

# *Application Analysis of Conceptual Design in Architectural Structure Design*

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**Keywords:** Conceptual Design, Building Structure, Design and Application

**Abstract:** With the development of The Times and the continuous development of science and technology, the demand for architectural design work is also increasing, and the concept design ideal has come into being. The application of conceptual design in architectural structure design is increasingly extensive. The concept of conceptual design focuses on the overall design and implementation of the building from a macro perspective, from the functional, structural, aesthetic and economic three aspects of comprehensive consideration. In order to further analyse the application value of conceptual design in architectural structure design, this paper first briefly expounds the importance of integrating conceptual design into it, and then focuses on the application of conceptual design in architectural design, aiming to deeply understand its connotation, explore its value, and explore its application in contemporary architectural design. The aim is to provide a reference for relevant personnel.

## 1. Introduction

Conceptual design is a kind of non-standard empirical design concept, which mainly combines seismic parameters and test results with the overall or individual mechanical relationship of the structural system, structural failure mechanism and engineering practical experience [1]. Before drawing construction drawings, the conceptual design concept can be incorporated into the building structure to make reasonable adjustment and arrangement, and it is convenient to choose the best architectural scheme. The overall application is not only fast, efficient and economically significant, but also can provide some design support for specific engineering construction, so that the conceptual design can be well integrated based on the actual situation of the building structure to further improve the rationality and science of the building [2].

## 2. The Importance of Incorporating Conceptual Design into the Design of Building Structures

First, architecture belongs to a kind of visual art. Integrating conceptual design into structural design can fully reflect the uniqueness and beauty of the main body of the building itself, highlight the beauty of the building, and give people a unique visual experience. There are many aspects to

the overall structure and design of the building, so designers need to focus on the layout of each space. Today, with the continuous development of economic globalization, architectural designers should determine their own structural design according to the actual needs of users. At the same time, they should organically combine China's unique aesthetic and humanistic concepts to achieve the unique effect of combining Chinese and Western, so that the architecture has a more unique aesthetic feeling, and strengthen creativity on the basis of following the laws of nature.

Second, conceptual design can fully reflect the humanized characteristics of buildings. Based on the current historical background, more and more people begin to attach importance to humanistic spirit and aesthetics. Therefore, in the process of architectural structure design, designers need to only focus on the people-oriented design concept, give full play to the unique value of conceptual design, and better highlight the humanistic advantages of architecture, actively use modern advanced technology to create a good living and working environment, improve people's quality of life, so that more and more people can identify with architectural design.

### **3. The Basic Conditions for Designing the Application Scheme**

#### **3.1 Refine the Diagram**

Conceptual design is based on the design principle and conception, guided by the structure concept, to carry on the in-depth analysis of the building structure. In this process, designers should simulate various structural conditions according to the actual stress state of the building to ensure the coordination and safety of the building. Because the scheme design is not based on the design drawing for the numerical calculation of the structure, therefore, the accuracy of the relevant values on the design drawing is necessary. According to the specific structural conditions of the building, try to avoid the weak links in the structure to ensure the rationality and scientific design of the scheme.

#### **3.2 Ensure Calculation Accuracy**

Structural design needs professional software to calculate the design accuracy, and it needs professional software support after integrating into the conceptual design. At this stage, there are many types of design software in the market, and the use methods and calculation specifications of different software are different to some extent, which will also lead to differences in the accuracy of building structures due to different software applications. Based on this, after conceptual design is integrated into it, relevant designers need to learn various software calculation modes to ensure the accuracy of structural data, so that the rationality of conceptual design can be scientifically evaluated and the reliability of structural design can be guaranteed.

#### **3.3 Satisfaction with Construction**

The introduction of conceptual design in the design of the building structure can ensure that the design scheme meets the needs of the actual construction, so as to meet the expectations of the owner for the construction project. On this basis, the project proposes a new architectural form, and introduces a new architectural form on this basis, so that it can better adapt to the new architectural requirements, and create conditions for the application of new building technology and new materials. In this way, it can not only improve the design quality and effect of the building, but also make the function of the building closer to the real needs, so as to ensure that the design of the building can adapt to a variety of diverse construction needs.

## 4. Specific Application of Conceptual Design in Architectural Structure Design

### 4.1 Site Selection

In the site selection, the idea of conceptual design is adopted, and the topographic elements are comprehensively considered and analyzed. Topographically, there will be different building structures in the project, so the overall stability of the building is particularly necessary. In the implementation of program design, designers should also pay attention to geological issues, conduct detailed on-site investigations, and have a deeper understanding of the local hydrogeology [3].

### 4.2 Selection of Architecture Scheme

In architectural design, structural design is the key to determine the quality of the project, so it is necessary to work out a set of scientific and reasonable structural design scheme in order to ensure the normal progress of subsequent projects. Specifically, before construction, it is necessary to comprehensively investigate and analyze the climate, geology, terrain, etc. of the area where the project is located, and fully grasp its design needs, so as to improve the quality of the design. On the basis of identifying external factors, it is also necessary to strengthen internal introduction. In the design stage, designers need to conduct in-depth research and analysis on the quality requirements of the design, and integrate these requirements into the engineering specifications flexibly, so as to provide guarantee for the scientific design and the improvement of construction. On this basis, comprehensive analysis is carried out from various aspects to ensure the suitability of the program, and scientific and comprehensive guidance for the follow-up project.

