

GENERATION AND DEVELOPMENT OF EXISTING CIVIL AIR DEFENSE COMMERCIAL FACILITIES IN CHINA

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Abstract: The development of urban underground space in China started from the construction model of civil air defense engineering combined with peacetime and wartime engineering. Since the reform and opening up in 1978, after more than 30 years of accumulation, its holdings have been considerable. During this period, with the development of economy, policy, and technology, four different generations of civil air defense engineering combined with commercial construction models for peacetime and wartime gradually formed. Their design concepts, functional models, usage conditions, development prospects, etc. are quite different. Among them, the first-generation facilities lack the foundation for renovation and will be demolished together with the ground buildings in future urban renewal. The second and third generation civil air defense projects combined with commercial buildings for peacetime and wartime will also enter a transformation period in the next 10 to 20 years. Through the interconnection of underground space, they will become an integral part of the fourth generation civil air defense project combined with peacetime and wartime commercial buildings. The dispersed The collection of spaces becomes a comprehensive network space, thus entering the era of the development of the city's second public space level.

Keywords: Civil air defense engineering; Both peacetime and wartime; Commercial buildings; Development trend

1 INTRODUCTION

in China was established in 1978 After the reform and opening up in 2000, it was gradually accepted and carried out in engineering practice. In December 1986, the Ministry of Urban-Rural Development and Environmental Protection and the National Civil Air Defense Office jointly held the "National Symposium on Combining Civil Air Defense Construction with Urban Construction" [1]. This meeting further clarified the basic principles for integrating civil air defense construction with urban construction in China. The guiding ideology promoted the comprehensive development of China's urban civil air defense projects combined with commercial facilities during peacetime and wartime, and was widely implemented with the prosperity of real estate development after the 1990s. Article 20 of the "Civil Air Defense Law of the People's Republic of China" promulgated and implemented in January 1997 states that "the construction of civil air defense projects should be conducive to peacetime economic construction, people's production and life and projects on the premise of ensuring wartime effectiveness [2] The promotion of the concept of "combining peacetime and wartime" has freed the construction of air defense projects from the responsibility limitations of the civil air defense department and gradually expanded it into a cause and responsibility for the whole people.

"The construction of underground buildings in Chinese cities started with civil air defense. It has become an effective means of urban development" [3]. However, the construction of civil air defense projects in the early days of New China lacked overall planning and design, and adopted the mass line of "creation, design, and construction", and the overall layout was consistent with urban development. Disjointed [4]. Therefore, the early requirements for the combined use of civil air defense projects during peacetime and wartime were not fully considered. It was not until after the reform and opening up that the national economic construction and civil air defense project construction systems were also reformed. Overall consideration has resulted in the fact that "the daily use of China's civil air defense projects started relatively late, with a relatively single form of use and few types of underground facilities. Compared with foreign countries, there is a large gap in terms of technological scale, economy, social and environmental benefits" [5].

Over the past 40 years since the reform and opening up, China's civil air defense engineering construction has become an important part of China's underground space construction, occupying a considerable position in underground commercial buildings. Lei Sheping, a humanities scholar at Northwestern Polytechnical University, once wrote an article analyzing the concept of the only "air-raid shelter" model in China, created the first brand of underground civil air defense business "Diyi Avenue", and became the "personnel" of the only listed company developing underground civil air defense business. The rise and fall of He Commercial Holdings Co., Ltd. (hereinafter referred to as Renhe Commercial) in the 25 years from 1991 to 2016 was systematically analyzed in terms of economic and social development [6]. Lei Sheping's analysis shows that there are many uncertainties in the current development of China's civil air defense projects combined with commercial facilities construction, especially as a series of advantages such as policy dividends, urban expansion, and land finance are gradually weakened. At the same time, in the face of the impact of e-commerce, In the context of slowing economic growth, how to continue to maintain and develop civil air defense projects and commercial facilities during peacetime and wartime is a question worth thinking about.

Classifies and analyzes China's existing civil air defense projects and commercial facilities from the perspective of architectural space and use development, in order to explore the use and development of these facilities in the future.

