International Journal of Advance Research in Science and Engineering
Volume No.07, Issue No.10, October 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Mix Design of Concrete by Replacement of Sand with Glass powder

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ABSTRACT:

Glass powder (GP) used in concrete making leads to greener environment. In shops, damaged glass sheets & sheet glass cuttings are go to waste, which are not recycled at present and usually delivered to landfills for disposal. Using in concrete is an interesting possibility for economy on waste disposal sites and conservation of environment. This project examines the possibility of using Glass Powder as fine aggregate replacement in concrete. Natural sand was partially replaced (0%-30%) with Glass Powder in concrete. Tensile strength, Compressive strength (cubes and cylinders) and Flexural strength up to 28 days of age were compared with those of high performance concrete made with natural sand.

Keywords: *Glass Powder ,Sand ,Concrete Mix, Waste Management.*

I.INTRODUCTION:

Concrete may be a wide used material within the world. Supported world usage it's placed at second position once water. Watercourse sand is one in every of the constituents employed in the assembly of standard concrete has become extremely dear and additionally scare. Within the scenery of such a bleak atmosphere, there's an outsized demand for various materials from industrial waste. Some various materials have already been used as a region of natural sand. For instance ash, slag, red mud, pounded ashes were employed in concrete mixtures as a partial replacement of natural sand. Equally the waste glass are collected from the retailers are used. The collected glasses are crushed to sand size And it may be used an alternate material for natural sand as partial replacement. In brief, successful utilization of glass as fine mixture can flip this material into a valuable resource. The construction industry presents an attractive market for the use of waste glass. One of the principal components of construction is concrete, due to its high compressive strength, durability and ease of construction. However, concrete production is highly resource and energy intensive, with the industry responsible for approximately 5-8% of worldwide greenhouse gas emissions (Scrivener and Kirkpatrick 2008). As such, opportunities to reduce the environmental impacts of the concrete industry are required.

The main reason of this is to create a better environment that free from polluted space and also to find a better solution for concrete mixture that can give higher strength to concrete from the waste glass product. Even it may gives less cost of using kind of admixture rather than buying expensive admixture to get great and higher strength in concrete.

