Study on the Urban Central Area’s Pedestrian Traffic System and the Construction Strategy and Implementation Mechanism

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Abstract — this paper reviews the urban center district pedestrian traffic system’s development, through the study of the practice of China and many cities in the world, which shows that the construction of three-dimensional pedestrian traffic system can effectively solve the problems like the traffic congestion in urban center area, space shortages and the others. In this paper, based on three-dimensional pedestrian traffic system elements, types and forms of knowledge, combined with the experience of the development of cities in China and the other countries in the world, we study the urban center area three-dimensional walking traffic system construction strategy and implementation mechanism, and try to summarize some strategies and measures, in order to provide some useful measures and methods to the three-dimensional pedestrian traffic system construction in the city center area.

Keywords -- Urban Center; pedestrian traffic system; Construction Strategies; Implementation Mechanism.

I. INTRODUCTION

Since the mid-20th century, with the growth in the number of motor vehicles produced such as air pollution, poor pedestrian environment "urban disease" that leads the world in many cities of the central area of functional decline, the development of economy and construction accelerated fast, while the shortage of the space of urban space become more and more serious. Based on the successful experience of domestic and international cities, building Three-Dimensional foot traffic system has become one of the effective ways to solve the plight of the development of urban centres in China [1,2].

II. CITY CENTER PEDESTRIAN TRAFFIC SYSTEM DEVELOPMENT SURVEY

A. City Center Pedestrian Traffic Planning Concepts Related to the Development

Process of systematic review of the West Road area of the city center, with the development of transport and economic and social change, the planning concepts pedestrian traffic system is also evolving, can be roughly divided for the following three categories:

Promotion of "separation of people and vehicles": the industrial revolution, the popularity of cars to make the city center pedestrian system in decline; until the 19th century, Germany, Britain, the United States and other countries to re-motor vehicle lanes and walking trails realize balanced development the importance of pedestrian street construction revived. At that time the planning concept of "Leide Bang" idea as a representative of people and vehicles.

Promote "people car sharing": in the 1970s, the energy crisis in Western countries walk wakeup recovery center neighborhood concerns, the rise of the "traffic tranquillity" and "shared street" as the representative of the planning concepts, both recommended traffic control or environmental improvement other measures to enable the coexistence of pedestrians and vehicles equality.

Promote "Walking priority": planning concepts produced after 1990, such as: "TOD (Transit-Oriented Development)" development model, "POD (Pedestrian-Oriented Development)" development model, "walking city" construction Conception et advocate highlight pedestrian traffic urban planning and construction functions.

B. Development of the City Center Pedestrian Traffic System by the "Planar" to "Three-Dimensional"

Evolution of Development Planning Theory does not relieve the city center due to traffic congestion caused by the problem of functional decline. Since the 1950s, American and European countries began a Three-Dimensional study of urban development, and the city center pedestrian system along toward the "Three-Dimensional" development. Construction of Three-Dimensional city center pedestrian traffic system has the following meaning:

1) "Three-Dimensional" help improve the traffic congestion problem

As the most concentrated, people most densely populated areas, traffic congestion in the city center area is particularly serious, seriously affecting the efficiency of the central area. The establishment of urban perspective pedestrian traffic system, the central area of pedestrian network boot in the air and underground development,
can greatly enhance the walking area without increasing occupy urban land, people and vehicles to ease traffic problems and contradictions.

2). “Three-Dimensional” help to optimize the public space environment

In high-density urban centers built environment, the traditional public space is particularly tight spaces and facilities often appear simple, the lack of dock space and communication problems. The establishment of urban perspective pedestrian traffic system will help the people freed from vehicle traffic, pedestrians must make "exclusive" space; at the same time through space consolidation and greening measures, creating a pleasant public space environment [3].

3) “Three-Dimensional” in favor of intensive development center space

City Center has a function of highly concentrated, high-density space exhibition and other features, the demand for a larger space for development. The establishment of urban legislation pedestrian traffic system is conducive to intensive land use, the expansion of space, Multi-level development, providing people with more public scope of activities, and create greater economic benefits.

4) "Three-Dimensional" in favor of integration of diverse spatial development

Traditional urban space layout single aggregated form the city center have been met Multi function space not high density mixed development needs and build Three-Dimensional city center pedestrian traffic system will help the series features a variety of space, to promote the development of diverse hybrid space avoid duplication and facilities scattered layout and other issues, adding vitality to the central area of.

