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**ON THE ISSUE OF COMPLIANCE OF THE INFRASTRUCTURE
OF RAILWAY TRANSPORT FACILITIES FOR SERVICING
LOW-MOBILITY GROUPS OF THE POPULATION**

Abstract. In a civilized society, the attitude towards people with disabilities is one of the most important indicators of its development. According to statistics, about 10% of the world's population suffers from various ailments that limit their physical abilities. Over time, this indicator will only grow, this, in turn, is due to man-made factors, an increase in life expectancy, injuries, diseases, etc. The article examines the experience of developed countries in creating accessible transport infrastructure for low-mobility groups of the population.

Various options and practical solutions for the construction and modernization of transport facilities are being considered, taking into account the service of low-mobility groups of the population.

Practical recommendations have been developed that can be used as a basis for the design, modernization and construction of railway infrastructure facilities, as well as creating conditions for low-mobility groups of the population.

Keywords. Railway transport, infrastructure, facilities, low-mobility groups of the population, people with disabilities, accessible environment, recommendations.

Introduction.

The attitude of the state towards the most vulnerable segments of the population and, first of all, to citizens with disabilities, as a rule, is an objective criterion determining the social well-being of the entire population.

The social policy currently being pursued in the world with regard to people with disabilities is the result of the socio-economic development of society over the past decades. The aim of this policy in almost all highly developed countries is to ensure equal opportunities for persons with disabilities. The term «ensuring equal opportunities» as defined in the Standard Rules on Ensuring Equal Opportunities for Persons with Disabilities, adopted by the UN General Assembly on December 20, 1993. (resolution 48/96), means «the process by which various systems of society and the environment, such as services, work and information, are made available to all, especially persons with disabilities» [1].

According to the normative literature, low-mobility groups of the population mean people who have difficulty moving independently; receiving services, necessary information or spatial orientation.

Based on this definition, the following can be attributed to the low-mobility groups of the population:

- people with disabilities (vision, hearing, musculoskeletal disorders – on crutches and wheelchairs);
- older people;

- pregnant women;
- people with baby strollers, etc .

Let's briefly consider the infrastructure, in more detail with the structures, standards for designing for low-mobility groups of the population can be found in the textbook [2].

In railway station buildings, the following basic service facilities and facilities should be provided for low-mobility groups of the population: lobbies; operating and cash rooms; hand luggage storage; special waiting and rest rooms - mother and child rooms, long-term rest rooms; restrooms; additional service rooms: retail (dining) halls of catering outlets; retail, pharmacy and other kiosks, hairdressers, points of communication enterprises, payphones; office premises: station attendant, medical aid point, security, etc.

Materials and Methods.

On foreign high-speed highways, extremely high attention is paid to the issues of servicing low-mobility groups of the population.

To ensure the possibility of unhindered movement and maintenance of low-mobility groups of the population on the territory of the passenger complex (passenger platforms, forecourt, railway station), the following are used:

- stairs, ramps, lifting devices - with a difference in floor heights in a building or structure;
- tactile pointers and traffic patterns, signal lanes, radio beacons – to guide passengers with visual impairments;
- audio informators, displays for broadcasting text information – for low-mobility groups with hearing impairments.

The railway stations of the world's largest cities are often multi-level structures, where the levels are interconnected by cascades of escalator passages, staircases, elevators (Figure 1).

Elevators are used for accessibility of platforms for low-mobility groups of the population (Figure 2).



a – Kyoto (Japan), b – Shanghai (China), c – Seville (Spain), d – Berlin (Germany).

