International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 4, Issue 12, December-2018

A TYPICAL REVIEW IN PROPERTIES OF REINFORCED CONCRETE INCORPORATED WITH STEEL FIBERS

Vennam Swathi, Dr. N Ruben

Department of Civil Engineering, VFSTR (Deemed to be University), Vadlamudi-AP.

Abstract:- Fiber Reinforced concrete has been widely used in civil Engineering. Fiber reinforcement is increased to improve the strength and durability of concrete. This paper represents the results from an experimental and analytical assessment of the influence and addition of steel fibers and mechanical properties of concrete. The various strength properties is cylinder compressive strength, tensile strength and volume fraction of the fiber. The strength of steel fiber reinforced concrete using the proposed models have been compared with the test data and present study and various other tests in the literature. The compressive strength of the concrete mixes was obtained from cylinder tests. The experimental findings to indicate the addition of steel fibers in concrete can slightly enhance the compressive strength, Tensile strength and modules of elasticity of the steel fiber reinforced concrete.

Keywords: Compressive strength, Tensil Strength, Steel fibers, Reinforced concrete.

Introduction

Fiber reinforced concrete defined as a composite materials made with Portland cement, aggregate and incorporating discrete discontinues fibers and which increases it's structural integrity continuous meshes, worn fabrics are not considered the discrete fibers. Generally fibers are steel fibers, glass fibes, synthetic fibes and natural fibers, so these are commonly applied to make the industrial floors and airport runways. The fiber element expose to dynamic loads, steel fiber reinforced concrete has ability to the excellent tensil strength and arrest the cracks. The tensil strength skin to cover the steal reinforced when a more efficient two-dimensional orientation of the fibers obtained. The fiber reinforcement used inthe three-dimensional randomly distributed fibers throughout the structural numbers when they added of fibers to control the shear resistance and cracks. It can be further utilised steel fibers with different yield strength are available in various shapes and sizes which improves te mechanical properties of the concrete in a wide range. Addition of the concrete generally steel fibers are available in various shapes, they are straight, crimped, hooked single, hooked, collected and twisted. It had been clearly demonstrated the hooked fibers performs better than straight and crimped steel fibers in terms of flexible strength and energy absorption capacities.

Fig.1 Steel Fibers in Reinforced Concrete

Materials

In these tests covered in three series of concretes accordingly BZS, BZI,BZ3. These concretes are made up in Portland, Cement, Aggregate gravel, Sand, Super plasticizer and Water. The maximum size of aggregate in these concrete in 16 mm composition of concrete is examined and different quantities of used dispersed Reinforcement.

For the concrete sizes BZI and BZ3, steel fibers are added in the dimensions of 1mm/50mm in the quantity, according 1% and 3 % are composed to concrete mass on the others, concrete of BZS series are treated in the "witness" concrete and consequently depressed reinforcement was not used steel fibers are mixed in the last stage concrete samples are started in 28 days of the climate chambers at the temperature (18°c) and the relative air humidity 95% and they are stored in dry air condition until the test.

S.No	Composition	Quantity Kg/m^3
01	Sand (0-2 mm)	630
02	Multi Fraction Gravel (2-8)	527
03	Single Fraction Gravel (2-8)	724
04	Cement	325
05	Water	162
06	Super Plasticizer CHRYSO Fluid C E	3.25
07	Steel dispersed fiber	According to assumption

Composite specification for the designed concrete mix of the tested concrete.

Methods

Acoustic Emission Method:

In these tests by means of samples are prepared, and the dimensions 50 x 50 x 100 mm, and the longer test elements. As they are being compressed and acoustic emission descriptions are noted. Compressions are performed without friction and strength test plates interface. For this purpose the surfaces involved are polished and mutually parallel with an accuracy 0.05 and then lubricated with grease. During the immediate compression of samples, the recorded descriptions of acoustic emission of the function of time were the events rate and effective value RMS [16].

Deformation Measurement Method:-

In these destructive tests, with the use of the deformation measurement method of cylinder samples and the dimensions of 150 x 30 mm. For measurement of deformations are accomplished by means of MGC plus measuring system. Deformation tens metric transducers. By using tens meters were stuck on two opposite walls parallel to the axis of the compressing force impact. The testing procedure consisting of load samples in the static manner. It was provided with the speed of 0.5µ m/s. As a result tests values are obtains from both opposite walls of the samples are averaged.

Mechanical Properties of Steel Fibers:

In these major Properties of the steel fibers are:

1. Compressive strength.
2. Tensile strength.
3. Poisson's Ratio.
4. Modules of Elasticity.

Compressive strength:

In the test results of the compressive strength (f^1_{cuf} and f^1_{cyp}) have been compared with the corresponding predicted strength. The comparison indicates that the proposed compressed strength model and the cube compressive strength. Fibers do little to enhance the specific the static compressive strength of concrete and increase the strength ranging from essentially perhaps 25% and fibers are substantially increases.

