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# Strength of concrete chopped Glass Fibers Tiles and effect of Glass Fiber

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***Abstract:** In this project we use the M-20 grade concrete designed as per IS 10262. finding the effects of the flexural strength, tensile strength and also the compressive strength. The aggregates which is used in this design was 20mm in size.*
*To study of compressive strength, flexural strength and tensile strength we cast the 6 cubes, 6 prism and 6 cylinders and tested it after the application of GFRC in the form of cement concrete tiles and in this process no special techniques was used for casting of tiles. The tiles thickness was 20mm and aggregate maximum size was 8mm. The water cement ratio was consistent and the some admixture content was varied from 8-1.5% to maintain slump in between 50mm-100mm.*
*The mix proportion was 1:1.78:2.66. the short fibers size were 30mm and the glass fibers were alkali resistant.*
*We carried out the effect of this short fiber on the compressive strength and also on water absorption. We cast six full size tiles 400mm*400mm*20mm and tested and result recorded.*

## I. INTRODUCTION

Concrete is the one of the most important building and the use of this material is increasing day by day in the entire world. The main reason of its most using is that it is cheap and easily availability. How ever it has some disadvantages just like brittleness and the poor resistance to crack opening. It have very low tensile strength and it also brittle material so therefore fibers are used for increasing tensile strength and for decreasing the brittleness. Till now variors experiments are have been done on fresh concrete as same as on hard concrete. But the basic material remains same and superplasticizers, admixture, are used for the increase and decrease the setting time and getting the workability and higher compressive strength.
Fibres which are applied for structural concretes are classified according to their material
As Steel fibres, Alkali resistant Glass fibres (AR), Synthetic fibres, Carbon, pitch and polyacrylonitrile (PAN) fibres.

## II. APPLICATIONS

The main area of FRC applications are as follows
*1)* Runway, Aircraft Parking and Pavements
*2)* Tunnel lining and slope stabilization
*3)* Blast Resistant structures
*4)* Thin Shell, Walls, Pipes, and Manholes
*5)* Dams and Hydraulic Structure
*6)* Different Applications include machine tool and instrument frames, lightingpoles,water and oil tanks and concrete repairs.

## III. ADVANTAGES AND DISADVANTAGES OF USING GLASS FIBERS IN CONCRETE

*A. Advantages*
*1)* Lighter weight
*2)* High flexural strength, high strength to weight ratio.
*3)* Toughness: GFRC doesn't crack easily-it can be cut without chipping.

*B. Disadvantages*
*1)* Durability: According to ACI 544.1R-96, *State of the Art Report on Fiber Reinforced Concrete*, "The strength of fully-aged GFRC composites will decrease to about 40 percent of the initial strength prior to aging." Durability can be increased through the use of low alkaline cements and pozzolans.
*2)* GFRC as a material, however, is much more expensive than conventional concrete on a pound-for-pound basis.

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## IV. PRESENT INVESTIGATION

The main purpose of the research is to findout the tensile strength, compressive strngth and flexural strength and other properties of GFRC. This study carried out on M20 grade concrete with 30mm size of glass fibers and content of fiber is varied from 0% - 0.3% of total weight of concrete. For study of this three properties no admixture was used.

The glass fiber effect on concrete tiles was studied that fiber content varied 0% - 0.7% of total weight of concrete. This tiles are used at various places because its heavy duty tiles aand also use for practical purpose.

