

Analysis of the combination of architectural art and technology

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Abstract

The discussion about combining architectural art with technology is not only a new trend of the contemporary architectural design, but also greater achievement people need for the functional level of the buildings. It is discussed about architectural art technique of expression and nature of construction technology and addressed the relationship between them. Reflection of combining architectural art with technology is described through analysis of Tokyo International Forum center atrium.

Keywords

architectural art, architectural technology, technique of expression.

1. Introduction

Abraham Harold Maslow pointed out in "Maslow's hierarchy of needs" that no one needs to have a hierarchy of being satisfied, from basic physiological needs to emotional fulfillment, including respect and love. A high level of demand will dominate people's consciousness, but it is the premise of meet the needs of lower level. The self-realization of feelings not only dominates architecture art performance of designers, also their artistic expression on building structure, and it is necessary to combine the two: architectural art and technology.

2. Architectural Art and Technology

2.1 Architectural Art and its Technique of Expression

The difference between architectural art and general art is that architectural art has the duality: material and spiritual and general art. The reason includes the following three points briefly: firstly the architecture must be with the aid of medium of certain entities to constitute it; secondly the beautiful works, designed and built by the architects with experience and artistic skills, has both practical and aesthetic characteristics; lastly architectural art of the highest level is to build an environment atmosphere, and to show the specific emotions and thoughts. That is why the building reveals art and at the same time also has a form of a state of matter.

A successful architectural works can express its artistic performance in a variety of ways. Performance methods can be roughly divided into two categories: purity performance and complexity. Purity performance method usually includes design form for building structure and color, selection of material quality, and space pattern arrangement etc. Relatively, complexity manifestations can increase the artistic charm of buildings by the performance of the cultural and linguistic means, or by other methods such as the utilization of hearing, smell and taste. ^[1]

2.2 The Essence of Architectural Technology

Construction technology as a form of physical manifestation, can express through the following technologies: structure fields, material and tectonic and the ecological technology etc.

2.2.1 Structure fields

The essence of structure can be divided into two different parts in a comprehensive perspective: the first parts are the details of structure form, structure components and nodes etc.; the second part is the relationship between elements in the whole structure, which is the entity relationship between structural components. ^[2]

2.2.2 Material and Tectonic

Material as constructs the construction entity which defines and forms space. Space is the nature of architecture and architects use different material, the basic elements of construction constitute, to design the structure of different buildings, thus forming diverse spaces that create a different atmosphere.

2.2.3 Ecological Technology

Low carbon city and ecological construction is the development trend, at present, and an increasing number of architects are devoted to saving energy and protecting the environment in architectural design practice. The research achievements of ecological architecture also provide more inspiration for architects. Ecological technology have been being Integrated into the art creation, not only being in art performance, but also adapting to today's development trend and promoting the development of low-carbon life.

2.3 Connections of Architectural Art and Technology

Nervi, Pier Luigi ^[3] said” Building is, and must be the combination of art and technology, rather than technology and art.” There are essential differences between the two. Both technical factors and artistic factors exist in the construction, and both should be regarded as a whole to be treated. There exists science and rationality of the technology in architectural art, and meantime the expression of the aesthetic feelings of art emerges in technology.

When buildings are being designed, the connotation of the technology is able to supply and allocate largely flexible architectural design elements, and is closely related to final architectural artistic effects, and plays a significant role in the expressive force of the buildings. When the buildings are being created, strengthening the correction of architectural technology is feasible and practical in order to express architectural art. Technology expression is indispensable in the artistic quality of buildings’ construction. The more technology expresses the higher artistic value the constructions possess.

3. Reflections on Atrium of Tokyo International Forum Center

The original meaning of atrium space is that buildings’ interior create a belonging to building its own external space. The atrium exists as a transition of architectural space and the external environment, which can achieve mutual infiltration of buildings and urban space through the interface transparency in the sunlight and nature. Atrium of Tokyo International Forum Center (Fig.1) possesses above features.^[4]

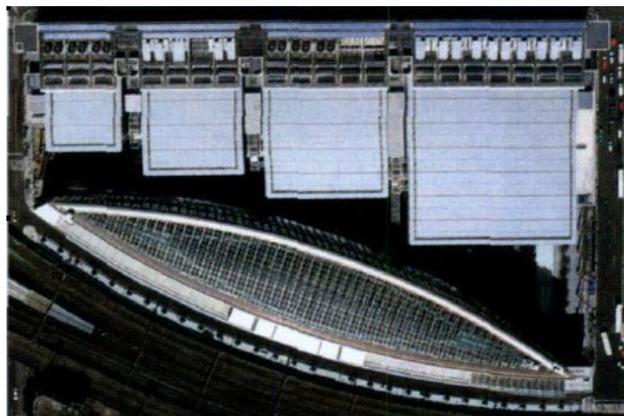


Fig.1 aviation image of Atrium of Tokyo International Forum Center after construction

