

Architectural Aesthetic Design for Residential Buildings

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Abstract

At present, residential buildings constitute the most prevalent building type in China. In particular, multi-storey residential buildings lack the diverse facade design options available for low-rise buildings, nor can they capture public attention through towering silhouettes as high-rises do. The development of large residential districts tends to result in monotonous overall neighbourhood appearances. This problem has attracted the attention of architects. Addressing formal aesthetic issues of residential buildings is also a critical task in urban construction. As unique aesthetic objects, residential buildings are constrained by factors including architectural functions, technical capabilities and construction conditions. Their forms often reflect the characteristics of specific eras, locations and societies.

Keywords

Residential Buildings, Aesthetic, Form, Design

1. Introduction

An aesthetic object refers to something capable of generating aesthetic pleasure. From an objective perspective, beautiful things are often associated with certain attributes, such as harmony, proportion, and symmetry. At the same time, aesthetics also involves human rational judgment; that is, aesthetic pleasure arises from the perception of an object as embodying “the unity of regularity and purposefulness.”

Residential buildings constitute an important and widely prevalent type of architecture in contemporary China.

The development of large residential districts tends to result in monotonous overall neighbourhood appearances. This problem has attracted the attention of

architects. In the context of contemporary urban development, exploring feasible approaches to enrich and diversify the living environment while addressing the aesthetic quality of residential architecture has therefore become an important concern in residential design.

Residential aesthetics is characterized by inherent principles and distinctive features. Identifying these characteristics and examining their underlying patterns are therefore essential to the study of residential aesthetics. Some studies adopt “temporality, regionalism, groupness, regularity and simplicity” as the five core characteristics of residential aesthetics, because this framework captures the unique attributes of housing that distinguish residential buildings from other building types (Zhu et al., 2015).

- Temporality: Residential buildings are not static objects. Their appearance evolves over time due to material weathering, vegetation growth, residents’ renovations and changing lifestyles. Aesthetic quality should be evaluated across the whole life cycle rather than only at the moment of completion.
- Regionalism: Housing is deeply rooted in its local context. A good residential design responds to local climate, traditional construction techniques, native materials and cultural identity, instead of copying universal stylized templates.
- Groupness: Dwellings are usually built in clusters. Residential aesthetics concerns not only single buildings, but also the harmony among buildings, the continuity of facade and the quality of shared space, balancing individual building expression and the overall appearance of the neighbourhood.
- Regularity: Residential design consists of repeated functional units such as house types and windows. Regularity creates visual order through repetitive elements. It avoids overwhelming visual chaos and facilitates practical construction.
- Simplicity: Housing serves daily life. Excessive ornament raises cost and maintenance burden. Simplicity pursues beauty through proper massing, proportion and materials, rather than redundant decorative forms, making aesthetics compatible with residential functions.

Collectively, these five dimensions cover the time dimension, local context, group relationship, visual order and formal principle. Together they form a comprehensive framework for analysing residential aesthetics.

While the design approaches for shaping the forms of residential buildings can be summarized as follows.

2. Volume and Form Design of Residential Buildings

Volume refers to the three-dimensional extent and massing of a residential building, while form refers to the organization and composition of its architectural form. Volume and form constitute two of the most important aspects of the overall visual image of a residential building (Zhu, 2012).

Generally, low-rise residential buildings have relatively small volumes, multi-story residential buildings have moderate volumes, while high-rise residential

buildings tend to have relatively large volumes.

Small-scale low-rise residential buildings, particularly villas, allow for greater flexibility and diversity in formal design. This is largely attributable to the relatively small number of building components involved in their composition, which provides greater freedom in organizing and articulating their forms (Liu & Wang, 2000).

As the building volume increases, its form tends to become more regular and coherent. Multi-story residential buildings generally emphasize an overall sense of rhythm, complemented by occasional variations in architectural details. In high-rise residential buildings, the overall form is primarily determined by the building plan and structural system, while variations resulting from the architectural treatment of individual details have a relatively limited influence on the building's overall form.

3. Composition of the Facade and Organization of Exterior Elements

The exterior facade of a residential building encompasses all protective elements of the building other than the roof. In certain cases, however, the roof and walls may exhibit a high degree of continuity, making it difficult to distinguish between them. In such circumstances, the roof may also be considered part of the building's exterior facade. The primary functions of the exterior facade of a residential building can be understood in terms of functionality, representation, and communication (Nie, 2004).

