



e-ISSN:2582-7219



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 4, April 2024



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.521



6381 907 438



6381 907 438



ijmrset@gmail.com



www.ijmrset.com



Beyond Paving: Investigating Novel Applications of Waste Plastic in Eco-Friendly Building Materials

Saisarthak M. Tadakhe¹, Piyush V. Patil², Sarthak V. Avhad³, Abhishekh K. Jamdhade⁴,
Ayush V. Salunke⁵, Nikhil N. Bhalke⁶

Department of Civil Engineering Sanjivani K.B.P Polytechnic, Kopergaon, India^{1,2,3,4,5,6}

ABSTRACT: Plastic is a material that does not degrade in the environment. Step by step, the volume of plastic garbage in municipal solid waste is growing rapidly. Hydrocarbons, which can be obtained from a variety of sources including coal, oil, and certain minerals, are used to make plastic. Plastic is considered useful during a time of scarcity, however after it is used, it is practically thrown away, posing a variety of risks. There are many different types of plastic, such as Low Thickness Poly-ethylene (the material) and High Thickness Poly-ethylene (HDPE). These leftover polymers are then to be effectively utilized in the production of paver squares. In order to produce high-quality blocks with warm and sound protection qualities to cope with contamination and to lower the overall cost of construction, low thickness polyethylene is spotlessly mixed in with the sand and aggregate at varying rates. development, this is likely the best way to prevent the accumulation of plastic garbage, a non-biodegradable poison. The goal of this initiative is to use plastic waste as a binder instead of cement, which will decrease the decrease the need for cement and lower the price of paver blocks. The country produces over 5.6 million tone of plastic garbage annually. Plastic disintegration is a very drawn-out process that takes several years. Thus, it makes sense to employ plastic trash in paver blocks. We have mixed fine and coarse gravel with plastic trash in different proportions for this technique. After being assembled, the paver squares were tested. The square plastic paver's maximum capacity to retain water is less. When compared to paver square, the results showed greater quality.

KEYWORDS: Plastic waste used in paver block Plastic Waste, Low Density Polyethylene, Polyethylene Properties, Plastic Paving Block

I.INTRODUCTION

Solid waste management is still an important problem, especially for low and middle-income countries when it comes to urban areas. The plastic debris used in this project came from then neighbourhood. At the moment, 25,940 ton of plastic waste are produced every day, or 9.46 million ton annually among the biggest Polypropylene and polyethylene make up a portion of plastic rubbish. Because it affects people as well as animals directly and indirectly, disposing of waste pollutes the environment around it. The ecosystem, marine life, humans, and animals are all seriously damaged by the billions of tone of plastic waste that wind up in the world's oceans. In order to produce cement-less pavers, the current study presents several forms of plastic waste as a binding agent that can totally displace cement. The components of a paver block are made of a mixer that mixes fine aggregate from nature with various kinds of plastic trash in varying amounts. Both financial and environmental benefits result from substituting plastic waste for cement. The results of the investigation indicate that sand can be mixed with different polymers without compromising its other characteristics or weakening it slightly, where paver bricks are made by melting or shredding materials. The amount of plastic that is used such as the use of PET containers, tote bags, cups, and other items is ever growing. Once used plastic is thrown away, it does not biodegrade. They are therefore either burned or dumped in a landfill. Because they damage the air and soil, neither process is beneficial to the environment. Any technique that can make use of this waste plastic for the construction's goal is always acknowledged. Polymer compounds are used to make plastic, and they are nondegradable. Plastic is a material that is both extremely helpful and dangerous. Plastic is a hazardous material that is not biodegradable and can persist for decades when use improperly the amount of plastic Municipal Solid Waste (MSW) is rapidly growing in volume of waste. The rate of expansion is thought to double every ten years.



II. LITERATURE REVIEW

Pooja Bhatia Due to challenges encountered in the steps of sample collection and treatment, the majority of developing countries do not have an adequate solid waste management system in place. Because low-density polyethylene (LDPE) is widely used in products like wrapping paper, thin bags, water sachets, and more, it is one of the main sources of this kind of pollution. The groundwater table and the nearby soil will be impacted by the waste plastic that is being dumped in landfills. This research proposes a reasonably simple process for producing LDPE-bonded sand blocks and pavers. It was discovered that when the sand's particle size shrank, the density and compressive strength rose. Additionally, the samples' impact resistance was significantly better than that of conventional clay paver blocks.

Aarti Ghude- Plastic is a material that does not decompose. Every day, there is a sharp increase in the amount of plastic waste in municipal solid waste. When plastic is required, it is crucial to use it at that moment because it can be reused afterwards. Plastic comes in a variety of forms, particularly High-Density Poly-ethylene (HDPE). The goal of this research is to use melted plastic trash to replace the bonding that cement provides in paver blocks. Plastic disintegration is an extremely drawn-out process that could take thousands of years. As a result, a project adds to less plastic waste. In this study, we combined fine and coarse gravel in varying proportions with plastic garbage. The paver pieces completed preparation and testing. The plastic's ability to absorb water.

