International Journal of Enhanced Research in Science, Technology & Engineering
ISSN: 2319-7463, Vol. 5 Issue 8, August-2016

Experimental Study on Strength Characteristics of Concrete Mix in 28 Days by Using Polyester Fibre with Super plasticizer

Ajay Bansal[1], Parveen Berwal[2]

[1]M.Tech Student, Department of civil Engineering, INDUS Institute of Engineering and Technology, Kinana, Jind, Haryana, India
[2]Asistant Professor, Department of Civil Engineering INDUS Institute of Engineering and Technology, Kinana, Jind, Haryana, India

ABSTRACT

In last few years there has been significant growth in the construction of Roads and various other Civil Engineering projects. Addition of Admixtures and various other materials in concrete has become an important phenomenon to get higher strength of concrete with the same proportion of material at cheaper rate. This work focuses on the comparison of compressive strength of cube, flexural strength of beam and splitting tensile strength of cylindrical specimen of normal M20 grade concrete with the addition of polyester fibre with super plasticizer in the concrete which lead to increase in the compressive strength of cube, flexural strength of beam and splitting tensile strength of cylindrical specimen of M20 grade concrete.

I. INTRODUCTION

Recent research aimed invention of new methods in strengthening concrete is under work for decades. A composite material can be defined as a combination of two or more materials that results in better properties than those of the individual elements used alone. In modification to metallic alloys each material holds its different physical properties, chemical properties and mechanical properties. The two constituents are reinforcement and a matrix. The vital role of composite material are their high strength and stiffness, combined with low density, when compared with bulk materials, allowing for a weight reduction in the finished part. Plain concrete possesses deficiencies like limited ductility, low resistance to cracking and low tensile strength. The cracks produce even before loading.

II. EXPERIMENTAL PROGRAMME

The prime objective of the study was to evaluate the structural properties of concrete containing polyester fibre and that of concrete containing with no polyester fibre of corresponding mix proportions. Since it is an established fact that hydration of pozzolanic material is a delayed process compared to hydration of plain cement concrete, the main emphasis was to compare the relative structural properties of two types of the concrete at later ages. Moreover, polyester fibre used in this study was obtained from 'Reliance Industries'. To establish its credential as a structural material, any type of concrete has to achieve the minimum acceptable criterion regarding the two most important structural properties viz. strength and durability. The present study is limited to the testing of strength of concrete.

Cement: In the present investigation, Portland Pozzolona Cement conforming to IS 1489:1991 is used. The total quantity of cement needed for the investigation is obtained in one lot from a fresh stock and without any lumps. The cement is tested Jaypee cement in accordance with the methods of test specified in IS: 1489:1991

Fine Aggregate: River sand available locally was used as fine aggregate. A lump of clay and other foreign materials were separated out carefully. Sand was washed and dried before testing. Sieve analysis of sand was done and specific gravity, water absorption , fineness modulus 2.66, 1.45 % and 2.44 respectively.

Coarse Aggregate: The coarse aggregate used were amixture of two locally available crushed stone of 10 mm and 20 mm size in 50:50 proportion. The aggregates were washed to remove dirt, dust and then dried to surface dry conditions. The specific gravity 2.78, water absorption 0.85 % and fineness modulus was found to confirm the requirements of IS: 383 – 1970.

Polyester fibre: Polyester fibre was used in cement concreteas a early reinforcement for cement to study the effect on durability characteristics of standard concrete. Polyester fibre was obtained from Reliance Industries Limited. Polyester fibre was white in colour and length of 12 mm used.

Water: The water used in the concreting work was thepotable water as supplied in the structures laboratory of our college. Water used for mixing and curing was clean and free from injurious amounts of oils, acids, alkalies, salts and sugar, organic materials or other substances that may be deleterious to concrete. As per IS: 456-2000 potable water is generally considered satisfactory for mixing and curing of concrete. Accordingly potable tap water was used for the preparation of all concrete specimens.

