

Mechanical Properties of Cane Reinforced Concrete by Using Crushed Granite Fines (CGF) As Fine Aggregate

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ABSTRACT: The use of steel reinforced concrete facade is gradually becoming unpopular because of the damage caused to the elements as a result of corrosion of the steel reinforcement. The possibilities of cane as a support material in concrete beam were explored. The essential goal was to determine the flexural behaviour of cane reinforced concrete beams. And also the crushed granite fine powder to be replaced river sand in concrete. Crushed granite fine powder is replaced to the level of 10%, 20%, and 30% in ordinary river sand. To adding spandex fiber as a crack arresting material in concrete. In the direction experimental investigation of Compressive strength of cube, Split tensile test for cylinder and Flexural strength test for beams at different curing periods like 7, 14 and 28 days. Finally the structural properties cane reinforced concrete will be compared with ordinary reinforced concrete.

KEYWORDS: Cane Reinforcement, Compression Strength Test, Split Tensile Test, Flexural Strength Test, Crushed Granite Fine Powder, Spandex Fiber

I. INTRODUCTION

Since the mankind has started the civilization and for that it has need various structural works such as buildings, pavements, bridges etc., in which concrete plays the most influential part second to none. With the reinforcement by the steel it becomes structurally more stable and sound it also has the strength against pushing and pulling forces. The RCC structures are rapidly deteriorating due to the changing environmental condition and the repetitive action of loading, hence more research works have been conducted to enhance the stability of the concrete which could perform well under environmental conditions.

The CGF generated by the stone crushing industry has accumulated over the years. Only insignificant quantities have been utilized and the rest has been unscrupulously dumped resulting in environmental problems. Presently, all the processing units are disposing this industrial waste by dumping it in open yards, that nearly occupying 25% of the total area of the industry.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 3, March 2017

Material properties for the study

Cane	Steel
Density= 1.14 g/cc – 1.53 g/cc	Density = 7.85 g/cc
Specific gravity= 1.14 – 1.53	Specific gravity = 7.85
Tensile stress= 204N/mm ² - 254 N/mm ²	Tensile stress=276 N/mm ² -1886 N/mm ²
Modulus of elasticity= 1.11X 10 ⁴	Modulus of elasticity= 2 X 10 ⁵
Ductility – Considerable	Ductility – Very good

Table 1 Materialproperties of cane and steel

PERFORMANCE OF SPANDEX FIBER

- Very high elasticity
- Almost white in colour
- Good resistance to oils and cosmetics
- Easily dried
- Abrasion resistant
- Heat settable

II. EXPERIMENTAL INVESTIGATION

COMPRESSIVE STRENGTH OF CONCRETE

The compressive strength of concrete is one of the most important and useful properties of concrete. In most structural applications concretes are employed primarily to resist compressive stresses. The compressive strength is frequently used as a measure of these properties. Concrete cube specimens of 150mmx150mmx150mm were casting. Concrete specimens were prepared using mix ratio 1:1.5:3 having water cement ratio as 0.50.

Compressive strength was calculated by using a formula,

$$f_{ck} \text{ (N/mm}^2\text{)} = \text{ultimate load (N)/area of specimen (mm}^2\text{)}$$

SPLIT TENSILE STRENGTH TEST:

Split tensile test was carried as per ASTM C496-90. Mortar cylinder of size 75mm diameter and 150mm height were casted with different systems. After 24 hrs specimens were de mould and cured. During casting it was compacted by table vibrated. For each system three specimens were cast. After curing the cylinders are tested in the universal testing machine of 1000 KN capacity.

Split tensile strength was calculated by using the formula,

$$F_{sp} = 2P/\pi ld \text{ (N/mm}^2\text{)}$$

Where,

P = load at failure (N)

D = diameter of the specimen (mm)

L = length of the specimen (mm)

FLEXURAL STRENGTH

The results of flexural strength at 7, 14, and 28 days are presented in given below. It shows that the flexural strength of concrete mix also decreases with increase in dust percentage replacement. Flexural strength also known as modulus of rupture, bend strength or fracture strength. The material is laid horizontally over two points of contact and then a force is applied to the top of the material through either one or two points of contact until the sample fails. The maximum recorded force is the flexural strength of that particular sample.

