

# ANALYSIS OF RESIDENTIAL RENOVATION DESIGN IN NORTHWEST CHINA UNDER THE BACKGROUND OF RURAL REVITALIZATION

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## Анотація

*Використовуючи сучасні архітектурні методи та впроваджуючи сучасне ремесло для поліпшення практичності та естетики житлових будівель, ми повинні звернути увагу на збереження та спадщину традиційної архітектурної культури, уникнути руйнівних перетворень та розвитку, виходити з концепції гармонії та єдності екології, природи та економіки. Науково проводити реконструкцію та проектування сільських житлових будівель.*

**Ключові слова:** *Північно-західний ремонт житлового будинку; сучасна архітектура, історична спадщина, обслуговування*

## Abstract

*While using modern architectural methods and implementing modern craftsmanship to improve the practicality and aesthetics of residential buildings, we must pay attention to the preservation and inheritance of traditional architectural culture, avoid destructive transformation and development, and proceed from the concept of harmony and unity of ecology, nature, and economy. Scientifically carry out renovation and design of rural residential buildings.*

**Keywords:** Northwest residential renovation design; modern architecture, historical inheritance and maintenance

## Rural revitalization and residential renovation design

Rural houses are places where villagers live, including the buildings, terrain and surrounding environment. The energy-saving renovation of residential buildings is mainly to design and transform the internal functions, decoration, surrounding environment, building functions, etc. on the basis of retaining the original building structure and style, so that it meets the requirements of thermal insulation, smooth airflow, and is both beautiful and practical. Sex, ecological and environmental protection.

The rural revitalization strategy is the core strategy of China's rural development. In the process of urbanization, the production and lifestyle of rural residents have undergone major changes. Compared with traditional dwellings, the functions of modern dwellings have also changed. The first is the change in

functions. Most traditional villages are dominated by agricultural production. In addition to living space, residential buildings also need to store farm tools and grain, as well as animal husbandry and breeding areas. With the changes in production methods, rural houses have independent spaces. Their functions are not only to meet basic living needs, but also include leisure activities and entertainment. In some areas, they also include functions such as garbage disposal. The second is aesthetic change. For example, the traditional building "pedal house" in Dangchang area, Longnan, Gansu Province, its architectural decoration style is a reflection of the natural ecological environment in Gansu Province. Traditional buildings are mainly wooden structures, and the roofs are spliced with templates, reflecting the diversity of local buildings and landscapes.

The development of modernization has had a great impact on these architectural forms in terms of aesthetic and cultural identity, and houses in some architectural forms are almost nowhere to be found. The third is the changes in the residential and family environment. The advancement of urbanization has had a greater impact on the original industrial model and education methods in rural areas. There is a phenomenon in Gansu that young labor forces go out to seek higher income. Most village residents are left-behind children and the elderly. The space use function in residential buildings has also been greatly weakened, and the distribution of residential buildings has gradually become denser.

Longnan City is located in the southeastern part of Gansu Province, adjacent to Shaanxi, Sichuan, etc. It has relatively rich annual precipitation, high vegetation coverage, and a relatively good ecological environment. Affected by factors such as the geographical location, transportation, topography and landform of the region, the economic development of the region is relatively slow. Pedal houses are unique residential buildings in the area, distributed in the forest area of Longnan City. Residential buildings are closely related to the ecological and natural environment of Gansu. Luren Village, Egou Scenic Area in Dangchang County, is located in a valley with a river landscape. The village is mainly located in the mountains on both sides of the river, and the forest vegetation is rich, and the north and south are connected to the scenic spot. The village has a population of about 457 people, most of whom are Tibetan, and has more than 300 residential buildings.

After conducting on-site investigations on the architectural culture and style of traditional pedal houses, most of the pedal houses have three single rooms and a double-decked corridor structure. Among them, the living room is arranged in the center of the first floor, with living rooms on both sides, and wooden stairs are designed under the eaves to connect to the second floor. The outer side of the eaves on the second floor will be decorated with diamond-shaped and other lattices, and the overall layout of the room is similar to that on the first floor. Among them, the exquisite wooden doors and windows and simple and generous lines reflect the local rainy climate. This is a characteristic architectural culture that unifies architecture and environment, and can also satisfy people's aesthetic orientation.

