

AN EXPERIMENTAL STUDY ON THE USE OF PLASTIC WASTE IN PAVER BLOCKS

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Abstract-Daily plastic waste disposal is a necessity for solid waste management. As a result, this study looked into the possibility of using plastic waste to create paver blocks for a pedestrian walkway. A trial mix was used to develop paver blocks made of recycled plastic in order to determine the best way to make paver blocks. The goal of this project is to study the properties of pavement blocks made from recycled waste plastic. Pavement blocks are ideal for straightforward laying and finishing on pathways as well as streets. Here, the design considerations for pavement blocks incorporating waste plastic bags and the strength characteristics of pavement blocks made of waste plastic are presented. The environment and modern society will benefit from it. Utilising plastic in construction fields with minimal additions is the main goal.

Keywords: Plastic paver blocks, Plastic waste.

I. INTRODUCTION

Municipal Solid Waste (MSW) includes plastic as one of its major constituents, and efforts to recycle plastic waste have led to extensive research projects, like those in concrete blocks. Plastic waste was also looked into for its potential to replace aggregate or cement to create concrete blocks with value-added performance in

addition to sustainability. The properties of the concrete can be slightly or significantly altered by the addition of recycled plastic. Recycling wastes can help cut down on the production of solid waste, as well as pollution and other risks. Making composite materials, for instance, is a creative way to get rid of plastic waste.

All over the world, concrete is a common building material. The three most typical components of concrete are cement, sand, and coarse aggregate. Concrete is extremely useful, but as time goes on, it is running out, making it necessary to look for alternatives.

In India, pavement technology has been used for parking lots and footpaths for many years, and it now serves a variety of purposes. This project conducts tests on properties like compression and oven performance. The raw materials used in this paver block are more readily available and affordable than those used in conventional paver blocks, including cement and readily available aggregates.

Karma Tempa, Nimesh Chettri, Gautam Thapa, Phurba, Cheki Gyeltshen, Dawa Norbu, Dikshika Gurung (2022)- an experimental investigation was carried out to recycle plastic waste as a substitute to cement as a binding constituent. Also, it reduces carbon footprint and reduces environmental pollution and health hazards. The maximum mass loss of 70.33

g was observed corresponding to 2.56% wear for PP/PS P50 samples. Other mix ratios show a lower loss in mass and percentage wear. All mixed and HDPE PW samples show compressive strength equivalent to M20 and M30 concrete respectively with lower values for PP/PS.

II. AIM

Using materials that are readily available locally, this study investigates the viability of using recycled plastic as a paver block.

III. OBJECTIVES

- The main objective is to make paver blocks out of plastic rather than cement.
- To provide affordable, effective paver blocks that the average person can easily afford.
- To assess the feasibility of using waste plastic in the construction of pavement blocks.
- Alternatively, we can reduce our reliance on plastic in our environment.

IV. MATERIALS

1. Plastic required

a. PP



Fig1: PP plastic

b. LDPE



Fig2: LDPE plastic

2. Mould of specific size



Fig3: mould of size 200x100x60(mm)

3. Gas cylinder

4. Barrel

5. Safety Equipment

- a) Gloves
- b) Mask
- c) Covered shoes

6. Stirring equipment

7. M Sand



Fig4: M sand (less than 4.75)

8.Quarry Dust



Fig5: quarry dust

V. PREPARATION PROCESS

- 1) Gathering the waste plastic
- 2) Making them fine particles for melting
- 3) Melting of plastic
- 4) Including sand in melted plastic
- 5) Moulding
- 6) Drying

VI. METHODOLOGY

1. Collection of plastic

Unusable products like stretch wrap, food bags, water bottles, ice bags, milk bags and agricultural film are all examples of LDPE

products utilized in this process. Plastic containers, bottles, toys, ropes are examples of PP plastic.

2. Grinding the plastic

Making the collected plastic into an appropriate size for melting.

3. Melting the plastic

Lighting a tiny fire beneath the metal drum and gently heating it will help the plastic melt until it turns into a liquid. Gently place the plastic trash preserve with the plastic on the melted plastic's surface until it melts down to a liquid.

4. Adding adequate materials

- Aggregate, plastic, or sand

A thick liquid will eventually develop if diligent mixing continues until all of the plastic has melted. Even at extremely high temperatures, lumps of LDPE can develop. Continue heating and stirring until all lumps have been eliminated and a homogeneous paste has been produced because they affect the material's strength. This task could take up to 30 minutes to finish. The liquid cannot be used as a building material if it is allowed to heat up to the point of burning. It is acceptable for a few liquid-generated flames to be present.

5. Filling of Mould

To prevent mould from sticking, make sure the mould is free of any pieces of plastic, clean, and properly lubricated. Remove the sludge as soon as possible using the metal shaft trowel and a spade. Be careful and wear gloves because the combo is really hot. Mould's edges are lubricated for simple removal.

6. Drying and setting

Before shaking (a rocking motion works well) the hot fluid in the mould releases the edges, give it a few minutes to solidify.

Keep making an effort to get rid of the mould. When the mixture has sufficiently solidified remove the mould and depart. It should have solidified in approximately two hours.

TESTS CONDUCTING

- **Compressive energy test:** The plastic paver block is subjected to a compressive electricity test to determine its energy and eligibility for use.

- **Temperature test:** This test is carried out to establish the paver block's melting point, or the maximum temperature at which it will not melt. In order to determine the precise temperature at which our paver block melts, two hours of predetermined temperature are used in the oven to bake the paver blocks.



Fig7: compression testing machine

VII. RESULT



Fig6: Paver block after demoulding

COMPRESSION TEST

Plastic & sand Proportion	Compressive strength of plastic paver blocks (N/mm ²)
LDPE	20.21
LDPE with 10% M sand	15.5
LDPE with 10% Quarry dust	10.75
PP	10.1
PP with 10% M sand	6.7
PP with 10% Quarry Dust	2.25

Table1: Compression strength test

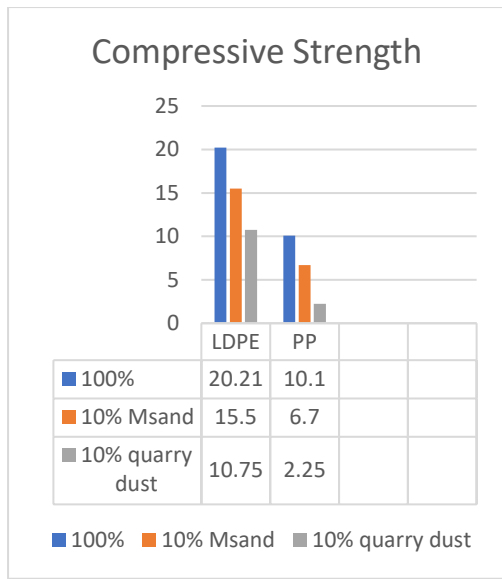


Fig8: Compression test graph



Fig9: Temperature testing machine

TEMPERATURE TEST

	At Temperature (°C)	Result
LDPE	50	No Changes
	100	No Changes
	Above 100	Melting Starts
PP	50	No Changes
	100	Melting Starts

VIII. APPLICATIONS AND BENEFITS

- 1) Utilising waste plastic from the paver square is a fruitful method of removing plastic waste.
- 2) Due to its lack of water permeability, the risk of unprepared growth of organisms is almost evenly distributed.
- 3) It can be used in gardens, platforms, pedestrian and bicycle paths, and other areas.
- 4) Can be use in light visitors avenues.
- 5) It lowers greenhouse gas emissions.
- 6) It needed minimal preservation or almost none at all.
- 7) It lessens both land pollution and water pollution.
- 8) It decreases the consumption of raw materials with sparkle.

IX. CONCLUSION

Unusable plastics can be utilised in the creation of pavement blocks, according to the investigation's and analyses' conclusions. This newly created pavement block can be used to build rigid pavement.

- Unusable plastics could be used in the production of paver blocks.
- Less time is needed for manufacture.

- It can be used gardens, pedestrian routes, pathways, railway stations and many other places.
- When compared to concrete paver blocks, the cost of plastic has been reduced by nearly 50% due to the substitution of cement.
- By using plastic in paver blocks, the burden is reduced by up to 15%.
- Since plastic paver blocks absorb water much less than concrete ones do, a suitable drainage system might be needed to handle runoff.

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