



Analysis of the form characteristics of traditional dwellings in the Xihaigu area of Ningxia, China^{*}

Yanjun Li^{1a}, Xiaoyu Zhang^{2b} and Liyue Wu^{1c}

¹School of Art and Design, Shaanxi University of Science and Technology, Xi'an, China

²School of Art, Zhengzhou Vocational College of Taxation and Finance, Zhengzhou, China

^aylw55668@163.com. ^b757562730@qq.com. ^cliyuewu420@hotmail.com

Abstract. This paper takes the traditional residential buildings in the Xihaigu area as the entry point. Through field research and data analysis, it demonstrates the spatial composition, morphological characteristics and construction techniques of different types of residential buildings, and studies the regional cultural characteristics of traditional residential buildings in the area. Provide some foundations for subsequent research and provide some reference basis.

Keywords: Silk Road; Ningxia; Xihaigu area; traditional houses; building types

1 Introduction

Located in the northwestern part of China in an area of poor natural environment and relative economic backwardness, the Xihaigu region of Ningxia is situated in the southern part of the Ningxia Hui Autonomous Region, including Yuanzhou District, Haiyuan County, Xiji County, Jingyuan County, Panyang County, Lund County of Guyuan City, and Tongxin and Yanchi Counties of Wuzhong City (Yan Ningna, 2015). The region is a transit place of the ancient Silk Road and a meeting place of the Central Plains, Xixia, Grassland and Desert cultures. Therefore, the research and excavation of the traditional culture and its residential architecture in this region has important significance and academic value. The way of residential construction in the Xihaigu region is mostly a spreading traditional settlement, and in the process of building houses, it focuses more on the overall structure of the building, emphasizes the intermingling of architecture and nature, and the construction materials are adapted to the local conditions (Wang Fei, Zhou Dian, Yang Lu, 2017), and materials are taken from the local area, and materials are used according to the method. Such as city fortresses, large courtyards, medium-sized courtyards, simple compounds and joint rows of kilns and caves, etc. embodies not only the physical carrier of the traditional residential form and architectural art, but also the folk culture and the daily life of the working people purely present the scene.

2 Ningxia Region Overview

Ningxia is located in the upper reaches of the Yellow River in western China, bordering Shaanxi Province to the east, Inner Mongolia Autonomous Region to the west and north, and Gansu Province to the south (Figure 1). It is one of the birthplaces of Chinese civilization and is located on the "Silk Road", which starts from Xi'an in Shaanxi Province, passes through Pingliang in the north to Guyuan City and Tongxin County in Ningxia, and finally enters Wuwei City in Gansu Province from Zhongwei City in Ningxia. Silk Road Its main role is to link the commodity trade and cultural exchanges between the East and the West, and is also the hub of communication and exchanges. The basic mode of traditional regional architecture is adjusted with the change of living environment, and its architectural form is inevitably affected by topography, climate characteristics and material resources. Due to the different historical development background and living environment, the level of economic development in different regions is not coordinated and unbalanced, and finally the development of architectural culture in different regions is inconsistent, with their own characteristics and differences. Therefore, the study of traditional residential buildings in Ningxia should first have a full understanding of the natural ecological environment and social and cultural environment of the region.

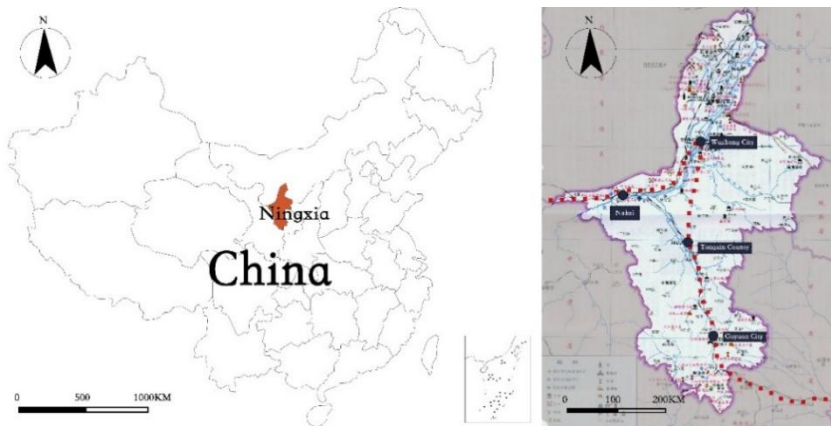


Fig. 1. shows this. Location of Ningxia and transit routes of the Silk Road. Source: National Center for Basic Geographic Information, redrawn by the author.

