

# HOW TO ESTABLISH THE PROACTIVE DEFENCE SYSTEM OF PUBLIC BUILDING SPACE IN THE TOURIST AREA

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## **Abstract**

*The research objective of this paper is to prevent accidents that endanger personal safety by setting up a multi-level active emergency defence system in the public building space of the holiday tourist area.*

*The current disaster prevention measures applied in the public building space don't play their defensive role effectively. The fatal problem of the public space defence research state of the past accidents is static, passive. In fact, the distribution of people in public space is movement and change; people in space are moving, and buildings will have dynamic changes in emergencies. The design of the active emergency defence system for the public space should draw on the research theory of dynamics, establish the research frame from the perspective of microscopic research of architecture and city, absorb the advantages of the current disaster prevention measures, and further develop new multi-levels. The design of the active emergency defence system of the public space, in response to various hazards including crime and noise etc. to protect the personal safety of the personnel present. The automatic & manual control of the active emergency system should be reversible and easy to maintain.*

*The public building space studied in this paper is located in the tourist area. It mainly studies the design of the defence system and requires more technical priorities and difficulties. The active emergency defence system of the public building space in the tourist area should be active defence, supplemented by passive defence. On the basis of the set supporting facilities to meet the safety objectives, the operation of the multi-dimensional active emergency defence system should consider the instantaneous and dynamic nature of space defence.*

**Keywords:** emergency measures, enclosure, defensive space, security inspection, defense measures in emergency situation.

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## Introduction

The defense of public space is a problem that has always been valued by designers in the tourist area. Designers who have exhausted their efforts have been criticized for the many incidents that have become more and more random that endanger public safety in the tourist area.

Randomly occurring sudden personal injury events are likely to occur in public spaces?

Not always, residential buildings have their own limitations and ills in the tourist area. In the defensive defense of urban design, residential buildings are always in the first place. Designers have taken into account the concessions of buildings and surrounding roads when designing residential areas, and the spacing between buildings follows clear design specifications and local standards. The property company arranges a 24-hour post at the entrance of the community, confirms the face of the resident, and arranges the outdoor monitoring in the community. Strangers are not easy to enter the community. The living space has a small separation space, and the layout about alarm and fire protection system are in place. The owners have a high degree of vigilance. They install protective fences, doors and windows and other defense facilities in their homes, and they are familiar with escape routes and protection knowledge.

Relatively speaking, injuries in public spaces are more concerned than residential buildings in the tourist area.

In the tourist area, the purpose of public buildings is to build a large number of residents. The functions of the main spaces of various places serve a large number of people, designing various spaces for people's stays, and forming practical public buildings for purposes such as display, communication, and learning. The crowd gathers in a large space, such as the auditorium of the concert hall. For the concert hall, people pay more attention to its acoustic effects, and even its shape is designed for sound.

Williams, M. (1883) mentioned that the design of the church space should consider the operation of the concert.

