

The Use and Expression of Beam and Column Structure in Interior Space Decoration Design

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ABSTRACT

Beams and columns are the non-removable frames that support interior spaces. This study takes the beams and columns in the interior space decoration design as the research objects, expands the combination of the main body of the building and the outer edge of the decoration, and analyzes how to use the design to modify and beautify the main body of the beams and columns in the interior space with a case study, so as to improve the beauty and practicality of the interior space.

Keywords: *Beam and column structure, Space design, Following the trend.*

1. INTRODUCTION

The horizontal ones are beams, and the vertical ones are columns. Beams and columns serve as the "bones" of the interior space, carrying and supporting the interior space. In addition to seismic and load-bearing functions, the beams and columns in the interior space also have the functions of separating space, adjusting layout and decorating and beautifying the space. By making good use of the beam and column structure, design can be integrated into life to create a comfortable, natural and tasteful interior space.

2. RELATIONSHIP BETWEEN BEAM AND COLUMN STRUCTURE AND INTERIOR SPACE DECORATION DESIGN

People hope that the house can have comfortable space and reasonable layout, and the space layout is generally divided by the beam and column structure. The beam and column structure is architecturally sound, but may not be reasonable in terms of decorative design. There are some house layouts that are unreasonable in design, and there are columns that cannot be hidden or beams that are oppressive to people. According to the fengshui theory of Chinese traditional culture, "considering overhanging beams, three generations will be damaged" and "a room with columns will endanger

marriage". Although these are folk legends, a poorly designed beam and column structure would have a certain impact on people from the perspectives of visual effect and fengshui theology. When people work and live in this space for a long time, it is easy to form a psychological or subconscious suggestion over time, affecting people's physical and mental health. Another case is that the beam and column structure is reasonably designed in the space, and the function of the main body of beam and column exists reasonably in different space positions. However, considering the decoration effect, it is suggested to add some beams and columns with mainly decorative function in order to achieve the design effect they want. Whether these beams and columns are hidden or added, the ultimate purpose is to make interior space comfortable and beautiful. The beam and column structure is the largest dynamic line in the interior space, and is also the most important element to be solved in the decorative design, which determines the pattern of the house and provides the space forging element for the reference of space decoration design. It is necessary to grasp the aesthetic rules of balance, stability, unity and change. And the beam and column structure is both the "bone" and "flesh and blood" of the interior space, decorating and beautifying the interior space.

3. CLASSIFICATION OF BEAM AND COLUMN STRUCTURE IN INTERIOR SPACE DECORATION DESIGN

This study classifies beam and column structures that are necessary in interior spaces and cannot be removed, and are reasonable in terms of architectural function but require beautification in terms of architectural decoration. The beam structures that often appear in interior spaces are as follows: beams positioned against the wall but at a certain distance from the wall, beams positioned in a more central interior space, beams positioned between two functional areas, and beams exposed after the removal of the wall due to modification of the house structure. Column structures often found in interior spaces are as follows: freestanding columns without wall connections on all sides, T-shaped columns, L-shaped columns and rectangular columns connected with walls on one or both sides. Through decorative design and structural beautification of unreasonable beam and column structures classified above, it is suggested to improve the form of interior space, enhance the practicality of interior space, and improve the personality and taste of interior space through architectural decorative design.

4. CASE STUDY ON THE USE AND EXPRESSION OF THE MAIN BODY OF BEAM AND COLUMN IN THE INTERIOR DESIGN

- Partial furred ceiling

Partial furred ceiling is applicable to the case where the beam is close to the wall against the bed. ("Figure 1") With the use of partial furred ceiling, it can not only hide the beam, but also create a variety of changing layers to the space. With the reasonable design of lighting and the design of the lamp, it would achieve the purpose of hiding the original beam structure and enhancing the decoration and beauty of the ceiling.



Figure 1 Partial furred ceiling.

- Increasing the false beam

There are asymmetrical beams on the ceiling ("Figure 2"). According to the design aesthetics and needs, it is suggested to add fake beams to make the roof beams meet aesthetic standards such as unity, symmetry, and balance, and connect with the real beams to form decorative ceilings such as "mouth-shaped ceiling" or "field-shaped ceiling", weakening the sense of abruptness of original beams and increasing the aesthetics and sense of unity of the space. False beams are installed for decorative purposes ("Figure 3"). People pursue fashion, individuality and uniqueness in the decorative style of interior space, and retro trends are prevalent. In order to present a unified design effect and install fake beams inside the roof, these beam structures of Chinese modern antique architecture, American rugged and rustic style, Southeast Asian casual style, etc. have no load-bearing function, but can set the atmosphere and reflect the personality.



