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A Case Study of Wuhan City in the International Context of Green Sustainable Use of Historic Building Conservation

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ABSTRACT

The conservation of historic buildings is currently a key concern of the state, and historic buildings contain the rich cultural heritage and social significance of the city. With the continuous development of the city, the demand for the sustainable use and renewal of historical buildings has increased. In the research of green sustainable use of historical buildings conservation, western countries have accumulated a series of pioneering theories and practical experiences for the relevant development of Asian countries and provided an international context for the relevant development of Asian countries. The green sustainable conservation and adaptive reuse projects of Wuhan Pinghe Packing Factory and Wuhan Theatre in China not only epitomizes the achievements and realities of different Asian countries in this field, but also serve as a reference for the sustainable use and renewal of historic buildings conservation.

GREEN SUSTAINABLE USE OF HISTORICAL BUILDINGS IN EAST AND WEST

Green Sustainable Use of Historical Buildings in European Countries

The progress of human society has been driven by industrial civilization, and the worship of modern technology has overlooked the relationship between man and nature, which has been respected in the traditional Chinese philosophy of nature for thousands of years. 1992, Agenda 21, released at the United Nations Conference on Environment and Development in Genève, set the tone for the development of the global green building industry; 1993, the World Congress of Architects held in Chicago in 1993, at the World Congress of Architects in Chicago, the concept of "sustainable design" was introduced. Since then, a series of pioneering green building assessment methods and labeling systems have been introduced in many countries, and in the early 21st century, green building technologies began to enter the field of historic building conservation. Historic buildings, with their regional cultural and historical heritage, are unique in their green sustainability, not only in terms of performance, but also in providing inspiration for the

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establishment of new buildings in the region. As a carrier of cultural heritage, historical architecture is also an important pillar for the sustainable development of spiritual culture in contemporary society. Early discussions on how the current green building codes apply to historic or existing buildings were initiated in some Western European and American countries. Green sustainability-related codes and guidelines for historic buildings have been proposed based on national conditions and culture. In Italy, a leading country in the integration of historic buildings and green sustainable design, in addition to setting different energy and environmental requirements for monumental and non-monumental historic buildings according to criteria such as building scale, the overall sustainability of historic building conservation and restoration projects is assessed from the design phase to construction and even to the operation and maintenance phase, in terms of historical values, cultural value, water conservation, materials and resources, indoor environment, design innovation and regional priority. The overall sustainability of historic building conservation and renovation projects from design to construction and even operation and maintenance phases. In addition to national green building systems, European countries have also established transnational collaborative research projects, such as 3ENCULT, a research project launched by the European Union's Seventh Framework Programme, known as the "EU Energy Efficiency in Cultural Heritage Project", which demonstrates the diversity of forces driving green energy efficiency in historic buildings. In the United States, campaigns such as "Make the White House Green" have led to significant reductions in energy consumption, solid waste, and carbon emissions in existing government buildings through retrofitting. The relevant practices in Europe and the United States have served as a backdrop for the greening of historic buildings in Asia and China and have provided inspiration for the latter on multiple levels.

Green Sustainable Use of Historic Buildings in Asian Countries

The rapid development of Asian cities is accompanied by the rapid renewal of urban buildings, and many historic buildings are decreasing due to various reasons, and the disappearance of these historic buildings is accompanied by the disappearance of the architectural history, spirit, memory and culture contained in the buildings. Therefore, the conservation of historic buildings in Asian countries has fully absorbed the framework and experience previously established in some European and American countries, such as the relevant ordinances and policies from the United Kingdom have been partially applied and integrated into the local conservation practices of some Southeast Asian countries, such as Singapore and Hong Kong, China. However, due to the significant differences between Asian and European countries in terms of historical background, religion, climate, architectural culture and environment, cultural heritage conservation in Asian countries has been adapted and adapted to international conservation theories and practices. In this regard, Asian countries have good innate conditions compared to other countries, but there are also problems that need to be addressed. For example, in many Asian countries and regions, the concept of sustainable coexistence and harmony with nature is an important part of traditional architectural

