**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**

**O. M. BEKETOV NATIONAL UNIVERSITY**
**of URBAN ECONOMY in KHARKIV**

Methodical recommendations
for coursework

# "ARCHITECTURE OF MODERN HOUSING"

*(for applicants of the second (master's) level of higher education*
*full-time study in specialty 191 – Architecture and urban planning)*

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# INTRODUCTION

Individual residential buildings at the modern stage have become one of the most massive objects of architectural activity in urban and suburban environments. Every year, the scale and pace of residential buildings expands, and the density of such areas increases. Providing the population with comfortable living conditions is one of the most important tasks of architecture, both at the level of a separate residential unit and at the level of the architectural environment.

Today, solving the residential problem, the quantitative growth of individual residential buildings is of dominant importance. But the task of its qualitative improvement remains urgent. Close attention is required to ensure the necessary level of comfort, aesthetic expressiveness, architectural and planning organization of a residential building, and especially its connection with the natural environment.

Socio-political and economic transformations, the emergence of higher financial and modern technical capabilities of society, changes in construction and economic relations led to the emergence of new trends in the development and formation of individual housing. It has become a real possibility to transition from the construction of a typical house to an individual, orderly building that considers the requirements of a certain homeowner.

The need to increase the recreational and health potential of individual housing is due to the acuteness of environmental problems, which is intensified in the conditions of scientific and technical progress and processes of globalization. In connection with the progressing urbanization and its negative consequences (environmental pollution, intensive construction, and destruction of territories with unique natural resources), the human need to observe natural elements grows and the creation of houses in the natural environment becomes more in demand.

However, the excessive interest in the rapid development of green areas, which prevails over the considerations regarding the formation of a comfortable living environment, has led to architects ignoring the issues of analysing the natural landscape of the area for construction. Providing housing with the necessary quality of the recreational environment is not considered an important task during its design.

At the same time, the organic inclusion of landscaping elements into the structure of the building as an integral part of it ensures a favourable microclimate in the residential structure.

Improving people's ideas about a healthy lifestyle, greening and beautifying the environment generates massive needs for creating housing with high quantitative and qualitative indicators. The transition to the design of individual residential buildings of increased comfort in a natural environment with a recreational function developed on the site provides an opportunity to improve the quality of life of the population, improve the ecological characteristics of the environment, improve health, and implement sustainable development of its ecosystems in the future.

In this regard, the search for new, non-traditional design techniques aimed at creating a comfortable living environment, organically integrated into the natural environment, becomes urgent.

During the design of modern individual housing, it is necessary to ensure high comfort of family living in a private house, which should be facilitated by considering hygienic and psychological factors of creating comfort. An important element of ensuring the comfort of housing is the safety of residence. During creating a modern residential building, it is necessary to consider the organization of the life activities of a specific family. At the same time, it is important to predict changes in this family in the future.

These guidelines provide the material needed for organizing independent work and completing the coursework “Architecture of modern housing”.

## 1 THE PURPOSE AND OBJECTIVES OF THE COURSE WORK

The main goal of the course work is for students to master the basics of the methodology and design skills of modern individual residential objects that have pronounced characteristics (figurative, functional, structural, etc.) considering the natural environment.

During developing the coursework “Architecture of modern housing”, the following tasks must be solved:

– mastering the basics of the methodology of designing a residential building as an environmental object (content, stages of work);

– rational functional zoning of the residential building and the adjacent territory (small garden);

– the use of modern architectural planning, constructive and compositional techniques during the design of a residential building and the adjacent territory (small garden) taking into account the factors affecting their formation;

– creation of an expressive architectural and artistic image of a residential building and its separate functional zones;

– maximum consideration of the characteristics of the surrounding area to create comfortable conditions for residents.

## 2 THE COMPOSITION OF THE COURSE WORK

The course work “Architecture of modern housing” involves the development of a project of a residential building integrated into the environment with the presence of a natural component (vegetation, reservoir, relief) on a real sub-base with landscaping of the surrounding area.

The scope of the course work is 1–2 A1 formats.

