

PROFESSIONAL TRAINING REPORT

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

by

GANESH RAJAN (39890007)



**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

JUNE 2019



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
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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 : S GANESH RAJAN

Semester : III

Reg No. : 39890007

Batch : 2019-2021



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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 S GANESH RAJAN (39890007) who had undergone training in SACRED GROOVES, AUROVILLE 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 Sheetal.A.

Internal Examiner

External Examiner



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E-mail: archhod@sathyabama.ac.in



DECLARATION

I S GANESH RAJAN hereby declare that the Professional Training Report from 11-12-2020 to 22-12-2020 done by me under the guidance of Ar. MANU GOPALAN is submitted in partial fulfillment of the requirements for the completion of practical training session.

DATE : 30-01-2021

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. Manu Gopalan Chief Architect of Sacred Grooves, Auroville** 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.

CONFIRMATION LETTER



Date: 11-12-2020
Place: Auroville.

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

CONFIRMATION LETTER

This letter is to certify that Mr. **Ganesh Rajan** 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 his 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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AUROVILLE- 605101
WWW.SACREDGROVES.IN | SACREDGROVES@AUROVILLE.ORG.IN | CALL US AT: 0413-2623696

JOINING LETTER



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 Mr. **Ganesh Rajan** 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



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
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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
M. Arch (Building management)

Continuous Assessment Report for Professional training
(Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

1. Name of the office / organization : SACRED GROOVES - ECOLOGICAL HOUSING PROJECT
2. Address & Contact Number : NEAR, CENTER GUEST HOUSE, AROVILLE - 605101
04132623696
3. Name of the student : S. GANESH RASAN
4. Duration : From 11-12-2020 To 18-12-2020
5. Total No. of days : 6
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 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active Participation in the Project activities		✓			
Documentation and tracking of project		✓			
Presentation Skills developed		✓			
Understanding of construction details & techniques		✓			
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation & tracking activities		✓			
Preparation / Management of drawings		✓			
Learning / Application of software in Projects		✓			
Preparation of concept for projects		✓			
Site Management / Discussion with clients		✓			
Overall Grading*	<u>A</u>				

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

7. Any other Remarks : _____

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



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1. Name of the office / organization : SACRED GROOVES - ECOLOGICAL HOUSING PROJECT
2. Address & Contact Number : NEAR, CENTER GUEST HOUSE, AROVILLE - 605101
04132623696
3. Name of the student : S. GANESH RASAN
4. Duration : From 21-12-2020 To 02-01-2021
5. Total No. of days : 10
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 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active Participation in the Project activities		✓			
Documentation and tracking of project		✓			
Presentation Skills developed		✓			
Understanding of construction details & techniques		✓			
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation & tracking activities		✓			
Preparation / Management of drawings		✓			
Learning / Application of software in Projects		✓			
Preparation of concept for projects		✓			
Site Management / Discussion with clients		✓			
Overall Grading*	<u>A</u>				

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

7. Any other Remarks : _____

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

WEEKLY REPORT



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QUALITY SYSTEM CERTIFICATION
DNV-GL
ISO 9001:2008

DEPARTMENT OF ARCHITECTURE
M. Arch (Building management)
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1. Name of the office / organization : SACRED GROOVES - ECOLOGICAL HOUSING PROJECT.

2. Address & Contact Number : NEAR CENTER GUEST HOUSE, AUROVILLE - 605101
04132623696

3. Name of the student : S. GANESH RAJAN

4. Duration : From 4-01-2021 To 13-01-2021

5. Total No. of days : 9

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 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active Participation in the Project activities		✓			
Documentation and tracking of project		✓			
Presentation Skills developed		✓			
Understanding of construction details & techniques		✓			
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation & tracking activities		✓			
Preparation / Management of drawings		✓			
Learning / Application of software in Projects		✓			
Preparation of concept for projects		✓			
Site Management / Discussion with clients		✓			
Overall Grading*	B				

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

7. Any other Remarks : _____

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



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(Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

1. Name of the office / organization : SACRED GROOVES - ECOLOGICAL HOUSING PROJECT

2. Address & Contact Number : NEAR CENTER GUEST HOUSE, AUROVILLE
04132623696

3. Name of the student : S. GANESH RAJAN

4. Duration : From 18-01-2021 To 22-01-2021

5. Total No. of days : 5

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 marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active Participation in the Project activities		✓			
Documentation and tracking of project		✓			
Presentation Skills developed		✓			
Understanding of construction details & techniques		✓			
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation & tracking activities		✓			
Preparation / Management of drawings		✓			
Learning / Application of software in Projects		✓			
Preparation of concept for projects		✓			
Site Management / Discussion with clients		✓			
Overall Grading*	A				

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

7. Any other Remarks : _____

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

WORK DIARY

(Annexure –VIII)

DATE	PROJECT NAME	WORK DONE	DATE	PROJECT NAME	WORK DONE
11-12-2020		Sacred Grooves Site Tour and Orientation	04-01-2021	Prototype House	Flooring Design
14-12-2020		Earth Crete Column Casting Workshop	05-01-2021	Bubble Area Renovation	Bamboo roof design execution.
15-12-2020		Earth Crete Column Casting Workshop	06-01-2021		Oxide Flooring, Wax Flooring Workshop
16-12-2020	Bubble Area Renovation	Beam Casting and Framework	07-01-2021		Sacred Grooves Site Tour to Tahir House
17-12-2020	Bubble Area Renovation	Beam Casting and Framework	08-01-2021		Introduction to Araish Plaster a Workshop
18-12-2020	Bubble Area Renovation	Beam Casting and Framework	09-01-2021		Introduction to Araish Plaster a Workshop
21-12-2020	Bubble Area Renovation	Existing Structure Dismantle	11-01-2021		Introduction to Araish Plaster a Workshop, Case Study on PTDC
22-12-2020	Bubble Area Renovation	Site Measurements and Design Execution	12-01-2021	Bubble Area Renovation	Tile Cleaning, Roofing Structural Details
23-12-2020	Bubble Area Renovation	Site Measurements and Design Execution	13-01-2021	Bubble Area Renovation	Tile Cleaning, Roofing Purlins and Rafters
24-12-2020		Adobe Bricks and Foundation Digging	16-01-2021	Bubble Area Renovation	Tile Cleaning, Roofing Weathering Treatment
26-12-2020		Column Foundation, Adobe Bricks, Case Study of Town hall	17-01-2021	Bubble Area Renovation	Tile Placement
28-12-2020	Bubble Area Renovation	Roofing Design, Existing Structure Dismantle	18-01-2021	Bubble Area Renovation	Tile Placement
29-12-2020	Bubble Area Renovation	Bamboo Harvesting	19-01-2021	Prototype House	Flooring Design Execution
30-12-2020	Bubble Area Renovation	Bamboo Harvesting	20-01-2021	Prototype House	Flooring Design Execution
31-12-2020	Bubble Area Renovation	Bamboo roof design execution, Case Study Joseba House site visit	21-01-2021		Lime Chakki Workskop
02-01-2021	Prototype House	Flooring Design	22-01-2021		Lime Chakki Workskop

Chief Architect Signature:

Office seal:

CONSOLIDATED CERTIFICATE



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 Mr. **Ganesh Rajan** of 4th Semester **M.Arch – 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 his Internship tenure, he has worked on the Sacred Groves Ecological housing project and have been exposed to various earth building techniques.

