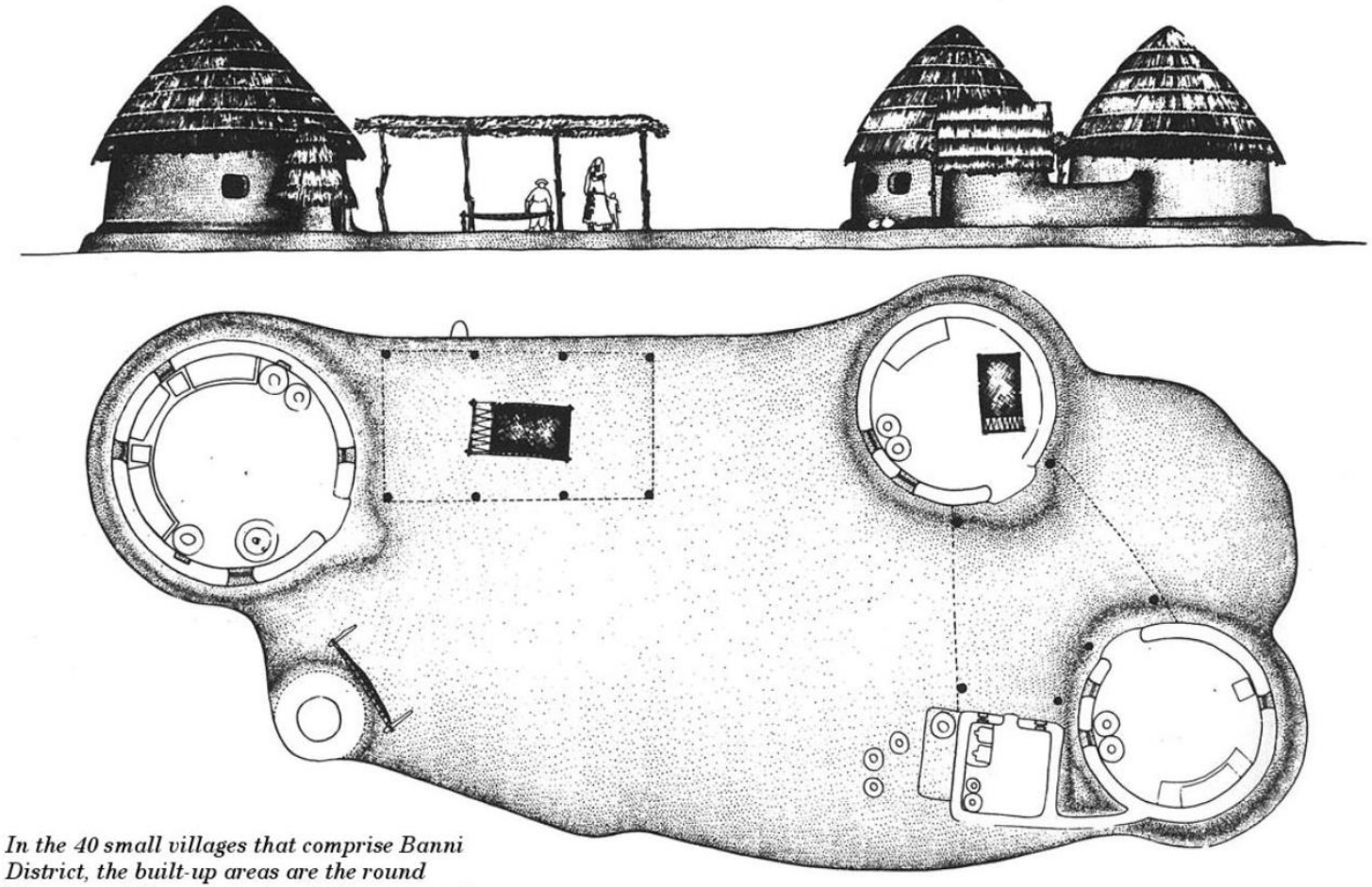
Bhunga Vernacular Architecture

Earthquake Resistant Architecture of Gujarat, India

Bhunga - Introduction

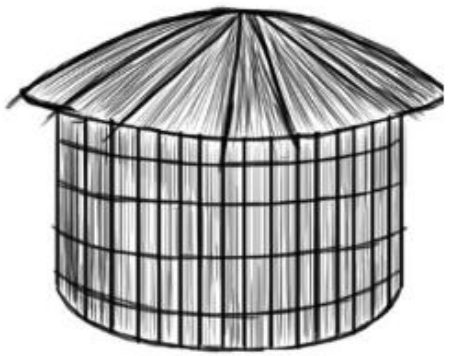
- *Traditional houses unique to the Kutch region of Gujarat, India*
- *The houses are circular and walled with a thatched roof*
- *They are known for earthquake resistance and climate responsiveness*
- *Also protect against sandstorms and cyclonic winds*

- *Typical Indian example of 'Architecture without architects'*
- *The dwelling is visually attractive and environmentally sustainable*



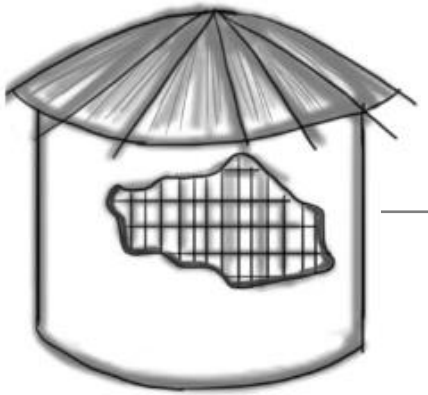
In the 40 small villages that comprise Banni District, the built-up areas are the round bhunga *and the rectangular* choki, *connected by a raised platform.*
