REPORT NUMBER: 301-MGA-2007-001

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

FORD MOTOR COMPANY
2006 FORD EXPEDITION XLT 4X2
NHTSA NUMBER: C60206

PREPARED BY:
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Test Date: April 10, 2007

Final Report Date: May 8, 2007

FINAL REPORT

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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This final test report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, in response to Contract Number DTNH22-06-C-00030.

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Date: 4/13/07

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Date: 4/13/07

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5/8/07
Date of Acceptance

Technical Report Documentation Page

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9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105		*10. Work Unit No.* *11. Contract or Grant No.* DTNH22-06-C-00030	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Enforcement, Office of Vehicle Safety Compliance 400 Seventh Street, SW, Room 6111 Washington, D.C. 20590		*13. Type of Report and Period Covered* Final Report 4/10/07 to 5/08/07 *14. Sponsoring Agency Code* NVS-220	
15. Supplementary Notes			
16. Abstract A rear impact was conducted on a 2006 Ford Expedition XLT 4X2 at MGA Research Corporation on April 10, 2007. This test was conducted to obtain data indicant of FMVSS 301R. The impact velocity was 79.7 km/h. The ambient temperature at the time of impact was 9 degrees Celsius.			
17. Key Words Fuel System Integrity Test 2006 Ford Expedition XLT 4X2 NHTSA No: C60206		*18. Distribution Statement* Copies of this report are available from: National Highway Traffic Safety Admin., Technical Ref. Division, Room 5108 (NPO-230) 400 Seventh Street, S.W. 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 2006 Ford Expedition XLT 4X2 was impacted by a Moving Deformable Barrier (MDB) at a velocity of 79.7 km/h. The test was performed at MGA Research Corporation on April 10, 2007. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

One real-time camera and three high-speed cameras were used to document the impact event. In addition, real-time video was taken of the gas cap closing and static rollover.

- Left Rear Half 1000 fps
- Right Rear Half 1000 fps
- Overhead Rear Half 1000 fps
- Real Time Pan 24 fps

Two ballast Part 572B, 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.

SECTION 2

DATA SHEETS

DATA SHEET NO. 1

TEST VEHICLE SPECIFICATIONS

Test Vehicle: 2006 Ford Expedition XLT 4X2 NHTSA No.: C60206
Test Program: FMVSS 301 Fuel System Integrity Test Date: 4/10/2007

TEST VEHICLE INFORMATION

Manufacturer	Ford
Model	Expedition
Body Style	XLT
Major Options	Reverse Sensing System, Safety Canopy w/Rollover Sensing
NHTSA No.	C60206
VIN	1FMFU15576LA76097
Color	Med. Wedgewood Blue
Delivery Date	1/8/2007
Odometer Reading (mile)	303
Dealer	Jim Bass Ford, Inc.
Transmission	Automatic Overdrive
Final Drive	Rear
Number of Cylinders	8
Engine Displacement (L)	5.4
Engine Placement	Longitudinal

DATA FROM VEHICLE'S CERTIFICATION LABEL

Manufactured By	Ford Motor Company
Date of Manufacture	03/06

GVWR (kg)	3221
GAWR Front (kg)	1429
GAWR Rear (kg)	1872

VEHICLE CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bench	Bench	Bench	
Number of Occupants	3	3	3	9
Capacity Wt. (VCW) (kg)				743
Number of Occupants x 68 kg.				612
Cargo Wt. (RCLW) (kg)				131

DATA SHEET NO. 1 (continued)

TEST VEHICLE SPECIFICATIONS

Test Vehicle:	2006 Ford Expedition XLT 4X2	NHTSA No.:	C60206
Test Program:	FMVSS 301 Fuel System Integrity	Test Date:	4/10/2007

DATA FROM VEHICLE'S TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	300	300
Cold Pressure (kPa)	240	240
Recommended Tire Size	P265/70R17	P265/70R17
Recommended Load Range	113	113
Tire Size on Vehicle	P265/70R17	P265/70R17
Tire Manufacturer	Continental	Continental
Location of Placard of Vehicle	Driver Door Sill, Lower Rear Corner	
Type of Spare Tire (full size/space saver)	Full Size	

DATA SHEET NO. 2

PRE-TEST DATA

Test Vehicle: 2006 Ford Expedition XLT 4X2 NHTSA No.: C60206
Test Program: FMVSS 301 Fuel System Integrity Test Date: 4/10/2007

WEIGHT OF TEST VEHICLE

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	592.9	631.4		622.8	743.4	
Right	kg	600.1	626.0		621.9	736.2	
Ratio	%	48.7	51.3		45.7	54.3	
Totals	kg	1193.0	1257.4	2450.4	1244.7	1479.6	2724.3

CALCULATION OF TARGET TEST WEIGHT (TTW)

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	2450.4
Rated Cargo/Luggage Weight (RCLW)	kg	131
Weight of 2 P572B ATDs	kg	148
Calculated Vehicle Target Weight (TVTW)	kg	2729.4

Vehicle Wheelbase	3018 mm
Weight of Ballast secured in cargo area	147 kg
Method of Securing Ballast	On rearmost seat with ratchet straps
Vehicle Components Removed for Weight Reduction	None

VEHICLE ATTITUDES

	Units	LF	RF	LR	RR
As Delivered	mm	915	914	907	909
As Tested	mm	903	901	889	890

DATA SHEET NO. 2 (continued)

PRE-TEST DATA

Test Vehicle: 2006 Ford Expedition XLT 4X2 NHTSA No.: C60206
Test Program: FMVSS 301 Fuel System Integrity Test Date: 4/10/2007

FUEL SYSTEM DATA

	Units: Liters
Usable Capacity of "Standard Tank" (Owner's Manual)	106.0
Usable Capacity Figure Furnished by COTR	106.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	97.5 to 99.6
Actual Test Volume (entire fuel system filled)	98.0

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: 2006 Ford Expedition XLT 4X2 NHTSA No.: C60206
Test Program: FMVSS 301 Fuel System Integrity Test Date: 4/10/2007

MOVING BARRIER'S TEST WEIGHT

	Units	Front	Rear	Total
Left	kg	400.1	282.6	
Right	kg	370.2	311.0	
Ratio	%	56.5	43.5	
Totals	kg	770.3	593.6	1363.9

Tires (Mfr, line, size)	Yukohoma
Tire Pressure (kPa)	207
Brake Abort System (Yes/No)?	Yes
Date of Last Calibration	11/29/2006

DATA SHEET NO. 4

POST-TEST DATA

Test Vehicle: 2006 Ford Expedition XLT 4X2 NHTSA No.: C60206
Test Program: FMVSS 301 Fuel System Integrity Test Date: 4/10/2007

IMPACT VELOCITY

	Units: km/h
Required Impact Velocity	80.0
Actual Impact Velocity (Trap No. 1)	79.7
Actual Impact Velocity (Trap No. 2)	79.7
Average Impact Speed	79.7

Temperature at Time of Impact (°C)	9
Test Time	10:19 am

WELDING ROD IMPACT POINT

	Units: mm
Vertical distance from target center (+ above target / - below target)	1 mm above
Horizontal distance from target center (+ to the right / - to the left)	17 mm to the right

DATA SHEET NO. 5

STATIC ROLLOVER TEST DATA

Test Vehicle:	2006 Ford Expedition XLT 4X2	NHTSA No.:	C60206
Test Program:	FMVSS 301 Fuel System Integrity	Test Date:	4/10/2007

