

SUNKEN CAVE DWELLINGS --- SEEN FROM TYPOLOGICAL & ANTHROPOLOGICAL PERSPECTIVES

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ABSTRACT:

With more and more farmers flowing into cities from rural area of Sanmenxia, Henan Province because of economic development and rapid pace of urbanisation in China, the sunken cave dwellings in that area are being either abandoned or replaced by brick-and-mortar houses built on the ground. These underground houses, unique because of their invisibility, together with the inhabitants and their life closely related to these caves, are gradually diminishing from below the horizon. This research, based upon relevant studies, typological and anthropological theories, is designed to find the links between architectural vernacularism and the physical features of the place and cultural influences by closely examining 11 sunken cave dwellings. The study focuses on both unification and variations of the dwellers, some common techniques and practice in digging, strengthening and embellishing of these structures. Besides, oral history documentation conducted for this research provides clues to the understanding of the history of the area. The findings of the research are that the vernacular architecture in the area under study are the results of the combined influences of both unique physical features of the place, the economic development, and the values and creativity of the dwellers there.

1. INTRODUCTION AND MOTIVATION

In the wide hilly expanse of north and northwest China there exist clusters and clusters of invisible houses with a very unique architectural style for inhabitation. In Chinese this kind of residential houses are called *di kēng yuàn* (地坑院) which has been translated into English in several ways such as sunken cave houses, subterranean dwellings, underground cave dwellings, pit houses, pit courtyards and so on. The most conspicuous feature of this residential architecture is that they are not on the ground, instead, they are built underground. To a large extent, they are not built, but are dug into the earth. Earth is taken out of a rectangular hole about 6m to 7m deep and then caves are dug into the earth on four sides leaving an outlet for entrance and exit. This distinguishes them from ordinary caves in that ordinary caves are usually dug on the slope of a hill. *Di Keng Yuan*, an underground rectangular courtyard is usually made up of more than 8 caves for a family, large or small, as well as livestock the family possesses to inhabit. This kind of residential dwelling is popular in various provinces in China such as Gansu Province, the Autonomous Region of Inner Mongolia, Qinghai Province, Shanxi Province, Shaanxi Province, Hebei Province, and Henan Province, covering an area of approximately 636,000 km² and sheltering around 40,000,000 people according to an assessment done in 1981 (ASC, 1981). Since there is still a large number of people living in cave houses despite the fact that many farmers have left the countryside as a result of the rapid urbanisation in China, it is architecturally and economically meaningful and instructive to find out the various subtle and intricate propelling forces behind the special way of habitation, the techniques involved in the construction and even the methods to protect these ancient-styled houses. It is also philosophically and anthropologically significant to find out the typical Chinese interpretation of the relationships between man and nature and the relationships among men.

Over the years, due to the development of economy and the rising of cultural consciousness, studies of cultural landscapes

and vernacular architectures have been paid attention to in China. However, by now researches on sunken cave dwellings in China is far from enough though some researches have been done and some papers have already been published. Researches on sunken cave dwellings are mainly of physical aspects of the architectures, such as the comparison and contrast between cave housing and other types of housings in terms of temperature, moisture, ventilation speed, chemical analysis of the loess, the force distributions of loessial arches of cave dwellings, with Liping Tong, Li Tang, and Jiayin Zhu from Zhengzhou University and other scholars taking the lead in this domain (Tong, Han, 2008) (Tong, Xu, 2015) (Tong, Xu, 2016) (Zhu, Tong, 2016) (Zhou, Ren, Tang, 2011). Compared with the studies of other vernacular architectures in China such as the Beijing quadrangles, the Hakka dwellings, etc., studies of sunken cave dwellings are neither wide nor deep enough.

In this regard, studies of sunken cave dwellings in China with the help of various means such as on-site measurement and sketches, computer-aided drawings, space analysis, and especially anthropological studies associated with the vernacular architecture of a specific place is insufficient and even scant. The reason is that no due attention is paid to the people living in these houses, to the way they lead their life in their houses, to the stories behind the houses, to the events taking place during the construction or during the long term of their use, should these be categorized into the field of anthropology. Propelled by the current academic ecology in this domain, this paper is an attempt to gain a broader and deeper insight into the cultural landscapes in this region for the purpose of which 11 sunken cave dwellings in Yangjiayao Village and Mazhuang Village, Sanmenxia City, Henan Province, China are chosen as the specimen.

2. METHODOLOGY

It is necessary to give a brief introduction to the theories on which this research is conducted. To define cultural landscapes, Carl Sauer sees it at two layers: "The cultural landscape is

fashioned from the natural landscape by a cultural group. Culture is the agent, the natural area is the medium, the cultural landscape the result." (Sauer, 1963) Being the materialised culture, vernacular architecture is an excellent exemplar to elaborate the cultural landscapes. In terms of the content of vernacular architecture study, Henry Glassie (2000) expresses his definition by saying that: "We call buildings vernacular to highlight the cultural and contingent nature of all building....Proposing distinctions and labelling buildings along the way, the study of vernacular architecture is an approach to the whole of the built world. It favours completeness, recognizes diversity, and seeks ways to use buildings as evidence in order to tell better versions of the human story." And according to Adams and McMurry, the ultimate goal of vernacular architecture studies is not to reconstruct a physical landscape but to interpret it (Adams & McMurry, 1999). However, one of the most prominent characteristics of vernacular architecture is its anonymity. Sources like drawings, evolution of design can hardly be found. For the means of conducting researches on vernacular architecture, Rapoport (1969) recommends people to analyse them through a specific point of view instead of tracing its development. Bronislaw Kasper Malinowski (2010), with the regard of the specific conditions and situations in China, airs his views: "It was necessary to read in the open book of Chinese life, and learn how the live Chinese mind works in reality....Such an anthropological approach is indispensable as a supplement to important historical work.... History can be read back, taking the present as its living version, quite as much as it can be read forward, starting with the archaeological remains of the dimmest past and the earliest written records. The two approaches are complementary and they must be used concurrently."

Guided with the supporting theories and the given methods, this research is based upon primary sources and secondary sources. Primary sources are mainly from field investigations, including first-hand measurements of 11 sunken cave dwellings by laser metering device, on-site sketches, computer-aided drawings, mappings, interviews, photographs. Secondary sources are references from books, journals, and data from the government and organisations. Primary sources are comprised of quantitative studies and qualitative studies. For quantitative studies, a total of 104 caves and 11 sunken courtyards are measured and are studied in details. In Yangjiayao Village, 7 sunken cave houses are studied of which 3 are abandoned and 4 are still in use; in Mazhuang Village, 4 sunken cave houses are studied with one already abandoned and 3 being still in use. For qualitative studies, typological studies and oral history are two of the major approaches. The former is more about physical aspects which categorises sunken cave dwellings from different perspectives, such as the scales of caves, the shapes of the cave arches, the patterns of windows, doors and gates, the materials used in the facades, the interior arrangement, the variations of entrances, the vocabulary and grammar that locals use in house building and the architectural nuances within the area. The latter concerns more about anthropological aspects that more efforts are made on the conversations and observations of the dwellers, such as the relationship in the neighbourhood, the history and the stories behind sunken cave dwellings, the everyday activities, etc. These are the methods mainly used in the project.

3. PHYSICAL ASPECTS OF SUNKEN CAVE DWELLINGS

3.1 The location of Sanmenxia

Owing to its position, Sanmenxia lies on the transition zone between the Loess Plateau in the west and the North China Plain in the east, with tremendous variations in altitude but a continuity of type of dwelling in architecture. Loess is mainly distributed within mid-latitude in the north hemisphere where the climate is arid or semi-arid with the lowest temperature being below 0°C, the frost-free period half-year long, the annual precipitation between 250-600 mm, and the annual evapotranspiration over 1,000 mm. In China, the loess belt is normally at 33°N-47°N. The loess belt ranges from 50m to 300m in thickness and in west of Henan Province the thickness is between 50-100m (Hou, Ren, Zhou, Li, 2017). The nature of the loess is one of the determinant factors of cave dwellings. People take the advantage of the nature of loess in constructing cave houses in Sanmenxia and any other places along the loessial belt in China. Silo-cave making is in fact an activity based on the knowledge of local raw soil and experiences from countless cases passed down from generations to generations.

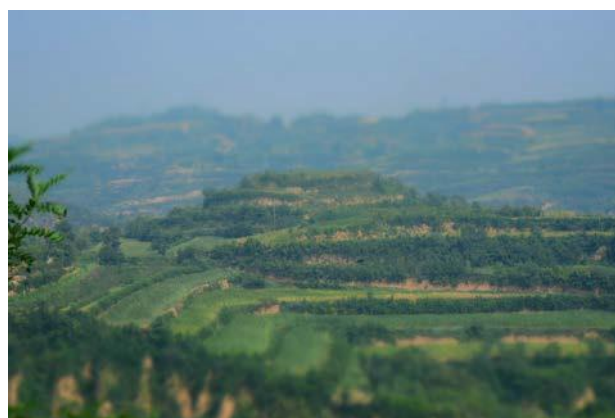


Figure 1. Landscapes in Sanmenxia

3.2 The loess in Sanmenxia

Loess, a sediment formed in the Pleistocene epoch in China, is classified into three types, namely the loess of Wucheng, Lishi Loess and Malan loess. Caves are normally built in the Lishi loess and some in Malan loess owing to the easiness of digging and the structure of calcareous concretions. But because Lishi loess is more solid and contains more concretions than Malan loess and the loess of Wucheng, it is the best place for cave building among the three (Hou et al., 2017). Loess is composed of a number of mineral elements, such as montmorillonite, quartz, feldspar and micas. Quartz accounts for 47.5-53% of the loess, feldspar 37.5-43%, and micas 3-7.7%. As for chemical constituents, there are SiO₂, Al₂O₃, CaO, Fe₂O₃, MgO, Na₂O, K₂O. in the loess. And SiO₂, Al₂O₃, CaO constitute an overwhelming percentage, over 70%, to be exact. Besides, there are other carbonates, sulphates, halides, and other soluble salts (Chen, 2012). The nut structure inside the loess is mainly composed of calcareous concretions, or rather, the CaCO₃ which functions as aggregates in the loess. CaCO₃ takes many forms in the loess depending on geologic process and climate. In Sanmenxia it exists mostly in the shape of gingers. These ginger-like stones are the most prominent feature of the loess in Sanmenxia and the sizes and forms of these stones vary in exactly the same way gingers do.



Figure 2. Ginger nuts in the loess

According to a study, ginger nuts contain 70%-80% CaCO_3 and 20%-30% clay, and within the clay most of the chemical material is SiO_2 (Li, Zhao, Wang, Li, 2011). Based on the chemical analysis done by Northwest Water Conservancy Science Research Institute and Shaanxi Water Conservancy Science Research Institute (1959), the carbonization of CaCO_3 produces HCO_3^- which can react with colloids of the clay and such reaction help to raise the plastic index and viscosity of the loess. Other carbonates and sulphates (such as CaSO_4 , $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, MgSO_4 , K_2SO_4) can cement with the surface of loess particles as well. These elements all lead to an ideal performance in compressive strength to the whole body of the loess. In terms of the compressive strength of the loess, Chang, Blaser and Stephenson (1987) state: "Loess with a suitably granulated composition can be worked to the equivalent of 50 brick, which is widely used in China and has a compressive strength of 50 kg/cm^2 ." From the observations by the researcher of this project, though many caves have been abandoned for ages in Sanmenxia, they continue to exist there even though cars and trucks are running over them.

Residential constructions in rural Sanmenxia are mainly guided by empiricism. According to elder villagers, the more ginger nuts there are in the loess, the more solid the loess is. Experiences of the locals guide them that if the top of a cave arch consists of layers of ginger nuts, then the caves are supposed to be more secure and can endure longer.



Figure 3. A sunken cave dwelling in Yangjiayao Village.

3.3 The climate, geographical feature and history of Sanmenxia

Wind erosion and water erosion by the Yellow River, the Wei River, the Jing River, the Luo River, and the Fen River determines that land in Sanmenxia is not fertile. And with the precipitation, the records of 50 years of the rainfall in Sanmenxia from 1960 to 2009 show that the high water season is between June and September with an average precipitation of 386.6mm. In the recorded 50 years, precipitation decreases linearly and the drying coefficients of 25 years out of the 50 years are greater than 3.5, which means that drought years account for 50% in the 50 years (Chen, 2013). Also situated in the transition point of plateau and plain, Sanmenxia has been one of the crucial places since ancient times that wars never ends on this piece of land. These lead to the fact that trees are not abundant in Sanmenxia and wood is insufficient in construction activities. What's worse, locals survived wars but were not rich enough to buy common materials to build decent houses. However, confronted with the hostile environment, local people are forced to find out a most economic way to be sheltered, that is the sunken cave dwelling.

4. THE CULTURAL ACTIVITIES AROUND SUNKEN CAVE DWELLINGS

Vernacular architecture is the materialised culture that involves human activities, comprehension of space and place, philosophies, the embedded values and codes. With the ideas ad hands of the local people, constructing sunken cave dwellings, or rather reshaping the natural landscapes, has become an ideal way of connecting man and nature.

4.1 The procedures of construction

The form of a sunken cave house determines that it is constructed in an opposite way to the one that is built on the ground. In this area a pit is firstly dug 6m to 7m downwards from the ground which will become the sunken courtyard. Normally the pit is dug 30cm smaller than the designed size in order to leave space for further embellishment. The interviews with villagers show that at the start of pit digging, they use baskets to empty the loess and when the pit is deep enough, they use wheelbarrows and rope hoists to transport the loess from the pit. A paper makes this process more clear that before the courtyard is dug 4m deep, loess is taken out manually and when the pit is deeper people use rope hoists to empty loess (Tong, Zhang, 2007). Loess is normally dumped to the nearby ditches and the loess along the 4 sides of the pit gets dried and solid as the pit is being dug. Often the pit is dug deeper on the main side with superior caves than on the other 3 sides with inferior caves so as to signify the superiority of the main caves as by tradition these caves are occupied by elder family members. And the 4 edges of the square pit is raised higher than the ground level forming slopes around the sunken courtyard so that rain water will not go down into the courtyard but flow away outside. The 4 vertical walls of a courtyard, are locally called *ái miàn* (崖面, meaning cliff surface). These 4 walls are not plumb down, not absolutely 90° vertical to the ground. This is to make sure that the loess on the top of the courtyard can be supported for the sake of its own gravity and will not collapse after years of erosion of wind and rain. To reduce the gravity over the arch, some villagers even remove the earth over the arch which creates small terraces in the vertical walls. And some apply plaster onto the walls to strengthen them.

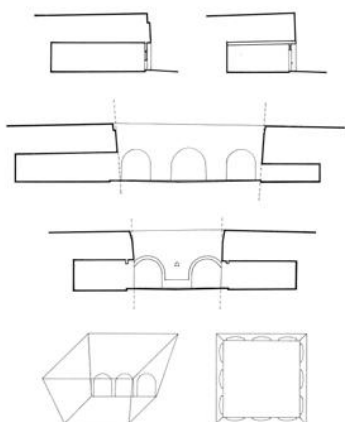


Figure 4. 4 pieces of vertical walls are not absolutely 90° vertical to the ground

Before a courtyard is finished, a well has to be dug to drain off rainwater and to keep the house dry. It is told by villagers that the depth of a well is at least the depth of the courtyard and the well is constructed like a jar. Diameter of the mouth of a well is 1m or so. To avoid mud and dust silting up the well in sunny days, the mouth of the well is usually covered with a round millstone. The thickness of the millstone is around 10cm and usually there is a hole in the centre of the millstone so that residents can hook the stone and remove it from the mouth of the well in rainy days.

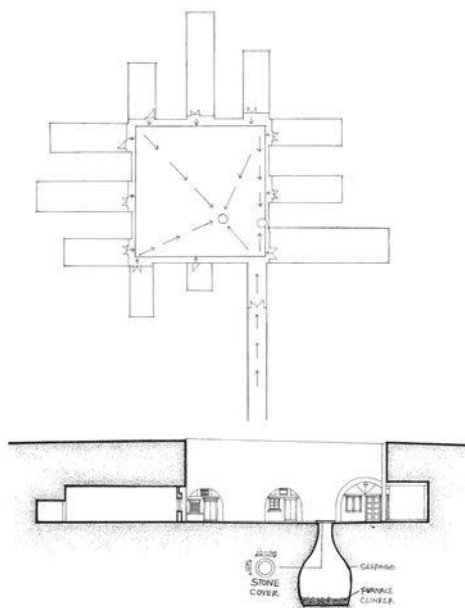


Figure 5. The jar-like well

According to Compilation Committee of the History of Shaanxian County (1988), the groundwater in this region is 50m to 80m below the ground while a sunken cave house is normally no more than 12m below the ground level, so houses are hardly affected by the groundwater. From the memories of the villagers, even in the heaviest rainy days, wells in their courtyards could drain nearly all of the water that flowed into it. This is verified in Construction Techniques of Sunken Cave Housing that "though a small part of the rainwater gets drained through the ground of the courtyard, most of the rainwater is

drained by the well. The well functions well even when rain is up to 800ml which is the maximum annual precipitation in this region. And there is no record of water overflowing from a well" (Wang, Du, Zhang, Liu, Li, 2013).

After a courtyard is fully completed, for example, the vertical walls on four sides get naturally dried, the edges polished, and the entrance of the house dug through, villagers begin to dig caves (a step locally called *dā yáo*, 打窑) on the 4 sides of courtyard. The outlines of caves are drawn by experience. Based on the outline, people begin to build the arch over the loess wall and then dig the cave horizontally little by little.

In this area, the façade of the caves are called the faces of caves, the bottom part of the caves are called the legs of caves. Normally the face of the middle cave on the main side is built with bricks and the faces of the west and east caves are built with half bricks and half adobe bricks. This is an usual way used by locals who didn't have plenty of money to buy bricks but still wanted to have a relatively organised and decent house. Therefore, more bricks were used to build the most important caves, and to be exact, the middle cave on the north side which is right on the symmetric line of the whole house to show its importance. For the east and west caves they only strengthened the cave legs and the bottom of the main window with bricks to protect the cave from rainwater erosion, and they used adobe bricks for the upper part of the main window. This was economical and at the same time the cave face gets well protected. Over the adobe bricks, they would apply mud with straws to even and to smooth the surface of the bricks. Sometimes they would apply lime mortar over the mixture of mud and straws for protection and to beautify the face of the cave.

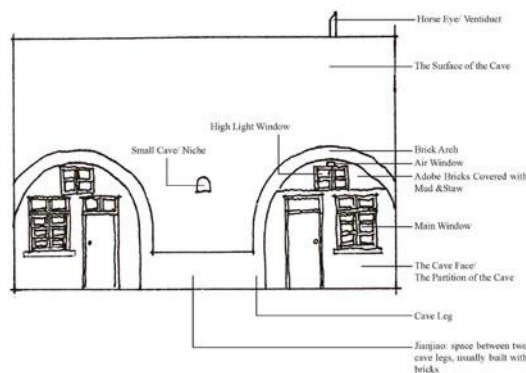


Figure 6. The cave face

There are mainly two ways to protect the loess walls from wind erosion and water erosion. Villagers either apply the mixture of mud and straw onto the adobe bricks or after the application of mud and straw onto the adobe bricks, they apply a layer of lime mortar.

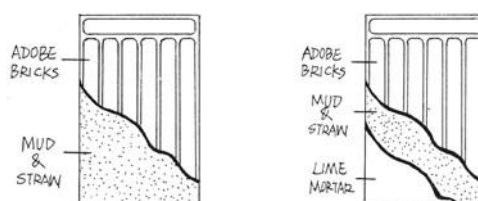


Figure 7. Two ways used by the villagers to protect the loess walls

According to Wang et al.(2013) if 5 to 7 people work full time in digging a cave, then the maximum of their work is to empty 100m³ of soil each day and it will take them around 1 month to complete constructing one cave. However, this is calculated under the best conditions. Most of the elder villagers are not only dwellers but also architects and constructors, but for them such construction was never easy. An elder villager recalls the construction of his house: "I started digging this house since 1972, at that time, China was still in the phase of the People's Commune. I work in the Production Team during the day and could only dig caves part-time. Each day I would dig more than 100 baskets of earth. In winter, the sun rose around 6 o'clock, so I would get up at 4 and dug 40 baskets of earth, emptied the earth and then I worked in the production team. At noon, during the lunch time, I dug 30 baskets of earth. At night, after my wife set the table and dinner was ready, I dug another 40 baskets, when the meal turned cooled, I started eating my diner." His sunken cave house hasn't been completed even today, 3 caves left undug. "It was an enormous work in terms of both time and energy to empty the earth from a piece of land about 18m by 12m to make the sunken courtyard, let alone the amount of earth from caves. So we used to help each other. I really cherish the days digging caves together." told by another dweller. From the interviews with dwellers, lending hands to each other was one of the most the efficient ways of such construction and sunken cave dwellings in the two villages are works of collaboration and cooperation within the neighbourhood.

By material, 5 types of cave faces are found in the two villages, namely the faces of bricks and adobe bricks, faces of bricks covered with cement, faces of bricks only, faces of adobe bricks and faces of adobe bricks covered with lime mortar. Below displays the faces of adobe bricks covered with lime mortar. Nuances can be found through typological study.

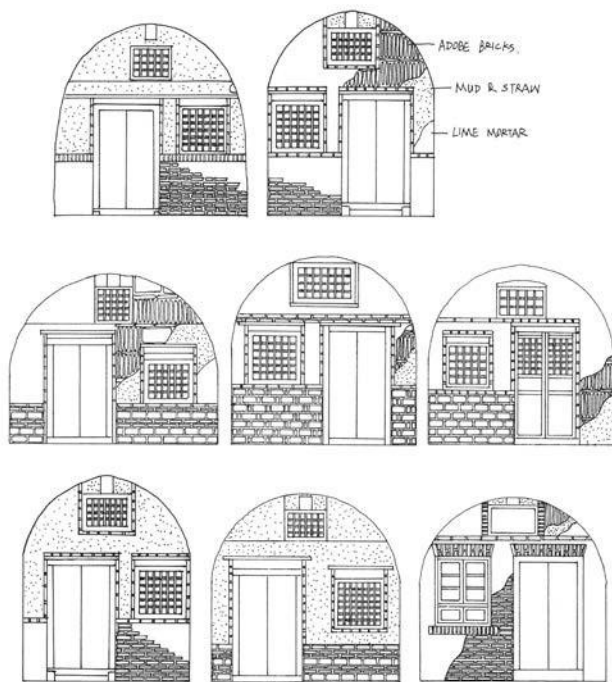


Figure 8. Typological study of the cave faces (adobe bricks covered with lime mortar)

As for arches of caves, 6 types are found in the two villages, namely loessial arch with outline covered with and without lime

mortar, loessial arch covered with lime mortar, loessial arch covered with cement, loessial arch, brick arch (1 layer, 2layers of bricks), half brick arch. Arches together with cave faces consist most of the cost of house. Richer family will use more bricks in arch making so as to make the cave more secure.

