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Slurry Infiltrated Fibre Concrete Mechanical Performance

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Introduction

Concrete has a low resistance to cracking, a low tensile strength, and a low ductility. Traditional reinforced bars are used to increase the tensile characteristics of concrete members. These add tensile strength to concrete members without increasing the concrete's intrinsic tensile strength. The addition of small, tightly spaced, and uniformly dispersed fibres to concrete has long been known to work as a crack arrester and improve the static and dynamic properties of the material. The mechanical parameters of SIFCON specimens, such as compression strength, split tensile strength, flexural strength, flexural toughness, and stress – strain characteristics, are examined in this study and then compared to conventional FRC and conventional concrete.

Concrete has a low tensile strength and ductility, making it susceptible to cracking. To improve the tensile characteristics of concrete members, traditional reinforced bars are used. These increase the tensile strength of concrete members without increasing the intrinsic tensile strength of the concrete. Small, closely spaced, and uniformly dispersed fibres added to concrete have long been known to act as a crack arrester and improve the material's static and dynamic properties. This study examines the mechanical properties of SIFCON specimens, such as compression strength, split tensile strength, flexural strength, flexural toughness, and stress-strain characteristics, and compares them to conventional FRC and conventional concrete.

Description

Slurry Infiltrated Fibrous Concrete is a unique type of fibre reinforced concrete. It differs from traditional fibre reinforced concrete in two ways. They are the fiber's production process and substance. Fiber content in FRC is lower than in SIFCON; fibre content in FRC typically ranges from 0.5 to 2 percent by volume, but fibre content in SIFCON can range from 5 to 12 percent. SIFCON is made in a unique way due to its high fibre content. Fibers are introduced to the wet or dry mix of the concrete during mixing in FRC, but cement slurry is infiltrated into a bed of preplaced fibres in SIFCON.

The fibres can also be injected directly into the cement sand slurry. SIFCON has proven to be effective in constructions that have been subjected to blast and dynamic loads. The composite's high ductility and impact resistance make it ideal for structural components that must withstand high impact forces while also being ductile, such as explosive storage cabinets, blast-resistant doors, high-security vaults, and missile silo structures. It's also great for precast applications where traditional reinforcement methods aren't working.

SIFCON is a pre-casting technology in which fibres are placed in a mould or on a substratum and then infiltrated with cement-based slurry. Fibers can be strewn by manually or with fiber-dispensing machines. Fiber aspect ratio, fibre geometry, and placement technique all influence the amount of fibre that can be included.

The materials utilised in this study of Fiber Reinforced Reactive Powder Concrete are listed below. The steps involved in preparing SIFCON specimens are listed below:

- Form preparation, i.e. substrates
- The steel fibres' placement
- Getting the SIFCON slurry ready
- Slurry infiltration through the packed steel fibre bed
- The process of curing

Slurry penetrated fibre concrete mix design based on packing density. Ordinary Portland cement, 2 mm fine sand from a river, Metakaolin, fly ash, superplasticizer, and steel fibres Metakaolin and fly ash have been used to substitute cement in percentages of 5, 7.5, and 10%. On the volumetric replacement for 2, 3, and 4%, a fibre has been pre-placed in the mould. Throughout the experimental work, one part of binding material, including pozzolanic material and cement, and one part of fine sand were used in the ratio of one part binding material, including pozzolanic material and cement, to one part fine sand.

As per mix proportion of slurry infiltrated fiber concrete is divided into two part one part is FASIFCON (that is fly ash slurry infiltrated fiber concrete) and the second part is MKSIFCON (that is Metakaolin slurry infiltrated fiber concrete). Seventy-two cubic specimens with dimensions of 100 ×100 ×100 mm3 were cast and tested to determine the compressive strength of slurry infiltrated fiber concrete including fly ash and Metakaolin [1-5].

Conclusion

FASIFCON (fly ash slurry infiltrated fibre concrete) and MKSIFCON (mix proportion of slurry infiltrated fibre concrete) are the two parts of the slurry infiltrated fibre concrete mix (that is Metakaolin slurry infiltrated fibre concrete). To assess the compressive strength of slurry penetrated fibre concrete containing fly ash and Metakaolin, 72 cubic specimens with diameters of 100 100 100 mm3 were cast and tested. A high range water reduction agent has been employed to increase the workability of CONPLAST SP-430 in slurry that conforms to ASTMC494 type- F. By the way, the addition of superplasticizer is 1%.

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