**Contents of the coursework:**

1. Situational plan (Appendix A).

2. Schemes (Appendix B):

– scheme of the landscape analysis of the territory, S 1: 2000;

– scheme of the functional zoning of the territory, S 1: 2000;

– scheme of the transport and pedestrian paths, S 1: 2000.

3. Photo fixation of the design area from different angles (Appendix B).

4. Master plan of a residential building (S 1 : 500 or 1 : 1000), wind rose, explication and symbols to the master plan. The master plan shows a residential building, farm sites, a landscape recreation area (Appendix C, D). An image of the streets adjacent to the land plot with a solution for pedestrian entrances and car entrances to the territory is also mandatory.

5. Floor plans (S 1 : 100) with the image of furniture and sanitary equipment. Coordination axes and dimensions of the main structural elements are drawn in accordance with the current state standards for the design of drawings. On the plans, the areas of all rooms are indicated (the mark is placed in the lower right corner of the room, emphasized by the main solid line; measurement accuracy to hundredths of a square meter). The names of the premises are given in the explication (Appendix E).

6. Facades (S 1 : 100) with an indication of the extreme coordination axes and height marks of the main structural elements (Appendix F).

7. Section (S 1 : 100) along the stairs without a detailed image of structural units. Coordination axes and dimensions of the main structural elements are drawn in accordance with the current state standards for the design of drawings. On the section, the height marks of all structural elements and the dimensions between the axes of the supporting structures are indicated (Appendix G).

8. Perspective images of the residential building (visualizations) with the inclusion of the surroundings (staffage) in the corresponding graphics (Appendix H).

9. Technical and economic indicators (Appendix H).

10. Interior plan of a residential building (S 1 : 100) and its visualization.

## 3 FEATURES AND SEQUENCE OF THE COURSE WORK

The course work is performed based on the assignment issued by the supervisor. The task is performed based on the initial typological situation issued by the teacher.

First, it is worth deciding on the location of the residential building and its connections with the environment. The next step is to carry out a scheme of comprehensive assessment of the development territory in relation to planning restrictions and visual perception of the environment, highlighting the unique properties of the situation. During developing a course work, it is necessary to solve a set of tasks such as the development of a conceptual solution for a residential building according to a modern approach to object design; the organization of its rational functional zoning (with the possibility of multifunctional use and further transformation), which ensures the satisfaction of various needs of residents; the choice of techniques for forming the adjacent landscape; creation of an expressive architectural and artistic image of the environment. It is important to analyse the current state and modern trends in the design of residential buildings, to consider the influence of urban planning, social, technical, economic, and natural factors.

**Course work implementation sequence:**

1. Familiarization with the textual part of the task, topographical basis of the area, study of methodical recommendations and literature on this issue.

2. Implementation of the scheme of landscape analysis of the territory (S 1 : 2000).

3. Development of the scheme of functional zoning of the territory (S 1: 2000).

4. Development of a scheme of transport and pedestrian pathes (S 1: 2000).

5. Development of a sketch of the master plan of a modern residential building (using the example of a villa in a natural environment) (S 1 : 500 or 1 : 1000).

6. Execution of drawings according to the approved sketch of the master plan of a modern residential building using certain computer programs.

7. Development of plans, facades and section of a modern residential building (S 1 : 100 or 1 : 200).

8. Performing bird’s-eye perspective and perspective sketches.

9. Designing the exposition (with a video presentation) of the course work.

10. Course work defence.

### 3.1 Scheme of landscape and urban analysis of the territory

Getting started, it is necessary to conduct a landscape analysis of the selected territory (Appendix B). The further general design decision of a modern residential object should be based on the results of this analysis. The scheme of landscape analysis of the territory is carried out on a topographic map (S 1: 2000). Information about the landscape features of the selected area should be indicated on the scheme. It is necessary to indicate the general character of the relief of the territory, identify the individual features of the territory. It is necessary to determine the specifics of the site, graphically show existing natural dominants and nodes of spatial composition, unique landscape combinations. It is also necessary to analyse the degree of improvement and greening of the territory on the scheme.

