

**REPORT NUMBER: NCAP305I-KAR-18-020**

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

**TESLA, INC.**

**2018 TESLA MODEL 3 LONG RANGE RWD 4-DOOR SEDAN**

**NHTSA NUMBER: O20185000**

**PREPARED BY:**

**APPLUS IDIADA KARCO ENGINEERING, LLC.**

**9270 HOLLY ROAD**

**ADELANTO, CA 92301**



**SEPTEMBER 4, 2018**

**FINAL REPORT**

**U.S. DEPARTMENT OF TRANSPORTATION  
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION  
OFFICE OF RULEMAKING  
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\_\_\_\_\_  
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NHTSA, Office of Crashworthiness Standards

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

## TECHNICAL REPORT DOCUMENTATION PAGE

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		<b>15. Supplementary Notes</b>	
<b>16. Abstract</b> An FMVSS No. 305 Indicant test, in conjunction with an NCAP frontal barrier 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 frontal barrier 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 frontal barrier impact test was performed by Applus IDIADA KARCO Engineering, LLC. on a 2018 Tesla Model 3 Long Range RWD 4-door sedan on August 20, 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.: O20185000

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/20/18

**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 <sup>2</sup>	kPa	6.895
Temperature	General Use	°F	°C	$=(T_f - 32)/1.8$
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
$R_o$	$\Omega$	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
$R_{i1}$	$\Omega$	Electrical Isolation Value of Propulsion Battery Negative to Chassis Ground
$R_{i2}$	$\Omega$	Electrical Isolation Value of Propulsion Battery Positive to Chassis Ground
$R_i$	$\Omega$	Electrical Isolation Value of Propulsion Battery - The Minimum of $R_{i1}$ and $R_{i2}$
$R_i/V_b$	$\Omega/v$	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.: O20185000Test Program: FMVSS No. 305 Indicant Test Test Date: 08/20/18**TEST VEHICLE INFORMATION**

NHTSA Number	O20185000
Model Year	2018
Make	Tesla
Model	Model 3 Long Range RWD
Body Style	4-Door Sedan
Body Color	Black
Odometer Reading (km / mi)	6 / 4

**DATA FROM VEHICLE'S CERTIFICATION LABEL**

Manufactured By	Tesla, Inc.
Date of Manufacture	Jul-18
VIN	5YJ3E1EA5JF061210
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
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**DATA SHEET NO. 1 ... (CONTINUED)**

**TEST VEHICLE INFORMATION**

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185000

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/20/18

*For all battery types:*

<b>Description</b>	<b>Volts</b>
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)	400.0

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

<b>Description</b>	<b>Volts</b>
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.: O20185000

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/20/18

**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.

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**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.

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**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.: O20185000

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/20/18

**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 <sub>b</sub>	V		400.00
V <sub>1</sub>	V		205.70
V <sub>2</sub>	V		191.10
R <sub>o</sub>	Ω		219,400
V <sub>1</sub> '	V		55.50
V <sub>2</sub> '	V		57.00
R <sub>i1</sub>	Ω		1,145,384
R <sub>i2</sub>	Ω		1,071,770
R <sub>i</sub>	Ω		1,071,770
R <sub>i</sub> /V <sub>b</sub>	Ω/V	500	2,679

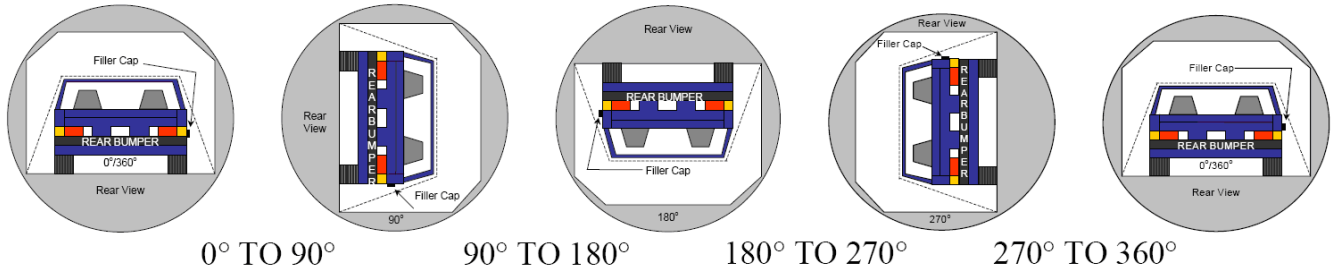
Is the Measured Electrical Isolation Value ≥ 500 Ω/V?	Yes
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**DATA SHEET NO. 5**  
**STATIC ROLLOVER TEST DATA**

Test Vehicle: 2018 Tesla Model 3 Long Range RWD 4-Door Sedan NHTSA No.: O20185000

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/20/18



**PROPULSION BATTERY ELECTROLYTE COLLECTION TIME PERIOD**

Test Phase	Rotation Time	Hold Time	Total Time
0° To 90°	83	300	383
90° To 180°	83	300	383
180° To 270°	78	300	378
270° To 360°	83	300	383

**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.: O20185000

Test Program: FMVSS No. 305 Indicant Test Test Date: 08/20/18

**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 <sub>b</sub>	V		8.50	4.52	5.13	8.49	8.48
V <sub>1</sub>	V		3.93	3.57	3.64	3.18	3.90
V <sub>2</sub>	V		4.20	4.07	4.12	2.30	4.20
R <sub>o</sub>	Ω		219,400	219,400	219,400	219,400	219,400
V <sub>1</sub> '	V		1.06	1.05	1.05	0.99	0.52
V <sub>2</sub> '	V		1.14	1.14	1.14	1.13	1.10
R <sub>i1</sub>	Ω		1,228,883	1,126,031	1,148,842	837,752	2,996,054
R <sub>i2</sub>	Ω		1,139,973	1,052,963	1,074,860	543,461	1,198,645
R <sub>i</sub>	Ω		1,139,973	1,052,963	1,074,860	543,461	1,198,645
R <sub>i</sub> /V <sub>b</sub>	Ω/V	500	134,114	232,957	209,524	64,012	141,350

