# Research on Innovation Mode and Spatial Reconstruction of Architectural Design under the Background of Urban Renewal

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**Abstract:** This paper discusses the challenges and opportunities faced by architectural design under the background of urban renewal, and puts forward four innovative models: adaptive reuse, mixed function design, green ecological design and intelligent design. The paper further analyzes the methods and strategies of micro-,meso-and macro-level spatial reconstruction, including the transformation and mixed utilization of building functions, the transformation and optimization of internal space, the functional reorganization and vitality creation of blocks, the improvement and sharing of public service facilities, the protection and activation of historical and cultural blocks, the optimization of urban functional layout and industrial structure adjustment, the optimization of transportation network and the strengthening of regional relations, the construction of ecological pattern and the expansion of green space. Through multi-dimensional integration design thinking, we will promote the optimization and regeneration of urban space and contribute to the construction of a more livable and sustainable urban environment.

## 1. Introduction

With the acceleration of global urbanization, urban renewal has become an important topic of urban development. Urban renewal is not only a physical transformation of old urban areas, but also an overall upgrade of urban functions, spatial forms and social structures. In this context, architectural design is facing unprecedented challenges and opportunities. How to realize the sustainable development of the city while respecting the historical context and meeting the needs of modern functions has become an important topic for architects. This study is expected to provide a new perspective and method for architectural design under the background of urban renewal, promote the optimization and regeneration of urban space, and contribute to the construction of a more livable and sustainable urban environment.

## 2. Challenges and opportunities of architectural design under the background of urban renewal

Urban renewal refers to the renovation, improvement and reconstruction of areas that have been built, their functions have declined or their layout is unreasonable, so as to improve the quality of urban environment, optimize urban functions and promote urban economic and social development [1]. The background of urban renewal mainly includes the urban expansion brought by rapid urbanization, the functional degradation of old urban areas, the demand for historical and cultural protection and the improvement of residents' quality of life.

In the process of urban renewal, architectural design is facing multiple challenges. The first task is to optimize the functional layout in the limited urban space, taking into account the flexibility and adaptability of the space to meet the ever-changing use needs. At the same time, the renewal project must respect and continue the historical context of the city, properly protect the cultural heritage and regional features, and avoid the homogeneous development of "one side of a thousand cities" [2]. In addition, ecological sustainability has become an issue that cannot be ignored, and the design needs to incorporate green concepts to promote energy conservation and emission reduction; The problem of social equity has become increasingly prominent. How to make different classes and groups benefit fairly and prevent residential exclusion and social stratification caused by urban renewal is a

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deep appeal that urban renewal must respond to.

However, challenges and opportunities coexist. Innovative thinking, such as extension design method, provides a new path to solve complex urban problems, and the integration of new materials, intelligent construction and information technology is constantly expanding the technical boundary of architectural design. Urban renewal is also increasingly moving towards a multi-collaborative model, and the joint participation of government, enterprises, communities and residents makes the design more responsive to the real social needs [3]. At the same time, the policy support at the national and local levels has superimposed huge market demand, which has injected strong impetus into the architectural design industry, making urban renewal not only a practice to improve the living environment, but also a key opportunity to promote industry transformation and high-quality urban development.

## 3. Innovative mode of architectural design

As shown in Figure 1, the four innovation modes do not exist in isolation, but are intertwined to form an overall solution. For example, adaptive reuse projects often overlap intelligent transformation to improve operational efficiency; Hybrid functional complexes often adopt green certification standards simultaneously. This multi-dimensional integration design thinking is reshaping the value generation logic of urban space.

