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European Journal of Advances in Engineering and Technology, 2022, 9(4s):87-92
International Conference on Tech Trends in Science & Engineering (ICTTSE) 2022
Suryodaya College of Engineering & Technology, Suryodaya Polytechnic, Nagpur, Maharashtra, India

Research Article ISSN: 2394 - 658X

Experimental Overview on Paver Block using Fly Ash, Rice Husk Ash and Plastic

Satish D. Kene[1], Dr. Arun Patel[2]

[1] PhD Scholar RKDF University, Bhopal – Madhya Pradesh, India, SVPCET, Nagpur - Maharashtra, India, Department of Civil Engineering, satishkene2285@gmail.com
[2] Department of Civil Engineering, RKDF University, Bhopal – Madhya Pradesh, India, arunpatel123@gmail.com

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ABSTRACT
This paper is literature survey of the use of waste plastic, Fly ash and rice husk ash in concrete paver blocks is aimed at reducing cement content and leading to better economy and durability. The primary objective of this research is to understand the properties, economical, technological and environmentalbenefits of waste used in paver block.

Key words: Paver block, Fly ash, rice husk ash, plastic, Quality control and impact on environment.

INTRODUCTION

Concrete paver blocks are formed from cement, fine aggregates, coarse aggregates (10 mm and below), water, and other materials. Material qualities, water cement ratio, mixing technique, and curing process all have a role in the overall performance of concrete paver blocks. Pavers come in a variety of shapes, sizes, and colours to satisfy the imaginations of landscape architects and naturalists. They are arranged in various patterns. Natural resources are diminishing around the world, while garbage generated by industry, agriculture, and residential areas is expanding dramatically. In the construction of a sustainable building, non-traditional and new materials are used. Recycling waste products such as plastic, fly ash, and rice husk ash in order to compensate for a lack of natural resources and discover alternate methods of environmental conservation.

Waste plastic, fly ash, and rice husk ash are used in concrete paver blocks to reduce cement content and aggregate, resulting in improved frugality and durability. It will also aid in the protection of the environment by contributing to a solution for the safe disposal of waste plastic, fly ash, and rice husk ash. Because raw ingredients are available but in limited quantities, resources are required in the manufacture of cement paver blocks. On the other hand, during the entire production process to make good quality paver block raw materials with specified qualities, an imbalance of ecology and habitat arises. Other materials with the qualities required for good quality paver blocks can be used to replace up to 30% of the raw ingredients. Rice husk ash has a silica content of 98 percent and can be utilised to produce hardness, strength, and durability. Rice husk ash is a waste product from industry that is readily available. Fly ash is a waste product that remains after coal is burned in a thermal power station and can be utilised as a paver block raw material. Ca, Si, and other elements are always present in fly ash. During paver block manufacturing, fly ash acts as a workability agent. Plastic is a third essential additional raw material, and as we all know, plastic is a major environmental issue. It can be extracted from the waste stream and used to make paver blocks or for road construction. Plastic reinforces the structure, increasing

its tensile strength and load bearing capacity. All three extra components contribute to the paver block's good and necessary qualities.

MATERIALS AND METHODS

The work presented in this paper reports an investigation on the behaviour of Paver block produced from blending cement with FA, RHA and plastic. The physical and chemical properties of RHA, FA, OPC and plastic were first investigated. The effect of RHA on concrete properties was studied by means of the fresh properties of concrete and the mechanical properties i.e. compressive strength was studied as the time dependent property.

- Cement
- Rice Husk Ash
- Fly Ash
- Plastic
- Aggregate
- Chemical Admixture

EXPERIMENTAL PROGRAMME

Experimental programme covers of test on cement, RHA, FA, Test on concrete, Plastic and paver block with partial replacement of cement with RHA and FA and 10% of replacement aggregate with plastic.

Rice Husk Ash

1) Normal Consistency = 17%
2) Initial and Final Setting time = 195min. and 265min.
3) Compressive Strength = 11 N/mm2
4) Specific Gravity = 2.09

Ordinary Portland Cement

OPC 43 grade cement is used for this whole experimental study. The physical test results on OPC are as follows.

1) Normal consistency = 22%
2) Initial Setting time = 30 min.
3) Final Setting Time = 10 hrs.
4) Specific Gravity = 3.15

Test on Concrete

An M25 mix is designed as per guidelines in IS 10262, 1982 based on the preliminary studies conducted in the constituent materials. Tests on fresh concrete are obtained as follows.

