

Statement

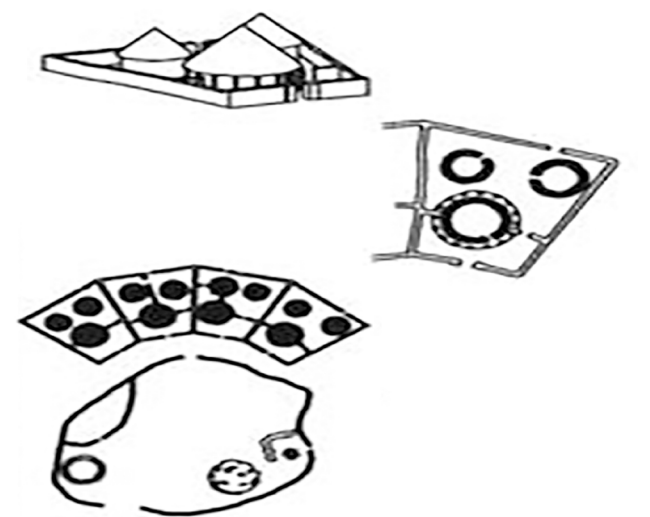
If the iconic image of the Western house is the rectangular plan with a hip roof, or Middle Eastern house is the living spaces around a courtyard, then the prevailing image of Lesotho's house is undoubtedly the cylindrical living spaces with the thatched roof around a courtyard.

This project is developed based on this predominant image of Lesotho's house. In this regard, the round Lesotho house is adapted into the hexagon with a thatched roof on the top which creates the same identity for new Lesotho houses. Hexagon is extremely repetitive, structurally efficient, the ultimate scalable shape, and has identical segments.

Concept

If the iconic image of the Western house is the rectangular plan with a hip roof, or Chinese house is the curved roof and non-load-bearing partitions, or Middle Eastern house is arranged living space around a courtyard, then the prevailing image of Lesotho's house is undoubtedly the cylindrical living spaces with the thatched roof around a courtyard.

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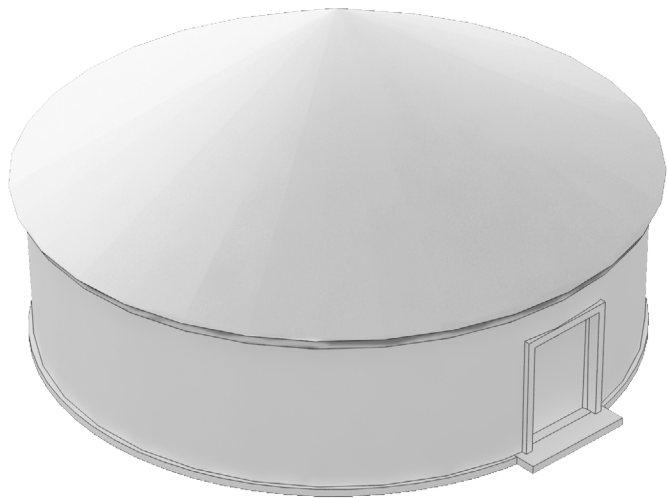


Groblersdal, South Africa

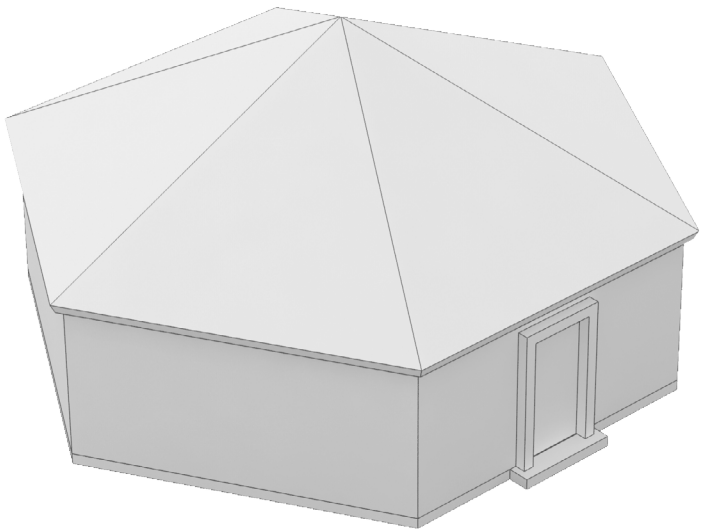


Typology of South Africa Houses
Gerald Steyn (2005)

