Project standard design and special research report — —Take underground commercial design of AB block in Xuzhou Central International Plaza as an example

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Abstract: According to uniform standard underground building design regulations draft, the central international plaza, A/B block of underground commercial design of Xuzhou city as an example, the system of underground construction in the planning and construction requirements, general layout design, disaster prevention design three basic framework and 6 architectural design problems, in order for new regulations smoothly promulgated engineering design reasonable feasibility verification.

In 2016, the standard quote Department of the Ministry of housing issued the standards for the construction of engineering standards in 2017 and revised plans (Draft), which lists 4 categories of total 113 standard researches, studies and revision plan. Including the national mandatory standards for construction projects, including technical specifications of outdoor water supply projects in public buildings and other 29 standards; and the construction of the recommended national standards, including public fiber broadband access project technical standards, civil air defense basement design standards for total 46 standards. "The underground building design standard" is a research branch, which belongs to the "planning technology ", is still in the stage of compilation of technical demonstration, "Xuzhou City Central International Plaza, AB block" was selected as a trial design project, which is designed by LIANCHUANG construction design company, and it make the "standardized underground architectural design draft " to the actual technical demonstration.

Keywords: underground commercial building, streamline; clear height; walking system; fire separation; sunken square

1. Project Pilot Design Case Overview

Xuzhou Central International Plaza is located in the core area of the main city of Xuzhou City, and it is the benchmark project and new business district of Huaihai economic circle in Xuzhou in the future. The project covers an area of 42.8 thousands square meters, and the height is 259 meters. The 63 floors in the West Tower are Serviced Apartments, the 57 floors in the East Tower is used for office business as five star hotel, There are 10 floors in senior commercial podium and B4 is business district and more than 2000 parking spaces. Set underground mall at the base north, docking with the rail transit station in the future, the general construction of city square on the base construction, including river and green belt landscapes, it can hold large city activities and provides a new leisure place for the people of Xuzhou city.

The engineering design is a part of the Xuzhou Central International Plaza, which is the future city leisure square under the large underground commercial network, carrying the subway traffic flow from the city, and becomes underground commercial pedestrian system with super high-rise building underground commercial system. The construction of a B site covers an area of 14 thousand square meters, at the forth underground floor, the building area is about 34 thousand
square meters, B1/B2 is used for under business and B3/B4 is used for the underground commercial parking lot. Ground square has been put into use. The two phase of the construction of A plots, currently on the ground is the Xuzhou department shop, and it will develop for underground business with the B land in the future.

2. Return of The Planning

The norm test design: the general layout of the plane, when large underground commercial facilities due to various restrictions on land use, face mort retreats, how to solve the reasonable layout of outdoor pipelines?

In order to maximize the utilization of underground space, main project in the basement reduced red line 3 meters, according to the design, the outdoor pipeline layout need to avoid the two lane underground garage entrance, two bicycles underground garage of the mansion, a special anti access ramp entrance, 4 septic tank and underground chamber into the exhaust outlet. 3 meters retreat line can not meet all outdoor piping layout requirements. Standard test in the design, the East, south and west toward the municipal road three directions, combined with the B1 floor enhancing the height requirements, B1 wall roof inward extension of a 2 meter wide, high beam and bottom elevation are not changing, the local can drop plate 950mm, flat bottom plate beam bottom, the two water supply pressure tube in the safe position of mining structure adopt the cross beam method, this can solve the requirements of cable equipment and pipelines, ensure maximum utilization of underground whole space, also ensures that the B1 floor height of space requirements.

3. Underground Floor Height Design

Specification design: at the underground building design, how to design underground commercial environment comfortably and meet the requirements in the basic minimum height of underground space?

