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# Sustainable Development of Structure Using Alccofine

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***Abstract:*** ***Due to its extraordinary adaptability as a construction material, concrete is the single most utilised produced substance on earth, with an annual production surpassing 2 billion metric tonnes (Crow 2008). The damaging impact on the environment caused by the manufacture of concrete's components is one disadvantage as a construction material. These negative effects can be reduced by using alternative/green ingredients in concrete in place of Portland cement and natural aggregates. Any construction project's overall cost directly relates to the amount of concrete utilised in the project. The largest energy- and environmentally-demanding ingredient in traditional concrete is Portland cement. In the process of making it, fuel is burned to heat the raw materials to about 1,500°C, which decarbonizes the limestone. Due to fuel combustion and decarbonization, 0.81 kg of CO2 is emitted for every kilogramme of cement during this process (Hendriks et al. 2000).The most substantial single material component in the constructed environment is often concrete. Significant environmental and financial benefits might be realised if the embodied energy of concrete can be decreased without compromising performance or raising costs. The main ingredients of concrete are Portland cement, aggregate, and water. Although Portland cement generally only makes about 12% of the mass of concrete, it is responsible for 93% of the total energy contained in concrete and 6–7% of global CO2 emissions (Mehta 1998). There are a lot of papers available, replacing cement with In this study, the strength of concrete is examined, and the costs of OPC concrete and concrete with ALCCOFINE are compared. Silica fume is typically recommended as the ideal cement extender in high performance concrete applications where high strength and low permeability are the primary criteria. Despite the fact that silica fume is known to promote durability, the increased water content in concrete frequently negates its addition.***
***Keywords: Alccofine, , Compressive Strength, Concrete, Cement***

## I. INTRODUCTION

There is a large demand for raw materials as a result of urbanisation and the advancement of technology. The use of additional waste materials in concrete is absolutely necessary since non-renewable resources are few and concrete-making ingredients must be maintained. To combat the issue of environmental pollution, waste materials such as silica fume, lime stone quarry fine, blast furnace slag, etc. can be utilised in place of cement. In the current study, an effort has been made to examine the concrete's strength and shrinkage properties by partially substituting the cement with varied ratios of aggregate. Another cementatious substance, alocofine, has been used to make binary and ternary mixes, respectively, to partially replace to compensate for the decrease in strength of concrete caused by the inclusion of at higher percentage levels. The findings of the current investigation demonstrated a notable improvement in the compressive strength and shrinkage characteristics of concrete with the addition of and both alccofine.It is well established in literature that many studies have been carried out in past to investigate strength characteristics of concrete containing , blast furnace slag, rice husk and silica fume etc.

Alcofine is a byproduct of coal-fired power plants and is frequently used in blended cements, however there are relatively few research on the strength and durability of concrete that contains it. High-calcium (HCFA: ASTM class C) is created by burning lignite or sub-bituminous coal, whereas low-calcium (LCFA: ASTM class F) is produced by burning anthracite or bituminous coal. Utilising waste materials, as in the construction industry, reduces technical and environmental issues with plants, lowers electric costs, and lessens the amount of solid waste and greenhouse gas emissions related to the production of Portland clinker. It also preserves the natural resources that are already available. Despite its advantages, field application nevertheless faces real challenges. Because of the sluggish pozzolanic reactivity of, concrete that contains a large amount of as a partial cement substitute matures significantly more slowly than control concrete. Newly created admixtures enable very low water/binder ratios without sacrificing workability.

### *A. Objectives*

*1)* To explore the suitability of use of and alccofine 1203.

 

2) To study the effect of partial replacement of cement with (FA) in varying percentages on compressive strength.
3) To investigate the effect of partial replacement of with Alccofine (AF) in varying percentages on compressive strength.
4) To compare the compressive strength and shrinkage characteristics of standard concrete and with and alccofine both**.**

*B. Problem Statement*

1) Increase Compressive strength of concrete by partial replacement of Cement using Alcofine

