ME 486C Capstone Project

Fall 2025

67% Hardware Update

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Project Overview

Primary Goal

- Install a solar air heating system to provide heat to the RE building during the winter and provide an alternative method of heating contrary to nonrenewable devices.

Figure 1: Air-Based Solar Thermal Panel

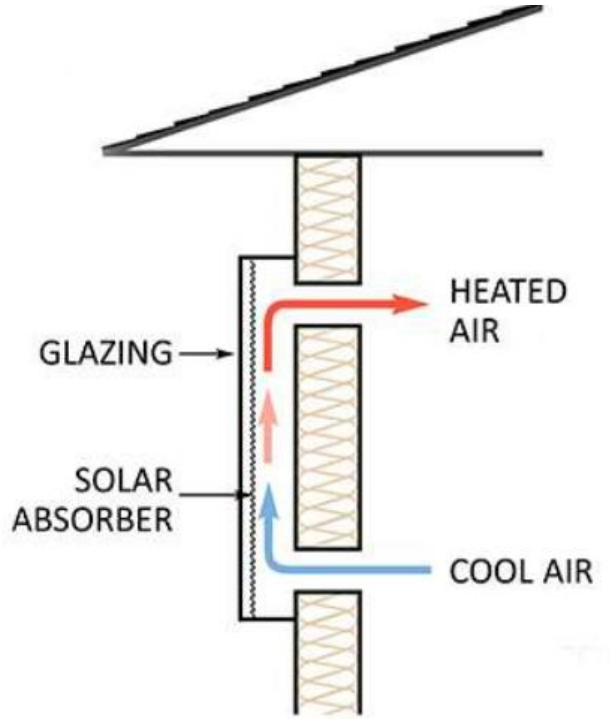
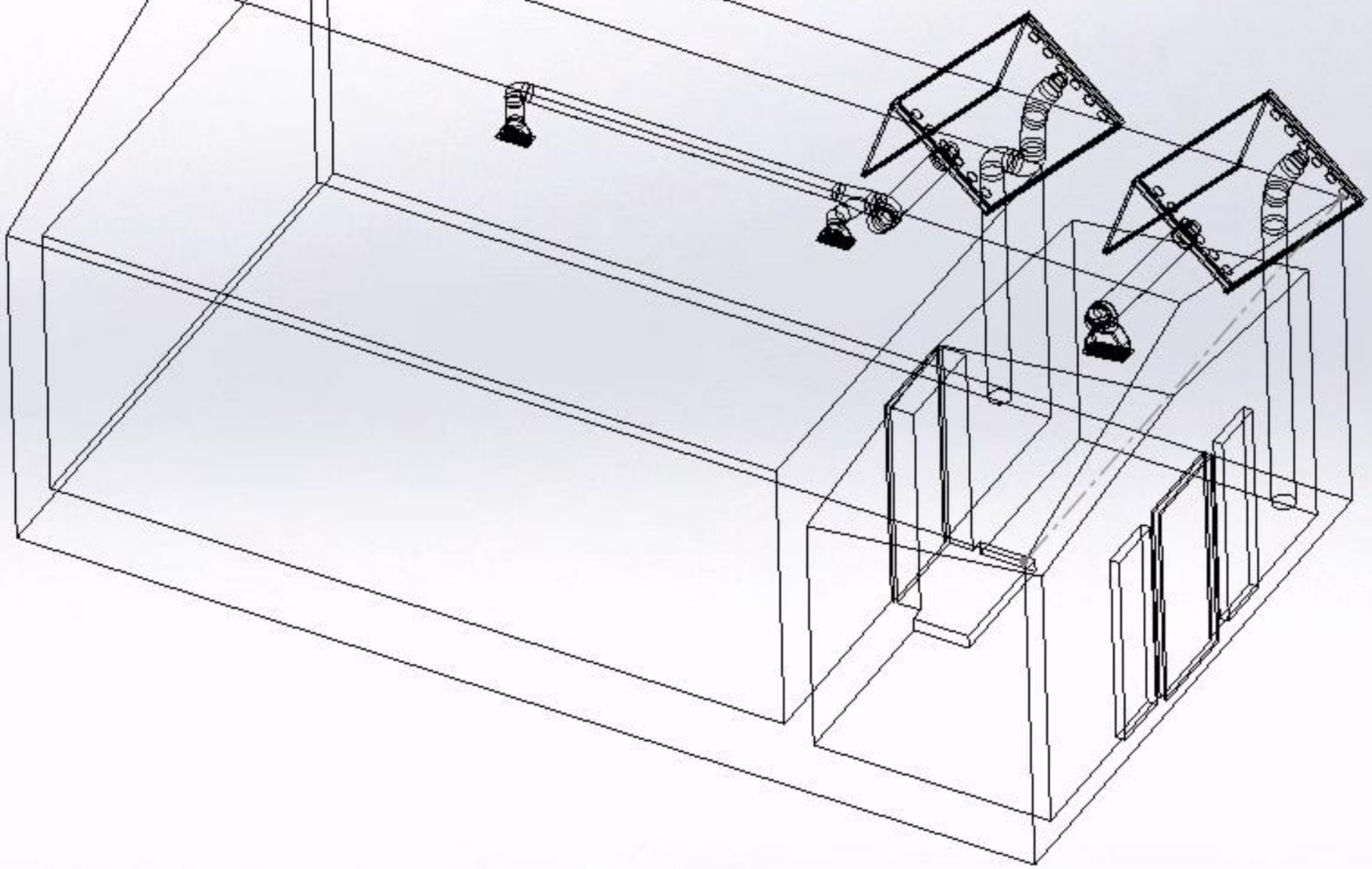


