MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
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Methodical recommendations
for practical classes, organization of independent work
and implementation of a course project
on the subject

"ARCHITECTURAL DESIGN OF BUILDINGS AND STRUCTURES: RESIDENTIAL GROUP WITH MID-RISE BUILDINGS"

(for third-year students of full-time study of specialty
191 – Architecture and Urban Planning)

Kharkiv
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2021

Methodical recommendations for practical classes, organization of independent work and implementation of a course project on the subject “Architectural design of buildings and structures: a residential group with mid-rise buildings” (for third-year students of full-time study of specialty 191 – Architecture and Urban Planning) / O. M. Beketov National University of Urban Economy in Kharkiv ; compilers : O. V. Smirnova, B. I. Bozhynskyi. – Kharkiv : O. M. Beketov NUUE, 2021. – 46 p.

Compilers: O. V. Smirnova,
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Recommended by the department of architecture of buildings and structures and architectural environment design, record № 8 on 10.02.2021.

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INTRODUCTION

The methodical recommendations provide the material necessary for the implementation of practical classes, development of a course project and the organization of independent work of students during the study of the discipline "Architectural design of buildings and structures: housing group with medium-rise buildings" on the module № 5 "Housing group with medium-rise buildings" (Content module 5.1. Pre-design analysis of the territory for design. Content module 5.2. Development of a master plan for a residential group. Content module 5.3. Spatial planning solution of a residential group with medium-rise buildings).

These guidelines are intended for third-year students to implement a residential group project with middle-rise buildings. In this project, it is necessary to solve a complex of architectural and planning, engineering, technical, environmental and aesthetic issues.

The purpose of these recommendations is to acquaint students with the peculiarities of the formation of a residential group with medium-rise buildings as a modern architectural object.

Students should analyze the current state of design of modern housing groups with medium-rise buildings. This analysis will lead to the creation of new residential complexes that will help change the architectural and planning organization of the city as a whole. The new architectural and spatial environment must be more flexible, meet modern conditions, and be able to make the necessary changes in the future.

In this regard, it is necessary to analyze the experience of designing residential groups (mainly these are objects from far abroad) and develop appropriate recommendations. These guidelines consider the features of the formation of the functional and aesthetic component in the creation of modern housing groups with medium-rise buildings. Also in the recommendations the typological characteristic of housing groups is given, regularities and requirements to their formation are stated.

1 THE PURPOSE AND OBJECTIVES OF THE COURSE PROJECT

The main goal of the project is to consolidate the knowledge gained by students in lectures on the courses “Fundamentals of Urban Planning” and “Typology of Buildings and Structures”. This knowledge should be consolidated in the process of independent work on the project. The following tasks must be solved during project development:

– maximum consideration and use of natural conditions of the housing group for the organization of a comfortable and large-scale environment for human habitation;

– creation of a harmonious and integral composition of the living space;

– rational organization of the system of transport and pedestrian paths in the housing group;

– development of living environment design;

– creation of an architectural and planning solution and an expressive artistic image of a residential building of medium storey;

– solving architectural and planning tasks taking into account environmental, sanitary and fire safety requirements.

2 THE COMPOSITION OF THE PROJECT

The project is performed on standard sheets of A1, A0 format in this composition:

1. Master plan of the housing group with the development of living environment design, Scale 1:500.

2. Plans of the first and typical floors of the designed residential building, Scale 1:100, Scale 1:200.

3. Sections of a residential building, Scale 1:100, Scale 1:200.

4. Facades of a residential building, Scale 1:100, Scale 1:200.

5. Plans of basic types of apartments in a residential building with furniture, Scale 1:50.

6. General views (perspective views) of a residential building (two or three views).

7. Sketches of the basic viewpoints of the residential group; in these sketches, students should depict design elements.

8. Technical and economic indicators for a residential building.

9. Technical and economic indicators for the master plan of the residential group.

10. Brief explanatory note to the project.

3 THE SEQUENCE OF THE PROJECT

The course project is performed on the basis of the task issued by the project manager. The task consists of text and graphic parts. The text indicates the number of people living in the housing group; family ratio of residents (average number of family members) living in different types of apartments.

The graphic part of the task is the topographic basis of the territory in the scale of 1:2 000.

The sequence of the project:

1. Acquaintance with the text part of the task and the topographic basis of the area, the study of guidelines and literature on this issue.

2. Execution of an abstract on the topic of the project.

3. Execution of the analysis of the territory chosen for construction using computer graphics (schemes of the analysis of a landscape of the territory, functional zoning of the territory, also transport and pedestrian ways in scale of 1:2 000).

7. Development of a sketch of the master plan of a residential group with medium-rise buildings; development of architectural, artistic and spatial organization of the housing group on a scale of 1:500. Approval of the sketch.

8. Execution of drawings according to the approved sketch of the general plan of the housing group with medium-rise buildings completely with the use of certain computer programs.

9. Execution of drawings of the general plan of a residential group with middle-rise houses; the drawing must contain all the elements of the improvement in a scale of 1:500; the drawing must be done completely using computer graphics.

10. Development of architectural-planning, compositional and figurative solution of a 3–5-storey sectional residential building on a scale of 1:500.

11. Approval of the sketch of the project of a 3–5-storey residential building. Determination of technical and economic indicators for a residential building.

12. Determination of technical and economic indicators of the territory of the housing group.

13. Execution of the image of a perspective view of the residential group from a bird's eye view and execution of sketches of perspective views of the residential area.

14. Final design and graphic completion of the project.

15. Execution of the project presentation and a brief explanatory note to the project. If desired, the student can make a video presentation of his project.

16. Defense of the project.

3.1 The content of the abstract and methods of its implementation

The main purpose of writing an abstract is that in the process of working on it, the student gets deeper into literary sources and normative literature on the design of residential groups. The abstract is performed according to the following plan:

1. Classification of medium-rise residential buildings and their functional zoning.
2. Mid-rise residential group and its main elements.
3. Methods of architectural and planning organization of residential development.
4. Architectural and planning organization of medium-rise housing groups.
5. Technical and economic indicators.
6. References.

Each section of the abstract should have illustrations.

3.2 Volumetric-spatial composition of the residential group

Each housing group must have a complete compositional solution that is related to the composition of neighboring housing groups. When developing a general volumetric-spatial composition of a residential group, it is necessary to perform the following procedures:

1. Determine the main compositional axes of the territory of the residential group, taking into account the landscape, the main pedestrian and transport links.

2. To form sequentially located sites for various purposes during the movement of pedestrians through the territory of the residential group.

3. Design micro-spaces, devoid of both monumental scale and tightness.

4. Alternate open and closed spaces, smooth turns of footpaths and multifaceted perspectives that suddenly open to the eye.

To achieve the integrity of the architectural and landscape composition of the residential group, it is necessary to identify its *compositional center.* In one case, the compositional center is a children's play complex with a vertically marked play element. Alternatively, the compositional center can be a platform for short-term rest at the intersection of the main footpaths with a small architectural form (fountain, arbor, pergola, etc.). Otherwise, the compositional center is a clearing with a solitaire, a landscape group, a decorative pond, and the like. The composition center, depending on local conditions and general architectural design, can be closer to the entrance to the residential group. In addition, the compositional center can be in the depths of the territory of the residential group or in its geometric center.

In the volumetric-spatial solution of the territory of the residential group, in addition to the center of the composition, there are also main and secondary compositional axes. The main axis most often coincides with the main and shortest direction of pedestrian movement and leads to the compositional center. Minor axes can run parallel or intersect with the main composite axis. The nature of the pattern of primary and secondary pedestrian connections can be both geometric and landscape.

For the integrity of the composition, all compositional centers and axes must form a single spatial-visual system.

The functional use of the territory also leaves an imprint on its appearance. Thus, for the area where sports grounds are located, the presence of elements of regular planning and use of artificial surfaces is typical. For playgrounds, on the contrary, the advantage of the closed small spaces and use of difficult forms of a microrelief is characteristic.

An important element of architectural and landscape design of the residential group is the solution of courtyard driveways and pedestrian alleys.

Pedestrian alleys are divided as follows:

– the main alleys connecting the residential groups with the center, school, kindergarten;

– main alleys, which combine sites for different purposes;

– minor alleys leading to the entrances to playgrounds and sports grounds;

– decorative alleys designed to organize walking on small recreation areas.

Tracing of pedestrian alleys and paths within the residential group is planned taking into account all leading directions (Appendix A).

3.3 Functional planning solution for the territory of a residential group

After preliminary calculation of the main elements that make up the territory of the housing group (Appendix B, C) perform the scheme of functional zoning of the territory in the form of a clausura (architectural sketching exercise) in the scale of 1:2 000 (Appendix A). The main task of this clausura is to finally determine the location of all functional zones and develop a scheme of functional zoning. At the same time, it is necessary to take into account the planning constraints that students received during the analysis of the territory. Students must also consider the requirements for each functional area and the requirements for the mutual placement of functional areas.

Recently, during the formation of the living environment, the building system consisting of housing groups is becoming more widespread. This system introduces structural differentiation and individual isolation of internal spaces into the development of a residential group. In addition, this system makes the internal spaces proportional to a person, this system corresponds to the scale of vital functions carried out in a residential group

The grouping of the volumes of buildings and the location of residential buildings in a group can be different both in the configuration of buildings and in the form of their mutual adjoining. The composition of a residential group can be built on the rhythm of simple and complex volumes. The space created by houses can be simple or complex, open, closed or semi-closed (Appendix E).

In this project, students must develop a small housing group, which is a separate space of 3–5-storey buildings. Only residents of this group intend this space for use. This residential group can be adjacent to a residential or main street. In the diameter of the compositional-planning core, such a group has dimensions of 60–100 m (Appendix C).

Distances between residential buildings are taken based on insolation and lighting requirements in accordance with the norms (Section 10, State Building Regulations (SBR) 360-92**) and fire safety norms (State Building Regulations 360-92**, Annex 3.1). For example, the distance between the long sides of houses 4–5 floors high is not less than 20 m, and the distance between the long side and the ends of houses with windows from residential premises is not less than 15 m (paragraph 3.13 of State Building Regulations 360-92**)

At each residential group, a landscaped yard with playgrounds for children, for adults, sports grounds, utility and dog walking areas, as well as areas for short-term parking (Appendix C) is arranged.

The size of these sites depends on the population of the housing group and is determined in accordance with the rules “State building regulations of Ukraine. Urban planning. Planning and construction of urban and rural settlements. SBR 360-92**”. The population is first determined by the typical sections of residential

buildings, approved in the project of the village. At the same time, it is assumed that the number of living rooms in an apartment is equal to the number of its inhabitants.

The dimensions of children's playgrounds are taken based on the norm of 0.7 m^2 per person living in this courtyard. The distance of these sites to the windows of residential buildings should be at least 12 m (table 3.2 SBR 360-92**). After determining the total required area of children's playgrounds, this area is divided into three types of playgrounds according to the standards and taking into account the radius of service:

– *playgrounds for toddlers*: F = 25–80 m^2, R_{serv} = 40–50 m;

– *playgrounds for preschool children*: F = 100–120 m^2; R = 50–100 m;

– *playgrounds for children of primary and secondary school age*:

F = 120–180 m^2; R = 100–150 m

Playgrounds for toddlers (from 1 to 3 years) are placed separately from other playgrounds. A shadow canopy or pergola is placed on such a site, equipped with garden benches, a sandbox, low swings, and a low concrete bowl with water.

Playgrounds for preschool children (from 3 to 7 years old) have several areas: a place for games with special equipment, an area of quiet games with a sandy yard, a place for free games, an area for cycling and rollerblading. Playgrounds are equipped with shade canopies and benches.

Playgrounds for children of primary and secondary school age (from 7 to 14 years) have a variety of equipment, including elements of sports. At least one mobile equipment (swing, carousel) and a number of small stationary devices are placed on such a platform. Playgrounds for preschool and schoolchildren can be combined into a play complex.

The shape of the sites in the plan can have a variety of configurations: geometric, picturesque, combined, but should not have sharp corners that are inconvenient for placing equipment and small architectural forms.

The size of quiet recreation areas for adults is taken based on the norm of 0,1 m^2 per 1 person living in this yard, and the distance from them to the windows of

residential buildings should be at least 10 m (table 3.2 SBR 360-92**). Such platforms are equipped with shade canopies, pergolas, trellises, garden benches.

The sizes of areas for physical education for children and adults are taken at the rate of 2 m^2 per person with a minimum distance to the windows of residential buildings of 10–40 m (Table 3.2. SBR 360-92**). It is allowed to reduce, but not more than 50 %, the area of sports grounds if there is a sports complex for several residential groups. The residential group can accommodate such sports grounds: volleyball, badminton, table tennis, and “townlets”.

Children's playgrounds, sports grounds, as well as quiet recreation areas for adults are isolated from the surrounding area, but in such a way, that they are well ventilated. Therefore, hedges are planted around these sites and row plantings of trees are designed.

The dimensions of utility areas for cleaning carpets and waste bins are determined at a rate of 0,3 m^2 per person with a minimum distance of 20 m to the windows of residential buildings. At the same time, the minimum distance from the grounds for waste bins to children's playgrounds, sports grounds, as well as grounds for quiet recreation of adults should be at least 20 m. Moreover, the distance from utility sites to the most distant entrance to a residential building should be no more than 100 m (table 3.2 SBR 360-92**). Landfill sites for waste bins should be isolated from the surrounding area and shaded with dense plantings of trees and bushes.

The dimensions of *areas for short-term parking* are taken at the rate of 0,8 m^2 per person with the number of cars in the parking lot of 10 or less and the distance to residential buildings not less than 10 m (table 7.5 SBR 360-92**).

The main (two-lane) passages 5,5 m wide are designed for the entrance to the residential group, and the secondary (single-lane) passages 3,5 m wide are designed for the entrance to individual houses (paragraph 3.11 of SBR 360-92**). The distance from the driveway to the walls of houses is at least 6 m. A sidewalk 1 m wide is arranged along the driveway. On single-lane driveways, traveling platforms are provided with a width of 6 m and a length of 15 m at a distance of no more than 75 m from each other. Dead-end passages must be no longer than 150 m and these passages

must end with turning platforms measuring 12 m × 12 m for turning recycling and fire trucks. When designing passages it is necessary to strive for their minimum length. It is also necessary to exclude the transit of cars through the housing group, to provide for the organization of underground parking (Appendix D).

The travel profile consists of a carriageway and a one-sided sidewalk located on the building side. The connection of the driveway to the carriageway of the street must be two-lane 5,5 m wide and have a radius of curvature of at least 8 m free entry and exit from the territory of the residential group.

The utility driveways are designed as separate dead ends leading to utility sites, or they are combined with the main internal driveways.

The next step in the development of a housing group is the design of its territory using landscape design tools.

The architectural and artistic appearance of the housing group largely depends on the quantity and quality of landscaped areas. The area of landscaping of the residential group must be at least 6 m^2 per 1 person.

Playgrounds for children, for adults and sports areas should be isolated from each other and the surrounding buildings with greenery and between them should be paths and free planting of greenery.

Green strips between houses and driveways are organized in the form of lawns with picturesque flowerbeds and groups or rows of bushes. A single-row planting of trees is being designed along the driveway. Large trees should be placed no closer than five meters from the exterior walls of houses to organize the passage of fire engines around the house.

Landscaping of the territory of a residential group plays an important role in identifying its planning structure, in emphasizing the main compositional axes and nodes. Greenery is placed mainly in landscape groups. Landscape group is an independent composition of trees and bushes. The optimal number of trees in a landscape group – 3–5 trees – is established by the conditions of visual perception of this group from all points, in a compact and compositionally integral form. These

qualities are preserved for all variants with an odd number of specimens of trees: 3, 5, 7.

The planting of trees in main lanes is usually done in a single row in a regular or mixed style. Landscaping of primary and secondary alleys can be arranged in regular, mixed and free styles. Alleys designed for walking are often designed in a landscape style.

For landscaping the territory of the residential group, deciduous trees with a crown diameter of 3–7 m (maple, chestnut, linden, birch) are used. Coniferous trees with a crown diameter of 1,5–4 m (spruce, thuja, juniper, pine) are also used for landscaping. In addition, various types of shrubs are used for landscaping, including for hedges. Park lawns and various types of flowerbeds (Rabatte flowerbeds, mixborders, etc.) are arranged on the territory of the housing group.

When landscaping it is necessary to use the existing relief, and if necessary to create an artificial micro relief with slides, which can be supplemented with a decorative pond.

Elements of landscape design in residential areas are determined taking into account the landscape of the area, climatic conditions and the position of these areas in relation to the urban environment. If housing groups are close to a park, forest park or pond, you can reduce the recreational space in housing groups. If the park, pond or forest park is remote from residential groups, it is necessary to increase comfort, as well as to strengthen the natural motives in the living environment.

When deciding on the design of a residential group, attention should be paid to the development of small architectural forms. Among the most commonly used design elements in the improvement of residential groups are: benches, lamps, decorative pools and fountains, gazebos, pergolas, trellises, flower vases. The main requirement for the compositional solution of small architectural forms is their stylistic unity. This stylistic unity can be achieved by using the method of similarity of geometric shapes, modularity and transformation of elements. In addition, this stylistic unity can be achieved by using related materials (wood, natural stone, concrete and reinforced concrete, metal and plastic).

All driveways and utility sites must have an asphalt surface; playgrounds and sports grounds should have a crushed stone or improved ground surface, and pedestrian walkways and paths should be covered with decorative ceramic or concrete slabs, gravel surfaces, natural stone or artificial materials, and breccia.

3.4 Development of a project for a residential building of medium storey

Before developing a project for a residential group, you should familiarize yourself with the classification of mid-rise residential buildings and determine their types. According to the space-planning solution, middle-rise residential buildings can be sectional, gallery, corridor, terraced or have a mixed structure. The nature and form of the plan of residential buildings, their number in the residential group can be adjusted taking into account the proposed options for the compositional solution of the residential group (Appendices F, G, H, I).

The sectional house in the plan has four basic types of sections: ordinary sections having two external walls, *end sections* having three external walls, angular and turning sections; each of these sections may have different shapes in plan.

By orientation, the sections of a residential building are divided into latitudinal (unlimited and partially limited orientation) and meridional (limited orientation).

The meridional sections of residential buildings can only be used when the longitudinal axis of the house is directed in the meridian direction - from north to south. The meridian sections of houses typically have four apartments per floor. In this project, it is undesirable to use meridian sections.