## II. LITERATURE SURVEY

1) G. Murali (March 2012) "Experimental investigation on concrete with partial replacement of coarse aggregate" The study on effects of Shahabad (a variety of cudappah) stone and the chemical admixture (sepal) on concrete were investigated. Natural aggregate had been replaced with the waste Shahabad stone in four different percentages namely 10, 20, 30 & 40 %. A comparison was made between the specimens of partially replaced coarse aggregate and the same set of specimens admixed with supaflo. The effects on compressive strength, split tensile strength and modulus of rupture were reported. Test results indicated that the replacement of coarse aggregate by 30% had attained a good strength.
2) Mohd Monish (February 2013) "Demolished waste as coarse aggregate in concrete" This experiment study is a part of comprehensive program wherein experimental investigations have been carried out to assess the effect of partial replacement of coarse aggregate by demolished waste on workability and compressive strength of recycled concrete for the study at 7 and 28 d. The compressive strength thus, observed was compared with strength of conventional concrete. Test results showed that the compressive strength of recycled concrete up to 30% coarse aggregate replacement (C. A. R.) by demolished waste at the end of 28 d has been found to be comparable to the conventional concrete.
3) Preeti Saini (April 2015) "A Review on Recycled Concrete Aggregates" This experiment focuses on the coarse RCA which is the coarse aggregate from the original concrete that is created after the mortar is separated from the rock which is reused. The use of RCA in new construction applications is still a relatively new technique. Literature survey reveals that compressive strength primarily depends upon adhered mortar, type of aggregates, age of curing and ratio of replacement from new material to aggregate and cement, water absorption, strength of parent concrete, interfacial transition zone and moisture content.
4) Prakash Somani (May 2016) "Use of demolished concrete waste in partial replacement of coarse aggregate in concrete" In this study we have taken the demolished concrete aggregate 10%, 20%, 30% by weight of the conventional coarse aggregate and the concrete cubes were casted by that demolished concrete aggregate then further tests conducted such as workability , compressive strength for that DAC and the result obtained are found to be comparable with the conventional concrete. For 30% replacement of coarse aggregate the 28 days compressive strength is 82.65% of the compressive strength of conventional concrete.
5) April 2013, Yatin Patel studied the durability aspect of high performance concrete with alccofine and . In this study, the effect Alccofine as supplementary cementitious materials and also as a filling materials on the strength and durability of concretes was investigated. The conclusions drawn from the practical experiments conducted during the study shows that the investigator concluded that compressive strength achieved by using 8 % of Alccofine and 20% is 54.89Mpa and 72.97 MPa at 28 and 56 days respectively.
6) Abhijitsinh Parmar, Dhaval M Patel Studied “Experimental Study on High Performance Concrete by Using Alccofine and - Hard Concrete Properties”. In this paper author said that now a day’s demand of high performance concrete is increasing day by day. A concrete can be made high performance by using SCM’s. In this research work author replaced cement with Alccofine, GGBS and . The test’s which were taken into consideration were compressive strength test, chlorides attack tests, sea eater test and accelerated corrosion test at the age of 28 and 56 days. The author concluded that the results shows that concrete incorporating with alccofine and have higher strength and also alccofine has increased the durability of concrete have reduced the chloride diffusion. The compressive strength achieved by using Alccofine (8%) + (20%) is 54.89 Mpa at 28 days and 72.97 Mpa at 56 days.
7) Ansari U.S, Chaudhri I.M, Ghuge N.P, Phatangre R.R. Studied “High Performance Concrete with Partial Replacement of Cement by Alccofine& ”.In this study cement is partially replaced by Alccofine and for M70 grade of concrete. The compressive strength of concrete of OPC concrete and with Alccofine and is compared and it has been found that the strength of concrete got increased by 20% with partial replacement of cement by Alccofine. The author concluded that the compressive strength of concrete increases with increase Alccofine and content in HPC up to 15 – 20%.

 

High density of the mix was achieved and subsequently higher packing value. It is found that Alccofine is cheaper than cement. So, for better strength and durability of concrete it should be promoted in Indian Construction Industry.

8) Mahim Mathur, Ashish Mathur, Performance of Concrete by Partial Replacement of Alccofine -1203 Alccofine 1203 a mineral admixture in concrete when it is added in cement concrete for the green state and hardened state i.e..For workability and strength of concrete using ordinary Portland cement (43 grade). Partial replacement with ordinary Portland cement (43 grade) which varies from 1% to20% at interval of 1%, 2%, 3%, 4%, 5%, 10%, 15%, 20%, cubes for cement and 3 cubes forM20 mix cement partially replaced with Alccofine 1203,and 6 cement cubes ,3 for cement and sand , 3 for cement sand and alccofine. A total thirty three mixes were prepared for grade of concrete. All mix of concrete was examined for slump test of fresh concrete and by compressive strength for 3 days, 7days and 28 days.
Total number of specimens for cubes was 33 which were casted for testing to study influence of alccofine1203 on concrete and cement. These Concrete specimens were deep cured in water under normal atmospheric temperature. Slump was found better in partial replacement at 10% as compared to that of addition of alccofine 1203 for M20 grade of concrete. M20 grade concrete, the compressive strength observed was 41.11N/mm2 which are greater than the target compressive strength of normal M30 grade concrete. On the basis of strength increment of variation mix of concrete gives better performance which indicates the consumption of waste material as mineral admixture for concrete could be promoted in a big way for environmental sustainability. Cement cubes has been test for 3,7&28 day strengths and partially replaced cement with 10% of alccofine and strength of 19.26 Mpa achieved in 28 day.

