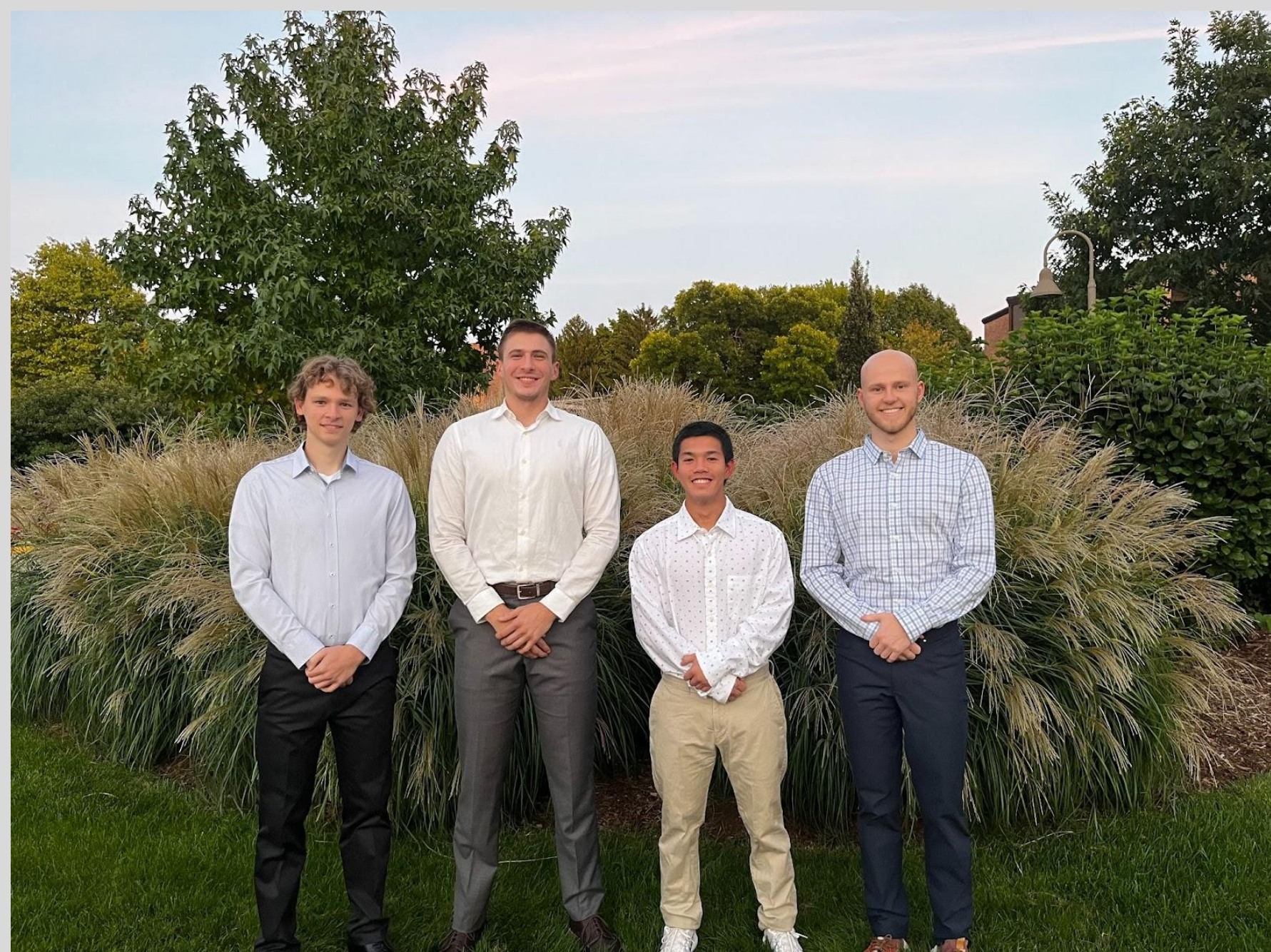


Team 05: Duck-less Dorm Heating



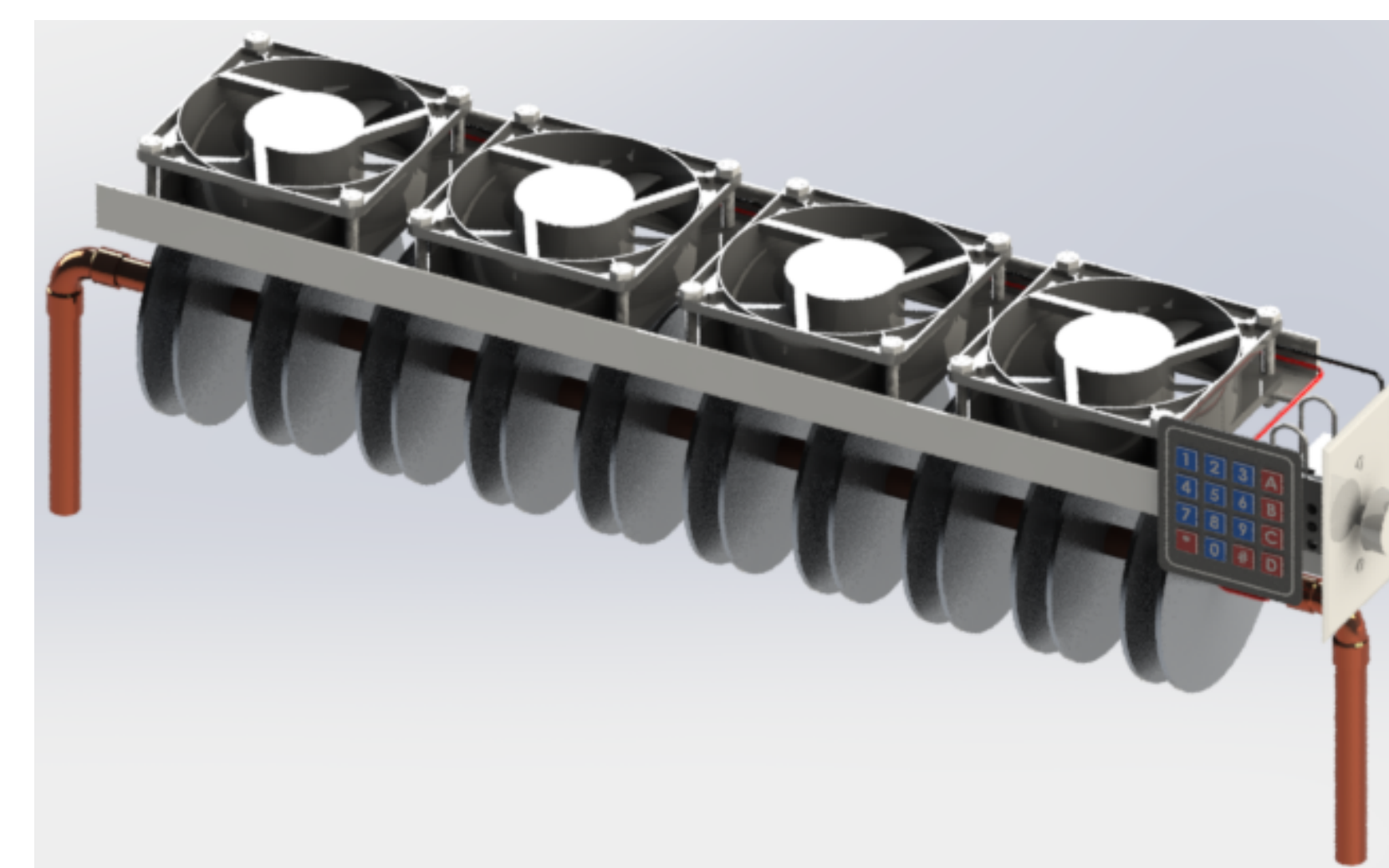
