

# Calvin DeKoter

Mechanical Engineering, Class of 2022  
University of Waterloo

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Phone: 226-627-9406

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## Summary of Qualifications

### **Mechanical Design and Fabrication**

- Extensive experience gained in precision mechanical design and fabrication at WFE and Schukra of North America
- Adept at solid modelling and surfacing in SolidWorks and Creo to design and analyse structural components
- Skilled with the metal lathe, milling machine, metalworking tools and methods, rapid prototyping, and MIG welding
- Proficient with composites manufacturing methods and design strategies for Kevlar and carbon fibre components

### **Simulation and Analysis**

- Strong data analysis and visualization skills built by using Matlab and Excel to drive project decisions
  - CFD and thermal design capabilities strengthened by using Star-CCM+ for cell fuse design and simulation
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## Engineering Experience

### **Waterloo Formula Electric**

Battery Mechanical Lead

Dec. 2019 – Present

- Designed custom copper cell fuses to protect Li-Ion battery cells under short circuit and overload conditions
- Validated and improved cell fuse designs with combined thermal and electrical simulation in Star CCM+
- Reduced heat generation at cell connections by characterizing the contact resistance and standardizing assembly
- Designed and fabricated custom punch and die tooling to produce 300 cell fuses quickly and accurately
- Updated the mechanical design of battery pack for a more stringent rule set by implementing cell support foam
- Adapted a laptime simulator to optimize the 2021 battery design for the highest dynamic event score at competition

### **Richard Childress Racing**

Junior Aerodynamics Engineering

**NASCAR Cup Team**

Jan. 2020 – Mar. 2020

- Accurately evaluated NASCAR aerodynamic devices in full-scale wind tunnels with an uncertainty of only 0.5%
- Fabricated and installed new parts, prototype designs, and test equipment to improve the performance of the vehicle
- Analyzed 3D scan data with GOMInspect software to produce templates and inform aerodynamic design decisions

### **University of Waterloo**

Online Learning Assistant

**Engineering Ideas Clinic**

Sept. 2020 – Dec. 2020

- Improved the accuracy of a robotic arm by designing and machining precision components from aluminum and plastic
- Prototyped an electrical system including motors, analog and digital sensors, and a PLC controller for a conveyor belt
- Designed and tested an electric vehicle drivetrain on a small go-kart to showcase automotive components

### **Waterloo Formula Electric**

Composites Team Lead

Jan. 2019 – Dec. 2019

- Designed, tested, and fabricated a fire retardant Kevlar and Nomex firewall for the vehicle by vacuum bagging
- Identified process deficiencies in the old method and documented an improved process to produce quality parts
- Carefully tested various layup configurations to maximize strength and stiffness without compromising weight
- Precisely designed and fabricated a fireproof cover with only 3 millimetres of clearance from the vehicle frame

### **Schukra of North America**

New Product Development Co-op

**Leggett and Platt Inc.**

Sept. 2018 – Dec. 2018

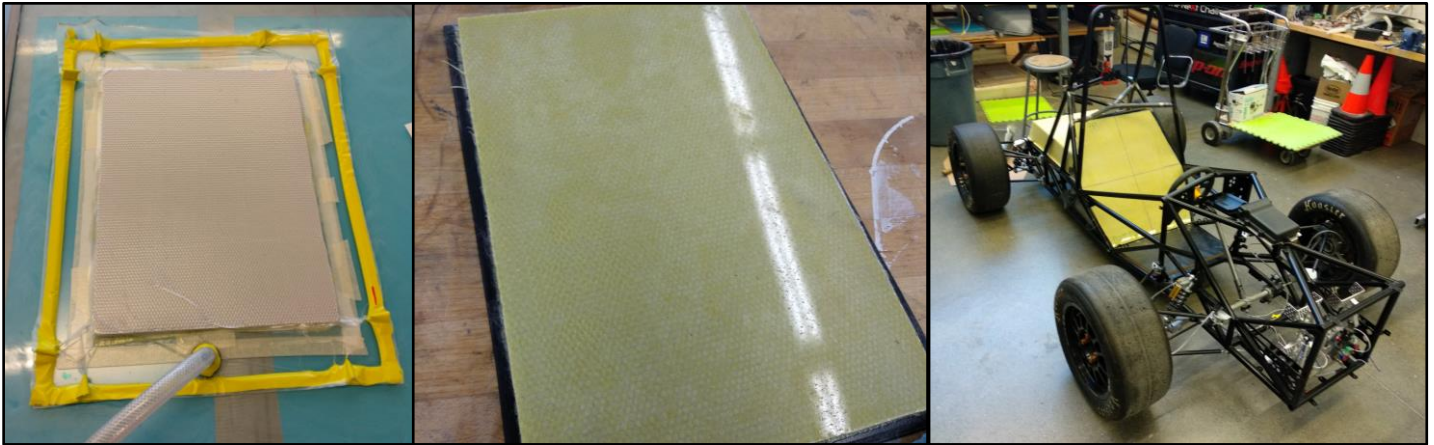
- Identified design solutions to noise and durability issues in electromechanical actuators while maintaining part cost
- Organized and analyzed noise data to objectively grade actuator sound quality with Artemis Suite and Microsoft Excel
- Reduced the time spent by 80% to process and visualize oscilloscope measurement data with an Excel template

