REPORT NUMBER: 301-CAL-10-5

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

Toyota Motor Corporation
2010 Lexus HS250h
Sedan

NHTSA NUMBER: CA5111

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

October 12, 2010

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

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16. Abstract

Compliance tests were conducted on the subject 2010 Lexus HS250h Sedan 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:

None

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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 2010 Lexus HS250h Sedan, 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 kg 2010 Lexus HS250h Sedan was impacted from the rear by an 1357.0 kg moving barrier at a velocity of 79.5 kph (49.4 mph). The test was performed by Calspan Corporation on October 12, 2010.

The test vehicle was equipped with a 55 liter fuel tank which was filled to 93 percent capacity with stoddard fluid prior to impact. Additional ballast (22 kg) was secured in the vehicle rear seat 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.

Based on this test, the vehicle as tested appears to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity." The average vehicle longitudinal crush was 587 millimeters.

SECTION 3

SUMMARY OF TEST RESULTS

DATA SHEET 1

TEST VEHICLE SPECIFICATIONS

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 2010 Lexus HS250h Sedan

Vehicle Body Color: Obsidian NHTSA Number: CA5111

Engine Data: 4 Cylinders; ____ CID; 2.4 Liters; ____ cc

Transmission: ECVT Speed; ____ Manual; x Automatic; ____ Overdrive

Final Drive: ____ Rear Wheel Drive; x Front Wheel Drive; ____ 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; ____ Stab Control ____ Traction Control x Anti-Theft

DEALER AND DELIVERY INFORMATION:

Date Received: Sept. 8, 2010 ; Odometer Reading 12.9 km

Selling Dealer: Classic Lexus

2551 Som Center Rd; Willoughby, OH 44094

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufacturer: Toyota Motor Corporation

Vehicle Build Date: 1/10

VIN:: JTHBB1BA6A2026282

GVWR: 2125 kg; GAWR: 1161 kg FRONT; 1000 kg REAR

DATA FROM VEHICLE'S TIRE LABEL AND SIDEWALL:

Location of Tire Placard: Driver door sill

Type of Spare Tire: T145/70D17

	Front	Rear
Maximum Tire Pressure (sidewall - kPa)	300	300
Cold Pressure (tire placard - kPa) – test pressure	230	230
Recommended Tire Size (tire placard)	P215/55R17	P215/55R17
Vehicle Tire Size with load index & speed symbol	P215/55R17	P215/55R17
Tire Manufacturer	Michelin	Michelin
Tire Name	Energy MXV4 S8	Energy MXV4 S8
Treadwear, Traction, Temperature	440, A, A	440, A, A

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) = 375 kg

No. of Occupants x 68.04 kg = 340.2 kg

Rated Cargo/Luggage Weight (RCLW) = 34.8 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 =	514.5	489	60.3	1003.5
Rear =	333.5	327	39.7	660.5
			Total Delivered Weight (UDW) =	1664

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	1664	kg
Rated Cargo/Luggage Weight (RCLW) =	34.8	kg
Weight of 2 p.572E Dummies @ 78 each =	148	kg
TARGET TEST WEIGHT =	1846.8	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 22 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
Front =	564	531	59.6	1095
Rear =	371	372	40.4	743
			Total Vehicle Test Weight (ATW) =	1838

Weight of Ballast Secured in Vehicle[1] = 22 kg Ballast Type Lead shot

Method of securing Ballast: Rear footwell

Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in millimeters):

	Left Front	Right Front	Left Rear	Right Rear	CG[2]
AS DELIVERED:	720	733	726	721	1074
AS TESTED:	707	716	708	707	1094

Vehicle's Wheel Base: 2706 mm

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

[2]Rearward of the front axle centerline.

VEHICLE PRE-TEST WIDTH AND IMPACT OFFSET MEASUREMENT:

Vehicle Width at Widest Point: 1792 mm Location: Front wheel fender

Centerline offset for impact line: 358 mm

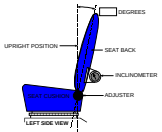
Filler neck side (left/right) left

DATA SHEET 2 (continued)

PRE-TEST DATA

Vehicle: 2010 Lexus HS250h Sedan NHTSA No. CA5111

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.



FRONT SEAT ASSEMBLY

Seat back angle for driver's seat: See below

Measurement instructions: Headrest post set at 89 degrees with level sill.

Seat back angle for passenger's seat: Same as driver

Measurement instructions: Headrest post set at 89 degrees with level sill.

2. SEAT FORE AND AFT POSITIONING:

Positioning of the driver's seat: Full range of travel 290 mm. Seat was set full down mid at 145

Positioning of the passenger's seat: Mid position

3. FUEL TANK CAPACITY DATA:

3.1 A. "Usable Capacity" of the standard equipment fuel tank is 55.0 liters

B. "Usable Capacity" of the optional equipment fuel tank is n/a liters

C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 = 50.6 to 51.7 liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 51.1 liters

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

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.

Hybrid vehicle. Fuel pump starts when vehicle ignition is on and gasoline engine is operating.

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: Centered at geometric center of tilt. Telescope wheel centered at mid range of Travel.