Right: Patterned white clay frames little girl's face, as she peers in through the window of a bhunga. *Note thickness of wall, constructed with sun-dried mud blocks.*

Evolution and Present Form



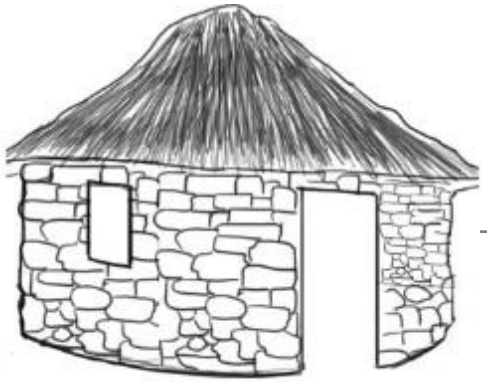
Bawad ni Bhungi

- Using Babul tree wood to build the construct all parts of the house
- Leaves of the tree are used to make the thatched roof



Chan Matti Thipi

- Coating the bunngi with a mixture of clay (matti) and cow dung coating



Pathar na Bhunga

- Using the nearby mountain stone and built bhunga

Matti no Bhungo

- Mud bricks are used to build the walls

Construction Materials

- *Materials available only in the Banni region are used for construction*

Walls and flooring

- *Chikani Matti (Clay)*
- *Cow/camel/horse dung*

Roof

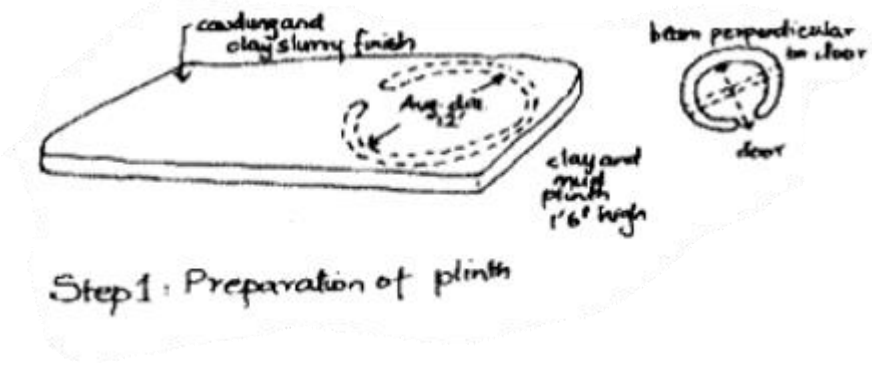
- *Gando Bawado (Babul) tree, Vaas (Bamboo)*

