

## Minimizing the Residential Indoor Spaces for Comfort Living

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**Abstract:** The present article is devoted to the analysis of structural elements of a room prepared for comfort living. A new variant for minimizing the space in a room for comfort living is shown on the example of a studio-apartment in two levels on an attic floor. An overview of the apartment is shown, as well as layout plans of floors with furniture. Favorable transitory elements between zones in the rooms are offered. For comfort and harmonious looks, the smoothed shape of the living room is proposed. A low-pitched staircase is projected. A lay-out is designed for borders between different floor coatings and ceiling-embedded lamps that create an almost-tangible “light wall” on their border. For optimal use of the area, a plan of partition walls with tapered cornered was developed. A design solution was found for using a space under the section of the staircase flight. A solution was found for natural lighting in all the rooms due to the absence of partition walls and using glass partition walls and doors, creating a two-light volume and a stained-glass window in the cupola. The stained-glass window over the kitchen zone also warms the kitchen with solar light. For domestic items storage, a naturally-ventilated volume is provided: built-in wardrobes behind the staircase, racks, a stockroom, a niche over the toilet room and stockroom, drawers under the podium and stairs of the lower staircase flight. Interiors design and decoration were developed. The article has an overview of reference literature in the sphere of the optimal design of residential spaces.

**Key words:** Apartment-studio in two levels • Zoning • Space minimizing • Comfort living

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### INTRODUCTION

With the real estate in large cities being as expensive as it is, small-size apartments are often the only solution for many people. Low cost of construction, small area needed for the buildings and low operational cost – these are just a few advantages of a small apartment.

The work [1] suggests that no new areas be engaged for construction, but passages are built between buildings over the transport lanes, with restaurants, trading areas and office spaces be organized there. The work [2] suggests that cubic rooms be constructed in the second and third levels protruding outside the façade line so they are sun-lit from three sides.

The idea to divide space into non-rectangular volumes makes it possible to use the building area in

an optimal way and create good architecture. E.g., the work [3] suggests that a residential room is composed of separate volumes forming shapes of triangles, diamonds and trapezes. Staircases are positioned on the outside, which makes it possible to free some space, make the rooms insulated from one another, with passages between the rooms be done on the staircases – and create a more diverse and exciting design. The works [4, 5] suggest that rooms be made oval and occupy a minimum area with the maximum volume.

The work [6] gives examples of residential capsules by a Japanese architect Kisho Kurokawa. The capsule principle is used for hotels, for example, in Osaka. This is a room for sleeping-but not the apartment for constant living.

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The works [7, 8] give an overview of reference literature in the sphere of the optimal design of residential spaces. The work [9] states that a two-level flat is economically feasible, so a variant of an apartment in two levels in the attic floor was selected. The basic norms and regulations were used for the project [10].

The zoning of functional areas were based on the ideas described in [11] that is devoted to interpreting the urban space of Saint-Petersburg, as a combination of air bodies limited and divided by buildings, trees, fences etc. The apartment spaces should also have clear shapes; each of them should have its own meaning and expression.

The work [12] deals with the problem of forming the internal space and volume of buildings related to various architectural styles of certain periods ("modern", modernism, post-modern etc.), as well as general tasks of creating a humanistic environment. In the work [13] a volume-space interior composition of a separate apartment is shown.

The monograph [14] described the social nature of design, as its technologies are used in any type of design tasks if a lot of people are involved.

