

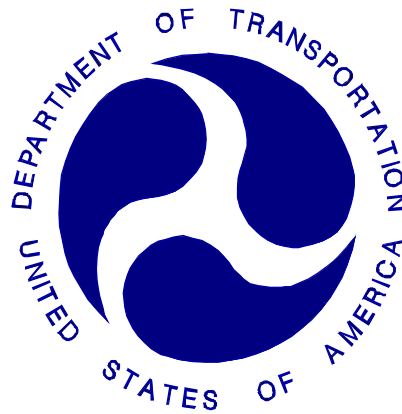
REPORT NUMBER: 301-CAL-09-04

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

NISSAN MOTOR CO. LTD.
2009 NISSAN MURANO
4-DOOR SUV

NHTSA NUMBER: C95204

CALSPAN
TRANSPORTATION SCIENCES CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225



April 16,2009

FINAL REPORT

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance (NVS-224)
1200 New Jersey Avenue, SE
Washington, DC 20590

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-06-C-00031. This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufactures' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.



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16. Abstract Compliance tests were conducted on the subject 2009 Nissan Murano 4-door SUV in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301R-02 for the determination of FMVSS 301 compliance. Test failures identified were as follows: The test vehicle appeared to comply with all requirements of FMVSS 301R-02 "Fuel System Integrity – Rear Impact."					
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SECTION 1

PURPOSE AND TEST PROCEDURE

This rear impact test is part of the FMVSS 301 Compliance Test Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-06-C-00031. The purpose of this test was to determine if the subject vehicle, a 2009 Nissan Murano 4-door SUV, meets the performance requirements of FMVSS No. 301R-02 "Fuel System Integrity – Rear Impact." The test was conducted in accordance with the Office of Vehicle Safety Compliance's Laboratory Test Procedure (TP-301R-02, dated January 17, 2007).

SECTION 2

COMPLIANCE TEST RESULTS SUMMARY

A 2051.5 kg 2009 Nissan Murano 4-door SUV was impacted from the rear by a 1362.5 kg moving barrier at a velocity of 79.3 kph (49.3 mph). The test was performed by Calspan Corporation on April 16,2009.

The test vehicle was equipped with a 82.14 liter fuel tank which was filled to 92 percent capacity with stoddard fluid prior to impact. Additional ballast (76 kg) was secured in the vehicle cargo area. Two ballast Part 572E 50th percentile male Anthropomorphic Test Device (ATD) were placed in the front occupant seating positions.

The crash event was recorded by three high-speed cameras and one real-time camera. High-speed camera locations and other pertinent camera information are found on page 3-6 of this report. Pre- and post-test photographs of the vehicle can be found in Appendix A.

There was no fuel system fluid spillage following the impact or during any portion of the static rollover test. The average vehicle longitudinal crush was 312 millimeters. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity."

SECTION 3

SUMMARY OF TEST RESULTS

DATA SHEET 1

TEST VEHICLE SPECIFICATIONS

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2009 Nissan Murano 4-door SUV
 Vehicle Body Color: Merlot NHTSA Number: C95204
 Engine Data: 6 Cylinders; - CID; 3.5 Liters; - cc
 Transmission: CVT Speed; - Manual; x Automatic; - Overdrive
 Final Drive: - Rear Wheel Drive; - Front Wheel Drive; x Four Wheel Drive

MAJOR TEST VEHICLE OPTIONS:

x AC; x Pwr Steering; x Power Brakes; x Power Locks; x Power Seats
x ABS; x Tilt Wheel; x Stab Control x Traction Control x Anti-Theft

DEALER AND DELIVERY INFORMATION:

Date Received: 9/24/09 ; Odometer Reading 87 km
 Selling Dealer: West-Herr Nissan
 Dealer Address: 3580 Southwestern Blvd. Orchard Park NY 14127

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufacturer: Nissan Motor Co. LTD.
 Vehicle Build Date: 03/08
 VIN: JN8AZ18W19W127671
 GVWR: 2375 kg; GAWR: 1237 kg FRONT; 1160 kg REAR

DATA FROM VEHICLE'S TIRE LABEL AND SIDEWALL:

Location of Tire Placard: Lower B-Pillar
 Type of Spare Tire: Temporary

	<u>Front</u>	<u>Rear</u>
Maximum Tire Pressure (sidewall - kPa)	300	300
Cold Pressure (tire placard - kPa) – test pressure	230	230
Recommended Tire Size (tire placard)	P235/6R18	P235/6R18
Vehicle Tire Size with load index & speed symbol	104T	104T
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Dueler H/T 687	Dueler H/T 687
Treadwear, Traction, Temperature	300 B B	300 B B

VEHICLE CAPACITY DATA:

Type of Front Seats: - Bench; x Bucket; - Split Bench
 Number of Occupants: 2 Front; 3 Rear; 5 Total
 Vehicle Capacity Weight (VCW) = 408 kg
 No. of Occupants x 68.04 kg = 340 kg
 Rated Cargo/Luggage Weight (RCLW) = 68 kg

DATA SHEET 2

PRE-TEST DATA

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids)= UDW:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	534.0	537.5	58.4	1071.5
Rear =	390.0	372.5	41.6	762.5
Total Delivered Weight (UDW) =				1834.0

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	1834.0	kg
Rated Cargo/Luggage Weight (RCLW) =	68.0	kg
Weight of 2 p.572E Dummies @ 78 each =	156	kg
TARGET TEST WEIGHT =	2058.0	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 61.5 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	594.0	596.5	58.0	1190.5
Rear =	438.5	422.5	42.0	861.0
Total Vehicle Test Weight (ATW) =				2051.5

Weight of Ballast Secured in Vehicle¹ = 76 kg Ballast Type Lead Shot

Method of securing Ballast: Compartment placement

Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in millimeters):

	Left Front	Right Front	Left Rear	Right Rear	CG ²
AS DELIVERED:	867	866	885	890	1174.5
AS TESTED:	849	851	873	872	1185.6

Vehicle's Wheel Base: 2825 mm

¹Ballast weight does not include the weight of instrumentation, on-board cameras and data acquisition system

²Rearward of the front axle centerline.

VEHICLE PRE-TEST WIDTH AND IMPACT OFFSET MEASUREMENT:

Vehicle Width at Widest Point: 1884 mm

Location: Rear Axle

Centerline offset for impact line: 376.8 / 1507.2 mm

Filler neck side (left/right) Left

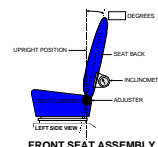
DATA SHEET 2 (continued)

PRE-TEST DATA

Vehicle: 2009 Nissan Murano 4-door SUV

NHTSA No. C95204

Nominal Design Riding Position for adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



Seat back angle for driver's seat: 21

Measurement instructions: Seat back was positioned 10 degrees rearward of full upright position

Seat back angle for passenger's seat: 21

Measurement instructions: Seat back was positioned 10 degrees rearward of full upright position

2. SEAT FORE AND AFT POSITIONING:

Positioning of the driver's seat: Full forward full up to full rear full down was 284 mm

Seat was positioned at 142 mm on face of cushion with lowest vertical cushion adjustment

Positioning of the passenger's seat: 24 detents available – seat was positioned at notch 12 from 0

3. FUEL TANK CAPACITY DATA:

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 82.14 liters

B. "Usable Capacity" of the optional equipment fuel tank is - liters

C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 = 75.57 to 77.21 liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 75.71 liters

Stoddard Fluid: specific gravity: 0.764; kinematic viscosity: 0.96 centistokes; color: Red

3.3 Is vehicle equipped with electric fuel pump? Yes- x; No-

If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

With ignition turned "ON"

4. STEERING COLUMN ADJUSTMENTS:

Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

Operational Instructions: Column was set to detent 3 from 0. Telescopic travel was 40 mm.

Column was centered at 20 mm from 0.

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position:

4 detents available – seat belt adjuster was positioned at uppermost or 0.