His contribution to the project has been good!

We wish him all the best for his future endeavors.

Yours's sincerely,


Amal Ali
Architect


Architecture & Design
Ar. Manu Gopalan
Principal Architect
CA/2000/26025


Manu Gopalan
Chief Architect
CA/2000/26025

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Ar. Manu Gopalan

Education :

- SPA, New Delhi
- Nomi Bose Award for the best Thesis
- Golden Medal- Professional Degree in Architecture
- Strategic Planning Campaigns
- Non Violent Direct Action (NVDA)

About The Architect...

A professional Architect, Director of Education & Research Programs and Photographer with over 19 years experience in the management of international organisations such as Greenpeace, Amnesty International, Architecture & Development and Auroville International Township. Focus group- Children & Youth action for the Environment. Led teams with over 650 people at a given point in time. Worked in multi-country contexts in India, Nepal, Sri Lanka, Pakistan, Burma, Thailand, Philippines, Malaysia, Turkey, The Netherlands and the United Kingdom. Widespread rural development work exposure in South and South-East Asia especially developing Ecological Micro-projects in the areas of water, sanitation and housing.

Manu's work as an Architect is to develop new cost-effective building solutions using Natural and Recycled materials. This, he believes, would go a long way to develop the city and its infrastructure much faster and without accumulating a huge landfill behind us. He loves to work in a story-telling stream with the focus on one person normally. His stories have been published in some Delhi based newspapers and magazines. Before moving to Auroville he has built hospitals, schools and houses in New Delhi, Bangalore, Calicut, Nagercoil and Yercaud. He has also worked with some campaigning organizations on environment and human rights issue

Vision and Teaching...

He Believes in hands on work, feel the materials, touch them and mend them. The core of the work, according to him is toughness. When communication is right and hard work certain then the quality of work is gaurenteed. Anyone can design and build, with the knowledge of centuries and through trail and error experiments, under the guidance, everyone is given access and freedom to learn what they like and can choose more light from their field of interest.

The Sacred Grooves Community...

Sacred Groves is a community in Auroville, India. Which strives continually to bring down the barriers between the earth and the now toxic building processes employed in modern times. We believe in an ecologically balanced and sustainable model of construction and have been researching on the endless possibilities in ecological development since our conception. Sacred Groves has a unique perspective to look at any problems faced by us during construction, we strive to achieve the perfect balance between the building and its ecological surroundings. The work at Sacred groves is majorly powered by volunteers and Architectural interns and some hired labour from the neighbouring villages.

Sacred Groves is more than just using green building methods and materials. It is about creating an environment where people can live a more sustainable life. A place to find solutions for many issues the modern world is facing. Not only ecological sustainability is of importance also social and economic sustainability get equal attention.

Sacred Grooves promotes to have a great variety of residents to be able to live together in order to create unity in diversity. The cohousing principle, the open structure, sharing, and different clusters, make a flexible approach possible, to find ways where individuals can live together towards unity.

Sacred Groves wants to be a place which can provide their residents with all their basic needs, without any money involved. Although this aim may be high, they invite everybody willing to take up this challenge to be part of Sacred Groves. They want to become an alternative to the increasing development of conventional construction, and the growing individualization of the society. It wants to become a place for those who believe that creating unity in diversity is more than just words. A place that can proudly show the world that there is a better way to build and to live together.



PROJECT - I

The Design brief of this project is to renovate a existing roofing in a wash area with a new stable roofing structure. And the specifications were to only use locally available materials which was available within the site.

Project Status - Completed

Built up Area – 130 sqft

Work Done :

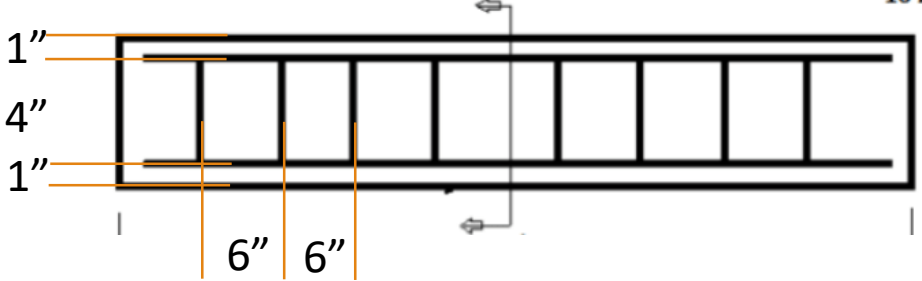
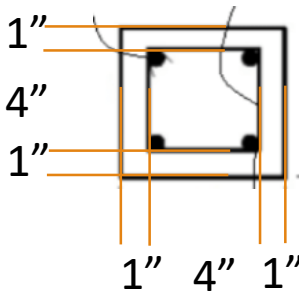
- Dismantling the existing structure
- Casting a Earth Crete Column
- Harvesting Bamboo in the site
- On site Roofing Detailing and Construction
- Tile Placements

EARTH CRETE COLUMN



Earth Crete as its name suggests is concrete but made with its main component as earth and not cement. It is a wet mixture of earth, broken debris and cement is used for the sole purpose of binding all of these materials.

Form Work with
Double legged Stirrup
paced at 6" C/C



Mixing Ratio

4



Stone Jelly

2



M Sand

2

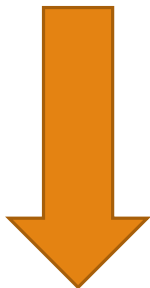


Locally available Sand

1



Cement



After Pouring the mixture it takes around 24 - 48 hours for curing

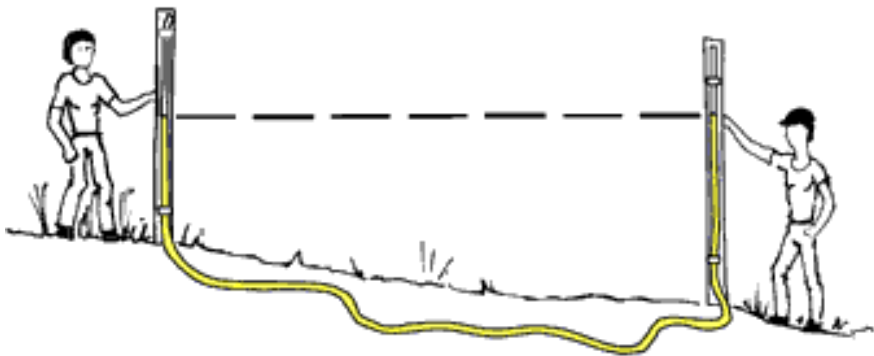


DISMANTLING THE EXISTING STRUCTURE AND PLACEMENT OF EARTH CRETE COLUMNS



Tubular Level for Checking the levels of all the 4 columns without any height difference.

