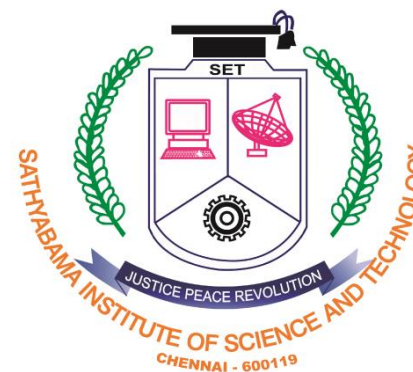


PROFESSIONAL TRAINING REPORT

Submitted in partial fulfillment of the requirements for the award of
Master of Architecture degree in Sustainable Architecture

by

CHANDHINI MENON S
39890004



SCHOOL OF BUILDING AND ENVIRONMENT
DEPARTMENT OF ARCHITECTURE

SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

PROFESSIONAL TRAINING REPORT FORMAT GUIDELINES

Sequence of the **A3 Formats** to be bounded in the Practical Training Report

Title Page –	Refer Annexure - I
Bonafide Certificate –	Refer Annexure - II
Declaration –	Refer Annexure – III
Acknowledgements – Order of names to be acknowledged -	Refer Annexure – IV
Confirmation letter	Annexure – V
Joining Letter	Annexure – VI
Weekly Report (Xerox copy of 2 weeks in one A3 sheet)	Annexure – VII
Work diary	Refer Annexure – VIII
Consolidated Certificate (Experience)	Annexure – IX
Table of Contents with page numbers	Refer Annexure – X

Note: Bring the original copy of the following

- Letter of consent to appoint you as a trainee
- Confirmation letter, Joining Letter, Monthly Report, Consolidated Certificate

PROFESSIONAL TRAINING REPORT

Submitted in partial fulfillment of the requirements for the award of
Master of Architecture degree in Sustainable Architecture

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CHANDHINI MENON S
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SCHOOL OF BUILDING AND ENVIRONMENT
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DEC 2020

(Annexure I)



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

(Est U/s(3) of UGC Act, 1956) Accredited with Grade "A" by NAAC (A Christian Minority Institution)

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHEMMENCHERY, CHENNAI – 600119. TAMILNADU.

PHONE: 2450 1443/9941912481 INTERNET: www.sathyabama.ac.in

E-mail: archhod@sathyabama.ac.in



**SCHOOL OF BUILDING AND ENVIRONMENT
DEPARTMENT OF ARCHITECTURE
M. Arch (Sustainable Architecture)**

**PROFESSIONAL TRAINING PORTFOLIO (S89 INT)
DEC 2020**

Name of the Student : CHANDHINI MENON S

Semester : III

Batch : 2019-2021

Reg No. : 39890004



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

M. Arch (Sustainable Architecture)

BONAFIDE CERTIFICATE

This is to certify that the professional training (S89 INT) is the work of **CHANDHINI MENON S (39890004)** who had undergone training in **SCARED GROOVES** and has been monitored by the continuous assessment during **Dec 2020 to Jan 2021**.

DR. DEVYANI GANGOPADHYAY

DEAN,

School of Building and

Environment

Department of Architecture

Submitted for Viva voce Examination held on Sheela.A.

Internal Examiner

External Examiner



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

(Est U/s(3) of UGC Act, 1956) Accredited with Grade "A" by NAAC (A Christian Minority Institution)

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PHONE: 2450 1443/9941912481 INTERNET: www.sathyabama.ac.in

E-mail: archhod@sathyabama.ac.in



DECLARATION

I **CHANDHINI MENON S** hereby declare that the Professional Training Report **11'DEC 2020 to 23'JAN 2021** done by me under the guidance of **Ar. AMAL ALI** is submitted in partial fulfillment of the requirements for the completion of practical training session.

A handwritten signature in black ink, appearing to read "Chandhini Menon S".

DATE : 28 – JAN – 2021

PLACE : CHENNAI

SIGNATURE OF CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. Devyani Gangopadhyay**, Dean and Head of Department, School of building and Environment, Dept. of architecture for providing me necessary support and details at the right time during the progressive training session.

I would like to express my sincere and deep sense of gratitude to **Ar. AMAL ALI (SCARED GROOVES)** for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work. My sincere thanks to **Ar. Sheetal Kalamkar**, Professional Training Coordinator for her motivation.

I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of Architecture who were helpful in many ways for the completion of the project.

(Also thank Architect of the firm)

AR. Amal Ali

Scared grooves

Auroville

CONFIRMATION LETTER

(Annexure –V)

t



Date: 09-01-2021
Place: Auroville.

To,
The Head of the Department,
Faculty of Architecture,
Sathyabama Institute of Science and Technology
Chennai, Tamilnadu

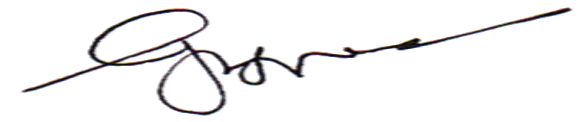
CONFIRMATION CERTIFICATE

This letter is to certify that Mr. **Chandhini Menon** of 4th Semester M.Arch -Sustainable Architecture at **Sathyabama Institute of Science and Technology, Chennai** has been confirmed as an **Architectural Intern** in our Organization based on her academic and professional achievements for 1 month practical training starting from **11th December 2020** onwards.

Yours's sincerely,


Amal Ali
Architect




Manu Gopalan
Chief Architect
CA/2000/26025

Come build with us!

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WWW.SACREDGROVES.IN | SACREDGROVES@AUROVILLE.ORG.IN | CALL US AT: 0413-2623696

JOINING LETTER

(Annexure –VI)



Date: 29-01-2021
Place: Auroville.

To,
The Head of the Department,
Faculty of Architecture,
Sathyabama Institute of Science and Technology
Chennai, Tamilnadu

JOINING LETTER

This letter is to certify that Ms. **Chandhini Menon** of 4th Semester **M.Arch – Sustainable Architecture** at **Sathyabama Institute of Science and Technology, Chennai** has joined our office as a trainee, in the forenoon on **11th December 2020** as a part of internship programme under the university Curriculum.

Yours's sincerely,


Amal Ali
Architect



Come build with us!

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WEEKLY REPORT

(Annexure –VII)



SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO BE UNIVERSITY)

Accredited with 'A' grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.
Phone: 044 - 2450 3150 / 3151 / 3152 / 3154 / 3155 Fax: 044 - 2450 2344
www.sathyabama.ac.in



DEPARTMENT OF ARCHITECTURE PROFESSIONAL TRAINING REPORT 2018

(Continuous progress report of the trainee architect/Project Manager for the period of One month in the office to be submitted to HOD by the Trainee in Charge of the Organization)

1. Name of the office / organization : Sacred Grooves
2. Address & Contact Number : Sacred Grooves , Auroville
3. Name of the student : Chandhini Menon S
4. Duration : From 11 - 12 - 2020 To 23 - 01 - 2021
5. Total No. of days : 32
6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month, which will be converted to the allotted 40 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture	✓				
Participation in the office		✓			
Reading of drawings		✓			
Presentation Techniques		✓			
Model making works	✓				
Understanding of construction details		✓			
Drafting Skills (Manual / Computer)		✓			
Site Supervision / Discussion with clients		✓			
Adherence to Time schedule		✓			
Other computer skills		✓			
File and Office Maintenance	✓				
Coordination with other consultants		✓			

Overall Grading*	A
------------------	---

(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

7. Any other Remarks : Her contribution to the firm is been Good.

8. Signature of the
Head of the Office /
Organization (With Seal)

Amal
Amal Ali
Architect



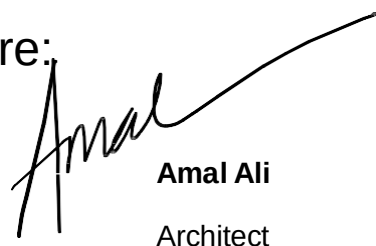
WORK DIARY

(Annexure –VIII)

DATE	PROJECT NAME	WORK DONE	DATE	PROJECT NAME	WORK DONE
11/12/20	Site	Site tour – Building explanation	31/12	Bamboo harvesting /Case study	Bamboo Harvesting
14/12	Tool room	Tool learning	4/1/21	Bamboo Detail	Bamboo Construction -Roof
15/12	Material	Material learning	5/1/21	Bamboo Detail	Bamboo Construction -Roof
16/ 12	Wash area	Column construction	6/1/21	Bamboo Detail	Bamboo Construction -Roof
17/12	Wash Area / case study	Column construction	7/1/21	Case study	Jesaba House
18/12	Wash area	Column detail	8/1/21	Wash area	Roofing Detail
21/12	Prototype two	Flooring design	11/1/21	Wash area	Roofing Detail
22/12	Prototype two	Flooring design	12/1/21	Wash area	Roofing Detail
23/12	Adobe Brick	Adobe Brick	13/1/21	Wash area	Roofing Detail
24/12	Wash area/Case study	Cita Dyn	14/1/21	Wash area	Roofing Detail
28/12	Arish Plaster	Arish Plaster detail	15/1/21	Wash area	Roofing Detail
29/12	Prototype 2	Flooring Design	16/1/21	Wash area/ Tile plaster	Roofing Detail
30/12	Prototype 2	Flooring Design	17/1/21	Wash area	Roofing Detail

Chief Architect Signature:

Office seal:


Amal Ali
Architect



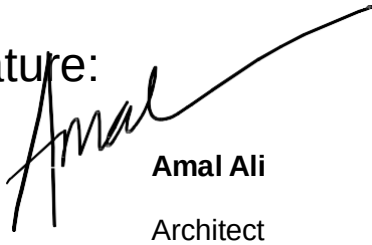
WORK DIARY

(Annexure –VIII)

DATE	PROJECT NAME	WORK DONE
18/1/21	Roofing Detail	Roofing
19/1/21	Thahir House	Case study
20/1/21	Roof detail	Tile Layoing / Detailing
21/1/21	Wash area	Tile Laying
22/1/21	Lime Chaki/ Tile Laying	Tile Laying / Lime
23/1/21	Wash area	Tile Laying

Chief Architect Signature:

Office seal:


Amal Ali
Architect



Consolidated Certificate (Experience)

Annexure – IX



Date: 29-01-2021
Place: Auroville.

To,
The Head of the Department,
Faculty of Architecture,
Sathyabama Institute of Science and Technology
Chennai, Tamilnadu

TRAINING CERTIFICATE

This letter is to certify that Ms. **Chandhini Menon** of 4th Semester **MArch – Sustainable Architecture** at **Sathyabama Institute of Science and Technology, Chennai** has been working in our organization as an **Architectural Intern** for a period of **30 days** from **11-12-2020** to **23-01-2021**.

During her Internship tenure, she has worked on the Sacred Groves Ecological housing project and have been exposed to various earth building techniques.

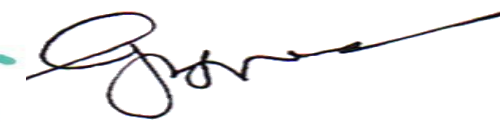
Her contribution to the project has been good!

We wish her all the best for her future endeavours.

Yours's sincerely,


Amal Ali
Architect




Manu Gopalan
Chief Architect
CA/2000/26025

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The sacred groves project was designed to solve the problem of the shortage of affordable housing in auroville which deterred some people from joining the community, by constructing 108 homes for new comers, aurovilians and volunteers.

// The project is designed to be a model of ecological community living using ecological sensitive construction methods.

// The aim of the project is to achieve simpler, more self sufficient yet interdependent and ecological way of living by providing low cost , low maintenance , off grid ecological housing incorporating the following elements.

// Energy self sufficiency using solar , wind , pumped storage and biomass system.

// Water self sufficiency from rainwater and grey water harvesting. Some food self sufficiency from the provision of organic vegetable garden for each house.

// Preservation of forest areas - the sacred groves.

// Thick walls and passive cooling system negate the need for a/c and even fan.

// Compost toilets.

// Shared space and utilities to encourage community activities and interdependence.

// The sacred groves project offers an alternative model of construction by reusing waste building rubble to construct houses made of earth concrete .

Re cycling wood from packing crates.

Sacred Groves

Portfolio

CHANDHINI MENON S



Ar Manu
Gopalan,
Principle
Architect



Joseba,
Project
Handler



Ar Rene
Jansenn,
Building
Biologist



Ar Amal
Ali,
Architect



Raja,
Contractor



Sivaraju,
Site
Maintenance



Ar Sarin
Veetil,
Architect



Subramani,
Head Mason



Selvarassou,
Accountant



Shaku,



Eva,



Kaliya,



Oshi

The team

The people of Sacred Groves

SACRED GROOVES

- Energy self sufficiency using solar , wind , pumped storage and biomass system.
- Water self sufficiency from rainwater and grey water harvesting.
- Some food self sufficiency from the provision of organic vegetable garden for each house.
- Preservation of forest areas - the sacred groves.
- Thick walls and passive cooling system negate the need for a/c and even fan. Compost toilets.
- Shared space and utilities to encourage community activities and interdependence.
- The sacred groves project offers an alternative model of construction by way of : reusing waste building rubble to construct houses made of earth concrete .
- Re cycling wood from packing crates.