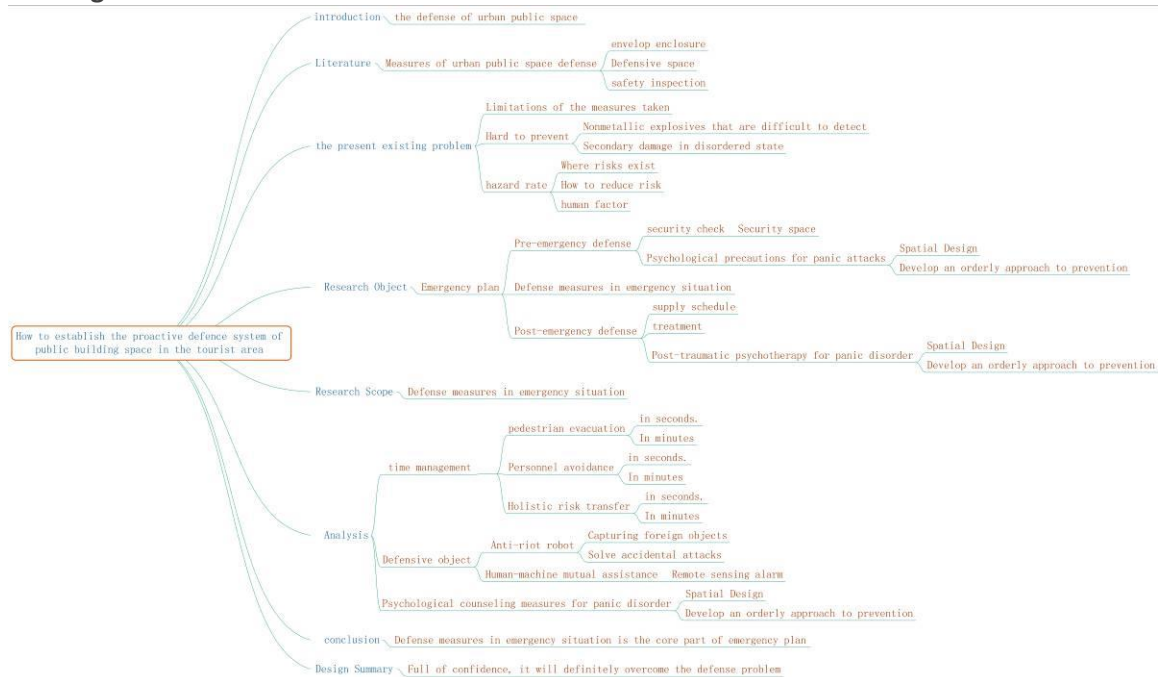
Churches are being extended, school-houses and chapels built; penny readings, lectures, concerts, etc., are in active operation, and even drinking fountains are in70 course of construction; but the trout have suffered and the woodcocks are gone.

Williams, 1883: 70

Williams, M. only considers the acoustic effect is limited to the design ideas at the time, the security defense system is the basis of public building design. The building area is set according to the seat, and the design standard is about 1m<sup>2</sup>/seat. People enter the seat according to the assigned seat number, and the audience in the middle seat needs to get up to pass. At the beginning of the performance, people's attention is concentrated in the performance area, and the lighting is very dark. In this situation, unexpected events, whether in the audience area or in the performance area, will cause riots. People want to leave the place. But in the dense seating area, it is much harder to get past the others and find the exit as soon as possible.

Especially in these public buildings in the tourist area, there is more traffic in the tourist season. People from all over the world are unfamiliar with each other, put down their vigilance, and fully trust public security. They gather in a limited space of to participate in various public events. It should be mentioned that these public buildings have been in accordance with the norms in the urban planning stage and architectural design, but these are far from meeting the security protection of the emergency state.

## Investigation framework



**Figure 1:** The content of the investigation framework of this paper  
Source: author

This paper discusses emergency measures in public buildings in tourist areas by the designer's view. The Investigation framework (see figure1) in this paper was influenced by Viollet-le-Duc, E. (1876), who carefully discussed how to defend and how to build a castle in his view. We can see many of his experiences, from the primitive society to the eighteenth century.

Though a fortress cannot be moved, the defensive system of a district can and ought to be studied, in view of various contingencies. In future warfare the plan of temporary fortification ought to play a principal part and may be made to do so. In other terms, an army ought to be able to fortify itself everywhere, and take advantage of every position. It is temporary fortification therefore which it is desirable to render easy, prompt, and efficacious, in order to defeat the combinations studied beforehand by the enemy, to reduce him in certain cases to the defensive, when he was hoping to attack, and to embarrass his movements on the great scale by unforeseen resistance at a point which he expected to pass with ease, and oblige him incessantly to modify his plans by rapidly executed arrangements for defence.

Viollet-le-Duc, 1876: 380

It is still necessary to set up a fixed defense system in public buildings, and this system should be combined with modern science and technology to better play a role in security protection. There are many similarities between the Nebuchadnezzar of New Babylon (Leonard, 1915) and the defensive design of Vitruvius in ancient Rome, and their views add more power to the research framework.

Vitruvius outlined the main points of building the Roman wall (Vitruvius Pollio, & Perrault, 1692):

In Fortification four things are consider'd; the disposition of the Ramparts; the Figure of the whole place, the building of the Walls; thickness, materials, and terrass; the figure and disposition of the Towers.

