

An Experimental Investigation of Waste Plastic and Crushed Sand in Paver Block

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Abstract— Concrete paving blocks are ideal materials on the footpaths and roads for easy laying, better look and finish. Paver block has low cost maintenance and easily replace with a newer one at the time of breakage. So an attempt is made to study regard the properties of the paver block which is manufactured using waste plastic and crushed sand. Waste plastic used to replace cement in the production of pavement block. conventional M20 grade concrete paver block and paver block made of waste plastic and crushed sand of proportion waste plastic to crushed sand: 100:00, 90:10, 80:20,70:30 and 60:40 and tested for weight, water absorption, rebound hammer and compressive strength test. Paver block of proportion 100% plastic and 0% sand gives maximum compressive strength of 23 N/mm² which is more than conventional M20 grade concrete paver block.

Key words: Low Density Polyethylene Plastic (LDPE), Crushed Sand, Compressive Strength Test

I. INTRODUCTION

Waste plastic which is increasing day by day and pollutes the environment and become serious problem to the environment which is mainly low density polyethylene plastic (LDPE) type of plastic waste which is difficult to recycle. Hence, this plastic waste can be effectively used for making Pavement block sand it also used for decorative purposes. In this paper Low Density Polyethylene (LDPE) plastic bags are cleaned and added with crushed sand at various proportions to prepare paver block. Crushed which is easily available than natural sand. Hence, waste plastic and crushed sand can be effectively used for making paver block. It controls pollution and reduce cost. This is one of the best ways to reduce plastic waste, which is non-degradable pollutant. PVC Color used to attain desired shades. Conventional M20 grade concrete paver block and paver block of waste plastic and crushed sand tested for nondestructive test such as water absorption, rebound hammer and destructive test such as compressive strength test to check its suitability to use it at different location for different purposes.

II. OBJECTIVES OF PROPOSED WORK:

- 1) To find weight, water absorption, rebound hammer and compressive strength of conventional M20 grade concrete paver block and paver block made from waste plastic and crushed sand in following proportions:

Waste Plastic 100%: Crushed Sand – 0%

Waste Plastic 90%: Crushed Sand - 10%

Waste Plastic 80%: Crushed Sand – 20%

Waste Plastic 70%: Crushed Sand – 30%

Waste Plastic 60%: Crushed Sand – 40%

- 1) To compare results and Cost of conventional M20 grade concrete paver block and paver block made of waste plastic and crushed sand.

- 2) 3. To check its suitability for use it at different locations.

III. METHODOLOGY ADOPTED FOR DISSERTATION

- 1) Mix design of conventional M20 grade concrete paver block. Estimating quantity of waste plastic and crushed sand required for preparing one paver block.
- 2) 2. As per table no.3.1 Casting of conventional M20 grade concrete paver block and paver block made of waste plastic and crushed sand in Block specimen of hexagonal shape of Area 31436.7mm² (side: 110 mm, Height: 60mm)
- 3) 4. Testing of different Block specimen for weight, Water Absorption, Rebound Hammer and Compressive Strength Test.
- 4) 5. Results and Comparative study of conventional M20 grade concrete paver block to the paver block made of waste plastic and crushed sand.

Sr. No.	Proportion	No. of Samples		
		Weight and Water Absorption Test	Rebound Hammer Test and Compressive Test	M20 grade
1	100:00	3	3	Test sample require For 7 and 28 days: 3 for each test
2	90:10	3	3	
3	80:20	3	3	
4	70:30	3	3	
5	60:40	3	3	
Total No. 30				Total No.6

Table 3.1: Proposed works

IV. PROCEDURE

A. Melting:

For melting purpose Densifier machine used and it operates on electricity.



Fig. 4.1. : Densifier Machine

B. Mixing:

With the help of trowel melted plastic paste and crushed sand mixed at different proportion.

C. Filling of Mould

On the inner surface of the mould oil is applied and then hot mixture obtained from mixing filled in mould and compress under Hydraulic pressing machine.

D. Water

Clean potable water is used for cooling the mould for 2 to 3 hours.

