Deliverable H - Prototype III and Customer Feedback

GNG 1103 – Engineering Design

Faculty of Engineering – University of Ottawa

Team 7

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Introduction

Construction team 7 has been tasked to design and develop a greenhouse to grow vegetables year round for an aboriginal community in Le Domaine off of Barriere Lake. Previously, we have defined the problem and have made a working prototype 1 using popsicle sticks and a prototype 2 using the AutoCad software. Throughout the semester, we have interacted with our client as well as the Professor to get clear feedback on what needs improvement and how we can achieve a better final prototype based on what we already have. Since the initial problem definition as well as setting up a constructive project plan, we have moved forward creating a working final prototype 3 which is the full scale greenhouse shed. This final prototype include all the components and adjustment we have made throughout the semester and have taken into consideration all previous mistakes. Below are pictures of the physical model and explanation of the steps taken to make sure all the requirement are met.

Prototype 3

Currently Prototype 3 is being constructed with the wooden structural body being built so far. The project still requires to be insulated by covering the the walls and roof with polyethylene sheets corrugated roofing panel. Images of the current construction of prototype 3 are shown below.


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Prototype Test Plan

What:

Prototype 3 is a the final stage product based on the continuation of all the previous prototypes. It is a physical comprehensive prototype. Designed to be a physical working model made in the structure lab using wood, screws and nail gun to put together. The size of this prototype will be 6 ft x 4 ft with a height going up to 6 ft. This prototype will be fully functional with insulated walls, working door, and room for hydroponic system to grow vegetables.

From prototype 1 that confirmed that the slanted roof is effective at having snow not accumulate on the roof by sliding off. This slanted roof has remained in the design for this final prototype.

From prototype 2 that confirmed the dimensions of the design. The larger design change that was made in prototype 2 has carried over to this prototype to effectively house the hydroponic design inside.

Why:

Prototype 3 is designed to test that the greenhouse design will be completely functional. It is design to test and prove the theory that the greenhouse will be able to retain heat inside to grow vegetables throughout the year regardless of the seasonal temperatures outside.

If this prototype is successful and wins the competition, a large scale greenhouse will be designed with a larger size to grow more vegetables for a realistic output of food for a greenhouse.

When:

Prototype 3 is designed in the last stage of building phase. This makes sense as we have had two prototypes before to base on and make adjustments from our previous discoveries of any flaws or mistakes. We have until design day on November 26th to finish up the last prototype and with our schedule the deadline it should be met with no issues.

Stopping criteria:

The stopping criteria for the greenhouse is being able to successfully grow crops inside the structure. This includes being able to have room to house the hydroponic design developed by the hydroponic team.

Another criteria and most important one is to be able to maintain proper temperatures for the crops inside the greenhouse. Generally crops require a temperature of 21 to 23 degrees celsius. Due to the design with insulating material and absorbing sunlight that this temperature will be achieved. When complete the greenhouse will be tested outdoors in the winter climate verify the internal temperatures that the greenhouse can achieve.

If prototype 3 is successful at growing crops inside then a large scale final product will be possible with the same general design.

Feedback

Our client liked the direction we are going on finishing this last prototype. Furthermore, TA and lab coordinators have given us their full support and approval that the build for the last prototype is going well. One area that the lab coordinator had a discussion with us was regarding the design of the roof. Since we have decided to only slant the roof on one side inside of having it like a normal roof with a triangle shaped frame, he wanted to make sure we were okay with this and give us constructive suggestions are how we should approach the build. Overall, the build is being positively reviewed by everyone who has seen it and we are confident that the finish product will meet the client's standard.

Conclusion

Currently the construction of prototype 3 is going very well. With knowledge of theory of the design and confirmation from the previous prototypes, everything is going according to plan with the final prototype. We are confident that the design of the greenhouse will be a success and are looking forward to its completion.