

## Structure mode and method in building space construction

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### Abstract

Through the analysis of building space construction, this paper can make the building exert its functions to the greatest extent. This paper first introduces the spatial attributes of architectural space from the space form features and space form attribute, and then introduces the constitution of building space from the limitation of vertical and horizontal direction, the constitutive relation of binary building space and the constitution form of multiple building spaces. At last, this paper expounds the construction method of building space.

### Keywords

Building space; attribute; method.

## 1. Introduction

### 1.1 Space form features

There are three basic characteristics of spatial form: the limitation of space, the permeability of inside and outside, and the participation of human beings. Therefore, defining the relevance and sequence of space becomes the quintessence of spatial form.

#### 1.1.1 The circumference and opening of space

A room can make people feel closed and obstructed if they are all walls on all sides, while the four sides without walls will make people feel open and sprightly, so it can be seen that the open or closed space will affect the emotional and spiritual feelings of the people, and in the architectural space, it is appropriate to deal with the relationship between the circumference and the penetration.

#### 1.1.2 The contrast and change of space

When we enter the high and large space from the low and small space, we can borrow the contrast and the contrast of the space to make the latter feel taller. When we enter the open space from enclosed space, we can make people feel more open with the contrast of space. If the space of different shapes is organized together, it can also break the monotony by making use of the contrast and change of space. Even if the two spaces are long and narrow, they are connected vertically to each other; they can be used for comparison with their direction.

#### 1.1.3 The permeation and level of space

In dividing space, we consciously keep the separated space to some extent connected, so that people in a certain space can see other spaces, so that the space permeates each other and borrows each other, which will greatly enhance the sense of space. The building with this feature is the space for the lobby of the Berlin conference hall and the space for the VIP lounge of the Guangzhou friendship theatre and so on.

#### 1.1.4 The organization and form of space

The organization and form of space include walkway combination, unit type combination, wide hall type combination, series combination, centralized combination and courtyard type combination.

### 1.2 Space form attribute

The single space has centripetal nature, clear boundaries and formal rules. It is the most basic unit of building space and the foundation of complex space. The space formed by the elements of space, its

shape, proportion, scale, closure and openness, influence the spatial characteristics of the space and the psychological feelings of the human being.

The form of space

[1] The rectangular space has obvious directivity, the horizontal cuboid has a stretch feeling, and the vertical cuboid has a sense of ascension. [2] Trigonometric conical space has a strong sense of ascension. [3] Cylindrical space has a sense of centripetal agglomerate. [4] Spherical space is cohesive and has a strong closed sense of compression. [5] Circular space has obvious directivity and flow sensation. [6] The inward nature of the arched section space is gathered along the axis. [7] The hexahedral space is isotropic and has a solemn and rigorous static state. In addition to the regular geometry space, there are also some "odd" or deformed spatial shapes, which are used more and more in modern architecture.

1.2.2 the proportion of space

The proportion of space refers to the relationship between the elements of the space itself, the elements, the elements and the whole. The proper proportion of space should be considered in terms of functional requirements and human mental feelings. The towering space has upward momentum and produces sublime and majestic feeling. The long and narrow space has a forward momentum, a profound sense of progress and a sense of progress. The spacious and low space has a tendency of horizontal extension, resulting in a sense of openness.

The scale of space

The scale of space is a subjective standard to measure the size of building space and its constituent elements. It involves the visual perception of spatial images. The buildings are far apart from each other, and the outer space formed is open and unobstructed. The distance between buildings is closer and the closeness of outer space is stronger. When the building distance is closer, the sealing ability is stronger. The buildings are near and high, and the space formed is very closed.

The limitation of space

The four vertical planes are completely enclosed into a space, which is the most typical and the most restrictive form of architectural space. Space is introverted. The entrance of the restricted elements has a great influence on the space closure and openness. [1] When there are no openings on every side of the area, there is no continuity and visual continuity with the adjacent space. With these openings, there is continuity and at the same time the sense of space is weakened. [2] If the entrance to the corner is introduced, the independence of each surface will be enhanced, and the use and activity of diagonal or windmill patterns will be strengthened. [3] If a surface is required to dominate the space vision, it can be different from the other three aspects in dimension, form, surface, expression, or surface opening.

## 2. The constitution of building space

### 2.1 The limitation of vertical and horizontal direction

Space itself is infinite, it has no form. Because of the limitation of the entity, it is able to measure the size, make it form, and restrict a space to do it from two directions: One is the vertical direction, which limits the space. The other is horizontal direction. Because of gravity, it is first necessary to have a bottom surface, which can be covered by a top surface, so as to limit the space.

