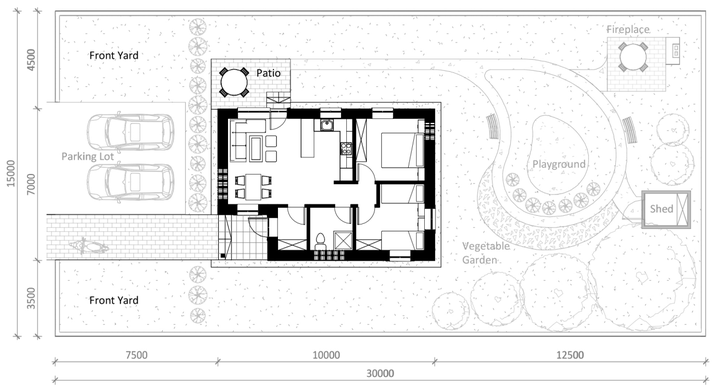
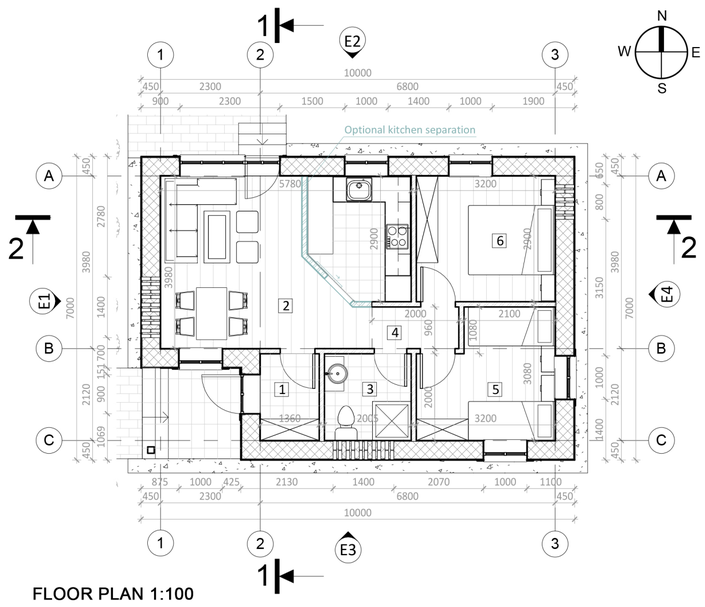
RISE IN THE CITY 2018 - LESOTHO AFFORDABLE URBAN HOUSING DESIGN



SITE PLAN 1:500 SITING Basic project coverage Future improvements



FLOOR PLAN 1:100

EXPLICATION

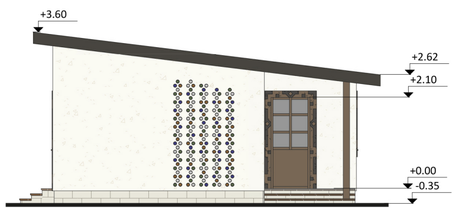
No.	Name	Area
1	Entry	2.72 m²
2	Living Room	22.03 m²
3	Bathroom	4.00 m²
4	Corridor	1.92 m²
5	Bedroom	8.67 m²
6	Bedroom	9.28 m²
		48.62 m²

Adobe Floor (tile imitation imprint)