2 CURRENT STATUS OF CHINA'S CIVIL AIR DEFENSE PROJECTS COMBINED WITH COMMERCIAL FACILITIES DURING PEACETIME AND WARTIME

in China that were built before the 1980s, the vast majority were built after the 1990s. Among them, except for the basements of high-rise buildings and underground garages in communities, civil air defense projects are concentrated in off-site locations. Construction, combined with the construction of urban squares and green spaces, has become the main construction method. Among these urban civil air defense facilities that combine both peacetime and wartime, commercial facilities are the component that has the closest contact with the public. In addition to underground transportation facilities (parking, tunnels, subways, etc.) and municipal facilities (various pipelines, common ditches, logistics systems, etc.) etc.) is the most important component. At present, the number of existing and newly built underground commercial facilities in China is huge. Especially first-tier cities such as Beijing, Shanghai, Guangzhou, and Shenzhen, as well as new first-tier cities such as Chengdu, Hangzhou, Chongqing, Wuhan, and Nanjing, have built a large number of civil air defense projects combined with commercial facilities during peacetime and wartime [7-8]. For example, among the underground commerce in Chongqing's commercial center, underground commerce in building basements accounts for 51% of the entire underground space, independent civil air defense projects account for 40% during peacetime and wartime, and underground commerce at transportation stations only accounts for 9% [8]. Among them, construction The basement also contains a considerable portion of civil air defense projects combined with commercial facilities.

Urban underground commercial facilities are a supplement to ground commercial facilities. Existing domestic large-scale civil air defense projects combined with commercial facilities are often located in the following types of locations: ① Green space squares in urban commercial centers or under roads; ② Green space squares in CBD office areas; ③ Residential buildings District central green space; ④ tourist area entrance square; ⑤ city large transportation hub square, etc. Moreover, with the construction of urban subways, many large-scale civil air defense projects combined with peacetime and wartime projects are often closely connected with subway stations.

The local environment of different types of areas determines the difference in the functional layout of these civil air defense projects combined with commercial facilities during peacetime and wartime. Only by adapting to local environmental conditions and understanding the functional needs of local citizens can we invest in the construction of civil air defense projects in such areas and combine them with commercial facilities to give them appropriate daily functions. For example:

(1) When developing and constructing underground spaces under green squares or roads in urban commercial centers, you first need to consider building an underground pedestrian transportation system to connect underground businesses, ground commercial facilities, public transportation hubs, static transportation facilities, etc.; secondly, walk along the underground For transportation routes, a series of small supporting commercial facilities are arranged to form underground streets to supplement the large commercial facilities on the ground, such as the underground space of Xinjiekou, Nanjing.

(2) The development and construction of underground space under the green square in the CBD office area is usually for the construction of comprehensive commercial and static transportation supporting facilities for the block. It is also generally connected with the subway station and becomes the node of the transportation hub and the core space of the area, responsible for It provides functions such as transportation connections, after-work breaks, lunch breaks, business negotiations, night parties, and lifestyle shopping, such as the underground space of Nanjing Hexi Central Plaza.

(3) The underground space located in the green space in the center of the residential area is limited by the functions of the community. First of all, it is usually used as parking facilities and civil air defense engineering facilities. It may also be used as commercial life facilities, such as large supermarkets, small restaurants, and small lifestyle shops (such as Laundry, shoe repair shop, breakfast shop, etc.), such as the underground space of Nanjing Olympic Silver City Xidi International Community.

(4) In the underground space built in the entrance square of the tourist area, as the flow of people in some scenic spots increases year by year, the demand for various tourist service supporting facilities (such as catering, toilets and parking facilities) has increased sharply. However, due to the environmental protection of the tourist area The special requirements make it very difficult to build large-scale ground facilities. On the one hand, tourist attractions in urban areas lack space for ground building expansion and are costly. On the other hand, the environment of tourist attractions in natural scenic spots is the first factor for their survival. Ground buildings will have a negative impact on the value of scenic spots. Therefore, the construction of supporting underground spaces, especially underground parking spaces, has become a reasonable choice. For example, the underground space of Nanjing Daxing Palace is equipped with a large bus parking lot on the second underground floor and a small vehicle parking lot on the third underground floor to serve the Presidential Palace and Meiyuan New Village Scenic Area.

(5) The construction of underground spaces in large urban transportation hub squares, especially the construction of civil air defense projects in the square in front of railway stations, combined with commercial facilities during peacetime and wartime, has a history of decades in China. On the one hand, as the core transportation hub of the city, there is a dense flow of people and a strong demand for civil air defense shelter space, so it is usually large in scale; on the other hand, the square in front of the train station is empty, but there is a large demand for parking and commercial supporting facilities. Modern railway stations often have multi-level transportation transfer models. From top to bottom, they set up elevated bus terminals, train waiting halls, platforms, bus interchanges, taxi terminals, long-distance stations, and urban rail transit. stations, underground parking lots, etc. Therefore, it has become inevitable to use underground

and elevated spaces mainly with various dynamic and static transportation facilities. New large-scale railway stations have been implemented as examples, such as Nanjing South Railway Station, Beijing South Railway Station, and Shanghai South Railway Station.. However, simple commercial development does not necessarily guarantee good operating conditions. The rise and fall of the underground street in the square in front of Harbin Railway Station is an obvious example. A series of problems in people flow guidance, commercial formats, operating forms, etc. have caused the collapse of operating conditions..