Starting the project of a 3–5-storey sectional residential building, you must first develop an ordinary section of such a building. Then, on the basis of this ordinary section, it is necessary to design other types of sections which are in this house (appendices G, H). It is desirable to develop a two-room row section (just in case three-room) to create the best sanitary and hygienic living conditions in this house: through ventilation, unlimited or partially limited orientation.

Sectional houses consist of several identical or different sections in terms of planning and differ in the number of storeys, length and configuration of the plan. Planning solutions of sections determine the number of apartments facing the stairwell of each floor (Appendix J). In accordance with the number and type of apartments, a conventional designation of the type of sections 3–4, 1–2–3, 1–2–2–1 and so on was adopted, where the number of digits corresponds to the number of apartments on the floor, and the value of the digits corresponds to the number of rooms in each apartment.

The orientation of living rooms to the cardinal points must meet the requirements of insolation and ventilation of apartments. The space-planning solution of the sections of a residential building should provide the necessary insolation in one-, two- and three-room apartments in at least one room, and insolation in four- and five-room apartments – in at least two rooms.

The four-apartment sections in a residential building are divided into three groups according to the conditions of orientation: these are groups of limited, partially limited and unlimited orientation. Varieties of four-apartment sections are sections with a developed plan, with a difference in floors, with a shift of pairs of apartments in the floor plan.

End sections are located at the edges of the house. The simplest solution to the end section is to repeat the row section with a change in the end outer wall, which can have window openings, balconies and loggias.

Turning sections of a residential building are used to create houses with a complex contour with turns and fractures of the facade line. The most common are sections with a rotation of 135 degrees with external and internal angles and the so-called corner sections with a rotation of 90 degrees.

In the practice of design, there are several ways to form reversible sections.

One way is to change the direction of the walls between sections in a row section. The corner of the house is formed by blocking two turning sections. This is the simplest way, in which all the basic elements of the row section of a residential

building are preserved, only the shape of the living rooms, which are located near the sloped wall, changes.

The second method is to form an angle due to rotation in the middle of the section. There are two options here. One of them is to design a staircase with oblique corners. You also need to design an apartment that will be opposite to this staircase. In such an apartment, the common room is pentagonal. Stairs in this section are individual. The rotation is also possible by inserting a sector shape inside the section. A common room is located in a wide area of the sector. In this case, the typical two-flight staircase is retained.

The section of a residential building with a rotation of 90 degrees (angular) has a completely different planning structure, inherent only in the angular sections. The stairwell is located only at the inner corner. Entrances to the apartment in this case are made either from the stairwell or, more often, from the stairwell or from the corridor adjacent to the wall of the stairwell. Such sections usually have three or four apartments.

Sectional houses mostly consist of rectangular sections that have simple dimensions. The optimal width of the sections for the second and third climatic regions is 11–13 m, and for the southern regions – 9–10 m. Along with rectangular sections, sections with a complex perimeter are used. In the practice of designing lift-less houses, sections are used that can be interlocked with other sections in several directions. These sections are used to create complex residential formations. Such sections of residential buildings include shamrock sections, cross sections and free planning sections.

The sections are blocked so that all the stairwells are located on one side of the house and preferably on the side of the yard. In cases where, due to the conditions of orientation or special conditions of the place, this cannot be done, through passages are made on the ground floors.

Blocking techniques in sectional residential buildings are very similar to blocking apartments in low-rise block of flats. These are such techniques for blocking sections of houses as: building sections in one line, with displacement to one side, or

with alternating protrusions and indents of sections in relation to the blocking axis. In the case of designing a house on the terrain, the house can have a curved or broken plan that corresponds to the direction of the horizontals. In conditions of steep terrain, houses can be located across the contours. In such conditions, the vertical displacement of the block sections is used. Thus, the so-called “cascade” houses are formed.

Methods for blocking residential sections in combination with sections of various configurations and inserts allow you to create a wide variety of volumetric-spatial solutions for residential buildings.

The condition for creating a figurative composition of residential buildings is also the use of an active and expressive silhouette of residential buildings. For this purpose, in the volumetric-spatial solution of the volumes of residential buildings, variable number of storeys from 3 to 5 floors are used, tower ends of corner and turning sections, complicated compositions of pitched roofs are also used.

Terrace houses of sectional type are a kind of sectional. Their construction is largely similar. In the center of the section is a stairwell. Construction of terraces is carried out by reducing the size of apartments. The size of the apartments is reduced both in area and in number of rooms. It is important that the position of kitchens, bathrooms and vents be strictly fixed.

When designing residential buildings for hot climates, it is desirable to use gallery buildings. The layout schemes of gallery-type, lift-free residential buildings can be reduced to three main groups: linear, articulated, and spatial. Galleries can be located on each floor, across a floor or across two floors and serve two or three floors, respectively.

There are two methods of building stairs in gallery houses: the staircase can be outboard, that is, protrude from the main volume of the building and built into the main volume of the house.

When organizing residential groups with the use of gallery houses, spaces of courtyards of various shapes are formed. In such yards, there are children's playgrounds, recreation areas and utility areas.

In houses that form the development of the main or residential street, small public institutions (cafes, shops, pharmacies, etc.) may be located on the ground floor.

The next stage is the development of architectural and planning solution of the apartment and its elements in the structure of a residential building of medium storey.

An apartment is a microenvironment in which a person in different periods of life has to spend most of his time. If earlier the apartment was mainly a place for satisfying the physiological needs of the family (sleep, food, personal hygiene, internal family communication and raising children), now it also acquires the function of spiritual development of the individual (self-education, professional and amateur activities).

When designing apartments, it is necessary to adhere strictly to the principle of functional zoning of the apartment. A prerequisite for this is the independence of the operation of the zones (Appendix J).

At two-part zoning, the apartment is divided into two zones: collective and individual. The collective zone of the apartment includes common room, living room, dining room, children's playroom and their service area (kitchen, toilet, and pantry). The individual area of the apartment includes personal living rooms, the couple's bedroom and their service area (bathroom, dressing room, corridors). Each of these functional areas of the apartment must have a direct connection with the hallway, which serves as a link between the areas and the outside world.

At three-part zoning of the apartment, there are such zones: collective, individual, and a service zone (kitchen, kitchen-dining room, a bathroom, a toilet, pantries, etc.). The hall unites all three zones and is the main communication node of the apartment.

One of the main requirements for the spatial organization of the apartment premises is to provide the possibility of a variant placement of the planned functional zones, and in each of these zones, the implementation of various groupings of the necessary equipment and furniture should be ensured. These functional zoning schemes reflect only a fundamental difference in the living processes that take place

in apartments, but do not take into account the demographic composition of the family. In large families, there is a need to organize a functional area for adult children or for older parents. In this case, the individual zone splits into two independent subzones. Shared premises can also be organized in these sub-zones. The second collective subzone is located at the hallway, and it has its own composition of utility rooms.

In the structure of any apartment, three components can be conditionally distinguished:

– architectural and spatial organization;

– technical tools and equipment;

– furnishings.

The first two components of an apartment are completely determined by the project of the house, its construction and the architect's intention. The third component depends on the size, configuration and proportions of individual rooms, that is, it also depends on the project.

The layout of the apartments differs primarily in the number of rooms and the size of the total area, consisting of living and utility space. The type of apartment is determined based on the number and demographic composition of the family. These are one-, two-, three-, four- and five-room apartments.

Premises – the main element of the spatial organization of the apartment, which includes one or more areas of domestic life processes. By the nature of use, all rooms in the apartment can be divided into two groups: living quarters (personal living rooms and family rooms) and utility rooms (personal hygiene rooms, utility rooms, communication rooms and storage rooms).

The entrance hall is an apartment lobby, a visiting card of the culture of its inhabitants. The compositional and aesthetic value of the hallway in the overall structure of the apartment is very great, especially if it has natural light. In the hallway, one gets the first impression of the interior of the apartment. At the same time, the functional load of the hallway is quite large – the hallway serves as a storage place for outerwear, shoes, and household and sports items. There is always a

wardrobe in the hall. Here people get dressed before leaving and undress when they enter the apartment, meet guests and visitors. In addition, the entrance hall is the communication center of the apartment, which must have two zones:

– the entrance zone, where people take off their outerwear, shoes and get rid of their luggage;

– a hall area, where there can be a mirror, a table, an armchair.

The width of the hall should be not less than 140 cm.

A common room or a parlor for family recreation and reception of guests can have various functional contents. It can be entertainment, relaxing, dining, receiving guests, etc. The main areas in the parlor are a seating area and a dining area (if there is no separate dining room), which are sometimes supplemented by a recreational area and in one-room apartments also a working and sleeping area.

The recreation area in the apartment is used mainly in the evening, so its position in relation to the source of natural light can be any. The main equipment of the recreation area consists of a sofa, armchairs, a low coffee table, musical instruments, and radio and television equipment. Essential in organizing a recreation area in an apartment is the presence of free space, the need for which is due to purely psychological needs (visibility), and can be a place for dancing or for children to play. The distribution of zones in the common room is influenced by the location of the TV, because it is necessary to adhere to the minimum distance between it and the audience.

