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Studies On Behaviour Of Light Weight Aggregate Concrete By Incorporating Alccofine

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ABSTRACT

This study conducts an empirical inquiry with the objective of improving the compressive resilience of lightweight aggregate concrete by integrating alccofine, an additional cementitious substance. The study involves the replacement of a portion of cement with varying percentages of alccofine, namely 7%, 14%, 21%, and 28%, in the formulation of lightweight aggregate concrete. The main goal of this study is to achieve the principal aim of this research is to identify the optimal replacement percentage that yields the highest compressive strength while maintaining the desired properties of lightweight concrete.

Keywords – Concrete, Pumice, Alccofine.

I. INTRODUCTION

In concrete, natural stones such as lime and stone are usually applied as coarse aggregate. Environmental resources are heavily exploited as an outcome of the growing popularity of concrete in developing. Synthetic the usage of lightweight aggregates might take the role of coarse aggregates. Utilizing lightweight concrete allows for more flexible design, significant cost savings, trimming dead loads, thinner sections, tiny structural components, etc. Concrete that possesses a density that is significantly less by concrete comprised of crushed stone or gravel is referred to as lightweight concrete. Ordinary concrete weighs a lot. Therefore, if employed, it significantly increases the structure's dead weight. In addition to eliminating the construction's bulk weight, concrete that's lightweight is also capable of serving as thermal insulation.

II. LITERATURE REVIEW

1) Lakshmi Kumar Minapu, et al (2019) they have conducted an experimental study involving the creation and testing of nine sets of cubes, cylinders, and prisms. These sets were designed with varying proportions of pumice stone, which was used as a substitute for natural coarse aggregate. Each set comprised four cubes, two cylinders, and two prisms, aimed at assessing compressive resilience, tensile resilience, and flexural resilience, respectively. Pumice stone was utilized as a partial replacement for natural coarse aggregates, combined with fly ash and silica fumes in different ratios. The cubes, cylinders, and blocks were molded according to the Proportions for the M30 design mix and subsequently cured for a duration of 28 days. Following this curing period, tests were conducted to evaluate the compressive resilience, tensile resilience, and flexural resilience. The outcomes of the study led us to the conclusion that lightweight aggregates, like pumice stone, exhibit no discernible inferiority compared to natural coarse aggregates. This suggests their suitability for construction purposes.

2) R.Rathan Raj et al (2017) this study centers on assessing the compressive resilience of concrete by substituting a portion of cement with Alccofine. The project involves an experimental investigation of concrete, wherein cement is substituted with Alccofine at varying percentages 0%, 4%, 8%, 16%, 17%, 20%, 25%, 50%, 75%, and 100%, over durations of 7 and 28 days. The concrete's design mix used throughout the experiment adhered to the M25 specifications. The examination revealed that the rise in

compressive resilience percentages, in both 7-day and 28-day curing periods, reached its peak at a 16% replacement rate. At this level, the compressive resilience exhibited a significant enhancement, measuring 50.95% and 60.95% higher than the conventional concrete.

3) Pragati J. Jagtap1, et al (2020) this article explains that lightweight concrete possesses a satisfactory level of strength, positioning it as a potential alternative construction material within industrialized building systems. The aerated lightweight concrete exhibits a compressive resilience due to its reduced density. This outcome is attributed to an elevated count of voids generated by the foam dispersion within the sample. As a result, the concrete's compressive resilience experiences a decline. In fact, the compressive resilience of bubbled lightweight concrete falls short by 27% compared to the requisite standard. This discrepancy renders it unsuitable for application wall with no structural load-bearing function material. Nevertheless, it's acknowledged that the concrete's compressive strength is sufficient when used within non-load bearing structural contexts.

4) Dr. Dilip K Kulkarni, et al (2019) They conducted a study involving low-density concrete, where they illustrated a comparison between the densities of conventional concrete and lightweight concrete. Since lightweight concrete exhibits notably lower density than standard concrete, this reduced density contributes to the reduction of dead loads on structures. Additionally, it accelerates the construction process and upholds structural efficiency.

5) T. Parhizkar, et al(2019) They have conducted an experimental study that delves into the characteristics of lightweight concrete made using volcanic pumice lightweight aggregates. To achieve this objective, two variations of lightweight concrete were created, one utilizing lightweight coarse and natural fine particles, and the other utilizing low-density coarse and fine particles. The study examined their physical, mechanical, and durability proper fine and coarse particles with low weight ties. The results demonstrate that these low density concrete formulations adhere to the requirements for structural lightweight concrete. This conclusion is drawn from assessments of parameters like compressive resilience, tensile resilience, and drying shrinkage.

