



# Research on Material Language in the Renovation of Existing Industrial Buildings

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**Abstract:** Since the 1990s, China has implemented the policy of “suppress the second industry and develop the third industry” in order to promote the adjustment of social and economic structure, and thus the industry has begun to face industrial transformation. As time goes by, the material language of the existing industrial buildings gradually conveys a broken, desolate expressiveness, which makes people have a certain “sense of fright caused by the fracture of time”, and it has also brought negative impacts to the shaping of the image of a beautiful city. Therefore, we need to re-understand the expression methods of materials in existing industrial buildings according to the needs of the new era. Louis Kahn once said, “It is easier for materials to reveal the existence of meaning than space, and materials are easier to decode and illustrate. The rich texture and color of materials make it easier to perceive and grasp by human senses and has a more direct meaning than space”. Therefore, this paper explains the material types (material vocabulary) in the renovation of existing industrial buildings in China, and then through the analysis of related cases, derives the strategy and methods for the renovation of existing industrial buildings in China (materials pragmatics).

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## 1 Material Vocabulary in the Renovation of Existing Industrial Buildings in China

### 1.1 The Semantics of Existing Materials and Newly Added Materials

#### 1.1.1 Semantics of Existing Materials

The existing materials here refer to the original building materials that can still convey historical and cultural characteristics and structural aesthetics in the renovation of existing industrial buildings. Existing industrial buildings can convey diversified architectural styles through existing materials. For example, early traditional industrial buildings used the language of bluestone, gray tiles, red bricks and wood to create the quaint ambience of industrial buildings; Western retro-style industrial buildings highlighted the proportion, detail decoration, and color matching to heighten the Western classical ambience of industrial buildings is; modern industrial buildings use concrete and other modern building materials to create a simple and clean architectural style and so on.

#### 1.1.2 The Semantics of Newly Added Materials

The addition of new materials can help solve the aging problem of existing materials in the renovation of existing industrial buildings, rationally strengthen and renew the original building structure and functionally repair the original building texture to realize the regeneration of building functions. Meanwhile, with the rapid changes of the times, the use of new materials in the renovation will start off from the current aesthetic concepts, and combine with the application of new materials and new technologies to carry out architectural renovations to

resolve the sense of shock caused by "time fracture". Therefore, the addition of new materials also has contemporary significance.

## **1.2 Existing Materials Commonly Used in the Renovation of Existing Industrial Buildings**

### **1.2.1 Old Wood**

“People like to deal with it and the feeling of touching it with their hands. From touching it to seeing it can resonate emotionally”——Wright.

Although wood generally has good tensile and compressive properties, due to the low corrosion resistance of wood, erosion and other problems lead to corrosion of wood when it is exposed to rain, wet weather, insects, bacteria and other organisms during long-term use in the renovation of existing industrial buildings. Long-term corrosion and use will affect the functions of wood. It will gradually cause wood moth-eaten, cracking, decay, twill and other problems, which will affect the safety, functionality and aesthetics etc. of industrial building spaces. But on the other hand, if it does not affect safety and functionality, the texture of these old woods will give the space a quaint and natural feeling.

### **1.2.2 Broken Bricks**

In China's existing industrial buildings, the commonly used bricks are red and gray bricks. After a long time of polishing, bricks' material properties, surface texture and color brightness all exhibit a relatively stable state, but morphological damage and cracks will occur in bricks too due to a long time of use, and mottled texture effects can be observed between the brick wall of some industrial buildings and the broken concrete surface. On the one hand, although it reflects the disrepair of the original industrial building for a long time, on the other hand, this damaged form and texture also enriches the plain texture of the space and gives traces of "history".

### **1.2.3 Broken Concretes**

Concrete has strong plasticity, impermeability, frost resistance, and erosion resistance in long-term use. We often obtain concretes with different properties by changing the ratio of concrete base materials. Although the surface of concrete will crack when it encounters dry and wet shrinkages, and will deform under continuous load or large temperature difference, generally speaking, concrete is a building material with long life under normal use. The

biggest disadvantage of concrete materials in the renovation of existing industrial buildings is that they are irreversible. Once the concrete is poured into shape, it is difficult to change the shape and texture of the material. Meanwhile, it is difficult to remove concretes. Therefore, we must learn to use concrete materials carefully in the renovation of existing industrial buildings.

