

Comprehensive Application of Bamboo Elements in Modern Interior Design

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Abstract—With the change of contemporary people's aesthetic taste, advocating the green and natural, fresh and healthy has become a trend of interior design. Bamboo elements are also widely used in modern interior design. This paper introduces the practical application of bamboo elements and materials and the interaction among bamboo materials, bamboo culture and interior design from various aspects. Also, it analyzes the deficiency of the application of bamboo elements in the current interior design and the future application prospect of bamboo elements.

Keywords—bamboo element; interior; modern

I. INTRODUCTION

In traditional Chinese culture, bamboo is praised because of its crispness, elegance, proud snow and frost, and outstanding appearance by the Chinese people, especially by literati and poets, which are consistent with the traditional Chinese aesthetic taste and ethical and moral concepts. Therefore, bamboo has been endowed with the reputation of perseverance, modesty and style of "gentleman". [1] In the historical process of Chinese civilization, bamboo, a special natural substance, has already penetrated into many aspects of the material and spiritual character of the Chinese nation, but also penetrated into the fields such as culture, religion, art, ethics, and also added a different unique color to Chinese traditional culture.

II. THE CONNOTATION OF BAMBOO ELEMENTS

A. Excellent Physical Properties

Bamboo is the plant growing fastest in the world. It has a short growth cycle and a fast cycle, which is 1-3 times faster than the average tree. Therefore, bamboo materials are cheap, widely distributed, and easily to be adopted. Secondly, bamboo is a hollow stem plant with a circular tubular structure. Its cross-section is hollow, light, and strong. With jointed body, its wall thickness is tough and elastic, and its main pole is slender. In addition, the hollow and thin-walled structure of bamboo, the slender shape, and the stress characteristics of easy split along the grain form a good cylinder structure in mechanics, which reduces the processing difficulty of bamboo materials. In addition, the energy consumption of bamboo is very low. The results show that the energy consumption of bamboo is much lower than that of concrete and steel under the same building area.

B. Excellent Aesthetic Performance

Bamboo has natural texture, delicate and smooth surface. The green color is the main. Bamboo is quiet and elegant, and is an excellent decorative material. Bamboo poles stand tall and straight, and has knotty body. It shows a natural and regular protruding curve, and has strong rhythmic beauty. Because of the original natural attributes of bamboo materials, it can quickly create a unique artistic atmosphere of nature, which makes people involuntarily associate with nature. And it has a strong sense of introduction compared with other materials.

C. Strong Oriental Cultural Connotation

Japanese bamboo culture is deeply influenced by Chinese bamboo culture. After introducing Chinese bamboo culture into Japan, due to the different social and cultural backgrounds of Japan, bamboo culture has evolved and inherited continuously in Japan, and bamboo has been used in all aspects of production and life. And it has promoted the formation of the Japanese nation's idea of advocating nature.

III. APPLICATION BASIS OF BAMBOO ELEMENTS

A. Natural performance of bamboo

The color of bamboo is elegant, mainly including bamboo green, bamboo yellow and charcoal. The color is fresh and elegant, which gives people a fresh, quiet and natural feeling. Because of the original nature of bamboo, it is a natural green with vigorous vitality in people's eyes.

B. Bamboo Is Used as Material

In recent years, many countries in the world have made great efforts and achievements in the utilization of bamboo materials. New bamboo materials are constantly emerging. There are many kinds of decorative products which are processed and comprehensively utilized with bamboo raw materials, such as, bamboo flooring, bamboo wallpaper, bamboo wallboard, bamboo ring sandwich board, rotary cutting board, bamboo silk board, and bamboo knitted decorative board and so on.

1) *Ground laying materials*: At present, bamboo composite wood-based panels are frequently used as ground paving materials. Bamboo composite wood-based panels are

made of bamboo as the main raw material, processed with other materials, and processed by a specific process. They have the characteristics of heat insulation, good wear resistance of surface paint film and durability. In addition, bamboo composite wood-based panels can also make up for the defects of traditional wood floors which are easily to be deformed, damaged and damped. More importantly, bamboo composite wood-based panels can be directly paved without building a keel, which has saved a certain amount of indoor space [2]. With natural bamboo texture and fresh and elegant color, it has been widely used in indoor space ground laying.

