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"PREPARE PAVEMENT BLOCK USING WASTE PLASTIC"

[1]Prasad Pathare, [2]Yash Shinde, [3]Swastik Shinde, [4]Swapnil Kamble, [5]Shrikant. T. Patil

[1]Student, [2]Student, [3]Student, [4]Student, [5]Lecurer

[1]Department of Civil Engineering,

[1]JSPM's Jaywant Rao Sawant Polytechnic, Pune, India

Abstract: A very large number of plastics have been collected from various places such as tourist & public places. High Density Polyethylene Plastic is collected, cleaned & used as a replacement for Aggregate in the manufacturing process of plastic paver block. The center government of India said that more than 30.5 lakh tone of plastic waste generated in 2018-2019 & 34 lakh tone waste was generated in 2019-2020, 2020-2021-year waste is not calculated India's plastic waste generation more than doubled the last 1-decade years within average annual increase of 21.8 percentage per year. Plastic Paver Block project is helpful in reducing plastic waste in different proportion with aggregate. The degradation rate of plastic is very slow then other waste hence the project is helpful in reducing plastic waste on the earth in useful way. The study of plastic paver block has clearly established that plastic paver block is better alternative to normal cement paver block.

Keywords - Waste plastic, Concrete, Plastic pieces, Compressive strength, Pavement block.

I. INTRODUCTION

As the world's population grows, so does the waste. With the growing consumer population, the production of non-degradable waste material has created a waste disposal crisis. One of the solutions to this crisis of disposing problem is to recycle waste into useful product. Many governments agency, private organization & individuals are in the process of completing various studies and research project on the feasibility of using waste plastics, environmental friendliness, and performance, saving our world from environmental pollution. As development progress, so does the cost of construction and sidewalk maintenance. The product is available in various sizes & shapes such as rectangular, square & round blocks of different sizes.

Plastic is very common material that is now widely used by everyone in the world. Recyclable plastic plays a major role in this period as it is compact & light in the weight. The big problem with plastic is its decomposition. Plastics are made from polymer chemicals and are not biodegradable. The use of eco-friendly and lightweight building material has grown in popularity in the building industry. Consumption of plastic materials from 5 million tonnes in the 1950^{s} to 100 million in the 2000^{s}.

A large number of face-lifts are being provided along the sidewalks. These paving blocks are an ideal material for a great look and finish on the sidewalk, which is versatile pleasing, efficient & economical. Requires proper maintenance if properly constructed and laid. Most of the concrete paving blocks constructed in Indian are also working satisfactorily but the occasional failure of two main factors leads to more wear on the surface and variation in the strength of the block. Most of the replacement in our project are done by volume and weight calculation. We change plastics together, so our plastic replacement percentage is 0 %, 2.5 %, 5 %, 7.5 %, 10 %, 12.5 %, 15 %, 17.5 %, 20 % plastic weight is used to replace to aggregate for manufacturing of paver block. In this project study of recycled plastic waste is presented in crushed form. Plastic waste material has been replaced by weight. We used HDPE granules, coarse aggregate, fine aggregate, cement and water in different proportion. Paver blocks were created and tested to the delight of IS code. The result of this work suggests that those without ready-made paver block may go for use in areas up to a light traffic area.

Aim: - To Prepare Eco-friendly Pavements Blocks Using Waste Plastic.

Objective: -

1. To prepare pavements block by partial replacing aggregate with waste plastic.

2. To test compressive strength of plastic pavements block.

3. To compare compressive strength of plastic pavement block with conventional pavements block.

II. LITERATURE REVIEW

1. Critical Review on Types of Bricks Type 14: Plastic Sand Bricks:

Manish kumar sahu, lokesh singh:

Brick is one of the most common masonry construction units used as a building material, due to demand various types of waste have been investigate for inclusion in bricks, there is a significant imbalance between the availability of traditional building material and their demand in recent times. On the other hand, plastic waste is abundant and disposal of waste plastics is the biggest challenge as frequent reuse of PET bottles poses a potential risk of conversion into toxic substances and very little plastic waste is recycled. This paper deals with the recycling and production process, the materials used as well as the testing method of plastic sand block.

