

An innovative sanitary fixture for performing ablution in public facilities

Ahmed Hanafi Mokhtar

*Department of Architecture, American University of Sharjah, Sharjah,
United Arab Emirates*

Received 11 July 2023
Revised 15 December 2023
23 December 2023
Accepted 14 January 2024

Abstract

Purpose – This study aims to introduce the design and the design process for an innovative sanitary fixture to be used in public facilities for the purpose of ablution. This purpose-made fixture is needed to support the hygienic, safe and comfortable performance of this essential function in public facilities in many parts of the world. The study also clarifies the need for this function and critically reviews current designs to address it.

Design/methodology/approach – The study started by critically reviewing the standard built-in models for ablution. It also identified and analyzed new approaches to designing standalone ablution fixtures. The study then specified the characteristics of a better ablution fixture and involved drafting a design based on these characteristics, making a wooden prototype to test the design and receiving users' feedback. The design was adjusted and tested again for more feedback. Finally, the study resulted in the development of a final design. It used digital fabrication to create the design prototype with improved aesthetics, tested it again and received user feedback.

Findings – A survey of users showed that they found the innovative fixture more comfortable and safer than the commonly used built-in models. The main concern was the potential for water to splash on clothes from the high faucet.

Originality/value – In addition to showing an innovative design for a purpose-made sanitary fixture for ablution, the study makes the reader aware of the various challenges of providing a hygienic, safe and comfortable facility for users to perform this function. This is very useful for the many designers and facility managers who deal with the issue.

Keywords Design, Interior design, Ergonomics, Property and facilities management, Ablution, Sanitary fixture

Paper type Research paper

© Ahmed Hanafi Mokhtar. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/legalcode>

The author gratefully acknowledges the assistance of the digital fabrication lab at the College of Architecture, Art and Design at the American University of Sharjah (AUS) in the production of the wooden models presented in this paper. In addition, he gratefully acknowledges the assistance of Ms Basant Helal, an AUS graduate student, in the literature review used in the paper. Publishing this paper was supported by a grant from the open access program at the AUS. This paper represents the opinions of the author(s) and does not mean to represent the position or opinions of the AUS.



1. Introduction

The provision of sanitary services is essential to any facility. Cultural norms and preferences have an impact on the type of sanitary services offered. In many parts of the world, such as the Middle East, Southeast Asia and regions of Africa, the practice of five daily prayers by practicing Muslims is one of these cultural norms with such an impact. As these prayers extend throughout the day and have designated times, those who use public facilities, including workplaces, malls, conference halls, transportation hubs and schools, will need to pray while in these facilities. The act of praying requires one to be in ablution state. Hence, the facility user might need to wash his or her face, arms and feet with water to attain such status. This clearly requires the use of sanitary services. [Figure 1](#) shows an example of a sanitary service for the ablution function.

Nonetheless, the demand for these sanitary ablution services goes beyond regions of the world where Muslims make up the majority of the population. It is required in other regions of the world when a facility, such as an international airport, a train station, a university or a conference hall, is frequented by a sizeable Muslim community. Unfortunately, due to a shortage of such sanitary services, Muslims can be seen performing ablution using regular lavatories. This can be a reason for discomfort for all users of the sanitary services, as these lavatories are not intended for such a purpose ([Mokhtar, 2010](#)).

It is beneficial for readers who are not familiar with the function of ablution to have a fundamental understanding of the ablution process. This will aid in recognizing the challenges with the design of the appropriate sanitary facility and the sanitary units/fixtures that can serve this function ([Mokhtar, 2003](#)).

For practicing Muslims, ablution is a state that must be attained before prayer. To achieve this state, a person must use water to do certain acts in a specific sequence. This is known as the ablution process. The process may be performed at any time, and the state of ablution can be maintained for the performance of one or more prayers. Nevertheless, some activities may end this state, such as going to the toilet, passing wind, sleeping, or being unconscious ([Sabiq, 1991a](#)). Thus, there will always be a number of individuals who need to perform ablution before prayer. The ablution protocol begins with the cleansing of the palms, mouth, nose by sniffing, face, each arm up to the elbow, wiping the hair with moist hands, massaging the ears with wet hands, and finally washing the feet up to the ankle ([Sabiq, 1991b](#)).

Sanitary services that intend to provide a comfortable, safe, and hygienic environment to perform ablution require an ablution unit/fixture that is designed for that specific purpose. Typically, a number of these units/fixtures are hosted in a specially designed space (e.g., [Figure 1](#))



Source: Author's own creation

Figure 1.
Sample of a space
providing a sanitary
service for ablution

that is usually away from other sanitary services, particularly toilets. This is to assure the cleanliness of the space, which is an important religious requirement (Mosque Development Committee, 2013).

This paper presents an innovative design for an ablation fixture that can be installed in an ablation space. The fixture aims to improve the comfort, safety, and hygiene of facility users who perform ablation. In Section 2, the paper reviews the design considerations of the ablation space as a whole and discusses research that addresses these considerations. Section 3 focuses on the ablation unit/fixture and identifies its various design requirements. In Section 4, the paper provides an analysis of the different approaches for designing stand-alone ablation fixtures. In Section 5, it specifies the characteristics used by the author to design the proposed sanitary fixture, goes through the design iterations, and shows the innovative design and its key features. Finally, Section 6 discusses users' feedback on the design.

