Research on the Architecture and Application Design of Naxi Residential Buildings in Lijiang, Yunnan Province

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***Abstract**: The unique artistic style and charm of Naxi residential buildings are the physical manifestation of Naxi people's diligence and wisdom. After field investigation and data measurement, Naxi residential buildings have unique layout form, structural space and decorative art elements. It is unique in scale, shape, inheritance and protection, forming the largest concentration of Naxi residential buildings in Dayan town, Lijiang, and the most complete state of architectural culture and component preservation. It is an important historical and cultural heritage that can not be copied in the world to study human civilization. Applied design research can reproduce the architectural features by miniaturizing the proportion and improve people's understanding of Naxi residential buildings.*

***Key word**: Naxi Minority; Residential Buildings; Decorative Elements; Application Design; Yunnan*

Lijiang is the Pearl of the western Yunnan Plateau. Naxi residential buildings in the ancient city take the mountain as the background and the water as the vein to form the style of free layout, high-low combination and fine level. The whole structure group embodies the charm of human settlements, ecological environment, and harmony between man and nature. The folk buildings in Lijiang ancient city, with the abundant physical products of ancient buildings, explain the inheritance and continuation of Naxi people's splendid cultural life, such as folk customs, worship of nature, absorption of advanced culture and religious belief. This general height has a great influence on the new modern urban buildings and residential buildings. It is an important practical basis for the study and consideration of the development of Naxi residential buildings, and also an important component of the study of the brilliant cultural process of Naxi people. At present, the application design of Naxi residential buildings is still lacking in the market or college practice teaching. The application design of Naxi residential buildings can help students to improve their understanding of the structure and space of ancient buildings. At present, from the perspective of the original building legacy, repair and treatment technology, on-site protection and appropriate conservation measures of Lijiang ancient city, the building state of Lijiang ancient city is more like simulating the ancient building community phenomenon, which has to cause social concern and thinking. However, this paper does not involve the phenomenon of simulating ancient building community, because it is not discussed.

The Overall Structural Form of Naxi Residential Buildings

Naxi residential building adopts civil structure, and the main bearing frame adopts Yunnan pine, which has been growing for more than 20 years and has a diameter of about 30 cm, and is painted with chestnut shell color. The gable is built to the roof with adobe bricks, while the rear wall of the yard is generally built at a

height of 4m, with three rectangular windows of about 1m above. A courtyard is made up of three rooms, with walls of up to 50cm thick. Naxi residential buildings are basically based on the common architectural forms of traditional residential buildings in China, such as three rooms with one screen wall, four courtyards with atrium, front banquet with back dormitory, one floor with one courtyard, one floor with two courtyards, two floors with two courtyards, etc., which are adapted to the geographical environment through partial reconstruction. Among them, the three courtyards with atrium are the most common architectural forms of Naxi residential buildings. In addition to the pattern of one front courtyard with one back courtyard, there are also a small number of two floors with two courtyards buildings.

The residential cluster area of Dayan town and Shuhe town represents the harmonious integration of Naxi residential building layout, shape, style and decorative art elements, which is the highest achievement of Naxi residential building. From the actual investigation, data and the building customs of Lijiang residential buildings, we can see that no matter the Naxi building with modern concrete structure or traditional civil structure, the roof adopts the traditional building material of our country - black tiles. The two ends of the gable ridge purlin of the civil structure building extend outward about 50 cm in a unified way, just like the four corners of the roof as a flying eaves structure, which makes the straight ridge and eaves line produce the beauty of curve. The most common layout of Lijiang residential buildings is three rooms with atrium. The basic orientation of the main house is facing the north and facing the screen wall. The second floor adopts the ratio of seven to eight (unit: foot, the most commonly used unit for Naxi housing construction), and the gable adopts the flat floor space with a total height of about 5m. Lijiang natives are generally shorter in height. Residential buildings are divided into seven to eight spatial proportion structure, which not only ensures the maximum utilization of raw materials, but also effectively adjusts the temperature difference between morning and evening. The height of the foundation of the main building is 50-100cm, which is obviously higher than that of the East and West Wing. Compared with the East and West Wing rooms, the main building materials and decorations are more simple, the color is more stable, and the carving is more exquisite. It is the place where the most powerful old man and master of Naxi family live. The East and West Wing rooms have a slightly lower ground base, so the overall house is relatively low, generally for young people and guests. If the family population is small, the West Wing houses are generally kitchens, livestock houses, or storage of food and production equipment. In rural areas, the second floor of the main house and the East Wing house generally does not live in people, but stores dry food, and the second floor of the West Wing house generally piles livestock and grass.

