

Low Cost Sanitation System for Rural Areas using Bamboo as a Superstructure

Sachin Mahurkar¹, Saurabh Jain²

(Department Of Civil Engineering), Parthivi College of Engineering & Management, Bhilai-3 (C.G.) India
smsachin23[at]gmail.com

(Department Of Civil Engineering), Sagar Institute of Science Technology & Research, Ratibad, Bhopal (M.P.) India
er.saurabhcivil[at]gmail.com

Abstract: Various attempts have been made by government of India to provide sanitation system to each & every home. sanitation coverage targets are ambitious, particularly the national goal to attain 100% sanitation coverage by 2019, and there is a little dispute that sanitation targets are still far away. There is no question that innovative designs by using local available materials, a little extra cost, can aid rural people to take care of their personal hygiene needs independently. This paper aims to provide a low cost sanitation system using bamboo as a superstructure for rural areas or for the people who cannot afford the present market rate sanitation system in a very low cost budget and minimal time. By the use of this system the people save time thus increase their working hours moreover they will be saved from dreadful diseases.

Keywords: Low cost, eco-friendly, low space utilization, Low cost slag bricks, use of bricks.

1. Introduction

The low cost sanitation system is an eco-friendly, technically appropriate and economically affordable. It is an indigenous technology and the system can easily be constructed by the locally available labour and materials. It provides health benefits by safe disposal of human excreta. The system consists of sub-structure and super structure. The sub-structure is made of fly ash bricks masonry or slag bricks or of locally available stones and the super structure is made of bamboos sliced in to two parts and arranged in zig-zag form. The toilet consists of a pan with a steep slope of 25°-28° and an especially designed trap with water seal requiring only about 1 to 1.5 liters of water for flushing, thus helping conserve water. It does not need scavengers to clean the pits. There is a one pit of sufficient size and capacity. The capacity of each pit is normally designed for 3 years of usage.

2. About the Project

A. Objectives of the Proposed Project

The main objectives of this research proposal is to provide low cost eco-friendly sanitation system. The following were also proposed :

- To use locally available low cost materials for masonry like stones, slag bricks etc.
- To make low space utilization.
- To use bamboo as a super structure.
- To save time for construction of sanitation system as well as of people utilizing it.
- To provide a healthy and hygienic environment.
- Making the environment clean thereby reducing the many dreadful diseases.

B. Importance of the present project

The problem of providing low cost sanitation and making the country clean and free from dreadful diseases has become most important part of government of India. Several attempts have been made by government. The sanitation coverage targets are ambitious, particularly the national goal

to achieve 100% sanitation coverage by 2017, and there is little dispute that sanitation targets are still far away. Access to water and sanitation services is a fundamental right of all people whatever their gender, physical ability, economic status or age. Therefore all water and sanitation programs need to address the needs of all sections of society. The problem of providing a suitable low cost sanitation system with affordable price is still a big issue . government has adopted various plans of providing sanitation systems and making the country 100% sanitized and free from dreadful diseases, moreover due to unavailability of sanitation people and mainly women have to travel a long distance which is not safe.

The purpose of this project is to provide an affordable sanitation system which will be eco-friendly & less time consuming over the government sanitation system and thereby comparing the cost difference and construction time. Bamboo being used as a superstructure is a versatile, strong, renewable and environmentally friendly material. Bamboo is an extremely strong fiber with twice the compressive strength of concrete, and roughly the same strength to weight ratio of steel in tension. In addition, testing has shown that the shape of bamboo is hollow tube gives it a strength factor of 1.9 times over an equivalent solid pole. The structural advantages of bamboo are its strength and light weight thereby properly constructed bamboo buildings are inherently resistant to wind and earthquakes. Well treated bamboo has a life expectancy of 50 years without losing its structural properties

C. Materials used

- Cement : Ordinary Portland cement 53 grade.
- Fine aggregate :sand.
- Coarse aggregate
- Bamboo sticks sliced in two pieces.
- Sanitary pan with water seal trap
- Gas outlet pipe.

D. Methodology

- To evaluate the cost estimation of present government adopted sanitation system.
- To collect the low cost slag bricks, fly ash or locally available materials.
- To collect the bamboo sticks..
- Construction of septic tank with bricks or of stones and covering it with slab .
- Placement of pan with trap having water seal
- Construction of superstructure using bamboo sticks.
- Provision of outlet gas pipe and also an outlet for emptying of pit when filled fully.

