

Research on Architectural Culture and Kiln Dwelling Forms in Yulin Area, Northern Shaanxi Province

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Abstract: The traditional kiln cave dwellings in northern Shaanxi are not only the main habitat of people's daily life, but also an important carrier of regional culture. The architectural morphological characteristics of kiln cave dwellings in Yulin are shown in detail by adopting various methods, such as data analysis, flat elevation section analysis and model drawing analysis. From a theoretical point of view, the traditional residential compounds in Yulin are mainly represented by kiln courtyard and mixed courtyard, and also show the regional characteristics of kiln as the main body and kiln houses integrating with each other. This study aims to provide scientific basis for the protection and inheritance of traditional residential compounds, as well as for the reuse of kiln cave architecture, which has the qualities of "ecology, greenness and environmental protection". This study aims to provide scientific basis for the conservation, inheritance and reuse of the "ecological, green and environmental protection" qualities of kiln architecture.

Keywords: Kiln Cave, Architectural Culture, Building Forms, Traditional Houses, Northern Shaanxi Province

1. Causes and Prospects of Traditional Kiln Houses

As the birthplace of the land-based "Silk Road", Shaanxi has nurtured a rich variety of ethnic and regional cultures during its development, which has promoted the social and economic prosperity and development of each region. Located in the northernmost part of Shaanxi Province, northern Shaanxi covers the cities of Yulin and Yan'an, with a total land area of 80,744 square kilometres ^[1]. Due to the special geographic location and rich and diverse resources of this region, the characteristic loess hilly landscape has been formed in this region. Due to the extremely poor environmental conditions in the rural areas of the region, the economic development is also relatively lagging behind, therefore, the local unique form of kiln construction came into being, these buildings not only have a deep historical heritage, but also contains a rich cultural connotation. Kilns can not only provide people with resting places but also one of the important living environment ^[2]. However, with the continuous progress and development of society, the kiln is gradually regarded as a symbol of "backwardness" and "regression", and gradually abandoned by people. Worse still, the traditional Chinese architectural culture has also been abandoned ^[3].

This study aims to explore the close connection between architecture, art and culture. Regional design research centred on "people". This study aims to gain a deeper understanding of the regional characteristics and folk culture of residential buildings in terms of architectural style, morphological features and decorative arts. By studying the functionality and artistry of kiln-dong architecture decoration, the study further strengthens the close connection between kiln-dong architecture, regional culture and decorative art in northern Shaanxi. By studying the customs of local residents in terms of spatial layout and decorative art of kiln cave architecture, it is possible to gain an in-depth understanding of the connection between the architectural art of folk houses and folk culture in northern Shaanxi. In addition, the most representative kiln cave compounds were further selected as case studies, aiming to provide detailed data basis for future in-depth studies of kiln cave residential architecture in northern Shaanxi.

2. On the basic overview of the kiln cave dwellings in northern Shaanxi Province

The kiln cave in northern Shaanxi has a rich cultural heritage of thousands of years, and it is

regarded as a way for people to pursue a healthy life because of its adaptability to its geographical location, its use of local resources, its architectural style that maintains a primitive ecology, and its spatial characteristics of warmth in winter and coolness in summer, and suitable temperature. With the improvement of the level of economic development, people pay more and more attention to the harmonious relationship between the quality of living and the natural environment. The design methods and construction experience of kiln caves are deeply influenced by the unique local environmental features and humanistic customs, and such features are clearly reflected in many aspects such as architectural forms, decorative arts and functional applications (figure 1, figure 2).

