



Talking About the Impact of Large-Span Spatial Structure on the City and Society

Taking the HSBC Bank Building as an Example

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Abstract. With the continuous development of today's society, the forms of buildings in cities are constantly changing. This also shows that while the construction science is making continuous progress. Human beings have an increasing demand for various building structures, especially large-span space structures, and their functional requirements are increasing. Most of the facilities in buildings, such as airports, stations, stadiums, bridges, belong to large-span buildings. Because of its diverse structure and broad development prospects, it also has a subtle effect on society and the city. This paper briefly introduces the large-span space structure and its impact on the city, and at the same time, it is verified and illustrated by the architect's design and achievements in architectural examples.

Keywords: large-span spatial structure · urban construction · social effect · influence

1 Large-Span Spatial Structure

1.1 Overview of Large-Span Spatial Structure

In recent decades, the long-span [1] space structure has developed rapidly in many countries through continuous evolution. The scale and span of various buildings have likewise become larger and larger with the update of technology. The update of technology also enriches the structural form of space.

At present, the spatial structure has become one of the symbols to measure the level of a country's architectural technology [2], and many landmark buildings and famous landscapes in many cities are built using large-span spatial structures. This has also led to this spatial structure having a corresponding social effect to a certain extent, affecting the development of the city where it is located, and more able to meet the requirements of human beings' continuous pursuit of improving and expanding their living space, as shown in Fig. 1.

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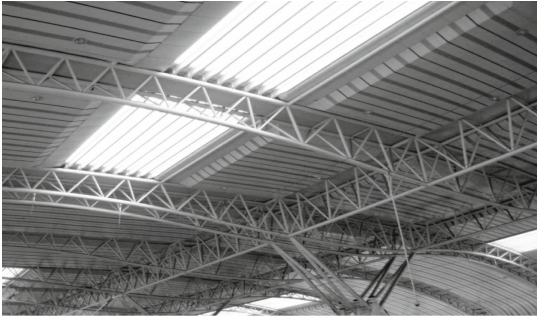


Fig. 1. Large-span spatial structure

1.2 Characteristics of Large-Span Spatial Structures

In addition to the characteristics of convenient assembly, flexible structure and good economic benefits, the current large-span space structure also has a great feature that it has a variety of structural forms.

At present, most of the large-span space structure buildings in our country are still relatively restrained in structural form, which also shows that the existing large-span space structure buildings lack bold innovation. It also reflects the lack of idealistic combination between novel architectural ideas and new structural creations.

Only in the coordination between the beautiful structural shape and the reasonable mechanical performance can it play a typical role in the development process of the large-span space structure [10].

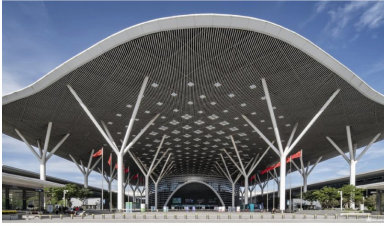
1.3 Application Scope of Large-Span Spatial Structure

The emergence of large-span space structures makes the form of buildings no longer limited to traditional structures. From the initial airports, stations, stadiums, bridges and other facilities to the current super high-rise buildings, the application scope of large-span space structures is constantly expanding. In some systems, both design and construction are becoming mature, and at the same time, new application scopes are also bred [1], as shown in Fig. 2.

At present, the large-span space structure has been expanded from large-scale structures to large-scale structures, that is, the structure span has developed from 200 m to thousands of meters, and the overall coverage area has reached several square kilometers. This novel and challenging development can allow people to control regional climate, it can also protect a large site somewhere.

1.4 Development and Social Effects of Large-Span Spatial Structure on Urban Construction

With the rapid development of various types of large-span space structures at home and abroad, the spans and scales of their structures have also become larger and larger, and the structural forms of buildings have also become diversified [3]. Research on structure



(a) Shenzhen International Convention and Exhibition Center



(b) Beijing Daxing Airport



(c) Beijing National Stadium



(d) HSBC Bank Building

Fig. 2. Building example

is more and more extensive, the corresponding construction technology and materials have been innovated, and many new spatial structure forms have also been developed.

In urban construction and development, the large-span space structure can be used as a landmark building to enhance the image of the city; as a cultural and entertainment venue to meet people's growing cultural and spiritual needs; as a venue for exhibitions to provide a place for economic development and exchange; The requirements of sports provide people with fitness venues and enhance the friendship between people; as an industrial building, it meets the requirements of giant equipment and large operating spaces brought about by the development of science and technology [4].

In China, many characteristic and magnificent large-span buildings have become landmark buildings and characteristic attractions in the region. The appearance of these buildings and structural spaces has greatly promoted the gathering of people and the development of the tourism industry, contributing to the harmony of the local society and economy. Effect has made a huge contribution [5].