STODDARD SOLVENT SPILLAGE MEASUREMENT

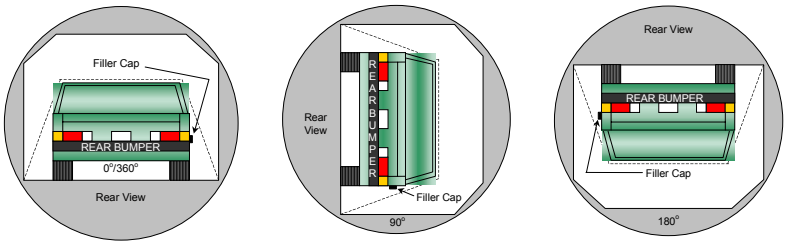
A. From impact until vehicle motion ceases: 0 g
(Maximum Allowable = 28 grams)

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

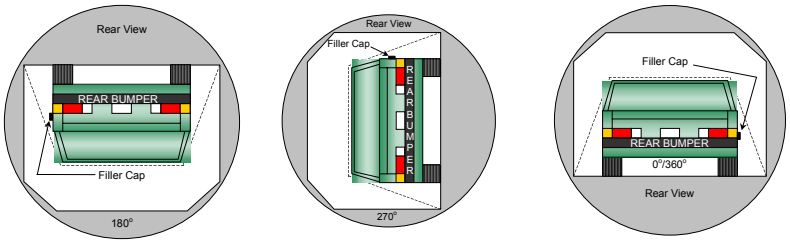
C. For the following 25 minutes: 0 g
(Maximum Allowable = 28 grams/minute)

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: 2006 Ford Expedition XLT 4X2 NHTSA No.: C60206
Test Program: FMVSS 301 Fuel System Integrity Test Date: 4/10/2007

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) = 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	

180° TO 270° 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	

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

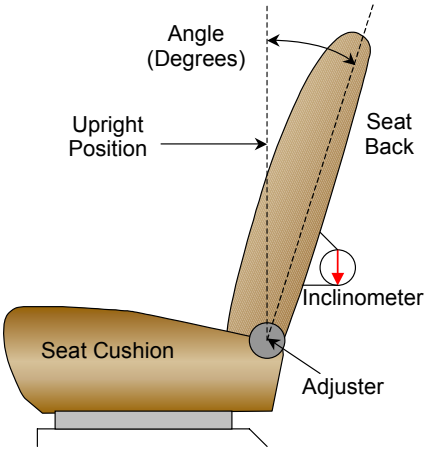
TEST VEHICLE INFORMATION

Test Vehicle:	2006 Ford Expedition XLT 4X2	NHTSA No.:	C60206
Test Program:	FMVSS 301 Fuel System Integrity	Test Date:	4/10/2007

NORMAL DESIGN RIDING POSITION

For both driver and passenger seat backs:

The seat back angle is measured relative to the rockers sill. Remove the seat back panel and position the inclinometer as shown in the drawing, 13 inches above the back pivot point on the rear outboard seat frame. Avoid taking measurements on the reinforcement plates.



FRONT SEAT ASSEMBLY

Driver Seat Back Angle	20.9°
Passenger Seat Back Angle	21.6°

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	250 mm	125 mm
Passenger Seat	180 mm	90 mm

D-RING ADJUSTMENT

The driver and passenger D-rings were placed in the mid position.

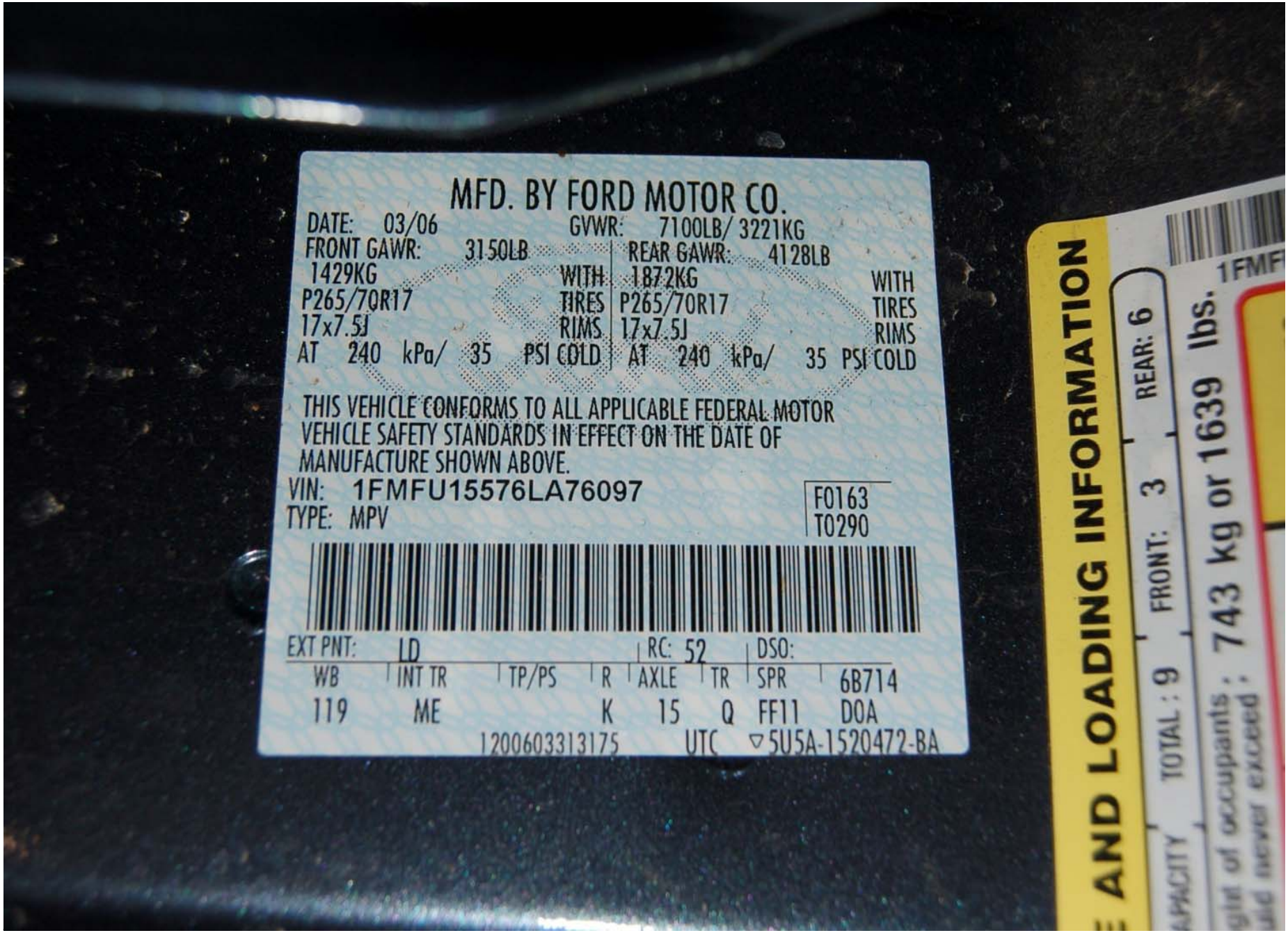
STEERING COLUMN ADJUSTMENT

The steering column was placed in the mid position.

