



## Experimental Study on Concrete Compressive Strength Made With Crush Basalt as Fine Aggregate

### KEYWORDS

Sand, Crushed Quarry Stone Dust, Alternative Material, Physical Properties, Mechanical Properties., compressive strength

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**ABSTRACT** Cement, sand and aggregate are basic needs for any construction industry. Sand is a prime material used for preparation of mortar and concrete and which plays a major role in mix design. Now a day's on account of erosion of rivers and considerable environmental issues, there is a scarcity of river sand. The non-availability or shortage of river sand will affect the construction industry hence there is a need to find the new alternative material to replace the river sand, such that excess river erosion and harm to environment is prevented. Many researchers are finding different materials to replace sand and one of the major materials is quarry stone dust. Using different proportion of these quarry dust along with sand the required concrete mix can be obtained. Within this paper we are casting cubes by using crushed basalt sand and calculating its compressive strength in order to study its suitability for construction purpose. Observations from the tests performed were conducted in the laboratory of KCT Engineering College Gulbarga. where precise data were gathered and completely attained from the concrete Grade of M20 concrete cubes of size 15x15x15 cms size, and they are cured for 3,7,14, and 28 days in the concrete technological laboratory tank of KCT Engineering College Gulbarga.

### INTRODUCTION

Cement, sand and aggregate are essential needs for any construction industry. Sand is a major material used for preparation of mortar and concrete and plays a most important role in mix design. In general consumption of natural sand is high, due to the large use of concrete and mortar. Hence the demand of natural sand is very high in developing countries to satisfy the rapid infrastructure growth. The developing country like India facing shortage of good quality natural sand and particularly in India, natural sand deposits are being used up and causing serious threat to environment as well as the society. Rapid extraction of sand from river bed causing so many problems like losing water retaining soil strata, deepening of the river beds and causing bank slides, loss of vegetation on the bank of rivers, disturbs the aquatic life as well as disturbs agriculture due to lowering the water table in the well etc. Quarry dust can be replaced to natural sand as it gives compatible strength<sup>3</sup>. Some of the artificial sands are performing better than the river bedded sand and can be used suitably in the construction industry<sup>2</sup>.

### II OBJECTIVES

- The objective of this study is to investigate compressive strength of the concrete made with crushed basalt as fine aggregate
- To study the compressive strength development of concrete made with the crush basalt as fine aggregate.
- To study the development of compressive strength in the normal concrete prepared by using good quality river bedded sand.
- To compare the compressive strength development

of concrete prepared by using crush basalt as fine aggregate and good quality river bedded sand available in Gulbarga.

### MIX DESIGN OF M20 GRADE CONCRETE

#### A. 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.

Sl. 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 were used.

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

S. No	Characteristics	Value obtained experimentally
1.	Fineness modulus	2.8
2.	Specific gravity	2.63

**FINE AGGREGATES**

Crushed Basalt which is available at Gulbarga region

**Table 2 Physical properties of Fine Aggregate as crushed Basalt.**

S. No	Characteristics	Value obtained experimentally
1.	Fineness modulus	1.9
2.	Specific gravity	2.72

**COARSE AGGREGATE (Basalt):** Locally available coarse aggregate retaining on 4.75mm sieve of basalt stone 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 Kalaburgi. 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, which is termed by the authors over here as the Normal concrete.
2. The concrete prepared by using the Crushed Basalt in place of fine aggregates in concrete.

**RESULT AND DISCUSSION**

**Table 5 Compression strength of Concrete prepared with river bedded sand 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

From the above tabular column we can notice that the strength development of normal concrete that 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.

**Table 5 Compression strength of Crushed Basalt as fine aggregate in Concrete cubes in N/mm<sup>2</sup>**

% ge of different sands in concrete	3 days	7days	21 days	28days
Crushed basalt	11.48	18.66	20.09	28.42

From the above tabular Colum we can notice that the strength development of concrete that is made with the utilization of Crushed bsalt which is available in Gulbarga area are 11.48 N/mm<sup>2</sup>,18.66 N/mm<sup>2</sup>,20.09 N/mm<sup>2</sup>,28.42 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 the strength development of normal concrete that is concrete made with the utilization of good quality sand which is available in Gulbarga area 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.

From the above we can notice that the strength development of concrete that is made with the utilization of Crushed Basalt which is available in Gulbarga area are 11.48 N/mm<sup>2</sup>,18.66 N/mm<sup>2</sup>,20.09 N/mm<sup>2</sup>,28.42 N/mm<sup>2</sup> at 3,7,21,28 days of curing respectively.

Together fine and coarse aggregate make about 75- 80 % of total volume of concrete and hence it is very important to fine suitable type and good quality aggregate nearby site. Recently natural sand is becoming a very costly material because of its demand in the construction industry due to this condition research began for cheap and easily available alternative material to natural sand.

From the above studies we can notice that the strength development of concrete made with using crushed basaltic stone are greater compared to normal concrete prepared . hence authors are of the opinion that crushed basaltic fine aggregates and concrete prepared out of it can be used comfortably for construction purpose.

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