

REPORT NUMBER: 301-MGA-2011-004

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

**FORD MOTOR CO.
2011 FORD EXPLORER XLT
NHTSA NUMBER: CB0203**

**PREPARED BY:
MGA RESEARCH CORPORATION
5000 WARREN ROAD
BURLINGTON, WI 53105**



Test Date: June 7, 2011

Final Report Date: June 23, 2011

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVENUE, S.E., NVS-220
WASHINGTON, D.C. 20590**

Technical Report Documentation Page

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				14. Sponsoring Agency Code NVS-220	
15. Supplementary Notes					
16. Abstract A rear impact was conducted on a 2011 Ford Explorer XLT at MGA Research Corporation on June 7, 2011. This test was conducted to obtain data indicant of FMVSS 301R. The impact velocity was 78.8 km/h. The ambient temperature at the time of impact was 35 degrees Celsius.					
17. Key Words Fuel System Integrity Test 2011 Ford Explorer XLT NHTSA No: CB0203				18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Admin., Technical Ref. Division, 1200 New Jersey Avenue, SE Washington, D.C. 20590	
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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 Ford Explorer XLT was impacted by a Moving Deformable Barrier (MDB) at a velocity of 78.8 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 Ford Explorer XLT NHTSA No.: CB0203
 Test Program: FMVSS 301 Fuel System Integrity Test Date: 6/7/2011

TEST VEHICLE INFORMATION

Manufacturer	Ford Motor Co.
Model	Explorer XLT
Body Style	Truck
Major Options	None
NHTSA No.	CB0203
VIN	1FMHK7D89BGA14944
Color	Kona Blue Metallic
Delivery Date	5/24/11
Odometer Reading (mile)	54
Dealer	Ed Schmid Ford
Transmission	Automatic
Final Drive	Front Wheel Drive
Number of Cylinders	6
Engine Displacement (L)	3.5
Engine Placement	Lateral

DATA FROM VEHICLE'S CERTIFICATION LABEL

Manufactured By	Ford Motor Co.
Date of Manufacture	01/11

GVWR (kg)	2794
GAWR Front (kg)	1397
GAWR Rear (kg)	1497

VEHICLE CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench	Bench	
Number of Occupants	2	3	2	7
Capacity Wt. (VCW) (kg)				695
Number of Occupants x 68 kg.				476
Cargo Wt. (RCLW) (kg)				219

DATA SHEET NO. 1 (continued)
TEST VEHICLE SPECIFICATIONS

Test Vehicle: 2011 Ford Explorer XLT NHTSA No.: CB0203
 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	P245/60R18	P245/60R18
Recommended Load Range	104H	104H
Tire Size on Vehicle	P245/60R18	P245/60R18
Tire Manufacturer	Michelin	Michelin
Location of Placard of Vehicle	Lower B-Pillar	
Type of Spare Tire (full size/space saver)	Space Saver	

DATA SHEET NO. 2

PRE-TEST DATA

Test Vehicle: 2011 Ford Explorer XLT NHTSA No.: CB0203
 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	565.2	461.8		613.3	545.7	
Right	kg	563.8	445.4		633.2	521.2	
Ratio	%	55.4	44.6		53.9	46.1	
Totals	kg	1129.0	907.2	2036.2	1246.5	1066.9	2313.4

CALCULATION OF TARGET TEST WEIGHT (TTW)

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2036.2
Rated Cargo/Luggage Weight (RCLW)	kg	136
Weight of 2 P572E ATDs	kg	148
Calculated Vehicle Target Weight (TVTW)	kg	2320.2

Vehicle Wheelbase	2863 mm
Vehicle Width	2010 mm
Weight of Ballast Secured on 2 nd Row Seats	136 kg
Method of Securing Ballast	Ratchet Straps
Vehicle Components Removed for Weight Reduction	None

VEHICLE ATTITUDES

	Units	LF	RF	LR	RR
As Delivered	mm	817	817	841	848
As Tested	mm	802	803	830	831

DATA SHEET NO. 2 (continued)

PRE-TEST DATA

Test Vehicle: 2011 Ford Explorer XLT NHTSA No.: CB0203
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)	70.4
Usable Capacity Figure Furnished by COTR	70.4
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	64.7 to 66.2
Actual Test Volume (entire fuel system filled)	65.5

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 Ford Explorer XLT NHTSA No.: CB0203
 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 Ford Explorer XLT NHTSA No.: CB0203
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)	78.8
Actual Impact Velocity (Trap No. 2)	78.8
Average Impact Speed	78.8

