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## Accessibility as a criterion of quality in an architectural spatial environment (on the example of the city of Almaty)

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**Abstract:** The main function of architecture is to arrange living space for everyone regardless of their citizenship, social status, age, and physical abilities. The quality of a settlements' architectural and spatial environment depends on various conditions where one of the key criteria at present is the need to consider interests of specific groups of people and explore architectural planning solutions that will ensure accessibility (safety and convenience) for low-mobility groups of the population. The article shows architectural planning aspects of forming an environment in terms of its convenience for low-mobility groups of the population. Also, it offers directions for the improvement of a settlements' environment considering a criterion of accessibility. The article's conclusions prove that accessibility (barrier-free space) is one of the key criteria of developing a high-quality architectural spatial environment.

**Keywords:** low-mobility groups of population, accessible environment, architectural spatial environment, architectural planning solutions

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## Introduction

Low-mobility groups of the population are people who experience difficulties while tending to their needs and moving around. It applies to the following groups: visually and hearing-impaired people, people with affected locomotor system (including disabled people in wheelchairs), temporarily incapacitated people, people of advanced age (60 years and older), people with prams, preschoolers, and pregnant

women. Based on WHO reports, disabled people of various categories make up about 15% of the world population (The global WHO website). This number is increasing with population growth, an ageing population, spreading of diseases, and as a result of various disasters. In Kazakhstan, according to statistical data from the Department of Labour and Social Protection, the number of disabled people makes up 3.5% of the total population.

Architecture's goal is to provide a high quality of living space for all people, including those belonging to the low-mobility category.

## **1. Problem**

After the break up of the USSR in 1991, Kazakhstan, one of the former Soviet republics, embarked on its own independent course of action in areas including architecture and urban engineering. During that period many problems of urban development were solved by means of updating general plans, partially reconstructing old housing, and quickly building new residential areas. In 1997, the construction of Kazakhstan's new capital, Astana City, began. In post-Soviet conditions architects searched for their own language to express local cultural and structural traditions.

Kazakhstan's integration into the global space made it possible for the country to attract foreign investors and new technologies to architecture and construction. Urban construction began implementing the best practices of advanced countries and methods of creating humane architectural spatial environment with citizens' interests in mind.

One of the main problems in Kazakhstan cities was the lack of physical means for low-mobility citizens' socialization. The architectural spatial environment of our settlements were designed for an average person with standard anthropometric data with no physical disabilities and restricted free navigation in residential, social and transport systems for low-mobility groups of the population (Abdrassilova & Murzagaliyeva, 2017).

Since 2013 in order to develop the scientific basis for creating an accessible environment in the cities of Kazakhstan, we have conducted research in the largest city of Kazakhstan, Almaty. This work included the analysis of international and Kazakh experience in designing the environment, normative and methodological references, existing buildings, and conducting a full-scale survey (measurements, photo-recording) of buildings in Almaty.

## **2. Discussion**

Lack of physical and psychological barriers in urban space, i.e. environmental accessibility for every category of population is one of the most important conditions of urban space convenience and one of the criteria of urban space quality. So, one of the main goals of a modern cities' development is to create a barrier-free

architectural spatial environment. Breakthroughs in this field may be seen in the largest cities of developed countries and demonstrate great opportunities for integrating low-mobility citizens into the life of society (Ercan & Memlük, 2015; Meuser, 2012; Rahman et al., 2017).

In the last few years this problem has been addressed in Kazakhstan cities as a consequence of economic and humanitarian achievements of the country.

Systematic work to create a barrier-free environment in the cities of Kazakhstan has a short history. The first state standards in the field of designing an accessible environment for low-mobility groups of the population appeared after the year 2000: RDS (Guidelines for construction) RK 3.01-05-2001 “Urban planning. Planning and construction of populated areas, taking account of the needs of people with disabilities and other people with limited mobility”, MSN (international building codes) 3.02-05-2003 “Accessibility of buildings for people with limited mobility”, SP (building rules) RK 3.06-15-2005 “Designing of buildings and constructions taking into account accessibility for people with limited mobility. Generalities”. Later, these documents were used as guides for construction rules for the design of public and residential buildings. However, in practice, the regulatory requirements for an accessible environment have not been fully implemented.

