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EXPERIMENTAL STUDY ON M40 GRADE CONCRETE BY PARTIAL REPLACEMENT OF CEMENT WITH WOOD POWDER AND GLASS POWDER

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ABSTRACT

There is growing enthusiasm for the development of Concreten asphalts, due to its excessive best, durability, better capability and in preferred financial system over the lengthy haul. Present day development price is at its tallness with utilizing fundamental materials like concrete, coarse aggregates and first-rate aggregates. Leaving waste materials to nature in particular can understand ecological problems. In this manner, reuse of waste materials has been pressured. Ventures create bunches of waste materials, which can be beneficial in fractional substitution of essential materials because of their piece and it has a tendency to be validated conservative. In a growing country like India a first-rate degree of modern waste are contaminating the natural. With a view to the over, this examination goes to be used of such mechanical result for esteem covered software. Moreover the waste can enhance the properties of improvement substances. Wood dirt is a facet-effect or waste result of carpentry sports, for instance, sawing, processing, arranging, directing, dull and sanding. It is made from satisfactory particles of wood. These duties can be achieved by way of carpentry hardware, convenient electricity contraptions or by means of usage of hand apparatuses. Glass is normally applied in constructing development organisations and enormous measure of glass is powdered each day. The transfer of waste glass is an ecological issue as waste glass causes transfer problem.

In this present examination an endeavor had been made in the present examination to talk about the Workability, Compressive quality, Split rigidity, Flexural quality of cement by supplanting Cement with Wood powder (WP) and Glass powder (GP) with various substitution levels 0%WP+0%GP, 5%WP+5%GP, 10%WP+10%GP, 15%WP+15%GP, 20%WP+20%GP, 25%WP+25%GP for M40 Grade of concrete.

1. INTRODUCTION

The improvement inside the development enterprise anywhere at some stage in the sector is advancing. Numerous systems are being manufactured, each non-public and non-non-public. Because of the growth within the cost of improvement materials, in particular bond, pulverized stone (coarse mixture), excellent sand (quality aggregate); there may be the want to analyze the utilization of interchange constructing substances which might be domestically on hand. Since most constructing development works include of Concrete work; in this manner, decrease in price of Concrete era will reduce the fee of building development. In this issue number one factor is to ponder the fractional substitution of the wooden powder residue and glass powder with the various price in the Concrete and to check the houses of the Concrete by using contrasting and the normal cement.

The supplanting of Cement with certain wooden powder in Concrete that makes the structure all the more light in weight. The quality and functionality test are dissect in this paper. The most critical properties of cement is the quality in compressive power. Additionally, expanding the wooden residue in organization caused diminishes in unit weights and compressive quality estimations of mortars with a parallel increment in water retention esteems at all ages. The wooden powder dust supplanted by Cement gives the properties and the advantages in the real generation of cement.

Objectives of the study:

From this study the following conclusions were made

1. The principle point of this work is use of waste materials (wooden powder) and Glass powder (GP) as bond which is blended (expansion and fractional substitution) with OPC to examine the effect of these waste materials on different parameters of Concrete review i.e. M40.
2. To assess and analyze the aftereffects of usefulness, compressive quality, split elasticity and flexural quality of M40 review of cement by utilizing wooden powder and Glass powder with standard cement.
3. To look at the building properties of so enhanced cement for M40 (expansion and fractional substitution) examples with controlled blend concrete.
4. To guarantee the ideal utilization of household and mechanical waste and lessen the carbon impressions.
5. The essential goal is to sum up the properties of cement with the utilization of waste material, for example, wooden powder and Glass powder.
6. Wooden powder and Glass powder in Concrete that makes the structure all the more light in weight.

2. LITERATURE REVIEW

Velmurugan.P, Jose RavindraRraj.B, et al[2].,(2017) In this present study partial replacement of waste wood powder is investigated by varying proportion in the concrete .The replacement of fine aggregate (sand) with certain wooden powder in concrete that makes the structure more light in weight. The workability, strength and durability test are studied in this paper. From this study it was concluded that addition of wood ash as alternate material for sand can be done. Partial replacement of wood ash with sand up to 30% is effective. Compressive strength and split tensile strength was found to be good when compared to control concrete, percentage increase of wood ash showed increase in strength. Addition of wood ash makes the concrete light weight. Wood waste powder replacement with sand for 10%, 20%, 30% was found to be higher than conventional concrete .

