

EXPERIMENTAL STUDY ON MECHANICAL AND DURABILITY PROPERTIES OF HIGH STRENGTH CONCRETE USING STEEL FIBRE

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Abstract-The dissertation work is to study the influence of GGBS and STEEL FIBRE in achieving High strength fibre reinforced concrete (HSFRC). High strength concrete requires high amount of cement compared to the nominal grade. Several research works have been carried out in past decades limiting to admixtures which provide the pathway to identify supplementary cementitious material. This study investigates the performance of various mixtures which are addition with cement includes GGBS and SILICA FUME 10% with STEEL FIBRE 0%, 1%, 1.5%, 2% respectively. Manufactured sand is used instead of river sand. The employment of manufactured sand in concrete is gaining momentum recently. Con-plast SP430 of 1.5% for every specimen is used in order to improve the workability of the mix. Specimens are casted for M60 grade as per mix design. Concrete specimens are tested for mechanical properties which includes Compressive strength test, Split tensile strength and Flexural strength test. Durability test includes, Water absorption test. The testing is done as per Indian standards and curing process is done under normal water conditions. The maximum compressive strength obtained in 28 days 69.5 N/mm².

Key Words: steel fibre (SF), GGBS, Silica Fume,

1. INTRODUCTION

The term high-strength concrete is generally used for concrete with compressive strength higher than 60Mpa. When added to concrete mixes, steel fibres distribute randomly through the mix at much closer spacing than conventional reinforcing steel. Depending on their aspect ratio, fibres act to arrest cracking by decreasing the stress intensity factor at the tip of inherent internal cracks. The main purpose of the tests is to examine the effect of fibre addition on the shear strength concrete.

2. SPECIAL MATERIAL USED

2.1 GGBS

Ground Granulated Blast Furnace Slag is a by-product from the blast-furnace used to make iron. These operate at a temperature of about 1500 degrees centigrade and are fed with a carefully controlled mixture of iron-ore, coke and lime-stone.

Table 1.1 Properties of GGBS

Properties	Test results
Specific gravity	2.9
Bulk density	1200 kg/m ³
Fineness	>350m ² /Kg

2.2 SILICA FUME

Silica fume is a finely-divided mineral admixture, available in both un-compact and compacted forms. The ultra-fine material will better fill voids between cement particles and result in very dense concrete with higher compressive strength and extremely low permeability. It is an artificial Pozzolanic material.

Table 1.2 Properties of silica fume

Properties	Test results
Specific gravity	2.2
Bulk density	1350-1510 kg/m ³
Fineness	15000 m ² /Kg

2.3 STEEL FIBRE (CRIMPED FIBRE)

Steel fibre (SF) is small piece of reinforcing material introduced in concrete to increase its tensile strength. Steel fibers have been given more and more attention for its better performance of crack controlling and preventing deadly flaws. The crimped steel fibers are made of either carbon steel or stainless steel. They are quite rigid materials and this rigidity imposes mechanical properties of High Strength Fibre Reinforced Concrete

Table 1.3 Properties of steel fibre

Properties	VALUE
Fibre Diameter(mm)	0.45
Fibre length (mm)	40
Aspect ratio l/d	80
Ultimate tensile Strength (Mpa)	910
Elastic Modulus(Gpa)	210

