

“Plastic Waste Utilization for Manufacturing of Paver Block”

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ABSTRACT

Plastic Pavers are created by recycling waste plastics. Plastic garbage, which is growing at an alarming rate, has become an eyesore and, as a result, pollutes the environment, particularly in urban areas. A considerable amount of plastic is carried into the separating regions and then wasted or burned, polluting the environment. As a result, these waste plastics will be put to good use. The usage of plastic in everyday life is expanding. Every year, India produces 26000 tonnes of plastic, which is extremely detrimental to the environment. Because the breakdown of plastic is quite gradual, we decided to employ it in our project to make paver blocks. We use plastic waste to replace cement in this procedure. The project is really beneficial in reducing plastic trash. In this project, we use a variety of materials in suitable proportions, such as sea sand and quarry dust.

1. INTRODUCTION

Plastic is manufactured via poly condensation from natural elements such as cellulose, coal, natural gas, and crude oil. Plastic is a flexible organic substance made up of synthetic and semi-synthetic organic compounds that can be easily moulded into solid objects. Plastic is employed in a wide range of items, including paper crafts and space crafts. Because plastic is sturdy and long-lasting, it provides superior strength. Then there's the lighter weight, weather resilience, and chemical resistance. Plastic may be easily moulded into any shape. Long chains of atoms are linked together in plastic polymers. Plastic is usually an organic polymer with a high molecular mass, although it can also contain other materials. Plastic can be used as a good binding material due to the above features.

1.1 PAVER BLOCK

Block paving, often known as brick paving, is a popular decorative method of laying down a pavement or hard surface. Individual bricks may be pulled up and replaced afterwards, which is a major advantage of brick over other materials. Once the paving bricks have been changed, this allows for corrective work to be done beneath the surface of the paving without leaving a permanent mark. Driveways, pavement, patios, town centres, precincts, and, more often, road surfings are examples of common uses.

1.2 EXPERIMENTAL PROPERTIES

1.1. PLASTIC WASTE

The plastic used in this procedure is gathered from the local region in the form of plastic bottles. Plastic's basic features are listed here.

Table - 1: Properties of plastic bottles

Sr. no.	Particulars	Value
1.	Melting point	115 C
2.	Thermal coefficient of expansion	Ca. 0.6×10^{-4} to 2.3×10^{-4}
3.	Density	0.920 - 0.950
4	Tensile strength	0.20 - 0.40 (N/mm ²)

2. QUARRY DUST

Crushed sand with a particle size of less than 4.75 mm is extracted from rock using state-of-the-art crushing equipment. The following are the characteristics of quarry dust:

Table- 2: Properties of Quarry Dust

Sr. no.	Description	Value
1	Specific gravity	2.620 & 2.70
2	Grading zone	Zone II
3	Fineness modulus	2.952

3. SEA SAND

We used the sea sand because it represents greater strength. The paver block is prepared and tested, with the findings compared to those of a concrete paver block.

Table -3: Properties of Sea sand

Sr. no.	property	Value
1	Natural water content [%]	10.7
2	Specific gravity	2.59
3	Unit Weight	1.602
4	Fineness modulus	2.70

2. METHODOLOGY

Plastic is represented by the paver block with dimensions of 230x110x80mm. Dust from quarries: The sand from the sea was prepared. Then, in a metal container, melt the plastic at 150°C. After the plastic has melted, mix in the quarry dust and sea sand in the right proportions. Using a cloth, wipe away the mould. After that, apply the oil to the mould. After applying the oil, pour the mixture into the mould. Because the mixture is hot, handle it carefully and condense it to prevent internal spills. It is let to dry for 24 hours. Remove the mould after 24 hours and it is ready to use.



Fig.No.1 Heating Plastic



Fig.No.2 Paver Block

2.1 TESTING OF SPECIMEN

1. Compressive strength for paver block :

A plastic paver block with dimensions of 230 x 110 x 80mm was cast. The maximum load at failure was measured, and the average compressive strength was estimated using the formula: (Ultimate load in N / Area of cross section (mm²)) = Compressive strength (N/mm²).