Temperature at Time of Impact (°C)	35
Test Time	3:23 pm

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)	2 left

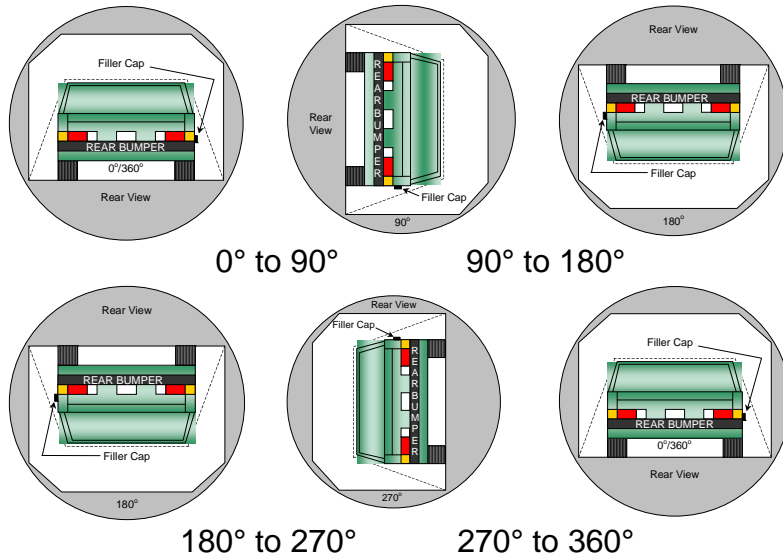
DATA SHEET NO. 5
STATIC ROLLOVER TEST DATA

Test Vehicle: 2011 Ford Explorer XLT NHTSA No.: CB0203
 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



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 Ford Explorer XLT NHTSA No.: CB0203
 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) = 126 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) = 110 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) = 116 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	

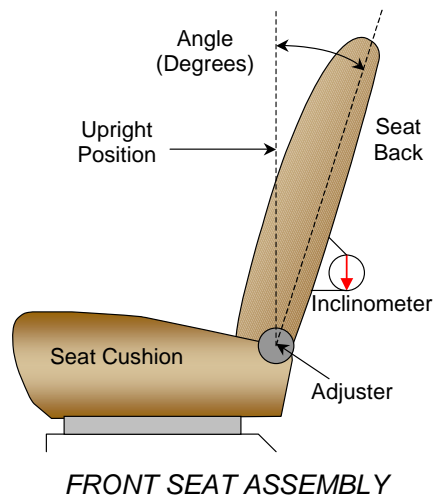
FORM 1
TEST VEHICLE INFORMATION

Test Vehicle: 2011 Ford Explorer XLT
Test Program: FMVSS 301 Fuel System Integrity

NHTSA No.: CB0203
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 head rest post at 16.7 degrees.



Driver Seat Back Angle	17.2° at headrest post
Passenger Seat Back Angle	17.3° at headrest post

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	330 mm	150 mm
Passenger Seat	250 mm	126 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.

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MFD. BY FORD MOTOR CO.

DATE: 01/11

GVWR: 6160LB/ 2794KG

FRONT GAWR: 3080LB

REAR GAWR: 3300LB

1397KG

WITH 1497KG

WITH

P245/60R18 104H

TIRES P245/60R18 104H

TIRES

18X8.0J

RIMS 18X8.0J

RIMS

AT 240 kPa/ 35 PSI COLD AT 240 kPa/ 35 PSI COLD

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

VIN: 1FMHK7D89BGA14944

F0000
T0382

TYPE: Truck



EXT PNT: L6
WB INT TR TP/PS R AXLE TR DSO: SPR BUBIS
113 BL 1201101063362 A 3E J AABB NOA
UTC SUSA-1520472-BA

A-1.

Vehicle's Certification Label



TIRE AND LOADING INFORMATION

SEATING CAPACITY TOTAL : 7 FRONT: 2 REAR: 5

The combined weight of occupants and cargo should never exceed : **695 kg or 1533 lbs.**

▽ 5U5A-1532-AA (TLU)

TIRE	SIZE	COLD TIRE PRESSURE
FRONT	P245/60R18 104H	240 KPA, 35 PSI
REAR	P245/60R18 104H	240 KPA, 35 PSI
SPARE	T165/80D17 115M	415 KPA, 60 PSI

**SEE OWNERS
MANUAL FOR
ADDITIONAL
INFORMATION**

1FMHK7D89BGA14944



Vehicle's Tire Placard

A-3.



Pre-Test Front View of Vehicle

A-4.



Post-Test Front View of Vehicle

A-5.



Pre-Test Left Side View of Vehicle

A-6.