Flexural strength was calculated by using the formula,

$$R=3PI/2bd^2$$

Where,

P = maximum load

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Vol. 6, Issue 3, March 2017

l = span length in mm
b = average width of specimen in mm
d = average depth of specimen in mm

III. RESULTS AND DISCUSSION

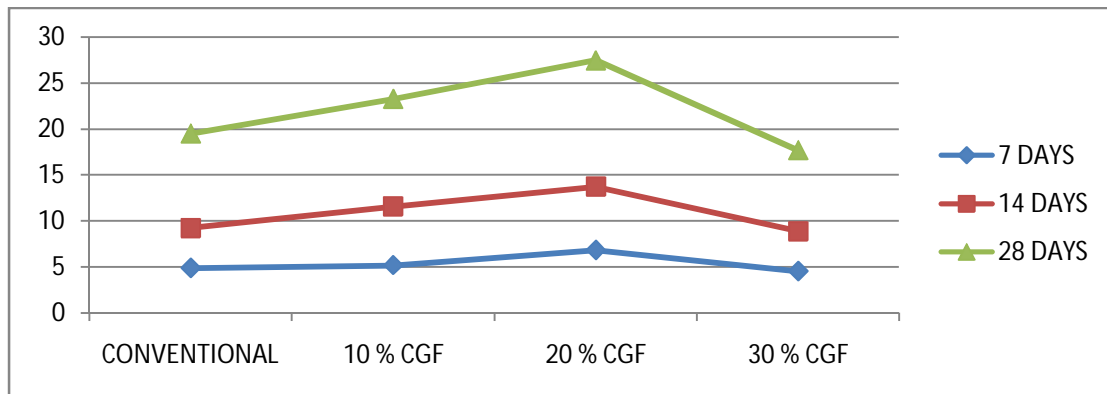
Compressive Strength of Concrete

Size of cube 150 X 150 X 150 mm

CALCULATIONS:

CGF CONTENT IN %	DESIGNATION	COMPRESSIVE STRENGTH IN Mpa		
		7 DAYS	14 DAYS	28 DAYS
0	CONVENTIONAL	4.88	9.77	19.53
10	M1	5.186	11.59	23.27
20	M2	6.83	13.74	27.45
30	M3	4.54	8.89	17.71

Table 2 Compressive Strength of Concrete



GRAPH 1 COMPRESSIVE STRENGTH IN CONCRETE

Split Tensile Strength Of Concrete

Size Of Cylinder 300X150mm

Calculation:

CGF CONTENT IN %	DESIGNATION	SPLIT TENSILE STRENGTH IN Mpa		
		7 DAYS	14 DAYS	28 DAYS
0	CONVENTIONAL	0.45	0.91	2
10	M1	0.53	1.07	2.14
20	M2	0.59	0.87	2.73
30	M3	0.44	0.88	1.73

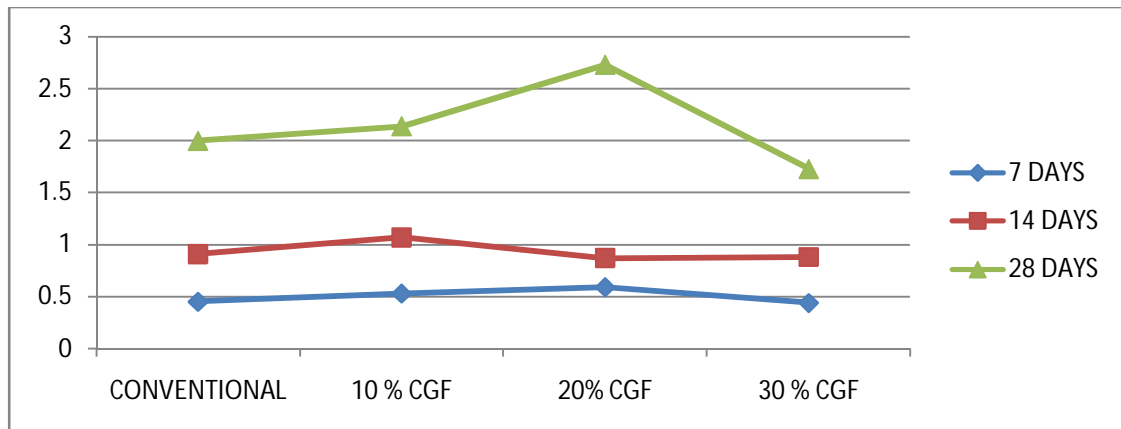
Table 2 Split Tensile Strength of Concrete

