

Three-dimensional structure of transport hub in urban environment

Napreenko Lidiya

Russian State University named after A.N. Kosygin (Technologies. Design. Art), Moscow, Russia

E-mail: 180194@stud.rguk.ru

Abstract: Transport is the backbone of any city. With its help, links are established between urban areas and the suburbs, as well as social interconnection is carried out. The hub makes it easy to transfer between different routes and types of public transport. The article discusses the classical classification of the tree-dimensional structures of transport hubs, as well as a new extended classification.

KEYWORDS: TRANSPORT, DESIGN, TRANSPORT HUB, URBAN ENVIRONMENT

1. Introduction

The processes of globalization and urbanization have led to the fact that about 52% of the world's population is concentrated in cities. Nowadays, for the metropolis, there is an acute issue of creating a high-quality urban environment, one of the key factors of which is public transport. It is needed to ensure freedom of movement around the city. Public and private transport, as well as pedestrian connections, form the skeleton of an urbanized area. Accordingly, transport planning is planning the freedom of movement of each citizen.

2. Preconditions and means for resolving the problem

A modern city is a complex system, which is the most important infrastructural component. The larger its transport network, the more complex its transport network. As it is difficult to cover all districts of the city with direct routes, the creation of transport hubs is one of the tasks for creating a high-quality urban environment. The transport hub combines three major components: transport, road network and passenger traffic (Figure 1). This integration serves to improve passenger comfort, simplify the operation of the transport system and reduce traffic congestion.

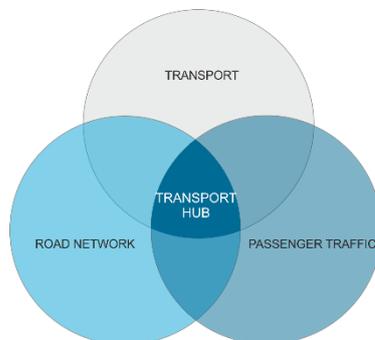


Figure 1. Scheme of transport hub

2.1 Theoretical Model

In the most general sense, a transport hub is any stopping point where a passenger can change a route or mode of transport [1]. In a narrower sense, transport hub is both an element of the urban environment and a three-dimensional structure that allows transplanting and solving a range of social and domestic problems.

A transport hub is an infrastructural element of the planning structure of a city for transport and public purposes, which performs the functions of distributing passenger flows between modes of transport and directions of movement, and also provides passengers with additional services in parallel [2]. Competently organized, including in a design context, transport hub is a point of attraction for the citizens and tourists.

The primary problem the designers at the planning stage of the transport hub at the intersection of transport and passenger flows are facing is to determine the three-dimensional structure of the hub. According to the classification in literature [1], all transport hubs are divided into two categories:

- flat;
- capital.

In this classification, the flat transport hub is exclusively intercepting parking lots (Figure 2).

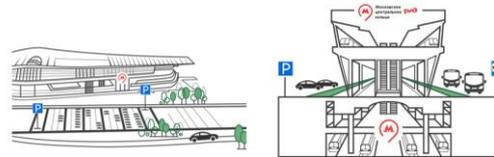


Figure 2. Scheme of transport hub: flat and capital

Having analyzed the examples of existing transport hubs, both in Russian and foreign practice, as well as the definition of transport hub as a public space that unites various types of transport, it is possible to expand this classification, considering the greater difference in structural options.

This article proposes the following classification of transport hubs in terms of three-dimensional structure:

- planar single-level transport hub;
- planar two-level transport hub;
- capital multilevel transport hub.

A single-level plane transport hub means that all pedestrian and transport links are on the same level. Transport hubs of this class can be seen in any, even a small city, for example, stopping several routes of one or several types of transport (Figure 3).



Figure 3. Planar single-level transport hub in Moscow, Russia

A planar two-level transport hub connects no more than two levels of pedestrian and traffic flows (for example, metro and bus). In the Austrian city of Graz, during the reconstruction of the station of the same name, the movement of tram lines underground made it possible to create a modern version of this type of transport hub [3]. Due to the division of human flows by the levels of the complex, all types of transport have a simple transition between themselves (Figure 4).

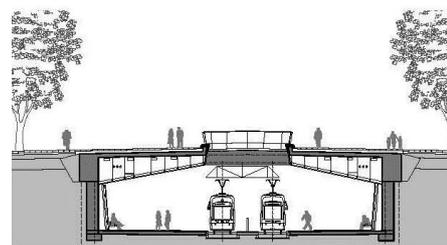


Figure 4. Planar two-level transport hub in Graz, Austria

Moving the existing stop underground could solve the problem of unsatisfactory location of routes relative to each other and dissociation of various types of public transport. The creation of a large area visible from all sides was a powerful impetus for the development of the attractiveness of this node, not only as a transport facility, but also as an urban space. At the same time, a bright accent was created in the form of a roof over several bus station stops. It is an oval disc-ring, which the locals call the "golden eye". Thanks to the golden material of the roof, this canopy creates a slight glow around it, and if you look at this material from below, from the very stop, it becomes clear that it reflects a slightly modified version of everything that is under this canopy, in particular passengers, buses and lanes for movement.



Figure 5. Transport hub Graz: in the foreground the illuminated light of the tram line, bus stops under the golden eye canopy and the railway station.

The advantages of planar transport hubs include the low cost of design and implementation, as well as the creation of a qualitatively new public space, which, in addition to the convenience of transplanting, can solve public and everyday problems by placing small architectural forms and small retail outlets.

Multi-level capital transport hubs are characterized by the presence of several levels, the purpose of which is to separate passenger flows and reduce the building area. To create a modern transport hub of this type, it is necessary to create a space that provides exceptional opportunities for passengers.

The West Kulun transport hub in Hong Kong is an exciting example of a multi-level transport hub (Figure 6). This international railway station covers an area of approximately 400,000 square meters. It includes fifteen underground tracks - nine for long-distance trains and six for transfers [4]. The exterior walls in the building are made of 4,000 glass panels, and curving white columns support the arched roof. The large glazing has been designed so that natural light penetrates even the lower levels of the transport hub.

The unusual structure is integrated into the landscape, with passengers immediately entering the checkout area, where flows are divided into arrivals and departures. For the first, the third underground floor is allocated, and for the second - the second, and platforms are located on the fourth underground floor. This solution allows you to maximize the division of human flows, while the halls are supplemented with small retail outlets, where you can find what you need on the road.



Figure 6. West Kulun's floor plan.

The use of underground areas for transport facilities is a common practice in China. Designers do not spend colossal areas in a built-up city on objects of short-term stay, because of this, less stringent requirements are imposed on insulation. The entrance at ground level is the most convenient for all groups of passengers using this transport hub. This solution allows you to divide users into those who are familiar with the structure of the site, who, for example, use it to travel to work, and those who are here for the first time. In addition, you do not need to use additional lifts - stairs and ramps to get to the transport hub. This standard technique will increase passenger traffic and significantly improve the quality of the environment of this transport hub (Figure 7).

The ticket area, located on this level, is complemented by navigation, which allows users of all categories to easily find the desired direction or platform. For non-standard situations, friendly staff are always ready to help, which is especially important for older passengers, since they are still more accustomed to asking for advice than looking for information on a digital display.



Figure 7. Transport hub West Kulun, Hong Kong, China Capital transport hubs are much more expensive in design, construction and operation, however, a large area allows you to place both full-fledged transport complexes and additional public and retail spaces, which can significantly reduce costs [5].

3. Conclusion

The use of one or another tree-dimensional structure of a transport hub should take into account both the existing urban development and landscape, and the estimated passenger traffic and the throughput of the future hub [6].

4. References

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