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS



A-1.

Vehicle's Certification Label

A-2.

Vehicle's Tire Placard

Pre-Test Front View of Vehicle

Post-Test Front View of Vehicle

Pre-Test Left Rear Closeup View of Vehicle

Post-Test Left Rear Closeup View of Vehicle

Pre-Test Right Side View of Vehicle

Post-Test Right Side View of Vehicle

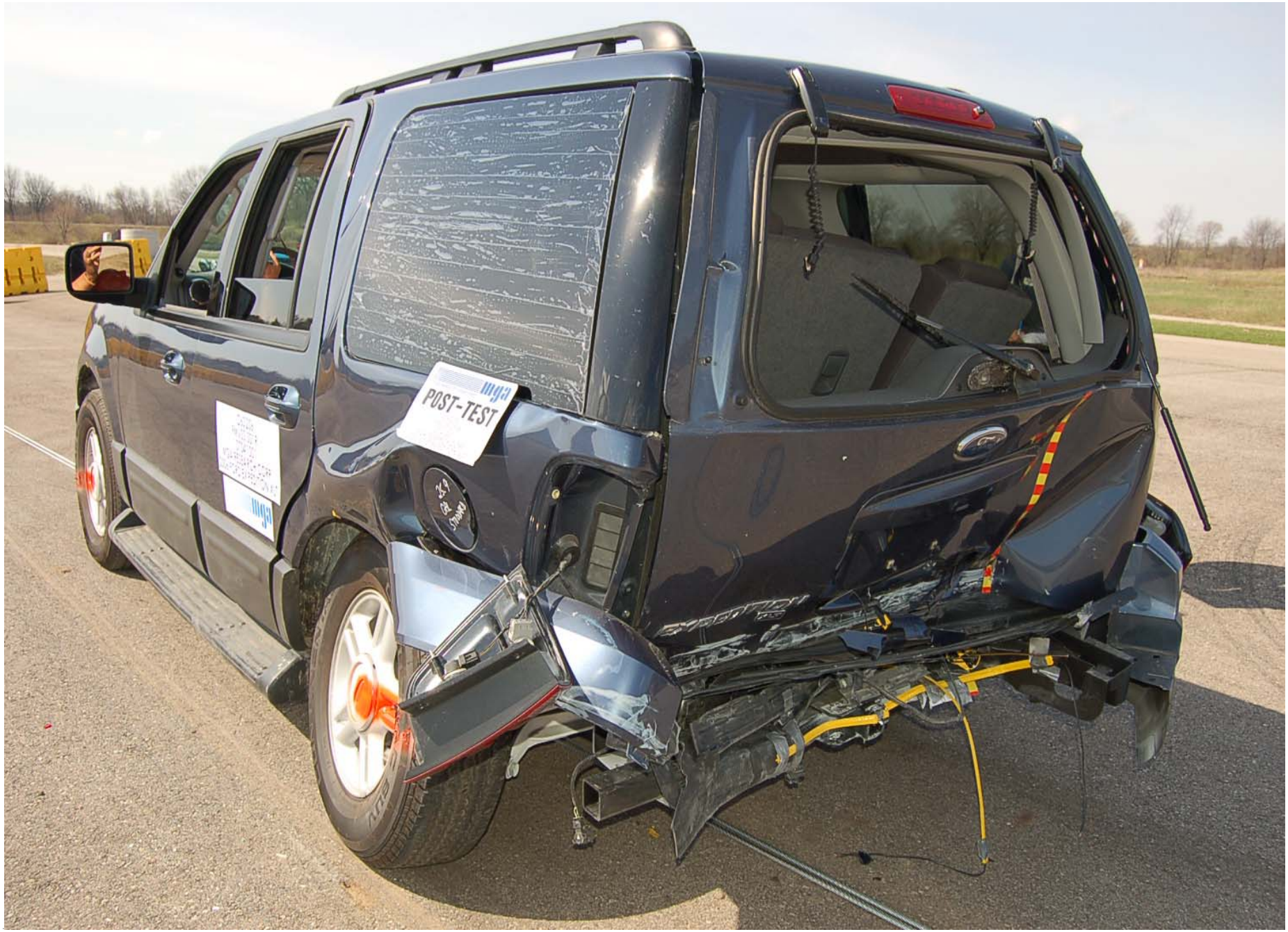
Pre-Test Rear View of Vehicle

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

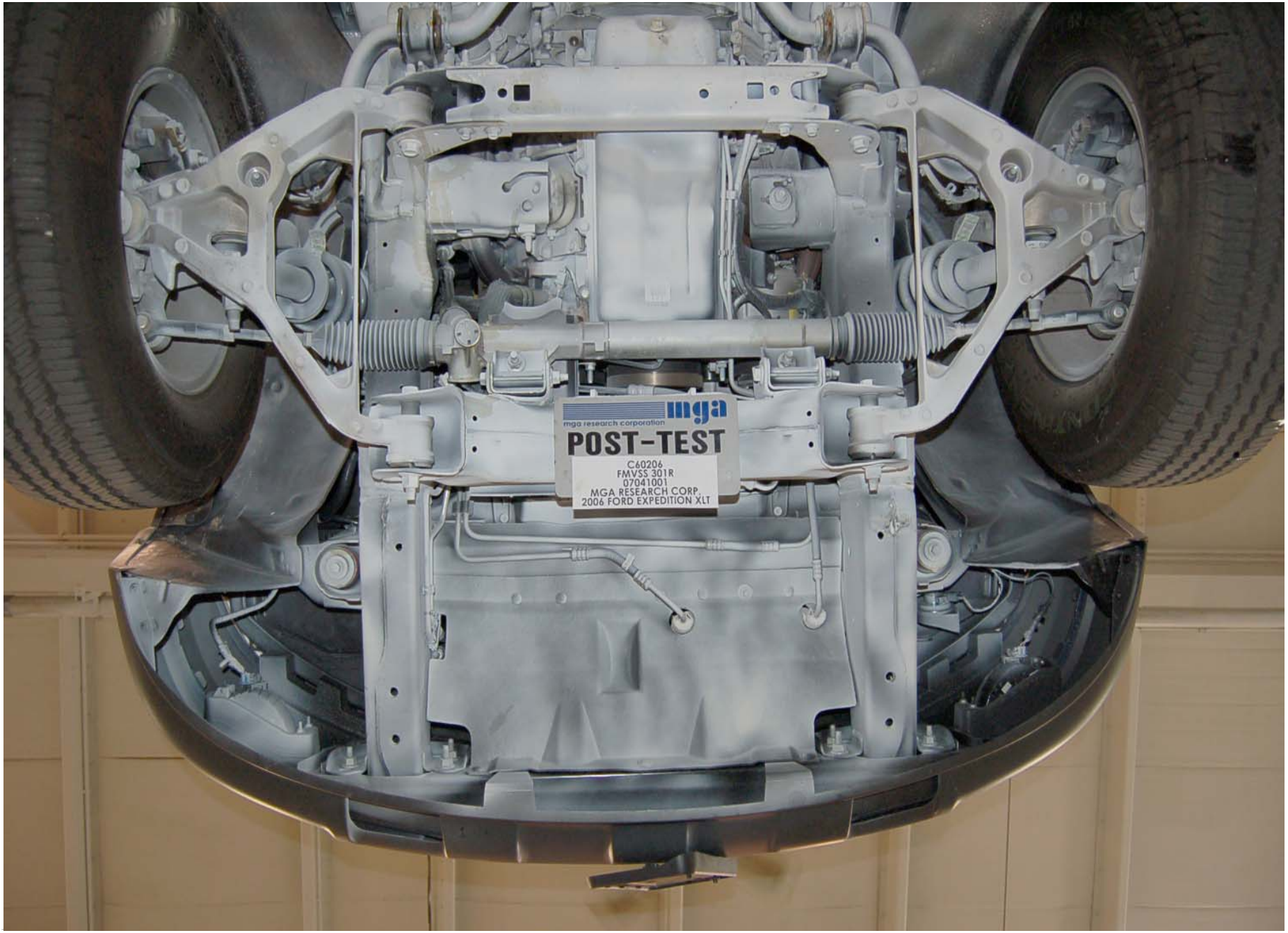
Pre-Test ¾ Rear View From Left Side of Vehicle



