"STRENGTH PARAMETERS OF BASALT FIBER REINFORCED CONCRETE WITH OVER BURNT BRICK AS A REPLACEMENT TO COARSE AGGREGATE"

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Abstract: Fibers are utilized in concrete to work on its structural integrity. Now a day, among all basalt fibers, an inactive mineral fiber is acquiring significance because of its uncommon properties, which incorporate protection from corrosion and low thermal conductivity. Basalt fiber reinforced concrete (BFRC) is another kind of fiber reinforced concrete, which is made of superior execution basalt fiber and concrete. It has a place with the classification of multiphase heterogeneous composite materials. It likewise works on tensile strength, flexural strength and durability of concrete. Basalt fiber in concrete is yet an exploratory region because of limited studies. Hence, an efficient report on basalt fiber-reinforced concrete was done by getting ready Concrete blocks of blend percentages of 0.1%, 0.2% and 0.3% of basalt fibers. And also, Concrete blocks of over burnt bricks as replacement to the coarse aggregates with 10%, 20%, and 30% of the Compressive and Flexural strength of concrete. Necessary tests for the materials are conducted and mix design is prepared confirming to IS 10262. Specimens are prepared for varying relieving periods of 7 days, 14 days, and 28 days. Finally, the respective strength tests are conducted, analyzed and compared. The compressive strength increases on replacement of 10%, 20% and 30% of burnt bricks with coarse aggregates. Whereas flexural strength has decreased from 10% to 30% replacement for 7 days, 14 days and 28 days. Mixes having 0.1% and 0.2% volume fraction of basalt fiber were seen to expand the compressive strength to the maximum. Whereas compression strength with 0.3% volume fraction of basalt fiber were observed to increase at 7days, 14days with decrease after 28days. The flexural strength of basalt fiber of mixes having 0.1% and 0.2% is increased at 28days. Whereas flexural strength mix of 0.3% is decreased at 28 days. Likewise, basalt fiber is viewed as amorphous and hydrophilic in nature.

Keywords: Basalt fiber, Burnt brick, Compressive strength, flexural strength.

INTRODUCTION:

Basalt fiber reinforced concrete (BFRC) is another sort of FRC, which is done of superior execution basalt fiber. It as a material to work on properties of concrete has certainly stood out, and its field of engineering application is turning out to be a greater. In real-life applications, many substantial designs are intended to withstand ordinary design loads and also to unsure dynamic loads like impact, explosion, earthquake and so forth. Consequently, the concentrate on the dynamic properties of BFRC, under high strain rate impact has basically critical in dynamic examinations of concrete structures. As of now, the use of basalt fiber, concrete to develop further its properties has become a hot region, yet the examination on dynamic mechanical properties under the effect load is yet deficient. The dynamic qualities of concrete under ultimate strain rates are unique in relation to that on the account of static loads. The actual properties and static relations of BFRC have been very much concentrated in live structural design, however concentrates on the dynamic properties of BFRC, particularly under high strain rate stacking conditions, are restricted. Freeze-thaw harm is one of the major factor which will influence the endurance of the concrete structure. It makes the inner structure of the concrete loose and decayed and in this manner debilitates the mechanical property of the material. Research has shown that adding fibers into the concrete can further develop its freezing obstruction. From one viewpoint, filaments can repress the arrangement and improvement of the breaking, subsequently upgrading the matrix strength. Then again, adding strands can build the quantity of harmless pores which can assuage the freezing pressure and accordingly reduce the damage degree of the concrete caused by freeze-thaw. The basalt fiber, as another kind of concrete reinforced material, is normal for minimal expense, great similarity with the substantial network, predominant mechanical property, strong corrosion resistance and climate cordial legitimacy in its creation. An ever-increasing number of studies have been directed on the improvement of the substantial's enemy of freezing property by consolidating basalt strands.

BASALT FIBER

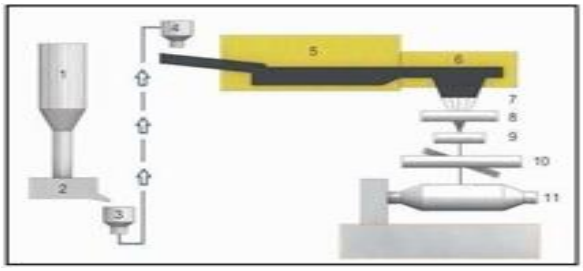


Figure 1: Process of fiber forming

Basalt Fiber Products:
By using these primary products, the secondary products are produced such as basalt chopped fiber, basalt fiber rebar, CBF roving, basalt geo-textile.


Figure 2: Chopped fiber


Figure 3: CBF roving


Figure 4: Basalt fiber rebar


Figure 5: Basalt geo-textile

PREPARATION OF TEST SPECIMENS:
In this task, we are utilizing following examples, cubes of size 150 mm x 150 mm x 150 mm and beams of size 100 mm x 100 mm x 500 mm to view the compressive and flexural strength. By following 7, 14 and 28 days of curing.

