Specification of Solution

Introduction

The purpose of this section is to discuss and explain the various aspects of the final solution that our team has selected, which can be seen in more detail in section 4. This includes a detailed description of the hydroponic system design, the costs of the project, instructions for implementation and use of our model, and results of the project. The detailed description will include a CAD drawing and a detailed description of our project. The cost section will explain our costs for the design, implementation, and maintenance needed for our design. The implementation section will explain how to use and maintain The Drip Hydroponics System. This section will describe the results that have been concluded from current testing, and the overall functionality of the model.

Design Description

In section 4 we used team logic and the Delphi method to select a final design. Originally after the discussion PWW chose to build an aeroponic system, but after further research realized that the aeroponic system did not meet the criteria of our client. An aeroponic system would be to unreliable and require more energy than desired.   The final decision for a hydroponic system was based on the on the system will be reliable, use very little electricity, and use a moderate amount of water.

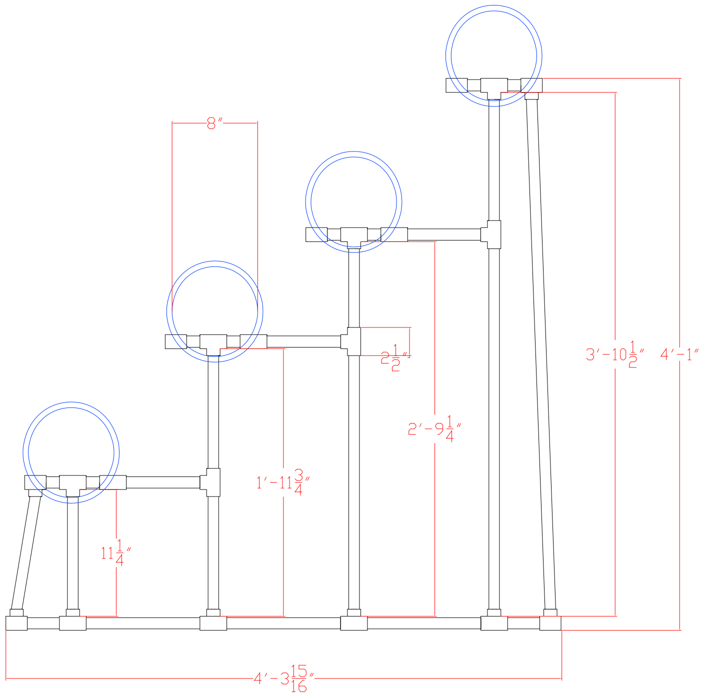

Figure 13, AutoCAD Side view of Drip Hydroponic System

Our final solution scene in figure 13, is named, “The Drip Hydroponic System.” This system’s design that will use the least amount of resources in order to produces the largest amount of vegetables or fruits. The Drip Hydroponic System is a fully functional way to grow vegetables and fruits without soil and with minimal human interaction. The hydroponic system contains a pump, nutrient solution, solution storage barrel, nutrient delivery hoses, nutrient catchment system, solution delivery rings, 8 inch PVC pipe, ½ inch PVC pipe, a 1 inch PVC pipe support structure, and nets to hold the plants in place. We chose to use PVC pipe for most of the structure do to the fact that it is much lighter and therefore easier to ship to New York, yet still is durable. In addition the PVC will be able to withstand the corrosive chemicals that are found in most common fertilizers.

Figure 14: A front view of solution tank draining to plants.

As scene in Figure 14, the entire support structure for our system is completely constructed out of 1 inch PVC pipe, hemp rope, and connecting PVC pieces. The project's entire support structure is spray painted in order to make all the mismatching colored pieces of PVC pipe look uniform, as seen in Figure 15. Sitting on top of the support structure is the eight-inch diameter PVC pipes that have a total of sixteen holes cut in the top for the plants to sit in. The plant's roots sit inside of a perlite and marble mixture inside of each basket.

