Eurasian J. Sci. Eng., 2024, 10(1), 12-22
https://doi.org/10.23918/eajse.v10i1p2

Published by Tishk International University
Available at: https://eajse.tiu.edu.iq/submit/

RESEARCH ARTICLE Open Access

Vertical Accessibility for Wheelchair Users at Historic Buildings

Salem Mokhtar Tarhuni [1]*

[1]Architectural Engineering Department, Faculty of Engineering, Tishk International University, Erbil, KRG, Iraq

Article History
Received: 05.12.2022
Revised: 29.01.2023
Accepted: 12.02.2024
Published: 28.03.2024
Communicated by: Assist. Prof. Dr. Abubakar M. Ashir
**Email address:*
salem.mokhtar@tiu.edu.iq
**Corresponding Author*

Abstract:
Disability (equality) Acts call to provide disabled people accessibility to all buildings. Historic buildings are special types of existing buildings, and these Acts are applied to them. However, Acts and principles of architectural conservation call for minimum change in historic buildings, but minimum change can often not be possible for providing accessibility into or within historic buildings for persons with disability. This paper aims to review the solutions that were applied for providing vertical accessibility into and within historic buildings for wheelchair users from an architectural conservation point of view. The research methodology depended on a literature review. The results of the study demonstrated that the main difficulties are in applying preservation and restoration approaches, whereas the rehabilitation approach is more flexible regarding providing accessibility. Furthermore, the reconstruction approach has some special situations. It is a new construction legally; this means in the re-construction operation of non-exiting historic buildings, the codes of new buildings regarding accessibility should be applied. In general, providing accessibility will contribute to achieving equality for disabled people, transporting furniture to upper floors, and increasing visitors to historic buildings, including elderly people and families with baby prams who will benefit from physical access. The importance of research resides in accessibility in heritage is a new under-research subject. Careful examination of historic buildings' conservation approaches and beneficial accessibility solutions gives lessons learned for intervention and contributes to developing a code of practice for architectural heritage accessibility.
Keywords: *Wheelchair Users; Historic Buildings; Conservation Approaches; Accessibility.*

1. Introduction

Historic buildings (HBs) have high cultural value and are considered a form of national heritage and should, therefore, be conserved [1]. They are existing buildings, and a critical aspect of their conservation involves determining the appropriate levels of intervention done to them, which include a combination of many actions, i.e., preservation, rehabilitation, restoration, and reconstruction. Numerous conservation principles have been established to provide guidance to conservators in effectively conserving these buildings. Nowadays, there are plenty of HBs, which people use for different functions or visit as tourists. However, wheelchair users suffer from the difficulty of accessing these buildings. Most countries issued anti-discrimination regulations and accessibility codes that offer to provide disabled people needs in buildings. Applying these codes is mandatory for new construction and existing buildings. Historic Buildings as a special type of existing buildings mostly are not exempted from accessibility Acts. Applying these codes is difficult because HBs are characterized with special values.

This situation caused a conflict between conservation legislation protecting the building and discrimination legislation protecting the rights of disabled people. Foster [2] presented this conflict as she stated architectural conservation Acts that exempted and protected HBs from harmful access

alterations yet still attempted to find a balance between the goals of accessibility and conservation. However, Kose [3] tends to give priority to accessibility rather than cultural values, as he stated that HBs must be usable by everyone, such as visitors and persons who work there as staff. Denying people with disabilities from being employed is a violation of human rights. Therefore, priority should not be given to the cultural values of HBs.

Furthermore, the dilemma of vertical accessibility for wheelchair users in HBs was demonstrated by Smith [4], who stated that HBs acquire several challenges when used in a different historical period. According to different priorities, HB's new use could be different from the original one that was built for.

