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Experimental Investigation on Paver Blocks by the Partial Replacement of Fine Aggregates by Plastic Waste

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ABSTRACT: Plastic material consumption is increasing as a result of population growth. The majority of plastic materials are discarded in landfills and are not efficiently reused in most applications. Plastic is a material that does not disintegrate. The amount of plastic garbage in municipal solid waste is gradually increasing. Plastic is made from hydrocarbons found in a variety of places, including oil, coal, and various minerals. Plastic is considered as useful during times of scarcity, yet it is largely abandoned after use, posing a variety of hazards. There are many different types of plastic, such as High Thickness poly-ethylene (HDPE), Low Thickness poly-ethylene (LDPE), and so on. Every year, more than 56 Lakh Tonnes of plastic wastes are generated in India, yet the rate of breakdown of plastic trash is quite sluggish. As a result, this project is beneficial in terms of introducing plastic garbage in a productive manner. Furthermore, excessive use of natural sand in construction has a variety of negative social and environmental effects, and the government has restricted mining and use of natural sand in several areas of India to address this, causing sand prices to skyrocket. Therefore, the goal of our project is to try and replace some amount of sand with plastic waste, while also lowering the cost of paver blocks in comparison to traditional concrete paver blocks.

I. INTRODUCTION

Paver block is a dynamic, visually appealing, functional, and cost-effective material. that, when properly constructed and installed, requires little to no maintenance. The majority of concrete block pavement in India has likewise fared admirably. Natural resources are diminishing around the world, while garbage generated by industry and residential areas is expanding dramatically. To make up for the depletion of natural resources and to find new ways to protect the natural environment, sustainable construction comprises the usage of non-conventional and novel materials, as well as recycling and reuse of waste materials. Because plastic is non-biodegradable, it is classified as a non-renewable resource. Plastic garbage must be properly disposed of at the end of its useful life. Plastic is a cutting-edge material for use in construction. Plastics are used because of their unique qualities, such as low density, ease of manufacturing, good mechanical capabilities, chemical resistance, and great thermal and electrical insulation.

According to our research, discarded plastic is India's most significant cause of pollution. An increase in the quantity and variety of solid wastes produced by mining, industrial, agricultural and residential operations has been attributed to population growth, increased urbanization, and higher living standards as a result of technical developments. To identify ways to reduce the quantity of waste plastic used in the building of pavement blocks in order to create a more eco-friendly environment. This project will show how waste plastic may be used to make concrete paver blocks, as well as how to dispose of plastic garbage in an efficient manner. Polymer-modified paver blocks can be used in road and building construction. As a result, waste plastic can be blended in some form with concrete and aggregates without affecting its other properties or compromising its strength. In this initiative, discarded plastic will be collected from municipal solid trash and used to make pavement blocks, which are commonly found in parks, roadside pathways, and building yards.

Concrete blocks are mass-produced in large quantities and come in standard sizes. This block has excellent interlocking properties, is durable, and is attractive. Different varieties of pavers are extensively utilized. Plastic paver blocks, on the other hand, require cement, fine aggregates, coarse aggregates, and plastic waste to be manufactured. The durability and compressive strength of both regular and the modified paver blocks are compared for the same grade. Paving blocks are the most popular alternative for laying pavements and driveways since they can be opened to traffic immediately after being repaired

