IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
PP 61-66

"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. In this work PVC plastic is used as partial replacement of cement in percentage in o, 10, 20, 30. Plastic is harmful material for human beings, animals, nature etc.; in India per year around 40 million tonns PVC plastic are use. 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, 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 .zig-zag 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 use. 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. About 40 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 × 100 × 80 mm are used. We are designed for heavy traffic M-40 concrete mix design.

A. ADVANTAGES

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

B. DIFFERENT TRAFFIC OF PAVER BLOCK AND GRADES USES

- Non-traffic Areas:- Building premises, public garden, domestic drives etc. Grade M-30
- Light Traffic:- pedestrian plazas, shopping complexes, car parks, rural road with low traffic, residential road etc. Grade M-35

- Medium Traffic:- city streets, small market road, medium market road, low volume road etc. Grade M-40
- Heavy Traffic:- bus terminals, industrial complexes, mandi houses, factory floor, industrial pavement etc. Grade M-50
- 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 plastic is crushed to powder and replaced for sand in 0%, 10%, 20% and 30%.

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

Table-Ⅳ: Properties of PVC plastic

Description	**Value**
Density	specific gravity 1.4
Water absorption	0.04 – 0.4
Hardness	Rigid PVC is very hard
Strength	Rigid PVC has extremely good tensile strength
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.

II. 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 **0.8:1.13:2.2** For M-40.

III. 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 x100mmx80mm.Mould as shown in fig.

Fig.2. MOULD

A. 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.

B. 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.

C. 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.4. VIBRATING OF CONCRETE

D. 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 14 to 21 days. Curing tanks is changed every 4 to 5 days. After curing, the blocks are dried in natural air.

Fig.4. DRYING 0F PAVER BLOCK

IV. Testing Of Paver Block

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, prism, or cylinder, is compressed between the platens of a compression-testing machine by a gradually applied load.

Compression strength= Applied load / plan area

Fig.5. COMPRESSIVE STRENGTH TEST MACHINE

V. Results And Discussion

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

TABLE V. CONVENTIONAL PAVER BLOCK

Curing days	**Applied load (kN)**	**Compressive Strength (N/mm^2)**	**Average (N/mm^2)**
7 Days	650	27.08	26.7
	630	26.25	
14 days	710	29.58	29.2
	690	28.8	
28 Days	750	31.25	30.6
	720	30	

TABLE VI 10% REPLACEMENT OF PVC POWDER IN CEMENT

Curing days	**Applied load (kN)**	**Compressive Strength (N/mm^2)**	**Average (N/mm^2)**
7 Days	665	27.70	27.5
	650	27.08	
14 Days	750	31.25	30.73
	725	30.21	
28 Days	770	32.08	31.5
	740	30.9	

TABLE Ⅶ 20% REPLACEMENT OF PVC POWDER IN CEMENT

Curing days	Applied load (kN)	Compressive Strength (N/mm^2)	Average (N/mm^2)
7 days	655	27.29	26.77
	630	26.25	
14 days	740	30.83	30
	700	29.17	
28 Days	730	30.44	30.01
	710	29.59	

TABLE Ⅷ 30% REPLACEMENT OF PVC POWDER IN CEMENT

Curing days	Applied load (kN)	Compressive Strength (N/mm^2)	Average (N/mm^2)
7 Days	640	26.6	26
	610	25.1	
14 Days	720	30	29.3
	690	28.75	
28 Days	710	29.5	28.81
	675	28.125	

VI. Conclusion

From this experiment, it is concluded that:-

1. Using PVC plastic with cement partially replacement 10%, 20%, and 30% reduce pollution.
2. Plastic is polluted ingredient in the nature so used in paver block to reused the pollution in the area.
3. The finishing, shape, interlocking and appearance of the paver block are good.
4. It is cost effective.
5. From our experimental study, we concluded that 10% replacement of cement with PVC plastic is applicable.
6. Skilled labour not required for installation paver block.
7. Paver block are easily available in market.

References

[1]. Ganesh Tapkire, Satish parihar, Pramod Patil and Hemraj R Kumavat, "Recycled plastic used in concrete paver block", International Journal of Research in Engineering and Technology(IJRET).
[2]. International Journal of Civil and Structural Engineering Volume 1, No 4.
[3]. Ankit Arora and Dr. Urmil V. Dave "Utilization of plastic waste in concrete" International journal of students research in technology & management.
[4]. M.S. Shetty "Concrete Technology", S. Chand & Company Limited.
[5]. IS 15658: 2006, "Precast concrete blocks for paving- specification", Bureau of Indian Standards, New Delhi, India.
[6]. IS10262: 2009, for concrete mix design.
[7]. IS 383: 1970, Specification of coarse aggregates.