

A
MINOR PROJECT REPORT on
PLASTIC PAVER BLOCK

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degree of

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(Civil Engineering)

Under the Guidance of
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CERTIFICATE

This is to certify that the Minor Project report on “Plastic Paver Block” is submitted by **Harshit Sharma (202277)** as Minor Project work for MINOR PROJECT (BT CE 703 A) in the curriculum of Bachelor of Technology from Central University of Haryana, Jant-Pali, Mahendergarh, Haryana, is work carried out by him under my supervision and guidance. I wish the better future for him

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ABSTRACT

The purpose of this study is to using plastic waste instead of cement in paver blocks, cutting paver block costs when compared to concrete paver blocks, which are more expensive currently on the market. At present, India produces plastic trash amounts to roughly 3.5 million tonnes every year. But the fact is that the rate of decomposition of plastic garbage is also very sluggish. As a result, our project contributes to the reduction of plastic waste and its conversion into a usable resource. In this experiment, we combined plastic trash with quarry dust, coarse aggregate, and ceramic powder in various amounts. The paver blocks were produced and tested, with positive results. It is most economical and environmental friendly solution present in the construction industry for plastic wastes

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1. INTRODUCTION

General Plastics are hazardous material due to the difficulty of decomposition. But also the utilisation of plastic is growing by the day in our life. Here we aim to convert the waste plastic into a paver block. Plastic we used here is collected from a plastic recycling unit. In a year, currently about 3.5 million India dumps thousands of tonnes of plastic waste. The rubbish that has been dumped pollutes the environment. As a result, it has an impact on both humans and animals both direct and indirect methods. Plastic trash can be used to substitute cement, which has both environmental and economic benefits.

Paver block paving is versatile, aesthetically attractive, functional, and cost effective and requires little or no maintenance if correctly manufactured and laid. Most concrete block paving constructed in India also has performed satisfactorily. The use of Nonconventional and innovative materials, and recycling of waste materials in order to compensate the lack of natural resources and to find alternative ways conserving the environment. We made two types of paver blocks using various ingredient mix proportion ratio as like sand, coarse aggregate, RCA (**recycled concrete aggregate**) .we done 12 sample of plastic paver block. It is very easy to use survival for predistrians.it also shows good heat resistance compared to the concert paver block.it can be used in gardens, pedestrian paths and cycle way etc. The main aim of the project is to use plastic waste instead of cement. Already government has banned on plastic but we also tried to remove remaining available plastic on our surrounding area because of it is badly affected on human beings and animals life directly or indirect way.

2. OBJECTIVE

- To produce paving blocks by using collected HDPE plastic wastes (plastic bags).
- To investigate the compression strength, water absorption and melting point of the paving block.
- To compare the paving block with the other blocks available in the market.
- To devise a method for efficiently and effectively utilising waste plastics.
- To reduce natural resource usage in the production of blocks and paving bricks.
- Minimize and reuse waste plastic generation on land and water to prevent land and water degradation and pollution hazards.
- To manufacture materials that are affordable to the average person.

3. SCOPE

- Significant amount of plastic waste is removed
- Increases self employability
- Innovative method to convert plastic waste to usable product.

4. MATERIAL COLLECTION

A. Collecting plastic waste :- we are collected the plastic waste from the neighbour village , Plastic is thrown here and there in the village which pollutes our environment.



Figure 9 collecting plastic waste

B. Extracting sand and aggregate from brokeed cubes :- as we are manufactured plastic paver block from RCA , we are extracting sand and aggregate from broken cubes which is available in our laboratory , we convert them into small size with the help of Los Angeles abrasion testing machine.

after machining process we sieves the material by 13.2 mm sieve and retained on 10 mm sieve . After these process we get the aggregate and same process for extracting the sand by passing the material from 4.75 mm sieve .