Super plasticizer: Conplast X421IC is aqueous solution based on lignosulphonates and non-toxic with IS: 9103: 1999, Tominimise permeability and increase the waterproofing properties of concrete water reducing admixture & IS 2645-2003 as an integral waterproofing compound.

Concrete Mix Design for M 20 grade standard concrete:

Mix design is a sound engineering principle to rationalize various parameters in the application of concrete. Mix design facilitates to know correct input of cement, aggregates and water to cement ratio to attain desired workability and pronounced strength: all culminating in the techno-economic optimation associated with feasibility.

In the present investigation the existing method as per IS 10262:2009has been used for selecting the referenced mix (M 20), however new information given in IS 456:2000 have been incorporated. In order to get the final mix proportions for the reference mix design three trails had been prepared and tested at 28 days.

Test specimens: various tests conducted on the standard concrete with Polyester fibre added varying percentage 0 %, 0.5%,0.8%,1.0% ,1.2% of cement and replacing fine aggregate and coarse aggregate of equal quantity. For each percentage variation of Polyester fibre 3 samples were tested and average value of these three observations was taken as final result. Standard cubical moulds of size 150 mm x 150 mm x 150 mm , cylindrical moulds of size 150 dia. and 300 mm height and beam 150 mm x 150mm x 500 mm made up of cast iron were used to prepare the concrete specimens for the determination of compressive strength, split tensile strength and flexural strength.

III. TEST PROCEDURE

Compressive Strength Test: The cubes weretested at the age of 7days. Compression strength test were carried out on 150 mm X 150mm X 150 mm cubes with compression testing machine. The specimen, after removal from curing tank was cleaned and dried According to Indian standard procedure laid down in IS: 516-1959

Split Tensile Strength Test: The test wasconducted according to IS : 5816-1999 code. This test was carried out by placing a cylindrical specimen of size 300mm x 100mm dia. Laid Horizontally between the loading surfaces of a compression testing machine and the load was applied until failure of the cylinder, along vertical diameter

Flexural Strength Test: The test was conductedaccording to IS : 516-1959 .The dimensions of each specimen (100mm x 100mm x 500mm) were noted before testing. No preparation of the surface was required. The bearing surfaces and loading rollers are wiped clean, and any loose sand or other material removed from the surfaces of the specimen where they are to make contact with the rollers. The specimen was then placed in the machine in such a manner the load is applied to the uppermost surface as cast in the mould, along two lines spaced 133 mm apart. The axis of the specimen was carefully aligned with the axis of the loading device. The load was applied without shock and increasing continuously at a rate such that the extreme fibre stress increased at approximately at a rate 180 kg/min for the 100 mm specimens. The load was increased until the specimen fails, and the maximum load applied to the specimen during the test was recorded.

IV. DISCUSSION AND RESULTS

Compressive Strength Test:

Test discussion for cube compressive strength: Polyester fibre concrete containing 0% fibre after 28 days was found to be having compressive strength 33.96 N/mm^2 . A gain in strength with age is observed.

Polyester fibre concrete containing 0.5% fibre after 28 days was found to be having compressive strength 43.98 N/mm^2 . A gain in strength with age is observed.

Polyester fibre concrete containing 0.8% fibre after 28 days was found to be having compressive strength 45.27N/mm^2 . A gain in strength with age is observed.

Polyester fibre concrete containing 1.0 % fibre after 28 days was found to be having compressive strength 46.84 N/mm^2 . A gain in strength with age is observed.

But Polyester fibre concrete containing 1.2% fibre after 28 days was found to be having compressive strength 42.65 N/mm^2. On further addition of fibred crease in strength with age is observed.

Split Tensile Strength Test:

Polyester fibre concrete containing 0% fibre after 28 days was found to be having Split Tensile strength 3.56 N/mm^2. A gain in strength with age is observed.