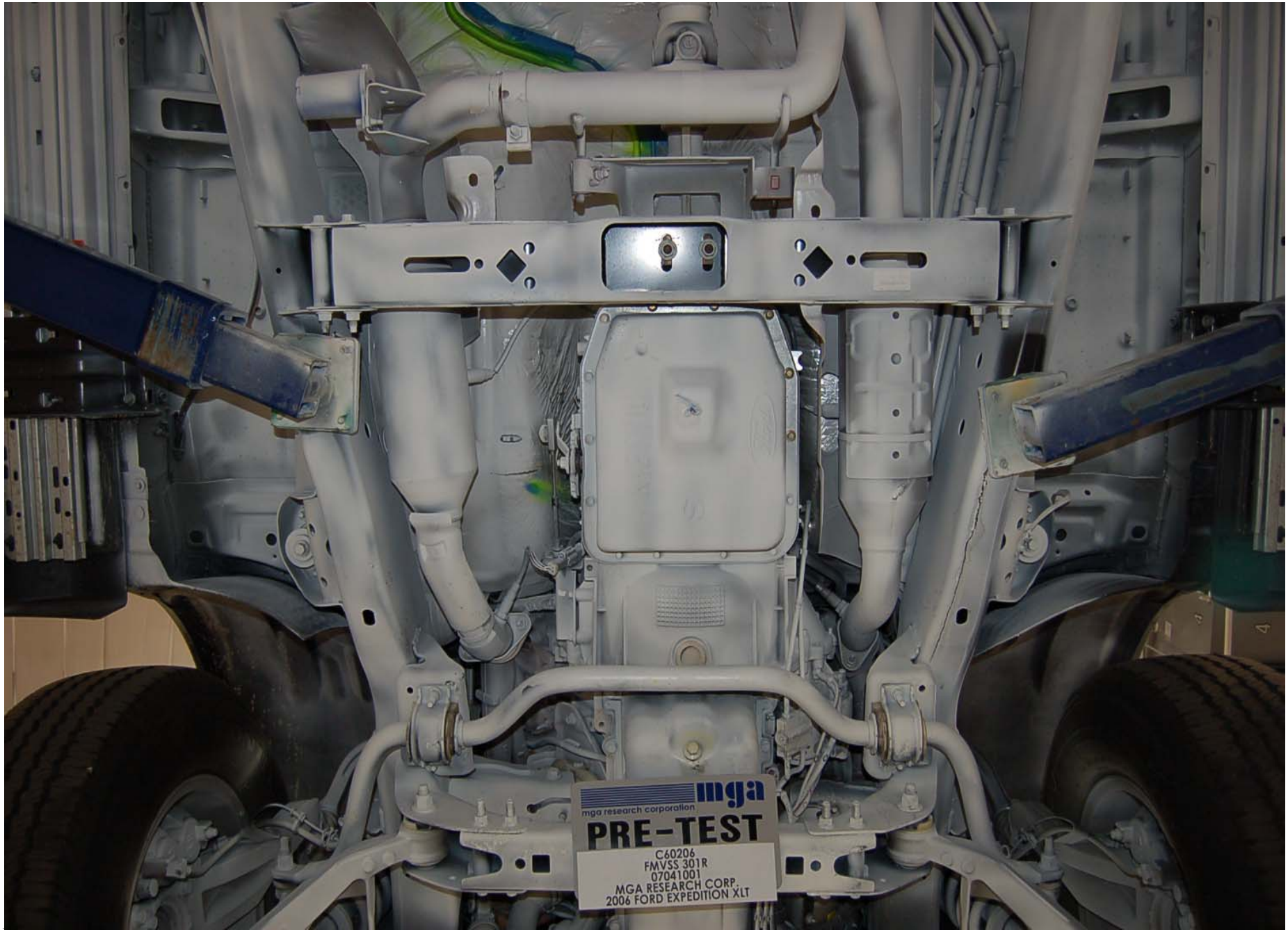
Post-Test ¾ Rear View From Left Side of Vehicle