In recent years, most villagers have built houses with brick-wood, brick-concrete structures, and doors and windows have also been decorated with relatively simple decorations. The "pedal houses" have almost disappeared, or have collapsed or been idle. Analysis reasons: The height of traditional "pedal rooms" is relatively low and the open rooms are small. The wooden roof structure is easily corroded by rainwater, etc, causing rain leakage. The doors and windows are designed to be relatively small, and the overall lighting is poor. In addition, there is no kitchen chimney in the design, making fire and cooking is inconvenient, and there are certain fire hazards. Cooking and smoking causes the smoke and color of pillars, walls and some furniture.

At the same time, traditional dwellings lack the necessary kitchen, shower room, etc. for modern life. The living room on the first floor undertakes various functions including eating, hospitality, and storage

of farm tools and food. However, due to space constraints, sanitary conditions cannot meet people's need for modern life. The needs of life, coupled with the local rainfall, the wooden structure cannot meet the waterproof requirements, and encounter long-term rainy weather, indoor humidity, and insufficient lighting in the bedroom. This paper cooperated with the local design institute to conduct on-site mapping and analysis of these "pedal houses", and obtained corresponding house designs and architectural models, which intuitively reflected the original appearance of local characteristic houses and were important historical data for the protection of architectural culture.

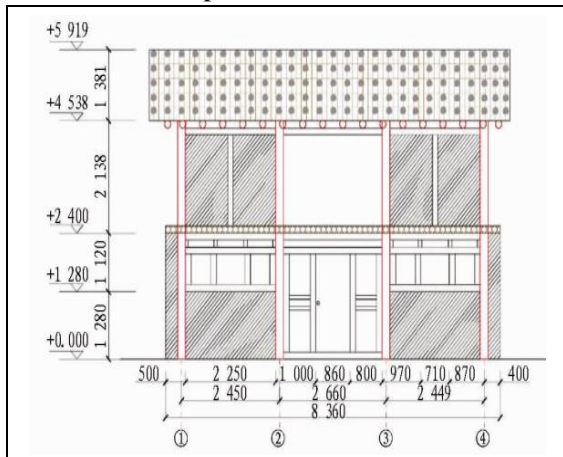


Figure 1 Front view of “Pedal Room”



Figure 2 Restoration model of “Pedal House”

Modern residential design attaches great importance to the consideration of many aspects such as the environment, building materials adapt to local conditions, and innovates traditional construction techniques. Building methods and forms vary, pursuing practicality and aesthetics.

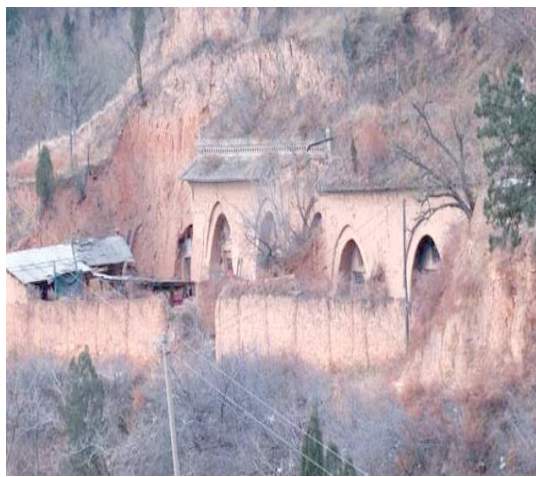


Figure 3 “Ancient Cave Cave”in Northwest China



Figure 4 Cave buildings in Northwest China

The climate in the northwest is relatively harsh, and natural resources and energy such as wind, solar energy, and plants can be fully utilized in design and transformation. For example, green pergolas are designed in residential courtyards and plants are planted to cover the entire courtyard's green space. In summer, cool breeze can be used to reduce the heat. This design method mainly uses the natural conditions of the northwest region to improve environmental quality. Compared with traditional

