CELLULAR CONCRETE WALL PANEL AN ALTERNATIVE TO WALLING SYSTEM

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ABSTRACT

In this paper method of prefabricated wall panel with the use of cellular lightweight concrete and bamboo is described. This is prefabricated building methodology for low cost housing and the economical advantages achieved by its adoption. In a building wall is most important component, which can be analyzed, based on the need thus, it improving speed of construction and reduces the construction cost. Cellular lightweight concrete wall panel consist bamboo as reinforcement. At all four side of panel grooves are provided for interlocking and it reduces cost of mortar. Prefabricated panel assured a higher level of quality assurance.

Key Words: CLC Technology, Cellular Lightweight Concrete, Prefabrication, Bamboo.

I. INTRODUCTION

1.1 Cellular Lightweight Concrete

Cellular lightweight concrete is nothing but concrete which is mixture of foam, cement, water and fly ash. This technology is useful for the developing the residential and other non-commercial constructions or buildings. Foam concrete and bamboo can be used for cast in place construction as well as precast construction. Cement based units such as panels can be prefabricated, and this contains a higher level of quality assurance for the constructed facilities.

1.2 Benefits

There are number of benefits of LCM. These include:

1. Reduces the dead weight of a structure from 1/3rd to ½ the weight of normal concrete.
2. Can be manufactured to precise specifications of strength and density.
3. Can be nailed, planed, drilled and sawed.
4. Provides excellent heat and sound insulation.
5. Can be applied with all traditional surface finishes: paint, tiles, bituminous membranes, Carpets etc.
6. oisture/water resistant and fire resistant.

1.3 Bamboo

Bamboo is giant grass, not a tree. Bamboo culms are a cylindrical shell divided by solid transversal diaphragms at nodes and have some intriguing properties such as high strength in the direction parallel to the fibbers, which run longitudinally along the length of the Culm, and low strength in a direction perpendicular to the fibbers. The density of fibbers in cross-section of a bamboo shell varies with thickness as well as height. Fiber distribution is

more uniform at the base than at the top or the middle. This is because bamboo is subjected to maximum bending stress due to wind at the top portion of the Culm.

Bamboo is a natural Functionally Graded Material (FGM). It is a composite with hierarchical structure. The strength of bamboo is greater than most of the timber products.

The mechanical properties vary with height and age of the bamboo Culm. Research findings indicate that the strength of bamboo increases with age. The optimum strength value occurs between 2.5 and 4 years. The strength decreases at a later age. The function of the nodes is to prevent buckling and they play a role of axial crack arresters.

Prefabricated structure means a structure which is fabricated in workshop and then installed on site. In this the method measurements are directly taken from the site. Then required component are manufacture in the workshop and then these components are directly placed on the site.

Low cost means the cost is minimizing by the use of appropriate alternative material or methodology which are same in practices.

II. MATERIALS

2.1 Cement

In the foam concrete cement is used. Portland cement of 43 grade confirming to IS 12269:1987 is used in this study.

2.2 Fly ash

Fly ash, the bye - product in thermal power plants. Fly ash conforming to IS 3812 (part-1).

2.3 Foaming agent

For making foam, air entering agent is used in the proportion of 30 ml per litter water.

III. PANEL DESIGN

3.1. Introduction

This cellular light weight concrete wall panel consist bamboo as reinforcement and it covers with the foam concrete. For designing new wall panel following following points are taken in to consideration.

3.2. Simplicity of Design

The design made is moreover quit simple to understand. This interlocking pattern so provided that it locks the panel horizontal as well as vertical. The side grooves are made deep so as to provide good interlocking.

3.3 Convenience in use

The main purpose or aim of developing interlocking panel is it's easy to use. i.e. easy to placing and lying. The cement paste is applied to the wall with the help of brush on the bottom and side of wall.

3.4 Eco-friendly

The new designed wall panel has combined advantages of bamboo and cellular lightweight concrete as both materials are eco-friendly. The wall built in CLC wall panel would not require plaster it saves natural sand.

