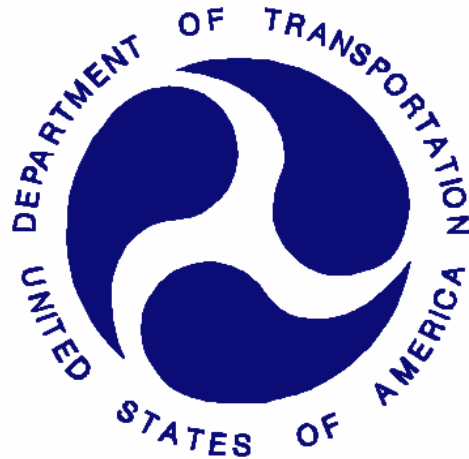


**REPORT NUMBER: 301-MGA-2010-005**

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

**NISSAN MOTOR COMPANY LTD  
2010 NISSAN CUBE  
NHTSA NUMBER: CA5201**

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



**Test Date: July 9, 2010**


**Final Report Date: August 11, 2010**

**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**

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:  Date: 7/30/2010  
Joe Fleck, Project Engineer

Reviewed by:  Date: 7/30/2010  
David Winkelbauer, Facility Director

FINAL REPORT ACCEPTED BY:

**Edward E. Chan**

Digitally signed by Edward E. Chan  
DN: cn=Edward E. Chan, o=National Highway Traffic  
Safety Administration, ou=Office of Vehicle Safety  
Compliance, email=ed.chan@dot.gov, c=US  
Date: 2010.08.11 13:21:26 -04'00'

COTR, Rear Impact

8/11/2010  
Date of Acceptance

### Technical Report Documentation Page

<b>1. Report No.</b> 301-MGA-2010-005	<b>2. Government Accession No.</b>	<b>3. Recipient's Catalog No.</b>	
<b>4. Title and Subtitle</b> Final Report for Fuel System Integrity Test of a 2010 Nissan Cube NHTSA No.: CA5201		<b>5. Report Date</b> July 30, 2010	
		<b>6. Performing Organization Code</b> MGA	
<b>7. Author(s)</b> Joe Fleck, Project Engineer		<b>8. Performing Organization Report No.</b> 301-MGA-2010-005	
<b>9. Performing Organization Name and Address</b> MGA Research Corporation 5000 Warren Road Burlington, WI 53105		<b>10. Work Unit No.</b>	
		<b>11. Contract or Grant No.</b> DTNH22-06-C-00030	
<b>12. Sponsoring Agency Name and Address</b>  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		<b>13. Type of Report and Period Covered</b> Final Report 7/9/2009 – 8/11/2010	
		<b>14. Sponsoring Agency Code</b> NVS-220	
<b>15. Supplementary Notes</b>			
<b>16. Abstract</b> A rear impact was conducted on a 2010 Nissan Cube at MGA Research Corporation on July 9, 2010. This test was conducted to obtain data indicant of FMVSS 301R. The impact velocity was 79.0 km/h. The ambient temperature at the time of impact was 28 degrees Celsius.			
<b>17. Key Words</b>  Fuel System Integrity Test 2010 Nissan Cube NHTSA No: CA5201		<b>18. Distribution Statement</b> 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 2010 Nissan Cube was impacted by a Moving Deformable Barrier (MDB) at a velocity of 79.0 km/h. The test was performed at MGA Research Corporation on July 9, 2010. Pre-and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Two ballast Part 572E, 50<sup>th</sup> 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 Stoddard Solvent leakage during the static rollover, see page 11 at the end of this report for further details.

**SECTION 2**  
**DATA SHEETS**

**DATA SHEET NO. 1**  
**TEST VEHICLE SPECIFICATIONS**

Test Vehicle: 2010 Nissan Cube NHTSA No.: CA5201  
Test Program: FMVSS 301 Fuel System Integrity Test Date: 7/9/2010

**TEST VEHICLE INFORMATION**

Manufacturer	Nissan Motor Company LTD
Model	Cube
Body Style	Passenger Car
Major Options	None
NHTSA No.	CA5201
VIN	JN8AZ2KR1AT150625
Color	Chrome Silver
Delivery Date	6/17/2010
Odometer Reading (mile)	22
Dealer	West-Herr Nissan
Transmission	Automatic
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	Nissan Motor Company LTD
Date of Manufacture	10/09

GVWR (kg)	1750
GAWR Front (kg)	900
GAWR Rear (kg)	860

**VEHICLE CAPACITY DATA**

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				390
Number of Occupants x 68 kg.				340
Cargo Wt. (RCLW) (kg)				50

**DATA SHEET NO. 1 (continued)**  
**TEST VEHICLE SPECIFICATIONS**

Test Vehicle:	<u>2010 Nissan Cube</u>	NHTSA No.:	<u>CA5201</u>
Test Program:	<u>FMVSS 301 Fuel System Integrity</u>	Test Date:	<u>7/9/2010</u>

**DATA FROM VEHICLE'S TIRE PLACARD**

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	357	357
Cold Pressure (kPa)	230	230
Recommended Tire Size	P195/55R16	P195/55R16
Recommended Load Range	86V	86V
Tire Size on Vehicle	P195/55R16	P195/55R16
Tire Manufacturer	Toyo	Toyo
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: 2010 Nissan CubeNHTSA No.: CA5201Test Program: FMVSS 301 Fuel System IntegrityTest Date: 7/9/2010**WEIGHT OF TEST VEHICLE**

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	390.5	270.3		448.2	336.1	
Right	kg	384.7	264.9		414.1	303.0	
Ratio	%	59.1	40.8		57.4	42.6	
Totals	kg	775.2	535.2	1310.4	862.3	639.1	1501.4

**CALCULATION OF TARGET TEST WEIGHT (TTW)**

Measured Parameter	Units	Value
Total Delivered Weight (UVW)	kg	1310.4
Rated Cargo/Luggage Weight (RCLW)	Kg	50
Weight of 2 P572E ATDs	kg	148
Calculated Vehicle Target Weight (TVTWT)	kg	1508.4

Vehicle Wheelbase	2530 mm
Vehicle Width	1695 mm
Weight of Ballast Secured in Rear Seat	47.6 kg
Method of Securing Ballast	Ratchet Straps
Vehicle Components Removed for Weight Reduction	None