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

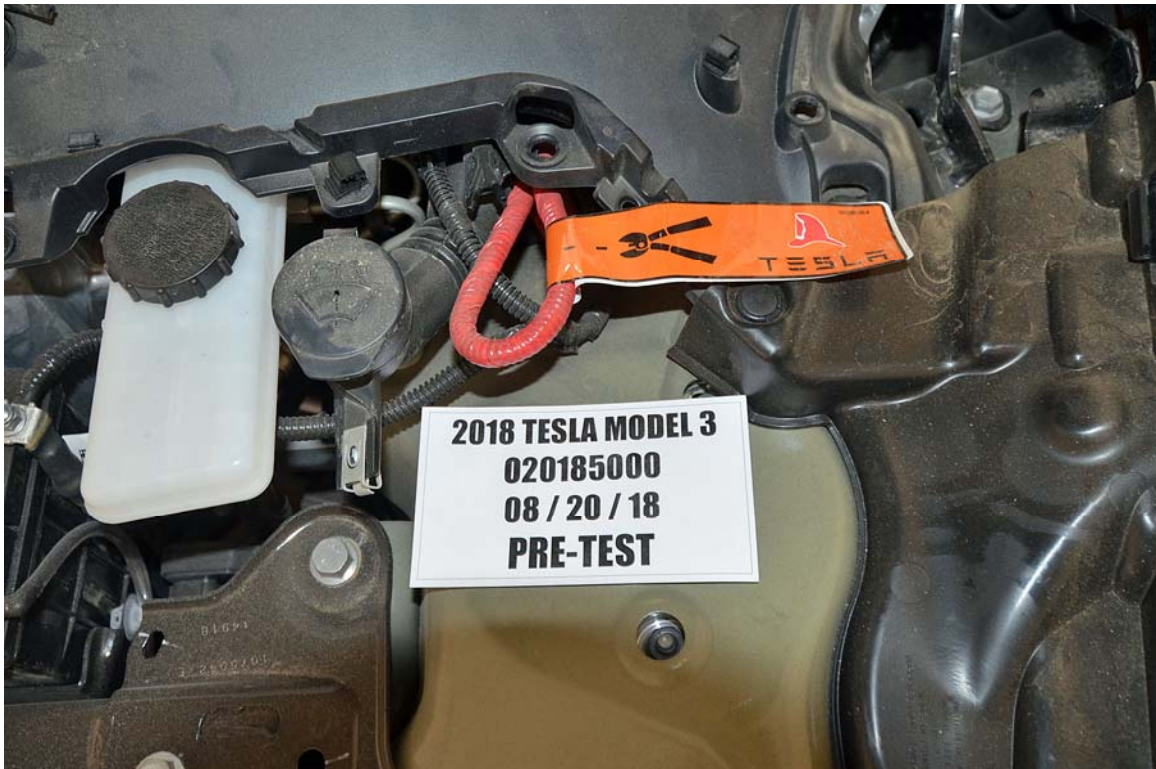


FIGURE 4. First Responder Warning Location



FIGURE 4a. First Responder Warning Location

Photograph Not Applicable

No Other Vehicle Label  
Related to Electric  
Propulsion System

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

Photograph Not Applicable

Vehicle Not Equipped with  
Manual High Voltage  
Service Disconnect

FIGURE 6. Manual High Voltage Service Disconnect In Place

Photograph Not Applicable

Vehicle Not Equipped with  
Manual High Voltage  
Service Disconnect

FIGURE 7. Manual High Voltage Service Disconnect Removed



FIGURE 8. Pre-Impact View of Propulsion Battery

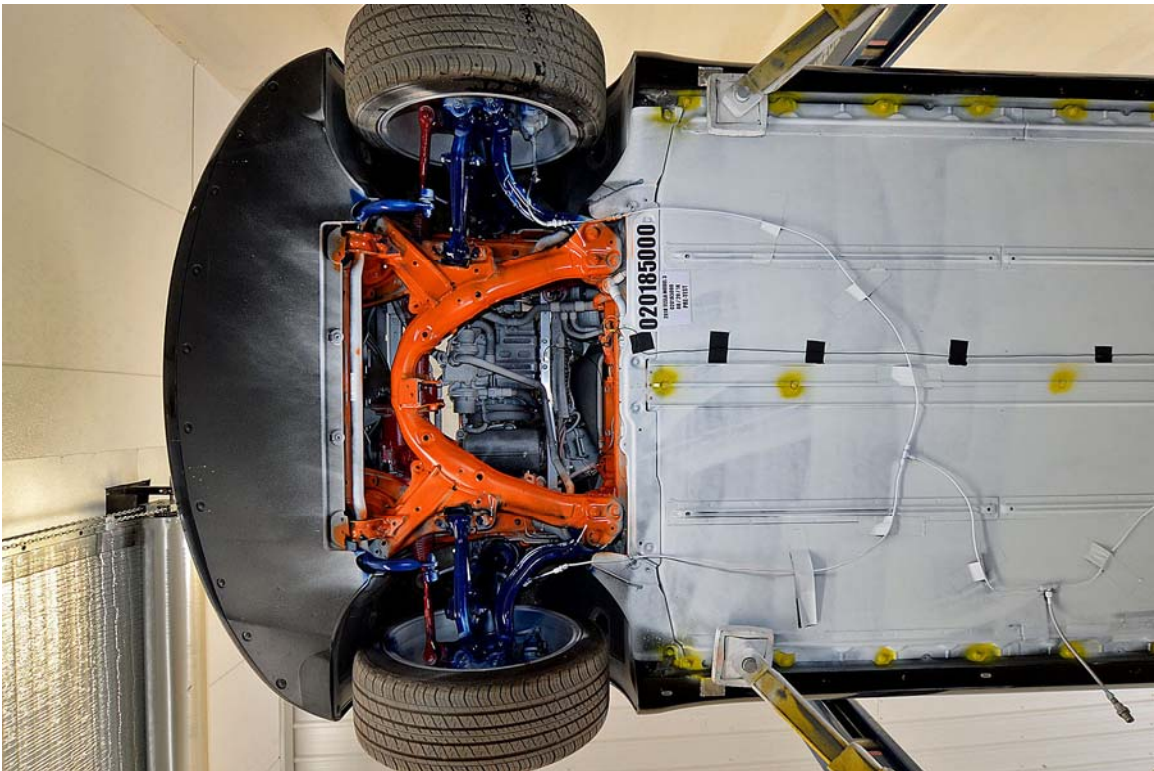


