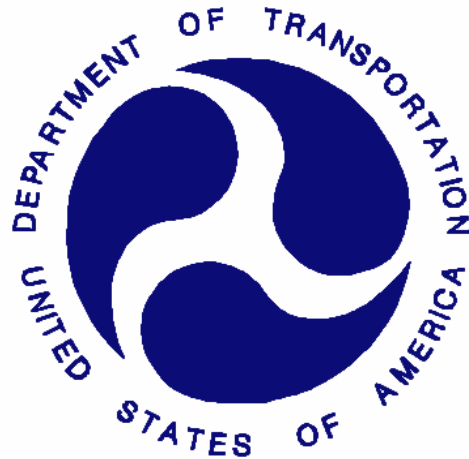


REPORT NUMBER: 301-MGA-2007-001

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

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

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



Test Date: April 10, 2007

Final Report Date: May 8, 2007

FINAL REPORT

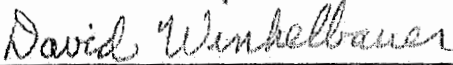
**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW, ROOM 6111
WASHINGTON, D.C. 20590**

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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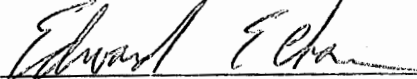
Prepared by: 
Joe Fleck, Project Engineer

Date: 4/13/07

Reviewed by: 
David Winkelbauer, Facility Director

Date: 4/13/07

FINAL REPORT ACCEPTED BY:


COTR

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.	
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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
 Test Program: FMVSS 301 Fuel System Integrity

NHTSA No.: C60206
 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

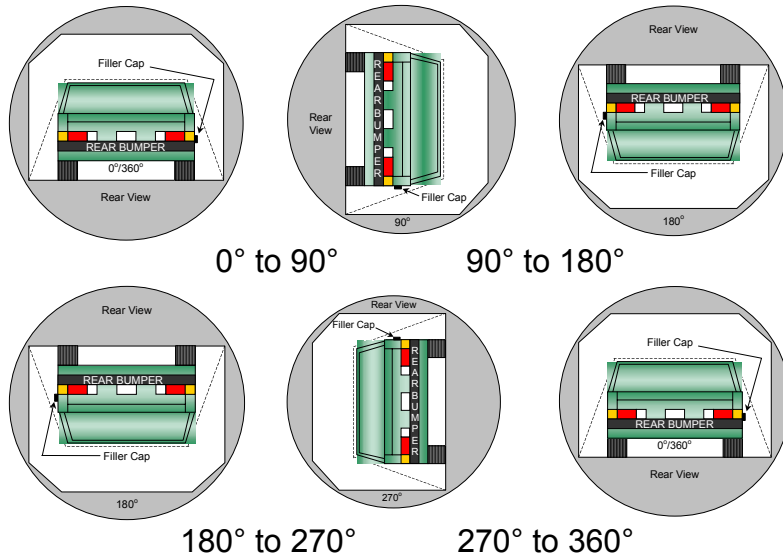
DATA SHEET NO. 5
STATIC ROLLOVER TEST DATA

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



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	

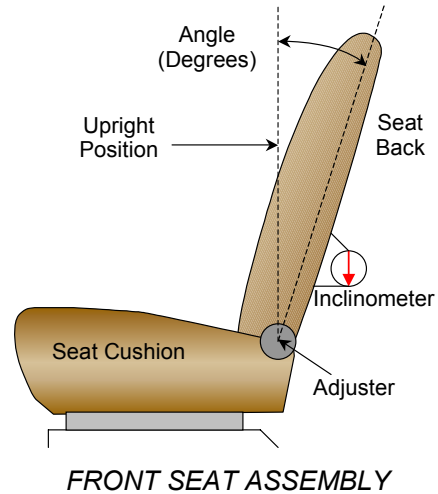
FORM 1
TEST VEHICLE INFORMATION

Test Vehicle: 2006 Ford Expedition XLT 4X2
Test Program: FMVSS 301 Fuel System Integrity

NHTSA No.: C60206
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.



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

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MFD. BY FORD MOTOR CO.

DATE: 03/06	GVWR: 7100LB/ 3221KG
FRONT GAWR: 3150LB	REAR GAWR: 4128LB
1429KG	WITH TIRES RIMS 1872KG
P265/70R17	P265/70R17
17x7.5J	17x7.5J
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: 1FMFU15576LA76097
TYPE: MPV

F0163
T0290



EXT PNT:	LD	RC: 52	DSO:				
WB	INT TR	TP/PS	R	AXLE	TR	SPR	6B714
119	ME		K	15	Q	FF11	DOA
1200603313175				UTC ▽ 5U5A-1520472-BA			

AND LOADING INFORMATION

REAR: 6

FRONT: 3

TOTAL: 9


Capacity of occupants: 743 kg or 1639 lbs. 1FMF
Should never exceed:

Vehicle's Certification Label

WITH TIRES RIMS
 kPa/ 35 PSI COLD
 REAL MOTOR
 TE OF

F0163
 T0290

DSO:
 SPR 68714
 FF11 DOA
 SUSA-1520472-BA



TIRE AND LOADING INFORMATION

SEATING CAPACITY TOTAL : 9 FRONT: 3 REAR: 6

The combined weight of occupants and cargo should never exceed : **743 kg or 1639 lbs.**

TIRE	SIZE	COLD TIRE PRESSURE	SEE OWNERS MANUAL FOR ADDITIONAL INFORMATION
FRONT	P265/70R17	240 KPA, 35 PSI	
REAR	P265/70R17	240 KPA, 35 PSI	
SPARE	P265/70R17	240 KPA, 35 PSI	

SUSA-1532-AA (TLU)

1FMFU15576LA76097

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 Rear Closeup View of Vehicle

A-6.



