

Experimental Studies on Replacement of Cement with Chalk Powder in Concrete

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Abstract: *The materials chosen for construction should be sustainable and should not endanger the resources. They should be conveniently used by the ordinary people and economical. Chalk powder is abundant, versatile, renewable and cheap. Reusing of chalk powder reduces the waste released by various schools, colleges and educational institutions. Since there is no standard method of disposal. The aim of this experimental study was to check whether there is a possibility of using the chalk powder in addition to the other constituents of concrete and to study the Strength properties. Behavior of cement concrete in terms of compressive strength for convention Concrete, Chalk Powder reinforced concrete. In this project cement will be replaced by chalk powder in various properties by Weight of cement in ranging from 5 to 30 percentage Hence the cubes prepared will be checked for their comprehensive strength and compared with conventional concrete. The perform on concrete will be noted.*

Keywords: Chalk Powder Reinforced Concrete, Chalk Powder, Compressive Strength, Admixture.

I. INTRODUCTION

The cost of constructing a building is increasing day by day as cost of building materials are increasing, the use of any alternative material that has tendency to partially replace the building material may reduce the cost of the construction to certain level in this research we have selected materials Chalk Powder for partially replacement with cement chalk powder is easily available, renewable and also cheap. The main aim of this research is to check if the above materials can be used instead of cement up to certain percentage. In this project, the workability, compressive strength as well as flexural strength of concrete made of Chalk Powder. Concrete is a mixture of paste and aggregates, or rocks. The paste, composed of Portland cement and water, coats the surface of the fine (small) and coarse (larger) aggregates. Concrete production is the process of mixing together the various ingredients—water, aggregate, cement, and any additives—to produce concrete.

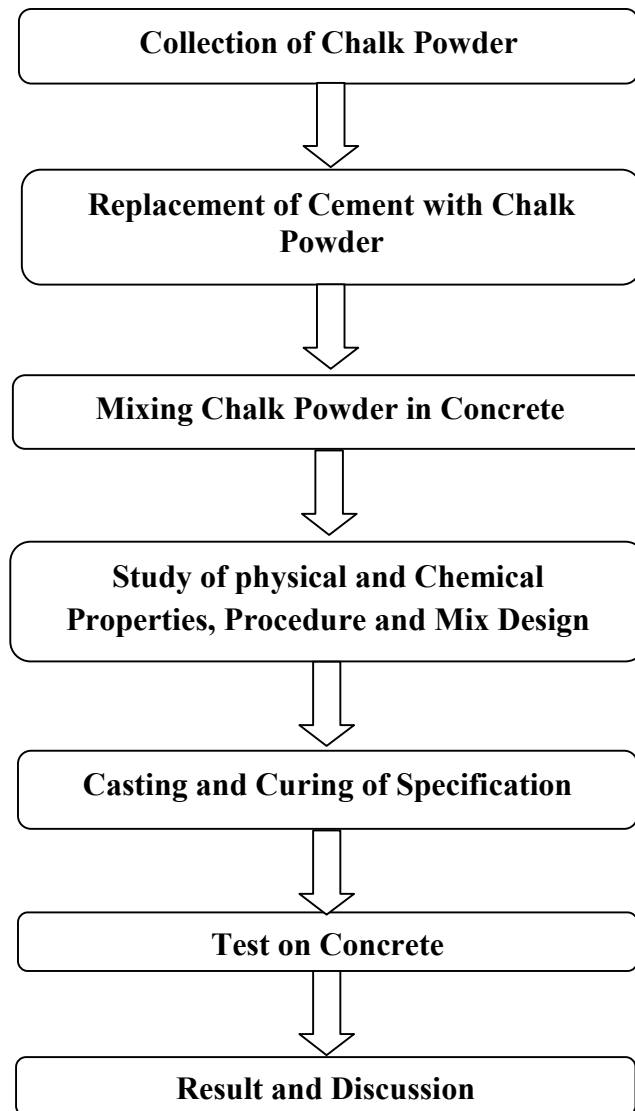
Concrete production is time sensitive Chalk powder is abundant, versatile, renewable and cheap. Reusing of chalk powder reduces the waste released by various schools, colleges and educational institutions. The aim of this experimental study was to check whether there is a possibility of using the chalk powder in addition to the other constituents of concrete and to study the strength properties. In the present study the deformation properties of concrete cubes under static loading condition and the behavior of structural components in terms of compressive strength. The chemical formula of limestone, chalk is CaCO_3 and it is a carbonic salt of calcium. Artificial chalk is called magnesium carbonate. For this, the empirical formula is MgCO_3 .

II. CHALK POWDER

Chalk is a common name of the compound calcium carbonate. Its chemical formula is CaCO_3 . Calcium carbonate is a form of limestone. Chalk is a common substance found everywhere. It is a soft, highly porous, white sedimentary carbonate rock of limestone. It is composed of calcite shells or skeletons of planktons. Chalk is pure calcite with only 2–4% of other mineral content. It forms effervescence when it comes in contact with an acid. The chalk was formed over millions of years from the protective coverings of small organisms like phytoplankton that lived in the seas and oceans. When these organisms died their protective coverings fell to the ocean bed. And they accumulated. Earth movements caused some of these deposits to experience extremely high temperatures and pressures, forming chalk.