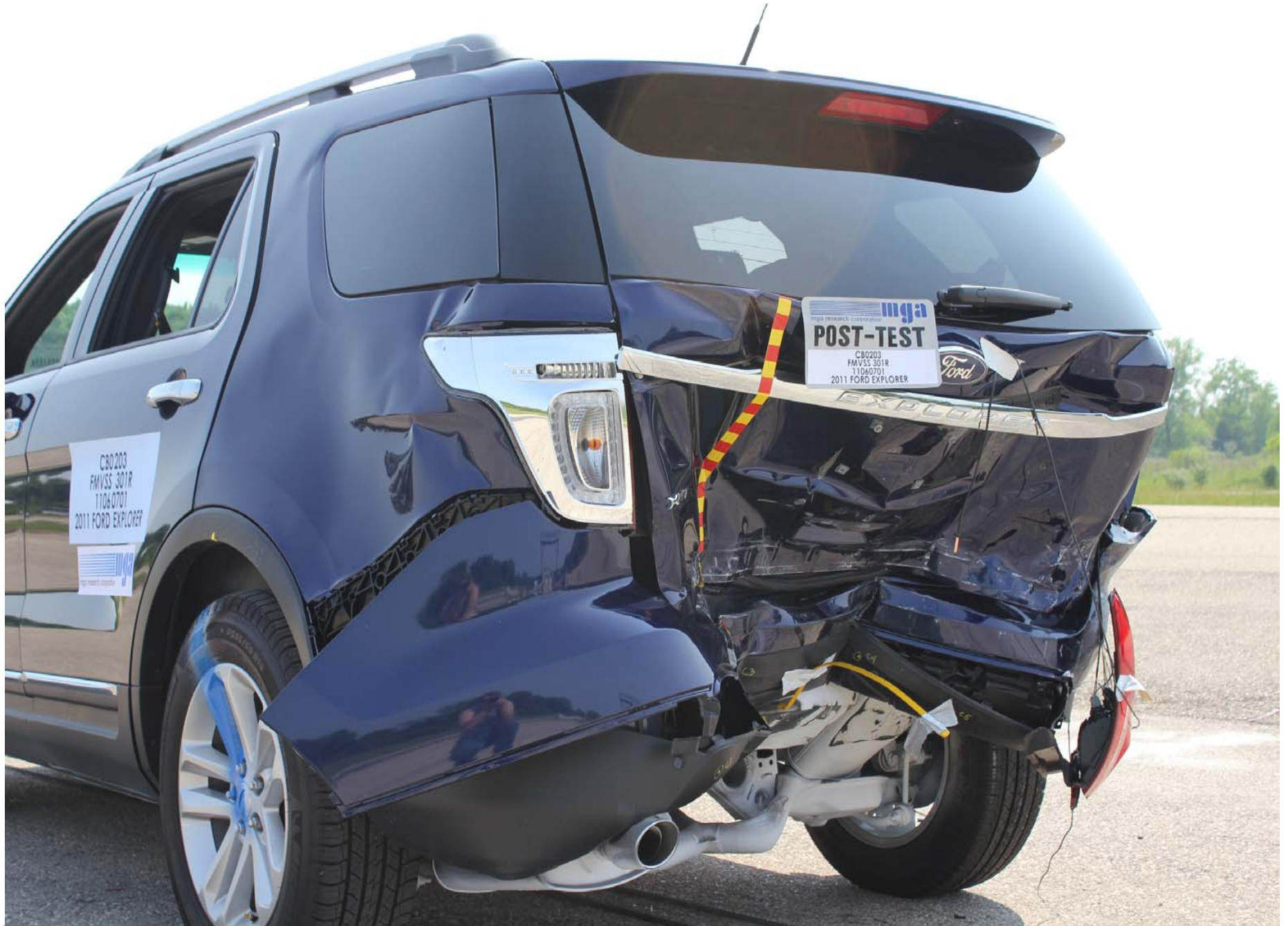
Post-Test Left Side View of Vehicle

A-7.



Pre-Test Left Rear Close-up View of Vehicle

A-8.



Post-Test Left Rear Close-up View of Vehicle

A-9.



Pre-Test Right Side View of Vehicle

A-10.



Post-Test Right Side View of Vehicle

A-11.



Pre-Test Right Rear Close-up View Vehicle

A-12.



Post-Test Right Rear Close-up View of Vehicle

A-13.



Pre-Test Rear View of Vehicle

A-14.



Post-Test Rear View of Vehicle

A-15.



Pre-Test ¼ Frontal View From Right Side of Vehicle

A-16.



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

A-21.