### 3.2 Scheme of functional zoning of the territory

The scheme of functional zoning of the territory must be carried out on a topographic map in S 1: 2 000. It provides information about the functional organization of the territory chosen for the design of a modern residential object. The volume and relative location of all existing functional zones must be marked on the scheme. Areas of the territory are highlighted in different colours, according to their functional affiliation, and, in the case of presence on these areas, buildings are highlighted in colour according to their function (the building is highlighted in the same colour as the territory, but a tone darker) (Appendix B).

### 3.3 Scheme of transport and pedestrian paths

The scheme of transport and pedestrian routes provides information on the organization of existing road and pedestrian traffic on the territory, carried out on a topographic map in S 1: 2 000 (Appendix B). It is necessary to analyse the traffic and mark on the scheme the following elements:

– roads with a high level of traffic intensity;

– roads with a low level of traffic intensity;

– one-way traffic (show direction);

– two-way traffic.

Public transport stops should be highlighted on the scheme if there are on the territory. Specify the type of transport, mark transport parking lots. It is necessary to analyse the paths of pedestrian traffic and mark on the scheme:

– transit pedestrian traffic;

– targeted pedestrian traffic.

### 3.4 Development of a sketch of the master plan of a modern individual residential building (using the example of a villa in a natural environment)

The sketch of the **master** plan is made in S 1 : 500 or 1 : 1000 (Appendix C, D). The formation of the architectural and landscape environment of a modern residential building should be carried out using a regular, landscape and mixed planning structure and with the inclusion of natural (vegetation, geoplastics, water devices) and anthropogenic (small architectural shapes, sculpture, decorative covering) means of landscape design.

A small garden is an open architectural and landscape space with clear boundaries, that should be the main element that ensures the connection of the natural environment with the volume of the residential building.

The selection of the territory of the land plot for placing a modern residential building and a small garden should be carried out considering certain criteria: the favorable location of the plot, the level of its comfort, etc. The most promising for placing a modern residential building and a small garden are land plots on the outskirts of the city and beyond it, as well as free territories intended for new construction with the presence of convenient transport links and engineering communications.

The main advantage of these areas is their high ecological characteristics (favorable microclimatic conditions, low noise level, low level of gas pollution). Such an environment has a positive effect on the psychophysical and emotional state of a person. The zoning of the territory of a small garden near a residential building should be clear with the allocation of main and additional functional zones. The main

zones of a small garden near a modern residential building include the security zone and the main entrance, the residential zone, and the recreational zone with a park landscape.

*The security and the main entrance zone* should be in the immediate vicinity of the residential building and make a favorable aesthetic impression due to the use of various decorative elements in its design (front gates, arches, and pergolas at the entrance to the garden, decorative sculptures and small architectural shapes, flower beds, decorative paving). The house with the adjacent territory forms a living area of a small garden. This is a quiet, peaceful area. Staying in it should be comfortable in any weather. One part of the zone should be located on the sunny side, and another part of the area can be lying in the shade. During the rain, rest can be done on the covered terrace or the green roof of the garage (solarium). It is desirable to install a patio fireplace on the site next to the house. The place is chosen considering the direction of the prevailing winds. It is advisable to place a green lawn with a swimming pool, a reservoir with a waterfall or a cascade.

In the organization of the master plan of the territory of a modern residential building, it is possible to use two following techniques:

– full preservation of natural elements of the environment on the site;

– improvement of the visual and aesthetic qualities of the natural landscape environment due to the reconstruction of vegetation, the use of geoplastic elements in combination with water devices.

A modern residential building on the master plan can be located in the center or on one of the boundaries of the plot (depending on the natural and climatic features of the territory).