Figure 2: Air Solar Thermal System Diagram



SolidWorks Assembly

Mounting Materials

- 14-gauge Unistrut
- Nylon Unistrut Cone Nuts
- 5-inch Lag Screws
- Unistrut Pivot Bracket
- 1.5-inch Square Washers
- 0.5-inch Locking Washers

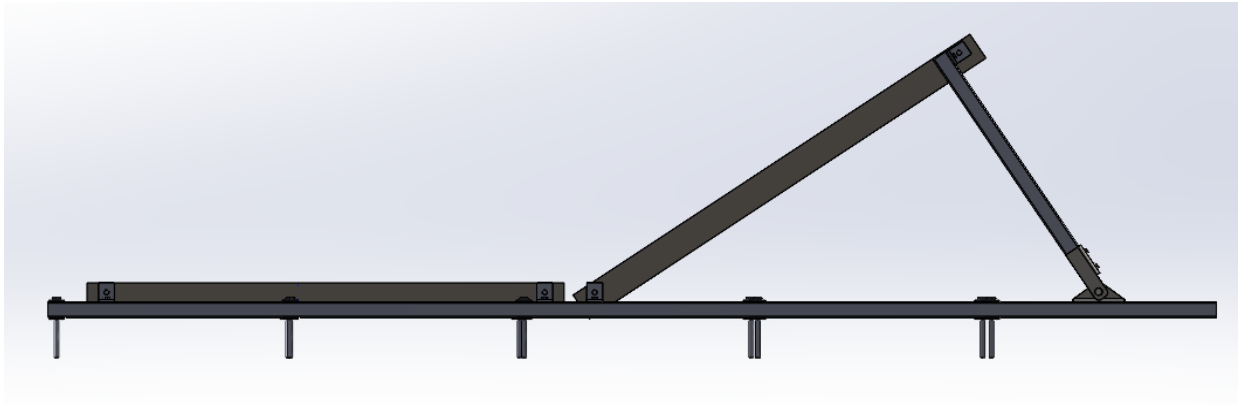


Figure 4: Solar air heater mounting

Figure 5: Mounting Bracket

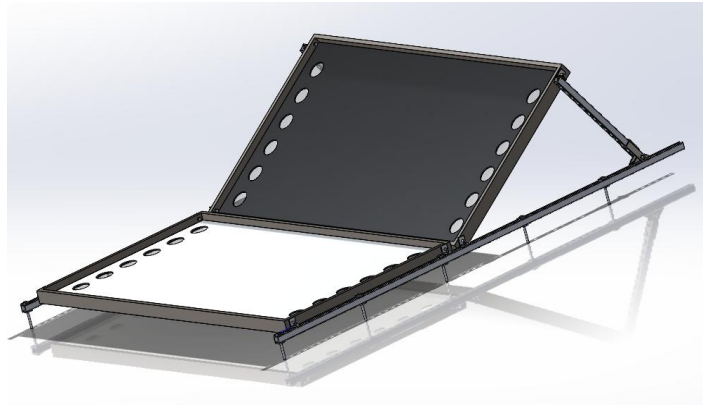


Figure 6: Solar air heater Mounting

Circuit Diagram

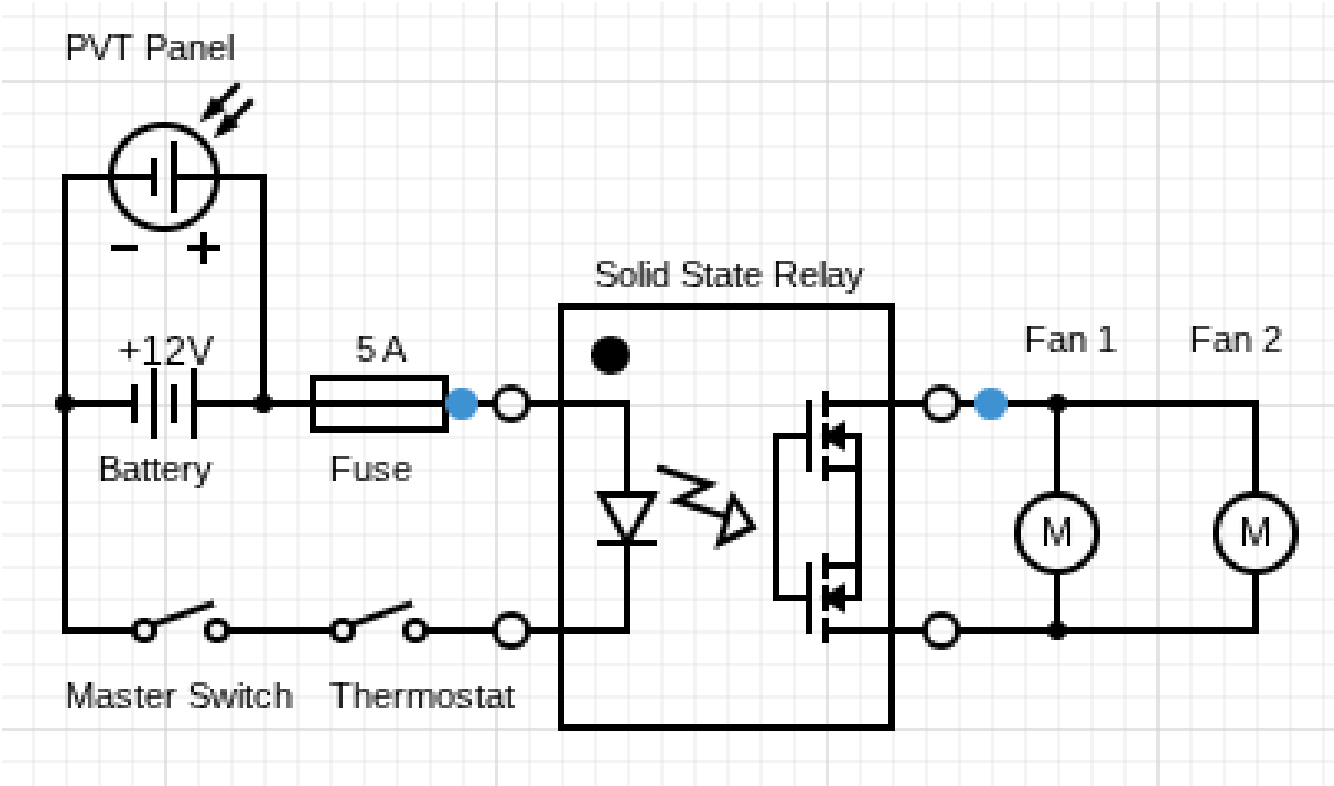


Figure 7: Circuit Diagram

Wind Load Calculations

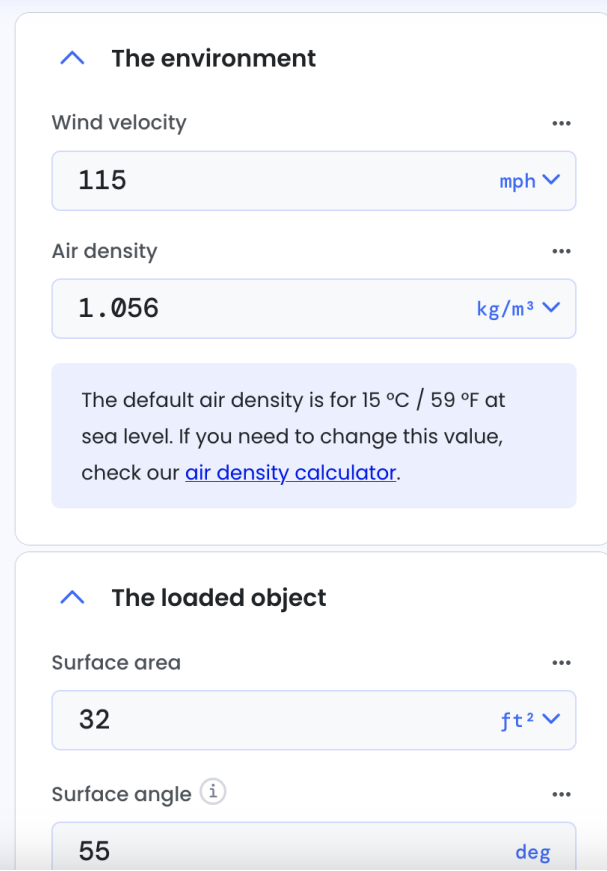


Figure 8: Environmental Wind Speed

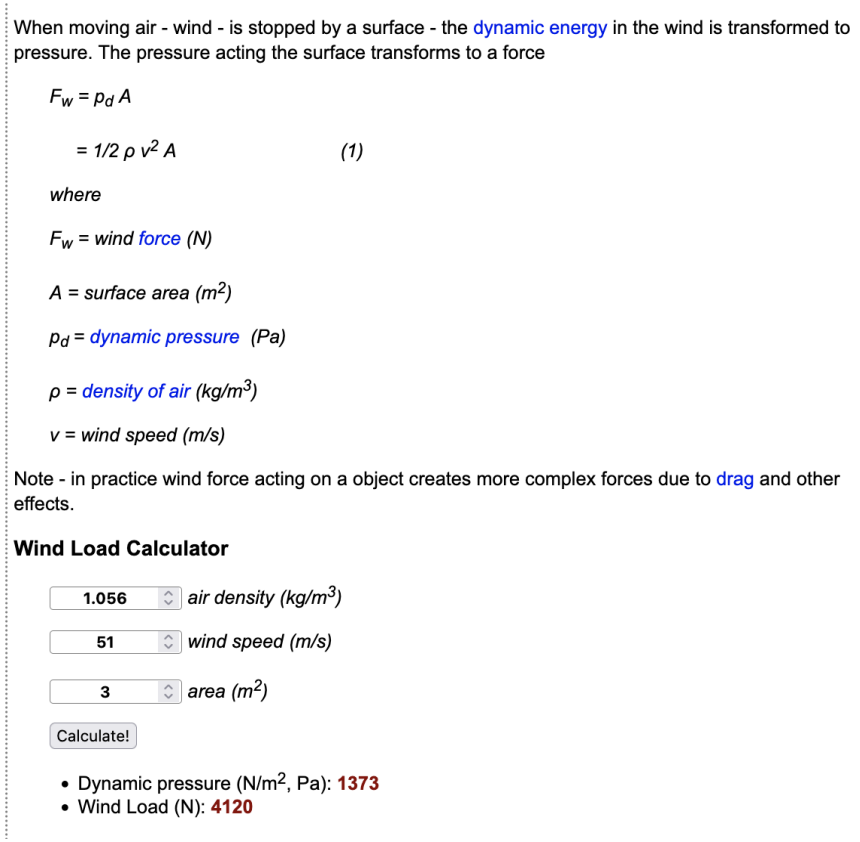


Figure 9: Wind Speed on Mounting System

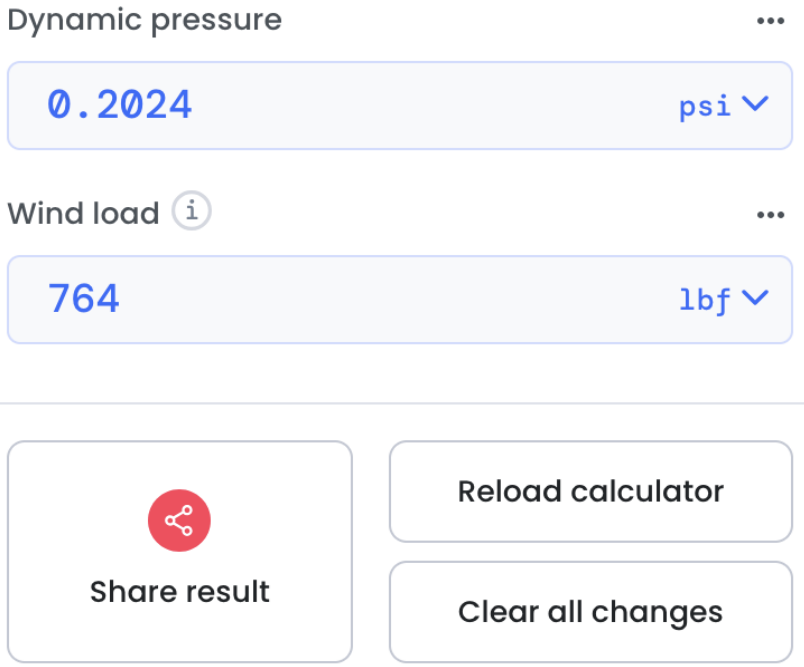


Figure 10: Wind Load

Purchasing Plan

Bill of Materials								
Name	Part Number	Quantity	Cost	Make/Buy	Primary Vendor	Manufacturer	Part Status	Total Cost
L Bracket	236244	8	3.37	Buy	The Home Depot	Superstrut	13-Oct	26.96
8x6x6 Wye	643092	1	17.98	Buy	The Home Depot	Master Flow	13-Oct	17.98