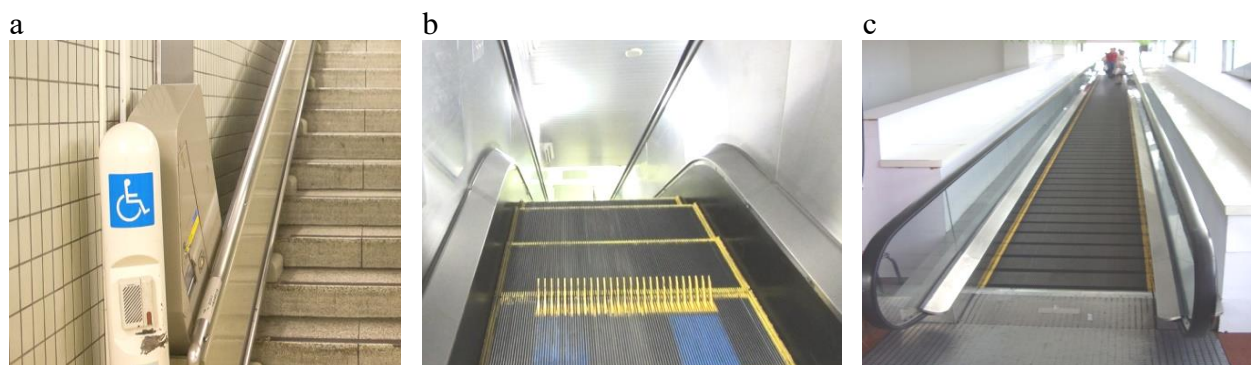
Figure 1 - Train stations



Figure 2 - Elevators for people with limited mobility

Also, various devices are used for the free movement of passengers between levels: lifts (Figure 3, a), escalators (Fig. 3, b), for horizontal movement – travelators (Figure 3, c).

In addition to the means for moving passengers, floor-mounted tactile means are used on platforms, in train stations and on approaches to them (Figure 4).



a – lift; b – escalator; c – traveller.

Figure 3 - Devices for moving passengers in the station

Reduced-level ticket offices for wheelchair users, terminals, visualization tools and others are also used, allowing low-mobility groups of the population to use the HSR infrastructure along with other passengers. There is practically no problem with boarding a train for low-mobility groups of the population on foreign HSR, since the infrastructure was initially built taking into account the parameters of the rolling stock in terms of matching the height of the floor of the car and the level of the platform for boarding and disembarking passengers.

Infrastructure of high-speed railways to serve low-mobility groups of the population using resource-saving and environmentally friendly materials and technologies, as well as renewable energy sources

High-speed railways (HSR) are one of the most promising modes of transport for the development of passenger transportation. They allow you to reduce travel time, increase passenger comfort and safety. However, in order for the VSM to be accessible to all categories of the population, including those with limited mobility, it is necessary to ensure their accessibility and safety.



a – platform (China), b – platform (Japan), c – railway station (South Korea),
d – station area (South Korea)

Figure 4 - Floor tactile signs

Results and Discussion.

Low-mobility groups of the population include people with disabilities, the elderly, pregnant women and other categories of citizens who have mobility restrictions. A number of measures must be implemented to ensure access of these population groups to the VSM, including:

1) Improved accessibility of railway stations and forecourts. Train stations and station forecourts should be equipped with ramps, elevators, escalators, and other devices and devices to ensure access of low-mobility groups of the population to buildings and structures, as well as to toilets and other premises.

2) Providing access to platforms and rolling stock. Platforms should be equipped with special ramps, lifts, and other devices and devices to ensure access to platforms for people with limited mobility. The rolling stock must be equipped with special equipment to ensure access of low-mobility groups of the population to the rolling stock.

3) Creation of special conditions for low-mobility groups of the population on board the rolling stock. Special places for low-mobility groups of the population should be provided in the rolling stock, as well as devices and devices for providing assistance to these groups of the population.

Energy efficiency and environmental safety requirements must also be taken into account in the design and construction of the VSM. To do this, it is necessary to use resource-saving materials and technologies, as well as renewable energy sources.

The implementation of these measures will ensure the access of low-mobility groups of the population to the housing and communal services, as well as increase energy efficiency and environmental safety of the infrastructure of the housing and communal services.

Information devices can be visual, acoustic (sound) and tactile [3-5]. Groups and types of information signaling devices and means of communication accessible to the disabled in Table 1.