Figure 2 Increasing the false beam.



Figure 3 Increasing the false beam.

- The beam beautification

("Figure 4") This method is applicable to beams that appear in a space in an attractive position. According to the saying, there are carved beams and painted rafters. Most of the beams inside the ancient buildings were exposed, and the ancient people carved and painted them to make the structure, which was originally used to bear the weight, rich and glorious. As a continuation and inheritance of ancient architecture, workers can also paint or carve on the reinforced concrete beams, transforming the beams and the space where they exist into an interior space with a sense of the times. A beautified beam can also distract attention from its own character and thus weaken it.



Figure 4 The beam beautification.

- The beam transfiguration

Transforming the beam into a partition ("Figure 5") is suitable for locations where the beam appears just between two functional areas. For example, it is suggested to add a wall below the beam or do some modeling with different decorative materials below the beam to transform the beam into a

doorway. Also, for functional areas, it is feasible to put a few screens under the beam, hang iron shelves, and cleverly use the beam structure to transform into a connection point to separate different space areas. Then the beam would have the decorative effect. Therefore, the purpose of being practical and beautiful will be achieved, killing two birds with one stone.



Figure 5 The beam transfiguration.

- building a wall and welding beam

This method of building a wall and welding beam ("Figure 6") is applicable in the case of overall house re-planning and renovation. Interior space distribution is reshuffled, and walls are built under or close to the beams as much as possible. In this way, it would avoid the abrupt beam structure above the interior space. In other words, it can avoid the sense of disharmony between the ceiling and the ground, which is depressing and unattractive.



Figure 6 Building a wall and welding beam.

- Making cabinet below the beam

In the era of whole house customization, many people use whole house customization in interior decoration. The flexible design and construction solutions of whole house customization are suitable for solving the problem of unattractive and impractical architectural design of most beam

structures in interior spaces. Through the whole house customization, the following beam problems in interior space design can be solved. For example, for the beam against the wall ("Figure 7"), making the cabinet under beams should consider the needs of the user, followed by consideration of the relationship between the cabinet and the space. According to the size of the beam and the wall, people can customize the cabinet under the beam, so that the cabinet and the beam in the façade will form a plane. ("Figure 6") For the beam far from the wall and more centered in the space, the cabinet shelves, display cabinets, TV cabinets, etc. could be designed under the beam according to the functional division of space required by the different cabinet shape, enhancing the integration of space.



Figure 7 Making cabinet below the beam.

- roof leveling

One major limitation of this method of roof leveling ("Figure 8") is the floor height of the house. If there are some beams in tricky positions and the space is high enough, people can take the roof leveling, with no complex decorative lines. The effect is similar to the popular minimalist style in recent years, and it is silent, overall, quiet, simple and sharp in the interior space design style.



Figure 8 Roof levelling.

The common column structure in interior space can be divided into round column, rectangular

column, T-shaped column and L-shaped column according to column shape. Considering the column types, columns can be further divided into free-standing columns and wall columns. Free-standing column is the column that is not against the wall on all sides, also known as isolated column. Free-standing column in the decorative design is more difficult to deal with, but the design is reasonable to play a very good artistic effect. Wall column is the column connected with the wall, and there are two kinds of column structures, such as a single side connected to the wall and both sides connected to the wall.

4.1 The Use and Expression of Independent Columns in Space Design

Round free-standing columns were often used in ancient buildings in China and in Western countries, such as the wooden columns used in ancient China and the Roman columns in the West, both of which were cylindrical in shape. The more common column shape in modern architecture is the square column. How should these free-standing columns be represented in the design of interior spaces? The following methods are summarized here.

- heterogeneous isomorphism

("Figure 9") When a separate column appears abruptly in the space, the location is conspicuous, but people cannot hide it. Considering this situation and the relationship between column structure and space, people can design different materials for the surface of free-standing column, so that the free-standing column can be integrated into the overall design style according to the overall style of interior design.



Figure 9 Heterogeneous isomorphism.

- allo isomorphism ("Figure 10")

In addition to changing the surface material of the free-standing column, it is suggested to find the connection point between the column and them from the angle of the ceiling and the structural nature of the floor space, and design an external structure for the column according to the position of the free-standing column in the space and the overall decoration style of the space, so as to make this free-standing column a bright landscape in the interior space.



Figure 10 Allo isomorphism

- layout isomorphism

When it comes to free-standing columns that happen to be in functional areas ("Figure 11"), it is suggested to design them in conjunction with functional areas. If the free-standing column is close to the dining room, it can be incorporated into the dining and kitchen area for an integrated design. If it is close to the living room, it can be incorporated into the structure of the TV cabinet for a design. The design of the column structure in the interior space takes into account functionality while retaining the maximum architectural aesthetic of the column itself.