2. Manufacturing and Testing of Plastic Sand Bricks:

Mr. N. Thirugnanasambantham, P. Tharu n Kumar, R. Sujithra, R. Selvaraman, P. Bharat hi:

The plastic is biodegradable substance that takes thousands of years to decompose water pollution for land as well as environment. The amount of plastic waste in the municipality is solid waste (MSW) is expanding rapidly. It is estimated that the utilization rate is doubled for every 10 years plastic has been used extensively, the largest plastic waste polyethylene (PE). The use of earth-based clay material reduced resources and environmental degradation. This project is wasteful as the clay required for brick is huge. Plastic is effectively used to reduce the space required to dispose of this waste. This protects against various deadly diseases polyethylene (PE) bags are cleaned. Joined together in different ratios to obtain high strength brick with thermal and sound insulation properties. This is great way to avoid plastic deposits waste helps to conserve energy, reduce the total cost of construction and so on. The project seeks to make plastic sand bricks using waste plastic.

Pooja Bhatia

Most developing nations lack proper solid waste management systems difficulties in the sample collection and treatment phase. Low Density Polyethylene (LDPE) contributes as a major source of such pollution due to the widespread use of its products including water bags, thin bags, wrapping paper, etc. Disposable plastic that is disposed of groundwater filling that will affect the groundwater as well as the surrounding soil. A relatively simple one the technology proposed in this paper is LDPE bound sand blocks and pavers. As the size of the sand particles decreased, the density and compressive strength increased. Sample also exhibit higher impact resistance compared to conventional clay paver block.

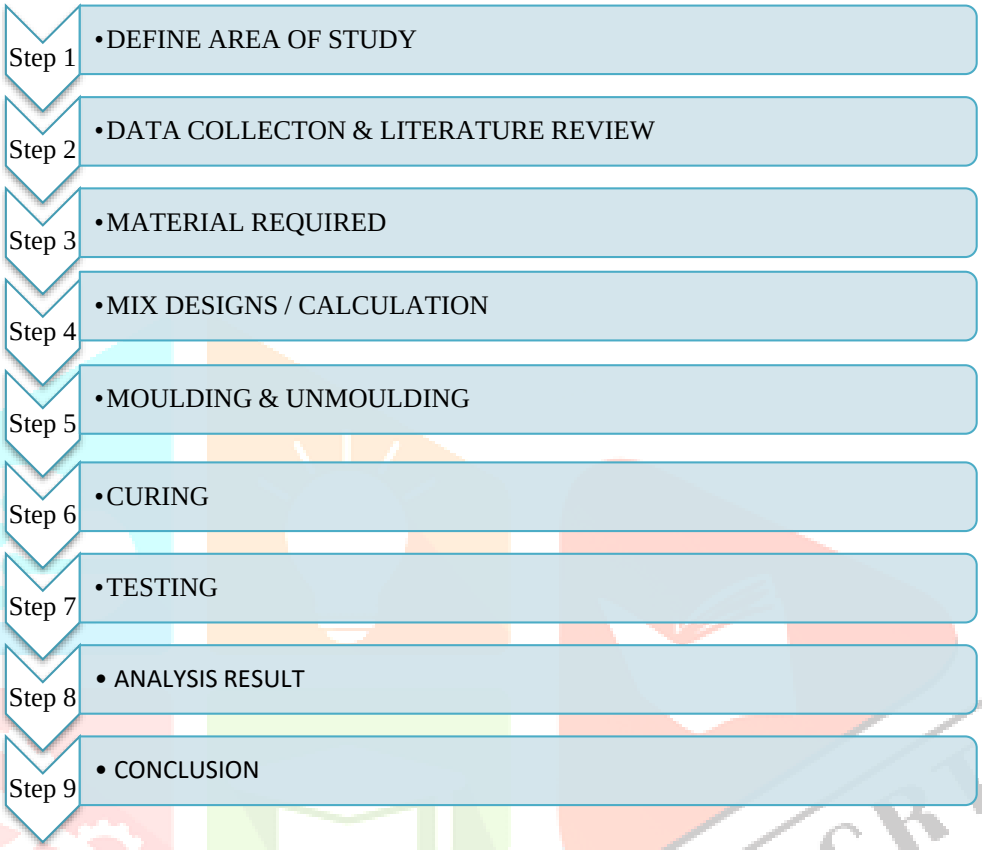
Aarti Ghude

The plastic is non-biodegradable material. The amount of plastic in municipal solid waste has increased fast day by day. Plastic can be reused after use. There are many types of plastic such as high-density polyethylene (HDPE), the aim of this project is to change the bonding given by cement in paving. Blocks with molten plastic waste. Plastic degradation is a very long process may apply. Thousands of years so a project helps reduce plastic use. In this facilitation, we use nature waste in harmony with fine & rough. Paver blocks were created and tested. Plastic paver blocks have low water absorption capacity.

