Types of Industrial Architectural Heritage and Digitalized Protection Method of Zhenjiang

LI Xiao^{1a*}, LIU Chang^{2b}

¹Art School, Jiangsu University, Zheng Jiang, China

²Art School, Jiangsu University, Zheng Jiang, China

Abstract: As an ancient historical city, where the Grand Canal meets the Yangtze River, Zhenjiang has more than 100 modern industrial architectural heritages and its scientific protection and utilization has become an important subject in the development and historical renewal of Zhenjiang city. By investigating and analyzing the basic types of industrial architectural heritage in Zhenjiang, this paper discusses the digital protection strategies and puts forward several specific digital protection methods such as heritage information collection, database construction, interactive experience. To promote the industrial architectural heritage in Zhenjiang to produce comprehensive value in the course of social development.

1 Analysis on the Status Quo of Zhenjiang's Industrial Architectural Heritage

The reuse of industrial architectural heritage in Zhenjiang is mostly in the form of functional replacement. The Xijindu Industrial Building Remains Conservation Area has successively protected and transformed its internal printing plant, municipal pesticide factory, and municipal filter factory. The reconstructed Xijindu Historic District has become a comprehensive tourist destination integrating public visits, leisure and entertainment, venue display, cultural exchanges and other functions. In recent years, Zhenjiang City has adopted a museum model in its renovation to transform distinctive historical buildings into urban public places to show citizens and tourists the development and transformation of Zhenjiang's modern industry, thus highlighting the preciousness of industrial heritage culture. The former site of Asia Fire Oil Company located on Changjiang Road was listed as a

cultural relics protection unit of Zhenjiang City in 1982, and has now been transformed into a Zhenjiang Folk Culture Art Museum.

In addition, Zhenjiang upholds the principle of repairing the old as before, repairing major historical blocks, important neighborhoods, and some old buildings to eliminate dangers. The city's old water plant was renovated on the original site, and the old railway station was retained and repaired when it was demolished. The construction section houses with unique verandah style. It can be seen that the protection of industrial architectural heritage in Zhenjiang City has achieved initial results, but the transformation and activation model is single, lacks innovation and interaction, and lacks information and data management models. In the future, the new digital technology can be effectively combined with the activation and utilization, and new sustainable development ideas for the protection and reuse of industrial architectural heritage can be explored.

Table 1 STATUS OF ZHENJIANG INDUSTRIAL CONSTRUCTION HERITAGE

	name	time	address	status quo	Use type
A Appropriate method, up to standard, good effect	Texaco Oil Company	1866	Yangtze River Section	Demolished	Culture
	British Merchant Asia Oil Company	1910	Changjiang Road	Folk Art Exhibition Hall	Culture
	Filter Factory	1966	Yangtze River Section	Comprehensive place	Commercial
	Advance printing plant	Anti-Japa nese War	Yingjiang Section	Comprehensive place	Commercial
	Hengshun Vinegar Factory	1840	Guangyuan Road	Vinegar Culture Museum	Culture
B Up to standard,	Railway station building	1918	Ximen Railway Station	well-preserved	---
	Yicheng flour mill	1914	Xinhe Bridge	well-preserved	---
	Waterworks	1934	Changjiang Road	well-preserved	---

^a1056509585@qq.com

^b1056509585@qq.com

average effect	Pesticide Factory	1954	Yangtze River Section	Pesticide Factory Co., Ltd.	Commercial
	Mobil Oil Company	1906	18 Yingjiang Road	nursing home	Residential
	Jingkou Gate	Tang	Canal ruins	Landmark	— —
C Poor effect, serious damage	Hezhong Silkworm Breeding Farm	1926	Sijiao Ferry	Two existing watchtowers	— —

large-particle water to wash the stone wall, which had an important influence at that time.

2 Types and characteristics of Zhenjiang industrial architectural heritage

2.1 Spatial characteristics

In the early days, the spatial form of industrial buildings in Zhenjiang has begun to have the design characteristics of modern architecture. The form of architectural space in the middle and later periods has gradually opened up. The architectural style has been learned from the West. Industrial functions, production steps, storage spaces, and mechanical equipment scales all affect the industrial building space. The size and layout are important factors. They are affected by functional requirements and have a large volume of space (the building span is more than 10 meters). There are no walls in the interior space of the building, and the span between columns is more than 4.5 meters. Such buildings have a regular plan and flexible layout. Gao Duo is controlled between 3 meters and 4 meters according to the type of industry, which has the real spatial characteristics of modern industrial buildings. At the same time, the modern industrial buildings in Zhenjiang are advanced and breakthrough in design, especially in the choice of building materials, using steel, cement, glass, machine-made bricks and tiles as the main building materials, and the building walls are clear water brick walls; The roof adopts native flat tiles, cement tiles or butterfly tiles, and some buildings are flat roofs. For example, the new factory building of Yicheng Flour Mill adopts large-wave steel double-slope roof and glass wall; the building of railway station's public works section uses

2.2 Structure type

The structural types of industrial buildings in Zhenjiang in modern times can be divided into: ①brick-concrete structure-based production workshops and warehouse buildings;②frame structure-based office, hospital, residential, and storage buildings; ③reinforced concrete structures as the representative Production workshops and warehouse buildings;④Private enterprise workshops or residential houses in the factory with brick-wood structures as the mainstay; ⑤ Former residences of celebrities built with traditional wooden structures as representative. Among them, brick-concrete structures mostly appear in industrial buildings built by private workshops. They are mainly modern national capital industries. The building volume is small. The outside of the single-storey factory building is loaded by brick piers and filled with brick walls. The inner triangle wooden roof truss bears the weight. It is a brick wall and gable; the reinforced concrete structure is constructed by pre-embedding steel bars and then pouring concrete, which greatly improves the seismic performance of the building. Therefore, industrial buildings using this structure type have survived wind and rain but have been preserved in large quantities. The interior of this type of building With large space and flexible layout, it is suitable for space reuse modes with multiple functions.

