China Research Status of Ground Landscape Design for Subway Entrances and Exits

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Keywords: Subway entrance and exit, Landscape design, Literature review.

Abstract. Main domestic documents about subway entrance landscape design has been analyzed. It has been concluded that subway entrance landscape concept, interaction of subway entrance and surrounding landscape, common features and individual features of subway entrance landscape, elements of subway entrance landscape, design strategies and design principles of subway entrance landscape, the optimization strategy for subway entrance landscape, subway entrance landscape element comment system establishing. And the research direction in the future has been raised.

Introduction
The subway system in China was first built in the capital Beijing. Beijing Metro Line 1 began its trial operation in January 1971. Since then, the construction of the subway in mainland has been developed slowly in about 30 years. Since the 21st century, the number of subways in China has grown exponentially, and people have begun to pay more attention to the design of ground landscapes of subway entrance and exit.

The subway entrance and exit bear the heavy responsibility of people leaving the station, entering the station, and transferring the station, and are the link between the subway and the city \[1\]. The careful design of the ground landscape of the subway entrance and exit is not only the needs of functions, but also a combination of various needs such as urban construction, humanization and aesthetics in the new era.

In recent years, the literatures on the landscape of subway entrance and exit have sprung up. Most of researches focus on the shape and style design of the annex buildings such as the wind pavilion at the entrance and exit. The in-depth researches on the spatial form and landscape design of the subway entrance and exit are relatively rare. This article sorts out the latest relevant literature on the ground landscape design of subway entrances and exits, to explore the main problems required as clue serial data, and briefly discuss the content of the literature and the research results for later reference and further research.

Research on Concept of Ground Landscape Design of Subway Entrance and Exit

Entrances and exits are generally associated with the intention of the door. An entrance and exit is often a space that spans from one functional space to another. In the subway building, the building of the entrance and exit is the entity of the door, which makes it clear that this is the location of the subway entrance and exit.

However, unlike the conventional doors, subway entrances and exits are the transition between underground space and above-ground space. Passengers to go through the subway entrance and exit, can not only be completed through such a simple action of stepping over, but also needs to complete the height difference conversion of the platform of the underground station and the entrance and exit of the building through the tools such as elevators and escalators. In the study of the landscape of subway entrance and exit, people often extended the meaning of entrance and exit, taking the subway entrance and exit as a composite space containing the subway station space, connecting passages, mouth building of entrance and exit and the space near the mouth building, and showing two distinct
main research directions for underground space landscapes or above-ground space landscapes of subway entrances and exits.

At the beginning of designing the ground landscape of subway entrance and exit, we must first define the concepts of subway entrance and exit, ground landscape and landscape design. In the past ten years, scholars have made the following research on the definition of the ground landscape design of subway entrances and exits:

In 2009, Zhao Ying limited the external space of the subway entrance and exit, pointing out the horizontal and vertical limiting elements of the external space of the subway entrance and exit [2].

In 2010, Tang Wei, Chen Mingfeng and Tang Jian discussed the concept of landscape design in detail [3].

In 2011, Wu Xiaoyun defined the connection space inside and outside the subway station and pointed out the content of the connection space [4].

In 2012, Leng Hulin defined the concept of the space around the subway entrance and exit in a qualitative way, and proposed that the relationship between the subway entrance and exit and the surrounding space should be based on the human behavior habits to determine the spatial extent of the relationship with the subway entrance and exit [5].

In 2013, Li Xun discussed the concept of Subway Entrance and Exit and pointed out the elements contained in the subway entrance and exit [6].

In 2014, Yao Xiangui elaborated on the entrance and exit in the narrow sense and the entrance and exit in the broad sense, and pointed out that the entrance and exit in a broad sense is a composite space composed of a series of elements [7].

In 2015, Xia Chuanchuan demonstrated the definition of urban public landscape and pointed out that urban public landscape includes two aspects: natural landscape and artificial landscape [8]. Qu Meiling defined the transition space of the subway station, and pointed out that the transition space includes the transition of the internal station and the station hall, the station hall and the entrance and exit, the entrance and exit and the surrounding environment [9].

