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Study On Strength Improvement Of Concrete Using Glass Fibre

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Abstract – *The construction field has experienced a growing interest in the advantages of glass fibre reinforcement in concrete. Between the different fibres available, e.g. steel, synthetic, glass, and natural fibres, steel fibre is probably the most investigated and most commonly used. Worldwide, a great deal of research is currently being conducted concerning the use of glass fibre as reinforcement in concrete. Light weight facilitates easy and rapid installation and also decreases the load applied on the structure. The light weight and tough material also minimizes the transportation cost, permits flexibility in design, and reduces the environmental impact. Superior strength enhances the ability to endure seismic loads. In the present experimental investigation, glass fibres has been used to study the effect on compressive, split tensile and flexural strength on M25 & M30 grades of concrete with varying percentage of glass fibre*

Keywords- ***Glass fibre, concrete, strength***

I- INTRODUCTION

Glass fibre reinforced concrete composites contain high strength glass fibres that are surrounded by a cementitious medium. In this shape, both the fibres and the environment maintain their natural individual chemical characteristics. However, the concrete produced has improved resultant properties that cannot be attained if either of the components is used individually. The glass fibres are the main elements that carry the load, while the enclosed matrix keeps the fibres in the preferred position and direction. The medium facilitates transfer of the load on the fibres, and shields them from the damage due to environment. Glass fibres can be integrated into the matrix either in constant or irregular lengths. The most widespread shape in which glass fibre reinforced composites are used in structural applications is known as laminate. This form is achieved by consolidating fine fibre layers and a matrix into the desired size. The orientation of fibre in each layer, and the stacking sequence of the layers, can be used to produce a range of mechanical properties of the composite materials.

Glass fiber reinforced concrete (GFRC) also called GRC or FRC is a cementitious, composite material, cast in thin shell shapes for use in construction. GFRC can be used wherever a light, strong, weather resistant, attractive and fire retardant material is required. GFRC can be used as wall panels, window surrounds, spandrels, column covers, soffits, cornices, brackets, quoins, railings, pilasters, copings, domes, etc. Landscape and hardscape uses include site furnishings, planters, bollards, urns, tables and fountains. GFRC is used in historical restorations and renovations, for the replication of building ornaments of terra-cotta, carved stone and even wood.[1]

II-MATERIAL & METHODOLOGY

Cement

OPC- 53 grade available in local market is used in the investigation. The cement used has been tested for various proportions as per IS: 4031-1988 and found to be conforming to various specifications of IS: 12269-1987. The specific gravity was 3.02 and the fineness was 3200 cm

Coarse aggregate
Crushed angular stone from a local source was used as coarse aggregate.

Fine aggregate
Wainganga River sand was used as fine aggregate. The specific gravity and fineness modulus was 2.55 and 2.93 respectively.

Glass fibre properties
- Density-2.6T/m3
- Elastic Modulus– 73GPa
- Tensile strength– 1700MPa
- Filament diameter- 14µ
- Specific Gravity– 2.6
- Length– 12mm
- Aspect ratio-857.1
- Sp. Surface area– 105m2/kg
- No. of fibres– 220millions per Kg

Test specimens Test specimens consisting of 150×150×150 mm cubes for Compressive strength, 150mmΦ, 300mm length cylinders for split tensile strength and 150×150×700 mm beams for flexural strength using different percentage glass fibre for M25 grade of concrete mix were cast and tested as per IS: 516 and 1199.

Table 1- Compressive strength for M25 grade of concrete mix with different % of glass fibre (N/mm 2).

No. of days	Ordinary concrete	with 0.15% GF	with 0.30% GF	with 0.45% GF
7	21.66	23.33	25.66	25.66
28	26.66	28.36	29.66	29.9

Table 2- Split Tensile l strength for M25 grade of concrete mix with different % of glass fibre (N/mm 2).

No. of days	Ordinary concrete	with 0.15% GF	with 0.30% GF	with 0.45% GF
7	4.62	5.1	5.2	5.25
28	5.9	6.3	6.4	6.45

Table 3- Flexural strength in for M25 grade of concrete mix with different % of glass fibre (N/mm 2)

No. of days	Ordinary concrete	with 0.15% GF	with 0.30% GF	with 0.45% GF
7	3.35	3.33	3.66	3.66
28	4.5	5.36	5.66	5.9

III- RESULT

Table-1 gives 28 days compressive strength for M25 grade of concrete mixes with different % of glass fibre and their values are observed to be varied from 28.36 to 28.9 N/mm 2

Table-2 gives 28 days Split Tensile strength for M25 grade of concrete mixes with different % of glass fibre. These values are observed to be varied from 6.3 to 6.45 N/mm 2

Table-3 gives 28 days Flexural strength for M25 grade of concrete mixes with different % of glass fibre and the values are observed to be varied from 5.36 to 5.9 N/mm2.

CONCLUSION

1) The increase in compressive strength for M25 grade of concrete mixes at 28 days is observed to be 10 to 12%.

2) The flexural and split tensile strength for M25 grade of concrete mixes at 28 days is observed to be 15% to 20%.

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