

An Experimental Study on Addition of the Glass Waste Into Concrete

^[1]Md Shabaaz Bukhari ^[2] Asst. Prof. Vaibhav R. Shirodkar
^{[1][2]} Girijabai Sail Institute of Technology Karwar

Abstract:- The quantity of waste glass in India has been increasing significantly without being recycled increasing the risk to public health due to scarcity of land area. This growing problem of waste glass in country can be alleviated if new disposal options other than landfill can be found. The main goal is to investigate the possibility to improve the compressive strength by the partially replacing natural aggregates. Waste glass is the least expensive of all the concrete constituents & is much less expensive than natural aggregates, thus the idea is to replace 20% of the sand by glass in order not to weaken the concrete by adding too much glass. Therefore, different samples of the most common glass materials were collected and crushed to be included in concrete as partial occupant in concrete mix.

Keywords:- Compressive Strength, Split Tensile Strength, Flexural Strength, Mix Proportion.

I. INTRODUCTION

Solid wastes are substances and masses resulted by various human activities that have to be dumped. Solid wastes generally include industrial waste, medical waste, demolition, rehabilitation wastes, repair. During the last decades it has been recognized that glass waste is of large volume & is increasing year by year in shops & construction factories.

The quantity of waste glass in the locality has been increasing significantly without being recycled increasing the risk to public health due to scarcity of land area. The growing population of waste glass in locality as the production cost of concrete will go down in concrete construction sector is advantageous. As the production cost of concrete will go down, waste glass is used as aggregates for concrete. The waste glass can be recycled, but it is costly to remove the color of the colored glasses & recycled again. Estimated cost for housing is more and some construction materials like natural sand are also becoming ingrate. However, the availability of river sand for the preparation of concrete is becoming scarce due to excessive mining from the riverbeds, lowering of water table, sinking of bridges are becoming common threats.

The present scenario demands identification of substitute materials for the river sand & making concrete. Recently some attempts have been made to use the waste glass as partial replacement in concrete. The objective is to present the result of experimental investigation properties of concrete made with glass concrete natural fine aggregate is

substituted by weight by waste glass. Compressive, split spoon strength are compared up to 7 days, 14 days, & 28 days of ages.

II. OBJECTIVES OF THE STUDY

1. To study the effect of waste glass on properties of concrete mixes as partial requirement.
2. To compare the effect and strength due to the addition of glass.
3. To provide an alternative light weight material.
4. To evaluate the performance of glass concrete.

III. MATERIALS AND METHOD

Cement : In this experiment, 43 grade ordinary Portland cement (OPC) with brand name JK cement was used for all concrete mixes. The testing cement was done as per IS 8112:1989. The specific gravity of cement was found to be 3.10.

Fine Aggregate : The sand used for the experimentation was locally produced and was confined to zone-II. The specific gravity of fine aggregate was found to be 2.69. The testing of fine aggregate was done as per IS 383:1970.

Coarse Aggregate : The coarse aggregate used in this experimentation where 20mm and 10mm size and was confirming IS 383:1970. The specific gravity was found to be 2.560.

Water : The water used was clean and free from oils, salts and acids. The portable water available in the laboratory was

used for the casting all specimen in this investigation. The quality of water was found to satisfy the requirement of IS 456:2000

Waste Glass :Waste glass the waste glass are obtained from the scrap shop disposal.the samples were grouped under fine sized glass & are sieved . The sieve analyses revealed most size ranges from 2.36mm to 0.015m in particle size diameter with fairly good gradation patterns.

Mix proportion : M30 grade of concrete with the mix ratio (1:1.50:2.43) was adopted with and water cement ration was 0.45. The glass quantity in concrete was varied in 20% by weight of cement.

3.1 Test for Concrete Ingredients

Sl no	component	Specific gravity/ Water absorption in percentage
01	cement	3.092
02	Coarse aggregate(CA)	2.560
03	Fine aggregate(FA)	2.690
04	water	1.000
05	Waste glass	2.530
06	Coarse aggregate (Water Absorption)	1.026 %
07	Fine aggregate (Water Absorption)	1.667%

3.2 Test for Hardened concrete

Compressive Strength Test : For the compressive strength test, the specimens of size 15cm X 15cm X 15cm cylinder specimen of length 30cm and diameter 15cm where casted and tested on compressive testing machine of capacity 2000KN as per IS 1086-1982

Spilt Tensile Strength of concrete : For the tensile strength the cylindrical specimens of size15cm diameter and length 30cm where cast spilt tensile test obtained by testing the specimen on CTM of capacity 2000KN as per IS 5816:1999

Mix proportion and water cement ration : A constant mix proportion of 1: 1.5:2.43 was used for all the sample tested. The water cement ration adopted was 0.45 and was kept constant for all the mixes.

