

# **APPROPRIATE TECHNOLOGY WORKSHOP**

**ACADMIC SESSION  
2017-2018**

The Workshop was conducted by **Ar. Aditi S. Shivniwar** for 3<sup>rd</sup> Year Students. She gave a lecture and aware them about Environmental issues, vernacular Architecture and Appropriate Technology.

### **Introduction**

Appropriate technology is a grass roots approach to technology that builds a strong sense of community and encompasses benefits that span across social, environmental, cultural, economic, and spiritual facets. Appropriate technology is not a one size fits all approach, but rather adapts to best fit the community in which it is developed. Appropriate technology best fits with the community it serves because it is created by the people to meet a need. Therefore, the communities are placed at the centre of decision making and create technologies that will best serve their communities in the long term.

### **Aim**

To study and understand the appropriate techniques of locally available material.

### **Objective**

- To study and know about locally available material
- To study the techniques for a particular material
- Develop a basic understanding of material like bamboo and mud.

### **Scope and limitations**

- Study was restricted to two materials like mud and bamboo.
- Only on 5 techniques were introduced on which students have to work.

### **Workshop Brief**

Make a working model of 1' X 1' Room by using mud or bamboo, and sheets presentation on particular material and related techniques on which they are going to work.

5 techniques list is as follows:

1. Adobe
2. Cob wall
3. Rammed Earth
4. Wattle and Daub
5. Whole Bamboo Culms

**Adobe bricks** (mud bricks) are made of earth with a fairly high clay content and straw. If produced manually the earth mix is cast in open moulds onto the ground and then left to dry out. Adobe bricks are only sun-dried, not kiln-fired. When used for construction they are laid up into a wall using an earth mortar. Before drying out, the finished walls are smoothed down. Often a clay render is applied as a surface coating.



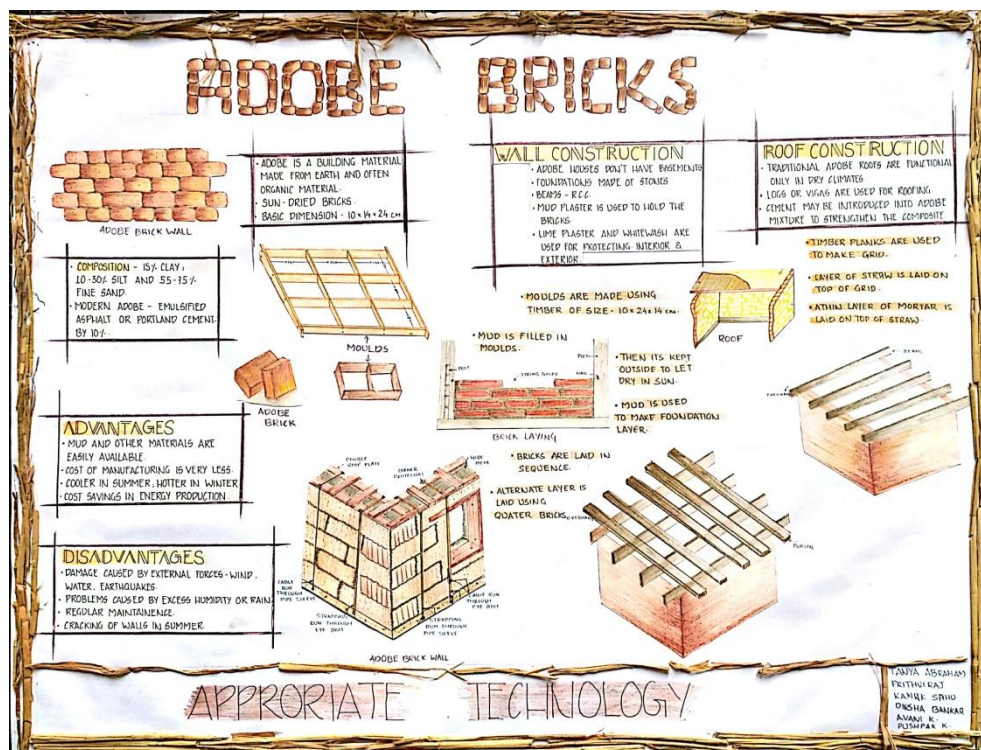
Adobe Bricks laid for sun dry



House model made with  
Adobe Brick Method



Adobe wall without Mud plaster



**Cob, cobb** is a natural building material made from subsoil, water, fibrous organic material (typically straw), and sometimes lime. The contents of subsoil naturally vary, and if it does not contain the right mixture it can be modified with sand or clay. Cob is fireproof, resistant to seismic activity, and inexpensive. It can be used to create artistic, sculptural forms, and its use has been revived in recent years by the natural building and sustainability movements.



