



## EVALUATION AND DESIGN ACCESSIBILITY OF MOSQUE'S FACILITIES FOR PEOPLE WITH DISABILITIES

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### ABSTRACT

The condition of the grand mosques in the Boyolali, Surakarta, and Karanganyar areas currently does not consider facilities that can accommodate people with disabilities. This study aims to improve the accessibility of mosque facilities and provide proposals for designing facilities that are accessible for mosque worshipers, including those with disabilities. The object of this research consists of several great mosques located in Boyolali, Surakarta, and Karanganyar. The accessible congregation is used to conduct access audits using a questionnaire to assess the level of accessibility as well as to determine the priority of the selected mosque, and then design the mosque facilities using AutoCAD software concerning the Regulation of the Minister of Public Works and Public Housing No. 14 of 2017. The results of the congregation show that 4 mosques are not accessible and 1 mosque is less accessible. Based on the analysis, it shows that the Madaniyah Great Mosque located in Karanganyar was chosen to be the object of the proposed improvement because it has the highest accessibility index value and the current condition of the mosque is the most likely to be repaired, so that mosque facilities are accessible for people with disabilities. The proposal to improve facilities at the Great Madaniyah mosque is to provide a unique parking lot with a size of 5 m x 2.3 m, provide an incline with a slope of 5° and have handrails on both sides, provide two types of ablution places, namely with a seat and no seat, provide toilets equipped with kick plates, automatic hinges, panic buttons, and handrails; provide lifts with handles on all sides and a lift size of 120 cm x 230 cm; provide signs or signs in unique parking lots; add signposts; provide a particular prayer area and a special lane located close to the entrance to the prayer area

### KEYWORDS:

Accessibility; Disability People; Mosque; Regulation; Religion

### INTRODUCTION

The mosque is not just for those people without disabilities. Therefore, it is also crucial that people with disabilities (PwDs) be provided accessibility to give them an equal opportunity to perform congregational prayers together with other devoted Muslims while helping them fulfill their responsibilities and social roles [1]. Religious places are regarded as physical environments that are connected to religious or holy happenings that can improve essential human values and the human spirit [2]. Accessibility is a measure of the ease and comfort of a location in interacting with each other. In other words, accessibility measures the relief of individuals' activities of different types, sites, methods, and times [3]. Accessibility is a general term used to describe the degree to which devices, services,

environments, entities, buildings, or facilities are accessible by as many people as possible [4]. Therefore, to realize the equality of rights of persons with disabilities with the general public, the government and the community must fulfill public facilities, one of which is a mosque.

Compared to other public buildings, mosques have a higher level of accessibility and usability. It is because mosques are regularly used at least five times a day for worship, so they must be accessible to everyone [5]. The Regulation of the Minister of Public Works and Public Housing Number 14 of 2017 concerning Requirements for Ease of Building stipulated that the prayer area must be an appropriate, easy-to-access area equipped with directions and informative markers.

Such as providing a particular parking space, a

place for special ablution, special toilets, road ramps, unique prayer places, and signs or signs. Data from the Ministry of Social Affairs of the Republic of Indonesia in 2021 shows that Central Java has more than 15,000 people with disabilities, of which the majority are people with physical and multiple disabilities. As a provider of facilities and infrastructure, the government must pay attention to people with disabilities in public places, one of which is mosques. There are 2 great mosques in Boyolali, located on Jalan Merapi and in the district government complex. While in Surakarta is the Great Mosque of Surakarta, while in the Sebelas Maret University environment, namely the Nurul Huda Mosque, and in Karanganyar, there is the largest mosque, namely the Madaniyah Great Mosque.

Based on direct observations at the Great Mosque of Boyolali and Surakarta areas, it is known that access to the ablution area has a small pool as a place for washing feet. There is no special ablution place, no unique toilet, no ramp and handrails, no signs and there is no unique parking space for persons with disabilities. Based on these problems, this study uses the Accessible Congregation approach, namely the movement for the accessibility of places of worship to make areas more inclusive of persons with disabilities [6]. In addition, the concept of ergonomics is also applied to the proposed improvement of facilities, In addition, the ergonomics concept is also applied to the proposed improvement of facilities. According to [7], ergonomics is a "scientific study of the relationship between people and their work environment." Ergonomics is the study of human aspects and characteristics (ability, strengths, limitations, etc.) related to work and to process of the information obtained to design good products, tools, machines, environments, and work systems.

