Prototype I and Customer Feedback

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1 Outline of Client Feedback

During our meeting with the client on the 22nd of February, 2023, we showed various potential designs for the greenhouse. The client had concerns about the interlock and being able to replicate it in any attempt to expand on the greenhouse. However, since the client decided that our design would be in her house, there was no need for it anymore. Additionally, the client would like dutch doors for ventilation, unfortunately upon research we found them to be expensive.

2 Prototype I and Tests

What:

Our first prototype involved the physical creation of a small scaled greenhouse with basic materials obtained from the dollar store. In deliverable E we planned to test a proof of concept for our greenhouse design and confirm our planned dimensions at a smaller scale. This prototype is critical for creating a base physical design from which we can study easier for identifying potential issues and new inventive ideas.

Why:

These dimensions won't be highly critical to the final, much larger, greenhouse design; however, we can analyze how the components of our greenhouse prototype operate at a smaller, more controlled scale to have an idea of how we can compensate for any issues at a larger scale (final size). The following is a picture of the prototype we developed.

After completing the prototype, we obtained a greater understanding of the relations between wooden members and the pressure of members on each other at converging points. The measurements are relatively similar to our planned dimensions (scaled down to an appropriate length due to the restrictions of our materials) and the greenhouse parts cooperate relatively well at this small scale. Although the wooden beams will be more difficult to work with at a larger scale (heavier, longer), this test still validated the cooperation of the planned measurements.

When:

The first prototype was completed on March 3rd, 2023. The timing of the prototype's creation was helpful for visualizing and developing a deeper understanding of our design before beginning construction on the actual greenhouse during the lab session the following week (week of March 6th).

3 Analysis of Critical Components

The greenhouse frame is made entirely of wood and consists of a hexagonal base along with rectangular walls and triangles for the roof section. The walls and roof sections will be made out of polyethylene sheeting and the structure will overall be held together by various screws and nails. Please note that there will not be a concrete base for easier relocation of the structure. Since using just wood and polyethylene sheeting will make the greenhouse fairly light weight and prone to being blown away by the wind, guy lines will be attached to each of the top vertexes, fixing the greenhouse to the ground and assuring stability.

4 Feedback from Potential Client

For feedback from a potential client, my (Jacob) dad has grown a great interest in the greenhouse project. My family recently has done renovations on our backyard and wanted to pursue a hobby of growing small crops like tomatoes and herbs to have with some meals. For this location, the greenhouse would be scaled down such that it can fit in the backyard with plenty of space for gardens. After presenting the design to my parents, they raised some concerns for the construction of the roof of the greenhouse. The roof of the greenhouse has multiple members meeting at one specific vertice; the angles between each member and roof need to be quite close to 60 degrees and the ends of each member will require specific cuts such that the members converge equally at the point. With the time slot given to us for the remainder of the term until design day, they mentioned that it might be difficult to finish in time. This feedback was a valuable reminder to form an extensive, detailed plan on how construction will be taking place. Before our first session constructing the greenhouse in the makerlab , we will discuss and document measurements (angles and lengths of wood members as well as the cuts for the ends of the wood members) so that we conserve our time in the lab and finish with a sturdy final structure.

5 Update to Target Specifications, Design, or BOM

TA FEEDBACK:

- The Bill of Materials requires a section that contains a comprehensive, informative description. For example, what type of wood are you using since different types of wood have different prices. The same applies to screws and nails. Also, think of materials to seal small cracks, for example, silicone sealant, to make the greenhouse waterproof.

Updated BOM:

NO	Product	Size	Use	Cost ($)
1	polyethylene sheeting	Around 215 m^2	Building structure	70$

2	Screws and Nails	About 100	Fastening	15$
3	Wood (For sides)	9ft (10 pieces)	Frame	290$
4	Door	6ft by 3ft Thickness: 3cm	Entrance	177.7$
5	Wood (For base)	4ft (7 pieces)	Base	180$
6	sealing glue tubes	300 ml each (3 pieces)	Framing, base	33 $
7	guy lines	4 m long each (6 pieces)	fastening structure to the ground	17.40 $

6 Test Plan for Prototype II

What:

We plan to develop a representation of the prototype in onShape where we can test new features brought to our attention after receiving more feedback from the client.

Why:

The client recommended that we implement windows or holes with trap doors on them in order to produce more airflow throughout the structure for the plants in the hydroponics system. This ventilation system is planned to be added in addition with the dutch door. Additionally, we wish to use this prototype to further test any reaction/support forces at the vertices, at the midpoint of longer sections (test the flex of the material), and at the base of the structure (where the weight of the entire structure is being held). Any concerning stability issues will be considered during the construction fo the greenhouse.

When:

During our next group meeting on Friday March 10th 2023 we will develop the prototype model in onshape.

7 References

1. https://www.walmart.ca/en/ip/6Pcs-Tent-Guy-Line-Ropes-Reflective-Cord-Tent-Nylon-Rope-with-Guy-Ropes-Tensir-Outdoor-Camping-Hiking-Awning-Tents-Yellow/44EB2YGD8JK7?skuId=1AJ2B3B0070P&offerId=2128A83A7A7A45BDA6FE4663ABE8B446
2. https://www.rona.ca/en/product/sika-sikabond-construction-adhesive-300-ml-interior-and-exterior-grey-106403-74165087?viewStore=41070
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