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Comparison of Compressive Test of Paver Blocks Made with Plastic with Normal Paver Concrete Blocks

Pooja Bhatia[1], Akash Sahu[2], Pratima Sahu[3], Abhishek Verma[4]

[1]Assistant Professor, Dept. of Civil Engineering, SSIPMT, Raipur, Chhattisgarh, India
[2]UG student, SSIPMT, Raipur, Chhattisgarh, India
[3]UG student, SSIPMT, Raipur, Chhattisgarh, India
[4]UG student, SSIPMT, Raipur, Chhattisgarh, India

Abstract - The goal of this project is to substitute cement in our block of paving stones with plastic waste, decreasing the cost of the paving stone block when compared to typical concrete paver blocks. Every year, almost 300 million tonnes of plastic rubbish are generated worldwide. The pace at which plastic garbage degrades is likewise exceedingly sluggish. As a result, the initiative is beneficial in terms of eliminating plastics in a meaningful manner. We utilised plastic garbage in various amounts with thin aggregate in this project. The paving stones were produced and tested, with the outcomes being discussed.

Key Words: Paver block, LDPE Plastic waste, Tiles waste.

1.INTRODUCTION

The events of the twentieth and early twenty-first centuries, as well as studies on garbage, show that waste, regardless of its form or categorization, whether solid, liquid, or hazardous, has become a major consequence of modernisation and economic progress. Global garbage creation rates are expanding at a higher rate than ever before, During the next 15 years, per capita trash generation rates are expected to range from 1.2 to 1.42 kg/person/day, rising from roughly 1.3 billion tonnes per year in 2015 to over 2.2 billion tonnes per year by 2025. As a result, scientists have cautioned that growth will continue unless people modify how they utilise and reuse natural resources. Sub-Saharan Africa, of which Ghana is a part, generates up to 62 million tonnes of waste every year. Despite the fact that garbage creation per capita in this region is normally low, it ranges from 0.09 to 3.0 kg/person/day, with an average of 0.65 kg/capita/day.

The results of paver blocks constructed from plastic trash, fine aggregate, and ceramic waste were better. It also has a high level of heat resistance. It may be utilised in gardens, footpaths, and cycleways, as opposed to concrete paver blocks.

Landfilling, incineration, biodegradation, and recycling are the four main methods for disposing of plastic trash. Landfilling or incineration can be used to dispose of all sorts of plastics. Landfilling, on the other hand, is seen as extremely wasteful since it necessitates a wide space that may leach contaminants into the soil and surrounding ecosystem, which are not eco-friendly. The plastics will mix with other municipal wastes to leach the ground in the form of toxic chemicals hence contaminate the underground water. These will not only cause pollution to the water bodies, but the land and air will also be affected. When plastic waste is thrown into the water, it forms small pallets, swallowed up by aquatic life which can lead to its death and, even worse, its destruction. The second option, incineration, is a way of extracting a minimum amount of energy from plastic burning. Burning plastic releases harmful and poisonous gases, which have negative environmental and health consequences. Biodegradable polymers can be used, but they take a long time to degrade, thus plastic trash continues to accumulate. Because of their similar look, biodegradable plastics may contaminate and disrupt the present recycling system. Unsystematic waste management and littering routine will contribute to a significant problem for city authorities, especially in the urban areas, thus makes recycling is the best option to dispose of waste plastics other than the three options because it uses minimum energy consumption.

Since plastics are one of the important components of municipal solid waste (MSW), efforts to recycle plastic waste have led to intensive research work on concrete blocks, for example. Plastic waste was explored for potential use as an aggregate or cement replacement in the production of a concrete block with value-added performance, in addition to improving sustainability. Recycled plastic can be added into concrete without affecting its qualities or weakening it significantly. The waste in concrete can be used as an aggregate or as part of a cement-based binder phase, but keep in mind that not all waste is suitable for this application. As a result, civil engineers must study alternative materials that can completely or partially replace traditional concrete constituents.

A thorough study of literature was conducted in order to investigate the behaviour of recycled plastic in the manufacturing of plastic paver blocks from solid waste. Satish Parihar tested the stability of concrete mixes with recycled plastic aggregate in varied concentrations. The amount of waste plastic collected in the twenty-first century has caused significant obstacles for its disposal, compelling authorities to spend in encouraging It uses coarse plastic waste aggregates in concrete, which is critical to a thriving construction sector. For the preparation of concrete, three

replacement levels were used depending on the percentage of aggregate: 10%, 20% and 30%. Poonam Sharma3 and his colleagues studied cement-concrete blocks for paving slabs for rural roads.

2. EXPERIMENTAL PROCEDURE

2.1 Properties of Materials

Plastic waste (LDPE)

Plastic waste used for paving stones was collected from the surrounding area. A plastic bag is included. The plastic bag used is approximately 50 microns. The basic features are provided below.