The height of underground building affects the cost and time limit, and also has direct relation with the running cost. At the engineering level, height depends on the thickness of roof, the beam height, the ceiling pipe, line required height. On the one hand, the underground mall height as low as possible, reduce the load of air conditioning and lighting; on the other hand, should meet the requirements of the space environment, avoid repression, therefore, the contradiction of environmental comfort and energy saving is the main problem affecting the height. Studies show that underground businesses, when there are large supermarkets and department shops, the floor height should be 5.1~5.4 meters. If it is in the middle and high grade format underground commercial, the floor height can even be 6 meters. The ceiling height should be controlled within 1 meter, with removable ceiling panels. When the pipeline is repaired, remove the ceiling plate. In the standardized test design, there are two floors of underground commercial in A and B plots, using for underground sale of small paved commercial street. The elevation of the B1 floor building of A and B blocks is -6.000 meters (height is 4.9 meters, indoor and outdoor height difference is 0.1M, the square is covered with soil depth 1.0m); the building elevation of B2 is -11.200 meters (height is 5.2 meters). The overall space through various styles of ceiling processing, has no depressive feeling. Therefore, the majority of the current domestic middle and high-end shopping mall’s B1 clean height can be 3.9 meters to 4.2 meters. The way of weakening the floor height in the test design is the ceiling to do the proper line exposed and stylized. But if make an overall aluminum gusset plate ceiling, suggest to appropriately raise the height.
4. Underground Traffic Organization

Standard test design: how to efficiently integrate the underground commercial facilities with the urban traffic hub and the people flow organization into an integral?

The project fully considers the connection with the urban subway hub, and the efficiently organization and lead of underground commercial pedestrian flow, underground traffic flow and public traffic. Specific planning strategies are as follows: (1) underground commercial circular sub channel segments small blocks, central nave or outdoor Sunken Plaza will be set at the junction. Through the radioactive active line, the subway passenger flow leads the people to the central sunken square, then leads to the small commercial district. (2) the diagonal walk active line between B block and C block leads to the 2th underground commercial sunken square. Here is the B block evacuation square, also a mix of underground commercial and outdoor space. (3) B2th floor subway transportation hub flow, after leaving the station, two groups of escalators are led to the B1st floor central nave, then the escalator leads people to a higher floor space, with smooth series of vertical traffic connections flowing. The underground walk system also combines sunken square to set up greening, landscape, rest facilities, lighting windows, cultural walls and other factors, which connects the sections of the walkways naturally, alternating inside and outside.

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5. Evacuate sunken square

Standard test design: The evacuation width of “fire prevention measures for underground building sunken square”

The partition of square underground commercial’s fire compartment are as follows: First-stage project (part of A/B block): commercial housing and equipment are allocated on the B1/B2 floor, and two sunken squares are set from west to East in the commercial area of the B block. Each square’s short dimension is no less than 13 meters, and the minimum utilization area is no less than 180 m². In the sunken square, outdoor steps and escalators are designed for evacuation. Excluding projection area of outdoor evacuation stairs, escalators, fire lanes and return yard and other facilities, the net area of each floor used for evacuation is 182m² (more than 169m² space in ladder clear height more than 2.0m should be reckoned in effective evacuation area), and meet the evacuation area access to this area’s overall number of people of each fire compartment, should be calculated the area in accordance with the 5 per capita / m² Code for fire prevention regulation of Jiangsu Province stipulates that the sunken square shall be no less than one and the outdoor evacuation stairway with a width of no less than 2 m through the ground. Its total width shall not be less than 30% of the width of the evacuation.

The total evacuation width of the central sunken square is calculated as 7m at the B1 level, and should be reckoned into the width of the evacuation 2100mm, which is less than the width of the evacuation stair 3500mm of the sunken square. In accordance with the new regulations, when a sunken square fire area needs to be evacuated by a sunken...
square, “the total net width of the evacuation staircase shall not be less than the total design net width of any fire area access to the outdoor wide space”. Taking central sunken square as an example, there are total of three fire areas being evacuated to the sunken square, where the maximum net width of the evacuation is 4000mm. The width of the actual sunken square toward the ground is: the width of the effective arc of the evacuation staircase 3500mm; here, the converted evacuation width is used to the outdoor escalator, namely, according to the width of 90% escalators, the width of evacuation is 1010mm * 90%=909mm; Therefore, the total evacuation width of the sunken square can be 3500+909=4409mm > 4000mm. Therefore, according to the new regulations, the evacuation width of the test design project is applied to the converted width of the outdoor escalator (Figure 5, evacuation design of B1 floor central sunken square).

This project test design discussed the 3 provisions of “Planning and general requirements”, 17 provisions of “architectural design”, 9 provisions of “disaster prevention design”. In this paper, only representative practical engineering problems can be chosen. In the repeated comparison and demonstration process of “new regulations” and the local underground commercial building fire protection design code, this test design and summary evaluated the adaptability and coverage of the provisions of the first draft of “New regulations” which will serve as a reference and guide for the promulgation of the “New regulations” in the future.