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Rehabilitating indigenous technologies for mud construction

1. GENERAL INFORMATION

1.1 Title of practice or experience

Rehabilitating indigenous technologies for mud construction

1.2 Category of practice/experience and brief description

Due to one man's persistent, wise, skilful and persuasive efforts, mud has been restored to its rightful status as a worthy construction material that can help produce durable houses and dwellings for both rich and poor. Architect Laurie Baker spent lonely and long years perfecting the skills required to build lasting mud houses. His teachers: traditional craftsmen and masons who still build the largest number of houses in the country with mud. His science: an unbroken tradition of architecture that stretches over 4,000 years. More people in India today live in houses constructed out of mud than out of any other material. Most of these houses have been built by those who live in them, with the assistance of persons skilled in the use of mud as a building material. And this is also the situation in countries like Australia and even many of the other so-called advanced countries. Many of these houses are 50-100 years old.

In contrast to other construction materials, including cement and steel, mud does not demand imported commercial energies and is therefore a favoured material for those desirous of living sustainably. But modern materials are also environmentally destructive and Baker has made architects aware of this aspect of their work. He has shown that the firing of even mud brick requires the felling of trees. He has therefore insisted that architects develop their conscience about not using expensive and imported materials that use up a lot of natural resources in their manufacture: this applies not only to cement and steel, but also to bricks and timber, glass, asbestos, galvanised iron sheets and so on.

Contrary to popular perception, mud houses are affordable to all classes and can be designed to suit different tastes and fancies. They are environmentally virtuous and can face the elements with as much hardiness as supposedly stronger constructions made from concrete. For those not yet fixated on the inevitability of the use of modern materials and on their much vaunted strength, mud houses can be a liberating way to meet housing needs, private and public, without extravagance but with elegance.

Laurie Baker's pioneering efforts in using mud in durable house construction have spawned a new generation of younger architects liberated from the older fixations and prejudices and all too willing to experiment with materials like mud and mud mortar, once looked down upon by those who closely identified modern building with only modern materials. The beneficiary has been the public, not only those who are inclined to mud because it is inexpensive and copiously available, but also those who consider themselves at the vanguard of society's new yearnings.

One more beneficiary is the building tradition of old, and the indigenous construction techniques using mud, which have received a fresh lease of life from the attention and research now being focussed on them.

1.3 Name of person or institution responsible for the practice or experience

Laurie Baker
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1.4 Name and position of key or relevant persons or officials involved

Not available

1.5 Details of institution

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2. THE PROBLEM OR SITUATION BEING ADDRESSED BY THE PRACTICE/INNOVATIVE EXPERIENCE

More than 25 million families (200 million or 20% of the population) in India are still without a roof over their heads. This is not an unusual scenario in most, if not all, countries of the South. The problem of providing mass housing would be insurmountable if one imagines this vast unsheltered population can only be housed once adequate quantities of cement and steel (and the funds or loans for these) are available. The fact of the matter is that such quantities will never be available. Even if they were, it does not mean they would be affordable since their manufacture requires expensive imported fuels.

Since the homeless are generally also the economically deprived, it is doubtful if such materials will ever be destined for their use. Modern materials and architecture colleges have effectively mired most modern minds, particularly the architects and government bureaucrats, in one-dimensional thinking. For 5,000 years, people have constructed houses without either cement or steel and provided durable solutions. Several million houses of mud have remained standing for centuries.

In India even today, the largest number of houses constructed are out of mud. In contrast, the country's experience with modern materials is fairly recent. Not enough time has elapsed to enable a proper evaluation and assessment of their ability to withstand the forces of nature. There are indications already that they may not pass the long-term test. For example, in most coastal areas, where large numbers of people live, metal rods used in reinforced concrete construction (RCC) of houses and bridges have been unable to withstand the forces of corrosion and are giving way. RCC slabs have been unable to protect residents from heavy downpours and these leak profusely.

Indigenous building solutions face neither of these problems. The questions to ask of the older architecture are: How did they do it? Are there really

no other construction materials available besides cement and steel? What solutions used earlier are still valid today? Is it true that mud is not as strong as cement and steel? Are concrete and steel perceived to be better simply because they are seen to be the result of modern scientific and technological processes; or is this merely one more uncritical assumption we have inherited about the inherent goodness of all modern inventions? Why isn't mud considered modern? Is this a problem of mud itself or is this merely a problem of the modern mind?

Laurie Baker, though trained in formal Western architectural science, was one of the fortunate few who escaped the mental straitjacket imposed on architects today by modern materials like steel and cement. He spent many years observing how people in the rural areas of India constructed houses and also thoroughly studied the materials they used for construction. He experimented with several materials, improved the scientific basis of several traditional house-building techniques and designed elaborate new homes based on the primary use of mud as construction material. His own house located in Thiruvananthapuram (capital city of Kerala state) is completely constructed out of mud.

