COMPARATIVE STUDY OF GLASS FIBRE REINFORCED CONCRETE & STEEL FIBRE REINFORCED CONCRETE

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Abstract—Concrete is a relatively brittle material, when subjected to normal stresses and impact loads. As a result, there is a characteristic that plain concrete members could not support loads and tensile stresses that occurred, concrete beams and slabs. The addition of steel reinforcement and glass reinforcement significantly increases the strength of concrete, and results of steel fibre reinforced concrete. The development of microcracks in concrete structure must be checked and glass fibre reinforced concrete has high tensile strength and fire resistance. The M20 grade of concrete are arrived with following ingredient such as cement, fine aggregate, coarse aggregate, water, steel fibre, glass fibre and superplasticizer. The variables in this study include the steel fibre (crimped) and glass fibre (alkali resistant) percentage in addition. The compressive strength of steel fibre and glass fibre reinforced concrete with the varying percentage of fibre of M20 grade of concrete.

Index Terms—Glass fibre, Steel fibre, Compressive strength.

I. 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. 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.

II. MATERIALS
- **Cement** Pozzolana Portland cement is used in the project work, as it is readily available in the local market. The cement used in the project work has been tested for various preparations as per IS: 4031-1988 and found to be conforming to various specifications of IS: 1489-1991.
- **Fine aggregate** Locally available river sand conforming to grading zone 2 of IS: 383-1970. Clean and dry river sand available locally will be used. Sand passing through IS 4.75mm sieve will be used for casting all the specimens.
- **Coarse aggregate** Crushed annular granite metal from a local source will be used as a coarse aggregate. The coarse aggregate used in the project work of 60% of 20mm aggregate and 40% of 10mm aggregate.
- **Glass fibre** It is the material made from extremely fine fibres of glass. It is a light weight, extremely strong and robust material. There are distinctive sorts of fibre however in these we have taken AE-glass fibre to show better resistance and a very good insulation to electricity.
- **Water** Water should be free from acids, oils, alkalies, vegetables or other organic impurities. Soft waters also produce weaker concrete. Water has two functions in a concrete mix. Firstly, it reacts chemically with the cement to form the cement paste in which the inert aggregates are held in suspension until the cement paste has hardened. Secondly, it serves as a lubricant in the mixture of fine aggregates and cement.
- **Steel fibre** Percentage volume fraction of fibres was varied from 0 to 2 % Crimped steel fibre of 0.75mm diameter with 60mm length is used and its aspect ratio is 80. Density of steel fiber is 7850Kg/m³.
- **Super plasticizer**: High range water reducing admixture of Cerahyperplast XR W40 having a specific gravity of 1.01-1.11 was used to maintain the workability of mix.

III. METHODOLOGY
The collection of material for the Glass fibre reinforced concrete and Steel fibre reinforced concrete are obtained for M20 concrete mixes were collected and casted. The conventional concrete was cured in water M20 Grade mixes were designated in accordance with IS:10262-2009. Conventional concrete was casted with M20 mix and made to water curing. Another set of cubes were casted using Glass Fibre and Steel Fibre of 0.5%, 1% and 1.5% with M20 concrete and allowed for water curing. Cubes were casted for 7, 14, 28 days for conventional concrete, Glass fibre and steel fibre to study the compressive strength. For this experimental study a total 63 cubes were casted for determine the strength. The specimens are taken from the water after 7, 14 days and 28 days and visual observation are made.
IV. RESULT AND DISCUSSION

The compressive strength of concrete at 7, 14 and 28 days curing of cube for M20 grade of concrete are given in the fig. The results show that there is increase in compressive strength in case of glass fibre reinforced concrete and Steel fibre reinforced concrete specimen when compared to conventional concrete.

![Graph showing compressive strength of conventional concrete](image1)

![Graph showing compressive strength of 0.5% glass fibre concrete](image2)

![Graph showing compressive strength of 1.0% glass fibre concrete](image3)

![Graph showing compressive strength of 1.5% glass fibre concrete](image4)
V. CONCLUSION
The following conclusions could be drawn from present investigation.
1. Max. compressive strength for M20 Grades of concrete was obtained by addition of 1.5%.
2. It is observed that compressive strength increases from 8 to 21% for 7 days, 6 to 12% for 28 days.
3. Workability of concrete increases by the use of steel fibre reinforced concrete.

VI. REFERENCES


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