1) Slump Test=55mm
2) Vee-Bee = 13sec.
3) Compaction factor =0.95
4) Flow Test =78 %.

Testing methods

Testing is done as per following IS code. The testing done for compressive strength of cubes as per IS: 516 – 1959.

TEST RESULT

Experimental investigation is carried out on the paver block test specimens to ascertain the strength related properties namely compressive strength. This paper presented the test results of the experimental investigation carried out on the test specimens to study the optimum percentage of replacement of cement with FA & RHA and aggregate with waste plastic.

Testing of Compressive strength

Testing of paver block samplings are tested for 7, 14, 28 and 54 days compressive strength by using compressive testing machine. After conducting compressive strength testing the test results are tabulated.

Table-1 Table for compressive strength of paver block.

MIX				Strength of Paver Block in N/mm^2			
Sr. No.	**Flyash by wt. of % cement**	**Rice huskash by wt. Of % cement**	**Plastic by wt. of % aggregate**	**7 Days**	**14 Days**	**28 Days**	**54 Days**
1	**Control Mix**			18.7	26.7	33.2	42.3
2	20	0	10	14.2	27.6	34	36.5
3	18	2		14.5	25	31	34
4	16	4		15.2	23.2	31.1	34
5	14	6		15.5	23.2	28	33.2
6	12	8		15	22.5	26.2	31.2
7	10	10		14	19	26	30
8	8	12		14	17.8	24.8	28.3
9	6	14		13.3	18.6	25	28
10	4	16		13.1	18.2	25.6	27.3
11	2	18		12.9	17.7	24.5	26.9
12	0	20		12.7	17.1	24	26.5

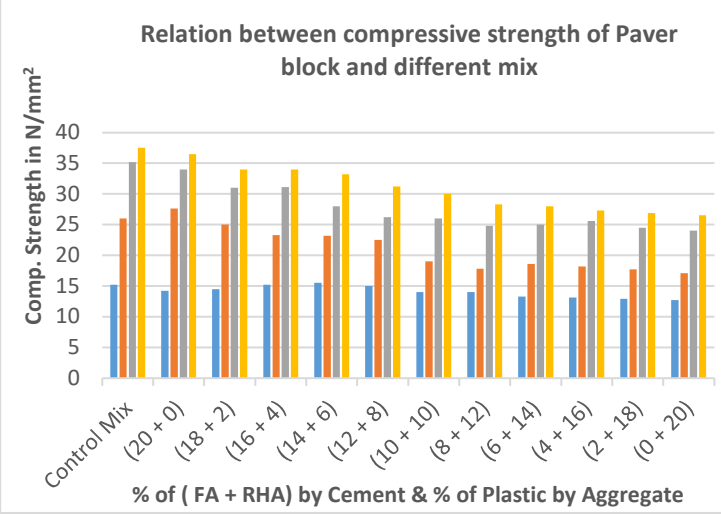

Fig.1 Relation between compressive strength of paver block in days and different mix.

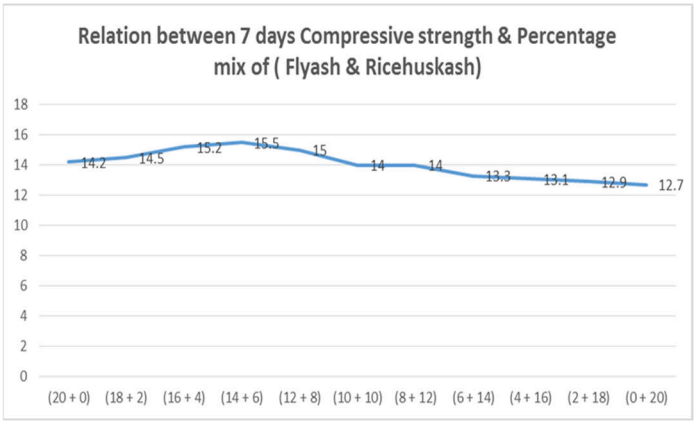

Fig.2 Relation between compressive strength of paver block in 7 days and different mix.