Reclaimed Wood Floor

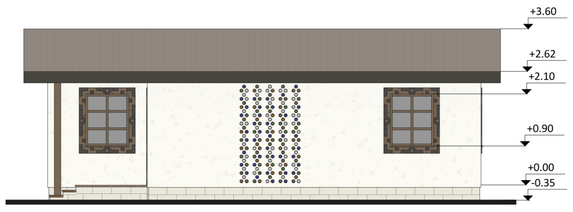
Ceramic Tiles

Clay-brick Paving

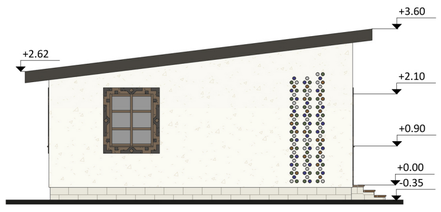


ELEVATION 1 1:100

ELEVATION 2 1:100



ELEVATION 3 1:100

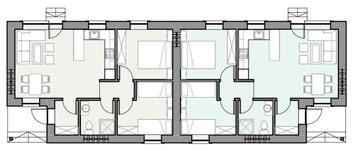


ELEVATION 4 1:100

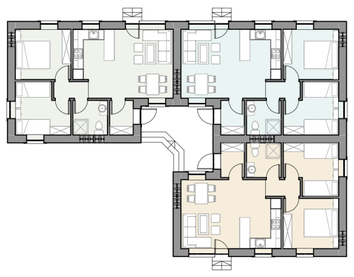
SECTION 2-2 1:100

SECTION 1-1 1:100

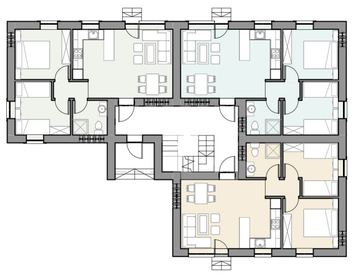
TWO APARTMENT - ROW HOUSING 1:250

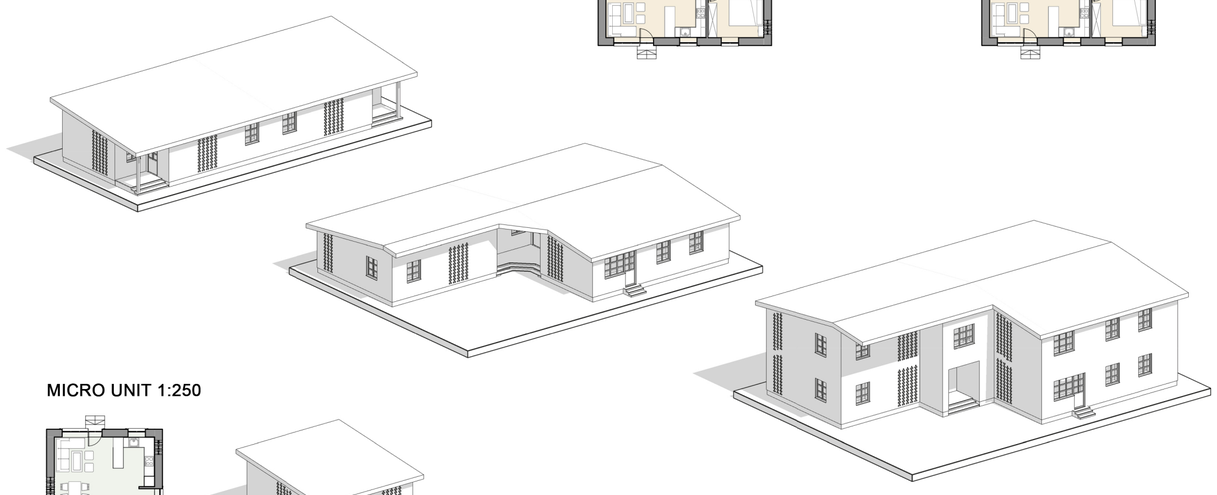


THREE APARTMENT CLUSTER 1:250

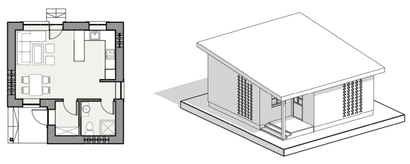


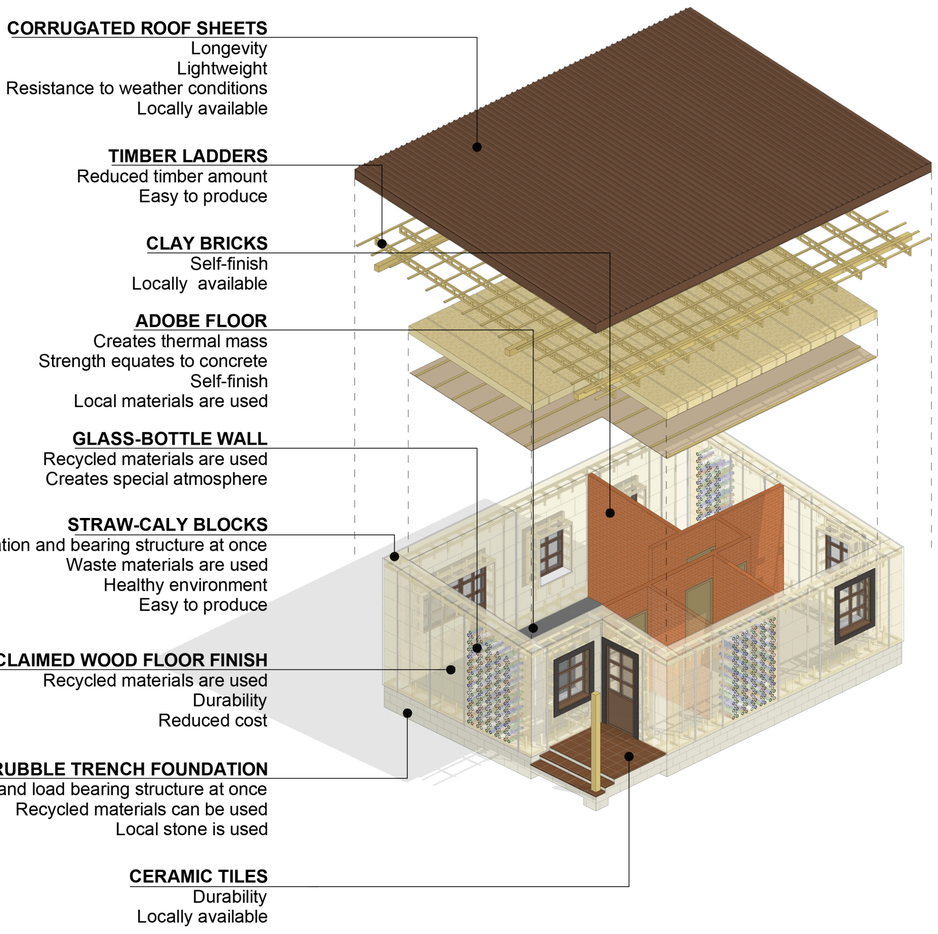
SIX APARTMENT - TWO STOREY HOUSE 1:250



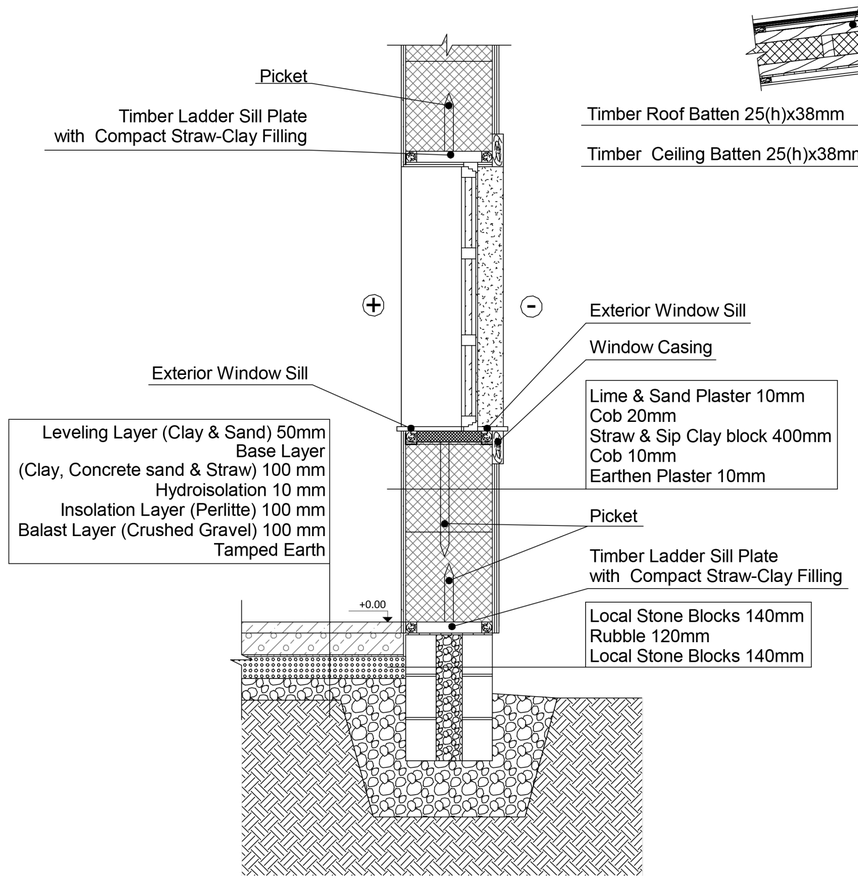


MICRO UNIT 1:250

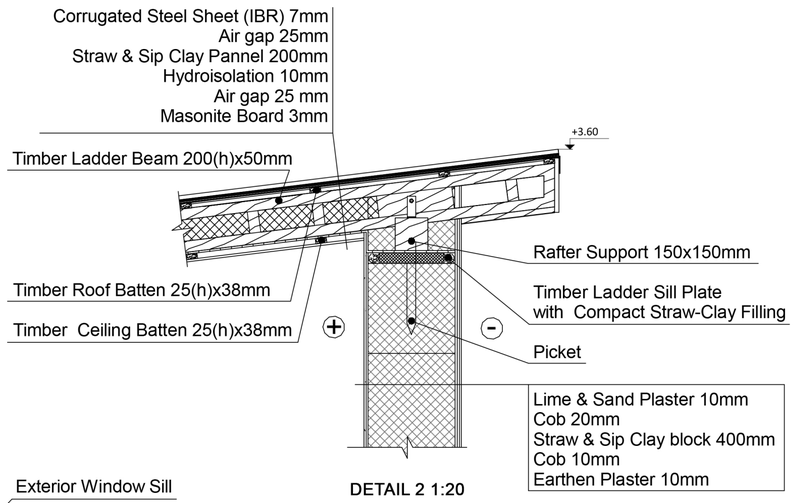




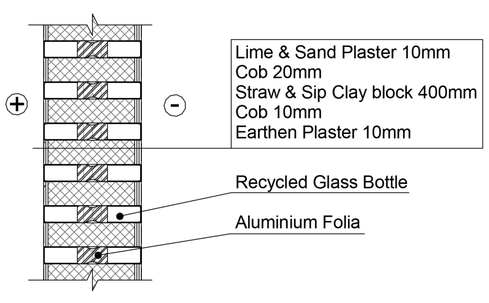
MAIN STRUCTURE ISOMETRY 1:100



DETAIL 1 1:20



DETAIL 2 1:20



DETAIL 3 1:20

RISE IN THE CITY - 2018
LESOTHO AFFORDABLE URBAN HOUSING DESIGN COMPETITION

The shape of the prototype arose from analysis of nowadays Maseru urban structure. Majority of existent dwelling houses are rectangular in plan and have slightly-sloped roofs so is the prototype – to be easily mixed in local urban environment. The house is designed so that it could be sub-blocked from either of three sides and still maintain crucial natural light in all living areas. In the city areas where densification is a key factor, second floor could be added to develop an apartment building. On the other hand, the design could be easily adapted to a single-room micro unit for those who have smaller income, with an ability to aggregate the house on demand, when budget increase.

Floor plan is divided into three sections – main living area in the front of the house, calm bedroom zone in the back and auxiliary as the joining part. Main living area has a direct link to both other sections as well as to the patio. Enclosed entry is designed as part of ancillary section, as it prevents cold air spreading to other premises during cold seasons.