- *There is no construction cost as the materials are available in nature*

Construction

Step 1: Foundation

A trench is dug in a circle for the foundation for the construction



Step 2: Preparation of Mud Lumps/Bricks

- *A mixture of Chikni matti (Clay) and cow dung with little water is mixed*
- *Large lumps are roughly molded into an egg shape*

Step 3: Drying

- *These mud eggs are dried by covering them with a cloth to avoid holes and cracks*

Step 3: Laying the Mud eggs or bricks

- *Rows of mud eggs are laid neatly on the circular plinth and covered with another layer of cow dung*

Step 4: Openings

- *Openings (doors and windows) are made initially after 2-3 layers of mud eggs are placed*

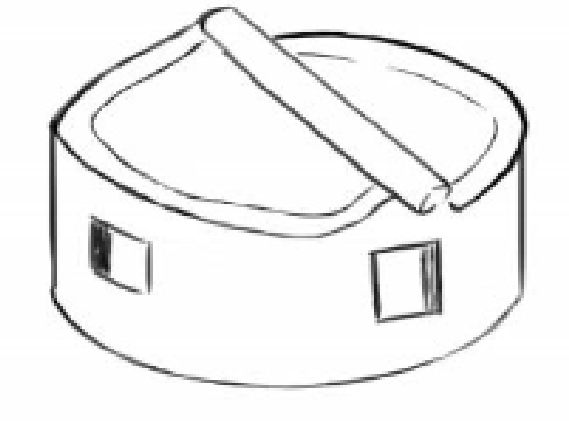
Step 4: Layering

- *Walls are later plastered with a mixture of cow dung and water*

Construction

Step 5: Roof Structure

- *Adi (Traditional Horizontal Beam) is placed perpendicular to the door*
- *The ends of the beam rest on a slightly raised potion of the wall and fixed with wooden pegs*



Step 6: Roof Structure (2)

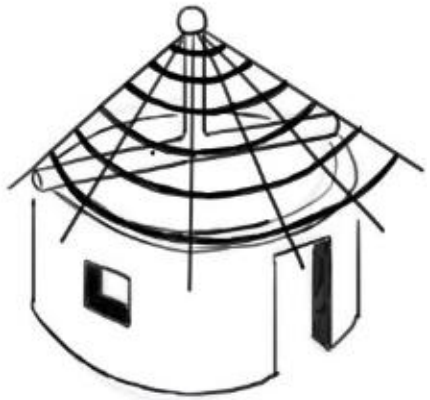
- *Patli (Vertical Kingpost) is placed on the Adi to support the roof*

