Improving the Strength of Panels Using Sugarcane Fibers

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Abstract— Ferro cement is a form of reinforced concrete that differs from conventional reinforced or prestressed concrete primarily by the manner in which the reinforcing elements are dispersed and arranged. It consists of closely spaced, multiple layers of mesh or fine rods completely embedded in cement mortar. This paper describes the various experiments conclusions and remarks drawn by the authors. The result obtained are going to help in the project work to investigate the behaviour of Ferro-cement panels for various parameters and loading. This is useful to find solutions by searching new design techniques and method of construction. Compressive strength of mortar was taken into account. The Ferro cement panel consisted of two thin Ferro cement layers reinforced with palm and sugarcane fibers. Steel wires were used to tie the two layers of iron meshes together. A total of 1:3 sandwich panel was casted. The proposed panels are lighter in weight relative to the conventional brick walls. This kind of lightweight construction process would lead the construction industries for having a green and earthquake resilient environment. Two Different Layers will be used in our project the one was Palm fibers with Ferro cement panel and sugarcane fiber With Ferro cement Panel of 150mm Thickness. These have been used in the aerospace industry for many years and more recently they are being used as load bearing members in naval structures. Presently, it has gained attention to be used as an effective structural form in the building and construction industries. Banana fiber reinforcement increases biodegradability, reduces cost and decreases environmental pollution and hazards. Ferro cement has been regarded as highly versatile construction material possessing unique properties of strength and serviceability. Its advantageous properties such as strength, toughness, water tightness, lightness, durability, fire resistance, and environmental stability cannot be matched by any other thin construction material.

Keywords: Ferro-cement panels, Sugarcane Fibers

I. INTRODUCTION

A. Ferro Cement

Ferro cement is the composite of Ferro (Iron) and cement (cement mortar). Ferro cement can be considered as a type of thin-walled reinforced concrete construction in which small-diameter wire meshes are used uniformly throughout the cross section instead of discretely placed reinforcing bars and in which Portland cement mortar is used instead of concrete. In Ferro cement, wire-meshes are filled in with cement mortar. It is a composite, formed with closely knit wire mesh; tightly wound round skeletal steel and impregnated with rich cement mortar.

Ferro cement is a type of thin wall reinforced concrete commonly constructed of hydraulic cement mortar reinforced with closely spaced layers of continuous and relatively small size wire mesh which may be made of metallic or other suitable materials. Since Ferro cement possess certain unique properties, such as high tensile strength to weight ratio, superior cracking behavior, light weight, mould ability to any shape and certain advantages such as utilization of only locally available materials and semi-skilled labor, it has been consider to an attractive-material and a material of good promise and potential by the construction industry, especially in developing countries. It has wide range of application such as in the manufacture of boats, barges, prefabricated housing units, biogas structures, silos, tanks, and recently in the repair and strengthening of structures. Ferro cement is suitable for low cost roofing, precast units and man-hole covers.

B. Properties of Ferro Cement

Ferro cement is a type of a reinforced concrete haring large amount of smaller diameter wire meshes are needed, these wires are metal wire and sometimes other type of suitable material can be used sand, cement, mortar mix and quantity of reinforcing material decide the strength of Ferro cement.

C. Ferro Cement Panels

Ferro cement is a type of slim wall reinforced concrete panel where hydraulic cement is casted with closely spaced layers of continuous small diameter metal mesh. The main goal of this work is to compare flat Ferro cement panel with conventional materials with respect to strength, Time cost for affordable cost housing.

II. SUGARCANE FIBER

Sugarcane is a natural plant fiber, which is collect from the sugarcane plant. Sugarcane is an oldest crop known to man, a major crop of tropical and sub-tropical regions worldwide. Sugar cane is the most efficient biofuel feedstock in commercial use today and sugar cane ethanol will contribute to reduce greenhouse gas up to 90% compared to conventional fuels. Mainly sugarcane fiber is called the "bagasse". Bagasse is the fibrous material that remains after sugarcane is crushed to exact their juice from sugarcane. It is dry pulp residue left after the extraction of juice from sugarcane.

