

Experimental Investigation of Concrete using Basalt Fibre And GFRP Sheet

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Abstract

Concrete made with Portland cement has sure characteristics: it's far especially robust in compression but vulnerable in tension and has a tendency to be breakable. The fibre content is various within the range of 0–2%.The major investigate are tensile and compressive and workability, flexural strength. To discover the variation of conventional concrete and proposed concrete with fibers and geometry of Basalt fibers to the concrete is the goal of the study. In our project proposed concrete used as M30grade of concrete with 0%, 0.5%, 1%, 2% percentage of fiber were used. Compressive strength test, split tensile, Flexural test results is plotted for 7, 14 and 28 days, also compare the conventional Vs proposed concrete results.

Keywords: Concrete, Basalt, Fibre and GFRP sheet.

1. INTRODUCTION

Fiber strengthened concrete (FRC) is Portland cement concrete strengthened with extra or much less randomly disbursed fibres. Fibres had been used as reinforcement due to the fact that ancient times.FRC is cement- based totally composite fabric that has been advanced in current years. The homes of various materials utilized in creation with its wonderful flexural-tensile energy, resistance to splitting, effect resistance and terrific permeability and frost resistance. The composite material is 2 or more materials companied after that created one shape used to microscope. In the previous couple of years, organic fibers have turn out to be an attractive reinforcement for polymeric composites from cost-efficient and environmental point of view. There's an growth inside the environmental focus within the world which has aroused an hobby inside the research and the development of biodegradable substances. Biological/natural fibers can be obtained from natural assets such as flora, animals or minerals.

2. METHODOLOGY

Figure 1 shows the methodology.

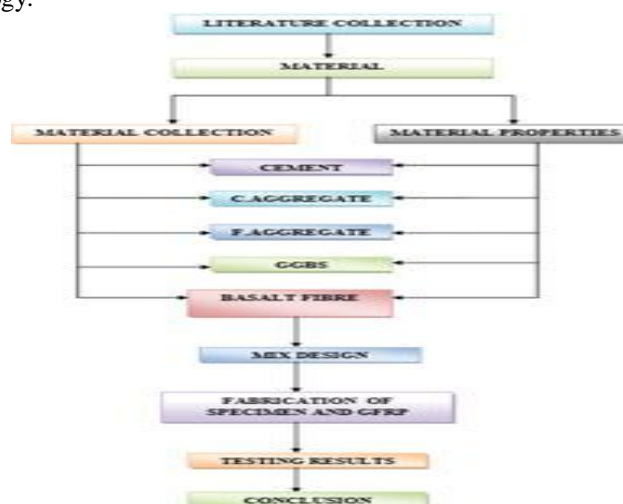


Figure 1 Methodology

3. MATERIAL COLLECTION

3.1 Cement

Table 1 shows the properties of cement.

Table 1: Properties of Cement

Description of test	Test results obtained	Requirements of IS: 8112 1989
Initial setting time	65 minutes	Min. 30minutes
Final setting time	270 minutes	Max. 600minutes
Fineness (specific surface by Blaine's air permeability test)	412.92 m ² /kg	Min. 225 m ² /kg

3.2 Basalt fiber

For these motives they're an excellent opportunity to glass fibers as reinforcing cloth and combined with the decrease fee of basalt, this fiber. They can be used from very low temperatures (approximately -2 hundred °C) as much as high temperatures in the range of 700-800 °C, which makes them an brilliant financial opportunity to other high-temperature-resistant fibers. Figure 2 shows the basalt fiber.



Figure 2 Basalt fiber

3.3 GFRP sheet

The maximum drastically used magnificence of fibres in composites is those fabricated from E-glass.. it's far manufactured as non-stop filaments in bundles, or strands, every containing normally among 2 hundred and 2000 character filaments of 10-30 µm diameters.

4. MIX DESIGN

4.1 Calculate the cement content

$$\begin{aligned} \text{Cement content} &= \text{water content/w/c ratio} \\ &= 186/0.35 \\ &= 531.43 \text{ kg/m}^3 \end{aligned}$$

4.2 Calculate Coarse Aggregate and Fine Aggregate

$$\begin{aligned} V &= (w+(c/sc) + (1/p) (fa/ sfa)) \times (1/1000) \\ \text{Fine Aggregate} &= 639.048 \text{ kg/m}^3 \\ \text{Coarse Aggregate} &= (1-P/P) \times \text{fax} (sca/ sfa) \\ &= (1-0.365/0.365) \times 639.048 \times (2.69/2.8) \\ &= 1068.09 \text{ kg/m}^3 \end{aligned}$$

Hence mix design per m³.

