REPORT NUMBER TR-P28001-15-NC

NEW CAR ASSESMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORP.
2008 CADILLAC CTS
4-DOOR SEDAN

NHTSA NUMBER: M80105

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DECEMBER 18, 2007

FINAL REPORT

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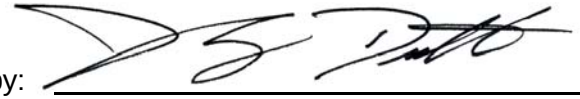
Prepared by:  Date: December 18, 2007

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Date of Acceptance

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16. Abstract

A 35 mph (56.3 km/h) frontal barrier impact test was conducted on the subject 2008 Cadillac CTS 4-Door Sedan at KARCO Engineering, LLC, in Adelanto, CA, on December 18, 2007. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301, and footwell intrusion performance. The impact velocity was 56.04 km/h. The ambient temperature at the barrier at the time of the crash was 12.8 degrees Celsius. The vehicle's maximum post static crush was 477 mm at DPD 5, to the right of the vehicle's centerline. The test vehicle was equipped with a 3-point continuous belt system and a second generation airbag at both front outboard positions. With respect to FMVSS 208 'Occupant Crash Protection', the occupant injury criteria summary is as follows:

Measurement Description	Units	Threshold	Driver ATD	Passenger ATD
Head Injury Criteria (HIC)	N/A	1000	653.0	539.5
Max. Chest Accel. (3 msec. Chest Clip)	G's	60	45.6	41.2
Left Femur Force	Newtons	10008	-329.8	-1163.0
Right Femur Force	Newtons	10008	-662.3	-403.6

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SECTION 1
PURPOSE AND SUMMARY OF TEST M80105

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 Cadillac CTS 4-Door Sedan at a velocity of 56.04 km/h. The test was performed at KARCO Engineering, LLC on December 18, 2007

Three (3) real-time and fourteen (14) high-speed cameras were used to document the frontal barrier impact event. Camera locations and other pertinent camera information can be found in Data Sheet number 14 (page number 24) of this report.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head (primary and redundant), chest (primary and redundant) and pelvis triaxial accelerometers, chest displacement potentiometers, six-axis upper neck transducers, right/left femur load cells, and lower leg instrumentation. Seat belt load cells were placed on the driver’s and passenger’s lap and shoulder belts to measure dummy torso and pelvic section loading. Shoulder belt spool-off was measured for the driver and passenger dummies. The driver (position 1) ATD (Serial No.034) and the right-front passenger (position 2) ATD (Serial No. 035) were calibrated 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 477 mm at DPD 5, to the right of the vehicle's centerline. Both the driver and passenger side doors remained closed and latched during the impact event, and were operable after the impact.

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

The passenger’s visible contact points were as follows: The passenger ATD's head, chest, and abdomen contacted the airbag. 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	653.0	45.6	-31.3	-329.8	-662.3
Passenger	539.5	41.2	-26.3	-1163.0	-403.6

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 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

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 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/h	56.04
Test Weight	kg	2124
Impact Angle	degrees	0
Average Rebound	mm	955
Maximum Static Crush	mm	477

DOOR OPENING AND SEAT TRACK INFORMATION

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

TEST DUMMY INFORMATION

Description	Driver	Passenger
Dummy Type/Serial No.	50% Male Hybrid III No.034	50% Male Hybrid III No. 035
Head Contact	Airbag, headrest	Airbag
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	14	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 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	M80105
Make	Cadillac
Model	CTS
Body Style	4-Door Sedan
VIN No.	1G6DT57V980146340
Color	Thunder Gray
Delivery Date	12/13/07
Odometer (Miles)	16.0
Dealer	Hubacher Cadillac
Transmission	6-Speed Automatic
Final Drive	AWD
Type/No. of Cylinders	V6
Engine Displ. (L)	3.6
Engine Placement	Longitudinal
Roof Rack	No
Sunroof/T-top	Yes
Tinted Glass	No
Traction Control	Yes
Power Brakes	Yes
Front Disc	Yes
Rear Disc	Yes

Anti-Lock Brakes	Yes
All Wheel Drive	Yes
Power Steering	Yes
Driver Front Airbag	Yes
Driver Side Torso Airbag	Yes
Driver Side Head Airbag	No
Driver Curtain Airbag	Yes
Pass. Airbag	Yes
Pass. Side 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	Yes
Power Windows	Yes
Power Seats	No
Other	n/a

Does the Owner's Manual provide instructions to turn off automatic door locks?	No

DATA FROM CERTIFICATION TABLE

Manufactured By	General Motors Corp.
Date of Manufacture	Nov-07

GVWR (kg)	2334
GAWR Front (kg)	1139
GAWR Rear (kg)	1195

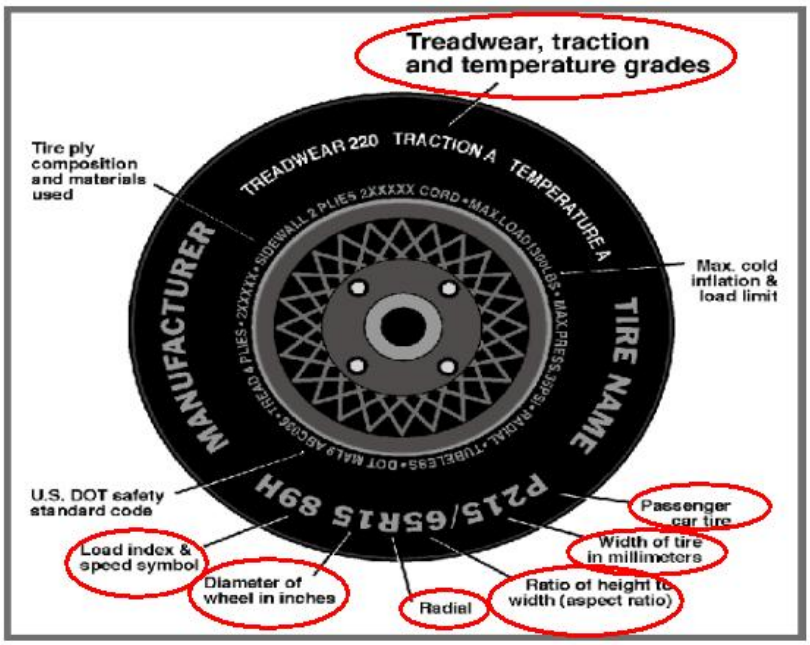
VEHICLE SEATING CAPACITY AND WEIGHT INFORMATION

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Weight (VCW) (kg)				404
Cargo Weight (RCLW) (kg)				64

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

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)	240	240
Recommended Tire Size	P235/50R18	P235/50R18
Tire Size on Vehicle	P235/50R18	P235/50R18
Tire Manufacturer	Michelin	Michelin
Treadwear	300	300
Traction	A	A
Temperature Grades	A	A
Tire Plies - Sidewall	2 Polyester	2 Polyester
Tire Plies - Body	2 Polyester + 1 Polyamide + 2 Steel	2 Polyester + 1 Polyamide + 2 Steel
Load Index/Speed Symbol	97V	97V
Tire Material	Polyester, Polyamide, Steel	Polyester, Polyamide, Steel
DOT Safety Code Right	B9NP	B9NP
DOT Safety Code Left	B9NP	B9NP

DATA SHEET NO. 2…(CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	515	443	958	532	535	1067
Right	kg	527	427	954	543	514	1057
Ratio	%	54.5	45.5	100.0	50.6	49.4	100.0
Totals	kg	1042	870	1912	1075	1049	2124

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1912
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Weight (RCLW)	kg	64
Calculated Target Vehicle Test Weight (TVTW)	kg	2128

TEST VEHICLE ATTITUDE AND CG

	Units	LF	RF	LR	RR	CG Aft of Front Axle
As Delivered	mm	710	713	733	730	1310
As Tested	mm	710	710	711	706	1423

Vehicle Wheel Base (mm): 2880

Weight of Ballast Secured in Cargo Area (kg): 5

Weight of Items Removed (kg): 57

Vehicle Components Removed: Tail Lights, Rear Bumper, Trunk Carpeting, Rear Door Panels, and Rear Window

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

FUEL SYSTEM DATA

Fuel System Capacity from Owner's Manual (L): 68.13

Actual Test Volume with Entire Fuel System Filled (L): 63.36

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: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

SPEED TRAP DATA

Measured Paramater	Units	Requirement	Value
Trap No. 1 Velocity	km/h	55.1 to 57.12	56.04
Trap No. 2 Velocity	km/h	55.1 to 57.12	55.99

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4708	4248	460
Center	mm	4820	4383	437
Right Side	mm	4708	4340	368

VEHICLE REBOUND FROM BARRIER

Measured Paramater	Units	Value
Left Side	mm	915
Center	mm	915
Right Side	mm	955
Average	mm	928

DATA SHEET NO. 4

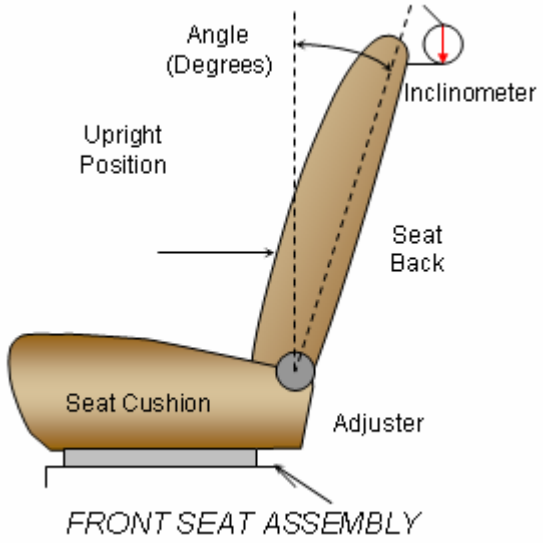
TEST VEHICLE INFORMATION

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

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

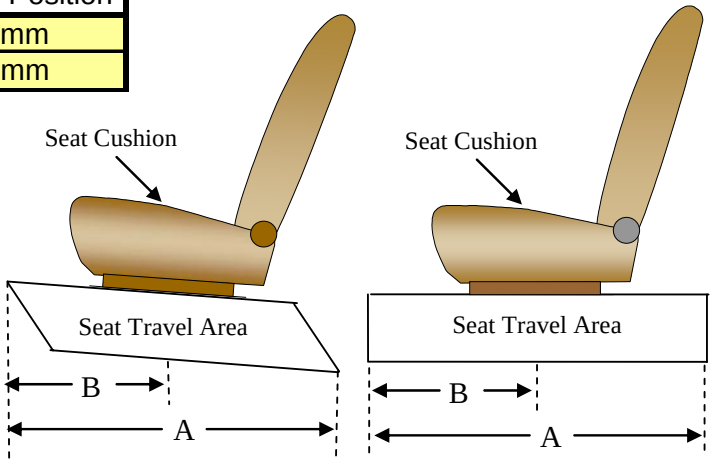
Position	Degrees
Driver w/ Seated Dummy	8.2 @ Headrest
Passenger w/ Seated Dummy	8.2 @ Headrest

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	270 mm	135 mm
Passenger Seat	270 mm	135 mm



SEAT BELT ANCHORAGE

Position number one (1) is the uppermost position.

SEAT BELT ANCHORAGE POSITIONING

	Total Number of Positions	Placed in Position
Driver Seat	5	3
Passenger Seat	5	3

TEST VEHICLE INFORMATION

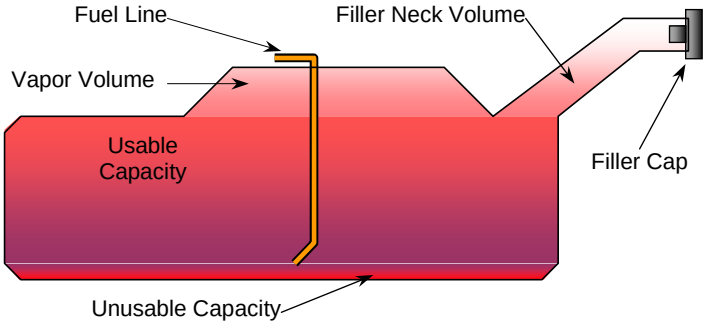
Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

FUEL TANK CAPACITY

	Liters
Usable Capacity of Standard Tank	68.13
Usable Capacity of Optional Tank	
Usable Capacity Used for FMVSS 301	62.68 to 64.04
Actual Amount of Solvent Used	63.36

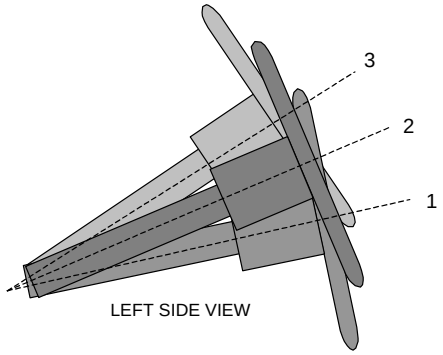
The test vehicle is equipped with an electric fuel pump. The fuel pump will operate for approximately two (2) seconds with the ignition in the "ON" position, after which the fuel pump automatically shuts off. The fuel filler door is located on the right rear fender. The standard fuel tank occupies the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



VEHICLE FUEL TANK ASSEMBLY

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when moved through its full range of motion. An aluminum plate is placed across the rim of the steering wheel, an inclinometer is placed on the plate and the angle is measured.



STEERING COLUMN ASSEMBLY

STEERING COLUMN POSITIONS

	Degrees	Fore/Aft Position
Lowermost - Position No. 1	18.2	110
Geometric Center - Position No. 2	20.5	130
Uppermost - Position No. 3	22.8	150

DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

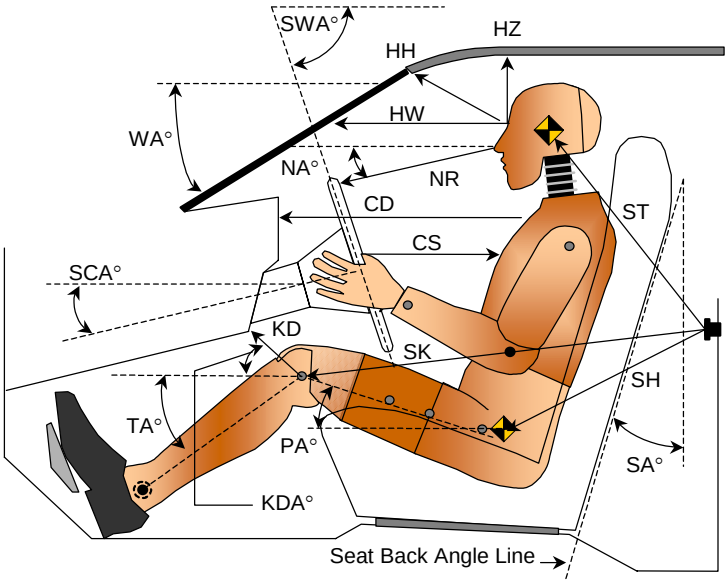
Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

TEST DUMMY POSITION MEASUREMENTS

Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (°)	Length (mm)	Angle (°)
WA	Windsheild angle		22.6		
SWA	Steering wheel angle		70.5		
SCA	Steering column angle		19.5		
SA	Seat Back angle		8.2 @ Headrest		8.2 @ Headrest
HZ	Head to roof (Z)	207	90.0	205	90.0
HH	Head to header	390		392	
HW	Head to windshield	698		700	
HR	Head to side header (Y)	260		271	
NR	Nost to rim	418	7.8		
CD	Chest to dash	548		604	
CS	Chest to steering hub	360			
RA	Rim to abdomen	239			
KDL	Left knee to dash	190	23.8	158	
KDR	Right knee to dash	150		205	29.4
PA	Pelvic angle		23.4		23.2
TA	Tibia Angle		39.1		38.7
KK	Knee to knee	295		275	
SK	Striker to outboard knee	522	4.2	551	4.2
ST	Striker to head	518	88.2	502	89.0
SH	Striker to H-Point	128	0.0	136	0.0
SHY	Striker to H-Point (Y)	241		225	
HS	Head to side window	310		325	
HD	H-Point to door	141		138	
AD	Arm to door	115		122	

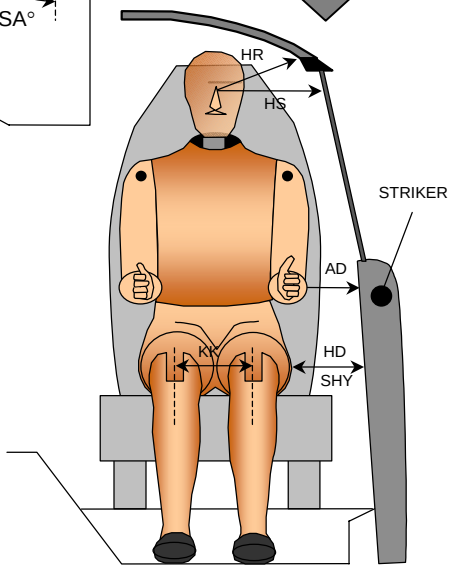
Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

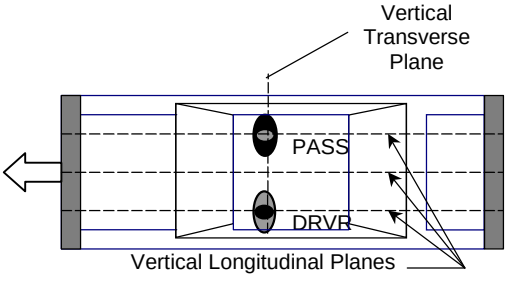
Test Program: NHTSA 35mph NCAP Test Date: 12/18/07



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

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)



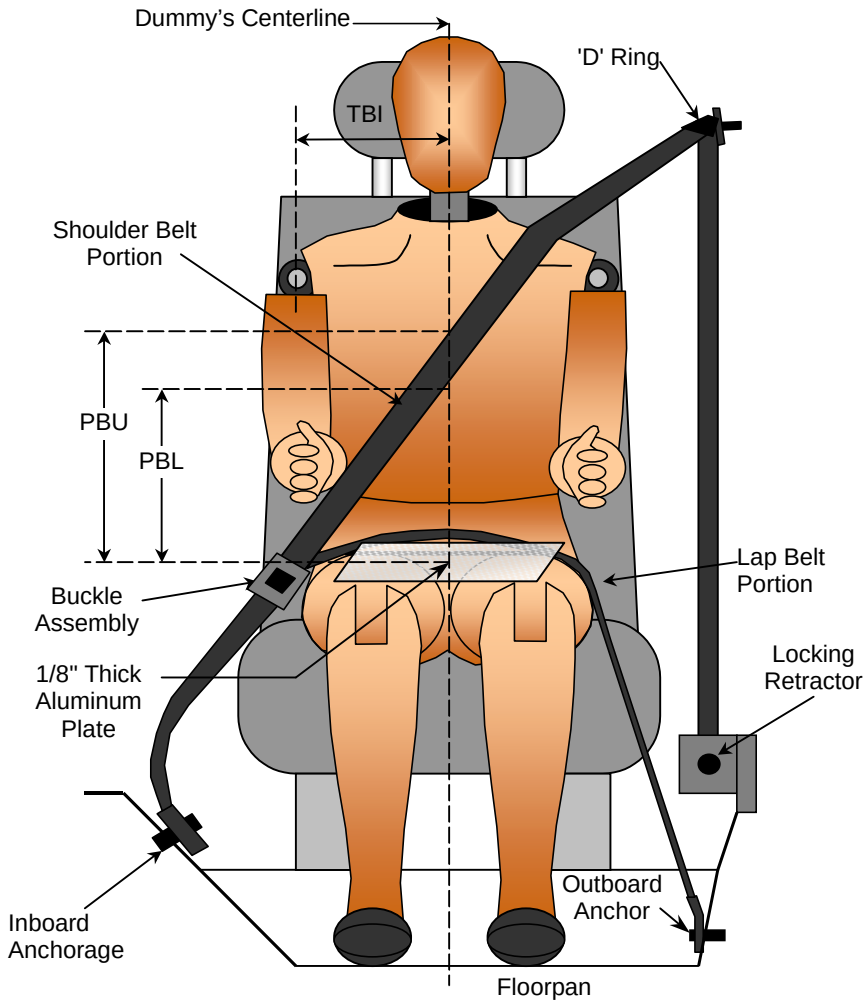


DATA SHEET NO. 6

SEAT BELT POSITIONING DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07



SEAT BELT POSITIONING MEASUREMENTS

Measured Parameter	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	215	230
PBU - Top Surface of Reference to Belt Upper Edge	mm	305	285
PBL - Top Surface of Reference to Belt Lower Edge	mm	230	220
Lap Belt Tension	Newtons	10	10
Shoulder Belt Tension	N/A	Retractor	Retractor

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATIONS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurement (mm)		
		X	Y	Z
1	Left Rear X-Member	2005	-715	400
2	Right Rear X-Member	2000	720	395
3	Engine Top	4055	-30	910
4	Engine Bottom	4090	50	260
5	Left Brake Caliper	4115	-805	340
6	Right Brake Caliper	4115	805	340
7	Instrument Panel			[1]
8	Left Rear X-Member (Z-Axis)	2005	-715	400
9	Right Rear X-Member (Z-Axis)	2000	720	395

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: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
Retractor Reel to D-Ring	mm	675	675
Shoulder Belt Length as Measured on ATD	mm	840	843
Lap Belt Length as Measured on ATD	mm	650	665
Remainder of Belt on Reel	mm	1110	1120
Total Belt Length for Continuous Webbing Systems	mm	3275	3303

SHOULDER BELT SPOOL-OFF DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	189	220
As determined electronically	mm	Failed	289.8

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 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

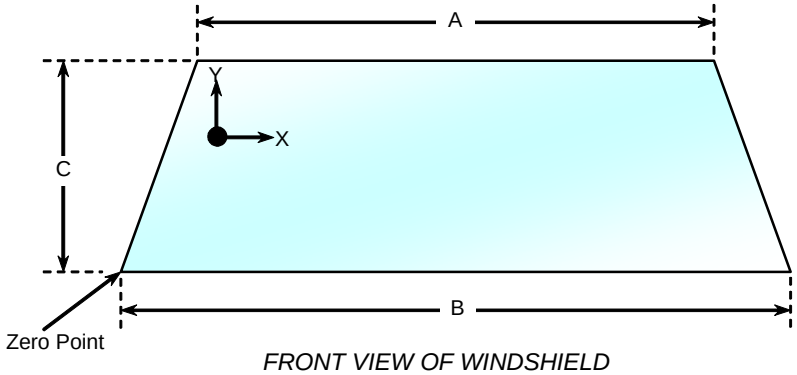
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with rubber cement type adhesive. plastic molding covers the windshield periphery.

