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An Experimental study on Effect of Square Slab using Rice Husk Ash and Glass Fibre on properties of Cement with partial replacement of Fine Aggregate by Quarry Dust

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Abstract: Fibre reinforced concrete is a composite material consisting of mixing of cements, fine aggregate, coarse aggregate and fibres. The fibre reinforced concrete exhibits better fatigue strength and increased static and dynamic tensile strength and compressive strength. In this project, the strength of fibre reinforced concrete was investigated partial replacement of cement with Rice Husk Ash and fine aggregate with quarry dust. Glass fibre was added in the order of 0.25% and 0.5% by weight of cement. Rice Husk Ash used to replace Ordinary Portland Cement by 10%, 20%, and 30% by weight of cement proportions. Quarry dust was used as partial replacement of fine aggregate by 20%.

Keywords: Compression strength, Tensile strength, Rice Husk Ash, Quarry dust and Glass fibre.

1 INTRODUCTION

Glass fibre reinforced cement (GRF) is a material made of a cementite's matrix composed of cement, sand, water and admixtures, in which short length glass fibre are dispersed. It has been widely used in the construction industry for many advantages such as, being light weight, fire resistance, good appearance and strength. Various application of GFRC shown in the study of the experimental test results, techno-economic comparison with other types, as well as the financial calculations presented, indicates the tremendous potential of GFRC as an alternative construction material.

2 OBJECTIVES

To determine the properties of Rice Husk Ash (RHA), Glass fibre and Quarry dust. To find the effect of Rice Husk Ash (RHA) on concrete by replacement of cement. To determine the behaviour of concrete produced from cement with combination of Rice Husk Ash (RHA), fine aggregate of Quarry dust and Glass Fibre at different properties. To determine the mechanical properties of concrete such as compressive strength, split tensile strength and flexural strength.

3 MIX PROPORTION

The mix ratio of the conventional M40 grade concrete by weight is arrived from IS code method (Ads per IS 10262:2009)

Table 1: Mix Proportion

Cement	431.82 kg/m^3
Water	190 kg/m^3
Fine Aggregate	696.8 kg/m^3
Coarse Aggregate	1045.2 kg/m^3
Water/cement ratio	0.44

Table 2: Mix Proportion for replacement materials

100% Cement	431.82 kg/m^3
10% RHA	43.2 kg/m^3
20%RHA	86.3 kg/m^3
30%RHA	129.5 kg/m^3
Water	190 kg/m^3
Remaining 80% Fine Aggregate	557.44 kg/m^3
Coarse Aggregate	1045.2 kg/m^3
0.25% Glass Fibre	1.079 kg/m^3
0.5% Glass Fibre	2.159 kg/m^3

4 EXPERIMENTAL INVESTIGATION

For any successful investigation, numerous tests have to be performed and the trend of result should be studied carefully before arriving at the final conclusion. To have reliable results from the tests experimental set up and testing procedure are required. The various tests to be performed for the investigation on the present topic are as follows, 1. Compression test on cube 2. Split tensile test on cylinder 3. Flexural test on prism 4. Flexural test on square slab.

5. RESULT AND DISCUSSION

Compression test on cubes

The compressive strength of cubes for conventional concrete at 7 days is 24.72 N/mm², 14 days is 36.83 N/mm² and 28 days is 48.48 N/mm².

Specimen	Compressive strength (N/mm²)		
	7 days	14 days	28 days
S1	**31.51**	**40.66**	**53.48**
S2	30.49	39.28	50.82
S3	29.42	38.53	49.50
S4	28.62	36.49	48.79
S5	26.22	34.76	43.07
S6	25.66	34.13	42.61

