



## Effect of Alccofine and GGBS Addition on the Durability of Concrete

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### Abstract

Portland cement is the most important ingredient of concrete. A large scale production of cement plant consume large amount of energy and produce a number of undesirable products ( $CO_2$ ) which negatively affect the environmental and depletion of natural resources. This treat to ecology has to lead to researchers to use industrial by-products as supplementary cementitious material in making concrete. In view this silica fume (SF), ground granulated blast furnace slag (GGBS), rice husk ash, fly ash (FL), metakolin, alccofine (AL), micro fine material, etc.; are tried out for replacing cement partially or fully in concrete, without compromising on its strength, also reduce greenhouse gases and sustainable way of management of waste. A new ultra-fine material emerged in market is called alccofine. This is available as a cementitious material for replacing cement. Since this a new material, a study is tried out with the combination of Alccofine and GGBS. Ordinary Portland Cement 53 grade was used throughout the study and the grade of concrete is M20. Totally 108 cubes and 27 cylinder were cast and tested in the laboratory with nine different percentage combination of alccofine (A), GGBS (G) and cement (C) ( $C_{100}$ ,  $C_{70}A_{0}G_{30}$ ,  $C_{90}A_{10}G_0$ ,  $C_{60}A_{10}G_{30}$ ,  $C_{30}A_{10}G_{30}$ ,  $C_{40}A_{0}G_{60}$ ,  $C_{85}A_{15}G_0$ ,  $C_{55}A_{15}G_{30}$ ,  $C_{25}A_{15}G_{60}$ ). Each case 3 nos. of specimen were used for repeatability. It is intended to study the compressive strength, and its durability properties like acid attack test, sulphate attack test and rapid chloride permeability test (RCPT). Among the nine different combination the maximum compressive strength of concrete is achieved by using AL10% and GGBS 30% is 38.08 N/mm<sup>2</sup>. C60A10G30 is 28.76% higher than the control mix. Result shows that concrete incorporating alccofine and GGBS have higher compressive strength and alccofine enhanced the durability of concrete also.

*Keywords:* Alccofine; GGBS; Compressive Strength; Acid Attack Test; Sulphate Attack Test.

## 1. Introduction

### 1.1. General

Cement- based material is among the most important construction material, and it is most likely that they will continue to have the importance in the future. However, these construction and engineering materials must meet new and higher demands, these construction materials such as GGBS, SF, AL, and FA etc. GGBS and AL used as supplementary cementitious materials (SCM). When pozzolanic materials are incorporate to concrete, the GGBS present in this materials react with the calcium hydroxide released during the hydration of cement and forms additional C-S-H gel which improve the durability and the mechanical properties of concrete.

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