Assistant Behaviour of Plain Cement Concrete When Mixed With Glass Steel and Polyamide Fibres

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Abstract - Concrete is generally used material for the improvement of various sorts of structures in the propelled time of normal systems. Concrete is strong in weight yet it is weak in strain and shear. In show day headway of fiber fortified strong some new sort of strands like glass, carbon, polypropylene and aramid fibers are given in plain concrete to the adjustment in unbending nature, weariness characteristics, shrinkage properties, influence, flexural quality, and compressive quality. The mechanical properties of fibers reinforced concrete is analyzed by using (steel fiber, glass fiber and polyamide) with different weight part of strands concerning bond.

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1. INTRODUCTION

Concrete is generally used material for the improvement of various sorts of structures in the propelled time of normal systems. Concrete is strong in weight yet it is weak in strain and shear. In show day headway of fiber fortified strong some new sort of strands like glass, carbon, polypropylene and aramid fibers are given in plain concrete to the adjustment in unbending nature, weariness characteristics, shrinkage properties, influence, flexural quality, and compressive quality. The mechanical properties of fibers reinforced concrete is analyzed by using (steel fiber, glass fiber and polyamide) with different weight part of strands concerning bond.

Glass fiber is likewise critical in those regards however eroded in basic condition in the solid. At some point in scaffolds and asphalt, flexural fatigue strength is the important parameter and it is designed on the basis of fatigue loading.one more advantage of adding fibres in the concrete gives the higher fatigue strength. Mixing of steel fibre in plain concrete give the formation of concrete composite having improved ductility and high energy absorption capacity composite (stiffness).

In this investigation distinctive kind of strands are utilized for various reason. One sort of fiber is more grounded and stiffer while the second kind of fiber is adaptable and prompts increment strength and vitality ingestion limit of the solid grid. One sort of fiber is littler, and it enhances the scaffolds of smaller scale splits, and this prompts a higher the rigidity of the solid. The second fiber is bigger and it diminishes the spread of full scale splits in concrete and along these lines enhances the strength of solid part.

Generally, the bond nature of fibers is penniless upon the surfaceCharacteristics of strands, and its perspective extent. The bond can be upgraded by growing the surface brutality of fibers, or by extending the perspective ratio.Therefore, in this examination, I have tried to make one additional move to complete the huge issue by means of finishing the tests with high fiber content (2.0%). The result shows that FRC has most outrageous quality at 1.5% as appear differently in relation to 2.25%with little effect on compressive quality anyway increase versatility of strong structure.

2. METHODOLOGY

The preliminary plan contains tests in weight quality test, flexural quality test and split unbending nature test. For getting Compressive quality at 7 and multi day (39+39) =78 shape cases of 150x150x150mm size each were Casted. (39+39)=78 barrel molded cases each with 150mm x 300mm stature were tossed to find part flexibility and (39+39)=78 shafts gems of size 100x100x500mm each were cast to find flexural quality. Assurance of Material:

2.2. DETERMINATION OF CEMENT CONTENT:

Water cement ratio =0.42
Water content =190.79lt
Therefore cement = 190.79/0.42 = 450.5 Kg > 250 Kg
Hence cement content is OK for severe exposure as per table 23 of IS 383-1970

2.3. DETERMINING COURSE AND FINE AGGREGATE:

Volume of entrapped air is 2% for maximum size aggregate that is 20mm.Now using equation 2nd and 3rd of page 107 of SP 23

$$V = W + \frac{C}{S_e}\left(1 - \frac{f_a}{p_S f_a}\right)\frac{1}{1000} f_a$$

0.98=[190.79+449.5/3.15+1/0.315×f_a/2.60] ×1/1000

f_a = (0.98×1000-190.79-449.5/3.15) ×0.315×2.60

f_a =543.13 kg/m^3

Similarly for coarse aggregates:

$$V = W + \frac{C}{S_c}\left(1 - p - \frac{1}{S_{ca}}\right)1000 - \frac{C}{a}$$

0.98= [188.79+449.5/3.15+1/(1-0.315) ×c_a/2.60]
×1/1000 c_a = (0.98×1000-188.79-449.5/3.15) ×0.685×2.60