Table 2 STRUCTURE AND FEATURES OF SOME INDUSTRIAL BUILDINGS IN ZHENJIANG

	Name	Time	Features and features	Structure	Typical architectural types
1	Hengshun Sauce Vinegar Factory	1840	Traditional style	Brick and wood structure	workshops, warehouses
2	Texaco Fire Oil Company	1866	Combination of China and the West	Brick and wood structure	Office buildings
3	Mobil Oil Company	1906	Combination of China and the West	Brick and wood structure	Office buildings
4	ASIA Oil Company	1910	Combination of China and the West	Brick and wood structure	Office buildings
5	Railway Works Section Station	1918	Combination of China and the West	Outer porch style brick structure	Office, residential accommodation
6	A flour mill (flour mill)	1914	Combination of China and the West	5-story reinforced concrete frame structure	Office buildings
7	Waterworks	1934	Combination of China and the West	Brick and wood structure	Office buildings
8	Pesticide Factory	1954	Combination of China and the West	Brick and wood structure	Office buildings
9	municipal filter plant	1966	Modern architecture	Steel and reinforced concrete structures	Workshop
10	Forward Printing Factory	Anti-Japanese War	General buildings	Brick wall/steel roof truss	Plant, warehouse, office building
11	Chinese Union Silkworm	1926	Combination of China and the West	Brick wall	Office buildings

	Improvement Society				
12	Headlamps Limited	1905	Combination of China and the West	Reinforced concrete structure	Office buildings
13	Merchants Bureau	1873	Combination of China and the West	Brick-concrete structure	Office buildings
14	Guo Lizheng	1920	Traditional architecture	Brick and wood structure	Office building, former residence of celebrities
15	Zhenjiang British Consulate	1890	Western-style architecture	Brick-concrete structure	Consulate, office building, former residence of celebrities

3 The digital protection method of Zhenjiang industrial architectural heritage

The current digital technology has improved the problem of lagging in information management in the activation and utilization of heritage. By using information technology, it can provide new ideas for the protection of industrial architectural heritage to a greater extent, and enable more cultural heritage to be expressed in digital and visual art. Presented to the public.

3.1 Building an industrial architectural heritage database and building an information platform

Build Zhenjiang's industrial heritage database through informatization and visualization to further promote the classification and protection of industrial architectural heritage. At present, the data collection for Zhenjiang industrial building remains mostly adopts traditional document management methods. Daily data sharing, analysis, statistics and release are all carried out in Excel. It is difficult to ensure the timeliness of monitoring the status of old industrial building remains. The comprehensiveness of analysis and analysis is also not conducive to the integration, sharing and release of real-time monitoring data information. Using digital protection methods, building an industrial architectural heritage data center and building multiple data sources to realize a comprehensive information data platform with multi-functional services such as data management, analysis, transmission, and information query, for future industrial architectural heritage protection work Provide accurate and effective data resources. With the assistance of integrated database and satellite navigation, it can not only query the basic information of each industrial architectural heritage online, but also generate its value evaluation standard through the collected, summarized, and detected information data, effectively promoting the value evaluation of industrial architectural heritage Work to improve the accuracy of classification and protection of industrial architectural heritage.

3.2 Use digital information technology to increase public participation

Digital interactive display and publicity is an effective medium to spread the culture of industrial architectural heritage, and it is also a new way to promote the

revitalization and reuse of industrial architectural heritage. Interactive experience can further increase the enthusiasm of public participation and attract social media attention. Use digital technology to build a digital museum of industrial architectural heritage and a network information data platform, and guide users into the digital experience space through smart mobile terminals, the network, Weibo, WeChat, and wireless sensor technology. In an interactive environment, users can operate electronic devices or virtual objects autonomously to increase the interest and authenticity of participatory contextual experience. This will not only help the public to deepen their understanding of the industrial architectural heritage, but also provide diversified contacts for the public to understand the industrial architectural heritage. In addition, it is also possible to use multimedia, new technologies, virtual reality, artificial intelligence and other methods to creatively design the intangible culture in the industrial architectural heritage, combining traditional intangible culture with digital technology to show the unique value of cultural heritage and enrich the industry. Enrich the ways of spreading architectural heritage.

4 Conclusion

Based on the status quo of Zhenjiang's industrial architectural heritage, it is very important to evaluate the industrial architectural heritage with cultural value potential. In particular, it is necessary to make use of digital technology, build an information platform through the construction of an industrial architectural heritage database, and use digital information technology to enhance public participation and other digital protection methods to promote the cultural protection and use of industrial architectural heritage, and promote the rejuvenation of industrial architectural heritage life.

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