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Experimental Study on Paver Block Production using Construction and Demolition Waste

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Abstract: ***Construction and Demolition (C&D) waste, a major component of the solid waste is defined as a waste. resulting from the construction, renovation and demolition of structures. Till date a significant portion of C&D waste is disposed of in the landfills which not only consumes a considerable amount of landfill volume but also leads to environmental and health risks. As construction cost increases and land area gets scarcer, it becomes vital to take measures that incorporate a solution to the same. Developing a sustainable construction material (PAVER BLOCK) using construction and demolition (C&D) waste by diversion of C&D waste from the main waste stream can help in gaining a substantial area of land. The present study aims to develop C&D waste paver block of size 275 mm × 220 mm × 130 mm. Cement and fly ash were used as a binder along with C&D waste as replacement for natural coarse and fine aggregate***

Keywords: Eco-friendly, Paver block, Experimental investigation, Construction waste, Demolition waste, Sustainable construction, Recycling, Waste management, Compressive strength, Durability

I. INTRODUCTION

If made and installed properly, paver block pavement is adaptable, aesthetically pleasing, practical, affordable, and requires little to no maintenance. The majority of concrete block pavement built in India has performed admirably, but there are two major issues are sporadic failure brought on by severe surface wear, and variation in block strength. The world's natural resources are running out at the same time that industrial and residential waste production is sharply rising. In order to make up for the lack of natural resources and to find alternative methods of preserving the environment, sustainable development for construction involves the use of non conventional and innovative materials as well as the recycling of waste materials. The amount of waste plastic that has accumulated in the 21st century has created significant challenges for their management.

II. MATERIALS USED AND ITS PROPERTIES

Materials used for the experiment includes ordinary Portland cement of grade 43, fine aggregate of size less than 4.75 mm, coarse aggregate of size less than 4 mm.

A. Cement

The physical properties of the ordinary Portland cement of grade 43 is depicted in Table 1.

Table.1. Properties of Cement

Properties	Measured values
Fineness	2.75%
Consistency	33%
Soundness	1.95%
Bulk density	0.87kg/m3
Initial setting time of cement	30 min
Final setting time	600 min
Specific gravity	3.12

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B. Coarse aggregate

Construction companies often mine sufficient rock deposits to create crushed stone, which is then crushed into different sizes using a crusher. The resulting crushed stone can subsequently be used to make concrete and asphalt, as well as a base material for roads, driveways and other construction projects. In order to make concrete, which is a strong and long lasting substance, crushed stone is frequently utilised as an aggregate. Additionally, it serves as the base material for paver blocks, giving the pavers a solid base.

C. Fine aggregate

Manufactured sand (M- sand) is artificial sand produced from crushing hard stones into small sand sized angular shaped particles , washed and finely graded to be used as construction aggregate. It is a superior alternative to River sand for construction purpose.

Table.2. Properties of Fine Aggregate

Properties	Measured values
Specific Gravity	3
Bulk density	13.27%
Soundness	3mm
Fineness modulus	2.49

D. Construction& Demolition Waste

As per the construction and demolition (C&D) waste rule 2016, any waste comprising building materials, debris and rubble resulting from construction, remodeling, repair and demolition of any civil structure is classified as c and D waste. C&D waste are in several types. We particularly using brick types c & d waste using size c & d waste will sieve in 4.35mm.

Table.3. Properties of C&D Waste

Properties	Measured values
Specific Gravity	2.15
Bulk density	0.798kg/m3
Soundness	3mm
Fineness modulus	2.28

E. Chemical Additives

Air entraining agents: These are used to create air bubbles within the concrete mixture which can improve its freeze-thaw resistance and durability.



Fig.1 Coarse Aggregate



Fig.2 Cement



Fig.3.Fine Aggregate




Fig.4 C&D Waste Fig.5 Chemical Additives

III. MIXTURE PROPORTION AND TEST PREPARATION

The details of the mixing proportions and identifications for grade 20 MPa concrete (M 20) are seen in Table 4

Table.4 Mix Design

Materials	Percentage
Cement	12%
C&D Waste	27.5%
Coarse aggregate	3mm
Chemical Additives	2.28
Water	15%





Fig.6 Mixing of Materials Fig.7 Casting of Paver Block Fig.8 Air Curing

IV. TEST RESULTS AND DISCUSSIONS

The compressive strength test of paver block size is 275mm x 220mm x 130mm employed. The test was conducted as per the code of IS 15658-2006.The tests were carried out at a uniform stress after the specimen has been centered in the testing machine. The Compressive strength of 9 N/mm2 is achieved in 14 days. Then after we proceed 28 days of the compressive strength, we get 14.7N/mm2 . 5. As per the required is above 10, so it is satisfied.




Fig.9 Water Curing Fig.10 Compression Test

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Following table represent the C&D Replacement result

Table.5 Strength Result

Block	C&D Waste Replacement	Result
A	60%	50%
B	70%	60%
C	80%	90%

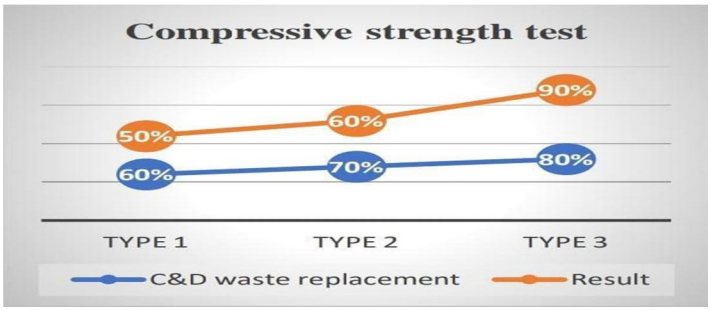


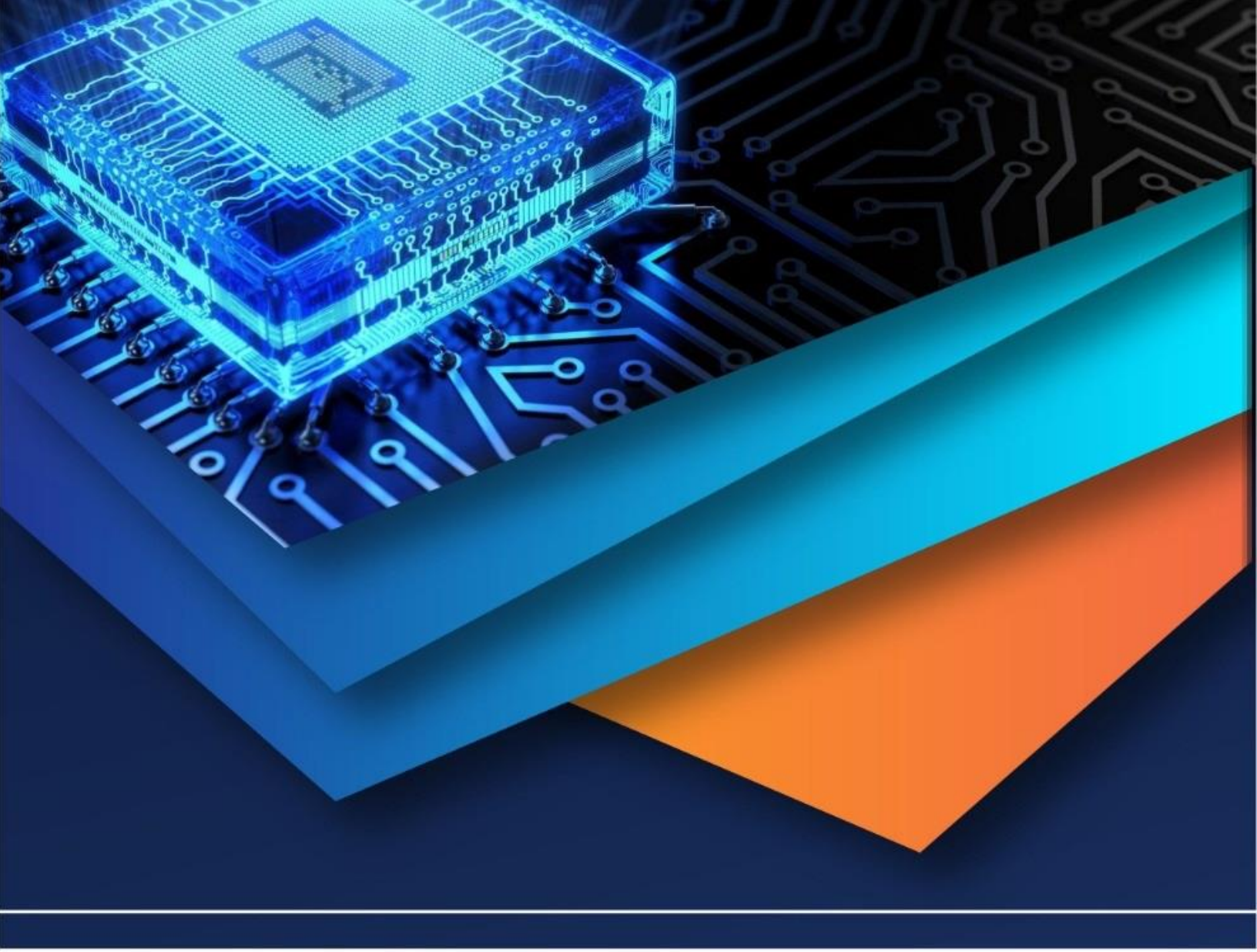
Fig.11 Graph Result

V. CONCLUSION

The utilization of C&D waste in production of paver block has productive way of disposal of C&D waste . The cost of paver block is reduced when compared to that of concrete paver block. Paver block made using C&D waste, M sand, coarse aggregate and cement have shown better result. It also shows good heat resistance. Though the compressive strength is low when compared to the concrete paver block it can be used in gardens, pedestrian path and cycle way etc.

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