The placement of the dining area in the layout of the common room is due to the position of the kitchen. For convenient service, the dining area is located at the door to the kitchen or near the dispensing window. The main equipment of the dining area is a dining table and the required number of chairs. The dining table should be located directly next to the kitchen with a free access to it for service. In addition, there may be a cupboard or shelves for dishes. The working area of the kitchen, as a rule, is located by the window.

The most comfortable are common rooms with a ratio of the sides of the plan from 1:1 to 1:1,5. Premises of common rooms close to a square in their proportions

are aesthetically and ergonomically better than oblong rooms, but such oblong rooms, with the same area, have a larger perimeter of walls, which is especially important for walk-through common rooms. At the same time, in a square room, it is not possible to place the entire necessary set of furniture completely.

Spatially rich and very easy to use, those common rooms that have a complex outline. Here, the alcove can be both a dining area and a study or a seating area.

The common room is often the main element of the composition of the apartment, since it is the most ceremonial room, due also to the psychological attraction to it as a family-wide center of communication.

Often sliding partitions are used to change the spatial characteristics of the common room. This allows you to create a system of spaces that flow into each other.

Personal living quarters are designed to accommodate areas for individual use. They are designed, as a rule, of three types:

– bedroom for the couple;

– living room for two people;

– living room for one person.

All private rooms should be impassable.

The main areas in personal living spaces are:

– sleeping and individual rest area;

– zone of individual pastime;

– area for placing personal belongings for cultural and household purposes;

– clothing and linen area.

The possibility of a variant solution of zones is provided by the minimum width of the premises: bedrooms for one person – 2,25 m, bedrooms for two people – 2,5 m. However, if there are doors in the end wall and in the bedroom of the spouses, the minimum width of the room is taken at least 3 m.

In the bedroom for the spouses, a double bed is usually placed, which is placed with its end against the inner wall in such a way that you can freely approach this bed from both sides. There is also a wardrobe (if there is no built-in closet), dressing table, ottoman, bedside tables, as well as provide space for a cot.

For temperate climates, it is not recommended to place beds near the outer walls, and if placed, taking into account the following conditions: the distance from the outer wall to the end of the bed should be at least 40 cm, and to the longitudinal side of the bed – at least 80 cm.

The preschooler's bedroom should be as free as possible for games. In addition to the bed, there are cabinets for toys, a desk, which can be very small, folding or pullout. A bunk bed can be installed in the bedroom for two preschoolers. In the bedroom of a schoolboy or student, the area of individual lessons (desktop) should be located near the windows at a distance of not more than 1,5 m and so that the light falls on the left side. Direct light is also possible when the table is attached to the long side of the window.

Sometimes a group of private rooms in an apartment is supplemented with an *office*. In this office, the areas of mental work and storage of literature and a relaxation area (a sofa that is used for sleeping) are of predominant importance. The office can be combined with a common room through transformable partitions.

The best for placing personal belongings are built-in wardrobes and closets. These cabinets are arranged in two versions: in the form of a cabinet partition between two rooms or at the end of the room. At the same time, dressers serve as reliable acoustic protection against noise. Sometimes the area of clothing and linen is transferred from private premises to specially equipped rooms – dressing rooms, which are very convenient to use. If the dressing room is also used for dressing, it is equipped with a dressing table and mirror.

The kitchens are used for household chores (cooking and eating, ironing, sewing, etc.). Thus, a full kitchen consists of two main areas: the work area and the dining area. The cooking area or work area of the kitchen is the most saturated in terms of the number of technological processes and items of equipment. Cooking is associated with a sharp deterioration of the microclimate in the room. Therefore, the work area should have good ventilation and natural light. Kitchen equipment with a gas stove requires insulation of the room from the entire space of the apartment. At an electric stove, it is possible to apply temporary isolation of a working zone from other rooms.

Depending on the size, kitchens are designed in the form of: kitchen-niche, working kitchen, kitchen with occasional meals and kitchen-dining room. Kitchens-dining rooms are the most widespread.

Kitchens-niches, as a rule, apply in specialized houses with small apartments and equip with electric stoves.

Working kitchen – an isolated room with natural light and ventilation. The entrance to the working kitchen can be from the dining room, and if the kitchen is adjacent to the common room, it is necessary to have a separate entrance from the hallway or corridor. The area of such a kitchen must be at least 5 m^2.

The kitchen with occasional meals should have an area of at least 8 m^2. This is a bright room with a full set of equipment in the work area and limited space for eating. In this case, the common room should be a permanent place for a dining table for all family members. The entrance to such a kitchen is arranged from the hallway or corridor.

The kitchen-dining room should have an area of at least 8 m^2 for small families and at least 10–12 m^2 for large families. In such a kitchen, there is a clear spatial division into two full-fledged zones – the work area and the dining area for all family members.

Cooking is a single technological process, united by a certain sequence of operations. Regardless of the number of family members and the amount of cooking, any kitchen maintains the same order of work, and at the same time the order of sequential arrangement of equipment. In kitchens of the extended form with a window on the narrow side of the room, the single-row arrangement of the equipment has extended. In wider kitchens, two-row equipment placement or corner placement is possible.

Recently, this type of kitchen has become more and more common as a single room, which has sufficient space to accommodate a work area, a dining area and a communication area in which a TV is installed. Such a kitchen is designed for the entire family.

Sanitary facilities need conditions of strict isolation. Zones of personal hygiene are organized in these premises. These areas are purely individual four types of such premises are mainly used in the apartment: bath, shower, and toilet, separate and combined bathroom. Each type has a number of planning solutions. The dimensions of the premises are determined depending on the composition of the equipment. The main devices that make up the equipment of sanitary facilities are bath or Jacuzzi, shower tray, sink, toilet, hand basin, and in some cases – a bidet. If the apartment does not have a separate laundry room, the bathroom should have space for a washing machine. Toilets are designed of two types: a toilet only with a pan, if it is located directly next to the bathroom, and if the toilet is far from the bathroom, then in addition to the pan a washstand is provided. The width of the toilet must be at least 0,8 m, depth – not less than 1,2 m. Bathroom doors should only open outward. Combined bathrooms are used only in one-bedroom apartments, as well as in large apartments if there is a second bathroom. Entrance from the living quarters and kitchen to the shared bathroom or toilet is not allowed. All bathrooms are equipped with exhaust ventilation. In hot and especially in humid and hot climates, it is desirable to arrange bathrooms with natural light, because it is better to ventilate the bathrooms.

Open or summer premises of the apartment – an additional place for rest, meal and housework. In a warm climate, these rooms are the main area of life of the family throughout the summer. The area of summer premises should not exceed 15 % of the total area of the apartment.

The group of summer rooms of the apartment includes various types of balconies. The extension of the balcony slab varies from the minimum – 30 cm (*French balcony*) to 105 cm. *Balconies-loggias* are balconies with a partial recess in the wall, which allows increasing the extension of the slab up to 150 cm. There are also types of balconies such as *loggias, terraces and glazed verandas*.

The *French balcony* consists of double doors with a window and an external railing. Extension of a balcony plate is used for boxes with flowers. The practical value of such a balcony is small, but its aesthetic merits deserve attention. This

balcony helps to combine visually the outer space with the interior. It is advisable to design such a balcony in the premises facing the city street, when other types of summer premises are difficult to use (Appendix F).

Balconies that are not protected from the wind are uncomfortable. Loggias-balconies or semi-loggias, and full-fledged loggias have a number of advantages in comparison with balconies. Such loggias are protected from the wind; they can serve several rooms at the same time. The depth of the loggias is much greater than the depth of conventional balconies. This allows you to create a number of functional zones on their area and organize a variety of greenery in the loggia.

Terraces are mainly typical of low-rise buildings. In houses of average storeys they are used in terraced houses or in houses on a relief. The terrace in this case is the roof of the lower apartment, while the terrace area is not included in the total area of the apartment.

Veranda is an attached or built-in glazed unheated room that is used in all types of houses. Even in comfortable weather, residents try to turn loggias into glazed verandas, because they can be used for two or three months longer than non-glazed ones.

The functional organization of the summer premises of the apartment depends on their belonging to this or that room of the apartment. In the case of adjoining the kitchen in these rooms, the household function will prevail (drying clothes, airing clothes, utility pantry). When adjacent to a common room or bedroom, summer rooms are used mainly for recreation. For a safe stay in a summer room, the height of the barrier in middle-rise buildings is 105 cm.

In all types of houses, apartments can be located in one or in different levels. On this basis, all types of apartments can be divided into two groups: apartments with the location of all rooms in one level and apartments located in two or more levels. In the West, this type of apartment is called a multi-storey. There are apartments in which the premises are located on two levels (these levels have a difference in height by half a floor), as well as two-storey apartments (with a difference in height to one floor) with an internal staircase. The apartments of this group are characterized by the

maximum isolation of the premises of the family-wide and individual zones. The zones are arranged floor by floor. In apartments, which is more expensive, the common room is often two stories high.

In such apartments, internal stairs are often placed in the hallway or common room. Intra-apartment stairs can be one- and two-flight, straight or with winding steps. The distribution of the winder steps must be carried out in such a way as to provide in the first third of the step length relative to the railings such a march width that is close to the size of straight steps. The square where the steps of the winder staircase are rotated is divided into three treads. Indoor stairs are designed of lightweight construction, often wooden or using metal.

