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Expermental Investigation on Concrete by Partial Replacement of Fine Aggregate with Glass Powder for M40

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Abstract: ***The sustainability of the concrete industry is threatened because it is one of the biggest consumers of natural resources. The major issue facing the concrete industry is the economic and environmental concern. In this study, discarded glass is used as a partial replacement for fine aggregates in concrete to solve concerns of economic and environmental significance. Waste glass powder was used as a substitute for fine aggregates in the M25 mix at weight percentages of 0, 10, 15, 20 and 25%. The compressive strength and splitting tensile strength of the concrete specimens were measured at 7 and 28 days, and the findings were compared to those of regular concrete. According to the findings, employing waste glass powder as a partial replacement for fine aggregates up to 15%.***
Keywords: Glass powder, Compressive strength, Split tensile strength test.

I. INTRODUCTION

A widely utilised substance worldwide is concrete. There is a disproportionately high demand for diverse materials made from industrial waste in this desolate landscape. Natural sand from the area has previously been made from a variety of sources. In the same way, used waste glasses are gathered from stores. The collected glasses are crushed until they reach the consistency of sand, and they can be used as a partial replacement for natural sand. In other words, glass can become a valuable resource when used effectively as a finer mixture.

II. OBJECTIVES

The following are the study's goals:

1) To assess the effectiveness of using glass powder to partially substitute fine aggregate in concrete.
2) To research and contrast the performance of glass powder concrete and standard concrete.
3) To comprehend how glass powder can be used to boost strength.

III. MATERIALS:

Glass powder, cement, fine aggregate, coarse aggregate, and water are the raw materials needed to complete the current work's concreting procedures.

A. Cement

Depending on their purity and composition, the materials are pulverised, blended in particular proportions, and then burned in clinker at temperatures between 1300 and 1500 °C. The materials partially fuse and sinter at this temperature to produce clinker with a nodular shape. The clinker is cooled and ground into a fine powder after being mixed with 3 to 5% gypsum. The by-product of using the aforementioned method is cement. This project was built with standard Portland cement. Cement of grade 53 is used. Testing has been done on cement's degree of fineness, consistency, and initial and final setting times.

B. Fine Aggregate

Any shattered stone bits that are 14" or smaller, like natural sand, are considered fine aggregates. Because it describes the size, or grading, of this particular aggregate, this product is frequently referred to as 1/4"' minus. In zone II, river sand.

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C. Coarse Aggregate

However, they typically have a diameter between 3/8 and 1.5 inches. Particles larger than 0.19 inches are referred to as coarse aggregates. The remaining coarse aggregate, which is mostly composed of gravel, is mostly composed of crushed stone.

D. Water

Water is a chemical substance made of hydrogen and oxygen.exists as a gas, a liquid, and a solid.

E. Glass Powder

Glass scrap was obtained for this experiment from a glass recycling business in Coimbatore. The crushing and milling processes were employed to create the experiment's waste glass came from a Coimbatore glass recycling business. Crushing and milling were utilised to create the glass powder for this study. A very fine powder called glass powder is created by grinding glass. To prepare it, high precision machining tools are required because it must be uniform and consistent throughout. The cost varies according to the applications and degree of grinding.

