Deliverable D-Conceptual Design

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Professor Muslim Majeed

Presented by :

Aleksandar Plackoski, 300074474

Joshua Coutinho, 300117908

Carter Ingalls, 300114073

Adrian Fournier, 300062441

Xinyan Jiang, 300049676

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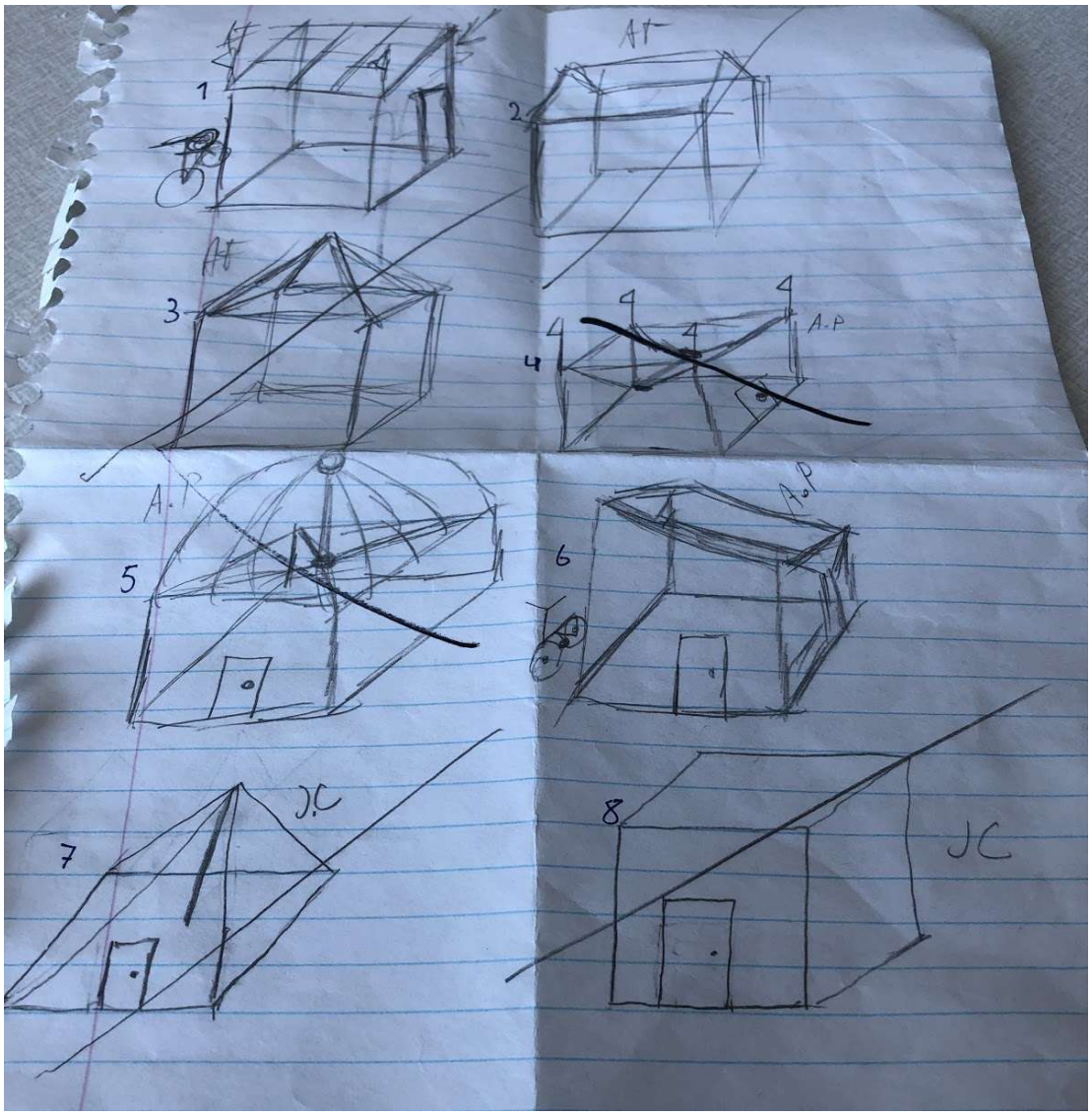
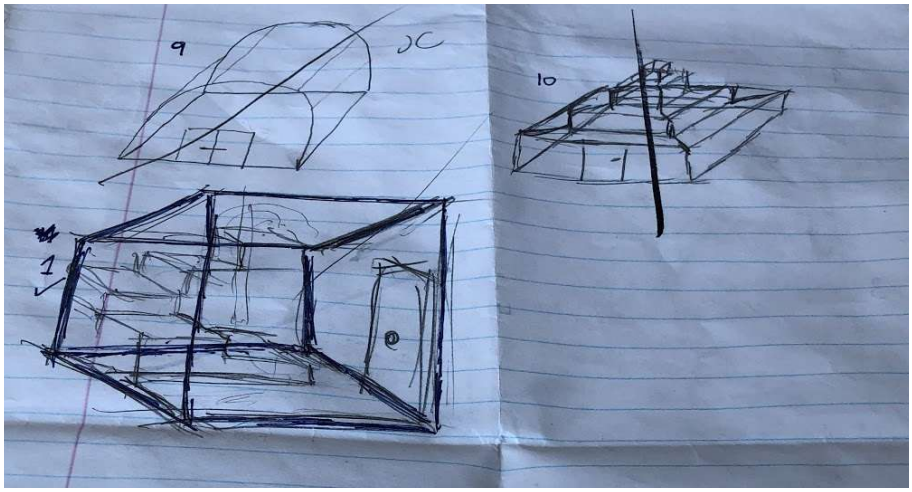
Introduction