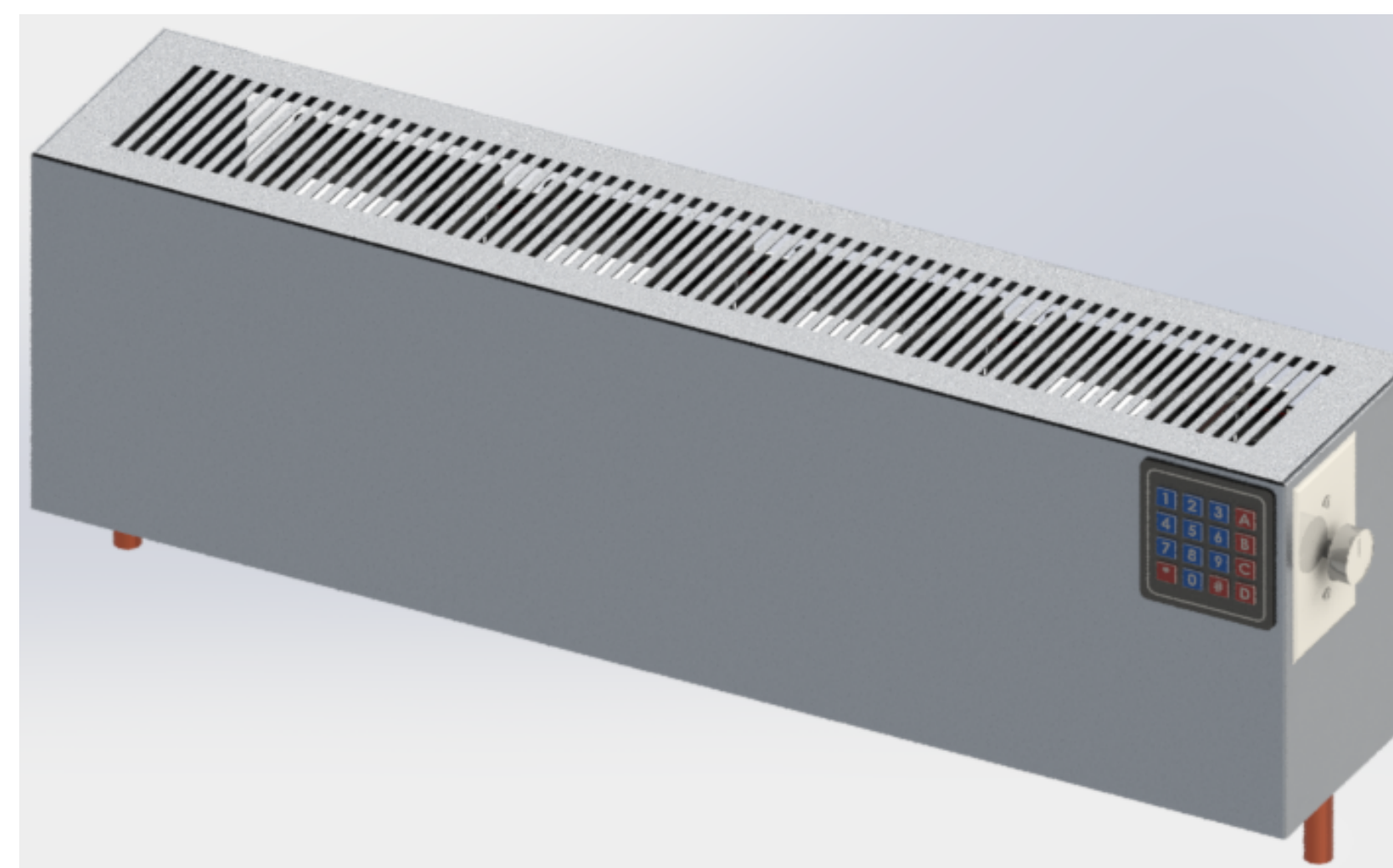
Team 5



Left to Right: Zac Runhaar, ME; Nick Grossmann, ME; Dat Cao, ME; Sam Hoover, ME

The Solution

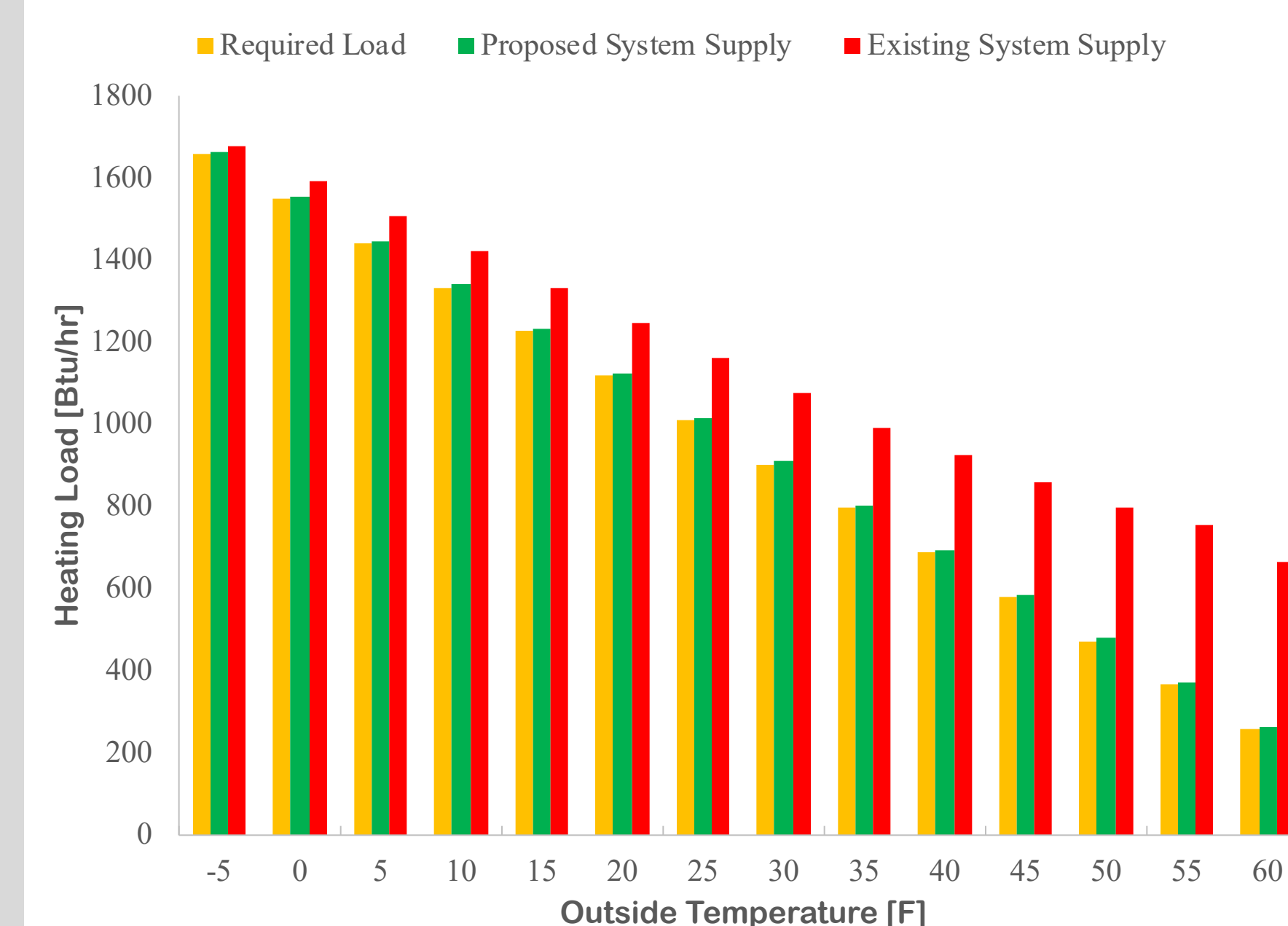
Our solution is a high efficiency forced air radiator that meets the heat load requirement of a dorm room, reduces the physical size of the system, and gives the students the power to control the temperature in their dorm room without sacrificing excess loss to the environment. This is accomplished with an array fans positioned over a radiator with 20 circular aluminum fins. The fans can be activated individually, and their speed can be adjusted using a variable speed controller. The radiator is enclosed in a steel housing designed to protect the heat distribution unit from damage and protect the students from the “hot” internal components.



Trimetric View of the Proposed Solution with and without visible Housing

Results

- Reduced the physical footprint by 54% in comparison to the existing system.
- Reduced the thermal energy required to heat each dorm room by 11%.
- Reduced Calvin’s total yearly heating load by 900 [MBTU] or 0.57%. This is equivalent to 85.13 [Tons] of CO₂.
- Developed an interface that allows for the system to be installed without the need for significant changes to the dorm infrastructure.



The Problem

Calvin University utilizes an array of radiators to distribute heat to all the dormitories on campus. These radiators are supplied by hot water utility lines. The benefit of this system is that it is cost effective, easy to install, and easy to maintain. The downside of this system is that there is no effective way to control how much heat is dispersed into each room. In the case of this system the radiators distribute too much heat. To gain control of a dorm room’s temperature, students will open the window to vent the extra heat. This practice is extremely inefficient and wasteful.