Tube leveler is a technique used to determine the apparent inclination of an object or surface and for matching elevations of locations that are too far apart for a spirit level to span. The simplest water level is a section of clear tubing, partially filled with water. The ends are held vertical, and the rest of the tubing lies on the ground or floor. The water level at each end of the tube will be at the same elevation, whether the two ends are adjacent or far apart.



Pits of Depth 18” are dug and filled with construction waste stones and M-sand for foundation purposes, the new Earth Crete columns are placed inside the pits and water is poured for setting the sand



BAMBOO HARVESTING

Bamboo Harvesting and Treating

Bamboo should be harvested when the wood is at its maximum strength, usually between 3 to 5 years old. It is best to harvest bamboo with the least amount of sap in it to minimize the sugars and starches that attract pests and fungal growth.

The best time is in the dry season, during the period of the new moon and in the early morning or evening.

Treating

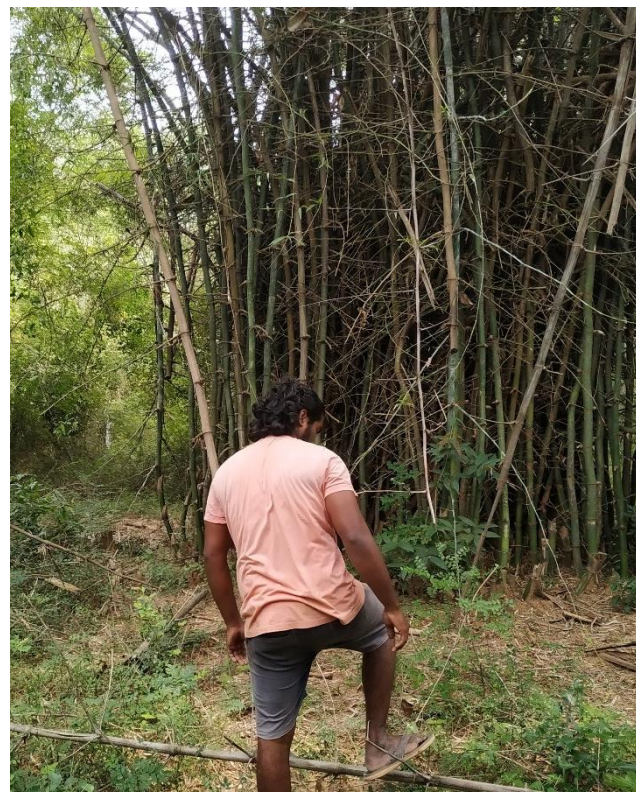
After the bamboo is cut as much of its sap is removed as possible. A traditional method is to lie the freshly cut bamboo in a flowing stream for several weeks to leach out the sap replacing it with water.

Another method is to stand the bamboo upright in drums of water for several days. The bamboo draws in the water and exudes the sap.

Yet another method is to inject water under pressure into the end of the culms to force the sap out.

Untreated bamboo will, like any grass, not last long. For short term purposes such as scaffolding or buildings for temple ceremonies the bamboo is not treated and may only last 2 or 3 years. Good harvesting and treatment can extend the life up to as much as 20 or 30 years.

Treatment provides protection against the natural enemies of bamboo, termites, powder borer, fungus and wet rot.



Bamboo Harvesting



Bamboo Harvesting

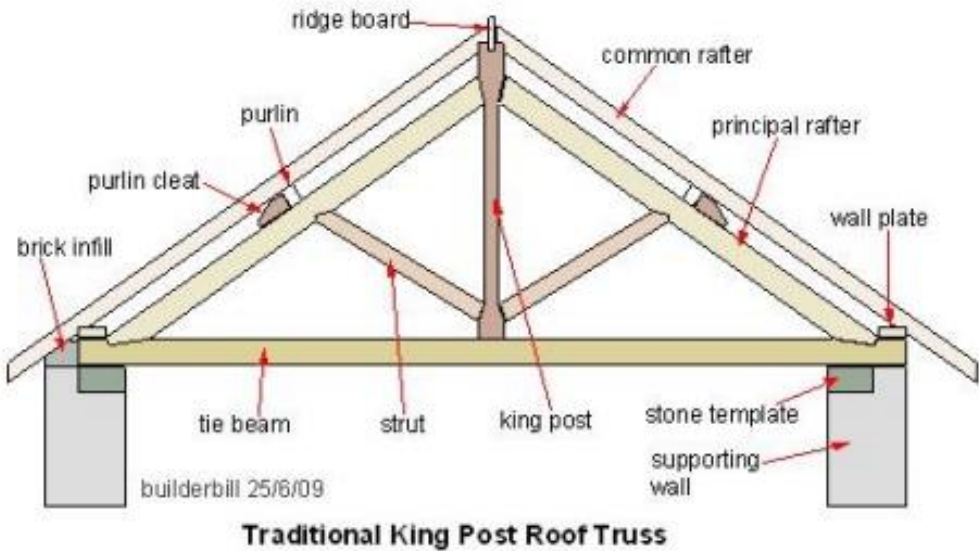


Bamboo Water Treating



Bamboo After Treatment

ROOFING DESIGN – Structural Details



King Post

Rafter

Tie Beam

Earth Crete Column

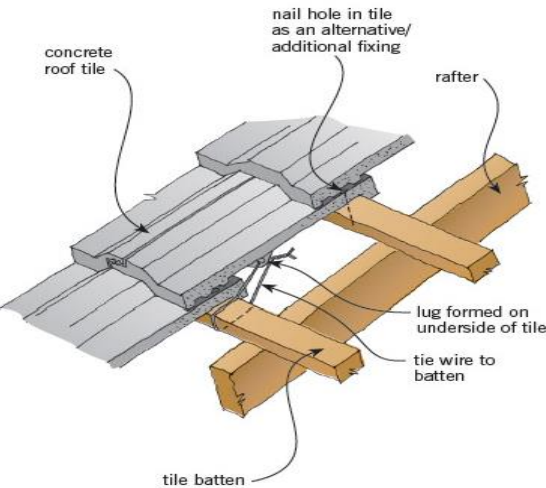


Bubble Area After Laying Terracotta Tiles

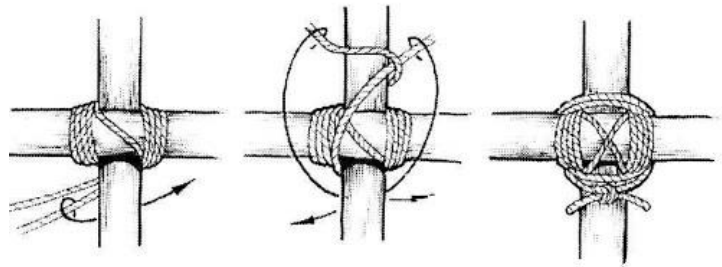


Rafter

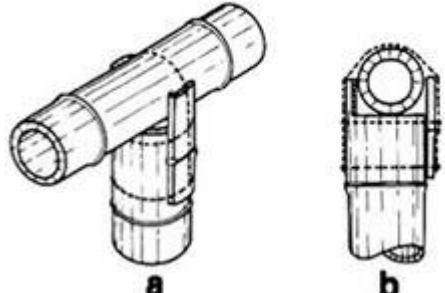
Tile Batten



Bamboo Lashing



Bamboo Lashing with coir rope
Japanese Square Lashing
technique



Joinery details of King Post and
Ridge Beam – Double ear Flap
Joint



Use of Bamboo Nails for
structural stability

RESEARCH AND STUDY

Work Done :

