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# COMPARATIVE STUDY ON CONCRETE MIX WITH REPLACEMENT OF FINE AGGREGATE

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**Abstract -** With restrictions on purposeless digging of river sand and stone grinding, there is a rising need in general society to differentiate evidence of elective fine totals. One promising option has been granulated slags produced in steel plants, yet was constrained to incomplete substitutions because of property varieties. The majority of this slag is by and by dumped. Granulated impact heater slag (GBS) is genuinely like sand yet has low thickness and has quality issues when utilized in concrete. In the current work another handling strategy has been disclosed to change over this slag into fine total to be utilized as 100 % substitution to waterway sand, for development reason. This numerous stage preparing includes change fit as a fiddle of the slag granules. Quality, solidness and functionality of the solid projected with handled granulated impact heater slag (PGBS) were found to fulfil the guideline prerequisites of the shape tests. This imaginative prepared granulated impact heater slag or slag sand is a financially feasible and ecologically worthy elective material for supplanting stream sand having gigantic monetary effect, preservation of normal assets and beneficial re-cycling of procedure side-effects.

**Key Words: Compressive Strength of concrete mix with replacement of fine aggregate, coarse aggregate, Opc 53 grade cement, GGBS, Admixture (BASF).**

## 1. INTRODUCTION

Concrete is one of the most volume-fed materials and India will need concrete in enormous proportions as it develops in the region. Around three-fourths of the concrete size is filled with coarse and fine aggregates. Currently, coarse aggregates come from splitting huge rocks and mountains which have long-term environmental effects. Fine mixture or sand is extracted from river bed which is also being depleted and drained and its extensive mining has contributed to an ecological imbalance. Demand for aggregates is growing constantly in India. In 2015, India fed 3330 MT of total aggregates (coarse and first-rate) in line with the current estimate and will need 5075 MT of aggregates by using 2020. With restrictions on river sand and stone crushing mining, there has been an increasing demand for the identification of alternative aggregates in the civil engineering fraternity. To mitigate environmental impact, alternative materials to be used as satisfactory aggregates are being notably investigated all around the world. Slag has been one of the maximum sought alternative aggregate materials due to its similarity with aggregates and quantity generated by using steel industries suits properly into the call for the delivery gap.
With ecological concerns and restrictions on the environment, the availability of natural aggregates, especially river sand, is significantly reduced and most of the evolved countries have changed their combination standards to allow opportunities or artificial aggregates consisting of slag in roads and construction. Steelmakers have now started to implement contemporary slag processing techniques in order to transform slag as a commodity to meet the production requirements criteria. Present improvement is a good sized pass towards safety of environment through introducing processed granulated blast furnace slag as an eco-friendly opportunity to river sand. This initiative is first of its kind within the country.

## 2. LITERATURE RIEVEW

**EXPERIMENTAL EXAMINE ON 100% REPLACEMENT OF RIVER SAND WITH GRANULATED BLAST FURANCE SLAG SAND.**

**a) D. Satish Kumar, Praveen Kumar, Rameshwar Sah, Marutiram Kaza and SMR Prasad (2016) performed study on "Converting Granulated Blast Furnace Slag into Fine Aggregate".**

Current change is a wide circulation in the direction of surroundings safety by the introduction of treated granulated blast furnace slag as a green alternative to river sand.This initiative is first of its kind within the country. Results of this research show that the bodily characteristics of slag samples have substantially advanced after the processing. The debris shape has progressed. The processed granulated blast furnace slag (PGBS) changed into just like the actual river sand. The shapes of the natural river sand and PGBS debris resemble closely. Size distribution of the processed granulated slag become also similar to river sand. PGBS matched the required physical homes of fine aggregate for use in concrete.

