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**OVERVIEW OF ELEMENTS OF ACCESSIBILITY ON RAILWAY
TRANSPORT FACILITIES AFTER THE PERFORMED WORKS FROM
ASPECTS OF PERSONS IN WHEELCHAIRS**

Key Words

Cross checking
Reconstruction
Railway
Accessibility

Abstract

Modernization and reconstruction of railways include measures that require the application of standards in both design and execution of works. The obligation to adhere to the application of both domestic and foreign standards, instructions, and regulations is defined by the law on construction. Although the project documentation also performs the necessary control and approval of the facilities that need to be reconstructed or modernized, it happens that the constructed facilities do not meet the needs of all users or are not constructed adequately. This paper includes examples of two facilities: the Belgrade Centre railway station and the Rakovica - Resnik railway section. The paper presents the elements of accessibility, with the observed advantages and disadvantages, on the facilities and planned railway traffic services after the performed works from the aspect of persons in wheelchairs.

1. INTRODUCTION

Although significant progress has been made in the development of transport infrastructure for many years, there are still obstacles for all users of the transport service that do not allow full access [1]. Whether it is road, rail, water or air transport, attempts are being made to implement similar measures not only on infrastructure, to which it is necessary to provide adequate access, but also on the arrangement of

adequate vehicles. With such a universal approach, it is possible to provide better service to all transport users.

The improvement of the railway infrastructure in the Republic of Serbia, after a long period of inability to invest in the regular maintenance of the railway, is increasingly gaining another more favorable situation. Special attention in railway traffic is increasingly paid to the accessibility of facilities and the service provided to persons with reduced mobility, which includes persons with disabilities.

This paper presents certain problems that people in wheelchairs may face in the realization of railway transport on the reconstructed parts of railways and stations.

2. LITERATURE REVIEW

Responsibility and access of the whole society can have the impact of better living conditions, which enables equality of persons with disabilities in all aspects of social needs [2]. Although this document was published twenty-three years ago, the principles set are still relevant today and a lot of effort and understanding is needed to establish them.

Solving the problem of people with disabilities in wheelchairs and access to railway stations was done by physical arrangement and enabling accessibility. Some research on the level of train accessibility and opportunities for barrier-free travel are analyzed per regions in the Czech Republic, after certain interventions on infrastructure as well as comparisons of the situation with other countries [3]. Based on the observed accessibility criteria, a database of urban railway systems and their assessment by continents for people in wheelchairs was created [4]. The conclusion of this document is that such studies can contribute to indications for improving the accessibility of railway systems. One of the regular ways of evaluating transport systems is the assessment of user satisfaction with the level of quality and accessibility. In [5] it was found that on the Danish Railways as an important influence on overall travel satisfaction that accessibility is very important.

Numerous literature in this area indicates that it is necessary to observe the personal opinion of railway users in order to make certain improvements, whether it is infrastructure or type of service.

3. FUNCTIONAL SPACE OF RAILWAY STATIONS AND HALTS

In the area of the station or stop where the reception-dispatch of passengers is performed, it is necessary to provide safe access, easy navigation and movement in the area with good connections and orientation that such a facility requires. It is necessary to bring and take the passenger from the area of the official place in the best and shortest way, and in the area of the station or stop it is necessary to provide him with insight and give all the information about the station contents [6] - [7].

4. ASSESSMENT OF THE FUNCTIONAL SPACE OF RAILWAY STATIONS AND STOPS IN THE PART OF THE BELGRADE RAILWAY JUNCTION

In order to review the performed works, their accessibility and usability, the reconstructed sections of the railway and the station in the Belgrade railway junction were selected, namely the section Rakovica-Resnik and the station Belgrade Center.

4.1. Rakovica - Resnik railway section

There are two stations and two stops on this reconstructed section. Passengers are received and dispatched at the observed stations and halts.