Inspired by Gandhi, Baker set out to prove to the world, and particularly to India's architects and housing experts, that mud is as good a material for building houses as cement and steel. In fact, Baker argues that mud construction in environments like those of Kerala is decidedly superior to reinforced cement, for various reasons. Mud houses need never be seen as an inferior product. Houses constructed from mud can also be of five-star quality, if the owner so desires and can afford it, and if the engineer concerned properly understands mud construction techniques.

As for housing planners, Baker has continued to insist that mud can also be considered primary construction material for large-scale mass housing schemes since it is ubiquitous and almost free. It is here that he has faced the greatest difficulties since planners see themselves as great modernisers and *a priori* refuse to entertain the idea that citizens should continue to live in mud houses in the 20th century. They feel this would be morally wrong or civilisationally improper. This is the reason why housing has become a problem for governments since they feel it can only be solved with large quantities of cement and steel. Laurie Baker has proved that this is a fallacy since mud houses are sometimes better than houses made of cement and steel and more comfortable as well. From the economic point of view, they are also still the best solution. From the technical point of view, all problems faced with regard to mud housing have been effectively solved: the techniques are well known in the tradition. Where necessary, these techniques have also been modified and improved by architects like Baker so that it is possible to argue

that mud building technology has come of age.

Through his advocacy and work, Baker has been able to finally convince bureaucrats and those in charge of planning for housing – at both the national and international levels – that mud should be taken into account as an important and dignified solution to the problems of mass housing of our times.

3. DESCRIPTION OF THE PRACTICE/INNOVATIVE EXPERIENCE AND ITS MAIN FEATURES

There are several techniques of house construction using mud which have been tested over centuries and are well documented. The principal ones are discussed in detail in a set of manuals on mud construction written by Laurie Baker himself and published by Council for Advancement of People's Action and Rural Technology (CAPART) (Delhi) in 1985. There is also an illuminating biographical study of Laurie Baker and his work, which also contains detailed studies of several mud houses constructed by prominent and wealthy people who refused to use cement and steel and who preferred a house designed by Baker from mud. Other manuals and learning guides on mud housing have also been published by some of Baker's students. The literature on mud housing techniques may not be vast, but it is adequate and competent (see Section 10 for literature details).

In fact, the relatively limited body of literature on mud housing does not reflect the array of skills and the fund of expertise that human beings have displayed all around the world in mud construction for centuries. In his manual, *Mud* (which has been published in a bilingual Hindi-English edition), Baker describes simply and clearly the principal processes involved in the construction of mud houses. He begins first with the process of selecting the soil for the proposed house and describes how to arrive at the best possible mixture of sand and clay. He provides a series of different and very simple tests by which an average person can check for himself whether a particular soil is appropriate for the purposes of construction or not. Baker insists that there is no need to go far for procuring the right type of soil for house construction. He points out that soil can be as easily found below the ground as it is available above the ground.

There are methods available which use stabilisers to help stabilise weak soils. For example, lime manufactured through village-level processes is a good stabiliser and can be safely used in place of cement. And there are others – straw, cowdung, tannic acid, oil, sugar and molasses, plant juices and bitumen and so on – all available within the village environment. But generally in many parts of India, soils are strong enough not to require stabilisers of any kind.

Baker next proceeds to describe the different indigenous systems of constructing the most important part of the mud house, that is, the walls. Several systems are described:

- (a) **The “cob” system:** Large lumps of mud are moulded in the shape of a huge elongated egg, about 6 inches in diameter and about 12 to 18 inches in size. Rows of cobs are placed over each other to make a wall. Gaps and holes are filled and the wall is slammed down at the sides. The cob system is the easiest for those constructing a mud house for the first time and no special tools, equipment or moulds are required.
- (b) **The system of constructing walls by ramming:** Here, one requires wooden equipment, because the principal merit of the system is that the earth is packed hard by ramming, making the walls exceedingly strong. Basically, the process involves two parallel planks held firmly apart with metal rods and bolts. Mud is thrown into the space between the planks and then rammed down with either a wooden or a metal ramrod. Once a layer is completed and has hardened, the planks are released, taken high up and the next layer is installed.
- (c) **Adobe or sun-dried brick systems:** Moulds of brick are filled with the right mix of wet mud. The mould is then removed and the brick dried in the sun. This is the most popular form of brick-making since it uses only solar energy, which is free. Recently, developers have invented a machine which can be used to produce compressed mud bricks. However, the machine is quite exhausting to operate as one must use muscle power to do the compression. However, the bricks that come out of the process have a fine smooth finish and walls using such bricks can take the load of a three-storeyed house.
- (d) **Wattle and daub methods:** This is used particularly for meeting housing requirements in areas prone to cyclones or earthquakes. Wattle is used to form the structure of the house and mud is used to daub the walls. During the rains, the daub may be washed away but it is easily replaced. The wattle can withstand any earth tremors.

Finally, Baker discusses the siting of mud houses, the laying of foundations, and important and tried techniques for protecting such mud houses from heavy rain. Through his elaborate manuals, Baker has simply taken the architectural skills required for mud-house construction and placed them back in the hands of ordinary people for them to understand and use. The architect becomes a subsidiary person in the general scheme of things.

