Brick Manufacturing By Using Waste Plastic & Sand

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Abstract- *This project paper manages utilization of waste plastic bottle containers as brick material. Plastic waste which is expanding step by step moves toward becoming high and also dirties the earth, particularly in high mountain towns and visitor trekking areas where no rubbish accumulation framework exists and furthermore which are disposed of or burned which prompts the pollution of land and air. The transfer of waste plastics is a greatest test, as continued reusing of PET bottles containers represent a potential risk of being changed to a cancer-causing material and just a little measure of PET bottles are being reused. Thus this Poly ethylene terephthalate (PET) bottles are cleaned and included with fine total (sand) at different ratios (1:2, 1:3, 1:4) to acquire high quality brick blocks that have warm and sound protection properties to control contamination and to decrease the general expense of development, this is a standout amongst the most ideal approaches to maintain a strategic distance from the amassing of plastic waste which is an on degradable toxin. The sand that must be obtained from the valuable stream beds/mines. The plastic waste is normally accessible in surplus amount and thus the cost factor descends. Since this type of brick blocks have more compressive strength and less water absorption. Thus this sort of brick blocks are ideally utilized for underground septic tank construction, submerged constructions, and underground construction like passages and furthermore utilized for the sub structure of the buildings so as to oppose the leakage of the water on account of less water absorption limit and furthermore have high compressive quality which oppose the substantial basic burdens. The main drawback of this work is the cost because the sand rate is high due to the demand and also the cost of collection of plastic waste in large amount. But is preferable for government to dispose this waste plastic in the government buildings construction as a waste plastic bricks.*

I. INTRODUCTION

In India the large amount of waste plastics are obtained from the household areas, hotels bus stand, Railway stations and other crowded areas. Especially the large quantity of waste plastic water bottles are obtained. Only few amounts of water bottles are get recycled due to transportation cost and others are get disposed in the forest or nearby lakes, river beds, and sea. This causes land pollution, air pollution and water pollution due to contamination. It also one of the reason to cause various diseases like dengue, malaria,In India the large amount of waste plastics is obtained from the household areas, hotels bus stand, Railway stations and other crowded areas. Especially the large quantity of waste plastic water bottles are obtained. Only few amount of water bottles are get recycled due to transportation cost and others are get disposed in the forest or nearby lakes, river beds, and sea. This causes land pollution, air pollution and water pollution due to contamination. It also one of the reason to cause various diseases like dengue, malaria, plague and rat-bite fever due to breeding of mosquitos and rat. Hence in order to reduce the waste plastic contamination in our environment and also to convert them into useful construction material this project work was carried out. In this project, the sand is the one of the main material used for the manufacturing process of the waste plastic bricks. Since sand gives the great property of this plastic bricks, which gives required hardness, shapes and also gives the required physical properties to this plastic bricks. They also protect the plastic by resisting the thermal insulation up to certain degree Celsius. Hence the sand play vital role in the waste plastic bricks. As most of the local manufactures are producing bricks of size 220x100x75mm and 220x105x75mm, so the same dimensions was adopted for production of waste plastic bricks. The brick mould was prepared according to this dimension with steel and wood at the workshop. Five samples of each ratio's (1:2, 1:3. 1:4 ratio's) were prepared. In this each ratio only one part of the waste plastic is taken from the total amount of weight and the sand amount is taken at different amounts. The casting and demoulding of this waste plastic bricks are done manually.

II. LITERATURE REVIEW

The use of plastic waste in bricks would open a solution for the disposal issues regarding plastic wastes. Many research works have been done in the area of the use of plastic waste in manufacturing of bricks.

1.) Miss. P. Subhadra et al: Volume- 5, Issue-01, Jan.-(2022): - Brick is one of the most common masonry units used as building material. Due to the demand, different types of waste have been investigated to be incorporated into the

bricks. There has been a considerable imbalance between the availability of conventional building materials and their demand in the recent past. On the other hand, the plastic waste is abundantly available and the disposal of waste plastics is a biggest challenge, as repeated recycling of PET bottleposes a potential danger of being transformed to a toxic material and only a small proportion of plastic wastes are being recycled. Because of costly conventional recycling techniques, there has been an increased demand for more scientific and innovative technologies to effectively recycle these materials. This paper deals with recycling and manufacturing process, materials used as well as the testing method of plastic sand bricks the compressive strength was reduced significantly by15% when replacingof west plastic. Its bonding strength

2.) Mr. Aman Kumar et al (2020): Present a report on Manufacturing Bricks from Sand and Waste Plastics, this report concludes that, making bricks from sand and waste plastics can be an alternative to the available traditional clay bricks. Sand plastic bricks have lower water absorption (1.5%), bulk density(1.497Kg/L), and apparent porosity when compared with those of normal clay bricks. Sand plastic bricks have near same compressive strength(5MPA) than normal clay bricks (4.3 to 6.9) Plastic brick have low weight compression to normal brick. Waste plastics which is available everywhere may be put to an efficient use in brick making. Sand plastic bricks can help reduce the environmental pollution thereby making the environment clean and healthy

3.)Mr. Anubhav Verma (2022): Present a report on preparation of brick using sand and plastic bottles, this report concludes that. Waste plastic, which is available everywhere, may be put to an effective use in brick making. Plastic sand bricks can help reduce the environmental pollution, thereby making the environment clean and healthy. Plastic sand bricks reduce the usage of clay in making of bricks. Plastic sand bricks give an alternative option of bricks to the customers on affordable rates. Water absorption of plastic sand brick is zero percent. Compressive strength of plastic sand brick (8.6N/mm2) is more than compression to the normal red brick (5.58N/mm2) they perform the test at different - different ratio (1:3) is very good for high compressive strength ratio.

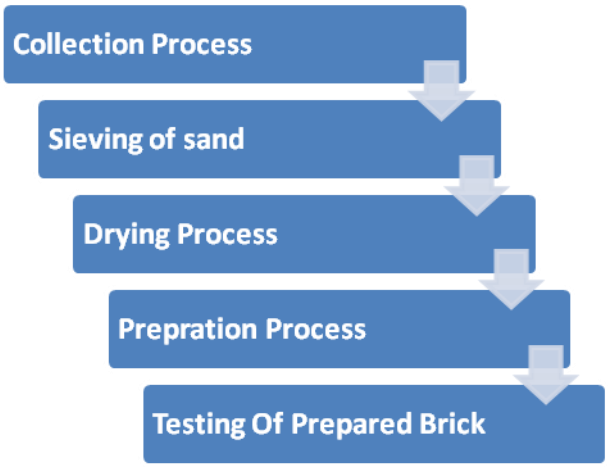
4.) Prof. A. S. Moon et al issue 4 April (2022): Present Ecological brick by use of west plastic & sand, this report concludes Waste plastic, which is available everywhere, may be put to an effective use in brick. Plastic bricks can help reduce the environmental pollution, thereby making the environment clean and healthy. Plastic sand bricks reduce the usage of clay in making of bricks. Plastic sand bricks give an alternative option of bricks to the customers on affordable rates. it reduces the weight of brick compression to normal brick. Water absorption of plastic sand brick is zero percent.

5.) R. S.Kognole et al (2019): Present a report on Utilization of Plastic waste for Making Plastic Bricks, this report concludes that. Waste plastic, effective use in brick making. Plastic sand bricks can help reduce the environmental pollution, thereby making the environment clean and healthy. Plastic sand bricks reduce the usage of clay in making of bricks. Plastic sand bricks give an alternative option of bricks to the customers on affordable rates. Water absorption of plastic sand brick is zero percent. We conclude that the plastic sand bricks are useful for the construction industry when we compare with Fly Ash bricks and 3rd class clay bricks.

III. METHODOLOGY

3.1 COLLECTION PROCESS:

In this the collection procedure was done to acquire the required measure of materials for the preparing of plastic bricks. And further more to get the great quality materials for getting the extraordinary quality and other physical properties. The accumulation of sand was done from the river bed close Ponnai in Vellore region. The gathered measure of sand is around 50 kg in the cleaned bond sack. The accumulation of waste plastic containers was finished by gathering from the marriage functions, hotels and from the street collectors. So we collected the plastic wastes at various possible sites. In this the collection procedure was done to get the required measure materials for the preparation of waste plastic bricks.



3.2 Collected material

3.2.1 **SAND**

Sand is a granular material made out of finely separated shake and mineral particles. It is defined by size.

Sand can likewise allude to a textural class of soil or soil type Hence the sand assume fundamental job in the waste plastic blocks the tests like Specific gravity, Fineness modulus, and Sand Replacement test were directed for getting the physical properties of sand and the acquired outcomes are

S.NO	CONTENT	VALUES
1	Specific Gravity	2.56
2	Bulk Unit Weight	1.42 g/cm^3
3	Grade of sand	Grade zone 1
4	Fineness modulus	3.96
5	Coefficient of uniformity	2.48
6	Coefficient of curvature	1.06

Table 1 Properties of sand

3.2.2 POLYETHYLENE TEREPHTHALATE (PET)

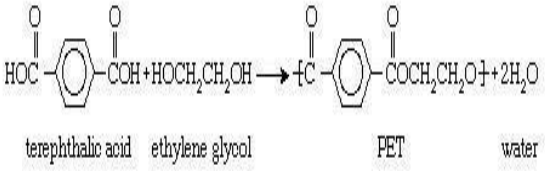


Fig 2 Chemical equation of PET

Presented by J. Rex Whinfield and James T. Dickson in 1940, this plastic is a standout amongst the most ordinarily utilized on earth. Curiously enough, it took an additional 30 years before it was utilized for completely clear drink bottles, for example, the ones created by Coca-Cola and Pepsi Companies. PETE plastics make up 96% of every plastic jug and holders in the United States, yet just 25% of these items are reused. By being careful and making a point to reuse code 1 plastics, you're guaranteeing a cleaner domain and less landfill contamination. Some of the Physical properties of polyethylene terephthalate (PET) are

Table 2 Properties of plastic (PET) bottles

S NO	CONTENTS	VALUES
1	Chemical Formula	(C10H8O4)n
2	Density	1.38 G/Cm^3 (20 °C)
3	Melting Point	> 250 °C
4	Boiling Point	> 350 °C
5	Solubility In Water	Practically Insoluble

3.3SIEVING OF SAND

The sieving of sand process was carried out in order to take the required size of sand. And also, to avoid the large size aggregates (chips) from the sand. So, the sand was sieved with IS sieve 4.75mm.

3.4 DRYING PROCESS

The drying process was done in order to remove the water content from the collected river bed sand and collected waste plastic water bottles. In this drying process the collected materials are spreaded over the cleaned surface at the sunlight during day time and then collected the spreaded materials after the sunset and then stored in the covered room. Since the collection was done after the sunset was to prevent the retaining of moisture content from the snow fall during the winter season. This drying process was carried out up to3 days

3.5 PREPRATION PROCESS

Fig 3 Preparation steps

The Pan which is used for melting the waste plastic bottles should be heated until the drop of water get evaporated. After the heating was done the collected and dried waste plastic bottles (PET) was put into the pan which get heated due to the heated pan and at certain temperature this placed plastic get melts and get boiled. During the melting process the continuous stirring was required. Because the continuous stirring helps to melt the non-melted plastics bottles. During to the melting there is no form of adding water or other cooled materials. Since the plastic gets bursted around the surroundings due to the presence or addition of moisture.The mixing process was carried out after the plastic bottles get melted properly and then in boiling condition. The while the boiling of the plastic molten immediately add the dried sand into the pan which was having molten plastic inside it. After the process of mixing the sand and liquid plastic molten in the pan the process of placing the prepared sand and plastic slag in the prepared brick mould was take place. But in this, the prepared slag was in hot condition so the process of self-compaction takes place upto 3/4th of the mould. So, then it requires normal compaction with steel rod. The demoulding of the casted plastic bricks was done one hour later after the process of placing the plastic sand slag into the brick mould.

Fig 4 Preparing steps of waste plastic sand bricks

IV. RESULT & DISCUSSION

TESTS ON PREPARED BRICKS

The different sorts of tests on plastic bricks were led to check the characteristics of blocks for developments. This kind of brick tests are led at both in building site and in laboratory center. This brick blocks are most established and imperative development materials in view of their toughness, loading bearing strength, quality and minimum cost. To get the quality structure, the great quality materials are required. To choose the good quality materials a few tests on brick blocks are to be carried out. Hence the tests which are required to discover the reasonableness of the bricks for construction purpose are examined beneath.