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position:

Full up

6. COMMENTS:

None

DATA SHEET 3

MOVING DEFORMABLE BARRIER (MDB) DATA

Vehicle: 2010 Lexus HS250h Sedan NHTSA No. CA5111

MDB FACE MANUFACTURER AND SERIAL NUMBER:

Plascore serial number A0810004

MDB DETAILS:

Overall Width of Framework Carriage	=	1250	millimeters
Overall Length of MDB (incl. honeycomb impact face)	=	4120	millimeters
Wheelbase of Framework Carriage	=	2591	millimeters
Tread of Framework Carriage (Front & Rear)	=	1875	millimeters
C.G. Location Rearward of Front Axle	=	1136	millimeters

MDB WEIGHT:

Left Front	=	358.0	kg	Left Rear	=	322.0	kg
Right Front	=	404.0	kg	Right Rear	=	273.0	kg
TOTAL FRONT =		762.0	kg	TOTAL REAR	=	595.0	kg
TOTAL MDB WEIGHT =		1357.0	kg				

Tires (Mfr, line, size): Dunlop Radial Rover AT P205/75R15

TIRE PRESSURE:

Left Front	=	207	kPa	Left Rear	=	207	kPa
Right Front	=	207	kPa	Right Rear	=	207	kPa

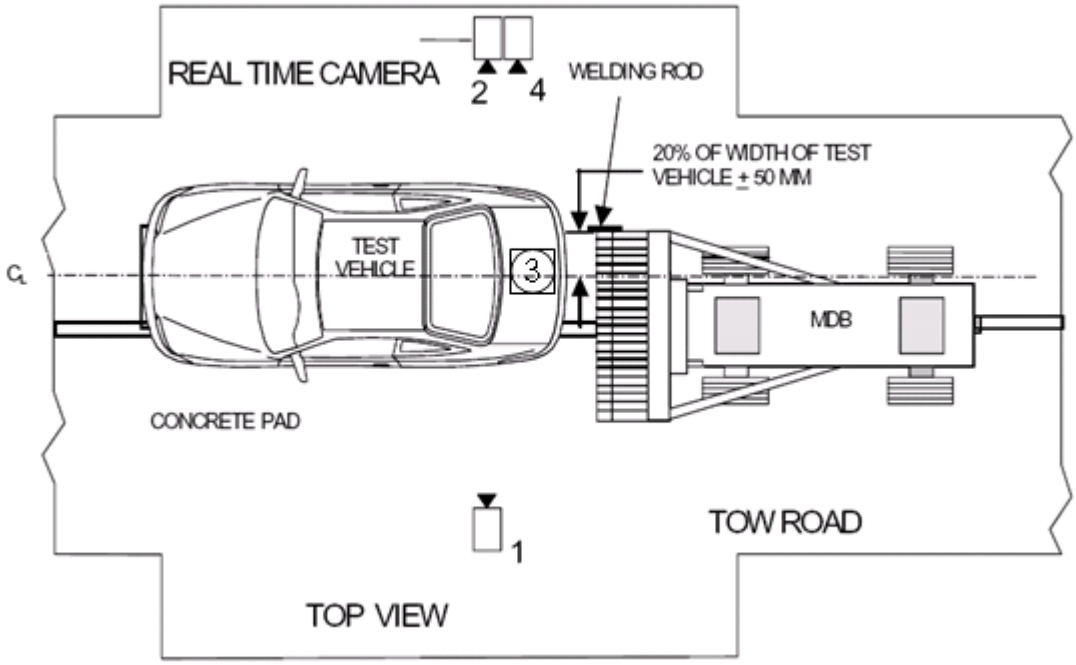
Brake Abort System? (Yes/No) Yes

Date of Last Calibration: 5/15/2010

DATA SHEET 4

HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY

Vehicle: 2010 Lexus HS250h Sedan NHTSA No. CA5111



Camera No.	View	Coordinates (millimeters)			Angle (deg.)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Left Side View	7040	1190	925	-1.6	24	1000
2	Real-Time Camera	-	-	-	-	-	30
3	Overhead View	0	780	4900	-90	20	1000
4	Right Side View	7460	1550	945	-0.4	24	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: 2010 Lexus HS250h Sedan NHTSA No. CA5111

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

ACTUAL IMPACT VELOCITY WITHIN 1.5 M OF IMPACT PLANE:

Trap No. 1 = 79.5 km/h Trap No. 2 = 79.6 km/h

Average Impact Speed = 79.55 km/h

WELDING ROD IMPACT POINT:

-24 Vertical distance from target center (+ is above) Tolerance: ±40 mm

12 to right 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: 2010 Lexus HS250h Sedan NHTSA No. CA5111

POST TEST SEAT DATA

LOCATION	SEAT MOVEMENT (mm)	SEAT BACK FAILURE
P1 (Left Front)	0.0	Seat slightly bent
P2 (Right Front)	0.0	Seat slightly bent

POST TEST ATD CONTACT DATA

LOCATION	Position 1 (Driver)	Position 2 (Passenger)
Head	Head rest	Head rest
Chest	-	-
Abdomen	-	-
Left Knee	-	-
Right Knee	-	-

VEHICLE DIMENSIONS:

Vehicle length (mm.):

	Left Side	Centerline	Right Side
Pre-Test	4623	4698	4624
Post-Test	3935	4096	4154
Crush	688	602	470

Vehicle Wheel Base(mm.):

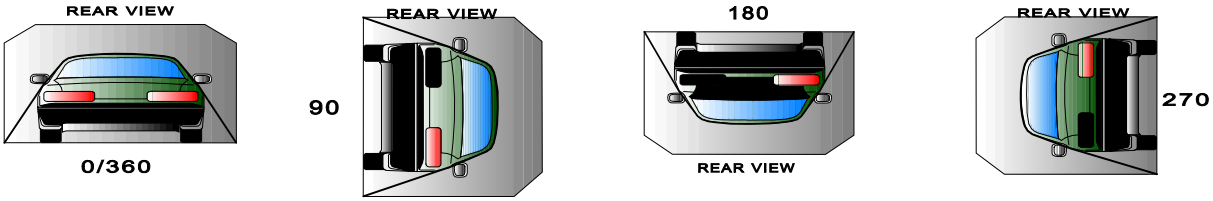
	Left Side	Right Side
Pre-Test	2706	2701
Post-Test	2568	2730
Crush	138	-29

