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Structural behaviour of ferrocement self compacting concrete using M-sand under axial and lateral pressure load

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ABSTRACT

Present Paper describes the structural behavior of ferrocement self-compacting concrete using M sand under axial and lateral pressure load. The structural performance of the all tested tanks in terms of strength, cracking behavior and energy absorption was investigated. M sand is produced by reducing large pieces of aggregate into sand-sized particles. An experimental program was designed in the current work to examine the structural behavior of ferrocement self-compacting concrete using M sand under axial and lateral pressure load. The self -compacted concrete is an innovative product in the civil engineering field in India. In this paper discussed the using ferrocement self-compacting concrete tanks is better than the conventional concrete tanks.

Keywords— *Ferrocement, Self-compacting concrete, Ferrocement tanks, Structural behaviour, Pressure loads*

1. INTRODUCTION

In many countries, ferrocement tanks are used for the collection and storage of water for drinking, washing, animal use, irrigation and agricultural purpose. Ferrocement tanks vary in capacity, size, and shape and they may be built by hand. They are usually cheaper than steel tanks or fiber reinforced plastic because of the high manufacturing cost of the other materials. M sand is produced by reducing large pieces of aggregate into sand-sized particles. M sand is used in mixtures in an area where the natural sand is not available. The size of M sand is less than 4.75mm. The cost of construction can be controlled by use of M sand is the alternative material for construction. The ferrocement tanks have better corrosion resistance and they have lower maintenance costs than steel tanks. In ferrocement tank, large amounts of small diameter mesh uniformly distributed within the concrete section are used these lead to provide a very efficient and simple form of crack control. Additionally, a number of researches investigated a method for strengthening and repairing of concrete reinforcement tanks that depend on using ferrocement technic. From their results, it was concluded that this method of construction provides durable and high strength water tanks. The main objective of the current research is studying the structural behavior of ferrocement self-compacting concrete using M sand under axial and lateral pressure load. The matrix was designed to have high strength, low water to binder ratio, flow characteristics and high durability. In the current paper, ferrocement tanks different in the reinforcement system were designed, constructed and tested under pressure loads.

2. LITERATURE REVIEW

Y. Shaheen, F. Aboul-Ella, "Structural performance of ferrocement tanks under pressure loads" This paper makes the study of Ferro cement tanks two types of Ferro cement tanks (RT1, RT2) internal dimensions are 800mm*800mm*400mm. wall and footing thickness 40mm and 70mm.silica fume used as a partial replacement for cement. Polypropylene fibres are added in mortar mix. Using welded mesh and expanded mesh, Steel wire meshes used under tensile load. The result from the paper is highest mechanical properties of welded wire mesh compare with expanded wire mesh.

Y. B. I. Shaheen, A. A. Elsayed, "Design and construction of Ferro cement water tanks'' This study deals with the Ferro cement is a type of thin wall reinforced concrete construction.ferrocement has better corrosion resistance and lower maintenance cost than steel .the developed Ferro cement tanks is four times cheaper than the other constructed tanks. The optimum displacement of cement with silica fume was found to be 15%.major significance qualities of the Ferro cement, low consumption of materials, easy to be repaired, good behaviour to cracking, it can be prefabricated.

Prajapati Krishnapal, Chandak, Rajeev and Dubey Sanjay Kumar, "Development and properties of self compacting concrete mixed with fly ash" The main purpose of this paper is the development and properties of SCC mixed with fly ash. Addition of fly ash in SCC increases filling and passing ability of the concrete. Increases flash, super plasticizers content in SCC reduce the water demand and compressive strength of the concrete.

M. B. Varma, M. B. Hajare, "Ferrocement: Composite material and its applications" In this paper, mostly four types of meshes used in the construction, hexagonal (or) chicken mesh, welded wire mesh, expanded wire mesh, woven wire

mesh. Ordinary Portland cement (OPC) is used, application of Ferro cement are, floating marine structure, maintenance, and repair of decorating structure, water tank construction. Ferro cement is an important alternative for RCC and repair material in future, the performance of the Ferro cement depends on the properties of reinforcing mesh, it is the suitable material for repairing the defective RCC structural element to increases their performance.