Table-3: Compressive strength of the cubes

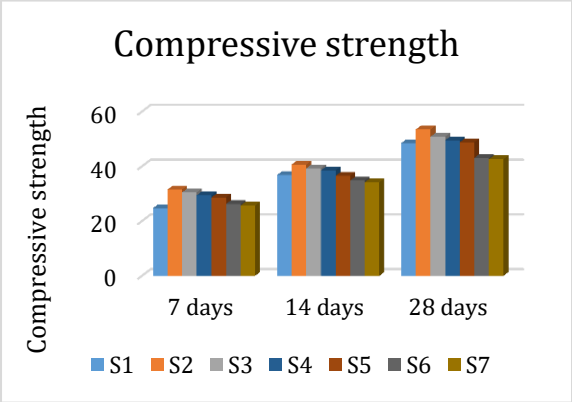

Chart-1: compressive strength result

Split tensile strength on cylinder

The split tensile strength of cylinder for conventional concrete 7 days14 days and the 28 days are 1.87 N/mm², 2.63 N/mm², and 3.5 N/mm²

specimen	Split tensile strength (N/mm²)		
	7 days	14 Days	28 Days
S1	**1.98**	**2.76**	**3.67**
S2	1.91	2.68	3.58
S3	1.86	2.61	3.47
S4	1.79	2.54	3.38
S5	1.74	2.43	3.26
S6	1.69	2.34	3.17

Table-4: Split tensile strength for cylinder

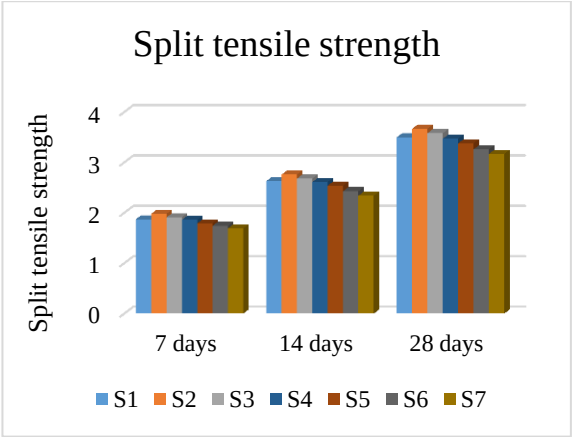

Chart-2: Split tensile strength strength result

Table-5: Flexural strength for cylinder

Specimen	Flexural strength (N/mm²)		
	7 days	14 days	28 days
S1	5.45	6.42	7.4
S2	**5.48**	**6.79**	**7.7**
S3	5.38	6.23	7.35
S4	4.76	5.89	7.12
S5	4.56	5.44	6.91
S6	4.44	4.83	6.82
S7	4.29	4.56	6.79

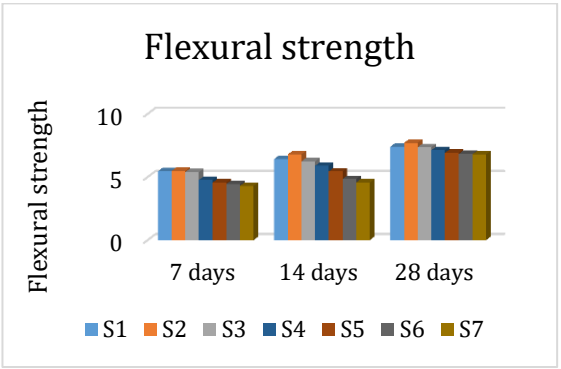

Chart-3: Flexural strength result

Load and deflection for ordinary RCC slab

The deflection was measured at one points using the dial gauge, fixed at one end. The deflection increased according to load increases. Load and displacement values for ordinary reinforced concrete column are shown below.

Table-4: load deflection for conventional slab

Sl. No.	LOAD	DEFLECTION
1	0	0
2	0	0.03
3	0	0.07
4	4	0.09
5	5	0.14
6	5	0.2
7	5	0.3
8	9	0.47
9	21	0.75
10	56	1.01

Table-5: load deflection for replacement slab

Sl. No.	LOAD	DEFLECTION
1	0	0
2	12	0.125
3	59	2.21
4	89	3.76
5	122	4.4
6	179	5.3
7	219	6.1
8	337	6.9
9	440	7.8
10	516	8.7

