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Public Toilet

Anugya Gautam[1*], Kritika Bhattarai[2], Annada Shrestha[3], Pratikshya Khanal[4], Kailash Shrestha[5]
[1]Dept of Architecture, Kathmandu Engineering College, Nepal, E-mail: gtm.anugya@gmail.com
[2] Dept of Architecture, Kathmandu Engineering College, Nepal, E-mail: kritikabhattarai20@gmail.com
[3] Dept of Architecture, Kathmandu Engineering College, Nepal, E-mail: annada9559@gmail.com
[4] Dept of Architecture, Kathmandu Engineering College, Nepal, E-mail: pratikshyakhanal90@gmail.com
[5]Assoc. Professor, Dept of Architecture, Kathmandu Engineering College, Nepal, E-mail: kailashrestha13@gmail.com

***Abstract*— The provision of public toilets is not only a matter of land use but also an essential design and planning concern. It is an essential infrastructure to guarantee the right to sanitation in public spaces. Given this, the present research aims to understand the perspective of public toilet on the basis of planning, innovative approaches, universal access and sustainable features. For this research, two cases of public toilets were studied. On the whole, the importance of the public toilet on the basis of different innovative approaches, planning and universal access is highlighted in this study with regard to health, sanitation, and accessibility issues.**

Keywords*— *Planning, Innovative Approach, Universal Access, Sustainability

Introduction

A public toilet is a room or small building with toilets (or urinals) and sinks for use by the general public. The facilities are available to the public and are commonly separated into male and female toilets, although some are unisex, especially for small or single-occupancy public toilets. Increasingly, public toilets are accessible to people with disabilities. Public toilets may be municipally owned or managed and entered directly from the street. Or they may be within a building that, while privately owned, allows public access [1]. Nowadays, public toilets having sustainable and innovative features have been used worldwide.

Literature

A. Zoning/Planning Strategies

The location of toilets should not be too remote from the main traffic area, transportation hubs, or parks to avoid long-distance walking. It should be located in a place that is directly visible to the people with no such obstructions While planning a public toilet, male and female sections should be separated. Separate sections for differently abled people and gender-friendly areas should be incorporated into the plan as well.

Single entrance/exit plans work satisfactorily provided the path of the users do not cross each other and the entrance is wide enough. Adequate space should be allocated for each fixture, including clearances in front of and beside them, to ensure comfortable and safe use. These spaces include space occupied by the appliances

themselves, additional space required by the user, and further space for their own belongings or circulation within the toilets [2]. The wet and dry areas of the toilet should be separated from one another. In order to keep the floor dry, the vanity top-cum-wash basin should be installed outside the toilet cubicle for common use by all users.

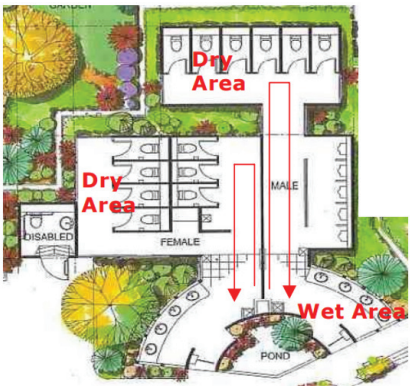

Figure 1: A typical guided plan of a pulic toilet

Figure 1[2] shows an example of a typical public toilet plan, where different male, female and differently abled sections are separated. The plan further shows the wet area (basins) and dry area (commode) within the toilet.

B. Design Standards

When designing a public toilet, it is important to consider various factors to ensure functionality, accessibility, hygiene, and user comfort. While there may not be a universal standard that applies to all regions, here are some common design considerations and guidelines to help you create a well-designed public toilet.

TABLE 1
RATIO OF USERS TO TOILET

S.N.	Number of people	Wash basin	Urinals	Male	Female
1	50	2	2	1	1

* *Corresponding Author*

It is essential to consider the expected user traffic and the comfort and convenience of the users while designing a public toilet. The above table shows a standard ratio of the number of users to the cubicles and wash basin that is required.

TABLE 2
STANDARD DIMENSIONS OF THE CUBICLE

Cubicle	Dimension in m
For commode	3 ft. by 5 ft.
For urinal	2 ft. 6 in. by 5 ft.
For differently-abled	5 ft. by 7 ft. 3 in.

Table 2[3] shows the minimum area that is required for cubicles and these sizes can often be exceeded for design and usability purposes. All standard cubicles should have a 1 ft. by 6 in. diameter maneuvering space within the cubicle [4]. The Urinals should be separated by modesty boards of height that is not less than 1 ft. by 2 ft. 6 in. If 2 or more urinals are installed, one should be installed at the child's height. All W.C. cubicles should be fitted with drum roll toilet paper dispensers.

C. Universal Access

The first requirement to take into account is the availability and signage of this type of bathroom that should be oriented for both sexes. Directional signs leading to the toilets should meet the needs of differently abled people. Flooring should be made up of tactile tiles which guides the user to the toilet.