2.1 Natural environment Natural environment

In the Western Zhou Dynasty, Ningxia was located in the hinterland with mild and moist climate, good ecological environment and excellent air quality. Ningxia is a region of temperate forest and grassland climate, because of its rich forest resources, it has become an excellent place for animals to multiply and inhabit. After entering the Qin and Han Dynasties, a large number of immigrants moved in, which seriously damaged the vegetation in the mountain area. In the later period of the Northern Song Dynasty, due to the long-term political confrontation between the Song Dynasty and the

Western Xia Dynasty, Ningxia region was in the front line of defense against attacks of the Northern Song Dynasty. During this period, wars and conflicts were frequent in this region. As a result, the army stationed here inevitably made large-scale reckless reclamation, and the forest and grassland resources in Ningxia region were seriously destroyed, and the relationship between people and land began to change negatively for a long time. In the later three dynasties, large-scale folk, military, horse, firewood, charcoal trading development, forest vegetation suffered large-scale destruction, and the shrubs on the loess tableland were cut down. The ecological environment of Ningxia was further deteriorated due to the war and the irreversibly reclaimed land by immigrants in Tongzhi period of Qing Dynasty. With the establishment of New China, the number of arable land, population and livestock increased year by year, and the production and management of indiscriminate reclamation and deforestation further worsened the relationship between man and land. Since the end of the last century, the ecological reconstruction has been focused on the large-scale return of farmland to grass and forest, through which the local ecological environment has been significantly improved (Figure 2). Because the original ecological problem is very serious and intractable, coupled with excessive population pressure and other reasons, the ecological environment renewal is slow and difficult to reverse. It has created the double poverty of environment and humanity in Ningxia.



Fig. 2. Distribution of water resources in Ningxia

Source: National Center for Basic Geographic Information, redrawn by the author

2.2 Cultural environment

The Hui population in Ningxia region accounts for 54.3% of the total population, which is the largest Hui inhabited area in China. In the process of living together with the Han nationality for a long time, the traditional residential buildings, as the carrier, have gradually formed a residential culture and artistic form with distinct regional characteristics. This section will explain that under the influence of unique environment, the Ningxia region has formed a unique architectural art form. The natural geographical

location and social and human conditions of Ningxia prove its cultural diversity. Local culture is the original farming culture and grassland culture absorb and complement each other, contact and blend each other, and finally form a very distinctive and diversified cultural structure in the local. Because of this, a large number of architectural relics and historical culture have been left in the local area, which has created a good material basis for contemporary research on the architectural characteristics of traditional dwellings in this area(Figure 3).



Fig. 3. Distribution of historical resources in Ningxia

Source: National Center for Basic Geographic Information, redrawn by the author

2.3 Distribution of traditional dwellings

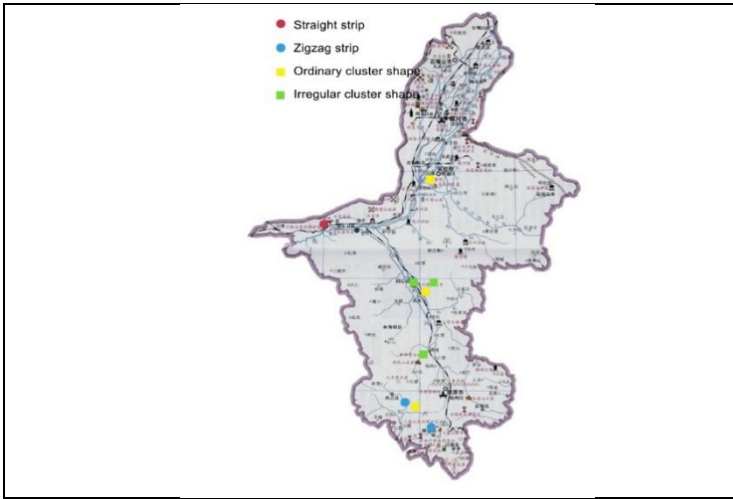
Every traditional village inherited in Ningxia region has a strong purpose of choosing houses, which can be summarized into two aspects according to different needs: on the one hand, it belongs to the material needs of survival, physiology and safety; The other side is the spiritual needs of people who desire communication and faith in order to pursue development (Table 1).