Step 7: Placing the Rafters

- *Mann (Cone) is fixed on the Patli with rafters*

Step 8: Netting

- *The rafters are bind together with a straw rope net*

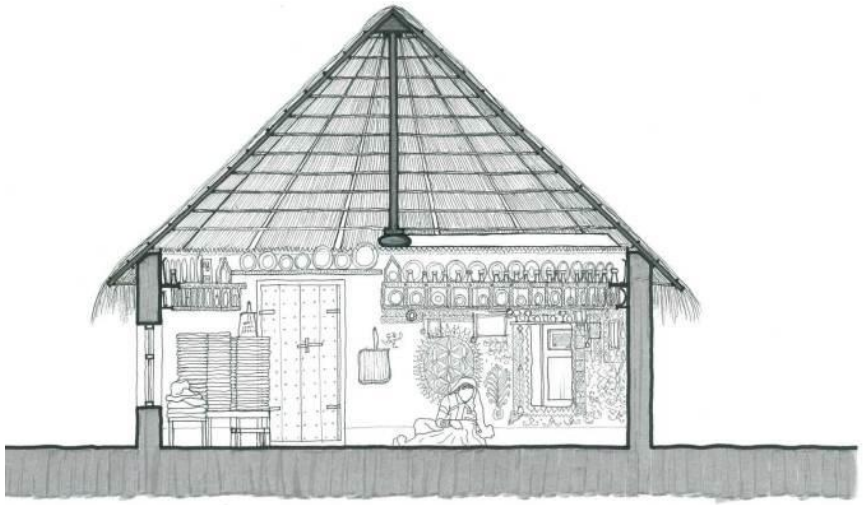


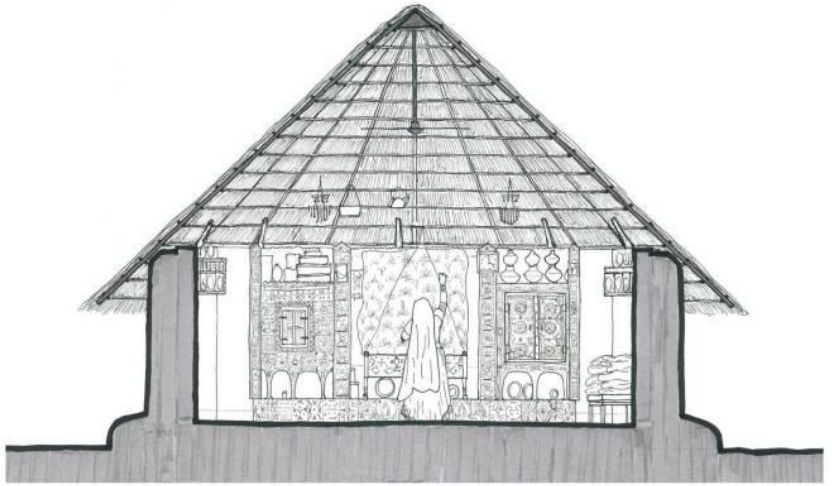
Step 9: Laying Straw Bundles

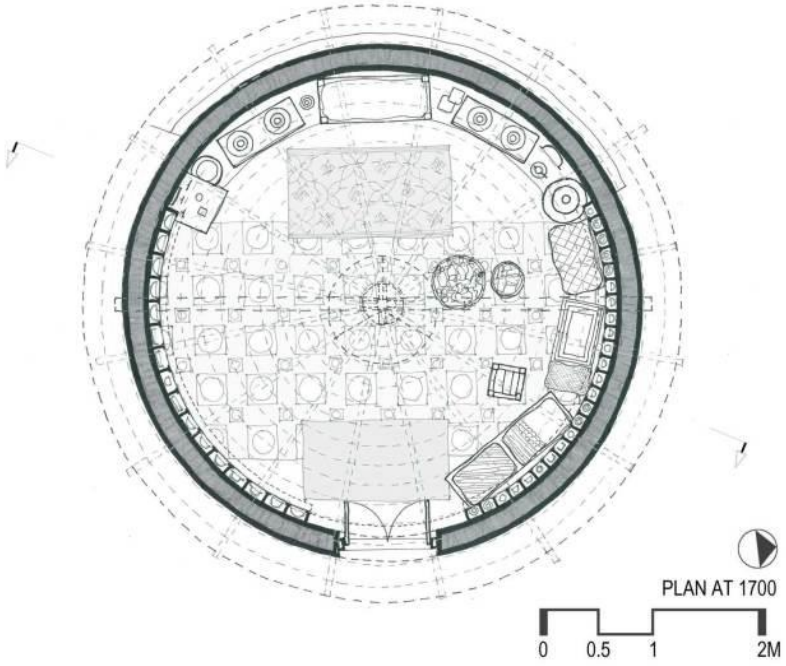
- Straw bundles are placed careful on the rafters to form the roof

