



Ergonomic Design of Private Outdoor Living Spaces

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Abstract. In urban environment, as well as in individual interiors, the access to outdoor spaces is very important, especially to green and sunlit areas, and areas with a sky view. These closed functional sections are therefore complemented by public and private spaces open to the external environment. The opening of residential spaces to the natural environment is particularly preferred. In multi-family housing, it is possible mainly thanks to the use of adjacent balconies, loggias, etc., which provide the opportunity to stay outdoors, but still within a private residential area. The paper discusses such issues as: types of private external spaces, their aesthetic and structural shaping, their relationship to internal sections and other rooms, the conditions of their construction in the vicinity of already existing and designed dwellings, the advantages and disadvantages of analyzed solutions (case study) and recommended ergonomic design criteria, taking into account the general and specific housing needs (including those of people with disabilities).

Keywords: Architecture · Ergonomics in architectural design · Housing design

1 Introduction

A modern house consists of a lounge area (rooms) and service area (entrance hall, kitchen, bathroom). The functional and spatial program of a house is diversified by the intermediate zone between the indoor and outdoor space (balcony, loggia, terrace), which provides the opportunity to spend free time outdoors, however, within a dwelling.

Balconies and loggias consist an important element of shaping the body of a building, which, as a result, becomes more spatially differentiated; the layout of light and shadows on the facade is varied and dynamic. Moreover, additional façade forms allow the use of different building materials, surface textures and colors.

Direct outdoor access is an important criterion for choosing a dwelling. For various reasons, balconies or loggias are oftentimes very small and do not meet users' expectations. Their quality is also influenced by various factors independent of the housing standard, these include, above all: climatic conditions, sun exposure, as well as location in relation to neighboring buildings and dwellings.

2 Trends in the Shaping of the House Outdoor Space

In countries with mild and warm climates (including the Mediterranean countries), weather conditions are favorable for spending time outdoors. Therefore, housing open to the outdoor environment were already known in the ancient times. Even today, large terraces, balconies and even roof tops are used for recreational purposes there.

For centuries, residential houses with balconies or terraces were rarely built in Poland and other Central and Eastern European countries, as, at that time, they were considered to be mainly an element shaping the architecture of the building [2]. Their subordinate utility role was determined by both climatic conditions and lifestyle. Strict etiquette of i.a. fashion did not favor informal outdoor activities. Private and, with time, public gardens and parks were places of recreation and play. What is more, the intensification of development in large cities was the reason for the lack of private space outside dwellings. Balconies, terraces, arcades, etc. were more characteristic of palace and manor buildings of the richest social groups, while residences surrounded by greenery (with private parks and gardens) were located outside the city centers.

Overcrowding and tight urban development (especially in the 19th century) led to poor hygienic and sanitary living conditions for the majority of population. The outdoor space of the tenement houses was limited to narrow balconies on the front side (from the street) and to narrow courtyards at the back of tenement houses which included owners' apartments and dwellings in outhouses rented to worker families. Due to poor sanitary conditions, many community activists and scholars criticized the then urban development model, overcrowding of dwellings and lack of free recreational area.

After the First World War, the postulate of improving hygienic conditions gained in importance. Among others, many housing estates for less affluent dwellers were built. Thanks to lower building intensity and surrounding the buildings with greenery it was possible to provide better natural light and sunshine of apartments, as well as improve their functional and spatial diversity by using terraces, balconies, galleries or home gardens (Fig. 1). Such design decisions were then justified primarily by preventive care [3].



Fig. 1. Terrace with a pergola and private garden by a worker house (Wroclaw 1926) [5]

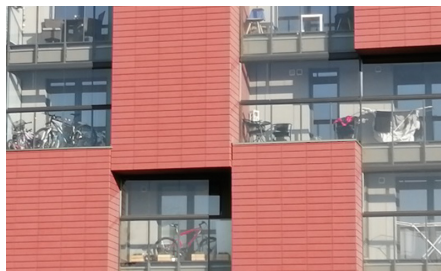


Fig. 2. Narrow balconies as a space used only for e.g. drying clothes or storage of bikes and various equipment (photograph by the author).

The pre-war concepts of building housing estates and apartments with access to green areas continued after World War II. Numerous apartments built at that time had a balcony or a loggia. However, due to economic reasons they were often replaced by the so-called French windows (*porte-fenêtres*), or new buildings were built without these elements at all. That is why, such buildings are called “blocks”, as they look like rectangular boxes. In this case, the important architectural values (material, structural, aesthetic), which are provided by the use of additional spatial forms such as balconies, were not appreciated.

In post-war residential buildings the actual depth of balconies or loggias is usually about 120 cm. This is due to cost-saving and technological reasons (using e.g. large block and slab technology) [6]. In such case, a narrow balcony or loggia cannot be used effectively for recreational purposes, as it is not possible to set up a table with chairs or a sun lounger and as a result, oftentimes those spaces are used merely as additional storage space (Fig. 2).