### **1.2.4 Old Metal Materials**

Metal materials have good compressive, tensile, and flexural properties, and metal components are usually assembled with accessories and have good reversibility. Therefore, metal materials are often used as structural materials to be incorporated into existing industrial building renovations for reinforcing the structural strength of the original building. Meanwhile, metal materials have good plasticity. Through cutting, rolling, drawing and other processes, metal can be shaped into various sizes and shapes to realize the expression of architectural shape and spatial characteristics. Different metal materials will also show different luster and texture under the action of light and shadow. For example, common metal materials in China's existing industrial buildings include steel, aluminum, and weathering steel.

Generally speaking, metals are light, strong, and ductile, making them ideal structural materials. The passing of time may result in special effects of diverse colors, rich patterns and textures, which will help to show characteristic architectural skins and structures. For example, smooth aluminum plates and stainless steel plates can reflect the aesthetics of modern technology and craftsmanship; copper plates can achieve the combination of modernity and history; corrugated plates bring rich details to the building; natural untreated steel plates are more likely to leave nature and imprints, showing the influence of time on architecture<sup>[1-2]</sup>.

## **2 Material Vocabulary in the Renovation of Existing Industrial Buildings in China**

The replacement of spatial functions is the purpose of the renovation of existing industrial buildings. In the process of functional replacement, the new architectural functional space needs to be realized through the reorganization of materials. Therefore, in the renovation of existing industrial buildings, we

usually use the characteristics of building materials to perform functional and reasonable replacement of the building in a certain way, that is, to renew and organize the vocabulary of materials from a "practical" perspective.

### **2.1 The Integration of Materials and Functions**

The integration of space in the renovation of existing industrial buildings is to sort out the existing materials, analyze the surrounding environment, and selectively move, replace, or even delete the original interface materials. During the sorting, add appropriate materials to reinterpret the space.

For example, the headquarters of Beijing Blue Cursor Group, which was transformed from a large-scale Panasonic factory, realized the combination of spatial functions by reintegrating the original building structure. The plant is about 700 square meters and 8.5 meters high. The design team transformed it into a north-south event venue for the Group's exhibition. Their design concept is to divide the site into two areas: the newly added catering service area in the north and the exhibition area in the south that retains the original building frame structure. The entrance of the building is switched to the northern entrance hall shaped by metal surface. Upon entering, there is a catering service area with reception. This area can provide a variety of reception facilities: such as wardrobes, signature desks, toilets, and photo areas. The use of modern materials integrates the northern space into a composite space; the southern exhibition area retains the frame structure of the original Panasonic factory and revitalized it into a multifunctional exhibition hall. In addition, the serial white translucent panels extending from the facade to the top surface are interspersed and integrated with the truss on the top of the original building, suggesting and explaining the historical spatial form of the space.

### **2.2 Material and Morphological Reorganization**

Reorganization is a form of separating and merging the elements of something to achieve changes in the structure and shape of things. In the existing industrial building renovation projects, the reorganization of space mainly refers to the structural and morphological adjustment of the building materials due to the functional or aesthetic needs of the original building space after the renovation, thereby realizing the reasonable renewal of the building and also

gives a certain degree of freedom to architectural transformations.

Take the renovation of the entrance to the sales office of Apple Community in Beijing as an example. The building was converted from the boiler room of the original Beijing Brewery. During the renovation process, the design team believed that the industrial traces left by the boiler room should be preserved as much as possible, and at the same time, new building components were applied to meet the new spatial functional requirements. At the entrance, the design team considered that the interpenetration of indoor and outdoor spaces can give people a new spatial experience, so the design team chose a corroded iron plate combined with irregular steel ribs to restructure the inverted bucket-like structure to reflect the penetrative relationship of the entrance space and guide the flow of people with this retractable morphological relationship. Meanwhile, this material form is also a memory of the old boiler room and is symbolic<sup>[3-5]</sup>.

