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Architectural Criticism on Exterior Pavement Material Suitability of the Muhammad Cheng Hoo Mosque Jambi: A Universal Design and Accessibility Regulation Perspective

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ABSTRACT

This study critically examines the exterior flooring materials of the Muhammad Cheng Hoo Mosque in Jambi, Indonesia, a mosque built in 2012 in a Sino-Islamic architectural style inspired by the Cheng Hoo Mosque in Surabaya and established by the Chinese Islamic Foundation of Jambi. The research addresses the use of glossy ceramic tiles in outdoor areas, which technical literature generally considers unsuitable for wet exterior environments due to their low slip resistance. This condition poses significant safety risks, particularly for elderly visitors and women who must walk barefoot after crossing the batas suci (sacred boundary). Using a qualitative descriptive approach, the study combines structured field observations with a normative literature review. Five exterior zones were evaluated against three normative frameworks: the seven principles of Universal Design, Indonesian accessibility regulations, and technical literature on flooring materials. Environment-Behavior Theory was also applied to explain the conflict between ritual barefoot practices and unsafe surface conditions. The findings show that four of the five observed zones are paved with glossy ceramic tiles that are unsuitable for wet outdoor use by barefoot pedestrians. Safety risks are further exacerbated by the absence of adequate drainage gradients, tactile guiding paths, and handrails. This study fills an important gap in both international and Indonesian scholarship, as previous mosque flooring studies have focused primarily on interior ablution areas, while research on exterior flooring safety in Indonesian mosques remains limited. The study proposes design recommendations that improve safety and

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accessibility while preserving the mosque's Sino-Islamic architectural identity.

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1. INTRODUCTION

The Muhammad Cheng Hoo Mosque in Jambi is a multicultural mosque featuring a blend of Islamic and Chinese architectural styles. Established in 2012, its current congregation is predominantly composed of vulnerable groups, such as the elderly and mothers, who face high physical safety risks. Field observations conducted in May 2026 revealed a serious architectural safety deficit in the exterior area (veranda) specifically, the utilization of glazed interior ceramic tiles in an outdoor zone directly exposed to rainfall. The risk of Slip, Trip, and Fall (STF) accidents is uniquely amplified by Jambi's microclimate, situated in a humid tropical zone with high rainfall, as well as the *batas suci* (sacred boundary) regulation that requires worshippers to mobilize barefoot on this wet and slippery surface.

Despite the high urgency of safety, existing literature on Cheng Hoo Mosques in Indonesia consistently remains constrained to the dimensions of aesthetics, cultural acculturation, and facade typology (Febriana & Sumardiyanto, 2023; Narhadi, 2019; Saputra et al., 2024). On the other hand, domestic accessibility studies have only touched upon ablution areas and interiors (Adha & Mutiari, 2025; Anjani & Lestari, 2026; Safitri, 2024). Meanwhile, contemporary global research over the past five years has also fully focused on interior ablution areas in the arid Middle Eastern region (I.-J. Kim, 2024b, 2025; I.-J. Kim & Bendak, 2021). Consequently, the safety evaluation of exterior mosque pavements in tropical climates with barefoot users represents a crucial research gap that this study urgently seeks to address.

Based on this literature gap, this study aims to: (1) describe and classify the condition of the exterior pavement at the Muhammad Cheng Hoo Mosque Jambi based on field observations; (2) conduct an architectural criticism of its suitability based on Universal Design principles and national accessibility regulations; and (3) formulate design recommendations that are safe, accessible, and sensitive to the building's Sino-Islamic identity.

Normative Architectural Critique and POE

Normative architectural criticism evaluates architectural works based on their compliance with specific standards or principles established as benchmarks (Antoniades, 1992; Zevi, 1974). Within this approach, assessment is conducted by comparing existing conditions with applicable normative criteria, without requiring quantitative empirical measurements. This method is considered valid and common in evaluative architectural research, including studies on accessibility and safety within the built environment.