8 inch 90	148768	10	9.98	Buy	The Home Depot	Master Flow	Acquired	99.8
6 inch 90	148733	2	8.68	Buy	The Home Depot	Master Flow	Acquired	17.36
8 x 6 adapter	148857	4	14.28	Buy	The Home Depot	Master Flow	Acquired	57.12
6 inch duct	1013032134	1	59.98	Buy	The Home Depot	Master Flow	Acquired	59.98
8 inch duct	1013032129	1	67.98	Buy	The Home Depot	Master Flow	Acquired	67.98
Duct Insulation	1002502317	1	27.98	N/A	The Home Depot	Master Flow	Donated	0
10 x 4 to 6 register box	148962	2	12.49	Buy	The Home Depot	Master Flow	13-Oct	24.98
14 x 6 to 8 register box	351407	1	14.98	Buy	The Home Depot	Master Flow	13-Oct	14.98
10 x 4 vent	324411	2	13.98	Buy	The Home Depot	Master Flow	Acquired	27.96
14 x 6 vent	497808	1	14.98	Buy	The Home Depot	Master Flow	Acquired	14.98
Super Strut	863322	3	0	Buy	The Home Depot	Superstrut	Acquired	0
16 AWG Wire	B0CP1SGHK7	1	17.99	Buy	The Home Depot	NAOEVO	Acquired	17.99
Henry Roof Sealant	111806	1	10.98	Buy	The Home Depot	Henry	Acquired	10.98