Tensil strength:

In these tensil strength namely steel fiber reinforced concrete, tensil strength and modules of elasticity from the test results with the corresponding predictions from models. The high magnitude has been predicted for the Tensil strength reposted to the various investigations may be due to the difference in degree of compaction mix proportions, loading rate in the test procedure.

$$\mathbf{Fspc = 0.55\ \sqrt{f^1}_{cy}\ for\ 40\ mpa \quad < f^1\ cy\ < 90\ mpa}$$

$$\mathbf{Fn = 08.3\sqrt{f^1}\ cy\ for\ 40\ mpa \quad < f^1\ cy\ <90\ mpa.}$$

Poisson's Ratio:

In thses test results with the corresponding value predicted using models reported in table. It indicates the passion ratio accurately. It is reporting on the passions ratio concrete is limited and the value is 65 mpa grade concrete and 0.26for plain reinforced concrete which is slightly higher value. The variation may be due to difference aggregate proposition, aggregate size and variation of the loading.

Modules of Elasticity:

The predicted value of the modules of elasticity of (SFRC) has been composed with the experimental results is presented and predicted test result accurately. The modules of elasticity of plain concrete are in good agreement and model proposed in the study.

$$\mathbf{E_c = 0.82x4.7\ \sqrt{f^1}_{cy} = 3.8\ \sqrt{f^1}_{cy}\ (Gpa)\ for\ 55mpa < f^1_{cy} < 125\ mpa.}$$

Conclusions:

In this present study following conclusions are noted.

→ The maximum increase in compressive strength due

to the addition of steel fibers found to be small (less then10 %) in various grades of concrete (35, 65 85 mpa).

→ The maximum increase in Tensil strength and modules of rupture due to the adding of steel fibers found to be about 40 % in various grades of concrete.

→ It is to justify for using fibers in concrete and post – cracking response is significantly enhanced with fiber dosages across the different concrete grades.

→ The maximum increase in strain corresponding the compressive strength was found to be about 30 % and to enhanced the strain capacity is derived from the use of fibers.

→ The test proved that concrete being compressed it is not possible to determine the level of stresses initiating cracking "ơ".

→ As the result of reinforcement of the concrete structure with polymer inclusion and destruction is test.

→In addition the level of critical stresses for concrete saturated with higher than for witness concrete.

Reference:

1) Agrawal, R., Singh, A. K., and Singhal, D. _1996_. "Effect of fiber reinforcing index on compressive strength and bond strength of steel fiber reinforced concrete." *Institute of Engineers (India)*, 77_1_, 37–40.

2) Ashour, S. A., Wafa, F. F., and Kamal, M. I. _2000_. "Effect of concrete compressive strength and tensile reinforcement ration on the flexural behavior of fibrous concrete beams." *Eng. Struct.*, 22_9_, 1145–1158.

3) Bureau of Indian Standards _BIS_. _1959_. "Methods of test for strength of concrete." *IS: 516*, BIS, New Delhi, India.

4) Bureau of Indian Standards _BIS_. _1982_. "Recommended guidelines for concrete mix design." *IS: 10262*, BIS, New Delhi, India.

5) Bureau of Indian Standards _BIS_. _1999_. "Splitting tensile strength of concrete: Method of test." *IS: 5816*, BIS, New Delhi, India.

6) Gao, J., Sun, W., and Morino, K. _1997_. "Mechanical properties of steel fiber reinforced high strength light weight concrete." *Cem. Concr.Compos.*, 19, 307–313.

7) Ghosh, S., Battacharya, C., and Ray, S. P. _1989_. "Tensile strength of steel fiber reinforced concrete." *Institute of Engineers (India)*, 69_1_, 222–227.

8) Hannant, D. J. _1978_. *Fibre cements and fibre concretes*, Wiley, New York.

9) Hueste, M. B. D., Chompreda, P., Trejo, D., Cline, D. B. H., and Keating, 2004_. "Mechanical properties of high strength concrete for prestressed members." *ACI Struct. J.*, 101_4_, 457–465.

10) Irvani, S. _1996_. "Mechanical properties of high performance concrete." *ACI Mater. J.*, 93_5_, 416–426.

11) Oh, B. H. _1992_. "Flexural analysis of reinforced concrete beams containing steel fibers." *J. Struct. Eng.*, 118_10_, 2821–2836.

12) Padmarajaiah, S. K. _1999_. "Influence of fibers on the behavior of high strength concrete in fully/partially prestressed beams: an experimental and analytical study." Ph.D. thesis, Indian Institute of Science, Bangalore, India.

13) Song, H. W., and Hwang, S. _2004_. "Mechanical properties of high strength reinforced concrete." *Constr. Build. Mater.*, 18, 669– 673.

14) Taerwe, L. R. _1992_. "Influence of steel fibers on strain softening of high strength concrete." *ACIMater. J.*,89_1_,54–60