Post-Occupancy Evaluation (POE) represents an operationalization of normative criticism within the context of operational buildings. POE assesses building performance across functional, technical, and user-behavior aspects after the building is occupied (Preiser et al., 2015). In a systematic review of 234 POE articles (2006–2022), Lolli et al. (2022) emphasized that POE enables the identification of gaps between the intended performance in the design phase and the actual performance experienced by users—making it a highly relevant methodological framework for this study.

Environment-Behavior Theory

Environment - Behavior Theory Lang (1987) and Rapoport (1980) examines how the quality of the built environment directly shapes the behavior and safety of its users. This theoretical lens is particularly critical in the context of mosque exterior pavements, where the *batas suci* ritual creates an involuntary behavioral condition: users, especially the elderly are compelled to walk barefoot on surfaces that were not designed with this behavior in mind. Rapoport (1980) argues that designers must understand culturally embedded user behaviors as primary constraints, not afterthoughts. The barefoot requirement is precisely such a constraint: an unalterable ritual that demands the built environment not the user to adapt.

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The failure to do so constitutes a fundamental design deficit that Environment-Behavior Theory makes legible.

Universal Design in Houses of Worship

Universal Design is defined as the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design (Story et al., 1998).The seven formulated principles encompass: (1) Equitable Use, (2) Flexibility in Use, (3) Simple and Intuitive Use, (4) Perceptible Information, (5) Tolerance for Error, (6) Low Physical Effort, and (7) Size and Space for Approach and Use.

The application of Universal Design in mosques faces unique challenges due to ritual requirements. A study on Universal Mosque Design (Al-Mansoor, 2018) suggests that as public buildings used at least five times a day, mosques must be accessible to all groups. Users with physical disabilities, particularly the elderly, encounter difficulties at entrance and footwear-removal areas. Furthermore, an accessibility study of the Sheikh Zayed Grand Mosque Suhardi et al. (2024) directly documented visitors falling due to slippery floors when wet, reinforcing that material texture is not merely an aesthetic concern but a matter of life safety In Indonesia, research on Universal Design in mosques has expanded in recent years. A comparative study of two mosques (Anjani & Lestari, 2026) revealed weaknesses and challenges in realizing inclusive mosque designs. Similarly, a study at the Nurul Kalam Grand Mosque in Pemalang Safitri (2024) indicated that most mosques in Indonesia remain inaccessible to all segments of the congregation. Specifically, research at the Klaten Grand Mosque (Adha & Mutiari, 2025) found that the absence of ramps and the utilization of slippery flooring materials serve as primary barriers to accessibility, particularly for users with disabilities and the elderly.

Characteristics of Paving Materials and Safety of Mosque Floors

Material slip resistance is a critical safety factor for pavements, particularly under wet conditions. In technical literature, smooth, glossy glazed materials are consistently identified as having low slip resistance and are not recommended for areas regularly exposed to water (I.-J. Kim, 2024b, 2025). Conversely, matte-textured materials with higher surface roughness provide better traction in wet conditions by increasing the contact points between the floor surface and the sole of the foot (I.-J. Kim, 2024b).

Within the context of mosques, a series of studies by Kim between 2021 and 2025 established empirical evidence regarding flooring safety risks. (I.-J. Kim & Bendak, 2021) examined 15 mosques in Dubai and Sharjah, finding that smooth ceramic ablution floors generated friction coefficient values below the safety threshold under wet and soapy conditions. I.-J. Kim (2024a) expanded this study to 30 mosques in the UAE, emphasizing the urgency of surface innovation to create inclusive and safe environments. I.-J. Kim (2025) formulated that ceramics with higher texture peaks and deeper valleys provide superior traction in humid conditions. Furthermore, (I. Kim, 2025) proposed a 10-phase framework based on a systematic review of 90 studies (2000–2024) to enhance pedestrian pathway safety.

An important national contribution is provided by (Achsanta & Lukman, 2026) in their study at the Grand Mosque of Bandung, which documented complaints from elderly users regarding slippery floors in the ablution area, confirming that wet flooring conditions increase the risk of falls among older age groups. These findings are contextually relevant despite their focus on interior areas.