The purpose of this document is to show the ideation and selection process used by our group to decide on a greenhouse concept design. Using the benchmarking performed in previous submissions and the identified needs, the proposed designs are to be ranked and the top concepts being further analyzed.

Brainstorming Results



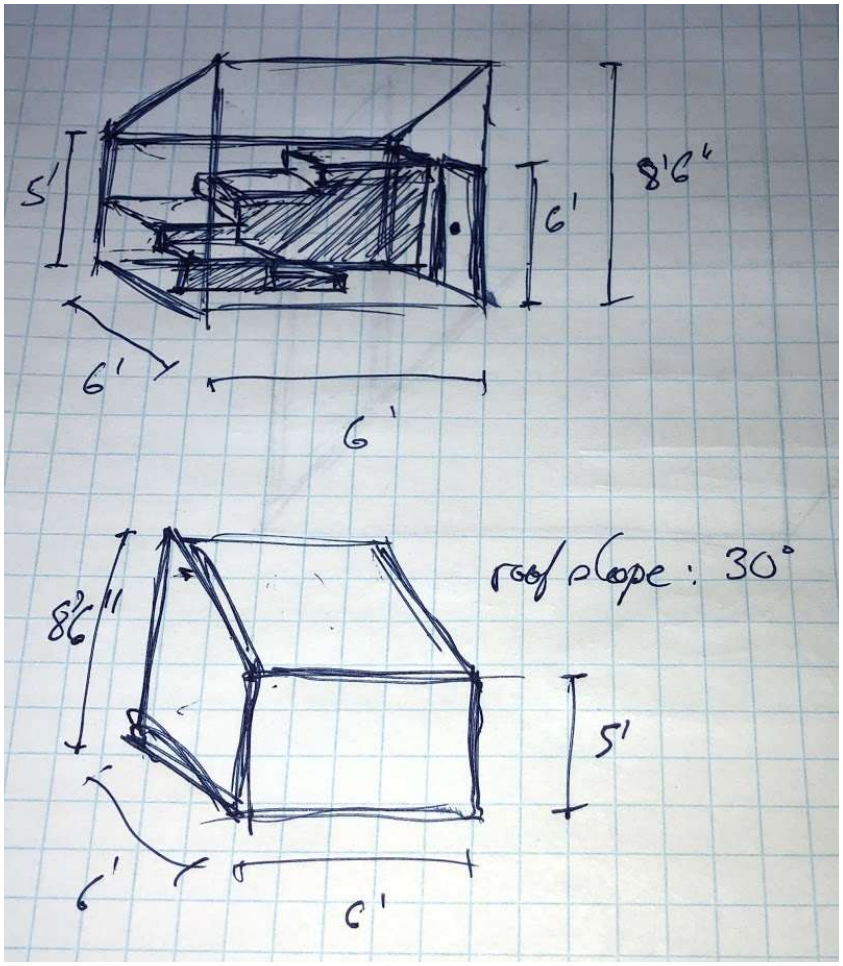


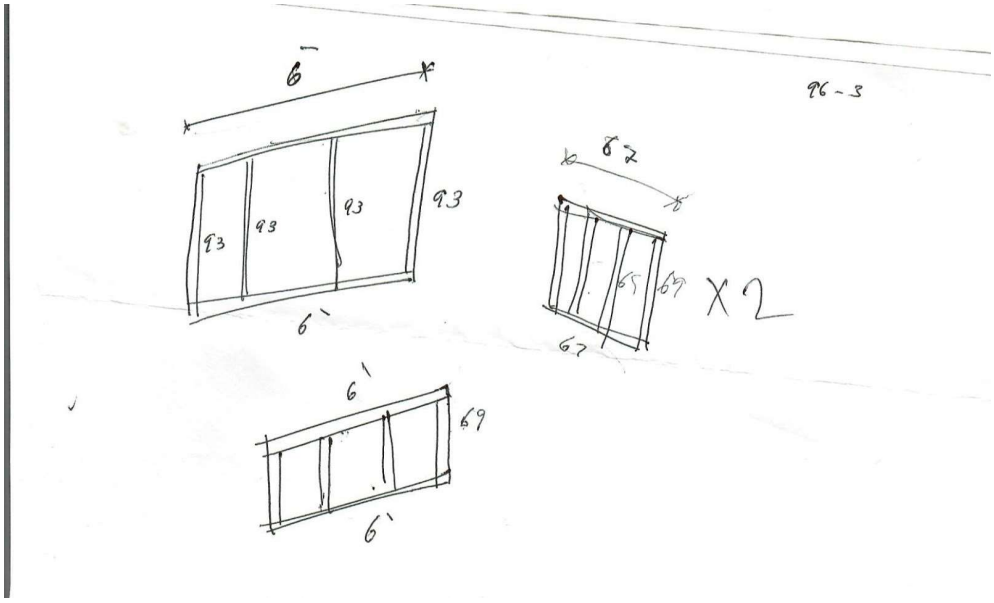
1) A 6x6 box with a slanted roof for water collection.
2) A 6x6 base that leads to a triangular shaped roof similar to a house.
3) A 6x6 box with a pyramid on top.
4) A 6x6 castle shaped box with a concave roof for collecting water.
5) A 6x6 box shape with a dome roof
6) A 6x6 box with a slanted roof for water collection.
7) A 6x6 base with a tent shape enclosure
8) A 6x6 cube
9) A 6x6 base with a cylindrical farm shed enclosure.
10) A 6x6 square base pyramid with gutters at each level