The treatment of residential facade elements involves the arrangement and combination of essential external architectural elements, such as windows, balconies, sunshades, air-conditioning units, protective panels, corridors, and stairwells, as well as decorative elements. Their design should be considered comprehensively in relation to artistic effects such as light and shadow, color, and proportion.

The design of building facades should follow fundamental aesthetic principles, including rhythm, contrast, harmony, balance, and unity (Nie, 2004).

Rhythm refers to the repetitive and ordered arrangement of architectural elements, which gives the architectural composition a sense of regularity and harmonious unity, thereby enhancing its aesthetic appeal.

Contrast refers to emphasizing differences in the color, form, and scale of architectural components to express the characteristics of a building, enrich its facade, and enhance its aesthetic quality.

When two architectural elements are similar in form, color, or scale, the contrast between them is reduced, allowing a common order to emerge and enabling the two elements to achieve a harmonious relationship.

Balance refers to the equilibrium achieved through the distribution of architectural volumes. This balance may result from the symmetrical arrangement of individual architectural units, but it can also be achieved through asymmetrical ar-

rangements in which architectural units of different volumes are compositionally balanced. Symmetry can therefore create a sense of balance, while balance itself is not necessarily dependent on symmetry and may also encompass asymmetrical forms of composition.

Unity refers to the identification of common elements among different colors, architectural components, or architectural forms. By integrating these otherwise scattered but related elements, unity helps establish coherence within the architectural composition, thereby enhancing the perceived sense of volume and visual consistency of the building.

The principal approaches to architectural facade composition include: 1) horizontal composition; 2) vertical composition; 3) grid composition; and 4) scattered composition, among others (Avéneau, 2016).

Horizontal composition creates a sense of relaxation, tranquility, and stability, and can readily achieve a harmonious relationship with the architectural form of the corresponding level. On residential facades, elements that can contribute to horizontal division include windows, balconies, sunshades, cornices, ring beams, and other architectural components.

Vertical composition involves dividing the exterior facade of a residential building through the regular arrangement of vertical elements or lines. For buildings with relatively flat forms, vertical divisions can mitigate the compositional limitations associated with excessive horizontal flatness, creating a taller and more dynamic visual impression.

Grid composition is formed through the arrangement of horizontal and vertical lines. These grids can be formed by structural elements such as columns and ring beams, or by horizontal and vertical sunshades. In residential buildings with balconies arranged at each bay, a strong grid composition can naturally emerge. The repeated balconies, together with the resulting complex patterns of light and shadow, form an integrated grid-like composition across the exterior facade.

Scattered composition involves arranging certain facade elements across the exterior surface in a regular yet interlaced manner, creating a pattern of dispersed elements. This approach can enliven a repetitive and orderly residential facade by introducing visual variation within an overall regular composition. Scattered composition is highly decorative. In addition to being consciously incorporated into the architectural design, it can also provide residents with a certain degree of freedom in personalizing their exterior spaces. This creates a relatively informal and spontaneous visual effect while adding a contemporary character to the facade.

4. Component Form and Detail Treatment of Residential Buildings

Just as a piece of piano music is ultimately expressed through the performance of the pianist, the architectural form of a residential building is likewise realized through the treatment of each individual component and its details.

Detail design does not mean making an architectural design unnecessarily complicated or visually cluttered. Rather, it involves refining individual details to influence the overall architectural image and further enhance the aesthetic quality of the building as a whole. Elements such as the arrangement of stairwells, the division of window frames, the treatment of corners, and the use of ceramic tiles all fall within the scope of detail design (Shan et al., 2002).

For example, the stairwell is a distinctive component of the facade of multi-story residential buildings. Its projecting vertical form and varied window proportions can introduce visual variation to the facade. As the stairwell also commonly serves as an entrance to the residence, it often becomes a prominent architectural feature. Therefore, to address the difficulty of distinguishing between multi-story residential buildings, particular attention should be given to the design of stairwells and entrances.

Windows are often described as the eyes of a house. Just as the eyes are important functional organs of the human body, windows are essential architectural components that serve both functional and visual roles and can have a strong and lasting impact on the overall architectural image.

Therefore, window design should carefully consider both their lighting and ventilation performance and their overall form and proportion. In addition to achieving an appropriate visual appearance, window design should ensure adequate lighting and ventilation to meet the functional requirements of residential buildings.

In residential buildings, excessive ornamentation of windows is generally inappropriate. However, subtle variations in their form and detailing can introduce visual interest and vitality to the overall architectural image.