Post-Test Left Rear Closeup View of Vehicle

A-7.



Pre-Test Right Side View of Vehicle

A-8.



Post-Test Right Side View of Vehicle

A-9.



Pre-Test Rear View of Vehicle

A-10.



Post-Test Rear View of Vehicle

A-11.



Pre-Test ¼ Frontal View From Right Side of Vehicle

A-12.



Post-Test 3/4 Frontal View From Right Side of Vehicle



Pre-Test ¾ Rear View From Left Side of Vehicle

A-14.



Post-Test ¾ Rear View From Left Side of Vehicle

A-15.

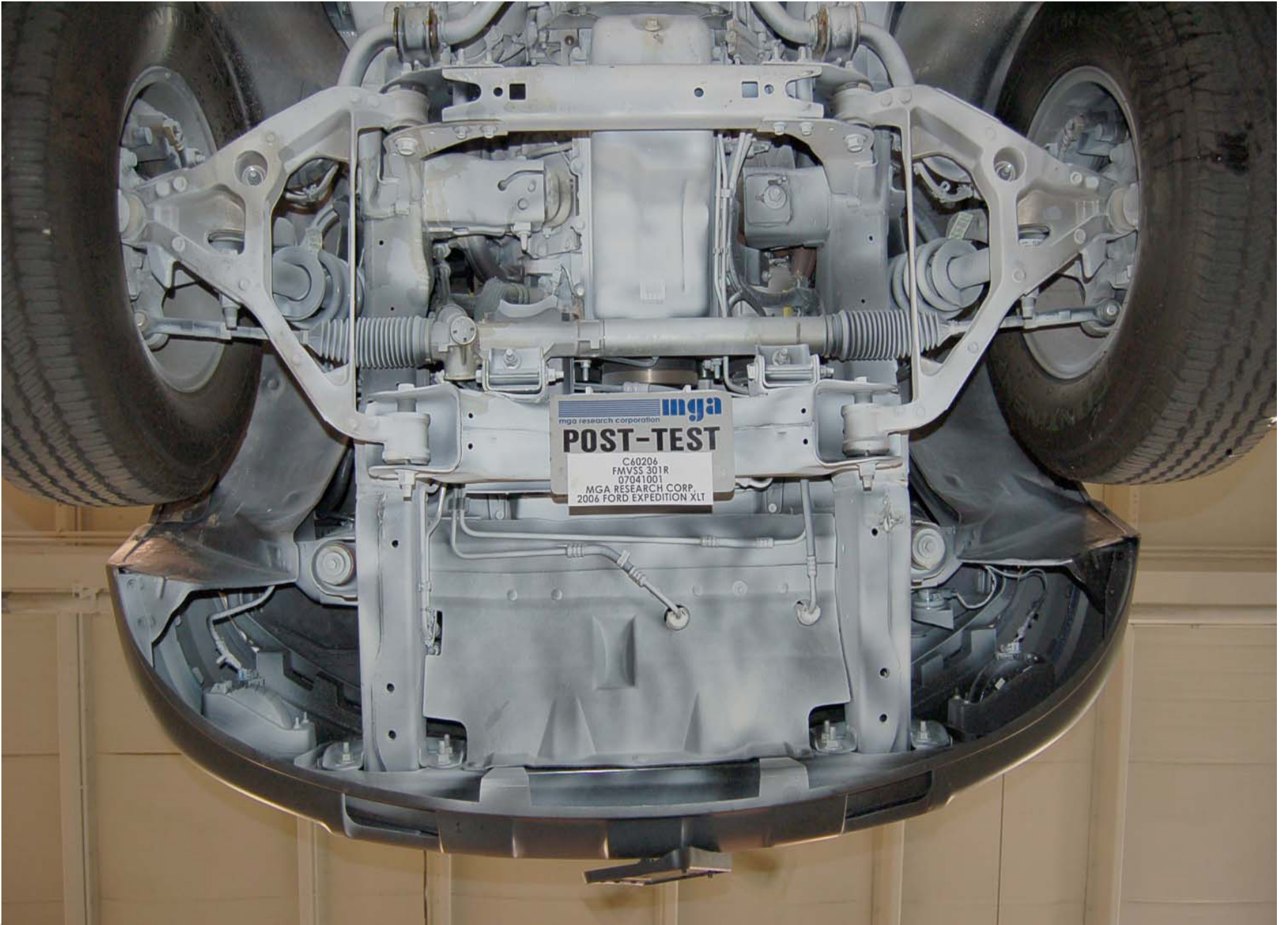


Post-Test Impact Point

A-16.



