

April 14, 2024

Yesterday was the award ceremony for the 2024 CYSF, and I already know what I want to do for my project next year.

I recently watched a video by Dami Lee, titled: "Biomimicry: Hoax or Genius?". Here are notes from this video:

- Biomimicry: The design and production of materials, structures, and systems that are modeled on biological entities and processes.
- Flax Fibers: Renewable and Biodegradable material, and have similar properties as glass and carbon fiber.

Biopolymers: A building material made of the cells of different organisms. They have great insulation properties, and can regulate moisture. They can be modified to a desired behaviour.

I have decided to do an engineering project, where I design a home that is both functional, and environmentally friendly.

I call it...

the Bio-Home

April 15, 2024

Now, I'm just going to look at some more videos on Biomimicry

Notes from "Design for life":

- We can put steel structures into the ocean, and materials will grow on the steel. This material has similar properties as reinforced concrete. This is made from minerals in the seawater.
- We can make atmospheric carbon.

I also found a video titled "10 Eco-Friendly Building Materials". Here are notes for that video:

- Cork: Insulate and provides long-term protection from the elements. No trees need to be cut down. Easy to recycle. Cork can be harvested from the same tree every nine years. They take 25

years to fully grow, and can live up to 300 years

- Mycellium: The tiny roots of mushrooms that is dried. It is durable enough to resist mold, water and even fire

- Algae: The photosynthesis is turned into usable energy for buildings. The algae can be grown in glass panels, then turned into bio-mass.

I found a video by the same channel. It is titled "Green Architecture Saving the World". Here are notes:

- Green walls can be put on the side of buildings to help clean the air. these can also be known as vertical gardens

Here are notes from a Nat-Geo video:

• In 1991, architect, Mick Pearce designed a self-cooling and self-heating building. (Eastgate Centre)

• The building was inspired by a termite mound.

• By increasing the surface area, heat loss is improved at night while heat gain is reduced during the day.

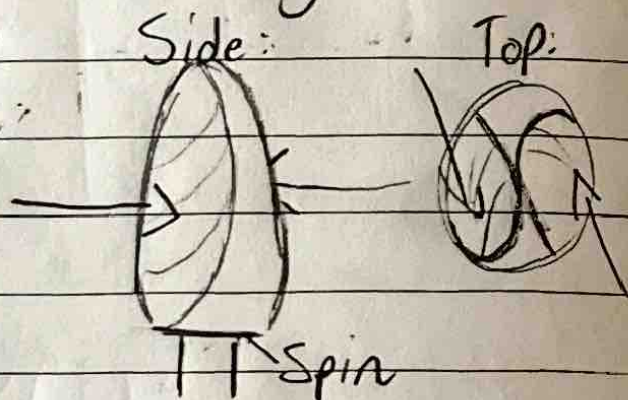
April 16, 2024

I continue to look at videos on biomimicry architecture.

Notes from "5 examples of biomimicry architecture"

• Coral exoskeletons are made of CaCO_3 .
We can combine carbon dioxide and calcium carbonate to make concrete. It takes less energy to make compared to regular concrete.

• Efficient wind turbine:



June 12, 2024

It's been a while since I've worked on this project, but I'm no longer very busy, so I can work on this again!

I bought a book called "Homes for Our Time", so here are some notes from there:

- Varandas create more openness and space outdoors without having a yard
- Green Roofs blend into the natural landscape
- Skylights allow for the use of natural light
- Corner bedrooms for light
- Folding windows are cool