2. RESEARCH METHODS

This study employs a descriptive qualitative approach utilizing a normative architectural criticism strategy. This approach was selected because the primary objective is to describe

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the existing conditions and evaluate them against normative criteria, rather than generating quantitative measurement data. The overall research framework, including data collection, analysis stages, and evaluation criteria, is illustrated in Figure 1. This methodology aligns with the tradition of evaluative architectural research, which utilizes structured observation as its primary instrument (Antoniades, 1992; Preiser et al., 2015).

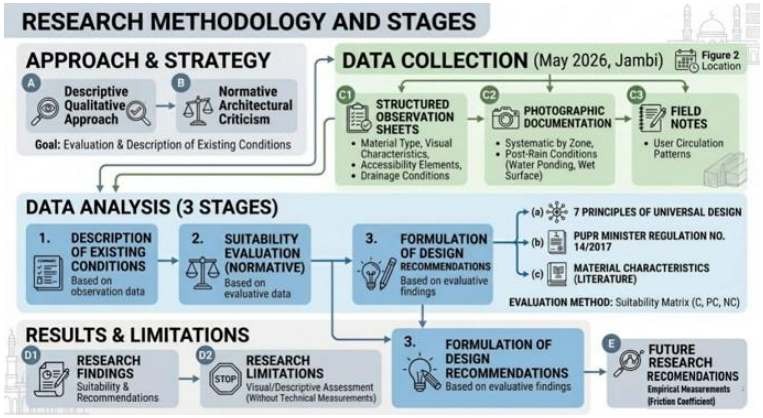

Figure 1 Research Methodology and Research Stages

Data collection was conducted through structured field observations in May 2026 at the Muhammad Cheng Hoo Mosque in Jambi (Figure 2). The observation instruments comprised: (1) zone-by-zone observation sheets recording material types, visual surface characteristics, the presence of accessibility elements, and drainage conditions; (2) systematic photographic documentation of each zone taken under post-rainfall conditions to document water ponding and wet surface states; and (3) field notes regarding observed user circulation patterns.

Figure 2 Location of Muhammad Cheng Hoo Mosque in Jambi
Source: Field Observation, 2026

Data analysis was carried out in three distinct stages. First, describing the existing conditions of each zone based on observational data. Second, evaluating suitability by comparing the described existing conditions against three normative frameworks: (a) the seven principles of Universal Design Story et al. (1998); (b) the Minister of Public Works and Public Housing (PUPR) Regulation , (2017)No. 14/2017; and (c) the general characteristics of pavement materials as outlined in technical literature (I.-J. Kim, 2024a, 2025). Third, formulating design recommendations based on the evaluative findings. The evaluation results are presented in a suitability matrix categorized into: Compliant (C), Partially Compliant (PC), and Non-Compliant (NC).

Research limitations: The material assessment is based on visual surface characteristics and general descriptions in technical literature, rather than direct measurements of the friction coefficient. The findings of this study are evaluative-normative in nature and do not

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claim measurable technical values. Empirical measurements are highly recommended as an agenda for future research.

3. RESULT AND DISCUSSION

3.1 Description of Existing Conditions per Zone

Based on field observations, the exterior areas of the Muhammad Cheng Hoo Mosque Jambi are classified into five evaluation zones, each characterized by distinct material properties and exposure conditions. Table 1 and Figure 3 presents the identification of each zone.

Table 1 Identification of Zones and Existing Conditions of Exterior Pavement

Zone	Location	Existing Materials	Water Exposure	Footwear	Drainage
A	Main staircase	Polished granite/geometric patterned cemaric tiles	Directly exposed to rainfall	Removed (*batas suci*)	No visible drainage
B	Roofed veranda	Glossy checkerboard ceramic tiles	Semi outdoor, exposed to wind – driven rain/drips	Removed (*batas suci*)	Water ponding observed
C	Side corridor	Glossy checkerboard ceramic tiles	Semi-outdoor	Footwear permitted (sandals)	Water ponding observed
D	Secred boundary (*batas suci*) area	Glossy ceramic tiles/polished granite	Frequently wet	Removed (mandatory)	indaquate
E	Parking lot	Hexagonal paving blocks	Directly exposed to rainfall	Footwear permitted (sandals)	Moderately adequate

