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A Review on Strength Properties of Concrete with Silica Fume, GGBS and Dead Animal's Bone Aggregates

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Abstract

Nowadays the biggest problem in every Sector is waste material. In every industry the waste are dumped in our near surrounding. It is dangerous for environmental substance like present in biosphere and it covers land day by day. In construction field raw material are too much expensive in India as well as across the world. So, using of waste instead of raw materials like cement, fine aggregate and Coarse aggregate. Replacement of raw material by waste in some specific percentage it decreases the cost of the construction and gives the strength. The waste material used for this investigation are GGBS, Silica fume, Quarry dust and Bone in different percentage 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45% and 50% for cement and 5%, 10%, 15%, 20%, 25%, 30% for fine aggregate and 10%, 20%, 30%, 40% for coarse aggregate. In this study the review on replacement of the cement, fine aggregate and coarse aggregate with GGBS, Silica Fume, Quarry dust and bones the specimens are prepared for the examiner of various strength of cement concrete.

Keywords – Cement, Fine aggregate, Coarse aggregate, GGBS, Silica Fume, Bones, Quarry Dust.

I. INTRODUCTION:

Human Population size has grown enormously over the last hundred years, which results in increase demand for numerous commodities. Demand creating tremendous pressure on our natural resources. As waste creates diseases which leads to even death. This investigation is totally based on reuse of waste and bones of dead animals. Cement is replaces 10% to 50% with Silica and GGBS, which gave results in binding and increase strength of specimen. Coarse aggregate replace with bolder bones as 10%, 20%, 30%, 40%. the investigation shows that the silica fume increase the compressive strength and GGBS will increase durability of specimen and bones gives light weight to specimen and strength .

II. LITRETURE SURVEY

Nayak Awasare (2014) had completed the project on analysis of strength characteristics of GGBS concrete. In this GGBS is used in substitutions of cement. Cement Concrete M20 grade with partial replacement of cement with GGBS are prepared. Replacement percentage 20%, 30%, 40% and 50% is done. Cylinders, Cubes and Beams were cast. Investigation on strengths of concrete is done. It concludes that workability of concrete increase with increase in GGBS, The compressive strength is maximum at replacement of 30% Cement with GGBS in M20 grade. The value of Flexural strength is give good performance for 20%, 30% and 40% replacement of cement.

Anwar Ahmad 'et al.' (2015) had studied the concrete properties using bone powder by partial replacement of cement. In this study bone powder is used in substitution of cement. Cement concrete M25, with bone powder substitution of cement is prepared. Replacement percentage 1.5%, 3%, 4.5%, 6%, 7.5%, 9%, 10.5% is taken. Specimens for Compressive Strength were cast and compressive strength tested. It conclude that the optimum value of replacement of bone powder is 7.5% with cement in M25 cement concrete.

Javed Ahmad Bhat, 'et al.' (2012) Substitution of coarse aggregate with Crushed animal bones is investigated in this research. Replacement of coarse aggregate is being done by Crushed Bones in this investigation. Cement concrete M20 grade with partial replacement of cement with crushed bones is prepared. Replacement percentage 25%, 35%, 50%, 75%, 100% is taken. Investigation on compressive strength has been conducted. It concludes that by replacing coarse aggregate with crushed bones make the concrete light in weight. The decrease in strength as compare to normal cube but it increase by using Slice fume as per future scope of this study.

Chalamcharl venu gopal, 'et al.' (2017) investigated on the substitution of cement with GGBS in concrete. In this study GGBS is used in replacement of cement. Cement concrete M25 grade with partial replacement of cement with GGBS are prepared. Replacement percentage 0%, 20%, 40% is used in the study. Investigation on compressive strength is conducted. It conclude that the Life of concrete will improve and by the addition of 40% of GGBS at place of cement to enhance the strength properties.

Gopireddy Madan and G. Vimalanandan (2019) had completed their project on experimental investigation of concrete with GGBS, Quarry Dust and Steel Slag waste. In this study GGBS is used substitution of cement and Quarry Dust is used in replacement of fine aggregate and steel lag is used in replacement of coarse aggregate. Cement concrete M40 grade with partial replacement of GGBS, Quarry Dust and steel slag waste are prepared. Replacement percentage 0%, 10%, 20%, 30%, 40%, 50%, 60%, and 70% is done. Cylinder and Cubes were molded. Investigation on compressive and split tensile strength was done. It concludes that workability of concrete was increase by replacing GGBS, SSW and QD. The maximum strength of compression and Split tensile is achieved at 40% replacement of GGBS. The maximum strength of compressive and split tensile is achieved ate 50% fine aggregate with Quarry dust is substituted. The maximum strength of Compressive strength and split tensile is achieved at 60% replacement of Coarse aggregate with Steel slag waste.

Tanveer Asif Zerdi, 'et al.' (2016) In this study GGBS is used in at place of cement in few percentage. Cement concrete M25 grade with partial replacement of Cement with GGBS are prepared. Replacement percentage 0%, 10%, 20%, and 30% is done. In this study cubes were molded. Investigation on compressive strength was done. Normally by adding the GGBS in concrete result the decreases in strength, but at the replacement of 20% GGBS in concrete results the strength approx nearer to the normal concrete. The workability of concrete will increase by adding GGBS.

