Deliverable D - Concept Design February 17, 2019

-Flat roof(Steven)
-Gable roof
-Windmill for power(Steven)
-Earthships - houses made of tires
-Rammed earth walls - Chris
-Metal Domes with tunnels between them
-SIP panels -Chris
-Pre-fab homes
-Bunk bed nooks
-Recycled materials (Lawrence)
-Porch/garages (Oren)
-Wood stove (Oren)
-Rainwater catchment (Oren)
-Generator (Lawrence)
-Fold out beds(Sarah)
-Storage space under the bed (sarah)
-Table that pulls out from the wall when needed (saraH)
-Bunkbed with desk underneath (srah)
-Loft sar
-Gravity pressurized water heater (Zen)
-South facing window with heat sink Zen)
- Vertical tunnel with ladder down to underground cool celar (Zen)

-Compactor
-Walk in closet - suitcases (taylor)
-kids+master bedroom (Oren)
-Wheels on the home (Taylor)
-The shed is a car
-Buy them a house (Taylor)
-Build a wall (Taylor)
-GoFundMePage (Taylor)
-Dome shape
-Treehouse (Taylor)
-Strip of houses
-Modules
-Couch-bed (Taylor)
-Cardboard couch bed (Taylor)
-Bed in the wall(Steven)
-Cardboard shed

-Trap door to the bathroom (Taylor)
-Neutral paint colour (Lawrence)

The following document describes the ideas and concepts that were suggested by each member of the construction group. The ideas will be compared and benchmarked, while the best will be included in the final project. A conceptual design will be put together using this information.

Chris

One option is to build a shelter using rammed earth walls, where sand and soil is packed tightly into thick walls, providing a cheap and effective structure. The walls can also be formed into any shape, and don't need any finishing material on the exterior walls. Another option is to use structurally insulated panels. These panels are 4' x 8' consisting of rigid foam sandwiched between two sheets of plywood. SIP panels have a high R value, and can be cut to any size. The most inexpensive option would be to frame 2' x 8' panels out of lumber and plywood. The design could be modular and expandable, so it could be built to any size.

The third option would be to use standard lumber, and build panels that can be assembled on site. This option would be the least expensive, and require the least amount of skilled labour.

Oren

The idea of having a small front porch would have been viable mainly due to many reasons involving the building of a modular home. There is lack of storage space and proper heat systems within the house and so building porches could help reduce heat loss within the house, and create useful storage space for coats and shoes, especially during the harsh Canadian winter days.

A wood stove was the least inexpensive fuel option as compared to gas, oil, pallet and coal. Wood burning stoves can be more efficient and provide much more heating power than an open fireplace.

Building rainwater catchment areas would help in the easy collection and use of water personally by the owners of the home. These are a relatively easy way to maintain water resources in a small house as these, and can significantly reduce water bills upon the families.

Lawrence

An option for the home is to use recycled materials specifically using recycled wood for the components. This allows the home to stay true to its carbon-free nature; functioning as a net-zero home while being made from net-zero materials. These materials are generally cheaper than newer materials as well. Overall, this is a good option for ensuring that this home will be beneficial to the environment as well as more affordable.

Another option for the home is to include a generator. A generator is an option to keep the house running electricity and hot water reliably unlike less efficient solar panels. A generator

can act as a backup source of electricity should installed solar panels fail. This is beneficial for cases such as power outages.

We also want to ensure that the modular home is comfortable for everyone who lives in it; this is why it's a good idea to keep the home's aesthetics as neutral as possible. Examples include a neutral coloured interior such as interior walls, floors and furniture, as well as a neutral coloured exterior such as exterior walls, siding, door, window, roof, etc.

Taylor

One option for the net zero modular home would be a closet. This is a very useful idea because a closet is a good place for storing items. A family that will be using this home will be bringing a couple suitcases which means they need a place to store their belongings. We will implement this in the final design.

Another option for the home is a home on wheels. Have you ever been in a car chase? Well here's your time to be in a home chase. Have you ever had someone run to your house and try to steal it? Well now you can run them over. In all seriousness, a home on wheels is useful incase an evacuation of the area is needed and you need to get somewhere quickly. As well, you will not need to take apart the home, you can just drive with it fully assembled. It's pretty much an RV.

Sarah

One of the biggest struggles in building a small home is a lack of space. To make up for this lack of space, it would be beneficial to install different pieces of furniture, such as a dining room table and chairs which could fold into the wall (or be hung up on the wall) when not in use. The same can be done for a bed. This would allow for extra space inside the home when the different pieces of furniture are not in use.

In addition, a storage option is leaving under the bed empty. The bed would be able to be lifted easily, and underneath the bed frame would be storage for different items such as luggage, clothing, or personal belongings.

Another idea for a bed would be a bunk bed, with a desk below it. This would allow the homeowner a space to do work (or homework for children), while making good use of the vertical space.

Steven

Some of the idea that i came up with was a Flat roof. A flat roof would be beneficial in terms of surface area. Since it is not at an angle, the roof will have less space and will cost less to make. As well, it will take less effort to build the roof since it would just be a plywood on the top. This is a bad idea for a lot of reasons. The first reason is the only time you'll get direct sunlight is in the middle of the day when the sun is perpendicular to the roof. As well, during the winter, snow will get trapped on top and won't be able to get it down.

Zen

Hot water is a desirable aspect to any home, and so the gravity pressurized water heater would be a perfect implementation into our design. It uses water captured from the rainwater catching system, and fills two tanks. The first tank is larger than the second and it is placed high up near the ceiling. The second tank is placed on top of the wood stove. Water fills the higher up tank from the rain water catch. There would be a pipe coming from the bottom of the larger cold water tank that goes to the smaller tank on top of the wood stove. The force of gravity from the water in the cold water tank would pressurize the hot water tank as well as the cold water taps. Another pipe would connect the bottom of the hot water tank to the taps that need hot water.

A free means to heat the livable shed would be desirable, so a south facing window could be implemented. The floor should be able to act as a heat sink and absorb the sun's energy while it is available and free. The preferable material for the heat sink would be dark tile flooring, however cheaper alternatives are possible as well.

The thought of a food storage space in a building lacking connection to the electrical grid, would encourage anyone to do a bit of extra work for their modular home. There could be a tunnel that leads to an underground root cellar, using a ladder. There would be an initial phase to construction that would involve hollowing out this space and reinforcing it with chicken wire ferris cement. This would give the person living in the shed a means of preserving food.

Final Design

After comparing all of our ideas, we have decided to go with a wood design, as it is the most inexpensive. The design will be modular, and built in two foot wide panels before being shipped to the site. This method will make the assembly of the structure much easier, and will not require skilled tradesmen. The structure will also be expandable, and can be built to any size.

The final design will also include the following concepts:

- It will utilize as many recycled materials as possible, obtained from recycling centers such as the re-store.
- Windows will face south to maximize heat in the winter.
- Each unit will have a wood-stove used for heat as well as cooking. This can be used as a supplement to other sources that may or may not be available at each location, such as propane or natural gas.
- Units will feature a system for catching rainwater to be used as grey water.
- The roof will be a gable, to accomodate a solar panel system.
- Each unit will have an enclosed, unheated porch, as this provides storage space without using heat.
- There will be a place for a generator as a backup power supply.
- There will be a kitchen, bedroom, storage closet, and living room.
- Beds will be able to fold up against the wall, in order to conserve space.
- A table and chairs will also be foldable, and may be stored against the wall.
- A system of bunk beds will be built for children.

A series of sketches describing the various panels are attached.