QUANTITY OF BFRC:
For cubes:
Mass of cement = 1.0665 kg
Mass of fine aggregates = 2.47 kg
Mass of coarse aggregate = 2.82 kg
Volume of water = 0.53 ml
Volume Admixture = 0.015ml
Specific gravity of basalt fiber = 2.60 gm/cm³
For 0.3% by volume of basalt fiber to be added = 0.3 X 15 X 15 X 15 = 10.125cm³
Mass of basalt fibre to be added =2.60 X 10.125 =26.32 gm

For Beams:
Mass of cement = 4.97 kg
Mass of fine aggregate = 11.52kg
Mass of coarse aggregates = 13.16kg
Volume of water = 2.48 l
Volume of admixture = 0.0711ml
Specific gravity of basalt fiber = 2.60 gm/cm³
For 0.3% by volume of basalt fiber to be added =–0.3 X 15 X 15X 70 = 47.25 cm³
Mass of basalt fiber to be added = 2.60 X 47.25=122.85gm

Materials used for over burnt brick.

MATERIALS	AMOUNT
Cement	316 kg/m^3
Water	158liter
Fine aggregates	731.76kg/m^3
Coarse aggregates	596.97kg/m^3
Red brick	475.35kg/m^3
Water cement ratio	0.5%

RESULTS AND DISCUSSION:

Table I: Compression Test on Conventional Concrete

Specimen	7 days (N/mm²)	14 days (N/mm²)	28 days (N/mm²)
Cube 1	14.100	17.300	24.000
Cube 2	16.800	18.400	26.300
Cube 3	15.200	19.200	27.400
Average	15.367	18.300	25.900

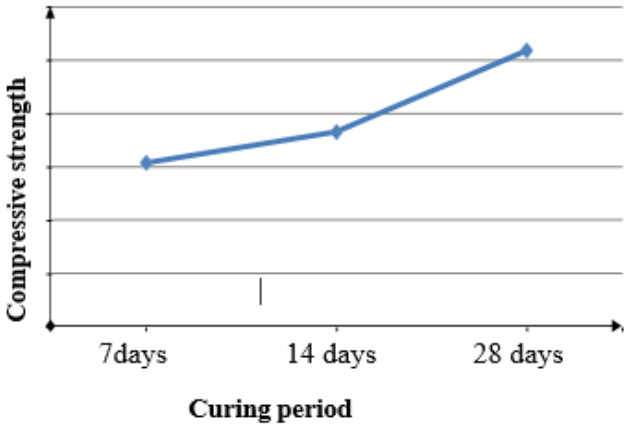


Table II: Compression test on basalt fiber

Basalt fiber (%)	7 days	14 days	28 days
0.1	21.11	35.67	42.55
0.2	27.77	54.99	59.62
0.3	25.185	36.89	45.96

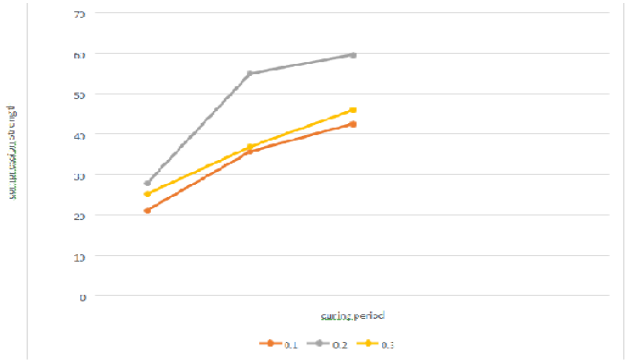


Table III: Compression Test on Burnt Brick

Replacement of burnt brick	7 days	14 days	28 days
10	20	23.24	28.49
20	19.51	21.73	27.47
30	17.73	21.11	26.22

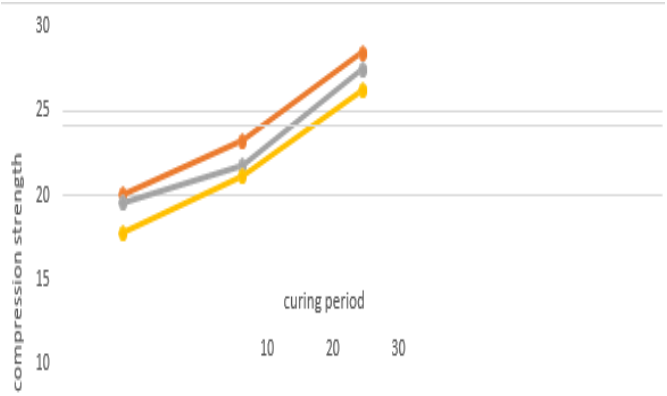


Table IV: Flexural Test on Conventional Concrete

Specimen	7 days (N/mm²)	14 days (N/mm²)	28 days (N/mm²)
Cube 1	3.000	4.100	5.200
Cube 2	2.810	4.000	5.150
Cube 3	2.600	3.900	4.700
Average	2.803	4.000	5.017

