REPORT NUMBER: NCAP305I-KAR-14-007

NEW CAR ASSESSMENT PROGRAM (NCAP)
FMVSS NO. 305 INDICANT TEST

VOLKSWAGEN DE MEXICO S.A. DE C.V.
2014 VOLKSWAGEN JETTA HYBRID SE 4-DOOR SEDAN

NHTSA NUMBER: O20145801

PREPARED BY:
KARCO ENGINEERING, LLC.
9270 HOLLY ROAD
ADELANTO, CA 92301

DECEMBER 9, 2013

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF RULEMAKING
MAIL CODE: NVS-111
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FINAL REPORT ACCEPTANCE BY OCWS:

_____

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NHTSA, Office of Crashworthiness Standards

Date: _____

_____

COTR, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

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Final Report of New Car Assessment Program FMVSS 305 Indicant Testing of a 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No. O20145801	December 9, 2013
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15. Supplementary Notes

An FMVSS No. 305 Indicant test, in conjunction with an NCAP side moving deformable barrier (MDB) impact test was conducted on the subject 2014 Volkswagen Jetta Hybrid SE 4-door sedan in accordance with the specifications of the applicable Office of Crashworthiness Standards Test Procedures for the generation of consumer information for the New Car Assessment Program (NCAP). No test failures were reported.

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SECTION 1
TEST PURPOSE AND PROCEDURE

An FMVSS No. 305 Indicant test, in conjunction with an NCAP side moving deformable barrier (MDB) impact test was conducted on the subject 2014 Volkswagen Jetta Hybrid SE 4-door sedan.

The indicant test was conducted in accordance with the Office of Crashworthiness Standards Laboratory Test Procedure, dated September, 2012 to determine compliance to the requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 305, 'Electric-Powered Vehicles: Electrolyte Spillage and Electrical Shock Protection' for the purpose of providing consumer information.

This FMVSS No. 305 Indicant test is part of the MY 2014 New Car Assessment Program Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract no. DTNH22-D-09-00122.

SECTION 2
SUMMARY OF TEST RESULTS

A side moving deformable barrier (MDB) impact test was performed by KARCO Engineering, LLC. on a 2014 Volkswagen Jetta Hybrid SE 4-door hybrid sedan on November 25, 2013. Electrical isolation measurements were taken immediately post-impact and observations were made relating to electrolyte spillage and battery retention. A static rollover was subsequently performed on the subject vehicle and electrical isolation measurements were taken at each stage of the rollover.

Based on the test results, the 2014 Volkswagen Jetta Hybrid SE 4-door sedan appears to meet the requirements for electrolyte spillage, electrical isolation, and battery retention during FMVSS No. 305 indicant testing.

Data sheets, along with pre-test and post-test photographs of the test vehicle, are included in this report to document the test.

SECTION 3

DATA SHEETS

Test Vehicle: 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No.: O20145801

Test Program: FMVSS No. 305 Indicant Test Test Date: 11/25/13

CONVERSION FACTORS

Quantity	Typical Application	Std Units	Metric Unit	Multiply By
Mass	Vehicle Weight	lb	kg	0.4536
Linear Velocity	Impact Velocity	miles/hr	km/hr	1.609344
Length or Distance	Measurements	in	mm	25.4
Volume	Fuel Systems	gal	liter	3.785
Volume	Small Fluids	oz	mL	29.574
Pressure	Tire Pressures	lbf/in^2	kPa	6.895
Temperature	General Use	^oF	^oC	=(Tf -32)/1.8
Force	Dynamic Forces	lbf	N	4.448
Moment	Torque	lbf-ft	N•m	1.355

DATA SHEET NO. 1

TEST VEHICLE INFORMATION

Test Vehicle: 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No.: O20145801

Test Program: FMVSS No. 305 Indicant Test Test Date: 11/25/13

TEST VEHICLE INFORMATION

NHTSA Number	O20145801
Model Year	2014
Make	Volkswagen
Model	Jetta Hybrid SE
Body Style	4-Door Sedan
Body Color	Platinum Gray Metallic
Odometer Reading (km / mi)	55 / 34

DATA FROM VEHICLE'S CERTIFICATION LABEL

Manufactured By	Volkswagen De Mexico S.A. De C.V.
Date of Manufacture	Aug-13
VIN	3VW637AJ2EM209260
GVWR (kg)	2010

ELECTRIC VEHICLE PROPULSION SYSTEM

Type of Electrical Vehicle	Gas-Electric Hybrid
Propulsion Battery Type	Lithium Ion Battery
Nominal Voltage (V)	220.0
Automatic Propulsion Battery Disconnect	Yes
Physical Location of Automatic Propulsion Battery Disconnect	Inside passenger compartment
Auxiliary Battery Type	12 Volt Lead Acid

PROPULSION BATTERY SYSTEM DATA

Electrolyte Fluid Type	LiPF6
Electrolyte Fluid Specific Gravity (g/cc)	1.2
Electrolyte Fluid Kinematic Viscosity (cSt)	Unavailable
Electrolyte Fluid Color	Colorless
Propulsion Battery Coolant Type	Air
Propulsion Battery Coolant Color	N/A
Propulsion Battery Coolant Specific Gravity	1.0

LOCATION OF BATTERY MODULES

Location	Inside passenger compartment behind rear seat back

DATA SHEET NO. 1 … (CONTINUED)

TEST VEHICLE INFORMATION

Test Vehicle: 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No.: O20145801

Test Program: FMVSS No. 305 Indicant Test Test Date: 11/25/13

For all battery types:

Description	Volts
Minimum Operating Voltage	
Maximum Operating Voltage	
95% of Maximum Operating Voltage	
Test Voltage (no less than 95% of Maximum)	

For batteries that are rechargeable ONLY by an energy source on the vehicle:

Description	Volts
Minimum Operating Voltage	150
Maximum Operating Voltage	252
Test Voltage (Maximum practicable state of charge within normal operating range)	220.0

DATA SHEET NO. 2

PRE-IMPACT DATA

Test Vehicle: 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No.: O20145801

Test Program: FMVSS No. 305 Indicant Test Test Date: 11/25/13

VEHICLE CHASSIS GROUND POINT(S) LOCATION(S)

DETAILS OF VEHICLE CHASSIS GROUND POINT(S) AND LOCATION(S):

The chassis ground used for the electrical isolation measurements was located on the top plate that covers the Electric Drive Power and Control Electronics compartment. The chassis ground connection was secured with one of the bolts used to seal the top plate that covers the Electric Drive Power and Control Electronics compartment. A photograph of the location is included in Figure 21 of Appendix A and is also visible in Figure 22 of Appendix A.

PROPULSION BATTERY SYSTEM

DETAILS OF PROPULSION BATTERY COMPONENTS:

The electrical propulsion system utilized one Lithium-Ion (Li-Ion) Battery and a traction motor to propel the vehicle. The battery is located behind the rear passenger seat back. The propulsion battery service disconnect is located on the front top side of the battery, behind the rear passenger seat back. The propulsion battery's automatic disconnect is physically contained within the propulsion battery. A photograph of the location of the service disconnect is included in Figure 6 of Appendix A and is also visible in Figure 9 of Appendix A.

DATA SHEET NO. 3

PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS

Test Vehicle: 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No.: O20145801

Test Program: FMVSS No. 305 Indicant Test Test Date: 11/25/13

VOLTMETER INFORMATION

Make	Fluke
Model	16
Serial No.	82810107
Internal Impedence Value	10 MΩ
Resolution	0.001

ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS

Code	Units	Description
V_b	V	Propulsion Battery Voltage
V_1	V	Propulsion Battery Negative to Chassis
V_2	V	Propulsion Battery Positive to Chassis
R_O	Ω	Resistance of Grounding Circuit
V_1'	V	Propulsion Battery Negative to Chassis with R_O installed
V_2'	V	Propulsion Battery Positive to Chassis with R_O installed
R_{i1}	Ω	Electrical Isolation Value of Propulsion Battery Negative to Chassis Ground
R_{i2}	Ω	Electrical Isolation Value of Propulsion Battery Positive to Chassis Ground
R_i	Ω	Electrical Isolation Value of Propulsion Battery - The Minimum of R_{i1} and R_{i2}
R_i/V_b	Ω/v	Electrical Isolation per Volt of Propulsion Battery

Code	Units	Threshold	Pre-Test
V_b	V		221.30
V_1	V		104.00
V_2	V		105.90
R_o	Ω		217,700
V_1'	V		8.17
V_2'	V		8.16
R_{i1}	Ω		5,153,674
R_{i2}	Ω		5,168,411
R_i	Ω		5,153,674
R_i/V_b	Ω/V	500	23,426

Is the Measured Electrical Isolation Value ≥ 500 Ω/V?	Yes

DATA SHEET NO. 4

POST-IMPACT DATA

Test Vehicle: 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No.: O20145801

Test Program: FMVSS No. 305 Indicant Test Test Date: 11/25/13

VOLTMETER INFORMATION

Make	Fluke
Model	16
Serial No.	82810107
Internal Impedence Value	10 MΩ
Resolution	0.001

ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS

Code	Units	Threshold	Post-Test
V_b	V		2.19
V_1	V		0.92
V_2	V		0.83
R_o	Ω		217,700
V_1'	V		0.06
V_2'	V		0.45
R_{i1}	Ω		6,524,779
R_{i2}	Ω		388,823
R_i	Ω		388,823
R_i/V_b	Ω/V	500	1,767

Is the Measured Electrical Isolation Value ≥ 500 Ω/V?	Yes

PROPULSION BATTERY SYSTEM COMPONENTS

Has the propulsion battery module moved within the passenger compartment: No

Describe any movement: There was no movement of the propulsion battery.

Has an outside propulsion battery component intruded into the passenger compartment: No

Describe any intrusion: There was no intrusion of the propulsion battery into the occupant compartment.

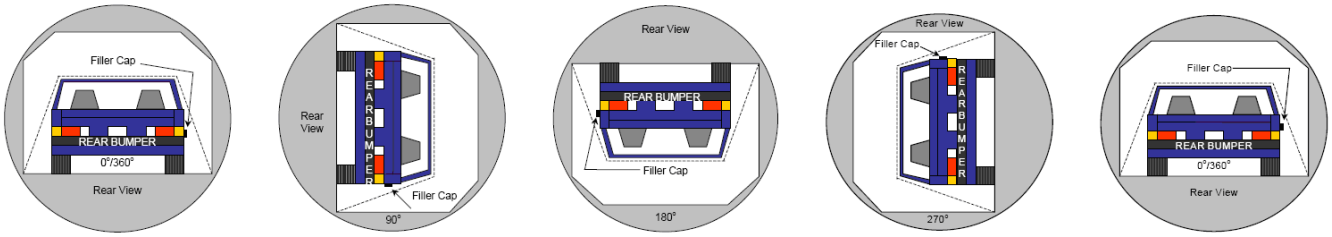
Is there propulsion battery electrolyte spillage visible in the passenger compartment: No

DATA SHEET NO. 5

STATIC ROLLOVER TEST DATA

Test Vehicle: 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No.: O20145801

Test Program: FMVSS No. 305 Indicant Test Test Date: 11/25/13



0° TO 90° 90° TO 180° 180° TO 270° 270° TO 360°

PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	84	300	384
90° To 180°	87	300	387
180° To 270°	86	300	386
270° To 360°	85	300	385

TEST VEHICLE PROPULSION BATTERY ELECTROLYTE SPILLAGE

Test Phase	Propulsion Battery Electrolyte Spillage (L)	Spillage Location
0° To 90°	0.0	N/A
90° To 180°	0.0	N/A
180° To 270°	0.0	N/A
270° To 360°	0.0	N/A

Is the Total Propulsion Battery Electrolyte Spillage Greater Than 5.0 Liters?	No spillage occurred
Is the Propulsion Battery Electrolyte Spillage Visible in the Passenger Compartment?	N/A

DATA SHEET NO. 5 … (CONTINUED)

STATIC ROLLOVER TEST DATA

Test Vehicle: 2014 Volkswagen Jetta Hybrid SE 4-Door Sedan NHTSA No.: O20145801

Test Program: FMVSS No. 305 Indicant Test Test Date: 11/25/13

VOLTMETER INFORMATION

Make	Fluke
Model	16
Serial No.	82810107
Internal Impedence Value	10 MΩ
Resolution	0.001

ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS

Code	Units	Threshold	90°	180°	270°	360°
V_b	V		0.000	0.000	0.000	0.000
V_1	V		0.000	0.000	0.000	0.000
V_2	V		0.000	0.000	0.000	0.000
R_o	Ω		217,700	217,700	217,700	217,700
V_1'	V		0.000	0.000	0.000	0.000
V_2'	V		0.000	0.000	0.000	0.001
R_{i1}	Ω		Zero Volts*	Zero Volts*	Zero Volts*	3,526,740
R_{i2}	Ω		Zero Volts*	Zero Volts*	Zero Volts*	Zero Volts*
R_i	Ω		Zero Volts*	Zero Volts*	Zero Volts*	Zero Volts*
R_i/V_b	Ω/V	500	Zero Volts*	Zero Volts*	Zero Volts*	Zero Volts*

Is the Measured Electrical Isolation Value ≥ 500 Ω/V?	Yes

*Zero Volts is considered as being compliant.

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

TABLE OF PHOTOGRAPHS … (CONTINUED)

FIGURE 1. Auxiliary Power Module Warning Label

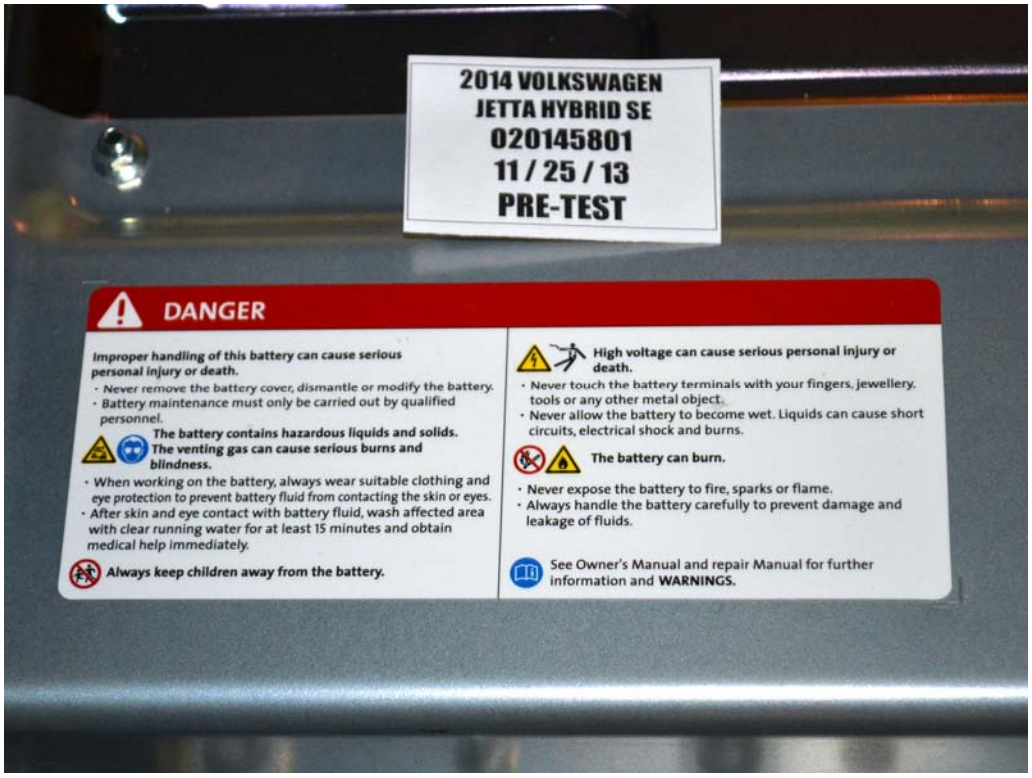


FIGURE 1a. Auxiliary Power Module Warning Label

FIGURE 1b. Auxiliary Power Module Warning Label

FIGURE 1c. Auxiliary Power Module Warning Label

FIGURE 2. Power Inverter Warning Label

FIGURE 2a. Power Inverter Warning Label

FIGURE 3. First Responder Warning Label

FIGURE 4. First Responder Warning Location

FIGURE 5. Other Vehicle Label(s) Related to Electrical Propulsion System

FIGURE 5a. Other Vehicle Label(s) Related to Electrical Propulsion System

FIGURE 6. Manual High Voltage Service Disconnect in Place

FIGURE 7. Manual High Voltage Service Disconnect Removed

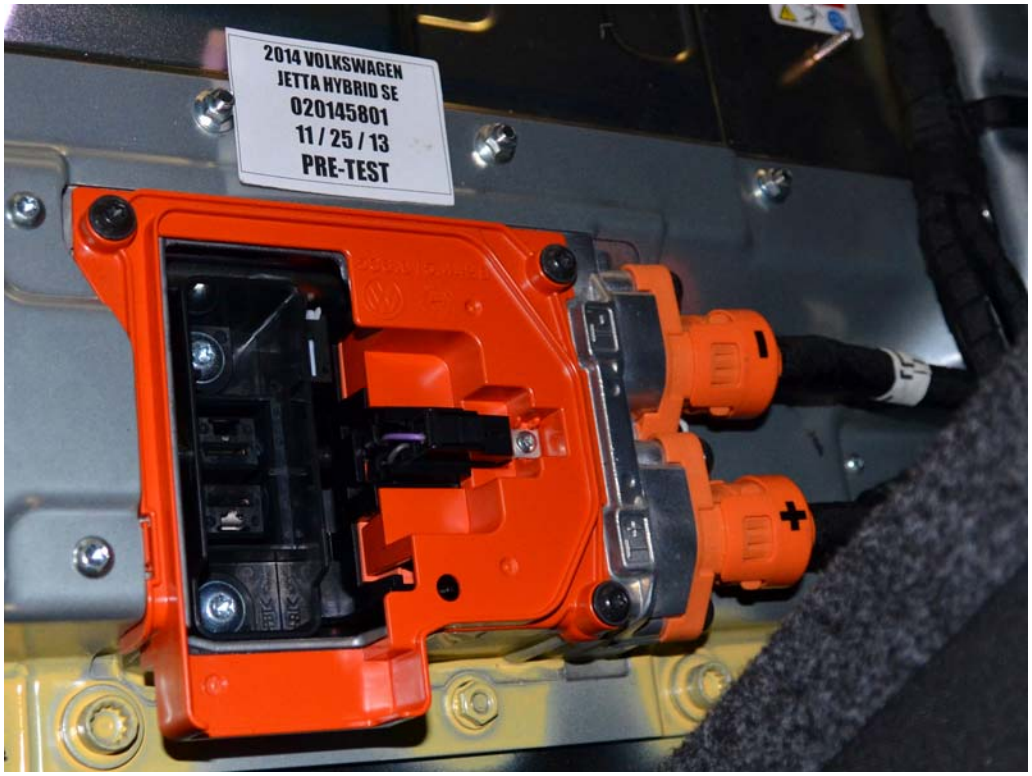


FIGURE 8. Manual High Voltage Service Disconnect Removed

FIGURE 9. Pre-Impact View of Propulsion Battery

FIGURE 9a. Pre-Impact View of Propulsion Battery

FIGURE 10. Post-Impact Front View of Propulsion Battery

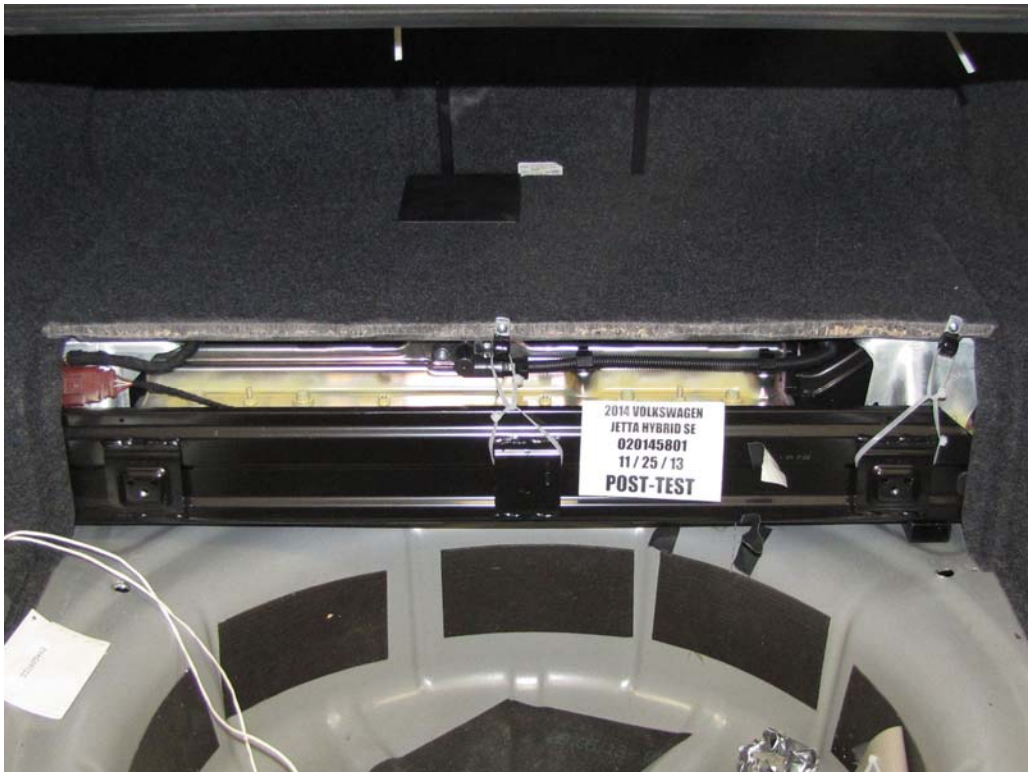


FIGURE 11. Post-Impact Rear View of Propulsion Battery

FIGURE 12. Pre-Impact View of Propulsion Battery Box(s) or Container(s) which Holds Individual Battery Modules

FIGURE 12a. Pre-Impact View of Propulsion Battery Box(s) or Container(s) which Holds Individual Battery Modules

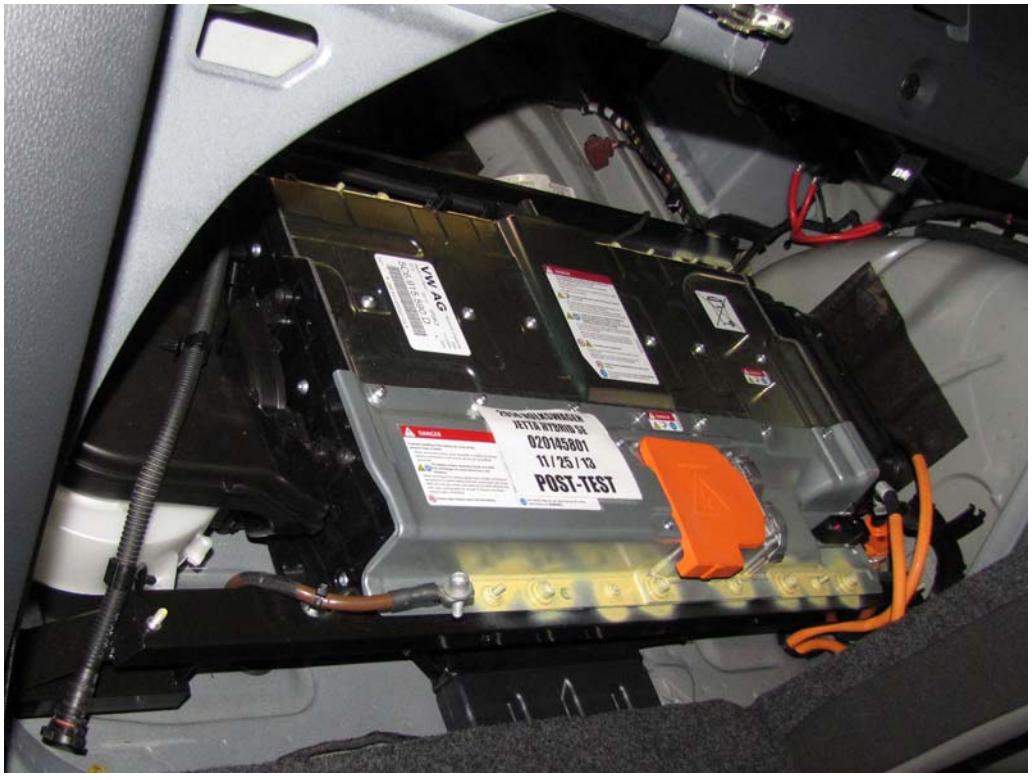


FIGURE 13. Post-Impact View of Propulsion Battery Box(s) or Container(s) which Holds Individual Battery Modules

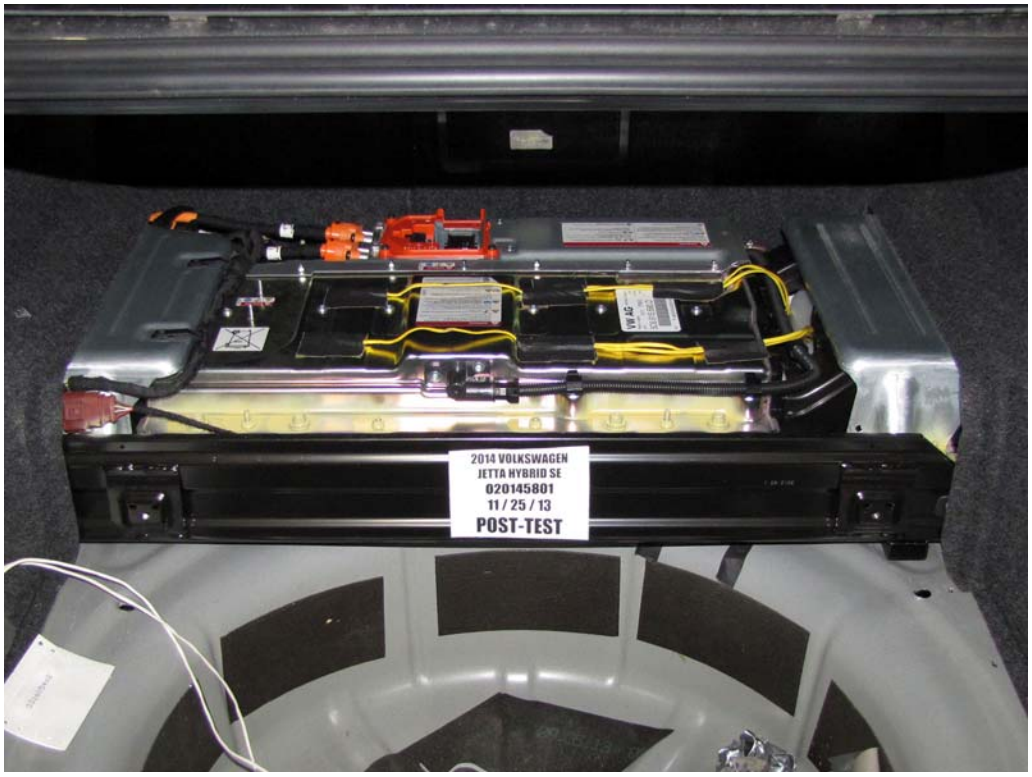


FIGURE 13a. Post-Impact View of Propulsion Battery Box(s) or Container(s) which Holds Individual Battery Modules

Photograph Not Available

Upper Cover Not Removed Pre-Test

FIGURE 14. Pre-Impact View of Propulsion Battery Module(s)

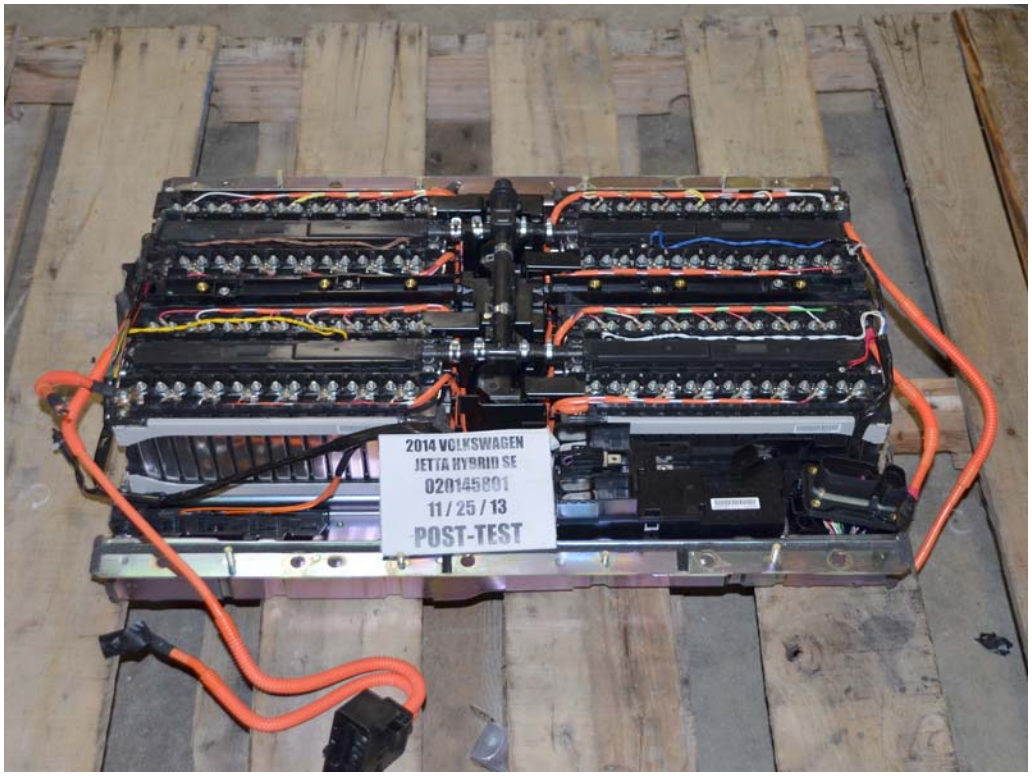


FIGURE 15. Post-Impact View of Propulsion Battery Module(s)

FIGURE 16. Pre-Impact View of Electric Propulsion Drive

FIGURE 16a. Pre-Impact View of Electric Propulsion Drive

FIGURE 17. Post-Impact View of Electric Propulsion Drive

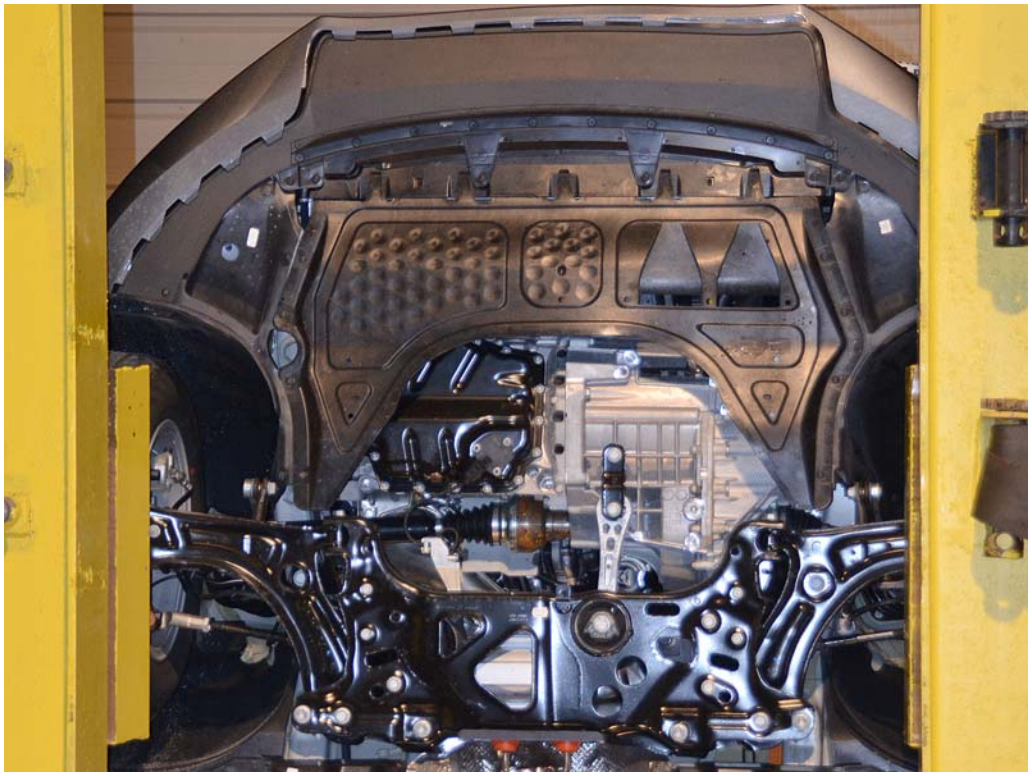


FIGURE 17a. Post-Impact View of Electric Propulsion Drive

FIGURE 18. Pre-Impact View of High Voltage Interconnect(s)

FIGURE 18a. Pre-Impact View of High Voltage Interconnect(s)

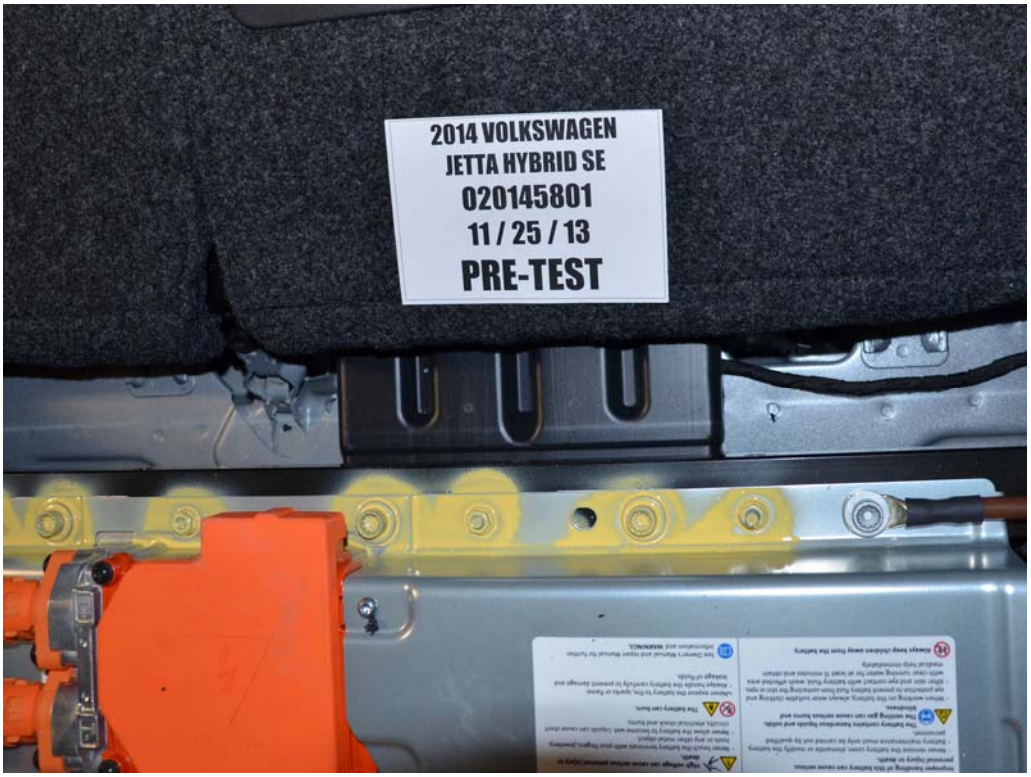


FIGURE 19. Pre-Impact View of Propulsion Battery Venting System(s)

FIGURE 20. Pre-Impact View of Other Visible Electric Propulsion Components

FIGURE 21. Pre-Impact View of Ground Lead Attached

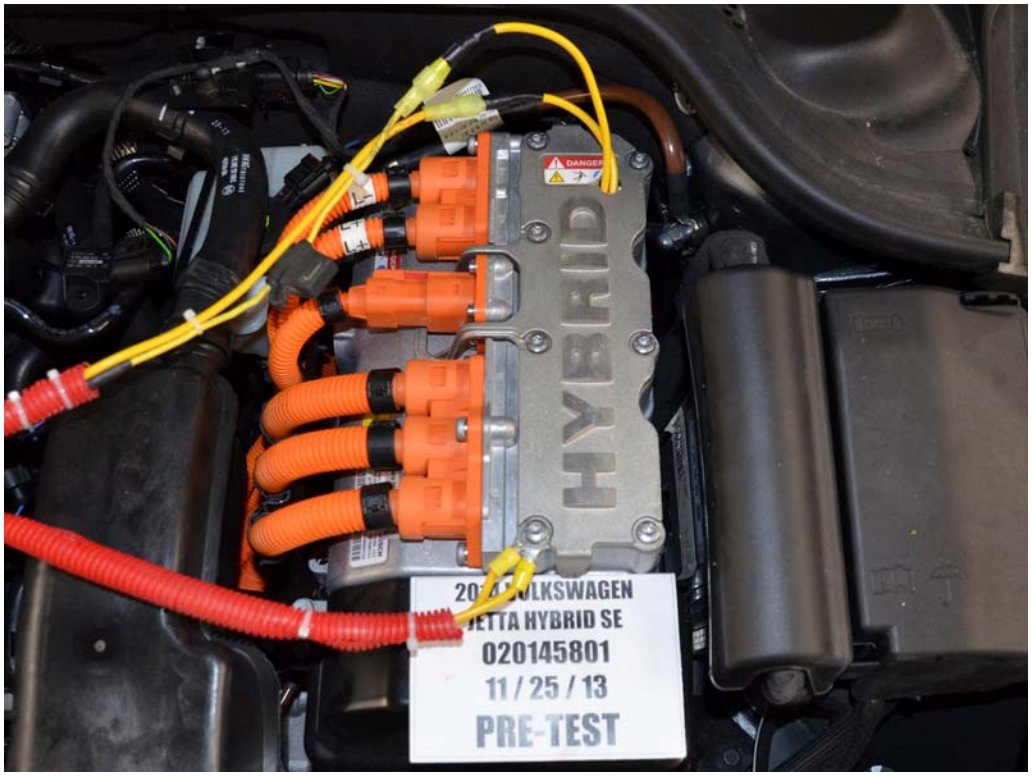


FIGURE 22. Pre-Impact View of High Voltage Leads Attached

FIGURE 23. Pre-Impact Close-Up View of High Voltage Leads Attached

FIGURE 24. Pre-Impact View of Installed Test Interface Port

FIGURE 25. Post-Impact View of Installed Test Interface Port

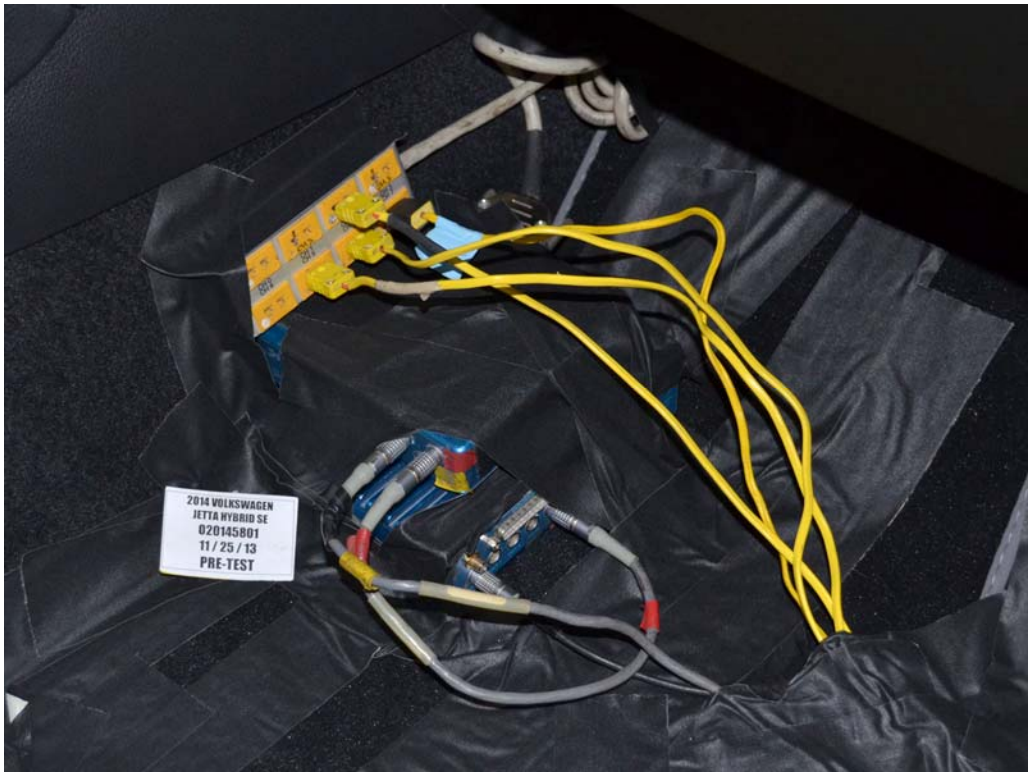


FIGURE 26. Pre-Impact View of Other Test Devices

FIGURE 26a. Pre-Impact View of Other Test Devices

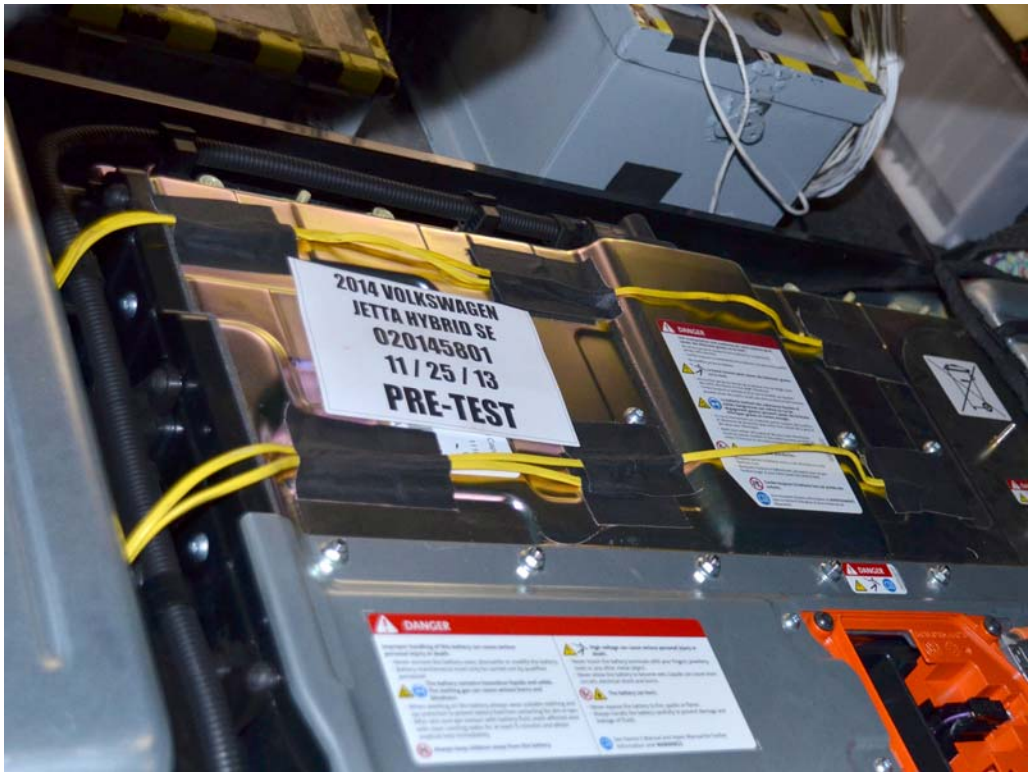


FIGURE 26b. Pre-Impact View of Other Test Devices

FIGURE 27. Post-Impact View of Other Test Devices

FIGURE 27a. Post-Impact View of Other Test Devices

FIGURE 27b. Post-Impact View of Other Test Devices

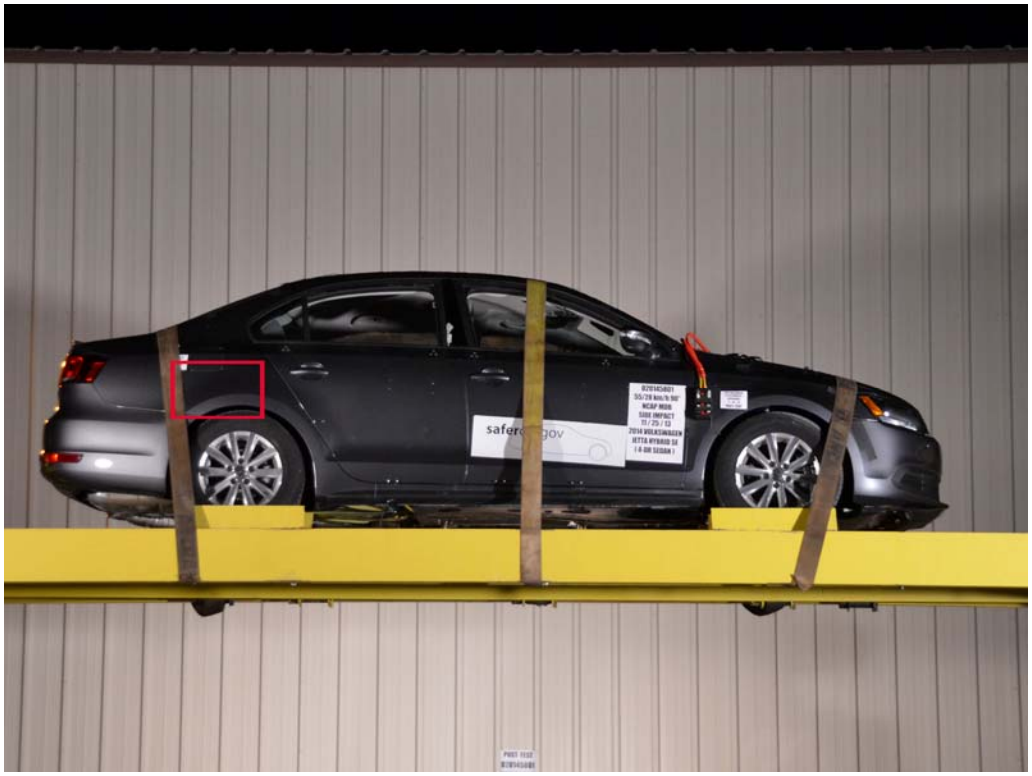


FIGURE 28. FMVSS No. 305 Static Rollover at 0°

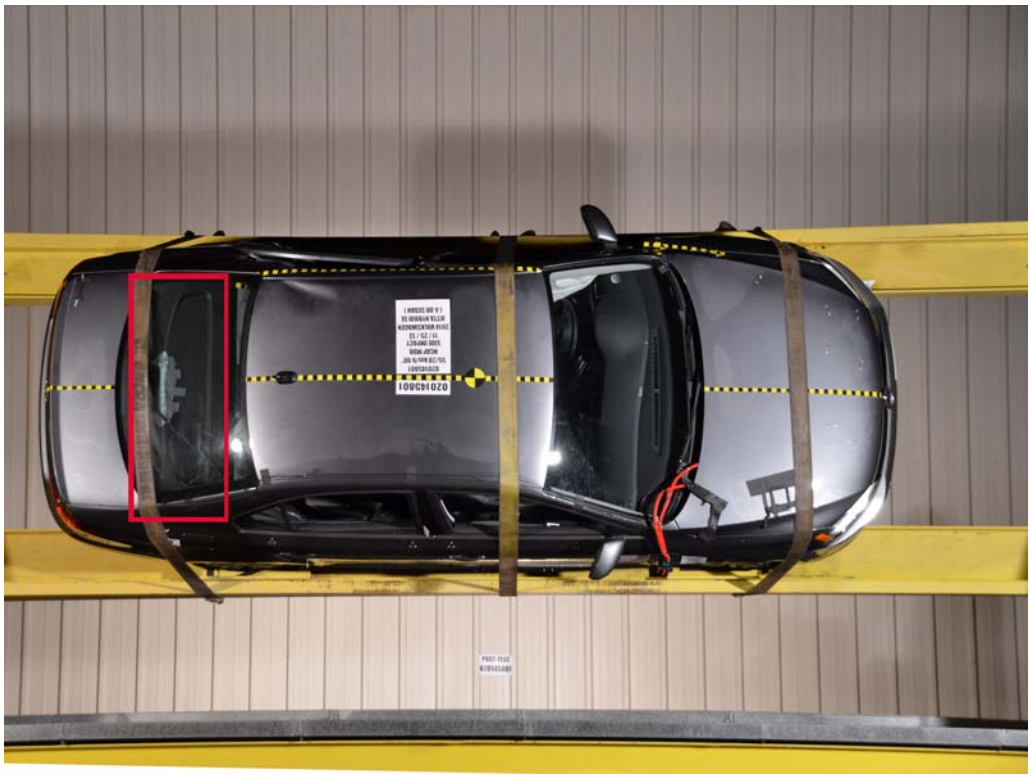


FIGURE 29. FMVSS No. 305 Static Rollover at 90°

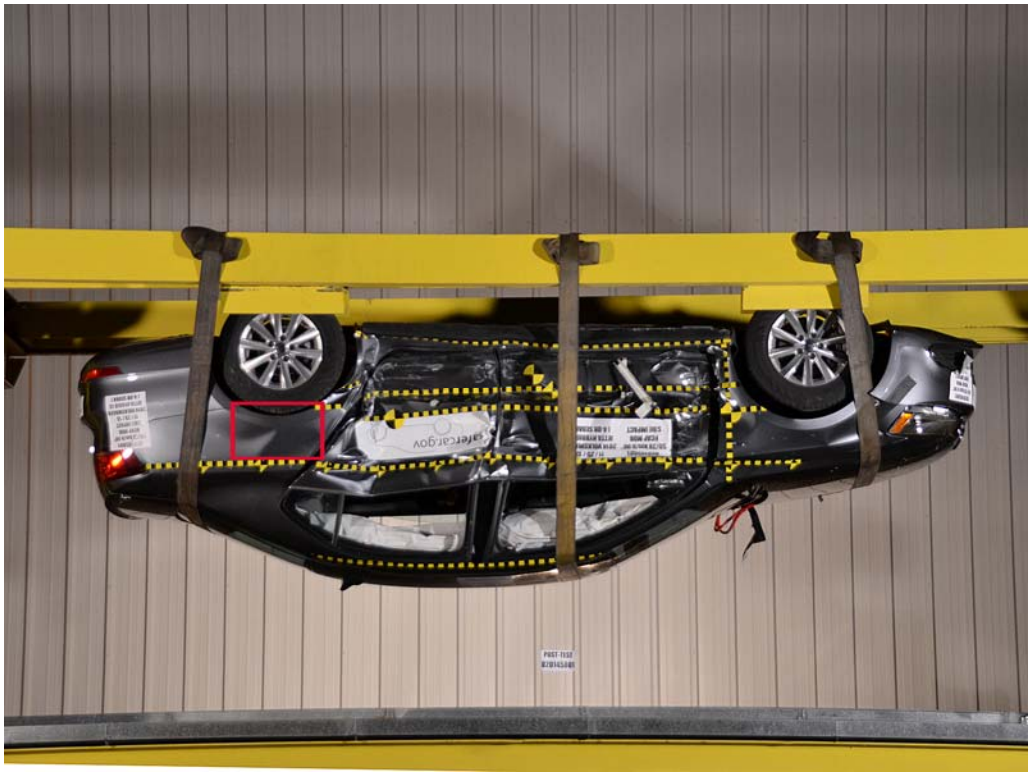


FIGURE 30. FMVSS No. 305 Static Rollover at 180°

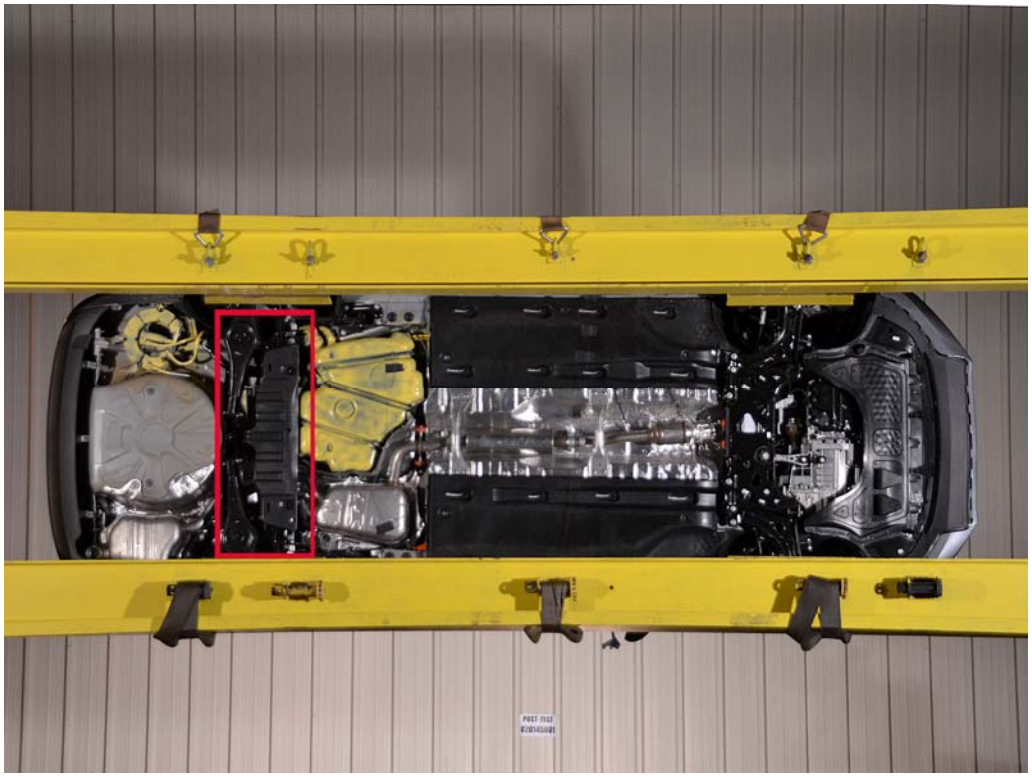


FIGURE 31. FMVSS No. 305 Static Rollover at 270°

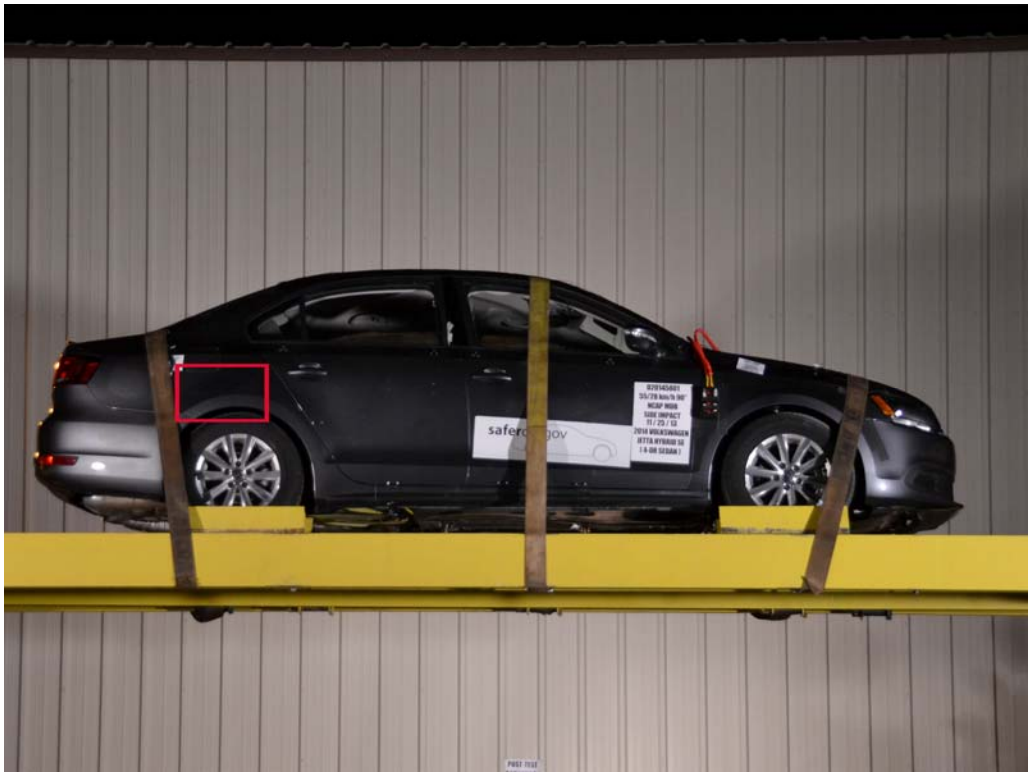


FIGURE 32. FMVSS No. 305 Static Rollover at 360°

FIGURE 33. Pre-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

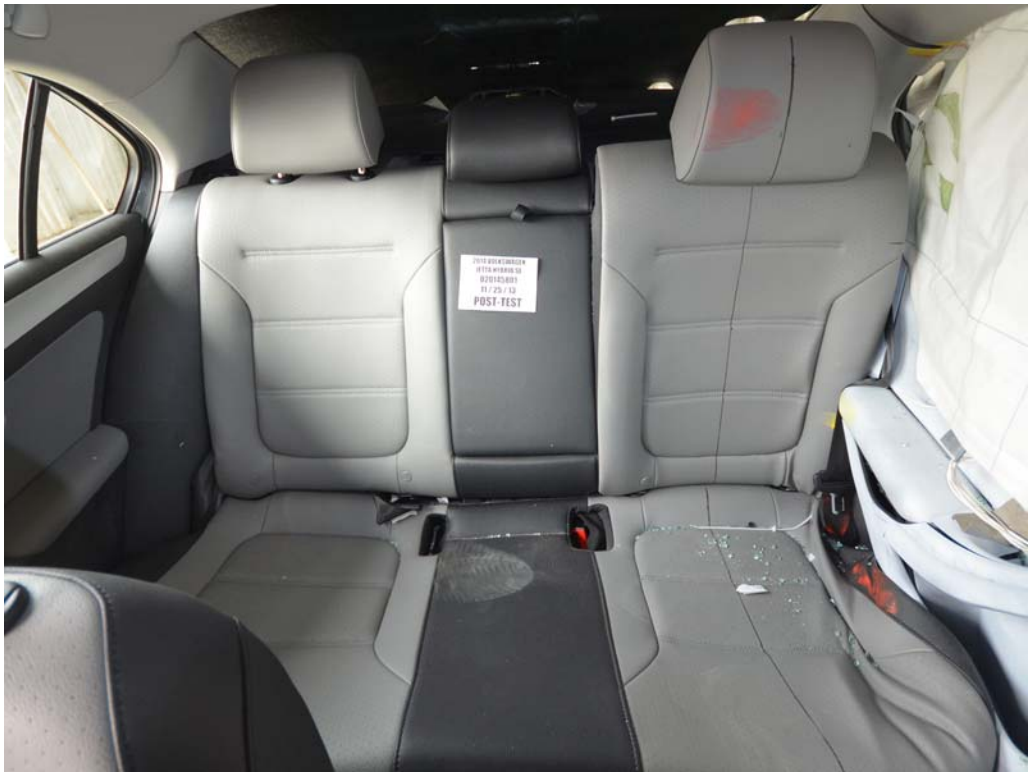


FIGURE 34. Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

Photograph Not Applicable

No Battery System Mounting and/or Intrusion Failure

FIGURE 35. Post-Impact Propulsion Battery System Mounting and-or Intrusion Failure(s)

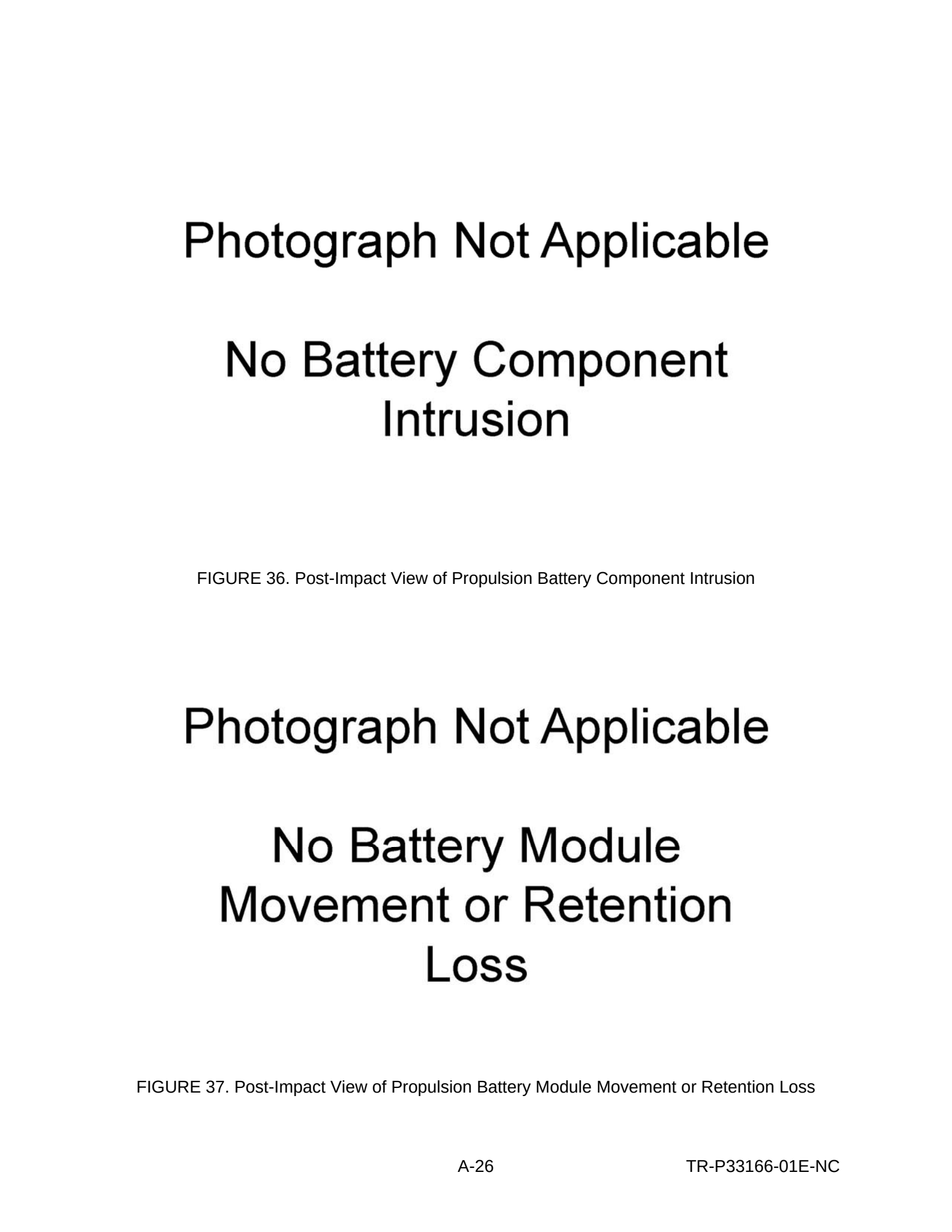


FIGURE 36. Post-Impact View of Propulsion Battery Component Intrusion

FIGURE 37. Post-Impact View of Propulsion Battery Module Movement or Retention Loss

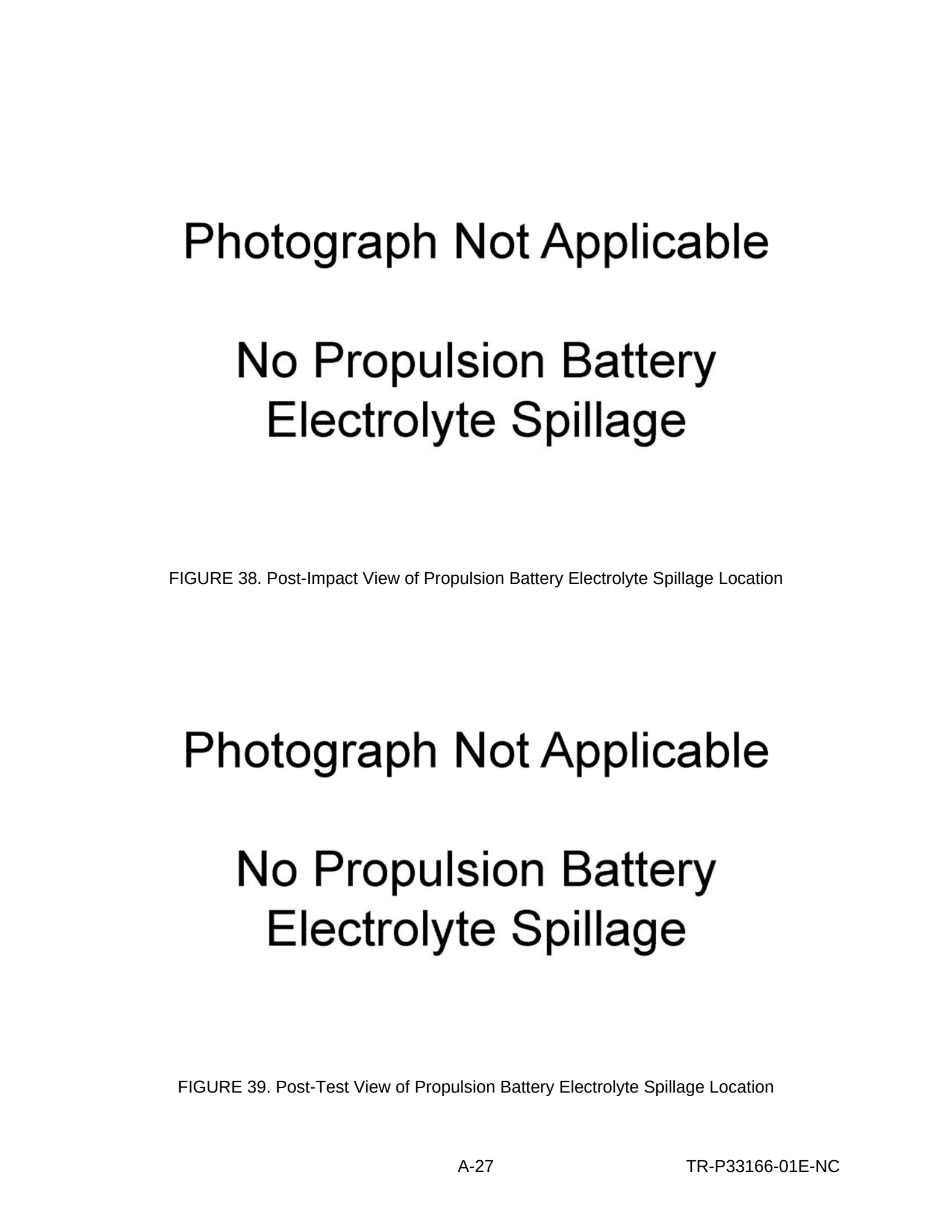


FIGURE 38. Post-Impact View of Propulsion Battery Electrolyte Spillage Location

FIGURE 39. Post-Test View of Propulsion Battery Electrolyte Spillage Location