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Vol. 6, Issue 3, March 2017



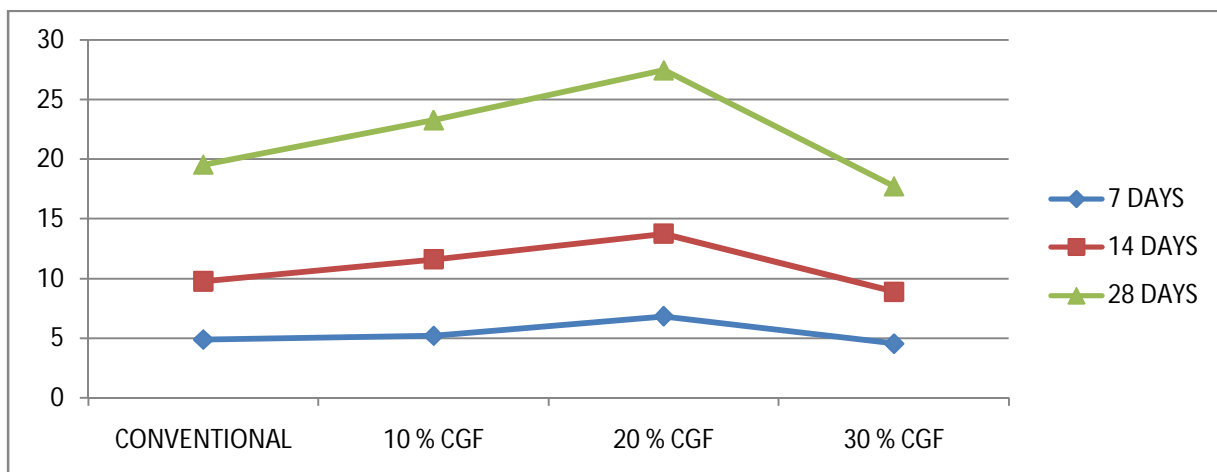
GRAPH 2 SPLIT TENSILE STRENGTH IN CONCRETE

Flexural Strength Of Concrete

Calculation:

CGF CONTENT IN %	DESIGNATION	FLEXURAL STRENGTH STRENGTH IN Mpa		
		7 DAYS	14 DAYS	28 DAYS
0	CONVENTIONAL	1.4	2.1	2.5
10	M1	1.56	2.11	2.8
20	M2	1.43	2.0	2.85
30	M3	1.48	2.5	3.0

TABLE 3 FLEXURAL STRENGTH OF CONCRETE



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Vol. 6, Issue 3, March 2017

IV. CONCLUSIONS

The following conclusions are drawn from this study:

1. Compressive strength of concrete increased with the increase in sand replacement with different replacement levels of Crushed Granite Fine (CGF) powder . However, at each replacement level of fine aggregate with Crushed Granite Fine (CGF) powder, an increase in strength was observed with the increase in age.
2. Compressive strength at 7, 14, 28 days increased by 10%, 20%, 30% compared to ordinary Conventional concrete.
3. Split Tensile Strength at 7, 14, 28 days increased by 10%, 20%, 30% compared to ordinary Conventional concrete.
4. The flexural strength test of M₂₀ grade cane reinforced concrete beams at 7, 14, and 28 days is obtained when compared with ordinary steel reinforcement concrete.
5. The addition of admixture (Epoxy) for M₂₀ grade concrete increases the workability.
6. Water absorption of concrete increases with increased percentage of CGF.
7. To adding of Spandex fibre as a crack arresting material in concrete.

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