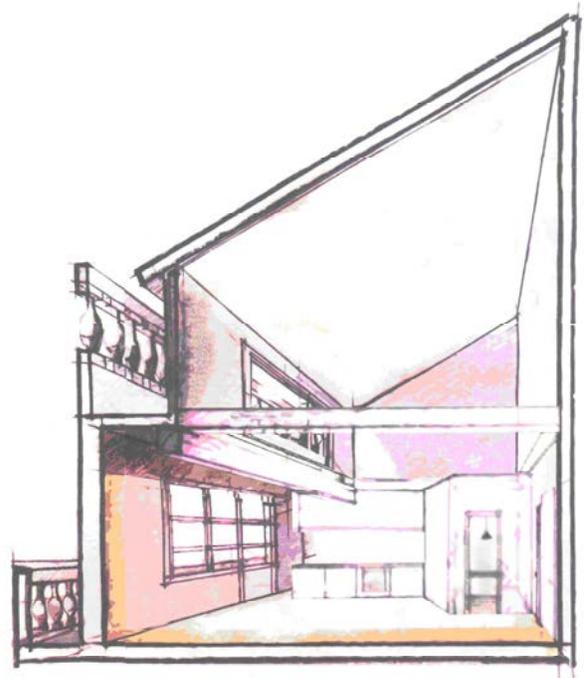


Fig. 1: An overview of an open-design studio-apartment

## MATERIALS AND METHODS

The method of designing on the basis of the optimal use of the spaces in the room. Using a clean-cut scaling, elegance and decoration in the interior. Using state-of-the-art construction materials and design.

**The Main Part:** Minimizing the living spaces is shown on the example of a studio-apartment (Fig. 1) on an attic floor, with the area of 22.2 m<sup>2</sup> at the elevation of 5.75 m and the possibility to build a floor at the elevation of 2.7 m. The size of the first level is 3.7 × 6 m<sup>2</sup>; the second level is 3.7 × 5.6 m<sup>2</sup>. The article proposes a variant for comfort living of four people on this area.

An open-design apartment is the variant for minimizing the apartment space, as the absence of internal partition walls makes it possible to use the space in an optimal way. The design with spaces flowing into one another not only creates a feeling of wide spaces and freedom but is also convenient.

In the first level (Fig. 2) there is an entrance lobby, a toilet room for visitors, a stockroom, a living room-dining room, a kitchen, built-in wardrobes, a staircase leading to the second level and a recessed balcony. There are no corridors, as they only take up space.

A coat-peg shaped as a plank is behind the entrance door. Wet clothes and umbrellas can be put into the drying wardrobe in the stockroom located on the other side of the entrance door. There is an air-conditioner over

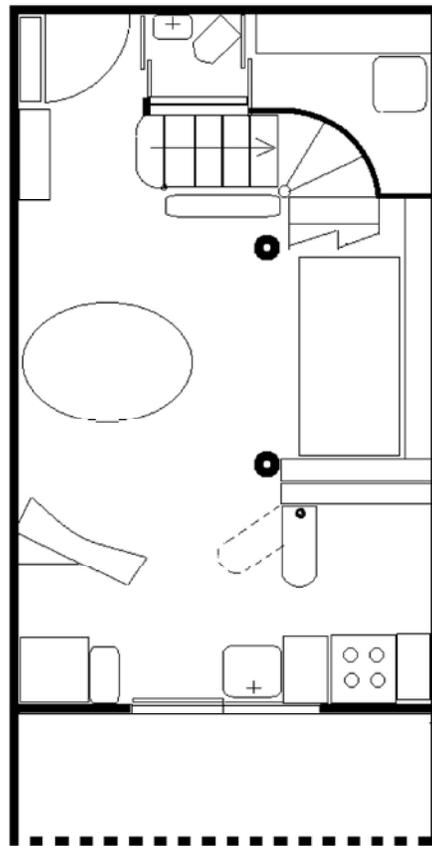


Fig. 2: The first level layout plan

the door. A large mirror reflecting a person on the staircase full-height can be positioned over a shallow bureau. The mirror expands the room visually and the reflection in a lighted mirror expands the volume of the room even more. The entrance lobby has natural lighting as there are no partition walls or tall furniture, which makes the entrance lobby look like a residential space and improves the comfort in the auxiliary spaces.

In the entrance lobby there is a door to the toilet room equipped with a lavatory pan and a wash-basin. The console toilet equipment is a space-saving variant that is also optimized for cleaning, which improves comfort.

Sliding glass doors between the toilet room and stockroom visually expand both spaces. The stockroom, which has natural ventilation, has a drying wardrobe and a washing machine. All the detergents are insulated from the main rooms, which improves sanitary conditions.

There also are storage areas with natural ventilation over the ceiling of the toilet room and stockroom. The ceiling is at the elevation of 2.2 m, which makes it possible to make a niche 0.5 m high.

