



# SAFETY URBAN PLANNING AND DESIGN BASED ON DISASTER PREVENTION, CRIME PREVENTION AND PSYCHOLOGICAL SAFETY.

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## Abstract

*In order to ensure the public safety of residential areas, starting with the urban public safety of Xi'an, the construction environment of defense safety, fire safety and traffic safety, and the public safety environment of residential areas are investigated. According to the characteristics of housing in Xi'an planned economy era and market economy era, the existing situation is analyzed from the aspects of overall planning layout, road traffic space, building monomer, public activity space, greening space, and lighting facilities. Based on the analysis results, the principles of planning and design of public safety space environment in Xi'an residential areas are put forward. The planning and design methods of residential space environment are discussed and studied in detail from the aspects of residential defense safety, fire safety, and traffic safety, so as to provide reference for the planning and design of urban residential safety and to create a safe, healthy and harmonious living environment for residents.*

**Keywords:** Xi'an Residential Area, Public Safety, Residential Environment.

## 1. Introduction

Urban residential area is the main place for urban residents to survive. The public safety of residential area is related to the vital interests of residents. With the development of social economy, more and more unexpected incidents and disasters occur in urban residential area. Through the study of public security environment in residential areas, reasonable planning and construction of residential environment are carried out to ensure public security in residential areas. This has a very realistic meaning for the people of residential areas (Houle et al. 2017).

In the process of researching the public security environment of Xi'an residential area, the idea of "theory-practice-theory" and multi-disciplinary comprehensive research method are used to study the construction environment of public security of Xi'an residential area from the perspective of urban planning and design (Hyojik et al. 2017), and the planning method of public security space environment of residential area is discussed in detail.

From theory to practice and then to the application of deductive induction of theory, practical problems and theoretical analysis can be combined. With the help of multi-disciplinary induction, the current problems can be comprehensively understood from multiple dimensions. Through this research method, the theories of many different fields are creatively linked, and the construction environment of Xi'an residential public safety is accurately studied.

## 2. State of the art

For the study of urban public safety, the specific conditions of each country are different. In Japan, because of its geographical location and conditions, it is often attacked by natural disasters such as earthquakes and typhoons, so there are many studies on

disaster prevention (Ming and Xiang 2017). In the United States, the response to natural disasters is mainly transferred to the handling of multiple crisis events. At present, the public safety management in the United States includes national security management, social crisis management, economic crisis management mechanism, and moral crisis management (Butun et al. 2016). Russia's public safety includes a wide range of natural disasters, emergencies, public health incidents and so on (Fraga-lamas et al. 2016). In China, the study of urban public safety mainly includes urban safety planning with disaster prevention as its main focus. In the 1980s, China began to form some relevant laws and norms. With the development of society, the problem of urban security has become more and more serious. China has gradually shifted from focusing on natural disasters and individual security to dealing with comprehensive public security incidents (Prasad et al. 2016). Referring to the research methods and thinking of urban public safety, the public safety of residential areas is discussed, so as to provide a safe and harmonious living environment for urban residents.

## 3. Methodology

### 3.1. Investigation and Research on public safety environment of residential areas in Xi'an

The public safety space environment of Xi'an residential area is investigated and studied by using the methods of field investigation, questionnaire survey and on-site interview, and its current situation is summarized. A total of 360 questionnaires were sent out and 280 were recovered. 270 valid questionnaires were statistically valid. According to the survey results, the types of public safety incidents are as follows.

Urban residential public security mainly comes from human-made public security problems in residential areas and outside. Human-made public security prob-

lems can be reduced by means of space environment planning and the creation of public security environment atmosphere. However, natural safety accidents are often unpredictable, irresistible and unavoidable. It is concluded that there are several types of human accident safety incidents frequently occurring in Xi'an residential areas: theft and robbery incidents, fire incidents, traffic accidents and so on. The proportion of all kinds of incidents is as follows.

### *3.2. Analysis on the space environment of residential defense safety*

In the planned economy era, some old residential areas are not clearly separated from the outside world. If the design of the entrance and exit of residential areas is not reasonable, the visibility of some residential roads is not high; the public communication space of residents is insufficient or even absent, which reduces the opportunities to provide natural surveillance for people; on the contrary, the burglar-proof windows at the bottom will provide convenience for criminals to climb to a certain extent. Drainage pipes and air conditioning racks in some residential areas are also one of the reasons for more burglaries in residential areas. Because some trees are too close or the branches of big trees have reached the windows of houses, they may become a hiding place for criminals. The lack or damage of lighting facilities in old residential areas is also one of the reasons for theft.