Comments: None

DATA SHEET 6

FMVSS 301 ROLLOVER DATA

Vehicle: 2010 Lexus HS250h Sedan NHTSA No.: CA5111



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Stage	Rotation Time (spec. 1 -3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
0º - 90º	1	minutes	12	seconds	5	minutes	6	minutes	12	seconds	7	minutes
90º - 180º	1	minutes	12	seconds	5	minutes	6	minutes	12	seconds	7	minutes
180º-270º	1	minutes	12	seconds	5	minutes	6	minutes	12	seconds	7	minutes
270º-360º	1	minutes	11	seconds	5	minutes	6	minutes	11	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)
0º - 90º	0	0	0	n/a
90º - 180º	0	0	0	n/a
180º-270º	0	0	0	n/a
270º-360º	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
0º - 90º	None
90º - 180º	None
180º-270º	None
270º-360º	None

APPENDIX A

PHOTOGRAPHS

NOTE: NHTSA number was not available at test time,
correct NHTSA number is CA5111

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Figure A-1: Vehicle Certification Placard

Figure A-2: Vehicle Tire Placard

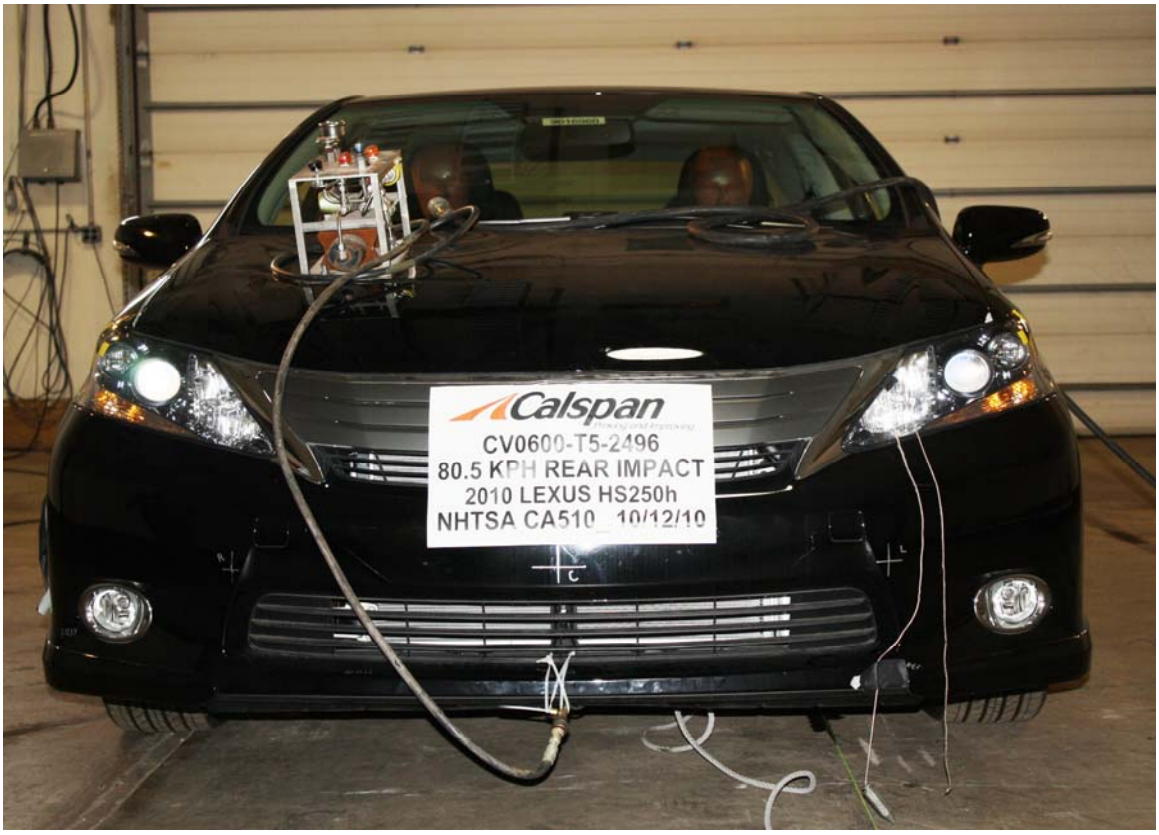

Figure A-3: Pre-Test Front View

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

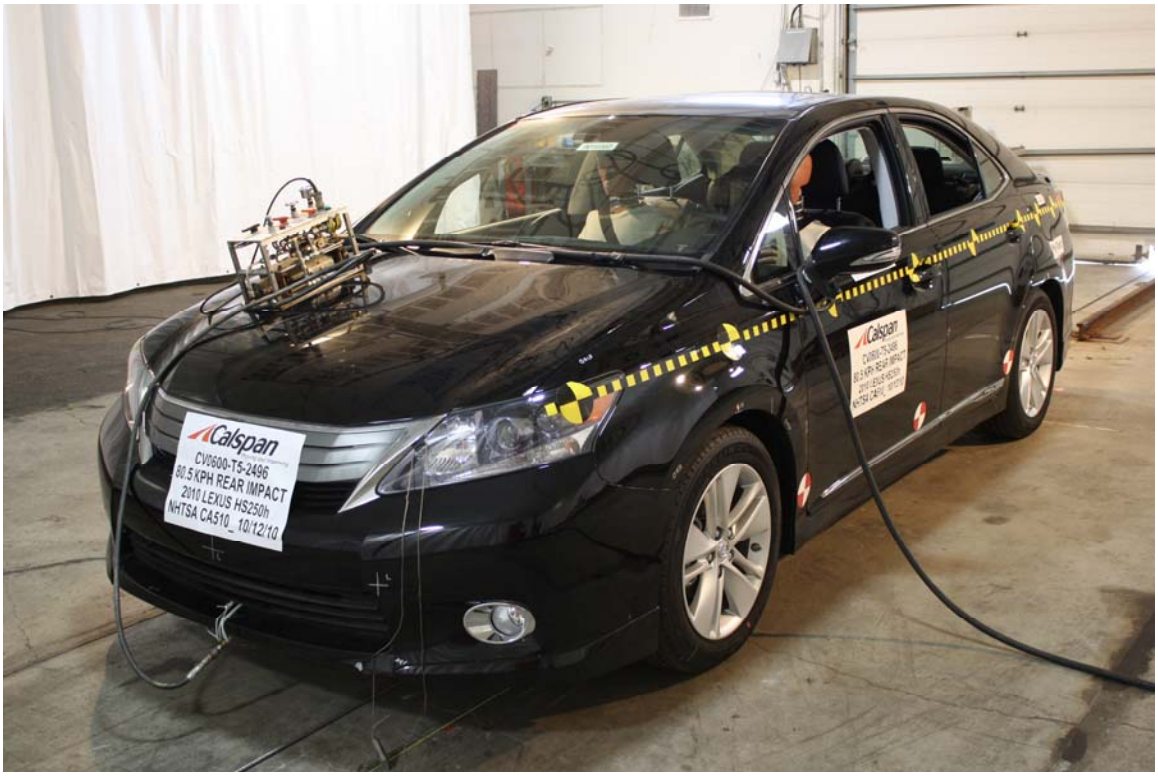

Figure A-9: Pre-Test Left Front Three-Quarter View

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

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

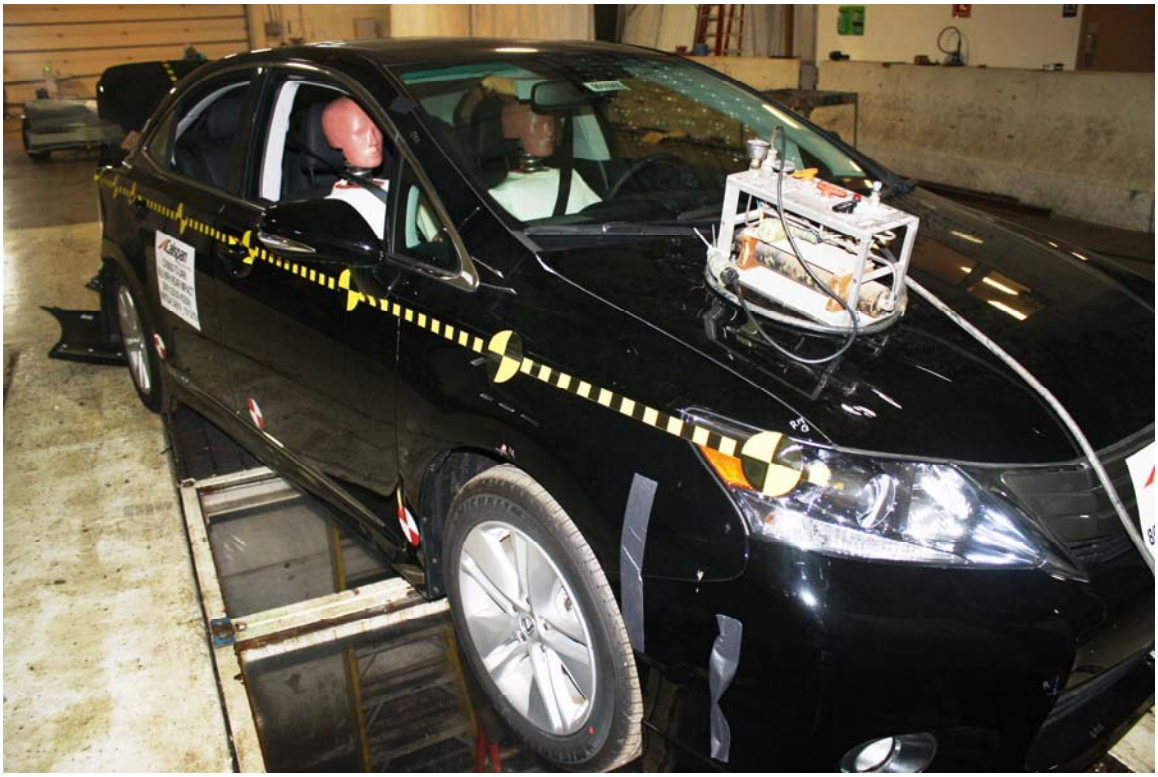

Figure A-12: Post-Test Right Front Three-Quarter View

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: Post-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

