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Review on the Performance of Glass Fibre Reinforced Concrete and Steel Fibre Reinforced Concrete

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Abstract-Over the decades, there has been a significant increase in the use of fibres in concrete for improving its properties such as compressive strength and workability. The fibre concrete is also used in retrofitting existing concrete structures. Among many different types of fibres available today, glass fibre and steel fibre is a recent introduction in the field of concrete technology. Glass fibre has the advantages of having higher tensile strength and fire resistant properties, thus reducing the loss of damage during fire accident of concrete structures. The important properties of steel fibre is its superior resistance to cracking and crack propagation. Plain concrete has low tensile strength, less ductility, destructive and brittle failure. In order to improve these properties of plain concrete, an attempt has been made to study the effect of addition of glass fibers and steel fibre in pozzolonic Portland cement concrete. In the this experimental investigation fibers in 0 to 2 percentage has been studied for the effect on strength properties of concrete by carrying compressive strength test at 28 days for M20 and M25 grades of concrete and slump cone test for workability of concrete,Flexural Strength. In addition, to improve the workability of higher fibre volume mixes, water reducing admixtures are often used.

Keywords:Concrete,Glassfibre,Steelfibre,Admixture

1. INTRODUCTION

Concrete is the most widely used construction material which has several desirable properties like high compressive strength, stiffness and durability under normal usual environmental factors. While at the same time concrete found to be brittle and weak in tension. It is well known that concrete mixed with other material was applied for resistance purpose. Fiber reinforce concrete is a family of composite materials that combine the high compressive strength properties of cement mortars with significantly increased impact, flexural and tensile strengths imparted by the fiber reinforcement.

Without any fiber in the concrete there was development of the cracks due to plastic shrinkage, drying shrinkage and other reasons of changes in volume of concrete. The development of these micro cracks causes elastic deformation of concrete. The presence of fibers provides crack arresters. When the first crack occurs in the matrix, the strong fibers pick up the load. That support is stronger than the matrix itself, so the next crack must occur elsewhere. More loading adds only new cracks, immediately arrested, rather than causing first cracks to propagate. Failure develops as a gradual, like - plastic yielding. In the present work, glass fibers, 10 micrometre in diameter and 6 mm long and steel fibre, of 0.75mm diameter with 60mm length in diameter are used for the preparation of standard grade concrete. A preliminary test program has been carried out to study the strength characteristics of fibre reinforced concrete with the addition of glass fiber and steel fibre to concrete.

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2. REVIEW OF LITERATURE

Dr. K.M.Tajne, P.S.Bhandari (2014) In the present experimental investigation, glass fibres has been used to study the effect on compressive, split tensile and fle xural strength on M20 & M25 grades of concrete with varying percentage of glass fibre. a) A reduction in bleeding is observed by addition of glass fibres in the concrete mixes; b) The percentage increase of compressive strength of various grades of glass fibre concrete mixes compared with 28 days compressive strength is observed from 12 t0 18% and c) The percentage increase of flexural and split tensile strength of various grades of glass fibre concrete mixes compared with 28 days is observed from 16 to 20%.

Eng. Pshtiwan N. Shakor, Prof. S. S. Pimplikar. (2011) In this study trial tests for concrete with glass fibre and without glass fibre are conducted to indicate the differences in compressive strength and flexural strength by using cubes of varying sizes. Various applications of GFRC shown in the study, the experimental test results, techno-economic comparison with other types, as well as the financial calculations presented, indicate the tremendous potential of GFRC as an alternative construction material.

Kavita S Kene, Vikrant S Vairagade and Satish Sathawane,(2012) The following conclusions could be drawn from the present investigation. 1.Max compressive strength for M20 grade of concrete was obtained by addition of 0.5%, 50 mm length, hook end (S2) steel fibers. 2.Max split tensile strength for M20 grade of concrete was obtained by addition of 0.5%, 50 mm length, hook end (S2) steel fibers.

3.Ratio of compressive strength of cylinders to the compressive strength of cube was found to be nearly 3:4. 4.Workability of concrete affected by addition of fibers. Addition of S2 fiber reduces workability of concrete in comparison to other fibers for different volume fraction.

