Strength And Durability of Glowcrete Paver Block By The Partial Replacement of Aggregate With Demolition Waste

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Abstract- *Due to the rapid urbanization and development of country the demolition occurs and energy demand increases. Disposal of the demolition waste is a major problem but only a few amount of demolition waste is reused. The concrete does not absorb the solar energy. Glowcrete is a concrete which absorb solar energy and emitts light on night time.Here the fine aggregate and coarse aggregate are partially replaced by demolishing waste.After curing of 28 days the paver block is coated with a mixture of epoxy resin and strontium illuminate with a thickness greater than 5mm.The compressive strength, flexural strength and water absorption of the glowcrete paver block with M30 mix design is calculated which is compared with a conventional block made in M30 mix design. This glowcrete paver block manufactured from demolition waste will reduce the problem of disposal of demolition waste and also it is energy efficient.*

Keywords- compressive strength test, demolition waste, glowcrete, paver block, water absorption test

I. INTRODUCTION

Glowcrete paver blocks represent a pioneering advancement in sustainable construction practices by integrating demolition waste as a partial substitute for conventional aggregates. This innovative approach not only mitigates the environmental impact of waste disposal but also harnesses the inherent properties of demolition materials to enhance safety.

By repurposing demolition waste such as concrete rubble or crushed masnory as a key
Component of the paver block, glowcrete not only reduces the strain on natural resources but also diverts substantial amounts of waste from landfills. This aligns with the principles of the circular economy, promoting resource efficiency and minimizing waste generation.

Moreover, the incorporation of glow-in-the-dark elements within the paver blocks adds a distinct layer of functionality. This luminescent feature improves visibility in low-light conditions, enhancing safety for pedestrians and motorists alike in urban settings. Whether illuminating walkways, bike paths, or parking lots, glowcrete paver blocks offer a visually striking and practicalsolution for enhancing night time visibility.

II. LITERATURE REVIEW

Arvind singh gaur, et al., (2022) Most of the research has suggested a replacement of natural aggregate up to 50% by demolition wastes to reach the desired performance level of paver blocks. The studies have focused primarily on M20, M25, and M35 grades of concrete for making paver blocks.

G balasubramanian, et al.,(2020) From the test results, it can be inferred that the replacement of fine aggregate by demolition waste can be recommended. The concrete paver blocks show 91% strength attainment at 28 days and these blocks can be used in low load bearing areas. Further this method of manufacturing concrete paver block is cost efficient.As this method encourages the utilization demolition waste, it reduce the improper disposal of the same into landfills and it is more sustainable.

M mageswari, et al., (2021) By imparting photo luminescent properties in concrete, a self sustainable concrete is obtained. This investigation suggests that the percentage of phosphorescent material can be increased by 50% to improve the glow. The effect of photo luminescent properties on the strength of the concrete is studied descriptively. The implementation of photo luminescence induced concrete at a large scale would prove to be an ideal alternative for the illumination of roadsand to light up the rural households of the country. It would be fruitful to pursue further research on this concept in order to help the construction industry to provide effective solutions to this existing problem of lack of energy resources.

Shivkumar hallale, et al., (2018)In present investigation an attempt has been made to study the effect of demolished aggregate in paving block. Partially replaced demolished aggregate paving block has higher compressive strength as comparing to fully replace demolished paving block at both 14& 28 days.

III. MATERIALS AND METHODOLOGY

3.1 MATERIALS USED

3.1.1 Phosphorescent material

Blue colour strontium aluminate (SrAl2O4) and epoxy resin is mixed in a ratio of 2:1 and used as coating material.

Fig 3.1 : Strontium aluminate

3.1.2 Demolition waste

The conventional paver block available in the market are crushed mannually by using a hammer and used as the demolition waste.

Fig 3.2 : Demolition waste

3.2 METHODOLOGY

The project follows the steps given below :

- Collection of materials and determination of properties of the material.
- Casting of the specimen with different % of replacement of aggregate with demolition waste.
- Curing of the specimen for 7 & 28 days.
- Determination of compressive strength, flexural strength and water absorption test.
- Coating the specimen with phosphorascent material.

3.2.1 Compressive strength test

Compressive strength determines the maximum load carrying capacity of the specimen. Compressive strength of the specimens are calculated by using the compressive strength testing machine.

3.2.2 Flexural strength test

Flexural strength is the resistance to bending. Flexural strength of the specimen was calculated at both 7 & 28 days of curing. It is calculated by universal testing machine.