Polyester fibre concrete containing 0.5 % fibre after 28 days was found to be having Split Tensile strength 3.97 N/mm^2 . A gain in strength with age is observed.

Polyester fibre concrete containing 0.8% fibre after 28 days was found to be having Split Tensile strength 4.15 N/mm^2. A gain in strength with age is observed.

But Polyester fibre concrete containing 1.0% fibre after 28 days was found to be having Split Tensile strength 3.77 N/mm^2. Further addition of fibre content leads to decrease in strength with age .

Polyester fibre concrete containing 1.2% fibre after 28 days was found to be having Split Tensile strength 3.63 N/mm^2 . A decrease in strength with age is observed.

Flexural Strength Test: Polyester fibre concrete containing 0% fibre after 28 days was found to be having Flexural strength 3.93 N/mm^2. A gain in strength with age is observed.

Polyester fibre concrete containing 0.5% fibre after 28 days was found to be having Flexural strength 4.21 N/mm^2 . A gain in strength with age is observed.

Polyester fibre concrete containing 0.8 % fibre after 28 days was found to be having Flexural strength 4.38 N/mm^2 . A gain in strength with age is observed.

Polyester fibre concrete containing 1.0 % fibre after 28 days was found to be having Flexural strength 4.27 N/mm^2. A gain in strength with age is observed.

But Polyester fibre concrete containing 1.2% fibre after 28 days found to be having Flexural strength 4.18 N/mm^2 . On further addition of fibre content decrease in strength with age is observed.

Table 1: Result of Cube Compressive Strength Of Polyester Fibre Concrete With Age

Percentage Of Fibre	No of Days
	28 days
0	33.96
0.5	43.98
0.8	45.27
1.0	46.84
1.2	42.65

Table 2: Result of Splitting Tensile Strength of Polyester Fibre Concrete with Age

Percentage of fibre	No of Days
	28days
0	3.56

0.5	3.97
0.8	4.15
1.0	3.77
1.2	3.63

Table 3: Result of Flexural Strength of Polyester Fibre Concrete with Age

Percentage Of Fibre	No of Days
	28 days
0	3.93
0.5	4.21
0.8	4.38
1.0	4.27
1.2	4.18

CONCLUSION

On the basis of the results and discussions on this investigation the following conclusions are drawn: Strength is observed in concrete containing Polyester fibre after 28 days of curing. The compressive strength of Polyester fibre concrete increased with increase in percentage added of Polyester fibre with cement for 1.0% and then gradually decreased with 1.2% addition with standard concrete. The split tensile strength and flexural strength of Polyester fibre concrete increased at 0.8% of cement with standard concrete. Reduction in workability is obtained when we increase the limit of 1.0 %.The Polyester fibre concrete content upto 1.0% having increase in compressive in 28 days. But 0.8% having increase in splitting tensile strength and flexural strength.

REFERENCES

[1]. IS 456-2000: Code of practice for plain and reinforced concrete. Bureau of Indian Standards, New Delhi, 2000.
[2]. Mix Design by Indian Standard Recommended Guidelines as per IS: 10262 :2009.
[3]. Mix Design by Indian Standard Recommended Guidelines as per IS: 10262 :1982
[4]. IS: 1489(part 1):1991 Specification for Portland pozzolana cement specification (fly ash based). Bureau of Indian Standards, New Delhi, 1991.
[5]. IS: 383-1970: IS specifications for coarse and fine aggregate from natural sources for concrete. Bureau of Indian Standards, New Delhi, 1997.
[6]. IS: 516- 1959: Methods of tests for strength of concrete. Bureau of Indian Standards, New Delhi, 1999.
[7]. IS: 5816-1999 Method of test for split tensile strength of concrete cylinders.
[8]. IS: 516- 1959: Methods of tests for flexural strength of concrete. Bureau of Indian Standards, New Delhi, 1999.
[9]. IS:2645-2003 specification for integral water proofing compounds.