Research on Accessible Retrofitting Strategies for Historic Buildings in the Context of Accessible Urban Environment Design

-A Case Study of The Guangdong Hall

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Abstract. In recent years, as society advances and cultural heritage awareness increases, the conservation and utilization of historic buildings have gained more attention in urban planning and design. However, access to these buildings is often challenging for individuals with limited mobility, such as the elderly and disabled. This study focuses on a representative historic building in Tianjin: Guangdong Hall. The paper explores the theoretical basis of the accessible design of historical buildings, and through the renovation of the Guangdong Hall, a series of methods for retrofitting the interior and exterior accessible spaces of historical buildings are sorted out. It aims to provide a reference for the accessible design of historical buildings in order to promote a more inclusive and sustainable urban environment.

Keywords: Historical buildings, Accessible design, Urban design, Heritage conservation

1 INTRODUCTION

In 2010, China had approximately 85.02 million people with limited abilities, and by the end of 2017, there were over 240 million elderly people aged 60 and above. These two demographics together constituted more than 23% of the total population[1], underscoring the importance of creating accessible urban environments in urban planning and design. The concept of accessible design originates from early 20th-century international humanitarian thought. Developed countries such as the United States[2] and Japan[3] have taken the lead in setting standards for accessibility, providing valuable models for China. Since the 1980s, China has introduced numerous accessibility-related laws and codes. The promulgation of the Law of the People's Republic of China on the Construction of an Accessible Environment in 2023 fully reflects the importance the State attaches to the construction of an accessible environment[4].

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China is a late starter in accessible design and has not developed a system. Although standards for accessible design have been compiled, they are not detailed. In this study, a case study of a representative historic building is selected to deepen the research on its retrofit design by examining accessible access in historic buildings, and a series of strategies for accessible retrofit in Chinese historic buildings are summarized to provide a basis for accessible construction in urban planning and design.

2 LITERATURE REVIEW

The term "accessible design" is used to describe a design that eliminates obstacles for users, especially people with different types of limited abilities, and emphasizes the importance of inclusivity in the design of urban public spaces[5]. In parallel, the theory of conservation and reuse of historic buildings, rooted in the Venice Charter of 1964 and later expanded by the Nairobi Recommendation of 1976 and the Washington Charter of 1987, advocates the preservation of historic buildings while allowing moderate alterations to adapt them to contemporary needs[6]. This includes maintaining the original condition of Grade I buildings, allowing interior adaptations for Grade II buildings while preserving their historic value, and primarily preserving the main facades and characteristic features of Grade III buildings to ensure harmony within historic neighborhoods[7]. It is therefore necessary to delineate the scope of retrofitting of historic buildings in order to provide accessible retrofitting of historic buildings without destroying their historic features (see **Table 1**).

3 RESEARCH METHODOLOGIES

In this study, the Guangdong Hall was selected for research. Built in 1907, Guangdong Hall is one of the best-preserved and largest Qing-style Hall buildings in China, with rich historical and cultural values. In order to enable people with limited abilities to visit the building with maximum independence and comfort, the space and accessible facilities involved in the accessible retrofit of the historic building are shown in **Table 1**.

Table 1. Scope of accessible routes for historic buildings. Source: The author.

	Exterior Accessible Environment	Interior Accessible Environment			
Scope of accessible routes for historic buildings	Horizontal or vertical pathways from accessible parking spaces to building entrances	Visiting Route	Exhibition Design	Service Facilities	Signage system
		Entrances, stairs, ramps, handrails, lifts,	Display facilities, audio-visual	Service counters, low-level facilities	Signage design and installation, signage

		platforms, and corridors	facilities, wheelchair seating	and accessible toilets	lighting, accessible signage

4 DESIGN PRACTICE

The study highlighted several accessibility issues at Guangdong Hall. Visiting routes are not fluid, with inaccessible north and south entrances for individuals with limited abilities, numerous steps and thresholds (see **Fig. 1**), damaged floor paving, and a lack of handrails. Exhibition design issues include insufficient lighting in the doll display area and generally dim lighting, along with a lack of sound and hard-to-read display text. Service facilities are also inadequate, lacking accessible parking and toilets. Additionally, the signage system fails to provide accessible and child-friendly directional signs.