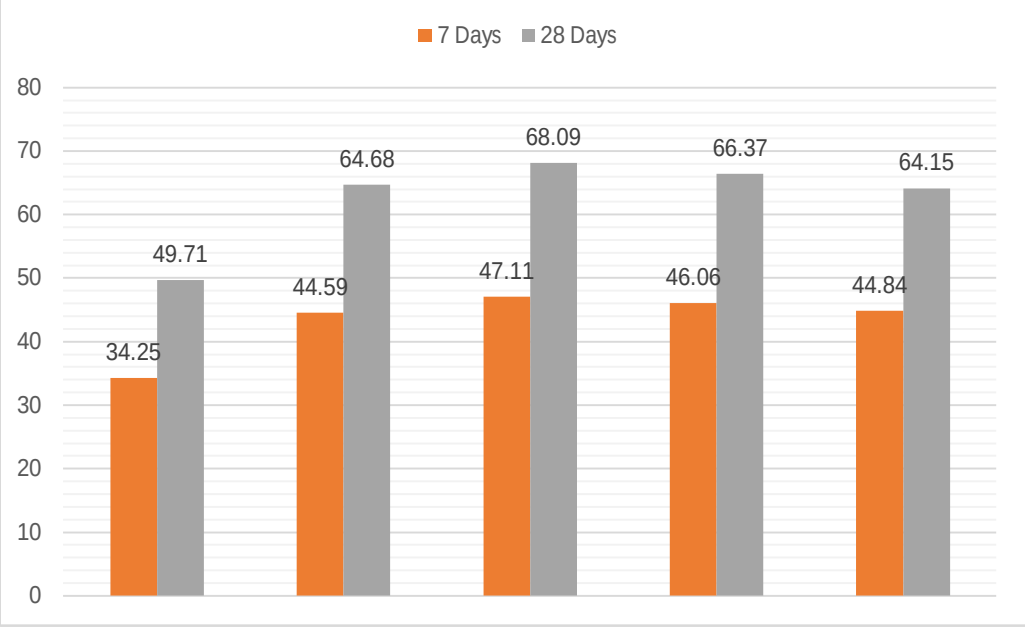
IV. EXPERIMENTAL INVESTIGATIONS

A. Compressive Strength Results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in Table 1.

Table 1: Compressive strength of concrete with percentage of Glass powder

S.No.	% of glass powder	Compressive strength, N/mm^2	
		7days	28 days
1	0	34.25	49.71
2	10	44.59	64.68
3	15	47.11	68.09
4	20	46.06	66.37
5	25	44.84	64.15



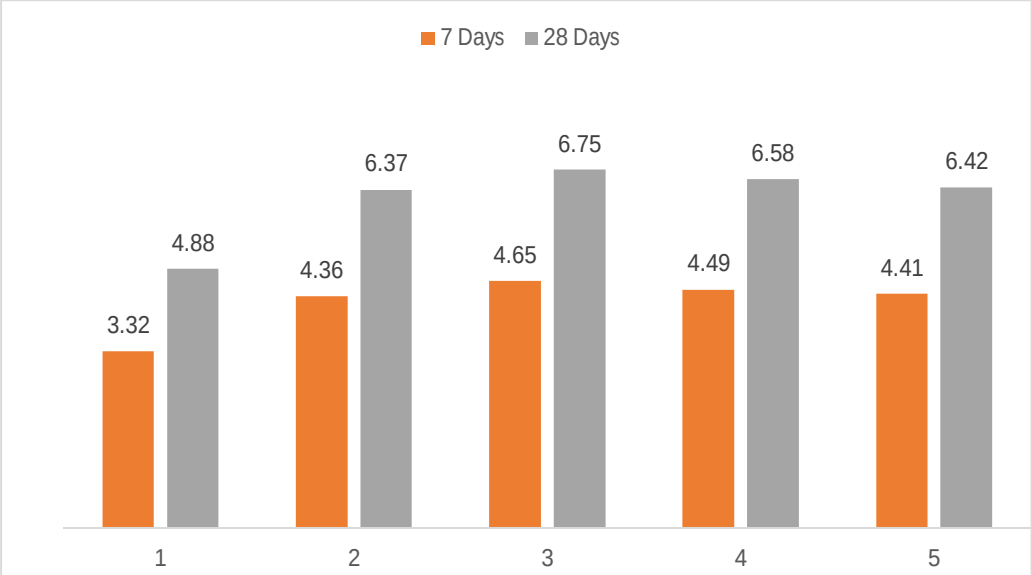
Graph 1: Compressive strength of concrete with percentage of Glass powder

B. Split Tensile Strength Results

The split tensile strength conducted in flexural testing machine for the cast and cured specimens and the results are furnished in Table 2.