## III. METHODOLOGY

### A. *Material Selection*

1) *Cement:* Using OPC for the making of M30 grade of Concrete
2) *Alccofine 1203:* A patented low calcium silicate-based mineral supplement is called Alccofine 1203. Unique particle size distribution is produced through controlled granulation. Its pozzolanic reactivity and latent hydraulic property lead to an improved hydration process. Alccofine 1203's addition enhances the packing density of the paste component. Because of this, the water need and additive dose are reduced, enhancing the strength and durability characteristics of concrete at all ages.
3) *Aggregate:* Using nominal aggregate size of 20mm

## IV. MIX DESIGN

Although it has several limitations, the typical recycled aggregate created after processing can be used in building to some extent. Additives are injected into the building process to improve the characteristics of the recycled aggregate in order to improve the qualities of this newly manufactured aggregate. In this project, we'll utilise 11%, 12% & 13% Alcofine 1203, respectively, as a partial replacement of cement and run a number of tests on it.

### A. *Casting*

We will use cubes with the dimensions 150x150x150mm in this operation. Using Alccofine 1203, casting will be done for two different types of material: natural aggregate and recycled aggregate. The cast cubes are then evaluated for workability, water cement ratio, specific gravity, etc., before being compared to one another. 10%, 11%, 12% Alccofine 1203, and 88% natural aggregate (coarse aggregate, fine aggregate) make up the slurry for cubes with natural aggregate.

### B. *Preparation of Slump*

n the project that comes next, we'll experiment with concrete from the M30 grade. This the grade taken into consideration when using natural aggregate for conventional construction and when mixing aggregate with ACCOFINE 1203. The currently used concrete mix is made up of 11,12,13% alccofine by partial replacement of cement.

### C. . *Mixing and filling of concrete in Moulds*

After the batching process was completed, the required amount of water was added, and the mixture was then carried out by repeatedly rotating a shovel to ensure colour consistency. The deliberate avoidance of excessive water pouring was done. The three layers of the uniform mixture were added to the moulds by tamping each layer 25 times, which filled any gaps in the moulds and compressed the concrete.

 

*D. Compaction*

Compaction of the concrete and filling voids if any in the cube. The mould is then covered with plastic sheet to prevent excess water from escaping.

*E. Curing*

The hardened concrete samples are then remoulded after 24 hrs. and submerged in a clean water bath for curing until the age of testing i.e. 7 days, 14 days and 28 days.

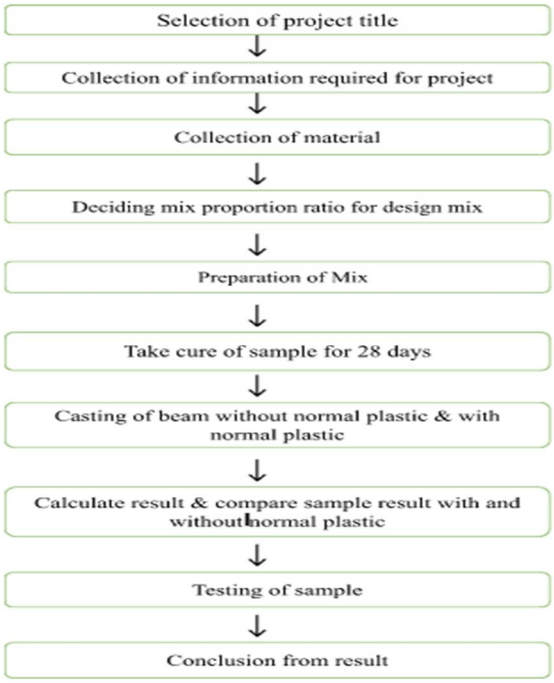


Fig 1. System Architecture

## V. CONCLUSIONS

In this chapter the processing of demolished concrete into recycled aggregate are discussed . The collection, segregation, transportation , crushing , washing, scrubbing and sizing are discussed briefly. Also, the preparation of concrete for testing are discussed briefly according to their suitable proportion.

