# Project Deliverable D: **Conceptual Design** GNG 1103 – Engineering Design

**Faculty of Engineering - University of Ottawa**

**Present to :**

**Muslim Majeed**

**For the course :**

**Engineering Design**

**GNG 1103**


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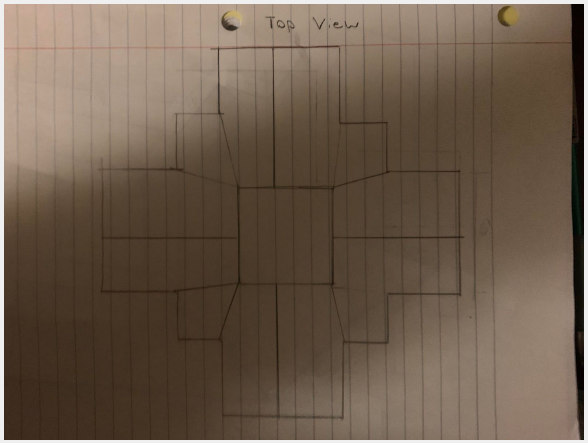
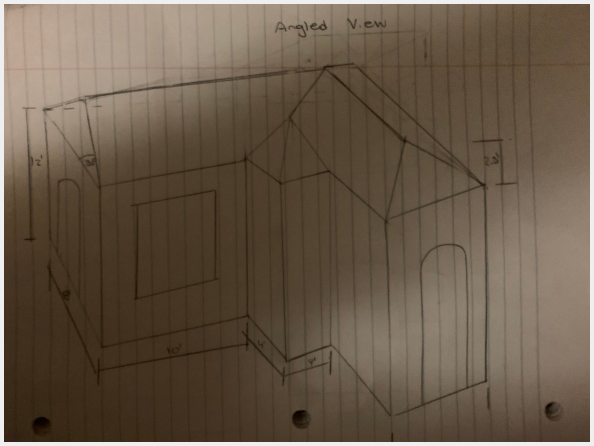
## Introduction

Based on the following problem statement, and the benchmarking in the last part, the group has created a list of designs (three designs each).

> *The community of the Algonquins of Barriere Lake are in need of a safe, self-sustaining and affordable greenhouse that can provide produce for an extended amount of time, throughout the year.*

| **Greenhouse**<br><br>**Specifications** | **Importance (weight)** | Hybrid 8 Ft. W x 4 ft. D Greenhouse |
|---|---|---|
| **Company** | | Palram |
| **Cost ($)** | **3** | 969.99 |
| **Size (L*W*H $ft^3$)** | **4** | 4*8*8 |
| **Weather Resistant** | **5** | Yes |
| **Frame Material** | **4** | Aluminum |
| **Panel Material** | **4** | Polycarbonate |
| **Year-Round Use** | **5** | Yes |
| **Score** | | 54 |
| **Link** | | https://www.wayfair.ca/outdoor/pdp/palram-hybrid-8-ft-w-x-4-ft-d-greenhouse-palr1166.html |

| Person | Design photo | Design explanation |
| --- | --- | --- |
| Caleb |  <br>  | This design is unrealistic for the project at hand, but would be a very good design not considering the budget and other factors like the need for it to be module and easily transportable. The design features 4 long hallways leading to a center portation with a raised roof increasing the possibility of growing hanging plants or crops. The super greenhouse also has 4 enterces for looks, when in reality this is very inefficient as the back space could be used to plant more crops. The structure is made out of simple 2”x 4” and 2”x 6”, along with polycarbonate panels so light can travel through. |