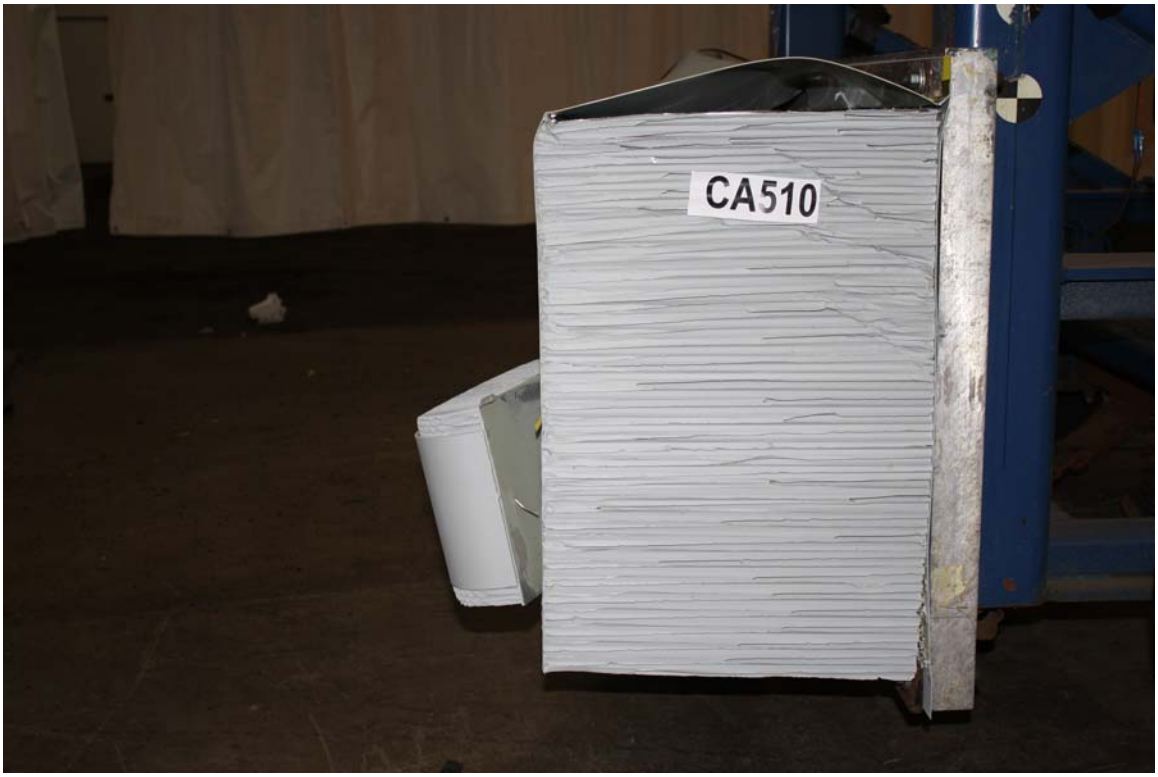

Figure A-22: Post-Test MDB Left Side View

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

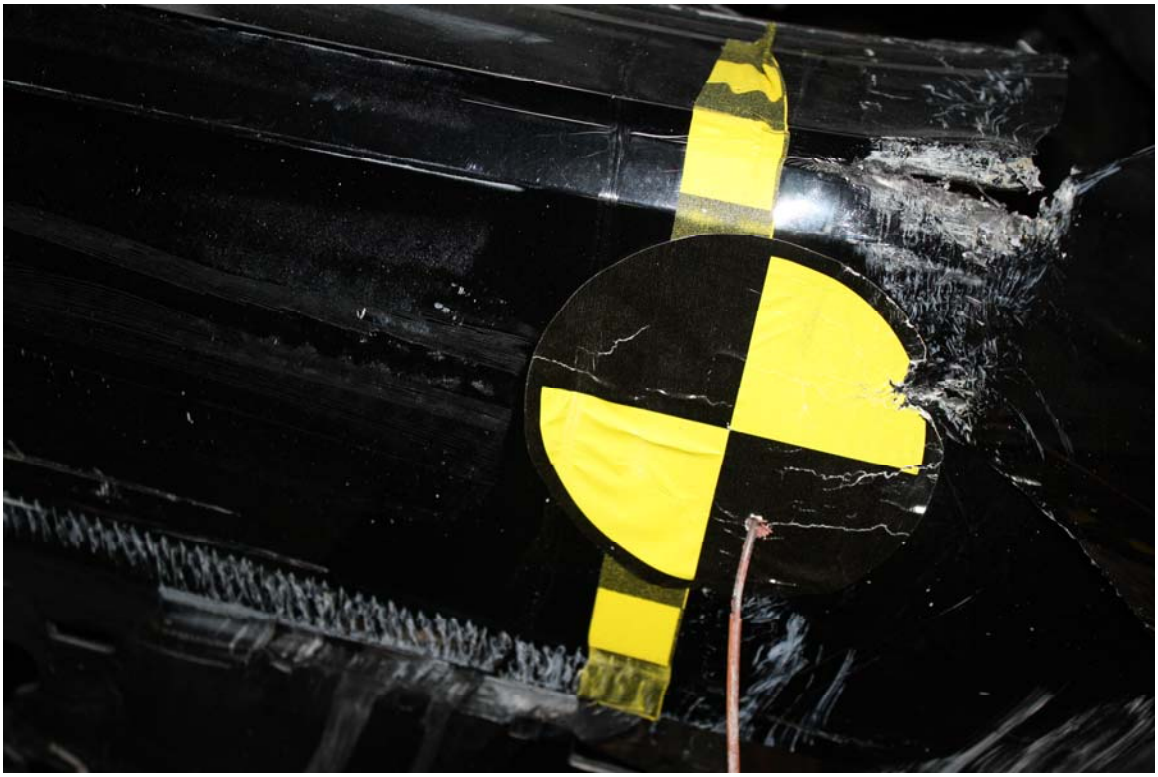

Figure A-28: Post-Test Impact Target View

