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Evaluation of Strength of Plastic Paver Block

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Abstract: ***Use of concrete paver block is now a day becoming popular, they are used for paving of approaches, paths and parking area and also the pre-engineering building and pavements. In this project, our aim is to study the possibility of using plastic waste as a binding material instead of cement in the manufacturing of paver blocks. At present nearly 56 lakhs tones of plastic waste is produced in India per year. Disposal of plastic waste in an environment is considered to be a big problem due to its very low biodegradability and presence in large quantities. The paver block which is made up by adding plastic help to reduce plastic bag waste and also improve the tensile properties of the paver block. Using this type of the plastic will reduce the cost of the paver blocks.***

Paver block paving is aesthetically attractive, functional, and cost effective and requires little maintenance if correctly manufactured and laid. Natural resources are depleting worldwide at the same time the generated wastes from the industry and residential area are increasing substantially.

Keywords: Paver Block, Plastic Waste , Natural River Sand

I. INTRODUCTION

Paver block paving is aesthetically attractive, functional, and cost effective and requires little maintenance if correctly manufactured and laid. Natural resources are depleting worldwide at the same time the generated wastes from the industry and residential area are increasing substantially. Plastic waste used in this work was brought from the surrounding areas. Currently about 56 lakh tonnes of plastic waste dumped in India in a year. The dumped waste pollutes the surrounding environment. As the result it affects both human beings and animals in direct and indirect ways. Hence it is necessary to dispose the plastic waste properly as per the regulations provided by our government. The use of plastic waste instead of cement provides potential environmental as well as economic benefits.

1) *Properties of Plastic Wastes :* Corrosion resistant, Good Insulation for cold, heat and sound saving energy, It is economical and has a longer life, Maintenance free (such as painting is minimized), Hygienic and clean, Ease of processing / installation, Light weight.

II. METHODOLOGY

A. The plastic wastes are heated in a metal bucket at a temp of above 150˚.
B. As a result, Plastic waste gets melt on heating.
C. The materials (Sand) are added to it in right proportion at molten state of plastic and well mixed.
D. The metal mould is cleaned by using waste cloth.
E. Now the mixture is transferred to the mould.
F. Compact it well in hot condition to reduce internal pores present in it.
G. Then the blocks are allowed to dry for 24 hours so that they harden.
H. After drying the paver block is removed from the moulds and ready for the use.



Fig. 1 Manufacturing Process

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III. MIX RATIO

1) Block Type 1 - Six blocks were casted using mix ratio provided below.

Plastic Bags = 1 kg, Sand = 3 kg

2) Block Type 2 - Six blocks were casted using mix ratio provided below.

Plastic Bags = 1 kg, Sand = 4 kg

IV. RESULT & DISCUSSION

1) Abrasion Value Test: The principle of Los Angeles abrasion test is to find the percentage wear due to relative rubbing action between the paver block sample and steel balls. This value is called Los Angeles abrasion value.

TABLE I Abrasion Value Test

Sr. No.	Weight of Sample (W1) (gms)	Weight of material retained on 1.7 mm sieve (W2) (gms)	Loss in weight due to wear (W1 - W2) (gms)	Abrasion value [(W1 - W2) / W1] * 100 %	Average abrasion value (%)
R_1 Ratio Block (1 : 3)					
1	5000	4310	690	13.8	13.66
2	5000	4330	670	13.4	
3	5000	4310	690	13.8	
R_2 Ratio Block (1 : 4)					
1	5000	4410	590	11.8	12.13
2	5000	4380	620	12.4	
3	5000	4390	610	12.2	

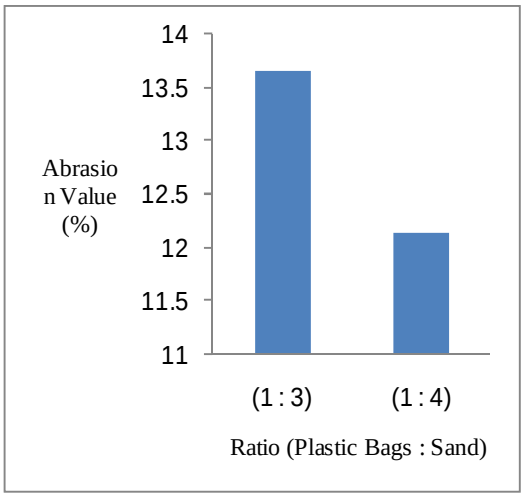


Fig. 2 Abrasion Value (%) V/S Ratio (Plastic Bags : Sand)

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2) *Compressive Strength Test:* This is done to know the compressive strength of the paver blocks. Generally, three paver block specimens of each mix proportion are taken to laboratory for testing and tested one by one. In this test, a paver block specimen is put on compression testing machine and applied pressure till it breaks. The ultimate pressure at which is crushed is taken into account. All three paver block specimens average result is taken as paver block's compressive strength.