Old School

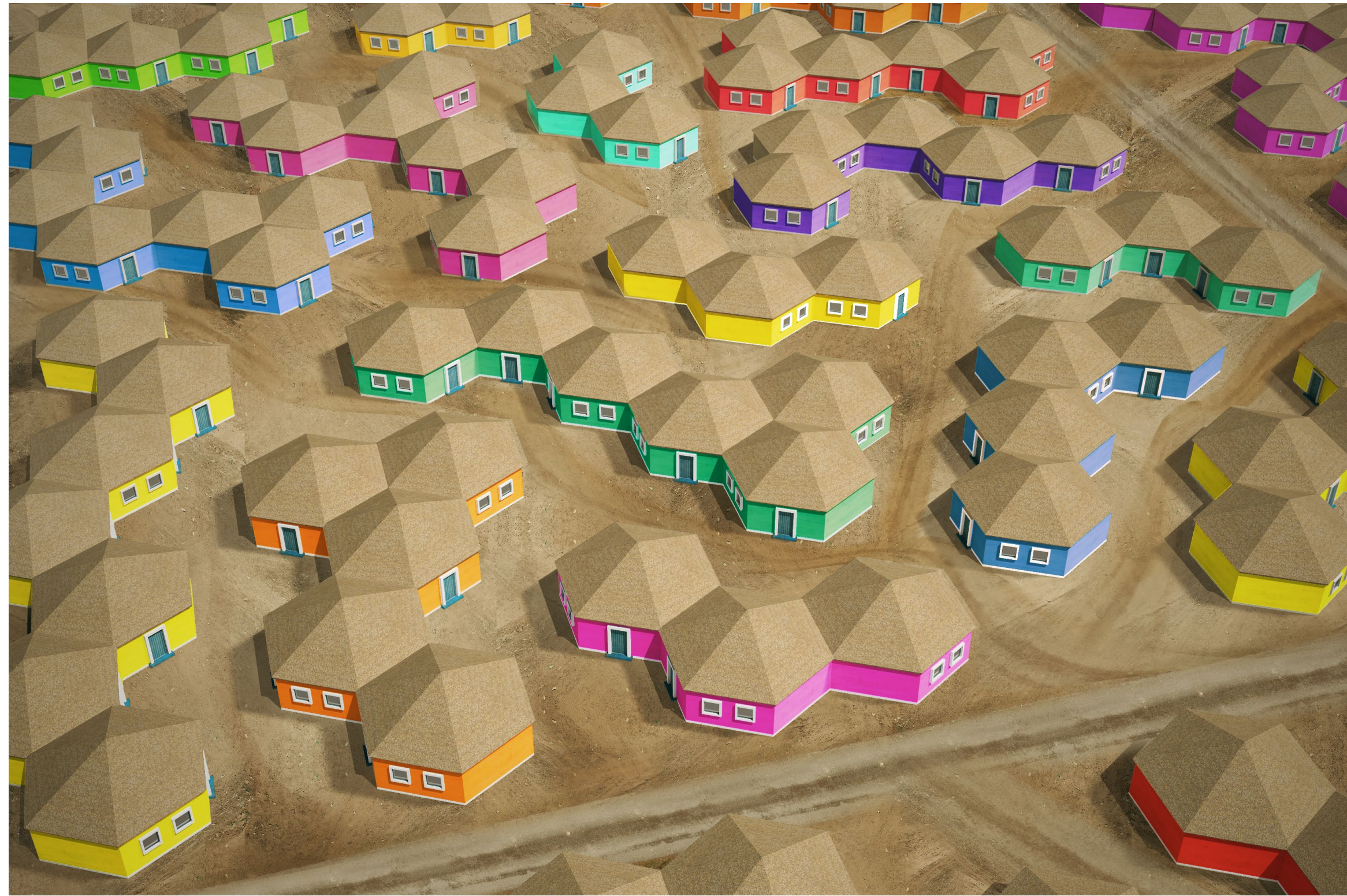
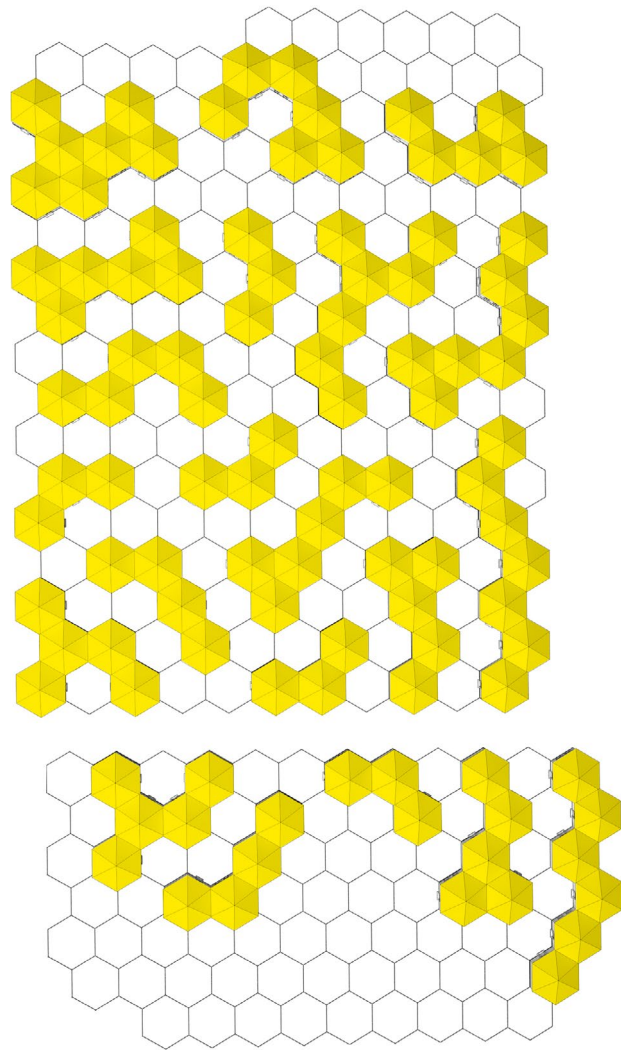


New School



Aesthetics

The culture and artistic works of this part of the world is quite colorful and very impressive. We believe that colors, materials, nature, have a huge impact on the psychology of the people who occupy these spaces. The project proposes a collective of hexagon dwellings in a large scale with vivid colors, arranged in a unique pattern. The colorful hexagons can create a unique identity for the dwellings in Lesotho and have strong roots in local culture. People can paint their house's walls with colorful concrete and create an impressive colorful hive which presents the colorful culture of Lesotho.



Construction and Materials

One of the best ways for unskilled local labor to master a construction technique is to make it highly repetitive. In this project, a unique modular system is developed so that the construction of each wall of the hexagon is exactly the same and purely repetitive. This unique module could also use for the framing of the roof (Fig 1). In other words, each module can be cut in half, rotated in place to make a triangle surface, and to be arranged into a pitched roof (Fig 2). The module is made of 3D wire Panel with a size of 4.5m × 2.25m (width × Length). After alignment of panels like a hexagon, using Shotcrete (sprayed concrete) to cover both interior and exterior surfaces by Foam Concrete. This construction method removes the need of using columns and beams and cuts down structure costs.

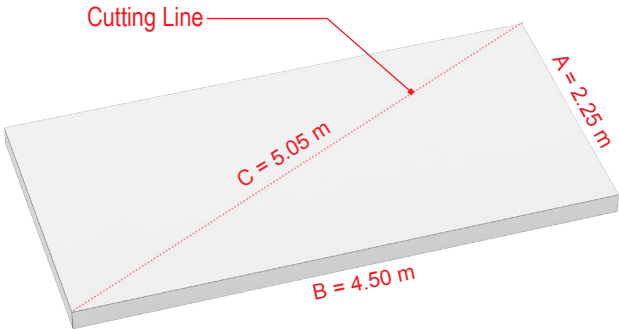


Figure 1

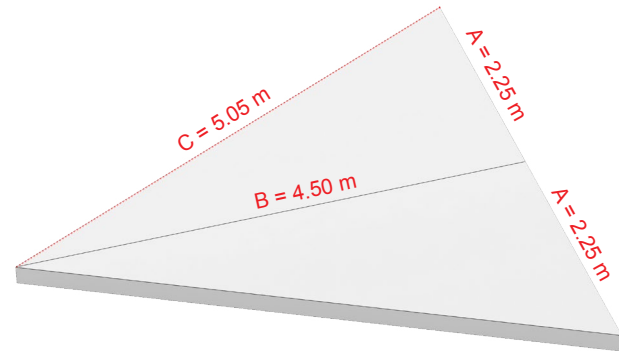
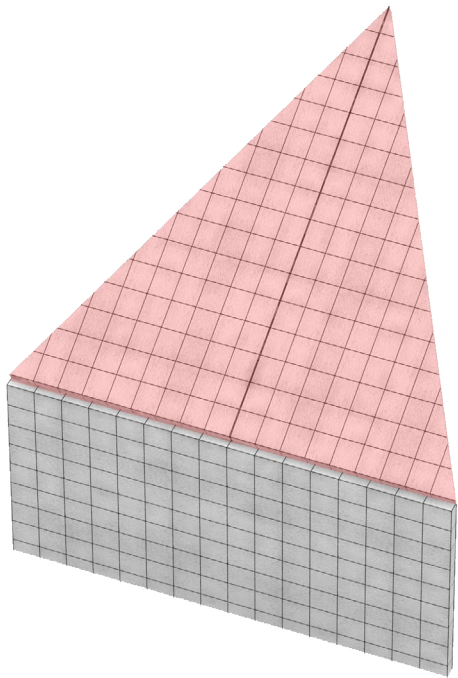
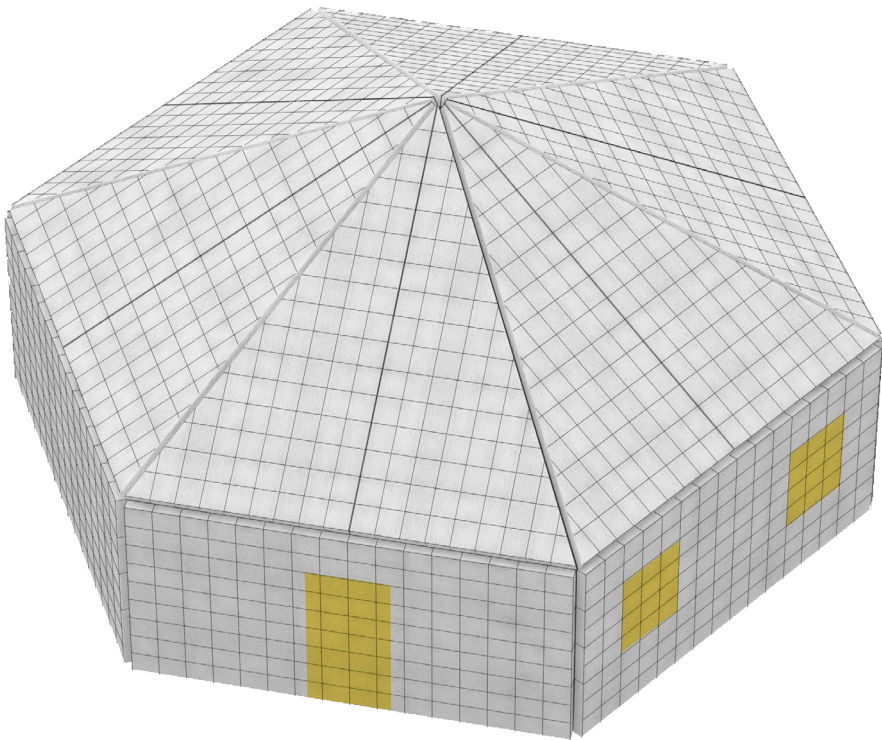