The prototype is designed so it would be sustainable and energy efficient. This is achieved by ensuring good insulation of roof, walls and floor. To make it more cost-effective, materials are selected so that they serve more than one function at once (straw-clay block walls as bearing structure and insulation, rubble trench foundation as bearing structure and drainage), are recycled (rubble, glass-bottles, straw) and local (straw, clay, sandstone, limestone); construction is simple, so with a little bit of training, unskilled workers can carry it out. Some of the elements, such as straw-clay blocks and timber ladders, may be manufactured in advance to speed up and facilitate the building process. Despite that all of those materials are environmentally-friendly, they are user-friendly as well – straw-clay construction helps to control humidity, temperature and sound quality, is fire and earthquake resistant.

The concept of aesthetical appearance came up from the study of traditional Basotho houses and beauty of natural local materials. Basotho are accustomed to use various patterns and colors in their traditional design, that's why, in spite of the project is going to be repetitive, it is able to become diverse and unique every time. This is achieved by using clay and stained-glass look walls. Clay, while easily available in Maseru and common in Basotho culture, is very easily sculptured – niches, wall and floor finishes, furniture, even bathroom equipment can be modeled from it; it can be carved or etched to compose patterns, shades can be altered using different natural pigments. Stained-glass look walls, made from recycled glass-bottles, help to fulfill house with colors and create intimate atmosphere where needed. This can adapt prototype to anyone's identity.

In a nutshell, the design is simple, versatile, sustainable, environmentally and user friendly, unique every time, while still affordable.