A common approach is to use window casings. Window casings can generally be divided into two types: masonry window casings and painted window casings. The former are typically constructed with quarter-brick masonry and then finished with paint, whereas the latter are formed entirely through paint application. Compared with masonry window casings, painted window casings have a more refined and simple appearance, making them particularly suitable for residential buildings.

Architectural details can be classified into three categories according to their location: top, middle, and bottom treatments (Matsumura et al., 2006).

Top treatment: A flat roof generally conveys a more modern character, whereas a pitched roof tends to create a greater sense of stability. The addition of moldings can further refine the roof design and enhance its elegance.

Middle treatment: The middle section can make effective use of functional components, such as balconies and windows, to enrich the architectural composition.

Bottom treatment: The bottom section should convey a sense of stability while maintaining visual continuity and integration with the overall building.

The objectives of detailed design include:

- 1) Functional goals: Detailed architectural and structural treatments should

meet the functional requirements of the building, such as waterproofing and structural stability. The combination and connection of exterior and interior components should be clear and rational, thereby ensuring that functional requirements are integrated with appropriate aesthetic qualities in the treatment of architectural details.

2) Decorative goals: Based on specific design intentions, exterior design elements should be carefully organized, and appropriate decorative components may be introduced to enhance the aesthetic quality of the architectural form and create a pleasing visual effect (Yang, 2006).

5. Texture Expression and Matching of Building Materials

Different textures of building materials produce different visual and tactile stimuli, which can in turn evoke different psychological responses.

Traditional Chinese courtyard residences primarily use wood and brick as building materials. These materials convey a sense of solemnity and simplicity while creating a natural and comfortable architectural character.

Due to the shortage of timber and restrictions on the use of clay bricks, large areas of exposed wood and plain brickwork are no longer commonly used in new residential buildings. Instead, a variety of tiles and coatings are increasingly employed as exterior finishing materials.

Contemporary material production and construction techniques can produce a wide range of textures, from smooth to rough, and can imitate natural materials such as stone and brick. These techniques make it possible to achieve architectural effects that evoke a natural character while also supporting a modern architectural style. The selection of building materials should consider the following two aspects:

1) Enhancing material quality: Material quality should be improved primarily through the use of high-quality building materials, while avoiding low-grade materials such as paints, mosaics, and tiles.

2) Achieving ecological and energy efficiency: Ecological and energy-efficient design involves the use of energy-saving or renewable building materials throughout the planning, design, and use of the building. These materials can improve the building's thermal insulation performance and reduce energy consumption (Tong et al., 2015).

6. Color Design of Residential Buildings

Residential areas constitute important living environments for people. The appropriate selection and combination of colors for residential buildings and building groups can create a pleasant and harmonious visual environment, which is the primary objective of color design in residential architecture.

The beauty of color lies in harmony, which is achieved through contrast and balance. Color contrast is a simple and direct means of creating aesthetic appeal by enhancing visual effects and impact. Color balance, on the other hand, requires

color combinations to be visually pleasing without becoming excessively stimulating (Shokokusha, 2021).

The color design of residential building groups can draw on the systematic principles of color composition theory, including the relationships among brightness, hue, saturation, warm and cool colors, area, shape, and texture. The coordinated application of these principles can integrate color with other design elements, thereby creating a harmonious visual environment and enhancing aesthetic pleasure.

To create a lively and refreshing visual effect, color contrast can be enhanced by using multiple colors with relatively high saturation and brightness. To create a quiet and simple visual effect, colors with lower saturation, weaker warm-cool contrast, and a more unified hue can be used.

In addition, the selection of building colors should respond to the climatic and geographical characteristics of the city and maintain harmony with the surrounding natural environment. At the same time, building colors should possess distinctive characteristics that reflect the spirit of the times and contemporary architectural character. Particular attention should also be paid to the continuity of historical context, with architectural colors selected appropriately in relation to the historical and cultural characteristics of the surrounding environment.

This paper takes the form of a theoretical review. For this reason, we hold the view that: Temporality, regionalism, groupness, regularity and simplicity form a framework guiding choices of massing, facade composition, details, materials and color. Residential design involves inherent trade-offs between aesthetic quality, function, construction constraints and resident modifications.

As a result, architects assume multiple roles, including those of sociologists, engineers, and artists. In residential building design, architects should likewise employ diverse approaches and consider the complex interplay of natural and social factors in order to create residential architecture that is both functional and aesthetically refined (Zhu, 2012).

Author Contributions

Peifang Sun, the first author, drafted the manuscript; Chenxin Wang, the second author, revised and polished the text.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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