

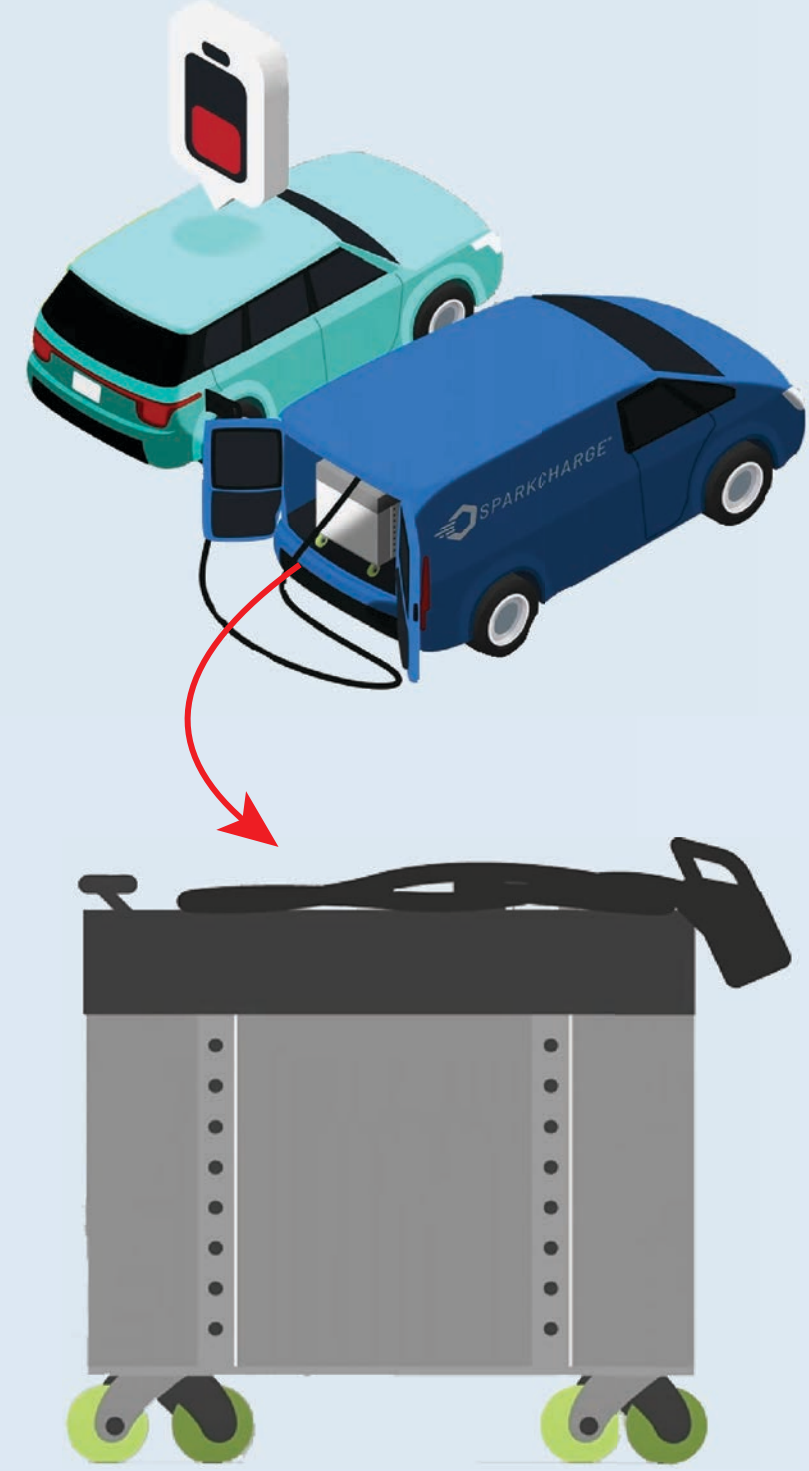
SparkCharge Roadie V3 Environmental Hardening

Minimizing damage and downtime of batteries through the retrofit of waterproof solutions

SCOPE 2023-2024



What is SparkCharge/Roadie V3?

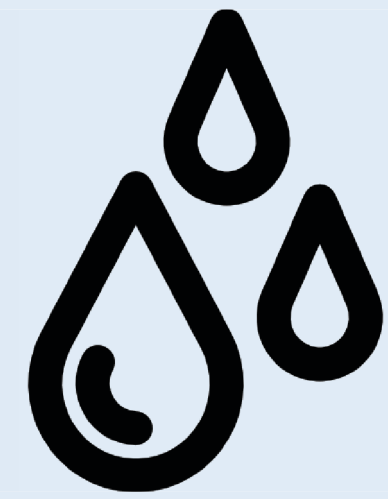


SparkCharge is the world's largest mobile EV charging service provider. Their service delivers much needed electric power directly to individual and fleet customer EV vehicles, regardless of location and grid connection capabilities.

