

The Development and Application of Boshan Steamed Bread Kiln in Urban Renewal-Taking Boshan Ancient Kiln Village as an Example

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Abstract. With the acceleration of urban modernization, the improvement of productivity, and the advancement of science and technology, people have higher and higher requirements for the quality of life, and the production of ancient methods has been updated and iterated, and folk architectural heritage has not been paid attention to. After the 1990s, the ceramic industry was gradually replaced by tourism, and the mass production of factories replaced earth kiln workshops. The development of urbanization made modern buildings replace traditional architectural features, although the contradiction between "modern" and "traditional" was prominent. The 2020 Boshan Ceramics and Glass Art Biennale officially opened in Boshan Ancient Kiln Village, which was renovated on the basis of old street buildings. Taking Boshan Ancient Kiln Village as an example, in order to make the folk architectural heritage valued, this paper discusses the application of the steamed bread kiln in the urban development process from the historical development of the main kilns in Boshan, the structural characteristics of the building itself, the combination with the surrounding buildings and the sustainable development.

Keywords: component; Ancient kiln village; protection; utilization

1. An overview of the historical city of Boshan

Boshan was called "Yanshen" in ancient times. It has rich cultural landscape. A Xiaofu River runs through it. It has a long history. There is Ancient Battlefield of the Long Spoon, Yanshen Temple, Yin Garden, Fan Gong Temple, etc. It is also the hometowns of many historical celebrities, such as the teacher of the Qing Dynasty's emperor Tingquan Sun, Qing Dynasty poet Zhixin Zhao, and people's role model Comrade Yulu Jiao, etc. Boshan has four major cultures, namely, the filial piety culture represented by Wenjiang Yan, the Qi culture represented by the Great Wall of Qi, the industrial culture produced by the abundant mineral resources - the Ceramics and Glass culture and the Ancient Kiln.

The ceramic industry is called "kiln industry" in Yanshen Town. The important origins of Boshan ceramics are Dajie, Wulong, Shantou, Beiling, Fushan, Shitanwu and other places (Figure 1). "In the late Tang Dynasty, the first kiln fire was slowly lit in Boshan, starting a thousand-year-long history of ceramic glaze production. Boshan generation used earthen utensils and dug to build kilns, which were passed down from generation to generation, creating distinctive features and ancient kiln culture [1].