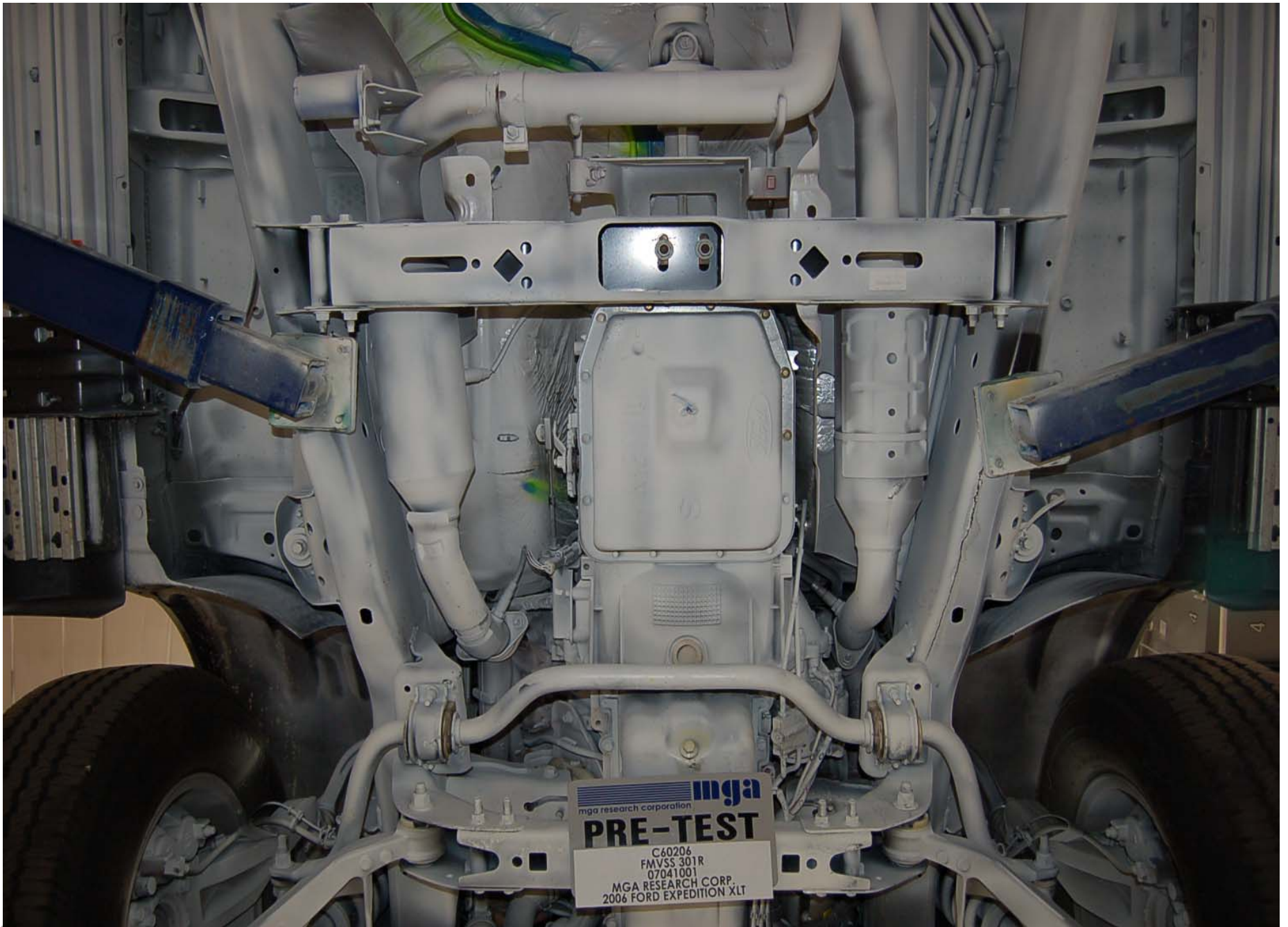
Pre-Test Underbody View 1



A-17.