culture, while in some countries in Southeast Asia and South Asia, the colonial history makes it relatively easy to integrate and adapt Eastern and Western concepts and technologies. These buildings have features that have long been adapted to local climatic and other regional conditions. Their outstanding traditional energy efficiency helps to maximize energy efficiency in conservation, restoration and reuse. In recent years, the use of green and sustainable technologies in the conservation and renovation of historic buildings has been increasing in Asia. Among many Asian countries, Malaysia is a leader in this regard in the CCB, being one of the first to introduce green building rating standards for historic buildings, encouraging innovative and environmentally friendly new design expressions that combine traditional historic buildings with new additions. Green sustainable buildings, although starting slightly later than other countries in China but developing rapidly, at the end of 2015, the Ministry of Housing and Urban-Rural Development of the People's Republic of China promulgated the Green Retrofit Evaluation Standard for Existing Buildings (GB/T51141), which gives the green building evaluation standards for existing buildings in terms of planning and architecture, structure and materials, HVAC, water supply and drainage, electrical, construction management, operation management, and improvement and innovation, respectively. The assessment system of retrofitting is given in the aspects of planning and building, structure and material, HVAC, water supply and drainage, electrical, construction management, operation management and improvement and innovation. However, up to now, China still lacks a systematic rating and guidance system specifically for the green and sustainable repair and renovation of historic buildings. Despite this, a number of domestic historic building conservation and renovation projects have borrowed from existing theories and evaluation systems abroad while exploring green and sustainable renovation and retrofitting strategies that are applicable to local and specific types of historic buildings. For example, the green sustainable design of the Pinghe Packing Factory project in Wuhan, which takes into account the local climatic conditions and the characteristics of the neighborhood, and aims to be a three-star demonstration project for green renovation of historic buildings, was awarded the "Green Ecological Technology Award" by the Architectural Design Award of the Architectural Society of China in 2020, and has become one of the demonstration projects reflecting the progress of the development of green sustainable conservation and revitalization technologies for historic buildings in China. With the "double carbon target" policy of carbon neutrality in the past two years, the green and sustainable renovation and utilization of historical buildings have gained attention again.

THE HISTORICAL VALUES AND ARCHITECTURAL DESIGN OF WUHAN THEATRE

Wuhan Theatre's Historical Value

Built in 1959, the Wuhan Theatre is the youngest of Wuhan's nearly 100 years of bright historical relics. Wuhan Theatre is the first large theater built in Wuhan at the

beginning of China's founding, but also the largest modern viewing theater in Wuhan. The theater has a history of political and cultural activities is the center of the place, Wuhan Theater is therefore also an important venue for cultural and artistic exchanges and performances of famous groups at home and abroad is an important venue for the construction of spiritual civilization in Wuhan, leaving behind many venues' history, culture, spiritual memories. These emotions and meetings are other buildings cannot be given, but also the current Wuhan City, one of the few units of cultural heritage protection can continue to use. Wuhan Theatre has made great contributions to the construction of national theaters, and it has provided technical data and standards for the national preparation of relevant opera houses (Figure I and II.) In 2008, Wuhan Theatre was listed as an excellent historical building in Wuhan, and in 2011, it was named as a municipal-level cultural relics protection unit in Wuhan. 2019 was selected as the "fourth batch of China's 20th century architectural heritage projects.

Figure 1. Architectural Design Information Collection.

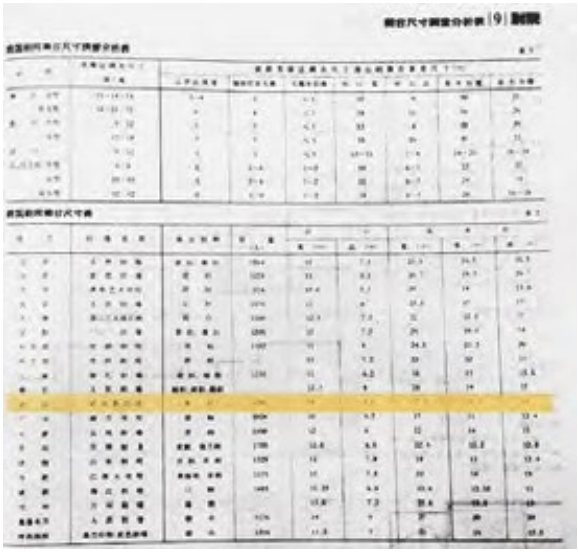

Figure 2. Stage size table.