**VEHICLE ATTITUDES**

	Units	LF	RF	LR	RR
As Delivered	mm	677	678	673	680
As Tested	mm	660	668	651	654



**DATA SHEET NO. 2 (continued)****PRE-TEST DATA**Test Vehicle: 2010 Nissan CubeNHTSA No.: CA5201Test Program: FMVSS 301 Fuel System IntegrityTest Date: 7/9/2010**FUEL SYSTEM DATA**

	Units: Liters
Usable Capacity of "Standard Tank" (Owner's Manual)	50.0
Usable Capacity Figure Furnished by COTR	50.0
Usable Capacity of "Optional" Tank	
92-94% of Usable Capacity	46.0 to 47.0
Actual Test Volume (entire fuel system filled)	46.6

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: 2010 Nissan Cube NHTSA No.: CA5201  
Test Program: FMVSS 301 Fuel System Integrity Test Date: 7/9/2010

**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)	Yokohama
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: 2010 Nissan CubeNHTSA No.: CA5201Test Program: FMVSS 301 Fuel System IntegrityTest Date: 7/9/2010**IMPACT VELOCITY**

	Units: km/h
Required Impact Velocity	80.0
Actual Impact Velocity (Trap No. 1)	79.0
Actual Impact Velocity (Trap No. 2)	79.0
Average Impact Speed	79.0

Temperature at Time of Impact (°C)	28
Test Time	9:11 am

**WELDING ROD IMPACT POINT**

	Units: mm
Vertical distance from target center (+ above target / - below target)	4 down
Horizontal distance from target center (+ to the right / - to the left)	8 left

## DATA SHEET NO. 5

### STATIC ROLLOVER TEST DATA

Test Vehicle: 2010 Nissan Cube

NHTSA No.: CA5201

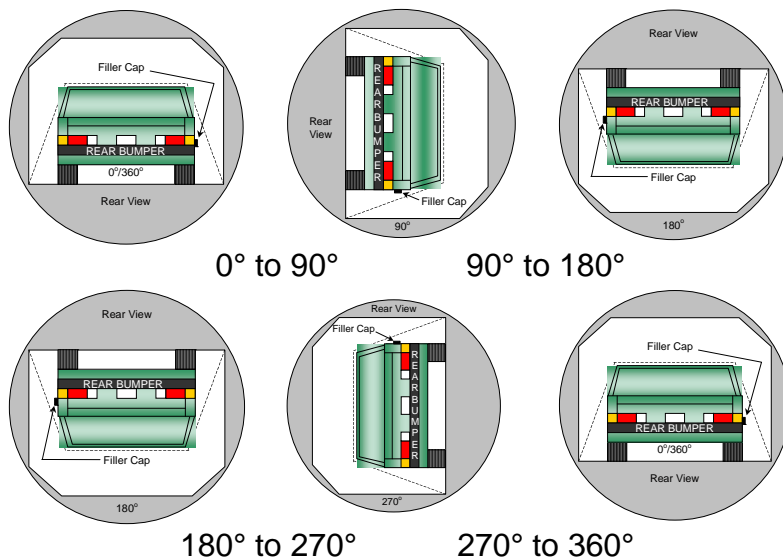
Test Program: FMVSS 301 Fuel System Integrity

Test Date: 7/9/2010

#### 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: 2010 Nissan Cube NHTSA No.: CA5201  
 Test Program: FMVSS 301 Fuel System Integrity Test Date: 7/9/2010

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

**0° TO 90° Rotation Time (sec) = 117 sec**

Test Phase	Spillage (g)	Spillage Details
First 5 minutes from onset of rotation	358	
Sixth minute from onset of rotation	68	
Seventh minute from onset of rotation	78	
Eight minute if required	68	

**90° TO 180° Rotation Time (sec) = \*\* sec**

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

**180° TO 270° Rotation Time (sec) = \*\* sec**

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

**270° TO 360° Rotation Time (sec) = \*\* sec**

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

\*\* Due to Stoddard Solvent leakage the static rollover was not completed

# FORM 1

## TEST VEHICLE INFORMATION

Test Vehicle: 2010 Nissan Cube  
 Test Program: FMVSS 301 Fuel System Integrity

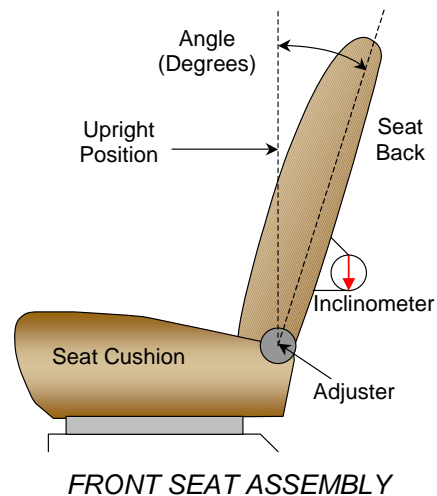
NHTSA No.: CA5201  
 Test Date: 7/9/2010

### 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:

Driver: Per Form 1 Appendix 3A, 1035 mm

Passenger: Per Form 1 Appendix 3A, 1065 mm



Driver Seat Back Angle	-3.9° at headrest post = 1035 mm
Passenger Seat Back Angle	-1.8° at headrest post = 1065 mm

### SEAT FORE/AFT POSITIONING

	Total Fore/Aft Travel	Placed in Position #
Driver Seat	260 mm	130 mm
Passenger Seat	240 mm	120 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.

## LABORATORY NOTICE OF APPARENT TEST FAILURE TO OVSC

FMVSS NO. 301R TEST DATE:	July 9, 2010
LABORATORY:	MGA Research Corporation
CONTRACT NO.:	DTNH22-06-C-00030
DELIVERY ORDER NO.:	Modification 007
LABORATORY PROJECT ENGINEER'S NAME:	Joe Fleck
TEST SPECIMEN DESCRIPTION:	2010 Nissan Cube
VEHICLE NHTSA NO.:	CA5201
VIN:	JN8AZ2KR1AT150625
MFR:	Nissan Motor Co.
APPARENT TEST FAILURE DESCRIPTION:	The test vehicle was subjected to a 301R Fuel System Integrity test. During the 301 Static Rollover portion of the test Stoddard spillage was collected and measured. From the onset of rotation at 0 degrees for the first five minutes a total of 358 grams of Stoddard was collected.
FMVSS REQUIREMENT, PARAGRAPH(S) :	FMVSS 571.301 S5.6: Fuel Spillage in any rollover test, from the onset of rotational motion, shall not exceed a total of 142 g for the first 5 minutes of testing at each successive 90° increment.
NOTIFICATION TO NHTSA (COTR):	Ed Chan
DATE:	7/09/2010
BY:	Joe Fleck
REMARKS:	A photo of the vehicle certification label is attached.