FIGURE 9. Pre-Impact Front View of Propulsion Battery



FIGURE 10. Post-Impact Front View of Propulsion Battery

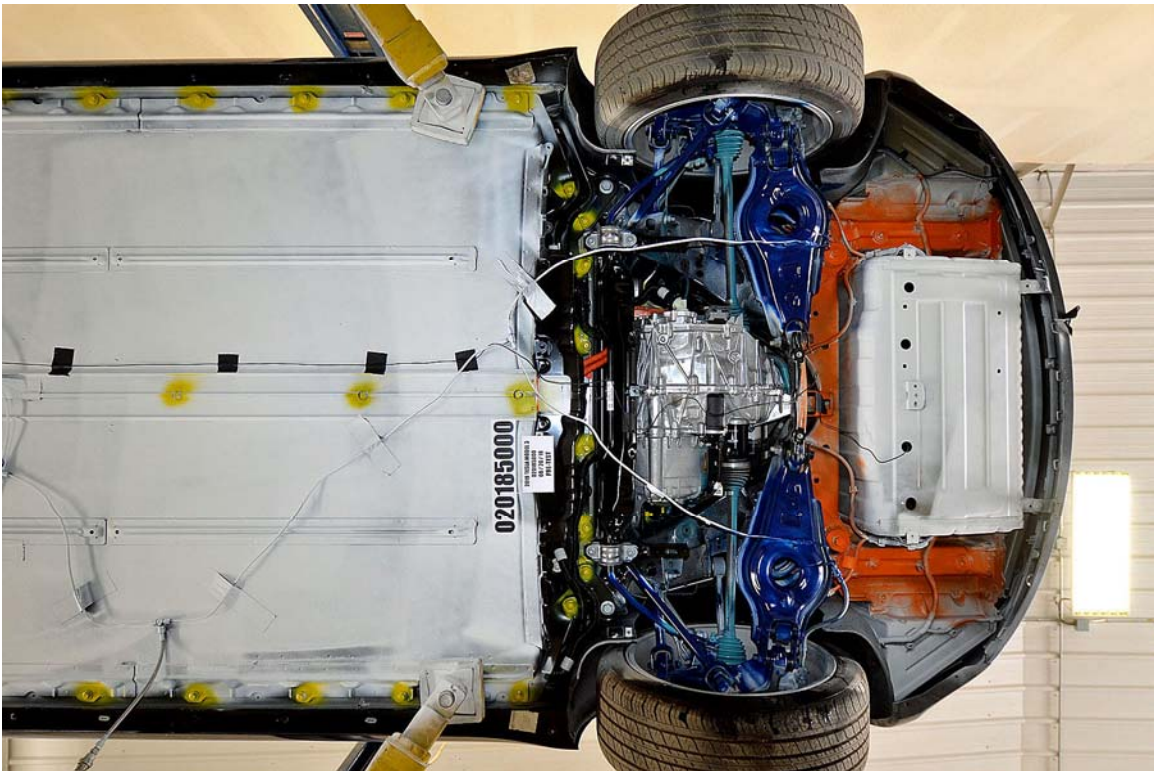


FIGURE 11. Pre-Impact Rear View of Propulsion Battery

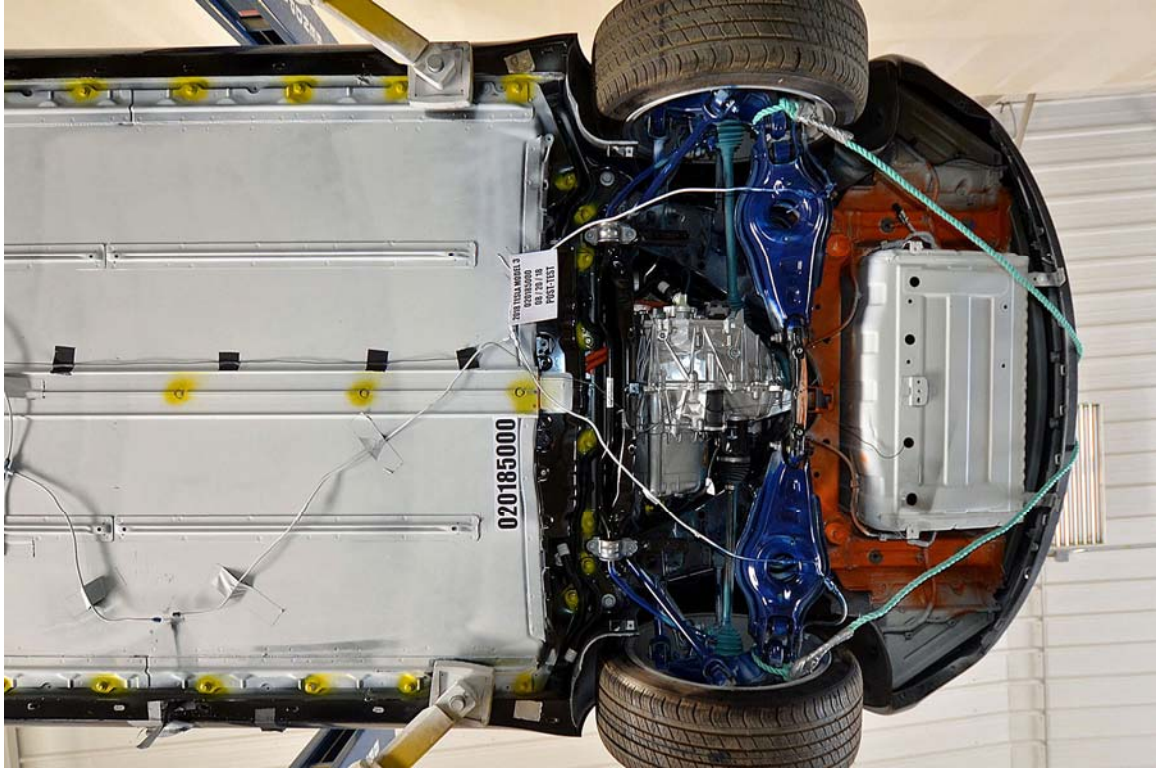


FIGURE 12. Post-Impact Rear View of Propulsion Battery

Photograph Not Applicable

Battery Not Removed  
From Vehicle

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

Photograph Not Applicable

Battery Not Removed  
From Vehicle

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

Photograph Not Applicable

Battery Not Removed  
From Vehicle

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

Photograph Not Applicable

Battery Not Removed  