Apartments are classified from the standpoint of insolation and ventilation. Thus, apartments are divided into several types. The first type is one-sided apartments. In such apartments, the light front goes to one side of the house. Such apartments do not have through ventilation. The second type is two-sided apartments. In such apartments, the light front is located at an angle or on opposite sides of the house. Such apartments have angular or through ventilation. One-sided apartments are the least hygienic if they are designed for middle and southern climatic latitudes. One-sided apartments have optimal hygienic qualities.

4 GRAPHIC DESIGN OF THE PROJECT

The graphic design of the project with the help of computer programs should help to reveal more accurately the architectural, planning and artistic idea of organizing a residential group with middle-rise buildings (Appendix L, M). For a better disclosure of the concept of the project, you should think over the means of graphic presentation of the project so that the finished exposition is performed at a high level (Appendix N).

On the master plan, it is necessary to show the wind rose, the contours of the relief, the network of streets and driveways (in red lines). In addition, on the master plan, you need to depict the roadway, the placement of residential buildings, the

sports core, green spaces, and you need to show the boundaries of the residential group. On the master plan sheet of a residential group with middle-rise houses, you need to place an explication of buildings and territories, as well as the estimated and design balances of the territory and technical and economic indicators for the master plan (Appendix K).

In general, the final design of the exposition of the project can be performed in monochrome or polychrome colors.

For the graphic design of the project, it is recommended to use several computer programs. Students should be able to demonstrate a variety of graphics and prepare a 3D video presentation of their project proposal.

5 TECHNICAL AND ECONOMIC INDICATORS

Technical and economic indicators for a residential building

1. Building area, m^2.
2. Living area, m^2.
3. Total area, m^2.
4. Construction volume, m^3.
5. Coefficient K1 (ratio of living space to total).
6. Coefficient K2 (ratio of construction volume to total area).

Technical and economic indicators by housing group

1. Population of the housing group (measured in the number of persons).
2. The territory of the housing group, ha.
3. Number of apartments (measured in number of pieces).
4. Residential fund, m^2.
5. Housing provision, m^2 / person.
6. Building density, percentage.
7. Landscaping, m^2 / person.

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GLOSSARY

Building plot – a plot of territory where houses with adjoining plots are located. On such a site of the territory, a blocked residential building with individual adjacent areas can also be placed.

A residential development complex is an area that, as a rule, has a size of less than 30 hectares (but not less than 5 hectares). This territory is formed in the system of urban and regional infrastructure. We are talking about transport, engineering and social infrastructure. This area is a relatively isolated residential entity. This residential formation is detached from the surrounding buildings and the environment. This residential formation has a system of internal passages, separate service facilities and public areas.

Red building lines – lines that indicate the existing, planned (changed, newly formed) boundaries of common areas. In addition, these lines denote the boundaries of land plots on which engineering and technical support networks, power transmission lines, communication lines (including line-cable structures), pipelines, highways, railway lines and other similar structures are located. Buildings and structures should not protrude beyond the red lines towards the street or square. Within the red lines, it is allowed to place structural elements of road transport structures (supports of overpasses, stairs and ramps of underground pedestrian crossings, pavilions at stopping points of city public transport).

Building lines – conditional lines that establish building boundaries when placing buildings and structures. These structures are indented from the red lines or from the boundaries of the land.

Building offset – the distance between the red line or border of the land plot and the wall of the building or structure.

Street – an area intended for traffic and pedestrians, which includes a two-lane carriageway, curbs, ditches and berms.

Passage – an area intended for traffic and pedestrians, which includes a single-lane carriageway, shoulders, ditches and berms.

A residential building is an apartment building in which apartments have common out-of-apartment premises and engineering systems.

Sectional residential building – a building consisting of one or more sections. Walls without openings separate these sections from each other. Apartments of one section have access to one staircase directly or through a corridor.

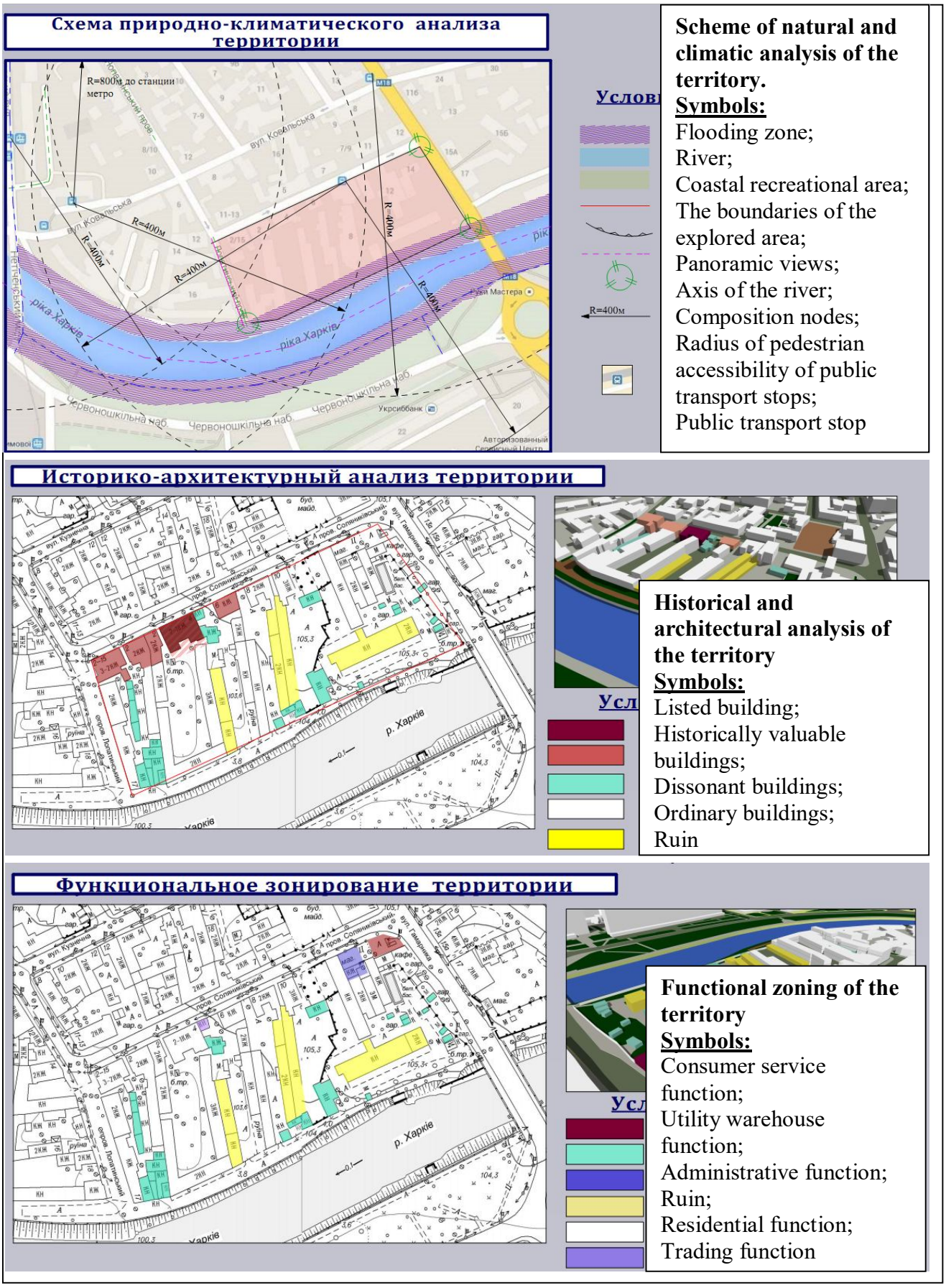
Gallery-type residential building – a building in which all apartments on a floor have exits through a common gallery to at least two stairs.

Corridor-type residential building – a building in which all apartments on the floor have exits through a common corridor to at least two stairs.

Blocked building – a type of low-rise residential building in which the same type of residential buildings are blocked with each other by sidewalls. These houses are located in a row. Each of these houses has a separate entrance, a small front garden and, sometimes, a garage.

Recreational zone is a territory for mass recreation of the population. These are mainly recreational forests, recreational reservoirs, as well as national, natural, city and other parks and the like.