2010 Nissan Cube Certification Placard

**APPENDIX A**  
**PHOTOGRAPHS**



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MFD BY. NISSAN MOTOR CO., LTD.  
 DATE 10/09  
 GVWR 3858 LBS.  
 GAWR FR. 1984 LBS.  
 WITH P195/55R16 TIRES.  
 16X6 RIMS. AT 33 PSI  
 COLD SINGLE.  
 GAWR RR. 1896 LBS.  
 WITH P195/55R16 TIRES.  
 16X6 RIMS. AT 33 PSI  
 COLD SINGLE.  
 THIS VEHICLE CONFORMS  
 TO ALL APPLICABLE FED-  
 ERAL MOTOR VEHICLE SA-  
 FETY AND THEFT PREVEN-  
 TION STANDARDS IN EFF-  
 ECT ON THE DATE OF MA-  
 NUFACTURE SHOWN ABOVE.  
 VIN: JN8AZ2KR1A150625  
 TYPE: MPV  
 COLOR W TRIM TRANS  
 KYO REOF08B  
 AXLE ENGINE  
 GH54 MR18 (DE) 1798CC

J  
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8  
A  
Z  
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K  
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1  
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6  
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5

A-1.

Vehicle's Certification Label





**TIRE AND LOADING INFORMATION**  
**RENSEIGNEMENTS SUR LES**  
**PNEUS ET LE CHARGEMENT**

SEATING CAPACITY NOMBRE DE PLACES	TOTAL TOTAL	5	FRONT AVANT	2
			REAR ARRIÈRE	3

The combined weight of occupants  
and cargo should never exceed **390 kg** or **860 lbs.**

Le poids total des occupants et du chargement ne  
doit jamais dépasser **390 kg** ou **860 lb.**

TIRE PNEU	SIZE DIMENSIONS	COLD TIRE PRESSURE PRESSION DES PNEUS À FROID
FRONT AVANT	P195/55R16 86V	230kPa , <b>33PSI</b>
REAR ARRIÈRE	P195/55R16 86V	230kPa , <b>33PSI</b>
SPARE DE SECOURS	T125/70D15	420kPa , <b>60PSI</b>

**SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION.**  
**VOIR LE MANUEL DE L'USAGER POUR PLUS DE RENSEIGNEMENTS**

ZB

1FC1B





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



A-7.



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



A-10.



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 ¾ Frontal View From Right Side of Vehicle