Rakovica station

Access to the platforms is done through roads and underpasses that lead to the platform. As part of the reconstruction that was carried out, the access roads were not treated, so it is not possible for people with disabilities to reach the platform because the existing stairs are not adapted, Figure 1-2. For access to the platforms for people in wheelchairs, mobile platforms that are not in function have been set up, Figure 3. The platforms that have been reconstructed have been placed at a height of 0.55 m, through which it is possible to enter in the level of new railway passenger vehicles without hindrance, Figure 4. There is no parking space for people with disabilities in the station area.



Figure 1 . Access by street



Figure 2 . Access by street

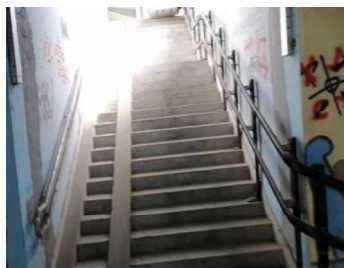


Figure 3. Access to platforms



Figure 4. Platforms

Knezevac halt

Access to this halt exists on both sides, and the platform is reached with a footbridge, Figure 5. Arrival by footbridge is not possible for people in wheelchairs because there is no elevator, Figure 5. The reconstructed platform was placed at a height of 0.55 m, through which unhindered entry into new railway passenger vehicles was enabled. In the stop there is no arranged parking space for people with disabilities.

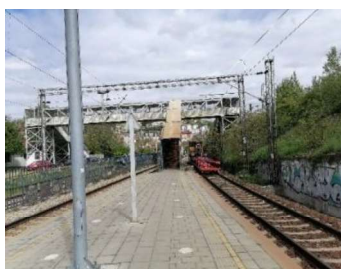


Figure 5. Access to the platform and platform

Kijevo halt

Access to this halt exists on both sides, and the platform is reached via pedestrian and road roads. On the one hand, the slope of the access ramp enables independent movement of persons in wheelchairs, Figure 6, and on the other hand, independent access of persons in wheelchairs is not possible, Figure 7. There is no parking space for people with disabilities in the stop.



Figure 6. Access to the platform



Figure 7. Access to the platform

Resnik station

Rakovica station is open for receiving and dispatching passengers and goods. Reconstructed capacities for passengers and platforms were accessed via local roads and footpaths, (Figure 8-9). The first and third platforms have been reconstructed to a height of 0.55 meters, which enables wheelchair access to level all new passenger railway vehicles. Direct independent arrival of persons in wheelchairs is possible only on the first platform, (Figure 10). Access to the third platform can be done only through underpasses and mobile platforms that are not in

function, (Figure 11). Another platform on which it is possible to receive a passenger train due to its height is not possible for people in wheelchairs to enter. The width of the second platform does not provide sufficient safety for the movement of all passengers when there are passengers in wheelchairs on it. There is a parking space for access for people with disabilities.



Figure 8. Access to the underpass, platform and parking lot



Figure 9. Access to the underpass from the street



Figure 10. Access to the platform



Figure 11. Access to the platform from the underpass with movable platforms

4.2. Belgrade center station

The Belgrade Center station is the largest passenger station in the Belgrade railway junction. Arrival and departure of passengers at the railway station is possible through city and taxi transport and private cars from access roads and pedestrian paths. Access to station capacities and tracks is realized through stairs and elevators. The height of the access sidewalks, although done almost level, does not allow independent safe movement of persons in wheelchairs, (Figure 12-13). The built-in elevator construction enables unhindered movement from the access plateau to the platform for people in wheelchairs, (Figure 14). For the reception of passengers who cannot move independently or a person with a disability, there are also stationary wheelchairs, (Figure 15). In the area of the Belgrade Center station, there is access to the station ticket office from the platform via a mobile platform that is not able to transport a person in a wheelchair, (Figure 16). Access to platforms in all vehicles that cannot be entered in the level is possible only from the platform (closest to the exit) by means of a movable vertical ramp for wheelchairs, (Figure

16). Arrival from one platform to another in the current state is not possible between all platforms and it is done exclusively through the underpass. Access to platforms where there are sloping ramps is not possible due to the large slope that cannot be overcome by people in wheelchairs, (Figure 17). There is a parking space for access for people with disabilities.