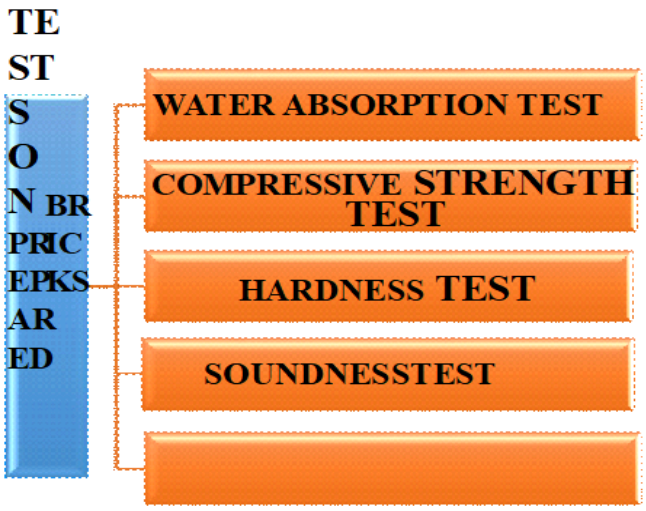
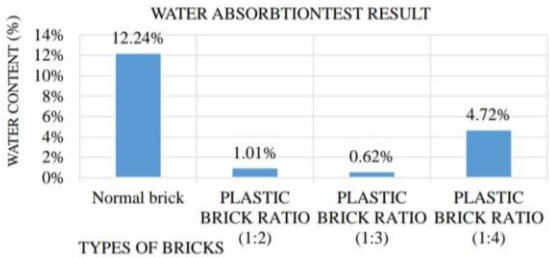


Fig 5 Types of test on bricks 3.6.1

4.1 WATER ABSORPTION TEST

Absorption test is carried on the brick is to discover the measure of dampness content consumed by the brick under extreme conditions. In this test, dry bricks are taken and weighted. Then these bricks areput in water with full drenching for a time of 24 hours. After 24 hours the wet brick are cleaned the water at the surface with cloth and weight this wet brick. The distinction among dry and wet brick block weights will give the measure of water assimilation. Normally the brick should have less than 20% of water absorption value. Hence this test result is shown below



4.2 COMPRESSIVE STRENGH TEST

Normally the Compressive strength of bricks is determined by compression testing machine. Hence the prepared bricks are placed in the compressive testing machine. After placing this brick in compression testing machine, the load is applied on it until brick breaks. Note down the value which obtained at the breaking point and find out the compressive strength value of brick. Minimum compressive strength ofbrick is 3.50N/mm2. If it is less than 3.50 N/mm2, then this type of bricks is not useful for construction purpose. The obtained results was shown in chart

4.3 HARDNESS TEST

This type of test was conducted to check the hardness property of the prepared plastic brick. Hence this test was carried out either in laboratory or in construction site. In this test the sharp tool was used to scratch the surface of the bricks and the identifying the hardness by the depth of the scratch which was done by the sharp tool. If the brick has less impression, then the brick is a hard brick. The following figure shows the before and after scratch results.

Fig 10 After scratching

4.4SOUNDNESS TEST

From this test, the observed result was that the sound of normal brunt clay brick was less when compared with the plastic sand bricks of different ratios. The plastic bricks does not get any crack or damages during the process of checking the soundness, but the brunt clay bricks get abraded at their surface.

Fig 12 Soundness test

V. CONCLUSIONS

In this project, the plastic is used as the binder material so it restricts the absorption of water and also provides the good plasticity to the brick. So hence this type of bricks also resist the earthquake loads. This type of plastic bricks have high compressive or crushing strength at the ratio (1:3). And also has less absorption value when compared to normal conventional burnt clay bricks. So hence the plastic sand brick ratio 1:3 is preferable for the usage for the constructions. By use of plastic sand bricks, the water absorption was highly reduced. This plastic sand bricks are used as foundation bricks below the plinth level in order to avoid the seepage of ground water. Also, the study presented above helps in reducing the plastic waste disposal problem and converts that useless waste material into a useful construction material. The main drawback of this type of waste plastic sand bricks are easily get fire at normal fire. So, this type of bricks can be used at underwater construction, underground construction and also used for underground septic tank construction. Because this type of bricks can withstand high load than the normal brick. Hence the main aim of this project was to reduce waste plastic in our environment by utilizing as a material for the building construction. Since by using in the underground construction the plastic also get degraded naturally.

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