AJEMA GLOBAL RESEARCH NETWORK

AMERICAN Journal of Engineering, Mechanics and Architecture
Volume 4, Issue 05, 2026 ISSN (E): 2993-2637

Accessibility of Cultural Heritage Sites for People with Reduced Mobility: Architectural Approaches and Practical Solutions

Asrorov Asrorkhon Zafarkhonovich
Master's student, Mirzo Ulugbek Samarkand State University of Architecture and Civil Engineering, Samarkand, Uzbekistan. +998970130474, aaz13@icloud.com

Abstract: *This article addresses the pressing challenge of creating an architecturally accessible environment at cultural heritage sites. It examines the theoretical foundations of the universal design concept, the principles of international heritage protection legislation, and the rights of people with reduced mobility. Special attention is given to the tension between accessibility requirements and the principles governing the preservation of historic buildings, and methodological tools for resolving this tension are proposed. Using the Gur-Emir architectural ensemble in Samarkand, Uzbekistan — a fifteenth-century monument inscribed on the UNESCO World Heritage List — as a case study, the article analyses accessibility barriers and proposes a set of concrete architectural adaptations that comply with the principles of minimum intervention and reversibility. The guiding principles of an architectural concept for integrating accessibility elements into the historic setting are formulated. The findings are applicable to the development of methodological guidelines for adapting other historic heritage sites.*

Keywords: *accessible environment; people with reduced mobility; cultural heritage; universal design; architectural adaptation; Gur-Emir; Samarkand; minimum intervention principle.*

1. Introduction

Equal access for all citizens to cultural heritage sites is one of the central challenges of contemporary architectural practice and of public policy in the field of social inclusion. According to the World Health Organization, more than 1.3 billion people worldwide — roughly 16 per cent of the global population — live with some form of disability. When elderly people, pregnant women, parents with prams and other groups with reduced mobility (hereinafter RMG) are also counted, the share of the total population that may require an adapted environment is estimated at between 25 and 35 per cent [1].

Historic buildings and ensembles are frequently inaccessible to a significant proportion of visitors because of the very features that define them: high thresholds, steep staircases, narrow doorways and uneven paved surfaces. Yet the right to participate in cultural life, as guaranteed by the UN Convention on the Rights of Persons with Disabilities (2006) and by the domestic legislation of most states, necessarily includes the right to visit cultural heritage sites [2].

The practical testbed for the solutions developed in this article is the Gur-Emir ensemble in Samarkand — the dynastic mausoleum of the Timurids, a fifteenth-century monument inscribed on the UNESCO World Heritage List as part of the serial nomination 'Samarkand — Crossroads of Cultures' (2001). The monument attracts hundreds of thousands of tourists every year; nonetheless, its spatial organisation presents substantial barriers for people with reduced mobility,

making the development of adaptation proposals both timely and practically significant.

The aim of the article is to systematise theoretical and methodological approaches to the adaptation of heritage sites for RMG and to propose concrete architectural solutions for the Gur-Emir ensemble that comply with UNESCO World Heritage protection requirements.

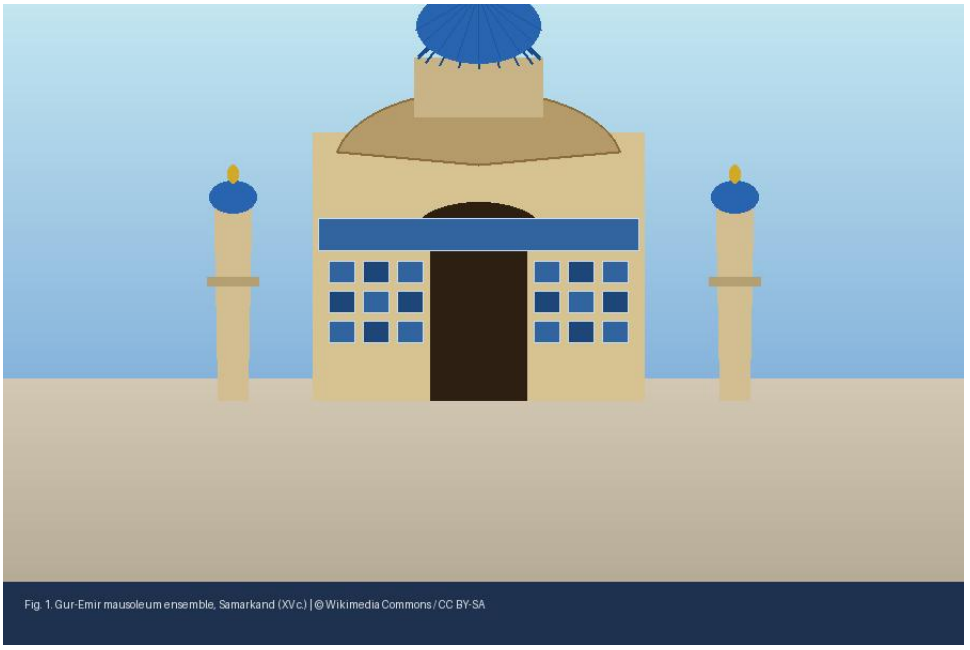

Fig. 1. Gur-Emir mausoleum ensemble, Samarkand, Uzbekistan (XV century)

