



Analysis of Traditional Architectural Screen Wall Design Ideas Based on Science of Design

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Abstract. Based on a deep understanding of the methodological origins of the design methodology, explore for the relationship between the philosophy embedded in it and the traditional architectural screen wall, and analyze the idea of the creation of the screen wall from two aspects of the theory: “facts” and “truth-seeking”, and sort out the process of the creation and evolution of the screen wall. It proves that designers on the need to focus on human needs in their design activities, which is the essence of design.

Keywords: traditional architectural screen wall · science of design · design ideas

1 Introduction

Modern architecture is complex and diverse, and has developed a specific culture, but there seems to be little discussion about where they came from, why they were founded, and what changes have been made to form the style that people like. These thoughts are particularly important for designers to understand the nature of how man-made things are created in order to be truly innovative. For this reason many researchers have explored this area. For example, Jing Pei and Kefan Zhang has combined the theoretical basis of science of design to interpreted the traditional Chinese architecture [1, 2]. However, there is a lack of research on the cultural and design concept analysis of architectural components at present. Therefore, this paper takes the traditional architectural screen wall as an example and combines it with science of design to sort out the design thinking contained in traditional architecture and enrich the research system of design deontology in modern architecture.

2 The Origin of the Concept of Science of Design

In the 1980s, Herb Simon, in his book “The Science of Artificial”, proposed a symmetrical way of looking at artificial things, that is, man-made things are divided into “internal environment” and “external environment”. The internal environment refers to the organization and composition of the thing itself, while the external environment refers to the environment in which the thing is located at the moment. The way to achieve the purpose or function of man-made things is to adapt the “internal environment to the external

environment”, and the process of design is to study and find the ways and means to adapt to the external environment [3].

Mr. Guanzhong Liu combined Simon’s concept with the theory of “operational research” and incorporated it into design practice, on the basis of which he proposed the theoretical approach of the science of design. The theory emphasizes that the design process begins with the discovery of the “facts”, which is to determine the content of the design, including examine the actual needs of the target group under the influence of different environmental and temporal factors, and summarizing the objectives that the design should achieve. Then “seek truth”, including choose materials, technology, shape, color and other elements, and finally create a “thing” can solve the problem and meet the needs [4].

The study of relevant “facts” and its connection with “truth-seeking” is emphasized in the science of design. From a single living space to a variety of architectural complexes, the formation of architectural culture does not happen overnight either. By looking at the evolution of architecture, we need to focus on multiple influences, rather than a single cause, and by looking at it through the lens of design chronology, we can analyze both internal and external causes in a more comprehensive way, thus forming a systematic understanding.

3 The Relevance of Architectural Screen Wall to the Science of Design

The science of design declassifies design as a purposeful human creative activity. In this definition, there are two elements in design activity: one is purpose, the other is creativity, and purpose is the ultimate point of human creation [4]. In other words, with the continuous change of people’s living needs, the development of architecture has never stopped. From the primitive era of live in cave, the prototype of screen wall emerged. During the long period of feudal society, the screen wall even gradually became a symbol of family rank, official rank and wealth. As an important part of ancient architectural space, the process of first building because of the awareness of the needs, then finding shortcomings during the residence and improving, and finally achieving the purpose and meeting the needs, it is the practice of design.

Therefore, although the science of design is an innovative theory for future design, it can still be used to explain the development of traditional architectural screen wall, which helps to understand the nature of screen wall invention, as well as the interrelationship with space and environment. This can promote the thinking what is the “facts” of modern architectural design, and carry out more in-depth design.

4 Explanation of the Science of Design of Screen Wall

4.1 The “Facts” Dimension of the Screen Wall

4.1.1 The Embodiment of Zhongzheng Thought

In traditional Chinese culture, under the influence of the etiquette concept, the thought of Zhongzheng is everywhere, which is best exemplified by the widespread adoption of the

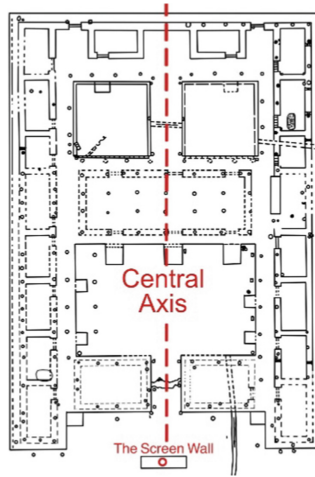


Fig. 1. Plan of the Western Zhou building site (Photo credit: Briefing on the Excavation of the Western Zhou Building Site in Fengchu Village, Qishan, Shaanxi. Redrawn by author)

concept of “central axis” in architecture [5]. The most typical example is the Forbidden City in Beijing, whose overall layout and strict sense of order were influenced by the “central axis”, highlighting the main palace and the Mingtang on the axis.