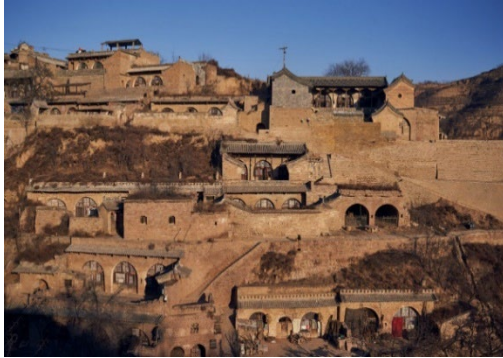


Figure 1: Shaanbei Kiln Cave (self-drawn)



Figure 2: Shaanbei Kiln Cave (self-drawn)

2.1. Current status of kilns in Yulin

The preservation and inheritance of traditional residential buildings is a long-term public activity involving a number of sectors. With the development of the times and the improvement of people's living standards, traditional culture is gradually being forgotten and traditional dwellings are in danger of disappearing. From 2012, when the state began to implement the protection policy for traditional villages, until the end of 2021, China has released five national-level protection lists of traditional villages, of which there are 113 in Shaanxi Province, 46 in northern Shaanxi Province, and 31 in Yulin City; during this period, a large number of outstanding historical and cultural cities, towns and villages, and characteristic neighbourhoods and folk customs tourist places have emerged nationwide. Since 2015, the Shaanxi Provincial Department of Housing and Construction has worked with other departments to implement the province's traditional village protection policy. By the end of 2021, the province has released three batches of traditional village protection lists, totalling 429 lists. Of these, 197 lists were in northern Shaanxi (about 2/5 of the province's total), while Yulin City had 97 lists. According to the available data, the number of traditional villages in northern Shaanxi is increasing year by year, which is a positive and optimistic trend of change. Behind these data lies the state's high recognition, attention and inheritance of a series of material and intangible cultures such as residential architecture, folk culture and humanism ^[4] (figure 3, figure 4).



Figure 3: Yulin kiln map (self-drawn)



Figure 4: Yulin kiln map (self-drawn)

2.2. In-depth analysis of causes

The climatic characteristics of the northern Shaanxi region, such as little rain, dryness, prolonged periods of cold and sandy winds, were one of the key factors in the formation of kiln architecture. At

the same time, the predominantly agricultural living environment made the outdoors the main place of activity for residents. Residents of northern Shaanxi like to organise collective activities during certain seasons, which not only strengthens neighbourly relations and brings extra fun to the monotony of life, but also injects new vitality into the architectural culture of kiln dwellings. This kind of living style of "living in groups" has made the traditional kiln caves continue to this day, and has a unique regional and national character. The formation of the kiln is the result of the unique natural environment and human history of the local double influence and constraints [5].

2.3. Morphological design of the foundation

In northern Shaanxi, kiln buildings are usually presented in groups, and due to the complexity and specificity of the site selection, the residential building compounds in this region generally show the layout characteristics of kiln-dominated and kiln-house-integrated [6]. In the construction process of kilns, the perfect combination of architecture and nature is highly valued. A notable feature is that the morphology of kiln caves varies due to differences in geographic location and geological landforms. For example, in the rocky mountain areas, the exposed bedrock became the main building material for kilns, so stone kilns were the most numerous, followed by brick kilns and earth kilns (figure 5, figure 6) [7]. In the plains or hilly areas, due to the flat terrain and fertile soil, adobe kilns built with rammed earth were the most common. In the Loess Plateau, people usually dig cliff kilns on the cliffs between the gullies (figure 7). In the Loess Plateau region, they mostly dig holes in the ground as their living space and form the pattern of "one house and two courtyards". In the flatter areas, the number of Ming kilns is relatively high (figure 8). As a unique building material and living space, the traditional philosophical ideas embedded in kilns are also reflected in their architectural design, resulting in a unique "kiln-style" courtyard pattern. No matter what kind of courtyard design, it shows the unique form and architectural art of the kiln cave dwellings in northern Shaanxi, and also reflects the architectural culture of the kiln cave dwellings and the local customs [8].



Figure 5: Brick kiln diagram (self-drawn)

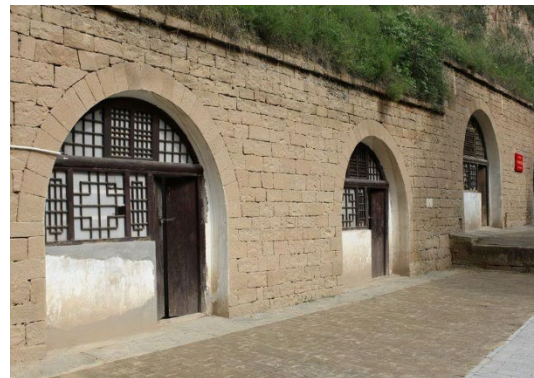


Figure 6: lit. earthen kiln map (self-drawn)



Figure 7: lit. leaning against a cliff kiln (self-drawn)



Figure 8: Ming Imprisoned Kiln (self-drawn)

2.4. On the artistic creation of buildings

The method of construction in the art of architecture. This method of construction is characterised by a symmetrical and balanced relationship. The architectural art of kiln caves in northern Shaanxi is

outstanding because of the skilful combination and application of its special architectural structure. During the construction of kiln caves in northern Shaanxi, the double-centred round arch technique is often adopted, which is closely related to the economic status of the local residents and the construction ability of the workers. In addition to these, such architectural elements as the daughter wall, kiln eaves and doors and windows all show exquisite craftsmanship and rich variety, which combine functionality and decoration and together shape the unique artistic charm of kiln cave architecture.

On the artistic approach to interior decoration. When decorating the interior of a kiln, the people of northern Shaanxi would first paint and level it several times using yellow earth mixed with straw and hair strands to create a relatively clean and tidy interior. Then, white lime would be applied to the outermost part to brighten up the interior and prevent the kiln walls from peeling off, thus reflecting the ecological nature of the kiln. When choosing the sealing method for the doors and windows of the kiln, paper paste was chosen. This is because the paper gluing method has better expansion, air permeability and light transmission than other materials. While ensuring indoor lighting, it also achieves good indoor ventilation, which fully embodies the green and environmentally friendly features of kiln cave architecture.

3. Analysing the architectural form of kiln cave dwellings in northern Shaanxi Province

3.1. Analysis of the kiln courtyard design of the Suide Liu Family Courtyard

The Liu Family Compound (Yaowu Liu) is located in the village of Aijiagou, 50 miles north of Suide County. It was included in the third batch of China's traditional villages list by the Ministry of Housing and Urban-Rural Development on 17 November 2014, and so far it has a history of more than a thousand years and is quite well preserved. It has an excellent geographical location, convenient transport and beautiful natural environment. The total area of the village is about 8 square kilometres, covering an area of 500 acres, with 21 traditional buildings. However, it is unfortunate that some of these traditional buildings have been left unused as they have not been maintained for a long time. The village has a small river that flows from the west to the east and finally joins the Wuding River, which provides an abundance of water for domestic use to the local residents. The village is crisscrossed with roads and villagers live in high density, forming an organic whole that is relatively independent and has strong vigour and vitality. Observing the spatial layout of the village's settlement, it can be seen that it adopts a point-like spatial design, with residents distributed along the river in a stepped manner. Looking at the façade of the buildings, a staggered settlement pattern is shown at the hillside or mountain bay. In addition, the centuries-old date palms are used as embellishments, so that it still retains its ancient flavour, especially the design concept of "unity of heaven and mankind" of the kiln building is fully embodied.

The Liu Family Compound is a typical kiln courtyard-style residential building, consisting of two parts: the lean-to kiln and the Ming-imprisoned kiln. Its layout is north-south oriented, with a rectangular plan, consisting of five main kilns and six compartment kilns, with a north-south length of about 25 metres and an east-west width of about 33 metres (figure 9, figure 10). The main entrance of the courtyard is located in the south-west direction and features a European-style attic and a gate made of bricks and tiles with a very creative decorative design (figure 11a). Above the gate, there is a circular relief decorated with the Han Chinese motifs of "peony over pomegranate" and "hundred years of wealth", together with cloud patterns, geometric shapes, and botanical motifs on the roof ridge, which together form a creative gate. Underneath the bas-reliefs hangs a plaque with the words "Cultivation and study passes on to the family", the core idea of which is to teach people how to make a living and behave. In the agriculture-dominated Chinese folk culture, this idea has been regarded as a classic inheritance, which not only has the meaning of warning and education, but also conveys the elders' deep teachings and ardent hope for the future grandchildren, as well as expresses the owner's desire for a better life in the future. The European-style attic door design shows that the homeowners at that time already possessed a relatively open mode of thinking and were able to accept and absorb foreign cultural elements^[9].

