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Research Article

SLURRY INFILTRATED FIBROUS CONCRETE (SIFCON)

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ABSTRACT
SIFCON is a high-strength, high-performance material containing a relatively high volume percentage of steel fibres as compared to SFRC. It is also sometimes termed as 'high-volume fibrous concrete'. The origin of SIFCON dates to 1979, when Prof. Lankard carried out extensive experiments in his laboratory in Columbus, Ohio, USA and proved that, if the percentage of steel fibres in a cement matrix could be increased substantially, then a material of very high strength could be obtained, which he christened as SIFCON .

INTRODUCTION
In conventional SFRC, the steel fibre content usually varies from 1 to 3 percent by volume, it varies from 5 to 25 percent in SIFCON depending on the geometry of the fibres and the type of application. SIFCON is made by infiltrating a low-viscosity cement slurry into a bed of steel fibres 'pre-packed' in forms/moulds. .

MATERIALS AND METHODS
The matrix in SIFCON has no coarse aggregates, but a high cementious content. However, it may contain fine or coarse sand and additives such as fly ash, micro silica and latex emulsions. The matrix fineness must be designed so as to properly penetrate (infiltrate) the fibre network placed in the moulds, since otherwise, large pores may form leading to a substantial reduction in properties.
A controlled quantity of high-range water-reducing admixture (super plasticizer) be used for improving the characteristics of SIFCON. All types of steel fibres, namely, straight, hooked, or crimped can be used Proportions of cement and sand generally used for making SIFCON are 1: 1, 1:1.5, or 1:2. Cement slurry alone can also be used for some applications. Fly ash or silica fume equal to 10 to 15% by weight of cement is used in the mix. The water-cement ratio varies between 0.3 and 0.4, while the percentage of the super plasticizer varies from 2 to 5% by weight of cement. The percentage of fibres by volume can be any where from 4 to 20%, even though the current practical range ranges only from 4 to 12%.

RESULT AND DISCUSSION
Uniaxial Tensile Strength
Unlike the cracks which form in continuous reinforced cementitious composites such as ferrocement, the cracks in SIFCON do not extend through the whole width of the specimen. Instead, they can be short and randomly distributed within the loaded volume, i.e. on the surface and through the depth of the specimen. The ultimate tensile strength of SIFCON typically varies from 20 to 50 MPa, depending on the percentage of steel fibres and the mix proportions used.

Compressive Strength
The cement slurry (without fibres) used in the making of SIFCON generally develops a one-day strength of 25 to 35 MPa, and a 28-day strength of 50 to 70 MPa. The corresponding values for SIFCON composites are 40 to 80 MPa and 90 to 160 MPa, respectively, depending on the percentage of steel fibres incorporated in the matrix. SIFCON exhibits an extremely ductile behavior under compression.

Flexural Strength

The values observed range from 25 to 75 MPa with an average of about 40 MPa. SIFCON is found to possess excellent ductility both under monotonic and high-amplitude cyclic loading.

Shear Strength

SIFCON specimens were 30.5, 28.1, 33.3 and 31.8 MPa, respectively, for fibre lengths of 30, 40, 50 and 60 mm, indicating thereby that the fibre length does not seem to affect the shear strength. The average shear strength of SIFCON can be taken as about 30 MPa as compared to just about 5 MPa for plain concrete.

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