- Study on how a Soil test is done (Clay Soil Shake Test)
- Adobe Brick Making – A Hands on Experience
- Cob Wall
- Wattle and Daub Wall
- Lime Washing on a wall
- Earthen Flooring
- Lime Chakki

UNDERSTANDING NATURAL MATERIALS

1.Egg / sand / mud:



2.Kadukkai :



MIXTURE OF RATIOS:

18 kg kadukkai seed: ratio with
750 litres of water

STEPS:

- 1.Kadukkai should be broken
 - 2.To mix lime in machine along with kadukkai Jaggery water.
 3. 3:5 lime chaki mortar(small scale)
 - 4.9:5 (lime and sand) for larger scale and keep mixture for (5 to 10 days)
- Kadukkai and jaggery water, jaggery at a mixture of 20kg.



3.Lime and shell lime:



Cost: Rs: 30 to 35
Kiln process(burning of lime)
Slack process(3 min)
Add little amount of water

Shell Lime
(Non Hydraulic Lime)

Hydraulic Lime

Klin Processing

Slaking Lime

Usage for
Plastering

4.Surki Plaster:

Mainly consists of brick powder, in the ratio 1:1,can be used in for brown texture,used as a brick powder. In palingu plaster can be used instead of marble powder and can also be made as matte finish.



Jaggery

Binding Components :



Cactus

Cow urine:

mainly used as a good binder for lime.it acts as a good binding material.(half white coloured is mostly taken



Coir



Cow Urine



Suruki Powder

WHAT IS SOIL TEST?

Soil test is the way to examine the composition of our local earth by using the technique of shake test.

Every time the soil that is dug out is tested before starting the premix by using shake test. This is done to evaluate the percentage of clay, silt and sand in it, which gives us a rough idea whether the soil is suitable for making cob or not.

HOW IS IT DONE?

- Take the sample of the soil that you may want to use.
- Crush these sample and place them in the jar, between one third of the jar itself.
- Fill the jars nearly to the top with water and about a full teaspoon of salt or two drops of non-foaming liquid soap.
- The salt or soap will accelerate the clay settling out.
- Shake long and hard.
- At the end of shaking, suddenly stop moving the jar and leave it undisturbed.

Things Required To Perform Soil Test



MATERIALS REQUIRED:

To perform the soil test or shake test, we need a clear glass jar with tight lids and straight sides, subsoil that we will use to make cob, a gallon of clear water and a couple of ounces of salt or non-foaming liquid soap.

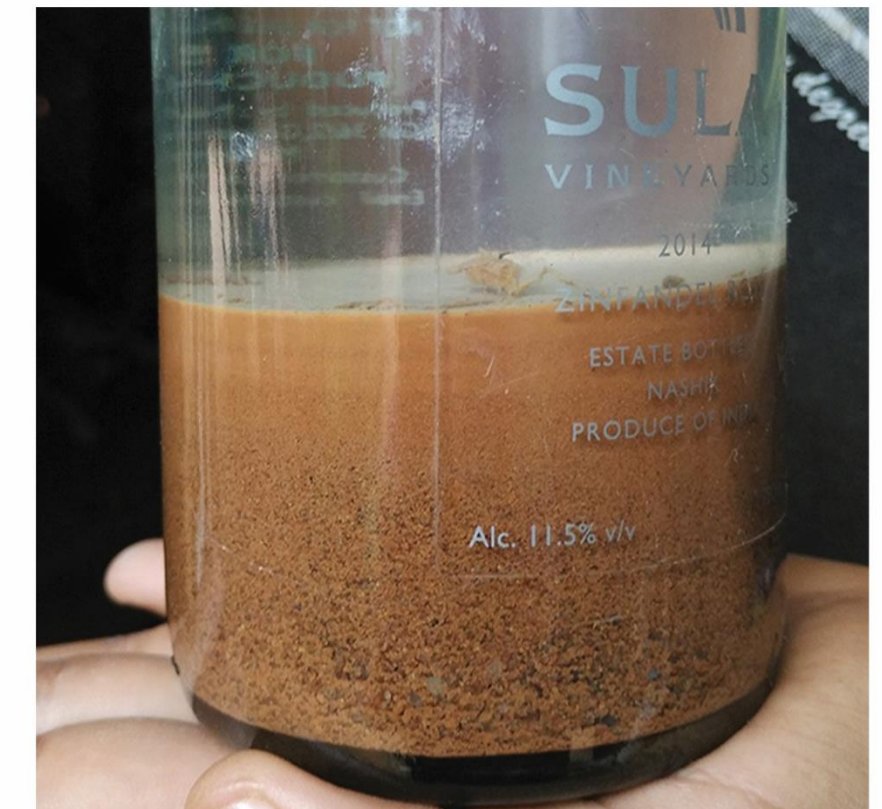
SHAKE TEST

TIME TAKEN:

- Useful sand will fall in 3-5 seconds.
- Fine sand and silt will fall next, for up to 10-20 minutes.
- If the jar is left undisturbed, the clay will gradually settle down, leaving the clear water above it.
- It might take hours, days or even weeks, depending upon the type of clay.

CALCULATION OF PERCENTAGE!

- Total height of jar = a
- Clay % = $\frac{x}{a} \times 100$
- Silt % = $\frac{y}{a} \times 100$
- Sand % = $\frac{z}{a} \times 100$
- clay % should = 14% - 20%
be b/w



ADOBE BRICKS



WHY ?

It is one of the ancient building techniques that are popular in the middle east.

It uses natural and readily available material that can found around you.

Adobe bricks are a fireproof, durable yet biodegradable, non-toxic building material which provide sufficient thermal mass to buildings.

It has low sound transmission levels through walls and gives a secure and solid feeling.

It is economical and easy way to learn.

