



Partial Replacement of Cement In Concrete By Using Waste Glass Powder and Fly Ash.

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Abstract: It's an intriguing potential to use glass in concrete to save waste disposal costs. Glass is a non-toxic substance that may be recycled and reused repeatedly without altering its chemical composition. Glass is an amorphous substance that contains a lot of silica, making it potentially pozzolanic when the particle size is under 75 μm . A significant issue with using glass in concrete is the chemical interaction that occurs between the silica-rich glass particle and the alkali in the concrete's pore solution, which is known as Alkali-Silica Reaction. If proper measures aren't taken to reduce its effects, silicate reaction can be particularly harmful to the durability of concrete. Fly ash is used to glass concrete to improve the workability and decrease the alkali silica reaction. Because of the concrete's longevity, using discarded glass powder to make concrete promotes environmental sustainability. The current project's goal is to determine the durability of concrete made from fly ash and waste glass powder. In this inquiry, it was suggested that glass powder and fly ash be used in concrete as a partial replacement for cement. 0%, 10%, 20%, and 30%, of the cement was replaced with a mixture of fly ash and glass powder. Compressive strength of the cubes were investigated and contrasted with normal concrete after 7 and 28 days, respectively. A 28-day capillary absorption test on cubes was examined and compared to traditional concrete. The findings indicated that the potential for using glass powder with fly ash as a partial replacement of cement in concrete has a considerable amount of increase in durability with increase in percentage.

Keywords: Fly Ash, Glass Powder, Compressive Strength, Durability.

I. INTRODUCTION

As the industries waste is piling up every day, there is a pressure on industries to find a solution for its disposal. The use of waste material in concrete can also reduce the consumption of natural resources. The waste materials included in this study Waste Glass Powder and Fly Ash.

Glass powder is one of the most active research areas that encompass a number of disciplines including civil engineering and construction materials. Waste glass locally available and it has been collected and made into glass powder.

In this research study the (OPC) cement has been replaced by glass waste powder accordingly in the range of 0%, 10, 20% and 30% by weight of cement for 0.30, 0.35, and 0.40 water/cement ratio. To check the compressive strength. Waste glass (WG) generates severe environmental problem with increasing environmental challenges to decrease solid wastes and reuse them as much as possible, concrete manufacturing has utilized several techniques to accomplish this objective.

The principal goal of this study is to search the appropriateness and the effect of using waste glass powder (WGP) as partial substitution of cement weight for three main types of concretes. Three essential types are ordinary concrete.

Fly ash (FA) is by product obtained after burning of coal in power plant as waste, however considered as one of the building materials having reasonable binding properties.

Test on aggregate

1. Abrasion Test on Aggregates

Result of Abrasion Test: Abrasion value of aggregate is 30



2. Shape of Aggregates

Result of Soundness Test: Irregular shape obtained

3. Specific Gravity and Water Absorption Test on Aggregates

Result: = 2.52

Result of Test:

The specific gravity is 2.52

And water absorption 1.8 %

Table no:1 Physical Properties of Coarse Aggregate

Sr No.	Particulars	Properties
1.	Color	White
2.	Particle size	<90 micron
3.	Specific gravity	2.5

Table no:2 Observations of fineness modulus

Property	Aggregate	
	20m m	10mm
Fineness Modulus	7.52	3.19
Specific Gravity	2.52	2.65
Water Absorption	1.82	1.30

Test on fine aggregate /sand

Fineness modulus test

Table no:3 Physical Properties of fine Aggregate

Sr. No	IS Sieve	Weight Of aggregate retained	Percentage	Cumulative Percentage
1	600 micron	60	60%	60%
2	300 micron	12	12%	72%
3	150 micron	10	10%	82%
4	Pan	8	8%	90%

Total cumulative percentage = 304%

F.M= Total cumulative percentage retained /100
=304/100

Result: F.M = 3.04%

Table no:4 Properties of glass powder

Property	Value
Size	<4.75 mm
Fineness Modulus	3.04
Specific Gravity	2.59
Water Absorption	2.8%



4.1.2 Test on glass powder

1. Water absorption test

Result: The water absorption is 5 %

Fineness modulus test

4.1.3 Test on cement

1. Soundness Test on Cement

Results

The difference between these two points is 1.8 mm.

So the cement taken for this test is sound.

2. Fineness of cement

Result: The fineness of cement is 3%

3. Consistency of cement

Calculation:

Result:

Property	Value for Cement	IS CODE: 12269 - 1987
Specific Gravity	3.13	3.10-3.15
Consistency	31%	30-35(%)
Initial setting time	33 min	30 minimum minutes
Final setting time	186 min	600 maximum minutes