III. FORMS OF THE CITY CENTER AND THREE-DIMENSIONAL SYSTEM OF PEDESTRIAN TRAFFIC

System components can be divided into Three-Dimensional walking: walking path (including air pedestrian corridor, underground trails, trails ground, as well as vertical ancillary transport facilities), public space nodes (including squares and green spaces and other open space, commercial and office facilities and other large public buildings, car parks and bus stations and other transportation hubs conversion, etc.) and facilities (including identification systems, infrastructure, services, facilities, etc.) [4].

A. Three-Dimensional Pedestrian Traffic System

City center pedestrian traffic system is mainly concentrated in the high accessibility of ground floor space close range, depending on the level of Three-Dimensional space can be divided into the following three types(Fig.1):

1) Air pedestrian traffic system

Air pedestrian traffic system means walking in the neighbourhood using a number above the ground pedestrian bridge or the like on the ground floor above the various functions to link up the urban space, an independent ground street walking space system formation. Usually take the easy, smooth and continuous layout to avoid mixing behavior of people and vehicles premise of providing convenient and accessible walking routes; in general, in the form of walking trails organizations can be divided into four.
2) Underground pedestrian traffic system

Underground pedestrian traffic system is corresponding with the air pedestrian traffic system, located below ground level, alone or in combination with other city buildings and facilities of pedestrian traffic system [5]. Usually take the simple, continuous and clear layout of the form, focusing on the development of convergence of the various functions of space, provide identification and safe walking routes; in general, in the form of walking trails organizations can be divided into three (Fig. 2).
3) Ground pedestrian Traffic System

Ground pedestrian traffic system between the air and underground pedestrian traffic connection switching system plays the role of the foundation is the presence of air and underground pedestrian traffic system [6]. Depending on the natural conditions and program development, domestic and urban transportation system ground pedestrian mode varied, different characteristics. In general, in the form of walking trails organizations can be divided into four (Fig.3).

B. Three-Dimensional form of pedestrian traffic system

Walking through the Three-Dimensional traffic system in the form of a combination of three types of pedestrian system, reorganizing the distribution of the right of way of the city center, so walking trails through smoothly, while achieving a conversion space walk and other functional spaces, effectively revitalize the land resources, expand the space. In general, it can be divided into three forms: the air - ground pedestrian transportation system, underground - ground pedestrian traffic system and air - ground - underground pedestrian traffic system (Fig.4).
IV. BUILDING POLICY PERSPECTIVE CITY CENTER PEDESTRIAN TRAFFIC SYSTEM

A. Three-Dimensional focus on pedestrian traffic system construction overall planning

To achieve space intensive and diversified development, the city center pedestrian traffic system perspective should be weighed in transportation, commerce, environmental and other aspects of the relationship between the interests of the premise, in order to maximize the overall efficiency as the goal, take “overall construction sequence by planning and construction policy point, step forward building”.

On the one hand, the sequence of construction should be planned according to different plots of the central area of the construction sequence for undeveloped areas, alignments considered in turn Three-Dimensional system of pedestrian traffic, route nodes and nodes in series, good planning and construction of public space walks reserved [7]. Hong Kong's Three-Dimensional traffic system, such as walking "step forward" in the form of construction, its construction began in the area of a connection Standard Chartered building, Jardine House and Hong Kong Post Office Air Gallery, more than ten years by gradually extending the number of airlink Gallery and surrounding buildings, transport links are connected, and built more than 3000 m long elevated walkway in the area of the connection system. Based on this system, the government continues to promote the construction, it has completed a flyover in Wan Chai and Admiralty bridge walk pedestrian system system.

On the other hand, it could be considered during the planning and construction of the pilot take the form of development, successful experience to promote, the final completion of the full Three-Dimensional system of pedestrian traffic. Hangzhou CBD as a priority in the core area to build eight small-scale air corridor systems, connecting several buildings within eight blocks, which in turn promote the experience after reaching the desired effect, the central area of the building over a wide range by a perspective pedestrian traffic systems link up.

