# Deliverable H – Prototype III and Customer Feedback

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## Irrigation system

#### Prototype III

For this week's deliverable, the hydroponics team constructed a physical comprehensive prototype to test the strength of the pump, which we purchased in accordance with the previous deliverable's theoretical calculations of required pressure. We also finalized and built the mounting solution of the PVC pipes onto the construction team's final structure in preparation for design day.

#### **Testing Plan**

Test	Test Objective (Why)	Description of Prototype used and of	Description of Results Recorded	Progress
ID		Basic Test Method (What)	and how these results were	
			used (How)	
1	Check if the pump attachment is compatible with dimensions and joining types of the rest of the system	Attach the fittings together (½" female hose /½" male threaded to ½" female threaded to ½" female slip connect) and use them to join the PVC and the pump. Submerge pump into bucket of water and turn it on. Check for leaks between fittings.	All connections were compatible with one another, meaning we could use these parts to join our pump to the rest of the pipe system.	Passed
2	Check if the water pressure at the highest level and longest trajectory has a high enough flow rate.	Connect one of the 10 ft PVC pipes to the pump via the fittings mentioned above. Cut a 2.5 ft length of ¼" polyethylene tubing and perforate 28 holes (as evenly spaced as possible). Drill a ¼" hole at the 5ft point of the PVC pipe and insert the ¼" poly tube. Hold finger at the end of the poly tube and turn on the pipe to feel water pressure.	The flow rate of the water at the farthest end of the system was more than sufficient. There are some concerns regarding possibly too strong of a pump (could be damaging to the system). We may have to determine a solution to mediate water flow.	Passed – New information
3	Check if the PVC piping system is structurally sound/check the stability of our mounting solution via pipe clamps.	Once all the PVC pipes have been joined with elbow fittings, tee fittings and couplings (slip connection with PVC cement) and secured to the construction team's foundation with pipe clamps, apply moderate force to different points on the shelf structure and verify stability of pipe connections. Shake the structure as well.	The pipe system held itself together despite agitation of its supporting foundation. This means it will be relatively durable in a child dominated environment.	Passed
4	Check if the polyethylene tubing is compatible with the ¼" barbed/ ½" female threaded adapter, which connects to the ½" male threaded/1/2" female slip connection fitting and then to the PVC.	Join the 3 adapters and then use the piece to connect a 2.5ft polyethylene tube (¼" outer diameter) to the PVC pipe system.	The <sup>1</sup> / <sub>4</sub> " barbed end was not compatible with our polyethylene pipe, because we tried to connect two male ends of the same size (so one cannot overlap the other). This indicated to us that we must replace the fitting with a <sup>1</sup> / <sub>4</sub> " compression fitting (female fit for poly tubing).	Failed - Solution found.
5	Check if the whole system is watertight	Once all the perforated polyethylene tubes have been installed with the	If there are no leaks and if the structure holds, we may proceed	To be Completed

	(no leaks)	correct connections and the shelves have been coated with tarp, turn on the pump and let water run through the entire hydroponic system. Inspect every joint for leaks and any other structural malfunctions.	with the current design. If there are leaks, we must use sealant and/or Teflon tape to fix any issues. We may need to investigate other fitting solutions as well.	
6	Check that the water distribution to the surface of the shelves is relatively even	Once all the perforated polyethylene tubes have been installed with the correct connections and the shelves have been coated with tarp, cover the tarp surface with brown paper and turn on the pump to see how quickly and strongly different sections of the paper are being dampened.	If the water pressure is much stronger at the closer ends of the pipes and on the lower shelf levels, we may need to use stopper valves to partially suppress water flow in certain sections. Otherwise, we may proceed with the current solution.	To be Completed

### Our next steps

The final step of our project is to add the perforated tubing section. This will include the connection of the already perforated tubes to the PVC via compression fittings and the fixing of the tubes along the sides of the pots. We will also be installing stopper valves at the start of each tube once the original tubes split into three paths.



## Grow lights

#### Testing plan

Test	Test Objective (Why)	Description of Prototype used and of Basic	Description of Results to be	Progress
ID		Test Method (What)	Recorded and how these results will	
			be used (How)	
1	Check if the Govee lights	Cut the Govee lights and plug them in to see	If they work properly then we can	Completed
	can be cut and still work	if they light up and still have all the feature or	proceed with the rest to place under	Passed
		not	the shelves	
2	Check if the Govee lights	Connect the 2 separated strips and see if they	If they work properly then we can	Completed
	can be reconnected and	light up and still have all the feature or not	proceed with the rest to place under	Passed
	still work		the shelves	
3	Check if the app works	Connect the strip and use the app	If they work properly then we can	Completed
	properly with the lights		proceed with the rest to place under	Passed
			the shelves	
4	Check if the different	After connecting each strips using the wires,	If they work properly then we can	Completed
	sections of light work	try the app and see if it recognizes each	proceed with the rest to place under	Passed
	properly with the app	section as it should or not	the shelves	
5	Check if the wires	Connect the cut strips with the wires and see	If they work properly then we can	Completed
	conduct the right amount	if they work or not	proceed with the rest to place under	Passed
	of electricity		the shelves	
6	Check if the polyurethane	Spray the strips and place water on them and	If they work properly then we can	Completed
	spray protects the system	try to light them to see if the work or not	proceed with the rest to place under	Passed
	from water spills		the shelves	
7	Check if the 3M clips can	Place the 3M clips and place the wires in	If they work properly then we can	Completed
	properly stick and	them to see if the hold or not	proceed with the rest to place under	Passed
	support wires		the shelves	
8	Check if the app allows	Play around with the app	If they work properly then we can	Completed
	for timers and specific		proceed with the rest to place under	Passed
	lights presets		the shelves	

#### What has happened after prototype II and what have we done

After prototype II we realized that the building and modification of the lights required heavy soldering focus and lots of time. This therefore created a problem because we were time limited and could not rush this process. We also had been informed that there would not be any budget support for the Hydroponics team, and this completely ruined our original plan for the grow lights.

In order to solve the problem, we quickly pivoted to a new product for purchase with included every essential feature we were looking for except for the right amount of light output for the plants. This shortcoming was unfortunate, but we believe it was the best choice for this project under the circumstances.

With the new product, there was not much testing to do because it was very similar to the previous prototype. However here is what we have done.











### What's next

To ensure our product is performing properly for design day, we will be cleaning up our lights by changing how they are placed on the structure to hide the wires connecting them. We will also practice the configurations on the phone application to demonstrate all the possibilities.

### Pot and Plant Design

each shelf will be divided into four sections those Sections will be filled with soil and ready for the seeds.



the three Lower Shelves will be divided into two sections to give more space for large plants. 1. The dimensions of every shelf have been taken individually to make sure that the dimensions are correct for all shelves.

2. The wood is cut into the needed dimensions and is ready to be used and fixed in place by screws once the shelves are covered by plastic/tarp.