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COMPARATIVE STUDY OF FERROCEMENT PANELS BY COMBINATION OF BAMBOO AND STEEL MESH UNDER DIFFERENT LOADING WITH CONVETIONAL FERROCEMENT PANELS

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ABSTRACT
The world timber demand is increasing at a rapid rate but the timber supply is depleting. It's been found through research that bamboo can suitably replace timber and other materials in construction and other works. Industrially treated bamboo has shown great potential for production of composite materials and components which are cost-effective and can be successfully utilized for structural and non-structural applications in construction. Bamboo is one of the oldest traditional building materials used by mankind. The bamboo culm, or stem, has been made into an extended diversity of products ranging from domestic household products to industrial applications. Bamboo is quite common for bridges, scaffolding and housing, but it is usually used as a temporary exterior structural material. In many overly populated regions of the tropics, certain bamboos supply the one suitable material that is sufficiently cheap and plentiful to meet the extensive need for economical housing. With the advancement of science and technology and the tight supply of timber, new methods are needed for the processing of bamboo to make it more durable and more usable in terms of building materials. Studies have been carried out on the basic properties and on processing of bamboo into various kinds of composite products. Bamboo has several unique advantages like ability to grow fast with a high yield and also it matures quickly. Additionally bamboo can be grown abundantly and that too at a lower cost which makes it more economical.

KEYWORDS: Ferrocement, Steel Mesh, Bamboo Mesh etc.

INTRODUCTION
Through research it has been found that some species of bamboo have ultimate tensile strength same as that of mild steel at yield point. Experimentally it has been found that the ultimate tensile strength of some species of bamboo is comparable to that of mild steel and it varies from 140N/mm2- 280N/mm2. Bamboo is a versatile material because of its high strength-to-weight ratio, easy workability and availability. Bamboo needs to be chemically treated due to their low natural durability. It can be used as Bamboo Trusses, Bamboo Roofs Skeleton, Bamboo walling/ceiling, Bamboo Doors and Windows, Bamboo Flooring, Reed Boards, Scaffolding. The following factors should be considered in the selection of bamboo culms (whole plants) for use as reinforcement in concrete structures:Use only bamboo showing a pronounced brown colour. This will insure that the plant is at least three years old.Select the longest large diameter culms available.Do not use whole culms of green, unseasoned bamboo.Avoid bamboo cut in spring or early summer. These culms are generally weaker due to increased fibre moisture content.Sizing- Splints are generally more desirable than whole culms as reinforcement. Larger culms should be split into splints approximately 3/4 inch wide. Whole culms less than 3/4 inch in diameter can be used without splitting. Splitting the bamboo can he done by separating the base with a sharp knife and then pulling a dulled blade through the stem. The dull blade will force the stem to split open; this is more desirable than cutting the bamboo since splitting will result in continuous fibres and a nearly straight section. Seasoning- When possible, the bamboo should be cut and allowed to dry and season for three to four weeks before using. The culms must be supported at regular spacings to reduce warping.

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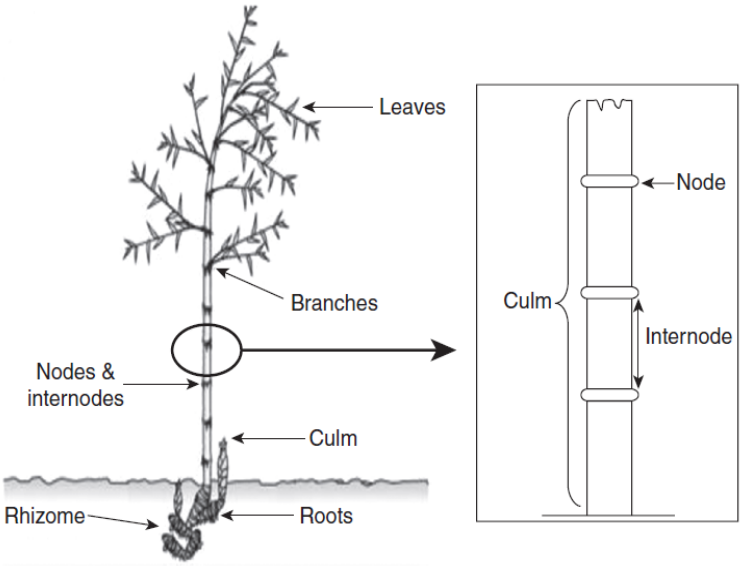

Fig.1 Structure of bamboo

MATERIALS

1. Cement

The cement used in this experimental work is "Ulttratech 53 grade Ordinary Portland Cement". All properties of cement are tested by referring IS 12269 - 1987 Specification for 53 Grade Ordinary Portland Cement.