MOODBOARD

Glass-bottle Walls

Traditional Patterns

Lime Plaster

Straw Walls

Structural Timber

Ceramic Tiles

Clay curving

Clay Brick pavement

Earthen Plasters

Clay Color

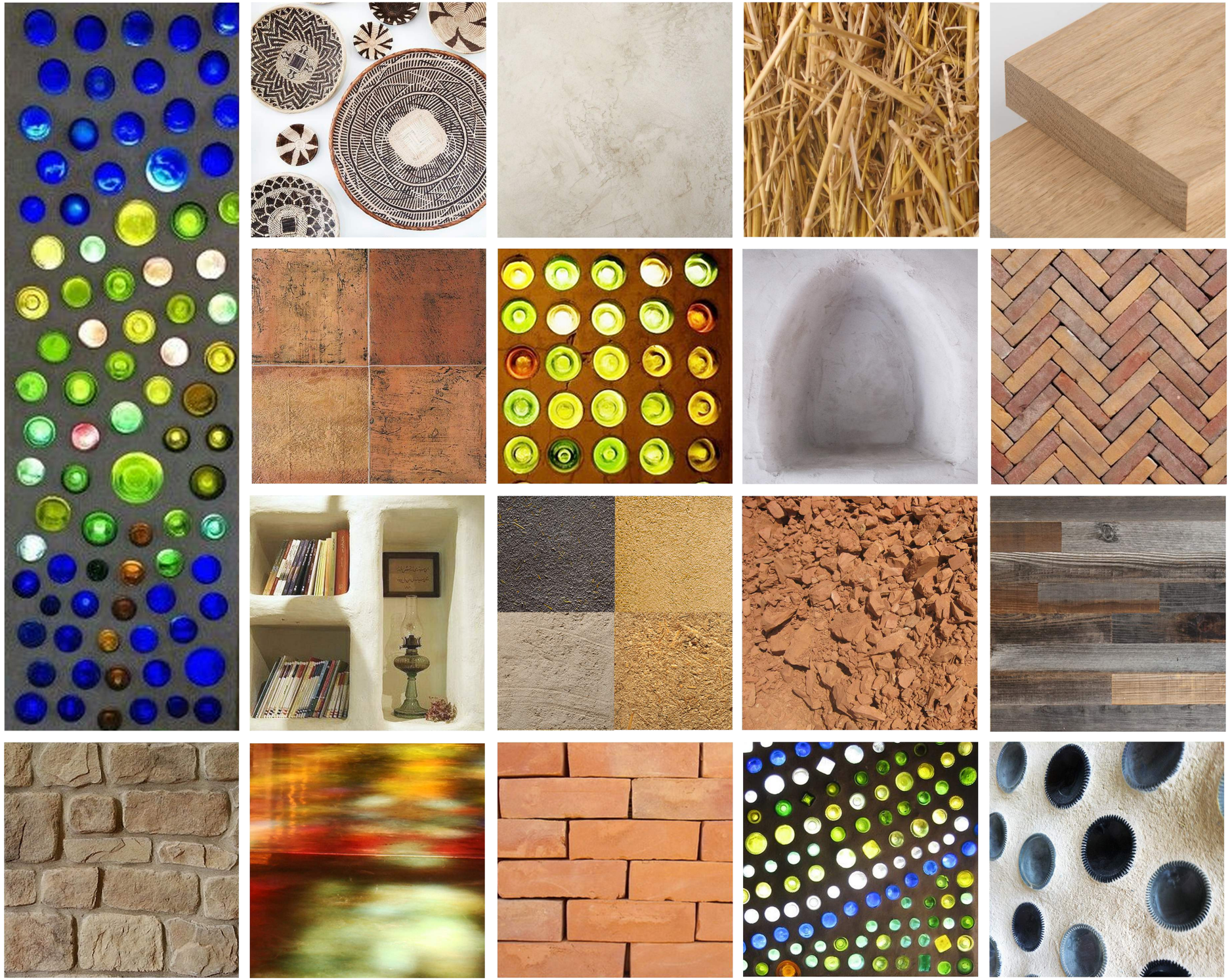
Reclaimed Wood Flooring

Sandstone

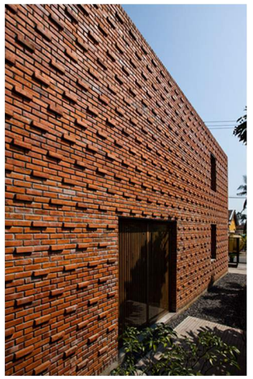
Stained-galss impression

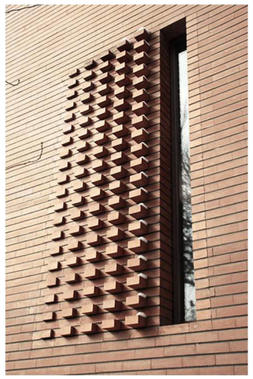
Clay-brick Walls

Adobe Flooring



PRIMARY DESIGN IDEA





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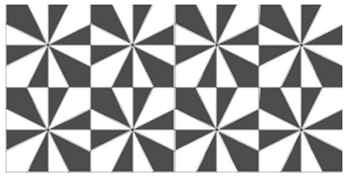

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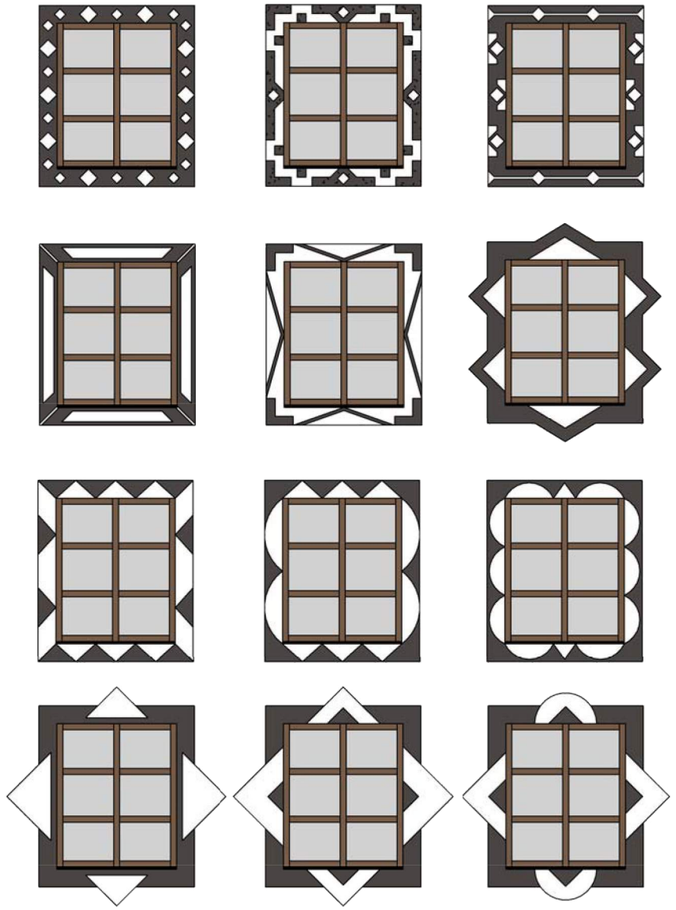
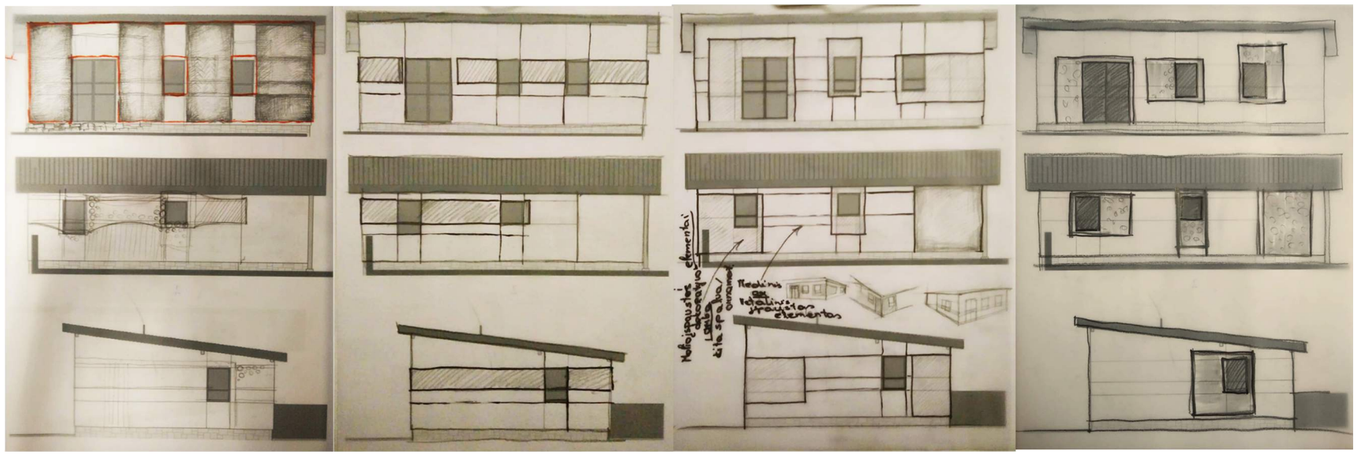
PATTERN DESIGN REFERENCES