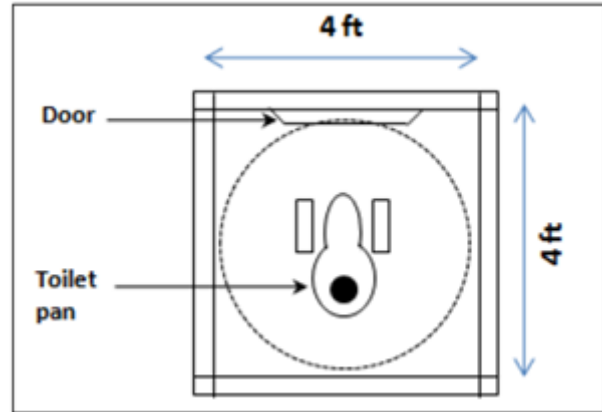
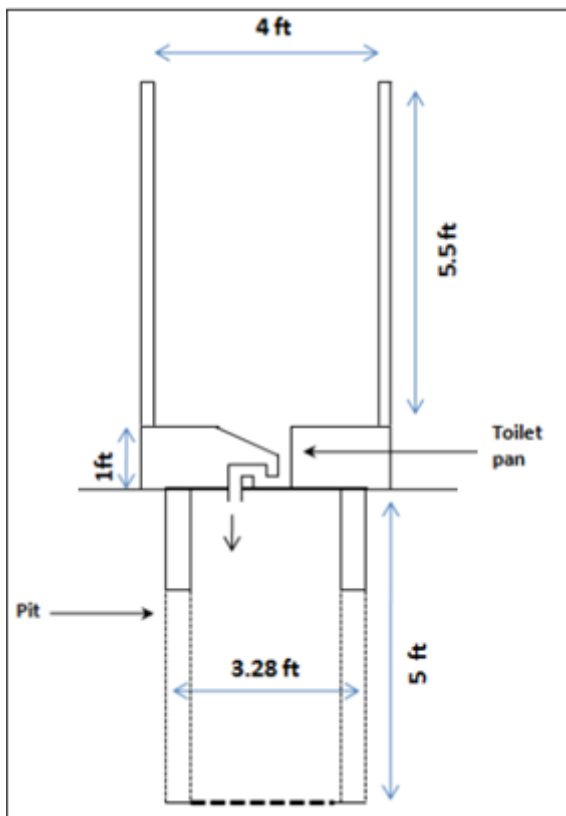
E. Bamboo Qualities at a Glance

It is light in weight. It offers a sustainable solution for construction. Due to its regenerating quality it falls under the category of being a renewable resource. It has high tensile strength. And that most of the demerits of bamboo construction can be countered.

To improve durability which is perceived as the biggest drawback, simple precautions of selecting appropriate Species, harvesting time- cutting methods, preventing water from collecting over the node during rains, right age at which bamboo is cut, seasoning air drying or kiln drying, chemical treatment etc. can increase the life of bamboo.

The intervention of appropriate construction technology, to increase the durability of bamboo structures is possible by protecting them. Deep eaves for protection from rain, and a similar protection at foundation and plinth, can go a long way, in increasing the durability of a bamboo structure.

F. Experimental plan



Salient features

- 1) Appropriate where space is limited
- 2) Easier to empty when pit fills
- 3) Low cost and eco-friendly
- 4) Superstructure made from locally
- 5) Available bamboo sticks
- 6) It is appropriate for Rural, semi-urban and urban area peoples.
- 7) It is constructed in two days
- 8) The plinth level basement may be circle or square shape

Cost Estimate

Details	No. of Units	Unit Cost (in Rs.)	Total amount (in Rs.)
Toilet pan with p-trap	1	250	250
Jute bag for connecting the p-trap			50
Squatting slab	1	300	300
cement	1	250	250
Masonry charges	1mason	300	600
sand	3 bond	300	300
Total			1750

3. Conclusion

1. Different groups have a wide variety of needs, and social, financial and institutional barriers must be over come to address these needs and ensure everyone can access the sanitation services. The low cost sanitation project approaches have inadvertently excluded the poor and rural people. This further increases inequity and makes achieving community water and sanitation outcomes, such as an open defecation free environment, impossible.

2. The Bamboo has known qualities and an established reputation of being a wonder building material (eco friendly, regenerative, high tensile strength, low cost etc.). It is light in weight and offers a sustainable solution for construction. Due to its regenerating quality it falls under the category of being a renewable resource. It has high tensile strength. And that most of the demerits of bamboo construction can be countered.

3. By providing the low cost sanitation system, not only the rural people but also the semi-urban and urban people saves time and increase their working hours thereby reducing the chances of having some dangerous diseases.

4. The sanitation system is appropriate for low space utilization and it can be made in two days by locally available materials and semi-skilled labours. The materials used are also eco-friendly and affordable.

References

- [1] “Bamboo -An Alternative Building Material for Modest Houses Chandra Sabnani”, M. V. Latkar, and Utpal Sharma.
- [2] Appropriate Low-cost toilet technology – An Indian perspective ,Gramalaya
- [3] Manual on the design, construction and maintainance of low-cost pour flush water seal latrines in India, AK. Roy, P.K. Chatterjee, K.N. Gupta,
- [4] Lal A.K., `Hand Book of Low Cost Housing.
- [5] Creating user-friendly water and sanitation services for the disabled