c_a =1194 kg/m^3

2.4. DETAIL OF EXPERIMENT PERFORMED:

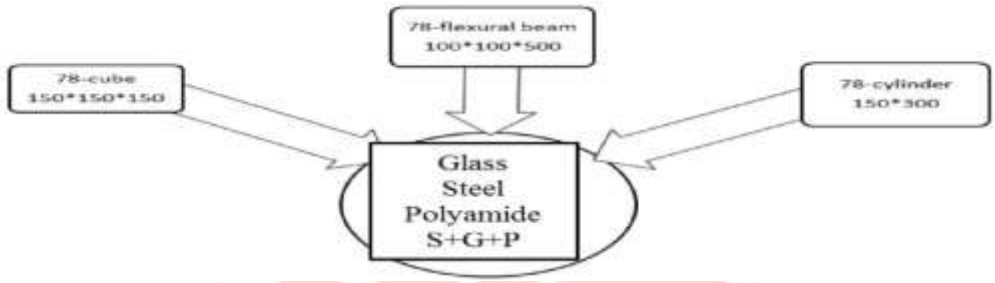


Figure N0.2.4.(i): Detail of Cubes, beams and cylinders

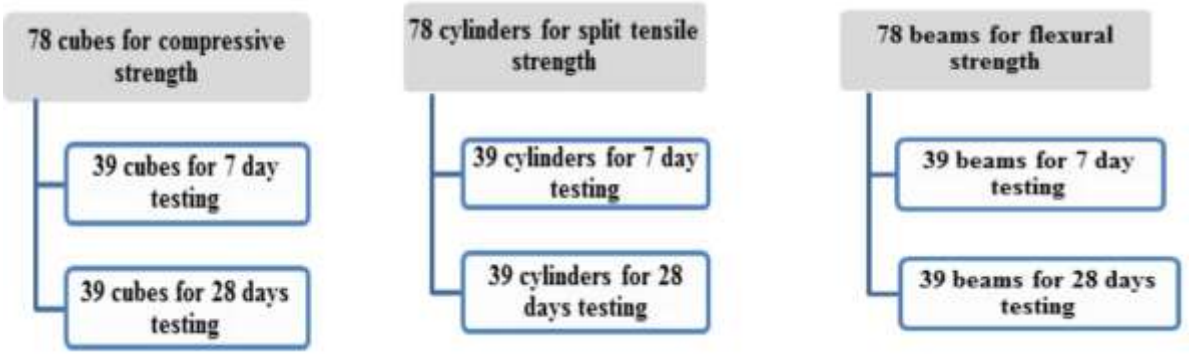


Figure No.2.4 (ii). Testing Details of Cubes, beams and Cylinders

2.5. SPECIMEN PREPARED FOR EXPERIMENT

Concrete cube of size 150mm*150mm*150mm were casted for determining the compressive strength of concrete. Cylindrical concrete specimen having dimension 150mm diameter and 300mm height were casted to determine the split tensile strength of concrete. Beam specimens of size 100mm*100mm*500mm were casted to find the modulus of rupture.

2.6. MECHANICAL PROPERTIES TESTING

2.6.1. COMPRESSIVE STRENGTH TEST

The compressive nature of bond is an irreplaceable parameter like weight, flexure et cetera. The effect of polypropylene fiber, glass fiber and steel fiber on the compressive nature of bond has been discussed in various composed works and watched that these fibers either decreases or grows the compressive nature of concrete, anyway as a rule affect is immaterial generally speaking. Compressive quality trial of cement is estimated on 150 mm*150mm*150mm 3D squares of standard size. As appeared in Figure 3.10, a compressive testing machine (CTM) with limit of 3000 KN at stacking rate 5.25 KN every second is utilized. The normal compressive quality of three blocks is taken for each test, and the test were led at age of 7 days and 28 days

Figure No.2.6.1. Compressive Strength Test

Compressive strength was then calculated by the equation:
$f_{cu}=P/A$
Where, f_{cu}==compressive strength,
P =maximum crushing load resisted of cube before failure,
A=cross-sectional area of cube

2.6.2. Split tensile strength test:
The split tensile strength of cylindrical concrete specimens of size 150mm*300mm is also determine in compressive testing machine.
As shown in Figure 3.11, a compressive testing machine (CTM) with capacity of 3000 KN at loading rate 5.25 KN per second is used.
Three identical specimens of concrete were casted in all the mixtures and for the entire test the average results of three specimens are taken.

