REPORT NUMBER TR-P27210-01-NC

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORP.
2008 CADILLAC CTS
4-DOOR SEDAN

NHTSA NUMBER: G80100

PREPARED BY:
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NOVEMBER 27, 2007

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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Technical Report Documentation Page

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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
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15. Supplementary Notes: During the test, an infant child restraint positioned in the rear seat became unattached from its base, leading to severe interaction with the driver's seat. The agency had concerns about the effect the child restraint had on the front seat occupant's injury readings. As a result, the driver injury readings recorded during the event may not be indicative of this vehicle's performance.

16. Abstract: An experimental 35 mph (56.3 km/h) frontal barrier impact was conducted on a 2008 Cadillac CTS 4-Door Sedan at Karco Engineering, LLC on November 27, 2007. The impact velocity is 56.04 km/h. The ambient temperature at the barrier face at the time of impact is 18.0 degrees Celcius. The vehicle's maximum post-test static crush is 485 mm at the vehicle's centerline. The test vehicle is equipped with a 3-point continuous belt system and second generation supplemental airbags in both front outboard seating 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	622.9	534.9
Max. Chest Accel. (3 msec Clip)	G's	60	45.9	36.7
Left Femur Force	Newtons	10008	-964.4	-923.1
Right Femur Force	Newtons	10008	-1275.7	-589.8

17. Key Words 56.3 km/h NCAP Frontal Barrier Impact Test New Car Assessment Program (NCAP) 2008 Cadillac CTS 4-Door Sedan NHTSA No. G80100		**18. Distribution of Statement** Copies of this report available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin. 1200 New Jersey Ave, SE, Room W43-410 Washington, D.C. 20590	
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SECTION 1

PURPOSE AND SUMMARY OF TEST G80100

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 November 27, 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, Appendix C contains the Dummy Calibration data, and Appendix D contains the Child Restraint System Report.

There was 100 percent windshield retention and there was no intrusion into the protected zone of the windshield during the impact event. There was no stoddard solvent leakage after the event or during any phase of the static rollover.

The maximum static crush of the vehicle was 485 mm at the vehicle's centerline. Both the driver and the 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 and chest contacted the airbag. The head also contacted the headrest. Both the left and right knees contacted the knee bolster.

The passenger's visible contact points were as follows: The passenger ATD's head contacted the airbag and headrest. The chest also contacted the airbag. Left knee contacted the glove box.

Occupant injury data is contained in table below.

OCCUPANT DATA SUMMARY

ATD Position	HIC	3 msec Clip (g)	Chest Defl. (mm)	Left Femur (N)	Right Femur (N)
Driver	622.9	45.9	-33.7	-964.4	-1275.7
Passenger	534.9	36.7	-32.3	-923.1	-589.8

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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

PRIMARY IMPACT DATA

Measured Parameter	Units	Value
Velocity at Impact	km/h	56.04
Test Weight	kg	2123
Impact Angle	degrees	0
Average Rebound	mm	617
Maximum Static Crush	mm	485

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Front Door opening	Remained closed and latched, opened w/o tools	Remained closed and latched, opened w/o tools
Rear Door Opening	Remained closed and latched, opened w/o tools	Remained closed and latched, opened w/o tools
Seat Track Shift (mm)	None	None
Seat Back 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	Airbag, Headrest
Chest Contact	Airbag	Airbag
Abdomen Contact	None	None
Left Knee Contact	Bolster	Glovebox
Right Knee Contact	Bolster	None

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 Accelerometers	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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

NHTSA No.	G80100
Make	Cadillac
Model	CTS
Body Style	4-Door Sedan
Vin No.	1G6DT57V680139247
Color	Black
Delivery Date	11/19/2007
Odometer (Miles)	91.0
Dealer	Rydell Automotive Group
Transmission	6-Speed Automatic
Final Drive	AWD
Type/No. Cyl.	V6
Engine Disp. (L)	3.6
Engine Placement	Longitudinal
Roof Rack	No
Sunroof/T-Top	Yes
Tinted Glass	Yes
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 Airbag	Yes
Driver 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. Cond.	Yes
AM/FM CD	Yes
Tilt Steering	Yes
Automatic Door Locks	Yes
Power Windows	Yes
Power Seats	Yes
Other	N/A

Does Owners Manual provide instructions to turn off automatic door locks. No

DATA FROM MANUFACTURER

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

GVWR (kg)	2330
GAWR Front (kg)	1120
GAWR Rear (kg)	1210

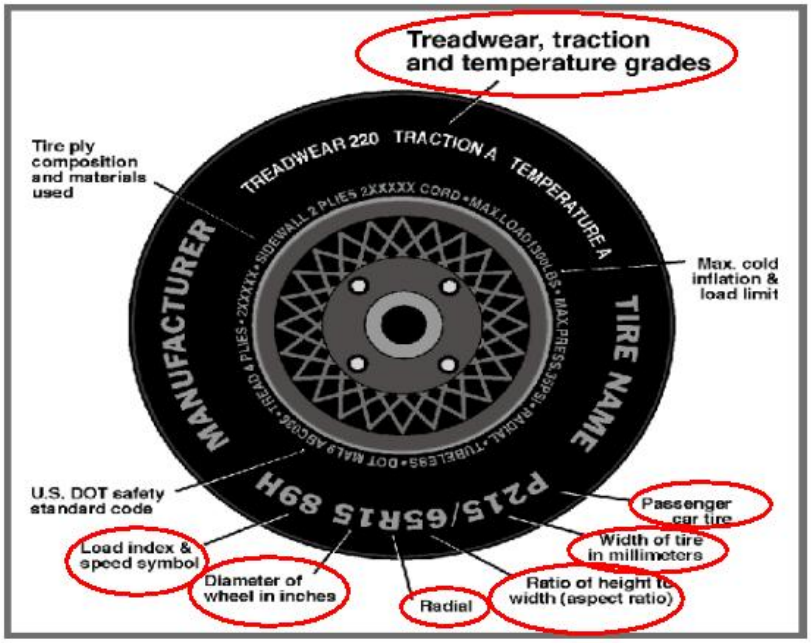
VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

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



TIRE INFORMATION

Measured Parameter	Front	Rear
Max. Tire Pressure (kpa)	300	300
Cold Pressure (kpa)	240	240
Recommended Tire Size	P235/55 R17	P235/55 R17
Tire Size on Vehicle	P235/55 R17	P235/55 R17
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	98H	98H
Tire Material	Polyester, Polyamide, Steel	Polyester, Polyamide, Steel
DOT Safety Code Right	B9JJ PNEX 3807	B9JJ PNEX 3807
DOT Safety Code Left	B9JJ PNEX 3807	B9JJ PNEX 3807

DATA SHEET NO. 2...(CONTINUED)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	510	450	960	534	534	1068
Right	kg	510	443	953	535	520	1055
Ratio	%	53.3%	46.7%	100.0%	50.4%	49.6%	100.0%
Totals	kg	1020	893	1913	1069	1054	2123

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1913
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Wt. (RCLW)	kg	64
Calculated Vehicle Target Wt. (TVTW)	kg	2129

TEST VEHICLE ATTITUDE AND CG

	Units	LF	RF	LR	RR	CG (aft of front axle)
As Delivered	mm	720	717	730	728	1347
As Tested	mm	712	710	706	705	1432

Vehicle Wheel Base (mm): 2885

Weight of Ballast Secured in cargo area (kg): 5

Weight of Items Removed (kg): 103

Vehicle Components Removed: Trunk lid, tail lights, spare tire and tools, rear windows, rear bumper Rear door panels, exhaust

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

FUEL SYSTEM DATA

Fuel System Capacity From Owners 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? Electric

If electric, does pump operate with ignition switch "On" & engine "OFF" Yes

Fuel System Particulars: Electric fuel pump. Activated when electrical system is activated. Fuel pump will run during the operation of the engine.

DATA SHEET NO. 3

POST-TEST IMPACT DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

SPEED TRAP DATA

Measured Parameter	Units	Requirement	Value
Trap No.1 Velocity (Primary)	km/h	55.51 to 57.12	56.04
Trap No.2 Velocity (Redun.)	km/h	55.51 to 57.12	56.03

VEHICLE STATIC CRUSH

Measured Parameter	Units	Pre-Test	Post-Test	Difference
Left Side	mm	4696	4360	-336
Center	mm	4825	4340	-485
Right Side	mm	4696	4365	-331

VEHICLE REBOUND FROM BARRIER

Measured Parameter	Units	Value
Left Side	mm	625
Center	mm	631
Right Side	mm	596
Average	mm	617

DATA SHEET NO. 4

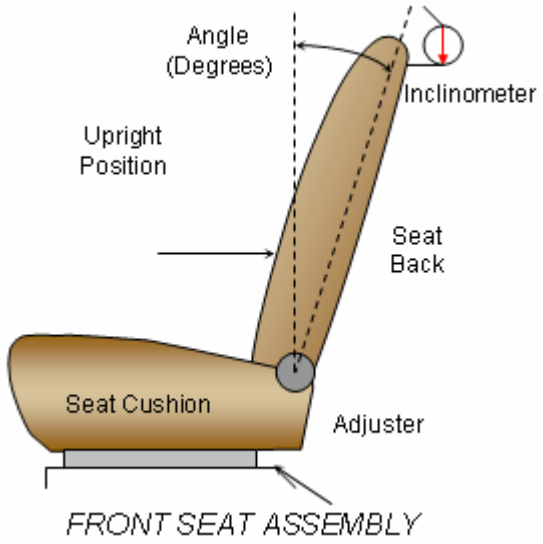
TEST VEHICLE INFORMATION

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

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 of the seat using a digital inclinometer.



SEAT BACK ANGLES

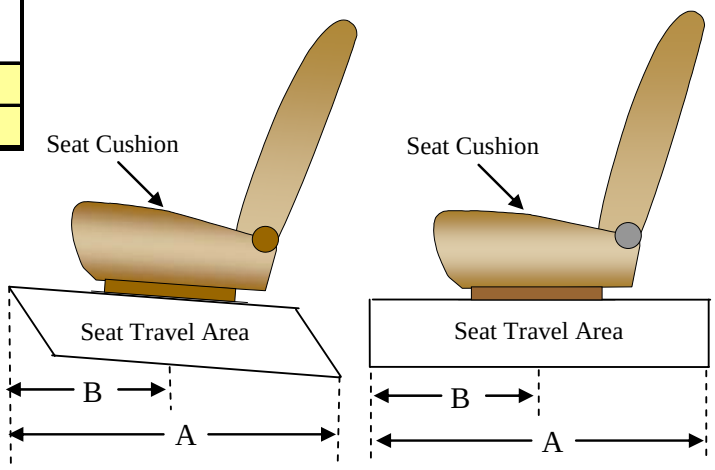
	Deg.
Driver w/seated Dummy	8.3 @ Headrest
Passenger w/seated Dummy	8.3 @ Headrest

SEAT FORE/AFT POSITIONS

The total seat travel was measured from forward most position to rearmost position, irrespective of vertical seat height in those positions. The seat was set at the longitudinal mid position. There were vertical adjustments on the seats that were equipped with the vehicle. They were placed at the lowermost position.

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position
Driver Seat	270 mm	135 mm
Passenger Seat	270 mm	135 mm



SEAT BELT UPPER ANCHORAGE

Position number one (1), the uppermost position.

SEAT BELT UPPER ANCHORAGE

	Total # of Positions	Placed in Position #
Driver Seat	5	1
Passenger Seat	5	1

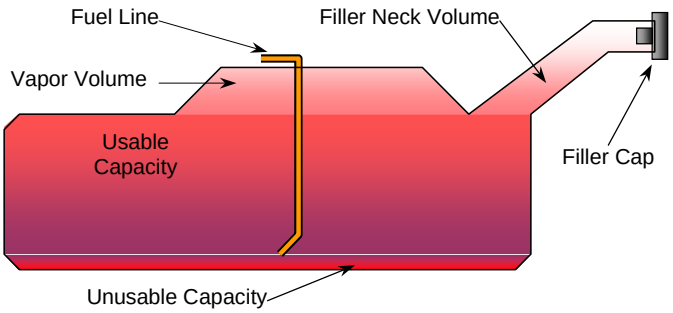
Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07 s

FUEL TANK CAPACITY

	Liters
Usable Capacity of "Standard Tank"	68.13
Usable Capacity of "Optional" Tank	
Usable Capacity used for FMVSS 301	62.45 to 64.04
Actual Amount of Solvent used	63.36

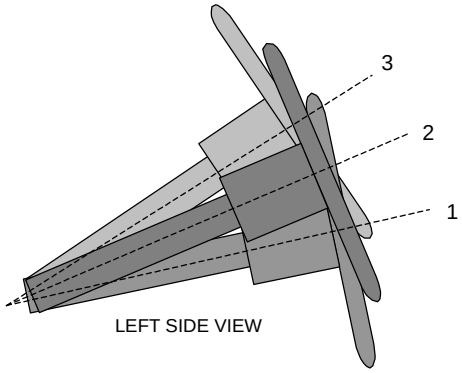
The test vehicle is equipped with an electric fuel pump. The fuel pump operates for approximately two seconds after the ignition is placed in the "ON" position, after which the fuel pump automatically shuts off. The fuel filler door is located on the right rear fender. The standard fuel tank occupies the area under the rear 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 (mm)
Lowermost positon No. 1	18.4	190.0
Geometric center position No. 2	20.5	208.0
Uppermost position No. 3	22.6	225.0

DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

TEST DUMMY POSITION MEASUREMENTS

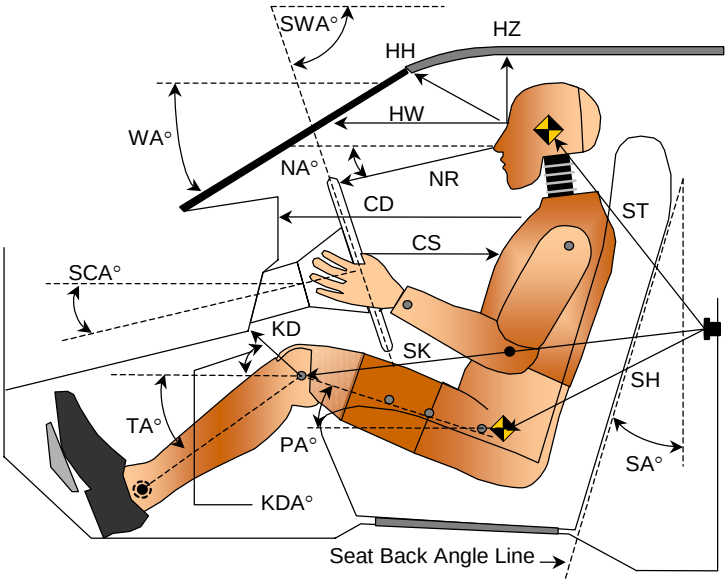
Code	Measurement Description	Driver		Passenger	
		Length (mm)	Angle (deg)	Length (mm)	Angle (deg)
WA	Windshield Angle		22.7		
SWA	Steering Wheel Angle		71.5		
SCA	Steering Column Angle		19.5		
SA	Seat Back Angle		8.3 @ Headrest		8.3 @ Headrest
HZ	Head to Roof (Z)	202	90.0	200	90.0
HH	Head to Header	384		386	
HW	Head to Windshield	691		695	
HR	Head to Side Header (Y)	251		269	
NR	Nose to Rim	420	8.5		
CD	Chest to Dash	551		598	
CS	Chest to Steering Hub	360			
RA	Rim to Abdomen	231			
KDL	Left Knee to Dash	182	31.0	144	
KDR	Right Knee to Dash	145		204	31.2
PA	Pelvic Angle		22.5		21.8
TA	Tibia Angle		38.6		37.6
KK	Knee to Knee (Y)	305		275	
SK	Striker to Knee	535	1.0	542	2.5
ST	Striker to Head	532	90.0	508	90.0
SH	Striker to H-Point	119	0.0	126	0.0
SHY	Striker to H-Point (Y)	235		230	
HS	Head to Side Window	300		315	
HD	H-Point to Door (Y)	138		148	
AD	Arm to Door (Y)	115		124	

DATA SHEET NO. 5…(CONTINUED)

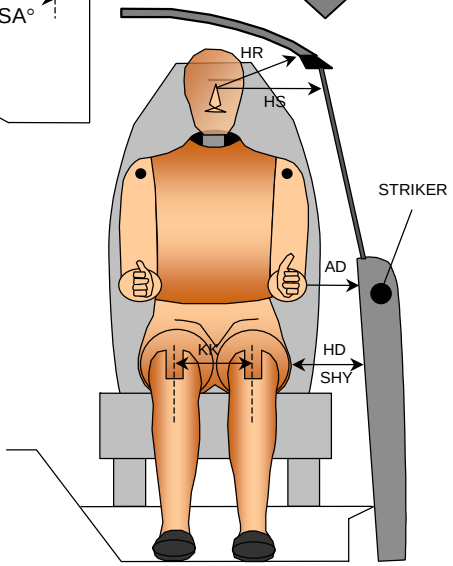
DUMMY POSITIONING IN VEHICLE

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

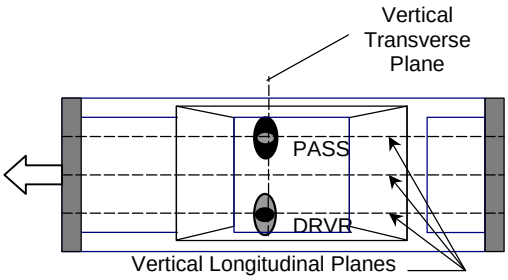
Test Program: NHTSA 35mph NCAP Test Date: 11/27/07



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



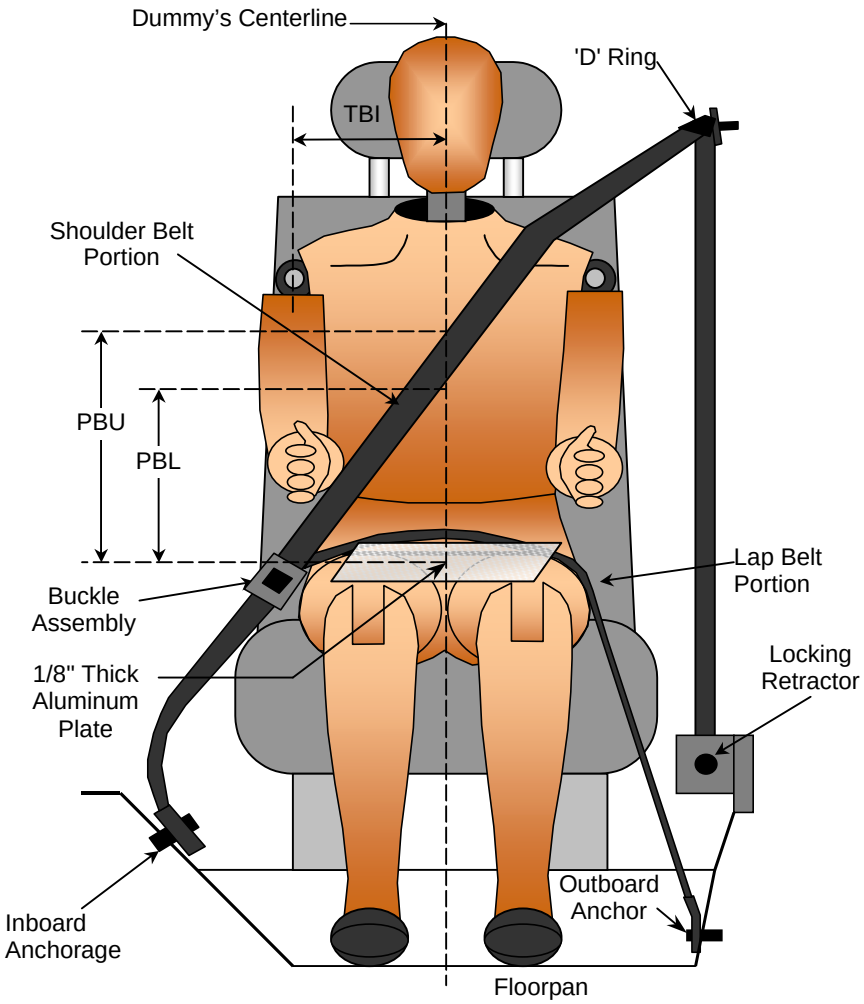
DUMMY MEASUREMENTS FOR FRONT SEAT OCCUPANTS

DATA SHEET NO. 6

SEAT BELT POSITIONING DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07



SEAT BELT POSITIONING MEASUREMENTS

Measured Parameter	Units	Driver	Passenger
TBI - Dummy C/L to Lap/Shoulder Belt Intersect	mm	254	258
PBU - Top Surface of reference to belt upper edge	mm	305	305
PBL - Top Surface of reference to belt lower edge	mm	235	235
Lap Belt Tension	Newtons	10	10
Shoulder Belt Tension	N/A	Retractor	Retractor

DATA SHEET NO. 7

VEHICLE ACCELEROMETER LOCATION

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

VEHICLE ACCELEROMETER PRE-TEST LOCATIONS

No.	Accelerometer Location	Measurement (mm)		
		X	Y	Z
1	Left Rear X-Member	1965	-710	370
2	Right Rear X-Member	1970	710	370
3	Engine Top	4025	10	895
4	Engine Bottom	4190	105	160
5	Left Brake Caliper	4115	-700	360
6	Right Brake Caliper	4115	700	360
7	Instrument Panel			[1]
8	Left Rear X-Member (Z-Axis)	1965	-710	370
9	Right Rear X-Member (Z-Axis)	1970	710	370

1.) No longer required by NHTSA

DATA SHEET NO. 8

SEAT BELT ASSESSMENT TEST DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

SEAT BELT POSITIONING MEASUREMENTS

Measurement Description	Units	Driver	Passenger
Retractor Reel to "D" ring	mm	732	751
Shoulder Belt length as measured on ATD	mm	852	880
Lap Belt length as measured on ATD	mm	675	652
Remainder of belt on reel	mm	989	962
Total belt length for continuous webbing systems	mm	3248	3245

SHOULDER BELT SPOOL-OFF DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	185	196
As determined electronically	mm	265	234

BELT STRETCH DATA

Measuerment 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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

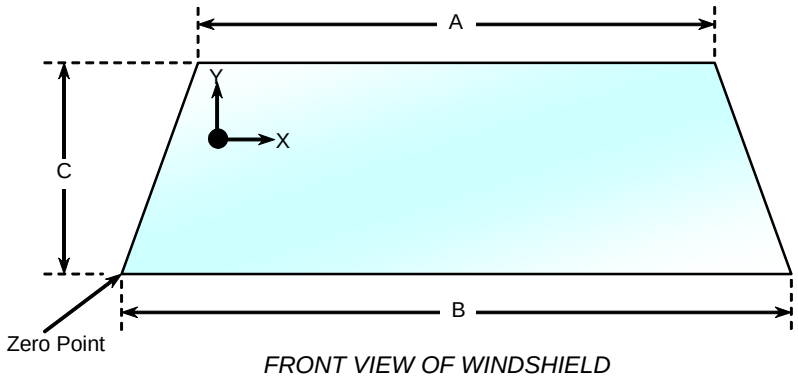
Windshield Mounting Details: Windshield glass is secured to the vehicle frame with a rubber type adhesive, and rubber molding.

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: 20.0 °C

WINDSHIELD PERIPHERY MEASUREMENTS

Measurement	Pre-Test(mm)	Post-Test(mm)	% of Retention
Left Side	2213	2213	100
Right Side	2213	2213	100
Total	4425	4425	100



FRONT VIEW OF WINDSHIELD

WINDSHIELD DIMENSIONS

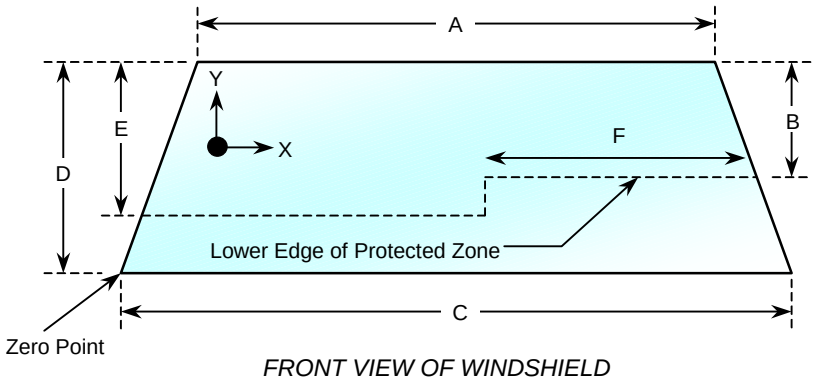
Item	Units	Segment Length	Molding Width
A	mm	1190	N/A
B	mm	1505	10
C-Left	mm	865	N/A
C-Right	mm	865	N/A

DATA SHEET NO. 10

WINDSHIELD ZONE INTRUSION FMVSS 219 DATA (PARTIAL)

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07



FRONT VIEW OF WINDSHIELD

WINDSHIELD AND PROTECTED ZONE

Item	Units	Value
A	mm	1190
B	mm	590
C	mm	1505
D	mm	865
E	mm	520
F	mm	501

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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

Test Time: 11:17 AM Temperature: 18.0 ° C

STODDARD SOLVENT SPILLAGE MEASUREMENTS

A. From impact until vehicle motion ceases: 0.0 oz.
(Maximum Allowable = 1 ounce)

B. For the 5 minute period after motion ceases: 0.0 oz.
(Maximum Allowable = 5 ounces)

C. For the following 25 minutes: 0.0 oz.
(Maximum Allowable = 1 oz./minute)

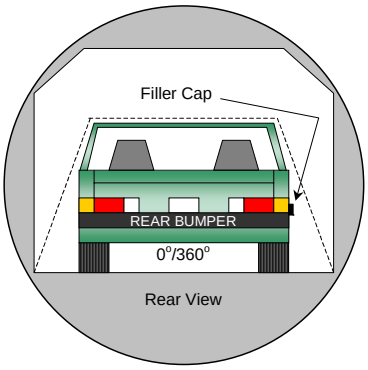
D. Spillage Location Details: No leakage occurred

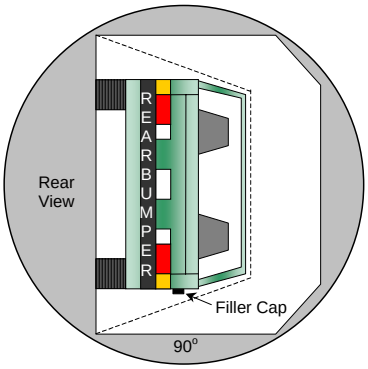
DATA SHEET NO. 12

FMVSS 301 STATIC ROLLOVER DATA

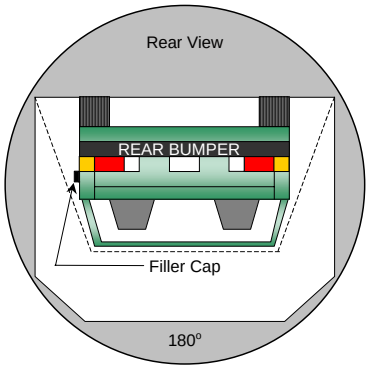
Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

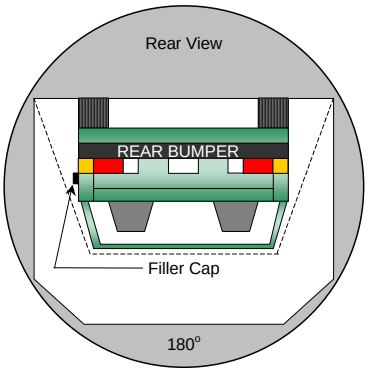




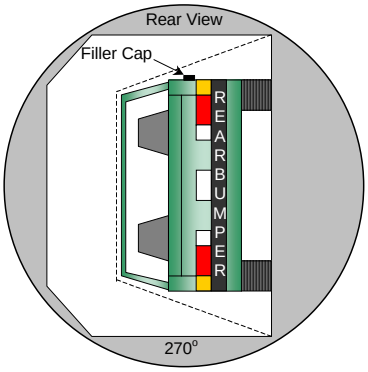
0° to 90°

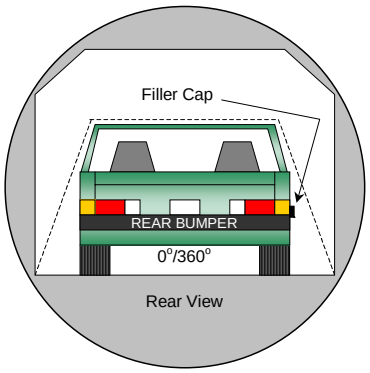


90° to 180°



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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

SOLVENT COLLECTION TIME TABLE IN SECONDS

Test Phase	Rotation Time	Hold Time	Total Time
0° to 90°	82	305	387
90° to 180°	81	302	383
180° to 270°	79	301	380
270° to 360°	83	303	386

FMVSS 301 SPILLAGE TABLE REQUIREMENT (oz.)