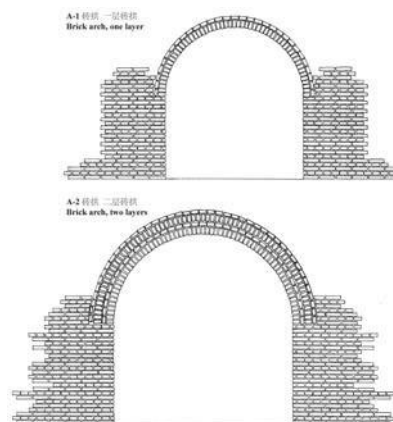


Figure 9. Typological study of the cave arch (brick arches)

There are several patterns of bricklaying used in embellishing the cave face.

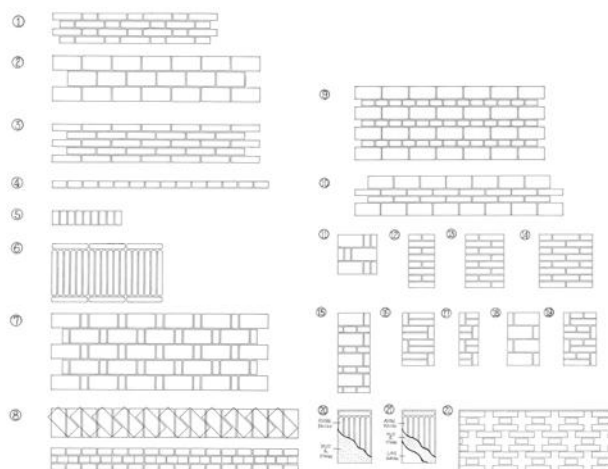


Figure 10. Patterns of bricklaying

4.2 The usage of caves within a sunken cave dwelling

4.2.1 Orientation: Generally speaking, the usage of caves is largely determined by the physical conditions. Among several physical conditions of the caves, such as luminance, temperature, moisture and wind speed. orientation is one of the most important ones that can affect all the others.

From the research of the houses in the two villages, the horizontal depth of caves ranges from 2m to 22m. Horizontal depth of a cave is normally determined by the quality of the loess and the type of use. A cave for toilette is normally 2m deep while a cave for grain storage or for tool storage is normally more spacious. Caves are dug by the household demands. For living, the depth of caves is from 5m to 12m. Because only one side of the cave faces the courtyard and only one side functions as portal for light coming, so without artificial aids the deeper the caves, the poorer the day lighting is in caves. Therefore, in this region the most important cave of a

house is the cave situated in the best orientation. If a house is situated in the north and facing south, then the middle cave on the north side of the courtyard is on the most favourable orientation, gaining the longest sunshine of the day. And the most important activities will be held in this cave. To attain the most sunshine, bed is always located right below the window and stove is in the middle of the cave and storage for grains or tools is placed at the end. Told by a landlady she used to put her baby on the bed so that she could still take care of him while cooking or doing chores. Today, in the same cave, besides the bed lies a table for mah-jong, where her neighbours and friends entertain themselves after work in the field. From the conversations with other dwellers, the interior arrangement today is quite different from that in the past that back in the days when cattle, sheep, chickens were kept by every household, they were kept at the end of the cave. Men and animals shared spaces in one single cave.

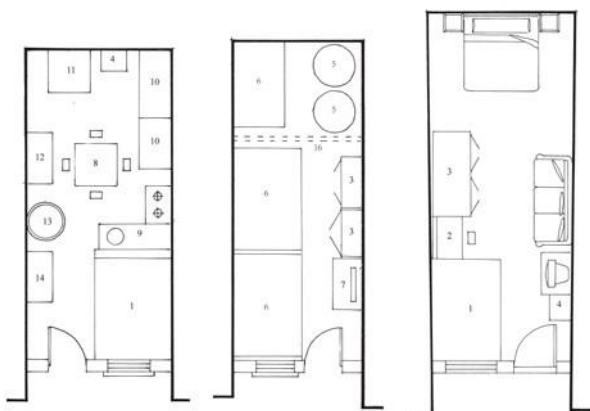


Table 11. Interior arrangement

1. Silo-bed 2. Dressing table 3. Wardrobe 4. Refrigerator
5. Water tank 6. Bed 7. TV 8. Mah-jong 9. Stove 10. Counter
11. Dining table 12. Cupboard 13. Water vat 14. Desk
15. Cabinet 16. Curtain 17. sewing machine 18. Tea table

Limited by the location of the houses, natural light can only be gained from the courtyard, but in some sunken cave dwellings when location permitted, caves would be dug horizontally as deep as 22m reaching the ditch outside if the situation just happened to have one such a ditch.. Though natural light can hardly reach every corner of the cave, the cave gets one more window or a back door, which is useful for dumping the loess to the ditches during the construction.

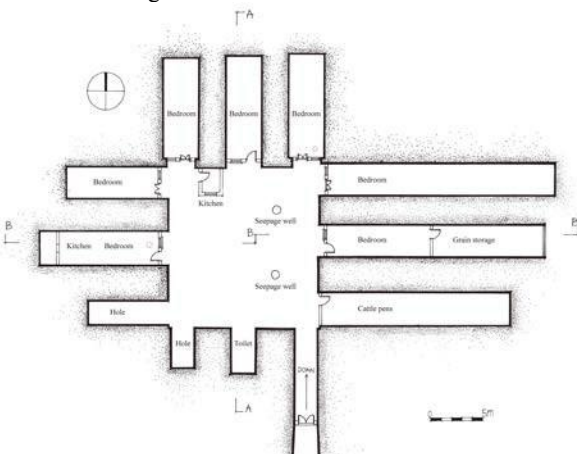


Figure 12. Architectural drawings of No7 sunken cave dwelling. Caves on the east side of the courtyard are the deepest found in the two villages.

422 Cave distribution among a family: Caves in sunken cave houses are not distributed randomly but are according to family members' statuses in their families. In fact, there are two important considerations or principles in cave distribution among family members. One is piety, the other the unity of family and state.

The best caves are always for the senior family members. This is a way to show respect and love for seniors by other members of junior positions. The authority of senior members is highly respected. Caves at different positions indicate the hierarchy of a family which correspond to the notion of the unity of family and state. This notion is rooted from the enfeoffment system of the Zhou Dynasty that land was distributed by the King of Zhou to his relatives. This system directly combined royal families with the state and to a great extent, families were politicised in it. Domestic status or hierarchy always works in assigning members caves. When boys in a family grow up and have their own small families, they have to have their own caves in the same courtyard. A saying about this in Sanmenxia goes like this, "The elder brother takes the east and the younger one the west", meaning the elder one takes the cave(s) on the east side of the sunken cave house and the younger one take the cave(s) on the west side. The underlying value behind the way is that the east cave(s) is believed to be superior to the west cave(s). There is a companion saying, "The elder brother lives in the south and the younger brother in the north". This is the same principle for distribution when a courtyard runs on east-west axis, indicating that caves at the south end are superior to the ones at the north end. Since almost all sunken cave houses in this research run on a north-south axis, the first rule is frequently used. Taking the No.2 sunken cave house in Mazhuang Village as an example, the owner of the house bore 8 children in her life, 6 daughters and 2 sons. Her house runs on a north-south axis. She and her husband used to live in the main cave on the north side, the best cave in the whole house which receives the longest sunshine. When her eldest son got married, the small family occupied the cave next to her cave and they no longer ate with her but cooked the meal by themselves. The son's kitchen was the middle cave on the east side of the house. When her younger son developed his own family, they lived in the north cave on the west of the house, west to the cave where his parents lived. The middle cave on the west side served as the kitchen of the younger son. Her daughters used to live in the north cave on the

east side of the courtyard. When all of the daughters got married and left, the owner still kept the cave for accommodating her daughters and grandchildren when they visited her.

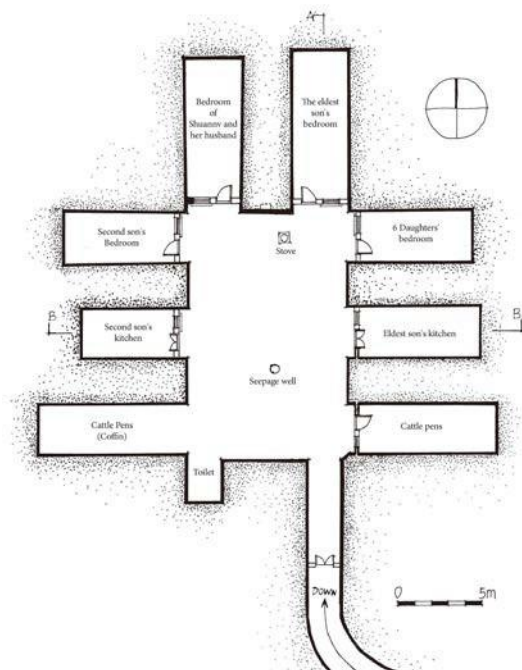


Figure 13. Cave distribution in No.2 house

5. THE HISTORY AND STORY BEHIND SUNKEN CAVE DWELLINGS

For aged villagers, the invisibility of sunken cave dwellings not only shelter them from dreadful weather but also protect them during the war time. "The spatial features enable the sunken cave house to better protect the soldiers during the Chinese Civil War." A villager told that Yangjiayao Village was once a crucial spot during the Chinese Civil War. Based on his narration, the story finds its root in an article entitled A Special Escort--A Military Operation in Retrospect (Liang, 2003a, 2003b, 2003c) and in Compilation Committee of the History of Sanmenxia City, published in 1999, that sunken cave dwellings covered a troop to escort a code book and a large sum of money to the No. 5 Division of the New Fourth Army in 1946.

Sunken cave dwellings also presents its superiority in disguise and in economy during the 2nd World War. The detailed records of military actions particularly air raids documented in History of Sanmenxia City show that Sanmenxia was devastated between 1939 and 1944 (Compilation Committee of the History of Sanmenxia City, 1999), and Guan points out that during the 2nd World War local people in Sanmenxia City were too poor to build houses and the sunken cave houses in the loess became their shelters until Japan unconditionally surrendered to China (2003).

One of the dwellers among the 11 sunken cave houses is different from other. By appearance, after renovation, his sunken cave house is the most beautiful one in the two villages. According to him, the house he and his families living in was dug by his father. "In 1950s, my father answered the call of the government to emigrate from Sanmenxia for the construction of the Sanmenxia conservancy project. Therefore from 1956, my father together with other emigrants from the construction area in Sanmenxia set their foot on the road to Dunhuang, Gansu

Province. He went there on his own and got married there. However, many people could hardly get accustomed to the dreadful environment in Dunhuang. The climate was too dry and hot, making their life harder compared with that in Sanmenxia. What's worse, they missed their home terribly, their root is always in Sanmenxia not in Dunhuang. Finally most of the emigrants returned home and my father came back as well." However, when the emigrants came back, they lost almost everything, there was no house nor land for them to settle down. They had to start over again from the place they called home. Luckily, when his family moved back to Sanmenxia, the Production Team helped his father find a piece of land and he started digging the first cave for the family. "My father never stopped digging so as to provide a happier and cosier life for us." Influenced by his father, being the second generation of architect and constructor in his family, he knows what sunken cave dwellings mean for him. In 2006, the Chinese State Council (2006) issued a policy (Guofa [2006] No.17) to pay compensation to those who moved from their homes to other places for the construction of medium and large-sized water conservancy projects. Each family member could receive 600RMB per year for 20 years as compensation and the due respect and remembrance for those who gave up everything to support the country. The dweller got the money, 2,400RMB every year for 4 family members, 20 years, but his father was no longer able to witness the compensation from the government.

Undeniably cave housing is unique in that it has been emotionally tied with Chinese particular with the older generations and it conveys the strong willpower of the nation in the hard time.

SUMMARY

As product of human efforts to live in this world, houses function as shields to protect people from rain, snow, hot, cold, animals and other dangers. Houses also function as a place for various human activities including sleeping, eating, entertainment and others. However, styles of residential architectures vary from place to place due to various factors such as climate, landforms, collective habits of residents and their civilization. Thus, interpretation of houses in a particular place especially those with distinct features usually involves some important aspects especially the ways dwellers perceive their environment, their relationship with nature and the relationships among themselves.

With the theories of typology and anthropology as the guiding principles, the paper is an attempt to find out the reasons why houses in Sanmenxia, Henan Province, China lies underground, how they are designed, built, embellished, and used a living unit for a family. To do this, the research touches the links between the special style of the residential houses with the features of the local landforms, the economic factors, and the creativity of the villagers there. The field work in the two villages and interviews with a number of villagers greatly facilitated the research and the discoveries the author of this paper desired to make.

The climate zone and the geographical position—the belt of loess—where the area lie, the unique physical features of the landscape, the difficulty to have access to building materials, the underdeveloped economy and the values and creativity of the dwellers are all the factors which helped shape and mould the architectural vernacularism in Sanmenxia area Henan Province China.

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