

Effects Of Glass Fibre On Concrete

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Abstract: This project was carried out to understand the effects of glass fibre on concrete. Glass fibres are available at cheaper cost in market. Glass fibre was added as an admixture to know its effects on concrete. To increase the life of structure, Glass Fibre reinforced concrete can be used. It is often known as GFRC. Various percentage of glass fibres were added in concrete and the results were compared with Plain Cement Concrete to understand the Effects of glass fibre on concrete. Concrete beams were casted and allowed to cure for 28 days. The result showed that addition of 1% of glass fibre increased the flexural strength of concrete, there were minimal or no changes noted in workability of concrete. On further addition of 2% of glass fibre, although the strength of concrete increased significantly but the workability of concrete decreased. It became very difficult to handle the concrete and carry out tamping process.

Keywords: Glass fibre, Effects, Flexural strength, Analysis

I. INTRODUCTION

GFRC or glass fibre reinforced concrete is best suited for construction work to be carried out at an economical cost. Glass fibre can easily be mixed with concrete and no additives are required for the mixing of glass fibre in concrete. It can be made available by variety of sellers. Glass fibres have also been started selling on e-commerce website and with a comfort of your desk, one can procure the need of glass fibre. Glass fibre makes concrete stronger similar to any steel reinforced concrete. Due to its economic cost, it does not affect the rise in construction cost. There are 2 main methods or techniques to manufacture GFRC – The Spray- Up process and Premix process.

II. LITERATURE REVIEW

Durga Chaitanya Kumar Jaagarapu concluded that workability of concrete increases at 1% and mentioned that the compressive strength, flexural strength and Split tensile stress increases at 1% and glass fibre- a waste product can be used in concrete. The compressive strength is very high at 1% at 7 days and 28 days testing. He also mentioned that on further addition of glass fibre, the workability of concrete decreases.

V. R. Sivakumar and O. R. Kavitha studied that including more extent of glass fibre in concrete reduces the workability of SCC. The outcomes show that fiber addition of glass fibre had no full-size effect at the compressive strength, however split tensile and flexural strength of GFSCC changed into elevated when dosage of glass fibers became accelerated this may be due to the bridging impact of concrete.

Sandeep L. Hake¹, S. S. Shinde, Piyush K. Bhandari, P. R. Awasarmal, B. D. Kanawade, concluded that Workability of SCC mix depends upon flow value of fresh concrete mix. Fiber addition has reduced the crack propagation in concrete making it more durable and sustainable for tensile stresses.

Abdul Rasheed, Anuj Verma, Mohd Rashid, mentioned as tensile and compressive strength increases with increase in percentage of glass fibre with respect to volume of concrete, marine and hydraulic structural elements can be provided with extra concrete cover supported by glass fiber, which makes it hard for elements that cause deterioration to reach the surface of steel reinforcements, preventing corrosion and increasing the life of concrete in these environments.

Akshaya Kumar Shukla, Dr. Bharat Nagar, shows that the concrete mix gets tougher and not as much of workable. Hence author deliberated 0.1 to 0.6% variation of glass fibres. The water absorption of the concrete decreases by the increase in fiber content.

Ms. Reshma T.V, shows a reduction in bleeding improves the surface integrity of the concrete as well improves its homogeneity and reduces the probability of cracks. It shows GFRC is Eco-friendly and economical compared to conventional mixed concrete.

III. PROJECT ANALYSIS**A. Effects Of Glass Fibre In Concrete**

Glass fibres are generally used in concrete to govern plastic shrinkage cracking and drying, shrinkage and cracking. Additionally they lower the permeability concrete and therefore lessen the bleeding of water. Some kinds of fibres produce more effect, abrasion and shatter resistance in concrete. Typically fibres do no longer increase the flexural strength of concrete, so it can not replace resisting moment or structural metallic reinforcement. A few fibres lessen the power of concrete.

The quantity of fibres added to concrete mix is measured as a percentage of general extent of the composite term 'extent fraction' (V_f). V_f is generally tiers from 0.1 to three%. Element ratio (l/d) is calculated by dividing fibre length (l) by it diameter (d). Fibres with non- circular pass section use an equal diameter for the calculation of thing ratio.

If the modulus of elasticity of fibre is higher than the matrix (concrete or mortar binder), they help to hold the burden by way of increasing the tensile electricity of the material. Some latest seek indicated that the use of fibres in concrete has constrained effect on the impact resistance of concrete substances. This finding is very critical considering that traditionally people suppose the ductility increases while concrete strengthened with fibres.

B. Apparatus Required For Project

- a) Trolley type weighing balance machine
- b) Vibrating machine
- c) Universal Testing Machine
- d) Beam Mould

C. Casting Procedure

- a) Preparation of material (sand, cement, aggregate, water).
- b) Proportioning of material consisting of water as according to amount derived.
- c) Weighing, all the materials as per quantity required.
- d) Mixing of concrete – Concrete blending is a manner of mixing the factor of concrete consisting of cement, sand, combination, water, and admixture collectively to make concrete of suitable grade. To make the distinct grades of concrete, mixing of concrete materials ought to be achieved nicely as in step with the mix layout of concrete to acquire the design power of concrete.
- e) Filling – The concrete was filled in beams in three different layers and after each layer the concrete was tamped with a tamping rod of 16mm in diameter, 0.6m long. Due to tamping all the air gaps are removed and it makes mix dense.
- f) Compaction – It is done by tamping and by vibrating on vibrating machine to achieve stable concrete with no air voids.
- g) Casting – Concrete was kept in beam mould for setting for 24 hours and after 24 hours, we de-moulded the beam mould and put it for curing for 28 days.
- h) Curing - After curing, flexural strength on beam is carried out on universal testing machine.
- i) Results - The results were noted down, necessary calculations are done and then results are displayed.

IV. CONCLUSION

It was found that addition of 1% of glass fibres can increase the flexural strength of beam as compared to plain cement concrete. We further added 2% glass fibres and to our surprise the flexural strength increased insignificantly however the workability of concrete was so affected that even addition of glass admixture did not help us in workability.

Thus, Fibres can increase the Flexural strength of concrete in a passive way eg : confining effect upto a certain range of fibre content.

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REFERENCES

- [1]. Durga Chaaitanya KumarJaagaarapu- American Journal of Engineering Research (AJER) e-ISSN: 2320-0847 p-ISSN : 2320-0936 Volume-5, Issue-5, pp-100-104
- [2]. B Vandevyvere¹ , Z Sierens¹ , E Verstryngne² , L Vandewalle² and J Li¹ - Effect of Glass Fibres on the Mechanical Behaviour of Concrete with Recycled Concrete Aggregates (RCAs).
- [3]. V. R. Sivakumar and O. R. Kavitha- An experimental study on combined effects of glass fiber and Metakaolin on the rheological, mechanical, and durability properties of self-compacting concrete
- [4]. JAMBOO KUMAR JAIN- EFFECT OF CHOPPED GLASS FIBERS ON THE STRENGTH OF CONCRETE TILES
- [5]. Eng. Pshtiwan N. Shakor*, Prof. S. S. Pimplikar- Glass Fibre Reinforced Concrete Use in Construction
- [6]. Patil Deogonda, Vijaykumar N Chalwa —Mechanical Property of Glass Fibre Reinforcement Epoxy Composites| International Journal of Scientific Engineering and Research (IJSER) ISSN (Online): 2347-3878, Volume 1 Issue 4, December 2013.
- [7]. Ban. Bakir, and Haithem. Hashem —Effect of Fibre Orientation for Fibre Glass Reinforced Composite Material on Mechanical Properties| International Journal of Mining, Metallurgy & Mechanical Engineering (IJMMME) Volume 1, Issue 5 (2013) ISSN 2320-4052; EISSN 2320-4060.
- [8]. R.Sakthivel, D.Rajendran —Experimental Investigation and Analysis a Mechanical Properties of Hybrid Polymer Composite Plates| International Journal of Engineering Trends and Technology (IJETT) – Volume 9 Number 8 - Mar 2014.
- [9]. Vinay H B, H K Govindaraju, Prashanth Banakar —Processing and Characterization of Glass Fibre and Carbon Fibre Reinforced Vinyl Ester Based Composites| IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | PISSN: 2321-7308.
- [10]. K. Devendra, T. Rangaswamy — Strength Characterization of E-glass Fibre Reinforced Epoxy Composites with Filler Materials| Journal of Minerals and Materials Characterization and Engineering, 2013, 1, 353-357.
- [11]. M.Manoj Kumar, R.Sathish, M.DineshKumar, M.Pradeep —Experimental Investigation on the Behaviour of Fibre Reinforced Composite Material| International Journal of Emerging Technologies and Engineering (IJETE) Volume 2 Issue 2, February 2015, ISSN 2348 – 8050.
- [12]. Prashanth Banakar , H.K. Shivanandz and H.B. Niranjana “Influence of Fibre Orientation and Thickness on Tensile Properties of Laminated Polymer Composites| International Journal of Pure and Applied Sciences and Technology ISSN 2229 – 6107
- [13]. T D Jagannatha and G Harish —Mechanical Properties of Carbon/Glass Fibre Reinforced Epoxy Hybrid Polymer Composites| International Journal of Mechanical Engineering and Robotics Research, ISSN 2278 – 0149 www.ijmerr.comVol. 4, No. 2, April 2015.
- [14]. Alok Hegde, R S Darshan, Fayaz Mulla, Md Shueb, M Rajanish — Tensile properties of unidirectional glass/epoxy composites at different orientations of fibres| Int. Journal of Engineering Research and Applications, ISSN : 2248-9622, Vol. 5, Issue 3, (Part -1) March 2015, pp.150-153.
- [15]. M. R. Sanjay, B. Yogesha —Studies on Mechanical Properties ofJute/E-Glass Fibre Reinforced Epoxy Hybrid Composites| Journal of Minerals and Materials Characterization and Engineering, 2016, 4, 15-25.
- [16]. F. K. Alves de Sousa, I. Ujike, and A. Kadota —Effect of Different Fibre Angles for Composite Material with Fibreglass Reinforced on Mechanical Properties| International Journal of Mining, Metallurgy & Mechanical Engineering (IJMMME) Volume 4, Issue 1 (2016) ISSN 2320–4060.
- [17]. Amit Kumar Tanwer —Mechanical Properties Testing of Uni-directional and Bi-directional Glass Fibre Reinforced Epoxy Based Composites| International Journal of Research in Advent Technology, Vol.2, No.11, November 2014E-ISSN: 2321-9637.
- [18]. Yunfu Ou , Deju Zhu , Huaian Zhang , Liang Huang , Yiming Yao, Gaosheng Li 1and Barzin Mobasher —Mechanical Characterization of the Tensile Properties of Glass Fibre and Its Reinforced Polymer (GFRP) Composite under Varying Strain Rates and Temperatures| Article MDPI.
- [19]. Dr. Jawad Kadhim Oleiwi, Dr. Emad Saadi Al- Hassani, Dr. Emad Saadi Al- Hassani —Experimental Investigation and Mathematical Modeling of Tensile Properties of Unsaturated Polyester Reinforced by Woven Glass Fibres| Engg. & Tech. Journal, Vol.3,Part(A) no.3,2014.
- [20]. Sathishkumar T P, Naveen J. —Glass fibre-reinforced polymer composites – A review| Article in Journal of Reinforced Plastics and Composites · June 2014.