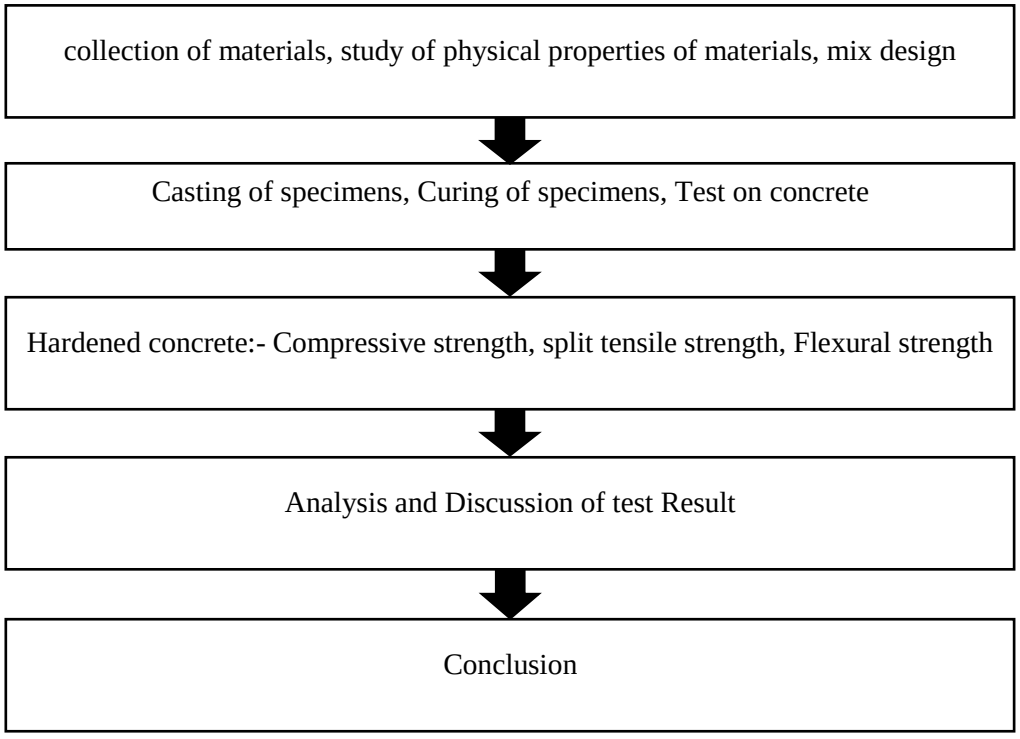
II.OBJECTIVE:•

To judge the utility of glass powder as a partial replacement of cement in concrete. To check and compare the performance standard concrete and glass powder concrete.

To know the effectiveness of glass powder in strength improvement

The utilization of glass powder which might be known as factory-made sand has been accepted as aartifact within the industrially advanced countries. As a results of sustained analysis and biological process works undertaken with regard to increasing application of this industrial waste, the extent of utilization of glass powder within the industrialized nations has been reached quite hour of its total production. The utilization of factory-made sand in India has not been abundant well-liked, when put next to some advanced countries.

III.METHODOLOGY OF THE STUDY:



IV.LITERATURE REVIEW:

Gunalaan Vasudevan, Seri GanisKanapathypillay (2013):

This study was conducted to investigation the effect of using waste glass powder in concrete Laboratory work was conducted to determine the performance of control sample and concrete with used glass powder . The performance of these types of concrete was determined by the workability test, density test and compressive strength

test. The workability of concrete is determine using slump test and compacting factor test. Meanwhile, compressive strength test done to determine the strength of concrete for each type of concrete, a total of six 150mm X 150mm X 150mm cube were cast. The cubes were tested at age of 7, 14 and 28 days to study the development of compressive strength. The result indicate that the concrete with using waste glass powder were able to increase the workability of concrete and also the compressive strength. However, the density is reduced compare to standard mixture of concrete.

Gautam Singh, Akhil Bhaskar (2014):

This experiment shown the property of concrete containing waste glass powder as a fine aggregate replacement material. The use of waste or by product in concrete production has advantages for improving some or all of the concrete properties. The work is examines the effect of using of waste glass powder as cement and sand replacement material into a concrete.. Glass constitutes about 5% of the municipal solid waste stream but only a small percentage of it is recycled. Waste contains about 72.5% SiO_2, when it is ground to the fineness of around 600 micron SiO_2 in it react with alkalis in cement to form Cementous product. Such product help contribute to strength and durability in concrete. Glass powder was partially replaced as 5%,10%,15%,20% with sand and tested for it compressive strength workability and alkalis test and compared with those of conventional concrete, From the result obtained it is found that replacement of 20% glass can be more beneficial and capable of increase strength up to 45% for M20.

Nabil EL Naber , Sherzad Issa Ismail (2017):

Several studies have been made to examine the potential mineralogical and mechanical properties of glass aiming to improve the characteristic properties of concrete where glass has been used in various forms, powder form or fine and coarse aggregate form, taken as part of aggregate or replacement of cement. However, the results presented in these studies were sometimes very different, even contradictory, due to the way in which the glass was used in these experiments, leading to a difficulty in distinguishing between the effect of Glass. To overcome this confusion the present research aimed to study the effects of glass powder on the properties of concrete by series of test for two constant quantities of cement, 350 and 400 kg per cubic meter. To reach the target of this research, two campaigns were done. In the first campaign the glass powder is gradually increased from trial to another by an increment of 2.5% of the cement's weight, from a rate of 2.5 up to 15%, without any chemical additive. This methodology made it possible to show the effect of the glass powder on the characteristic properties of concrete and defined its real contribution without being confused with the role of the fine aggregate. In the second campaign the study is extended to add the glass powder by rate of 7.5% to the batches with the use of super-plasticizer type F to investigate its potential mechanical properties. The slump test and compression test showed modest results in the first campaign but very important results in the second, when the glass powder was added with the plasticizer, which could be promoted to serve the concrete industry, particularly the production of the self compacting concrete where high performance concrete is required.

