

in-depth investigation in recent years about the civil and construction technology, now we can improve the technology and use new materials to protect, preserve, transform and maintain their regional characteristics.

1) The transformation of the retaining wall made of immature soil

Traditionally, immature soil is directly rammed on the wall of earth, so the effects of preventing earthquakes are relatively poor. New technology needs to be implemented to improve this situation. People can reinforce the caves in several ways: ①set horizontal beam in the basis; ②wall directly rammed should be reinforced under the bottom 20 centimeter by using lime-soil, asphalt and other resilient materials; ③digging ditches and fill the foundation with sand and gravel (He, 2005)

Ring beam on the wall is the most important anti-seismic measure. It can spread the load from the roof. If the top of the wall and roof system are linked, the outwards collapse of the wall can be avoided in the earthquake. To build a solid building, the best means of transformation is to set up continuous, horizontal beam. If possible, it is best to connect the beams above the door and window with horizontal beam.

The wall insulation and heat preservation can be improved by first attaching reed to the outer wall, then plastering grass marl. These measures can be applied to main walls which are made of immature soil. It can also be applied to retaining walls according to appropriate economic conditions.

2) Maintenance and Modification of caves

Caves have three levels of maintenance: major, medium and minor repairs. Every year there needs to be minor repairs, such as cavity filling, sealant, painting walls. Medium repairs mean reinforcing the top of the cave. Some old caves, especially deeper caves, suffer from partial collapse because of a leaking roof. People can use rafter to support the entire or partial roof of the cave to solve this problem. Major repair means the partial renewal of caves. When there are serious cracking in the cave and the roof of the cave shows the sign of collapse, people will need to cut the front and dig deeper at the rear for a partial renewal. This is one of the reasons why mountains are constantly eroded.

3) The traditional caves have the advantages which

modern residential buildings don't possess. With the development of energy and economy in the towns in northern Shaanxi, the new-type residential caves have become an important part of the housing market (Fig. 5). They can be divided into private houses and commodity residential houses, the development of which is open to further study.



Fig. 5. Three-dimensional cave program of Zhidan County

3. 2. The measures proposed

Integration - is a system of scientific methodology. Individual component factors of a system are relatively independent, blind, or even in the state of confusion, often because of the organizational deficiencies in the regulation and control. (Goncharenko, 2004). Although the various factors can still develop normally on the whole, the system is difficult to create the greatest efficiency as a whole in harmony, thus affecting the further development of the system. However, by adjusting each factor of the system—the time, space, status, role, tasks and so on—the system will establish a new organizational structure and the relationship between the individual component factors will be in order, which lead to the ultimate realization of the biggest force of the system.

Reconstruction - is a system of scientific methodology. A system in operation, often because of the impact of external and internal factors of the individual components, changes its original structure even disintegrates, which leads to abnormal operation of each factor of the systems and may even make the sustainable development of the overall system difficult. To deal with it, it is necessary to re-structure the disintegration