

EVALUATION OF WASTE GLASS POWDER AS ADMIXTURE AND PARTIAL REPLACEMENT OF FINE AGGREGATE IN CONCRETE

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Abstract— *Cement is the third most energy intensive material after steel and aluminium produced in tones. Cement industry consumes raw materials rich in silica, alumina, iron and calcium. Therefore this industry has been actively involved in finding ways to use waste products in the manufacturing of cement both as secondary fuel and raw material. Since the demand in the concrete manufacturing is increasing day by day, the utilization of river sand as fine aggregate leads to exploitation of natural resources, lowering of water table, sinking of the bridge piers, etc. as a common treat. An attempt has been made in using crushed glass as fine aggregate in the replacement of river sand. The aim of the present work was to use glass powder as admixture in concrete and partial replacement of fine aggregate. In this present work use 10% and 20% waste glass powder used. And for partial replacement of fine aggregate 5, 10, 15 and 20% waste glass powder used for compressive strength.*

Keywords— *Compressive Strength, Glass Powder, Partial Replacement on Concrete*

I.INTRODUCTION

Concrete is an inevitable material in the human being's life, because of its superior characteristics like strength and durability. The interest of the construction community in using waste or recycled materials in concrete is increasing because of the emphasis placed on sustainable construction, the waste glass from in and around the small shops is packed as a waste and disposed as landfill. Glass is an inert material which could be recycled and used many times without changing its chemical property. Besides using waste glass as cullet in glass manufacturing, waste glass is crushed into specified sizes for use as aggregate in various applications such as water filtration, grit plastering, sand cover for sport turf and sand replacement in concrete.

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The present scenario demands identification of substitute materials for the river sand for making concrete. Recently, some attempts have been made to use ground glass as a replacement in concrete. The objective of this project is to present the results of experimental investigations on Physical and Mechanical properties of concrete made with waste Glass powder concrete. Natural fine aggregate, cement is substituted by weight by waste Glass Powder at rates varying from 0, 5, 10, 15, and 20 percentages. Compressive, Tension, are evaluated and compared up to 7 and 28 days of ages.

II. MATERIALS USED

1. MATERIAL

Cement:

Portland Pozzolana cement of grade 53 conforming IS 8112 was used throughout the work.

Aggregates:

Fine aggregates used all through the study comprised of river sand and strictly pass from 4.75mm IS sieve, conforming to as per IS383-1970 with specific gravity of 2.62. Coarse aggregates taken of machine crushed stone angular in shape passing through 20mm IS sieve and retained on 4.75mm IS sieve with specific gravity of 2.75.

Water:

The locally available potable water, which is free from concentration of acid and organic substances, is used for mixing the concrete. Permissible limits as per is: 456-2000

Glass:

Waste glass was taken from Echo Aluminium Store, Rajkot. It was crushed in Los Angeles abrasion apparatus. They sieved though 1.18mm IS Sieve for G.P. admixture for concrete and fine aggregate replacement they sieved though 4.75 mm. The specific gravity of waste glass was 2.4. Chemical properties of glass powder PH value is 10.25 and its colour light blue

Table 1. Glass powder Sieve analysis

Sr. no	IS sieve size(mm)	Weight retained on each (gm)	Cumulative weight retained (gm)
1	4.75	0	510
2	2.36	400	910
3	1.18	80	990
Total		0	1000

2. Mix Proportion

Mix design of the concrete is made strictly as per the specification of the IS 10262 : 2009. From IS code specification mix of M30 grade is designed. And this we used 10 different types of mixes

Table 2. Mix proportion for Glass powder as 10%

No of Mix	Glass powder as admixture	Glass particle as Fine aggregate
Mix-0	0%	0%
Mix-1	10%	5%
Mix-3	10%	10%
Mix-4	10%	15%
Mix-5	10%	20%

