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Research Paper

Glass Waste Powder as Partial Replacement of Cement

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ABSTRACT
A large quantity of waste glass is being generated yearly. Glass is disposed of in landfills after it becomes waste, which is inappropriate because it does not disintegrate in the environment. Thus, significant quantity of energy required for the manufacturing, which begins with site extractions and ends with industry output, cement manufacture and it also creates many types of pollution. This study confirms that glass waste powder (GWP) can be used to partially replace cement in new concrete mixtures. Two concrete mixes with compressive strength 25 MPa and 32 MPa respectively were created for this purpose, using 0%, 10%, 15%, 20% and 25% of the waste glass powder to partially replace cement.
Keywords: *Glass, environment, compressive strength, fresh concrete properties, cement production, sustainability*

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I. INTRODUCTION

Every year, a large amount of waste glass is produced all around the world. Glass is disposed of as waste in landfills, which is unsustainable because it does not breakdown in the environment. Using shredded glass for partial replacement of cement in concrete can be an important step towards creating a lasting infrastructure system. For keeping the natural deposits at their current levels, the concepts of recycling and sustainability were created. Chemical and agricultural processes in India generate a large and high amount of industrial waste every year. Energy and the environment can be saved by taking in industrial waste into concrete. is the environmental benefit of using these by-products, such as diverting materials from the waste stream, when producing one ton of conventional cement An equivalent amount of CO_2 is released into the atmosphere during the production process one ton of ordinary portland cement, Dangerous for the environment . Accordingly, an alternative must be selected. Moreover, the prices of cement are also increasing rapidly each year. Therefore, it is necessary to make rational use of industrial wastes to reduce costs and environmental concerns. Concrete is a building material that contains cement, fine aggregate and coarse aggregate along with water in it. According to current global data, the construction industry needs millions of tons of cement every year. Ordinary Portland cement is the most common used cement during construction works.

II. MATERIALS

2.1 **Cement**

The experiment is carried out with ordinary Portland cement (OPC). 3.15 and 1551 kg/m3 were found to be the specific gravity and density, respectively.

2.2 **Glass**

In 25 MPa and 32 MPa concrete mix, partial replacement of cement with glass powder had not noticable effect on slump test results. GWP in a 25 MPa concrete mix produced the highest slump (75 mm), demonstrating the benefit of partial replacement of cement with waste glass powder for improved workability.

2.3 **Aggregates**

Fine aggregates is used of fineness modulus of 2.89, a specific gravity of 2.77, and a 3.09 percent water absorption. The specific gravity and absorption of the coarse aggregates used are 2.46 and 2.41, respectively.

III. EXPERIMENTAL RESULTS AND DISCUSSION

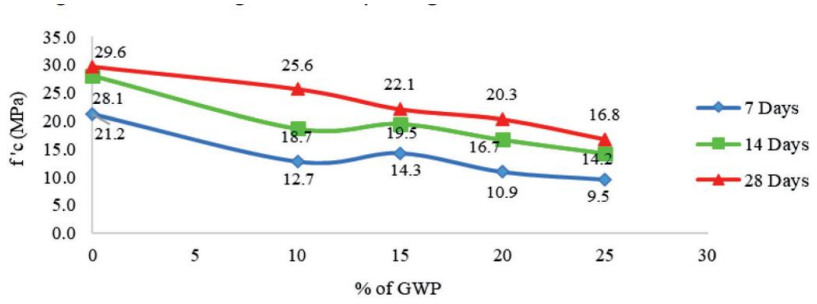
3.1 Fresh concrete properties

In both 25 MPa and 32 MPa concrete mixes, partial replacement of cement with glass powder had no discernible influence on the slump test findings. The results of the dip were extremely close to and within the

target values (25 mm-75 mm). The 20 percent GWP in a 25 MPa concrete mix produced the highest level of slump (75 mm), demonstrating the benefit of partially replacing cement with waste glass powder in enhancing workability. However, this partial replacement was ineffective in terms of compressive strength. On the other hand, the results shown in Fig. 4 reveal that the GWP at 10% and 15% resulted in the maximum slump of 32 MPa in the concrete mix (75 mm).

3.2 Hardened concrete properties

The results showed that the compressive strength of the concrete pillars at day 7, 14 and 28 decreased as the GWP ratio increased for 25 MPa concrete mix. However, with a replacement rate of 10%, the average compressive strength was obtained at 25.6 MPa, exceeding the specified compressive strength by a factor of two at 28 days. The results for concrete grade 32 MPa were similar, except that higher compressive strength was observed with a substitution rate of 15% versus 10%. As a result, using 15% GWP as a cement substitute represented the best replacement rate without affecting the compressive strength of the design mix after 28 days.



IV. CONCLUSION

In conclusion, we studied that 10% and 15% of Glass Waste Powder in 25 MPa and 32 MPa concrete grades, respectively, has no discernible impact at the air content material in sparkling concrete, however affords first-rate workability, because the hunch values in each concrete mixes had been inside the goal variety of 25mm-75mm. In the glide desk test, the glide percent extended from sixty eight percentage to eighty four percentage in 25 MPa concrete and from fifty two percentage to eighty percentage in 32 MPa concrete. In phrases of electricity, the outcomes confirmed that at 7, 14, and 28 days, the concrete with Glass Waste Powder had decrease compressive electricity than the manipulate blend in each concrete grades. Glass Waste Powder, which substituted 10% and 15% of the cement in 25 MPa and 32 MPa concrete mixes, respectively, passed the purpose compressive electricity of 25 MPa with the aid of using 2.four percentage and 32 MPa with the aid of using 1.6 percentage.

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