Table 1 - Technical means available for the disabled

Group	Subgroup	The View
1 Technical means of public information accessible to the disabled	1.1 Visual means of information	1.1.1 Printed: signs, signs, signs, billboards, stands, etc.
		1.1.2 Electronic: placards, large screens, displays, etc., including means duplicating audio information and sign language translation devices (for people with hearing disabilities).
	1.2 Audio means of reproducing information	1.2.1 Acoustic means: speech synthesizers, voice announcers, loudspeakers, reproducers, etc., including devices for audio duplication of visual information (for people with visual impairments).
1.2.2 Auxiliary audio systems with induction circuits and their elements: audio duplication devices, headphones, etc.		
2 Technical means of signaling for general use, accessible to the disabled	1.3 Tactile means of information	1.3.1 Pointers, signs, etc., made in relief font.
		1.3.2 Signs, plaques, etc., made in Braille.
	2.1 Visual means of signaling	2.1.1 Graphical means of signaling, including safety signs (warning signs).
2.1.2 Light signaling devices, including light signaling devices, light beacons, traffic lights.		
2.1.3 Color-coded signaling devices, including signal colors, color markings, contrasting color stripes.		
2.2 Sound signaling devices	2.2.1 Sound signaling devices of notification signaling, including voice sirens, sound beacons.	
	2.2.2 Audible alarm devices for emergency and warning alarms, including warning sirens, emergency sound sirens, as well as audible alarm devices that duplicate light alarm devices for emergency and warning alarms (for people with visual impairments).	
2.3 Tactile signaling devices	2.3.1 Static tactile devices, including tactile markings, tactile stripes, tactile coatings (the tiles are embossed or textured).	
	2.3.2 Dynamic tactile devices, including vibration alarms, tactile vibrators.	
3 Technical means of public communication accessible to the disabled	3.1 Means of one-way communication	3.1.1 Loudspeakers
		3.1.2 Loudspeaker communication systems
3.2 Means of two-way communication	3.2 Means of two-way communication	3.1.3 Microphones
		3.1.4 Laryngophones
		3.1.5 Headphones
		3.2.1 Loud-speaking means of communication
3.2.2 Means of communication with reception amplifiers		
3.2.3 Textual means of communication, including with a «running line», fax machines		
3.2.4 Payphones		

Specific examples of technical solutions

The following technical solutions can be used to ensure access of low-mobility groups of the population to railway stations and forecourts:

- 1) Ramps. Ramps must be at least 1.5 meters wide and have a slope of no more than 1:12.
- 2) Elevators. Elevators must have a load capacity of at least 1000 kg and a cabin width of at least 1.1 meters.
- 3) Escalators. Escalators must have a step width of at least 0.6 meters and an angle of inclination of no more than 35 degrees.
- 4) Lifts. Lifts must have a load capacity of at least 300 kg and a cabin width of at least 0.9 meters.

The following technical solutions can be used to ensure access to platforms for low-mobility groups of the population:

- 1) Ramps. Ramps must be at least 1.2 meters wide and have a slope of no more than 1:12.
- 2) Lifts. Lifts must have a load capacity of at least 300 kg and a cabin width of at least 0.9 meters.
- 3) Means of mechanization. Special lifts, elevators or other means of mechanization can be used to lift and lower low-mobility groups of the population from platforms.

The following technical solutions can be used to ensure access to rolling stock for low-mobility groups of the population:

- 1) Lifts. Lifts must have a load capacity of at least 300 kg and a cabin width of at least 0.9 meters.
- 2) Special places. Special places for low-mobility groups of the population should be provided in the rolling stock, equipped with handrails, seat belts and other devices for the convenience of boarding and disembarking.

The following technical solutions can be used to ensure the energy efficiency and environmental safety of the HSM infrastructure:

- 1) Use of energy-efficient materials. Energy-efficient materials, such as thermal insulation materials, energy-saving double-glazed windows and others, must be used in the construction of HSM infrastructure facilities.
- 2) The use of energy-saving technologies. Energy-saving technologies, such as automatic lighting control, the use of renewable energy sources and others, must be applied when operating the infrastructure facilities of the VSM.

Conclusion.

The development of the infrastructure of the housing and communal services, taking into account the requirements of accessibility for low-mobility groups of the population and energy efficiency, is an important task to ensure transport accessibility and environmental safety.

The station building is designed to carry out all operations related to the departure, arrival or transfer of passengers.

For departure passengers, including those with limited mobility, it is especially important to consistently locate the most necessary premises for them: ticket offices, information desks, storage rooms, and a waiting room. It is in this order - from the entrances to the station and the main operating rooms - that the main devices in these rooms for the disabled are considered.