Table 1. Statistics of different forms of villages

Chart source: Drawn by the author


Overall morphology type		Village name	quantities
Belt	Straight belt	North Changtan Village	1
	zigzag belt	Xiaohu Village, Yangjiadian Village	2
Cluster	ordinary cluster	Mageda Village, Machang Village, Dong Mansion	3
	irregularly cluster	Yantai Village, Tongxin County, and Huangdobao Village,	3


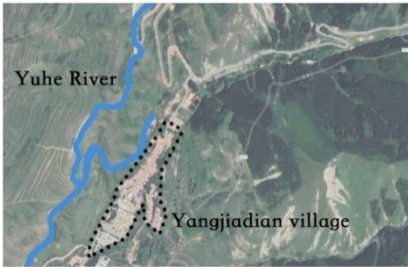



Fig. 4. Distribution of villages with different forms
Source: Drawn by the author






Some traditional villages in Ningxia seem to be distributed along rivers, and the surrounding villages rely on abundant groundwater or sufficient rain to ensure village production and meet the normal needs of daily life (Figure 4). In the high altitude area of the southern mountainous area of Ningxia, the rainfall increases with the increase of altitude. The windward slope receives more rainfall than the leeward slope, and the southerly slope receives more rain than the northerly side. From the macro level, the most influential factor is terrain. The traditional villages distributed in the higher terrain are scattered and scarce, and the distribution in the lower area is more concentrated and numerous, so most of the traditional villages are distributed in the valley at lower elevation and near the water source (Table 2). From the micro level, the level change and flat degree of specific geographical terrain will have a great impact on the distribution form and scale of villages and the difficulty of construction technology.

Table 2. Relationship between villages and water systems
Source: Photographed and drawn by the authors.

typology	location	Village name	icon
Waterfront	Not only are they relatively close to water sources, but they are also all located	Huangdo-bao vil-lage	

	<p>where the waterways curve or diverge.</p>	<p>Ma Chang village</p>	
		<p>Yangjiadian village</p>	
		<p>Dong Fu</p>	
<p>Water Surrounding Type</p>	<p>Immediately adjacent to the water system and mostly located where the water system curves or bifurcates.</p>	<p>North Changtan Village</p>	
		<p>Ma'ohmu Village</p>	

		<p>Nitsuhe village</p>	
		<p>Tongxin town</p>	
<p>Water crossing type</p>	<p>Located in a valley location, penetrated by a water system</p>	<p>ink slab village</p>	

3 Types and characteristics of traditional houses

Through regional research, mapping, drawing and data analysis, this paper extracts three typical traditional houses of different types for research and analysis. The first one is the traditional courtyard type located in Liangbao Village of Longde County, the second one is the kiln courtyard type located in Ma Ohmu Village of Tongxin County, and the third one is the composite courtyard type located in Ma Chang Village of Xiji County.

3.1 Combined courtyard type

Liangbao Village, Dienan Township, Longde County, was the key point of the Silk Road during the Han and Tang dynasties. The fort was built in the Song Dynasty, covering an area of about 2 square kilometers, and was a defensive city building. It was severely damaged during the Haiyuan Earthquake in 1920. At present, there are about 17 families still surviving and in use in Liangbao Village, and most of these residential compounds are in the form of triple and quadruple houses.

Among them, Liangbao Village, a group of 48 Hui Liu's house is the most representative of the traditional residential architecture of a family compound. The courtyard is located in the north-south direction, with a length of 29 meters in the north-south direction and a width of 14 meters in the east-west direction. The main body of the building is a reinforced adobe building, and because of the long north-south span of the courtyard, the space between the individual buildings is also relatively spacious, and is enclosed by the buildings and walls into a more regular compound form(Figure 5).

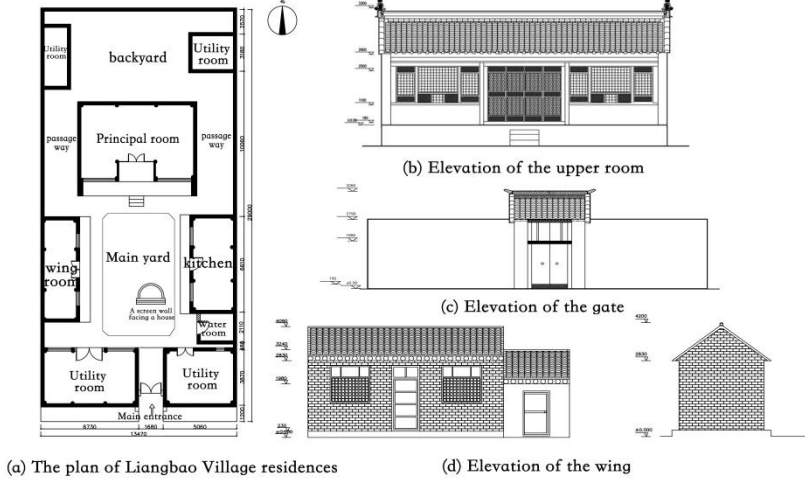


Fig. 5. The plan and elevation of the folk houses in Liangbao village.

