

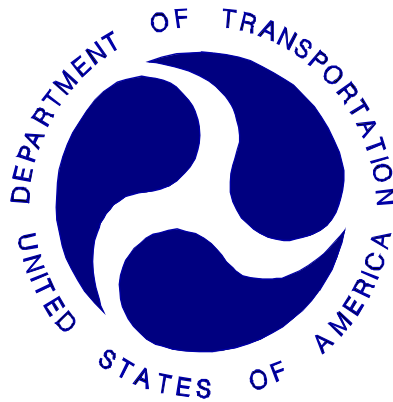
REPORT NUMBER: 305-CAL-10-01

**SAFETY COMPLIANCE TESTING FOR FMVSS 305  
ELECTRIC POWERED VEHICLES: ELECTROLYTE SPILLAGE  
AND ELECTRICAL SHOCK PROTECTION**

TOYOTA MOTOR CORPORATION  
2010 LEXUS RX450  
4-DOOR SUV

NHTSA NUMBER: CA5100

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



February 9, 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

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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Approval Date: March 1, 2010

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted by \_\_\_\_\_

Date: \_\_\_\_\_

**TECHNICAL REPORT STANDARD TITLE PAGE**

1. Report No. 305-CAL-10-01		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of FMVSS 305 Compliance Rear Impact Testing of a 2010 Lexus RX450 4-Door SUV NHTSA No.: CA5100				5. Report Date February 9, 2010	
				6. Performing Organization Code CAL	
7. Author(s) James Czarnecki, Project Engineer David J. Travale, Program Manager				8. Performing Organization Report No.	
9. Performing Organization Name and Address Calspan Transportation Sciences Center P.O. Box 400 Buffalo, New York 14225				10. Work Unit No.	
				11. Contract or Grant No. DTNH22-06-C-00031	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance 1200 New Jersey Avenue, SE Washington, D.C. 20590				13. Type of Report and Period Covered Final Report, February 2010	
				14. Sponsoring Agency Code NVS-220	
15. Supplementary Notes					
16. Abstract Compliance tests were conducted on the subject 2010 Lexus RX450 4-Door SUV in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-305-00 for the determination of FMVSS 305 compliance. Test failures identified were as follows:  The test vehicle appeared to comply with all requirements of FMVSS 305 "Electric Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection."					
17. Key Words Compliance Testing Safety Engineering FMVSS 305				18. Distribution Statement <u>Copies of this report are available from:</u> National Highway Traffic Safety Administration Technical Reference Division (TIS) (NPO-230) 1200 New Jersey Avenue, SE Washington, D.C. 20590 Telephone No. (202) 366-4946	
19. Security Classification of Report UNCLASSIFIED		20. Security Classification of Page UNCLASSIFIED		21. No. of Pages 38	
22. Price					

## TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE AND TEST PROCEDURE	1-1
2	COMPLIANCE TEST RESULTS SUMMARY	2-1
3	SUMMARY OF TEST RESULTS	3-1
	Data Sheet 1 - Test Vehicle Specifications	3-2
	Data Sheet 2 – Pre-Test Data	3-3
	Data Sheet 3 - Moving Deformable Barrier (MDB) Data	3-6
	Data Sheet 4 - Pre-Impact Electrical Isolation Measurements & Calculations	3-7
	Data Sheet 5 - High Speed Camera Locations and Data Summary	3-8
	Data Sheet 6 – Post-Test Data	3-9
	Data Sheet 7 – Post-Impact Electrical Isolation Measurements & Calculations	3-11
	Data Sheet 8 – FMVSS 301 Rollover Data	3-12
	Data Sheet 9 – FMVSS 305 Rollover Data	3-13
APPENDIX A	PHOTOGRAPHS	A-1

## **SECTION 1**

### **PURPOSE AND TEST PROCEDURE**

This rear impact test is part of the FMVSS 305 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 RX450 4-Door SUV, meets the performance requirements of FMVSS No. 305 “Electric Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection.” The test was conducted in accordance with the Office of Vehicle Safety Compliance’s Laboratory Test Procedure (TP-305D-00, dated December 29, 2005).

## SECTION 2

### COMPLIANCE TEST RESULTS SUMMARY

A 2331 kg 2010 Lexus RX450 4-Door SUV was impacted from the rear by an 1797 kg moving barrier at a velocity of 79.2 kph (49.2 mph). The test was performed by Calspan Corporation on February 9, 2010.

The test vehicle was equipped with a 65.1 liter fuel tank which was filled to 92 percent capacity with stoddard fluid prior to impact. Additional ballast (22 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 3-8 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 391 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: 2010 Lexus RX450 4-Door SUV

Vehicle Color: Black NHTSA Number: CA5100

Engine Data: 6 Cylinders; - 6 Cylinde - Engine

Transmission: ECVT Speed; - Transmission: ECV Speed; - Transmission:

Final Drive: - Rear Wheel Drive; - Final Drive: - Rear Wheel Drive;

**MAJOR TEST VEHICLE OPTIONS:**

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

**DEALER AND DELIVERY INFORMATION:**

Date Received: 9/11/09 ; Odometer Reading 217 km  
 Selling Dealer: Northtown Lexus  
 Dealer Address: 3930 Sheridan Drive Amherst, NY 14226

**DATA FROM VEHICLE'S CERTIFICATION LABEL:**

Vehicle Manufacturer: Toyota Motor Corporation  
 Vehicle Build Date: 06/09  
 VIN: JTJBC1BAXA2006516  
 GVWR: 2710 kg; GAWR: 1360 kg FRONT; 1385 kg REAR

**DATA FROM VEHICLE'S TIRE LABEL AND SIDEWALL:**

Location of Tire Placard: Driver side door along front lower B-pillar sheet metal  
 Type of Spare Tire: Temporary

	<u>Front</u>	<u>Rear</u>
Maximum Tire Pressure (sidewall - kPa)	350	350
Cold Pressure (tire placard - kPa) – test pressure	230	230
Recommended Tire Size (tire placard)	P235/55R19	P235/55R19
Vehicle Tire Size with load index & speed symbol	P235/55R19 101V	P235/55R19 101V
Tire Manufacturer	Bridgestone	Bridgestone
Tire Name	Dueler H/L	Dueler H/L
Treadwear, Traction, Temperature	260 A A	260 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) = 370 kg  
 No. of Occupants x 68.04 kg = 340 kg  
 Rated Cargo/Luggage Weight (RCLW) = 30 kg

