Review on Experimental Study of HPC using Tertiary Blends of GGBS and Metakaoline

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Abstract – The project is to study of HPC using tertiary blends of GGBS and Metakaoline.

Concrete is the most extensively used construction material in the world. The addition of mineral admixture in cement has suddenly increased along with the development of concrete industry, due to the consideration of cost saving, energy saving, environmental protection and conservation of resources. however environmental view both in terms of damage caused by the extraction of raw material and carbon dioxide emission during cement manufacture have brought pressures to reduce cement consumption by the use of supplementary materials. High Performance Concrete (HPC) is the latest development in concrete. It has become more popular these days and is being used in many prestigious projects. Mineral admixtures such as fly ash, rice husk ash, metakaolin, silica fume GGBS etc are more commonly used in the development of HPC mixes

This study presents the effect of metakaolin (MK) on the mechanical and durability properties of high strength concrete for a constant water/binder ratio.The characteristics like workability, compressive strength and flexural test , RCPT ,durability of M60 grade .HPC mixes idifferent percentages of metakaolin or GGBS by weight of cement along with some suitable super plasticizer.

Keywords- Compressive strength, Durability, High Performance Concrete, High reactivity Metakaolin, GGBS Mineral Admixtures.

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I. INTRODUCTION

Concrete is mostly used construction material all over the world I view of its compressive strength, high mouldabilty, days and is being used in many prestigious projects such as Nuclear power projects, flyovers, and multi-storeyed buildings.

Metakaolin (MK) or calcined kaolin, other kind of pozzolan, produced by calcination has the capacity to supplant silica fum eas an option material. In India MK can be created in extensive sum, as it is a result of kaolin mineral which has boundless demonstrated stores accessible in the nation. Ground Granulated Blast Furnace is a byproduct from the Blast furnace slag is a solid waste discharged in large amount by the iron and steel industry in India. These work at a temperature of around 1500 degree centigrade and are sustained with a painstakingly controlled blend of iron – mineral, coke and limestone. This slag is occasionally tapped off as a liquid fluid and on the off chance that it is to be utilized for the fabricate of GGBS it has been quickly extinguished in extensive volumes of water.

Structural stability and economic considerations. It was found that in addition to improvement in strength, concretes with very low w/c or w/b ratios also demonstrated other improved properties, such as higher elastic modulus, high flexural strength, lower permeability, improved abrasion resistance, and durability. This is usefulfor HPC development.. HPC is the newly development in concrete. It has become more popular these days and is being used in many prestigious projects such as Nuclear power projects, flyovers, multistoried buildings.

Metakaolin (MK) or calcined kaolin, other type of pozzolan, produced by calcination has the capability to replace silica fum eas an alternative material. In India MK can be produced in large amount, as it is a product of kaolin mineral which has wide spread proven reserves available in the country. Ground Granulated Blast Furnace is a byproduct from the Blast furnace slag is a solid waste discharged in large amount by the iron and steel industry in India.

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II. LITERATUTRE SURVEY

Eva Vejmelkova, et al., (2010). "Elite cement with Czech Meta kaolin: Experimental examination of quality, strength and solidness attributes" Construction and Building Materials. . Alaa M. Rashad et.al.(2016): In this paper the outcomes gives that the compressive quality prior and then afterward being presented to lifted temperature as substance of MK incresased.. Then, GGBS was partially substituted with 2%, 4%, 6%, 8% and 10% mMK, by weight. Cement was partially replaced with 70% GGBS, by weight Then, GGBS was partially substituted with 2%, 4%, 6%, 8% and 10% mMK, by weight Kamaldeep Singh et.al.(2015): In conclusion, a comprehensive literature review was performed in order to gain insight into the key issues relevant Strengthening of Cement Concrete using Fly ash & Metakolin. In the study, These materials have been reduced the cement content and added strength much more than the prior situation. ,also it has made cement manufacture cheap and more eco-friendly C M Dordi et.al : In the present study, activation of GGBS has been carried out by further grinding granulated blast furnace slag. Such slag is known as microfine GGBS (MFGGBS).

III. CONCLUDING REMARK OF LITERATURE

From the literature review we come to know that the investigation is done on the study of behaviour of composite fiber in MK. sometime cement is replaces partialy by MK or GGBS in 3 different percentage 0 ,10,20..GGBS also used as a alternative for cement. due to this high strength is developed. From above GGBS can be replaced up to 40 %.

IV. GAP IN LITERATURE

From above we get results separately when MK partially replaced by cement or GGBS partially replaced by cement. Now in this project we are going to do mix design by using both at the same time MK and GGBS as a tertiary blend.

V. METHODOLOGY

The study has been divided into various parts:

In the first part, the material characterization of the recycled aggregates as per Indian standards was conducted.

The aggregates characterization are done by conducting the following tests as per IS 2386 Part III: 1990 and IS 2386 Part IV: 1990 and the properties of the crushed unprocessed aggregates were found.

