Partial Replacement of Cement with High Silicate Glass Powder in Concrete

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Abstract:- **Cement manufacturing industry is one of the carbon dioxide emitting sources besides deforestation and burning of fossil fuels. The global warming is caused by the emission of green house gases, such as CO2, to the atmosphere. Among the greenhouse gases, CO2 contributes about 65% of global warming. The global cement industry contributes about 7% of greenhouse gas emission to the earth's atmosphere. In order to address environmental effects associated with cement manufacturing, there is a need to develop alternative binders to make concrete. Consequently extensive research is on going into the use of cement replacements, using many waste materials and industrial by products. Efforts have been made in the concrete industry to use waste glass as partial replacement of coarse or fine aggregates and cement. In this study, finely powdered waste glasses are used as a partial replacement of cement in concrete and compared it with conventional concrete. This work examines the possibility of using Glass powder as a partial replacement of cement for new concrete. Glass powder was partially replaced as 10%, 20%, 30% ,40%and 50% and tested for its compressive, Tensile strength up to 28 days of age and were compared with those of conventional concrete; from the results obtained, it is found that glass powder can be used as cement replacement material up to particle size less than 75µm to prevent alkali silica reaction**

INTRODUCTION

Concrete is a blend of cement, sand, coarse aggregate and water. The key factor that adds value to concrete is that it can be designed to withstand harshest environments significant role. Today global warming and environmental devastation have become manifest harms in recent years, concern about environmental issues, and a changeover from the mass-waste, mass-consumption, and mass-production society of the past to a zero-emanation society is now viewed as significant. Normally glass does not harm the environment in any way because it does not give off pollutants, but it can harm humans as well as animals, if not dealt carefully and it is less friendly to environment because it is non-biodegradable. Thus, the development of new technologies has been required. The term glass contains several chemical diversities including soda-lime silicate glass, alkali-silicate glass and boro-silicate glass.

RECYCLING OF GLASS

Post-consumer glass containers have traditionally been disposed of either in domestic refuse, which ends up in landfill, collected in designated collection spots for reuse/recycling, or collected from kerbside and then transported to collection sites. The major aim of environmental authorities is to reduce, as far as possible, the disposal of post-consumer glass in landfill and diversion to economically viable glass product streams. Glass is a unique inert material that could be recycled many times without changing its chemical properties. In other words, bottles can be crushed into cullet, then melted and made into new bottles without significant changes to the glass properties.

GLASS POWDER

Glass is a transparent material produced by melting a mixture of materials such as silica, soda ash, and CaCO3 at high temperature followed by cooling during which solidification occurs without crystallization. Glass is widely used in our lives through manufactured products such as sheet glass, bottles, glassware, and vacuum tubing. The amount of waste glass is gradually increased over the recent years due to an ever-growing use of glass products. Most waste glasses have been dumped into landfill sites. The Land filling of waste glasses is undesirable because they are not biodegradable, which makes them environmentally less friendly. So we use the waste glass in concrete to become the construction economical as well as eco-friendly. The glass powder used in the present study is brought from Bharuch market. This material replaces the cement in mix proportion.

FIG: GLASS POWDER

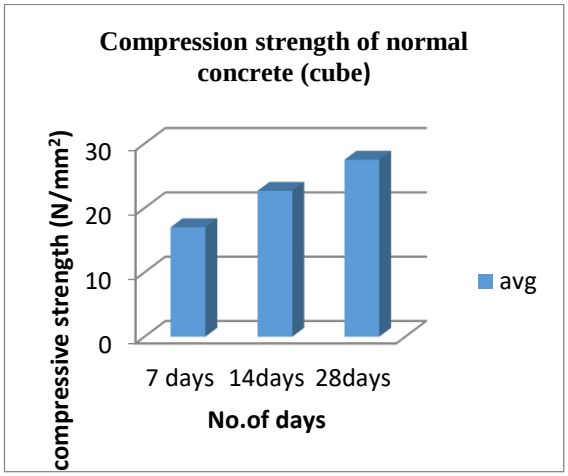
COMPRESSIVE STRENGTH TEST:

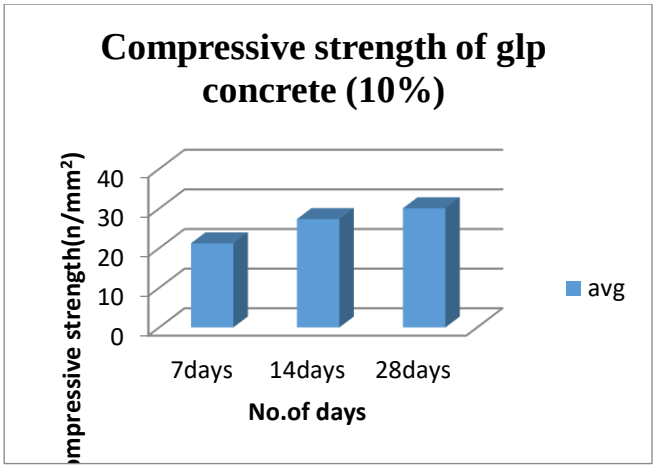
The compressive strength of concrete is one of the important and useful properties of concrete. In most structural application concrete is employed primarily to resist compressive stresses. In those cases, where strength in tension or in shear is of primary importance, the compressive strength is frequently used as a measure of those properties.

GLASS POWDER REPLACED CONCRETE
10% REPLACEMENT OF GLASS POWDER

CONCLUSION

- At the level of 10% replacement of cement by glass powder meets higher strength as compare to that of normal concrete and other percentage of replacement of cement on 28th days.
- By using the glass powder as cement replacement it reduces emission of co2 from concrete and also reduce the environmental pollution.
- Glass powder concrete increases the compressive strength effectively, when compared with conventional concrete
- On addition of GLP 7th day's rate of gain of strength is low but at 28th days it meets required design strength.
- .That rate of increase of strength is more for go10%, 20%,30%,40% and 50% glass powder added concrete with respect to normal concrete for 7 days results.





FUTURE SCOPE

The project work was emphasized on use of glass materials as partially replacement of cement. Further one can extend this work as follows.

- The glass materials can also used as partially replacement of coarse aggregates and fine aggregates in concrete.
- The glass powder and silica fume are the pozzolanic materials. Therefore compressive strength can be studied by using this materials same as partially replacement of cement in concrete. And also can be determined its optimum dosage range when concrete riches maximum strength.
- The tensile strength of concrete also can be studied by using glass materials in a concrete

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