

## Ergonomic and Disability-Friendly Ablution Path Design in Mosques (An Inclusivity and Comfort Approach)

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**Abstract:** Accessibility for people with disabilities is an important aspect of the design of public facilities, including access routes to places of worship. This study aims to design a disability access route from the ablution area to the mosque by considering the principles of universal design and accessibility standards. The research method uses a literature study approach, analyzing various journals and related regulations to produce an appropriate design. In this design, the access route is designed with a minimum width of 150 cm and a maximum ramp slope of 1:12 to ensure ease of use. Handrails are placed at a height of 85-90 cm, and a flat landing area is provided at the end of the ramp to facilitate the movement of wheelchair users. The entrance to the mosque is designed with minimal access to stairs, and additional small ramps are used if necessary. Clear signs and adequate lighting are installed to improve visibility and navigation, including signs in Braille. The results of the study show that this design not only meets accessibility standards but also provides a safe and comfortable environment for all users. In conclusion, the application of universal design principles and strict accessibility standards can create effective and inclusive access routes, supporting better accessibility in public facilities.

**Keywords:** Disability Accessibility, Universal Design, Access Paths, Accessibility Standards, Design Principles

### Introduction

Inclusive and sustainable infrastructure development has become one of the global priorities in efforts to achieve the Sustainable Development Goals (SDGs) (UNPRPD, 2024). Among the 17 SDGs, there are several that are relevant to the provision of disability-friendly facilities, such as goal 3 on good health and well-being, goal 10 on reduced inequalities, and goal 11 on sustainable cities and communities. In this context, the provision of ergonomic and disability-friendly ablution paths in mosques is an important step that not only meets physical needs but also supports inclusivity and equality of access for all groups, including people with disabilities (Nations, 2024). These facilities are expected to be able to create a more comfortable and safe worship environment, which is in line with the principles of the SDGs to be fair to every human being (Rachmad, et al.,

2024).

Mosques as centers of religious and social activities play an important role in people's lives, especially in Muslim-majority countries (Sözeri, et al., 2022). However, many mosques still pay little attention to the special needs of people with disabilities, especially in terms of accessibility to ablution facilities. Ablution paths that are not disabled-friendly can be a barrier for them to perform their worship comfortably and safely (Rahmad, et al., 2023). Therefore, designing an ergonomic and disability-friendly ablution path is very crucial in realizing an inclusive mosque. This design not only considers aspects of functionality, but also aspects of comfort, safety, and ease of use, so that all worshippers can perform their worship properly without any obstacles.

Ergonomics in the design of ablution paths involves considering technical details such as floor slope, seat height, faucet position, and adequate space for wheelchair users or other walking aids (Anwar & Raif, 2022). This approach ensures that the ablution path can be used by everyone, including those with physical disabilities. On the other hand, the use of safe and non-slippery materials is an important factor in preventing accidents, such as slipping, which often occur in wet areas (Malik, et al, 2023). With the right design, this facility will support the health and well-being of users, in line with the SDGs goal of encouraging infrastructure that supports healthy living.

The importance of disability-friendly ablution pathways must also be seen in the context of laws and regulations. Many countries have set specific standards regarding the accessibility of public facilities, including places of worship. In Indonesia, for example, Law Number 8 of 2016 concerning Persons with Disabilities and Government Regulation Number 13 of 2020 concerning Appropriate Accommodation for Persons with Disabilities in the Public Sector emphasize the importance of accessibility for all, including in religious settings (Malik, et al., 2022). Therefore, mosques as public facilities need to meet these standards to provide fair and equal services to all worshippers.

Considering the above aspects, this study aims to develop a design for ablution paths in mosques that not only meet ergonomic standards but are also friendly for people with disabilities. This study will examine the various design elements needed to create an inclusive and safe ablution path, and how the design can be implemented in various mosques by considering environmental conditions and the specific needs of the congregation. The results of this study are expected to be a guide for mosque managers, architects, and other stakeholders in creating more inclusive worship facilities and supporting the SDGs goals in the field of sustainable infrastructure development.

