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To cite this article: K A Mannan 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **780** 012051

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The intensity of prayer room's natural lighting

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Abstract. A mosque as a place of worship for Muslims, not only functions as a place of prayer but also functions for other worship activities such as reading the Quran, religious lectures, and celebrating Islamic holidays. Each activity needs to be supported by good lighting so that each activity can run optimally. This study will discuss the aspect of light as supporting the function of the mosque, with a focus on the natural lighting of the mosque prayer room. The case study was conducted at the Taqwa Nandjar Mosque located in Tangerang Selatan, Banten, Indonesia. This study uses a quantitative method, where the data collected is the lighting intensity (lux) in the prayer room area of the Taqwa Nandjar Mosque. The result is the natural lighting at Taqwa Nandjar Mosque has not met the minimum required lighting standard for the mosque and artificial lighting is needed to increase the light intensity in the Taqwa Nandjar mosque room to meet the minimum lighting standards.

1. Introduction

Comfort is necessary when someone performs worship. There are several aspects related to the convenience that need to be fulfilled. One of the comfort aspects when worshipping is visual comfort. Visual comfort comes from lighting that can support building user activities properly. Also, good visual comfort at a place of worship can bring a feeling of calm and closeness to the creator when someone is performing worship [1]. This is because a place of worship is considered to have a different quality of space from the surrounding buildings, which can support the sacredness of rituals carried out inside or outside the place of worship [2].

Mosques as places of worship for Muslims also need to pay attention to visual comfort aspects in their lighting design. For mosque lighting itself, we can divide it into two, namely sacred lighting and functional lighting. From previous research, it is known that light can influence the formation of visual perceptions of Allah's presence in prayer [3]. This is known as sacred lighting. On the other hand, there is also research that discusses lighting from a functional side. Functional lighting is lighting to support the function of a mosque as a place of worship such as prayer, reading the Qur'an, and other worship [4].

Daylight is one of the key elements for mosque lighting. Without proper daylighting, a mosque's space will not function properly [5]. This study will discuss the aspect of light as supporting the function of the mosque, with a focus on the natural lighting of the mosque prayer room. This is to see the potential use of natural lighting to meet the functional needs of mosque users such as praying and reading the Al-Qur'an. The case study was conducted at the Taqwa Nandjar Mosque located in Tangerang Selatan, Banten, Indonesia. The Taqwa Nandjar Mosque was chosen because apart from being used as a place



of prayer, this mosque is also used for other worship activities such as reading the Al-Qur'an, religious lectures, Islamic holidays, and others.

2. Research methodology

This study uses a quantitative method, where the data collected is the lighting intensity (lux) in the prayer room area of the Taqwa Nandjar Mosque. The data was collected by measuring the light intensity at ten points in the prayer room area of the Taqwa Nandjar Mosque. Measurements were made at 09.00 AM and 02.00 PM, using a lux meter.

The analysis was carried out by comparing the measurement results with visual comfort standards for the prayer room and classroom. Visual comfort standards for the prayer room and classroom were obtained from the results of the previous literature review, namely from the Indonesian National Standard SNI 03-657-2001 for lighting [6].

This study will focus on the relationship between visual comfort and the level/magnitude of lighting values so that other variables related to visual comfort in this study will be considered non-existent.



Figure 1. Research thinking framework.

3. Results and discussion

3.1. Building site analysis

Taqwa Nandjar Mosque is located at Jalan Cendrawasih Raya No. 64, Sawah Baru, Ciputat District, South Tangerang City, Banten, Indonesia. To the east of the mosque is bordered by a car park. To the north of the mosque is bordered by a motorbike parking area and a minaret. To the south of the mosque is bordered by gardens and the Tahfidz Islamic boarding school. To the west of the mosque is bordered by residential areas. There are public facilities such as toilets, ablution places, parking for motorbikes and cars, a management area, and a foyer area for mosque users who want to rest.

The main part of the mosque is the prayer room which is in the deepest position in the mosque area. Further information regarding the position and condition of the Taqwa Nandjar Mosque can be seen in the following figure 2:



Figure 2. The position of the mosque with the Qibla direction (www.al-habib.info/arah-kiblat).