2. Design considerations for the ablation space

Common references that address architecture design standards (e.g. Neufert, 2023) do not address the design standards for ablation sanitary services. Therefore, Mokhtar (2003) started the discussion of these standards by identifying the various challenges in designing ablation spaces and providing the first guidelines for designing ablation spaces (Mokhtar, 2006). The guidelines covered the appropriate location of the ablation space in relation to the prayer space to improve the hygiene issue, identifying and recommending dimensions for standard ablation models, calculating the number of ablation units, the design of ablation space components such as access and doors, selecting water faucets, accessories, finishing materials and signs. Since then, several projects have focused on the subject from different points of view, as reviewed below.

In terms of the relationship between ablation spaces and toilet facilities, it is common that designers tend to cluster them in the same zone, as both require plumbing connections. Yet, a clear segregation of these two functions is required since their proximity results in foul smells and the mixing of clean and unclean zones. Failing to resolve the relation between these two functions in terms of location and orientation may result in doubtful ablation (Haraty *et al.*, 2019). Therefore, the Dubai Building Code requires that the positioning of toilet facilities be separated from ablation spaces and be planned while taking into consideration the wind direction (Government of Dubai, 2021). According to the Abu Dhabi mosque development regulations (Mosque Development Committee, 2013), ablation facilities should be positioned in the clean zone, where no shoes are worn (prayer and ablation areas), while toilets should be outside the clean zone.

In terms of raising the hygiene level, several factors have an effect, specifically the location of the ablation space, the ventilation systems, the facility management and the users' awareness. Regarding the issue of locating the ablation space, it is essential for designers to do so in a manner that prevents the mixing of the clean zone and the nonclean zone (Mokhtar, 2006). According to Hasri *et al.* (2021), recognizing the clean zone from the nonclean zone can be achieved through the use of different materials, color coding and patterns.

Users of the ablation facility who walk on the prayer areas' carpets with wet feet will experience unfavorable odors and hygiene issues. Particularly, fungi, bacterial accumulation and contagious skin diseases can rapidly spread among users (Haraty *et al.*, 2019). Therefore, Mokhtar (2006) recommended a distance between the ablation space and the prayer space so feet have a chance to dry. Poor ventilation, odors and damp prayer carpets will ultimately result in severe discomfort and hygiene issues (Hasri *et al.*, 2021). Some

facilities resort to providing ablution areas at the basement level, which also raises the issue of hygiene because of the limited natural ventilation provided. Sunlight and natural airflow were also found essential to avoiding the spread of disease and fungus in the ablution rooms (Utaberta and Shakir, 2021). Wind directions need to be considered to prevent the transfer of humidity and humidity-related bad smells to the praying space.

Religious teachings discourage the waste of water during ablution. About half a liter of water might be enough to perform ablution as per the instructions of the Prophet Mohammed (Al-Bukhari, 2023). However, a study in Sultan Salahuddin Abdul Aziz Mosque, Selangor, conducted on 100 Muslim Malaysian respondents showed that six to nine liters of water were used on average per ablution process (Johari *et al.*, 2013). The study showed a correlation between human behavior and ablution tub design. In the survey, 89% of the respondents agreed that there was a need for a water control system. It was concluded that a system is required to control the behavior of individuals performing ablution, and an enhancement to the ablution tub design was suggested (Johari *et al.*, 2014). According to the Abu Dhabi mosque development regulations, tap sensors would be implemented within ablution spaces to help reduce water consumption (Mosque Development Committee, 2013).

Facility management is also important to consider. A study by Utaberta and Shakir (2021) on mosques considered tourist attractions in Malaysia and found that some tourists lacked awareness of the function of the ablution space, mistaking it for a space to urinate. This highlights the need for clarifying signage and monitoring by facility management.

To further enhance human comfort and the overall ablution experience, it is recommended to include hooks, soap fixtures and hand dryers (Malik *et al.*, 2023). The provision of additional features such as antislip mats, equipment storage, drain covers and hanging hooks can significantly improve comfort and safety levels. In a study conducted on 30 mosques in Dubai, Sharjah and Ajman in the United Arab Emirates, the availability of these features was assessed (Kim *et al.*, 2020). Only six mosques provided anti-slip mats, and most of them lacked hangers and equipment storage.

3. The design requirements for an ablution sanitary unit/fixture

The ablution unit/fixture is the most important component for comfort, safety and hygiene within the ablution space. For readers who are not familiar with such a unit, Figure 2 shows unit samples. The design of ablution units has advanced from water in clay-made designs to ceramic units to the current advanced stations (Gamal, 2018). Although the initial unit designs concentrated only on the provision of water, recent studies highlight the importance of design considerations that aid in minimizing the risks of injuries, diseases and discomfort (Kim and Omar, 2019; Kim and Bendak, 2021; Ramlal *et al.*, 2022). Other studies considered the needs of the physically challenged and the elderly (Dawal *et al.*, 2020; Hasbi and Hamat, 2020).