Source: Field observation, Mei 2026

Zone A

Zone B

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Zone B

Zone C

Zone D

Zone E

Figure 3. Observation Location Zone
Source: Field Observation, 2026

Four out of the five zones (A, B, C, D) utilize glazed materials with smooth and glossy surfaces. During observations conducted after rainfall, significant water ponding was observed in Zones B and C, while Zones A and D were uniformly wet. Zone D represents the most spatially critical point: it is here that users first remove their footwear and immediately step onto a potentially wet surface to descend the staircase in Zone A. Furthermore, no handrails on either side of the staircase, tactile paving guides, alternative ramps, or slippery floor warning signs were found across any of the observed areas.

3.2 Criticism of Material Characteristics

In the technical literature of architecture and facilities, glazed ceramic tiles with smooth, glossy surfaces are generally classified as non-recommended materials for outdoor areas regularly exposed to water. I.-J. Kim (2024a, 2025) consistently characterizes glazed materials as having low slip resistance under wet conditions, particularly in environments exposed to large volumes of water, such as ablution areas and in the context of this study, exterior zones exposed to rainfall.

Regarding the observed physical characteristics, all ceramic tiles in Zones A through D feature a glossy finish, indicating an absence of surface micro-texture. In technical literature, the lack of micro-texture means that the contact points between the floor surface and the sole of the foot are severely reduced when wet, drastically decreasing the friction effect I.-J. Kim (2024b). This condition is exacerbated in Zone A (staircase) due to gravitational forces that add downward momentum as users descend the steps, exponentially increasing the risk of slipping. From an Environment-Behavior perspective, this physical configuration directly conflicts with the ritual behavioral constraint of walking barefoot: users cannot avoid the unsafe surface, nor can they modify the ritual, the design bears full responsibility for mediating this conflict (Rapoport, 1980).

Conversely, Zone E (hexagonal paving blocks) exhibits distinct conditions. Visually, the paving blocks possess a rougher surface texture and inter-block gaps that function as micro-drainage channels. These characteristics align with general literature recommendations for exterior pavement materials, although they still require periodic maintenance to prevent moss and algae growth.

3.3 Evaluation of Universal Design Principles

Table 2 presents the suitability evaluation matrix comparing existing conditions against the five Universal Design principles most relevant to the context of exterior pavements. Zone E is included in this evaluation for completeness.

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Table 2 Conformity Matrix to Universal Design Principles

UD Principles	Observation Indicators	Zone A	Zone B	Zone C	Zone D	Zone E
Equitable Use	The material is safe for everyone to use, including the elderly and barefoot users.	**NC**	**NC**	**NC**	**NC**	**C**
Flexibility in Use	Safe surface in both wet and dry conditions	**NC**	**NC**	**PC**	**NC**	**PC**
Perceptible Information	There are tactile paths or differences in texture as danger information.	**NC**	**NC**	**NC**	**NC**	**NC**
Tolerance for Error	There are handrails and safety elements in case of a wrong step.	**NC**	**PC**	**PC**	**NC**	**PC**
Low Physical Effort	The surface does not require excessive caution when traversed.	**NC**	**NC**	**PC**	**NC**	**C**

Note: C = Compliant; PC = Partially Compliant; NC = Non-Compliant. Source: author's analysis, 2026

Zones A and D received a Non-Compliant (NC) rating across all five evaluated principles. These two zones serve as the footwear-removal transition points, paradoxically representing the moments of highest risk. Zone B received NC ratings for three principles and PC for two, primarily reflecting the presence of partial handrail structures that do not fully meet regulatory standards. Zone C fared marginally better due to permitted footwear use, receiving PC on three principles. Zone E is the only zone achieving Compliant ratings for Equitable Use and Low Physical Effort, though it remains Non-Compliant for Perceptible Information due to the absence of tactile guiding paths across all evaluated zones.