Post-Test Impact Point

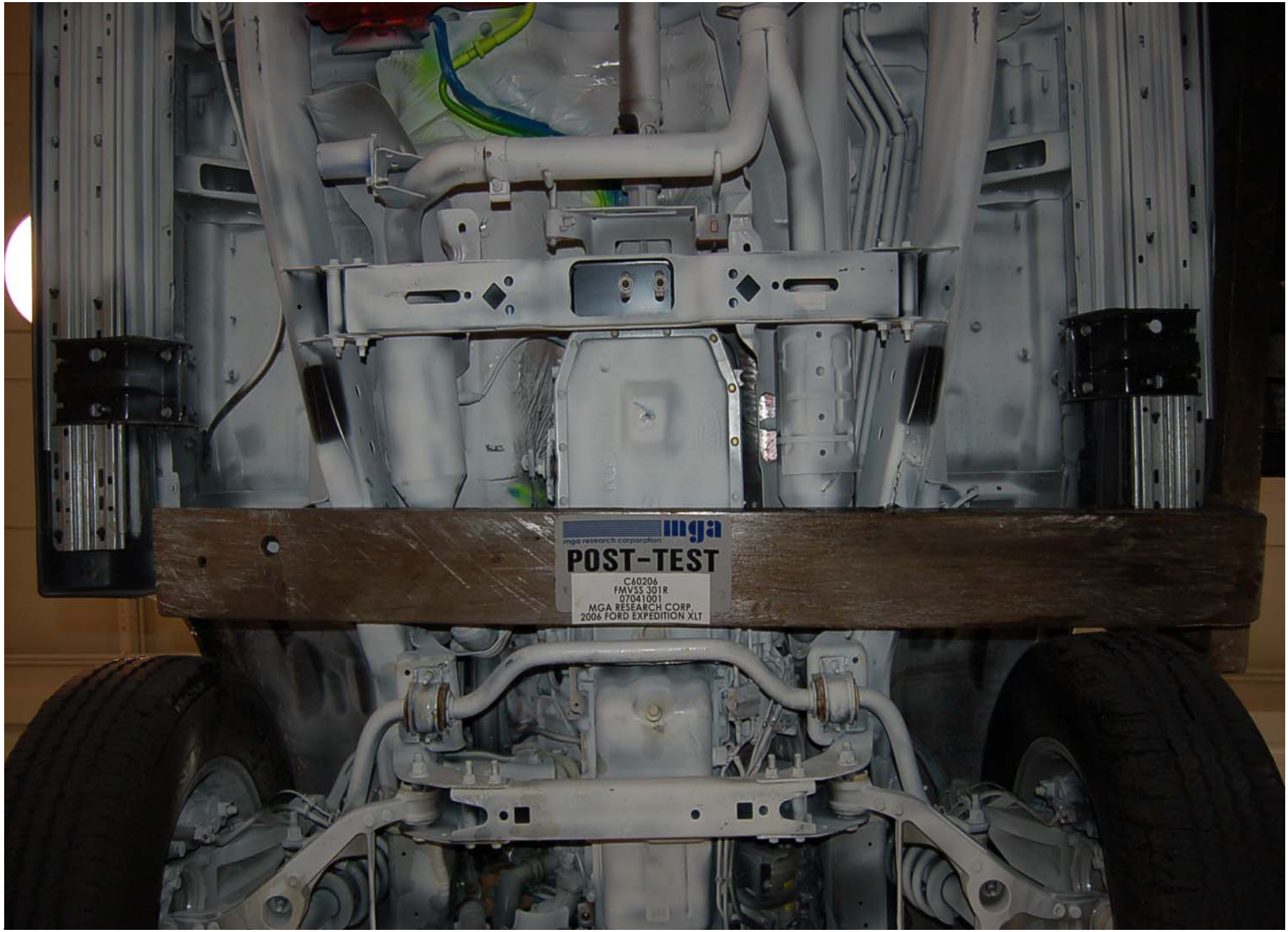
Pre-Test Underbody View 1



Post-Test Underbody View 1

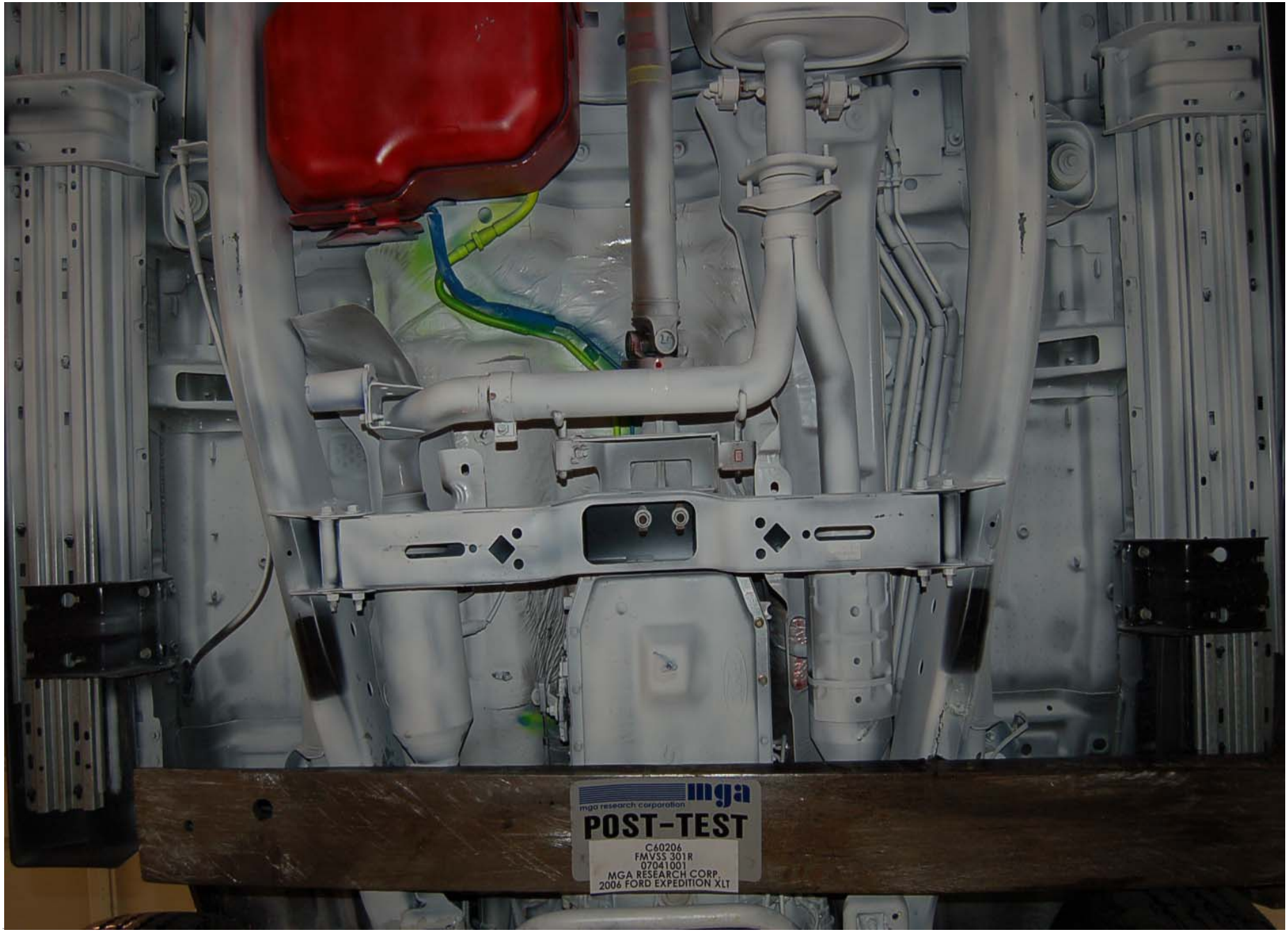


Pre-Test Underbody View 2