IV. FIGURES AND TABLES

Table 4.1:Result of compression strength for7, 14 and 28 days.

days	Reference concrete cubes with no glass waste	Concrete cubes with glass waste
7	29.778	30.000
14	36.00	36.667
28	41.778	42.074

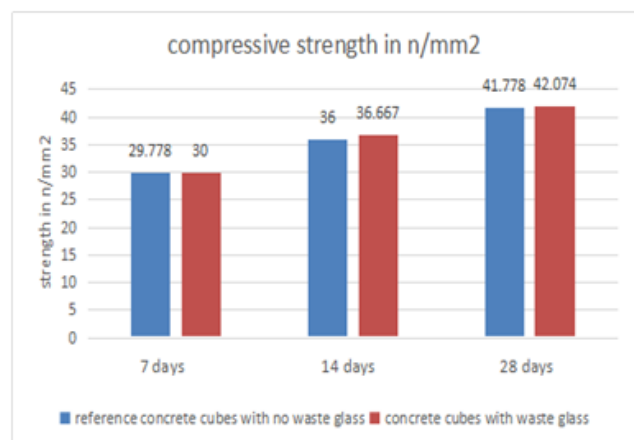
Table 4.2Comparison flexural of strength for 7,14 and 28 days

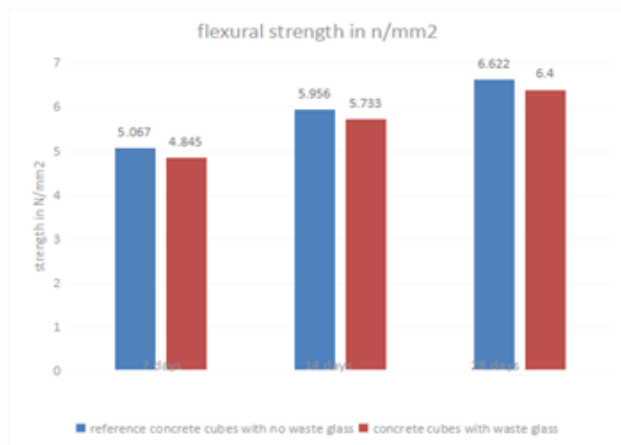
days	Reference concrete cubes with no glass waste	Concrete cubes with glass waste
7	5.067	4.845
14	5.956	5.733
28	6.622	6.400

Table 4.3: Comparison split tensile of strength for7,14 and 28 Days

days	Reference concrete cubes with no glass waste	Concrete cubes with glass waste
7	2.207	2.080
14	2.490	2.390
28	2.826	2.782

Figures 4.1 comparison of compressive strength for 7,14,28 day





Figures 4.2 comparison of flexural strength for 7,14,28 days

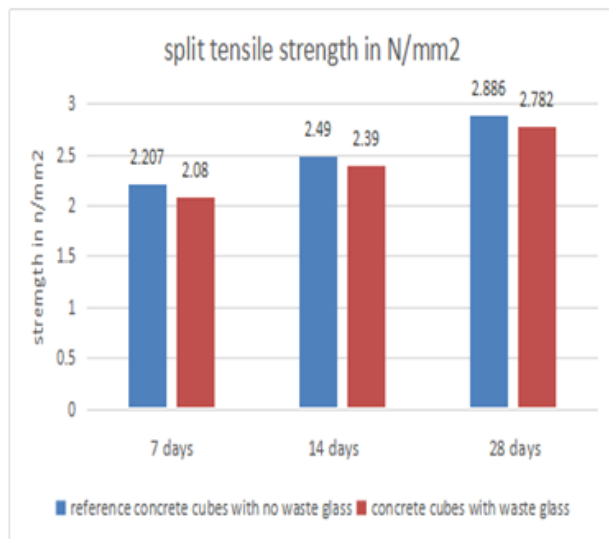


Fig 4.3 Comparison of split tensile Strength for 7,14 and 28 days

V. CONCLUSION

By the mix design we had carried out for M30 grade of concrete by replacing of fine aggregates by glass we have come to the conclusion that,

1. Maximum compressive strength is obtained with increase in the % of glass waste by 1% weight of cement is 42.074N/mm².
2. Maximum tensile Strength obtained by % glass waste

by 2.782 N/mm².

3. Usage of glass in the concrete reduces the cost of concrete hence it is economical
4. Fine aggregates resources are constant but construction activities increase day by day ,therefore thinking in the direction of replacement of it would be a right thought.
5. Use of waste lass concrete meets strength requirements and also gives uniform texture to the concrete surface,therefore it can be used for construction without problems.

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