Source: Author drawing.

From the plane of the courtyard, the southern end of the mansion is a five-room inverted house, followed by a symmetrical three-room compartment, the three-room upper room is located in the center of the courtyard, with a passageway on both sides, and after the upper room, there is an open backyard and an unorganized utility room. From the façade, one can enter the courtyard through the main entrance of the central room of the inverted block, and at the entrance of the courtyard, there is a corresponding wall(Figure 6a), which, on the one hand, has the function of blocking the line of sight of outsiders, and on the other hand, it can also accentuate the ambience of the building and increase the momentum of the residence. The wall is complementary to the houses and the courtyard buildings, combining them into an inseparable whole.

The upper house in its courtyard is a raised-beam structure with rammed earth walls and wood splicing(Figure 6b), and the overall structure of the building is simple, with ordinary materials, rammed earth walls spliced with wooden doors and windows, and because Ningxia is located in the inland northwest of the country, with little average precipitation, the roof slopes are small; the winters are severe and long, with prevailing northerly winds. Winter and spring are dry and sandy, so the north side of the upper room has no windows and thicker walls to protect against wind and keep warm; the south side has larger windows so that it has sufficient light.

The building materials are locally sourced using a form of rammed construction of raw earth and wheatgrass, which strengthens the overall strength of the material through its viscosity, and also resists natural disasters such as cold outdoor environments in the winter and high winds and sand in the spring and fall. The walls were rammed as much as possible to connect them into a group structure (QI Yicong,ZHANG Xingguo,FAN Yindian.2015). In terms of decorative materials, the doors and exterior windows are made of wood splices with yellow and green paintings (Figure 6c), including traditional Hui decorative patterns such as flowers, scrolling grasses, branches and vines, fruits, etc. The styles are simple and light, but the addition of colors gives people a very bright and peaceful feeling. Backyard is thatched toilet and sundry rooms (Figure 6d), compared with the rest of Ningxia thatched toilet structure form is basically the same, there are common features, the site will be in a corner of the compound, away from the upper room. It was often enclosed by a wall and roofed, which was connected to the walls of the courtyard building. The mansion is located in the fort after hundreds of years, earth walls and stone doors, tiles and wooden windows are still well-preserved, in the local and even the surrounding areas is very rare, the study of architectural form and culture provides a very important physical basis and high value of historical materials.



(a) A screen wall facing a house



(b) upper house



(c) Inverted utility room



(d) Backyard utility room

Fig. 6. Liangbao village residence status map Source: Photo by the author

3.2 Kiln yard style

The kiln, with a history of more than 4,000 years, is widely distributed in the Loess Plateau in northwest China. In the Shanxi-Gansu-Ningxia region of China, the loess layer is very thick, coupled with the loess' good uprightness, the wise Chinese people took advantage of these favorable conditions and dug holes to live in (Zhu Ming, Lu Xiaobin.2018). Kiln dwellings in the Xihaigu region are also highly favored by villagers and are more commonly distributed. Located in Tongxin County, Wuzhong City, Tongxin County, Yuhai Township, hemp lumps of the village to the east for about 4 kilometers of the wilderness, there are several kiln courtyard-style traditional homes, measured the characteristics of the distinctive preservation of the more intact two households (Figure 7).

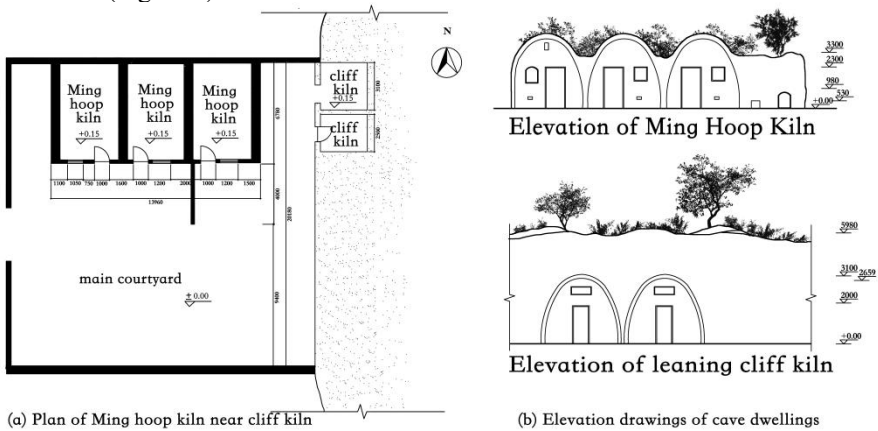


Fig. 7. Plane elevation of open hoop kiln near cliff kiln. Source: Author drawing.

