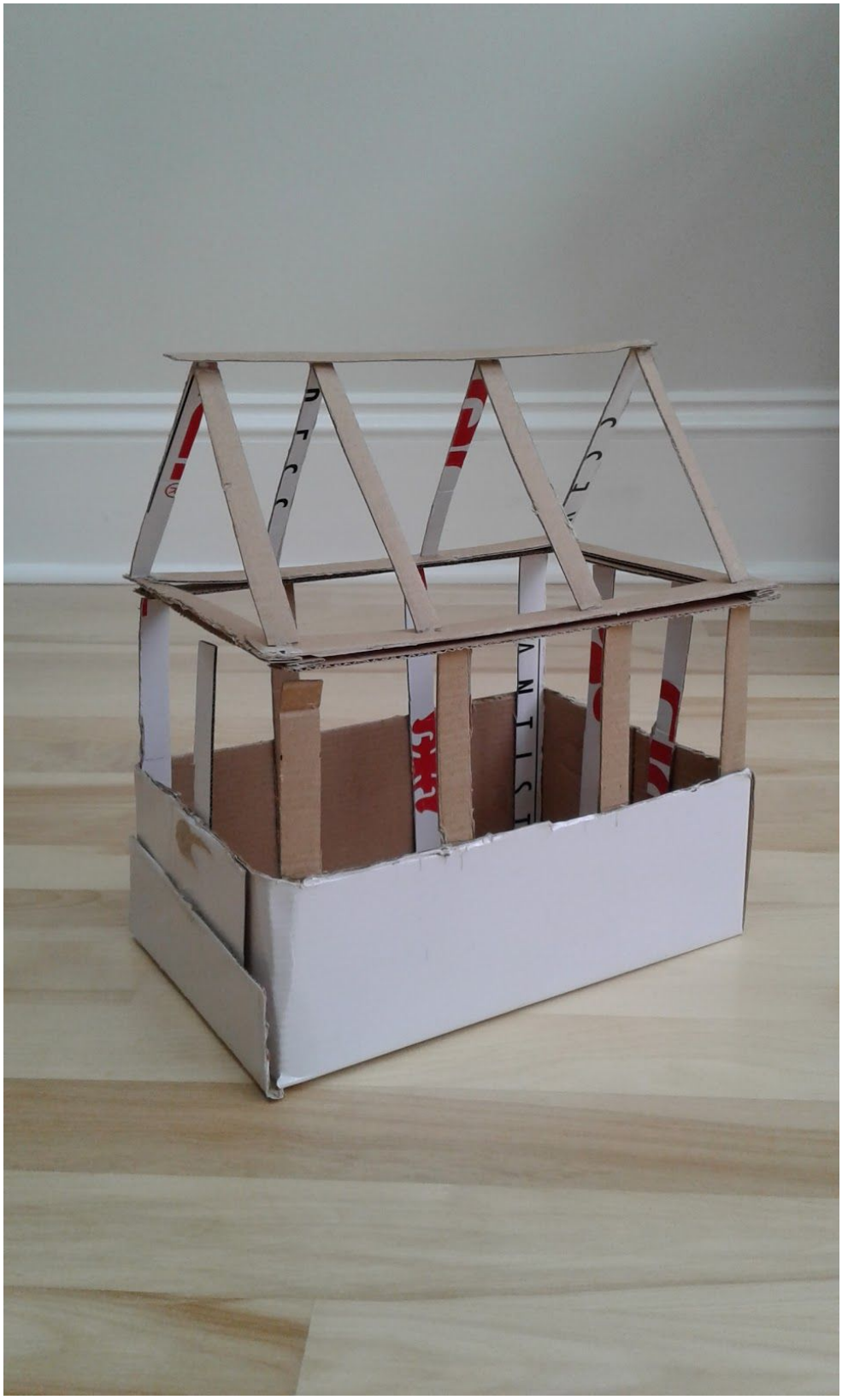
Deliverable F - Prototype 1



Analysis (What We Learned)

Prototype 1 is made up of cardboard that has been glued together, and was constructed in two parts; the roof and the “body”. The limits of this prototype were proposed by the simplistic materials used and the small scale at which it was constructed. Some of the limits include a lack of representation of all materials included in the actual design, a lack of representation of the systems that will be used to attach the walls to the base and the roof to the walls, a lack of representation of the hydroponic system (including the gutters) and a lack of representation of the clear materials that will be used to make the roof and the windows. Constructing a scaled prototype of our design gave us a much better spatial understanding of the greenhouse, and it helped us to realize a few aspects of our design that could use some refining. Among said aspects are the method of attaching the walls to the foundation, the overall design of the roof and the height of the “half-wall”.

While constructing prototype 1 we used only adhesive and cardboard, but it helped us to realize the challenge it will be to attach the sections of greenhouse in a way that it can be taken apart and put back together. Our original plan was based on a bracket system, where the walls would simply sit on the foundation, held in place by metal “cradelling” it on each side (the same system would attach the roof to the walls). During the process of building the prototype we realised that this system would not likely offer the support necessary for the greenhouse to resist high wind or snow storms (which it will very likely encounter), and it would also pose some problems when it comes to the physical construction and transportation of the pieces. We are now working on refining this subsystem, likely changing it to a system based on bolts that can easily be undone. It is possible that we will still include brackets for additional stability but they will no longer be the main component of the subsystem.

During this process we also came to understand that it is very important we revise the design of our roof and check that the angle of the roof we included in the original design is feasible based on the tools we have access too. On the prototype, the integrity of the roof depends entirely on the adhesive holding it together. The actual design will not use adhesive, and the structure must support itself and provide enough stability to weather winter storms and support snow build up. Because the current design is more complex than the one we were able to recreate on the first prototype, we will consider constructing a more realistic prototype of the roof to better test the stability. In addition we will go over the calculations used to determine the angle of the roof and we will confirm that there are construction methods conducive to achieving our intended results.

After examining the finished prototype 1, we are also re-evaluating the height of the wooden portion of the walls. Our current design included them being 2 feet wood and 2 feet clear materials, and we are now considering the value of reducing the 2 feet of wood to only 1 foot. It is easier to see on the physical model that the walls will considerably reduce the amount of sunlight reaching ground level, which is where the hydroponics team plans on placing the majority of the plants. Shortening the wooden walls would help to increase the plants’ exposure

to sunlight but it would allow for more heat to be lost to the environment as the plastic materials are not ideal for insulation.

Finally, through building the base (which we also did this week) as well as prototype 1, we realized the importance of extremely precise measurements for the vertical beams of the walls. Some of the planks that were cut for the foundation were not perfectly even (horizontally), but in the end it did not negatively effect the stability because it was not uneven vertically (which is the direction in which those beams offer support). If the measurements are not accurate for the walls, the roof will not sit properly and that will negatively affect the structural integrity. As you can see from the photos above, this occured in the first prototype.