Vitruvius Pollio, & Perrault, 1692: p113.

The purpose of establishing a research framework is to discover three aspects of defensive measures. The defense measures in public places are divided into three categories: envelop enclosure, defensive space, safety inspection.

First of all, let's look at the containment measures, the wall will make the inside and outside space, protect the people of the inside space from external intrusion. In the primitive social period, there are such defensive measures. Later, with the level of protection, the nesting of enclosures is more complex, from a single space to multi-space development.

People have different defensive design methods for enclosed spaces. The Minoan Palace has more than a thousand rooms that protect the king. It is a maze. The walls of China are divided into inner walls and outer walls, and the walls in the imperial city. It is also designed with internal passages, which can be directly connected to the outside of the city. For example, In the plan of Chang 'an city in tang dynasty (Chinese Architecture, 2014), people inside the palace could move through the internal walkway of the palace wall to the Shanglin garden outside the city. In actual use, this Vasari Corridor (Virtual Uffizi, 2007) became the safe passage of the Medici family from Palazzo Pitti to the interior of Uffizi and through Ponte Vecchio on the Arno River, they can safely reach the safe passage on the opposite bank. The complexity of it has its superiority to defend against foreign enemies. However, the construction cost is high, the walls and walkways covered a large area, and the soldiers guarded the walls day and night. And the operation also requires a lot of manpower and material resources.

Second, the setting of defense space. The tower on the wall is such a space. The space inside the tower and the passage inside the wall is convenient for soldiers to supply food and transport weapons and ammunition. There are several layers in the tower, and there are many ways to defend against attacks.

It is recorded in many documents. The tower has the function of looking at the enemy. The design of the great Ishtar Gate is more complicated in designing the defensive features of the tower. Let's take a look at the description of Leonard, W. (1915):

It will be noticed in the plan that the central roadway is not the only entrance through the gate; on each side of the two central gate-houses a wing is thrown out, making four wings in all. These also are constructed of burnt-brick, and they serve to connect the gate with the two fortification-walls of unburnt brick. In each wing is a further door, giving access to the space between the walls. Thus, in all, the gate has three separate entrances, and no less than eight doorways, four ranged along the central roadway, and two in each double wing.

Leonard, W., 1915: 54

The tower and the wall\underpass will show more effective defensive energy efficiency. Third, security checks require special space settings. Responsible staffing must also be trained.

In the ancient gates and tax barriers have inspections, in addition to registering and verifying the identity of the intruders, but also check the luggage carried. In Yamen (the free dictionary, 2003) government office in ancient China, and the official residence, and even at the gates of the palace, security inspections must still be set. The contents of the inspection are very similar. Prohibited items, weapons, etc. are prohibited from being carried. Important documents, property, etc. are not allowed to flow out at will. Through security checks, unruly behavior is ruled out. This depends on the force of the Yamen. The security inspection space includes waiting area, inspection area, question area, safety area and other areas. Entering the above area, people's attention will be concentrated.

The waiting area is generally suitable for long and narrow teams, surrounded by low fences. Waiting for the spacing within the team is appropriate for the human scale and range of activities. The inspection area includes inspection preparation space, inspection space, and inspection of the diversion space. The personnel in the waiting area enter the inspection preparation space, hand over the official documents, open the luggage, and talk with the inspection officials; there are officials in the inspection space, sometimes equipped with troops, and the atmosphere is compared Serious. After the investigation, people were told to wait for the diversion space after the inspection. Whether to pass the inspection is based on the judgment of the inspection official. Those who do not meet the strict inspection requirements are not allowed to pass through this place.

The cross-examination area is set up for people carrying contraband and suspected wanted criminals. The space has more high fences, and the interrogation room and the detention room are equipped with force. The safe area is the place where people pass through the self-divided space.

### **The present existing problem**

The three defensive measures in public places are used in conjunction with each other in actual use. Traditional defensive measures have been tested by current emergencies. Their limitations are undoubtedly exposed to emergency situations. Traditional defensive measures are difficult to prevent emergencies that break out in public places, especially in tourist areas (The flow of people is several times that of normal times, and the inside and outside of public buildings are lined up with teams). The traditional defensive measures take into account the situation of ideal static positioning, it is difficult to control the disorderly dynamic behavior of people in public buildings in a panic. This emergency response can disturb our deployment good early evacuation plan.

To make matters worse, inspection officials cannot define non-metallic items as contraband. In that situation, even with video surveillance, there was no way to avoid an unexpected incident. In the event of an emergency, the explosives smashed glass, furniture, building components, etc. These pieces will expand the scope of the bomb itself. In addition, people may experience accidents such as squatting in a panic, and the accidents may not be imagined, but they have indeed Happened in many places.

In the face of the risk rate of emergencies, it should be considered from three aspects:

- Where risks exist?
- How to reduce risk?
- What are the human factors?

Careful analysis of where the emergency occurred, the author had found that most of the space enclosed by the space. There are many shapes of the enclosed space, and historical events in Basilica (Appian, & White, 1899) will be more concerned. For example, the Senate of the Rome period, the churches of different periods, the classrooms of the United States, is this accidental? The space of Basilica is suitable as a discussion space. Here, social and political factors are thrown away. the hidden danger of this form of enclosure is inconvenient to evacuate, set too much furniture, and the evacuation streamline is affected by the direction of the wall. Guided motion lines, according to the static situation, people can withdraw from the room in the safety distance specified by the design specifications. However, in the static situation, the interior of the room is basically normal, so why leave the room? Leave the room is it safe? Is the situation outside better than in the room?

In fact, the room has to face two kinds of unexpected situations: accidents and intentional attacks. This is hard to explain. When an accident occurs, people instinctively want to escape from the accident site. If there is an accident outside, the indoor is temporarily safe; if there is an accident in the room, then evacuation is the right choice. If it is an attack, the opposite is true. A sudden attack inside the room should be evacuated. The person in the outdoor attack room relies on the defense of the room. When the defense fails, people will try to rush out of the room and confront the enemy. This situation is very labor intensive and energetic. It is also dangerous. In both cases, important defensive requirements have been put forward for the room, evacuation lines and counter-attack measures, both of which must be configured in public buildings. Exit position, etc... The pace depends on people's ability to move their legs, the speed depends on their physique, in emergency and fear situations, they are greatly affected, much slower than normal.

How to fight back, how to defend in public buildings? The challenge of design is that public spaces are crowded, relying on security personnel to identify and predict the unfortunate people. But the innocent people entering public buildings should be protected, keep them safe, and it is the designer's responsibility. The use of safe building materials to build buildings not only to ensure that the enclosed walls are strong, even if an explosion or other accident, the fragments of these components will not cause harm to people. Light glass should also be designed to break in one direction, facing the outside.

Security checks are also a condition for ensuring proper use of the defense system. How to strengthen the waiting area, inspection area, cross-examination area, security design of the safety zone is to be considered in each public building project. This requires a lot of scientific and technological platform help to reduce the likelihood of a danger happening. Regarding the design of the counterattack, the author had gotten a lot of inspiration from the design of the tower. It is necessary to arrange more counterattacks for more preparation space. The mechanical design part of this part is prepared. At the same time, the design of counter-attack measures is divided into levels, according to the scope of protection and the number of personnel. Just like a tower, the guard range of a tower is generally in meters. This is ancient data, and it is an outdoor range, which is small compared to indoors. Some. The specific design content will be explained in detail in the later cases.

There are also human factors, security personnel are trained. For most people who come to public buildings, they don't actually know how to use the defense system here. They don't know much about how to escape and save themselves. Timed training and temporary training. It is very important. The training is for people who have entered the safe area after security inspection.

The regular training is divided into multiple time slots every day, and each batch of visitors is trained. Temporary training means predicting that an emergency will occur in the building. The nearest staff member will quickly notify everyone how to defend and evacuate, and control and stabilize everyone's nervousness. Both of these trainings are designed to establish the stability of the defense system operation. The above ideas are intended to reduce the chances of regrets, if we pay more attention to defensive measures.

### **Research Object**

The ultimate goal of this study is to establish a complete set of contingency plans. It includes pre-emergency defenses, defenses in emergency situations, and post-emergency defenses. The plan was developed with reference to the in time of Emergency (Department of Defense, 1968), the first chapter of the first part of this emergency manual. Strengthen technical measures for safety inspections of pre-emergency. Establish an orderly protection system, including space design and fear prevention, and hardware facilities. post-emergency, the defense measures are mainly in the establishment of the material supply system, the planning of the disposal plan, the traumatic psychological reconstruction after the accident, etc., and do a well-organized remedial plan.

The above two stages need to strengthen the design of the defense system in the design of public buildings. Previous public building projects have taken these defensive measures. Although there are certain effects, the consideration of the dynamic situation is not comprehensive.

When the emergency state occurs, it is the most important. After designing the defense and counterattack scheme, the damage of the emergency accident can be appropriately reduced. This is also an important research scope of this paper, and according to the design scheme of the Shahu Concert Hall designed by the author in Weihai, China, Specific technical design to develop research on defense programs.

### **Research Scope**

Defense measures in emergency situation. How many people in public buildings retreat when an emergency occurs? This is a difficult problem. The research wants to try control the direct damage and indirect damage of the accident. In the design of aggregation space, the author rejected the spatial form of basilica, in order to avoid risks.

In the above, the disadvantages of the form of the Basilica for evacuation are discussed. The space where people flow together should not be used in Basilica. Although Basilica has been an important place for gathering people since Roman times, the route of evacuation in the event of an accident is too long, especially for the audience, it is very difficult to escape in time. The author chooses a circular plane for the interior space of the concert hall. The stage is in the center, the audience area surrounds the stage, but each has a partition.

### **The Analysis of Defense measures in emergency situation**

Careful study of the situation at the time of the accident, the author mainly analyzes from three aspects: time management, determine the defensive object, panic disorder psychological counseling measures. Develop a corresponding defense program. (see figure2)