## Methods

This study uses a qualitative approach with a literature study method to analyze various relevant sources, including scientific journal articles, regulations, and standards related to the design of disability-friendly ablution paths (Williamson, et al., 2021); (Tsatsou, 2020); (Hashemi, et al., 2022). Researchers collect and review literature that includes ergonomic theory, inclusive design principles, and legal regulations governing the accessibility of public facilities, especially in religious environments (Asghar, et al., 2020); (Sholihah, et al., 2016). This approach allows researchers to identify key concepts and best practices that can be applied in the design of ablution paths in mosques, while understanding the legal and social contexts that underlie the need for disability-friendly facilities.

The results of the literature study are then visualized through Artificial Intelligence (AI)-based design (Wu, et al., 2022). This design was created to represent the implementation of concepts found in the literature into a model that can be practically adapted. The use of AI in visualization aims to produce accurate and efficient representations, and allows simulation of various scenarios of the use of ablution paths by people with disabilities (Kim, et al., 2021); (Pisoni, et al., 2021); (Bennett, et al., 2021). Through this approach, the study not only produces theoretical guidance but also provides practical visualizations that can be used as references by architects, mosque managers, and other stakeholders in designing inclusive and ergonomic facilities.

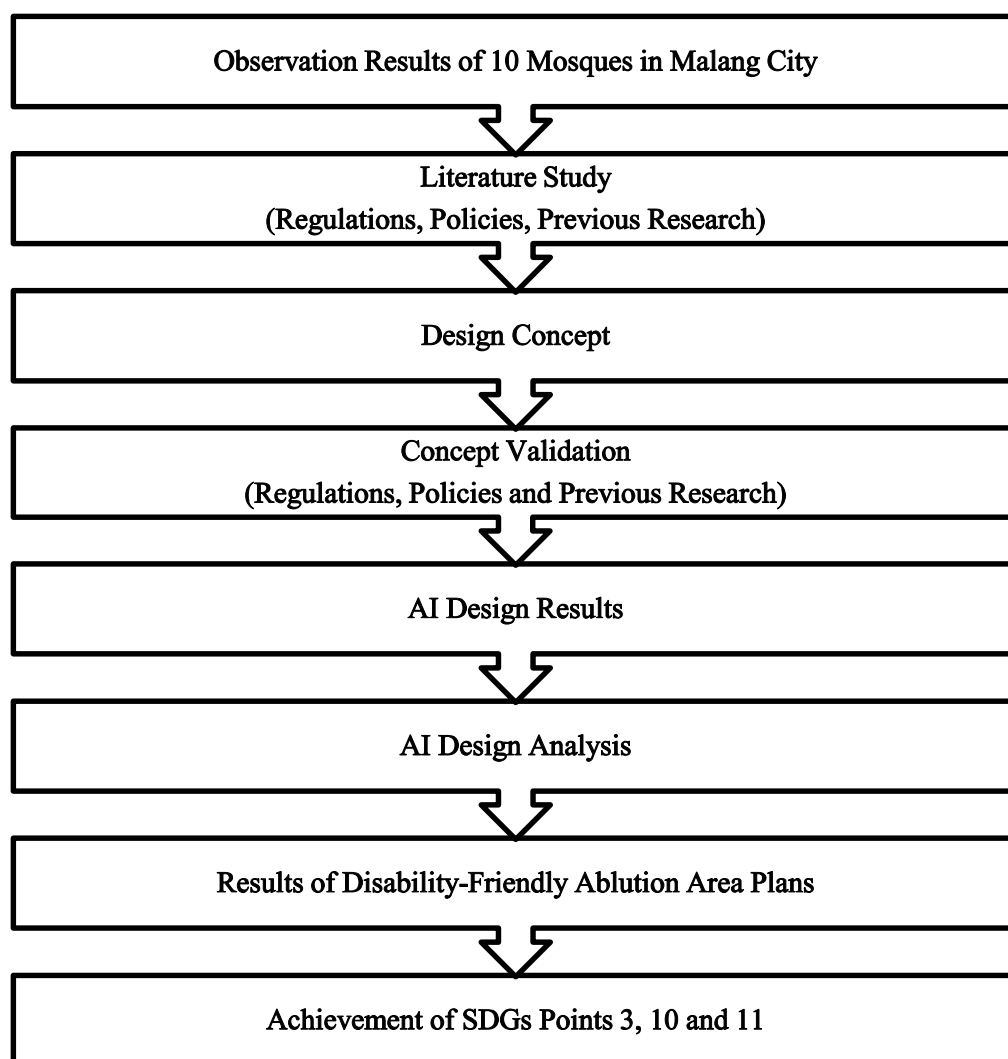


Figure 1. Analysis Method Map

## Design of Disabled Ablution Area

**Source:** Artificial Intelligence Design Analysis (2024)

In addition to sinks and handrails, chairs and ramps are also crucial elements in inclusive design. Chairs should be 45-50 cm high from the floor, with a minimum width of 50 cm and a depth of 40-45 cm, based on ergonomic