APPENDIX A



Scheme of natural and climatic analysis of the territory.
Symbols:
Flooding zone;
River;
Coastal recreational area;
The boundaries of the explored area;
Panoramic views;
Axis of the river;
Composition nodes;
Radius of pedestrian accessibility of public transport stops;
Public transport stop

Figure A.1 – Example of schematic analysis of the territory

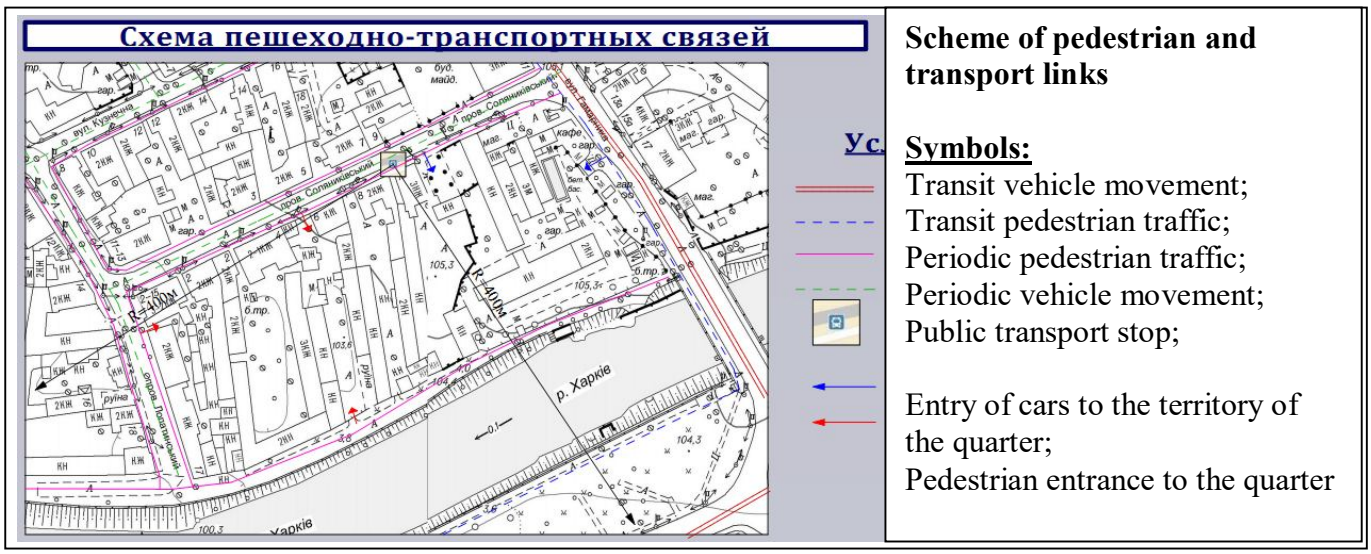


Figure A.2 – Example of schematic analysis of the territory

APPENDIX B

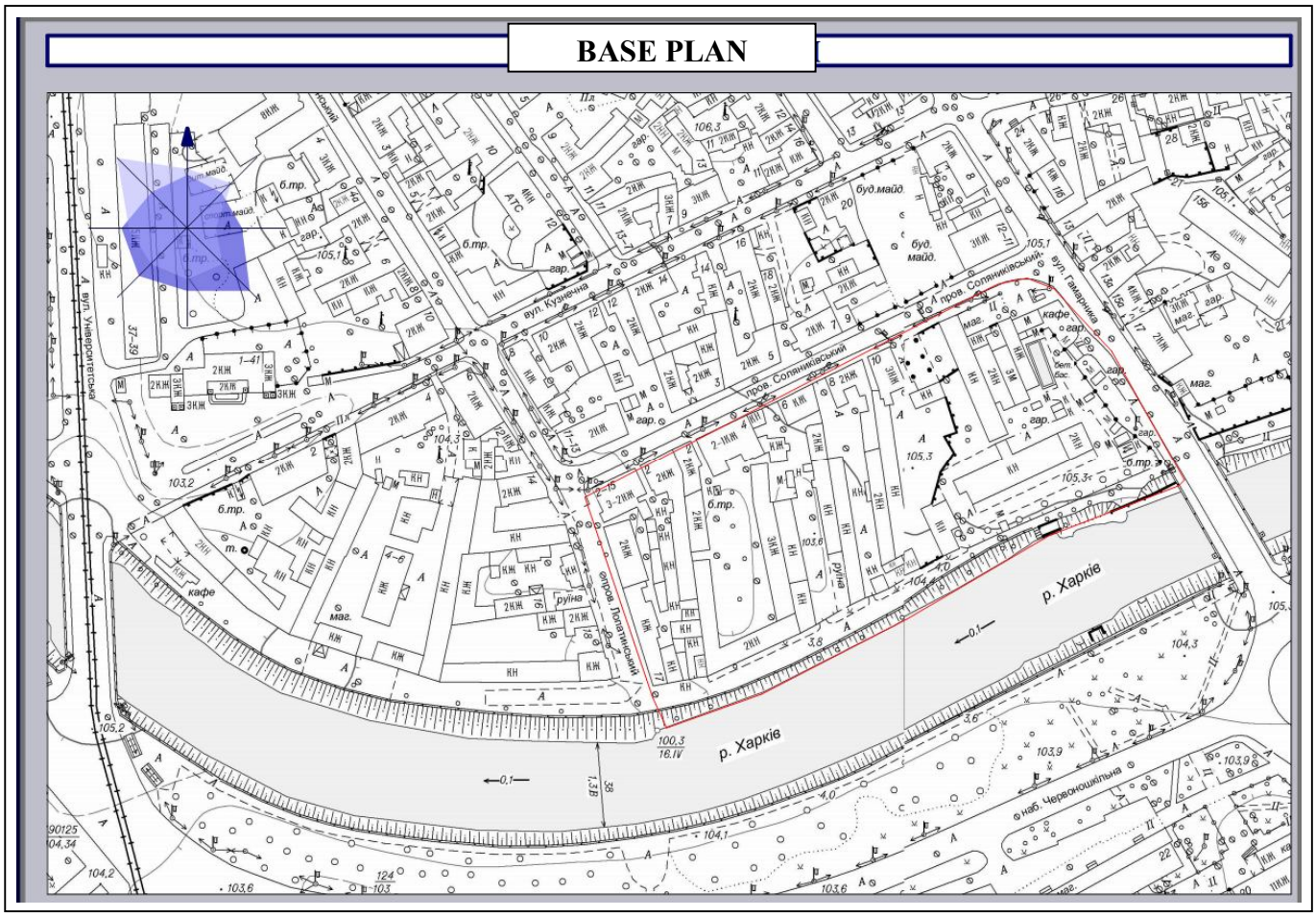


Figure B.1 – An example of the implementation of the base plan of the territory

APPENDIX C

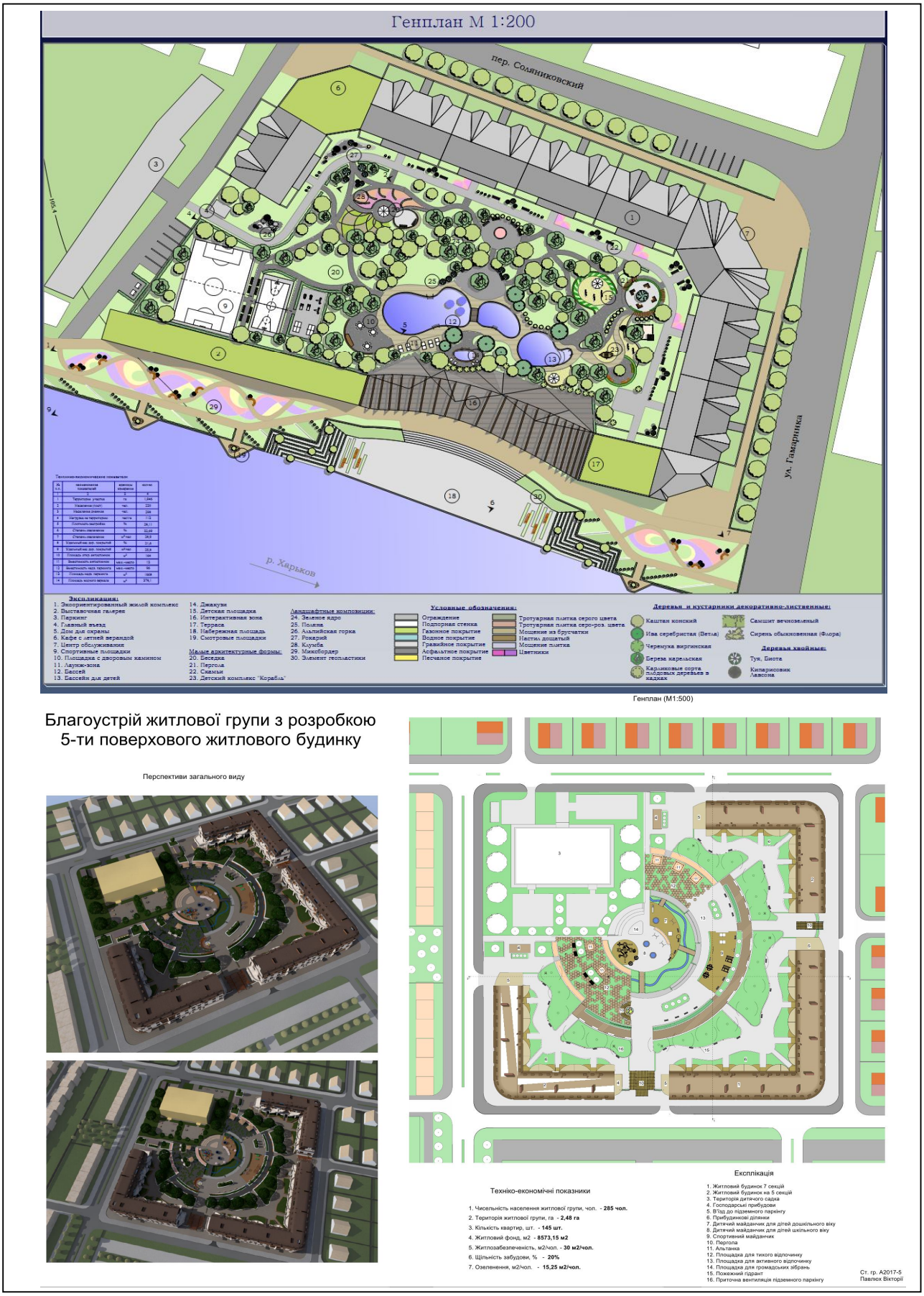
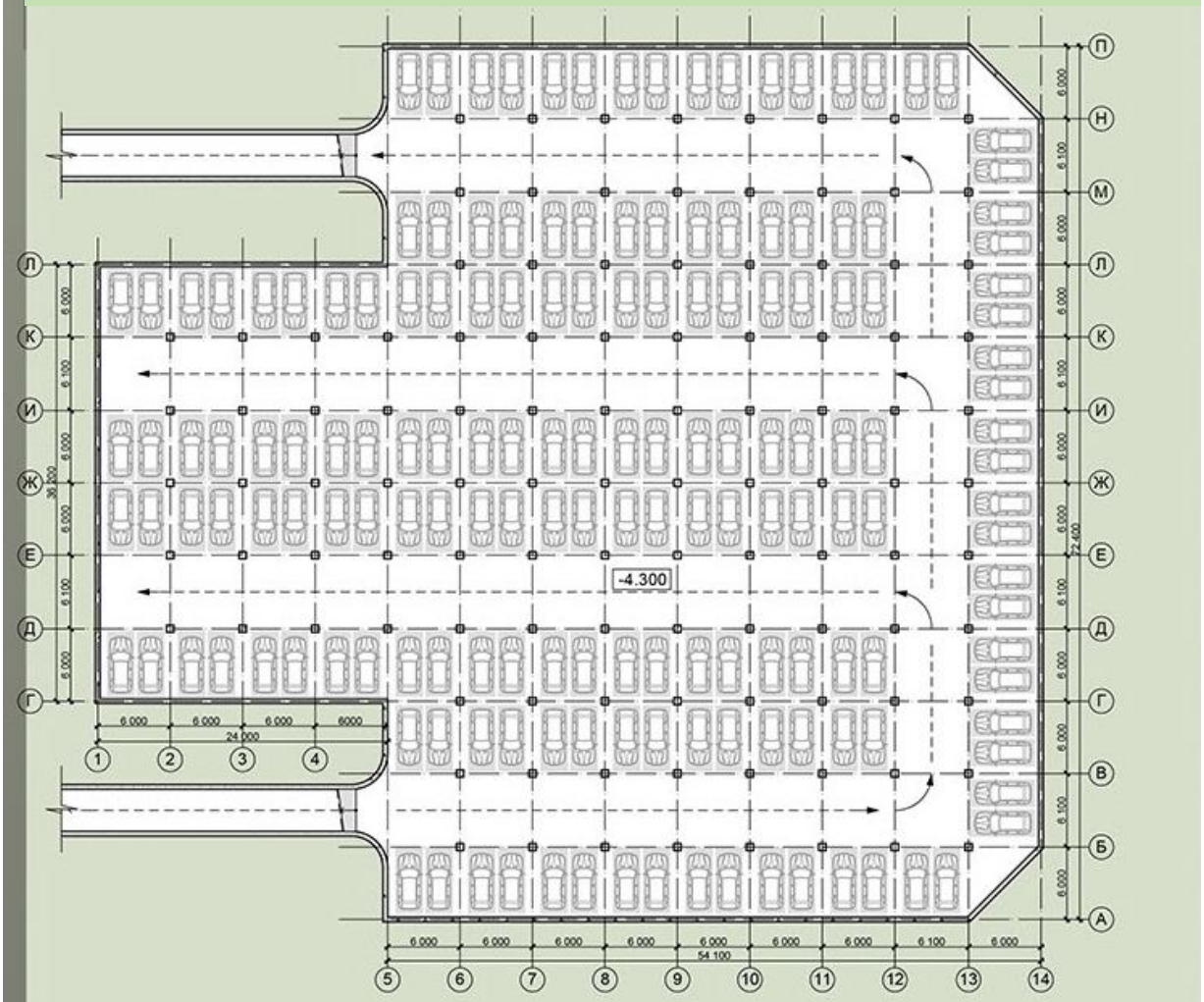


Figure C.1 – Example of graphic design of the master plan of the housing group

APPENDIX D

Parking plan



Technical and economic indicators for parking

S_{total} = 4966 м^2;

Standardized capacity - 120 car places

Estimated capacity -168 car places

$S_{parking}$ = 3288,7 м^2;

$S_{driveways}$ = 1677,3 м^2;

One-way traffic (travel width - 6.1 m);

Installation of the car in reverse, without additional maneuver;

The angle of installation of cars to the axis of passage – 90˚;

Types of cars: middle-class cars

Figure D.1 – An example of an underground parking plan

APPENDIX E

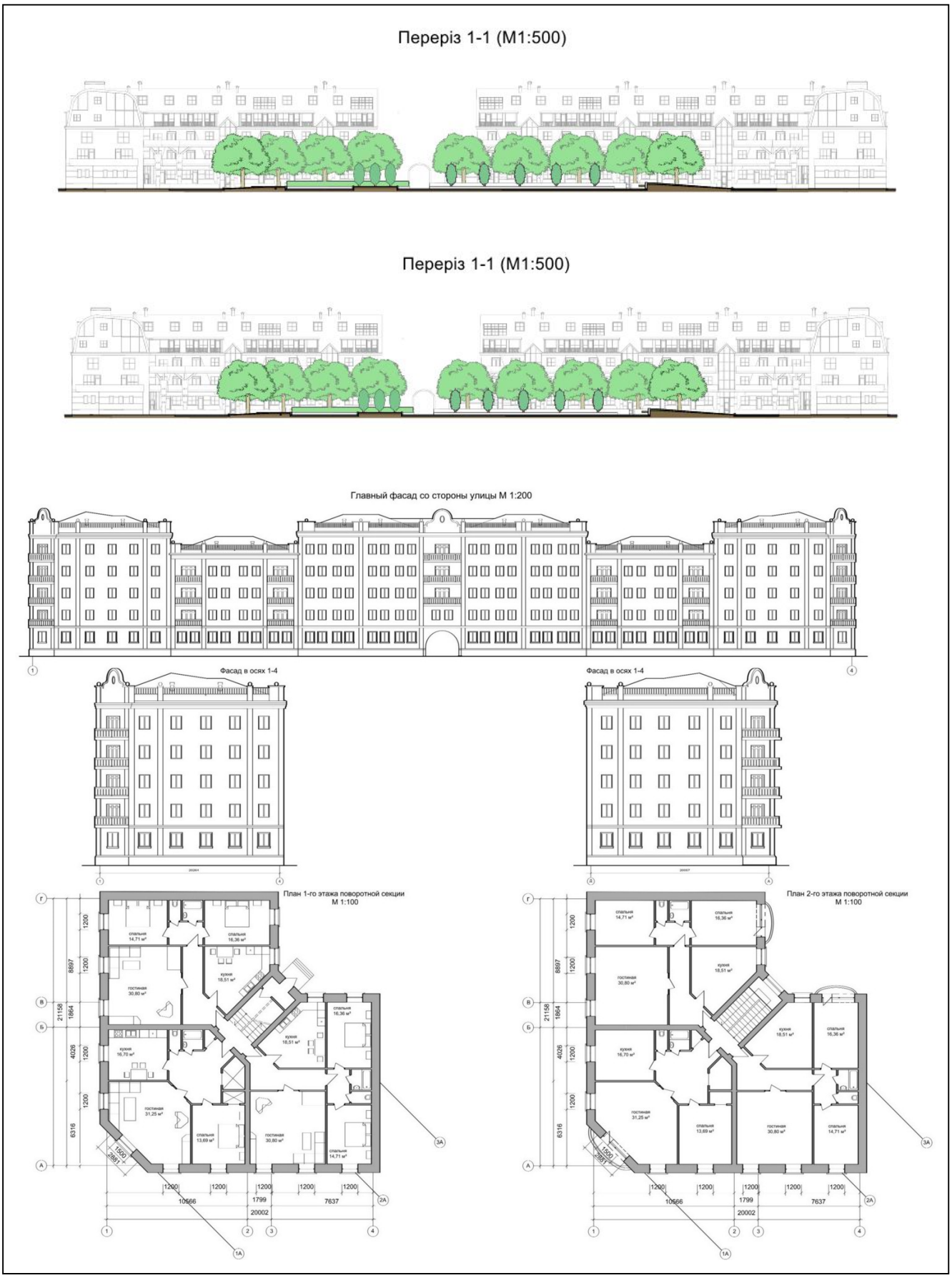
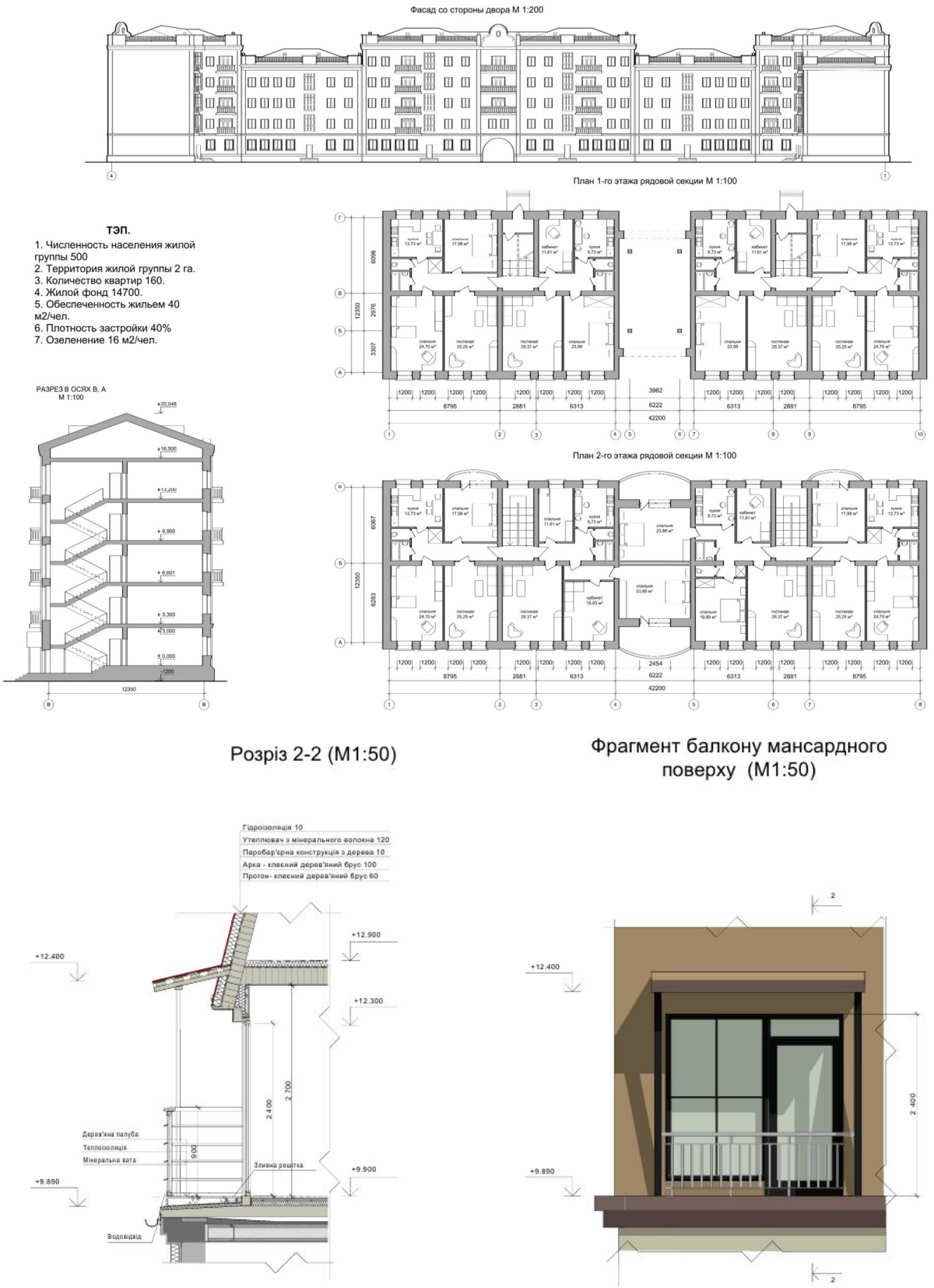