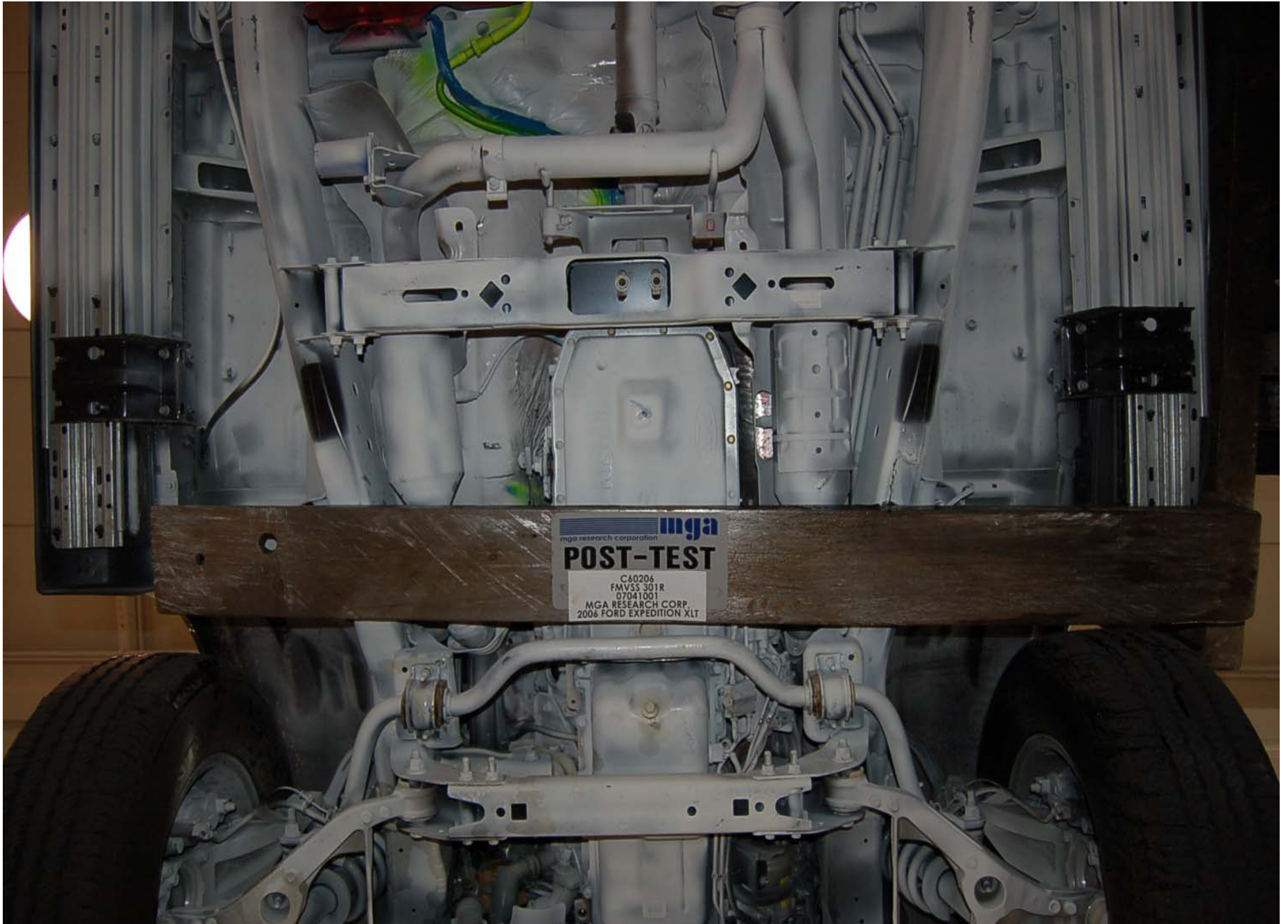
Post-Test Underbody View 1

A-18.



Pre-Test Underbody View 2

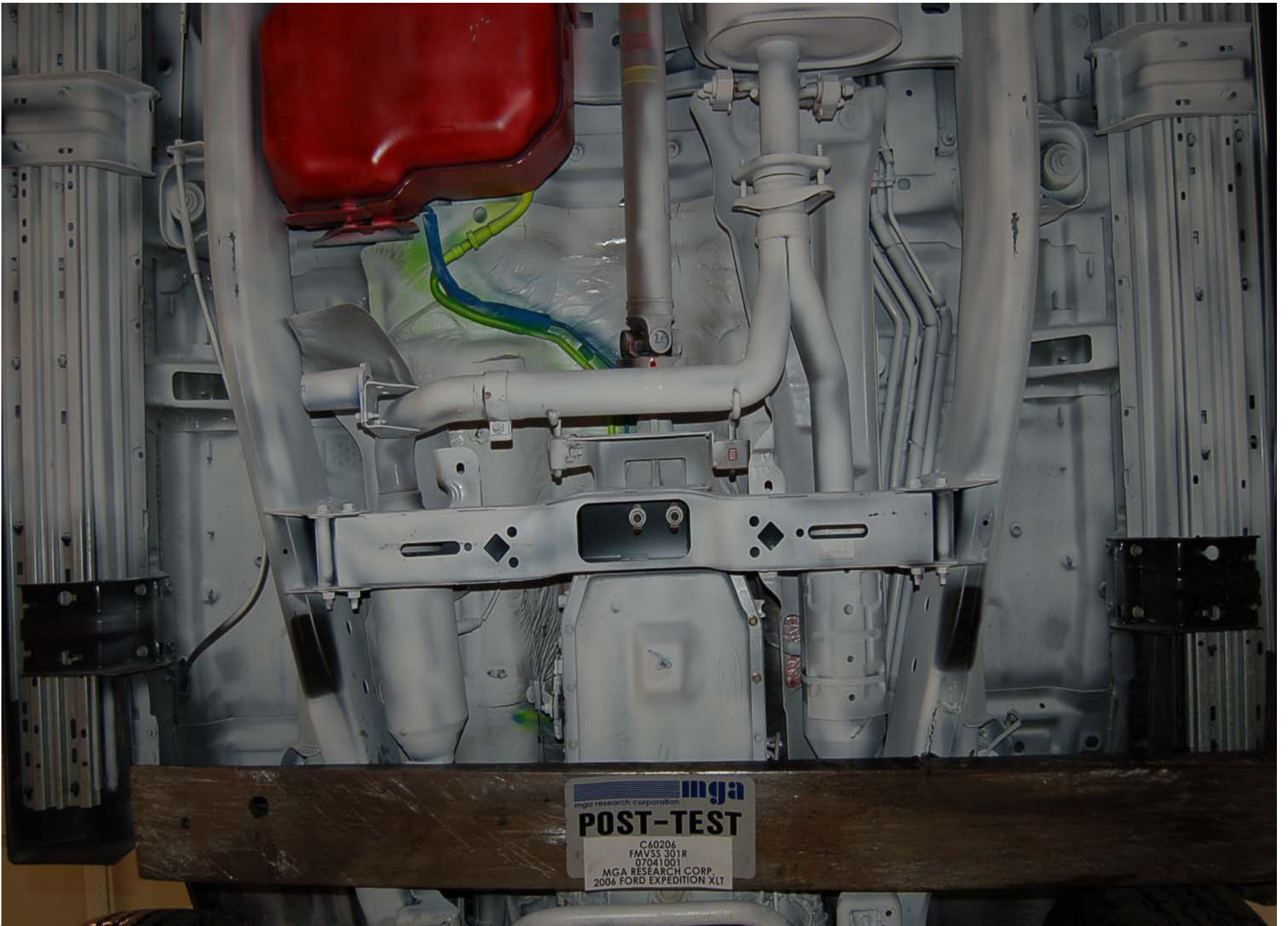
A-19.