principles to ensure comfort and ease of use for all types of disabilities (Çobanyıldızı, 2021). Meanwhile, ramps should have a maximum slope of 1:12 with a minimum width of 90 cm and a flat base of 150 cm above and below the ramp, in accordance with 468/KPTS/1998, which regulates accessibility in buildings and the environment. The space for movement should also be large enough, with a minimum free area of 150 cm x 150 cm to allow wheelchair users to rotate 360 degrees, as regulated in 468/KPTS/1998 on accessibility. Finally, signage should be installed at a height of 140-160 cm from the floor with a minimum font size of 3 cm and high color contrast to ensure that information is accessible to all users, including those with visual impairments, in accordance with applicable accessibility guidelines (PUPR, 1998). These elements, if implemented properly, will meet national and international standards and support the goal of creating an inclusive and comfortable worship environment for all worshippers.

### Visual Design of the Ablution Path

The visual design of the ablution path using a ramp needs to see the slope that suits the needs. The numbers for height, width, and slope are shown in the technical drawing that explains the dimensions and accessibility, such as in the following image.

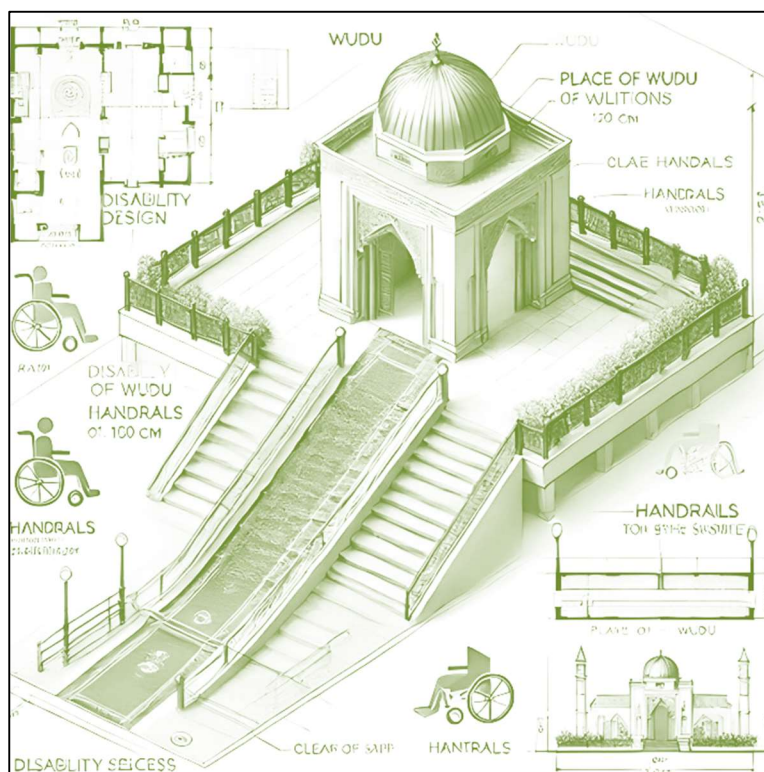


**Figure 3.** Ablution path to prayer place that is friendly to the disabled

**Source:** Artificial Intelligence Design Analysis (2024)

When designing a disability-friendly ablution path to a prayer place, it is very important to consider applicable standards and regulations so that the design is not only functional but also safe and in accordance with safety regulations. The ablution path must have a minimum width of 150 cm or more, ideally to allow wheelchair users to pass each other (Aulia & Octaviana, 2024). For the turning area, the width of the path must be at least 200

