



Practical Study on Construction Cost Consumption Index and Low Carbon Emission Transformation Strategy

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Abstract. Achieving carbon peak carbon neutralization is not only the inherent requirement of China's high-quality development, but also China's solemn commitment to the international community. In the field of construction, procurement, manufacturing, construction and life cycle transportation and disposal account for about half of the terminal energy consumption of the whole society, so it is more necessary to undertake an important task in the dual-carbon task. It is an urgent task to systematically measure the carbon emissions of buildings and realize the cost of low-carbon buildings. Based on the construction project cost, based on the research on the key indicators of Shaanxi local and green building consumption, in response to the national double carbon call, the concept of people-centered development, and the market-oriented resource allocation of the closest measurement technology to people's livelihood, contribute the cost concept to the construction of green, harmonious and beautiful Shaanxi.

Keywords: Construction cost · cost index · consumption index · green building

1 Assumption of Consumption Index for Low-Carbon Transformation of Residential Buildings

In promoting the exchange and development of low-carbon technology. Explore high-tech technology and innovation of low-carbon and renewable energy through evaluation and comparison. The selection standard is composed of four aspects: carbon emission standard, scientific and technological innovation, economic value and industrialization feasibility [1].

Carbon emission standard: low-carbon renovation of residential buildings, whether it is design, transformation, operation, or even possible demolition in the future, the task is set to aim at low-carbon emissions.

Economic value: the transformation is carried out on the basis of existing buildings, which saves costs than new buildings, and does not produce waste and expenses for demolition. There are many excellent regional dwellings in China, which have high promotion value. If it can be popularized, it can not only solve the problem of comfort, but also save high construction costs, so it is economical [2].

Industrial feasibility: the idea of transformation is based on the background of new rural construction, and its achievements, transformation methods and technologies are bound to promote the region.

Scientific and technological innovation: this is the most hesitant. On the one hand, excessive scientific and technological content will inevitably have an impact on the demonstration and promotion of rural housing transformation, on the other hand, this is contrary to our original intention: low cost, low cost, and low technology. The final results hope to make use of the most basic principles to make small transformations and solve big problems.

2 Low-Carbon Design of Residential Buildings

2.1 Object Determination

The range of folk houses is very wide and has certain similarity. Finally, the state-level traditional villages are selected, and the villages and buildings are representative to a certain extent. The village is located in the hilly area about 2 km from the Xiaolangdi Water Control Project of the Yellow River. According to the basic principle of fengshui, the village shows the pattern of “negative yin embracing yang, back cliff face ditch”, and chooses to be on the relatively open sunny slope in the site. This pattern forms a relatively closed regional living environment, which is conducive to the formation of a good ecological cycle of microclimate. The face ditch ushered in the south cool breeze, the back mountain can block the north cold wind in winter, facing the sun in order to obtain abundant sunshine, gentle slope to avoid flooding and soil and water conservation [3].

The types of caves are all against the cliff kiln, facing south or southeast, making full use of the natural sunshine and conforming to the local wind. The main plane shape of the courtyard is siheyuan and Sanheyuan, which is mainly composed of upper room, east-west wing room and street-facing room (the courtyard has no street-facing room). The upper room is a cliff cave with a smaller bay, generally 3 cm and 3.3 m deep, generally 8 cm deep, which is beneficial to the thermal insulation of the indoor environment of the building. But at the same time, there are also the problems of lack of light and poor ventilation, the depth of the east-west wing is small, mostly half-slope roof, slope to the inner courtyard, with a strong defense, while forming a more stable courtyard wind environment. Most of the cave courtyards have fallen into disrepair and are uninhabited, so the project team chose a representative courtyard for sustainable renovation [4].

2.2 Object Status Quo

The shape of the courtyard is a courtyard, and the upper room is composed of two cave openings, with a depth of 8.1 m and a depth of 3.3 m. The top of the cave is a brick coupon. Through the interview, it is found that the main problems are as follows: (As shown in Fig. 1).

- (1) there is a lack of a bathroom to take a bath in the courtyard. Most rural families are aqua privies. When the whole family enters the toilet, they have to go to the road outside the hospital. There is no place to take a bath.

