ISSN 2395-1621

Experimental Study on Glass Bit Concrete by Partial Replacement of Fine Aggregate with Waste Industrial Glass

[#1]Prof.S.S.Kolapkar, [#2]Sanjay R.Singh, [#3]Nagesh M.Yellure, [#4]Akshay P.Unde, [#5]Dinesh B.Vani, [#6]Harshwardhan S. Rajput, [#7]Pruthviraj P.Lakal

[#1234567]Department of Civil Engineering
Padmabhooshan Vasantdada Patil Institute of Technology
Pune, India.

ABSTRACT

In India, million tons of glass waste is produced every day. The waste collected from industry, shop mainly consists of window glass, tubes, bear bottle, etc. which is released in the dumped at the available land spaces, thereby leading to severe environmental pollution The main objective of this study is to minimize the problem of solid waste management and utilization of solid waste in construction industry by Partial Replacement of Fine Aggregate with Waste Industrial Glass.

Key words : WASTE GLASS, CEMENT, SAND, AGGRIGATE, WATER

ARTICLE INFO

Article History

Received: 3rd June 2018

Received in revised form :

3rd June 2018

Accepted: 5th June 2018

Published online :

6th June 2018

I. INTRODUCTION

Concrete is a homogeneous mixture of cement, water, sand and aggregate forming a compression member to resist compressive stresses in structure. The use of concrete is increasing rapidly and various types in concrete are introduced in too less time so to use glass in concrete and develop glass bit concrete was the main purpose of project. The concept was to revolutionize technology and open up the new horizons in concrete application that was before uncountable.The project is based on development of concrete by means of glass waste in replace of aggregate to some extent. Glass is very popular construction material. As it has been used at many places in civil engineering works such as windows, doors and for architectural beauty but not used in concreting work. We got an idea to use glass waste in concrete and study its effect on various properties of concrete. So replacing of aggregate with some percent of glass waste and to see whether its result is permissible as a compression member as per Indian standard was the main purpose of project.

II. MATERIALS AND METHODS

Collection of Glass waste

Glass waste basically contains of window glass, tubes, bear bottle etc. Out of these “glass waste” is used in present study , although a small proportion of the post-consumer glass has been recycled and reused, a significant proportion, which is about 84% of the waste glass generated in, is sent to landfill. Glass is a 100% recyclable material with high performances and unique aesthetic properties, which make it suitable for wide-spread uses. Besides, the current recycling state and legislative forces pose great pressures on glass recycling and reusing. The use of glass as aggregates in concrete has great potential for future high quality concrete development.

A. CEMENT

Here the Ordinary Portland Cement (OPC) is used. The grade of the cement is 53.

B. SAND

The sand used was clean, sharp river sand that was free from clay, loam, dirt and organic or chemical matter of any description and was sand passing through 2.36mm zone of British standard test sieves. The sand had a specific gravity of 2.27 and its density is 3.72g/cc.

C. WASTE GLASS

The waste glass passing 2.36mm sieve and it is retained 450 microns sieve. The specific gravity of the waste glass is 3.03 and the density of the waste glass is 3.78 g/cc. Also the waste glass had the good sound resistance.

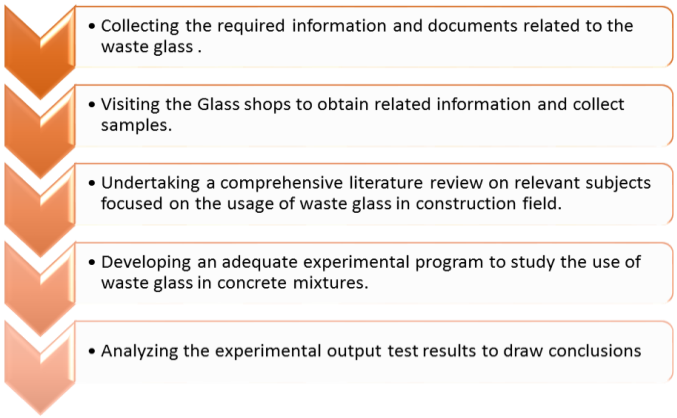
D. WATER

The water used was potable water, which was fresh, colourless, odourless and tasteless water that was free from organic matter of any type. The water is used for the construction work it's also preparing a brick, curing, concrete, cleaning material, etc., the pH value is 6-7 only used.