The living- and dining-room is a combined space that is the core of the apartment and its main room for common use. In order to make it cozier, the smoothed corners are proposed. The semi-circle plane is created with columns, furniture, floor coating, curtains and lamps. The “center-of-gravity” for visitors is an oval table with an elegant chandelier over it. On the wall over the table there is a flat TV that can be imbedded into a shallow rack. On the opposite, between the columns, there is a sofa. Columns make the living room look festive and are protruding architectural elements zoning the room.

The space behind the sofa is used for built-in wardrobes. At the head of the sofa there is a glass rack that does not obstruct natural lighting. The low ceiling over the sofa (under the staircase) creates a clubby feel and the high ceiling over the dinner table promotes a festive atmosphere of communication.

The arch window adds to the “palace” style. Symmetrical to it, in the partition wall of the toilet room, there is another arch window. A lamp is installed into it to create a light border. The mirror over the wash-basin reflects the light from the window and visually expands the toilet room. The window covered with semi-transparent curtains ensures the natural lighting in the toilet room and stockroom, as well as visually expands the volume of the lobby and the toilet room due to the space outside the window.

A piano will lend a music hall status to the living room and cover the space under the staircase. The portal of the fireplace with flowers will create a romantic look and

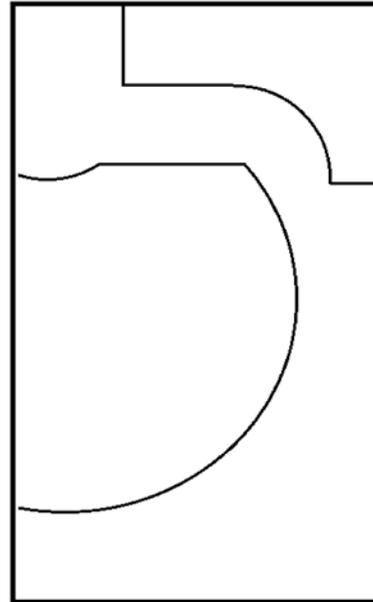


Fig. 3: The layout plan of different floor coatings in the first level

separate the living room from the kitchen. The minimum of furniture will visually expand the living room, filling it with light and air.

The living room is also separated from other room by floor covering. Zoning with the floor is always intuitive and does not interfere with architecture of the spaces. Fig. 3 shows the borders of different floor coatings and the advantages of a curved moulding are discussed in the work [15]. A row of lamps embedded into the ceiling near the moulding created another light wall on the border. Light zoning does not decrease the volume of the room but creates an almost-tangible border.

The color solution of the rooms in the first level is white (pearl), which adds to the festive look and expands the space. A harmonious combination of all the elements makes it possible to achieve a unity of style and color solution of the common room.

A wooden staircase to the second level is at the entrance so it does not cross the living room. Elegant railings and pillars suit the “palace” style of the living room. The staircase introduces an unusual spatial solution due to the two-light volume and an original interaction of rooms in the apartment. An opening in the floor of the second level is at the distance of 400 mm from the wall so as to move the light opening to the center of the living room, as well as to allow the built-in wardrobe be installed behind the staircase. Under the stairs of the lowest staircase flight, there are shoes drawers pulled towards the entrance lobby.

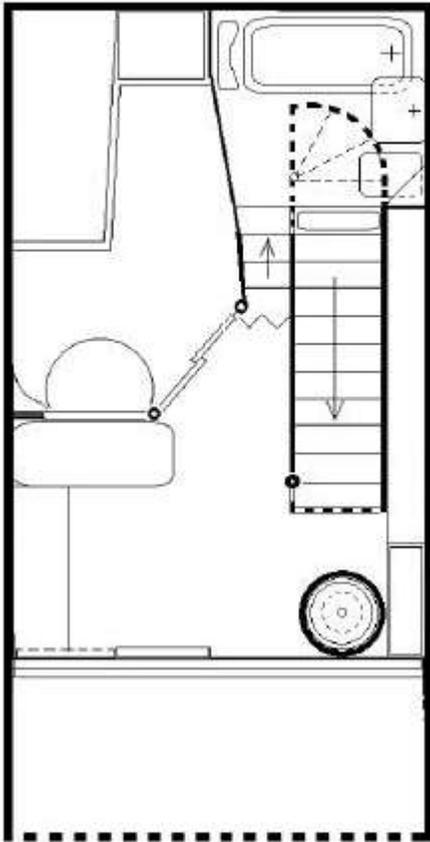


Fig. 4: The second level layout plan

The staircase is the most hazardous area in the apartment, so no space-saving is acceptable here. It is proposed to combine the turning and the cork-screw design of the staircase. As the floor is at the height of 2.7 m, there are 5 steps in the lower flight and 12 steps in the upper flight of the staircase, with the width 250 mm and the setback 30–50 mm. In the turning segment there are 3 winding steps. The height of the tread rise is 135 mm, which makes it possible to keep the slope angle at 28°; considering the limited space in the apartment, it makes good comfort.

