Exploration and Analysis of Container Architectural Adaptability Design in Central Jiangxi Province

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Abstract. Containers have always been used as materials in construction projects, and have the advantages of low carbon environmental protection, quick installation, convenient transportation, low construction price, and recyclable recycling. There is a potential for development in the field of sustainable buildings and fabricated buildings. Exploring the adaptability design of this modular unit can promote the industrialization of container construction. The purpose of this project is to make an in-depth discussion and study on the functional adaptability of container architecture in central Jiangxi Province province.

1. Introduction
A container is a large container for loading goods. Due to rising construction materials costs, rising labor costs, frequent natural disasters, and rapid population growth in recent years, many architects are now starting to break away from the traditional constraints and open up new areas, that is, the architectural design of the retrofit container.

1.1. Advantages of container construction
Low price. As a carrier of goods, containers are widely used in sea, railway and road transportation, and are widely used in the world. Containers are convenient and cheap to transport. Compared with other modes of transport, the shipping of containers leaves the smallest carbon footprint. A used container costs about $1,400, while a brand new one costs about $3,800. There are a lot of abandoned containers in the eastern coastal areas of China and the interior areas with developed railways. This makes the container very consistent with the recycling principle of green building in terms of raw materials.

Material prefabrication. Containers are prefabricated, industrially mass produced, and 98 per cent of the container can be recycled. However, the size of the container is narrow and long, so in the design process, two long containers are often put together to form a large space with a length-width ratio more suitable for room size. The structure of container is also very simple, its basic structure is steel structure, which provides the full possibility for its transformation.

Flexible assembly. The size of containers is relatively uniform, because its neat size provides a great possibility for transformation. If it is suitable for functional transformation, the general body shape is relatively simple and standard. However, in order to pursue novelty and shape, many designers
transform containers into interesting buildings, and sometimes they can also add other materials such as boards.

1.2. Climatic characteristics of central Jiangxi Province
Central Jiangxi Province refers to the central region of Jiangxi Province province, which usually refers to Fengcheng city, Zhangshu city, Gaoan city and Xinguan county. Poyang lake plain terrain, south of the main hills. It belongs to subtropical monsoon humid climate, with long summer and short winter. It belongs to the hot summer and cold winter regions among the five climatic regions divided by China.

2. Formatting the title, authors and affiliations
In the design standard for energy conservation of public buildings, it is stipulated that the shape coefficient of the areas in central Jiangxi Province province that are hot in summer and cold in winter should be less than or equal to 0.55. The smaller the shape coefficient, the smaller the building energy consumption; Shape coefficient is an important factor that affects the level of building energy consumption. The layout design affects the indoor thermal environment and air flow. The rational layout of the building plan combined with the building function can reduce the heat transfer loss of the room and reduce the infiltration of cold air in the room. Natural ventilation is mainly the use of wind pressure principle, can also use patios, stairwells to increase the area of the opening inside the building, facilitate the improvement of natural ventilation effect.

Under normal circumstances, the same volume, material, mass of the object, in the same environmental conditions, the absorption of solar radiation heat is the same, the difference only lies in the distribution of heat in the body. In fact, building insulation is as far as possible to the excess solar radiation heat barrier in the building, so that the indoor comfortable thermal environment, which requires us to analyze the external environment of the building. The building is not the same as the general form, it needs to have lighting and ventilation, which is necessary to have Windows and doors, and the solar heat radiation will be transmitted into the interior through the Windows and doors.

For buildings in the south, preventing rain water leakage is also an important part, especially for buildings of this kind of container, rain water corrosion is more harmful to steel plate. The most common method for preventing rainwater leakage is to use a sloping roof. At the same time, the slope of the roof should be as large as possible, which can effectively prevent water accumulation and prevent snow accumulation in winter. These measures can be the retrofitting of buildings with sloping roofs or direct container modifications.

3. Analysis on the adaptive transformation of containers in central Jiangxi Province

3.1. Architectural lighting
Good architectural lighting plays a great role in energy conservation. Of course, as long as the orientation is correct, all buildings in central Jiangxi Province can get good lighting conditions. However, the contradiction with sunlight is shading. Southern areas may have stronger requirements for shading. Therefore, good shading is needed in buildings in a central Jiangxi Province area, and some energy consumption of air conditioning can be saved. Take Fengcheng city as an example, its latitude is 27°, and a 2m high window has a distance of 800mm.

