

# A LITERATURE STUDY PAPER ON SUSTAINABLE CONCRETE USING RECYCLED GLASS MORTAR

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**Abstract-** Global warming is caused by emission of greenhouse gases such as CO<sub>2</sub>, which contributes to 65% of global warming. Cement industries as a global contributor to 7% of greenhouse gas emission. In this regard, there is a need for alternative binding materials from waste materials. In such cases, glass being an amorphous material with high silica content, can be used as pozzolanic material with particle size less than 75µm. In this research, cement is replaced with glass powder by 0%, 10% & 20% and the mechanical properties of concrete are studied such as compressive strength, flexural strength with glass powder immersion time in water as 0, 1 & 2 hours.

**Key Words:** Waste glass powder, compressive strength, flexural strength, concrete, durability.

## INTRODUCTION

Glass is an amorphous material with high silica content making it potentially pozzolanic when particle size is less than 75µm. Due to its expansion and cracking problems it cannot be used as aggregate in concrete, but due to its silica content ground glass is considered as pozzolanic material which can be used in place of cement in concrete.

## LITERATURE REVIEW

**Effective utilization of waste glass powder as the substitution of cement in making paste and mortar (Dhirendra Patel, R.K.Yadav) Volume 199, 28 February 2019**

In this research, studies were carried out to examine the mechanical properties of concrete using 63µm glass powder with substitution levels of 0-20% for O.P.C. Results stated that 20% of glass powder substitution for O.P.C. gives nominal strength.

**Influence of glass powder on the properties of concrete (Veena V. Bhat, N.Bhavanishankar Rao) Volume 16, October 2014**

In this research, investigation is carried out using waste glass powder as substitution for cement in concrete by 5%, 10%, 15% and 20%. Results stated that compressive strength of nominal concrete and glass powder concrete matched at 20% substitution level in 28 days.

**Performance of concrete by using glass powder (Er. Manoj Kumar Meena, Er. Jagriti Gupta, Dr. Bharat Nagar) Volume 5, Issue 9, September 2018**

In this research, studies were carried out using waste glass powder as substitution for M35 grade concrete by 0-25% for cement. Results stated that 28 days compressive strength of GP concrete matched with nominal concrete by 20% substitution level.

**Waste glass powder as cement replacement in concrete (Honhjian Du, Kiang Hwee Tan) Volume 12, 2014**

In this research, studies were carried out for mechanical properties of GP concrete by substitution levels of 0%, 15%, 30%, 45% and 60% for cement. Results showed that mechanical properties of GP concrete were not decreased at 28 days strength up to replacement of 30% with regard to nominal concrete.

**Effect of using glass powder in concrete (Shilpa Raju, Dr.P.R.Kumar) Volume 3, July 2014**

In this research, studies were carried out by using GP as replacement for cement in the range of 5%-40% by increments of 5%. The compressive strength and flexural strength of GP concrete and nominal concrete are compared at the age of 7, 28 & 90 days. Results stated that 20% GP concrete showed similar values.

**Waste glass powder as partial replacement of cement for sustainable concrete practice (G.M.Sadiqul Islam, M.H.Rahman, Nayem Kazi) June 2017**

In this research, studies were carried out on compressive strength of GP concrete by substitution levels of 0-25% for curing period of 1 year. Results stated that 20% GP concrete showed higher strength than nominal concrete.

**Studies on glass powder as partial replacement of cement in concrete production (Dr.G.Vijaya Kumar et al) IJETAE, Volume 3, Issue 2, February 2013**

In this research, studies were carried out by replacing cement with glass powder by 10%, 20%, 30% & 40% for 28 days & 60 days. Results stated that glass powder concrete compressive strength increased by 19.6%, 25.3% & 33.7% respectively and flexural strength increased by 83.07%,

99.07% & 100% for 20%, 30% & 40% of glass powder replacement when compared to conventional concrete.

#### **Waste glass powder as a partial replacement of cement for sustainable concrete practice (Abhishek Tiwari.et.al) IRJET, Volume 6, Issue 4, April 2019**

In this research, studies were carried out for M<sub>25</sub> grade concrete in which cement is replaced by glass powder by weight of 5%, 10%, 15%, 20% & 25%. Results stated that strength of 10% GP concrete increased by 15% for 28days when compared to conventional concrete.

#### **Waste glass powder as a partial replacement of PPC (Kрати Gahoi, Rajeev Kansal) 2018**

In this research, studies were carried out for M20 and M30 grade GP concrete with substitution levels of 5%, 10%, 15%, 20% & 25% for 3, 7 & 28days. Results stated at 10% replacement level both m20 & M30 grade GP concrete exhibited higher strength than nominal concrete.

#### **Experimental study on replacement of cement by glass powder (R.Vandhiyan.et.al) IJERT, Volume2, Issue 5, May 2013**

In this research, studies were carried out by replacing cement with glass powder in proportions of 5%, 10% & 15%. Results stated that compressive strength and flexural strength of 10%GP concrete increased by 25% and 37% when compared to conventional concrete.

#### **Glass Powder- A partial replacement for cement (Ashutosh Sharma.et.al) IJCEM, Volume 1, Issue 11, February 2015**

In this research, studies were carried out for M<sub>25</sub> grade concrete with cement replacement by 5%, 10% & 15% using glass powder to test compressive strength for 3days. Results stated that 10%GP concrete compressive strength increased by 52.6% in 3days when compared to conventional concrete.

#### **Comparative study of waste glass powder as pozzolanic material in concrete (Ankur Meena.et.al) NIT, Rourkela 2012**

In this research, studies were carried out by replacing cement with waste glass powder in percentages of 15% & 30%. Results stated that 30% GP concrete increased its 28days strength when compared to conventional concrete.

#### **Utilization of glass powder as a partial replacement of cement and its effect on concrete strength- A review (Ismail Ansari.et.al) IJAMCE, Volume 3, Issue 1, February 2016**

In this research, studies were carried out to find compressive strength of glass powder concrete. Results stated that glass powder with less than 75 $\mu$ m particle size increases

compressive strength to a good level and the optimum level of replacement percentage as 20-25% GP in cement. It also stated that a mechanical property of concrete reduces if glass powder is used as fine aggregate replacement in concrete.

#### **Analysis of glass powder as a partial replacement of cement in concrete (Hosanna.S.et.al) Special Issue 2019**

In this research, studies were carried out for compressive strength of M<sub>20</sub> grade concrete with cement replacement levels of 25%, 35% & 50% waste glass powder at 7days & 28days. Results stated 25% GP replacement level showed maximum compressive strength as 35.23N/mm<sup>2</sup> at 7days curing.

#### **Experimental study on use of waste glass powder as partial replacement to cement in concrete(S. Lalitha.et.al) IJESRT, October 2017**

In this research, studies were carried out to test the compressive strength, split tensile strength and flexural strength of concrete for 28days for cement replacement levels of 5%, 10% & 15%. Results stated that all the mechanical properties have increased up to a replacement level of 10% beyond that level all the properties have been decreased when compared to nominal concrete.

#### **CONCLUSIONS**

1. Replacement of glass powder to cement decreases the quantity of cement in concrete with helps in balancing environmental degradation.
2. Compressive strength and flexural strength of normal concrete and glass powder concrete showed similar results at 20% replacement level for a curing period of 28days.
3. Use of waste glass powder makes the concrete more economical than normal concrete.

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