According to the architectural form kilns can be divided into three types, the first type of kiln built against the cliff, the second type of kiln built in the flat area of the open hoop kiln, and the third type of kiln built by digging deep into the ground. Joint rows of kilns are mostly built at the back of the mountain and facing the water, in order to meet the lighting and ventilation of the compound (Li Zheng, Pei Lei.2000). Generally, they are enclosed on four sides, but also on three sides, as in the case of the kiln dwelling compound against the mountain. The first household kiln house compound among them has one side leaning against a 6-meter-high mountain, with a kiln width of 3 meters and a depth of 3.5 meters (Figure 8). It was excavated with the terrain and blended in with the landscape. Like the other forms of kilns, it is durable, warm in winter and cool in summer, and has much better lighting and ventilation than the other two forms of kilns, which is why this side of the kiln is used for human habitation (Figure 9). The Ming Hoop Kiln was built on flat ground like an ordinary house, with a foundation wall made of earth and yellow straw mortar, a vaulted kiln roof, and a double-sloped kiln roof filled with earth, plastered with straw mortar, and with short

rafters on the front and back, making it look like a house from afar, but a kiln from close up.



Fig. 8. Ming hoop kiln Photo. source: Self-taken



Fig. 9. Photo of the interior of the cave dwelling .Source: Self-taken

The architectural decorations of the kiln courtyard are relatively single, mainly wood carvings, which are used for the decoration of doors and windows. Window frames in the shape of a square grid, where the installation of glass grid sparse, paste paper grid is more dense, these seemingly no rules for the combination of doors and windows together, just became a special form of kiln doors and windows. Not only to adapt to the light and ventilation, but also in the monotonous loess wall is highly decorative. From the decorative aspects can be seen in the northwest people rough, thick, atmospheric and other characteristics.

There is also a lot of open and flat area in the Xihaigu region, where the soil is easy to mold in the shaping process, with high viscosity and good stability. Therefore, pit kilns are also very common in the region. The second kiln courtyard is a typical sunken courtyard with a length of 6 meters and a depth of 9 meters (Figure 10a). The sunken dugout courtyard refers to digging a quadrangular earth pit directly downward on a flat surface, cutting holes directly into the elevation of the downward dugout earth wall, and then advancing horizontally to enclose an underground quadrangular courtyard , and all of these unique kilns are located on loess plateau where there are fewer gullies and cliffs. The materials of the dugout courtyards come from locally sourced

materials, and this low-carbon construction method not only saves land and construction costs, but also keeps the courtyard warm in winter and cool in summer due to the insulating properties of the thick loess.

The daily living is inside a row of north-south oriented Ming hoop kilns in the main courtyard (Figure 10b), which are made of adobe masonry. The bottom of the kiln is made of soil, then the wood is bent into an arch as the support of the hoop kiln, and then masonry is built step by step, and finally, the doors and windows are opened on the façade (Jing Kang.2016). In the interior of the Ming hoop kiln, in order to make the interior of the kiln cleaner and tidier, white lime plastering is often used around the hole, and wood carvings are used to make the interior of the kiln full of life, and the stove and the kang are the main furnishings of the kiln, and in order to avoid the smoke generated by the cooking and the kang from being diffused in the interior, the pipe for exhausting the smoke is embedded in the face of the kiln, which is directly connected to the outside in order to guarantee the quality of the air inside the kiln.

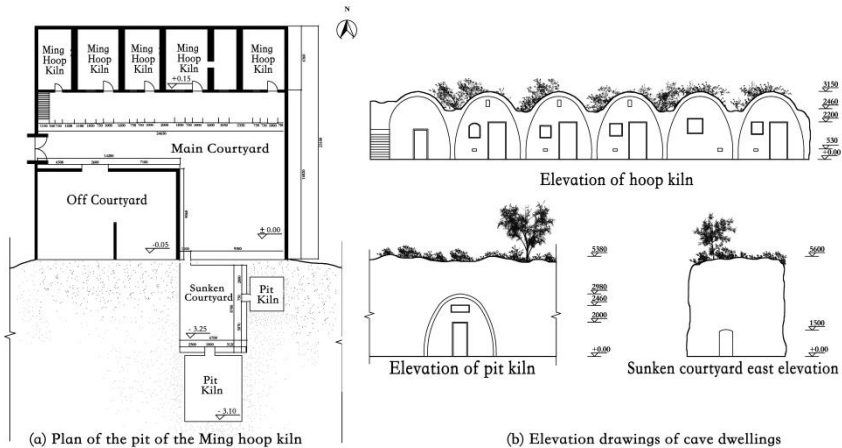


Fig. 10. surface elevation of Ming hoop kiln. Source: Author drawing.

The spatial structure of this house is also very rich, vertically there are above ground open hoop kilns and sunken courtyards enclosing the pit kilns; horizontally there are three enclosed courtyards, the main courtyard is used for the daily activities of the household (Figure 11), the side courtyard is used for keeping livestock, and the sunken courtyard is used as a buffer and enclosure for entering the underground space. To summarize, the kiln in the Xihaigu area is a natural response to the humanistic environment of the region where it is located, as well as a love and insistence on the loess building materials, which well interprets the concepts of "respect", "suitability", and "savings" in the aesthetics of the architectural region, and pursues the concept of "respect", "suitability", and "savings" (Figure 12). The concept of "respect", "suitability" and "saving" in architectural regional aesthetics is well interpreted, and a regional beauty and original ecological beauty is pursued (Li Weidong.2009).



Fig. 11. Source: Self-taken



Fig. 12. Photo of the entrance gate of the courtyard .Source: Self-taken

3.3 Composite Courtyard Form

Xiji County Nit River Countryside Ma Chang Village Yuanwan mosque next to the Ma family house, Hui people. The Hui tradition is all in the form of the mosque as the center of the circle, and all the dwellings coincidentally revolve around the mosque. The mansion from the plane (Figure 13), the north end of the compartments symmetrical left and right, three-room upper room is located in the center of the courtyard, leaving the two sides of the mezzanine, behind the upper room there is the age-old leaning cliff kiln, the earliest building in the compound compound, the upper room and compartments are due to the later standard of living and then constructed.

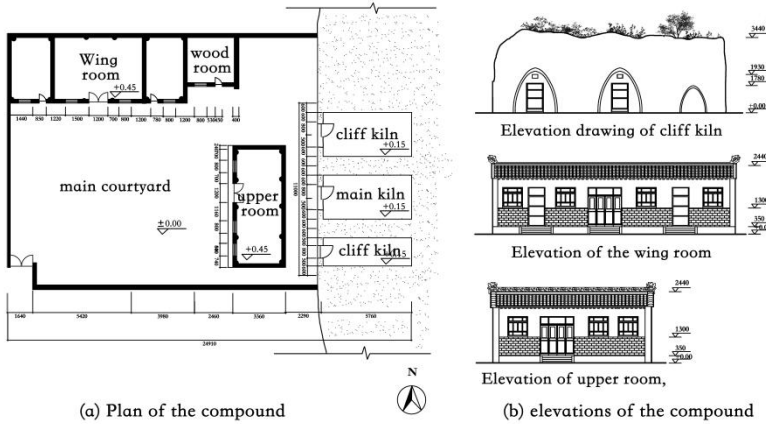


Fig. 13. Composite courtyard plane elevation. Source: Author drawing.

The depth of the rooms is large, and the houses are three-roomed with a large area and good stability. Earlier, people used local poplar wood as beams for the stability of the houses and rammed earth walls on the periphery, which was "earth and wood structure". With the improvement of life, the material of the houses changed and the walls were changed to brick walls. The exterior walls and roofs of Hui buildings are generally dominated by cool colors such as white, green, blue, yellow, etc., which are combined with local natural conditions in specific applications. Due to the arid and rainy climate characteristics of China's northwestern region, the local people are most eager for water and oasis, and the water is colorless, was shining in the blue sky under the water also became blue. Only to make the exterior walls and roof color with the use of water-related, are cool and cool tone (Figure 14 a). It can also be concluded that in the process of urbanization, the residential architecture has changed a lot, and also changed the habitat in the villages.

Kilns were originally constructed of raw earth and were exposed to the elements, making them susceptible to the external natural environment. During the long history, the soil material has been subjected to rain, weathering and various external damages, which made the lean-to kiln (Figure 14b) in a latent state of collapse. The households have now moved into the newly built brick composite houses (Figure 14c-d). This change is a sign of the villagers' improved standard of living, which is in line with the natural environment, social culture and ideology of the local people.