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III. LITERATURE REVIEW

Sudha Kumar (2001) carried out an experimental investigation to study the thermal behavior of hollow and in filled Ferro cement roofing panels, under steady state heat flow conditions. The materials used for infilling the Ferro cement panels were insulating materials like vermiculite, and thermocole. These materials were mixed with cement and/or sand in the correct proportions and then used for filling up. Several such units were cast and tested under steady state heat flow conditions using a plate heater and a constant temperature water bath circulator. Test results indicate that the hollow Ferro cement panels have less thermal inertia and heat capacity, and they have a very good thermal damping capacity. Similarly, the thermal inertia and heat capacity of these hollow panels can be increased by infilling the air space with the low conductivity materials.

Masood et al. (2003) investigated the performance of Ferro cement panels in different environments. The study investigated the performance of Ferro cement panels under normal, moderate, and hostile environments. The conditions were created using potable and saline water for mixing and curing. Fly ash, a waste material, was also used as partial replacement of cement. The Ferro cement slab panels cast with varying number of woven and hexagonal mesh layers were tested under flexure. Compressive and tensile strength of control specimens and load-carrying capacity of the panels under flexure with and without fly ash were investigated. Result showed that addition of fly ash in different environments affects the flexural strength of panel for both woven and hexagonal wire fabric.

Milon et al (2013) have examined the flexural performance of Ferro cement panels under normal and saline water exposure was investigated. For this rationale, a series of thin mortar plate specimens of 275 mm × 275 mm (width× length) in size were casted with varying number of mesh layers, thickness and immersed condition. For the expedition of the effect of saline water, accelerated constant current corrosion test was performed. Mid-point loading test was done to measure the flexure performance of the specimens. Test results revealed that the flexural performance of Ferro cement wall panel reduces due to the effect of saline water.

Ramesh and Newel carried out experimental investigations to obtain more accurate information regarding the tensile strength of mesh and to examine the possible influence of having multiple strands acting together. The results of the investigations were then fed-back into the design program and again compared with experimental values. Four and six layers of meshes were used, which wen evenly spaced. Centrally evenly split between top and bottom. However, all the mesh had the same length (is. 325 mm). Flexural test on specimens (350x120~38 mm) were wired out under simply supported span of 300 mm under the point loading. Based on the study it has been concluded that (i) the yield strength and the ultimate tensile strength 0blaiMd for meshes with I\VO or more longitudinal wires or the same diameter are greater than those obtained for a single wire; (ii) no significant changes occur in the yield strength and ultimate tensile strength of wire meshes as a result of increasing the number of longitudinal wires in the mesh. Moreover, the stress-strain cave remain within a limited range; (iii) there is a definite role of transverse wires in increasing the tensile strength of wire meshes. The transverse wires must therefore be taken into account when analyzing Ferro cement under tension and flexure.

Ferro cement elements of 12 to I5 mm thick were found to be excellent in corrosion resistance over a period of 14 to 15 years. It is also recommended to use mechanical casting process, galvanized iron meshes. well-graded sand for mortar, waterproof coating for production of strong and sound Ferro cement structure. It is also observed that bad compaction and poor workmanship results in micro - cracks and increase in the rate of corrosion

IV. MATERIALS PROPERTIES

A. Concrete

A composite material that consists essentially of a binding medium, such as a mixture of Portland cement and water, within which are embedded particles or fragments of aggregate, usually a combination of fine and coarse aggregate. Concrete is by far the most versatile and most widely used construction material worldwide. Concrete is a very strong and versatile mould construction material.

B. Cement

The cement should be fresh, of uniform consistency, and free of lumps and foreign matter. It should be stored under dry conditions for a short duration as possible. The choice of particular cement should depend on the service conditions. Service conditions can be classified as electrochemically passive or active.