Figure E.1 – Example of spatial planning solution of a residential building

APPENDIX F



Performed by a student of group A2017-5 V. V. Pavliukh, head – senior teacher O. I. Rossokha

Figure F.1 – Architectural and constructive solution of a residential building

APPENDIX G

Figure G.1 – Examples of floor plans of a residential building

APPENDIX H

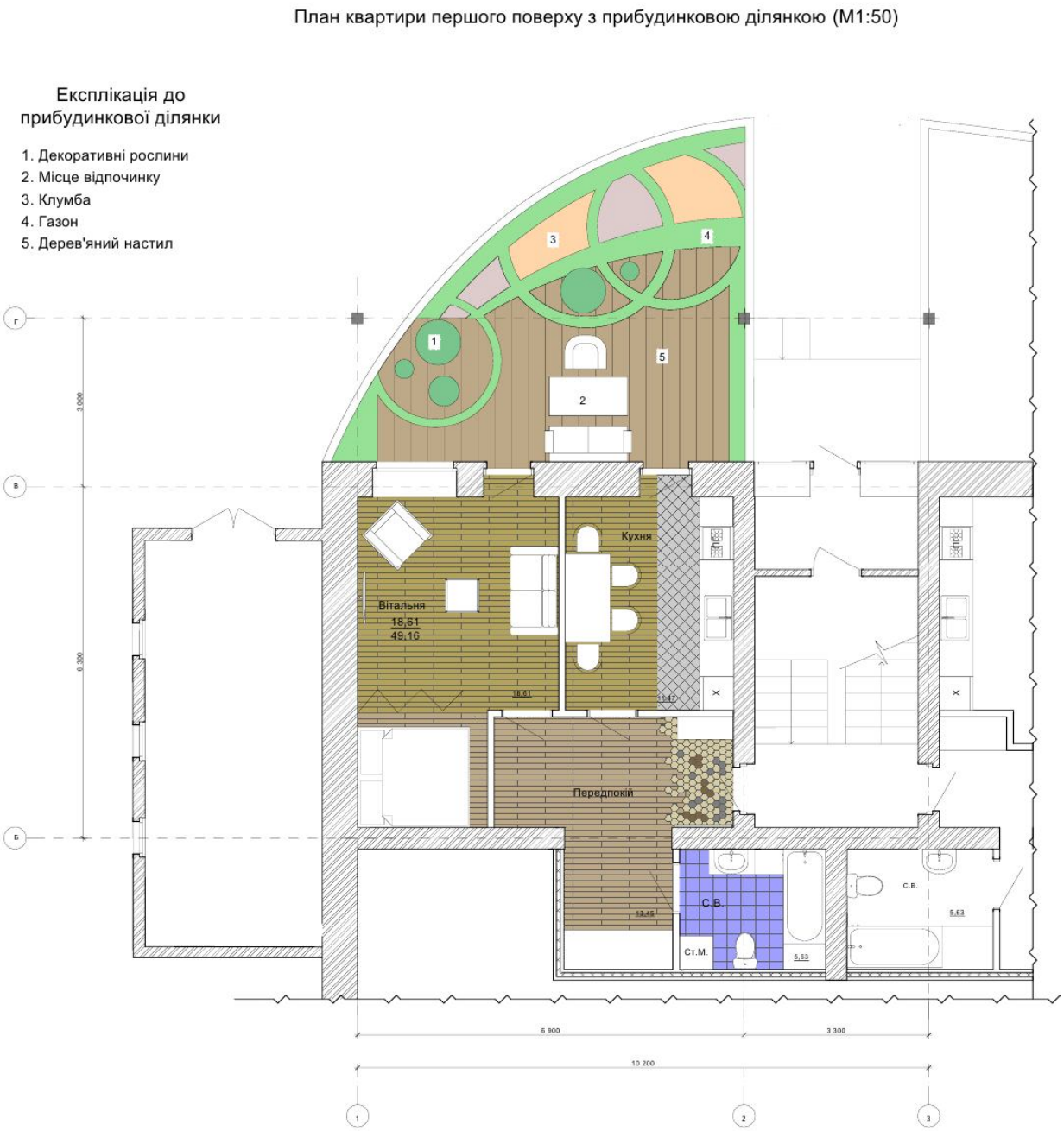
Figure H.1 – Examples of floor plans of a residential building

APPENDIX I

Figure I.1 – Example of a three-dimensional composition of a residential building

APPENDIX J

AN EXAMPLE OF A PLANNING SOLUTION FOR AN APARTMENT



Performed by a student of group A2017-5 V. V. Pavliukh, head – senior teacher O. I. Rossokha

Figure J.1 – An example of the graphic design of an apartment plan

APPENDIX K

Figure K.1 – Examples of drawings of facades and sections of a residential building

APPENDIX L

Figure L.1 – Examples of presentation of perspective sketches of a residential group

APPENDIX M

AN EXAMPLE OF VISUALIZATION OF A DESIGN SOLUTION
FOR A RESIDENTIAL GROUP

Performed by student A. Khlaponina, head – Doctor of Science (Architecture), Professor N. Ya. Kryzhanovska

Figure M.1 – Example of visualization of the design solution of the housing group

APPENDIX N

Figure N.1 – Examples of complex graphic design of the exposition of the project “Residential group with middle-rise buildings”

Виробничо-практичне видання

Методичні рекомендації
до проведення практичних занять, організації самостійної роботи
та виконання курсового проєкту

з навчальної дисципліни

**«АРХІТЕКТУРНЕ ПРОЄКТУВАННЯ БУДІВЕЛЬ І СПОРУД:
ЖИТЛОВА ГРУПА З БУДИНКАМИ СЕРЕДНЬОЇ ПОВЕРХОВОСТІ»**

*(для студентів 3 курсу денної форми навчання
спеціальності 191 – Архітектура та містобудування)*
(Англ. мовою)

Укладачі: **СМІРНОВА** Ольга В'ячеславівна,
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Відповідальний за випуск *О. А. Попова*
Технічний редактор *В. І. Шалда*
Комп'ютерне верстання *О. В. Смірнова*

План 2021, поз. 486 М

Підп. до друку 27.04.2021. Формат 60 × 84/16.

Друк на ризографі. Ум. друк. арк. 2,7.

Тираж 50 пр. Зам. №

Видавець і виготовлювач:
Харківський національний університет
міського господарства імені О. М. Бекетова,
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Свідоцтво суб'єкта видавничої справи:
ДК № 5328 від 11.04.2017.