**ELECTRIC VEHICLE PROPULSION SYSTEM:**

Electric Vehicle Type: - Electric; x Electric/Hybrid  
 Propulsion Battery Type: Ni-MH  
 Nominal Voltage: 288 V  
 Location of Automatic Propulsion Battery Disconnect Left side of 2<sup>nd</sup> row seat  
 Auxiliary Battery Type: Lead Acid Battery

## 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)
<b>Front =</b>	620.0	591.5	56.1	1211.5
<b>Rear =</b>	485.0	464.5	43.9	949.5
<b>Total Delivered Weight (UDW) =</b>				2161.0

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight (UDW) =	2161.0	kg
Rated Cargo/Luggage Weight (RCLW) =	30.0	kg
Weight of 2 p.572E Dummies @ 74 each =	148	kg
<b>TARGET TEST WEIGHT =</b>	<b>2339.0</b>	<b>kg</b>

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 22.0 KG OF CARGO WEIGHT:

	Left Side (kg)	Right Side (kg)	Ratio (%)	Total (kg)
<b>Front =</b>	655.0	636.0	55.4	1291.0
<b>Rear =</b>	529.0	511.0	44.6	1040.0
<b>Total Vehicle Test Weight (ATW) =</b>				<b>2331.0</b>

Weight of Ballast Secured in Vehicle<sup>1</sup> = 25 kg Ballast Type Lead shot

Method of securing Ballast: Location placement

Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in millimeters):

	Left Front	Right Front	Left Rear	Right Rear	CG <sup>2</sup>
AS DELIVERED:	820	825	833	834	1206.1
AS TESTED:	813	815	824	824	1224.7

Vehicle's Wheel Base: 2745 mm

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

<sup>2</sup>Rearward of the front axle centerline.

VEHICLE PRE-TEST WIDTH AND IMPACT OFFSET MEASUREMENT:

Vehicle Width at Widest Point: 1892 mm

Location: Front Axle Center - Body Trim Quarter Panel

Centerline offset for impact line: 378 mm

Filler neck side (left/right) Left

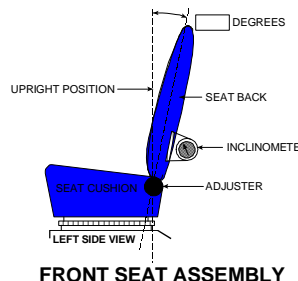
**DATA SHEET 2 (continued)**

**PRE-TEST DATA**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No. CA5100

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: 88

Measurement instructions: Measured 88 degrees from back of head restraint post

Seat back angle for passenger's seat: 88

Measurement instructions: Measured 88 degrees from back of head restraint post

**2. SEAT FORE AND AFT POSITIONING:**

Positioning of the driver's seat: 300 mm of travel – full up forward to full down rearward

Placed in middle at 150 mm

Positioning of the passenger's seat: 288 mm of travel – full up forward to full down rearward

Placed in middle at 144 mm

**3. FUEL TANK CAPACITY DATA:**

3.1 A. "Usable Capacity" of the standard equipment fuel tank is	<u>65.1</u>	65.1
B. "Usable Capacity" of the optional equipment fuel tank is	<u>-</u>	-
C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 =	<u>59.9 to 61.2</u>	liters

3.2 Actual Amount of Stoddard solvent added to vehicle for test = 20.2      20.2

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.

The fuel pump is activated 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: Mechanical middle is 24.2 degrees and 20 mm travel

DATA SHEET 1 (continued)

GENERAL TEST VEHICLE PARAMETER DATA

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No. CA5100

5. SEAT BELT UPPER ANCHORAGE:

Nominal design riding position: 4 detents – placed in top or 0

6. PROPULSION BATTERY SYSTEM DATA (COTR SUPPLIED):

Electrolyte Fluid Type: KOH

Electrolyte Fluid Specific Gravity: 1.27 g/cm<sup>2</sup>

Electrolyte Fluid Kinematic Viscosity: 1.91 mPs

Electrolyte Fluid Color: Clear

Propulsion Battery Coolant Type, Air

Color and Specific Gravity:

Location of Battery Modules: x In Occupant Compartment -      Outside Occupant Compartment

7. PROPULSION BATTERY STATE OF CHARGE

Maximum State of Charge: -

Test Voltage (≥95% of maximum) -

OR

Range of Normal Operating Voltage: 240-400

Test Voltage (within range) Yes

8. Details of Chassis Ground Points and Locations:

Any points on the body which are not painted

9. Details of Propulsion Battery Components:

Propulsion battery is located under rear seat cushion. Service plug location is next to battery with vents located in the front of the seat floor.

10. Comments:

None

**DATA SHEET 3**

**MOVING DEFORMABLE BARRIER (MDB) DATA**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No. CA5100

MDB FACE MANUFACTURER AND SERIAL NUMBER:

-

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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):		-					

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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**

**PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No. CA5100

**VOLTMETER INFORMATION:**

<b>Make:</b>	<u>Fluke</u>	<b>Model:</b>	<u>75</u>	<b>S/N:</b>	<u>35303240</u>
<b>Internal Resistance Value:</b>	<u>120K</u>	<b>MΩ</b>			
<b>Resolution:</b>	<u>-</u>	<b>V</b>			
<b>Last Calibration Date:</b>	<u>7/13/09</u>				

Propulsion Battery Voltage : (ready to drive position)	V <sub>b</sub>	=	<u>306.4</u>	V
Propulsion Battery to Vehicle Chassis:	V <sub>1</sub>	=	<u>130.0</u>	V
Propulsion Battery to Vehicle Chassis:	V <sub>2</sub>	=	<u>150.0</u>	V
Propulsion Battery to Vehicle Chassis Across Known Resistor:	R <sub>o</sub>	=	<u>120K</u>	Ω
Propulsion Battery to Vehicle Chassis with R <sub>o</sub> installed:	V <sub>1</sub> '	=	<u>8.99</u>	V
Propulsion Battery to Vehicle Chassis: with R <sub>o</sub> installed:	V <sub>2</sub> '	=	<u>11.50</u>	V

**ELECTRICAL ISOLATION MEASUREMENTS:**

R <sub>i1</sub> :	<u>3475</u>	Ω	$R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$
R <sub>i2</sub> :	<u>2698</u>	Ω	$R_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$
R <sub>i</sub>	<u>2698</u>	Ω	Lesser value of R <sub>i1</sub> and R <sub>i2</sub>
R <sub>i</sub> /V <sub>b</sub>	<u>8787</u>	V	Electrical Isolation Value

Is the Electrical Isolation Value ≥ 500 Ω/V?