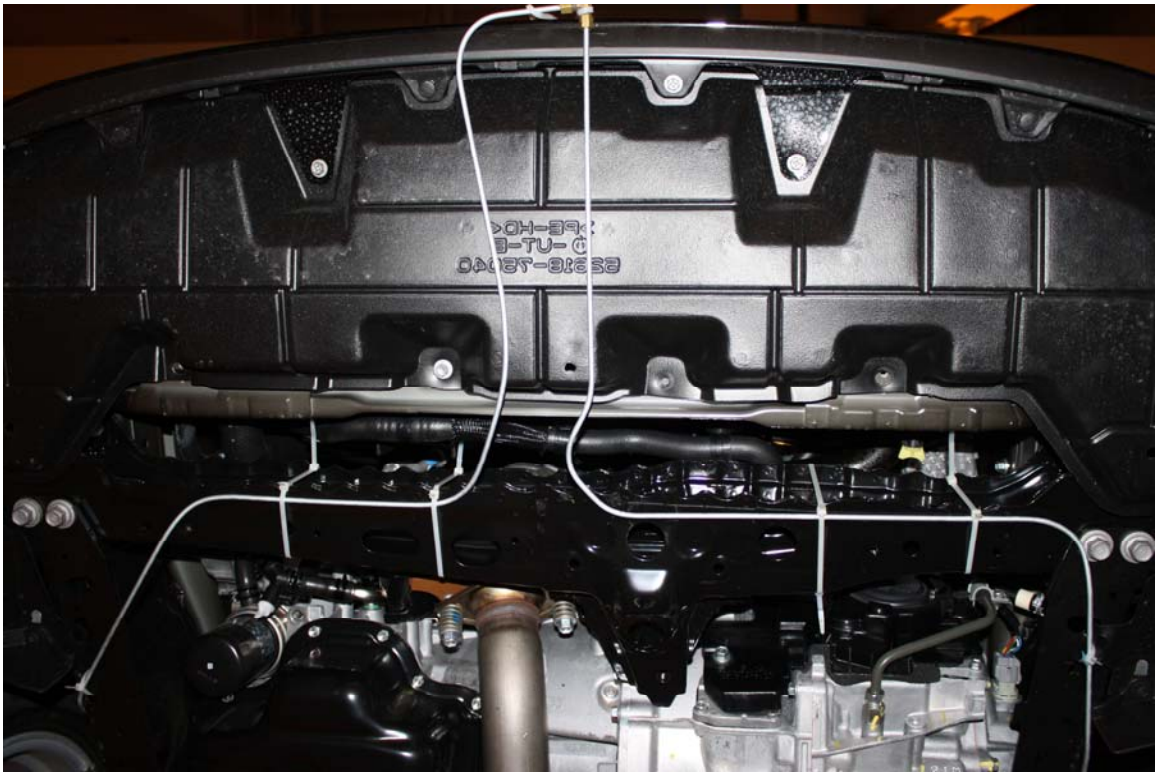

Figure A-29: Pre-Test Front Underbody View

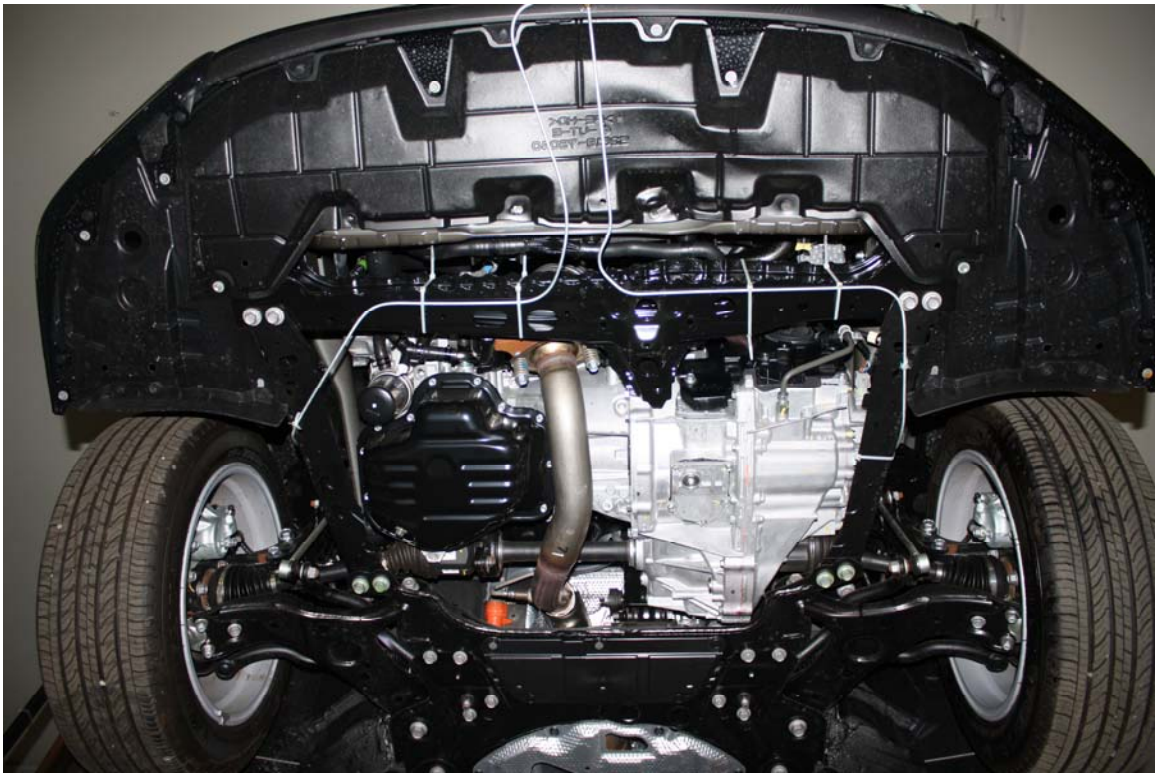

Figure A-30: Post-Test Front Underbody View

Figure A-31: Pre-Test Mid Underbody View

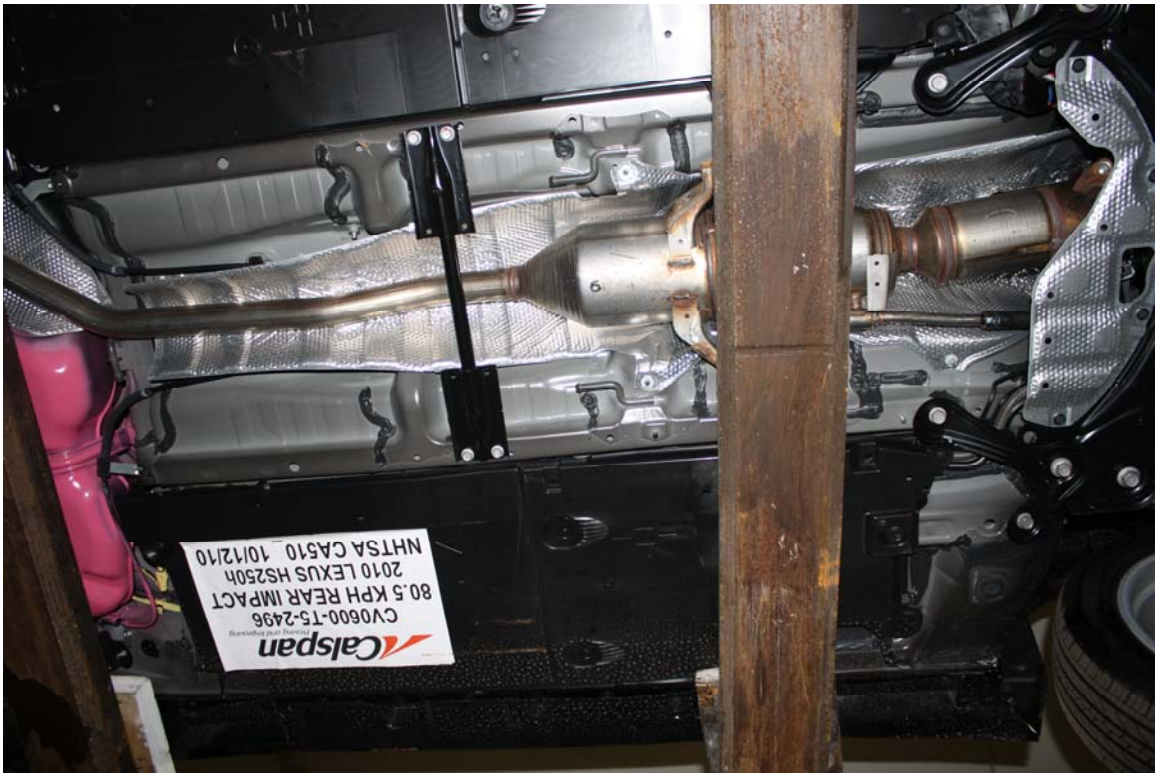