3 CHINA'S CURRENT CLASSIFICATION METHODS AND CHARACTERISTICS OF CIVIL AIR DEFENSE PROJECTS IN BOTH PEACETIME AND WARTIME COMBINED WITH COMMERCIAL BUILDINGS

China's civil air defense project, which combines peacetime and wartime, has a history of more than 40 years. These 40 years were a period of China's reform and opening up, economic development and urbanization process. Civil air defense engineering facilities are one of the cornerstones of the city's comprehensive protection capabilities, and they also occupy a position that cannot be ignored in urban construction. At the same time, with the expansion of major and medium-sized subway (light rail) construction after the mid-1990s, the popularization of high-speed railway passenger lines and highways in cities, and the gradual advancement of urban real estate development, a large number of urban underground projects began to be constructed in conjunction with civil air defense projects. , the combination of peacetime and wartime projects has become the main body of civil air defense project construction.

In the early 1980s, the city entered the urban construction management system. However, due to the constraints of combat readiness requirements, technical conditions and economic environment, the construction standards were relatively low. The "Small Commodity Street" was a typical form of civil air defense projects at that time that combined peacetime and wartime projects. After the 1990s, the economy developed greatly. At the same time, the construction of civil air defense underground streets began in the main roads of major commercial districts and the squares in front of train stations. Construction standards gradually improved and the building volume gradually increased, but the functions were still relatively simple. Around the beginning of the 21st century, with the development of urbanization, local GDP grew rapidly, and residents' requirements for urban environment also increased. Commercial complexes appeared across the country, and began to explode in the second decade of this century. With the growth, underground space functions are gradually becoming integrated. With the commencement of subway construction in many domestic cities, the number of comprehensive underground spaces built on subway stations has gradually increased. The network formed by subway station hall floors and underground passages connects the underground spaces of surrounding commercial buildings.

According to the evolution of the development of civil air defense projects and commercial buildings in China , in order to have a clearer understanding of the existing civil air defense projects in China , we can try to divide them into the following categories based on different building forms, standards, and functions. The product of four stages:

3.1 The First Generation of Civil Air Defense Projects Combined with Commercial Buildings During Peacetime and Wartime

Examples: Nanjing Confucius Temple Underground Street, Anshan Underground Street, Qingdao Longshan Underground Street, etc.

Features: The first generation of civil air defense projects is a combination of peacetime and wartime projects, with shallow burial depth and small spatial scale. The civil air defense basements of various small and medium-sized ground -level buildings are connected through passages with openings of 3 to 4 m. The floor height is small, the equipment is simple, and simple entrances and exits are often used for connection. On the ground floor, there is a lack of barrier facilities such as escalators and elevators. Most of the functions are small commercial facilities and the environment is poor.

3.2 The Second Generation of Civil Air Defense Projects Combined with Commercial Buildings During Peacetime and Wartime

Examples: Nanjing Daxing Palace underground space, Nanjing Beiji Pavilion underground space, Beijing Xidan underground space, Harbin Hongbo Plaza underground street, etc.

Features: The second-generation civil air defense project is a combined peacetime and wartime project. The burial depth is shallow and the spatial scale is large. It is a single-building multi-story large-scale underground space built using city squares or green spaces. Its normal functions are limited to underground commerce (mostly developed for Large supermarkets or small commodity indoor blocks) (basement one) and underground parking facilities (cars, bicycles) (basement two), focus on interior decoration, escalators, elevators and other equipment are relatively complete, and the business form is greatly affected by the local environment. (For example, the business in the underground space of Arctic Pavilion closed down and had to be rebuilt).

3.3 The third Generation of Civil Air Defense Projects Combined with Commercial Buildings during Peacetime and Wartime

Examples: Nanjing Hexi Central Plaza comprehensive underground space, Xi'an Bell and Drum Tower Square underground space

Features: The third generation of civil air defense projects is combined with commercial buildings during peacetime and wartime, with shallow burial depth and large spatial scale. It is a single-building multi-story comprehensive commercial facility built using urban parks or large green spaces, including comprehensive commercial formats (supermarkets, shopping malls), movie entertainment, restaurant streets, etc.), underground parking, focusing on the comprehensive use of various functions and connections with surrounding underground crossings, often forming a network with central green spaces and trail systems, directly connecting with subway stations or bus facilities, forming a local comprehensive Large-scale consumption and leisure nodes often become the core part of urban local comprehensive disaster prevention facilities.