Figure 10 process of extracting sand and aggregate

5. MATERIALS USED

1.HDPE Plastic HDPE (High Density polyethylene) is a thermoplastic polymer produced from the monomer ethylene. HDPE is known for its high strength-to-density ratio. The density of HDPE can range from 930 to 970 kg/m³ . Although the density of HDPE is only marginally higher than that of low-density polyethylene, HDPE has little branching, giving it stronger intermolecular forces and tensile strength than LDPE. The difference in strength exceeds the difference in density, giving HDPE a higher specific strength. It is also harder and more opaque and can withstand somewhat higher temperatures (120 °C/248 °F for short periods). They are very slow to undergo microbial degradation and can stay intact in the environment for up to centuries. Production of HDPE and other plastics is steadily increasing year by year because of their demand in daily life activities. The packaging industry has been experiencing drastic growth over the past few years. The increased demand for packaged goods has accelerated the demand for high-density polyethylene (HDPE)

Density 930 – 970 kg/m³

Melting point 110 – 140 °C

Thickness 0.4mm – 25mm

Water Absorption < 0.05%



Figure 3 plastic waste

2. SAND :- fine sand are part of quarry like other materials that excavated from the ground such as rock, stone, riprap, aggregate, slate or gravel. Sand is actually some grainy materials made by mineral and rock particles, much coarser than silt and finer when compared to gravel, when it is measured 8 by size. Sand cannot be renewed and it is defined as non-renewable resources and sand is highly demanded for concrete making. Sand has the capability of improving the plastic mechanical properties such as rigidity and characteristic strength. Another study showed that clay particles; due to their large surface area, sand was found to better bind with plastics. Partical size is smaller than 4.75 mm



Figure 4 Sand

3.AGGREGATES Aggregates are raw materials that are produced from natural sources and extracted from pits and quarries, including gravel, crushed stone, and sand. When used with a binding medium, like water, cement, and asphalt, they are used to form compound materials, such as asphalt concrete and Portland cement concrete. Partical size :- range from 13.2mm – 10 mm sieve tested according to Indian standard IS:383-1970.



Figure 5 Aggregate

6. PROCEDURE

A. Plastic Composition

HDPE plastic waste was collected from dumping site and parcel wraps . The plastic bags were clean, free from other ingredients inside the poly bags. These bags were heated till it turns to viscous form. About 150°C to 160°C heat was required to melt the plastic bags.



Figure 6 Plastic Melting

B. PREPARATION OF SAND AND AGGREGATE

Pre heat the both sand and aggregate at 105* degree Centigrade . Pre heat them to remove the moisture.



Figure 7 Pre heating of Sand and Aggregate

C. Mixing Procedure Manufacturing of plastic paver blocks had to be done in open places. A metal tin with fire under it was arranged to heat the plastic. The plastic bags were heated according to the weights given in the mix design. While heating care had taken by wearing gloves to hands, a long rod used for mixing the plastic waste. When the plastic changes to viscous form fine sand added into the mixture. The both materials are mixed thoroughly. The mixing process should be done fast. The procedure repeated for coarse sand according to ratio. Oil was applied on the mould to get friction resistance when the block removed after placing. The mixture of plastic and sand then poured into a mould and kept for drying for 24 hours. After completion of 24 hours, the block gets hardened and it is removed from the mould.



Figure 8 Mixing

D. CASTING

After mixing of all the materials together ,Fill them into Mould and take them on the vibrator machine for 30 second.

The mould should be IRON mould



Figure 9 casted blocks over vibrating machine



Figure 10 casted paver block

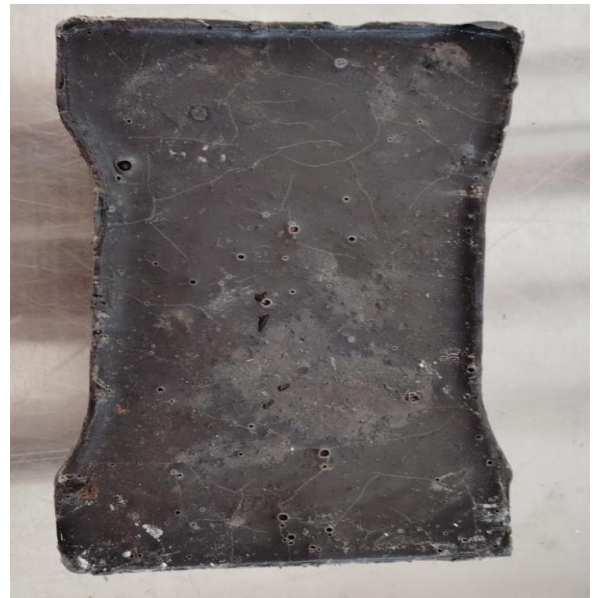


Figure 11 plastic paver block

7. MIX PROPORTION

Particular	Plastic	Sand	Aggregate
Block type 1	1	2	2
Block type 2 (RCA)	1	2	2
Block type 3 (RCA)	1.25	2	2

8. RESULT AND ANALYSIS

1. Compressive strength test

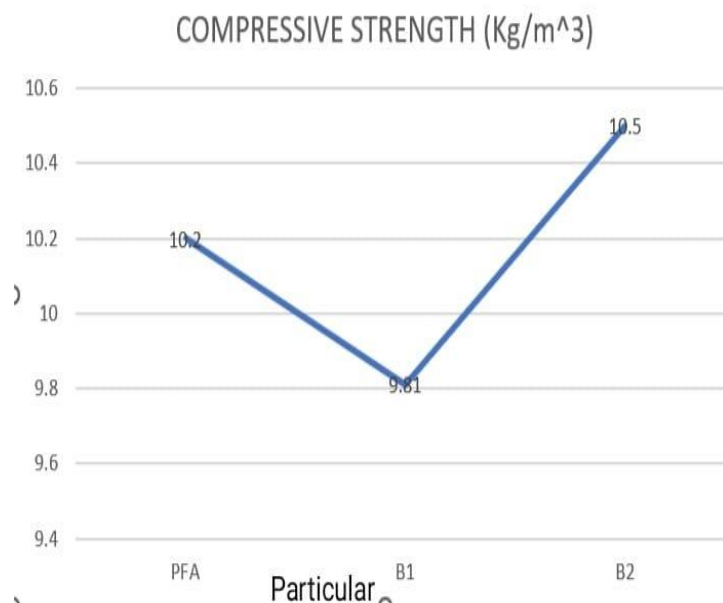
If a material is introduced in construction field, the main aspect to be considered is strength. To find the resistance of this plastic paver under compression, compressive strength test has to be done by using UTM (Universal Testing Machine). The surface of the paver block should be plane in all the sides, so that the load can distributed evenly. The importance of finding compressive strength is to measure the load bearing capacity of the block.

The compressive strength of the paver block is noted 10 (N/mm²)



Figure 12 compressive strength testing

PARTICULAR	COMPRESSIVE STRENGTH (Kg/m ³)
PFA	10.2
B1	9.81
B2	10.5



2. Melting point test

As plastic can melt for heat, so melting point test is conducted to the plastic bricks to check at what temperature the brick will melt. The produced paver block will be kept in an oven for 2 hours and after 2 hours it's condition will be verified.

Temperature (°C)	State
50	No change
100	No change
150	Melts



Figure 13 melting point testing

3. Water Absorption Test

Water absorption is used to determine the amount of water absorbed under specified conditions.

We are tested our plastic paver block

The result is occurring only 3% water is observed by paver block.

