Experimental Investigation on Fully Replacement of Cement and Coarse Aggregate by Polythene and Steel Slag for Paver Block Construction

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***Abstract*- India is developing countries were construction of roadways and building plays a vital role in overall development. As the demand of paver block is increasing day by day for construction of roadways the requirement is very high and it is necessary to find sustainable alternative to concrete paver as a paver block.**

The materials used for plastic paver blocks are polythene bags, steel slag, sand with a proper mix proportion. The polythene bags are replacement of cement; steel slags are added as concrete aggregate; sand is used as a fine aggregate. The mix proportion ratio is 1:1:2 and the grade of concrete is M25 at the compressing strength of 25MPa.The paver block specimens of 18 numbers were cast cured an tested blocks for both conventional concrete and replacement of concrete for about 7, 14 and 28 days for compressive strength. In this work it is found experimentally that plastic paver block gives better strength as compare to conventional paver block. The replacement of plastic paver block is light weight with high effective strength durability and be used in parking sector, reduce the environmental pollution. Hence, the project is helpful in reducing plastic waste in a useful manner. In this project we have used plastic waste with a steel slag in a different proportion.

I.INTRODUCTION

1.1 GENERAL

Now at present 56 lakh tones of plastics were dumped in India per year. It takes 20-1000 years based on its composition. The dumped waste pollutes the surrounding environment. As the result it affects both human beings and animals in direct and indirect ways. Hence it is necessary to dispose the plastic waste properly as per the regulations provided by our government. The replacement of plastic waste for cement provides potential environmental as well as economic benefits. The large volume of materials required for the construction is potentially a major area for the reuse of waste materials. Recycling the plastics has advantages since it is widely used and has a long service life, which means that the waste is being removed from the the lack of natural resources and to find alternative ways conserving the environment. Plastic is used in this work was brought from the surrounding areas. The dumped Plastics Pollutes the environmental benefits. In the form of dumping the Plastics, either of that it can be reused as a one of the material that being used in our daily life. As the plastic has a high bonding strength than that of the cement for increasing the strength of block steel slag be added as coarse aggregate for certain maximizing the strength.

Majorly, there are two of plastics are being available they are Thermo plastic and Thermo setting plastics. As thermo plastic can be used as recycled of certain substances but thermo setting plastics be used as reused substances. In the form that in the comparison of both the plastic reused manner is safe, eco-friendly and suitable for the economy. With the view to the investigation the behavior of steel slag, reused plastic can obtain a certain paving bock as a innovative and also has a high strength and durability. As a specified problem solving techniques for providing pavement in areas where conventional types of construction are less durable due to many operational and environmental constraints for specific requirements viz. footpaths, parking areas etc. using conventional blocks are being common so that, as per IS 15658 standard thickness of paver blocks waste stream for a long period. In the development of construction. are60mm (for light traffic), 50mm (no traffic), 80mm

(heavy traffic) is commonly used in India. Paver block required high compressive strength, flexural strength, residual compressive strength, water absorption to used it in a paver blocks. The amount of plastic waste has been increasing due to increased number of damping plastics in the ground. As a modern investigation that in the combination of the steel slag with the plastic can obtain a high strength and the durability with proper weight capacity in the form of obtaining certain testing and curing of a paver blocks. There is a certain bonding between the steel slag and the burnt plastics. In the form of that it is suitable, for the certain areas in the roads as a strong paver blocks. Here the used plastic is low density polyethylene as a substance for low air pollution and also economy.

Therefore, as per the investigation that the replacement of cement steel slag and the plastic have a high bonding and also eco-friendly and durability. Hence, it is suitable that the replaced paver block has a potential than that of the conventional block that it could improves the strength, toughness and bonding of the matrix. Hence, this study investigates that the potential of using plastic as a full replacement of cement and the steel slag a coarse aggregate in the production of the plastic paver block.

II. MATERIALS USED

2.1 GENERAL

As up to the core of possible, the current practice is followed in the paver block manufacture and usual test on paver block was continued.

2.2 MATERIALS USED

- Coarse aggregate (steel slag)
- Fine aggregate (M-sand)
- Plastic (fully replacement of cement)

2.2.1 COARSE AGGREGATE

Steel slag is an industrial byproduct obtained from the steel manufacturing industry. It is produced in large quantities during the steel-making operations which utilize Electric Arc Furnaces (EAF).

Steel slag can be used in the construction industry as aggregates in concrete by replacing natural aggregates. Natural aggregates are becoming increasingly scarce and their production and shipment is becoming more difficult.

Typical steel slag chemical composition.

Constituent	Composition (%)
CaO	40 - 52
SiO_2	10 - 19
FeO	10 – 40 (70 - 80% FeO, 20 - 30% Fe2O3)
MnO	5 - 8
MgO	5 - 10
Al_2O_3	1 - 3
P_2O_5	0.5 - 1
S	< 0.1
Metallic Fe	0.5 - 10

2.2.2 FINE AGGREGATE

The cost of construction can be controlled by the use of manufactured sand as an alternative material for construction. The other advantage of using M-sand is, it can be dust free, the sizes of m-sand can be controlled easily so that it meets the required grading for the given construction. It doesn't have the presences of impurities such as clay, dust and silt coatings. It improves the durability and strength of the concrete.

PROPERTIES OF FINE AGGREGATE

PROPERTIES	VALUE
Type of aggregate	M sand
Size of fine aggregate	4.75mm
Specific gravity	2.73
Fineness modulus	4.5

2.2.3 PLASTIC

Plastic waste used in making paver block was collected from the surrounding locality LDPE is indicated by resin number 4. It includes plastic bags. The plastic bag used is of about 50 microns. The basic properties are provided below.

PROPERTIES OF LDPE

SI.NO	PROPERTIES	VALUE
1	Melting point	150°
2	Thermal co efficient of expansion	$100\text{-}200x10^{-6}$
3	density	0.910-0.940
4	Tensile strength	0.2-0.40(N/mm^2)

III. CONCLUSION

From this study the effective utilization of the fully replacement of the plastic than the cement can develop the strength and durability of the paver block to withstand the load Reduction in land requirement problem of dumping plastic, reduction in the emission of greenhouse gases.15% - 20% of weight

can be reduced when polythene bags plastic is used in the paver block. Cost is comparatively reduced than that of the concrete paver block. In regards of following tests it is observed that the plastic paver block is better in strength and better against water absorption and can be effectively used in path ways.

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