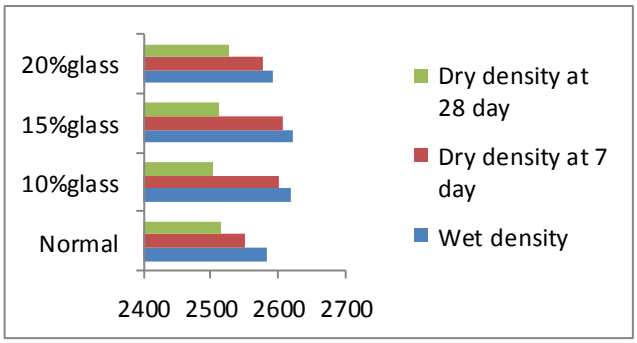
III. METHODOLOGY

GENERAL

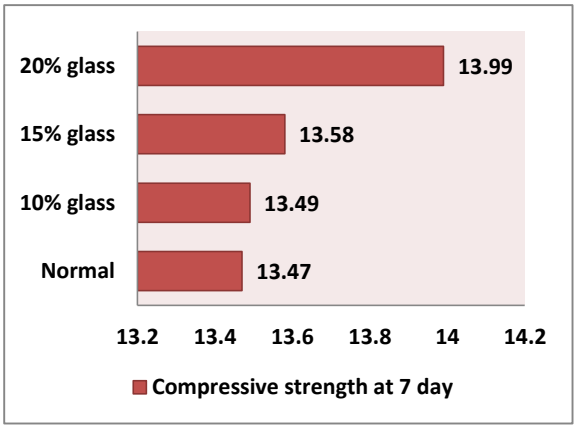
The various steps are involved in this project. So, the step by step procedure is given by the following flow chart.



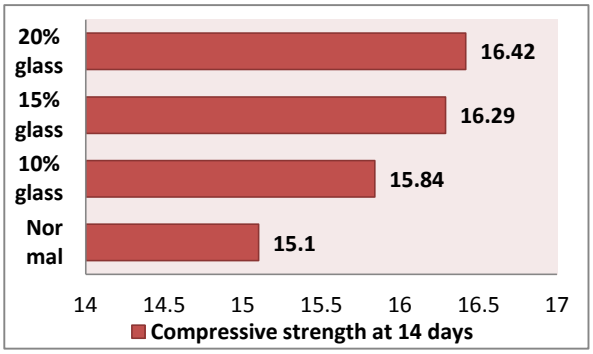
IV. RESULTS AND DISCUSSION



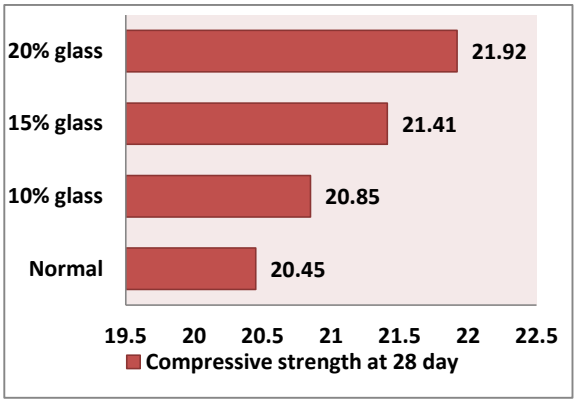
Comparison of density



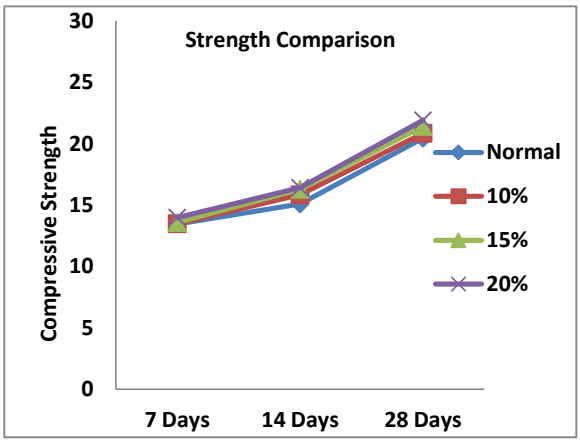
Determination of compressive strength at 7 day after curing



