



A Review on effect of Waste glass on mechanical properties of Concrete

¹Devendra Kr. Sharma, ²Kuldeep Mahiya, ³Narendra, ⁴Pooja Prajapat, ⁵Sachin Sharma

¹Assistant Professor, ^{2,3,4,5}Student

¹Department of Civil Engineering,

¹Sobhasaria Group of Institution, Sikar, India

Abstract :

The concrete is most significant material which used in construction industry. Significant world search latest solutions for ecological problems to use for waste material that pollute environment and harmful for environment. In this study, discussed about use of waste glass in concrete. Cement mostly used in concrete and cement industries emits up to 7% greenhouse gases to atmosphere of earth. The concrete consist cement as binder , course aggregates, fine aggregates and water. Concrete is very strong as compare to tensile strength. At present days many waste materials used as partial replacement of cement and some admixtures which improve the properties of concrete. In this study we discussed about use waste glass as partial replacement of cement. The waste glass used in concrete as replacement of course aggregates and fine aggregates.

IndexTerms - waste material, Glass powder, Concrete, admixtures

1.INTRODUCTION

The concrete is most significant material which used in construction industry. Significant world search latest solutions for ecological problems to use for waste material that pollute environment and harmful for environment. The concrete consist cement as binder , course aggregates, fine aggregates and water. Concrete is very strong as compare to tensile strength. At present days many waste materials used as partial replacement of cement and some admixtures which improve the properties of concrete. Use of waste glass in concrete make structure more durable , denser and reduce the water absorption. Glass may be added in crushed form and in powder form with or without addition of admixtures and plasticizers as addition material in the nominal concrete. According to latest studies use of waste glass as a powder form, crushed form and partial replacement in concrete.

Rivew of Litration:-

Vijaykumar et al (2013), presented that waste reuse is most issue in for healthy environment at present time. Concrete at present widely used in construction fields. Cement mostly used in concrete and cement industries emit up to 7% greenhouse gases to atmosphere of earth. The concrete consist cement as binder, course aggregates, fine aggregates and water. Concrete is very strong as compare to tensile strength. As result if glass powder increase in place of sand then workability of concrete increased and permeability decreased. Glass powder mostly replaced (10, 20, 30, 40)% and improve compressive strength up to 40%.

Vasudevan and Kanapathy Pillay et al. (2013) examining the impact of utilizing the waste glass powder in concrete by six specimen size 150mm x 150mm x 150mm cube of concrete. The properties of the specimens were determined by the workability test, density test, and compressive strength test at of 7, 14, and 28 days and determined that waste glass powder enhance the

compressive strength of concrete. The outcomes from the experiment showed that the solid with glass powder could expand the workability and compressive strength of the concrete composite.

Bhagyasri et al. (2016) presented that cement was partially replaced by 90 μm glass powder in concrete for studying the properties of concrete. Casting M20 grade of cubes with different % of glass powder used like 10%, 20%, 30%, and 40% and tests performed at 7 days, 14 days and 28 days. Optimum result found at 20% amount of glass powder which enhance compressive strength.

Jangid and Saoji et al. (2014) presented that glass powder added at different amount of doses in specimen form 0% to 40%. And reduce the amount of cement in concrete. As a result 5% of glass powder improve compressive strength and 20 % amount of waste glass powder is optimum dose for enhancing all mechanical [properties of concrete.

Malik et al. (2013) prepared various samples which used 0% to 40% amount of waste glass in specimen of M25 grade. Waste glass was used as form of fine aggregates and after 28 days curing and 30% of amount used found good result of properties of concrete as compared to conventional concrete.

Ramana and Samdani et al. (2013) studied the effect of replacing fine aggregates in sand with crushed glass in the range of 0%, 5%, 10%, 15%, 20%, 25% and 30%. Various mechanical properties such as compressive strength, split tensile strength and flexural strength were surveyed in this paper. The results obtained from laboratory tests were noted and compared with conventional concrete. It was observed from the results that replacing fine aggregates with crushed glass increased the mechanical properties by up to 15% and replacing fine aggregates with crushed glass decreased it by up to 30%.

Dabiri et al. (2018) conducted this study to find out the effect on compressive strength and weight of concrete by replacing concrete aggregates with waste glass particles. To accomplish the objective, 27 cubic samples were made; out of which 6 samples were made of normal concrete while the rest samples had glass particles mixed in different proportions. Micro-silica was added to the glass-containing cubes to suppress the alkali silica reaction (ASR). The test results demonstrated that replacing aggregates with more than 30% glass particles increased the compressive strength. The weight of concrete remained almost the same for most of the samples. It can be concluded from the results that the ideal ratio of replacing aggregates with glass particles is 50%.

Ganiron Jr. et al. (2014) conducted this experimental study to find the option of replacing coarse aggregates in concrete mix. In this study, crushed glass bottles were used in place of coarse aggregates and its effect on the physical and mechanical properties of the mix was noted. The experimental results showed that the optimum way of replacing coarse aggregates with recycled glass bottles is up to 10% of the weight of coarse aggregates and the mix design adding 5% weight to the concrete mix provides desirable results for compressive strengths. It was proved through the experiment that coarse aggregates can be effectively replaced with recycled glass bottles.

Turgut and Yahalizade (2009) conducted their experimental study by replacing the fine aggregate (FA) of the concrete mixture with different levels of fine glass (FG) and coarse glass (CG) and researching the physical and mechanical properties of the cubes. The results of FG and CG substitution were compared with each other. The values of various properties of the samples such as compressive strength, flexural strength, splitting tensile strength and abrasion resistance were observed and noted at 20% FG substitution. Their values were 69%, 90%, 47% and 15% higher compared to the normal concrete sample. It was also concluded from the results that the alkali-silica reaction (ASR) in concrete is suppressed by the weight of FG at 20% substitution level.

Kaviateja et al. (2016) conducted their study on investigating the replacement of fine particles by crushed glass. The control mix ratio of 1:1.5:3 was grouped by volume with a water binding ratio of 0.5. Samples were prepared with replacement rate from 0% to 40% at intervals of 10%. Samples of size 150 mm x 150 mm x 150 mm were cast and tested at 3 days, 7 days, 28 days, 56 days and 90 days to analyze the compressive properties of concrete. From the experimental results it was found that the compressive strength increases up to 20% replacement level and it decreases at 30%, 40% replacement level. The split tensile strength test also concluded that the split tensile strength decreases with increasing glass content.

Elaiyarasu et al. (2015) conducted a research work to investigate the effects on the strength of concrete when recycled glass bottles were used as an alternative coarse aggregate. The test results proved that using aggregates instead of glass gave better results in strength and was more economical than conventional concrete.

Conclusions:-

Conclusion of this study work observed that waste glass utilized in various forms like glass powder, fine aggregates, powder with aggregates, coarse aggregates in concrete. Waste glass used as partial replaced to aggregates, and fine aggregates in concrete and suitable for structural applications. Waste glass enhances the mechanical properties of concrete and 20% replacement improve maximum compressive strength of concrete. Hence waste glass in powder form and aggregate form suitable waste material for enhancing properties of concrete

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