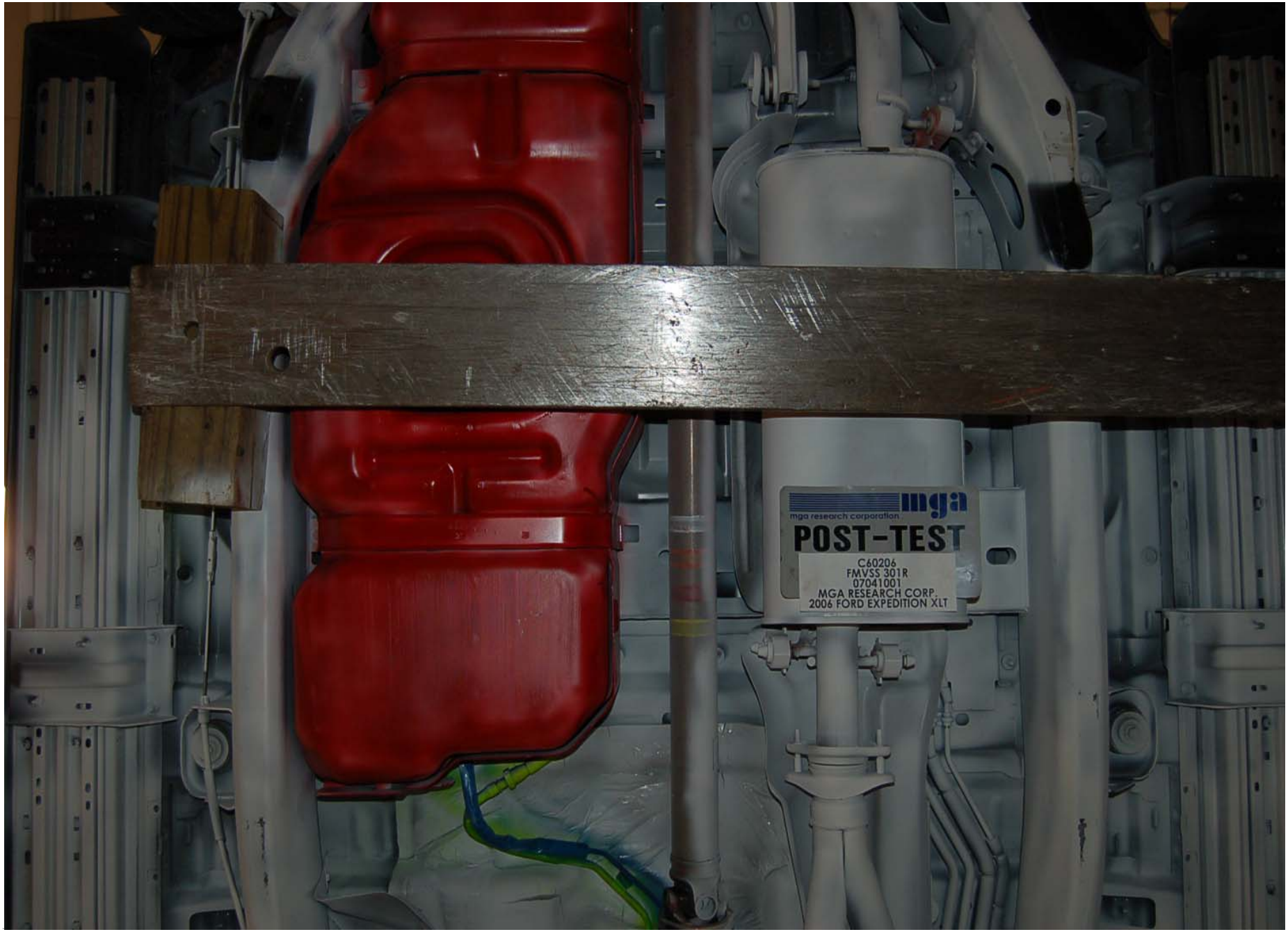
Post-Test Underbody View 2

Pre-Test Underbody View 3

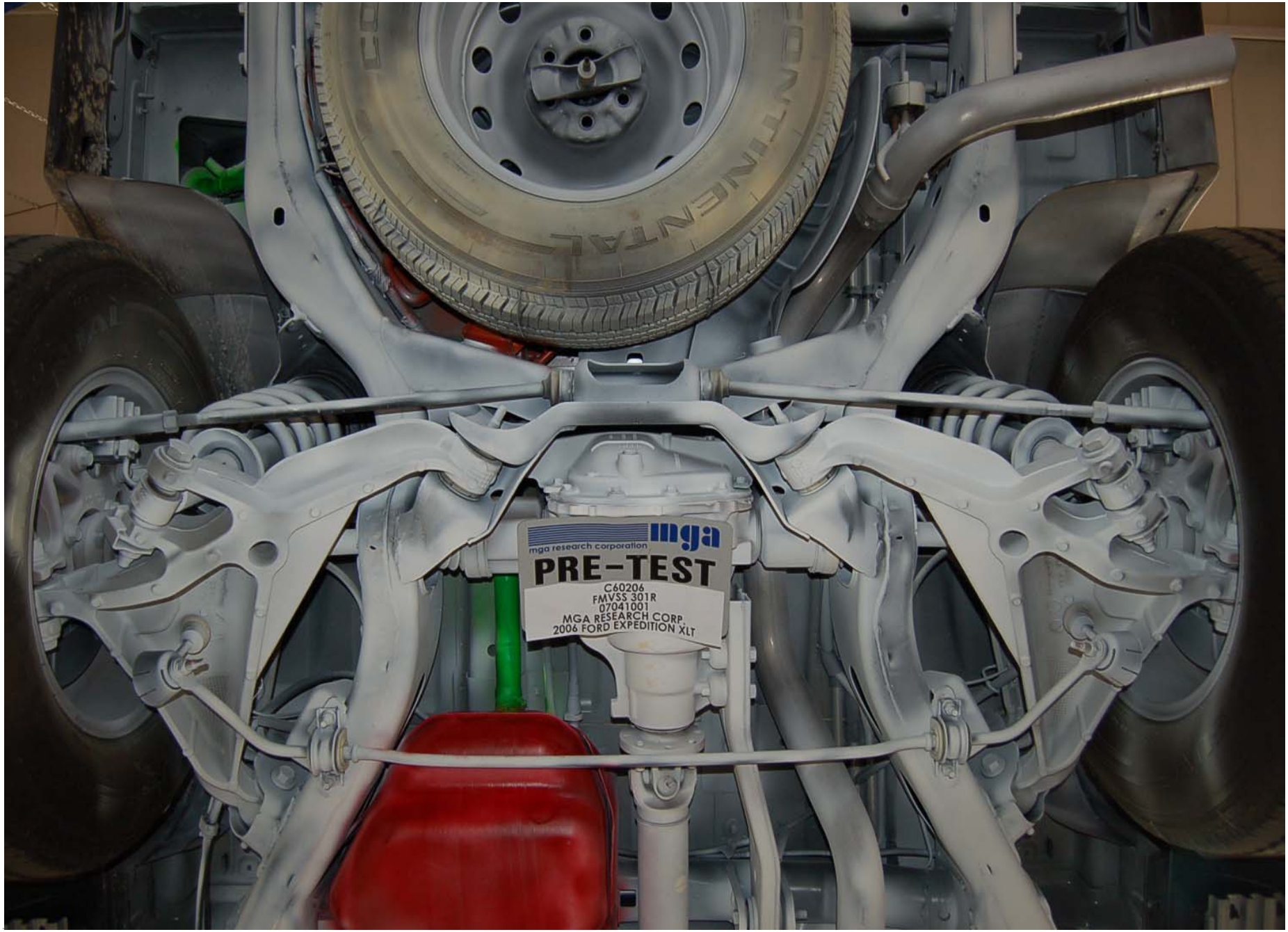


Post-Test Underbody View 3

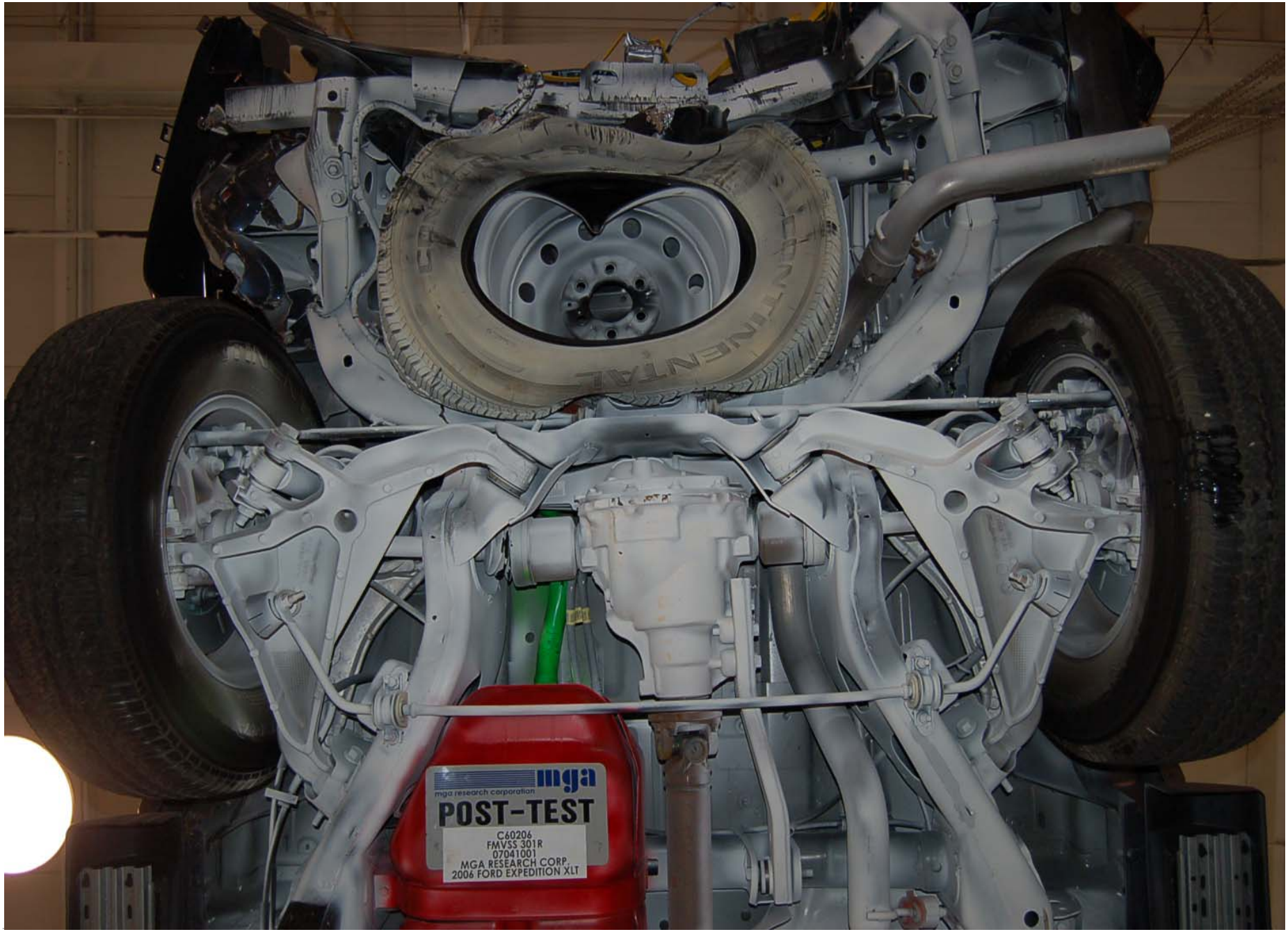
Pre-Test Underbody View 4