2.1.1 The limitation of vertical direction

The method of building limited space in vertical direction is "surround" and "set up". The object is set in space, specifying a place in the space, so as to limit the local space around it. The establishment is the simplest form of space limitation, the establishment is only the visual psychological limit, the establishment can not be divided into specific part of the specific space, provide clear form and measure, but rely on the force, energy and potential of the entity to obtain the possession of space. Therefore, cohesive force is the main characteristic of establishment, so establishment is often a central restriction.

### 2.1.2 The limitation of vertical direction

There are five ways of defining space in horizontal directional components: convex, concave, overlay, erect and texture changes. Partial reduction or improvement of a certain part of the ground can change people's sense of space. Buildings often use this technique to emphasize or highlight some of the space, or to use the change of ground elevation to divide space in order to adapt to the needs of different functions or to enrich the space. Covering is a specific and practical form of restriction, and a top cover is placed at the top, so that the lower space has obvious use value. The operation of the covering should focus on shaping the shape, size and atmosphere of the space, rather than exaggerate the solid material that is covered. To set up is to protruding the confined space in the surrounding space. The difference is that the lower part of the space is composed of subordinate subspaces. Set up, relative to the lower side space, the scope of the space is clearly affirmed. In the operation, entity form is more positive, and space form is often the subordinate part of other parts. And the multi-layered space, refers to each space is a set of space from the upper level, after repeated and formed a group of space, this form of operation to create a hierarchical relationship between space, called space in space.

## 2.2 The constitutive relation of binary building space

The joint form creates a shared space, which is simple and clear. The superposition of form causes the front and back relations of space, and the precondition of producing this order is the tendency of the former space pressure to encroach on the latter space, thus causing the direction and order. The change of the positions or directions of the two space forces can also create abundant spatial force images inside and outside.

### 2.2.1 Conjunction

The two separated spaces are connected by a transitional space, and the characteristics of the transitional space play a decisive role in the composition of space. A transitional space is inserted in the middle of the two large spaces. The transitional space should be small and low, so as to lay the main space for it. [1] The space between the transitional space and its space is exactly the same in form and size, and constitutes a repeated space series. [2] The space between the transitional space and its space is different in form and size, emphasizing its own connection function. [3] The transition space is larger than the space it is associated with, and it is organized around them to become the dominant space of the whole. [4] The form and orientation of the transitional space depend entirely on its spatial characteristics. The buildings that use the method of conjunction are the Australian Embassy in Paris, the library of Taiwan Zhongyuan University and so on.

### 2.2.2 Contact

The two spaces do not overlap, but the surface or sideline contacts each other to form the building space. Contact is the most common form of spatial relations. The degree of visual and spatial relationship between two spaces depends on the characteristics of segmentation elements. [1] Depending on entity segmentation and strong spatial independence, the degree of opening affects the sense of space. [2] In a single space, separate partition faces are set up, but two spaces are separated. [3] The line space column segmentation has strong visual and spatial continuity, and its penetration degree is related to the number of columns. [4] There are two distinct and continuous spaces based on the ground elevation, ceiling height or wall treatment.

### 2.2.3 Containment

Large space contains small space, and the two space produces continuity in vision and space. [1] The size of the two spaces should be distinctions. [2] The size and space are of the same shape and different azimuth. [3] The contrast of the size and space of different forms.

### 2.2.4 Intersection

When the two space forces overlap, they form a joint, interlocking and cohesive space form. [1] The interpenetration of two volumes can be equal to each space. [2] Interspersed parts merge into one space and become part of its overall volume. [3] Interspersed part of self-integration, become the original two-space connection space.

#### 2.2.5 Superposition

When the size of the same size, the shape of the same (or different), different azimuth of the space form overlap each other, the two forms all undermine their characteristics, and combine to produce a new combination.

### 2.3 The constitution form of multiple building spaces

Because of the openness of space, the creation of space force image is not only focused on internal space, but also the creation of organic combination of internal space and external space. Through the movement and change of single force image in direction, position and structure, it can also create abundant spatial force images. The combinations can be summarized as concentration, tandem type, radial type and group type.

#### 2.3.1 Concentration

The centrality is composed of a stable centripetal structure, usually with a certain number of secondary spaces around a central dominant space, generally expressed as a rule, a stable geometric limit, and a self centered character of a point and a circle, showing a perfect, sacred and honorable expression. Such as Hagia Sophia Church, Bengalese parliament mansion and the Holocaust Memorial Hall in Washington.

