

REPORT NUMBER: 301-MGA-2011-012

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

**BAYERISCHE MOTORENWERKE AG
2011 BMW X3
NHTSA NUMBER: CB0505**

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



Test Date: August 30, 2011

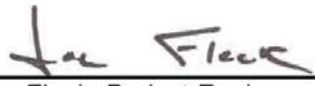
Final Report Date: September 27, 2011

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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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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Technical Report Documentation Page

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16. Abstract A rear impact was conducted on a 2011 BMW X3 at MGA Research Corporation on August 30, 2011. This test was conducted to obtain data indicant of FMVSS 301R. The impact velocity was 78.9 km/h. The ambient temperature at the time of impact was 27 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 BMW X3 was impacted by a Moving Deformable Barrier (MDB) at a velocity of 78.9 km/h. The test was performed at MGA Research Corporation on August 30, 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
- Overhead Overall 1000 fps
- Left 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 BMW X3 NHTSA No.: CB0505
Test Program: FMVSS 301 Fuel System Integrity Test Date: 8/30/2011

TEST VEHICLE INFORMATION

Manufacturer	Bayerische Motorenwerke AG
Model	X3
Body Style	SUV
Major Options	None
NHTSA No.	CB0505
VIN	5UXWX5C5XBL701199
Color	Vermilion Red Metallic
Delivery Date	8/27/2011
Odometer Reading (mile)	76
Dealer	BMW of Ann Arbor
Transmission	Automatic
Final Drive	Four Wheel Drive
Number of Cylinders	6
Engine Displacement (L)	3.0
Engine Placement	Longitudinal

DATA FROM VEHICLE'S CERTIFICATION LABEL

Manufactured By	Bayerische Motorenwerke AG
Date of Manufacture	02/11

GVWR (kg)	2330
GAWR Front (kg)	1090
GAWR Rear (kg)	1285

VEHICLE CAPACITY DATA

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Split Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				410
Number of Occupants x 68 kg.				340
Cargo Wt. (RCLW) (kg)				70

DATA SHEET NO. 1 (continued)**TEST VEHICLE SPECIFICATIONS**Test Vehicle: 2011 BMW X3NHTSA No.: CB0505Test Program: FMVSS 301 Fuel System IntegrityTest Date: 8/30/2011**DATA FROM VEHICLE'S TIRE PLACARD**

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	350	350
Cold Pressure (kPa)	220	240
Recommended Tire Size	245/50R18	245/50R18
Recommended Load Range	100V	100V
Tire Size on Vehicle	245/50R18	245/50R18
Tire Manufacturer	Pirelli	Pirelli
Location of Placard of Vehicle	B Pillar	
Type of Spare Tire (full size/space saver)	None	

DATA SHEET NO. 2**PRE-TEST DATA**Test Vehicle: 2011 BMW X3NHTSA No.: CB0505Test Program: FMVSS 301 Fuel System IntegrityTest Date: 8/30/2011**WEIGHT OF TEST VEHICLE**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	463.6	473.1		500.3	541.1	
Right	kg	475.8	469.0		511.7	539.3	
Ratio	%	49.9	50.1		48.4	51.6	
Totals	kg	939.4	942.1	1881.5	1012.0	1080.4	2092.4

CALCULATION OF TARGET TEST WEIGHT (TTW)

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1881.5
Rated Cargo/Luggage Weight (RCLW)	kg	70
Weight of 2 P572E ATDs	kg	148
Calculated Vehicle Target Weight (TVTW)	kg	2099.5

Vehicle Wheelbase	2810 mm
Vehicle Width	1882 mm
Weight of Ballast Secured in Rear Seat	77.1 kg
Method of Securing Ballast	Ratchet Straps
Vehicle Components Removed for Weight Reduction	None

VEHICLE ATTITUDES

	Units	LF	RF	LR	RR
As Delivered	mm	775	772	798	796
As Tested	mm	759	759	779	776

DATA SHEET NO. 2 (continued)**PRE-TEST DATA**

Test Vehicle: 2011 BMW X3 NHTSA No.: CB0505
Test Program: FMVSS 301 Fuel System Integrity Test Date: 8/30/2011

FUEL SYSTEM DATA

	Units: Liters
Usable Capacity of "Standard Tank" (Owner's Manual)	60.2
Usable Capacity Figure Furnished by COTR	60.2
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	55.4 to 56.6
Actual Test Volume (entire fuel system filled)	55.9