6. COMMENTS:

None

DATA SHEET 3

MOVING DEFORMABLE BARRIER (MDB) DATA

Vehicle: 2009 Nissan Murano 4-door SUV

NHTSA No. C95204

MDB FACE MANUFACTURER AND SERIAL NUMBER:

N/A

MDB DETAILS:

Overall Width of Framework Carriage	=	<u>1250</u>	millimeters
Overall Length of MDB (incl. honeycomb impact face)	=	<u>4120</u>	millimeters
Wheelbase of Framework Carriage	=	<u>2591</u>	millimeters
Tread of Framework Carriage (Front & Rear)	=	<u>1875</u>	millimeters
C.G. Location Rearward of Front Axle	=	<u>1139</u>	millimeters

MDB WEIGHT:

Left Front	=	<u>357.0</u>	kg	Left Rear	=	<u>323.0</u>	kg
Right Front	=	<u>404.0</u>	kg	Right Rear	=	<u>273.5</u>	kg
TOTAL FRONT	=	<u>761.0</u>	kg	TOTAL REAR	=	<u>596.5</u>	kg
TOTAL MDB WEIGHT	=	<u>1357.5</u>	kg				

Tires (Mfr, line, size): _____

TIRE PRESSURE:

Left Front	=	<u>207</u>	kPa	Left Rear	=	<u>207</u>	kPa
Right Front	=	<u>207</u>	kPa	Right Rear	=	<u>207</u>	kPa

Brake Abort System? (Yes/No) Yes

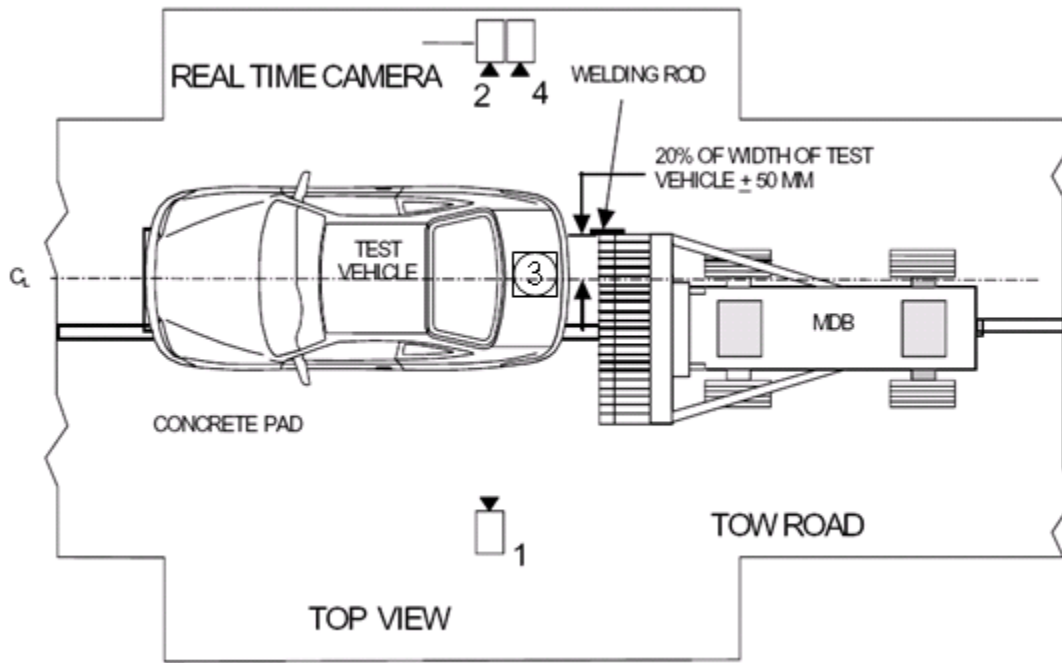
Date of Last Calibration: 06/07

DATA SHEET 4

HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY

Vehicle: 2009 Nissan Murano 4-door SUV

NHTSA No. C95204



Camera No.	View	Coordinates (millimeters)			Angle (deg.)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Left Side View	7117	1805	1094	3.6	25	1000
2	Real-Time Camera	-	-	-	-	-	30
3	Overhead View	0	0	4880	90	12.5	1000
4	Right Side View	7764	1423	954	1.1	25	1000

* Reference (from point of impact); all measurements accurate to within ± 6 mm.

