

NAU Solar Capstone

Hardware Review 1

Drew Bandhauer

Cole Jennings

Drake Cleveland

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Project Sponsor: Jon Heitzinger

Faculty Advisor: Dr. Jennifer Wade

Instructor: Dr. Sarah Oman

The solar thermal capstone team has begun prototyping through a testing mount for the solar panel to acquire temperature, pressure, and flow rate readings through an individual panel. The panel will be mounted at a 30 degree angle with respect to horizontal. In designing this, the team determined the length of the side that would act as the hypotenuse, then applied cosine and sine functions to determine the leg lengths. Next, in conjunction with Home Depot's website and the determined dimensions, the team priced out the wooden frame of the mount; brackets and screws excluded. This back of the envelope calculation is depicted below in figure 1.

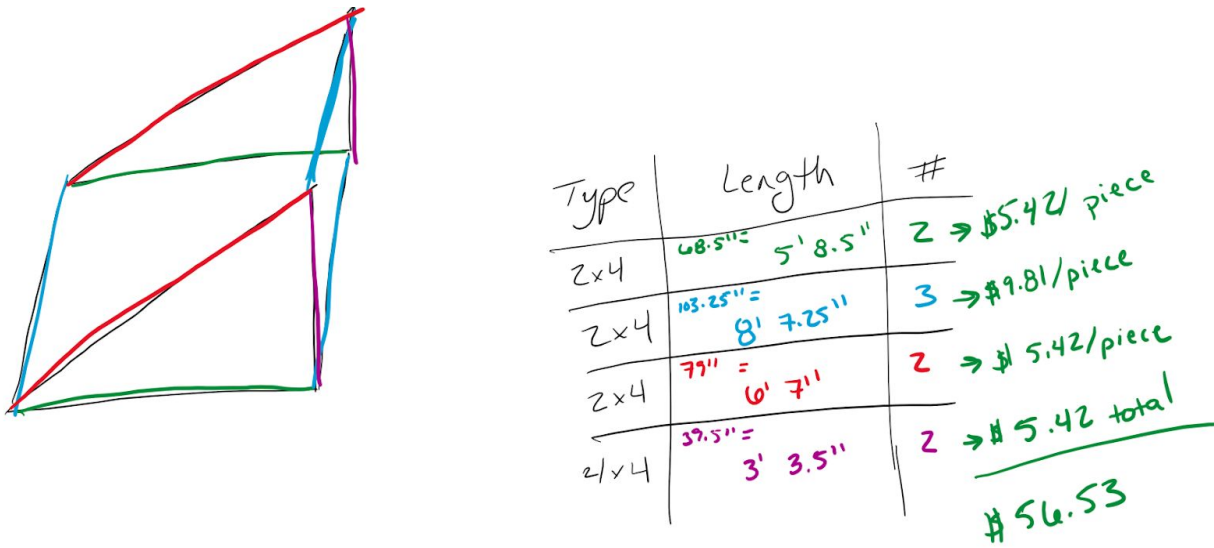


Figure 1: Back of the envelope pricing

After determining the wood requirements, the team planned out joints and mounting brackets, eventually deciding to use various Simpson ties and their accompanying screws. These added necessary structural integrity and allowed the frame to be constructed. The team encountered issues with craftsmanship throughout the construction process, but was able to overcome these issues through secondary supports and use of these simpson ties, eventually creating the frame depicted below in figure 2.



Figure 2: Completed mounting frame

The vertically-oriented 90 degree angles of the frame feature Simpson ties which join one 4x4 and two 2x4's each. The 2x4's are then further supported with additional wood to create a larger mounting face against the 4x4. This prevents twisting at these joints and gives the screws more wood to contact thus improving the overall functionality. On the other four 90 degree angles, different Simpson ties join 2x4's and 4x4's. These angles are not as heavily supported as they do not bear as much weight. Finally, to achieve the 30 and 60 degree angles of the panel itself, cross beams are attached to industrial door hinges to ensure the angles are met and adjustable, while providing a large enough face to mount the panels with room for error. The load-bearing joints are depicted below in figure 3, and the door hinge/non-load-bearing 90's are pictured in figure 4.



Figure 3: Load-bearing 90 degree angle joint



Figure 4: 30 degree angle joint and non-load-bearing 90 joint

Going forward, the team must install the solar panel to the mount, determine what fittings are needed for the water line, and install testing equipment. These steps have been halted by limited access to the solar panels and testing space, but as of Friday, September 4th, the team will gain access to the panel and testing space. Once the panel has been mounted and any adjustments have been made to ensure testing conditions are standardized, the team will begin outfitting the panel with fittings, testing equipment, and panels. Once this has been completed and the team has justified knowledge of the panel performance, the team will be able to finish the overall design of the solar system and submit the design specifications to the GreenFund for installation and budgeting. It is expected these final steps will be completed very quickly barring further wait time from external sources.