Determination of compressive strength at 14 day after curing



Determination of compressive strength at 28 day after curing



Comparison

V. CONCLUSION

The data presented in this project show that there is great potential for the utilization of waste glass in concrete as fine aggregate. It is considered that form would provide much greater opportunities for value adding and cost

recovery. Strength gain of glass bit concrete is satisfactory.

It has been concluded that 20% glass could be used as fine aggregate replacement in concrete without any long-term detrimental effects. The 28 days strength of 20% glass is 21.92 MPa for M-20 grade which is permissible as per Indian standard. And the strength of concrete gradually increases as compare to plain concrete.

The optimum percentage replacement of sand with fine glass aggregate was determined to be 20%.

Compressive strength was found to increase with the addition of waste glass to the mix up until the optimum level of replacement. This can be attributed to the angular nature of the glass particles facilitating increased bonding with the cement paste.

In proportions exceeding 20%, waste glass was found to negatively impact the development of compressive strength. It is suggested that in larger quantities, the angular nature of the glass aggregate reduces available cement paste and leads to the formation of microscopic voids within the concrete matrix

VI. ACKNOWLEDGMENT

We would like to express my sincere gratitude towards our guide Prof.S.S.Kolapkar and their encouragement and constant support for study and research. We would also like to thank CSK Rmc Plant Dhari, Pune for providing essential information and support. We would also like to thank Prof. Kushal S. Kanade for his support and knowledge to assist us with all the useful information and help us overcome our hurdles

REFERENCES

[1] Dr. Haider K. Ammash, Muhammed S. Muhammed, Ali H. Nahhab, “Waste glass used in concrete in replacement of aggregate” , Al-Qadisiya Journal For Engineering Sciences Vol. 2 Year 2009

[2] J. Acad. Indus. Res. Vol. 1(6) November 2012 “Use of glass wastes as fine aggregate in Concrete” S.P. Gautam, Vikas Srivastava and V.C. Agarwal

[3] Md. Sarfiuddin ,Mohhmadd Zamin Jumaat , M. A. Salam , M. S. Islam and R. Hashim, “using of waste glass as fine aggregate in concrete”, International Journal of the Physical Sciences Vol. 5(13), pp. 1952-1963, 18 October, 2010

[4] M. Iqbal Malik, Muzafar Bashir, Sajad Ahmad, Tabish Tariq,UmarChowdhary”Study of Concrete Involving Use of Waste Glass as Partial Replacement of Fine Aggregates” IOSR Journal of Engineering (IOSRJEN) e-ISSN: 2250-3021, p-ISSN: 2278-8719 Vol. 3, Issue 7 (July. 2013), ||V6 || PP 08-13

[5] Mayur B. Vanjare, Shriram H. Mahure “Experimental Investigation on Self Compacting Concrete Using Glass Powder” International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 3, May-Jun 2012, pp.1488-1492

[6] Bhupendra Singh Shekhawat1, Dr. Vanita Aggarwal2 M “Utilisation of Waste Glass Powder in Concrete – A Literature Review” International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) Vol. 3, Issue 7, July 2014 Copyright to IJIRSET www.ijirset.com 14822.

[7] Bhandari. P.S, Tajne. K.M “Use of waste glass in cement mortar” International Journal of Civil and Structural Engineering, Volume 3, No 4, 2013

[8] K. V Ramana1, Shaik Summary Samdani “Study on Influence of Crushed Waste Glass on Properties of Concrete” International Journal of Science and Research (IJSR)