3.1 Project Profile

Tokyo International Forum Center is designed by architect Rafael Vinoly and structure engineer Mr. Watanabe, and located in Chiyoda-Ku of Tokyo commercial and cultural center. It is a multi-functional comprehensive facility where many international forums, kinds of performance, and art exhibitions are held. There is a glass atrium, called Glass wall, whose plane is spindle –shape in

the architectural layout. The length of atrium is 214 meters, the largest width 32 meters and the floor level 60 meters.

3.2 Analysis of architectural art and technology

The Yamanote line and the Tokaido Shinkansen are shown at the bottom of Fig.1. The building is surrounded by the roads where there are subways crossing underground. Shinkansen is landed in the edge of Tokyo International square with its soft curvature. When Mr. Vinoly designed architectural form, the atrium outline was fully in conformity with Shinkansen, thus not only complementing each other, but also forming and enriching the landscape here. Glass curtain wall, for steel structure, was used in outside wall of atrium. Transmittance and perspective of glass was taken advantage of to integrate external square and atrium interior visually. Adoption of transparent material not only expands the depth of the space itself, but emphasizes the relations of the internal space and time changing. When Mr. Vinoly designed it, natural light the glass hall absorbed was adopted to transmit to the underground arena and the arena would be brilliant more. The arena is just the atrium which is formed a whole with the theater group of building space. And this is also the root of the basic design.

Two kinds of structure forms are set up in the ship-bottom-shape space. One is a combination of compression bar set up along the upper roof lens and catenary hanging bar. Another structure is an arch bar set up between two pillars and a tie rod connected and opposed to the arch bar. The arch bar helps to improve the level of the roof surface rigidity and the roof surface is also an arch. In the structural system, the two different independent forms can resist the main stress of the roof. Besides, ribbed bar, which connects the compression members and tension members in the two kinds of structure forms, constructs the roof. ^[5] Glass curtain wall uses a simple structure. Detail components not only are unique, but also embody the force transfer relationship.

When Mr. Watanabe designed the structure of glass atrium, two steel columns, just apart 124 meters and overhanging length 45 meters in order to improve the transparency of curtain wall and reduce visual barrier of structures, are designed to support the roof truss to relieve the front bearing. The columns use double pipe for steel structure, and the interior grouts high strength concrete to prevent buckling and increase the stiffness. At the same time, rainwater pipelines and cable conduits are set up at the internal columns so the columns are also the equipment columns of the main roof. In view of the seismic factors, the wall and roof of the glass hall are designed to tension structure with maximum transparency for light steel. To ensure the stability when the earthquake happens, horizontal trussed system, supporting the roof, is composed of two groups of internal bars connecting side walls. Diagonal over-bridge, as a horizontal truss, spans glass hall and connects side wall to limit deformation caused by seismic load. ^[6]

The glass hall is an integrated space including foyer. Escalators, stairs, elevators, ramps and air corridors contact with all parts of the other special spaces. Ramps are established along the walls since the first floor, bottom-up around the hall. Air corridors are set up at the 4th, 5th, and 6th floors, connecting ramps to link transport and enrich space level simultaneously.

The art beauty of the form and line in the glass atrium is united with the actual field perfectly. In the aspect of structures and materials selection, they are taken advantage of adequately to combine with inner and outer space organically. Natural lighting is used to forming a glamorous glass space environment. Atrium of Tokyo International Forum Center is integrated into the construction technology in the art beauty. The art of space form itself is taken into account on the aspect of architectural technology sufficiently. The art of space form and architectural technology of the Atrium of Tokyo International Forum Center exists not alone but in unity and harmony.

4. Conclusion

It is vital for architects to understand architectural technology completely to complete a remarkable architectural form. Only the architects fully understand engineering principle, pay attention to the safety and economic efficiency of the structures and materials and appropriate technology, they can

reflect efficiency, economic and aesthetic essence of architectural art and construct the buildings accepted and appreciated by the people.

New breakthroughs of architectural technology on architectural art form and design ideas embody aesthetic values, form technology science and play a significant role in architectural creation. It is with the understanding of architectural art more and more that the embodiment of the architectural technology reaches a new height now.

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