Figure A-32: Post-Test Mid Underbody View

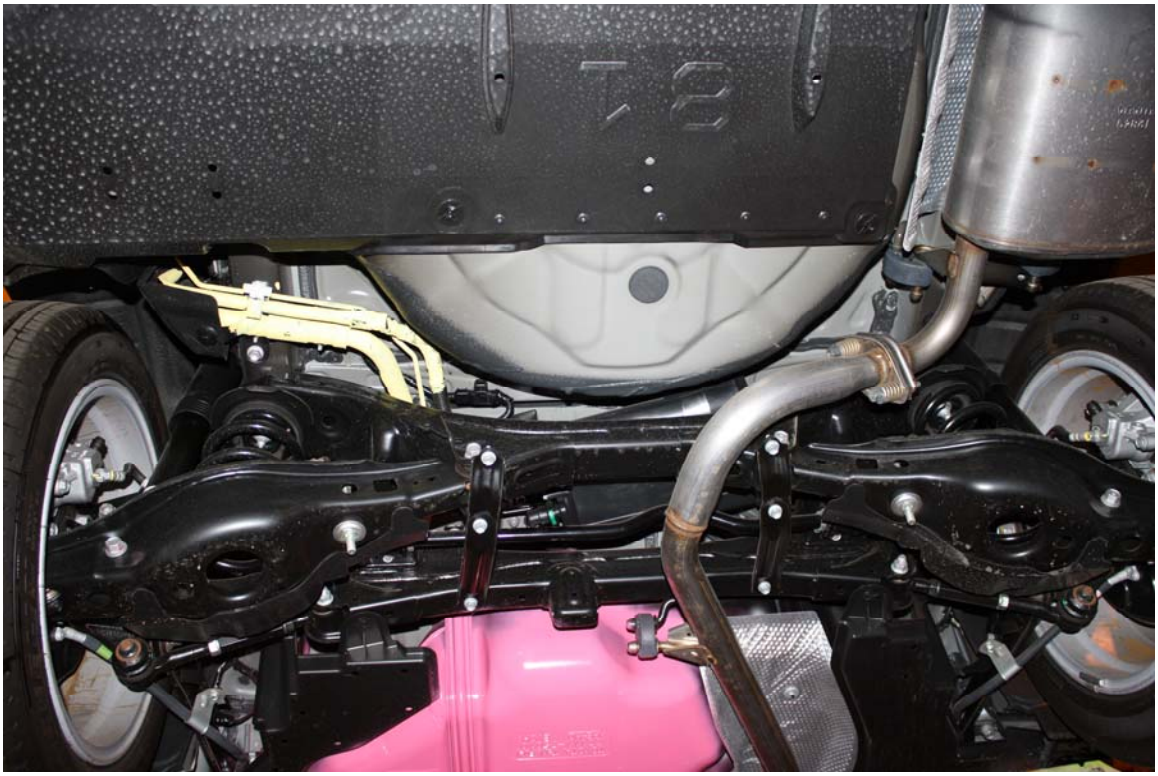

Figure A-33:Pre-Test Rear Underbody View

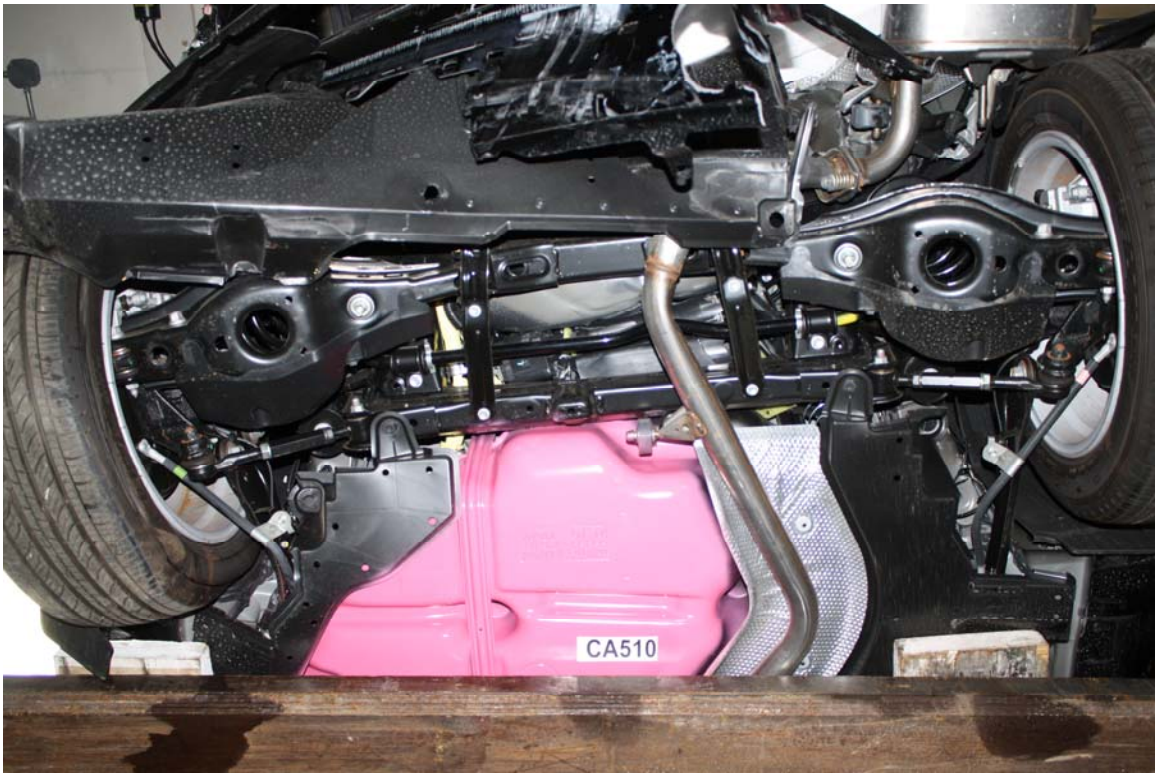

Figure A-34: Post-Test Rear Underbody View