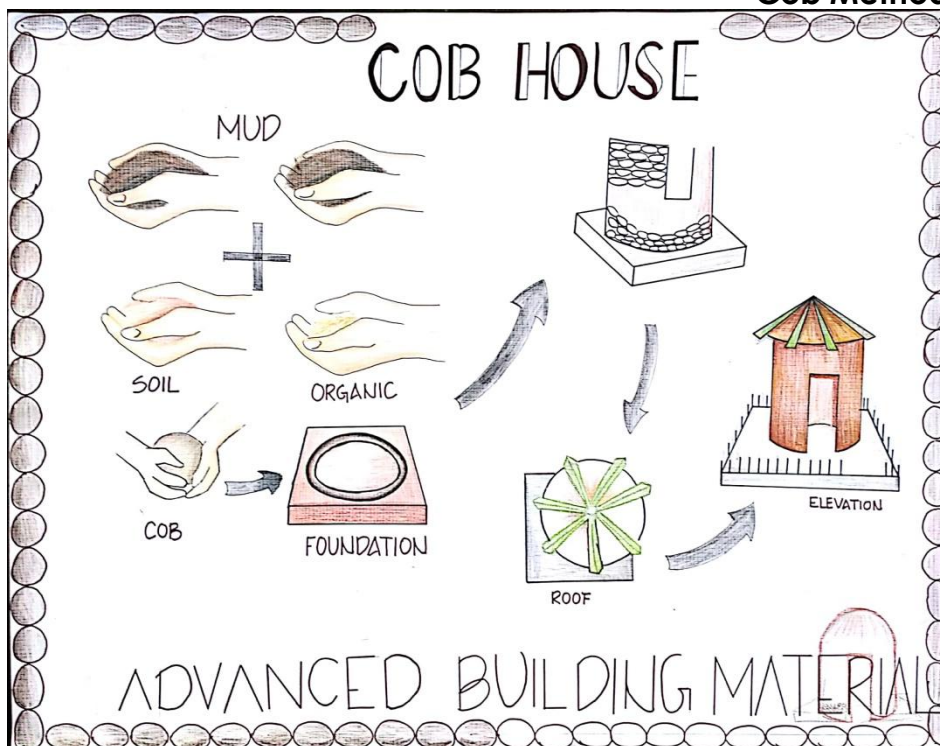
Students are preparing material for Cob wall