The paper aims to study the existing accessibility solutions that were applied in HBs for wheelchair users and determine their suitability according to the approaches and principles of architectural conservation. The importance of the research resides in studying accessibility in heritage, which is a new under-research subject. Careful examination of HBs' conservation approaches and beneficial accessibility solutions give lessons learned for intervention toward accessibility. This will also contribute to developing a code of practice to improve accessibility into and within architectural heritage.

2. Methodology

The research methodology depended on a literature review through online search using keywords at google scholar and Web of Science journal searching databases. This paper aims to conduct a comprehensive review of research concerning the accessibility of historic buildings for wheelchair users. The keywords: historic building and wheelchair users were utilized in searches of relevant literature titles. Additionally, the term "accessibility solutions" was employed to identify pertinent literature. Further references were sought by examining the citations within each article. A collection of articles, books, and codes of practice was compiled, with titles initially screened for relevance. Abstracts were consulted only if deemed pertinent to the subject matter, and studies less relevant to historic building accessibility were excluded from the review process.

3. Architectural Conservation Principles and Approaches

For guiding interventions in Historic Buildings (HBs), it is essential to adhere to the principles of architectural conservation. These principles advocate for minimal intervention, emphasizing like-for-like repairs in terms of materials and methods. Repair work should be reversible, ensuring that any changes made can be undone if necessary. Sensitivity in repairs is crucial, respecting the historical context and significance of the building. Additionally, maintaining truth to materials is important, ensuring a clear distinction between original and new materials used in interventions [5].

In architectural conservation work, the central issue is the process of intervention, as the product—the historic building—already exists [6]. The intervention in HBs means any action that has a physical effect on the fabric of buildings to extend their life [7]. It is crucial that interventions at historic sites respect their heritage value and character-defining elements [8]. The approaches of HB conservation include preservation, rehabilitation, restoration, and reconstruction, either individually or in combination with each other.

3.1 Preservation

Preservation, the initial intervention approach, entails safeguarding, maintaining, and stabilizing the existing materials, form, and integrity of a historic place. This method is selected when the values of the historic building pertaining to its materials take precedence or when the materials, features, and spaces remain largely intact. [8].

The preservation process includes maintenance which goals to retain the cultural significance of HBs in appropriate condition and can be defined as “maintaining the fabric of a place in its existing state and retarding deterioration” [12]. Moreover, preservation encompasses consolidation aimed at enhancing the strength and stability of historic buildings. [7], [9].

The preservation approach reflects the principle of minimal intervention. Some interventions for providing wheelchair users accessibility into HB, which complies with this principle, can be a simple portable short ramp or a semi-permanent demountable ramp, which is commonly used for small different levels into or within HB. In general, the preservation approach is not reaching the stage of altering HB to provide accessibility.

3.2 Rehabilitation

In the field of architectural conservation, the rehabilitation approach is defined as the process of making a contemporary use of a historic building possible. It is used when the HB is in poor condition and/or when alterations or additions are essential for its new or continued use. In all cases, rehabilitation must uphold the cultural values of HB [10].

Rehabilitation includes repair, adaptive reuse (alteration, additions), or a combination of these operations. Repair “is done to fix something that is broken or damaged” [11]. Another aspect of rehabilitation is adaptive reuse, which involves altering or improving a place to accommodate its existing or proposed use [12]. Uses change, and if HBs cannot change as well, many of them may be lost [10]. When it comes to additions to historic buildings, they may be deemed acceptable as long as they do not compromise the cultural significance of the place or diminish its interpretation and appreciation. [12]. An addition is a partially new building, usually not envisioned at the time of original construction. Since it is new, the addition is required to comply with the codes for new construction, although the existing building itself does not have to comply. From the accessibility point of view, the rehabilitation approach in terms of alteration and additions can reach the stage of altering HB to provide vertical accessibility if the new function requires this alteration or addition.

3.3 Restoration

Restoration, the third level of intervention, entails reverting the existing fabric of a place to a recognized earlier state through the removal of accretions or the reassembly of existing components without adding new materials [12]. The earlier state might be HB’s date of construction or a time at which a significant event associated with the HB occurred [10]. Restoration is prioritized as the primary approach when the historic value of a place during a specific period is deemed more important than the potential loss of existing materials [8]. From the accessibility point of view, the restoration approach prevents alteration or additions to HB to provide vertical accessibility.

3.4 Reconstruction

In the field of historic building conservation, reconstruction is defined as the re-creation of a historic structure that no longer exists [10], based on documentary or physical evidence [7]. Also, the Burra Charter for the Conservation of Places of Cultural Significance (ICOMOS) defined reconstruction as “returning a place to a known earlier state and is distinguished from restoration by the introduction of new material into the fabric.” [12]. While the British Standards [7] and ICOMOS [12] recognize reconstruction as a conservation process, it may not always be considered as such because reconstruction involves the creation of a new structure with new materials rather than dealing with existing buildings. For instance, Green [10] stated that re-construction projects “occupy an ambiguous position in architectural conservation [...] the building must not be interpreted as a historic building, but only as a reminder of a lost structure [...]. The public must never be led to believe that they are seeing the real thing.”.

4. Vertical Accessibility Solutions that were Applied for Wheelchair Users into/ within HB

4.1 Architectural Solutions

4.1.1 Ramps

Vertical accessibility into and within historic buildings (HB) presents a problem wheelchair users face. Ramps are the proper solution for locations where the elevation change is not substantial. Ramp is an architectural low-cost modification that assists all users [13]. The ramp types that are used as solutions for vertical accessibility into and within HB are Portable short ramps, semi-permanent, and permanent ramps.

A portable short ramp (Figure. 1a, 1b) is suitable when fabric constraints in terms of preservation approach may not permit a permanent intervention. A semi-permanent demountable ramp (Figure. 1c, 1d) meets the requirements when there is a slight difference in level [14]. The portable and semi-permanent ramps can be applied in any intervention approach in HBs. Also, they comply with minimal intervention, truth to materials, sensitivity, and reversibility principles. However, the portable ramps are not sturdy fixed to the floor and might be hazardous to safety [15].

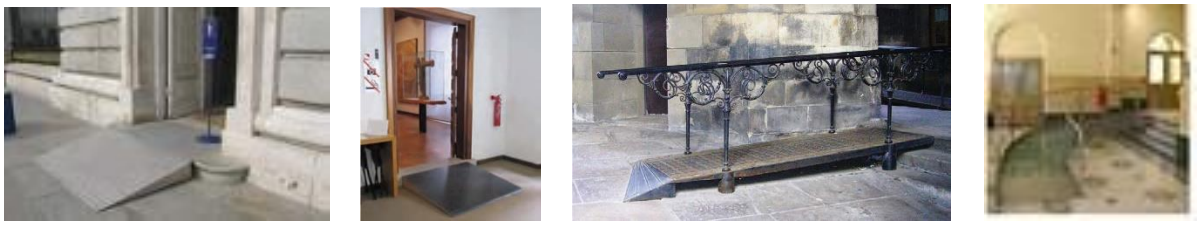

Figure 1: Ramps (a) Exterior portable [14], (b) Interior portable [16], and (c) Exterior semi-permanent [17], (d) Interior semi-permanent [18]

Regarding the permanent ramps, the shape of the ramp can be straight (Figure. 2a, 2b) or curved (Figure. 2c), or another shape. Installing a ramp on an HB should not impact its historic fabric. It's essential to respect the symmetry of existing elevations and maintain the rhythm of the street. Where a ramp is acceptable, high-quality materials compatible with the existing building are more appropriate [17]. Due to space constraints to allow for sufficient span distance, a steep ramp for wheelchair users might be erected. If this poses a risk to pedestrian safety, an indoor ramp may be a suitable alternative [15].