X = (Impact Point) + Forward

Y = (Impact Point) + To Right

Z = (Ground Level) + Down

DATA SHEET 5

POST-TEST DATA

Vehicle: 2009 Nissan Murano 4-door SUV

NHTSA No. C95204

REQUIRED IMPACT VELOCITY RANGE:: 78.5 to 80.1 km/h

ACTUAL IMPACT VELOCITY WITHIN 1.5 M OF IMPACT PLANE:

Trap No. 1 = 79.3 km/h Trap No. 2 = 79.3 km/h

Average Impact Speed = 79.3 km/h

WELDING ROD IMPACT POINT:

0 Vertical distance from target center (+ is above) Tolerance: ± 40 mm

0 Horizontal distance from target center (+ is right) Tolerance: ± 50 mm

STODDARD SOLVENT SPILLAGE MEASUREMENT:

A. Front impact until vehicle motion ceases -

Actual = 0 g Maximum Allowable = 28 g

B. For 5 minute period after vehicle motion ceases -

Actual = 0 g Maximum Allowable = 28 g

C. For next 25 minutes -

Actual = 0 g/minute Maximum Allowable = 28 g/minute

D. Provide Spillage Details:

None

DATA SHEET 5

POST-TEST DATA (Continued)

Vehicle: 2009 Nissan Murano 4-door SUV

NHTSA No. C95204

POST TEST SEAT DATA

LOCATION	SEAT MOVEMENT (mm)	SEAT BACK FAILURE
P1 (Left Front)	0	None
P2 (Right Front)	0	None

POST TEST ATD CONTACT DATA

LOCATION	Position 1 (Driver)	Position 2 (Passenger)
Head	Back of head to head restraint	Back of head to head restraint
Chest	None	None
Abdomen	None	None
Left Knee	None	None
Right Knee	None	None

VEHICLE DIMENSIONS:

Vehicle length:

	Left Side	Centerline	Right Side
Pre-Test	4625	4794	4625
Post-Test	4313	4496	4463
Crush	312	298	162

Vehicle Wheel Base:

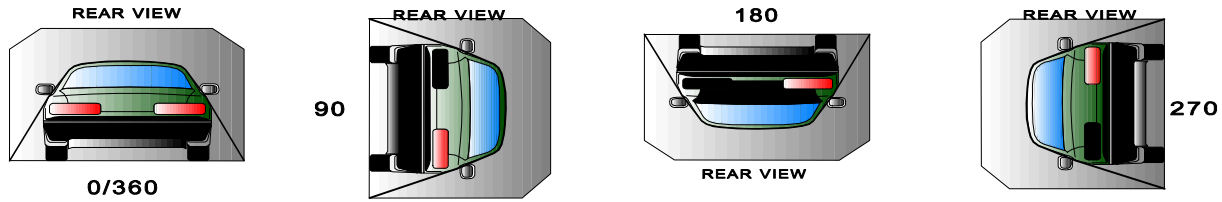
	Left Side	Right Side
Pre-Test	2821	2825
Post-Test	2723	2835
Crush	98	-10

DATA SHEET 6

FMVSS 301 ROLLOVER DATA

Vehicle: 2009 Nissan Murano 4-door SUV

NHTSA No.: C95204



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Stage	Rotation Time 05(spec. 1 -3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
	1	minutes	09	seconds	5	minutes	6	minutes	9	seconds	7	minutes
0° - 90°	1	minutes	10	seconds	5	minutes	6	minutes	10	seconds	7	minutes
90° - 180°	1	minutes	07	seconds	5	minutes	6	minutes	7	seconds	7	minutes
180°-270°	1	minutes	05	seconds	5	minutes	6	minutes	5	seconds	7	minutes

II. FMVSS 301 REQUIREMENTS: (Maximum allowable solvent spillage):

First 5 minutes from onset of rotation	6th min.	7th min.	8th min. (if required)
142 g	28 g	28 g	28 g

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

Rollover Stage	First 5 minutes from onset of rotation (g)	6th min. (g)	7th min. (g)	8th min. (if required) (g)
0° - 90°	0	0	0	N/A
90° - 180°	0	0	0	N/A
180°-270°	0	0	0	N/A
270°-360°	0	0	0	N/A