The courtyard is very clean and neatly paved with stone slabs. The five-hole main kiln was built facing south with the mountain range at its back, and the total height of the kiln was about 5.75 metres with a depth of about 7.80 metres; the main kiln was connected by two 1-metre-wide aisle doors on the west side, with a one-entry-two-openings design; there were three compartmentalized kilns on each of the east and west sides, and an extra compartmentalized kiln was added at a later stage of the east compartmentalized kiln for storage, and these compartmentalized kilns were relatively shallow, with a

depth of about The depth of these chamber kilns is relatively shallow, about 3.68 metres; between the western chamber kiln and the main kiln, there is a small kiln, which is known as the passageway of the upper brain. The local residents called this passage an escape route so that people could escape through it in case of enemy invasion and it was not easily detected; a hidden passage was dug out at the back of the easternmost kiln, which was used in daily life to establish contact with neighbours and was the best option for escape, from which the wisdom of the local residents can be seen (figure 11b, figure 11c).

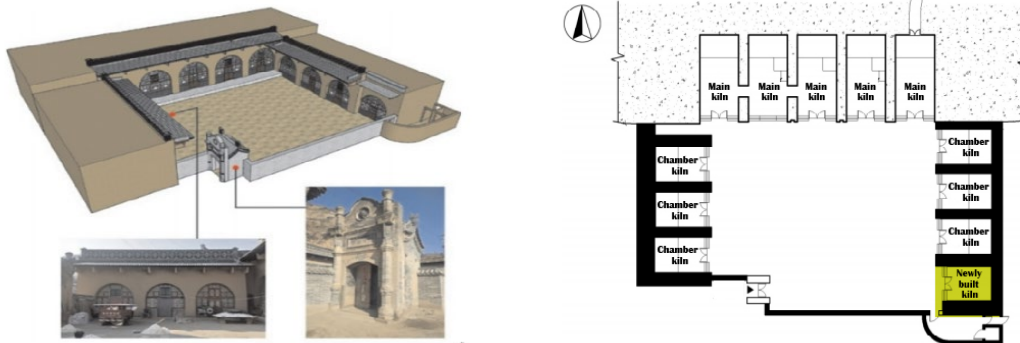


Figure 9: Plan of the Liu Family Compound (self-drawn) Figure 10: Liu Family

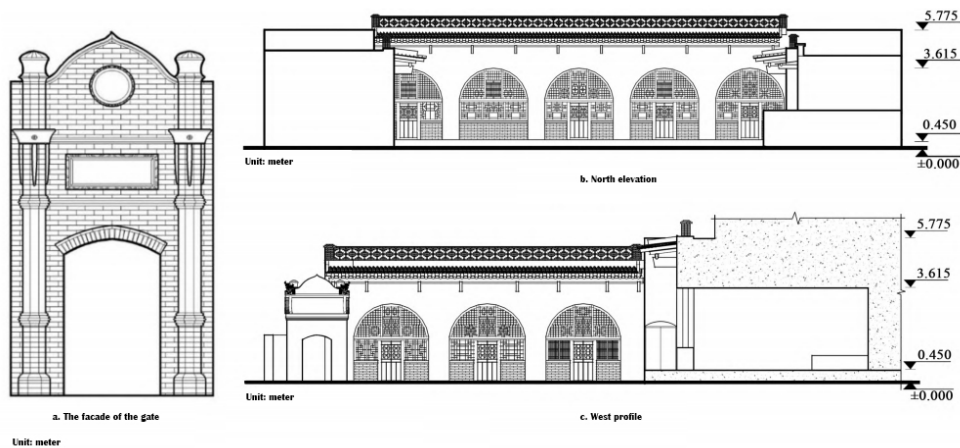


Figure 11: Elevations and Sections of the Liu Family Courtyard (self-drawn)