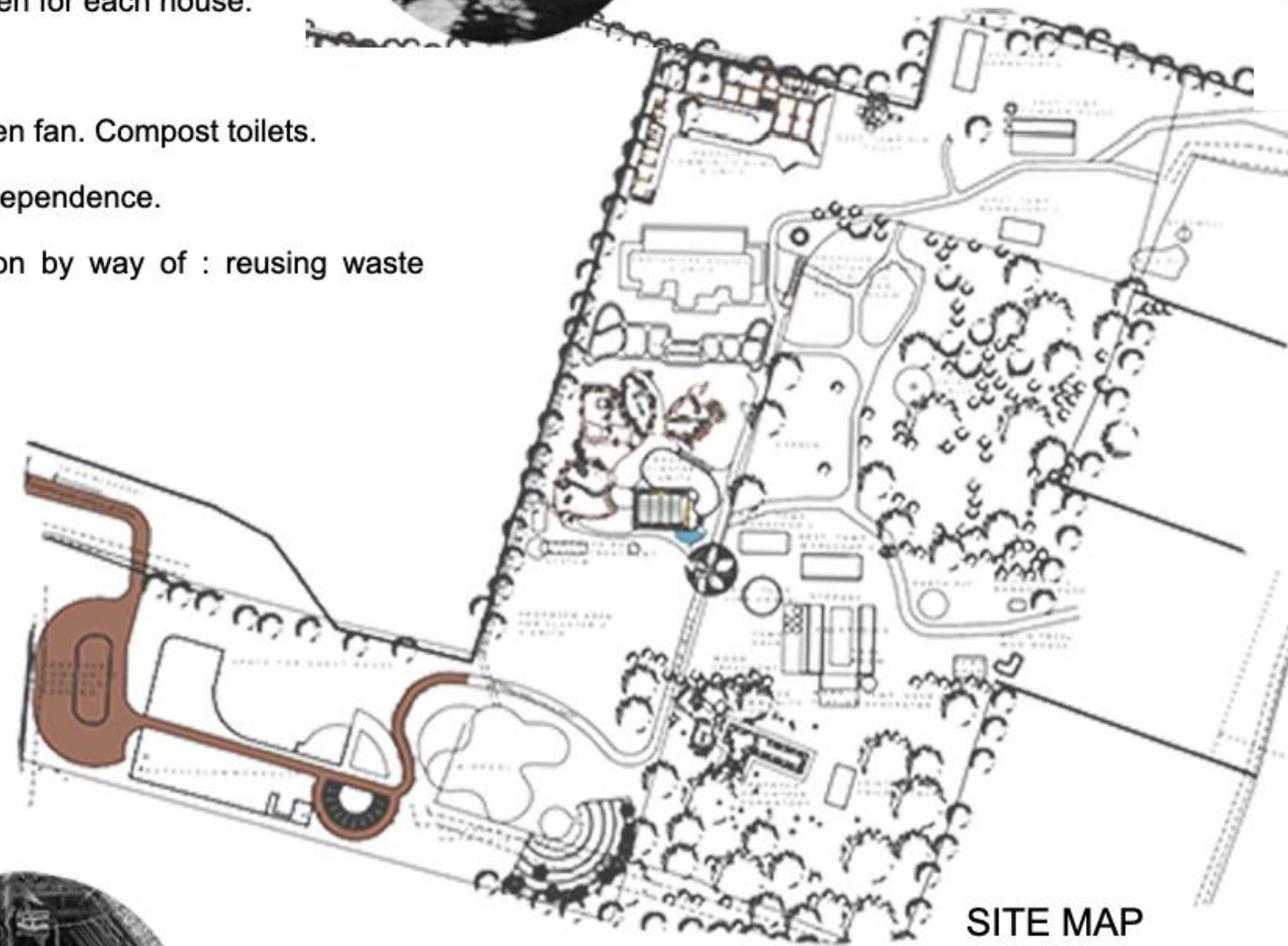
LIME CHAKI



TOOL ROOM



PROTOTYPE



SITE MAP



THAIR HOUSE



DORM



HUMAM



COMMON HOUSE

PROTOTYPE HOUSE



A set of three houses for three different kinds of users, inspired by co housing principles . There are common shared spaces which increases chances for human interaction . The prototype as it is rightly named is a culmination of all the beliefs of sacred groves.

The first house is for couples , second house for single person and third house is for a family.

The plinth is made of earth-crete upto the sill level .Waste petrol pipes were used as shuttering.

The walls are made of cob, plastered with mud and finished with lime wash. The windows and doors have arches on top. The upper floors are made with coconut wood planks. The roof is manglore tiled roof. The large overhangs help to protect the building from rain .



SECOND HOUSE



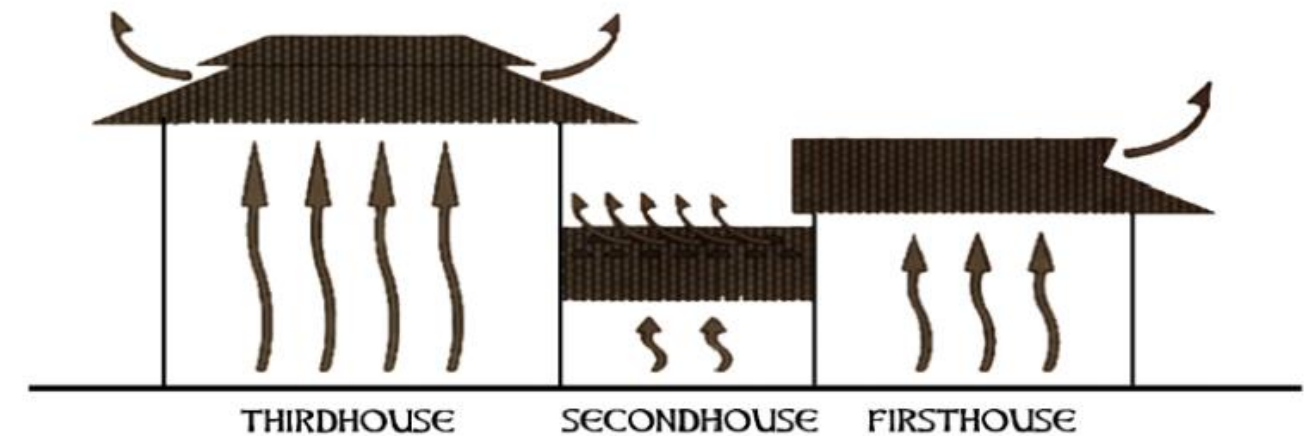
FIRST HOUSE



THIRD HOUSE



VERANDA



LIME

Revival of Lime :

DURING LAST 25 YEARS , LIME HAS ENJOYED A STEADY REVIVAL FOR REPAIRS TO HISTORIC BUILDINGS . THE SOFT , POROUS AND FLEXIBLE NATURE OF LIME MORTARS AND PLASTERS IS NOW UNIVERSALLY RECOGNIZED AS BEING VITAL TO MAINTAIN THE TRADITIONAL BREATHING PERFORMANCE OF OLD BUILDINGS . IN ADDITION , AN INCREASING NUMBER OF ARCHITECTS AND ENGINEERS AND BUILDERS ARE NOW BEGINNING TO REALISE THAT LIME HAS MANY BENEFITS TO OFFER IN NEW CONSTRUCTION.SUALLY UNDER WATER) TO MATURE.

Lime cycle :



Lime Kiln :

A LIME KILN IS USED TO PRODUCE QUICKLIME BY CALCINATION OF LIMESTONE .THE CHEMICAL EQUATION FOR THIS REACTION IS :



THIS REACTION TAKES PLACE AT 900 DEGREE CELSIUS ,BUT A TEMPERATURE AROUND 1000 DEGREE CELSIUS IS USUALLY USED TO MAKE THE REACTION PROCEED QUICKLY. EXCESSIVE TEMPERATURE IS AVOIDED BECAUSE IT PRODUCES NONREACTIVE , DEAD BURN LIME.



Lime

Cement

✓	—	Permeability	—	✗
✓	—	Flexibility	—	✗
✗	—	Rigidity	—	✓
✗	—	Moisture Attraction	—	✓

✓	—	Holding excess moisture	—	✗
---	---	-------------------------	---	---

✗	—	✖ ✖ ✖	—	✓
---	---	-------	---	---

Weather proof



Weather proof

Reduces CO₂



Increases CO₂



NON - HYDRAULIC LIME

- PURE LIME
- GOOD WORKABILITY
- MORE REACTIVE

Hydraulic Lime :

- IMPURE LIME
- GOOD WORKABILITY
- LESS REACTIVE

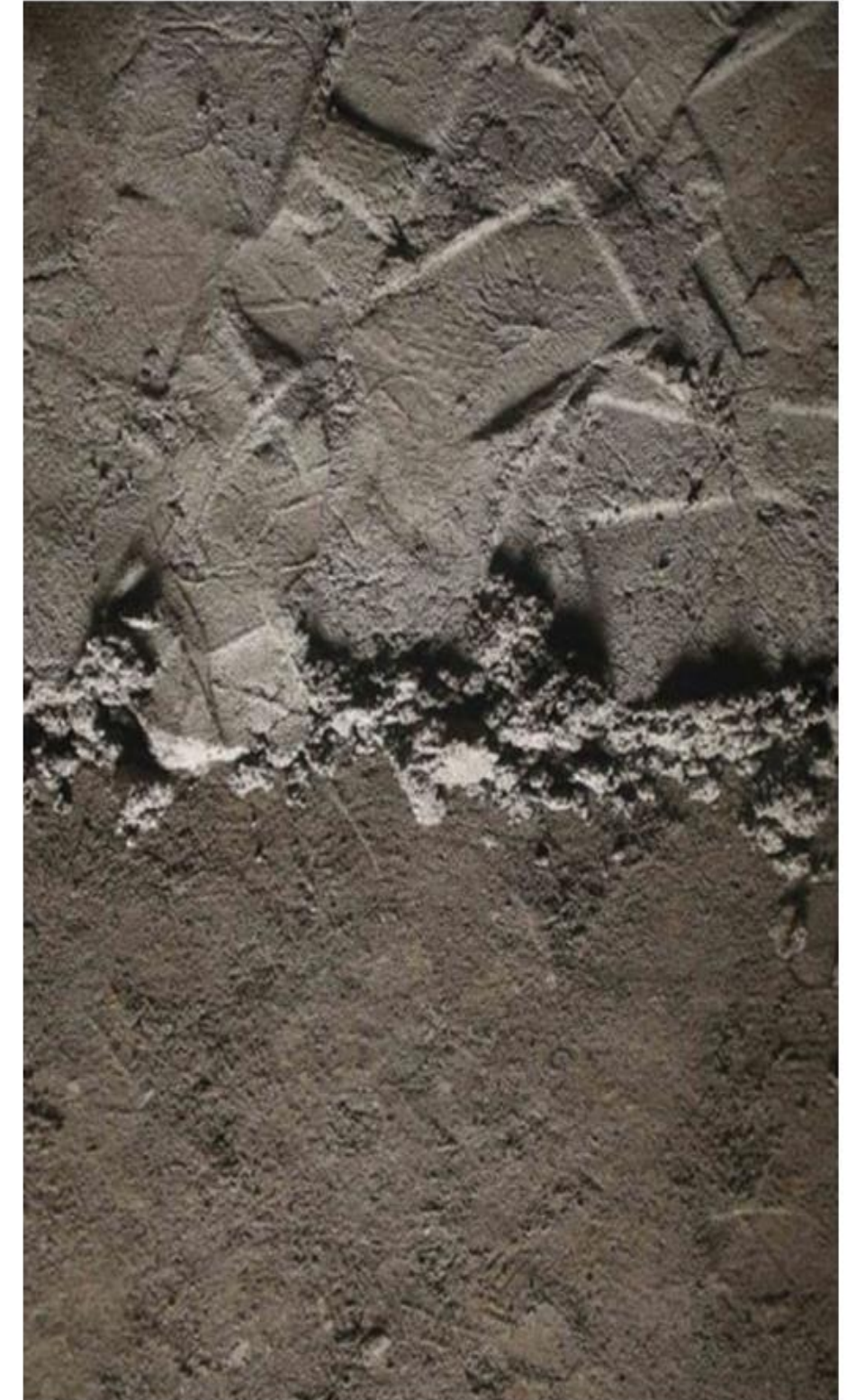
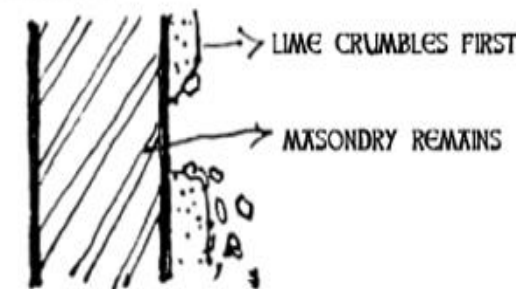
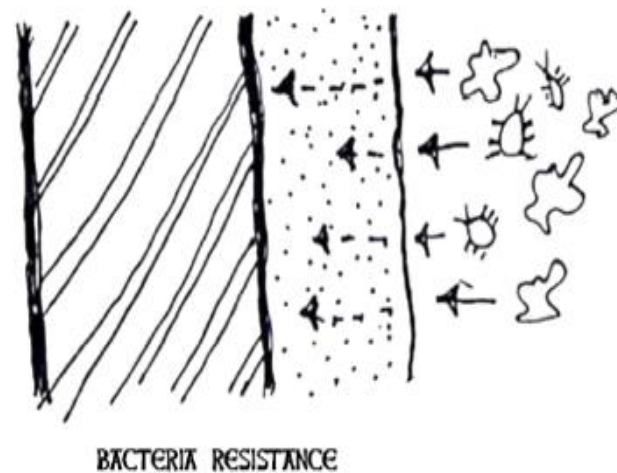
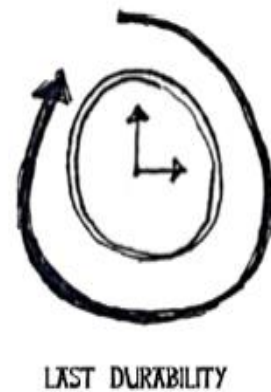