SKETCHES OF WINDOW CASINGS

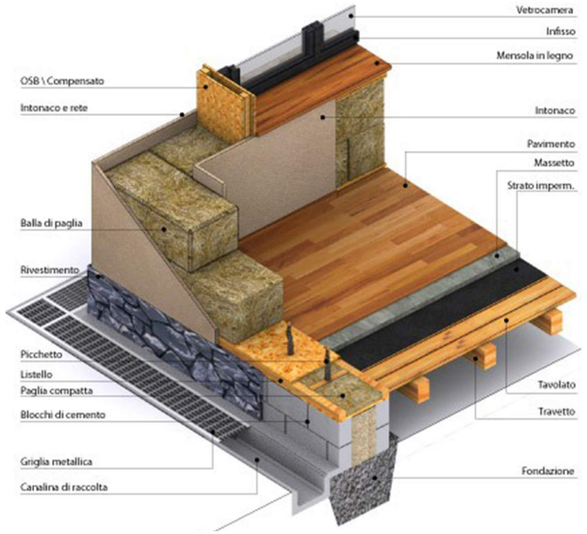


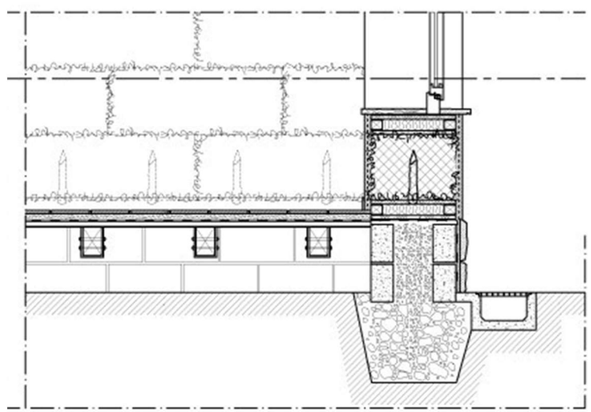
DESIGN SKETCHES

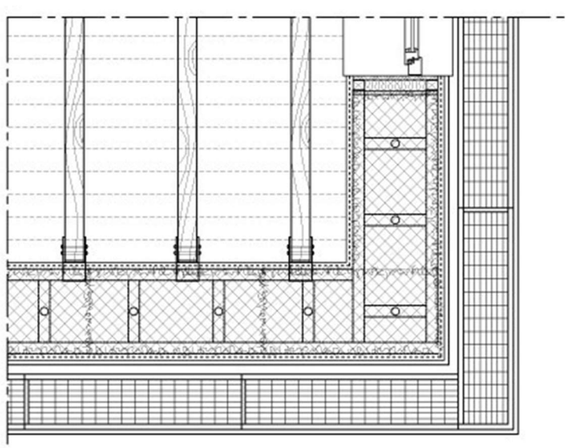
EARLY DESIGN SKETCHES



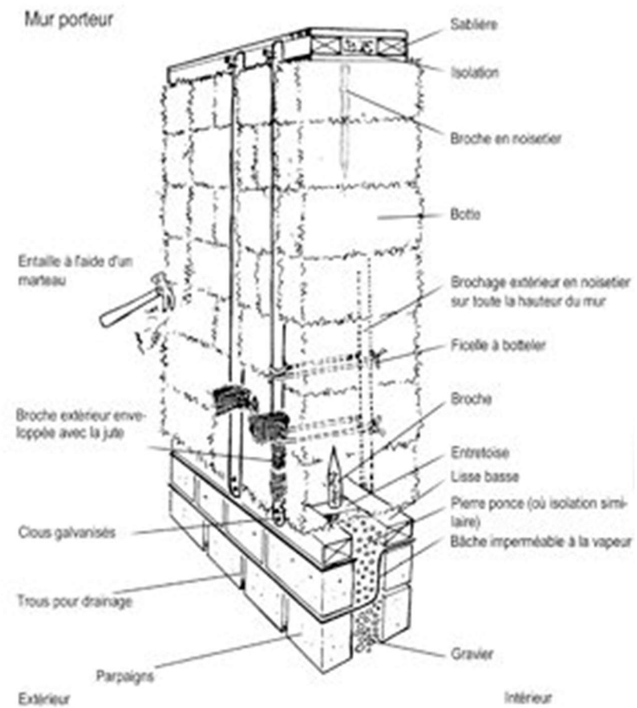
CONSTRUCTION REFERENCES



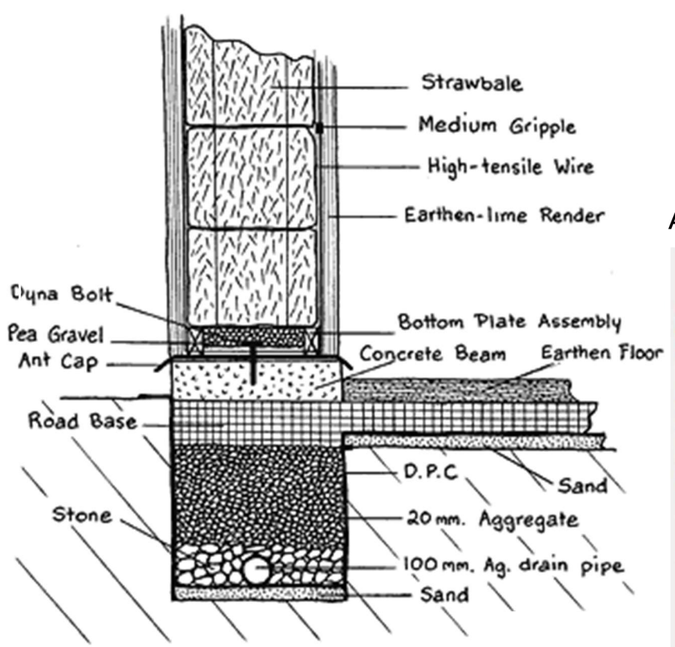




STRAW BALE WALL



RUBBLE TRENCH FOUNDATION

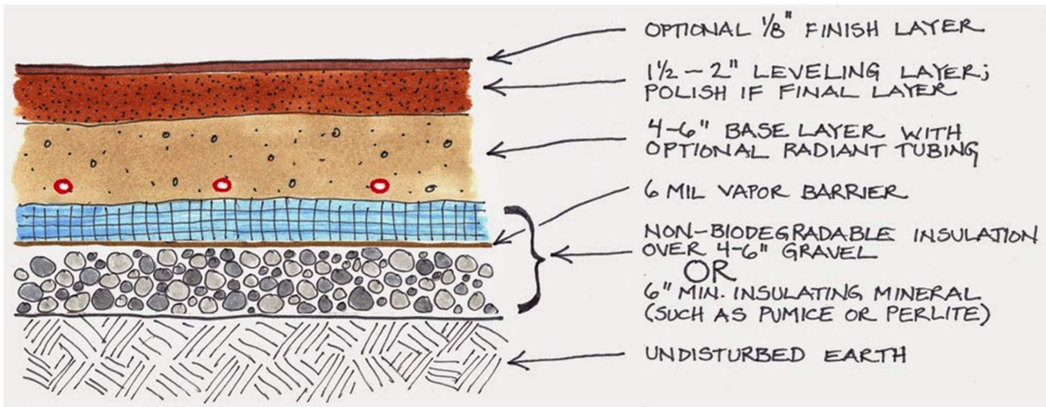


STRAW-CLAY BLOCKS

STRAW ROOF INSULATION

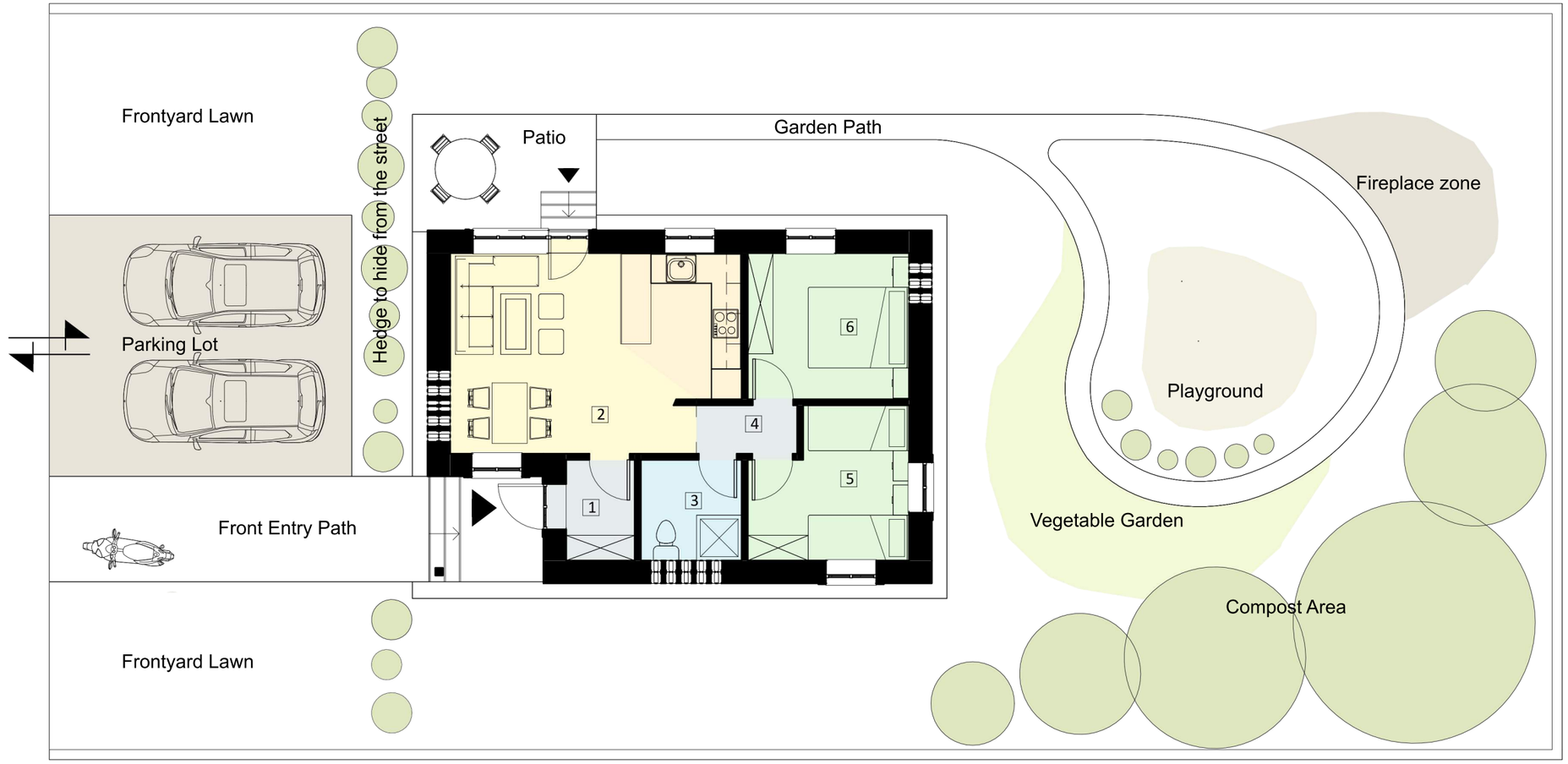
OPTIONS TO REDUCE TIMBER

ADOBE FLOOR



SPATIAL ARRANGEMENT

Main living area:
Living - dining zone
Kitchen zone
Ancillary area:
Entry
Corridor
Bathroom
Sleeping area:
Bedrooms



SKETCHES OF SPATIAL ARRANGEMENT

ARCHITECTURAL CRITIC & RESPONSE

1. SITING

1.1. The site is rather generous in terms of shape. Normally, the low income housing sites are almost square in shape. You may consider changing the shape to the square type, especially for the size in this design (+ - 450m^2).

The plot dimensions were chosen not accidentally. According to the contest Questions & Answers (question answer A2), "Plot sizes in Maseru vary widely, though 15x30 m and 30x30 are fairly standard". According to Lesotho Urban Housing Profile, relationship between plot sizes and coverage in residential plots should be (shown only relevant):

Plot size m^2	Max plot coverage %	Max size of dwelling m^2
400	30	120
500	30	150
900	25	225

It comes that for standard plot size of:

- 450 m^2 (15x30 m) max plot coverage should be 30% and max size of dwelling – 135 m^2;
- 900 m^2 (30x30 m), 25% and 225 m^2 respectively.

According to the Competition Brief, densification is a key factor. The size of my design is 70 m^2 – pretty small. This is the reason why I am using a smaller standard plot (450 m^2) as well. I believe that sub-blocking of the design should be used for larger plots to reduce the consumption of land and the impact on the landscape.

1.2. The north point is not shown on your site plan. It is very important that this orientation is shown on your site plan. Because of the very cold winter in Lesotho, it is very important to expose as much as possible of your building to the northern winter sun to minimize the need for space heating.

The comment accepted. North arrow added.