In the city, because of the geographical conditions and population density, the second floor of the room is transformed into a bedroom (the current residential inn is very typical), but the spatial structure of the building has not changed. However, this paper holds that the application of the screen wall in Naxi architecture is not a fusion of foreign architectural culture. No matter in form or decoration, Naxi screen wall is slightly thin, with small size, monotonous decorative elements and simple form. Because the screen wall is the essence and symbol of Bai architectural culture. The reference of Naxi architectural culture is worth pondering and studying, so we prefer to call the screen wall which occasionally appears in Naxi's architecture as the wall with rich structure. Modern Naxi residential buildings still retain the appearance characteristics of traditional buildings, but some changes have taken place in the local decorative components. Especially the interior decoration style adopts modern design concept and modern decoration material technology. Lijiang's pleasant climate and living conditions promote the formation of a large open space layout between the three rooms and the screen wall, which is an integral part of its residential buildings. The central area is generally

paved with black gray pebbles and tiles. The pattern is mainly bat, which means good luck. Around the yard, shrub grass, osmanthus, Yunnan camellia, pomegranate, papaya, cherry, tea plum, rose, rose and orchid are often planted. The gate is generally set at the junction of the East-West wing room and the enclosure according to the geographical location. The beams are painted with auspicious patterns and small sculptures on both sides. Rhododendron and other plants are planted in the hospital to create a practical, beautiful and elegant environment.

Decorative Art Elements of Naxi Residential Buildings

With the penetration of modern architectural language, a series of modern changes have taken place in Naxi residential buildings in Lijiang. However, no matter what kind of modern architectural form is injected, the traditional decorative elements such as "six doors", "hung fish", "tile cat" and bats are still a major feature of Naxi architecture.

"Six doors": cultural heritage

After absorbing the essence of architectural culture of Han, Bai and Tibetan people, Naxi gradually formed their own unique skills and distinctive Naxi decorative features. Six doors is the most representative element and the most wonderful part of Naxi residential building decoration elements, which has been retained until now. It is not only practical but also contains rich cultural meaning, which is an important basis for interpreting, analyzing and deconstructing Naxi culture.

The carved lattice of the six doors is decorated with animals, plants, characters, stories of characters, geometric patterns and so on. It evolved on the basis of myths, legends and auspicious patterns of the folk, revealing the humanistic customs of the cashier's western people. Most of the six doors are decorated with animal and plant patterns, most of which are bat patterns. Not only in doors and windows, but also in bat patterns, which means "five blessings and longevity" to symbolize good luck. There are also common plum, orchid, bamboo, chrysanthemum, lotus, pomegranate and peacock patterns. Naxi people adore frogs, so frog patterns inevitably appear in the decorative patterns of buildings. The first one is the pattern of characters. Naxi people are the achievers of the creation of characters. For example, Dongba characters with pictographic significance are admired by the world. The words "Fu" and "Shou" often used in door and window decoration are full-bodied and mellow, which complement the pattern combination around. The second is the pattern of the story, which is also an important reference for scholars to study the history and culture of Naxi. Among them, the most used patterns are “SanDuo god”, “coming-of-age ceremony”, “Dongba Sutra”, “The 3rd Kingdom of Yulong”, etc. This seems to be a vivid scene of life, depicting the inheritance of history and culture and the yearning for a better life. The third is the small geometric pattern, the common ones are cloud and thunder pattern, bead pattern, palisade pattern, rhombic pattern, milk nail pattern, rope pattern, vortex pattern, zigzag pattern, etc., which are mostly used as the decoration of door and window edges and play the role of finishing point.

The simple decorative elements of the six doors inherit the door and window components of Naxi folk houses, and on this basis, they are continuously protected, so that we can better inherit and develop the decorative art of the six doors of Naxi people with great personality.

"Hung fishes": application reference

Hung fish is a kind of wooden structure suspended on both sides of the ancient building gable. It was born in the ancient architecture of the Central Plains and existed for a long time. However, with the development of the times, the structural components of the hung fish gradually go away, which has been hard to find in modern architectural objects.

Hung fish construction has become a symbol of Lijiang residential buildings. Although it is small in size, it implies a variety of cultural significance. One is the symbol of reproductive reproduction, which refers to the original meaning of gender, spouse and multiple children. Under the influence of local religion, Buddhism and Taoism, Naxi people are all reflecting the strong behavior of procreation. The second is the symbol of integrity, which is a peculiar existence in Chinese symbolic culture. The third is the symbol of the five elements theory. Hung fish in the ancient buildings are mostly round eight diagrams plates with their mouths, which means water pools and fire under water pressure. Therefore, Naxi people regard the hung fish as an image to protect the safety of their homes and infuse the concept of five elements into the hung fish. The fourth is the symbol of praying for blessings. Hung fish hang on both ends of the roof all year round, praying for the meaning of safety and prosperity of the family.