3.4 Evaluation of Accessibility Regulations

The Minister of Public Works and Public Housing (PUPR) , (2017) Regulation No. 14/2017 concerning Building Accessibility Requirements mandates that public buildings meet accessibility standards for diverse users, including persons with disabilities, older adults, and other mobility-impaired groups (Kovalska & Zdetovetska, 2025; Nahdatunnisa & Tahir, 2024). This regulatory orientation is consistent with broader universal design literature, which emphasizes that accessibility standards need to be integrated from the earliest design stage and maintained through implementation and operation (Gupta et al., 2025; Pada et al., 2025).

The evaluation identified three primary non-compliances within the existing conditions of the Muhammad Cheng Hoo Mosque Jambi. First, regarding surface texture requirements, pedestrian surfaces in accessible public environments are expected to provide safe and non-slippery walking conditions, because slippery finishes are repeatedly associated with fall risk, especially in wet conditions and on sloped surfaces (Chew et al., 2024; Pinto et al., 2020). Evidence from campus-scale slip assessments further shows that frictional resistance declines when surfaces are wet, which is directly relevant to exterior circulation areas exposed to rain (Chew et al., 2024) Therefore, the use of glazed ceramic tiles across the primary exterior zones of the Muhammad Cheng Hoo Mosque Jambi indicates non-compliance with accessible surface requirements and increases risk for elderly users and people with mobility limitations (Kapsalis et al., 2024).

Second, tactile guiding path requirements, the absence of tactile elements across all evaluated exterior zones conflicts with inclusive circulation principles that call for multisensory navigation support (Kovalska & Zdetovetska, 2025). The regulation requires the installation of tactile paving comprising guiding blocks and warning blocks, along the primary circulation paths of public buildings (Nahdatunnisa & Tahir, 2024). No tactile elements were found across any of the evaluated exterior zones.

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Third, handrail and ramp requirements, accessible entrances require more than stairs alone because stair-only access restricts independent entry for wheelchair users and many older adults (Kovalska & Zdetovetska, 2025). PUPR , (2017) Regulation No. 14/2017 mandates the provision of handrails on both sides of a staircase and the availability of alternative ramps with a maximum slope of 1:12 (Aji et al., 2022; Suhardi et al., 2024). In addition, handrails remain a basic safety and accessibility feature on stairs and ramps, yet mosque studies have documented unstable or noncompliant handrails as continuing hazards for wheelchair users and the elderly (Suhardi et al., 2024). Accordingly, the absence of standard-compliant handrails on both sides of the main staircase and the lack of an alternative ramp at Muhammad Cheng Hoo Mosque Jambi indicate a clear barrier to independent and safe access (Aji et al., 2022)

3.5 Contextual Factors Exacerbating Risk

Two specific contextual factors distinguish this case from similar studies in other contexts and should be highlighted as findings that contribute to filling the literature gap. First, the humid tropical climate. Jambi is situated within a humid tropical region characterised by high rainfall and constant air humidity. Wet floor conditions are therefore not occasional occurrences but rather a regular state. The water ponding observed in Zones B and C indicates that the existing floor slope is insufficient for effective drainage. The combination of glazed materials and inadequate drainage creates layered safety hazards significantly worse than either factor alone, a condition that fundamentally differs from the arid UAE context studied by Kim (2021–2025).

Second, the barefoot condition in exterior areas. The *batas suci* regulation requiring worshippers to remove their footwear is an unalterable practice due to its ritualistic and religious nature. Drawing on Environment-Behavior Theory Rapoport (1980), this establishes a condition in which users particularly the elderly who experience a decline in proprioceptive function must traverse potentially slippery surfaces without the protective traction of rubber soles. While (Achsanta & Lukman, 2026) documented similar complaints among the elderly in the interior ablution area of the Bandung Grand Mosque, the condition at the Muhammad Cheng Hoo Mosque Jambi occurs in the exterior, where exposure to rainfall is substantially greater a specific and unaddressed combination in the reviewed literature.