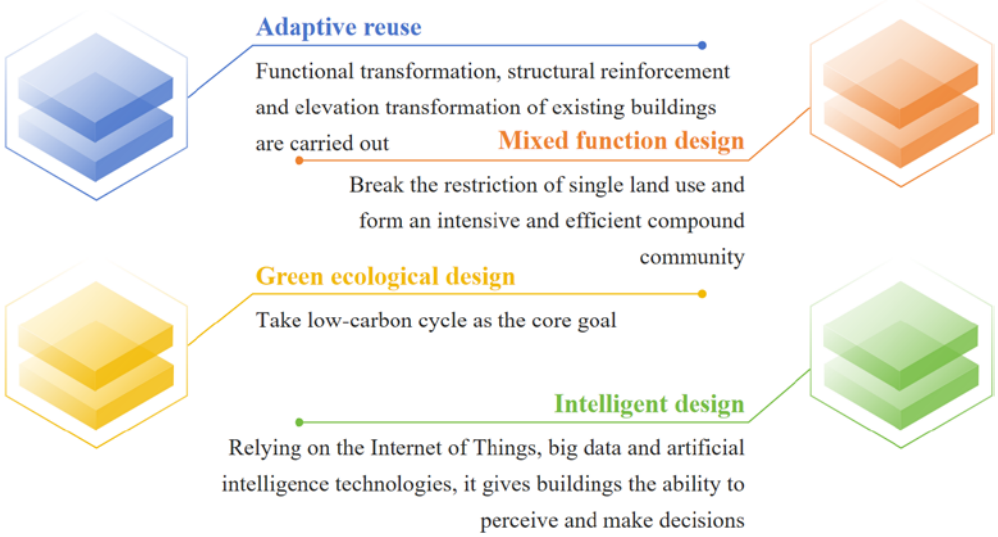


Figure 1 Four innovative modes of architectural design

### 3.1 Adaptive reuse

Through the functional transformation, structural reinforcement and elevation transformation of existing buildings, it can adapt to the new use requirements, while retaining historical value and spatial memory. This model emphasizes the organic renewal of "metabolism" rather than the complete demolition and reconstruction [4]. For example, transform abandoned factories into cultural and creative parks, and transform old warehouses into commercial complexes. Technical means include structural safety assessment, modular addition and application of detachable components to ensure the compatibility and stability of the old and new systems. In addition, through digital modeling, the transformation scheme is optimized to balance the contradiction between protection and development. It is helpful to reduce the waste of resources, reduce carbon emissions and continue the urban context. The regeneration of existing buildings not only saves the consumption of materials and energy needed for new construction, but also strengthens the spirit of place through spatial narration.

### 3.2 Mixed function design

By breaking the restriction of single land use, the mixed function design vertically or horizontally superimposes the functions of residence, office, commerce and culture to form an

intensive and efficient compound community. Usually, the spatial paradigm is to set up shops and public service facilities on the ground floor, and to lay out houses or share offices on the upper floor [5]; With the help of flexible partition, intelligent partition management and dynamic traffic organization, and combined with TOD (public transport oriented development) mode, the functional coordination is realized, which not only significantly improves land use efficiency, stimulates street vitality and promotes social communication, but also promotes the balance between work and residence by shortening commuting distance, and helps to build a compact and sustainable urban spatial structure.

### 3.3 Green ecological design

Green ecological design takes low-carbon cycle as the core goal, and reduces the environmental load of buildings in the whole life cycle by comprehensively applying passive energy-saving technology, renewable energy system and ecological building materials [6]. At the same time, with the help of three-dimensional greening means such as rain garden, green roof and vertical greening, combined with intelligent energy consumption monitoring and adaptive control system, and the promotion of prefabricated construction to reduce construction pollution, it not only effectively improves urban microclimate, enhances biodiversity, and creates a "breathing" building environment, but also effectively responds to the national "double carbon" strategy, significantly enhancing users' health and comfort experience.

### 3.4 Intelligent design

Intelligent design relies on the Internet of Things, big data and artificial intelligence technologies, which endows buildings with the ability of perception and decision-making and realizes efficient and intelligent operation. By deploying sensor networks to collect real-time data of environment and people flow, the operation of equipment is dynamically adjusted, and the space utilization efficiency is optimized by using digital twin technology; Combined with smart home terminal, service robot, AR navigation system and cloud integrated management platform, the linkage control of security, fire protection and lighting systems is realized [7]. This model not only greatly improves the efficiency of building operation and maintenance and the personalized experience of users, but also makes the building an intelligent node in the urban governance network, and promotes the upgrading of urban management to a refined and intelligent direction.