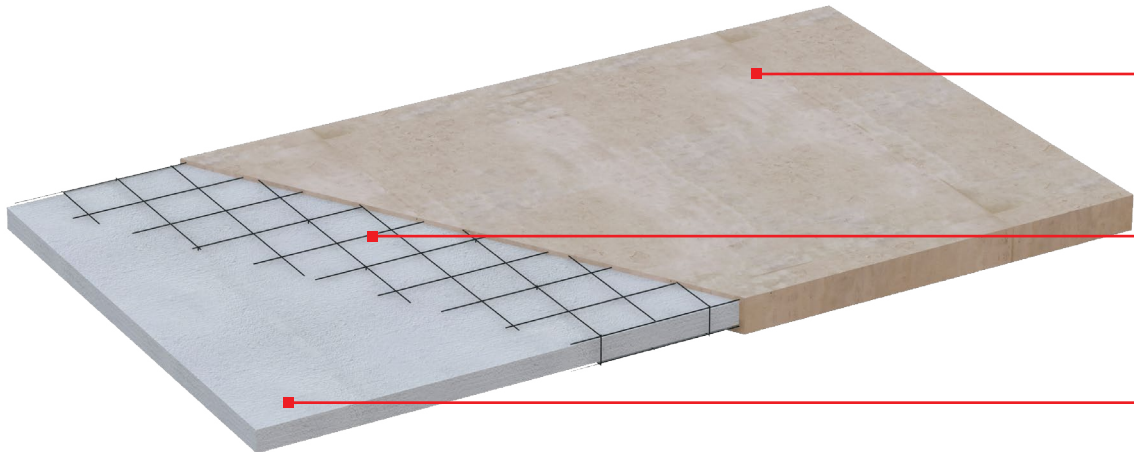
Figure 2



Two rectangular modules (3D wire Panel: 4.5m × 2.25m) together create 1/6 of hexagon volumetric mass.



After setting up the volumetric mass, the opening will be designed, projected on the surface, and cut out.



Shotcrete (5cm Foam Concrete)

Metal Mesh

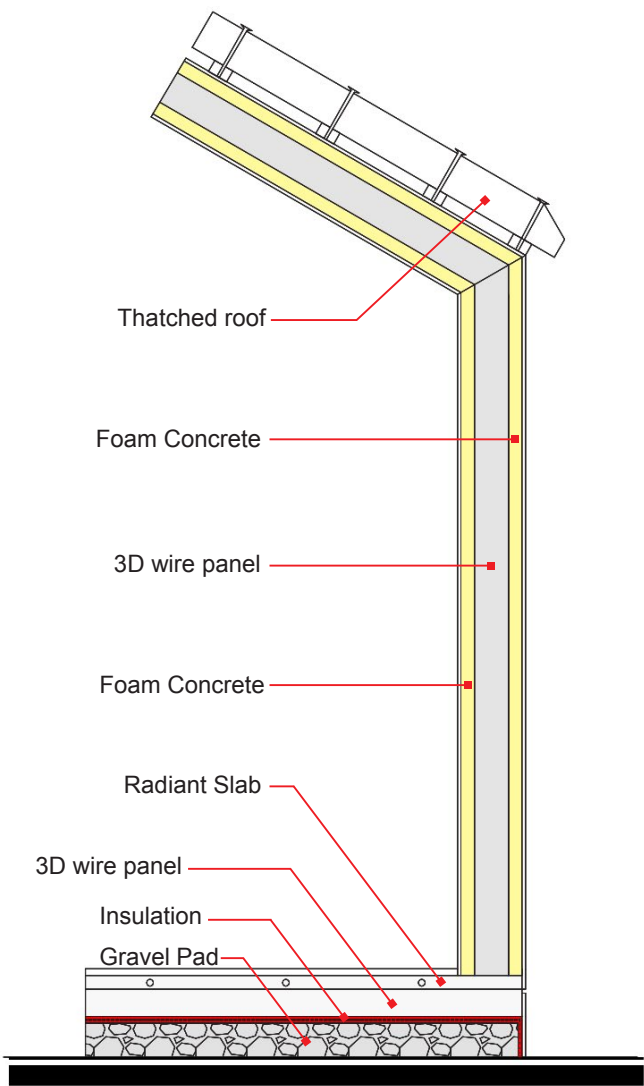
Polystyrene (10 cm)

Material, Size:4.5m × 2.25m
3D wire Panel will be covered by a layer of Foam Concrete

