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EXPERIMENTATION ON SELF-COMPACTING CONCRETE USING METAKAOLIN

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Abstract: Concrete is a mixture of cement, sand, and aggregates which is hard and strong and is mostly used to achieve compressive strength in construction. The many research and development were taken placed on concrete to accomplish different properties. Self-Compacting Concrete (SCC) is one of the developments of concrete after adding some other constituents to the concrete mixture. Self-Compacting Concrete (SCC) is concrete that has the property of self-compaction without using other equipment. Self-Compacting Concrete is again developed and Metakaolin is partially replaced by cement in SCC to improve the strength of concrete. Metakaolin is a Pozzolanic material having similar properties to cement but a size very fine than cement which is its advantage, the finer metakaolin particles fulfill the fine gap between cement particles and give the concrete more strength as compared to simple concrete.

Index Terms **- Self-compacting concrete, metakaolin, silica fume, workability, compressive strength test**

I. INTRODUCTION

SCC is made by adjusting the aggregate content and using a combination of chemical and mineral admixture consisting of high range water reducing superplasticizers. High doses of superplasticizers produce a mix with high fluidity and allow for a reduced water-powder ratio. The SCC is poured into forms and flows easily around congested areas of reinforcement without the need for standard consolidation. It is a possible quality concrete without the use of vibrators. Metakaolin is an anhydrous calcined form of kaolinite. Rocks that are rich in kaolinite are known as kaolin or China clay, traditionally used in the manufacture of porcelain. The particle size of metakaolin is lesser than cement particles. The quality and reactivity of metakaolin are strongly dependent on the characteristics of the raw material used. Metakaolin can be produced from various primary and secondary sources containing kaolinite. We studied research papers in which we found that 15% replacement of Metakaolin by weight shows good results, improves the properties of Hardened concrete, and reduces shrinkage and Creep. Some papers say 25% Metakaolin's replacement by cement's weight gives good strength results. We decided to change the percentage of Replacement of metakaolin to 7,14,21,28% by weight of cement. The main objective of this study is to find out the Compressive strength, and tensile strength of concrete mix by replacing cement with Metakaolin in different percentages.

3.1 Literature review

- Rahmat Madandoust, S. Yasin Mousavi (2012), studied the fresh and hardened properties of self-compacting concrete for a total of 15 mixes including 0-20% of metakaolin content replaced by cement by weight with 3 water/binder (W/B) ratio of 0.32, 0.38 and 0.45. The tests performed for fresh properties are slump flow, visual stability index, T50, V-funnel, and L-box. The hardened properties were tested for Workability, compressive strength, splitting tensile strength, and ultrasonic pulse velocity (UPV).
- R.Sivakumar, N.Mohanraj, D.Saratahkumar, T.S.Venkatachalam (2017) studied the effect of Metakaolin on Strength of the Concrete. In this study, they replaced the percentage of metakaolin by 0%, 5%, 10%, and 15% for the M25 grade of concrete and cured for 7 and 28 days. They performed tests for compressive strength, split tensile strength, and flexural strength, and the replacement percentage of metakaolin for getting maximum compressive strength, split tensile strength and flexural strength is also determined.
- In the paper named study of self-compacting concrete using MK and densified Authors Yugasini, Nitya, and Stellor, decided to deal with the study of SCC in which they replaced cement partially with MK and silica fumes in 5 %, 10% and 15% and they observed that hardened properties like tensile strength and compressive strength increases and workability increases. They mentioned methodology, code they used, materials, and experimental setup in their paper.
- A. Dinesh of Shri. Ramakrishna Engineering College, says in their paper experimental study on Self Compacting Concrete, that replacement of fly ash by 5, 10, 15, 20 and 25% of cement and silica fumes by 2.5%, 5%, 7.5%, 10%, and 12.5% by cement they found that by replacing silica with cement partially fresh properties like increase and hardened properties like workability increases and hardened properties are also increases. Similarly, by replacing flyash they found that workability

increases but hardened properties decrease. In the result, they said as we increase the percentage of fly ash and silica fumes the compressive strength decreases and workability increases.

- In the paper of title incorporation of silica fumes and Metakaolin on SCC whose author is O. M. Ofuyatan, A. M. Olowofoyiku, S.O. Edeki, J. Oluwafemi, and O. David studied the action of admixtures on SCC. In this experiment, they replaced silica fumes and MK with cement in 5,10,15,20, and 25%. They took a constant water-cement ratio of 0.38 they found that segregations to resistance decreased, flowing ability decreased, and compressive strength increases. They state that 15% replacement of cement by MK by weight gives the highest strength and more replacement led to decrease strength.

3.2 Aim

To determine the effect of Metakaolin a Pozzolanic Admixture on the fresh and hardened properties of Self Compacting Concrete.

3.3 Objectives

In this project, we are dealing with the replacement of cement with metakaolin in self-compacting concrete. Metakaolin is a pozzolanic material with similar properties to cement but particle diameters much lesser than cement particles, which helps to increase the strength of concrete.

We studied various research papers where we found that the cement replacement by metakaolin up to a certain limit increases the strength of the concrete. The following are the objectives of our project.

1. To determine the material used in Self Compacting Concrete.
2. To determine the physical properties of materials used in Self Compacting Concrete.
3. To determine the properties of fresh concrete.
4. To determine the mechanical properties of Self Compacting Concrete that contain Metakaolin.

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