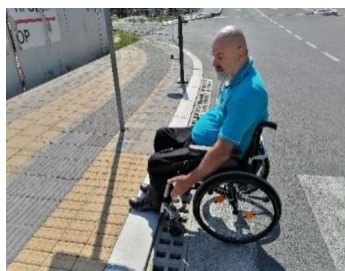


Figure 12. Access to the pedestrian road next to the station

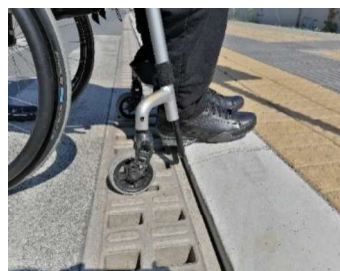


Figure 13. Curb on the pedestrian road next to the station



Figure 14. Access elevator construction towards the platforms



Figure 15. Station service for transportation of a person in a wheelchair



Figure 16. Station service for entering railway vehicles and moving ramp for going to the ticket office

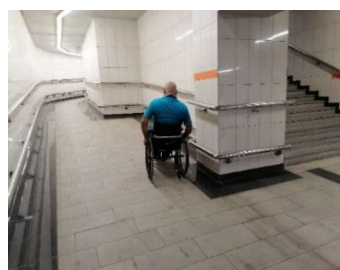


Figure 17. Sloping vertical ramp to the platform

5. CONCLUSION

In various activities carried out by associations of persons with disabilities at the national level, the Republic of Serbia, are not always able to independently achieve the desired results. The results of the research on the line Rakovica - Resnik indicate: 1. partial solution of platform and track capacities in the station Rakovica and the Kneževac stop did not provide accessibility of the complex, 2. access pedestrian paths on one side in the Kijevo halt were not built at an adequate slope, 3. in the station Resnik direct access without problems is provided only on the 1st. platform. The results of the research at the Belgrade Center station indicate to us: 1. Access pedestrian paths on roads and platforms do not enable independent movement of persons in wheelchairs, 2. Access to all station facilities is not possible. The general conclusion for the line Rakovica - Resnik and the station Belgrade is that despite the great effort in arranging accessibility, access to all facilities and independent access to the platform for people in wheelchairs is not provided. Another important note is that instead of installing movable platforms for the movement of persons in wheelchairs, it can only be replaced by an elevator construction that allows all other persons with reduced mobility to move freely. Although there are many positive solutions for people with disabilities, the example of the city of Vienna with the latest solutions could be taken as an example in the entire Republic of Serbia. As the first next step, it is considered that partial observation and solution of railway lines or stations cannot bring significant results and improvements, but this must be observed on the entire railway network and expanded in interaction with other modes of transport. As the second next step is to present this problem of insufficient technical knowledge of associations of persons with disabilities, they must have the support of the wider professional (technical) public to solve individual problems in performing works and educating supervisory bodies on construction sites.

REFERENCES

- [1] "Improving Transport for the People with Mobility Handicaps," European Conference of Ministers of Transport, 1999.
- [2] "The Disability Concept of The Austrian Federal Government", Federal Ministry for Labor and Social Affairs, Section IV, 1998
- [3] J. Matuška, "Railway system accessibility evaluation for wheelchair users: case study in the Czech Republic", *Transport*, Volume 32 (1): pp 32–43, 2017.
- [4] A.F. Ferreira, A.D. Leite, L.F. Pereira, et al., Wheelchair accessibility of urban rail systems: Some preliminary findings of a global overview, *IATSS Research*, <https://doi.org/10.1016/j.iatssr.2021.01.003>
- [5] M. Brons, M. Givoni, P. Rietveld, "Access to railway stations and its potential in increasing rail use", *Transportation Research Part A* 43, pp 136–149, 2009.

- [6] UIC 10181 (User information in Railway Stations),
<https://uic.org/passenger/passenger-railway-stations/>
- [7] UIC 140 (Eurostations - accessibility to stations in Europe),
<https://uic.org/passenger/passenger-railway-stations/>
- [8] COMMISSION REGULATION (EU) No 1300/2014 on the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility