

Application of Plastic Bottle as a Wall Structure for Green House

¹ Nikhil Datir ² S. S. Kadam

JSPM'S RSCOE IInd Shift Polytechnic, Tathawade, Pune - 33

Department of Civil Engineering, Maharashtra, India

Abstract: Plastic bottle as a Wall structure plays important roles in supporting the superstructures, separates spaces in the buildings into the sections and the delineates a space in open air. Most of the construction of a house in a Malaysia use bricks and the mortar which is consists of cement, aggregates and water as a materials to build the structure of a wall. However, the cement and the bricks manufacturing process will be contribute to a high emission of a carbon dioxide (CO₂) which may lead to global warming. Therefore, The objective of this paper is to find an the alternative solution to reduce this environmental problem. The alternative way that can be solve the problem is by replacing the use of bricks in the building construction by plastic bottles filled with sand as we called it plastic bottle green house. Reuse of these non-biodegradable plastic bottles not only can be solve the environmental problem, but it can also be reduce the pollution. The main concern of this project is a strength of bottle bricks.

1. Introduction

Global warming refers to what is believed to be a trend where earth's temperature is increasing. This is believed to be the primarily due to the emission of man-made pollutants that cause more of the sun's energy to be trapped in the atmosphere. These pollutants are referred to as-so called greenhouse gases. Most of the pollutant also occur naturally in the environment in some form or another and while man-made emissions are often relatively small compared to those naturally occurring, they may be affecting the natural balance in the environment. While it is estimated that it would take many years for there to be catastrophic consequences to the increase in greenhouse gas emissions, it could be too late to reverse the trend if something is not done now. Eco-house also known as the Green building, is the creative buildings and supportive infrastructure that reduce the use of resources, create healthier living environments for people, and minimize negative impacts on local, regional, and global ecosystems.

Features of Rainwater Harvesting

- Reduces urban flooding.

- Ease in cheaper in construction compared to other sources, i.e. dams, diversion, etc constructing system in less time.
- Economically. The Rainwater harvesting is a ideal situation for those areas where there is inadequate groundwater supply or surface resources.
- Helps in utilizing a primary source of the water and prevent the runoff from going into sewer or storm drains, thereby reducing the load on treatment plants.
- Recharging water into the aquifers which help in improving the quality of existing groundwater through dilution.

2. Related Work

Walker et. al., (2007) [1] In their paper entitled, “Eco-house also known as Green building, is the creative buildings and supportive infrastructure that reduce the use of resources, create healthier living environments for the people, and minimize negative impacts on local, regional, and global ecosystems

U.S. Department of Energy, (2010) [2] In this paper, Green building also has been studied at United State it shows that the annual impacts of building construction including 35% of carbon dioxide production which is the major contributor to global warming.

Eriosi, (2013) [3] In this paper, Compressive Strength can be defined as the maximum compressive stress that a material is capable of withstanding without fracture

Pati et. al, (2014) [4] In this paper, In a small village in Nigeria, a solution has been applied to not only provide shelter in a poverty stricken country, but find a use for the refuse Packing sand into the plastic bottles is a technique that started nine years ago in India, South and Central America. Named “bottle brick” technology, is the compacted sand inside the bottles is almost 20 times stronger than bricks.

3. Methodology

Compression test is carried out to test the compressive strength of 250ml bottle brick, 1.5L bottle brick and clay brick using compression testing machine. The area of clay brick is the 0.021m² (0.22 m x 0.09 m). Since the area of contact of 250ml bottle brick and 1.5L bottle brick are not in regular shape like brick, their area is calculated by using irregular shape formula. The area obtained for 250ml bottle brick and 1.5L bottle brick are 0.002m² and 0.006m². From the testing, the maximum force can be applied on 250ml bottle, 1.5L bottle, and clay brick until failure. . Firstly, a formwork is built with plywood in dimension of 1.2 m x 1m x 0.75m. Then reinforcement steel bars are placed inside. 34kg of cement, 68kg of sand, and 136kg of aggregates and 17kg of water are measured

using electronic balance, and then mixed by concrete mixer for in a ratio of 1:2:4 and water cement ratio of 0.50. A formwork of 1.2 m x 1m x 0.75m dimension A total of 308 bottles of 250 ml mineral water are used to produce bottle bricks. All the bottles are dried before the proceed to the next step which is filling of sand. Filter funnel is used to be ease the filling of sand into the bottle since the opening of bottle is undersized. Sand is the wet partially so that it can be compacted easily and thus increasing the density of bottle bricks. Sand is compacted in three the layers and each layer is compacted with 20 blows with tamping rod. In order to make sure all the bottles are completely compacted, quality check is carried out and those which are less compacted are improved. Wall structure is constructed using the mortar to bond the plastic bottles together after completed filling the sand into plastic bottles by. Cement, sand and water are to be mixed together according to mortar ratio 1:2 and water cement ratio 0.30 by using concrete mixer.

Results

Plastic bottles can cause be the green construction by saving energy and resources, recycling materials, minimizing the emission, having significant operational savings and increasing work place productivity. These 13 plastic bottles can be the vertical garden ideas will interest you if you are a creative person, DIY lover and love to grow plants. This way you can be use plastic bottles to make something amazing out of them. Repurpose of those old bottles, which can you usually throw away to grow your favorite plants either indoor or outdoor and help to save our environment. If you love DIY ideas and you have a green thumb then starting a window farm is a smart idea. A window farm will let you do the lot of with the little amount of space you have. The indoor window Falls the crops to take full advantage of the light and vertical space available at the windows.

Conclusion

Use of innovative materials with the sustainable application such as plastic bottles can have considerable benefits including finding the best optimization in energy consumption of the region, reducing environmental degradation. Generally the bottle houses are bio-climatic in design, which means that when it is cold outside is warm inside and vice versa. Re-using the plastic bottles as a building materials can have substantial effects on saving the building embodied energy by using them instead of bricks in walls and reducing the CO₂ emission in manufacturing the cement by reducing the percentage of cement used. Plastic bottles can be cause the green construction by saving energy and resources, recycling materials, minimizing the emission, having significant operational savings and increasing work place productivity. Cost compression between the bottles wall is roughly half than conventional brick masonry. i.e., the Total cost of 10 m² Brick masonry wall is Rs. 7444.25 and total cost of 10 m² Bottle masonry wall is Rs. 3879.2 . Use of innovative materials with the sustainable application such as plastic bottles can have considerable benefits including finding the best optimization in energy consumption of the region, reducing

environmental degradation. Plastic bottles can cause the green construction by saving the energy and resources, recycling materials, minimizing the emission, having significant operational savings and increasing work place

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