Table 2: Split tensile strength of concrete with percentage of Glass powder

S.NO	% of glass powder	Split Tensile Strength, N/mm^2	
		7days	28days
1	0%	3.32	4.88
2	10%	4.36	6.37
3	15%	4.65	6.75
4	20%	4.49	6.58
5	25%	4.41	6.42



Graph 2: Split tensile strength of concrete with percentage of Glass powder

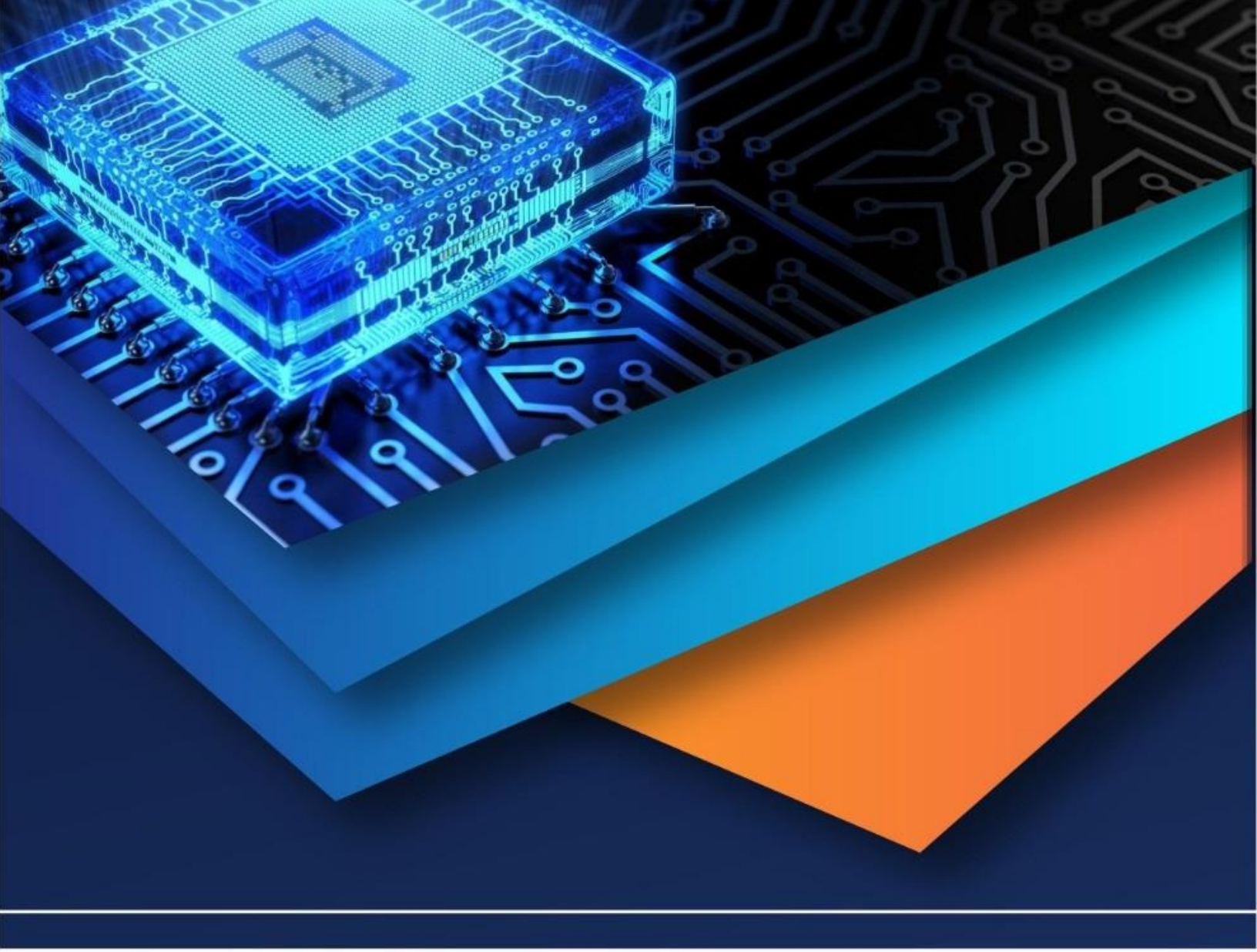
V. CONCLUSION

1) The normal concrete of compression strength result 34.25 N/mm^2 for 7 days, 49.71 N/mm^2 for 28 days.
2) The normal concrete of split tensile strength result 3.32 N/mm^2 for 7 days, 4.88 N/mm$^{2\ for}$ 28 days.
3) The maximum compressive strength found to be 47.11 N/mm^2 and 68.09 N/mm^2 for 7 and 28 days by 15% partial replacing of glass powder.
4) The maximum split strength found to be 4.65 N/mm^2 and 6.75 N/mm^2 for 7 and 28 days by 15% partial replacing of glass powder. .

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