The toilet space should be large and must allow a 5 ft. diameter turn for a wheelchair and be free of obstacles. The grab bars are essential elements that facilitate mobility they should have a circular section with a diameter of 1 to 2 in. and a minimum length of 2 ft. 3 in., and they must be located at a height of between 2 ft. 3 in. to 2 ft. 6 in. from the floor and be 2 ft. to 2 ft. 3 in. apart.

Similarly, the washbasin should have no pedestal and should be located at a maximum height of 2 ft. 6 inches from ground level, leaving a minimum free space of 2 ft. 3 in. underneath, allowing the frontal approach of a wheelchair user. The horizontal reach from the seat of the wheelchair must be a maximum of 2 ft. The maximum height of the mirror should be 3 ft. from the ground [5].

D. Innovative Approaches

With the rapid development of technology, smart toilets have emerged. It is one of the latest innovations in public restrooms. Public toilets should be designed to minimize hand contact as far as possible for hygienic reasons. Opening the door, flushing the toilet, and washing your hands are all controlled by touchless sensors.

Touch-free technologies like automated doors, flushers triggered by motion sensors, wave-to-open switches, and hand-free sanitary hardware like dispensers operated with foot pedals are now requisites to create touch-free and infection-controlled public spaces. Features of touch-free approaches could be cleaner facilities, lower cost, and sustainability. Installing energy-saving lighting fixtures with sensors can reduce our overall energy consumption and promote sustainability [6].

Methodology

The qualitative methodological approach used in this research comprised data collection and analysis. Both primary and secondary data collection were done. Primary data included interviews, and questionnaires, whereas the secondary data included literature books, the internet, and magazines. Further, two case studies were chosen to allow a deeper understanding of the subject matter. Lastly, the analytical part was prepared to study more about how public toilets can be improved according to the need of the user and how different innovative approaches can be incorporated for less energy consumption of the building.

Case Studies

A. Patan Dhoka Public Toilet

In a unique way in its design, planning, and sustainability, the public toilet of Patan Dhoka stands out from the other general types of public toilets. As a structure that has once become a winner of the ARCHASIA design competition, we decided to do a case study about it.

Figure 2: Front view of Patan Dhoka Public Toilet

1) Planning and design standards: The toilet covers an area of 500 sq. ft. that includes an entry foyer, toilet section, and a small ATM booth which is now used as a small café. In the circular entry foyer, token is collected by the users to use the toilet. The central foyer as sown in the figure leads to different sections of male, female, and an inclusive toilet. The size of the cubicles is adequate i.e., 5 ft. by 3 ft. in male and female sections and 5 ft. 6 in. by 6 ft. in the inclusive section. The materials used for flooring and walls are ceramic tiles and terracotta tiles on some parts. For universal accessibility**,** a 1:6 ratio ramp leads the users to the toilet. Tactile tiles are used in flooring to guide the people to the inclusive section.

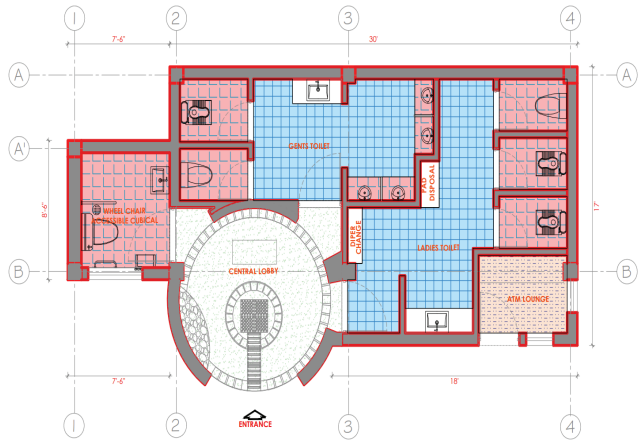

Figure 3: Plan of Patan Dhoka Public Toilet

2) Sustainability and Innovative Approach: One of the sustainable features of this toilet is that the effluent goes into a biogas digester, that is now used in the small café (5 ft. by 6 ft.) of the building. Similarly, the rainwater from the roof is harvested and used in the toilet area.

There are some innovative approaches that are used and are based on the concept of smart toilets. It includes motion-detector flushes, taps, and hand dryers with sensors and a menstrual hygiene dispenser for pads. These types of sensor fixtures are mainly introduced to improve and maintain the health and hygiene performance of the public. The menstrual pads were disposed of by the help sanitary pad disposable machine.

In the case of lighting and ventilation, skylights have been provided in both the sections of the male and female areas. Within the skylight opening, a zero-energy fan is used for ventilation purposes which exhausts as well as provides fresh air inside.

B. Tripureshwor Public Toilet

The public toilet in Tripureshwor is built incorporating different innovative, sustainable, universal, and user-friendly approaches regardless of its façade design, we decided to do a case study about it.

Figure 4: Tripureshwor Public Toilet

1) Planning and design standards: The toilet covers an area of 500 sq ft with a length of 28 ft and a width of 12 ft [7]. There are four male urinals in the male section and two cubicles for women and one for the differently abled. The size of the cubicles is 4 ft.10 in. by 3 ft. 3 in. in male and female sections and 5 ft by 3 ft. 6 in. for the inclusive section. There is no foyer space provided and the circulation space is not adequate. A small shop is present for token collection to go inside the toilet.

