ISSN: 2455 - 1597

ijergs
Open Access

International Journal of Engineering Research and Generic Science (IJERGS)
Available Online at www.ijergs.in

Volume - 5, Issue - 2, March – April - 2019, Page No. 69 - 72

An Experimental Investigation on Concrete containing Meta kaoline

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Abstract

Met kaolin is a material which can be used as an admixture to gain the strength of conventional concrete and helpful to produce high strength concrete. Met kaolin is used in a conventional concrete to improve or modify the strength of concrete. If the structure having insufficient or poor curing, like underground structures which undergo serve loss of compressive strength, use of met kaolin proves to be very useful. This paper deals with the properties of concrete with varying percentage replacement of met kaolin in M-25 grade of concrete. The mix M1, M2, M3 and M4 were obtained by replacing 0,5,10 and 15 percent mass of cement by Met kaolin. The test results indicated that admixture met kaolin when used at optimum quantity tend to increase the strength of the concrete mix when compared with conventional concrete.

Keywords: Met kaolin, concrete, pozzolanic.

Introduction

One of the most and widely used building materials is Concrete which is good in resisting the compressive load and compressive forces acts on a building. By addition of some pozzolanic materials, the various properties of concrete viz, workability, durability, strength resistance to cracks and permeability can be improved. Many modern concrete mixes are modified with addition of admixture, which improve the microstructure as well as decrease the calcium hydroxide concentration by consuming it through a pozzolanic reaction.

Metakaolin is a pozzolana, probably the most effective pozzolanic material for use in concrete. It is a product that is manufactured for use rather than a by-product and is formed when china clay, the mineral kaolin, is heated to a temperature between 600 and 800ºC. Its quality is controlled during manufacture, resulting in a much less variable material than industrial pozzolans that are by-products. First used in the 1960s for the construction of a number of large dams in Brazil, metakaolin was successfully incorporated into the concrete with the original intention of suppressing any damage due to alkali-silica reaction.

Materials Used

Cement: OPC of 53 Grade confirming to IS:12269-1987 was used in the investigation. The specific gravity of cement was 3.10 Maintaining the Integrity of the Specifications.

Coarse Aggregate: Crushed stone aggregate having a maximum size of 20 mm from a local source having the specific gravity of 2.7 conforming IS 383-1970 was used.

Fine Aggregate: Locally available river sand which is passing through 4.75mm IS sieve and conforming to grading zone-II of IS 383-1970 was used. The specific gravity of fine aggregate was 2.61.

Meta kaolin Meta kaolin is not a by-product. It is obtained by the calcinations of pure or refined Kaolinite clay at a temperature between 6500 C and 8500 C, followed by grinding to achieve a finesse of 700-900 m^2/kg. Metakaolin is a pozzolanic additive/product which can provide many specific features. Metakaolin is available in many different varieties

and qualities. The purity will define the binding capacity or free lime.. When used in concrete it will fill the void space between cement particles resulting in a more impermeable concrete. Meta kaolin, is a relatively new material in the concrete industry, is effective in increasing strength.

Experimental Program

Mix proportioning of concrete is according to IS 10262-2009

Table 1: Mix Proportions

Mix	Cement	Metakaolin	F.A	C.A	W/C
1	372	0	698	1238	0.5
2	352	19	698	1238	0.5
3	316	38	698	1238	0.5
4	316	56	698	1238	0.5

The mix proportion of this investigation was 1:1.87:3.32 and M25 grade of concrete was adopted.

Preparation of Specimen

In this study minimum three specimens were tested at each selected age the tests for compressive strength of cube specimen's size 150mm×150mm×150mm. Test was performed as per IS 516:1959.

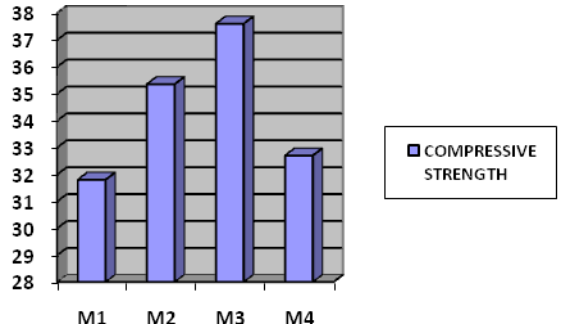
The strength characteristics of concrete with varying percentage of metakaolin were studied by casting cubes. The constituents of the concrete viz, cement, fine aggregate and coarse aggregate were mixed to appropriate proportion by adding water. Metakaolin is added to the different mix in varying proportion as a partial replacement for cement. Moulds for cube of size 150x150x150mm were prepared and concrete was poured in to the mould layer by layer and vibrate thoroughly. The specimens were removed from the moulds after 24 hours and then the specimens were cured with water for 28 days.

Compressive Strength

For mix, the cubes of size 150mm were cast (7 days and 28 days) and tested using Compression Testing Machine (CTM). The specimen placed on the platform of the CTM. The load applied gradually until the failure stage. The ultimate load noted and calculated the compressive strength of corresponding specimen.

Results and Discussions

The Compressive strength results of concrete specimens with 0%, 5%, 10 % and 15% with 0.5 water cement ratio shown in table-



It was found from the experimental results that the compressive strength has increased for the specimens with varying percentage of meta kaolin as replacement for cement when compared with the conventional concrete. The test result obtained are presented in table 2.

It is observed that 10% replacement of cement with meta kaolin increased the compressive strength of concrete by 21.3%. The other percentage of meta kaolin such as 5 and 15 percentages also showed considerable increase in strength characteristics of the concrete when compared with the conventional concrete.

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