III. CONSTITUENTS OF MATERIALS

The materials to be used are Cement, Sand, Coarse aggregate, pumice, Alccofine and Water.

A-CEMENT: We will be using most commonly used type of cement that is OPC, Ordinary Portland Cement 53 grade conforming to I.S. – 12269- 1987.

B-FINE AGGREGATES: Small-sized particulate materials we will be using Sand and conforming to IS: 383.

C-COARSE AGGREGATE: Large-sized particulate materials of nominal size of 20mm down are chosen and tests to determine the different physical properties as per IS 383-1970.

D-PUMICE AGGREGATE: aggregate of nominal size of 10mm down are chosen and tests to determine the different physical properties

E-ALCCOFINE: We will used alccofine micro material to replace some part of cement that is OPC, Ordinary Portland Cement 53 grade.

F-WATER: Water serves a crucial role in concrete as it initiates chemical reaction with binding material. Throughout the research and for the curing of concrete samples, standard drinkable water will be employed.

SPECIFICATIONS OF CEMENT:

SL NO.	TESTS	RESULTS
1	Normal Consistency	34%
2	Initial Setting Time	35 MINUTES
3	Final Setting Time	480 MINUTES
4	Specific Gravity	2.45

SPECIFICATIONS OF FINEAGGREGATE:

SL NO.	TESTS	RESULTS
1	Specific gravity	2.49
2	Fineness	2.9

SPECIFICATIONS OF COURSE AGGREGATE:

SL NO.	TESTS	RESULTS
1	Specific gravity	2.63
2	Water Absorption	0.8%
3	Size	20mm
4	Fineness	7.5

SPECIFICATIONS OF PUMICE:

Sl no.	Tests	Results
1	Specific gravity	1.94
2	Water Absorption	13.4%

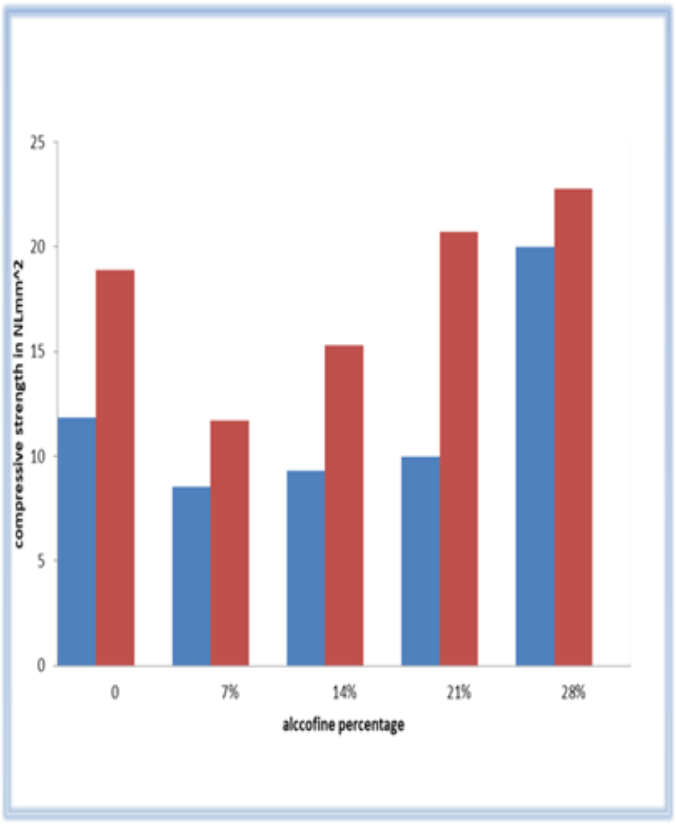
SPECIFICATIONS OF ALCCOFINE:

Sl no.	Tests	Results
1	Appearance	white
2	Specific Gravity	2.86

IV. TEST ON CONCRETE:

a) TESTS ON HARDENED CONCRETE
COMPRESSIVE STRENGHT:

COMPRESSIVE STRENGTH		
Alccofine percentage	7 Days (N/MM^2)	28 Days (N/MM^2)
0 %	11.82	18.89
7%	8.55	11.68
14%	9.28	15.3
21%	9.98	20.69
28%	20	27.48



V. CONCLUSION

- This research demonstrates the increase in strength and workability with 21 and 28% of incorporating alccofine in the cement.
- This research demonstrates that is not much variance in the strength for 7and 14% of incorporating alccofine in the cement.
- The maximum compressive resilience has obtained is 18.89 N/mm^2 in cement, fine aggregate and water without alccofine.
- The maximum compressive resilience has obtained is 27.48N/mm^2 with 28% addition of alccofine.
- The percentage of compressive resilience increase is 45.5 % with 28% addition of alccofine.

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