B. Focus on Three-Dimensional Pedestrian Traffic System Construction Standards and Harmonization of Norms

To ensure the integrity, security and convenience, setting norms and uniform construction standards is an important task to carry out Three-Dimensional pedestrian traffic system construction. Construction planning and design standards, including standards and guidelines for the design of two parts, the former respond pedestrian walkway design dimensions (clearance, higher net), access facilities (pavement, stairs, etc.), lighting conditions (lights, light boxes, etc.), identification system (instructions licensing, road signs, etc.), accessibility (ramps, escalators, etc.) and other aspects of detailed
provisions to provide technical support for the Three-Dimensional city center pedestrian traffic system construction; the latter should be through the establishment of principles, such as security, accessibility, comfort, etc., to provide qualitative perspective pedestrian traffic system construction requirements to ensure the effective implementation of construction work. For example: Minneapolis "sky walk system construction basic standards" regulate the content requirements for the construction of a series, including clear width, net height, lighting conditions, the identification information prompted, use active content, etc.; Hong Kong Planning Department "Hong Kong pedestrian planning study" not only provides a walkway planning and design standards and reference drawings has also developed guidelines of construction principles (connected properly, safe, comfortable and accessible, attractive and rich vitality, etc.), in favor of constraints construction practices [8].

C. Focus on Layout of Three-Dimensional Pedestrian Traffic System

In spatial layout, the city center pedestrian traffic system requires a combination of Three-Dimensional traffic control and commercial benefits to be considered. On the one hand, should consider strengthening the construction of Three-Dimensional space and pedestrian space transportation hub convergence, realize walking with other modes of transport, traffic function and other functions orderly conversion, and connect the hub nodes via Mass Rapid public transport, the establishment of efficient urban transport network. Such as Kowloon and Hong Kong Island, walk through the construction of a large number of people and vehicles to achieve air corridor branches, reduce traffic congestion situation; Paris La Défense will motorized transport system located underground, ground to achieve full pedestrianization, by stairs, escalators and other vertical enhance pedestrian facilities and underground stations, parking contact, to improve the overall efficiency of transportation area.

On the other hand, the construction should be considered by the ground, ground and underground facilities and commercial outlets scattered through them to form a "economic corridor" to achieve maximum economic efficiency, to add vitality to the city center. Such as Japan, Tokyo Roppongi Hills multi system air walk around the subway station construction range 0.19 km2, and extensive use of conversion elevation place ramps, corridors, platforms, connecting more than 200 stores, has created contiguous high-density commercial services community, promote local economic development [9].

D. Focus on Pedestrian Traffic System Construction to Create the Environment

In pleasant environment for the guidelines, the city center pedestrian perspective Transport system should focus on landscape environment construction increased pedestrian access and public open space by green landscaping (public green, green square, building vertical greenening, green trails, etc.), additional pieces (sculptures, fence design, etc.) and facilities configuration (no It means barrier facilities, lighting, etc.), and create a green, characteristic pedestrian environment and increase the flow of people walking interest. As Taipei's Xinyi air bridge system by providing measures to improve accessibility and planting flowers and abundant trails and other space environment, greatly improving the comfort and safety of the air bridge system; floor Shanghai Lujiazui pedestrian corridor corridor system based on the present bottom grayish hue, through the installation of complex systems and the use of LED lighting landscape for the public to create a unique night walk surroundings.

E. Focus on the Overall Three-Dimensional Coordinate System Construction of Pedestrian Traffic

Measures taken in respect for regional diversity and the premise of the construction of three-dimensional traffic system the city center pedestrian areas should consider the organizational structure, details of the deal in trail space environment, configuration and other aspects related facilities, as far as possible to maintain the original promenade, texture and spatial context environment, to promote new and existing coordination walking system, showing the overall style. Stereoscopic pedestrian area of the old city center traffic system construction Taiwan original focus on Old pedestrian space (such as arcade trail) walking space with new coordinate convergence, follow the principle of "first build oriented", the trail winds aspect grid, materials and facilities strengthen the existing building coordination [10]; Shenzhen Luohu Golden Triangle Area, all-weather pedestrian system planning focusing on ground and underground space development is the convergence point for coordination and definition of "with the traffic planning site (aerial tram station level) of convergence "principle, all levels are based on the overall status of walking system were coordinated convergence trail, form a multi-level, multi-dimensional way of foot traffic system.

V. IMPLEMENTATION MECHANISM CITY CENTER PEDESTRIAN PERSPECTIVE TRANSIT SYSTEM

A. Increase Stimulus Support

Three-Dimensional view of the city center pedestrian traffic system has insufficient promotion, construction technical difficulties, higher construction costs and other issues, low community participation in the construction of universal enthusiasm, therefore, could be considered to
increase the stimulus support and attract more attention who further promote the construction and implementation.