The design of the ablution unit/fixture must consider specific religious and functional considerations. Mokhtar (2006) outlines the following design requirements:

- Before ablution, people need places to put their belongings, like watches, glasses and jackets. Shelves and clothes hangers are needed for this.
- Ablution water must be fresh. The water used to wash the face cannot be used to wash the arms. Thus, designs that depend on retaining an amount of water that can be reused, even by the same person, are excluded.
- The design should minimize water splashing on users' clothes from surfaces. In addition, the level of wetness on surfaces that come into contact with humans should be minimal.

- The user would have to wash each foot by hand, one at a time. This is a religious requirement for many Islamic schools of thought. Hence, the user should be able to do so while maintaining a safe and comfortable balance.
- Users should not have to do painful torso bending, which is especially hard for people who are sick, have special needs or are old. It is also important to have hand supports like handrails to help people stand, sit and keep their balance.
- Given the moist foot condition, it ought to be safe to enter and depart the unit. Designs that require users to step up and then step down to use the unit pose a risk of slipping accidents.
- Elements of design that are difficult to clean and take a long time to dry should be avoided since water encourages the development of bacteria.
- People should not bump into each other while using the ablution units, so there should be enough space between them.

4. Approaches to designing the ablution sanitary unit/fixture

Mokhtar (2006) examined the standard models for ablution units and categorized them into four built-in models, as shown with examples in Figure 2. A built-in model means that the ablution unit is constructed on-site from several nonmovable elements. Built-in models are the default approach designers use for providing sanitary facilities for ablution.

Model 1 in Figure 2 is designed for the user to sit while performing their ablutions. A channel drains the water in front of the seat. Mokhtar (2006) provided the dimensions that relate this model's various components to produce the most comfortable configuration of the model. This model may be designed in several ways. A good one will include a shelf for the user to put personal belongings that should not be exposed to water before starting the ablution process. The base of the seat should be at the same level as the approaching floor to reduce the possibility of the user slipping with wet feet after conducting ablution (which is not the case in the existing sample shown for Model 1 in Figure 2). The benefit of this model, if it is well-designed, is that the user will maintain their balance with a reduced chance of falling, especially when washing the feet. Yet, bending the torso to reach the water and lifting the feet to wash them are necessary (see the right side of Figure 1) and can be challenging for some users. Hence, many users reduce the load on their torso by holding the faucet or the shelf. Using the model also results in substantial wetting of the pants while the user washes the upper parts of the body.

Model 2 in Figure 2 uses lavatories. The majority of individuals at home use this model to perform ablution. The benefit of this design is that water splashes have less effect on the user's clothes. Nonetheless, the user must bend the torso to clean the upper parts of the body, which they would do anyway for cleaning tasks other than ablution (such as handwashing). However, some users would find it difficult to lift their feet to the lavatory level. Hence, the model may hinder certain users from completing the normal ablution process. For public ablution spaces, Mokhtar (2006) offered dimensions for the lavatory height and its faucet to make the model more comfortable for the task. This led to lowering the lavatory to enable the user to elevate their feet comfortably and raising the faucet to reduce the need to bend the torso. In a public facility, this model requires a high degree of maintenance to ensure that the lavatories are free of human waste from sniffing and mouthwashing. Water typically remains on the countertops next to the lavatories, lowering the cleanliness of the process. In addition, there is a danger of slipping when the individual is elevating one foot and balancing on the other.

water drainage. To wash the upper parts of the body, the user needs to bend to reach the faucet level. Thus, the faucet should be higher than those in Models 1 and 3. Nonetheless, it should not be too high so that the user may wash their feet without having to raise them too high. When washing each foot, the user must maintain balance. The left side of [Figure 1](#) demonstrates how users typically support their bodies using the faucet, a shelf or a bar.

In a study conducted by [Al Oweini \(2022\)](#) to analyze the ergonomics and risks involved in using these four models identified by [Mokhtar \(2006\)](#), the researcher asked five male participants to perform ablution using one of the mentioned models. Using the rapid upper limb assessment (RULA), postures were observed and the models were scored accordingly. This assessment analyzes the angles at which body parts move while performing a task and scores the movements. The study results showed Model 1 to be the most comfortable relative to the other models. Yet, it is worth mentioning that the RULA assessment mainly focuses on the neck, lower arm and wrist movements. Although preferred by respondents, users reported that Model 1 causes the most water splashing on the floor and on users' clothes relative to the other models; several users reported the need to dry the seat after every user.

In another study at a higher learning institution, [Abd Ghani et al. \(2021\)](#) surveyed 303 respondents, of whom 67% were female and 33% were male. The results found that 82.8% of the male respondents and 85.4% of the female respondents preferred the standing units (Model 4). A study by [Hasbi and Hamat \(2020\)](#) reported that some users found the standing unit more comfortable for relatively shorter participants as compared to taller ones. On the other hand, respondents with a higher weight preferred the seated unit since it allowed them to easily complete the foot cleansing stage.