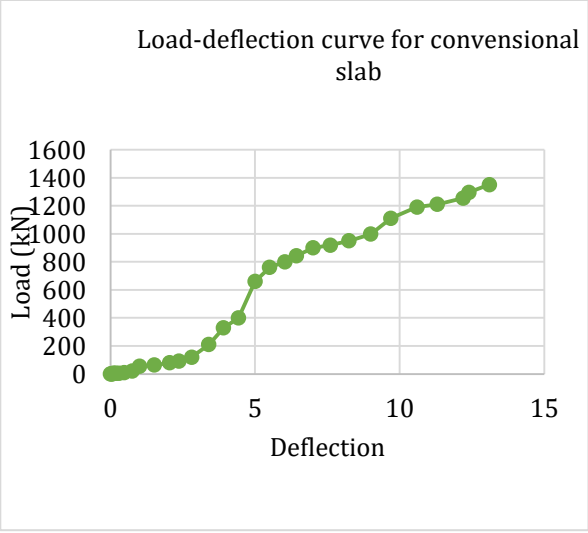

Chart-3: deflection curve (conventional)

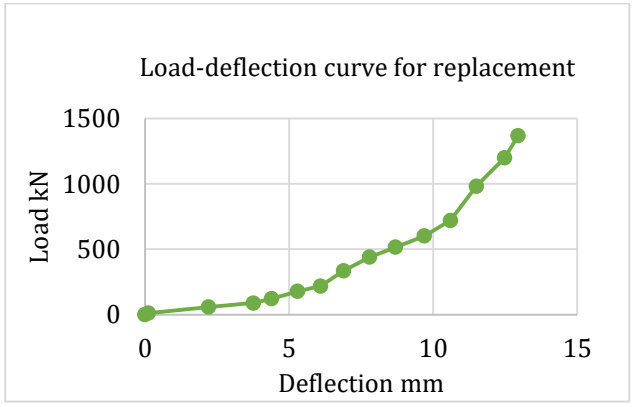

Chart-4: deflection curve (Replacement)

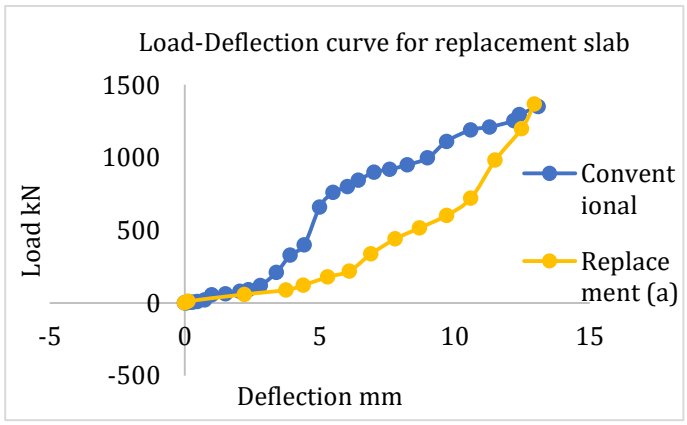

Chart-5: Comparison graph C and NC

6. CONCLUSION

Fiber-reinforced concrete is a composite material consisting of mixtures of cement, fine aggregate, coarse aggregate and fibers. The fiber reinforced concrete exhibits better fatigue strength and increased static and dynamic tensile strength. In this project, the strength of fiber reinforced concrete was investigated with partial replacement of cement with rice husk ash and fine aggregate with quarry dust. Glass fiber was added in the order of 0.25% and 0.5% by weight of cement. Rice husk ash was used to replace Ordinary Portland Cement by 10%, 20% and 30% by weight of cement proportions. Quarry dust was used as partial replacement for fine aggregate by 20%. Totally 12 cube specimens of size 150 mmx150 mm x150mm were casted to conducted compression strength and totally cylindrical specimens of size 300 mmx 150 mm were casted to test split tensile strength. Totally 6 mixer were prepare to test the behavior of fiber. The specimens were casted and cured at 7 days to obtained better results. The results were compared with M40 grade of concrete without fiber. The 10% replacement of Rice Husk Ash with cement, 0.25%

of Glass Fiber showed higher compressive strength of 31.51N/mm^2 at 7 days and spilt tensile strength of 5.38N/mm^2 at 7 days and flexural strength of 5.48N/mm^2 at 7 days.

7. REFERENCE

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