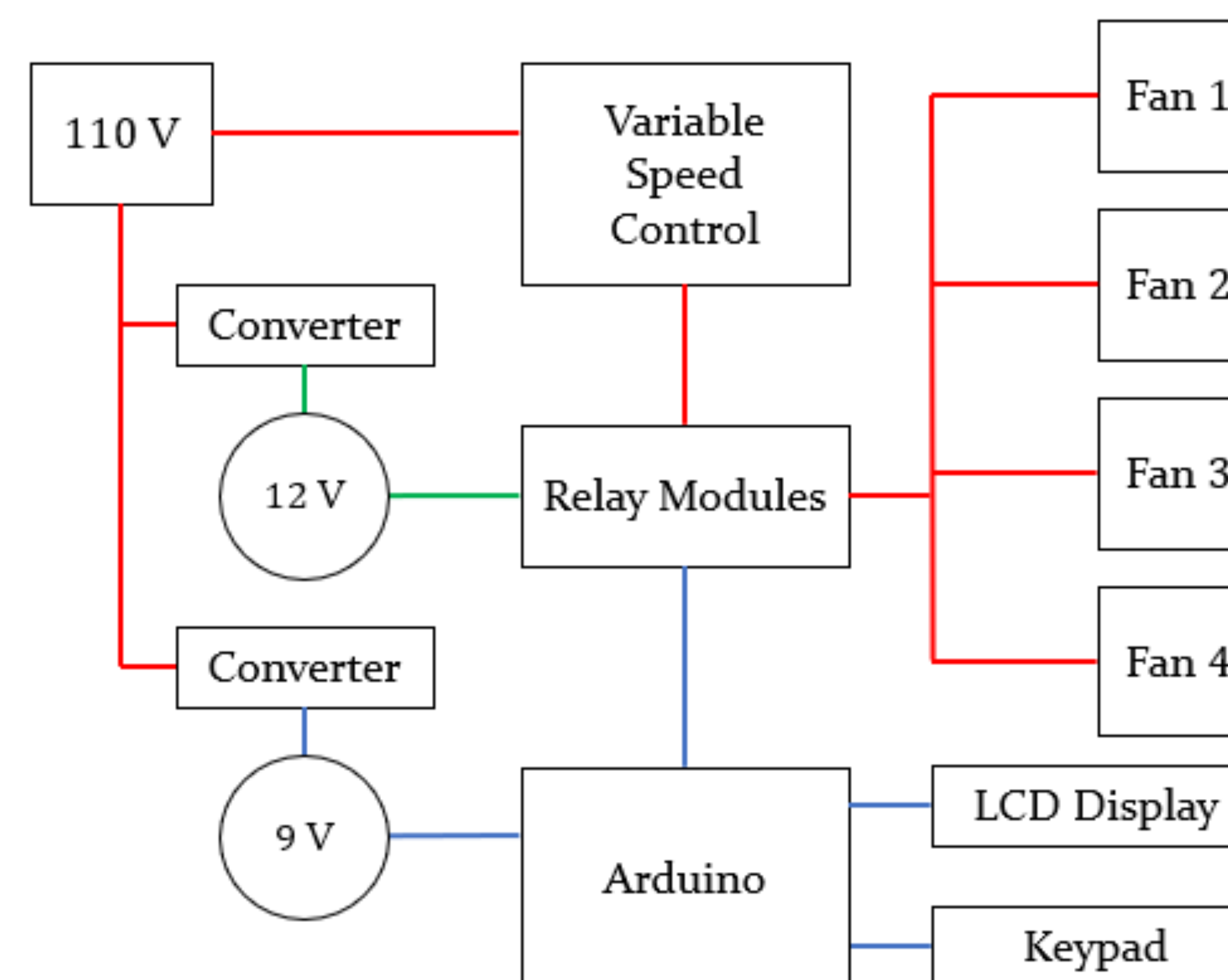


Calvin's current heat distribution unit.

Control Unit Design

Control Unit Function

- The LCD Display is used to display temperature at the inlet and outlet of the radiator.
- Relay modules are used to turn fans on and off based off the user input to the keypad.
- The variable speed controller is used to adjust the air flow out of the fans by varying the amount of current that is sent through their motor.



Control Unit Schematic

Future Improvements

- Automated Temperature Controls
- Seamless Housing
- Open Window “Kill” Switch

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