For arrival passengers, the main task is to provide the shortest and most convenient ways to get to public transport stops, eliminating collisions with departure passengers and, as a rule, bypassing the station premises. With a large length of passenger buildings, open openings can be used for the convenience of exiting the platform to the forecourt, eliminating the need to bypass the building along its perimeter (arches, gaps, tunnels).

From the point of view of servicing the low-mobility population, it seems promising to combine operating rooms and waiting rooms in a single space (zone). Functional zoning in this

case is provided with the help of stationary and mobile billboards and stands, sectional furniture, decorative landscaping and other techniques, which will not only avoid construction barriers when moving people with disabilities horizontally, but also eliminate vertical movement. An important element in this case is a system of spatial landmarks that helps people with disabilities of various categories to find the most rational ways to move.

It is imperative to develop the basic requirements for accessibility of public buildings and structures for the disabled and other low-mobility visitors on the railway transport of Kazakhstan. As well as the requirements for servicing low-mobility passengers at railway and other types of transport infrastructure facilities in the Republic of Kazakhstan.

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ХАЛЫҚТЫҢ МОБИЛЬДІЛІГІ ТӨМЕН ТОПТАРЫНА ҚЫЗМЕТ КӨРСЕТУ ҮШІН ТЕМІРЖОЛ КӨЛІГІ ОБЪЕКТІЛЕРІНІҢ ИНФРАҚҰРЫЛЫМЫНЫҢ СӘЙКЕСТІГІ МӘСЕЛЕСІНЕ

Аңдатпа. Өркениетті қоғамда мүгедектерге деген көзқарас оның дамуының маңызды көрсеткіштерінің бірі болып табылады. Статистикаға сәйкес, әлем халқының шамамен 10% физикалық мүмкіндіктерін шектейтін белгілі бір аурулардан зардап шегеді. Уақыт өте келе бұл көрсеткіш тек өседі, бұл өз кезегінде техногендік факторларға, өмір сүру ұзақтығының ұлғаюына, жарақаттануға, ауруларға және т.б. байланысты болады.

Халықтың аз қозғалатын топтарына қызмет көрсетуді ескере отырып, көлік объектілерін салу және жаңғырту бойынша түрлі нұсқалар мен практикалық шешімдер қарастырылады.

Теміржол инфрақұрылымы объектілерін жобалау, жаңғырту және салу, сондай-ақ халықтың аз қозғалатын топтары үшін жағдай жасау кезінде негіз ретінде қабылдануы мүмкін практикалық ұсынымдар әзірленді.

Түйінді сөздер. Теміржол көлігі, инфрақұрылым, құрылыстар, халықтың аз қозғалатын топтары, дене мүмкіндіктері шектеулі адамдар, қолжетімді орта, ұсынымдар.

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К ВОПРОСУ СООТВЕТСТВИЯ ИНФРАСТРУКТУРЫ ОБЪЕКТОВ ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА ДЛЯ ОБСЛУЖИВАНИЯ МАЛОМОБИЛЬНЫХ ГРУПП НАСЕЛЕНИЯ

Аннотация. В цивилизованном обществе отношение к людям с ограниченными возможностями является одним из важнейших показателей его развития. По статистике, около 10% населения земного шара страдает теми или иными недугами, ограничивающими их физические возможности. Со временем этот показатель будет только расти, это, в свою очередь связано с техногенными факторами, увеличением продолжительности жизни, травматизма, заболеваний и т.п. В статье рассматривается опыт развитых стран мира по созданию доступной транспортной инфраструктуры для маломобильных групп населения.

Рассматриваются различные варианты и практические решения по строительству и модернизации транспортных объектов с учетом обслуживания маломобильных групп населения.

Разработаны практические рекомендации, которые могут быть приняты за основу при проектировании, модернизации и строительстве объектов железнодорожной инфраструктуры, а также создании условий для маломобильных групп населения.

Ключевые слова. Железнодорожный транспорт, инфраструктура, сооружения, маломобильные группы населения, люди с ограниченными физическими возможностями, доступная среда, рекомендации.
