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Original Research Article

URBAN SOLUTIONS IN THE UNIVERSAL PLANNING OF RESIDENTIAL SPACES FOR THE ELDERLY AND THE DISABLED

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A b s t r a c t

The article concerns the creation, in accordance with the EU idea of integrated accessibility, more and more favorable legal and design conditions for shaping the space of the residential development environment with equalized physical and social accessibility among elderly, disabled and non-disabled people. The research results presented in the article indicate the existing limitations and new possibilities in improving the general principles of creating urban assumptions for universal design. For this purpose, sixteen elements and their functional and spatial features were identified, which, in all people with various disabilities, as research has shown, directly increase the surrogate and corrective effectiveness of perception and communing with the residential development environment. From among those identified, those elements were distinguished which, in the residential development space, most equalize its accessibility for people in the characterized categories of visual, auditory, motor and intellectual disabilities. These are the elements of the spatial layouts of residential development, which also that have the strongest impact on increasing the safety, independence and freedom of movement of each inhabitant in their housing estate.

Keywords: universal urban planning, integrated accessibility of residential development space, the environment of the elderly and the disabled

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1. INTRODUCTION

1.1. Purpose and Subject of Research

The article presents the results of the research on the conditions and methods of creating urban solutions in universal planning of residential development space for the elderly and the disabled.

The main objective of these studies was to demonstrate that it is fully possible, in accordance with the EU idea of integrated accessibility, to shape the space of the socio-physical environment of residential development, with the help of the such elements architectural and urban, of the spatial layout that directly increase the surrogate and corrective effectiveness of perception and the way of communing with the built environment in order to equalize the accessibility of its space between all non-disabled people, the elderly and with various disabilities.

1.2. Description of the Method and Scope of Research

The research results presented in the article were obtained on the basis of the following analyzes of design conditions in the field of:

- development of legal regulations concerning the use of the environment by the elderly and disabled in the world and in Poland,
- planning (adaptive) indications related to increasing the effectiveness of the perception and communing of the elderly and disabled with the environment in the residential development space,
- universal functional and spatial solutions in the urban plan of a place of residence adapted to the needs of elderly and disabled people.

The evaluation of the possibility of increasing the surrogate and corrective effectiveness of perception and communing of the elderly and disabled with the residential development environment in universal urban planning was carried out on the basis of the analysis of the mechanisms of[2]:

- contacts of a persons with various disabilities with the functional and spatial structure of residential development, in terms of living together in the same development area intended for all disabled and non-disabled residents,
- orientation of a persons with various disabilities in the residential development space, as a basis for equalizing independence in use of the built environment between all non-disabled and disabled residents.

[2] The residential development environment on an urban scale - it is the totality of the elements created as a result of human activity, with a dominant residential function, interrelated, interacting and dependent on each other. On the other hand, the space of the residential development environment - is one of the basic elements related to architectural design and urban planning for the equalization of physical and social accessibility among the elderly, disabled and non-disabled people.

2. RESEARCH RESULTS AND DISCUSSION

2.1. The development of legal regulations concerning the use of the environment by the elderly and disabled in the world and in Poland

An inaccessible environment, and in it social and physical barriers create a disability which makes it difficult to secure the basic existential needs of man and limits, above all, the possibilities of self-realization. Many areas of life of the elderly and the disabled related to discrimination can be regulated by legal acts, and compliance with them will greatly facilitate overcoming difficult life situations. Within a dozen or so years, many norms and legal acts have been introduced to improve the lives of people with disabilities in the environment, not only physical but also social.

The architect's point of view as a designer influencing the development of integration of disabled people with the public is significantly different from the point of view of a lawyer and specialists from other fields involved in the construction investment process. It should be noted that for the development and implementation of a project meeting essentially all the needs of fully functional and disabled users, it is not enough to know the rules of design art (design skills) and awareness of the importance of these needs and the good will of all participants in this project [8]. The good will, which is strongly declared earlier, usually disappears when problems arise related to co-financing of such an enterprise. Therefore, effective consideration in designing the needs of the elderly and the disabled users of the environment cannot be realized without administrative regulations and law enforcement.

The analysis of the development of legal regulations carried out in this aspect clearly shows the previous and current course of the fight for establishing equal rights for all users of the environment. The first provisions of the construction law, taking into account the needs of disabled persons, were mostly limited to legal acts describing construction solutions for special purposes. Examples of such standards are German *DIN* 18 024 and 18 025 and similarly the first French standards *NF* P 91 201 are included [4]. Such an imposed way of architectural and urban design was a barrier to finding the best solutions to meet the needs of people with disabilities. An example of such regulations in Poland was the so-called "Seventeenth" from 1980, which despite its importance in the Construction Law was not taken into account by designers [10].

Designing according to such legal regulations was then argued for the need to pursue the democratic will of most people fully functional, not taking into account that the limitations of physical or mental fitness are usually not a matter of choice. Back in 1987, at the Seminary CIB W84 in Prague, particular attention was paid to the political problem of people with disabilities who were in many countries a less educated social group with little work and earning opportunities, which were equated to minority and ethnic minority groups [9].

