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A Paper on Experimental Investigation on Concrete Paver Block and Plastic Paver Block

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Abstract: ***India is a developing country and construction of roadways and buildings plays a main role in overall development. As the demand of paver block is increasing day by day for construction of the roadways the requirement is very high and it is necessary to find sustainable alternative to concrete paver block.***
The paver blocks are normally used in construction of roadways, specifically in construction of footpaths, parking areas, garden, temporary road etc. The main objective of this work is to use PVC plastic replacing cement and reduces cost and to give sustainable solution pollution. Disposal of PVC plastic waste is becoming critical day by day. Millions tone of plastic waste generated every year in world.
In India per year around 8 million tons PVC plastic are use. In this topic, we are utilized PVC plastic waste which is waste of PVC pipe industry. The research work is determination of the effect of use PVC plastic waste powder as replacement of cement in percentage 0, 10, 20, and 30. Cube specimens of 36 numbers were cast cured and tested cube for 7, 14, and 28 days compression strength.
We are designed paver block for medium traffic and use grade M-40 as per is code 15658:2006. Plastic is harmful material for human beings, animals, nature etc.it reduce the quantity of cement to be used in concrete. Also PVC powder is provided to be economical and considered as environmental friendly material. In this work it is found experimentally that Plastic paver block gives better strength as compare to conventional paver block.
Keywords: Paver block, PVC plastic waste, compressive strength, M-40(mix design), crushed stone.

I. INTRODUCTION

Paver block has been briefly used in other country including in India for some specialized problem solving technique. Paver gives better performance and it is also available in different shape, sizes, colours and patterns .zigzag paver block gives better performance.

These block are used non traffic, light traffic, medium traffic and heavy traffic area. In this project we are used PVC waste plastic to reduce cost and environment. These waste plastics are to be effectively used. Today, it is impossible for any vital sector to work efficiently without usage of plastic.

We are use cement, coarse aggregate, crushed stone, and PVC plastic. Specific gravity (density) The true specific gravity of PVC is about 1.4, which is comparatively heavy among plastics, PVC Polyvinyl chloride is the world's third-most widely use, after polyethylene and polypropylene.

In India 8 million tonnes are produced per year. PVC comes in two basic forms: rigid and flexible. The rigid form of PVC is used in paver block. Strength increase after replace by cement with plastic as compared to conventional block. Paver mould size is 240 × 110 × 80 mm is used. We are designed for medium traffic then choose M-40 concrete mix design as per is code 15658:2006. PVC waste plastics provide to be an economical material for use in concrete work. The main purpose of this experiment is to reduce pollution.

A. Advantages

1) To safeguard the environment by utilizing waste property.
2) Strength comparison between plastic used paving block more strength as compare to concrete paver block.
3) There is a wide range of type, colours and sizes of block pavers hence there are so many design possibilities.
4) To provide an economical construction material.
5) Repairing work of plastic paver block is very easy.
6) Low cost as compare to concrete paver block.
7) To use various waste material in construction methodology.
8) Easy installation.

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B. Different Traffic Of Paver Block And Grades Uses

1) Non-traffic Areas:- Building premises, public garden, domestic drives etc. Grade M-30
2) Light Traffic:- shopping complexes, car parks, rural road with low traffic, residential road etc. Grade M-35
3) Medium Traffic:- city streets, small market road, medium market road, low volume road etc. Grade M-40
4) Heavy Traffic:- bus terminals, industrial complexes, mandi houses, factory floor, industrial pavement etc. Grade M-5
5) Very Heavy Traffic:- container terminals, ports, docks yards, airport pavements etc. Grade M-55

II. MATERIALS

A. Cement

Cement is a binding material it is hard it plays important role in construction; a substance that sets hardens and adheres to other materials, binding together. Here, ordinary Portland cement of 53 grade is used.

Table-I: Properties of cement

Property	Value
Specific gravity	3.00
fineness	5.3
Specific gravity	34
Initial setting time	45 minutes
Final setting time	600 minutes

B. Coarse Aggregate

Locally available coarse aggregates are used in this work. Various types of coarse aggregate available various shape in construction aggregate passing through 12mm sieve and retained on 10mm sieve and tested as per standard specification IS:383-1970.