II. LITERATUREREVIEW

B. Shanmugavalli and k.Gowtham et.al [1] investigated about the current literature is concerned with plastic waste management. This author made use of waste plastic in paver blocks. Plastic waste (LDPE), coarse aggregates, quarry dust, and ceramic waste were all checked for proportion and chemical composition. For casting paver blocks, three different mix ratios are chosen, and test specimens are prepared and tested for compressive strength and oven testing. After testing, it was discovered that the compressive strength is low, allowing it to be used on non-traffic and low-traffic roads while also reducing waste due to the use of waste plastic. Mukesh Chavan and Shubham Tamhane et.al [2] In the paper investigated the suitability of waste voltaic bottles and polyethylene bags for the development of paver blocks for construction. Based on their observations, they discovered that plastic can be used in concrete and has a bonding property. Plastic is widely used in the production and construction of bricks, roads, and other building materials. It is the most effective method of disposing of plastic waste and provides a temporary solution to the ecological and environmental issues associated with plastics use. Darshan s. shah and prof. Jayesh kumar Pitroda et.al [3] investigated the concept of pervious concrete for the manufacture of pavement to reduce stormwater runoff, mitigate surface runoff, replenish aquifer and water table, and so on in this paper. The study on pervious concrete makes pavement in rural areas more suitable to meet rural area requirements such as reducing stormwater runoff, increasing groundwater levels, and eliminating costly storm water management practices. According to their case study, there is a significant savings of approximately 193 Rs/m² or 29 Rs/m³ or 18 Rs/feet² for the construction of a 1m*1m* 0.15m size pavement. Pervious concrete is a new concrete for rural pavement construction that has cost advantages and pervious concrete is extensively used worldwide because of its environmental benefits, hydraulic and durability properties. Dr. Muhammad Maqbool Sadiq, Muhammad Rafique khattak, [4] found out the uses various plastic waste materials in concrete. They investigated the use of pulverized plastic as a partial replacement for fine aggregate in concrete. The behavior of concrete is investigated in terms of the effect of various concrete properties under various combinations of plastic waste material. Fine aggregate in the concrete mix proportion was replaced with plastic waste at 10%, 15%, 20%, 25%, and the other concrete materials remained the same for all other mixes. The slump cone test yielded a low workability result. Flexural strength test and compressive strength test were done after 28 days, and in both strength decreased with the increase in the percentage of plastic. Sarang Shashikant Pawar, Shubhankar Anant Bujone, [5] worked on the usage of the fly ash and waste plastic paver block in this paper. If this type of plastic is used for construction, we will reduce the amount of waste we produce. We can use the plastic paver block because it has a longer life. They replace plastic with crushed aggregate in 10%, 20%, and 30% of the cases. Based on the findings, they concluded that using plastic to improve the properties of paver blocks is a viable option. As a result, their strength increased by up to 30%. R. Vasudevan, A. Ramalinga Chandra Sekar, B. Sundarakannar, R. Velkannadi, [6] discovered in this literature review that Plastic waste from Both the industrial and domestic sectors can be used as a source of raw material for the flexible pavements. Plastic waste, which are primarily used for packaging, are made up of PP, PE, and PS. The Softening point ranges from 1100 to 1400 degrees Celsius. To coat the aggregate, various waste plastics are used. Waste plastic's thermal and physical properties were investigated. The aggregate is modified in the dry process by coating it with polymers, resulting in such a stronger modified raw material for flexible pavement. Using a greater proportion of plastic waste reduces necessity of bitumen by around 10% while increasing the strength and performance of the road.

III. MIX DESIGN

Table 1 Mix Design

Volume of concrete	1 m ³
Mass of cement	413 kg/m ³
Mass of water	186 litres
Mass of coarse aggregate 20 mm	1133.234 kg/ m ³
Mass of Fine aggregate	700.553 kg /m ³

Table 2 Mix Design with plastic waste for 9 blocks for 200X100X80 Size mould

Plastic	Cement (kg)	Fine aggregate (kg)	Coarse aggregate (kg)	Water (litres)
0 % (0kg)	5.97	10.08	16.31	2.67
10%(1.008kg)	5.97	9.072	16.31	2.67
20%(1.512kg)	5.97	8.568	16.31	2.67
30%(2.016kg)	5.97	8.064	16.31	2.67
40%(2.52kg)	5.97	7.56	16.31	2.67

IV. METHODOLOGY

COLLECTION OF MATERIALS

Plastic waste was procured from the nearby plastic management centre. Plastic waste that were mostly collected were plastic bags, Plastic container waste, buckets, mug etc. Crushing of the plastic waste was made to make powder form.



Fig.1: crushed plastic waste

SPECIMEN PREPARATION

Concrete Mix Design:

Mix design was made for M-30 grade concrete according to I.S 10262-1982. The fine aggregate was replaced by plastic waste in 10%, 15%, 20%, and 25%. The test results were analyzed and compared with theoretical values, from various code books.

Weigh batching and Mixing:

Batching was practiced with the help of a weighing balance. Materials were measured according to the mix proportions which was made. Mixing was done by hand mixing. It was mixed for 3-5 minutes, along with the addition of water.



Fig.2: Handmixing of materials

Placing and Compaction:

Molds are cleaned and coated with oil to avoid an attachment between concrete and molds from creating. Placed concrete in a mold with dimensions of 200x100x80mm and vibrated it. The vibration of the blocks was done to remove the trapped air in concrete.



Fig.3:compaction

De molding and curing:

Fresh concrete was placed in molds and allowed to sit for 24 hours. After the 24 hours of casting, it is placed in a water tank to cure. Similarly, after 24 hours of casting, plastic waste concrete specimens were de-molded and placed in a water tank for curing at 7 Days, 14 Days, and 28 Days.



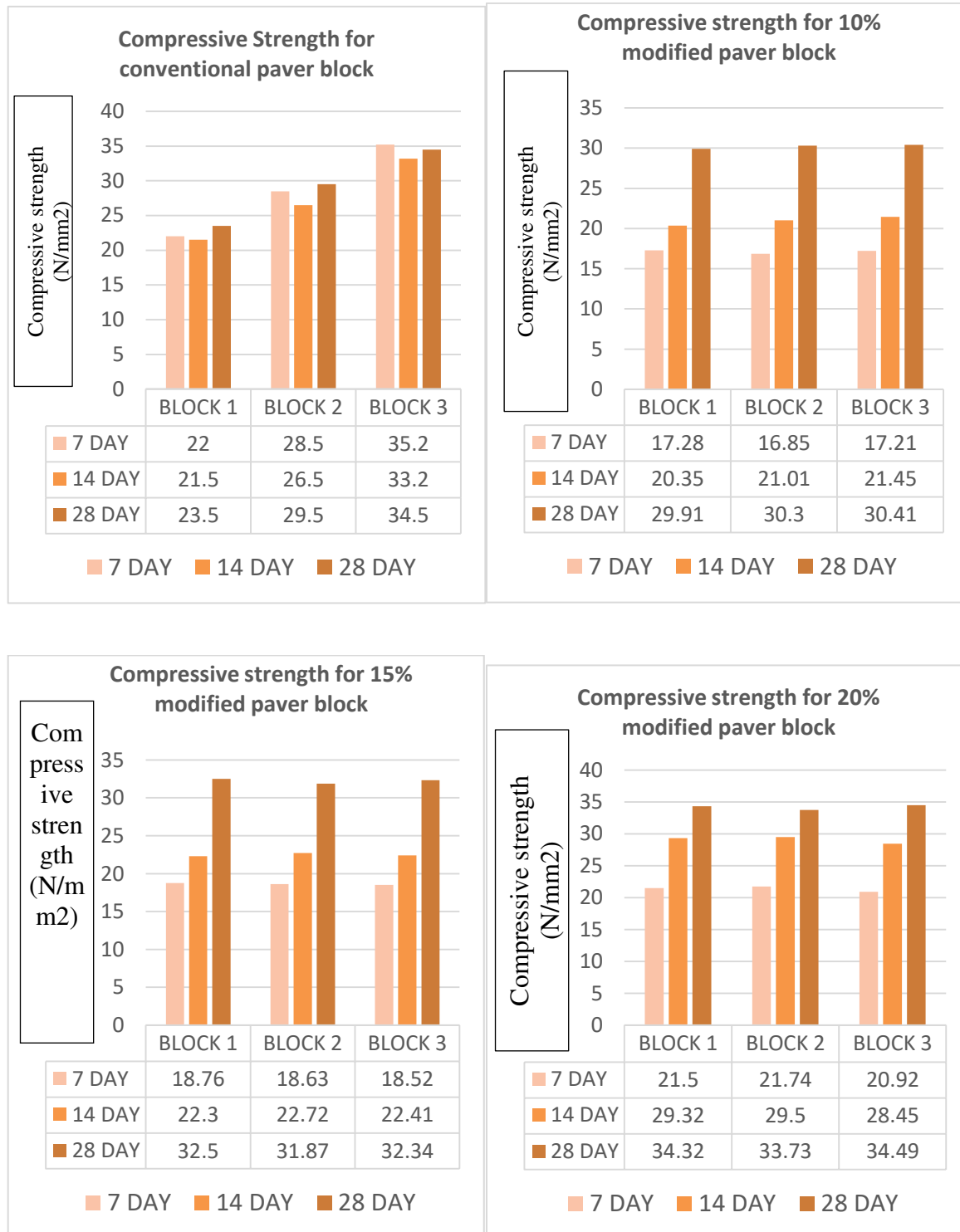
Fig.4: curing

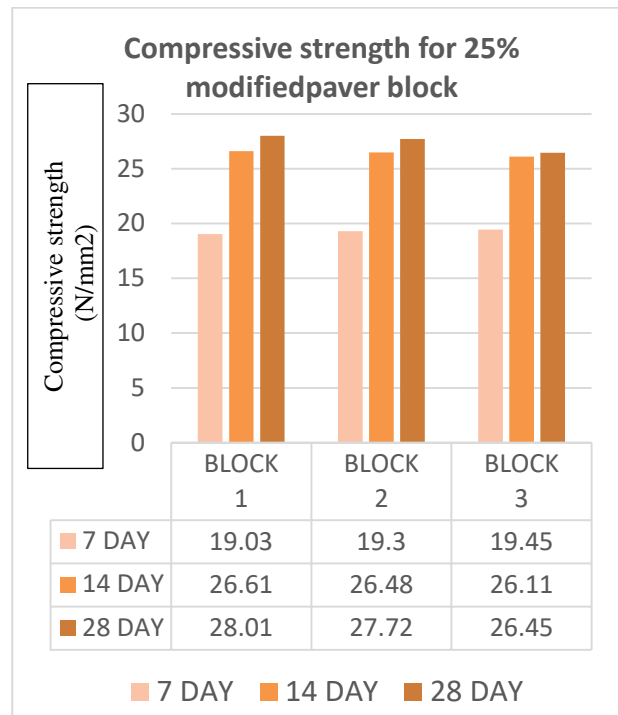


Fig.5:compressive strength testing

V. RESULTS AND DISCUSSIONS

COMPRESSIVE STRENGTH TEST RESULTS





VIII. CONCLUSION

The following observations are drawn from the experimental study on concrete with plastic aggregates: The compressive strengths of modified (plastic-added) cement concrete are equal to those of plain cement concrete. For fine aggregate, the optimum content for plastic added is found to be 20% by weight of sand. The addition of plastic aggregates for the remaining 25% that was added showed a significant decrease in compressive strength, and therefore 20% of natural fine aggregate can be replaced to prepare the concrete Paver blocks. Hence, Plastic waste in the right quantity can be effectively used in the concrete as a partial replacement for fine aggregates, providing a solution to the plastic waste disposal problem.

REFERENCES

- [1]. B. Shanmugavalli, K. Gowtham, P. Jeba Nalwin, B. Eswara Moorthy "Reuse of Plastic Waste in Paver Blocks" International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Vol. 6 Issue 02, February-2017.
- [2]. Mukesh Chavan, Shubham Tamhane, Sunil Chavan, Rushikesh Phuge "Manufacturing of pavement block by using waste plastic and sea sand" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 p-ISSN: 2395-0072 Volume: 06 Issue: 3 | Mar 2019
- [3]. Darshan S. Shah, Prof. Jayesh Kumar Pitroda, Prof. J. J. Bhavsar. "Pervious Concrete: New Era For Rural Road Pavement" International Journal of Engineering Trends and Technology (IJETT) volume-4 issue-8, 2013
- [4]. Dr. Muhammad Maqbool Sadiq, Muhammad Rafique Khattak, "Literature Review on Different Plastic Waste Materials Use in Concrete" JETIR (ISSN-2349-5162), June 2015, Volume 2, Issue 6
- [5]. Sarang Shashikant Pawar, Shubhankar Anant Bujone, "Use of Fly ash and Plastic in Paver Block", International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 11 | Nov -2017
- [6]. R. Vasudevan, A. Ramachandra Sekar, B. Sundarakannan, R. Velkennedy b "A technique to dispose waste plastics in an ecofriendly way—Application in construction of flexible pavement"



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