2. Fine aggregate

Only fine aggregate is used in ferrocement. Coarse aggregate is not used in ferrocement. Normally, the aggregate consists of well graded fine aggregate (sand) that passes a 2.34 mm sieve; and since salt-free source is recommended, sand should preferably be selected from riverbeds and be free from organic or other deleterious matter.

3. Water

In ferrocement, the water used for mixing cement mortar should be fresh, clean and fit for construction purposes; the water of pH equal or greater than 7 and free from organic matter such as silt, oil, sugar, chloride and acidic material (ACI Committee 549R-97).

4. Preparation Of Mould

Mould made up of steel, concrete or wood can be used. Considering the economical condition concrete mould and wooden mould are used. Concrete mould of dimension 490 mm x230 mm x 60 mm is constructed to obtain a wall panel of required size for the construction of the precast ferrocement panel. Concrete mould of required dimension is constructed to obtain precast ferrocement roof for the store room. After the ferrocement gets hardened the precast panels are demoulded from the concrete mould and is undergone for curing

5. Preparation of Mesh

steel mesh and bamboo mesh were cut according to the required dimensions for test specimen size. The meshes were wooden hammers. Then they were used in the ferrocement slab over which the mortar mix was poured.Bamboo mesh were prepared by cutting bamboo into strips each strips having its size 600 mm x15 mm x 6 mm. which are coated by bitumen

6. Preparation of Mix

Cement and fine aggregate with the ratio of 1:1.5 is measured , taken and undergone to normal hand mixing. Initially dry mix preparation on water and super plasticizer together to give flow ability to the mix.

7. Construction Method

The first step is to prepare the skeletal framework onto which the wire mesh and bamboo mesh is fixed. A alternate layers of wire mesh & bamboo mesh is required, and depending on the design, up to 4 layers have been

used. The sand, cement and additives are carefully proportioned by weighing, mixed dry and then with water. Hand mixing is usually satisfactory, but mechanical mixing produces more uniform mixes, reduces manual effort and saves time. The mix must be workable, but as dry as possible, for greater final strength and to ensure that it retains its form and position between application and hardening.

After checking the stability of the framework and reinforcement, the mortar is applied either by hand or with a trowel, and thoroughly worked into the mesh to close all voids. This can be done in a single application, that is, finishing both sides before initial set takes place. For this two people are needed to work simultaneously on both sides.Thicker structures can be done in two stages, that is, plastering to half thickness from one side, allowing it to cure for two weeks, after which the other surface is completed. Compaction is achieved by beating the mortar with a trowel or flat piece of wood.Care must be taken not to leave any reinforcement exposed on the surface, the minimum mortar cover is 1.5 mm. Each stage of plastering should be done without interruption, preferably in dry weather or under cover, and protected from the sun and wind. As in concrete construction, ferrocement should be moist cured for at least 14 days.

CONCLUSION

Ferrocement is a labour intensive and a material saving technique has never been able to compete with reinforced cement concrete. However, innovative structures in different parts of the world have clearly indicated the unique, unmatched properties of this material and therefore the vast potential waiting to be explored. These special structures in the past include aircraft hangars & the famous Turin Hall built by Nervi. More recently the laminated Ferrocement technique developed by Martin Iorns by spraying an engineered mortar on layers of mesh holds a great promise. This has been demonstrated in various offshore structures, bringing down labor costs and improving the Ferrocement matrix.

From above research study we can conclude that bamboo is more efficient than other specimen, it shows better results as compared to steel. If we combine both steel and bamboo in same specimen then we can get more probable output as compared to individual specimens. i.e. different specimen of steel and bamboo.

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