Resolution of the Mayor’s office of Almaty No. 10/1186 of December 4, 2007 “On the implementation of the rehabilitation Program for disabled people in Almaty for 2006-2008” obliges the state departments in Almaty to take measures to ensure and audit the city’s infrastructure for their accessibility to disabled people (source: <http://ardi.kz/wp-content/uploads/2015/03/buildings.pdf>).

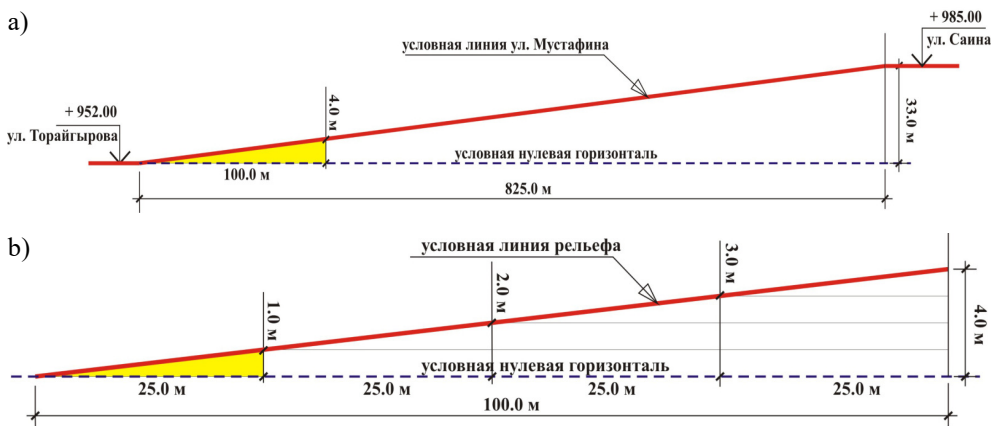
The relevance of the problem of accessibility for disabled citizens in Almaty is due to the number of such citizens in the largest city of Kazakhstan (population is about 1800,000 people), the need to provide a wide range of medical, educational and other services. Creating an accessible environment for people in need required the state to solve a large spectrum of social, economic, technical, and humanitarian issues.

One of the most difficult issues “grew” from the topography of the city of Almaty. The Planning scheme of the city, located on the foothill plain, has a expressed relief (slope-3-4%) and a configuration extended in the South-North direction. The constant slope of the terrain makes it difficult for low-mobility groups to get around the city. This makes it necessary to create flat areas, recreational areas that exclude the existing permanent slope.

We have developed a proposal for one urban area with an active terrain. The section of the residential area “Orbita” along Musstafin street was considered and it was found that the slope of the terrain is 4%, i.e. the elevation of the terrain is 1 m every 25 m (Fig. 1).

The humanization of the state policy of Kazakhstan, the focus on creating equal conditions for all citizens, and the desire to solve social and economic problems at a decent level have contributed to the fact that the issue of creating an accessible environment have been widely implemented in Almaty in a fairly short period of time.

Problems of developing an accessible environment are the focus of attention of city council of Kazakhstan's largest city, Almaty.



**Fig. 1.** Scheme of differential slope of the residential area “Orbita” (Abdrasilova & Murzagaliyeva, 2017): a) on Musstafin street, between Toraiyrov and Sain street; b) a fragment of the terrain slope on a 100 m long section

In 2017-2018, a comprehensive program aimed at creating a barrier-free environment took place resulting in the reconstruction of 103 km of sidewalks, the building of more than 2,000 ramps at stops and sidewalks, and the setting up of 750 transport stops adapted for disabled people's needs (Akulova, 2018). In 2018, an inclusive educational school was launched in Almaty. It is the first educational establishment adapted for children with specific needs.

Informational components of the barrier-free environment in Almaty include colour and material contrasted surfaces at pedestrian crossings, sidewalks, staircases, building entrances as well as the use of sound and colour signals. These help to ensure safety and convenience by guiding a person and warning them of obstacles and impediments, as well as easing spatial orientation. Tactile information in the form of contrasting surface materials is used for navigation and functional zone recognition, as well as a method for warning of danger. Consequently, different kinds of materials are used on pathways, road curbs, railings and handrails to provide a feeling of safety and to guide movement around the city (Agranovich-Ponomareva, 2003). Tactile information provided by means of various textures and patterns are set directly on the ground or floor surface before hazardous areas (passages, beginning and end of stairs and ramps, elevator doors, and turns). An important and informative method of warning in public places (on stair landings, in elevators) is Braille script in the form of embossed letters.

The city authorities and public organizations have applied great efforts to humanize Almaty's urban environment, and their experience is worth studying and implementing in other cities, all the more so that a study conducted by the authors of this article three years ago revealed a low level of environmental planning for fulfilling the needs of low-mobility persons. However, despite present achieve-

ments, the problem of adapting the environment to low-mobility citizens is still rather acute in some parts of the city. People in wheelchairs are rarely seen in the street because of the difficulty to move around the city due to the many obstacles and impediments in their way. Case analyses on the different levels of the urban environment showed that the accessibility and ability to safely move around unassisted for disabled people is generally not fulfilled (Fig. 2).



**Fig. 2.** Improvement as a result of the city's program to create an accessible environment  
(Photo: E. Murzagaliyeva)

For example, in some areas of the city where a pedestrian crossing meets a road there are still obstacles, such as:

- a high road curb;
- lack of slanted corners;
- lack of warning and guidance at pedestrian crossings and around traffic lights by tactile information on the ground;
- ramp gradients are more than 1:20 required by standard (SP RK 3.06-15-2005).

Other problems that can be encountered on open staircases and ramps at entrances are the following:

- lack of two-sided railings with handrails at a height of 0.7 and 0.9 m (SP RK 3.06-15-2005);
- lack of tactile ground information at the beginning and ending edge of a ramp;
- obstacles in the form of pillars blocking the way of a wheelchair;
- slippery ramp and stair surfaces that are unsafe for walking on even for fully mobile individuals.

Regional factors, such as climate conditions and lay of land are of an essential importance when it comes to the comfortable movement of pedestrians in the city (Dursun & Yavas, 2016). The region is notable for its acutely continental climate, and Almaty's layout due to the proximity of its mountain ranges stretches along the 'north-south' lines with a relief gradient of 3-4% which directly affects the movement of people with physical disabilities. For example, the height difference between the southern and northern districts along the main streets of Almaty is as high as 2.5%. Low-mobility citizens have to apply significant effort to overcome such slopes in hot, humid summers and in cold winters. In order to improve accessibility around the urban environment, flat covered areas and recreational zones for

respite should be constructed. Such thoroughfares should contain various functional small-scale architecture forms such as benches and drinking fountains to protect from sun and humidity in hot summer, and moreover, be equipped with informational elements.

An analysis of the accessibility of buildings and constructions for various purposes in Almaty also revealed problems related to thoroughfares within buildings. Obstacles to the free movement of wheelchairs are insufficient width of corridors, stairs, doorways with high thresholds, and unsuitable elevators. Compounding the difficulty of accessibility is the lack of a standardized stationary ramp with mandatory fences and handrails and a slope of 1:20 in places where there is a floor height difference of more than 0.2 m. As well as the lack of tactile ground warnings in front of elevators, stairs and guides in corridors (SP RK 3.06-15-2005).

The experience of low-mobility individuals in public places (such as cinemas, theatres, sports complexes, circus etc.) is hindered by the fact there is no requirement for the number of seats available people in wheelchairs in an auditorium which should make up no less than 1% of the audience (SP RK 3.06-15-2005).

These negative examples show that low-mobility citizens experience difficulties while moving around the city; they have trouble getting into buildings unassisted or navigating their way once inside.

