

Project Deliverable C : Design Criteria

GNG 1103 – Engineering Design

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# Introduction:

The main objective of this deliverable is to establish a list of prioritized design criteria, perform benchmarking, and determine target specifications. Moreover, with the customer needs defined in “deliverable B” document, this information will guide us to develop our project.

The Algonquins of Barriere Lake community are faced with the challenge of having limited access to food supply due to their isolated location. The Algonquins of Barriere Lake community do not have access to proper electricity and water supply.

The task at hand is to design a greenhouse hydroponic system that would help to produce fauna. We met up with our client, a representative of the community who informed us about the community’s requirements. After the meet up with the client, we developed a brief but comprehensive list of needs based on the information we received. This derivable denotes how the needs have been interpreted and summarized as a design criteria. This design criteria consists of the functional and non-functional requirements, and constraints. After observing and evaluating similar greenhouse hydroponic systems that are currently available to customers we were able to gather information that would be able to give us ideas.

## **Constraints:**

1. The size which are Length, Width, and height of the Greenhouse (meters, ft).
2. Cost(\$).
3. Operating conditions: Temperature (°C) and snow.
4. Weight(lbs).

## **Functional Requirement:**

1. Easy to Assembly
2. Weight supported
3. Contains an hydroponic system
4. Should allow plants to have access to sunlight (Nutrient solution)

## **Non Functional Requirement:**

1. Aesthetics
2. Product Life
3. Security
4. Corrosion and UV resistance
5. Location
6. Safety: clear construction to prevent any damage

## Translating Needs into Design Criteria

#	Need	Design Criteria
1	The greenhouse should be highly sustainable. For example, wind and solar energy would be used.	<ul style="list-style-type: none"> <li>● Contains an hydroponic system.</li> </ul>
2	The greenhouse hydroponic system should be able to supply nutrients to itself. i.e. self-sufficient.	<ul style="list-style-type: none"> <li>● Contains an hydroponic system.</li> <li>● Nutrient solution.</li> </ul>
3	The greenhouse hydroponic system should have its own heating system due to rough weather conditions.	<ul style="list-style-type: none"> <li>● Operating condition: temperature (°C), snow.</li> <li>● Should allow plants to have access to sunlight.</li> </ul>
4	The greenhouse should have its own water filtration system.	<ul style="list-style-type: none"> <li>● Contains an hydroponic system.</li> <li>● Reservoir size for filtration system.</li> </ul>
5	The greenhouse should be compact in size.	<ul style="list-style-type: none"> <li>● Maximum length, width, and height.</li> </ul>
6	The greenhouse should be easy to assemble and disassemble easily when transported.	<ul style="list-style-type: none"> <li>● Weight supported.</li> <li>● Easy to Assembly.</li> </ul>
7	The greenhouse hydroponic system should be easy to maintain.	<ul style="list-style-type: none"> <li>● Aesthetics.</li> <li>● Safety: clear construction to prevent any damage.</li> <li>● Contains an hydroponic system</li> </ul>
8	The greenhouse should have a barrier.	<ul style="list-style-type: none"> <li>● Security.</li> </ul>
9	The greenhouse hydroponic system should have a low budget.	<ul style="list-style-type: none"> <li>● Cost (\$).</li> </ul>

# Benchmarking

Evaluation For Each specification on a scale of 1 - 3: **3-blue** **2-yellow** **1-red** (3 being the highest)

Specification	Palram Victorian Finial Hybrid Greenhouse system	Garden in a box	Oasis Hobby Greenhouse
Company	Palram	OLT	Palram
Panel Material	Polycarbonate	Low Density Polycarbonate cover	Polycarbonate panels
Frame Material	Aluminium	Black powder metal	Aluminum
Tools needed for maintenance	Screw, Bolts, Nuts	Screw and Nails	Screw, Bolts, Nuts
Ventilation Included	yes	yes	yes
Doors Included	yes	yes	Yes (Lockable Door)
Rodent/insects Resistance	Doors and walls keeps them out	insect netting included Doors used to keep them out	Lockable doors
Snow load Resistance and Capacity	Yes, 15.4 lbs	Not mentioned	Yes, no capacity mentioned
Water Collection	Yes	no	Not mentioned
Weather resistant	yes	Not mentioned	yes
Dimension	6ft x 8ft	8 ft X 8ft	8 ft X 8ft
Price	1219.99 \$CAD	1,799 \$USD	1949.99 \$CAD
weight	92 lbs	260 lbs	113 lbs
Easy to assemble	Instructions are given, but can be tricky	Yes	Instructions are given, but can be tricky

