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Study on Percentage Replacement of Cement by Glasspowder for M20 Grade Concrete

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ABSTRACT

Now a day's industrial wastages are polluting the environment. this study aims at reuse of such waste by products for new purpose. This glass waste can satisfy the users. This waste glass modified into powder for reuse. Percentage replacement of glass powder at the proportion proportions 0%,2.5%,5%,7.5%,10%, at water cement ratio of 0.45 and curing period is 7,14,28 days. Addition of glass powder may lead to small changes in workability of concrete and slight increase in mortar flow. Tests are conducted on respected replacement of glass powdercornetite glass powder results in increase of strength of concrete. Glass powder has pozzolanic reactivity nature. it has the Within the alkaline surroundings of concrete, glass is unstable and This deleterious alkali-silica response problems. Using of glass powder in concrete is to reduce money which is investing on disposal of glass powder. In this we observe the differences between the properties of concrete with finely powdered glass and normal concrete. According to effects received, it's determined that the tumbler glass powder can be reused as cement percentage replacement fabric as much as particle size less than 300μm to save you alkali silica response. Convincing results at 5% glass powder.

KEYWORDS: *Glass powder, Concrete, Mortar, Compressive strength.*

I. INTRODUCTION

In present days concrete is most used construction material, because of its material, because increasing development in infrastructure industry. In our country the cement production is expected to nearly 500 million tons, by the year 2020 and 800 million tons by 2030.Concrete has many applications in day-to-day life like construction of highways, tons-rise buildings and etc. Due to high usage of concrete will release greenhouse gas like CO2 in large quantity, thiscauses the global warming and this contributes 65% in total. The total industries of cement release 7% greenhouse gas in to the environment. To decrease this global warming of environment we have to choose other binders are introduced to make concrete.In recent days, various studies are done to reuse waste glass as a percentage replacement with regularly used materials in concrete making to decrease CO2 emotion. A major problem with glass powder at concrete making process, the development of chemical reactions between the silica present in glass particles with alkali matter present in rest of concrete, this is known as Alkali – Silica reaction and commonly called as "Concrete Cancer" it is very harmful for the sustainability of concrete to withstand design lifeperiod, if suitable precautions are not taken to reduce their effects. This Alkali –

Silicate reaction is decreased by addition of mineral admixtures to concrete. Most used mineral admixtures to decrease Alkali-Silicate reaction are fuel ash, silica fume and metakaolin. Several studies are demonstrated these mineral admixtures has a capability to decrease Alkali-Silica reaction.

Waste Glass Source:

- Food storage glass bowls and glass door doors manufacturing shops.
- Glass decorative items and outdated tube lights, electric bulbs.
- At Glass polishing and glass window and door manufacturing shop.

II. LITERATURE REVIEW

1.Dr.G. Vijayakumar, MSH. Vishaliny, Dr.D. Govindarajulu, et al., (2013).

In this research studies are done at 10, 20, 30 and 40% replacement. From this study it was concluded the atisfactory results at 20%, 30% and 40% and increases the compressive strength by 19.6%, 25.3%, and 33.7% respectively. Tensile strength raised by 4.4% at 40% replacement.

2.Hongian Du, Kiang Hwee Tan, et al., (2014).

In research studies are at 15, 30, 45 and 60% by weight of cement. From the test results it was concluded that the rate and total heat production at hydration process is negligible. From the test results they concluded that the satisfactory results occurat 30% replacement by glass powder.

3.Dhanaraj Mohan Patil, Dr. KeshavK. Sangle, et al., (2013)

The cement is replaced at 10%, 20% and 30%. From this test they concluded that, in addition of glass, powder early-stage strength is low but design strength is got in 28 days and best replacement percentage is 20%.

III. MATERIALS

CEMENT:

The cement is a binding property material, it is used in the construction it undergoes setting, it has hardening property. In this project we use opc 53 grade of cement conforming to IS :1026210262-2009

FINE AGGREGATE:

The particles which are pass from 4.75mm sieve. And it is a cost saving material. Conforming to IS 383-1970 codal provision.