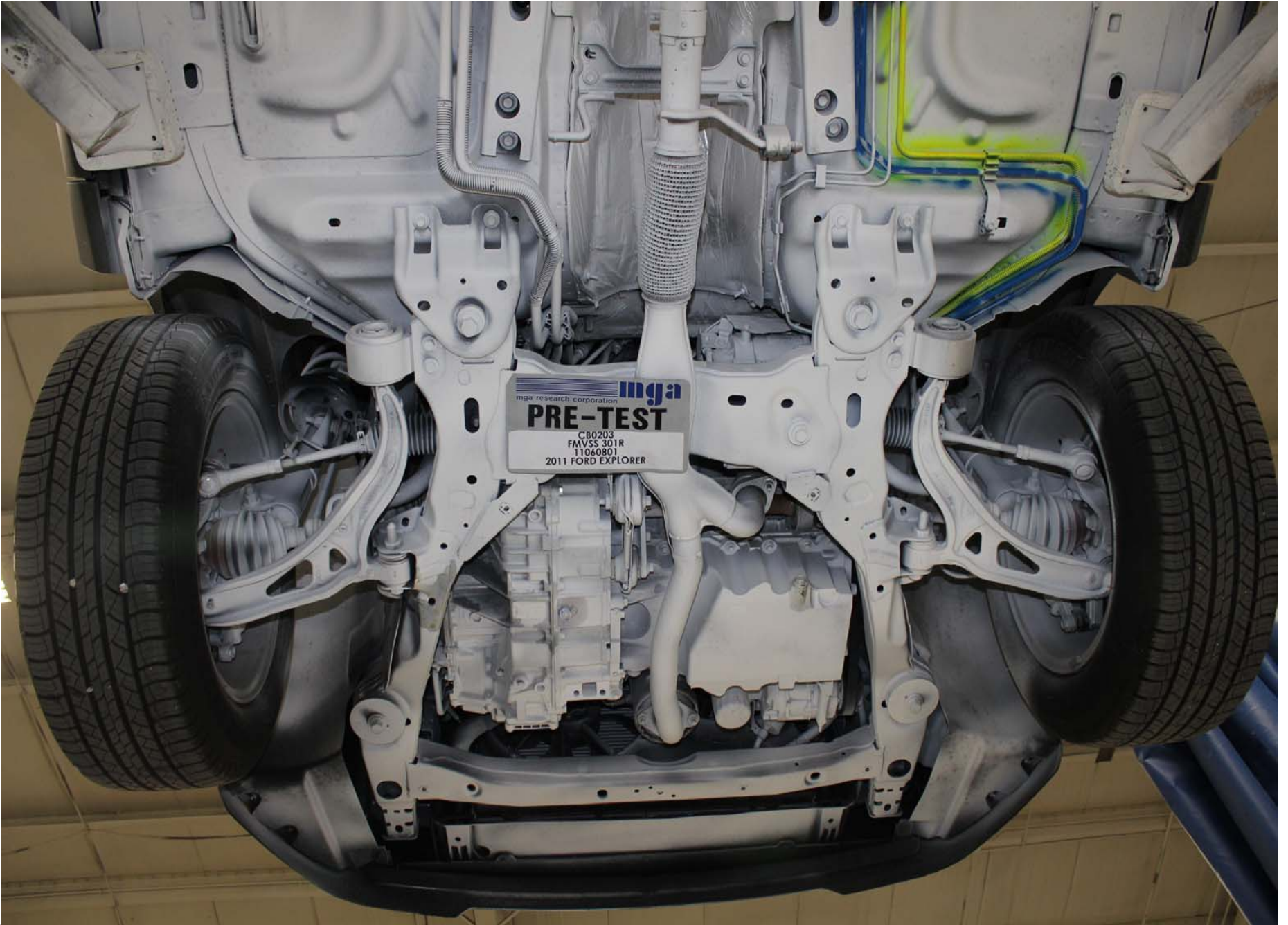


Pre-Test Impact Point



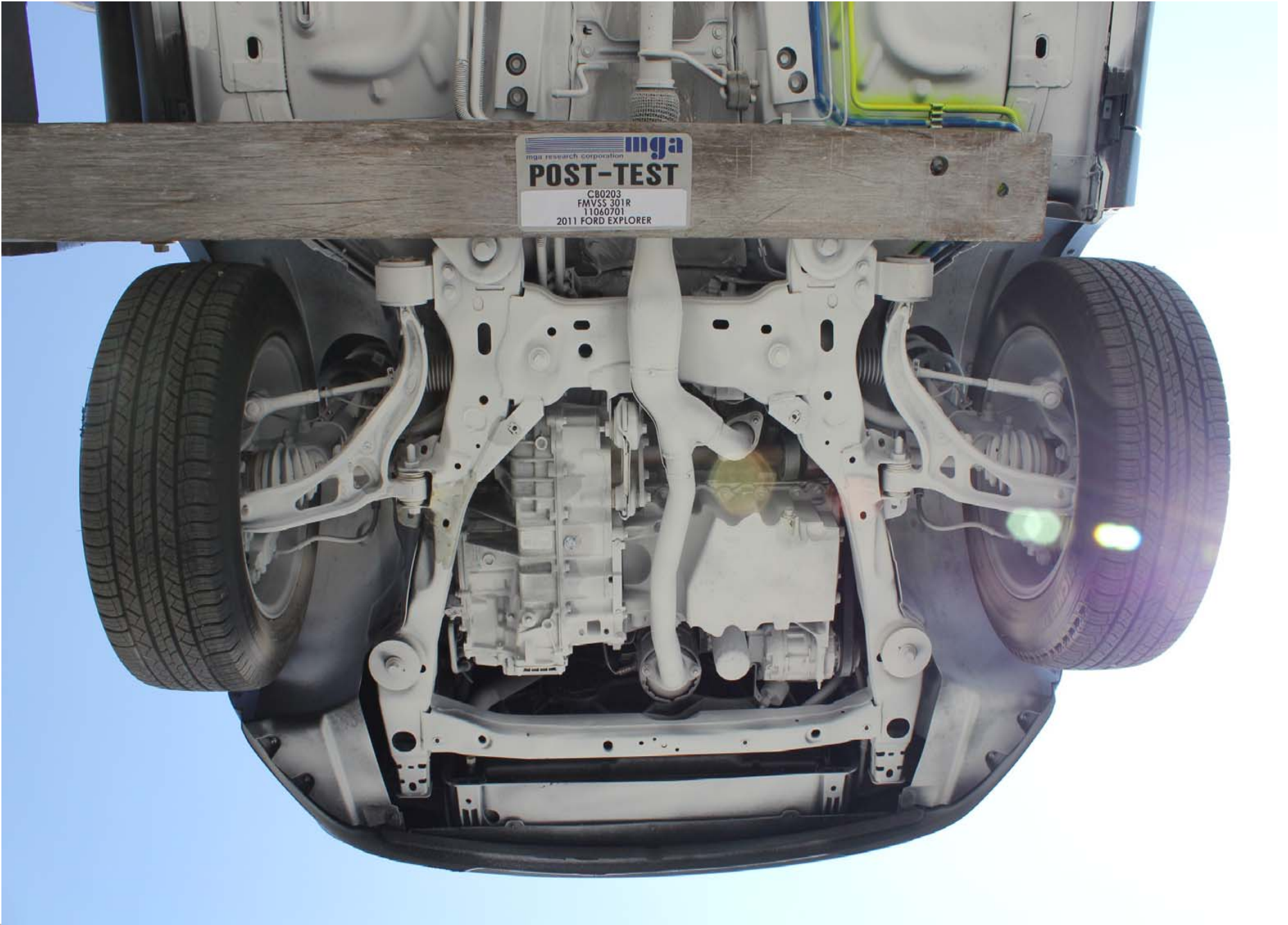