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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

VEHICLE MEASUREMENT TABLE

No.	Measurement Description	Units	Pre-Test	Post-Test	Diff.
1	Total length of vehicle at centerline	mm	4825	4340	-485
2	RSOV to front of engine	mm	4183	4038	-145
3	RSOV to firewall centerline	mm	3695	3630	-65
4	RSOV to leading edge of right door	mm	3321	3330	9
5	RSOV to leading edge of left door	mm	3337	3343	6
6	RSOV to lower leading edge of right door	mm	3337	3335	-2
7	RSOV to lower leading edge of left door	mm	3340	3338	-2
8	RSOV to upper trailing edge of right door	mm	2171	2180	9
9	RSOV to upper trailing edge of left door	mm	2182	2188	6
10	RSOV to lower trailing edge of right door	mm	2212	2210	-2
11	RSOV to lower trailing edge of left door	mm	2215	2214	-1
12	RSOV to bottom of right 'A' pillar	mm	3300	3311	11
13	RSOV to bottom of left 'A' pillar	mm	3310	3306	-4
14	RSOV to firewall on right side	mm	3700	3675	-25
15	RSOV to firewall on left side	mm	3700	3693	-7
16	RSOV to steering column	mm	2775	2835	60
17	Center of steering column to left 'A' pillar	mm	387	410	23
18	Center of steering column to headlining	mm	435	420	-15
19	RSOV to right side of front bumper	mm	4696	4365	-331
20	RSOV to left side of front bumper	mm	4696	4360	-336
21	Length of engine block	mm	570	570	0
RD	RSOV to right side of dash panel	mm	2950	2970	20
CD	RSOV to center of dash panel	mm	2960	2960	0
LD	RSOV to left side of dash panel	mm	2950	2970	20

DATA SHEET NO. 13…(CONTINUED)

VEHICLE STRUCTURAL MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

VEHICLE STRUCTURAL MEASUREMENT TABLE

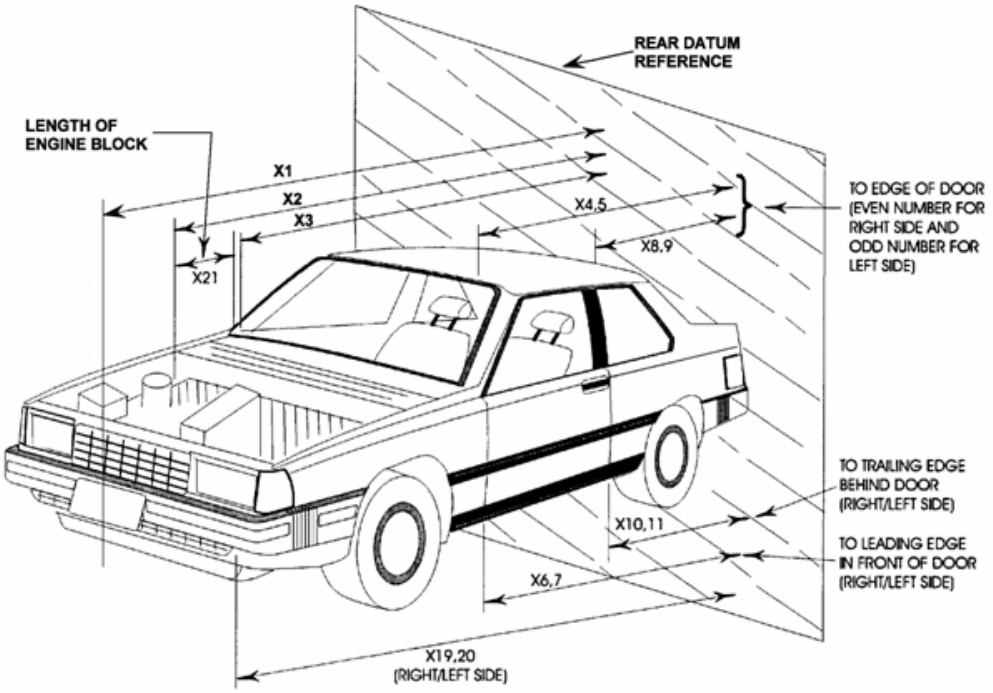
No.	Measurement Description	Units	Pre-Test	Post-Test	Diff.
1	Total length	mm	4825	4825	0
2	Total width	mm	1790	1775	-15
3	Bumper top height	mm	532	595	63
4	Bumper bottom height	mm	366	201	-165
5	Longitudinal member top height	mm	444	301	-143
6	Longitudinal member bottom height	mm	334	221	-113
7	Distance between longitudinal members	mm	780	280	-500
8	Longitudunal member width	mm	70	80	10
9	Engine top height	mm	926	970	44
10	Engine bottom height	mm	155	199	44
11	Engine and gear box width	mm	1020	1020	0
12	Front bumper to engine distance	mm	647	735	88
13	Front shock absorber fixing width	mm	835	860	25
14	Bonnet leading edge height	mm	980	810	-170
15	Front shock absorber fixing width	mm	905	875	-30
16	Front bumper to front axle distance	mm	866	485	-381
17	Front axle to 'A' pillar distance	mm	585	540	-45
18	'A' pillar to 'B' pillar distance	mm	1165	1165	0
19	'B' pillar to rear axle distance	mm	1140	1137	-3
20	'B' pillar to 'C' pillar distance	mm	1060	1056	-4
21	Roof sill bottom height	mm	1306	1310	4
22	Roof sill top height	mm	1419	1425	6
23	Floor sill bottom height	mm	185	196	11
24	Floor sill top height	mm	362	360	-2

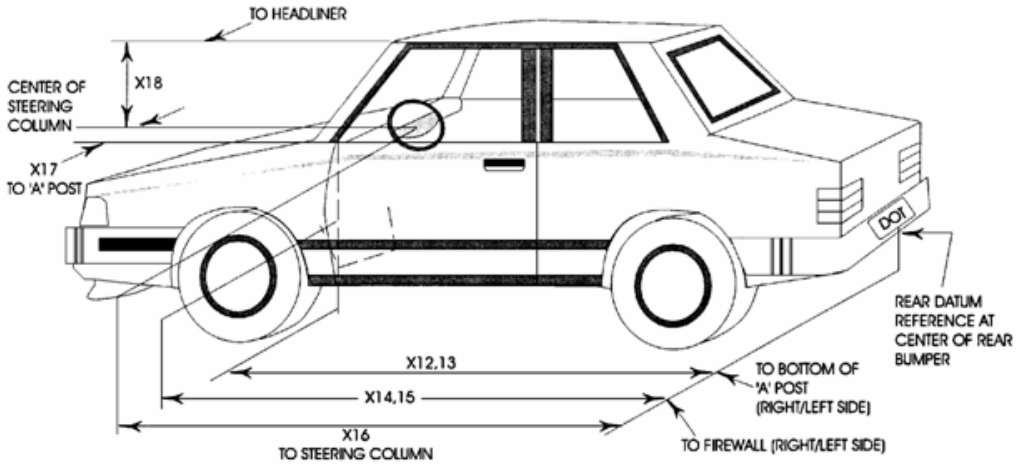
DATA SHEET NO. 13…(CONTINUED)

VEHICLE MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07





DATA SHEET NO. 14

CAMERA LOCATIONS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

VEHICLE CAMERA MEASUREMENT TABLE

No.	Camera View	Location (mm)			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	-2575	-7691	-1027	0	8368	20mm	1000
3	Closeup Left Side	-1937	-6821	-1041	0	7531	50mm	1000
4	Driver and Interior View	-6696	-5987	-1071	-17	8126	ZOOM	1000
5	Steering Column (Bottom)	-1972	-8184	-2879	-13	9477	35mm	1000
6	Steering Column (Top)	-1966	-8141	-3258	-13	9610	35mm	1000
7	Overall Right Side	-2581	7718	-1058	0	7715	20mm	1000
8	Closeup Right Side	-1643	6301	-1073	0	6391	50mm	1000
9	Passenger and Interior View	-5136	9516	-2460	-10	10306	ZOOM	1000
10	Right Side View	-1582	7995	-1713	-6	8201	ZOOM	1000
11	Windshield View	-354	0	-5749	-90		24mm	1000
12	Driver Front View	363	-543	-2548	-34		25mm	1000
13	Passenger Front View	381	445	-2548	-34		25mm	1000
14	Pit View of Engine	-756	0	1495	90		12mm	1000
15	Pit View of Fuel Tank	-3398	0	1495	90		8mm	1000
16	Real Time Driver	-1926	-8089	-1704	-1			30
17	Real Time Passenger	-1433	8047	-1704	-1			30
18	Driver Side On-Board	-1353	-573	-1355	-1	799	12	1000
19	Passsenger Side On-Board	-1349	572	-1355	-1	731	12	1000

All measurements are made relative to the point of impact.

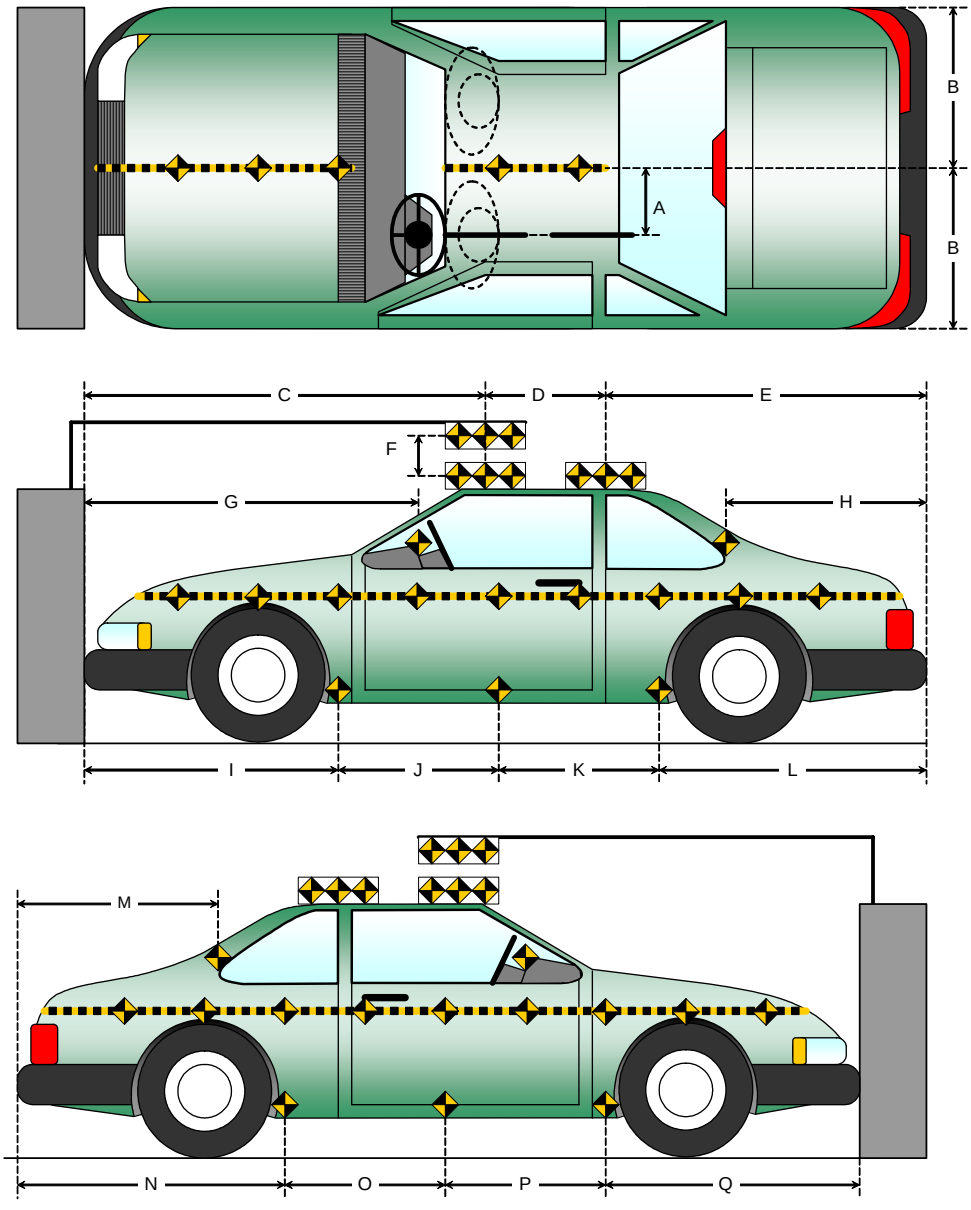
DATA SHEET NO. 15

PHOTOGRAPHIC REFERENCE TARGET LOCATIONS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

All Dimensions in (mm)	
Item	Value
A	N/A
B	1790
C	N/A
D	N/A
E	N/A
F	N/A
G	1880
H	1219
I	1327
J	980
K	980
L	1550
M	1219
N	1550
O	980
P	980
Q	1327



DATA SHEET NO. 16

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

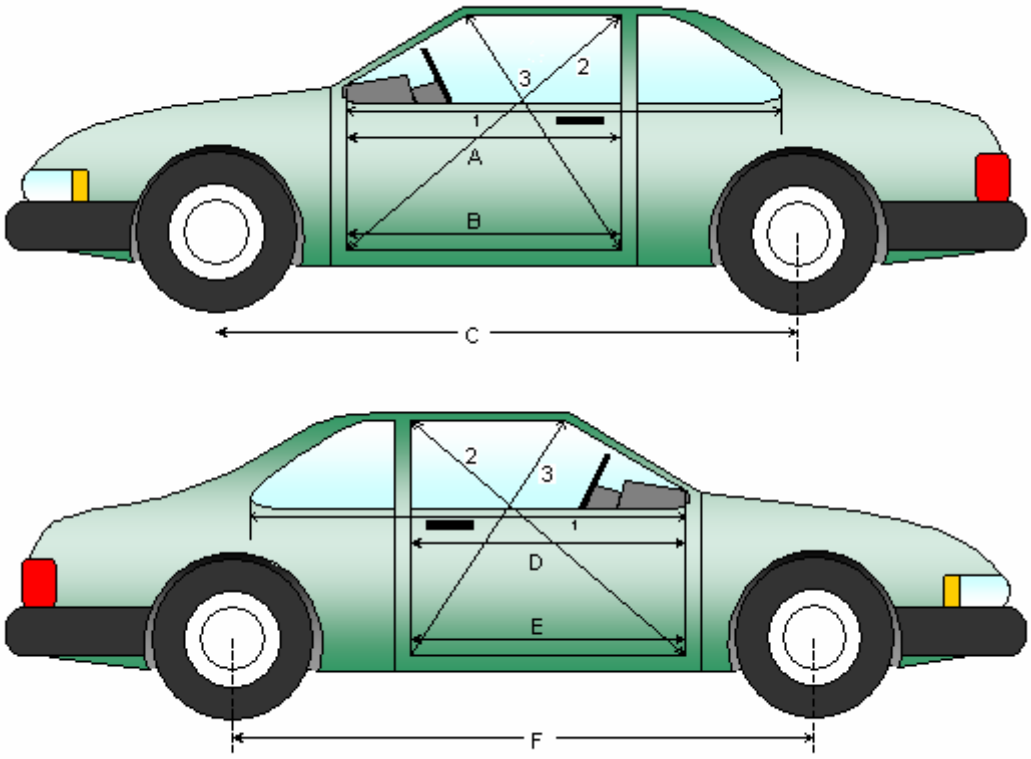
Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

DOOR OPENING WIDTH TABLE

Item	Description	Units	Pre-Test	Post-Test	Diff.
1L	Left Side	mm	1056	1056	0
2L	Left Side (Diagonally)	mm	1481	1476	-5
3L	Left Side (Diagonally)	mm	890	896	6
1R	Right Side	mm	1056	1058	2
2R	Right Side (Diagonally)	mm	1501	1488	-13
3R	Right Side (Diagonally)	mm	871	870	-1

WHEELBASE MEASUREMENT TABLE

Item	Description	Units	Pre-Test	Post-Test	Diff.
C	Left Side Wheel Base	mm	2885	2815	-70
F	Right Side Wheel Base	mm	2885	2790	-95



DATA SHEET NO. 16…(CONTINUED)

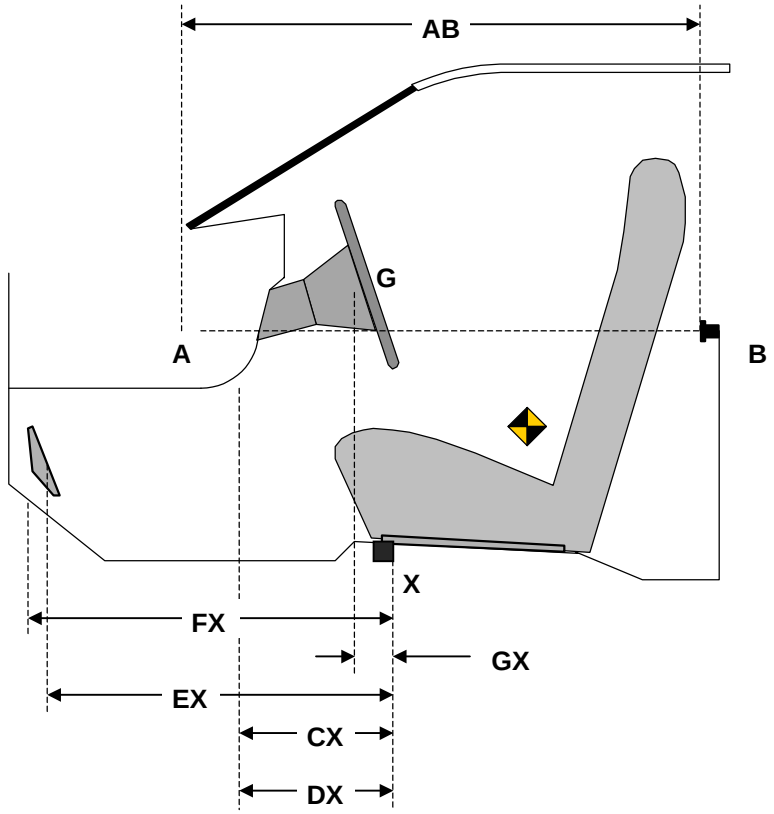
VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

DRIVER COMPARTMENT INTRUSION TABLE

Item	Description	Units	Pre-Test	Post-Test	Diff.
AB	Door Opening (Inside window jam)	mm	1056	1056	0
CX	Left Knee Bolster to X	mm	230	195	-35
DX	Right Knee Bolster to X	mm	200	175	-25
EX	Brake Pedal to X	mm	556	466	-90
FX	Foot Rest to X	mm	616	551	-65
GX	Center of Steering Wheel Hub to X	mm	50	50	0

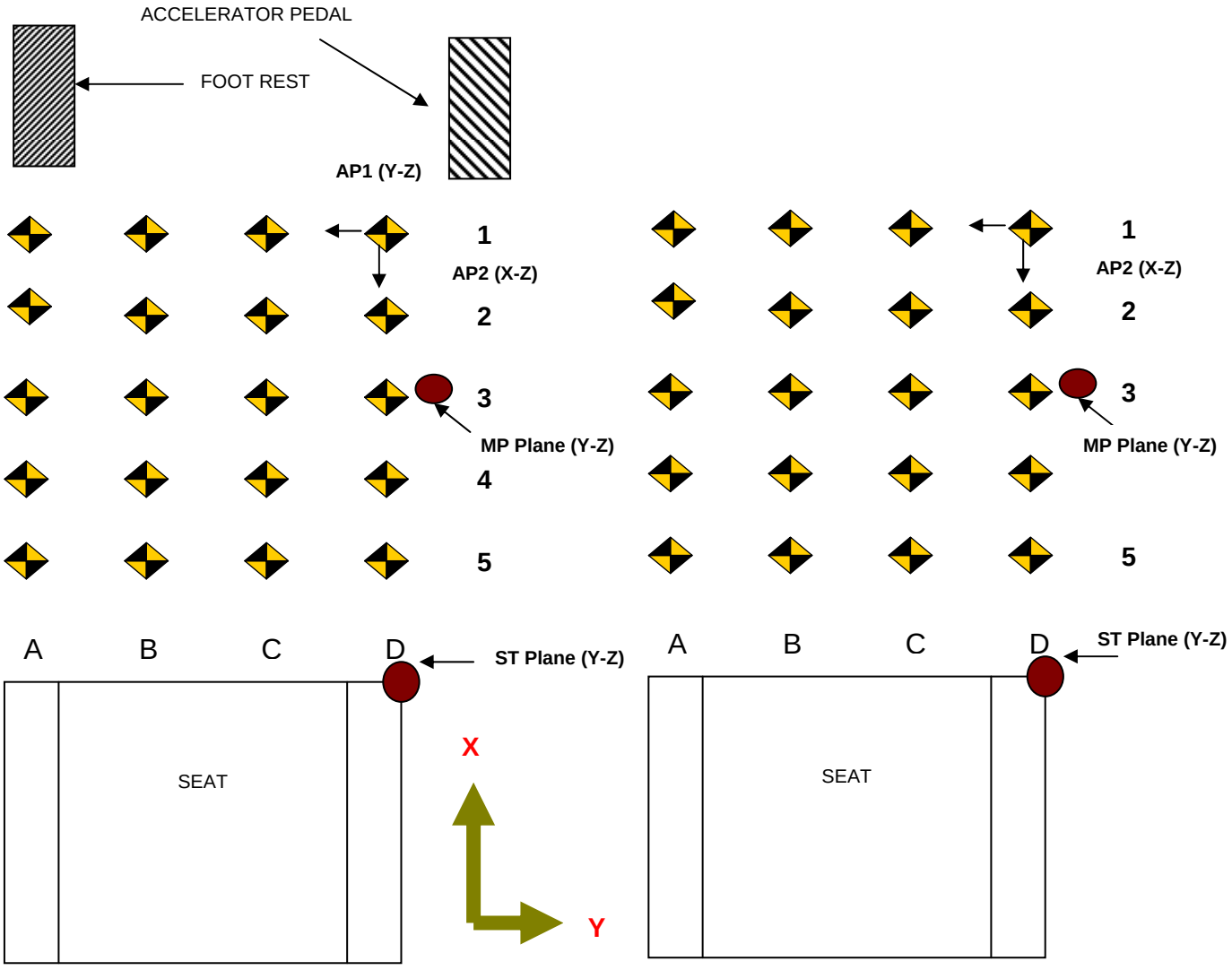


DATA SHEET NO. 16…(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07



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.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

All measurements in mm

DRIVER FLOOR PAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	609	597	591	587	614	607	603	602	5	10	12	15
2	520	515	507	501	526	524	518	514	6	9	11	13
3	394	391	384	372	399	399	395	387	5	8	11	15
4	262	255	250	238	266	261	258	250	4	6	8	12
5	131	127	123	111	136	135	131	120	5	8	8	9

DRIVER FLOOR PAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	47	154	248	383	48	155	253	382	1	1	5	-1
2	43	149	243	378	45	153	246	381	2	4	3	3
3	37	136	234	374	45	146	242	382	8	10	8	8
4	32	128	227	366	43	140	239	377	11	12	12	11
5	24	119	222	354	40	136	239	368	16	17	17	14

DRIVER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	36	26	22	31	58	47	43	49	22	21	21	18
2	75	56	52	53	95	79	76	70	20	23	24	17
3	77	69	55	55	97	91	79	77	20	22	24	22
4	82	78	62	61	102	102	88	90	20	24	26	29
5	89	85	70	70	110	108	96	102	21	23	26	32

DATA SHEET NO. 16…(CONTINUED)

VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

All measurements in mm

PASSENGER FLOOR PAN X-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	584	584	589	591	581	580	586	589	-3	-4	-3	-2
2	489	490	495	492	487	487	490	487	-2	-3	-5	-5
3	386	383	383	382	383	382	379	375	-3	-1	-4	-7
4	285	280	279	279	278	276	274	272	-7	-4	-5	-7
5	183	180	178	175	178	177	175	166	-5	-3	-3	-9

PASSENGER FLOOR PAN Y-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	-263	-156	-56	7	-274	-172	-70	-2	-11	-16	-14	-9
2	-265	-159	-58	9	-278	-172	-70	-2	-13	-13	-12	-11
3	-265	-162	-61	4	-280	-177	-73	-9	-15	-15	-12	-13
4	-274	-165	-61	3	-289	-179	-76	-13	-15	-14	-15	-16
5	-278	-168	-64	2	-293	-184	-80	-16	-15	-16	-16	-18

PASSENGER FLOOR PAN Z-AXIS

	Pre-Test				Post-Test				Difference			
	A	B	C	D	A	B	C	D	A	B	C	D
1	31	34	45	49	44	47	63	68	13	13	18	19
2	56	59	68	72	70	73	83	89	14	14	15	17
3	59	60	78	79	76	76	96	95	17	16	18	16
4	63	64	86	87	79	84	107	104	16	20	21	17
5	69	70	90	91	93	90	111	109	24	20	21	18

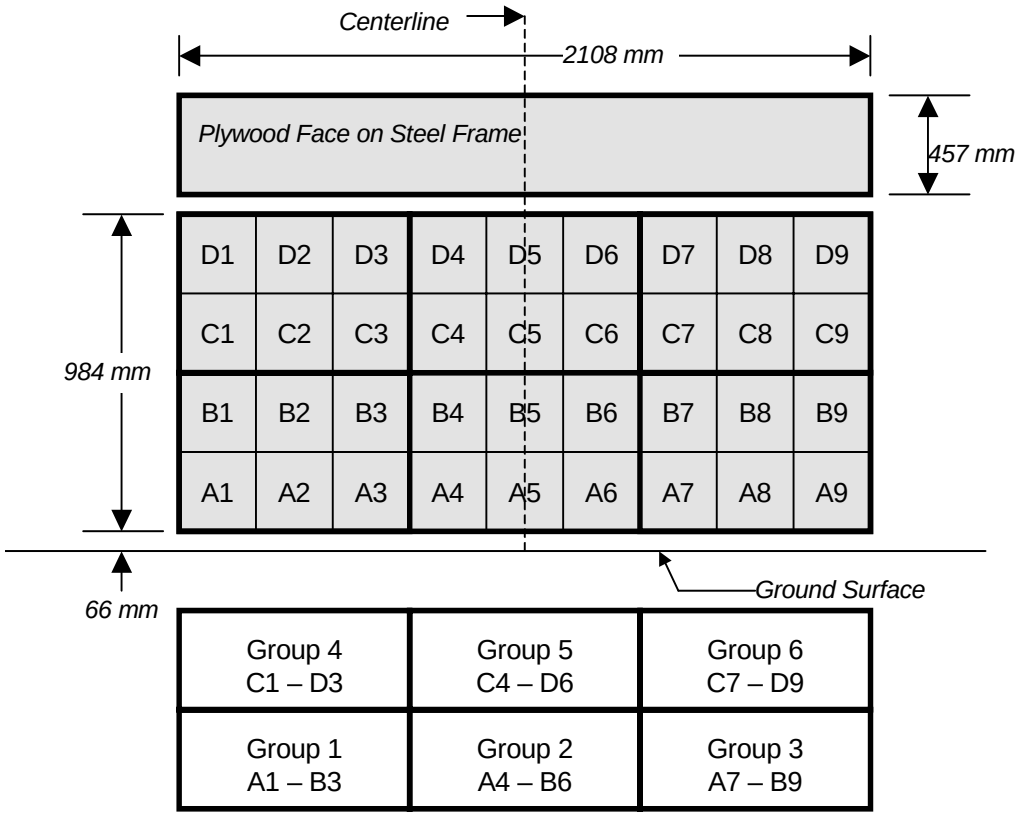
DATA SHEET NO. 17

FIXED BARRIER LOAD CELL LOCATIONS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

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 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

VEHICLE INFORMATION

VIN: 1G6DT57V680139247 Wheel base (mm): 2885

Vehicle Size Category: 4-Door Sedan Test Weight (kg): 2123

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

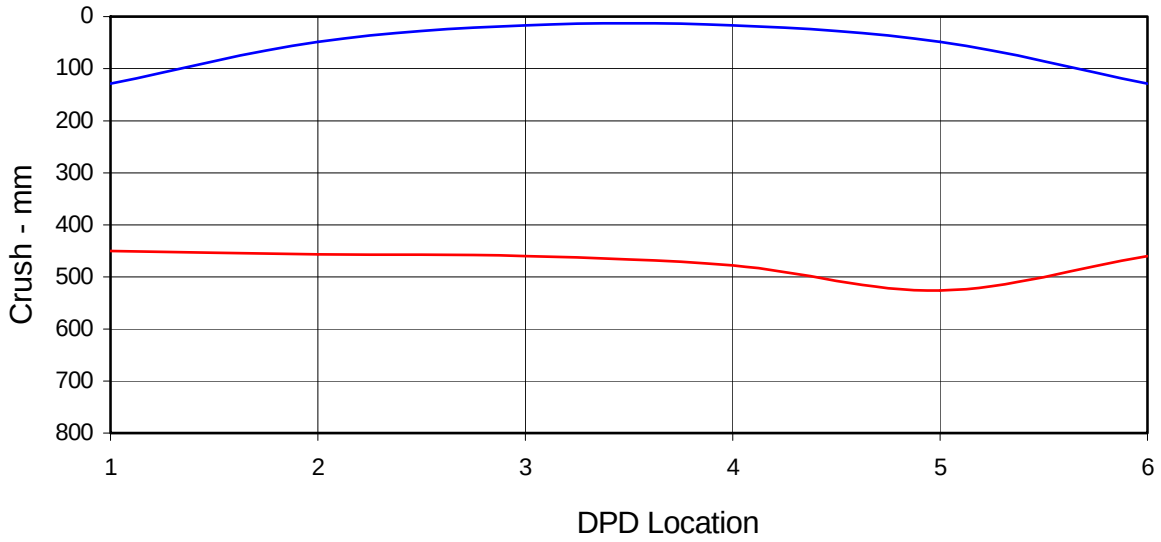
Velocity Change (km/h): 56.0 Time of Separation (msec): 64.0

CRUSH PROFILE

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

Damage Region Length (mm): 1385 Impact Mode: Full Frontal

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
C1	Crush zone 1 at left side	mm	129	450	-321
C2	Crush zone 2 on left side	mm	48	457	-409
C3	Crush zone 3 on left side	mm	17	460	-443
C4	Crush zone 4 on right side	mm	17	478	-461
C5	Crush zone 5 on right side	mm	48	526	-478
C6	Crush zone 6 at right side	mm	129	460	-331