Figure No. 2.6.2. Split tensile strength test

The prepared cylindrical specimens were instrumented and a failure load (P) was noted.The split tensile strength of the cylindrical specimen
was calculated using equation:
$F_{ct}=2p/\pi Ld$,
Where, f_{ct}==split tensile strength of specimen,
P =maximum crushing load resisted cylindrical specimen
before failure, L=height of specimen
D=diameter of cylindrical specimen

2.6.3. Flexural strength:
According to code, IS: 9399-1979, flexural strength of 100mm*100mm*500mm prisms are tested in flexural testing machine. The specimen is tested at the age of 7 days and 28 days and the average of three specimens are taken as the flexure strength of concrete. Three identical specimens of concrete were casted in all the mixtures and for the entire test. As shown in Figure 3.11, the flexural prisms were simply supported over the span of 600mm. the split tensile strength of the cylindrical specimen were calculated using equation: $f_{cf}=pl/bd^{2.}$
Where f_{cf}= flexural strength of
concrete specimen, p=failure load at
which beam specimen is failed,
l=length of beam specimen,

b=width of beam specimen, d=depth of beam specimen

Figure No. 2.6.3. Flexural strength

28- day split tensile strength of fibres

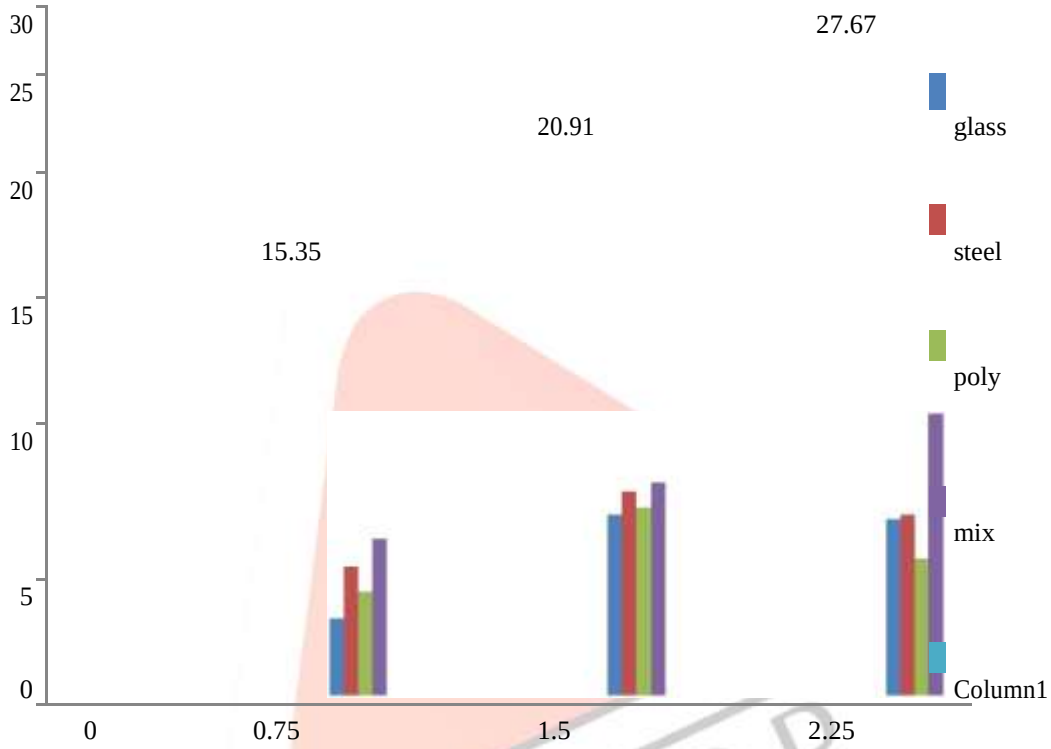
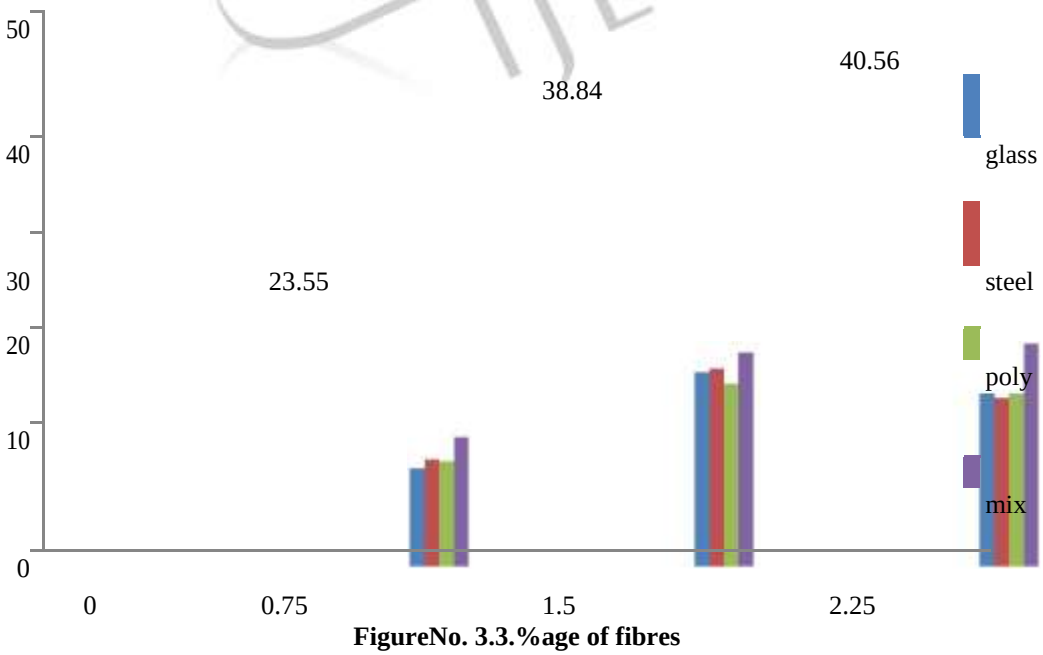