Post-Test Underbody View 2



Pre-Test Underbody View 3



A-21.

Post-Test Underbody View 3

A-22.



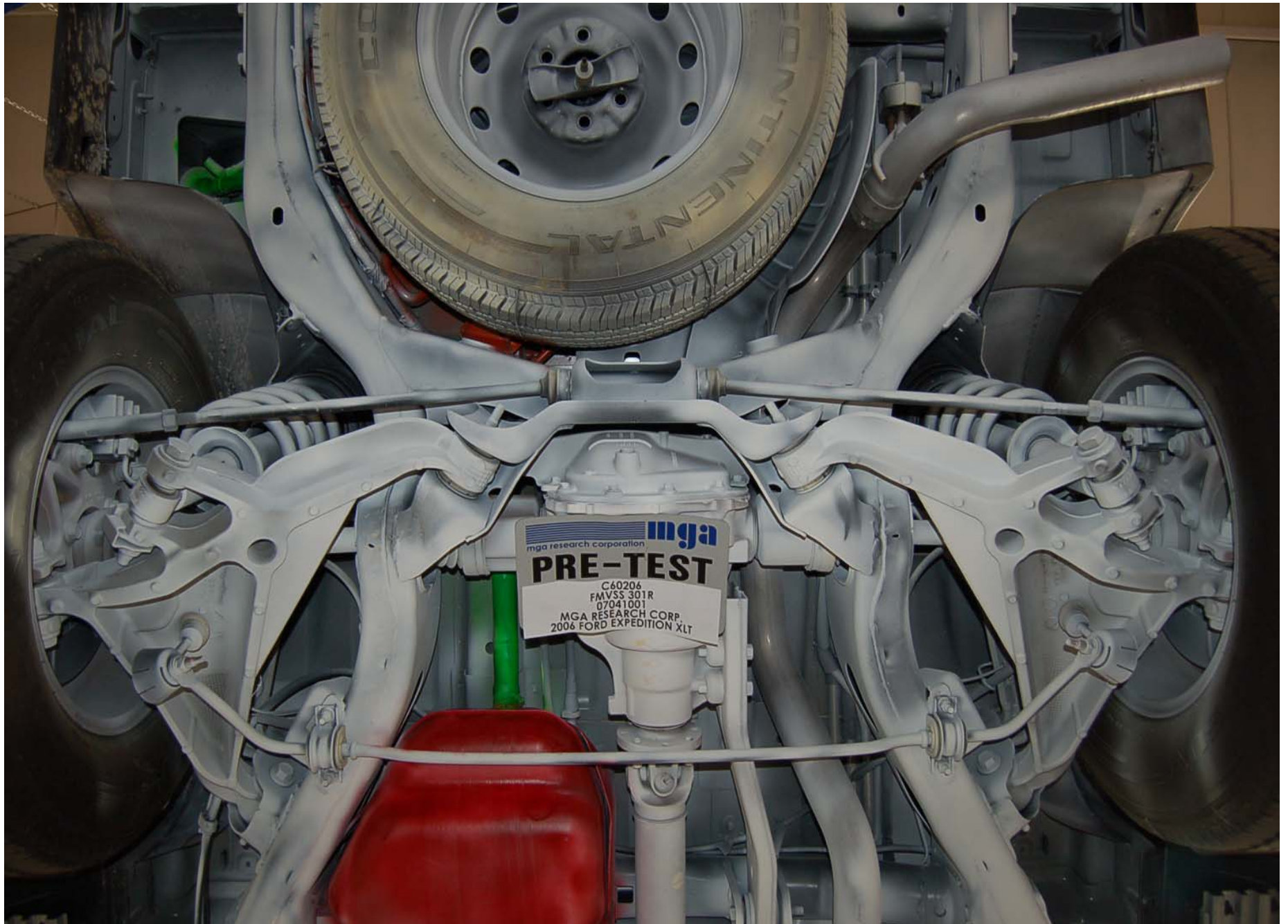
Pre-Test Underbody View 4

A-23.



