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<https://samvardhini.in>**Dr. Aswathy G.R**

Assistant Professor (Contract)
Department of Sanskrit
K.V.S.M. Government College,
Nedumangad
Kerala University,
Thiruvananthapuram
E-mail: draswathygr@gmail.com
Mob: 8137040355

Integrating Tradition and Sustainability: Building Materials in Vāstuśāstra

Dr. Aswathy G.R

ABSTRACT

Vāstuśāstra, the traditional Indian science of architecture, provides a comprehensive framework for designing structures that harmonize with nature and promote well-being. This research paper delves into the traditional and eco-friendly building materials prescribed in Vāstuśāstra, emphasizing their relevance in modern sustainable construction practices. Materials such as clay, wood, stone, lime and natural fibres are examined for their ecological benefits, cultural significance and alignment with sustainable development goals. The research paper highlights the energy efficiency, durability and low environmental impact of these materials, advocating for their integration into contemporary architectural practices.

KEY WORDS

Samarāṅgaṇa sūtradhāra, Mayamata, Srīśam, Mūthasari, Varḍhaki

Introduction

Traditional building materials which have been used in *Vāstuśāstra* for centuries include materials such as mud, clay, stone, wood and bamboo. These materials are typically abundant, affordable and sustainable. They are also believed to have positive effects on the health and well-being of the occupants of the building. Modern building materials, on the other hand, are often made of synthetic materials such as cement-concrete, steel and plastic. These materials are often mass-produced and widely available, making them more affordable in some cases. However, they may have negative impacts on the environment and the health of the occupants due to the production process and potential toxins released from the materials.

Although it is clear that the texts referring to *Vāstuśāstra* were written in that time when building materials like concrete and cement did not exist, the use of materials such as stone, brick and wood mentioned in the texts continues to this day. A vast resource of traditional knowledge about these material finds little use in the contemporary context outside of the dynamics of preferences and prejudices. Conventional building materials are described below.

1. Timber (wood)

The sixteenth chapter of *Vanapraveśa*, in *Samarāṅgaṇa sūtradhāra*, provides a detailed description of the types of trees which should be used for building houses while also ensuring that nature and living beings are not harmed. The process of carving idols from tree (wood logs) emphasizes the importance of maintaining a physical relationship between humans and trees. In *Bṛhadāraṇyaka Upaniṣad* the sage *Yājñavalkya* proclaims that a tree is equal to a man. His hair being represented by leaves, skin by peel, and blood by the bark of the tree. The inner bark is similar to flesh, inner fibres represent veins, inner core symbolizes bones and the core or pit of the tree is similar to marrow.¹

Trees, like humans, also undergo aging. This can be determined by looking at the holes in their leaves. It is not advisable to use very young or old trees for construction purposes.² For instance, the *Srīśam* tree has a lifespan of 300 years and it is recommended to use this tree for building between its 16th and 150th years. The age of the tree can be determined by examining the shadow of a human.³

1.1. Selection of Timber

To get wood required for house construction, one should go towards east or north direction in fast (without having any meal) when the auspicious star (*Śuka nakṣatra*) is in

slow transit. One has to go to that area where the tree is to be cut and stay there in fasting state. Standing stable trees should be adopted. The creatures which live on it must also speak loudly. After that, find a clean place not too far away with suitable woods and build a temporary abode there (This is a place to cut woods and carpentry works for house purposes). Oblation should be done there by food and drinks. Then the *mūthasari* (main carpenter) should give up food at night, leave his tools without accompanying his crew members and observe and examine to understand the suitable trees for house construction.

The average age of a tree is 300 years, and 16 years to 150 years old trees can be used for house construction. Just as humans decay with age, trees also decay with their age. However, problems such as holes in trees and falling leaves indicate it.

1.2. Trees to be avoided

Just as trees to be accepted, the text on *Vāstuśāstra* also prescribes which trees to be avoided. Do not consider trees growing in crematorium, village road, roadside, pond, ashram, garden at boundaries, low-lying area, uneven area, etc.

Those which grow in soil that has a spicy, sour, bitter and salty taste, trees in cracked ground, gnarled trees, juniper like trees, growing blue colour trees, whose bark is dry and flaky, crooked trees, rough charred and dry, growing in swamps, with broken branches, under possessed by someone, standing by the banks of rivers, trees which are hollowed out, sheltered by organism such as bees, snakes, etc., blooming out of time, diseased, etc. should be avoided. The trees like *Karṇikāra* are to be avoided. Those should not be used for home construction or making furniture.

1.3. Method of taking measurements for trees cutting

When the shadow of a man comes to the same direction, the tree's shadow can be assumed by that same principle and the height of the tree can be understood (extrapolated) by measuring it.

1.4. Gender of Timber

According to *Mayamata* tree having many branches, which are straight and thick, is considered as a male tree. A female tree is considered to be thick at the base and thin at the top. If the thickness increases in the top part and base is thin, it is neuter tree. The most acceptable for the *Muhūrta* pillar is the male tree. But all gender trees are considerable for home construction⁴.

