

AN LITERATURE REVIEW ON COMPARATIVE STUDY ON STRENGTH PARAMETERS OF ALCCOFINED CONCRETE WITH CONVENTIONAL CONCRETE

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ABSTRACT

In the construction field, supplementary cementitious materials (SCMs) have brought about a technological revolution in the manufacturing of concrete as a partial replacement or addition to conventional binder mass. Keeping this in mind, this paper aims to summarise and discuss the reported findings on the mechanical and durability properties of alccofine-1203 based concretes. It is also aimed to give a better understanding of the behaviour and effect of alccofine-1203 as an SCM in various types of concretes. The alccofine-1203 has ultra-fine particles with a unique chemical composition that improves the hydration process and pozzolanic reaction. Therefore, its incorporation in concrete has resulted in good workability, reduction in segregation, reduction in heat of hydration, and reduction in permeability to concrete, and increased the rate of hydration process and improved the pozzolanic reaction to achieve high strength to concrete at the early curing stage. The presence of calcium (CaO) and silica (SiO₂) in alccofine-1203 improved the mechanical and durability properties of concrete better than the other SCMs. From the literature review, the optimum dosage of alccofine-1203 is obtained between 15 to 20%, and at these percentages, the improvement in mechanical and durability properties of the concrete is highest.

Keywords: Compressive strength (CS), Flexural strength (FS), Alccofine, Strength.

1. INTRODUCTION

The most important construction materials are cement based materials and it is most likely that they will continue to have the same importance in the future. The construction and the engineering materials must meet new and higher demands. As far as productivity, economy, quality and environment is concerned, they have to compete with other construction materials too like plastic, steel and wood. The durability of concrete means it should have resistance to weathering action, chemical attack or any other process of deterioration. Durable concrete will retain its original form quality, and serviceability when exposed to environment. These materials include traditional Portland cement and other cementitious materials, such as Alccofine. Alccofine is either combined at the cement works or at the concrete mixer when the concrete is being produced. Cementitious materials for concrete are fine mineral powders. When this material is mixed with water, they react chemically to form a strong rigid mass that binds aggregate particles together to make concrete. Alccofine is a new generation, micro fine material of particle size and is much finer than other hydraulic materials like cement, fly ash, silica etc. being manufactured in India. Alccofine has unique characteristics to enhance “performance of concrete” in fresh and hardened stages due to its optimized particle size distribution.

There are two types of Alccofine: -

Alccofine 1203: - It is an alccofine with low calcium silicate. Alccofine 1200 series is of 1201, 1202, 1203 which represents fine, micro fine, ultrafine particle size respectively. Alccofine 1203 is a slag based SCM having ultra-fineness with optimized particle size distribution. Alccofine 1203 provides reduced water demand for a given workability, even up to 70% replacement level as per requirement of concrete performance.

Alccofine 1101: - It is an Alccofine with high calcium silicate. It is a micro finer cementitious grouting material for soil stabilization and rock anchoring. The performance of Alccofine is superior to all other admixtures used in India. Due to high calcium oxide (CaO) content.

2. LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the research work carried out by various researchers. Based on the study of in this area problem identification was made. Various international journals in which the relevant work was published were studied and the detailed literature reviewed related to this topic and some of them are presented in the following paragraphs.

Jagadeesan R^{1*} and Gokul S (2023) According to the results of the study, using Alccofine as substitute may greatly better the strength. The addition of Alccofine enhanced the compressive strength, with the greatest strength reached at a replacement level of 15%. Furthermore, it reduced the porosity, resulting in increased durability features such as

resistance to water and chloride ion penetration. The research also discovered that adding Alccofine resulted in denser microstructure, which contributed to its increased mechanical qualities and durability. Finally, the study results indicate that using a supplemental material has the potential to increase its strength and durability.

Shivam singh baghel ,Rajesh joshi (2022) This case study clearly shows that Compressive strength of the Alccofinated concrete were increased by 22.5% and the flexural strength also increased by 20% as compared to Conventional Concrete.