Avinash G B, Roja A P, Santosh M R

Plastic paver block is made using waste plastic. There is a lot of plastic disposal or incineration brought into the separation area is contaminated atmosphere & air. Garbage plastic is heated and sand is poured into it by hand, also runs mechanically. The present work consists of 40 %, 50 %, 60 % & 70 % by weight of sand required to fill plastic waste paver mold. In it four-tasks, it was found that at least 60 % waste must be added to get the desired mold size and 70 % waste add.

III. METHODOLOGY



IV. Advantages of Plastic Paver Block:

- Good quality control in a factory-made paver block offers the high durability of plastic pavements block is almost same as conventional paver block.
- The surfacing system provides easy and eco-friendly access to underground utilities, the sidewalk was unharmed.
- The construction method of paving block surface is labor-intensive & require less sophisticated equipment.
- This project allows waste plastic to recycling.
- Any shapes can be possible for decorative purpose.

V. Ingredients of Plastic Paver Block:

Plastic paver block uses the same material as conventional concrete, plastic pieces is main material for making this block.

1) Cement
2) Stone Chips
3) Dust
4) Plastic Pieces
5) Water

Cement: Cement is generally can be defined as a material which possesses very good adhesives & cohesive properties which make it possible bond with other material to form compact mass.

1) Ordinary Portland Cement
2) Pozzolana Portland Cement

Dust: Dust is made of fine particles of solid matter. On earth, it generally consists of particles in the atmosphere that come from various sources such as soil lifted by wind. The dust is used in our paver block to reduce of pores.

Stone Chips: The size of stone chips is bigger or smaller than 4.75 mm or almost same as 4.75 mm. The main reason of using stone chips in the plastic paver block is for strength of block. For this study 4.75 No sieve is used. Which stone chips passing through 4.75 No sieve is used in plastic paver block. The stone chips are used in plastic paver block is use for strength of block. Crushed sand as fine aggregate: Manufactured sand which satisfies the requirements of IS 383-1970 is used to make smart dynamic concrete and not river sand. Crushed sand is used for reducing of pores in the block.

Plastic Pieces: In this project we are using pieces of High-Density Polyethylene plastic because of getting strength from thickness of plastic. We collect plastic from our college campus & household waste material. We put the collected HDPE plastic in a plastic Grinder for creating Pieces less the 8 mm for passing from sieve.

Water: Portable water is used to make Plastic Paver Block for curing. Above ingredients are used to make plastic paver block.

VI. CALCULATION OF MATERIAL USE IN PAVER BLOCK

Mix design ratio = 1: 2: 4 (1 = Cement, 2 = Dust/Sand, 4 = Stone chips)

Size of paver bock = 3.5 KG

Weight of Cement = 3.5/ 7 = 0.5 Kg Cement

Weight of Dust = 0.5 X 2 = 1 Kg Dust

Weight of Aggregate = 0.5 X 4 = 2 kg Cement

If we replace plastic with stone chips at 2.5%, the Calculation will be like this.

4 X (2.5/ 100) = 100 Gm Plastic

Aggregate weight after adding Plastic = 2 – 0.100 = 1.9 Kg Aggregate.

Plastic Percentage in Paver Block	Weight of Cement	Weight of Dust	Weight of Aggregate	Weight of Plastic Pieces
0%	0.5 Kg	1 Kg	2 Kg	0 Kg
2.5%	0.5 Kg	1 Kg	1.9 Kg	0.1 Kg
5%	0.5 Kg	1 Kg	1.8 Kg	0.2 Kg
7.5%	0.5 Kg	1 Kg	1.7 Kg	0.3 Kg
10%	0.5 Kg	1 Kg	1.6 Kg	0.4 Kg
12.5%	0.5 Kg	1 Kg	1.5 Kg	0.5 Kg
15%	0.5 Kg	1 Kg	1.4 Kg	0.6 Kg
17.5%	0.5 Kg	1 Kg	1.3 Kg	0.7 Kg
20%	0.5 Kg	1 Kg	1.2 Kg	0.8 Kg

VII. MIX PROPORTION

Concrete mix is designed for plastic paver block this is standard code is mix design of plastic paver block is different from conventional paver block. Mix design is used for getting optimum strength to the block.