Source: author's schematic illustration based on UNESCO documentation and field survey, 2024

2. Methodology

This research applies a qualitative and case-study-based methodology focused on the architectural accessibility assessment of cultural heritage sites for people with reduced mobility (RMG). The Gur-Emir architectural ensemble in Samarkand, Uzbekistan, was selected as the primary case study because of its historical significance, UNESCO World Heritage status, and high tourist visitation.

The study methodology consisted of several interconnected stages. First, a comprehensive review of international and national normative documents related to universal design, accessibility standards, and cultural heritage preservation was conducted. The analysis included the UN Convention on the Rights of Persons with Disabilities, the Venice Charter (1964), UNESCO World Heritage operational guidelines, and the legislation of the Republic of Uzbekistan concerning accessibility and cultural heritage protection [3].

Second, field observations and visual surveys of the Gur-Emir ensemble were carried out to identify existing accessibility barriers. The survey focused on pedestrian circulation routes, entrance zones, internal spaces, vertical level changes, paving conditions, sanitary infrastructure, and information systems. Accessibility barriers were classified according to user categories, including wheelchair users, visitors with mobility impairments, visually impaired individuals, and hearing-impaired visitors.[4]

Third, comparative analysis of international architectural adaptation practices at historic heritage sites was undertaken. International examples, including the Tower of London, the Colosseum, and the Palace of Versailles, were examined to identify effective methods for balancing accessibility requirements with heritage preservation principles [5].

The research also applied the principles of universal design, minimum intervention, reversibility, authenticity preservation, and legibility as the main analytical framework for

evaluating adaptation proposals. Based on the collected data, practical architectural solutions were developed for the Gur-Emir ensemble while ensuring compliance with UNESCO heritage conservation standards.

3. Theoretical Foundations: Universal Design and Heritage Protection

3.1. The Universal Design Concept

The concept of universal design, developed by architect R. Mace at North Carolina State University in 1997, has become the methodological cornerstone of contemporary accessible-environment design. Unlike 'special design', which targets specific user categories, universal design aims to create an environment usable by the widest possible range of people without the need for further adaptation [6].

The concept rests on seven principles: equitable use (designs do not segregate any group of users); flexibility in use (accommodation of a wide range of individual preferences and abilities); simple and intuitive use; perceptible information regardless of a user's sensory abilities; tolerance for error; low physical effort; and adequate size and space for approach and use [7].

The practical requirements for implementing these principles include: pedestrian pathways at least 1,800 mm wide; ramps with a maximum gradient of 1:12; vertical platform lifts as an alternative to ramps where level changes are significant; tactile guidance systems for the visually impaired; and accessible sanitary facilities with a manoeuvring space of at least 1,500 × 1,500 mm.

3.2. Principles of Cultural Heritage Protection

The primary international instrument governing work on historic properties is the 'International Charter for the Conservation and Restoration of Monuments and Sites' (Venice Charter, 1964). It establishes principles that are obligatory for any intervention in the historic fabric: the principle of authenticity — preservation of original materials and structures; the principle of integrity — retention of the monument as a unified whole; the principle of minimum intervention — changes shall be kept to the minimum necessary and shall be reversible; and the principle of legibility — new elements shall be distinguishable from the historic ones [8].

The most stringent requirements apply to sites inscribed on the UNESCO World Heritage List. Any significant changes to such properties require prior approval from the World Heritage Committee. This circumstance is of fundamental importance in relation to the Gur-Emir ensemble

In the Republic of Uzbekistan, the normative framework for accessibility comprises the Law on the Rights of Persons with Disabilities (2020), the building code KMK 2.08.02-09 'Public Buildings and Structures', and the Law on the Protection and Use of Cultural Heritage (2001). The ratification of the UN Convention on the Rights of Persons with Disabilities in 2021 created additional state obligations in this domain.