1.3. You also show carports on your site plan, and in front of your house as well as the entertainment area at the back. For Low income earners, the car is a luxury not easily affordable, and only acquired late in life upon graduation to a higher income group. I think the car should not be one of the key factors in design. Also, the entertainment area at the back should not be an informer like the car. You can just show them on your site plan as possibilities for future addition.

I realize that a car is a luxury for low income people in Maseru. Both carports and entertainment area are definitely only possibilities for future addition. The comment is accepted. Parking lot and entertainment area are shown as future addition. Although I believe that the design of the plot has to take carports into account thinking about long-term development of the city - avoiding cars everywhere on the streets as the income of the people grows.

2. PLANNING

2.1. The shape of your house is very relevant to this part of the world.

Appreciate the comment.

2.2. The overall space planning can be revisited, especially the living areas. The bedrooms are fine. Looking at your design, and from the Porch, one enters into the Entrance Hall, which is a confined space. There is also this bathroom space next to it, with the kitchen opposite them. The kitchen could work much better if placed where the entrance hall and Bathroom are placed. The Main Entrance door could thus be opening directly into the living space, which would be much bigger in size if the kitchen is placed as suggested. The Entrance Hall is a luxury in low cost housing, and for low cost housing, spaces need to be flexible and multifunctional. Currently, the entrance hall cannot be used for any other function, hence it can be done away with.

The scheme with an enclosed entry is a key to my design. It might be questioned if the entry is not too big, although, as I have stated in my project description – I believe that an enclosed entry is necessary for this climate zone (especially because most of low income dwellers do not heat their houses as it is too expensive) as it prevents cold-air spreading to main living areas. This makes the house more energetically efficient.

The kitchen could be placed in the south of the house, although if staying with a scheme with enclosed entry, cold south side is most suitable for entry and bathroom.

Nonetheless, this design is made that would be easily sub-blocked from either of three sides (West, South, East) and I believe that natural light in the kitchen is mandatory. This dictates that kitchen should be in the North side of the house.

