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ERGONOMIC ASPECTS OF INTERIOR AND EXTERIOR DESIGN IN RECEPTION TRANSPORT BUILDINGS

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Abstract The study examines current issues and trends in the design, ergonomics, and construction of ground station complexes. Best practices are examined based on the interconnection of different modes of transport, integration into the building structure, citywide transport functions, minimum intersections of passenger flow, spatial layout, and visual information environment, passenger comfort.

Keywords: Ergonomics; design; stations; bus stations; passenger flow.

1. INTRODUCTION

Rail, air, and road transport have long been widely developed in our country and Europe. They correspond to a system of buildings and structures designed for passenger transport that has been developed over decades – road and rail stations, airports, etc. In connection with improving the quality of life of the population, the existing system of surface passenger transport services also needs modernization, as it does not meet modern requirements. This is due to many problems that are manifested in the operation of this type of facility, such as the mismatch between passenger flows and station capacity, the low level of convenience, the underdeveloped service network, the lack of cultural and social infrastructure, and the inefficient use of the territory.

2. CURRENT STATE

The relevance of the topic is related to the dynamic change in the architectural and spatial structure of the city and the development of transport. The study traces the exterior and interior spaces of railway stations and bus stations in three Bulgarian cities. The object of the report is the contemporary state of waiting rooms and station forecourt around transport buildings. The subject is focused on the ergonomic aspects in the design of the pedestrian space and waiting area in Bulgarian railway stations and bus stations. The aim is to observe whether the basic principles and requirements for the safety and convenience of railway stations and bus stations in large cities are met. To achieve the set objective, the following tasks are solved: an analysis of the current state of transport reception buildings in Bulgaria is made; comparisons with similar buildings in other world cities are made; good practices are analysed and conclusions are drawn for optimizing the spaces in waiting areas.

Buildings for railway transport in Bulgaria were constructed in the first half of the 19th century, while buildings for road and air transport began to be constructed only in the first quarter of the 20th century [3, 4, 5]. The term transport reception buildings refer to a building or group of

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buildings constructed immediately adjacent to the roads to serve travellers by various means (for rail, water, air, or road transport).

Transport buildings have different subgroups, including buildings serving passenger transport and buildings serving goods transport. The buildings of passenger transport or the so-called reception buildings at the various stations are considered here [3, 4, 5]. Station buildings fulfilled several functions at the same time – serving passengers, transporting mail, luggage, and other goods, managing and controlling traffic, etc. In the station building itself, suitable conditions must be provided for passengers to rest, regardless of the length of their stay, to obtain food (in the restaurant or the buffets), and to satisfy certain cultural, domestic, and sanitary needs [2]. The following groups of premises are formed:

• Passenger service facilities (waiting rooms; operating room with ticket offices; post office; bank branches; currency exchange offices; travel and hotel agencies; restaurants, breakfast rooms, cold buffets; toilets with showers; hairdressers; small hotel at large stations; other outlets selling newspapers, magazines and souvenirs; medical and pharmacy; at border stations, as well as at air and sea stations, facilities for customs control are also provided);
• Premises for goods and luggage - reception area conveniently connected to the station forecourt and the operation hall, store, and transport corridors (tunnels);
• Administrative premises for station management
• Communication rooms - tunnels, passageways, and platforms. Railway pedestrian tunnels are more than 3-4 m wide. Platforms are built 6-12 m wide and 300-400 m long. They should be covered.

Bus stations are buildings serving medium and long-distance bus transport, providing for the arrival and departure of passengers. Bus stations are divided according to the area they serve - suburban trips, long-distance trips, and international trips. Bus stations consist of:

• Reception building - it houses the main administration, traffic control, offices of transport agents, passenger and baggage service rooms;
• Station forecourt – here, as at the railway stations, the separation of passenger flows begins. It is also where communication with the city or the part of the city being served takes place. The station forecourt has several zones - pedestrian, transport (parking lots, garages, etc.). Bus stations are single-level buildings due to the lower passenger flow and freer layout compared to railway stations. The main building is the reception building, where the main administration is located, traffic control is carried out, the offices of the transport agents are positioned, and the passenger and baggage service rooms are located.
Servicing of passenger flows takes place directly between the station forecourt and the platforms [3, 6].

