

Analysis of requirements and the necessary investments in the railway station adjustment program for persons with special needs*

UDK 330.322:[656.211:364-787.522]

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Abstract: People with special needs from the standpoint of social communities have specific requirements for access, mobility, entry and exit of railway vehicles designated to transport passengers. The EU has defined standards and requirements related to persons with special needs. The aim of this paper is to analyze the technical requirements of equipment and identify the necessary investment funds related to the increasing mobility of persons with special needs in the rail transportation system. This analysis would be one of the initial steps approaching the conditions and requirements that apply in the EU in adapting the system of transport for people with special needs.

Keywords: people with special needs, investments, mobility, technical-technological requirements, phase solutions, railways

Rezime: Osobe sa posebnim potrebama sa stanovišta društvenih zajednica imaju specifične zahteve u pristupu, kretanju, ulasku i izlasku u železnička vozila namenjena za prevoz putnika. EU ima definisane normative i uslove vezane za osobe sa posebnim potrebama. Cilj ovog rada je da se analiziraju tehničko-tehnološke zahtevi u vidu opreme i naznače neophodna investiciona sredstva, vezana za povećanje mobilnosti osoba sa posebnim potrebama u sistemu prevoza železnicom. Ova analiza bila bi jedan od početnih koraka približavanju uslovima i zahtevima koji važe u EU u oblasti prilagođavanja dela sistem transporta osobama sa posebnim potrebama.

Ključne reči: osobe sa posebnim potrebama, investicije, mobilnost, tehničko-trehološki zahtevi, fazna rešenja, železnice

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* This paper forms part of the results of research on project TR 36040 financed by Ministry of Education and Science of the Republic of Serbia

1. INTRODUCTION

Persons with special needs (Persons with Reduced Mobility - PRM) are a part of the overall population which has minor or larger problems regarding access and use of transportation services due to their health, psychomotor or other impairments. According to various European Union conventions (as well as the conventions of many other global organizations - UNICEF), all persons with reduced mobility must have equal position with the persons without specific needs. This category of population includes:

- a) Persons with impaired mobility (either using wheelchairs or generally),



- b) Blind persons,



- c) Partially sighted persons,



- d) Other persons with intellectual disabilities, persons with other disabilities such as asthma or orientation problems, elderly people and parents with

small children.



Europe seriously considers these increasing categories of population thus becoming a significant part of the transportation market. In numerous announcements, UIC International Union of Railways has proposed and ordered its members to enable equal use of railway to the persons with special needs as the persons without such disabilities by means of paying special attention, technical solutions and additional investments. On the Serbian railway network, development of the model project has not started yet, also investments in equipment, technical solutions or phases are not planned.

Necessary investments for equipping railway stations with devices and equipment for persons with special needs are not small. The number of railway stations on the Serbian railway network should be primarily considered, followed by individual costs of various types and classes of equipment intended for persons with special needs. Therefore, investment activity should be split into phases with priority given to those railway stations with the largest transport operations in passenger transportation.

1.1 EXISTING REGULATIONS – UIC REGULATIONS

UIC International Union of Railways has set and ordered, thus giving the recommendation to all its members regarding the manner and technical technological requirements for solving these issues. Documentation or reports, announcements supporting the activities for resolving these issues are discussed through documents also present on the European Union level and as such provide clear and obliging recommendation to be implemented as much as possible in national reports, instructions and laws regarding persons with special needs or persons with reduced mobility (European Directive 2008/164/EC, European document COST 335 and UIC 140 Accessibility to Stations in Europe).

1.2 PRESENT EQUIPMENT OF OFFICIAL PREMISES ON SERBIAN RAILWAYS

On the Serbian Railways network passengers departed from 590 official premises (292 stations, 277 stops and 21 other official premises). On railway stations Beograd, Novi Sad, Niš, Subotica, Kraljevo and Čačak, there is partially placed equipment for persons with special needs, namely for partially sighted persons. Equipment on these stations consists of rough surfaces in parts of station area and panels of special type. For arrival and departure of passengers with special needs in wheelchairs, the following railway stations are equipped: Beograd, Novi Sad, Vrbas, Bačka Topola and Subotica. Passenger, a person in wheelchair, takes a certain specified place in the car which is technically equipped for their transportation in trains. As a part of the transportation service, persons in wheelchairs are provided with the following: parking lot for motor vehicle used for persons with special needs in wheelchairs, access without stairs special mobile lifts used for lifting persons in wheelchairs so that they can enter the passenger car or to get off the passenger car.

From the abovementioned, it can be seen that only 2.73% of railway stations are partially equipped compared to the total number of official premises. It should also be mentioned that the existing equipment in the stated official premises does not meet the main needs in this area at all and the stated stations are not equipped with all necessary equipment for persons with special needs either.

2. ANALYSIS OF REQUIREMENTS AND THE NECESSARY INVESTMENTS, INFRASTRUCTURE AND SIGNS FOR MOVING AND GUIDING PERSONS WITH SPECIAL NEEDS

Arrival and departure of passengers does not refer only to issuing tickets, it refers to the entire process from the arrival of passengers to the official premises

(station building), use of facilities at the station and departure of passengers from the station platforms.

Accessibility to passengers with special needs, or persons with reduced mobility, can be observed through this sequence or chain that can be interrupted at the weakest points (street, access without stairs, ribbed rubber walking pads, elevator or another means for taking over or transporting persons, gaps between platforms and transportation means, transportation means).

The main elements that have to be fulfilled for solving transportation availability to all persons with special needs, or with impaired mobility, are reflected through several elements [3], [2].





- Investment activity for equipping and construction of infrastructural parts of railway station intended for the use by persons with special needs: access roads, sidewalks, parking areas, special parking lots,...
- Investments in equipment for ordering, ticket sale and giving necessary information – available systems for ticket sale with audio-video instructions and Braille alphabet for blind and partially sighted persons,
- Investments in transport means – vertical transport – by means of elevator and stairs with handrails for persons in wheelchairs,
- Investments in the preparation of bridges for overcoming the gap between platform and train – plan for solving the gap between platform and vehicle for wheelchairs,
- Investment – guide for blind and partially sighted persons and ribbed rubber walking pads and locations where it is easy to recognize the change of movement direction,
- Investment in improving and adaptation of part of transport means – in vehicles the following should be provided: places for persons with impaired mobility, monitors and service information, illuminated panels displaying the next stop, warning light when the door closes,
- Investment in public security – visual and acoustic systems, emergency systems or intercoms, possibility for front exit from the train in case of emergency situations, special chairs for carrying persons that cannot walk and special cars for the transportation of persons in wheelchairs over the tracks.
- Investments in the procurement or reconstruction of railway cars
- Other accompanying investment activities

Identification or presentation of critical locations for the movement of persons with special means or with impaired mobility is grouped into a set of functional entities.

The next table shows the necessary equipment – according to the abovementioned regarding investments, required for various categories of persons with special needs on a railway station. It should be highlighted that the

needs of persons with special needs are not the same for different categories they belong to (categories a,b,c and d).

Functional entities of a railway station altogether represent the entire area of the railway station, which persons with reduced mobility can use in the phase of implementing their need for travel.

Equipment type				
Access to station				
Parking – dedicated number of parking lots	x	x	x	
Sidewalk	x	x	x	
Access without stairs	x			
Rotating door *	x	x	x	
Area of station building and platforms				
Automatic sliding doors	x	x	x	
Stairs and handrails		x	x	
Toilets and equipment	x	x	x	
Ticket machine	x	x	x	
Cash desk	x	x	x	x
Phone booth	x	x	x	x
Equipment in waiting lobbies	x	x	x	x
General map of platforms	x	x	x	x
Ticket barrier	x	x	x	x
Elevators on platforms	x	x	x	
Sheds*	x	x	x	x
Information panels and points for emergency calls	x	x	x	x
Ramp for entering the car from the platform	x		x	
General features				
Ramps for pedestrians	x	x	x	
Sensitive warning lane	x	x	x	x
Luggage cart			x	
Electronic guiding systems		x		

From the aspect of investment activities in the stated equipment on railway stations, it should be highlighted that equipment for persons with special needs

is specific by its type and manner of production. Global experience states that such type of equipment is up to 50% more expensive than similar equipment for commercial program.

3. INVESTMENT - NECESSARY EQUIPMENT FOR PERSONS WITH SPECIAL NEEDS

UIC recommendations refer to all railway stations on the railway network of a member railway authority. Type and size of investment are primarily based on the number of passengers with special needs that use railway on the stated railway station, total number of passengers on the stated railway station, travel pattern of passengers with special needs, total number of passengers in town or railway station zone, etc.

In the Republic of Serbia there are about 800,000 persons with different kinds of disabilities (Source: TV Studio B, February 12, 2011 | 10:57). Compared to the total number of population, it arises that in the Republic of Serbia there is between 10-15% of population with various kinds of disabilities, which is a high number.

Distribution of the number of passengers by official premises.

As none of the investments can be implemented at once in this scale (we mention that there are totally 292 stations, 277 stops and 21 other official premises on the Serbian railway network), equipping of stations with equipment for passengers with special needs should be implemented in phases.

Phased implementation of investments provides the following advantages:

- It gives the opportunity to entirely implement an investment in accordance with actual possibilities
- It gives the opportunity to finalize the investment
- It gives the opportunity to monitor and control the investment
- It gives the opportunity not to dissipate funds on a large number of activities

According to the conducted researches and based on recommendations, investments in phase I would include the following railway stations:

Belgrade	Novi Beograd	Novi Sad
Pančevo	Niš	Subotica
Zemun	Valjevo	Užice

Note: 41% of total passenger transport on the Serbian Railways is realized on the stated stations (1-9) (source: Serbian Railways statistics). Priorities in investments among the stated stations regarding the equipment for passengers with special needs can be the subject of another paper by applying multicriteria analysis or FUZZY logics.

In the second phase, priorities would be determined according to special criteria and by applying multicriteria analysis and they would involve all other railway stations on the Serbian railway network.

By applying unit prices and actual needs by railway stations, the following table shows investment values for equipping railway stations with equipment and means in accordance with the needs of persons (passengers) with special needs, namely for phase I only. Prices were calculated based on average prices, VAT excluded, without design and supervision costs, without structural interventions in the parts and areas included in the government budget and which would be used by all passengers on railway stations. Investment value given in the form of bill of quantities refers only to the necessary funds according to the calculated amounts for the needs of passengers with special needs.

No	Type of equipment	STATION								
		BEOGRAD	NOVI BEOGRAD	NOVI SAD	PANČEVO	NIŠ	SUBOTICA	ZEMUN	VALJEVO	UŽICE
A	Access to station									
	Total	69950	55300	56550	35300	24800	25300	26550	24800	27800
B	Area of station building+ramps									
	Total	220000	213000	208500	132500	205500	146000	238000	129000	218000
C	Total: A+B	289950	268300	265050	167800	230300	171300	264550	153800	245800
D	Total	2056850								

Total required investment value for equipping railway stations with necessary equipment for persons (passengers) with special needs is 2,056,850 EUR.

Total investment for equipping all official premises on Serbian railway network is not reciprocal to the number of departed passengers by official premises. It is stated that in the first phase only 9 official premises – stations should be equipped according to the conducted analyses, where 41% of the total railway transportation occurs. European tendencies are such that each railway station should be equipped with minimal technical infrastructural means related to the persons with special needs. According to the Law in design in the EU, new infrastructure designs have to contain parts referring to technical and infrastructural solutions referring to passengers with special needs.

4. CONCLUSION

This paper shows requirements and the necessary investments for equipping railway stations with necessary resources for persons with special needs. Requirements and investment program has a phased character and it cannot be expected to implement the entire investment at one time. International organizations, primarily UIC and UNICEF, in their announcements and proposals gave instructions to all railway authorities primarily in Europe to keep to the attitude and adapt their transportation systems for the purpose of overall equality among passengers.

Railway stations within the Serbian Railway Network possess modest equipment and infrastructure which cannot enable the equality for both passengers with reduced mobility and ordinary passengers in using transportation systems.

Total required investment value for equipping railway stations with necessary equipment for persons (passengers) with special needs is 2,056,850 EUR. The calculated costs are negligible compared to the budgets of public enterprises, in the case of Serbian Railways.

Existing papers in this area of bringing railway closer to persons with special needs are used as the starting point for further researches in this area. Proposed measures in this paper surely represent the basis for extended researches in this area. Analysis of requirements and the necessary investments are surely one of the following researches in this area by applying multicriteria analyses or FUZZY logics.

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To cite article, use the following format: Atanasković, P., D. Đorđević, D. Sajfert: Analysis of requirements and the necessary investments in the railway station adjustment program for persons with special needs, Industrija, Vol. 40, No. 1, pp 191-199