THE TERM 'HYDRAULIC' MEANS TO 'HARDEN UNDER WATER'. IT IS SLAKED ENOUGH TO CONVERT THE CALCIUM OXIDE TO CALCIUM HYDROXIDE BUT NOT WITH SUFFICIENT WATER TO REACT THE DI-CALCIUM SILICATE . IT IS THIS DICALCIUM SILICATE WHICH IN COMBINATION WITH WATER PROVIDES THE SETTING PROPERTIES OF HYDRAULIC LIME .

NON HYDRAULIC LIME IS PRODUCED IN TWO FORMS: 1.HYDRATED LIME 2. LIME PUTTY .

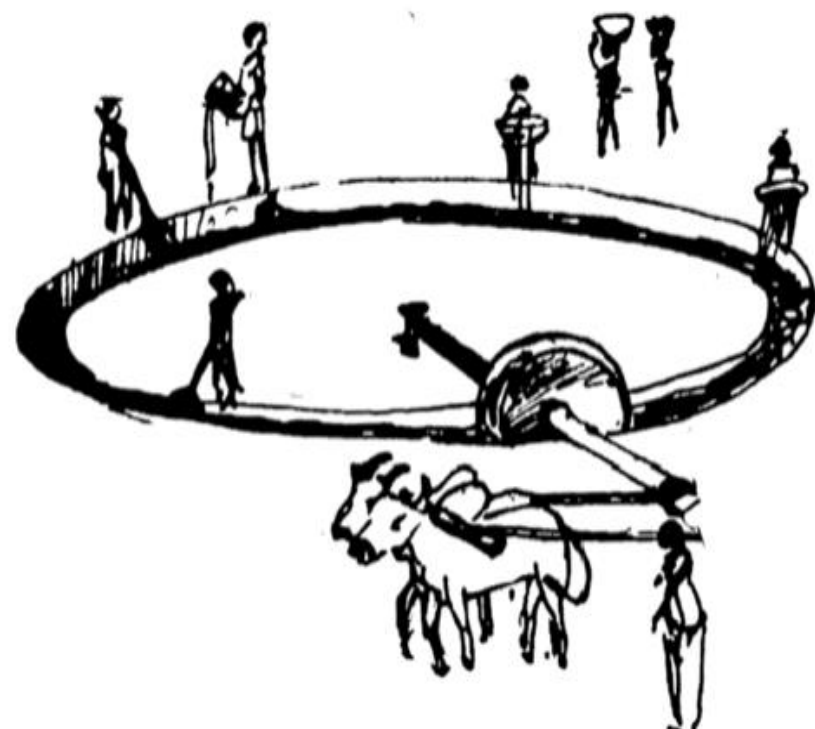
STORED LIME PUTTY IS ALWAYS NON HYDRAULIC AND AS NAME SUGGESTS , LIME PUTTY IS IN FORM OF A PUTTY MADE FROM JUST LIME AND WATER . IF QUICK LIME IS SLAKED WITH EXCESS OF WATER THEN PUTTY IS PRODUCED. IF LESS WATER ; THEN RESULT IS DRY MATERIAL . THIS IS GROUND TO MAKE HYDRATED LIME. HYDRATED NON HYDRAULIC LIME CAN BE MIXED WITH WATER TO FORM LIME PUTTY. BEFORE USING IT . IT IS LEFT IN THE ABSENCE OF CARBON DIOXIDE .

Why Lime :



Lime Chaki

IT IS A TRADITIONAL WAY OF MAKING LIME MORTAR. IT IS A LARGE AND HEAVY GRINDING STONE TIED TO THE CENTER THAT USED TO BE PULLED BY BULLS OR TRACTOR.



Procedure :

9 BANDS OF LIME AND 15 BANDS OF QUARRY SAND IS REQUIRED TO MAKE ONE BATCH OF LIME MORTAR. KADUKKAI JAGGERY WATER IS POURED ACCORDING TO THE REQUIREMENT.

WHILE THE WHEEL IS ROTATING PEOPLE WITH SHOVELS WILL SCRAPE THE SIDES OF THE CHAKKI SO THAT THE MIX IS EVEN AND WELL GROUND.

LIME MORTAR :



3 (LIME)



5 (M SAND)



SOLUTION NEEDED AS PER CONSISTENCY

LIME PLASTER :



3 (SEIVED LIME) :



5 (M SAND)



SOLUTION NEEDED AS PER CONSISTENCY

THE MIX IS CHECKED BY TAKING A SMALL SAMPLE IN OUR HANDS AND SHAKE THE MORTAR FROM SIDE TO SIDE AND UPSIDE DOWN AND THE MORTAR SHOULD NOT FALL. THIS MEANS MORTAR IS READY.

LIME AND QUARRY DUST IS POURED FIRST INSIDE THE PIT . 3 : 5



THE SHOVEL TOOL IS REQUIRED TO MIX INTO EACH OTHER .

FERMENTED KADUKKAI JAGGERY SOLUTION SHOULD BE ADDED AS MUCH AS NEEDED .





Procedure :

it is prepared by adding 18 kg of broken kadukkai and 20 kg of jaggery to 700 l of water in a tank and left to ferment for atleast two days .
this depends on the weather , quicker in summer and longer in winters.



kadukkai is locally available additive and increases the water resisting quality of lime.

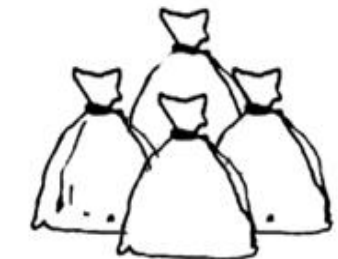
jaggery , which is sticky in nature acts as a very good binder.



BROKEN KADUKKAI SEED



BROKEN KADUKKAI SEED



KADUKKAI SEEDS ARE TIED UP IN SACK



BROKEN KADUKKAI SEED



BROKEN KADUKKAI SEED



BROKEN KADUKKAI SEED

Community kitchen

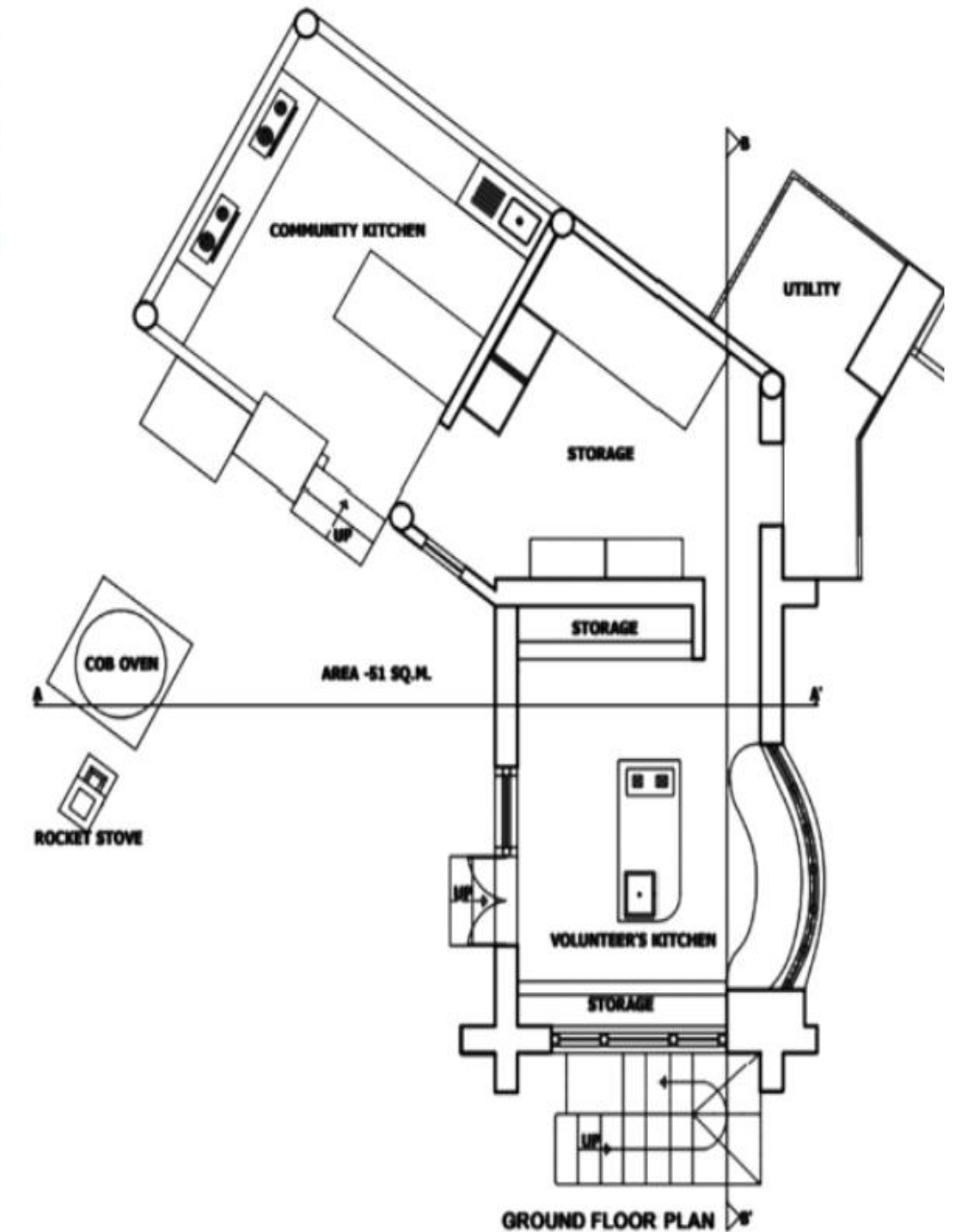
Community kitchen is the part of base camp which is being made of future volunteers of the site it has separate kitchen for ammas and separate kitchen for volunteers. the structure is made of cob and adobe with rubble trench foundation.

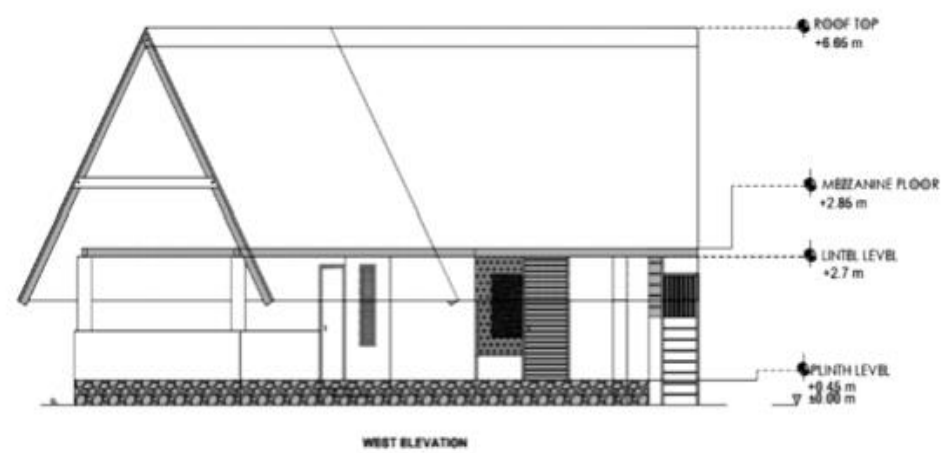
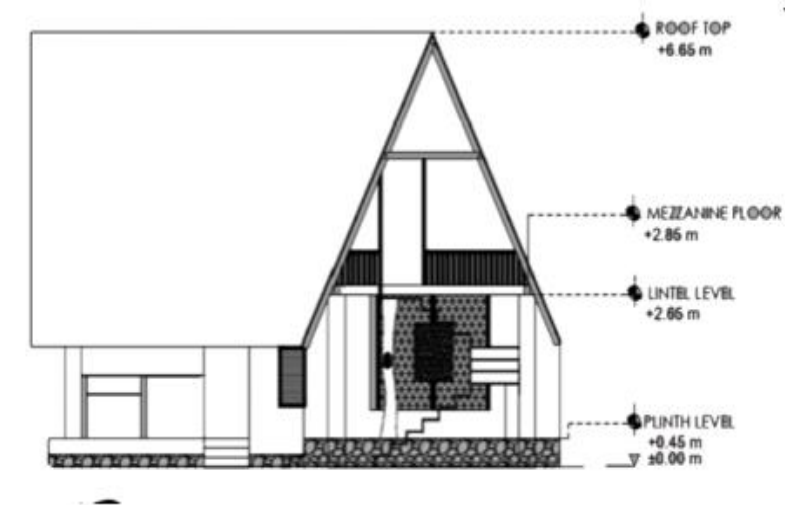
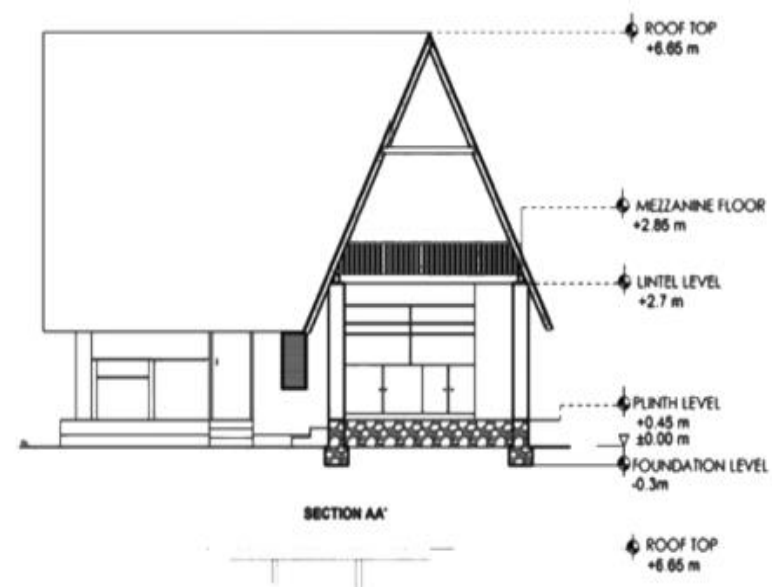
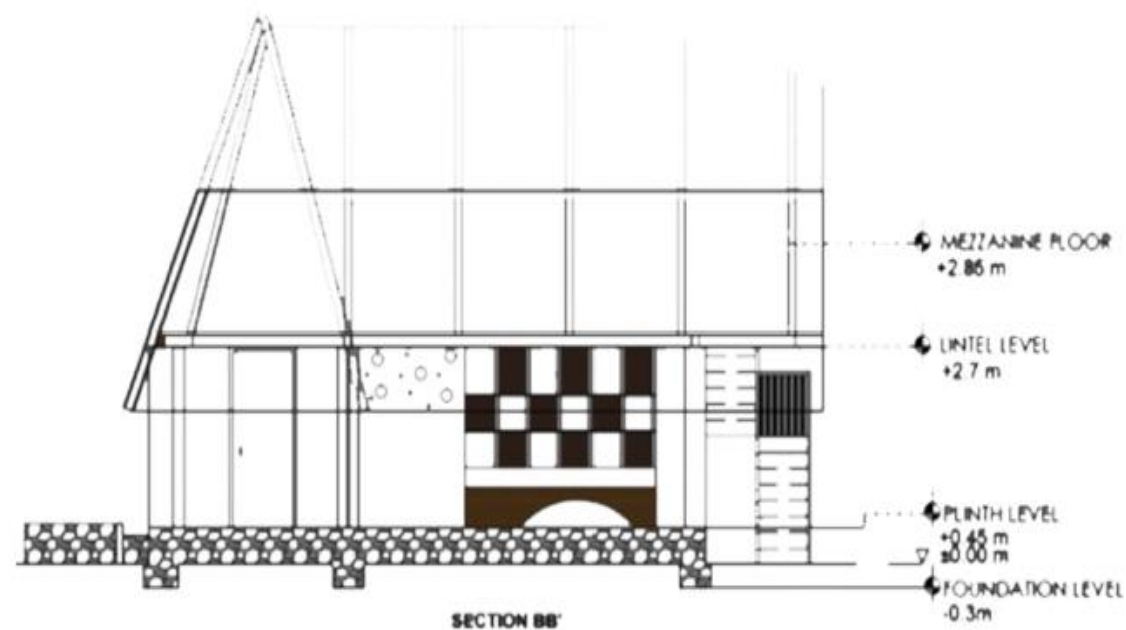
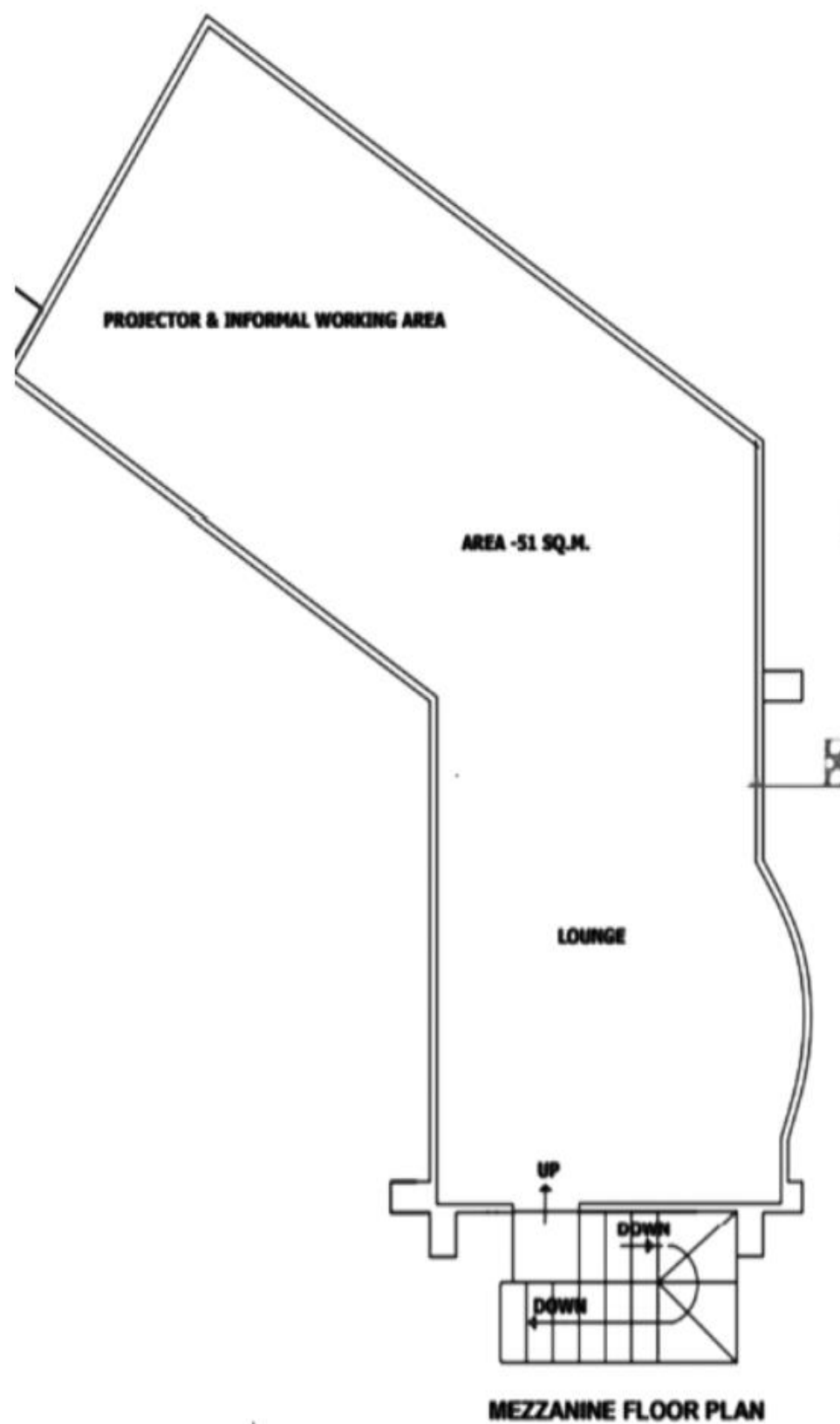
Techniques involved :

cob
adobe
rubble trench



Drawings





Rubble masonry foundation

a rubble trench foundation , as its name reveals , describes a continuous trench filled with crushed stone. the foundation uniquely provides both structural bearing as well as water drainage in a single foundation system.

the width of the trench determines bearing capacity for loads above. the stone fills provides a continuous drain along the entire foundation perimeter , ensuring that no water can freeze underneath to cause potential heaving in the building structure.

Construction :

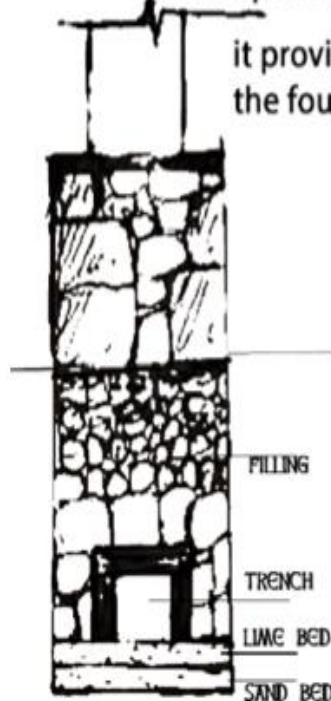
a foundation pit of depth 1.5' and width of 1.5' is dug. the base of pit is rammed ; and a channel is created by placing two broken stone slabs vertically such that there is a 4" wide gap on both sides from wall of pit and is closed with another stone slab on top. the the outer portion of trench is filled with broken stone pieces.

the broken stones and rubble are filled in the middle portion of pit and is compacted. slope factor of 1 inch for 1 meter should be provided .

Benefits :

requires less labour, uses less material, and reduced material costs
the rubble fill can use recycled crushed concrete instead of gravel , as long as fine particles are washed out.

it provides full water drainage under structural bearing element of the foundation, ensuring that footer remains dry all the time



DIG THE TRENCH WITH THE DROP OF 1CM FOR EVERY 1M



THE DIG TRENCH IS LEVELLED ACCORDING TO SLOPE



RUBBLES LAD VERTICAL , WITH THE GAP OF 4" IN BTWN THE SIDE WALLS OF CHANNEL



Adobe

Adobe refers to the sun dried brick made with a mixture of mud and lime in a ratio 4:1. the bricks are in regular prism which could be made in different measurements as per the requirement



Preparation of adobe :

1.lay the tarp and add subsoil and lime . The mixture should be in a ratio of 4:1. Quarry dust also can be added depending on the clay content of the soil.

After the dry mix is made add water. Addition of water do not have a standard ratio.

After addition of water the mix should be stamped. After spreading the mix on tarp by stamping flip the mix from all sides and stamp again in order to obtain a good mix. This step could be repeated several times.

When the mix is ready use a mould of required size to make adobe .

Before putting mix inside the mould make sure that the mould is thoroughly washed with water and apply a bit mix before hand on the mould so that after the brick is made the mould could be taken out easily.

Once the bricks are made keep it under direct sun to get dried. Sometim sometimes the bricks gets cracked when kept under-sun directly due to the mistakes made while making the mix of putting inside the mould. Cracked bricks could be used for finishing works.



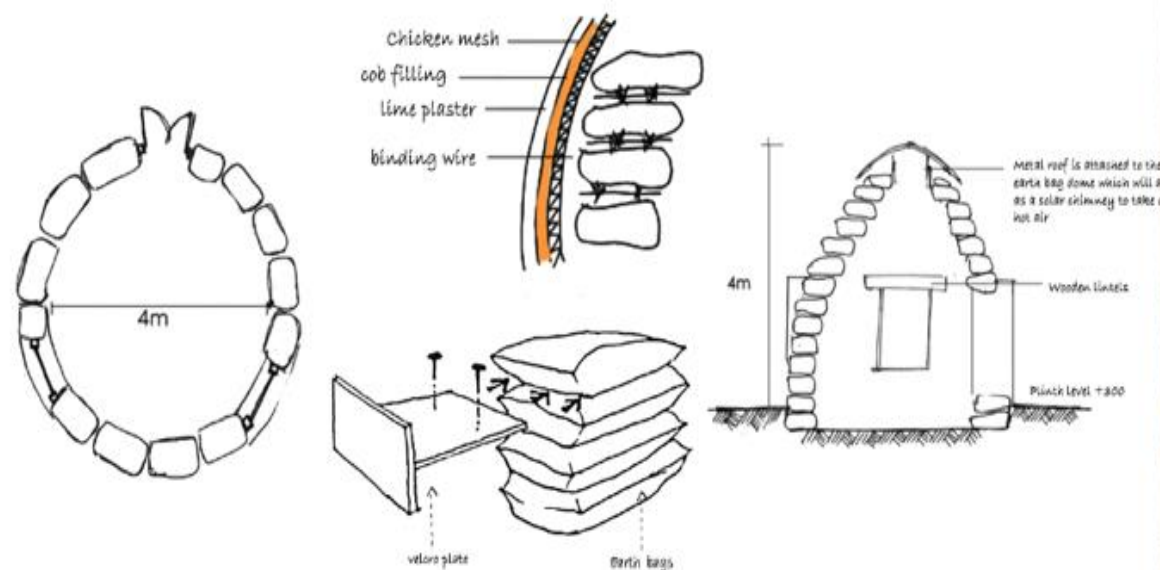
Earthbag dome

Earth bag construction is a type of Advanced Building Construction. It is also popular as super adobe. In this type of construction cement bags are used as the form work for the earth. The earth-bag dome was conceived as a very simple dome structure with a solar chimney at the top to keep the air circulating.

Construction :

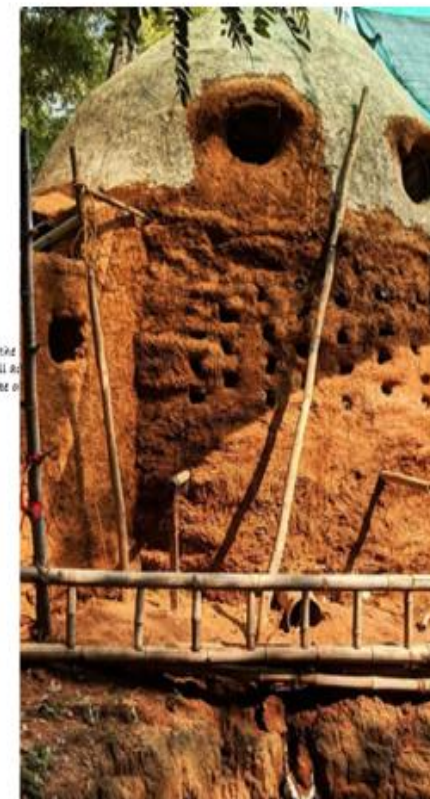
A pit with inner diameter of 4m and width and depth of 1.5ft and 1.5ft was dug. The rubble trench foundation with the water channel leading to the rain water pit

for the construction of the dome, a compass was made for reference point. it had horizontal and vertical movement. the foundation of the structure is rubble trench and over it sacks filled with mud mixture. (2:1:1, mud lime and quarry dust) are placed till sill level.



after each level metal wires are placed to make sure that the bag do not displaced.

after the bags were placed, chicken mesh was placed over, mud plaster and lime plaster was done.



Mud plaster

mud plastering is the traditional organic plaster consisting aggregate, binder and additives. raw mud construction always results in cracking as mud dries. it depends on layerness of application.

Scratch coat :

it is a very thin layer of plaster which is applied in an upward motion using hands.

this coat is coarse not smooth. this facilitates in the binding of two different kinds of material.

earth: quarry dust : rice husk (5:1:1)

Levelling coat :

the undulations on the wall surface can be levelled using spirit level.

it is applied directly on to the wet scratch coat; thicker.

we can achieve levelled surface in multiple thin layers than one thick layer.

Finish coat :

Smoothen the surface first using a wooden floater and then using a wet sponge gently going in circles contains the final required finish.

. Earth : quarry dust : cow dung in the ratio 3:1:1. Cow dung is used in the plaster for better water resistance, better termite resistance, better in absorbing impacts and better antiseptic properties.



lime plaster

to prevent the building from direct action of rain and moisture, lime plastering is used for exterior plastering.

Scratch coat :

The unsieved chakki lime is taken in required quantity and is mixed with kadukkai - jaggery water, to make a liquid paste and is applied over the walls as the first coat.

The wall should be moist before applying plaster.

the mix should be thrown on the walls with a good force using a trowel in a bottom to top motion.

Levelling coat :

It is the 2nd coat which is applied when the first coat is dried.

the mixture should have more water consistency.

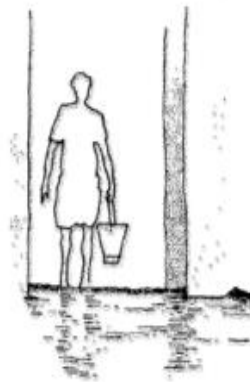
The surface is levelled using a metal or wood chisel and spirit level.

Finish coat :

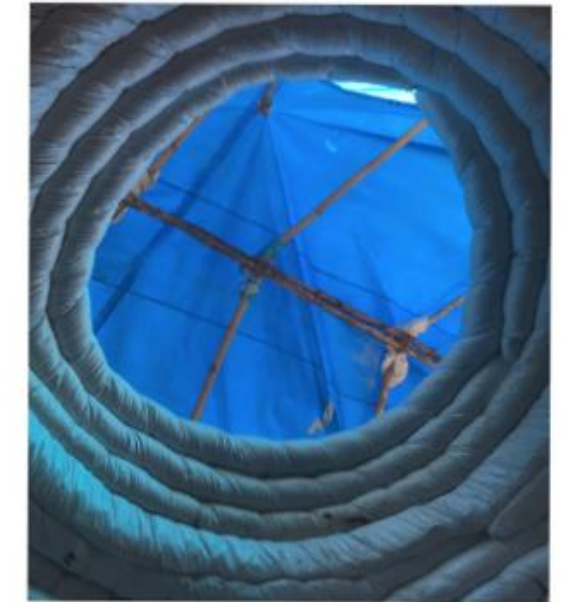
Smoothen the surface with wooden floater and then using wet sponge in circular motion.

Final coat is applied using sieved lime to cover minute cracks and to give a smooth surface.

Required colours can be achieved by mixing lime with natural pigments and coloured sand and applying as a final lime wash.



Earthbag dome

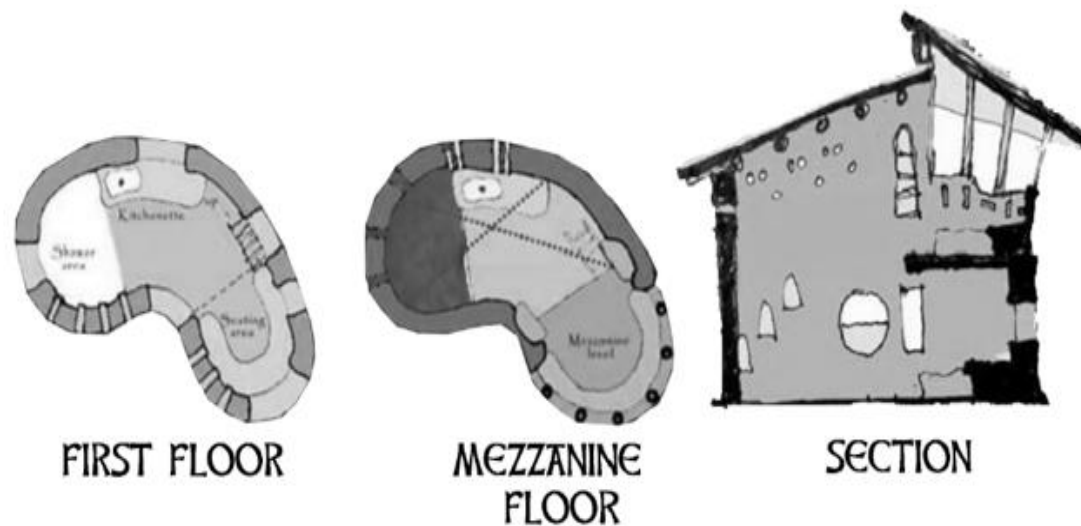


Build Free



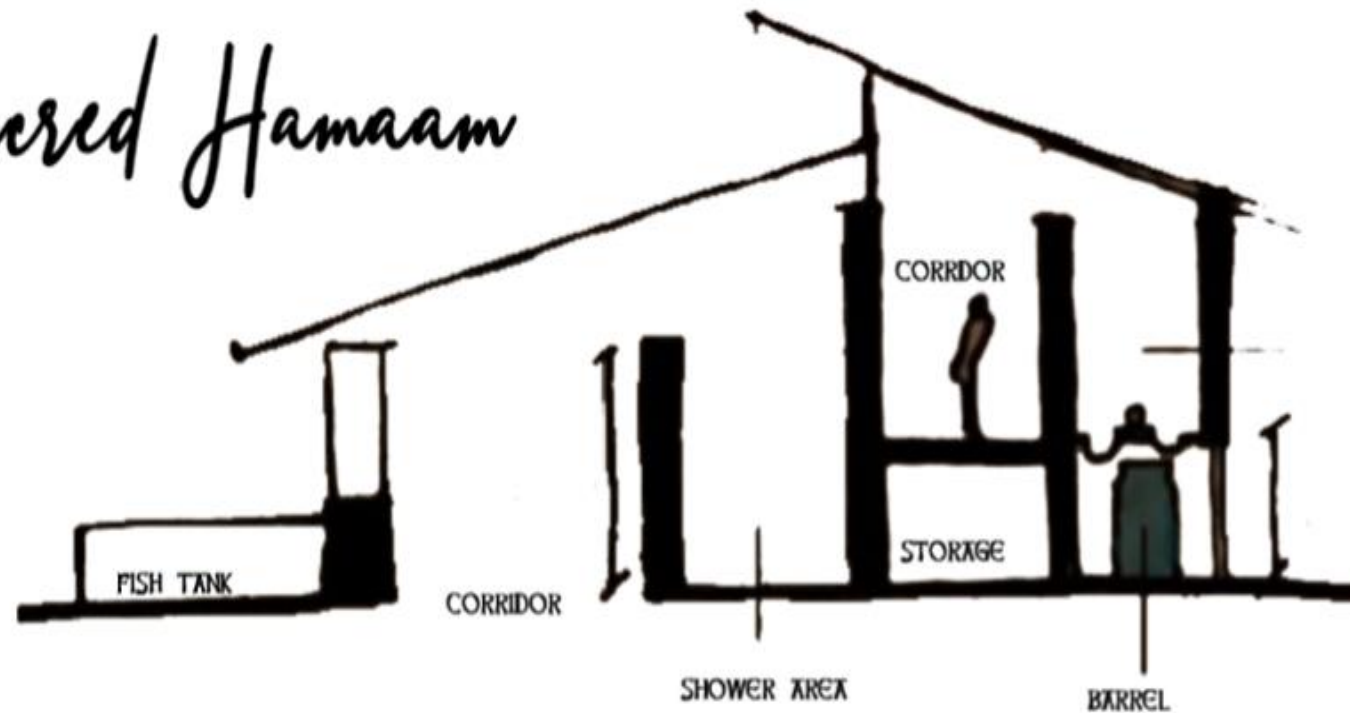
THE DESIGN WAS APPROACHED IN A VERY RUDIMENTARY STYLE. THE VOLUNTEER XAHER, WAS ASKED TO ENACT HIS ACTIVITIES AFTER HE COMES BACK FROM WORK EVERY EVENING. A GROUP OF TEN PEOPLE HOLDING EACH OTHER'S HANDS FORMED A BOUNDARY ACCORDINGLY AND VOILA! THE DESIGN WAS DONE! THE PLAN WAS CHALKED IMMEDIATELY ON THE GROUND RIGHT AWAY .

THE HOUSE IS A STRUCTURE WHICH IS BUILT ON THE CONCEPT OF BUILT FREE . IT WAS STARTED WITH AN IDEA OF BUILDING WITH FREE WILL AND THE PLANING PROCESS WAS AN ORGANIC ONE WITH THE USER DIRECT PARTICIPATION AND DESIGN BEING MADE ON THE SPOT WITH RESPECT TO THE MOVEMENT OF THE USER IN SPACE FORMED BY VOLUNTEERS MAKING IN THE MAKE SHIFT WALL / WINDOW / DOOR / BY HOLDING HANDS



Sacred hamaam is a structure made of earthcrete .the lower level has three shower areas and three wash basins. The higher level has three dry compost toilets.

Sacred Hamaam



If handled smartly solid waste can be converted to a very good manure moreover human faeces gives the most nutritious compost. Dry compost toilets are relevant because: it saves water by minimal use. Human faeces being rich in ammonia provides very good quality compost.

components :



Conversion of human faeces into compost:

the faeces should be humid but not wet in order to become compost. thus ideally it is effective to separate urine and bum wash water from faeces.

every time after using toilet the faeces should be covered with saw dust or dry leaves to keep wetness away.

it should be maintained at hot temperature within the range of 40 -60 degree celcius . this temperature enables bacteria that oxidizes waste and eliminates pathogens to thrive.

the maggots eat the undigested food scraps in faeces and break it down more for bacteria to take over.

with these parameters compost will be ready in 6 months. the compost could be made using aerobic reaction as well as non aerobic reaction.

Earth crete



Earthcrete is same as concrete , but the ratios of materials used is different and instead of river sand is replaced by quarry dust . In the entire construction process , use of cement is only 2% of portland cement. Earthcrete could be used from foundation till plinth level in construction .

preparation :



PREPARATION OF MIX



SHIFTING THE MIX



POURING THE MIX INSIDE THE FORMWORK

cement acts as a binder , and aids in fast setting. we used one barn for one batch of earthcrete.

nine bands of soil harvested from site is used.

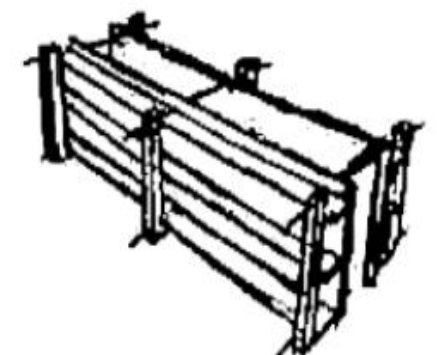
Demolition waste is an alarming concern in todays scenario. Using it instead of virgin material allows the material to be reused and extend its life. Studies shows that the strength of using demolition waste is similar to that of virgin material.

It is used-by breaking into required size using a stone hammer.

Add cement , soil and rubble in theratio 1:9:18 or its equivalent , in layers.slowly add water and keep mixing.

Shift the mix to bands and pour mix into the form work which should be prepared beforehand.

Use wooden stick to push in the mix to compact it well. Level the top portion and leave it to set.



Soil Tests

Jar test :

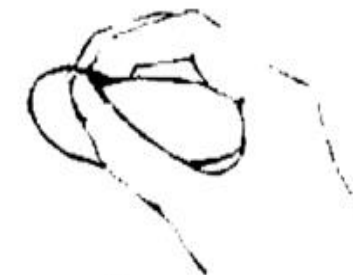
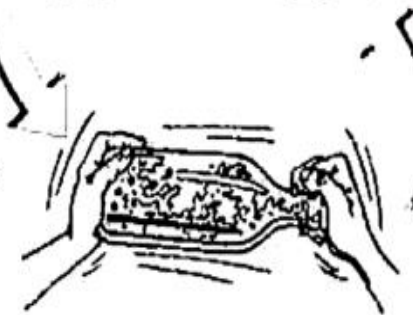
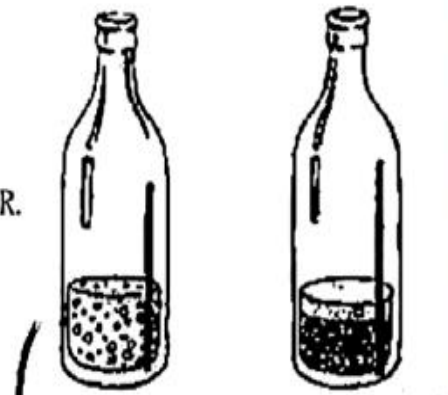
THE TEST HELPS IN IDENTIFYING THE TYPE OF SOIL. FILL A CLEAR GLASS JAR HALFWAY WITH A SOIL SAMPLE.

FILL THE REMAINING HALF WITH WATER , LEAVING A BIT OF AIR.

ATTACH LID , THEN SHAKE THE JAR VIGOROUSLY UNTIL ALL CLUMPS OF SOIL IS BROKEN UP.

SET THE JAR ASIDE TO REST , UNDISTURBED.

AFTER 24 H AFTER 24 HOURS THE JAR'S CONTENTS WILL HAVE SETTLED INTO DISTINCT LAYERS : SAND , SILT , AND CLAY. BY EXAMINING THE PROPORTION OF THESE LAYERS , THE TYPE OF SOIL COULD BE IDENTIFIED. JAR TEST



Natural materials



Drop test :

THE TEST DETERMINES THE AMOUNT OF CLAY AND SAND CONTENT IN THE SOIL.

AFTER THE JAR TEST ,USING THE SAME SOIL ,MAKE A LUMP BY ADDING WATER TO IT AND FORM A SMALL BALL.

DROP THE BALL FROM A MINIMUM HEIGHT OF 1 METER.

IF THE SHAPE OF BALL IS TOO FLAT ; THE SOIL IS CLAYEY .

THE SOIL WITH MORE CLAY MUST BE MIXED WITH SAND AND THE SOIL WHICH HAS MORE SAND CONTENT MUST BE MIXED WITH CLAY BEFORE USING IT FOR CONSTRUCTION PURPOSE.

Lime plaster



Oxide plaster

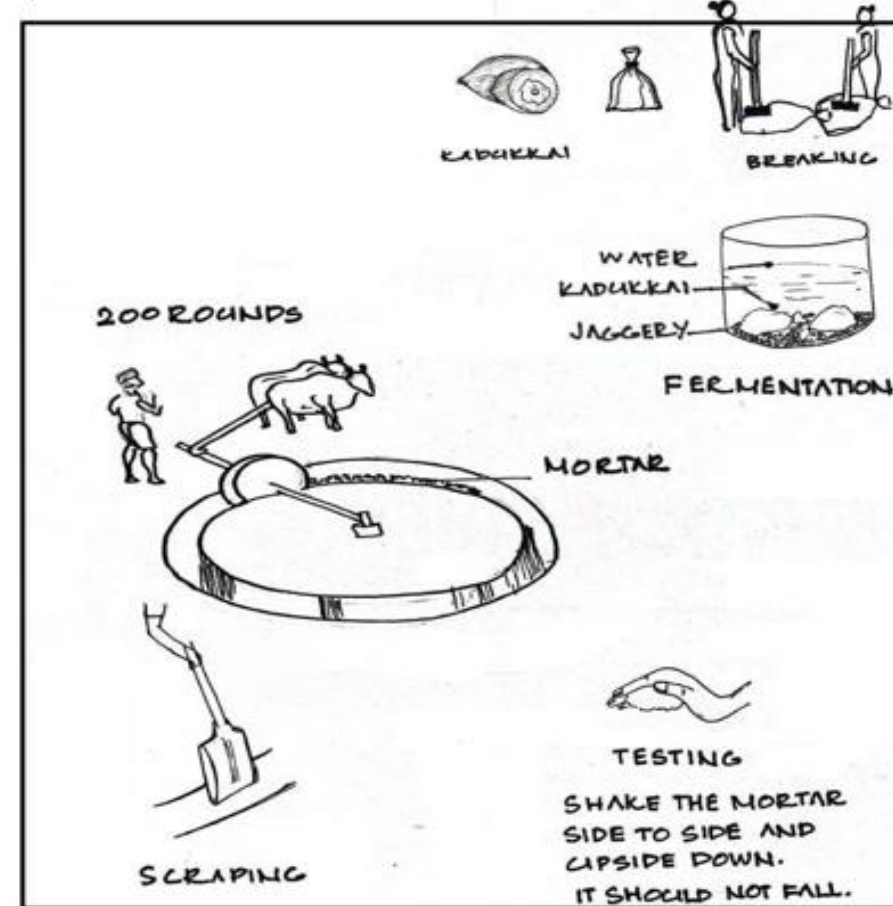




Lime Chakki

Traditional way of making lime mortar.

process



constituents

Lime + Quarry dust + (kadukkai + jaggery)

ratio

9 : 15

Lime Quarry dust

kadukkai jaggery

ratio
18kg : 20kg : 700l
kadukkai jaggery water

Kadukkai increases water resistance and jaggery acts as good binder



In Pictures, On right
1 The traditional way of making lime mortar, with large heavy grinding stone tied to the centre, pulled by bulls. (currently-tractor)



2 The Chakki



3 The pouring of quarry dust

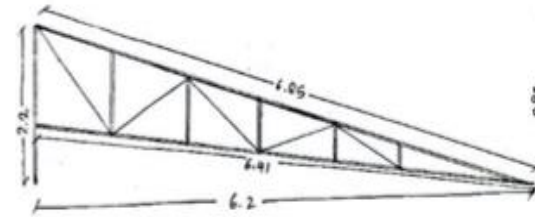


4 The mortar sample

On left
The wheel rotates while the people with shovels scrape the sides to ensure that the mix is well ground

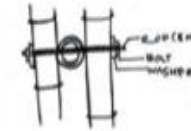
Roofing detail

01 template making



Nails are placed according to the measurement of the truss and threads are tied. Cut the bamboo accordingly

02 fixing bamboo



- 1 Fix horizontal and vertical bamboo
- 2 Fix all diagonal bamboo



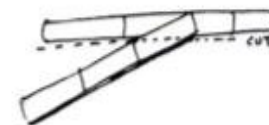
bamboo dowel



To make the bamboo stronger

tools used

- 1 8 mm thick rod
- 2 8 mm bolt nut
- 3 Washer
- 4 Drilling machine
- 5 Sanding machine
- 6 Kathi (long knife)
- 7 Paint brush
- 8 Rope



bamboo pecks



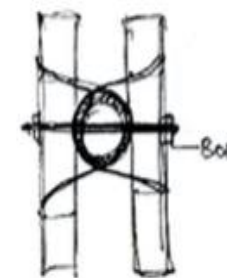
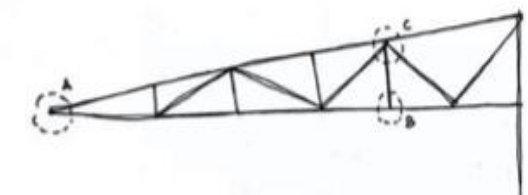
03 knotting



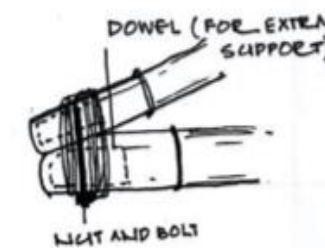
y knot

04 Oil varnishing

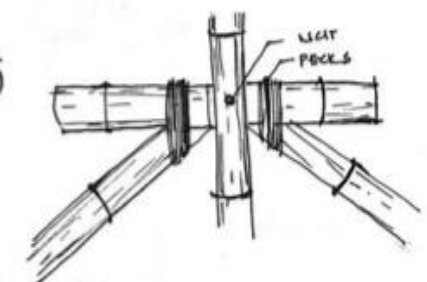
Waste engine oil is used to polish bamboo for protection from moisture and termites.



ELEVATIONAL VIEW
DETAIL B.



