Research Paper Engineering

# Investigation of Compressive Strength of Concrete Made With Bhagodi Sand and Baitumchella Stone


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**ABSTRACT**

The emerging demand of construction materials made us to utilize recycled quarry materials in concrete as replacement of aggregates. Utilization of natural resources and preservation of environment is the essence of any development. An attempt has been made to save the environment and utilize the baitum chella stone as replacement of coarse aggregates in this project.

Herein this paper an experimental study has been carried out of M20 grade concretes basically of two types . 1. Concrete prepared by using commonly available river bedded sand as fine aggregate and locally available coarse aggregates. 2. Concrete is prepared with bhagodi black sand as fine aggregates and baitumchella stones as coarse aggregates. Cubes were cast and tested in compressive testing machine. Results shows that baitumchella stones can be used as coarse aggregates in concrete and bhagodi sand in concrete for construction purposes.



**KEYWORDS** Bhagodi Black Sand, Compressive Strength, baitumchella stone, bhagodi sand.


## INTRODUCTION

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. Baitumchella stone is a stone terrain available in andhara Pradesh area , these stones are available in different colours. 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 result 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 is to investigate compressive strength of the following concretes

To study the compressive strength development of concrete made with the utilization of black bhagodi sand and baitumchella stone as coarse aggregates

To study the development of compressive strength in the normal concrete prepared by using good quality river bedded sand and locally available coarse aggregates.

To compare the compressive strength development of above two concrete for studying the feasibility of its utilization from strength point of view.

## MIX DESIGN OF M20 GRADE CONCRETE

**Mix Proportions:**

Cement = 350.0 kg/m3

Water = 192.0 liters

Fine Aggregates = 688.0 kg/m3

Coarse Aggregates = 1295.0 kg/m3

Admixtures = 0 kg/m3

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 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 | 2.68 |
| 2. | Specific gravity | 2.72 |

**COARSE AGGREGATE (baitumchella stones)** Locally available coarse aggregate retaining on 4.75mm sieve of basalt stone is used.

The aggregate size of 20mm, crushed angular shape and free from dust is used.

**Table 3 Physical properties of Coarse Aggregate (Basalt 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 as place of fine aggregates and locally available coarse aggreges in concrete, 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 and baitumchella stones as coarse aggregates in concrete.

**RESULT AND DISSCUSION**
**Table 5 Compression strength of Concrete cubes of normal concrete in N/mm²**

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

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 Gulgarga area are 10.54 N/mm$^2$,17.78 N/mm$^2$,24.02 N/mm$^2$ and 26.34 N/mm$^2$ 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 for M20 grade of concrete are quite a good.

**Table 6 Compression strength of Bhagodi sand and baitumchella stone Concrete cubes in N/mm2**

| % of different sands in concrete | 3 days | 7days | 21 days | 28days |
|---|---|---|---|---|
| Good quality sand | 9.93 | 17.08 | 23.36 | 25.02 |

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 for M20 grade of concrete are quite a good.

**V. CONCLUSIONS**
From the above tabular column values the following conclusions are drawn

In the concrete made with bhagodi black sand and baitumchella stone as coarse aggregates the following results of compressive strengths are obtained. 9.93 N/mm$^2$, 17.08 N/mm$^2$,23.36 N/mm$^2$,25.02 N/mm$^2$ 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 which are known by authors as normal concrete are 10.54 N/mm$^2$,17.78 N/mm$^2$,24.02 N/mm$^2$ and 26.34 N/mm$^2$ 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 for M20 grade of concrete are quite a good, sufficient enough to be utilised in the construction of structures

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