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
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DATA SHEET NO. 3
MOVING BARRIER DATA

Test Vehicle: 2011 BMW X3 NHTSA No.: CB0505
 Test Program: FMVSS 301 Fuel System Integrity Test Date: 8/30/2011

MOVING BARRIER'S TEST WEIGHT

	Units	Front	Rear	Total
Left	kg	401.4	279.6	
Right	kg	368.9	312.5	
Ratio	%	56.0	44.0	
Totals	kg	770.3	592.1	1362.4

Tires (Mfr, line, size)	Kumho
Tire Pressure (kPa)	220
Brake Abort System (Yes/No)?	Yes
Date of Last Calibration	6/24/11

DATA SHEET NO. 4**POST-TEST DATA**Test Vehicle: 2011 BMW X3NHTSA No.: CB0505Test Program: FMVSS 301 Fuel System IntegrityTest Date: 8/30/2011**IMPACT VELOCITY**

	Units: km/h
Required Impact Velocity	80.0
Actual Impact Velocity (Trap No. 1)	78.9
Actual Impact Velocity (Trap No. 2)	78.9
Average Impact Speed	78.9

Temperature at Time of Impact (°C)	27
Test Time	2:00 pm

WELDING ROD IMPACT POINT

	Units: mm
Vertical distance from target center (+ above target / - below target)	14 up
Horizontal distance from target center (+ to the right / - to the left)	0

DATA SHEET NO. 5
STATIC ROLLOVER TEST DATA

Test Vehicle: 2011 BMW X3

NHTSA No.: CB0505

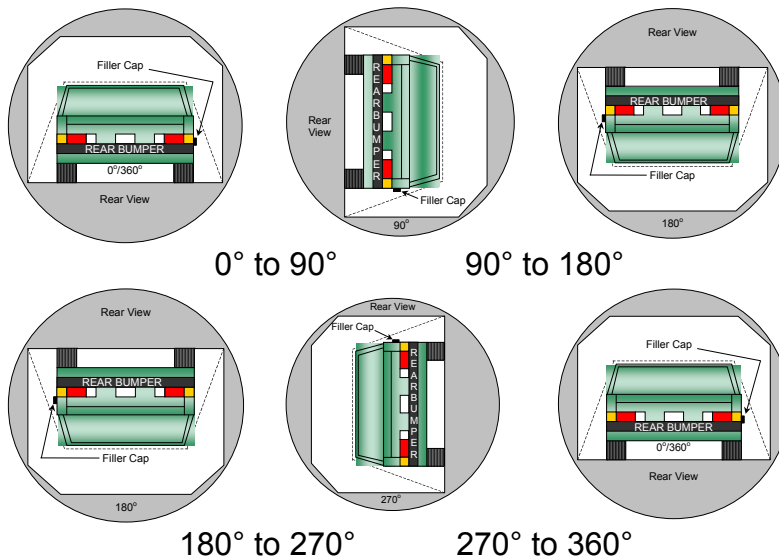
Test Program: FMVSS 301 Fuel System Integrity

Test Date: 8/30/2011

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 BMW X3NHTSA No.: CB0505Test Program: FMVSS 301 Fuel System IntegrityTest Date: 8/30/2011**STODDARD SOLVENT SPILLAGE MEASUREMENT****Hold Time = 5 minutes at all intervals****0° TO 90° Rotation Time (sec) = 118 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) = 109 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 BMW X3

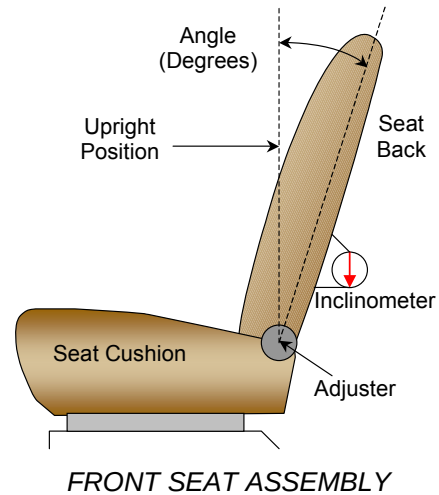
NHTSA No.: CB0505

Test Program: FMVSS 301 Fuel System Integrity

Test Date: 8/30/2011

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 back of seat frame at 25 degrees.