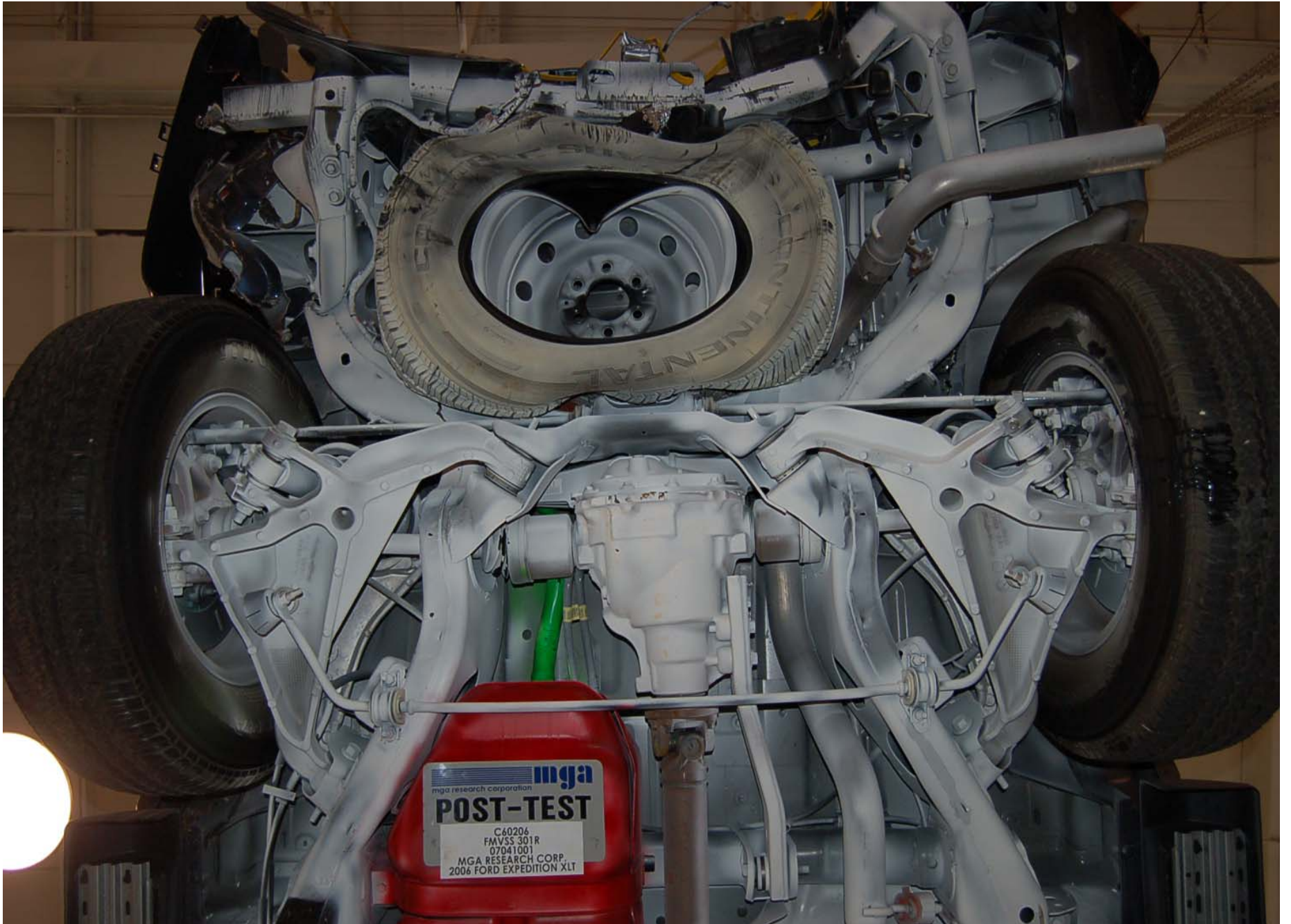
Post-Test Underbody View 4

A-24.