## 4. Methods and strategies of spatial reconstruction

### 4.1 Microscopic level

#### 4.1.1 Transformation and mixed utilization of building functions

At the micro level, functional transformation of existing buildings is a common means of spatial reconstruction. For example, the abandoned industrial workshop will be transformed into a creative studio, an art exhibition space or a characteristic business place. Like Beijing 798 Art District, it used to be a factory area. By transforming the old factory building into a multi-functional space such as galleries, art studios and cultural shops, it successfully realized the transformation from an industrial production space to a gathering place of cultural and creative industries, which not only preserved the historical features of the building, but also endowed it with new vitality and value [8]. At the same time, the mixed use of architectural functions is encouraged, and multiple functions such as residence, office, commerce and leisure are integrated in the same building to create a "vertical community". For example, in some comprehensive apartment buildings in cities, commercial shops are set on the ground floor, office space is on the middle floor, and residence is on the high floor. Residents can meet various needs of daily life in the building, which reduces the travel distance and improves the efficiency of space utilization and convenience of life.

#### 4.1.2 Transformation and optimization of internal space

Spatial layout adjustment. Redesign the internal space layout of the building, break the original

closed and unreasonable space division and create a more open and flexible space. For example, remove unnecessary partition walls and adopt open office layout or transparent public space design to enhance the mobility and interactivity of space. In the renovation of some old hotels, the traditional closed guest room corridor was changed into an open landscape corridor, which not only improved the lighting and ventilation, but also provided guests with a better viewing experience and improved the quality and attractiveness of the hotel.

Spatial scale optimization. According to the use requirements, the spatial scale is adjusted [9]. For the space with high floor height, the usable area can be increased by adding interlayer; For the area where the space is too tight, the space can be widened by removing some structures or using light partitions. In some small commercial shops, the attic space is used to set up storage areas or rest areas, so as to expand the functions in a limited space.

#### 4.1.3 Renovation of building facade and micro-transformation of public space

Facade update. The building facade is an important part of the city image. By renovating the facade, replacing the building skin materials, redesigning the door and window styles, adding color decoration, etc., the appearance image of the building can be improved, so that it can be coordinated with the surrounding environment or show its unique personality. The buildings in some historical blocks, by retaining the original architectural structure, repair and update the facade in retro style, reproduce the historical features, and at the same time integrate modern design elements, realizing the integration of tradition and modernity.

Micro-transformation of public space. At the micro level, the small public spaces around the building are carefully designed and transformed, such as street corner parks, community Little Square, pedestrian paths and so on. Create a comfortable and pleasant public activity space by increasing green vegetation, setting up leisure facilities and optimizing ground pavement. In the old community of the city, pocket parks are built with idle corners, equipped with fitness equipment, chairs, flower beds and other facilities, which provide convenient leisure and fitness places for residents and improve the quality of life of the community.

### 4.2 Mesoscopic level

#### 4.2.1 Functional reorganization and vitality creation of blocks

Functional partition optimization. Re-examine and adjust the functions of urban blocks, break the limitation of traditional single functional zoning, and realize the mixing and complementarity of functions. Integrate business district, residential district and office district organically, and build a comprehensive area integrating work, life, consumption and entertainment in the block. Take the creative and cultural block of OCT in Shenzhen as an example. This block integrates the functions of creative office, art exhibition, special catering and leisure shopping, forming a unique block atmosphere, attracting a large number of creative talents, consumers and tourists, and becoming one of the vitality centers of the city.

Reconstruction of street space. Street is an important part of a block. Remodeling the street space includes optimizing the street section, increasing the walking space and improving the street landscape facilities. In some cities, motor vehicle lanes are appropriately narrowed, sidewalks are widened and bicycle lanes are set up to create a continuous and comfortable slow-moving system [10]. At the same time, planting street trees, setting landscape sketches and arranging cultural facilities on both sides of the street will improve the landscape quality and cultural connotation of the street, make the street a public space where people are willing to stay and communicate, and enhance the vitality of the block.

#### 4.2.2 Perfection and sharing of public service facilities

Facilities supplement and upgrade, according to the needs of residents and users in the block, supplement and improve various public service facilities, such as schools, hospitals, community service centers, libraries, gymnasiums, etc. In the process of facility construction, the quality and function of facilities should be improved, and advanced technology and design concepts should be

adopted to provide better services for residents. The newly-built community health service center is equipped with advanced medical equipment to provide more comprehensive and convenient medical services; The community library adopts intelligent management system to enrich the collection types and create a good reading environment for residents.