Table -1: PROPERTIES OF LDPE

Sl.No.	Particulars	Value
1	Melting point	150°
2	Thermal co efficient of expansion	100-200X10^{-6}
3	Density	0.910-0.940
4	Tensile strength	0.20-0.40(N/mm^2)

Ceramic wastes

Ceramic waste is produced as a byproduct of the coating and polishing processes. As an extra addition, ceramic waste can be utilised as a partial cement replacement or a partial sand replacement from fine aggregate to obtain distinct concrete qualities.

Fine aggregate

Fine aggregates are essentially all natural sand particles extracted from the earth during the mining process. Fine aggregate is made up of 14 mm natural sand or crushed stone particles "or fewer This product is sometimes referred to as 1/4' "less in terms of the size or categorization of that specific aggregate.

2.2 Mix Ratio

Ratio – 1:4, 1:5, 1:6

Block type 1- Three pavers were cast using the blend ratio.

provided below

Plastic waste = 200gm

Fine Aggregate= 800gm

Ceramic waste = 75gm

Block type 2- Three pavers were cast using the blend ratio.

provided below

Plastic waste = 166gm

Fine Aggregate= 834gm

Ceramic waste = 75gm

Block type 3- Three pavers were cast using the blend ratio.

provided below

Plastic waste = 143gm

Fine Aggregate= 857gm

Ceramic waste = 75gm

We have kept the weight of our blocks same for all samples =1075gm

2.3 Preparation of Test Specimens

Plastic garbage is cooked in an oil tepa at temperatures over 150. The plastic garbage melts as a result of heating. Materials In the molten state of plastic, ceramic waste, aggregates, and other elements mentioned in the preceding chapter are added in the right proportions and well mixed. The metal mould is thoroughly cleaned with a waste towel. This mixture is now being transferred to the mould. It will be heated and compacted in order to limit the number of interior pores. The blocks are then allowed to cure for 24 hours in order to solidify. When the paving block has dried, it is taken from the moulds and is ready for_use.

Fig 1 Heating

Fig 2 Adding

Fig 4 Drying

Fig 3 Casting

2.4 Testing of Specimens

Compressive strength for paver blocks

100X100X60mm plastic paver bricks were poured. The average compressive strength is determined using the equation below once the maximum load at the fault reading is measured.

Compressive strength (N/mm2) = (Ultimate load in N / Area of cross section (mm2))

Fig 5 Experimental Setup for Compression test

Oven test

Since the paver is made of plastic, we need to know its melting point, so the overflow test is run. The pavement is held in the oven for 2 hours and after 2 hours it is shown.

III. RESULT AND DISCUSSION

Compressive Strength

COMPRESSION STRENGTH FOR BLOCK TYPE 1

Proportion name	Plastic Waste (gm)	Ceramic waste (gm)	F. A. (gm)	Compressive stress (N/mm^2)	
PPB-1	200	75	800	8.98	
PPB-2	200	75	800	9.48	
PPB-3	200	75	800	9.65	
			Avg	9.37	

COMPRESSION STRENGTH FOR BLOCK TYPE 2

Proportion name	Plastic Waste (gm)	Ceramic waste (gm)	F. A (gm).	Compressive stress (N/mm^2)	
PPB-1	166	75	834	8.56	
PPB-2	166	75	834	8.64	
PPB-3	166	75	834	8.45	
			avg	8.55	

COMPRESSION STRENGTH FOR BLOCK TYPE 3

Proportion name	Plastic Waste (gm)	Ceramic waste (gm)	F.A. (gm)	Compressive stress (N/mm^2)	
PPB-1	143	75	857	7.56	
PPB-2	143	75	857	7.23	
PPB-3	143	75	857	7.89	
			avg	7.56	

Fig 6 Comparison of Compressive Strength of Blocks

Oven Test Result

Since the road surface is made of plastic, you need to know the heat resistance. Therefore, the plastic plate is put in the oven for 2 hours.

Samples	Temperature (ºC)	Remarks
Sample 1	50	no change
	100	no change
	150	Melts
Sample 2	50	no change
	100	no change
	150	Melts
Sample 3	50	no change
	100	no change
	150	Melts

As we increased the ratio, we noted that the strength went down.

3. CONCLUSIONS

Based on the experimental results, the following conclusions were drawn.

1. Use of plastic waste in production Paving stones have a productive way to recycle plastic waste.

2. slab packaging cost on concrete paving stones.

3. Plastic waste, paving stones made from quarry dust, Total aggregate and ceramic waste are shown Better results.

4. It also shows excellent heat resistance.

5. Compressive strength is low It can be used in comparison with cinder block blocks. In gardens, trails and bike paths, etc.

6. It can be used in both non-market and low-power routes.

7. plastic paving stones are less brittle than concrete. Concrete sidewalk blocks are more brittle than plastic sidewalk blocks. The main advantages are the durability and cost-effectiveness of paving slabs made from plastic waste.

8. Plastic bricks are lighter, stronger and cheaper than concrete bricks.

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