Architectural Design of Wuhan Theatre

Wuhan Theatre by the architects of the South China Institute of Architecture and Design He Rumph, Wang Bingzhen, Mr. Yu Shuyu designed together, its overall architectural style is elegant classical Soviet-style architecture, style condensed and simple form of Soviet-style architectural style of the entire building modeling lines simple, presenting a large door with large windows, end, great atmosphere (Figure 3). Wuhan Theatre as a whole presents a symmetrical composition with the axis of Western classicism, the front façade is a vertical three-part composition. The top of the building is decorated with the red star emblem symbolizing the Soviet regime at that time and floral motifs on both sides, with wheat ears and gears symbolizing the peasants and the working class, with a very socialist atmosphere; the floral decorations imitate stone carvings in the form of central axis symmetry, and the column capitals are carved with patterns of flowers, leaves and stems, with the motifs implying a good moral; the architectural elements of Chinese classical gardens are adopted on the side elevations and the third floor outer room platform. Such as carved octagonal pavilions, flower decorations of imitation stone railings (Figure 4), the main building of Wuhan Theatre southeast facing northwest, the entire plan layout presents a form of central symmetry. The main building from the entrance, along the straight line in turn stage, auditorium and other spaces, forming the central axis of the building layout, auxiliary spaces around the important space distribution, along the central axis on both sides of the arrangement.

Figure 3. Wuhan Theatre.

Figure 4. The Red Star emblem on top of the front façade of Wuhan Theatre.

The Main Principles and Specific Contents of Sustainable and Rational Utilization

Due to the special nature of Wuhan Theatre as a historical building. In the renovation of the Wuhan Theatre, the conservation policy of "conservation-oriented, rational use, strengthening management" was formulated. The principles of continuity, authenticity, minimal intervention, integrity, and the use of appropriate conservation techniques are used in the renovation. The principle of authenticity means that when restoring and renovating historical buildings, the materials, design, and technology of the buildings themselves are preserved, and their original state and history are maintained, so that restoration must be carried out on the basis of evidence and historical research and in accordance with the original characteristics and texture of the buildings. The protection of historical buildings is through all aspects, so to ensure the integrity of the building and the appearance of the surrounding area, each functional space and decoration of the building has its own historical significance, to retain the historical information intact, in order to maximize the retention of the historical value of historical buildings and architectural life mark. Historical architecture is a product of history and the times, the building itself has recorded the information of human social changes, these historical information gives the building a unique temperament, Wuhan Theatre has 60 years of

history, after many times of repair and upgrade, the original wooden doors and windows replaced with aluminum insulation windows, the stage into a multi-layer stage grapevine. The combination of historical architecture and contemporary technology not only preserves the historical flavor of the building but also adds modern technology to meet the needs of use so that the building will not be abandoned. To ensure the continuity of the building and to mitigate damage, excessive intervention should be avoided to prevent damage to the culture, value, and historical information of the historic building. In the restoration of the Wuhan Theatre, because the theater facade of the provincial building facade carvings, finishes, ceilings, etc. are extremely valuable with high preservation value of historical relics, so the basic use of cleaning restoration to reduce the intervention of the historic building to achieve the principle of minimal intervention. The use of appropriate conservation techniques for restoration is conducive to the long-term preservation of historic buildings, and the original techniques and materials used in historic buildings should also be protected. Repair should be in accordance with the original materials and techniques of the building to repair, should be the repair of historic buildings as the heritage of culture and architectural skills. Wuhan theater as a historical building its construction process and construction materials and today's materials and processes are quite different, modern materials have strong practical advantages with efficient, environmentally friendly, economic features, while traditional techniques can reflect the craftsman's superior memory and unique aesthetic characteristics of the times. Its historical era features are retained in the building's exquisite carvings, line feet and components on the basis of meeting the use of function and the use of green design means, the building on the repair, transformation, safety reinforcement, so that it retains the original era of historical memory at the same time and cannot be used for a long time. Wuhan Theatre is not only a historical building heritage, but also retains a generation of meetings at the same time is also a historical heritage building museum is in use and will be used for a long time, has a very high social significance.