2. Bricks

There are four types of soil, with one having a salty taste and another being dull white in colour. The remaining two types of soil are black and red. Red soil is commonly used for brick-making. To make bricks and tiles, it is important to ensure that the soil used does not contain gravel, stones, roots or bones. The soil must be mixed with white sand and softened before adding water and grinding it in to powder form. Barks of banyan tree, kadambu, mango tree, kadukka, and t̄ānni should be added to the mixture along with soaked triphala (a combination of gooseberry, t̄ānnikka, and kadukka) that has been pounded for a month. The bricks should be shaped to be 4, 5, 6, or 8 aṅgulas in breadth and should be double the length of their breadth and half as thick as their breadth. They should be dried and then baked in fire. After one to four months, the Vaṛdhaki bricks should be carefully submerged in water to ensure they are not too wet when taken out for construction⁵.

The bricks selected should be blood red in colour, well baked and well proportioned. Bricks that are black, weak, old, crumbly, chipped, and uneven and have fragments of stones are not desirable. In traditional belief bricks are generally divided into male, female and neuter categories. If it is one aṅgula long it is classified as male, if it is two aṅgula long it is classified as female and if it is rounded with curved edges it is classified as neuter. But these should be firm, properly baked and sound like a lute when touched. Brick and gender determination are of great importance in temple construction matters.

The Indian brickwork is similar to the English Bond pattern and includes the use of corbelling for spanning openings. Bricks were utilized for constructing fire altars and basements, as well as walls with projections and recesses. The bricks were set in mortar and plastered over. The size of the bricks corresponded to a module of 1 Pāda horizontally and 1 Pāda vertically. The nominal size of the brick was 8A x 4A x 3A (~24 cm x 12 cm x 9 cm), which is still commonly used in various parts of India.⁶

2.1. Bricks in Modern time

For brick making, it is important to use soil that contains approximately 25% clay and 75% sand. Bricks made from soil containing 20-30% alumina, 50-60% silica, and 5-6% iron oxide with small amounts of lime and magnesium are highly durable and strong. The standard size for bricks used in construction works is 190 x 90 x 90 mm, which increases to 200 x 100 x 100 mm after the addition of lime. The height can be 40 mm instead of 90mm. Bricks are classified into three categories: A, B, and C. Properly baked bricks are classified as class A, slightly over baked bricks as class B,

and less baked bricks as class C. Class A bricks are suitable for all important fine works, whereas class C bricks should only be used for non-essential works.⁷

The best bricks should have following characteristics

1. Uniform color
2. Baking to perfection. Not burnt or unbaked
3. Bricks should not break if they are knocked together in hands or dropped from a height of 2 meters.
4. It should make a metallic ringing sound when tapped with a mallet or small hammer
5. Scratching with nails should not leave a mark on the brick

Apart from these bricks, pressure-formed steam-baked sand-bricks of 90% sand and 10% lime required water by weight are as strong as clay bricks. The calcium silicate produced outside protection from caries and with off-white colour. Don't need to apply plastering over these. Another advantage of these is light weight. (Sandstones are being collected in nearby areas of Cherthala).

3. Rock

Stone is one of the most important building materials. Stones are used in one way or the other for building foundations, floors, walls and for making concrete. Today, stones of various sizes are obtained by cutting, breaking and blasting various rocks in the earth's crust according to convenience. Geologically, rocks can be classified into three categories as igneous rocks, sedimentary rocks and metamorphic rocks.

Igneous rocks are formations where liquid materials in the earth core are periodically released and become solidified. They are commonly known by the name *kariṅkal*. A variety of rocks with different characteristics can be found in this section. These are very strong. Granite, trap and basalt belong to this category.

Sedimentary rocks are rocks formed by sand, gravel and silt washed away by water. The silt accumulated over the years is compacted by the weight of the overlaying layers. Silica, lime and potash, which may be present in the water, bind the various grains of sand together. Sandstone and limestone are formed in this process.

When igneous rocks or sedimentary rocks undergo changes in form, texture and grain size due to single or combined action of extreme heat, high pressure and chemical reaction over time, they are called metamorphic rocks. Slate, schist and marble are produced in this way.⁸

3.1. Śilālakṣṇa in Vāstu

The word stone in Sanskrit is *Śila*. Stone is mostly used in temple construction. The stone plays some important role in basement construction of the house. The stone should be monochromatic, stable, viscous, pleasant to touch, aged, laying east or north facing, geomagnetic and auspicious.

एकवर्णाः स्थिराः स्निग्धाः सुखसंस्पर्शनान्विताः।
प्राचीनाश्चाप्युदीचीना भूमग्नाः शुभदाः शिलाः॥⁹

When determining the age of the stone, if it is light weighted stone, it makes the sound of a partially baked bricks. It is soft even when hammered. A mature stone produces a deep sound, is smooth, feels cool to touch, does not crack and is lustrous. Aged stone is suitable for all purpose. Very old stone is rough like the skin of a frog or fish. There will be lines and spots. Such stones are not suitable for use.