From Vehicle

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

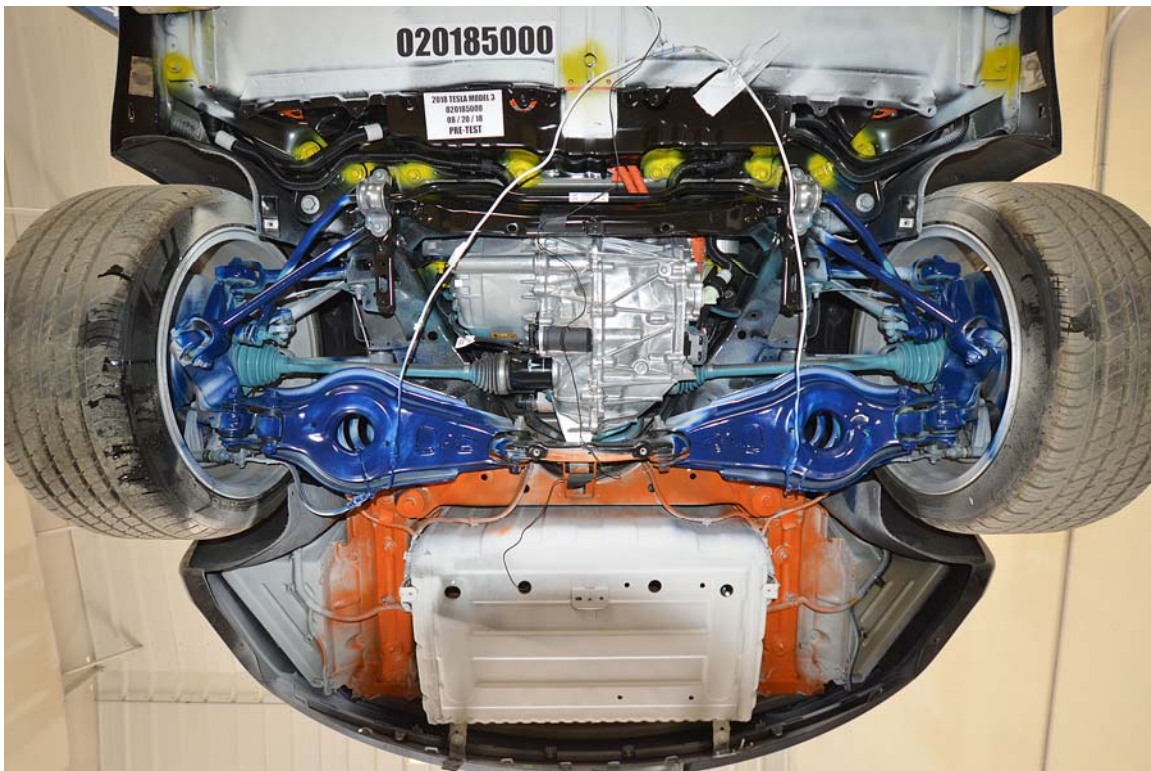


FIGURE 17. Pre-Impact View of Electric Propulsion Drive

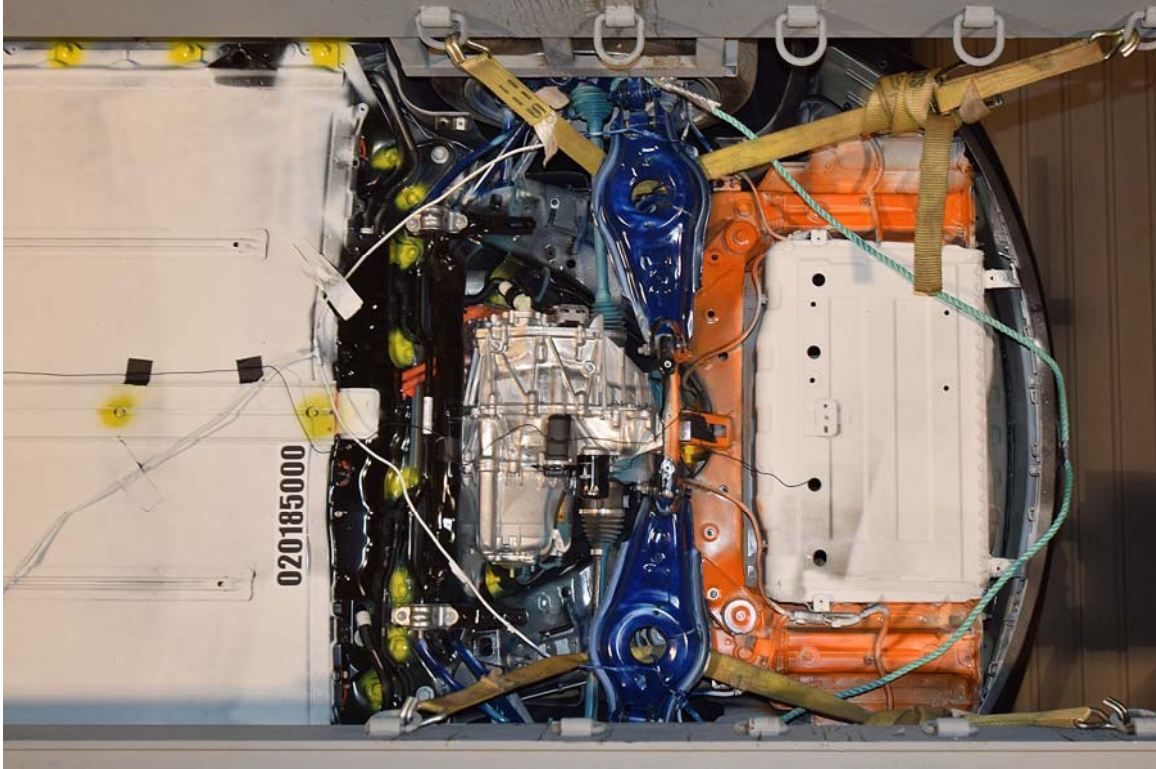


FIGURE 18. Post-Impact View of Electric Propulsion Drive



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



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

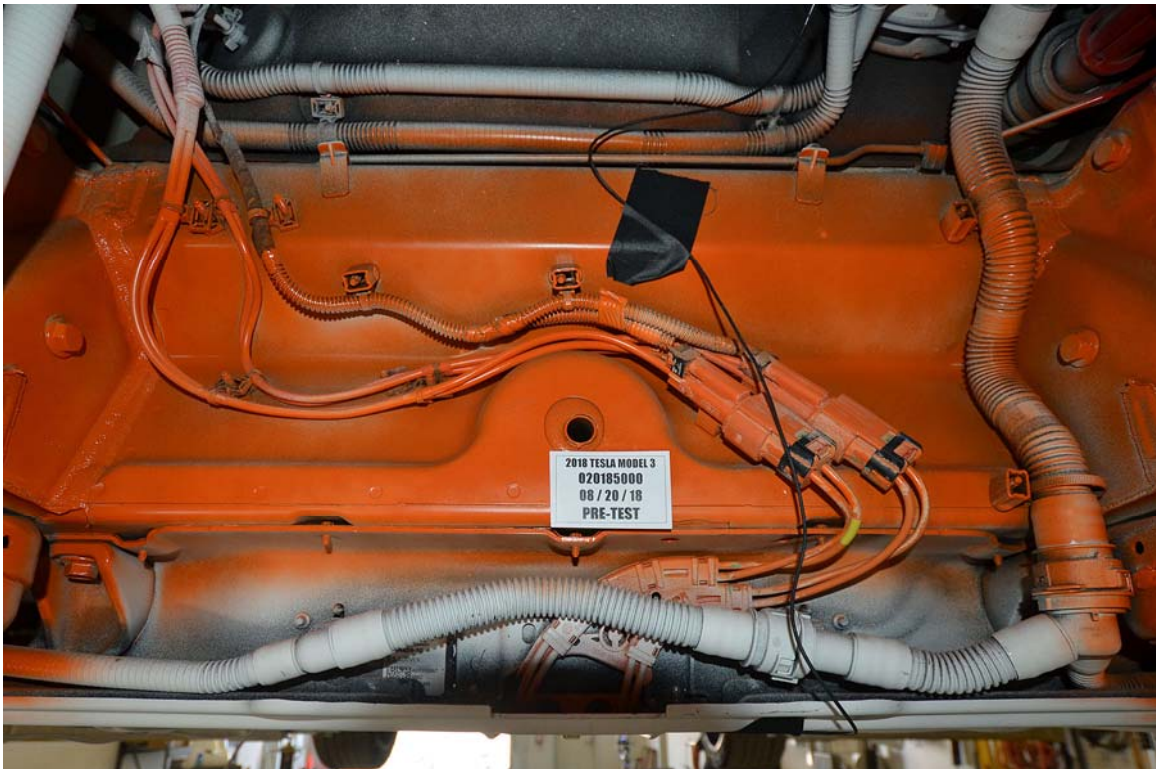


FIGURE 19b. Pre-Impact View of High Voltage Interconnect(s)



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



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

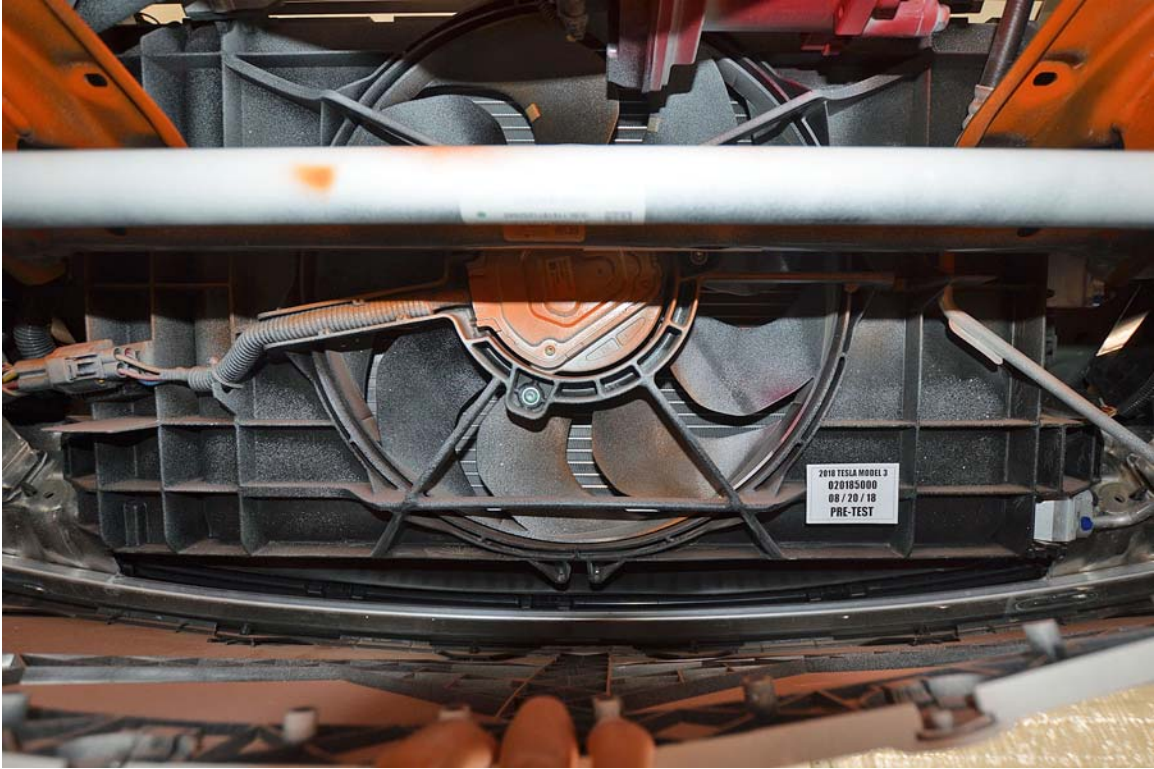


FIGURE 20a. Pre-Impact View of Propulsion Battery Venting System(s)