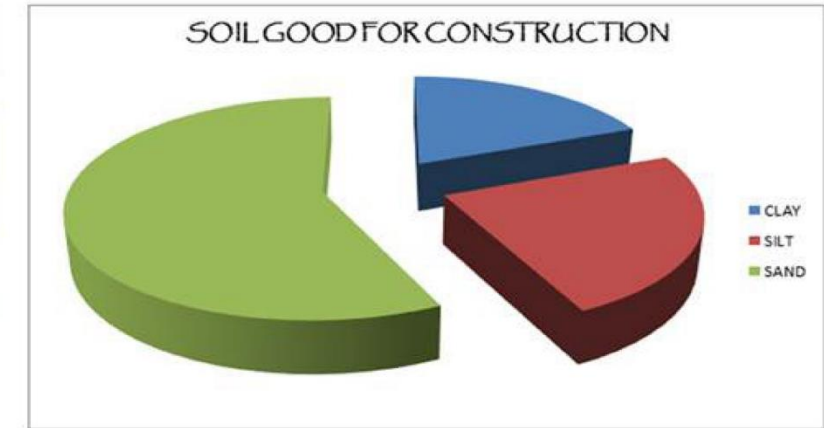
Risk of extensive shrinkage and cracking is prevented as they are totally dried before use.

It is time consuming.

Initially cob was only used for the construction, And after a lot of experiments, we used Adobe bricks for the construction of walls.

SOIL TEST

The sub soil 600 mm underneath the ground was dug out at our own site. According to the sedimentation test, the soil was good for construction.. The soil should be devoid of any organic matter and with 15 - 25% of clay, 5 - 30% of silt and around 60% of sand.



MAKING OF BRICKS



LAYING OF BRICKS



COB :



Stage 1 :
Earth and quarry dust
is mixed in the ratio
of 5:1 in a tarp by
adding water.

Stage 2 :
After the right
consistency is achieved
straws are added
evenly.

Stage 3 :
Once the mixture is
ready the cob chunks
are made.

Stage 4 :
To check the strenght
of cob certain tests
are done.

Strength of Cob

Test 1 – Drop ball Test

Make a sphere of the prepared mix and drop it from a certain height. Then the sphere should merge with the mixture which is already prepared, if it does so then the mixture has a good compressive strength. There should not be any cracks on the surface as well.

Test 2 – Drop Ball Test

Make a cigar shape out of the mix in such a size that you can hold the mix with both your hands. You should be able to pull it in horizontal was such that it does not break.

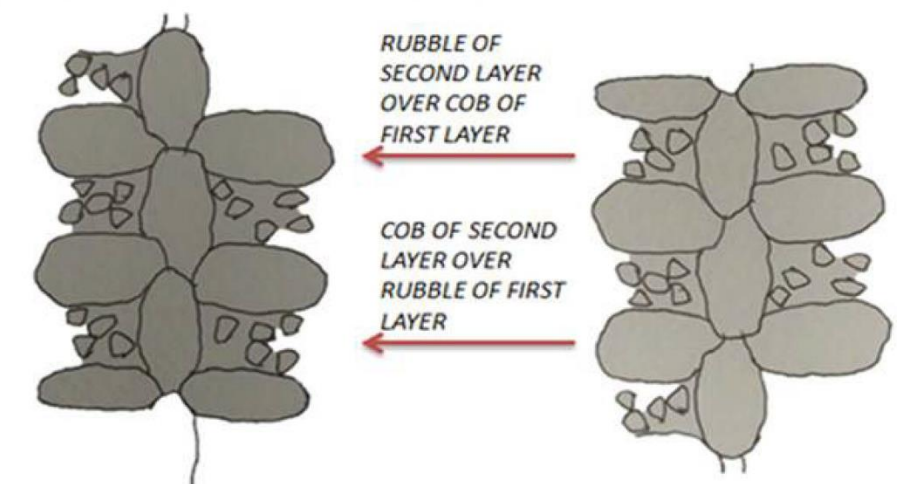
Test 3 – Crunch Test

Make a ball out of the mix. Take the sphere near your ears and crush the ball. You must be able to hear a crunchy sound. If it does then the sample has passed the test.

WHAT IS COB?

- The literal meaning of cob is “A lump” or “Rounded mass”.
- Cob is a mixture of subsoil, sand (optional), fiber while adding water to bind them effectively.
- Sub soil is the soil taken from at least 2ft below the ground. The top layer should not be taken for cob because it is rich in nutrition and is meant for agriculture. And the soil that should be used for construction should ideally be devoid of any organic substance.
- From subsoil we get sand, silt and clay. Sand (optional) for the compression in the building and clay acts as binding agent.
- Fibersuch as coconut fiber and rice straws is for the tension in the wall and is used to bind and hold the structure together.

APPLICATION OF COB:

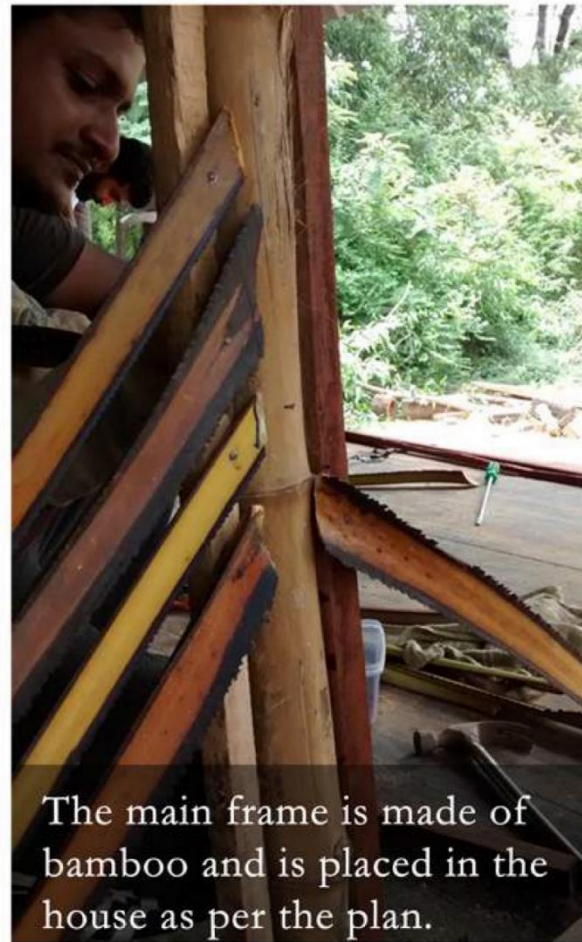


WATTLE AND DAUB

WHAT IS WATTLE AND DAUB?