3.4 The Fourth Generation of Civil Air Defense Projects Combined with Commercial Buildings during Peacetime and Wartime

Examples: Nanjing Xinjiekou underground space system, Beijing Zhongguancun Plaza underground shopping mall as the core underground space system

Features: The fourth-generation civil air defense project combines commercial facilities with urban regional underground space systems during peacetime and wartime. The overall structure is complex, often with an underground pedestrian system or underground road system as the core of a subway station, connecting various types of underground facilities built in various periods. together to form a regional comprehensive underground space system. Taking Xinjiekou, Nanjing, as an example, Xinjiekou Station has promoted the integrated development of the surrounding underground space, forming a station-oriented and network-extended underground pedestrian system growth model [9]. Its development has been driven by the huge economic benefits obtained by commercial entities connected to the site in more than ten years. Many commercial entities have "opened their doors", connecting internal underground streets with subway entrances and exits, allowing underground pedestrian networks to open to the interior of each block. Continue to extend [10].

In this type of underground space system, civil air defense engineering facilities are often only one component of it. They are usually composed of several independent civil air defense basements or single-built civil air defense engineering facilities, combined with subway stations, non-protective underground public spaces, and underground pedestrian systems. Connection composition. Most of this type of underground space is constructed in a decentralized manner and is connected by various connecting passages. The spatial structure is very complex, but it is often composed of a main underground pedestrian trunk road or an underground road system as the main transportation link, with the connecting trails as "tree branches", connect many types of underground spaces into "branches and leaves", and directly apply the entrances and exits of each project itself to form a towering tree that integrates underground spaces.

4 MAINTENANCE DEVELOPMENT TRENDS OF VARIOUS GENERATIONS OF CIVIL AIR DEFENSE PROJECTS, ETC.

China's civil air defense engineering construction has gone through a long development process. The development process of the four generations of civil air defense engineering combined with commercial buildings mentioned above is the epitome of China's economic development process after the reform and opening up. Due to the differences in social environmental conditions, construction background conditions, and construction standards in different periods, the four generations of civil air defense projects formed during peacetime and wartime combined with the characteristics of commercial buildings have entered different development situations.

The first generation of civil air defense projects combined with commercial buildings in both peacetime and wartime construction numbers was small, with relatively low standards, relatively small areas, and small passage widths, but they were usually located in prosperous areas of the city, such as old commercial districts. Due to size restrictions, it is often difficult for large-scale commercial facilities to enter, and many of them are occupied by small shops of a self-employed nature. Sun Liang, an architectural scholar at China University of Mining and Technology, once stated that the more suitable scale aspect ratio of underground streets is concentrated in 1.0~1.7 (the scene width value is 3.0~7.5 m, and the height value is 3.0~4.5 m), the value span of the area width ratio is relatively large, concentrated in 1.9 to 2.7 (the store width value range is 8.4 to 12 m) [11]. Due to the shallow burial depth and small spatial scale of these early civil air defense facilities, it was difficult to achieve such scale requirements through content and space adjustment. At the same time, their ground supporting buildings were also very dilapidated. Therefore, during the regional renewal period, ground streets and alleys are often demolished and rebuilt together. For example, the project in the Gongyuan Street area of Nanjing Confucius Temple Underground Street was demolished in mid-October 2013 along with the renovation of ground buildings.

The second generation of civil air defense projects combined both peacetime and wartime operations with a large number of commercial buildings. Most of the existing urban arterial underground streets and train pre-war square underground streets belong to this type. The construction standards are still not high, but the space volume is large and the internal spatial form is relatively single. , "a street with shops facing each other" is the portrayal. Most of the commercial facilities are still a collection of small shops, and there are also a few large supermarkets. The construction demonstrations of these projects are mostly the result of administrative decisions and lack long-term considerations in

terms of location, business type, environment, space design, etc. Some of the projects that were once in good operating condition have fallen into trouble due to the development of the times, but their overall structure and body The volume makes demolition usually not an optional update method, and functional reconstruction and expansion is imperative. For example, Nanjing's Beijige underground space and Beijing's Xidan underground space have also been renovated and expanded in the past two years.

