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## REUSE OF PLASTIC AS A BINDER IN PAVER BLOCKS

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### ABSTRACT

Replacement of concrete paver blocks using waste plastic is a simpler way of providing paver blocks at a cost-effective price and better usage. It requires a multi-faceted approach to be addressed. Plastic waste is an increasingly concerning issue that has significant environmental and health implications. Plastic waste is generated from a variety of sources, including single-use plastics, and packaging materials. Plastic production has overtaken most man-made materials including metals and has long been under environmental scrutiny. Most plastic wastes are accumulated in landfills, the natural environment, and oceans. It is seen that with the current trend of global production and waste management, approximately 12000 million metric tons of plastic will accumulate in landfills and in the natural environment by the year 2050.

**Keywords:** Plastic, Cement, Binder, Sand, Pavers.

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### I. INTRODUCTION

Plastic paver blocks are used as an alternative to traditional concrete pavers. They are made from recycled plastic and are environmentally friendly. These blocks are durable, easy to install, and require less maintenance than concrete pavers. They are lightweight and can be easily transported, which makes the installation process quick and efficient. While the initial cost may be slightly higher than traditional blocks, the durability and low maintenance requirements make them cost-effective options in the long run. Sustainable development for construction involves the use of non-conventional and innovative materials, and the recycling of waste materials in order to refill the lack of natural resources and to find alternative ways of conserving the environment. Harmful chemicals like PCBs, DDT, and PAH, which get absorbed in the plastic debris that floats in the seawater, have a varied and harmful range of chronic effects like endocrine disorders. The toxins are transferred in the food chain as they get absorbed in the animals' bodies after they eat the plastic pieces. Human beings consume these contaminated fish and mammals. Plastic pollution is affecting the global economy. It is destroying the fishing and aquaculture industries. Recycling of waste plastic is important. This can be accomplished by using reusable bags, bottles, and containers, as well as avoiding products that are packaged in excessive plastic materials. Additionally, improving waste management systems can help reduce plastic waste. This includes implementing recycling programs, promoting composting such as vermicomposting, and improving waste collection and disposal.

### II. EXPERIMENTAL PROCEDURE

#### 2.1. Materials Used:

**Cement:** Cement is a binding material that binds all the materials used in the construction of paver blocks. The cement used for the experimental work is ordinary Portland cement (OPC) of Grade 53. OPC 53 grade which surpasses the requirements of IS12269-1987. OPC is a higher strength cement to meet the needs of the consumer for higher strength concrete. **Sand:** Fine aggregate is an essential component of concrete. The most commonly used fine aggregate is natural river sand. The demand for the natural sand in the construction industry has consequently increased due to extensive use of concrete resulting in reduction of sand sources. The sand used for the experiment was collected from a near-by quarry. **Waste Plastic:** Plastic waste used in making paver block was collected from the surrounding locality. It includes plastic bottles. The bottles used are of about 0.25-0.89mm thick. We are using Low Density Polyethylene Waste Plastic (LDPE) in this project because the High-Density Polyethylene Plastic becomes powder when heated or melted. But the LDPE plastic become liquid when heated

and in atmospheric temperature it again hardens and acts like a binding material in manufacturing of paver blocks.

**2.2 Mix Ratio**

Material	Block 1	Block 2
Sand	1	1
Waste Plastic	2	2

**Fig.1**

**2.3 Preparation of Test Specimen:**

We have made two samples for our project. One including cement as a binder and the other including waste plastic as a binder. This was done to compare the traditional paver blocks with the plastic paver blocks.

a) For both the samples, moulds of size 100mx100mmx100mm were used, taking two moulds for each sample.



**Fig 2: Casting and Drying**

- b) Cement mortar proportion of 1:1.5 mixes is obtained referring to IS 10262 as recommended. The proportion of cement, fine aggregate was 1:1.5 by weight and water cement ratio is maintained as 0.5 throughout investigate
- c) For the plastic paver blocks, sample mixture of 1:2 ratio of fine aggregates and plastic was maintained throughout the investigation.
- d) The mixture of sample is then transferred to the clean, dried and greased moulds, in three layers, each layer being tamped 25 times, and compacted to have a smooth flat surface.
- e) The various tests conducted on cement, sand and waste plastic are specific gravity test, water absorption test, initial and final setting time, standard consistency test, slump test and compressive strength test.

**III. RESULTS & OBSERVATIONS**

**Table 1: Test on Cement**

Properties	Results Obtained	IRC Recommendation	ReferenceCode Book
Standard Consistency	34%	Not Specified	IS:4031
Initial Setting Time	35min	Not less than30min	IS:4031 part-1-1996
Specificgravity	3	Not more than3.15	IS:2720PART-3
CompressiveStrength	53N/mm2	Not less than43Mpa	IS:1568-2006

**Table 2: Test on Fine Aggregate**

Properties	Results Obtained	IRC Recommendations	ReferenceCode Book
Specific gravity	2.57	2.54-2.7	IS-15658-2006

**Table 3:** Test on Waste Plastic

Properties	Results Obtained	IRC Recommendations	Reference CodeBook
Compressive Strength	13N/mm <sup>2</sup>	Not specified	IS-15658-2006



**Fig 3:** Compression Testing Machine, Slump Test, Melting and compacting

#### IV. CONCLUSION

1. Utilisation of plastic waste in paver blocks yields satisfactory strength requirement of paver blocks. But, use of higher proportion of plastic waste in paver blocks reduces the strength.
2. The proportion of sand and plastic waste with ratio 1:2 was found to be satisfactory, which obtained a compressive strength of 13N/mm<sup>2</sup>.
3. Use of plastic waste in paver block reduces the weight of the paver block by 57%, thus producing light weight paver blocks.
4. With the use of plastic waste, cost of paver block reduces considerably.
5. Effective utilisation of plastic waste reduces the overall waste and thus are environmental friendly.

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