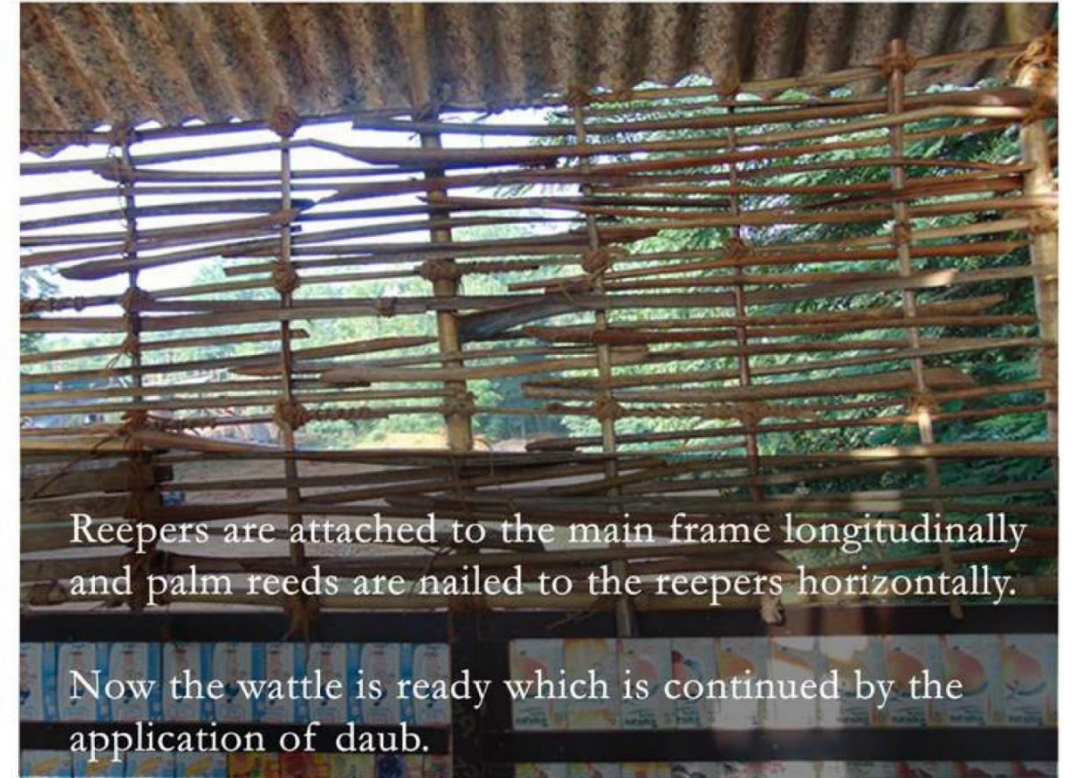
Wattle and daub is a simple and very effective wall construction technique. It was often used in medieval Europe and is known for its earth-quake resistance.

A wattle is a woven wooden skeleton and daub is a sticky mixture of sub soil (the layer of earth beneath the top soil) and fibres like rice straw and rice husk that is applied on the wattle. It is a very effective earthquake resistant structure



The main frame is made of bamboo and is placed in the house as per the plan.

Palm reeds were used because they don't get attacked by termites even after it gets wet.



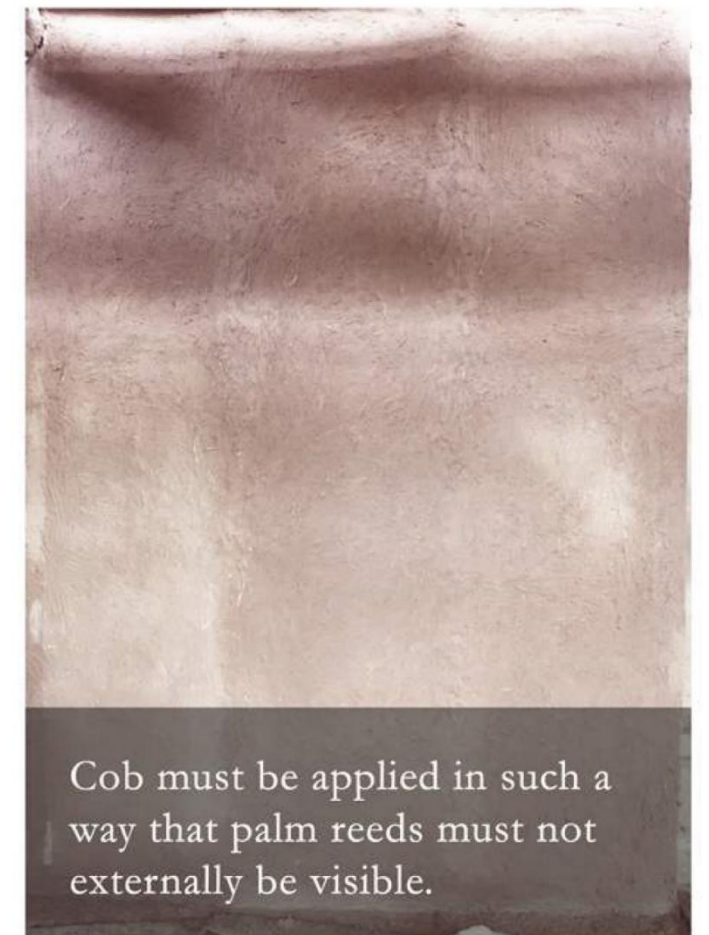
Reepers are attached to the main frame longitudinally and palm reeds are nailed to the reepers horizontally.

Now the wattle is ready which is continued by the application of daub.



Cob batch is prepared and applied on both the sides of the palm reeds.

The wet mix was then laid on the wattle from both the sides in such a manner that there were no air gaps left.



Cob must be applied in such a way that palm reeds must not externally be visible.

WATTLE AND DAUB WALL

LIME WASH

INTRODUCTION

Lime has been used for thousand of years as a binder in mortars, plasters and paints.

Lime is a breathable material, whic means it allows airborne moisture to penetrate through it, and does not trap moisture inside a wall.

Lime plaster is used to prevent the building from direct action of rain and mositure, and hence it is used for exterior plastering.

INTERIOR WASH

MATERIALS USED :

Non -hydraulic lime(shell lime), palm jaggery, cow urine.

The wall is prepared by brushing and cleaning it, followed by the base coat.

which includes the application of infinity strokes as it covers the pores in the wall.