### 2.1. Objective of the Study

- To find out an appropriate and 100% alternative of pleasant aggregate.
- To find out viable usage of waste substances in production industry that during flip significantly reduce the use of excellent aggregate and ultimately reduce production cost.
- To explore opportunities of enhancing mechanical properties of concrete the usage of steel slag instead of quality mixture absolutely.
- To evaluate the impact of the usage of steel slag in concrete.

## 3. MATERIALS AND BASIC TEST

The components used to build roadways also evolved over time, again in comparison to the early days of the Roman Empire.
The materials which we have used for our project are as follows.

- Fine aggregate
  a. River sand.
  b. Crushed stone sand.
  c. Processed slag sand.
- Coarse aggregate.
- Cement
  a. OPC 53 grade.
  b. GGBS.
- Admixtures (BASF).

### 3.1. Tests Conducted

Different test were completed to discover the properties of the materials such test led are as per the following:

1. Sieve analysis of fine aggregate.
2. Sieve analysis of coarse aggregate (20mm & 10mm).
3. Specific gravity and water absorption of fine aggregate & coarse aggregate
4. Impact value of coarse aggregate.
5. Los Angeles abrasion test.

## 4. METHODOLOGY

- Mixing
- Casting
- Curing
- Testing

## 5. RESULT AND DISCUSSION

The compressive strength and Flexural strength is carried out to know the strength characteristics of the different fine aggregates used in the concrete mix. Total 27 no of cubes were casted; the crushing strengths of the cubes were tested using the universal testing machine.
The cubes were cured using curing tank and were tested for a period of 7 days, and 28 days respectively.

The results obtained through the study can be justified saying that comparative to the other sand such as natural sand, GBS, & crushed stone sand; PGBS has obtained the maximum strength properties; which clearly indicate that PGBS can be 100% replaceable and utilized in the construction of the roads, paver square, flooring and sustainable burdens and so on.

**Table: 5.1**
**Compressive strength of concrete cubes**

| Period | 7days | 28days |
|---|---|---|
| Natural sand | 32.3 | 46.8 |
| GBS | 29.7 | 40.29 |
| PGBS | 41.6 | 57.6 |
| Crushed stone sand | 33.62 | 51.8 |

**Table: 5.2**
**Flexural Strength of concrete cubes**

| Period | 7days | 28days |
|---|---|---|
| Natural sand | 4.41 | 5.39 |
| GBS | 4.10 | 5.19 |
| PGBS | 4.99 | 5.82 |
| Crushed stone sand | 4.56 | 5.73 |