4. The Tension between Accessibility and Heritage Protection: Methodological Resolution

Ensuring accessibility at historic properties generates a fundamental tension between two systems of requirements. The right of people with reduced mobility to participate in cultural life is enshrined in international conventions and domestic legislation. Yet heritage protection principles limit the possibilities for architectural intervention, and the failure to adapt historic sites de facto constitutes discrimination against a substantial portion of the population [9].

An analysis of international practice — Historic England's guidance 'Easy Access to Historic Buildings', the US Americans with Disabilities Act with its exemptions for historic properties, and the French mechanism of 'adaptation in lieu of compliance' — demonstrates that this tension is relative rather than absolute. With consistent application of the principles of minimum intervention, reversibility and legibility, the task of reasonable adaptation proves solvable in the great majority of cases.

The key instrument is the concept of the 'accessibility chain': accessibility is not delivered by

isolated elements but by an unbroken sequence of accessible routes from the transport node to the principal functional zones. The architect's task is not to make every square metre accessible (which is frequently impossible without damaging the monument) but to create a continuous accessible route that allows visitors to experience the primary values of the site.

An examination of practice at major historic sites — the Tower of London, the Colosseum in Rome, the Palace of Versailles — illustrates the applicability of the following approaches: concealed or removable lifting devices; alternative accessible entrances; contrast guide strips while retaining the historic paving; multi-sensory formats for spaces that are physically inaccessible to RMG; and digital tools (mobile applications, virtual reality) as a complement to architectural measures.

5. Accessibility Barrier Analysis: Gur-Emir Ensemble

5.1. Spatial and Architectural Characteristics of the Ensemble

The Gur-Emir ensemble took shape in the early fifteenth century under Timur and his successors. Its components include: the main entrance pishtak (monumental portal) with a forecourt, the central mausoleum with its characteristic ribbed dome on a tall drum, and two minarets. The monument was built using the compositional devices characteristic of Timurid architecture: monumental propylaea, rich ceramic tile decoration, and a high-set dome [10].

The principal planning axis of the complex runs from north to south. Circulation along it leads sequentially through the entrance portal (pishtak), across an open courtyard, through the mausoleum portal and into the main hall containing the cenotaphs. From the standpoint of accessible environment design, the ensemble is characterised by several critical features: multiple vertical barriers (thresholds and steps), historically established stone-slab courtyard paving, and a protected status that places strict limits on any intervention.

5.2. Identified Accessibility Barriers

A field survey of the ensemble made it possible to identify and classify accessibility barriers by user category and by ensemble zone. The principal barriers for wheelchair users and people with mobility impairments are: the absence of designated parking spaces and dropped kerbs on the approach routes; a threshold at the entrance pishtak of 15–20 cm; uneven stone paving throughout the courtyard; three entrance steps to the mausoleum with a combined rise of approximately 50 cm; a wooden threshold at the mausoleum entrance doorway (10 cm); uneven marble floor finish inside the hall; and the absence of accessible toilet facilities and an adapted ticket counter.

For visitors with visual impairments: the absence of tactile guidance and warning tiles throughout the site; insufficient lighting in certain interior zones; and no tactile analogues for perceiving the architectural and artistic features of the building. For visitors who are hard of hearing or deaf: the absence of information in formats alternative to spoken language (subtitles, sign-language interpretation). In total, the survey identified 15 specific barriers distributed across six zones of the property.[11]

