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# An Experimental Investigation on Construction of Tree Bench by Using PET Bottles

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**ABSTRACT:** The main goal of this project is to use the plastic bottles in tree bench construction, which reduces pollution. A simple, low-tech solution to our plastic, eco-bricks follow Earth's ancient example in carbon care. Polyethylene terephthalate (PET) waste bottles filled with production sand are successfully used as eco-building blocks in the manufacture of plastic bottles. Experimentally, PET bottles are given a higher compressive strength compared to clay fired bricks. The project is accepted with the full 1:3 cement mortar, 0.4 water to cement ratio. For the outside area we built a tree bench with PET bottles. If you compare the cost estimate with PET bottles, you save half that of conventional clay bricks.

**KEYWORDS:** Polyethylene Terephthalate (PET), Conventional mud bricks, PET bottles.

## I. INTRODUCTION

Around the world, the disposal of plastic waste is a major concern as it is inherently non-biodegradable and hazardous due to its potentially harmful effects on human health and the environment. Taking into account the increasing environmental pollution, a new concept of PET bottles was introduced. When filled with sand, gravel and soil or granite powder, these bottles have excellent insulating properties. A PET bottle must be a short-term building block that can be reused indefinitely in the short term. Compress, secure and store plastic safely from industry and in the long term from the biosphere. This removes more plastic and CO<sub>2</sub> from the biosphere than was added by the process. Raise the individual and collective ecological awareness of those involved in the process. Contribute to the conservation and promotion of biodiversity.

## II. RELATED WORK

**PV Vigneshwar 2021 :** it helps to understand the reuse of PET bottles for temporary residential structures.

**M.Aravind 2021 :** using non-renewable resources cannot lead to sustainable development and causes to the resource depletion which can bring a destructive concern for the future generation.

**Jabir Zakari Yau 2020 :** found that the stone dust and laterite are viable resources for manufacturing bottle bricks, while sharp sand cannot be used as it does not reach the minimum compressive strength.

**Uche Emmanuel Edike 2020 :** investigated the implications of the use of wet laterite, stone dust and sharp sand in the production of eco-bricks.

**P.Lalzaliana 2019 :** Used plastic bottles were filled with crushed recycled aggregate (RA) and desired water content and were sealed. Bottles containing crushed RA with size less than 425  $\mu\text{m}$  had higher compressive strength as compared to those containing RA with a size between 425  $\mu\text{m}$  & 4.75 mm.

**Federico C. Antico 2017** :develops an experimental characterization of density, filler content (by volume), thermal shrinkage, elastic modulus and deformation recovery capacity using four different filler materials: PET etc.

**Ravi kumar 2016** : conclude that PET bottle masonry is cost effective compared to brick masonry. It is also one of the first and fore most steps for initiation of building concept.

### III. METHODOLOGY

#### MATERIALS STUDY

##### 1. PETBOTTLES

- ThePET bottleisonlypackedwithsand and Granite powder
- ThePET bottlesdensityishigherthan0.33g/ml
- ThePET bottlemusthaveadensityof0.70g/ml orless
- The PET bottleissealedtightwithascrewdownlid.



Figure 1. PET bottles

##### 2. CEMENT

All of these tests used ordinary Class 53 Portland cement (meeting the requirements of IS: 12269). This cement also generally conforms to ASTM Type I cement specifications.

**Table-1**Testconductedoncement

S.NO	Testsoncement	Cement
1	Finenessofcement	4%
2	Specificgravity	3.15
3	Normalconstituency	30%
4	Initial setting timeFinalsettingtime	20minutes 560minutes

3.SAND

In the present work locally available manufactured sand has been used as fine aggregate. Other unwanted matter present in the sand has been separated before use. The sand was sieved through 4.75mm sieve to avoid the presence of pebbles and organic matter