4. DESCRIPTION OF THE INSTITUTION RESPONSIBLE AND ITS ORGANISATIONAL ASPECTS

Laurie Baker studied architecture at the Birmingham School of Architecture. During his early work in India, he met Mahatma Gandhi and was sufficiently influenced by him to return to India and place his services at the disposal of leprosy homes. Later, in 1966, he moved to Kerala and worked with tribals in some of the areas in the state. In 1970, he moved to Trivandrum (Thiruvananthapuram) and has been constructing houses all over Kerala ever since. He has served on the Governing Board of the Housing and Urban Development Corporation (HUDCO) and the National Institute of Design. He has also been associated with the working group on housing in the Indian Planning Commission. He has profound knowledge of indigenous techniques of construction in mud which he has not only studied but also simplified and improved to such an extent that persons wishing to construct their houses today using only mud can do so with confidence.

Institutions like HUDCO, CAPART and state-level housing institutions like COSTFORD in Kerala now routinely offer options for housing construction based on mud and on the pioneering work carried out by Baker. HUDCO has even founded the Laurie Baker Mud Foundation which propagates techniques of mud construction.

5. PROBLEMS OR OBSTACLES ENCOUNTERED AND HOW THEY WERE OVERCOME

The principal problem Baker has faced everywhere, especially at the official level, is the common unfounded opinion that mud houses are necessarily only meant for the poor who cannot afford more modern materials like cement or concrete. This opinion has by now been rendered obsolete largely because Baker has been able to erect several projects and individual residences for affluent people in cities like Thiruvananthapuram (including his own residence) out of mud. These houses are far more aesthetically pleasing and elegant than those constructed out of cement and steel.

Similarly, government housing agencies have tended to discount Baker's ideas simply because they are more familiar with modern materials and do not know how to translate his ideas on a large scale as is presumably required for mass housing projects. After the Latur earthquake in Maharashtra, Baker was called in to design cheap, earthquake-proof houses. The bureaucratic handling of his project and the manner in which the houses were eventually constructed left a bitter taste in his mouth.

However, today, it is only a singularly uneducated architect who would

claim he is unaware of the potentialities of mud as a building material or who would claim that mud is an inferior material to work with. To that extent, the work of Laurie Baker and of those whom he has taught and who follow his principles and his example has been singularly successful.

6. EFFECTS OF THE PRACTICE/INNOVATIVE EXPERIENCE

Laurie Baker's ideas and writings have had an enormous following among the younger architects coming out of architecture school. He has spawned a generation of architects who now freely construct mud houses or stone houses, using only natural materials, in different parts of the country. His ideas have also penetrated officialdom and influenced housing corporations like HUDCO to offer options for construction of houses in mud to customers and development agencies.

7. SUITABILITY AND POSSIBILITY FOR UPSCALING

Upscaling is not an option in mud housing. Mud houses, by definition, cannot be beyond a certain height and are limited in the number of storeys that can be constructed (three storeys maximum with compressed hard brick).

8. SIGNIFICANCE FOR (AND IMPACT ON) POLICY-MAKING

The use of mud in housing and construction projects leads to enormous cost savings, not just for the individual developer, but for the country as well. Conventional construction relies on steel and cement, both of which entail energy-intensive industries dependent on scarce oil supplies the foreign exchange requirements for which are a heavy drain. Mud construction requires locally available resources like mud and water which are available at little or no cost. Mud housing is also a centuries-old phenomenon, while modern housing using modern materials is not even a century old. It is thus too early as yet to come to a proper assessment as to which is the more durable.

Baker's work has proved to most people and governments that mud housing is a far saner and more rational approach to solving the problems of housing, particularly for those who can never dream of owning a house otherwise. The application of the refined principles of mud-house construction can also improve the life of existing mud houses radically.

9. POSSIBILITY AND SCOPE OF TRANSFERRING TO OTHER COMMUNITIES OR COUNTRIES

The principles of mud housing can be replicated in any environment where mud can be obtained. Special architectural skills are not necessary for construction of single dwelling homes. Multi-storeyed projects may require the assistance of architects or engineers. The principles of construction are simple to explain and the techniques equally easy to work with. The manuals written by Laurie Baker himself are models of clarity and can be used profitably by people who may not have direct access either to him or to skilled people in their own neighbourhoods.

10. OTHER COMMENTS

The following literature on mud housing is an important source of information on mud housing techniques for the purposes of erecting either personal dwellings or public buildings:

- (a) Laurie Baker, *Mud* (From COSTFORD, Nirmiti Kendra Complex, Ayyanthol, Trichur 680 003, Kerala, India);
- (b) Laurie Baker, *Houses: How to Reduce Building Costs* (From COSTFORD, Nirmiti Kendra Complex, Ayyanthol, Trichur 680 003, Kerala, India);
- (c) Vinoo Kaley, Bharat Jan Gyan Vigyan Jatha, *Build Your House to the Rhythm of Life*; and
- (d) Gautam Bhatia, *Laurie Baker: Life, Work & Writings* (Penguin Books, India).