Driver Seat Back Angle	25.0°
Passenger Seat Back Angle	25.0°

SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	300 mm	150 mm
Passenger Seat	300 mm	150 mm

D-RING ADJUSTMENT

The driver and passenger D-rings were fixed.

STEERING COLUMN ADJUSTMENT

The steering column was placed in the mid position.

APPENDIX A
PHOTOGRAPHS

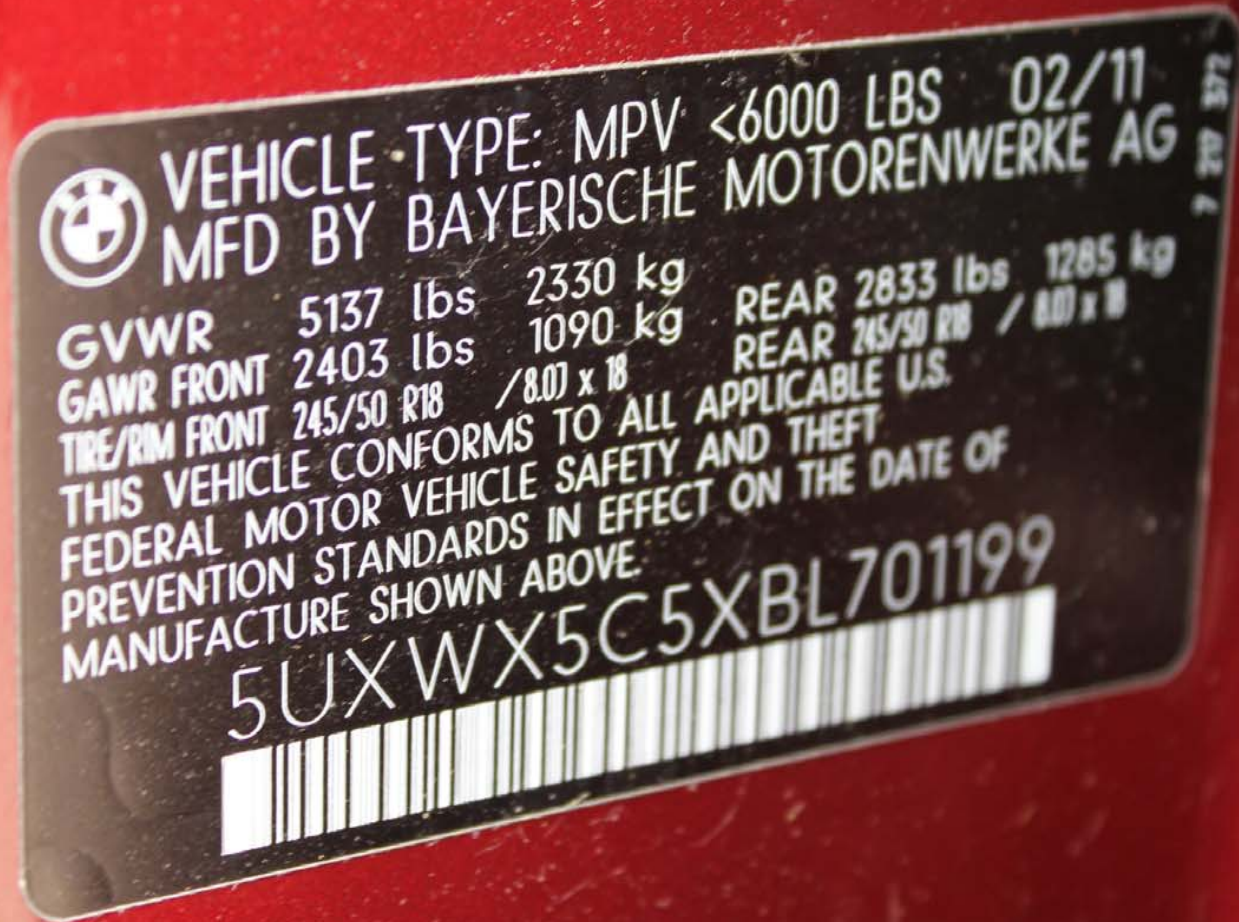
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Vehicle's Certification Label

IMPORTANT!



See inflation
are specified
above up to
mph only!