Fig.No.3 Practically Test

2. Water Absorption Test :

This paver block is first weighted in the dry state before being immersed in water for 24 hours. They are then removed from the water and wiped clean with a cloth. The difference between the percentages of dry and moist blocks is then calculated:

$$[W2 - W1] / W1 \times 100 = \text{Water Absorption}$$

Where W1 = dried block's weight.

W2 = weight of wet block



Fig No.4:Water Absorption Test

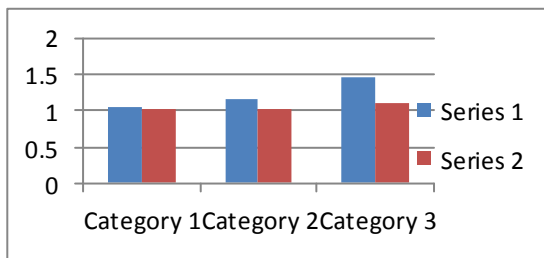
3. RESULTS

3.1. Compression Strength Test:

Table 4: Compression Strength Test Results

Specimen	Plastic waste	Quarry dust	Sea sand	Compressive stress (N/m ²)
PPB- 1	1	½	1	1.089
PPB-2	1	½	1	9.20
PPB-3	1	½	1	1.028
			Average	1.012

Flow Chart 1: Comparison between two proportion in Compression Strength Test



The chart gives information about difference between compression test results of two proportions:

Series No.1= Proportion is 1:1:1

Series No.2=Proportion is 1:1/2:1

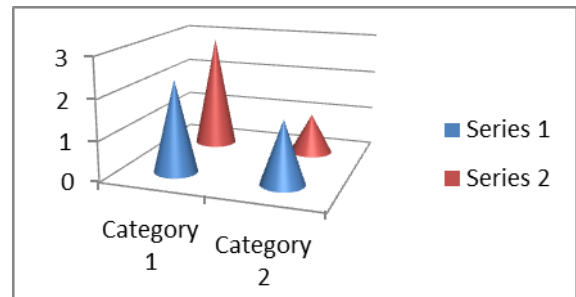
Plastic: Quarry Dust: Sea Sand

3.2. Water Absorption Test:

Table 3.2: Water Absorption Test Results

Sr. No.	Specimen	Water absorption		Water Absorption in %
		Dry weight (kg)	Wet Weight (kg)	
1.	PPB- 4	1.048	1.078	2.863
2.	PPB- 5	1.089	1.100	1.010

Flow Chart No2 : Comparison between two proportion in Water Absorption Test



The chart gives information about difference between absorption test results of two proportions :

Series No.1= Proportion is 1:1:1

Series No.2=Proportion is 1:1/2:1

Plastic: Quarry Dust: Sea Sand

4. CONCLUSION:

- Non-traffic and traffic roads can both benefit from waste plastic paver blocks.
- When compared to concrete paver blocks, paver blocks are less expensive.
- Paver blocks built from plastic waste, quarry dust, and sea sand performed better.
- It also has a high heat resistance.
- Plastic is an innovative material for using it in construction purpose.
- It can be used in light traffic road or footpath.
- It requires less time for manufacture.

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5. REFERENCES:

- Mohan D.M.S., Plastic Bags in Pavement Blocks.
- B. Shanmugavalli's Reuse of Paver Block Plastic Waste .

- Dinesh. S, "Utilization of Waste Plastic in Brick and Paver Block Manufacturing," Dinesh. S., 1 Assistant Professor is available.
- Chaitanya Khair, Dikshita E. "Manufacturing of Paver Block By Using Waste Plastic".
- Aarti G., Ram K. "Utilization of Waste Plastic in Paver Block".
- Dinesh S. "Utilization of Waste Plastic in Manufacturing of Brick and Paver Block".
- Lairenlakpam Billygraham Singh, "Manufacturing bricks from sand and waste plastics".