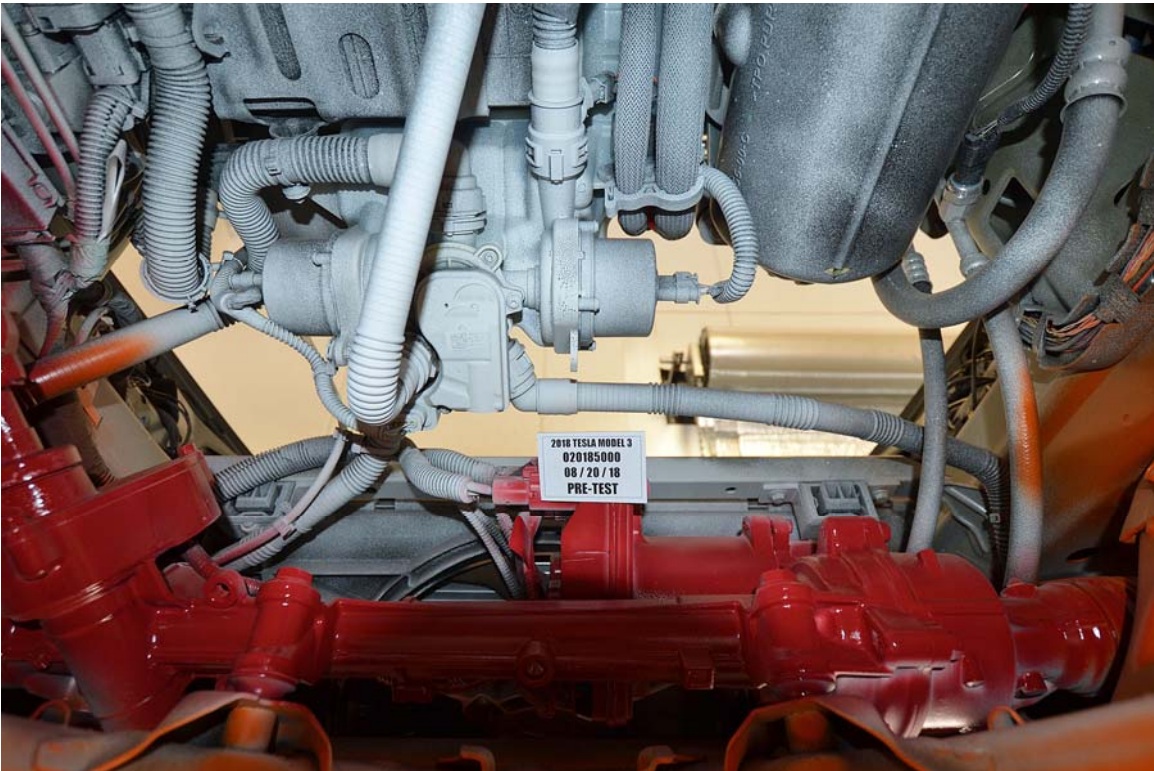


FIGURE 20b. Pre-Impact View of Propulsion Battery Venting System(s)