2.3. The living areas and kitchen can be open plan type, without any walls to define spaces. This helps opening up the internal space so as to make them more dynamic and flexible.

The Bathroom could be placed where the kitchen is originally placed on your design, to help open up the internal space.

The living area and the kitchen is open-planned. The wall separating kitchen from the living room is optional. Although, it shows versatility of the design and ability to adapt for a specific user. Made more visible.

About kitchen location – please refer to the answer 2.2.

3. MATERIALITY

3.1. Your walls are made from straw mixed with clay. This is a brilliant idea, but the only problem is the sourcing of straw, especially in the urban areas, which are in the lowlands. The highlands of Lesotho are characterized by intensive agricultural farming, and produce straw in abundance. This is used a lot in roofing as well. The sourcing of straw might have to be from the highlands, and transport costs could render your project out of reach of low income earners.

I understand the issue of the transportation and I am sure that I am not able adequately estimate it. Although I believe that it is a possible alternative to conventional structure because:

- This is a prototype for a repetitive buildings. I believe that with planning in advance and taking in account multi-constructions at the same time, logistics price could be manageable.
- Straw is a waste material nowadays. Finding a way how to use it would help country economically and increase income of local farmers.

3.2. The thickness of your walls is too much, and is double the normal size of standard brick wall construction in most of Lesotho. While this is good for thermal massing, it may eventually blow the cost of your building out of reach of the low income earners. Also, thinking about this, the straw walls are high maintenance as they will need to be waterproofed, and retouched every now and then. Our rain here normally comes with lots of wind, and thus gets to be highly erosive. Maintenance is one aspect that could be minimized by use of more durable building materials like fired clay bricks, sandstone or even pressed concrete blocks. These are much more easily accessible in the urban areas.