Post-Test  $\frac{3}{4}$  Frontal View From Right Side of Vehicle



Pre-Test ¾ Rear View From Right Side of Vehicle





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



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



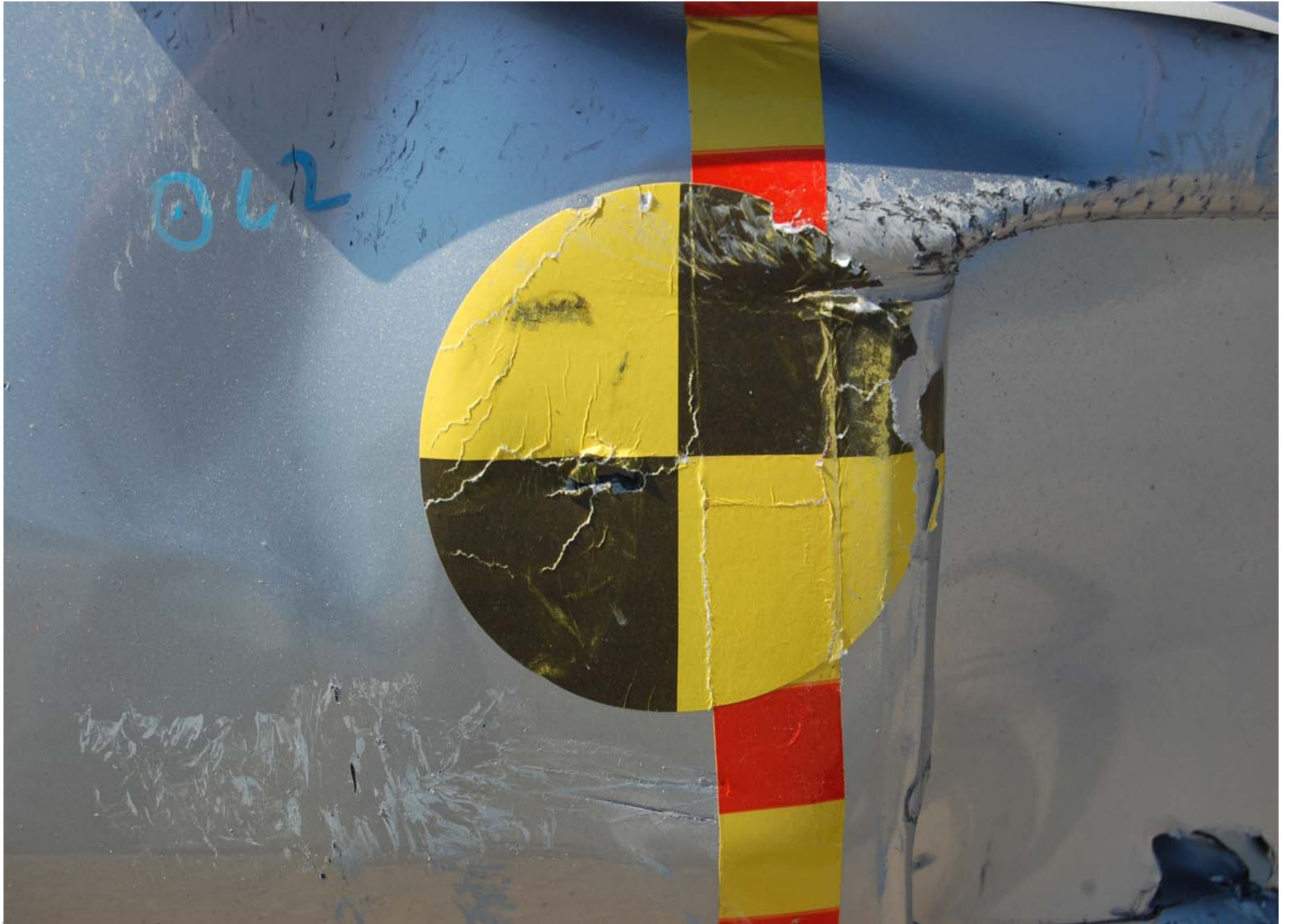


Post-Test ¾ Rear View From Left Side of Vehicle



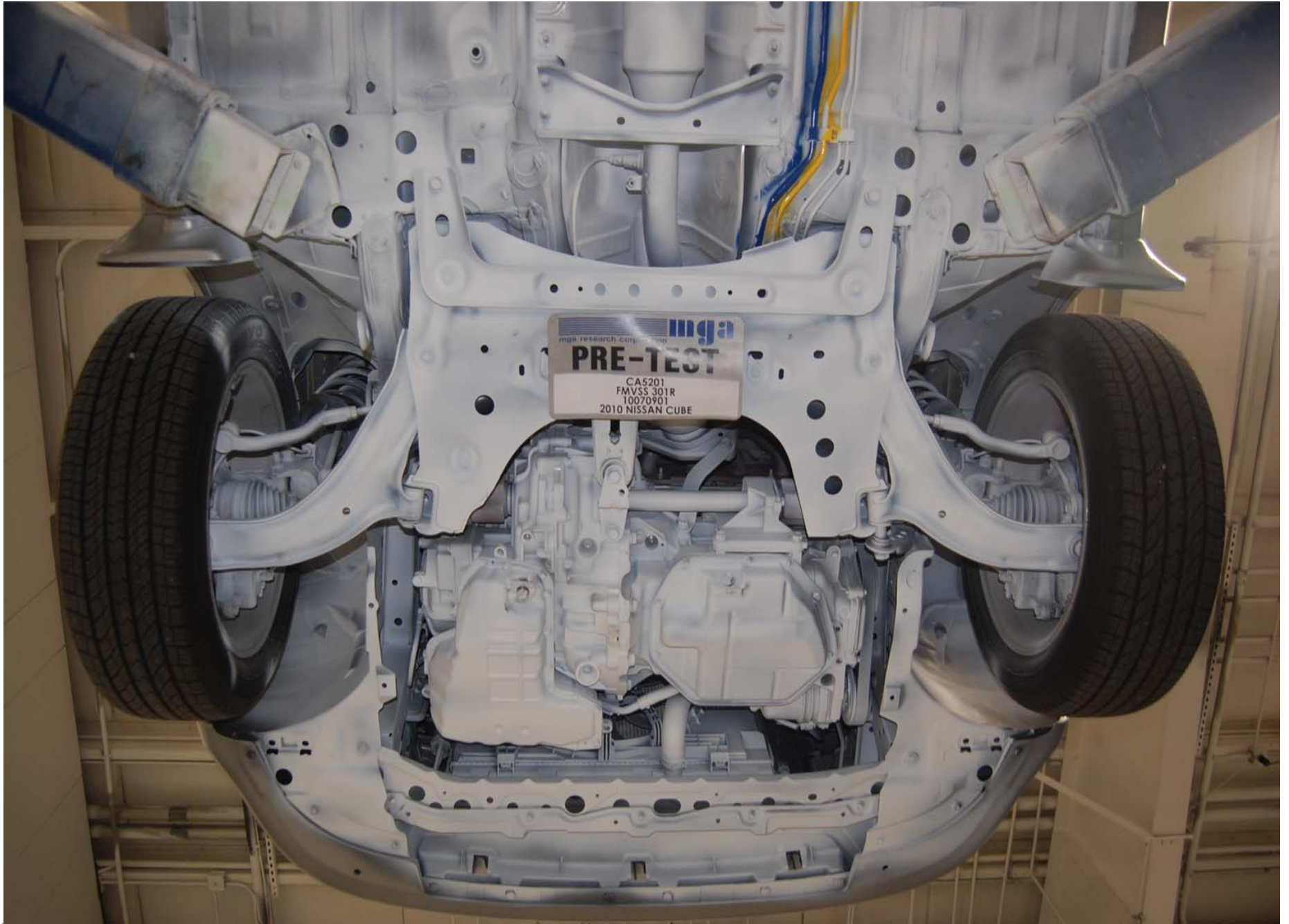
Pre-Test Impact Point



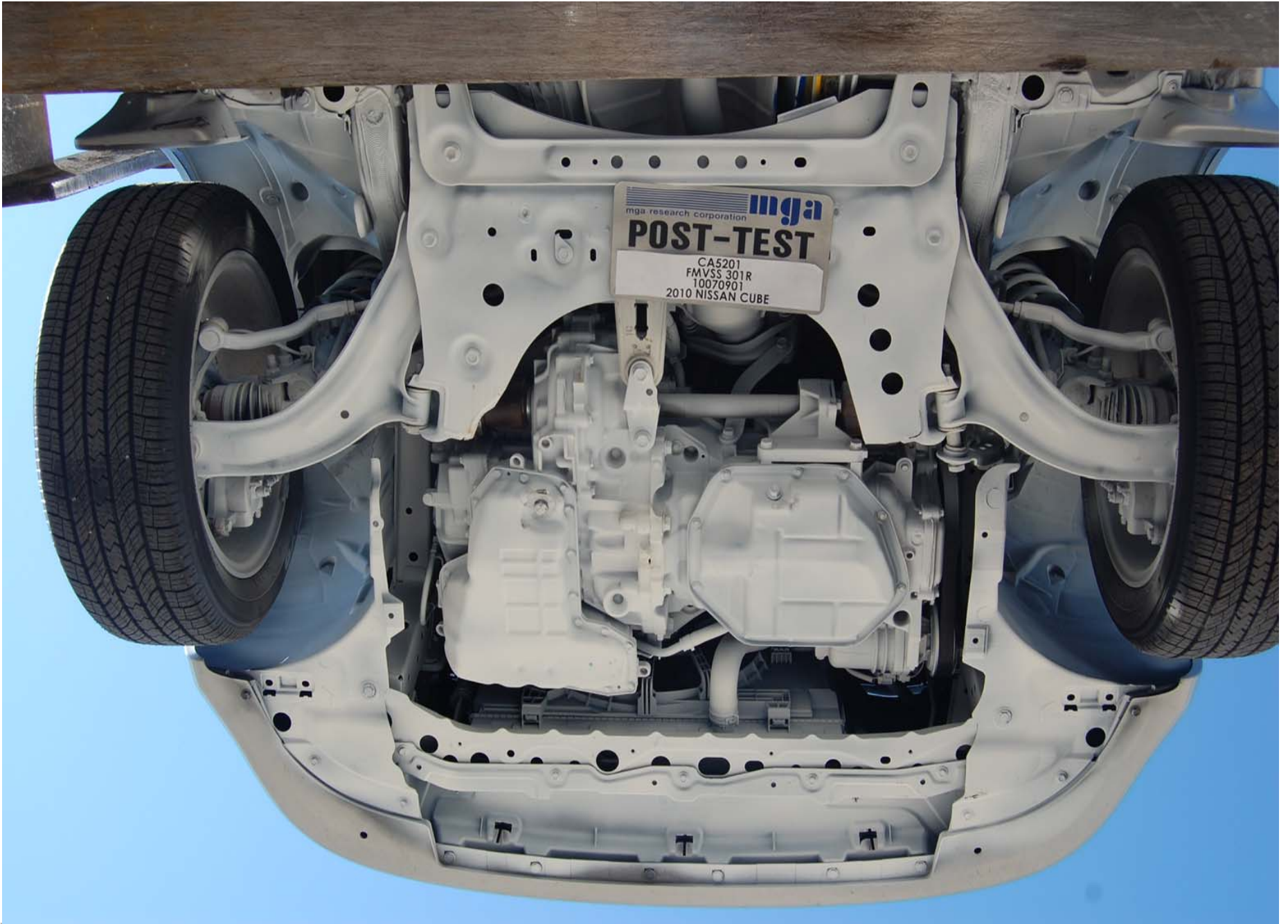