Based on the explanation of the condition of several mosques in Boyolali and Surakarta, it is known that there are still mosques that have the same situation or are not accessible for people with disabilities. Therefore, it is necessary to research the accessibility of the mosque, which can be used as a reference for improving the facilities and infrastructure at the mosque to make it more accessible for people with disabilities.

## METHODS

For this research, two methods of data collection were used, which were site assessment and access audit using an accessible congregation approach and semi-structured interviews. "Accessible congregation" is a term that means "a place of worship where communication, attitude, and physical can be easily accessed for people with disabilities [6]. This research was carried out at several mosques around the areas of Boyolali, Surakarta, and Karanganyar. Next, semi-structured interviews were conducted with respondents who were members of the mosque committee, like the chairman and mosque chief, and people with disabilities who were in the area. This

research only covered 3 categories of disabilities: the wheelchair, stick users, and the elderly. After that, the mosque that has the highest accessibility index and also considers the current condition of the mosque if the project is implemented that will propose an improvement to the mosque facilities.

### Site Assessment and Access Audit

The type of site assessment and access audit is designed to assess how well the facilities will work for disabled people. Identification of the accessibility of the mosque is carried out using the congregation's accessible approach from research [8]. Then the accessible congregation approach is carried out by distributing questionnaires containing several aspects and criteria regarding the Regulation of the Minister of Public Works and Housing No. 14 of 2017 referring to the study [9] and then modifications are made by adding criteria based on regulations. Here is the questionnaire design shown in Table 1.

After that, the data processing stage was carried out by calculating the mosque accessibility index value based on a questionnaire that had been distributed with the following conditions:

- Each answer choice for each sub-aspect of the accessibility assessment indicator is given a weight. The weight of the accessible assessment is two, the less accessible assessment weight is one, and the inaccessible assessment weight is zero.
- The recapitulation process for assessing accessibility is calculated by weights and divided by the maximum score.
- If the results of the accessibility index show a range between 0.00-0.33 including not accessible, 0.34-0.66 including less accessible, and 0.67-1.00 including accessible [6].

The questionnaire in Table 1 will be distributed to five mosques to determine the level of accessibility of each mosque, and then the mosque management will fill out the questionnaire, including people with disabilities. In addition to distributing questionnaires, measurements of mosque facilities were also carried out to determine the specifications of all facilities as well as to determine whether the specifications of the facilities followed the Regulation of the Minister of Public Works and Public Housing Number 14 of 2017 concerning Requirements for Ease of Building

### Semi-structured Interview

Semi-structured interviews are part of the access audit data collection for the assessed buildings. In the semi-structured interview, the interviewer is allowed much greater freedom to ask supplementary questions in case of need. A semi-structured interview is where the researcher has a list of questions they want to cover in the interview, and an interview guide [10]. At times, there may be specific questions if the situation requires it, and the question sequences can be changed. Semi-structured interview content for this

Table 1. The Questionnaire

No	Aspect	Criteria	Acc	Less Acc	Not Acc
1	Parking Lot	Parking lots for PwDs must have a minimum free space of 1.6 meters for wheelchair users to enter/exit their vehicle			
		Parking spaces for PwDs are provided with the provision of 2% of the total capacity			
2	Ramp	The ramp must be at least 1.2 meters wide and slope < 6°			
		Ramps with a width of more than 2.2 meters must be equipped with a handrail in the center of the ramp			
3	Ablution Area	There are separate ablution rooms for men and women			
		The ablution room with the toilet or bathroom must be separate			
4	Toilet	There is a kick plate on the toilet door			
		There are accessories in the form of a hand wash basin, mirror, trash			
5	Prayer Area	The width of the entrance can be accessed by wheelchair users			
		Anti-slip floor			
6	Lift	The lift is equipped with an automatic emergency landing device using battery power which in the event of a power outage, the lift will stop			
		The lift is equipped with a mirror using stainless mirror material and continuous handrails on both sides of the lift room with a height of 65 cm - 80 cm with a minimum distance of 5 cm from the vineyard to the wall.			
7	Signage	There is a guiding block in the mosque environment			
		Informative and easy-to-understand signs			
		There are signs outside and inside the mosque			
		K1(n*2), K2(n*1), K3(n*0)			
		Total			
		Accessibility Index			

research includes general facilities, specific facilities for a person with disabilities, and activities provided for PwDs.