A-22.

Post-Test Impact Point



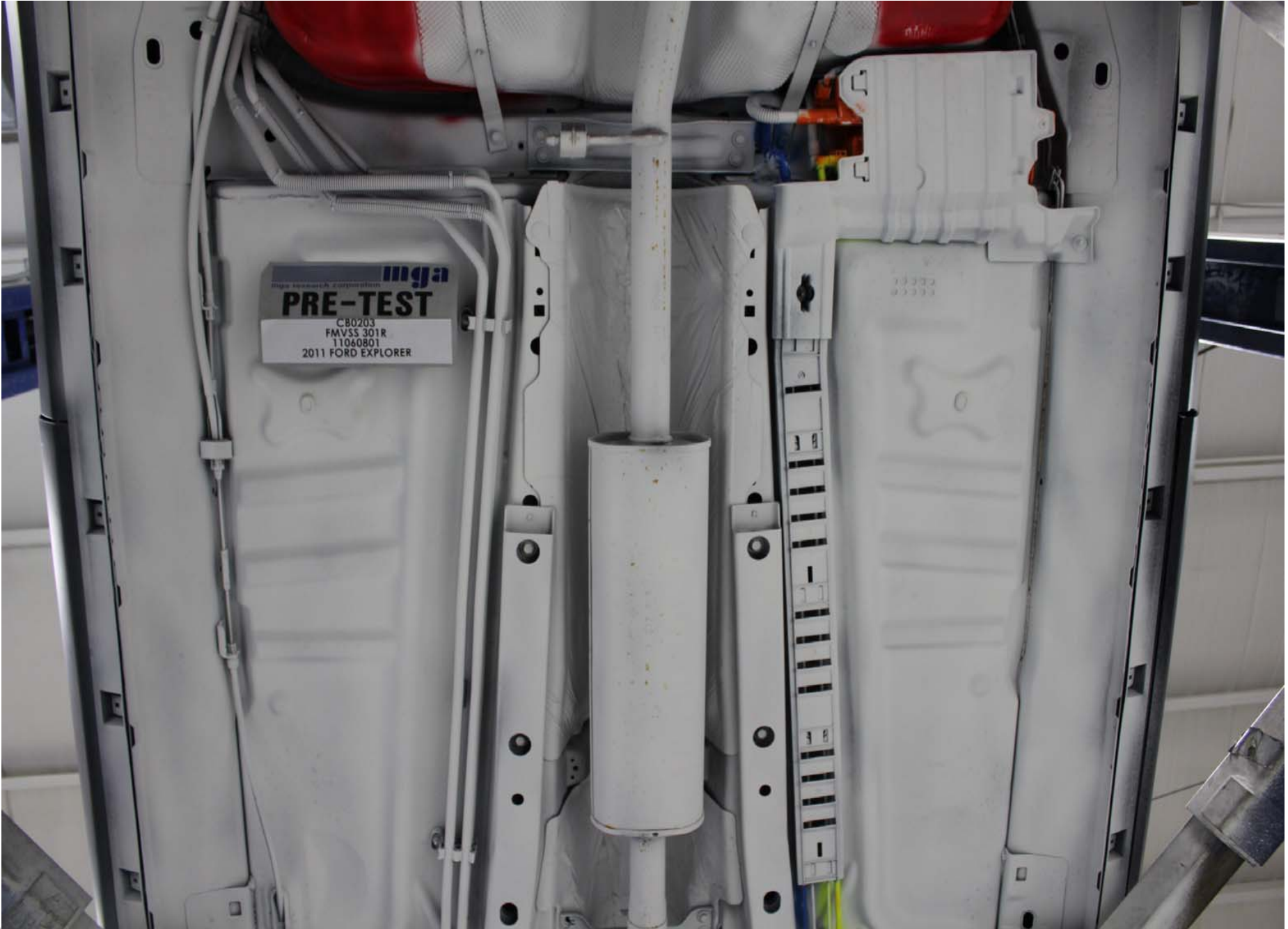
A-23.