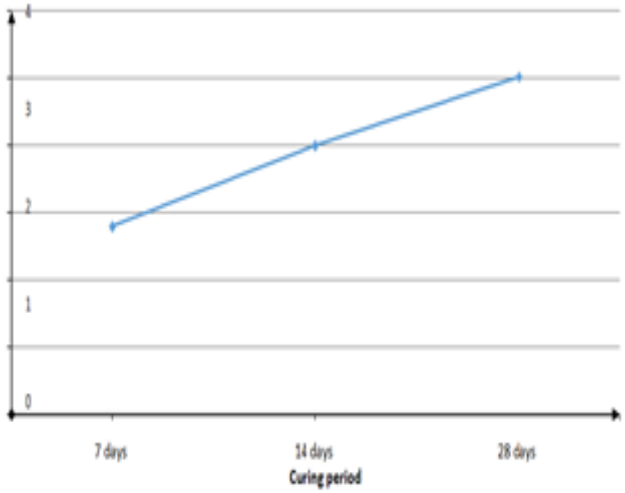


Table V: Flexural Test on Basalt Fiber

% of fiber	7days (N/mm^2)	14 days (N/mm^2)	28 days (N/mm^2)
0.1	3.84	7.84	8.51
0.2	8.23	12.58	14.68
0.3	6.43	9.54	10.4

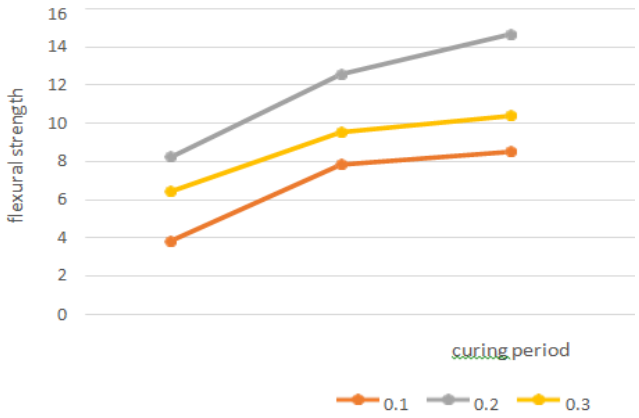
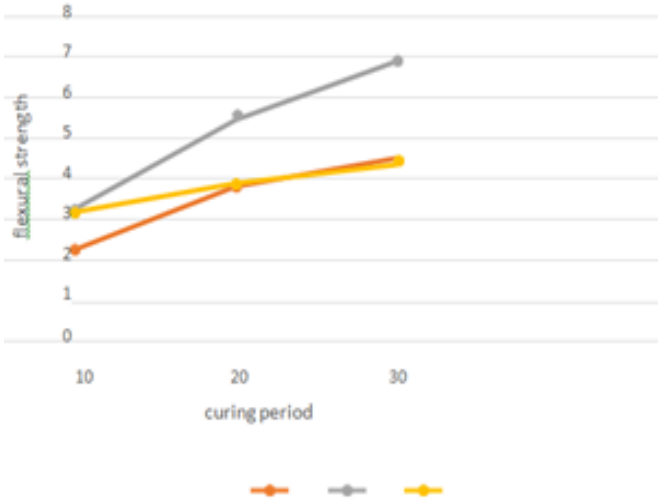


Table VI: Flexural Test on Burnt Brick

Replacement of burnt brick	7 days (N/mm^2)	14 days (N/mm^2)	28 days (N/mm^2)
10	2.25	3.81	4.51
20	3.25	5.45	6.9
30	3.18	3.89	4.35



CONCLUSION:

Basalt fiber was found to be an amorphous in nature. The compressive strength increases on replacement of 10%, 20% and 30% over burnt bricks with coarse aggregates and it is more than conventional concrete with curing of 7, 14 and 28days. There is very narrow difference between the conventional concrete and the concrete with replacement in terms of compressive strength. The expansion in compressive strength and flexible modulus of concrete at 28 days having 0.1%, 0.2%, and 0.3%volume fraction of basalt fiber was in order of 42.55,59.62 and 45.96 respectively Mixes having 0.1% and 0.2% volume fraction of basalt fiber were observed to increase the compressive strength to the maximum. Whereas compression strength with 0.3% volume fraction of basalt fiber were observed to increase at 7days, 14days with decrease after 28days.Flexural strength has decreased from 10% to 30% replacement of coarse aggregates by over burnt bricks for7 days, 14 days and 28 days. The flexural strength of basalt fiber of mixes having 0.1% and 0.2% is increased at 28days was in order 8.51 and 14.68 respectively. Whereas flexural strength mix of 0.3% is decreased to 10.4 at 28 days.

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