



MANUFACTURING AND TESTING OF PLASTO GRANITE BLOCK

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ABSTRACT

The world cities generated 2.01 billion tonnes of solid waste, where 0.74 Kilograms of solid waste is generated by a person per day. In India, nearly 26 thousand tonnes of plastic waste is being produced per day. The availability of plastic waste is huge, where it leads to various hazards like land pollution, ground water pollution etc., and the aim of this project is to replace cement and fine aggregate material with plastic waste and granite sludge material. Granite sludge is a byproduct generated from the granite polishing industry. Plastic waste like LPDE (Low Density Polyethylene) is used to act as a binding material, where this type of plastic cannot be recyclable but it can be reusable to make a new building material. This study demonstrates wastes like plastic and granite sludge are used for manufacturing the plasto granite block. The plasto granite blocks are casted at different mix design are tested by the tests like compressive strength test, water absorption test. It helps to dispose the plastic in a productive way.

Keywords: LPDE (Low Density Polyethylene), granite sludge.

1. INTRODUCTION

Municipal Solid waste management is very important, because the plastic waste which is increasing day by day becomes huge which creates hazard to environment. The characteristics, quantities, volume and composition of solid waste generated may differ from one country to another and between urban and rural areas. It depends mainly on the climate, living condition and economic standards of the area. In which the waste plastics from household is being generated in large quantity like polyethylene which is followed by polypropylene. Large volume of materials required for construction is potentially a major area for the reuse of waste materials. Recycling the plastics has advantages like it is widely used as a durability, which means that the waste is being removed from the waste stream for a long period. The amount of concrete is used in conventional concrete is more and has more environment impact. To reduce the huge usage of conventional material it is necessary to develop an innovative product in accordance with the increasing waste material.

2. EXPERIMENTAL PROCEDURE

2.1. PROPERTIES OF MATERIALS

GRANITE SLUDGE

Granite powder, a waste material from the granite polishing industry, it is like a pozzolanic materials such as fly ash, slag etc. where it is used as a filler material (substituting fine aggregate) to reduce the void ratio in concrete. Its specific gravity is 2.5 and its natural moisture content is 0.42.

TABLE 1.PROPERTIES OF GRANITE SLUDGE

Sl.NO.	DESCRIPTION	VALUE
1	specific gravity	2.5
2	natural moisture content	0.42
3	fineness	2.45
4	Grading zone	Zone 2 of soil

PLASTIC WASTE (LDPE)

This plastic waste are collected from household items like shopping bags, bread bags, frozen food bags, plastic sheeting, packaging film and sheeting etc. Where it is a Thermoplastic resin indicate by number 4. These kinds of wastes are non-recyclable, so we use this resource to make a new building material. Their properties are mentioned below.

TABLE 2.PROPERTIES OF LPDE

SI.NO.	DESCRIPTION	VALUE
1	Density	0.91-0.94
2	Melting point	105 ⁰ C
3	Thermal coefficient of expansion	100 - 200X10 ⁻⁶ K ⁻¹
4	Tensile strength	5 - 25 MPa

2.2. MIX RATIO

Block type 1 – three blocks were casted using mix ratio provided below

Plastic waste (LPDE) = 1

Granite sludge = 3

Block type 2 – three blocks were casted using mix ratio provided below

Plastic waste (LPDE) = 1

Granite sludge = 1

2.3. PREPARATION OF TEST SPECIMEN

Plastic wastes are heated above 105⁰ C temperatures in a barrel by light the plastic at the top using a small flame. Sometimes plastic waste lumps may remain even at very high temperatures. So stirring and heating must be continuing until all lumps are removed and a homogeneous paste is obtained. After that we want to add granite waste until the required mixture, which is discussed above. Keep mixing so that the plastic, which tends to act as a binder. It is very well mixed in and looks like grey cement, the mould should be very clean and oiled. The mixture is quickly removed using the spade with the metal shaft and put it into the mould with the trowel where compaction is done to avoid pores. Allow the hot mixture in the mould to set for a few minutes, when the mixture has hardened enough, remove the mould and leave. It will harden in 4 hours.



Fig1. MELTING THE PLASTIC



Fig 2 ADDING GRANITE SLUDGE WITH PLASTIC AND MIXING



Fig 3.PLACING AND COMPACTING



Fig 4.CASTED BLOCK

2.4. TESTING OF SPECIMENS

COMPRESSIVE STRENGTH FOR PLASTO GRANITE BLOCK

Plasto granite block shape is I DUMBLE; its size is 185mmX275mmX80mm while casting. The ultimate load at which block is crushed is taken into account. By using the formula with experimental readings the compressive strength will be determined. The plastic paver blocks of different ratios are tested one by one.

$$\text{Compressive strength (N/mm}^2\text{)} = (\text{ultimate load in N} / \text{area of cross section in mm}^2)$$



Fig 5. EXPERIMENTAL SETUP FOR CTM



Fig 6. TESTED SPECIMEN

WATER ABSORPTION TEST

In this test, the block first weighted in dry condition and then they are immersed in water for 24 hours. After that they are taken out from water and they are wiping out with cloth. Then the difference between the dry and wet weight of the blocks help to determine the water absorption. It is denoted in percentage.

$$\text{Water absorption (\%)} = ((\text{weight of block at wet state} - \text{weight of block at dry state}) / \text{weight of block at dry state}) \times 100$$

3. RESULT AND DISCUSSION

3.1. COMPRESSIVE STRENGTH TEST RESULTS

This test is important to determine the compressive strength of the block.

TABLE 3. COMPRESSIVE STRENGTH RESULT FOR BLOCK TYPE 1

SI.NO.	MIX NAME	PLASTIC WASTE	GRANITE SLUDGE	COMPRESSIVE STRESS (N/mm ²)
1	PGB - 1	1	3	7.23
2	PGB - 2	1	3	7.15
Average				7.18

TABLE 4. COMPRESSIVE STRENGTH RESULT FOR BLOCK TYPE 2

SI.NO.	MIX NAME	PLASTIC WASTE	GRANITE SLUDGE	COMPRESSIVE STRESS (N/mm ²)
1	PGB - 1	1	1	9.05
2	PGB - 2	1	1	8.95
Average				9.00

3.2. WATER ABSORPTION TEST RESULTS

Hence the plasto granite block is made with plastic and granite sludge. Where, it is required to know its water absorption capacity.

Table 5.WATER ABSORPTION TEST RESULT

SI.NO.	MIX NAME	BLOCK TYPE	WATER ABSORPTION IN %
1	PGB - 1	1	1.0
		2	1.0
2	PGB - 2	1	1.0
		2	1.0




4. CONCLUSION

The compressive strength is low when compared to the conventional concrete block, where it can be used for non-traffic categories like monument premises, domestic paths, embankment slopes and sand stabilization area etc. The water absorption is very low when compared to the conventional concrete block, where the risk of algae and fungus formation is almost eliminated in this block. It is used around the foundation to eliminate nonstructural water damage which is caused by seepage of flow. Heat of hydration is not generated in this block due to the absent of cement particles, therefore no curing is required. The low density polyethylene plastic wastes are non-recyclable, so we reuse it in a productivity way of disposal. This method is suitable for the countries which has the difficult to recycle/dispose the plastic waste. Cost of this block is very low when compare to conventional concrete block. Because of the numerous advantages further research would improve the strength and quality of plasto granite block.

5. REFERENCES

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