When selecting a site for station buildings in large cities, taking into account the location, type, and category of the station building itself, it should be considered the following:

• To create the greatest facilities for passengers in the reception building as well as safe and convenient access to it and the tracks/platforms;

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• To allow for the future development and expansion of station facilities and passenger accommodation to accommodate future increases in passenger/traffic flows;
• To comply with all urban planning principles regarding the layout of the station forecourt, communication, and the general architecture of the station ensemble;
• To provide for the possibility of including the station complex in the general development of the settlement;
• To create a convenient connection to all parts of the settlement with the shortest possible route, which means locating the station junction at the intersection of several urban highways, and in some cases - in the centre of the settlement with the track at the level, below the level or above the level of the street network [1, 2]. The passenger facilities, waiting areas, and the station forecourt are the city's visiting card. We will follow the space in these areas in three Bulgarian cities – Sofia, Varna and Stara Zagora.

The new building of the Central Railway Station – Sofia (Figure 1, 2) was opened on September 6, 1974 [8]. The decorative layout in the main reception hall on the wall above the ticket counters is in metalwork, spread over 200 square metres. The interior has been renovated to meet European safety requirements. The waiting areas are decorated with elements of biophilia. Less welcoming and safer is the forecourt area. It is difficult for people with special needs and passengers with luggage. There are obstructions with the pavement along the route, the lighting, in the darker hours of the day, is poor. There are no suitable and sufficient waiting places outside the building. The air is polluted as the station forecourt is adjacent to a major boulevard.

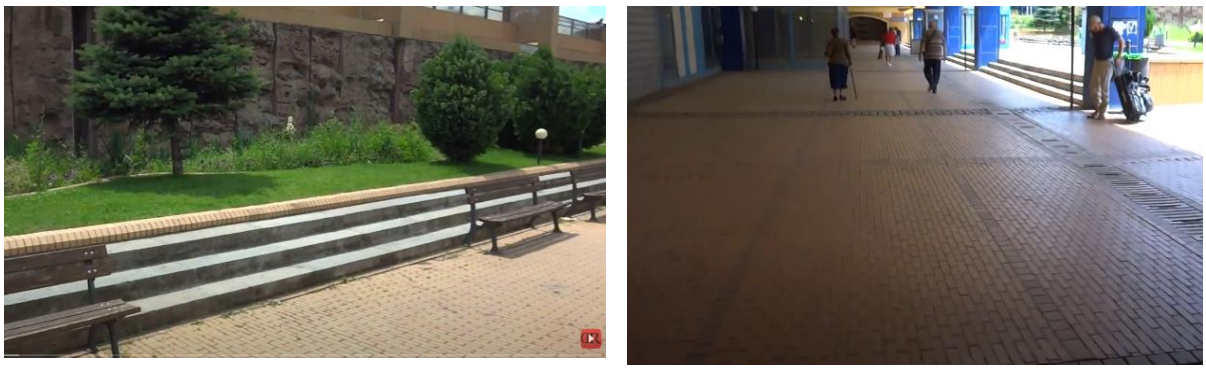

Figure 1. Forecourt Square – underpass and pedestrian zone, Sofia.

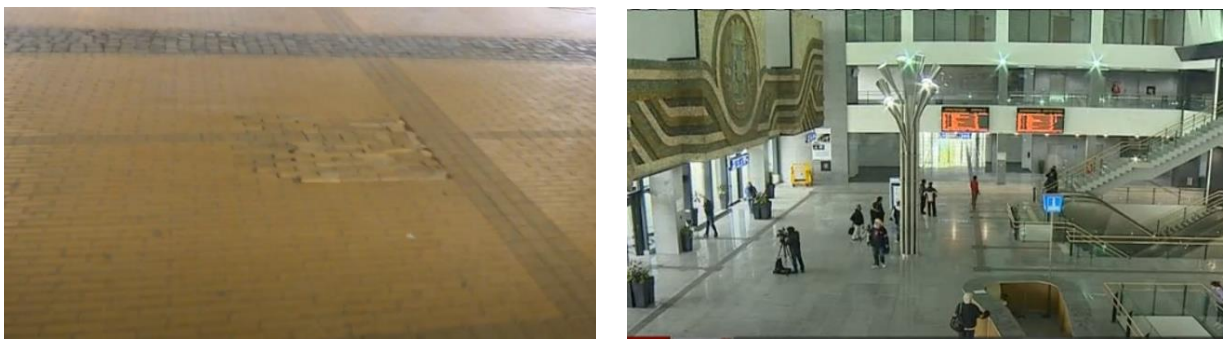

Figure 2. Running line and renovated interior of Sofia Central Railway Station.

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The building of Varna railway station was declared an architectural monument of local importance and was opened on March 3, 1925. The interior does not meet the requirements for a safe and comfortable stay. The waiting area is inadequate and has insufficient seating for the passenger flow (Figure 4, 5, 6). There is no clear demarcation of arrival and departure areas. Pigeons fly in the area and the area is littered with their droppings.

The forecourt is in a deplorable state – uneven ground for pedestrians, with fast food restaurants. The landscaping of the forecourt is not maintained. The bus station building in Varna was built in 1971. It has long since failed to meet modern requirements. For this reason, the building is being constructed according to a new design (Figure 3), observing all European safety requirements. There are comfortable waiting areas inside and outside, a foreourt with landscaping is designed [7, 9].

Figure 3. 3D design of Varna bus station.

Figure 4. Varna railway station – interior.

Figure 5. Varna forecourt – before.

Figure 6. Varna railway station, forecourt – now.

The railway station complex – Stara Zagora [10] was completely reconstructed, including all installation systems and the reception building (Figure 7). A complete architectural renovation of the station has been carried out, and the electrical installation, water supply and sewage systems, etc. have been replaced under European standards in the field. The objective is to ensure the safety of passengers and the quality of transport services offered.

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Figure 7. Modernised look of Stara Zagora railway station.

The principle of diversification of transport function implies that the interconnection system performs the function of linking several modes of transport and pedestrian flows. This principle should emphasize two aspects: the interaction of different modes of transport and the organisation of pedestrian movement concerning vehicles. In most Bulgarian cities, the distance between the bus station and the railway station is long, there is a lack of convenient and fast transport between the two structures or there are two bus stations (in Varna - old and new; in Burgas – south and west), which creates difficulties for the passengers.

The main function of a public transport facility is to transfer passengers between different modes of transport. The main priority in the operation of the intercity complex is pedestrian routes in terms of vehicles, which should be minimal as well as safe and convenient. The principle of diversification of the transportation function implies the distribution of priorities for people moving through the interstate complex in any modern city. In this regard, pedestrians should be given top priority in the design of transportation receiving facilities: the lack of underpasses and overpasses, wide sidewalks, and narrow access roads make it difficult for travelers to access transportation. People need to feel comfortable, to move freely and safely around the stations and bus terminals and their adjacent parking and public transport stop. The scarcity of urban territory requires a continuous modernisation of the functional and planned organisation of public transport facilities.

Good practices around the world show that, in the design and operation of modern transport complexes, the separation of passenger flows inside the building is carried out in the following two ways:

1. The spatial method of separating passenger flows involves separating the waiting area (e.g. boarding the train) from the disembarkation area. In St. Petersburg, Russia, in the new complex, the separation of arriving and departing passengers is provided at different levels (Figure 8). This method is applicable both in international airports, which have sufficient space to accommodate both groups of passengers, i.e. with significant facility capacity, and in railway stations and bus stations.

Figure 8. Railway station in St. Petersburg.

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2. With lower passenger flows it is not practical to create two independent passenger areas. A common waiting area layout is becoming a widespread solution. This architectural and spatial proposal is based on the lack of temporal overlap between the process of passengers boarding and disembarking from a ship, plane, train, or bus, as implemented in the Sydney and Miami [11, 12] train stations (Figure 8, 9).

Figure 9. Railway station – Sydney and Miami.

3. CONCLUSION

In conclusion, we can summarize that the design of intercity and international transport complexes can be carried out based on new principles, by creating architectural and planning solutions for these receptive transport buildings, taking into account various factors (urban planning, functional-technological, socio-economic, environmental, sanitary and hygienic, etc.) that provide the most rational functioning of transport stations in the structure of the modern city.

The need to study advanced domestic and foreign experience, and to make appropriate recommendations for the design and construction of modern transport complexes must meet the growing demands of a particular country's population.

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