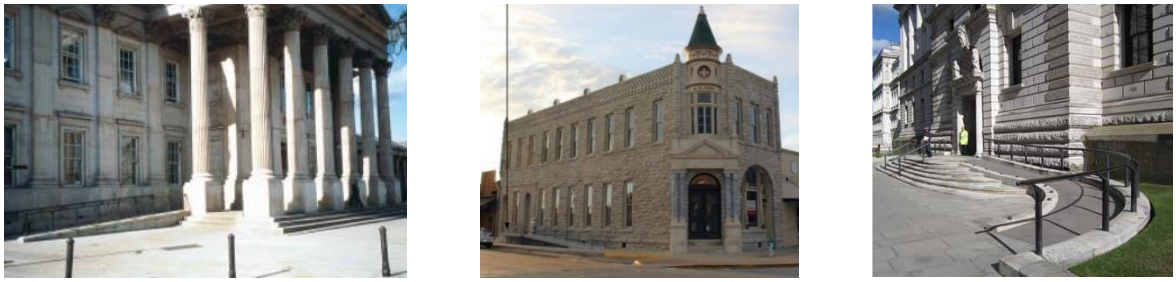

Figure 2: Permanent entrance ramp (a) Straight ramp [19], (b) Straight ramp to new entrance [20], (c) Curved ramp [21].

The permanent ramp solution can be applied in rehabilitation or reconstruction approaches of architectural conservation, including the addition process. This intervention complies with the principle of truth to materials but does not comply with minimal intervention, reversible, and sensitive repair principles.

4.1.2 New Entrance Leads To Interior Ramp/ Lift

According to Foster [22], a significant aspect of access planning revolves around determining the location and method of incorporating lifts into HBs and devising strategies for emergency egress. Before starting mechanical solutions in terms of different types of lifts, we can present some architectural solutions that can be done to provide accessibility into the interior ramp/lift in case accessibility into HB is not possible from outside the building. These solutions include a new entrance and adding an elevator tower at the side or rear façade.

a) New Entrance: Many historic buildings (HBs) with stepped front entryways have some incline or ramp at the back entrance, allowing access and maintaining an aesthetic value [20]. However, when a proper back entrance is not available, and there is a high-raised main entrance, the removal of steps and the lengthening of the existing entrance can sometimes accommodate this [15]. Also, the solution of a new entrance at the basement level leads to an interior lift that can be used [22]. Where appropriate, consideration should be given to regarding the ground at the entrance to overcome the need for larger and minimize the visual impact on the building [17]. The scheme implemented at Queen's House (Figure 3) addressed accessibility concerns without relying on ramps. Instead, it involved lowering the external landscape to establish a level entry into the basement through an existing door opening. This approach required adding a base to the existing external horseshoe stairs. The pathway connects to a new lift installed internally within a nineteenth-century stairwell. The newly paved route offers access to all public visitors and is not exclusively designated for disabled individuals [22].

Figure 3: Queen's House, Greenwich; the access solution is by creating a level entry into the basement via an existing door opening [22]

Furthermore, when adding a ramp at the main entrance is impossible, converting a ground-floor window at the front of the building into a door is feasible. The work includes proper ramp leads to the new door or using a platform lift giving rise to the entrance level. Another option, according to the circumstances, is to length the new entrance to the level of the garden that leads to the interior ramp/ platform lift.

The new entrance solution can be applied in the rehabilitation or reconstruction approaches of architectural conservation, as these approaches permit alteration and addition processes. This intervention complies with the like-for-like repairs (materials) and truth-to-materials principles but does not comply with minimal intervention, reversible, and sensitive repair principles.