Post-Test Impact Point



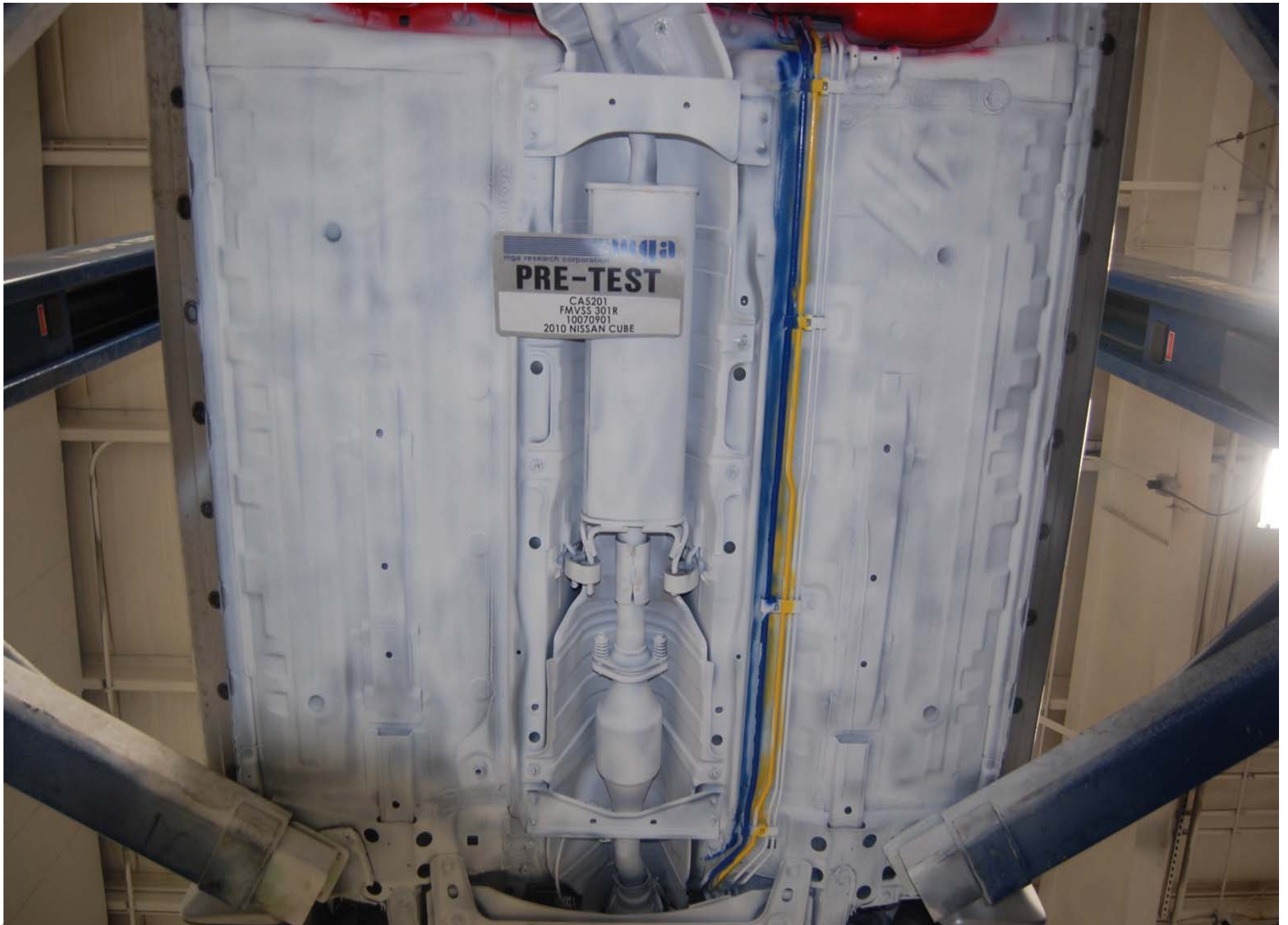


Pre-Test Underbody View 1



Post-Test Underbody View 1



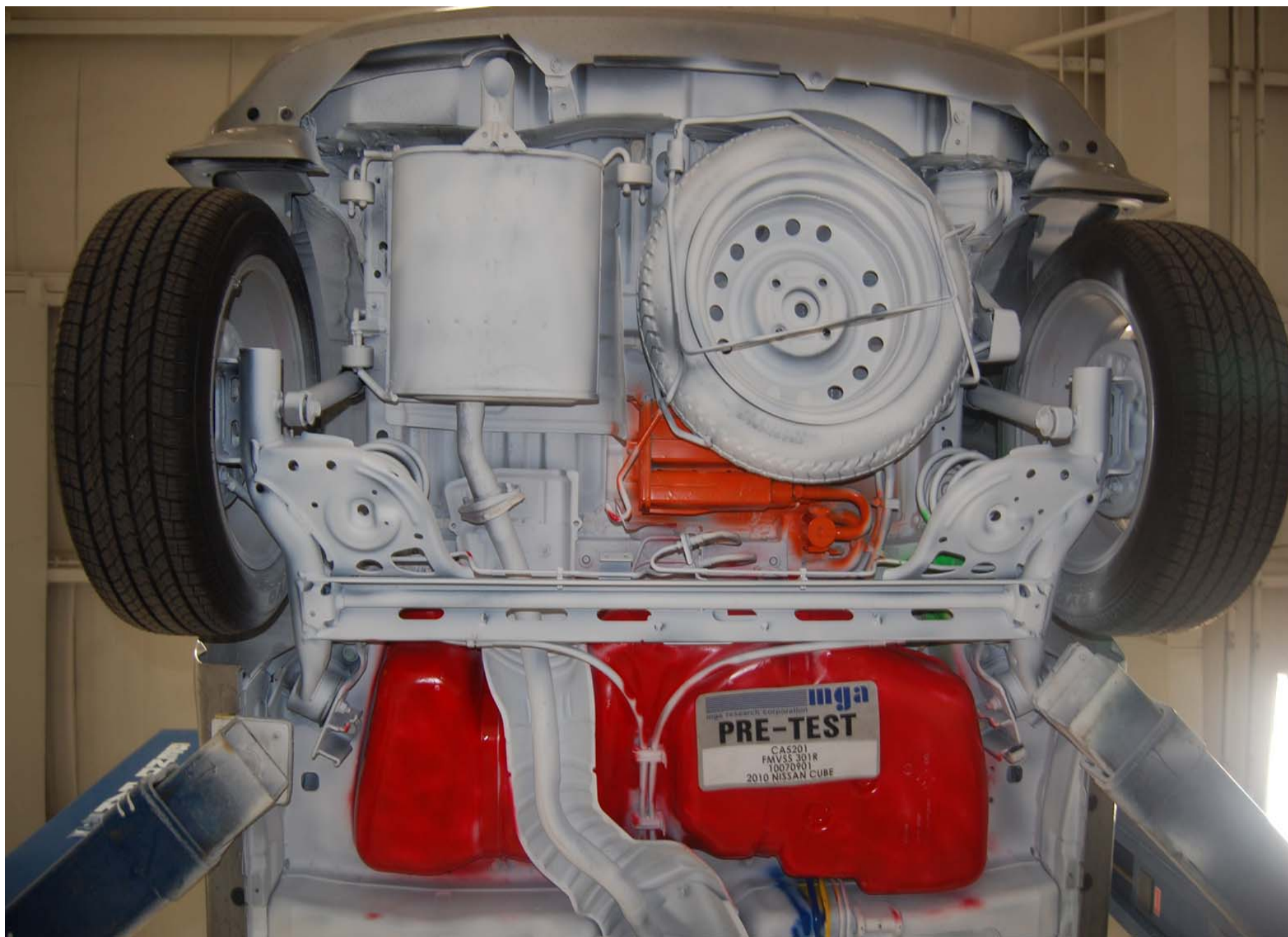


Pre-Test Underbody View 2

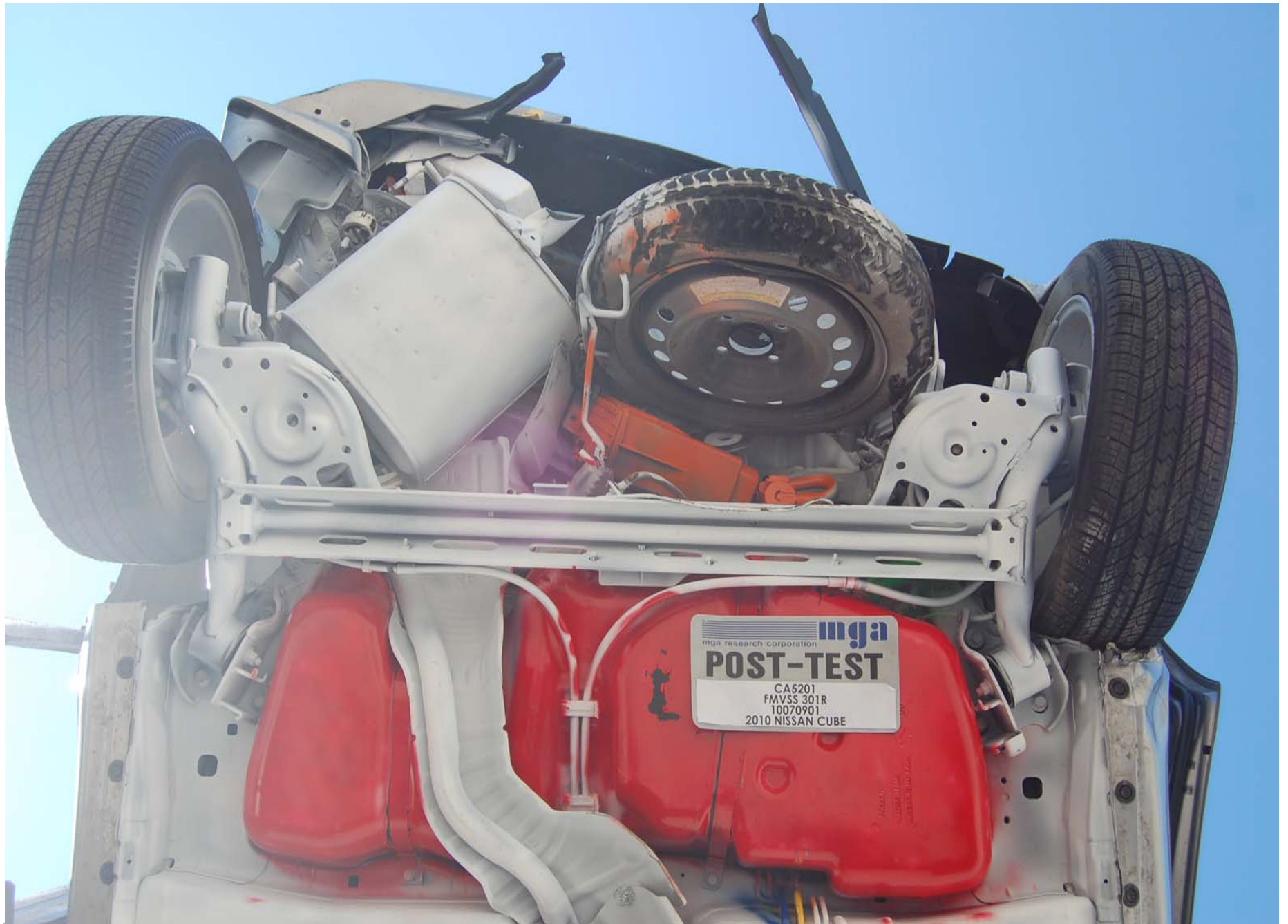