Establishment of facilities sharing mechanism. Promote the sharing of public service facilities, break the boundaries between departments and units, and improve the efficiency of facilities. The sports facilities of the school are open to the surrounding residents during non-teaching hours, and the parking lots of government agencies and units are open to social vehicles at night or on holidays. By establishing a reasonable sharing mechanism, we can realize the optimal allocation of resources, meet the needs of more people, and at the same time enhance the cohesion and interaction of the community.

#### 4.2.3 Protection and activation of historical and cultural blocks

Cultural heritage protection. For the blocks with historical and cultural value, the first task is to strictly protect the cultural heritage, including historical buildings, cultural relics and historical sites, and traditional street patterns. Formulate scientific protection plans and take effective protection measures to ensure the authenticity and integrity of cultural heritage. Regularly maintain and repair historical buildings, follow the principle of "repairing the old as the old" and retain their original architectural style and technological characteristics; When renovating the pavement, drainage and other infrastructure of traditional streets and lanes, we should pay attention to maintaining the original scale and trend of streets and lanes.

Excavation and activation of cultural connotation. Dig deep into the cultural connotation of historical and cultural blocks, and transform cultural resources into economic and social benefits through cultural display, cultural activities and cultural and creative product development. Set up folk museums and cultural exhibition halls in historical and cultural blocks to display local history, culture and traditional skills; Hold traditional festivals, folk performances and other cultural activities to attract tourists and citizens to participate and enhance cultural identity; Develop cultural and creative products with local characteristics, such as traditional handicrafts and cultural souvenirs, to enhance the cultural influence and commercial value of the block.

### 4.3 Macro level

#### 4.3.1 Optimization of urban functional layout and adjustment of industrial structure

Functional zoning develops in coordination. Re-examine the functional zoning of the city from the macro level, break the boundaries of administrative areas, and promote the coordinated development between different functional areas. Strengthen the connection between the central business district of the city and the surrounding residential areas and industrial parks, realize the balance between occupation and residence through convenient transportation network and perfect infrastructure, and reduce the pressure of commuting. At the same time, according to the development orientation and resource endowment of the city, the leading functions of each functional area are defined, so as to avoid functional homogenization competition and form a development pattern of complementary advantages and coordinated progress.

Industrial structure upgrading and spatial adaptation. With the development of urban economy, promote the upgrading and transformation of industrial structure, eliminate backward production capacity and cultivate emerging industries. Accordingly, the urban space should be adjusted and optimized to provide a suitable space carrier for the development of emerging industries. Planning and building high-tech industrial parks and innovation incubation bases in cities, supporting perfect scientific research, production and living service facilities, attracting high-tech enterprises and innovative talents to gather. At the same time, the traditional industrial zone will be transformed and upgraded, and the added value of the industry will be enhanced by updating equipment, optimizing technological processes and developing producer services, so as to realize the benign interaction between industry and space.

#### 4.3.2 Traffic network optimization and regional contact strengthening

Construction of comprehensive transportation system. Optimize the city's transportation network and build an integrated transportation system with rail transit as the backbone, conventional public transportation as the main body and slow traffic as the supplement. Strengthen the construction of rail transit, improve the coverage and accessibility of rail transit, and guide the expansion of urban space along the axis of rail transit. At the same time, optimize conventional bus lines, strengthen the connection and transfer between public transport and rail transit, and improve the service quality and attractiveness of public transport. In addition, improve the urban slow traffic system, build a continuous, safe and comfortable network of bicycle lanes and pedestrian lanes, and encourage green travel.

Integrated development of regional transportation. At the macro level, strengthen the traffic links between cities and surrounding areas and promote the integrated development of regional traffic. Construction of highways, intercity railways, urban expressways and other external transportation channels will shorten the time and space distance between the city and surrounding cities and regions. For example, the Beijing-Tianjin-Hebei region has strengthened the ties between Beijing and Tianjin, xiong'an new area and other cities by building the Beijing-Tianjin Intercity Railway and the Jingxiong Intercity Railway, and promoted regional coordinated development. At the same time, strengthen the planning and construction of regional transportation hub, realize the seamless connection between different modes of transportation, and improve the operational efficiency of regional transportation.