3.2.3 Water absoption test

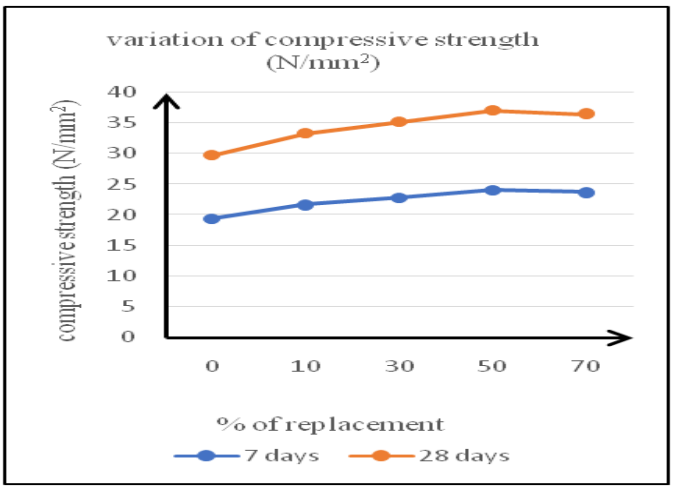
The water absorption test determines the durability of the paver block. The water absorption test was carried out on the paver block with different % of replacement of aggregate with demolition waste.

IV. RESULTS

4.1 Compressive strength test

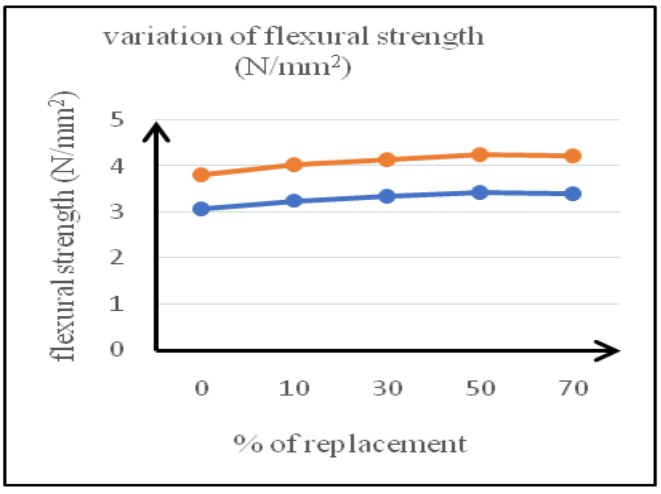
Table 1: Compressive strength of paver block

Specification	No. of days of curing	Compressive strength (N/mm^2)
P07	7	19.32
P028	28	29.72
P107	7	21.60
P1028	28	33.24
P307	7	22.80
P3028	28	35.09
P507	7	24.03
P5028	28	36.97
P707	7	23.67
P7028	28	36.43



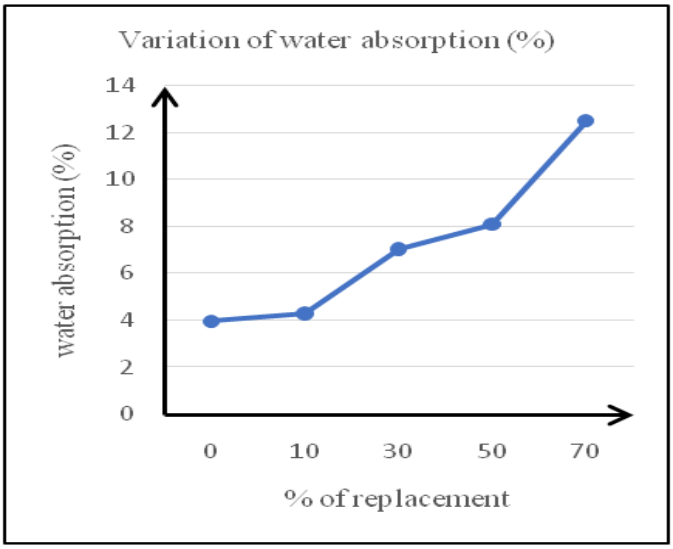
4.2 Flexural strength test

Specification	No of days of curing	Flexural strength (N/mm^2)
PO7	7	3.07
PO28	28	3.81
P107	7	3.25
P1028	28	4.03
P307	7	3.34
P3028	28	4.14
P507	7	3.43
P5028	28	4.25
P707	7	3.40
P7028	28	4.22



4.3 Water absorption test

Specification	Water absorption (%)
P07	3.97
P107	4.30
P307	7.03
P507	8.09
P707	12.47



V. CONCLUSION

- The compressive strength and flexural strength shows highest value in 50 % replacement of aggregate with demolition waste than other percentage of replacement.
- The water absorption of the paver block increases with increase of percentage of replacement.
- The water absorption test after coating the paver block with strontium aluminate and epoxy resin is found to be zero.
- The durabilty of paver block is increased after providing the coating.

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