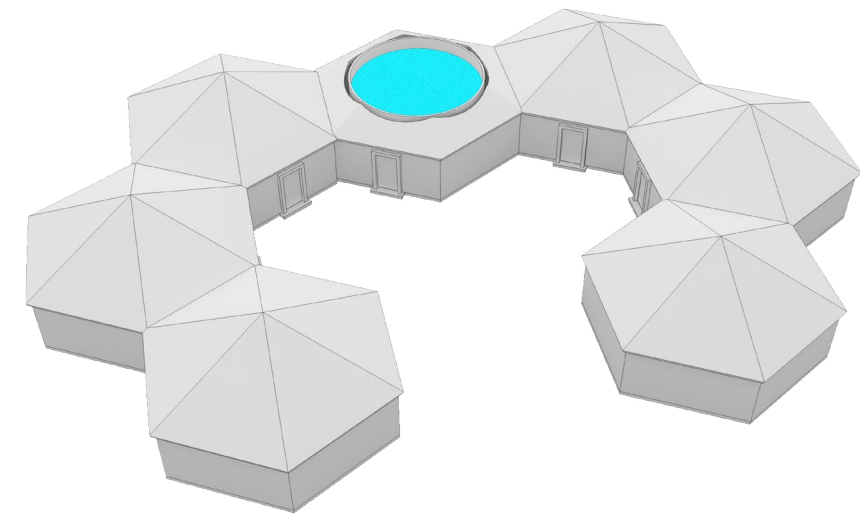
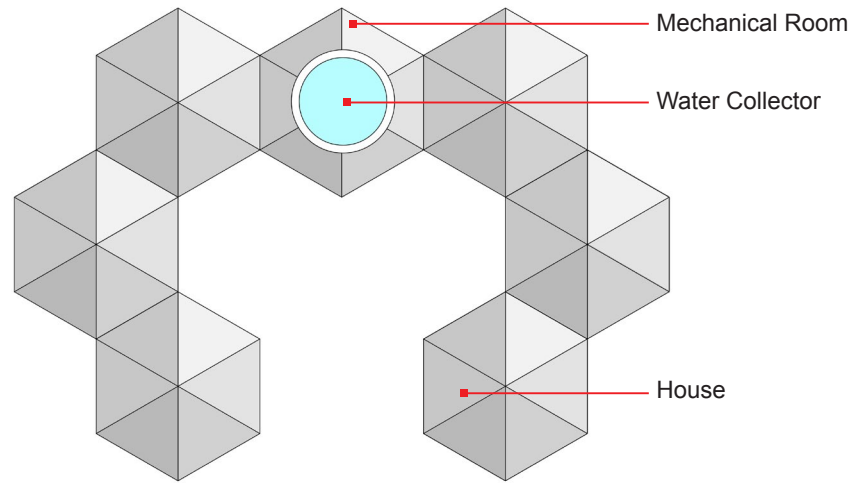
Energy Efficiency

The wall and roof are made of 3D wire panel that is covered by Foam concrete. The panels core is made of Polystyrene with 10 cm thickness and up to 0.24 W/m²K thermal conductivity. A layer of Foam concrete with 5 cm thickness and a range between 0.10 W/ m²K to 0.56 W/ m²K thermal conductivity covers both indoor and outdoor surfaces. The roof is also covered with thatch which is a perfect thermal insulator and waterproof material.

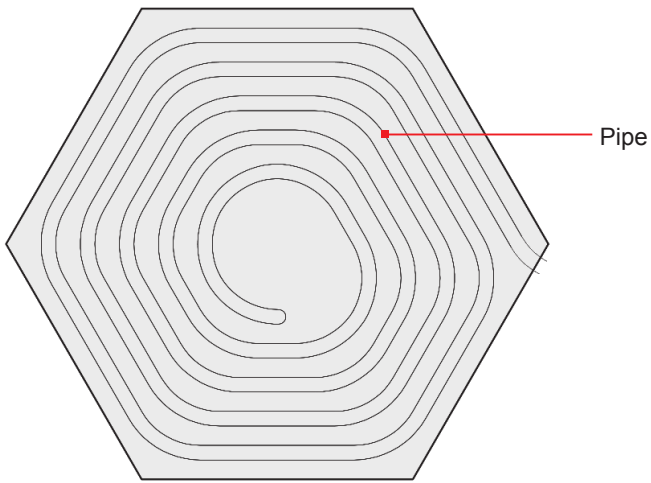
The suggested heating system for the house is a radiant slab system. This system can create a uniform heat source in the floor and efficiently heats the interior space without much waste.



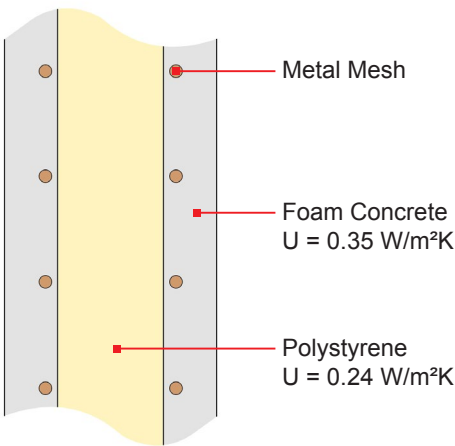
Wall Section



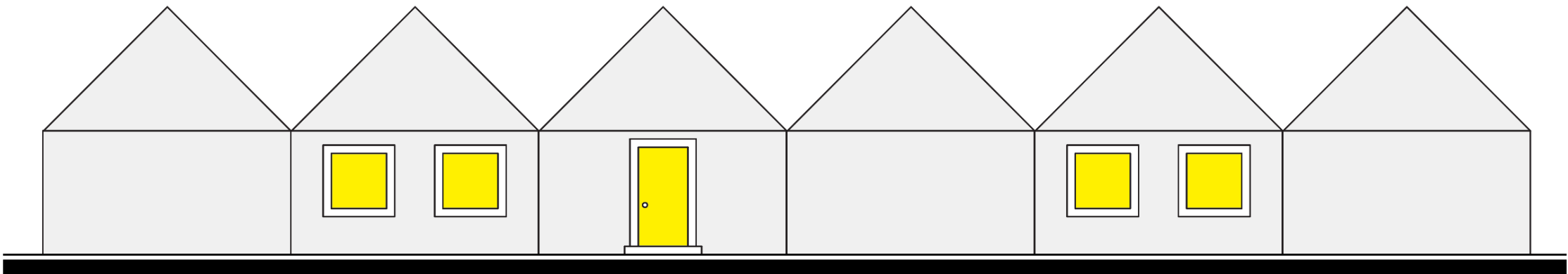
Water Collector
One module can be used as a water collector and mechanical room and shared between several houses. This strategy causes the cost of the mechanical system to be broken down and decrease exponentially.



Heating System
Floor with pipes for radiant slab system



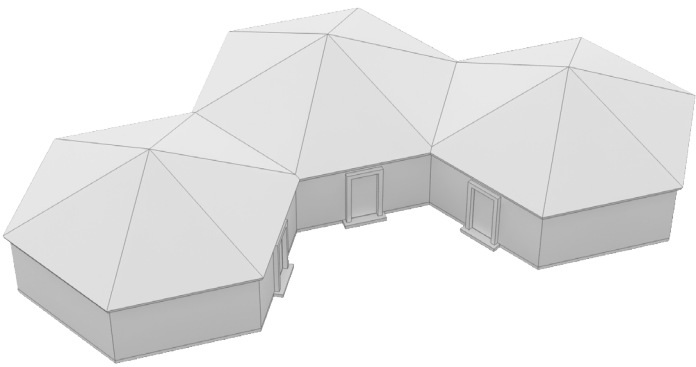
U- Value
Thermal conductivity coefficient of wall's layers



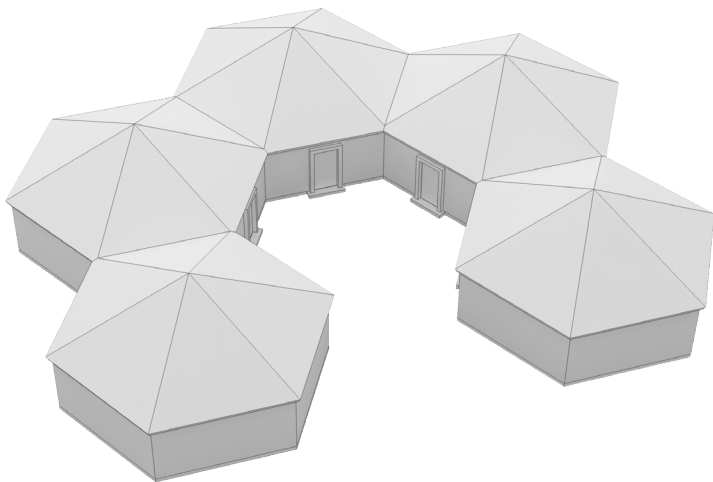
Openings
To decrease the heat transfer between indoor and outdoor, the size of the opening has been minimized. For each module, the total amount of openings including door and windows is about 6 percent of the wall and roof areas.