Table-2: Properties of Manufacturing sand

Material	Manufacturing sand
Specific Gravity	2.53
Bulking of sand	4 %

IV. EXPERIMENTAL RESULTS

1. COMPARISON OF COMPRESSIVE STRENGTH



Figure 2. Compressive Strength on PET bottles

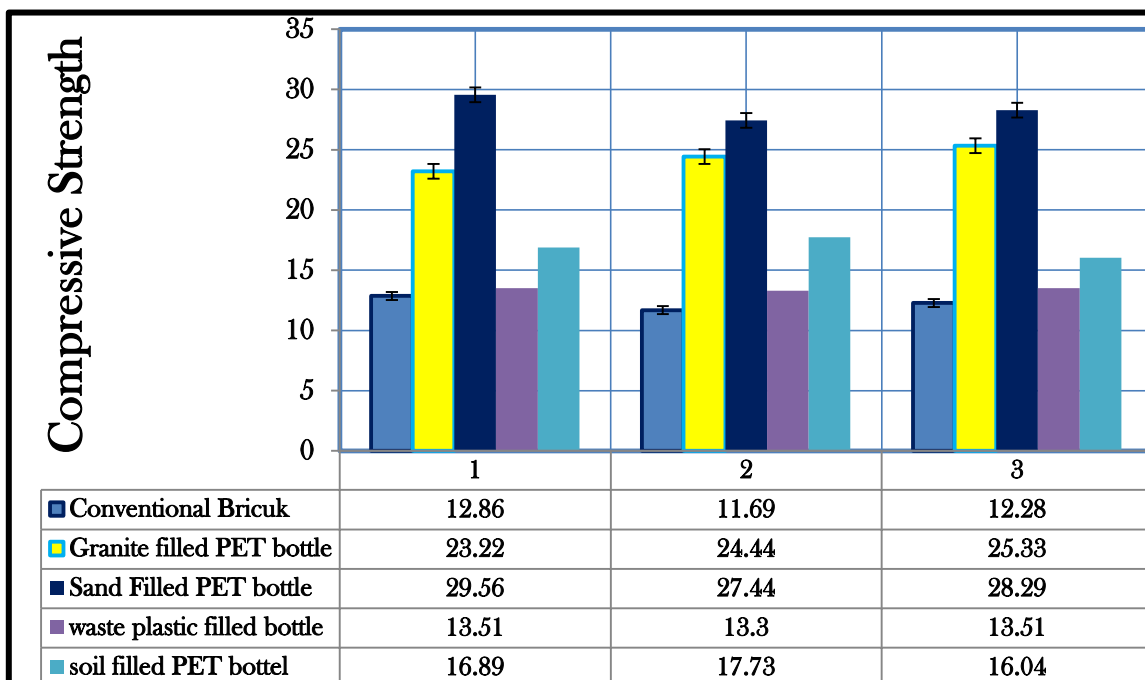


Chart1. Comparison of Compressive Strength

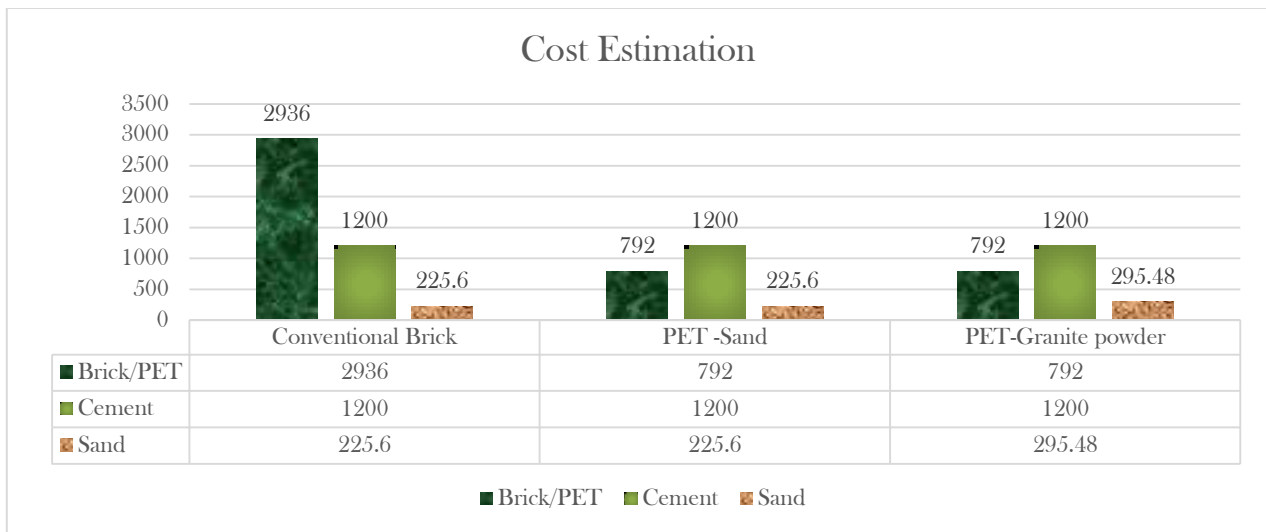
- The compressive strength of Granite powder filled PET Bottle enhanced to 24.33 N/mm<sup>2</sup>.
- The compressive strength of sand filled PET Bottle enhanced to 28.43 N/mm<sup>2</sup>.

- Hence The Compressive strength of Sand filled PET Bottle is more when compare with other PET Bottle filled with other materials& Conventional bricks.

**2. COMPARISON OF COST ESTIMATION**

The cost comparison between bottle wall is about half that of traditional brickwork. That is to say, the total cost of a brick tree bench is Rs. 4361.6 and the total cost of a sand filled bottle tree bench is Rs. 2586.6 and the total cost of a granite powder filled tree bench is Rs.2287.48.

**COSTESTIMATION OF TREEBENCH**



**Chart2. Cost Estimation**

**3. CONSTRUCTION**



- Step:1** Site selection involves choosing the appropriate location for a construction project.
- Step:2** Surface leveling ensures a smooth and even foundation for the construction work.
- Step:3** Earthwork excavation involves removing soil and other materials to prepare the site for construction.
- Step:4** Marking is the process of identifying and marking the boundaries of the construction site.

**Step:5** Layering of cement mortar is the process of applying a layer of cement to create a solid and stable foundation.

**Step:6** undation is the base on which the structure is built, providing stability and support.

**Step:7** Layer of bricks involves laying bricks in a specific pattern to create walls or other structures.

**Step:8** Curing is the process of allowing concrete to dry and harden over time to achieve maximum strength.

**Step:9** Finishing involves adding the final touches to the construction work, such as painting or decorating.



## V. CONCLUSION

1. Cost comparison between bottles wall is roughly half than conventional brick masonry. i.e., Total cost of around Brick tree bench is ₹4361.6 and total cost of around PET Bottle filled with sand & Granite powder tree bench is ₹2539.8 & ₹2241 similarly
2. The Compressive strength of PET sand & Granite powder filled Bottle is increased by 79.41% & 65.901 % similarly when compare with Burned Clay mud brick
3. Aesthetic point of View PET Bottles tree bench is more attractive compared to normal bench.

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