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Analysis on the Development of Industrial Architectural Heritage Regenerative Design

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ABSTRACT

People are always accustomed to carefully protecting Chinese agricultural civilization and rich ancient ruins thousands of years ago as cultural relics. Compared with them, industrial architecture has only a history of nearly a hundred or decades. Many industrial buildings have lost the use value of industrial architecture due to the termination of industrial activities. These industrial buildings that have not reached the design life are now facing the situation of being eliminated and abandoned because they are neither ancient nor cultural relics. Driven by various factors such as interest, people regard them as waste, garbage, and obstacles, and are anxious to destroy them. This so-called constructive destructive behavior has threatened the compatibility and continuity of urban forms. During the construction process, traces of industrial buildings have been completely removed, and their inherent context and texture have been completely wiped out. In the long history of China, they are also indispensable physical evidence of social development. The information about China's social development, the influence of population, and the national economy carried by industrial buildings are even greater than the cultural heritage of other historical periods. Today, when a conservation-oriented society is advocated, this kind of Great Leap Forward renewal and transformation method is contrary to the principle of sustainable development. In order to better promote the organic renewal of urban construction, it is the original intention of this article to seek progressive and orderly recycling design to contribute, maximize the value transfer of industrial architectural heritage, and clean up the historical evolution of Chinese and foreign attitudes towards industrial regenerative design.

Keywords: *industrial architectural heritage, regenerative design, evolution*

I. INTRODUCTION

With the rapid expansion of the urban area, the industrial functional areas that were originally located on the edge of the city are approaching or are in the center of the city, occupying strong location conditions. Their existence makes the space and environment seem chaotic, leading to the unreasonable layout of urban functions and imperfect urban functions, which have hindered the healthy development of cities. These secondary industries withdrew from the bustling urban areas and developed tertiary industries such as commerce and services. In the current situation of high housing prices and a small amount of land available for development, "retreating two into three" has indeed become a wonderful game to crack the bottlenecks that restrict the property market. However, due to the large-scale reconstruction of old cities and the construction of new cities, almost every city in China has become a construction site, and the form of reconstruction has been unified and modeled. Every city looks the same and has no characteristics. A series of negative problems such as environmental pollution and ecological pressure have also been caused during the demolition and construction process. Against this background, after being "retired" as the protagonist of China's industrialization era, the question about what should go next causes rethinking of all sectors of society.

II. CONCEPT OF INDUSTRIAL ARCHITECTURAL HERITAGE

The "Neath Tal Charter", adopted by the International United Nations Heritage Conservation Federation in July 2003, defines industrial heritage: Industrial heritage refers to buildings and structures made for industrial activities, the crafts and tools contained in such buildings and structures, and the towns and landscapes in which such buildings and structures are located, and all their other tangible and intangible manifestations. Industrial heritage can be distinguished narrowly and broadly based on time. The narrowly defined industrial heritage refers to the industrial relics following the industrial revolution that

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broke out in Britain in the 18th century. In the broad concept, it can summarize the relics that reflect human technological means in different historical periods, such as the sites where people used to produce and process stone tools, ancient resource mining, smelting sites, and even ancient large engineering sites such as water conservancy projects in prehistoric times into the category of industrial heritage.

Industrial heritage can be divided into tangible and intangible based on content. The tangible heritage can be divided into two types: inconvenient to transfer and easy to transfer. The buildings used for production, workshops and workshops, boundary stone boundary monuments, and all underground structural components are all part of the inconvenient to transfer of industrial heritage. Industrial activities such as tools and appliances, machinery and equipment, office supplies, graphic materials, audio products and other records about corporate history are part of the industrial heritage that is easy to transfer. Intangible industrial heritage includes technological processes, production technologies and expressions related to industrial culture in industrial activities, as well as intangible forms that exist in people's minds, spiritual ideas, oral teaching, and so on. The industrial architectural heritage is the material component of the industrial heritage. In the field dominated by environmental design research, the author focuses more on the "industrial architectural heritage" in the industrial heritage. Therefore, the "industrial architectural heritage" is extracted from the industrial heritage, and the specific research content is the tangible content that is inconvenient to transfer of the industrial heritage mentioned in the concept.