b) Addition of elevator tower at side façade: For providing accessibility to all floors of HB, adding an exterior elevator tower at the side or rear façade can be the proper solution if altering the main façade causes the loss of its architectural value. For instance, the new lift tower at Oglethorpe County house, Lxington (Figure. 4) was prepared with a new entrance to avoid modifying the main historic entrance. On each floor, openings were provided to enable movement between the old and new structures. Alternatively, the tower could stand independently, with short connecting pathways to the HB on each floor. This solution distinguished the new tower from the HB. The new elevator tower provides many benefits to HB. The main aim of this solution is to provide accessibility for disabled people. Also, the

elevator can serve to transport furniture to the upper levels. Furthermore, emergency exit stairs may also be incorporated into the elevator tower. This tower is distinctly modern and is differentiated from the historic sections of the building [23]. The new tower is compatible in form with this unique building and has caused a minimal change to its overall historic significance [23]. This intervention, which includes alteration and addition processes, can be applied in architectural conservation rehabilitation or reconstruction approaches. Adding an elevator tower at the side façade of HB complies with the principles of truth to materials and like-for-like material.

Figure 4: Oglethorpe County house, Lxington, GA. (a) Before accessibility alteration (b) After accessibility alteration (c) Detail [23].

4.2 Mechanical Solution

Several types of lifts are available, many of which can be adapted to HBs. A lift can be installed without causing substantial harm to historic features. It is often the most effective method of providing access to all significant spaces on every floor of a historic building [23]. Lifts include two types: platform and passenger lifts.

4.2.1 Platform lifts

Platform lifts can be classified into vertical platform lifts and inclined platform lifts (stair climber lifts/ chair lifts).

a) Vertical Platform Lift: This type of platform lift is easy to use for vertical accessibility inside and outside buildings. For instance, the wheelchair lifts at the Grosvenor Museum (Figure. 5a) and St Albans Cathedral (Figure. 5b) raise or lower users to several levels. The lift should not require a key to enter or operate the lift. Also, it does not need to be completely enclosed, a penthouse, or a very shallow pit. Platform lift is widely recommended for interior access [14].

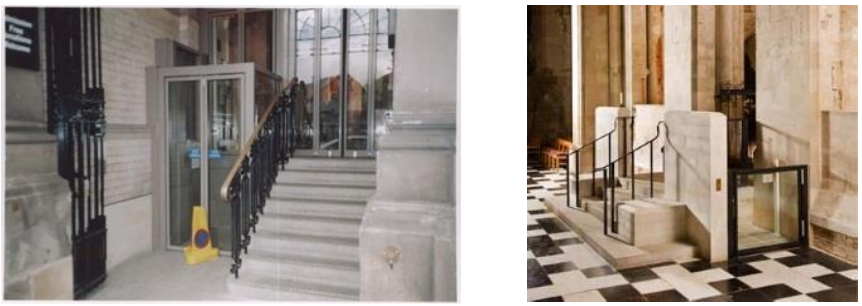

Figure 5: (a) Vertical platform lift at the Grosvenor Museum, Chester [23], (b) Vertical platform lift at Albans Cathedral [21].

b) Inclined platform lift (stair climber lift): This kind of lift follows the inclination of stairs. It can be used externally (Figure. 6a) or internally (Figure. 6b and 6c). It is affixed to railings alongside stairs and has a platform where a wheelchair can be positioned. The platform ascends diagonally along the railing, traversing over the stairs. The platform may be vertically stored along the railing when not in use. However, installing the railings necessary to support an inclined lift often entails removing or

obstructing significant features, such as balusters, so it may not be suitable for significant or narrow stairs [23].

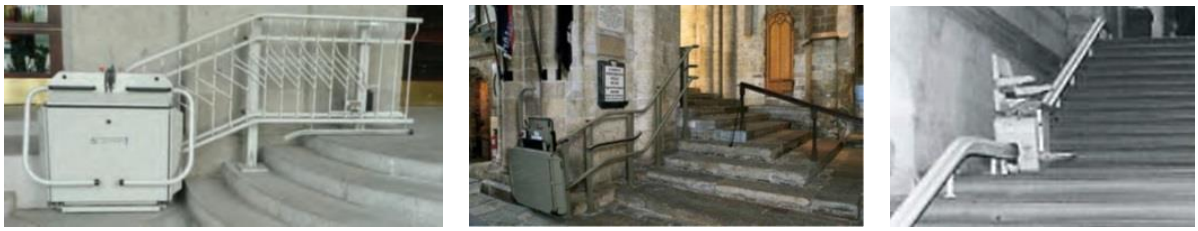

Figure 6: Inclined lifts (a) Exterior stair climber lift [21], (b) Interior stair climber lift [16], (c) Interior chair lift [19]