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S):

Rollover Stage	Spillage Location
0° - 90°	None
90° - 180°	None
180°-270°	None
270°-360°	None

APPENDIX A

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Figure A-1: Vehicle Certification Placard



Figure A-2: Vehicle Tire Placard



Figure A-3: Pre-Test Front View



Figure A-4: Post-Test Front View



Figure A-5: Pre-Test Left Side View



Figure A-6: Post-Test Left Side View



Figure A-7: Pre-Test Right Side View



Figure A-8: Post-Test Right Side View



Figure A-9: Pre-Test Left Front Three-Quarter View



Figure A-10: Post-Test Left Front Three-Quarter View



Figure A-11: Pre-Test Right Front Three-Quarter View



Figure A-12: Post-Test Right Front Three-Quarter View



Figure A-13: Pre-Test Left Rear Three-Quarter View



Figure A-14: Post-Test Left Rear Three-Quarter View



Figure A-15: Pre-Test Right Rear Three-Quarter View



Figure A-16: Pre-Test Right Rear Three-Quarter View



Figure A-17: Pre-Test Rear View

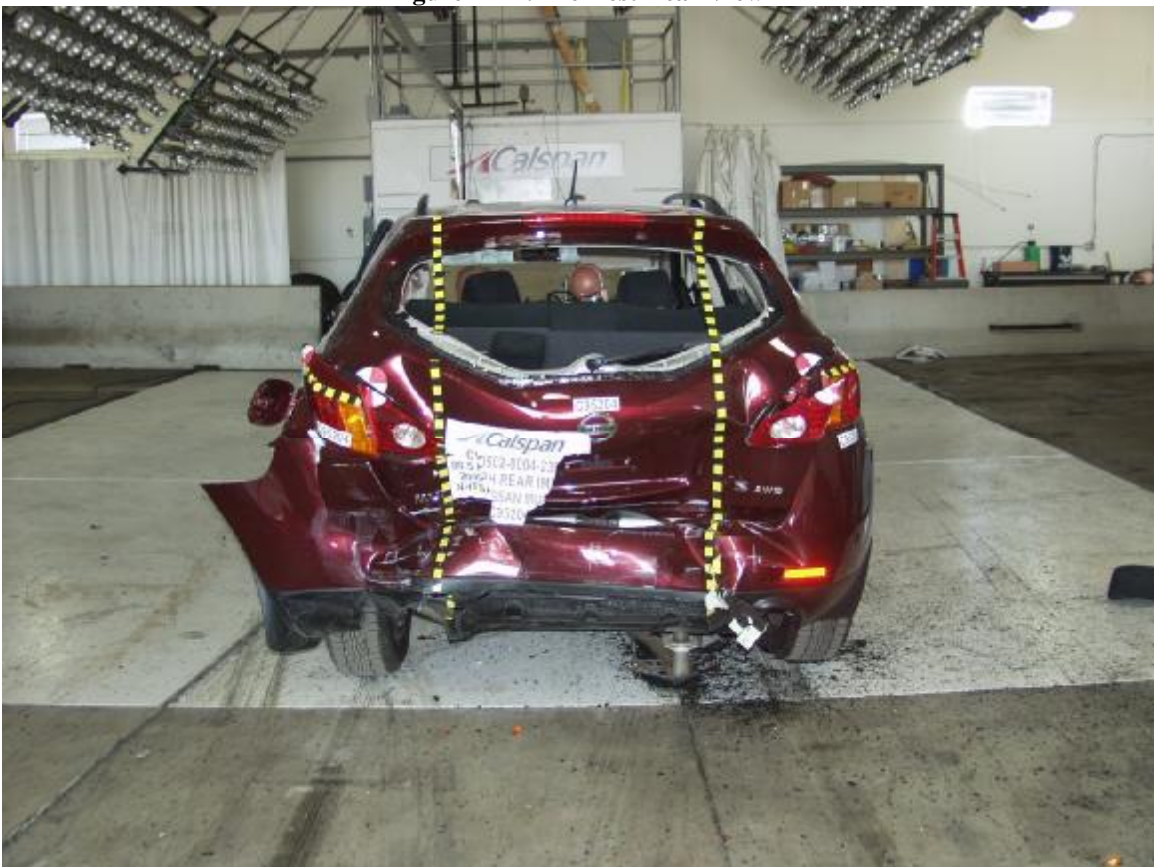


Figure A-18: Post-Test Rear View



Figure A-19: Pre-Test MDB Front View



Figure A-20: Post-Test MDB Front View



Figure A-21: Pre-Test MDB Left Side View



Figure A-22: Post-Test MDB Left Side View



Figure A-23: Pre-Test MDB Right Side View



Figure A-24: Post-Test MDB Right Side View



Figure A-25: Pre-Test MDB Top View



Figure A-26: Post-Test MDB Top View