Stones are also distinguished by their gender. Male stones are uniform in colour, dense, smooth and cylindrical in shape. It produces the sound of huge bell when struck with a hammer. Female stones have a wide base and narrow head and make a cymbal sound when struck. The neutral stone is wide around us and makes no sound. The gender of the stone is particularly relevant in the construction of temples and idols.¹⁰

Mayamata states, if the stone is damaged by sun, fire or wind, it is too softy, agitated by alkaline water, dislocated, roughened, with cracks, lines, spots, flaws, immature and indefinable colour, then it is to be discarded.¹¹

A *Vāstu* architect goes out at an auspicious time to look for objects in the north, north-east or east direction, just as he goes in search of woods. Rituals are performed by invoking the stone. The stone-dwelling creatures are asked to leave from stone. The stone is split by striking with a sharp chisel. After that it is trimmed to a regular shape and the face is carefully marked. The selected stone should be longer than its depth.

The choice of stone should depend on the work. Uniformity and availability are the main factors affecting in selection. It is not the correct way to mix different types of stones for each construction works. A less hard stone with a dense fine grain is best for masonry and decorative use. Solid stone is best for walls and dams. Stones which are not damaged by exposure to acids should be used in industrial cities. Stones which are not worn away by rubbing should be used for paving and road construction.

4. Making of Mixtures for construction (*MiŚritam*)

Mixture construction is done with natural materials just like other construction materials. A passage in *Mayamata* describes various types of mixtures. *Karāla* (black gram), *Mudgi* (Chickpeas), *Gulmaṣam* (Gooseberry), *Kalka* (Thalimathalam) and *Cikna* (Betelnut) mixed with lime can be used for all works. ‘*Karāla*’ is a gravel of the size of *Kadukka* and *Tānnika*. ‘*Mudgi*’, which is the size of a pea seed, and ‘*Gulmāṣa*’, a grain of sand which is one, one and half or two times the size of a lotus thread. *Gulmāṣa*, *Karāla*, *Mudgi* can be prepared by adding lime and clam along with the above mentioned. Grind sand and lime to make *Kalka*. *Cikna* is in liquid form. All these five compounds should be used for the brick according to the situation. First grind each of the above with pure water. Along with these, add the milk of *Kṣīradruma*, *Kadambu*, Mango tree, *Kadukka* tree and *Tānni*, juice of *Triphala* and black gram water.¹²

After that gravel, shell and lime should be added to the well water and stirred. In this way the acāryas make viscous for *Kalka* and *Cikna*. *Bandhōdaka* is made by adding curd, milk, ghee, water, jiggery, butter, banana, coconut milk and mango juice. After washing the wall with clean water, polish the surface with *bandhōdaka*. This is how the mixture called *sudhā* or *cānd* was made.

Conclusion

In Vāstuśāstra, the ideal home is constructed using a variety of traditional building materials such as wood, stone, mud and bamboo. Wood is commonly used for structural elements and decorative features, while stone is often used for foundations and walls. Mud is a popular material for walls, floors, brick and roofs due to its insulating properties. Bamboo is used for various purposes, including structural elements, flooring and window coverings. These materials not only provide natural beauty but also have functional benefits such as thermal insulation and durability.

Today, most of the traditional materials are no longer in use or they are only partially in use. Modern materials such as cement, steel, m-sand, concrete, metals like Aluminium, synthetic wood, various flooring materials, glass, paint manufacturing chemicals, etc. are highly energy intensive and costly. Although expensive in this era, such materials are essential for multi-storied buildings and interior designing. Due to errors in selection of materials and construction techniques, it adversely affects the indoor air quality. Likewise, more redundant interiors can lead to higher indoor temperatures. Carbon neutral construction is now becoming more and more popular as it resists global warming, natural

disasters and carbon emissions. A carbon neutral method is a method or construction that uses quality old wood, roof tiles, burnt bricks, etc. that has been used for previous construction activities without using any new natural resources. By this method cost-effective construction works can be done.

Footnotes

1. *Bṛihadāraṇyaka Upaniṣad* 111.9.28, in Radhakrishnan, The Principal Upaniṣad, pp. 243-244.
2. *Samarāṅgaṇasūtradhāra* Ch.XIV.
3. *Ibid.*
4. *Mayamata*, Ch.XV.
5. *Ibid.* XV.115-120.
6. A Text Book of *Vāstuvīdhyā*.
7. Civil Engineering, Dr.A.Achyuthan, Dr.K.Vincent Paul.
8. *Mayamata*.Ch.XV.114.
9. *Ibid.*, XV.67b-68a.
10. *Ibid.*, XXXIII.5-7.
11. *Ibid.*, XXXIII.196-31.
12. *Ibid.*, XVIII.92-93.

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