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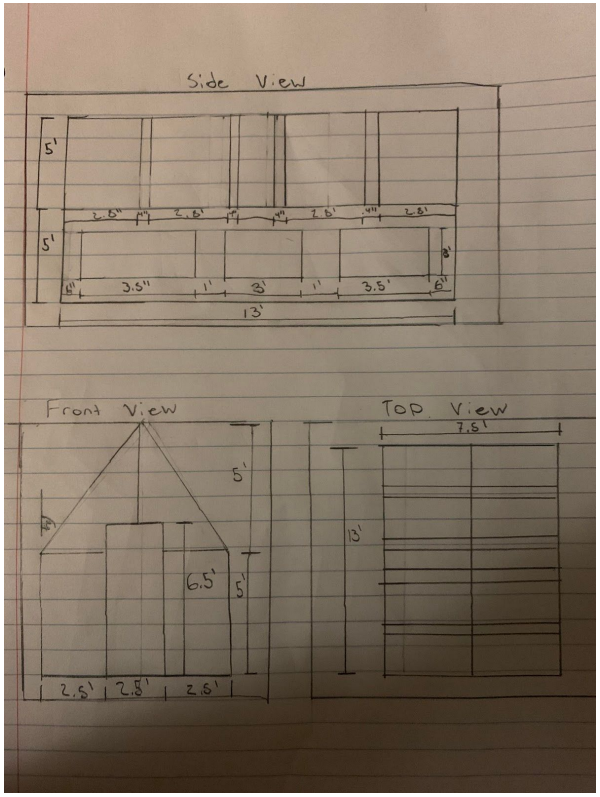
| |  | This design is a more simple approach, taking a rectangular shape with an angled roof. The walls are long with lots of windows to increase natural lighting, and polycarbonate panels on the roof in between the support beams which are along the roof every 2.8'. The walls are lower around 5' high so the roof is larger with more window space increasing the time the crops/plants will receive sunlight. |

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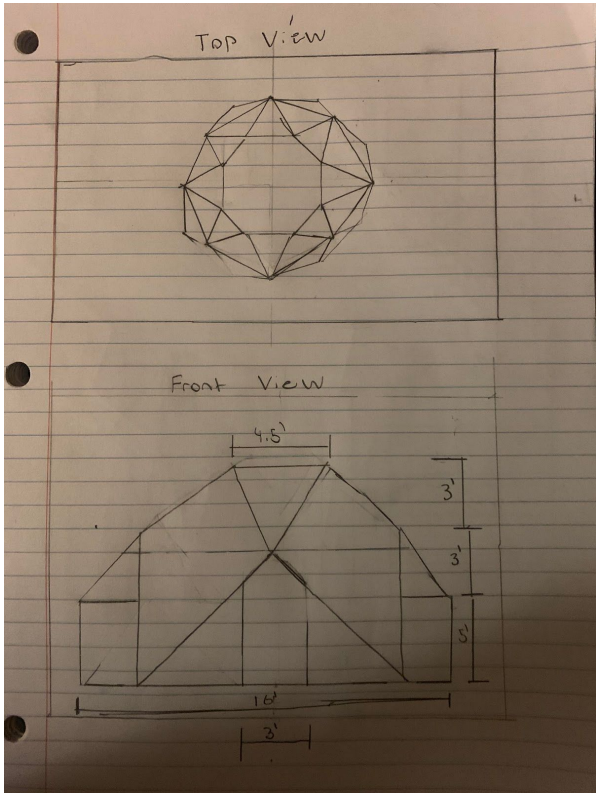
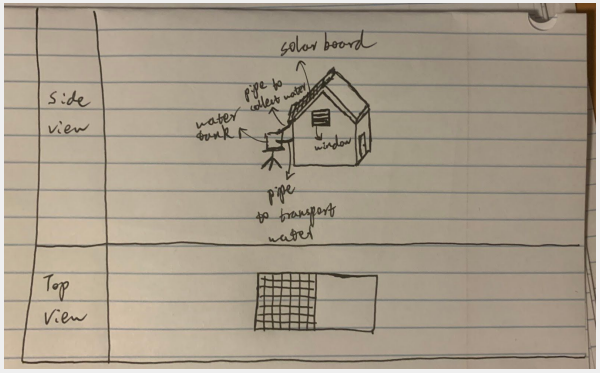
| |  | This design takes the shape of a sphere to help with natural lighting as more light will be able to travel to the plants from the sun in every angle. These support beams are made up of simple 2”x 4” planks, with polycarbonate panels covering the support beams to inclose the greenhouse. The support beams also form triangles through the greenhouse as it has more support that way. |
| Ekko |  | This design is just a normal greenhouse with a tank outside. There is a half-pipe along the roof which is used to collect the rain and transports to the water tank. And the tank can transfer the water into the house with a pump inside. The size can be 6*8*6 or 6*8*8. The roof facing north will be placed on a solar board and another side will not be placed on anything since norch side can alway accept more sunshine to help the plants grow. |