Figure A-27: Pre-Test Overhead Vehicle and MDB View



Figure A-28: Post-Test Impact Target View



Figure A-29: Pre-Test Front Underbody View



Figure A-30: Post-Test Front Underbody View



Figure A-31: Pre-Test Mid Underbody View



Figure A-32: Post-Test Mid Underbody View



Figure A-33: Pre-Test Rear Underbody View

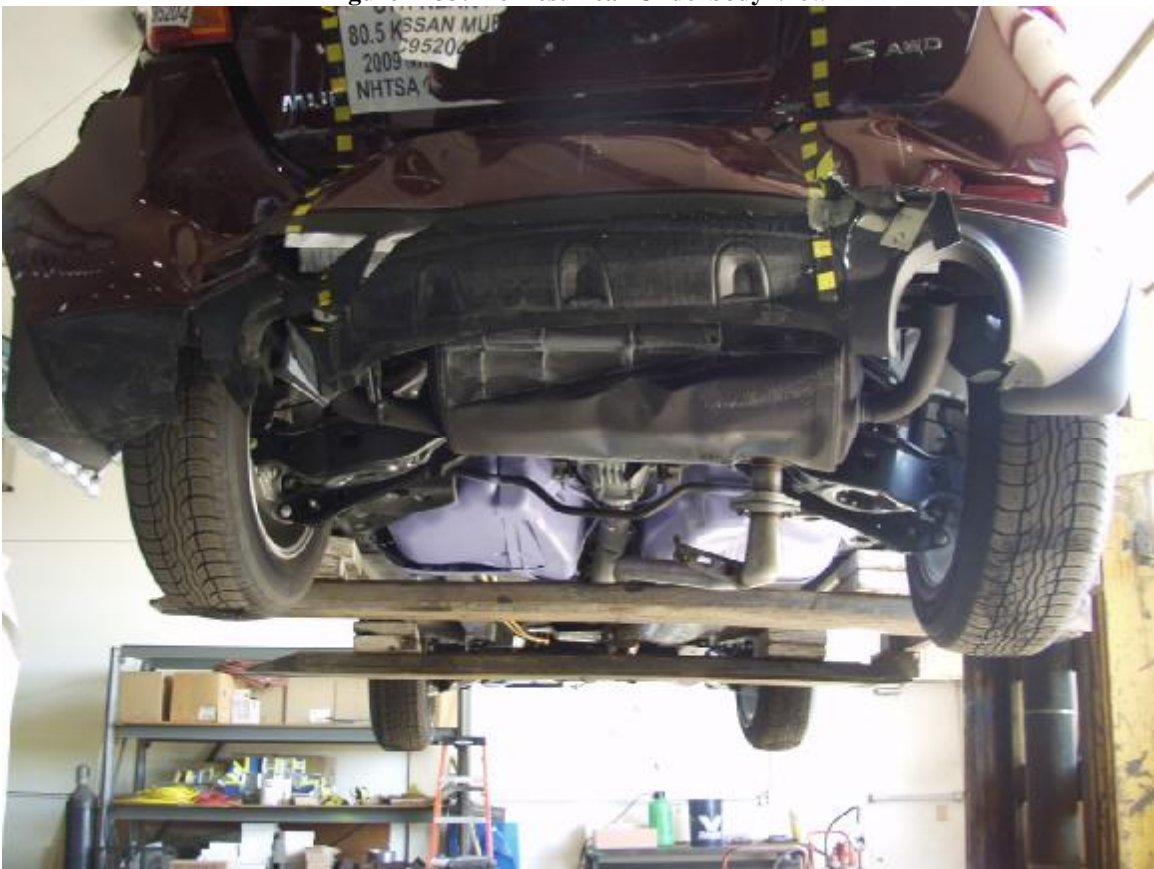


Figure A-34: Post-Test Rear Underbody View



Figure A-35: Pre-Test Fuel Filler Cap View

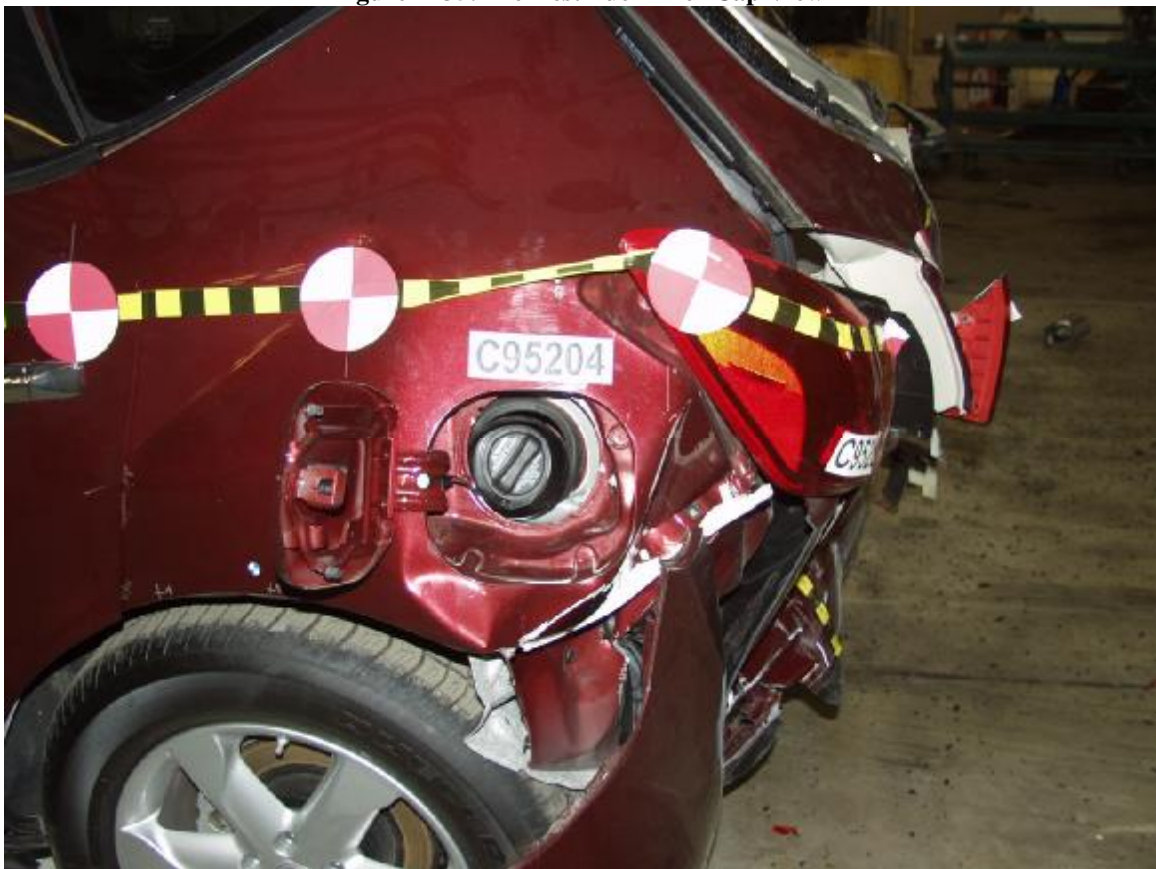


Figure A-36: Post-Test Fuel Filler Cap View



Figure A-37: Impact View



Figure A-38: Rollover 90° View



Figure A-39: Rollover 180° View



Figure A-40: Rollover 270° View



Figure A-41: Rollover 360° View