Furthermore, inclined lifts are generally visually intrusive and can quickly become obsolete unless they are kept in use and maintained regularly [14]. These lifts can greatly influence the architectural character of a building and should be considered only when no alternative solution is viable [17].

The inclined platform lift and vertical platform lift can be applied in the rehabilitation or reconstruction approaches of architectural conservation, which include alteration and addition processes. These solutions comply with the truth to materials principle but do not comply with minimal intervention, reversible, and sensitive repair principles.

4.2.2 Passenger lift

A passenger lift is used for access to upper floors and can be located inside (Figure.7a) or outside HB (Figure. 7b).

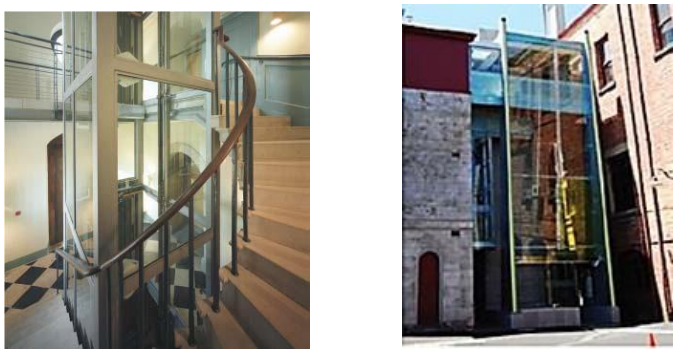

Figure 7: (a) Interior passenger lift [19], (b) Exterior passenger lift [18].

Limited use of limited access lifts avoids the need to build the lift's case or penthouse or deform the facade and limits the amount of alteration to interior space [14]. This lift can be accessed up to five floors [22]. Furthermore, the external lift's resting position should be as low as possible, while the platform and restraints' design should prioritize transparency [17]. The passenger lift solution can be applied in rehabilitation or reconstruction approaches, including alterations and additions. This intervention complies with Like-for-like repairs (materials) and truth-to-materials principles but does not comply with minimal intervention, reversible, and sensitive repair principles.

5. Discussions

The rehabilitation approach is more flexible regarding providing vertical circulation into or within the historic buildings (HBs) for disabled people. Also, the reconstruction approach must comply with new construction codes regarding accessibility. On the other hand, providing vertical access for disabled people in HBs exceeds the level of preservation approach. Also, the restoration approach contradicts any alteration. However, merely citing the historical significance of historic buildings as the sole reason for their importance is insufficient for not having full access or it cannot be altered.. Historic buildings endure because they have successfully adapted to new functions over time. [4]. This is

supported by Total [24], as he stated that the endurance of most HBs relies on their proceeded with feasible use, and this may, in addition to other things, require alteration or some physical intervention to improve accessibility. Discrimination against disabled people often arises due to obstacles, which may be physical in nature. These barriers can be eliminated or modified to mitigate their impact.

The solutions outlined in this research can be categorized into architectural and mechanical solutions (table 1). Each solution has a different effect on the historic fabric of the building. As indicated, many accessibility features can be incorporated in a manner or location that minimizes their impact. Given the individuality of each building, it is essential to assess each HB to determine the most suitable approach for providing accessibility. Innovative accessibility solutions can be developed with minimal effect on HB. This is supported by Marten and Gardner [18] as they stated “There is no one solution to a problem. Different heritage buildings will have varying levels of significance and different settings, and there may be various possible solutions to optimize access for all. Each case needs to be assessed on its own merits and the best set of solutions found. Also, Tutal [24] stated that every HB is a unique, irreplaceable asset that reflects a rich and various expression of past societies, and the degree of accessibility that can be accomplished is subject to the characteristics of HB's site. Furthermore, Foster [22] stated that access plans vary enormously in scope and approach. The opportunities and constraints at each building according to existing features, current or intended use, and cultural value, converge to formulate a suitable solution tailored to the specific building.