Kashish Arora, et al[3],(2018) Since economical parameters and compressive strength are fundamental properties of concrete in two different stages of production, the correlation between costing parameters and compressive strength has been used instead of using water-cement ratio versus compressive strength relationship. From this study it was concluded that In case of replacement of coarse aggregate, 20% asbestos cement sheet waste content can be taken as the optimum dosage for compressive strength, which can be used for giving maximum possible compressive strength at any age for Asbestos cement sheet waste aggregate concrete.

3. MATERIALS USED

In this study Ordinary Portland cement of 53 grade (ACC cement) has been procured and has been used.

OPC 53 grade cement

Aggregates are divided into two categories from the consideration of size.

i).Coarse aggregate ii). Fine aggregate

In this study coarse aggregate of nominal sizes of 20mm, 12mm are used.

20mm coarse aggregates 12mm coarse aggregates

The fine aggregate used in this study is river sand which is obtained from local company and shown in figure.

Fine aggregate

Wood powder

Wood dust is the main component of particleboard. Wood dust is a form of particulate matter, or particulates. Research on wood dust health hazards comes within the field of occupational health science, and study of wood dust control comes within the field of indoor air quality engineering.

Wood powder

Glass powder

Glass is an amorphous & transparent material, which is super-cooled liquid and not a solid. Glass can be made verity of forms and sizes from small fiber to meter-sizes pieces. Primarily glass is produced by melting a mixture of materials such as silica, CaCO3, and soda ash at high temperature followed by cooling during which solidification occurs without crystallization. Glass powder can be used as cement replacement material upto particle size less than 90µm.

Glass powder

Superplasticizers:

The superplasticizers also produce a homogeneous, cohesive concrete generally without any tendency for segregation and bleeding.

In this study, CONPLAST SP430 has been used in concrete mix to have high workability.

CONPLAST SP430

Mix Design

Final trial mix for M40 grade concrete is 1:1.63:2.54 at w/c of 0.45

4. EXPERIMENTAL INVESTIGATION

Casting of cubes and cylinders

Casting of cubes and cylinders as done for M40 grade self compacting concrete, the mix proportion is for which we are casting cubes for normal concrete, with the partial replacement of concrete

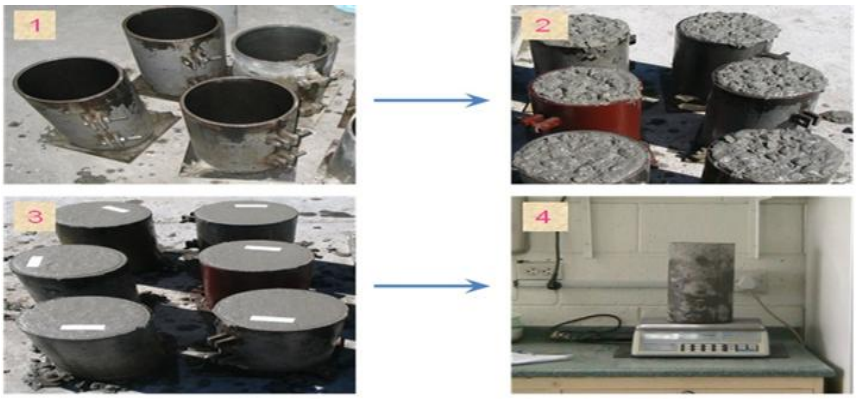
Filling the mould (for 150 mm cube 3 equal layers)

Compacting with compacting bar

150 mm moulds should be filled in three approximately equal layers (50 mm deep). A compacting bar is provided for compacting the concrete. It is a 380 mm long steel bar, weighs 1.8 kg and has a 25 mm square end for ramming.

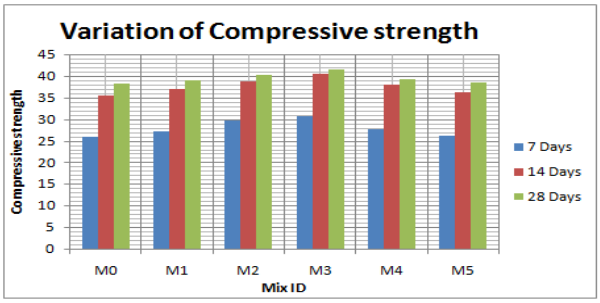
Compacting the concrete in the cube mould

