

Regeneration of Traditional Dwellings in Qingling Mountainous Area

Xiping Zhao, Jingqin Wang, Jiaping Liu

School OF Architecture, Xi'an University of Architecture & technology, Xi'an, China

Abstract: The chosen base of QinMao Village is located at the top of QinLing Mountain. The climate there is quite cold. That is a poverty-stricken area with a low level of economic and cultural development, and it is lack of energy. Faced with the lashing of modern living style, the local traditional dwellings gradually lost their vitality and continuity, even disappeared. Therefore, inheriting and improving the civilian residences there becomes an arguent issue recently. Under such a poverty-stricken situation, we established many living and manufacturing units in order to develop entertainment tour in farmhouse, ecological methane tank, economical crops cultivation and economical crops simple manufacture. Using eco-design theory, we try our best to improve the village's economic and cultural standard with an ecological way, and inherit and improve the traditional dwellings with regional ecological techniques.

Keywords: Rammed earth wall; cycle courtyard; Entertainment farmhouse; 3R material

1. INTRODUCTION

---Poverty makes alter, alter makes flexibility, and flexibility makes eternity.

The vitality and sustainability of traditional residential buildings is depended on the adaptation to living style changes. At present, Chinese traditional residential buildings are declining and disappearing gradually. It is urgent to protect, inherit and develop the Chinese traditional residential buildings.

During the process of close to open, the style and the content of the local architecture has changed greatly. It clearly shows the strength of the economy. During the process, it is difficult to judge which way is better or worse. However, this changes will no doubt lead to destruction in the view of traditional inherit. But for the local residents, these changes reflect the natural development of architecture. What we should do is to accept the reality and pilot the development to a healthy way.

The case site, a rural village named as Qinmao, which is geographically situated in the central part of China, between the Yangtze River and Yellow River, and top of Qinling mountain. It is within the administration range of Shangzhou city in Shaanxi province of China.

1.1 Historically, this region was the feudality of Shangyang, who was a famous reformer in Qin dynasty. And this region was also the gateway of ancient capital Changan city, and the main drag from northwest to southeast of China.

1.2 The climate in this area is the moderate mountain climate. It is cold in winter and the minimum temperature is around minus 10-Celsius degree.

1.3 The building style and construction methods reflect the local climatic property of the large precipitation and humid environment. The rain proof becomes the dominant factor in the design.

1.4 Stone foundation, rammed earth wall and large tile roof are the major property in this region. With the process of the history, this region has become poverty, low economy and short of energy resources. The local residents have been changing this situation by themselves. The aim of this paper is to guide the traditional residential buildings sustainability development.

2. GEOGRAPHIC CONDITIONS

Shaanxi Province, with a south-north length of 870 kilometers and the east-west width of 200-500 kilometers, is divided by Baiyu Mountain and Qinling Mountain. Three characteristic natural parts have been formed: the northern Shanbei (which means the north of part Shaanxi in Chinese) plateau, the middle Guanzhong (which means the middle of Shaanxi in Chinese) plain, and the southern Shannan (which means the south of Shaanxi in Chinese) area, where Qinmao village locates. Specifically Qinmao village, with an altitude of about 1420 meter, locates at the peak of No. 302 National highway in the south hillside of the Qinling maintain. It belongs to the high hillside topography. Qinmao village lies in the valley of the Qinling maintain, sprawls with a river. It is cold in winter and the annually average temperature is around 10-Celsius degree. It has the distinguish seasons and considerable daily temperature differences. Local residential buildings reflect the heavy precipitation in this area. With more than 1-meter long stretch-out eave and double eaves for protecting the house from rain, buildings in Qinmao

village have the property of southern residential buildings in China.

Qinmao village — Situated in the area of Shangzhou city in Shaanxi Province of China, it is in the area of moderate and low earth-rock mountain. The climate is the moderate mountain climate. The agricultural climate is in the range of high-cold climatic region. An under-development area as it is, the local traditional residential building culture is extinguishing slowly.

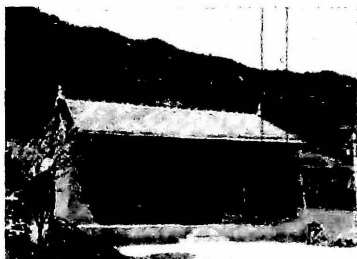


Fig.1 Traditional dwelling

3. RECOGNITION OF CURRENT SITUATION

The long historical Chinese traditional residential buildings have the feature of unique cordial feeling in the ancient China, which has developed in harmony with nature. As a historical civilization proof, the Chinese traditional residential buildings transmit the superior memory. Nowadays they still symbolize a spiritual civilization. With the influence of urbanization and the regional economy development, Chinese traditional residential buildings have to face some dilemma situation and choice. The wealthy farmers will choose some popular villa and the poorer farmers have to live in a shabby houses (fig.1, fig2).



