

# Application Strategies of Transparent Design in Architectural Design

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**Abstract:** Transparent design is a reverse space processing method in architectural design that involves partially or completely removing the original division of space, thereby making the entire space more diverse. The application of transparent design methods mainly includes the processing of two-dimensional and three-dimensional spaces, and it involves aspects like building entities, design spaces, design materials, and building structures. Transparent design is a popular form of modern architectural design. It transforms the space and reflects the beauty of the space, allowing light, sight, and air to freely blend throughout the space. At the same time, architectural design is also consistent with the idea of “form follows function” advocated by contemporary architecture, so it has been gradually growing in popularity in architectural design. This article presents a detailed analysis of transparent design, including the types of transparent design, structural model design in transparent design, and the application strategies of transparent design in architecture.

**Keywords:** Architectural design; Transparent design; Glass

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## 1. Introduction

Aesthetics and comfort are crucial aspects of contemporary architectural design, with a focus on the external aspect of form. Because modern people prefer being unrestrained, most living environments are mainly designed with the idea of spatial transparency, showing obvious spatial hierarchy through different structures and materials. The indoor colors and light are also considered as part of the design, so as to achieve better results. This design method helps promote the development of the construction industry and allows more diversified architectural forms.

## 2. Overview of transparent design

Transparent design is currently one of the most common and efficient methods for processing two-dimensional and three-dimensional spaces. It mainly includes physical processing, space processing, material construction, and many other aspects. The application of transparent design in architectural design can effectively manage two or more spaces. The spaces can be segmented and divided through different construction methods and

materials, which enhances spatial openness and minimizes obstructions. As a result, natural light is better able to illuminate the environment within the space <sup>[1]</sup>.

The first application of transparent design in China was in the construction of Jiangnan classical gardens. The transparent design method was used to plan and reorganize transparent structural spaces such as doors and windows, so that visitors can have a variety of experiences in various spatial situations. It also enhances the correlation between various landscapes, thereby efficiently connecting various spatial scenes. Besides, it also highlights the unique beauty of classical gardens and makes visitors feel relaxed and happy. At the same time, the transparent design overcomes the limitations of previous architectural spaces and strengthens the layering of the landscape, which makes the garden more appealing to the public.

### 3. Transparent design type

#### (1) Visual transparency

Transparent or translucent decorative materials and building materials can be used to achieve visual transparency. Visual transparency can be divided into three categories. (i) Absolute transparency: Transparent design not only maximizes visual effects but also fosters a sense of openness. Transparent glass is mainly used to achieve this effect because it can create exquisite, translucent, open, and clear visual effects. (ii) Translucency: Translucent glass and valances are mainly used in a translucent design. Through the appropriate combination of various materials, a layered and hazy aesthetic can be created. The division of space should not be the sole emphasis in a design, but the style, materials, and colors should also be considered. Spaces cannot be completely separated scientifically and reasonably. Instead, it should be adaptable to local conditions and circumstances to ensure the continuity and fluidity of the building. (iii) Enhancing visual perspectives through virtual modification methods. The design's transparency can be elevated by incorporating features such as wall openings, intricate patterns, or grilles in specific areas. This design technique is widely used in some classical gardens in southern China. However, in the architectural design process, it is crucial to focus on the harmonious coordination of materials, colors, and styles to cultivate a subtle, profound, and refined artistic concept <sup>[2]</sup>.

#### (2) Ventilation design

It is important to have good ventilation in a building. Today, as the living standards of society continue to improve, the demand for ecologically friendly and healthy housing has gradually increased. The indoor ventilation effect can be effectively improved by allowing air circulation in the indoor space. In actual design, In practical design, it is essential to consider the primary structural orientation and openings of the building. Proactive efforts should be made to improve the ventilation of buildings to fulfill the demand for healthy and environmentally friendly structures. In addition, when designing openings, the outside air should be fully utilized to create airflow, thereby improving the quality of the indoor environment. In addition, proper placement of air ducts and consideration of wind direction are crucial in the design process, and the positioning of air inlets and outlets should be optimized. This allows the odor and moisture as well as the heat and harmful gases from the room to be dissipated quickly, <sup>[3]</sup>.

#### (3) Space transparency design

Space transparency design is a holistic design concept and processing method. When designing transparency in and around a building, it is important to ensure a harmonious blend, interaction, and connection between the building's interior and exterior. This can be achieved by selectively creating

openings and openings in partitions, in line with the design objectives. In the case of a multi-layer transparent design, emphasis should be placed on enhancing the visual flow effect, with a focus on improving continuity, openness, and the seamless connection between layers to achieve a multi-dimensional aesthetic purpose. In building design, it is necessary to understand the rhythm and dynamics of the space and conduct in-depth research and analysis of spatial flow to infuse the entire area with a sense of vitality.

## **4. Structural model design in transparent design**

### **4.1. Types of glass**

#### **(1) Tempered glass**

Tempered glass is produced by heating, softening, cutting, and rapid cooling of ordinary glass. Tempered glass is strong, and when it breaks, it will turn into small shards instead of large pieces of glass. Besides, it is safe, low-cost, and abundant <sup>[4]</sup>.

#### **(2) Laminated glass**

Laminated glass is made by combining ordinary glass and tempered glass. Its safety factor is even higher than that of tempered glass. Besides, laminated glass will only crack but not break into pieces. In addition, it has a better soundproofing effect and also the color of the film can be changed to achieve the desired aesthetic.