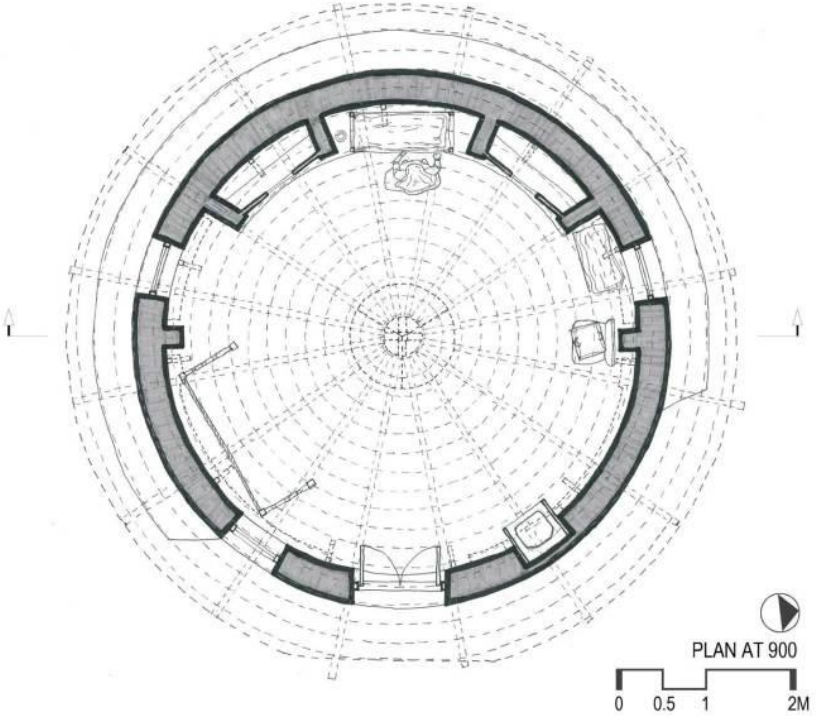
Modifications

- *It takes 20-30 days for constructing one Bhunga*
- *Recently to install urban services the Bhunga has been modified*
- *The original construction method and the buildings have been retained*
- *Modifications include installation of water supply line, gas supply and electricity line*









Climate Responsiveness

- *Thick walls keep the interiors cool in the hot desert climate*
- *Courtyards provide passive cooling during the daytime*

- *Small and low height openings provide cross ventilation*

Climate Responsiveness

- *The thatched roof provides insulation*
- *Keeps the home cool during hot summers and warm during winters*
- *Long life, flexible and durable*

- *Cow dung plaster is a good binder and also helps in creating a fine, smooth finish*
- *Prevents cracking in floors and increases the insulation of the house*

Construction

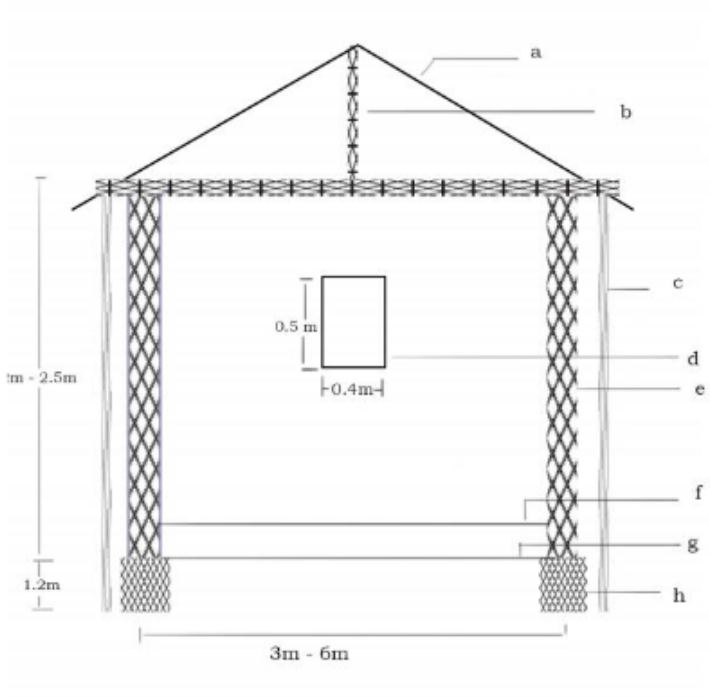


Fig: Elevation Of Bhunga

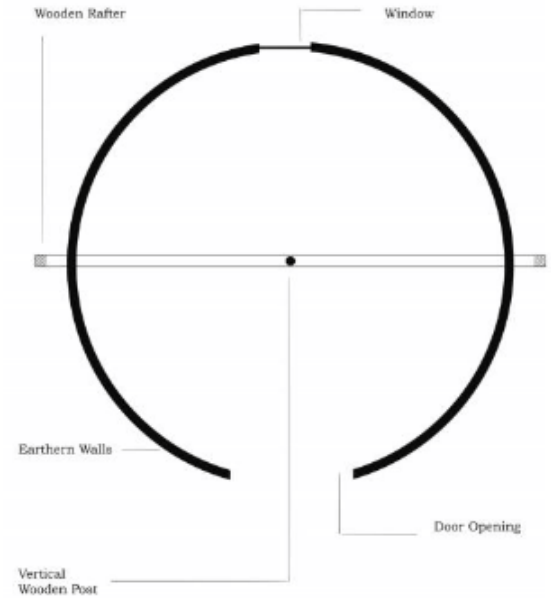
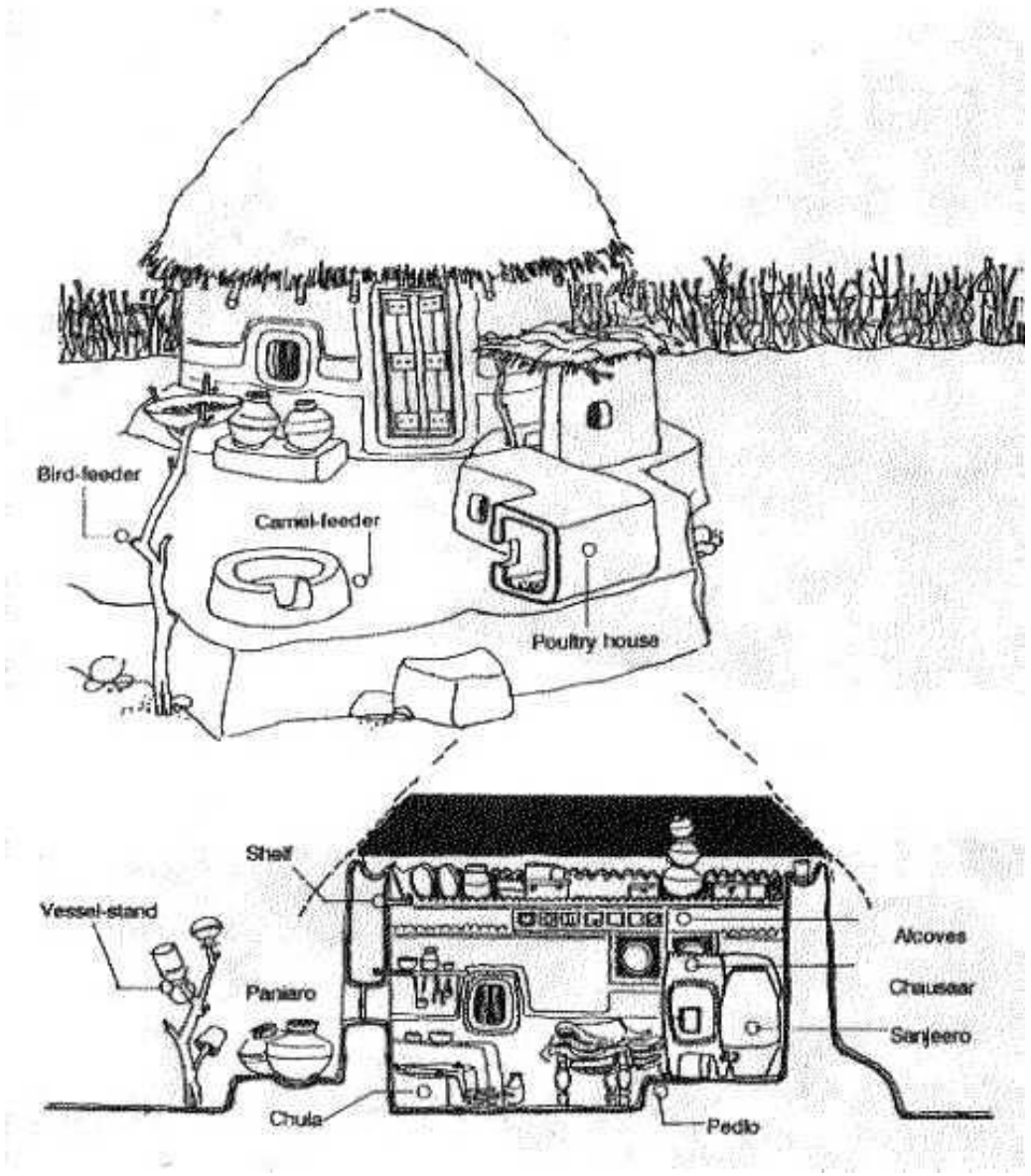


