UNIVERSAL DESIGN.
METHOD OF QUALITY RESEARCHES OF RESIDENTIAL SPACE

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Abstract
Problem statement: The paper fits the trend of Universal Design and focuses on urban space of large housing estates, which is not suitable for all users, and has structural and non-structural barriers.
Methods: The author for the study of such problems has developed its own method of research, which is part of a larger Urban Audit, published in the author’s habilitation monograph. This article, due to the ability to reach a wider audience, presents this method in English.
Findings and Results: The method was applied to 4 large housing estates, where a total of 356 seats were examined, and 130 were assessed in a negative way. The managers of surveyed settlements were acquainted with results and modernization proposals, which were soon implemented in their neighborhoods.
Conclusions and recommendations: The main task developed by the author of the research method is to improve the quality of urban spaces of large housing estates. However, due to its universal character it can also be used for housing built today.

Streszczenie
Problematyka: Artykuł wpisuje się w nurt Projektowania Uniwersalnego i skupia się na przestrzeni urbanistycznej wielkich osiedli mieszkaniowych, która nie jest przystosowana dla wszystkich użytkowników, czyli posiada bariery strukturalne oraz niestrukturalne.
Metody: Autorka do badań tego typu problemów opracowała własną metodę badawczą, którą jest częścią szerszego Audytu Urbanistycznego, zaprezentowanego w monografii habilitacyjnej autorki. Ten artykuł, ze względu na możliwości dotarcia do szerszego grona odbiorców, prezentuje tę metodę w j. angielskim.
 Wyniki: Metoda została zastosowana na 4 wielkich osiedlach mieszkaniowych, gdzie zbadanych zostało w sumie 356 miejsc, z czego 130 zostało ocenionych w sposób negatywny. Zarządcy badanych osiedli zostali zapoznani z rezultatami oraz propozycjami modernizacji, które wkrótce wdrożyli na swoich osiedlach.
Wnioski. Zasadniczym zadaniem opracowanej przez autorkę metody badawczej jest poprawa jakości przestrzeni urbanistycznej wielkich osiedli mieszkaniowych. Ze względu jednak na jej uniwersalny charakter może być także zastosowana dla osiedli budowanych współcześnie.

Keywords: Author’s research metod; Modernization; Structural and non-structural barriers; Universal Design; Urban space of housing estate.

1. INTRODUCTION

Universal Design applies to the whole broad spectrum of issues and is dedicated to the creation of buildings, products and environments that should be available for both healthy people and people with disabilities.
able to all, regardless of age, ability or social status. Mace described his research and observations in the work of Universal Design: *Housing for the Lifespan of all People* [1] published by the U.S. Department of Housing and Urban Development in 1998, The Center for Universal Design at North Carolina State University, which is the fastest-acting unit in the United States, dealing with this type of design [2]. Detailed rules for this type of design can also be found in the position: Connell B. R. et al.: The Principles of Universal Design [3].

The main intention of Universal Design is to simplify the life of citizens, to create more useful flats and the entire built environment with minimal financial outlay, or if possible without charge at all.

Universal Design should be regarded rather as the direction and philosophy of thinking, than a strict method. In Poland, this kind of thinking about design and the built environment, building and the product became important after joining the European Union.

The author has developed in this field its own research method that can be used in the space of a housing estate in order to adapt it for all users.

Research Universal Design is a part of a broader test method, named Urban Audit, which examines the large housing estates in accordance with the principles of Sustainable Development and was published in the author’s habilitation monograph. This paper, due to the possibility of access to the international audience, presents this method in English.

2. UNIVERSAL DESIGN IN URBAN SPACE

*People do not like barriers.* This simple statement would be considered not only as a motto for this chapter, but as a kind of a truism, for which professor Jan Gehl in his flagship book *Life between buildings* [4], indicates the principles of Universal Design and finally, on which the activities of the New York organization PPS – Project for Public Places are based [5] and which deals with creating public spaces friendly for all, called *placemaking*.

Contemporary times should encourage the creation of spaces available and comfortable for each user.

Meanwhile, the space of housing estate can be divided into a series of obstacles that need to be divided into:

- structural,
- non-structural [6].

**Structural barriers (BS) in space of housing estate**

Generally, spatial barriers can be divided into architectural, urban and equipment.

Structural barriers (BS) are the all elements present in the housing estate, which make any difficulty in their defeat for a person with permanent or temporary motoric problems, an elderly person or a parent with a stroller. This group will include both architectural elements (e.g. the outdoor stairs) as well as the urban ones (e.g. undulating walkways).