E. Remove the Mould

Remove the specimens from mould by repeatedly shaking the mould and left for air.

F. Color

For coloring paver block PVC color used.

V. RESULTS

A. WEIGHT TEST:

Table No. 5.1 Comparison of Weight between different types of paver block:

Sr. No.	Type of Paver block	Proportion	Weight (Kg)
1	Conventional M20 grade Concrete Paver block	M20	4.97
2	Waste Plastic: Crushed sand	100:00	1.26
		90:10	1.88
		80:20	2.19
		70:30	2.99
		60:40	3.86

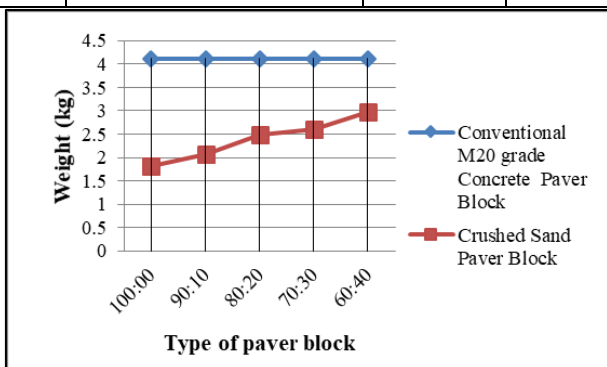


Fig. 5.1: Comparison of Weight between different types of paver block:

From fig. No.5.1. It is observed that the weight of conventional M20 grade concrete paver block is more than paver block made of waste plastic and crushed sand and it increases with increase in Crushed sand.

B. Water Absorption Test:

Sr. No.	Type of Paver block	Proportion	Water Absorption (%)
1	Conventional M20 grade Concrete Paver block	M20	4.97
2	Waste Plastic: Crushed sand	100:00	1.26
		90:10	1.88
		80:20	2.19
		70:30	2.99
		60:40	3.86

Table 5.2: Comparison of Water Absorption between different types of paver block:

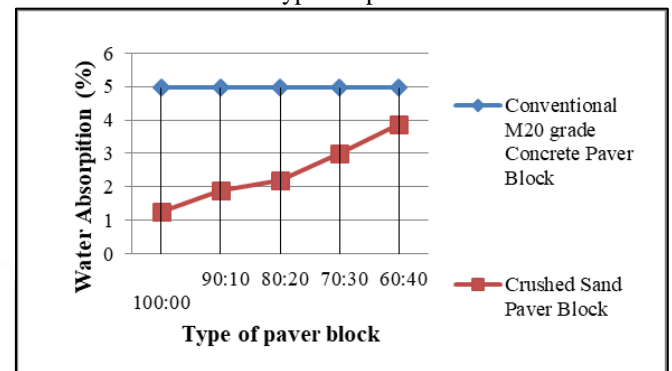


Fig. 5.2: Comparison of Water Absorption between different types of paver block:

From fig. No. 5.2 Water absorption of conventional M20 grade concrete paver block is more than the paver block made of waste plastic and crushed sand and it increases with increase in Crushed sand. As per IS-15658:2006 water absorption of paver block is 7%.

C. Rebound Hammer Test:

1) Comparison of Rebound Hammer Test between different types of paver block:

Sr. No.	Type of Paver block	Proportion	Average rebound number	Compressive Strength (N/mm ²)
1	Conventional M20 grade Concrete Paver block	M20	24.5	21
2	Waste Plastic: Crushed sand	100:00	25.5	23
		90:10	23.75	21
		80:20	22.5	18
		70:30	21.25	16
		60:40	20.75	14