2) *Wall paving material*: In recent years, bamboo wood-based panels, bamboo plywood, bamboo skin and so on are common on the wall. Bamboo wood-based panels have the advantages of low cost, long life, and low water absorption. The strength of bamboo is higher than that of wood formwork, and the weight of bamboo is lighter than that of steel formwork, which is conducive to environmental protection. Bamboo plywood, which is made of bamboo strips laminated vertically and horizontally, has unique texture and color, and is often used as wall panels. Bamboo skin is very thin and flexible, and retains the inherent texture. More importantly, bamboo skin can handle light well, and will not produce dazzle light, which are very important for interior space.

3) *Structural frame materials*: The bamboo frame structure is composed of beams, columns and arches. Structural frame materials need to process bamboo. At present, the main processing method of structural frame materials is heating, straightening or bending with charcoal fire or gas gun. In addition, bamboo material is now developed as a kind of hybrid structure which combines with steel structure, reinforced concrete, metal connectors, membrane structure and masonry structure. This kind of hybrid structure can make up for the shortage of single bamboo material. In addition, the current new bamboo inheritance materials can even crush and glue bamboo materials so as to improve and strengthen their physical properties.

4) *Bamboo furniture*: Bamboo has the characteristics of compactness and toughness, and is an excellent furniture material. At the same time, the original natural attributes and authenticity of bamboo can bring specific natural tactile and visual feelings to people in interior space, and make indoor and outdoor space interrelated [3]. Common bamboo furniture include: round bamboo furniture, bamboo chip furniture, bamboo integrated furniture, bamboo scrap material furniture. With the technological innovation of bamboo technology and the emergence of bamboo wood-based panels and bamboo laminates, the material structure and shape of bamboo furniture are more diversified and artistic. This kind of bamboo furniture not only retains the charm of traditional bamboo furniture, but also meets the needs of modern aesthetics, comfort and convenience.

5) *Bamboo elemental displays*: Making different bamboo decorations with different bamboo species is a common use of bamboo materials. It can form different decorative sketches in interior design, incorporating art in nature, which makes people feel natural, fresh and elegant, and has a long history of artistic conception. Common bamboo species for bamboo display are as the follows. *S.tunghomii McClure* has thin bamboo wall, long bamboo fiber, fine material, and good toughness, and it is a very good weaving material. *Dendrocalamus barbatus Hsueh et D. Z. Li* has dark green bamboo joints. The material is fine, and is often used as decorative bamboo raw materials. *Fargesia spathacea Franch* has compact and tough bamboo material, and it is an excellent decorative material.

IV. FORM CONSTRUCTION OF BAMBOO ELEMENTS IN INTERIOR DESIGN

A. *Application of Bamboo in Courtyard*

Bamboo has been praised and chanted by many scholars and poets since ancient times because of its crispness, uprightness and evergreen seasons. Therefore, bamboo is an indispensable plant arrangement in the oriental courtyard. In addition, bamboo sticks with smooth body are often used to make fence walls or partition screens in the courtyard to create a quiet environment with Zen spirit. The common method of making bamboo is to arrange bamboo sticks with smooth, thick and thin bamboo vertically or horizontally, tied with bamboo ropes or bonded with special glue.

B. *Application of Bamboo in Hotel Lobby*

In the application of bamboo in hotel lobby, bamboo is moved from outdoor to indoor as a green scenic spot. It is often used in hotel lobby (especially in Chinese style hotel) to combine with landscape landscaping organically to create an elegant and dignified lobby space environment. In addition, other more common methods are to place smaller bamboo bonsai (such as *dracaena sanderiana* and *Rhapis excelsa* "Thunb." Henry ex Rehd) at the entrance of the hall, which plays an ornamental role, and has the meaning of "peace, wealth and auspiciousness".

C. *Application of Bamboo in Tea Room*

The use of bamboo elements in tea rooms is mainly manifested in bamboo processing decorations, tea room furniture (tea seats, etc.) made of bamboo as the main material, bamboo shutters, and bamboo screens made of bamboo materials to partition space, together with decorations such as bamboo slips and bamboo plaques, bamboo hanging calligraphy and bamboo carvings, which give more cultural and artistic connotations to tea rooms. In the use of bamboo elements in tea rooms, designers often skillfully use bamboo scenery for artistic creation, but also use the common framing and borrowing techniques of ancient gardens, so that the tea room is full of poetic and picturesque. The use of bamboo elements in tea rooms endows the whole space environment with interest, style and atmosphere, creates a comfortable, leisure and elegant indoor

tea room space, creates an artistic atmosphere of tea charm and bamboo charm, and meets people's needs for a high-quality spiritual world.