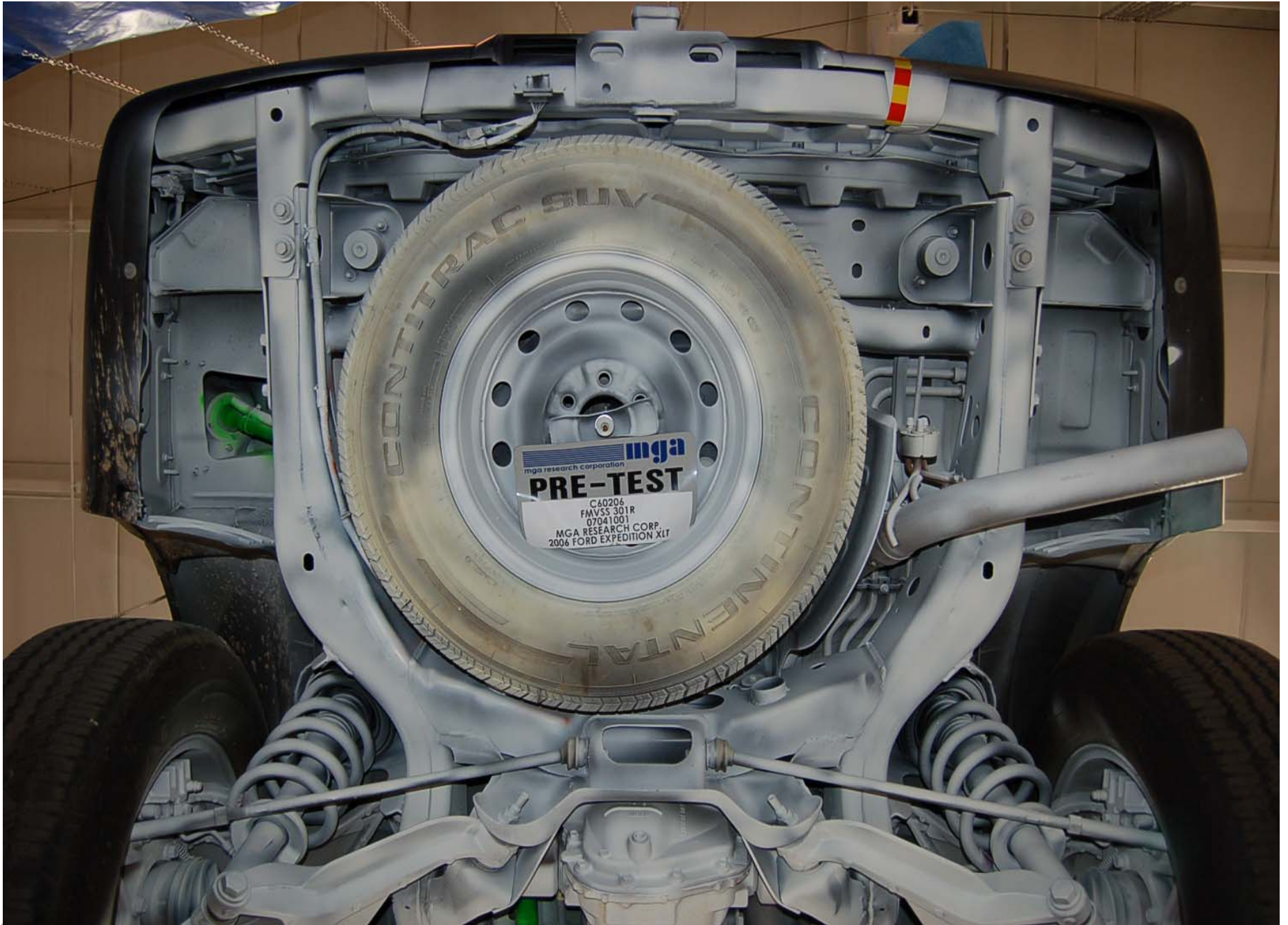


Pre-Test Underbody View 5

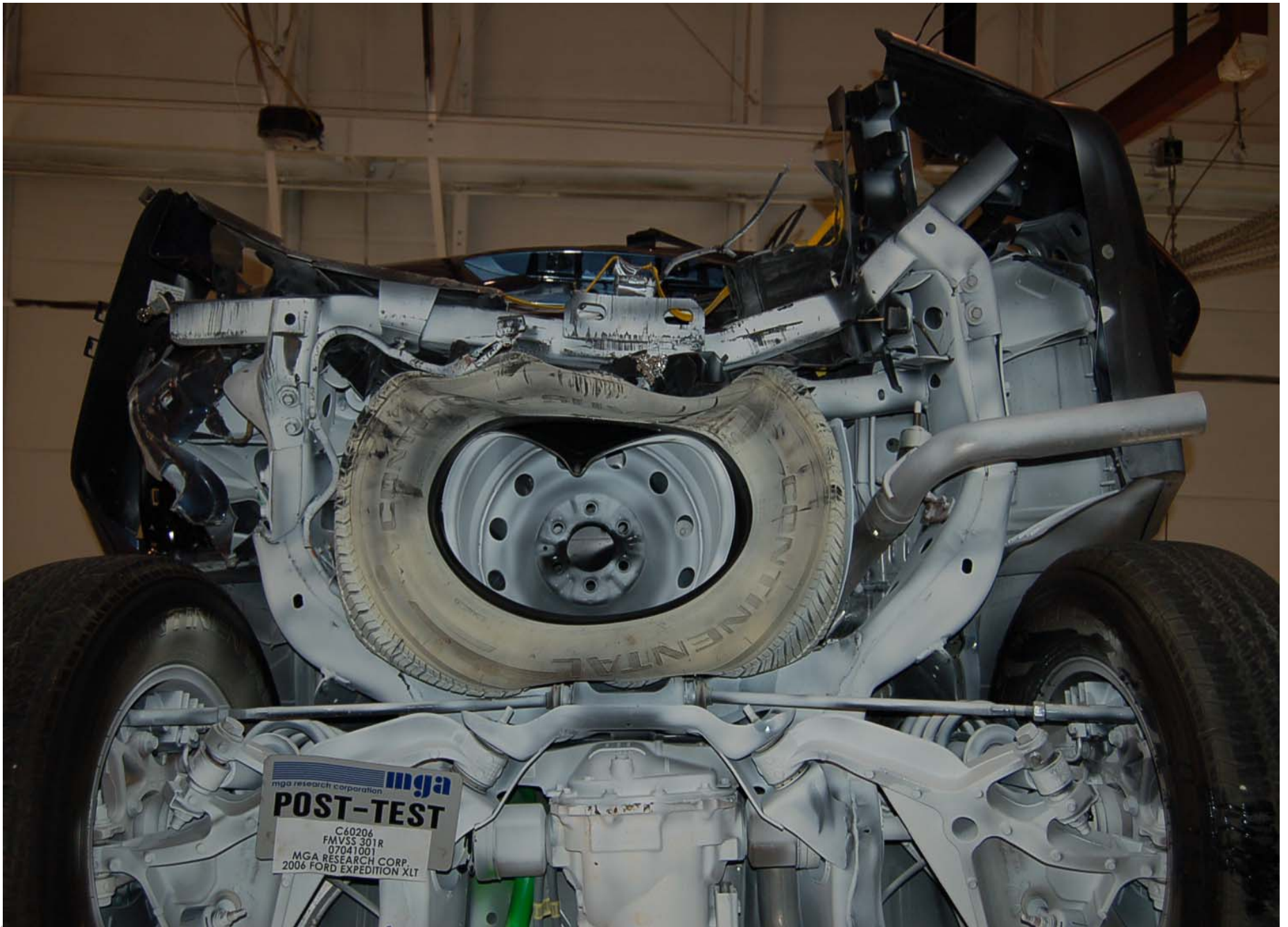
A-25.



Post-Test Underbody View 5



Pre-Test Underbody View 6



Post-Test Underbody View 6

A-28.



Pre-Test Front View of MDB



A-29.

Post-Test Front View of MDB

A-30.



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

A-31.



Post-Test ¾ Right Side View of MDB

A-32.



Pre-Test ¾ Left Side View of MDB



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

A-34.



Pre-Test Top View of MDB

A-35.



Post-Test Top View of MDB



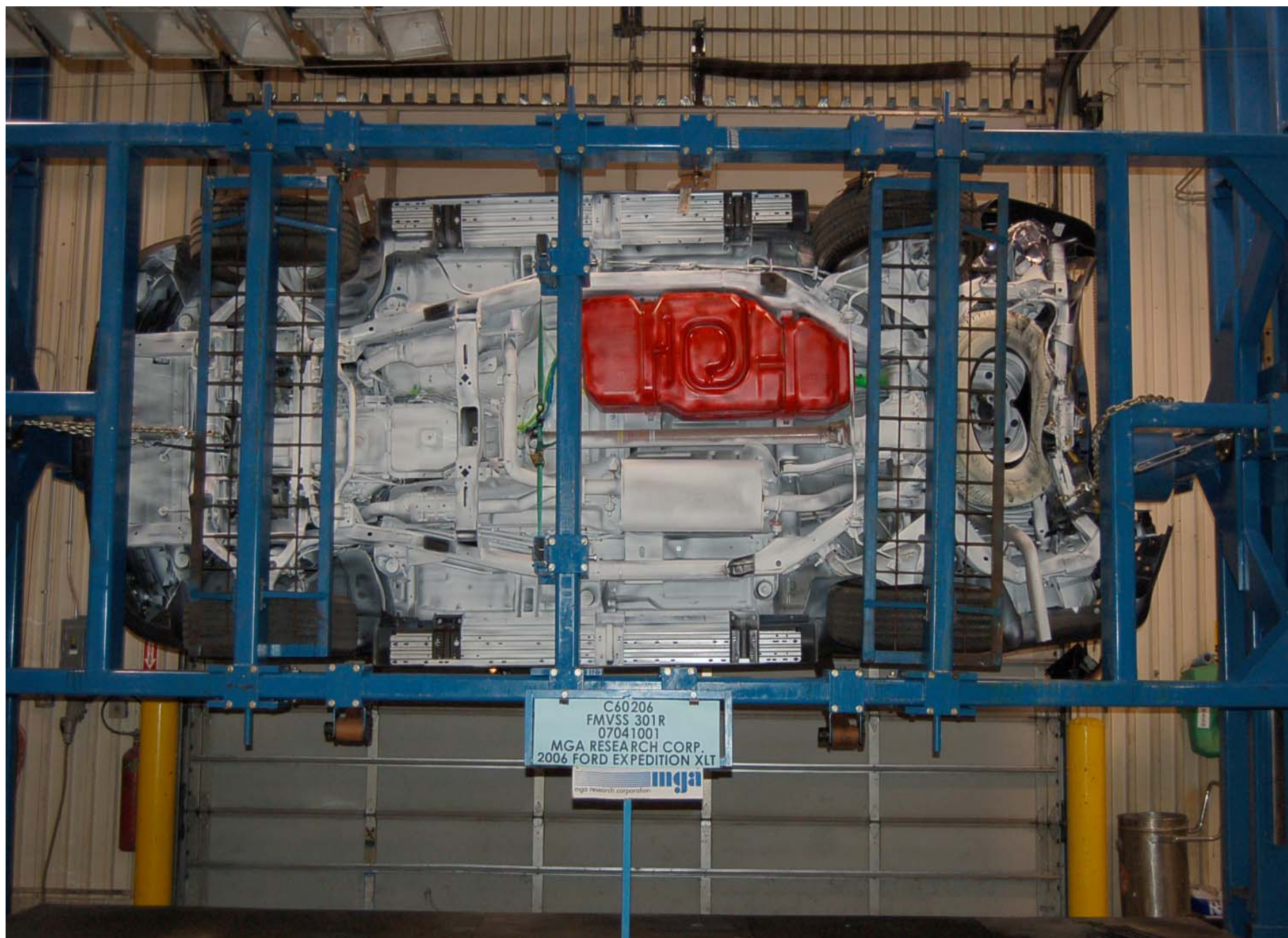
Static Rollover at 90 Degrees

A-37.



Static Rollover at 180 Degrees

A-38.



Static Rollover at 270 Degrees



Static Rollover at 360 Degrees