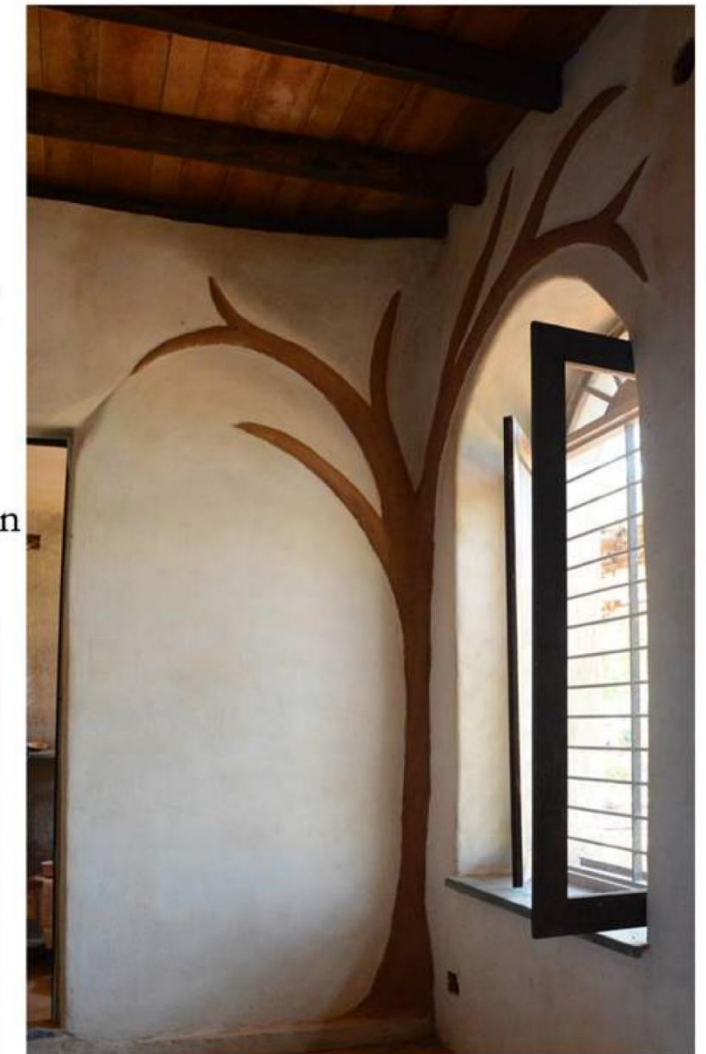
The base coat requires minimum of 3-4 coats to achieve an uniform white colour.



Slaking process



Sieving process



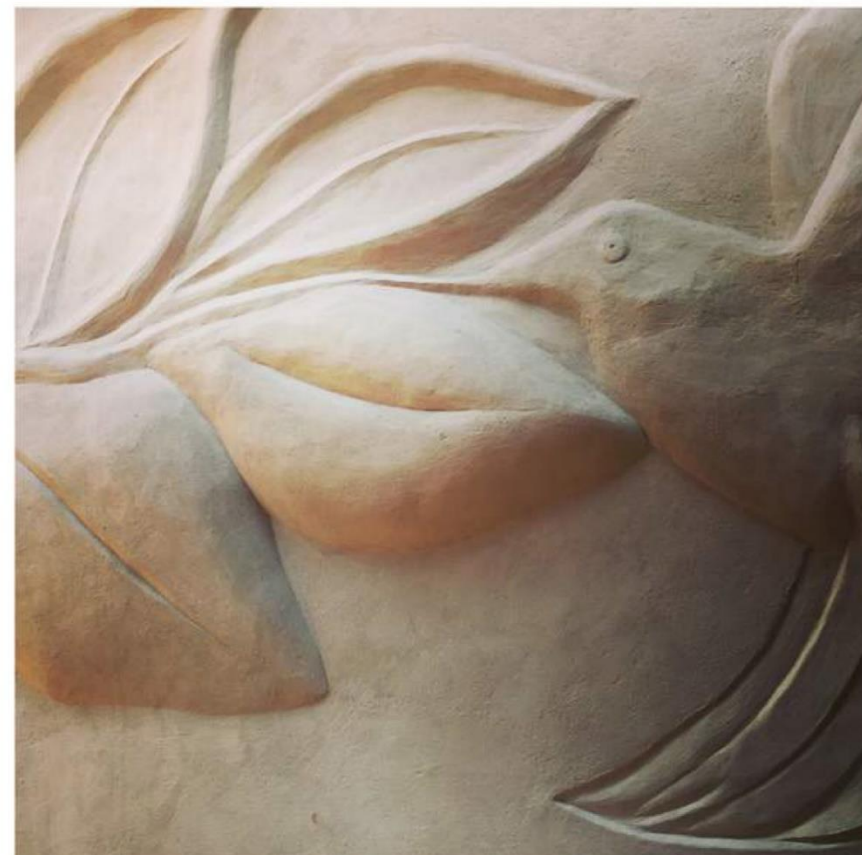
EXTERIOR WASH

MATERIALS USED :

Lime, quarry dust, kadukkai -jaggery water.

The mixture is obtained from the above mentioed material and it is used in the base coats.

To check whether the mix is good , it is taken in hand and a little gap is left between the fingers,and the palm is turned upside down, if the mix doesn't fall down then it is a good one.



EARTHEN FLOORING :



Charcoal and Quarry dust Layer:

This layer is added to prevent the action of termites on the floor. As the particles of quarry dust are sharp, they get interlocked in each other and form a compact base for the flooring.

Capillary Break :

A Layer of sand is laid on the quarry dust layer, over which a layer of pond liner sheet is laid which is the capillary break for the floor (To prevent water to come out due to capillary action).

Earth is rammed and compacted to the desired level as an infill for the flooring. A Rammer is used to create a well compacted floor base.

Well Compacted Floor Base

The Base is made well compacted free from organic matter with marking at 524mm (Final Floor Level)

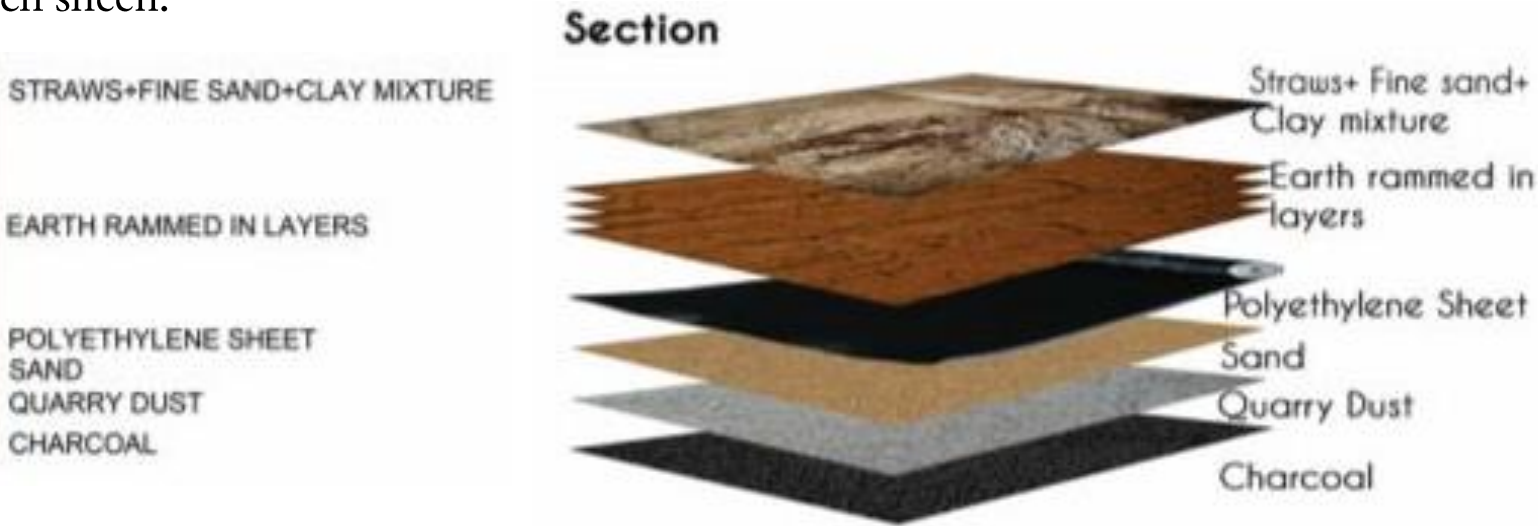
Final Layer:

Mix of Fine sand, Fine earth and straws mixed with clay as a binder in a propotion of 1:2:1.