Cob wall construction



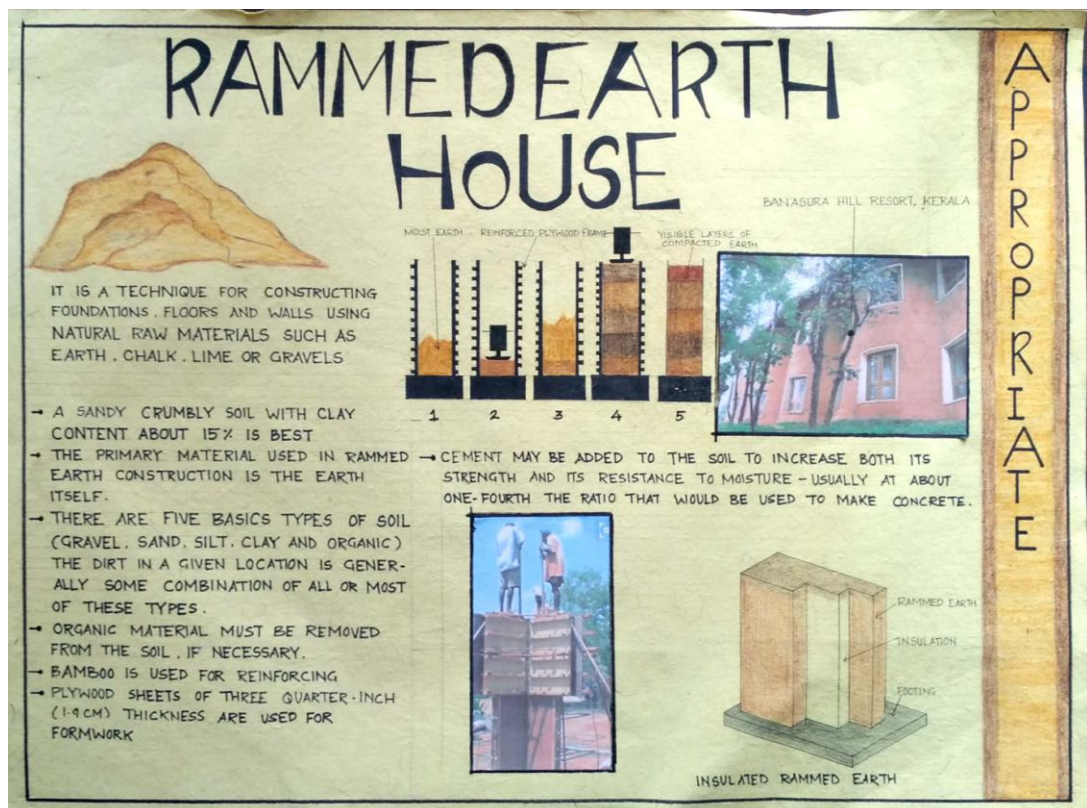
House model made with Cob Method








**Rammed earth** involves compressing a damp mixture of earth that has suitable proportions of sand, gravel, clay, and/or an added stabilizer into an externally supported frame or mold, forming either a solid wall or individual blocks.

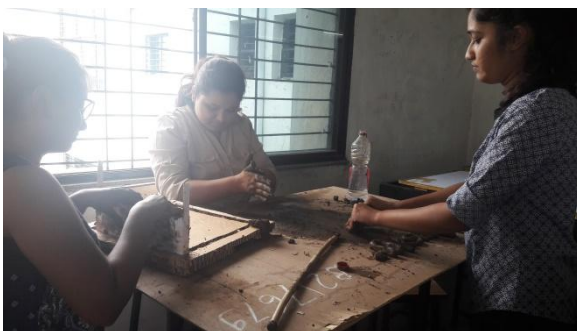
The construction of an entire wall begins with a temporary frame, denominated the "formwork", which is usually made of wood or plywood, as a mold for the desired shape and dimensions of each section of wall. The form must be durable and well braced, and the two opposing faces must be clamped together to prevent bulging or deformation caused by the large compressing forces. Damp material is poured into the formwork to a depth of 10 to 25 cm (4 to 10 in) and then compacted to approximately 50% of its original height. The material is compressed iteratively, in batches or courses, so as to gradually erect the wall up to the top of the formwork. Tamping was historically manual with a long ramming pole, and was very laborious, but modern construction can be made less so by employing pneumatically powered tampers.



METHOD-A	METHOD-B	METHOD-C
<p>MATERIAL - STRAW, SOIL, CEMENT</p> <p>PROCEDURE -</p> <ul style="list-style-type: none"> <li>- TAKE WATER (60%) IN A CONTAINER.</li> <li>- ADD SOIL (30%) TO IT AND MIX WELL TO MAKE SURE NO LUMPS ARE REMAIN.</li> <li>- CHECK THE CONSISTENCY (SLURRY) AND ADD CEMENT (10%) MIX IT AGAIN.</li> <li>- THEN ADD STRAW INTO THE MIXTURE AND SOAK IT.</li> </ul>	<p>MATERIAL - SOIL, STRAW, CEMENT, SAND</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>- TAKE SOIL (60%), CEMENT (10%), SAND (15%), STRAW (15%) AND DRY MIX THEM WELL.</li> <li>- WHEN MIXED PROPERLY SPRINKLE WATER AND MIX WELL (DRY MIXTURE)</li> </ul>	<p>MATERIAL - SOIL, AGGREGATE, SAND, CEMENT</p> <p>PROCEDURE</p> <ul style="list-style-type: none"> <li>- TAKE SOIL, SAND, CEMENT, AGGREGATES AND DRY MIX THEM WELL</li> <li>- ADD WATER AND MIX WELL UNLESS THE SOIL THIGHTNESS.</li> </ul> <p>THE CONSISTENCY SHOULD BE</p>
		