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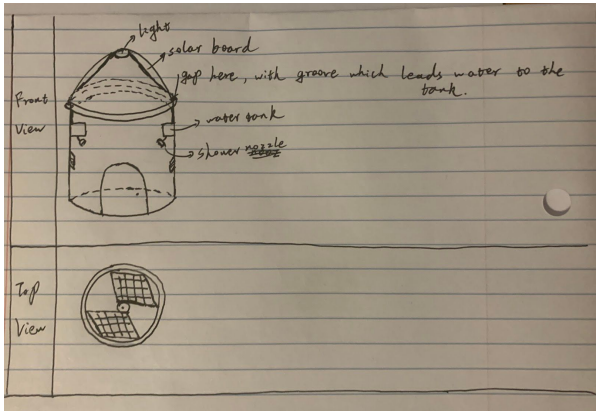
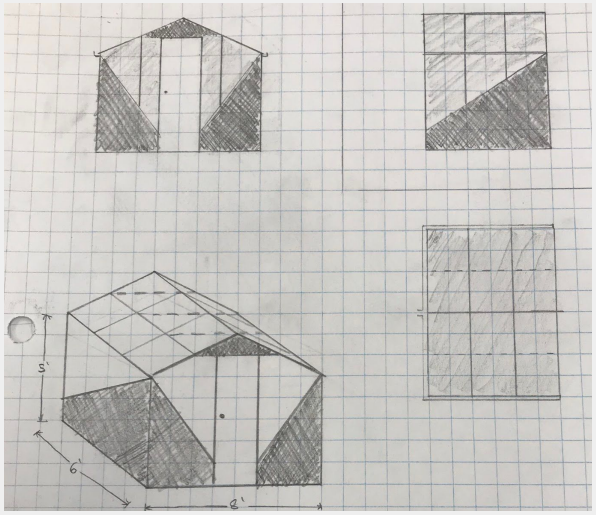
| |  | This design is just like a cylinder with a half spherical roof. And the material of the greenhouse is transparent plastic. As the round roof can collect more sunshine than other shapes, the two solar boards are inlaid on the roof. The light is just at the middle of the two boards. There is a gap between the roof and the wall, which can collect rain and transport water to the two (or more) water tanks. There are switches to control the shower nozzles, which can water all the plants in the room. The wall of the greenhouse should be transparent plastic as well so that the plants can get enough sunshine to grow up. The radius of the greenhouse should be about 6 ft and the height should be 8 ft so that there is enough space to place the water tanks and shower nozzles. |
| Luke<br>**$ |  | This design allows us to have a much smaller volume while still maximising the growing area. The importance of this is to reduce heating costs which scale proportionally to the volume. The sides where the sun will not shine through as well as the first 1' off the ground all around will be covered in plywood in order to maximise structural strength, insulation and will also prevent small animals from burrowing in from the base. But, unfortunately it will not be all weather resistant. |