Ceramic origin

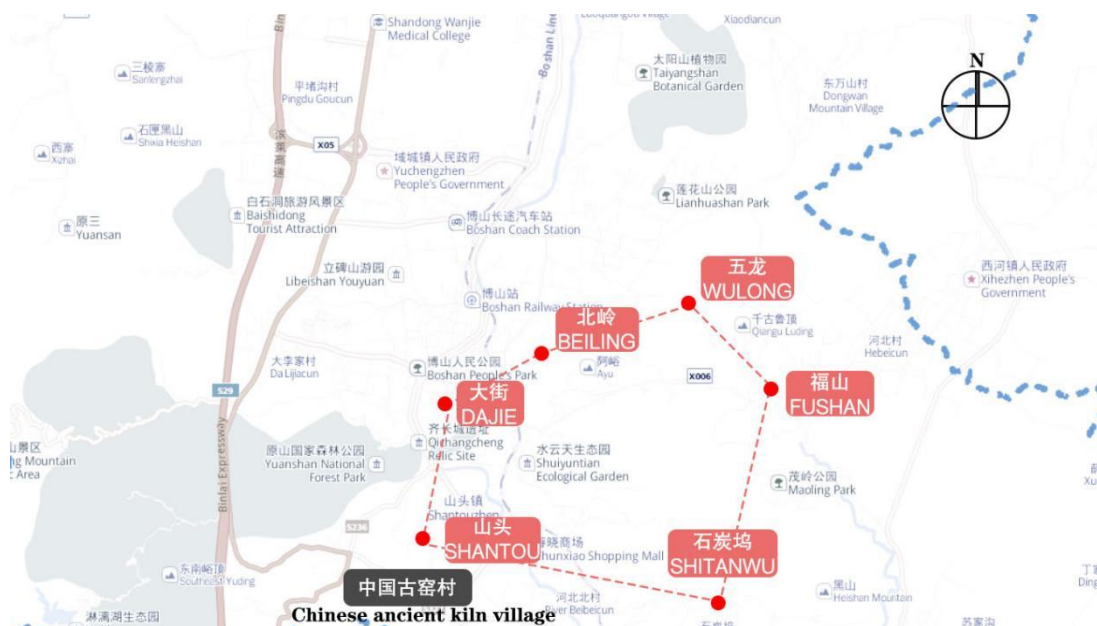


Figure 1. Important Origin of Boshan Ceramics

2. History and Development of Steamed Bread Kiln

The millennium kiln industry in Boshan is confirmed by the history of the ancient Chinese kiln village in Boshan District, Zibo City.

Yanshen Ancient Town is the birthplace of Boshan Ceramics, a famous industrial town and the home of pottery and glaze. The town was established in 1935. In 2006, the building complex of Ming and Qing Dynasties in the town was designated as a municipal key protection unit by Zibo City. In 2007, it was designated as "Chinese Ceramic Ancient Kiln Village". It is the main birthplace of the five major ceramic bases in the country, Zibo Ceramic Base.

"Shandong Tongzhi" said that "its benefit to the people is no less than that of Jingdezhen on the right side of the Yangtze River", which has a greater influence [2]. Boshan ceramics first appeared at the end of the Neolithic aged 8,000 years ago in the "Post-Li Culture". During the Dawenkou culture, the ancestors of Boshan invented the pottery cart, and fired white pottery with the abundant local kaolin. At the beginning of the Western Zhou Dynasty, the state of Qi established the special position of "pottery official" for managing the production of pottery. During the Tang and Song Dynasties, Zibo produced a batch of influential ceramic products. Porcelain kiln was destroyed by the war in the Yuan Dynasty, coupled with the impact of Jingdezhen. The development of Boshan kiln was stagnant. Boshan ceramics re-emerged in the Ming Dynasty and prospered for over 400 years. During the Qianlong period, seven major kiln factories (Figure 2, Figure 3) were formed in Boshan, and the ancient town of Yanshen developing in Shan Tou, was one of them.

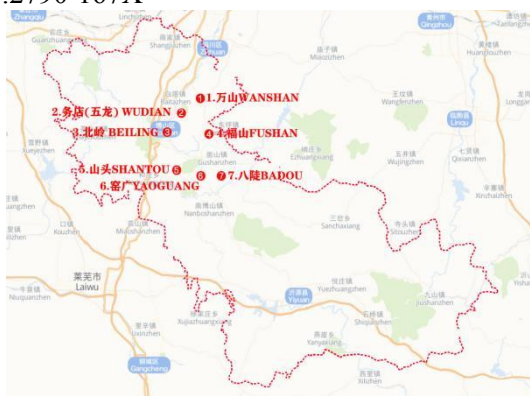


Figure 2. Distribution map of the seven major kiln factories in Boshan

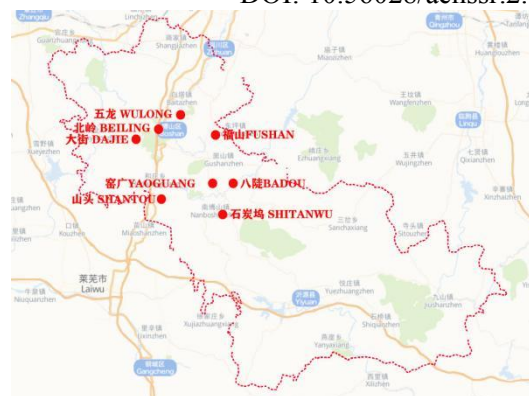


Figure 3. The main distribution map of Boshan steamed bread kiln

Shantou area is mountainous, rich in mineral and coal resources, and contains high-quality clay. The local people make a living by making kilns, and there are countless large and small kilns. The special chimney is named the steamed bread kiln because it looks like a steamed bun. From the plane, it is in the shape of a horseshoe, so it is also called a horseshoe kiln. The appearance of the steamed bread kiln can be traced back to the Western Zhou Dynasty. It is a well-documented porcelain-fired kiln in the northern region [3].