Pre-Test Underbody View 1



A-24.

Post-Test Underbody View 1



A-25.

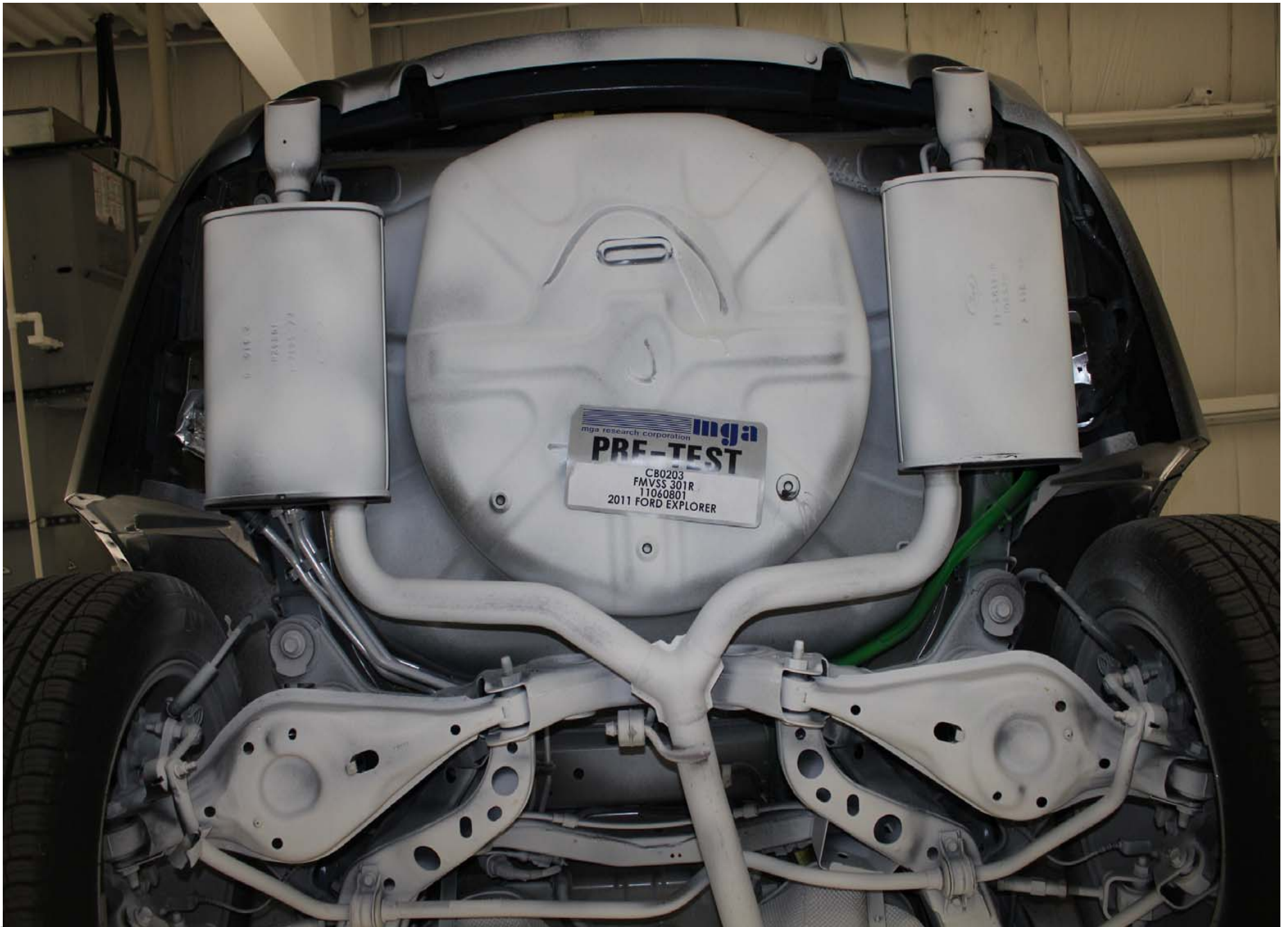