Finishing



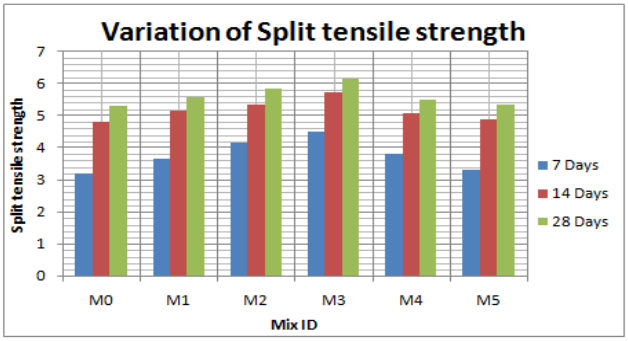
Compressive strength of concrete

S. No	%WP+%GP (Mix ID)	Compressive strength of concrete		
		7 Days	14 Days	28 Days
1	0WP%+0GP% (Mo)	25.77	35.55	38.22
2	5WP%+5GP% (M1)	27.11	36.88	38.88
3	10WP%+10GP% (M2)	29.55	38.66	40.22
4	15WP%+15GP% (M3)	30.66	40.44	41.5
5	20WP%+20GP% (M4)	27.77	38	39.11
6	25WP%+25GP% (M5)	26.22	36.22	38.44



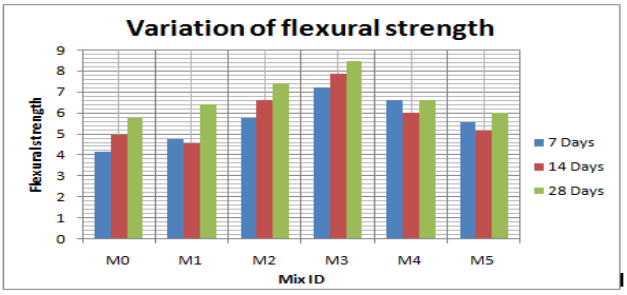
Split tensile strength

S. No	%WP+%GP (Mix ID)	Split tensile strength of Concrete		
		7 Days	14 Days	28 Days
`1	0WP%+0GP% (Mo)	3.20	4.81	5.30
2	5WP%+5GP% (M1)	3.68	5.16	.59
3	10WP%+10GP% (M2)	4.17	5.37	5.87
4	15WP%+15GP% (M3)	4.53	5.73	6.15
5	20WP%+20GP% (M4)	3.82	5.09	5.52
6	25WP%+25GP% (M5)	3.32	4.88	5.37



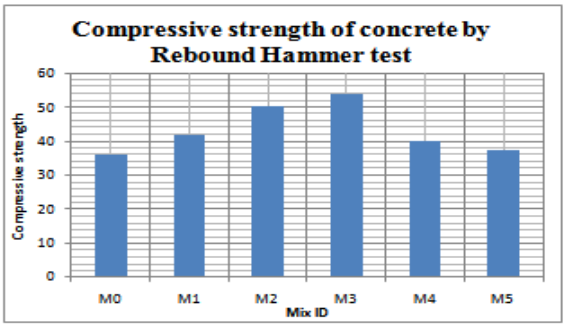
Flexural strength

S. No	%WP+%GP (Mix ID)	Flexural strength of Concrete		
		7 Days	14 Days	28 Days
1	0WP%+0GP% (Mo)	4.15	4.97	5.80
2	5WP%+5GP% (M1)	4.77	4.60	6.42
3	10WP%+10GP% (M2)	5.80	6.63	7.46
4	15WP%+15GP% (M3)	7.26	7.88	8.50
5	20WP%+20GP% (M4)	6.63	6.01	6.63
6	25WP%+25GP% (M5)	5.60	5.18	6.01



Compressive strength of concrete by using Rebound Hammer Test

S. No	%WFS+%RDA	Compressive strength of concrete
1	0%+0%	36.1
2	5%+5%	41.9
3	10%+10%	50
4	15%+15%	53.8
5	20%+20%	40
6	25%+25%	37.2



5. CONCLUSIONS

From the above study the following conclusions were made

1. The use of wood powder and glass powder as a partial replacement of cement provides us an alternative source to use the waste into a useful material. Also the attempt to use the plentily available crushed stone sand is found to obtain good results.
2. The value of slump decreases with increase in the percentage of Glass powder and wood powder dust from 0%GP+0%WP to 10%GP+25%WP.
3. The value of compaction factor decreases with increase in the percentage of Glass powder and Wood powder from 0%GP+0%WP to 10%GP+25%WP..
4. The optimal value (maximum value) of compressive strength was observed at 15%GP+15%WP for 7days, 14 days and 28 days. After 15%GP+15%WP the compressive strength of concrete decreases.
5. The optimal value (maximum value) of Split tensile strength was observed at 15%GP+15%WP for 7days and 28 days. Similar to the compressive strength split tensile strength decreases with increase in the percentage of Glass powder and Wood powder.
6. The optimal value (maximum value) of Flexural strength was observed at 15%GP+15%WP for 7days and 28 days. After 15%GP+15%WP the Flexural strength of concrete decreases.

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