III. THE EVOLUTION OF INDUSTRIAL ARCHITECTURAL HERITAGE REGENERATIVE DESIGN

In the 1920s, "industrial archaeology" was proposed as a concept, and the concept of "industrial heritage" was also well known. In 1932, French architect Pierre Chareau remodeled an old apartment in Paris. The designer broke through the norm and applied new design concepts to boldly use new materials and new technologies in the transformation. In China, his work is called "Glass House", and it became the world's first glass curtain wall building. Its birth is marked as the sprout of reuse of old buildings. At the time, this "glass house" type of radical reuse design was incompatible with conservative archeological relic restorationism. From the conception of "industrial archeology" to the design of industrial architectural heritage regenerative design is an inevitable product of the development of the whole society. From negative protection to active design, the process is divided into three stages, that is, the period of germination and exploration entered by people's doubts, the period of popularization entered by the improvement of social recognition, and the mature period in which a large number of successful cases have emerged.

A. Exploration period of industrial architectural heritage regenerative design

The exploration period was between the 1950s and 1960s. European countries were busy with urban reconstruction after World War II. How to preserve historical buildings became an urgent issue for European countries. The introduction of the "Venice Charter" in 1964 opened the curtain on the protection of old buildings, but the Charter only provided protection for buildings with historical or significant historical value. The ubiquitous industrial architectural heritage was rejected. Therefore, the industrial architectural heritage protection movement carried out under the guidance of this charter was extremely slow and conservative. At the same time, Western architects, under the support of new trends and new technologies, continue to challenge conservative stereotypes of cultural relics. They advocate the coexistence of architecture and cities, and advocate the development concept of protecting historical and industrial architectural heritage. A group of pioneering designers in Italy continued the design ideas of Chareau. They transform the Casteviano Museum, the Red House Museum of Genoa, and the Castle Museum of Verona in a concise form with strong modern aesthetics. Steel, glass, and concrete in a large number of modern materials appear in structures form of buildings. In addition, a chocolate factory in San Francisco was transformed into a shopping center by famous American landscape architect Lawrence Halprin in 1964, with catering services. The dilapidated factory has been revitalized after being transformed, becoming the first case of industrial building heritage reuse in the form of commercial transformation. The designer first proposed the "architecture recycling theory" here, and New York artists will discard the Industrial workshops, re-dividing their spaces and transforming them into lofts where they live and create, later known as "LOFT". From the protection of the industrial architectural heritage during this period, it can be seen that the historical and cultural buildings with less stock have gradually expanded to the large and generalized industrial architectural heritage. However, the transformation and reuse of industrial architectural heritage in this period only stayed in the individual behaviors of the niche designers, and did not form an independent theoretical system of transformation and reuse of industrial architectural heritage in the true sense.

Compared with foreign countries, China was in a relatively backward economy during this period. The

way of treating cities was still a negative way of demolition and construction.

B. The popularity of industrial architectural heritage regenerative design

The popularization period was from the 1970s to the 1980s. During this period, the western countries accompanied the oil crisis. People began to realize the importance of environmental protection, and realized that pushing the old and building new was a very expensive way to transform. At the same time, the government also actively participated in and promulgated relevant policies and regulations for the reconstruction and reuse of industrial architectural heritage. For example, in 1977, the International Architectural Association adopted the "Chapter of Machu Picchu" which states that, in order to prevent continuous environmental degradation, emergency first-aid measures must be initiated. It is necessary to call for efficient use of existing natural and human resources, and clearly point out that the protection and reuse of existing ancient buildings and the construction of historical sites should be combined in order to ensure that these cultural relics should have vitality in addition to their historical commemorative significance. At the same time, in the process of considering urban renewal, contemporary buildings with excellent design works should also be included in the scope of protection. In the positive environment with the theme of promoting the use of protection, the form of industrial architectural heritage transformation has expanded from a single architectural transformation to a historical location, community, or even city level. Urban construction is closely linked to urban revival, showing a harmonious scene where history and modernity merge, and old buildings serve modern life and ideas. The Lowell National Historic Park in the United States is a designer's reuse design of more than 100 industrial architectural heritages. This originally abandoned industrial area was transformed into a modern multifunctional historical national park by the designer's hands, which perfectly preserves historical fragments and use value.