Balamuralikrishnan and Saravanan (2021) used 0%, 5%, 10%, 15% and 20% of alccofine-1203 to replace cement to investigate the effect of alccofine-1203 on the compressive strength of cement mortar. By replacing 10% cement with alccofine-1203, the mortar specimen has shown the highest compressive strength in all stages of curing, and specifically, at 28 days, it has attained a compressive strength of 53.12MPa, whereas the specimen with 100% cement attained only 44.74 MPa.

Kavyateja, Guru Jawahar, and Sashidhar (2020) investigated the mechanical properties of SCC, developed by partial replacement of cement using 25% fly ash with 0%, 5% 10% and 15% alccofine-1203 combinations. The developed mixes were designated as NM, SCC0, SCC1 SSC2, and SCC3 concerning the alccofine-1203 replacement percentages. Based on this, it was concluded that 25% fly ash and 10% alccofine-1203 is an optimum percentage to partially replace cement to achieve SCC with superior strength properties.

Sanjeev Kumar et al. (2019) investigated to enhance the strength properties of lightweight aggregate concrete using alccofine-1203. In this study, the authors attempted to obtain the strength decreased to the lightweight concrete due to partial replacement of coarse aggregates with coconut shells by using partial replacement of cement with alccofine-1203. Cement replaced with 6%, 8%, 10% and 12% of alccofine-1203.

It was concluded that compared to coarse aggregate based control mix, the concrete mix with 8% alccofine-1203 has 18% lowest density and it is least among all the developed mixes. The 28 days test results showed that the partial replacement of coarse aggregates with coconut shells reduced the compressive strength of concrete from 44.8MPa to 35.49MPa, and by replacing cement with 8% alccofine-1203, the compressive strength of lightweight concrete increased to 42.41MPa

P. R. Kalyana Chakravarthy, R. Rathan Raj (2017) The main objective of this work focuses on the compressive strength of concrete with partial replacement of cement with Alccofine.

The project focuses on the experimental investigation on concrete by replacing cement with Alccofine on varying percentage. 0%, 4%, 8%, 16%, 17%, 20%, 25%, 50%, 75% and 100% for 7 and 28 days. The design mix carried out throughout the experiment was M25. The increase in percentage of compressive strength for 7 days and 28 days curing was found to be maximum at 16% replacement exhibiting the value of 50.95 % and 60.95% when compared with conventional.

S. Kavitha and T. Felix Kala (2016) have explained about the use of alccofine within the SCC as the strength enhancer. They found the improvement in strength properties with increase in alccofine dosage and the results of their investigation proved that alccofine can be used as a strength enhancer within the SCC.

D. Sharma, S. Sharma and Ajay. G (2016) conducted experimental investigation about the strength improvement of concrete using foundry slag as an alternative for conventional fine aggregate and alccofine as substitute for cement. They concluded that reasonably high strength concrete can be achieved by means of substituting fine aggregate with 10% to 45% of foundry slag and replacement of cement with 15% of alccofine.

M.V. Sekhar Reddy, K. A. Latha and K. Surendra (2016) had done experimental work on partial replacement of cement with fly ash and alccofine for M40 Grade concrete.

The fly ash and alccofine are replaced at 5%, 10%, 15%, 20% with cement. The conclusion summarizes that the addition of alccofine indicates an early strength gaining capacity and is ecofriendly to nature. Alccofine showed greater results then compared with fly ash in long term Strength Properties.

3. CONCLUSION

The review of earlier studies related to partial replacement of Cement with Alccofine reveals that there is a significant change in the strength properties of concrete such as compressive strength, flexural strength. These experiments were carried out in various grade concrete to find out the result. From the above literature reviews optimum percentage of Alccofine varies from 0% to 20% .

Up to these Percentage Replacement improvement in the strength of concrete has been observed in terms of Compressive Strength, Flexural Strength and Tensile Strength on partial replacement of Cement with Alccofine.

4. REFERENCES

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