3.2. Measurement of data analysis

In this study, researchers took measurements using a lux meter at several points in the mosque. Measurements are made to get the value of light intensity in the prayer room area of the mosque. There are 10 points of measurement location from point 1 to point 10. Measurements were made at 09.00 am

and 2.00 pm. The Luxmeter is placed on the floor with a height of 0 meters from the floor. This is to measure the light intensity on the horizontal part of the mosque floor. Photo of lux meter placement in the mosque prayer room area and lux meter measurement point can be seen in the image below:

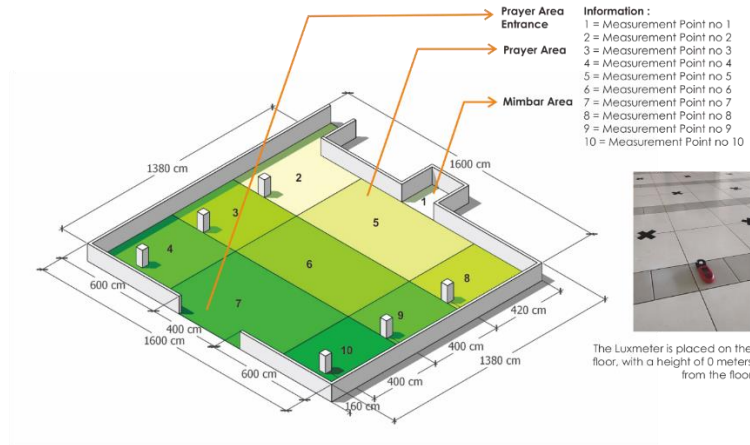


Figure 3. Measurement points in the prayer room area of the Taqwa Nandjar Mosque.

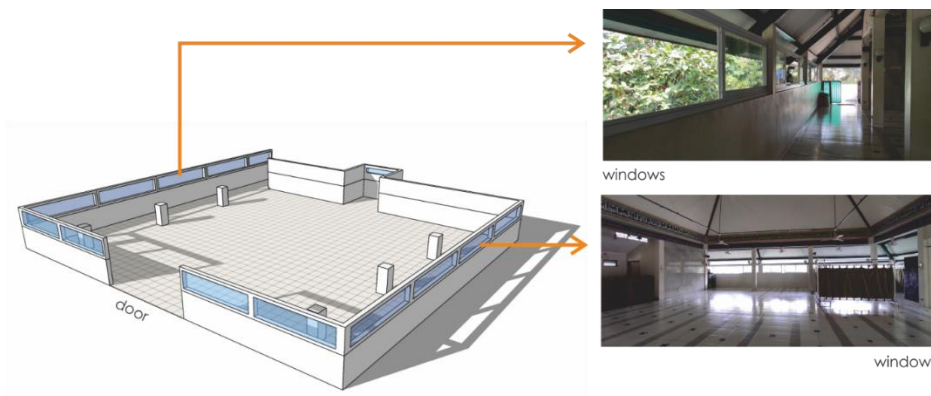


Figure 4. The position of the windows and doors in the taqwa nandjar prayer area.

Furthermore, the measurement results are compared with the Indonesian National Standard for lighting, SNI 03-6575-2001. Lighting Standards SNI 03-6575-2001 for lighting mosques and classrooms can be seen in the following table:

Table 1. Minimum lighting levels and color rendering for a house of worship.

Function	Lighting Level (lux)	Color Rendering Group	Note
House of worship			
Mosque	200	1 or 2	For places that require a higher level of lighting can use any type of local lighting
Church	200	1 or 2	idem
Vihara	200	1 or 2	idem

Source: SNI 03-6575-2001

Table 2. A recommended minimum level of lighting and color rendering for an educational institution.