Post-Test Underbody View 2





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 ¾ Right Side View of MDB





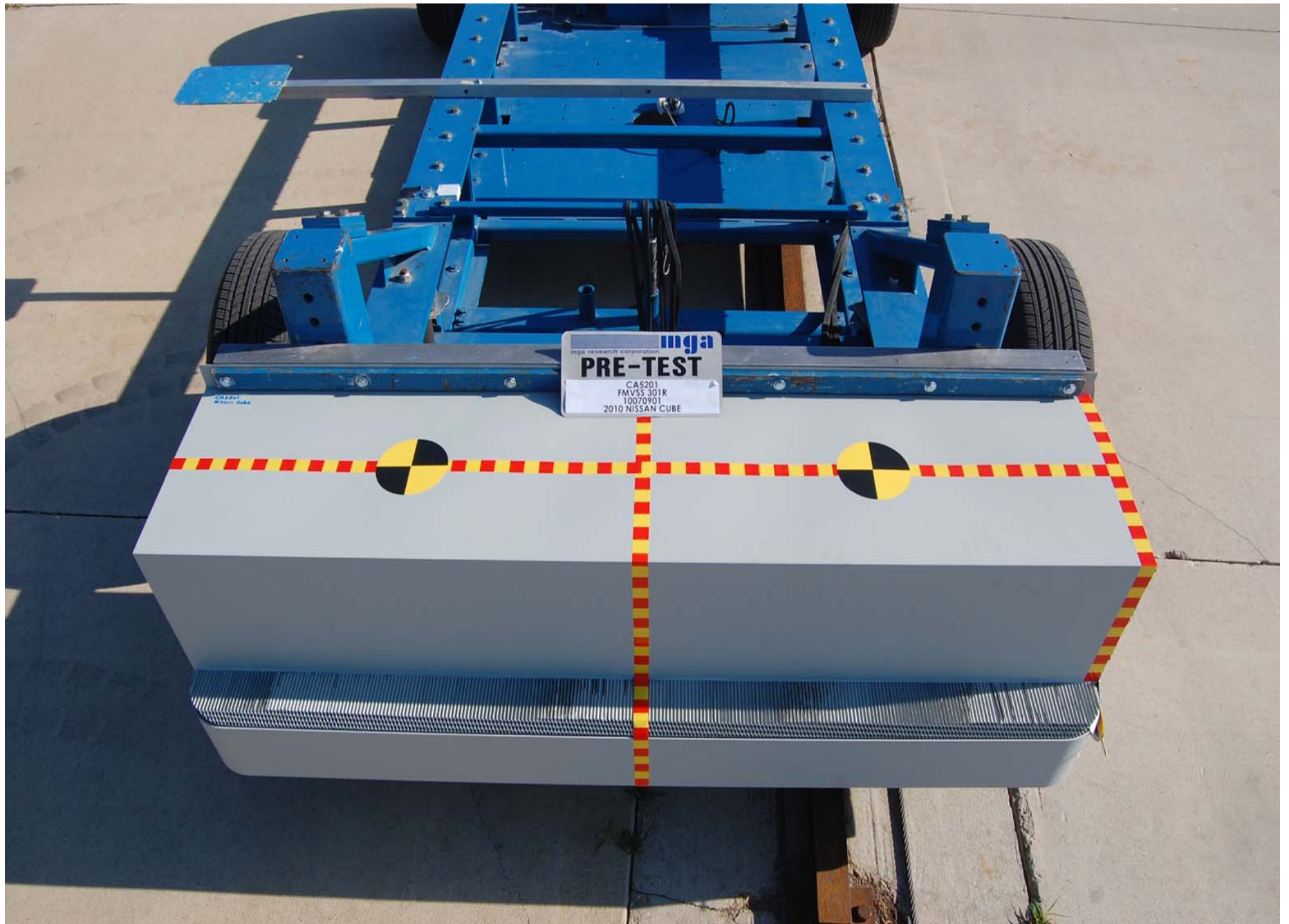
Pre-Test ¾ Left Side View of MDB