In addition to the very common built-in ablution models, there are a number of approaches for designing units that can be installed as independent sanitary fixtures. There are important advantages to having independent units. It is usually faster and easier to install. It is also more economical to remove and later reinstall in the case of retrofitting or changing the location of the ablution space.

[WuduMate \(2023\)](#), developed several models for ablution units. Most of the models have seats. Therefore, the design has the same issues related to the advantages and disadvantages of Model 1 mentioned in [Figure 2](#). The unit is made of acrylic, which may degrade with water over time, particularly in areas with a large number of users. It also has several flat surfaces, which make it more difficult to maintain its cleanliness.

Almasa Wash Basin ([Saudi Ceramics, 2023](#)) integrates a second low basin to wash the feet with the typical wash basin used for the upper part of the body. The design includes a handle at the upper basin that can direct the shower head in the lower basin to wash different parts of the foot. However, the user will not be able to wash their feet by hand, which is a requirement in some schools of thought.

Similarly, the Bold Foot Washer ([Bold, 2023](#)) provides a fixture to be added under the lavatory and is used to wash the feet. The fixture has the same issue of not expecting the user to wash their feet by hand. The design includes electronic components and a moving part, which can increase maintenance requirements.

On the other hand, the Auto Wudu Washer ([AACE Technologies, 2023](#)) has two wash basins, one for the upper parts of the body and the second for the feet. The comfort level for the upper part of the body will be similar to the model with a lavatory (Model 2 in [Figure 2](#)), where the users need to bend a little to reach the faucet level. The main advantage is the lower basin, where the users do not need to raise their feet to the lavatory level, which is more comfortable. The model also provides two hand grabs to help the users balance their bodies while standing on one foot to wash the other foot in the lower basin. The model is a

high-tech one with several electronic parts. This represents a maintenance challenge for most mosques and prayer areas where there is a need to minimize maintenance. The unit is also large relative to the size of a typical ablution unit.

5. The proposed innovative sanitary fixture

For many years, the author observed how different users performed ablution using the four models shown in [Figure 2](#) and several of the stand-alone fixtures. He also performed the process hundreds of times using various designs. The experience showed a need for a better fixture design that helps ensure comfort, safety and hygiene. As a starting point, the author wrote down the functional objectives of a purpose-made design for an ablution fixture. These objectives are in addition to the religious and functional requirements mentioned above in Section 2. These functional objectives are:

- Comfortable use during the different processes, starting from approaching the unit until leaving it.
- Safe use, where the user should not be trying to balance his/her body on one foot while washing the other.
- Cleanliness in use, where the user does not have to sit on a wet seat from a previous user.
- Minimal wetting of clothes during ablution.
- Ease of cleaning and maintaining the fixture.
- Aesthetic appeal.
- Ease of manufacturing and transporting to have a competitive price.
- Ease and speed of installation and reinstallation (if needed).

Following these design objectives, the author needed to make some fundamental design decisions. The first one was to select the standing position to perform ablution (similar to Model 4 in [Figure 2](#)). The decision was based on the observation that many users perform ablutions standing even when there is a seat. This is confirmed by a survey conducted by the author, as shown in [Figure 3](#). The survey – which is discussed further in Section 6 – shows that only 11% of the participants always use the seat, while most of the others either do not like or do not prefer to use the seat. Another confirmation comes from the study mentioned in Section 3 above by [Abd Ghani *et al.* \(2021\)](#), where the standing model proved to be more comfortable. Another reason for the standing position is that it minimizes the water splashing on clothes over the thighs and also avoids the use of the seats, which are typically wet.

A second design decision is to separate the water source needed for washing the upper part of the body (mouth, nose, face, arms and head) from the water source needed for the lower part of the body (feet). This is in contrast with having one low source where the user needs to bend the torso to wash the upper part of the body and raise the feet to wash them, as would be the case in Model 4 in [Figure 2](#).

A third decision is to include a hand shower to assist those who cannot balance their bodies while washing their feet. Such a balance is required when the user raises one foot, stands on the other and also bends the torso to wash the foot by hand (see the left side of [Figure 1](#)). The hand shower will push water to the feet level. A fourth design decision is to include an integrated shelf for the users to put their belongings (e.g. watches and glasses) while performing ablution.

