Project Deliverable F – Prototype I and Customer Feedback

GNG1103

Group 13

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Introduction:

This document is the first document covering one of the many iterations of prototypes that our team will be doing. Here we will outline our plan for this specific prototype, the objectives that we hope to be met with it, and the stopping criteria for these tests. We will also go over photographs of the first prototype with descriptions for needed detail and clarification. One section will analyze the subsystems of the project. This analysis will cover what the main systems of our design are, their intended use, materials, and needed research or tests in order to ensure complete functionality. Finally, feedback from the previous meeting with the client is provided in order to keep track of the evolution of our design, and some of the problems we may need to address.

Prototype Pictures and Description:

For the prototype we constructed a 3-D model of one section of our heated sidewalk. Popsicle sticks were used to build the base of the model. The popsicle sticks represent where the rubber material would be. We used duct tape that was twisted into a rope and this represents the heater tape and the extension cord. We glued on a fabric top that is very similar to the fabric top that we will have one the real product.

Top View:



Bottom View:



Prototyping Test Plan:

**Testing Purpose:**

The feature of the sidewalk that we wanted to test was the traction of the sidewalk when there is ice frozen to the fabric top. For this we froze water to the fabric and then rubber the bottom of a boot on them to see what the traction was like.

**Testing Procedure:**

To do this test there were a few steps:

1. We put the mat under cold water.



1. We put the mat in the freezer.



1. We rubbed a boot over the fabric top of the mat to gauge the level of traction.



**Testing Results:**

Even with water frozen to the fabric top of the mat the boot had a lot of traction. This shows that the test was successful, and that the fabric top will work well for our final product. Another major goal of this prototype is to show the client the proof of design in order to receive feedback about the design. The testing on this prototype was deemed successful once sufficient traction was felt by the person walking on it. We wanted minimal mat movement and significant traction.

Critical Systems Analysis:

There are two main parts in our design, one is the top mat, and one is the heated system. For the top part, the rug that we have is Concord Precut Rugs' surface. It makes of polyester, which has a rough surface. It enables to cause friction forces on the surface. The force provides safe protection for people to walk with; it reduces the risk of people falling. Because the surface of the sidewalk will be smooth when the snow gets melting. Also, this mat's material can absorb a certain amount of melted snow, which decreases the risk of water exist on the surface. About the heated system, the power that we applied is electric power to support heated energy. Because the silver wire connects to the carbon heater tape, as the current passes through the system, the tape creates heat power. So, the heated energy will spread to the top surface.

The heated energy was created by flowing current from wires, and the system worked under Canada standard voltage with GFCI. This component can protect our system, to minimize system failures. The total energy will be measure from power to convert into energy. Besides, the heated energy created shows as the ability to melt the snow. We can observe the process of snow falling on the surface to get how is the heated system works efficiently. Because melting the snow requires energy, it relates to the mass of the snow, the hot melt value of snow, and the changing temperature. We need to measure these variables during the process, to get the result that we want.

Feedback and Comments:

The client liked that the project is very simple.

The client encouraged us to keep our idea of the heating element wire idea.

The client wanted thought to be put into theft prevention.

The client encouraged us to ensure that the mat will be able to be used by people in wheelchairs.

The client wanted to ensure that the mat would be designed in such a way that water and melted snow would not stay on the mat in case of a flash freeze.

The client was very happy that we had a safety measure in place to avoid potential hazards.

Conclusion:

In conclusion, we are on the right track with the project. The client liked most of our ideas for the initial design and we will work on the things that he suggested. The prototype test went well and proved that the fabric top will have good traction even when frozen. All of our materials required for the final product have been approved by the TA’s so we will soon purchase those and start working on the final product prototypes including the main heating element system.

Wrike:

<https://www.wrike.com/workspace.htm?wr=16&acc=4350701#path=folder&id=624871504&c=list&vid=17380316&p=624526941&a=4350701&t=653607376&so=5&bso=5&sd=0&st=space-624526941>