For 7 and 28 Days

Table 3. Mix proportion for Glass powder as 20%

No of Mix	Glass powder as admixture	Glass particle as Fine aggregate
Mix-0	0%	0%
Mix-1	20%	5%
Mix-3	20%	10%
Mix-4	20%	15%
Mix-5	20%	20%

For 7 and 28 Days

3. Result

Strength of concrete for 7 days with glass powder as admixture of 10% and 5%, 10%, 15% and 20% replace with sand

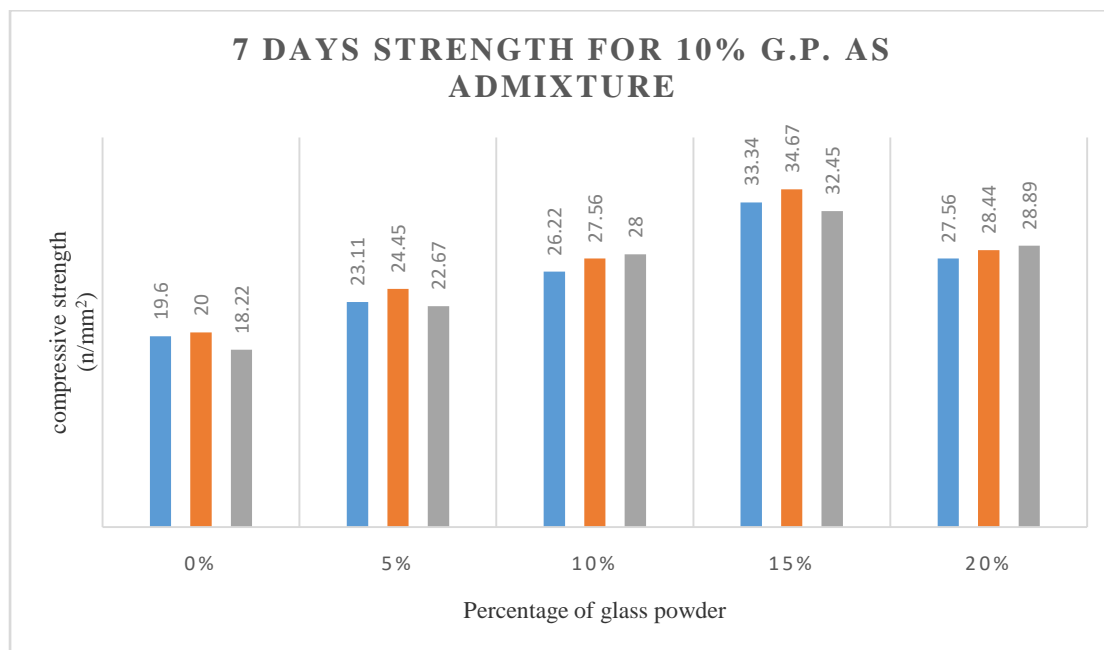


Fig. 1. 7-Days compressive strength for 10% G.P. as admixture

Strength of concrete for 28 days with glass powder as admixture of 10% and 5%, 10%, 15% and 20% replace with sand.