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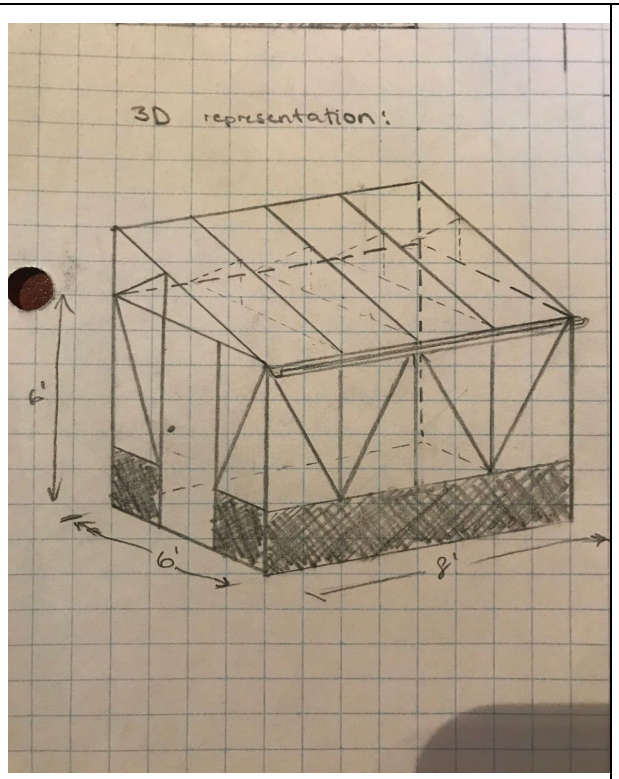
| *$ |  | This design is very simple in its construction, the 1 way slanted roof also gives lots of benefits. Firstly,it allows for easy rainwater collection as there is only one way in which the water will run off. Additionally, the sun will only shine through in one direction so the back wall can be constructed from plywood which is a much better structural material than the clear plastic or acrylic. There will also be a baseplate for animal prevention. |
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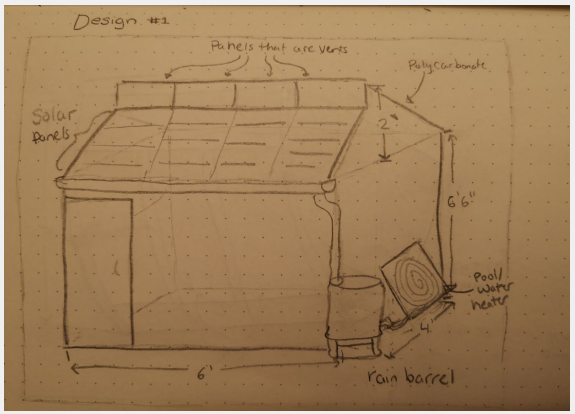
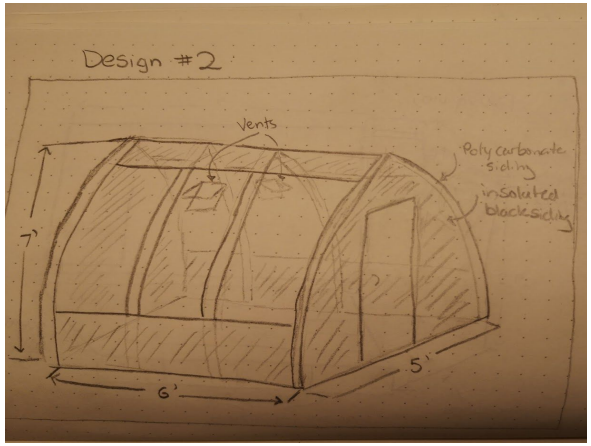
| Valerie<br>*$ |  | This design is set up almost like a house, except the roof is split up into two levels, one is steeper than the other in a way that is similar to a gable and sawtooth greenhouse. This makes space for vents within the roof. The roof also contains a gutter that siphons into a rain barrel at the end. This rain barrel connects to a water heater similar to this pool heater. This will make sure that the water remains at a reasonable temperature. The side that is steeper is made out of polycarbonate, to allow light to get into the greenhouse, and the shallower side supports 4 panels of solar panels to provide power to the greenhouse and the hydroponic pump. |
| |  | This greenhouse is a gothic design where the sides are curved and they come up to a point, this makes it harder for snow to remain on the roof. The front, back, and at the bottom and very top are insulated parts as to provide more heat to the greenhouse. This design makes the greenhouse easily accessible, and allows light to access more of the greenhouse during the day. Again this greenhouse is built with polycarbonate panels as the strength and low cost makes it ideal for greenhouses. Again there are vents attached to the side of the building to allow air circulation. |