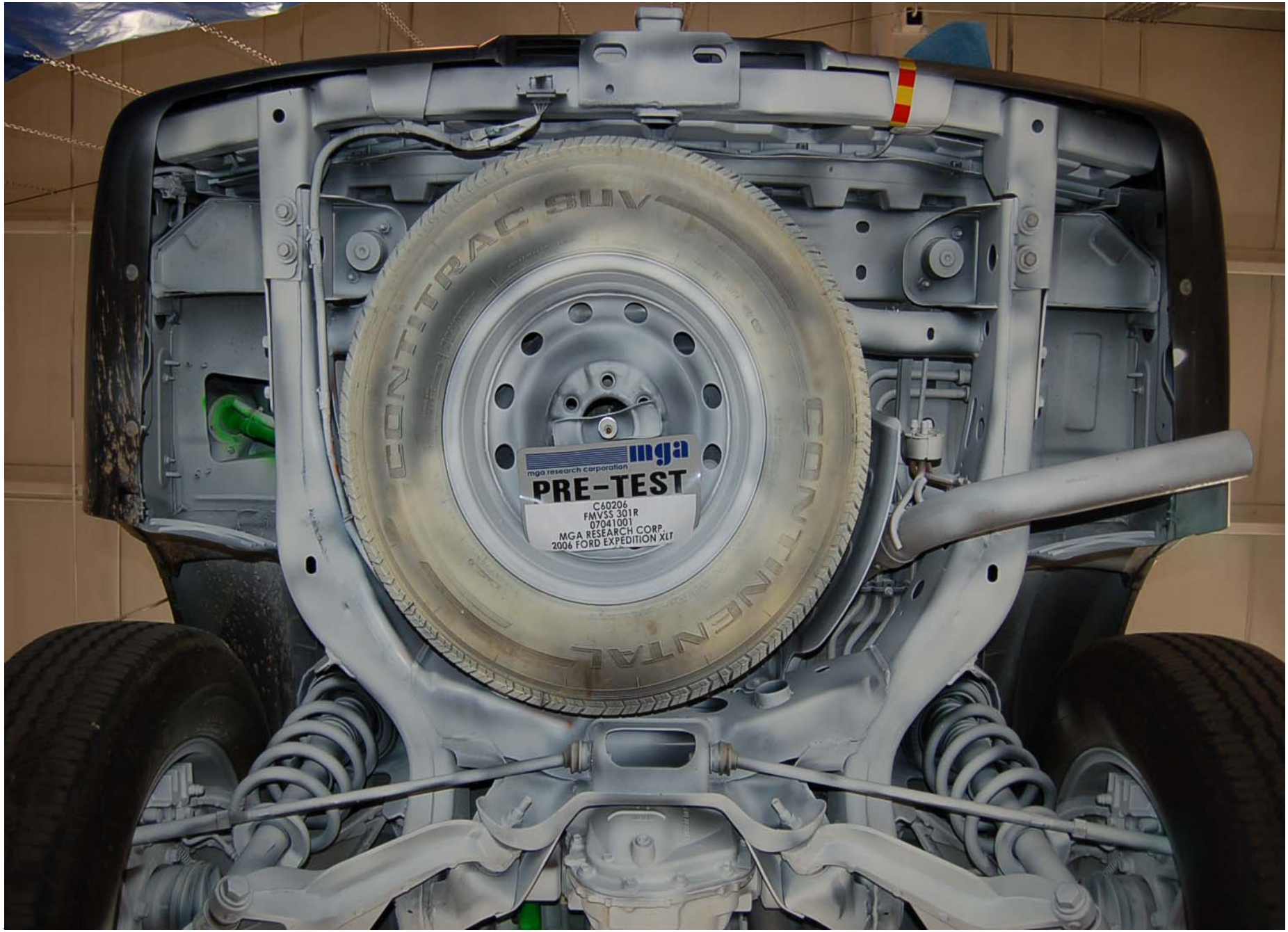
Post-Test Underbody View 4



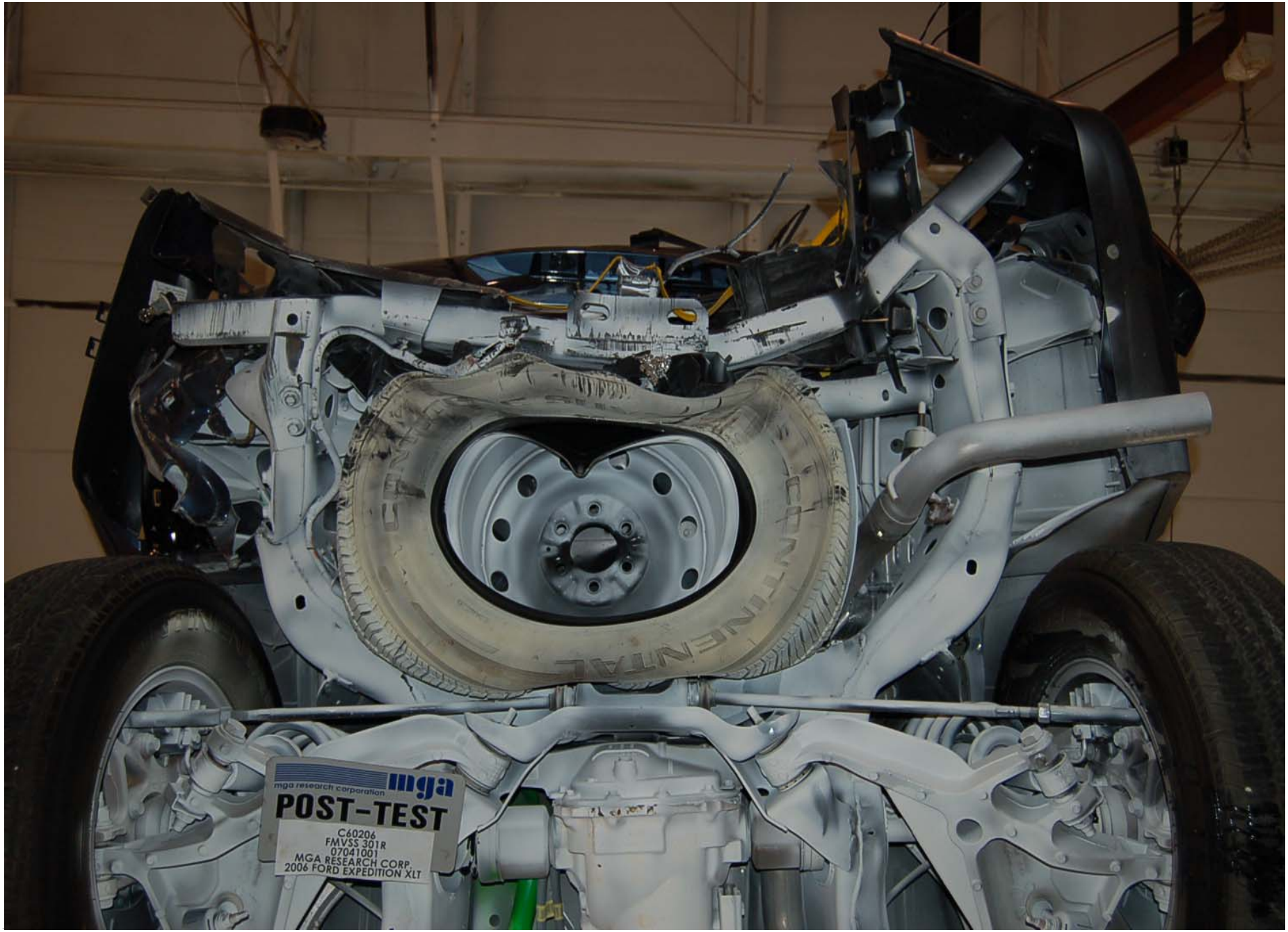
Pre-Test Underbody View 5



Post-Test Underbody View 5



Pre-Test Underbody View 6