The kitchen is near the window and has natural lighting. Scientifically reasonable sizes for optimal working processes are presented in the work [16]. The inductive kitchen stove makes comfort conditions and ensures energy-saving. Near the rack, a bar-stand is installed with a turning mechanism, which makes it possible to transform the space and improve the interior without breaking up and interfering with the working space of the housewife.

A spherical stained-glass window over the bar-stand in the panorama window in the ceiling improves the natural lighting and also helps warm the kitchen with

sunlight. This improves the comfort, health and “family climate” and decreases the fatigue.

The second floor (Fig. 4) is the zone for private rooms. There is a bedroom, a study, a combined toilet and bathroom and a terrace. The bedroom is separated with sound-proof partition walls with tapered corners, which makes it possible to use the space in the optimal way and create a favorable interior. Under the ridge, a 0.6 m podium is built with a wardrobe and a mattress on it. There are fixing points for hammock over the mattress. During the day time, the mattress is raised to the front or the side wall to free up the podium for board games. The space under the podium has drawers for household items. The bedroom and podium have natural ventilation.

The sliding glass doors and the partition wall that is parallel to the window make it possible to keep the natural lighting in the bedroom and visually expand the volume of the bedroom and the lobby. The color solution of the bedroom is calm beige and the wall over the bed is to be left white to serve as a screen for films or changing pictures of the projector design.

The hall of the second floor combines the functions of a study and the second bedroom. There is a desk at the window and a massage table or a bed near it.

On the other side, near the panorama window there is a place for a hanging chair for reading near the cupola stained-glass window and a place for a transformer-bed. The raising bed can be put away to form a common plane with built-in wardrobes, so as to turn into a bookcase during the day.

Over the staircase, a fish-bowl is installed; it is visible from the lobbies of the first and the second floors. Lamps in the fish-bowl and the stained-glass window, being positioned in the same axis, combine the spaces of both floors and create an interesting interior.

A combined toilet and bathroom with natural ventilation has a lavatory-pan-bidet, a wash-basin and a bath. The bathroom walls are covered with ceramic tiles with a panorama picture having a perspective to expand the space in the bathroom. The mirror lighted with lamps will also expand the volume of the bathroom. A fireplace and a TV over it will add to the comfort.

For the optimal use of the space over the staircase, the floor level in the toilet-bathroom is to be elevated by 0.6 m, so as the bath’s edge is at the podium level, which will make the approach to the bath convenient and improve the interior; in this way, the bath will not take up space. The rooms with different height of ceilings and sloped ceilings look cozy. A shelf for the fish-bowl is 0.3 m above the podium. Fish-bowl helps keep the natural lighting in the toilet-bathroom and visually expands the

space in the bathroom and the lobbies. It can as well be call a relaxation room.

The terrace and the recessed balcony, which do not require additional expense for construction and design, improve the architectural solution and make it possible to expand the space of the residential area.

### CONCLUSIONS

A small-size apartment can be harmonious and cozy if the following practical recommendations are observed:

- if the area is limited, the two-level apartment variant is preferable;
- open-layout apartments (studio-apartments) are preferable;
- partition walls with tapered corners are recommended for optimal use of the space; there should be no sharp corners;
- transitory elements should be selected so as to naturally connect the “transitory volumes” with the open design and dividing the space into separate zones;
- the ceilings should be made with different heights and slopes;
- different floor coatings should be used;
- light zoning should be used;
- the area over the staircase can be used by building a podium;
- the natural lighting should be kept in every rooms due to absence of partition walls and creating a two-light volume, as well as stained-glass windows and transparent racks, using glass doors and partition walls;
- storage spaces should also have natural ventilation.

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