<p>ADVANTAGES</p> <ul style="list-style-type: none"> <li>- LOW COST HOUSING</li> <li>- LOAD BEARING CAPACITY</li> <li>- HIGH INSULATION RATING</li> <li>- FIREPROOF</li> <li>- HIGH SOUND RESISTANCE</li> <li>- THERMAL MASS STABILIZES AIR TEMPERATURE</li> <li>- ECONOMICALLY CHEAP CONSTRUCTION.</li> </ul>	<p>DISADVANTAGES</p> <ul style="list-style-type: none"> <li>- CONSTRUCTION IS LABOUR INTENSIVE.</li> <li>- THE STRUCTURES MADE USING EARTH IS SUSCEPTIBLE TO WATER DAMAGE.</li> <li>- CARBON BENEFITS ARE REDUCED IF CONCRETE IS USED.</li> <li>- MAINTENANCE AT REGULAR INTERVALS IS NECESSARY.</li> </ul>	<p>REFERENCE</p> <ul style="list-style-type: none"> <li>- WIKIPEDIA</li> <li>- SLIDESHARE</li> </ul>



Students are preparing material for Rammed Earth Wall



Students are making Rammed Earth Wall

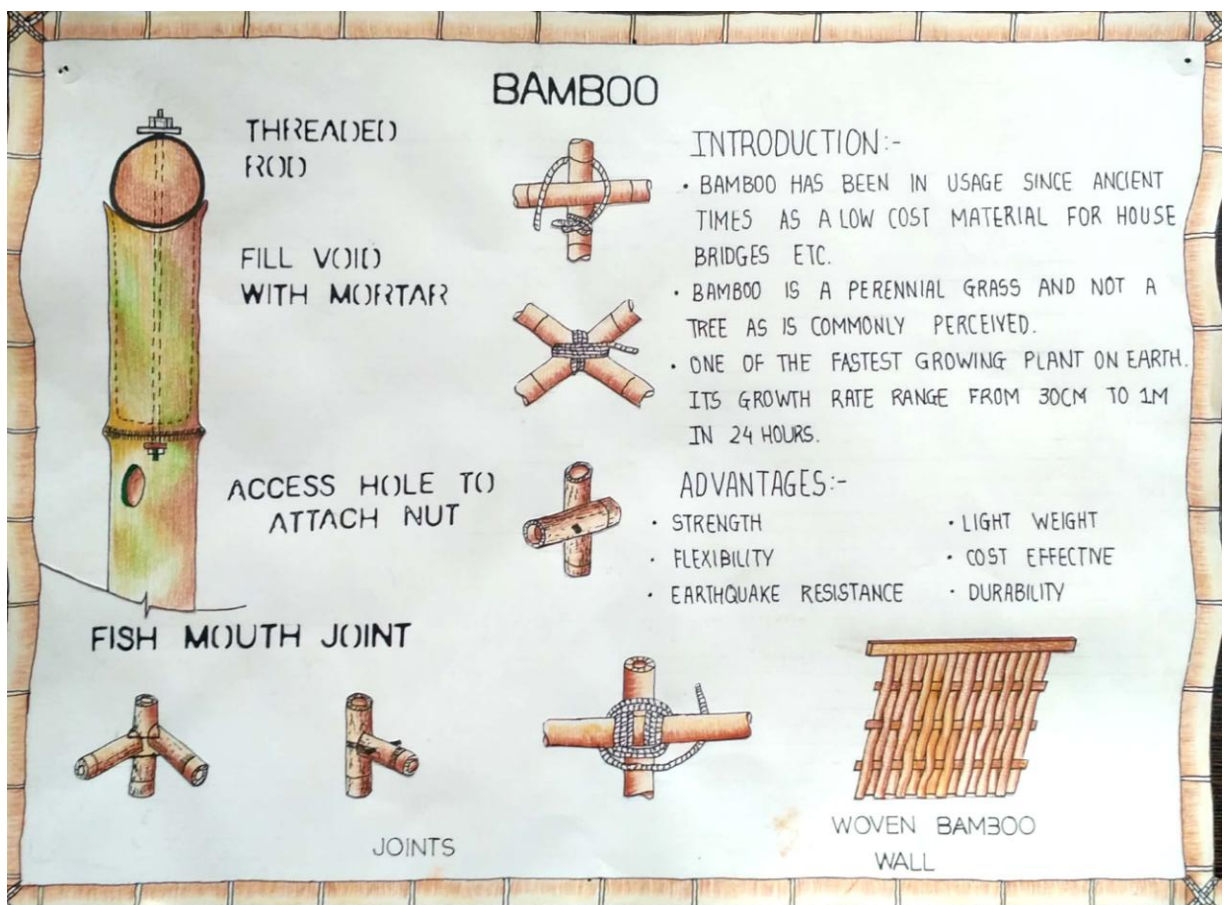


House model made with Rammed Earth Method



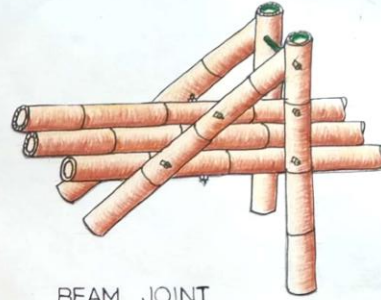
**Bamboo** can be utilized as a building material as for scaffolding, bridges and houses. Bamboo, like true wood, is a natural composite material with a high strength-to-weight ratio useful for structures. Bamboo has a higher compressive strength than wood, brick or concrete and a tensile strength that rivals steel.

Bamboos are some of the fastest-growing plants in the world, due to a unique rhizome -dependent system. Certain species of bamboo can grow 35 inches/890 mm within a 24-hour period, at a rate of 0.00003 km/h (a growth of approximately 1 mm (or 0.02 inches) every 2 minutes).

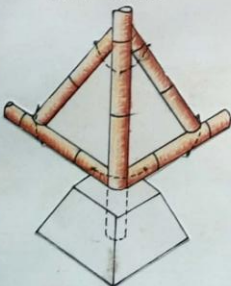


### BAMBOO JOINTS AND JOINERY TECHNIQUE

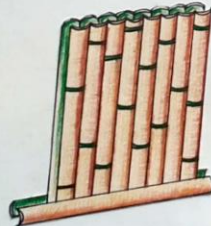
- DO NOT USE GREEN FRESH CUT BAMBOO. BAMBOO HAS TO BE COMPLETELY DRY BEFORE USING IT IN CONSTRUCTION.
