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BAMBOO TECHNIQUES

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ABSTRACT: In India, from the north eastern states like Assam to central India and southern states of Andhra Pradesh and Karnataka carries nearly 80% of bamboo cultivation all together. Different species of bamboos grown with short, long and wider size and length are useful in construction works and in creating cultural art works and furniture.

With proper knowledge of these bamboo species, techniques can be used to utilize it for various purposes. We can use bamboo to form the structural frame of the house, for floor decks, walls, and roof tiles, halved bamboos are preferred. Friction tight rope connection, Wedge connection, Positive Fitting, Plug-in bolt connection are some conventional techniques which are traditionally used in India and many Asian countries.

KEYWORDS - Bamboo, connection, techniques, Joinery, Structure detail.

I. INTRODUCTION

Bamboo is very useful material for construction of house and others structure from ancient times bamboo has been used for this purpose in our country and in many other parts of the world recently started appearing in designer homes as flooring, walling and paneling material. It has been used successfully to rehabilitate soil ravage by brick making India. With the rising global concern, bamboo is a critical resource as it is very efficient in sequestering carbon and helps in reduction of green House gas emissions.

In the modern context when forest cover is fast depleting and availability of wood is increasingly becoming scarce, the research and development that bamboo could be a viable substitute of wood. varied uses and applications in building construction have established bamboo as an environment – friendly, energy – efficient and cost – effective construction material. Bamboo renewable raw material resources and if properly treated and industrially processed, components made by bamboo can have a reasonable life of 30 to 40 years.

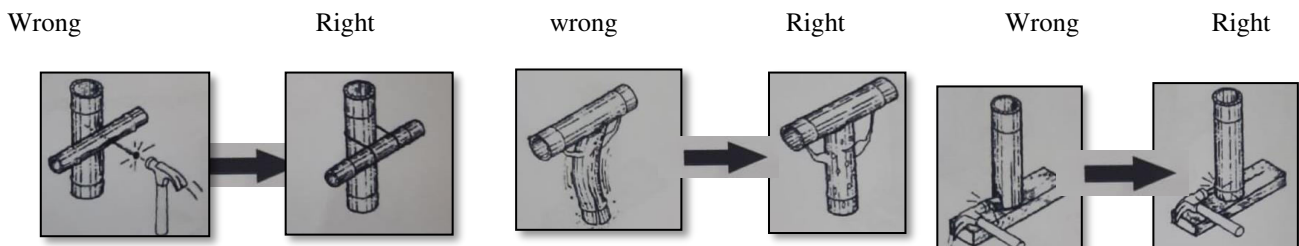
II. METHODOLOGY

- Cause and Effect Research Techniques

TECHNIQUES AND PRINCIPAL -

A fresh bamboo cannot be used for joining or any other construction purpose, for commercial use a mature and processed bamboo not less than 3 year should be used for joints, only a dry and mature bamboo of 4-6 years. A bamboo treated with BORAX (boric acid preservation treatment) can be a best option, or any modern technique of preservation can be helpful to avoid infection after harvest.

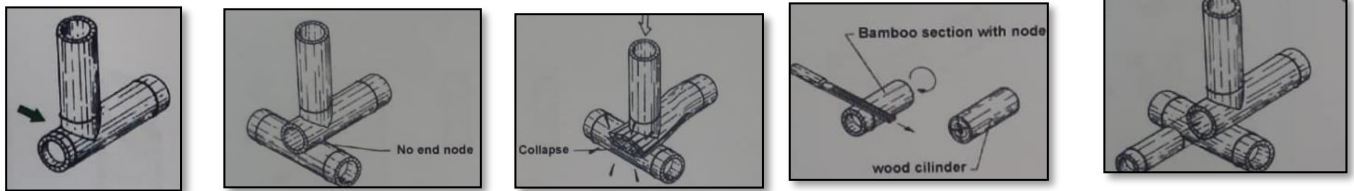
A bamboo with the right diameter and wall thickness used as a column make sure the lower part connecting with the surface ends with a node. Technique remaining.....