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: 12.8 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test (mm)	Post-Test (mm)	% of Retention
Left Side	2190	2190	100.0
Right Side	2190	2190	100.0
Total	4380	4380	100.0



FRONT VIEW OF WINDSHIELD

WINDSHIELD DIMENSIONS

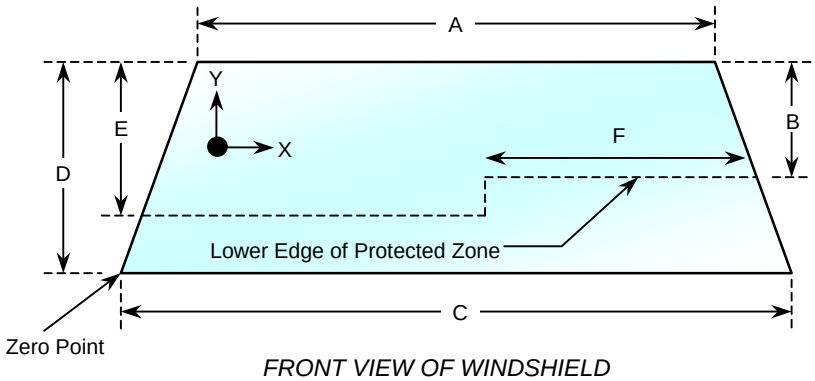
Item	Units	Segment Length	Molding Width
A	mm	1180	5
B	mm	1470	35
C-Left	mm	865	5
C-Right	mm	865	5

DATA SHEET NO. 10

WINDSHIELD ZONE INTRUSION FMVSS 219 DATA (PARTIAL)

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07



FRONT VIEW OF WINDSHIELD

WINDSHIELD AND PROTECTED ZONE

Item	Units	Value
A	mm	1180
B	mm	370
C	mm	1470
D	mm	865
E	mm	535
F	mm	495

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 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

Test Time: 11:55 AM Temperature: 12.8 ° C

STODDARD SOLVENT SPILLAGE MEASUREMENTS

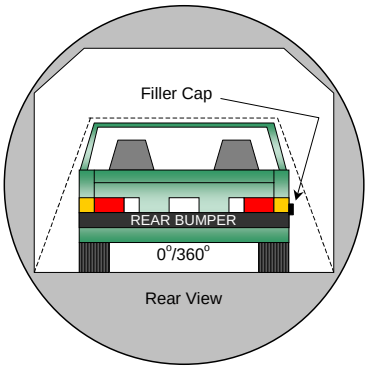
A.	From impact until vehicle motion ceases: (Maximum allowable = 1 ounce)	0
B.	For the 5 minute period after motion ceases: (Maximum allowable = 5 ounces)	0
C.	For the following 25 minutes: (Maximum allowable = 1 oz/minute)	0
D.	Spillage Details:	No leakage occurred

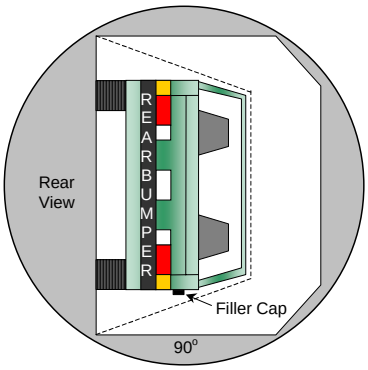
DATA SHEET NO. 12

FMVSS 301 STATIC ROLLOVER DATA

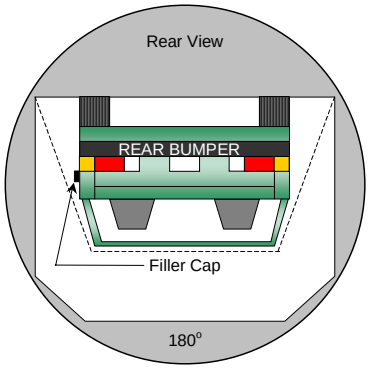
Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

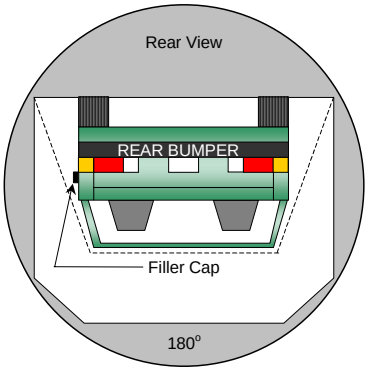




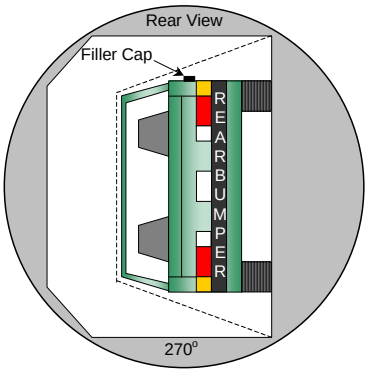
0° to 90°

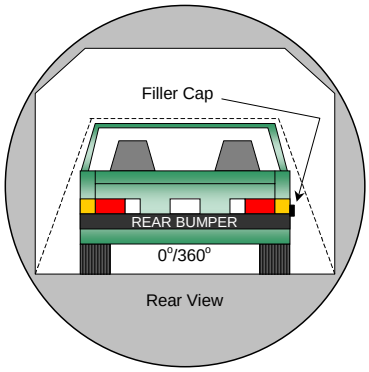


90° to 180°



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 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	83	303	386
90° to 180°	84	306	390
180° to 270°	88	302	390
270° to 360°	84	305	389

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 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

VEHICLE MEASUREMENT TABLE

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Length of test vehicle at centerline	mm	4820	4383	-437
2	RSOV to front of engine	mm	4105	4028	-77
3	RSOV to firewall centerline	mm	3710	3690	-20
4	RSOV to upper leading edge of right door	mm	3330	3335	5
5	RSOV to upper leading edge of left door	mm	3325	3207	-118
6	RSOV to lower leading edge of right door	mm	3343	3330	-13
7	RSOV to lower leading edge of left door	mm	3335	3330	-5
8	RSOV to upper trailing edge of right door	mm	2180	2187	7
9	RSOV to upper trailing edge of left door	mm	2178	2184	6
10	RSOV to lower trailing edge of right door	mm	2215	2204	-11
11	RSOV to lower trailing edge of left door	mm	2207	2205	-2
12	RSOV to bottom of right A-pillar	mm	3336	3315	-21
13	RSOV to bottom of left A-pillar	mm	3326	3307	-19
14	RSOV to firewall on right side	mm	3630	3620	-10
15	RSOV to firewall on left side	mm	3668	3590	-78
16	RSOV to steering column hub	mm	2785	2800	15
17	Center of steering column to left A-pillar, Y	mm	415	390	-25
18	Center of steering column to headlining, Z	mm	415	415	0
19	RSOV to right side of front bumper	mm	4708	4340	-368
20	RSOV to left side of front bumper	mm	4708	4248	-460
21	Length of engine block	mm	500	500	0
RD	RSOV to right side of dash panel	mm	2986	2977	-9
CD	RSOV to center of dash panel	mm	2950	2968	18
LD	RSOV to left side of dash panel	mm	2986	2972	-14

DATA SHEET NO. 13…(CONTINUED)

VEHICLE STRUCTURAL MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

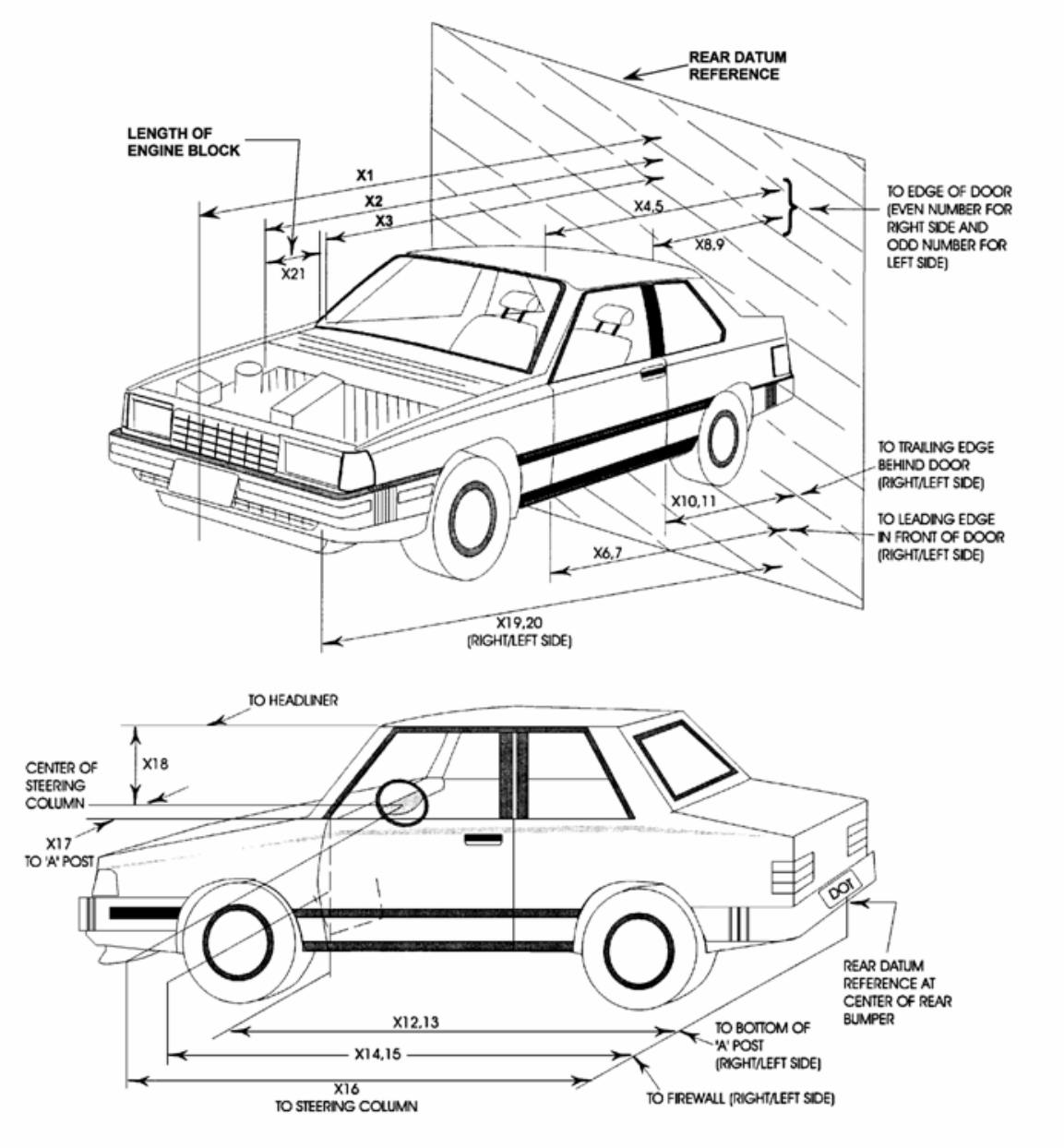
VEHICLE STRUCTURAL MEASUREMENT TABLE

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length	mm	4820	4383	-437
2	Total width	mm	1780	1783	3
3	Front bumper top height	mm	540	490	-50
4	Front bumper bottom height	mm	366	315	-51
5	Longitudinal member top height	mm	444	485	41
6	Longtidunal member bottom height	mm	344	415	71
7	Distance between longitudinal members	mm	780	640	-140
8	Longitudinal member width	mm	70	70	0
9	Engine top height	mm	895	915	20
10	Engine bottom height	mm	186	206	20
11	Engine and gearbox width	mm	1020	1020	0
12	Front bumper-engine distance	mm	707	365	-342
13	Front shock absorber height	mm	825	855	30
14	Front hood leading edge height	mm	700	812	112
15	Disatnce between front shock absorbers	mm	890	870	-20
16	Front bumper-front axle distance	mm	860	410	-450
17	Front axle to A-pillar distance	mm	580	540	-40
18	A Pillar to B Pillar distance	mm	1160	1155	-5
19	B Pillar to rear axle distance	mm	1135	1125	-10
20	B Pillar to C Pillar distance	mm	1010	1010	0
21	Roof sill bottom height	mm	1350	1280	-70
22	Roof sill top height	mm	1420	1350	-70
23	Floor sill bottom height	mm	193	164	-29
24	Floor sill top height	mm	365	353	-12

VEHICLE MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07



DATA SHEET NO. 14

CAMERA LOCATIONS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

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	-2321	-7097	-1087	0	8105	20	1000
3	Closeup Left Side	-1826	-6103	-1113	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	-2355	5906	-1163	0	7409	20	1000
8	Closeup Right Side	-1594	6975	-1083	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	-2163	209	-1391	-1	869	12	1000
17	Passenger Side Dummy On-Board	-2163	-209	-1391	-1	871	12	1000
18	Real Time Driver	-1926	-8089	-1704	-1	7597		30
19	Real Time Passenger	-1433	8047	-1704	-1	7598		30

All measurements are made relative to the point of impact.

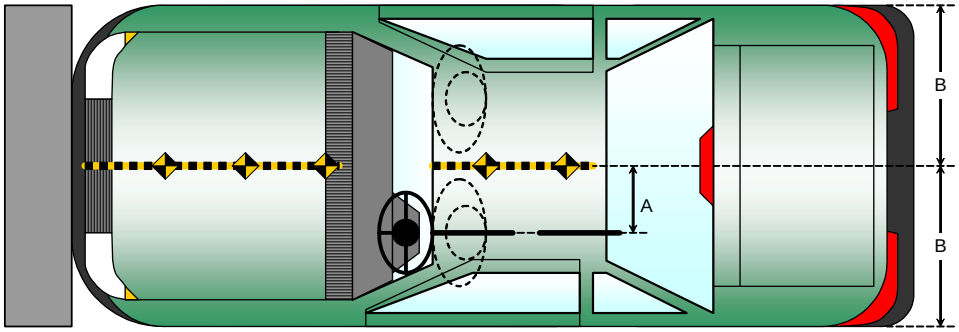
DATA SHEET NO. 15

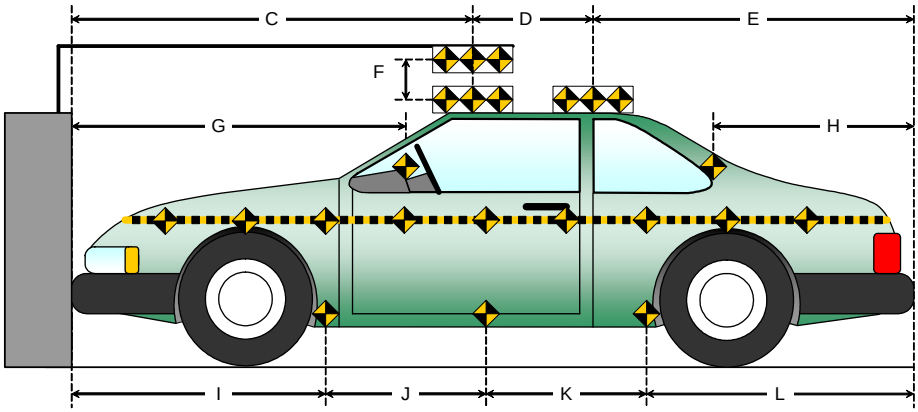
PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

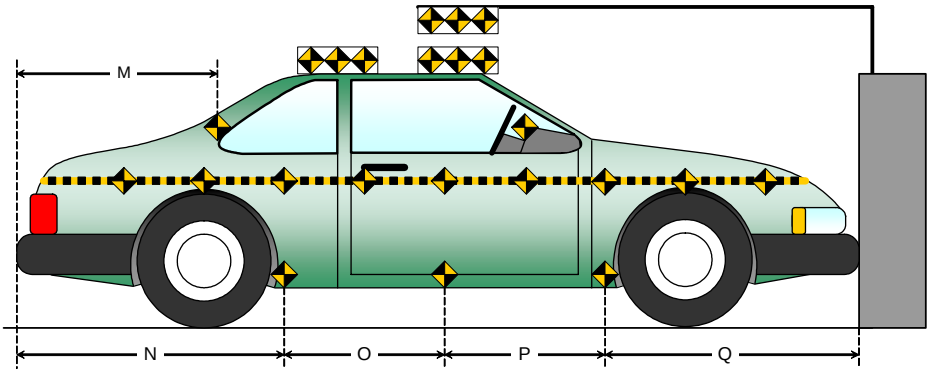
Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

All Dimensions in Millimeters (mm)	
Item	Value
A	
B	890
C	
D	
E	
F	
G	1865
H	1225
I	1320
J	980
K	980
L	1545
M	1225
N	1550
O	979
P	979
Q	1320







DATA SHEET NO. 16

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

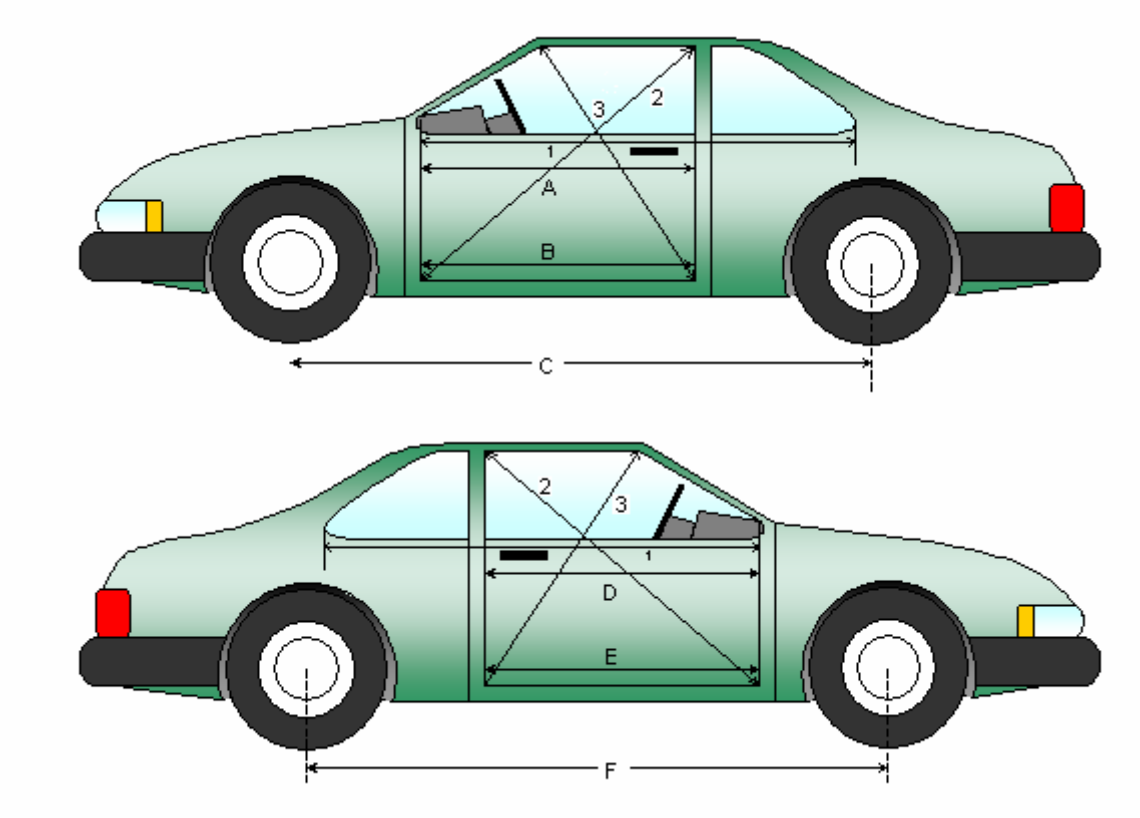
Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

DOOR OPENING WIDTH TABLE

Item	Description	Units	Pre-Test	Post-Test	Difference
1L	Left Side	mm	1061	1049	12
2L	Left Side (Diagonally)	mm	1436	1405	31
3L	Left Side (Diagonally)	mm	886	870	16
1R	Right Side	mm	1056	1050	6
2R	Right Side (Diagonally)	mm	1471	1453	18
3R	Right Side (Diagonally)	mm	886	891	-5

WHEELBASE MEASURMENT TABLE

Item	Description	Units	Pre-Test	Post-Test	Difference
C	Left Side Wheelbase	mm	2880	2810	70
F	Right Side Wheelbase	mm	2880	2785	95



DATA SHEET NO. 16…(CONTINUED)

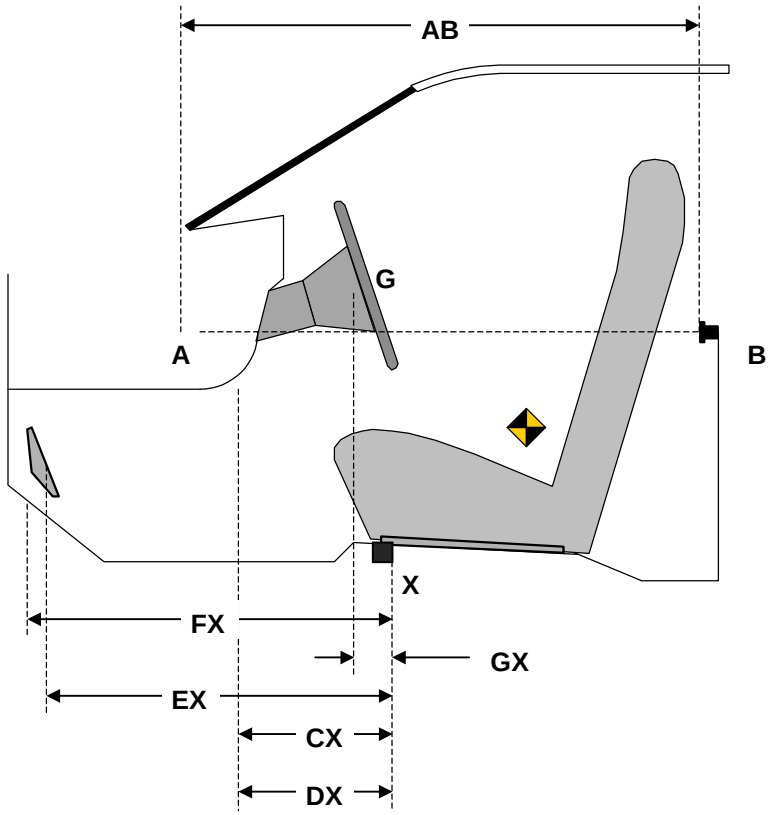
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

DRIVER COMPARTMENT INTRUSION TABLE

Item	Description	Units	Pre-Test	Post-Test	Difference
AB	Door Opening (Inside Windown Jam)	mm	1061	1049	12
CX	Left Knee Bolster to X	mm	200	200	0
DX	Right Knee Bolster to X	mm	155	150	5
EX	Brake Pedal to X	mm	525	525	0
FX	Foot Rest to X	mm	570	570	0
GX	Center of Steering Wheel Hub to X	mm	20	50	-30

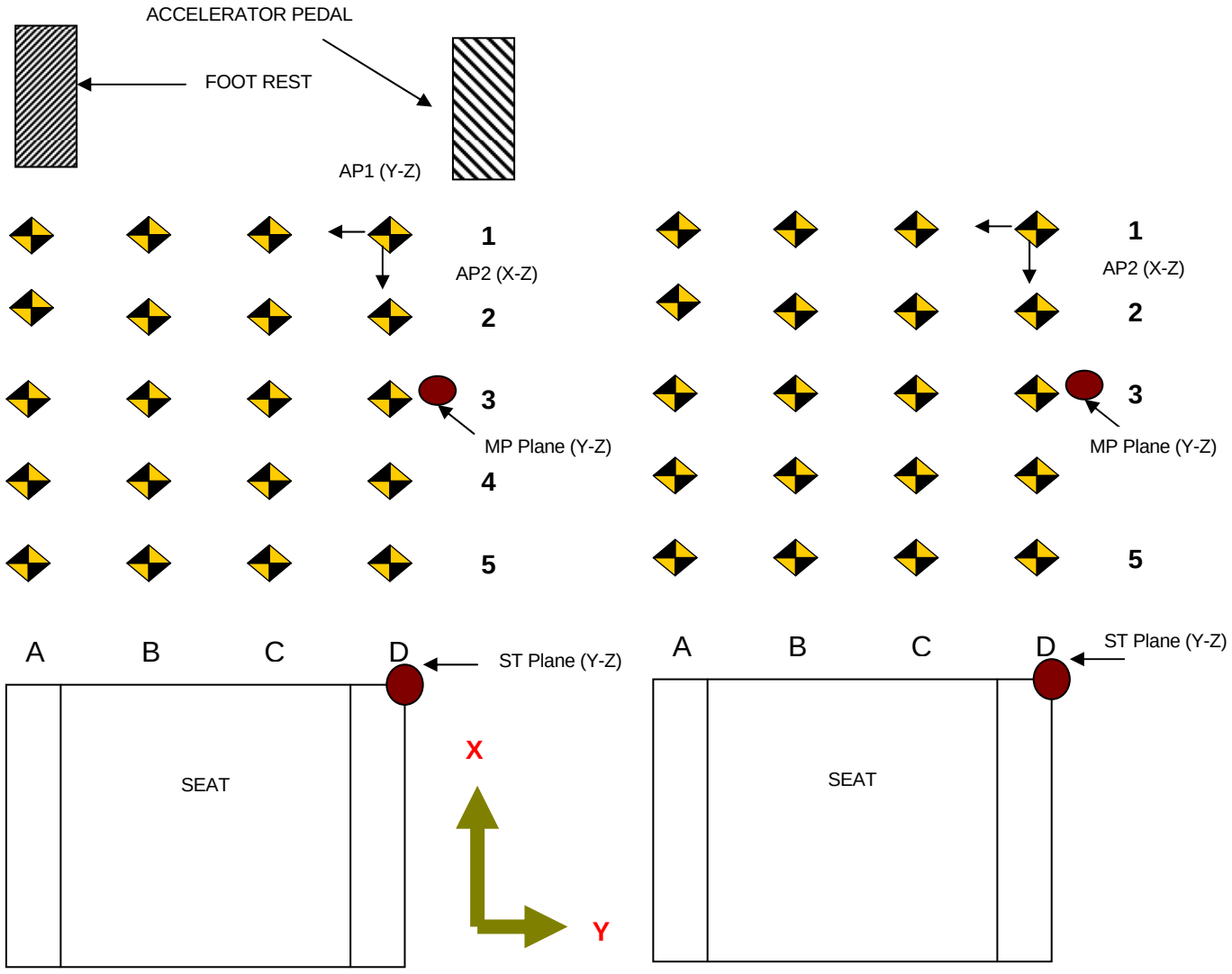


DATA SHEET NO. 16…(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07



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 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