000	mph
240	KPA
35	PSI
280	KPA
41	PSI



TIRE AND LOADING INFORMATION RENSEIGNEMENTS SUR LES PNEUS ET LE CHARGEMENT

SEATING CAPACITY
NOMBRE DE PLACES

TOTAL

5

FRONT
AVANT

2

REAR
ARRIÈRE

3

The combined weight of occupants and cargo should never exceed 410 kg or 904 lbs.
Le poids total des occupants et du chargement ne doit jamais dépasser 410 kg ou 904 lb.

TIRE / PNEU	SIZE DIMENSIONS	COLD TIRE PRESSURE PRESSION DES PNEUS A FROID
FRONT / AVANT	245/50 R 18	220 KPA, 32 PSI
REAR / ARRIÈRE	245/50 R 18	240 KPA, 35 PSI
SPARE DE SECOURS	NONE	NONE KPA, NONE PSI

**SEE OWNER'S MANUAL
FOR ADDITIONAL
INFORMATION**

**VOIR LE MANUEL DE
L'USAGER POUR PLUS
DE RENSEIGNEMENTS**

BMW
6853358



- Must See
- When requi
- prec servi
- Use tires prop
- BMW

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 of Vehicle



Post-Test Right Rear Close-up View of Vehicle



Pre-Test Rear View of Vehicle



Post-Test Rear View of Vehicle

Pre-Test $\frac{3}{4}$ Rear View From Right Side of Vehicle



Post-Test ¾ Rear View From Right Side of Vehicle



Pre-Test $\frac{3}{4}$ Rear View From Left Side of Vehicle