June 18, 2024

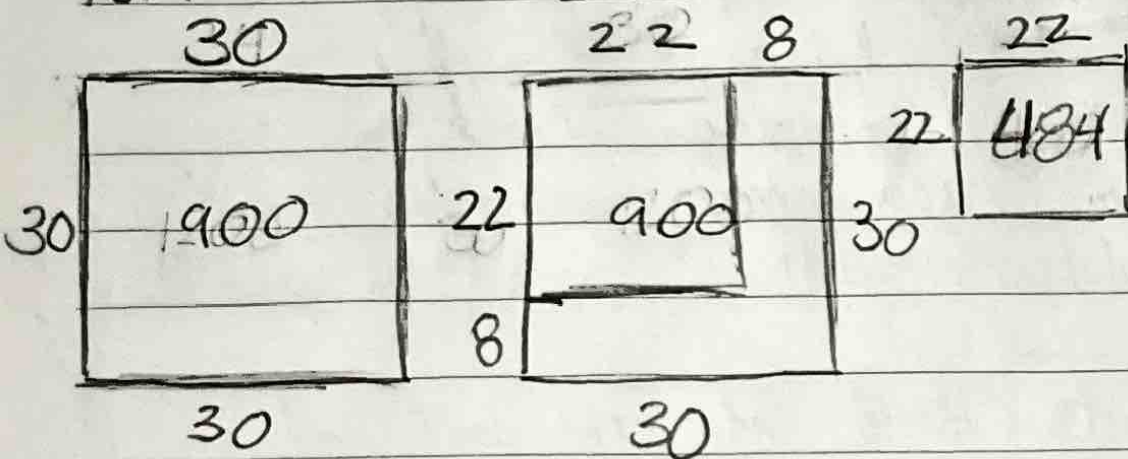
I'm now starting the planning for the home. I want two floors, the upper level being private, and the lower being public, and a rooftop garden.

Floors 900 ft^2 , 900 ft^2 , 484 ft^2

1st:

Znd:

3rd:



* Total area: $2,284 \text{ ft}^2$

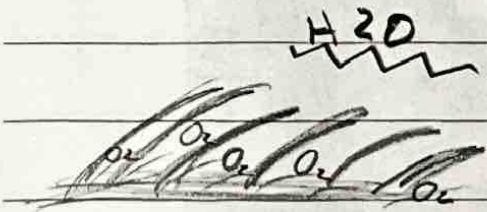
July 2 -



This week, I'm volunteering at the Calgary Zoo's camps, and I've been learning a lot:

- River Otters have small, thin hairs on top of dense hairs to keep warm and trap air.

- River Otters produce oils that stick to their hairs to protect themselves from the cold water



Sept 27, 2024

For the canopy of the roof of the house, I want to base it of a lotus leaf:

- Lotus leaves are water repellent because of tiny wax-covered bumps, that create water droplets that clean the leaves.

- Superhydrophobic coatings

- Makes surfaces highly water repellent, which can be used to direct water more quickly.

- It also keeps itself clean by using the water droplets to remove dust and contaminants

- The cuticle of the leaves have papillae that are $10\mu\text{m}$ - $20\mu\text{m}$ in height and $10\mu\text{m}$ - $15\mu\text{m}$ in width, which maintain surface tension and the cohesion of water. They are also hydrophobic.

Nov 9, 2024

Solar Punk: an idealistic and optimistic version of Cyber Punk. A way in which technology helps humans and our planet.

Notes from Dami Lee's "SolarPunk Cities: Our Last Hope?"

- People in suburbia create up to 4x more emissions than those who live in cities

- Aardvizen in the netherlands:

 - ↳ Houses made with mostly recycled materials, reused materials, and locally sourced materials.

 - ↳ 70% of electricity and 100% of their heating is generated on-site

- Fusion energy. YAY!

Nov 12, 2024

Notes from Dune Cities: Fiction or Reality:

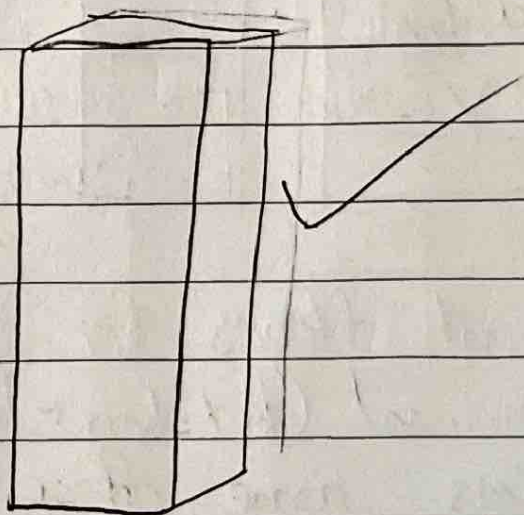
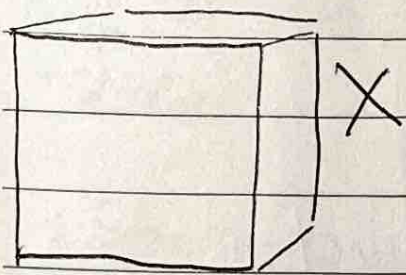
- Passive cooling: Using shade and insulation to keep heat out of a home. Using materials that store heat.
- Concrete has to be made by mining for coarse sand
- Sand is the most consumed resource after water
- Companies like Finite have been looking into making composites using desert sand to make concrete. It's biodegradable, and can cut the carbon footprint in half
- Wind catchers in buildings can remove the need for mechanical AC.

Finite Concrete:

- Has very similar properties as housing bricks and residential concrete
- Does not require extreme temperatures to be made.
- Can be coloured

Thin houses:

- Thin houses that are tall allow for less space to be used!

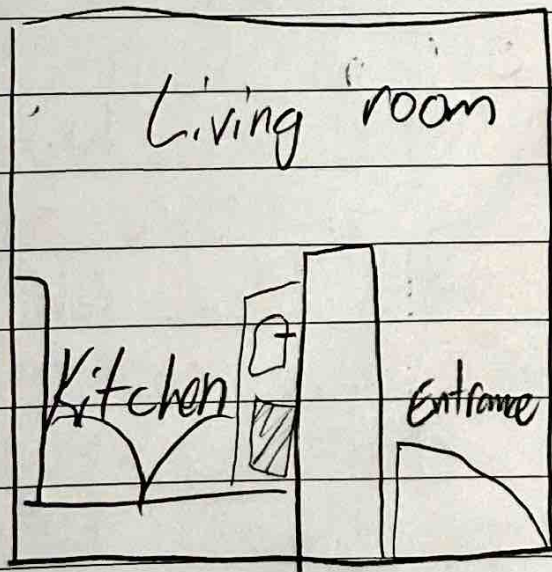


Nov 24, 2024

Because this house has to be narrow,
I'm trying to find ways to maximize
space:

- Storage under stairs

- Under floor heating!



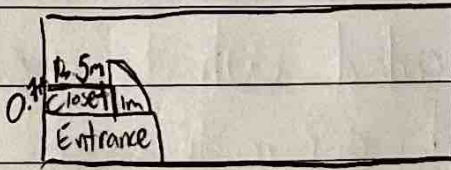
Make a separate area
for Kitchen!

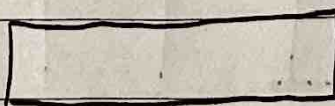
- Different floors for different functions such
as communal (Kitchen + Dining), living space,
bedrooms, home office + library, etc.

I have decided that this house will be designed for a four-person family; to reach the largest amount of people as possible. (The tech used to design this house can be re-applied to be bigger or smaller). Here are how big each floor and room will be + their functions

Rooms:

- Entrance:  $2.5m \times 1.5m = 3.75m^2$ 37161216m²

- Living Room:  20m²
(Also size of the base of the home + stairs)

- Stairs:  1.5m

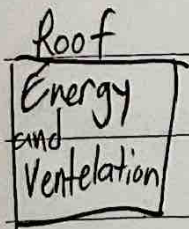
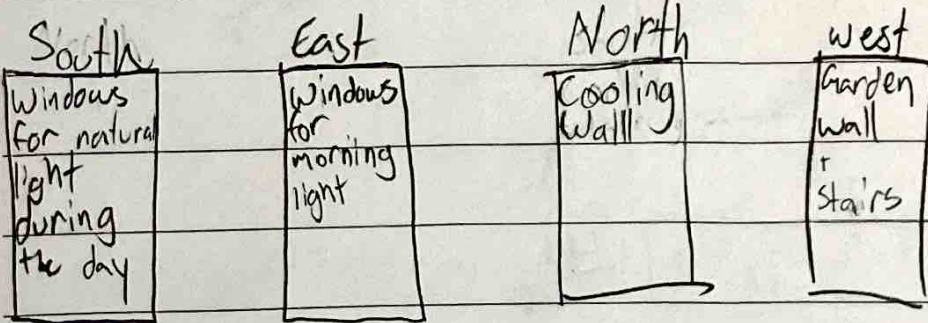
Jan 8, 2025

I have now decided to partially scratch my last idea for the home layout. I will keep the multiple floor concept to use the least amount of ground surface area as possible.

Floors:

1. - Entrance, Living room, Kitchen, bathroom
2. - Bedrooms, bathroom
3. - Play space, TV, library
0. - Storage

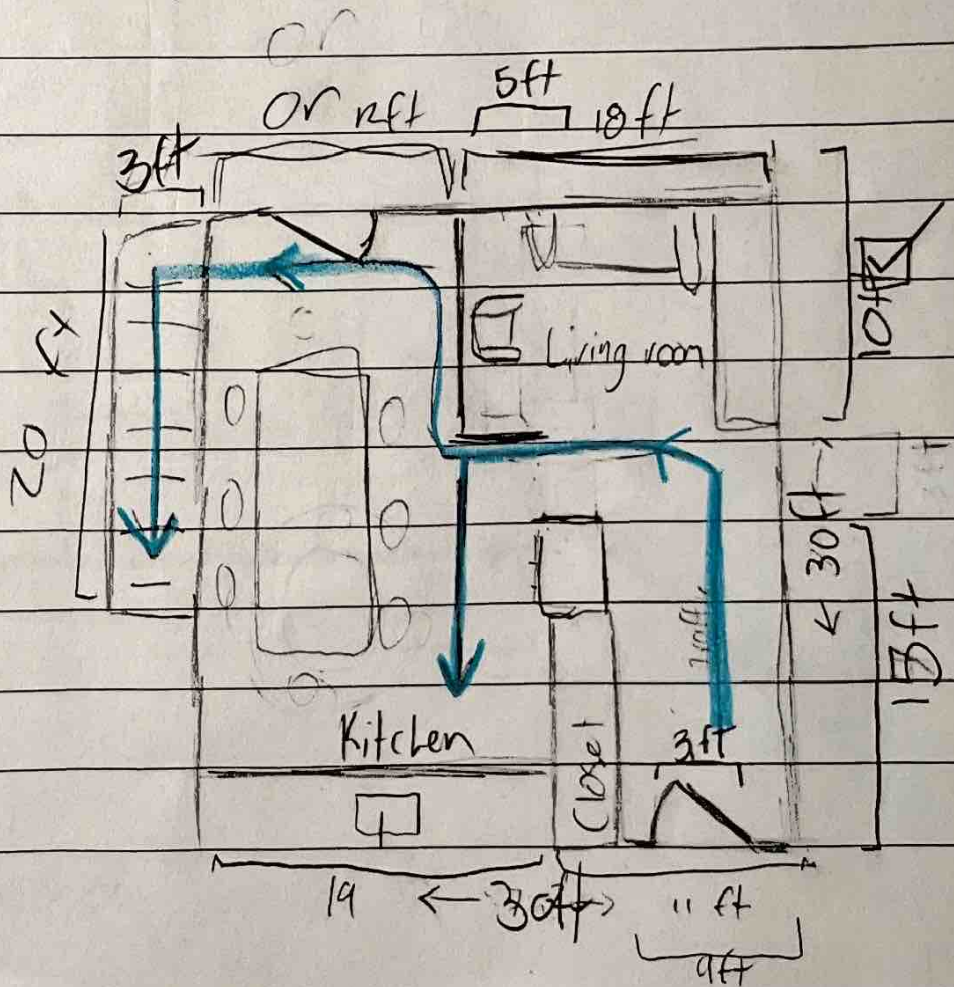
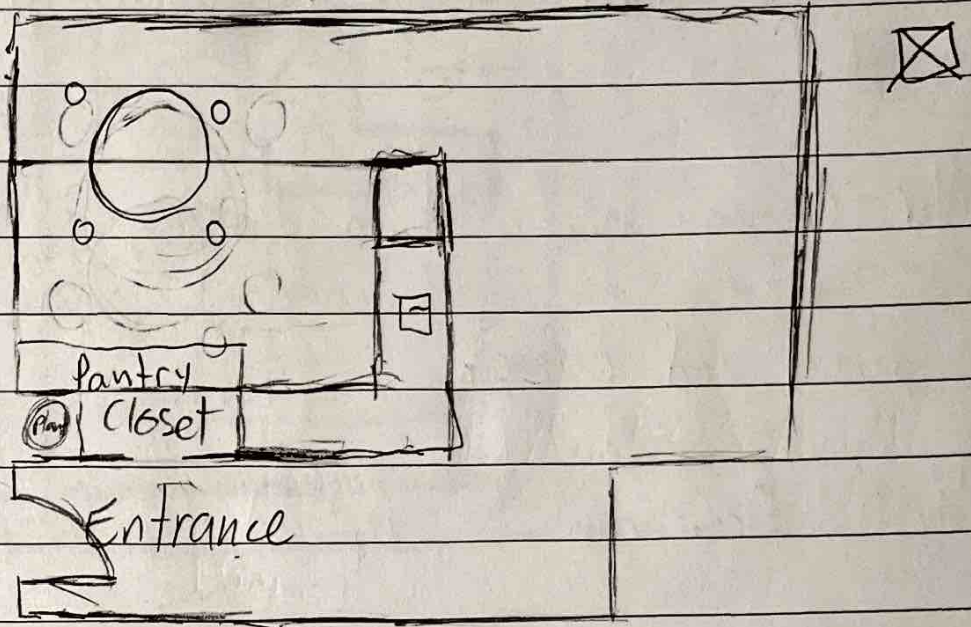
I also have decided what each side of the home will do. (not accurate size of wall) (or shape)



Jan 10, 2025

Here are the plans for the layout of each floor without dimensions

Floor 1

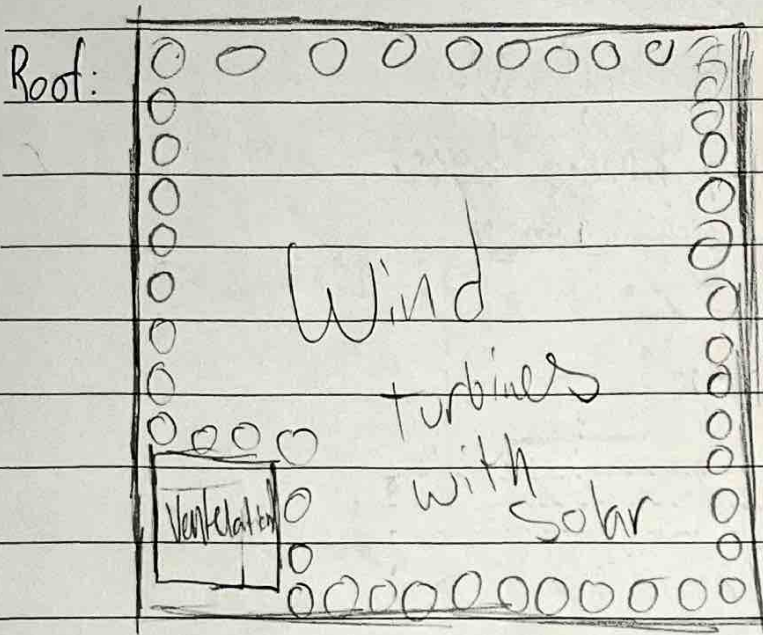


Feb 1, 2025

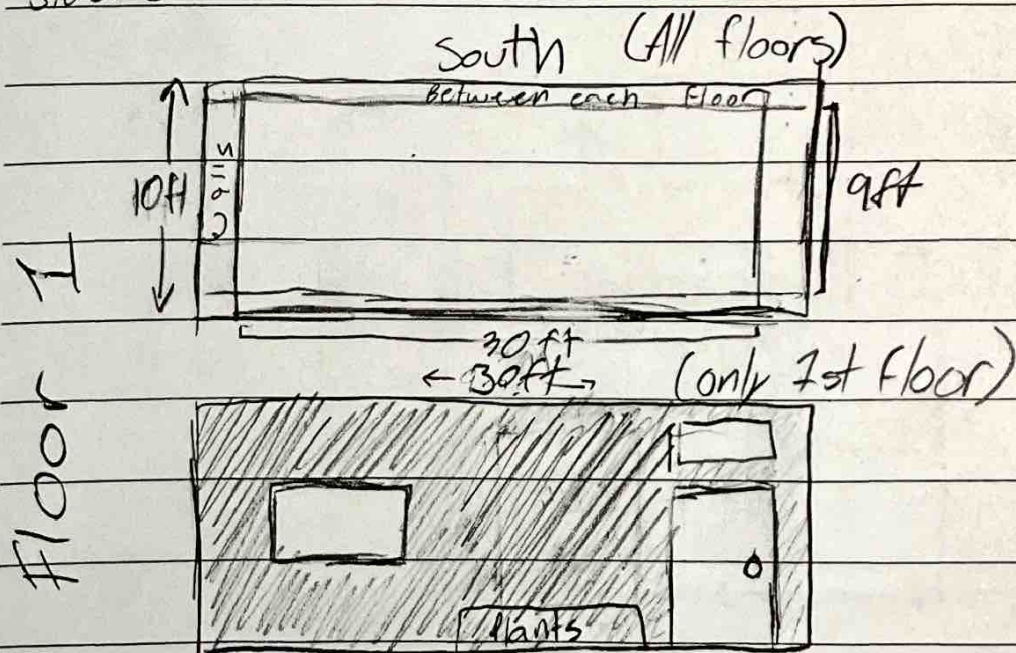
I will continue floor plan concepts, but first I found a series on Netflix called "Abstract", and there is an episode on bio-architecture. Here are notes from that:

- Neri Oxman has aided in designing a sculpture made entirely of natural compounds such as chitin and pectin, and casein

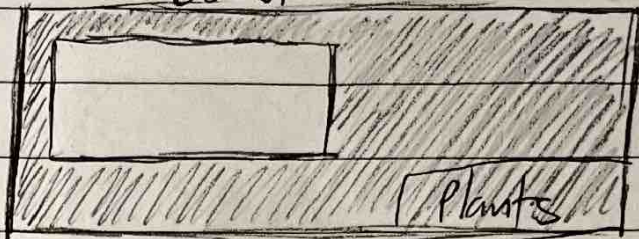
- Any plastics can be replaced by bio-polymers



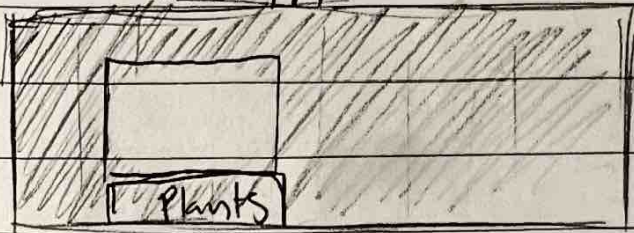
Now, I will make side views of each floor which include east and south sides



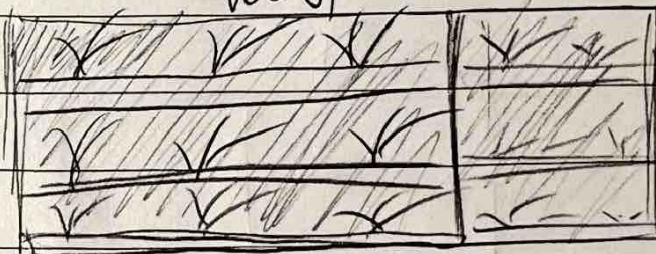
East



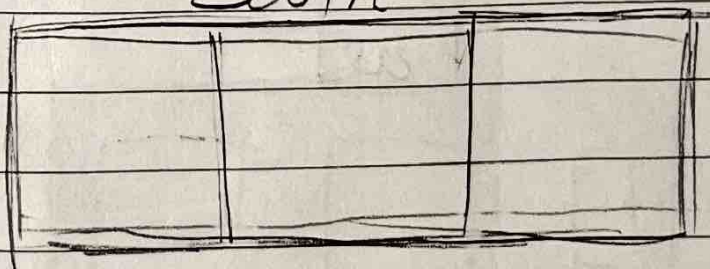
North



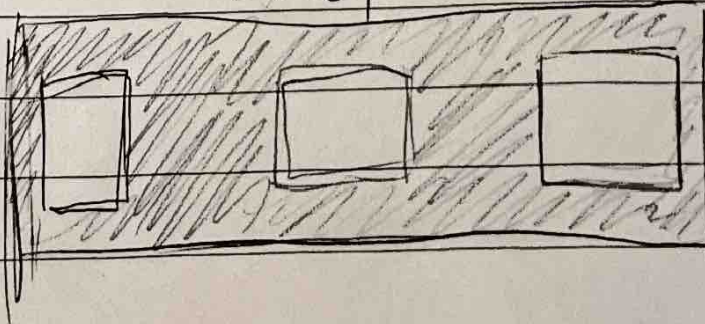
West



South

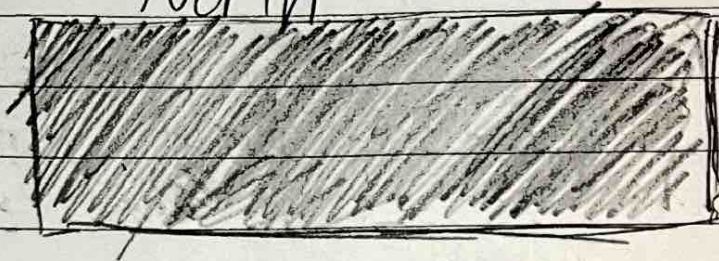


East

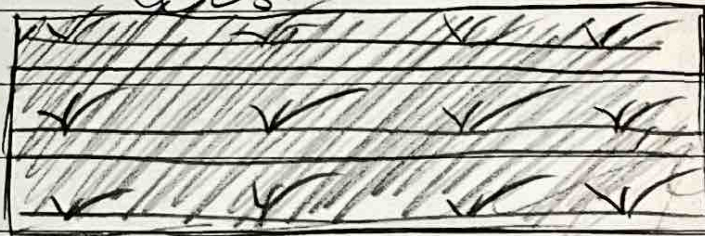


Floor 2

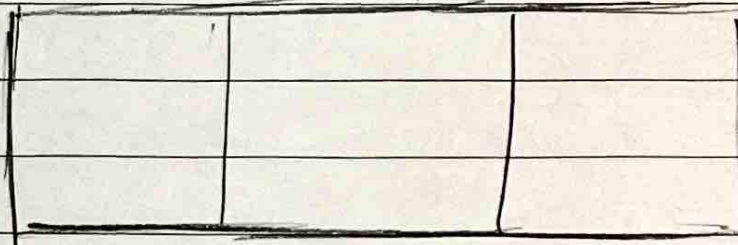
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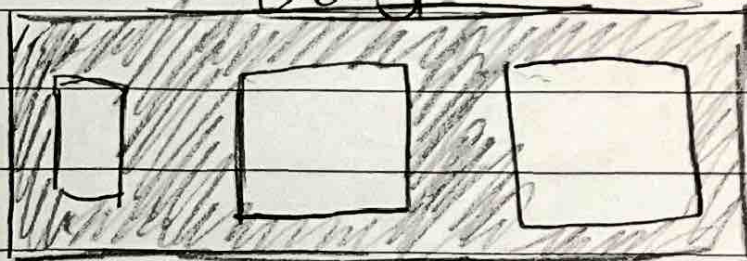
West



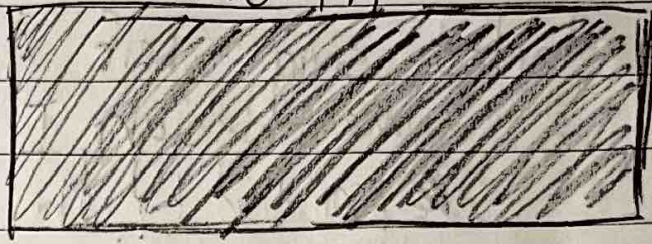
South



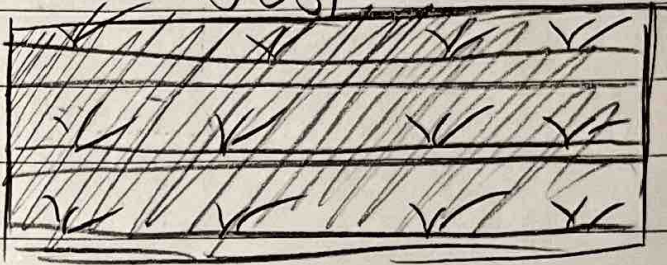
East



North



West



Feb 9, 2025

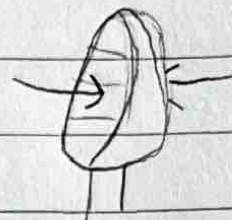
Today I started using Chief Architect to make the home design. I will use the materials list provided by the software to find eco-friendly substitutes.

Mar 7, 2025

Yesterday, I finished making the floor plan for the Bio-Home.

The layout has been made with consideration of what technologies will be used to provide energy to the home:

- Efficient wind turbines will be used to provide electricity for the house.



- A wind catcher will be used as an AC; the floor plan is designed to transport that air throughout the home.

- One wall will use rain water to cover its surface. This will be the cooling wall. The water will absorb heat, then be evaporated, or carried away by the wind. This is how sweating works, according to the National Institutes of Health.

Mar 9, 2025

Today, I am starting to build a model of the Bio-Home to more easily demonstrate how the home works and all of its components.

The model will be a scale of $1/30$, or $1\text{cm} = 1\text{ft}$. Although, in our time, I cannot find eco-friendly model-building materials, I will indicate what materials the real home will consist of.

Materials for real Bio-Home:

- Concrete → Ecopact
- Brick → Finite concrete
- Tempered glass → None
- Carpet → Cork
- Subfloor → Bamboo
- Framing → Bamboo
- Drywall → Cork or Bamboo
- Trim + Railing + Wall panel + Doors → Bamboo
- Insulation → Recycled materials
- Door Knob + Door hinge + Screws → Recycled metals
- Adhesive → None :{

Mar 15, 2025

Notes about EcoPact concrete:

- 90% lower CO₂ emissions
- EcoPact is just as functional as standard residential concrete

Mar 17, 2025

Bamboo for construction:

- India is the largest producer of bamboo
- One of the most rapid-growing plants
- Its strength is almost equal to steel
- Harvest happens every 3-5 years, compared to traditional wood, which is every 25 years

Is insulation eco-friendly

• The problem is not how plastics perform in insulation, it's how they are made and disposed of.

• Using recycled materials would ^{almost} solve the manufacturing problem. *Fibreglass*

• Fiberglass, cellulose, and mineral wool have similar problems.

Tempered glass:

- Is recyclable and frequently reused.
- Has a long life.

Flowers + Plants for vertical garden

- Japanese barberry
- Weigela

*I also finished the model of the bio-home.

All that is left is to write the Conclusion.

Last entry

This project was so fun to work on. I hope that I bring this knowledge with me wherever I go.

I am optimistic about our future of sustainability and cooperation.

- Everett Sansom

2025