Komal Chawla1 and Bharti Tekwani1 (2013) Studies Of Glass Fiber Reinforced
Concrete Composites Addition of glass fiber in reinforced concrete increases the toughness by 1157% compare with conventional reinforced concrete. The value of toughness observed maximum 272.4 KN mm when using fiber content 0.67% and 1.25% steel(12 mm reinforcement bar) The modulus of elasticity of glass fiber reinforced concrete is increases 4.14% compared with conventional reinforced concrete The percentage increase of compressive strength of various grades of glass fiber concrete mixes compared with 28 days compressive strength is observed 37%.The percentage increase of flexure strength of various grades of glass fiber concrete mixes compared with 28 days compressive strength is observed 5.19%.

Patil Shweta, Rupali Kavilkar (2014) : Study of Flexural Strength in Steel Fibre Reinforced Concrete. The addition of binding wire or a steel fibre into the concrete significantly increases the flexural strength. 2. At constant percentage of fibre=1.5%& by increasing aspect ratio of fibre from 40 tp 70, it is observed that the flexural strength is increased from 36.7% to 58.65% as compared to plain concrete strength. 3. At constant aspect ratio 70 and by increasing percentage volume of fibres from 0.5% to 2.5%, it is observed that the flexural strength is significantly increased from 29.2% to 119.69% as compared to plain concrete. 4. By addition of binding wire as a steel fibre to the concrete, it is observed that the compressive strength slightly decreased. 5. The maximum drop in compressive strength (decrease of 31.10% as compared to plain concrete) is observed with the aspect ratio 70 & percentage volume of fibre of 1.5%. 6. From load deflection curve , it is observed that as the percentage of fibre increases with constant aspect ratio, the deflection of the beam is also increased before failure. The maximum deflection is observed with 2.5% fibre and 70 aspect ratio and it was 3.2mm.

4. COCLUSION

The initial cost is high and overall cost is low because of the good properties of fibre reinforced concrete. The glass fibre showed almost 20 to 25% increase compressive strength, flexural strength, and split tensile strength as compared with plain cement concrete and effect of the steel fibre reinforced concrete used for sustainable and long lasting concrete structure.

REFERENCES

[1] Dr. K.M.Tajne, P.S.Bhandari "Effect of Glass Fibre on Ordinary Concrete", volume 3 Issue 11,November 2014.

[2] Pushpendra Soni, Raksha Parolkar "Study And Analysis Of Durability Of Fibre Reinforced Concrete" International Journal Of Engineering Sciences & Research Technology,Published June 2015.

[3] Eric P. Koehler and David W. Fowler "Study And Analysis Of Durability Of Fibre Reinforced Concret", International Journal Of Engineering Sciences & Research Technology,Published June 2015.

[4] Eric P. Koehler and David W. Fowler "Summary of Concrete Workability Test Methods" Aggregates Foundation for Technology, Research, and Education,Published August 2003.

[5] Eng. Pshtiwan N. Shakor, Prof. S. S. Pimplikar."Glass Fibre Reinforced Concrete Use in Construction",©gopalax -International Journal of Technology And Engineering System Jan – March 2011- Vol.2.No.2.

[6] Faisal Fouad Wafa "Properties and Applications of Fiber Reinforced Concrete" JKAU Eng. Sci., Vol. 2, pp. 49-63.

[7]Anette Jansson "Fibres in reinforced concrete structures- analysis, experiments and design the study".

[8]Kavita S Kene, Vikrant S Vairagade and Satish Sathawane," Experimental Study on Behavior of Steel and Glass Fiber Reinforced Concrete Composites" Bonfrin International Journal of Industrial Engineering and Management Science, Vol. 2, No. 4, December 2012.

[9] Komal Chawla1 and Bharti Tekwani1 (2013) "Studies Of Glass Fiber Reinforced Concrete Composites".

[10] K.Srinivasa Rao, S.Rakesh kumar, A.Laxmi Narayana " Experimental Studies on Steel Fiber Reinforced Concrete" American Journal of Engineering Research Volume-02, Issue-03, pp-20-26,Published 2013.

[11]J.A.O.Barros J.A.Figueiras C.V.D.Veen "The Use Of Glass Fiber–Reinforced Concrete As A Structural Material",Published 2007.

[12] Patil Shweta, Rupali Kavilkar " Study of Flexural Strength in Steel Fibre Reinforced Concrete" International Journal of Recent Development in Engineering and Technology Volume 2, Issue 5, May 2014.

[13] Chandramouli K., Srinivasa Rao P., Pannirselvam N., Seshadri Sekhar T.and Sravana P. "Strength Properties Of Glass Fibre Concrete" Journal of Engineering and Applied Sciences VOL. 5, NO. 4, APRIL 2010.