The floor surface of the ablution path should use non-slip material, especially in wet areas such as near the ablution, to avoid the risk of slipping. In addition, good drainage is essential, with the floor surface slightly sloping (0.5%–2%) towards the drainage to ensure water does not stagnate (Minimum Standards for Onsite Sanitation Technology Options in Kampala, 2023). The height of the washbasin should be installed at 80 cm from the floor, with the space below it 70 cm high and 60 cm deep to provide knee room for wheelchair users (Vitoonpanyakij, 2021). The mirror above the washbasin should be installed with its bottom no more than 100 cm from the floor. In addition, directional signs should use large and contrasting symbols, installed at a height of 120-150 cm from the floor, and the lighting of the path should be adequate with a minimum intensity of 100 lux without excessive shadows. This design is based on the principles of universal design, which emphasizes the accessibility of the environment for all people, regardless of age, size, ability, or disability (Centre for Excellence in Universal Design, 2024). By following these guidelines, the design of the ablution path will not only meet safety and regulatory standards but also ensure comfort and ease of access for all worshippers, including those with disabilities.

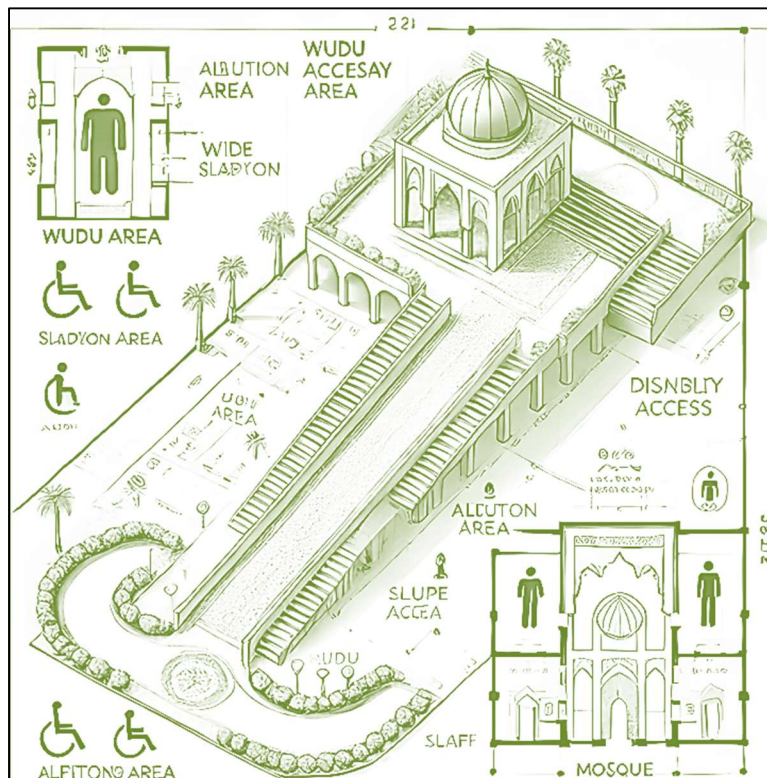


**Figure 4.** Ramp design path to the mosque

**Source:** Artificial Intelligence Design Analysis (2024)

The design of the disabled access path from the ablution area to the mosque must follow universal design principles that ensure accessibility for everyone, including wheelchair users, the elderly, and individuals with limited mobility. The path should have a gentle slope and a non-slippery surface to prevent accidents, especially when wet (Nusran et al., 2024). The width of the path should also be sufficient to accommodate wheelchairs and facilitate the movement of users of mobility aids. Handrails should be provided on both sides of the ramp, especially on the sloped sections, to provide additional support. Adequate lighting is also important, especially during morning and evening prayers, to ensure good visibility (Broyer, 2020). In addition, clear and easy-to-read signs should be installed along the path, including signs in Braille for users with visual impairments. These principles are in line with the concept of universal design, which emphasizes the importance of creating an environment that is accessible to all individuals without discrimination.

