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Factors Affecting Evacuation of Subway Station and Optimization Scheme

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Abstract

With the continuous acceleration of the modernization construction, the subway has become one of people to travel due to its unique advantages. Subways have been built in every major city in the number of subway, but how in the subway station in an emergency, will the crowd evacuation to a safe area quickly and efficiently, has become a research hotspot in recent years, based on the characteristics of subway station analysis the crowd evacuation, and put forward concrete optimized solutions, provide a reference for subsequent safe use.

Keywords

Railway station; influencing factors; optimization scheme.

1. Introduction

Along with the accelerating modernization drive, how people travel has changed, now all over the country, the small city has the figure of the subway the subway by its fast speed, large passenger traffic, pollution is small, fast and convenient advantage to become the first choice for people to go out to work, such as transportation in today's society, the subway plays an important role to alleviate urban traffic pressure. And it has irreplaceable significance for the future development of cities.

However, with the birth of the subway, because its station buildings are mostly underground, in the course of operation, it is inevitable that a variety of unexpected traffic accidents will occur, which will cause great losses to passengers' personal safety and property. There are countless reports about subway accident cases at home and injured more than5000.

Because the subway station has the characteristics of dense personnel and large mobility, as well as fewer entrances and exits and limited area, once a fire breaks out, the oxygen supply in the station will be insufficient. Moreover, due to the relatively closed environment in the station, the flue gas of combustible is not easy to be discharged in time and the heat dissipation is slow. Is more serious is that, under normal circumstances, the smoke diffusion speed is faster than humans, so will cause researchers fail to escape from the flue gas cause harm to

As the subway station is characterized by dense personnel and large mobility, as well as fewer entrances and exits and limited area, once a fire breaks out, the oxygen supply in the station will be insufficient. Moreover, due to the relatively closed environment in the station, the flue gas of combustible is not easy to be discharged in time and the heat dissipation is slow. Is more serious is that, under normal circumstances, the smoke diffusion speed is faster than humans, so will cause researchers fail to escape from the flue gas cause harm to human body, and also contains a lot of poisonous gas in flue gas, cause a serious threat to the life safety of the passengers, making personnel will be heat and toxic gas fume, poisoning, suffocation or death. Therefore, how to effectively control the smoke spread of the fire and create a safe

evacuation channel for the people escaping from the station is an important issue in the design of subway fire safety

Problems existing in the fire prevention and safety design of subway station buildings

At present the country has successively introduced various policies, to improve and make up for the station of the existing problems, and in the design of specific work, should be combined with the present existing problems and take positive and effective measures to ensure that the station has a good evacuation and fire conditions, in the design of evacuation, if there is no reasonable design safety evacuation exit, Once an emergency occurs, it will lead to the low efficiency of personnel evacuation, and it is difficult to evacuate passengers to the safe area in time. Therefore, in the design work, it is necessary to ensure the width of the safety exit and the number of exits should meet the national unified standards, so as to ensure the requirements of safe evacuation. At the same time, due to the dispersed and high density of personnel in the station hall, it is difficult to find the exit to evacuate in case of an accident. So in design work, to improve the public areas of the evacuation instructions, ensure the security of the passengers can timely find export evacuations, preventing congestion, stamp on the occurrence of the event, such as, on the other hand, to the reasonable arrangement of equipment room, optimize the evacuation passageway, ensure that the channel can maximize the crowd evacuation, ensure unblocked road, timeliness and convenience.

2. Analysis of the causes of subway accidents

2.1. Poor escape conditions

Because most of the subway construction in underground, relative to the relatively closed space environment, in an emergency, passengers escape conditions is poorer, and escape passage is narrow, is not conducive to large-scale population flow, in the event of an emergency, it is easy to stampede, secondary damage, if the secondary injuries, will increase the severity of the accident, It causes more casualties, and it's extremely detrimental to rescue efforts. Not only that, if the fire happened in underground lamp disaster, because the space is closed, can lead to a large number of gas does not spread out in time, what's more, because of the environment, can lead to combustion of incomplete combustion, CO gas have a harm to human body, it can effect to the human body, extremely disadvantageous influence to the person's breathing, therefore, In case of emergency, the escape conditions of subway are relatively poor [2].

2.2. Difficulty in rescue

Underground station relief difficulty to much higher relative to the ground buildings, so once at the underground station in an emergency, rescue difficulty is very high, compared with the ground buildings, underground station environment is closed, the space is narrow, in the event of accident, in the process of rescue, rescue workers to avoid meet with station staff will occur, form a stream of people cross phenomenon, It will not only slow down the evacuation speed of people, but also slow down the rescue speed, which has an extremely adverse impact on the rescue. In addition, due to the crowded space and high density, it is easy to cause secondary injuries. Moreover, due to the space problem, all rescue forces cannot be put in in time. Once the underground communication and lighting system is damaged, great harm will be caused to the station personnel.

2.3. Strong harmfulness

Due to the characteristics of high personnel density and passenger flow in subway, it is impossible to carry out a thorough inspection during security check, which will increase the security risks of trains and stations. In such a densely populated environment, the consequences of fire, terrorist attack and other incidents will be quite serious. All the above cases show that the occurrence of subway accidents has uncontrollability and strong

harm. Therefore, it is difficult to make the security check as meticulous as that of an airplane. Therefore, it is necessary to make more perfect rescue measures in order to deal with various emergencies.