Hardik Upadhyay, Pankaj Shah, Elizabeth George, "Tesing and mix design method of self compacting concrete", this paper is discussed about the testing and mix design of SCC. Testing of SCC is passing and filling ability. The name of the testing is Slump Flow test, V-Funnel test, U-Box test.mix design is the concept of Japanese based on the method. Coarse aggregate content is fixed at 50% of the solid volume, fine aggregate content is fixed at 40% of the mortor volume. Water power ratio is depending on the properties of the powder. suoerplasticizers dosage and the final water powder ratio are determined as to ensure the self-compact ability.

N. Nandhinishree, N. Saravanakumar, "Structural behavior of self compacting concrete confined with ferrocement under axial compression", this paper is discussed about the structural behavior of SCC confined with ferrocement under axil compression, the material used for this cement, aggregate, water, super plasticizers, reinforcement, and silica fume. Mix design of SCC aggregate size is below 12.5mm using 10mm aggregate, normally SCC means fine aggregate is more than the coarse aggregate. The result of this paper is the experiment SCC made by using silica fume as a mineral admixture, SCC with 10% replacement of cement with silica fume is given a good result both in compression and tension.

Paratibha Aggarwal, Rafat Siddique, Yogesh Aggarwal. "Self-compacting concrete-procedure for mix design", this paper is discussed about the procedure for the design of SCC. The test result for SCC is Slump cone test, v-funnel test, u-box test. Compressive strength at the ages of 7, 28, and 90 days these results are included in the paper. The test result range of slump cone test is 500-700mm, v-funnel filling ability range is 6-12 sec, u-box passing ability range is >8. The result of this paper is they do many trial method of procedure for mix design but they could not be satisfied the trial methods of SCC mix design. We do more trial and error method means the range will be satisfied somewhere.

Virendra Kumar Paul, Salman Khursheed, Siddhant Jain, "Benefit cost analysis of self compacting concrete over conventional reinforced cement concrete", which talks about the advantage and disadvantage of SCC, the process of selection of SCC, finally the result was helped using SCC is better than convention concrete. The benefit like reduction in noise, improved durability, thinner concrete sections, and faster construction. In some places, convention concrete is difficult to pour like edges. In that place, SCC is very easy to pour. So, SCC is better than convention concrete.

Manish Hajare, Dr. M.B. Varma, "Flexural behavior of ferrocement panels with different types of meshes", this paper talks about the effects of different types of meshes select the best and suitable mesh for future work. Ferrocement ingredients are cement, sand, water and Reinforcing mesh. Based on the tested of ferrocement panels. The two tested panels are a Flexural strength at cracking load and flexural strength at [12] ultimate load. The result of the paper is the ferrocement panels with weld mesh is the better tendency to tank load than the other two types of mesh.so, weld mesh is used for the ferrocemnt panel it gives the good result for future experimental work.

Sabarish K V, Partheeba paul, S.Gowtham, "Utilization of M sand as a partial replacement for fine aggregate in concrete elements", in this paper, An experimental result shows the quality of M sand is the better than the natural sand. M sand particles are cubical in shape, finely graded, and it provides greater durability. It can be eonomical as a construction material as a river (or) natural sand. Finally, the result was, the curing method of compressive strength, split tensile strength of concrete with 50% substitute of natural sand by using M sand as a higher strength to the concrete. The result of this paper, From 7 and 28 days the rates of strength development have been found to similar for control without M sand concrete.

3. CONCLUSION

The present review paper from the literature it is found out that the structural behavior of (FCSCC) using M sand under axial and lateral pressure load. Depends a lot of factors, in SCC adding silica fume as a mineral admixture, gelinium as a chemical admixture and using M sand is the alternative material for natural sand. Hence, it is concluded that the using ferrocement self-compacting concrete gives the best result in the experimental investigation compared to the conventional concrete.

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