The third generation of civil air defense projects combined with commercial buildings is one of the main forces in current construction. In large centralized green space squares or urban complexes in new urban areas, underground space is indispensable. In central areas adjacent to urban residential areas or CBD, commercial complexes are necessary supporting facilities, which usually include parking lots, cinemas, large supermarkets, food courts, shopping malls, etc. However, real estate prices in core areas are very high, so arranging these supporting functions in underground spaces is a more reasonable choice. At the same time, the relevant regulations on the construction of China's civil air defense projects and the construction requirements of civil defense projects require the deployment of outdoor evacuation spaces, material storage facilities, air defense basements and other facilities in these densely populated areas. These facilities can be combined with underground comprehensive commercial facilities in both peacetime and wartime. Facilities are combined and arranged, and the state and developers jointly invest to share the increased cost of locating comprehensive facilities in underground spaces. Therefore, the construction of such facilities has become an inevitable choice. Most of these facilities have been put into use within 10 years and are currently at the peak of their service life. In addition to a small amount of local functional adjustments and maintenance work, the current reconstruction work mainly focuses on the connection channels with the subway system and surrounding underground spaces. construction.

The fourth generation of civil air defense projects combined with commercial buildings during peacetime and wartime is gradually taking shape in major urban centers. Its construction presents a growth pattern similar to plant tillers. Driven by commercial interests, convenience and other forces, different builders use intricate underground pedestrian passages to connect various underground facilities in the area, and the successful underground space network once again drives the owners of surrounding undeveloped underground spaces to Develop, use and connect underground space. The numerous owners of this space network are motivated by their own different interests and invest in updating their own facilities. All of this makes the underground space network like an organism. Due to the mutual connection of their respective interests, it forms a whole that gathers resources from all parties, takes into account the interests of all parties, and is constantly developing, updating, and symbiotic. The construction of underground space has entered a development stage with partial self-management characteristics, forming the second spatial level of urban development. But at the same time, due to the differences in interests of the relevant economic entities or management departments, there will be various disharmony and iterations in the spontaneous construction process. For example, "First of all, it is not conducive to the establishment of a systematic underground pedestrian system in the central area. In order to reduce competition among commercial entities, , the implementation of internal operating time controls for entrances, exits, and passages has affected the smoothness of the underground pedestrian system." [9] "Secondly, the underground public space around the rail station in the central area cannot be guaranteed, and then the efficiency of the shopping mall comes first, the fire management lags behind, and the underground street attracts A large number of people flow, causing the passage to be overloaded" [10].

Therefore, in the development of contemporary urban underground space, how to guide operators to carry out construction in the direction envisioned by planning through regulations and economic policies is the key to realizing an ideal underground public space system. Therefore, the importance of construction guidance at the level of controlled detailed planning cannot be overemphasized. ignore. In general, from the perspective of urban development, composite utilization with the "underground pedestrian network" as the core can promote the efficient use of urban space [12]. At the same time, civil air defense engineering facilities connected through underground space will also improve their protective effectiveness and Usage efficiency.

China's four generations of civil air defense projects are integrated into both peacetime and wartime situations reflect the degree of compatibility between their respective construction goals, construction standards, and functional positioning during planning and construction, and later urban development.

5 PROSPECTS FOR THE CONSTRUCTION OF CHINESE CIVIL AIR DEFENSE PROJECTS COMBINED WITH COMMERCIAL BUILDINGS DURING PEACETIME AND WARTIME

China's civil air defense projects combined with commercial buildings have experienced four generations of development. From the initial small-scale projects, they gradually formed a self-managed symbiotic network and moved towards a path of self-growth and organic development. This is inevitable for the development of urban space.

However, the development conditions of China's urban underground spaces vary. In the central areas of large cities, land use pressure is high. Driven by economic interests, investors have the initiative to build. In general urban areas, the return on investment in underground space is still quite uncertain. Preferential policies in terms of land, taxation, and national investment are necessary driving forces for construction. In small and medium-sized cities or general areas, the construction of civil air defense projects often has no economic benefits at all, and policy regulations are the main controlling factor.

With the development of cities, civil air defense projects combined with commercial buildings will be an important part of China's civil air defense project construction. For civil air defense projects, reasonable use functions can provide economic support for the construction and maintenance of civil air defense projects. At the same time, strict

management is required to prevent transformative damage. The first generation of civil air defense projects combined with commercial buildings during peacetime and wartime will be demolished together with the ground buildings in future urban renewal due to lack of reconstruction foundation. The second and third generation civil air defense projects combined with commercial buildings for both peacetime and wartime will enter a transformation period in the next 10 to 20 years. Through the interconnection of underground space, they will become an integral part of the fourth generation of civil air defense projects combined with peacetime and wartime commercial buildings. Therefore, the main development direction of China's civil air defense projects combined with commercial buildings in peacetime and wartime is the interconnection of buildings in different periods, forming an underground space commercial network, integrating scattered spaces into comprehensive network spaces, and developing from entering the second space level of the city era.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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