#### Developing the Facilities

The selected mosque will be proposed improvements to all facilities so that they are accessible for people with disabilities by the Regulation of the Minister of Public Works and Public Housing Number 14 of 2017 concerning Requirements for Ease of Building using AutoCAD software. The design of facilities following the universal design concept can be applied. Universal design is an approach to designing production facilities and

products for users by considering several things, such as physical limitations, age range, and gender [11].

#### DISCUSSION

There are five mosques have been chosen for this study, which is located in Boyolali, Surakarta, and Karanganyar. This section consists of the data collection stage, which is the documentation and measurement of facilities, then distributing questionnaires as in Table 1 and interviews with mosque management. The mosques are summarized in Table 2. That shows the object of the mosque being researched and its description.

Table 2. Selected Mosque for This Study

No	Mosque	Description
1		Old Great Mosque of Boyolali, It is an old grand mosque in the city of Boyolali, consisting of 2 floor
2		New Great Mosque of Boyolali, This is a new grand mosque located in the city of Boyolali and has more complete facilities and a larger size.
3		The great Mosque of Surakarta is a great mosque in the city of Surakarta and is the oldest mosque
4		Nurul Huda Mosque is a mosque located at Sebelas Maret University and has complete facilities
5		The great Mosque of Madaniyah, Is the largest grand mosque in the city of Karanganyar and has facilities that support the presence of persons with disabilities

Documentation of mosque facilities is carried out, such as parking area, ramp and handrail, ablution area, toilet, signage, and prayer area. In addition, measurements of mosque facilities were also carried out to determine the specifications of all facilities as well as to determine whether the specifications of the facilities followed the Regulation of the Minister of Public Works and Public Housing Number 14 of 2017 concerning Requirements for Ease of Building.

The following is an example of documentation of the facilities at Madaniyah Great Mosque. In addition, the layout of each mosque is also carried out to determine the condition of the facilities in the mosque.

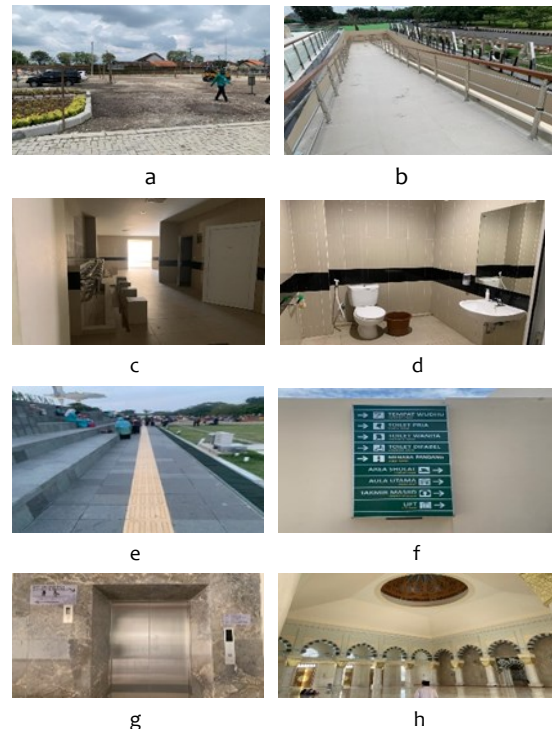


Figure 1. (a) Parking Area (b) Ramp (c) Ablution Area (d) Toilet (e) Guiding Block (f) Signage (g) Lift (h) Prayer Area

After that, data collection on the facilities in the mosque is carried out. The following is a recapitulation table of the availability of facilities in 5 mosques shown in table 3

