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Performance Onconcreteby Partial Replacement of Quarry dust in Fine aggregate

[1]M. Chaitanya Nava Kumar, [2]J. Sree Naga Chaitanya, [3]Dr. K. Chandramouli, [4]G. Hymavathi, [5]R. Durga Prasad

[1,2&4]Assistant Professor, [3]Professor & HOD, [5]UG Student; all are attached with Department of Civil Engineering, NRI Institute of Technology, Visadala (V), Medikonduru, (M), Guntur, Andhra Pradesh, INDIA

Corresponding Author: sreenagachaitanya@gmail.com

ABSTRACT

Quarry dust has been shown to work best when substituted for fine aggregate at a 40 percent . Strength than regular concrete and then starts to decline at 60%. The quantifiable compressive strength was used to confirm the proportion and types of concrete used when replacing sand with quarry dust. Quarry dust is used in the experimental work in the percentages of 0%, 20%, 40% and 60% in place of natural sand. 0.5% to 0.75% of the volume of concrete included hook-end steel fibres. After conducting trials on cube and cylinder specimens, the strength increases at 40% of quarry dust.

Keywords: Quarry dust, Hook - end Steel fibers, compressive strength, splittensile strength.

INTRODUCTION

The construction and the engineering materials must meet new and higher demands. Other building materials like plastic, steel, and wood must compete with them in terms of productivity, economics, quality, and the environment. Concrete should be resistant to weathering, chemical assault, and other degrading processes in order to be durable. When exposed to the environment, durable concrete will maintain its original form quality and functionality. These components include conventional Portland cement as well as alternative types of cement, such steel fibres and quarry dust. Sulphides and iron oxides make up the majority of a stone. Oxides including SiO_2, Al_2O_3, CaO, and MgO are also present in the charge and were either initially concentrated. Steel fibres are one of the supplementary constituents of steel fibre reinforced concrete, which is a composite material. These fibres are spread uniformly at random in modest amounts, ranging from 0.3 percent to 2.5 percent by volume in plain concrete.

OBJECTIVES

The objectives of this study are as follows

1. Aiming to maximise the use of steel fibre reinforced concrete's qualities.
2. Aiming to maximise the use of fine aggregate with quarry dust.
3. To assess the concrete's compressive and split tensile strength.

MATERIALS

The properties of cement are presented in Table 1.

Table 1 Physical properties of cement

S. No.	Property	Cement (53 grade)
1	Specific gravity	3.141
2	Fineness	9.78%

3.1 Quarry dust:

Quarry dust, a substance concentrated for use as aggregates for concreting purposes, particularly as fine aggregate, is a byproduct of the crushing process. Quarry dust has a similar range of particle sizes as sand, is grey in colour, and is granular in texture. Indian quarry dust has a specific gravity between 2.6 and 2.8 kg/m, which is roughly the same as the bulk density of traditional fine aggregate. When used as a sand substitute, quarry dust has a specific gravity of 2.75, which is greater than that of sand (2.6), according to the data shown in the table. The table also displays sieve analysis for various sand-to-quarry dust ratios. This implies that quarry dust would need less water in the concrete mix than sand.

3.2 Steel fibre reinforced concrete:

Steel fiber for reinforcing concrete is defined as short, discrete lengths of steel fibers with an aspect ratio (ratio of length to diameter) from about 20 to

100, with different cross-sections, and that are sufficiently small to be randomly dispersed in an unhardened concrete mixture using the usual mixing products. The best amount of steel fibers is with volume fraction from (0.4% to0.6%),enhances properties of concrete in compressive strength and splitting tensile strength.Adding steel fibers increases maximum load and maximum deflection as well as increases the toughness.

EXPERIMENTAL INVESTIGATIONS

4.1 Compressive strength results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 2 .

Table 2: Compressive strength of steel fibre reinforced concrete with quarry dust as partial replacement of fine aggregate in concrete

Sl. No	Quarry dust	7days N/mm^2		28 days N/mm^2	
		For Steel0.5%	For Steel0.75%	For Steel0.5%	For Steel0.75%
1	**NC**	27.67	27.67	39.54	39.54
2	0%	28.05	28.18	40.14	40.32
3	20%	28.45	28.65	40.76	41.06
4	40%	30.15	30.26	42.47	42.63
5	60%	28.66	28.95	41.01	40.78

4.2 Split tensile strength results

The split tensile strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 3.

Table 3: Split tensile strength of steel fibre reinforced concrete with quarry dust as partial replacement of fine aggregate in concrete

SL.NO	Quarry dust	7days N/mm^2		28 days N/mm^2	
		For Steel0.5%	For Steel0.75%	For Steel0.5%	For Steel0.75%
1	NC	2.74	2.74	3.93	3.93
2	0%	2.76	2.77	3.95	3.97
3	20%	2.88	2.95	4.02	4.04
4	40%	3.06	3.18	4.31	4.48
5	6%	2.84	2.91	3.97	4.01

CONCLUSION

In this study, the concrete ingredients like fine aggregate are partially replaced by quarry dust and steel fibres respectively. Quarry dust varied different percentages of NC0%,20%,40%,60%. andSteelfibresisvariedwithdifferentpercentageslike0.5%,0.75%.

1. The compressive strength for normal concrete for 7 days and 28 days are 27.67N/mm^2 and 39.54N/mm^2.
2. The Split tensile strength for normal concrete for 7 days and 28 days are 2.747N/mm^2 and 3.93N/mm^2.
3. At 40% replacement of fine aggregate by Quarry dust For Steel 0.5%the achieved compressive strength of concreteis 30.15N/mm^2& 42.47 N/mm^2 for 7 and 28 days.
4. At 40% replacement of fine aggregate by Quarry dust For Steel 0.75%the achieved compressive strength of concreteis 30.26N/mm^2&42.63N/mm^2 for 7 and 28 days.
5. At 40% replacement of fine aggregate by Quarry dust For Steel 0.5%the achieved Split tensilestrength of concreteis 3.06N/mm^2&4.31N/mm^2 for 7 and 28 days.
6. At 40% replacement of fine aggregate by Quarry dust For Steel 0.75%the achieved Split tensile strength of concreteis 3.18N/mm^2&4.48N/mm^2 for 7 and 28 days.

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