8x8x4 Junction Box	1007810624	1	40.55	Buy	The Home Depot	Cantex	Acquired	40.55
4x8 1 inch insulation	624637	1	16.98	Buy	The Home Depot	R-Tech	Acquired	16.98
Duct Tape	1010742507	1	13.98	Buy	The Home Depot	Everbilt	Acquired	13.98
Roll Insulation	1003829264	1	11.97	Buy	The Home Depot	Everbilt	Acquired	11.97
Caulk	362622	1	11.58	Buy	The Home Depot	GE	Acquired	11.58
PVT panel	NA	1	0	Buy	RE Lab	NA	Donated	0
Solar air panel	NA	2	0	Buy	RE Lab	Thermix	Donated	0
Thermostat	B0DNDS8PKF	1	23.15	Buy	Amazon	Riseem	13-Oct	23.15
Conduit	B0B6VGJCNJ	1	47.48	Buy	Amazon	Ansgery	13-Oct	47.48
Mesh	B0D59XWYQZ	2	17.99	Buy	Amazon	ASHXFSH	13-Oct	35.98
Fuse	B07K4DV8PV	1	0.5	Buy	Amazon	SIXQIZML	13-Oct	0.5
Solid State Relay	39-G2R-1DC5-N	1	5.63	Buy	DigiKey	Omron Electronics	13-Oct	5.63
Fan	N/A	2	0	Buy	DigiKey	SUNON	Donated	0
On/Off Switch	Heavy Duty Togg	1	12.81	Buy	Ebay	Multiservices10	13-Oct	12.81
Drip Edge Flashing	894788	8	8.729	Buy			Acquired	69.83
GAF Roll Roofing	561381	9	133.4	Buy			Acquired	1200.31
Gutter Screws	9837688	1	4.9	Buy			Acquired	4.9
Roofing Nails	7668421	1	6.1	Buy			Acquired	6.1
SKYSHALO Pipe Flashing	335478041	4	38.97	Buy			Acquired	155.86
Gold Galv Superstrut	863322	2	41	Buy	Home Depot	Superstrut	Acquired	82
Gold Galv L Bracket	410246	8	3.764	Buy	Home Depot	Everbilt	Acquired	30.11
Gold Galv Sqr Wshr	410247	4	10.59	Buy	Home Depot	SuperMag	Acquired	42.36
1/2 x 5 Lag Screw	473052	10	9.211	Buy	Home Depot	Everbilt	Acquired	92.11
1/2 nylon cone nuts	215101	4	7.145	Buy	Home Depot	Superstrut	Acquired	28.58
1/2 lock wshr 50 pk	352937	1	25.79	Buy	Home Depot	Everbilt	Acquired	25.79
1/2 galv wshr	339843	1	24.56	Buy	Home Depot	Everbilt	Acquired	24.56
1/2 x 5/16 galv bolt	356297	4	9.048	Buy	Home Depot	Superstrut	Acquired	36.19
1/2 x 1-1/2 galv bolt	202997	8	1.303	Buy	Home Depot	Everbilt	Acquired	10.42
1/2 x 13 tpi galv bolt	538892	8	0.603	Buy	Home Depot	Everbilt	Acquired	4.82
Pivoting Strut Brkt	S-5481-E/E-Galv	2	55.97	Buy	Flastners Plus	Flex-Strut	Shipping	111.94
Total								2605.54
Total Budget Left								394.46

Figure 11: Bill of Materials

Manufacturing Plan

Table 1: Tentative Installation Schedule

Task	Task Lead	Status	Scheduled Date
PVT Panel Removal	Brendan	Completed on 9/14	9/22/2025
Applying Tarp to Roof	Brendan	Completed on 9/16	9/22/2025
Mounting System Assembly	Jacob	In Progress	10/19/2025
Refurbish Both Panels	Jacob	Completed on 10/13	10/13/2025
Install New Roof	Calvin	Completed on 10/7	10/7/2025
Building Modifications for Mounting	Brendan	In Progress	10/27/2025
Electrical Installation	Tyler	Not Started	11/03/2025
Building Modifications for Ducts	Calvin	Not Started	11/03/2025
Ductwork Installation	Joseph	Not Started	11/03/2025
Solar Air Panel Optimization	Tyler	In Progress	11/10/2025

Demonstration

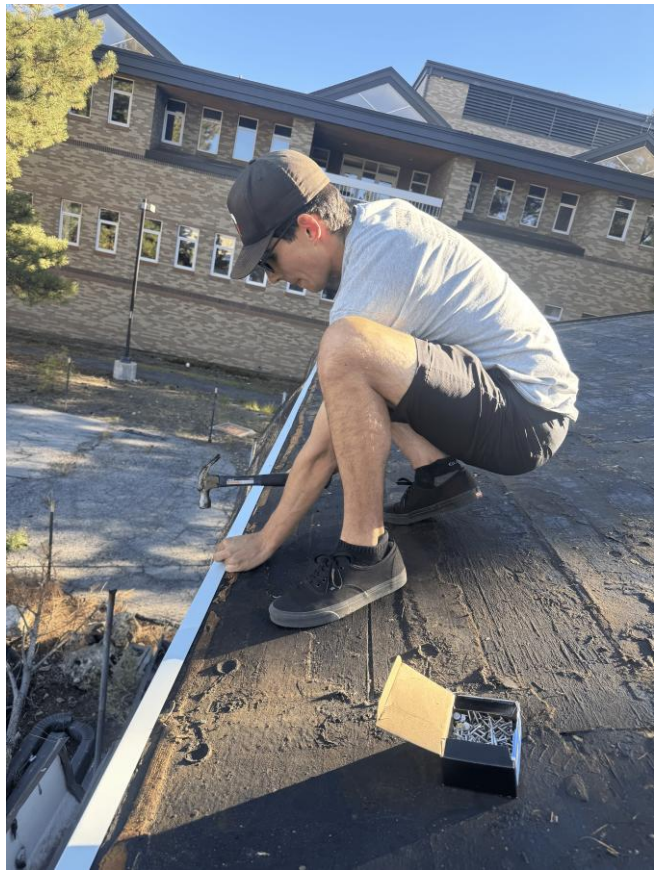


Figure 12: Applying Drip Edge Flashing

Figure 13: Installing Roofing Shingles

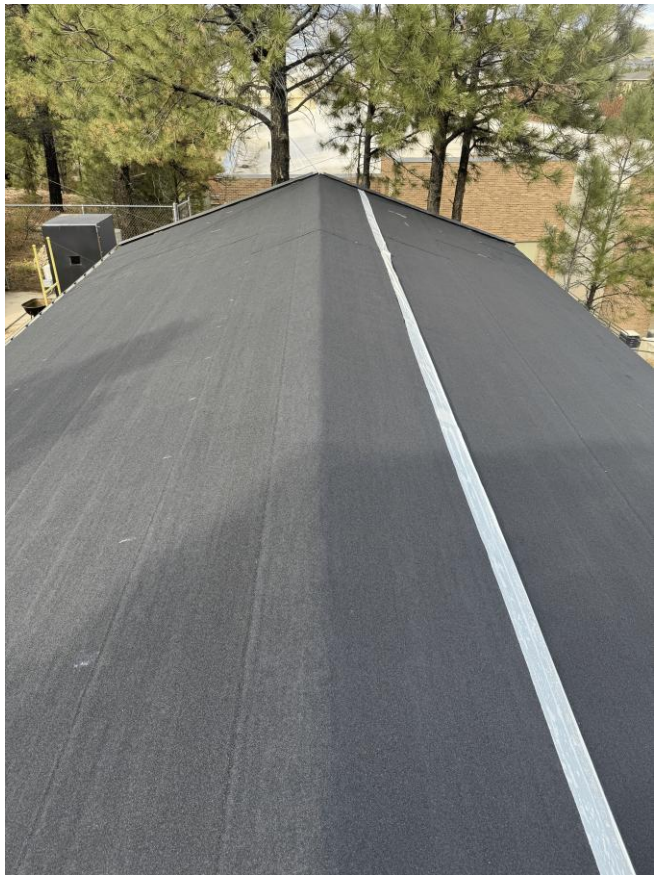


Figure 14: Finished Roofing

Demonstration

Figure 15: Refurbishing Second Solar Panel

Figure 16: Replacing Insulation

Figure 17: Applying Tape to Edges

Demonstration

Figure 18: Finished Solar Panels

Figure 19: Mounting Location

Gantt Chart

RE LAB Solar Heater

NAU Capstone Project FALL 2025

Project start: Mon, 8/25/2025

Display week: 1

Role and Tasks	ASSIGNED TO	PROGRESS	START	END
			8/25/25	12/12/25
Hardware Status Update (66% Build)	Everyone	100%	9/15/25	10/13/25
>Purchashed BOM	Calvin Schenkenberger	100%	9/21/25	10/6/25
>Both Solar Panels fully refurbished	Jacob and Brendan	100%	9/22/25	10/13/25
>Building / roof modifications installed (Drip edge)	Everyone	100%	9/28/25	10/13/25
>Install New Roof	Everyone	100%	9/28/25	10/13/25
>Circuit Diagram (Electrical Components)	Calvin and Brendan	100%	10/5/25	10/13/25
Peer Evaluation 2	Everyone	0%	10/1/25	10/20/25
UGRADS Registration	Everyone	0%	10/1/25	10/20/25
Draft of Poster	Everyone	0%	10/1/25	10/27/25
Finalized Testing Plan	Everyone	0%	10/14/25	10/27/25
Hardware Status Update (100% Build)	Everyone	0%	10/6/25	11/3/25
>Electrical Installation (Circuitry)	Tyler Hedgecock	0%	10/13/25	10/20/25
>Install Pipe Halo Flashing	Calvin and Brendan	0%	10/19/25	10/22/25
>Install unistrut guides	Jacob Apodaca	0%	10/14/25	10/19/25

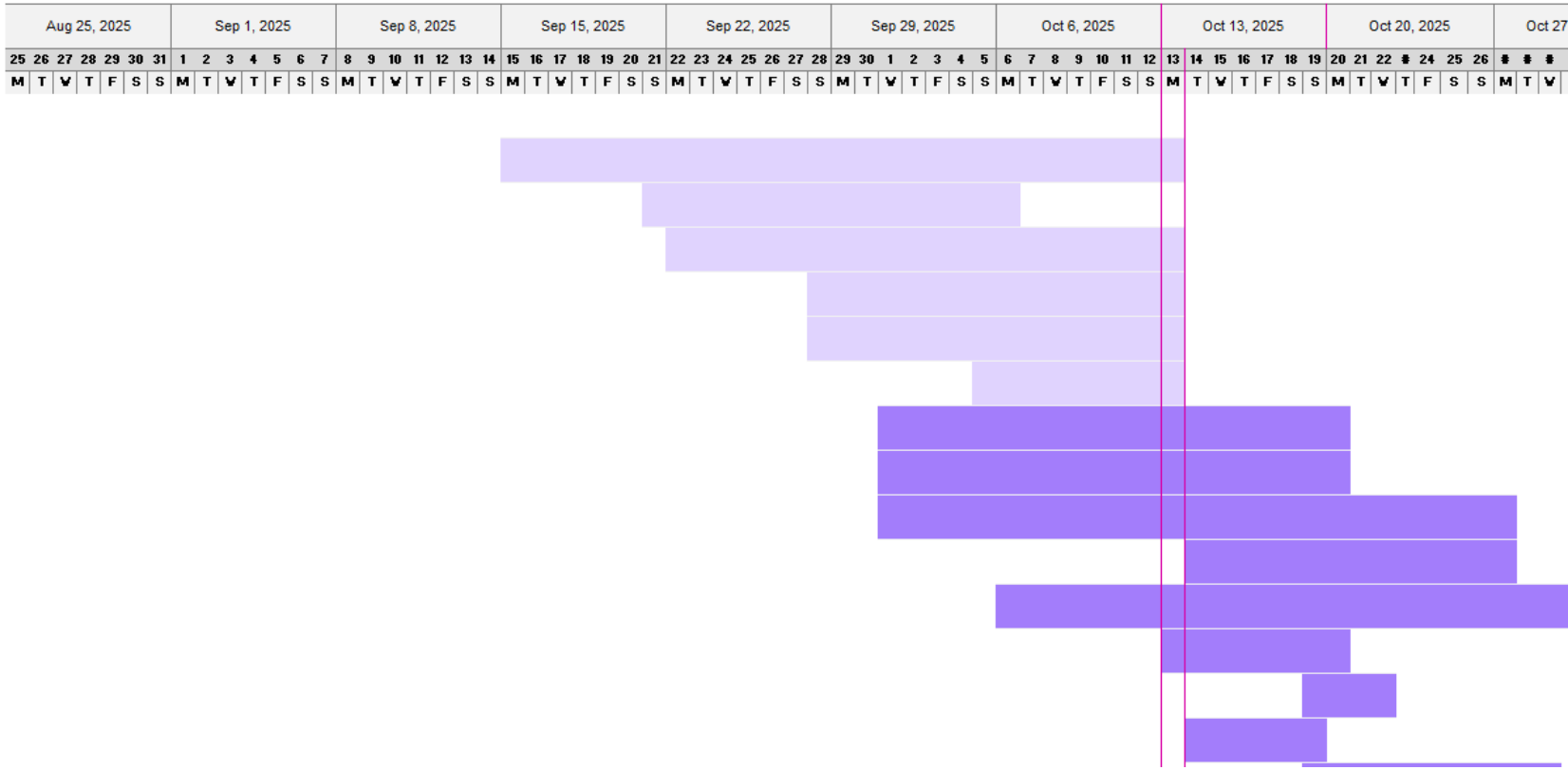


Figure 20: Up to Date Gantt Chart

Moving Forward

Manufacturing

- Mounting the solar air heaters
- Installing electrical
- Installing Ductwork

Testing

- Develop final testing plan
- Begin with initial testing

Figure 21: Renewable Energy Lab

Thank You
Questions?