



## Experimental Study on Partial Replacement On Coarse Aggregate With Pumice Aggregate And Cement With GGBS

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**Abstract:** Concrete is the most widely used construction material in civil engineering industry because of its high structural strength and stability. One of the disadvantages of conventional concrete is its high self-weight. This heavy self-weight of concrete will result in uneconomical structural material. To decrease the self-weight of concrete, the coarse aggregate is replaced partially by lightweight aggregate. The concrete industry is looking for supplementary cementitious material or industrial by product as Ground granulated blast furnace slag (GGBS) is the solid wastes generated by industry are used as a replacement material for cement

### INTRODUCTION

Concrete is a building material, consisting of cement, fine aggregate and coarse aggregate. Among the ingredients of concrete, coarse aggregate imparts greater volumetric stability and durability to concrete. Pumice stone is selected as replacement material for coarse aggregate. As coarse aggregates are replaced with pumice with 5,10, 15%. Concrete is a mixture of cement, water, and aggregates with or without chemical admixtures. Ground Granulated Blast Furnace is a byproduct from the Blast furnace slag is a solid waste discharged in large quantities by the iron and steel industry in India. As cement is replaced with ggbs in 5,10,15%. By using pumice & ggbs with coarse aggregate & cement with the above percentages we can obtain the great

strength compared to normal conventional concrete blocks

### MATERIAL

#### 1. Ordinary Portland Cement (OPC):

OPC is a special blended cement useful in general construction work and is especially suitable for applications in environmental conditions. 53 grade cement is used and it is used as a binding material.



#### 2. Coarse aggregate :

The size of the aggregate is more than 4.75mm is called as a coarse aggregate. For this project, we are using 10mm size aggregate. It is used as a concrete material to increase the strength.



### 3. Potable water:

Water is the key ingredient, which is mixed with cement, forms a paste that binds the aggregate together. The water causes the hardening of concrete through a process called hydration.



### 4. Pumice aggregate:

The main reason of Pumice aggregate is a natural lightweight aggregate which is formed by the sudden cooling of molten volcanic matter.



### 5. Ground Granulate Blast Furnance Slag (GGBS):

GGBS is obtained by quenching molten iron slag from a blast furnance in water or steam, to produce a glassy, granular product that is then dried and ground

into a fine powder.



### 6. Fine Aggregate:

Fine Aggregate is the essential ingredient in concrete that consist of natural sand or crushed stone. The quality and fine aggregate density strongly influence the harden properties of the concrete.



### TESTS ON MATERIALS USED:

#### 1. Impact test on aggregate:

Aggregate Impact Value test determines the aggregate Impact Value (AIV) of aggregates which provides a relative measure of the resistance of an aggregate to sudden shock or impact. Resistance of the aggregates to impact is termed as toughness. Impact Value should not be less than 45% for aggregates used for concrete other than wearing surface and 30% for concrete used in wearing surface.

#### 2. Crushing Test On Aggregate:



The aggregate crushing value provides a relative measure of resistance to crushing under a gradually applied compressive load. To achieve a high quality of pavement, aggregate possessing low aggregate crushing value should be preferred. The aggregate crushing value for cement concrete pavement shall not exceed 30%. The aggregate crushing value for wearing surfaces shall not exceed 45%.



### 1. Fineness test on cement:

The fineness of cement has an important bearing on the rate of hydration and hence on the rate of gain of strength and also on the rate of evolution of heat. Finer cement offers a greater surface area for hydration and hence faster the development of strength. According to the IS recommendations, the standard value of fineness of cement should have a fineness that is less than 10%, or the fineness of cement should not be higher than 10%.

### 2. Specific Gravity:

Specific gravity separates bad particles which are lighter than other particles, from good aggregates. Using specific gravity in cement mix design, we calculate the solid volume of aggregates in concrete mix. Gavel, water and cement are used for this test. The specific gravity of coarse aggregate of 10mm is 2.7.

## Cube casting

### ADVANTAGES

- Environmental friendly
- Increased strength
- Reduced heat of hydration
- Cost-effective
- Improved durability

### CONCLUSION:

The partial replacement of cement & coarse aggregate with GGBS & pumice with the 5, 10, 15%, can be considered as the increase in compressive strength when compared to plain concrete. The use of GGBS & pumice as partial replacement of cement & coarse aggregate is considered to reduce thermal cracking & resistant to chemical attack.

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