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Paver Block using Copper Slag and Plastic Waste

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Abstract: The main objective of this study is together various examination studies available by different researchers for waste utilization of copper slag and plastic waste through various techniques. Waste materials increases and causes environmental pollution. Every year 18 billion pounds of plastic seeps in to oceans. Many researchers found that by replacing the useful waste like copper slag and plastic waste with fine aggregate and cement respectively can be economical and eco friendly. This project present the usage of copper slag for the partial replacement of fine aggregate with plastic to make a paver block.

I. INTRODUCTION

A. General

This work focuses on the use of copper slag and plastic waste as a partial replacement of sand and cement respectively in paver block. As copper slag is a high density materials it increases the self weight of paver block there by increases the strength and toughness against the various kinds of loads. By this it can also be stated that the property of toughness and rigidness can be increased in the paver block by using copper slag in it. Copper slag, which is the waste material produced in the extraction process of copper metal in refinery plants, has low cost and its application as a fine aggregate in paver block production have many environmental benefits such as waste recycling and solves disposal problems. plastic waste used in this paver block is brought from surrounding areas. By replacing plastic waste in paver block, it can provide a potential environment as well as economic benefits.

II. MATERIALS

A. Plastic Waste

Plastics are an important material in our economy, and modern daily life is unthinkable without them. At the same time however, they can have serious downsides on the environment and health. Better design of plastic products, higher plastic waste recycling rates, more and better quality recyclates will help boosting the market for recycled plastics. It will deliver greater added value for a more competitive, resilient plastics industry. Every year 18 billion pounds of plastic seeps into oceans. The pollution in ocean is mostly from plastic, and it as a terrible impact on marine species.



Fig:-1



Fig:-2

B. Plastic waste Origin

Low-Density Polyethylene(LDPE) Carrybags, sacks, milk pouches cosmetic and detergent bottles High Density Polyethylene (HDPE) Carrybags, bottlecaps, household articles etc. polyethyleneterephthalate (PET) drinking water bottles etc. Polyethylene(PP)detergent ,biscuit packets, microwavetrays for ready made meal etc. Polystyrene(PS) bottlecaps. Foamed polystyrene :foodtrays, eggboxes, disposable cups etc.

C. Copper Slag

Copper slag is a by-product created during the copper smelting and refining process. As refineries draw metal out of copper ore, they produce a large volume of non-metallic dust, soot, and rock. Collectively, these materials make up slag, which can be used for a surprising number of applications in the building and industrial fields. Researchers studied to reuse the useful waste into the concrete like steel slag, copper slag and polymer wastes by using this process we can make concrete economical by replacing waste materials through fine aggregates. Sand is a natural resources and depletion of sand is a big issue for environment. So it is necessary to protect environment and reduction of waste by recycling and reusing of waste materials. This survey study based on the paver block performances by replacing copper slag and to find out the optimum solution of waste replacement in paver block by studying various authors researches and reviews Copper slag consists mechanical and chemical properties that is eligible as the material to be used in production of concrete as a partial replacement as a substitute for aggregates. Mechanical property of copper slag has good sound characteristics, good abrasion resistance and good stability for aggregate use. The world copper production is currently about 24.6 million tons (International Copper Study Group) and it is estimated that for every ton of copper produced, about 2.2tons of copper slag is generated as a waste.

D. Copper slag Origin

Copper slag is a by-product of copper extraction by smelting. During smelting, impurities become slag which floats on the molten metal. Slag that is quenched in water produces angular granules which are disposed of as waste or utilized.



Fig3:-copper slag

III. METHODS

A. Preparation of test Specimen

Preparation of Test Specimens plastic wastes are heated in a metal bucket at a temp of above 150°. As a result of heating the plastic waste melt. After proper melt of plastic copper slag is added in the metal bucket and mix thoroughly with spatula. Mixture prepared and added to the Mould. it. Then the blocks are allowed to dry for 24 hours so that they harden. After drying the paver block is removed from the Mould and ready for the use.



Fig4:- Preparation test specimen

IV. RESULTS

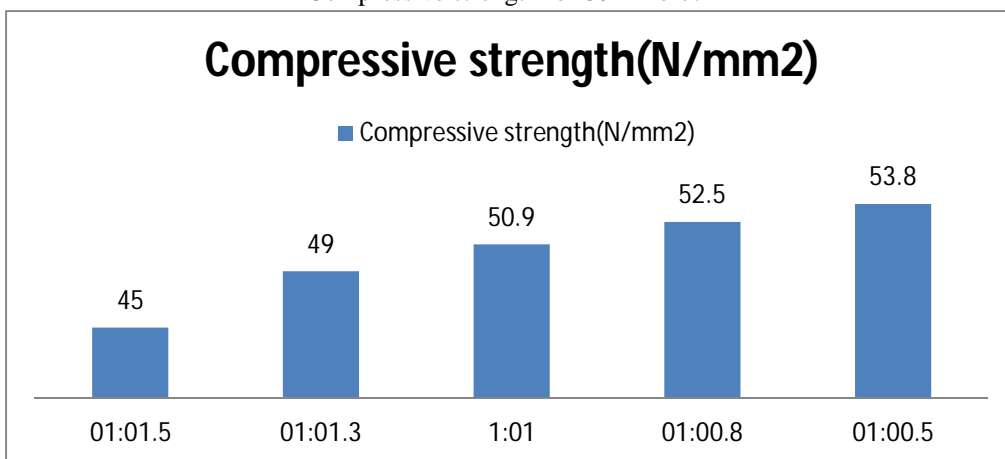
Compressive strength result for 80mm block

Sr. No.	Ratio	Plastic waste(kg)	Copper slag(kg)	Compressive strength(N/mm ²)
1	1:1.5	1.5	2.25	45
2	1:1.25	1.5	1.875	49
3	1:1	1.5	1.5	50.9
4	1:0.75	1.5	1.125	52.5
5	1:0.5	1.5	0.75	53.8

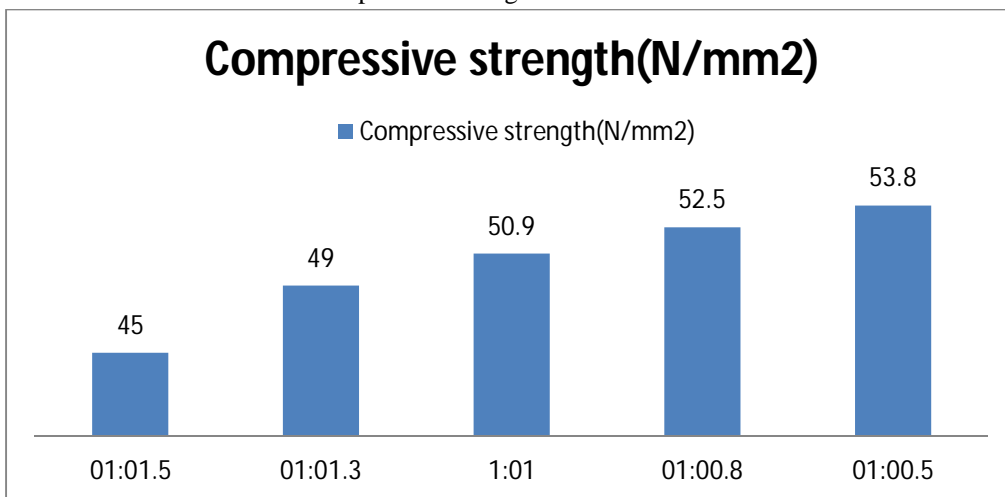
Compressive strength result for 60mm block

Sr. No.	Ratio	Plastic waste(kg)	Copper slag(kg)	Compressive strength(N/mm ²)
1	1:1.5	1.5	2.25	42
2	1:1.25	1.5	1.875	43.3
3	1:1	1.5	1.5	45
4	1.0.75	1.5	1.125	47.1
5	1:0.5	1.5	0.75	47.9

Compressive strength for 80mm block



Compressive strength for 60mm block



V. CONCLUSION

- A. Plastic is an innovative material for using it in construction purpose.
- B. Plastic paver block is a productive way of disposal of plastic waste.
- C. It shows better results such as strength.
- D. Compressive strength is higher compared to conventional paver block.
- E. The cost of paver block is reduced by utilizing the plastic waste and copper slag when compared to that of concrete paver block.
- F. This method is suitable for the country which has difficult to dispose recycled the plastic waste.vii)
- G. The results of compressive test shows that strength of paver block increases with respect to the percentage of copper slag added by weight of fine aggregate.
- H. Addition of copper slag increases the density and thereby self weight and hence it is suitable for bearing like Paver block.
- I. The workability enhanced with the mixing of copper slag.
- J. As copper slag is a high density materials it increases the self weight of paver block there by increases the strength and toughness against the various kinds of loads. By this it can also be stated that the property of toughness and rigidness can be increased in the paver block by using copper slag in it.

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