3. Fire prevention and safety design measures for subway stations

3.1. Reasonable design of fire prevention and safe evacuation work

The specific design of fire prevention and safety of subway station should follow the relevant unified standards. Due to the large flow of people and dense personnel in the station, in addition to the relevant design work, we should also carry out the simulation experiment of safe evacuation of the station, so that passengers can evacuate in a timely and orderly manner in case of emergency.

Design fire prevention and safe evacuation of subway stations. Due to the concentration and high density of subway station personnel, in addition to meeting the requirements of relevant design regulations, the simulation experiment of safe evacuation should be carried out during the design work, so that passengers can evacuate in a timely and orderly manner in the event of an emergency. At the same time, the public area of the station should meet the requirements of fire prevention, and the materials with fire performance should be used. The fire prevention construction of the public area of the station and the design of safe evacuation should be carried out in accordance with the actual situation of the public area of the station and the national laws and regulations. The design of fire prevention and safe evacuation of public buildings should be combined with the characteristics of human flow to reasonably design firewalls, fire doors and safe passageways to ensure the fireproof performance of materials and improve the design effect of safe evacuation.

Fire prevention and safety evacuation design of station equipment area. When designing safe evacuation passageways in underground stations, the convenience of the passageways should be improved as much as possible, and evacuation signs should be set up in station halls, entrance of passageways and other places to ensure that personnel can evacuate in time. The height of the safe evacuation passage should be designed below 1.8m. At the same time, in order to facilitate evacuation, the opening of the access door should be consistent with the direction of the safe evacuation, so that the personnel can evacuate effectively after opening the safe evacuation door. If it is impossible to avoid, the width of the channel should be appropriately widened, and each room of the channel should be set up with fire doors, which should have good fire prevention and sealing functions. In order to ensure that the fire door can be automatically closed in the event of a fire accident, you can use the automatic closing of the basic device, combined with fire detectors, center remote control design, to ensure the good application of fire doors. There are many equipment rooms in the station, and the size of the equipment in the room is large, which makes the size of many equipment rooms larger. In consideration of the safety evacuation of the staff in the room, two fire doors should be set up in the room with the length of more than 7m, and the distance between the two doors should be greater than 5m, and it should be noted that in the design of fire prevention work, we should not only consider how to design the safe evacuation of personnel, but also comprehensively consider the fire and rescue work.

The demand of design, make sure it has, at the time of the accident of fire rescue personnel arrived at the station the layer from the ground in a timely manner, and in this process, will not conflict with evacuation of the personnel, so that at the time of the accident rescue personnel can timely to fire rescue, not because of personnel evacuation affect the fire rescue [4]. In addition, it is also necessary to consider the fire prevention design of the ground and surrounding buildings of the subway safety exit. In the building area around the ground No. 2

of the subway building, materials with fire protection rating conforming to the standard are used to ensure the effect of regional fire prevention design in the scientific design work.

Selection of fire proof materials. Metro station design of firewall in the subway safety evacuation is a very important factor in work, a good design can effectively prevent the happening of the fire accident, avoiding the phenomenon of the spread of fire, so focus on firewall structure design, by using firewall partition inside the station site, which have good fire prevention effect. Under the condition of the reasonable design of fire prevention and safe evacuation, fire prevention materials to carry out the design and construction work, ensure that fire prevention materials conforms to the standard, adopted by the region, especially in the subway station hall and platform design points should be in accordance with the specific fire protection design standards the rational selection of raw materials, fire type as far as possible use won't burn. Do not support the burning of materials to carry out work, to avoid the use of glass fiber materials, asbestos materials during the generation of harmful gases, to ensure the safety of the building space.

3.2. Design measures for safe evacuation

For safe evacuation work on the subway station, the relevant research design personnel should grasp the rigorous, serious and pragmatic attitude, hold first the correct concept of life, seriously design work, in the effective under the condition of safe evacuation design work, efforts to improve the security of the whole system, makes the station has a good effect of safety evacuation.

Reasonable design of safety exits and escalators. In order to play a good role in the practical design, the safety outlet should be reasonably designed to meet the specific design standards and specifications. Fire protection area should be combined with the specific circumstances of the reasonable design of the safety exit. Stations in escalator design needs to be combined with the actual situation of the subway station building evacuation, effectively prevent people push in on the escalator, trample, prevent the happening of the secondary injury accident, reduce the harm to the workers as much as possible, in the process of design escalators, to prevent the phenomenon of plate to the ground, when the escalator down. The bearing capacity of the trays should meet specific safety evacuation standards. In addition, the first level of power supply should be set reasonably to ensure that the escalator will not break down and collapse in case of emergency, so that the system can maintain good operation.

Comprehensive design of safe evacuation. Emergency occurs, in order to ensure the stair, import and export channels such as emergency lighting system will still be able to run normally, make passengers can evacuate in a timely and effective manner, therefore to use the light guide in the design of logo, lead people to evacuate, improve the accuracy of the evacuation direction, and need to increase the professional knowledge of maintenance personnel training. Reasonable safety knowledge publicity and education work, in the event of an emergency, can be timely and effective evacuation of passengers, but also in the building space reasonable design of automatic alarm system, easy to carry out safe evacuation processing work.

4. Conclusion

To sum up, the current design and safety evacuation in the subway station fire problems still remain, a big an emergency can't guarantee to the timely and effective people evacuated to safety area, produce adverse effect to the life property safety of the staff, so this needs in specific fire prevention, safety evacuation design, sums up the design experience of related, Reasonably set fire protection area, fire rescue passageway and emergency evacuation plan, reasonably carry out publicity work, create a good atmosphere of subway station fire protection

environment, and give play to the positive role of fire prevention design and safe evacuation design while taking into account, safety, firmness and beauty.

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