D. Application of Bamboo in Residential Space

The application of bamboo in residential space is mainly to add and supplement bamboo elements to residential space, such as mainly ornamental bamboo and raw bamboo decoration, which adds green and vitality to residential space and brings nature into residential space. The arrangement of ornamental bamboo in the indoor space is very exquisite. Taking the indoor living space as an example, people mostly put bamboo as a greening plant directly in the living space, mainly in front of the porch, balcony and landing window. The use of bamboo in residential space creates a fresh, simple and natural space charm.

V. SPIRITUAL CONSTRUCTION OF BAMBOO ELEMENTS IN INTERIOR DESIGN

A. Connotation and Significance of Modern Bamboo Culture

Cultural connotation has always been the core of modern interior design. Therefore, the connotation of bamboo culture is constantly developing and improving with the changes of the times. People's understanding of the connotation of bamboo culture can be divided into several stages, and the most direct intuitive feeling is the most important one. The shape of bamboo, the application of bamboo crafts and bamboo decorative materials in interior design are the most intuitive perception of bamboo culture. Secondly, in the interior space full of bamboo elements, people can feel the artistic conception beauty after the integration of bamboo elements and space. The last stage is to understand the bamboo culture on the basis of feeling the artistic conception created by space, which is also the most difficult stage. In addition, whether bamboo plants are placed in the interior space or bamboo materials are used for interior decoration, bamboo elements are introduced into interior design; natural elements are introduced into the design. It conveys the modern design trend of natural and harmonious symbiosis. At the same time, bamboo culture is an integral part of Chinese traditional culture, and constantly adapts to the changes and development of the times to the contemporary era. It has formed the modern cultural connotation of advocating nature, low-carbon environmental protection and people-oriented.

B. Creating a Cultural Atmosphere in a Specific Place

When bamboo is used for indoor space environment landscaping, it is usually used in places with specific cultural connotations, such as tearoom, cultural halls, theme restaurants, etc. The more straightforward method is to combine the poems, paintings, calligraphy and prints related to bamboo with other decorative elements in the indoor space directly, or to combine historical allusions related to bamboo to create a cultural artistic conception of space. In addition, the creation of artistic atmosphere often imitates some methods of landscape design. The creation of artistic

atmosphere of bamboo landscape is mainly based on bamboo culture, which promotes bamboo design. People expand the associative space in the interior space, but also realize that bamboo is a special natural substance, which promotes the extension of the interior space artistic conception.

C. The Way to Better Integrate Bamboo Culture into Interior Design

As a concrete carrier of bamboo culture, bamboo is applied to interior design, which increases the cultural depth of interior space. The interior space has also become a carrier of bamboo culture. The interior space decorated with bamboo has become the expansion of bamboo culture [4]. From this point of view, bamboo material, bamboo culture and interior design are inseparable as a whole, which also provides some ideas on how to better integrate bamboo culture into interior design. When bamboo culture is integrated into interior design, bamboo culture can be better integrated into the design if the relationship among the three can be well understood and comprehensively applied; the elements of bamboo culture can be reconstructed and reorganized in combination with the times; and its integrity and coordination are emphasized. In addition, if the designers want to innovatively integrate bamboo culture into interior design, it is necessary to rely on bamboo culture. Bamboo culture is a part of traditional Chinese culture. Therefore, bamboo elements can be used as special design symbols in interior design to tap the vitality and source of interior design.

D. Significance of Green Environmental Protection and Sustainable Development

Green design concept is the trend of contemporary design. It contains two aspects: the concept of sustainable development and the concept of meeting green building materials. Bamboo is a truly pure renewable natural resource. Its advantages of low energy consumption and renewable performance conform to the basic concepts of sustainable development and green environmental protection, and also meet the concept of green building materials. At the same time, bamboo material is also in line with the original intention of green design concept, that is, to create a green, fresh and comfortable indoor space. Furthermore, the characteristics of sustainable utilization are also the regeneration of natural ecosystem, which reflects the coordinated development of human, indoor space and nature. While meeting people living needs, it reduces energy consumption to the lowest level and reduces environmental damage. [5]

VI. THE SHORTCOMINGS AND FUTURE APPLICATION PROSPECTS OF BAMBOO IN INTERIOR DESIGN

A. Deficiencies of Bamboo in Current Interior Design

1) Deficiencies of bamboo in application: At present, the application of bamboo in interior design in China is still in its infancy. The application of bamboo is still in the direct use of straightforward materials. However, there are fewer

types of bamboo that can be actually put into interior design, and most of the application methods are simple process and rough processing. The utilization level is low. It is normal that bamboo materials are moth-eaten and mildew. In addition, when bamboo is used as material, there is no perfect national standard from production to use, which limits the promotion of bamboo and bamboo materials. Bamboo materials should have anti-corrosion, anti-mildew, anti-insect treatment. Bamboo materials processing technology, durability, fire resistance, environmental protection and other requirements also need to meet the national standards.