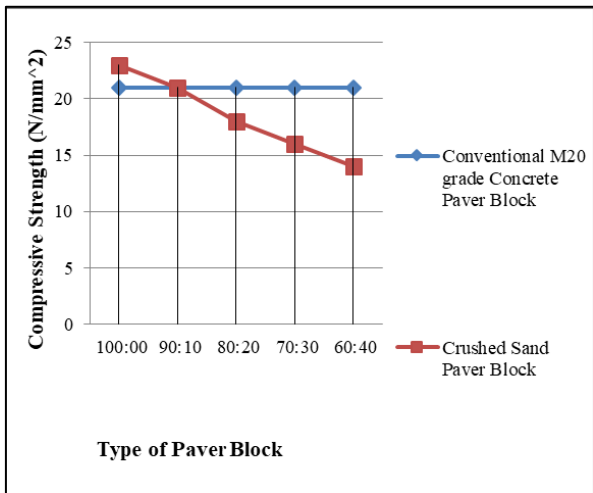


Fig. 5.3: Comparison of Rebound Hammer Test between different types of paver block:

From Fig. No.5.3. It is observed that Compressive strength for 100:0 and 90:10 proportions is more and further get reducing by increasing Crushed sand.

D. Compression strength:

Sr. No.	Type of Paver block	Proportion	Load (Kg)	Cross sectional Area (mm ²)	Compressive Strength (N/mm ²)
1	Conventional M20 grade Concrete Paver block	M20	492	22500	21.86
2	Waste Plastic: Crushed sand	100:00	710.66	31436.7	22.60
		90:10	642.66		20.44
		80:20	567.33		18.04
		70:30	528		16.79
		60:40	496.33		15.78

Table 5.4: Comparison of Compressive Strength between different types of paver block

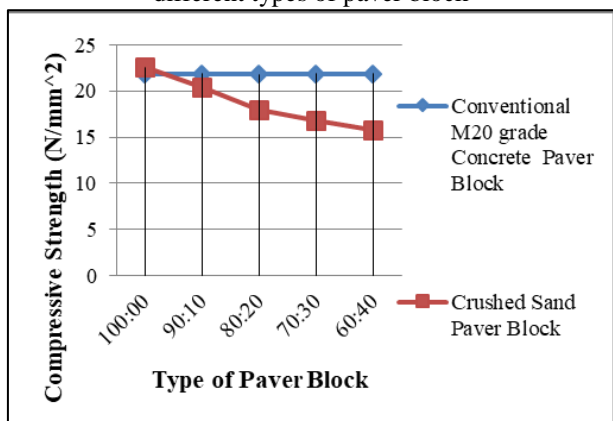


Fig. 5.4: Comparison of Compressive Strength between different types of paver block

From Fig. No. 5.4 It is observed that the compressive strength for 100:0 and 90:10 proportions is more and further get reducing by increasing Crushed sand.

VI. COST COMPARISON

Sr. No.	Conventional M20 grade concrete paver block (per Piece in Rs.)	Paver Block made of Waste plastic and Crushed Sand (Per Piece in Rs.)
1)	27	16

VII. CONCLUSION

- 1) Paver block made of Waste Plastic and Crushed Sand gives good result up to 20% replacement of crushed sand
- 2) The weight of conventional M20 grade concrete paver block is nearly twice than paver block made of waste plastic and crushed sand.
- 3) Water absorption of conventional M20 grade concrete paver block is nearly thrice than paver block made of waste plastic and crushed sand. As per IS-15658:2006 water absorption of paver block is 7%.
- 4) Compressive strength by rebound hammer test of paver block made of Waste Plastic and Crushed Sand for proportion 100:00 and 90:10 is 20 to 23N/mm² and further get reducing by addition of crushed sand.
- 5) Compressive strength of paver block made of Waste Plastic and Crushed Sand for proportion 100:00 and 90:10 is 21 to 23N/mm²and further get reducing by addition of crushed sand.
- 6) Cost of Paver block made of Waste Plastic and Crushed Sand is less than the conventional M20 grade concrete paver block. Hence, plastic paver block is economical than conventional concrete paver block and it is productive way of disposal of plastic waste.
- 7) Though the compressive strength is low, it can be used in gardens, pedestrian path.

VIII. FUTURE SCOPE:

- 1) To find different admixtures and materials to enhance the strength of waste plastic paver block.
- 2) To find suitable equipment for melting plastic

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