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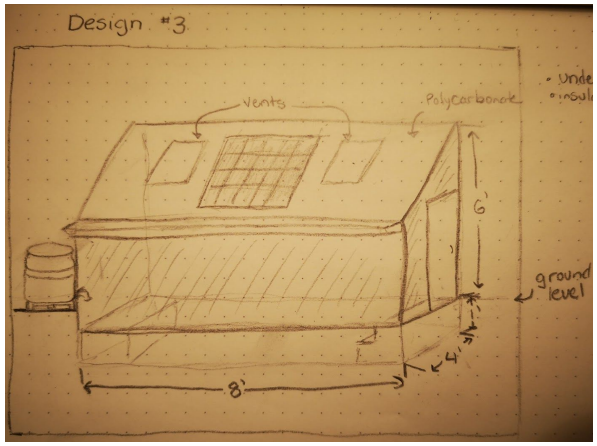
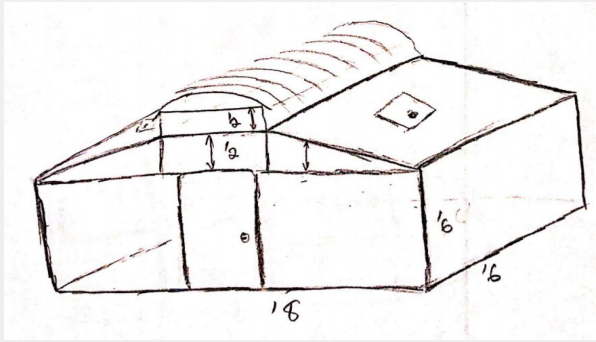
| |  | This last greenhouse takes on a lean-to design except for the fact that it is sunk-into the group by a depth of 1 foot, this provides more insulation for the greenhouse. With gutters similar to the first greenhouse which also siphons into a rain barrel. Since the greenhouse is lower than the rain barrel, it won't need to be raised to provide the water pressure to allow the water to flow from it. The roof is made from polycarbonate and has a solar panel in the middle to provide power to the greenhouse. The walls are insulated, to provide more heat to plants inside. Additionally, made of steel and weed with polycarbonate windows. |
| Gwladys |  | 6*8*8 ft fancy transportable greenhouse. This Green house is practical, sustainable and functional even during the cold season. Should be made by wood or by Metal. Glazing should be a mix of polyethene, patio doors and reclaimed windows. Rigid insulation is needed below the floor and on the north Wall. We can also add two small fans to refresh the air and geothermal heating system during the winter season. The rounded part of the roof improves the good sun exposition and contributes to the fancy design of the house.<br><br>*All those systems are made with a gutter to collect harvesting water and send it to a tank inside the greenhouse.* |

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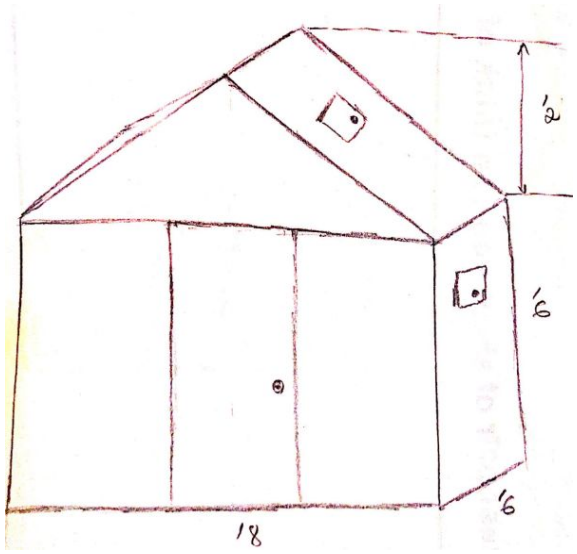
| |  | Hybrid Greenhouse of 6*8*8 ft with silver or wood frame. This Greenhouse is a simple one because it is easy to assemble and practical. Plants benefit from the balanced exposure to sunlight provided by two types of virtually unbreakable Polycarbonate panels, twin-wall at the roof and clear at the walls. Hybrid greenhouses are easy to install and include a galvanized steel base, a hinged door as well as other features that enhance their usability. That Type of Structure and material is sustainable. The greenhouses are capable of withstanding extreme weather conditions for many years of gardening use. Complete UV blockage and 100% UV protected; the panels do not discolour, fracture or shatter. This house has one window located on the roof and we can also add another Window on the side if we need more opening.<br><br>*All those systems are made with a gutter to collect harvesting water and send it to a tank inside the greenhouse.* |

