

## Research on the Strategies of High-rise Building Design Based on the Principle of Regionality

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**Abstract.** With the rapid development of economy and the increasing tension of land resources, the scale of high-rise building construction is gradually expanding. This form of building can meet the living requirements of more people. It has become the mainstream building type in China. There are many influencing factors in the design of high-rise buildings, and the influencing factors of regional characteristics are the most basic. This paper briefly describes the basic requirements of high-rise building design, and then analyses the influence of regionality on the formation of high-rise building design, in order to elaborate the regional design methods of high-rise buildings for reference.

### Introduction

Generally speaking, the regionality of architecture is influenced by climate, region or country or nation in geography. Because of the difference of geographical position, natural condition and historical and cultural tradition, the architecture of each region has obvious regional characteristics. The regionality of architecture is also reflected in the local society and humanistic environment. It is a historical and cultural tradition decided by the long-term life of people in a nation or region. Architects should seek and discover useful genes in the regional tradition, and combine it with modern science and technology culture to regionalize modern architecture and regional architecture. Modernization is the real creative space of architects.

### The influence of regional environment on high-rise building design and Its Countermeasures

#### 2.1 Impact of Natural Environment Elements on High-rise Buildings

The influence of natural environment factors on high-rise buildings is twofold, that is, climatic and geographical conditions, which will be analyzed below.

##### (1) Climatic conditions

The concrete design is embodied in the plane layout, agent surface design, elevation treatment, material structure and landscape design. For example, sunshine, wind direction, humidity and rainfall in an area are the most likely to affect the orientation, shape, doors and windows, materials and sunshade facilities of high-rise buildings. The great differences of traditional architectural styles in different regions are often the true reflection of different climatic conditions. Bioclimatological architecture is the prelude of ecological architecture. The further development of high-rise buildings should be ecologically integrated with the natural environment and have the lowest energy consumption.

##### (2) Geographical conditions

Geographical condition is the basic factor of regional principle of architecture. On the micro level, it is the response of the building to the specific construction site, which determines the treatment of the specific building and embodies the site nature. On the macro level, it affects the place image and psychological cognition of a region. For example, the NEC Super Tower in Tokyo Port Area, Japan, adopts the bottom 50 m high, the middle part which is set after 15 m overhead, and then the upper part. It presents a three-stage progressive retreat structure, which is not only beneficial to the seismic performance of the structure, but also can be combined with the structure.

Harmoniously integrate with urban environment [2].

## **2.2 Response Measures of High-rise Building Creation to Natural Environment**

Design should also respond to the natural environment and climate of its region. First, it is to continue the regional cultural and spiritual characteristics it has formed. At the same time, it can learn from the experience of traditional architecture to make its architectural life longer. For example, Rediano, a large Singapore real estate group, draws nutrients from traditional buildings according to different climatic characteristics in different regions. It develops buildings featuring Lingnan suspension tower in Guangdong, with small windows insulated and multi-lanes ventilated on both sides, which are welcomed by local residents. Regional high-rise buildings should have applicability, economy and ecology. Because of the constraints of local transportation, economy and politics at that time, regional buildings in different places formed a simple world outlook. In construction, they spontaneously propagated according to local conditions and took local materials. These renewable and recyclable materials reduced the energy of the whole construction process. Source consumption, and achieve a certain degree of economy and sustainability. Most excellent regional buildings follow different topography and landforms. In order not to occupy good land, maintain ecology and water and soil, they are advantageous to local situation and turn disadvantage into disadvantage, thus forming the richness and diversity of space forms [3-6].

### **How to embody the regionality of high-rise buildings**

#### **3.1 Reference to Local Spatial Organization and Spatial Form in Spatial Moulding**

In the short history of local architectural space, it is often influenced by special factors such as climate, humanities and history to form unique spatial form and ingenious organizational features. It is an important method for Xiangying humanistic environment and embodying regional characteristics to dig and bundle these characteristics, and then to cherish them in the shaping of super-storey architectural space.

#### **3.2 Geographical Features in Spatial Details**

The traditional buildings in the region often have some distinctive spatial features, which provide unique regional customs. These spatial features often play a cultural and psychological role, and become a landmark humanistic landscape in the region [8]. For example, dry-fence dwellings in hot and humid areas in the south, Baoqiao Yunnan inheritance dwellings and so on (see Fig. 1). The elevated style at the bottom of the dwellings has become a unique national style, while the arcade buildings in Qiaonan and other places in Guangdong (see Fig. 2) are also a unique form of street-side cuisine formed in response to the local vigilance characteristics of strong sunshine and rainy weather, which has good urbanity. It has become a landmark street form in southern cities. This regional form of the bottom overhead can be well reflected in the design of high-rise brackets, thus inheriting the spatial context of southern cities. For example, the super-large scale of the high-rise of the Benda Centre in Hong Kong (see figure 3) provides several levels of overhead space, providing a public place of shade and rain shelter for the city.