Under the market economy system, there is a negative space near the entrance and exit of many residential areas, which is not often used; in the road traffic planning of residential areas, the visibility of road organization in some residential areas is poor, which gives criminals shelter; Many commercial housing residential areas do not have a reasonable allocation of greening, but provide a hiding place for criminals to commit crimes; some residential areas in the building facade design some prominent decorative components, providing opportunities for criminals; unreasonable allocation of residential lighting facilities in the number and location should cause the attention of relevant departments.

### *3.3. Analysis on the present situation of fire safety space environment in residential areas*

Under the planned economy system, the fire prevention spacing between some buildings is too narrow, and more and more private cars lead to the narrow multi-way traffic and even occupy the fire control passage. In some residential areas, there are piles of debris on the fire control passage, which cause blockage and affect the efficiency of emergency rescue; the public activity space in residential areas is insufficient, which does not combine with the fire safety settings in residential areas; the quality of residential buildings is aging and there are potential fire safety hazards; some residential fire safety facilities are damaged or missing.

Under the market economy system, some residential buildings do not have enough firefighting operation sites, and the road structure of residential areas is too tortuous, which will affect the efficiency of disaster prevention and relief in residential areas; the situation of vehicle parking in disorder is widespread, which will affect the efficiency of disaster relief in residential areas to a certain extent; high-rise residential buildings have the characteristics of high building height and large flow of people. Once a fire occurs,

the loss will be great, so it is necessary to combine the characteristics of high-rise residential buildings to carry out fire protection design for high-rise residential buildings.

### *3.4. Analysis on the present situation of traffic safety space environment in residential areas of Xi'an*

In the planned economy era, roads in residential areas are not clearly classified and boundaries are not clear. Most residential areas adopt the mode of mixed traffic, which affects the traffic safety of residents in residential areas; narrow multi-roads affect the traffic safety of residents, especially in the areas where public activity sites intersect with roads in residential areas, the contradiction between people and vehicles is more prominent; trees and plants grow too vigorously so that they should be pruned in time to ensure the traffic safety of residential areas; and some of the traffic safety facilities in residential areas have been damaged.

Under the market economy system, the road structure in some residential areas is too circuitous, and the conflict between the low of people and vehicles at the intersection of the road and the public activity space is serious. The traffic organization mode of people-vehicle diversion in some residential areas of commercial housing built under the market economy system ensures the traffic safety of residential areas to a certain extent. Because of the increasing number of private cars, the contradiction between pedestrians and vehicles often occurs in residential areas, which results in potential safety hazards; residential areas often use a large number of tall trees, shrubs and other dense planting, and the traffic safety considerations in residential areas are not comprehensive; the allocation of traffic safety facilities in residential areas is also significantly better than that in old residential areas.

## **4. Result analysis and discussion**

### *4.1. Planning and design principles*

In terms of systematic principles, in view of the current situation of public security in Xi'an residential areas, it should be planned from the material space environment. At the same time, it is also supposed to pay attention to the construction of public security environment in residential areas. For the principle of overall coordination, to study the public safety of Xi'an's residential areas, it needs to place the residential areas in the city to study, grasp the integrity of the city, link the residential areas with the surrounding environment, and strengthen the relationship between the residential areas. Meanwhile, it is necessary to also consider the overall coordination of the interior of the residential area, grasp the whole residential area, and make rational layout and planning of the buildings, road space, green space, public communication space, security facilities, etc. According to the principle of adapting measures to local conditions, for different residential areas, specific planning of public safety space environment of residential areas should be carried out based on local conditions. The principle of people-oriented is to consider the public safety needs of residents in Xi'an, and to plan, design and arrange the space environment based on people's behavior and psychological needs, so as to embody people-orientation. As the principle of public participation, in public safety space environment planning in residential areas, familiarity among residents in increased

through the planning of public communication space, which has a positive role in ensuring public safety of residents.

#### 4.2. Space environment planning for residential defense safety

In terms of overall planning and layout of residential areas, the boundaries between residential areas and their surrounding environment should be clearly defined, and the sense of domain of residential areas should be emphasized, so as to give psychological hints to criminals. For the peripheral roads of residential areas, it is urgent to try our best to combine the layout of public service facilities such as commerce, medical treatment and entertainment to form the opportunity of natural surveillance; for the internal roads of residential areas, it is required to have a clear level; when setting up parking lots in residential areas, it is supposed to consider the adjacent buildings, so as to be able to appear in the sight of residents, and underground garage can install intelligent anti-theft devices. In residential areas, try our best to avoid the emergence of unused and managed negative space. The public space between groups should be equipped with seats, so as to form natural surveillance, so that strangers entering residential areas have psychological fear. The greening inside the residential area should not block people's sight. At the same time, some activities and rest facilities should be reasonably arranged to gather popularity and form the effect of public surveillance. In the facade design of residential buildings, people should try to reduce the building components which are easy to climb, and avoid overhanging structures as far as possible. In order to ensure the safety of residential areas, there are certain requirements in the brightness and intensity of residential lighting facilities. The number, type and location of lighting facilities will affect the safety of residential areas.