2) *Lack of bamboo culture connotation*: At present, the application of bamboo in interior design in China and other countries in the world is mostly based on bamboo material as an additional decoration and performance carrier, or bamboo material is directly used for decoration. However, the cultural connotation and charm of bamboo are seldom integrated into the design. As the most common plant image in Chinese classical traditional culture, bamboo, known as "one of three durable plants of winter — bamboo" and "one of Four Gentlemen", has become the best repository for ancient literati painters to express the high and bright, two-sleeve breeze and tough spirit. At the same time, the fresh and elegant charm of bamboo makes it often appear in Yunmo landscape paintings and poetry and lyrics. Bamboo has fresh and elegant characteristics and environmental protection significance. How to integrate the strong cultural connotation and environmental protection significance of bamboo into the concept of interior design, rather than simply stacking bamboo elements in the interior space, is the most worthy of consideration and exploration by designers.

B. Future Application Prospects of Bamboo Elements

1) *Integration of bamboo elements and modern design ideas*: Green design concept is the trend and core of contemporary design. And bamboo is a kind of green environmental protection material, which can also coordinate with the indoor environment, be in line with the concept of green, environmental protection and fashion in modern design. In addition, with the continuous development of the times, interior design is more and more inclined to use new forms of expression. Bamboo materials can become more colorful in material expression. Bamboo materials and glass, bamboo materials and membranes, bamboo materials and metals, bamboo materials and bricks and woods, etc., collide and merge with each other among various materials of different textures, thus achieving unexpected artistic effects. And it will create a unique and innovative interior space, which is in line with modern design concepts, and the trend of the times.

2) *Bamboo becomes a new environmental protection material*: In today's world, with the continuous growth of population, human beings have been facing the problem of

exhaustion of various resources because of the excessive demand for nature. In the case of serious shortage of existing forest resources and timber, bamboo, as a renewable resource, has become a new environmental protection material for interior design. In addition, the green, environmental protection and sustainable concept is the current and future trend of the development of interior design, and bamboo processing materials will be more widely used in interior design.

3) *Combining with local characteristics and cultural connotations*: When using bamboo elements in interior design, the designers should also consider combining local characteristics and cultural connotation with design, and explore how to make bamboo elements originate from culture and integrate into culture in interior design, and how to embody national characteristics and local culture in design. And then, it can create new manifestations of bamboo elements. This kind of interior design development direction is in line with the current and future development needs of cultural diversity of interior design, and is a very viable design direction. Just as the world's largest bamboo application project, the use of bamboo elements at Spain's Capital Airport, can be regarded as a model of the perfect combination of local cultural connotation and bamboo. Richard Rogers, its designer, once said, "We need to conform to Spanish characteristics and have new things at the same time. Bamboo is the combination of traditional and organic materials." [7] In addition, we can start with the texture of bamboo. The plant texture of bamboo has certain particularity. We can turn to the natural texture of bamboo as the starting point of design to explore the texture of bamboo culture and even Chinese heritage. The historical and cultural texture displayed by traditional culture is developing towards the direction of "combining with local characteristics and cultural connotations".

VII. CONCLUSION

In recent years, bamboo elements have been widely used in interior design. Bamboo materials are developing in the direction of green and environmental protection, and the application forms of bamboo elements in interior design are more abundant. The future development direction of bamboo elements is very broad, and the current use of bamboo elements in interior design is still very single. How to expand the more use of bamboo elements and integrate them into contemporary design is still a difficult problem for interior designers. Culture is the essence of design, and the cultural connotation of bamboo and the charm of bamboo should be considered by designers. How to integrate the cultural essence of bamboo into the design, not only the use of bamboo in the design, or the use of bamboo elements, not the stacking of bamboo elements, so the use of straightforward bamboo is far from enough. What the designer needs to do is to make the use of bamboo elements not only in the shape of the concrete form, or just in the stacking of various bamboo materials. How to make the bamboo elements in the design separate from the simple visual appreciation, but to let

people feel the bamboo in this space. In this specific indoor space environment, it is necessary to feel the bamboo, deepen the understanding of bamboo culture, and expand people's understanding. Associative space promotes the extension of interior space artistic conception and creates comfortable and cultural interior space.

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