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AN INVESTIGATION ON METAKOLIN MODIFIED CONCRETE PAVER BLOCKS

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Abstract - *Properly planned and constructed paver blocks provide excellent performance in regions where typical asphalt frameworks have a shorter administration life due to a variety of factors. Environmental and geographical requirements However, with the use of They can be designed to support small, medium, or heavy loads. in any circumstances, substantial and extremely heavy traffic conditions. The current project's purpose was to evaluate the properties of paver blocks, when the mix design is replaced with Metakaolin. For usage in asphalt and other application areas as the compressive, flexural, and water assimilation properties are the most important. The equivalent's key features for concrete paver blocks are as follows: been read for several cement mixtures in with varying rates of Metakaolin. Metakaolin was used as a partial substitute in the investigation, concrete was used, and varied rates were obtained. to ensure compressive, flexural, and tensile strength Water absorption of paver blocks in various states The It was discovered that blending in with a 10% substitute yielded the best results..*

***Key Words*: Metakaolin, Compressive Strength, Flexural Strength, paver blocks, concrete**

1. INTRODUCTION

Concrete is a material created artificially by solidifying a reasonable amount of concrete, sand, rock, and water. As most of us are aware, cement is a composite. Substance that is frequently used in construction industry all throughout the world it is deceptive. Aggregates achieved by combining the cementitious materials and water in predetermined amounts the project "Concrete" has begun. From the Latin word "concretus," which means "concrete" to join, together in order to solidify. The attributes of strength for The qualities of the solid are used to determine the constituents of the substance. used, as well as their collaborative activity During the assembly cycle of Concrete CO2 gas output is significant, resulting in causing harm to the common habitat and climatic conditions To concrete use reduction, fractional reserve of concrete Metakaolin is an example of an additional cementitious substance. Base debris, rice husk debris, GGBS, and silica fury, among other things, are used in the manufacture of solids. Metakaolin is a dehydroxylated sort of the Kaolin mud mineral. Stones having the significant level of kaolinite are called as the china soil (kaolin) was usually used as the gathering of the porcelain terminated material. Metakaolin reacts with Ca (OH)2, which is one of the consequence of hydration reaction of cement, and its structures the C-S-H gel. This gel advancement achieves extending strength and robustness of the strong. By supplanting concrete with Metakaolin extends the strength and strength, decreases the porosity in the strong, and lessens the vulnerability as well. The essential objective of this project is to investigate the conceivable use of Metakaolin as a midway replacement of cement in paver squares of different shapes.

2. METHODOLOGY

The mix design cycle is used to select the blending materials and their appropriate proportions. There are several methods for locating the solid mix design. The strategies used in India are in accordance with the BIS. The primary goal of the solid blend configuration is to find the appropriate extent where solid fixes like concrete, water, fine total, and coarse total should be mixed to supply the pre-set strength, solidness, and functionality and perhaps meet other IS: 456-2000 criteria. IS: 10262-2009 is a code that specifies the principles for apparent solid mix design. The qualities of the material used and the technique for producing cement blends with Metakaolin are changing at a rapid pace. The primary purpose of this examination study was to evaluate the various qualities of cement in terms of compressive strength, flexural strength, and water intake. The materials used for this research work and experiments performed on concrete specimens have been discussed.

2.1 Paver blocks

Concrete paver blocks were first used in Holland as substitution of paver blocks. These squares were rectangular perfectly healthy and had comparable size as the squares. Since latest fifty years, the square conditions of clearing blocks had been adjusted depending upon the applications. At first, they were arranged as non-interlocking or then again most of the way bury locking, by then changed to very interlocking shape types. These paver blocks are precast

strong units, which are laid on a pitiful compacted bedding over a profiled base course to fabricate a blacktop. If non-interlocking or somewhat interlocking paver blocks are utilized, then, at that point, it is called Concrete Block Pavement (CBP) and if interlocking paver blocks are utilized the asphalt is called 'Interlocking Concrete Block Pavement (ICBP). These squares being pre-projected units can be applied to any spaces and do not depends upon geological, environment conditions. They can be cast of any shapes and sizes to give food the need. They also offer catalyst improvement and can be expected to manage light, medium and robust traffic conditions safely.

Fig - 1 Paver Block

3. EXPERIMENTAL ANALYSIS

Concrete, sand, coarse aggregate, water and superplasticizers were blended altogether in the solid mix. At that point, it was filled in the elastic paver form of various shapes and distinctive thickness. All the filled paver molds were vibrated utilizing table vibrator. Subsequent to projecting, all the examples were finished with a steel scoop and it was saved for 24 hours. Following 24 hours, they were remolded from the paver shape and kept in the water tank for water relieving. A similar method was accomplished for 5%,10% and15% supplanting of concrete with metakaolin. To know the impact of backup of concrete with metakaolin, compressive strength, was done on the paver block.

As per IS 15658: 2006, compressive strength of paver block was determined at 7 and 28 day using universal testing machine (UTM). Minimum 3 samples were tested for 7 and 28 day strength. The average strength of 3 samples at 28 days were taken as compressive strength of paver block. The apparent compressive strength of paver block was multiplied with correction factor as it is mentioned in IS 15658: 2006 of table 5 Annex D to get Corrected compressive strength of paver block.

4. RESULTS AND DISCUSSION

In this part, the findings of studies on concrete paving blocks have been discussed. A comparison of findings was done to examine the effect of partial replacement of cement by Metakaolin in concrete mixtures to determine mechanical parameters at 7 and 28 days of age. One reference mix M0 of M40 grade was made without the inclusion of Metakaolin, and three additional mixes M1, M2, and M3 were prepared with Metakaolin in varying percentages of 5%, 10%, and 15% employed as partial replacement of cement, respectively. For the investigation, three different paver block shapes were used: zigzag, I, and Dumbel. Eight specimens of each type of paver block were cast and cured for seven and twenty-eight days, respectively.

4.1 Compressive strength

As per IS 15658: 2006, compressive strength of paver block was determined at 7 and 28 day using Universal testing machine (UTM). Minimum 3 samples were tested for each7days and 28 day strength. The apparent compressive strength of paver block was multiplied with correction factor as it is mentioned in IS 15658: 2006 to get corrected compressive strength of paver block.

Table -1: 7-days Compressive strength result MPa

Mix	Metakaolin (%)	Zigzag (80 mm)	Dumbel (60 mm)	I-shape (60 mm)
M0	0	54.26	54.42	52.96
M1	5	57.1	57	55.2
M2	10	64.10	64.35	62.32
M3	15	60.23	60.19	58.24

Table -2: 28-days Compressive strength result MPa

Mix	Metakaolin (%)	Zigzag (80 mm)	Dumbel (60 mm)	I-shape (60 mm)
M0	0	64.52	62.21	61.98
M1	5	68.12	65.34	64.53
M2	10	78.32	76.38	72.85
M3	15	70.26	69.17	68.28

5. CONCLUSIONS

The aim of the current exploration work is to decide the mechanical properties of cement with MK as the admixture for M40 grade of cement Paver blocks. Based on exploratory examination of the current examination study, the accompanying ends have been drawn.It is seen that compressive strength of paver block for all the shape and thickness at 7 and 28 days are expanded as level of concrete supplanting with metakaolin increments up to 10%. . 7 days compressive strength of paver block for all the shapes are more than required objective strength up to 15% concrete substitution. The most extreme compressive strength for all the shapes is more at 10% of substitution. The most extreme compressive strength of Dumbel (60mm) thickness at 10% substitution is 74 MPa which is about 23% more than that of control concrete. Flexural strength is expanding as concrete substitution increments up to 10% after that for 15% concrete substitution it is more than control concrete and furthermore over 5% substitution. 7-day and 28-day flexural strength is increments up to 10 % substitution after that it diminishes as level of substitution increments.

REFERENCES

[1] Saikumar A.V.S, Rao krishna.B "A Study on Strength of Concrete With Partial Replacement of Cement With Quarry Dust And Metakaolin" International Journal of Innovative Research in Science, Engineering and Technology vol. 3, Issue 3, March 2014.

[2] Shan C Sabu, Rijuldas V, Aiswarya S "Effect of metakaolin on various properties of concrete", International Journal of Advanced Technology in Engineering and Science, Vol. No.4, Issue No.01, January 2016.

[3] Srivastava,V Kumar.R , Agarwal V.C. and Mehta, P.K. "Effect of silica fume and metakaolin combination on concrete" International Journal of Civil Structural Engg. 2(3),2012: 893 – 900.

[4] Srinivasa Rao P, Sravana, Z. and Seshadri Sekhar, "Durability Studies on Steel Fiber Reinforced Metakaolin Blended Concrete", AKGEJC International Journal of Technology,Vol. 3, 2013 No.1, pp.38-43.

[5] Nishikant Koli, Sangar Abishek Manufacturing of paving blocks by using waste glass", International Journal of Scientific and Research Publications, Volume 6, Issue 6, June 2016 61 ISSN 2250-3153.

[6] Indian standard recommended guidelines for concrete mix design: 10262-198.