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"Improve Quality of Concrete Using Waste glass as the Replacement of Sand and Cement"

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Abstract: **-**The largest amount of natural resources is consumed in concrete industries, which is harmful to the stability of concrete industry. Environmental as well as Economic issues are the biggest challenge which the concrete industry needs to face now. Waste glass is a material that is harmful to the environment. Cement powder can be used to partially replace cement in concrete. This largely addresses environmental and economic issues. Therefore, by using waste glass as a partial substitute for sand and cement in concrete. 20% and 30% of waste glass powder can be replaced by cement, and 15% of cement can replace M-25 mixture. The compressive strength, durability (water absorption) of the concrete samples will be tested within 28 days, and the results will be compared with ordinary concrete. The outcome was finished up as the utilization of waste glass powder that the range is a fractional substitution of sand up to 30% for molecule sizes of 0–2.25 mm. What's more, substitution of 15% concrete.

Keywords: - Concrete, Glass Powder, *Workability*, Compressive *strength, Durability.*

INTRODUCTION

To make the concrete industry sustainable, Better to replace natural materials with waste. Large amounts of waste glass are produced worldwide. In India, 0.7% of the absolute urban waste is created which is made of glass . The UK produces more than 3000000 tonnes of waste glass each year. Waste glass is shredded to be used as aggregate of different sizes, such as water filtration, gypsum board, sand for sports fields, sand and concrete can be replaced with sand

Materials and their requirements are constantly increasing. Excessive use of fine sand in river channels will lead to the exploitation of natural resources, affect groundwater levels, reduce water flow, erode bridges, and erode river beds. If the sand is replaced by unused glass powder in a certain percentage and within a specific size range, this will decrease the measure of fine total and concrete required, along these lines forestalling the antagonistic impacts of stream digging and making solid development increasingly efficient. Due to the continuous growth of glass products, the output of waste glass has increased significantly in the past few years. Most useless glass is used in landfills. Lands full of waste glass may be useful because waste glass is not biodegradable, which reduces the strength of soil fertilizers. The use of this waste is important to us. It is very likely to use waste glass in the concrete construction industry.the waste glass powser used in the concrete structure when the structure cost reduction and the structure more economically. This step will serve two purposes; first, it will be environmentally friendly; second, it will use waste in place of waste natural resources which is very beneficial for the environment

The unused glass powder use the as a sand in concrete and No fine-grained reaction, so feasibility of using waste glass is seen in concrete. In addition, waste glass positively contributes to mortar microstructural properties resulting in improved mechanical performance (6). The shape of the glass was therefore in the range 0–2.625 mm.

In this research, finely totals were mostly supplanted by squander glass with 20%, 30%, and 15% cement in other samples with waste glass. Solid examples were tried for compressive quality, water retention and light weight for different waste glass rates. Compared to typical M-25 concrete mixtures the result was found to be a maximum increase in compressive strength as a fine composite for concrete mixtures with 20% waste glass. With the increase in waste glass, an increase in durability in water absorption is indicated. The density of concrete increased in the waste glass and thus the weight of concrete decreased compared to ordinary concrete. This paper is 20%, summarize the 30% and 15% treated with replacement of concrete with cement fixing glass, which can decrease the removal issues of waste glass and help to improve the concrete properties

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MATERIAL USED

Cement and Aggregates

43 grade ordinary Portland cement was used for every purpose. According to IS383–1970 [9] River sand of Zone 2 with a maximum size of 4.75 mm was used, with a specific gravity of 2.6.The coarse aggregate is crushed using a machine, which gives the aggregate stone an angle size, which is passed through a 4.75 mm IS sieve stuck to a 20 mm IS sieve. Having specific gravity of 2.7.

Waste Glass Powder

Waste glass bottle, was composed of soda lime glass, Jaipur, collected waste glass in Rajasthan. It was replaced in abrasive tools in Los Angeles and then 2.625 mm IS been riddled through the sieve. Specific gravity of waste glass was found 2.4. The compound structure of the glass was appeared in TABLE 1.

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EXPERIMENT& TESTS

Concrete Mix Design

The design of concrete batches was proposed using IS 10262 [10]. M-25 grade concrete is made with water with a cement ratio of 0.45. The mixing ratio used in the laboratory is shown in Table 2.

Test of Fresh Concrete

Determination of solid blends of functionality was through the use of the slope of the metal chute. Mould height and the difference in level between the highest point of the concrete has been reported as measured and recession. According to IS 1995 were tested for depression.

Tests of Hardened Concrete

The shape of each concrete mix highlights cubes of 15 x 15 x 15 cm and 10 x 10 x 10 cm, which determine the compressive and split tensile strength tests, respectively. IS 516-1959 [12] According to IS 516-1959 [13], fixed solid samples are normally tested at 7 and 28 days, respectively, to determine the compressive strength of the sample.

