

Analysis on Fire Prevention and Fire Evacuation Design in Large Commercial Building

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Abstract: Since the reform and opening up, especially over the past 10 years, China has gradually become the world's economic power, whose science and technology has also risen sharply. In the field of construction, the level of building and construction technology has risen sharply. At the same time, large-scale, diversified and functional modern commercial buildings have emerged. At the same time, its fire hazards have also increased dramatically, and the fire hazard has become more serious. New features such as large-scale, large space and multi-function, bring more difficulties to the design of fire prevention and safety evacuation of buildings. The current normative design provisions cannot fully meet the requirements of modern design. In addition to the current fire protection norms, the fire protection design of modern commercial buildings also needs to be combined with new ideas of performance-based firefighting design.

1. Introduction

The development and formation of commercial buildings are the result of the development of social economy and science and technology. Especially with the improvement of economy, the standard of living of people is rising day by day, and the concept of consumption has undergone great changes. People's consumption is no longer simply for the purchase of goods, more is the hope that shopping at the same time also be able to enjoy leisure, entertainment, catering and other complex functions. Therefore, to meet the new needs of large commercial buildings came into being, such as Shopping Mall and other large commercial buildings.

In recent years, the construction of large-scale commercial buildings has been rapidly developed. The ever-increasing scale of buildings and the diversification of building functions have created even greater difficulties for the safe evacuation of buildings. After the fire, in order to ensure their own safety, people need to evacuate the facilities quickly and rapidly and safely to the safety zone by evacuating the facilities such as the stairs or the safe passage in the shortest time. This is called safety evacuation.

2. The Characteristics of Commercial Building Fire and Internal Evacuation

With the improvement of modern building technology, the scale of commercial buildings also increased year by year, the overall size of tens of thousands to tens of thousands of square meters, each floor construction area of thousands to tens of thousands of square meters. For example, Tianjin Hedong Wanda Plaza mall construction area of 360,000 square meters. General shopping malls with men and women clothing, shoes and hats, bedding, daily necessities, children's products, supermarkets, home appliances and other zones, and set in different floors. Their common feature is that most commodities are flammable and partly flammable, which are concentrated and cause a high concentration of flammable and flammable materials.

Commercial buildings are public buildings of a service nature. Some people may increase the probability of a fire and increase the risk of fire due to the low security meaning, the poor personal qualities, smoking in public places and the littering of cigarette butts. For example, on February 15,

2004, employees of Albert Electric Co., Ltd. of Zhongbai Building, Jilin City, inadvertently dropped the leftover cigarette butts on the warehouse floor and left the warehouse without confirming whether the cigarette butts were being stamped out. Cigarette ignited the combustible material in the warehouse, causing a fire, killing 54 people were killed and 70 were injured, the direct economic loss of 400 million. In addition, if there is a fire inside the shopping mall, people need to quickly evacuate themselves to the outdoor safety zone, demanding higher requirements on the mobility of the evacuees. For the elderly, children, pregnant women, people with disabilities and other vulnerable groups will cause evacuation difficulties, resulting in the safe evacuation time cannot escape from the scene of the fire.

"Fire Code for Design of High-rise Civil Buildings" stipulates that the straight-line distance from any point in the business hall to the nearest evacuation exit should not exceed 30 meters. In general, the evacuation stairs are arranged around the building in the architectural design, and the actual walking distance evacuated from the most unfavorable point in the middle of the building often exceeds 30 meters. Because of the needs of large-scale commercial internal operation, the way in which counters and merchandise are placed in the business hall will constantly change, and the distance traveled in the display cases will inevitably increase greatly. At the same time, it also brings inconvenience to the establishment of evacuation signs.

3. Architectural Design of the Building Fire Protection Design

Building fire protection design is an engineering practice and it is combined with fire prevention and control requirements of buildings, with a certain scientific method, in accordance with certain steps to determine the behavior of building fire safety measures. The main content of building fire protection includes the causes of building fire, measures of passive fire prevention and measures of active fire prevention. There is a necessary relationship between the three. The factors that cause building fire and the determination of fire danger are the reference basis for braking by passive fire prevention and active fire prevention measures. Passive fire prevention design includes dividing fire protection zones and improving fire resistance requirements of building structures. Fire smoke evacuation systems and evacuation walkways and stairways are provided to meet evacuation requirements and ultimately reduce personnel and property losses. In the process of building construction drawings design, focusing on and strengthening the design of passive fire protection facilities, can reduce the chance of a major fire. Active fire protection design includes automatic fire alarm system and automatic sprinkler system, which can play an early detection of fire hazards, early fire extinguishing and other functions, to prevent the expansion and spread of fire. The above measures combined with each other can play a role in reducing fire loss and confirming the life safety of personnel.

4. Reasonably Set the Fire District and Safety Evacuation

In the event of a fire in a building, it is of paramount importance that the occupants of the building evacuate and evacuate to a safe place outdoors. People need to escape through certain safety routes and safety exits. "Architectural Design Regulations" The "Fire Code for High-rise Civil Buildings" stipulates that "safety exit" means "a staircase that is safely evacuated by personnel or an exit through the outdoor ground plane."

