

A Review on Utilization of Waste Glass in Construction of Paver Blocks

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Abstract— The technology of using industrial waste and other materials in the manufacture of concrete has been introduced in India in construction, a decade ago, for specific requirements namely footpaths, parking areas, etc. but is now being adopted extensively in different uses where the conventional construction of pavements using cement concrete and bituminous mix technology is not feasible or desirable. Waste glassware is also used abundantly and in large demand. To overcome the demand for aggregate glass waste materials can be used as alternate construction material. In the year 2019, 21 billion tonnes of glass waste have been produced in India out of which only 45% is recycled, which shows that there is a need for proper procurement and management of waste glass. This review illustrates the utilization of waste glass in construction materials such as paver blocks. The main aim of the study is to gain knowledge about the mechanical properties and physical properties of the blocks and other products produced with waste glass, to reduce the waste glass in landfill by producing sustainable construction material, and to overcome the demand for aggregates and clay. This study also looked at the feasibility of waste glass inclusion as partial FA replacement systems. Properties of concrete incorporates waste glass as a partial substitution. The waste glass material used was obtained from waste collectors. The study indicated that waste glass can effectively be used as a fine aggregate replacement without significant change in strength.

Keywords: Glasswares, Sustainable Materials, Construction Materials and Paver Blocks

I. INTRODUCTION

Concrete paving blocks have been extensively used in many countries for quite some time as a technical problem- working technique for providing pavement in areas where conventional types of construction are less durable due to many functional and environmental constraints. This technology has been introduced in India in construction, a decade ago, for specific demands namely paths, and parking, but now being adopted broadly in different uses where the conventional construction of pavement using bituminous blend or cement concrete technology isn't doable or desirable. Since the conventional sources are limited to a period and uneconomical too, waste glasswares took a replacement option as some part of the main constituents of concrete. Million tons of controlled waste from family units, businesses, and modern are discarded in landfill sites in most developing and developed nations causing a raise in landfill costs and ecological issues. Reusing of waste helps save landfill space and spare garbage removal costs.

In 1994, the United States produced 9.2 million metric tonnes of glass waste in landfills [29]. As indicated by 2010 information, the global generation of municipal solid waste was 1.3 billion tons, out of which glass represented 5 % of the waste. In India, which lies in the South Asian region,

1 % of complete metropolitan waste produced contains glass wastes

Out of the total glass manufactured in India just 45% is reused which shows that there is a requirement for appropriate acquirement and management of waste glass. Waste glass is accessible in various size portions, from a few micrometres (powder) up to a couple of centimeters, which makes it consider to replace ordinary, mineral concrete aggregates, fillers in concrete such as sand, gravel, etc. Besides, glass aggregate has been likewise utilized for the creation of decorative and aesthetic concrete because the uncovered glass particles in cleaned surfaces are alluring for certain decorative and architectural applications. Notwithstanding the use of glass totals in traditional concrete, research has been performed on the improvement of architectural self-compacting concrete (SCC) utilizing fine and coarse glass aggregate

II. HISTORICAL REVIEW

SP Gautam, V Shrivastava, VC Agarwal - J. Acad. Indus. Res, 2012 - researchgate.net, studied that was Materials and methods In order to study the effect of waste glassware as partial cement replacement on the strength of ... Cement: In this work, Ordinary Portland cement (OPC) of Birla (43 grade) brand obtained from a single batches.

EE Ali, SH Al-Tersawy - Construction and Building Materials, 2012 – Elsevier, studied that was Recycled glass as a partial replacement for fine aggregate in self compacting concrete.

KH Tan, H Du - Cement and Concrete Composites, 2013 – Elsevier, in this study, mortar made with waste glass as fine aggregates was investigated for its suitability for construction use.

TC Ling, CS Poon, HW Wong - Resources, Conservation and Recycling, 2013 – Elsevier, studied that was to find practical ways to recycle waste glass for the production of different concrete products such as concrete blocks, self-compacting concrete and architectural mortar. Some of these specialty glass-concrete products have been successfully commercialized and are gaining wider acceptance.

O Sadiq, Odatoyebi - NSE Technical Transaction, 2015 - eprints.lmu.edu.ng, studied that was glass particles has been used as replacement for coarse aggregate & fine aggregate and even in this work glassware was used as a partial replacement for sand as a fine aggregate in reinforced concrete, mixes of 0%, 10%, 20 % & 30%, glass content were cast into short beams for flexural strength test.

G Sharma, A Sharma - AIP Conference Proceedings, 2018 - aip.scitation.org studied that the current growth and recycling situation of waste glass and point out the direction for the proper use of waste glass as replacement of construction material. These will not only help in the reuse of waste glass but also create eco-friendly environment.

Di Qin, Yidan Hu and Xuemei Li, *Waste Glass Utilization in Cement-Based Materials for Sustainable Construction- 2021*, 11, 710. - In this study, a scientometric review was performed on the utilization of waste glass (WG) in concrete for sustainable construction, along with a comprehensive discussion. Scientometric analysis was carried out to evaluate the relevant study fields, publication trend of articles, most contributing sources, keywords co-occurrence, most cited articles and authors, and active countries contributing to the field of WG utilization in concrete for sustainable construction. Moreover, the sustainable aspects of WG utilization in construction materials were reviewed, and the influence of WG on the performance of cement-based materials (CBMs) was assessed. Particularly, the effect of WG on workability, compressive strength, split-tensile strength, flexural strength, microstructure, and durability of the resulting composite was evaluated

III. CONCLUSION

From the kinds of the literatures surveyed it is analyzed that by using waste glass as a construction material the utilization of natural resources like gravel, sand, etc can be minimized, the landfill occupied by the waste glass can be reduced, and the environmental issues due to waste glass can be sorted out, by adding waste glass with proper mix proportion enhances the compressive strength, flexural strength, tensile strength and durability of the structure. The cost of the construction can be reduced by partially replacing the waste glass with fine and coarse aggregate and it also makes the construction sustainable.

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