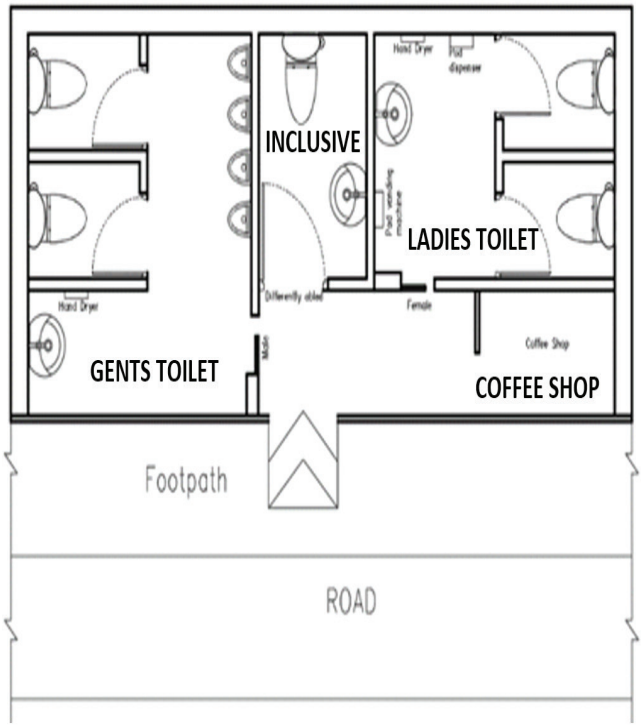

Figure 5: Plan of Tripureshwor Public Toilet

2) Sustainability and Innovative Approach: One of the sustainable features of this toilet is that toilets are equipped with technology that harvests rainwater for use. It has a waste management system based on automated technology. The toilet is equipped with a disposable machine for used menstruation pads and vending machine for fresh pads. The toilet is also equipped with automatic technology that dispenses water and liquid soap and also has a hand dryer.

In the case of lighting and ventilation, a translucent double glass block is constructed on the front, it also has an open plan which provides good lighting. It has windows on the back for ventilation.

Analysis

Nowadays, public toilets have evolved on the basis of designs, spaces, user functionality, and innovative technologies. This analysis aims to shed light on the state of public toilets, focusing on the chosen case of Patan Dhoka and Tripureshwor public toilets.

TABLE 3
COMPARISON BETWEEN PATAN AND TRIPURESHWOR PUBLIC TOILET

Description	Patan Dhoka	Tripureshwor
1. Design	Based on the vernacular Newari architecture.	A simple rectangular plan with no designs.
2. Planning	Provision of circular foyer as a buffer space.	The toilet is directly visible from the road and no buffer is provided.
	Improper placement of fixtures in differentlyabled section.	
3. Management	AEROSAN (A complete public toilet management system)	
4. Number of users	10 to 12 per hour	2 per hour

According to the analysis mentioned in the above table, Patan Dhoka's toilet incorporates every aspect that is essential for building a good public toilet. Its spatial planning allows user movement more accurately and efficiently. Introducing innovative technologies like motion sensor fixture which requires touch-free operations are found to be very much beneficial in improving hygiene, convenience, and user experience. It is designed functionally, strategically and aesthetically in both external and internal parts. In the context of Tripureshwor public toilet though there is provision of all the innovative technologies and other facilities that a good public toilet needs however the planning is not done properly.

Public toilets should be made inclusive and accessible to every individual. Features like ramps, wider doorways, and grab bars should be made available in public restrooms to promote inclusivity. Likewise, integrating sustainable design principles into public toilets, such as water-saving fixtures, energy-efficient lighting, solar panels, and rainwater harvesting leads to reduced operational costs. Patan Dhaka's public toilet has incorporated such features that have helped to reduce energy consumption in the building. For the toilet to sustain itself in the long run, both toilets are operated on a token system that is purchased by the user or paid a fee. The collected revenue is used for its management and maintenance.

Conclusion

In conclusion, the evolution of public toilets and their innovative designs has brought significant advancements in improving hygiene, accessibility, and overall user experience. The integration of technology, sustainable practices, and thoughtful design elements has revolutionized the way we perceive and utilize these essential facilities. Moreover, innovative designs have addressed the issue of accessibility, ensuring that public toilets are inclusive and cater to the needs of diverse user groups.

The facade design of a public toilet also plays a crucial role in creating a visually appealing and welcoming structure that integrates harmoniously with its surroundings. It serves as the public face of the facility, making a first impression on users and passersby. Thus, we can conclude that a public toilet can be properly utilized not only by its innovative features and technologies but also by its overall design. By considering aspects such as contextual integration, visual identity, materials, lighting, accessibility, sustainability, and artistic expression, the overall design of the toilet can contribute to an enhanced user experience and a positive impact on the urban environment.

Recommendation

This research would help to further study spacing, choices, and preferences of public toilets. It is recommended that intensive and conscious research in terms of economic, environmental, and aesthetic aspects should be done before designing and constructing public toilets.

Acknowledgement

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