Scalibilty

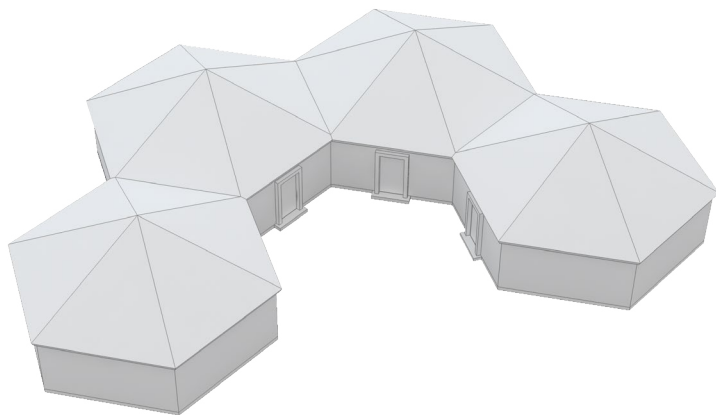
In this project, the courtyard is a result of the arrangement of dwelling units, or the negative space that is created between units. The expansion of dwellings causes the development of courtyards, urban routes and public spaces as well. The courtyards do not always have to be the same size, shape, or function. Their scales and size could be varied based of the function and program. They can be arranged in groups of 3, creating a larger shared garden. They can be arranged in groups of 20, creating a neighborhood with a plaza. There are hundreds of possibilities.



Houses arranged in a group of three



Houses arranged in a group of five

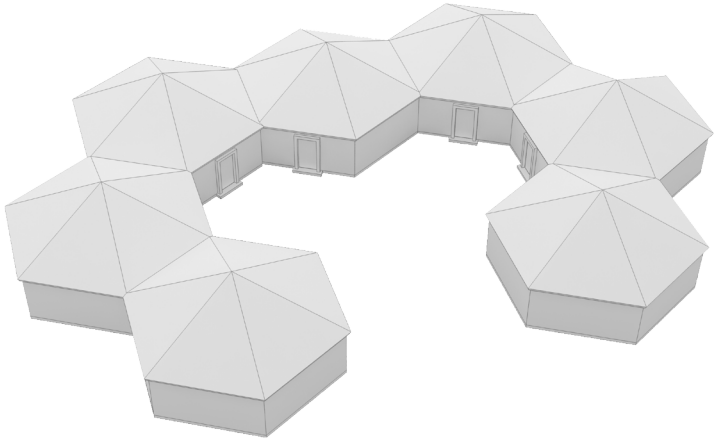


Houses arranged in a group of four

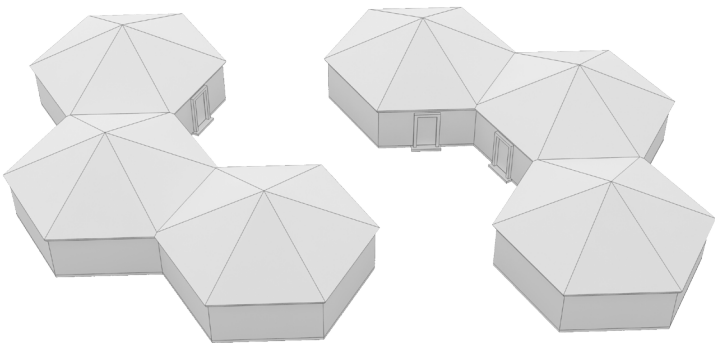


Possible Configurations

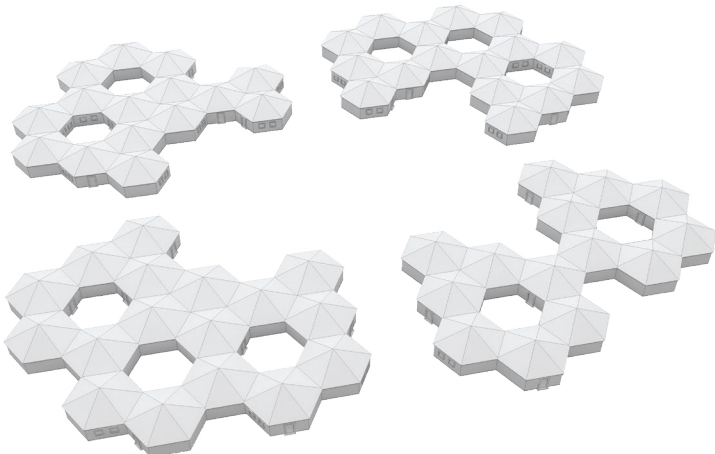
The Possible configuration of the hexagon can support a vast range of functions such as a school, cultural center, gallery, health care center, and buildings for public services. The negative spaces also can create courtyards, alley, public plaza, and gathering spaces.