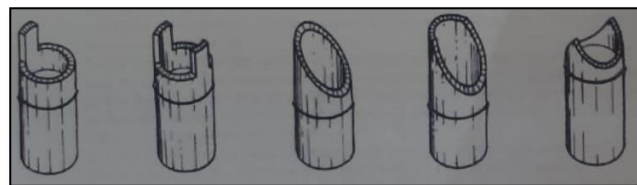
BAMBOO HAS NODES, USE THEM -

In construction, using bamboo nodes is very important, bamboo columns or beams need to have a nodes at both ends (or as close as possible towards the ends), if not the pressure of a structure on the joint may crush the bamboo. Often it

isn't possible to find bamboo of the required length with both end nodes in place. When this occurs you should insert a wooden cylinder of the appropriate diameter or a fitting piece of bamboo with a nodes.



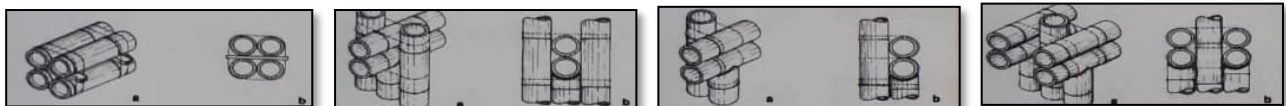
BAMBOO CUTS-



BAMBOO JOINERY TECHNIQUES -

Making good and aesthetically pleasing joints is rather complicated because bamboo is hollow, tapered, has nodes at varying distances, and it is not perfectly circular. It is important to keep all these constraints in mind when designing a bamboo joint. Traditions local practices and publications give some information on bamboo joinery, information is far complete as essential data is missing in most cases. many traditional joinery techniques suffer from weakness or deformation, where the strength of the bamboo culm itself is lost.

Before bamboo gets widely adopted in modern architecture and become affordable for all to use, the problem with bamboo joints and universal joining system has to be solved, after all timber, steel, and more recently prefabricated concrete, only became proper building material foe the same reasons.



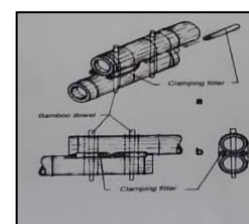
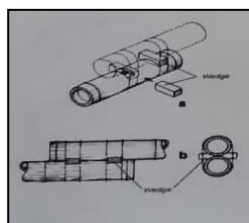
JOININGND FIXATION OF BAMBOO POLES -

Beam formed by 4 to 6 members. The top row is separated from the bottom with bamboo or wood slats so that the upper bamboos do not slide over the lower. Central double rafter. It has a wide range of application in the construction of bridges and structure for rural facilities. Lateral double rafter. Each of the rafters is secured independently at the side support and each other. It is often used in the construction of bridges and structure for rural facilities. Lateral double rafters Is often used as a central support for bridges structure or sheds

Traditional techniques -

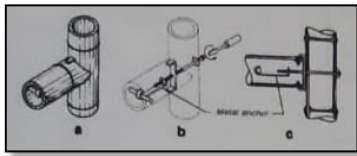
A. Joint with double wooden wedge.

B. joint with dowels and camping fitters



C. Bamboo joint with metal anchor
Techniques is used in various positions).

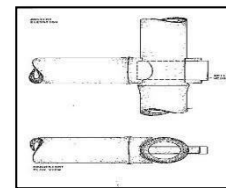
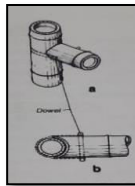
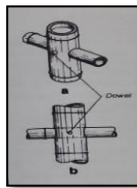
D. Friction tight rope connection. (This



E. Cross joint with dowel

F. Lateral joint with dowel

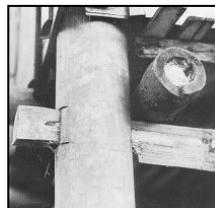
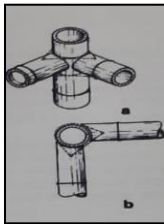
G. plug-in bolt connection



H. Corner joints

I. Wedge connection

J. Positive fitting



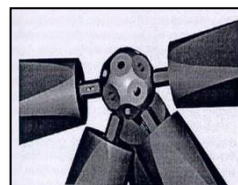
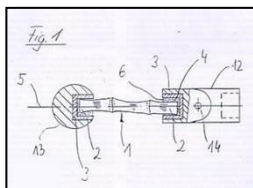
Modern connection techniques -

A. Bamboo-Tec

B. Transportation Armature

C. Induo -Anchor technique

D. Pan knot space



APPLICATION OF BAMBOO –

- Bamboo housing, Bamboo foundation.
- Bamboo flooring, Bamboo roofing.
- Bamboo truss trusses, Bamboo walling.

Bamboo housing –

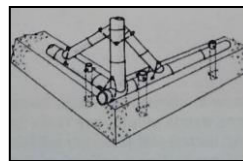
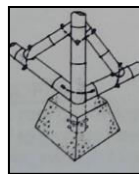
The majority of bamboo construction relates to the rural community needs in developing countries, as such domestic housing predominates and in accordance with their rural original, these building are often simple in design and construction relying on a living tradition of local skills and method. Other common types of construction include farm and school building and bridges.

Domestic housing and small building- there is a long-standing tradition of bamboo construction dating back to many hundreds of years. Different cultures have found in this material an economical system of building, offering sound yet light and easily replaceable forms of shelter. The methods activities and tools are often simple, straightforward, accessible even to the young and unskilled.

Bamboo foundation –

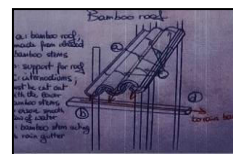
The use of bamboo for foundation is rather restricted. This is mainly due to the fact that like timber when in contact with damp ground, they deteriorate and decay very quickly unless treated with some very effective preservatives. However, in spite of their short life considerable use of bamboo is made as foundation or supporting posts in case of houses built on raised platform.

(A) **Bamboo in direct ground contact** - bamboo is placed either on the surface or buried. For strength stability, larger diameter & thick walled section of bamboo with closely spaced nodes should be used. (B) **Bamboo on rock or preformed concrete footing** -where bamboo is being used for bearings, it should be placed out of ground contact on footing of either rock or preformed concrete. the largest and stiffest section of bamboo should be used.



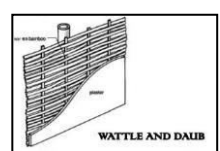
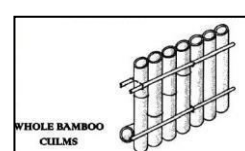
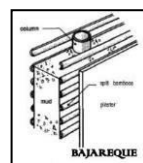
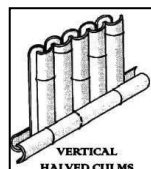
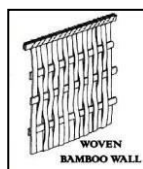
Bamboo trusses –

The bamboo has strength comparable to teak and sal. An experiment with the construction and testing of a 4m span truss made of round bamboo and different jointing techniques for web-chord connections gave results that were matching with the strength of timber.



Bamboo walling –

As the bamboo material is light in weight it is more advantageous in earthquake prone areas as its chances of failing are very less and even if it falls it can be re-erected easily with less human and properly loss with least efforts and minimum cost. Bamboo walls can be constructed in different modes like whole stem, halved or strips of bamboo can nailed to one or both the side of the bamboo frame split bamboo mats can be fastened to the bamboo posts or mats can be woven, mud can also be applied to both sides of such mats.



Bamboo for door and window –

For practical reasons, door and window are kept to minimum in bamboo housing. Door tend to be made of Wood or bamboo matting woven on a bamboo frame or bamboo “bars” puts up in a gate- like fashion.





III. CONCLUSION

- Since bamboo is an environment friendly material it should give more importance.
- Bamboo is very light in weight with compare to steel so dead load of the member can deceased with use of it.
- Bamboo is easily available material so it is economic material and by using it we can reduce the cost of construction.
- Since bamboo is very effective in seismic resistance, use of it should be safe.

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