

# Research on the Design of Old Building Reconstruction from the Perspective of Urban Catalyst Theory

Nanqi Wang

Jingdezhen Ceramic University, Jingdezhen 333403, China

## Abstract

In recent years, the 14th Five-year Plan has put forward the urban renewal policy, followed by the demolition and reconstruction of old buildings in various cities in China. However, in the process of development, the treatment of the buildings with "large demolition and large construction" is the mainstream, thus ignoring the protection and inheritance of the old buildings, and the new buildings are too modular and not distinctive, resulting in the situation of "one thousand cities with one side" in many cities. This paper cites the "urban catalyst theory" as trying to study the new strategy and specific design techniques of old buildings renewal under the guidance of the catalyst theory, so as to promote the development of cities in society, economy, culture and other aspects, and coordinate the harmonious relationship between old buildings and people.

## Keywords

Urban catalyst theory; Old building reconstruction; Renewal and reconstruction.

## 1. THE CONCEPT OF URBAN CATALYST THEORY

A "Catalyst" is a physical chemistry chemical that improves and enhances reactivity by interacting with a reactant, but it is not completely consumed throughout the chemical reaction. By extension, catalysis speeds things up without affecting their physical properties. The "Catalyst effect" refers to the extent to which a catalyst acts as a catalyst to affect the environment, things, etc. .

"Urban Catalyst" refers to a catalyst element placed in the process of urban development, and the surrounding urban environment to form an interaction, so that the catalyst point and adjacent elements resonate, contact and constitute a broader, more influential catalyst element, then a series of chain reaction, promote the transformation of the overall urban environment, accelerate the adjustment of urban planning landscape and architecture. In the process of urban development in our country, the catalyst of urban development is mainly devoted to the city's planning and layout and site development to produce chain reaction, and radiation to the entire social, economic, human and other fields, to achieve the sustainable development of the city as a whole.

## 2. THE DEVELOPMENT STATUS OF OLD BUILDING RENOVATION DESIGN

In the early architectural reconstruction design, "big demolition and big construction" is the mainstream. Now, the key is to comprehensively consider the environment in the transformation, which is a qualitative change in the understanding of the old buildings, but there are still many problems that need to be paid attention to in the transformation. For example, the high pattern of the transformation leads to the lack of urban characteristics and the situation of "the same cities", which further reduces the historical and cultural value of the old buildings itself. In addition, most of the old building features after renovation limit the

driving effect of the surrounding environment and surrounding residents, such as site buildings, so tourists are the main group, which are restricted by time, seasonal climate and other factors. In general, the protection of heritage, the renewal of the old city and the reconstruction of architectural features are not enough attention. At the same time, it is also affected by relevant policies, economic and other factors, forcing the transformation work to be restricted.

### **3. THE SIGNIFICANCE OF CATALYST THEORY IN THE DESIGN OF OLD BUILDING RECONSTRUCTION**

The old elements in architecture are of great significance both in spirit and matter, that is, the "Catalyst element" of the city, which is related to the quality of people's life and people's spiritual pursuit, it plays an important role in the development of the city, especially in the historic sites, abandoned factories and other old buildings in the historical and cultural blocks, which are an essential part of the construction of the city's cultural system, it is very necessary and important to preserve these old buildings; the new elements are placed to emphasize environmental change and adaptability, and to respect the urban context. The integration of new elements into the environment and the city does not mean that new elements should sacrifice self-evident. The existence significance and driving function of a large number of archaized buildings appearing in historical and cultural blocks are worth thinking, the effects of the transformation should not be a single, single emphasis on one aspect of development will lead to regional imbalances, should be a comprehensive consideration. In general, the potential impact of introducing a catalyst element to an old building is considerable, especially in the reconstruction of old buildings in historic districts, by using the "1" to drive the "N" in a snowball manner, have very important significance and function.

#### **3.1. To Protect the Heritage of History and Culture**

One of the main characteristics of the catalyst element is that it does not destroy the original urban element. The old building is an important carrier and expression of historical and cultural connotation, which contains rich cultural connotation, ideological spirit and artistic emotion. The application of catalyst theory, just and retain the traditional ideas existing in the traditional old buildings, complement each other. With the rapid development of all walks of life today, some excellent traditional architectural concepts must be innovated and perfected in the process of reconstructing old buildings. The connotation of many traditional architectural design concepts can still bring more positive impact on the development of contemporary architectural concepts, so it is necessary for people to carefully analyze and understand the development process and status quo of traditional old buildings. At the same time, the effective use of the local historical and cultural elements in the architectural space transformation can effectively tap the cultural value of the old buildings, in order to protect the old buildings must protect, inherit the advantages of traditional buildings, take its essence, remove the DROSS.