These tests are carried out to determine the concrete's compressive strength. To design a structure and determine how much pressure the cement can withstand, civil engineers essentially need to understand the compressive strength. The better it is and the more expensive the cement is, the greater the compressive strength.

Testing concrete cubes and keeping accurate cube test records do not equate to quality control of concrete operations. Even though the records frequently indicate good cube results, the real concrete is frequently awful. While actual concreting is sometimes done without consideration for the water to cement ratio, which affects the strength and endurance of the building, concrete cubes are frequently cast with a stiffer mix (lower water to cement ratio) or utilising more cement. Instead of focusing on maintaining appropriate cube test records, the engineer must manufacture concrete that is strong and durable for the structural members.

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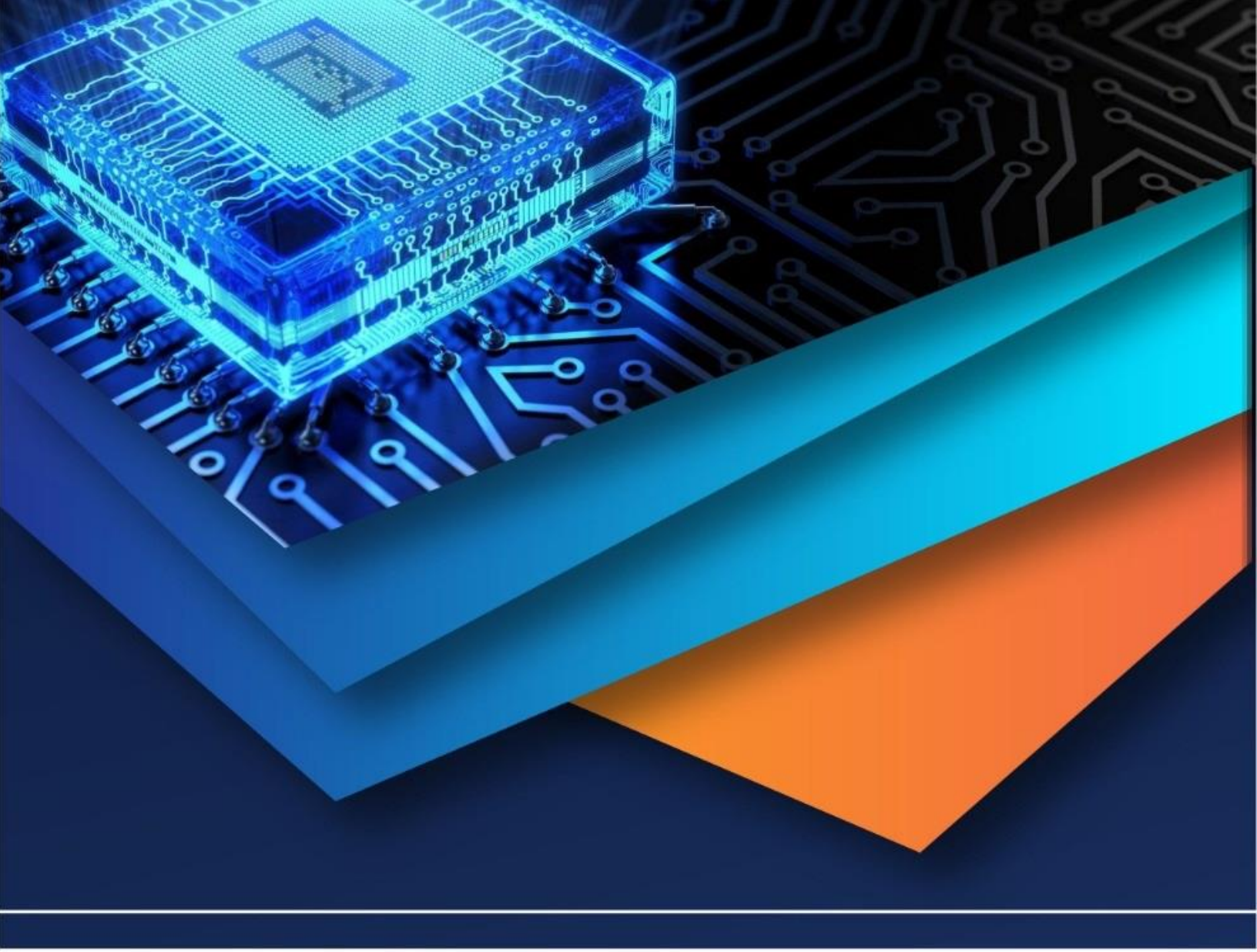

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