Dimensions and height rules must also be considered in this design. The maximum recommended slope for a ramp is 1:12, meaning every 12 units of horizontal distance should have a rise of 1 unit; for example, a 15 cm rise requires a ramp length of 180 cm (Bennett et al., 2021). The minimum ramp width is 90 cm, but 120 cm is recommended to make it easier for wheelchairs to maneuver. Handrails should be placed at a height of 85 cm to 90 cm from the ramp surface to provide sufficient support (Waspada et al., 2022). At the top and bottom of the ramp, a flat area with a minimum length of 150 cm and the width of the ramp should be provided to allow for resting and turning. The ramp surface should be made of a non-slip material, and if possible, should be covered to protect from rain. In addition, the entrance to the ablution area should be wide enough for easy access, with a minimum door width of 90 cm (Centre for Excellence in Universal Design, 2024). The path from the ablution area to the mosque should be straight or gently curved, avoiding sharp turns, and if there are elevation changes, ramps should be installed with handrails on both sides. The final steps leading to the entrance of the mosque should be kept to a minimum, with the addition of a small ramp if necessary, to ensure optimal accessibility for all users.



**Figure 5.** Map of the disabled access route from the accommodation area to the mosque  
**Source:** Artificial Intelligence Design Analysis (2024)

The design of the disabled access route from the ablution area to the mosque must meet the principles of universal accessibility, ensuring ease and comfort for all users, including those with physical disabilities. The ablution area is placed in an easily accessible area with an entrance wide enough to allow wheelchair users to enter easily (Dawal, et al., 2020). This ablution area is designed with an appropriate height, easy-to-reach taps, and non-slip floors to prevent accidents (Utami, et al., 2021). The access path connecting the ablution area to the main entrance of the mosque has a flat surface with a minimum width of 120 cm, adequate for wheelchair users or people with limited mobility (Hasbi & Hamat, 2020). This path is equipped with a ramp that has a slope of 1:12, where for every 1 meters increase in height, this path has a horizontal length of 12 meters (Nazeer, et al., 2021). This is designed to ensure that the ramp is not too steep and can be easily passed by all users. Along the ramp, there are handrails on both sides installed at a height of 85-90 cm from the path surface, providing additional support especially when the path is wet (Yıldız & Sogut, 2023).

At the top and bottom of the ramp, there is a flat landing area that serves as a resting place (Yarmuch, et al., 2020). This area is wide enough to allow wheelchair users to stop and turn easily, with a minimum length of 150 cm and the same width as the path. The entrance to the mosque is designed with easy access and minimal stairs, and if there is a change in elevation, a small ramp is added to ensure unhindered access for all users (Suhardi, et al., 2024). In addition, along the path, clear and easy-to-read signs are installed to aid navigation, with some of them available in Braille for visually impaired users (Wan, 2024). Adequate lighting is also installed along the path to ensure good visibility, especially at night or at dawn. Taking all these elements into account, the design of this disability access path complies with universal accessibility standards and principles,

ensuring that every user can use this facility safely and comfortably.

### Conclusion

From the results of this study, it can be concluded that the design of the disabled access path from the accommodation area to the mosque has been optimized to ensure accessibility, comfort, and safety for all users.

The following are the conclusions of the study results:

1. The access path adopts the principle of universal design, ensuring easy and safe access for all individuals, including wheelchair users and those with limited mobility. Facilities such as the ablution area are designed with wide doors, appropriate heights, and easy-to-reach taps, as well as non-slip floors to prevent accidents.
2. The access path has a minimum width of 150 cm with a flat surface, equipped with a ramp that has a slope of 1:12. This ensures ease of use and avoids ramps that are too steep. The flat landing area at the end of the ramp makes it easy for wheelchair users to rest and turn.
3. Handrails are installed on both sides of the ramp at a height of 85-90 cm for additional support. The entrance to the mosque is designed with easy access and minimal stairs, as well as the addition of a small ramp if there is a change in elevation, ensuring unhindered access.
4. Clear signs, including Braille, and adequate lighting are installed along the path to improve visibility and navigation, especially at night or at dawn. This design complies with accessibility standards that ensure safety and comfort for all users.

### Thank-you note

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