Table 3. Recapitulation of Facilities at Mosque

No	Facility	Mosque					Description
		1	2	3	4	5	
1	Parking Lots	-	-	-	-	-	No parking lot for PwDs at 5 mosques
2	Ramp	-	√	-	√	√	There are ramps, but not appropriate with the regulation of PUPR Ministerial No 14 of 2017
3	Ablution Area	-	-	-	-	√	Only found at Madaniyah Great Mosque
4	Toilet	-	-	-	-	√	but not appropriate with the regulation of PUPR Ministerial No 14 of 2017
5	Lift	-	-	-	-	√	but not appropriate with the regulation of PUPR Ministerial No 14 of 2017
6	Signage	-	-	-	√	√	There is signage but no complete and not informative

Based on the results of the recapitulation of the table, shows that the majority of facilities for people with disabilities are in Madaniyah Great Mosques, but

some facilities are not appropriate with the Minister of Public Works and Public Housing Regulation No. 14 of 2017. The mosque accessibility index value is calculated at the data processing stage with the following formula. Accessibility Index:

$$\frac{\text{column1 (nx2)}+\text{column2 (nx1)}+\text{column2 (nx0)}}{K1+K2+K3}$$

The following is a recapitulation table of the accessibility index values for all mosques shown in table 4.

Table 4. Recapitulation of the Accessibility Index

No	Mosque	Accessibility Index	Description
1	Old Great Mosque of Boyolali	0.28	Not Accessible
2	New Great Mosque of Boyolali	0.32	Not Accessible
3	Great Mosque of Surakarta	0.29	Not Accessible
4	Nurul Huda Mosque	0.38	Not Accessible
5	Great Mosque Madaniyah	0.53	Less Accessible

Table 4 shows that the Great Madaniyah mosque has the most significant accessibility index value, which means that the facilities in the mosque are close to being accessible for people with disabilities. In addition, table 4 shows that most of the special facilities for people with disabilities are found in the Madaniyah Grand Mosque. Still, it is not appropriate with the Minister of Public Works and Public Housing Regulation No. 14 of 2017. Therefore, the Madaniyah Grand Mosque was chosen as the object of the proposed facility improvement. This is because the great Madaniyah mosque allows additional facilities or changing facilities to comply with Minister of Public Works and Public Housing Regulation No. 14 of 2017. In addition, as the largest mosque, the Great Mosque of Madaniyah can be a reference for other mosques [10].

**DESIGN FOR PARKING LOT**

Madani Mosque has a large parking area for both motorbikes and cars. However, currently, there is no special parking space for wheelchair users. So wheelchair users have to walk far to the mosque. The following is an example of a motorbike used by people with disabilities who use wheelchairs. The following is a proposed improvement plan for the parking lot.

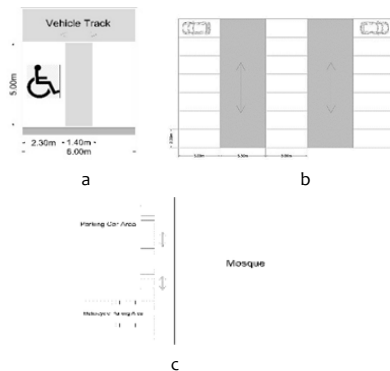


Figure 2. (a) Parking Area Dimensions (b) Parking Area Layout (c) Parking Area Location

Based on the research [12] which also applies the regulation of Minister of Public Works and Public Housing Regulation No. 14 of 2017, the proposed improvement to parking lots for people with disabilities is 2.3 meters x 5 meters and a free area of 1.4 meters. Then figure b shows the parking lot layout arranged in a row, then figure c shows the location of a special parking lot for people with disabilities, namely at the place closest to the mosque. This location is to facilitate access to the mosque for people with disabilities.