Any addition must be meticulously designed to minimize its impact on the historic resource. Moreover, new work should be distinct from the old while remaining compatible with the historic materials, features, size, scale, proportion, and massing to safeguard the integrity of the property and its surroundings. Ramps, lifts, and elevator towers should be distinguishable from the historic fabric yet harmonize with it, and they should be removable in the future without harming the original building. Additionally, they should not compromise any character-defining historical material. [23]. Furthermore, access solutions that are ugly or fail to blend with the surrounding environment are not considered effective solutions [4]. Lastly, the effectiveness and suitability of each accessibility solution should be assessed to determine the most suitable approach for providing access and preserving HB [23].

Table 1: Vertical accessibility solution for wheel-chair users into and within historic buildings.

Solution		**Means**	**Proper for**	**Disadvantage**	**Conservation Principles (Compliance)**	**Intervention Approach**
Architectural solutions	*Ramps*	Portable Ramp	- Low rise Entrance - Small change of level into/within HB	They might not sturdy fixed to floor and are hazardous to safety	All conservation principles	All conservation approaches
		Semi-permanent ramp	- Different levels - Small change of level into/within HB		-Min-intervention -Distinguishing materials -Reversibility	All conservation approaches.
		Permanent ramp	High rise Entrance	A steep ramp is danger	-Like for like material -Distinguishing old/new materials	-Rehabilitation (additions) - Reconstruction
	New Entrance	Alternative entrance leads to interior ramp/lift	High raise main entrance	Impact on the architectural character of a HB	Like for like material.	-Rehabilitation (alteration & additions) - Reconstruction
		elevator tower at side façade	Accessibility to upper floors	Impact on the architectural character	-Like for like material -Distinguishing materials	-Rehabilitation - Reconstruction
Mechanical solution	*Platform lift*	Vertical Platform lift	High raise entrance outside or inside HB	Impact on the architectural character	-Distinguishing old/new materials - Reversibility	-Rehabilitation - Reconstruction
		Inclined Platform lift	-High raise Entrance -Accessing to upper floor within HB	- Improper for narrow stairs -Visually intrusive -Can quickly obsolete	-Distinguishing old/new materials - Reversibility	-Rehabilitation - Reconstruction
	Passenger lift	Outside HB or in Courtyards	Accessing to upper floors	Impact on the architectural character	-Distinguishing materials - Reversibility	-Rehabilitation - Reconstruction
		Located within HB	Accessing to upper floors		-Distinguishing materials - Reversibility	-Rehabilitation - Reconstruction

6. Conclusions

Historic buildings do not comply with disabled people's accessibility requirements because they were built for abled people. In general, some architectural conservation approaches prevent any alteration to providing accessibility, whereas others deal with accessibility at different levels. The literature survey regarding the intervention in HBs for providing vertical accessibility for wheelchair users demonstrated that each case needs to be assessed on its own merits, and the solutions can be architectural or mechanical solutions. Each type of solution is proper for some situations and complies with some or all conservation principles and approaches. Also, it has a different impact on historic buildings. Portable ramp solutions comply with all conservation principles, whereas permanent ramps should comply with like-for-like material and distinguishing old/new materials principles. The principles of distinguishing old/new materials and reversibility should be provided regarding mechanical solutions. Finally, studying accessibility solutions that were applied in historic buildings and determining their suitability, and demonstrating the difficulties associated with providing services in HBs provides lessons learned for practitioners in the field of architectural conservation.

7. Conflict of Interest

There is no conflict of interest for this paper

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