Fig.2 Traditional dwelling elevation

New construction techniques will bring us a comfortable, convenient, relaxation and hygiene living environment, whereas the old Chinese traditional residential buildings fade gradually. When we realize this extreme phenomenon caused by this strong impact on and interaction with economy development, we believe that the local residential buildings should develop rationally. What is deep impressed us during the investigation is poverty, less farmland, extreme climate, labor force flow-out-to-city... If people live and construct buildings in this environment, the poorer farmers have to construct the buildings by the traditional techniques and rely on the nature favor for improving their poorer living conditions.

What we will do is to change the resident's living condition and activate the local economy development. Also what is important is to inherit and protect the local traditional landscape and technique of construction and agriculture industry. We know about those limit factors for local agriculture industry and also we believe that there are development potentials for local economic crops. Construction in this region should plan the development potentials, and promote the local economy development by the system of building design and village planning. Based on the belief of the tradition continuation, we probe into the promotion model of economy development and village space, and explore the rural regional economic courtyard model.

4. IMPROVEMENT PRINCIPLE AND PRACTICAL MEASURES

4.1 Improvement principle

Change to sustainable development, induction to the economic promotion model in the residential buildings planning.

4.2 practical measures

In the planning to combine the small organization units with corresponding topography and to classify the production model for different organization units based on the quality of the topography.

4.2.1 Entertainment tour in farmhouse: to enhance the countryside taste and to plant the economic crops, to develop the economic crops simple manufacture, to use natural energy resources.

4.2.2 Domestic animals breeding: to gather the nearby organization units and to be convenient for collecting the raw materials for methane pools.

4.2.3 Mushroom planting: to set up economic crops zone inside the house and outside greenhouses.

4.2.4 Economical trees cultivation: After the regional policy of "free of cultivation for forestation", economical trees can be planted inside the forest.

4.2.5 Economic crops simple manufacture: to manufacture economic crops simply integrated with several families by the model of manual workshop, and to make full use of wind energy (i.e. wind power mill).

4.2.6 Entertainment tour in farmhouse: to aim at improving the wildness taste of the buildings and to equip the leisure facilities.

4.2.7 Beekeeping: to feed in a concentrated way and to increase the output.

5. ALTER TO FLEXIBILITY IN THE VILLAGE.

Current situation: individual buildings scattering distribution, out-of-order.

Current situation: the whole village appears as a line with many mini-nucleuses

Alter: based on the consanguinity to change the separate dots.

Alter-flexibility: based on the theory of natural wave and accumulation to form organic organized living units.

Flexibility: to use the economy alter model to design the organized living units.

Flexibility-eternity: to explore the landscape axis to make eternal effect in basis of the commercial units (fig.3).

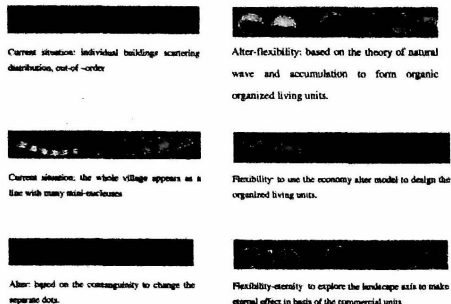


Fig.3 Alter to flexibility in the village

6.FIGURE OF THE BALANCE PROBABILITY FOR DIVIDING THE ORGANIZATION UNITS

The predicted probability is depended on the current situation factors. To achieve the best state of ecological circulation, it is decided that four families in average compose an organization unit for the 88 families in sum.

6.1 Methane pools, cultivable land, auxiliary house for production, windmill for production and logo.

6.2 Based on the consanguinity to compose the individual organization unit. (fig.4)

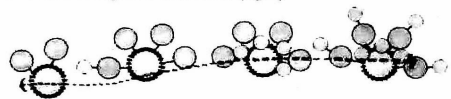


Fig.4 Based on the consanguinity to compose the individual organization unit

6.3 Space node, landscape node, dominant streamline, prevailing wind streamline, linear distribution, nucleus form distribution, common energy sources center, individual building composition, auxiliary facilities for production, way of space series connection.

7.REGENERATION OF TRADITIONAL DWELLINGS

7.1The altering process of the first floor space of individual building:

To continue the dominant position of hall in the building, this design arranges the toilet in the semi-indoor space, so that the main door functioned as a guard for the dominant position of hall. Because of the semi-privacy of the hall, it is necessary to design an attached living room to act as a private space for

everyday activity. It can improve the living quality and guide farmers to live in a modern life style. (fig.5)

7.2 The altering process of the second floor space of individual building:

Because of stairs in the semi-indoor space, this design focuses on the second floor space to improve the living quality. The close balcony and open balcony arrangement make the user adjust at ease. And the close balcony acts as a passive solar house to heat the room in winter. This main hall design gives prominence to the space feature of rural houses. (fig.6)

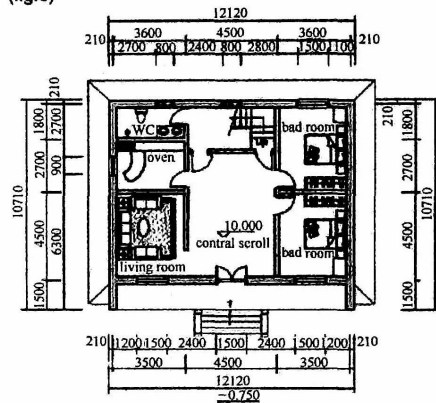


Fig.5 New-type dwelling first floor face

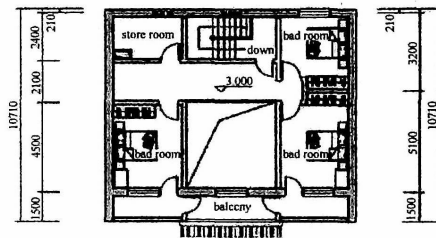


Fig.6 New-type dwelling second floor face

7.3The altering process of the top floor space of individual building:

Though leading ventilation channel to roof, this design can be symbolizes as the traditional module language of the chimney. In the design we deserve the beautiful curve of the traditional large roof and making use of the space under the roof as storing space.