(a) Berthing kiln



(b) upstairs



Fig. 14. Current situation diagram of compound compound Source: Self-taken

4 Conduct specific data analysis on the types and characteristics of traditional houses

4.1 Comparative analysis of traditional dwellings in Xihaigu area

Due to the influence of natural environmental factors such as landform, river system, environment and climate, different types of villages have different external morphological characteristics (Table 3). Secondly, due to the influence of villagers' lifestyle, productive forces, social organization composition and national culture, the spatial function composition inside the courtyard has its own spatial structure. Therefore, the horizontal data of traditional dwellings in Xihaigu area is compared.

Table 3. Comparative analysis of residential building types in Xihaigu area. Source of chart: Author's self-drawn

courtyard	Liangbao village residence	Machang village residence	Mageda Village Residential Buildings
County to which it belongs	Longde county	Longde county	Tongxin County
function	Military fortress	Ordinary village	Ordinary village
Structure type	Earth, wood, stone mixed structure tile house	Brick-soil structure	Earth built cave dwellings
Courtyard space characteristics	Courtyard, courtyard	Compound compound	Compound cave courtyard
Main function	Defense and habitation	reside	reside
Number of floors	monolayer	monolayer	monolayer

Decorative features	Wood carving is relatively exquisite, bold color, good luck, family prosperity.	The art of three sculptures is exquisite, the color is elegant and simple, highlighting the custom of "wealth is not exposed"	The decoration style is rough, vigorous, solid, simple and bright.
---------------------	---	---	--

The settlement form of each village is analyzed macroscopically, and the plan layout, spatial characteristics, structural types and architectural decoration characteristics of each household are analyzed microscopically (Table 4). Secondly, according to the influence of the traditional architectural hierarchy, the indoor and outdoor Spaces of local traditional dwellings are also formed into different functional divisions, and the drawings of each household are drawn and the differences of traditional buildings in Xihaigu area of Ningxia are summarized. The shaping techniques and performance characteristics of these traditional residential Spaces have a good guiding significance for the design of modern architectural groups and monomers.

Table 4. Regional characteristics of traditional architecture in Ningxia region .Source of the chart: drawn by the author

Morphological type			Typical characteristics
Traditional village	form	Adjacent water system type, water system around type, water system through type	a. Large dispersion, small polymerization b. Live around the temple c. Protect the terrain and use the site
	Graphical representation	Straight strip, zigzag strip, ordinary cluster, irregular cluster	d. Centralized layout e. Rational use of underground space
Residential building	Single building, three-heyuan style, four-heyuan style, fortress, cave style		a. Adapt to local conditions, flexible layout b. Internal courtyard space c. Create courtyard gray space d. Use of soil materials and technology e. Rough, solid visuals f. The slope of the roof varies regularly with rainfall

4.2 A comparative analysis of traditional dwellings in Xihaigu area and other areas

There is a great relationship between the roof form of traditional residential houses and precipitation in Ningxia, which can grasp the roof distribution form in northern Chuan District and Xihaigu district. The roof shape is consistent with the slope(Table 5). From north to south in Ningxia, the roof changes from flat roof type to tiled flowing water type, and the roof slope changes accordingly. The roof slope increases with the increase of rainfall in the region. The transition zone of rainfall in the range of 400m ~ 500mm isohyets often has several forms at the same time. However, in the construction of modern new rural areas, the government is easy to ignore the local regional characteristics, which makes the distribution characteristics of the roofs with local characteristics disappear day by day.

Table 5. Roof Types in Ningxia Area .Source: Drawn by the author

Roof type	Rainfall line range	region of distribution	Examples
flat roof without tiles	≤300mm	Along the Clearwater River Basin in Tongxin County	
Tiled roof with flowing water on one side	300mm~400mm	Haiyuan County, Xiji County area	
Tiled two-sided flowing roof	≥600mm	Jingyuan County, Jingyuan Liupan Mountain area	

In addition to roof types of traditional houses in Ningxia, Xihaigu area and Beichuan District still have great differences in courtyard layout, courtyard proportion, courtyard function and spatial characteristics. For detailed comparison information, see Table 6.