Water Absorption

The normal dry load of the concrete samples after the removal from the molds was estimated and the normal load of the concrete samples was measured at 28 days after being immersed in water for treatment. The percentage of water absorption for different solid cubes was measured and it gave an indirect solution of stability.

Light Weight

Average dry weight of concrete cube samples with 20%, 30% unused glass powder, in place of sand and 15% instead of concrete, with normal dry weight and percentage change in dry weight of ordinary M-25 concrete cube samples which was measured.

RESULTS AND DISCUSSION

Fresh Concrete

Table 2 lists the deceleration values for all mixtures. As concrete waste glass increases, so does the slowdown. Waste glass powder absorbs less water than sand, thereby improving the workability of the concrete mixture. For solid mixtures containing 20%, 30% waste glass, the slope is greatest. The form of slump with waste glass frit is shown in Figure 3.

Oxides	SiO_2	Al_2O_3	Fe_2O_3	MgO	Na_2O	K_2O
Percentage	70.4	1.9	1.2	10.3	14.0	0.4

TABLE 1 – Chemical Composition of Glass

Hardened Concrete

Table 3 shows the compressive quality test and water ingestion test in Table 4. The compressive strength test was performed on the 7th and 28th days. When 20% of the glass powder was replaced with sand and then replaced with 20% glass, the compressive strength of the powder began to decrease. Waste glass is used. The compressive quality of the solid blend with a waste glass substance of 40% was seen as lower than that of the reference blend.

Water Absorption

All water retention test blends was measured percentage of water retention. Percent increase in the volume of waste water is less absorption of water. 40% was the lowest price of the absorption of the composite concrete water with waste glass material. The percentage of water retention of the mixture is shown in Table 4.

Light Weight

The normal dry load of a cubic example of every blend contrasted with a typical blend was estimated, also, it was discovered that the thickness diminished as the substance of the waste glass expanded.Compared to the reference mixture, the dry weight of the concrete cube sample of the

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concrete mixture with a waste glass content of 40% was reduced by 5%. Therefore, waste glass powder concrete is lighter than ordinary concrete. Table 5 shows the dry thickness value and the percentage change in dry load relative to the ordinary mixture.

Fig-1 Cube Sample

Fig-2 Compaction by Vibrater

Waste Glass %	W/C Ratio	Water (ml)	Cement (Kg)	Fine Aggregate (Kg)	Waste Glass (Kg)	Coarse Aggregate (Kg)	Slump (mm)
0	0.45	911	2.025	2.025	0	4.05	75
20	0.45	911	2.025	1.62	0.405	4.05	69
30	0.45	911	2.025	1.4175	0.6075	4.05	61

TABLE-2 Mix Design of Concrete

Waste Glass in %	Cube Compressive Strength (N/mm2)	
	7 Days	28 Days
0	18	27
20	21	31
30	22	24

TABLE-3 Compressive Strength

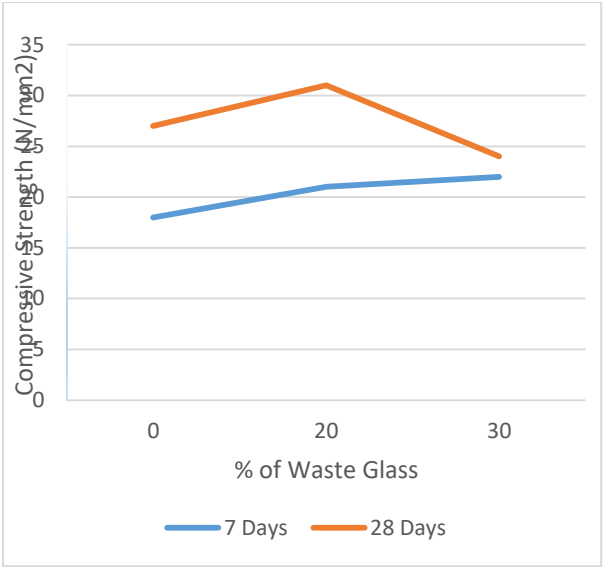

Fig-3 Compressive Strength Test

Waste Glass %	Avg. Dry Weight Before Curing(gm)	Avg. Weight After Curing(gm)	Water absorption (gm)	% Water Absorption
0	8389	8480	91	1.09
20	8212	8274	62	0.75
30	8140	8189	49	0.60

TABLE-4 Water Absorption

CONCLUSION

- The workability of concrete decrease when the increases of the waste glass powder.
- The compressive strength increases when the 20% amount of waste glass powder is replaced by fine aggregate and more then 20% replacement of glass powder compressive strength starts to decrease.
- The water retention diminishes when the measure of the waste glass powder increment in the solid blend structure.
- The composition of the waste glass powder in the concrete mix design decreases the overall cost of the concrete.
- The flexural strength is increase when the amount of waste glass

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powderreplacedupto 20% and more than 20% use of waste glass powder drops down flexural strength of concrete.

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