2 Building Examples

Due to the prominent position and role of the long-span spatial structure in urban development, countries around the world have invested a lot of energy in the development of the long-span spatial structure [6], which has also made it the fastest-growing structural form recently. The formation of space affects social relations and urban development to a certain extent. This article will illustrate it through an architectural example - the HSBC Bank Building.



Fig. 3. HSBC Bank Building

2.1 Overview of HSBC Building

The HSBC Bank Building in Hong Kong is an old British bank established in 1865. In 1886, the first building was built in Hong Kong, which belongs to the classical style with few floors. By 1935, a second building, 12 stories high, was constructed in a semi-classical and semi-modern form. In the 1970s, with the development of banking business, the bank's executives decided to demolish the old building and build today's new building in the central location of Hong Kong, China [7].

The new building was designed by the famous architect Norman Foster in 1979 and completed in 1985. It covers an area of 5,000 square meters and has 43 floors. The highest point reaches 180 m. The building has 8 groups of composite columns, each group includes here are 4 steel columns, and the span between the corresponding composite columns is 38.4 m. The building has 5 structural floors from top to bottom. The 33 floors with main functions are divided into 5 groups, as shown in Fig. 3.

2.2 Design Style of HSBC Bank Building

From the first generation to the fourth-generation, the overall design style and architectural form of the HSBC Bank Building in Hong Kong are constantly changing. The whole building and construction of the fourth-generation HSBC Bank Building designed by Man Foster perfectly embody the four characteristics of design—ecology, technology, humanity, and harmony [8], and are in line with contemporary architecture. Ideal state of design.

Humanistic care.

The ground floor of the entire bank building belongs to a huge open space, which was originally used as a small square, a space for gathering people. However, due to the particularity of the function of the whole building, and most of the staff inside the company are foreign workers, they can rest in the dressing room on normal working days, but can only rest in the open space on the first floor on the day off.

Over time, this part of the space has also become a fixed place for their rest days. In fact, this also reflects the architect's concept of humanistic care for design. Such a design is not only novel, but also contributes to the value of serving the public with the finished product, as shown in Fig. 4.



Fig. 4. Current situation on the first floor of the HSBC Bank Building

Ecology and Technology.

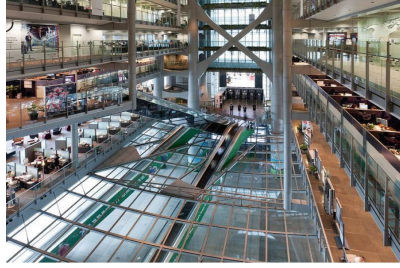
Architect Norman Foster has considered the use of natural conditions to reduce energy consumption in the buildings he designed (London City Hall, Swiss Re Headquarters, London Millennium Bridge, etc. [9]). The lower floors of the HSBC Building are open spaces, but due to the overall size of the building, light cannot reach these spaces. So Norman Foster came up with the idea that natural light can be illuminated from the top to the bottom through the refraction of light, as shown in Fig. 5.

Norman Foster set up solar reflectors on the exterior of the building and at the top of the atrium through a bold and innovative design. After multiple refractions of sunlight, the bottom and middle hollows are illuminated, as shown in Fig. 6. Such a design not only expresses the architect's design concept from a higher level, but also makes people think more deeply.

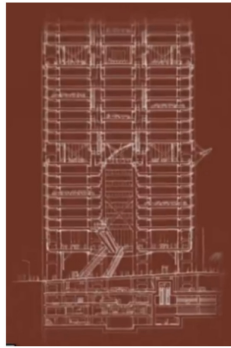
In general, the HSBC Bank Building designed by Norman Foster is not only very innovative and visually striking from the outside, but also the bold design of the large-span space structure and details inside also promotes the interaction between people. This green design also greatly promotes the sustainable development of the entire city.



Fig. 5. Design manuscript of the HSBC Bank Building



(a) Inside HSBC Bank Building



(b) Sectional view of the HSBC Bank Building

Fig. 6. Interior and Sectional View of HSBC Bank Building

3 Summary

In the current 20th century, in order to facilitate and strengthen the communication between people, designed buildings need to have a large and open space. The most representative of these buildings are airport buildings, stations, stadiums and other facilities, and these buildings all adopt a large-span spatial structure, which is in line with the current trend and eye-catching spatial structure, and these buildings have become the city where they are located. Centers or symbols, they have good play and economic benefits in the sustainable development and social relations of the city.

In recent years, new systems, new technologies, and new materials have been continuously developed in the research on large-span spatial structures all over the world. However, in our country, it is still necessary to further develop and study the required large-span spatial structures. Theoretical research and practical engineering practice can promote the more active and rapid development of China's large-span space, make my country's large-span space structure system more economical and rational, and make the large-span space structure better for my country. Urban and economic construction services.

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