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	630	627	633	648	604	595	598	606	26	32	35	42
2	534	534	542	552	508	504	508	511	26	30	34	41
3	434	438	442	442	408	407	408	402	26	31	34	40
4	337	335	335	332	310	303	302	293	27	32	33	39
5	220	228	231	237	192	197	198	196	28	31	33	41

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	6	110	201	342	39	144	232	372	-33	-34	-31	-30
2	6	114	202	346	35	145	232	376	-29	-31	-30	-30
3	8	116	202	340	34	142	229	366	-26	-26	-27	-26
4	7	119	203	334	31	141	224	357	-24	-22	-21	-23
5	16	121	205	333	34	140	221	350	-18	-19	-16	-17

DRIVER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	24	15	12	14	32	19	9	-2	-8	-4	3	16
2	76	53	51	56	83	57	52	42	-7	-4	-1	14
3	79	62	56	58	84	66	56	49	-5	-4	0	9
4	80	62	61	60	83	64	59	55	-3	-2	2	5
5	85	68	66	66	86	68	62	63	-1	0	4	3

DATA SHEET NO. 16…(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

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	622	621	625	620	571	583	595	597	51	38	30	23
2	524	521	525	418	466	483	494	494	58	38	31	25
3	315	419	419	322	366	380	387	393	51	39	32	25
4	222	319	323	222	264	278	292	296	51	41	31	26
5	222	222	223	222	171	182	193	198	51	40	30	24

DRIVER FLOORPAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-316	-157	-43	32	-357	-198	-83	-5	41	41	40	37
2	-317	-161	-46	31	-339	-194	-79	-1	22	33	33	32
3	-322	-166	-52	27	-345	-191	-78	2	23	25	26	25
4	-326	-168	-58	24	-341	-185	-77	6	15	17	19	18
5	-328	-173	-60	21	-336	-183	-74	8	8	10	14	13

PASSENGER FLOORPAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	5	13	23	27	25	27	36	38	-20	-14	-13	-11
2	49	51	73	74	65	67	85	84	-16	-16	-12	-10
3	54	52	75	75	70	67	87	81	-16	-15	-12	-6
4	57	58	76	77	73	72	88	81	-16	-14	-12	-4
5	59	64	84	84	77	76	94	87	-18	-12	-10	-3

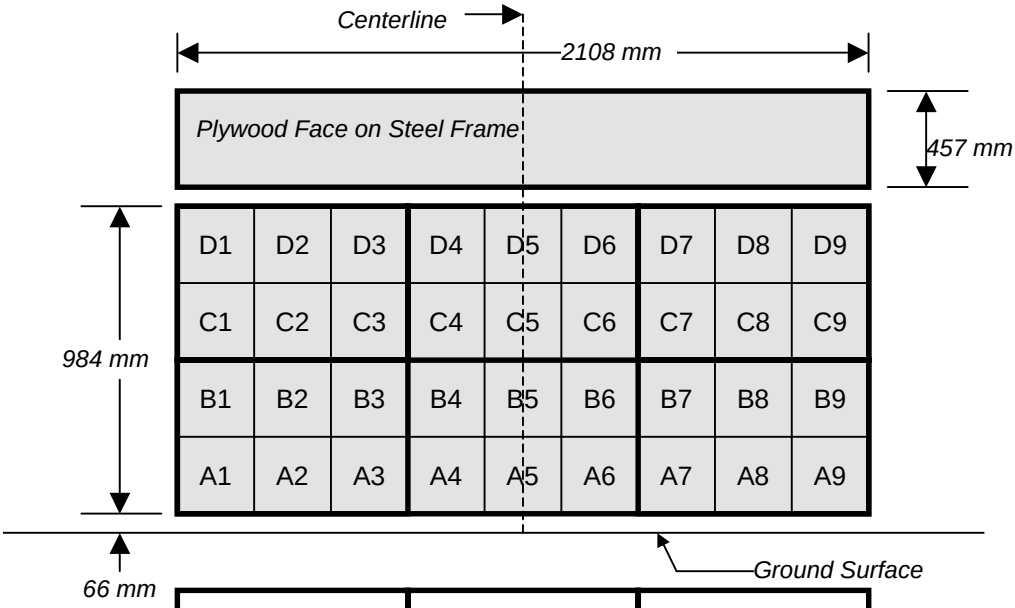
DATA SHEET NO. 17

FIXED BARRIER LOAD CELL LOCATIONS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

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



D1	D2	D3	D4	D5	D6	D7	D8	D9
C1	C2	C3	C4	C5	C6	C7	C8	C9
B1	B2	B3	B4	B5	B6	B7	B8	B9
A1	A2	A3	A4	A5	A6	A7	A8	A9

Group 4 C1 – D3	Group 5 C4 – D6	Group 6 C7 – D9
Group 1 A1 – B3	Group 2 A4 – B6	Group 3 A7 – B9

6 Groups of 6 Load Cells Each

DATA SHEET NO. 18

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07

VEHICLE INFORMATION

VIN: 1G6DT57V980146340 Wheelbase (mm): 2880

Vehicle Size Category: 4-Door Sedan Test Weight (kg): 2124

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): 56.04

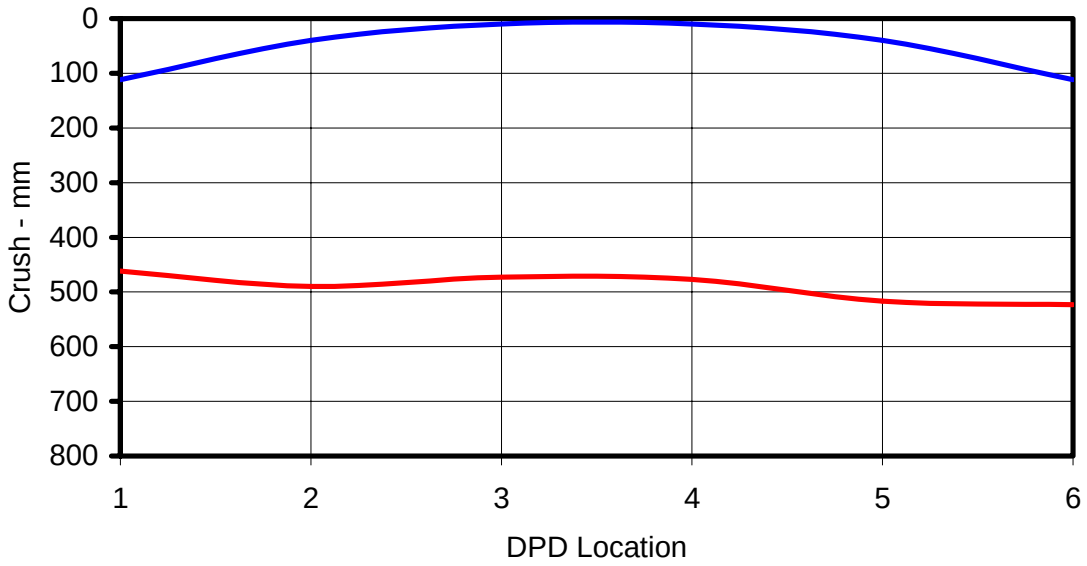
Velocity Change (km/h): 65.3 Time of Separation (msec): 62.9

CRUSH PROFILE

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

Damage Region Length: 1330 Impact Mode: Full frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side of vehicle	mm	112	462	-350
C2	Crush zone 2 on left side of vehicle	mm	40	490	-450
C3	Crush zone 3 on left side of vehicle	mm	10	473	-463
C4	Crush zone 4 on right side of vehicle	mm	10	477	-467
C5	Crush zone 5 on right side of vehicle	mm	40	517	-477
C6	Crush zone 6 at right side of vehicle	mm	112	523	-411