#### **3.2. Coordinate the Overall Development of the Surrounding Areas**

Touch theory knows the differences between different cities, and according to the different changes in each city and each region, it has regional characteristics. The catalyst reaction caused by the appropriate catalyst elements will not destroy the original regional environmental background, and it can guide the overall development of the surrounding area when affecting the surrounding area. So, introduced in the old building renovation design of urban catalyst theory, through the related old building history, structure content analysis, fully understand the old elements, can make catalyst elements have stronger suitability, better achieve a suitable, predictable catalyst reaction, in perfecting the old building itself at the same time, and the surrounding street landscape coordinated development.

### 3.3. Enhance Regional Characteristics

Although a large area of centralized residential areas and various distinctive living Spaces are the inevitable results of the development of The Times, the inherent historical and cultural atmosphere of the old buildings and the distinctive cultural characteristics are all unique "catalyst elements" in the city. Reforming old buildings with catalyst theory can not only protect local characteristics, but also enhance regional cultural characteristics. In today's Internet era, cultural elements with regional characteristics are valuable resources to strengthen the communication between cities and attract tourism to each other. If a city does not have characteristic and landmark buildings, then it will be difficult to pass on its city name card, and the catalyst effect is also difficult to occur effectively in the city.

## 4. SPECIFIC APPLICATION OF CATALYST ELEMENTS IN THE OLD BUILDING RECONSTRUCTION

**Table 1.** Available elements around the renovation design of old buildings

	Carrier	General Definition	Elements
<b>Material properties</b>	Old streets	Pedestrian or car shop place	Old streets is the connecting point and point, but also an important scene of community activities and economic activities. It has the function of connecting with the city.
	Structures	Objects used to display, indicate or provide municipal services, such as signs, monuments, etc	Structures convey historical and current stories of cities that are the invisible carriers of history.
	Facility and equipment	Old buildings and abandoned facilities in the surrounding environment. For example: train track, ancient Wells	The abandoned facilities and equipment of historical streets become an important catalyst element, with distinctive characteristics and historical and cultural value. The facilities appear in the form of "point" or "line" catalyst, which is connected to the surrounding environment, and can cause people's spatial association. The catalyst potential can not be underestimated.
	Site building	Old buildings or buildings of long time and of certain value	Site building is the tangible carrier of historical content and continuity, presenting the changes of urban residents' culture of life.
	New building	New buildings were built in recent years	The new architecture represents a new historical stage, and the relationship between it and the old buildings has various possibilities, such as: fusion, contrast, conflict, etc., forming a context of time.
	Open space for activities	Open space for both residents and tourists to operate their activities	Open space is the most adjustable and inclusive catalyst carrier. Different locations, different stages, different, can reflect different types of value.
<b>Non-material properties</b>	Location potential	Location is one of the core of grasping the project positioning, and even determines the development direction and overall planning of building reconstruction.	Non-material attribute catalyst element Often depends on the material form, and takes it as the material carrier or medium, in the common action of a variety of catalyst elements Next, play their own role.
	Regional characteristics	Site or regional unique culture, such as: clothing, handicrafts	
	Site spirit	Every piece of abandoned land or building carries the memory of the city and bears a deep cultural imprint on people's hearts.	
	Policy guidance	The promulgation and promulgation of appropriate policies and regulations have a guiding role in the development direction and planning of old buildings.	

Classification available elements around the old building renovation design (table 1).

#### 4.1. Material Catalyst Elements

The analysis of material catalyst elements is mainly classified from the morphology, which is generally divided into point elements, line elements and surface elements, which each have different characteristics. The direction of point elements is weak, the direction of line elements is strong, and the surface elements are the centralized expression of urban character. The point elements, line elements and surface elements are interwoven and work together. These characteristics for the reconstruction of urban regional spatial structure has great significance, combined with the analysis of the existing spatial structure design project, can well provide the basis for the positioning of catalyst elements, so as to realize the point catalyst, line catalyst, surface catalyst from building to the last to the city multi-level catalyst reaction, stimulate the vitality of the city.