A significant part of the housing stock is made up of historic tenement houses erected at the turn of the 19th and 20th century. Many of them have original balconies on the front side, stylishly matched to the decorative facades, however, they are also narrow. Exposure towards the street (even from the north) is not conducive to maintaining a sense of intimacy, and the longitudinal proportions hinder freedom of movement. On the other hand, from the courtyard side, tenements usually did not have balconies at all (Fig. 3), as they used to be covered with outbuildings. Many housing communities (especially in Germany) are currently undertaking modernization works and construction of balconies on the courtyard side, where the flat façade has no significant historical value (Fig. 4). Similar actions are also taken on housing estates built in the large plate technology.

Appropriate arrangement of the re-assembled structure often requires taking into account certain restrictions related to the ownership division of the plot and the apartments themselves, as well as to fire protection conditions (ensuring adequate spacing to prevent the spread of fire). Therefore, in many cases, balconies are not accessible from any room, but from the kitchen (Fig. 5). As a result, they lose their role as a functional extension of a room. Nevertheless, the adjacency of the kitchen offers other advantages, as balcony is an ideal place to eat outdoors on sunny days and it can also be a place to grow herbs and spices (and even vegetables) used in meal preparation.



Fig. 3. Elevations of tenement houses from the 19th/20th century on the courtyard side without balconies (photograph by the author).



Fig. 4. Contemporary balconies of steel construction at a historic building (photograph by the author).

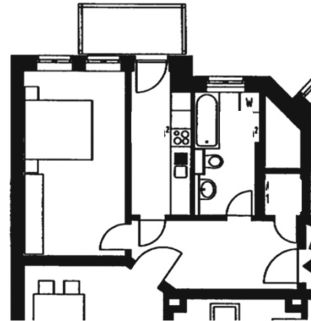


Fig. 5. Arrangement of balconies in the building design with access from the kitchen (image by the author).

3 Functions of House Outdoor Spaces and Their Design Criteria

In temperate climates, balconies and loggias seem to have little importance in the functional and spatial design of apartments, especially in comparison with Mediterranean architecture. Nevertheless, when such spaces are properly designed, they are willingly used by residents during warm days and evenings.

Smaller apartments (especially studio apartments) often do not have balconies or loggias, which are available in one-bedroom and larger apartments. In this case the factors which are taken into account are savings, as well as climatic and aesthetic requirements (architectural design of façade forms).

Joining of the housing space and the surrounding environment may be both direct or indirect, and it is achieved through:

- indirect visual contact using a transparent surface in the form of a traditional window, the so-called French window (porte-fenêtre) or flower window;
- direct visual and functional contact with the outdoor environment through balcony, loggia, terrace etc.

Balconies and loggias enable taking over the functions of a living room on warm days and evenings and joining of the living space with the outdoors. They can be considered as a space extending the living room or children's room [4, 7], as well as providing the possibility of meeting such outdoor needs in the open air as:

- passive rest (e.g. sunbathing, meeting with family and friends);
- active rest (e.g. gardening, exercising);
- children's play;
- contact with nature (limited in the city or in tall buildings);
- cultivation of potted greenery (flowers, herbs).

Open spaces significantly increase the comfort and standard of apartments, especially those in multi-family houses. Significant intensification of urban development, and its erection oftentimes in the midst of greenery, create favorable conditions for complementing the apartments with balconies, loggias and terraces, and sometimes even with home gardens, which are an important addition to the living rooms, by being able to take over their functions during warm days and evenings (Fig. 6). The favorable location depends on their sunlight exposure and connection to adjacent rooms. It is recommended to place them on the south or south-western side of the building, provided the outdoor spaces are not shaded by neighboring buildings. Moreover, they should be acoustically isolated from the street noise and provide privacy, as well as be a buffer zone, protecting against external noises caused especially by car traffic. It is recommended to shelter such outdoor areas against wind, rain and excessive sunlight. Loggias are less exposed to sun than balconies and the adjacent rooms are enshadowed during the summer season. Covering the side walls of a loggia is more advantageous for the users than balconies exposed to annoying external factors (sunlight, noise) [1].

Efficient use of a balcony or loggia requires the provision of usable area, which is necessary to set up the essential equipment (table, chairs, deckchairs, etc.) and entry space (Fig. 6). Apart from the size, the shape and proportions of the space are also important, as significantly large but narrow balconies (depth below 120 cm) are not used effectively, oftentimes becoming a storage area or a clothes drying space. Therefore, balconies and loggias should be no less than of 150 cm depth, allowing them to be furnished in several variants and used by people with disabilities (Fig. 6).

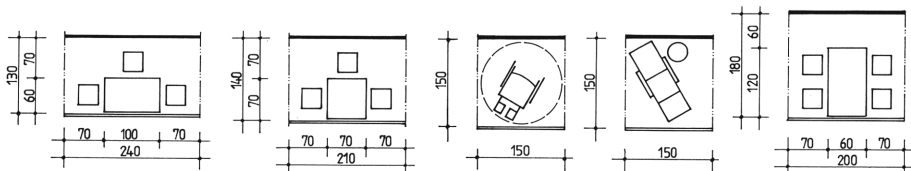


Fig. 6. Examples of balconies with different depths and their arrangement (image by the author).