Table-II: Properties of coarse aggregate

Description	Value
Size	10mm
Impact value	19.6 %
Crushing value	23.71

C. Crush Stone Aggregate

Crushed stone or angular rock is a form of construction aggregate, typically produced by mining a suitable rock deposit and breaking the removed rock down to the desired size using crushers. It is distinct from gravel which is produced by natural processes of weathering and erosion, and typically in shape.

Table-III: Properties of Crush Stone aggregate

Description	Value
Size	6mm
Impact value	27.16 %

D. PVC Plastic

PVC is commonly abbreviated as Polyvinyl chloride, is the world's third most widely produced synthetic plastic polymer, after polyethylene and polypropylene. In this work, PVC More than 8 million tons of plastic is dumped into our oceans every year. plastic is crushed to powder and replaced by cement in 0%, 10%, 20% and 30%.

Some of the most significant properties of Polyvinyl Chloride (PVC) are:

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Table-IV: Properties of PVC plastic

Description	Value
Density	specific gravity 1.4
Water absorption	0.04 – 0.4
Melting point	100°C to 260°C
Hardness	Rigid PVC is very hard
Economics	Readily available and cheap.



Fig.1 PVC Plastic Waste

E. Water

Water resources are natural resources of water that are potentially useful it should be use potable water which increase strength.

III.MIX DESIGN

Mix design is most important parameter and from mix design to know quantity of material and gives proper proportion this is accurate method. Mix design prepared as per is code IS 15658: 2006 and IS10262: 2000

We are followed these two is code and to find proportion 0.8:1.13:2.23 For M-40.

IV.PREPARATION OF SPECIMEN

A. Mould Preparation

The plastic moulds having dog bone shape are used for casting paving block. They were made in such a manner as to facilitate the removal of the moulded specimen without any damage. The size of mould is 240mm x110mmx80mm.Mould as shown in fig.



Fig.2 Mould

B. Weighing

The proportions or materials are taken by weight or by volume. The procedure we adopted was by weighing of the material as it is more accurate in comparison with volumetric method.

C. Mixing

After weighing all the ingredients which are to be used are taken for mixing process. The mixing process can done either by hand mixing or machine mixing. At first, cement and sand with PVC powder was mixed uniformly. Then 10mm coarse aggregate is mixed along with this. Then small pond was created and calculated quantity of water is poured in the pond. As PVC plastic is mixed, it requires more water. Because, plastic has the basic property of high resistance to water and non-absorbents.

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D. Compacting and Vibrating

Compacting of concrete was done after placing the mixed concrete in the paver mould. The compaction work is carried out manually with tamping rods. The concrete was filled in three layers. Each layer was tamped 25 times to avoid voids, after that compacting mould placed on vibrator and vibrate it to achieve full compaction. The concrete should be properly compacted and vibrated to remove the water and air voids and confirms that the concrete becomes denser, as it improves strength of concrete.



Fig.3 Vibrating of concrete

E. Drying and Curing

The casted cube was prepared for drying for 24 hours in normal atmospheric temperature. After that, the concrete is demoulded and the blocks are cured with water to permit complete moisture for 7, 14 to 28 days. Curing tanks is changed every 4 to 5 days. After curing, the blocks are dried in natural air.

V. TESTING OF PAVER BLOCK

A. Compressive Strength Test

Compressive strength test, mechanical test measuring the maximum amount of compressive load a material can bear before fracturing. The test section, usually in the form of a block, is compressed between the platens of a compression-testing machine by a gradually applied load.

Compression strength= Applied load / cross sectional area



Fig.4 Compressive Strength Test Machine

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VI. RESULTS AND DISCUSSION

Testing the compressive strength property of paver block with different replacement under Compression testing machine and following results are obtained.

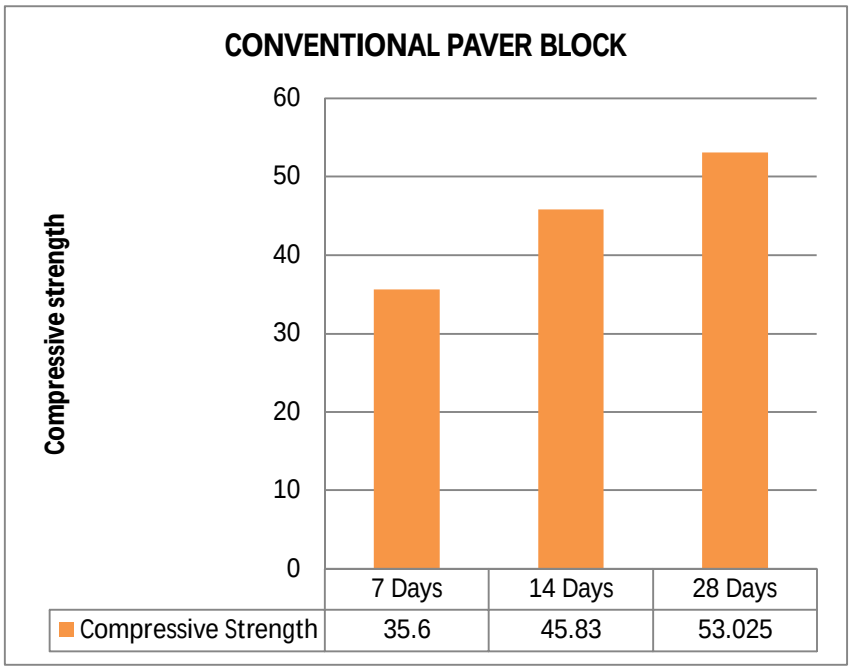


Fig.5 Conventional Paver Block

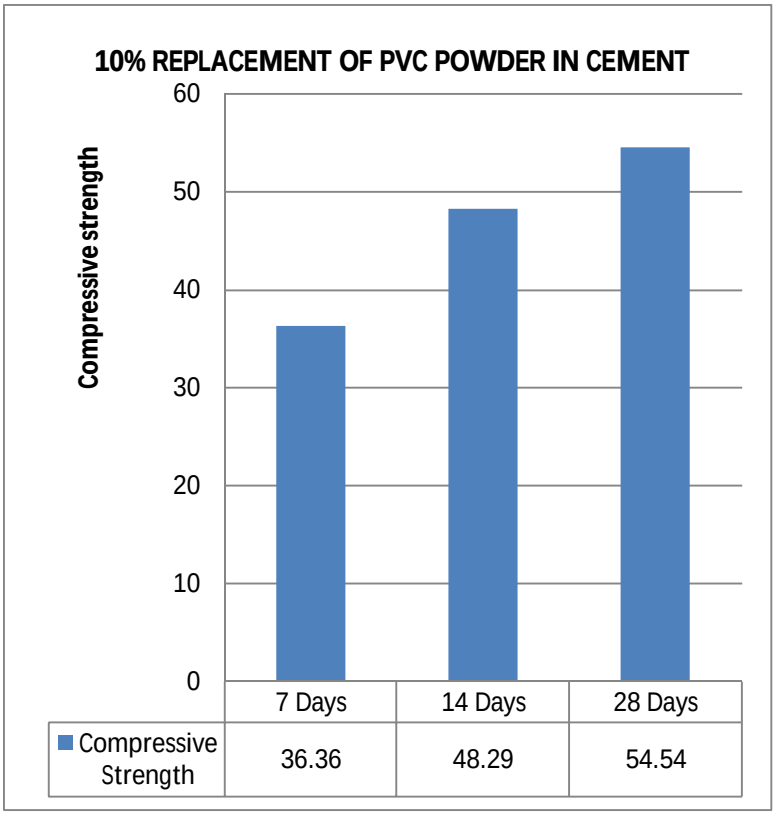


Fig. 6 10% Replacement of PVC Powder In Cement

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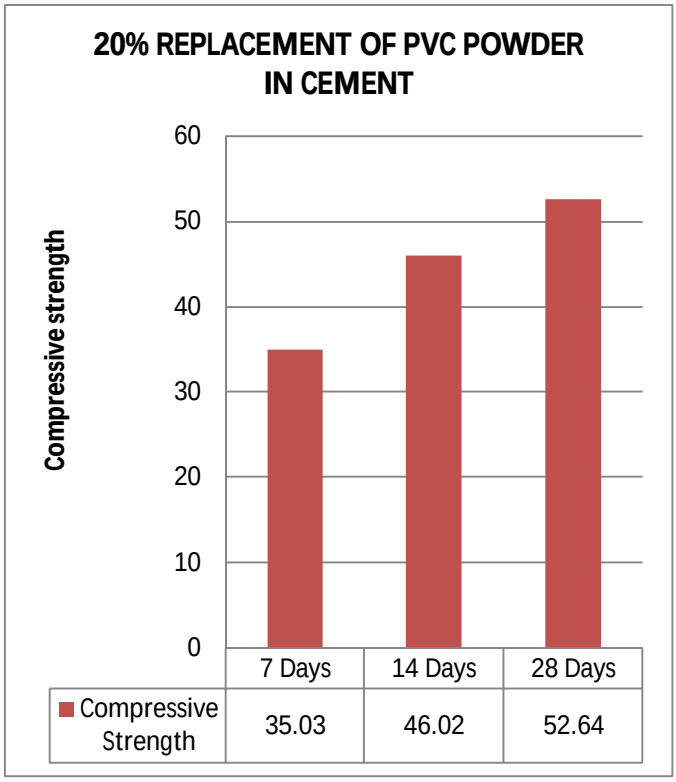


Fig.7 20% Replacement of PVC Powder In Cement

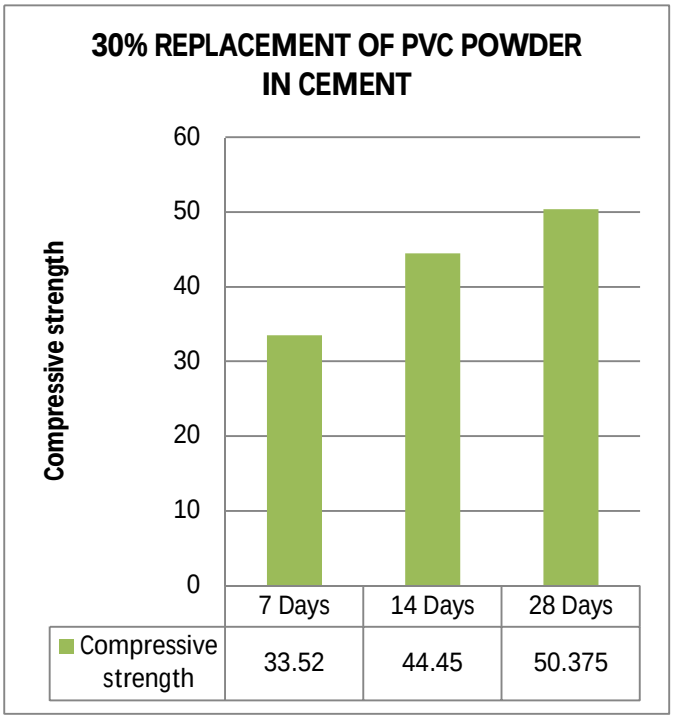


Fig. 8 30% Replacement of PVC Powder In Cement

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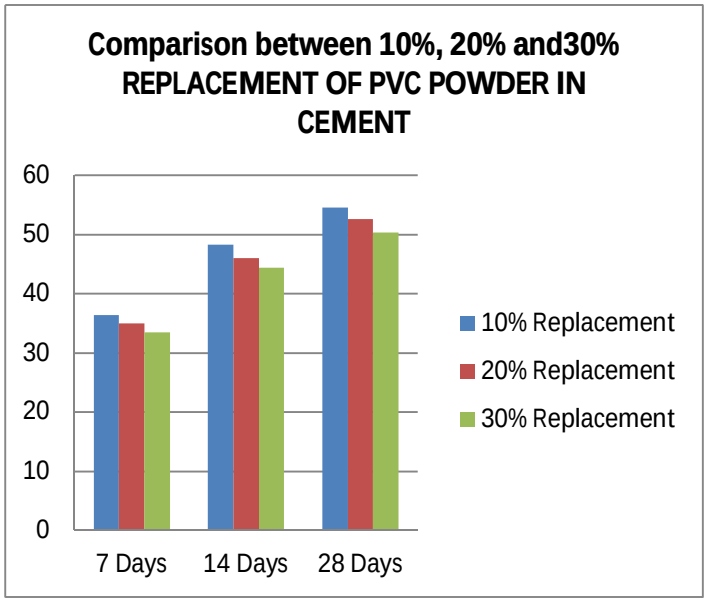


Fig. 9 Comparison Between 10%, 20% and 30% Replacement of PVC Powder In Cement

VII. CONCLUSION

From this experiment, it is concluded that:

A. Using PVC plastic with cement partially replacement 10%, 20%, and 30% reduce pollution.
B. Plastic is polluted ingredient in the nature so used in paver block to reuse the pollution in the area.
C. The finishing, shape, interlocking and appearance of the paver block are good.
D. From our experimental study, we concluded that 10% replacement of cement with PVC plastic is applicable.
E. Skilled labour not required for installation paver block.
F. Paver block are easily available in market.

VIII. ACKNOWLEDGMENT

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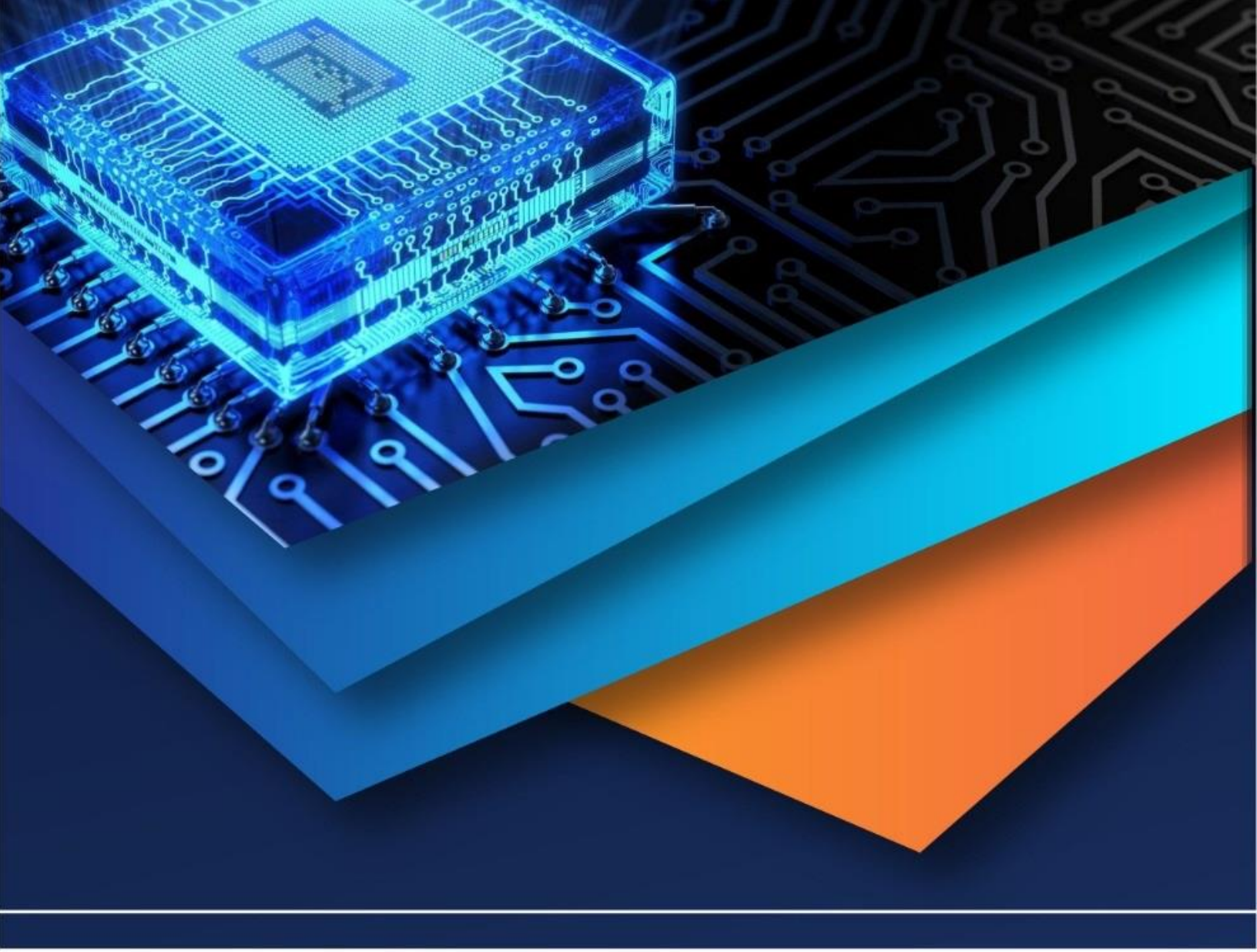
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