C. Sand

Sand is a granular material composed of finely divided rock and mineral particles. It is defined by size, being finer than gravel and coarser than silt. Sand can also refer to a textual class of soil or soil type; i.e., a soil containing more than 85 percent sand-sized particles by mass. The composition of sand varies, depending on the local rock sources and conditions, but the most common constituent of sand in

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inland continental setting and non-tropical coastal setting is silica, usually in the quartz

D. Ferro Cement Panels

Ferro cement is a type of slim wall reinforced concrete panel where hydraulic cement is casted with closely spaced layers of continuous small diameter metal mesh. The main goal of this work is to compare flat Ferro cement panel with conventional materials with respect to strength, Time cost for affordable cost housing. Ferro cement is a versatile structural constructional material possessing unique property of strength and serviceability. It is made with closely-knit wire mesh and mild steel reinforcing bars filled with rich cement mortar. Welded mesh may also be used in place of reinforcing bars. The use of Ferro cement panels of a large construction has been successfully in used European and South America countries. A composite material is formed that behaves differently from conventional reinforced concrete in strength, deformation, and potential application. The Ferro cement panels laid over sequentially erected dumpy pillars on the exiting RCC roof serve the purpose of secondary roof and can greatly enhance the thermal insulation.

V. RESULT

1) Tabular representation (strength after 28 days)

Sr. No.	Description	Compressive Strength in N/mm^2	Average in N/mm^2	Remarks
01	Plain ferro cement panels	23.92		
02	Plain ferro cement panels	22.43	23.19	
03	Plain ferro cement panels	23.24		

2) 3% Sugarcane fiber panels compressive strength test result

Sr. No.	Description	Compressive Strength in N/mm^2	Average in N/mm^2	Remarks
1.	Sugarcane fiber panels	22.47		
2.	Sugarcane fiber panels	22.1	22.52	
3.	Sugarcane fiber panels	23		

3) 5% Sugarcane fiber panels compressive strength test result

Sr. No.	Description	Compressive Strength in N/mm^2	Average in N/mm^2	Remarks
1.	Sugarcane fiber panels	22		
2.	Sugarcane fiber panels	21.6	21.83	
3.	Sugarcane fiber panels	21.9		

4) 7% Sugarcane fiber panels compressive strength test result

Sr. No.	Description	Compressive Strength in N/mm^2	Average in N/mm^2	Remarks
1.	Sugarcane fiber panels	21.3		
2.	Sugarcane fiber panels	20.5	20.96	
3.	Sugarcane fiber panels	21.1		

5) Tabular representation (strength after 14 days)

Plain ferro cement panels compressive strength test result

Sr. No.	Description	Compressive Strength in N/mm^2	Average in N/mm^2	Remarks
1.	Plain ferro cement panels	19		
2.	Plain ferro cement panels	18.8	18.73	
3.	Plain ferro cement panels	18.4		

6) 3% Sugarcane fiber panels compressive strength test result

Sr. No.	Description	Compressive Strength in N/mm^2	Average in N/mm^2	Remarks
1.	Sugarcane fiber panels	18.4		
2.	Sugarcane fiber panels	18	18.13	
3.	Sugarcane fiber panels	18		

7) 5% Sugarcane fiber panels compressive strength test result

Sr. No.	Description	Compressive Strength in N/mm^2	Average in N/mm^2	Remarks
1.	Sugarcane fiber panels	18		
2.	Sugarcane fiber panels	17.6	17.6	
3.	Sugarcane fiber panels	17.3		

8) 7% Sugarcane fiber panels compressive strength test result

Sr. No.	Description	Compressive Strength in N/mm^2	Average in N/mm^2	Remarks
1.	Sugarcane fiber panels	17.2		
2.	Sugarcane fiber panels	16.9	16.9	
3.	Sugarcane fiber panels	16.8		