#### 2.3.2 Tandem type

The tandem type structure is connected by a number of single space in a certain direction to form a spatial sequence, which has obvious direction, and has the trend of movement, extension and growth. It has variable flexibility, easy to adapt to the environment conditions, and is conducive to the development of space. Dormitories, office buildings, hospitals, schools, sanatorium and other buildings are generally suitable for tandem space combination.

#### 2.3.3 Radial type

The radial type is a combination of two components of centralization and series. It is a way to extend the secondary space from a concentrated core element. It can be divided into three parts: the same type of line arm, the vertical arm and the different line arm.

#### 2.3.4 Group type

The group structure generally forms a relatively centralized building space in terms of the common visual features of shape, size, or relationship, and the space of different dimensions, shapes and functions can be formed by close connection and some visual rules, such as axis. Such as the American Lowar Art Center.

## 3. The construction method of building space

The composing techniques of building space include grid constitution, axis control, space compound, motif repetition, space transformation, modulus control, specific constitution, space segmentation, space metaphorical method and spatial symbolic method.

### 3.1 Grid constitution

The axis plane grid of the load-bearing structure extends to the high direction, and the interlacing constitutes the space grid unit. Some fixed field positions are determined by the reference point and the reference line (sometimes invisible), so that they produce the common relationship and make the space unit series with order and inner rational connection.

### 3.2 Axis control

The axis is invisible, but it has the function of dominating the whole. According to certain rules and visual requirements, the spatial elements are arranged along the symmetrical axis, which can form a structured spatial combination and guide people to move along the axis. Such as the Imperial Palace of the Ming and Qing Dynasties along the central axis to the depth of the spatial sequence.

### 3.3 Space compound

At the same time in plane two-dimensional direction, it can be divided and enclosed in horizontal space, and the method of interruption, reduction and opening can be carried out on the elements of horizontal composition, through the vertical direction, the horizontal and vertical space permeates and transforms each other, resulting in the horizontal vertical circulation of vision and the expansion of complex space.

### 3.4 Motif repetition

According to the similar principles in the composition of the group, one or two kinds of spatial basic forms are used to form and combine the motif, which can make the space concise, clear and rich in the sense of rhythm, and increase the integrity and unity of space.

### 3.5 Space transformation

A typical spatial pattern, which is reasonable in form, structure and element order, is based on different processing and transformation in size, shape, organization and so on, which forms a new space that meets the requirements.

### 3.6 Modulus control

Le Corbusier 's mathematical system based on mathematical relationship and human scale has intrinsic harmonious relationship. The modulus is a standard unit size, which is generated by technical requirements. It makes the size of the building from the whole to the structural parts into the multiple of the standard unit. In building space composition, it dominates the main dimensions of space, helps to form a rich and varied combination, and ensures the unity of architectural space in change.

### 3.7 Specific constitution

In order to make the space of function and meaning important in visual and spatial perception as the prominent part, we can take the dominant position on the absolute size of the space unit; the form of the important space is compared with the other space units to achieve the visual emphasis; the important space is in the influence of the overall situation.

### 3.8 Space segmentation

The basic elements of the space are found scattered and decomposed into the simplest form, and then the concept of different perspectives and multi point perception is reorganized according to the relationship of time and space, and the existence of other parts can be perceived at the same time through the penetration of space. We can also divide the complete space in the general concept into different levels, separate them and recombine them so that they can match each other and echo each other.

### 3.9 Space metaphorical method

Using the rhetorical devices in language and writing, using the successful examples in history, or some familiar form, and even the historic allusions of history, choose some parts, fragments, parts and so on, and recombine them in the new architectural form to express a cultural tradition and create visual psychological associations. Metaphors and metaphors should be applied properly, so it is not appropriate to directly imitate the specific images in real life so as to avoid vulgarization.

### 3.10 Spatial symbolic method

Symbolism is a kind of association relationship between visual symbols and certain meanings. In the form of architectural space, the prototype of something familiar to people, or events with typical

significance, is summarized, refined and abstracted to the architectural modeling language, making people associate and comprehend some meaning to enhance the emotional appeal of the building to the people. The symbolism of architectural space can be divided into two kinds: abstract and concrete. The former emphasizes the creation of artistic conception, while the latter adopts the analogy method of concrete image.

#### 4. Conclusion

To sum up, we can see that the analysis of building space construction is very necessary, so that buildings can exert their functions to the greatest extent. A successful building will be able to combine the structure and characteristics of the building space perfectly, interspersed in the application of the architectural space elements, and merge with the surrounding environment.

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