One of SparkCharge's products, the Roadie V3, is an integral part of this service. The system weighs 1600 pounds and capable of delivering 70kWh of energy. This is equivalent to 250 additional miles on a standard EV on a single charge.

Goals

“Our team at Olin is tasked with ensuring that the Roadie's operation is not impacted by environmental factors such as heavy rain, snow, and debris.”



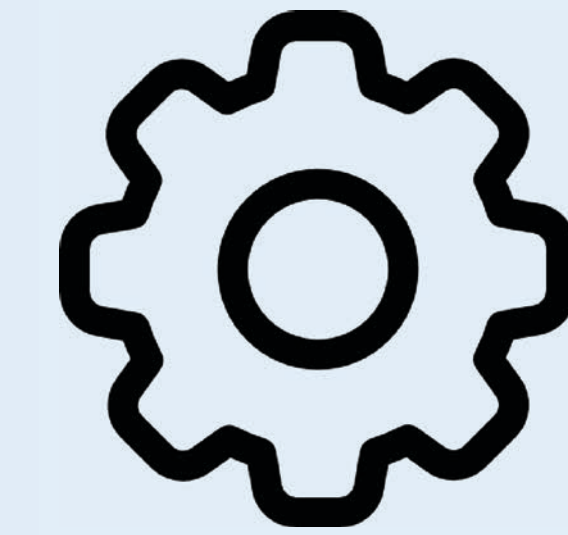
Waterproofing

Design a system that protects the Roadie V3 from all sources of water ingress



Ease of Installation

Ensure that our products can be easily installed and serviced by SparkCharge operators



Design for Manufacturing

Design components to be easily and cheaply manufactured with mass production techniques

Process

Research

Establishing requirements from industry standards

Ideation

Brainstorming various methods to fulfill requirements

Design

Creating, modeling, and simulating SolidWorks CAD ideas

Manufacture

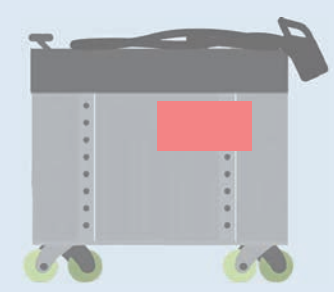
Using shop and outsourced equipment to create physical designs