3.2. Internal ventilation
Open and flexible body shape is suitable for ventilation, because the southern region is relatively humid and hot, so the requirements for ventilation are relatively high, ventilation by Windows and corridors. The main problem solved by ventilation is the orientation of the building, and the layout with a certain Angle between the building and the wind is more conducive to ventilation. After the orientation problem is solved, natural window opening can basically meet the ventilation requirements of the building.
3.3. Envelope insulation

The insulation form of container building can be divided into two types: internal insulation of structural wall and external insulation of structural wall. The differences between the two insulation methods are: external insulation design insulation performance is good, easy to eliminate hot and cold Bridges, using this energy-saving construction technology requirements are high, the project cost is large, and the insulation materials are easy to be destroyed in the construction process; Low cost and convenient construction of internal insulation design can preserve the original appearance of the container, but reduce the use of internal space. In the construction process, container buildings need to carry out lifting, construction, installation and other procedures. In order to facilitate the construction and retain the industrial characteristics of container skin, many container building insulation design adopts the way of internal insulation. In order to save indoor space, lightweight and efficient insulation materials can be used in the selection of insulation materials, which not only plays a role in heat preservation and insulation, but also does not occupy too much internal space.

3.4. Physical insulation

Different from the cold and cold regions in the north, the hot summer and cold winter areas have relatively high requirements for the heat insulation design of envelope structures. The heat insulation performance of envelope usually refers to the ability of the inner surface of the envelope to maintain a lower temperature under the action of outdoor comprehensive temperature and indoor air temperature fluctuation under the condition of natural ventilation in summer. For example, the wall of the container building in central Jiangxi Province can use new efficient insulation materials such as polystyrene plastic, rock wool, glass wool, and polyethylene plastic and composite wall to reduce the heat transfer coefficient of the external wall. Also can adopt double layer or multilayer vacuum glass, low-e glass, encapsulate glass or plastic window with good adiabatic performance, improve adiabatic performance of door window, reduce the heat conduction of indoor air and outdoor air effectively. At the same time, the insulation measures can also use energy-saving roofing such as overhead insulation roof and pumice sand insulation roof, which can also play a good thermal insulation effect. The principle is heating and reflection insulation.

4. Passive energy saving of container buildings in central Jiangxi Province

Passive priority building energy conservation design strategy has the characteristics of low energy consumption, redesign, high efficiency and high applicability. Low energy consumption, little use of conventional energy during operation; Re-design, mainly through design means, in the overall layout of internal space, detail node and other aspects of optimization, to effectively reduce the building heating, air conditioning, ventilation and other energy consumption.

4.1. Detailed construction

The high energy consumption of container building air conditioning in hot summer and warm winter is well understood by everyone. One of the important reasons for the high energy consumption of air conditioning is that the solar radiation is relatively large. 1/3 of the light in the natural environment is visible light and 2/3 is thermal radiation. The three passive building technologies related to solar radiation and heat are: thermal performance materials for building maintenance structures, window-wall ratio of the building, and external shading of the building. In areas with hot summer and warm winter, the main demand for heating is cooling, while the maximum calculated temperature difference between indoor and outdoor air conditioning cooling season is 6 ~ 8°C, so the main way to block solar radiation is external shading. Indoor window and wall ratios are related to indoor lighting, and also affect indoor lighting coefficient and air conditioning energy consumption.

4.2. Roof planting

Planting walls and green roofs often appear in green buildings. For container buildings, there is a slight difference between planting roofs and concrete floors. Because the roof of container is steel, its
waterproof performance is stronger than concrete, planting roof is weaker than concrete floor in waterproof treatment. The construction of planting roof on container roof is similar to common roof. For green roof, green roof is more free, users can grow plants according to their own ideas, on the one hand to meet the needs of urban greening, but also in line with the interests of users.

4.3. wall planting
Planting roof is more often used than planting wall in the building, but some planting walls in the building show more vitality, and the planting wall also has some shading effect. In the planting wall of container building, plant hanging is often used, with simple structure and convenient management and maintenance. And the plant that plant roofing often chooses choose "parthenocissus", this kind of plant survival ability is strong. In summer, the leaves flourish and flourish, which can play a good shading effect for the building to make up for the lack of horizontal sunshade, while in winter, the leaves fall sparsely, allowing the indoor rooms of the building to have sufficient light in winter.

5. Summary and prospect
With the rapid development of contemporary Chinese economy, the energy consumption of China's construction industry has increased rapidly, but China's energy consumption cannot keep up with the pace of national economic development. The current energy shortage has become the bottleneck of China's economic development, seriously hindering the improvement of people's living standards. Promoting container buildings, implementing building energy conservation and developing green buildings can not only save energy but also protect the environment. This paper mainly studies the adaptive design of container building from the aspect of building energy conservation in the middle of Jiangxi Province province, looking for solutions and construction design from the common problems of building function, heat preservation and heat insulation structure.

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