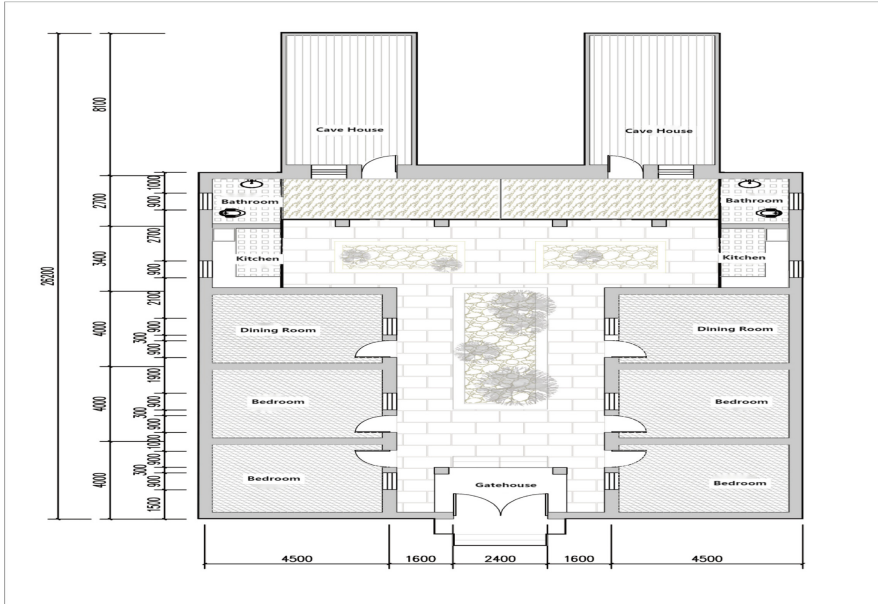


Fig. 1. Courtyard shape system

- (2) the thermal insulation performance of the wing is poor, and the indoor temperature is low in winter. They usually live in caves in winter and summer and move out to live in east-west wing rooms in spring and autumn. The cave is warm in winter and cool in summer, it is more comfortable, the temperature is not high or low in spring and autumn, and the room is well ventilated.
- (3) the interior of the cave is not well ventilated, the daylighting is insufficient, it is humid in summer and the inner wall of the cave is dewy in winter.

2.3 Reconstruction Plan

Adjust the building function

- (1) the toilet with shower, gargle and urination functions is added on the east and west side of the main room of the kiln house, and the solar hot water system in the sunshine room is connected with it, which, on the one hand, is convenient and improves the quality of life, on the other hand, the system is simple and the cost is low; the position of the original aqua privie remains unchanged, and the use of biogas in the later period can be considered [5].

- (2) Sunshine rooms are added on the outside of the cave, which can be used as a transitional space to avoid the direct external door of the cave and reduce cold radiation. In addition, as a sunshine room, it has the function of warm storage; the use of reflectors can reflect sunlight to the depths of the cave and increase the lighting effect inside the cave; guide plates are added inside the cave, which are combined with the outdoor wind catching tower to improve the indoor ventilation effect and improve the indoor dew and moisture phenomenon at the same time.

Maintenance and structural transformation

In order to protect the characteristics of the regional architecture, do not change the traditional practice of the external wall, and at the same time reduce the cost, do internal thermal insulation in the wing room, and replace energy-saving doors and windows at the same time; add aluminum foil thermal insulation coil to the roof, and make indoor ceiling to reduce the cold and heat load [6].

Comprehensive utilization system of solar energy

- (1) Direct heating sunshine room system: in winter, the sunshine room gets hot during the day, heats the internal air temperature and the cave wall, and radiates heat to the interior of the cave and the sunshine room at night to ensure the thermal comfort in winter; in summer, open the upper and lower vents of the glass outside the sunshine room, ventilation to take away the heat inside the sunshine room and the cave wall, so as to ensure the thermal comfort in the summer sunshine room.
- (2) Solar hot water system: through solar heat exchange, hot water is recycled in bathrooms and bedrooms, so as to provide hot water for daily use under the condition of increasing indoor temperature.

Simulation of transformation effect

Through the software to simulate the hourly temperature of the cave and wing room on January 1, without the use of solar heating system, the average temperature of the cave is 5 °C higher than that before the transformation, and the temperature of the wing room is 3 °C higher than that before the transformation. The lighting effect in the cave is also significantly higher than that before the transformation (see Fig. 2).