##### 4.1.1 Identifiability

Point and line elements as the key link, the feature is identifiable. Its identifiability is mainly manifested when used as a marker, providing external reference points for visitors, and thus forming a kind of clue of identification. As a guide, the system composed of markers has its unique particularity, and it also contains the transformation of space, which is a metaphor for the continuity of space. For example, the chimney of TaoXichuan in Jingdezhen (Figure 1), as a catalyst element, has a clear shape, which should have obvious contrast with the background, which can highlight its spatial position, and form a direction contrast with the surrounding trend. The spatial continuity implied by the line elements and the identifiability of the nodes are often easy to provide people with clear travel routes, which can improve the regional accessibility. In the renovation of old buildings, such as height changes or phase error, various points and line elements related to the markers can also be used to highlight the markers, so as to establish a local comparison, enrich the spatial level and activity space, and facilitate them to be identified and found in the complex space.



**Figure 1.** Taoxichuan Creative Square in Jingdezhen

##### 4.1.2 Continuity and Directionality of the Space

Continuity is the basic property of a line element. When making a road, its continuity mainly refers to the smooth flow of traffic and pedestrian routes, and its width, spatial structure, surrounding buildings, building facade and other continuity. As a boundary, clear visual continuity and boundary closure can strengthen the existence of boundaries. The continuity of the boundary is not absolute. When the building space visibility requirement is very high, the boundary can also be penetrated. As a changing line, it can allow the line of sight and the moving line to penetrate into each other.

The directionality of the line elements, the related elements are mainly the surrounding terrain, road extension curve, starting point and end point, is the direction of the overall environment, is a clear direction guide, can improve the streamline coherence of the building. As a boundary, it can also represent the direction, which is more about guiding the flow of people.

#### 4.1.3 Readability

Point and line elements emphasize identifiability, while the surface elements emphasize readability. We should not only pay attention to whether it is easy to identify, but also pay attention to the similarity and logic contained in the surface elements. Readability can be understood as imagery. Image is its material characteristics, combing and strengthening of visual cues and auditory cues, which enhance the readability can form a unique impression. In the image expression, the building facade is only the appearance, and there are different requirements in the social sense. First, we should analyze the object of the building reconstruction service, the specific age group, what professional class, integrated consideration. Second, there is a unique personality expression in the building, which makes it easier to be remembered by the visitors. Third, history and culture provide ways for the expression of images. It is of great significance to respect the historical and cultural background and give the unique cultural landscape of the architecture, especially in the contemporary urban construction of "one thousand cities on one side".

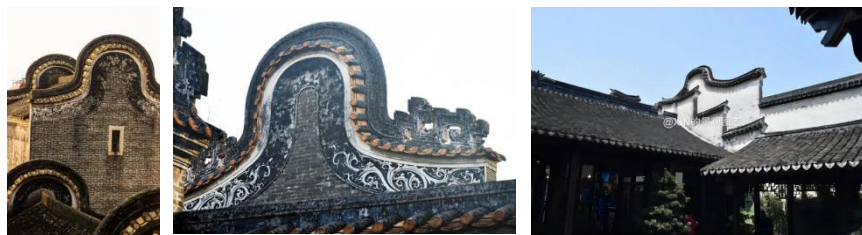
### 4.2. Non-material Catalyst Elements

In the reconstruction design of old buildings in cities, in addition to the material catalyst elements such as point, line and surface, it also emphasizes the use of non-material catalyst elements, which has a great effect on promoting the improvement of urban vitality. By deeply excavating the non-material catalyst elements, the city can better shape the urban cultural landscape, reflect the architectural personality, and express the block style. In the reconstruction of the old buildings and blocks that highlight the "cultural" elements, the material elements show the morphology of the non-material elements, so the understanding of the non-material catalyst elements can better help to shape the material catalyst elements based on the architectural space. The intangible catalyst elements in the reconstruction and design of old urban buildings are mainly manifested in four aspects: history and culture, urban culture, urban image and community culture.

#### 4.2.1 Enhance the Expression of Characteristic Culture

For catalyst elements, the historical and cultural background affects the expression of its form and the place of spirit, the surrounding environment, development stage, different national, can produce different architectural development characteristics, produce a unique cultural type, thus form different cultural background, form the distinctive cultural products under the material form. For example, in the building reconstruction of Gangtou Village, Huadu District, Guangzhou city, the "wok ear House" (as shown in Figure 2) is the unique architectural style of this village. Wok ear wall can prevent wind, fire prevention, direct sun, and can avoid the north wind blowing. Therefore, after receiving this project, the design team's first idea was to protect it as much as possible, and to enhance these architectural features with the folk culture, life wisdom and regional characteristics of the Lingnan people.