Pre-Test Underbody View 2

A-26.



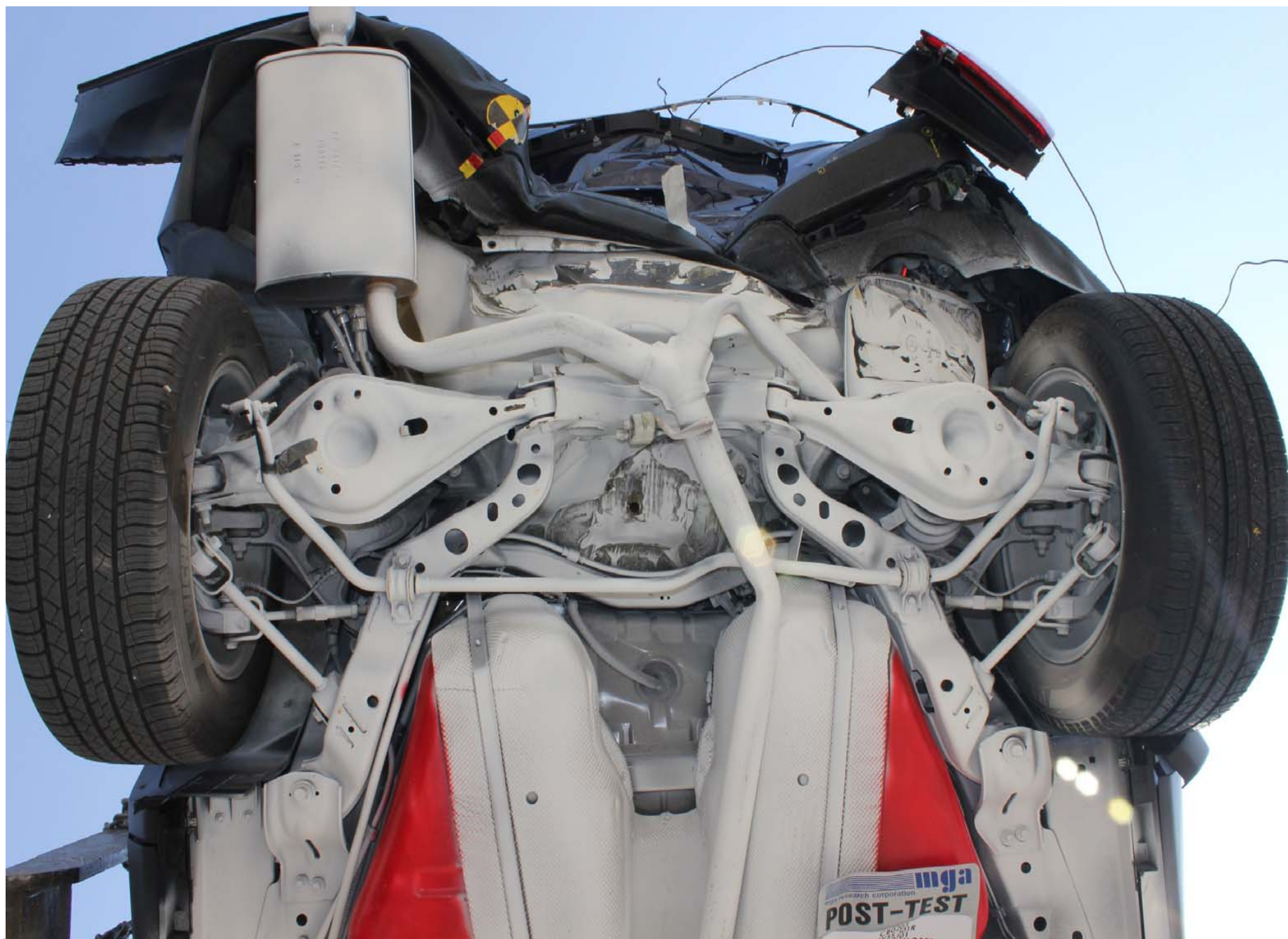
Post-Test Underbody View 2

A-27.