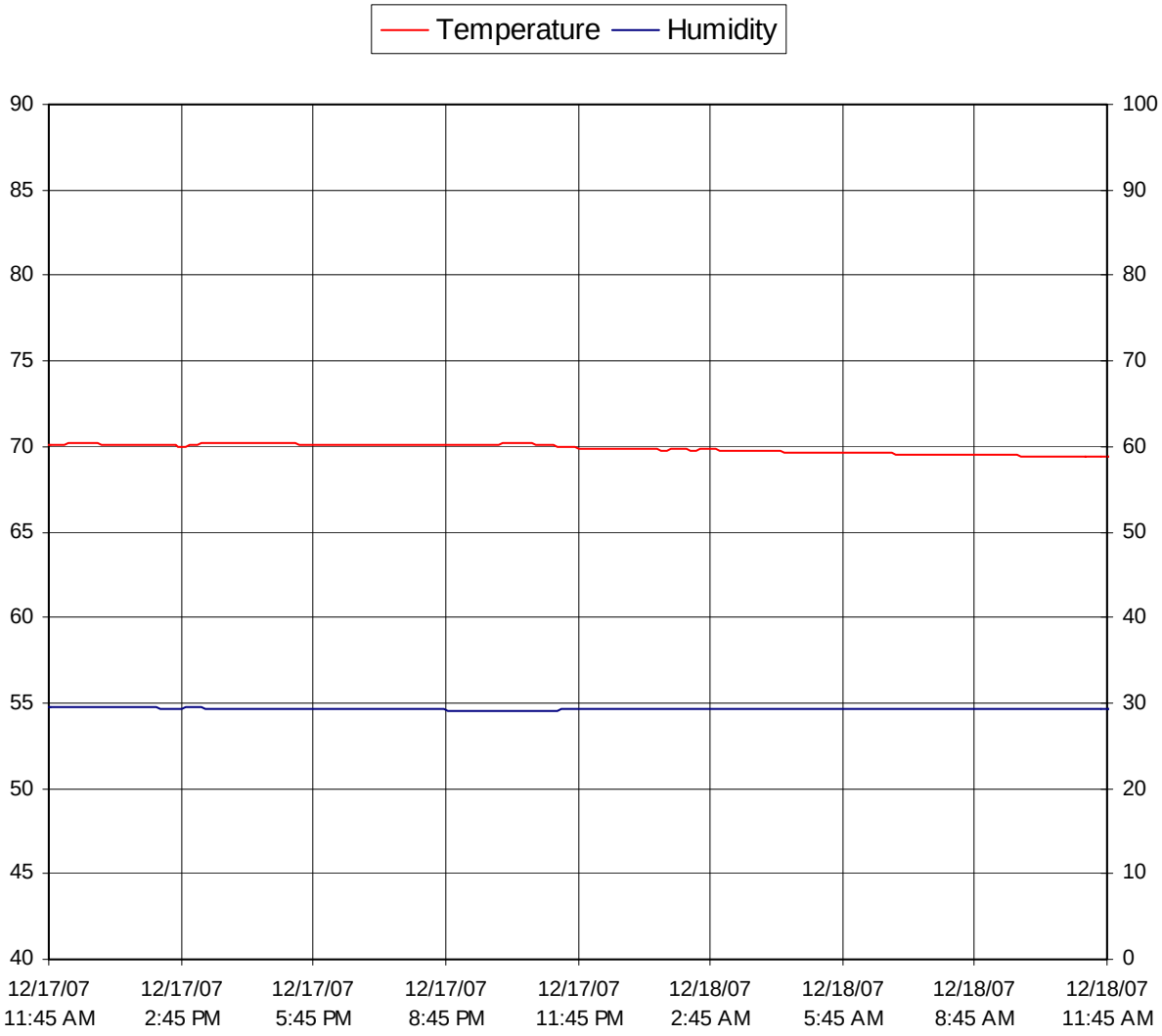


DATA SHEET NO. 19

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: M80105

Test Program: NHTSA 35mph NCAP Test Date: 12/18/07



APPENDIX A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

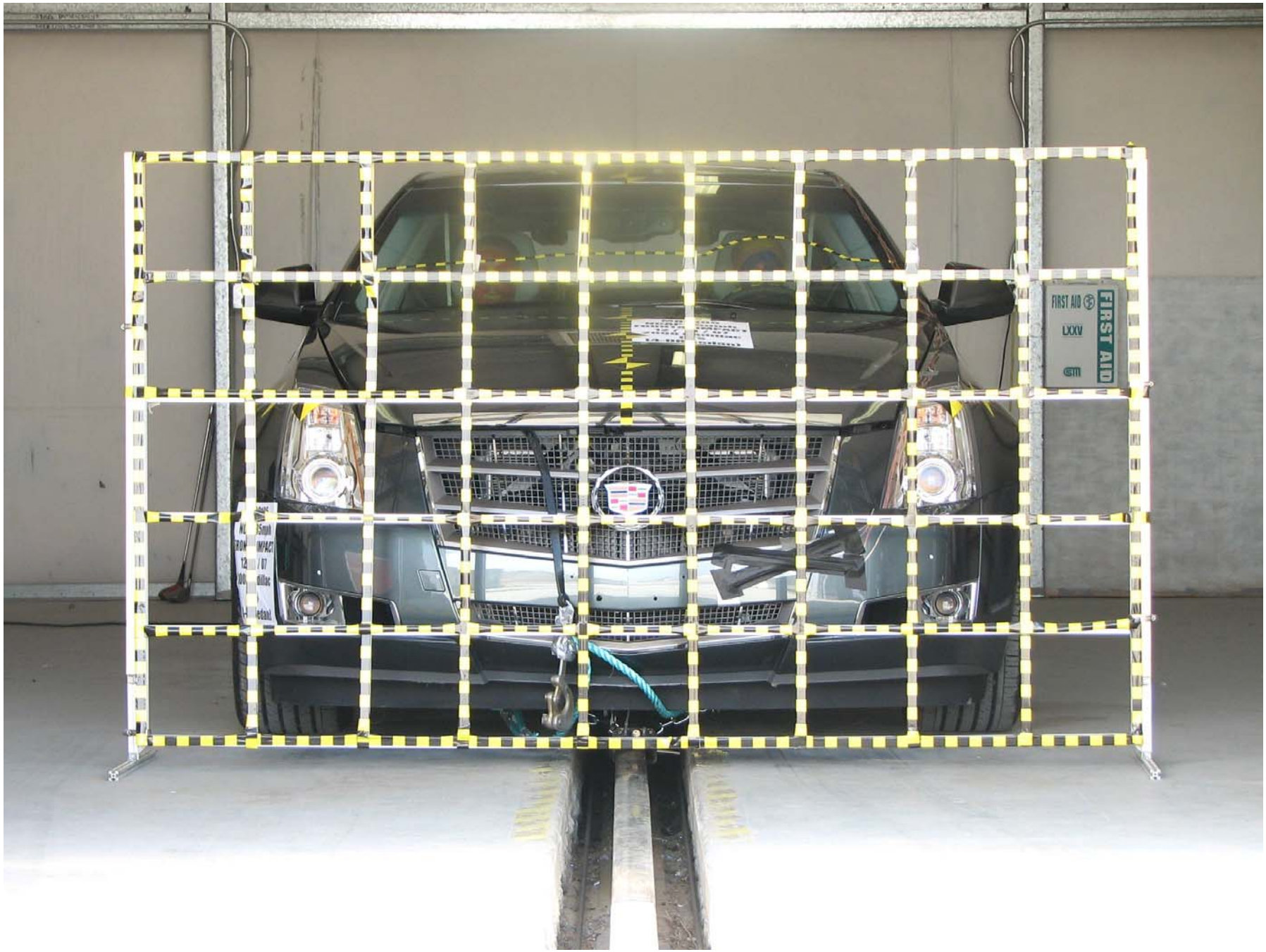


Figure A-1: Load Cell Location

This Space Intentionally Left Blank

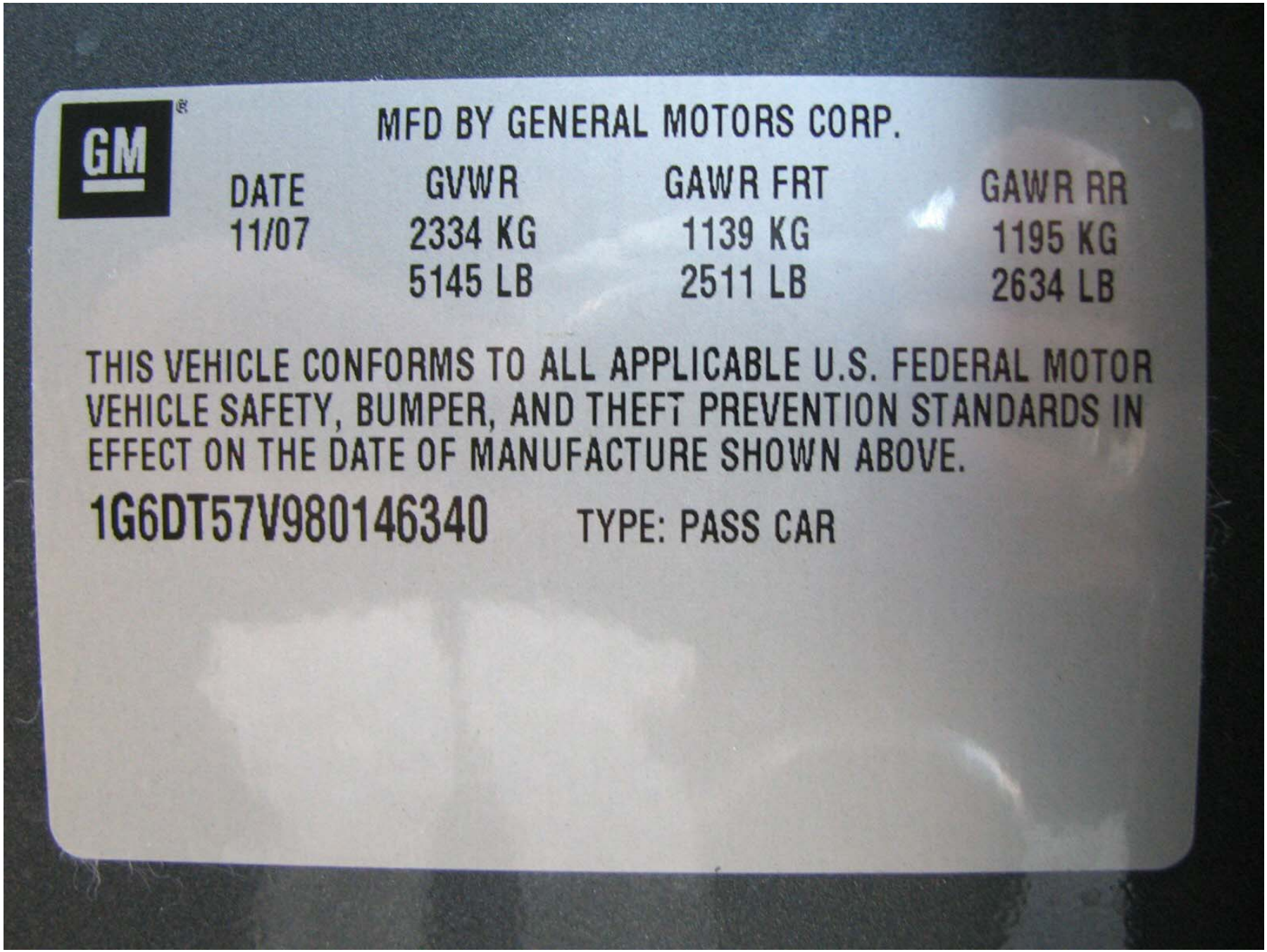


Figure A-2: Manufacturer's Label

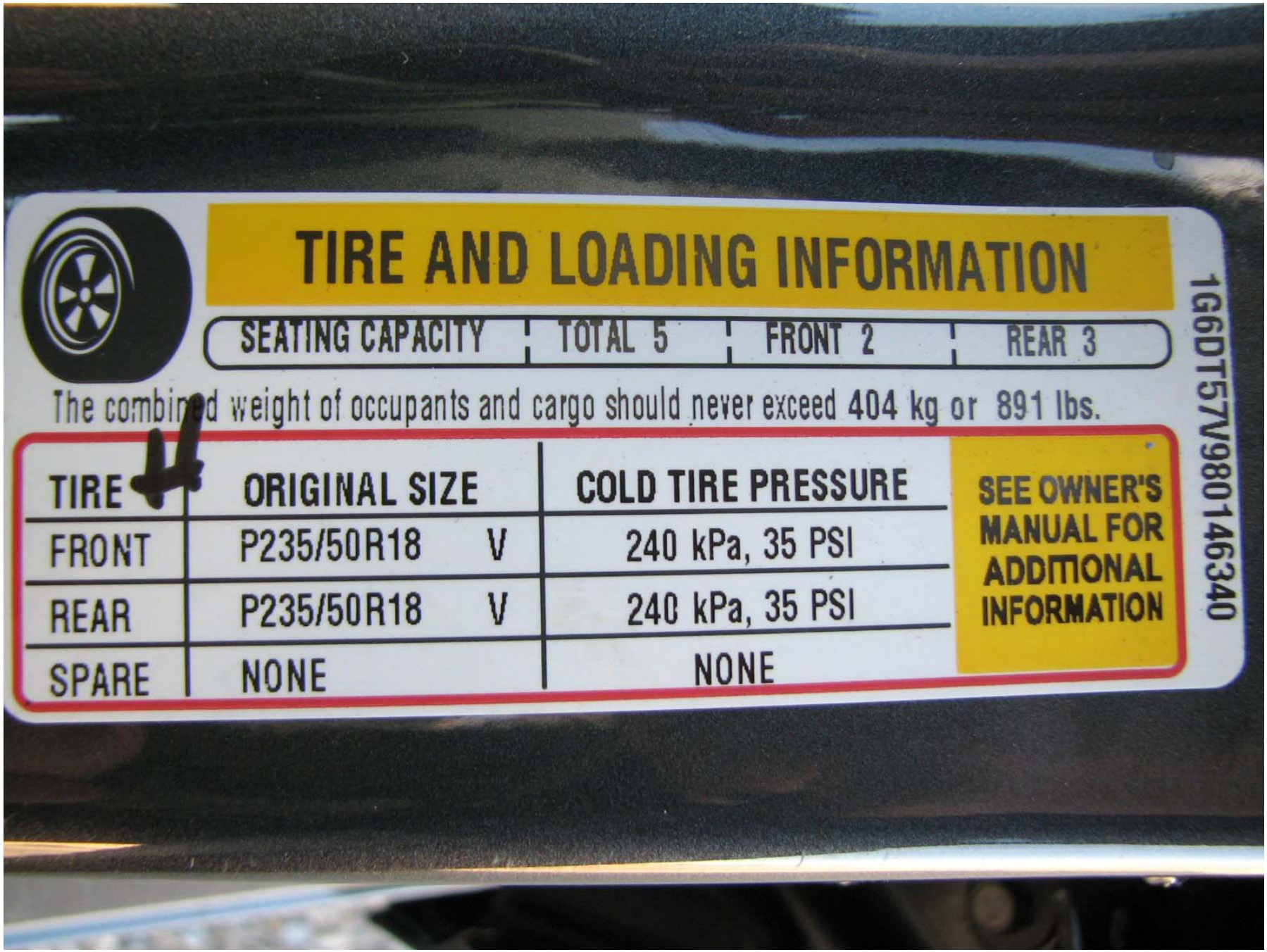


Figure A-3: Tire Placard

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

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

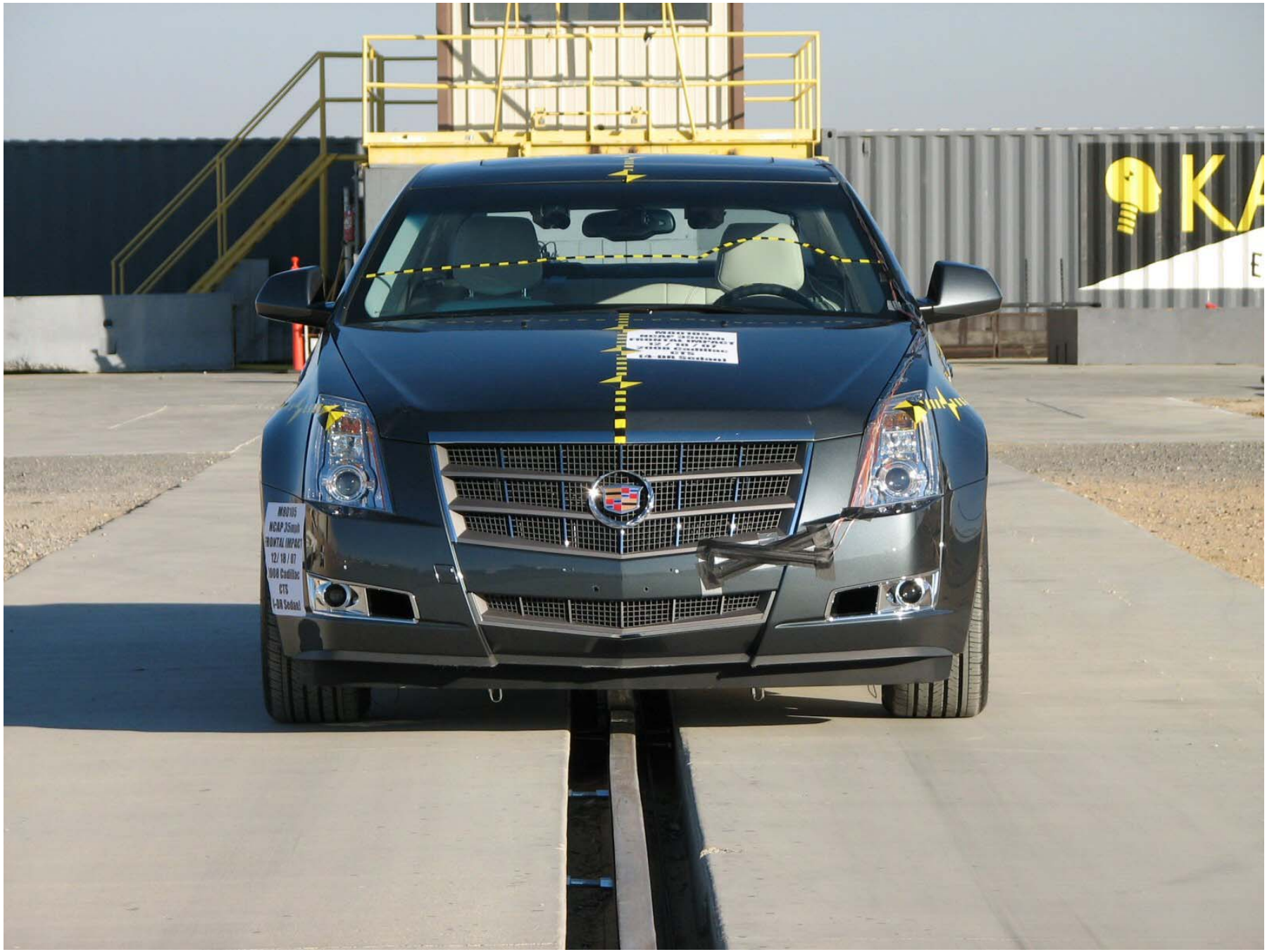


Figure A-6: Pre-Test Front View

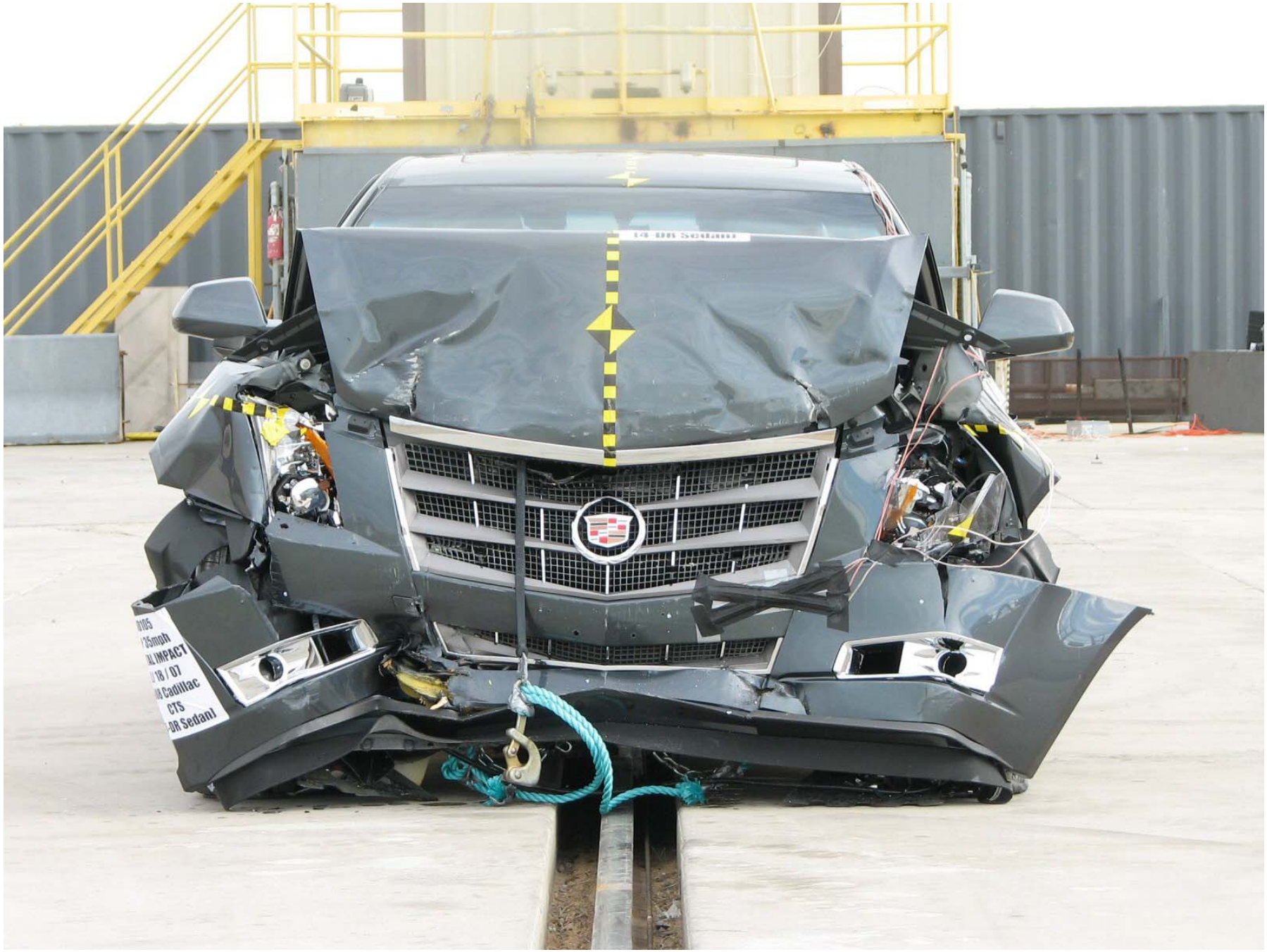


Figure A-7: Post-Test Front View (Vehicle Moved)

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

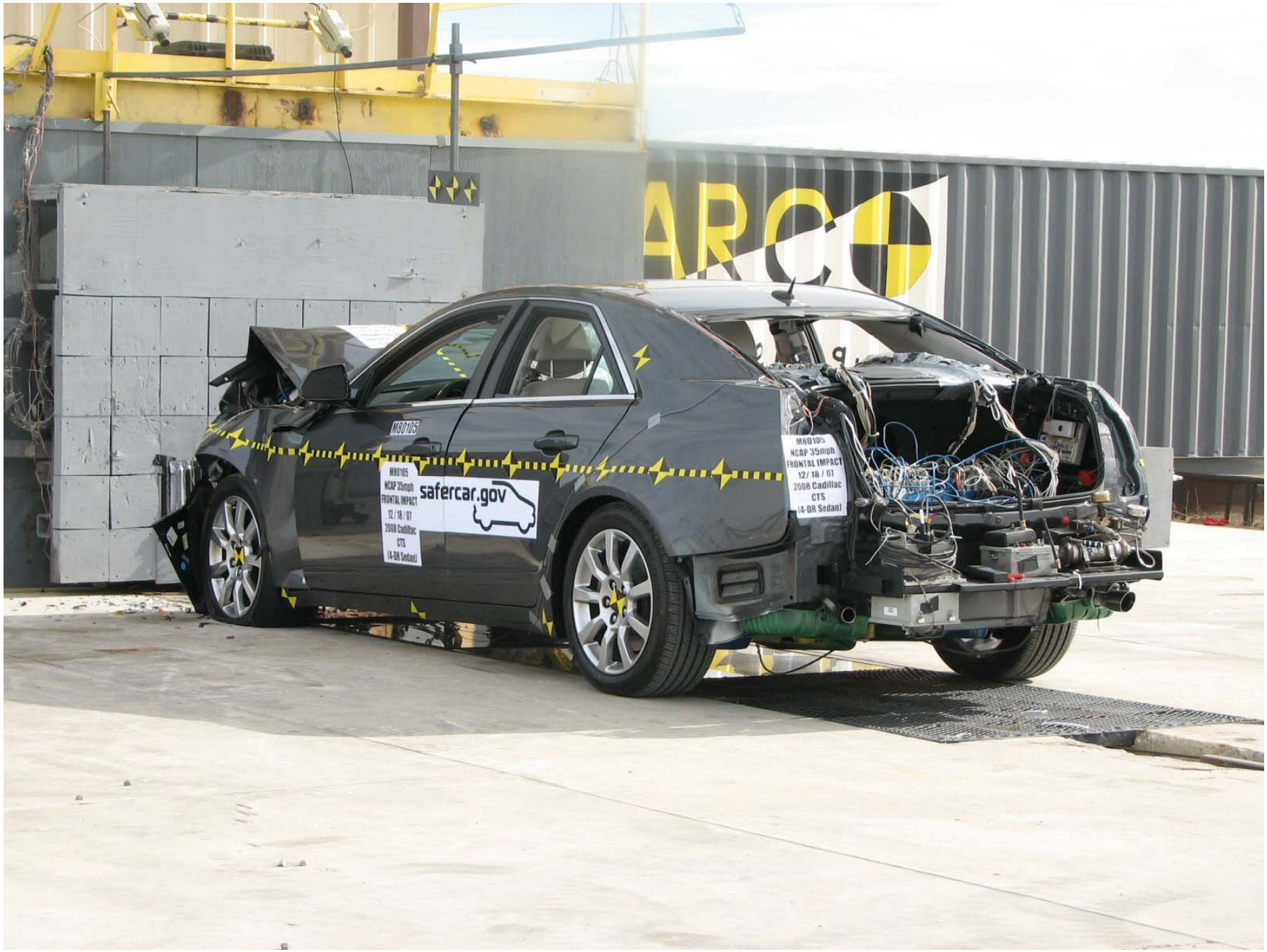


Figure A-15: Post-Test Left Rear ¾ View

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

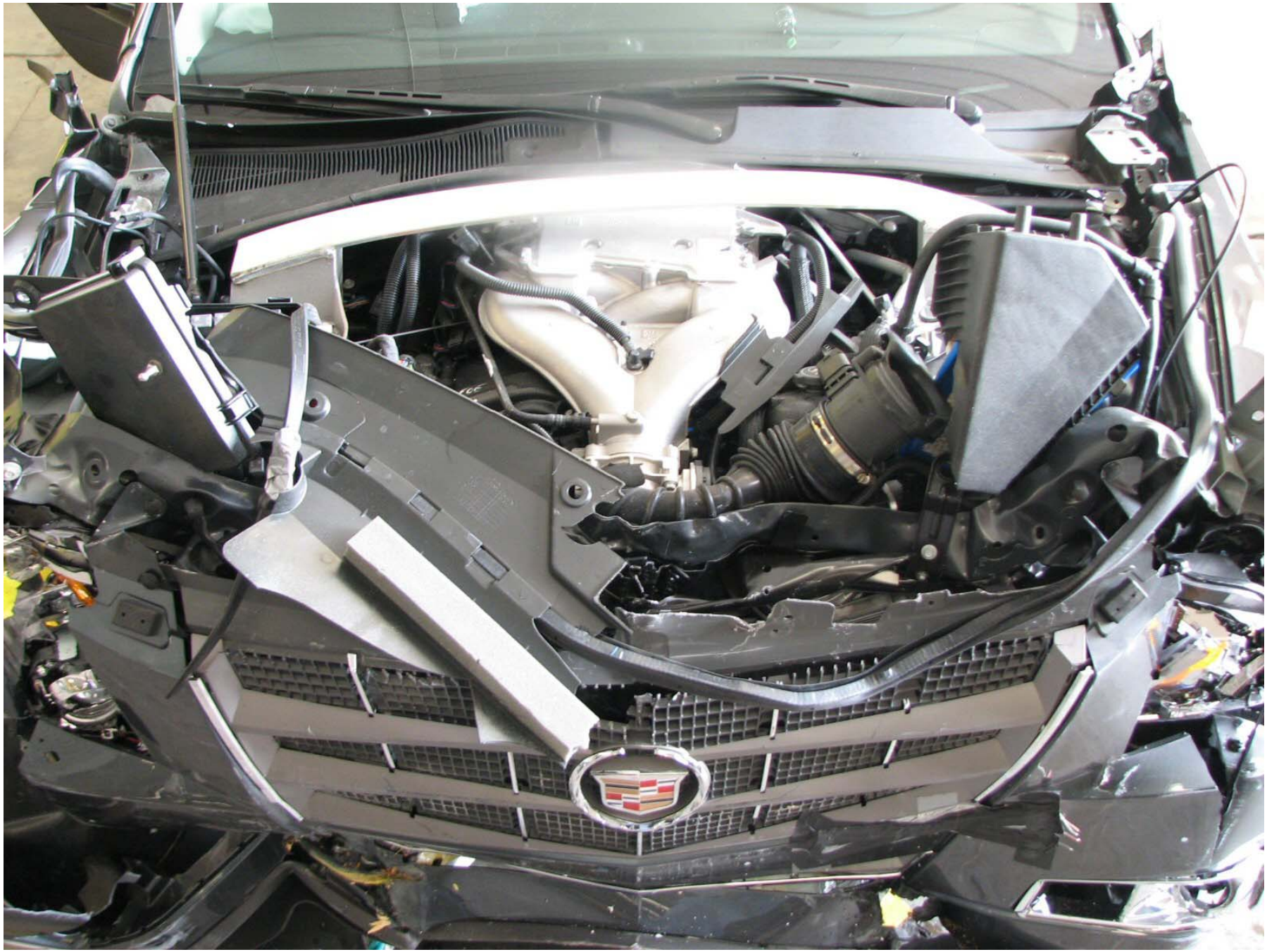


Figure A-21: Post-Test Engine Compartment (Vehicle Moved)

Figure A-22: Pre-Test Fuel Cap

Figure A-23: Post-Test Fuel Cap

Figure A-24: Pre-Test Front Underbody

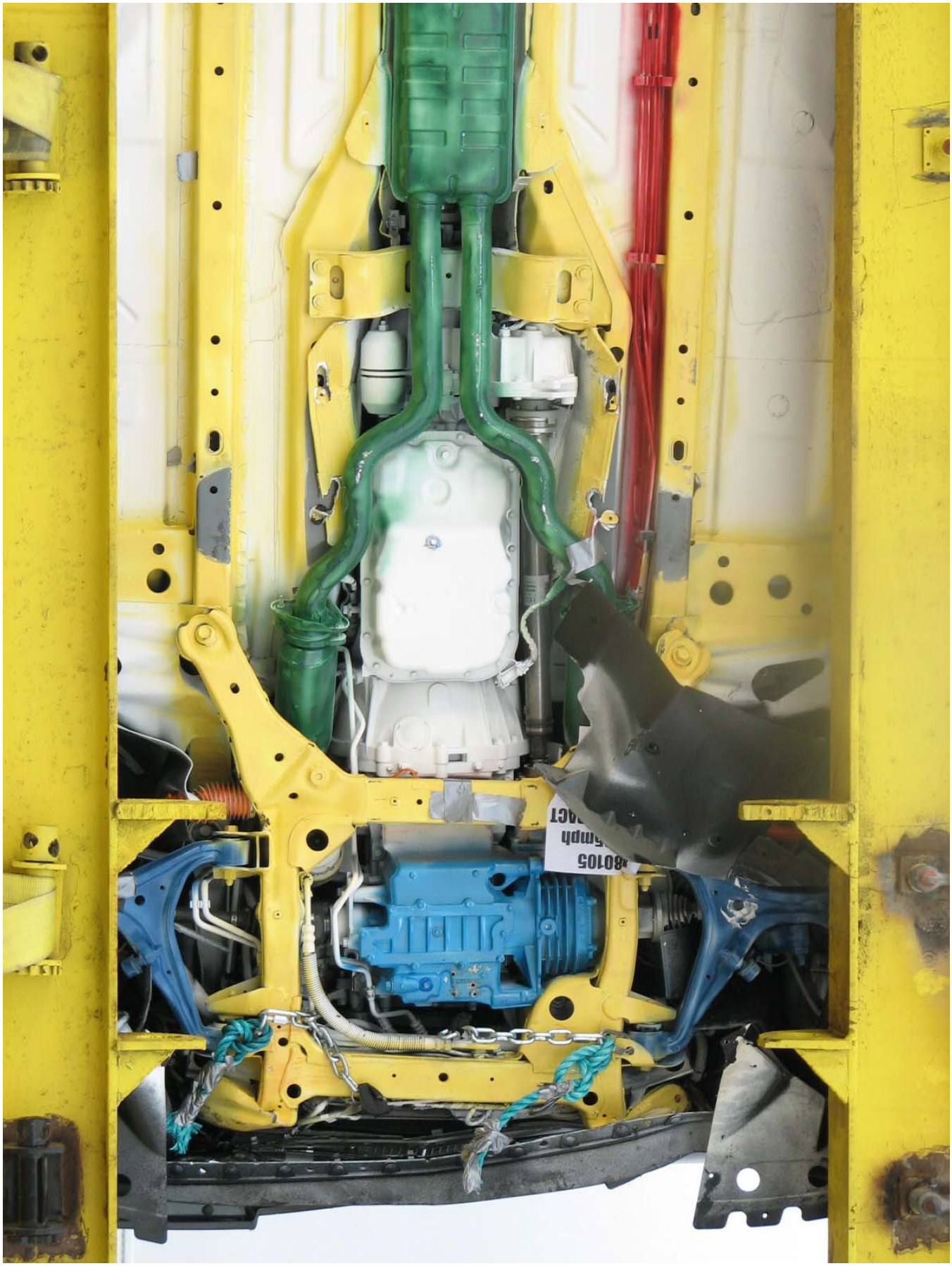


Figure A-25: Post-Test Front Underbody

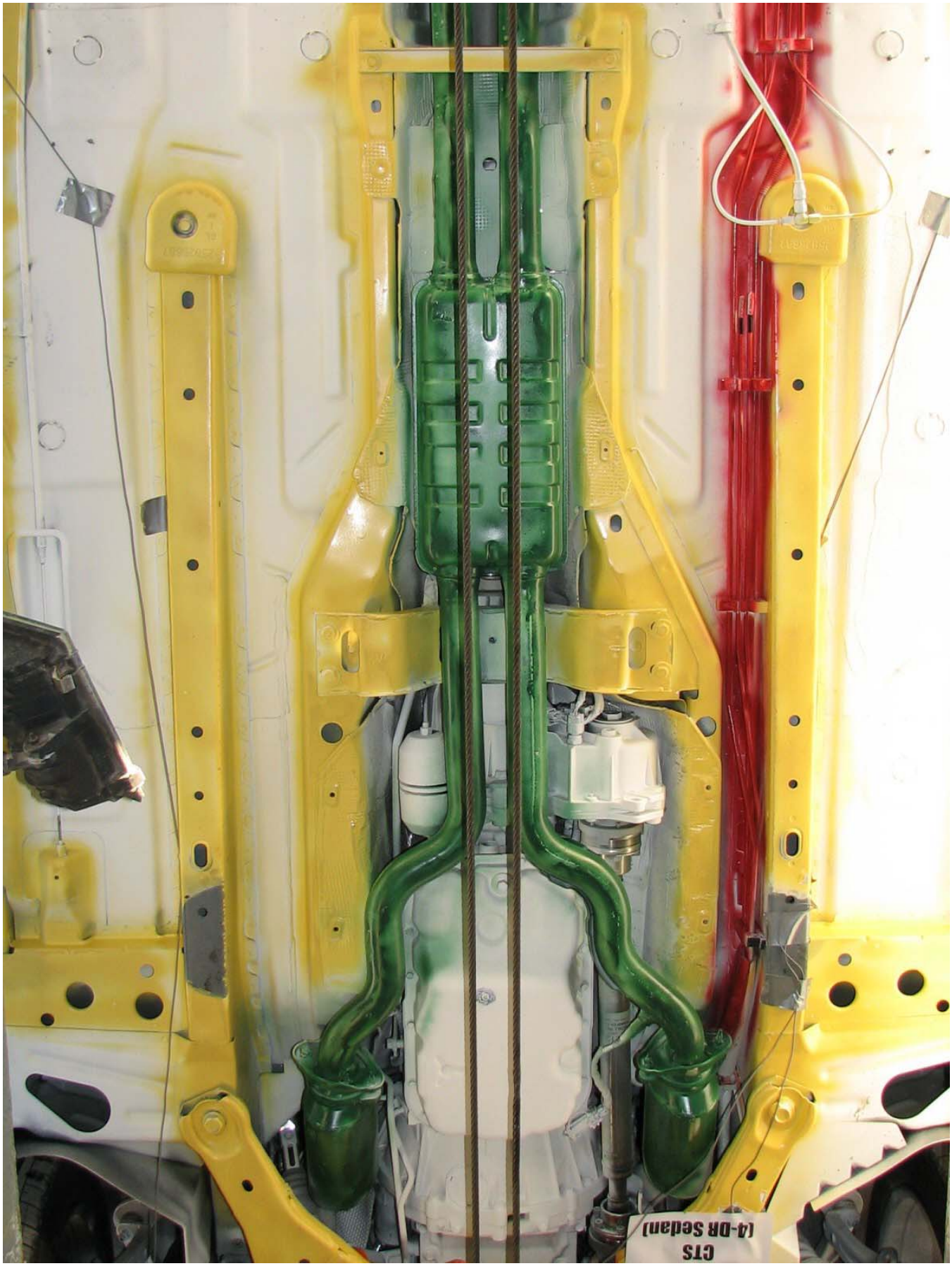


Figure A-26: Pre-Test Mid Underbody

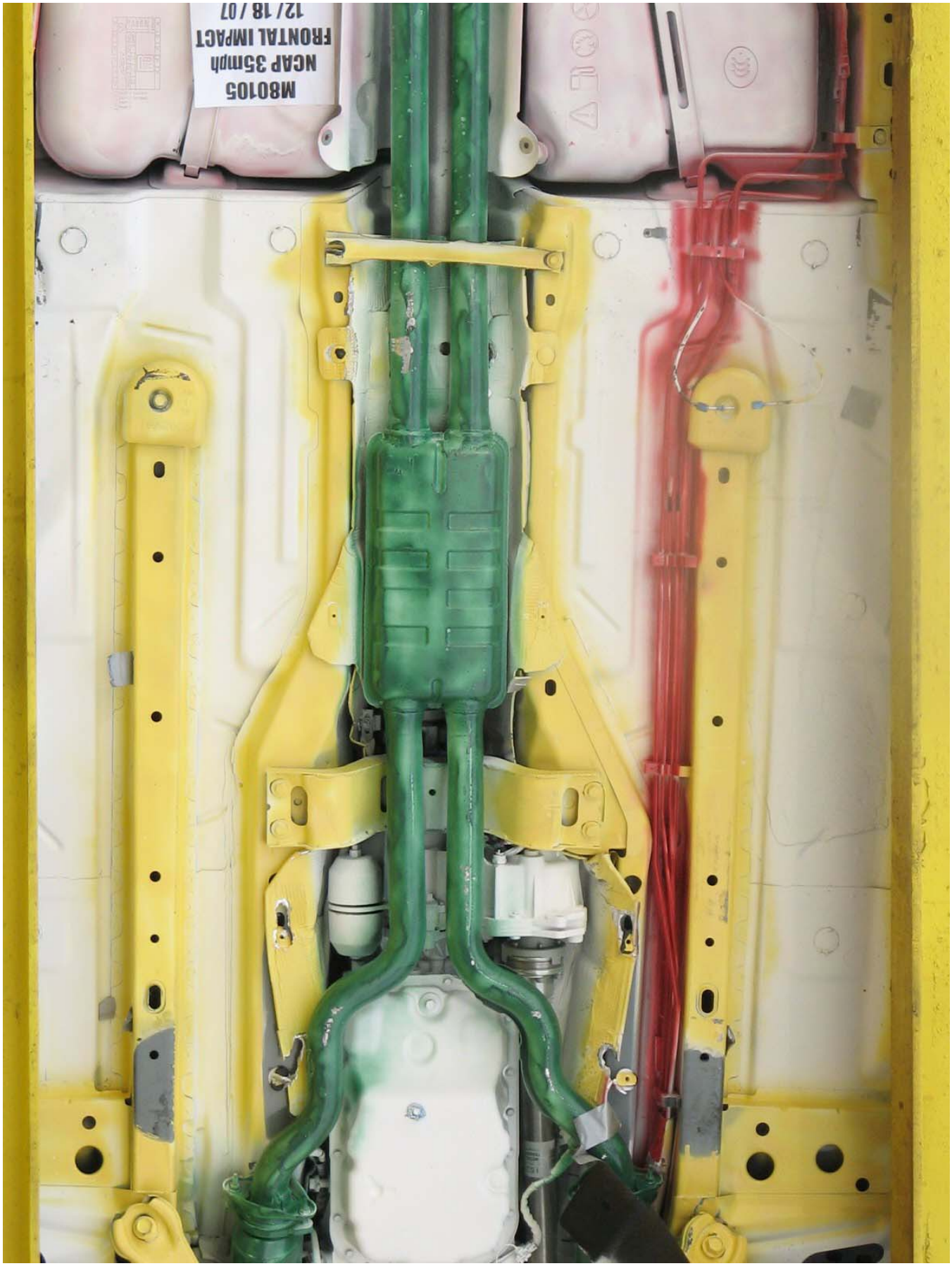


Figure A-27: Post-Test Mid Underbody

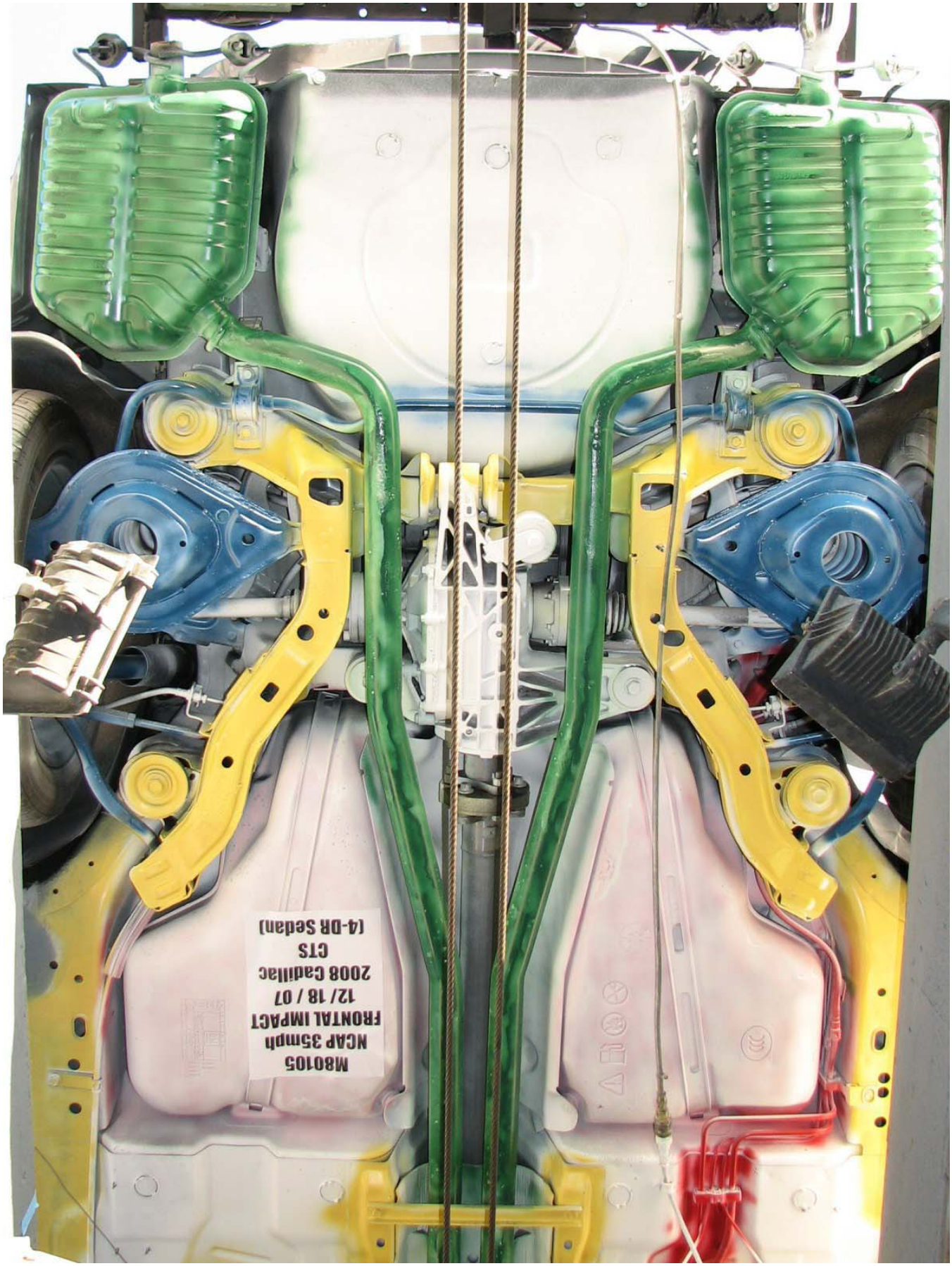


Figure A-28: Pre-Test Rear Underbody

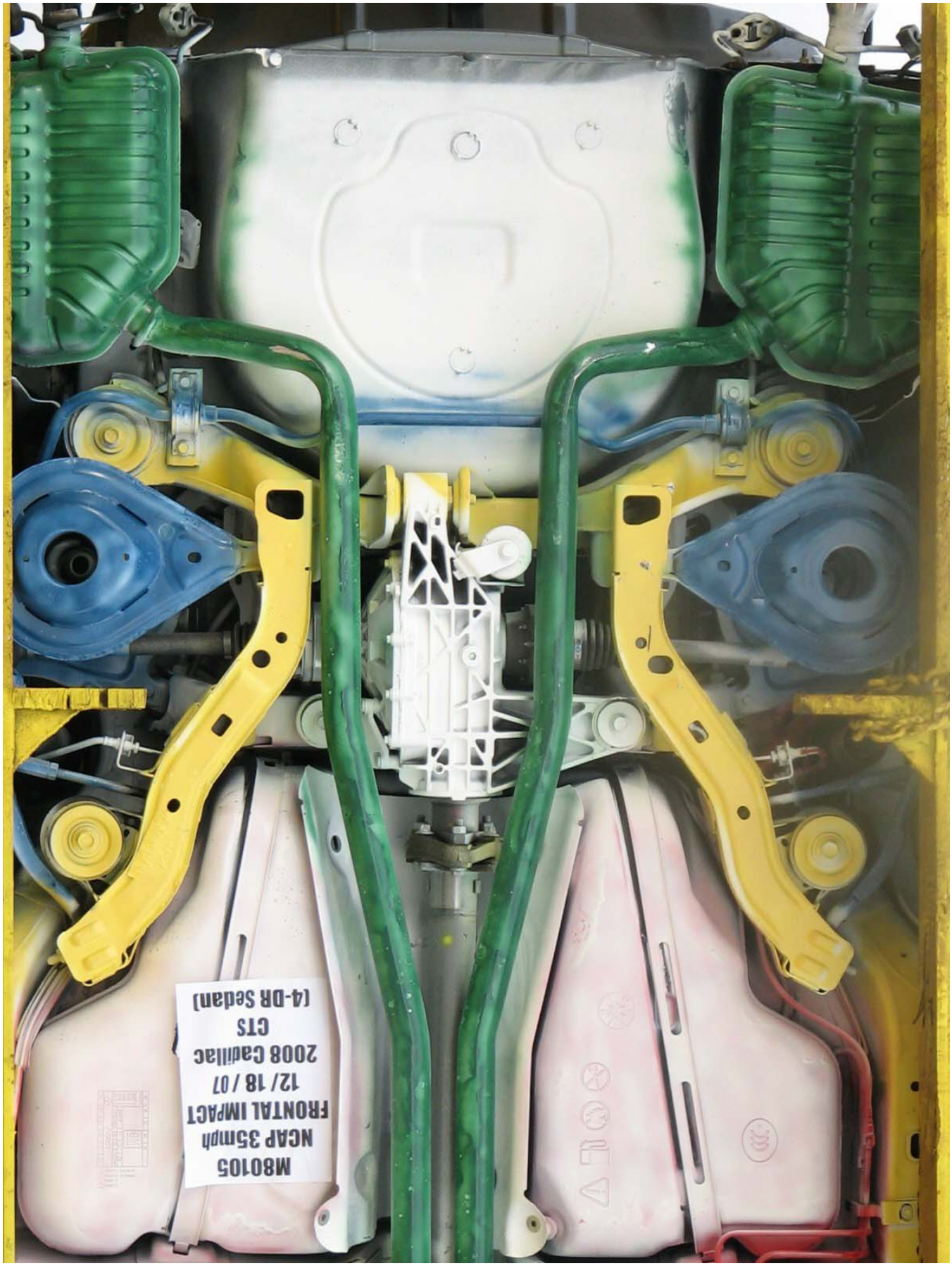


Figure A-29: Post-Test Rear Underbody

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)

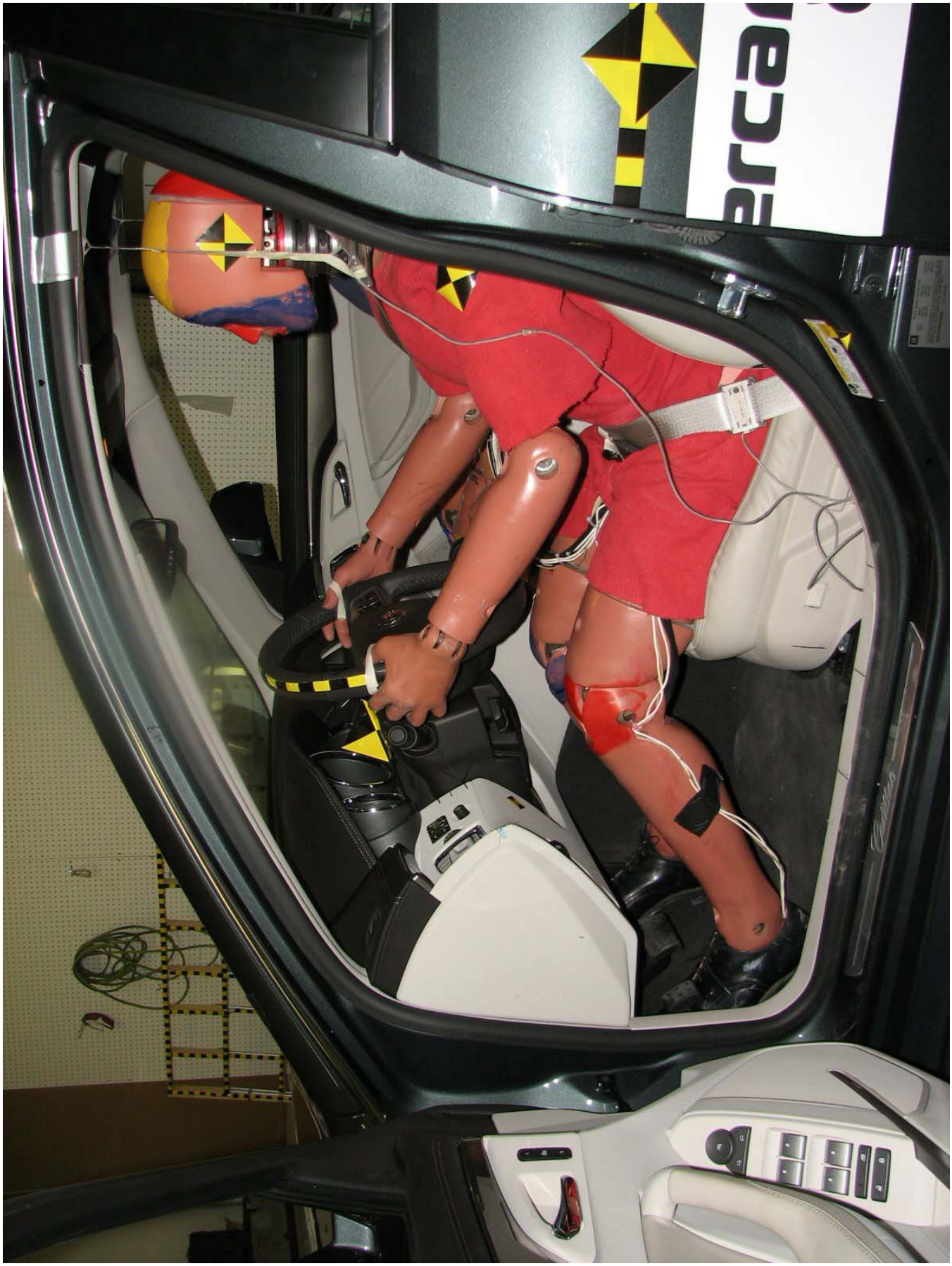


Figure A-34: Pre-Test Driver Dummy (Door Open)

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

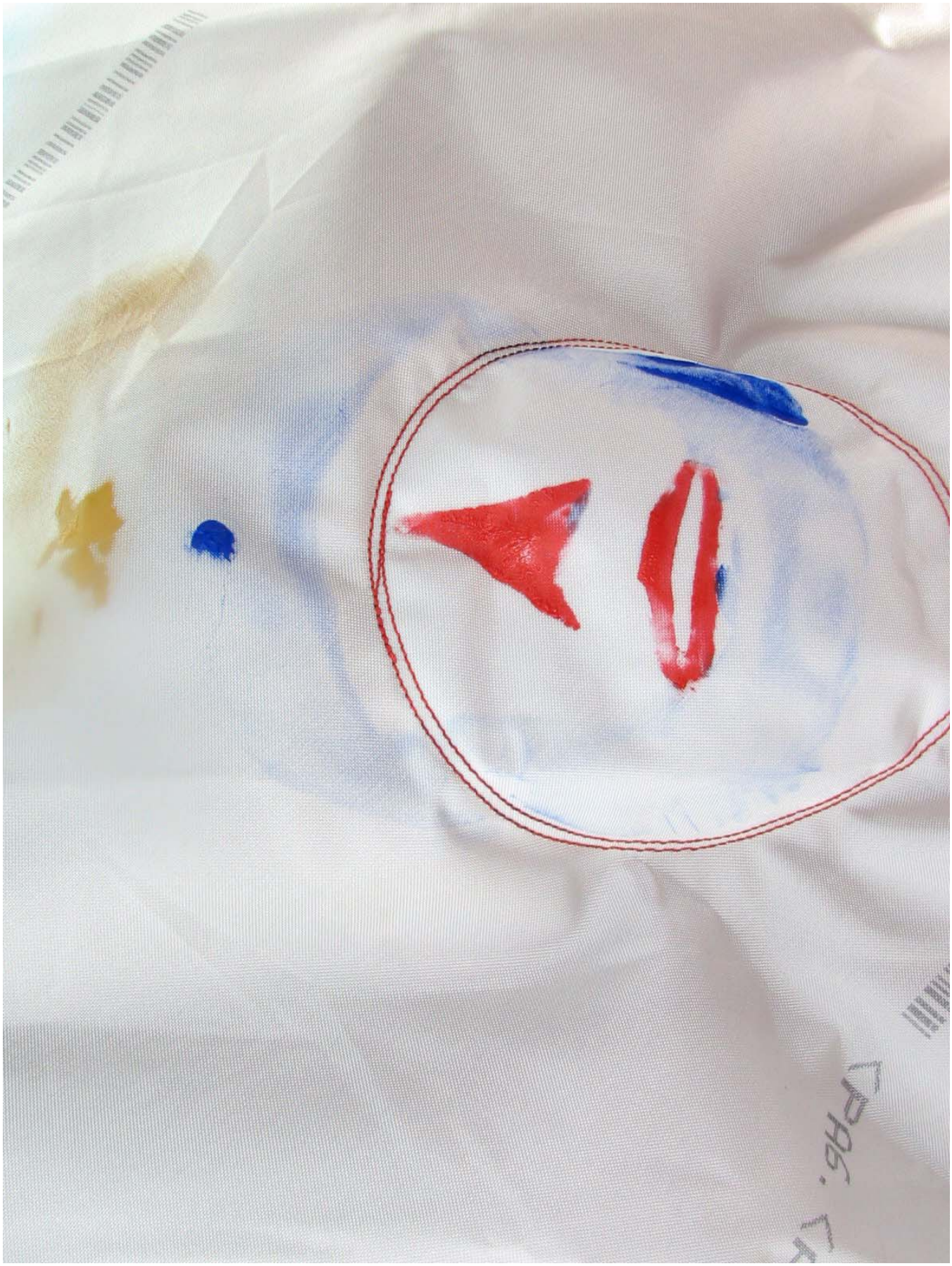


Figure A-43: Post-Test Driver Dummy Airbag Contact

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)

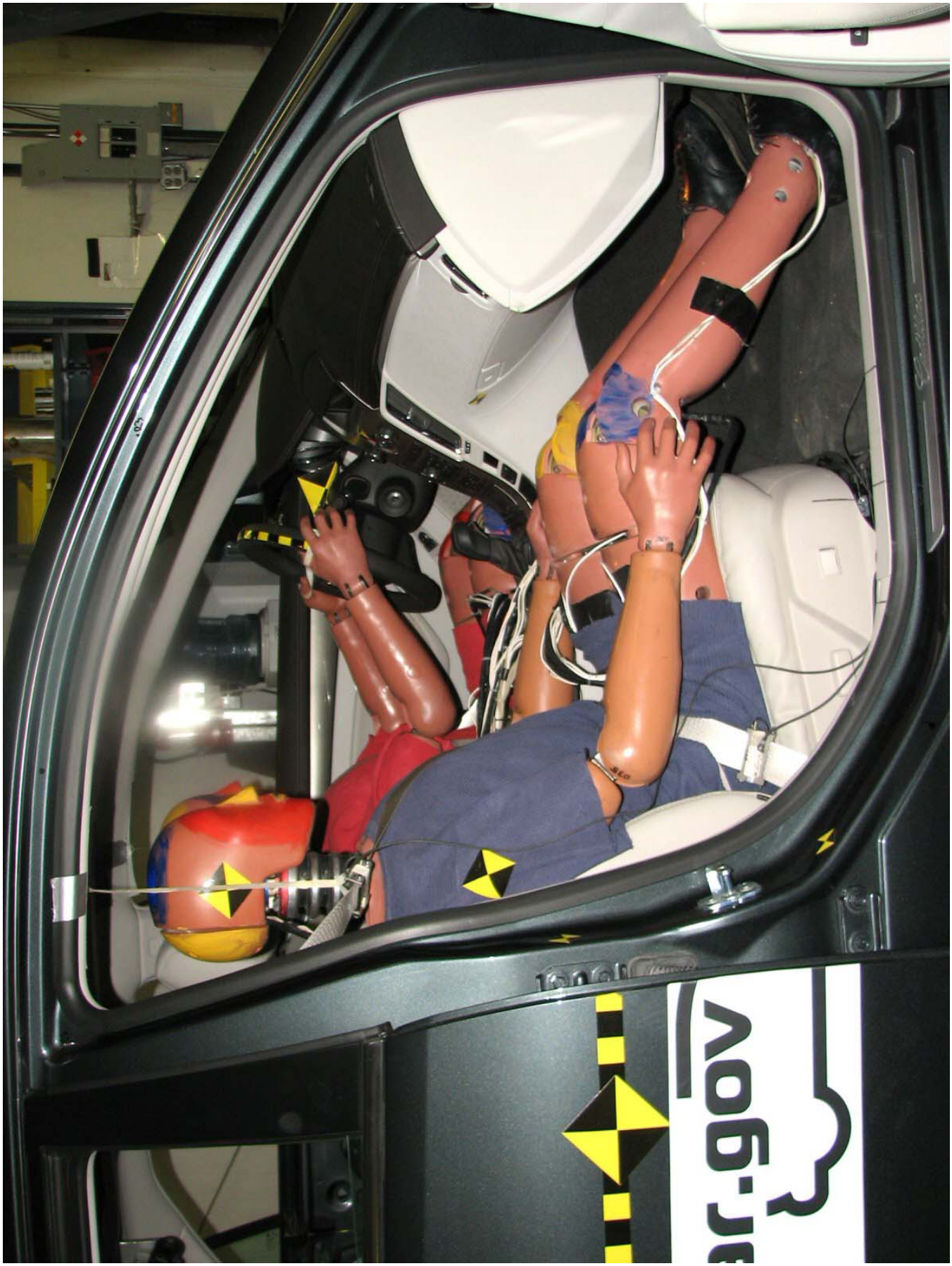


Figure A-48: Pre-Test Passenger Dummy (Door Open)