**Figure 2.** "Wok ear house" in Gangtou Village

Due to China's vast territory, the north and south climate and other factors differ greatly, the southern buildings are more to consider ventilation and moisture-proof, while the northern buildings are warm and cold. Therefore, there are great differences in the architectural concept and development level between the north and the south. In the reconstruction and design of the old building, we should not completely deny the reconstruction of "one size fits all", and the different demand factors should be fully considered. In addition, the cultural differences, regional customs and social life characteristics of different regions should be respected to better meet the different needs of consumers.

#### 4.2.2 Protect and Update Global Coordination

The protection and renewal of the old building reconstruction design is a continuous work. In order to obtain a better catalyst effect, the design catalyst effect requires the follow-up work to be coordinated with the previous building reconstruction. The renovation project of old buildings itself has hidden social value, which needs government supervision and promotion and the participation of local residents. In the process of promoting the work, the principle of consistency of the whole process should be maintained, the overall layout planning, the functional elements and value elements of the old buildings and blocks, should be sorted out, and the history and unique characteristics related to the old architectural culture should be summarized to build a tool platform for the subsequent design.

## 5. CONCLUSIONS

The renovation and design of old buildings is a thriving cause. Due to external factors, most work can only be promoted step by step, and the main participants should not be limited to government investment, but should participate in various parties and make suggestions together. The systematic working framework of the urban catalyst theory is introduced, which provides a systematic theoretical support for the future building reconstruction and historical protection work, and provides the implementation path for the specific design steps. The old buildings, old structures, available elements in the historical blocks as catalyst intermediary, through the intervention of these elements to trigger a chain reaction to promote the surrounding building renovation and regional renewal, apply these elements to promote the old city and abandoned factory transformation and remodeling, to lay the foundation for urban ecological global development, perfect and rich urban function system, to provide a more pleasant living environment.

## REFERENCES

- [1] He Ming, Zhang Danyin, Ye Siyang, Wen Xiaowan. Study on Block Micro-Update Strategy based on catalyst effect [J]. Furniture with Interior Decoration, 2022,29(05):120-124.
- [2] Kong Chow. Takes the conceptual design of the Shanghai Old Street Museum in Hohhot as an example [J]. Urban Building Space, 2022,29 (01): 148-150.

- [3] Jiang Nanqian. Research on Protection and Renewal Strategy of Historic Block based on Urban Touch theory [J]. House, 2019 (28): 181 + 125.
- [4] Hao Chibiao, Zhang Jingguo. Takes the design of Qingdao Film Museum as an example [J]. Famous China City, 2018 (10): 77-82.
- [5] Sun Miao, Chen Chen. The —— is based on the case comparison of Yishan Road block and Changyuan Block in Shanghai city [J]. City Buildings, 2019,16(19):12-20+152.
- [6] Liu Jianguo. Renewal design of old buildings based on humanistic regional needs [J]. Building structure, 2021,51 (21): 155-156.
- [7] Kou Hao. Research on Design of Old Buildings Based on Urban Memory [D]. Beijing University of Architecture and Architecture, 2020.
- [8] Li Jiefu. Research on Old Building Reconstruction and Auxiliary Landscape Design Based on Context Theory [D]. Shanghai Normal University, 2019.
- [9] Pei Hongxing, Yang Chenglin. Protection, renovation and reuse of ancient buildings [J]. China's New Technology and New Products, 2011(08):173.
- [10] Stone peak. Research on Old Industrial Building reuse [J]. Coal Technology, 2013(01):12-14.
- [11] Qiu Meng. Research on the ecological building concept in the Reconstruction design of old buildings [J]. Study on Urban Construction Theory Research (electronic version), 2018(32):83.
- [12] Zhu Zhu, Chen Mengying. —— takes Chenlaoxiang Historical and Cultural District in Xiangyang as an example [J]. Architecture and Culture, 2021(09):146-148.
- [13] Gu Creek, Min Bingxue, Jin Shiyong. —— takes Tianzifang as an example [J]. Smart Building and Smart City, 2021(06):43-46.