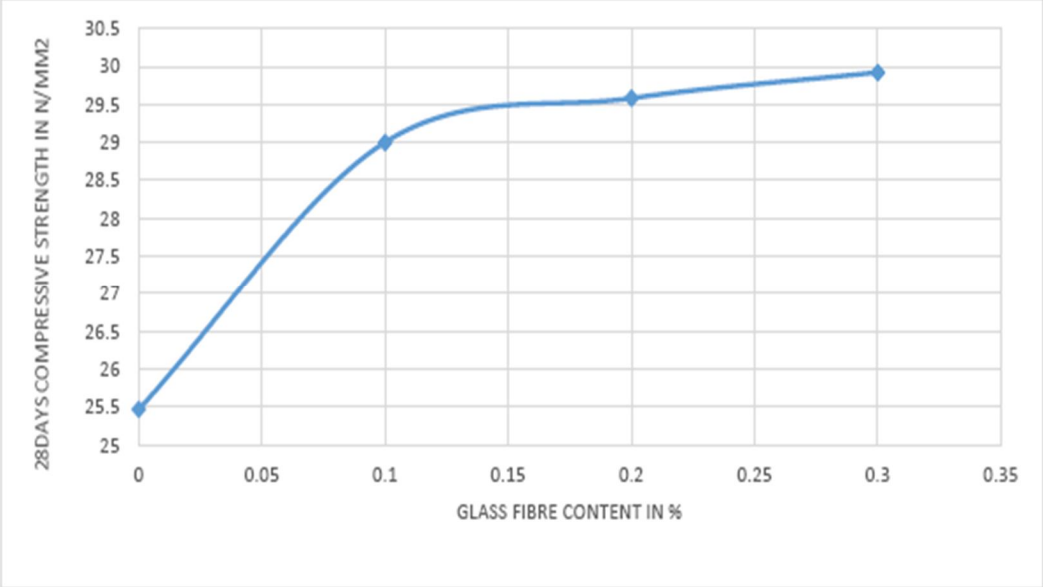
## V. RESULTS

### *A. Compressive Strength of Concrete (in N/mm2)*

The 28 days compressive strength was studied and the values of 3 samples studied are shown in the tabular form. Table 2 shows the data of 28 days compressive strength obtained. Table 2 gives the 28 days compressive strength of concrete with maximum nominal size of aggregates 20mm.The 28 days compressive strength was also plotted Fig3 by taking the average of this three values overall an increase in the compressive strength was observed with addition of fibers.

*Table 2 28 days compressive strength of concrete*

| Serial number | Without fibre | 0.1% | 0.2% | 0.3% |
|---|---|---|---|---|
| 1 | 25.33 | 28 | 28.88 | 30.22 |
| 2 | 25.77 | 31 | 28.88 | 28.88 |
| 3 | 25.33 | 28 | 31 | 30.66 |




Just lie Compressive strength test we did the

*1)* Split Tensile strength Test
*2)* Flexural Tensile strength Test
*3)* Water absorption of concrete Test

And come on the conclusion.

## VI. CONCLUSIONS

The impact of short discrete glass fibres on the compressive, split tensile, and flexural strengths of concrete was investigated in this experimental programme. Additionally, the impact of glass fibres on cement and vibration-produced concrete tiles is investigated. Compressive strength, wet transverse strength, and water absorption are the three parameters examined. With an increase in fibre concentration, the concrete mix becomes harsher and less workable, necessitating the application of an additive. However, proper workability could not be achieved even after administering dosages of admixture as high as 1.5%, and some segregation was seen. As a result, increasing the fibre content above 0.7% was not practicable.

The various observation based on the experimental result are as follows:

*1)* The presence of short discrete glass fibres with a fibre content in the range of 0.1% to 0.3% by weight of concrete had no effect on the compressive strength of concrete without additives.

*2)* The insertion of glass fibres boosts the concrete's split tensile strength.

*3)* The stress carrying capacity of concrete may rise in flexure because the flexural strength of concrete improves with an increase in fibre content.

*4)* The addition of fibres has been proven to boost the wet transverse strength of tiles.

*5)* As the fibre content of the concrete increases, so does its water absorption.

*6)* The presence of increasing amounts of fibres had a negative impact on the compressive strength of concrete with admixture, which remained unaffected up to 0.4% fibre content.

## REFERENCES

[1] Swami B.L.P. , “Studies on glass fiber reinforced concrete composites – strength and behaviour Challenges”, Opportunities and Solutions in Structural Engineering, 2010,pp-1-1

[2] Tonoli G.H.D., S.F. Santos,A.P. Joaquim,H. Savastano Jr “Effect of accelerated carbonation on cementitious roofing tiles reinforced with lignocellulosic fibre” Construction and Building Materials 24 (2010) 193–201

[3] Enfedaque .A, D. Cendon, F. Galvez , Sanchez-Galvez .V,“Failure and impact behavior of facade panels made of glass fiber reinforced cement(GRC)”. Engineering Failure Analysis 18 (2011) 1652–1663.

