Deliverable H

Prototype 3 and Test Plan

GNG 1103 Lab Section 8

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1. Introduction

The team is working towards creating a final prototype prior to our submission for design day. As we received feedback from the client and professor, we made changes and improvements to make the grow wall more stable, accessible and as safe as possible. We will examine the prototype in different tests with accurate observations and calculations, as well as accounting for possible errors. Upon the examinations, we will be improving upon the overall structure to eliminate any and all issues, infractions or possible mistakes.

2. Prototyping

2.1. Prototype 2 Results

The decision to incorporate sliding shelves into our 2nd prototype led to the cutting of sockets into the main beam supports. While this was meant to increase the modularity and adaptability of the design, it ultimately had a negative impact on the structural integrity of the beam. This led to a series of changes in the design of the prototype to address these issues.

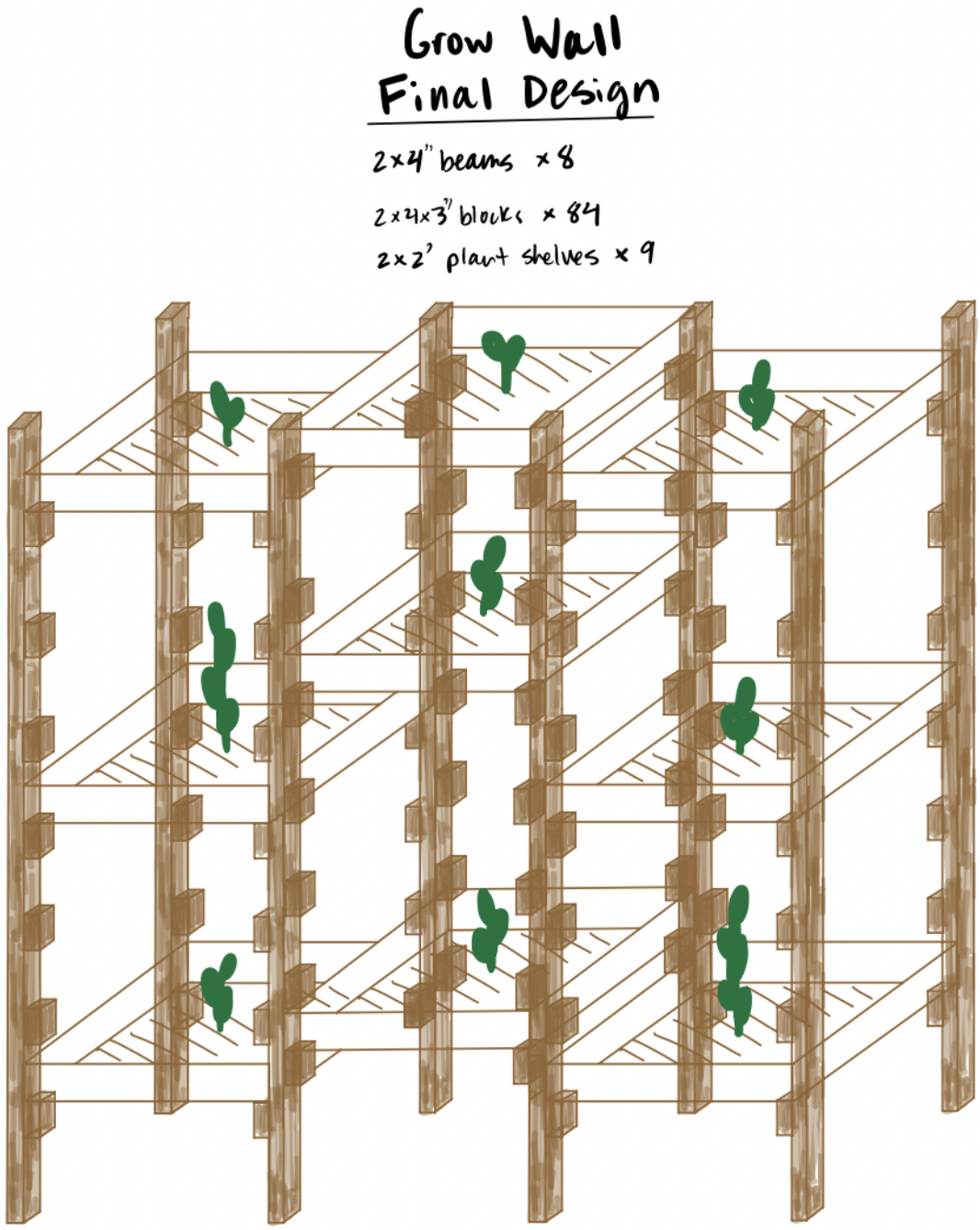
Firstly, it became apparent that the indents made to the main beam supports lowered the structural integrity of the beam, making the prototype unsecure. As a result, the fixed shelves that were originally in place had to be reinstalled to ensure stability and safety.

Secondly, the team had to reconsider the design of the prototype to find a solution that would allow for sliding shelves without compromising structural integrity. This involved extensive testing and modifications to the design until a solution was found.

Finally, the team learned a valuable lesson about the importance of careful consideration of the implications of design changes on the overall safety and functionality of a product. This experience highlighted the need for a thorough and rigorous testing process to ensure the integrity of a design before moving forward with production.

In the end, the changes made to the 2nd prototype resulted in a stronger and more secure product that still provided the desired modularity and adaptability.