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

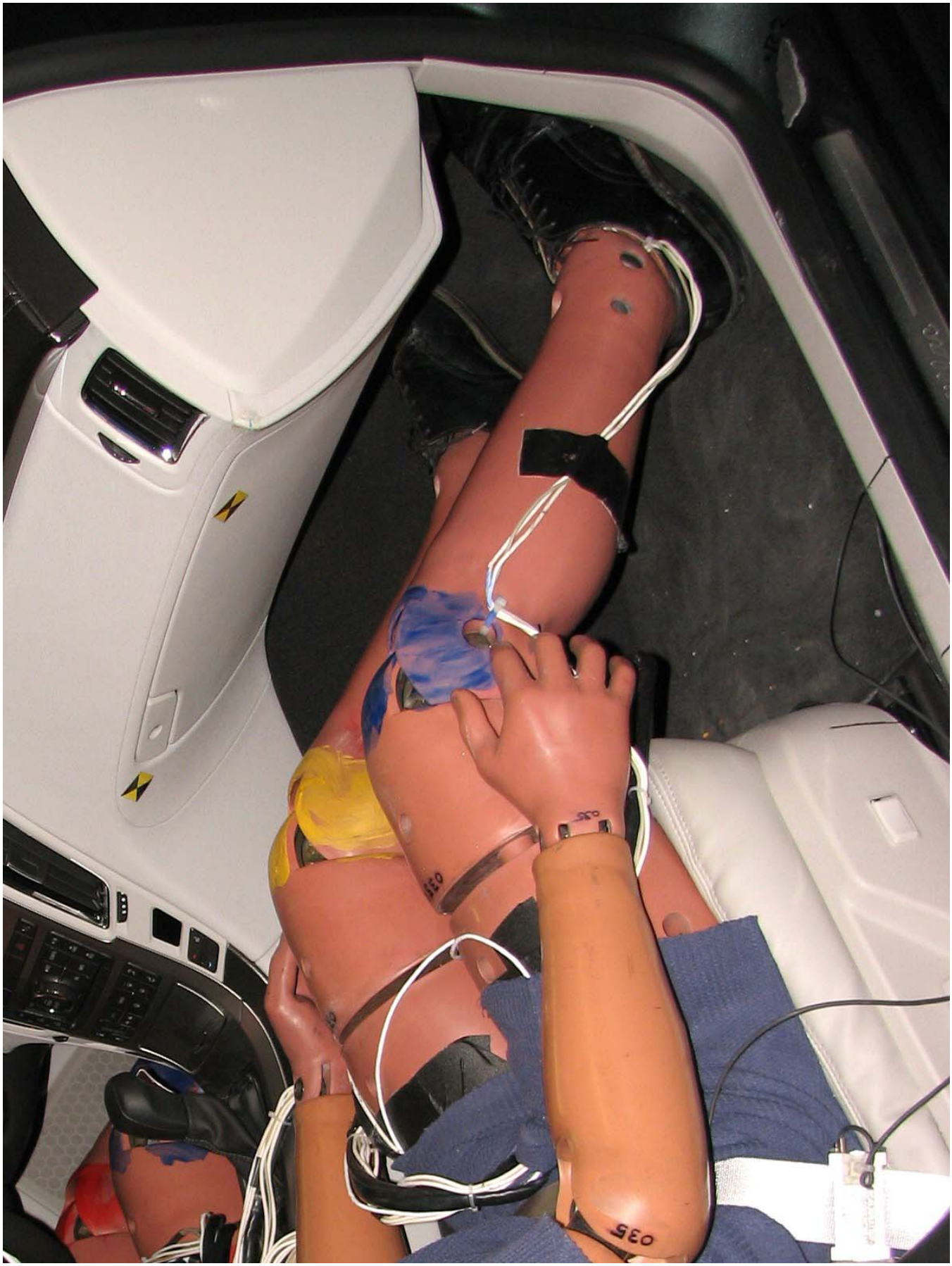


Figure A-50: Pre-Test Passenger Dummy Feet

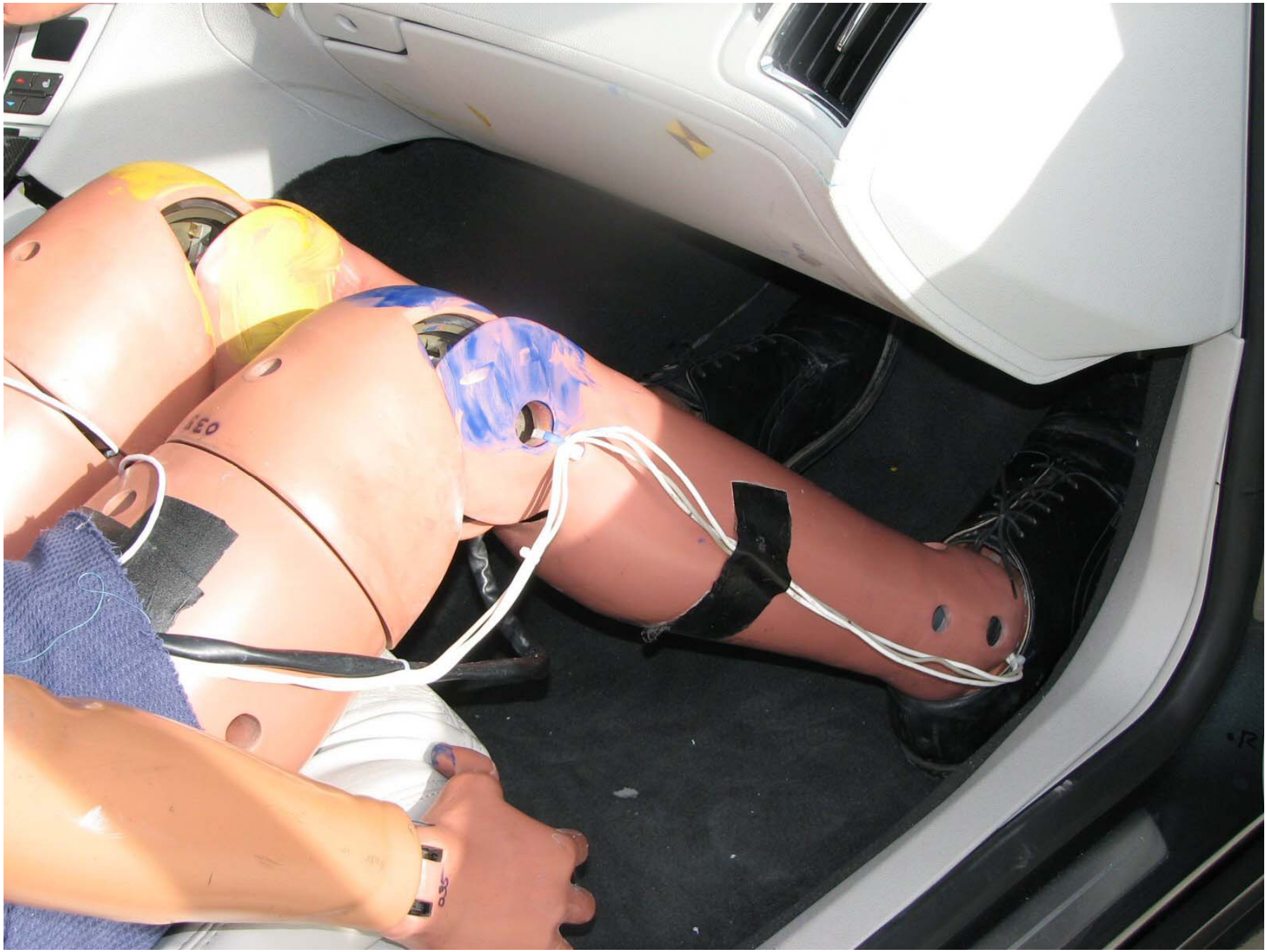


Figure A-51: Post-Test Passenger Dummy Feet

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

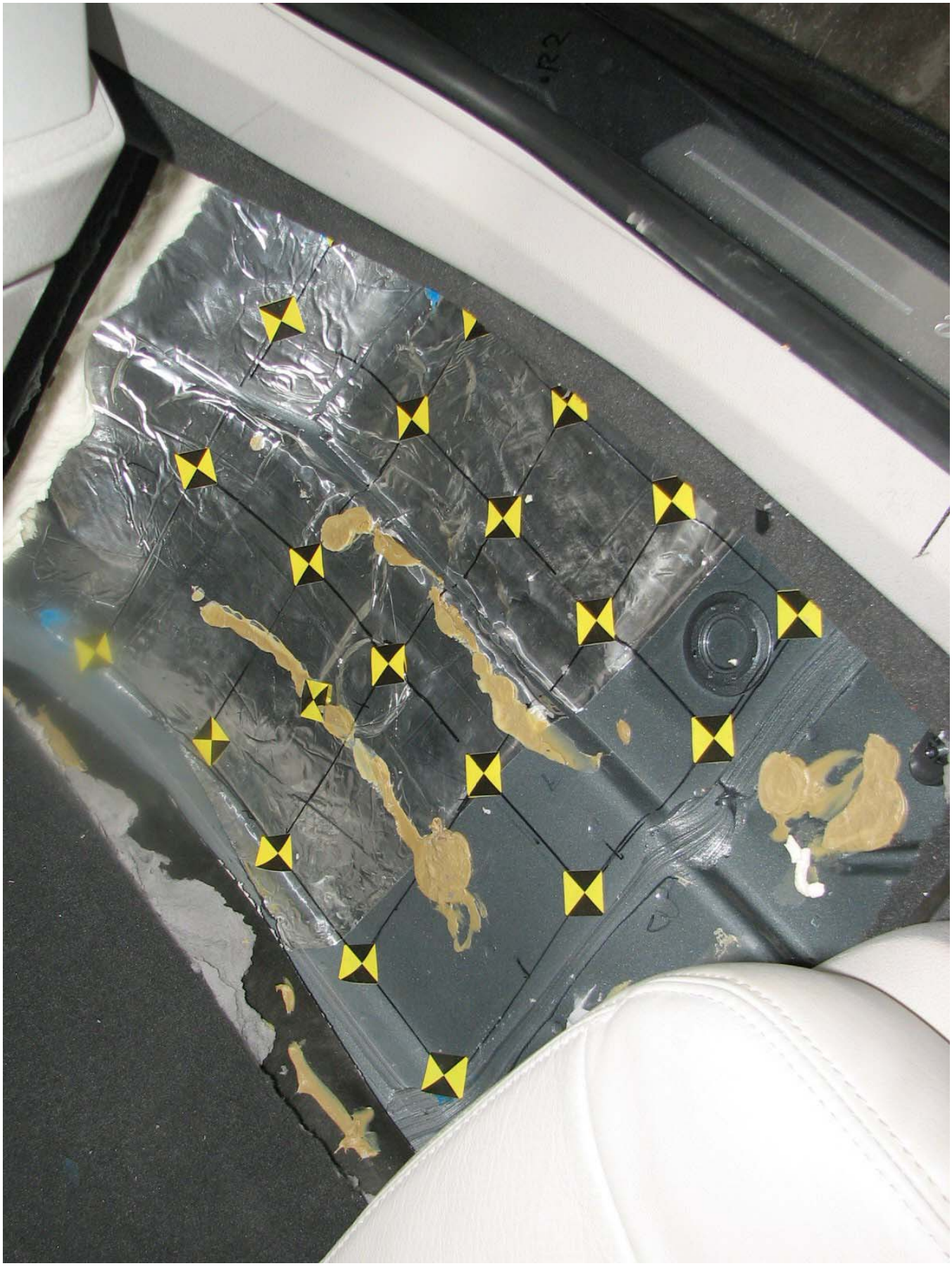


Figure A-55: Post-Test Passenger Side Floor Pan

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°)

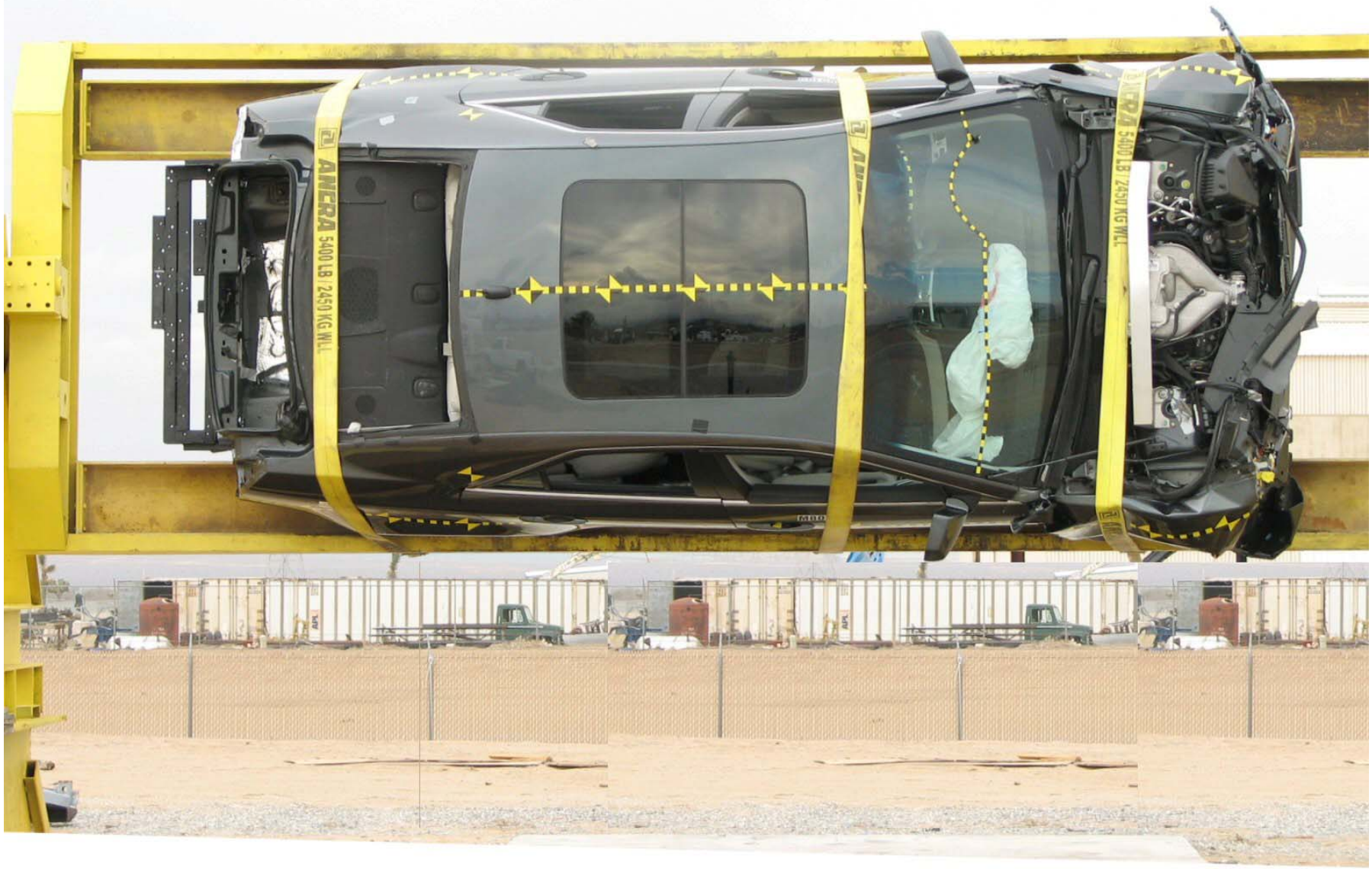


Figure A-59: Vehicle on Rollover Device (90°)

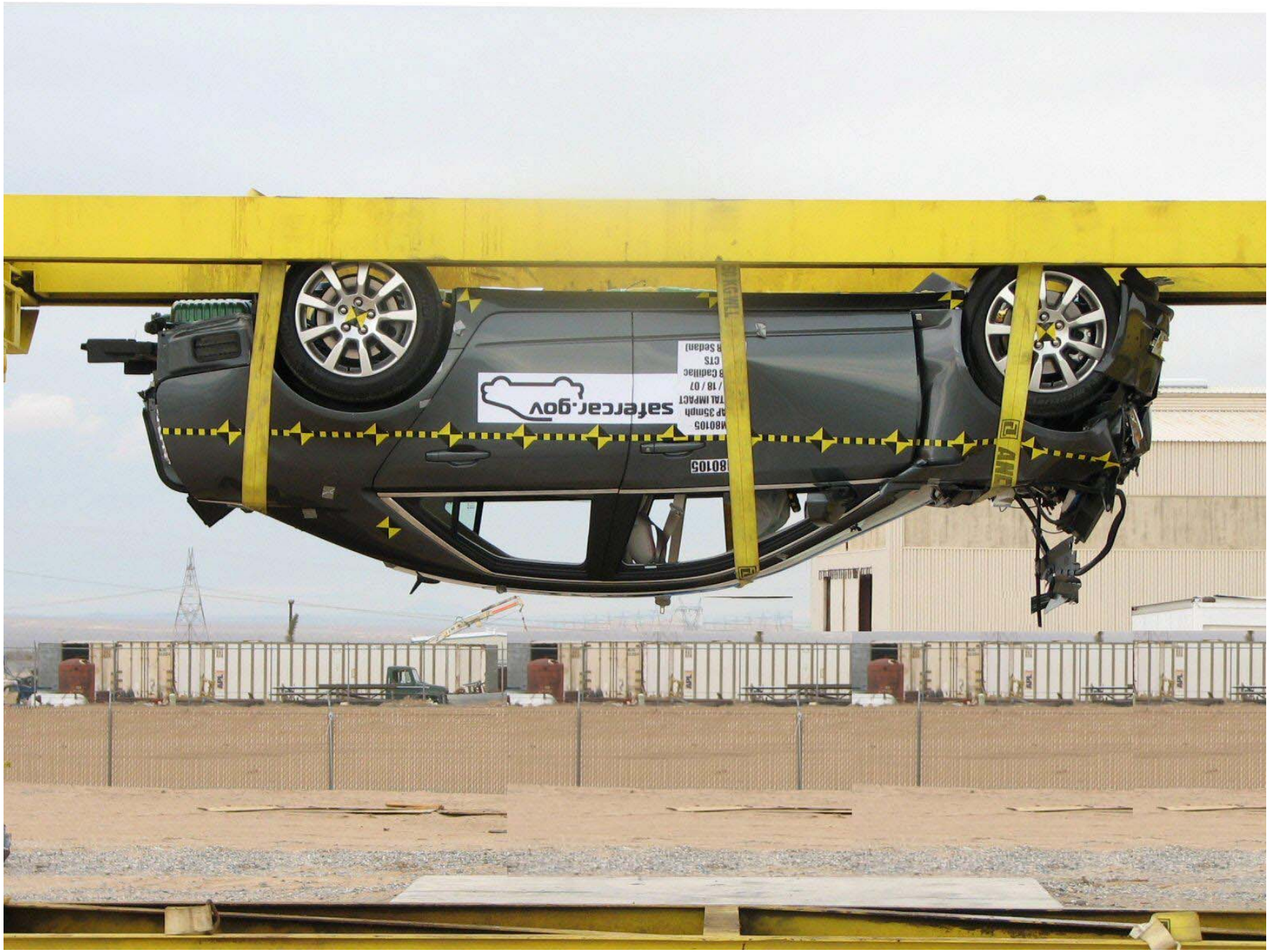


Figure A-60: Vehicle on Rollover Device (180°)

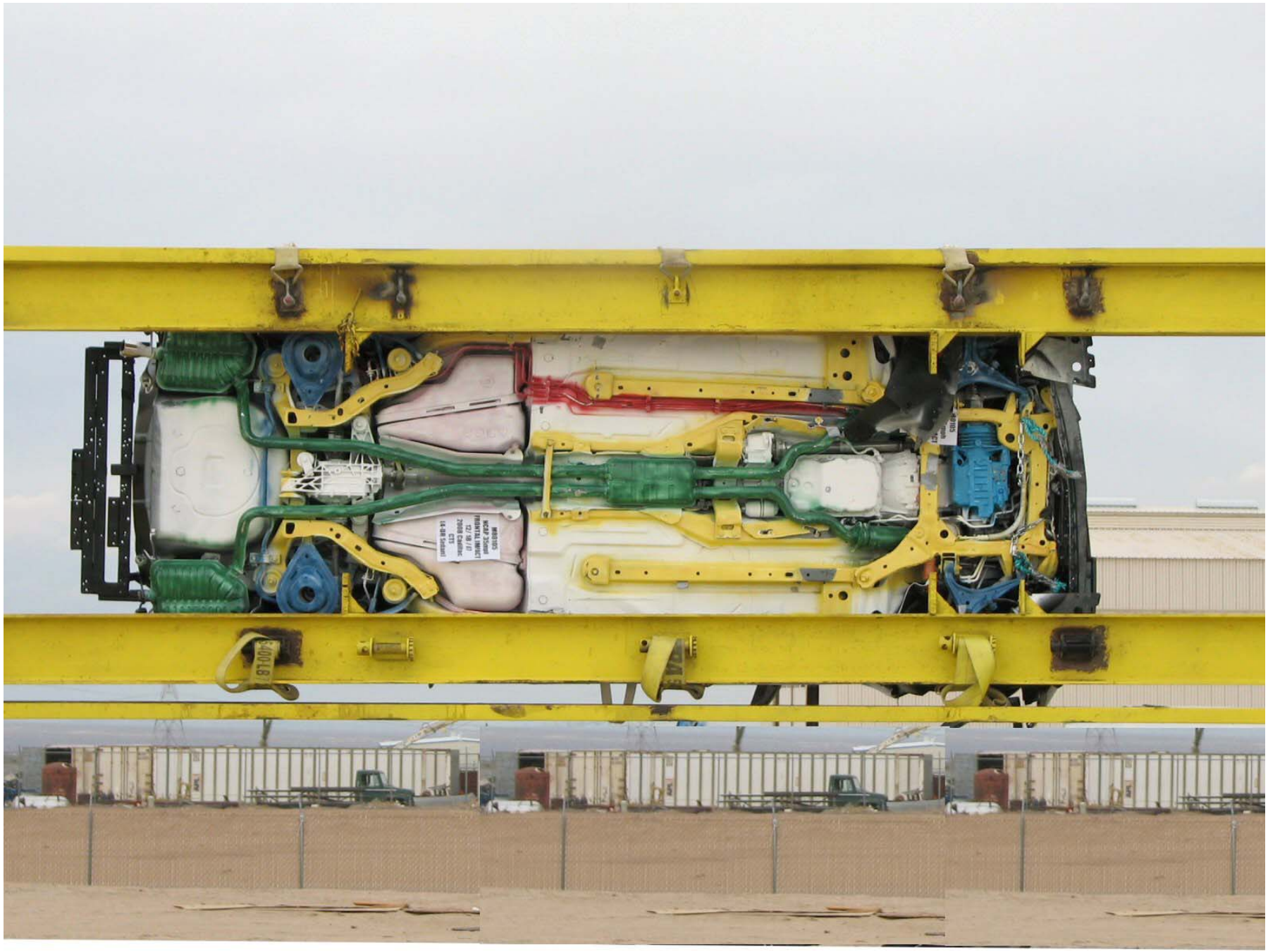


Figure A-61: Vehicle on Rollover Device (270°)

Figure A-62: Vehicle Impact

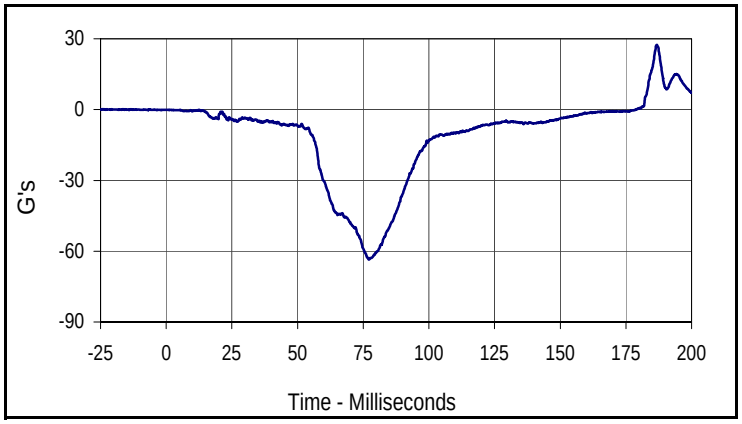
APPENDIX B
DATA PLOTS

LIST OF DATA PLOTS

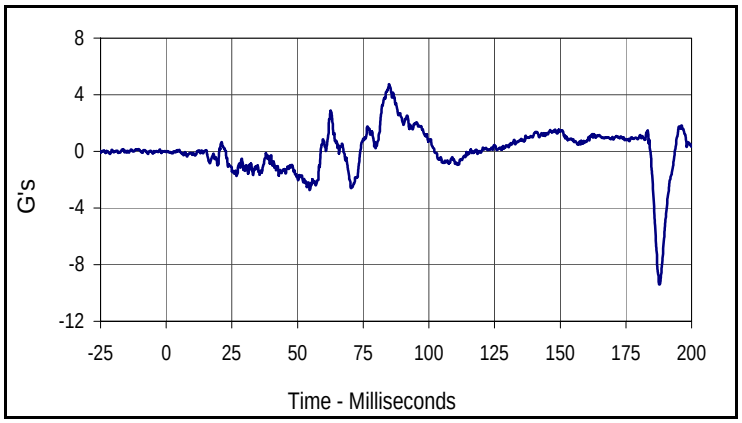
The following additional data plots for this test can be obtained from the research and development section of the NHTSA website. The website can be found at www.NHTSA.dot.gov.