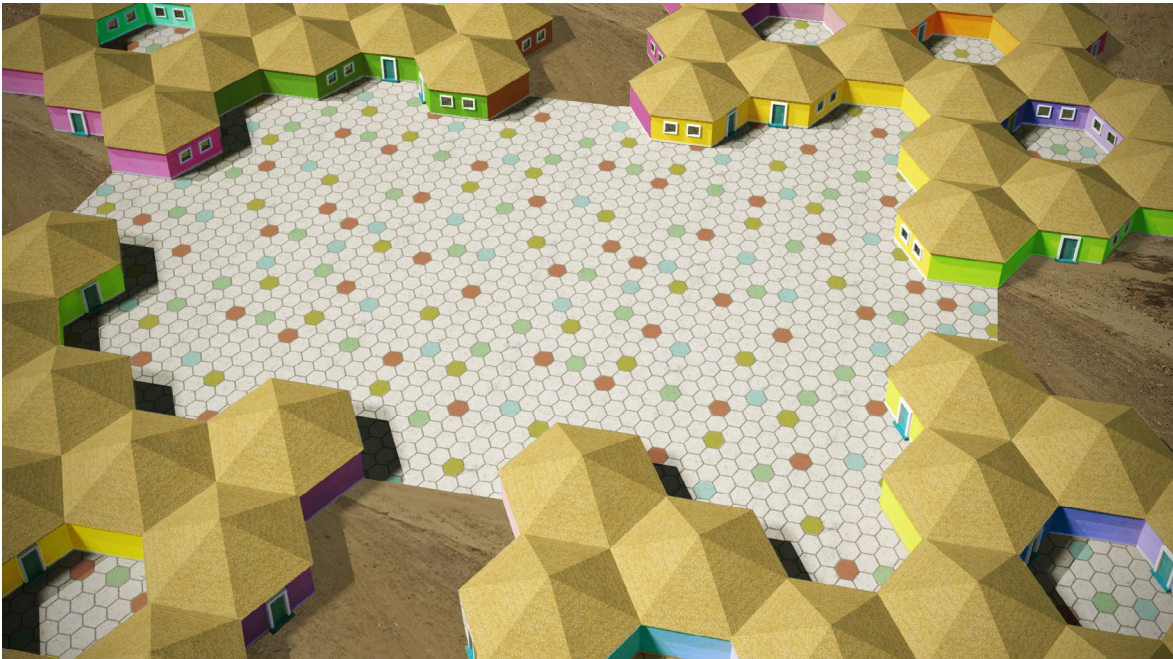
Units arranged to create a school



Creating an alley with negative space



Creating a Public Plaza



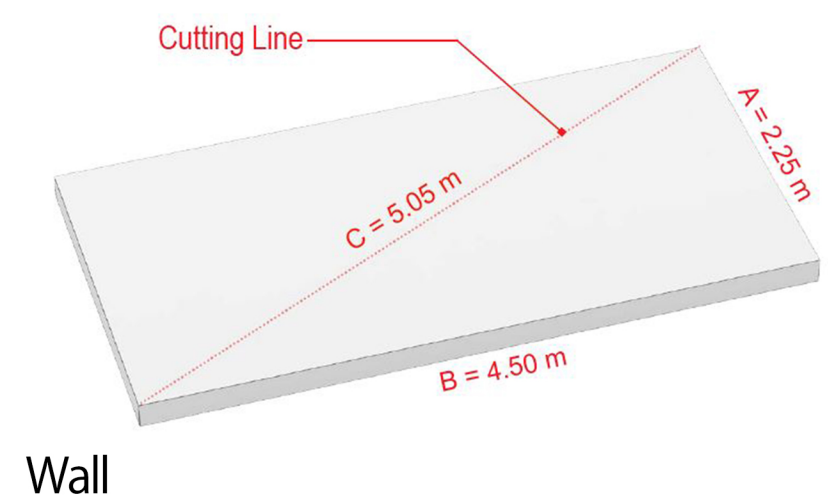
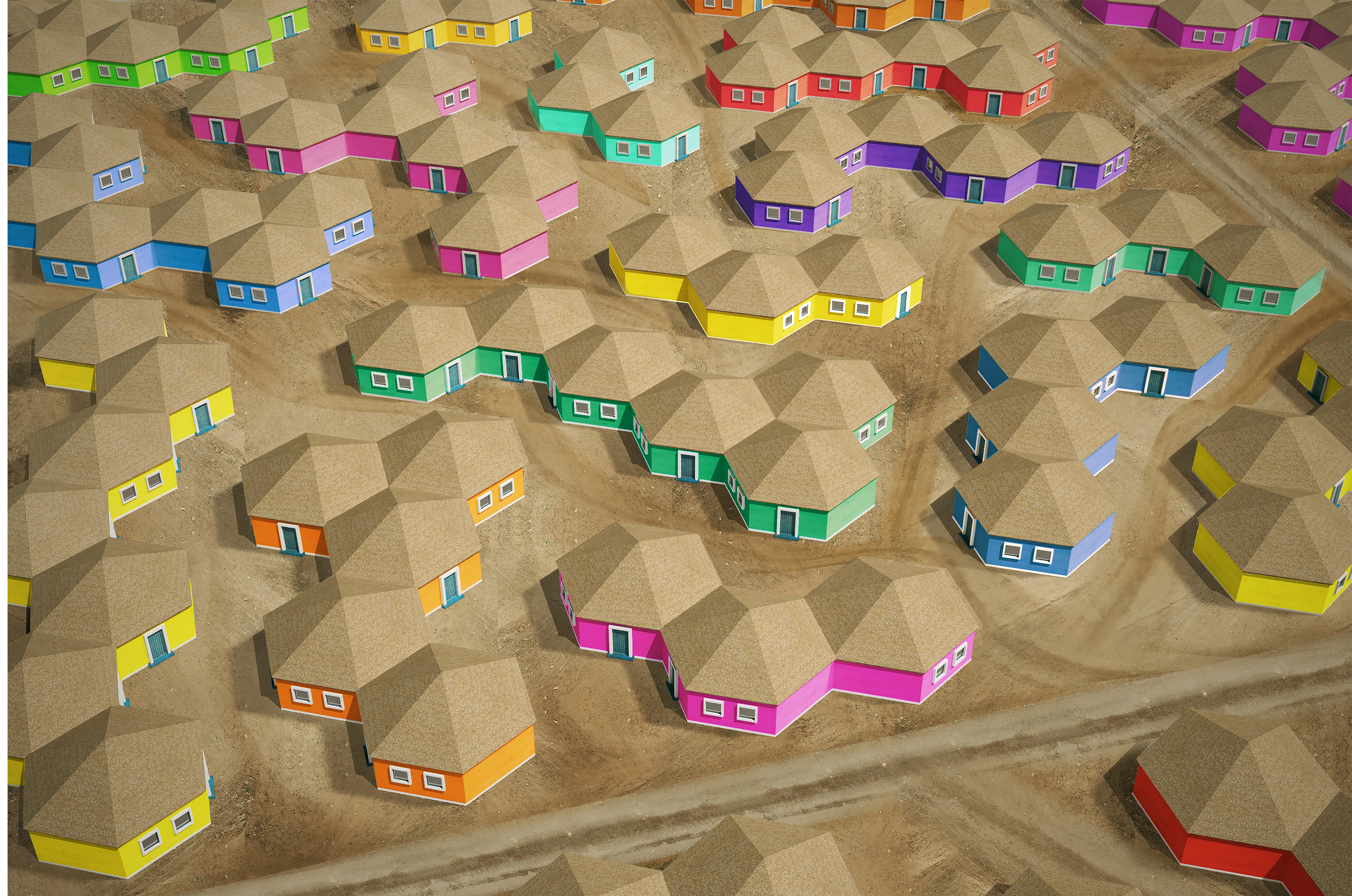