Yes/No  
YES

**If NO - Failure**

Comments:

None

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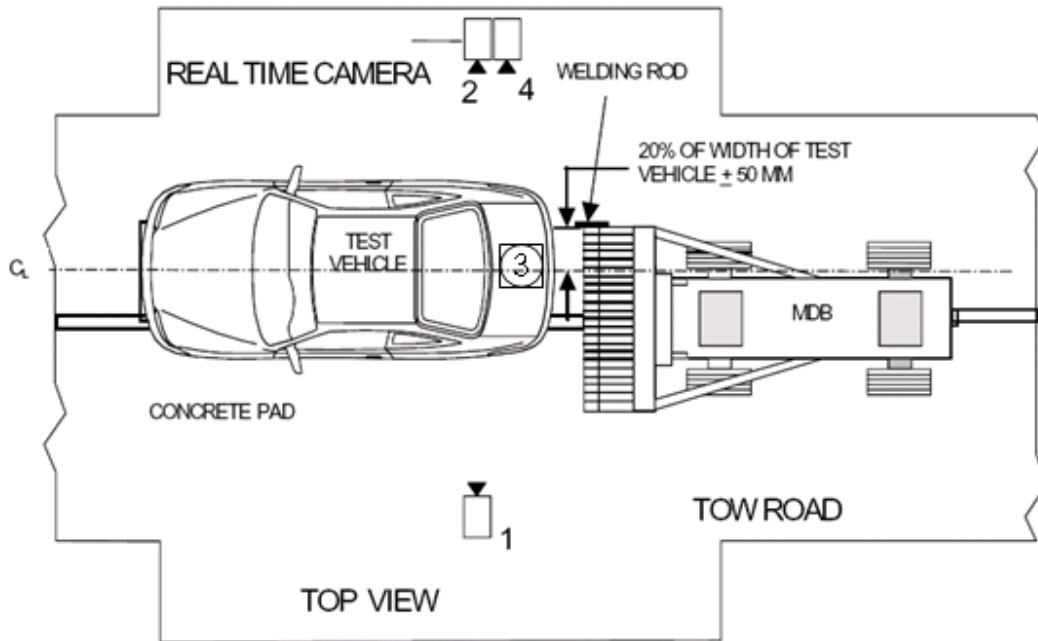
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DATA SHEET 5

HIGH SPEED CAMERA LOCATIONS AND DATA SUMMARY

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No. CA5100



Camera No.	View	Coordinates (millimeters)			Angle (deg.)	Lens (mm)	Film Speed (fps)
		X*	Y*	Z*			
1	Left Side View	8475	2130	1165	1.7	24	1000
2	Real-Time Camera	-	-	-	-	-	30
3	Overhead View	0	0	4880	90	20	1000
4	Right Side View	9505	1730	940	3.2	28	1000

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

X = (Impact Point) + Forward

Y = (Impact Point) + To Right

Z = (Ground Level) + Down

**DATA SHEET 6**  
**POST-TEST DATA**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No. CA5100

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

ACTUAL IMPACT VELOCITY WITHIN 1.5 M OF IMPACT PLANE:

Trap No. 1 = 79.2 km/h                      Trap No. 2 = 79.2 km/h

Average Impact Speed = 79.2 km/h

WELDING ROD IMPACT POINT:

-23    Vertical distance from target center (+ is above) Tolerance:  $\pm 40$  mm

-5    Horizontal distance from target center (+ is right) Tolerance:  $\pm 50$  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

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ELECTROLYTE SPILLAGE MEASUREMENT:

Is propulsion battery electrolyte spillage visible in occupant compartment?    - Yes (fail)    x No

For 30 minutes until vehicle motion ceases -

Actual = 0 L    Maximum Allowable = 5 L

Provide Spillage Details:

None

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**DATA SHEET 6**

**POST-TEST DATA (Continued)**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No. CA5100

POST TEST SEAT DATA

LOCATION	SEAT MOVEMENT (mm)	SEAT BACK FAILURE
<b>P1 (Left Front)</b>	0	Reclined
<b>P2 (Right Front)</b>	0	Reclined

POST TEST ATD CONTACT DATA

LOCATION	Position 1 (Driver)	Position 2 (Passenger)
<b>Head</b>	Back of head to head restraint	Back of head to head restraint
<b>Chest</b>	-	-
<b>Abdomen</b>	-	-
<b>Left Knee</b>	-	-
<b>Right Knee</b>	-	-

VEHICLE DIMENSIONS:

Vehicle length:

	Left Side	Centerline	Right Side
Pre-Test	4736	4774	4736
Post-Test	4345	4468	4428
Crush	391	306	308

Vehicle Wheel Base:

	Left Side	Right Side
Pre-Test	2745	2745
Post-Test	2683	2745
Crush	52	0

**DATA SHEET 7**

**POST-IMPACT ELECTRICAL ISOLATION MEASUREMENTS & CALCULATIONS**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No. CA5100

**VOLTMETER INFORMATION:**

Make: Fluke Model: 75 S/N: 35303240  
 Internal Impedance Value 120k MΩ  
 Normal Propulsion Battery Voltage (V<sub>b</sub>): 287 V

**ELECTICAL ISOLATION MEASUREMENTS**

V <sub>1</sub> = <u>123</u> V Impact	Time: <u>1</u> minutes	<u>06</u> seconds
V <sub>2</sub> = <u>145</u> V Impact	Time: <u>1</u> minutes	<u>10</u> seconds
V <sub>1</sub> ' = <u>8</u> V Impact	Time: <u>1</u> minutes	<u>16</u> seconds
V <sub>2</sub> ' = <u>9.5</u> V Impact	Time: <u>1</u> minutes	<u>28</u> seconds
R <sub>i1</sub> = <u>3759</u> Ω Impact	R <sub>i1</sub> = R <sub>o</sub> *(1+V <sub>2</sub> /V <sub>1</sub> )*[(V <sub>1</sub> -V <sub>1</sub> ')/V <sub>1</sub> ']	Time: <u>1</u> minutes <u>33</u> seconds
R <sub>i2</sub> = <u>3163</u> Ω Impact	R <sub>i2</sub> = R <sub>o</sub> *(1+V <sub>1</sub> /V <sub>2</sub> )*[(V <sub>2</sub> -V <sub>2</sub> ')/V <sub>2</sub> ']	Time: <u>1</u> minutes <u>38</u> seconds
R <sub>i</sub> = <u>3163</u> Ω Impact	Lesser value of R <sub>i1</sub> and R <sub>i2</sub>	Time: <u>1</u> minutes <u>43</u> seconds
R <sub>i</sub> /V <sub>b</sub> = <u>11023</u> Ω Impact		Time: <u>1</u> minutes <u>51</u> seconds