### 4.3 Structural Seismic Response

In the design of building structure, seismic design is a key link, through its optimization, the overall stability of the whole structure can be further improved. In the construction, concrete as a vital material, its performance and quality must meet the national regulations, so as to ensure that the building meets the corresponding requirements, and has good durability. In order to provide complete and accurate information to the designers, it is very important to evaluate the seismic level of the construction area. If the results of the calculation show that the seismic capacity of this area is relatively strong, it is necessary to increase the reinforcement ratio of steel bars. In the process of scheme design, it is necessary to use BIM technology to conduct a comprehensive simulation of the seismic condition of the building, and analyze the rationality and scientificity of the seismic design objectively and comprehensively.

### 4.4 Profile

When designing the anti-side of the structure, it should be distributed from top to bottom according to the stiffness demand of the structure, and it should be loaded horizontally to achieve the purpose of effectively preventing various safety accidents. For large buildings, high-rigidity beam cylinders can be used to achieve the purpose of energy saving and vibration reduction. The safety of the indoor environment can be well guaranteed through the analysis of the structural characteristics of buildings and the active innovation, such as the use of cable-stayed cables [4]. The application of conceptual design method to architectural structure design can make the design scheme further improved, not only improve the efficiency of design, but also get a more scientific and reasonable design scheme.

## **4.5 Coordinated Engineering Design and Material Utilization**

From the perspective of structural synergy, the use of materials can not be ignored. Reducing costs is the most profitable means for most enterprises, so pay attention to the role of structural materials, such as changes in beams. Rectangular beam is a common flexural member, but its practical application is few, so it must be analyzed from the structural point of view. Since there is a strain gradient on the cross section of the beam, it is necessary to ensure high utilization of the material when axial stress occurs. Plane truss is a kind of hollow structure, its structural characteristics is that in the case of beam compression, its upper structure has great advantages, its upper string is longer than the general lower string. For the square truss, the tension and compression stress should be consistent with the force direction of the belly bar, so that the force of the string tube tends to be consistent, and a certain bending moment should be retained in the section. In addition, the strength of the rods should be considered in the truss structure, and the stability of the structure should also meet the corresponding requirements from the point of view of the material. In order to get a reasonable structure, it can be achieved by controlling the length of the rod, the size of the section, or increasing the size of the section, but it is often difficult to get the ideal result in practice. For both structures, the upper chord beam must exhibit high rigidity to endure constraints, facilitating planar lateral support and effective truss connections. Typically, this is achieved through the use of crossed truss configurations. Should the overall spatial extent and span of the structure be substantial, spatial grid materials may serve as supports. In such cases, meticulous attention is required to manage the stress on compression rods and ensure the material strength is adequate. For the culling structure press rod, the material should be guaranteed to ensure that the rod has enough stress. When the material can be used effectively, it is required to have a high strength and a certain external stress. While enhancing the value of conceptual design, it is also necessary for relevant designers to accumulate their own theoretical knowledge constantly, so that the design scheme can develop in the direction of refinement.

## **5. Application of High-Rise Conceptual Design Method in Building Structure Design**

### **5.1 Improve the Quality of Design Talents and Lay a Good Foundation for Subsequent Development**

The integration of architectural structure and conceptual design is very important for the architectural design process, in which the designer plays an important role, and the professional level of the designer directly affects the architectural effect. It can be foreseen that the construction unit needs to train the professional ability and comprehensive quality of the designer. For example, designers should train conceptual design knowledge, organize and summarize materials and cases related to conceptual design for learning, and actively organize designers to participate in special training to further improve their professional quality. In addition, targeted training for designers' global awareness and innovative awareness, knowledge lectures, symposiums and other activities are organized to strengthen exchanges and communication, so that designers can further master the relevant knowledge of conceptual design and better complete the structural design of buildings.

### **5.2 Strengthen the Architectural Design Concept and Take into Account the Durability of the Building**

The key in the process of structural design is the structural system, and strengthening the concept of the whole system is also an indispensable key link in the implementation of conceptual design. Designers must have a deep understanding of the use and working characteristics of various

structural systems of buildings when using conceptual design to design architectural structures. At the same time, it is necessary to strengthen the conceptual design of the structural system, strictly control the design quality of the building from the perspective of overall performance and safety, and ensure that the function of the building can be maximalized. For example, in the selection of the structural system, the plane and facade should be used in favor of earthquake resistance, and the width of the seismic joint should be greater than the specified value of 50 cm in the code where it will not affect the use of the building, so as to avoid the impact in the earthquake.

### 5.3 Introduce Intelligent Technology to Improve the Efficiency of Scheme Design

With the rapid development of science and technology, intelligent technology has a huge impact on architectural design, especially the application of BIM, which provides designers with a new perspective and efficient design means. On this basis, the design results will be more accurate and reasonable than the traditional design mode, which can not only avoid the errors and contradictions in the traditional graphic design, but also effectively improve the design efficiency [5]. Three-dimensional digital model is an important basis for designers to carry out intelligent creative design. It enables designers to pay more attention to creative concept and scheme optimization, rather than tedious drawing and calculation. Moreover, computer graphics software is used to quickly and accurately simulate the motion relationship between objects in different scenes, so that designers can better interact and cooperate. This makes the design process simpler and smoother.

## 6. Conclusions

The design of building structure is the key to ensure the quality of the project, and also the key to the stable and reliable operation of the construction project. In the actual construction process, due to various reasons, there are certain defects in the structural design, which brings hidden dangers to the project. Based on this, we must start from the strategic point of view, the connotation and value of conceptual design in-depth understanding. On this basis, combined with building functional requirements and structural characteristics, integrated optimization is carried out for existing structural schemes to reduce errors as much as possible, and to promote the smooth implementation and execution of structural design schemes, so as to further promote the sustainable long-term development of the construction industry.

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