HIVE

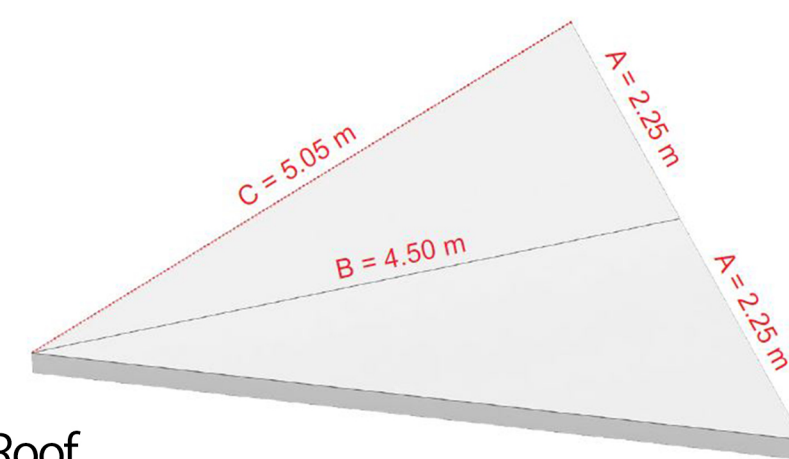
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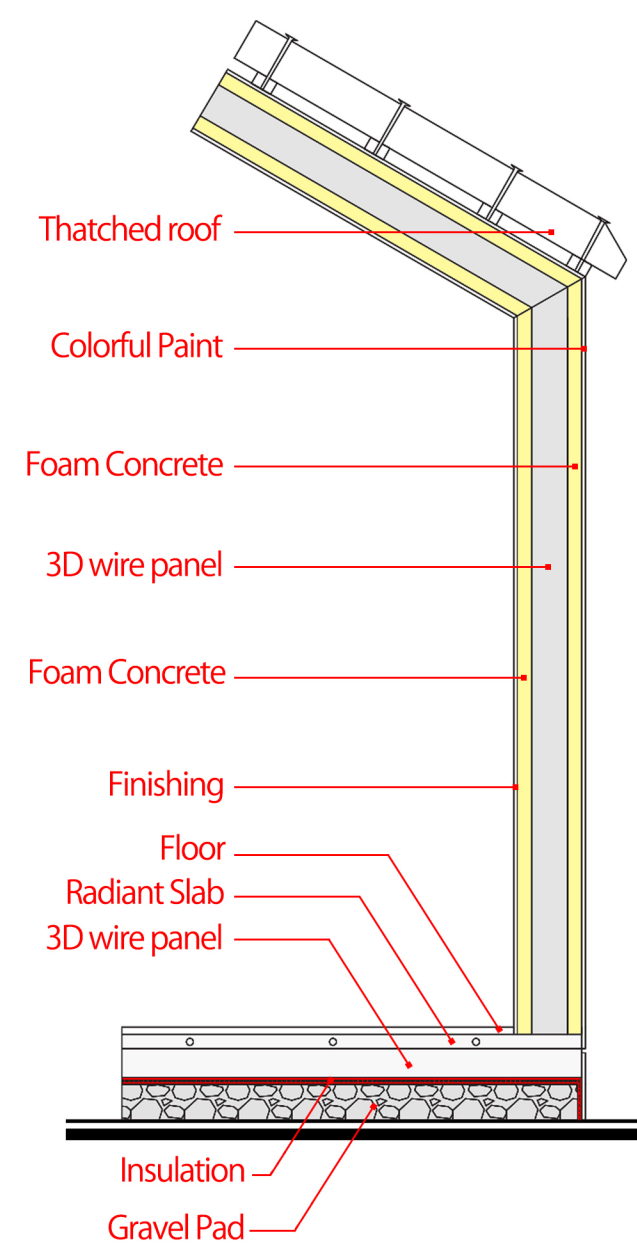
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Wall



