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EXPRIMENTAL STUDY ON PARTIAL REPLACEMENT OF CEMENT WITH WASTE GLASS IN CEMENT CONCRETE PAVEMENTS

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Abstract - *Environmental issues have off late attracted lots of attention worldwide. Disposal of wastes has huge environmental impacts As such; waste management and the safe disposal of waste have massive and far-reaching consequences for the environment and are of vital importance. The concrete industry is working tirelessly to adopt innovative measures to adopt waste glass and use it as a construction material. Today the construction industry is finding cost effective materials for strengthening the concrete. Waste management is becoming a major issue worldwide. One option for safe environmental and economic disposal of waste is to reuse them in building materials. Due to high material consumption of the construction industry, the utilization of used glass as a partial replacement for fine aggregate in structural concrete is partially attractive.*

***Key Words*: Environmental Issues, Construction Materials, Building Materials, Structural Concrete**

1. INTRODUCTION

It is possible to provide door to door service only by road transport .Concrete pavement a large number of advantages such as long life span negligible maintenance, user and environment friendly and lower cost. Keeping in this view the whole life cycle cost analysis for the black topping and white topping have been done based on various conditions such as type of lane as single lane, two lane, four lane different traffic categories deterioration of road. A highway pavement is a structure consisting of upper imposed layers of processed materials above the natural soil sub-grade, whose primary function is to distribute the applied vehicle loads to the sub-grade. The pavement structure should be able to provide a surface of acceptable riding quality, adequate skid resistance, favorable light reflecting characteristics, and low noise pollution.

1.1 Cement

Cement is one of the main building materials. It is a material having adhesive and cohesive properties. The cement used for making concrete is known as hydraulic cement. When water is added to the cement it starts reacting chemically in exothermic processes known as hydration of cement. In hydration of cement, cement paste is formed which covers the aggregate in concrete and also fill the voids. When the water content in cement is reduced, it starts losing its consistency. The loss of water content may be due to the adsorption, evaporation and subsequently sets transforming the mixture in a solid mass.

1.2 Reaction of Cement and Glass Powder

According to Shi *et al* (2005) glass powder having particle size less than 300 microns and below 100 microns shows pozzolanic properties. Fineness of the glass powder influences its pozzolanic behavior. Also the pore solution present for reaction greatly influences the pozzolanic behavior of the glass powder. Depending on the fineness of glass powder, glass powder exhibit pozzolanic reaction at a slower rate compared to with the cement hydration.

2. Durability

Hongjian *et al.* (2014) studied the effect of glass powder on concrete when cement is being replaced in different percentages. Also 15% glass powder was used as an additive to check the impermeability against chloride and water. Glass powder passed through 90 micron sieve and coarse aggregate with maximum size 10 mm was used. Grade of cement used is OPC43 and mix design to be designed is M50.

Research Gap

The use of waste glass as a partial replacement of cement has positive impact on the overall quality of the concrete. There is considerable increase in compressive strength of the concrete when waste glass is used at a certain percentage. The flexural strength as well as the tensile strength has also been found to have increased corresponding to the percentage of waste glass at which the compressive strength increases. The only drawback however is the decrease in slump values and workability of the concrete.

Glass Powder

Glass is a non-bio-degradable material and is not suitable for landfills. A lot of waste glass comes from the industries

which pollutes our environment. To make our environment pollution free concrete industries had used this waste glass as a replacement of aggregate, fine aggregate and cement and also as a supplementary cementing material. In my research, the glass powder is being partially replaced by cement in concrete.

3. CONCLUSIONS

The study was carried out with the aim to incorporate the waste glass, which is nuisance to the environment, in the construction of the cement concrete pavements without compromising with the quality of the concrete produced. The effect of waste glass on the compressive strength, tensile strength, flexural strength and the workability were studied to determine the impact of waste glass if used as a partial replacement of the cement.

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