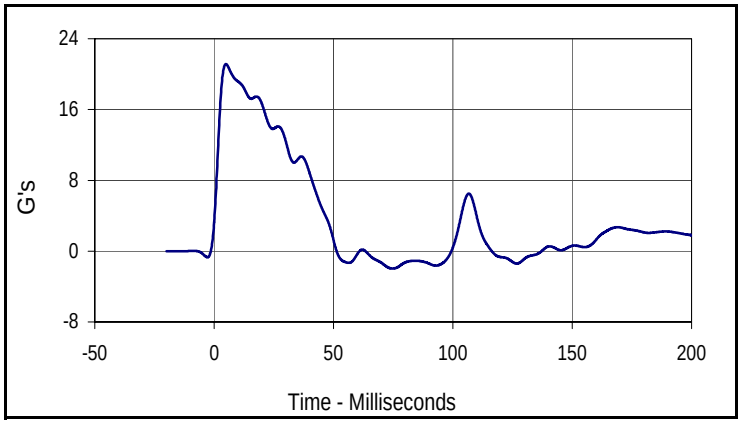
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
76.9	62.3	-44.9	182.3



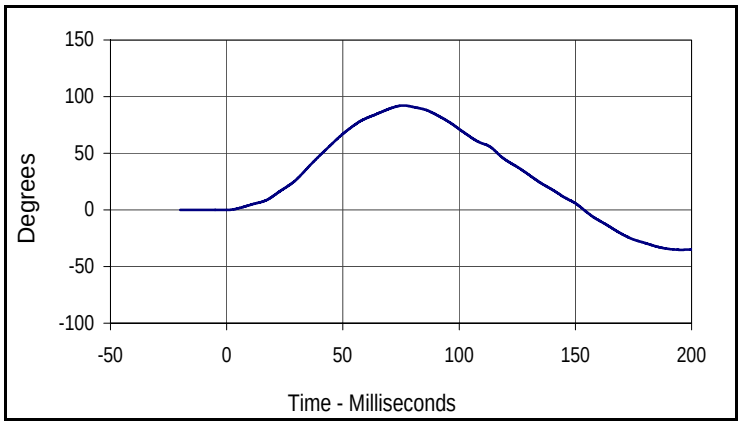
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
96.4	49.9	-69.5	14.5

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	7/1/08
ATD Serial No.:	034	Test I.D.:	NE06F

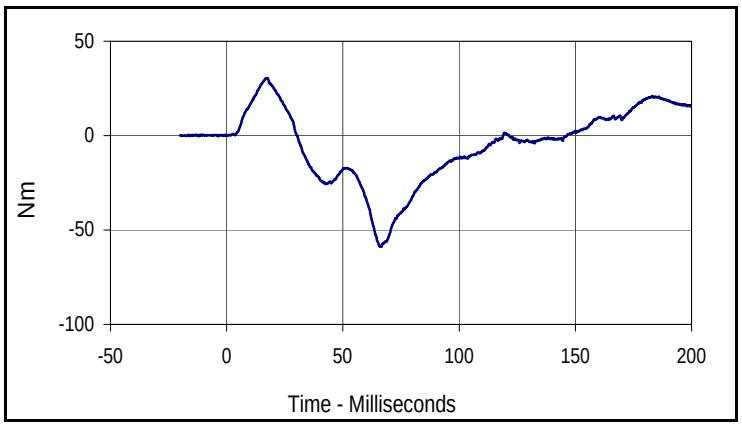
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.16	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	19.2	Pass
	20 Msec.	G's	14.0 to 19.0	16.7	Pass
	30 Msec.	G's	11.0 to 16.0	12.4	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	12.4	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	45.0	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	92.2	Pass
	Time	Msec.	72.0 to 82.0	76.1	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	153.8	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-58.8	Pass
	Time	Msec.	65.0 to 79.0	66.6	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	146.4	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
21.1	4.9	-2.0	74.7



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
92.2	76.1	-35.2	195.5



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
30.4	17.6	-58.8	66.6

Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	6/30/08
ATD Serial No.:	034	Test I.D.:	LK06S , RK06R

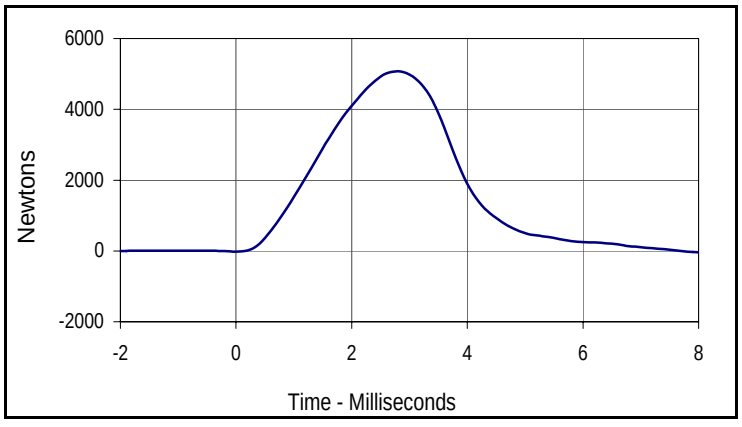
Left Knee

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	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5514	Pass
		Overall Test Results		Pass

Right Knee

Pendulum Velocity at T=0	m/sec	2.07 to 2.13	2.11	Pass
Peak Probe Force	Newtons	4715 to 5782	5074	Pass
		Overall Test Results		Pass

Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5513.6	2.7	-181.9	9.8



Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
5074.1	2.8	-127.3	10.0

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	6/30/08
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	886	Pass
B - Shoulder pivot height	mm	505 to 521	520	Pass
C - "H" point height	mm	84 to 89	89	Pass
D - "H" point from seat back	mm	135 to 140	137	Pass
E - Shoulder pivot from back	mm	84 to 94	93	Pass
F - Thigh clearance	mm	140 to 155	146	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	342	Pass
J - Elbow rest height	mm	190 to 211	199	Pass
K - Buttock to knee length	mm	579 to 604	595	Pass
L - Poplipteal length	mm	429 to 455	451	Pass
M - Knee pivot height	mm	485 to 500	487	Pass
N - Buttock poplipteal length	mm	452 to 477	474	Pass
O - Chest depth	mm	213 to 229	219	Pass
P - Foot length	mm	251 to 267	263	Pass
V - Shoulder breadth	mm	422 to 437	430	Pass
W - Foot breadth	mm	91 to 107	100	Pass
Y - Chest circumference	mm	970 to 1001	996	Pass
Z - Waist circumference	mm	836 to 866	864	Pass
AA - Location for chest circumference	mm	429 to 434	430	Pass
BB - Location for waist circumference	mm	226 to 231	229	Pass
		Overall Test Results		Pass

Test Program:	Dummy Damage Checklist	Test Date:	6/30/08
ATD Serial No.:	035	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	Test Date:	6/30/08
ATD Serial No.:	034	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: