REPORT NUMBER: 301-MGA-2011-003

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

GENERAL MOTORS LLC
2011 CHEVROLET CRUZE
NHTSA NUMBER: CB0103

PREPARED BY:
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BURLINGTON, WI 53105

Test Date: June 7, 2011

Final Report Date: June 23, 2011

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
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ENFORCEMENT
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COTR, Rear Impact

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Technical Report Documentation Page

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16. Abstract A rear impact was conducted on a 2011 Chevrolet Cruze at MGA Research Corporation on June 7, 2011. This test was conducted to obtain data indicant of FMVSS 301R. The impact velocity was 78.5 km/h. The ambient temperature at the time of impact was 35 degrees Celsius.			
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SECTION 1

PURPOSE AND SUMMARY OF TEST

PURPOSE

This rear impact test is sponsored by the National Highway Traffic Safety Administration (NHTSA) under contract number DTNH22-06-C-00030. The purpose of this test is to reduce deaths and injuries occurring from fires that result from fuel spillage during and after motor vehicle crashes and resulting from ingestion of fuels during siphoning.

SUMMARY

A 2011 Chevrolet Cruze was impacted by a Moving Deformable Barrier (MDB) at a velocity of 78.5 km/h. The test was performed at MGA Research Corporation on June 7, 2011. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and five high-speed cameras were used to document the impact event.

- Left Rear Half 1000 fps
- Right Rear Half 1000 fps
- Left Overall 1000 fps
- Overhead Overall 1000 fps
- Right Overall 1000 fps
- Real Time Pan 30 fps

Two ballast 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.

There was no Stoddard Solvent leakage after the event or during any phase of the static rollover.

The vehicle appeared to comply with all the requirements of FMVSS No. 301 “Fuel System Integrity.”

SECTION 2

DATA SHEETS

DATA SHEET NO. 1

TEST VEHICLE SPECIFICATIONS

Test Vehicle: 2011 Chevrolet Cruze NHTSA No.: CB0103
Test Program: FMVSS 301 Fuel System Integrity Test Date: 6/7/2011

TEST VEHICLE INFORMATION

Manufacturer	General Motors LLC
Model	Cruze
Body Style	Passenger Car
Major Options	None
NHTSA No.	CB0103
VIN	1G1PD5SH8B7171987
Color	Silver Ice Metallic
Delivery Date	5/24/11
Odometer Reading (mile)	9
Dealer	Ray Chevrolet
Transmission	Manual
Final Drive	Front Wheel Drive
Number of Cylinders	4
Engine Displacement (L)	1.8
Engine Placement	Lateral

DATA FROM VEHICLE'S CERTIFICATION LABEL

Manufactured By	General Mototrs LLC
Date of Manufacture	01/11

GVWR (kg)	1824
GAWR Front (kg)	946
GAWR Rear (kg)	878

VEHICLE CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				412
Number of Occupants x 68 kg.				340
Cargo Wt. (RCLW) (kg)				72

DATA SHEET NO. 1 (continued)

TEST VEHICLE SPECIFICATIONS

Test Vehicle:	2011 Chevrolet Cruze	NHTSA No.:	CB0103
Test Program:	FMVSS 301 Fuel System Integrity	Test Date:	6/7/2011

DATA FROM VEHICLE'S TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	P215/60R16	P215/60R16
Recommended Load Range	94S	94S
Tire Size on Vehicle	P215/60R16	P215/60R16
Tire Manufacturer	Firestone	Firestone
Location of Placard of Vehicle	Lower B-Pillar	
Type of Spare Tire (full size/space saver)	None	

DATA SHEET NO. 2

PRE-TEST DATA

Test Vehicle: 2011 Chevrolet Cruze NHTSA No.: CB0103
Test Program: FMVSS 301 Fuel System Integrity Test Date: 6/7/2011

WEIGHT OF TEST VEHICLE

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	428.7	278.1		473.1	342.0	
Right	kg	412.3	274.0		454.1	337.5	
Ratio	%	60.4	39.6		57.7	42.3	
Totals	kg	841.0	552.1	1393.1	927.2	679.5	1606.7

CALCULATION OF TARGET TEST WEIGHT (TTW)

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1393.1
Rated Cargo/Luggage Weight (RCLW)	kg	72
Weight of 2 P572E ATDs	kg	148
Calculated Vehicle Target Weight (TVTW)	kg	1613.1

Vehicle Wheelbase	2695 mm
Vehicle Width	1785 mm
Weight of Ballast Secured in Rear Seat	73.0 kg
Method of Securing Ballast	Ratchet Straps
Vehicle Components Removed for Weight Reduction	None

VEHICLE ATTITUDES

	Units	LF	RF	LR	RR
As Delivered	mm	705	708	708	713
As Tested	mm	691	695	678	686

DATA SHEET NO. 2 (continued)

PRE-TEST DATA

Test Vehicle:	2011 Chevrolet Cruze	NHTSA No.:	CB0103
Test Program:	FMVSS 301 Fuel System Integrity	Test Date:	6/7/2011

FUEL SYSTEM DATA

	Units: Liters
Usable Capacity of "Standard Tank" (Owner's Manual)	59.0
Usable Capacity Figure Furnished by COTR	59.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	54.3 to 55.6
Actual Test Volume (entire fuel system filled)	54.9

Test Fluid Type	Stoddard Solvent
Test Fluid Kinematic Viscosity (centistokes)	2.1 cSt @ 20° C
Test Fluid Color	Purple
Type of Vehicle Fuel Pump	Electrical
Activate Electric Fuel Pump Operation with Ignition Switch ON, but Engine OFF	Yes

Comments (noticeable attributes of fuel system components, capacity, etc.)	None

DATA SHEET NO. 3

MOVING BARRIER DATA

Test Vehicle: 2011 Chevrolet Cruze NHTSA No.: CB0103
Test Program: FMVSS 301 Fuel System Integrity Test Date: 6/7/2011

MOVING BARRIER'S TEST WEIGHT

	Units	Front	Rear	Total
Left	kg	374.2	308.8	
Right	kg	389.5	291.2	
Ratio	%	56.0	44.0	
Totals	kg	763.7	600.0	1363.7

Tires (Mfr, line, size)	Kumho
Tire Pressure (kPa)	207
Brake Abort System (Yes/No)?	Yes
Date of Last Calibration	8/6/2008

DATA SHEET NO. 4

POST-TEST DATA

Test Vehicle:	2011 Chevrolet Cruze	NHTSA No.:	CB0103
Test Program:	FMVSS 301 Fuel System Integrity	Test Date:	6/7/2011

IMPACT VELOCITY

	Units: km/h
Required Impact Velocity	80.0
Actual Impact Velocity (Trap No. 1)	78.5
Actual Impact Velocity (Trap No. 2)	78.5
Average Impact Speed	78.5

Temperature at Time of Impact (°C)	35
Test Time	9.03 am

WELDING ROD IMPACT POINT

	Units: mm
Vertical distance from target center (+ above target / - below target)	16 up
Horizontal distance from target center (+ to the right / - to the left)	4

DATA SHEET NO. 5

STATIC ROLLOVER TEST DATA

Test Vehicle:	2011 Chevrolet Cruze	NHTSA No.:	CB0103
Test Program:	FMVSS 301 Fuel System Integrity	Test Date:	6/7/2011

STODDARD SOLVENT SPILLAGE MEASUREMENT

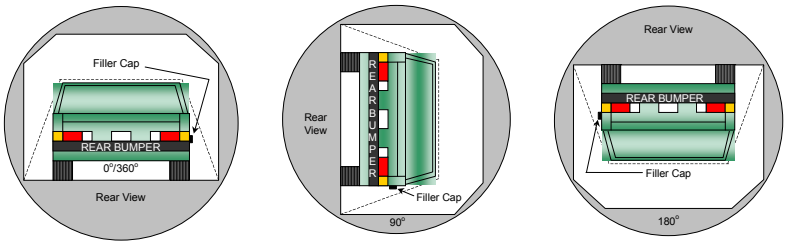
A. From impact until vehicle motion ceases: 0 g
(Maximum Allowable = 28 grams)

B. For the 5 minute period after motion ceases: 0 g
(Maximum Allowable = 28 grams)

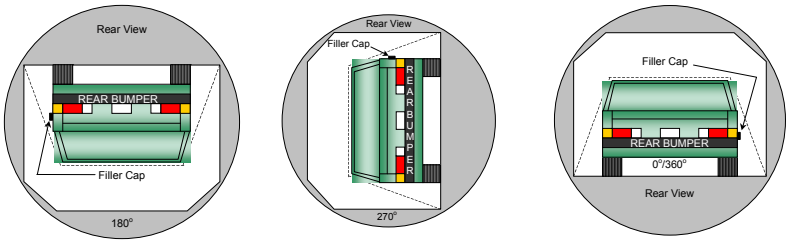
C. For the following 25 minutes: 0 g
(Maximum Allowable = 28 grams/minute)

D. Spillage: **None**

FMVSS 301 STATIC ROLLOVER DATA



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 180 seconds.

2. The position hold time at each position is 300 seconds (minimum).

3. Details of Stoddard Solvent spillage locations: **Not Applicable**

DATA SHEET NO. 5 (continued)

STATIC ROLLOVER TEST DATA

Test Vehicle: 2011 Chevrolet Cruze NHTSA No.: CB0103
Test Program: FMVSS 301 Fuel System Integrity Test Date: 6/7/2011

STODDARD SOLVENT SPILLAGE MEASUREMENT
Hold Time = 5 minutes at all intervals

0° TO 90° Rotation Time (sec) = 119 sec

Test Phase	Spillage (g)	Spillage Details
First 5 minutes from onset of rotation	0	
Sixth minute from onset of rotation	0	
Seventh minute from onset of rotation	0	
Eight minute if required	N/A	

90° TO 180° Rotation Time (sec) = 114 sec

Test Phase	Spillage (g)	Spillage Details
First 5 minutes from onset of rotation	0	
Sixth minute from onset of rotation	0	
Seventh minute from onset of rotation	0	
Eight minute if required	N/A	

180° TO 270° Rotation Time (sec) = 107 sec

Test Phase	Spillage (g)	Spillage Details
First 5 minutes from onset of rotation	0	
Sixth minute from onset of rotation	0	
Seventh minute from onset of rotation	0	
Eight minute if required	N/A	

270° TO 360° Rotation Time (sec) = 115 sec

Test Phase	Spillage (g)	Spillage Details
First 5 minutes from onset of rotation	0	
Sixth minute from onset of rotation	0	
Seventh minute from onset of rotation	0	
Eight minute if required	N/A	

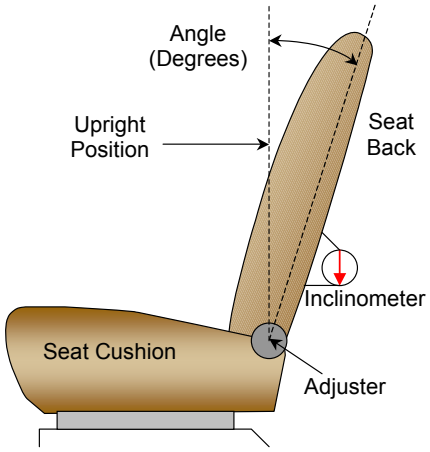
FORM 1

TEST VEHICLE INFORMATION

Test Vehicle:	2011 Chevrolet Cruze	NHTSA No.:	CB0103
Test Program:	FMVSS 301 Fuel System Integrity	Test Date:	6/7/2011

NORMAL DESIGN RIDING POSITION

With the seat in the mid fore-aft seat track position the angle of the driver's seat back when it is in the nominal riding position is set on headrest post at 8.5 degrees.



FRONT SEAT ASSEMBLY

Driver Seat Back Angle	9.0° at headrest post
Passenger Seat Back Angle	9.0° at headrest post

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	270 mm	135 mm
Passenger Seat	260 mm	130 mm

D-RING ADJUSTMENT

The driver and passenger D-rings were full up.

STEERING COLUMN ADJUSTMENT

The steering column was placed in the mid position.

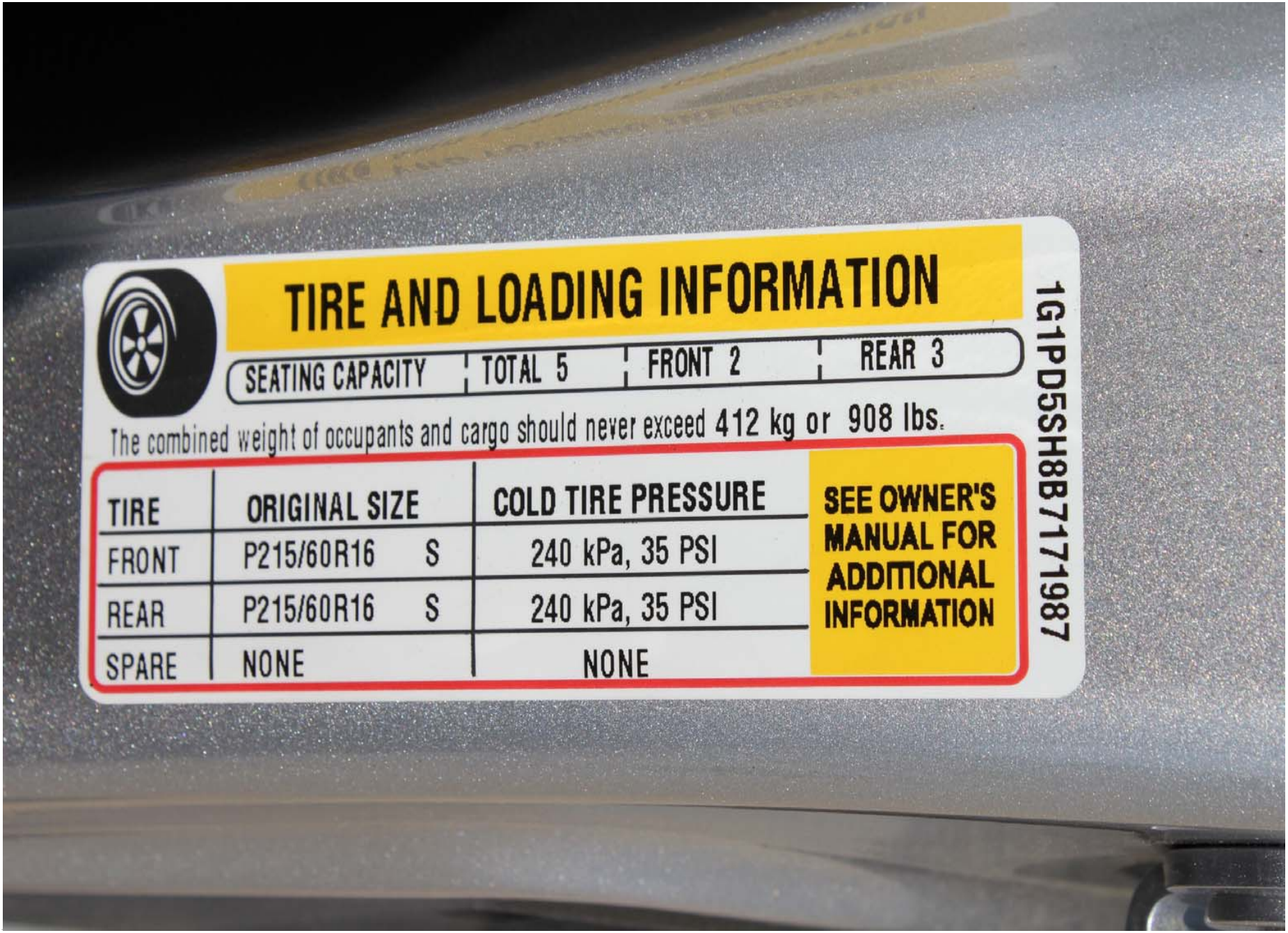
APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

A-1.

Vehicle's Certification Label



Vehicle's Tire Placard

Pre-Test Front View of Vehicle

Post-Test Front View of Vehicle

Pre-Test Left Side View of Vehicle

Post-Test Left Side View of Vehicle

Pre-Test Left Rear Close-up View of Vehicle

Post-Test Left Rear Close-up View of Vehicle

Pre-Test Right Side View of Vehicle

Post-Test Right Side View of Vehicle

Pre-Test Right Rear Close-up View Vehicle

Post-Test Right Rear Close-up View of Vehicle

Pre-Test Rear View of Vehicle

Post-Test Rear View of Vehicle

Pre-Test ¾ Frontal View From Right Side of Vehicle

Post-Test ¾ Frontal View From Right Side of Vehicle

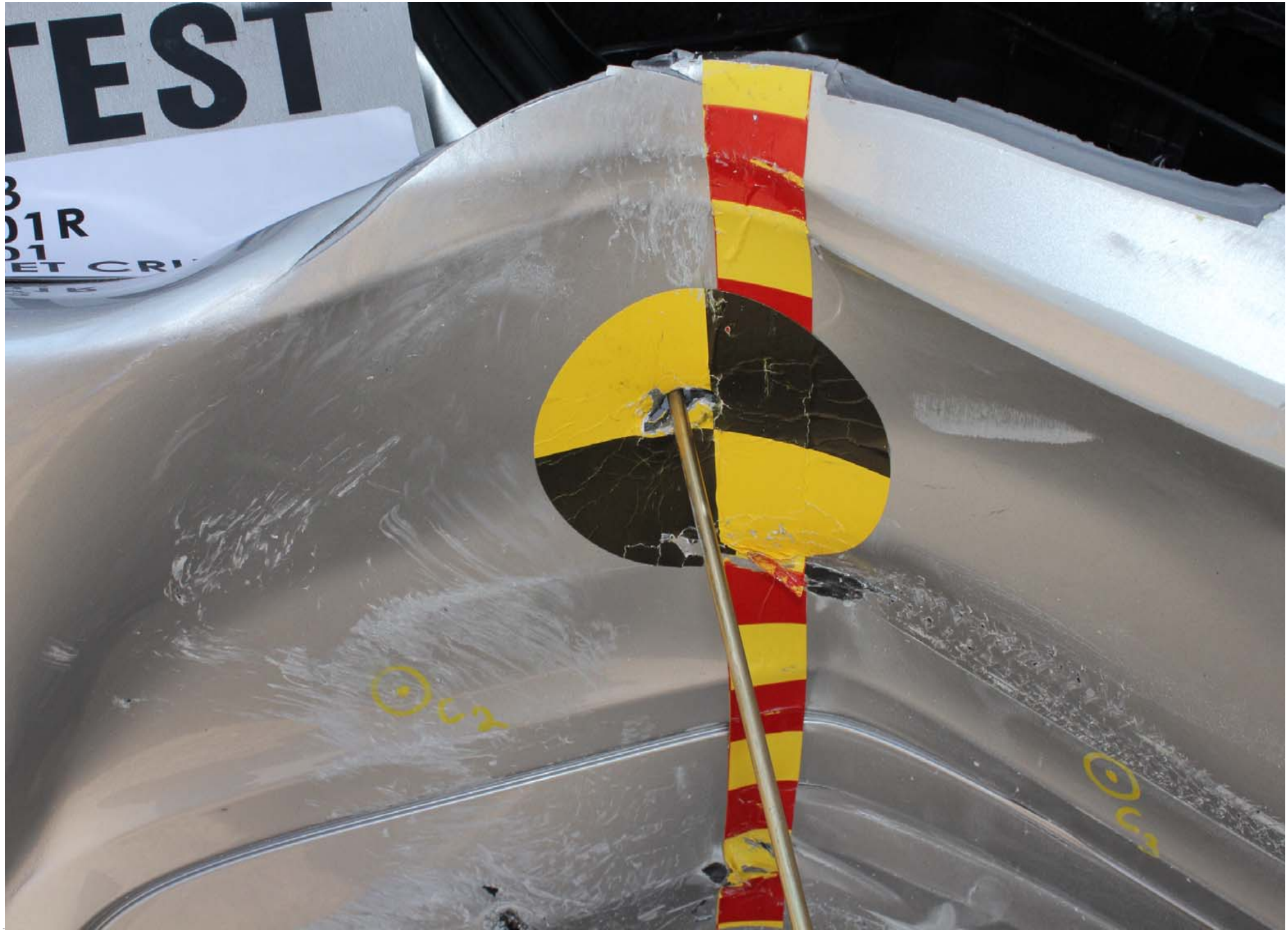
Pre-Test ¾ Rear View From Right Side of Vehicle

Post-Test ¾ Rear View From Right Side of Vehicle

Pre-Test ¾ Rear View From Left Side of Vehicle

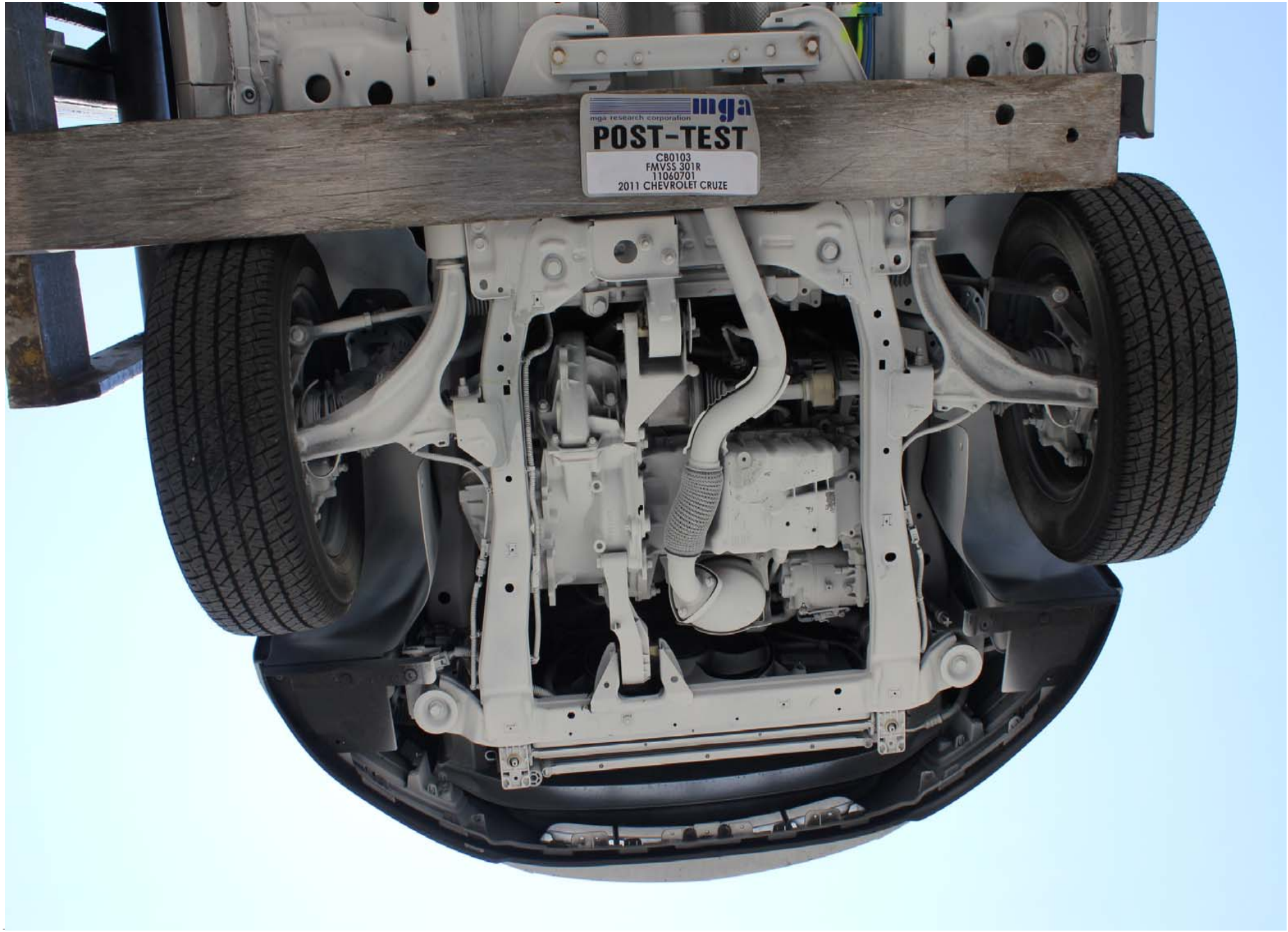
Post-Test ¾ Rear View From Left Side of Vehicle

Pre-Test Impact Point



Post-Test Impact Point

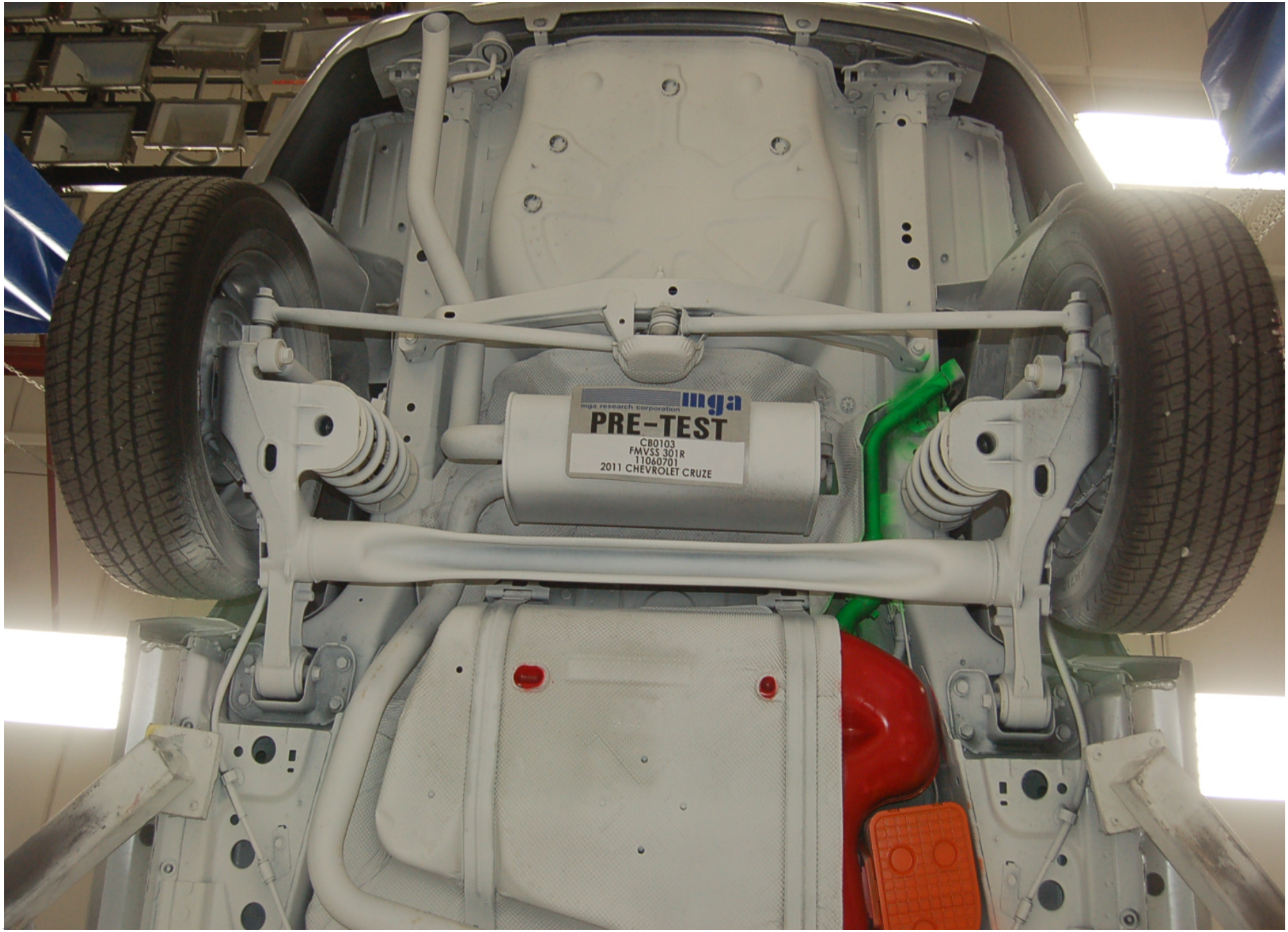
Pre-Test Underbody View 1



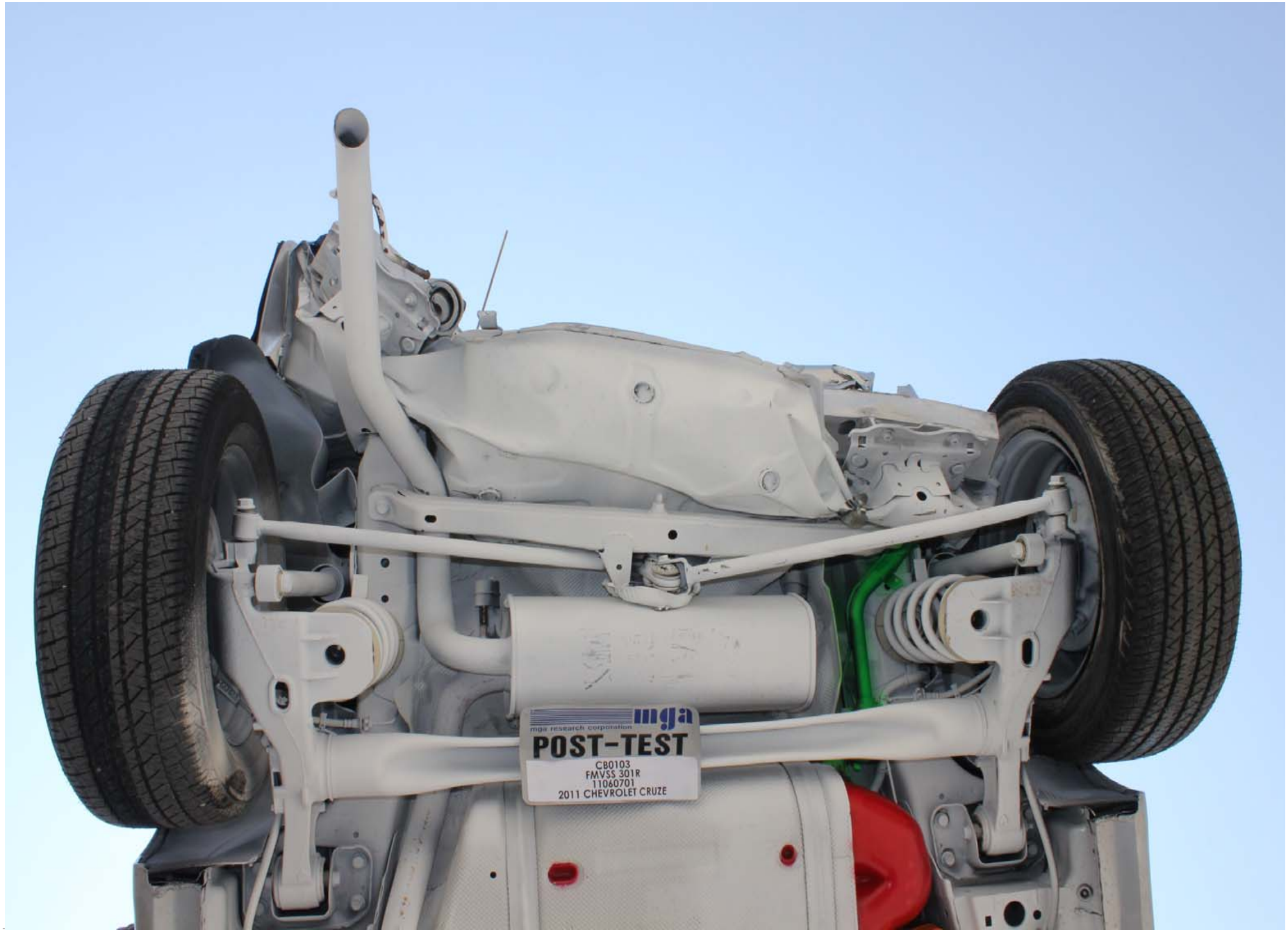
Post-Test Underbody View 1

Pre-Test Underbody View 2

Post-Test Underbody View 2



Pre-Test Underbody View 3



Post-Test Underbody View 3

Pre-Test Front View of MDB

Post-Test Front View of MDB

Pre-Test ¾ Right Side View of MDB

Post-Test ¾ Right Side View of MDB

Pre-Test ¾ Left Side View of MDB

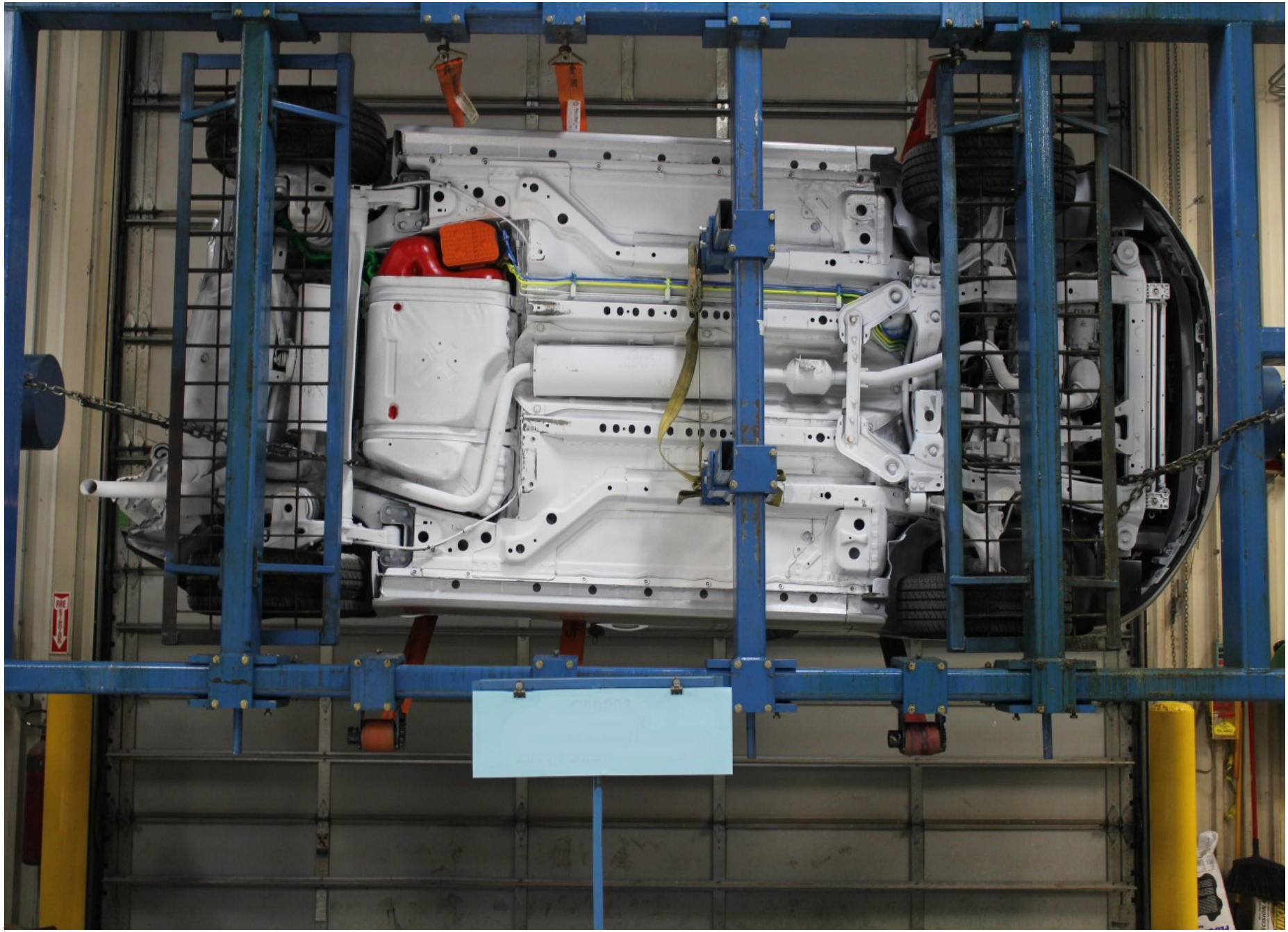
Post-Test ¾ Left Side View of MDB

Pre-Test Top View of MDB

Post-Test Top View of MDB

Static Rollover at 90 Degrees

Static Rollover at 180 Degrees



Static Rollover at 270 Degrees

Static Rollover at 360 Degrees