ELEVATION VIEW
DETAIL A



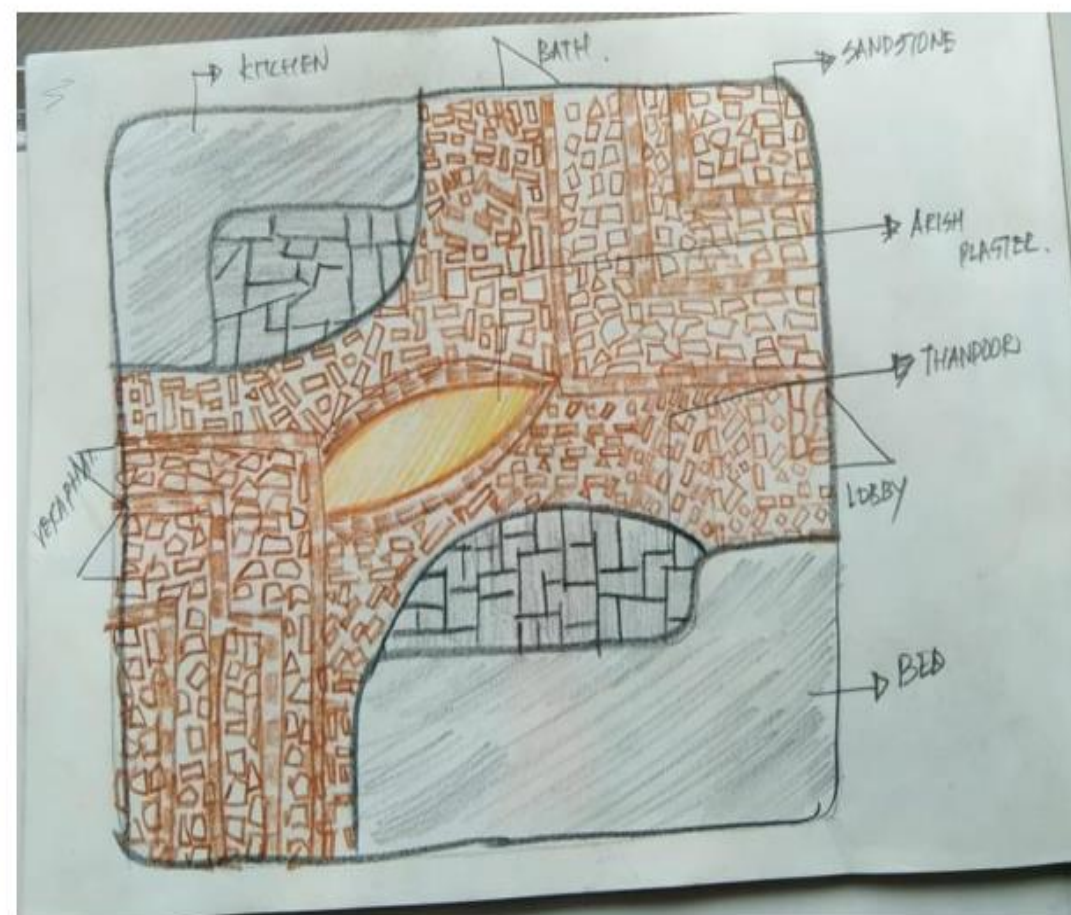
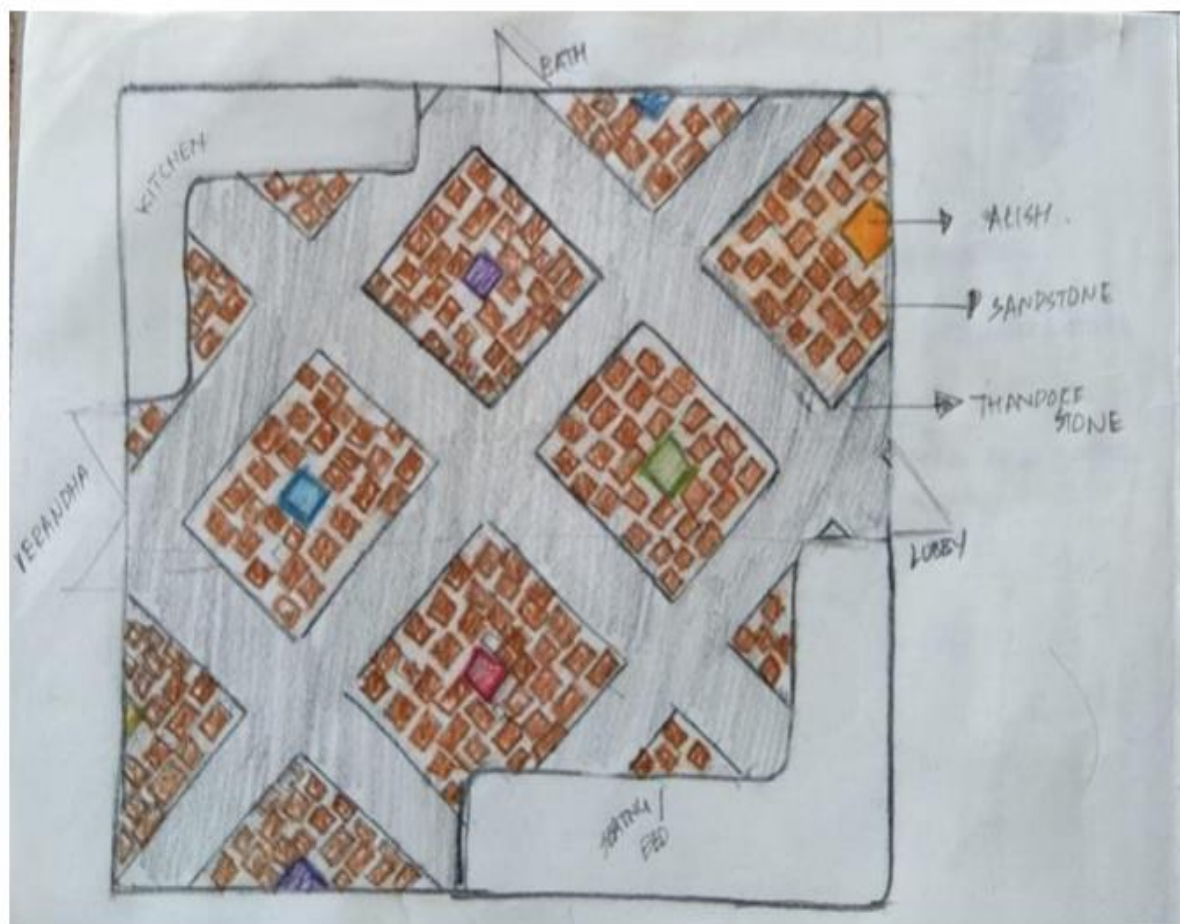
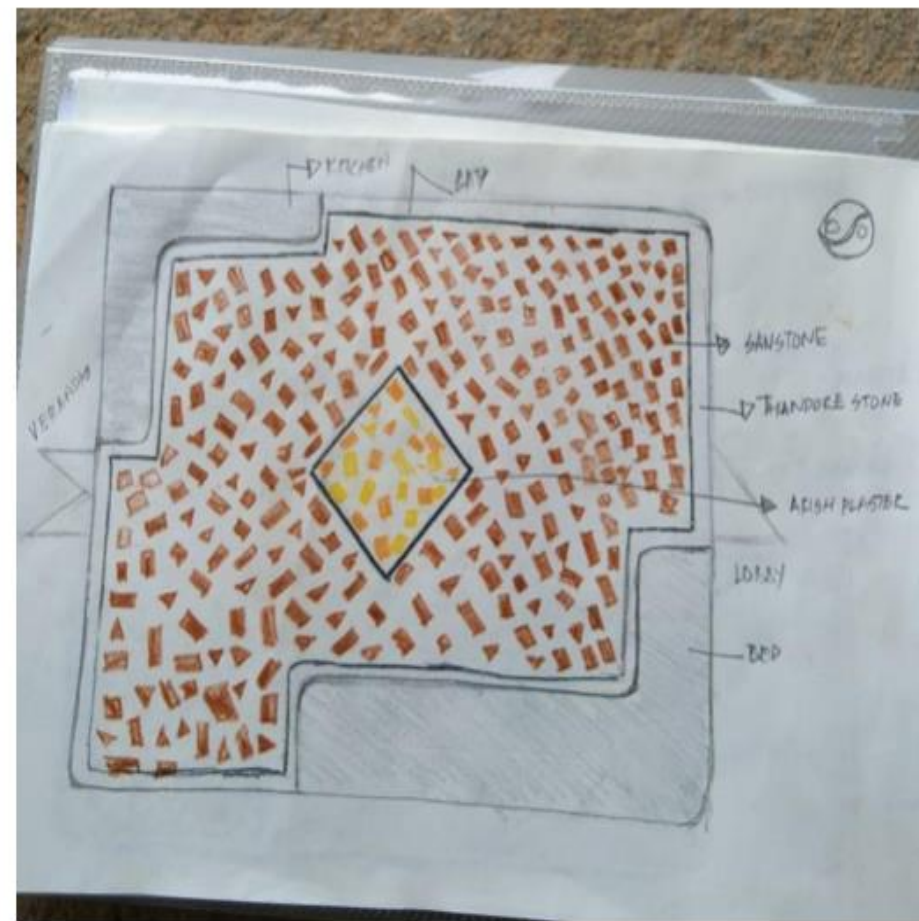
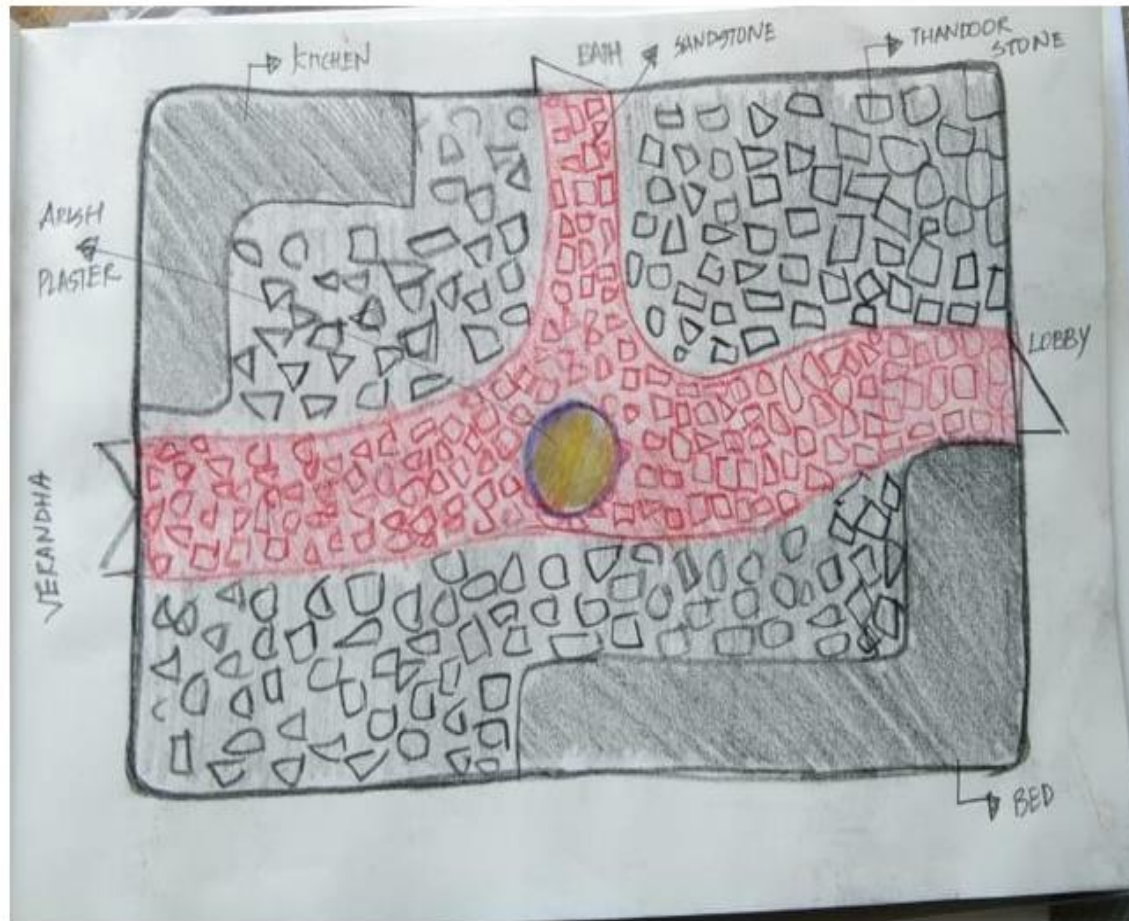
ELEVATION VIEW
DETAIL C



Process



Flooring detail



Case study

Human Scape

THE "HUMANSCAPES HABITAT- IS AN APPLIED RESEARCH AND DEMONSTRATION PROJECT OF SUSTAINABLE AND INTEGRATED URBAN LIVING PROJECT"

BEAUTY AND AESTHETICS IN THE BUILT AND NATURAL ENVIRONMENT ARE ESSENTIAL FOR A HEALTHY LIVING. TO CREATE SIMPLE AND ELEGANT FORMS IN KEEPING WITH THE SUSTAINABLE AND GREEN BUILDING PRACTICES. A PARTICIPATORY APPROACH IN PLANNING AND DESIGN

INTEGRATED ENVIRONMENTAL PLANNING OF WATER, ENERGY AND WASTE SO ZERO-DISCHARGE OF WATER, REDUCTION AND RECYCLING OF SOLID WASTE, WATER-EFFICIENT LANDSCAPING USING LOCAL ENDEMIC SPECIES, AND GROWING ORGANIC FOOD AS A MODEL FOR URBAN AGRICULTURE WOULD BE A HALLMARK OF THESE RESIDENCES.

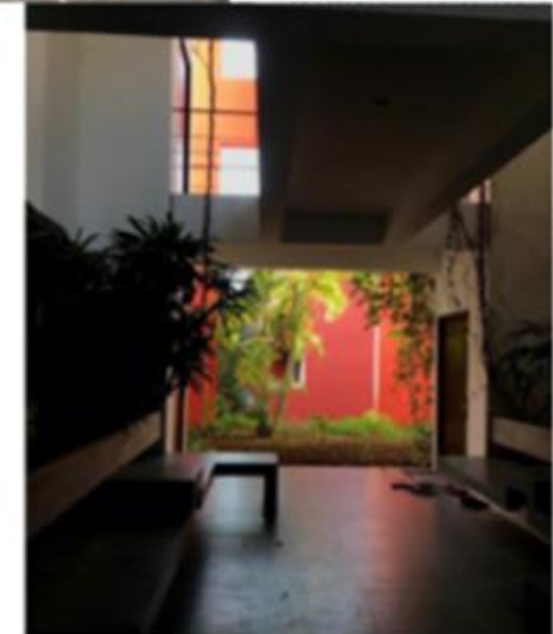
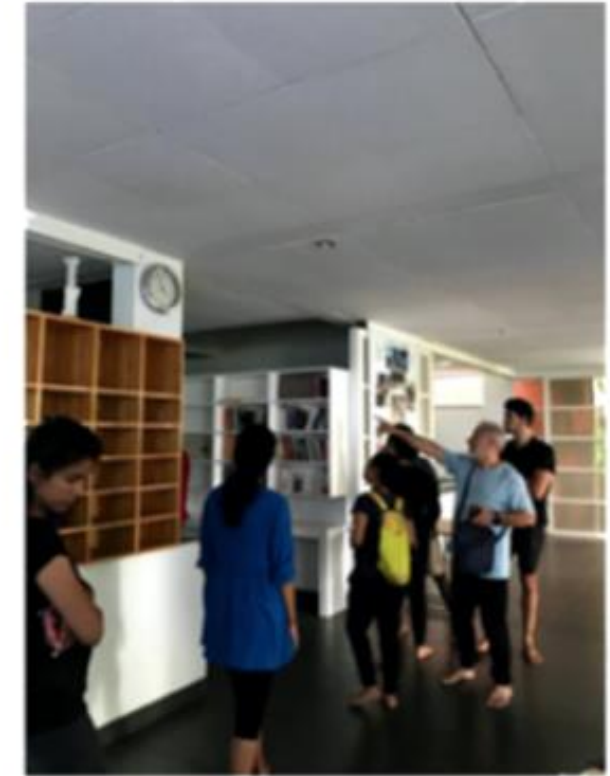
THE HUMAN ECOLOGY, USING THE PRINCIPLES OF "COHOUSING" CONCEPT OF LIVING, FACILITATING INTERACTION AMONG NEIGHBORS FOR INCLUSIVE SOCIAL DEVELOPMENT, ECONOMIC AND ENVIRONMENTAL BENEFITS.



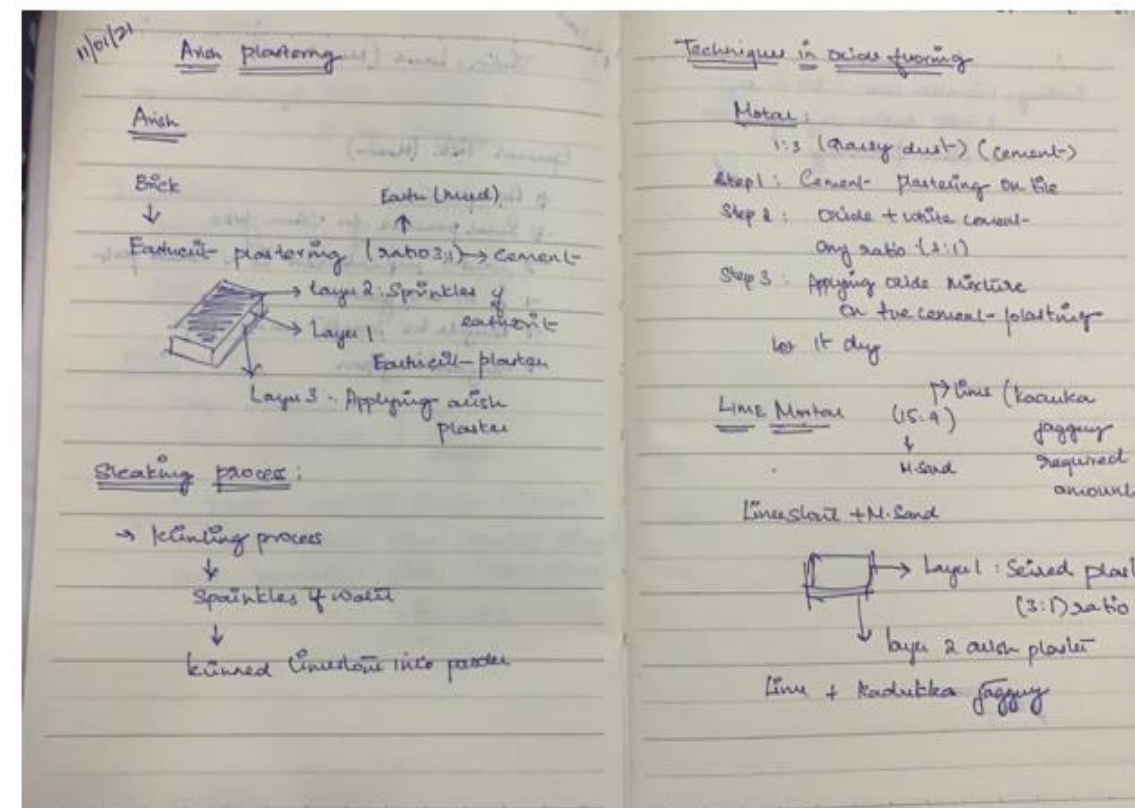
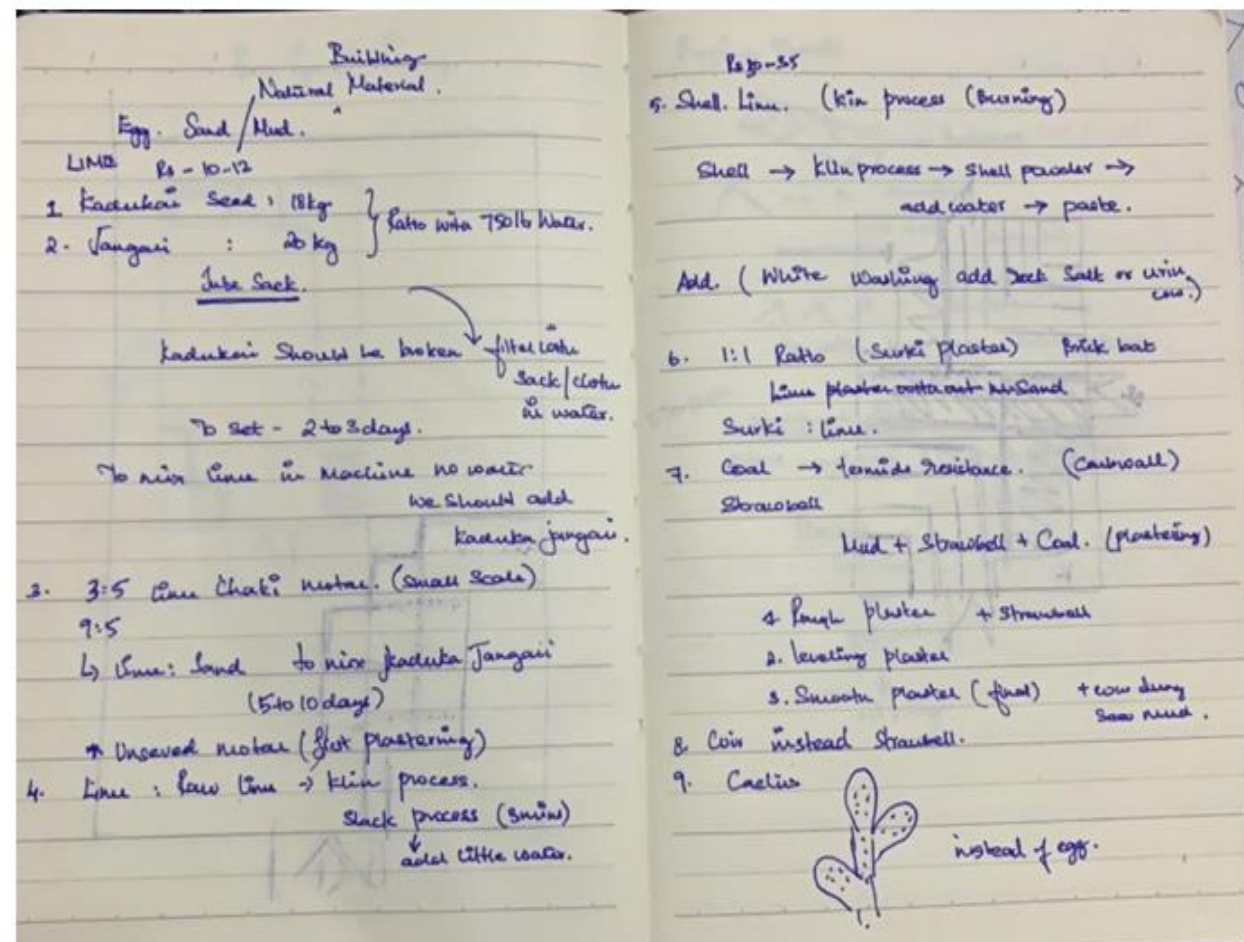
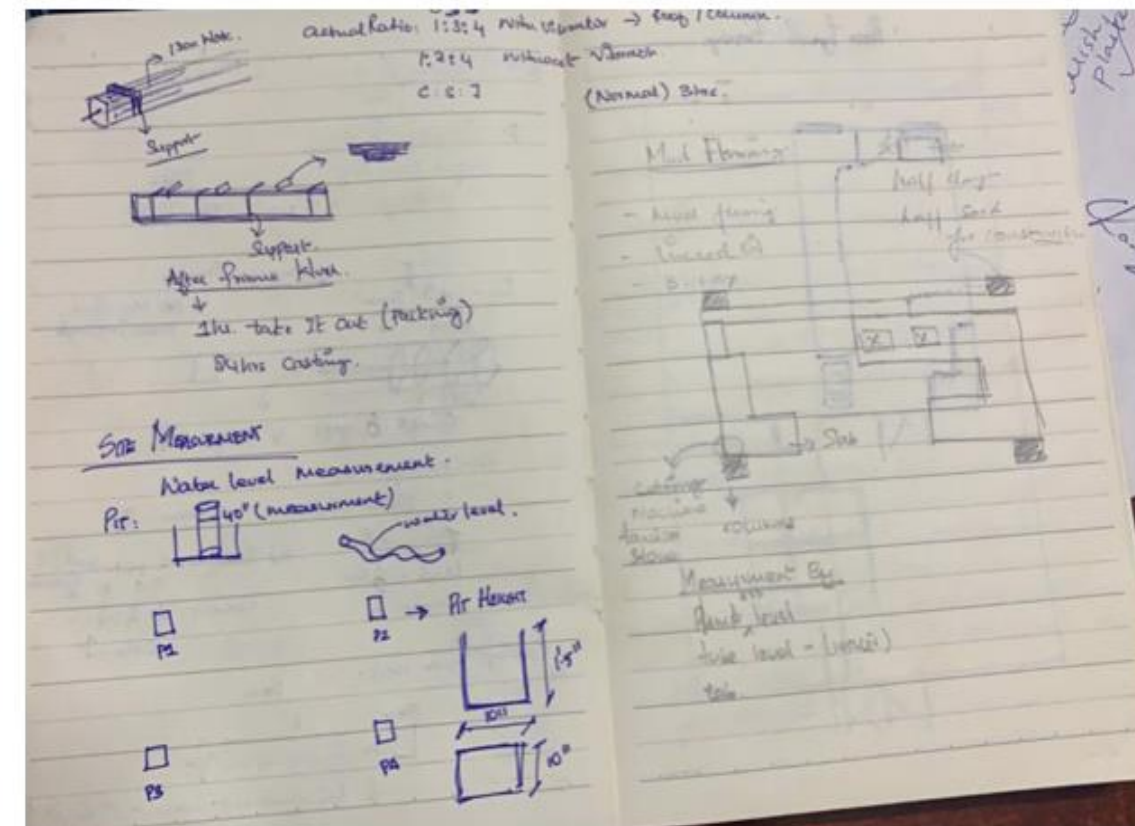
Joseba's House



citaden apartment



On site Works



THANKING YOU