Getting around in domestic spaces is not much easier. In apartment buildings, obstacles and impediments hindering low-mobility citizens can be found from the very entrance. Sometimes the entrance is equipped with abrupt transverse profile stairs that make ascending for elderly people and small children difficult. If the entrance is equipped with a ramp then generally its width and gradient do not meet required standards (ramp gradient of not more than 1:20 and the width no more than 1 m (SP RK 3.06-15-2005)) (Fig. 3). Making ascending or descending the inclined surface unassisted challenging for an adult with a pram or for a disabled person in a wheelchair. The lack of two-sided guard rails with handrails at the appropriate heights makes moving around difficult, and the unsuitable dimensions of landings at a wing door on the side of its opening make manoeuvring a pram difficult.



**Fig. 3.** Analysis of the accessibility of the residential environment on the example of entrance groups of residential apartment buildings in Almaty (Photo: E. Murzagaliyeva)

All these factors pose a danger to health and life for functionally disabled people, be it a small child, an elderly person, a handicapped person using an extra means of support and movement or a person suffering visual impairment.

Taking Almaty as an example we examined situations that hinder low-mobility citizens from leading a fully active life. It is difficult for people with specific needs to not only get over an apartment threshold, descend from their floor, get out of their doorway, and go to a store, a pharmacy or have a walk but also to move around their own apartment to perform their everyday domestic and physiological chores. The listed obstacles and impediments characterize the living space as unsuitable for physically impaired people.

In the last 2-3 years, many public buildings in Almaty (shopping and entertainment centres, airports, clinics) have been renovated taking into account the interests of low-mobility groups. Before the lack of specialized bathrooms (5% of the total number for women, 2% for men) and changing rooms for mothers and children on the same floor as a restroom for women were reasons for the isolation of low-mobility groups in the population. Now more and more wheelchair users are being included in social life: they study at universities, visit sports complexes, cinemas, shops, and restaurants.

## Conclusion

1. Low-mobility individuals, according to WHO reports, make up about 15% of the world population. To ensure these people can satisfy their everyday and social needs completely, it is crucial to provide them with free access to the urban infrastructure. Therefore, one of the main goals of modern city development is to create barrier-free architecturally spatial environments. Break-throughs in this field in some of the largest European cities demonstrates great opportunity for integrating low-mobility citizens into the life of society.
2. The leading city building accessible environments for disabled people is Almaty. An analysis of Almaty's architecturally spatial environment carried out by the authors showed that, since 2017, despite certain achievements there are still many examples in the city where the barrier-free ergonomic requirements of domestic and public places and transport infrastructure are not taken into consideration.
3. Architectural planning components in living space, places of social and community purpose and transport infrastructure should provide definite functional spaces and provide for the physiological capabilities and situations of various categories of disabled and elderly people.
4. When interacting with urban infrastructure and construction, the following difficulties for a physically handicapped person arise: intersection of pedestrian crossings and roads; open staircases and ramps (at the building entrance); devices and equipment; horizontal and vertical thoroughfares in the buildings; washing facilities; lack of tactile information on surfaces. To ensure disabled and elderly people are capable of performing necessary functions unassisted or with the help

- of an accompanying person the environment should be designed in compliance with ergonomic specifications.
5. Space arrangement and planning solutions of the urban environment for disabled people depends on certain climatic conditions and is created by means of landscape design, constructing roofs and covered pedestrian passages, as well as using special materials for coating ramps and staircases etc.
  6. An analysis of space arrangement of accessible environment in Almaty showed that existing recommendations regulating performance requirements of barrier-free construction in Kazakhstan are not strictly implemented in practice. There are essential problems concerning urban and residential environmental infrastructure, workplaces and recreation areas, services for low-mobility population groups in public places, and requires an optimized and unified approach in adapting the architectural planning of the environment.
  7. In 2018, Almaty's city council implemented an urban infrastructure reconstruction program concerning low-mobility people's needs. The experience of Almaty in developing a barrier-free environment should be implemented in other cities of Kazakhstan as accessibility and barrier-free environments are an important criterion of quality of a settlements' architectural, spatial environment. At the same time a high-quality spatial environment is an economic criterion affecting the city's pull both for residents and investors.

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