

SUSTAINABLE CONSTRUCTION OF BOTTLE WALL AND BINDING MATERIAL

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Abstract – Nowadays construction costs are rising. People who are economically good are able to afford the construction prices but in present scenario there are many who are not able to afford the basic necessity of house. So to decrease the cost of building materials here is a plan to build a house with bottle (glass or plastic bottle) and the binding material. And also the idea of bottle construction can also be used to build entertainment places like clubs, coffee houses, restaurants, resorts etc as this can also add to the aesthetic view of that place.

1. INTRODUCTION

Bottle construction is a plan to build a house with bottle (glass or plastic bottle) and the binding material as shown in [fig.1]. It is a type of sustainable development which maintain the environment as well as include binding material and also ensures the safety to life and property. This type of construction decreases the cost of binding material and help in making the bottle, a renewable material. Bottle construction is also beneficial for business in small area as people are attracted towards the aesthetic view of the place .



Fig.1: Bottle Wall Construction

1.1 CONSTRUCTION OF BOTTLE WALL

- Binding Mixture: A typical mortar mix is 3:1 mason sand to a pozzalan (fly ash) cement mix. Other mixtures could be made from mortar and clay. Bottle walls are extremely versatile and could be bonded with anything.
- The construction involves the use of glass bottles (jars, glass jugs, and other glass containers) as masonry units and sand, cement, mortar or concrete. Firstly, bottles must be collected and sorted. About 14,000 bottles of uniform size are needed to make a two-bedroom bottle-home.
- Although bottle walls can be constructed in many different ways, they are typically made on a foundation and rebar can be set to add stability to the structure. Bottle walls range one bottle to two bottles thick. Primitive mixture, such as concrete or clay can be used as mortar to bind the bottles. It is thickly spread on the previous layer of bottles followed by the next layer which is pressed into it.
- Two bottles can be cut and taped together to create a window-type effect. This taped bottles act as an opening allowing a light passageway. This also traps air and creates a small amount of insulation. Filling glass with liquid that will be subjected to freezing and thawing is not a good idea, but is useful if the glass is protected from temperature.
- Another technique is the plastic bottles are filled and tightly packed with the sieved sand. Once filled, the bottle becomes a “brick” that can be used as a basis to build a solid structure. A wall made “bottle

bricks” is up to 20-times stronger than a wall constructed of concrete blocks.

- Vertical Bottle Wall Construction: Bottles that are placed right side up within a frame will make a vertical bottle wall as shown in [fig.2]



Fig.2: Vertical Bottle Wall Construction- Wall Frame, Wire Mesh filled with Bottles and Final Plastering Process

- Horizontal Bottle Wall Construction: Once the frame for the building is constructed, the bottles are laid horizontally by using mortar in between and for the finish.
- Window frames and doorways can be accommodated in the construction, and windows and doors can be constructed in these spaces, just like in normal construction. Any kind of spacing between the bottles can be obtained.
- Roof Construction with Plastic Bottles: The plastic bottles mainly in its crushed state are used in the construction of roofs as shown in [fig.3]. They are very simple and artistic in nature. They have a good water proofing property. These waste bottles can behave as an immediate shelter. As a long-lasting roof performance can be provided by plastic roofs.



Fig.3: Different Plastic Bottle Roof Construction

1.2 LOADING ANALYSIS

- There are various methods to keep the bottle construction resistant to earthquake and wind load similar to the normal construction with concrete and brick. A column is constructed in between the wall with similar dimension as of the other column and with the similar thickness as of the wall. It would act as a shear wall of the structure.
- Beam to beam distance should be less.
- For wind load, windows and doorways are constructed to resist the lateral load.

2. ADVANTAGES

- Homes made construction from recycled plastic bottles are **bullet-proof** and **earthquake resistant**.
- **Employment:** Bottles are collected and filled with sand. The unemployed and handicapped are trained in their construction methods.
- **Aesthetic view:** Bottle houses are often more convenient to build in a circular fashion. The circular shape adds strength to the walls, while providing a very artistic and pleasing appearance.
- **Waste Management:** To build a small house one can use as many as 10,000 used bottles which are readily available. Waste that would otherwise be deposited in a landfill can now help solve other social problems of housing, schools and clinics. If the communities want to get rid of other plastic waste the bottles can be filled prior to construction.
- **Provide Structures:** Since in many parts of the world homeless people are considered outside normal society.it give structure and area for living to the needy one.
- **Durability:** The plastic bottles are known for their durability and can last as long as 300years.
- **Cost effective:** The use of recycle material make it more affordable than conventional building methods and will increase the accessibility to suitable housing. It is a well-insulated and cheaper solution. It also cut the cost of transportation of building material. For a region where money tends to be scarce, the houses are estimated to cost 1/3 of a house made of concrete and bricks

3. CONCLUSIONS

Here is a procedure to construct the bottle house which is resistant to external loads. Millions of plastic water and beverage bottles are discarded every year into the landfills. Sustainable reuse of bottles is beneficial for construction. Ordinary mortar is used to hold the “eco bricks” in place, as in regular masonry. The bottle construction techniques and their benefits must be spread and educate to local community. They are the group of people who are most benefitted by low-cost construction.

ACKNOWLEDGEMENT

I sincerely thank Mr. Satish and HOD Mr. Abhishek Sharma for their guidance and encouraging in carrying out the research work.

I also thank the Director of CBS College Dr. Narendra Dhansoia for providing me the opportunity to embark on this project.

REFERENCES

- [1] V.N Vazirani, “Concrete technology”
- [2] M.S Shetty, “Concrete technology” , Revised Edition