S. Arjun Kumar S. Ganesh Babu in addition with waste plastic waste lime sludge from the paper industry replaces fine aggregate. In project, we have to use lime sludge, waste plastic in different proportion with sand. The paver block is tested and we discussed about all test. Because of population increment the production of plastic waste is also increased. We will be using the method of landfilling for disposal of plastic which is very important. so, we can use the plastic in paver block.

Avinash G B, Roja A P, Santosh M Waste plastic is used to prepare the Plastic Pavers. A significant amount of plastic is being transported into the separating areas, where it is either burned or disposed of, polluting the air and surroundings. Sand is added to heated waste plastic, a process that can be done both mechanically and manually. In the current project, plastic pavers are created by adding 40%, 50%, 60%, and 70% of waste plastic to the weight of sand needed to fill the paver mould. It is discovered from those four trials that, in order to acquire the appropriate mould shape, at least 60% waste additive and 70% waste additive are needed.

Avinash Gb, Rosa Ap, Santosh M R, Puneetha kumari H M We may use waste plastic as cement in our project, and we'll use the plastic to make pavement blocks instead of throwing it away because it's affordable and readily available The plastic pavement block weighs less than the concrete pavement block. It also offers a brief process for creating a block.

Nonbiodegradable plastic garbage is expanding quickly and posing a hazard to the environment in a number of ways.

III. MATERIAL AND METHODOLOGY

1. Selection of material
2. Checking the material properties.
3. Proper mix design for the recycled plastic using paving block.
4. Melting the plastic waste, at the temperature of 140 0C to 160 0 C.
5. Mixing of sand in melted plastic.
6. Molding.
7. Unmolding.

1. choice of content.

The production of paver blocks requires a lot of plastic. Analysis showed that 3 kg of sand were needed for every 1 kg of plastic.

The total quantity of sand necessary depends on weather plastic is used for the blocks.

2. Proper mix design. (1:3). Plastic melts when heated to between 140 and 160 degrees Celsius, and the resulting liquid is measured in milli litre. When ½ kg of plastic bags are heated to 450 ml of liquid, what happens?

In a similar vein, the ratio of plastic mix proportion is

3. Command Experiment.

Use plastic and sand in the project to ensure that the paving blocks are correct in shape. Usually, water is used to mix cement, sand, and aggregate to make concrete pavement blocks. While the recycled plastic paving block only needed sand and plastic, regular pavement components use cement as its binding component. where the paving block's plastic binder can be used.

4. Blend the design.

The design of the plastic paving block mix is not properly established through the entire manufacturing process. The producing process' trial-and-error methodology is what this mix design is based on.

5. Forming and releasing moulds.

Because the material is excessively hot, handle the appropriate metal drum by carrying out the moulded and mix procedure. filled the mould with the material, levelled it properly, and tamped it down to prevent any voids. assistance of a trowel. Remove the mould once the mixer has solidified enough so that the slab will not collapse. In about two hours, it ought should establish.

MOULDING: After completion of proper mixing we place mix into required mould. In these projects we use the normal brick sizes (15*15*6 cm). After 2 days remove the brick from the mould and then done curing.

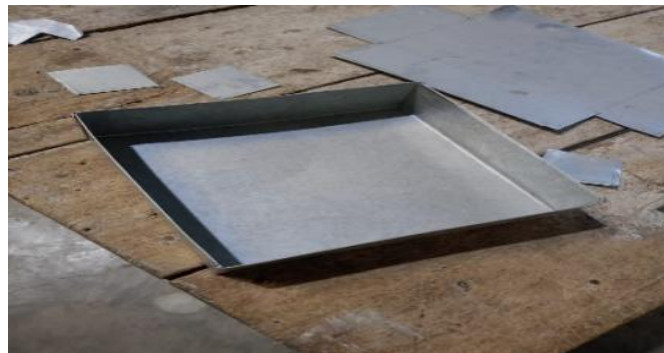


Fig no. 1- Mould



Fig no.2- Plastic paver block

IV. AIM

The purpose of this project is to lower the cost of paver blocks relative to traditional concrete paver blocks and substitute cement with plastic waste. Determining the appropriateness of the garbage is the aim of this investigation. Polyethylene bags, plastic containers as well as additional substances in the process of generating paver blocks for building.