In total, we can include there the following obstacles:

- staircases in the entrance area of the building without ramps or rails,
- treads or high thresholds in the entrance area to residential buildings or other objects in the residential space,
- outdoor stairs without ramps or rails,
- dilapidated (e.g. fragmentary) rails or rails with random spacing and angle, not adapted to modern requirements (in Poland: Dz. U. Nr 75 poz. 690 dated 12 IV. 2002),
- ramps or rails without railing,
- uneven sidewalks by e.g. negligence, aged surfaces or invasive nature activities (tree roots),
- sidewalks cut for example by drainage pipes or other obstacles,
- no reduction of the curb at the junction of the pedestrian traffics and vehicular roads,
- no use of signaling surface between the pedestrian traffics and vehicular roads,
- lack of parking places for the disabled,
- pedestrian traffics separate from the vehicular roads by accidental fence, which can be the cause of accidents for pedestrians especially the visually impaired,
- no resting areas (benches) on long-distance walkings.

These obstacles may occur in the all space of the residential estate. Structural barriers in the housing estate may occur individually or in groups, always, however, the presence of even one barrier may contribute to a negative assessment of the place and prevent the passage or transit of a person with motor problems. Each poorly designed place – a barrier in the settlements, should be subjected to modernization. Upgrading or design of the housing estate should be done so a logical manner, based on the social participation. An important factor is the application of the law, however, universal design, goes further and directs greater foresight.
Non-structural barriers (BN) in space of housing estate – wayfinding

The issue of wayfinding is defined as finding the road, running from one point in space or building to the next pointing the way and achieve the intended purpose. Wayfinding system includes such elements as the internal layout of the building, external organization objects, hints, signs, maps, logical progression of space and color coding [7].

The measure of properly designed spatial orientation system is that how users are experiencing the environment where it is provided. Do designed communicative components make it easy to find the goal? The system indicates the users way should calm down, create a friendly environment and give answers in advance of the potential questions about directions.

Successful system pointing the way should provide information to users in order to [7]:
- confirm that they are at the beginning or end of the road they chose,
- determine their current location in the building or space,
- state that the chosen path is correct,
- determine the distance to the goal,
- show the potential obstacles and ways of avoiding (bypass).

Wayfinding design space is determined by:
- architectural elements,
- graphic communication,
- verbal communication (audible)
- tactile communication [8].

Graphic description of wayfinding should contain the following four main elements:
- identification,
- confirmation,
- orientation,
- goal.

The cooperation of all distinguished elements is responsible for creating the bright and colorful space for all users in the process of wayfinding.