In 1980, the United Kingdom also officially passed the "Old Building Protection Act", which promoted urban regeneration through the reuse and protection of industrial architectural heritage. After 1981, the London Docklands Area Development Corporation was established. They took the development and construction of the old city as their main task. Such companies have emerged one after another, actively responding to urban renewal policies that led to the reuse of old buildings, and acted on them. The reuse projects have been carried out in a large number of old buildings, such as the London Convent Garden Market Renovation, Brett Pier, and New Kendia Pier. The Volkeringen ironworks in Saarland, Germany, was one of the major ironworks in the German Empire around 1890. After being discontinued in 1986, it was converted into an industrial museum. The original grinding tool room, ore field, and mechanical and electrical room were transformed for the experimental center, photography center, and art exhibition hall of the local university, and the original blast furnace was used as an observation tower.

At this time, the effect of the city's old city reconstruction practice in Europe and the United States has spread to many countries in Asia and the world, and has been recognized and vigorously developed. At the same time, China has also begun to focus on historic old buildings. The "Cultural Relics Law" promulgated by China in 1983 pushed the protection of old buildings onto the road to legalization, and announced key cultural relics protection units at all levels from the state to the region, which means that large number of important architectural heritages were effectively protected. In October 1986, the first seminar on the history of modern Chinese architecture was hosted by Mr. Wang Tan of Tsinghua University. After the conference, investigation and research work on modern buildings nationwide were launched. Although modern industrial buildings are also within the scope of modern buildings, and the shortcomings are not many as the key protection objects, at least it can be seen that people's thoughts on the protection of historical and cultural buildings have been widely accepted. However, during this period, there have also been cases of reconstruction and reuse of old buildings with historical value, complete structure and practical value. For example, the reconstruction of Peony Garden in Beijing was originally a factory building of a television factory and then transformed into an office building and apartments. Most of the projects that were reused and transformed in this period were self-issued by individuals, with small scale, many method defects, and relatively low level of transformation, but it is not difficult to see that the strategic ideas of environmental protection, ecological value, and sustainable development are gradually deepening into social development at all levels. This also shows that China has begun to enter the stage of budding exploration in the process of rebuilding old buildings.

C. The maturity period of industrial architectural heritage regenerative design

The maturity period is from the 1990s to the present: Old buildings in this period have undergone an effective transition during the popularization period. More and more designers and architects in western countries have focused their attention on the industrial architectural heritage. New developments have been made in the processing methods and theoretical foundations for the transformation of industrial architectural heritage. At the same time, industrial

building heritage reuse and transformation activities have gradually expanded to other ordinary buildings with use value, and artistic methods have also become diversified, which also marks the mature embodiment of industrial architectural heritage regenerative design in terms of scale and technical means. During this period of time, large-scale industrial building heritage regeneration designs have emerged to rejuvenate the decaying urban areas and build good results for new human settlements. At the same time, a number of influential cases around the world have emerged, such as the German Design Center, Nestlé's French headquarters, and the Tate Britain. They fully reflected modern high-tech concepts such as ecology, intelligence, modernism, post-modernism, and structuralism in the reconstruction. For example: Swiss SUVA Insurance Company was rebuilt from an office building. The designer added an intelligent skin outside the original building's stone. It is a new mechanized glass-aluminum alloy baffle controlled by a click engine that can be opened and closed automatically under different weather conditions. The transformation of modern industrial building heritage has received unprecedented attention, and gradually pushed it to a climax.