Fine sand : Chopped wet straws : sieved earth

The clay water is poured on the rammed earth layer and then the mixture of sand, earth and straws is laid with equal levelling of the floor.

Apply 5 coats of linsed oil for water proofing, termite proofing, durable and to create rich sheen.



LIME CHAKKI

Lime chakki is a Ancient technique of grinding lime that has been used in creating many ancient marvels. The chakki is a circular pit with diameter of 5 m with a heavy circular grinding stone pivoted at the center.

The Grinding stone is pulled by bullocks or a tractor until the right consistency is achieved. The most common use of chakki is to create lime plaster by adding dry mix first and then adding the wet additives as the bulls pull the grinding stone.



3 : 4



Hydraulic Lime Quarry Dust or M sand



Kadukkai Jaggery Mixture

In this process 18 kgs of kadukkai and 20kgs of Jaggery are ground and mixed in a huge circular container. Then 750 litres of water is poured into the container and kept for 48 hours. The mixture is allowed to get fermented in the process.

Hydraulic lime and quarry dust are mixed in a ratio of 3:5. The mixture is put into the chakki, and the fermented kadukai jaggery solution is poured into it. All the mixture should not be put into the chakki at once. One half can be considered as Batch 1 and can be ground for some time and then the other half to be put as the 2nd batch. This is because no part of the mixture remains unground. The wheel is rotated with the help of bulls or tractor and made to complete 150 rounds around the circle to achieve appropriate level of consistency.



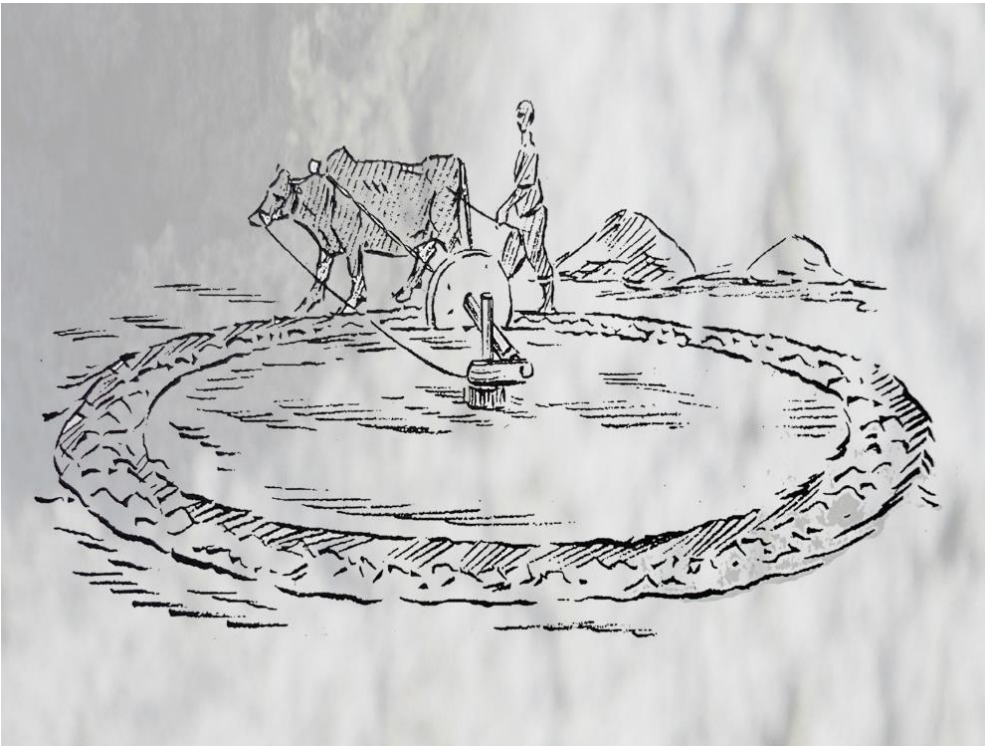
Kadukkai Seed to be crushed (18Kgs)



Jaggery (20Kgs)

Mixed with 750 litres of water
Fermentation for 48 hours

750 litres of Kadukkai Jaggery Water



ARAISH AND LOHI PLASTER

Materials Used :

Non Hydraulic Lime and Marble Powder or Suruki Powder (Fine Dust) Ratio Used is 1:1

Method :

- Non Hydraulic lime is used after its slaking process and marble powder or suruki Powder is added to it in 1:1 ratio.
- The Mixture of the above mentioned materials is taken sieved separately for fine particles
- The fine particles are then ground until it becomes as a paste like a patti consistency
- When touching the mixture we must not feel any kind of granules that is when the plaster is ready.

Application :

Araish Plaster and Suruki Plaster is Best Advised to be used on the walls rather than for Flooring as the surface tend to be smooth and slippery.

Steps to Apply Araish Plaster

- 1) Wet the lime wall with water until it stops absorbing water an hour before applying
- 2) Again wet the Wall before applying the mixture
- 3) Apply the mix on the wall in 2 layers over the finished smooth surface of lime plaster. Araish Plaster comes at a max thickness of 2-3mm.
- 4) When the layer is semi dried, with the help of a smooth pebble rub the wall gently.
- 5) Addition of Talcum Powder is used to reduce the friction and get the surface smooth.
- 6) The Process is continued until a smooth texture is achieved

1 : 1



Shell Lime
(Non
Hydraulic
Lime)



Marble
Powder



Suruki Powder



Sieving Process



Araish Plaster



Lohi Plaster



After 1st Coating



After 2nd Coating

Storage :

After the Mixture is ready it is transferred into a air tight container and water is poured until the mixture is submerged at 1 inch depth. Adding water is not needed if the consistency of the final plaster is a little watery. Just see to that the water is present over the plaster or else the plaster gets dried up.

Critical Overview...

My whole internship experience was very different as it involved hands on experience on what I do and design. Things which I think and design gets executed with my own hands which makes designing a enjoyment and satisfying overall. We were able to identify the possible mistakes people make on site and how they can be avoided in 1st place. Time management was the key in executing as we had tight deadlines.

Expanded my knowledge on social living, sustainability and traditional construction methods and practices using natural building materials without causing any harm to the environment.

So Overall It was a nice experience working at Sacred Grooves, Auroville. It just Opened a new dimension of living and lifestyle which I feel like carrying foreword from now on...

Thank You...