#### 4.3. Planning of fire safety space environment in residential areas

The overall planning layout should be based on the disaster prevention planning at a higher level, and the location of residential areas should be far away from dangerous sources, such as gas stations; the road space, green space, building groups and environmental facilities of residential areas should be rationally organized to ensure the fire safety of residential areas. To ensure reasonable fire prevention spacing of residential buildings, the basic requirements of fire passage in residential areas should be met. Negative space should be minimized in residential areas so as not to become a place for garbage and debris to pile up or bring about certain fire hazards. For areas with relatively concentrated residential areas, necessary refuge sites should be set up. Road organization in residential areas should take into account the evacuation of people and the avoidance of interference. Road design in residential areas should take into account the density and width of roads to ensure the smooth passage of evacuation. In addition, road space also has the function of preventing fire spread. For the organization of static traffic in residential areas, it is necessary to reasonably predict the future private car ownership. Greening in residential areas can also play a role in preventing the spread of fire, so it is supposed to choose some plants with higher fire resistance and more water content. The public green-

ing space of residential area is arranged in combination with the public center of residential area, which can provide temporary shelter for residents. For street greening, it usually plays a certain role in preventing the spread of disasters, but the tree species used should not be too large. In the design of building units, the fire-resistant grade of buildings should be considered, smoke-proof zones and fire-proof zones should be reasonably arranged, the number and width of safe exits of building units should meet the relevant standards, and the layout of building groups should meet the relevant standards as far as possible; the fire-fighting emergency facilities in residential areas should meet the temporary domestic water and emergency fire-fighting water when the fire comes, and the safety facilities should provide convenience for people and improve the efficiency of rescue and evacuation in the event of disasters.

#### 4.4. Space environment planning for traffic safety in residential areas

When planning residential roads, first of all, it is necessary to consider residential areas in the city, and properly handle the relationship between residential areas and urban roads. The grid road network is suitable for use in residential areas where the traffic volume of motor vehicles is small, which guarantees the safety of residents to a certain extent; the ring road network is suitable for small-scale residential areas. The dynamic traffic organization modes of residential areas mainly include pedestrian-vehicle branch, pedestrian-vehicle mixture and coexistence of pedestrians and vehicles. The traffic accidents of residential areas are minimized by the traffic mode of pedestrian-vehicle branch. The road network layout of residential areas under the mode of pedestrian-vehicle mixture traffic organization requires clear road classification and should run through the interior of residential areas. The organizational mode of coexistence of pedestrians and vehicles must be designed reasonably so that it will not affect the safety of residents in residential areas. There are three main static organization modes in residential area: underground centralized parking, ground parking, and overhead parking. Whatever static traffic organization mode is adopted, the relationship between parking lot and the road connecting parking lot should be reasonably arranged, the number of parking spaces should meet the requirements of relevant norms, the relationship between vehicles and pedestrians should be handled well, and the traffic safety in residential area should be improved. Greening can isolate traffic and pedestrian roads, and the parking range of residential areas can be reasonably defined by greening landscape. However, in the selection of greening tree species, it is necessary to avoid tall trees blocking the sight of pedestrians and drivers, causing unnecessary losses. Appropriate setting of illumination and height of outdoor lighting facilities will bring convenience to pedestrians and drivers. Setting deceleration facilities and roadblocks in some locations prone to traffic accidents will improve the traffic safety of residential areas.

### 5. Conclusions

Starting from the public safety of Xi'an, the public safety of residential areas constructed in different periods in Xi'an is investigated and studied. It mainly investigates the construction environment of defense safety, fire safety and traffic safety, and the public safety envi-

ronment of residential areas, and its current situation is also summarized and analyzed. According to the analysis results, the principles of planning and design of Xi'an residential public safety space environment are proposed. On the basis of following the above principles, the planning methods of Xi'an residential defense safety, fire safety and traffic safety are put forward, and the spatial environment planning of other public safety events in residential areas which are sensitive to residents is briefly discussed.

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