Post-Test Underbody View 6

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

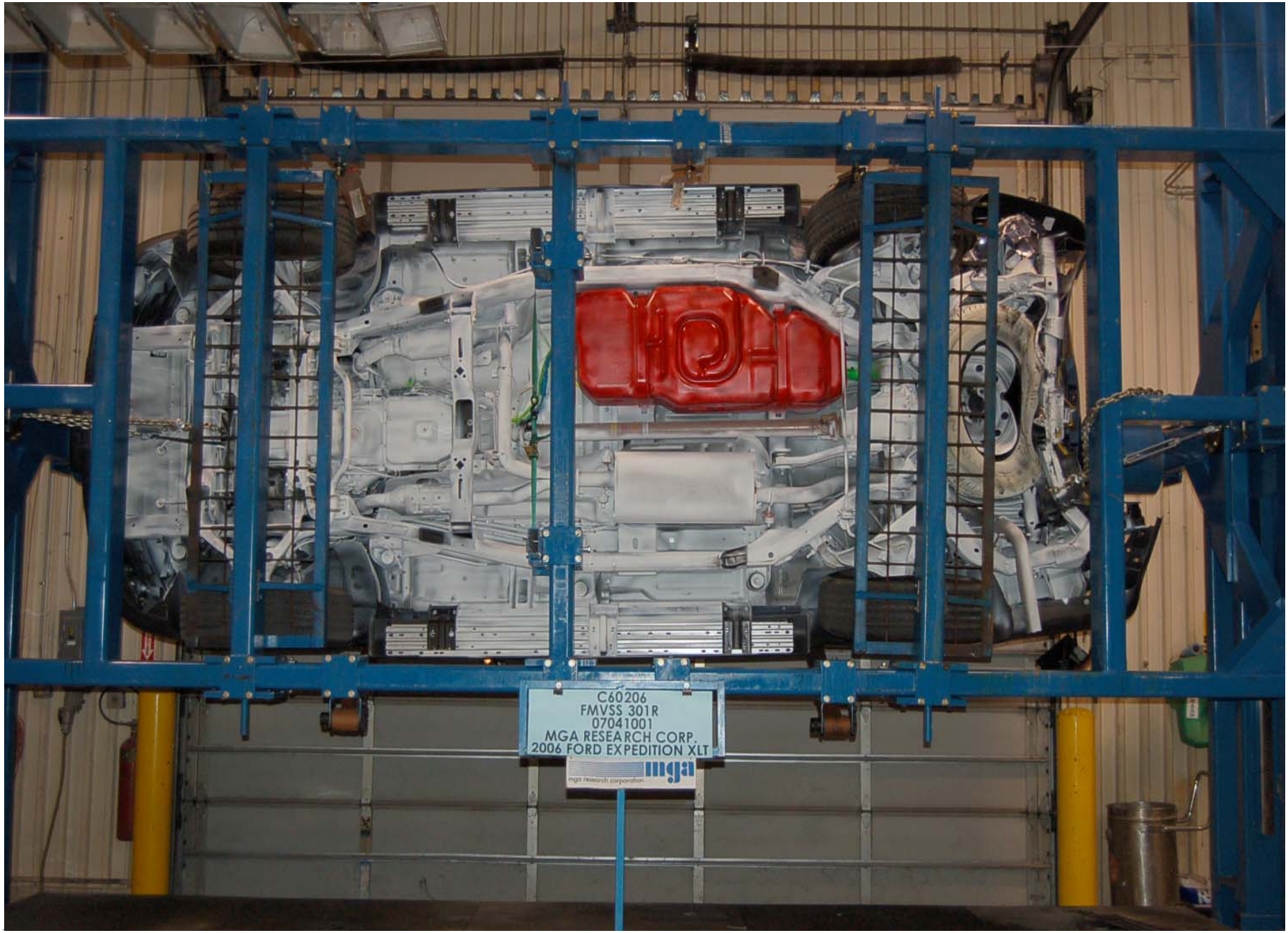
Post-Test ¾ Left Side View of MDB

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