Initial Weight :- 3093 gm

Final Weight :- 3213 gm

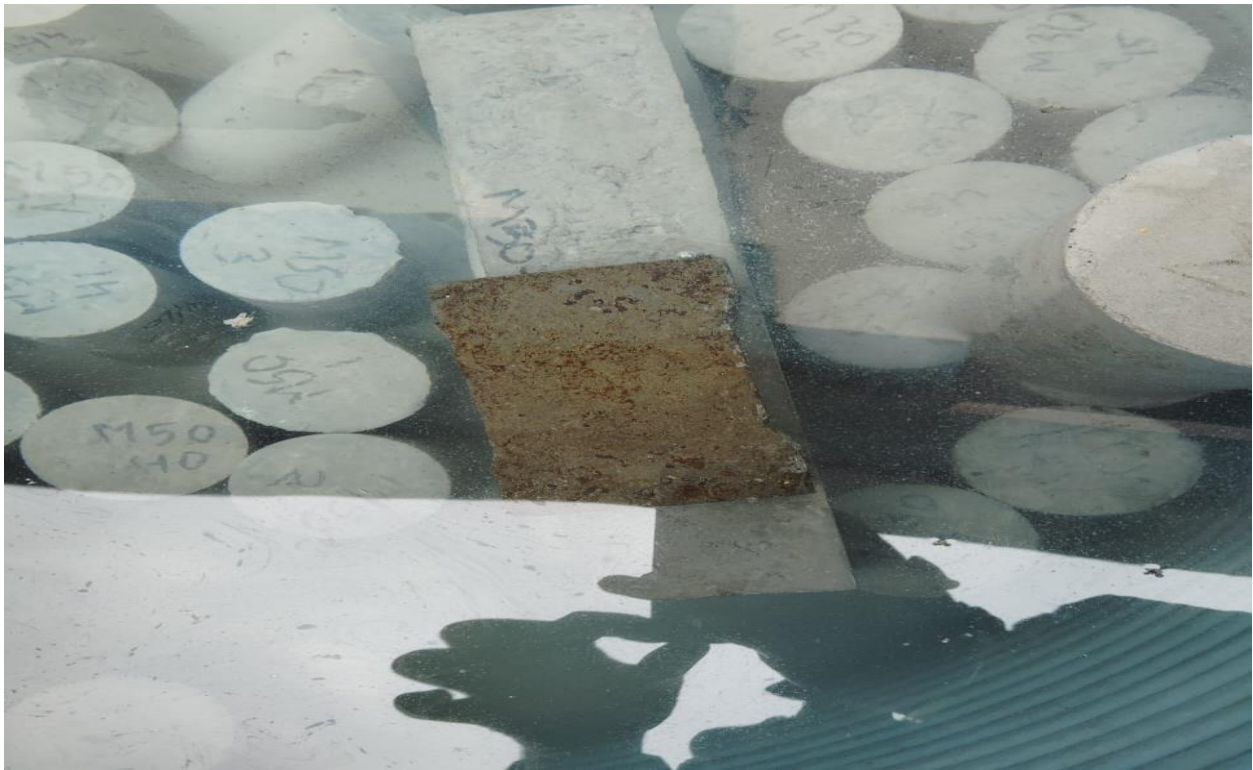


Figure 14 paver block shifted under water tank



Figure 15 initial weight before testing



Figure 16 final weight after testing

9. ADVANTAGES OF PLASTIC PAVER BLOCK

The cost of plastic paver block is low compared to other block available in the market which is economical. The production of plastic paver block by using only waste plastic and sand is an innovative attempt to reduce the pollution occurred by plastic bags. The utilization of waste plastic in production of paving block has productive way of disposal plastic waste. It also reduces greenhouse emissions and the consumption of raw materials. It also minimizes the health risk and also help the economy. Safer and clean environment will be created. On top of that, plastic paver block is good in terms of water absorption as it absorbs 1.8 % which is lower than concrete paver block (4.91%). Plastic paver block is lightweight (2.4 kg) compared to conventional block (3.3 kg) for 60mm block. These blocks made by only waste HDPE plastic and sand leads to total replacement of cement in designed ratios..

- They are light in weight
- They are water proof
- They are recyclable

10. CONCLUSION

From the above study, the analysis concluded that :-

- The waste plastics can be used in the paver block production.
- The density of plastic paver block is 2500 kg/m^3 which is higher than concrete paver block's having density 2200 kg/m^3 .
- Plastic is an innovative material for using it in construction purpose.
- Plastic paver blocks possess more advantages which includes resource efficiency.
- The utilization of waste plastic in production of paver block has productive way of disposal of plastic waste
- Compressive strength of plastic paver block is found to be 10.43% more than concrete paver block for ratio 1:1.5:1.5.
- It can be used in non-traffic and light traffic road, gardens, pedestrian path etc.
- It requires less time for manufacture.
- By using the plastics in paver block, reduces the weight up to 15%
- Water absorption through of plastic paver block is less than concrete paver block, hence proper drainage system will be required to take care of runoff.