The decorative art of hung fish in residential buildings is mainly displayed by its shape, color, shape, scale, material, symmetrical structure and sense of spatial level. The shape is generally a Taiji-Bagua diagrams with a round shape for a double fish, and single fish is relatively rare. In addition to fish shape, other shapes are varied. In Dayan, Ninglang, Yongsheng, Yulong and other places in Lijiang, there are pestle shaped, potted flower shaped, lotus shaped, basket shaped, pentagram shaped, lantern shaped, gourd shaped, rhombic, square, arrow shaped, ball shaped, double dragon winding, grass flower dragon shaped, bat shaped, pigeon shaped, butterfly shaped, heart shaped, leaf shaped, halberd shaped and longevity shaped, etc. The varied shape of the hung fish greatly enriches the visual art of the building and enriches the moral interest of the plastic art.

"Tile cat": blessing Implied

Tile cat is a unique gray pottery in Yunnan, which takes tiger as its prototype and is made of mud. Its face is particularly exaggerated, which means gobbling up evil spirits and money. Its shape is simple, thick and mysterious. In Lijiang residential buildings, tile cat squatting in the middle of the roof or in the gatehouse is a symbol of magic and martial arts, representing the strong courtyard, exorcising evil spirits, gather happiness, recruit money. Now tile cat has gradually become a major feature of Lijiang residential building components, integrating artistic beauty, religious culture, architectural decoration and folk art.

Tile cat is a wonderful folk handicraft of Bai nationality in Dali. Tile cat modeling is constantly innovating and has a very high value of art appreciation. With the rapid development of tourism, it is no longer limited to architectural decoration, but brought to the world by tourists and displayed in museums.

Application Design of Teaching Model in Naxi Residential Buildings

Application design (building model production) is a practical link, which is a comprehensive expression of

design, material, path, technology, color, touch, concept, etc. Architectural model design plays an important role in environmental art. It transforms the two-dimensional paper plan into three-dimensional model, and reappears the solid building appearance directly and stereoscopically in equal proportion, which plays an important role in explaining the drawing problems and improving the design concept. At the same time, it can improve the subject experience and the understanding of the structure and decorative elements of Lijiang local residential buildings.

At present, the construction application model industry has entered a new stage of development in the market due to its rich materials and production technology. The main performance is that the main plate of the building model is cut by hand and computer engraving machine. The mechanical engraving machine uses mechanical physical force and control cutter to carve and cut hard materials (marble, artificial stone, ceramic tile, etc.) and soft materials (PVC board, high density board, ABS board, acrylic board, double color board, etc.). The laser engraving machine transforms pure water into light energy through electric energy, and uses non-contact to carve and cut soft materials. The intervention of computer engraving machine improves the accuracy and efficiency of model plate processing, and makes the final shape of the model more exquisite.

In the model design and production of Naxi residential buildings, first of all, we need to use AutoCAD software and CorelDRAW software to decompose the various components of the model, and draw the sectional view, which is related to the accuracy of the model. After that, it is imported to the computer-controlled carving machine operation platform in PLT format to convert the path and generate the execution program of the carving machine, so as to guide the carving machine to move according to the predetermined path and orientation. Turn on the engraving machine to return to the engineering origin, select suitable tools, move and fix the model materials to the workbench, set the engraving parameters, keep the spindle at 18000-20000 rpm, and the machine can operate normally. The cut plate and carved text have the advantages of fine, beautiful, delicate and high processing accuracy.

In the process of plate bonding, the main plate should be bonded first, then the partition and decorative components should be bonded. After pasting, the building needs to be colored three times evenly. This operation requires a cleaner workplace and the stain on the board needs to be removed. The bottom board adopts artificial high density board, which is closely related to the main building. The ground adopts stickers, ground paint, etc. the treatment of landform uses oil sludge, gypsum, foam and paper scraps to create a level change. The landscape part adopts a reasonable proportion of model tree imitation, the ground uses grass powder or turf, and the water surface uses paint or glue. Finally, the model is modified to make it more beautiful and practical.

Conclusion

The artistic style, unique charm, spatial layout and decorative art elements of Naxi residential buildings provide us with physical reference for the study of ancient buildings in China. Through the research on the application design of Naxi residential buildings, people's overall understanding of Lijiang residential buildings is improved, and the innovation of color, material, technology, concept and space thinking is fully understood in the practice of architectural design

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