Table 2 shows the Mix Proportion.

Table 2: Mix proportion

Cement (kg)/m ³	FA (kg)/m ³	CA (kg)/m ³	Water (liter)/m ³
531.43	639.048	1068.09	186

5. TESTING RESULT

5.1 Ratios for special concrete (extra ingredients)

Ratio –I is adding 0.5 % of basalt fiber

Ratio - II is adding 1 % of basalt fiber

Ratio – III is adding 2 % of basalt fiber adding Ratio GFRP 6mm thickness adding laying.

Table 3 shows the compressive test result.

Table 3: Compressive test results

Mix Design	% Of Replacement	Compressive Strength(N/Mm ²)		
		7days	14 Days	28days
M ₃₀	0	19.6	25.6	33.56
	0.5	23.3	28.96	42.35
	1	22.3	26.6	34.89
	2	15.6	22.6	33.44

Figure 3 shows the compression test graph result.

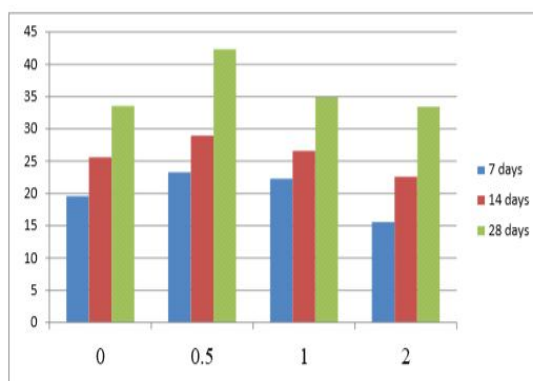


Figure 3 Compression test graph result

Table 4 shows the tensile test result.

Table 4 Tensile test result

Mix Design	% Of Replacement	Split Tensile Test (N/Mm ²)		
		7 DAYS	14 DAYS	28 DAYS
M ₃₀	0	2.5	3.1	3.9
	0.5	2.8	3.5	4.3

	1	2.4	3.06	4.09
	2	1.92	2.85	3.3

Figure 4 shows the tensile test graph results.

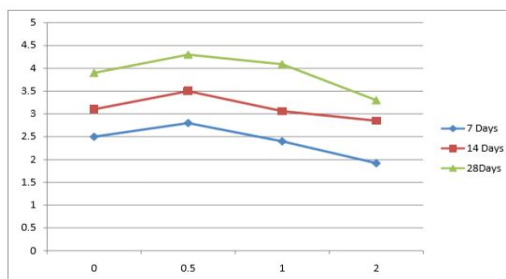


Figure 4 Tensile test graph result

Table 5 shows the Flexural test results.

Table 5: Flexural test result

MIX DESIG N	% OF REPLACEMENT	FLEXURAL STRENGTH TEST (N/mm ²)		
		7 DAYS	14 DAYS	28 DAYS
M ₃₀	0	2.3	4.3	5.25
	0.5	2.5	4.6	6.54
	1	2.1	4.1	5.12
	2	1.96	3.78	4.96

Figure 5 shows the flexural test graph result.

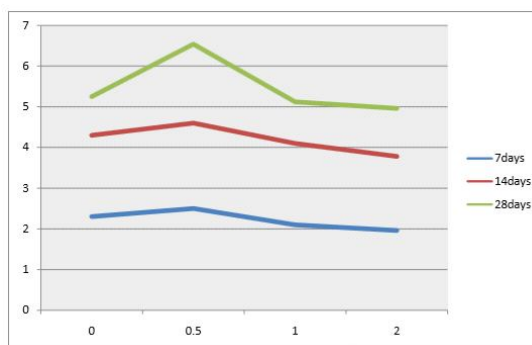


Figure 5 Flexural test graph result

6. CONCLUSION

The concrete beams reinforced with GFRP layer with 6mm thick shear reinforcement has been presented in our project.

- The compressive strength at 0.5 percentages Basalt fibre was 42.35N/mm². The increase percentage of strength at 2 percentage Basalt fibres with 6mm thick GFRP layer over controlled concrete cube strength 33.44N/mm² at 28 days.
- Both split tensile & Flexural strength at 0.5 percentages was increased as 4.3 N/mm², 6.54 N/mm² compared to conventional and increasing percentage of basalt fibre.

- From our experimental results 0.5 % Basalt fibre with 6mm thickened GFRP layer will gave better results compared to various ratios.

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