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: Speed Trap Photo

Figure A-38: Rollover 90° View

Figure A-39: Rollover 180° View

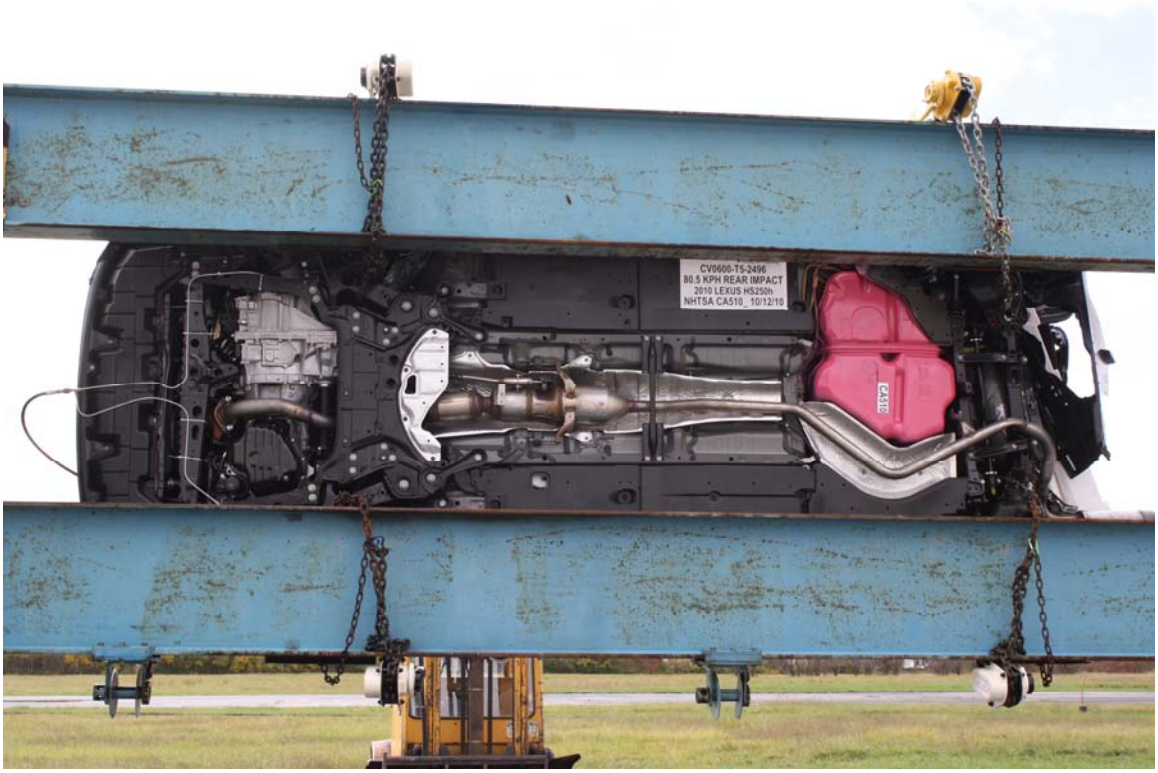

Figure A-40: Rollover 270° View

Figure A-41: Rollover 360° View