H. Dabiri, M.K. Sharbatdar , A. Kavyani , M. Baghdadi (2018):

Glass is a special type of materials which is widely used in various forms and colours for different usages. Coloured bottles comprise a large part of waste glass. To reduce the destructive effects of waste glass on the environment, it might be recycled. However, some indecomposable waste materials are buried. This will have harmful effects on the environment. A practical solution for reducing non-recyclable waste coloured glass is using them as replacements for materials in other industries such as concrete industry. The effect of replacing aggregate with waste glass particle on the compressive strength and weight of concrete is investigated in this study. To achieve the goal, totally 27 cubic specimens were created; 6 specimens were made of concrete, while waste glass particle was added to the mix of other specimens. To prevent Alkali Silica Reaction (ASR), silica was added to the mix of specimens containing glass. Generally, Results indicated that replacing aggregate with glass particle more than 30% lead to increment in compressive strength of concrete. The weight of concrete remains almost the same in all of the specimens. Briefly, based on the results it could be concluded that the optimum percentage for replacing aggregate with glass particle is 50%.

V.MATERIALS:

- **Cement:**Cement can be described as a material with adhesive and cohesive properties,which is capable of binding mineral fragment into compact mass. There are several types of cement available in market. Among which ordinary Portland cement is most well-known.

- **Fine Aggregate**:A fine aggregate is increase the following ability and segregation resistance when used at a suitable amount. Aggregate which passed through 4.75 IS sieve and retained on 75 micron (0.075mm) is termed as fine aggregate. The sand increase the volume of concrete and thus makes it cheaper. It fills the void in concrete and gives density to concrete. It makes the mass homogeneous and improve the strength of concrete.

- **Coarse Aggregate:** The size of aggregate bigger than 4.75mm is considered as coarse aggregate. It should be hard, strong, dense, durable, clean, and free from clay or loamy admixtures or quarry refuse or vegetable matter. The pieces of aggregate should be cubical, or rounded shaped. Coarse aggregate containing flat, elongation or flaky pieces of mica should be rejected. The grading of coarse aggregates should be as per the specification of IS 383-1970.

- **Glass Powder:**Glass is an ideal material for recycling. The glass powder is a pozzolanic material. The glass powder is increase the strength and durability of concrete when using suitable percentage. Glass is an inert material which could be recycled and used many times without changing its chemical property. The powder property should be satisfying the sand properties. Glass is crushed into

specifying sizes for use as aggregate in various applications such as water filtration, grit plastering and sand replacement in concrete.

- **Water**:Water is an important ingredient of concrete as it actively participates in the chemical reaction with cement. Since it helps to form the strength giving cement gel, the quantity of water is required to be taken very carefully . Water used should be free from impurities. Sea water shall not be used.

Outline of experimental investigation on concrete:

- The compressive strength of concrete with glass powder is quite the traditional concrete. the rise in compressive strength is that the interlocking properties of particles within the glass powder.
- Split durability of concrete will increase for glass powder. The explanation for variation is that the form and texture of glass powder.
- Flexural strength (modulus of rupture) of concrete will increase for glass powder. The explanations for variation are the form and texture of the glass powder.

VI.CONCLUSION:

The development of concrete with glass powder as fine mixture has been with success completed and also the results were conferred and analysed within the previous chapters. Supported the check results of M50 concrete the subsequent conclusions are drawn: A. General Conclusions

- Its potential to interchange glass powder by scarce sand for concrete.
- The glass powder concrete is a smaller amount practicable, robust and study compared to sand concrete.

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