Functional zoning in urban planning and architectural design

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Abstract. The article discusses a variety of issues, concerning functional zoning. These questions are being considered, starting from the wide-scale urban territories and up to small private plots and dwellings. The urban planning and design are being analyzed in accordance to the main classification features, i.e., in accordance to the number of population, planning schemes and planning structures. It is noted, that in the long run, the principles of zoning are highly dependent in the above-mentioned points of a master planning. The functional zoning of individual houses or flats are being considered with nearly the same method adopted. A dwelling division to functional zones depends upon its size, number of occupants, personal desires, etc.

Keywords: urban design and development, functional zoning, planning schemes and planning structures, urban settlement, masterplan, functional design, functional links, sequence of spaces, functional planning, household activities.

1 Introduction

Any architectural object, from a dwelling unit or a house, to a residential district or a megapolis, should be undergone to zoning, or dedicated to a number of different parts, according to their functional characteristics, which are called "functional zones".

2 The principles of functional zoning for residences

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The principal scheme of functional zoning of a house: 1 - Private zone (bedrooms, study, etc); 2 - Collective zone (living room, dining room, kitchen); 3 - Servicing zone (storage, cellar, laundry); 4 - Sanitary zone (bath, WC, etc); 5 - Communicated and access zone (corridors, entrance hall, stairs, etc).

The sequence of rooms to specific activities and functional procedures are summarized in table 1, and functional links, combined in so called «Functional Scheme», are shown on figure 2.

### Table 1

<table>
<thead>
<tr>
<th>№</th>
<th>Functional activities and procedures</th>
<th>Rooms and their number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sleeping</td>
<td>Bedroom (1 to 3-4)</td>
</tr>
<tr>
<td>2</td>
<td>Eating</td>
<td>Dining room (1)</td>
</tr>
<tr>
<td>3</td>
<td>Cooking</td>
<td>Kitchen (1)</td>
</tr>
<tr>
<td>4</td>
<td>Passive/active rest</td>
<td>Living room (1)</td>
</tr>
<tr>
<td>5</td>
<td>Washing, bath, etc</td>
<td>Bath, WC (1-2 of each)</td>
</tr>
<tr>
<td>6</td>
<td>Moving</td>
<td>Corridor, stair (1-2 of each)</td>
</tr>
<tr>
<td>7</td>
<td>Household activities</td>
<td>Storage (1-2)</td>
</tr>
</tbody>
</table>

In theory, the number of rooms in a private house or in a flat can be increased “ad infinitum”, only depending on the desire, needs and monetary potential of the owners. The possible reasonable enlarged list of rooms in functional zones, mentioned above, according to different activities, is presented below. This list is an enlarged version of table 1.

1. Sleeping: Bedrooms may include master bedroom, children bedroom/bedrooms, etc.
2. Eating: dining room, dining kitchen, etc.
3. Cooking: kitchen, etc.
4. Washing, bathing: bathroom, WC, shower, washroom, etc.
5. Household: general storage, wardrobe, cupboard, kitchen's storage, laundry, etc.
6. Moving: corridor, stair, entrance hall, lobby, etc.
7. Passive/active resting: Living (sitting) room, music room, children playroom, resection room, library, etc.
8. Summer and outdoor activities: Atrium, patio, balcony, veranda, terrace, loggia, barbecue site (outdoor kitchenette), etc.
9. Rooms and premises for other optional activities: Study, conservatory (winter garden), cellar, smoking room, etc.

The principles of zoning are based on number of physical and functional factors, which altogether create a scientific fundamental of architectural planning design. These factors are as follows:

Physical factors:
- Temperature and humidity of internal media (microclimatic regime);
- Natural lighting regime;
- Acoustics and noise control;

Functional factors:
- Visual reception and vision;
- Spaces for equipment/furniture, visitors and personnel/staff;
- Space for moving/motion, access and emergency movement.

3 The principles functional zoning for urban settlements

The urban planning, design and development also are traditionally based on principles of functional zoning. But, unlike the above-mentioned case, which require the establishing of functional links to elaborate a functional zoning of a living space of a dwelling, the urban zoning should be based on so-called “masterplan”.

A “masterplan” is a set of design documents for urban development, which is elaborated with respect to number of specific tasks, such as:
- social and economical;
- architectural and constructional;
- engineering and technical.

The first stage of a masterplan is usually of “short-term duration”, effective to say, 5 years. The second stage is usually termed “medium-term duration” and prospects up to 10 years. The final, third stage is called “long-term duration” and lasts up to 20 years. Usually, in practice, only the first and third stages are used and actually considered in a design procedure. Graphical implementation of a masterplan’ proposals is called a “city plan”.

An urban settlement, which are boroughs, towns, cities, etc may be classified according to: number of population, planning structures and planning schemes.

According to population all urban settlements are divided to the following groups:
- small-size urban settlements (small towns) have population less than 100,000;
- medium-size urban settlements (towns or small-cities) have population up to 500,000;
- large-size urban settlements (cities) have population up to 1,000,000;
- extra-large urban settlements (big cities) have population up to 5,000,000;
- megapolises have population over 5 million.
Fig. 3. Planning structures of urban settlements: A - Compact; B - Sprawling, C - Scattered. Legend: 1 - a river; 2 - a river, lake or sea; 3 - residential part of a town; 4 - industrial part of a town; 5 - an obstacle (a mountain).

According to planning schemes urban settlements may be of the following geometry: grid iron (regular or colonial); circular (radial); diagonal (combined) and free or natural (figure 4).

Fig. 4. Planning schemes of urban settlements: A - grid iron (or regular); B - circular (radial); C - diagonal (combined); D - free (natural). Legend: 1 - main streets (avenues); 2 - minor streets; 3 - city centres.

In an ideal case of an urban settlement, there should be the following separated zones, shown on figure 5: residential zone; industrial zone; zone of science and education; zone of major transport; sanitary and protection zone; storage zone; recreational zone with parks and greenery.
**4 Discussion**

The functional zoning of urban settlements is highly depended on the following features: the size and principal function of an urban settlement itself; the type of a planning structure and planning scheme; the historical background of a settlement, etc. For example, in rather small towns, intended specially for one major function, such as a health resort, or a university town, one may have no industrial enterprises of any sort. Thus, these settlements do not have an industrial zone and linked with it sanitary protection zone. Settlements of scattered type may have every separated part, devoted to a single function—e.g. residential, industrial and office/business ones. The distance to industrial part of such a settlement, usually dependent on some topographic features of a site itself acts as a sanitary protection zone. Finally, the central part of a settlement may be not of a business "downtown" type, but in old historical towns and cities usually acts as an “open museum”, being an archaeological feature of a locality.

**5 Conclusion**

1. A functional zoning, either architectural for residences of any type, or urbanistic for different settlements, must be considered as a fundamental for any design activities in architecture, building construction and urban planning and development. In its turn, the procedure of functional zoning is highly dependent on physical and functional fundamentals of architectural and urban design.

2. The traditional functional zoning of an urban territory, shown on figure 5, should be considered as an ideal case. In reality, the existing urban settlements of any size, population, planning structure or planning scheme may have a great number of functional zoning versions. Nearly, the only one functional zone, which exists every time, is the residential zone, combined with either educational, business, industrial or recreational ones.
and so on.

3. In the long run, it may be stated, that the smaller the urban settlement, the less self-containing and self-relating functional zones it possesses. Originally, the genesis of a functional zone starts from a single residence or enterprise of any type—industrial, commercial, public, etc.

4. Typically, at the first stage, all the functional zones, being only the individual objects, create a functional chaotic mixture within a settlement’s tissue. The second stage is the growth of these primitive zones and creating a larger settlement with the same mixture of functional zones, which are too far from the scientific modem principles of zoning ordinances. And finally, the third stage incorporates all the zones, necessary for normal existence of an urban settlement. They may be either specially created (like, recreational or educational zones), or may be removed or reconstructed within a settlement’s development (like an industrial or sanitary protection zone) and so on.

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