#### **(3) Insulated glass**

Insulated glass is a unique type of glass that combines regular and tempered glass using an aluminum hollow frame, creating a space between them. This design provides excellent sound insulation, thermal insulation, and frost protection. Therefore, when designing the transparent structure of a building, it is crucial to tailor the approach according to the specific usage needs.

### **4.2. Glass construction method**

#### **(1) Glass fin**

The vertical glass structures on glass components are called glass fins. Glass fins utilize the bending, self-weight, and compression capabilities of the glass itself to improve the overall design efficiency of the building and meet the requirements of a transparent design. When installing and setting glass fins, a suitable adhesive should be selected based on the type of glass used to enhance the bond between the glass wall and the glass fins. The main advantages of using glass fins are that it eliminates the need for metal frames, and all connecting parts are completely transparent and open, enhancing the openness of the space. Glass fins have been widely used in buildings such as lobbies and halls <sup>[5]</sup>.

#### **(2) Structural silicone glazing**

Structural silicone glazing involves the use of stainless steel, aluminum alloy, and other structural elements. The interior of the structure consists of glass, and rubber strips are employed for bonding. This approach creates a frame structure that seamlessly blends with the surrounding architecture and offers relatively high safety levels. The glass within the frame can improve internal transparency, strengthen the connection and integration with the external environment, and create a good visual space. However, in this type of structure, it is also necessary to control the concealment of the frame to improve the overall appearance.

#### **(3) Dot Point Glazing (DPG)**

As a new type of building structure, DPG is widely used in modern architecture. DPG is a method

that involves drilling holes at the four corners of tempered glass and using freely rotatable metal bracket claws for connection. This technique enhances the overall stability of the building. There are two types of DPG buildings, namely single column type and truss type. The single-column type and the truss type. The truss type can further be categorized into three subtypes: parallel truss, triangular truss, and fish truss. The primary advantage of these structures is their ability to fully utilize the support and transparency of glass and steel materials. This enhances the aesthetics and safety of the building. Single-column structure also consists of three subtypes: I-frames, square columns, and single steel pipes. Single-column structures are simple, have small footprint, and are suitable for inter-layer structures. Besides, they are highly safe, aesthetically pleasing, and easy to maintain, so it has been widely promoted and applied.

## **5. Application strategies of transparent design in architectural design**

### **5.1. Transparent design by the openwork method**

The use of openwork techniques to achieve architectural transparency design is illustrated by using the design of a coffee shop.

#### **(1) Front desk design**

The coffee shop's design features a blend of various colors, creating a diverse and culturally enriched atmosphere. Instead of traditional openwork techniques, the coffee shop features a glass openwork design at the front desk. The transparency of the glass enhances the visual hierarchy and allows for a clear view of the products displayed on the counter. In terms of materials and object arrangement, the frame structure incorporates a hollow design by blending metal frames with wooden cabinets, enhancing the interior décor's aesthetic appeal <sup>[6]</sup>.

#### **(2) Cafe leisure area design**

The leisure area of the coffee shop adopts the traditional openwork method, using square openwork and circular openwork structures to form partitions. This method can not only improve indoor openness, but also prevent physical partitions from dividing the interior as a whole <sup>[7]</sup>. Furthermore, partitioning with openwork design can significantly enhance the efficiency of indoor light transmission and reduce the need for artificial lighting, aligning with building energy conservation goals. Some seating areas also feature hollow design elements that complement the overall partitioning, creating a harmonious and unified space. A square three-dimensional hollow frame can be mounted on the coffee shop's wall, creating an illusion of extending the space outward. When illuminated, the three-dimensional frame's shadow effect enhances the sense of depth and dimension within the interior, achieving improved visual transparency. In addition, the shadows caused by the hollow partition wall can also serve as a "picture within a picture," not only extending the space but also enhancing the aesthetics of the architecture <sup>[8]</sup>.

#### **(3) The hollow design and dark contrast effect of the coffee shop**

In traditional carving, the building or decoration will be damaged to some extent <sup>[9]</sup>. Traditional openwork technology can no longer meet the current architectural design ideas and needs, and is gradually being replaced by other technologies. The coffee shop uses openwork techniques in the designs of the seats and glass bar counters, and some vibrant paintings are also hung on the black walls to make the colors of the room more diverse. The oil painting creates a strong contrast with the dim wall, which helps to enhance the visual impact.

## 5.2. Building transparency design based on DPG structure

### (1) Glass fins

Metal support claws are installed on the glass fins to make it a glass support structure. It has good permeability and is easy to construct, making it suitable for lobbies, shared spaces, and other places. However, there are certain limitations to glass fins when used in high-rise buildings. When the distance between the ground and the glass is close, people's senses and vision will be amplified, resulting in a serious sense of oppression<sup>[10]</sup>.

### (2) Truss

There are three types of trusses: parallel truss, triangular truss, and fish truss. A truss combines the beauty of steel structure and transparent glass, which not only increases the transparency of the building, but also adds to the modern artistic sense of the building. In addition, trusses can be coated with fire-retardant coatings, fluorocarbon coatings, or paints according to the building's usage requirements. However, the design of this structure is complex and difficult, and it may create a sense of bulkiness.

## 6. Conclusion

Generally speaking, the application of transparent design in architectural design can not only meet the viewing needs of the spatial structure, but also organically combine the architectural structure and the external structure to create a good visual effect, thus improving the architectural quality and the overall aesthetics of the building. Therefore, it is necessary to strengthen the research on transparent design methods. The selection of materials and structural types should also be considered when applying a transparent design. Both transparency and safety should also be fully considered to ensure the best design quality.

## Disclosure statement

The author declares no conflict of interest.

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