COARSE AGGREGATES:

Coarse aggregates are derived from weathering of rocks the particles which are retained on 4.75mm sieve. Coarse aggregates are given 60-80% volume of the concrete. Conforming to IS :383-1970 codal provisions.

GLASS POWDER:

Waste glass converted to powder form, and then passed through the sieve of 300 microns where more than 95% passed through the sieve of 600 microns.

In this mixing process taking proper amount of cement, fineaggregates,coarse aggregates and mixing with adequate amount of water without any salts. Firstly, mix the fine aggregates, coarse aggregates for 2-3 minutes and then add cement and according to percentage replacement add glass powder mix it will and add 0.45 water content and mix it well without any lumps.

IV. COMPRESSIVE AND SPILT TENSILE STRENGTH TESTS ONCONCRETE

Casting 150×150×150mm dimensions cube and 300×150mm cylinder for testing compressive and spilt tensile strength on concrete.

COMPRESSIVE STRENGTH TEST: Compressive strength test on concrete cube samples is done by using universal testing machine (UTM). This test done for different level of curing periods like 7,14,28 days for different levels of replacement of glass powder.

SPLIT TENSILE STRENGTH OF CONCRETE:

Universal testing machine (UTM) is used for testing of split tensile strength of cylinders. This text done for different level of curing periods like 7,28 days for different levels of replacement of glass powder.

V. RESULTS AND ANALYSIS

Tests on Cement:

S.No	Test	Results	IS code used	Acceptable limit
1	Specific gravity of cement	3.160	IS:2386:1963	3 to 3.2
2	Standard consistency of cement	7mm at 32% w/c	IS:4031:1996	w/c ratio 28%-35%
3	Initial and final setting time	35 mins and 10 hours	IS:4031:1988	Minimum 30mins and should not more than 10 hours
4	Fineness of cement	4.00%	IS:4031:1988	<10%

COMPRESSIVE STRENGTH

S.No	%Replacement of GP	Avg Compressive load			Cross sectional Area	Avg Compressive strength in MPa		
		7 Days	14 Days	28 Days		7 Days	14 Days	28 Days
1	0.00%	140	165	190	10000	14	16.5	19
2	2.50%	160	200	225	10000	16	20	22.5
3	5.00%	185	235	270	10000	18.5	23.5	27
4	7.50%	180	220	250	10000	18	22	25
5	10.00%	150	210	230	10000	15	21	23

SPLIT TENSILE STRENGTH:

S.NO.	% Replacement of GP	Avg Split tensile load in KN		Cross sectional Area	Avg Compressive strength in MPa	
		7 days	28 days		7 days	28 days
1	0.00%	75	140	141368	1.06	1.98
2	2.50%	160	220	141368	2.26	3.11
3	5.00%	120	200	141368	1.69	2.82
4	7.50%	125	170	141368	1.76	2.40
5	10.00%	130	165	141368	1.83	2.33

TESTS ON FINEAGGREGATES:

S.No	Test	Result	Acceptable limits
1	Fineness modulus	4.305	Not more than 3.2 mm
2	Specific gravity	2.73	2.0 to 3.1
3	Bulking of sand	4.0%	Less than 10%

TESTS ON GLASSPOWDER:

PROPERTIES OF GLASS POWDER:

properties	Cement	Glass power
Fineness % passing (sieve size)	< 90 µm	< 75 µm
Specific gravity	3 - 3.2	2.42 – 3.01
Colour	Gray	White

VI. CONCLUSION

- Increase in compressive strength of concrete at 2.5% and 5% at curing period of 7days,14days,28days and decrease in strength at furtheraddition. And Optimum percentage at 5% replacement.
- Increase in split tensile strength at 2.5% of glass powder.
- Workability decreases when increase in glass powder addition.

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