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

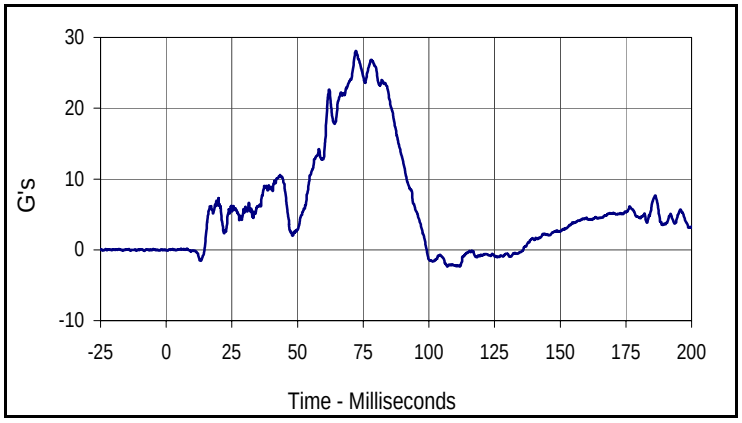
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	12/18/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	M80105



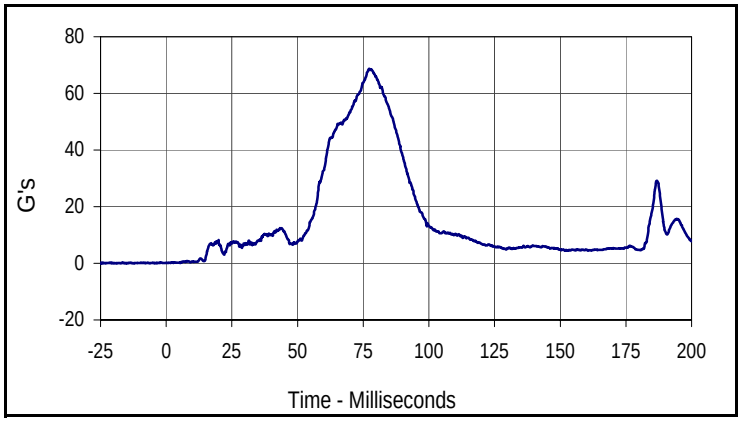
Curve Description			
Driver Head Primary X			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
27.4	186.7	-63.5	77.2



Curve Description			
Driver Head Primary Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.8	84.9	-9.4	187.7

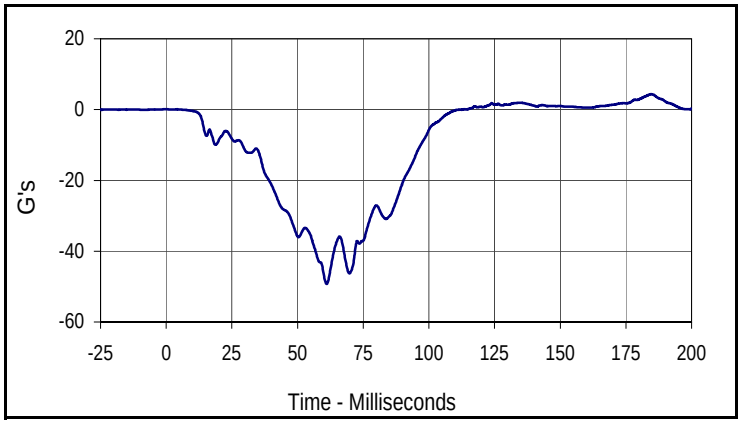


Curve Description			
Driver Head Primary Z			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
28.1	72.2	-2.3	107.1

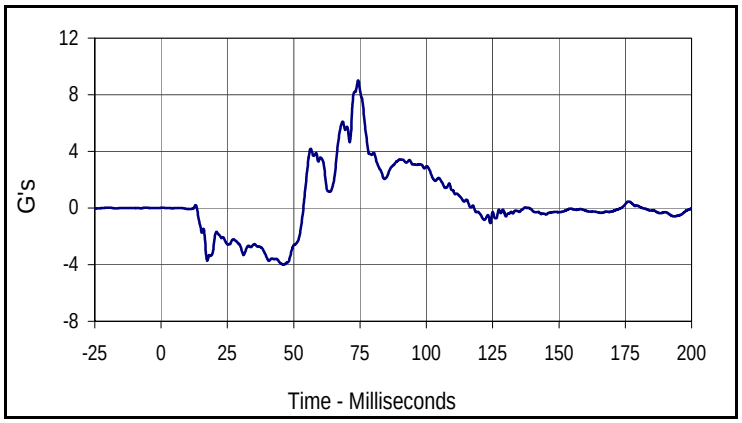


Curve Description			
Driver Head Resultant Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
68.7	77.3	0.1	0.7

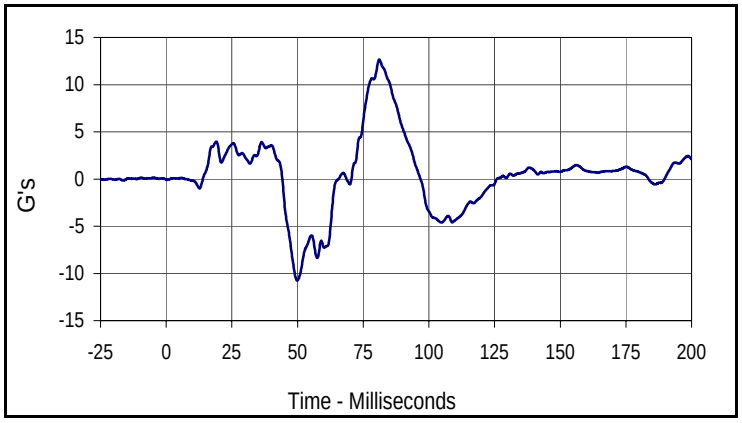
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	12/18/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	M80105



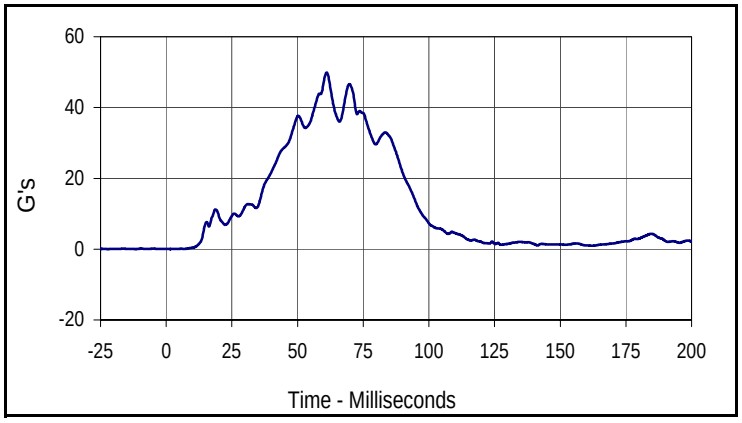
Curve Description			
Driver Chest Primary X			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
4.3	184.6	-49.2	61.1



Curve Description			
Driver Chest Primary Y			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
9.0	74.3	-4.0	46.2

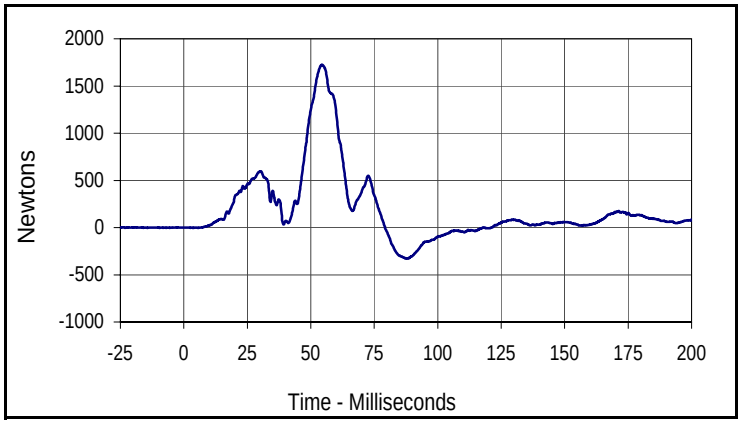


Curve Description			
Driver Chest Primary Z			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
12.6	81.1	-10.7	49.9

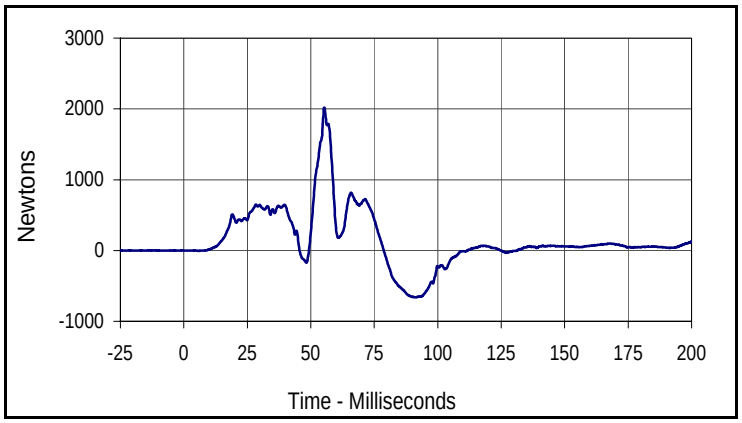


Curve Description			
Driver Chest Resultant Primary			
CURNO	Type	SAE Class	Units
004	RES	180	G's
Max	Time	Min	Time
49.9	61.1	0.0	1.5

Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	12/18/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	M80105

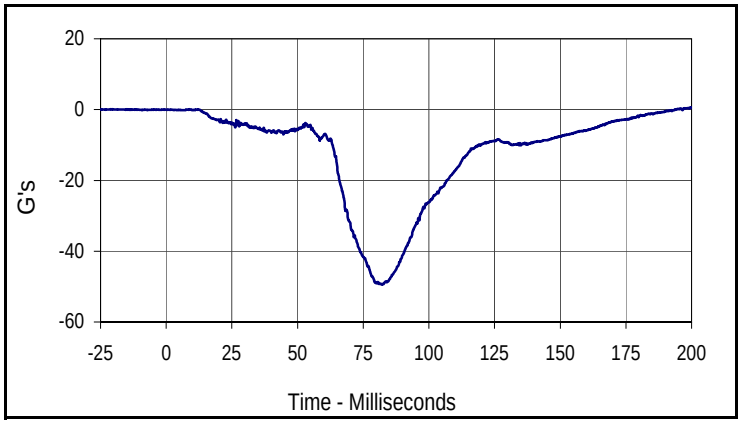


Curve Description			
Driver Left Femur Force Z			
CURNO	Type	SAE Class	Units
007	FIL	600	Newtons
Max	Time	Min	Time
1724.0	54.4	-329.8	88.2



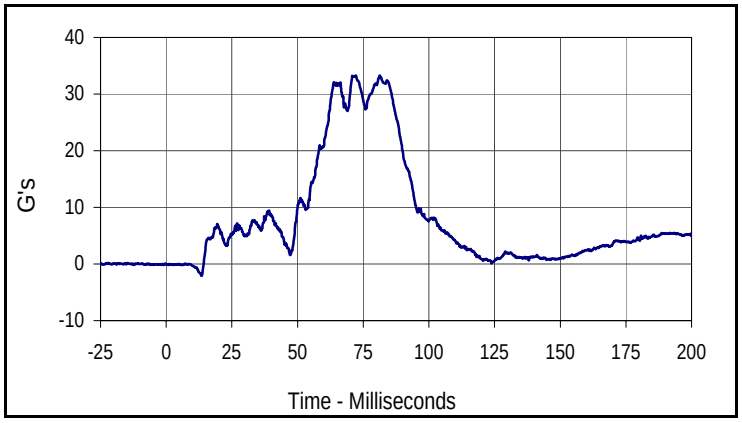
Curve Description			
Driver Right Femur Force Z			
CURNO	Type	SAE Class	Units
008	FIL	600	Newtons
Max	Time	Min	Time
2017.0	55.3	-662.3	90.9

Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	12/18/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	M80105

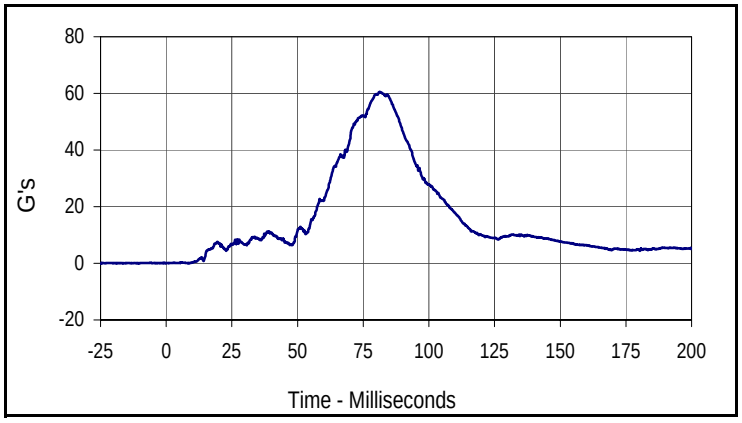


Curve Description			
Passenger Head Primary X			
CURNO	Type	SAE Class	Units
009	FIL	1000	G's
Max	Time	Min	Time
0.5	199.5	-49.4	81.9

Curve Description			
Passenger Head Primary Y			
CURNO	Type	SAE Class	Units
010	FIL	1000	G's
Max	Time	Min	Time
2.9	47.5	-13.5	78.5

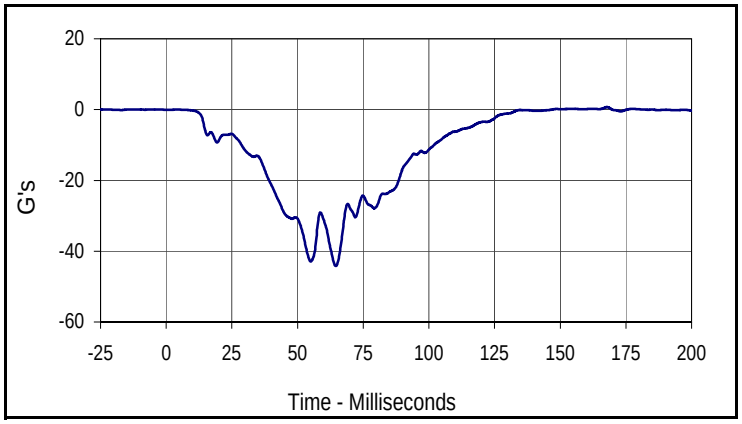


Curve Description			
Passenger Head Primary Z			
CURNO	Type	SAE Class	Units
011	FIL	1000	G's
Max	Time	Min	Time
33.3	72.1	-2.1	13.4

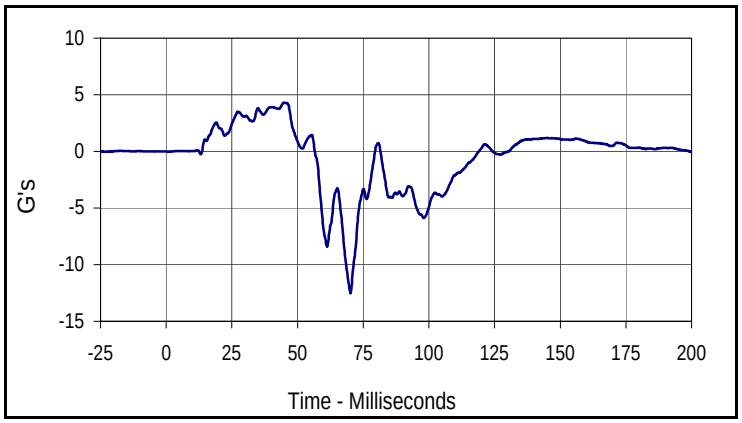


Curve Description			
Passenger Head Resultant Primary			
CURNO	Type	SAE Class	Units
009	RES	1000	G's
Max	Time	Min	Time
60.5	81.3	0.0	8.4

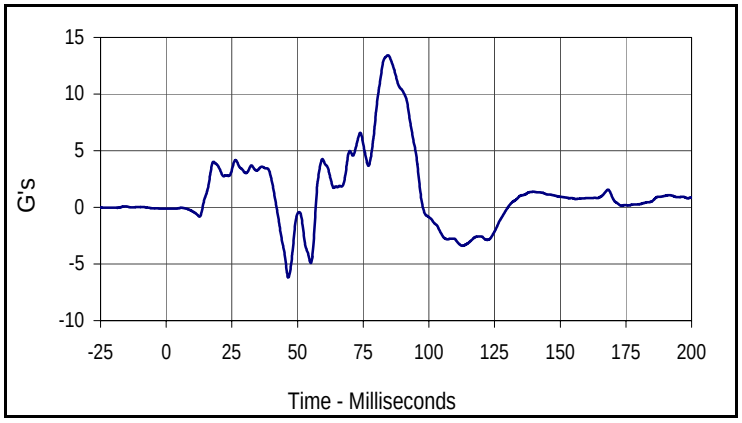
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	12/18/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	M80105



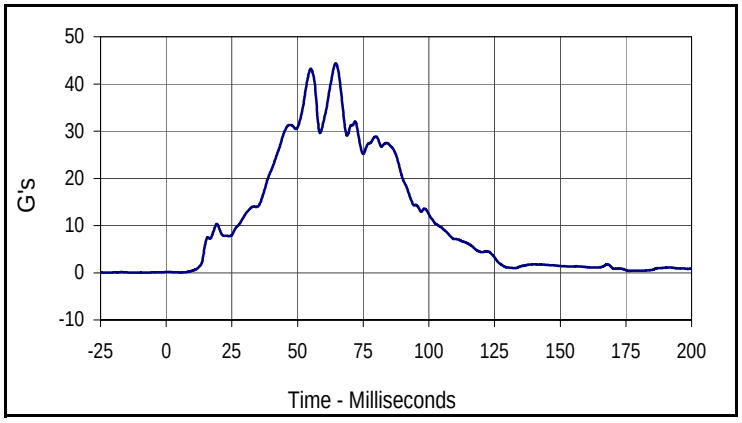
Curve Description			
Passenger Chest Primary X			
CURNO	Type	SAE Class	Units
012	FIL	180	G's
Max	Time	Min	Time
0.7	167.8	-44.2	64.5



Curve Description			
Passenger Chest Primary Y			
CURNO	Type	SAE Class	Units
013	FIL	180	G's
Max	Time	Min	Time
4.3	44.9	-12.5	70.2

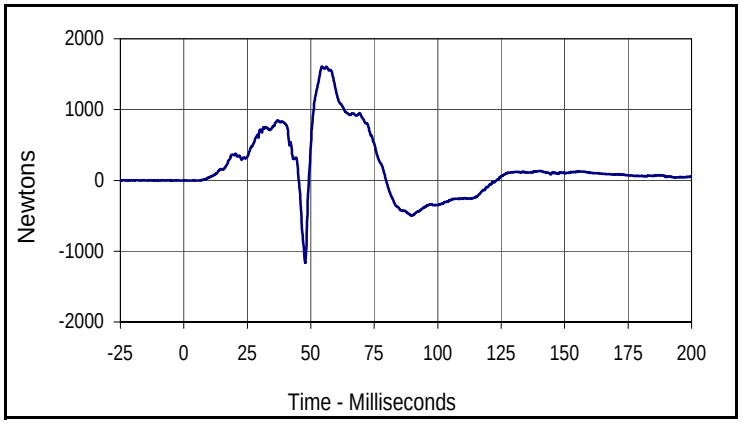


Curve Description			
Passenger Chest Primary Z			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
13.4	84.4	-6.2	46.5

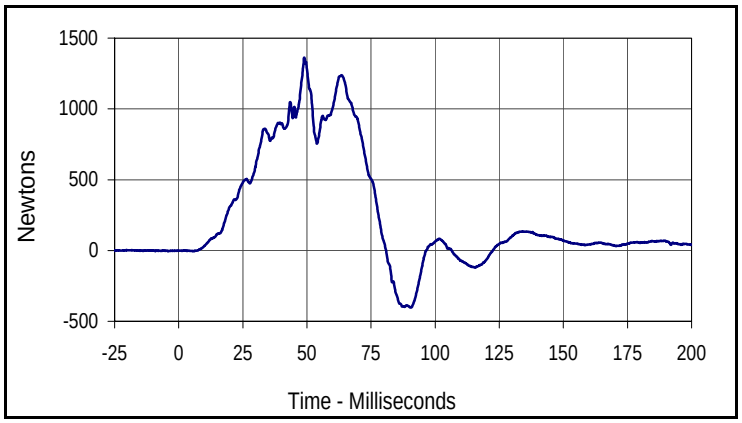


Curve Description			
Passenger Chest Resultant Primary			
CURNO	Type	SAE Class	Units
012	RES	180	G's
Max	Time	Min	Time
44.3	64.5	0.1	5.5

Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	12/18/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	M80105



Curve Description			
Passenger Left Femur Force Z			
CURNO	Type	SAE Class	Units
015	FIL	600	Newtons
Max	Time	Min	Time
1608.1	54.4	-1163.0	47.8

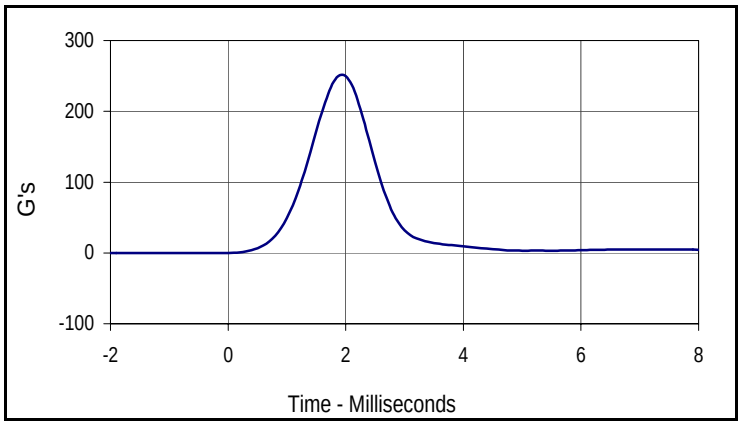


Curve Description			
Passenger Right Femur Force Z			
CURNO	Type	SAE Class	Units
016	FIL	600	Newtons
Max	Time	Min	Time
1361.2	49.0	-403.6	90.5

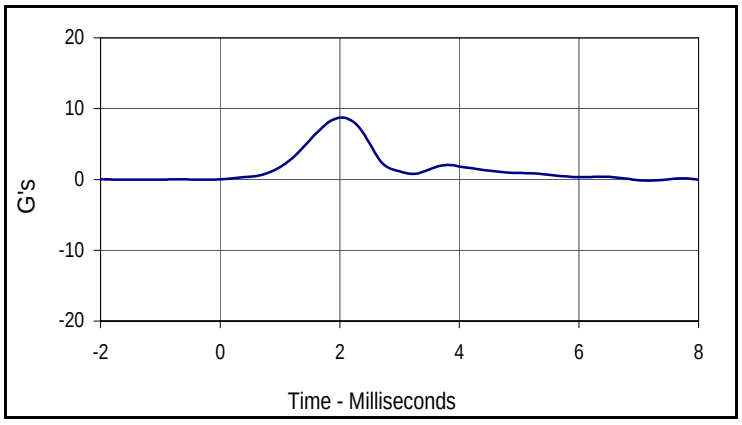
APPENDIX C
DUMMY CALIBRATION DATA

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	11/29/07
ATD Serial No.:	034	Test I.D.:	HD11E

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	8.7	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass



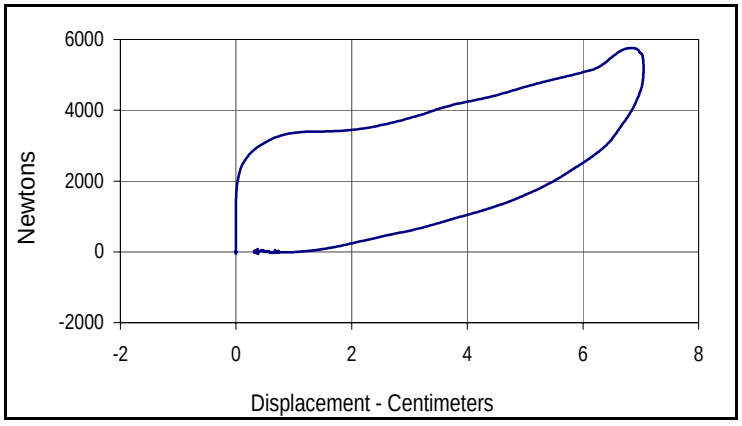
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
251.0	1.9	0.0	-1.8