### 4.3.3 Construction of ecological pattern and expansion of green space

Ecological corridor and patch protection. Construct the ecological pattern of the city from the macro level, and protect and repair the ecological corridors and patches. Ecological corridors include rivers, mountains, forest belts, etc. They are important components of urban ecosystem, and have the functions of regulating climate, purifying air, conserving water sources and maintaining biodiversity. By delineating the red line of ecological protection, the development and construction activities in ecological corridors and patches are strictly restricted to ensure the integrity and stability of the ecosystem.

Green space expansion and connection. Increase the green space area of the city, and improve the green space rate of the city by planning and building urban parks, country parks and urban green spaces. At the same time, pay attention to the connection and penetration of green space, form a networked green space system, and enable urban residents to reach all kinds of green spaces conveniently.

## 5. Conclusion

Urban renewal is not only a physical transformation, but also a comprehensive upgrade of function, form and social structure, which brings unprecedented challenges and opportunities for architectural design. The four innovative modes of architectural design-adaptive reuse, mixed functional design, green ecological design and intelligent design-do not exist in isolation, but are intertwined to form an overall solution. For example, adaptive reuse projects often overlap with intelligent transformation to improve operational efficiency; Hybrid functional complexes often adopt green certification standards simultaneously. This multi-dimensional integration design thinking is reshaping the value generation logic of urban space. In the aspect of space reconstruction, the micro-level emphasizes the transformation and mixed utilization of building functions, the transformation and optimization of internal space, the renewal of building facade and the micro-transformation of public space. At the middle level, it pays attention to the functional reorganization and vitality creation of blocks, the improvement and sharing of public service facilities, and the protection and activation of historical and cultural blocks. At the macro level, it involves the optimization of urban functional layout and industrial structure adjustment, the optimization of transportation network and the strengthening of regional ties, as well as the construction of ecological pattern and the expansion of green space.

## References

[1] Yang Rongbin, Xie Zaixin, Duan Zhuoqi, et al. Teaching Design and Practice of Architectural Space Reconstruction Based on Open Experiments [J]. Journal of Dali University, 2023, 8(12): 32-37.

[2] Wu Lin. Spatial Reconstruction and Architectural Regeneration in Urban Old District Renovation [J]. New Urbanization, 2025, (07): 38-39.

[3] Hao Jingyun, Bai Jianchao. Research on Age-friendly Community Space Renovation Based on Architectural Design [J]. New Urban Construction Technology, 2025, 34(06): 101-103.

[4] Xu Qian. Historical Building Protection and Reuse Design under the Background of Urban Renewal [J]. Beauty & Times (Urban Edition), 2025, (05): 7-9.

[5] Chen Ping, Kang Jinrun, Ding Ying, et al. Place Reconstruction and Revitalization of Old Sites—Practice of Spatial Activation of Huaian Old Factory [J]. Architectural Design Management, 2025, 42(05): 77-84.

[6] He Lin. Spatial Planning and Renovation Design of Existing Industrial Buildings [J]. Jiangsu Building Materials, 2025, (01): 70-71.

[7] Su Ping, Wang Zixuan, Jiang Lu. Reconstruction of Contemporary University Teaching Building Patterns Based on Spatial Adaptability [J]. Contemporary Architecture, 2024, (11): 59-63.

[8] Quan Hengyi, Lian Hua, Hu Jiaming, et al. Research on Spatial Reconstruction Strategies of Industrial Heritage from a Morphological Perspective—A Case Study of Guomian No. 5 Factory in Xi'an Textile City [J]. Chongqing Architecture, 2024, 23(04): 14-19.

[9] Ye Qingli. Analysis of Old Building Spatial Layout Planning Methods under the Background of Urban Renewal [J]. Urban Architectural Space, 2023, 30(02): 58-59.

[10] Yao Hui, Zou Ling, Wu Kai. Reconstruction and Regeneration of Spatial Order—Practice of COFCO Xi'an Qujiang Joy City Update Design [J]. Industrial Architecture, 2025, 55(03): 42-48.