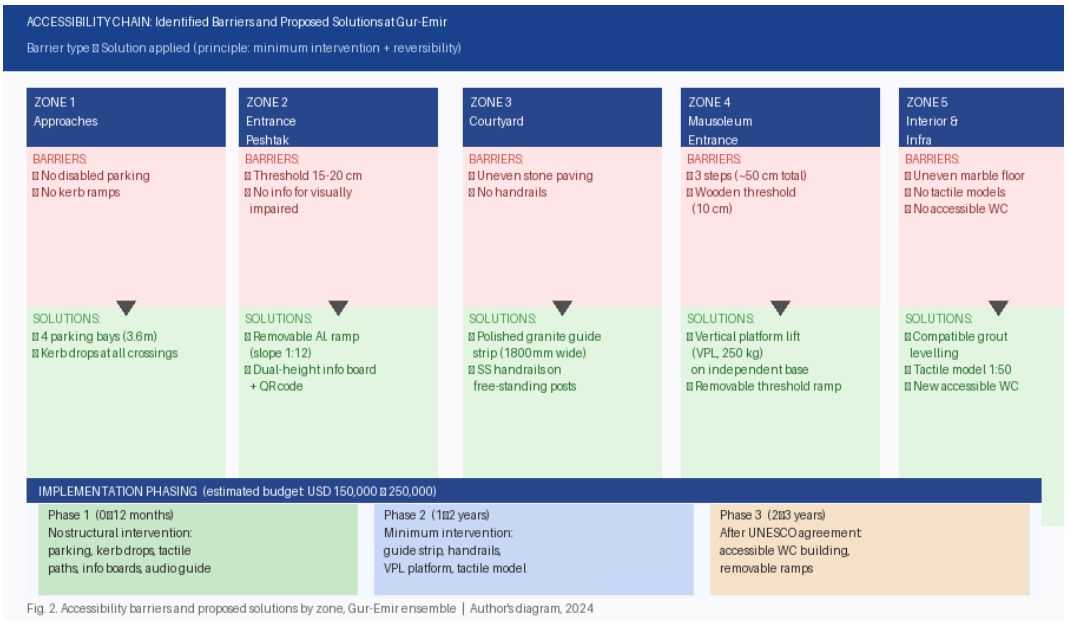

Fig. 2. Accessibility barriers and proposed solutions by zone, Gur-Emir ensemble

Source: author's diagram, 2024

6. Adaptation Principles and Design Proposals

6.1. Principles of Architectural Adaptation

On the basis of the barrier analysis and taking into account the protected status of the property, the following adaptation principles have been formulated.

Principle of intervention hierarchy: adaptation works are carried out in ascending order of intervention intensity — first, organisational and informational measures; then mobile equipment with minimum impact on non-historic elements; and only as a last resort, reversible modifications to historic structures.

Principle of concentrated accessibility: the goal is not universal access to every square metre of the site, but the creation of a continuous accessible route to the principal zones for experiencing the monument.

Principles of authenticity and legibility: new elements shall be clearly distinguishable from historic ones — by material or texture — while remaining compatible with the historic context in terms of scale and colour.

Principles of reversibility, multi-sensory provision and documentation: all modifications shall be technically reversible; for physically inaccessible spaces, tactile, audio and digital alternatives shall be developed; and all changes shall be recorded in restoration documentation[12].

6.2. Specific Design Proposals

The design proposals cover six zones of the ensemble. For the approaches and external space: a minimum of four designated parking bays (each 3.6 m wide), dropped kerbs at all pedestrian crossings along the route, and tactile guidance strips in yellow granite with contrasting texture.

For the entrance portal zone: a removable aluminium ramp at the pishtak threshold (gradient 1:12, width 900 mm) and a dual-height information board displaying an accessible route map, tactile inserts and a QR code linking to a mobile audio guide.

For the courtyard: a polished granite guide strip (600 × 300 mm tiles, total width 1,800 mm) along the route from the pishtak to the mausoleum, laid flush with the historic paving; stainless steel handrails on free-standing posts (no drilling into historic surfaces) at heights of 700 mm and 900 mm.

For the mausoleum entrance: a vertical platform lift (VPL) positioned to the side of the historic steps, mounted on an independent foundation with no contact loading on the historic structure

(capacity 250 kg, platform 800 × 1,200 mm); when not in use, the platform retracts to floor level, keeping the path clear. Additionally: a removable ramp to overcome the wooden threshold.

For the mausoleum interior: minor levelling of significant marble floor irregularities using a compatible mortar; a tactile model of the mausoleum at scale 1:50 on a rotating stand at a height of 700–850 mm; and a mobile audio guide describing the building in three languages, accessible via QR code[13].

For infrastructure: a new free-standing accessible toilet facility on the parking area (universal cubicle of at least 5.0 × 3.5 m); an adapted section of the ticket counter at 750 mm height with an induction loop for hearing-aid users. The overall budget for the first two implementation phases is estimated at USD 150,000–250,000, which is consistent with comparable projects in the region.

7. Results and Discussion

The conducted study identified significant accessibility barriers within the Gur-Emir ensemble that limit equal access for people with reduced mobility. In total, 15 major barriers were detected across six functional zones of the complex. The results demonstrate that the historical spatial organization of the monument creates considerable difficulties for wheelchair users, visually impaired visitors, elderly individuals, and other groups requiring adapted environments.

The analysis revealed that the most critical barriers are associated with vertical level differences, uneven historical paving, and the absence of accessible infrastructure. At the main entrance portal, thresholds reaching 15–20 cm create serious mobility limitations. Additionally, the mausoleum entrance contains steps with a combined height of approximately 50 cm, making independent access impossible for wheelchair users. Uneven marble flooring and historic stone paving further complicate movement within the complex.

The results also indicate insufficient accessibility support systems for visually and hearing-impaired visitors. The absence of tactile guidance systems, warning surfaces, accessible navigation maps, sign-language support, and audio descriptions significantly reduces the inclusiveness of the heritage site. These findings confirm that accessibility should not be limited only to physical movement but must also include informational and sensory accessibility components.