3.6 Design Recommendations

The following recommendations are formulated by simultaneously considering three aspects: user safety, compliance with accessibility regulations, and the continuity of the building's Sino-Islamic visual identity (Figure 3). For material replacement, each zone requires a different approach based on its level of water exposure and user conditions. Zone A (main staircase), which bears the highest risk due to direct rainfall exposure and mandatory barefoot use, should replace the existing polished granite with textured porcelain tiles or rough-finish natural stone such as andesite, both of which are classified in technical literature as appropriate for wet exterior staircases (DIN 51130). Step edges (nosing) should be fitted with dark-colored contrasting anti-slip strips to improve visual differentiation between steps. Material colors can be selected from the building's existing Sino-Islamic palette such as deep red or anthracite gray to maintain aesthetic continuity.

Zones B and C (roofed veranda and side corridor) should adopt matte or rustic-textured ceramic tiles in place of the existing glossy finish. The characteristic checkerboard pattern can be preserved through a two-tone matte tile combination, ensuring that the building's visual identity is maintained while substantially improving surface traction under wet conditions. Zone D (the *batas suci* transition area) demands the most careful material selection, as it is the point where users first make barefoot contact with the floor surface. Rough-finish andesite or unglazed ceramic tiles are recommended, as these materials provide adequate

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traction while remaining comfortable on bare feet. Zone E (parking lot) requires no material replacement, as the existing hexagonal paving blocks already possess surface characteristics appropriate for exterior use; however, periodic maintenance is necessary to prevent moss and algae growth and to ensure inter-block joints remain clear for effective drainage.

Regarding the drainage system, Zones B and C must be retrofitted with a minimum floor slope of 1.5% directed toward edge gutters to prevent water ponding, a condition directly observed during post-rainfall field observations. Drainage channels should be cleaned regularly and fitted with flush covers to eliminate the secondary hazard of tripping.

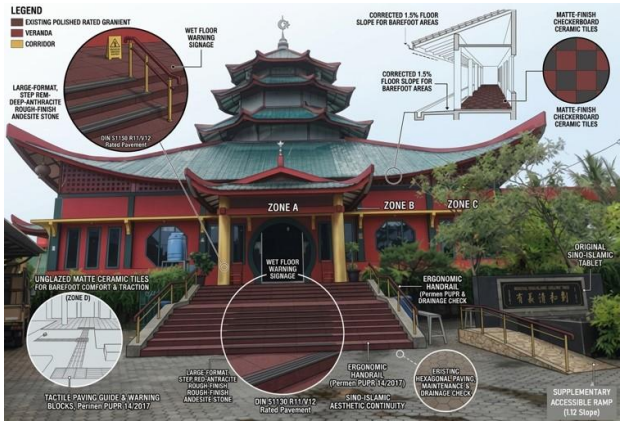

Figure 3 Design Recommendations

With respect to accessibility elements required under Permen PUPR , (2017) No. 14/2017, three interventions are critical. First, handrails must be installed on both sides of the main staircase at a height of 85–90 cm from the step surface, using materials and finishes that harmonize with the building's existing architectural character. Second, tactile guiding paths, comprising both guiding blocks and warning blocks — should be installed along the primary circulation route from the parking lot to the building entrance, in accordance with the tactile paving requirements stipulated in Permen PUPR (Peraturan Menteri PUPR Tentang Persyaratan Kemudahan Bangunan Gedung, 2017) No. 14/2017. Third, an accessible ramp with a maximum slope of 1:12 should be constructed on the lateral side of the main staircase to accommodate wheelchair users and elderly visitors for whom stair negotiation presents a significant physical barrier. As a supplementary measure, wet floor warning signage should be placed at the *batas suci* boundary and at the top of the staircase, particularly during and after rainfall, to alert barefoot users before they step onto potentially hazardous surfaces.

4. CONCLUSION

This study concludes that the exterior pavements of the Muhammad Cheng Hoo Mosque Jambi generally do not comply with Universal Design principles or the accessibility requirements of the Minister of Public Works and Public Housing (PUPR) Regulation No. 14/2017. Four of the five evaluated zones utilize glazed ceramic tiles, which technical literature characterizes as having low slip resistance under wet conditions. Safety risks are further intensified by the combination of frequent tropical rainfall and the religious practice of walking barefoot beyond the batas suci, exposing users directly to potentially slippery surfaces.