The Liu family compound pays great attention to the atmospheric and decent style in its decorative design. On the side of the brain, the daughter wall is made of green bricks, with a height of about 0.8 metres, which mainly serves the function of protection and defence, and is designed in the shape of "ten" with light and darkness, which is both aesthetic and atmospheric. The plastering process of the cliff face is made by mixing lime or loess with resilient materials such as straw, bale skins and hair, which not only keeps the cliff face clean and beautiful, but also enhances the stability of the kiln face to some extent. The picket stones on the eaves of the kiln are particularly eye-catching, which are covered with green-coloured tiles, and each of the eaves beams is methodically arranged, which gives a strong sense of array, and at the same time demonstrates a dignified and atmospheric atmosphere; above the picket eaves is decorated with a roof ridge, which is carved with delicate plant patterns, and on each side there is a closed-mouthed kissing beast, which means repelling disasters and taking refuge, three-dimensional, delicate and far-reaching, reflecting the owner's It is three-dimensional, delicate and far-reaching, reflecting the owner's prayers and aspirations for a better life. On top of the kiln legs, there are two niches dedicated to gods, one for the God of Land and the other for the God of Heaven. Usually, the inhabitants would cover their faces with red cloths, which would only be removed during special festivals to perform rituals to pray for a prosperous life and good weather in the new year. The position of the god of heaven and the god of land is fixed: heaven represents the greater and earth the lesser. Therefore, when making offerings to the God of Heaven, one should make sure that the direction of the offerings to the God of Heaven is east and the direction of the offerings to the God of Land is west in order to show respect to the God of Heaven.

3.2. Summary of the kiln courtyard form of the Liu Family compound in Suide

The kiln courtyard architecture of the Liu Family Courtyard is a classic representative of the kiln courtyard architecture in northern Shaanxi, featuring a bright three-dark two-six compartment kiln-style kiln triad. The layout of Liu's compound is very neat, with all kinds of components, and its decoration is both exquisite and in line with environmental standards. The combination of lean-to kilns and Ming confinement kilns not only demonstrates the characteristics of kilns built according to geographical conditions, but also embodies the philosophy of people living in harmony with nature and adapting to it.

4. Conclusion of traditional dwellings in kiln caves in Yulin City, Northern Shaanxi, China

This study delves into the architectural culture and architectural forms of kiln cave dwellings in Yulin City, Shaanxi Province, and carries out a detailed study according to the following two aspects. From one perspective, we have analysed and collated in-depth data on the number of traditional villages in Yulin City, Shaanxi Province. This not only reveals the various problems faced by the kiln cave dwellings in traditional villages in Yulin, such as the abandonment of kilns for reconstruction or random remodelling, but also leads to the loss of kiln cave buildings in terms of their unique architectural style and cultural value; from another perspective, the state and people in all fields of the society have paid more and more attention to the maintenance and restoration of the traditional residential buildings. However, due to the transitional nature of the protection measures, the destructive nature of human intervention and the exposure of the inherent defects of the kilns, the original modelling characteristics and cultural connotations of the buildings have been gradually diluted. Therefore, it becomes particularly important to deeply excavate and analyse the architectural features and cultural connotations of kiln cave dwellings, which is a task that contemporary scholars cannot avoid. Then from the perspective of the natural conditions and human history of kiln caves in northern Shaanxi, a preliminary discussion on the kiln cave residential architecture in Yulin City was carried out. The most representative Liu Family Courtyard in Yulin City was chosen for an in-depth analysis of its basic form and decorative art, and valuable data were obtained through a comparative analysis and study of the plain and elevated section drawings and model drawings of the courtyard. This provides a solid data and theoretical foundation for future scholars and communities studying regional architecture and traditional houses in northern Shaanxi.

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