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ANALYSIS OF SUSTAINABILITY OF GLASS SAND IN CONCRETE

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Abstract - Concrete is one of the most important construction material in the world and with the rapid development there is instant increase in the consumption of concrete for the construction of building and other structure and this cause the increase in the demands of other construction material such as course aggregate, fine aggregate and cement. The course aggregate and fine aggregate are the natural sand gone through the process of cutting and grinding to make them in a desired size and usable. While cutting of big and huge stone cause the loss of ecosystem and disturbance in ecology and cause the environmental degradation. Due this major problem there is requirement of replacement of aggregate with other material. So here I have tried to develop fine aggregate by using waste glass and to ensure suitability certain test were performed on the glass and other tests were performed on the casted and cured concrete cube and on the basis of that final conclusion were made.

***Key Words*: Waste glass, concrete, compressive strength test, specific gravity**

1. INTRODUCTION

Concrete is a largely used construction material in the world which is composed of course aggregate such as natural stone of standard size, fine aggregate such as sand and cement with water. Concrete is not only the largest used material but by this a large amount of natural resource is consumed annually which is of 12.6 billion tons (Mehta, 2002). The building material used for making concrete are naturally extracted except cement like course aggregate, fine aggregate The extraction of these natural aggregate are from non-renewable resources which ultimately harm environment and ecology. Various research work has been started by the researchers for the proper development and for more sustainability of concrete in India as well as worldwide with an aim to decrease the effect on ecology and environment and to save the raw materials. Sustainability and stability in concrete can be achieved by successfully replacing the building material by other alternative. Which will decrease the ill effect cause by extraction of these materials, on environment. Building material include course aggregate, fine aggregate and cement they can be replace by industrial waste, recyclable material or by product from industry. The main aim of the research work were mainly in concrete practices and they are the complete replacement of fine aggregate with crushed glass sand and to investigate the feasibility of sustainable reuse of waste glass crushed into concrete and the last is to obtain high strength concrete by using glass sand in concrete.

2. MATERIALS AND METHODS

Material

To pursue the present research work building material is required are:-

- Portland cement Type I
- Fine Aggregate
- Course Aggregate
- Glass

Methods

The methodology adopted in the present work was divided into four parts namely:-

- crushing of glass,
- testing on glass,
- concrete cube casting and curing
- Testing on concrete cube.

The glass was crushed just after the sampling was done and sieve from 4.75 mm sieve. Furthermore the investigation were done from several aspect such as geotechnical testing etc. the cubes were made by using concrete grade M20, which is a good grade for testing furthermore after curing testing was done on it on specific days and the result were obtained.

3. RESULTS

Results for geotechnical properties

- The Specific gravity of the glass sand is 2.039
- The Bulk density of the glass sand is 1.672 g/ml^3.
- The result for Grain Size Analysis is, Cu & Cc was found to be 2.039 & 1.127
- The fineness module is 3.5.
- The water absorption is 0.1%.

Result for compressive analysis test

Sand ratio / Testing days	25 %	50%	75%	100%
3 day	7.08 N/mm^2	7.50 N/mm^2	7.92 N/mm^2	7.02 N/mm^2
7 day	11.83 N/mm^2	11.52 N/mm^2	11.59 N/mm^2	11.03 N/mm^2
14 day	17.00 N/mm^2	17.28 N/mm^2	17.17 N/mm^2	17.90 N/mm^2
21 day	18.09 N/mm^2	18.42 N/mm^2	18.31 N/mm^2	18.13 N/mm^2
28 day	18.92 N/mm^2	19.03 N/mm^2	19.43 N/mm^2	19.62 N/mm^2

4. CONCLUSIONS

The specific gravity, bulk density of the glass sand sample is 2.039 & 1.672 which is lying in the range as per Indian standard. On the basis of sieve analysis test the crushed glass sample was found to be partially evenly distributed. Fineness Module was found to be 3.5 which puts it into the category of coarse sand. Results of water absorption was found to be 0.1% which is very low and negligible.

The M20 grade concrete cube are casted and are tested at 3, 7, 14, 21 and 28 days of curing. The compressive strength test results shows that the sample containing 50% and 100% glass sand content show good compressive strength on 28 days but on comparing test results of both the sample, sample containing 100% glass sand is showing better result than other one.

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