V. OBJECTIVE

1. Plastic is used in place of cement.
2. Shorten the paving block's setting time.
3. Lower the price of paving blocks.
4. There's no need to cure.
5. Compared to regular pavement blocks, plastic paving blocks are lighter.
6. Paving blocks can withstand moisture.
7. Durability comparisons between conventional paving blocks and plastic-used paving blocks
7. Degradation takes many years.
- 8 When plastic bags disintegrate in the sun, toxic substances are released into the soil.
- 9 Burning plastic bags releases a poisonous gas into the atmosphere, causing air pollution.
- 10 When animals consume poorly disposed of food bags, they can develop illnesses related to the stomach and intestines that can potentially result in asphyxia and death.
11. The dispersal of plastic in open areas leads to unsanitary conditions since it serves as a breeding ground for mosquitoes and insects that spread diseases like malaria and dengue

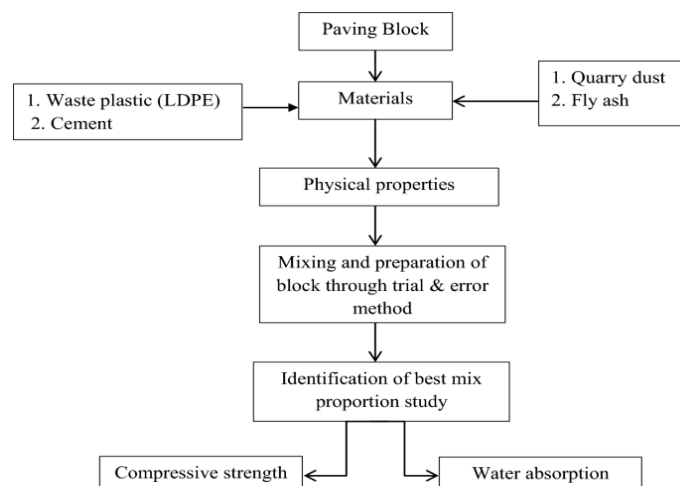
VI. APPLICATION

- 1) Paver Square's usage of discarded plastic offers a profitable option to get rid of plastic trash.
- 2) It can be used in gardens, pathways for bicyclists and pedestrians, and so forth.
- 3) Since it is not water permeable, there is almost no risk of owing to green growth and organisms.
- 4) It can be applied to roads with little or no traffic.
- 5) A 15% weight reduction is achieved by employing plastic in paver blocks.
- 6) It takes less of a perfect occasion to create,

VII. SELF SAFETY EQUIPMENTS

- Masks
- Gloves
- dungarees
- Covered
- Boots
- Shoes

VIII. METHODS OF PLASTIC PAVER BLOCK





IX. ADVANTAGES OF PLASTIC PAVER BLOCK

- It has strength and durability.
- Compact
- streamlines the installation of energy
- Increased thermal safeguarding
- Environmentally friendly
- Cost effective
- Low maintenance

X. DISADVANTAGES OF PLASTIC PAVER BLOCK

- Decreased density limited
- load bearing capacity
- insufficient fire resistance
-

XI. FUTURE SCOPE

A big entrance with lavish outdoor flooring is necessary for bungalow and apartment landscaping; there are other options, but the most crucial thing is to draw attention to the features. I am convinced that using plastic paver bricks is the most sensible, economical, and simplest way to accomplish the goal. Plastic pavement blocks are rather stiff and difficult for pedestrian and vehicle traffic because they are industrial items. These long-lasting, aesthetically pleasing precast pavers require little to no maintenance when constructed and installed correctly. Plastic paver blocks are a typical material that have many uses in hard landscaping.

XII. CONCLUSION

According to the analysis of the previously mentioned research, waste plastic can be used to make pavement blocks. This modified pavement block can be used for pedestrian construction, public buildings, government buildings, educational facilities and other low-traffic spots for parking. The waste that's left in the block is plastic. For fine aggregate, various quantities of waste plastic are utilized for varied workability, durability, and compressive strength and, most importantly, to minimize the amount of plastic waste.

REFERENCES

- 1) Ghuge, J., Surale, S., Patil, B. M., & Bhutekar, S. B. (2019). Utilization of waste plastic in manufacturing of paver blocks. *System*, 6(04), 1967-1970
- 2) Goyal, H., Kumar, R., & Mondal, P. (2023). Life cycle analysis of paver block production using waste plastics: Comparative assessment with concrete paver blocks. *Journal of Cleaner Production*, 402, 136857.
- 3) Agyeman, S., Obeng-Ahenkora, N. K., Assiamah, S., & Twumasi, G. (2019). Exploiting recycled plastic waste as an alternative binder for paving blocks production. *Case Studies in Construction Materials*, 11, e00246.
- 4) Anusha, G., & Dineshkumar, R. (2022). Study on paver blocks using waste plastics and sugarcane bagasse ash. *Materials Today: Proceedings*, 68, 2088-2092.
- 5) Suchithra, S., Oviya, S., Rethinam, S. R., & Monisha, P. (2022). Production of paver block using construction demolition waste and plastic waste—A critical review. *Materials Today: Proceedings*, 65, 1133-1137.
- 6) Tempa, K., Chettri, N., Thapa, G., Gyeltshen, C., Norbu, D., Gurung, D., & Wangchuk, U. (2022). An experimental study and sustainability assessment of plastic waste as a binding material for producing economical cement-less paver blocks. *Engineering Science and Technology, an International Journal*, 26, 101008.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com