Chalk has a greater resistance to weathering and slumping than the clays. It can hold water as it is highly porous. This is a great advantage for the areas that suffer from drought and that have large amounts of limestone. Because limestone can provide a natural reservoir in these areas that release water slowly. Chalk is used for making lime and Portland cement and as a fertilizer. Chalk can be natural as well as man-made.

III. METHODOLOGY



V. PRIMARY TESTS

5.1 Slump Test

The concrete slump test measures the consistency of fresh concrete before it sets. It is performed to check the workability of freshly made concrete, and therefore the ease with which concrete flows. It can also be used as an indicator of an improperly mixed batch. The concrete slump test measures the consistency of fresh concrete before it sets. It is performed to check the workability of freshly made concrete, and therefore the ease with which concrete flows.

It can also be used as an indicator of an improperly mixed batch. The quality of the mix is judged by the slump test. This studies the variation of construction materials in the mix. These tests focus on the water-cement ratio of the

concrete mix. Slump test is conducted at the site which does not require any lab arrangement or expensive testing machines. Hence this test is economical

VI/ MECHANICAL TESTS

6.1. Compressive Strength Test

Compressive strength test, mechanical test measuring the maximum amount of compressive load a material can bear before fracturing. The test piece, usually in the form of a cube, prism, or cylinder, is compressed between the platens of a compression-testing machine by a gradually applied load. Most of the concrete properties are related to the compressive strength that is obtained by compressive strength test. Compressive strength test is the easiest, most economical or most accurately determinable test. The variability of concrete is best studied by means of compressive strength tests.

6.2 Tensile Strength Test

The tensile strength of concrete is one of the basic and important properties which greatly affect the extent and size of cracking in structures. Moreover, the concrete is very weak in tension due to its brittle nature. Hence, it is not expected to resist the direct tension. So, concrete develops cracks when tensile forces exceed its tensile strength. Therefore, it is necessary to determine the tensile strength of concrete to determine the load at which the concrete members may crack.

VII. DURABILITY TESTS

7.1 Rapid Chloride Permeability Test

Rapid chloride permeability test (RCPT) is one of the widely used test methods to rapidly assess the durability of concrete, specifically its resistance against chloride ion penetrability. Many researchers have questioned the applicability of RCPT in mixes having supplementary cementitious materials (SCMs). Rapid Chloride Permeability Test Equipment (RCPT) are used for evaluation the resistance of a concrete sample to the penetration of chloride ions.

7.2 Alkali Aggregate Reaction

Alkali-aggregate reaction is a term mainly referring to a reaction which occurs over time in concrete between the highly alkaline cement paste and non-crystalline silicon dioxide, which is found in many common aggregates. Alkali aggregate reactions (AAR) occur when aggregates in concrete react with the alkali hydroxides in concrete producing a hygroscopic gel which, in the presence of moisture, absorbs water and causes expansion and cracking over a period of many years.

VIII. CONCLUSION

In this paper we are going to study compressive strength, slump test, tensile strength test, Rapid chloride test, alkali aggregate test for the different proportion of chalk powder. The material chosen for construction should be pollution and should not endanger the resources. They should be conveniently used by the ordinary people and be low in monetary cost. Chalk powder is abundant, versatile, renewable and cheap. Reusing of chalk powder reduces the waste released by various schools, colleges and educational institutions. The aim of this experimental study was to check whether there is a possibility of using the chalk powder in addition to the other constituents of concrete and to study the strength properties. In the present study the deformation properties of concrete cubes under static loading condition and the behavior of structural components in terms of compressive strength for chalk powder reinforced concrete.

REFERENCES

- [1] Concrete Technology by M.S. Shetty text book
- [2] IS 456-2000 (Design of Reinforced Concrete Structures) code book
- [3] THE EFFECT OF ADDITION OF LIMESTONE POWDER ON THE PROPERTIES OF SELF – COMPACTING CONCRETE, Vol. 2, Issue 9, September 2013, ISSN: 2319-8753.

- [4] International Journal of Emerging Technologies and Innovative Research (www.jetir.org | UGC and issn Approved), ISSN:2349-5162, Vol.6, Issue 5, page no. pp163-171, May-2019, Available at: <http://www.jetir.org/papers/JETIR1905C26>.
- [5] IS 10262 (Concrete mix proportioning) code book.
- [6] R. A. Silva et al., "Global premature mortality due to anthropogenic outdoor air pollution and the contribution of past climate change," Environ. Res. Lett. vol. 8, no. 3, 2013.
- [7] A. Pietrzak, J. Adamus, and B. Langier, "Application of titanium dioxide in cement and concrete technology," Key Eng. Mater., vol. 687, no. April 2016, pp. 243–249, 2016.
- [8] A. Joshaghani, "Evaluating the effects of titanium dioxide (TiO₂) and carbon-nanofibers (CNF) as cement partial replacement on concrete properties," MOJ Civ. Eng., vol. 4, no. 1, pp. 29–38, 2018.
- [9] D. M. Mircea, "Self-Cleaning Concrete for Landscaping Applications," MATEC Web Conf., vol. 289, pp. 1–4, 2019.
- [10] G. Diamantopoulos et al., "The Role of Titanium Dioxide on the Hydration of Portland Cement: A Combined NMR and Ultrasonic Study," Molecules, vol. 25, no. 22, 2020.