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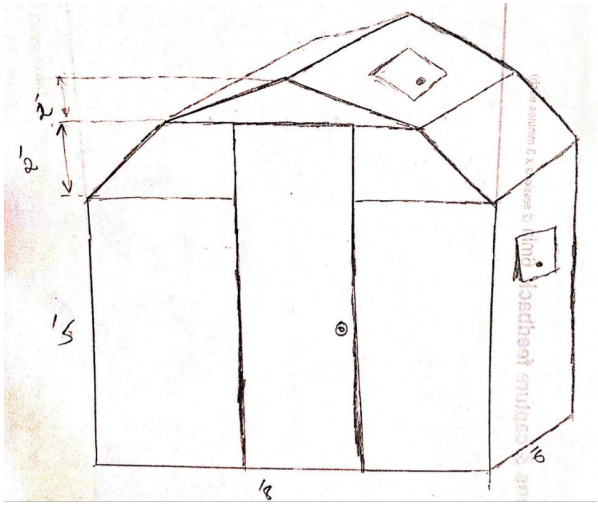
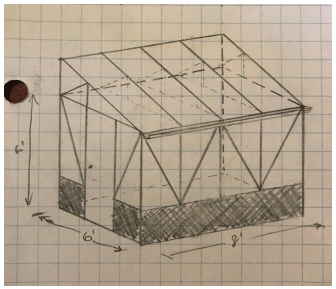
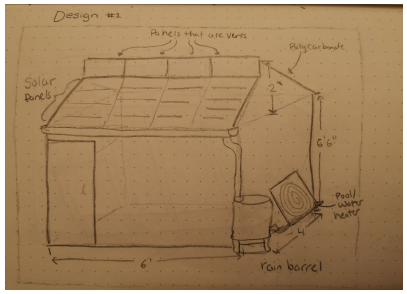
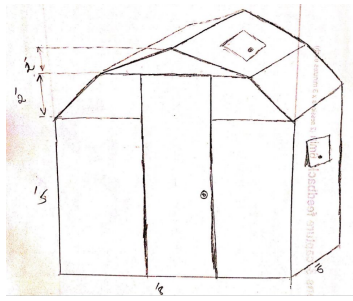
| |  | The Eco-house of 6*8*8 ft below is Highly resistant, no-tool assembly, safe polycarbonate greenhouse; Built with heavy-duty multi-wall glazing, for controlled light exposure and greater insulation. Allows maintaining level temperatures and diffuse sunlight<br>Provides up to 100% protection from harmful sun rays (UV),<br>Life-time resilient polycarbonate plastic walls; do not fracture, turn yellow or opacify over time, Easy-to-assemble, sturdy UV protected resin frame, held together with 'Pin & Lock' resin connectors, Stylish, classic barn shape design, developed for an optimal use of the interior space. Built-to-last thanks to outstandingly durable materials, this greenhouse is maintenance free. Protects your plants from the elements, so you can enjoy an extended growing period.<br><br>*All those systems are made with a gutter to collect harvesting water and send it to a tank inside the greenhouse.* |

**Benchmarking Based on three of the designs**

| Specifications | Importance (weight) | | | |
|---|---|---|---|---|
| **Group member** | | Luke | Valerie | Gwlady |
| **Picture** | |  |  |  |
| **Size (L*W*Hft$^3$)** | **4** | 6x8x6 | 6x4x8 | 8x8x9 |
| **Weather Resistant** | **5** | Yes | Yes | Yes |
| **Frame Material** | **4** | Wood | Wood | Aluminum |
| **Panel Material** | **4** | Polycarbonate | Polycarbonate | Polycarbonate |
| **Year-Round Use** | **5** | Yes | Yes | Yes |
| **Score** | | 48 | 40 | 40 |

As a team we all choose that Lukes second design will be the best suited and articulated design for our project and best design to overcome the problems we face as a group. We choose this design because it suits our needs of having a design that must be module and simple but can still function at high efficiency. It scored the highest on our benchmarking, and contains the most valuable features for the required greenhouse. The design is best for year round use, being more structurally stable and obtains the optimal amount of sunlight for the plants/crops.