There is no doubt that 400 mm wall thickness is way too much for conventional wall. Although for a technology of a straw wall it is minimum (with some more advanced exceptions which are too expensive in current situation).

I understand the doubts about straw walls durability, although the technique is not imaginary – it is wildly used internationally (USA, Germany, Poland only to begin with, even South Africa). To prevent walls from rot:

- Convenient thick-layers plaster have to be used. Most common is earth-lime but in some cases even earth plaster is enough. Cement-lime is not suitable as it traps the moisture. Both clay and lime are local materials in Lesotho and should not be a problem.
- House has to have quite large overhangs of the roof (at least 400-500 mm difference on the sources).
- Good air sealing has to be ensured.

The structure is even more durable in 3 or 6 apartment cluster (refer to presentation board) as the roof becomes two-pitched.

Straw walls can handle moderate moisture loads even better than conventional wall systems because of the vapor permeable plaster skins on either side, and because the straw itself can act as a large reservoir for moisture without ill effects, so long as it does not exceed an upper limit, and conditions for drying occur. This is a durable (counting nut decades but centuries) and extremely eco-friendly (when time comes can be dismantled without any negative effects on environment) solution.

I realize that fire clay bricks or sandstone are the most common materials for structures in Maseru. They are affordable and refer to local identity a lot. That's why I use them for inner walls, pavements and foundation. Although the goal of this project is to reveal alternative possibilities. Nonetheless, mortar walls without additional insulation do not provide suitable insulation. This is another reason why I chose straw walls – it allows combine load bearing structure and insulation in one material.

Despite the fact that concrete is the most common material in Maseru nowadays, I do not consider concrete blocks as an option because it does not refer to local identity and its sustainability is questionable.

3.3. Adobe Flooring and Cork flooring are not suited as building material finishes, and especially flooring. You may reconsider the use of these, and rather go for timber flooring instead. Cork is not easily available for use as flooring finish in this part of the world. Ceramic tiles are the preferred choice, and readily available.

I disagree with a statement that adobe and cork flooring are not suited as building material finishes. I understand that adobe flooring is not common nowadays but its popularity is growing in alternative housing designs. With growth of popularity, techniques are already developed and the result is adequate to modern houses. Modern earthen floors are not dusty, crumby dirt floors anymore – they are natural, warm, pleasant to touch, affordable solution. The slab works similar to concrete slab and is self-finishing. Nonetheless, with a little bit of training, unskilled workers can produce them.

According to my calculations, timber flooring and ceramic tiles are too expensive. And again, the main objective of this design is to find alternative solution.

Cork flooring is popular worldwide as an eco-friendly affordable solution, although I did not know if it is available in Lesotho. Comment is accepted. Reclaimed wood flooring is used instead of cork.

3.4. Your roof is multi – layered, and could prove too costly. Simple rafters and purlins could work very well for the size of your building, and you could use some affordable insulation or isolation to help with roof insulation.

Simple rafters and purlins are used in the project. Additional straw-clay insulation (between rafters) and hydro-isolation membrane are added.

4. General Comments

On the overall, your building has all it takes to win the competition, with aesthetics also being a strong point as illustrated. The use of color is also a very strong feature of your design, and coupled with the bottles built into the walls creates a very rich combination that is also highly unique.

Your presentation is also good.

Appreciate the comment.

MAIN PROJECT BUDGET BREAKDOWN

MATTERIAL	PRICE	UNITS	AMOUNT	TOTAL	COMMENT
FOUNDATION					
Sandstone blocks foundation	55	m	65	3575	60cm height double wall with mortar
Crushed stones for trench	300	m^3	14	4200	Recycled rubble could be used
FLOOR					
Crushed gravel 10cm	30	m^2	52	1560	Recycled rubble could be used
Perlite 10cm	45	m^2	52	2340	
Hydroisolation	9	m^2	52	468	
Base 10cm	20	m^2	52	1040	25% clay + 75% concrete sand + straw
Leveling layer 5cm	10	m^2	52	520	Clay Soil + Sand
Finish					
Wax and oil finish	10	m^2	52	520	
Reclaimed wood	60	m^2	36	2160	
Terracotta tiles 30x30 cm	70	m^2	6	420	For outside stairs and stair landings
WALLS					
Construction					
Straws-clay blocks	60	m^3	38	2280	Straw Bale (1x0.4x0.4) - M10
Timber ladder constructions	20	m	70	1400	50x50mm profile
Window & door ladder bucks	20	m	34	680	50x50mm profile
Pickets	3	each	80	240	50mm profile, 0.4m length
Straps	30	each	20	600	
Interior clay brick walls	100	m^2	41	4100	Bricks and mortar
Exterior finish					
Cob	6	m^2	65	390	2 layers
Lime and sand plaster	3	m^2	65	195	
Interior finish					
Cob	3	m^2	63	189	
Earthen plaster	3	m^2	63	189	
ROOF					
Construction					
Timber beams	100	m	33	3300	
Timber ladder rafters 20cm	130	each	13	1690	8.0m length, 38x38mm profile
Timber battens	6.5	m	238	1547	Roof and ceiling
Hydroisolation	9	m^2	90	810	
Straw clay planel insulation	12	m^2	50	600	20cm thicness
Exterior finish					
IBR Roof Sheet	85	m^2	90	7650	
Interior finish					
Masonite Board	37	m^2	50	1850	
DOORS & WINDOWS					
Exterior door	900	each	2	1800	
Interior hollow core doors	200	each	4	800	
Wooden windows	400	each	5	2000	1.2x1.0m
Wooden window	600	each	1	600	1.2x1.5m
			TOTAL:	**49713**	

100 WORDS STATEMENT

The prototype is designed so that it could be easily mixed in local urban structure and solve the demand of densification. It can easily be sub-blocked or aggregated to an apartment building. It is sustainable, energy efficient and affordable that is achieved by using local or recycled materials that can serve several functions at once; structure is simple so that even unskilled workers could accomplish it. Only natural materials are used so it is environmentally and user friendly. The aesthetical appearance is inspired by beauty of local substances with a touch of Basotho traditional art atmosphere.