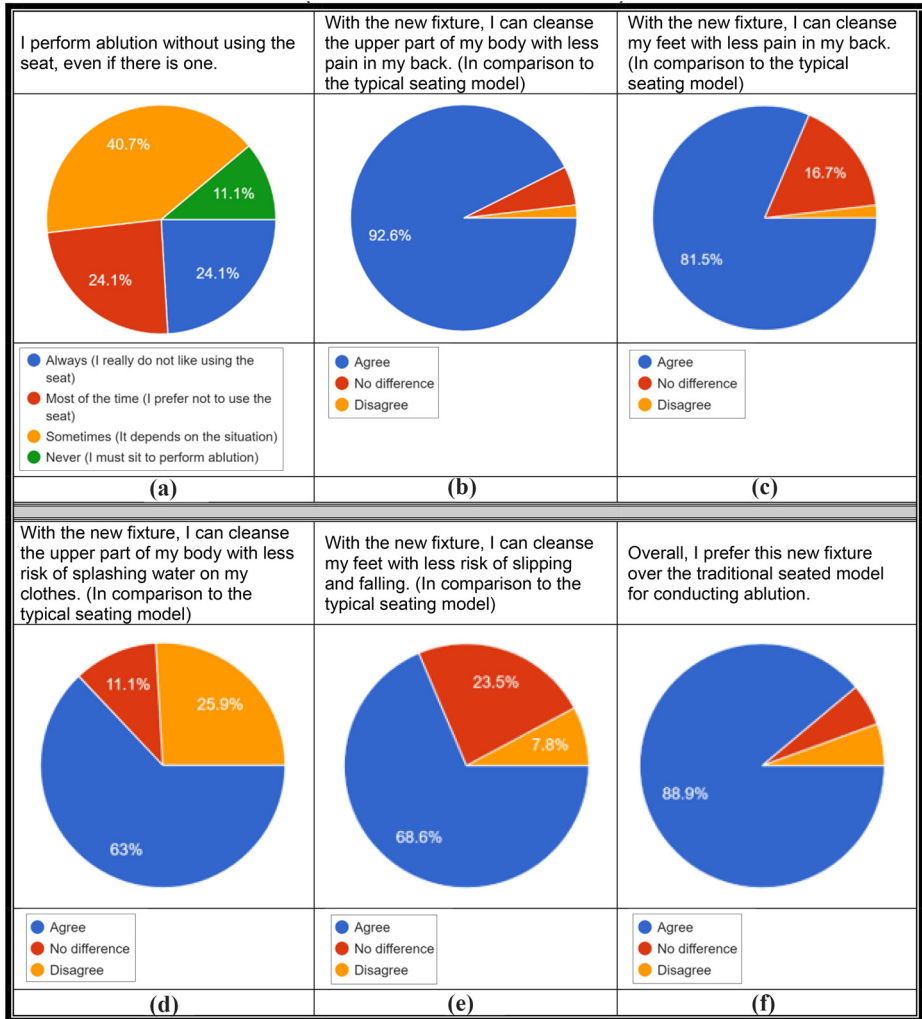


Figure 3.
Results of the survey conducted by the author for the new ablution fixture

Source: Author's own creation

The author translated these design decisions into a wooden physical model, as shown in [Figure 4\(a\)](#), put it beside an ablution space of a mosque, and asked users to provide feedback. Almost all users were satisfied by the idea that they did not need to bend their torso to wash the upper parts of the body by having a high source of water (a faucet). But the majority found it difficult to wash the feet, particularly those who needed to wash the feet by hand. Carrying the hand shower in one hand and washing the feet with the other was very challenging, and some users suggested foot support.

The feedback triggered the author to make changes. A foot support and a horizontal handgrip were added, and the hand shower was removed. The handgrip allows the user to



(a)



(b)

Source: Author's own creation

Figure 4.
Initial models for the
new ablution fixture

grab it while bending the torso, so s/he does not solely depend on the torso muscles while bending to wash the feet. The handgrip helps ensure that the person can stay in balance while standing on one foot. The modified version was also modeled in wood, as shown in Figure 4(b), and put to the test by users. The feedback in this case was also positive for the foot washing issue, with the exception that comfort levels varied with the different body sizes of the different users. The horizontal handgrip and the foot support were higher than needed for some users and lower than needed for others.

From these two initial models, the main components of the design were in place and were generally accepted by users. However, the design took the built-in approach, which did not satisfy the flexibility requirement defined by the author. The author went back to the drawing board and reconfigured the main characteristics of the design, taking the users' feedback into account. He designed a sanitary fixture that can be manufactured in a factory as a standalone piece out of vitreous China or similar material and can be hung on the wall of an ablution space, as shown in Figure 5(a). It will be used for washing the upper part of the body as shown in Figure 5(b) and for washing the feet as shown in Figure 5(c).

As explained in Figure 6, the sanitary fixture integrates all the main components needed for ablution. This starts with the shelf needed to put personal belongings before ablution. It