Analysis

<u>Greenhouse with Slanted Roof and Bike</u>

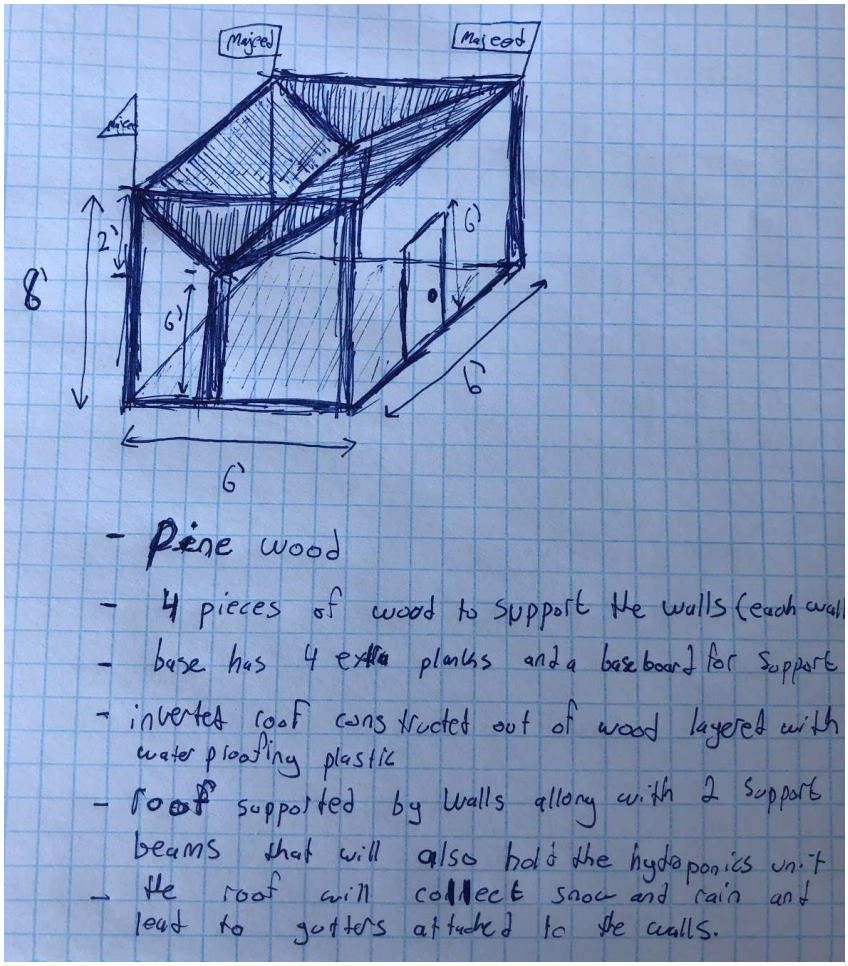
This greenhouse sits on a 6’ X 6’ base and will include three walls that are 6’ x 6’, the fourth wall being 6’ x 8’, and the door being around 2’6” x 6’8”. The plastic roof will be slanted so rain and snow can be collected in the gutters and stored. This idea is reasonably compact and portable, but also very useful because the water collection will be maximized. Although the recollection will be maximized with only one gutter collecting all the water, this also can lead to some problems. One problem is that since only one gutter is being used, heavy rainfall and precipitation can cause an overflow, and especially with snow, the gutter could fall and be a danger to anybody nearby. Additionally, snow can fall off the other side and block the door, or fall onto someone else, which could be another safety hazard. The following images are of dimensions for this greenhouse.


5'
6'
8'6"
6'
6'
8'6"
11
roof slope: 30°
5'
6'
6'


6'
93
93
93
93
6'
8'2
65
69
67
X 2
6'
69
6'

Castle Greenhouse with Inverted Roof and Flags

This greenhouse design uses an intricate design with a complex roofing system that is designed to collect water in the center of the roof and feed directly to the hydroponic unit. Collecting the water in the center of the roof would eliminate the need to use any gutter. However, one flaw with this design is in the winter the snow would build up on the roof, as it would have nowhere to run off, possibly causing damage to the structure. One possible solution developed that could eliminate that possibility is adding a structural support at each edge of the roof at the vertex of the roof but testing would need to be done to confirm that it would eliminate the problem. Another possible flaw could be if the roof holds water on the same spot for a prolonged period of time it is very likely the roof could develop a leak and the wood could be damaged. This greenhouse will sit on 6'x 6' base and would have four walls supporting the structure that would measure 6'x 8' along the sides, with the roof coming down at 6' at the center and 6'x 8' along the front and back, with a door that measures 6' tall at the front. The following image is of dimensions for this greenhouse.



Conclusion

In the end, our group decided to go with the greenhouse design that had the slanted roof for water collection. We chose to go with this design for a number of reasons, mainly because of its simplistic design, structural integrity and the ease of construction. Going forward ,we will be in close contact with our hydroponics team to further our design and continue the construction. The selected design includes plans for cascading plant platforms to be used by the hydroponic system, but this can be modified to suit the exact specifications of the hydroponic design.