In 2016, Li Hao proposed the concept of tourism-type subway station space and defined it [10].

From the research of the concept of ground landscape design for subway entrances and exits, it can be seen that: The ground landscape of the subway entrance and exit interacts closely with the surrounding environment and is also closely related to the urban landscape; Passengers not only interact with the subway entrance and exit, but also interact with the surrounding space. They are the medium for connecting the landscape in subway entrance and exit and public landscape. In the process of exploring the ground landscape design of the subway entrance and exit, the landscape of the subway entrance and exit cannot be separated from the urban landscape, and the interaction between the landscape and people cannot be ignored also.

**Exploration of the Interaction Between the Ground Landscape of the Subway Entrance and Exit and the Surrounding Environment**

People complete a conversion between the above-ground and underground space by passing the subway entrance and exit, or simply pass through the entrance and exit space, which all means crossing and feeling the entire environment of the entrance and exit. And for those who are not walking inside or just looking at the entrance and exit space with their eyes, the landscape of the entrance and exit will also become an aesthetic object, resulting in a relative impact on the human body and mind. It is very important to study the interaction between the ground and the surrounding area of the subway entrance and exit. Many scholars have also turned their attention to the relationship between subway entrances and exits and the surrounding environment and urban public space:

In 2012, Leng Hulin pointed out the interactive elements between the subway entrance and exit and the surrounding space, and elaborated the interaction law from the interaction between the subway entrance and exit and the road space, building space and open space [5].
In 2013, Shao Yichao studied the surrounding environment of the subway entrance and exit, and the relationship between the subway entrance and exit, the square outside the station and the surrounding environment. At the same time, he paid attention to the transfer of various vehicles on the square outside the subway entrance and exit station [11].

In 2015, Qu Meiling divided the transitional space of the subway stations around the university into two types: Being able to connect with the urban transportation system and Being able to orderly linkage with the building space environment around the subway station [9].

In 2017, Gao Changzheng and Zhao Huihui gave the suggestions on proposed the layout of the subway entrance and exit to cooperate with the surroundings in the three different environments of the street space, the building space and the open space [12].

In the interactive exploration of the ground landscape subway entrance and exit ground landscape and the surrounding environment, many scholars have paid attention to the relationship between subway entrances and exits and streets. The subways serve people, and the convenient transportation is the advantage of the subway. The subway entrance and exit is an important node for people to exit, enter, and transfer station, and is naturally closely related to the urban road. We need to deeply research the relationship between the ground landscape of the subway entrance and exit and the urban traffic landscape.

Nowadays, the number of private cars is huge, and their parking and management are also complicated. Non-motor vehicles are also often used as tools for short-distance travel because of their flexibility and compactness. Especially after having the sharing bicycles, the situation of randomly parking non-motor vehicles is becoming more and more serious. The parking and transfer method of vehicles on the subway entrance and exit has also become an important issue to be solved.

Exploration of the Commonality and Individuality Between the Spatial Landscapes of Subway Entrances and Exits

The subway entrance and exit are closely linked to the surrounding environment. However, as a node on a subway line, the subway entrance and exit and the subway line itself are also a whole, and it cannot be stripped off the overall design to only study the node itself. However, if the landscape design of each station is very similar, which will loss the uniqueness of each station, resulting to the blurring tendency of the image of the station, losing some ability to display regional features. How to balance the commonality and individuality of the landscape between stations in the same area or on the same metro line is also the focus of some scholars:

In 2015, Zhou Bin used Hangzhou Metro Line 1 as an example to analyze the application of commonality and individuality of the station's entrance and exit and ground landscape design, exemplified the common elements of the station's entrances and exits and ground landscape design, and pointed out that the ground landscape design should be based on conceptual design in terms of shape, material and color, and strengthen the subway identification [13].

In 2017, Wang Boya, Li Cheng and Yin Decheng took the Nanning Metro Line 1 as an example in 2017, and studied commonality application and individuality analysis of the common elements of the subway exit building and ground landscape [14]. In the same year, Zhao Bingran proposed that the landscape design of the subway should focus its functions, and the station decoration should also maintain a certain relationship with each other while having personality and recognition [15].

In summary, the landscape design of the subway entrance and exit should follow the overall style of concept design of the subway route landscape, to have certain relevance. This connection can be reflected in the common elements of the decoration, but the landscape should have the personality of the station itself.

Analysis of the Ground Landscape Elements of Subway Entrances and Exits

The elements are the indispensable units that constitute things. After having a certain understanding of the planning of the landscape of subway entrance and exit in the overall level, we can begin to
organize the elements of the ground landscape of subway entrance and exit. Experts and scholars carry out the research from different angles, and the contents of the ground landscape elements of the subway entrances and exits are not completely consistent:

In 2008, Zhao Yan summarized the ground landscape components of the subway station into soft landscape resources, facilities of landscape and service facilities such as main buildings, distribution squares, plants or waterscapes [16].

In 2010, Kong Lifang divided the subway entrances and exits and surrounding landscape elements into four aspects of entrance and exit buildings, plant configurations, barrier-free facilities, facilities of landscape and landmarks, to carry out discussion [17].

In 2013, Zou Yijian analyzed the landscape design elements of the underground entrance node from the perspective of urban landscape order: Elements of spatial order, elements of perceptual order, elements of natural landscape order, and elements of historical and cultural order [18].

In 2016, Zhang Liyang summarized the main elements of the landscape design of underground space entrance and exit into six aspects: plant landscape, ecological landscape, public facilities landscape, public art landscape, lighting landscape and stores landscape [19].

In 2018, Wang Zhiqi and Liu Xuemei pointed out that the spatial elements of the outdoor landscape of the subway are natural elements, the basic elements of the outdoor space of the subway, the changing elements of time and space, and the elements of the activities of the subway outdoor landscape space [20].

If time and space are classified as natural elements, and human activities and perceptions are classified into artificial elements, then after summarizing the elements of various angles, the elements of the landscape of subway entrance and exit can be roughly divided into two aspects: natural elements and artificial elements.

**Exploration of Design Strategy and Design Principles of the Ground Landscape of Subway Entrance and Exit**

For example, the design elements are like basic vocabulary, the design principles guide the overall structural level of the design, and the design strategy is the way to solve the design problem. It is the grammar of connecting basic vocabulary under the design principle. Summarize the design principles and design strategies of the ground landscape of subway entrance and exit, which can better guide the landscape design of subway projects in various regions and serve the city construction. Therefore, the design principles and strategies are the core of the ground landscape design for subway entrances and exits, and also the focus of research by experts and scholars:

In 2010, Zhao Yan summarized the principle of “people-oriented, overall systemic principles, clear personality principle, and sustainable development principles” in the study of ground space landscape design of metro stations [16].

In 2013, Wang Lin proposed that the design strategy of facilities of landscape at the entrance and exit of the Tianjin Metro should be “focusing on the expression of regional cultural elements, and be consistent with the urban style, paying attention to the shaping of details, lighting design, humanized design and ecological design” [21]. In the same year, Zou Yijian introduced the concept of “urban landscape order” to analyze the spatial form of urban underground space entrance, and summarize the landscape design principles of node space of urban underground entrance [18].

In 2014, Sun Xiaoming, Hu Qiaoyu and Pu Xiuyuan summed up the general principles of the design of subway entrances and exits, emphasizing that the design of subway entrance and exit design should combine local cultural heritage and historical background, and integrate modern elements [22]. Liu Yiting combined with the example of Wuhan Metro Line 2 to discuss in detail the highlights and shortcomings in the morphological and cultural design of the wind pavilion, the lighting design of the night and in the design of green planting, and proposed corresponding improvement strategies [23]. In other studies, Liu Yiting also discussed from the aspects of planning limitation, image shaping, landscape design and humanized design, and summed up the law of shaping the image of the subway.
entrance and exit that shows the image of the city by “following the formal beauty law, owing artistic creativity, seeking a sense of transparency and intervening in local cultural elements” [24]. Zhou Yong proposed that the design principle of the entrance and exit of the subway station combined with the urban landscape is the principle of using the functional requirements, the identification of the icon, the principle of combining with the urban landscape, and the principle of industrialization of production [25].

In 2015, Wang Dun and Wang Jianbing took Beijing and the Russian subway as examples, to summarize the common features of the urban subway landscape space, then analyzed the development characteristics of the landscape space of Guangzhou Metro, and put forward the strategy of enriching the spatial elements of Guangzhou Metro [26].

In 2017, Zhao Xiaolin analyzed and compared the various subway special sations in Shanghai, Suzhou and Wuxi, and proposed strategies to improve the vitality of the site, pointed out that the study of the landscape of the subway station and its surrounding space should make use of the experience of urban public space design and strengthen the iconic nature of space [27].

In 2018, Ma Weige took the greening transformation of Wuhan Metro Line 2 and Line 4 as an example, pointing out that the greening environment around the subway station should be built according to the situations of different stations, taking function as the leading factor, the overall integrating urban streetscapes, to reflect the culture and heritage of the sites [28].

Summarizing the literature, most of the points in which mentioned that in the design of the ground landscape design of subway entrance and exit, we must first meet the requirements of functions. In addition, it must be combined with the urban landscape, but it also emphasizes the importance of design and recognition in the design process.

**Analysis of the Optimization Strategy of the Ground Landscape of Subway Entrances and Exits**

Considering the function of the entrance and exit of the subway, it is generally considered that the orientation is a requirement for the ground landscape of the subway entrance and exit. In view of the problems of the distribution and confusion of some built subway entrances and exits in China, the optimization method of the old landscape needs to be explored.

In 2009, Zhao Ying proposed the concept of guidance system design, and proposed the optimization strategy of guidance system based on the design of the guidance system of external space of Shenzhen subway entrance and exit, pointing out that the essential feature of the subway entrance and exit is the feature of guidance [2].

**Establishment of Evaluation System of Ground Landscape and Landscape Element for Subway Entrances and Exits**

In the process of studying the ground landscape of subway entrances and exits, most researchers have adopted qualitative research methods. However, some people use the method of combining quantitative or qualitative with quantitative to evaluate the ground landscape of subway entrance and exits and its elements.

In 2011, Liu Tingting, Li Lei and Xu Feng took the Beijing Yonghegong subway station as an example, compared 13 influencing factors for different entrances and exits of the same station and multiple entrances and exits of different station, constructing the space evaluation index for square landscape of subway entrance and exit from three aspects of road traffic, environmental coordination and ecological landscape, verifying space evaluation index of landscape by taking the Yonghegong as a case [29].

In 2016, Li Wei proposed the concept of the tourism-type subway station space, and pointed out the composition of the cognitive elements of the tourism-type subway station space, and demonstrated the method of factor evaluation in landscape design of tourism-type subway station space [10].
The method of quantitative analysis makes up for the shortcomings of research methods, and encourages researchers and designers to find more scientific and rational methods to combine artistic aesthetics for design creation, giving a new idea of landscape design and inspection.

Conclusions

There are many references for the exploration of the landscape design of subway entrance and exit. Due to the development of the city and the prosperity of the subway, there will be more attention to the space landscape of the subway entrance and exit in the future. These documents are precious, and they have important guiding significance for the future exploration of the landscape design of subway entrances and exits. The recent researches on the ground-related landscape of subway entrances and exits involve fewer or still unresolved issues, which can be used as a new direction for future research:

(1) Problem about the conversion of the ground transportation mode of the subway entrance and exit and the transfer of vehicles; (2) Problem of combining the urban lighting project to exploring the night landscape of the subway entrance and exit; (3) The design strategy of the ground landscape of entrance and exit showing local characteristics; (4) Combine the latest scientific tools and scientific methods to make full use of new materials and technologies to create landscapes.

I believe that the pace of academic exploration will surely go further, and problems that have not yet been fully resolved will be further explored.

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