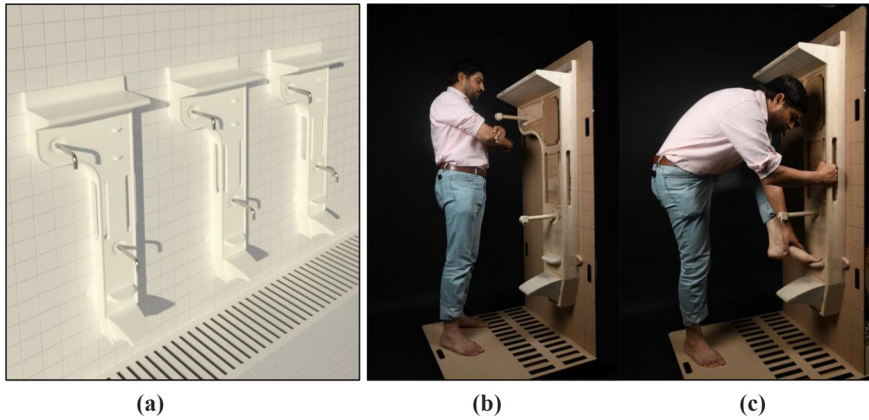


Figure 5.
Proposed sanitary
fixture for ablution

Source: Author's own creation

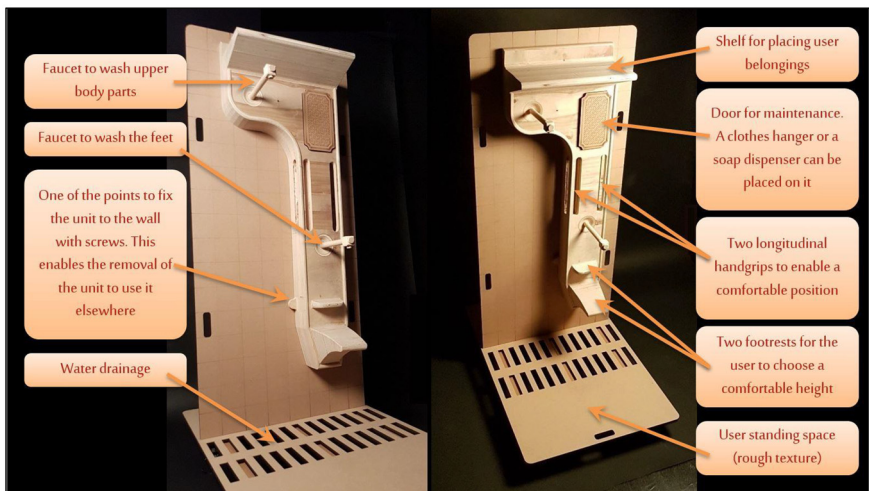


Figure 6.
Various components
of the proposed
sanitary fixture for
ablution

Source: Author's own creation

has a high faucet for the upper parts of the body and a lower one that is put at a height that does not require the user to raise the feet high or bend the torso very much. The design includes two foot supports at different heights to accommodate users with different body sizes and abilities to raise their feet. It also has two vertical handgrips. In contrast with a horizontal handgrip, vertical handgrips help the user select the level of grabbing the handle depending on their body size and comfortable bending position. The decision to have two handgrips considers that the user will alternate grabbing the handle with one hand and washing the foot with another one, as shown in [Figure 5\(c\)](#). The foot supports are curved to prevent any accumulation of wastewater from washing the feet; rather, they pass the water immediately to the drainage on that floor.

All the edges are smoothed for safety and hygiene. At the upper right corner, the unit has a door that is used when the unit needs plumbing maintenance or a change of battery in the case of infrared faucets. The design can accommodate different types of faucets (one-handle, metered, or infrared). The selection of the faucet largely depends on the cost limitations. The author recommends an infrared faucet with sensors in the nozzle. The author also recommends using faucets with aerators, not only to reduce water consumption but also to minimize the splashing of water on users' clothing. The fixture requires one source of water that will be behind the unit. From that source, two water-connecting hoses take the water to the two faucets. Simple, linear floor drainage is needed to drain the used water. Antifungal and antibacterial rough plastic, similar to the one used around swimming pools, should be used to cover the whole floor of the ablation space, including the area for the user to stand to perform ablation.

The overall design of the unit was adjusted to improve its aesthetic through proper proportions and curvatures. The unit is hung from the top, behind the shelf, by two screw hangers and secured with a third screw near the unit's bottom. Hence, the unit is very easy to remove and reuse as needed. Such ease of installation and reinstallation in the case of retrofitting is an important advantage of the design.

6. Testing the design

The model was manufactured using a router-based computerized numerical control machine. The purpose was to enable testing it by simulating the ablation process without water. Another objective is to trigger the interest of investors in making a working prototype using sanitary material and working faucets, which was beyond the capability of the author. The wooden prototype was put in several locations to get users' feedback, using a quick response code that connects to a questionnaire on specific aspects of the design. [Figure 3](#) shows the results of the feedback, which came from 58 participants. The results indicate a very positive user experience, and the comments were also very encouraging. A sample of the various types of comments is shown in [Figure 7](#). The main concern was the expectation that splashing water on clothes would occur when using the high faucet. This issue can be tested only with a fully functional prototype that runs water. However, the author's observations and practices of using both standing and seating models indicate that there will be some splashing, but it is expected to be much less than that which occurs when using a model with a seat.