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## Design and Manufacturing of a Kevlar Firewall for WFE's FSAE Electric Vehicle



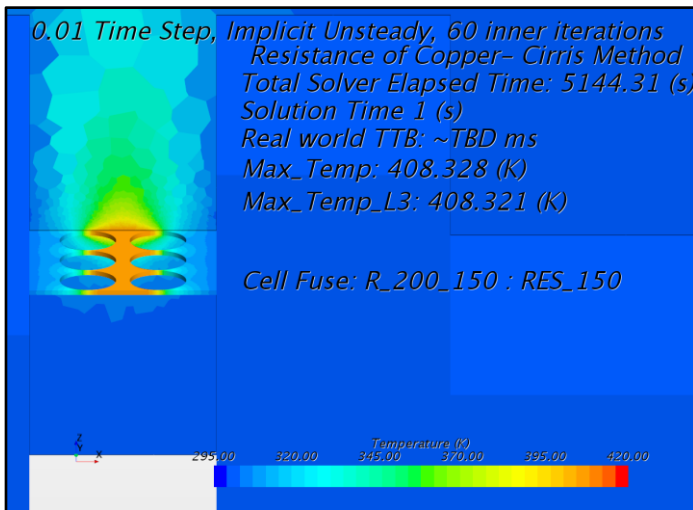
**Kevlar and FR Resin Test Samples**

Vacuum bagging the laminate ensured strong, stiff panels.

**Finished Firewall**

Kevlar, Nomex, Aluminum Sheet

## Design of a Copper Cell Protection Fuse for Waterloo Formula Electric's Battery Pack



### Fuse Design and Analysis

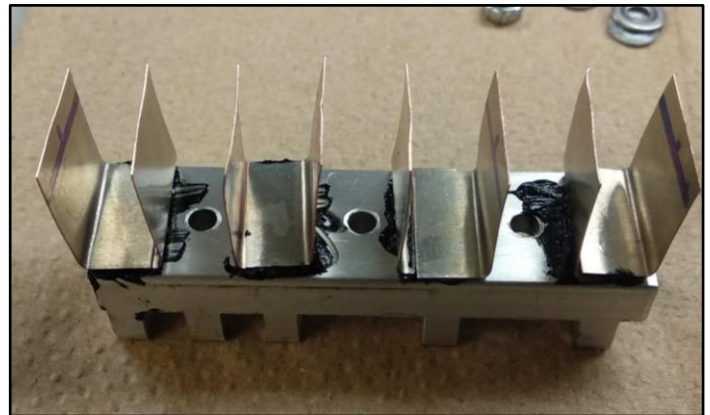
All 288 cells in the battery pack were to be protected by a fuse cut into the cell tab. Thermal and electrical design was completed in Star CCM+, then the fuse pattern was cut into material identical to the battery cell tabs.

The fusing time vs. current curve was shaped to fit between the cell thermal limit and pack fuse curve after extensive simulation and physical testing. Testing was completed on a custom high current test fixture up to 300 A.



**Finished Cell Tab Produced by Custom Die**

After the fuse design was complete, all 288 cell tabs were cut without scrapping any cells.



**Cell Tab Contact Resistance Study**

Cell-to-busbar resistance was measured at  $\approx 300 \mu\Omega$  after conductive grease application.