Figure 1 Dai Residence



Figure 2 Liuhe Riding Tower, Guangdong

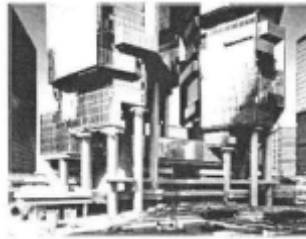


Figure 3 Benda Centre, Hong Kong

## **Design strategy**

### **4.1 Comprehensive Regional Natural Climate Environment**

In the design of high-rise buildings, the designers of construction projects need to have a certain understanding and mastery of the local natural customs, and to effectively integrate these contents into the architectural design. For example, in the aspect of building structure design or material selection, it is necessary to ensure that the structure can meet the local environment and climate. Different regions have formed relatively stable architectural structure style in the long-term development, which is most obvious in the graphic design. For example, common well type and inverted abundant type, as well as similar frog type and so on, these are the most commonly used plane type in architectural design. Designers need to integrate the main local trends in the design, but also need to take into account the natural lighting and wind direction of each room. These aspects require the designer to carry out on-the-spot investigation of the actual construction environment in the area, so that data can be referenced in the design.

### **4.2 Comprehensive Local Cultural Characteristics**

To a certain extent, high-rise buildings can play a representative role, such as Shanghai Global Financial Center, Shenzhen Diwang Building and Beijing International Trade Building, which are the main manifestations of modern urban architecture. Therefore, in the design of high-rise buildings, it is necessary to incorporate certain representativeness and local cultural characteristics. In this way, not only can culture be presented on the carrier of architecture, but also can make high-rise buildings and the surrounding environment live in harmony. In recent years, China's architectural design has been progressing. With the gradual maturity of construction technology, the use of relevant technologies to integrate the local cultural customs, so as to fully present the regionality in the architectural design, and make it become a major feature of the local attractions. In addition to paying attention to the building structure, it can also be processed on the details of the building. For example, in the collocation of colours, architecture is a striking part of a city. The use of colours can make the city more impressive. Others are in the area of architectural decoration, in these links to carry out regional design, can make the building more regional style. For example, in Yunnan minority architectural decoration pattern is the key and main way to embody the regionality, so in the design of high-rise buildings, we can combine the main use of the building to carry out regional decoration, will have national style and regional style elements, patterns and even some materials to use. In architectural design, these high-rise buildings can reflect their unique regional characteristics [10-12].

## Conclusion

In the section design of high-rise buildings, we need to consider the ventilation and lighting of buildings. From the section, we can analyze the flow state and path of air. These ecological applications generally start from the shared transportation core and set up the shared space which can directly ventilate and light at the direct connection between the transportation core and the outside world. Even if there are multiple units on one floor, there will be good natural wind and lighting. Therefore, under the economic development, high-rise buildings have increasingly become the main body of the city. When designing them, it is necessary to give full consideration to the local natural environment and climate, and at the same time, integrate the local humanistic customs into them, so as to publicize and inherit the local characteristic culture, so as to enable more buildings to be built. Form and style are presented. In order to make the service life of the building longer, and then in the practice of architectural design to promote the stable development of the construction industry.

## References

- [1]Sun S W,Liu X T,Liu W,et al.Design of High-Rise Building's Monitoring System for Electric Fire Base on CAN Bus[J].Applied Mechanics&Materials,2015,734:104-108.
- [2]Wang J F,Liu Y,Zhai X Q.The Research of High-rise Building Fire Safety Simulation Model Based on System Dynamics[J].Applied Mechanics&Materials,2014,614:605-609.
- [3]Lan L,Hanna A,Sinha A,et al.High-rise building subjected to excessive settlement of its foundation:a case study[J].International Journal of Structural Integrity,2017,8(2):210-221.
- [4]Park H S,Park C L.Drift Control of High-rise Building with Unit Load Method[J].Structural Design of Tall&Special Buildings,2015,6(1):23-35.
- [5]Kang K Y,Lee K H.Vulnerability Assessment Model for Cost Efficient Anti-terrorism Design of Super High-Rise Buildings[J].Journal of Asian Architecture&Building Engineering,2014,13(2):413-420.
- [6]Du C,Li W.High building layout design based on emotional differential evolution algorithm[J].Cluster Computing,2018(2):1-7.
- [7]Ha P T H.A Concept for Energy-Efficient High-Rise Buildings in Hanoi and a Calculation Method for Building Energy Efficiency Factor☆[J].Procedia Engineering,2016,142:154-160.
- [8]Xiong Y,Krogmann U,Mainelis G,et al.Indoor air quality in green buildings:A case-study in a residential high-rise building in the northeastern United States[J].J Environ Sci Health A Tox Hazard Subst Environ Eng,2015,50(3):225-242.
- [9]Bruelisauer M,Meggens F,Saber E,et al.Stuck in a stack—Temperature measurements of the microclimate around split type condensing units in a high rise building in Singapore[J].Energy&Buildings,2014,71(3):28-37.
- [10]Yan Y,Wang Q,Li W,et al.Discovery of potential biomarkers in exhaled breath for diagnosis of type 2 diabetes mellitus based on GC-MS with metabolomics[J].Rsc Advances,2014,4(48):25430-25439.
- [11]Mirrahimi S,Mohamed M F,Haw L C,et al.The effect of building envelope on the thermal comfort and energy saving for high-rise buildings in hot-humid climate[J].Renewable&Sustainable Energy Reviews,2015,53:1508-1519.
- [12]Tian H W.Research on Construction Safety Management of High-Rise Buildings Based on the Grey Hierarchy Evaluation Model[J].Advanced Materials Research,2014,919-921:1477-1481.