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
8.7	2.0	0.0	-1.2

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	11/29/07
ATD Serial No.:	034	Test I.D.:	CH11E

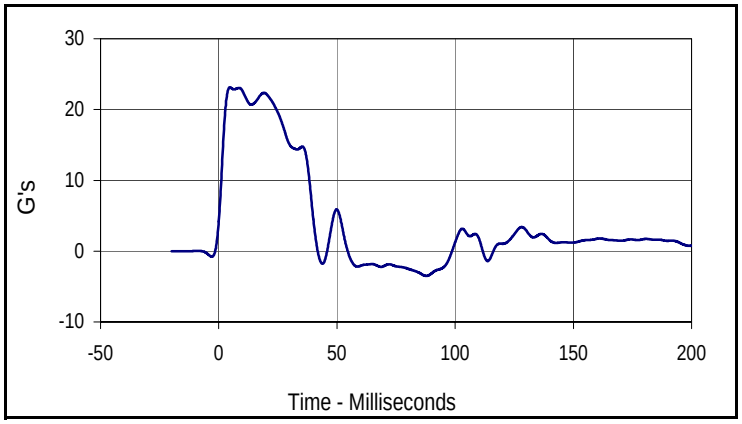
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.62	Pass
Peak Probe Force	Newtons	5159 to 5893	5755	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	7.05	Pass
Internal Hysterysis	%	69 to 85	71.8	Pass
		Overall Test Results		Pass



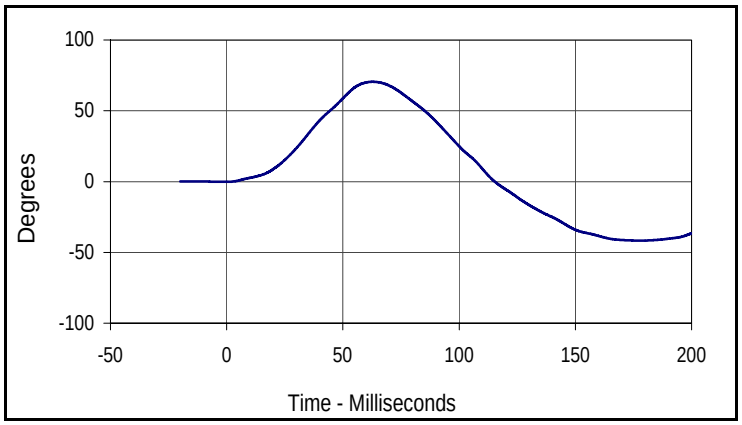
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	71.8
Peak Probe Force		Peak Chest Deflection	
5755		7.05	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	11/29/07
ATD Serial No.:	034	Test I.D.:	NF11E

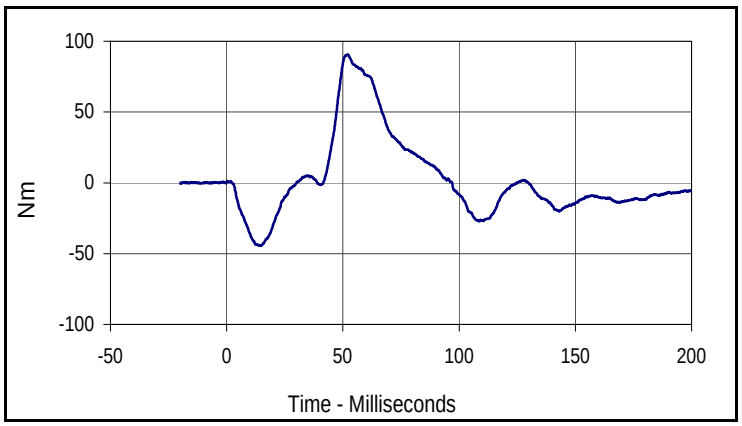
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.05	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	22.6	Pass
	20 Msec.	G's	17.6 to 22.6	22.2	Pass
	30 Msec.	G's	12.5 to 18.5	15.0	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	15.0	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	39.9	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	70.5	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	115.4	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	90.7	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
23.1	4.7	-3.5	87.8



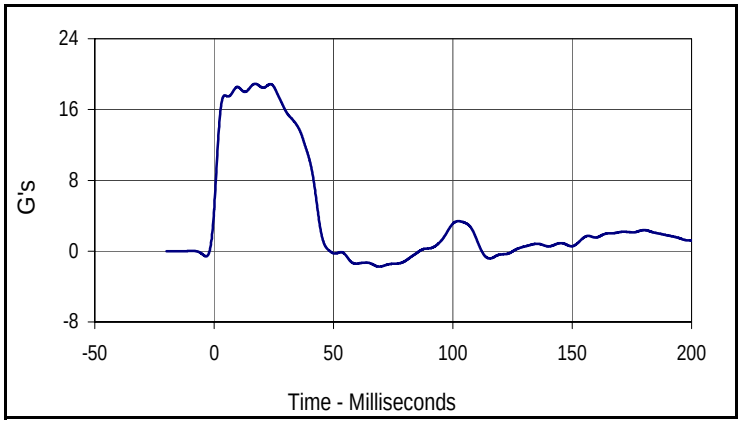
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
70.5	62.7	-41.6	178.6



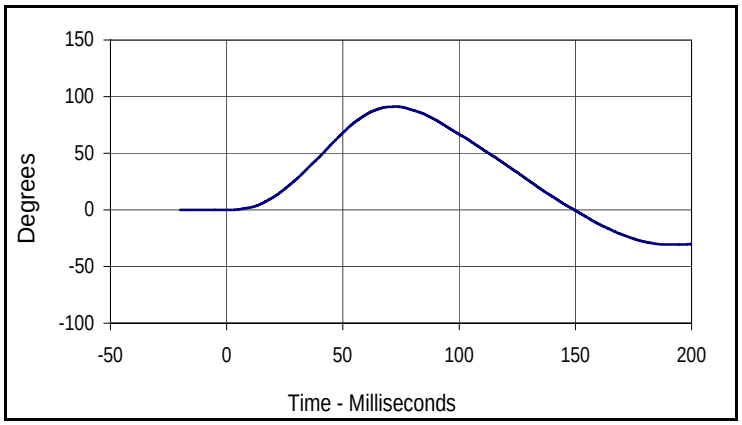
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
90.7	52.1	-44.4	14.7

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	11/29/07
ATD Serial No.:	034	Test I.D.:	NE11E

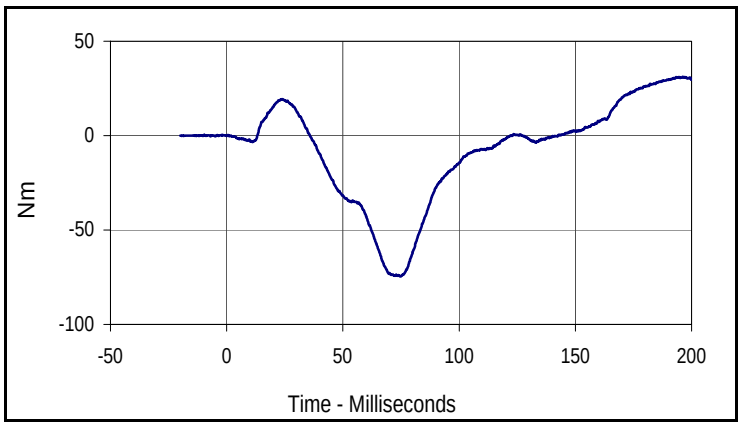
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.16	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.5	Pass
	20 Msec.	G's	14.0 to 19.0	18.5	Pass
	30 Msec.	G's	11.0 to 16.0	15.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	15.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	43.2	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	91.1	Pass
	Time	Msec.	72.0 to 82.0	72.7	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	149.6	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-74.5	Pass
	Time	Msec.	65.0 to 79.0	74.7	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
18.9	17.2	-1.8	69.1



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
91.1	72.7	-30.6	192.0



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
31.2	196.2	-74.5	74.7

Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	11/29/07
ATD Serial No.:	034	Test I.D.:	LK11E , RK11E

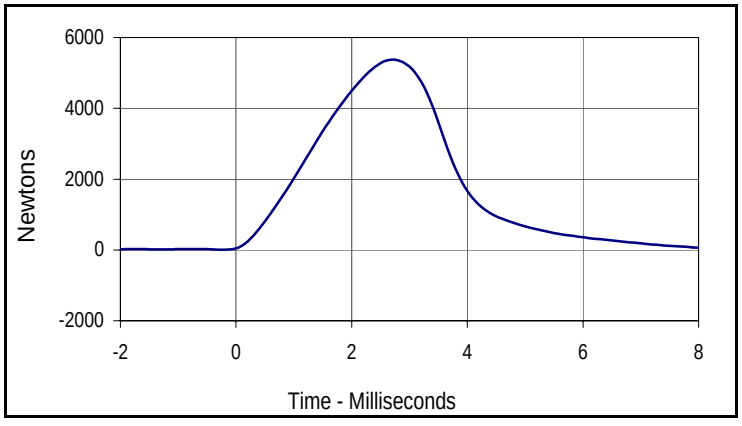
Left Knee

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	2.07	Pass
Peak Probe Force	Newtons	4715 to 5782	5284	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	5375	Pass
		Overall Test Results		Pass

Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5284.0	2.6	-14.2	-0.2



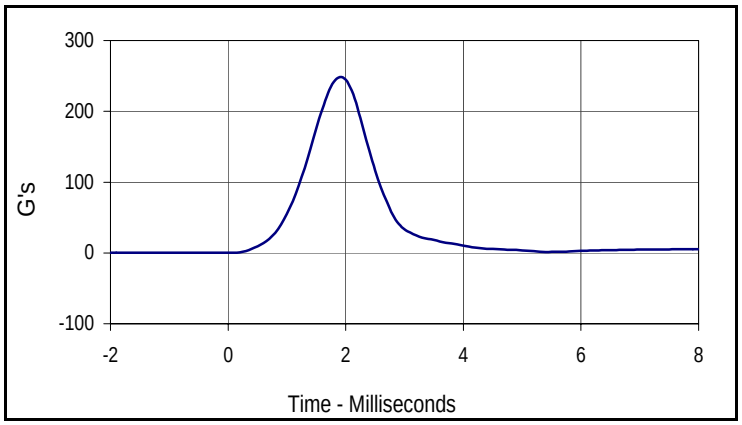
Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
5374.5	2.7	-2.6	9.8

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	11/29/07
ATD Serial No.:	034	Test I.D.:	N/A

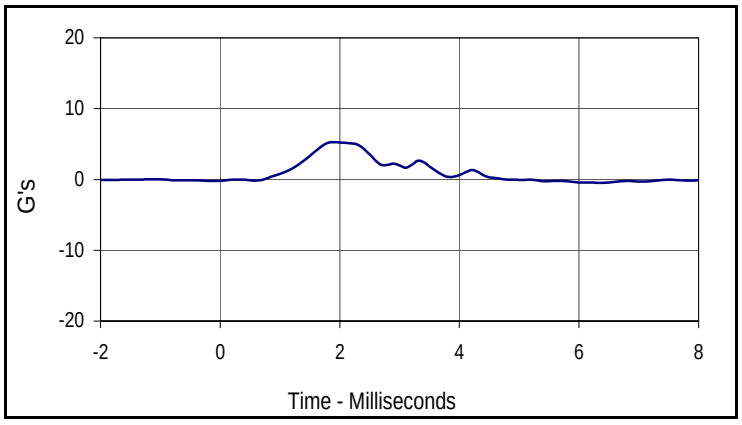
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	880	Pass
B - Shoulder pivot height	mm	505 to 521	507	Pass
C - "H" point height	mm	84 to 89	86	Pass
D - "H" point from seat back	mm	135 to 140	138	Pass
E - Shoulder pivot from back	mm	84 to 94	89	Pass
F - Thigh clearance	mm	140 to 155	150	Pass
G - Elbow back to wrist pivot	mm	290 to 305	295	Pass
H - Skull cap to back line	mm	41 to 46	44	Pass
I - Shoulder to elbow length	mm	330 to 345	340	Pass
J - Elbow rest height	mm	190 to 211	210	Pass
K - Buttock to knee length	mm	579 to 604	585	Pass
L - Poplipteal length	mm	429 to 455	443	Pass
M - Knee pivot height	mm	485 to 500	487	Pass
N - Buttock poplipteal length	mm	452 to 477	461	Pass
O - Chest depth	mm	213 to 229	224	Pass
P - Foot length	mm	251 to 267	260	Pass
V - Shoulder breadth	mm	422 to 437	430	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	860	Pass
AA - Location for chest circumference	mm	429 to 434	430	Pass
BB - Location for waist circumference	mm	226 to 231	227	Pass
		Overall Test Results		Pass

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	11/29/07
ATD Serial No.:	035	Test I.D.:	HD11F

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	248.7	Pass
Peak Lateral Acceleration	G's	≤15.0	5.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass



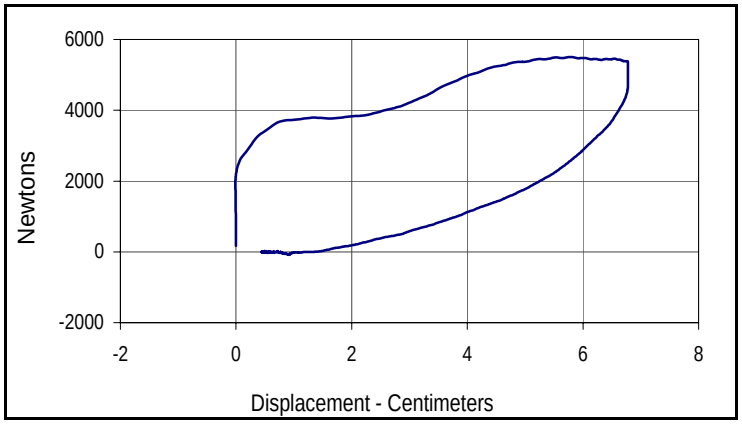
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
248.7	1.9	0.1	-1.4



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
5.3	1.9	-0.4	6.0

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	11/29/07
ATD Serial No.:	035	Test I.D.:	CH11F

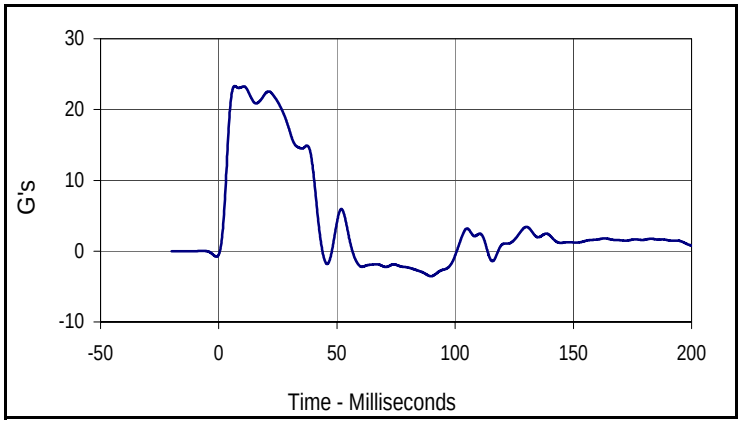
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.64	Pass
Peak Probe Force	Newtons	5159 to 5893	5507	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.78	Pass
Internal Hysterysis	%	69 to 85	74.5	Pass
		Overall Test Results		Pass



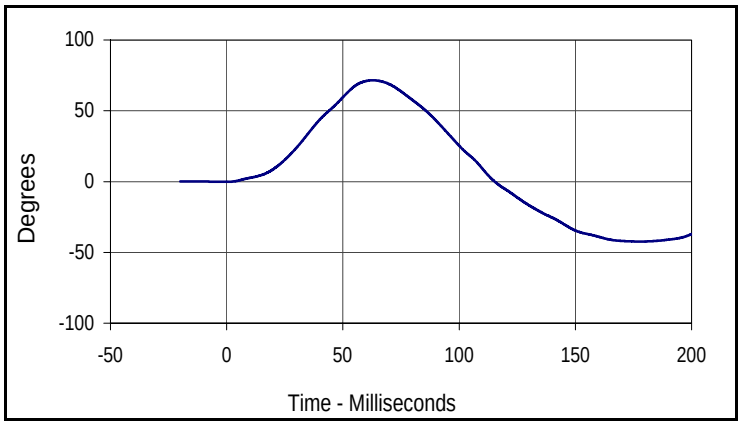
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	74.5
Peak Probe Force		Peak Chest Deflection	
5507		6.78	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	11/29/07
ATD Serial No.:	035	Test I.D.:	NF11F

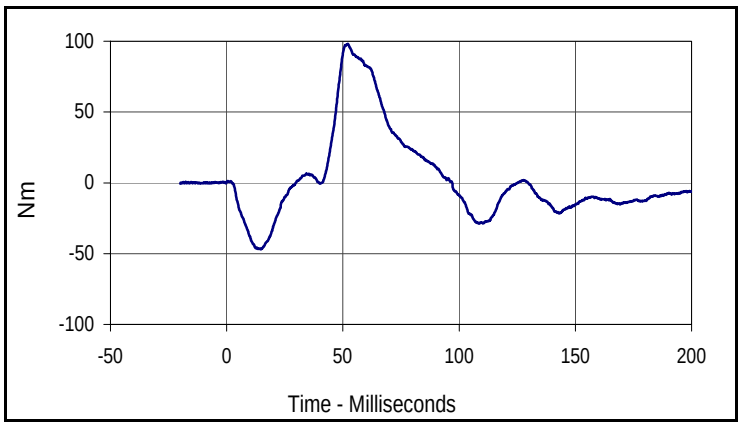
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	7.07	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	23.2	Pass
	20 Msec.	G's	17.6 to 22.6	22.4	Pass
	30 Msec.	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	98.1	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



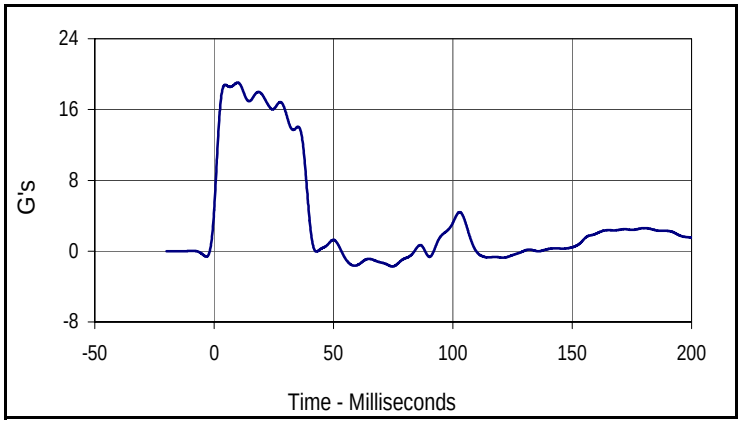
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
71.6	62.8	-42.3	178.6



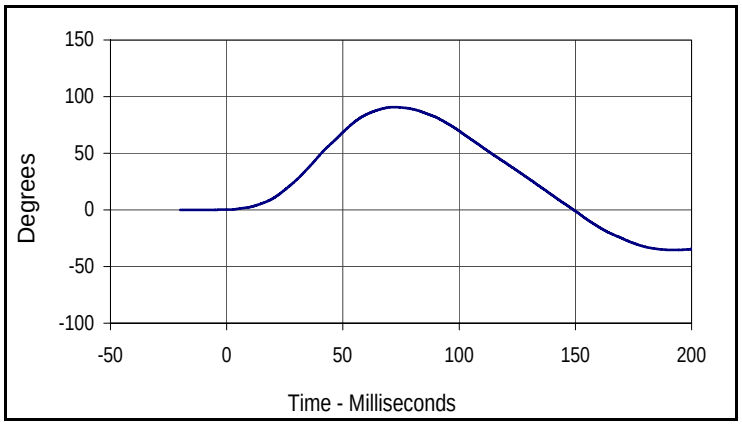
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
98.1	52.1	-47.0	14.7

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	11/29/07
ATD Serial No.:	035	Test I.D.:	NE11F

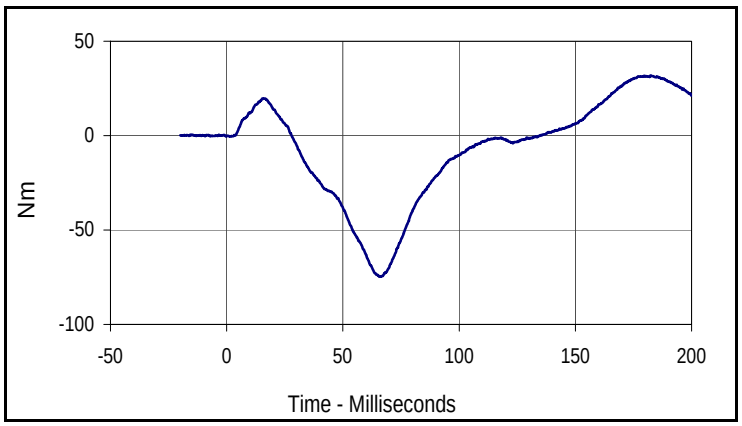
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.01	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	19.0	Pass
	20 Msec.	G's	14.0 to 19.0	17.7	Pass
	30 Msec.	G's	11.0 to 16.0	15.7	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	39.5	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	90.7	Pass
	Time	Msec.	72.0 to 82.0	72.0	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	149.3	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-74.8	Pass
	Time	Msec.	65.0 to 79.0	65.9	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	134.8	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
19.0	9.9	-1.7	74.6



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
90.7	72.0	-35.4	192.3



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
31.9	182.4	-74.8	65.9

Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	11/29/07
ATD Serial No.:	035	Test I.D.:	LK11F , RK11F

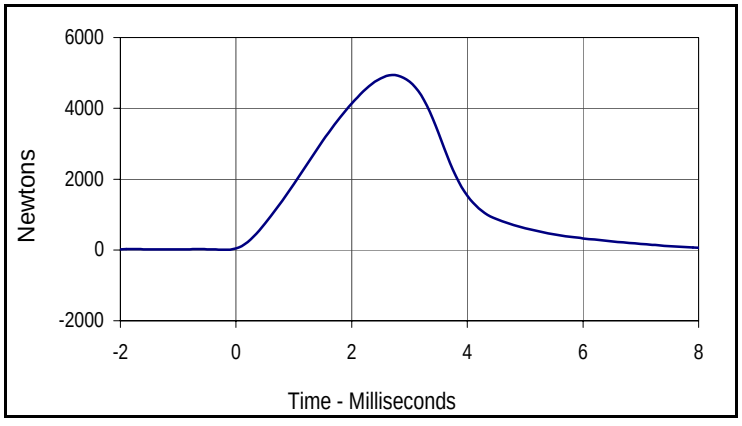
Left Knee

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	2.12	Pass
Peak Probe Force	Newtons	4715 to 5782	4804	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	4939	Pass
		Overall Test Results		Pass

Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
4803.5	2.6	-12.8	-0.2



Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
4938.7	2.7	-2.4	9.7

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	11/29/07
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	883	Pass
B - Shoulder pivot height	mm	505 to 521	510	Pass
C - "H" point height	mm	84 to 89	85	Pass
D - "H" point from seat back	mm	135 to 140	138	Pass
E - Shoulder pivot from back	mm	84 to 94	89	Pass
F - Thigh clearance	mm	140 to 155	150	Pass
G - Elbow back to wrist pivot	mm	290 to 305	296	Pass
H - Skull cap to back line	mm	41 to 46	44	Pass
I - Shoulder to elbow length	mm	330 to 345	336	Pass
J - Elbow rest height	mm	190 to 211	208	Pass
K - Buttock to knee length	mm	579 to 604	590	Pass
L - Poplipteal length	mm	429 to 455	439	Pass
M - Knee pivot height	mm	485 to 500	495	Pass
N - Buttock poplipteal length	mm	452 to 477	472	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	424	Pass
W - Foot breadth	mm	91 to 107	102	Pass
Y - Chest circumference	mm	970 to 1001	997	Pass
Z - Waist circumference	mm	836 to 866	862	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:	11/29/07
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:

Test Program:	Dummy Damage Checklist	Test Date:	11/29/07
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: