REPORT NUMBER: NCAP305I-KAR-18-021

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

TESLA, INC.

2018 TESLA MODEL 3 LONG RANGE RWD 4-DOOR SEDAN

NHTSA NUMBER: O20185002

PREPARED BY:

APPLUS IDIADA KARCO ENGINEERING, LLC.

9270 HOLLY ROAD

ADELANTO, CA 92301

SEPTEMBER 5, 2018

FINAL REPORT

U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

OFFICE OF RULEMAKING

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Prepared By: _____

Mr. Robert S. Ramos, Program Manager
Applus IDIADA KARCO Engineering, LLC.

Reviewed By: _____

Mr. Michael L. Dunlap, Director of Operations
Applus IDIADA KARCO Engineering, LLC.

Approved By: _____

Mr. Steven D. Matsusaka, Engineering Manager
Applus IDIADA KARCO Engineering, LLC.

Approval Date: September 5, 2018

FINAL REPORT ACCEPTANCE BY OCWS:

_____

Division Chief, New Car Assessment Program
NHTSA, Office of Crashworthiness Standards

Date: _____

_____

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

Date: _____

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15. Supplementary Notes

16. Abstract

An FMVSS No. 305 Indicant test, in conjunction with an NCAP side impact test was conducted on the subject 2018 Tesla Model 3 Long Range RWD 4-door sedan in accordance with the specifications of the applicable Office of Crashworthiness Standards Test Procedure 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 impact test was conducted on the subject 2018 Tesla Model 3 Long Range RWD 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 2018 New Car Assessment Program Test Program, sponsored by the National Highway Traffic Safety Administration (NHTSA), under contract no. DTNH22-13-D-00311L.

SECTION 2
SUMMARY OF TEST RESULTS

A side impact test was performed by Applus IDIADA KARCO Engineering, LLC. on a 2018 Tesla Model 3 Long Range RWD 4-door sedan on August 21, 2018. 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 2018 Tesla Model 3 Long Range RWD 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.

The NHTSA number in the placards used in Appendix A of this report are listed incorrectly with the first character as the numeral zero “0” instead of the letter “O”.

SECTION 3

DATA SHEETS

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185002

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/21/18

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

ELECTRICAL CODES

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

DATA SHEET NO. 1

TEST VEHICLE INFORMATION

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185002

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/21/18

TEST VEHICLE INFORMATION

NHTSA Number	O20185002
Model Year	2018
Make	Tesla
Model	Model 3 Long Range RWD
Body Style	4-Door Sedan
Body Color	Black
Odometer Reading (km / mi)	37 / 23

DATA FROM VEHICLE'S CERTIFICATION LABEL

Manufactured By	Tesla, Inc.
Date of Manufacture	Jul-18
VIN	5YJ3E1EA5JF061138
GVWR (kg)	2180

ELECTRIC VEHICLE PROPULSION SYSTEM

Type of Electrical Vehicle	Electric
Propulsion Battery Type	Lithium-Ion
Nominal Voltage (V)	350
Automatic Propulsion Battery Disconnect	Yes
Physical Location of Automatic Propulsion Battery Disconnect	Internal to HV Battery
Auxiliary Battery Type	12 Volt Lead Acid

PROPULSION BATTERY SYSTEM DATA

Electrolyte Fluid Type	Organic Electrolyte
Electrolyte Fluid Specific Gravity (g/cc)	1.2
Electrolyte Fluid Dynamic Viscosity (mPa s)	2.6
Electrolyte Fluid Color	Clear
Propulsion Battery Coolant Type	G48 Ethylene Glycol
Propulsion Battery Coolant Color	Light Blue
Propulsion Battery Coolant Specific Gravity	1.122 / 1.0

LOCATION OF BATTERY MODULES

Location	Beneath the occupant compartment underneath the vehicle; floor-mounted HV battery

DATA SHEET NO. 1 … (CONTINUED)

TEST VEHICLE INFORMATION

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185002

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/21/18

For all battery types:

Description	Volts
Minimum Operating Voltage	240.0
Maximum Operating Voltage	403.2
95% of Maximum Operating Voltage	383.0
Test Voltage (no less than 95% of Maximum)	399.2

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

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

DATA SHEET NO. 2

PRE-IMPACT DATA

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185002

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/21/18

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 a pre-existing chassis ground point located under the rear seat cushion next to the battery penthouse cover.

PROPULSION BATTERY SYSTEM

DETAILS OF PROPULSION BATTERY COMPONENTS:

The electrical propulsion system utilizes one Lithium-Ion (Li-Ion) battery and a traction motor to propel the vehicle. The propulsion battery is located on the underside of the vehicle between the axles. The battery is equipped with an automatic disconnect located within the battery enclosure. The first responder disconnect is located in the front trunk area, near the base of the windshield on the left side of the vehicle. Another first responder disconnect is located in the C-Pillar of the vehicle on the passenger's side.

DATA SHEET NO. 3

PRE-IMPACT ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185002

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/21/18

VOLTMETER INFORMATION

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

HV BATTERY ELECTRICAL ISOLATION DATA

Code	Units	Threshold	Pre-Test
V_b	V		399.20
V_1	V		204.50
V_2	V		190.80
R_o	Ω		219,400
V_1'	V		54.70
V_2'	V		66.10
R_{i1}	Ω		1,161,434
R_{i2}	Ω		857,531
R_i	Ω		857,531
R_i/V_b	Ω/V	500	2,148

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

DATA SHEET NO. 4

POST-IMPACT DATA

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185002

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/21/18

VOLTMETER INFORMATION

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

HV BATTERY ELECTRICAL ISOLATION DATA

Code	Units	Threshold	Post-Test
V_b	V		8.61
V_1	V		4.04
V_2	V		4.23
R_o	Ω		219,400
V_1'	V		1.08
V_2'	V		1.13
R_{i1}	Ω		1,238,731
R_{i2}	Ω		1,175,332
R_i	Ω		1,175,332
R_i/V_b	Ω/V	500	136,508

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.

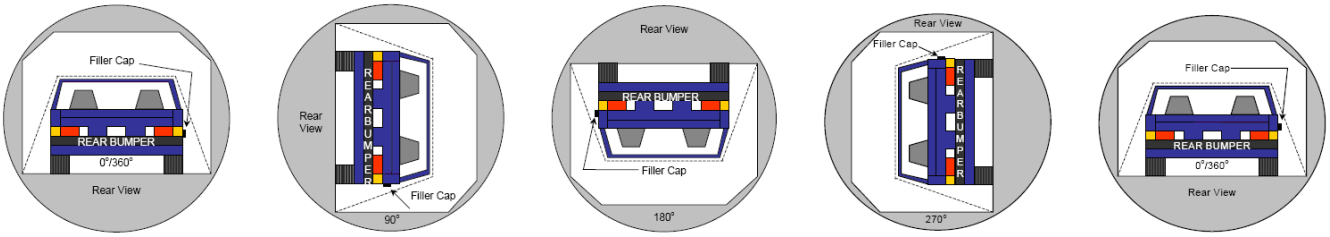
Is there propulsion battery electrolyte spillage visible in the passenger compartment: No

DATA SHEET NO. 5

STATIC ROLLOVER TEST DATA

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185002

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/21/18



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°	79	300	379
90° To 180°	78	300	378
180° To 270°	79	300	379
270° To 360°	79	300	379

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: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185002

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/21/18

VOLTMETER INFORMATION

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

HV BATTERY ELECTRICAL ISOLATION MEASUREMENTS AND CALCULATIONS

Code	Units	Threshold	0°	90°	180°	270°	360°
V_b	V		0.00	0.00	0.00	0.00	0.00
V_1	V		0.17	0.17	0.17	0.17	0.17
V_2	V		0.17	0.17	0.17	0.17	0.17
R_o	Ω		219,400	219,400	219,400	219,400	219,400
V_1'	V		0.05	0.05	0.05	0.05	0.05
V_2'	V		0.05	0.05	0.05	0.05	0.05
R_{i1}	Ω		1,145,752	1,151,726	1,142,383	1,161,070	1,176,784
R_{i2}	Ω		1,150,915	1,154,300	1,112,003	1,163,629	1,144,971
R_i	Ω		1,145,752	1,151,726	1,112,003	1,161,070	1,144,971
R_i/V_b	Ω/V	500	Zero Volts*	1,151,726,433	1,112,003,088	Zero Volts*	Zero Volts*

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

*Zero Volts is considered to be compliant.

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PHOTOGRAPHS

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Photograph Not Applicable

No Auxiliary Power Module Warning Label

FIGURE 1. Auxiliary Power Module Warning Label

FIGURE 2. Power Inverter Warning Label

FIGURE 2a. Power Inverter Warning Label

FIGURE 2b. Power Inverter Warning Label

FIGURE 3. First Responder Warning Label

FIGURE 4. First Responder Warning Location

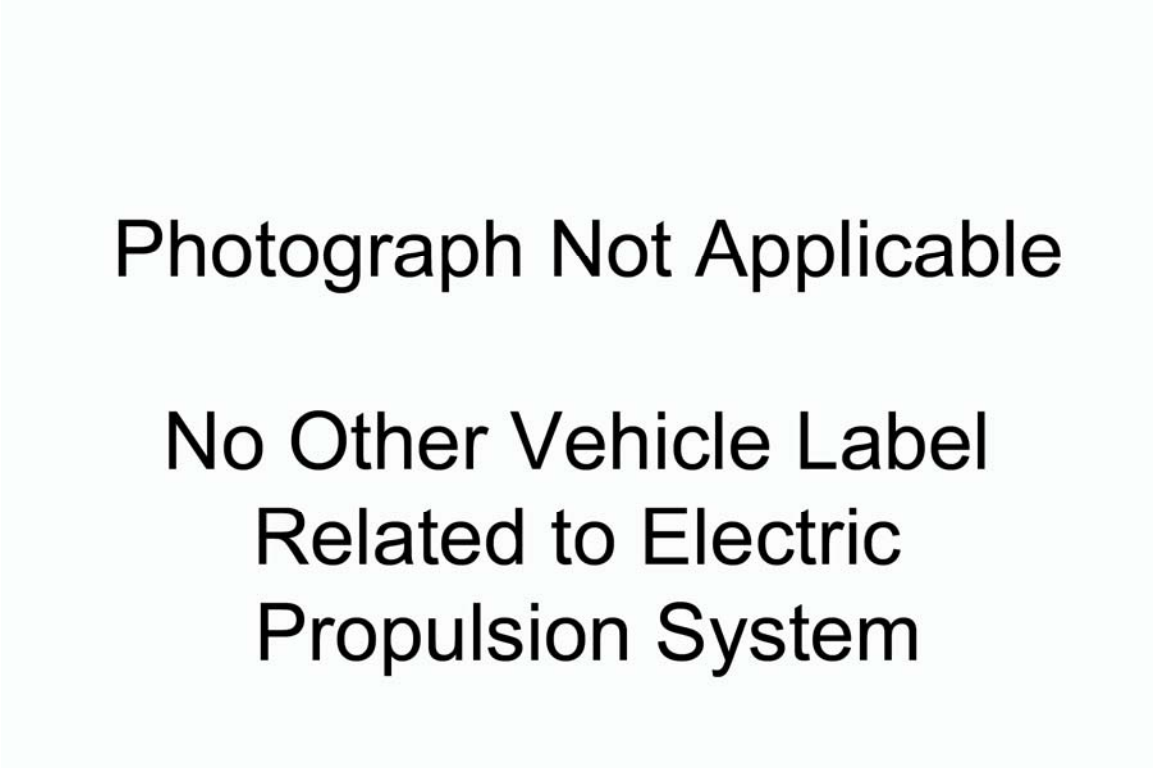

FIGURE 5. Other Vehicle Label(s) Related to Electrical Propulsion System

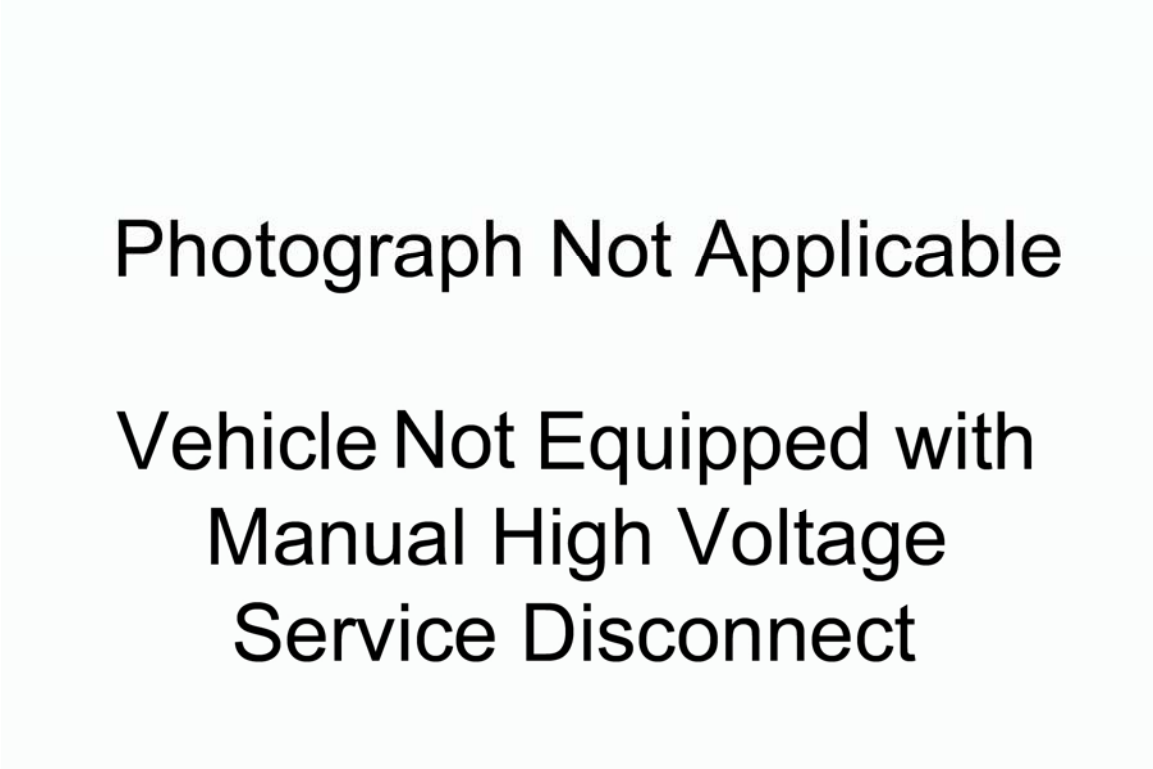

FIGURE 6. Manual High Voltage Service Disconnect In Place

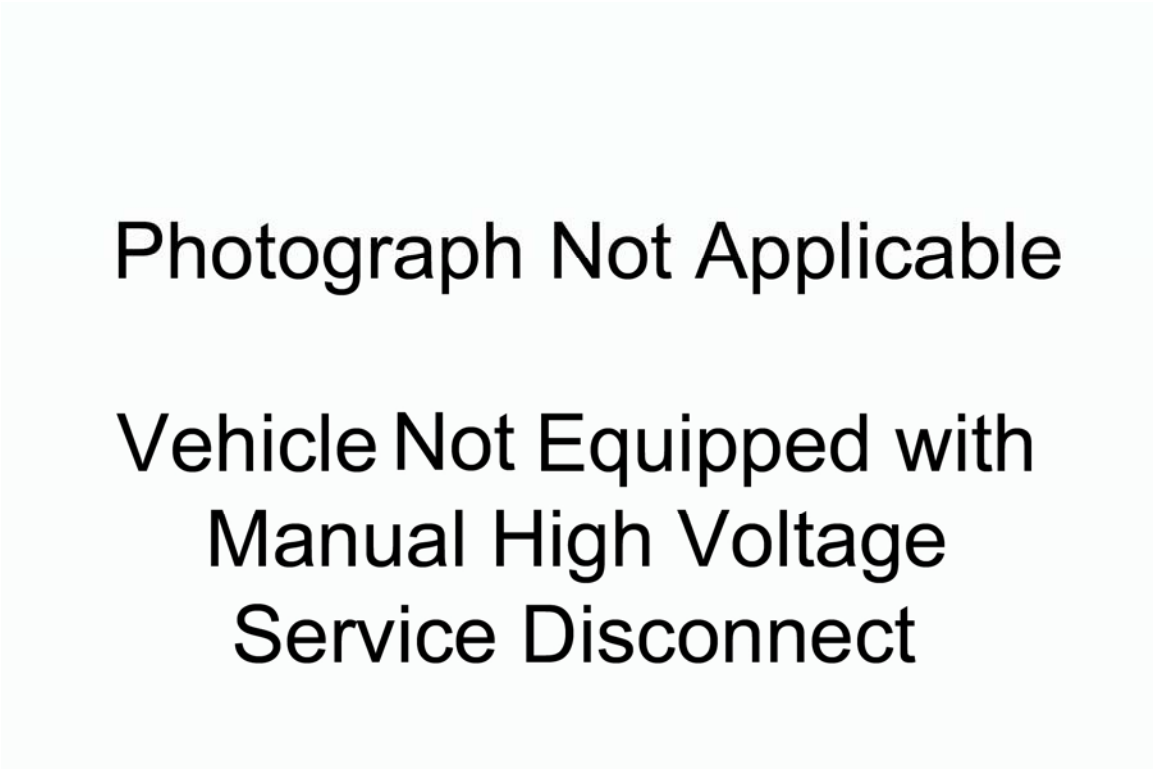

FIGURE 7. Manual High Voltage Service Disconnect Removed

FIGURE 8. Pre-Impact View of Propulsion Battery

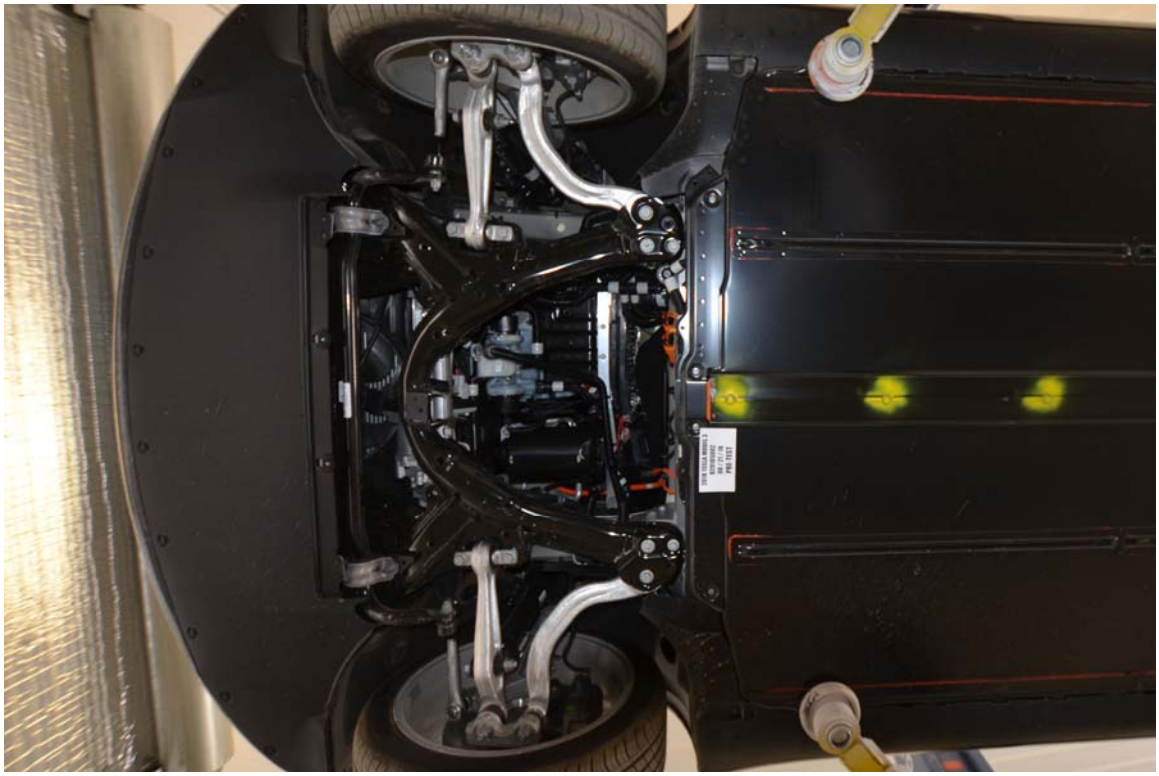

FIGURE 9. Pre-Impact Front View of Propulsion Battery

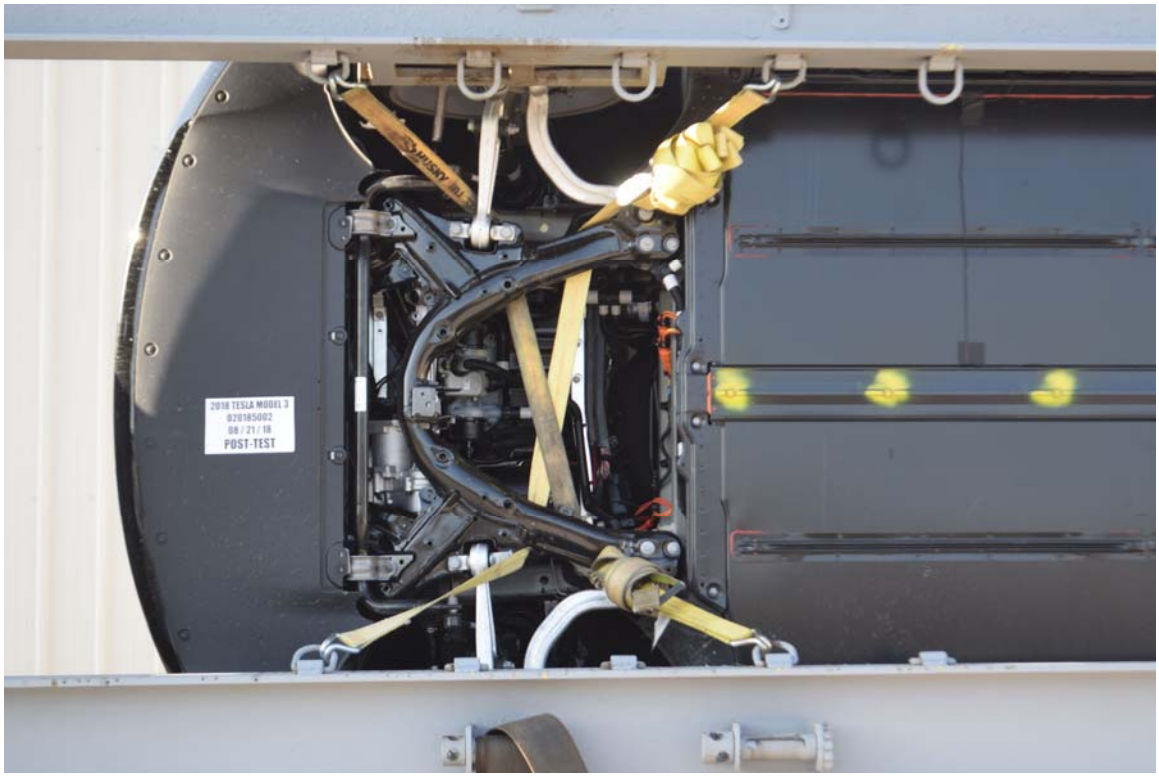

FIGURE 10. Post-Impact Front View of Propulsion Battery

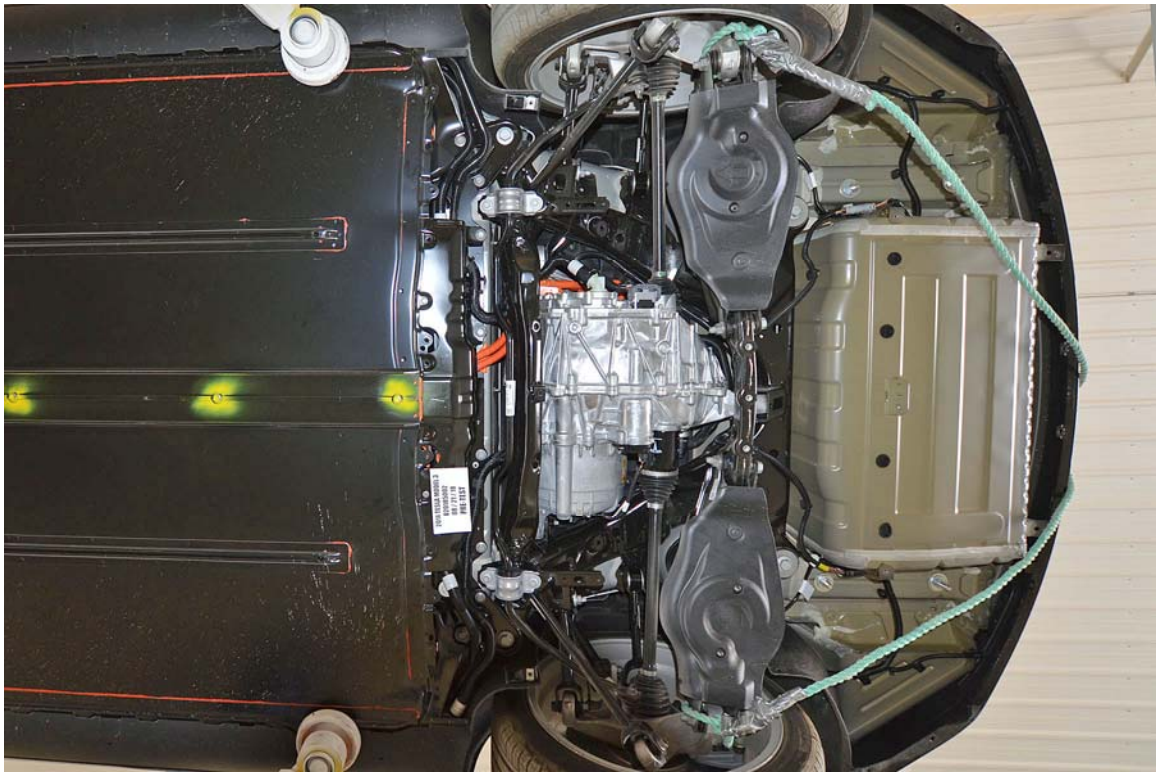

FIGURE 11. Pre-Impact Rear View of Propulsion Battery

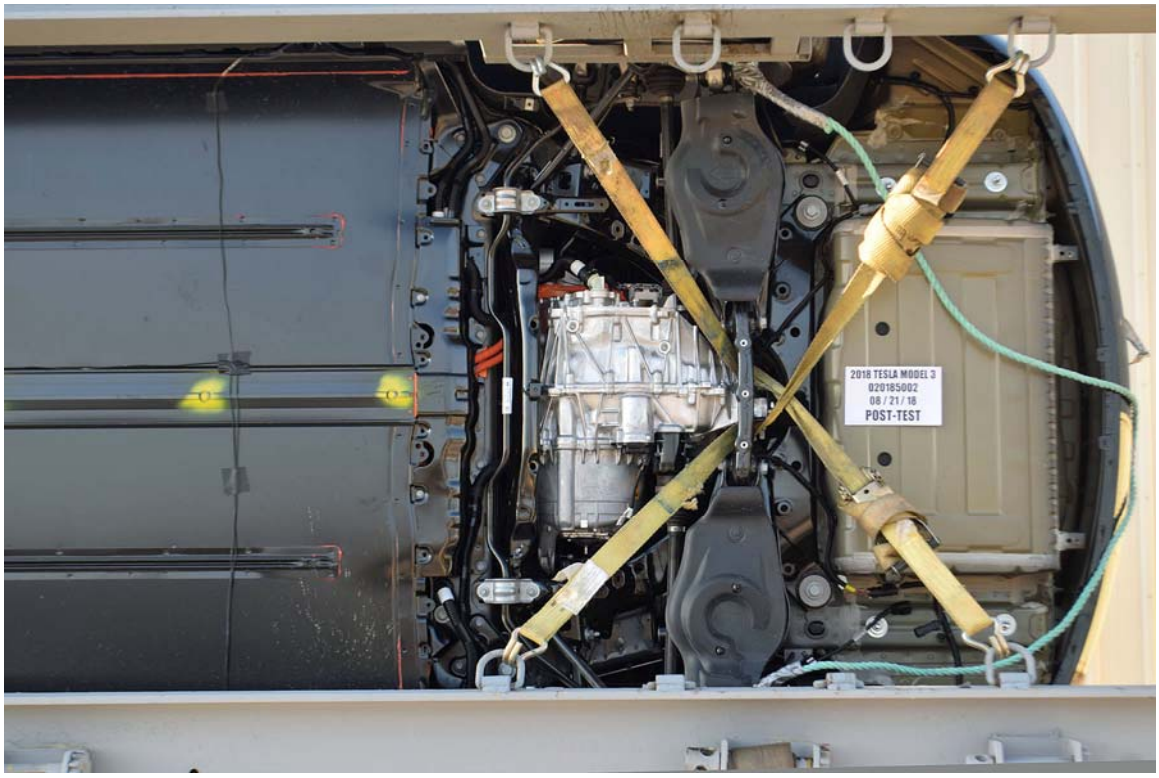

FIGURE 12. Post-Impact Rear View of Propulsion Battery

FIGURE 13. Pre-Impact View of Battery Box(s) or Container(s)
Which Holds Individual Battery Modules

FIGURE 14. Post-Impact View of Battery Box(s) or Container(s)
Which Holds Individual Battery Modules

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

FIGURE 16. Post-Impact View of Propulsion Battery Module(s)

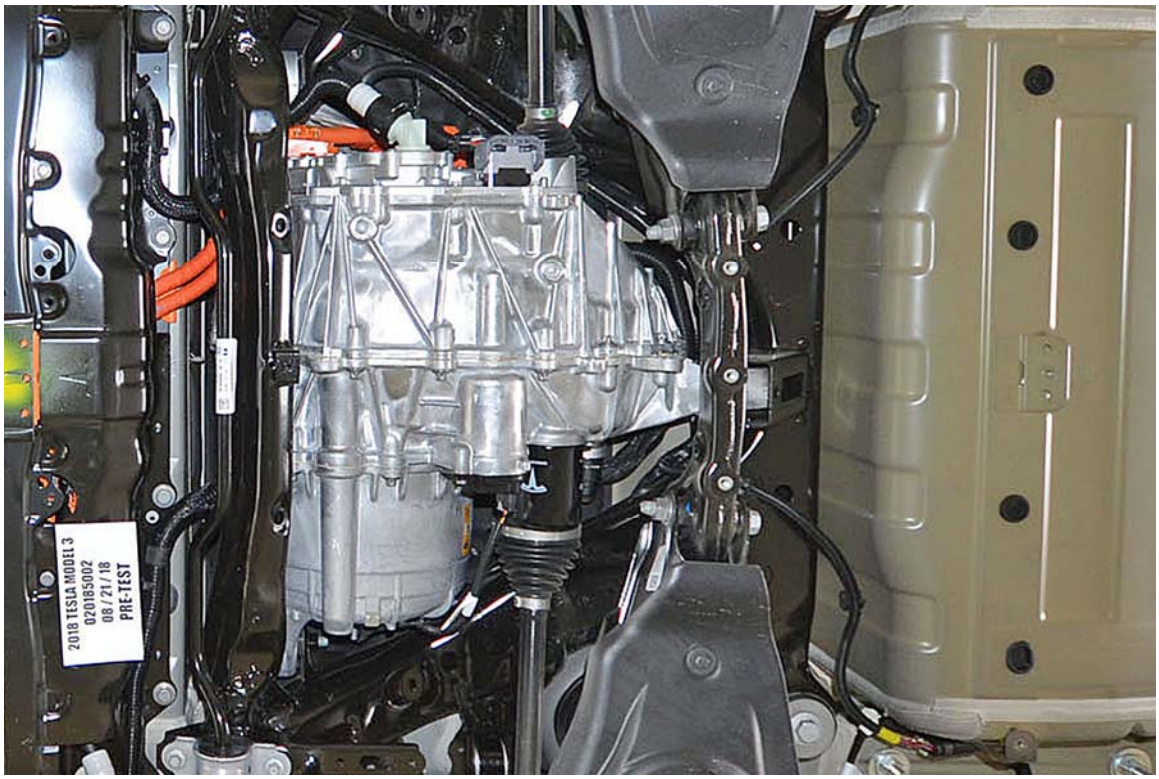

FIGURE 17. Pre-Impact View of Electric Propulsion Drive

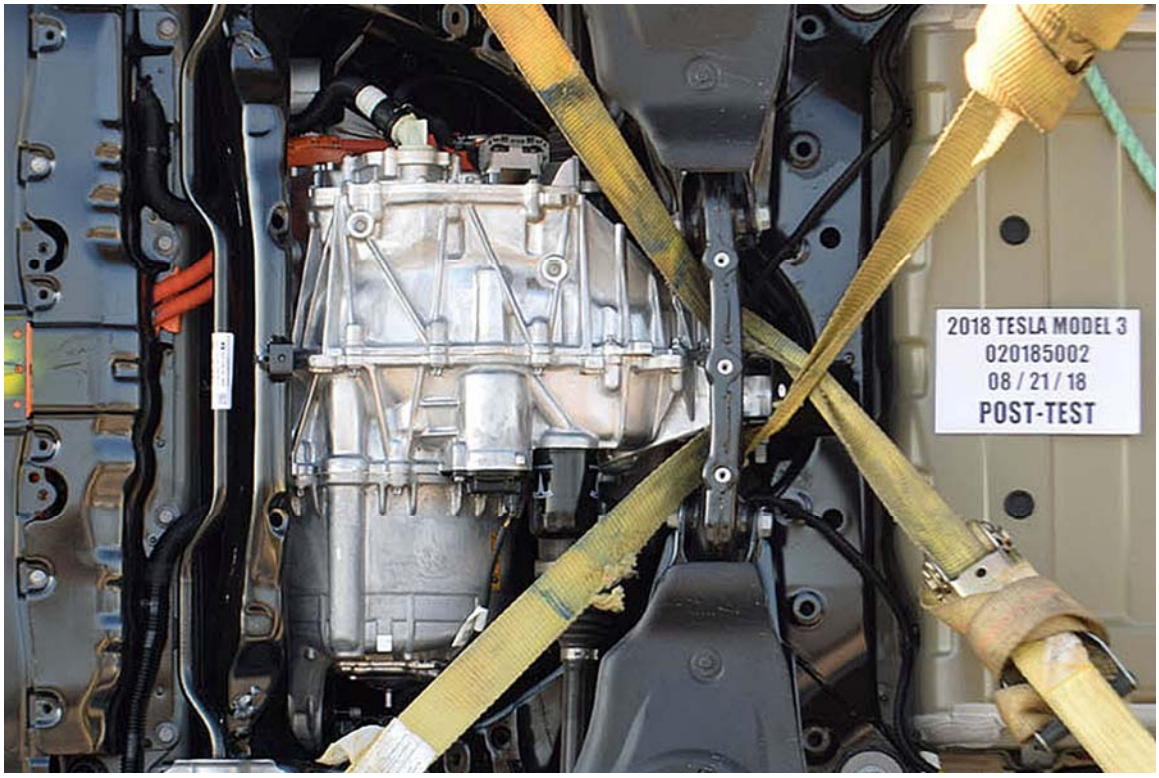

FIGURE 18. Post-Impact View of Electric Propulsion Drive

FIGURE 19. Pre-Impact View of High Voltage Interconnect(s)

FIGURE 19a. Pre-Impact View of High Voltage Interconnect(s)

FIGURE 19b. Pre-Impact View of High Voltage Interconnect(s)

FIGURE 20. Pre-Impact View of Propulsion Battery Venting System(s)

FIGURE 20a. Pre-Impact View of Propulsion Battery Venting System(s)

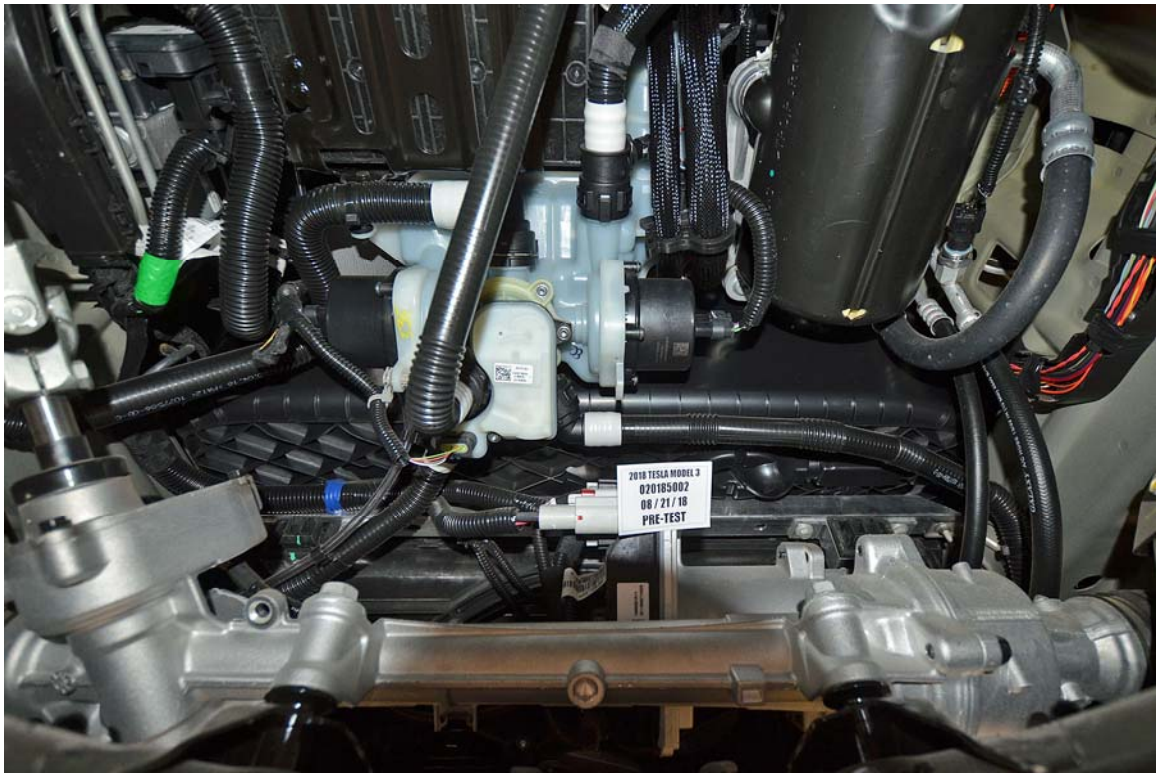

FIGURE 20b. Pre-Impact View of Propulsion Battery Venting System(s)

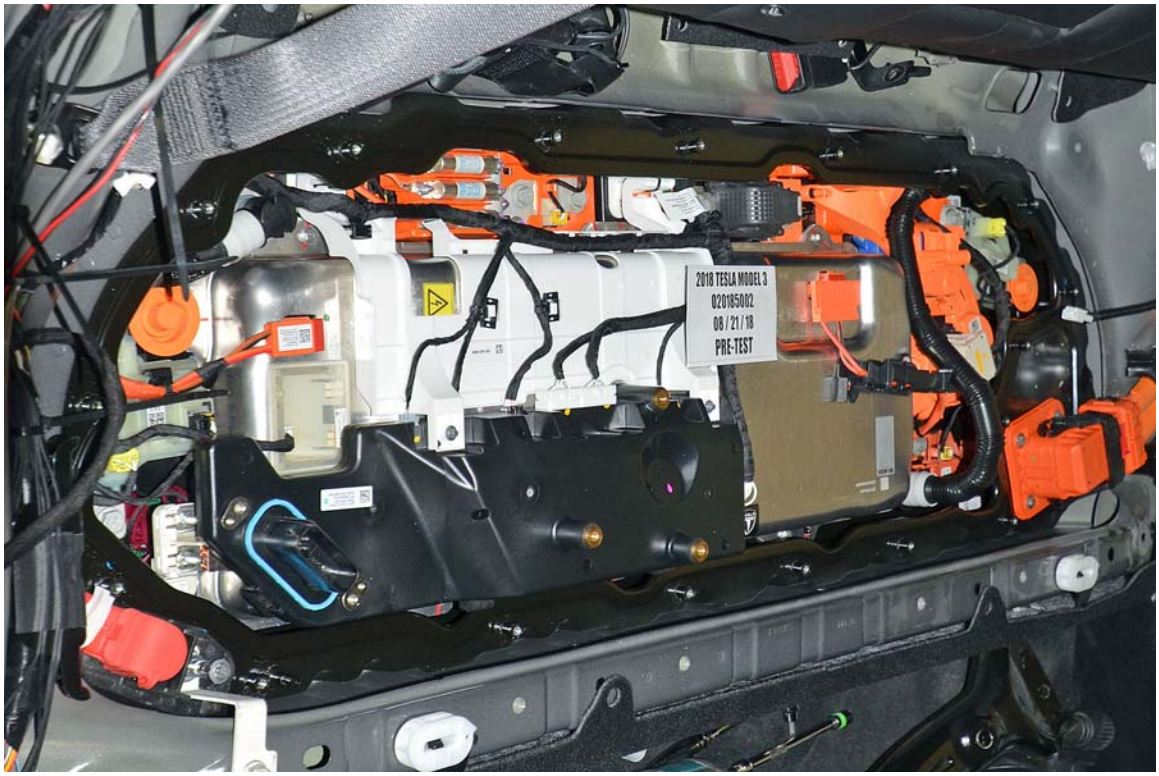

FIGURE 21. Pre-Impact View of Other Visible Electric Propulsion Components

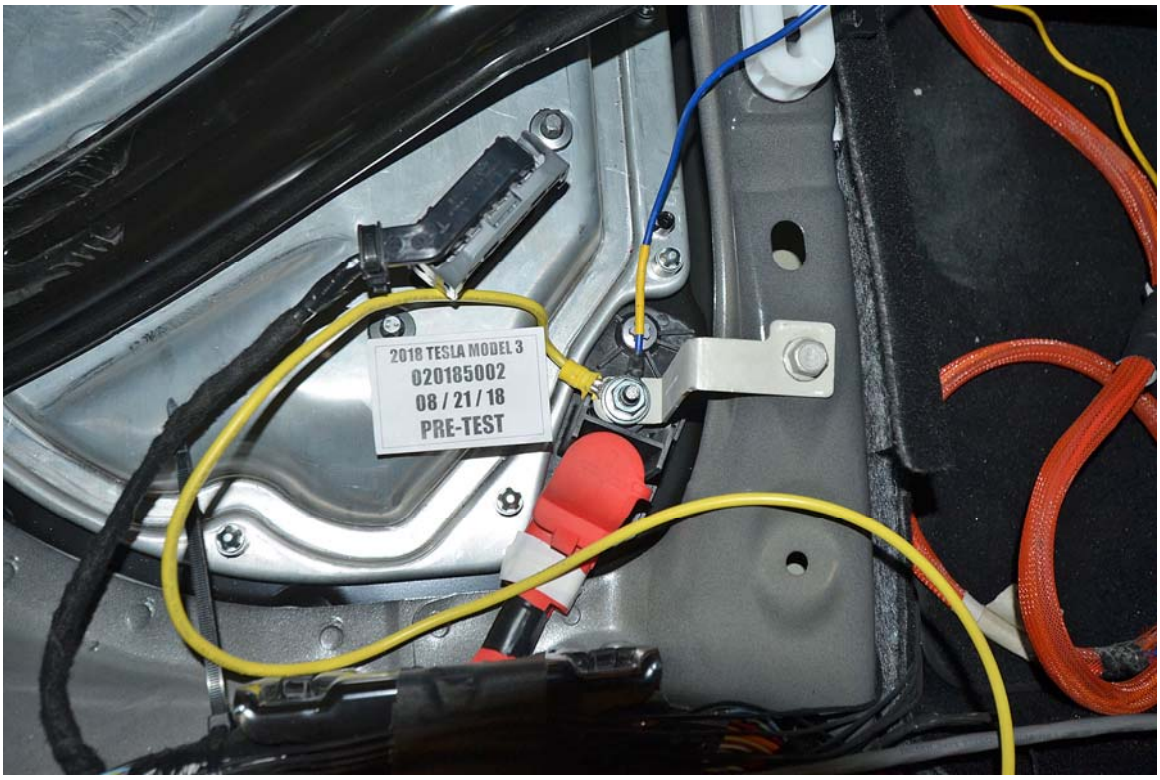

FIGURE 22. Pre-Impact View of Ground Lead Attached

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

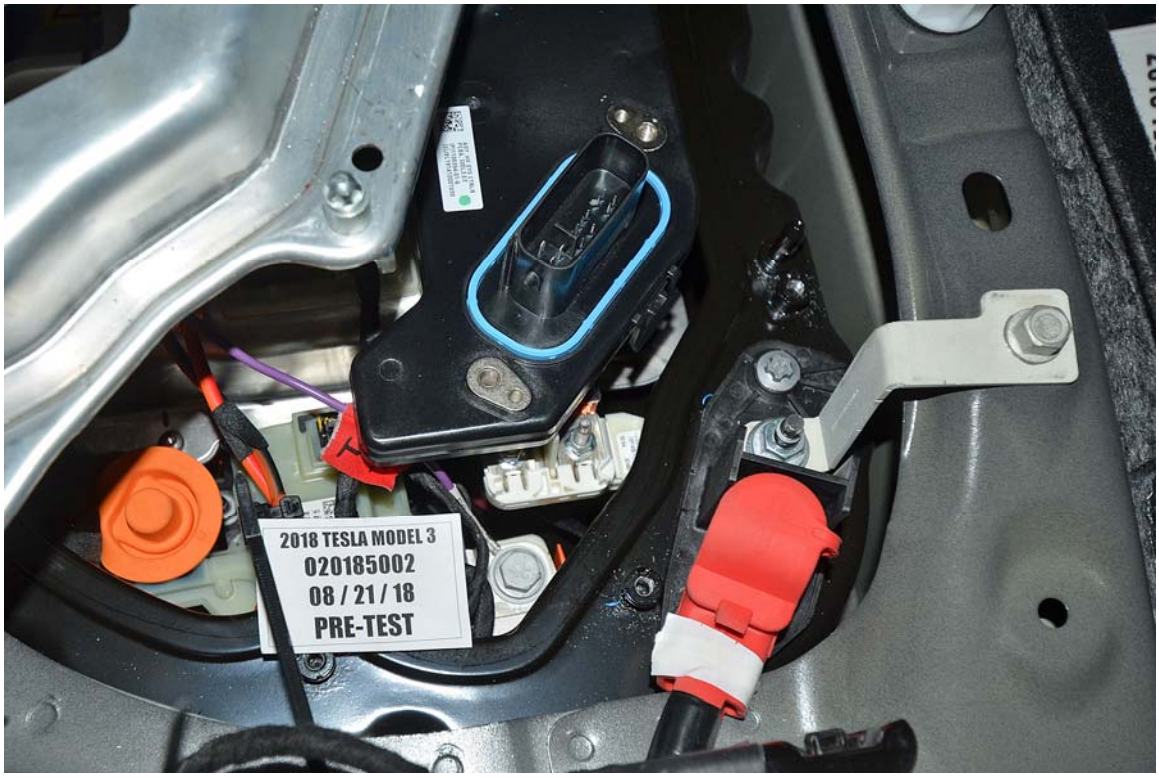

FIGURE 24. Pre-Impact Close-Up View of High Voltage Leads Attached

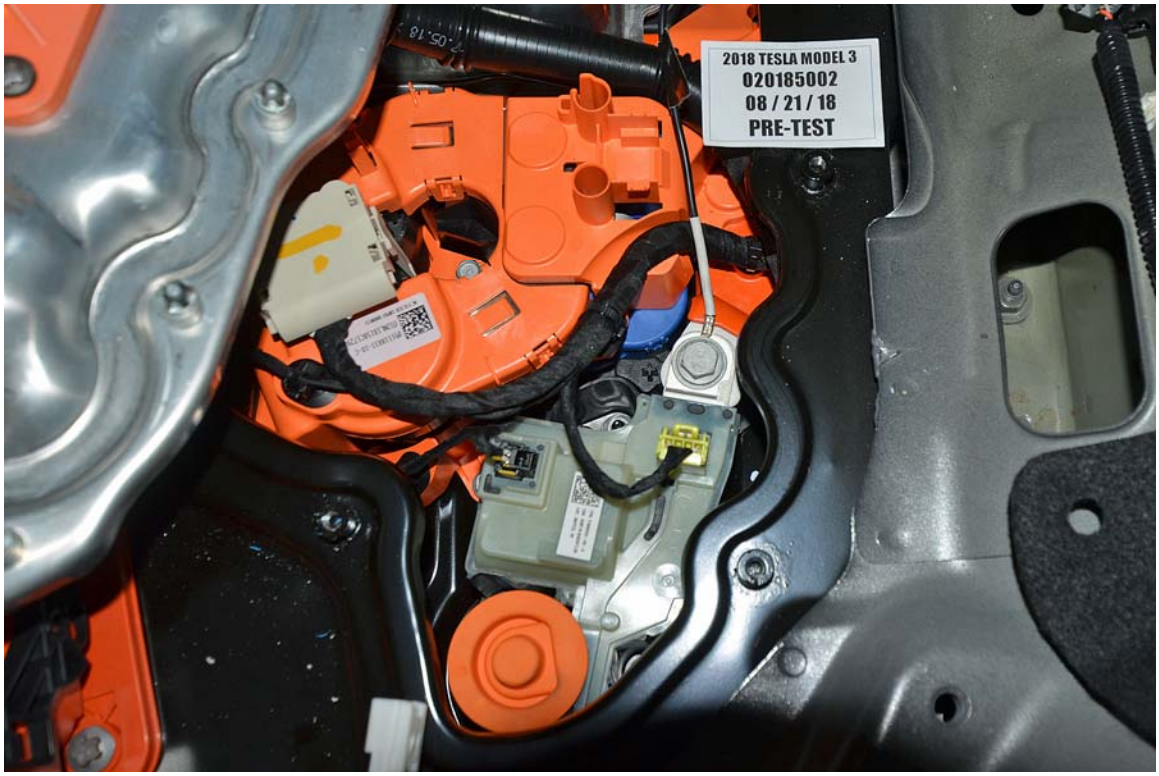

FIGURE 24a. Pre-Impact Close-Up View of High Voltage Leads Attached

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

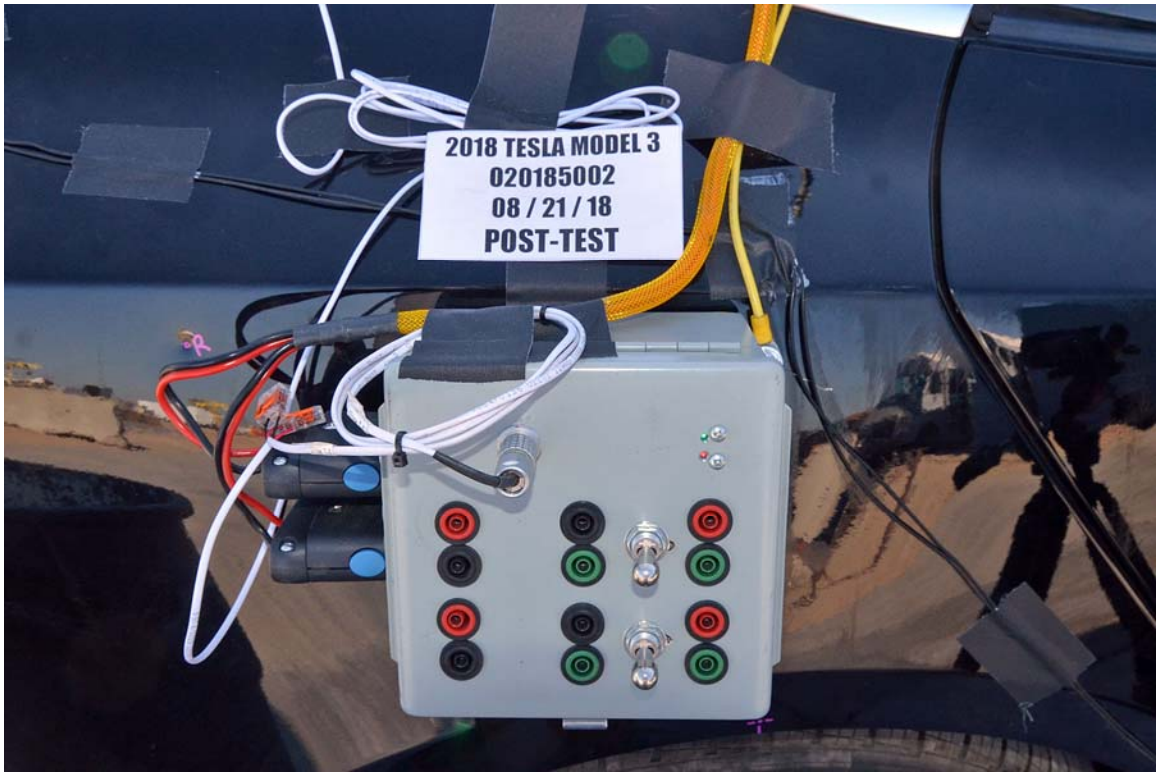

FIGURE 26. Post-Impact View of Installed Test Interface Port

FIGURE 27. Pre-Impact View of Other Test Devices

FIGURE 28. Post-Impact View of Other Test Devices

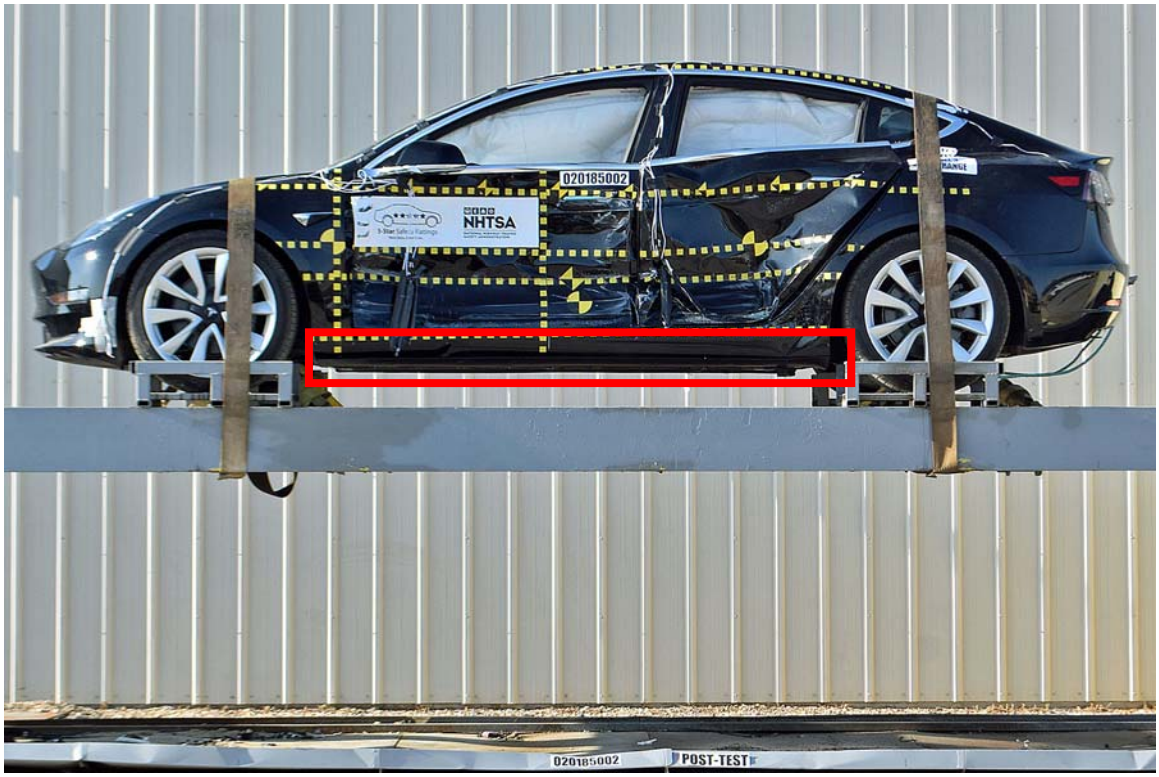

FIGURE 29. FMVSS No. 305 Static Rollover at 0°

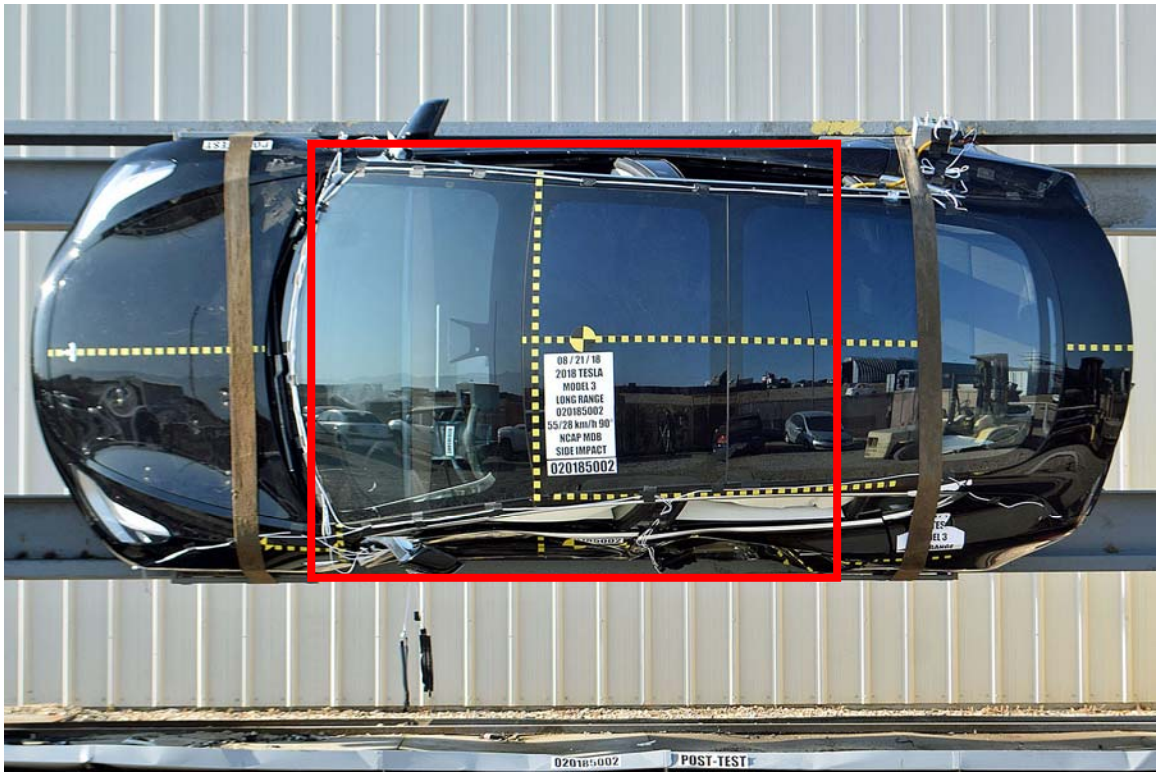

FIGURE 30. FMVSS No. 305 Static Rollover at 90°

FIGURE 31. FMVSS No. 305 Static Rollover at 180°

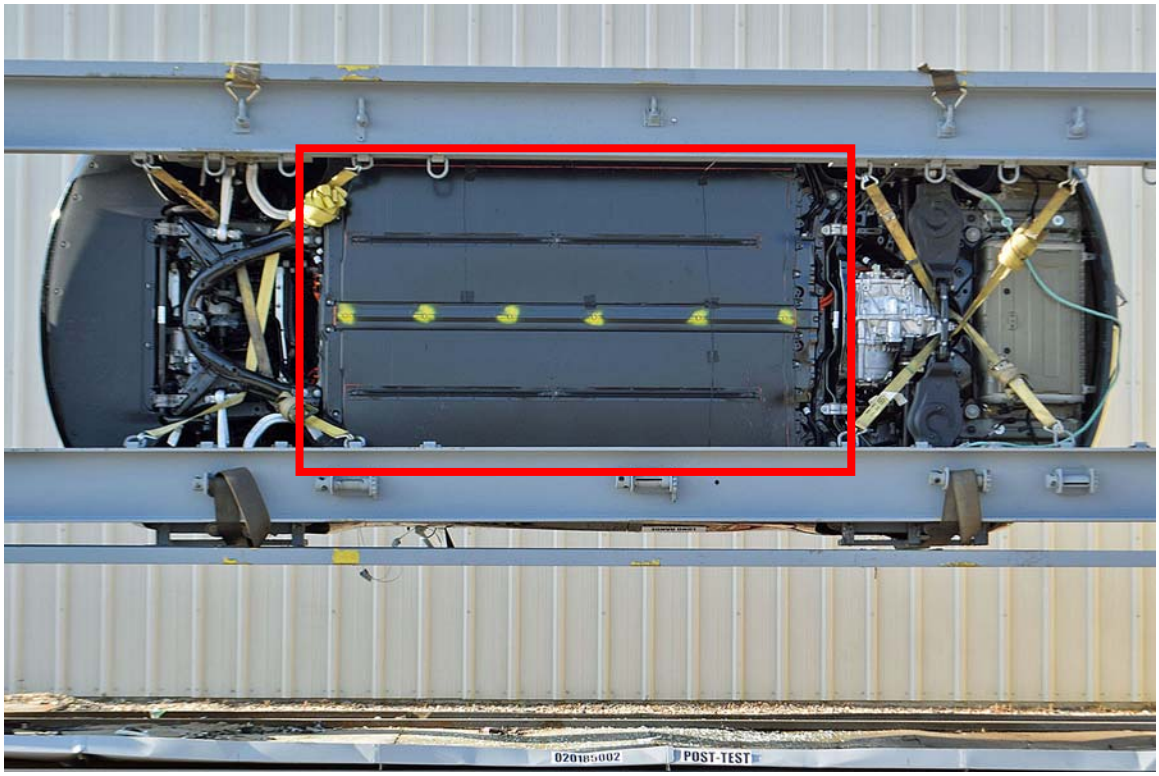

FIGURE 32. FMVSS No. 305 Static Rollover at 270°

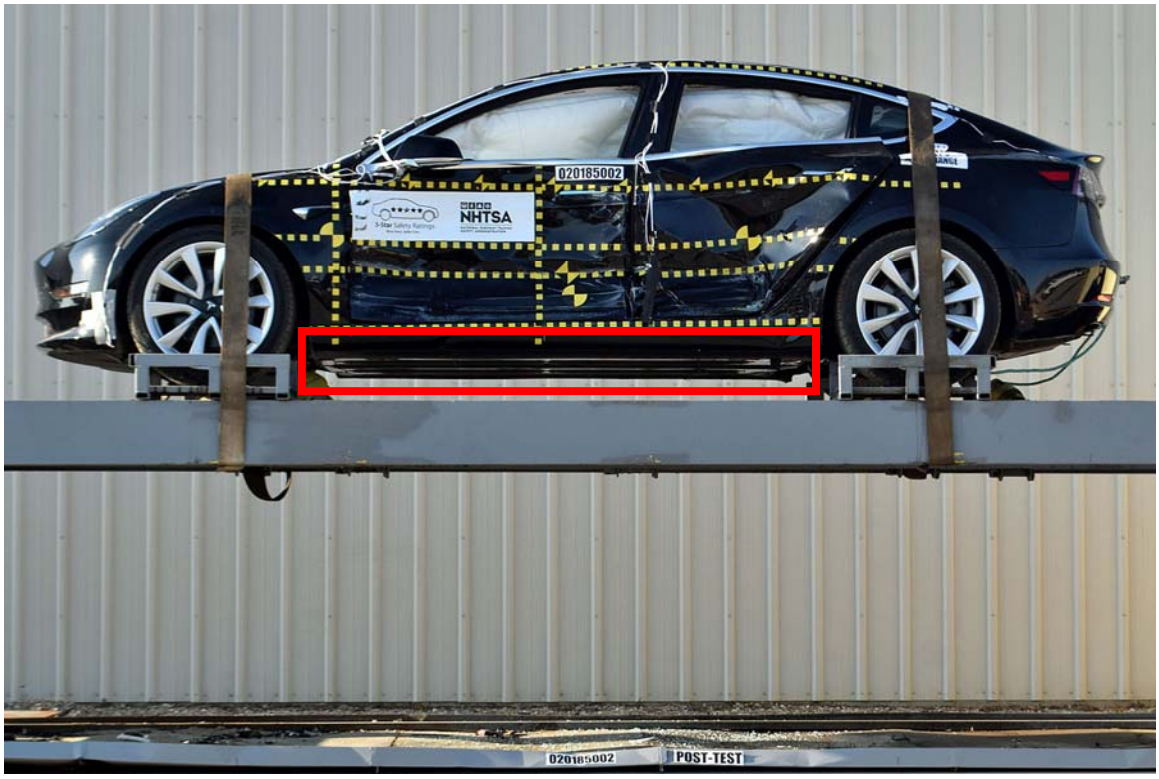

FIGURE 33. FMVSS No. 305 Static Rollover at 360°

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

FIGURE 35. Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

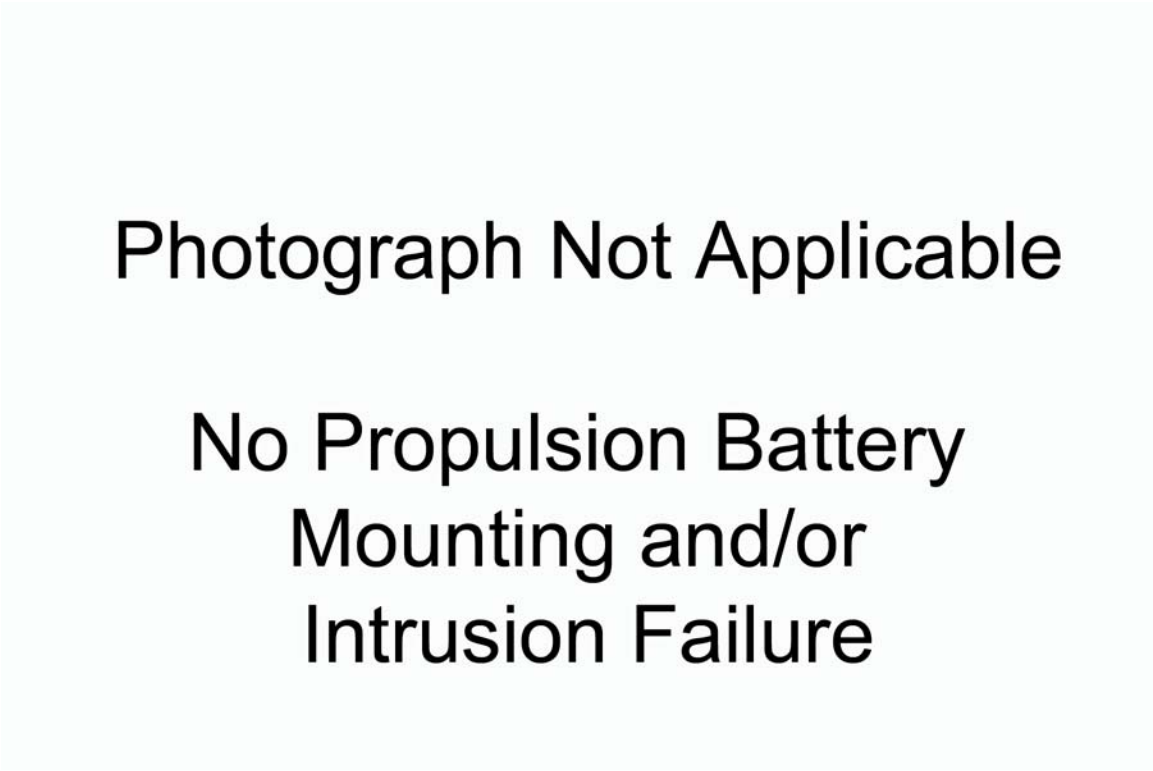

FIGURE 36. Post-Impact View of Propulsion Battery System
Mounting and/or Intrusion Failure(s)