- DO NOT USE BAMBOO WHEN IT IS LESS THEN 3 YEARS OF AGE.
- DO NOT USE BAMBOO POLES WITH PROFOUND VERTICAL CRACKS.
- DO NOT USE BAMBOO INFECTED BY INSECTS
- WHEN USING BAMBOO AS A COLUMN MAKE SURE THAT THE LOWER CONNECTION WITH THE SURFACE ENDS WITH NODE.



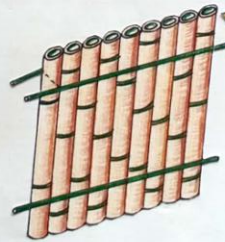
BEAM JOINT



SINGLE POST  
FOOTING



VERTICAL  
HALVED CULMS



WHOLE BAMBOO  
CULMS



Cutting Bamboo for Constructing  
Bamboo Wall



House model made with  
Whole Bamboo Culms Method



**Wattle and daub** is a composite building material used for making walls, in which a woven lattice of wooden strips called **wattle** is daubed with a sticky material usually made of some combination of wet soil, clay, sand, animal dung and straw.

### Construction

The wattle is made by weaving thin branches (either whole, or more usually split) or slats between upright stakes. The wattle may be made as loose panels, slotted between timber framing to make infill panels, or made in place to form the whole of a wall. In different regions, the material of wattle can be different.

Daub is usually created from a mixture of ingredients from three categories: binders, aggregates and reinforcement. Binders hold the mix together and can include clay, lime, chalk dust and limestone dust. Aggregates give the mix its bulk and dimensional stability through materials such as earth, sand, crushed chalk and crushed stone.

Reinforcement is provided by straw, hair, hay or other fibrous materials, and helps to hold the mix together as well as to control shrinkage and provide Flexibility.



**Students are making Wattle Wall**



**House model made with Wattle and Daub Method**