Post-Test ¾ Rear View From Left Side of Vehicle



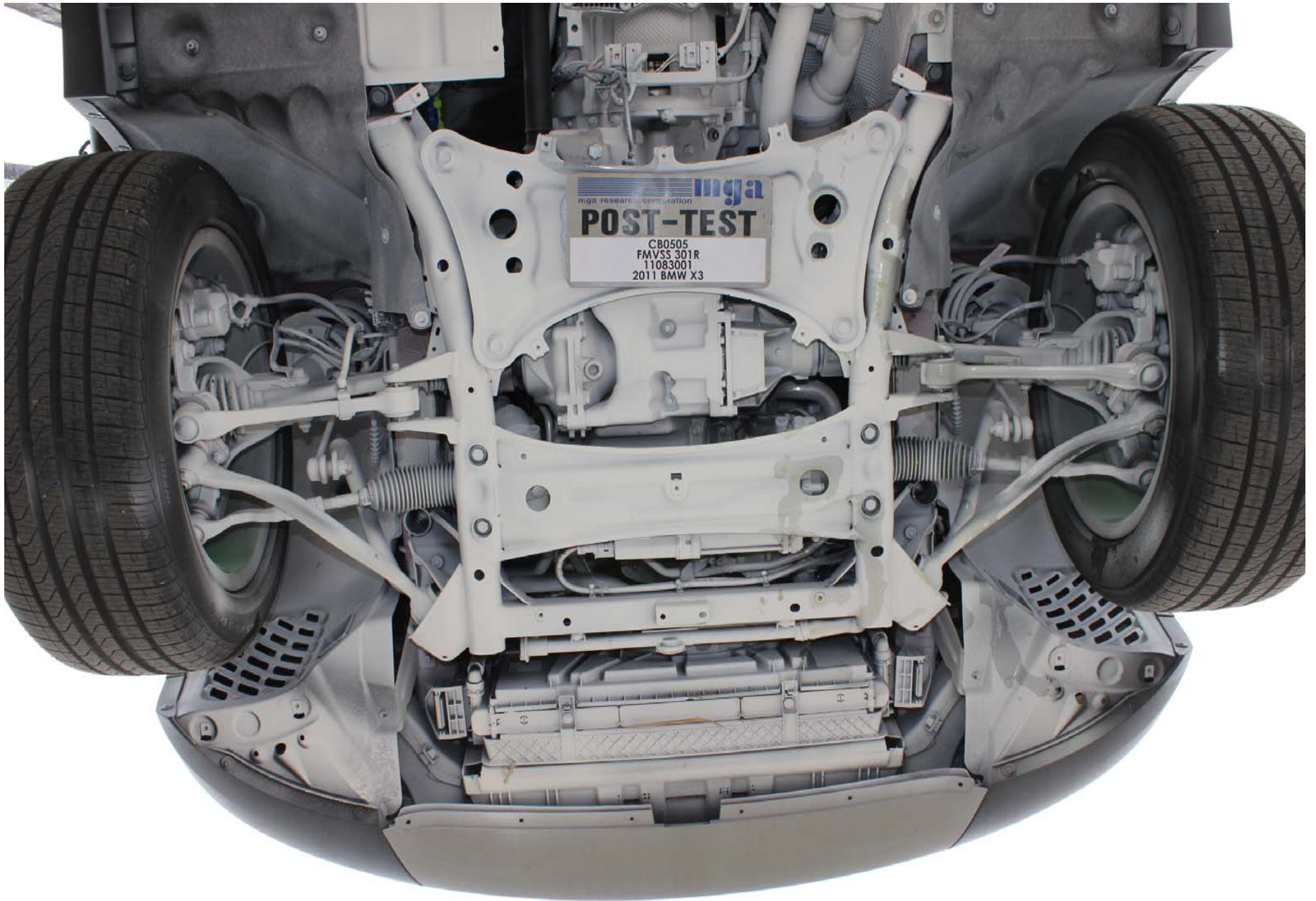
Pre-Test Impact Point



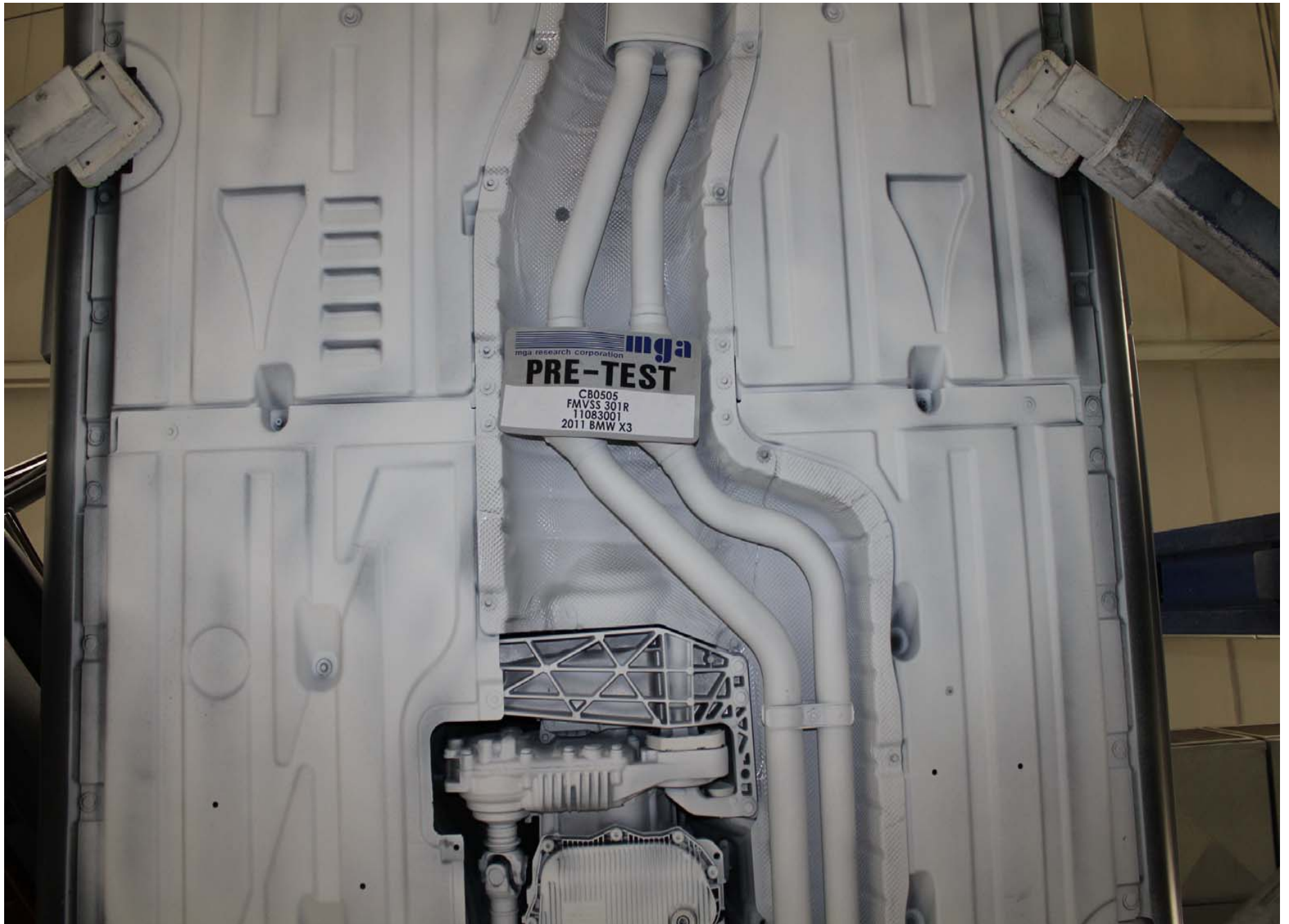
Post-Test Impact Point



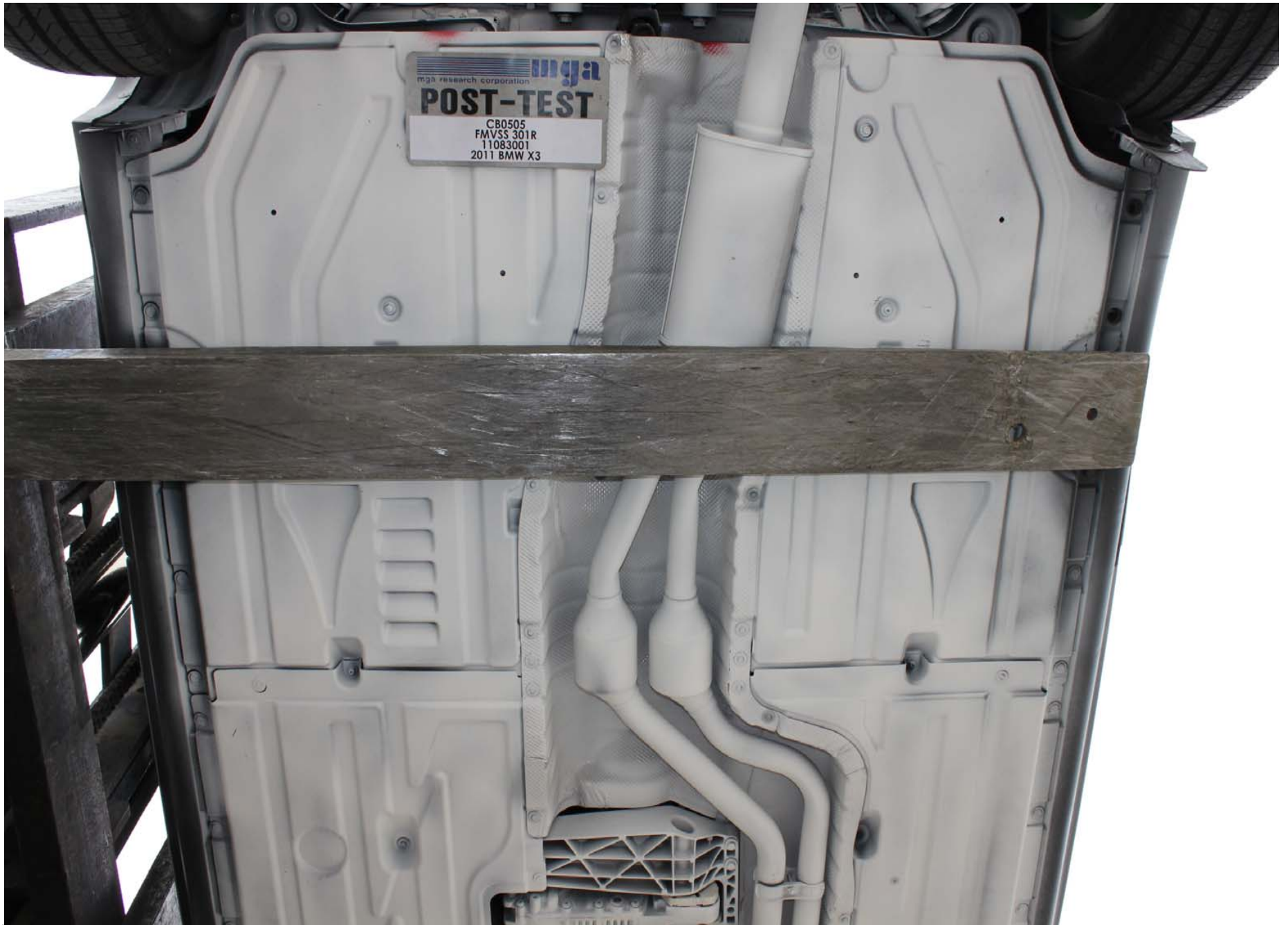
Pre-Test Underbody View 1



Post-Test Underbody View 1



Pre-Test Underbody View 2

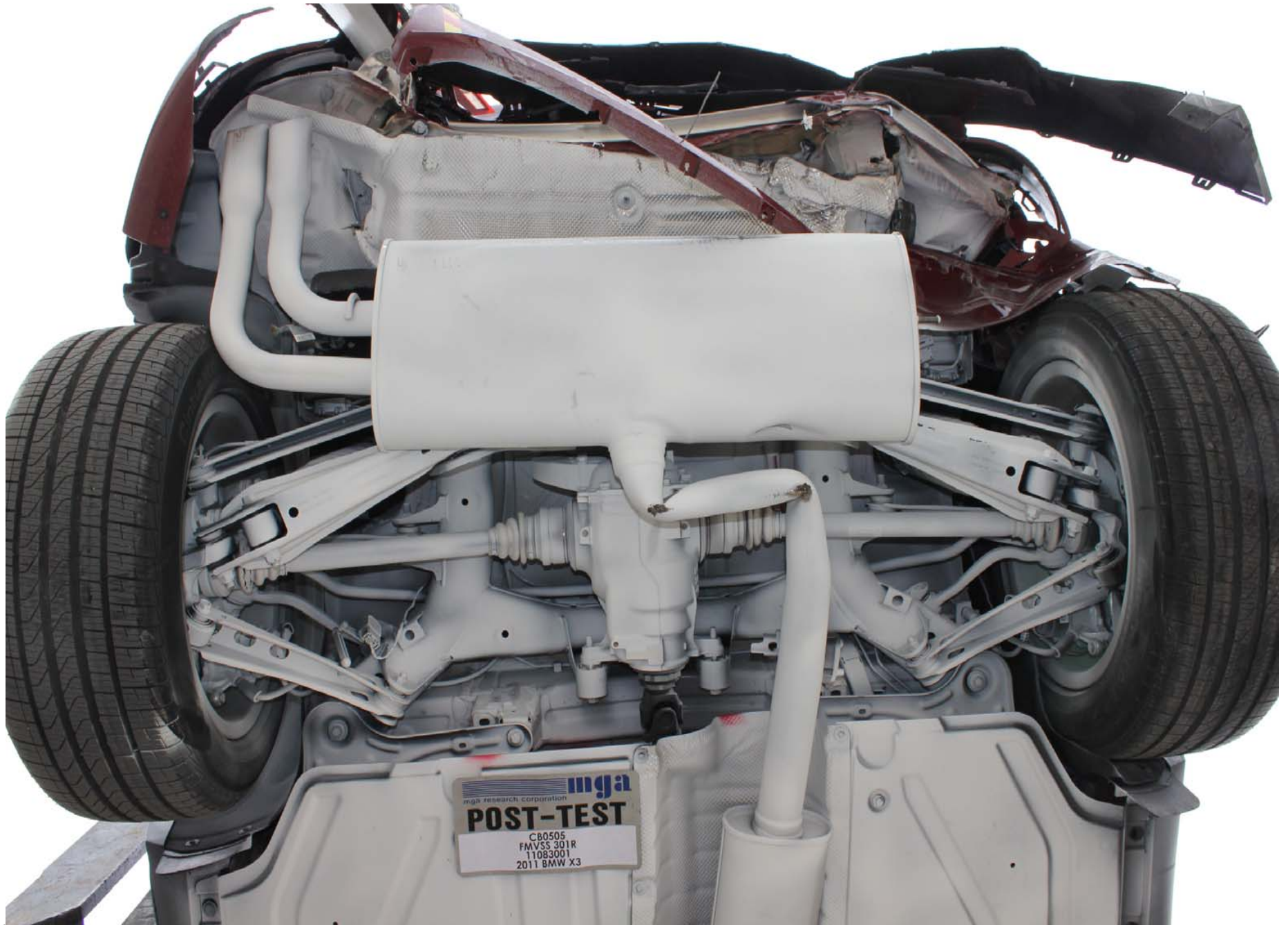


A-24.