Figure 11 Layout isomorphism.

- building a wall and connecting a column

("Figure 12") This method is suitable for interior spaces with planned redecoration throughout the house. If the distance between the free-standing column and certain walls or columns is appropriate, the new space can be enclosed, and it is suggested to build a wall between the free-standing column and the wall or column, so that the free-standing column can be decorated into it. At the same time, it is required to pay attention to whether the wall lines connected to the column are harmonious and beautiful in the space, and whether the size of the separated space is comfortable, without hiding the column for the sake of hiding it.



Figure 12 Building a wall and connecting a column

- Adding a dummy column

In order to achieve a uniform stylistic effect in an interior space ("Figure 13"), it is suggested to add decorative columns in some locations. If the interior is designed in Chinese style, people can design cylindrical columns in appropriate places. If the interior is designed in European style, people can place Roman columns of European style in appropriate places in the interior.



Figure 13 Adding a dummy column.

4.2 The Use and Expression of Wall Columns in Space Design

L-shaped and rectangle columns with a single attached wall tend to form a corner in the wall because of the difference in the thickness of the column and the interior wall. People can use the thickness of the corner to install cabinets against the wall, both for display and storage.



Figure 14 L-shaped and rectangle columns with a single attached wall.

A T-shaped column with a single side attached to the wall ("Figure 15") has a corner exposed that is not easy to decorate, but people can design a false column on the opposite side of this exposed corner to echo it and weaken the presence of the T-shaped column.



Figure 15 A T-shaped column with a single side attached to the wall.

The column with two sides attached to the wall is better to decorate. People can use this column as the centre and pivot point and do the cabinet on a full wall. Then, the column protruded from the wall part and the cabinet will form a whole plane. ("Figure 16")



Figure 16 The column with two sides attached to the wall.

The decoration design of interior space is flexible and adaptable to local conditions, and the beam and column structure appears in a variety of situations. People have to consider the comprehensive spatial relationship between the beam and column structure and the ceiling and ground, with the beam and column as the centre and the leading to make the design.

5. THE USE AND EXPRESSION OF THE MAIN BODY OF BEAMS AND COLUMNS IN THE DESIGN OF INTERIOR SPACE SHOULD BE IN ACCORDANCE WITH THE TREND

Zhuge Liang said, "with the favorable climatic, geographical and human conditions, people will be invincible." George Bernard Shaw, the English playwright, also said, "Ordinary people follow the mind, and wise people follow the trend", which shows the importance of following the flow. The idea of following the trend can also be used in the design and use of beams in interior spaces to bring original space and design concepts into perfect harmony.

The use of aesthetic rules to make the main body of beams and columns in interior design can be summarised in the following ways:

- Uniformity

Unity is an important condition for creating harmony and beauty. When decorating a beam and column structure, attention should be paid to the structure, material and colour of the main body of the beam and column to echo the design of the main body of the interior space.

- Balance

Balance reflects the relative balance of the beam and column structure in the interior space. In particular, when the main body of the beam and column is in conflict with the main body of the design in the process of modification and renovation, it is necessary to deal with the interconnectedness of the design and space of the main body of the beam and column in a reasonable manner. And two different spaces form a relative balance with the use of space flexibly.

- Contrast and compromise

The contrast and compromise should be combined with the spatial relationship between the beam and column structure and the ceiling and floor structure, with specific analysis of the specific problem, which is very comprehensive. At the same time, it is necessary to consider both the contrast in space, structure, material, colour, and the functionality.

6. CONCLUSION

Human life is spent mostly in indoor spaces, in addition to outdoor spaces. The beam and column structure is in turn an important architectural structure for indoor spaces. Whether the position of the beam and column structure is reasonable or not determines the design and application of the beam and column as the main body in the architectural space and plays a very important role in combination with the design concept of the designer, so that the functional areas of the interior space can be reasonably used, and play a role in the decoration and beautification of the beam and column. This study analyses how the beam and column structure should be used and expressed in architectural spaces through some real-life cases, and how the design and use of the beam and column structure should be adapted to different conditions and environments, so as to transform the unreasonable beam and column structure in the design of space into an advantage, and the deficiency into a design highlight. The use and expression of beam and column structures in interior design is also inseparable from the laws of aesthetics, like Newton's laws in the natural sciences, forming the theoretical basis of aesthetics. The combination of aesthetics and the flexibility of "following the trend" in the design of interior spaces is the first question people should address. The aim is to provide a comfortable, functional, harmonious, aesthetic and personalised interior space for human beings.

AUTHORS' CONTRIBUTIONS

This paper is independently completed by Jianying Huang.

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