Set the gate on the central axis of the courtyard wall, so that the central axis of the gate coincides with the central axis of the main building, is not only an important means to form the overall stability and solemnity of the exterior of the building and to give the courtyard space a sense of order, but also a basic method to form a sense of integrity and continuity of the architectural space. At the same time, under the influence of ritualistic thinking, it is often assumed that a central position is more indicative of dignity [6]. However, in ancient times, the setting of the “door” is equivalent to framing a space where positive or negative forces converge. If the residence is facing the courtyard gate, it will be infested by the legendary inauspicious object. In other words, in the minds of the ancients, there is a contradiction between this request that occupying a central position, maintaining the central symmetry of the complex and this practice of traditional dwelling practices that should be shielded from disturbance. One way of resolving this contradictory ‘thing’ was to build a strong enough shelter at the entrance to the building to screen the entrance to a certain extent, satisfying the axial character of the building while avoiding interference with the interior space, and so the screen wall was invented and used. For example, in the Western Zhou palace building site excavated in Fengchu Village, Qishan County, Shaanxi Province, there was the remnant of screen wall located four meters in front of the palace gate (Fig. 1). To some extent, it occluded the entrance of the courtyard but did not destroy the axial symmetry of the courtyard, and it also creates a circuitous space in front of the door, which satisfies people’s defensive psychology for the entrance of the courtyard.



Fig. 2. The double dragon screen wall in Longxing Temple, Zhengding County, Shijiazhuang City, Hebei Province (Photo credit: Internet)

4.1.2 Influence of Regional Culture

As a part of traditional architecture, the screen wall has been gradually integrated into the living environment of ethnic minorities in the North and South as the culture of the Central Plains spread. But on the basis of inheritance, it has been transformed and reconstructed by combining geographical characteristics, humanistic features and aesthetic ideas, forming a screen wall culture with its own ethnic characteristics.

Firstly, it plays an important role in the regulation of temperature [7]. In northern China, cold air is easy to blow into the inner courtyard, the screen wall in the courtyard to play a role in blocking the cold and insulation, while in the southern regions of the summer heat, the need to rely on air flow to cool, therefore the wall has more openwork carving, the wind can blow into the courtyard and bring down the temperature. Secondly, the screen wall for the Courtyard House light regulation also has a great role [8]. For example, the Bai ethnic group in Dali, worshiped the sun, often built houses facing the sun, this results in buildings that are too well lit in the morning, but too poorly in the afternoon. At this time, the screen wall can block part of the sunlight in the morning and reflect the light into the courtyard in the afternoon.

Influenced by cultural characteristics and aesthetic ideas, the costume forms of different ethnic groups are also different in style, especially the color of the screen wall. In northern China, influenced by nomadic culture, the style of the screen wall is heroic and atmospheric, using high saturation, strong contrast, bright colors, and decorated with a variety of three-dimensional carving. For example, the double dragon screen wall of Longxing Temple in Zhengding County, Shijiazhuang City, Hebei Province. The wall is painted red, the top and the heart of the wall are green glazed brick wrapped, the central pattern is the double dragon play bead figure, the four corners of the pattern is peony, the whole wall color contrast is bright, eye-catching, gorgeous solemn (Fig. 2). In the south, influenced by farming culture and ethnic minority culture, the colors are mainly blue, green and white, supplemented by color paintings, and the style of brick carving has a lively and rich sense of hierarchy. A typical example is the screen wall of folk houses in Dali, Yunnan Province. The color is elegant, and the warping angle of the eaves on the top of the wall forms an upward arc, making the whole light and lively (Fig. 3).

4.1.3 Expression of Spatial Rhythm

Ancient Chinese architectural art emphasizes the symmetry and balance, and the integration of space conforms to the principle of conforming to nature and blending in



Fig. 3. The screen wall of the ancient residence in Dali, Yunnan (Photo credit: www.dllyjszx.com/article-363.html#)

nature. The screen wall opposite the main door forms a space extending from inside to outside of the building, and also becomes a gray space that makes the courtyard space integrate and transition inside and outside [9]. Whether from the inside of the building to the outside, or from the outside to the inside, there is a slow psychological transition process, which makes people feel a spatial transformation (Fig. 4.1). The screen wall outside the door of residential buildings does not prohibit pedestrians passing, but it will make people unconsciously think that the public domain at the gate of the courtyard belongs to the building. And the wall inside the main entrance increases the spatial level and visual transformation inside the building, when people pass from the wide exterior street through the courtyard gate and then enter the interior courtyard, the scale of the space they are in changes from large to small, and then to large again (Fig. 4.2). This creates a rhythmic and rhythmical visual and psychological spatial scale from the exterior to the interior of the building, under the influence of “cadence”, the comfort of space is also enlarged.

The presence of the screen wall and the gate are complementary. Although it is a wall, it is quite a finishing touch at the entrance of the building due to its elaborate design creating a different sense of spatial atmosphere in different building types and different locations. Among the different building types, the walls of residential buildings are more diverse and dainty, with outstanding regional characteristics, while those in public buildings such as palaces and temples and Taoist temples are more imposing and grand in scale. It set up outside the door are either tall or intricate, adding to the solemn and mellow momentum of the building’s main entrance, while the walls inside the door are either small and delicate, or elegant and exquisite, creating a quiet and harmonious atmosphere.