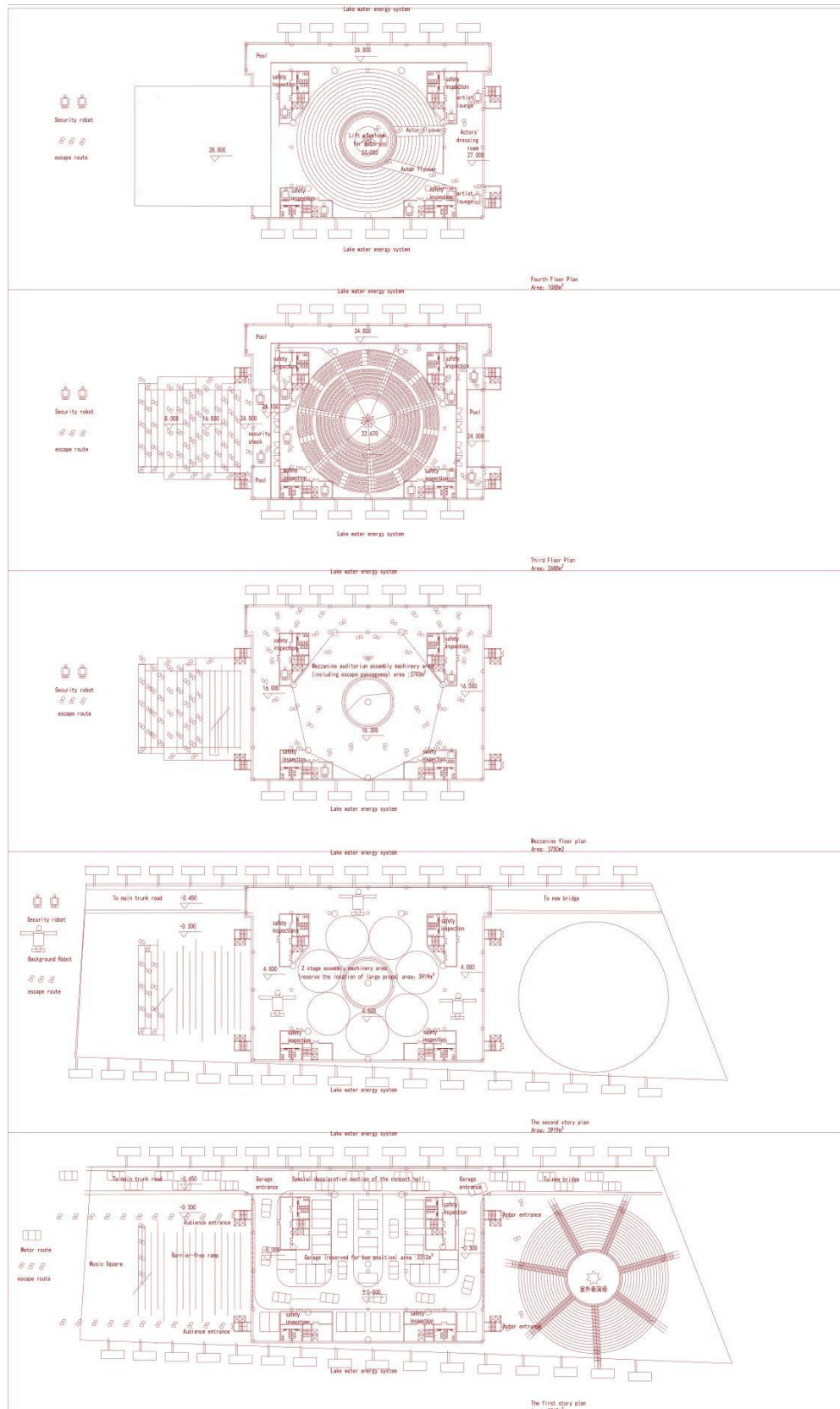


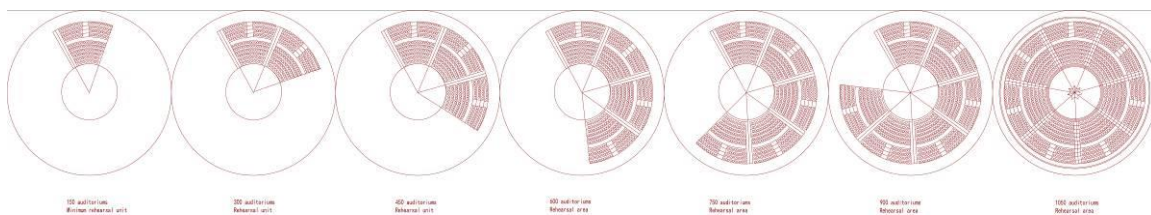
Figure 2: Develop a corresponding defense program; Source: author <sup>1</sup>

1 As shown in Fig 2. Develop a corresponding defense program: time management, determine the defensive object, panic disorder psychological counseling measures.



**Time management: race against time.**

Not exploding, make sure that the audiences evacuate from the accident location in seconds, evacuate from the aisle to the safe exit in a divided time. This situation is the audiences can escape from the accident in the fashion. Opportunity; need to open several safe exits on the wall, try to count the number of seats in each partition. For a 1000-seat concert hall, the author divides the audience into seven blocks, each with evacuation channels and emergency evacuation Export (see figure2). The stage is different from the audience area. There are lifting platforms up or down. These settings are also used normally during normal performances. The actors and staff will fasten the safety rope before use. The division of the seating area takes into account the actual operation of the concert hall. The seating area can be combined according to the size of the concert. This is more in line with the security requirements.



**Figure 3:** For a 1000-seat concert hall, the author divides the audience into seven blocks

Source: author <sup>2</sup>

It has already exploded, and it is too late to evacuate. It is necessary to ensure that personnel are close to avoiding explosive debris. The time for the audience to open the shelter space is measured in seconds, and the time in the dodge space is divided into points, and the escape space has access to the escape exit to the outdoor platform. The round seat is designed for the audience. Rotating to the left can open the seat cushion of the chair. There is space for one person to fit under the seat cushion. After the inside, the seat cushion is automatically closed, and the space automatically slides down to the evacuation passage. The passage went out of the house. Successfully avoided the explosive debris.