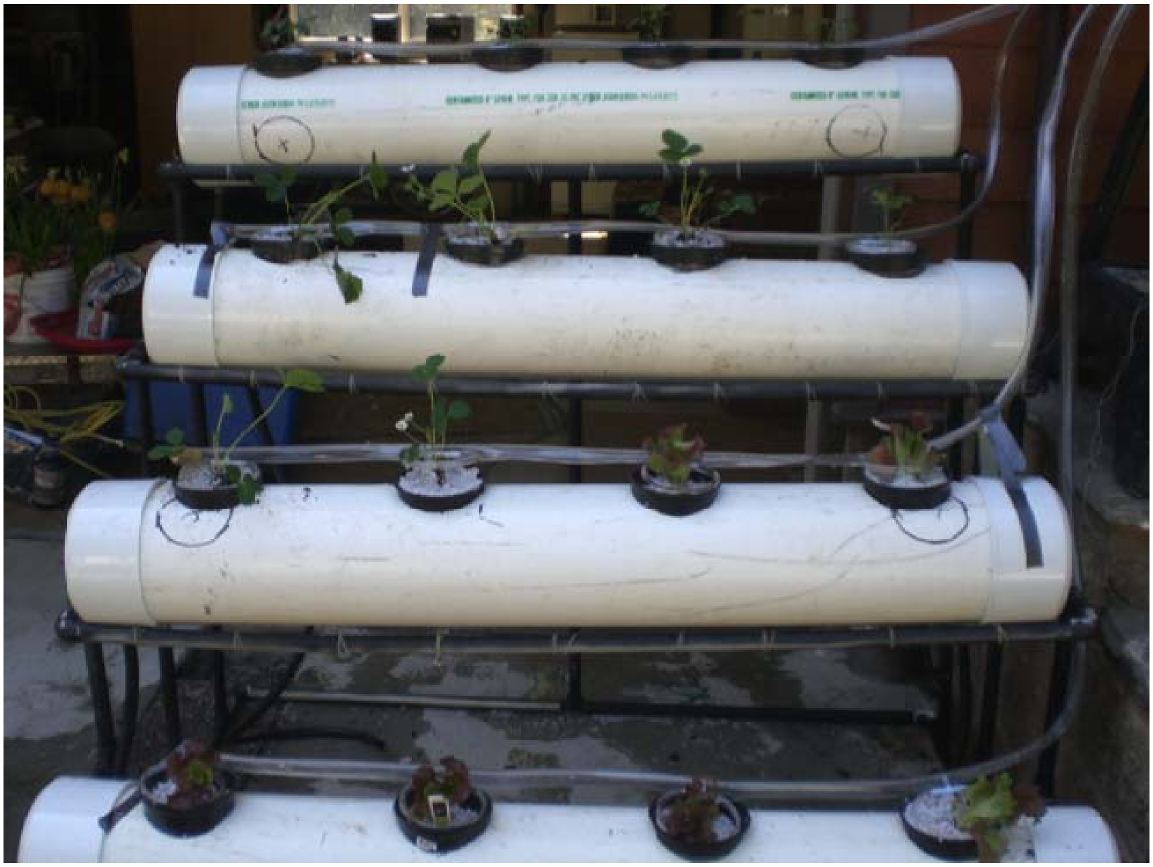

Figure 15: View showing 1” PVC structure and 8” plant housing.

Design’s Function

As scene in Figure 14, the entire system starts in the solution barrel that is planned to be mounted 15 feet above the project. The barrel contains the nutrient solution and an aerator. The aerator is a bubbling mechanism that supplies the nutrient solution with enough dissolved oxygen for the plants to live. Once the solution is aerated the release valve, Figure 16, is opened at the bottom of the barrel. Connected to the release valve of the tank is a four-way splitter, Figure 17. This splitter makes it possible for each individual row to receive nutrient without affecting the other rows. After the four-way splitter there is a short section of clear tubing attached to it. After a six inch section of tubing each hose has another valve so each row will have an individually controlled flow. Once the solution flows down the 15 feet of tubing and fills up the clear hose, Figure 15, the hose will become pressurized. Once the hose becomes pressurized the solution will fill up the “halos” that are placed around each plant. Once the halos fill up there is three holes drilled in the bottom of each halo, which will let water drip into the baskets as shown in Figure 18. Once the perlite is sufficiently saturated the excess nutrient solution will flow into the 8” PVC pipe. Once inside of each tube, due to a slate grade, the solution will drain to one side of the tube. Once on the left or right side of the tubes the solution will drain through drains that are on the bottom of each 8” pipe. The excess water collected is drained into a separate barrel located at the bottom of the system were the solution can be pumped up to the top barrel to be reused again.

Figure 16: Release valve.

Figure 17: Four-way hose splitter attached to 55-gallon drum.

Figure 18: Halo ring surrounding a lettuce plant.