4.2 The “Truth-Seeking” Dimension of the Screen Wall

Early in the era of cave dwelling, mankind, out of the need to prevent the invasion of wild animals, in front of or inside the cave entrance, stacked stone low wall, which is perhaps the earliest prototype of screen wall [10]. During this period, both living and building had to done to obtain materials from local sources, so choose unpolished and primitive stone. The screen walls in the Western Zhou Dynasty architectural sites mentioned above are made of rammed earth, and at this time the construction technology belongs to “the Thatch earth steps” stage, the practice of plain earth tamping is common and skilled.

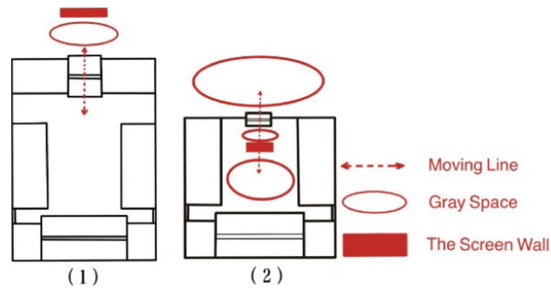


Fig. 4. Plan of the screen wall at different locations (Photo credit: Original)

During the Xia, Shang and Zhou periods, the ritual system was strict, except for the palace building, the regular residential buildings cannot be set up screen wall. According to the “Book of Rites”, the emperor’s building with a screen wall outside the gate, the wall of a vassal’s house can only be inside, the officer used a curtain; the scholars used only curtains [11]. The “screen” mentioned therein is generally made of wood or stone. In the Han and Jin dynasties, due to technological advances, wood was used in the construction of houses, and the range of use was wider and the decorative patterns were more diverse. In the painting of “Wenji Gui Han”, a wooden screen wall is depicted, with the ridge on top, covered with tiles. And the basic structure of the screen wall is clearly visible, providing a strong basis for the research on the history of screen wall development [10].

During the Tang Dynasty, the art of brick carving flourished and its use was gradually transferred from underground burial chambers to various types of buildings above ground [12]. The Song and Jin Dynasties, brick carving and decoration technology quickly developed into a unique art form. Blue bricks were widely used in the construction of screen walls with more standardized construction techniques. During this period, screen walls gradually developed from a part of palace buildings to folk buildings and were widely used in residential buildings. In the Northern Song Dynasty, Wang Ximeng’s “Qianli jiangshan Tu” depicts resident courtyard with screen walls (Fig. 5).

During the Yuan, Ming and Qing dynasties, the screen wall developed into a mature period, which formed relatively complete structure and shape, and the decoration and depiction were more vivid and delicate. Due to the rapid development of economy, architectural art became more and more prosperous, and this period was the heyday of glazing firing technology. And the use of coloured glaze in architecture also entered a flourishing stage, it began to be commonly used in royal architecture, so glazed screen walls appeared in large numbers in this period. However, due to the high production cost, most of them are used in palace and public buildings, and the folk houses still use blue bricks.

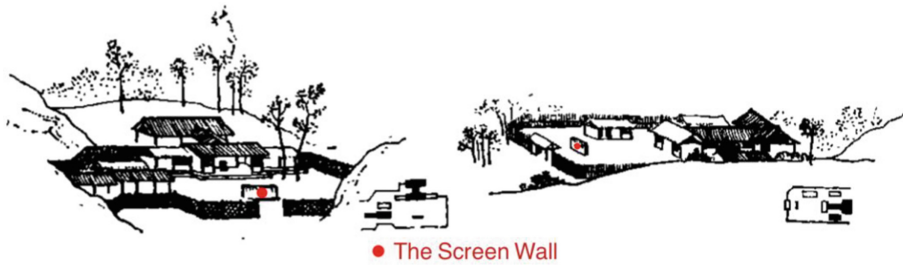


Fig. 5. The courtyard in “Qianli jiangshan Tu” (Photo credit: Palace Museum Journal. 1979, (02))

5 Conclusion

By analyzing both the “truth-seeking” and “factual” aspects, we can find that the screen wall, as a part of ancient Chinese architecture, did not appear without any basis, and its creation and evolution were influenced by multiple “people” and “things”. The wall was invented under the influence of ritualistic thinking, and then through the exploration of construction techniques, a variety of methods and processes have been derived. And with the development of time, under the influence of feudal class ideology, more forms and specifications were created and were widely used in folk architecture. This change in meaning is ultimately a reflection of the changing social ideology of the time, that is to say, regardless of how the screen wall has changed, it has evolved around people’s needs of functional and conscious. By clarifying the factors that influenced the creation of the screen wall in architecture, it proves that there is an inseparable interaction between the creation of things and the environment in which they exist. Design activities are not simply a game of shape and decoration, but that the only way that the good design to have more creativity and practical meaning is to have a deeper understanding of the needs of people.

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