



Shri ShamraoPatil (Yadravkar) Educational & Charitable Trust's  
**Sharad Institute of Technology , College of Engineering**  
**Yadrav- Ichalkaranji 416118**  
(Approved by AICTE, New Delhi, & Affiliated to Dr. BATU, Lonere, Shivaji  
University, Kolhapur)  
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## **Effective utilization of Plastic waste for casting of paving blocks**

### **ABSTRACT**

Looking to the global issue by post-consumer plastic waste, research efforts have been focused on consuming the waste on massive scale in efficient and environmental friendly manner. Plastic waste recycling is an excellent environmental friendly way as compared to disposal of waste plastic.

On the other hand, most of the roads are provided with footpath which is covered by Paver blocks. In places where underground utilities like water supply lines, underground drainage, underground electricity cables etc. are laid, interlocking paving blocks can be used with advantage of easy removal and replacing as and when needed.

On this outline of problem of disposal of plastic and demand of paving blocks, following proposal is based. It focuses on manufacturing paving blocks made up of 100% waste plastic which can be used for the application restricted to footpaths, cycle lanes, internal roads in gardens, Railway stations, overhead bridges, etc.

This can consume high amount of waste plastic along with reduction on the requirement of material for conventional paving blocks like cement and sand.



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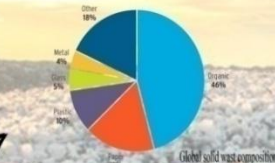
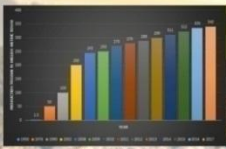
## Sharad Institute of Technology College of Engineering, Yadrav

### EFFECTIVE UTILIZATION OF PLASTIC WASTE FOR CASTING OF PAVING BLOCKS

#### DEPARTMENT OF CIVIL ENGINEERING

Plastic is non-biodegradable material and can remain on earth for 4500 years without degradation. The world's annual consumption of plastic material has increased around 20 times from 1950's to 2018.

On other hand most of the roads need footpath, cycle lane etc. Paver blocks are used for construction of this footpath and cycle lanes; while in some places, paver blocks can also be used for road construction under light traffic conditions.



#### SCOPE

The current project focuses on casting the paving blocks using 100% waste plastic. The suitability was tested using different tests like,

1. Compressive Strength Test.
2. Softening Point Test.
3. Flash and Fire Point Test.
4. Water Absorption Test.

#### METHODOLOGY



#### RESULT & DISCUSSION

##### 1. Compressive Strength Test

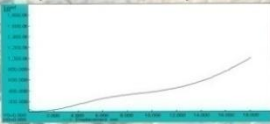
Table no. 1: Compressive strength of plastic paving block.

No.	Thrust Load (kN)	Area (m <sup>2</sup> )	Displacement (mm)	Compressive Strength (kN/m <sup>2</sup> )	Average Strength (kN/m <sup>2</sup> )	Remarks
1.	1000	0.024	18.2	42789.33		Compressive strength is above safe displacement (i.e. max. 10mm) due to plastic material.
2.	1000	0.024	18.1	41532.36	45360.84	
3.	1000	0.024	17.8	46740.74		

Table no. 2: Compressive strength of conventional paving block.

No.	Thrust Load (kN)	Area (m <sup>2</sup> )	Displacement (mm)	Compressive Strength (kN/m <sup>2</sup> )	Average Strength (kN/m <sup>2</sup> )	Remarks
1.	122.8	0.024	0	12114.40		Compressive strength is less than safe displacement.
2.	140.3	0.024	0	22242.79	21875.36	
3.	155.4	0.024	0	23900.31		

#### Graph of "Load v/s Displacement"



The strength without displacement taken by the plastic paving blocks was 877.19 KN/m<sup>2</sup>. Consider Factor of Safety as 1.25. 877.19 × 1.25 = 701.725 KN/m<sup>2</sup> say 700 KN/m<sup>2</sup>. The safe load carrying capacity = 700 KN/m<sup>2</sup> can be assumed.

##### 2. Flash and Fire Point Test:

1. The Flash and Fire point test on the plastic paving block was taken using standard procedure by Pensky Marten apparatus.
2. The results found were as follows:  
Flash point = 260°C  
Fire point = 300°C

##### 3. Softening Point Test:

1. The test was conducted using Ring and Ball apparatus and Glycerin was used as heating media
2. No signs of softening were found till 150°C. At 150°C the test was aborted.

##### 4. Water Absorption Test :

From the test, the water absorption was found to be negligible.

#### CONCLUSION

1. These paving blocks can be used at places where expected load coming on the surface is less than 700KN/m<sup>2</sup>.
2. These paving blocks can be used in open areas with light loads.

#### BENEFITS TO SOCIETY

1. Employment to rack pickers.
2. Employment to both skilled and unskilled workers in such industry.
3. Reduction in carbon footprints.
4. Fewer burdens on Municipal Authorities responsible for Solid Waste Management.
5. Helpful to aquatic life, as the dumping of plastic waste will be reduced.
6. Reduction in drainage blockage problems caused due to plastic waste in sewerage system.

#### POSSIBLE USES

1. Footpaths
2. Internal roads in Gardens
3. Cycle lanes
4. Open spaces around hospitals except parking
5. Railway bridges
6. Overhead bridges



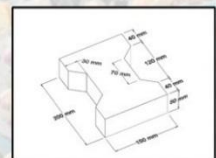
#### TENTATIVE COST ANALYSIS

1. Raw materials: - Waste plastic Rs.8 to 10 per Kg.
2. Processing charges: - Bulk production Rs.2 to 3 per block.
3. Profit: - Rs.2 per block.

**Cost per block = Rs. 15/-**

**The Casted Paver Block was of following shape and dimension :**

Area = 24300 mm<sup>2</sup>  
 Depth = 50 mm  
 Volume = 12,15,000 mm<sup>3</sup>.  
 Density = 634.92 Kg/m<sup>3</sup>.



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