Figure No. 3.2.%age of fibres

7-day flexural strength of fibres:



FigureNo. 3.3.%age of fibres

28-day flexural strength of fibres:

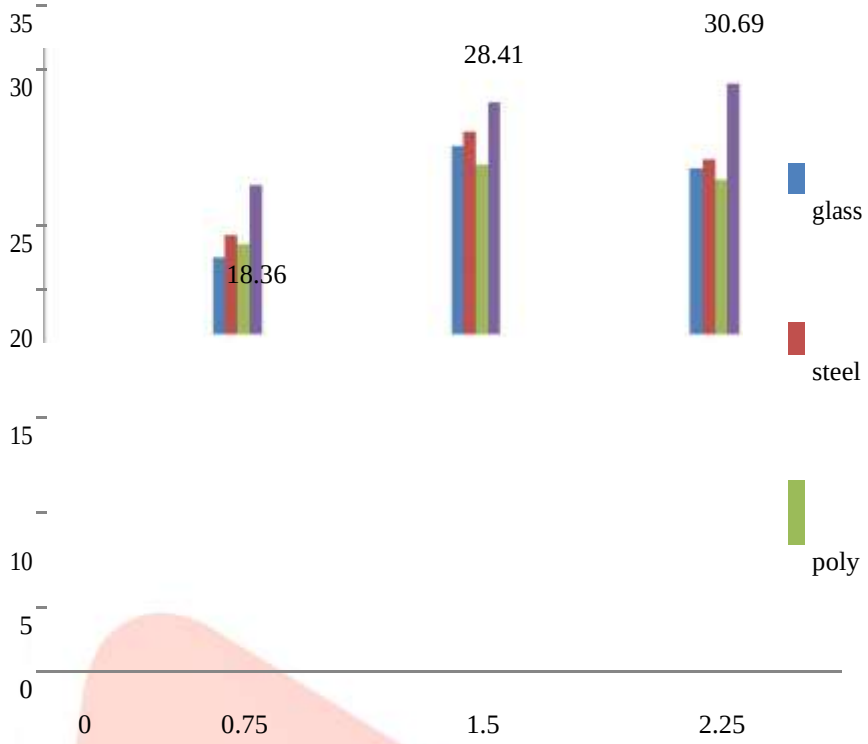


Figure. 3.4.%age of fibres

27-day compressive strength of fibres

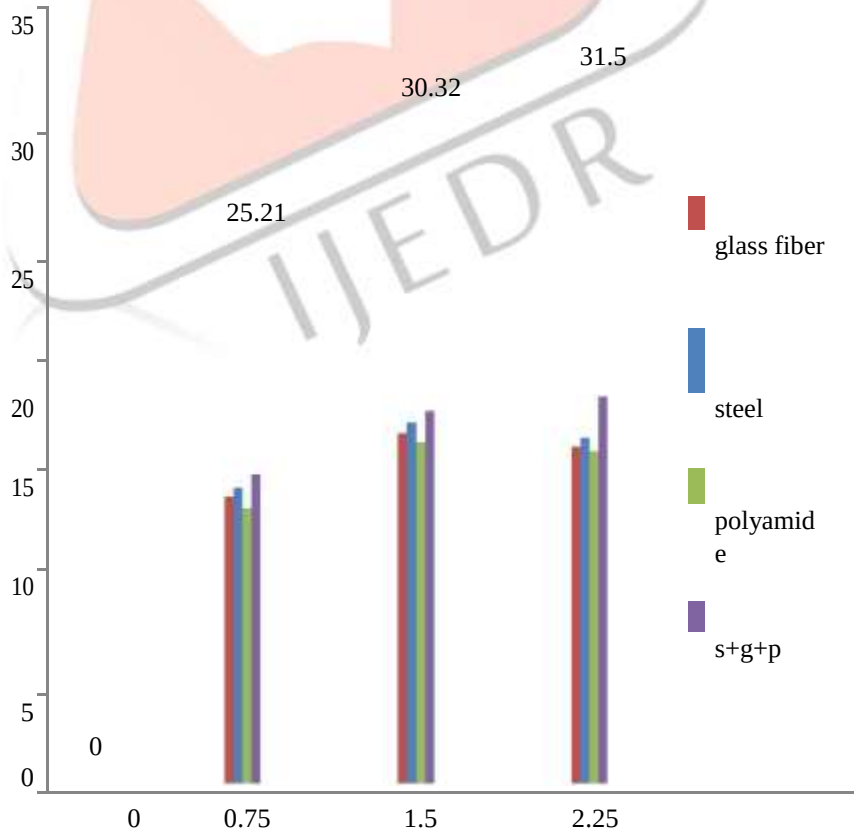


Figure No. 3.5.%age of fibres

28-day compressive strength of fibre

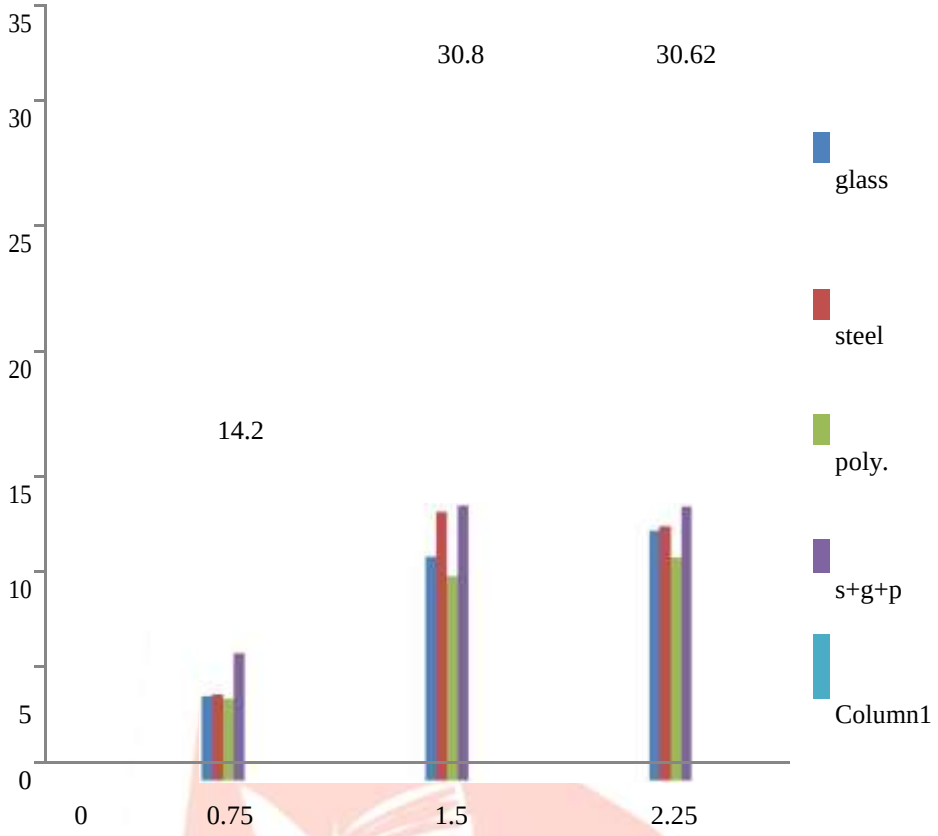


Figure No. 3.6.%age of fibres

CONCLUSION

- Fibers give a more secure working environment
- Flexural strength of concrete is largely affected by adding fibers in concrete almost increase up to 160%.
- It should be seen that the compressive strength of steel, glass, and polyamide fiber is almost same.
- Higher percentages of fibres from 1.5 percentages affect the workability of concrete, and decrease the strength of concrete matrix.
- 1.50% Dual fibre volume can be taken as the optimum dosage.
- By using these fiber, maximum strength should be obtained at 1.5 % of fibers.
- Tensile, and flexural behavior of concrete should be different for different type of fibres.
- The maximum size of course aggregate in concrete should not be more than 10mm to 20mmfor better result.
- The concrete mix design should not be affected by the addition of fibers.
- Fibers at lower quantity and reasonable cost fulfill all the require condition of the concrete.
- There is no proper maintenance require during addition into the concrete.

Reference:

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