[4] Mohamed S. Issa, Ibrahim M. Metwally, Sherif M. Elzeiny “Influence of fibers on flexural behavior and ductility of concrete beams reinforced with GFRP rebars” Engineering Structures 33 (2011) 1754–1763.

[5] Sung-Sik Park “Unconfined compressive strength and ductility of fiber-reinforced cemented sand.” Construction and Building Materials 25 (2011) 1134–1138

[6] Majid Ali , Anthony Liu, Hou Sou, Nawawi Chouw “Mechanical and dynamic properties of coconut fibre reinforced concrete” Construction and Building Materials 30 (2012) 814–825

[7] Frank Schladitz , Michael Frenzel , Daniel Ehlig “Bending load capacity of reinforced concrete slabs strengthened with textile reinforced concrete” Engineering Structures 40 (2012) 317–326

[8] Shasha Wang, Min-Hong Zhang, Ser Tong Quek “Mechanical behavior of fiber-reinforced high-strength concrete subjected to high strain-rate compressive loading” Construction and Building Materials 31 (2012) 1–11

[9] Alberto Meda , Fausto Minelli, Giovanni A. Plizzari “Flexural behaviour of RC beams in fibre reinforced concrete” Composites: Part B 43 (2012) 2930–2937

[10] Funke H. , Gelbrich .S , Ehrlich .A “Development of a new hybrid material of textile reinforced concrete and glass fibre reinforced plastic” Procedia Materials Science 2 ( 2013 ) 103 – 110

[11] Xiangming Zhou, Seyed Hamidreza Ghaffar, Wei Dong, Olayinka Oladiran, Mizi Fan “Fracture and impact properties of short discrete jute fibre-reinforced cementitious composites” Materials and Design 49 (2013) 35–47

[12] Mohammad Sayyar , Parviz Soroushian “Low-cost glass fiber composites with enhanced alkali resistance tailored towards concrete reinforcement” .Construction and Building Materials 44 (2013) 458–463

[13] Gowri .R, Angeline Mary.M., “Effect of glass wool fibres on mechanical properties of concrete”. International Journal of Engineering Trends and Technology (IJETT) - Volume4 Issue7- July 2013.

[14] Foglar Marek, Kovar Martin. “Conclusions from experimental testing of blast resistance of FRC and RC bridge decks”. International Journal of Impact Engineering 59 (2013) 18e28

[15] Bonakdar .A, Babbitt F., Mobasher B. “Physical and mechanical characterization of Fiber-Reinforced Aerated Concrete (FRAC)” .Cement & Concrete Composites 38 (2013) 82–91

[16] Chanaka M. Abeysinghe, David P. Thambiratnam , Nimal J. Perera “Flexural performance of an innovative Hybrid Composite Floor Plate System comprising Glass–fibre Reinforced Cement, Polyurethane and steel laminate” Composite Structures 95 (2013) 179–190