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



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

A-31.



Pre-Test ¾ Left Side View of MDB



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



Pre-Test Top View of MDB



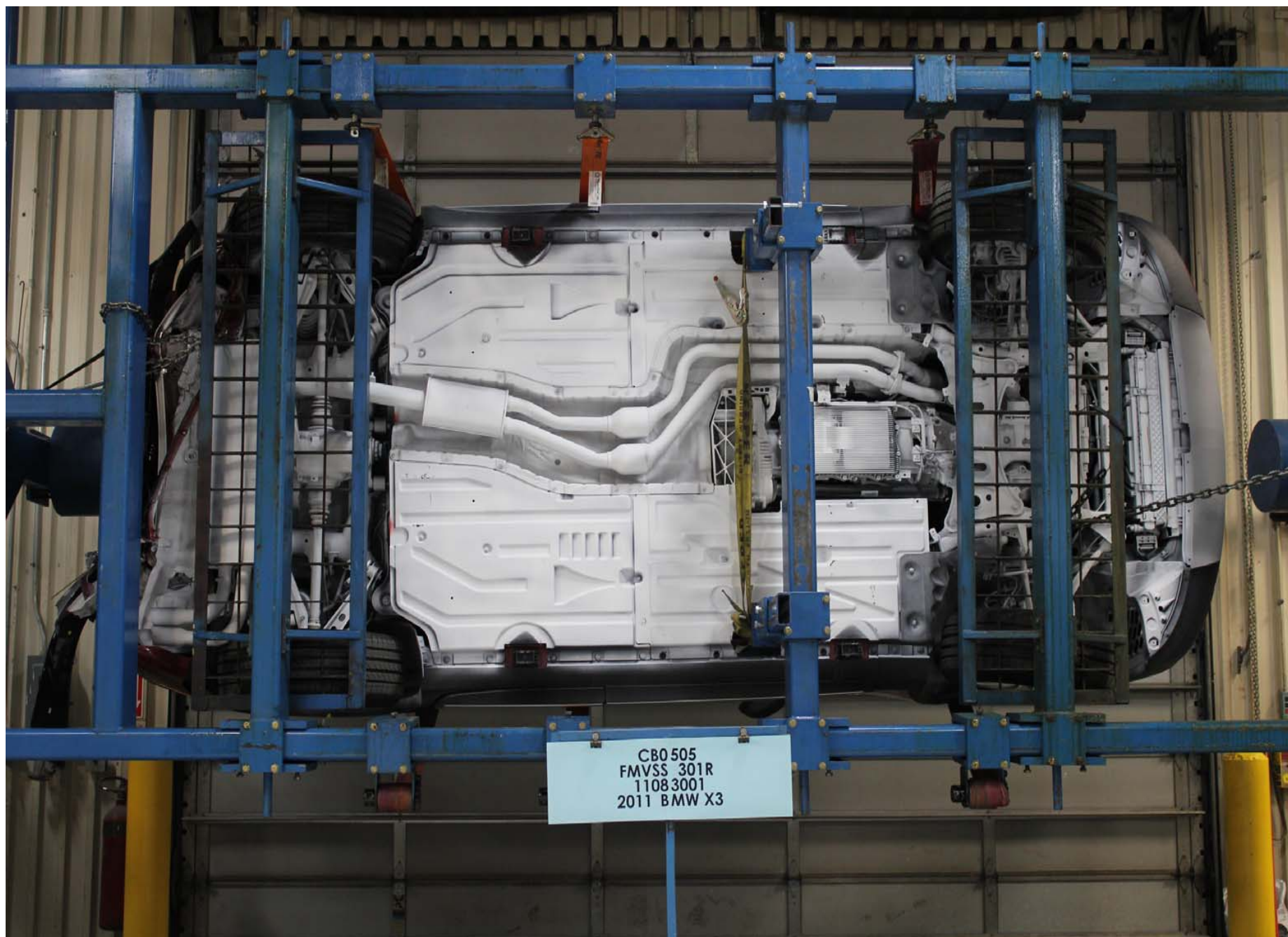
Post-Test Top View of MDB



Static Rollover at 90 Degrees



Static Rollover at 180 Degrees



Static Rollover at 270 Degrees



Static Rollover at 360 Degrees