M. Kotb, 'et al.' (2010) Effect of Grounded bone powder addition in cement mortar is investigated. Various mechanical properties of cement mortar determined and compared with normal cement mortar. On 0%, 5%, 10% and 15% addition of bone powder in cement mortar strength parameters were examine. By adding 5% of bone powder in the mortar results increase in strength, and the performance of mortar was not up to the mark by replacement of 10% and 15% of bone powder in cement.

S.K.Sirajuddin and T. Venkat Das (2019) quarry dust and GGBS is used as a alternative of sand and cement in some percentage. Cement concrete with partial replacement of GGBS and Quarry Dust are done. Replacement percentage of Cement with GGBS is 20%, 40%, 60% and Fine Aggregate with Quarry Dust in Percentage of 25%, 50% and 75%. Flexural Strength, Compressive strength, split tensile strength were examined for various specimens after a specific time period of curing. It shows that the optimum Replacement of cement with GGBS is 40% and the 50% quarry dust for maximum value of strength.

Lakhbir Singh 'et al.' (2016) Silica fume as a alternative of cement. Varying percentage of Silica fume 0% to 15% in cement concrete specimen is used. Investigation on compressive strength and Split tensile strength is done. It concludes that the Specimen achieved the optimum value of strength after 10% replacement of cement with the silica fume. The strength decreases after using more than 10% of silica fume. Similarly in optimum split tensile strength is achieved at 10% addition of silica at place of cement.

Sbvs Manikanta Varma, 'et al.' (2016) had completed project on study on bone Powder as alternative in concrete materials in grade M30. In this investigation Bone ash is used in replacement of cement. The replacement percentage 0%, 10%, 15%, 20% is done. Specimen were cast. compressive strength of the specimen is examined and concludes that the compressive strength is found to be increased. Chemical component of bones powder ash is almost same as cement.

Santosh kumar karri 'et al.' (2015) had completed their project on strength and durability studies on GGBS concrete. In this study GGBS is used in replacement of cement. Cement concrete M20 and M40 grades with partial replacement of Cement with GGBS are prepared. Replacement percentage 30%, 40%, 50% is done. Cylinders, Cubes and Prisms for compressive Strength were molded. Investigation on Flexural Strength, Tensile Strength and Durability Study with Sulphuric acid and hydrochloric acid has been done. It concludes that workability of concrete increase with increase in GGBS, The compressive strength is maximum at replacement of 40% cement with GGBS in M20 and M40 grade. Similarly the value of tensile strength is also maximum at 40% replacement of cement.

Gupta Gorav, Verma Nalin and Gaur (2017) examined the best substitution percentage for cement concrete with GGBS and Silica Fume. Substitution of fine aggregate and coarse aggregate has been done in this investigation. It concluded that on 28days, 5% GGBS and 5% silica fume is optimum values for the substitutions of aggregates. This is 3% more than the plain concrete. Same values of compressive strength of specimens are observed on 10% GGBS and 5% silica. On further substitution concrete decreases its strength gradually. But increase in amount of GGBS leads to decrease in workability of cement concrete. When cement is replaced by on 20% of GGBS and 6% of silica fume a significant increment in compressive strength is observed.

S D Geetha, 'et al.' (2018) Substitution fine and coarse aggregates with Bone Aggregate and Mangalore Tiles Waste. For fine aggregate, they used river sand. Also, Animal bones obtained from animals were also used. Coarse aggregate of 20mm down size, cubical and angular aggregate were used. Mangalore tile waste replaces the coarse aggregate by 10% and potable water was used. From there project, they concluded that Mangalore tiles can be used as replacement to coarse aggregate and fine aggregate with bone aggregates. In concrete mix resulted in decrease in strength compare to that of normal concrete. The maximum Strength was obtained when 8% of coarse aggregate and 4% of natural sand replaced by Mangalore tiles waste and bone aggregate.

III. INFERENCES:

The review from above study has drawn the following inferences:

I. GGBS, Silica fume and bone aggregates are the good substitutions of various materials used to prepare concrete. All three mentioned materials are waste materials and for them is can be a best disposal cum utilizing solution.

II. By using these materials in cement concrete increase in strength is observed in above studies. These materials are easily available and it can be a very useful way to replacement of cement and aggregates with these materials,

III. GGBS alone can replace the cement up to 10% but on further increasing its value decrease in strength is observed. Mixture of GGBS and silica fume can be used to increase the strength further.

IV. Fine and coarse aggregates can be replaced with bone aggregates and cement with suitable combination of GGBS and silica fume.

IV. CONCLUSION

In this investigation show that the Silica Fume increases the strength of specimen with the replacement of cement with Silica Fume. The GGBS is work as the durability agent in concrete, the maximum replacement of GGBS with Cement is 40% with suitable mixture of silica fume and Coarse aggregate with Bone aggregates. This mixture gives optimum strength and reduces the weight of specimen. This investigation show that the replacement of these materials will helps to enhance the properties of cement concrete and reduce the waste.

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