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Steam Heat Controller

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Client:
Iowa State
University

Introduction

Abstract
The team was asked to provide a temperature control system for steam heated rooms in Coover Hall. The system requires a user-friendly interface for each room and a steam valve controller unit that will accommodate the users' temperature preferences. The system is designed to save on energy costs and allows for system management.

Problem Statement
One steam valve controls the temperatures of up to five different rooms.

- Issues:**
- Temperature offset in different rooms
 - Difficulties adjusting temperature for different rooms
 - High energy consumption and costs

Requirements

- Functional**

 - Effectively control the room temperature
 - Incorporate multiple users' preferences
 - Removable mechanical system
 - Website interface
- Non-Functional**

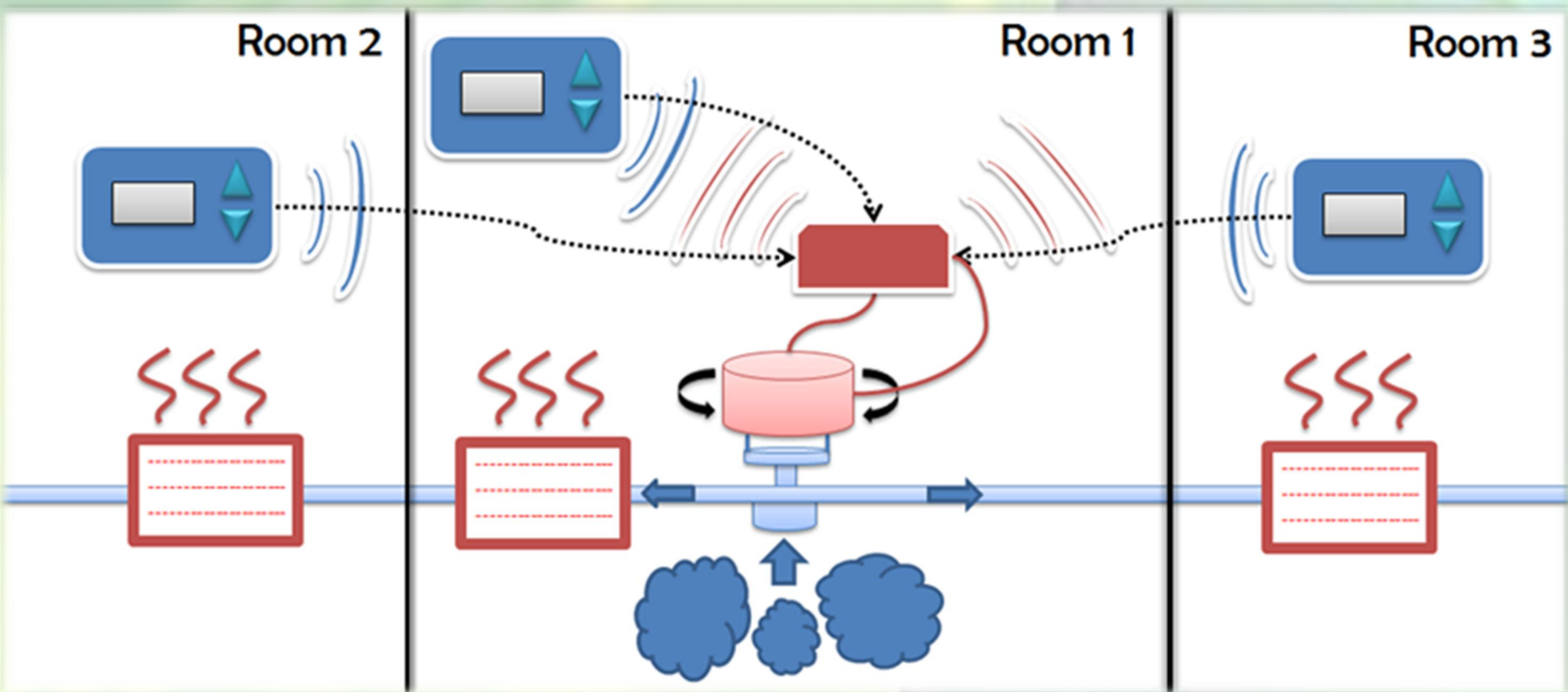
 - Large and graphical LCD
 - Large rubber base push buttons
 - Neutral color product enclosure
 - Compact control panel

- Constraints**

 - Minimum alteration to existing infrastructure
 - Long heating time constant
 - User rationality
- Deliverables**

 - One Controller Box
 - Three Control Panels
 - Documentation

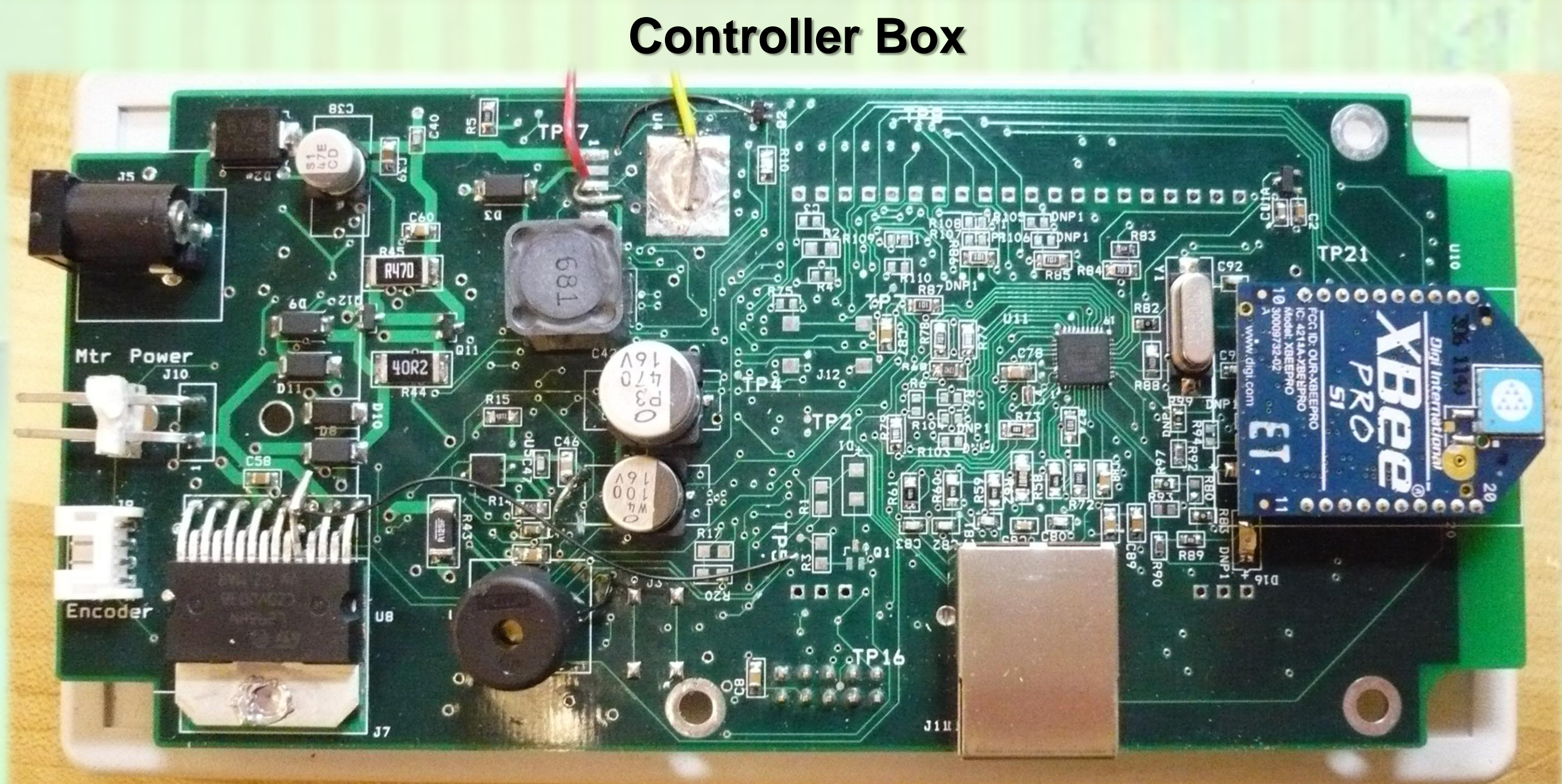
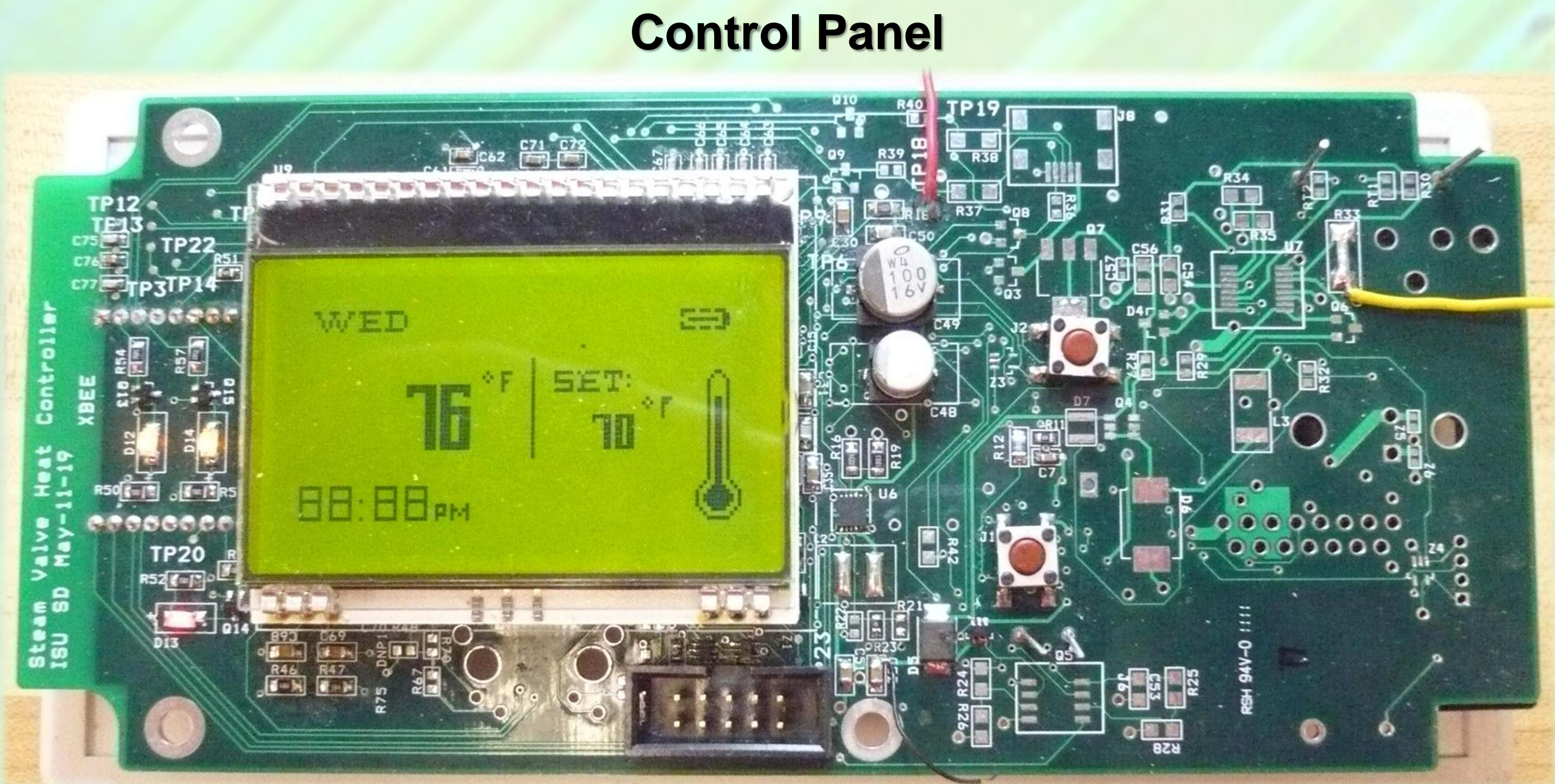
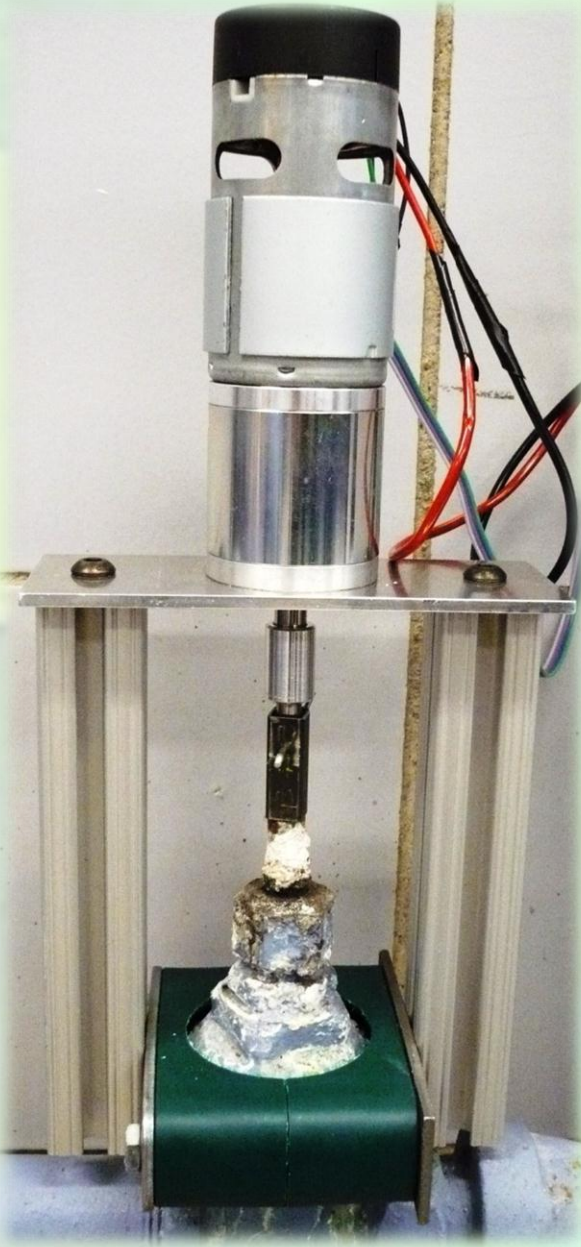
Implementation



- Control Panel**
- Microcontroller
 - Wireless Transceiver
 - LCD Display
 - Power Supply
 - Buzzer
 - Push Buttons
 - Temperature Sensor
 - Recharging Circuitry

- Controller Box**
- Microcontroller
 - Wireless Transceiver
 - Ethernet Module
 - Power Supply
 - Buzzer

- Gear Motor System**
- Gear Motor
 - Shaft Encoder
 - Motor Driver IC



Testing

- System**

 - Power Supplies
 - Microcontroller
 - Wireless Transceiver
 - Temperature Sensor
 - Gear Motor
 - LCD Display
- Functional**

 - Basic Functionality
 - Temp Control Functionality
 - Wireless Communication Range
 - Limitation Testing
 - Monitored Extended Use

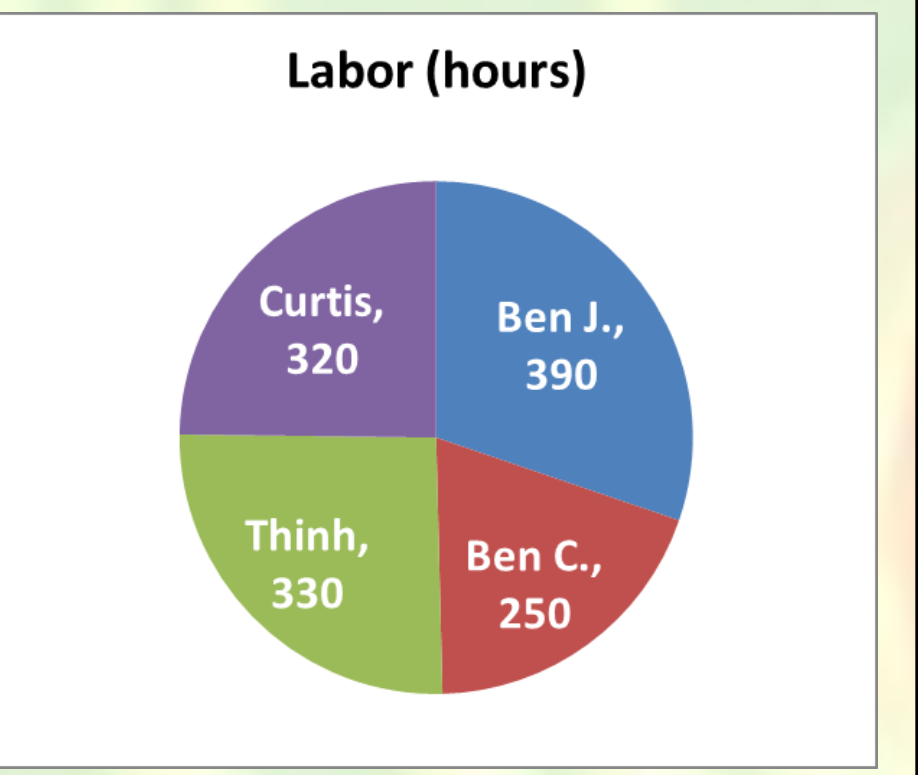
- Website Interface**
- Access Levels
 - Displays Current Temp
 - Remotely Set Temp
 - Data Collections



Budget

Controller Box			
Module	Cost	Module	Cost
Microcontroller	\$10.00	Ethernet	\$ 2.28
Power Supply	\$19.99	Motor System	\$ 79.77
Xbee	\$30.00	Other	\$ 35.00
PCB	\$ 8.00		
Total		\$185.04	

Control Panel			
Module	Cost	Module	Cost
Microcontroller	\$10.00	PCB	\$ 8.00
Power Supply	\$ 9.13	LCD	\$22.00
Xbee	\$30.00	Other	\$20.00
Total		\$99.13	



Conclusion

The team was able to successfully implement and test the two unit system: the control panel and controller box. The control panel consists of a wall mountable unit similar to a thermostat. It accepts temperature values from users and measures room temperature. The controller box will be situated next to the steam valve and appropriately adjusts heat output.

Possible improvements include completion of the recharging circuitry, and the Ethernet connection for the steam valve controller. Additional testing under various seasonal and environmental conditions is recommended.