### **2.3 Material and Visual Overlay**

Superposition refers to the mutual covering and the merging of two or more substances. In architectural design, if there are more solid places in the building, the building will appear heavy and dull; if there are more empty places in the building, then the building will appear light and bright. The superposition of material vision integrates the emptiness and solidity of the building itself, making the building appear transparent and solid. The superposition of space mainly reflects the principal-subordinate relationship of materials. Generally speaking, materials with a large proportion can be regarded as the base, and materials with a small proportion will appear to be prominent against the base. When solid materials are used as the base, we should pay attention to the superposition and combination of void materials, and also consider the integrity of the solid materials as the base, and vice versa. The superposition has the effects of mutual penetration, and the superposition of the two can achieve the complementation of the void and the solid visually.

Research Design Company transformed the Shenzhen Lao Nanxing Glass Factory, which was built in 1986, into an office space. By setting up corridors and entrances that constantly appear in the interior, they broke the space and re-bonded it, so that

the original form of the space with a severely uneven aspect ratio was adjusted to fit the office space, and the only horizontal passage was formed between the local spaces to strengthen the spatial layering while bringing the fun of walking across the space. In order to highlight the effects of space interpenetration, the design team also superimposed a large area of original red bricks with transparent glass to form a strong contrast between the void and solid, and the light and heavy of the space, which strengthened the visual tension. Meanwhile, after removing the old windows, the design team intentionally kept the window holes and installed floor-to-ceiling glass along the inner wall of the holes to bring a visual experience of clean glass superimposed on broken red brick sections<sup>[6-7]</sup>.

#### 2.4 The Deconstruction of Materials and Space

The concept of “deconstruction” originated in Heidegger's "Being and Time", which originally meant to decompose, dissolve, disassemble, and reveal. In the renovation of industrial buildings, on the one hand, it is the deconstruction of the material itself. Existing materials often show broken texture appearance, which has the meaning of deconstruction. The broken texture of existing materials is not only a material component of the building surface at this moment, it also reveals the materialization of the history and time of the existing industrial buildings; on the other hand, materials are a component of the building. In some building renovations, the materials are a result of the deconstruction and decomposition of the building space.

The project ID Town (the original printing and dyeing factory bleaching workshop) is a typical case to explain the deconstruction of materials and space. The mottled building frame surface left over from the original factory and the exposure of the original concrete foundation part suggest that the existing building is in a state of abandoned, while the black steel structures newly added to the original bleaching workshop during the renovation are scattered among the existing buildings. Since the existing buildings were not enclosed by walls or windows, the structure remains connected to the outdoors, blurring the space. The boundary between the renovated building ID Town and the outdoor environment has also become ambiguous, weakening the physical experience of the building itself. From the perspective of material use, there is no definite logic in the utilization relationship

between the original concrete wall and the black steel, but there is a containment relationship in terms of spatial location. Therefore, when describing ID Town, it is difficult for us to clearly point out whether ID Town refers to the newly added black building or the entire building including the existing bleaching workshop. The architectural space of ID Town is deconstructed into the existing building concrete frame, newly added structures, and the ambiguous space containing the relationship between the two, which makes people more inclined to treat ID Town as an architectural landscape.

### 3 Conclusions

The rational expression of the language of the existing industrial building materials can alleviate the over-prominent contradictions caused by the "time fracture", and at the same time, by creating unique architectural features, it can arouse people's memories of existing buildings and longing for the future of architecture. But we must also know that in the process of expressing material language, our opportunities and challenges exist at the same time: on the one hand, the update of material language brings new vitality and development to existing industrial buildings; on the other hand, if it fails to ensure the rationalization of the material language expression process and the scientific method, not only that the transformation cannot proceed smoothly, but it is also more difficult to produce the ideal design effects.

Upon the completion of this paper, some internal composition rules and creation methods for material application in the renovation of existing industrial buildings have been explored, stimulated designers' innovative thinking in material application, and established a material language expression method exclusive to the renovation of existing industrial buildings which can then shape their unique venue spirit more accurately.

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