**DESIGN FOR RAMPS**

The Madaniyah Mosque has 2 different ramp locations. The first one is in front of the mosque with a length of 40 meters and a width of 2 meters, and a ramp in the foyer of the mosque with a length of 5 meters and a width of 2 meters. In addition, the slippery ramp floor can endanger wheelchair users while moving. Then there is only a flat floor at the ramp. The following is a proposed improvement plan for the ramp:

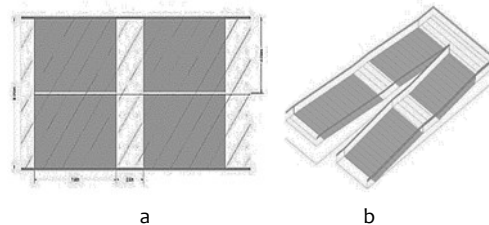


Figure 3. (a) Ramp Dimension (b) Ramp in Isometric View

Based on the research [13] and [14], the proposed ramp improvement focuses on the slope level of 6 degrees. This is to make it easier for wheelchair users to use the ramp. In addition, Figure 3 shows the width of the ramp is 2 meters, the length of the ramp area is 1.5 meters, and there are handrails on both sides to hold wheelchair users.

**DESIGN FOR ABLUTION AREA**

Special ablution places for people with disabilities have handrails and seats with a height of 45 cm and a width of 30 cm. In addition, the ablution place has a good lighting and ventilation system. The following are suggestions for improvements to the ablution area.

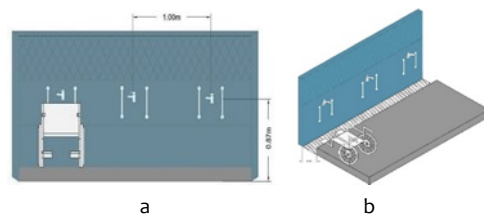


Figure 4. (a) Ablution Area Dimension (b) Ablution Area in Isometric View

Based on research [8] and [13], shows that chairs are needed by crutch users because they have problems with foot support when standing. Therefore,

the suggestion is to remove some of the seats in the ablution area because not all people with disabilities are more comfortable if there is a seat, especially wheelchair users. However, the presence of a chair will make it difficult for wheelchair users to perform ablution because they have to move from a chair to a seat or vice versa. This activity can increase the possibility of wheelchair users falling when they are about to move.

**DESIGN FOR TOILET**

The Madaniyah Mosque has a special toilet for people with disabilities, totaling one toilet and at the ablution area. The following are the specifications of the toilet in its current condition.

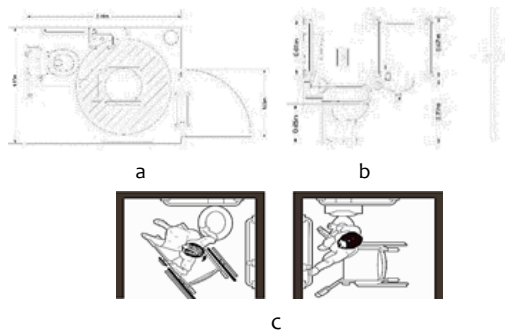


Figure 5. (a) Dimension of Toilet in Top View (b) Toilet in Side View (c) Movement of PwDs in Toilet

Based on research [8] and [9], the improvements to the toilet at the Great Mosque of Madaniyah focus on essential components that are not found in the toilet. Several components were added to the toilet design, which includes a horizontal handrail with a length of 74 cm and a vertical handrail with a length of 64 cm to facilitate people with disabilities to maneuver in the toilet; a kick plate on the door with a width of 20 cm to facilitate access to the toilet; a hinged door that can close automatically; and adding a panic button just in case the toilet user needs help. In addition, the recommended toilet height is 45 cm to make it easier to use.

**DESIGN FOR LIFT**

The Madaniyah Great Mosque has a special lift for people with disabilities, totaling 2 for males and females. The following are the specific lift specifications for persons with disabilities. There are some drawbacks to the lift in its current condition, such as the size of the room that one wheelchair user can only use. There is no handrail where this handrail function is essential to hold people with disabilities so they do not fall or if the lift experiences shock.