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

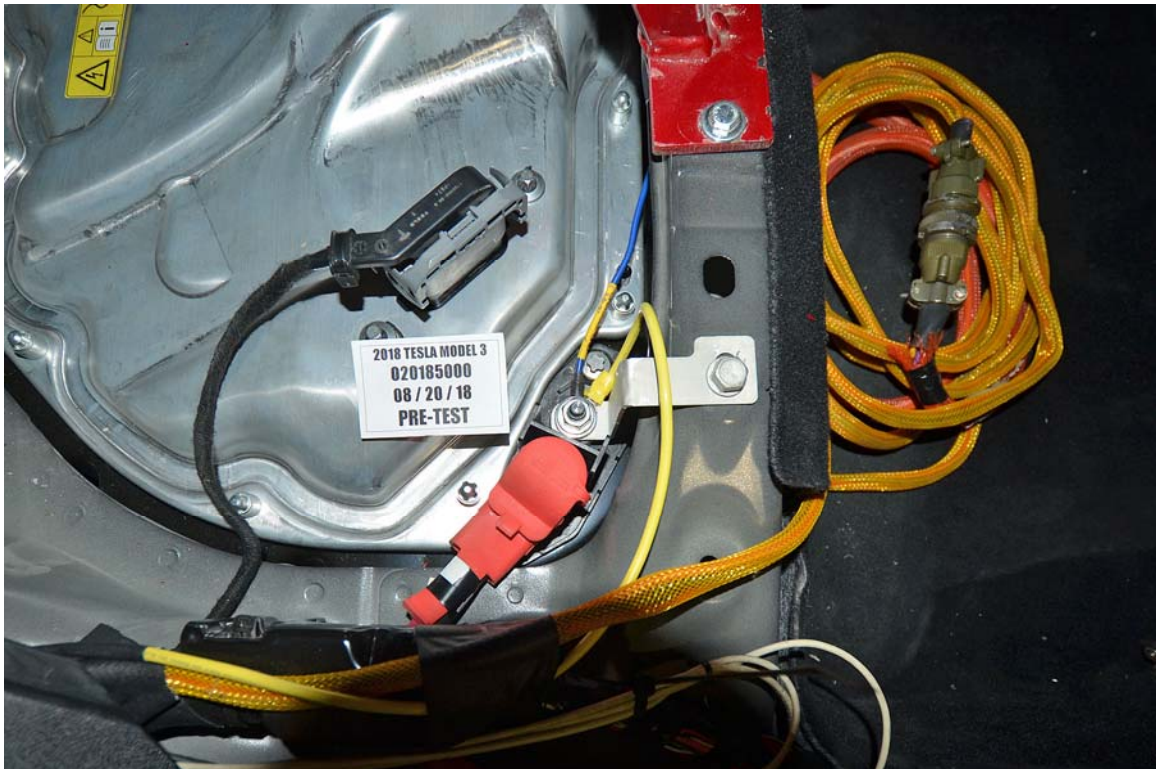


FIGURE 22. Pre-Impact View of Ground Lead Attached



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

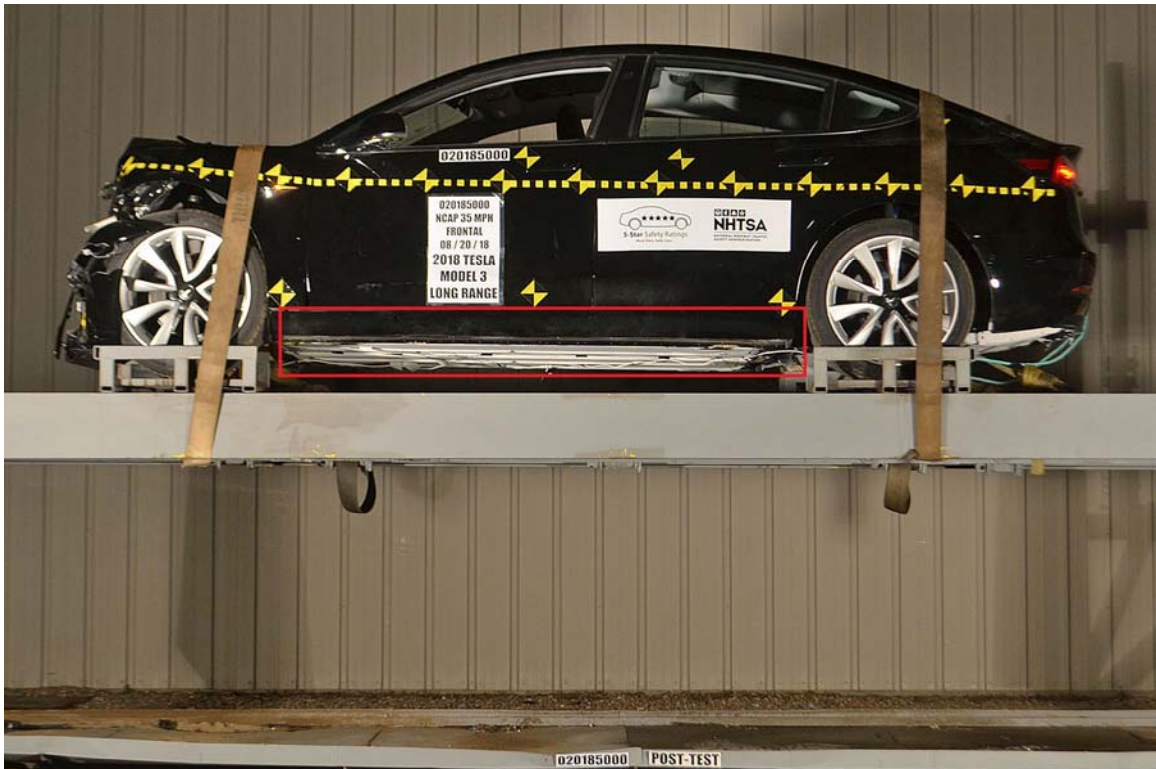


FIGURE 29. FMVSS No. 305 Static Rollover at 0°



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

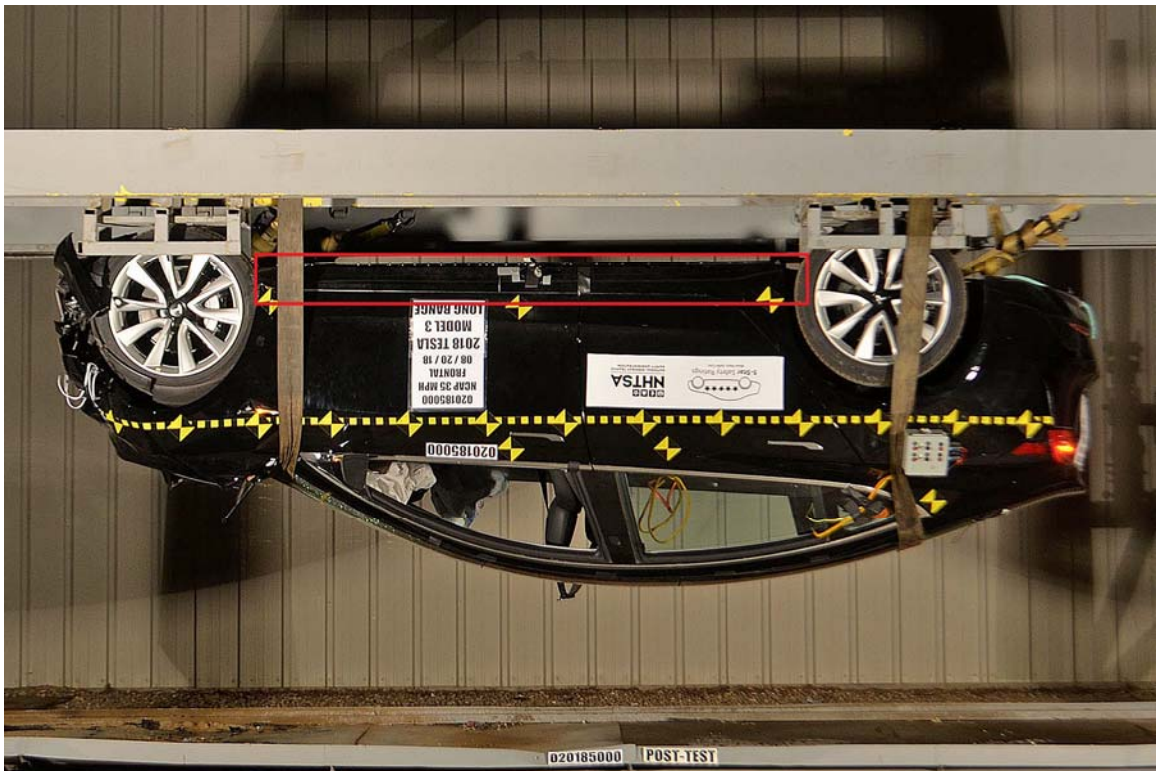


FIGURE 31. FMVSS No. 305 Static Rollover at 180°

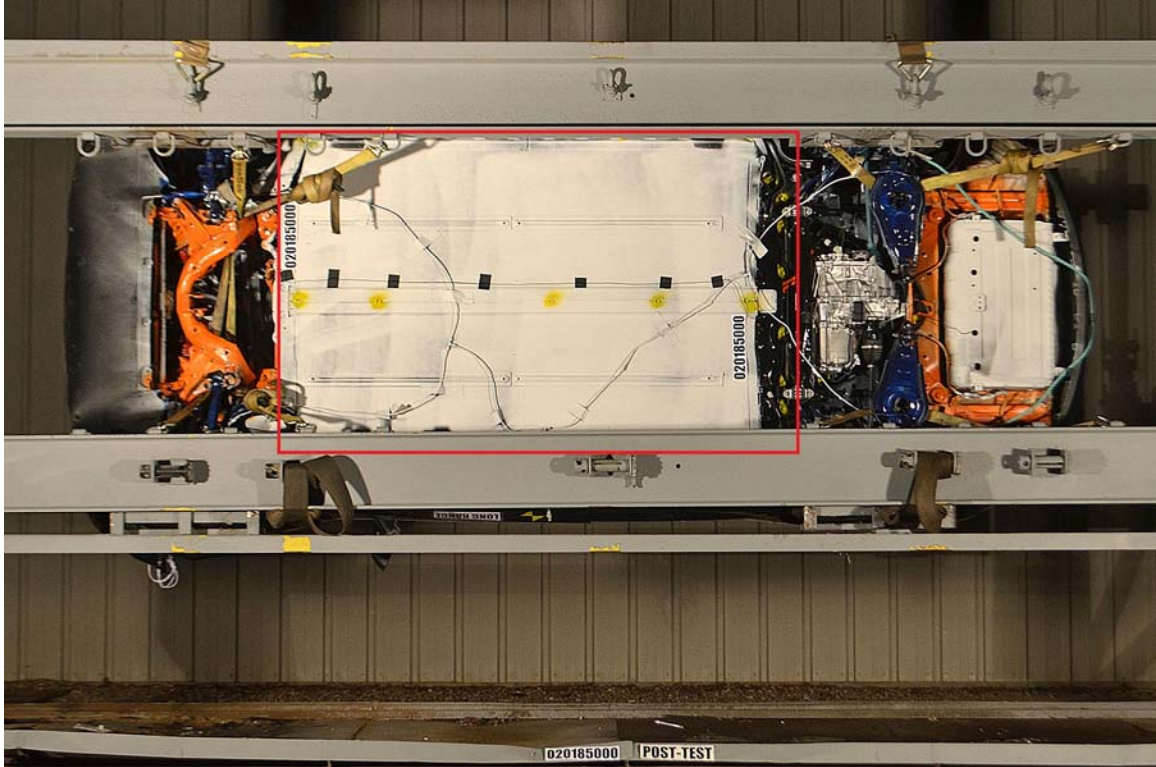


FIGURE 32. FMVSS No. 305 Static Rollover at 270°

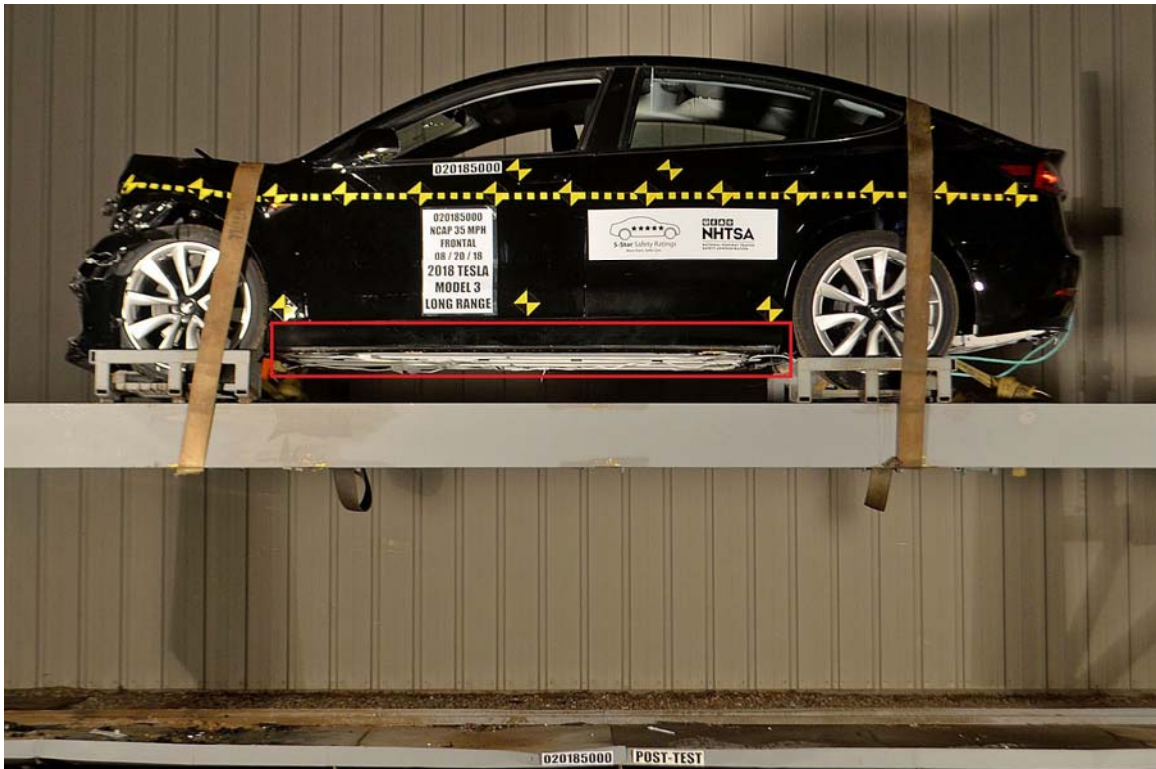


FIGURE 33. FMVSS No. 305 Static Rollover at 360°



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

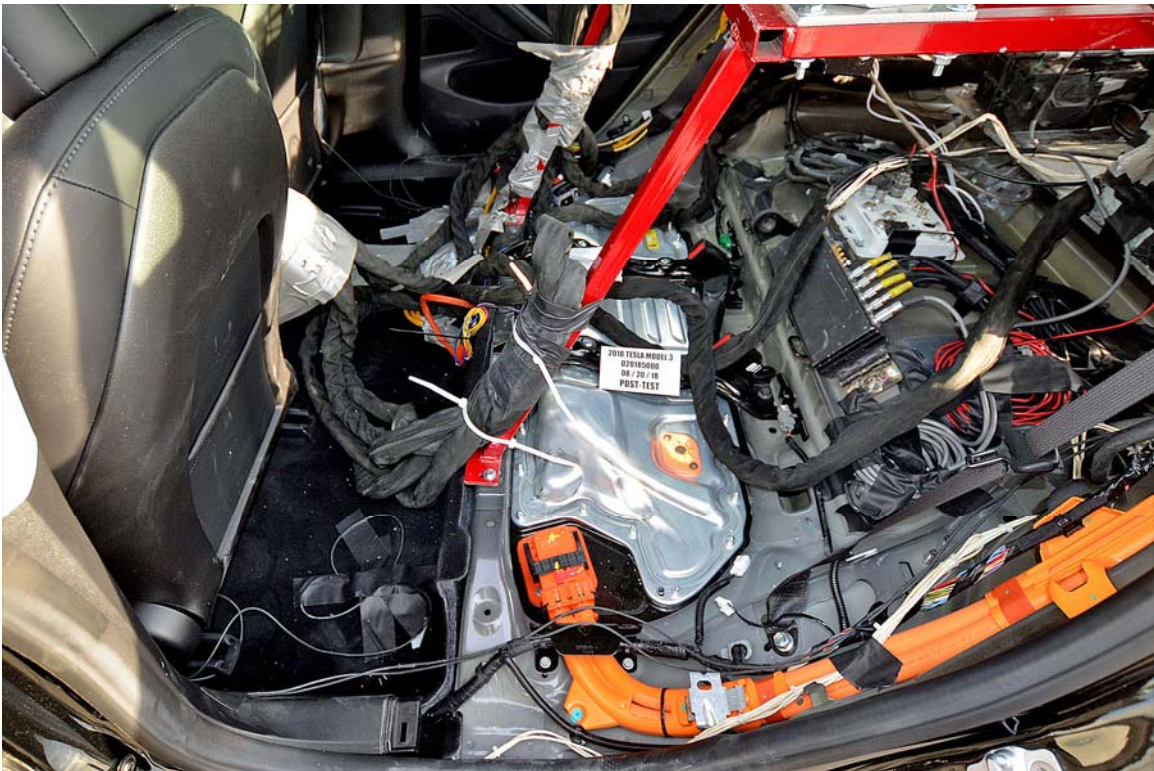


FIGURE 35. Post-Impact View of the Vehicle Passenger Compartment Adjacent to Propulsion Battery

**Photograph Not Applicable**

**No Propulsion Battery  
Mounting and/or  
Intrusion Failure**

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

**Photograph Not Applicable**

**No Battery Component  
Intrusion**

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

Photograph Not Applicable

No Propulsion  
Battery Movement or  
Retention loss

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

Photograph Not Applicable

No Propulsion Battery  
Electrolyte Spillage

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

Photograph Not Applicable

No Propulsion Battery  
Electrolyte Spillage

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