3.5 Details of New Designed Wall

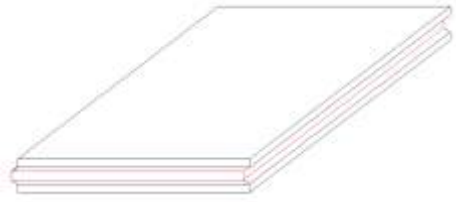

Fig. 1 Designed Wall Panel

This fig.3 shows the detail joints pattern of panel. At all four sides there are grooves are provided which helps for interlocking the panel. There are two different sizes of panels i.e. 3'x3'x4" and 3'x4'x4".

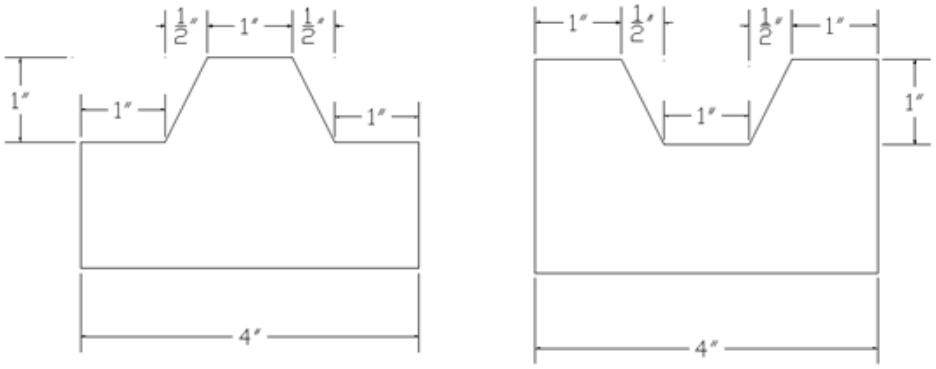

Fig.2 Designed Grooves(Male And Female)

In this fig.4 the details of grooves are shown. The depth of groove is 1 inch (1") and total thickness of panel is 4 inch (4"). There are male-female joints at exactly opposite side of panel. The depth of groove is 1 inch (1").

Fig.3 Bamboo Reinforcement

In above picture the details of bamboo reinforcement are shown. The bamboo strips are arranged in that fashion that the centre to centre distance between these strips is 4 inch (4"). And this strips are bind each other with the help of jute fibre. The size of bamboo strip is 1cm x1cm x90 cm. The arrangement of bamboo strips is shown in above fig.3.

IV. TESTS ON PANEL

Compressive test which is conducted on wall panel. The test results of wall panels compared with standard values confirming IS code.

Particulars	Unit	Value of Panel	Standard values confirming of (Red brick IS 2691-1988, IS 1077-1992)
Avg. Compressive strength IS 3495 part 1-1992	N/mm^2	2.53 – 2.9	3.5 N/mm^2

Fig 4.Compressive Testing

V. CONCLUSION

- Construction of wall with CLC wall panel is faster than normal brick construction.
- Bamboo reinforcement does not affected by foam concrete, it has proper bonding.
- Strength achieved by CLC wall panel is nearly equal to class second brick i.e 2.9 N/mm^2.
- It gives proper appearance which avoid plastering.

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REFRENCES

1. "Light weight/low cost construction methods for developing countries", By Engr. M. Haq and Engr. A. Liew in CBM-CI International Workshop, Karachi, Pakistan.
2. "Low Cost Housing ", By Mr.Raku Taur & Mr.Vidya Devit ACSGE-2009, Oct 25-27, BITS Pilani, India.
3. "Alternative building Material" By K.S.Gagdish.
4. www.buildwithhebel.com.
5. "A Structural Romance with Bamboo",By Inspiration.
6. "Performance Evaluation Of Bamboo Reinforced Concrete Beams",By Leena Khare The University Of Texas At Arlington December 2005.
7. "Research and Development on Bamboo Reinforced Concrete Structure" By Masakazu TERAI & Koichi MINAMI Fukuyama University, Japan 2012
8. " Experimental Investigation of Bamboo Reinforced Concrete Slab" By Dinesh Bhonde1, P. B. Nagarnaik2, D. K. Parbat, U. P. Waghe. 2014
9. "Development of structural lightweight foamed Concrete using polymer foam agent" By K.-J. Byun, H.-W. Song and S.-S. Park.
10. IS 2185 part 3.
11. IS 3495 part 1-1992