DESIGN AND DEVELOPMENT OF LIGHT WEIGHT STRUCTURE BY USING RENEWABLE MATERIAL

Kolekar D.S.[1], Prof.Vasatkar A.R.[2]

[1]*M.E. Civil (construction and management) second year student , Department of Civil Engineering, TSSMs BhivarabaiSawant college Of Engineering &Research,Narhe, Pune*

[2]*Assistant Professor , Department of Civil Engineering,TSSMs BhivarabaiSawant college Of Engineering &Research,Narhe, Pune*

ABSTRACT

Due to terrific growth in population all over India, there is increase in demand for buildings to provide adequate shelter for people. Because of this reason, there is increase in concrete structures and other type of structure such as a light weight structure, wooden structure, composite structure etc. But the concrete structures are very heavy as compared to wooden structure. So these concrete structures can be replaced by wooden composites materials and agricultural residues such as Saw Dust, Rice Husk, Coconut Husk , Jute etc. The implementation of new technology is necessary for waste material being efficiently& effectively utilized as sustainable resources in the industry.

The application of bamboo as a constructional material, is fast growing and ecologically friendly in construction industry & considered as quite appropriate. Bamboo panels can provide solution to the eco- housing activities at cheaper costs. A composite from agricultural residues reduces the carbon emission, which is major gas contributing to the global warming through greenhouse effect. These composites will help to decreases the pressure over the forests for wood recourses.

Keywords*: Bamboo, Composites Member, Agricultural Residues.*

1.INTRODUCTION

Now a day's rise of wood consumption in construction industry is very rapid. The reserves of native timber species is decreasing, hence the need aroused to find new renewable materials that may competently meet the demand .Now the attempts are being made to utilize this waste material and renewable material to fulfill the demand of modern urban worth. Large quantities of timbers are used in construction activities which fulfill the housing demand for increasing population. The timber naturally comes from forests which are under perpetual pressure.

This pressure is further increasing as an interior for the houses need more wood based products. Thus the potential of agro waste is developing. The small unit of agro based industry is situated in Karnataka. It manufactures particle boards by using a risk husk and any other type of agro waste. Adhesive is used as a binder for binding of agro waste. Agro waste is mixed with the other type of agro waste by using different type of adhesive resin. Particle board can be used for paneling, fall celling , flooring, furniture, flush door etc.

2.MATERIAL AND METHOD

- **Bamboo:-**

Bamboo is agro-forestry based renewable raw material resource. Bamboo is a grass not a wood and they are growing a very fast as compared to the timber. It is properly treated and the components made by using this treated bamboo may have a responsible life, near about 30-40 years. Bamboo has 8-10 sub families and number of difference species. It has ranging from the type of wood to bamboo herb. Bamboo is used in industrial processing and a high potential production of composites materials for housing and construction of building sector.

- **Epoxy Resin:-**

This resin is a group of synthetic resins which used as an adhesive and to make plastic. Epoxy resin is noted for their usefulness, but cost of this resin is high. Its high cost has limited use but imparts high resistance to chemicals. It has outstanding adhesion; toughness, durability, and this outstanding adhesion have made them valuable as coating materials. The epoxy resin adhesive is heat and chemical resistant. The strength of this adhesive is humiliated at temperature above 350 °F (177 °C). Epoxy resin is used as an adhesive and gives a hard, chemical resistant and solvent resilient finish. These resins are typically used for timber, boards, concrete, steel and fibers to make them to water, alkali and acids resistant. Epoxy resin coatings are used to put clear and definite appearance for the product based upon the performance necessities.

- **Saw dust and Coconut Husk:-**

Saw dust and coconut husk is the waste generated from the timber industry. It is reused in the industries for making of boards, fuel for fire purpose, rope, coach etc. In India, the coconut cultivation area is about 1.6 million ha and 12400 million nuts produced annually [1]. Almost 3.7 million tons of husk is produced annually and dry weight of husk in each nut is 0.3 kg.

These waste dusts fulfill the filler material requirement and it gives good properties. Major use of sawdust and coconut husk is for particleboard and as a fuel. The coconut husk is also known as coir. Coconut husk has become a very beneficial material in light of today's environmental and financial concerns. Coir fiber has been recognized as highly durable fiber in all type of matrices, polymers, bitumen, gypsum, cement, mud, fly ash- lime etc. Coconut husk is also used in the production of some popular products such as carpets, rugs, door mats, mattresses, car seat covers, brushes, bristles and flower pots.

Methodology:-

In construction industry the RCC structure is very heavy as compared to live loads on the structure .The concrete slab is designed for the live load and dead load; but

these live loads are less as compared to dead loads. Hence to withstand this dead load we have to provide greater sections in RCC structure. Based on this loading consideration, the slabs, beams and columns are designed. But in these structures the material used is sand, cement and aggregate which is non-renewable and obtained from natural resources.

After some years this materials are to decline. Therefore in future there will not be any material available for construction industry. Hence there is need to replace with renewable material such as a steel, wood composites, agricultural wastes, Bamboo etc. Renewable material gives the more green effect to buildings. Renewable materials can be produced or reused again and again, but concrete is not used again and again. By using renewable and lightweight materials for floor and wall, the dead load of slab and wall can be reduced. Thus the structure can be made light weight. Hence there is need to find out the light weight alternatives for RCC slab and brick wall.

Research Problem Definition:-

This project work is limited to study of various renewable materials and agricultural wastes. Followings are the objectives of proposed work:

- To identify, study and selection of Renewable Materials and Agricultural waste material for construction of floor and wall.
- To prepare the bamboo and wooden composites panel for wall and floor.
- To test the bamboo and wooden composite panel.
- To do design of bamboo and wooden composite floor and G+1 lightweight building.
- Cost analysis of designed structure.

3.RESULT AND ANALYSIS:-

From the results, it can be inferred that the Average Moisture content of the panels is 10.21%, Average Water absorption 13.09% and Average Density of panel is 0.5300 in g/cm3 or 530 in Kg/m3 or 0.019 lb. /In^3. As par Specification regarding particle board and plywood, the maximum water absorption allowed is 20% and water absorption of bamboo composite panel obtained was 13 %

The maximum Moisture content limit is 10-15% as compared to timber and particle board. The limit of moisture content is mentioned in timber engineering book and author of this book is Seven Thelandersson and Hans J. Larsen Water absorption of bamboo composite panel obtained was 10.09 %. The density of Bamboo composite panels is in the range of 450 – 600 Kg/m^3.

4.CONCLUSION:-

- Bamboo, coconut husk and saw dust are renewable material selected for the panel preparation, because it is available in local area nearby satara city and cost is very cheap. All material is green construction material.
- The various tests were performed to check the suitability of Bamboo composite panel as a wall and floor construction. The experimental results it was found that the panel is suitable for wall and floor construction and hence it needs to be safe.
- Modulus of rupture and modulus of elasticity of the panel is 36.21 N/mm^2 and 5731.55 N/mm^2. It is more than the wood composite panel such as 16.6 N/mm^2 and 2800N/mm^2.

5.REFERENCES:-

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