Paver Block Manufacturing using Different Proportion of Plastic Pieces

1ST Conventional Paver Block

Block	Manufacturing Date	Weight After Unmolding	Weight After 7 days	Weight After 14 Days	Compressive Test
	21 / 04 / 2022	3.450 Kg	3.594 Kg	3.501 Kg	28 N/mm^2

2nd Plastic Paver Block of 2.5%

3rd Plastic Paver Block of 5%

Block	Manufacturing Date	Weight After Unmolding	Weight After 7 days	Weight After 14 Days	Compressive Test
	11 / 04 / 2022	3.390 Kg	3.390 Kg	3.397 Kg	12 N/mm^2

4th Plastic Paver Block of 7.5%

Block	Manufacturing Date	Weight After Unmolding	Weight After 7 days	Weight After 14 Days	Compressive Test
	11 / 04 / 2022	3.327 Kg	3.450 Kg	3.461 Kg	15 N/mm^2

5th Plastic Paver Block of 10%

Block	Manufacturing Date	Weight After Unmolding	Weight After 7 days	Weight After 14 Days	Compressive Test
	15/ 04 / 2022	2.980 Kg	3.095 Kg	3.104 Kg	19 N/mm^2

6th Plastic Paver Block of 12.5%

Block	Manufacturing Date	Weight After Unmolding	Weight After 7 days	Weight After 14 Days	Compressive Test
	15 / 04 / 2022	3.050 Kg	3.183 Kg	3.195 Kg	20 N/mm^2

7th Plastic Paver Block of 15%

Block	Manufacturing Date	Weight After Unmolding	Weight After 7 days	Weight After 14 Days	Compressive Test
	05 / 04 / 2022	3.620 Kg	3.850 Kg	3.862 Kg	25 N/mm^2

8th Plastic Paver Block of 17.5%

Block	Manufacturing Date	Weight After Unmolding	Weight After 7 days	Weight After 14 Days	Compressive Test
	18 / 04 / 2022	2.117 Kg	2.300 Kg	2.310 Kg	22.5 N/mm^2

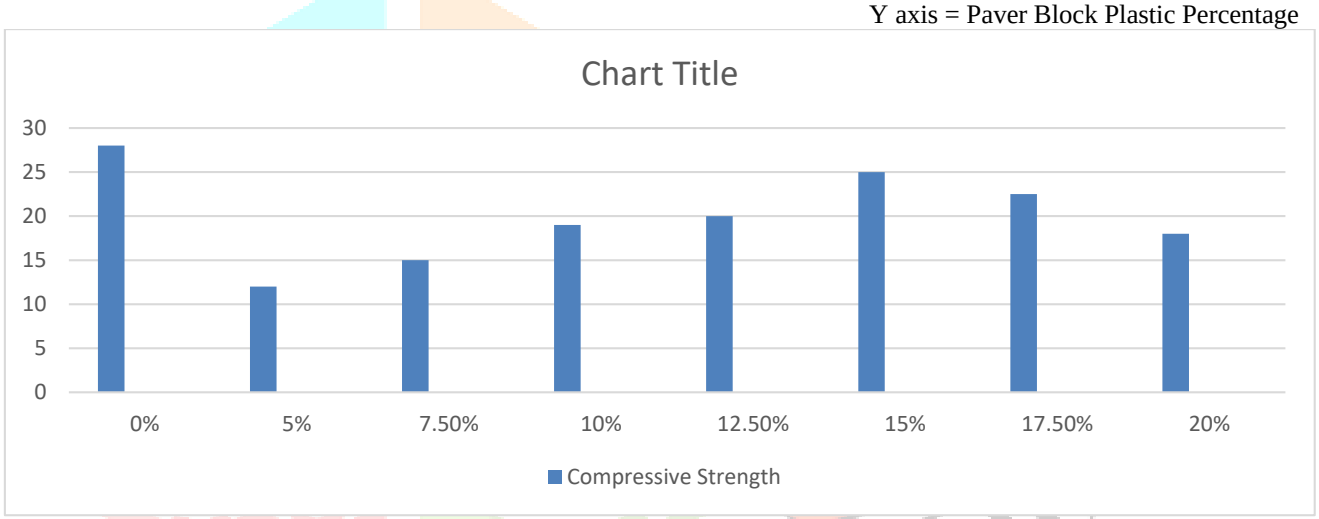
9th Plastic Paver Block of 20%

Block	Manufacturing Date	Weight After Unmolding	Weight After 7 days	Weight After 14 Days	Compressive Test
	18 / 04 / 2022	2.336 Kg	2.517 Kg	3.528 Kg	18 N/mm^2