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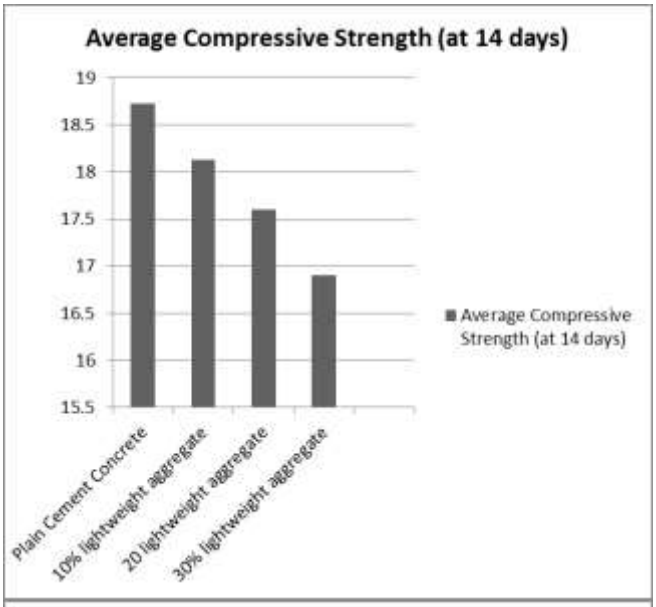
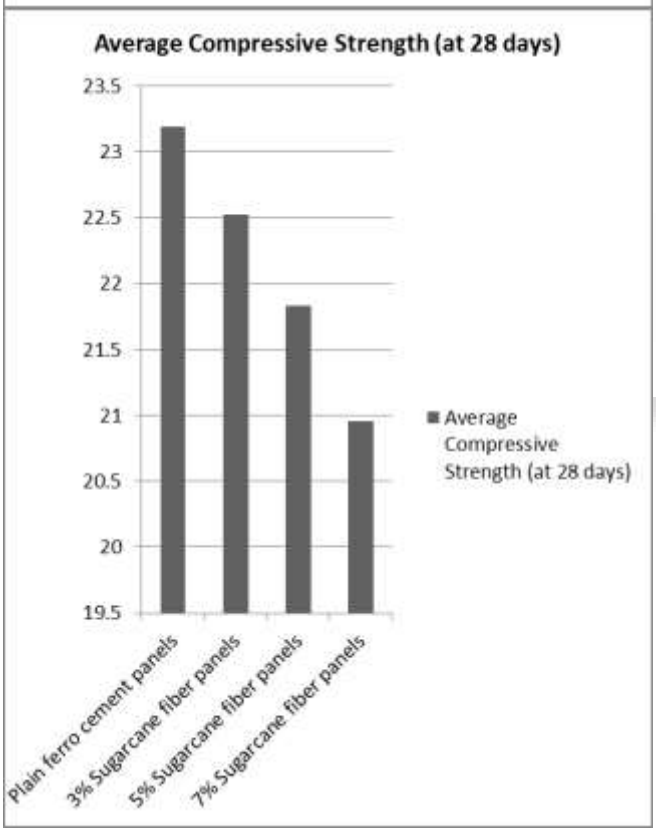
VI. GRAPHICAL REPRESENTATION





VII. CONCLUSION

In this project we find effect of Sugarcane fiber panels over the plain ferro cement panels, and we prepare the panels for test of plain, Sugarcane fiber panels. We use 3%, 5%, 7%, of Sugarcane fiber.

A. For 14 days cured panels has average strength sugarcane fiber.

1) The plain ferro cement panels has average strength 18.73 N/mm2.
2) The sugarcane fiber panels has average strength for 3% is 18.13 N/mm2.
3) The sugarcane fiber panels has average strength for 5% is 17.6 N/mm2.
4) The sugarcane fiber panels has average strength for 7% is 16.9 N/mm2.

Among all of that plain cement concrete is carry more strength as compare to the sugarcane fiber panels.

B. For 28 days cured concrete has average strength sugarcane fiber.

1) The plain ferro cement panels has average strength 23.19 N/mm2.
2) The sugarcane fiber panels has average strength for 3% is 22.52 N/mm2.
3) The sugarcane fiber panels has average strength for 5% is 21.83 N/mm2.
4) The sugarcane fiber panels has average strength for 7% is 20.96 N/mm2

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