residential design, the cost is lower, conforms to the concept of ecological design and renovation, is more operable, and is easier to promote. For example, the "Research on Key Technologies for Well-off Residential Buildings in Villages and Towns" project implemented in Xingqing District of Yinchuan uses the terrain and architectural layout of Yinchuan in the planning and design to follow the natural phenomenon of low precipitation and large evaporation in this area. In order to cope with the hot and dry summer climate conditions, ventilation and heat dissipation functions are strengthened in the architectural layout design, and buildings are staggered, long and short buildings are combined, or high and low buildings are combined to make more courtyards can face the southeast wind. In order to avoid the impact of winter closures. In the renovation design, try to avoid buildings facing north and south, and use green belts to block airflow in the north. In addition, in the Jianfuqiao District of Yinchuan, the advantages of more surrounding agricultural canals were fully considered, and the water body was introduced in the renovation design to create an outdoor scene of a water courtyard and a green shade landscape. It is consistent with the east and south winds. Air flow can be formed in summer. When the air passes through the water body and the green shade, it brings a temperature difference, generates cool airflow, creates a microclimate, and plays a cooling effect. After the renovation, the living ecological environment of the area has been greatly improved, forming a harmonious situation with low energy consumption, no pollution, and relatively balanced ecology.

In the construction and renovation of modern residential buildings, people are increasingly pursuing comfort and practicality. Through building layout and reasonable design of indoor and outdoor environments, the impact of local climate on the interior of residential buildings is reduced, thereby creating a micro-climate environment. For example, in the renovation of residential buildings in Yinchuan, considering that the area has more rain and snow in winter, but relatively rich solar energy, the houses are designed as semi-sheltered activity spaces. In the residential courtyard, buildings such as design courtyard walls, canopies, and front corridors use semi-sheltered methods to divide and define the space, which makes the space more layered and forms a semi-enclosed space. The envelope structure of the door and courtyard facing south is designed as glass window surfaces. In winter, sunlight can be absorbed during the day and the indoor temperature can be increased, and indoor temperature can be maintained at night to reduce heat loss. Through the design of the temperature buffer space, it can achieve the effect of warm winter and cool summer, form a local microclimate, and provide people with a more comfortable living environment.

In the renovation design of residential buildings, it is necessary to follow the principle of suitable development and attach importance to the design of energy-saving residential buildings. First of all, effectively protect and utilize the original residential buildings. Most of the ancient cave dwellings in the northwest appear in Weibei, Longdong and northern Shaanxi. Many of them have a long history and are in line with the climate and natural environment characteristics of the northwest region. The cave dwelling uses adobe as the main building material, and the overall shape of the house is simple. Most of the renovation design adopts a centralized layout, without considering the orientation of the room. Moreover, the buildings in the courtyard adapt to local conditions and are flexible in design. For the design and renovation of cave dwellings, the cave culture and the geological characteristics and ecological environment of the area must be considered. Make full use of the venue. First, design an energy-saving layout. The geographical location of the northwest region is relatively special. Horizontal courtyards are considered in the renovation layout, and windows are minimized in the northwest direction to avoid indoor heat loss. At the same time, the surface area of the building can be reduced. Dark window covers of Tibetan-style houses are used to better absorb solar radiation. Second, fully consider natural

resources. Use the heat storage properties of local raw soil to protect the natural environment and try not to occupy cultivated land. Most earth-arch houses use flat roofs, and skylight are designed on the roofs to provide lighting. No toilets are designed in the residential houses, but are designed on the outside of the house. The feces are naturally weathered or buried in sand and can be used as fertilizer. Secondly, consider the environmental protection and earthquake resistance of residential renovation materials. The arch hole is designed with characteristics and has strong compression capacity. In the construction of traditional residential buildings in northwest China, raw soil walls mainly use stone and plain soil directly, which is difficult to meet the earthquake resistance requirements of modern buildings. Therefore, in the renovation design, combining concrete technology and raw soil material technology can not only improve the thermal insulation of the wall with the help of adobe and artificial cavities, but also improve the seismic performance of the original wall, making it more suitable for people in the northwest region to live.

### Conclusion

In the process of promoting the rural revitalization strategy, residential renovation is an important content. In the actual renovation and design, it is necessary to conduct in-depth on-the-spot inspection and analysis to understand the actual needs of rural residents, integrate the development of local industries and economies, and pay attention to the inheritance and development of traditional architectural culture while relying on modern architectural methods and crafts., enhance the practicality and aesthetics of residential buildings, and promote rural revitalization and long-term development.

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