Is the measured Electrical Isolation Value ≥ 500 Ω/V?  x  Yes  -  No (Fail)

**PROPULSION BATTERY SYSTEM COMPONENTS**

Describe Propulsion Battery Module movement within occupant compartment:

None

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Has the Propulsion Battery Module moved within the occupant compartment?  -  Yes(Fail)  x  No

Describe intrusion of an outside Propulsion Battery Component into the occupant compartment:

None

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Has an outside Propulsion Battery Component intruded into the occupant compartment?  -  Yes(Fail)  x  No

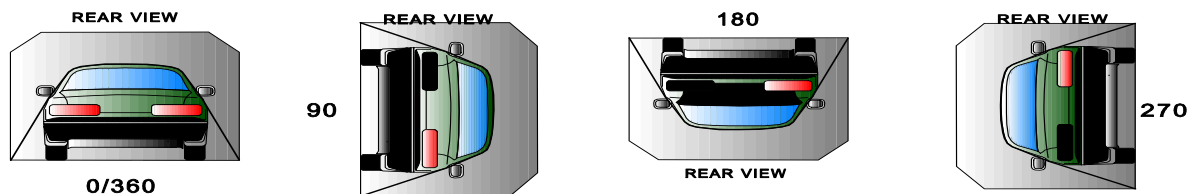
Is Propulsion Battery electrolyte spillage visible in the occupant compartment?  -  Yes(Fail)  x  No

**DATA SHEET 8**

**FMVSS 301 ROLLOVER DATA**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No.: CA5100



**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	
	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds
0° - 90°	1	20	5	5	6	20	7					
90° - 180°	1	10	5	5	6	10	7					
180°-270°	1	15	5	5	6	15	7					
270°-360°	1	20	5	5	6	20	7					

**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):**

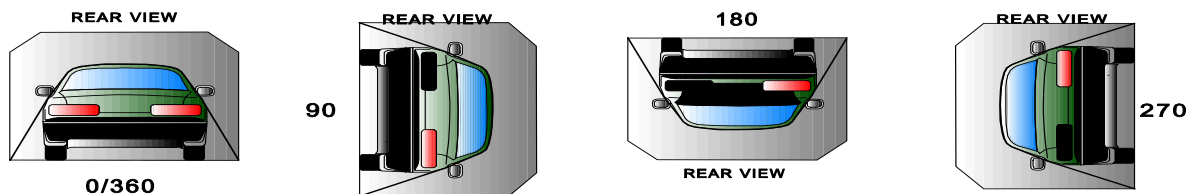
Rollover Stage	Spillage Location
0° - 90°	None
90° - 180°	None
180°-270°	None
270°-360°	None

**DATA SHEET 9**

**FMVSS 305 ROLLOVER DATA**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No.: CA5100



**I. DETERMINATION OF PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD:**

Rollover Stage	Rotation Time (spec. 1 -3 min)				FMVSS 301 Hold Time		Total Time				Next Whole Minute Interval	
	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds	minutes	seconds
0° - 90°	1	20	5	6	20	7	1	20	6	10	7	10
90° - 180°	1	10	5	6	10	7	1	10	6	15	7	15
180°-270°	1	15	5	6	15	7	1	15	6	20	7	20
270°-360°	1	20	5	6	20	7	1	20	6	20	7	20

**II. ACTUAL TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE :**

Rollover Stage	Propulsion Battery Electrolyte Spillage (L)	Spillage Location
0-90°	0	None
90-180°	0	None
180-270°	0	None
270-360°	0	None

Total Spillage:  0  L

**FMVSS 305 permits 5 L maximum**

Is the total spillage of Propulsion Battery electrolyte greater than 5.0 liters?     -  YES (Fail)     x  NO

Is Propulsion Battery electrolyte spillage visible in the occupant compartment?     -  YES (Fail)     x  NO

**DATA SHEET 9**

**FMVSS 305 ROLLOVER DATA (CONTINUED)**

Vehicle: 2010 Lexus RX450 4-Door SUV

NHTSA No.: CA5100

**III. ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS:**

**VOLTMETER INFORMATION:**

Make: Fluke Model: 75 S/N: 35303240  
 Internal Resistance Value (R<sub>o</sub>) 120k MΩ  
 Normal Propulsion Battery Voltage (V<sub>b</sub>): 276 V

$R_{i1} = R_o * (1 + V_2/V_1) * [(V_1 - V_1')/V_1']$        $R_{i2} = R_o * (1 + V_1/V_2) * [(V_2 - V_2')/V_2']$       Lesser value of R<sub>i1</sub> and R<sub>i2</sub>

Isolation Measurement (Volts)	Stage	R <sub>i1</sub> Ω	R <sub>i2</sub> Ω	R <sub>i</sub> Ω	R <sub>i</sub> /V <sub>b</sub> Ω/V	Time (min)	Time (s)
V <sub>1</sub> = 123	90°	3312	3798	3312	12000	1	20
V <sub>2</sub> = 145							
V <sub>1</sub> ' = 9							
V <sub>2</sub> ' = 8							
V <sub>1</sub> = 125	180°	3403	3905	3403	12329	1	10
V <sub>2</sub> = 150							
V <sub>1</sub> ' = 9							
V <sub>2</sub> ' = 8							
V <sub>1</sub> = 124	270°	3775	4389	3775	13676	1	15
V <sub>2</sub> = 145							
V <sub>1</sub> ' = 8							
V <sub>2</sub> ' = 7							
V <sub>1</sub> = 120	360°	3780	3834	3780	13696	1	20
V <sub>2</sub> = 150							
V <sub>1</sub> ' = 8							
V <sub>2</sub> ' = 8							

Is the measured Electrical Isolation Value ≥ 500 Ω/V?        x   YES        -   NO (Fail)

**COMMENTS:**

None

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**APPENDIX A**

**PHOTOGRAPHS**

## TABLE OF PHOTOGRAPHS

Figure	Photograph Title	Page
Figure A- 1	VEHICLE PLACARD	A- 4
Figure A- 2	TIRE PLACARD	A- 4
Figure A- 3	LABELS RELATED TO ELECTRIC PROPULSION SYSTEM	A- 5
Figure A- 4	PRE-TEST TEST PORT INTERFACE PORT INSTALLATION VIEW	A- 5
Figure A- 5	PRE-TEST TEST DEVICE INSTALLATION VIEWS	A- 6
Figure A- 6	PRE-TEST CHASSIS GROUND POINT VIEWS	A- 6
Figure A- 7	PRE-TEST FRONT VIEW	A- 7
Figure A- 8	POST-TEST FRONT VIEW	A- 7
Figure A- 9	PRE-TEST LEFT SIDE VIEW	A- 8
Figure A- 10	POST-TEST LEFT SIDE VIEW	A- 8
Figure A- 11	PRE-TEST RIGHT SIDE VIEW	A- 9
Figure A- 12	POST-TEST RIGHT SIDE VIEW	A- 9
Figure A- 13	PRE-TEST LEFT FRONT THREE-QUARTER VIEW	A- 10
Figure A- 14	POST-TEST LEFT FRONT THREE-QUARTER VIEW	A- 10
Figure A- 15	PRE-TEST RIGHT FRONT THREE-QUARTER VIEW	A- 11
Figure A- 16	POST-TEST RIGHT FRONT THREE-QUARTER VIEW	A- 11
Figure A- 17	PRE-TEST LEFT REAR THREE-QUARTER VIEW	A- 12
Figure A- 18	POST-TEST LEFT REAR THREE-QUARTER VIEW	A- 12
Figure A- 19	PRE-TEST RIGHT REAR THREE-QUARTER VIEW	A- 13
Figure A- 20	POST-TEST RIGHT REAR THREE-QUARTER VIEW	A- 13
Figure A- 21	PRE-TEST REAR VIEW	A- 14
Figure A- 22	POST-TEST REAR VIEW	A- 14
Figure A- 23	PRE-TEST MDB FRONT VIEW	A- 15
Figure A- 24	POST-TEST MDB FRONT VIEW	A- 15
Figure A- 25	PRE-TEST MDB LEFT SIDE VIEW	A- 16
Figure A- 26	POST-TEST MDB LEFT SIDE VIEW	A- 16
Figure A- 27	PRE-TEST MDB RIGHT SIDE VIEW	A- 17
Figure A- 28	POST-TEST MDB RIGHT SIDE VIEW	A- 17
Figure A- 29	PRE-TEST MDB TOP VIEW	A- 18
Figure A- 30	POST-TEST MDB TOP VIEW	A- 18
Figure A- 31	PRE-TEST OVERHEAD VEHICLE AND MDB VIEW	A- 19
Figure A- 32	POST-TEST IMPACT TARGET VIEW	A- 19
Figure A- 33	PRE-TEST BATTERY PROPULSION MODULE(S) VIEW	A- 20
Figure A- 34	POST-TEST BATTERY PROPULSION MODULE(S) VIEW	A- 20
Figure A- 35	PRE-TEST PROPULSION BATTERY VIEW	A- 21
Figure A- 36	POST-TEST PROPULSION BATTERY VIEW	A- 21
Figure A- 37	PRE-TEST HIGH VOLTAGE INTERCONNECT VIEW	A- 22
Figure A- 38	POST-TEST HIGH VOLTAGE INTERCONNECT VIEW	A- 22
Figure A- 39	PRE-TEST BATTERY COMPARTMENT VIEW	A- 23
Figure A- 40	POST-TEST BATTERY COMPARTMENT VIEW	A- 23
Figure A- 41	PRE-TEST BATTERY VENTING SYSTEM VIEW	A- 24
Figure A- 42	POST-TEST BATTERY VENTING SYSTEM VIEW	A- 24
Figure A- 43	PRE-TEST ELECTRIC PROPULSION COMPONENT(S) VIEW	A- 25
Figure A- 44	POST-TEST ELECTRIC PROPULSION COMPONENT(S) VIEW	A- 25
Figure A- 45	PRE-TEST ELECTRIC PROPULSION DRIVE VIEW	A- 26
Figure A- 46	POST-TEST ELECTRIC PROPULSION DRIVE VIEW	A- 26
Figure A- 47	PRE-TEST VEHICLE PASSENGER COMPARTMENT VIEW	A- 27
Figure A- 48	POST-TEST VEHICLE PASSENGER COMPARTMENT VIEW	A- 27

**TABLE OF PHOTOGRAPHS (Continued)**

Figure	Photograph Title	Page
Figure A- 49	POST-TEST PROPULSION BATTERY ELECTROLYTE SPILLAGE LOCATION VIEW	A- 28
Figure A- 50	PRE-TEST FRONT UNDERBODY VIEW	A- 29
Figure A- 51	POST-TEST FRONT UNDERBODY VIEW	A- 29
Figure A- 52	PRE-TEST MID UNDERBODY VIEW	A- 30
Figure A- 53	POST-TEST MID UNDERBODY VIEW	A- 30
Figure A- 54	PRE-TEST REAR UNDERBODY VIEW	A- 31
Figure A- 55	POST-TEST REAR UNDERBODY VIEW	A- 31
Figure A- 56	PRE-TEST FUEL FILLER CAP VIEW	A- 32
Figure A- 57	POST-TEST FUEL FILLER CAP VIEW	A- 32
Figure A- 58	IMPACT VIEW	A- 33
Figure A- 59	ROLLOVER 90 VIEW HIGHLIGHTING PROPULSION BATTERY LOCATION	A- 34
Figure A- 60	ROLLOVER 180 VIEW HIGHLIGHTING PROPULSION BATTERY LOCATION	A- 34
Figure A- 61	ROLLOVER 270 VIEW HIGHLIGHTING PROPULSION BATTERY LOCATION	A- 35
Figure A- 62	ROLLOVER 360 VIEW HIGHLIGHTING PROPULSION BATTERY LOCATION	A- 35



Figure A-1: Vehicle Certification Placard



Figure A-2: Vehicle Tire Placard





**Figure A-5: Pre-Test Test Device Installation Views**



**Figure A-6: Pre-Test Chassis Ground Point View**



**Figure A-7: Pre-Test Front View**



**Figure A-8: Post-Test Front View**



**Figure A-9: Pre-Test Left Side View**



**Figure A-10: Post-Test Left Side View**



**Figure A-11: Pre-Test Right Side View**



**Figure A-12: Post-Test Right Side View**



**Figure A-13: Pre-Test Left Front Three-Quarter View**



**Figure A-14: Post-Test Left Front Three-Quarter View**



**Figure A-15: Pre-Test Right Front Three-Quarter View**



**Figure A-16: Post-Test Right Front Three-Quarter View**



**Figure A-17: Pre-Test Left Rear Three-Quarter View**



**Figure A-18: Post-Test Left Rear Three-Quarter View**



**Figure A-19: Pre-Test Right Rear Three-Quarter View**



**Figure A-20: Post-Test Right Rear Three-Quarter View**



**Figure A-21: Pre-Test Rear View**



**Figure A-22: Post-Test Rear View**



**Figure A-23: Pre-Test MDB Front View**



**Figure A-24: Post-Test MDB Front View**



**Figure A-25: Pre-Test MDB Left Side View**



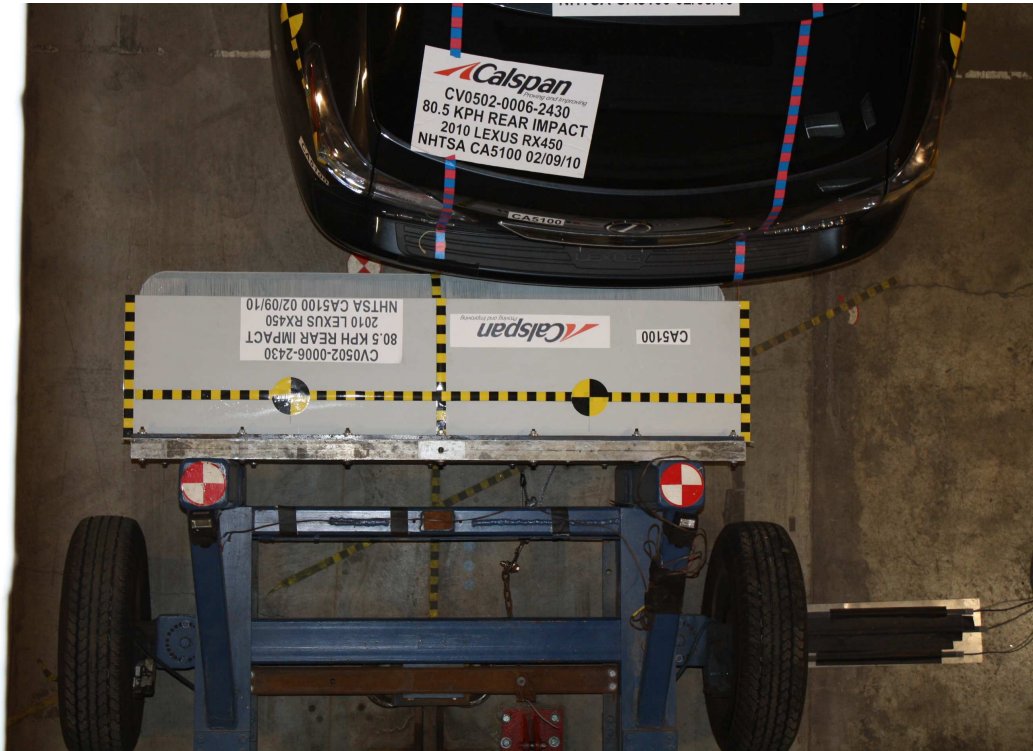
**Figure A-26: Post-Test MDB Left Side View**



**Figure A-27: Pre-Test MDB Right Side View**



**Figure A-28: Post-Test MDB Right Side View**



**Figure A-29: Pre-Test MDB Top View**



**Figure A-30: Post-Test MDB Top View**





**Figure A-33: Pre-Test Battery Propulsion Module(S) View**

Photo Not Available

**Figure A-34: Post-Test Battery Propulsion Module(S) View**



**Figure A-35: Pre-Test Propulsion Battery View**

Photo not available

**Figure A-36: Post-Test Propulsion Battery View**



**Figure A-37: Pre-Test High Voltage Interconnect View**

Photo not available

**Figure A-38: Post-Test High Voltage Interconnect View**



**Figure A-39: Pre-Test Battery Compartment View**

Photo Not Available – Rear Hatch would not open

**Figure A-40: Post-Test Battery Compartment View**

Photo not available

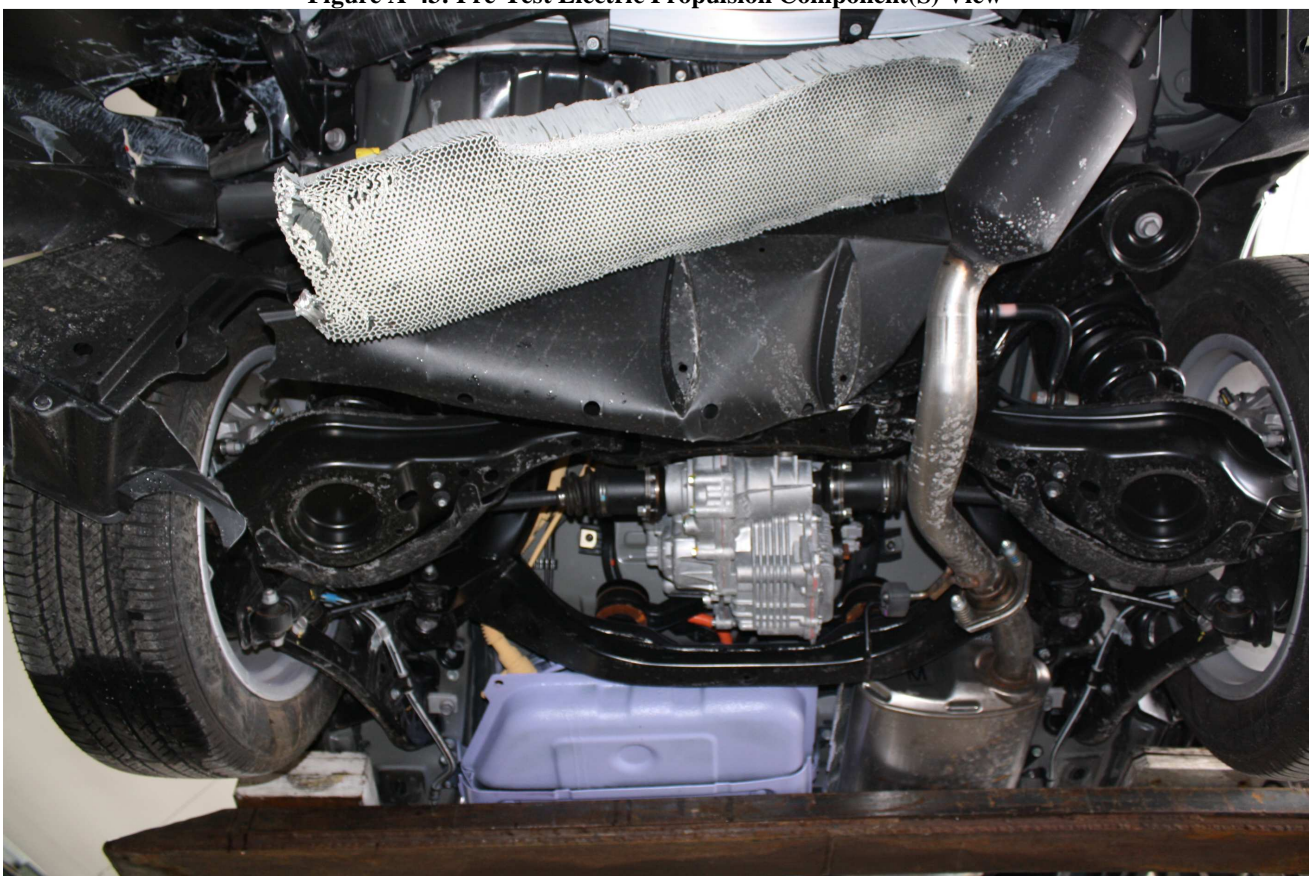
**Figure A-41: Pre-Test Battery Venting System View**

Photo not available

**Figure A-42: Post-Test Battery Venting System View**



**Figure A-43: Pre-Test Electric Propulsion Component(S) View**



**Figure A-44: Post-Test Electric Propulsion Component(S) View**



**Figure A-45: Pre-Test Electric Propulsion Drive View**



**Figure A-46: Post-Test Electric Propulsion Drive View**



**Figure A-47: Pre-Test Vehicle Passenger Compartment View**



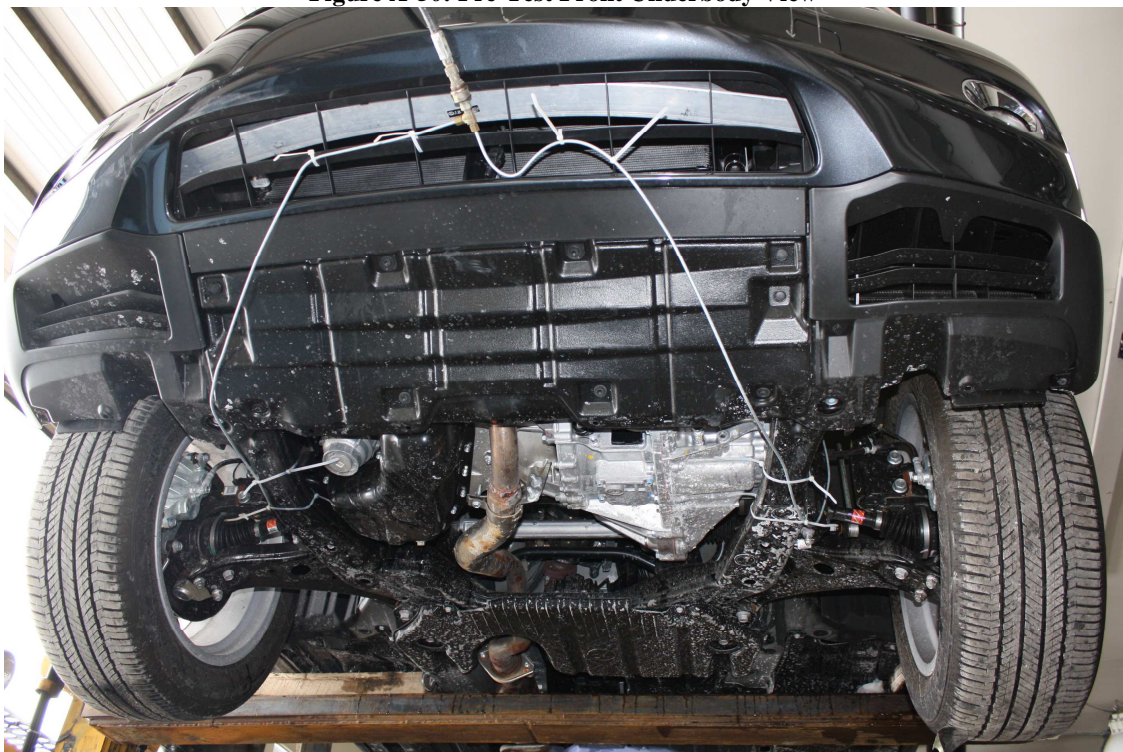
**Figure A-48: Post-Test Vehicle Passenger Compartment View**

No Spillage – Photo not available

**Figure A-49: Post-Test Propulsion Battery Electrolyte Spillage Location View**



**Figure A-50: Pre-Test Front Underbody View**



**Figure A-51: Post-Test Front Underbody View**



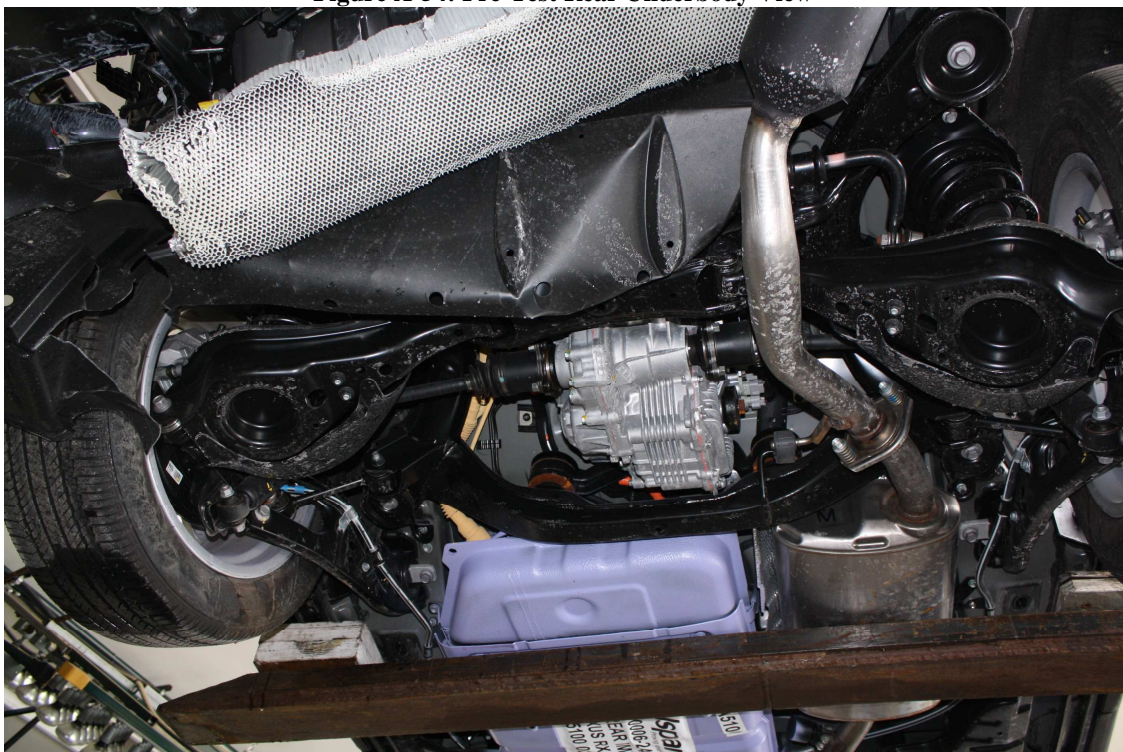
**Figure A-52: Pre-Test Mid Underbody View**



**Figure A-53: Post-Test Mid Underbody View**



**Figure A-54: Pre-Test Rear Underbody View**



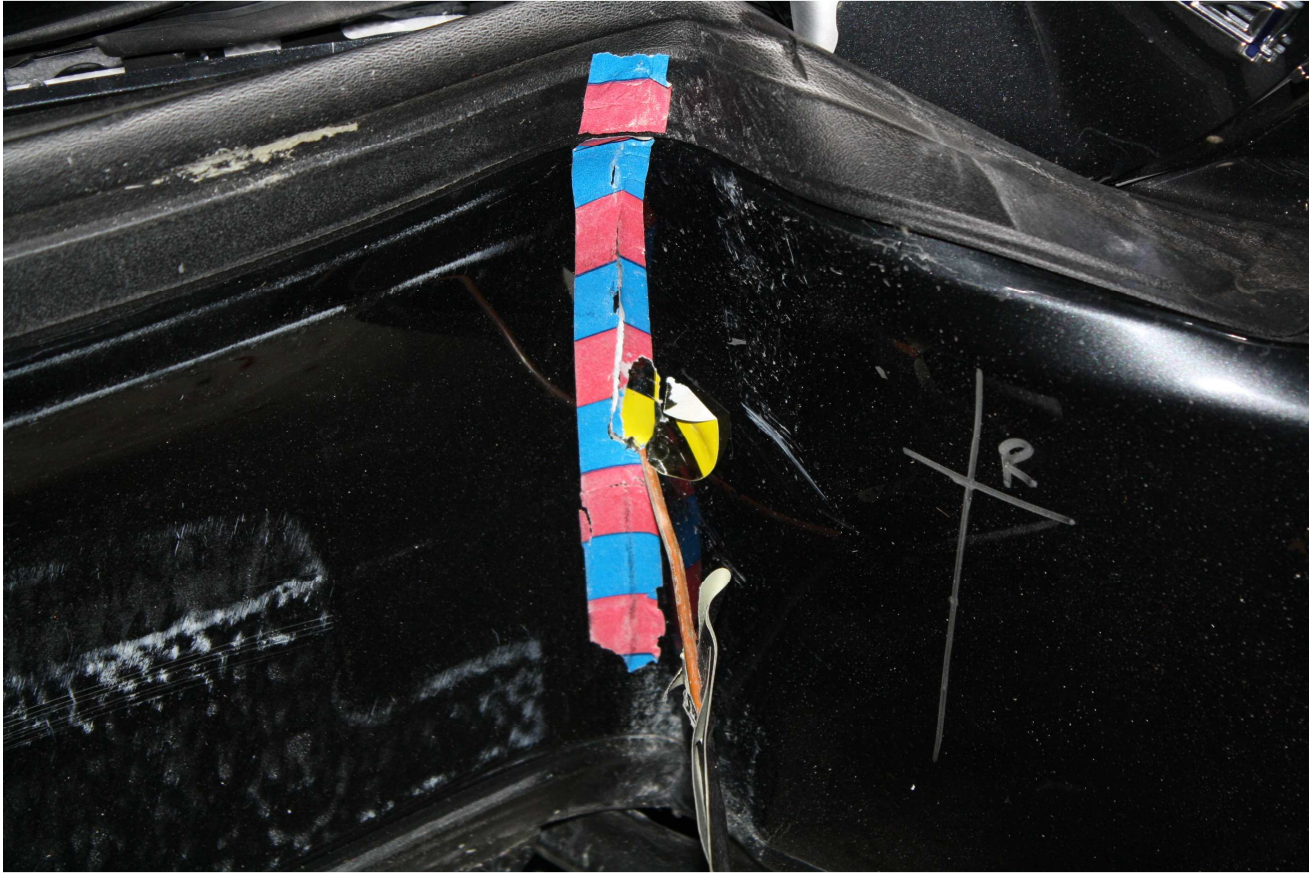
**Figure A-55: Post-Test Rear Underbody View**



**Figure A-56: Pre-Test Fuel Filler Cap View**



**Figure A-57: Post-Test Fuel Filler Cap View**



**Figure A-58: Impact View**





Figure A-61: Rollover View - 180°



Figure A-62: Rollover View - 360°