Table 6. Comparative table of traditional houses in the south and north of Ningxia. Chart source: Author's self-drawn

district	West Haigu area	Bukukawa ward
Courtyard layout	This area is based on compound courtyard and cave courtyard layout.	The courtyard layout of "one" shape and "L" shape is common in this area.
Courtyard proportion	1:3 (narrow and long) courtyard is mostly for ordinary civilian, the layout is relatively compact and practical.	3:4 (close to square) The courtyard covers a large area and the interior pattern is large.
Courtyard function	Ordinary village	Military fortress, ordinary village, commercial residence
Spatial feature	Single building, courtyard, courtyard	Fortress, courtyard
Slope of roof	The rainfall is heavy, and the roof slope is mostly tiled and two-sided water roof.	The rainfall is low, and the roof slope is small. It is mostly a flat roof or a water roof with a tile.
Architectural decoration	Brick carving, stone carving craft exquisite, exorcism to avoid disaster is also a yearning for official career.	Brick carving, stone carving simple and simple, the pursuit of peace and beauty.
Architectural form	The buildings are all one story, and the upper room is located on the central axis of the courtyard	Ordinary residential buildings have one floor, and military forts have two floors, covering a wide area and large courtyard space.

5 Conclusion

This paper summarizes the three types of residential architecture in volume are ordinary residential, architectural decorative colors and the combination of the natural environment of the Northwest, and the other two types of residential difference is with the development of society in the spatial composition of the household and the transformation of architectural forms. Analyzing and organizing the above three different types of traditional houses, from the macro view of the way of settlement creation, all of them reflect the traces of the integration of Hui and Han cultures, and from the micro morphology of the characteristics of the traditional houses also understand how the traditional houses are adapted and developed in the local area with the passage of time. This study on the traditional folk houses in Xihai Ancient region is not only conducive

to the inheritance of the "Silk Road" folk houses architectural art in the future, but also makes the regional folk houses shine in the soil of Chinese folk houses.

Funding

This research was supported by these funding projects below: 1. Project Source: Key Art Projects of the National Social Science Foundation Project name: Research on the Art of Traditional Chinese Dwelling Architecture and Folk Culture along the Land "Silk Road" in China. Number: No.18AH0082. Project Source: Major Project of the National Social Science Foundation of China Project name: Historical Collation and Research of Cultural Exchanges Between Chinese and Foreign Craftsmen Along The Silk Road Number: No.22&ZD2273. Project Source: Project of the Social Science Foundation of Shaanxi Province Project name: Yellow River Civilization: Research on the excavation and digitalization of traditional residential dwellings' architectural culture in Shaanxi Province Number: No. 2022J0034. Project Source: Project of Special Support Plan for High-Level Talents in Shaanxi Province

* Acknowledgement: this paper is funded by Fund projects: (1) The National Social Science Foundation of the Arts Key Project "Research on the Architecture Art and Folk Culture of Chinese Traditional Houses on the Land "Silk Road" (Number: 18AH008)"; (2) Project entrusted by the Ministry of Culture and Tourism: "Yellow River Culture and Chinese Civilization: Rescue Research on Shaanxi Traditional Residential Buildings and Residential Folk Culture" (No. 21HH02); (3) Shaanxi Province High-level Talents Special Support Program.

References

1. Yan Ningna. Research on the camping and development strategy of Hui community in Xihaigu, Ningxia [D]. Xi'an University of Architecture and Technology, 2015.
2. Wang Fei, Zhou Dian, Yang Lu. Research on Renewal and Reorganization Design of Vernacular Residences in Xihaigu Area of Ningxia[J]. Urban Architecture, 2017(23):31-33.
3. QI Yicong, ZHANG Xingguo, FAN Yindian. Research on the characteristics of traditional architectural construction of Hui people in Ningxia[J]. Journal of Western Habitat Environment, 2015, 30(03):44-50.
4. Zhu Ming, Lu Xiaobin. From the transformation of residential buildings to the respect of regional culture--Taking the transformation of kilns as an example[J]. Popular Literature and Art, 2018, 8(23):90-91.
5. Li Zheng, Pei Lei. The "earth" culture in Chinese traditional architecture--Kiln Cave Architecture[J]. Journal of Wuhan University of Science and Technology (Natural Science Edition), 2000(01):69-71.
6. Jing Kang. Research on Ecological Architecture of Hui People in Ningxia--Taking Cliff Kiln and Hoop Kiln as an Example[J]. Small and Medium-sized Enterprises Management and Science and Technology (Zhongdian Journal), 2016(12):58-59.
7. Li Weidong. Research on the Architecture of Hui People in Ningxia[D]. Tianjin University, 2009.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