As the saying goes, "the head rests on the golden top, and the feet step on ten thousand lamps". The Qing Dynasty poet Zhixin Zhao was buried on the top of the mountain. Lamps are used to describe the number of steamed bread kilns.

According to the Records of Boshan Ceramics Factory, before the founding of the People's Republic of China, there were many private kilns in Shantou, and there were more than 140 round kilns. With the encroachment of the years, today, there are only about 20 steamed bread kilns in Ancient Kiln Village [4].

With the development of the city and the advancement of technology, Boshan Ceramics Factory built the first coal-fired tunnel kiln in the country. Since then, the "steamed bread kiln" has gradually withdrawn from the historical stage.

3. Application of steamed bread kiln

The steamed bread kiln has unique structural characteristics, so it has contributed to the production of ceramics. Its shape is interesting and beautiful. It can also be used as building materials and pavement in the process of urban renewal. After the renovation, it can also be used as an ornamental landmark building.

3.1 . Structural characteristics of Boshan steamed bread kiln

The steamed bread kiln is a semi-down-flame round kiln. The structure of the kiln is divided into six parts: the kiln room, the kiln door, the passage, the fire chamber, the kiln bed and the chimney. The kiln body of the "steamed bread kiln" is cylindrical, with a spherical crown-shaped kiln roof and a circular hole at the center of the top. There is a kiln door in front of the kiln and two chimneys behind the kiln. The front of the kiln is the fire chamber, the back is the kiln platform, and the lower part of the fire chamber is the "bottom whistle". The outer body of the kiln is the base of bluestone, and the kiln body is made of saggar as raw material. Chimneys stand tall and are made of saggars or refractory bricks. The inner wall of the ancient kiln is extremely thick, with lime black bricks. The kiln wall gradually shrinks to the middle, which is very artistic [5].

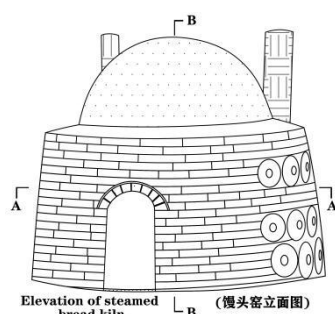


Figure 4. Elevation of steamed bread kiln

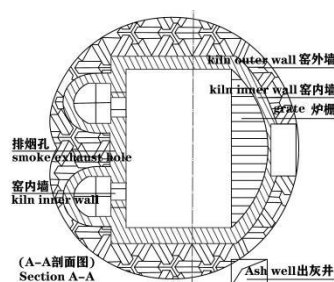


Figure 5. Section A-A

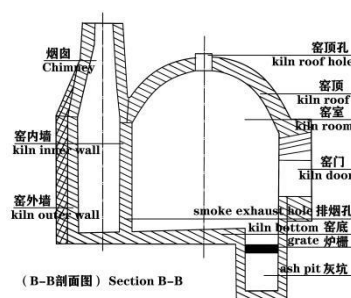


Figure 6. Section B-B

The kilns fired by Boshan Ceramics were originally coal kilns and wood kilns. The working principle is as follows. During firing the flames, firstly, they were sprayed from the firebox to the top of the kiln. Secondly, they were poured down to the bottom of the kiln. Finally, they were passed through the fired products and exhausted from the side wall of the kiln bottom (Figure 4 ~ Figure 6). Flue gas enter into the vertical flue of the sandwich wall and discharge. "Boshan District" records the process of firing pottery in intermittent circular kiln: raw material crushing, ingredients, grinding mud, stale, glazing, repairing white blan, drying, decoration, kiln installation, firing, kilning out, acceptance, and bundle from the factory [6].

There are three types of kilns: large kilns, medium kilns, and small kilns. The size of the steamed bread kiln is described by "rowing columns", which means that the finished pottery blanks of the steamed bread kiln will be placed in saggars, and then calculated by the number of saggars. As for vertical column, specifications include 4 rows of 8 columns, 5 rows of 10 columns, 6 rows of 12 columns, etc [5]. Judging from the current research and historical data research, the largest kiln in the ancient kiln village is the specification of seven rows and fourteen columns. If calculated by 5-inch diameter pottery bowls, the largest steamed bread kiln can fire 120,000 pottery bowls at one time.

