



## Strength Investigation of Concrete Made With Lime Stone as Coarse Aggregate and Fine Aggregate As Bhagodi Black Sand

### KEYWORDS

Bhagodi black sand, Shahbad stone (LIME STONE) compressive strength.

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### ABSTRACT

Concrete has several appealing characteristics that have made it as a widely used construction material. It is the material of choice where strength, performance, durability etc., are required and concrete is undoubtedly most versatile construction material. Currently the problems faced by the use of cement concrete includes high demand of cement concrete, cost of cement and concrete making materials, pollution, excessive extraction and utilization of natural river sand and stones, water etc. Because the sand is being extensively extracted from the river bed deposits, it is depleting at a faster rate. Hence it is necessary to find an alternative material such as industrial waste pieces of stones from the stone quarries in the cement concrete production. The present study aims at utilization and to ascertain the suitability of coarse aggregate in normal concrete with locally available good quality sand. One more concrete is prepared by using lime stone pieces as coarse aggregates and locally bad quality sand that is commonly known as bhagodi sand as fine aggregate. The comparison between above two concretes are made over here by testing the cubes compressive strength at 28 days. This burning factor of scarce availability of both fine and coarse aggregates has motivated the authors to do this project research under consideration.

### Introduction

The use of more and more concrete in construction not only results in scarcity of materials but also turns out to be expensive. In order to cope up with the depletion of conventional resources it would be worth to make use of suitable by-products to replace some of the conventional materials. A waste by-product obtained from the waste limestone aggregates are the waste broken pieces of limestone obtained from the limestone quarries. In this work, we have made an attempt to study the compressive strength of M20 grade cement concrete by using waste limestone aggregate as partial replacement to coarse aggregates. Bhagodi black sand is Chieply available sand in Gulbarga area. On account of the huge prices and legal hurdles of obtaining the river bedded good quality sand Engineers and various agencies are using this chieply available sand by replacing the good quality river bedded sand of Shahpur area. Currently India has taken a major initiative on developing the infrastructures such as express highways, power projects and industrial structures etc. to meet the requirements of globalization, in the construction of buildings and other structures concrete plays the rightful role and a large quantum of concrete is being utilized. River sand, which is one of the constituents used in the production of conventional concrete, has become highly expensive and also scarce. In the backdrop of such a bleak atmosphere, there is large demand for alternative materials. Since on account of various constraints construction activities in this area of authors is carried out with the cheaply available mud mixed black colored sand which is known as bhagodi sand commonly over in this area. Due to digging of the sand from river bed reduces the water head, so less percolation of rain water in ground, which re-

sult in lower ground water level. There is erosion of nearby land due to excess sand lifting as well as it destroys the flora & fauna in surrounding areas. Utilization of river bedded good quality sand and its excavation generates the turbulence created by dredging sand near the estuaries could damage the fragile ecosystem along the coast.

### II OBJECTIVES

The objective of this study are the following

- To study the compressive strength development of concrete made with the utilization of black bhagodi sand by adding in it lime stone coarse aggregates and to study the properties of black bhagodi sand.
- To study the development of compressive strength in the normal concrete prepared by using good quality river bedded sand and basaltic coarse aggregate.
- To compare the compressive strength development of concrete prepared by using black bhagodi sand and lime stone coarse aggregates and Normal concrete prepared with the locally best available sand and locally available coarse aggregates in Gulbarga.

### Mix design of m20 grade concrete

#### Mix Proportions:

Cement = 350.0 kg/m<sup>3</sup>

Water = 192.0 liters

Fine Aggregates = 688.0 kg/m<sup>3</sup>

Coarse Aggregates = 1295.0 kg/m<sup>3</sup>

Admixtures = 0 kg/m<sup>3</sup>

Water Cement Ratio = 0.55 Therefore,

Water: Cement: Fine Aggregate: Coarse Aggregate

0.55: 1: 1.965: 3.70

**III. Materials and methodology cement**

The common OPC 53 grade cement is used. The physical properties of the cement tested according to standard procedure conform to the requirement of IS 12269:1989

**Table 1 Physical properties of Cement**

S.No	Characteristics	Value obtained experimentally
1	Standard Consistency	33%
2	Fineness (90 micron sieve)	3%
3	Initial setting time	30 minutes
4	Specific gravity	3.0

**Fine aggregates**

Locally available good quality river sand passing through 4.75mm sieve conforming to the recommendation of IS383-1970 was used.