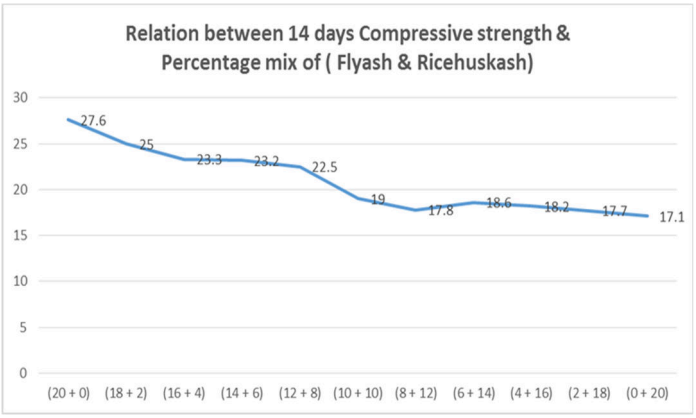

Fig.3 Relation between compressive strength of paver block in 14 days and different mix.

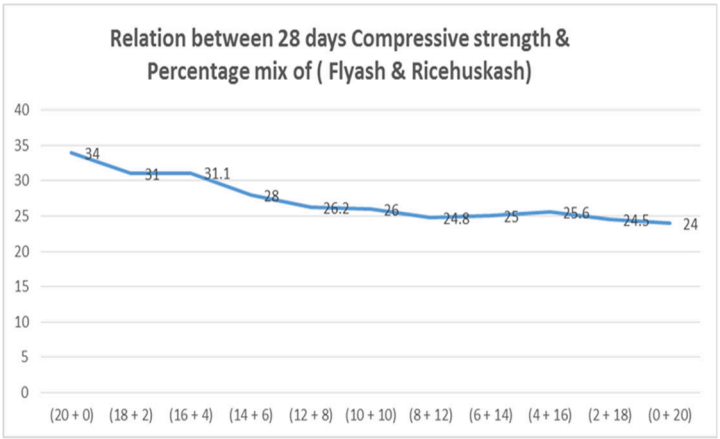

Fig.4 Relation between compressive strength of paver block in 28 days and different mix.

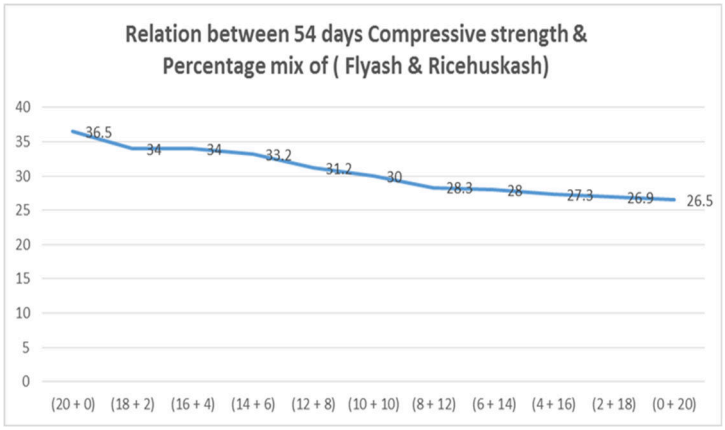

Fig.5 Relation between compressive strength of paver block in 54 days and different mix.

CONCLUSION

Based on the results presented above, the following conclusions can be drawn:

1) Compressive strength of paver block increases with the increase in the percentage of Fly ash and Rice Husk Ash up to replacement (14 %FA and 6 % RHA) of Cement and 10 % plastic of aggregate in Concrete for different mix proportions.
2) Paver block concrete requires approximate increase in water cement ratio due to increase in percentage of RHA. Because RHA is highly porous material.
3) The workability of RHA concrete of paver block has been found to decrease with increase in RHA replacement.
4) The water absorption of paver block increases after the addition of percentage increase of rice husk ash as compare to control mix.
5) Rice husk ash contains more silica, and hence we prefer rice husk ash use in concrete paver block than silica fume to increase the strength.
6) Through Rice husk ash is harmful for human being, but the cost of rice husk ash is zero and thus we prefer RHA use in concrete as compared to silica fumes.
7) The workability of RHA concrete has been found to decrease but FA increases the workability of concrete so RHA and FA mix together in concrete paver block to improve the workability of concrete.
8) In paver block Rice Husk Ash can be used with admixtures, plasticizers, and super plasticizers, for increasing the strength with partial replacement of cement.
9) The cost of construction will be reduced and also helps to avoid the general disposal technique of waste plastic.
10) Strongly conclude the use of fly ash, rice husk ash and plastic in a paver block is the best option for the disposal of fly ash, rice husk ash and plastic and ultimately reduces the pollution of environment.

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