Advantages and disadvantages are as follows. The fire chamber and the kiln room are combined into a steamed bun-shaped space. The advantages are that the volume is the largest, the heat is uniform, and the yield is high. The disadvantages are that it installs a furnace and light it once causing burning it for seven or eight days, which are low efficiency and serious pollution.

3.2 . The application of steamed bread kiln in urban renewal

In the past, steamed bread kiln, as a production tool, occupied a major position in the combination with architecture. The economic base determines the superstructure, and the kiln compound is a major feature in the local area. It integrates production and life into one, which not only solves the problem that the kiln occupies a large area, but also improves production efficiency and saves time. At the same time, the kiln is also a symbol of status. After all, only big families have economic conditions. The kilns are located in different positions in the courtyard, which is a derivative update of the courtyard building. At the same time, the shape of one circle and one side has become the biggest feature of the courtyard construction of the ancient kiln village.

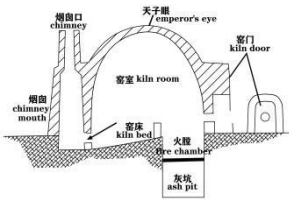















Besides, the saggars is used to turn waste into treasure and promote local sustainable development. Since the saggars used in ceramic production are consumables, they must be replaced after repeated use. As a derivative of the steamed bread kiln, the residents of the ancient kiln villages used their wisdom to use them as building materials and paved the ground.

Nowadays, most of the steamed bun kilns are abandoned or damaged, but they are still a symbol of ancient kiln culture, so the production building has been transformed into an ornamental building. Due to its unique shape and interesting structure, today's steamed bread kilns are like totems or landmark buildings, which are admired and visited by people, and also promote the development of

local tourism. Now in the ancient town of Yanshen, the bluestone road, zigzag can be seen everywhere. Household kilns as a kind of folk architecture has become a holy place for Internet celebrities to check in, attracting a large number of tourists, conveying Boshan culture at the same time.

The steamed bread kiln has played a role in the past and present life from a production type to a landscape type. Its application also promotes sustainable development and has become a local landmark with far-reaching influence.

Table 1 Steamed bread kiln application summary

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	Ceramics produced in steamed bread kilns			1. The production function of steamed bread kiln. Make ceramics as a production tool for subsistence.
	 Ru kiln	 Ding kiln	 Jun kiln	
	The combination of steamed bread kiln and architecture			2. Kiln and courtyard: as part of the building complex. Most villagers choose to place the kiln in a corner of the courtyard, making the kiln a natural barrier for their own courtyard.
				
	As wall material, floor covering			3. Pavement as building materials. The sturdy, beautiful and distinctive paving and walls have become architectural features, turning waste into treasure.
				
	As ornamental architecture, cultural attraction			4. As ornamental buildings and cultural attractions. Interior glass viewing gallery and elemental merchandise.
				

4. Conclusion

Early years, the "Venice Charter" in 1964, the "Machu Picchu Charter" in 1977 and the "Washington Charter" in 1987 emphasized the protection and development of culture and folklore. Jicai Feng established the first intangible cultural heritage protection data center in our country. He advocated to retain the characteristics of traditional villages, retain nostalgia, and retain the spiritual and cultural value of the village.

With its unique structural appearance and production methods, from ancient times to the present, Boshan Bread Kiln has played a role in production, by-product, a building community, and a landmark building, etc, and has become an important representative of Boshan folk architecture.

Although folk architecture has been gradually eliminated in historical development, its cultural and architectural features are immortal, and it can exist in another form and exert its residual heat. Buildings carrying history are witnesses of local history and culture. The Bread kiln recording the prosperity and glory of the era of large-scale production reflects the national culture and social

outlook of the time. The Ceramics containing thousands of years of ceramic history and culture need us to protect, develop and benefit. Thus, the cultural atmosphere, humanistic feelings and spatial structure characteristics of folk architecture with a strong sense of belonging are reproduced in the contemporary urban space.

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