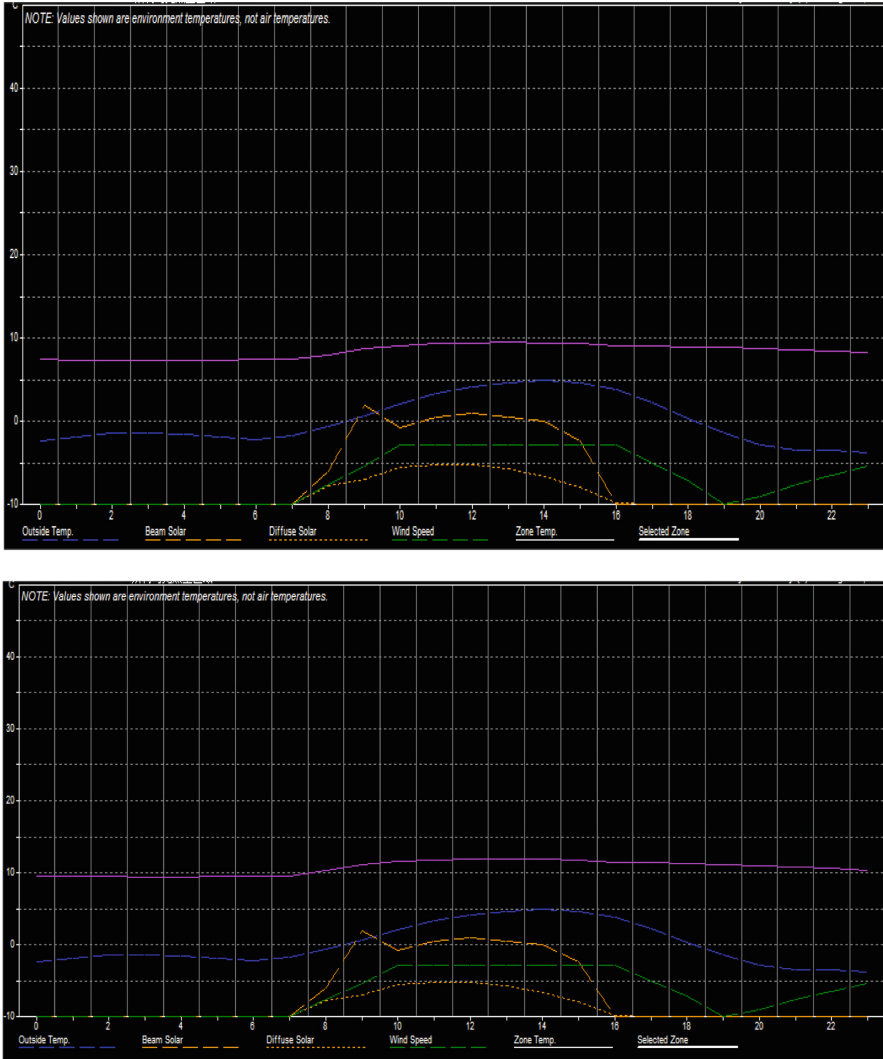


Fig. 2. Temperature comparison before and after revamping

3 Conclusion

As the core course of engineering cost major in colleges and universities, construction cost should ensure not only the necessary systematicness, but also the advanced content. According to the latest project cost calculation standard, study the project quantity calculation method, master the method, difference and compilation ability of bidding control price and bid quotation, ensure the integrity and accuracy of documents, and reflect the latest cost index system results. Aiming at the training of large civil engineering cost talents and meeting the needs of the development of the economy and construction

industry in the western region, this course not only mastered the professional knowledge and skills of “pricing compliance, quotation with discipline, adjustment and control, settlement in accordance with the law”. At the same time, it increases the strong engineering environment adaptability and communication and coordination ability training, which provides a basis for training high-quality applied talents with lifelong learning ability and innovative consciousness.

Through students’ design and innovation, it is possible to improve the quality of building enclosure structure and make rational use of solar energy technology to improve indoor thermal comfort. In addition, through research and interviews, it is necessary to pay attention to the maneuverability of technology in low-carbon transformation, and the construction cost should be low, and it can only be popularized if it can be accepted locally, although high and new technology can achieve zero carbon emission or zero energy consumption. However, due to the high cost and technical requirements, it is difficult to bear and can only sigh.

According to the budget index of the transformation, the main material expenses incurred by the transformation are mainly in the solar photovoltaic integrated photovoltaic system, submersible pump, booster pump, exhaust fan, radiator, polystyrene board, newly replaced energy-saving doors and windows, toilet renovation and so on.

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