Validation

Exposing prototypes to real-world situations for testing and iterating

Delivery

Handoff of all manufacturing methods, designs, and learnings

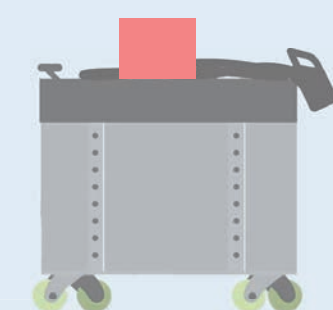


Main Control Board

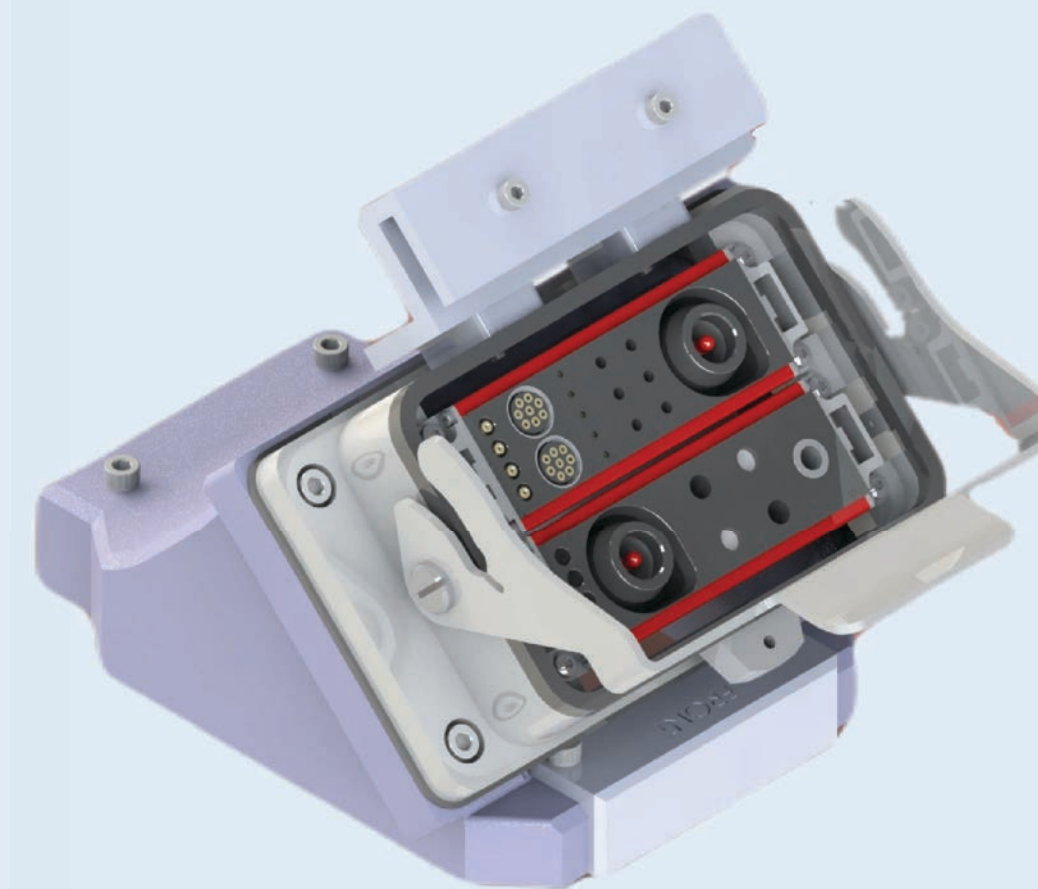


The Control Board, the electronic brain of the Roadie V3 system, is full of temperature and water sensitive electronic components. While the Control Board is not directly exposed to the elements, the risk of humidity, dust, and other debris damaging the board is non-negligible.

Our solution protects the Control Board by encasing the structure with a 3D printed, magnetically clasped ASA box. The design allows for maximum protection from splashes of water, while still enabling cool air to dissipate heat away from electronic components.

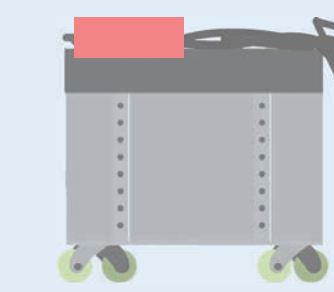


Power Connector

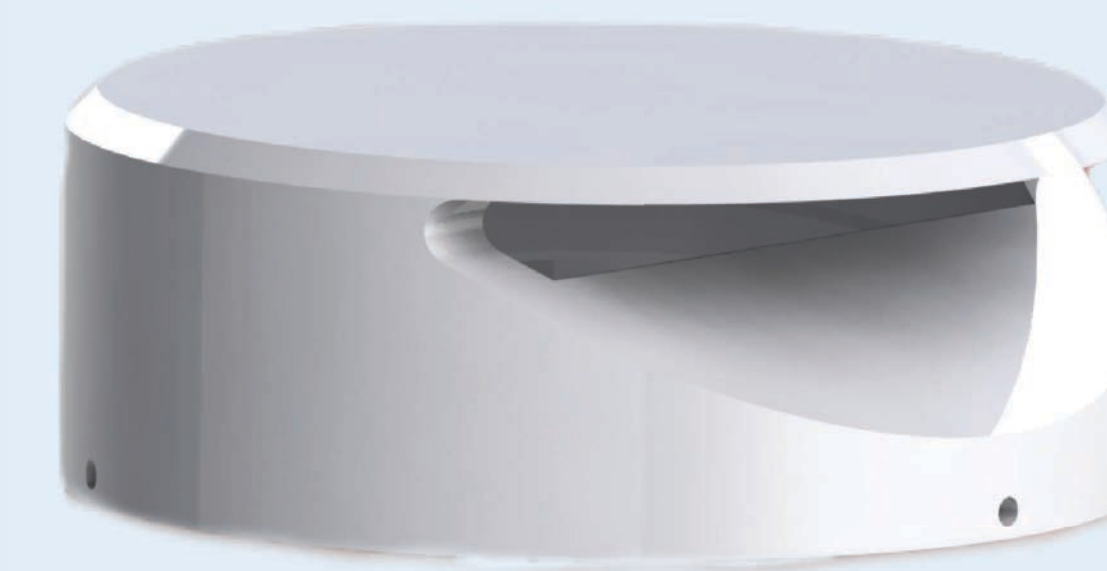


During charging, 600VDC of voltage flows through thick cables weighing 50 pounds each. For this operation to be safe and efficient, specialized connectors are integrated into the Roadie V3.

To protect these connectors from water ingress, we have created a 3D printed ergonomic solution that angles the connector opening away from rain, while also adding a flap mechanism to cover the connections while not in use.



Exhaust Fan



The large vertical exhaust opening allows for ingress of water into the battery. While the fan and radiator itself are water resistant, the ingress of water poses a risk to other internal electrical components.

Our team has developed a 3D printed ASA plastic cover that reorients and minimizes the gap needed for hot air to escape from the battery. Careful analysis was performed to ensure air flow is not restricted during operation while mitigating as much noise as possible.

Team



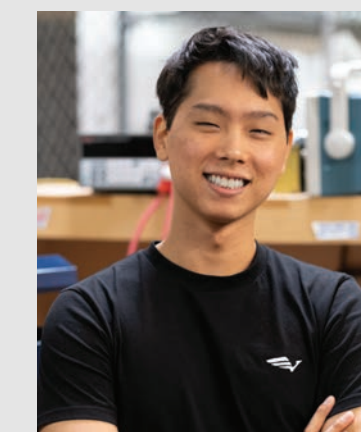
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