Pre-Test Underbody View 3

A-28.



Post-Test Underbody View 3

A-29.



Pre-Test Front View of MDB

A-30.



Post-Test Front View of MDB

A-31.



Pre-Test $\frac{3}{4}$ Right Side View of MDB

A-32.



Post-Test ¾ Right Side View of MDB

A-33.



Pre-Test $\frac{3}{4}$ Left Side View of MDB



A-34.

Post-Test $\frac{3}{4}$ Left Side View of MDB

A-35.



Pre-Test Top View of MDB

A-36.



Post-Test Top View of MDB



A-37.

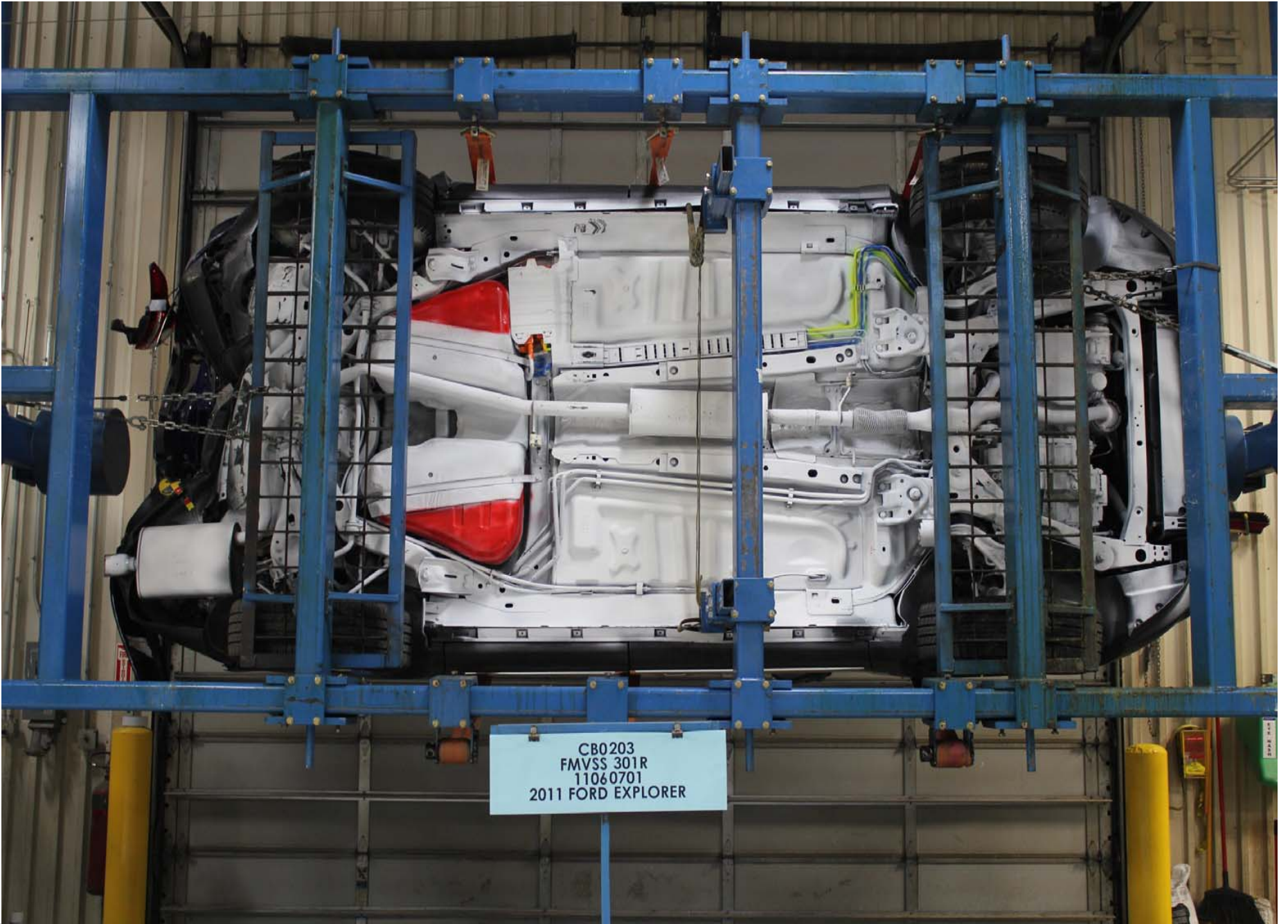
Static Rollover at 90 Degrees

A-38.



Static Rollover at 180 Degrees

A-39.



Static Rollover at 270 Degrees

A-40.



Static Rollover at 360 Degrees