Designing of outdoor living space should always take into account safety issues. The floor (even when wet) should prevent users from slipping and its appropriate slope should allow for quick drainage of rainwater. A stable railing preventing from falling

out should allow to look outside easily, while protecting the interior of the apartment from the insight of onlookers. What is more, its structure should particularly protect children from falling out.

Some apartments located on the ground floor of the building have terraces and home gardens and such a solution makes their functional and spatial program much more attractive (Fig. 7). Flats with adjacent gardens may be designed especially for families with many children, the elderly and people with disabilities (especially those on wheelchairs). However, such a solution requires appropriate architectural treatments, protecting the garden and the adjoining apartment against burglary and onlookers. It is therefore recommended to use, among others: fence nets, hedges, steep slopes between the terrace level and the adjacent area, burglar-proof windows, doors.

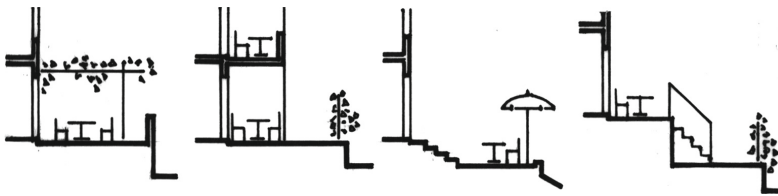


Fig. 7. Principles of spatial shaping of home gardens in relation to the level of housing and public space (image by the author).

Outdoor spaces are sometimes considered as vulnerable spaces in terms of anti-burglary protection (Fig. 8). This applies especially to ground floor apartments. The feeling of security is improved by individual (usually arbitrary) separation of space using grids. Through this measure, however, residents lose direct contact with the outdoors, and such bars also create unnecessary optical barrier.

4 House Outdoor Space for People with Disabilities

House outdoor space plays a significant role in the home life of people with disabilities, as depending on the degree of disability, it can become the main or sole place of contact with the outside environment.

Balconies and loggias are an important place of contact with the outside world for people with disabilities, accessible at any time, without having to leave the house. In many cases, they give them the only opportunity to be outdoors for long stretches of time. For this reason, it should be possible to enable spending time there even in adverse weather conditions (rain, wind, coldness, or heat). The size of the balcony or loggia enabling the proper fulfillment of the relaxation function, depends on the appropriate area, shape and proportions of the space (including the necessary wheelchair maneuvering space), as well as, among others, the way the space is arranged and the dimensions of the equipment (Fig. 9).



Fig. 8. Balcony grids as additional protection against burglary (Shenzhen, China, photograph by the author).

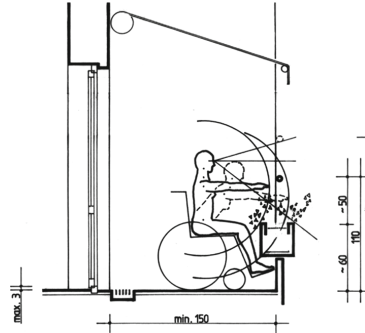


Fig. 9. The principle of balcony design for people with disabilities (image by the author).

Ergonomic design of the apartment outdoor space taking into account the needs of people with disabilities requires, among other things, meeting the following requirements:

- balcony doors with a suitable width (minimum 90 cm in clear view), without a threshold to ensure an easy passage for a person in a wheelchair;
- space providing freedom of movement, including full wheelchair rotation (Fig. 6);
- anti-slip flooring or carpet enabling safe movement even on wet surfaces;
- safe railings also allowing to look outside in a sitting position (Fig. 9);
- canopies or awnings protecting against rain and excessive solar radiation;
- walls protecting against wind and ensuring privacy;
- plug-in sockets for connecting, e.g.: TV sets, heaters, grills, etc.;
- arrangement of the potted greenery ensuring that it can be looked after in a sitting position.

5 Conclusions

Private house outdoor spaces are of great utility importance; they both complement and take over some functions of living quarters. What is more, outdoor spaces have an aesthetic significance as they are an important decorative element of the facade and the body of the building. Their ergonomic design requires taking into account such postulates as:

- sun exposure (south, south-west);
- size and proportions enabling the realization of various housing needs and taking over the functions of a living room during warm days and evenings;
- acoustic isolation from the street noise and visual isolation from passers-by and neighbors;

- protection against adverse weather conditions (wind, rain, etc.);
- accessibility for people in wheelchairs.

The best conditions for being outdoors are provided by partially sheltered balconies or loggias, which give a sense of intimacy and protection against the weather or gazes of strangers [1].

Numerous housing needs can be realized outdoors, such as: active rest, recreation and preventive care. A balcony or loggia often determines the success of a sale or rental of an apartment. This applies in particular to older buildings that are currently being modernized and did not have such space before. However, including external zones in flats increases the costs of development, and such additional expenses oftentimes hinder the purchase of an apartment with a certain number of rooms and suitable space, especially by buyers with a limited budget. Therefore, the design of balconies and loggias requires great care to ensure optimal conditions for the fulfillment of diverse housing needs (including those of people with disabilities).

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