Specification	Palram Victorian Finial Hybrid Greenhouse system	Garden in a box	Oasis Hobby Greenhouse
Company	Palram	OLT	Palram
Frame Material	3	2	3
Ventilation Included	3	3	3
Rodent/insects Resistance	2	3	2
Snow load Resistance and Capacity	3	1	2
Water Collection	3	1	2
Weather resistant	3	1	3
Dimension	3	2	2
Price	3	1	2
weight	3	1	2
Easy to assemble	2	3	2
Total	37	18	23

## Further Explanation Of Products listed in the benchmark

### Palram Victorian Finial Hybrid Greenhouse system



The greenhouse structure above features a 81.9 High x 72.8 Wide x 98.4 D. This greenhouse is more complex than what we are building. It features polycarbonate panels, galvanized steel base, a hinged door, twin-wall at the roof and clear at

the walls. It contains panels that are equipped with complete UV blockage and 100% UV protected; the panels do not discolor, fracture or shatter. The green house is capable of retaining its quality and surviving the extreme weather for many years of use. It withstands wind up to 55mh. It consists of:

- Aluminium frame that provides an extra-rigid, highly durable, corrosion-resistant structure.
- Built-In Gutters (gutter and gutter heads included): this allows water collection for a sustainable irrigation system.
- Roof vent: generates air circulation and regulates heat and humidity.
- Galvanized Steel base: provides more structural stability.

## Garden in a box



The greenhouse structure above features a base of 95 in. W x 92 in. D x 94 in. H. This greenhouse is less complex than the greenhouse structure mentioned earlier. It features a low density polycarbonate cover, a 33.5 in. high fencing backed with black wire mesh, a 20 in. high growing bed with an additional 13.5 in. black wire panel for a total of 33.5 in.

high perimeter fencing, and 28 in. wide growing bed. A functional door with closing zipper will help keep pesky critters and bugs out.

## Oasis Hobby Greenhouse



The greenhouse structure above features a 105 H x 97.32 W x 97.32 D. It provides sufficient sunlight exposure to your plants by using two types of

practically unbreakable polycarbonate panels, twin-wall on the roof and crystal-clear on the walls so the plants can flourish. The panels do not discolor, fracture or shatter. It features galvanized steel base, a hinged door, twin-wall at the roof and clear at the walls. The green house is capable of retaining its quality and surviving the extreme weather for many years of use. It withstands wind up to 55mh. It consists of:

- Double door allows easy access: Lockable for additional safety and protection.
- Galvanized steel base: provides more structural stability.
- Roof panels: Polycarbonate twin-wall 4 mm guards against heavy exposure to sunlight.
- Side louvre window: generates air flow and enables heat and moisture control.
- Wall panels: Crystalline polycarbonate supplies over 90% of light transmission.

## Engineering Design Specification

	<b>Design Specification</b>	<b>Relations (=, &lt; or &gt;)</b>	<b>Value</b>	<b>Units</b>	<b>Verification Method</b>
	<i>Functional Requirements</i>				
1	Easy to Assembly	=	yes	N/A	Test
2	Weight supported	=	yes	lbs	Analysis
3	Contains an hydroponic system	=	yes	N/A	Test
4	Should allow plants have access to sunlight (nutrient solution)	=	yes	N/A	Test

	<b><i>Constraints</i></b>				
1	Size (length, width and height)	<	8 * 8 * 6	ft.	Analysis
2	Cost	<	500	\$	Estimate
3	Temperature	=	-33 to 4.1	(°C)	Test
	<b><i>Non Functional</i></b>				
1	Aesthetics	=	yes	N/A	Test
2	Product Life	>	5	Years	Test
3	Security	=	yes	N/A	Test

## Conclusion

Having arranged all our available data, we now have a defined reference point for the production and development of the greenhouse. All through the design and prototyping phase, this deliverable will be a touchstone to make sure that our final product meets all customer needs and remains within our target requirements. Also, from the design criteria we have a clear understanding of what the product wants to achieve.