**Table 2 Physical properties of Fine Aggregate River bedded good quality sand**

S. No	characteristics	Value obtained Experimentally
1.	Fineness modulus	2.78
2.	Specific gravity	2.68

**Fine aggregates**

Locally available river sand passing through 4.75mm sieve conforming to the recommendation of IS383-1970 was used.

**Table 2 Physical properties of Fine Aggregate Bhagodi black sand**

S. No	characteristics	Value obtained experimentally
1.	Fineness modulus	2.97
2.	Specific gravity	2.72

**Coarse aggregate (lime stone):**

Limestone wastes obtained from the Shahabad Limestone Quarries of Gulbarga district is used as a replacement material for Basalt coarse aggregates in cement concrete. Locally available coarse aggregate retaining on 4.75mm sieve of lime stone is used.

**Table 3 Physical properties of Coarse Aggregate (Lime stone)**

S.NO	characteristics	Value obtained experimentally
1.	Fineness modulus	7.73
2.	Specific gravity	2.59

**Water**

Potable water suitable for drinking purpose available in the

campus of KCT Engineering college is utilised in the preparation of concrete.

**Methodology**

The basic tests required on the ingredients of concrete were carried out. Thereafter the mix design of the concrete is done. Then in the material testing laboratory and concrete technology laboratory of KCT Engineering college Gulbarga the mixing of the concrete is done. Concrete cubes of 15cmx15cmx15cm sizes were prepared and cured for 3,7,21, and 28 days of curing is carried out. Then these blocks are removed from the curing tank and tested for compressive strength in Compression testing machine of building material testing laboratory of KCT Engineering College Kalburgi. The results of compressive strength are tabulated in proper tabular columns.

**Concrete is prepared is of two types.**

1. By using sand of good quality in concrete in place of fine aggregates in concrete with the locally available coarse aggregates, which is termed by the authors over here as the Normal concrete.
2. The concrete prepared by using the black bhagodi sand of gulbarga in place of fine aggregates in concrete and incorporation of lime stone coarse aggregates.
3. To compare the compressive strength development of two above types of concretes, in order to predict the utilization of it in construction industry.

**IV. Result and discussion**

**Table 5 Compression strength of Concrete cubes made with normal concrete in N/mm<sup>2</sup>**

% of different sands in concrete	3 days	7days	21 days	28days
Good quality sand	10.54	17.78	24.02	26.34

Table 5 Compression strength of Normal Concrete cubes in N/mm<sup>2</sup>

From the above tabular Colum we can notice that the strength development of normal concrete that is concrete made with the utilization of good quality sand which is available in Gulbarga area

**Table 6 Compression strength of Bhagodi sand Concrete cubes with the addition of lime stone coarse aggregates in N/mm<sup>2</sup>**

% of different sands in concrete	3 days	7days	21 days	28days
Good quality sand	11.76	19.11	26.46	29.10

are 10.54 N/mm<sup>2</sup>, 17.78 N/mm<sup>2</sup>, 24.02 N/mm<sup>2</sup> and 26.34 N/mm<sup>2</sup> at 3,7,21,28 days of curing respectively.

**V. CONCLUSIONS**

From the above tabular column values the following conclusions are drawn

In the concrete made with bhagodi black sand and addition of lime stone coarse aggregates which is black in colour the following results of compressive strengths are obtained, are 11.76 N/mm<sup>2</sup>,19.11 N/mm<sup>2</sup>,26.46 N/mm<sup>2</sup>,29.10 N/mm<sup>2</sup> at 3,7,21,28 days of curing respectively.

In the concrete made with the utilization of good quality sand that is shahpur sand which is costly available in the Gulbarga are 10.54 N/mm<sup>2</sup>,17.78 N/mm<sup>2</sup>,24.02 N/mm<sup>2</sup> and 26.34 N/mm<sup>2</sup> at 3,7,21,28 days of curing respectively.

The black Bhagodi sand which is far cheaper than the good quality sand (Shahpur sand) is also good for the manufacturing of concrete because the strengths variations in between two types of concretes prepared with the above sands are not much. Beside this the compressive strength development in the bhagodi sand concrete which is cast, from the above tabular Colum we can notice that the strength development of bhagodi sand concrete by addition of lime stone coarse aggregates that is concrete made with the utilization of bhagodi sand which is available in Gulbarga area are 11.76 N/mm<sup>2</sup>,19.11 N/mm<sup>2</sup>,26.46 N/mm<sup>2</sup>,29.10 N/mm<sup>2</sup> at 3,7,21,28 days of curing respectively. The black Bhagodi sand which is far cheaper than the good quality sand (Shahpur sand) is also good for the manufacturing of concrete because the strengths variations in between two types of concretes prepared with the above sands are not much.

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