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





Rotation 90° Clockwise



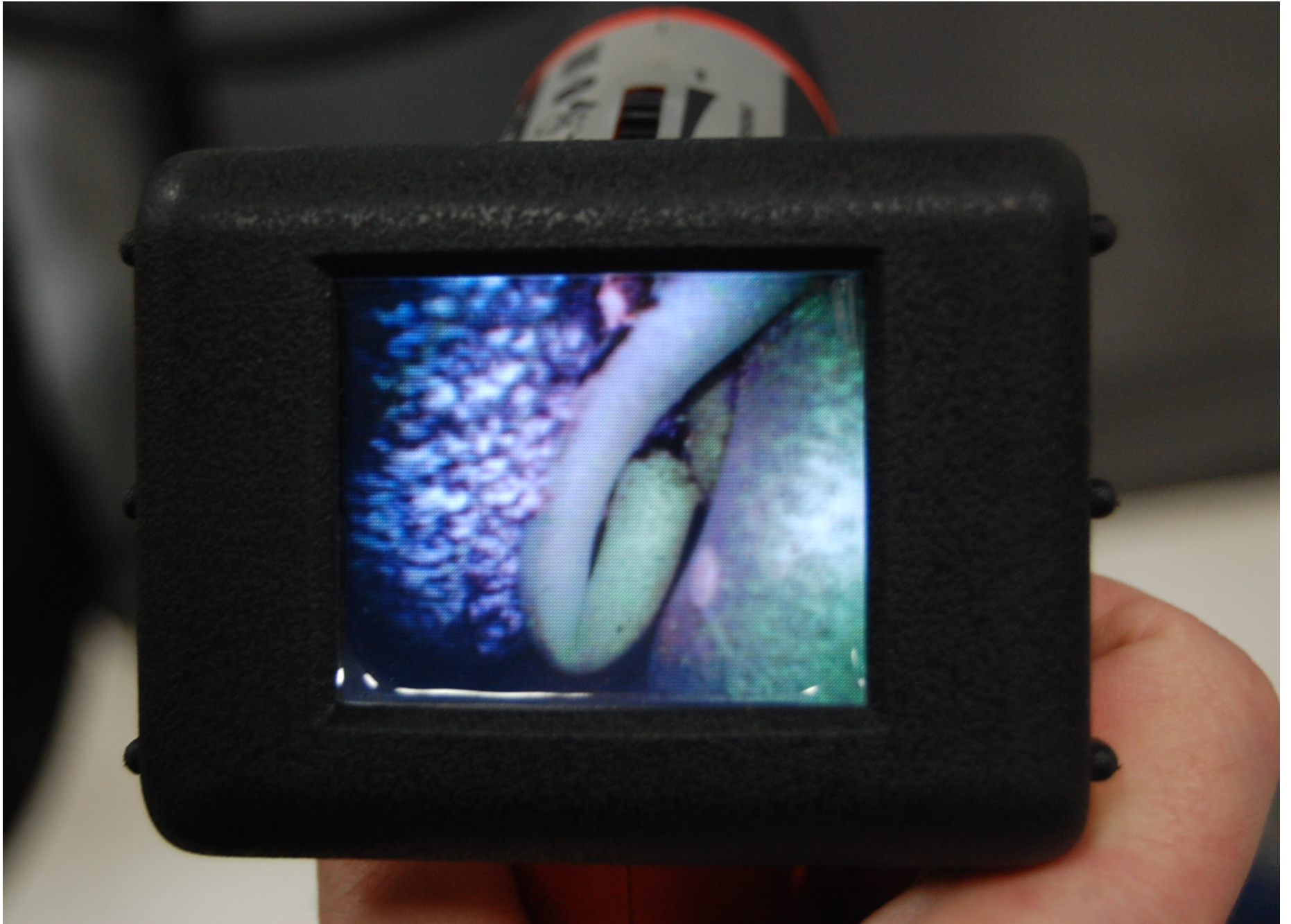
A-39.



Leak Point at 0°

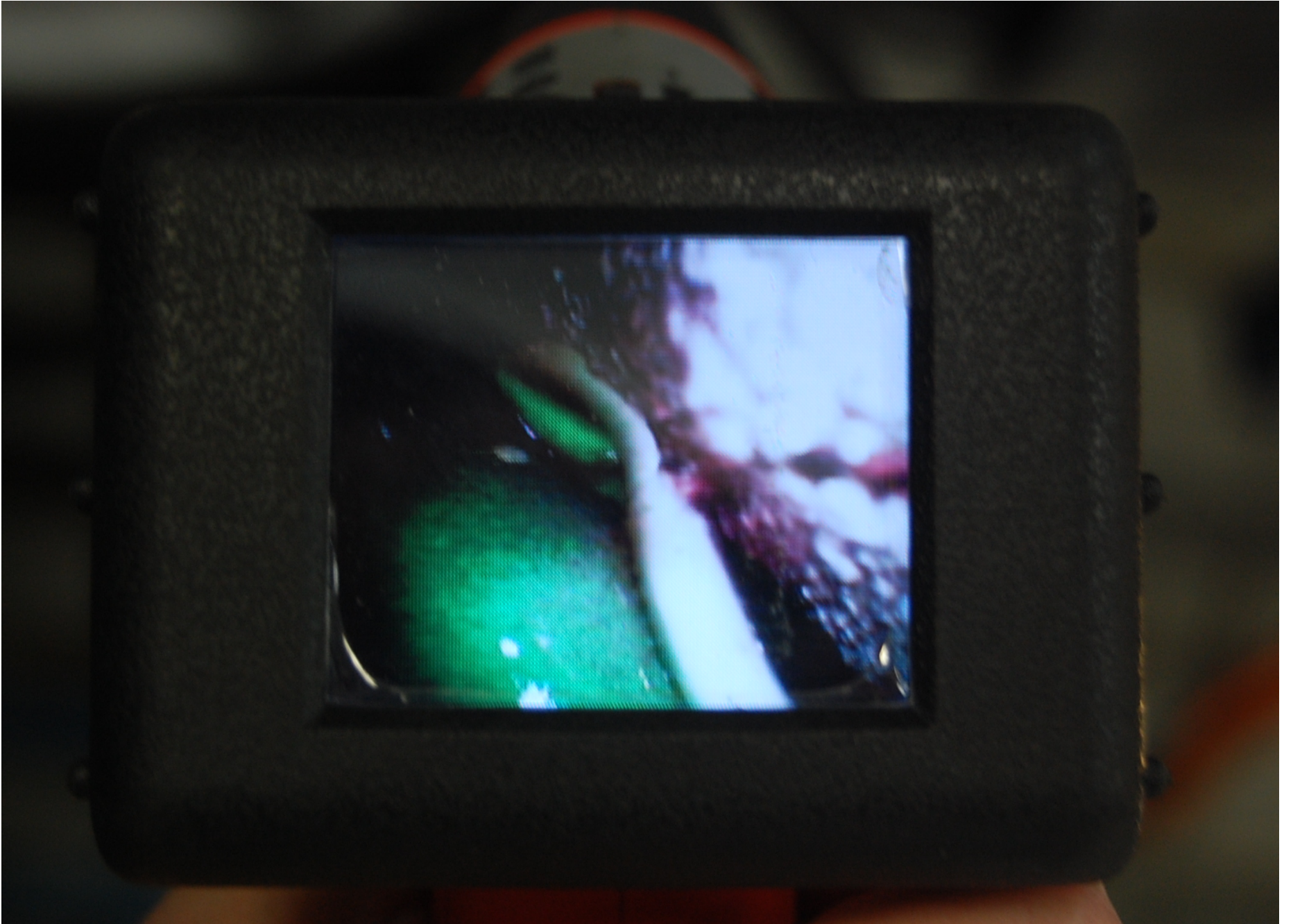


A-40.



Leak Point at 90°





Leak Point Post Inspection