If the explosion is not only from indoors, but also from the outdoor. The seat covers and walls of the stage area and the audience area fall from the ceiling, cover the audience area, and resist the explosives from the outside; at the same time, the stage area and the audience's seat area. The whole is moved down, and the hydraulic machine is set below to ensure that the audience can get away from the indoor explosives more quickly when avoiding the space. The height of the design is 7 meters, and the escape slide is designed under the mechanical area, which leads to the outdoor and is convenient for the audience. And the actor quickly left the building.

**Determine the defensive object: When explosives are around**

When the time is too late, some viewers are close to the explosion point, or are kidnapped by the mob, what should I do? Set up robots for counterattacks in the audience area and the stage area. They can capture explosive foreign objects, kill the hostages, and rescue the hostages.

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<sup>2</sup> As shown in Fig 3. The division of the seating area takes into account the actual operation of the concert hall. The seating area can be combined according to the size of the concert. This is more in line with the security requirements..

Each admission personnel wearing miniature brain induction equipment, timely detection of danger, through brain waves (Chholak, 2018). to inform the robot; When someone is injured or cannot be rescued in time, it can start the alarm signal when the hostage cannot call for help with words, notify the robot, and network for help, and locate the information.

### **Panic disorder psychological counseling measures**

The building is constructed and decorated with anti-explosive materials. The glass or curtain wall uses a one-way burst type to Reduce damage from debris by at least 50% in explosion. Even if there are debris, it flies out of the room and does not approach the audience and the actors. Each seat in the auditorium is separated, with a spacing of 300mm from each other. In terms of space design, the wall surface is streamlined, the interior color is mainly cold, and the outlet is set as much as possible. The door and window are designed to be normally open. The door frame is designed as an arc. The wall is wrapped at the corner to ensure emergency evacuation. The audience and actors will not be hurt by the raised corners. The ground, ceiling and wall are equipped with emergency led fluorescent strips to identify the shortest evacuation lines, ensuring that in the event of power outages, the audience and actors are still out of the dark under the guidance of emergency lights.

Under the guidance of the warning lights, the audience and actors will also hear the emergency alert broadcast, and open the night vision camera to locate the range of activities of those who have not been transferred in time to facilitate the rescue of external security personnel.

In addition, in the case of an explosion or a fire, smoke or toxic gas will diffuse the entire space, and the audience cannot see things and breathe. If smoke and poison gas are not removed in time, their eyes and respiratory tract will be damaged. In each space, according to an emergency vacuum cleaner of 20 square meters, the air purity is intelligently detected and automatically turned on.

### **Conclusion**

In summary, when designing public buildings such as concert halls in tourist areas, this paper proposes specific design concepts: defense measures in emergency situation is the core part of emergency plan.

This paper focuses on the defense measures in the emergency state: design ideas from time management, defensive objects and psychological counseling of panic disorder, and combined with the design drawings (see Figure 2), the location of the evacuated streamlines and safety inspections, as well as the position of the robots, are identified on each floor, which shows the approximate order of the defense system.

More importantly, pre- emergency defenses and post-emergency defenses are still considered in the drawings. They are the important parts of the emergency defense system. Evacuation passageways are required to ensure unblocked, and the establishment of safety inspection space is the key in pre-emergency response.

Supply and treatment are the focus in the post-emergency response. Emergency food and daily necessities supply warehouses and drug stores, emergency room space, etc. are placed under the barrier-free ramp. The outdoor theater meets the space requirements for outdoor emergency

drills and also ensures rehearsal needs on weekdays. The ground floor garage is designed to meet emergency needs and the roadway is unobstructed. Regarding the emergency, it is also necessary to ensure that all the security inspection machines, vacuum cleaners, identification lights, elevators, robot charging valves, etc., that maintain the defense system, during the emergency state and after a period of emergency (waiting for normal power supply recovery) It needs to be running all the time. To this end, the author uses the lake water resources around the concert hall to combine the waterfall landscape with the emergency defense energy to create a practical and beautiful lake energy system. Although this plan considers the whole defense system and designs the lake water energy system to support this system, this plan is still at the conceptual stage, and there are many aspects of the idea that need to be improved

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