The first signals on the international forum regarding the proposed need to expand the legal fight against discrimination of persons with reduced physical and mental fitness were reflected in the resolution 1921 (LVIII) of the UN Economic and Social Council of 6 May 1975 concerning the prevention of disability and rehabilitation of people disabled. In this resolution, it was emphasized that the Declaration on Social Progress and Development was adopted from the need to protect rights and ensure social protection and rehabilitation of people with physical and mental dysfunctions. The next important step in this direction was the adoption by the General Assembly of the United Nations (UN), resolution 2856 (XXVI) on December 9, 1975, the Declaration on the Rights of Disabled Persons, which refers to adopted previously the principles of the Universal Declaration of Human Rights and to the other obligations of the Member States and to the International Convention relating to disability. Further international legal acts expanding the rights of people with disabilities to use the environment include the Geneva Convention No. 159 of the International Labor Organization regarding occupational rehabilitation and employment of disabled people of June 20, 1983, in force in Poland from December 12, 2005. (Journal of Laws of 2005, No. 43, item 412).

The next was the resolution of the General Assembly of the United Nations (UN) of December 20, 1993 (annex / resolution 48/96) regarding the Standard Rules on the Equalization of Opportunities for Persons with Disabilities, which obliged countries Member States to improve their domestic law in this area. In a fully developed international document on the prohibition of discrimination and guaranteeing equality for persons with disabilities, it was unanimously adopted on 13 December 2006, resolution 61/106 of the General Assembly, Convention on the Rights of Persons with Disabilities, ratified by Poland on September 6, 2012 (Journal of Laws of 2012, item 1169). The main merit in adopting this Convention was the disabled community, affiliated to the International Disability Caucus, forming a coalition of 70 international, regional and national organizations fighting in the international arena for a legal act regarding their right to freedom and security, the right to freedom of movement and to independent living, right to health, work and education, and the right to participate in political and cultural life. This important event has started to have a significant impact on the lives of more than 650 million disabled people around the world, bringing them benefits and improving their lives.

In Europe, joint efforts to improve the quality of life and the situation of people with disabilities, as well as in the world, go back to the '70s. A clear change in the interpretation of the right to use the environment by people with disabilities is the resolution of the Council of Europe of 1984, which states the need to extend the concept of accessibility and calls for the need to formulate the foundations for

a pan-European standardization of methods to eliminate building barriers in the environment in order to create wide **integrated accessibility**.

In 1988, the Council of Ministers of the European Community established the second program of action "HELPOS"("Handicapped People in the European Community Living Independently in an Open Society"), aimed at creating conditions for a dignified and independent life for people with disabilities [5]. The newly formulated philosophy of European integration, adopted by the Council of Europe in order to establish a pan-European standard of design for all (called **universal design** or integral design), has become the basis for the entries included in the first edition published of 1990, of previously started work: "European Manual for an Accessible Built Environment "[16].

The first general strategy of the European Community regarding activities for disabled people was included in the European Commission communication on equal opportunities for people with disabilities. This "New European Community Strategy for Persons with Disabilities" of 30 July 1996 was adopted by the Council of the European Union by a Resolution on 20 December 1996. Integrated accessibility is understood in it as the implementation of programs promoting the adjustment of the physical environment (architecture and infrastructure), educational (education at all levels of learning), living (professional and public participation) and access to information and means of communication, to the needs of all people.

The year 1997 is considered a breakthrough in the Union's approach to the problems of people with disabilities, because on October 2 this year, the Treaty of Amsterdam was signed, which he introduced into the Treaty of the European Union, among others Article 13 (in force from May 1, 1999) prohibiting discrimination against people with disabilities. The next stage of the work of the European Union was the issuance by the Council on 27 November 2000 of the Decision establishing the Community Action Program on Combating Discrimination for the years 2001-2006, also on grounds of disability. At the summit in Nice on 7 December 2000, the European Social Agenda for 2000-2005 was adopted, in which it was stated that the European Union would expand "all actions aimed at achieving a more complete integration of disabled people in all areas of life". By decision of the Council of the European Union of December 3, 2001 – year 2003, it was established as the European Year of People with Disabilities. 2003 was to mark the tenth anniversary of the United Nations General Assembly's adoption of the Standard Rules on the Equalization of Opportunities for Persons with Disabilities.

In the following years, the Action Plan of the Council of Europe focused on further promotion of the rights and full participation of people with disabilities in society, and above all on improving the quality of life of people with disabilities in Europe 2006-2015 (Recommendation of the Committee of Ministers to Member States No. REC/2006/5). Following these declarations, are being

implemented in turn by the Parliament and the Council of the European Union the Directives on equal treatment of disabled people in employment and occupation, and on land-based transport (2007) and air transport (2008) for passenger traffic. During this period, the Communication of the European Commission of 15 November 2010 is also published. (IP/10/1505) – "European Disability Strategy 2010-2020". In February 2016, the EU-funded pilot project "EU Charter for Persons with Disabilities" was launched (Access City Award 2016/2017/2018). The EU Charter aims to ensure equal access to certain facilities, especially in the fields of culture, leisure, sport and transport [7]. The pilot project has been developed in collaboration with a specially established working group which currently consists of 17 EU Member States and the civil society organization of the European Disability Forum (EDF). This group is part of the High Level Group on Disability.

This EU course of action has recently been significantly reinforced by a legal document approved by the European Parliament on 13 March 2019 called the "European Accessibility Act". It is a directive, which regulates adapted to the needs of people with various disabilities availability inter alia services of telephone and electronic communications, banking, e-commerce, electronic equipment, for example, e.g. smartphones or self-service terminals. The European Accessibility Act also responds to the call from the disability community to adapt forms of contact with emergency services, which are also intended to be accessible to the deaf and speech impaired. Criticism from the European Disability Forum (EDF) was increasingly frequent during the successive stages of work on this document. The criticism concerned the most important provisions missing in the act:

- transport and services provided by micro enterprises, household appliances,
- legal obligation to ensure the accessibility of infrastructure and buildings in which people with disabilities live most of their lives.

EDF is now calling for better and more effective legislation. Independently the development of international and European legal regulations regarding the provision of disabled people with the same rights and obligations as other members of society, they are created in advance in some European countries (such as Sweden, the United Kingdom, Finland, the Netherlands) and the world (primarily in Canada, the United States of America and Australia), legal provisions that have more and more flexible and extended legal solutions in the area of how to build a friendly environment for people using it, including people with disabilities. Improvements of these solutions, not always fully accepted by the disabled, mainly concern design and implementation problems in the scope of:

- providing existing facilities, especially those covered by conservation protection,

- determining the parameters and quantities of architectural elements due to the individualized nature of physical and spatial needs of disabled people,
- granting state funds for public investments regarding existing and newly designed construction resources also available to people with disabilities.

In Poland, after the period of the political and economic transformation (in the '1990s) and in the period of Poland's accession to the European Union (at the turn of the century), many norms and legal acts were introduced that were to improve the life of disabled people in society. Since then, a number of detailed rules and regulations of law take into account the requirements of people with disabilities and the conditions to be met by building and engineering objects adapted to these requirements, and their equipment.

Political and economic changes and then adjusting Poland to EU law also forced in the scope of expanding the accessibility of disabled people, the progress of changes in social awareness and then in legal provisions. The highest legal act, the Constitution of the Republic of Poland and the Polish Charter of Disabled Persons adopted by the Sejm of the Republic of Poland in 1997 created a strong basis for the implementation of a specific right of disabled citizens and the obligations of public authorities towards them. Although the Charter of the Rights of Persons with Disabilities is a declarative act, it effectively establishes the directions of changing the rights of the disabled to full participation in society, access to goods and services, access to medical care, education, employment, living in an environment free of functional barriers, and in this:

- access to offices, polling stations and public facilities,
- free movement and general use of means of transport,
- access to information,
- possibilities of interpersonal communication.

In accordance with the Charter of Rights of Disabled Persons and EU directives, further legal regulations are created in Poland concerning persons with disabilities, in which problems related to the adjustment of construction and engineering objects are being addressed in order to eliminate architectural and spatial barriers. These regulations, such as: Construction Law, Road Traffic Law, as well as the Act on Spatial Planning and Development and the Law on Hotel Services, as well as executive ordinances for these acts [11], do not provide according to the EU the idea of integrated accessibility:

- full social participation (especially disabled people) in the design and investment process [18],
- solutions adjusting the law to the type of accessibility requirements, in particular the requirements for the design and implementation of housing infrastructure for the elderly and the disabled in the areas of social housing, not only in Poland.

At this stage of development of legal regulations concerning the use of the environment by the elderly and the disabled, Poland does not yet have strong legal

support in the European Union. At present, EDF (European Forum of People with Disabilities) organizations are effectively demanding these regulations at the EU forum. It should be noted, however, that even the most effective legal regulations will not ensure, without the good will of society, barrier-free design and build and the obligation to quickly adapt housing environment for older people and the disabled.

2.2. Planning (adaptive) indications shaping the space in the residential development environment for the elderly and the disabled

In universal terms, the problem of adapting the environment for the elderly and disabled becomes part of the Contemporary Integrated Urban Planning (CIUP), i.e. the general issue of adapting planned space to the needs and expectations of all people [16, 20].

Adapting the space of the residential development environment to the needs and expectations of all people, and thus also to the needs and expectations of the elderly and the disabled, consists in taking into account in universal urban planning, the mechanism of:

- recognizing the elements of the housing space by people with various disabilities, due to their different perceptions, especially related to equalizing independence in using the residential development environment between all non-disabled and disabled residents,
- achieving the elements of the housing space by people with various disabilities, due to their diversified way of communing with the residential development environment, to especially related to equalizing of conditions coexistence in the same area between all non-disabled and disabled residents.

The most contemporary trends in the interpretation of these conditions refer to three aspects of the various relationships between humans and space:

- **Corporeality** emphasizing the importance of the properties of the human body itself in interaction with space,
- **Individuality** characterizing every human being, exclude the design of space for an averaged model of an inhabitant of the built environment excluding of the design,
- **Multidimensionality** of the nature of human perception in the physical, physiological, psychological, as well as emotional and aesthetic spheres, having a significant impact on the functional understanding of space in order to meet all needs people.

This multifactorial problem of the diversity of relations between man and space in universal design additionally expands the need to take into account various categories and with varying degrees of disabilities of people living in the space of the built environment. Even more so, as T. Witkowski claims, you cannot

create common standards for various categories of disability, because there are significant differences between them [17].

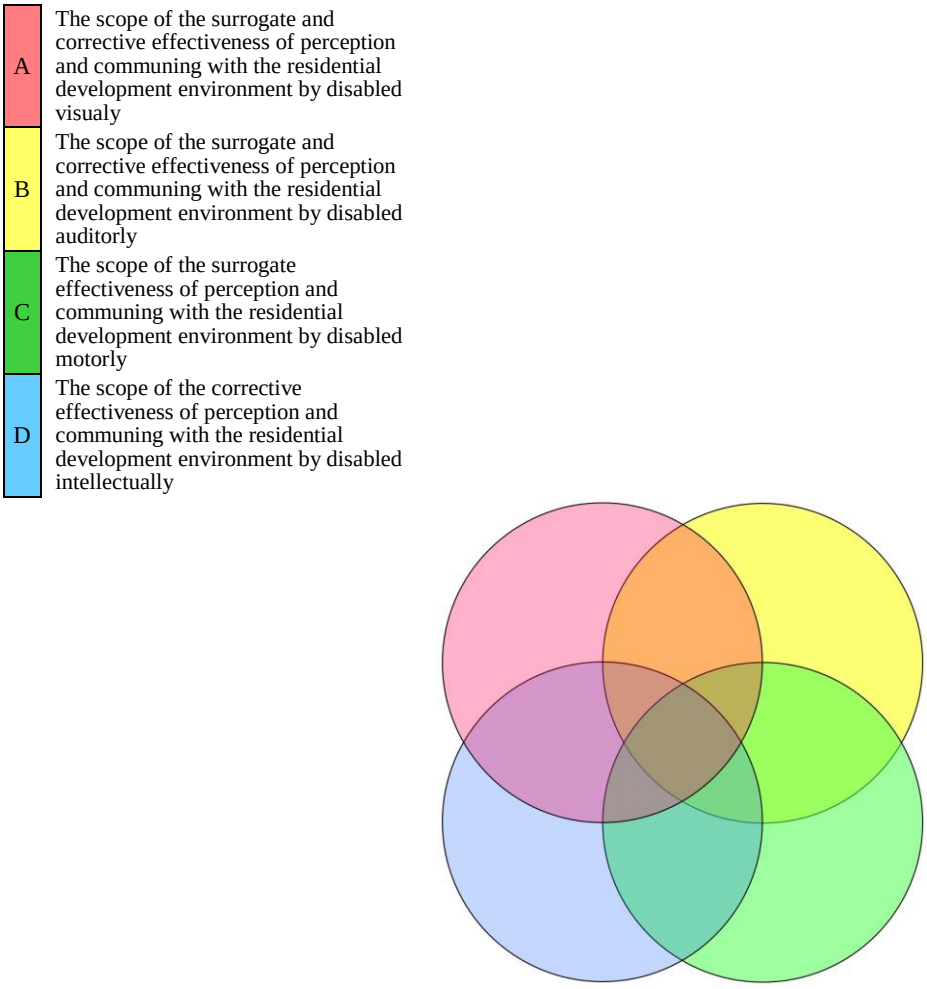


Fig. 1. Diagram of the scope of increased effectiveness of perception and communing with the environment in the residential development space, achieved among residents, with surrogate and corrective methods in the characterized categories of disability and in their mixed variants, also concerning the elderly (author's compilation)

Among the many different categories of disability in the field of reception and recognition of spatial phenomena at a distance (through vision, hearing and smell) and directly to the contact (through feeling: touch, temperature, taste, weight, pain, etc.), it is worth considering in the urban assumptions of universal design such categories of disability which primarily concern the most specialized long-range senses and mental and motor skills used by man in communing with

built space. According to Yi Fu Tuan writes that the human mental world results from the processing of sensory and motor experiences, where spatial efficiency precedes knowledge in the cognitive process [14], it is possible for the purposes of universal urban design to distinguish and characterize the categories disabilities of congenital, temporarily and permanently acquired and progressing in the process of disease and aging, such as (Fig. 1):

A. Visual disability concerns the sense whose system of receiving and processing light phenomena in the human mind is the most efficient, fastest and most reliable in contact with the environment, especially in long-range space. Visual disability, which affects both completely blind and visually impaired people, is classified in the spatial planning legislation and in the construction law among the disturbances of the reception of information, and above all, the disturbance of orientation in the space of the built environment.

Planning (adaptive) indications for creating a safe and accessible space built for people with such a disability concern the acquisition of the ability to move and to perform stationary activities thanks to application the "vision correction's" or use the "surrogate senses" such as: hearing, smell and distance movement, and the senses of feeling on directly contact [2]. For this reason, in each space of a residential development, basic light information's should be additionally supplemented with functionally adequate audible and tactile information's in the form of a signal and voice, and also ensured a sufficiently low level of background noise to obtain clear reception and spatial orientation of the propagating sounds.

The surrogate and corrective effectiveness of perception and communing with the environment in the space of sounds coming from solid, liquid and gaseous materials in the residential development area that allows, using "vision correction's" or "surrogate senses", independent recognition of distances, shapes and of interior compositions, numbers and of variety of interior elements and their functions, depends on:

- the arrangement, number, type and strength of the desired and undesirable (disturbing) sound sources, which cause temporary deafness, reverberation, reflections (echo), vibrations, which affects the intelligibility of listening to audio information in the form of a signal and voice,
- the size and shape of: structure and organization of road traffic, slope and faults: floor surfaces, the buildings bodies, wall surfaces and their openings, on the type and forms of high, medium and low greenery, on the intensity of colors and the type of surface texture of the materials, and also depends on the stationary and of internal climatic conditions, which affects the clarity of both listening to audio information and receiving information through the senses of movement and contact, i.e. feeling, smell and taste and in the case of visually-impaired people, also influences the clarity of the reception of some light information,

- the methods of creating for visually disabled people the main functional and spatial "orientation pathway", free from the emergence of unexpected and dangerous obstacles.

B. Auditory disability concerns the sense whose system of receiving and processing sound phenomena in the human mind is the second most efficient, fast and reliable in contact with the environment, after vision, also in the long-range space. Auditory disability, which affects both completely deaf and hearing-impaired people, can also cause imbalance.

Planning (adaptive) indications for creating a safe and accessible space built for people with such a disability concern the acquisition of the ability to move and to perform stationary activities thanks to application the "hearing correction's" or use the "surrogate senses" such as: vision, smell and distance movement and the senses of feeling and taste in direct contact. For this reason, in each space of a residential development, the basic sound information's should be additionally supplemented with functionally adequate light information's in the form of images and text, and also ensured adequate lighting for sign language and optimal spatial orientation for people with balance disorders [13].

The surrogate and corrective effectiveness of perception and communing with the environment in the space of light, shade and colors coming from solid, liquid and gaseous materials in the residential development area that allows, using "hearing correction's" or "surrogate senses", independent recognition of distances, shapes and of interior compositions, numbers and of variety of interior elements and their functions, depends on:

- the arrangement, number, type and strength of the desired and undesirable (interfering) light sources, which cause temporary blinding, after-images, reflections, flares, optical illusions, which affects the visual acuity of light information's in the form of images and text,
- the size and shape of: the structure and organization of road traffic, the slope and faults of floor surfaces, the buildings bodies, wall surfaces and their openings, on the type and forms of high, medium and low greenery, on the intensity of colors and the type of surface texture of the materials, and also depends on the stationary and of internal climatic conditions, which affects the clarity of both seeing light information and receiving information through the senses of movement and contact, i.e. feeling, smell and taste, and in the case of hearing-impaired people, also influences the clarity of reception of some sound information and accompanying vibrations [22],
- the methods of creating for auditory disabled people the main functional and spatial "orientation pathway", free from the emergence of dangerous and unexpected balance disorders.

C. Motor disability concerns the sense whose system of receiving and processing spatio-temporal-energic phenomena of motion in the muscles and joints of the human body, is the third consecutive highly efficient and reliable in

contact with the environment in long and near range space. Motor disability, which concerns people with difficulties in moving and performing manual activities, and other activities, inter alia related to speech verbally and body language, vision and hearing, also maintaining balance, is classified in the spatial planning legislation and in the construction law, primarily to disturbances in the mechanics of kinetic contacts with the space of the built environment.

Planning (adaptive) indications for creating a safe and accessible space built for people with such a disability concern the acquisition of the ability to move and perform stationary activities thanks to the "surrogate" use of both new integral kinaesthetic structures of the human body[3] and coordinated with it of intelligent technical devices, and basis support equipment. For this reason, in each space of a residential development, functionally adequate, additional surfaces and cubatures should be designed, and also use appropriates construction structures in order creating optimal freedom of motion and spatial orientation.

The surrogate effectiveness of perception and communing with the environment in the built space that allows, using "surrogate" senses and motor organs, independent and freely overcoming distances, and also enables, using substitute methods interiors and their elements using according with their functions, depends on:

- the type, number and size of spatial barriers which partially or completely cut off from the possibility of performing the intended activity, cause permanent or temporary limitations in the space of near and long range, and during their overcoming they cause increased effort, slowed movement and also disorientation, which adversely affects both physical and mental accessibility of human space [19]. This, in turn, leads to greaterlity a personality disintegration and intensification of social problems than in the case of the visually-impaired and hearing-impaired [17],
- the size and shape of: the structure and organization of road traffic, the slope and faults of floor surfaces, the buildings bodies, wall surfaces and their openings, on the type and forms of high, medium and low greenery, on the intensity of colors and the type of surface texture of the materials, and also depends on the stationary and of internal climatic conditions, which affects the clarity of both the recognized light and sound information and those received with the senses of movement and contact, i.e. feeling, smell and taste, and in the case of temporarily motorly disabled people it also affects the readability of receipt of special educational and warning information,

[3] Integral kinaesthetic structure (complex sensory sequence of activities over time, with variable dynamics and tension) of the human body, dependent on kinesthesia associated with personalized memory and kinesthetic perception, can be disturbed by kinetic neurological, rheumatoid, cardiovascular pathology, etc. and also as a result of total and partial damage or loss of motor organs [6, 12].

- the methods of creating for motorly disabled people the main functional and spatial "orientation pathway", free from the emergence of bothersome obstacles and unexpected balance disorders.

D. Intellectual disability concerns the mind both with a reduced level of intellectual functioning and difficulties in adaptive behavior [15]. The ICD-11 and DSM-5 classifications distinguish four degrees of intellectual disability: mild, moderate, severe and profound[4]. Mild and moderate disability concerns people who may acquire the skills to become independent (self-care and self-help) and does not get lost in a well-recognized terrain. Whereas people with severe and profound intellectual disabilities require constant care, because they have great difficulties in learning and understanding the world around them. In legislation, intellectual disability is primarily classified as a disorder of orientation.

Planning (adaptive) indications for creating a safe and accessible space built for people with such a disability concern the acquisition of the ability to move and perform stationary activities through the use of intensive cognitive training, mainly in terms of learning both templates of behavior and schemes of planned routes. For this reason, each residential development space should have additional functionally adequate information signs that are simple and easy to understand, as well as well-recognized symbols to increase orientation.

The corrective effectiveness of perception and communing with the environment in the housing space, and which, thanks to the use of "corrective" learning methods, enables independent recognition and overcoming further distances, and the use of interiors and their elements in accordance with their functions, depends on:

- the arrangement, the type, number and strength of the impact of undesirable spatial elements, which partially or completely interfere with the possibility to perform the intended activity, cause permanent or temporary limitations in in the space of near and long range, and also during overcoming them cause increased intellectual effort, anxiety or irritation and confusion, which adversely affects both the physical and mental availability of human space [19]. This, in turn, leads to increased personality disintegration and intensification of social problems [17],
- the size, shape and variability of: the structure and organization of road traffic, the slope and faults of floor surfaces, the buildings bodies, wall surfaces and their openings, on the type and forms of high, medium and low greenery, on

[4] The four-level division of intellectual disability present in the ICD-10 (International Statistical Classification of Diseases and Related Health Problems) prepared by the World Health Organization (WHO) and in the next version of ICD-11, the description and codes of which are valid from the beginning of 2022, it is identical to the division of intellectual disability in the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders) prepared by the American Psychiatric Association, the description and codes of which have been in force since mid-year 2013 [1, 3, 23, 24].

the intensity of colors and the type of surface texture of the materials, and also depends on the stationary and of internal climatic conditions, which affects the clarity of both the recognized light and sound information and those received with the senses of movement and contact, i.e. feeling, smell and taste, and also affects the readability of receipt of special educational and warning information,

- the methods of creating the main functional and spatial "orientation pathway" for people with intellectual disabilities, free from the occurrence of dangerous, unexpected disturbances of spatial orientation as a result of accidental changes to the key elements of a well-recognized terrain.

E. Senile disability concerns, to a greater or lesser extent, all the above-described categories of disability, which are gradually acquired by every human being in the process of biological aging. These disabilities, developing over time in older people often additionally burdened with other comorbidities, primarily affect their perception of the residential development environment as an environment with more and more inaccessible physically and socially, space.

The described disabilities, as already earlier been demonstrated, are in people, complex and varied. This has a significant impact on their perception and the way they communing with each space of the built environment. Due to the fact that the perception and contact with the space of the environment by all people has a multi-sensory character, it becomes possible to create, from similar elements, spatial architectural and urban layouts, with the same accessibility, common for both all non-disabilities, the elderly and people with various disabilities [21]. Therefore, it is worth finding an answer to the following question formulated by the author in a perverse way: ***What elements and their features of architectural and urban spatial layouts have the strongest affects the equalization of functional and spatial accessibility of the residential development environment to all residents, both non-disabled and elderly and with various disabilities?*** This is important for determining the general principles of creating urban assumptions for universal design, necessary to integrate all human needs based on respecting his independence and naturalness in the sustainable use of the space of the housing environment at all stages of both architectural and urban design.

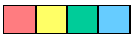
2.3. Universal functional and spatial solutions in the urban plan of a place of residence adapted to the needs of elderly and disabled people

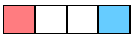
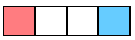
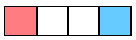
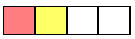
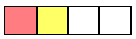
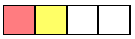
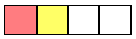
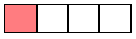
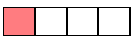
In order to answer the question previously formulated in this way was carried out, on the basis of the results of the evaluation of the possibilities of increasing the effectiveness of perception and communing of the elderly and disabled with the built environment, the identification these elements and of their architectural and urban features in the spatial layouts of residential development, which directly

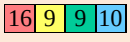
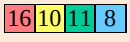
affect the equalization physical and social accessibility of this space of the built environment between all the non-disabled, elderly and with various disabilities residents.

Table 1 presents sixteen identified in this way: elements and their features of spatial layouts of residential development, as well as the results of the analysis of the impact of each of these features of the identified elements on increasing the effectiveness of perception and communing with space of built environment by people from the four previously characterized categories of disability: visual, auditory, motor and intellectual. The magnitude of the impact of these identified elements and their features of spatial layouts was determined on the basis of the calculated number of favorable correlations between these elements and their recognition and achievement by people, in the characterized categories of disability.

Table 1. The results of the analysis of the impact of the identified elements and their spatial features of architectural and urban layouts on increasing the effectiveness of perception and communing with built environment according to the characterized disabilities in terms of equalizing the social and physical accessibility of residential development space between all residents non-disabled, elderly and with various disabilities (author's compilation)

Characteristics of the elements of the spatial architectural and urban layout, influencing the increase of the effectiveness of perception and communing with the built residential environment, among residents elderly and with various disabilities	Influence of the characteristic of the layout element on increasing the effectiveness in terms of the described disability categories, during*:		Number of category correla-tions with the layout element
	recognizing the layout element	achieving the layout element	
1	2	3	4
1. Urban plan of the residential development layout (complexes of buildings, streets, greenery, etc.), that favoring neighborhood communities. More preferable, when its size and spatial arrangement (complexes in the layout of a courtyard, a forecourt, a bend, a nest, of a cul-de-sac, a corridor, a bay etc.) contributes to strengthening of a social contacts and of a mutual help between neighbors, also contributes to strengthening of a security.			**8** 4+4
2. Urban plan of the residential development layout (complexes of buildings, streets, greenery, etc.) created with the location of buildings in an area with a minimum slope. More preferable, when the area is flat.			**7** 4+3

3. Urban plan of the residential development layout (complexes of buildings, streets, greenery, etc.) with a simplified geometry of short distances. More preferable, when was created with the closest location to the place of basic necessity services (shop, pharmacy, doctor, diner, school, etc.).			**5** 2+3
4. Urban plan of the residential development layout (complexes of buildings, streets, greenery, etc.) with a simplified geometry of the spatial composition. More preferable, when was shaped on a rectangular mesh.			**4** 2+2
5. Urban plan of the residential development layout (complexes of buildings, streets, greenery, etc.) with a very low noise level of background acoustic. More preferable, when was created in an optimal geometry and location away from sources of noise.			**4** 2+2
6. Urban plan of the residential development layout(complexes of buildings, streets, greenery, etc.) with a very high level of lighting at night and in significantly darkened places. More preferable, when was created in an optimal geometry and location with natural and artificial light sources.			**4** 2+2
7. Residential development (complex of buildings and back-up facilities), low and one-storey. More preferable, when her is single-levelly, and also accessible to all residential premises from the street level.			**7** 4+3
8. Residential development (complex of buildings with gardens, pavements, etc.) with distinctive colors. More preferable, when it is created in clear contrast to its surroundings.			**3** 2+1
9. Residential development (complex of buildings with gardens, pavements, etc.) with the main distinctive entrance zones, additionally marked and with a direct driveway for a privileged car. More preferable, when the main entrances are accessible to all able and disabled residents.			**6** 2+4
10. Car-free residential development (complex of buildings with facilities and gardens, pavements, etc.). It is more advantageous when there is traffic in its vicinity without parking and			**5** 1+4

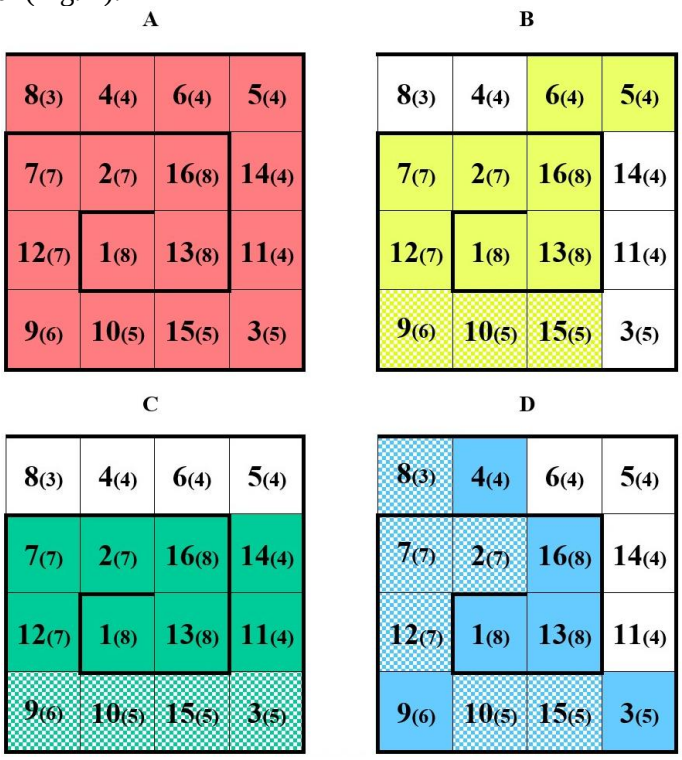
driving (min. 30 m to the parking space for unprivileged cars).			
11. Residential development (a complex of buildings whit facilities, gardens, pavements, etc.) with spatial parameters adapted to the various needs of social and physical contacts of people staying and moving independently with the use of assistive devices (stair-climber, wheelchair, stroller, crutches, cane, prosthesis, blind person's canine guide, etc.).			**4** 2+2
12. Residential development (a complex of buildings with back-up facilities and gardens, pavements, etc.) with technological parameters adapted to the various needs of social and physical contacts of people staying and moving independently with the use of supporting intelligent electrical and electronic devices.			**7** 3+4
13. Street furniture on area of residential development with a recognizable function or simple symbolism. More preferable, when was created in an optimal geometry and location for additional signs of the information light and sound.			**8** 4+4
14. Layout and type of the traffic surface on area of residential development with a distinct hardness and texture. More preferable, when was protected (cover, arcade, roofing, cleaning, etc.) against harsh weather conditions, as well as without gaps, faults, long and steep ramps that make it difficult to move.			**4** 2+2
15. Layout and type of greenery in the area of residential development with a distinct habit and smell. More preferable, when was created in an optimal geometry and location for additional signs of the information light and sound.			**5** 4+1
16. Main "pathway of functional and spatial orientation" in the area of residential development, free from the emergence of dangers and unexpected disturbances in the perception and the way of communing with the residential environment.			**8** 4+4
Number of correlations of the characterized elements of the layout with the described disability category	 16 9 9 10	 16 10 11 8	**89** 44+45

*Color coding of disability categories is in line with Figures 1 and 4.

The first column of the table describes: six identified features of an urban plan of a residential development layout, then six identified features of a single

residential complex, and finally four identified features of a objects of equipment street and recreational in a residential development area. The presented in second and third columns the results of the impact analysis using color coding of the disability categories, in the fourth column were showing in the numbers of correlation between these categories and the feature of each identified element of spatial layout of residential development.

The synthesis of the collected research results in Table 1 is presented on four spirals of ordered of elements and their features of the spatial architectural and urban layout according to the number of correlations, influencing the increase of the surrogate and corrective effectiveness of perception and way communing with residential development environment by elderly and disabled in the four characterized categories of disability: A – visual, B – auditory, C – motor and D – intellectual (Fig. 2).



Squares a wholed filled – total impact (when recognizing and achieving)
Squares a chequered filled – partial influence (when recognizing or achieving)

Fig. 2. Spirals of ordered of elements and their spatial features of architectural and urban layouts, according to the number of correlations influencing the increase of the surrogate and corrective effectiveness of perception and communing with residential development environment in all the elderly and the disabled, in four characterized categories of disability of: A – visual, B – auditory, C – motor, D – intellectual (author's work)

Only, spiral A showed the total impact (during recognizing and achieving) of all sixteen identified elements and their architectural and urban features of a built residential environment on the increase in the effectiveness of the surrogate and corrective perception of spatial layouts in the process of equalizing physical and social accessibility among all residents, non-disable and disabled visualy. This shows that in the built environment of every human being, the quality of the sense of sight is of paramount importance in determining the general principles of creating urban assumptions for universal design. Comparing the spiral of visual disability – A with the other spirals of: auditory disability – B, motor disability – C and intellectual disability – D, we can see that in the built environment residential of every human being, regardless of their type of disability, there are the nine common elements and their architectural and urban features influencing on equalizing physical and social accessibility between able-bodied and disabled residents. Table 1 provides a description of these nine elements and their features, numbered 1, 2, 7, 9, 10, 12, 13, 15, 16, which correlate with all four characterized categories of disability and their mixed variants. However, they have a diversified impact on increasing effectiveness both in recognition and in achieving them by all residents elderly and disabled.

For example, the controversial way of adapting the residential development environment to the needs of non-disable and disabled presented in the photographs (Fig. 3), would probably not have happened if at least some of the nine elements and their features, previously identified in Table 1, were taken into account there, i.e. such as:

- residential development located in the urban plan – on a flat area with no level differences (No. 2),
- residential premises of residential development – accessible from the street level, without additional lifts and a ramp (No. 7),
- zones of the main entrances residential development – additionally marked and always accessible to all able and disabled residents (No. 9),
- parking and traffic of cars in residential development environment – distant outside and limited to the necessary minimum (No.10),
- intelligent electronic and electrical devices of residential development – always accessible to all able and disabled residents (No. 12),
- layout and type of greenery in residential development environment – collision-free with additional signs of light and sound information (No. 15).

Fig. 3. Main entrance, in low-rise residential buildings, located more than 0.6 m above the street level with a driveway for disabled people, stairs and a ramp without external railings and in poor condition with uneven damaged surface, blocked with parked cars and of a utility container standing in front of the stairs - Kozanow estate in Wroclaw (author's photo, 2021)

However, only three out of sixteen identified elements and of their architectural and urban features in the spatial layouts of the residential development environment - marked with numbers: 1, 13, 16, are characterized by

the greatest number of correlations with all categories of disability, as they have a full impact on increasing effectiveness both in recognizing them and in achieving them by all residents elderly and disabled. They are the most universal in urban planning, both in the scale of the entire housing estate and in smaller elements of its development layout. These identified elements and their features, i.e.:

- layouts and size of residential development in the urban plan, favoring the strengthening of social contacts and mutual neighborly assistance (No. 1),
- street furniture of residential development, easily recognizable in terms of functionality, simple in symbolism and collision-free with additional signs of light and sound information (No. 13),
- main "pathway of functional and spatial orientation" in the area of residential development, free from the emergence of unexpected spatial barriers, disturbances in balance and perception (No. 16),

at the same time, in each resident, they fully strengthen also the sense of security, independence and freedom of communing with the space of residential development environment.

3. CONCLUSIONS

The conducted research on the conditions and methods of creating urban solutions in universal planning of residential spaces for the elderly and the disabled showed that the pace of introducing broad **integrated accessibility** into urban planning, which in the built environment can ensure a dignified and independent life for all elderly and disabled people depends primarily on from the progress in this area, the development of legal regulations in Poland, Europe and the world.

In each organized society in their area, legal regulations are created, which are the resultant of the economic, cultural, social, geographical, ecological, health, etc. Therefore, the article additionally pays special attention to the development of legal regulations in the context of creating more favorable conditions for both architectural design and urban planning for the elderly and disabled.

For the time being, these regulations, fully compliant with the EU idea of integrated accessibility, have been unsuccessfully demanded on the EU forum by the EDF (European Disability Forum) organizations. Exactly it's the inaccessible environment, barriers in the social and physical environment that create disability, create limitations that make it difficult to even secure the basic existential needs of a person, not to mention the possibility of self-fulfillment. For this reason, the answer to the question asked by the author in this article about the improvement of this accessibility in urban solutions of the space of the residential environment is the obtained results of research on elements and their features of spatial architectural and urban layouts, which in elderly and disabled people increase the surrogate and corrective effectiveness of perception and of freedom communing

with the built residential environment. They are of significant importance in solving the urban planning problem of **equalizing** the social and physical accessibility of residential development space, between all residents not disabled, elderly and with various disabilities. The research of sixteen identified elements and their features on the scale of:

- an urban plan of a residential development layout,
- a single residential complex,
- a objects of equipment street and recreational in a residential development area,

showed that the strongest correlations with all these elements and their features, occur in people with visual disabilities.

While, in people with various types of disability, as shown by correlation researches in four characterized categories disabilities: A – visual, B – auditory, C – motor and D – intellectual, the strongest impact on the sense of security, independence and freedom of a communing with the residential environment space, have urban solutions, in which the size and layout of residential developments favor the strengthening of social contacts and mutual neighborly help, in which the main "pathways of functional and spatial orientation" create areas free from the emergence of dangers and of unexpected disturbances in the perception and manner of a communing with the residential environment, and a small architecture is easily recognizable functionally and collision-free with additional signs of light and sound information. It should be noted that the obtained research results can be very helpful in improving the general principles of creating urban assumptions for universal design, for building spatial architectural and urban layouts of residential developments from a common elements with equalized accessibility, both for people not disabled, elderly, and with various disabilities.

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