2.2. Prototype 3 Sketch



2.3. Prototype Plan

To build the modular garden shelf with sliding boxes as shelves, start by cutting main supporting beams to the desired length and width. Cut smaller blocks of wood to the same width as the main beams and attach them evenly spaced apart. Cut wooden boxes to fit the size of the shelf and attach sliding hardware. Make sure the boxes slide smoothly on the blocks, and adjust the placement of the blocks if necessary. To increase the stability of the shelf, add brackets at the joints where the main beams meet.

The previous prototype had a similar design, but lacked the added stability of brackets. Adding brackets will ensure the shelf is more secure and durable.

3. Analysis and Feedback

3.1. Customer Feedback

Getting customer feedback is crucial for any business or project to succeed. However, there are situations where it is not possible to get feedback directly from customers. In this case, there were no more client meetings available, which made it difficult to obtain feedback. However, feedback was received from other professionals who were able to suggest changes between the last two prototypes.

The feedback received from these professionals was that the previous prototypes lacked stability and were prone to movement. Additionally, the shelves could be easily knocked over, which could potentially cause damage to the items stored on them. To address these issues, changes were made to the design of the shelf, which would make it more stable and durable.

One of the changes made was to stain the wood to prevent damage. Staining the wood helps to protect it from moisture, which can cause the wood to warp or rot over time. This would help to prolong the life of the shelf and make it more resistant to wear and tear.

While it is important to obtain customer feedback, feedback from other professionals can be valuable as well. Their expertise and experience can help to identify potential issues that may have been overlooked, and suggest solutions that can improve the final product. In this case, the feedback received was critical to improving the design of the shelf and ensuring that it met the needs of the customer.

3.2. Analysis

To address the feedback that the shelves were unstable and could be easily knocked over, we made several changes. First, we strengthened the frame of the shelves by using thicker and sturdier wood. We also added additional support brackets and reinforced the joints between the shelves and the frame. This made the overall structure more stable and less likely to wobble or tip over.

To address the concern about wood damage, we decided to stain the shelves. Staining provides a protective layer that helps prevent scratches, dents, and other types of damage to the wood. This not only increases the durability of the shelves but also enhances their aesthetic appeal.

In summary, we addressed the feedback by improving the stability of the shelves, adding additional support brackets, reinforcing the joints, and staining the wood to protect it from damage. These changes not only made the shelves more secure but also more visually appealing and long-lasting.

4. Task Plan

4. 1 Test Plan

Test ID	Test objective	Prototype and test method	Results to be recorded and use	Test duration and start date
1	Evaluate the overall strength capacity and solidity of the entire fully built system.	The prototype used will be the fully built completed model. The test method is similar to the previous strength tests performed, with the addition of stress tests performed. Along with applying forces along different sections of the shelves / posts or a combination of the 2, awkward force tests will be performed in which different forces are applied to unusual surfaces and angles on the final model.	The results to be recorded will be the successes / failures of the structure after these specific tests. Specifically things like any sorts of deformities, deflections or overall breakages throughout or after the tests are performed will be recorded. The results will be used to consider making potential changes in the major, minor, and combined components of the system based on their performances in the tests.	The test start date will be shortly after the construction of the fully scaled model. The test duration is 1.5 - 2 hours

2	Evaluate the complete functionality, appearance, and safety of the complete model.	The prototype used will be the fully built completed model. This test is essentially a culmination of previously performed tests with the exception of a few. This is including but not limited to; shelf slidability test, stillness / sturdiness test, smoothness / feel test, level test etc.	The results to be recorded will be connected to their respective tests. This means that for tests like the slidability test, the smoothness of the slide and the overall feel of the holding blocks will be recorded. Or for the level test, each faces' alignment will be recorded. These results will be used as a baseline for the minor adjustments that will be made to fully complete and perfect the prototype.	The test start date will be shortly after the construction of the fully scaled model. The test duration is no more than 3 days

4. 2 Mathematical Capacity

Following shown is the mathematics for the estimated load of the fully functional grow wall. Values with a star (*) are ones that have been calculated in previous deliverables.

DATA

Previous Mass Capacity for full frame* = 84.9504 kg

Newly estimated mass for hydroponics system = 15 kg

Estimated mass of added blocks = 0.46 kg

Estimated mass of added length frame = 6.01 kg

Estimated mass of added width frame = 1.91 kg

Safety / error adjustment = 1.30%

CALCULATIONS

Total mass of added blocks : 0.46 kg x 84 blocks = 38.64 kg

Total mass added length frame : 6.01 kg x 2 pieces = 12.01 kg

Total mass of added width frame : 1.91 x 2 pieces = 3.82 kg

Total estimated mass on frame subsystem :

(84.9504 kg + 15 kg + 12.01 kg + 3.82kg) x 1.40% safety = 162.09256 kg

- We can therefore conclude an error/adjustment included, estimated load of at most 162.09 kg on our final prototype.

5. Transfer of Knowledge

We have been able to connect all of our experiences as well as our full results to begin construction on our final phase of production: Our 3rd finalized prototype. Once again we've been able to use our experiences to boost our skills learned both in and out of this course. With our knowledge on our entire history of trial and error, full feedback, and these skills, we believe that we have been able to gather all these factors and create the most fitting final prototype possible.

6. Wrike Plan

Here is the Wrike link for this week's group work:
https://www.wrike.com/frontend/ganttchart/index.html?snapshotId=fZeb7Odiw7gcgOzpUPlHmpTay3hBauDc%7CIE2DSNZVHA2DELSTGIYA

7. Conclusion

In conclusion, the team is working towards producing the most desired and valued product for our client. We will be building the final prototype with the fact in mind that this will be the final design and will be the most accurate concept up to date. The team will focus on perfecting the design and working on the final few workings to finalize the concept.