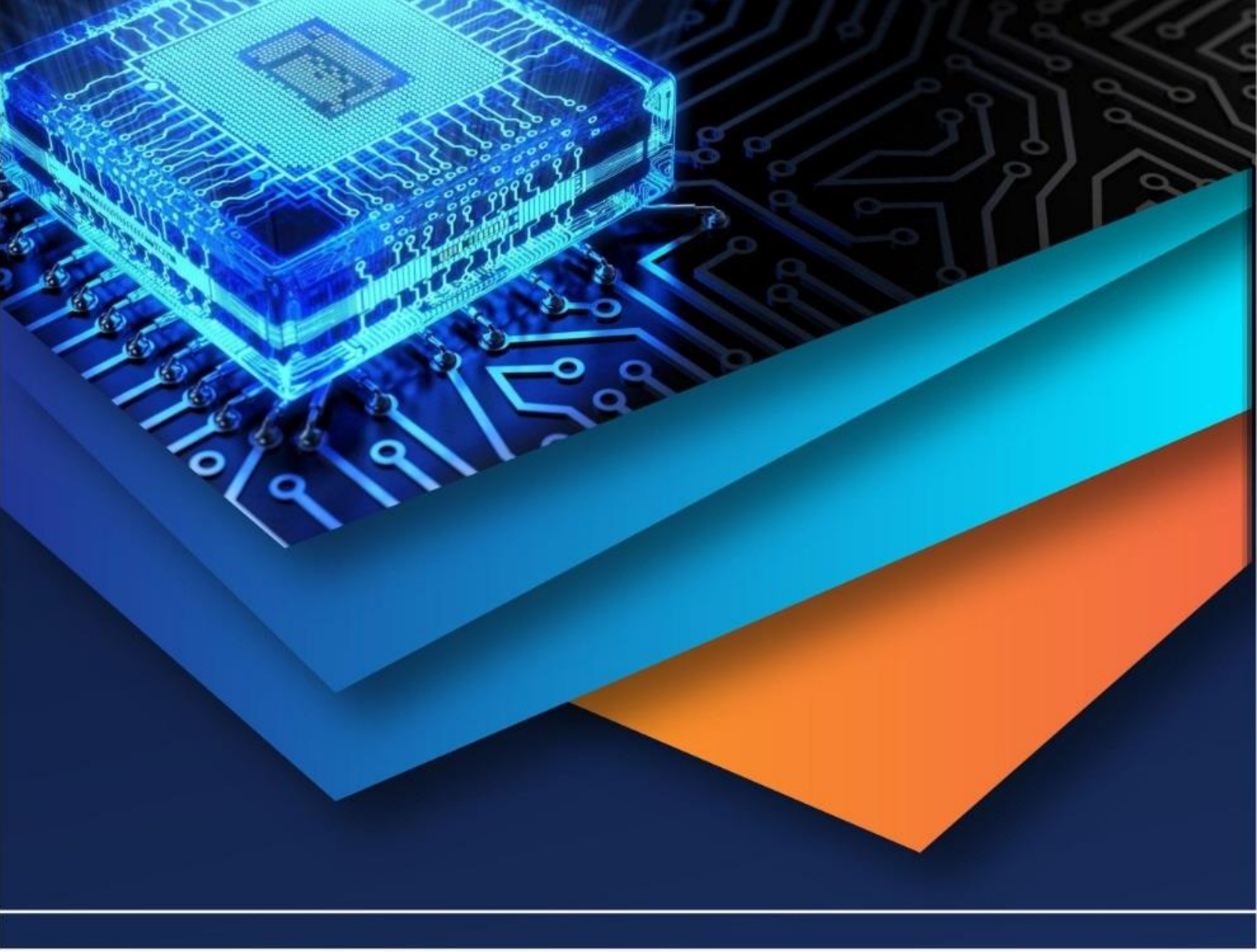
[17] Tassew S.T., Lubel A.S. ,“Mechanical properties of glass fiber reinforced ceramic concrete”. Construction and Building Materials 51 (2014) 215–224.

[18] Dey V., Bonakdar A., Mobasher B. “Low-velocity flexural impact response of fiber-reinforced aerated Concrete”. Cement & Concrete Composites 49 (2014) 100–110

[19] Pantelides C.P., Garfield T.T., Richins W.D., Larson T.K., Blakeley J.E. “Reinforced concrete and fiber reinforced concrete panels subjected to blast detonations and post-blast static tests”. Engineering Structures 76 (2014) 24–33.

[20] Agarwal Atul ,Nanda Bharadwaj ,Maity Damodar. “Experimental investigation on chemically treated bamboo reinforced concrete beams and columns”. Construction and Building Materials 71 (2014) 610–617

[21] Raphael Contamine, Angel Junes , Amir Si Larbi “Tensile and in-plane shear behaviour of textile reinforced concrete: Analysis of a new multiscale reinforcement”. Construction and Building Materials 51 (2014) 405–413



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