1) Planning incentives

Planning refers to incentives by rewarding land area or volume rate, the replacement property functions etc., to encourage private developers or private owners to participate in the construction of Three-Dimensional foot traffic system, and the construction of new and existing systems to link and improve overall development construction. Calgary, Canada as floor area ratio incentives, through regional planning regulations strict requirement of the new building and the existing pedestrian traffic must be coupled to the system, and as a quid pro quo, allowing the volume rate of new building plots to give the corresponding extent promotion; Hong Kong's area of incentives, by the developer or the owners of new buildings to provide additional gross floor area, to encourage new building and the surrounding existing or planned systems perspective pedestrian traffic convergence; Guangzhou replacement property policy, based on planning, management, security and other conditions, through to private developers or owners of private voluntary participation corridor construction to give preferential policies to change the function of the property, property replacement and other (within the scope of the connection layer and below the layer of Three-Dimensional system of walking), to provide them more development options, help increase participation.

2) Taxes incentives

Tax incentives means by taking "tax increment financing district," "tax relief concessions" and other systems, the establishment of tax incentives area to attract private developers or private owners to become more involved in the construction of Three-Dimensional traffic system to walk. Development strategy as the central area of Chicago, in underutilized land, delineated by "tax increment financing district," "tax relief concession areas" and "entrepreneurial zones" and other measures to promote land redevelopment and rehabilitation[11]; at the same time through tax breaks and other preferential treatment to attract more private capital investment, improve the planning of the central area Construction (including pedestrian traffic stereo system).

B. Encourage Diversification

Apart from giving the appropriate stimulus, the construction of Three-Dimensional city center pedestrian traffic system can also unpaid donations, engineering and construction companies recognize bundling etc., to encourage the diversification of sources of investment.

1) Donations

Given the differences in the economic benefits could be considered in the core area of the city center of the economic conditions are relatively attractive, unpaid donors to encourage private developers and private owners[12]. Practice shows that the higher economic attractiveness of the city center is an important condition for unpaid contributions to the implementation of the construction; office functions in some of the core business area, due to the high rents layer properties, many rental properties has a great story room for improvement, enhanced private developers or owners to invest in the construction of Three-Dimensional system of pedestrian traffic enthusiasm. Such as the construction of the flyover Minneapolis air corridor systems, private developers and the government in accordance with the value of the different accessibility are responsible for different parts of the building, the former major investment perspective pedestrian traffic system construction of the core area of the central area, the latter responsible for development and construction of the central area of the edge or remote areas perspective pedestrian traffic system (parking area associated with the core corridor, conference center and its associated line corridor, etc.). This way of unpaid donations practice in China's cities is also more common, often in the "public-private partnerships." Such as the construction of Shanghai Hongqiao business district core annular air corridor systems, during the planning of development in accordance with the different body systems planning to walk into a common segment (government investment) and open land segment (developer contribution).

2) Enterprise identify ways to build

The Government may consider increasing public-private partnerships on favorable terms, according to the road to sell a relatively large proportion of pedestrian traffic system perspective to private developers or private owners, and then play the combined effect of the construction business, to encourage more businesses donated behavior. You can refer to Taipei Xinyi District AirBridge system construction and implementation strategy, built by the municipal government system across the board1.44% sections, other sections built by private enterprise Shin Kong Mitsukoshi, Taipei Financial buildings. According to the survey, the highest proportion of donated air bridge Mitsukoshi said air bridge "can not only easy access to shopping, but also to promote the growth of business activity." Visible, encourage enterprises to conduct stereoscopic donated pedestrian traffic system is a effective way of financing, it is possible to solve traffic problems, provide the public with a pleasant walking space and active both commercial space and the people, businesses and governments win-win situation[13].

3) Project bundling mode

Government may consider bundling engineering manner, additional construction requirements, while
VI. CONCLUSION

The sense of constructions of Three-Dimensional pedestrian transportation system in city centers, not only limited to solving a simple problem of foot traffic level, but the city center is building a strategy of sustainable development. Learn from the successful experience domestic and abroad, should be in the future of urban planning and construction, to further explore the city center in line with local realities of the Three-Dimensional pedestrian transportation system construction and implementation of institutional strategies to alleviate the plight of the central area of spatial development, create economic, social and environmental benefits for the city.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

ACKNOWLEDGMENT

This work is supported by MOE(Ministry of Education in China) Humanities and Social Sciences Foundation (15YJCZH158).

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