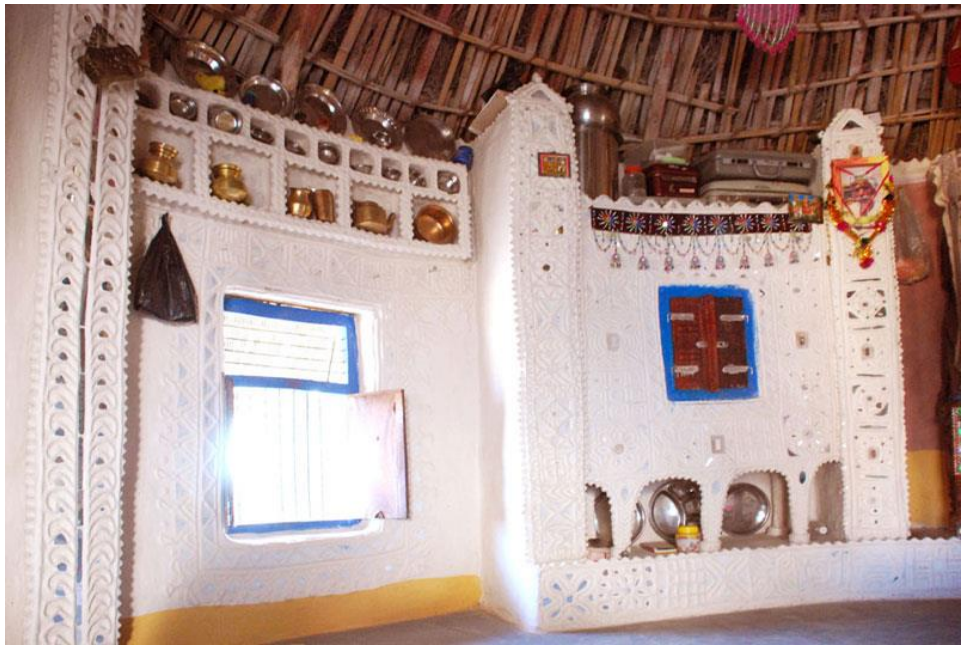
Fig: Plan Of Bhunga

a : Thatched/Tile roof
b: Vertical Wooden Post
c: Vertical Wooden Post
d: Window
e: Masonary Walls
f: Floor Level
g: Ground Level
h: Wall Extension

Jalli

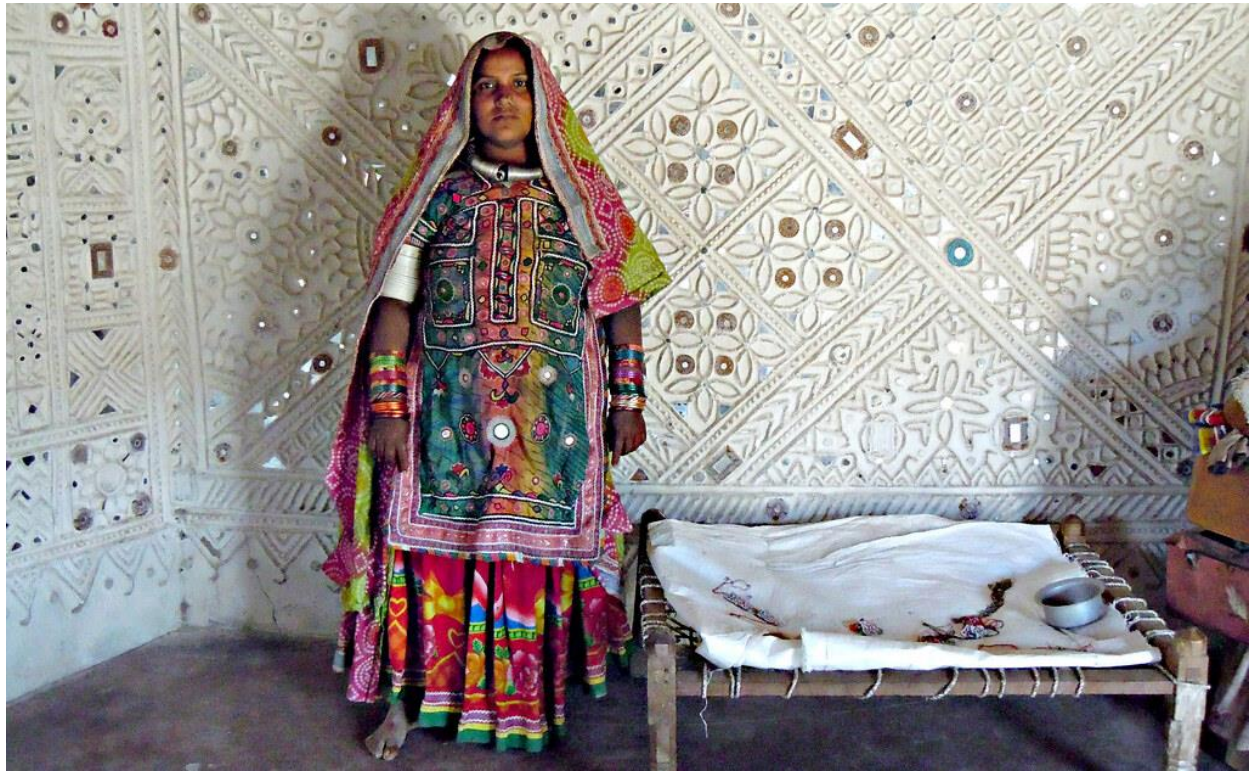
Internal and External Spaces





Wall Art and Ornamentation

- *Home interiors and exteriors are made attractive by intricate motifs and paintings*
- *Used to blend all the furniture within the house*
- *This art is known as Mattikaam and is usually done by women*
- *Stays forever and is resistant to any climatic conditions as the materials used are sustainable and widely available in the region*



Mattikaam on furnitures in Bhunga

SANJIRIYO (to keep *godhadi* blankets)

KOTHARIYO (storage of grain)

KOTHARIYO

PACHANI (use for keeping and Stacking Vessels)

PACHANI in a different form

Wall Art and Ornamentation - Method

1

2

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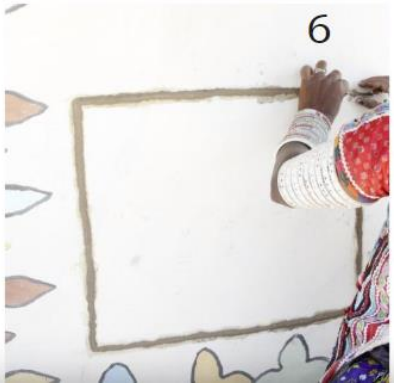
Wall Art and Ornamentation - Method



Wall Art and Ornamentation - Exterior