7. Conclusion

The function of ablation is common in many parts of the world. Public facilities should provide adequate sanitary services to address this function. Several standard built-in models exist for ablation units. Each has advantages and disadvantages. Several designs for standalone ablation fixtures were developed with various levels of success. The author designed an innovative ablation fixture that integrates all the needed functions into one unit that can be easily hanged on a wall and can be easily removed and reused. The fixture was developed through several design iterations and feedback from users. The purpose is to have a sanitary fixture that is used comfortably, safely and hygienically. It should also be economical to manufacture and easy to store, transport, install and reinstall. Feedback from users was very positive, with the exception of some users concerned about splashing water while using the upper faucet. A functional prototype with real sanitary material and a water connection is needed to check this issue. A portion of any group of users may have special capabilities or needs. Thus, in addition to the proposed sanitary fixture, the author recommends that both an

- The idea is simply perfect and tackles all my challenges and issues with current ablution facilities.
- I think I may be a little tall for the model, but otherwise, I find it to be much more comfortable than conventional fixtures.
- I think it's a great fixture.
- It's so convenient!
- The design is very innovative and nice. I am looking forward to trying it once it is implemented.
- An additional hand grab at the left side of the fixture at shoulder level will be useful. A 150-mm-high barrier in front of the water drainage might help protect against water splashes.
- A great design that has thought of the user's experience while performing ablution and the problems related to it.
- I think you need to add a sink under the top water faucet because if the water goes all the way down to the floor, it'll splash more and get on the user's clothes.
- Some older people prefer to sit down while doing an ablution. Also, the new design will splash much more water on the clothes from the upper faucet.
- An interesting design. Water splashes are the only concern.
- For women, the shelf might be placed too high for bags. Adding a small mirror would also help to fix the scarf after ablution.
- With the new model, the clothes are still not protected well, especially for overweight people or Gulf dresses. Cleaning the nose needs some protection from what comes out!! On the other hand, it will be better to keep the feet on the ground as much as possible.
- The new fixture looks intact and well designed; I am just concerned at how high the faucet is and the splashing it will cause.

Figure 7.
Sample comments
from the participants
in the survey

Source: Author's own creation

ablution model with a seat (Model 1 in [Figure 2](#)) and one with a lavatory (Model 2 in [Figure 2](#)) be used in limited numbers, in any ablution space in a public facility.

The new fixture can be used for functions other than ablution. For example, in the sanitary services of warehouses and factories, it can help users wash different parts of the body, including the feet, comfortably. It can also be used in homes where elderly or physically challenged users have difficulty using typical lavatories to perform ablution.

References

- AACE Technologies (2023), "Auto wudu washer", available at: <https://aace.com.my/> (accessed 23 June 2023).
- Abd Ghani, A., Sukadarin, E. and Nawi, N.M. (2021), "Investigation on the ergonomics design of wudhu' (ablution) station at a mosque in a higher learning institution", *Current Science and Technology*, Vol. 1 No. 1, pp. 15-25, doi: [10.15282/cst.v1i1.6442](https://doi.org/10.15282/cst.v1i1.6442).
- Al Oweini, W.G. (2022), "Ergonomic ablution station design", [Master's Thesis, American University of Beirut], Beirut, Lebanon.
- Al-Bukhari, M. (2023), "Sahih Al-Bukhari", Vol. 1 No. 4, Number 201, available at: <https://sunnah.com/bukhari:201> (accessed 23 June 2023).

- Bold (2023), "Bold foot washer", available at: www.mybold.com/Bold_Footwasher.pdf (accessed 23 June 2023).
- Dawal, S., Mirta, W., Nur, A. and Suhairi, A. (2020), "Ablution workstations design for person with physical disabilities in Malaysia", *Malaysian Journal of Public Health Medicine*, Vol. 20 No. 1, pp. 101-107, doi: [10.37268/mjphm/vol.20/no.Special1/art.670](https://doi.org/10.37268/mjphm/vol.20/no.Special1/art.670).
- Gamal, D. (2018), "A contemporary design vision of ablution spaces in mosques between necessity and environmental damage", *Journal of Architecture, Arts, and Humanistic Sciences*, Vol. 3 No. 9, pp. 289-317, doi: [10.12816/0044286](https://doi.org/10.12816/0044286).
- Government of Dubai (2021), "Dubai building code", Dubai, available at: https://dm.gov.ae/wp-content/uploads/2021/12/Dubai%20Building%20Code_English_2021%20Edition_compressed.pdf
- Haraty, H.J., Raschid, M.Y. and Utaberta, N. (2019), "Ablution spaces cleanliness: literature debate on the Malaysian mosque's design", *Journal of Social Sciences and Humanities*, Vol. 16 No. 6, pp. 1-7, available at: <http://journalarticle.ukm.my/19987/1/34258-106890-1-SM.pdf>
- Hasbi, S.A. and Hamat, S. (2020), "The ergonomics of the Islamic ablution: exploring considerations for the elderly in the mosque", *Cultural Syndrome*, Vol. 2 No. 1, pp. 59-77, doi: [10.30998/cs.v2i1.323](https://doi.org/10.30998/cs.v2i1.323).
- Hasri, N.H., Abd Hamid, A.B. and Ismail, M.D. (2021), "An analysis on prayer room design in shopping complexes: significance and function of ablution area", in Shariff, N.N.M., Yakob, M.A., Hamidi, Z.S., Aghwan, Z.A.A., Lateh, N. (Eds), *Selected Proceedings from the 1st International Conference on Contemporary Islamic Studies (ICIS 2021)*, Springer, Singapore, pp. 59-70, doi: [10.1007/978-981-19-2390-6_6](https://doi.org/10.1007/978-981-19-2390-6_6).
- Johari, N.H., Hassan, O.H., Anwar, R. and Kamaruzaman, M.F. (2013), "A behaviour study on ablution ritual among Muslims in Malaysia", *Procedia – Social and Behavioral Sciences*, Vol. 106, pp. 6-9, doi: [10.1016/j.sbspro.2013.12.002](https://doi.org/10.1016/j.sbspro.2013.12.002).
- Johari, N.H., Kamaruzaman, M.F., Hassan, O.H. and Anwar, R. (2014), "Correlation between behaviour and design in influencing ablution tub", in Hassan, O., Abidin, S., Legino, R., Anwar, R., Kamaruzaman, M. (Eds), *International Colloquium of Art and Design Education Research (i-CADER 2014)*, Springer, Singapore, pp. 431-436, doi: [10.1007/978-981-287-332-3_45](https://doi.org/10.1007/978-981-287-332-3_45).
- Kim, I. and Bendak, S. (2021), "Emerging safety risks from public facilities: a field study for ablution spaces in mosques", *Facilities*, Vol. 39 Nos 13/14, pp. 843-858, doi: [10.1108/F-09-2020-0109](https://doi.org/10.1108/F-09-2020-0109).
- Kim, I. and Omar, O.H. (2019), "A pilot study on ablution space safety in mosques: slip-resistance assessments of ablution floorings from a viewpoint of fall incidents", *Advances in Science and Engineering Technology International Conferences (ASET), Dubai*, pp. 1-5, doi: [10.1109/ICASET.2019.8714206](https://doi.org/10.1109/ICASET.2019.8714206)
- Kim, I., Omar, O.H. and El Deeb, R.A. (2020), "Safety overview of ablution spaces in the UAE mosques: a randomised survey in three cities", *Advances in Science and Engineering Technology International Conferences (ASET), Dubai, United Arab Emirates*, pp. 1-5, doi: [10.1109/ASET48392.2020.9118392](https://doi.org/10.1109/ASET48392.2020.9118392)
- Malik, I., Jamil, F. and Mujahid, B. (2023), "Analytical study of ablution spaces: case analysis of mosques in Lahore, Pakistan", *Annals of Human and Social Sciences*, Vol. 4 No. 1, pp. 104-122, doi: [10.35484/ahss.2023\(4-I\)11](https://doi.org/10.35484/ahss.2023(4-I)11).
- Mokhtar, A. (2003), "Challenges of designing ablution spaces in mosques", *Journal of Architectural Engineering, ASCE*, Vol. 9 No. 2, pp. 55-61, doi: [10.1061/\(ASCE\)1076-0431\(2003\)9:2\(55\)](https://doi.org/10.1061/(ASCE)1076-0431(2003)9:2(55)).
- Mokhtar, A. (2010), "Architectural design standards for Muslims prayer facilities in airports", *International Journal of Sustainable Development and Planning*, Vol. 5 No. 2, pp. 205-212.
- Mokhtar, A. (2006), "Design guidelines for ablution spaces in mosques and Islamic praying facilities", American University of Sharjah, available at: <https://goo.gl/3s7X2t> (accessed 23 June 2023).
- Mosque Development Committee (2013), "Abu Dhabi mosque development regulations", Volume 2 (Design), available at: <https://goo.gl/KYwWNj> (accessed 23 June 2023).
- Neufert, E. (Ed.) (2023), *Architects' Data 6th Edition*, Wiley-Blackwell, London.

-
- Ramlal, P., Lin, J., Buckley, C., Stenström, T. and Amoah, I. (2022), "An assessment of the health risks associated with shared sanitation: a case study of the community ablution blocks in Durban", *Environmental Monitoring and Assessment*, Vol. 194 No. 3, doi: [10.1007/s10661-022-09815-x](https://doi.org/10.1007/s10661-022-09815-x).
- Sabiq, A. (1991a), "Fiqh us_Sunnah, fiqh 1.35, Nullification of ablution", available at: www.iium.edu.my/deed/lawbase/fiqh_us_sunnah/vol1/fsn_vol1a.html (accessed 23 June 2023).
- Sabiq, A. (1991b), "Fiqh us_Sunnah, fiqh 1.27, The obligatory parts of the ablution", available at: www.iium.edu.my/deed/lawbase/fiqh_us_sunnah/vol1/fsn_vol1a.html (accessed 23 June 2023).
- Saudi Ceramics (2023), "Almasa wash basin", available at: <https://shop.saudiceramics.com/en/almasa-wb-ablution-1h-w-gm-acc-off-white.html> (accessed 23 June 2023).
- Utaberta, N. and Shakir, H.J. (2021), "Design framework for ablution spaces of iconic mosques in Malaysia", *Journal of Islamic Architecture*, Vol. 6 No. 4, pp. 251-263, doi: [10.18860/jia.v6i4.11702](https://doi.org/10.18860/jia.v6i4.11702).
- WuduMate (2023), "WuduMate classic", available at: <https://wudumate.com/wudu-foot-baths/wudumate-classic/> (accessed 23 June 2023).

Corresponding author

Ahmed Hanafi Mokhtar can be contacted at: mokhtar@aus.edu