VIII. Result

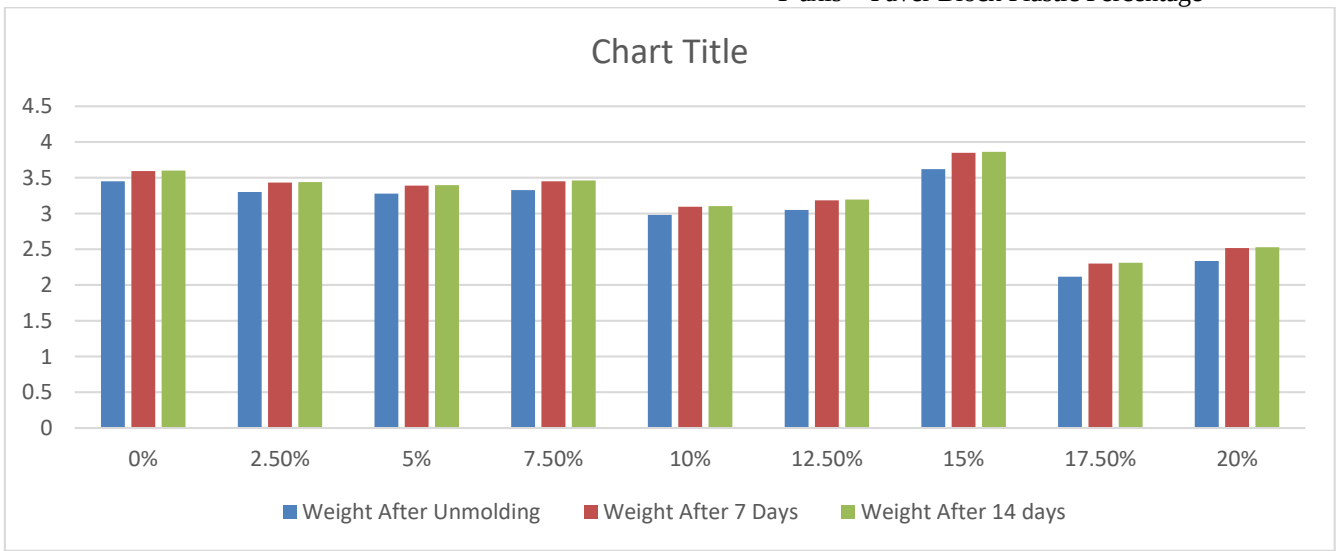
Compressive Strength of All Paver Block:

Scale: -
X axis = Compressive Strength
Y axis = Paver Block Plastic Percentage



Water Absorption Test of All Paver Block:

Scale: -
X axis = Water Increasing Percentage in KG
Y axis = Paver Block Plastic Percentage



From above Compressive strength Chart it concludes that the strength 15 % Plastic content used Plastic Paver Block is almost near to the Conventional Paver Block, as respectively 25 N/MM2 & 28 N/MM2

IX. CONCLUSION

- It is found that the compressive strength of 5%, 7.5 % of plastic paver block very low respectively 12 N/MM^2 & 15 N/MM^2.
- Strength of a block made using 15 % plastic is 25 N/MM^2, it is almost close to the conventional paver block of 28 N/MM^2.
- The compressive strength result showed that if we use plastic less & more than 15 % then the strength of plastic paver block will decrease.
- In 15 % of plastic block optimum content of plastic is achieved.

X. FUTURE SCOPE

Plastic sand brick gives us a good way to work on creative things related to the plastic and to try inventing some new civil engineering material which shows some amazing response. After preparing block out of plastic waste it is conclude that this project will be proved very helpful for the urban and costal region people, will have great impact on environment pollution created by plastic waste. Plastic Paver Block are affordable for people as compared to conventional block. For future work we can also add Fly Ash, Coconut Fiber, Rise Husk, etc. WE can use this material with plastic with specific ratio. We can also add some Hardener material, Various Plasticizer.

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