3. AUTHOR’S RESEARCH METHOD

The author has developed a method of the Urban Audit, which explores the spaces in housing estates in accordance with the principles of Sustainable Development (ecology-economy-society and culture). The Universal Design research method is a part of it (society and culture) and mentions all barriers structured and non-structured in residential areas, which are responsible for the discussed problems, according to their described evaluation criteria and demonstrate the principles of modernization.
<table>
<thead>
<tr>
<th>No</th>
<th>the name of the place – the barriers in the housing estate, pictogram</th>
<th>Structural barriers (BS)</th>
<th>Tested components of barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BS 1</strong></td>
<td>Pedestrian crossings*</td>
<td></td>
<td>1. reduce the curb across the width of the crossing or the occurrence of curb ramps at higher altitude difference (min. ramp’s width 0.9 m, ramp’s slope max. 5%, in the absence of barriers – side slope of the ramp to 10%) 2. the presence of the islet at the crossing (islets equal level with the level of the crossing or the existence of bilateral curb ramp at a distance of 1.2 m from one another, the use of tactile markings on the entire width of ramps) 3. marking the crossing (lanes, traffic lights and verbal) 4. surface of crossing (equal, at the site of contact with the road pavement surface texture change - tactile markings for the blind and partially sighted)</td>
</tr>
<tr>
<td><strong>BS 2</strong></td>
<td>Pedestrian traffics</td>
<td></td>
<td>1. the width of the pavement and slope (min. width 1.5 m without benches and others elements of the small architecture max. longitudinal slope 5%, transverse slope 2%) 2. surface, colors 3. signs for the visually impaired (e.g. guide lines of sight as contrasted with the road curbs or other lines of different color) 4. no barriers</td>
</tr>
<tr>
<td><strong>BS 3</strong></td>
<td>Contact points of pedestrian traffic with other elements of the estate</td>
<td></td>
<td>1. reduction of the curb or use the curb ramps 2. area (free of holes, equal) 3. ramps or rail ramps, if required by the altitude difference 4. signs for the visually impaired (change in the floor at the entrance to the contact point, change color)</td>
</tr>
<tr>
<td><strong>BS 4</strong></td>
<td>Cycle paths</td>
<td></td>
<td>1. width (1.5 m – when it is a one-way, 2.0 m when it is bidirectional) 2. surface and color (equal surface, the absence of barriers e.g. tree roots) 3. marking by the horizontal and vertical sign</td>
</tr>
<tr>
<td><strong>BS 5</strong></td>
<td>Cycle-pedestrian paths</td>
<td></td>
<td>1. width (2.5 m), longitudinal tilt (max. 5%) 2. equal surface, color diversity both zones, the lack of curbs between zones 3. marking by the horizontal and vertical sign</td>
</tr>
<tr>
<td><strong>BS 6</strong></td>
<td>Internal roads in housing estates – the so-called. residential zone</td>
<td></td>
<td>1. width (min. 5.0 m) 2. equal surface, horizontal barriers resulting from traffic calming, it is possible to overcome by the all users 3. absence of other barriers 4. signs (speed limit 20 km / h, traffic calmed, pedestrian priority)</td>
</tr>
<tr>
<td><strong>BS 7</strong></td>
<td>Outdoor stairs with ramps or rollover rail Internal roads in housing estates – the so-called. residential zone</td>
<td></td>
<td>1. equipment in legitimate ramps or rollover rail (height difference to 15 cm – 15%, from 15-50 cm – 8%, above 50 cm – 6% , ramp’s width 1.2 m, stair’s width min. 1.2 m) 2. surface (equal and smooth, it can be varied in color) 3. occurrence of 2 handrails (90/75 cm) 4. signs for the visually impaired (color contrast at the beginning and end of the ramp, change of surface for the blind)</td>
</tr>
</tbody>
</table>
Entrance zones to buildings*

1. the width of the zone (min. 1.5 m)
2. surface, colors (equal surface, no holes and barriers)
3. no stairs
4. the existence of legitimate ramps or rail ramps in the presence of the difference area (stairs)
5. glass door (transparency 50%), covered
6. the existence of an alternative entrance for people with disabilities
7. lack of items in the entrance area to prevent entry to all users

Wickets and gates in the area (e.g. on a fenced playground)

1. entry width (lawful 0.9 m, 1 m for wickets on playgrounds, 2.4 m for gates)
2. absence of doorstep
3. the size of the area in front of and behind the gate in accordance with the law, hardened, up to 1.8 m tall gates no pointed elements, handle and not the knob

Parking space for the vehicle of a disabled person

1. a place designed in accordance with the law (a fundamental dimension of a parking space in perpendicular to the axis of the road is min. 3.6 m x 5.0 m, and the parallel min. 3.6 m x 6.0 m)
2. reduction or lack of curb, equal flooring
3. marking by the horizontal and vertical sign

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**Table 2.**

Non-structural barriers (BN) – visual information. Types of non-structural barriers and their tested components

<table>
<thead>
<tr>
<th>No</th>
<th>the name of the place - the barriers in the housing estate</th>
<th>tested components of barriers</th>
</tr>
</thead>
</table>
| BN1 | visual information in the housing estate / street names | 1. occurrence, the term information system: urban or housing estate  
2. placement  
3. color contrast, clarity  
4. occurrence of numbering houses  
5. adaptation for blind and visually impaired (if the information is within reach of touch) |
| BN2/2a | the address information on the buildings / the address information on the entrances to homes | 1. occurrence, the term information system  
2. placement  
3. color contrast, size arrays, readability, content: the name of the street, house number, logic houses numbering  
4. adaptation for blind and visually impaired (if the information is within reach of touch) |
| BN3 | signposts to important residential buildings | 1. occurrence, the term information system  
2. placement  
3. color contrast, clarity  
4. adaptation for blind and visually impaired (if the information is within reach of touch) |

Source: own author’s
Symbols – pictograms proposed in the tables are introduced in order to prioritize and clarify individual barriers and to enable developing their map-based barriers found in residential structures.

Distinguished types of non-structured barriers should be tested in a similar way, which is system status maintenance, logic and clarity of visual information on the housing estate, which contributes to the problem of spatial orientation (wayfinding).