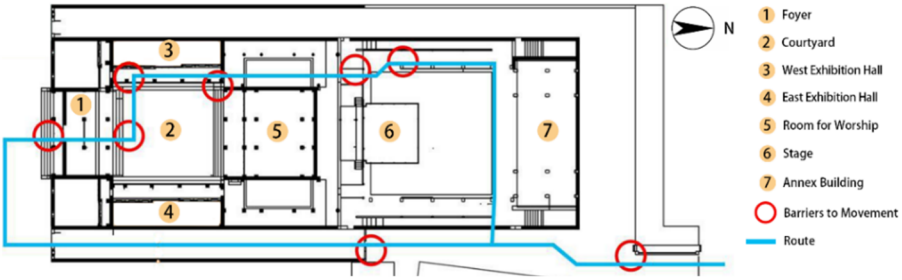

Fig. 1. Original floor plan and analysis of the barriers. Source: The author.

For conservation reasons, the design did not substantially alter the building, but realigned the original route and added accessible facilities (see **Fig. 2**).

Routes for the visually impaired include tactile paths, handrails, and audio guides. For the mobility impaired, designed ramps with handrails cater to height differences over 200mm, and removable ramps for those below 200mm. Additionally, accessible parking, seating (see **Fig. 3**), toilets, and a guidance system were added to enhance accessibility.

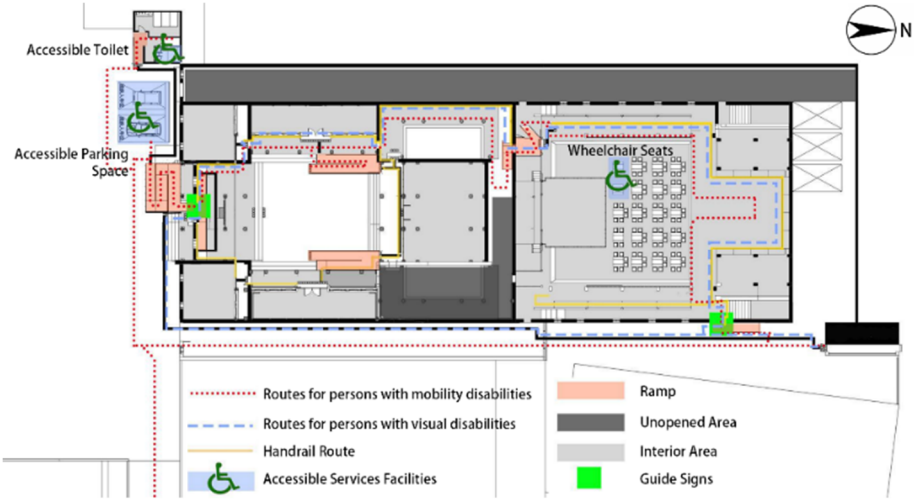

Fig. 2. Floor Plan of the Accessible Retrofitted Guangdong Hall. Source: The author.

Fig. 3. Stage rendering. Source: The author.

5 CONCLUSION

Based on the research on Guangdong Hall, the following targeted strategies for accessible renovation of historic Chinese buildings have been summarized, which are of great significance to urban planning and design:

1. Provision of accessible car parking spaces.

The parking space with the shortest walking distance from the entrance/exit of the historic building shall be designated as an accessible parking space. The accessible

parking space shall be provided with a passage of not less than 1200mm on one side so that wheelchair users can enter the accessible entrance directly from the space.

2. Reducing height differences

Traditional Chinese historical buildings often feature multiple steps and thresholds. In order to improve accessibility without damaging the original structure, ramps with a gradient of not more than 1/12 should be installed on the entrance steps. Additionally, at entrances where thresholds exceed 13mm in height, steps should be taken to reduce or eliminate these thresholds[8].

3. Establishing internal accessible routes.

To ensure accessibility, ticket gates should be at least 900mm wide and corridors over 1300mm wide for wheelchair access. Multi-story buildings should have accessible lifts. Indoor steps, a significant access barrier, need modifications for accessibility.

4. Improvement of signage and guidance systems

To enhance sign visibility for individuals with limited abilities, it is recommended to position signs at easily perceptible heights and use materials that reduce reflection. Additionally, to aid visitors with visual or hearing impairments, Braille and audio guide systems should be installed on signage.

5. Improvement of service facilities

To accommodate wheelchair users, historic buildings should equip all service counters with low-level sections at a height of 700-850mm[9]. In addition, it is recommended that accessible toilets be fitted with armrest toilets and sliding doors.

In the future, the research on accessible routes in historic buildings will gradually be extended to the outdoor spaces of historic buildings and even to the entire historic district. The aim is to create completely accessible routes from urban transport hubs to building entrances.

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