REPORT NUMBER: 301R-CAL-14-003

SAFETY COMPLIANCE TESTING FOR FMVSS 301R
FUEL SYSTEM INTEGRITY – REAR IMPACT

General Motors LLC
2014 Chevrolet Impala
Four Door Sedan

NHTSA NUMBER: C20140101

PREPARED BY:
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June 30, 2014

FINAL REPORT

PREPARED FOR:
U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration Enforcement
Office of Vehicle Safety Compliance
Mail Code: NVS-220
1200 New Jersey Avenue, SE
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15. Supplementary Notes		

16. Abstract

A compliance test was conducted on a 2014 Chevrolet Impala four door sedan in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301R-02 for the determination of FMVSS 301R compliance. Test failures identified were as follows:

None - The test vehicle appeared to comply with all requirements of FMVSS 301R "Fuel System Integrity – Rear Impact."

17. Key Words Compliance Testing Safety Engineering FMVSS 301R	***18. Distribution Statement*** Copies of this report are available from: National Highway Traffic Safety Administration Technical Reference Division (TIS) (NPO-230) 1200 New Jersey Avenue, SE Washington, D.C. 20590 Telephone No. (202) 366-4946

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SECTION 1

PURPOSE AND TEST PROCEDURE

This rear impact test is part of the FMVSS 301R Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-11-D-00243. The purpose of this test was to determine if the subject vehicle, a 2014 Chevrolet Impala four door sedan, meets the performance requirements of FMVSS No. 301R "Fuel System Integrity – Rear Impact." The test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-301R-02, dated January 17, 2007).

SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

A 1,876.5 kg 2014 Chevrolet Impala four door sedan was impacted from the rear by a 1357.0 kg moving barrier at a velocity of 78.79 kph (49.6 mph). The test was performed by Calspan Corporation on 6/16/2014.

The test vehicle was equipped with a 65.1 liter fuel tank which was filled to 93 percent capacity with stoddard fluid prior to impact. Additional ballast (85 kg) was secured in the vehicle cargo area. Two ballast Part 572E 50th percentile male Anthropomorphic Test Devices (ATD) were placed in the front occupant seating positions.

The crash event was recorded by three high-speed cameras and one real-time camera. High-speed camera locations and other pertinent camera information can be found on page 3-7 of this report. Pre- and post-test photographs of the vehicle can be found in Appendix A.

There was no fuel system fluid spillage following the impact and including all portions of the static rollover test. The maximum vehicle longitudinal crush was 655 millimeters of which the average was 418 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

SECTION 3

SUMMARY OF TEST RESULTS

This section contains information reporting for the following Data Sheets:

Data Sheet No. 1 – Test Vehicle Specifications

Data Sheet No. 2 – Pre-Test Data

Data Sheet No. 3 – Moving Deformable Barrier (MDB) Data

Data Sheet No. 4 – High Speed Camera Locations and Data Summary

Data Sheet No. 5 – Post-Test Data

Data Sheet No. 6 – FMVSS No. 301 Static Rollover Test Data

DATA SHEET NO. 1
TEST VEHICLE SPECIFICATIONS

Test Vehicle: 2014 Chevrolet Impala four door sedan
Test Program: FMVSS 301R Compliance Rear Impact Test
NHTSA No.: C20140101
Test Date: 6/16/2014

TEST VEHICLE INFORMATION AND OPTIONS

NHTSA No.	C20140101
Model Year	2014
Make	Chevrolet
Model	Implala
Body Style	Four Door Sedan
Body Color	Light Blue
Odometer Reading (km/mi)	178 km / 111 mi
Engine Displacement (L)	2.5
Type/No. Cylinders	I4
Engine Placement	Transverse
Transmission Type	Automatic
Transmission Speeds	6-Speed
Final Drive	Front Wheel Drive

Overdrive	Yes
Air Conditioning (AC)	Yes
All-Wheel Drive (AWD)	No
Anti-Lock Brakes (ABS)	Yes
Automatic Door Locks (ADL)	Yes
Power Brakes	Yes
Power Seats	Yes
Power Steering	Yes
Power Windows	Yes
Stability Control (Auto-Leveling)	No
Sunroof/T-Top	No
Tilt Steering Wheel	Yes
Traction Control System (TCS)	Yes

DEALER AND DELIVERY INFORMATION FROM CERTIFICATION LABEL

Manufactured By	General Motors LLC
Date of Manufacture	05/13
VIN	1G11Y5SL9EU106165

GVWR (kg)	2103
GAWR Front (kg)	1050
GAWR Rear (kg)	1053

TIRE PLACARD & SIDEWALL INFORMATION

Tire Placard Location: Driver's Door Sill
Spare Tire Type: T165-90R17

Measured Parameter	Front	Rear
Tire Manufacturer	Firestone	Firestone
Tire Name	Fire Hawk GT	Fire Hawk GT
Tire Type	All Season	All Season
Max. Tire Pressure (kPa)	300	300
Recommended Tire Size	P235/50R18	P235/50R18
Load Index/Speed Symbol	97H	97H
Recommended Cold Tire Pressure (kPa)	240	240
Tire Size on Vehicle	P235/50R18	P235/50R18
Treadwear/ Traction Grade/ Temperature Grade	460/ A / A	460/ A / A

VEHICLE CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Designated Seating Capacity (DSC)	2	3	-	5
Seat Type (Bench, Bucket, or Split Bench)	Bucket	Bench	--	
Capacity Weight (VCW) (kg)				428.0
DSC X 68.04 (kg)				340.2
Cargo Weight (RCLW) (kg)				87.8

DATA SHEET NO. 2
PRE-TEST DATA

Test Vehicle: 2014 Chevrolet Impala four door sedan
Test Program: FMVSS 301R Compliance Rear Impact Test
NHTSA No.: C20140101
Test Date: 6/16/2014

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW)			As Tested (ATW)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	522	315		592.5	361.5	
Right	kg	440	364		489.5	433	
Ratio	%	59%	41%		57.7%	42.3%	
Totals	kg	962	679	1641	1082	794.5	1876.5

TARGET TEST WEIGHT CALCULATION (TTW)

Measured Parameter	Units	Value	
Total Unloaded Vehicle Weight (UVW)	kg	1641.0	(A)
Rated Cargo/Luggage Weight (RCLW)	kg	87.8	(B)
Weight of two P572E ATDS @ 78kg each	kg	156.0	(C)
Target Vehicle Test Weight (TVTW)	kg	1884.8	(A+B+C)

*As tested Weight = (TTW -10kg) <=ATW < (TTW -5kg); TTW = Weight of Test Vehicle with 2 dummies and 87.8kg of Cargo Weight

GENERAL TEST VEHICLE DATA

Measured Parameter	Units	Value
Vehicle Wheelbase	mm	2835
Vehicle Length (at Centerline)	mm	5118
Vehicle Width	mm	1826
Weight of Ballast Secured in Cargo Area[1]	kg	85
Type of Ballast		Steel Plate
Method of Securing Ballast		Rear Foot well
Components Removed for Weight Reduction		0
Vehicle Width at Widest Point	mm	1857
Vehicle Width at Widest Point Location		C-Pillar
Centerline offset for impact line	mm	371
Filler neck side (left/right)		Right

[1] Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

TEST VEHICLE ATTITUDE AND CG

	Units	Left		Right		CG (aft of front axle)
		Front	Rear	Front	Rear	
As Delivered (UVW)	mm	746	765	753	751	1173
As Tested (ATW)	mm	727	739	727	739	1200

DATA SHEET NO. 2 (Continued)
PRE-TEST DATA

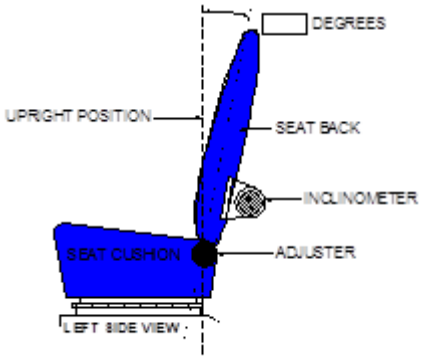
Test Vehicle: 2014 Chevrolet Impala four door sedan NHTSA No.: C20140101
Test Program: FMVSS 301R Compliance Rear Impact Test Test Date: 6/16/2014

SEATING

Nominal Design Riding Position (for adjustable driver and passenger seat backs). *Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.*

Driver Seat Instructions: The driver seat back was positioned according to the Nominal Design Riding position listed in FORM 1.

Passenger Seat Instructions: The passenger seat back was positioned to the Nominal Design Riding position listed in FORM 1.



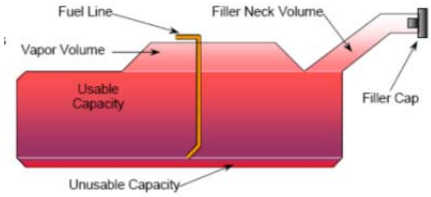
FRONT SEAT ASSEMBLY

Measured Parameter	Deg.
Driver Seat Back Angle	-15.9
Passenger Seat Back Angle	-15.1

SEAT FORE/AFT POSITIONING

Driver Seat: Was positioned according to the Nominal Design Riding position listed in FORM1.
Passenger Seat: Was positioned according to the Nominal Design Riding position listed in FORM1.

	Total # of Positions	Placed in Position #
Driver Seat	310	155
Passenger Seat	312	156



VEHICLE FUEL TANK ASSEMBLY

FUEL TANK CAPACITY DATA

Measured Parameter	Reference	Liters
Fuel System Capacity (Standard Tank)	Owner's Manual	70
COTR Usable Capacity (Standard Tank)	Form No. 1	70
Test Volume Range	92-94% of Usable Capacity	64.4 – 65.9
Actual Test Volume (Solvent Used)	93% of Usable Capacity	65.1

FUEL SYSTEM DATA

Measured Parameter	Value
Test Fluid Type	Stoddard Solvent
Test Fluid Specific Gravity	0.764
Test Fluid Kinematic Viscosity (centistokes)	0.96
Test Fluid Color	Purple
Electric Fuel Pump?	Yes
Can Activate Electric Fuel Pump with Ignition Switch On but Engine Off?	Yes

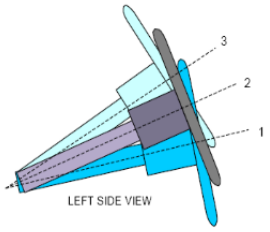
Fuel Pump Comments : None

DATA SHEET NO. 2 (Continued)
PRE-TEST DATA

Test Vehicle: 2014 Chevrolet Impala four door sedan NHTSA No.: C20140101
Test Program: FMVSS 301R Compliance Rear Impact Test Test Date: 6/16/2014

STEERING COLUMN ADJUSTMENT

Steering wheel and column adjustments are made so that the steering wheel hub is at the center of its geometric locus it describes when it moves through its full range of motion.



STEERING COLUMN ASSEMBLY

Operational Instructions: Tilit wheel was positioned to mid-range at 22.6 degrees and mid fore/aft position at 25 mm

SEAT BELT UPPER ANCHORAGE

Nominal design riding position

Operational Instructions: Anchorages were set to the most upright position

COMMENTS: None

DATA SHEET NO. 3
MOVING DEFORMABLE BARRIER (MDB) DATA

Test Vehicle: 2014 Chevrolet Impala four door sedan NHTSA No.: C20140101
Test Program: FMVSS 301R Compliance Rear Impact Test Test Date: 6/16/2014

MDB Face Manufacturer: Plascore MDB Face Serial No. A0813001

MDB SPECIFICATIONS

Measurement Description	Length (mm)
Overall Width of Framework Carriage	1250
Overall Length of MDB (incl. honeycomb impactor face)	4120
Wheelbase of Framework Carriage	2591
Tread of Framework Carriage (Front & Rear)	1880
CG Location of Front Axle	1136

MDB WEIGHTS

	Units	Front	Rear	Total
Left	kg	358.0	322.0	680.0
Right	kg	404.0	273.0	677.0
Ratio	%	56.2%	43.8%	100.0%
Totals	kg	762.0	595.0	1357.0

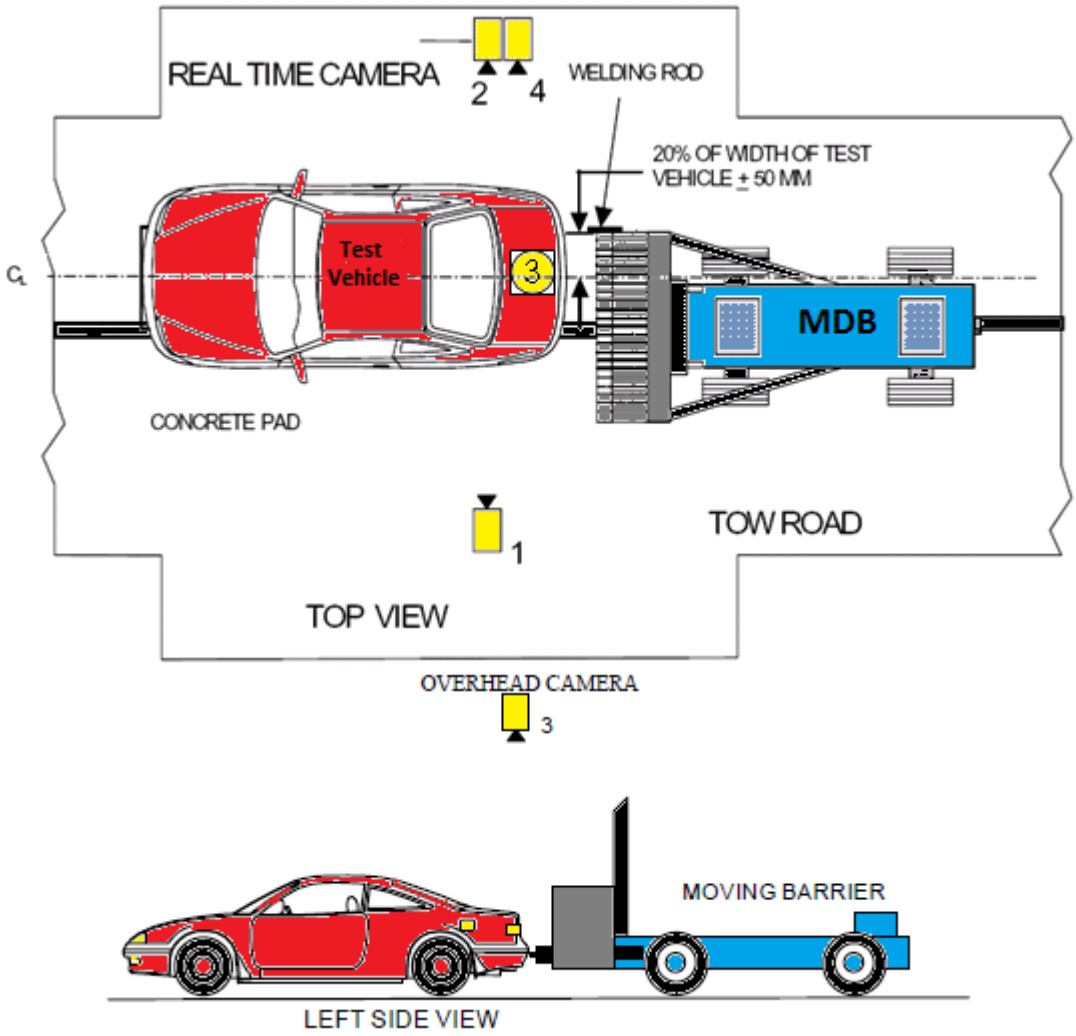
MDB TIRE SIZE & PRESSURES

	Units	Requirement	Left Front	Right Front	Left Rear	Right Rear
Tire Size		P205/75R15	P205/75R15	P205/75R15	P205/75R15	P205/75R15
Tire Pressure	kPa	200 ± 21	207	207	207	207

Brake Abort System? (Yes/No): Yes Date of Last MDB Calibration: May 15, 2010

DATA SHEET NO. 4
HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY

Test Vehicle:	2014 Chevrolet Impala four door sedan	NHTSA No.:	C20140101
Test Program:	FMVSS 301R Compliance Rear Impact Test	Test Date:	6/16/2014



No.	Camera View	Coordinates (mm)			Angle (Deg)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Left Side View	1668	10009	1446	0.2	24	1000
2	Real-Time Camera						30
3	Overhead View	1180	0	5372	-0.2	14	1000
4	Right Side View	1920	9573	1010	0.1	24	1000

* Reference (from point of impact); all measurements accurate to within ±6 mm.
X = (Impact Point) + Forward
Y = (Impact Point) + To Right
Z = (Ground Level) + Down

DATA SHEET NO. 5
POST-TEST DATA

Test Vehicle: 2014 Chevrolet Impala four door sedan NHTSA No.: C20140101
Test Program: FMVSS 301R Compliance Rear Impact Test Test Date: 6/16/2014

VIN: 1G11Y5SL9EU106165

REQUIRED IMPACT VELOCITY RANGE: 78.5 to 80.1 km/h

ACTUAL IMPACT VELOCITY (WITHIN 1.5 M OF IMPACT PLANE)

Measurement Description	Units	Speed
Trap No. 1	km/h	78.79
Trap No. 2	km/h	78.70
Average Impact Speed	km/h	78.76

WELDING ROD IMPACT POINT

Measurement Description	Tolerance	Units	Value
Vertical distance from target center (+ is above)	±40 mm	mm	+23
Horizontal distance from target center (+ is right)	±50 mm	mm	+5

STODDARD SOLVENT SPILLAGE MEASUREMENT:

A. From impact until vehicle motion ceases:
(Maximum allowable is 28 grams) 0 grams

B. For the 5-minute period after motion ceases:
(Maximum allowable is 28 grams) 0 grams

C. For the next 25 minutes:
(Maximum allowable is 28 grams/minute) 0 grams

D. Spillage Details: No Spillage Occurred

DATA SHEET NO. 5
POST-TEST DATA (Continued)

Test Vehicle: 2014 Chevrolet Impala four door sedan NHTSA No.: C20140101
Test Program: FMVSS 301R Compliance Rear Impact Test Test Date: 6/16/2014

DOOR OPENING AND SEAT TRACK INFORMATION

Description	Driver	Passenger
Locked/Unlocked Doors	Unlocked	Unlocked
Front Door Opening	Closed & Operational	Closed & Operational
Rear Door Opening	Closed & Operational	Closed & Operational
Seat Track Shift (mm)	0	0
Seat Back Failure	Reclined	Reclined
Glazing Damage	None	None

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Windshield Damage	None
Window Damage	None
Other Notable Effects	None

VEHICLE CRUSH MEASUREMENTS: LENGTH

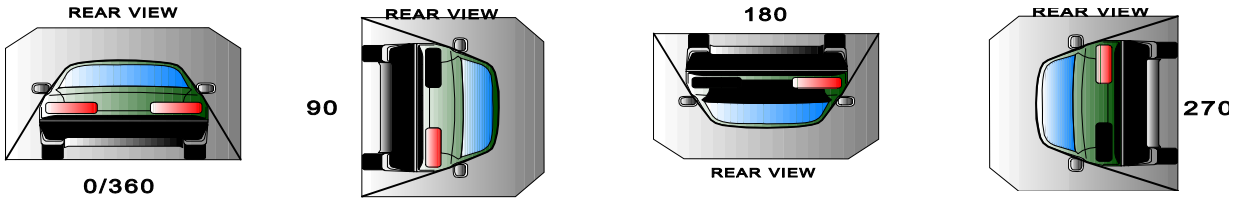
Measurement	Left Side	Centerline	Right Side
Pre-Test	4849	5118	4945
Post-Test	4698	4463	4498
Crush	151	655	447

VEHICLE CRUSH MEASUREMENTS: WHEELBASE

Measurement	Left Side	Centerline	Right Side
Pre-Test	2834		2836
Post-Test	2838		2800
Crush	-4		36

DATA SHEET NO. 6
FMVSS NO. 301 STATIC ROLLOVER TEST DATA

Test Vehicle: 2014 Chevrolet Impala four door sedan
Test Program: FMVSS 301R Compliance Rear Impact Test
NHTSA No.: C20140101
Test Date: 6/16/2014



Rear View

ROLLOVER SOLVENT COLLECTION TIME TABLE

Test Phase	Rotation Time (spec. 1 -3 min)		Hold Time	Total Time		Next Whole Minute Interval
	Minutes	Seconds	Minutes	Minutes	Seconds	Minutes
0° to 90°	1	13	5	6	13	7
90° to 180°	1	3	5	6	3	7
180° to 270°	1	1	5	6	1	7
270° to 360°	1	6	5	6	6	7

FMVSS 301 REQUIREMENTS TABLE (Maximum allowable solvent spillage)

First 5 Minutes (grams)	6th Minute (grams)	7th Minute (grams)	8th Minute (grams)
142	28	28	28

ACTUAL TEST VEHICLE STODDARD SOLVENT SPILLAGE TABLE

Test Phase	First 5 Minutes (grams)	6th Minute (grams)	7th Minute (grams)	8th Minute (grams)
0° to 90°	0	0	0	
90° to 180°	0	0	0	
180° to 270°	0	0	0	
270° to 360°	0	0	0	

ROLLOVER STODDARD SOLVENT SPILLAGE LOCATION TABLE

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

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

Figure A-1: Vehicle Certification Placard

Figure A-2: Vehicle Tire Placard

Figure A-3: Pre-Test Front View

Figure A-4: Post-Test Front View

Figure A-5: Pre-Test Left Side View

Figure A-6: Post-Test Left Side View

Figure A-7: Pre-Test Right Side View

Figure A-8: Post-Test Right Side View

Figure A-9: Pre-Test Left Front 3/4 View

Figure A-10: Post-Test Left Front 3/4 View

Figure A-11: Pre-Test Right Front 3/4 View

Figure A-12: Post-Test Right Front 3/4 View

Figure A-13: Pre-Test Left Rear 3/4 View

Figure A-14: Post-Test Left Rear 3/4 View

Figure A-15: Pre-Test Right Rear 3/4 View

Figure A-16: Post-Test Right Rear 3/4 View

Figure A-17: Pre-Test Rear View

Figure A-18: Post-Test Rear View

Figure A-19: Pre-Test MDB Front View

Figure A-20: Post-Test MDB Front View

Figure A-21: Pre-Test MDB Left Side View

Figure A-22: Post-Test MDB Left Side View

Figure A-23: Pre-Test MDB Right Side View

Figure A-24: Post-Test MDB Right Side View

Figure A-25: Pre-Test MDB Top View

Figure A-26: Post-Test MDB Top View

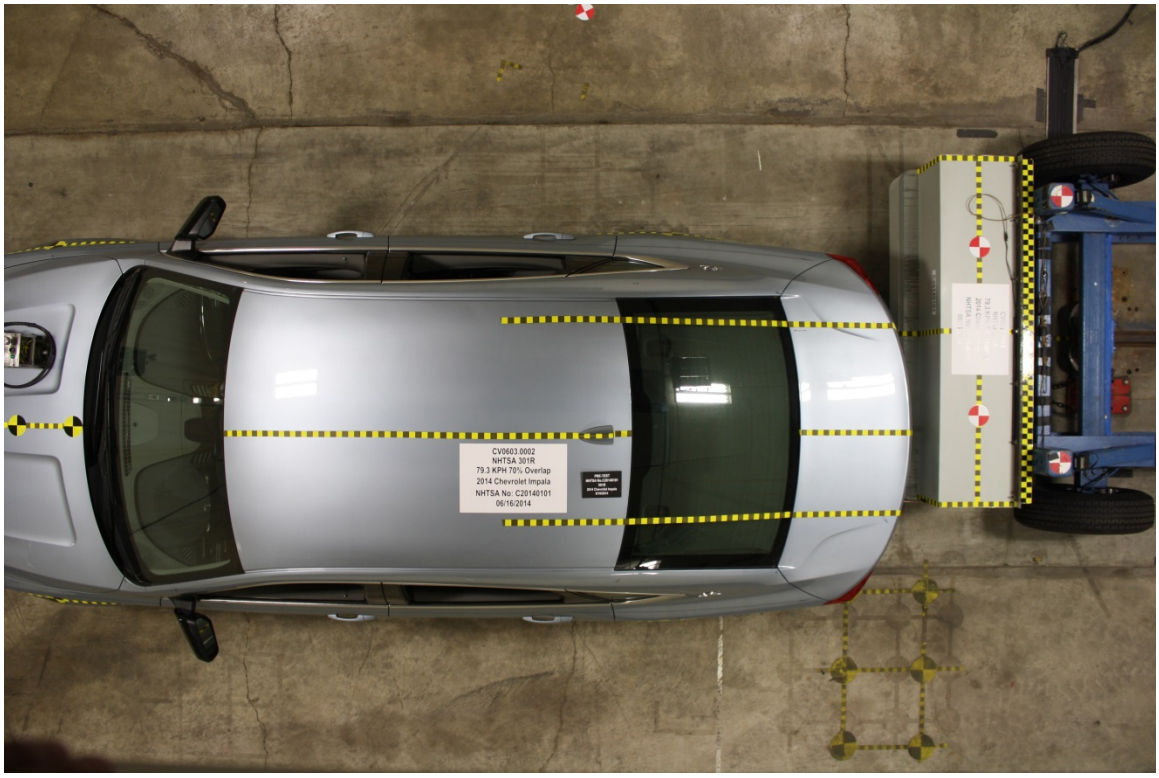


Figure A-27: Pre-Test Overhead Vehicle and MDB View

Figure A-28: Post-Test Impact Target View

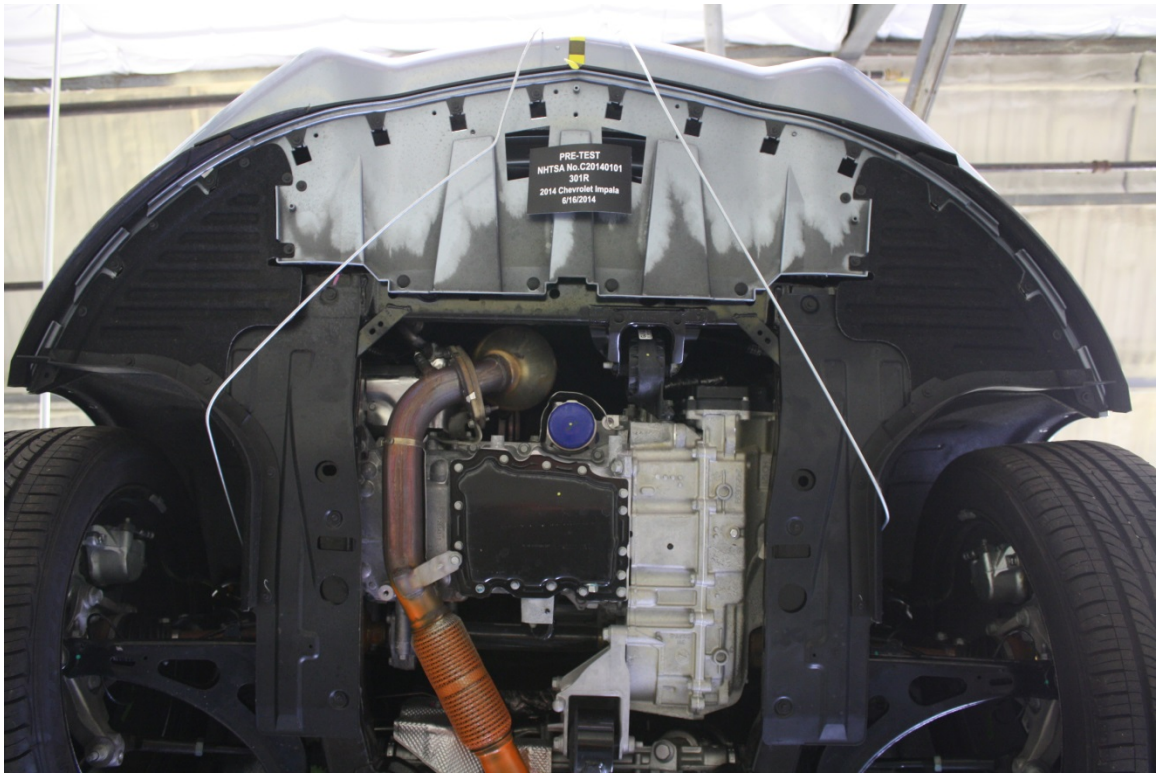


Figure A-29: Pre-Test Front Underbody View

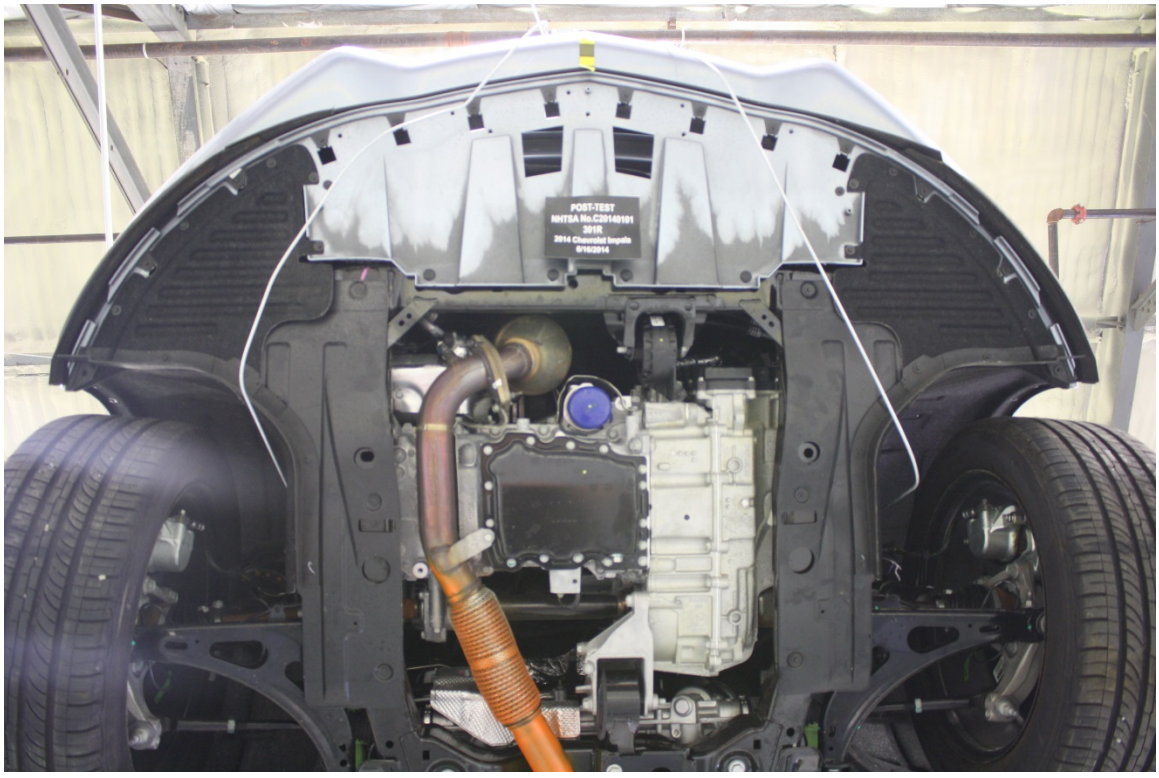


Figure A-30: Post-Test Front Underbody View

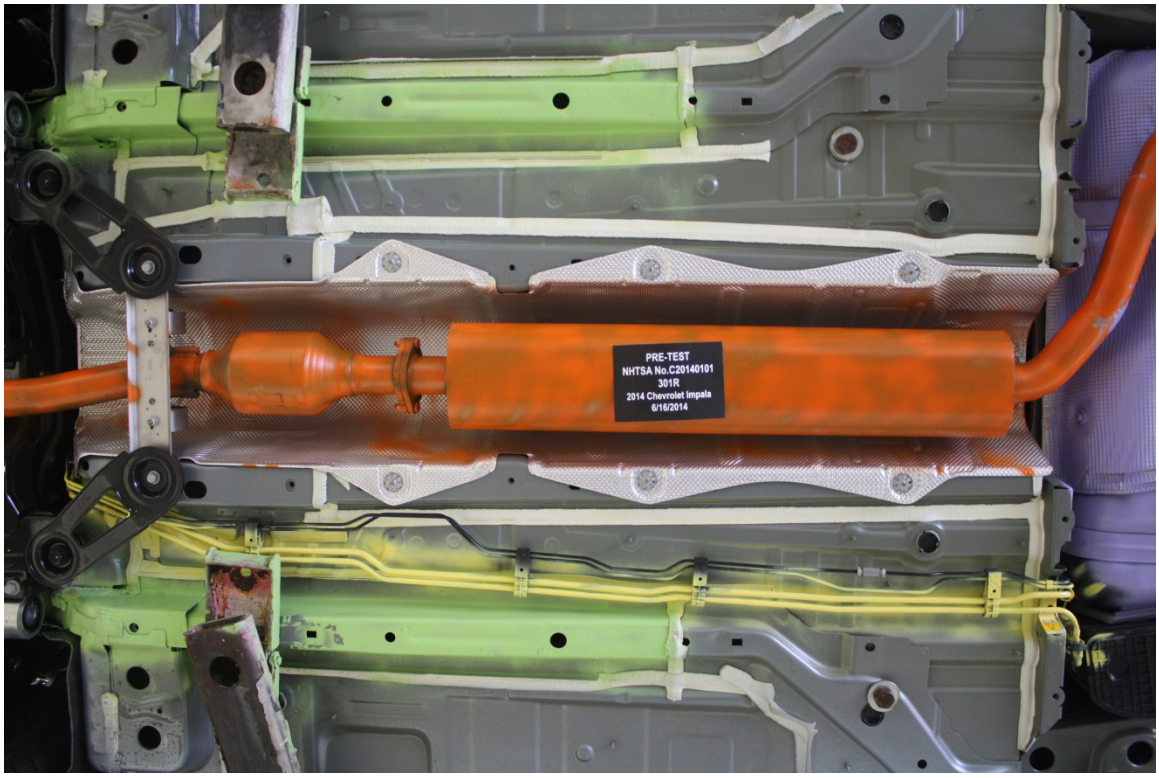


Figure A-31: Pre-Test Mid Underbody View

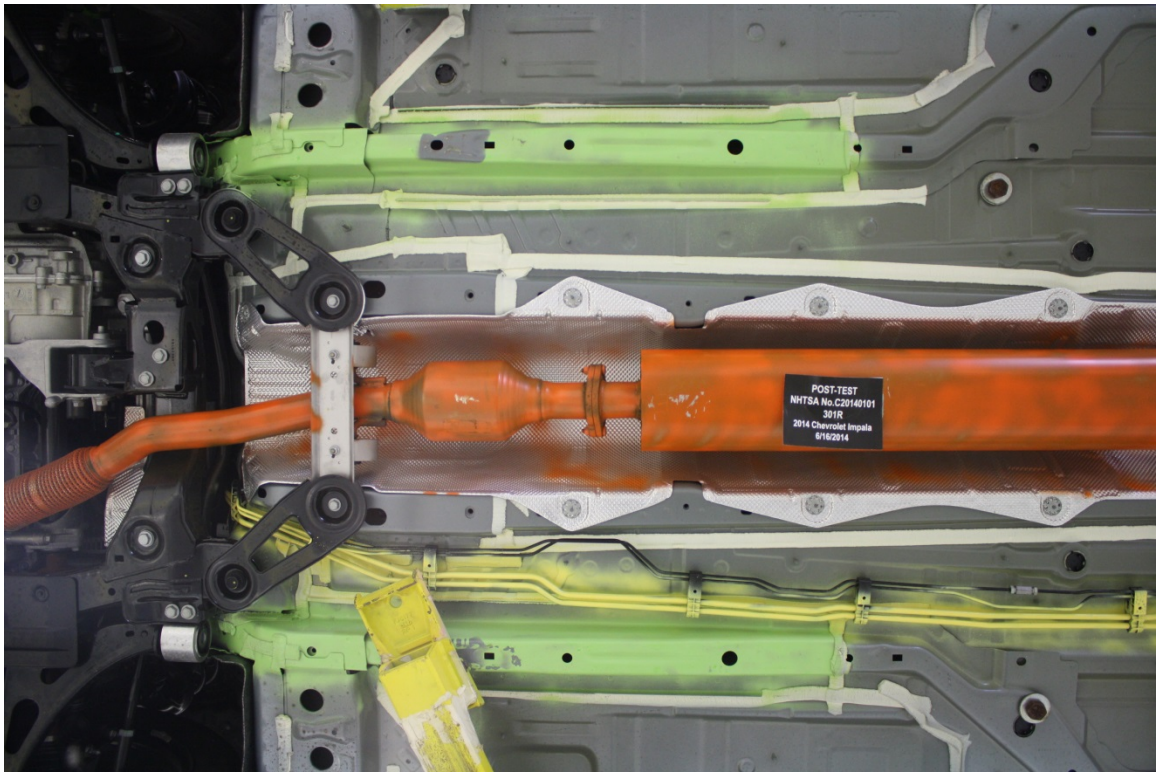


Figure A-32: Post-Test Mid Underbody View

Figure A-33:Pre-Test Rear Underbody View

Figure A-34: Post-Test Rear Underbody View

Figure A-35: Pre-Test Fuel Filler Cap View

Figure A-36: Post-Test Fuel Filler Cap View

Figure A-37: Impact View

Figure A-38: Speed Trap View

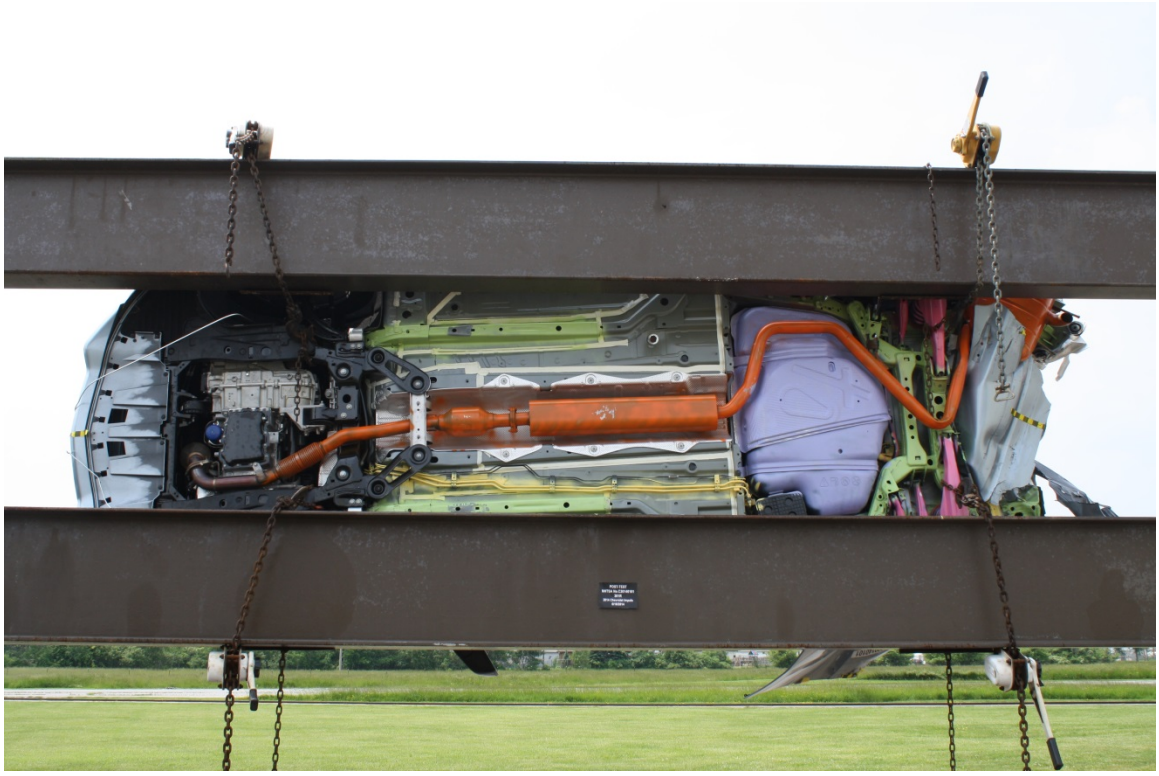


Figure A-39: Rollover 90° View

Figure A-40: Rollover 180° View

Figure A-41: Rollover 270° View

Figure A-42: Rollover 360° View