**Determination of criteria for evaluations of structural and nonstructural barriers**

Each barrier – places in residential space, assigned according to the assessment criteria developed. The author has adopted the following scale: failure to meet the standards without the possibility of improvement, failure to meet the standards with the ability to improve and meet the standards of basic by current regulations. It also adopted adequate for this type of analysis, naming ratings, respectively assessments of negative, neutral and positive. It seems that such a course of action will be easier to understand and use for managers of residential estates and also will have greater importance urging (in the case of neutral or negative ratings) to undertake modernization activities.

<table>
<thead>
<tr>
<th>Table 3.</th>
<th>Universal Design / Assessment criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment/points</td>
<td>Assessment criteria</td>
</tr>
<tr>
<td>1</td>
<td>the predominance of places – alleged structural barriers and non-structural – rated negatively; if there is a disproportion e.g.: a large number of structural barriers assessed negatively, neutral and / or positively evaluated the non-structural barriers, estate also gets a rating of 1, because of the greater harm of structural barriers</td>
</tr>
<tr>
<td>2</td>
<td>the predominance of places – alleged structural and non-structural barriers – rated neutral; if there is a disproportion e.g.: a large number of structural barriers assessed positively, neutrally evaluated non-structural barriers, estate obtained an equal to 2 points</td>
</tr>
<tr>
<td>3</td>
<td>the predominance of places – alleged structural barriers and non-structural – rated positively</td>
</tr>
</tbody>
</table>

Source: own author’s

The proposed scale of assessments:

- **negative rating** (equal to 1 pts.) – failure to meet the standards without the possibility of improvement
- **neutral rating** (equal to 2 pts.) – failure to meet the standards with the possibility of improvement
- **positive rating** (equal to 3 pts.) – basic meet the standards by the current legislation, the place is not a barrier.

<table>
<thead>
<tr>
<th>Table 4.</th>
<th>Example of analysis of structural barriers and recommendations for modernization</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS 3 Contact points of pedestrian traffic with other elements of the estate</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No</th>
<th>address and description of the situation (Tysiąclecia estate)</th>
<th>photograph</th>
<th>recommendations for modernization</th>
</tr>
</thead>
</table>
| 1 | Tysiąclecia 11 drainage groove at the intersection of pedestrian traffic
  1. groove at the contact point, short footbridge made of tinware
  2. surface smooth, change of colors,
  3. the lack of signs
  negative rating | | 1. the closure of the groove by constant footbridge to the entire width of contact point
  2. ----- 
  3. introduction of contrast markings for the visually impaired |

Source: own author’s
4. RESULTS

The presented method could be useful for managers of housing estate who would like to improve its urban quality. The author applied it to the 4 large housing estates (3 Polish and 1 German), built in communist times. 268 places were surveyed in Polish estates, and 88 in the German. In Polish estates 124 places have been evaluated negatively, 37 neutrally and 107 positive. It the German estate this result was respectively 6, 11 and 71 [9]. This result shows how much there is still to do on Polish settlements.

5. CONCLUSION AND RECOMMENDATIONS

Searching for reasons not adapted to all the Polish settlements, it can be stated, that the managers of the estates haven’t noticed the changing needs of residents. Yes, managers of settlements – housing estates administrations, cooperatives – care of its citizens at any age, but still it does not concern fully disabled people and the offer for the elderly focuses only on senior’s meetings. Meanwhile, the aging of the Polish society, and thus the growth of various types of disability is progressive. Another reason are the legal conditions, which by the time of political transformation, did not take into account the adaptation of the built environment for the disabled, and now this type of adaptation applies only to new estates or modernization. Cooperatives managing settlements from this period are therefore in a sense exempted from adapting residential space for all. However, if they already modernize the space of the estate, they do it mostly unlawfully. Another reason for this type of activity can also be traced in the insatiability of the housing market and the competitiveness of the cooperative housing prices to developers housing prices. In this context, the large housing estates are still attractive. Strategies for housing should therefore primarily rely on special urban audits of residential space, which will allow the distinction of all barriers and problems. Developed criteria for assessing urban residential space and specific research in the context of Universal Design, prepared by the author, can be used as source material, and the introduction to undertake such projects.

REFERENCES

[2] In Europe EIDD – Design for All Europe 100% self financing a European organization should be mentioned, which covers the entire area both in theory and in practice for design for all from built-up areas and material products for communication, services, and systems design
[6] This division was introduced on the basis of the principles of Universal Design, while a further specification of barriers, the author has based on its own observations