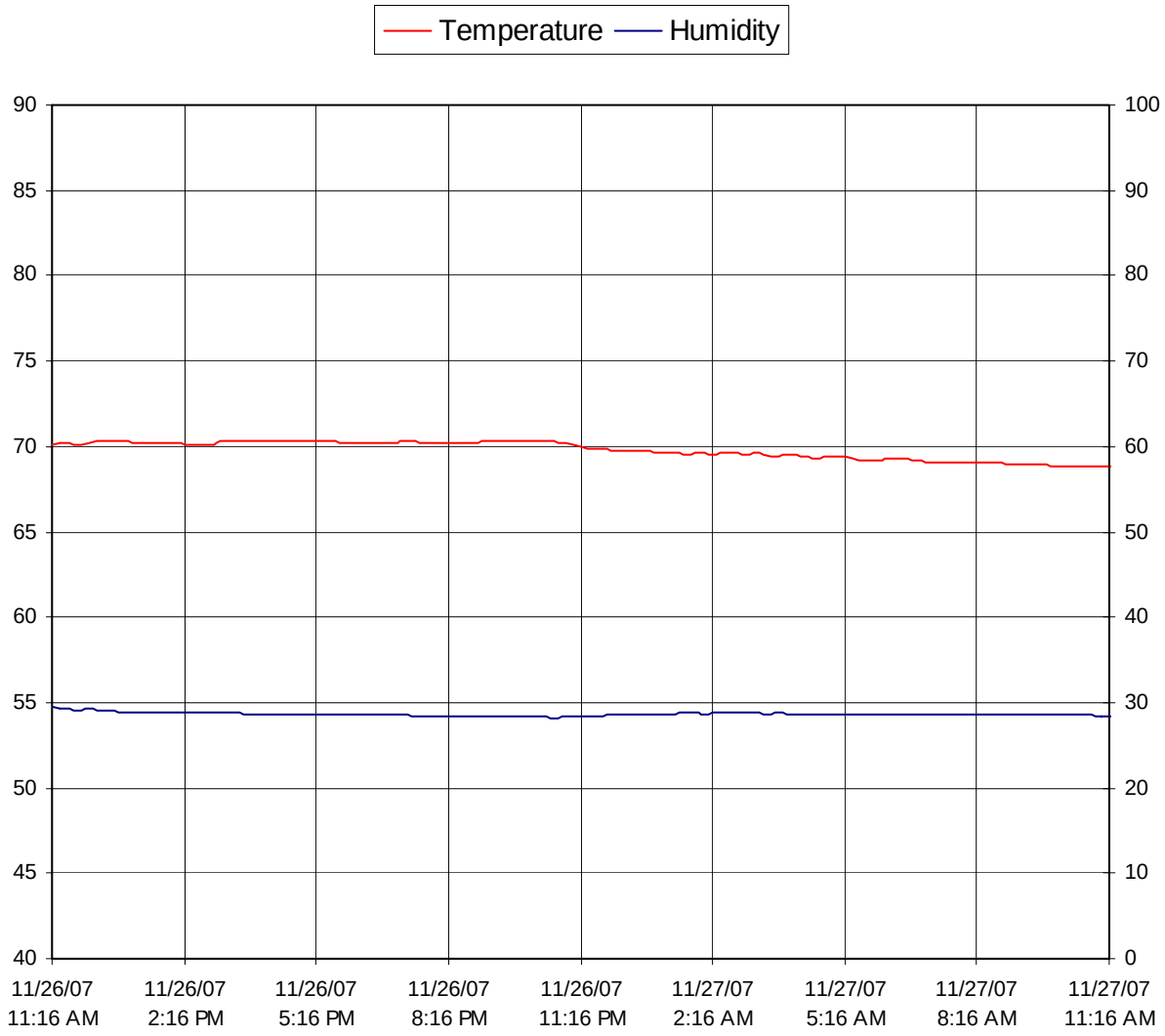


DATA SHEET NO. 19

DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07



APPENDIX A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

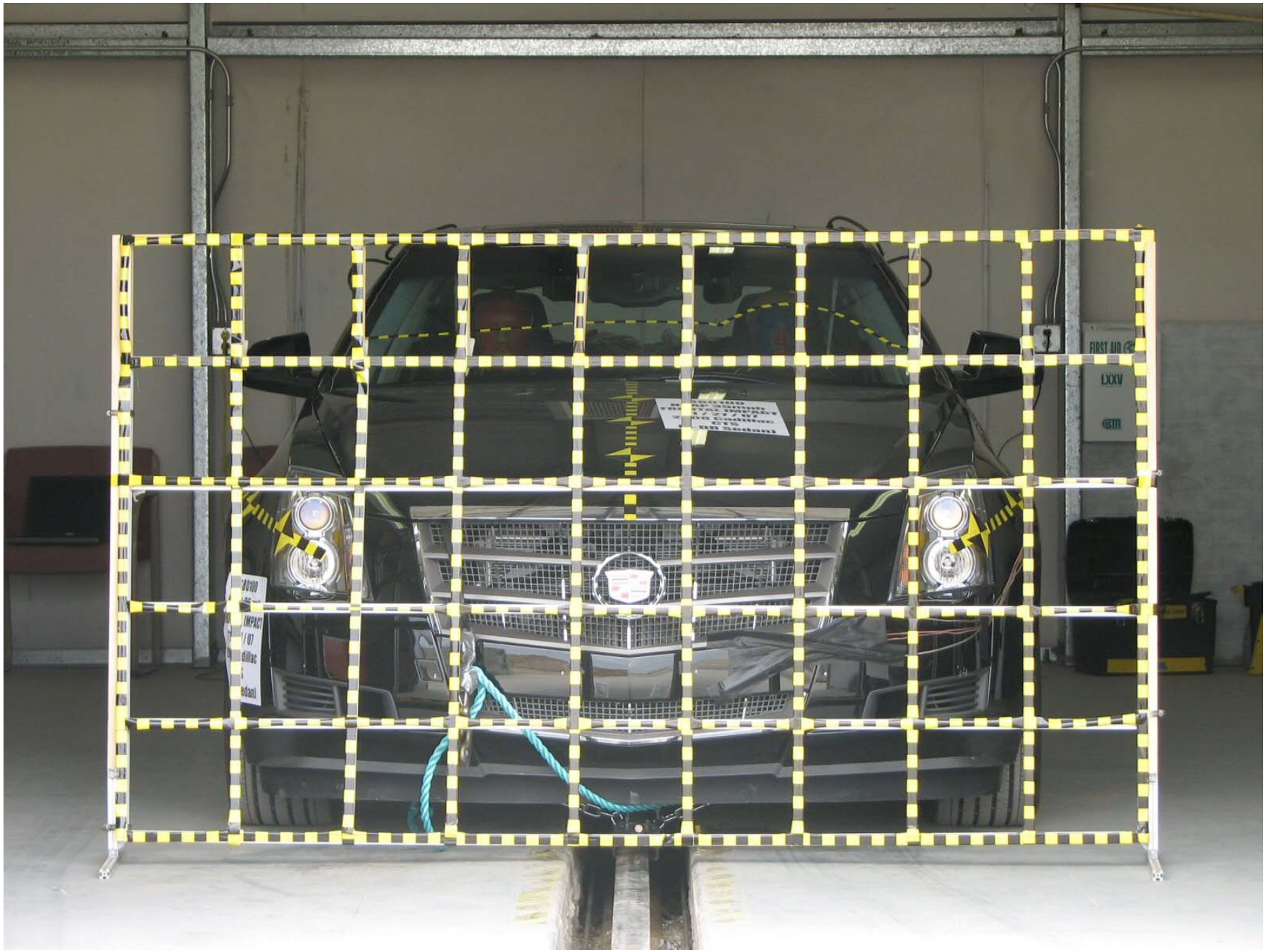


Figure A-1: Load Cell Location

This Space Intentionally Left Blank

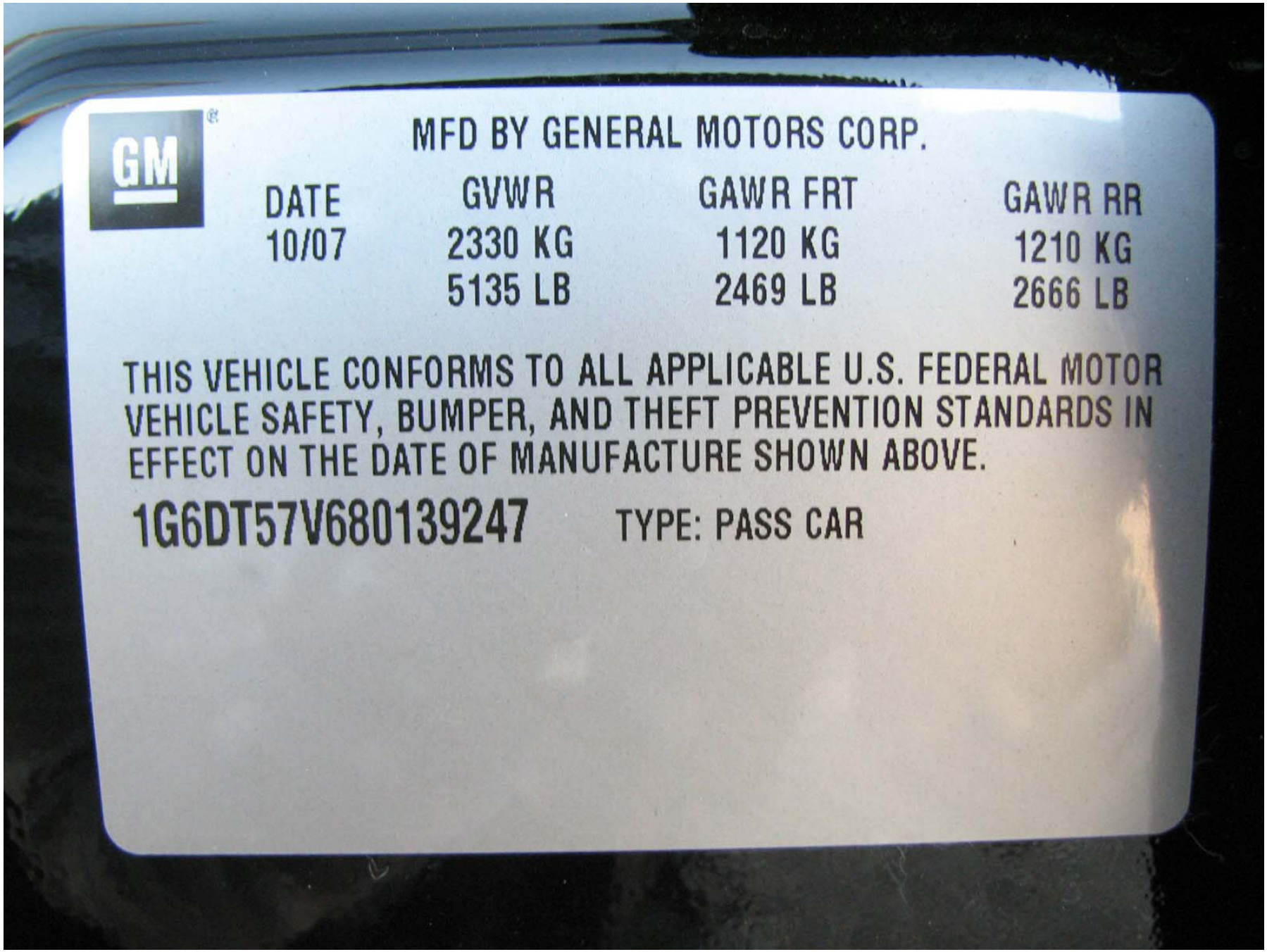


Figure A-2: Manufacturer's Label

Figure A-3: Tire Placard

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

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

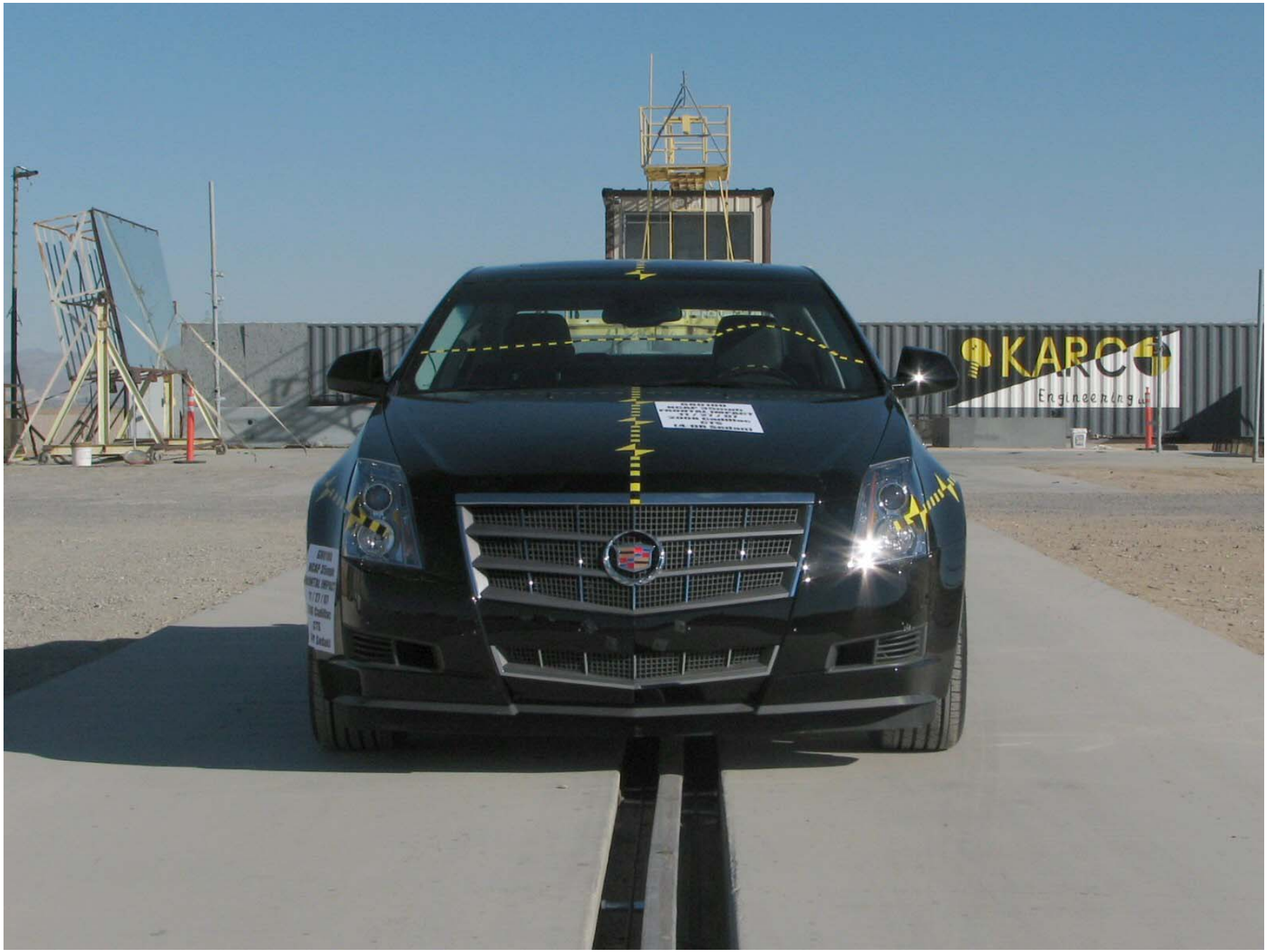


Figure A-6: Pre-Test Front View

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

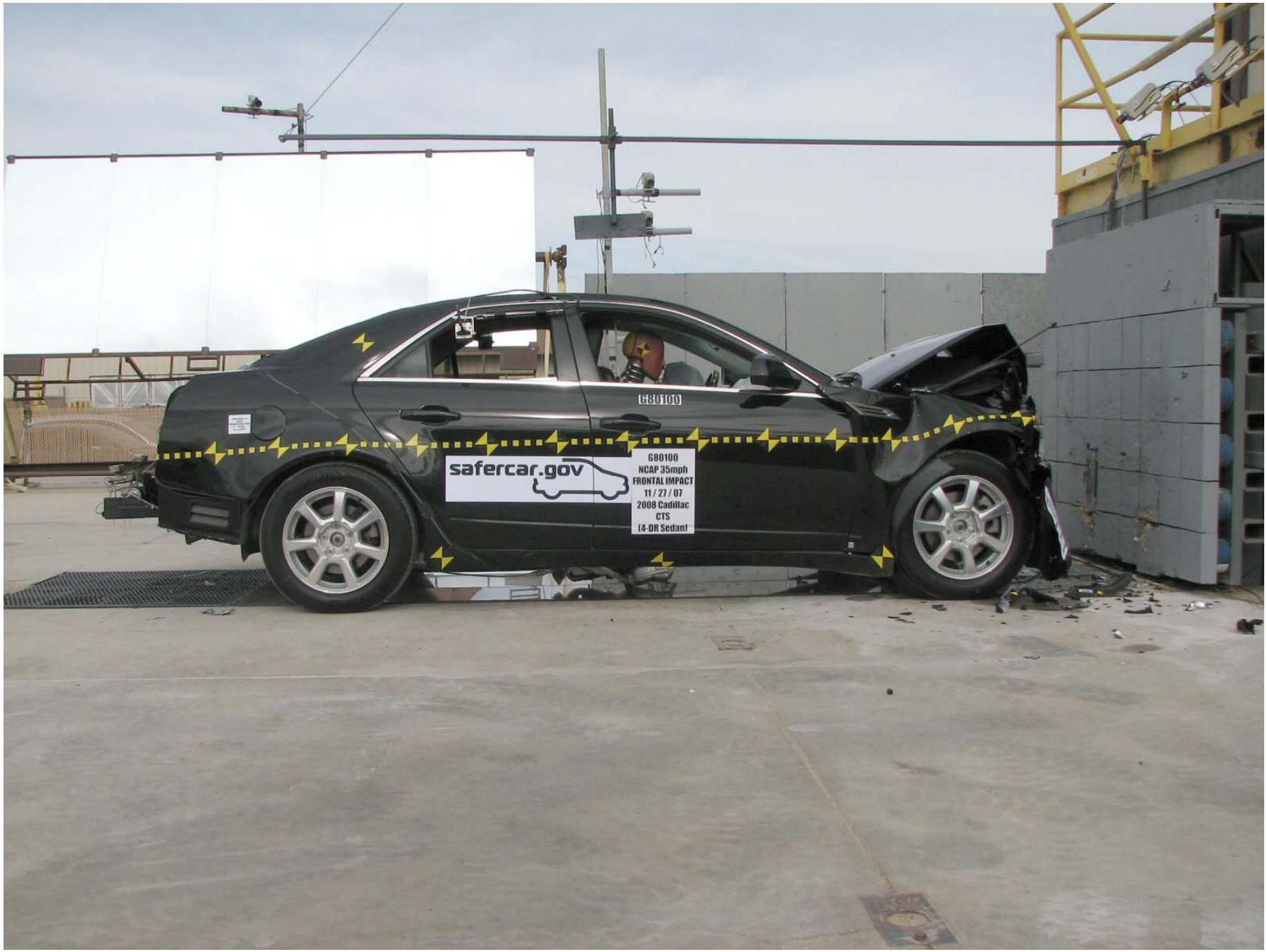


Figure A-11: Post-Test Right Side View

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

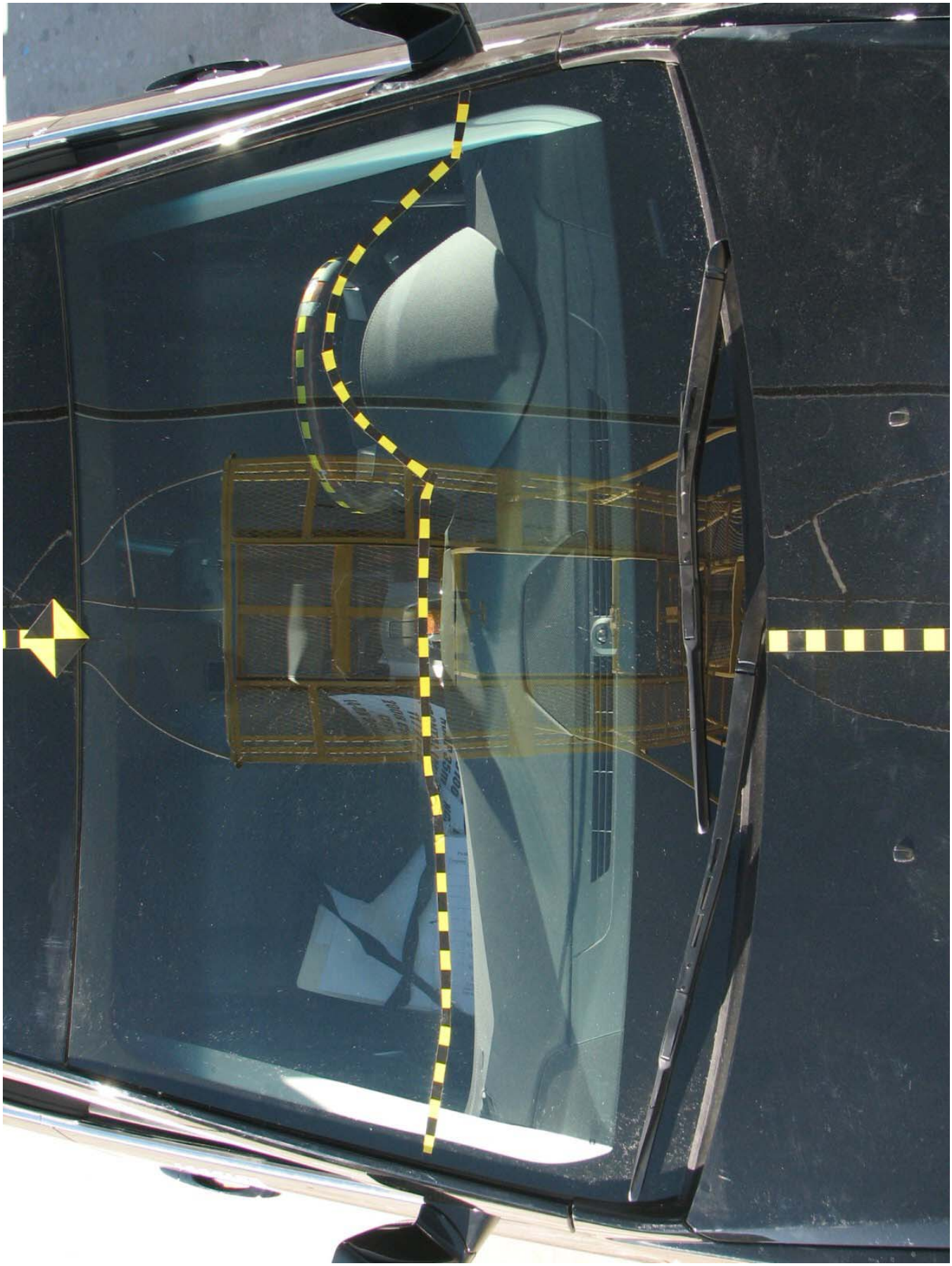


Figure A-18: Pre-Test Windshield

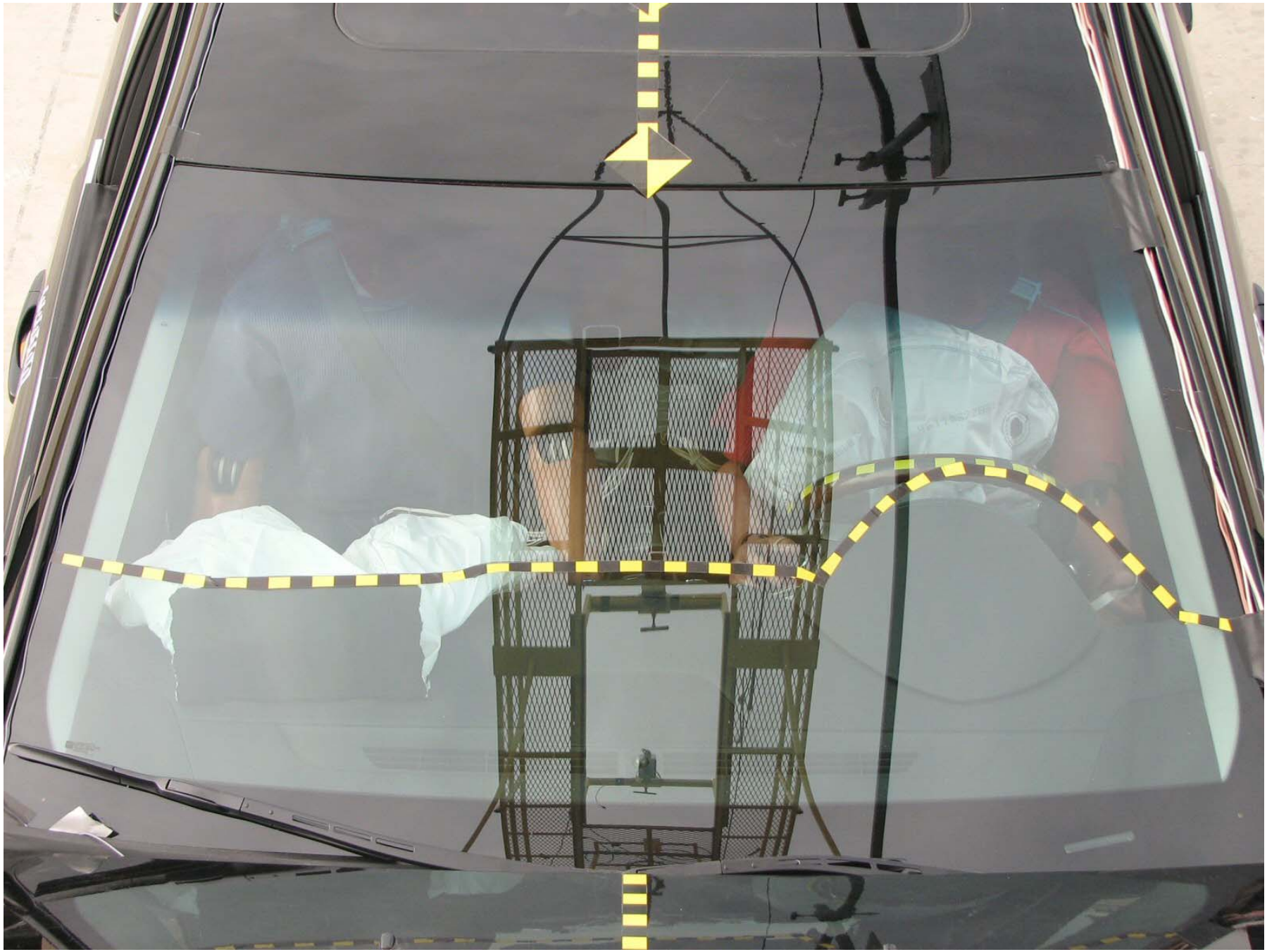


Figure A-19: Post-Test Windshield

Figure A-20: Pre-Test Engine Compartment

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

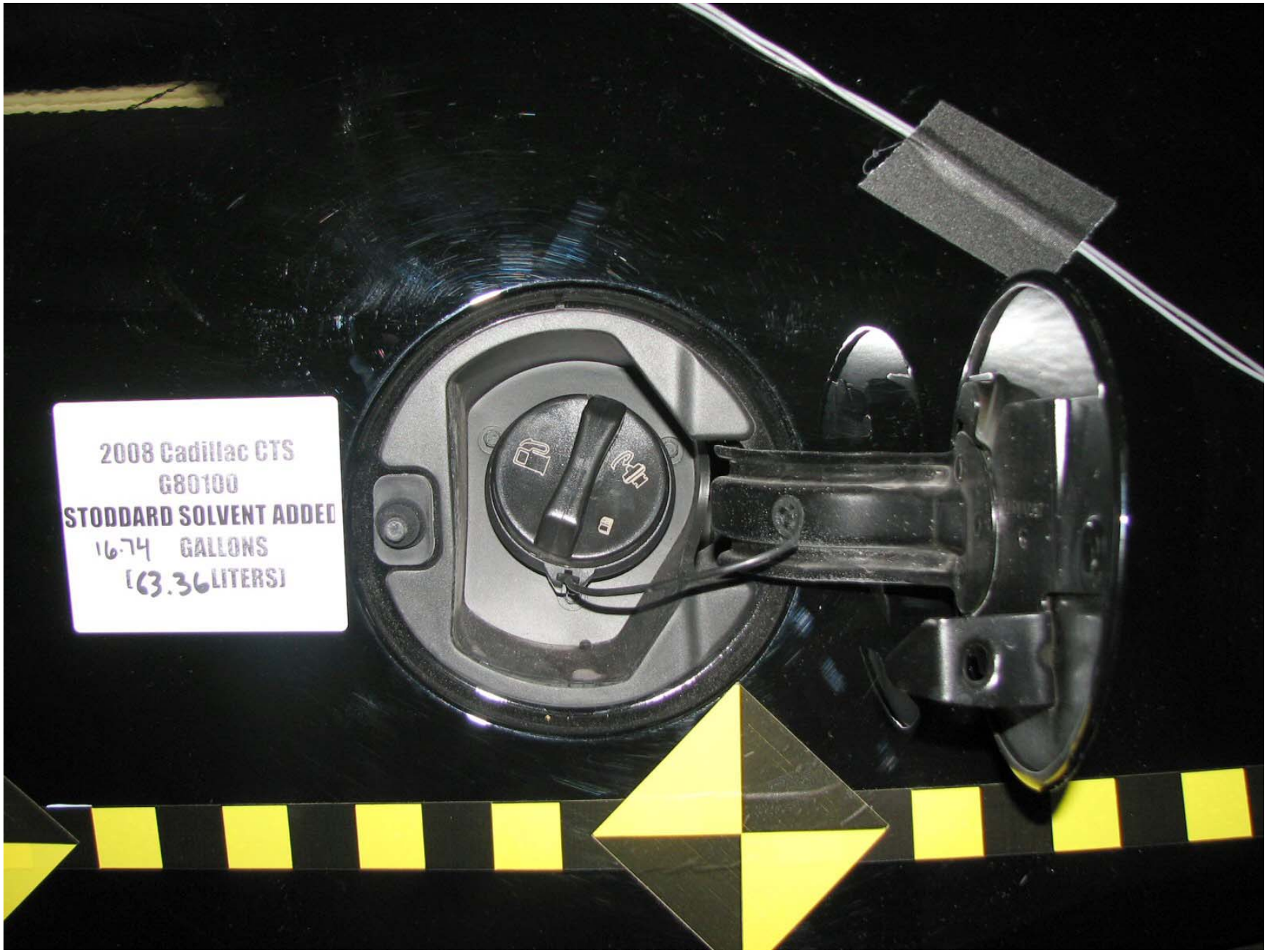


Figure A-22: Pre-Test Fuel Cap

Figure A-23: Post-Test Fuel Cap

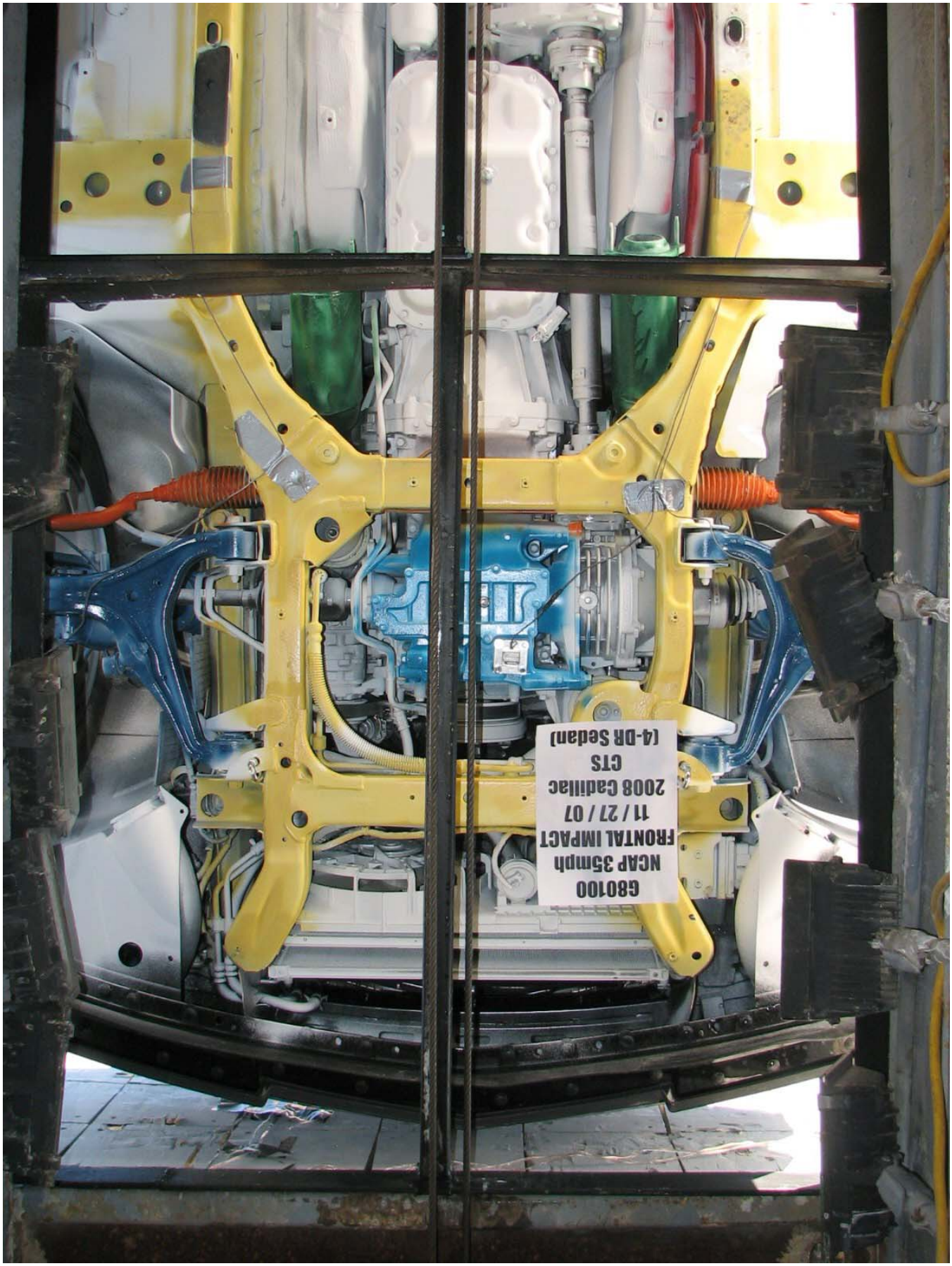


Figure A-24: Pre-Test Front Underbody

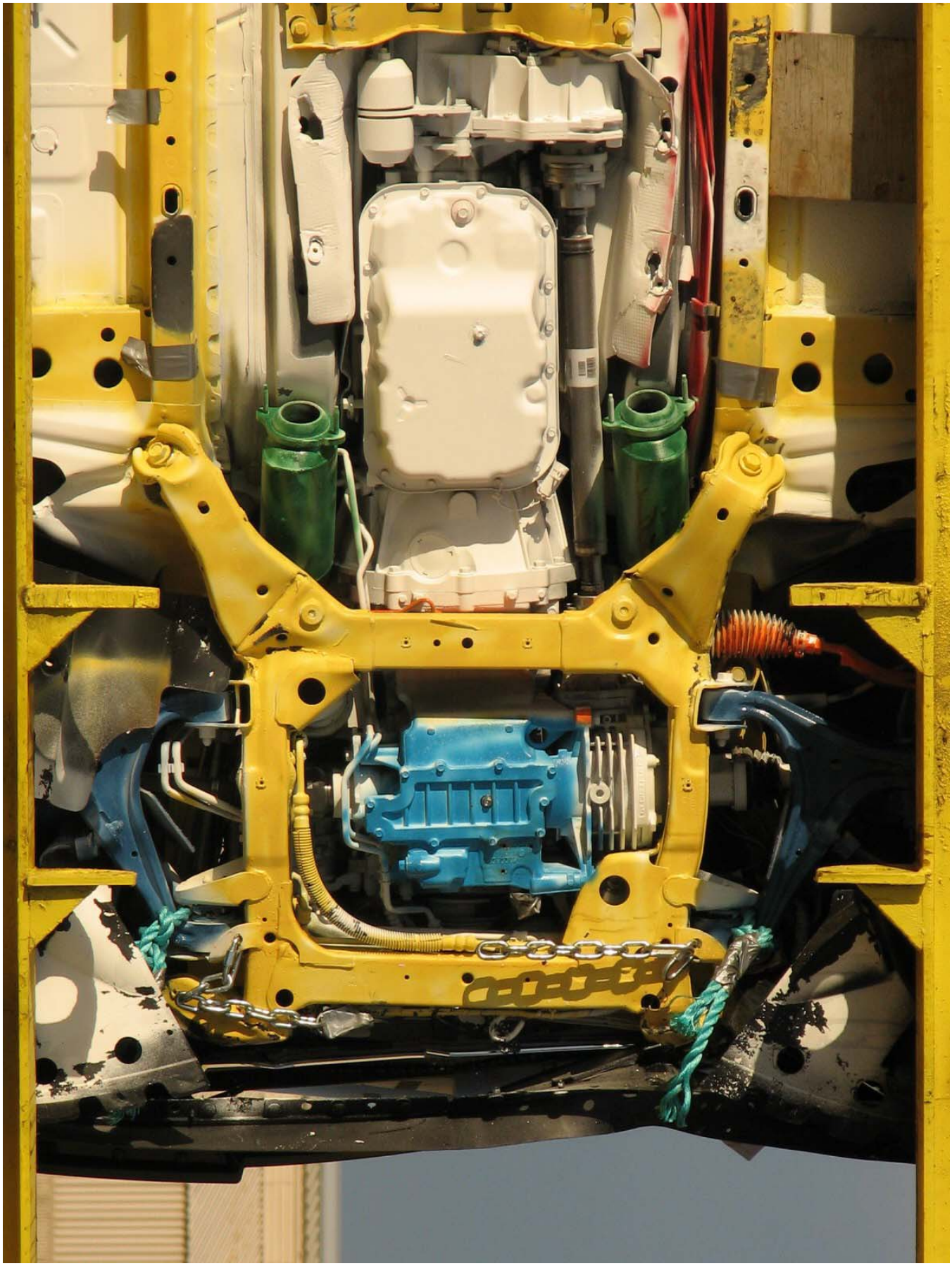


Figure A-25: Post-Test Front Underbody

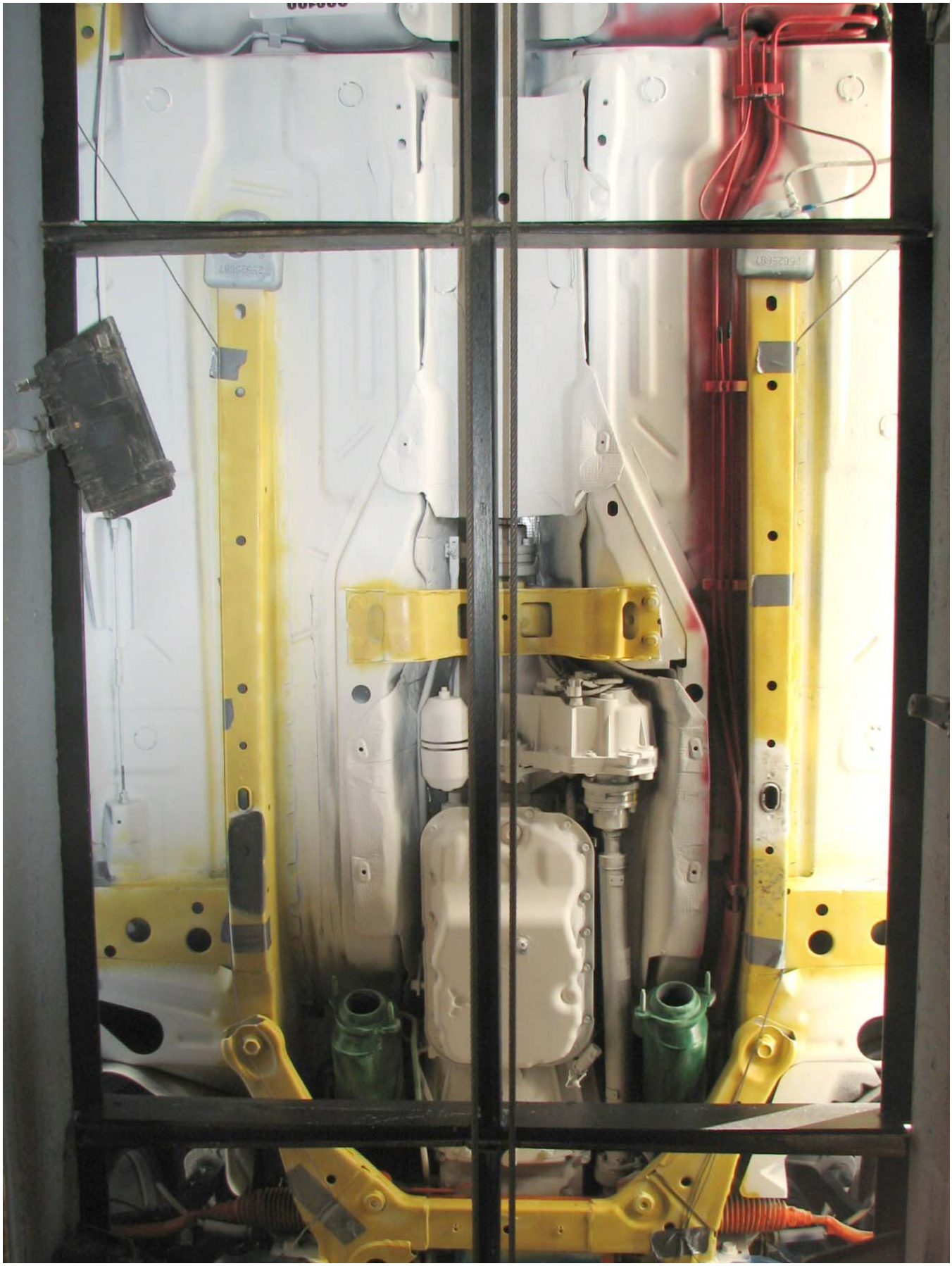


Figure A-26: Pre-Test Mid Underbody

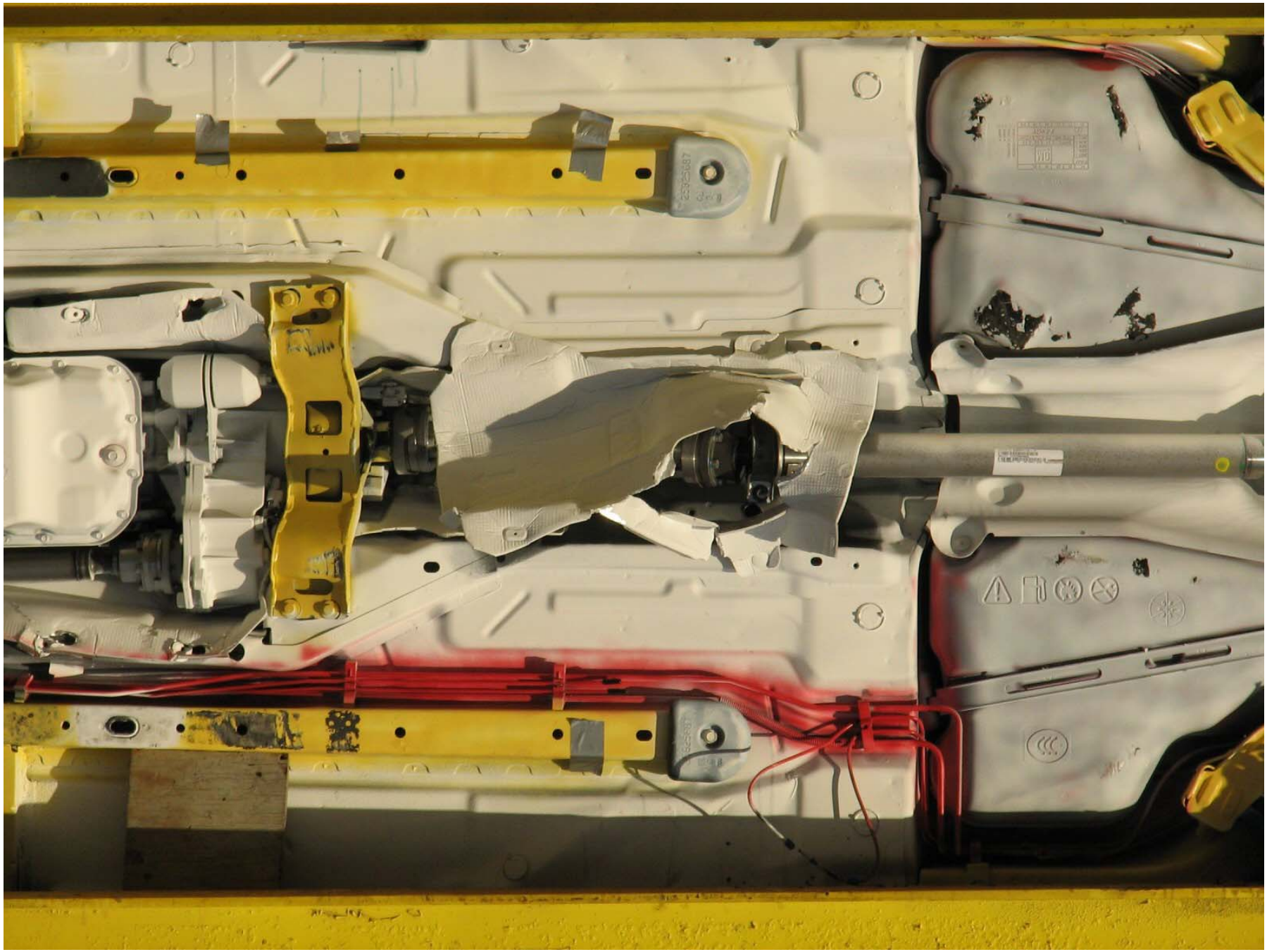


Figure A-27: Post-Test Mid Underbody

Figure A-28: Pre-Test Rear Underbody

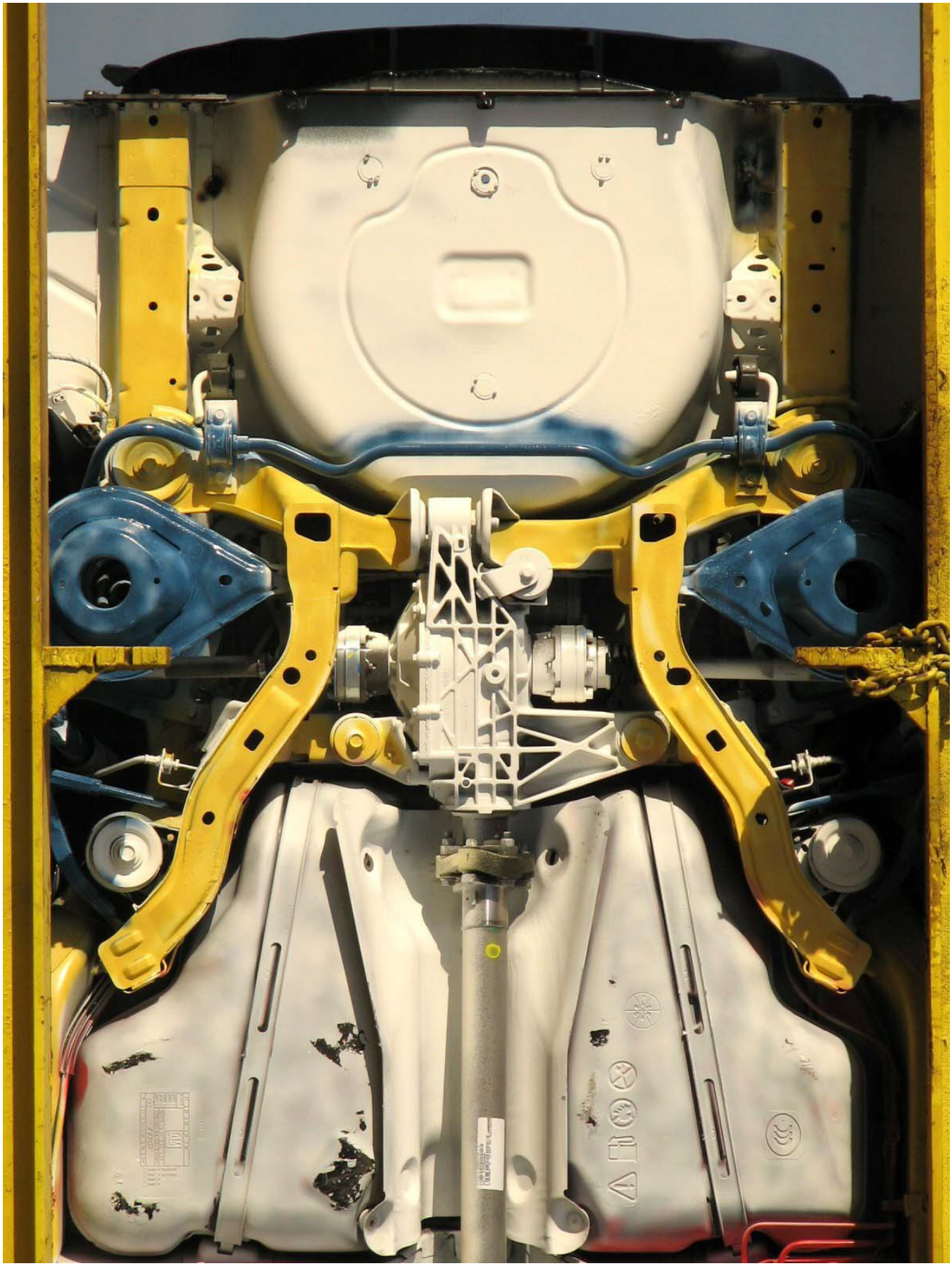


Figure A-29: Post-Test Rear Underbody

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

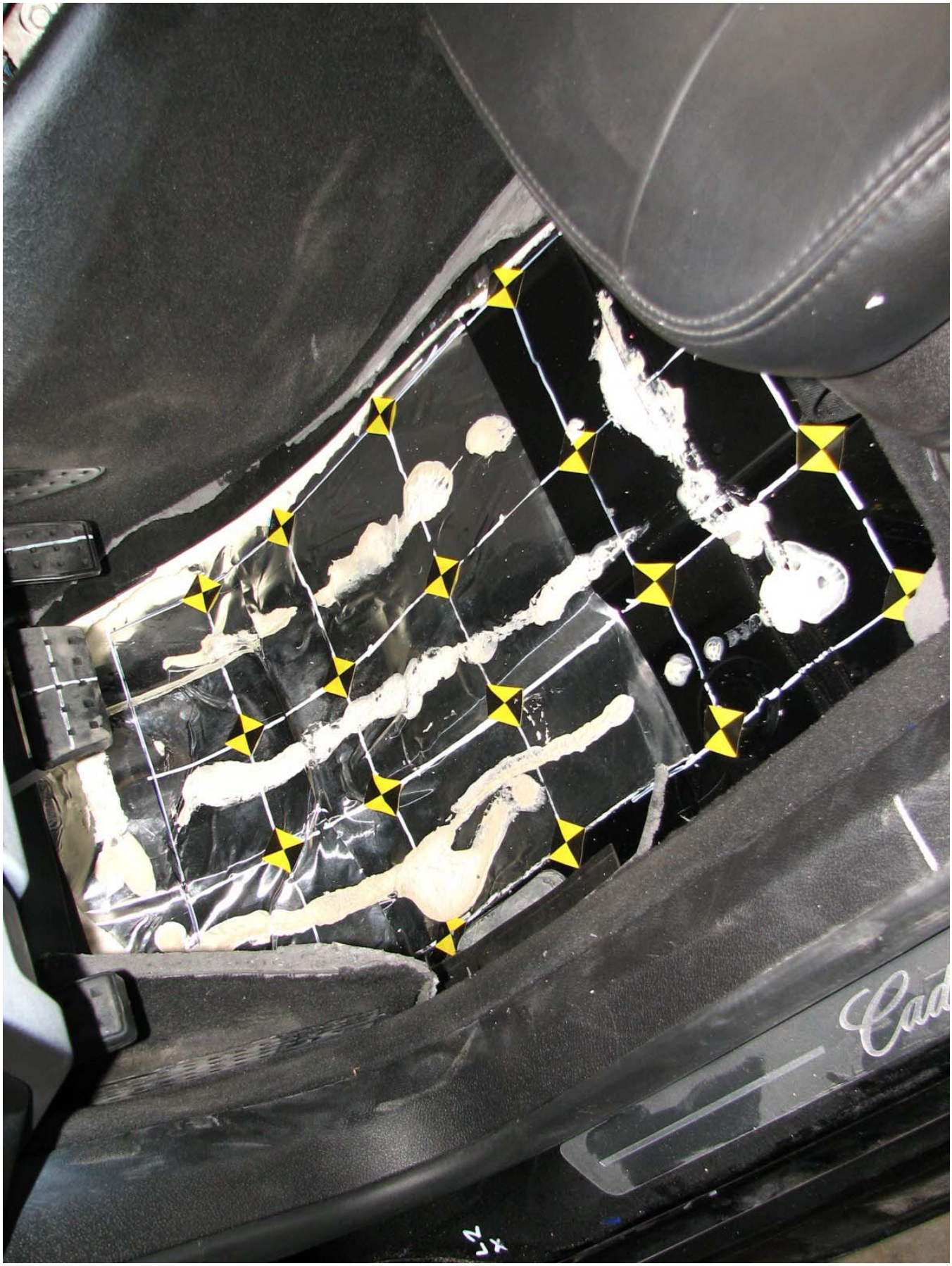


Figure A-41: Post-Test Driver Side Floor Pan

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)

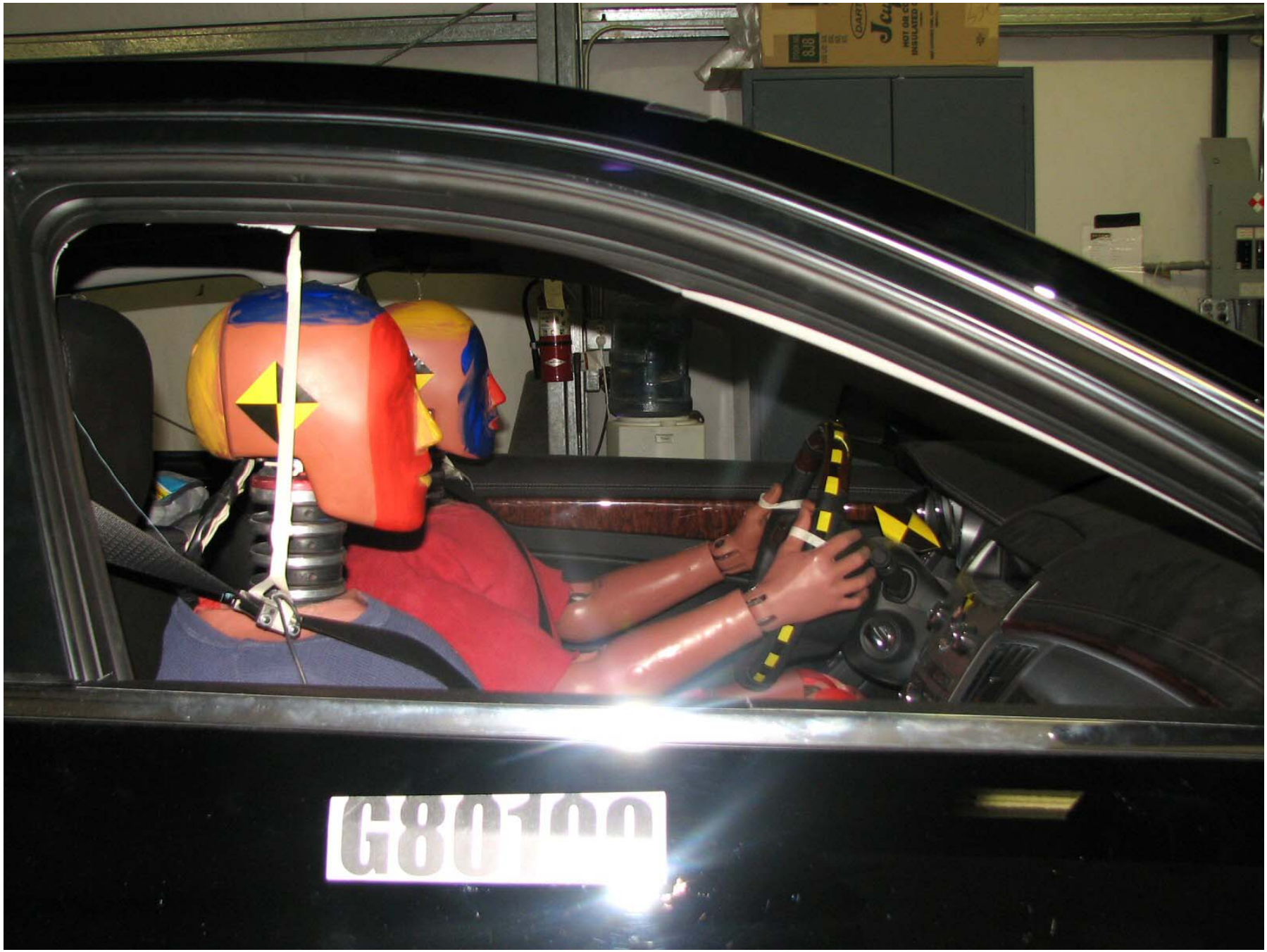


Figure A-46: Pre-Test Passenger Dummy (Through Window)

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)

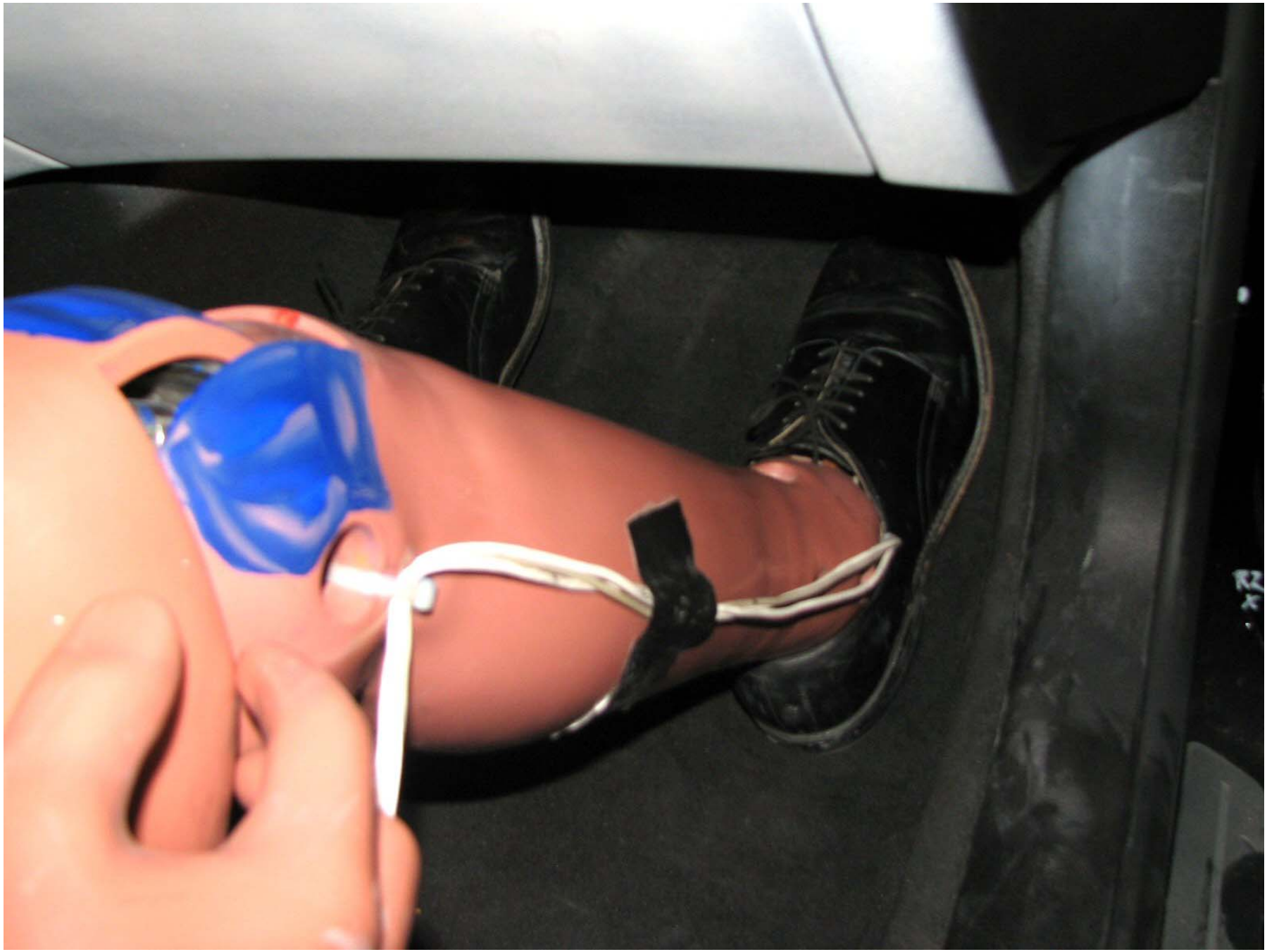


Figure A-50: Pre-Test Passenger Dummy Feet

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

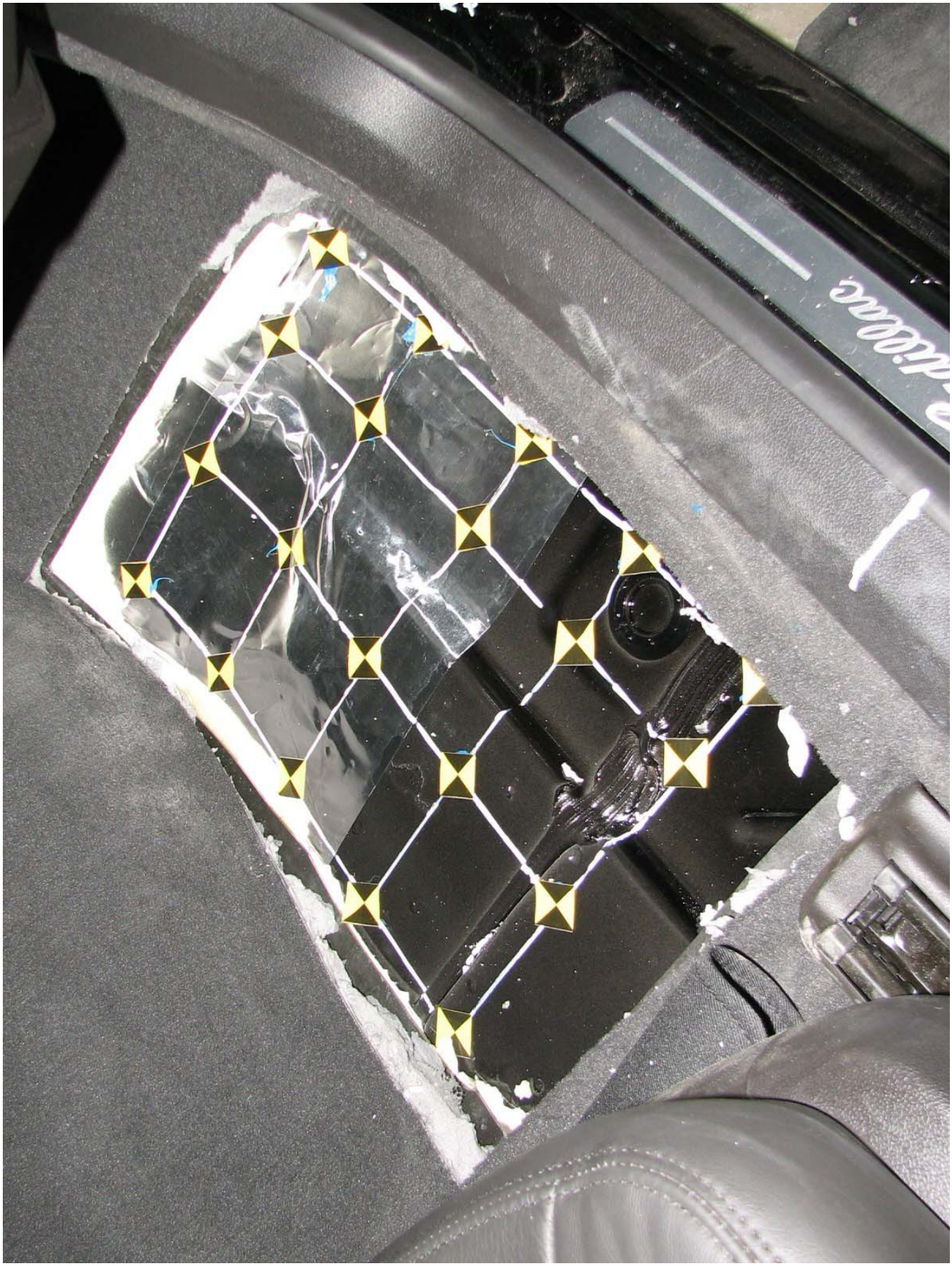


Figure A-54: Pre-Test Passenger Side Floor Pan

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

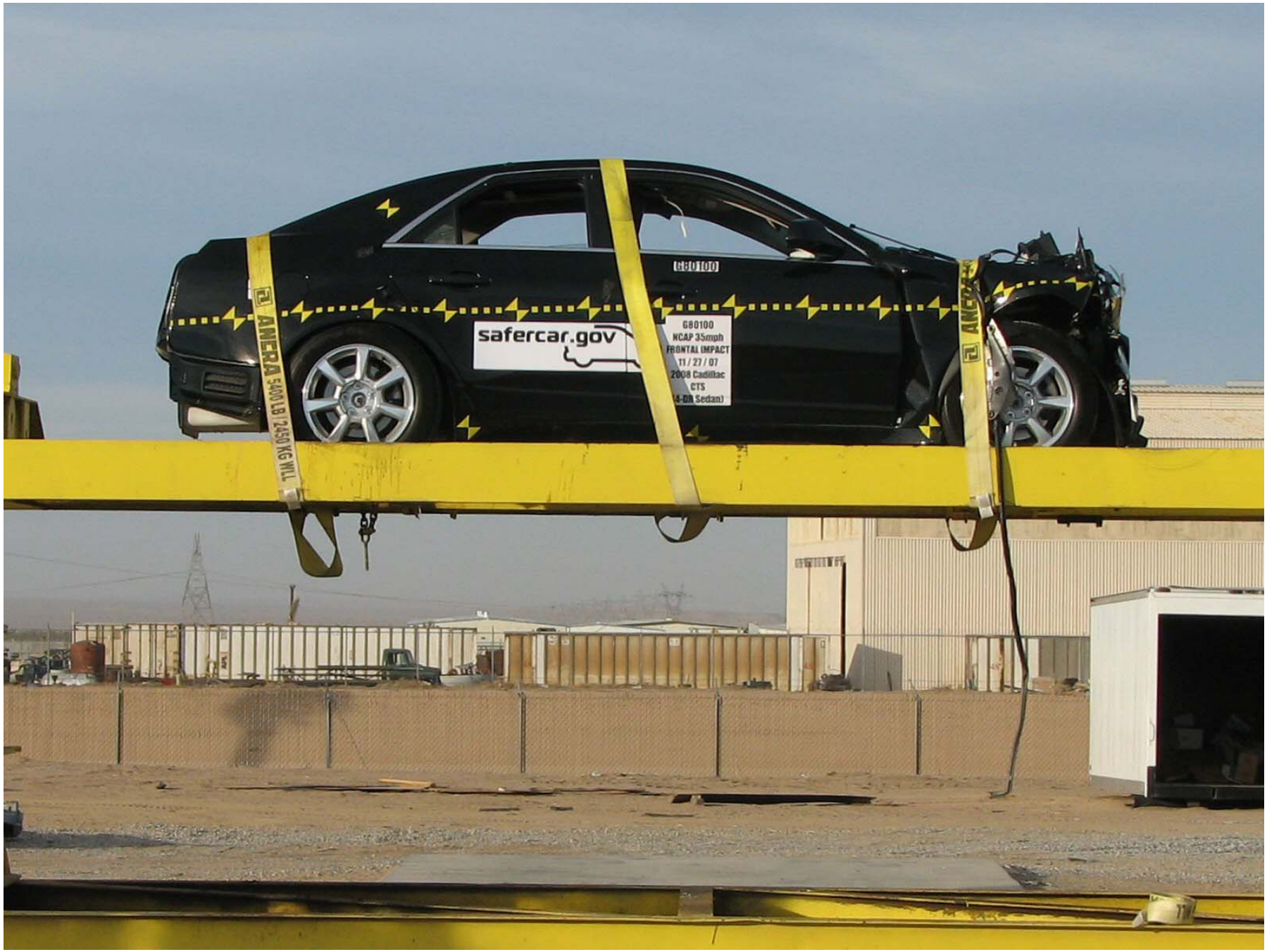


Figure A-58: Vehicle on Rollover Device (0°)

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

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

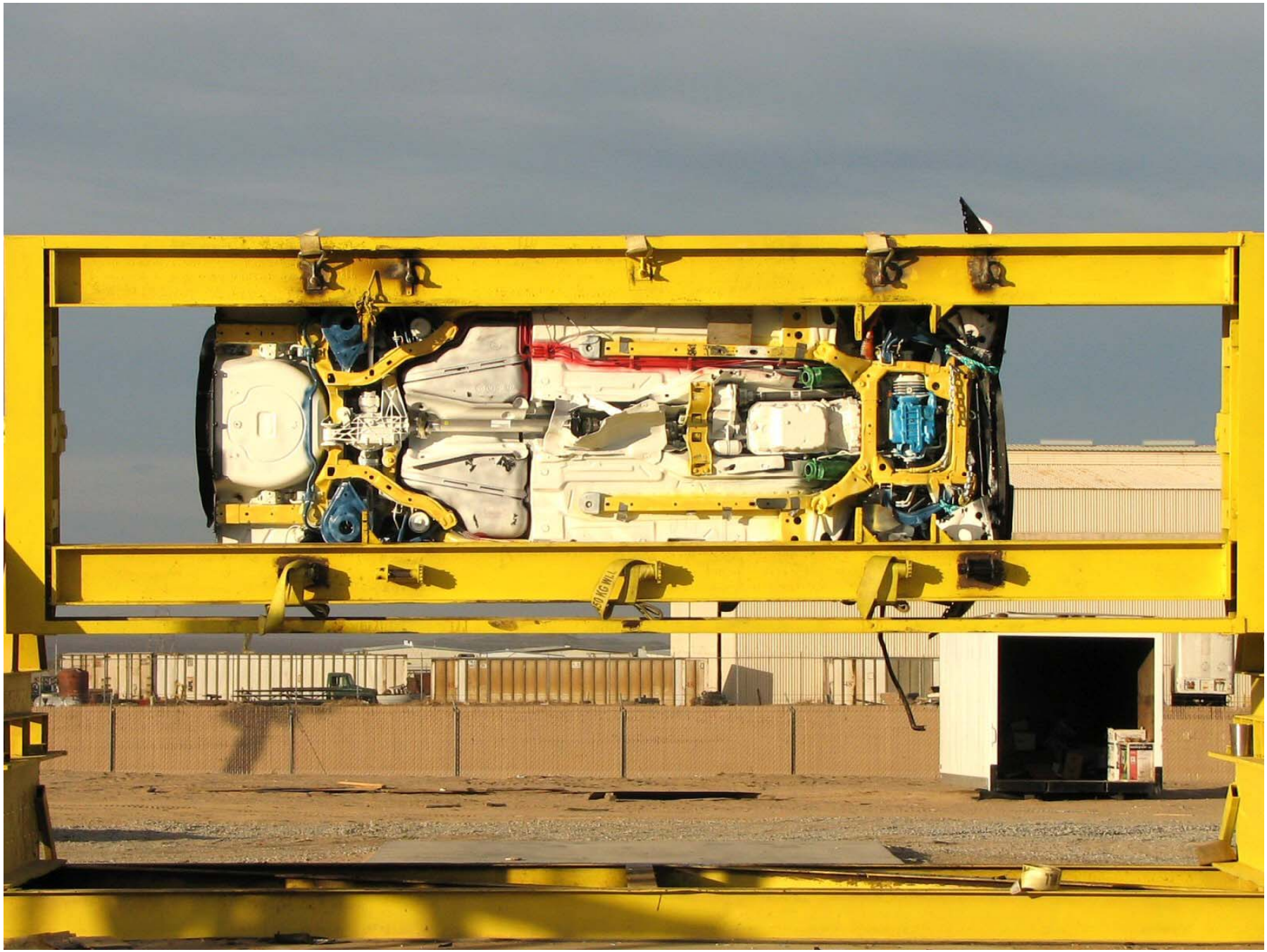


Figure A-61: Vehicle on Rollover Device (270°)

Figure A-62: Vehicle Impact

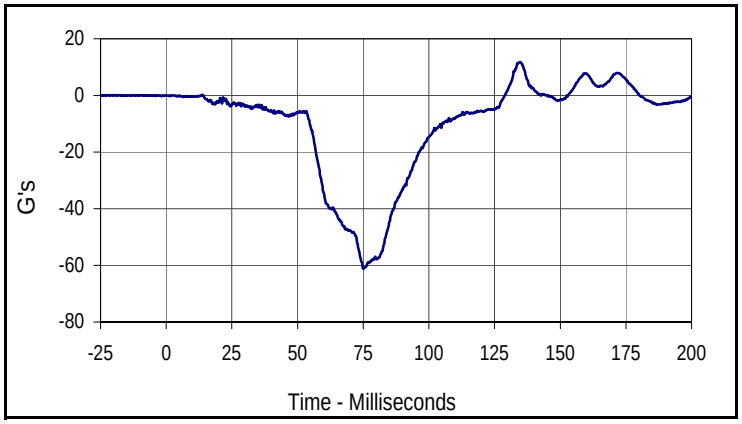
APPENDIX B
DATA PLOTS

LIST OF DATA PLOTS

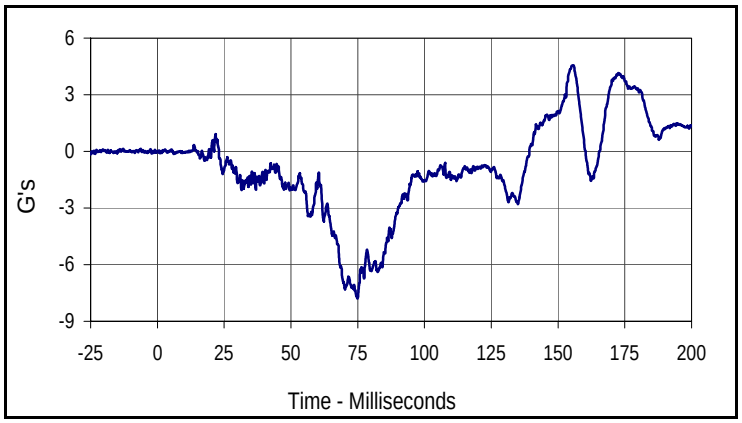
The following additional data plots for this test can be obtained from the research and development section of the NHTSA website. The website can be found at www.NHTSA.dot.gov.

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

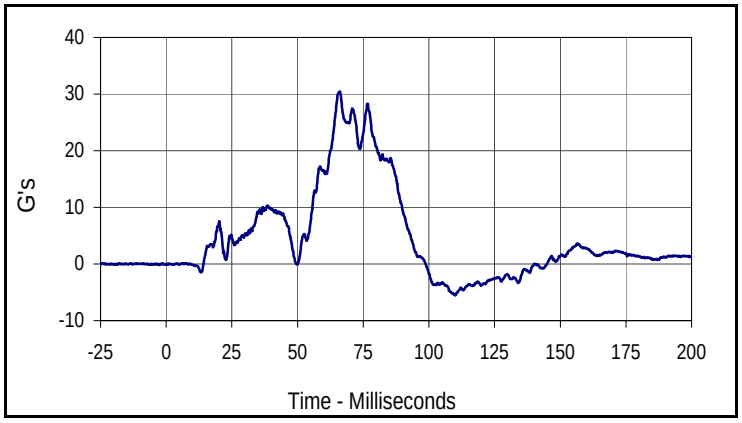
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100



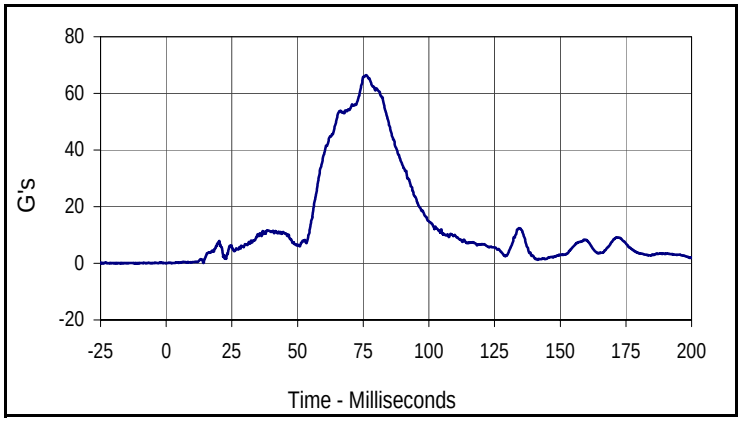
Curve Description			
Driver Head Primary X			
CURNO	Type	SAE Class	Units
001	FIL	1000	G's
Max	Time	Min	Time
11.7	134.8	-61.2	75.0



Curve Description			
Driver Head Primary Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
4.6	155.8	-7.8	74.9

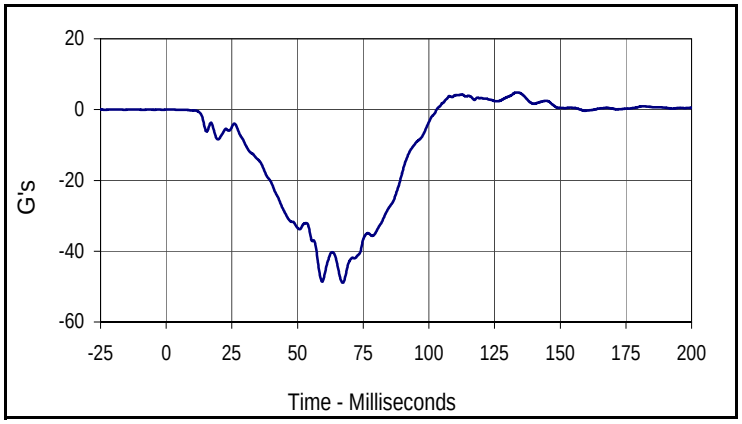


Curve Description			
Driver Head Primary Z			
CURNO	Type	SAE Class	Units
003	FIL	1000	G's
Max	Time	Min	Time
30.5	66.1	-5.6	110.0

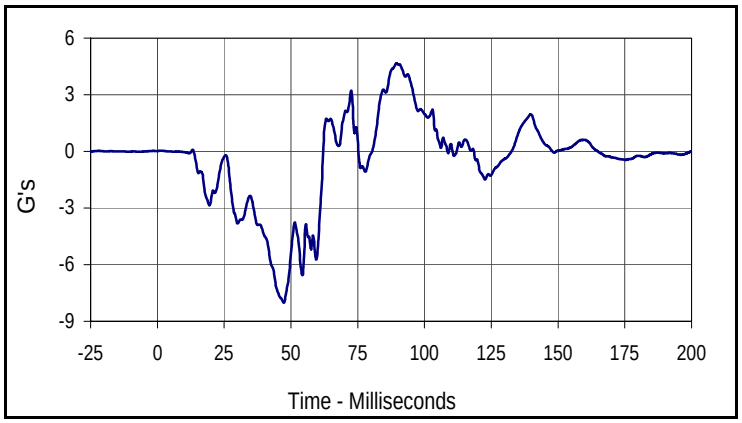


Curve Description			
Driver Head Resultant Primary			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
66.5	76.1	0.0	0.0

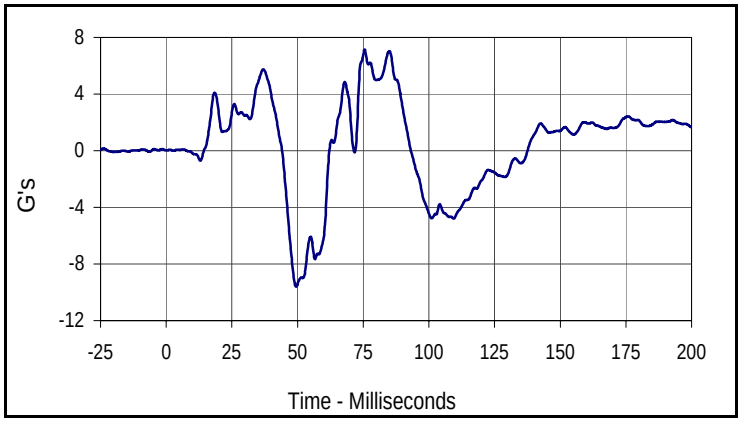
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100



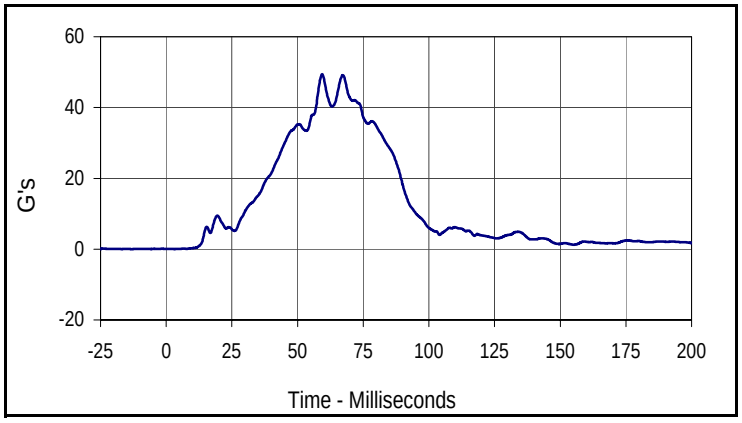
Curve Description			
Driver Chest Primary X			
CURNO	Type	SAE Class	Units
004	FIL	180	G's
Max	Time	Min	Time
4.8	133.2	-48.9	67.2



Curve Description			
Driver Chest Primary Y			
CURNO	Type	SAE Class	Units
005	FIL	180	G's
Max	Time	Min	Time
4.7	89.6	-8.0	47.3

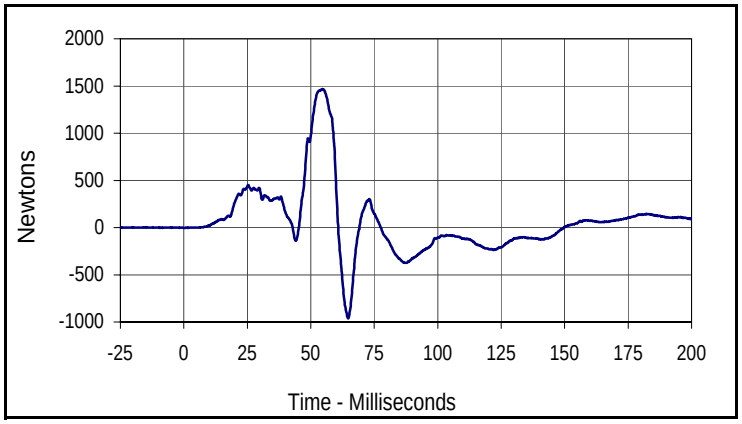


Curve Description			
Driver Chest Primary Z			
CURNO	Type	SAE Class	Units
006	FIL	180	G's
Max	Time	Min	Time
7.1	75.5	-9.6	49.4

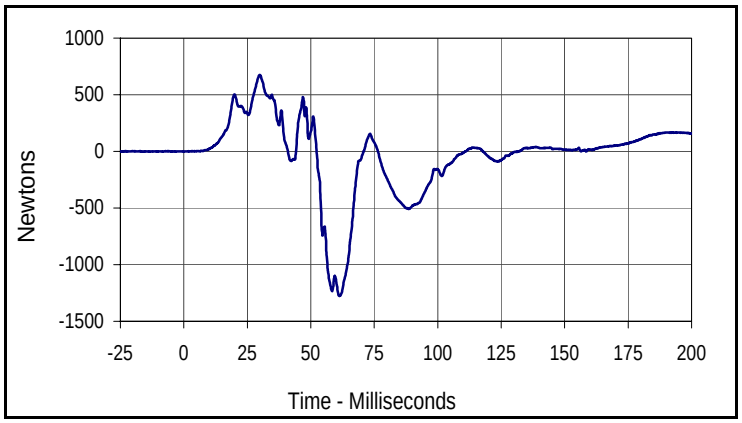


Curve Description			
Driver Chest Resultant Primary			
CURNO	Type	SAE Class	Units
004	RES	180	G's
Max	Time	Min	Time
49.4	59.4	0.0	3.2

Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100

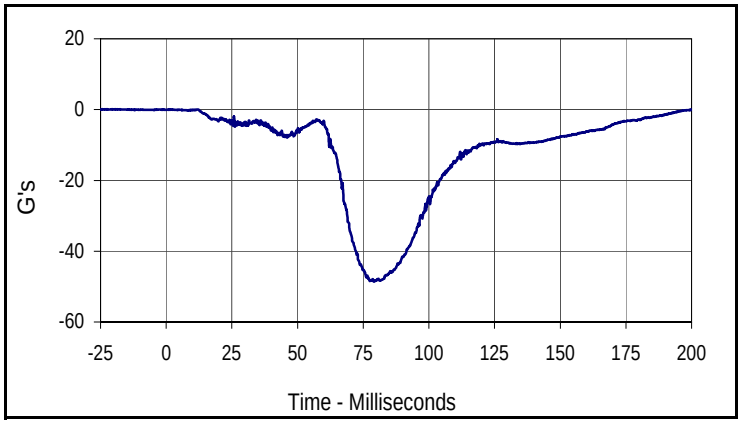


Curve Description			
Driver Left Femur Force Z			
CURNO	Type	SAE Class	Units
007	FIL	600	Newtons
Max	Time	Min	Time
1466.6	54.7	-964.4	64.7

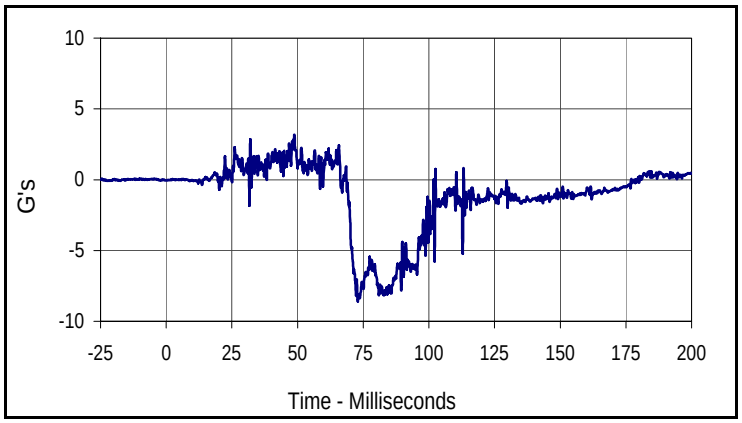


Curve Description			
Driver Right Femur Force Z			
CURNO	Type	SAE Class	Units
008	FIL	600	Newtons
Max	Time	Min	Time
675.2	29.9	-1275.7	61.2

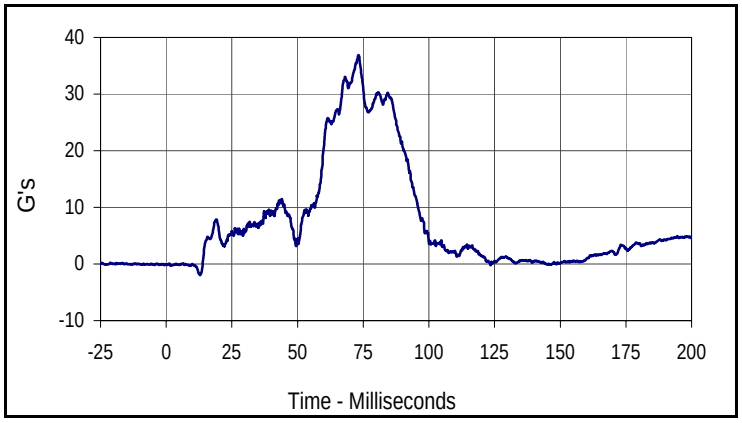
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100



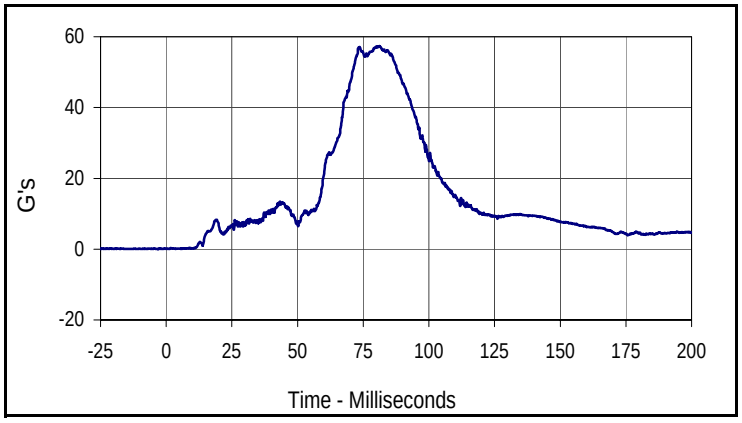
Curve Description			
Passenger Head Primary X			
CURNO	Type	SAE Class	Units
009	FIL	1000	G's
Max	Time	Min	Time
0.1	11.9	-48.6	79.1



Curve Description			
Passenger Head Primary Y			
CURNO	Type	SAE Class	Units
010	FIL	1000	G's
Max	Time	Min	Time
3.2	48.8	-8.6	72.9

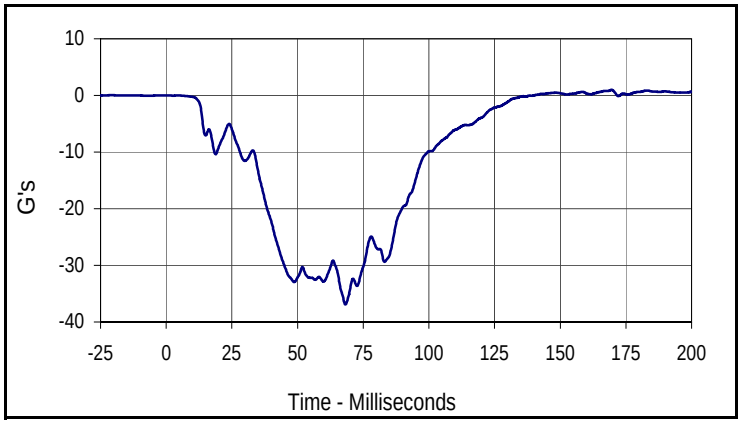


Curve Description			
Passenger Head Primary Z			
CURNO	Type	SAE Class	Units
011	FIL	1000	G's
Max	Time	Min	Time
36.9	73.2	-2.0	12.9

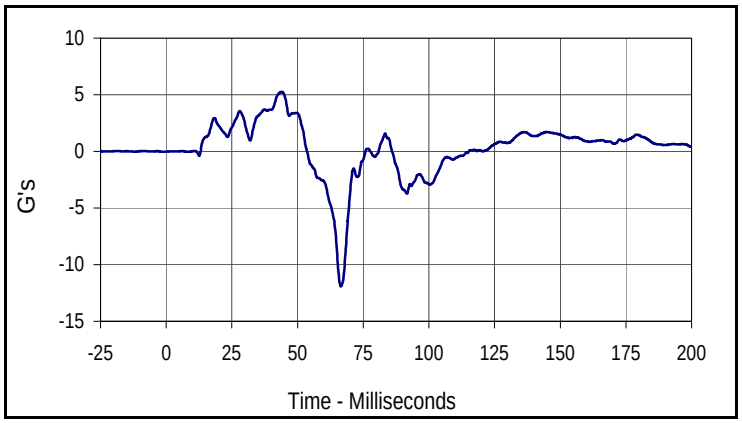


Curve Description			
Passenger Head Resultant Primary			
CURNO	Type	SAE Class	Units
009	RES	1000	G's
Max	Time	Min	Time
57.4	81.1	0.0	1.4

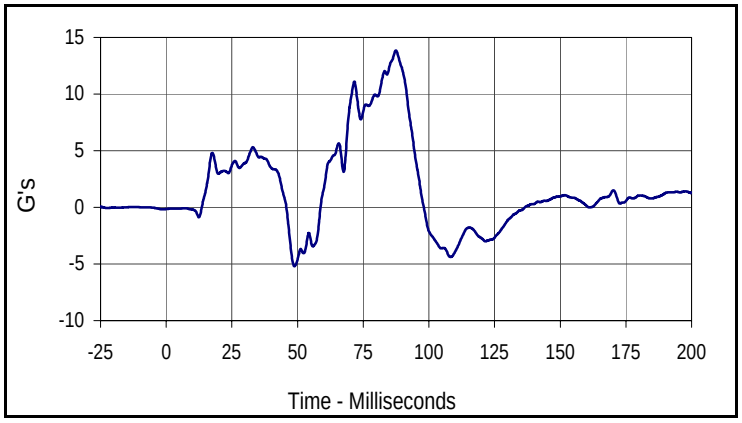
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100



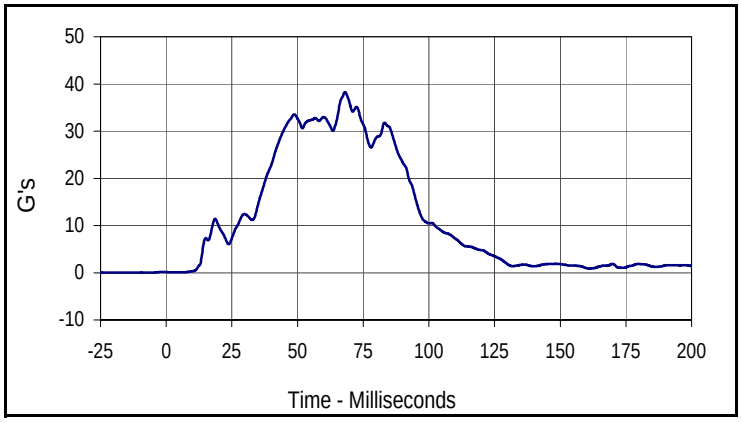
Curve Description			
Passenger Chest Primary X			
CURNO	Type	SAE Class	Units
012	FIL	180	G's
Max	Time	Min	Time
1.0	169.6	-36.9	68.2



Curve Description			
Passenger Chest Primary Y			
CURNO	Type	SAE Class	Units
013	FIL	180	G's
Max	Time	Min	Time
5.3	44.0	-11.9	66.5

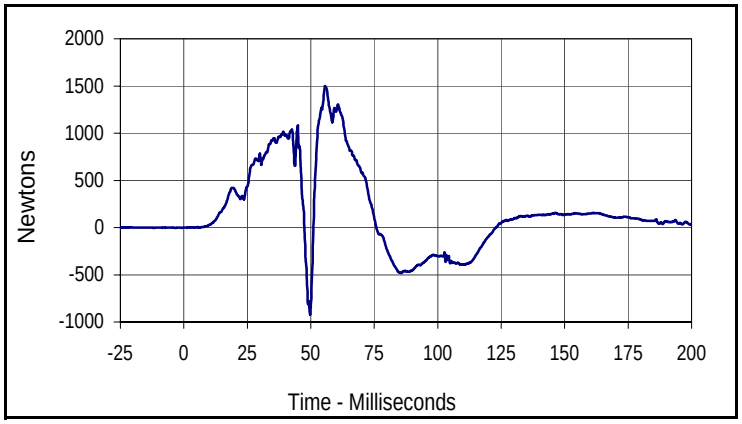


Curve Description			
Passenger Chest Primary Z			
CURNO	Type	SAE Class	Units
014	FIL	180	G's
Max	Time	Min	Time
13.8	87.4	-5.2	48.8

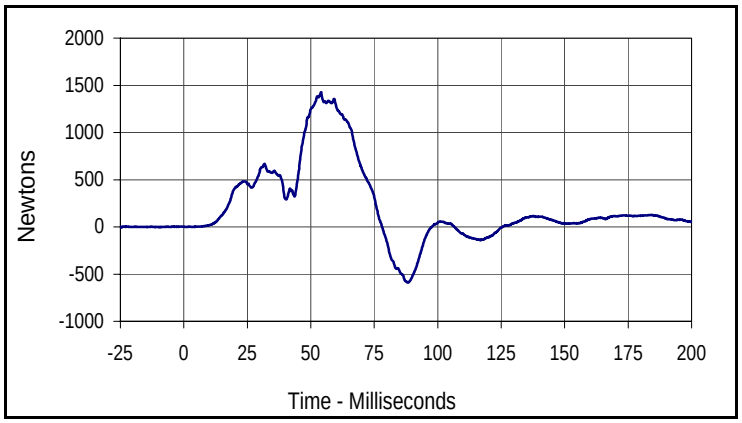


Curve Description			
Passenger Chest Resultant Primary			
CURNO	Type	SAE Class	Units
012	RES	180	G's
Max	Time	Min	Time
38.3	68.0	0.1	3.5

Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100



Curve Description			
Passenger Left Femur Force Z			
CURNO	Type	SAE Class	Units
015	FIL	600	Newtons
Max	Time	Min	Time
1497.4	55.6	-923.1	49.7



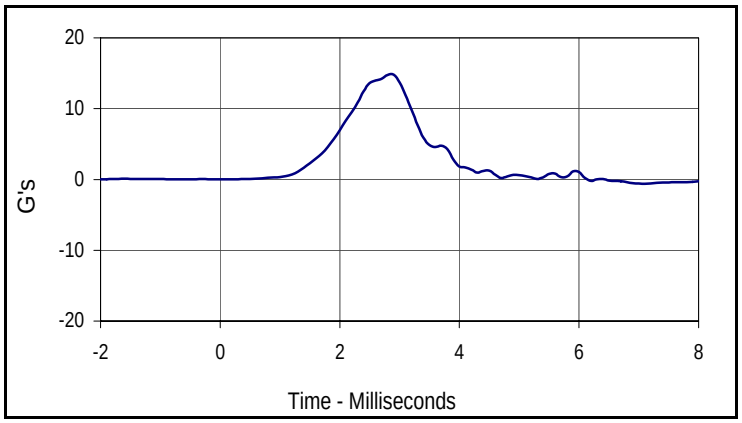
Curve Description			
Passenger Right Femur Force Z			
CURNO	Type	SAE Class	Units
016	FIL	600	Newtons
Max	Time	Min	Time
1427.4	54.0	-589.8	88.4

APPENDIX C
DUMMY CALIBRATION DATA

Test Program:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	11/16/07
ATD Serial No.:	034	Test I.D.:	HD11B

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	232.0	Pass
Peak Lateral Acceleration	G's	≤15.0	14.8	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

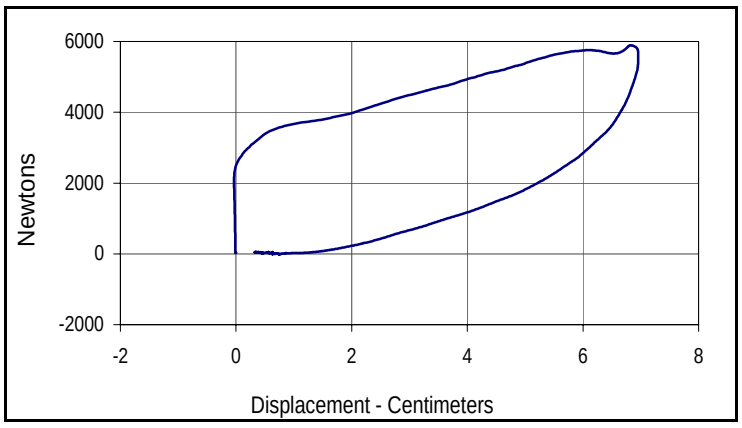
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
232.0	2.7	0.0	0.0



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
14.8	2.9	0.0	0.0

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	11/16/07
ATD Serial No.:	034	Test I.D.:	CH11B

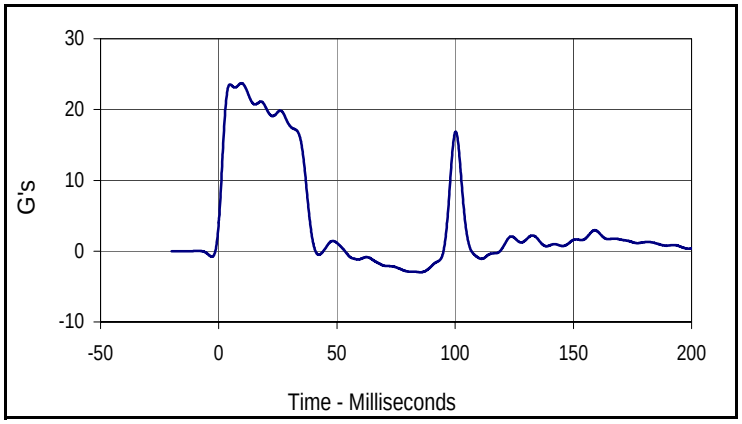
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.63	Pass
Peak Probe Force	Newtons	5159 to 5893	5891	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.96	Pass
Internal Hysterysis	%	69 to 85	72.7	Pass
		Overall Test Results		Pass



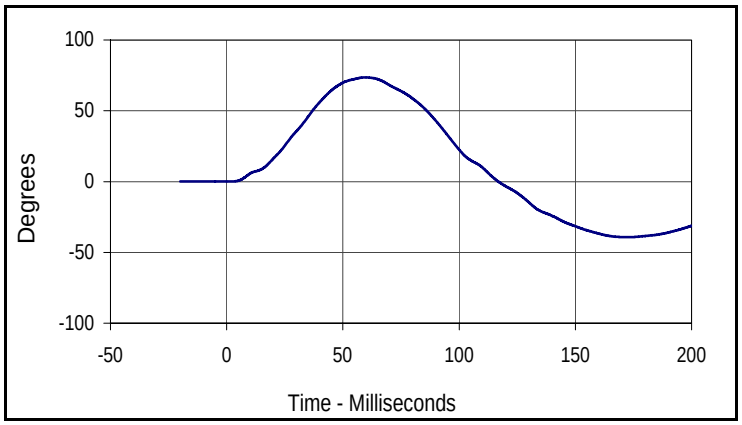
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	72.7
Peak Probe Force		Peak Chest Deflection	
5891		6.96	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	11/14/07
ATD Serial No.:	034	Test I.D.:	NF11B

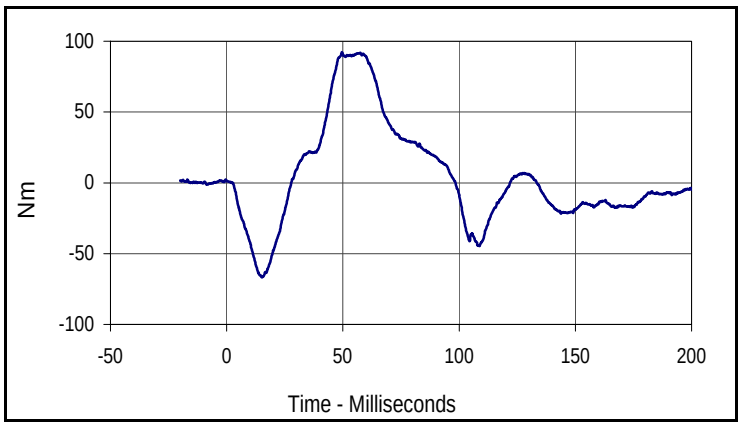
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.90	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	23.7	Pass
	20 Msec.	G's	17.6 to 22.6	20.2	Pass
	30 Msec.	G's	12.5 to 18.5	17.7	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.7	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	38.3	Pass
Maximum "D" Plane Rotation	Max	Degrees	64.0 to 78.0	73.6	Pass
	Time	Msec.	57.0 to 64.0	59.5	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	116.9	Pass
Moment About Occ. Condyle	Max	Nm	84.1 to 108.5	92.2	Pass
	Time	Msec.	47.0 to 58.0	49.6	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	98.5	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
23.7	9.6	-3.0	85.3



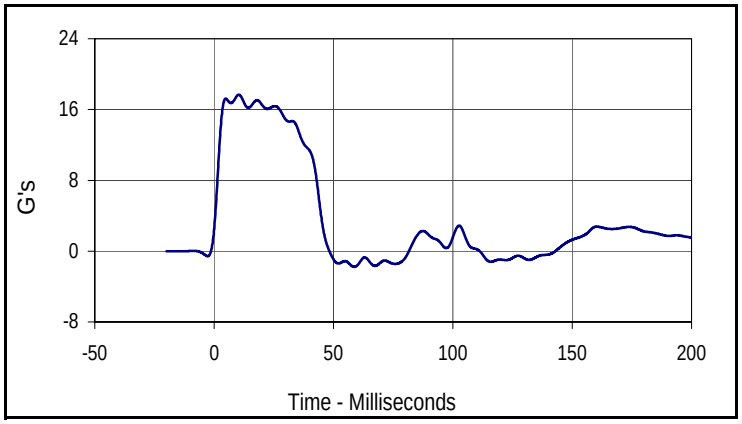
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
73.6	59.5	-39.3	172.4



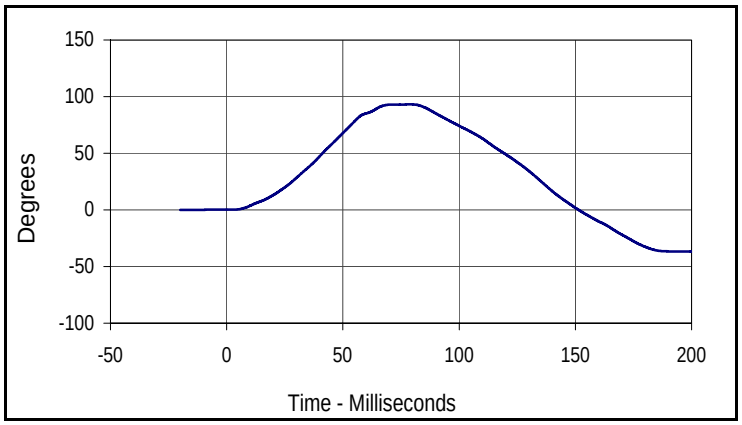
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
92.2	49.6	-66.8	15.1

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	11/16/07
ATD Serial No.:	034	Test I.D.:	NE11B

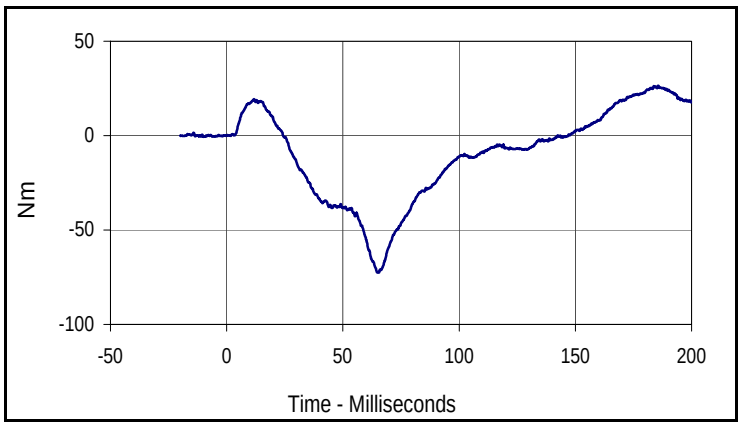
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.04	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.7	Pass
	20 Msec.	G's	14.0 to 19.0	16.6	Pass
	30 Msec.	G's	11.0 to 16.0	14.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	14.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	44.4	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	93.1	Pass
	Time	Msec.	72.0 to 82.0	79.4	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	151.4	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-72.6	Pass
	Time	Msec.	65.0 to 79.0	65.4	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	146.9	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
17.7	10.3	-1.8	58.7



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
93.1	79.4	-36.8	200.0



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
26.5	185.7	-72.6	65.4

Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	11/16/07
ATD Serial No.:	034	Test I.D.:	LK11B , RK11B

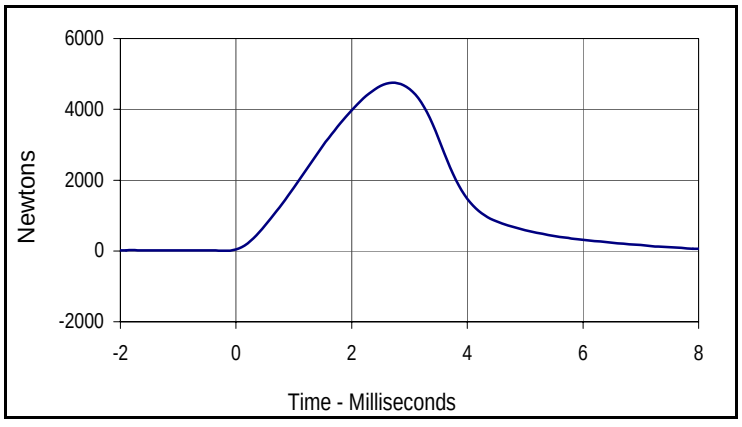
Left Knee

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	5679	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	4749	Pass
		Overall Test Results		Pass

Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5678.6	2.5	-4.4	10.0



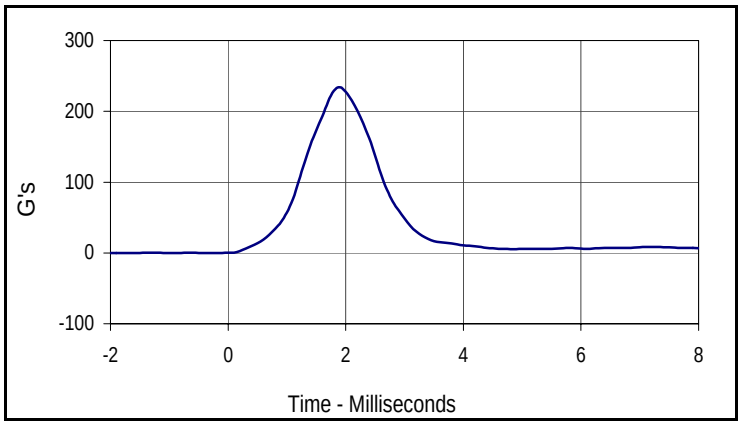
Curve Description			
Right Knee Probe Force			
CURNO	Type	SAE Class	Units
002	FIL	600	Newtons
Max	Time	Min	Time
4748.6	2.7	-2.3	9.7

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	11/16/07
ATD Serial No.:	034	Test I.D.:	N/A

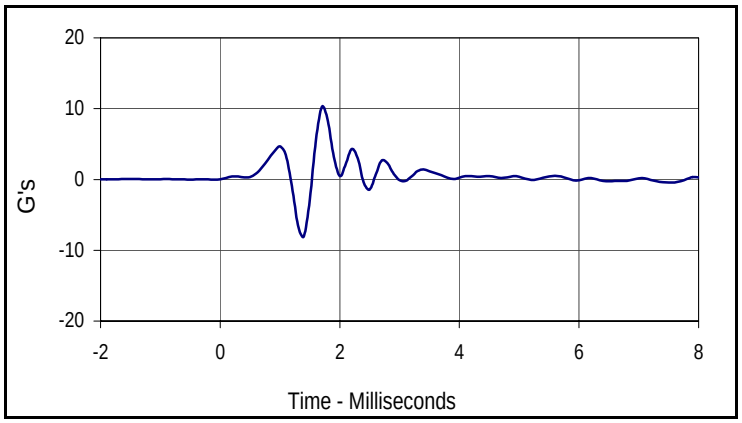
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	879 to 889	883	Pass
B - Shoulder pivot height	mm	505 to 521	515	Pass
C - "H" point height	mm	84 to 89	86	Pass
D - "H" point from seat back	mm	135 to 140	137	Pass
E - Shoulder pivot from back	mm	84 to 94	90	Pass
F - Thigh clearance	mm	140 to 155	152	Pass
G - Elbow back to wrist pivot	mm	290 to 305	302	Pass
H - Skull cap to back line	mm	41 to 46	43	Pass
I - Shoulder to elbow length	mm	330 to 345	337	Pass
J - Elbow rest height	mm	190 to 211	204	Pass
K - Buttock to knee length	mm	579 to 604	596	Pass
L - Poplipteal length	mm	429 to 455	447	Pass
M - Knee pivot height	mm	485 to 500	493	Pass
N - Buttock poplipteal length	mm	452 to 477	474	Pass
O - Chest depth	mm	213 to 229	220	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	105	Pass
Y - Chest circumference	mm	970 to 1001	996	Pass
Z - Waist circumference	mm	836 to 866	861	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:	Hybrid III 50th Percentile Male Head Drop Test	Test Date:	11/16/07
ATD Serial No.:	035	Test I.D.:	HD11A

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	233.9	Pass
Peak Lateral Acceleration	G's	≤15.0	10.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass



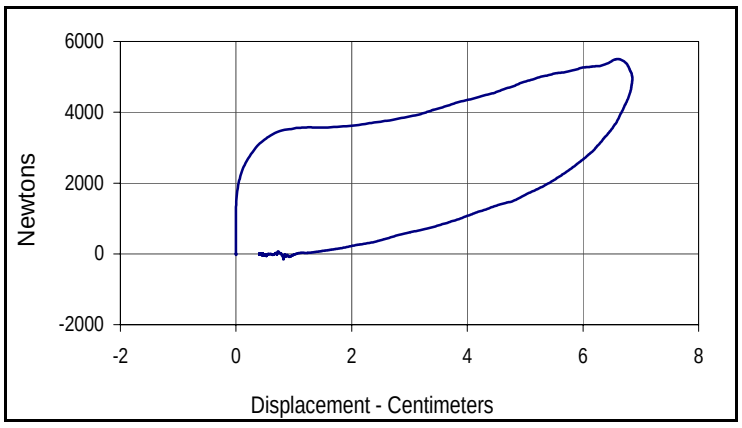
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
233.9	1.9	0.0	-0.2



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
10.3	1.7	-8.1	1.4

Test Program:	Hybrid III 50th Percentile Male Thorax Impact Test	Test Date:	11/16/07
ATD Serial No.:	035	Test I.D.:	CH11A

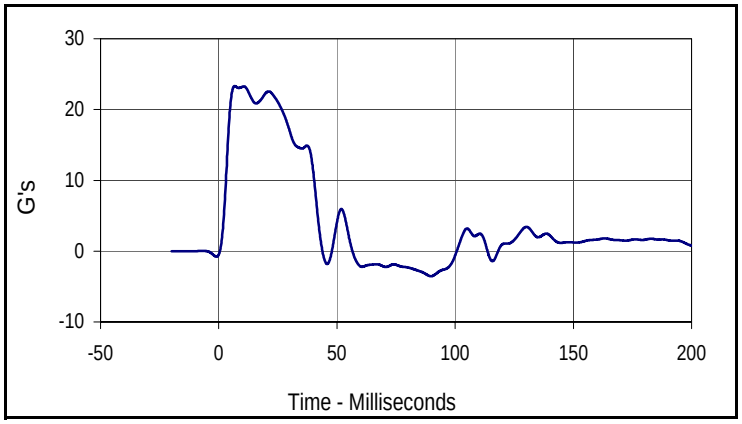
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	6.58 to 6.82	6.62	Pass
Peak Probe Force	Newtons	5159 to 5893	5503	Pass
Peak Sternum Deflection	CM	6.35 to 7.26	6.85	Pass
Internal Hysterysis	%	69 to 85	73.0	Pass
		Overall Test Results		Pass



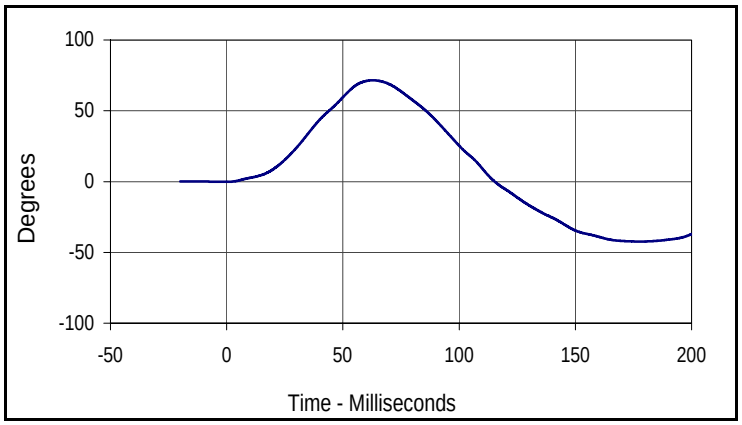
Curve Description			
Probe Force vs. Chest Deflection			
CURNO	Type	SAE Class	Hysterysis
001	FIL	180	73.0
Peak Probe Force		Peak Chest Deflection	
5503		6.85	

Test Program:	Hybrid III 50th Percentile Male Neck Flexion Test	Test Date:	11/13/07
ATD Serial No.:	035	Test I.D.:	NF11A

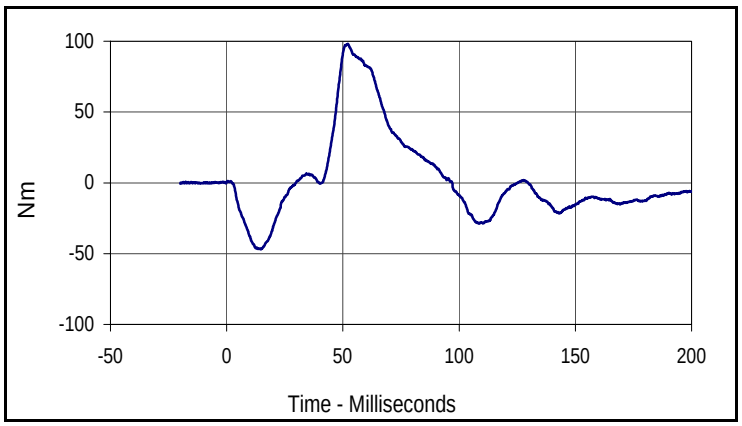
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.92	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	23.2	Pass
	20 Msec.	G's	17.6 to 22.6	22.4	Pass
	30 Msec.	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



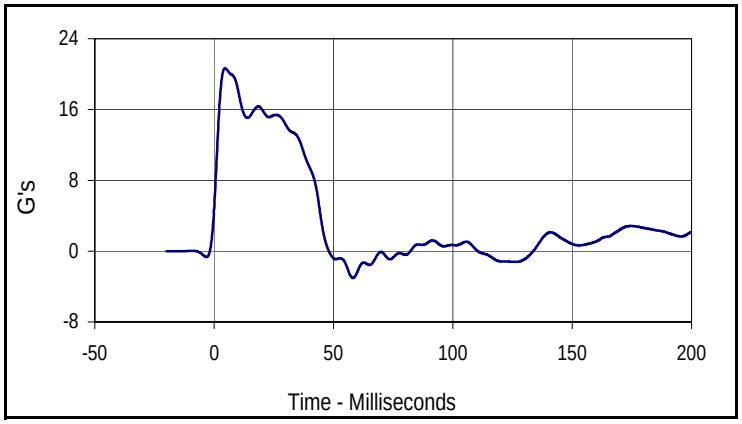
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
71.6	62.8	-42.3	178.6



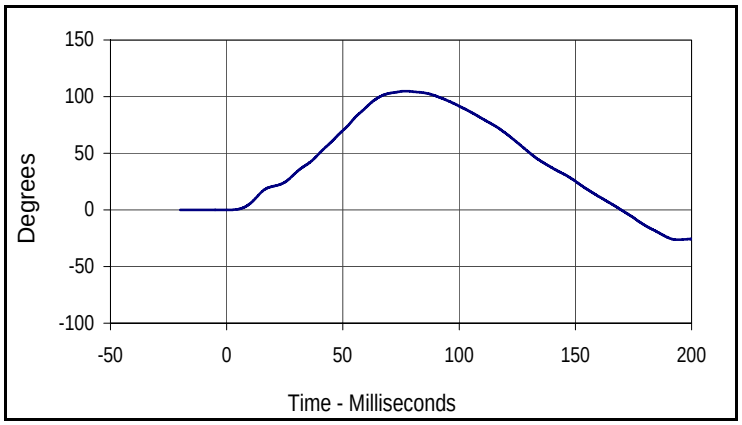
Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
98.1	52.1	-47.0	14.7

Test Program:	Hybrid III 50th Percentile Male Neck Extension Test	Test Date:	11/14/07
ATD Serial No.:	035	Test I.D.:	NE11A

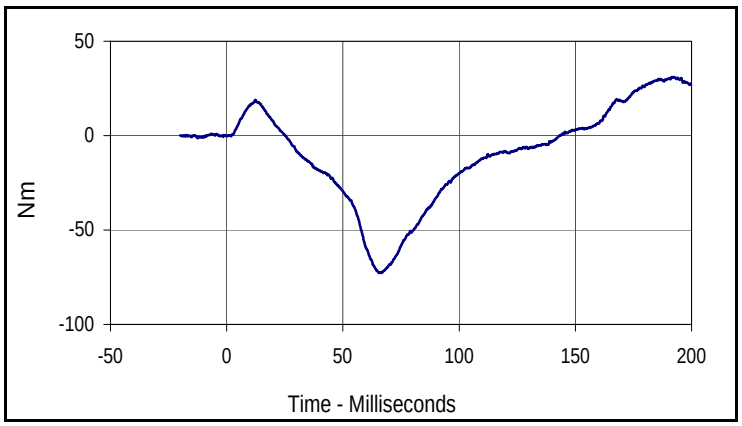
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.94 to 6.19	6.09	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	18.2	Pass
	20 Msec.	G's	14.0 to 19.0	16.0	Pass
	30 Msec.	G's	11.0 to 16.0	14.3	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	14.3	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	44.1	Pass
Maximum "D" Plane Rotation	Max	Degrees	81.0 to 106.0	104.9	Pass
	Time	Msec.	72.0 to 82.0	76.9	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	169.7	Pass
Moment About Occ. Condyle	Max	Nm	-52.9 to- 79.9	-72.7	Pass
	Time	Msec.	65.0 to 79.0	65.5	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	143.2	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Deceleration			
CURNO	Type	SAE Class	Units
001	FIL	60	G's
Max	Time	Min	Time
20.7	4.6	-3.0	58.1



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
104.9	76.9	-26.3	194.0



Curve Description			
Moment About Occipital Condyle			
CURNO	Type	SAE Class	Units
004	FIL	600	Nm
Max	Time	Min	Time
31.1	191.4	-72.7	65.5

Test Program:	Hybrid III 50th Percentile Male Knee Impact Test	Test Date:	11/16/07
ATD Serial No.:	035	Test I.D.:	LK11A , RK11A

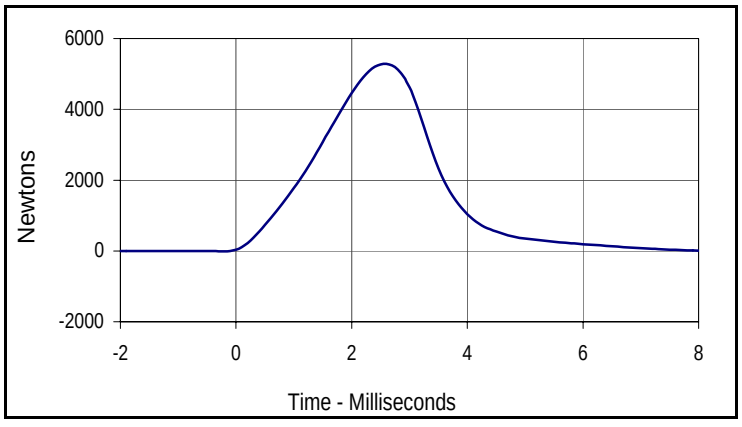
Left Knee

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	5577	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	5284	Pass
		Overall Test Results		Pass

Curve Description			
Left Knee Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	600	Newtons
Max	Time	Min	Time
5577.4	2.6	-15.3	-0.2



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

Test Program:	Hybrid III 50th Percentile Male External Measurements	Test Date:	11/16/07
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	882	Pass
B - Shoulder pivot height	mm	505 to 521	516	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	301	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	206	Pass
K - Buttock to knee length	mm	579 to 604	595	Pass
L - Poplipteal length	mm	429 to 455	446	Pass
M - Knee pivot height	mm	485 to 500	492	Pass
N - Buttock poplipteal length	mm	452 to 477	475	Pass
O - Chest depth	mm	213 to 229	218	Pass
P - Foot length	mm	251 to 267	258	Pass
V - Shoulder breadth	mm	422 to 437	430	Pass
W - Foot breadth	mm	91 to 107	104	Pass
Y - Chest circumference	mm	970 to 1001	993	Pass
Z - Waist circumference	mm	836 to 866	857	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

APPENDIX D
CHILD RESTRAINT SYSTEM

REPORT NUMBER TR-P27210-01-NC

NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

GENERAL MOTORS CORP.
2008 CADILLAC CTS
4-DOOR SEDAN

NHTSA NUMBER: G80100

PREPARED BY:
KARCO ENGINEERING, LLC
9270 HOLLY ROAD
ADELANTO, CALIFORNIA 92301

NOVEMBER 27, 2007

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
RULEMAKING
OFFICE OF CRASHWORTHINESS STANDARDS
MAIL CODE: NVS-111
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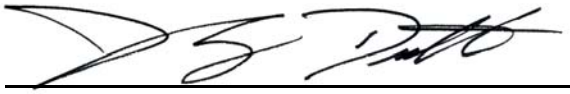
Prepared by:  Date: November 27, 2007

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FINAL REPORT ACCEPTED BY:

Manager, New Car Assessment Program

Date of Acceptance

COTR, NCAP Frontal Impact Program

Date of Acceptance

Technical Report Documentation Page

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TR-P27210-01-NC		

4. Title and Subtitle	5. Report Date
Final Report of one (1) Graco Snugride CRS Final Report of one (1) Combi Centre DX CRS NHTSA NO. G80100	11/27/2007 **6. Performing Organization Code** KAR
7. Authors Mr. Johnny H. Dutto, Project Engineer, Karco Mr. Frank Richardson, Program Manager, Karco	**8. Performing Organization Report No.** TR-P27210-01-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 NPS-111 400 Seventh Street, SW, Room 5311 Washington, D.C 20590	**13. Type of Report and Period Covered** Final Test Report Base Year **14. Sponsoring Agency Code** DOT/NHTSA/NRM/OCS

15. Supplementary Notes

16. Abstract

A frontal impact test was conducted on one (1) Graco Snugride CRS and one (1) Combi Centre DX CRS in conjunction with frontal barrier impact NCAP testing on a 2008 Cadillac CTS 4-Door Sedan and in accordance with the specifications of the Office of Crashworthiness Standards Test Procedure for the determination of CRS crashworthiness. This test was conducted at Karco Engineering, LLC on November 27, 2007.

Measurement Description	Units	Threshold	Left Rear (P4)	Right Rear (P3)
Head Injury Criteria (HIC15)	N/A	390	1285.3	No Data*
3 msec. Chest Clip	G's	50	57.3	49.3

17. Key Words	18. Distribution of Statement
New Car Assesment Program (Frontal NCAP) Frontal Barrier Impact Test Final Report of a Graco Snugride CRS Final Report of a Combi Centre DX CRS	Copies of this report available from: NHTSA Technical Reference Division National Highway Traffic Safety Admin 400 Seventh St., SW, Room 5108 Washington, D.C. 20590

19. Security Classification (this report)	20. Security Classification (this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	69	

Form DOT F1700.7 (8-72)

* Y Signal had a channel failure

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SECTION D1

PURPOSE AND SUMMARY OF TEST G80100

The purpose of this test is to obtain CRS performance data during 35 mph (56.3 km/h) frontal barrier impact NCAP test.

The frontal barrier impact NCAP test was conducted in accordance with the Office of Crashworthiness Standards (OCS) NCAP Laboratory Test Procedure.

SUMMARY

Two 12-month old CRABI's (P3 & P4) were instrumented with head, chest, and six-axis upper neck load cells. A tri-axial accelerometer was installed on the CRS and the CRS base.

The right rear (Serial No. 022) CRABI was calibrated prior to this test. The left rear (Serial No. 017) CRABI was calibrated prior to this test. CRABI calibration information is found in Section D-4.

CHILD DUMMY VALUES		
Location	HIC15 Values	3 Msec. Chest Clip
CRABI (P3)	No Data*	49.3
CRABI (P4)	1285.3	57.3

* Y Signal had a channel failure

DATA SHEET NO.1

CRASH TEST SUMMARY

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

CHILD RESTRAINT SYSTEM INFORMATION

Description	Position #3 CRS	Position #4 CRS
Manufacturer	Graco	Combi
Model Name	Snugride	Centre DX
Serial No.	8645THR3	927500
Type	Infant	Infant
Forward/Rearward	Rearward	Rearward

VISIBLE DUMMY CONTACT POINTS

Description	Position #3 CRS	Position #4 CRS
Head Contact	None	Upper and Lower Driver Seat back*
Chest Contact	None	Rear Seat
Abdomen Contact	None	Rear Seat
Left Knee Contact	None	Rear Seat and Seat back
Right Knee Contact	None	Rear Seat and Seat back
Left Toe Contact	None	Rear Seat and Seat back
Right Toe Contact	Rear Seat back	Rear Seat and Seat back

POST-TEST DOOR OPENINGS

Description	Position #3 CRS	Position #3 CRS
Right Rear Door	Remained closed and latched, opened w/o tools	Remained closed and latched, opened w/o tools

* P4 CRS became detached from CRS base during impact and contacted the driver seat

CAMERA COVERAGE

Description	Standard
High Speed	2
Real Time	0
Total	2

DATA CHANNELS

CRABI (P3 & P4) Sensors	26
Belt Sensors	4
CRS Sensors	12
Total	42

DATA SHEET NO.2

VEHICLE PARAMETER DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

TEST VEHICLE WEIGHTS

	Units	As Delivered Weights (UVW)			As Tested Weights (ATW)		
		Front Axle	Rear Axle	Total	Front Axle	Rear Axle	Total
Left	kg	510	450	960	534	534	1068
Right	kg	510	443	953	535	520	1055
Ratio	%	53.3%	46.7%	100.0%	50.4%	49.6%	100.0%
Totals	kg	1020	893	1913	1069	1054	2123

TARGET TEST WEIGHT CALCULATION

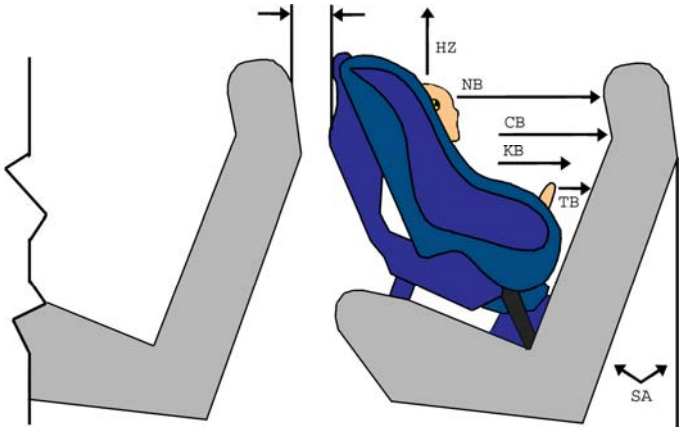
Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1913
Weight of 2 P572 ATD's	kg	152
Rated Cargo/Luggage Wt. (RCLW)	kg	64
Calculated Vehicle Target Wt. (TVTW)	kg	2129

DATA SHEET NO.3

CRABI POSITIONING IN VEHICLE

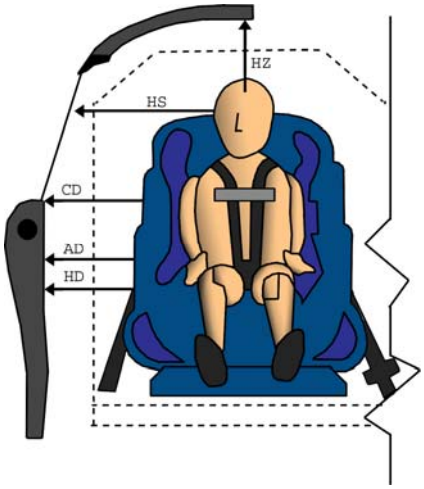
Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

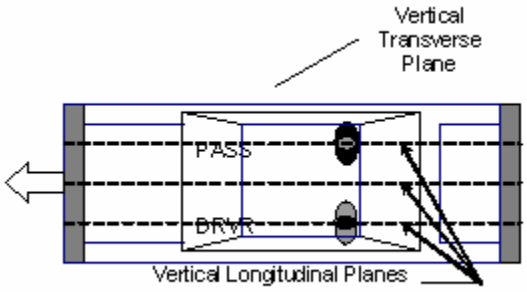
Test Program: NHTSA 35mph NCAP Test Date: 11/27/07



AD	Arm to Door
CD	Chest to Door
HD	H-Point to Door
HS	Head to Side Window
KK	Knee to Knee
TT	Toe to Toe

CB	Chest to Seat Back
HZ	Head to Roof
KB	Knee to Seat Back
NB	Nose to Seat Back
SA	Seat Back Angle
TB	Toe to Seat Back





DUMMY MEASUREMENTS FOR REAR SEAT OCCUPANTS

DATA SHEET NO.3

CRABI POSITIONING IN VEHICLE…(CONTINUED)

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

CRABI MEASUREMENTS

Code	Measurement	Units	CRABI (P4) Serial No. 017	CRABI (P3) Serial No. 022
SA	Seat Back Angle	deg.	25.0	25.0
HZ	Head to Roof (Z)	mm	350	341
CD	Chest to Door	mm	353	380
KK	Knee to Knee (Y)	mm	120	127
HS	Head to Side Window	mm	343	410
HD	H-Point to Door (Y)	mm	286	283
AD	Arm to Door	mm	223	227
NB	Nose to Seat Back	mm	513	565
CB	Chest to Seat Back	mm	463	485
FF	Foot to Foot	mm	90	66
KB-Left	Knee to Seat Back	mm	170	215
KB-Right	Knee to Seat Back	mm	165	217
TB-Left	Toe to Seat Back	mm	65	56
TB-Right	Toe to Seat Back	mm	60	55
CCA	Car Cushion Angle	deg.	9.5	11.5
BA	Back Angle	deg.	54.5	57.4
SCA	Seat Cushion Angle	deg.	40.4	37.1

DATA SHEET NO.4

CRS PERFORMANCE DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

CRS PERFORMANCE DATA

Location	CRS (P3)		CRS (P4)	
	Damage	Description	Damage	Description
Upper Tether Strap				
Upper Tether Buckle				
Upper Tether Hook				
Veh. Upper Tether Anchor				
Lower Anchor Strap				
Lower Anchor Buckle				
Lower Anchor Hooks	No		No	
Veh. Lower CRS Anchors	No		No	
5-Point Harness Connections	No		No	
Cracks on CRS	No		No	
Fabric Tears on CRS	No		No	
Vehicle Seat Structure	No		No	
Vehicle Seat Fabric Tears	No		No	

* P4 Child Seat became detached from the CRS base during impact and contacted the driver seat

DATA SHEET NO.5

CRS ACCELEROMETER LOCATIONS

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

Loc. No	Accelerometer Location	Measurements		
		X	Y	Z
1	CRS (P3)	1895	450	820
2	CRS Base (P3)	1800	490	680
3	CRS (P4)	1805	480	700
4	CRS Base (P4)	1640	535	610

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

DATA SHEET NO.6

CRS CAMERA LOCATIONS AND DATA

Test Vehicle: 2008 Cadillac CTS 4-Door Sedan NHTSA No.: G80100

Test Program: NHTSA 35mph NCAP Test Date: 11/27/07

CAMERA LOCATIONS

No.	Camera View	Location(mm)			Angle (Deg.)	Film Plane to Head	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Passenger Side Upper CRS View	-1791	590	-1341	-1	1043	10	1000
2	Driver Side Upper CRS View	1791	-589	-1341	-1	1043	10	1000

X = Barrier Face Y = Monorail Centerline Z = Ground DNR = Did Not Run NTM = No Time Marks

SECTION D2

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

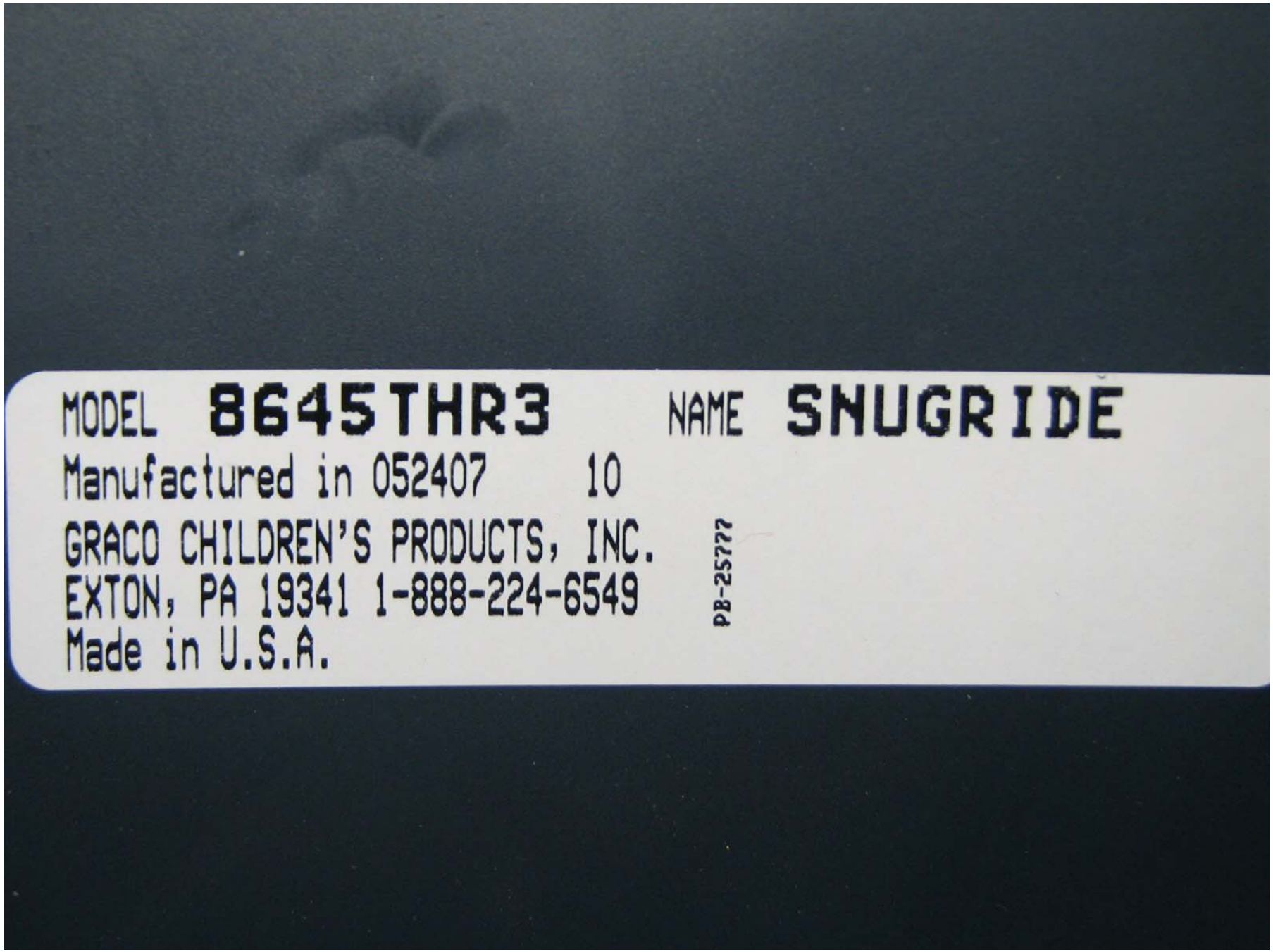


Figure D2-1: Position 3 CRS Label

Figure D2-2: Pre-Test Frontal View of Position 3 CRS

Figure D2-3: Post-Test Frontal View of Position 3 CRS

Figure D2-4: Pre-Test Rear View of Position 3 CRS

Figure D2-5: Post-Test Rear View of Position 3 CRS

Figure D2-6: Pre-Test Right Side View of Position 3 CRS

Figure D2-7: Post-Test Right Side View of Position 3 CRS

Figure D2-8: Pre-Test Left Side View of Position 3 CRS

Figure D2-9: Post-Test Left Side View of Position 3 CRS

Figure D2-10: Pre-Test Position 3 Front View (Head and Seat Belt Position)

Figure D2-11: Post-Test Position 3 Front View (Head and Seat Belt Position)

Figure D2-12: Pre-Test Position 3 Front View (Seat Belt Position)

Figure D2-13: Post-Test Position 3 Front View (Seat Belt Position)

Figure D2-14: Pre-Test Position 3 Right Side View

Figure D2-15: Post-Test Position 3 Right Side View

Figure D2-16: Pre-Test Position 3 Right Side View (Through Window)

Figure D2-17: Post-Test Position 3 Right Side View (Through Window)

Figure D2-18: Post-Test Position 3 Dummy Legs

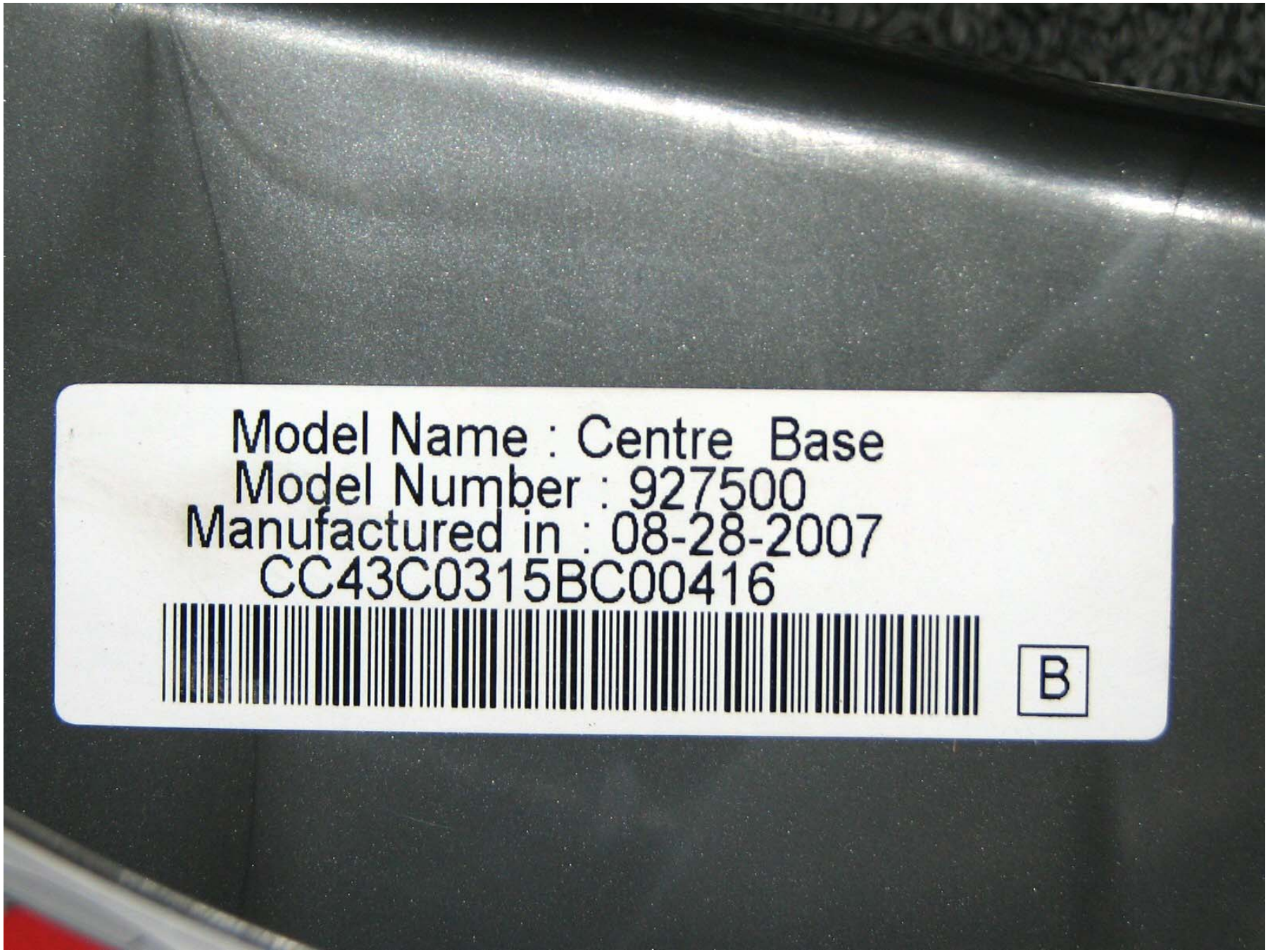


Figure D2-19: Position 4 CRS Label

Figure D2-20: Pre-Test Frontal View of Position 4 CRS

Figure D2-21: Post-Test Frontal View of Position 4 CRS

Figure D2-22: Pre-Test Rear View of Position 4 CRS

Figure D2-23: Post-Test Rear View of Position 4 CRS

Figure D2-24: Pre-Test Right Side View of Position 4 CRS

Figure D2-25: Post-Test Right Side View of Position 4 CRS

Figure D2-26: Pre-Test Left Side View of Position 4 CRS

Figure D2-27: Post-Test Left Side View of Position 4 CRS

Figure D2-28: Pre-Test Position 4 Front View (Head & Seat Belt Position)

Figure D2-29: Post-Test Position 4 Front View (Head & Seat Belt Position)

Figure D2-30: Pre-Test Position 4 Front View (Seat Belt Position)

Figure D2-31: Post-Test Position 4 Front View (Seat Belt Position)

Figure D2-32: Pre-Test Position 4 Left Side View

Figure D2-33: Post-Test Position 4 Left Side View

Figure D2-34: Pre-Test Position 4 Left Side View

Figure D2-35: Post-Test Position 4 Left Side View

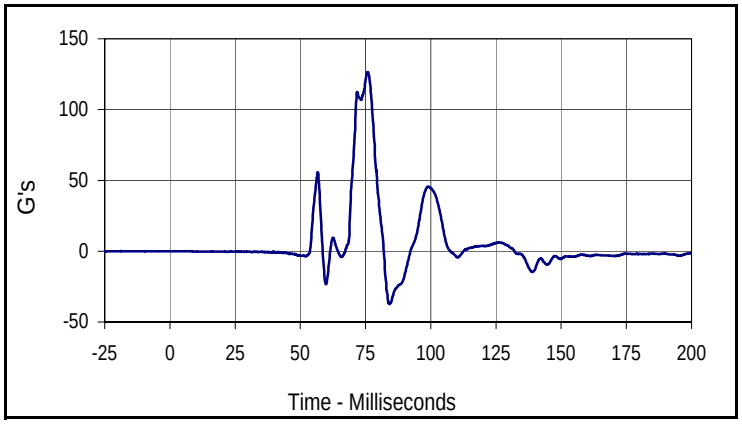
Figure D2-36: Post-Test Position 4 Dummy Legs

SECTION D3

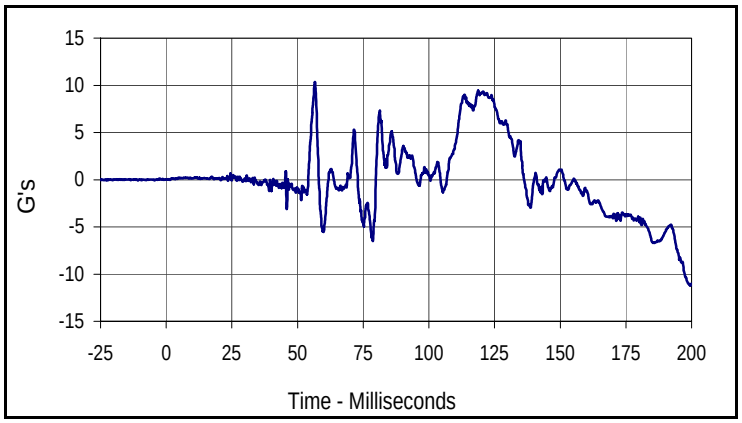
CRABI RESPONSE AND CRS DATA TRACES

LIST OF DATA PLOTS

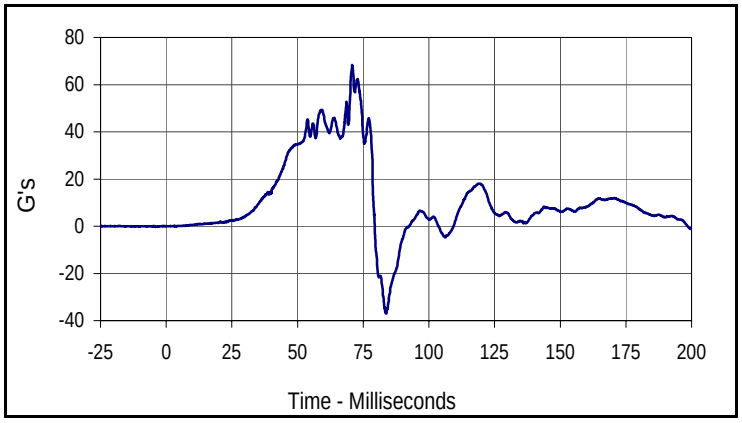
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100



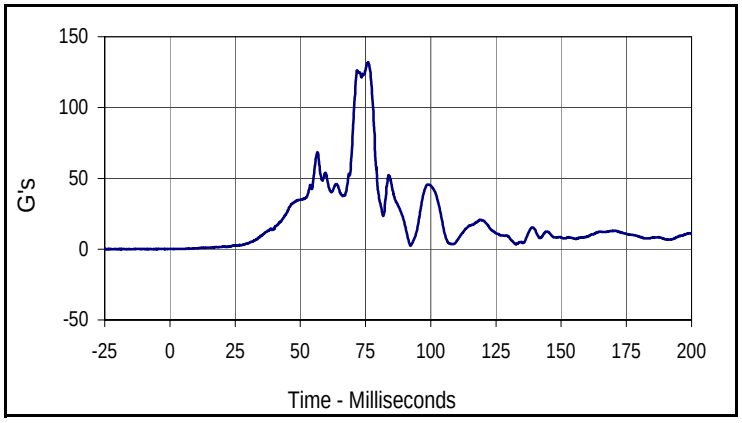
Curve Description			
CRABI Head X (P4)			
CURNO	Type	SAE Class	Units
142	FIL	1000	G's
Max	Time	Min	Time
126.5	76.0	-37.4	84.3



Curve Description			
CRABI Head Y (P4)			
CURNO	Type	SAE Class	Units
143	FIL	1000	G's
Max	Time	Min	Time
10.3	56.6	-11.2	199.5

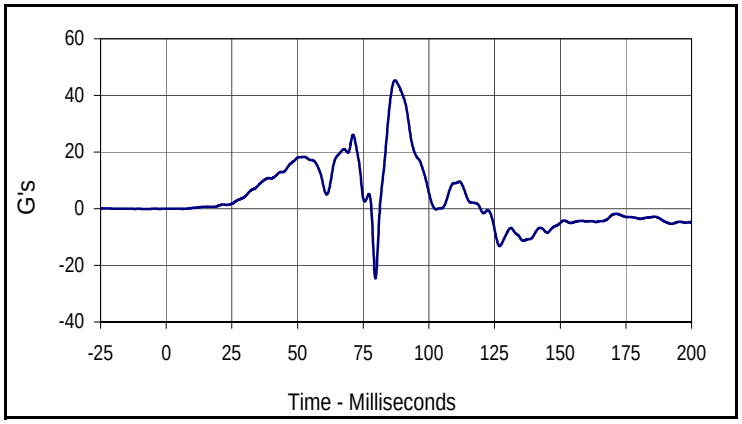


Curve Description			
CRABI Head Z (P4)			
CURNO	Type	SAE Class	Units
144	FIL	1000	G's
Max	Time	Min	Time
68.3	70.8	-37.0	83.8

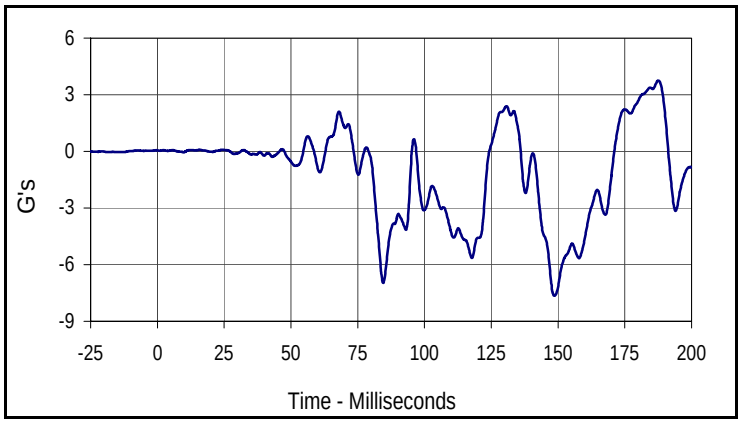


Curve Description			
CRABI Head Resultant (P4)			
CURNO	Type	SAE Class	Units
142	RES	1000	G's
Max	Time	Min	Time
132.1	76.0	0.0	1.5

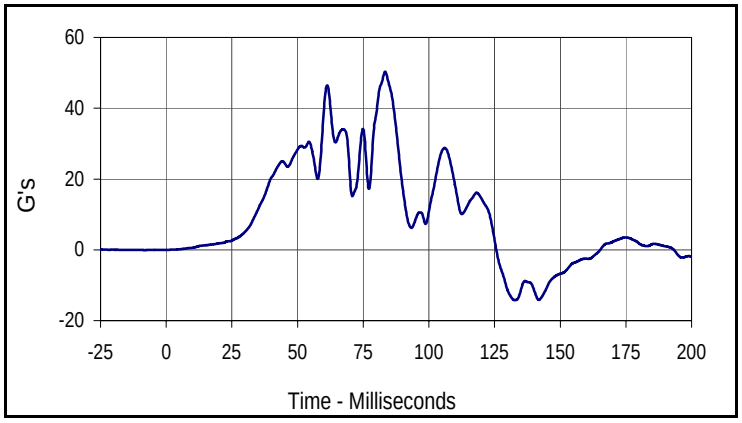
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100



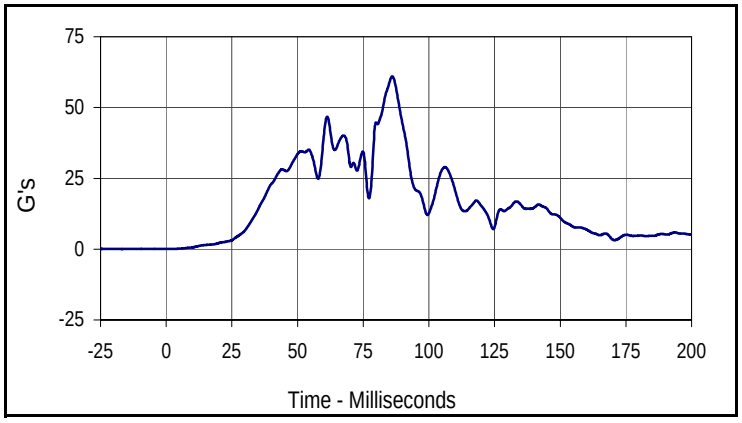
Curve Description			
CRABI Chest X (P4)			
CURNO	Type	SAE Class	Units
145	FIL	180	G's
Max	Time	Min	Time
45.4	87.1	-24.7	79.7



Curve Description			
CRABI Chest Y (P4)			
CURNO	Type	SAE Class	Units
146	FIL	180	G's
Max	Time	Min	Time
3.7	187.5	-7.7	148.6

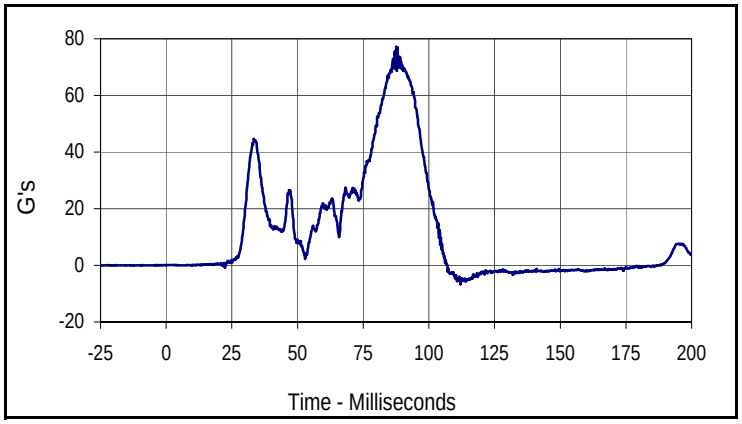


Curve Description			
CRABI Chest Z (P4)			
CURNO	Type	SAE Class	Units
147	FIL	180	G's
Max	Time	Min	Time
50.3	83.4	-14.2	132.7

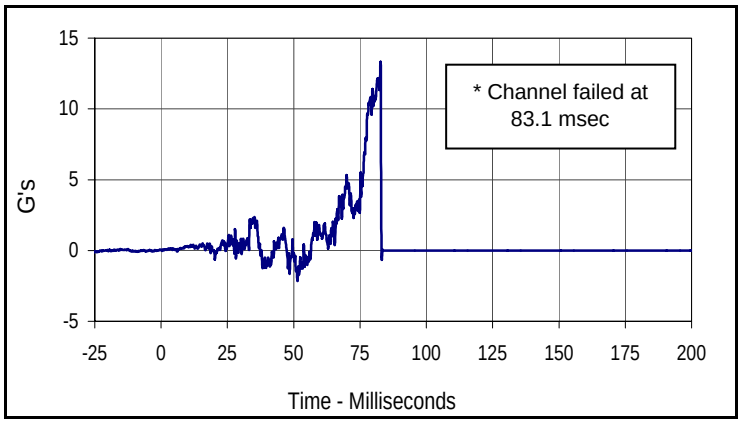


Curve Description			
CRABI Chest Resultant (P4)			
CURNO	Type	SAE Class	Units
145	RES	180	G's
Max	Time	Min	Time
61.0	86.1	0.0	1.0

Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100

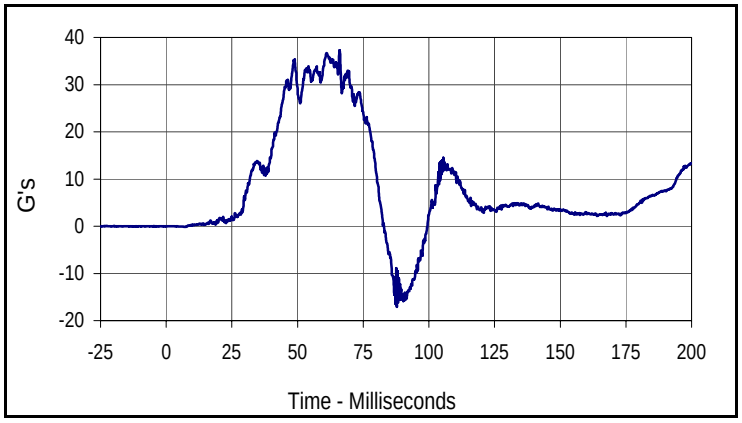


Curve Description			
CRABI Head X (P3)			
CURNO	Type	SAE Class	Units
163	FIL	1000	G's
Max	Time	Min	Time
77.1	87.5	-6.6	112.1



Curve Description			
CRABI Head Y (P3)			
CURNO	Type	SAE Class	Units
164	FIL	1000	G's
Max	Time	Min	Time
13.3	82.7	-2.2	51.5

* Channel Failed at 83.1 msec



Curve Description			
CRABI Head Z (P3)			
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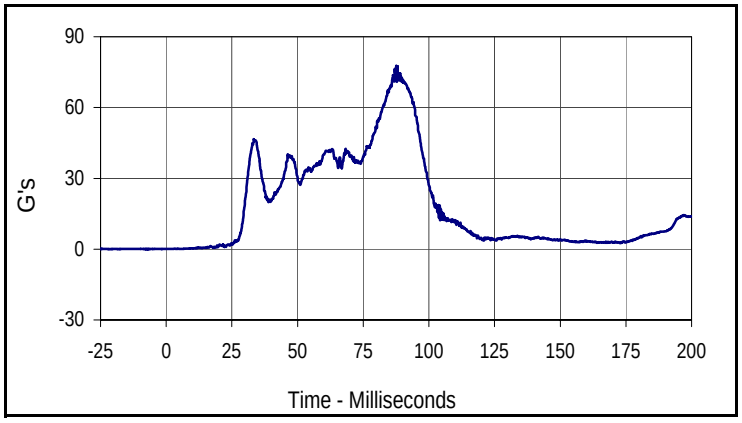
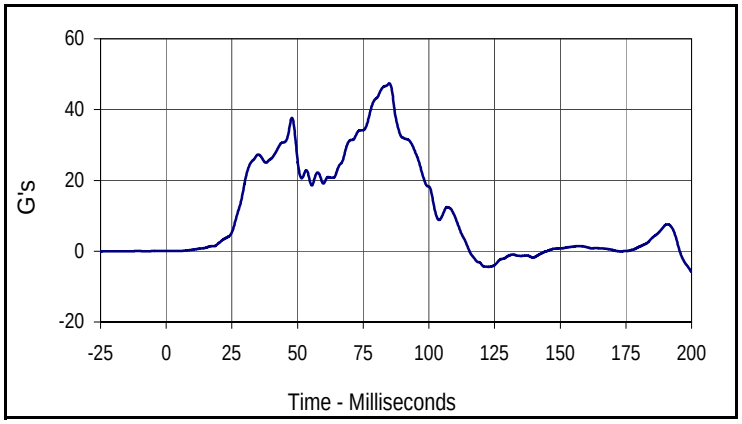
165	FIL	1000	G's
Max	Time	Min	Time
37.3	66.0	-17.0	87.8

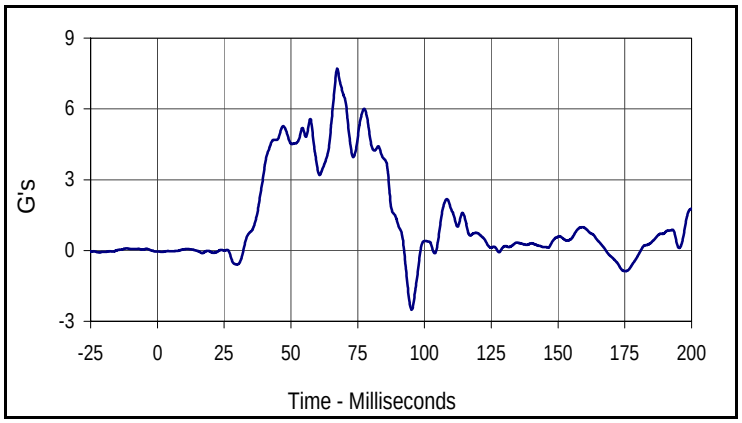


Curve Description			
CRABI Head Resultant (P3)			
CURNO	Type	SAE Class	Units
163	RES	1000	G's
Max	Time	Min	Time
77.6	87.5	0.1	0.0

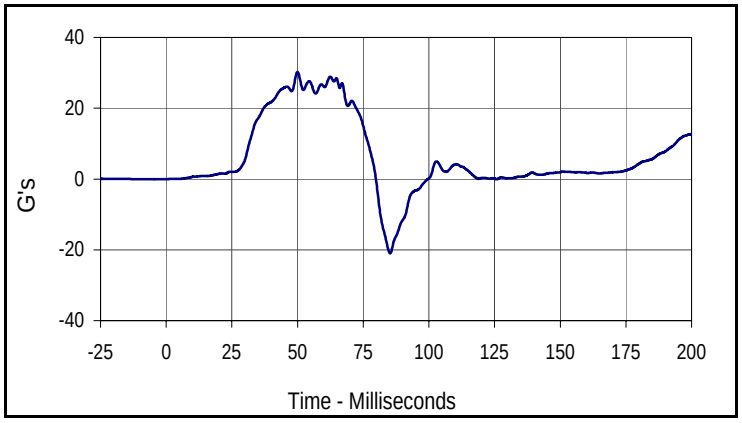
Test Vehicle:	2008 Cadillac CTS 4-Door Sedan	Test Date:	11/27/07
Test Program:	NHTSA 35mph NCAP	NHTSA No.:	G80100



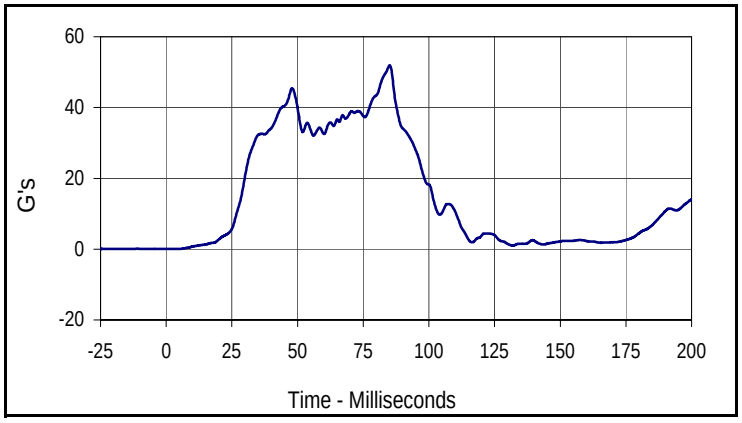
Curve Description			
CRABI Chest X (P3)			
CURNO	Type	SAE Class	Units
166	FIL	180	G's
Max	Time	Min	Time
47.4	84.9	-5.9	200.0



Curve Description			
CRABI Chest Y (P3)			
CURNO	Type	SAE Class	Units
167	FIL	180	G's
Max	Time	Min	Time
7.7	67.3	-2.5	95.2



Curve Description			
CRABI Chest Z (P3)			
CURNO	Type	SAE Class	Units
168	FIL	180	G's
Max	Time	Min	Time
30.3	50.0	-21.0	85.2