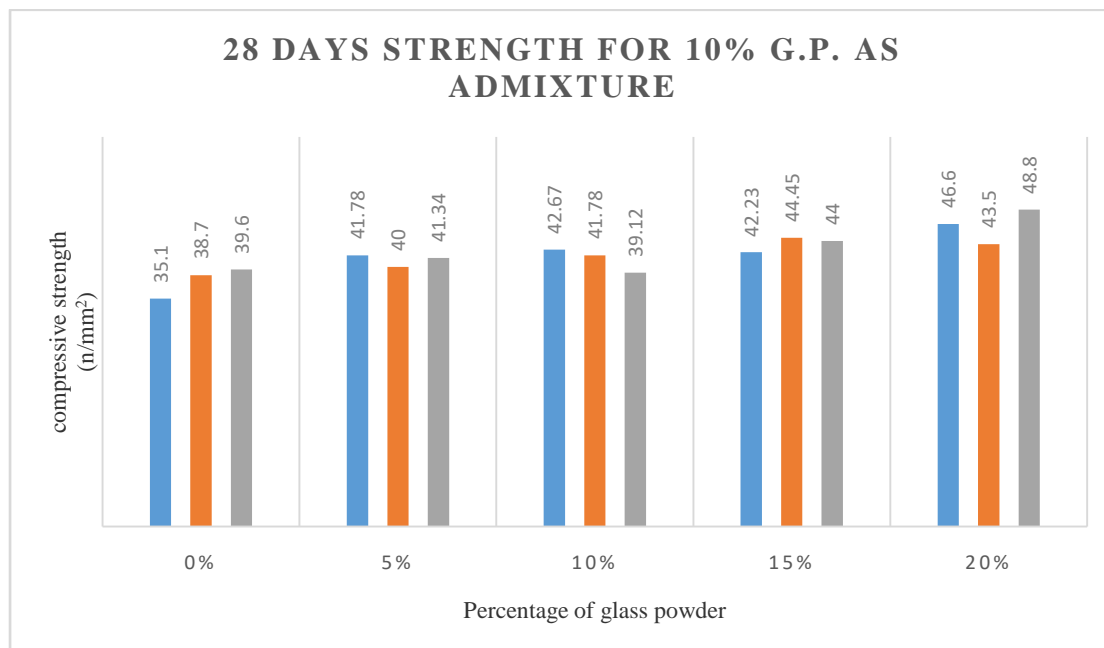


Fig 2. 28-Days compressive strength for 10% of G.P. as admixture

Strength of concrete for 7 days with glass powder as admixture of 20% and 5%, 10%, 15% and 20% replace with sand.

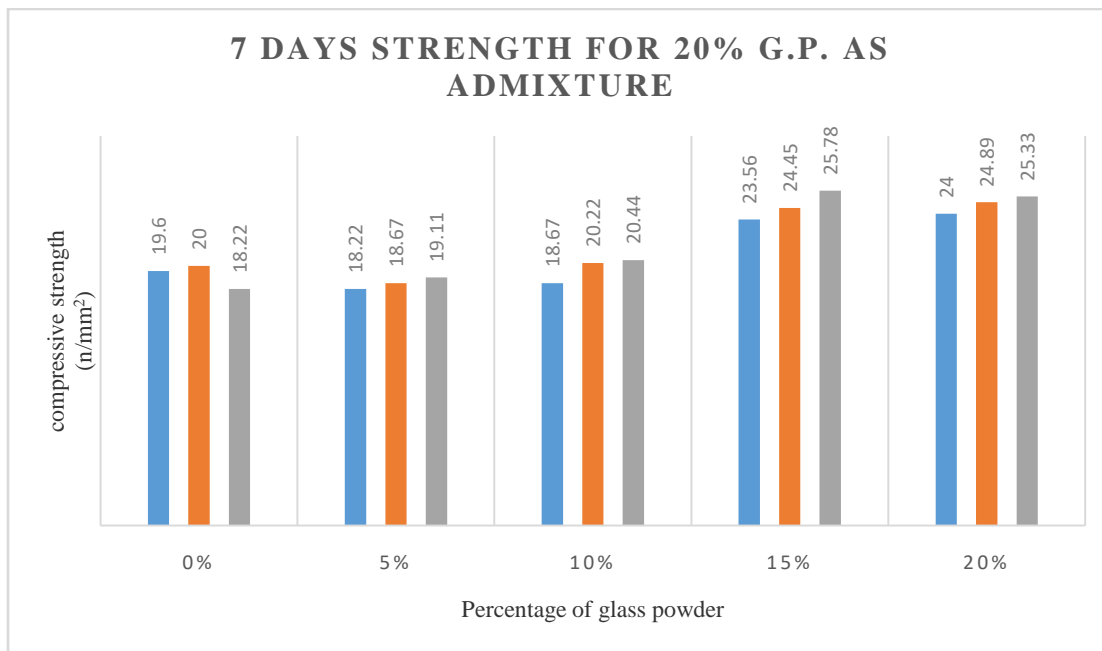


Fig 3. 7-Days compressive strength for 20% of G.P. as admixture

Strength of concrete for 28 days with glass powder as admixture of 20% and 5%, 10%, 15% and 20% replace with sand.