The findings indicate that improving pavement safety requires not only appropriate material selection but also consideration of accessibility and user behavior. To enhance safety while preserving the mosque's Sino-Islamic architectural character, the study recommends the use of slip-resistant paving materials in exterior circulation areas, improved drainage to prevent water ponding, tactile guiding paths for visually impaired users, and handrails in

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critical circulation zones. These measures would contribute to a safer and more inclusive environment for worshippers and visitors.

This study contributes to the discussion of mosque accessibility and pavement safety by integrating Universal Design principles, Indonesian accessibility regulations, and material suitability considerations within a single evaluative framework. However, the assessment is based on visual observation and literature-based material characteristics rather than direct friction measurements. Future research should therefore incorporate empirical slip-resistance testing and user-based evaluations to further validate and extend the present findings.

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REFERENCES

Achsanta, D. N., & Lukman, A. L. (2026). Pengaruh Desain Arsitektur terhadap Aksesibilitas Lansia pada Bangunan Masjid Raya Bandung. *Jurnal Arsir Universitas Muhamadiyah Palembang*, *10*(1), 97–111.

Adha, D. C., & Mutiari, D. (2025). Analisa Rancangan Kesesuaian Aksesibilitas Tempat Wudhu untuk Pengguna DIsabilitas (Studi Kasus: Masjid Raya, Klaten). *Seminar Ilmiah Arsitektur*, 510–518.

Aji, I. W. R., Suhardi, B., & Iftadi, I. (2022). Evaluation and Design Accessibility of Mosque's Facilities for People with Disabilities. *Journal of Islamic Architecture*, *7*(2), 306–313. https://doi.org/10.18860/jia.v7i2.17380

Al-Mansoor, N. F. (2018). Universal Mosque/Masjid Design. *Studies in Health Technology and Informatics*, 293–298.

Anjani, P., & Lestari, S. (2026). Arsir, Volume 10, Nomor 1, Juni 2026 | 85 Studi Komperatif Penerapan Pendekatan Universal Design Studi Kasus: Masjid Al Mujahidin Bandar Lampung, Masjid Baitus Shobur Tulang Bawang Bawat, dan Masjid Sudalmiyah Rais Surakarta. *Jurnal Arsir Universitas Muhammadiyah Palembang*, *10*(1), 85–96.

Antoniades, A. C. . (1992). *Poetics of architecture : theory of design*. Van Nostrand Reinhold.

Chew, M. Y. L., Asmone, A. S., & Lam, M. T. W. (2024). An Evidence-Driven Approach to Slip and Fall Prevention in Large Campus Facilities. *Buildings*, *14*(12), 3700. https://doi.org/10.3390/buildings14123700

Febriana, S. K., & Sumardiyanto, B. (2023). Simbol Harmonisasi: Akulturasi Budaya Islam DanCinaPada Ornamen Masjid Cheng Hoo Surabaya. *Jurnal LingKAr (Lingkungan Arsitektur)*, *2*(2), 74–86.

Gupta, A., Yadav, M., & Nayak, B. K. (2025). A Systematic Literature Review on Inclusive Public Open Spaces: Accessibility Standards and Universal Design Principles. *Urban Science*, *9*(6), 181. https://doi.org/10.3390/urbansci9060181

Kapsalis, E., Jaeger, N., & Hale, J. (2024). Disabled-by-design: effects of inaccessible urban public spaces on users of mobility assistive devices – a systematic review. *Disability and Rehabilitation: Assistive Technology*, *19*(3), 604–622. https://doi.org/10.1080/17483107.2022.2111723

Kim, I. (2025). Advanced Tribological Framework for Slip-Resistant Walkways: Systematic Review and Field Validation. *The Journal of Engineering*, *2025*(1). https://doi.org/10.1049/tje2.70125

Kim, I.-J. (2024a). Safeguarding public facilities: a study on enhancing safety in mosque amenities through slip-resistance and surface innovations. *Facilities*, *42*(7/8), 709–728. https://doi.org/10.1108/F-12-2023-0107

