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Development of Paver Block by Using Plastic Waste

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Abstract. The aim of the rapid industrialization and urbanization in the country leads lot of infrastructure development. This process leads to several problems like shortage of construction materials, increased productivity of wastes and other products. This paper deals with the reuse of waste plastics as partial replacement of coarse aggregate in M25 concrete is used for most constructional works. Waste plastics were incrementally added in 0%, 5%, 10%, 15% and 20% to replace the same amount of aggregate. Tests were conducted on coarse aggregates, fine aggregates, cement and waste plastics to determine their physical properties. Paver Blocks and Solid blocks of size 200mm X150mmX60mmand 2oommX100mmX65mm were casted and tested for 7, 14 and 28 days strength. The result shows that the compressive strength of M25 Concrete with waste plastic.

Keywords:- Plastic Waste, Fine Aggregate, Cement, Paver Block.

1. Introduction

Concrete block paving has been widely used nowadays because of its diverse advantages. It is forms in rectangular shape accordance to bricks shape and now there are many various shapes of paving blocks. These blocks are a type of concrete with good in quality and durability due to the manufacturing and the right method of mixture. The concrete paving blocks also something interesting and versatile because of its great resilience, its strength in accommodate traffic flow, interesting aesthetic, and function, cost effective and do not need to be maintenance if the correct way installations from first phase . The material that use for paving blocks has been widely changed where there are many of paving blocks are added or replaced with the used materials or wastes materials to reduce environmental pollutions besides can improve its strength and also their mechanical properties. From the literature study, there are many researchers use waste materials as the aggregate and cement replacement to create paving blocks. The materials used are plastic, fly ash, bottom ash, tin, limestone dust, tiles, rubber, coconut fiber, glass and so on which these materials are available in cheaper price or free of charge. However, there are several weaknesses in the common paving blocks which required high cost for its creation. In addition, the paving blocks that made from gravel with full quantities are heavy. Therefore, the purpose of this study was to review that waste materials such as tin and plastic and also quarry dust can be reuse as additives and replacement material in paving blocks. In addition, it is also intended to protect the environment from the accumulation of waste materials that can affect the ecosystem and environment especially to wildlife and humans. Objective of the study that wishes to be achieved is to produce paving blocks from tin, plastic also quarry dust and to identify the most economical cost of paving blocks.

This study also wants to achieve the lighter paving blocks and prove their durability by using compression tests To solve the problems and achieve the objectives, new paving blocks are produced with the use of waste materials that are available in free of charge to reduce costs and the percentage of used coarse gravel to 60% from the full percentage of coarse aggregate total which this rocks affects mass of pavingblocks.

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The 40% of the used materials are used as coarse aggregate. The scope of these study are to test the durability of Eco-Friendly Paving Block that use waste materials (tin and plastic) as an admixture in coarse aggregate with coarse gravel and unused materials (quarry dust) which is replacedfine aggregate in concrete mixture and will be compared to control paving blocks. These materials aremixed with cement and water according to the ratio. The used materials are cut to the needed sizes. There are 12 paving blocks produced where 6 of it are control paving blocks and the balance is Eco-Friendly Paving Block. The test will be done when the paving block reaches the 7 and 14 days of their mature age and the result of Eco-Friendly Paving Block will be compared to the control paving blocksbased on the test performed.

2. Literature Review

Interlocking Concrete Block Pavement (ICBP) technology has been introduced in India in construction,a decade ago, for specific requirement namely footpaths and parking areas etc. Now ICBP is being adopted extensively in different uses where the conventional construction of pavement using hot bituminous mix or cement concrete technology is not feasible or desirable. In this investigation, various properties such as compressive strength, split tensile strength, bending strength and water absorption of paver blocks consisting of crushed granite, unconventional materials such as kadapa andbroken paver for various percentage replacements of coarse aggregate are studied as per IS 15658:2006. Key words: IS 15658:2006, ICBP, kadapa, broken paver aggregate.

Foundries for the metal-casting industry generate by- products such as used foundry sand. Applications of foundry sand, which is technically, sound, environmentally safe for sustainable development. In this study, partially replacement of Cement (PPC 53 grade cement) in paver block byused foundry sand for determining the change in the compressive strength of paver blocks and cost of paver block. Partial replacement of cement (PPC 53 grade cement) in bottom layer in different percentage as like 10%, 20%, 30%, 40% and 50%. The compressive strength, flexural strength has beendetermined at the end of 7, 14 and 28 days and water 5 absorption test has been determined at 28 days. The paper also shows the cost comparison per block for the paver block mix proportion. KEYWORDS: Various Test, Portland Pozzolana Cement (PPC) Used Foundry Sand, Paver Block, Cost

Concrete paving blocks are ideal materials on the footpaths and roads for easy laying, better look andfinish. In this paper, a parametric experimental study for producing paving blocks using waste steel aggregates (the form of rounded bearings of size 6.35 mm) is presented. Waste steel bearings are added in concrete of paver blocks in various percentages. Rubber pads are also used below the paver blocks. Impact strength of paver blocks with various percentages of waste steel aggregates and usingrubber pads is investigated. Test results show that combination of using rubber pads and adding various percentages of waste steel aggregates in paver blocks gives upto 50% more impact strength than ordinary paver blocks. Index Terms - waste steel aggregates, compressive strength, flexural strength, V.

3. Methodology

Recycled plastic (RP), quarry dust, sand, soil, cement and water were the primary materials used in this study. The selected RP were polyethylene terephthalate (PET) polymer from the mineral water bottle (figure 1). The bottles were manually shredded using scissors to make the melting process easier. The shredded bottles were used either as binder or sand replacement in the paver block production depending on the methods of fabrication. In the heating method, RP acts as a binder and heated in oven before mixing it with quarry dust and sand. Whereas in the compression method, RP was processed and became fine particles that passing 0.6 mm sieve. Fine sand was supplied by a localquarry and passed through sieve 0.6 mm. It was dried and cleaned before the sieving process to remove any unwanted materials such as roots, debris and any organic matter. Similar preparation wasapplied to 1.4 mm size quarry dust which was obtained from a local quarry. In the compression method, other materials were 25 grade Ordinary Portland Cement (OPC), soil and water.

Figure 1. Recycled plastic.

This study has the following methodology for using recycled plastic used in the paving block

1. Lest out material required for the study
2. Check the properties of the collected material.
3. Prepare a mix design for the recycled plastic used in the paving block.
4. Making the paving block using proper mix and guidelines.
5. Check the properties of the recycled plastic used in the paving block.

4. Conclusion

The following conclusions were drawn from the experimental investigation

1. The utilization of waste plastic in production of paver blocks has a productive way of plastic waste.
2. The cost of paver block is reduced when compared to that of concrete paver block.
3. Paver blocks made using plastic waste, quarry dust, coarse aggregate and ceramic waste haveshown better results.
4. It also shows good heat resistance.
5. Though the compressive strength is low when compared to the concrete paver block it can be usedin gardens, pedestrian path and cycle way etc.
6. It can be used in Non-traffic and light traffic roads.
7. Not suitable in areas of heavy traffic.

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