Based on the identified barriers, a package of architectural adaptation measures was developed. The proposed solutions include removable ramps, tactile guidance strips, vertical platform lifts, accessible parking spaces, adapted ticket counters, handrails, and mobile digital audio guides. Particular attention was given to ensuring that all interventions comply with the principles of reversibility and minimum intervention required for UNESCO World Heritage sites.

The discussion demonstrates that the conflict between cultural heritage preservation and accessibility requirements can be effectively managed through balanced architectural approaches. International experience confirms that accessibility adaptation does not necessarily threaten the authenticity of historic monuments when modern technologies and reversible interventions are properly implemented [14], [15].

Furthermore, the study emphasizes that accessibility at cultural heritage sites is not only an architectural issue but also a social and ethical responsibility. Improving accessibility contributes to social inclusion, equal participation in cultural life, and sustainable tourism development. For Uzbekistan, where tourism and heritage preservation play an important economic role, the integration of universal design principles into restoration and conservation projects is becoming increasingly important.

Overall, the findings confirm that the Gur-Emir ensemble can be partially adapted for people with reduced mobility without damaging its historical value. The proposed methodological approach and architectural solutions may also serve as a practical model for the adaptation of other historic heritage sites in Uzbekistan and Central Asia.

8. Conclusion

This study confirms that the tension between accessibility requirements and cultural heritage protection principles is relative rather than absolute in character. With consistent application of the

principles of intervention hierarchy, reversibility, legibility and concentrated accessibility, it is possible to create a reasonably accessible environment at World Heritage sites without causing them substantial damage.

Using the Gur-Emir ensemble as a case study, 15 accessibility barriers have been identified and a package of 14 concrete design proposals has been developed, covering all zones of the property. The proposed solutions comply with both Uzbek and international accessibility legislation and with the UNESCO World Heritage protection standards.

The scholarly contribution of the work lies in the first comprehensive analysis of accessibility barriers at the Gur-Emir ensemble, the formulation of architectural intervention principles that take into account the protected status of this specific property, and the proposal of an 'intervention hierarchy' algorithm applicable to other historic heritage sites in Uzbekistan and Central Asia. Its practical significance derives from the readiness of the proposed solutions for use as the basis for a real design brief.

References

[1] World Health Organization. Disability and Health: Fact Sheet. — Geneva: WHO, 2023.

[2] United Nations Convention on the Rights of Persons with Disabilities: adopted by General Assembly resolution 61/106 of 13 December 2006. — New York: UN, 2006. — 34 p.

[3] International Charter for the Conservation and Restoration of Monuments and Sites (Venice Charter, 1964) // Preservation of World Heritage Sites: collected documents. — Moscow: RNIIKPN, 2002. — Pp. 12–18.

[4] Operational Guidelines for the Implementation of the World Heritage Convention / UNESCO World Heritage Committee. — Paris: UNESCO, 2021. — 174 p.

[5] Law of the Republic of Uzbekistan on the Rights of Persons with Disabilities, 15 December 2020, No. ZRU-656 // National Legislation Database of Uzbekistan. — URL: lex.uz.

[6] Historic England. Easy Access to Historic Buildings. — URL: https://historicengland.org.uk/images-books/publications/easy-access-to-historic-buildings (accessed: 10.10.2024).

[7] Marchetti S. Inclusive Heritage: Universal Design Principles Applied to Historic Sites // International Journal of Architectural Heritage. — 2021. — Vol. 15, No. 3. — Pp. 334–349.

[8] Mace R. Universal Design: The Concept and Its Principles. — Chapel Hill: NC State University, 1997. — 92 p.

[9] Pilyavsky V.I. The Architectural Heritage of Samarkand. — Leningrad: Stroyizdat, 1989. — 264 p.

[10] KMK 2.08.02-09 'Public Buildings and Structures' / State Committee for Architecture and Construction of the Republic of Uzbekistan. — Tashkent, 2009. — 62 p.

[11] UNESCO, *Accessibility and Inclusion in World Heritage Sites*, Paris, France: UNESCO Publishing, 2022.

[12] United Nations, *Disability Inclusion Strategy*, New York, NY, USA: United Nations, 2021.

[13] ICOMOS, *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties*, Paris, France: ICOMOS, 2020.

[14] Steinfeld E. and Maisel J., *Universal Design: Creating Inclusive Environments*. Hoboken, NJ, USA: Wiley, 2012.

[15] Imrie R. and Hall P., *Inclusive Design: Designing and Developing Accessible Environments*. London, U.K.: Taylor & Francis, 2001.