Kim, I.-J. (2024b). Tribological Analysis of Surface Textures in Porcelain Tiles for Enhancing Pedestrian Walkway Safety. *Tribology Transactions*, *67*(6), 1102–1116. https://doi.org/10.1080/10402004.2024.2412106

Kim, I.-J. (2025). Safer facility floor designing: a tribological insight into optimising ceramic tile surface textures for enhanced slip resistance. *Facilities*, *43*(3/4), 221–244. https://doi.org/10.1108/F-07-2024-0096

Kim, I.-J., & Bendak, S. (2021). Emerging safety risks from public facilities: a field study for ablution spaces in mosques. *Facilities*, *39*(13/14), 843–858. https://doi.org/10.1108/F-09-2020-0109

Kovalska, O., & Zdetovetska, N. (2025). Design of the entrance group of public buildings with regard to the needs of people with disabilities. *Current Problems of Architecture and Urban Planning*, (72), 392–405. https://doi.org/10.32347/2077-3455.2025.72.392-405

Lang, J. T. . (1987). *Creating architectural theory : the role of the behavioral sciences in environmental design*. Van Nostrand Reinhold Co.

Nahdatunnisa, N., & Tahir, M. A. (2024). Assessing the performance of the pedestrian path accessibility standards for people with disabilities. *SINERGI*, *28*(3), 669–684. https://doi.org/10.22441/sinergi.2024.3.022

Narhadi, J. S. (2019). Kajian Bentuk, Fasad, dan Ruang Dalam pada MAsjid Cheng Ho Palembang. *Jurnal Arsitektur ZONASI*, *2*(3), 183. https://doi.org/10.17509/jaz.v2i3.19261

Pada, J., Umar, I., Adejumo, S., Uwajeh, P., & Oseke, B. (2025). Universal Design Principles Applied in Architectural Design and Public Buildings: An Empirical Evaluation of the National Mosque and Nile University, Abuja. *Nile Journal of Engineering and Applied Science*, 163–173. https://doi.org/10.5455/NJEAS.279231

Peraturan Menteri PUPR Tentang Persyaratan Kemudahan Bangunan Gedung, Pub. L. 14/PRT/M/2017, Kementerian PUPR Republik Indonesia (2017).

Pinto, P. C., Assunção, H., & Rosa, M. P. (2020). Senior Tourists' Perceptions of Tactile Paving at Bus Stops and in the Surrounding Environment: Lessons Learned from Project ACCES4ALL. *International Journal of Sustainable Development and Planning*, *15*(4), 413–421. https://doi.org/10.18280/ijsdp.150401

Preiser, W. F. E. ., Rabinowitz, H. Z. ., & White, E. T. . (2015). *Post-occupancy evaluation*. Routledge.

Rapoport, Amos. (1980). *Human aspects of urban form : towards a man-environment approach to urban form and design*. Pergamon Press.

Safitri, H. H. (2024). Aksesibilitas dan Inklusivitas Desain Masjid Agung Nurul Kalam Pemalang sebagai Masjid Ramah Disabilitas. *Jurnal of Islamic Art and Architecture* , *2*(1), 74–81.

Saputra, E. I. S., Sauqi, M. A., Baiti, A. M. N., Widiastuti, B. W., Aprilliyan, L., 'Alimah, C. U., & Arifandi, A. (2024). Akulturasi Nilai Islam dengan Budaya Tiongkok dalam Arsitektur Masjid Muhammad Cheng Hoo di Kabupaten Jember. *CENDEKIA : Jurnal Penelitian Dan Pengkajian Ilmiah*, *1*(12), 876–884. https://doi.org/10.62335/s1yygh59

Story, M. F., Mueller, J. L., & Mace, R. L. (1998). *The Universal Design File: Designing for People of All Ages and Abilities*. North Carolina State University.

Suhardi, B., Nurazizi, M. F., & Iftadi, I. (2024). Improved Accessibility for People With Disabilities at the Sheikh Zayed Grand Mosque Using a Universal Design Approach. *Journal of Islamic Architecture*, *8*(1), 269–282. https://doi.org/10.18860/jia.v8i1.23412

Zevi, Bruno. (1974). *Architecture as space : how to look at architecture*. Horizon Press.

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