However, in the early 1990s, China was in the promotion stage. This stage was mainly based on the transformation behavior of some enterprises and individuals. Its forms are mostly art, advertising, architecture, media and other related studios, most of which were concentrated in economically developed cities such as Shanghai and Beijing. There were limitations and unity in the regeneration design of industrial architectural heritage in this period, but it was not difficult to see from the results that it had a good development trend and social acceptance. In the mid-to-late 1990s, the regeneration design of China's industrial architectural heritage was diversified. Participants spread from the original artists to socially savvy and artistic professionals, and analyzed the potential commercial value and architectural significance of industrial architectural heritage. According to the new requirements, we carry out diversified design through technical means, and the transformation object has developed from warehouses, light industrial plants to heavy industrial plants, even docks and docks, such as Shanghai's "Eighth Bridge", Beijing 798 Art District, Suzhou Riverside Studio, and so on. With the improvement of national economic examples and the advancement of scientific level, people also pay attention to promoting the organic combination of sustainable development principles such as energy saving, environmental protection and ecology when faced with the problem of the rebuilding of old industrial architectural heritage. At the same time, in order to encourage the regeneration design of industrial architectural heritage, China has carried out scientific research projects and demonstration projects such as energy-saving reconstruction and ecological reconstruction of old buildings. From this, it can be seen that China's industrial architectural heritage is moving towards the stage of active protection and utilization. (See "Table I")

TABLE I. REPRESENTATIVE DOCUMENTS RELATED TO THE PROTECTION OF HISTORIC BUILDINGS

Year	File name	The main idea	Limitation	Significance
1933	Charter of Athens	It was clearly pointed out that the architectural heritage of a specific historical period is of great significance in educating future generations.	No protection principles and specific measures had been proposed, and the environment of the neighborhood where ancient buildings are located was insufficiently understood.	It was the first programmatic document of urban planning, and proposed protection of historic buildings and areas.
1964	Venice Charter	It put forward basic concepts and basic principles, and expanded the scope of protection. It emphasized that the protection of monuments cannot ignore the surroundings.	The general industrial building heritage was not included in the scope of protection.	It was the first international charter on the protection of heritage buildings.
1976	Nairobi Recommendations	The concept of firmness, protection, preservation, and repair was defined as the connotation of protection. It was pointed out that the protection of historical sites should include prehistoric sites, historical towns, old towns, old villages and similar groups of historic sites.	There was no mention of industrial architectural heritage protection.	It emphasized the value of historical neighborhoods and clarified the vague concepts in the original charter.

Year	File name	The main idea	Limitation	Significance
1977	Charter of Machu Picchu	It summarized excellent contemporary buildings within the scope of protection. It was pointed out that while preserving and maintaining the city's historical sites, it should also pay attention to inheriting the general cultural traditions.		The scope of protection had been further expanded.
1987	Washington Charter	The natural and artificial environments in which cities, towns, historic centers, and residential areas within historical districts are located, as well as the urban cultural values of these areas were included in the scope of protection.		It was an important supplement to the Venice Charter, which was the second international regulatory document after the Venice Charter.
1999	Beijing Charter	It emphasized the significance of architectural culture, and put forward ideas such as sustainable development, people-oriented, and overall thinking to welcome the 21st century, moving from traditional architecture to broad architecture.		It was a programmatic document for the new period.

IV. CONCLUSION

As the imprint of the industrial era in the process of human culture, the industrial architectural heritage is an important part of the historical context in the process of urban development and construction. By combing the historical development of the industrial architectural heritage regenerative design in the vertical direction and the horizontal appearance, it is not difficult to find that the problems related to the industrial architectural heritage regenerative design are the issues that contemporary society should face directly and actively respond. Fortunately, the protection of industrial architectural heritage has attracted the attention of European countries in the middle of the last century. It has gradually matured through actual cases and has gained social acceptance and favor. China has also started to pay attention to the issues related to the regeneration design of industrial architectural heritage during the popularization period, and gradually matured through promotion during the mature period, providing a basic guidance for the planning and reconstruction of urban construction in the later period, in terms of industrial building heritage regeneration design and non-industrial building heritage reconstruction.

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