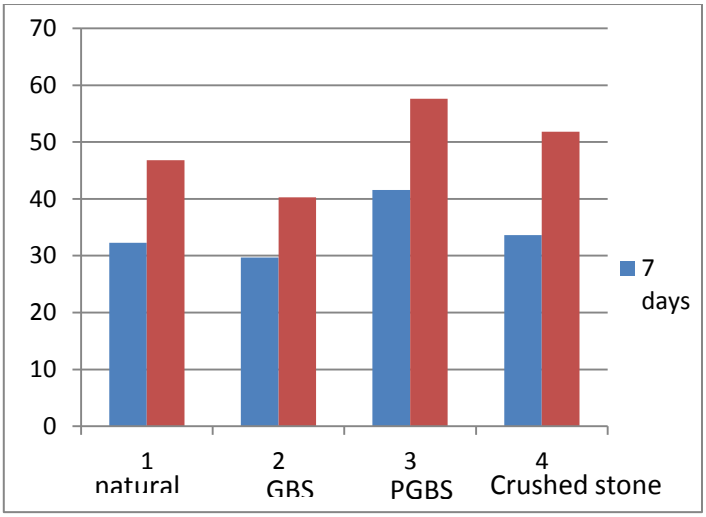


**Fig 5.3**
**Compressive Strength of the Cubes**

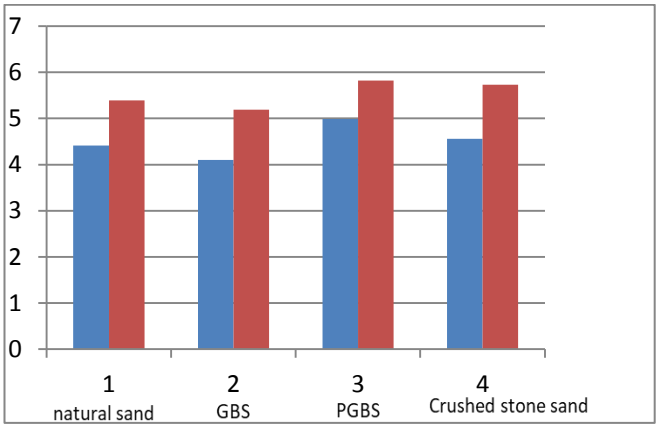


**Fig 5.4**
**Flexural Strength of the Cubes**

## 6. CONCLUSION

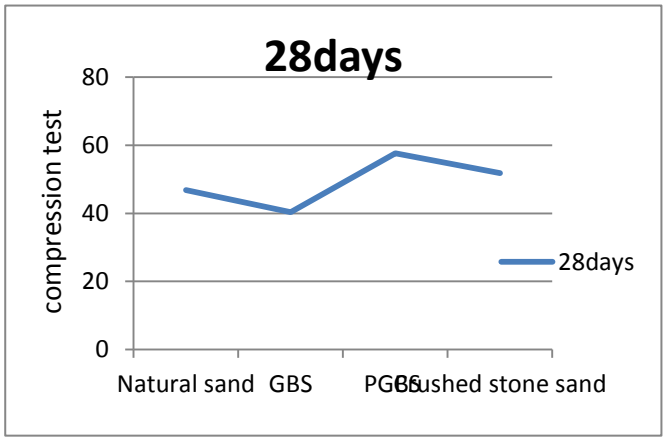


**Fig 6.1**

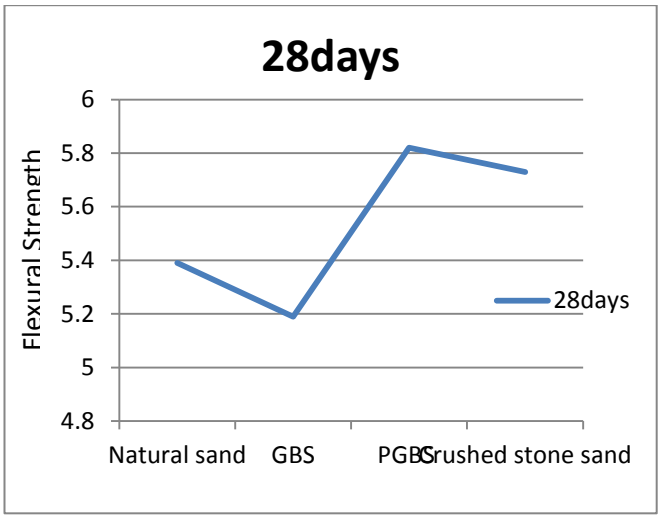


**Fig 6.2**

The above fig 6.1 and 6.2 shows the strength properties of compressive and flexural strength which clearly says that contrasted with the other sand, PGBS has arrived at the ideal quality properties and it very well may be 100% replaceable and utilized for the development reason, for example, Roads, paver square, flooring for substantial burdens and so on.

Vagrant component contemplates demonstrated that slag contain various sorts of substantial metals in low fixations and are well underneath the natural standards and subsequently the recently evolved slag sand doesn't have any ecological risks and can be applied securely in sea-going condition, For example, rivers , lakes or streams which do not impact the quality of water or amphibian life. Using slag as a total reduces the need for virgin material, vitality, and dirtying emanations created during the mining, preparation, and transport of that material. This would also help to decrease the massive slag heap ups by steel producers around their assembly units. The existence of a suitable elective total would help to regulate unlawful and widespread mining of daily properties, which has unfortunate effects on condition and economy.

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