

Modified Glass Fiber Reinforced Concrete

Suresh Soni¹, Brijesh Shukhwal² and Manish Singh³

Department of Civil Engineering, Poornima Institute of Technology and Engineering, Jaipur

E-mail: ¹suresh.soni@poornima.com, ²2016pietcvbrijesh023@poornima.org,

³2016pietcvmanish034@poornima.org

Abstract—Modified glass fiber reinforced concrete (MGFRC) is a material made of cement, sand, aggregate & waste glass powder to reduce some amount of pozzolanic material in terms of fine glass powder in concrete and compare with other pozzolanic material as fly ash and silica.

The research showed the data as 15% and 30 % replacement of by silica fume, fly ash and glass powder gives light weight, fire resistance, good appearance and strength.

Various application of MGFRC showing the study, the experimental test result, techno economic composing with other type as well as the financial calculation presented.

The result data are based on approximation hence will vary a small amount in according to material and environment.

Keyword: Pozzolanic, fiber reinforced concrete.

1. INTRODUCTION

Modified glass fiber reinforced concrete (MGFRC) is a form of fiber reinforced concrete. It can use mainly for panels of building and as esthetical purpose. This material is better in shape on the front of any building in comparison of other materials and has less density than steel. MGFRC mainly consist of such as, cement, polymer, fine sand, water & other admixture. [1]

MGFRC have been used mainly to produce of thin sheet component, from a paste or mortar mix. Normally glass does not harm the environment in any way but it can harm animals & peoples because it is non-biodegradable also. It is a type of waste occupies the unnecessary space. It comes with the 100% recycle ratio of unused glass sheet, bottles to make into a form of powder and this decreased the environmental problem due to cement can be reduced. The reaction between coarse and fine glass aggregate can could cause alkali- silica reaction in concrete but the glass powder could sub press their Astringency. Therefore glass is used as a replacement of supplementary cementitious material. [1]

2. LITERATURE REVIEW

There are some points figured out from above review: Glass powders loose a proportion of their moisture when placed in Portland cement. In nominal mix of concrete of proportion 1:2:4 was developed for present study, hence the compressive strength test were conducted to monitor the strength

development of concrete content 15% & 30% of glass powder as cement replacement.[1]

The particle size effect the strength of 7 & 28 day cube so we have to monitor the (150-100) and (50-100) size of particle of glass the achieving desire strength.[2]

When cement or mortar concrete is splashed or brought into contact with glass powder etching occurs. The reason of etching is that alkali in cement attacks on the some silicates which are used in manufacture of glass Some test were conducted in 2 series as in 1st 30% of pozzolanic were used as particle replacement of cement & in 2nd series 15% of pozzolanic were used as particle replacement of cement. After it when we test (150 x 150 x 150 mm) cube the compressive strength of 7 & 28 days. [2]

During the strength gaining period the curing of specimen was done by damp melting method. For 24 hours from time of addition of water to other ingredients. The temperature range of temperature was maintained from 22°C to 32°C at the place of storage of specimen. After a period of 24 hours cube was taken out from the mould and marked. [2]

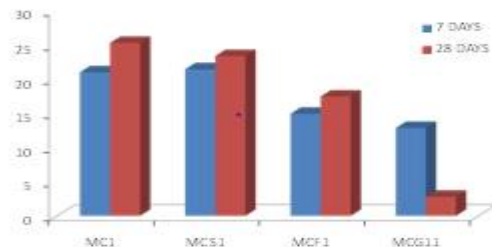


Figure No. 1: Compressive Strength 7 Days vs. 28 Days

3. METHODOLOGY

Waste glass show pozzolanic behavior under 100µm size.

The small particles in size of glass powder have higher reactivity with lime results higher compressive strength in concrete mix.

In comparison with fly ash concrete, fiber glass powder concrete had slightly early strength as well as late strength.

Micro structure examination shows that glass powder produces a denser matrix which improves durability property of concrete.

The coefficient of capillary absorption test also indicates that incorporation of timer glass powder improve durability.

The result obtained from the present study shows that there is great scope for the utilization of glass powder in concrete as replacement of cement and sand. [1]

Table No 1: Quantity of Materials

Material	Unit Price	
White Cement	11.50 Per Kg.	
Silica Sand	Rs 3.00 Per Kg	
Glass Waste	Rs 260 Per Kg	
Plasticizer	Rs 95 Per Kg	
S. B. R. Rubber	Rs 160 Per Kg	
Material	7 Days	28 Days
Normal Concrete	17.77	25.33
Glass Mixed Concrete	16.88	23.91
Fly Ash Cup	6.66	20.32

4. RESULTS

As seen from table 7 day, 28 day average compressive strength of concrete is maximum 17.77kn/m² to 25.33kn/m² and glass concrete is near to normal concrete material as 16.68kn/m² to 23.41kn/m². These results are nearly similar.

As per result expanding weight of glass fiber in ordinary solid, influences the cohesiveness between particles of cement.

Glass fiber does not effect on high performance concrete, it contains big gradation of coarse concrete so it leaves more voids between the particles and allows air to moves between.

The MGFRC has a good resistance towards tension. Due to this reason it is used as reinforcement in concrete. It increases

tensile strength of concrete. We simply can say that MGFRC is good alternative material of natural source, at their place where stones are costly or less available.

This material is environment friendly as it consumes less energy when it is produced. So it can be used to control pollution and production of CO₂ which is dangerous to environment.

MGFRC is good in placing, it gives aesthetic presentation and sharp vies. This material gives less expansion in cast of color of plaster or it can be used in indicate shape, curves and profiles. [2]

5. CONCLUSION

In the study here, the application of the glass fiber and powder as a strengthening material was investigated through various experimental works for durability, mechanical characteristics, strengthening effects and compressive strength. The glass fiber exhibited the compressive strength of concrete is maximum 17.77kn/m² to 25.33kn/m² and glass concrete is near to normal concrete material as 16.68kn/m² to 23.41kn/m². This result is nearly similar. The result increase in weight of glass fiber in normal concrete, affects the cohesiveness among particles of concrete. Glass fiber does not effect on high performance concrete. The MGFRC have a good resistance for tension that is the reason we choose reinforcement for concrete.

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