TABLE II Compression Strength of Plastic Paver Block

Ratio (Plastic Bags : Sand)	Compressive strength (MPa)	Average of Compressive strength (MPa)
(1 : 3)	13.87	14.13
	14.32	
	14.19	
(1 : 4)	17.09	17.02
	16.93	
	17.05	

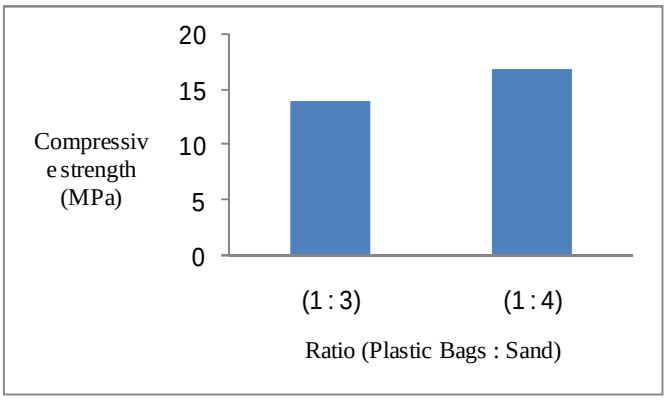


Fig. 3 Compressive Strength (Mpa) V/S Ratio (Plastic Bags : Sand)

3) *Rebound Hammer Test:* When the plunger of rebound hammer is pressed against the surface of the paver block, the spring controlled mass rebounds and the extent of such rebound depends upon the surface hardness of paver block. The surface hardness and therefore the rebound is taken to be related to the compressive strength of the paver block. The rebound is read off along a graduated scale and is designated as the rebound number or rebound index.

TABLE III (Rebound Hammer Test)

Ratio (Plastic Bags : Sand)	Compressive strength (MPa)	Rebound Number (N_R)		Average of Rebound Number (N_R)	
		Horizontal Hammer Position	Vertical Hammer Position	Horizontal Hammer Position	Vertical Hammer Position
(1 : 3)	13.87	22.30	18.56	22.58	18.92
	14.32	22.84	19.20		
	14.19	22.60	19.00		
(1 : 4)	17.09	26.90	22.40	26.68	22.19
	16.93	26.34	21.93		
	17.05	26.80	22.23		

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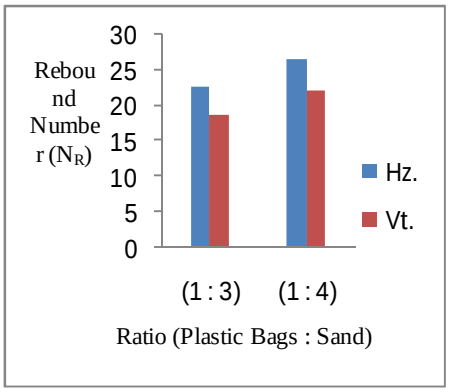


Fig. 4 Rebound Number (N_r) V/S Ratio (Plastic Bags : Sand)

V. COMPARISION

TABLE IV (Comparison between Concrete Paver Block and Plastic Paver Block)

	Abrasion Value (%)	Compressive strength (MPa)	Rebound Number (N_R)		Cost Per Block (Rs.)
			Horizontal Hammer Position	Vertical Hammer Position	
Plastic Paver Block	12.13	17.02	26.68	22.19	12 /-
Concrete Paver Block (Reference 1, 3)	14.70	18.89	26.10	21.84	28 /-
Difference	2.57	1.87	0.58	0.35	16 /-

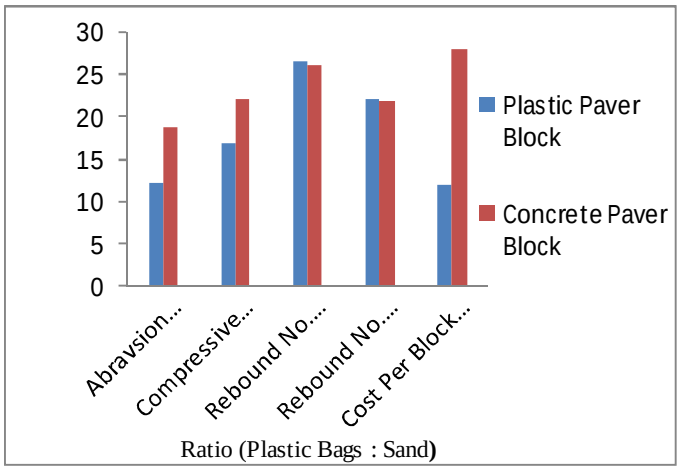


Fig. 5 Plastic Paver Block V/S Concrete Paver Block

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VI. CONCLUSION

From the above discussion, we might be conclude that:

A. Abrasion value of plastic paver block obtained is more than concrete paver block.
B. Though compressive strength obtained is less than concrete paver block it can be used in Garden, Pedestrian path, Cycle way, etc.
C. By using plastic waste in paver block instead of cement, higher hardness of paver block is obtained.
D. By using plastic waste in paver block, life of paver block might be increased.
E. The addition of plastic waste might increases the resistance against the wear & Tear.
F. The plastic paver block is so much economical than concrete paver block.
G. It can be used in Non-traffic and light traffic roads.

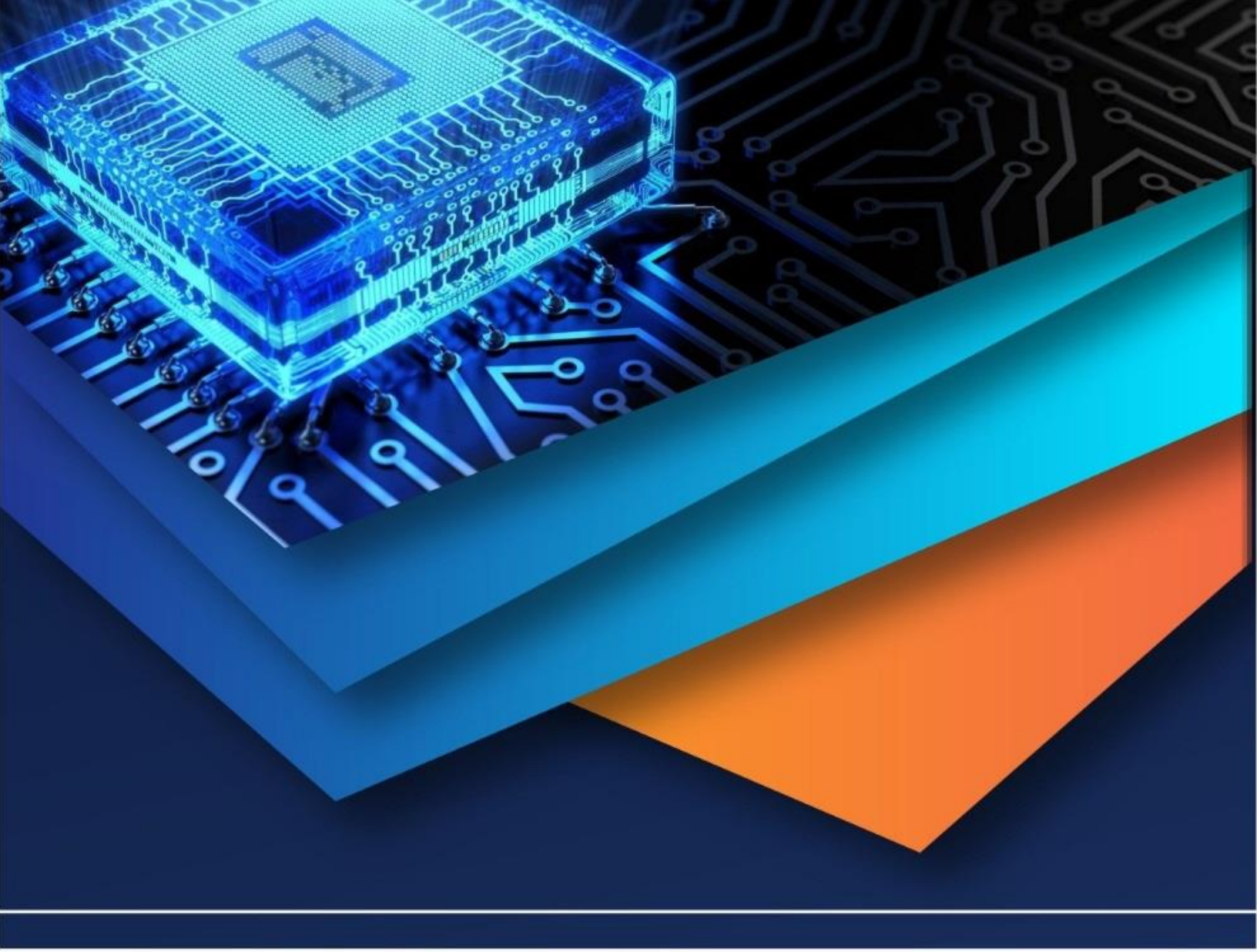
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