

Discussion on the Construction of Anti-smoke Construction Technology in Super High-rise Buildings

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Abstract: In recent years with the increasing number of super high-rise buildings and the ever-expanding scale the anti-smoke construction technology has attracted more and more attention. Based on this situation, this paper analyzes the smoke control technology of super high-rise buildings. The paper analyzes the importance of the application of anti-smoke construction technology in super high-rise buildings, analyzes the problems in the construction of smoke control and super high-rise buildings. The anti-smoke construction technology was studied and I hope that it can benefit the application of anti-smoke construction technology in high-rise buildings.

Keywords: *Super high-rise building, Smoke control, Construction technology, Problem and optimization*

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1 Introduction

The continuous boom of China's economy has driven urbanization to have a continuous acceleration as well, so super-tall buildings should also have to meet their own standards. In the construction of super high-rise buildings, fire protection construction is critical in particular. Good anti-smoke construction can effectively reduce the adverse impact of fire conditions on super high-rise buildings, provide greater convenience for fire rescue, and also effectively protect people's lives and property security. For super high-rise buildings, once a fire accident occurs, it will be more dangerous compare to ordinary buildings. According to relevant research, if a fire broke out on the bottom of a building of height

more than 100 meters, it took only less than 30 seconds for the smoke to reach the top of the super high-rise building. It can be seen that in the construction of super high-rise buildings, smoke extraction construction plays a vital role. In recent years, with the construction and commissioning of more and more super high-rise buildings in China, the problem of smoke exhausting from super high-rise buildings has become more and more obvious. Therefore, in order to effectively protect the fire performance of super high-rise buildings, the corresponding technology should be applied reasonably in the construction of smoke prevention and control. In this way, the smoke control function of super high-rise buildings can be significantly improved, which plays a key role in safeguarding people's lives and property.

2 The importance of the application of anti-smoke construction technology in super high-rise buildings

In super high-rise buildings, if smoke evacuation work is not done effectively. Smoke will not only be difficult to discharge in time, but also spread inside the building at a higher level. During such situation it may cause great difficulties for the firefighters to undergo rescue operations, but also causes people in the building to suffocate because of excessive smoke inhalation. Which in turn leads to a significant increase in the probability of casualties and a great adverse impact on society^[1]. If such a situation cannot be effectively solved, super high-rise buildings will be difficult to put into use due to safety issues, which will seriously hinder the development of China's construction industry and even the construction market economy^[2]. Therefore, the application of anti-smoke construction technology in the construction of super high-rise buildings can effectively

solve the problem of smoke spread caused by fire, so that the flue gas can be well controlled in time, so that it can be useful for rescue work of firefighters. Providing greater convenience, but also conducive to the timely escape of people in the building, can effectively protect people's lives and property security, and achieve

further reduction of losses. This will provide people with a safer living or office environment^[3]. This will allow people to give more trust to the super high-rise buildings, so that people can buy with confidence, and will have a good impetus to China's construction industry and its economic development.

Table 1. Comparison of poor anti-smoke effect and application of smoke control construction technology in super high-rise buildings

The effect of poor smoke control	Application of smoke control construction technology
Smoke cannot be discharged in time	Technology to promote the emission of smoke
Fire rescue is hindered	Facilitate fire rescue
Causing a large number of casualties	Reduce the probability of casualties
Causing a lot of property damage	Minimize property damage
Affect the sales of buildings	Enhance people's desire to buy
Affect the economic development of the construction industry	Promote the economic development of the construction industry

3 Problems that are easy to occur in the construction of smoke prevention and exhaust in super high-rise buildings

3.1 Construction aspects

At present, China's anti-smoke construction technology for super high-rise buildings is still in the initial research stage. The lack in experience and the construction process has not been sufficiently standardized. There is no perfect theoretical system for

reference in construction^[4]. Therefore, there are many problems in the construction of the project, such as copying the anti-smoke design of high-rise buildings. Design schemes cannot be consistent with the actual project, anti-smoke design is lacking of scientific and operability, and the installation of anti-smoke devices is not done scientifically. The existence of these problems makes it difficult to effectively integrate the smoke control construction of super high-rise buildings with other construction links^[5].

Table 2. Problems in the design of smoke control construction for super high-rise buildings

Related theoretical system	Imperfect theoretical system
Similarity with anti-smoke construction technology of high-rise buildings	Many designs are very obvious
Actual compliance with construction of smoke control	Many designs are seriously inconsistent with the actual construction.
Scientific and operational aspects	Many designs lack scientific and operability
Installation aspects of smoke control related devices	Many installations are not scientific enough

3.2 Problems in the setting of fire damper

In the anti-smoke construction of super high-rise buildings, the fire damper plays a vital role. The scientific and reasonable installation of the fire damper can control the fire of the super high-rise building to a certain extent, so that the adverse effects of the fire can be significantly lower. However, in the actual construction process, some construction workers cannot fully understand the function of the fire damper. This causes the fire valve installation to be irregular during the installation process. It is easy to make the installation of the fire damper not meet the requirements of national regulations. There may even be a leaking fire damper^[6]. Such a situation has a very negative

impact on the smoke control construction of super high-rise buildings. Even the quality of smoke control construction is difficult to be effectively guaranteed.

4 Reasonable application and optimization of anti-smoke construction technology for super high-rise buildings

4.1 Type optimization of natural smoke exhaust windows

For super high-rise buildings, in the event of a fire. A very effective method of smoke extraction is natural smoke exhaustion. Therefore, in super high-rise buildings, the room layout, passage location, window opening area and mode of the building have a very

important impact on the natural smoke exhaust of the building. For some super high-rise buildings in China today, which already have anti-smoke construction technology, usually only consider about the area of natural smoke exhaust windows, and ignore the type of natural smoke exhaust windows.

For example, in a smoke-proof construction of a super high-rise building with a height of 120 meters. Although the natural smoke exhaust window is designed to be more than 1/2 of the height of the room, according to the requirements of the specification and the use of the upper hanging window. In order to effectively solve the problem of fire distance between buildings, some areas also use a Class A fire window. However, such a natural smoke exhaust window is difficult to open in the event of a fire, and the function of exhausting smoke is difficult to fully exert^[7].

Therefore, in the application process of smoke control construction technology for super high-rise buildings, the design type of natural smoke exhaust windows should be highly valued. In the process of designing the natural smoke exhaust window type, the actual situation of the super high-rise building and the specific requirements for smoke prevention and control in the event of fire should be taken as effective basis and the type of external window should be rationally optimized to allow natural smoke exhaust. The effect of the window is fully utilized.

4.2 Reasonable setting of exhaust fan

When fire occurs in a super high-rise building, those mechanical smoke exhaust can be used to effectively discharge the smoke from the building. The flue gas can be effectively controlled to avoid the rescue work of firefighters and the evacuation of personnel in the building due to the hinderance of flue gas which get spreaded to most of the areas in the super high-rise building. Therefore, in the anti-smoke construction of super high-rise buildings, the exhaust fan and the exhaust tuyere should be carried out and have a reasonable setting. In the process of setting up, not only the form of the structure of the building should be taken into account, but also the size of the building and the function of the room should be taken into consideration, so as to clarify the area where the fire is prone to occur in the building, and install the mechanical exhaust system in an appropriate position^[8].

At the same time, the scientific calculation of the smoke exhaust of the smoke exhauster should be carried out. At the same time, according to the calculation results, the parameters of the exhaust fan should be reasonably selected, and the working state should be monitored to meet the requirements of the smoke emission during the fire. In this way, the exhaust fan can fully exert its advantages in the exhaust of super high-rise buildings.

Table 3. Smoke exhaust standard for buildings

Clearance \leq 6m / burden an anti-smoke section	Smoke exhaust per square meter \geq 60m ³ / h
Clearance height >6m / burden an anti-smoke section	The amount of smoke per square meter is determined according to the specifications.
Burden two or more smoke evacuation zones	The amount of smoke exhausted is determined by the sum of the smoke exhausted by two adjacent smoke prevention zones.

In order to have the proper setting of the exhaust fan scientific and reasonable, in the process of construction. The construction personnel should strictly follow the design drawings and at the same time a fire damper should be installed at the inlet of the exhaust fan. So that the exhaust fan can operate well at high temperature to achieve a reasonable application of anti-smoke construction technology for super high-rise buildings.

4.3 Scientific setting of fire dampers

For super high-rise buildings, in the application process of smoke exhaust construction technology,

the smoke exhaust fire damper should be placed in the place with fire separation requirements. So as to effectively control further spread of smoke and prevent the large-scale spread of fire. Under normal circumstances, the fire damper is placed on the side of the building firewall body, no more than 200mm from the wall. This installation method will protect the unfired room to a large extent, prevent the fire from spreading. Also the fire area is controlled within a certain range to effectively protect the life and property safety of the remaining unfired areas, so that the fire damper can fully play its role in the event of a fire.

Table 4. Installation location and conditions of fire protection valves for super high-rise buildings

Fire damper installation position	Fire damper installation conditions
Fire partition division	Not more than 200mm from the wall
Firewall partition	Not more than 200mm from the wall
When the air duct passes through the machine room	Not more than 200mm from the wall

For example, in the vertical duct between the vertical floor and the horizontal duct at different floors, a fire damper should be installed. This arrangement can effectively avoid high temperature smoke passing through the vertical duct during fire and spread to the rest of the floor, so that the fire is good. Control to further avoid casualties and property damage caused by the spread of fire.

5 Conclusion

The advancement of the era has driven the development of the construction industry to have a leap. Enormous amount of high-rise buildings have begun to enter people’s work and life, making the city more prosperous, while at the same time achieving further savings in urban space. For super high-rise buildings, good smoke extraction construction is the key to ensuring the safety of its usage and promoting its sales. If the smoke extraction effect of super high-rise buildings is not good, in the event of a fire, it will not only lead to the massive spread of fire, but also cause the smoke to spread to the whole building, the rescue of firefighters and the escape of people inside the building. It could be a great hindrance, but also can increase casualties and property losses. Therefore, in order to effectively prevent such hazards from happening, we need construction of smoke exhausting in super high-rise buildings. It is necessary to apply the exhaust gas technology well,

optimize the type of natural smoke exhaust windows, and make reasonable settings for the exhaust fan and exhaust system. The fire valve is properly installed so that it can effectively control the fire and minimize the casualties and property losses.

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