To survey all the useful material in the market

To collect all the important data

Method of data collection

Sampling design

Method of data analysis

Specification:-

- Grade of Concret = M60
- Purpose :- Prestress concrete t be used in Bridge Decks
- Equipment :- On site batching Plant
- Retantion :- 30 min
- Mix to be transported by tower crane
- RCPT values less than 100 coulomb
- Target strength at 28 days 70 Mpa
- Exposure condition sever
- Early strength criteria 30Mpa in 3 days

Schedule of work:

1] Casting of beams, Columns, Cylinder

There were multiple tests to be carried out in order to determine different performance parameters such as mechanical and durability parameters.To study the mechanical performance it is decided to conduct compressive strength tests on cubes at ages of 7, 14, 28 and 56 days. It is further decided to check the early strength development by conducting the 3 day.testing.Further part of mechanical performance will be checked by conducting the splitting tensile strength and flexure strength by casting cylinders and beams.

2] Testing of beams, Columns, Cylinder:-

Compressive Strength

There is a benefit of having concrete with a compressive strength in excess of the design strength. While maintaining a compressive strength of grade provides adequate strength, higher strength

concrete can easily be proportioned. The benefits produced in other performance criteria as a result of this increased strength are almost essential. The method for testing the compressive strength of concrete was taken from IS: 516.

Flexural Strength:

Flexural strength is a very important characteristic of concrete. Concrete use can be defined by this test.

Rapid Chloride ion Penetration Test (RCPT):

This test technique was initially created by the Portland Cement Association, under are scan program paid for by the Federal Highway Administration (FHWA). The first test technique might be found in FHWA/RD-81/119, "Fast Determination of the Chloride Permeability of Concrete." Since the test strategy was created, it has been changed and adjusted by different offices and standard's associations.

These include:

- AASHTO T277, "Standard Method of Test for Rapid Determination of the Chloride Permeability of Concrete"
- ASTM C1202, "Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration "The test method involves obtaining a 100 mm (4 in.) diameter core or cylinder sample from the concrete being tested. A 50 mm (2 in.) specimen is cut from the sample. The side of the cylindrical specimen is coated with epoxy, and after the epoxy is dried, it is put in a vacuum chamber for 3 hours. The specimen is vacuum saturated for 1 hour and allowed to soak for 18 hours. It is then placed in the test device

VI. EXPECTED/POSSIBLE OUTCOME

To study how much percentage of cement partially replaced by using tertiary blend of GGBS and metakaolin .to achieve the Strength by using partially replacement of tertiary blend by MK Ang GGBS.

VII. REFERENCES

Badogiannis E, Papadakis V.G., Chaniotakis E, Tsivilis S, ((2004)) "Exploitation of poor Greek kaolins: Strength development of metakaolin concrete and evaluation by means of k-value" Cement and Concrete Research

Christina mary V. and Kishore CH., (2015)"Experimental Investigation on Strength and durability characteristics of high performance concrete using GGBS and MSAND" APRN Journal

Deven Shinde, Mangesh Choudhari, (2016)"Detail Study of High Performance Concrete using GGBS."IJRITCC,

Dr.H.M. Somasekharaiah', Adanagouda, Veena.S. (2015)" Experimental Investigation on Strength and durability characteristics of Metakaoline Based High Performance Concrete with steel and Polypropylene Fibers. IJIRSET

Durai S, Dr. P. Muthupriya, (2013)"Experimental Investigation on High Performance Concrete Using GGBS as Admixture". IJETED.

Eva Vejmelkova a, Milena Pavlikova a, Martin Keppert a, ZbyneˇkKeršner b, PavlaRovnanikova c, Michal Ondracˇek d, Martin Sedlmajer d, Robert Cˇ erny´" (2010) High performance concrete with Czech metakaolin: Experimental analysisof strength, toughness and durability characteristics" Research gate ELSEVIER

Jian-Tong Ding and Zongjin Li (2002) "Effects of Metakaolin and Silica Fume on Properties of Concrete" ACI Materials Journal.

Kannan V, Ganesan K, (2012) "Strength and water absorption properties of ternary blended cement mortar using rice husk ash and metakaolin" Scholarly Journal of Engineering Research.

P.Dinkar, G. Sriam," (2013). Effect of Metakaoline Content on the Properties of High Strength Concrete".International Journal of Concrete Structure and materials.

P. Usha, L. Chris Anto, Elangovan, D. Prasannam, (2016) "Strength Characteristics of concrete Containing Metakaoline and GGBS. International Journal on Application in Civil and Environmental Engineering.

R. Vijaya Sarathy and G. Dhinakaran." (2014). Strength and Durability Characteristics of GGBS Based HPC."Asian Journal of Applied Science.

Sabir B.B, Wild S, Bai J, (2001) "Metakaolin and calcined clay as pozzolans for concrete :a review" Cement and concrete composite 23.

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