GREEN SUSTAINABLE RENOVATION AND UTILIZATION PRACTICE OF THE PINGHE BALING PLANT IN WUHAN, CHINA

The Historical Value of Pinghe Packing Yard

The famous industrial heritage complex "Pinghe Baling Yard" on Qingdao Road in Wuhan, China, was built in 1905. The Pinghe Baling Yard consists of a total of seven industrial buildings. The primary goal of the design is to rejuvenate and revitalize the Pinghe Baling Yard and adapt it to its new identity as a multifunctional cultural and creative park. The design team used a variety of approaches to preserve the building and add creative, sustainable green design. 2019 was named one of the winning projects for the UNESCO Asia-Pacific Heritage Awards for Cultural Heritage Conservation for the Pinghe Baling Yard, which was judged to have "contributed to the preservation of China's rich and diverse industrial heritage and the rapidly disappearing architectural landscape of the early twentieth century with the Pinghe Baling Yard." The design team

found a good answer to the question of how to balance the historical value of the building with the design needs. The originality of the building has been preserved to the maximum. The guideline of the first intervention in the building was achieved. The new public space added to the building creates a great connection between the historic complex and the surrounding buildings and provides an extremely vibrant center for activities related to Wuhan as a UNESCO design capital."

Integration of The Spirit of Place and Green Technology

The green building sustainability concept was integrated with the overall spatial flow and the spirit of architectural culture in the renovation and reuse of the Pinghe packing house. The concept of green sustainability is promoted, and a variety of green design approaches are also referenced and integrated. For example, the use of natural light is maximized while creating a natural and beautiful interplay of light and shadow. The design inspiration was drawn from the triangular shape of the sloping roofs of the surrounding historic district, which was incorporated into the new design scheme to preserve the original spirit of the site while echoing the historic architectural landscape. The same minimal intervention design approach was adopted for the Pinghe baling yard, preserving the authenticity, integrity, culture and technical craftsmanship of the building. The design of Heiwa Baling Grounds also implements the principle of green and sustainable use of historic buildings for conservation. The design of shading has been increased and has been designed in terms of indoor environment, energy saving, water saving and renovation. The highlight of the design is the further improvement of air quality and the implementation of intelligent operation technology. The green and sustainable design of the Pinghe Packing Plant effectively protects natural resources and reduces the impact and interference with nature through various green sustainable design measures such as "land saving, energy saving, water saving, material saving and indoor air quality". It also adopts energy-efficient multi-connector system, rainwater reuse system and air purification system, which greatly promotes the development of green design. The outstanding green sustainable design of Pinghe Packing House not only enables the building itself to be preserved for a longer period of time, but also stimulates the vitality of the surrounding space so that the historical building can be revitalized and leaves a new wealth of experience for the green sustainable conservation of Chinese historical buildings.

SUMMARY

With the promotion and popularization of the concept of green sustainability and the acceleration of urbanization, the demand for green sustainable renovation of historical buildings is also increasing. The protection and sustainable use of historical buildings is not only to guarantee the normal use of the buildings themselves and the needs of social development, but also to make the economic value, artistic value, cultural value and historical value of historical buildings fully protected and displayed. The concept of

restoration and renovation of buildings "to use for preservation" can not only avoid the historical buildings to avoid abandonment and dilapidation, but also can make it new life. The protection of historical buildings is not to be closed for a long time, but to use it normally, repair it, it will be healthy, will be renewed vitality, only sustainable green design can make the building more long-lasting preservation. The Wuhan Theatre and Pinghe Packing Yard have become a characteristic locality of Wuhan under green sustainable design, which not only preserves the historical memory but also allows further integration of traditional culture and modern science and technology to achieve the preservation of historical buildings. In the treatment of historical buildings due to respect for the maintenance of history, minimize intervention, preservation to avoid destruction. This requires that as much information as possible about the building's function, culture, period value, materials and techniques be obtained through complete investigation when restoring and renovating historic buildings. In this way, the sustainability of historic buildings can be achieved by extending their life cycle and adapting them to modern use.

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