7.4The cycle of courtyard: (Fig.7)

Combining different cycle system, this design adjusts measures to local conditions to reduce the living and construction initial cost. Induced by the building space and planning, the living conditions and environment can be improved. The individual courtyard becomes an ecological cycle.



Fig.7 courtyard Section

The classification of cycle:

Water cycle—the sewage into methane pool.

Energy cycle—living and breeding waste, dejecta into methane pool for power generation, the leavings for fertilizer

Material cycle—building materials from local materials, reuse, recycle (e.g. the used rammed earth wall for fertilizer, the used tiles, timber and fastigium is reused in the new house.)

Human cycle—the dead body buried behind the house or at the foot of the mountain, together with the family folks.

7.5 Feng-shui space integration:

Based on the Chinese philosophy of Yin-Yang (Yin means void or negative, Yang means solid or positive), the layout of traditional residential building can be achieved by adjusting the sum of the floor, height of one floor and ground level. The feature of lower-front-and-higher-behind and encircled by the right and left wing of a building reflects the ancient Chinese philosophy of back-on-Yin-and-face-Yang. In a house, room can be symbolized as Yang (positive or solid) and courtyard can be symbolized as Yin (negative or void). In combination with Yin-Yang or Void-Solid, this kind of sequence space solve the sunlight access, ventilation, thermal insulation, glare and noise controlling, etc. the courtyard receives sunlight, rain and dew, and it accepts air for ventilation, touches sky and connects earth. Together with the indoor hall, the courtyard forms an airflow channel and can be seen as the center of flow. People living in the courtyard make a small-scale universe, small nature and society. (Fig.8)



Fig.8 Regeneration residential buildings

8. THE MATERIALS OF REGENERATION DWELLING ACCORDING TO "3R" PRINCIPLE. (REUSED 、 RECYCLED 、 REDUCE)

This design makes full use of the local materials for their good properties, e.g. the large thermal mass of the rammed earth, the timber for bearing structure. The practical situation as follows:

8.1 Foundation:

Local stone for foundation. Half-underground-and-half-above-ground stone foundation is good at damp proof. The stone slice is laid between the foundation and the rammed earth wall, which is helpful for force transfer between the earth wall and stone foundation and for increasing the construction aseismatic potential.

8.2 Wall:

The rammed earth wall is believed as a kind of self-breath and life material. The moisture adjusting effect by the rammed earth wall has been verified. The solidity property of the rammed earth wall is not so bad compared with reinforced concrete. However, wind and rain erosion make it not so popular.

8.3 Reuse of the materials from the demolished traditional residential buildings:

Almost all the materials from the demolished traditional residential buildings can be reused or recycled, therefore impacts on environment could be reduce at minimum degree. The used timber and fastigium will be reused in the new house. Used rammed earth wall can be used for fertilizer.

8.4 With the use of natural materials, this design makes an effect of above landscape and to reflect the theme without any words.

9. CONCLUSIONS

In the regeneration design process of the Qinmao village, the original materials, such as stone, earth, river vegetation, etc. have been endown the new spirit. With thinking the economic sense of these materials, the immaterial content of these materials should be considered. The natural conformation embodies the relationship between human and nature. The traditional building techniques and the life evolution protect the relationship between human and history. All this make the regeneration traditional residential buildings is full of ecological philosophy in view of site choice, site layout, interior and exterior environment design, indoor setup, material use and construction technology. (Fig.9)



Fig.9 Ecological dwellings

ACKNOWLEDGEMENT

The paper belong to the special items fund of general office of education in Shaanxi Province (05JK253)

REFERENCE

- [1] Jiaping. Liu. *The scientific evaluation and regeneration of eco-building experience in traditional dwellings*. China Scientific Fund .2003/7. Vol.17.No.4

- [2] Jianli. Shang Jiaping. Liu. *Choosing Eco-material and sustainability development*. Journal of Chang'an.2003/11. Vol.23.No.6
- [3] Xiping. Zhao Jiaping. Liu. *Constructional technology of traditional dwellings of Yi race, Yunnan*. Journal of Xi'an University of Architecture & technology, Xi'an. 2005.Vol.37.No.1
- [4] Ying. Yan *Traditional dwellings art*. The publish of Sandong science and technology .2000
- [5] Hugo Houben and Hubert Guiland, *Earth construction: Acomprehensive guide*, 1994
- [6] Dvid Easton, *The Rammed Earth House*, 1996