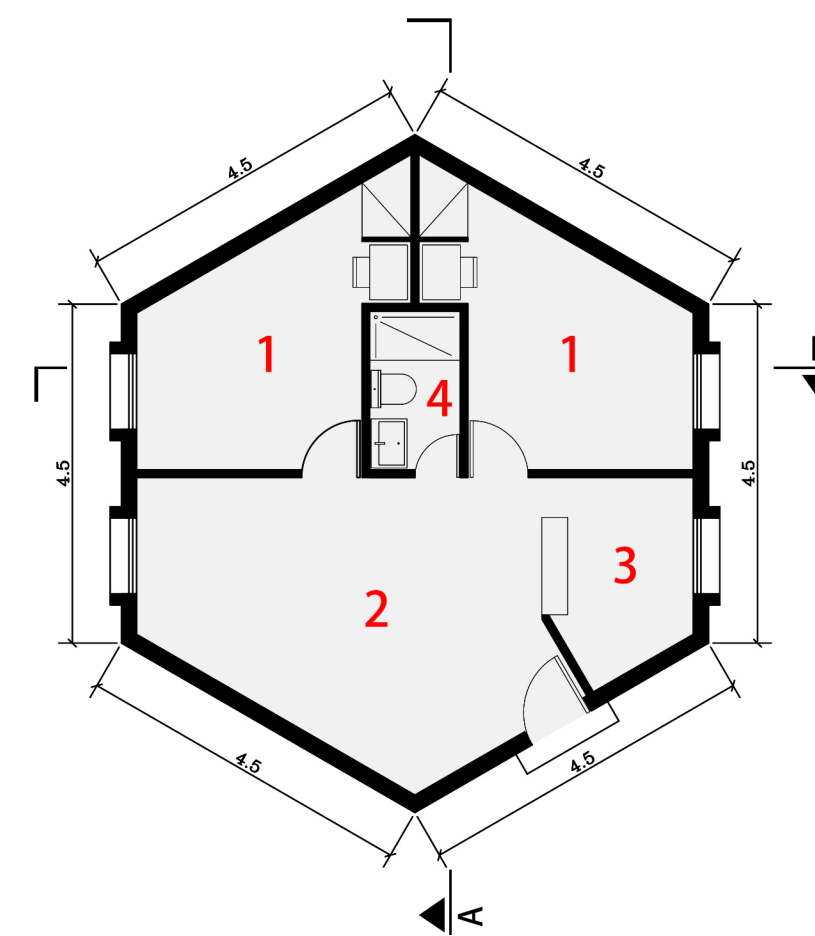
Roof



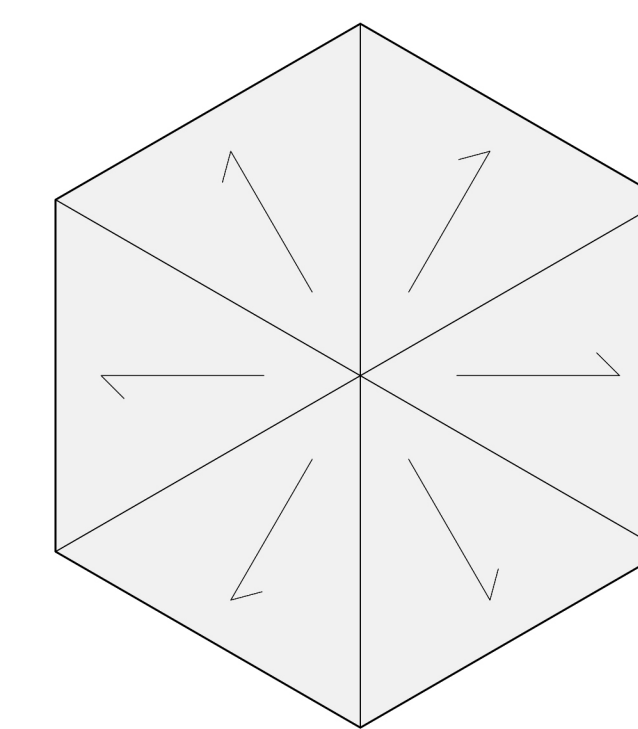
Wall Section

Sc: 1/20

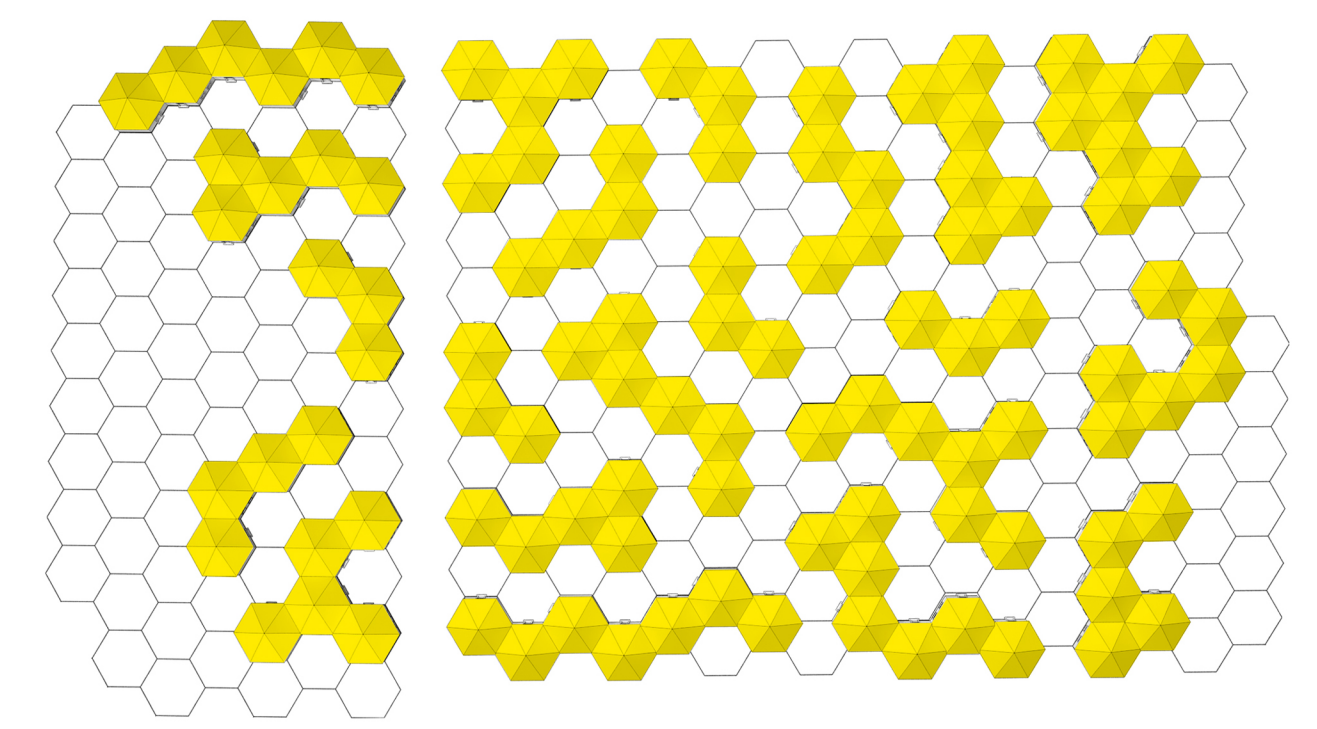
1. Bedroom (10 m²)
2. Living Room (18 m²)
3. Kitchen (5 m²)
4. Bathroom (2.5 m²)



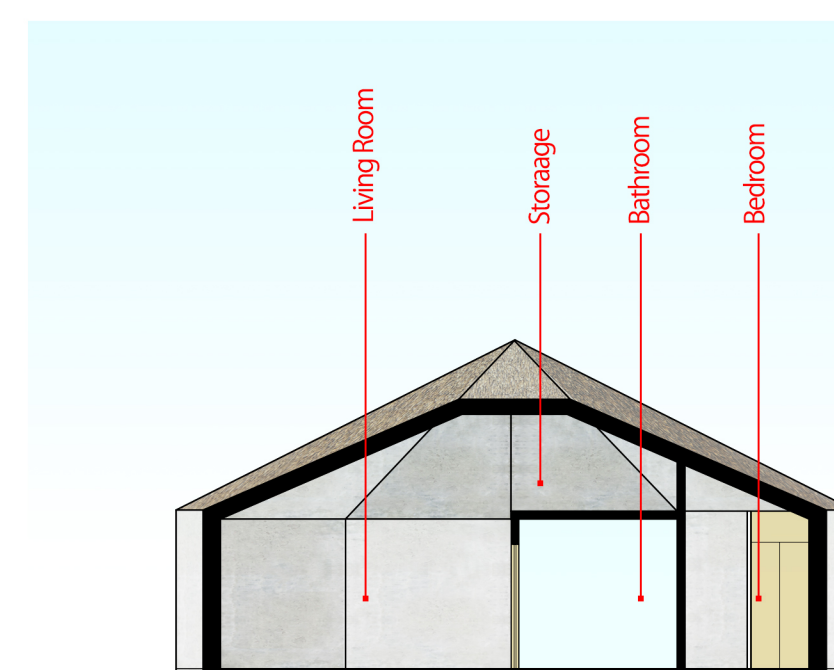
Plan
Sc: 1/100



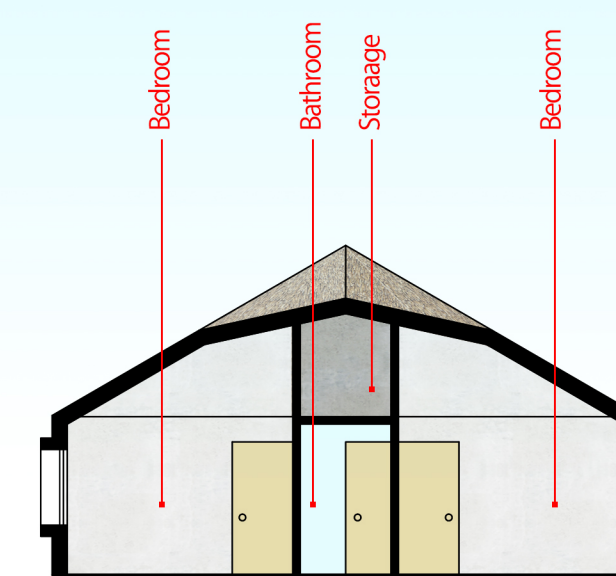
Site Plan
Sc: 1/100



Master Plan



Section A-A
Sc: 1/100



Section B-B
Sc: 1/100



Elevation
Sc: 1/100

Cost Estimation				
Item	Amount of a Unit	Cost Per Unit (\$)	Number of Units	Total Cost (\$)
Roof				
3D wire Panel with Foam Concrete	6 m ²	24	6	144
Thatched roof	6 m ²	6	6	36
Water Proof Layer	6 m ²	12	6	72
Wall				
3D wire Panel with Foam Concrete	10.16 m ²	40.64	6	244
Colorful Paint (outside)	10.16 m ²	8	6	40
Paint (inside)	10.16 m ²	5	6	30
Partitions				
Partitions	55 m ²	-	-	330
Floor				
Water Proof Layer for Bathroom	2.50	-	1	10
Water Proof Layer for Floor	47 m ²	-	1	94
3D wire Panel with Foam Concrete	47 m ²	-	1	188
Foundation				
Gravel Pad	47 m ²	-	1	100
Total				1288