Function	Lighting Level (lux)	Color Rendering Group	Note
Educational institutions			
Classroom	250	1 or 2	
Library	300	1 or 2	
Laboratorium	500	1	
Drawing Room	750	1	Use local lighting on the drawing table
Canteen	200	1	

Source: SNI 03-6575-2001

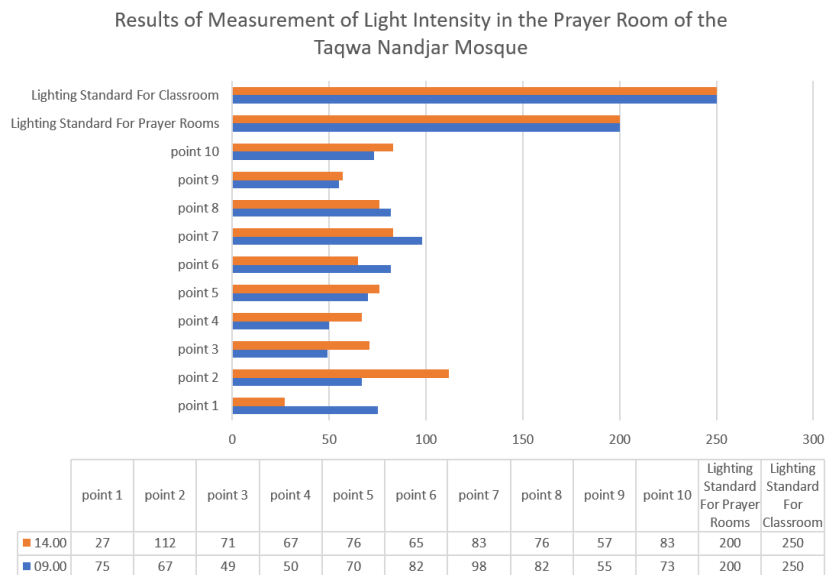


Figure 5. Results of Measurement of Light Intensity (Lux) in the Prayer Room of the Taqwa Nandjar Mosque.

From the table above, it can be seen that the highest measurement value is 112 lux and the lowest is 50 lux. When compared with the minimum lighting levels for the house of worship from the Indonesian National Standard SNI 03-6575-2001, the lighting intensity of the Taqwa Nandjar prayer room has not met the required lighting standard, where the standard level of lighting for mosque buildings is 200 lux.

To meet the need for reading the Al-Quran, the lighting in the prayer room area of the Taqwa Nandjar Mosque also does not meet the recommended minimum level of lighting for educational institutions from Indonesian National Standard SNI 03-6575-2001, where the standard level of lighting for a classroom is around 250 lux.

Several factors cause the Taqwa Nandjar mosque prayer room does not meet the minimum recommendations from the Indonesian National Standard (SNI) for lighting mosque buildings. Some of these factors are:

- During the day the lighting uses completely natural lighting/daylight, there is no lighting aid from artificial lighting.
- The overhang on the roof of the mosque, blocking direct sunlight from entering the building
- The trees around the Taqwa Nandjar mosque provide a shadow for the entire mosque building area.



Figure 6. Trees in the area around the mosque.



Figure 7. The overhang on the roof of the mosque.

4. Conclusion

Judging from the lighting aspect for the function of the mosque as a place of prayer and a place to read the Qur'an, the natural lighting at Taqwa Nandjar Mosque has not met the minimum required lighting standard, which is 200 lux. This is based on the mosque lighting standards in the Indonesian National Standard SNI 03-6575-2001. Therefore, the role of artificial lighting is needed to increase the light intensity in the Taqwa Nandjar mosque room to meet the minimum lighting standards required. Also, further research can find out the need for artificial lighting intensity for mosque prayer rooms, especially for the Taqwa Nandjar prayer room.

The intensity of natural lighting in the prayer room area of the mosque is also influenced by the presence of trees around the mosque where the trees reduce the intensity of sunlight that can be entering the prayer area. Therefore, regulating the distance between trees and buildings is one aspect that needs to be considered to obtain optimal natural lighting intensity.

Recommendation

Add artificial lighting to assist natural lighting during the day. Calculations regarding the amount of artificial lighting needed along with the details of the artificial lighting can be carried out in subsequent studies.

Acknowledgments

This research was made possible by a support from Department of Architecture, Universitas Pembangunan Jaya. The authors also thank to reviewers for their valuable comment to revise the paper. The data presented, the statements made, and the views expressed are solely the responsibility of the author.

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