

EFFECT OF FIBER REINFORCED CONCRETE ON STRENGTH PARAMETERS OF M30 CONCRETE

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Abstract: *This paper deals with an experimental investigation on the influence of polyester and glass fibers on strength parameters of the M30 concrete used in construction. In this study two types of concrete mixes were prepared individually. Polyester fiber of 0.1% to 0.4% and Glass fiber of 0.1% to 0.3% by weight of cement were added to the mixes. A comparative analysis has been carried out for conventional concrete with respect to the fiber reinforced in relation to their Compressive, Spilt tensile and Flexural Strength properties. As the Fiber content increases Compressive, Spilt tensile and Flexural Strengths are proportionally increasing. It is observed that fibers increased beyond 0.3% polyester fiber and 0.2% glass fiber content results in decrease in strengths. Economic analysis is indicating that with the addition of polyester and glass fibers increases in economy leads to higher initial cost by 8 to 11% is counterbalanced by the reduction in maintenance and rehabilitation operations by using Fiber Reinforced Concrete as compared to that of Conventional Concrete.*

Key Words: *F.R.C (Fiber Reinforced Concrete), P.R.C (Polyester fiber Reinforced concrete), G.R.C (Glass Fiber Reinforced concrete), C.C (convectional concrete), Mix design, Compressive Strength, Spilt tensile Strength and Flexural Strength. SSR (Standard Schedule of Rates).*

I. INTRODUCTION

In modern times a wide range of engineering materials(including ceramics, plastics, cement and gypsum products) incorporate fibers to enhance composite properties. The enhanced properties include tensile strength, compressive strength, elastic modulus crack resistance, crack control, durability, fatigue life, resistance to impact and abrasion, shrinkage, expansion, thermal characteristics, and fire resistance. The strength and durability of concrete can be changed by making appropriate changes in its ingredients like cement material, aggregate and water and by adding some special ingredients. Hence concrete is very well suited for a wide range of applications. However concrete has some deficiencies as low tensile strength, low post cracking capacity, brittleness and low ductility, limited fatigue life, not capable of accommodating large deformations, low impact strength. Fiber Reinforced Concrete (FRC) is a cementing concrete reinforced mixture with more or less randomly distributed small fibers. In the FRC, a number of small fibers are dispersed and distributed randomly in the concrete at the time of mixing and thus improve concrete properties in all directions. The fibers help to transfer load to the internal microcracks. FRC is cement based material that has been developed in recent year's. It has been successfully used in

construction with its excellent flexural – tensile strength, resistance to spitting, impact resistance and excellent permeability and frost resistance. It is an effective way to increase toughness, shock resistance and resistance to plastic shrinkage cracking of the mortar. These fiber's have many benefit's.

II. FIBER REINFORCED CONCRETE (F.R.C)

Fiber Reinforced Concrete is the type of concrete which contains Fibrous materials which increases its structural integrity. It contains short discrete fibers that are uniformly distributed and randomly oriented. Fibers include steel fibers, polypropylene fibers, glass fibers, natural fibers. With in these different fibers, that character of fiber reinforced concrete changes with varying concretes, fiber materials, geometrics, distribution, orientation and densities. In Fiber Reinforced Concrete, fibers can be effective in arresting cracks at both macro and micro levels.

Polyester Fiber Reinforced Concrete (P.R.C)

Polyester fibers are available in monofilament form and belong to the thermoplastic polyester group. They are temperature sensitive and above normal service temperature their properties may be altered. Polyester fibers are somewhat hydrophobic. Polyester fibers have been used at low contents (0.1%) to control plastic shrinkage cracking in concrete.



Polyester fiber

Glass Fiber Reinforced Concrete (G.R.C)

Glass fiber is available in continuous or chopped lengths. Fiber lengths of up to 35-mm are used in spray applications and 25-mm lengths are used in premix applications. Glass fiber has high tensile strength (2- 4Gpa) and elastic modulus (70-80Gpa) but has brittle stress-strain characteristics and low creep at room temperature. Claims have been made that up to 5% glass fiber by volume has been used successfully in

sand-cement mortar without balling.



Glass fiber

Tests on materials:

Laboratory tests were conducted to know the properties of cement, fine aggregate and coarse aggregate and those are discussed below:

Tests on Cement

- Cement used in the present project is of 53 grade Ordinary Portland Cement. Various physical tests like specific gravity, fineness, normal consistency, initial & final setting time, soundness on cement as per IS 4031.

Specific Gravity

- Specific gravity of cement used is 3.15.
- The specific gravity of cement as per IS requirements is in between 3-3.5.

Fineness of Cement

- Fineness of cement is tested by sieving of cement.
- Fineness of cement is 93.5%.
- The residue of cement should not exceed 10% by mass as per IS 4031: 1968.