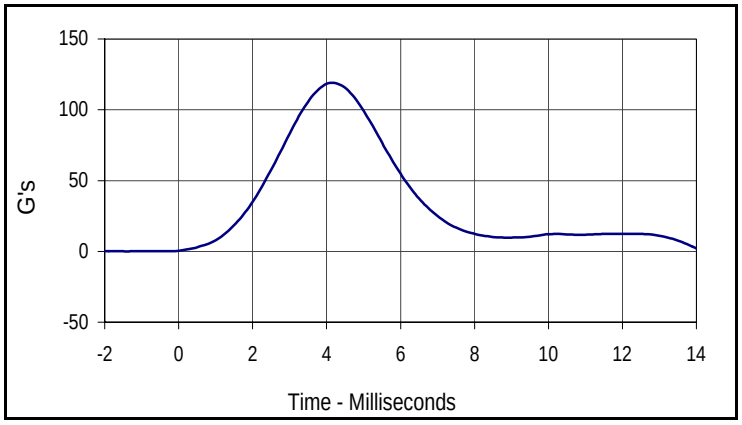
Curve Description			
CRABI Chest Resultant (P3)			
CURNO	Type	SAE Class	Units
166	RES	180	G's
Max	Time	Min	Time
51.9	85.0	0.0	3.2

SECTION D4

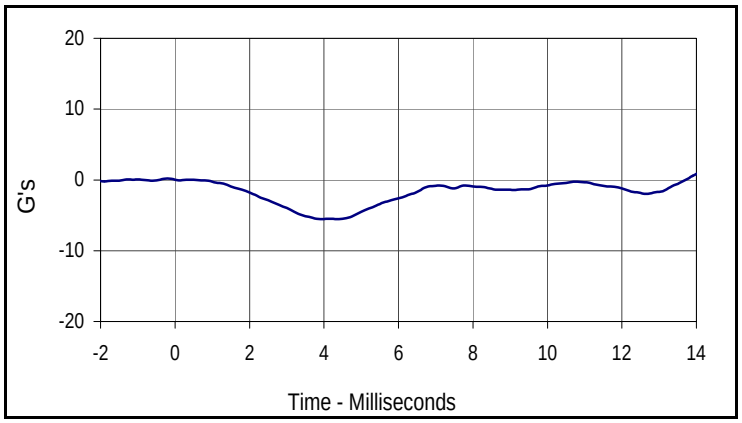
CRABI CALIBRATION INFORMATION

Test Program:	CRABI 12 Month Old Frontal Head Drop Test	Test Date:	11/16/07
ATD Serial No.:	017	Test I.D.:	FHD11C

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	100.0 to 120.0	119.0	Pass
Peak Lateral Acceleration	G's	≤15.0	5.5	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
119.0	4.2	0.0	-1.4

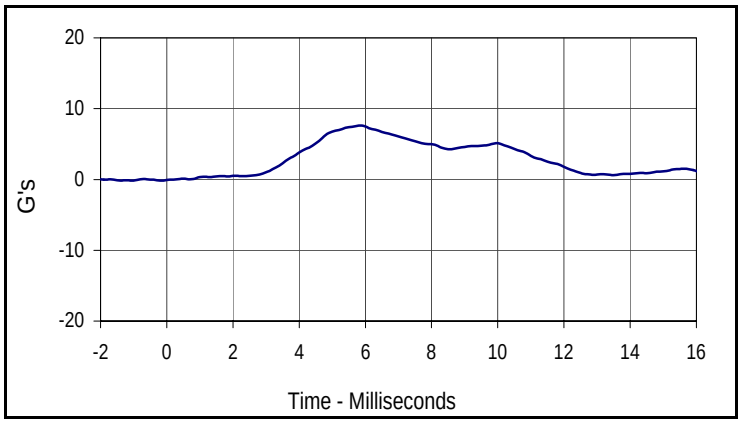


Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.2	-0.2	-5.5	3.9

Test Program:	CRABI 12 Month Old Rear Head Drop Test	Test Date:	11/15/07
ATD Serial No.:	017	Test I.D.:	RHD11C

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	55.0 to 71.0	62.2	Pass
Peak Lateral Acceleration	G's	≤15.0	7.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

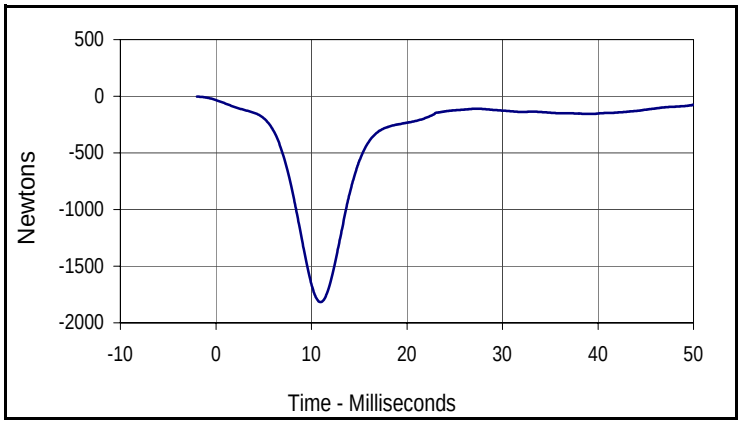
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
62.2	6.0	0.1	-0.9



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
7.6	5.8	-0.2	-1.4

Test Program:	CRABI 12 Month Old Thorax Impact Test	Test Date:	11/15/07
ATD Serial No.:	017	Test I.D.:	CH11C

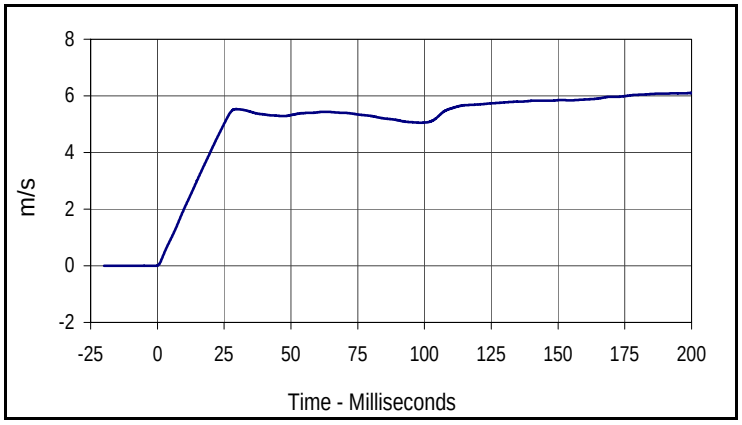
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	4.90 to 5.10	5.04	Pass
Peak Probe Force	Newtons	-1514 to -1796	-1657	Pass
		Overall Test Results		Pass



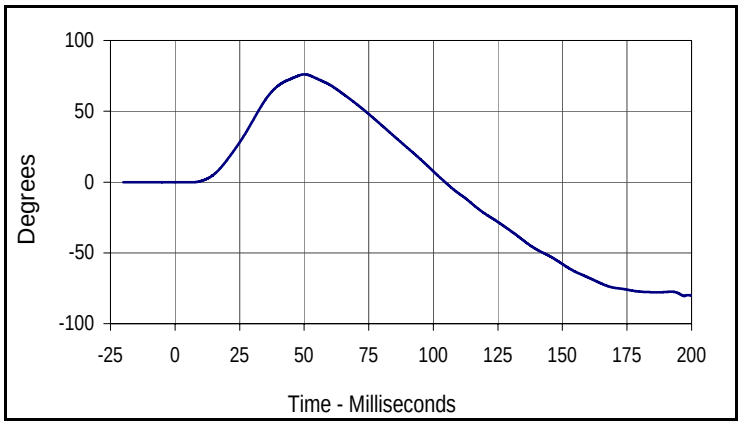
Curve Description			
Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	60	Newtons
Max	Time	Min	Time
-2.3	-2.0	-1657.2	10.0

Test Program:	CRABI 12 Month Old Neck Flexion Test	Test Date:	11/14/07
ATD Serial No.:	017	Test I.D.:	NF11C

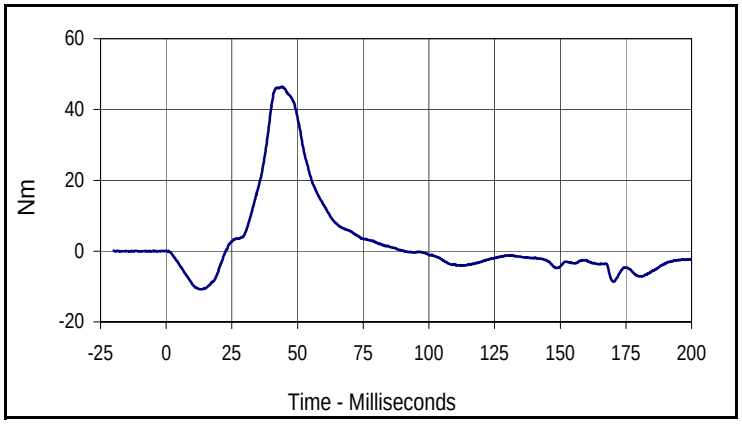
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.10 to 5.30	5.15	Pass
Pendulum Deceleration	10 Msec.	m/s	1.6 to 2.3	2.0	Pass
	20 Msec.	m/s	3.4 to 4.2	4.1	Pass
	25 Msec.	m/s	4.3 to 5.2	5.0	Pass
"D" Plane Rotation	Max	Degrees	75.0 to 86.0	76.1	Pass
Peak Moment in Rotation	Max	Nm	36.0 to 45.0	43.4	Pass
Positive Moment Decay, Time To 5 Nm		Msec.	60.0 to 80.0	71.5	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
6.1	199.3	0.0	-0.7



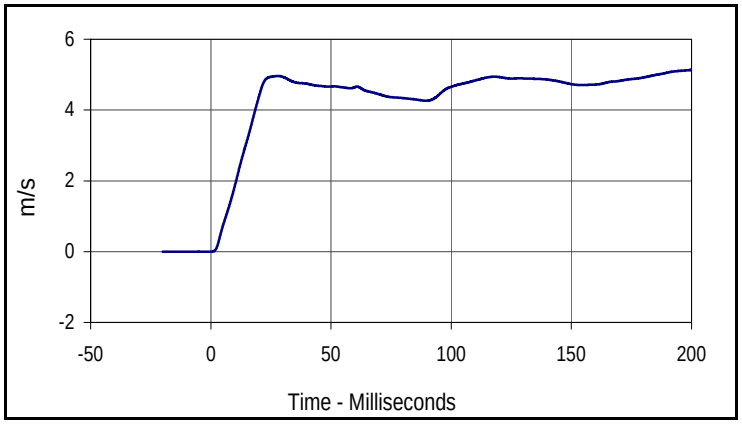
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
76.1	50.1	-80.5	197.1



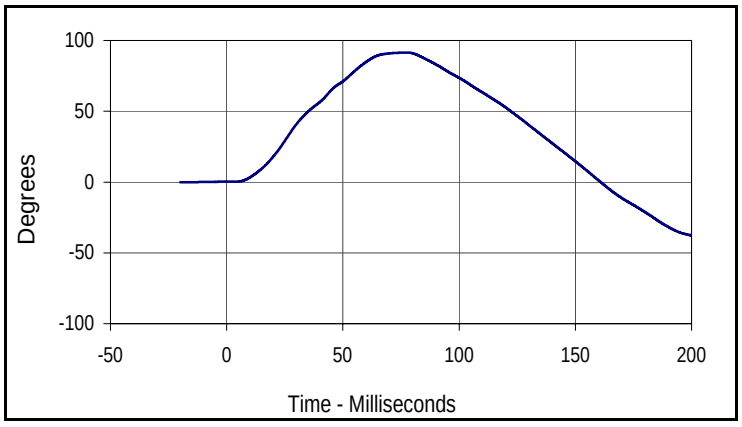
Curve Description			
Upper Neck Force Y			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
46.4	44.3	-10.8	13.5

Test Program:	CRABI 12 Month Old Neck Extension Test	Test Date:	11/14/07
ATD Serial No.:	017	Test I.D.:	NE11C

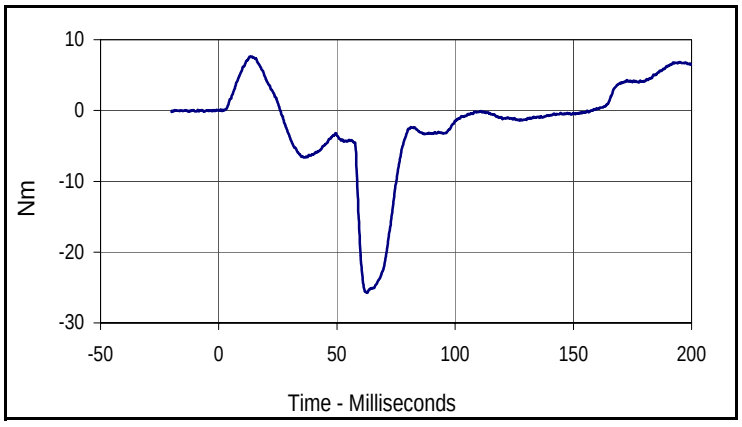
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	2.4 to 2.6	2.40	Pass
Pendulum Deceleration	6 Msec.	m/s	0.8 to 1.2	0.9	Pass
	10 Msec.	m/s	1.5 to 2.1	1.9	Pass
	14 Msec.	m/s	2.2 to 2.9	2.9	Pass
"D" Plane Rotation	Max	Degrees	80.0 to 92.0	91.5	Pass
Peak Moment in Rotation	Max	Nm	-12 to -23	-20.4	Pass
Positive Moment Decay, Time To -5 Nm		Msec.	76.0 to 90.0	77.9	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
5.1	200.0	0.0	0.1



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
91.5	77.5	-37.7	200.0



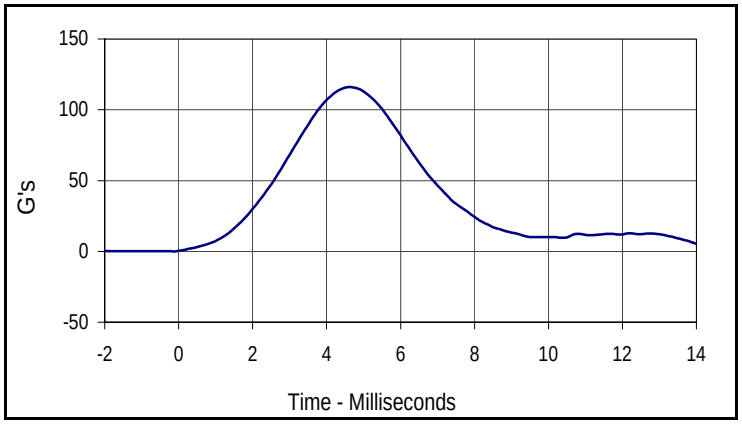
Curve Description			
Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
7.6	13.2	-25.8	62.8

Test Program:	CRABI 12 Month Old External Dimensions	Test Date:	11/16/07
ATD Serial No.:	017	Test I.D.:	N/A

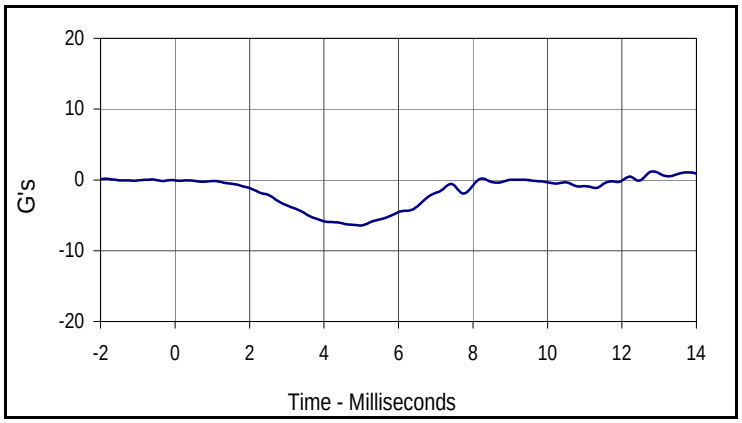
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
A - Total sitting height	mm	456.0 to 471.2	462	Pass
B - Shoulder pivot height	mm	276.6 to 291.8	284	Pass
C - "H" point height	mm	27.9 to 38.1	33	Pass
D - "H" point from backline	mm	40.1 to 50.3	46	Pass
E - Shoulder pivot from back	mm	50.3 to 60.5	52	Pass
F - Thigh clearance	mm	63.0 to 73.2	66	Pass
G - Elbow pivot to fingertip	mm	176.6 to 191.8	185	Pass
I - Shoulder pivot to elbow pivot	mm	99.1 to 114.3	104	Pass
J - Elbow rest height	mm	150.1 to 165.3	159	Pass
K - Buttock to knee length	mm	202.7 to 217.9	204	Pass
L - Poplipteal length	mm	138.7 to 153.9	142	Pass
M - Knee pivot height	mm	165.1 to 180.3	172	Pass
N - Buttock poplipteal length	mm	144.8 to 160.0	150	Pass
O - Chest depth with jacket	mm	107.5 to 122.7	112	Pass
P - Foot length	mm	92.4 to 102.6	94	Pass
Q- Stature	mm	727.7 to 753.1	N/A	N/A
R - Buttock to knee pivot length	mm	178.5 to 188.7	182	Pass
S - Head Breadth	mm	124.4 to 134.6	127	Pass
T - Head Depth	mm	149.9 to 165.1	153	Pass
U - Hip breadth	mm	158.5 to 173.7	160	Pass
V - Shoulder breadth	mm	200.7 to 215.9	213	Pass
W - Foot breadth	mm	39.1 to 49.3	47	Pass
Y - Chest circumference with jacket	mm	452.4 to 477.8	461	Pass
Z - Waist circumference	mm	447.0 to 472.4	450	Pass
AA - Refrence location for dimension Y & O	mm	256.5 to 266.7	263	Pass
BB - Reference Location For dimension Z	mm	106.7 to 116.9	110	Pass
CC - Shoulder Height	mm	299.7 to 314.9	303	Pass
DD - Chin Height	mm	289.6 to 304.8	294	Pass
		Overall Test Results		Pass

Test Program:	CRABI 12 Month Old Frontal Head Drop Test	Test Date:	11/22/07
ATD Serial No.:	022	Test I.D.:	FHD11D

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	100.0 to 120.0	116.0	Pass
Peak Lateral Acceleration	G's	≤15.0	6.4	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass



Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
116.0	4.6	0.0	-0.1

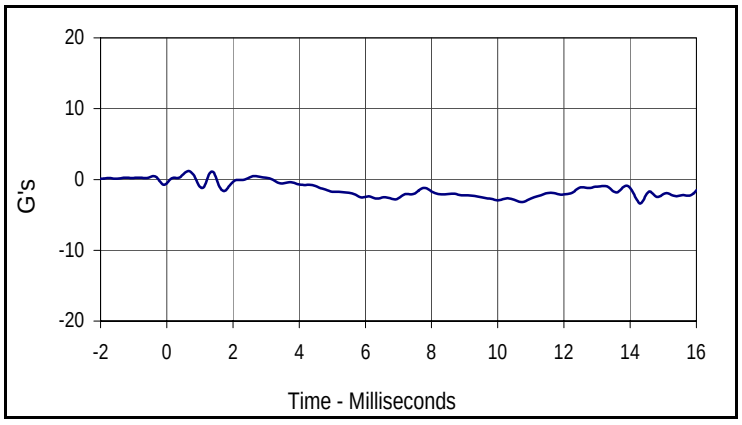


Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
0.1	-1.9	-6.4	5.0

Test Program:	CRABI 12 Month Old Rear Head Drop Test	Test Date:	11/22/07
ATD Serial No.:	022	Test I.D.:	RHD11D

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	55.0 to 71.0	60.1	Pass
Peak Lateral Acceleration	G's	≤15.0	2.6	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
		Overall Test Results		Pass

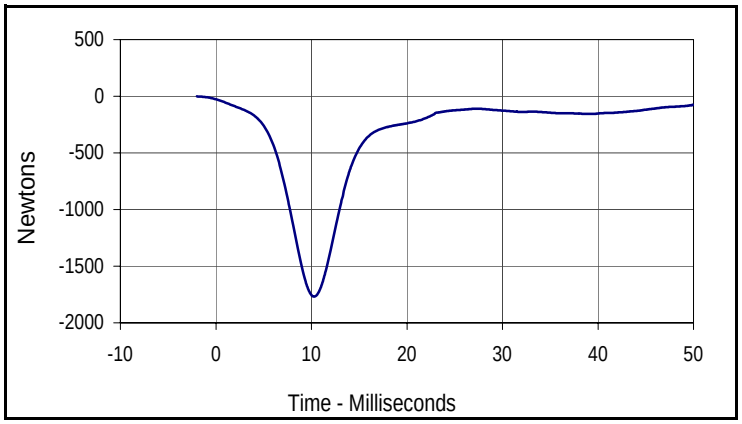
Curve Description			
Head Resultant			
CURNO	Type	SAE Class	Units
001	RES	1000	G's
Max	Time	Min	Time
60.1	6.0	0.3	-1.3



Curve Description			
Head Y			
CURNO	Type	SAE Class	Units
002	FIL	1000	G's
Max	Time	Min	Time
1.1	0.7	-2.6	5.9

Test Program:	CRABI 12 Month Old Thorax Impact Test	Test Date:	11/22/07
ATD Serial No.:	022	Test I.D.:	CH11D

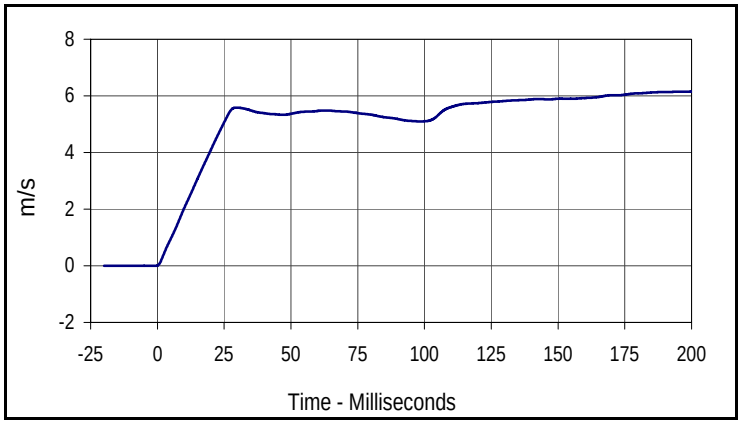
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Pendulum Velocity at T=0	m/sec	4.90 to 5.10	4.96	Pass
Peak Probe Force	Newtons	-1514 to -1796	-1754	Pass
		Overall Test Results		Pass



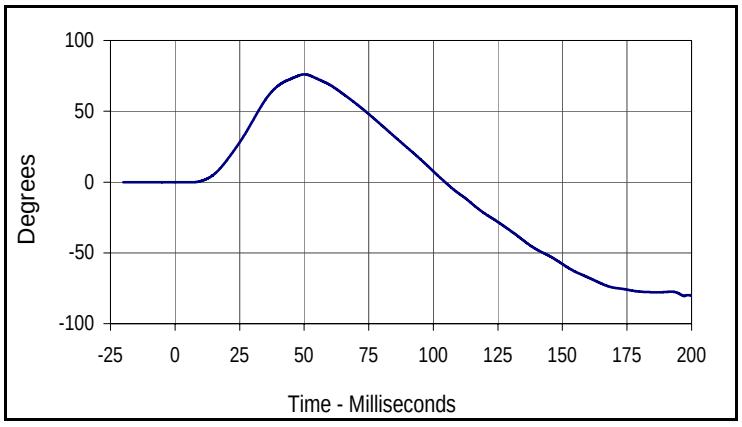
Curve Description			
Probe Force			
CURNO	Type	SAE Class	Units
001	FIL	60	Newtons
Max	Time	Min	Time
-1.3	-2.0	-1753.5	10.0

Test Program:	CRABI 12 Month Old Neck Flexion Test	Test Date:	11/23/07
ATD Serial No.:	022	Test I.D.:	NF11D

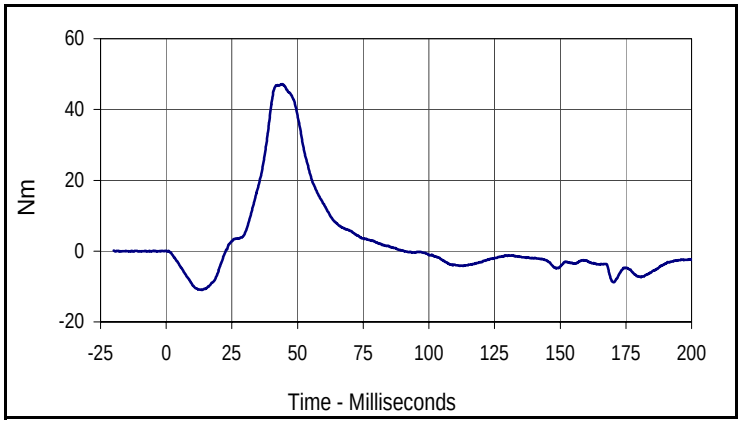
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	5.10 to 5.30	5.15	Pass
Pendulum Deceleration	10 Msec.	m/s	1.6 to 2.3	2.0	Pass
	20 Msec.	m/s	3.4 to 4.2	4.1	Pass
	25 Msec.	m/s	4.3 to 5.2	5.1	Pass
"D" Plane Rotation	Max	Degrees	75.0 to 86.0	76.1	Pass
Peak Moment in Rotation	Max	Nm	36.0 to 45.0	44.1	Pass
Positive Moment Decay, Time To 5 Nm		Msec.	60.0 to 80.0	71.6	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
6.1	199.3	0.0	-0.7



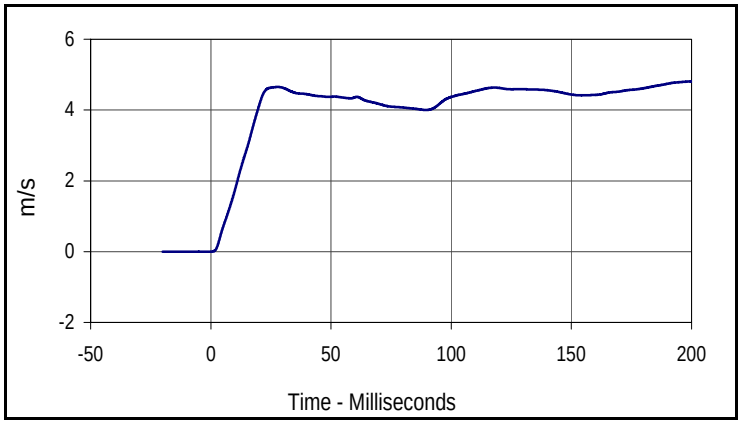
Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
76.1	50.1	-80.5	197.1



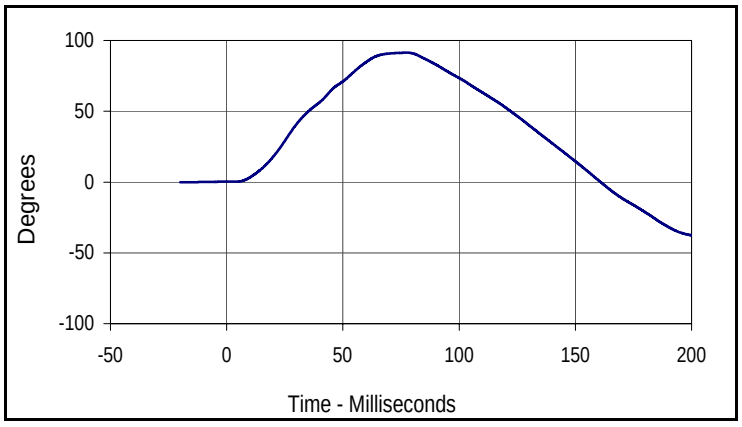
Curve Description			
Upper Neck Force Y			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
47.1	44.3	-10.9	13.5

Test Program:	CRABI 12 Month Old Neck Extension Test	Test Date:	11/22/07
ATD Serial No.:	022	Test I.D.:	NE11D

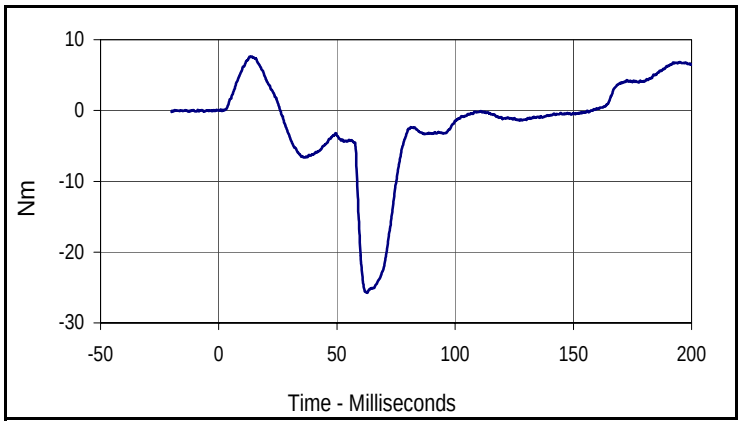
Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	30	Pass
Pendulum Velocity		m/s	2.4 to 2.6	2.43	Pass
Pendulum Deceleration	6 Msec.	m/s	0.8 to 1.2	0.9	Pass
	10 Msec.	m/s	1.5 to 2.1	1.7	Pass
	14 Msec.	m/s	2.2 to 2.9	2.7	Pass
"D" Plane Rotation	Max	Degrees	80.0 to 92.0	91.4	Pass
Peak Moment in Rotation	Max	Nm	-12 to -23	-18.5	Pass
Positive Moment Decay, Time To -5 Nm		Msec.	76.0 to 90.0	77.9	Pass
			Overall Test Results		Pass



Curve Description			
Pendulum Velocity			
CURNO	Type	SAE Class	Units
001	FIL	180	m/s
Max	Time	Min	Time
4.8	200.0	0.0	0.1



Curve Description			
"D" Plane Rotation			
CURNO	Type	SAE Class	Units
003	FIL	60	Degrees
Max	Time	Min	Time
91.4	77.5	-37.6	200.0



Curve Description			
Upper Neck Moment Y			
CURNO	Type	SAE Class	Units
002	FIL	600	Nm
Max	Time	Min	Time
7.6	13.2	-25.8	62.8

Test Program:	CRABI 12 Month Old External Dimensions	Test Date:	7/23/07
ATD Serial No.:	022	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	456.0 to 471.2	463	Pass
B - Shoulder pivot height	mm	276.6 to 291.8	284	Pass
C - "H" point height	mm	27.9 to 38.1	30	Pass
D - "H" point from backline	mm	40.1 to 50.3	42	Pass
E - Shoulder pivot from back	mm	50.3 to 60.5	57	Pass
F - Thigh clearance	mm	63.0 to 73.2	68	Pass
G - Elbow pivot to fingertip	mm	176.6 to 191.8	180	Pass
I - Shoulder pivot to elbow pivot	mm	99.1 to 114.3	103	Pass
J - Elbow rest height	mm	150.1 to 165.3	160	Pass
K - Buttock to knee length	mm	202.7 to 217.9	207	Pass
L - Poplipteal length	mm	138.7 to 153.9	141	Pass
M - Knee pivot height	mm	165.1 to 180.3	170	Pass
N - Buttock poplipteal length	mm	144.8 to 160.0	150	Pass
O - Chest depth with jacket	mm	107.5 to 122.7	111	Pass
P - Foot length	mm	92.4 to 102.6	98	Pass
Q- Stature	mm	727.7 to 753.1	N/A	N/A
R - Buttock to knee pivot length	mm	178.5 to 188.7	179	Pass
S - Head Breadth	mm	124.4 to 134.6	130	Pass
T - Head Depth	mm	149.9 to 165.1	157	Pass
U - Hip breadth	mm	158.5 to 173.7	163	Pass
V - Shoulder breadth	mm	200.7 to 215.9	210	Pass
W - Foot breadth	mm	39.1 to 49.3	47	Pass
Y - Chest circumference with jacket	mm	452.4 to 477.8	462	Pass
Z - Waist circumference	mm	447.0 to 472.4	457	Pass
AA - Refrence location for dimension Y & O	mm	256.5 to 266.7	260	Pass
BB - Reference Location For dimension Z	mm	106.7 to 116.9	114	Pass
CC - Shoulder Height	mm	299.7 to 314.9	302	Pass
DD - Chin Height	mm	289.6 to 304.8	297	Pass
		Overall Test Results		Pass