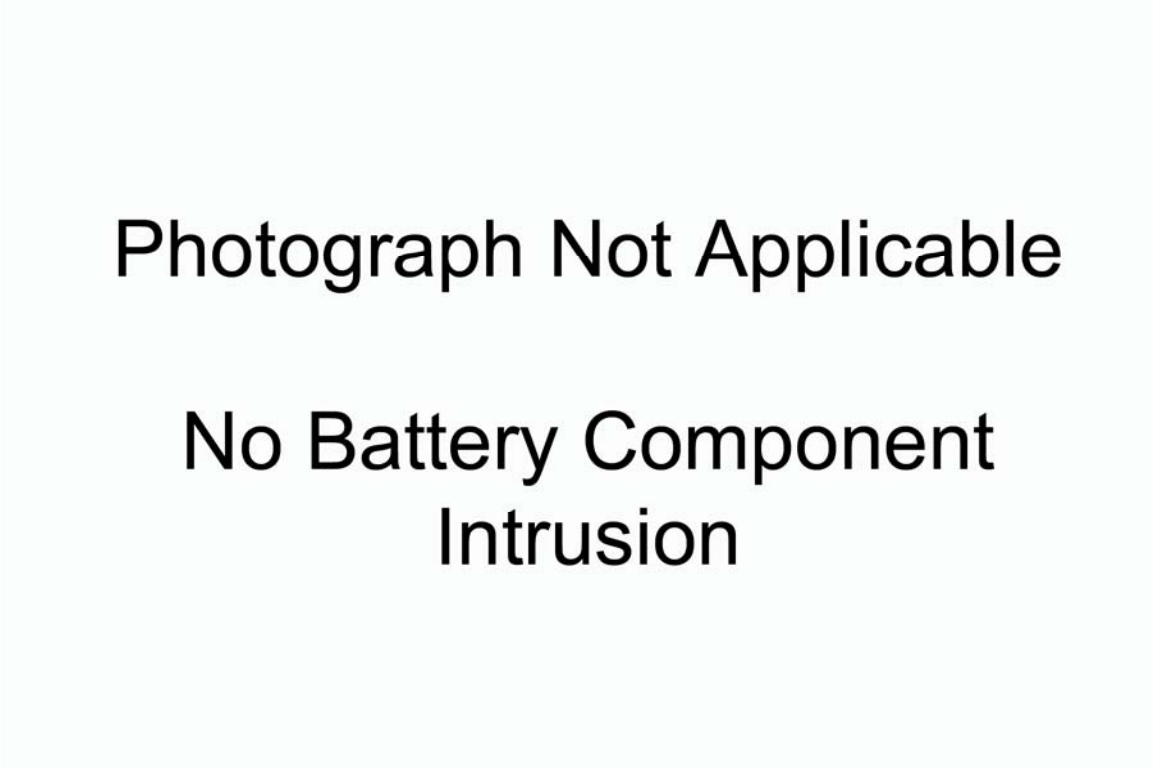

FIGURE 37. Post-Impact View of Propulsion Battery Component Intrusion

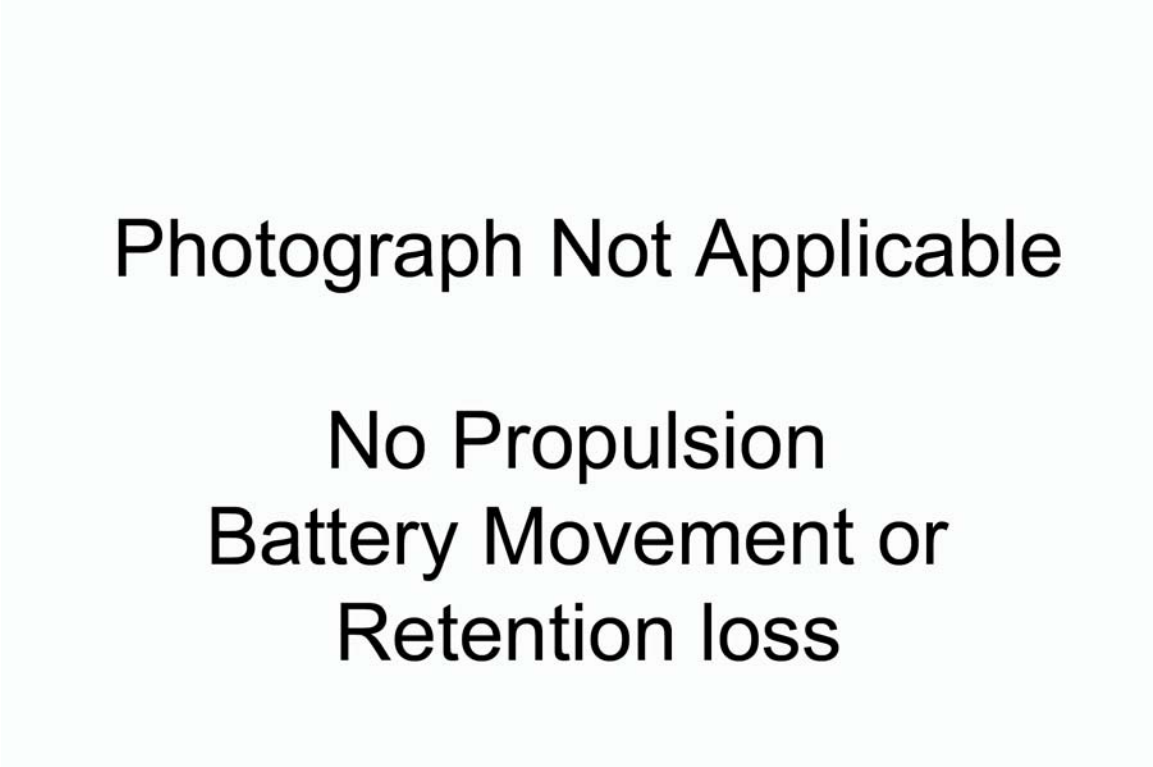

FIGURE 38. Post-Impact View of Propulsion Battery Module Movement or Retention Loss

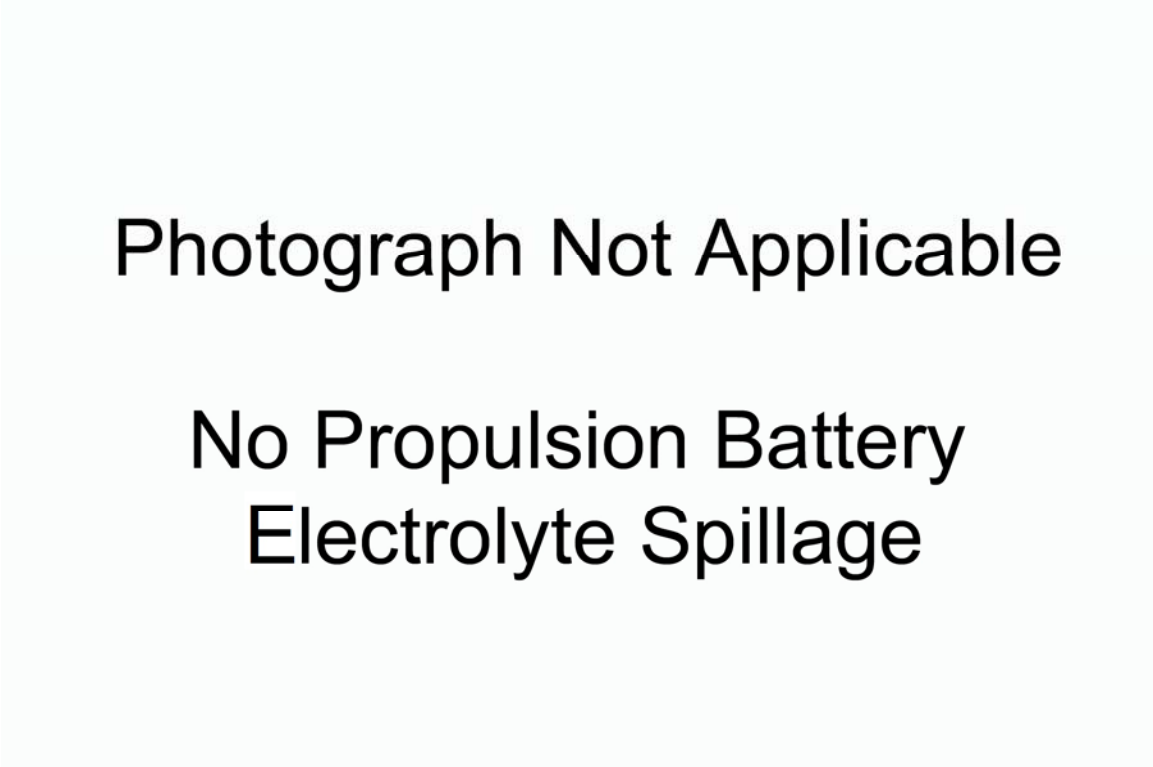

FIGURE 39. Post-Impact View of Propulsion Battery Electrolyte Spillage Location

FIGURE 40. Post-Test View of Propulsion Battery Electrolyte Spillage Location