The consistency of cement is 31 %

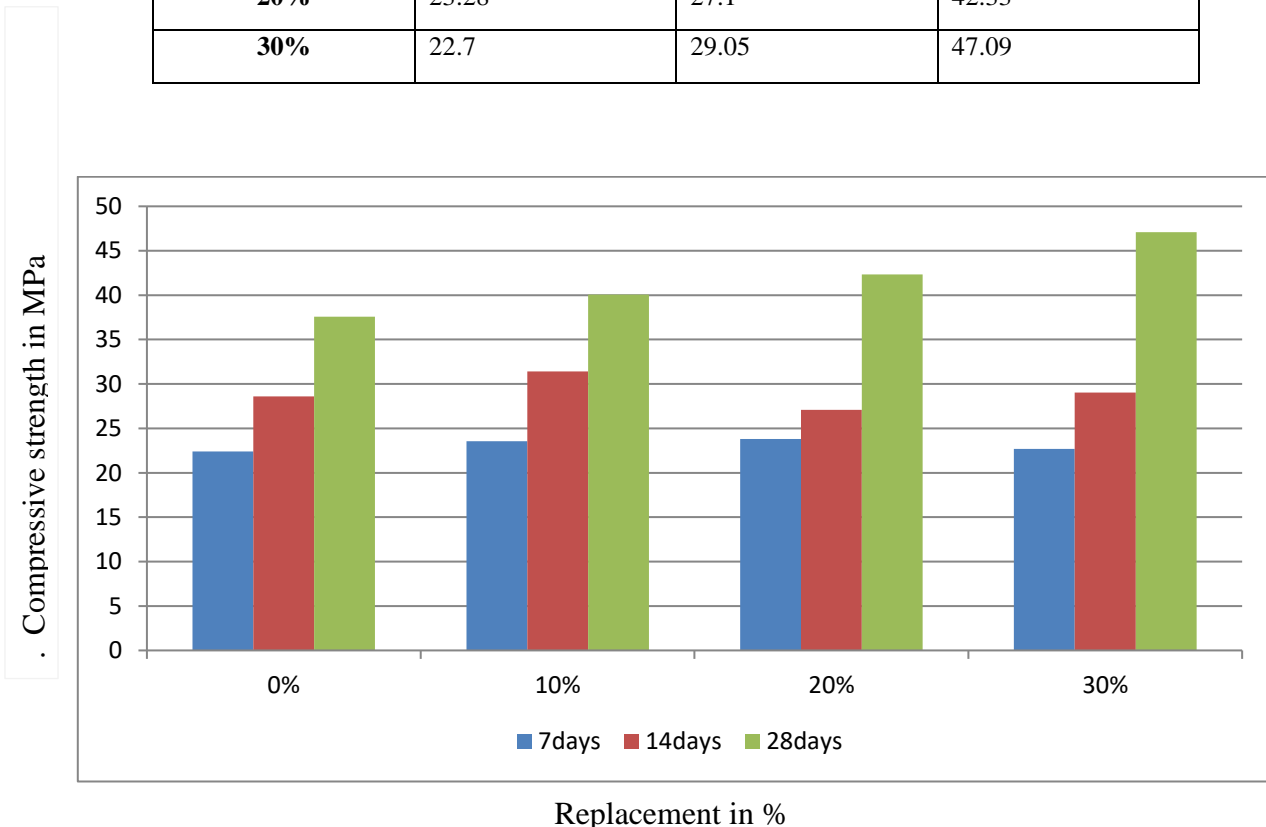
Compressive Strength Test: Compressive strength taken by Universal Testing Machine (UTM). It measured in mPa. We are taking compressive strength test on 7 days, 14 day, & 28 days respectively of replacement blocks 0% ,10%, 20%, 30% after 7days testing 8 three cubes of each replacement sample discussed in above. And we concluded result on the basis of readings obtained from compressive strength test.

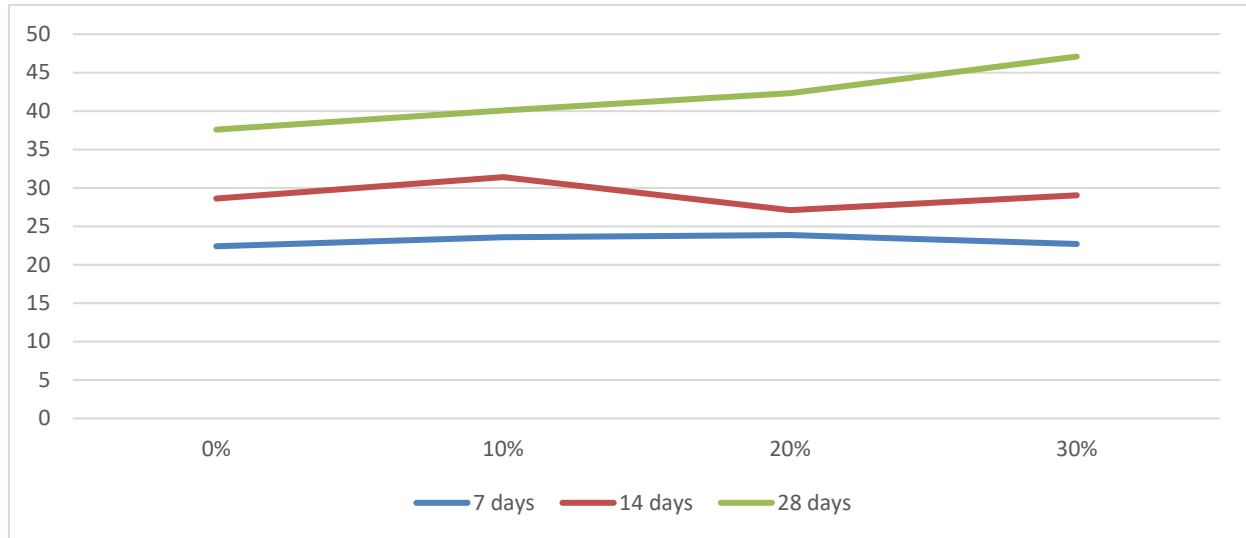




Discussion and Results:

Days and Replacement in %	7days	14 days	28 days
0%	22.4	28.6	37.58
10%	23.56	31.4	40.05
20%	23.28	27.1	42.33
30%	22.7	29.05	47.09





CONCLUSION

By increasing the dosage of waste glass powder and fly ash as 10%, 20% and 30%. The strength of concrete increases and at the time of testing on 7 days and 14 days the required strength is not obtained, but after proper curing and when the concrete blocks are hardened after 28 days the blocks gives higher strength as compare to 7 days and 14 days test.

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