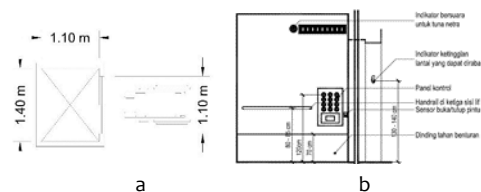


Figure 6. (a) Dimension of Lift (b) The Lift Button

Based on regulation by the Minister of PUPR No. 14 of 2017, improvements to the lift are such as widening the size of the lift, which is 120 cm x 230 cm, so that people with disabilities can move freely in the lift. In addition, it is necessary to add a handrail in the lift to hold people with disabilities so they do not fall easily. Beside that, research [15] explained that a tactile warning surface and braille should be provided in front of the lift and braille for visually impaired people

**SIGN AND SIGNAGE DESIGN**

The signs and signage at the mosque are complete, but there is no special parking sign for wheelchair users. This situation makes it difficult for wheelchair users to come. Therefore, special signs for people with disabilities need to be installed to the east and north of the mosque. Besides that condition, there are no special signs for people with disabilities, such as parking lot signs and signs for guiding blocks. The following are the specific lift specifications for people with disabilities:

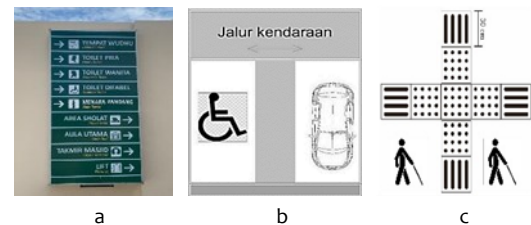


Figure 7. (a) Sign at the Mosque (b) Sign for the Parking Area (c) Sign for the Guiding Block

Another universal design principle, namely simple and intuitive use and perceptible information, is the use of signs or signage [10]. Based on research [15] in regulations in the form of signs and markings as well as ideal distances for reading a letter, information for the disabled is explained in the form of braille letters. However, the proposed design of signs or signs at the Great Mosque of Madaniyah focuses on the distribution and completeness of the signs. Currently, the signs are evenly distributed, such as in parking lots, ablution areas, toilets, and lifts. However, in the mosque entrance area, the sign indicating where the mosque facilities are located is only on the north side of the mosque, which is close to the parking lot. So it is necessary to add signs to make it easier for visitors to access the mosque. In addition, signs that need to be added are signs on guiding blocks, signs for unique parking spaces for people with disabilities, and signs for particular prayer areas for people with disabilities.

**DESIGN FOR PRAYER AREA**

The prayer area at the Madani Mosque still does not have a special prayer area for wheelchair or cane users, making it difficult for wheelchair and cane users to determine the location of prayer. The following is a design for a special prayer place for wheelchair and crutch users in the mosque

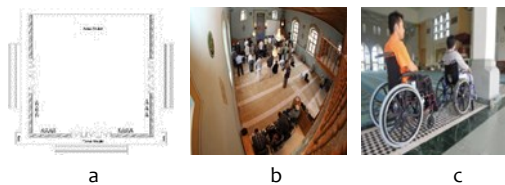


Figure 8. (a) Design for Prayer Area PwDs (b) Location of Pray for PwDs (c) Location of pray for PwDs

Research [16] and [17] shows that the location of unique prayer places for people with disabilities is near the entrance to facilitate access for people with disabilities and not disturb other worshipers. In addition to the proposed improvement, it is recommended to add a special lane for people with disabilities. With disabilities, to prevent the possibility of prostheses or equipment carried by people with disabilities containing dirt that can cause najis. Furthermore, the presence of a specific lane will make it easier for officers to clean the prayer area.

## CONCLUSION

Based on the case study, it can be concluded that the results of the accessibility assessment at the five great mosques located in the Boyolali, Surakarta, and Karanganyar areas show that the accessibility index value is in the range between 0.28 (inaccessible) and 0.53 (less accessible), which means mosque 5 has the highest rank regarding facilities provision at 0.53. It is followed by Mosque 4, which accomplished 0.38 of the facilities. Mosque 2 tied for 3rd with a 0.32 mark, mosque 3 tied for 4th with a 0.29 provision, and mosque 1 seems not to have good facilities establishment for PwDs, which only achieved 0.28. Based on the result above, indicates that the condition of the facilities and infrastructure mosque infrastructure does not consider accessibility, especially for persons with disabilities. The improvement facilities of the Great Mosque of Madaniyah that make it accessible for people with disabilities include a unique parking space, a ramp, an ablution place, a toilet, a lift, a sign or signage, and a prayer place.

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