The actual design of each project, the fire district is a reasonable division of an important part of the design of fire prevention, but also to ensure the safety of personnel evacuation preconditions, the fire evacuation plays a key role. At the same time, the perfect safety evacuation design can prevent buildings from fire and poisonous gas in the event of a building fire and evacuate to a safe place as soon as possible. It is also possible for firefighters to quickly reach the place of fire through the evacuation passage for fighting. When planning the layout of the building and evacuation of the staircase, it is required that the evacuation route is convenient and can satisfy people's daily use functions. Where possible, every point in the building can be evacuated in different directions to avoid bag-shaped walkways and cul-de-sacs. Take a commercial / residential building project in

Tianjin as an example. The first and second floors of the project are commercial and the third and higher floors are three high-rise residential buildings. The residential buildings in areas A and C are from the top of 23 floors to the top of buildings in residential area B, The total building height is 83.6 meters. A floor area of 3216 square meters, two-story building 3130 square meters. Residential standard layer in the 390 to 420 square meters.

5. Large Commercial Buildings Fire and Safety Evacuation Design

The performance of large-scale commercial buildings design process generally consists of preparation phase, quantitative calculation phase, program analysis and evaluation phase and the preparation of the reporting phase of these four stages. First of all, we must do a good job in all aspects of the preparatory work before the start of the project, the need to examine the characteristics of the surrounding sites and the functional requirements of the building, and then determine the building's fire safety objectives, loss targets and comparative basis; second, the preparatory work done To carry on the quantitative calculation, we should use the appropriate mathematical calculation tools to carry out statistics on the danger of possible fire hazard. Then analyze and evaluate the scheme. After the evaluation, it is the program preparation. During the compilation process, we should compare and analyze each the advantages and disadvantages of the program, select the appropriate fire design, and then submit the program to the appropriate parties and fire departments to review the fire performance demonstration. Fire performance design method has many advantages: First, it combines the multi-level technical requirements of fire protection design of buildings, and constantly emphasizes the overall performance of fire protection design, which is conducive to the scientific use of fire performance design; secondly, New materials and technologies to adapt to the requirements of modern architecture; again, it is conducive to the smooth progress of the management of fire protection design, the insurance sector and other departments also have some benefits; Finally, is conducive to the protection of people's lives and property Safe, but also conducive to social stability and unity.

According to the above design requirements and specific steps, we must pay attention to the above four points in the design of large commercial buildings and apply these new regulations to the actual architectural design. Specifically, first of all, in the selection of large commercial building materials, try to choose fire better performance of the material, you can choose the toughened material, this material can effectively block the heat to reduce the harm to people, but also in areas such as tempered glass isolation can Design automatic sprinkler system, when the fire occurs automatically sprinkler to cover the surface of the steel cover glass full of water to organize the temperature of tempered glass; Secondly, in the design of large commercial buildings to do the construction of the total layout, Including the size and orientation of the building, the designer should divide the space of the building into fire prevention and smoke prevention zones, and internally use such facilities as fire walls and fireproof floors to isolate the space between them, which is good for quickly removing the disaster Personnel safety evacuation; again, to flammable and explosive items to be arranged in the basements and other underground space; finally, to do a large commercial building fire smoke design, commercial buildings after the fire spread of fire and smoke exhaust system Good or bad safety evacuation of personnel will have a significant impact, so in the design of smoke can be Mechanical exhaust system in indoor pedestrian street, exhaust smoke volume than one hour to five times the volume of the ventilation pedestrian, should increase the area of the exhaust port NATURAL the evacuation time becomes longer. In addition, the design of large commercial buildings also pays special attention to the setting of safety exit. The average linear distance between any commercial indoor place and the safety exit should be within 30 meters. In the event of a fire, people can help people in the shortest Time to escape safely. In short, the scientific design of fire and safety evacuation of large commercial buildings can ensure people's lives and reduce unnecessary property damage.

Ensuring the safety of people's lives is one of the goals of the fire performance design of this project. The concept and method of time line are used for design. Due to the different locations of the fires, the evacuation routes may be affected. Therefore, it is necessary to design a reasonable

evacuation scenario based on the actual site where fire may occur and its impact on evacuation. Fire Performance Study Evacuation Simulation The main purpose of this study was to evaluate the feasibility of designing a commercial natural smoke evacuation system that determines whether a fire affected area is available to personnel in a given fire scenario and smoke extraction system Safe evacuation of fire within safe evacuation time (ASET).

6. Conclusions

In recent years, Chinese economy has developed rapidly and its science and technology level has been continuously raised. It has gradually become a world economic power. In the construction industry, the construction technology and level of our country have greatly improved. As a result, large-scale commercial buildings have emerged and have played a significant role in promoting economic development. However, in recent years, the fire risk of large commercial buildings has been on the rise and the losses caused by them have been very large. Therefore, the design of fire evacuation and safety evacuation in large commercial buildings has been continuously started to reduce unnecessary economic loss and casualties so as to maintain Social stability. This article mainly elaborates in detail three aspects: the characteristics of commercial building fires and internal evacuation, the content analysis of the current fire protection design codes of commercial buildings and the design of fire evacuation and safety evacuation of large commercial buildings.

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