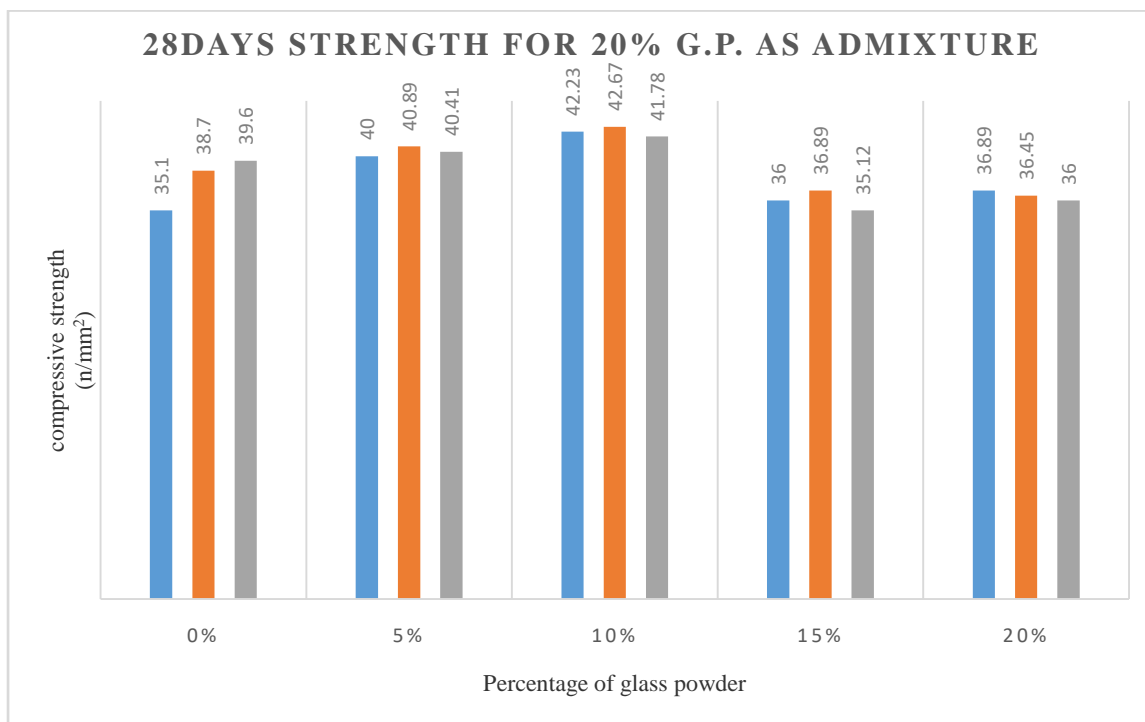


Fig 4. 28-Days compressive strength for 20% of G.P. as admixture

III. CONCLUSION

1. For 7 days using 10% of waste glass powder and replacement with 5, 10, 15 and 20% of sand compressive strength increases. But 15% sand replacement compressive strength is higher than other.
2. For 28 days using 10% of waste glass powder and replacement with 5, 10, 15 and 20% of sand compressive strength decreases.
3. For 7 days using 20% of waste glass powder and replacement with 5, 10, 15 and 20% of sand compressive strength increases. But 20% sand replacement compressive strength is higher than other.
4. For 28 days using 20% of waste glass powder and replacement with 5, 10, 15 and 20% of sand compressive strength decrease. But 5% replacement strength is parallel to 10% G.P. admixture

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