The connection of a residential building with the natural environment can be carried out using the following compositional methods:

– closed volume composition of the building. It is suitable for organizing housing in a small area, where it is necessary to provide visual and sound insulation of a residential building, as well as in a hot, dry climate. The volume of the building is formed around a landscaped courtyard. The connection of internal spaces with the

external environment, natural lighting, and regulation of the individual microclimate of interior spaces is carried out with an open atrium included in the volume of the residential building;

– central composition of the volume of the residential building. The premises of the building should be grouped around the main central space. The significant height of the central room emphasizes its special role in the composition and gives individuality to the architectural volume. A small garden is formed around the residential building. It is possible to arrange vertical landscaping of its surfaces;

– basilica composition of the volume of the residential building. The main spatial core of the building is developed in one direction. The space opens to the middle, highest membership, with windows at the top of the residential building. The connection with the natural environment is carried out with balconies, verandas, open and covered terraces, winter gardens, small garden;

– compact composition of a residential building. Rooms that do not require natural lighting are grouped around large spaces without direct connection with the outside environment. Independence from natural light makes the organization of the building free and diverse, often with complex volume plasticity. The active inclusion of natural elements in the structure of the building, the organization of roof gardens and vertical greening of the building's surfaces are characteristic for this composition;

– open volume composition of the residential building. It represents a set of volumes with a clearly expressed length in one or two directions. Inner courtyards, included in the structure of the building, ensure the connection of living spaces with the outside space. The interior space is organized according to the corridor or enfilade scheme (possible addition of hall rooms united according to the corridor scheme), includes, and actively forms the adjacent area.

*A recreation area with a park landscape* occupies a large part of the garden. It contributes to the creation of a unique comfortable atmosphere for active and passive recreation of the whole family, improves the microclimate and increases the level of aesthetic perception of the architectural and landscape environment. Here you can

recreate picturesque corners of living nature with decorative ponds, streams, waterfalls, cascades in combination with compositions of stones surrounded by a lawn or on the background of a sandy cover, which cause an association with “mountain”, “steppe”, “desert”, “swamp”, “coastal” landscapes. The planning and visual design of plots can be created using the motifs of a Japanese or Chinese garden or using the techniques of folk architecture. In all techniques, it is necessary to ensure an organic combination of the volume of the residential building and the garden with the surroundings. Among the additional zones in the small garden near the modern residential building, it is necessary to highlight sports, children`s, beach, household zones, an orchard, a vegetable garden.

*A sports area* is usually created on a plot with a flat relief. It can consist of several playgrounds: for badminton, table tennis, skittles, include a lawn for practicing gymnastics, a pavilion with simulators, a playing field for golf, football. To demarcate internal sites and isolate the area, it is worth using a shrub hedge.

*The children s zone* is created mainly for children from one to twelve years old and can be decided as a small playground with certain thematic symbols. It can be a space, sea, adventure playground or a peculiar space formed on the plots of children's fairy tales. Its planning elements can be a splash pool, a sandbox, a bridge, various game equipment. The main covering of the zone is a lawn.

*The beach area* is a site with a sandy or board surface, located near a natural or artificial body of water and intended for recreation with the presence of special equipment in the form of sunbeds, umbrellas, and canopies of awnings.

In addition to zones that perform recreational and health-improving functions, zones of utilitarian purpose are foreseen during the design of the master plan. An economic zone is in the garden to organize utilitarian and household processes and run a farm. This zone can include a greenhouse, a small bathhouse, a summer kitchen, etc. It is necessary to place the utility block. It is practically invisible on the site, but convenient to use. Zones with a utilitarian function also include an orchard, a vegetable garden. They should occupy the most favorable part of the site in terms of

lighting and soil and plant conditions. Their rational placement makes it possible to visually expand the space of the garden.

Placement of all zones on the site should be carried out considering the relief, the direction of the prevailing winds, orientation from the sides of the light and their functional purpose. All zones in the residential area can be separated from each other or organically included in its common composition. To connect the main areas of the territory of a small garden near a modern residential building, it is worth considering the trajectory of walking paths and alleys. It is worth providing 1-2 routes that connect all zones of the small garden with each other. These routes should be designed to go around each zone and pass through the entire territory of the land plot. The connection with the natural components of the environment existing on the territory and their inclusion in the structure of a small garden can also increase its aesthetic characteristics and level of comfort, create a unique recreational environment according to an individual design project.

### 3.5 Volumetric-spatial and architectural-planning solution of a modern individual residential building

The living space is the basis of the plan of a modern residential building. It is worth highlighting two main methods of building the three-dimensional structure of a modern residential building. The first (most traditional) method of building a three-dimensional structure of a residential building is based on the formation of a single, maximally generalized building structure with simple volume contours. Such volume in plan can have an elongated (rectangular) or compact (close to a circle, ellipse, square, triangle) shape. Based on rectangular plans, laconic volumes of residential buildings in the form of a parallelepiped are usually created. The compact form of the plan is more characteristic of tower-type houses. Due to the universal and diverse use of the internal space of this volume, it is possible to achieve the creation of a single enlarged, flexible living space. The method allows to create universal spaces suitable for various uses. It should be noted that this method is most typical for the construction of residential buildings in the urban environment on small plots, where

the formation of compact residential objects subordinated in scale to the surroundings is considered economically justified. It is also advisable to place them in difficult soil conditions (on mountain slopes, rocky soils, etc.). Such amounts contribute to maximum preservation of the environment and reduction of anthropogenic load on natural landscapes. For the most rational use of the plot of land, it is necessary to strive for vertical development of the volume with the free placement of recreational spaces and green areas on different levels of the building and the use of underground space for placing garages, utility rooms (with a small rest zone on their roofs).

The second method is based on the clear division of all premises into homogeneous functional groups, selection of the core of the composition and elements of functional connections. Each of them is divided into a special part of the volume, and the elements that serve for functional connections are used as connecting links of the composition. The structure of houses with a complicated plan form can be multivariate (“trefoils”, “crossroads”; various curvilinear forms). Depending on the function and area, internal spaces can be combined horizontally or vertically. Such residential buildings are characterized by a clear dependence on the features of the surrounding natural landscape, inclusion of landscaped exterior spaces in the compositional structure of the house, a variety, and dismemberment of planning schemes for the formation of space. The choice of method depends on the urban planning characteristics of the construction site, its size and shape, sanitary and hygienic and fire protection requirements, technical and economic considerations. One of the main factors affecting the choice of compositional and architectural planning solution of a modern residential building is the natural environment, which can actively reveal the aesthetic characteristics of the building.

The first method is expedient to apply when the demands of diversity of functional processes, blurring of their forms and boundaries prevail. The second method is the most effective in case of prevailing requirements for the isolation of functional processes and their certainty, a significant area of the site. The choice of the nature of the organization of the spatial structure of the building depends on their typological characteristics, specifics, socio-demographic orientation, natural and

climatic conditions, local architectural and historical traditions, aesthetic preferences of residents, etc. The spatial structure of a residential building reflects the social organization of a certain family (the minimum amount of living space for one person, the nature of exploitation, the dominant life processes and the priority function of the house depending on its location). The quality of the living environment of buildings in free urban areas is affected by their functional, planning, architectural and spatial organization, technical and aesthetic characteristics. The choice of stories, architectural compositional and constructive solutions of residential buildings should be based on the requirements of the development of the construction area, the level of engineering equipment, and local construction materials. The main parameters of a residential building should be interconnected and form a harmonious whole. The presence of a complex of indicators contributes to ensuring a high standard of living, and therefore, the social efficiency of the residential environment. Achieving and ensuring living comfort is the main goal of designing modern residential buildings. Comfort is achieved by clear organization of the structure of the house.

The building can have not a traditional shape but consist of a set of different three-dimensional components that reflect its structure. The rigid and correct form of the volume of a residential building denies the existence of individuality, subordinates the processes of human life to mechanistic orderliness, and complicates further modifications of the volume in accordance with increased needs and changed functions.

It is necessary to solve specific tasks in the process of forming the architectural and landscape environment of a modern residential building:

– provision of rational subject-spatial filling of interior and exterior spaces (on the basis of functional zoning), taking into account the identification of their dominant function and a certain style;

– compliance with comfortable microclimatic conditions in the system of interior and exterior spaces, taking into account the nature of their operation;

– an integrated combination of elements of the anthropogenic environment with the natural landscape of the site and its surroundings;

– solving the necessary conditions for visual perception of the natural environment (the ability to observe the sunrise and sunset, to contemplate the most interesting natural elements of the environment like meadows, mountains, sea, etc.);

– compliance with safety conditions due to engineering and technical devices and natural elements of the environment.

The organization of modern residential objects should be formed considering the priority along with the residential additional functions, general quality indicators of the subject-spatial environment with the identification of the demographic composition of the residents and the nature of the exploitation of the residential entity. The formation of volumetric and spatial compositions and planning decisions of modern residential buildings is influenced by the climatic features of the area, the structure of its natural landscape, the area of the land plot, etc.

Currently, the most common individual houses are villas, mansions, and cottages. Their planning structure is determined by the nature of the zoning of the main volume of the building. Zoning is a clear planning allocation of groups of premises that have uniform functions and internal relationships.

Functional zoning brings clarity to the architectural and planning decision, contributes to the clarification of compositional and structural schemes, provides for the unification of spaces with similar functions into zones corresponding to their purpose, the placement of which can take place in one or more levels depending on the number of floors of the building. It is worth providing for the following functional areas in the structure of a modern residential building.

*The zone of public premises* is used for various collective forms of recreation, solitude, solemn events, reception of guests. In the structure of this zone, it is advisable to distinguish the following groups of premises: cultural and leisure, relaxation, and health, and recreational.

*Cultural and recreational premises* are united according to the principle of organizing the family's life processes related to its cultural ideas. The main premises are a hall, a living room, a reception and banquet hall, a library, a cinema hall. The most significant and accented spaces in the house can include an open grand

staircase, skylights, etc. They form the centre of the family's collective life and are located near the entrance area. It is appropriate to have a permanent or episodic (transformation of fences) connection with the dining area, recreational areas, and a small garden, which can be an extension of the interior of the house. According to the nature of the connection with the external environment, they are classified as closed, semi-closed and open.

*Relaxation and health premises* are grouped considering the prevalence of passive and active recreation spaces, which form different relaxation spaces, and sports-oriented spaces. The main premises in the group are a sauna, a swimming pool, a jacuzzi, a massage room, a solarium, rooms for playing billiards or bowling, and a gym. They contribute to the recovery, restoration, and emotional unloading the human body. The placement of these premises involves their interaction with bathrooms and showers, premises of cultural, leisure and recreational purposes and open spaces like terraces, a patio, a small garden.

*Recreational premises* serve to combine or demarcate functional zones, orient residents, and provide a reserve for the development of a residential building. The main premises are a balcony, a veranda, a loggia, a winter garden. Terraces, roof gardens, patios are arranged with the aim of expanding the limited space of the house and organizing panoramic views of the landscape and architectural compositions of the garden (reservoirs, hills, small architectural shapes). Considering the topography of the area allows to form an individual volume-planning structure of a modern residential building. The small slope of the site practically does not affect the planning; at a slope of up to 15 % different solutions are used at the level of the first floor; with a slope of more than 15 % it is advisable to create terraced and other types of buildings. Placement of recreational spaces requires their mandatory inclusion in the structure of cultural and leisure, relaxation and health and individual spaces. The interior, limited by stained glazing (which is often transformed), emphasizes the direction of the visual compositional axis, becomes a natural extension of the visible environment.

*The zone of individual premises* serves to organize the personal space of all residents of the building, considering the needs of each family member. There are several groups of rooms: sleeping rooms (bedrooms), working rooms for residents of the building (office) and service personnel (servants' room, security), children's playrooms. The bedrooms are designed to be impenetrable. They are located isolated from the premises for active activities. The office requires the creation of silence, conditions of natural lighting. Its placement depends on the planning decision of the house, the specifics of the owner's activity. If the activity involves visiting the study office is connected to the hallway. If activity requires isolation the entrance to the office should be from the common room or bedroom (expands the possibilities of their alternative use). The premises of the working staff are designed in isolation in connection with the entrance area.

*The zone of economic and household premises* provides for the organization and implementation of household operations, necessary to ensure the daily life processes. The composition of utility and technical premises (depends on the household needs of the family, forms of organization of engineering systems) can be represented by several rooms; multi-purpose premises (with an automated system, zoning by types of processes); a large universal block. The main premises are kitchen, utility room (main, guest), pantry, boiler room, laundry, workshop, cellar, main and guest garage. The kitchen is the room with the most equipment. The connection of the kitchen with other rooms depends on its type: a niche kitchen (opens to a common room, for small families that do not lead a developed household), a working kitchen (requires a direct connection on the same level with the dining room or common room through opening), kitchen-dining room (includes a work area and a dining area, preferably located next to the living room). Multi-level houses have two isolated kitchen units. The placement of the farm block is due to its utilitarian purpose and episodic nature of use: in communication rooms, basement, attic. It serves as a buffer between public, individual premises, the entrance to the house. Its organization is predominantly around an exploited courtyard with the selection of one or more separate entrances from the site.

The mutual location and grouping of functional zones in the house should be carried out considering the technological connections between them. The main means of communication are spaces like halls, corridors, gateways, transitions (covered, semi-open and open), ramps (difference of levels inside the building), stairs (multi-story buildings), elevators and exits (expensive buildings). They concentrate and organize different axial directions: the main one is to the zone of public premises, secondary is to the zones of individual and household premises. Accentuation of these spaces is achieved by various architectural and planning means, decorative design. The methods of interconnection of functional zones provide for the possibility of their combination and different location options in the structure of a residential building (separately or in a group of adjacent zones, in a free position).

A modern residential building is a residential entity, the subject-spatial content of which is formed in accordance with a wide range of utilitarian, spiritual, social, economic, and aesthetic needs of an individual family. The composition and size of the family, its age structure, gender composition, and projected development in the future are considered. All requirements are implemented in the building in terms of volume and planning in the form of main and additional rooms with the possibility of organizing various relaxation processes (Appendix E). Currently, society's progressive ideas about spatial solutions, orientation towards maximum comfort and increased functionality have necessitated the organization of multi-functional residential buildings. These can be houses with a predominant social, labor, sports, creative and other functions (houses-museums, houses-galleries, houses-studios, houses-offices, houses-gyms, houses-ateliers). In modern residential buildings of this type (for one or two families, with attached plots), there is always a real possibility of equipping a workshop for amateur and professional activities; content in special economic premises of domestic animals; passion for gardening, flower growing, etc.

Along with the residential function, following additional functional zones can be provided in the structure of a modern individual residential building:

– zone of integral space (recreational zones, winter gardens, spaces for exhibitions and communication);

– entertainment zone (specialized or universal media space);

– zone of exhibition space (spaces of permanent and temporary expositions);

– information and business zone (spaces with modern technical equipment for providing information activities);

– work area (various workshops, studios, etc.);

– interactive creative zone (spaces for technical, musical purpose, artistic creativity);

– sports area (gym, swimming pool, sports grounds and premises serving them);

– entertainment zone (spaces for concerts, dances with surfaces for broadcasting interactive videos, creation of 3D holograms);

– shopping area, etc.

The formation of the volume-spatial structure of a modern residential building is aimed at the creation and development of its multi-faceted space with the following methods of compositional association:

– identification of the dominant space (central location, increase in height, device of light lanterns, accentuation of the main element);

– strengthening of the visual axis of the space (on the vertical and horizontal level by light, colour, connecting open and glazed spaces);

– the presence of general delimiting elements of space (fixed and transformed shielding structures, flexible fences, vertical landscaping for functional and visual unification, isolation of premises);

– the presence of interpenetrating structural elements of space (a room or a functional zone as a structural element capable of freely (“flowing” into others to form a multifunctional space);

– harmonization in the design of interior and exterior space (reflection of the exterior of the house in its interior, use of a single style and materials, colour and lighting solutions, decor, and landscape design).

The advantages of planning solutions of such residential units are the possibility of their gradual expansion by using transformed or reserve space,

superstructure, or annex of additional premises. Their formation should be carried out considering the techniques of free planning and organization of a comfortable microclimate. The formation of the volume-spatial and architectural-planning solution of a modern residential building with an individual microclimate should take place considering the conditions of high and low temperatures.

*In the areas with high temperatures*, characteristic of the southern regions, it is important to protect the residential building from overheating. Comfortable conditions are achieved by combining techniques of architectural and planning organization with a number of the following constructive measures that weaken the negative impact of solar radiation: choosing the optimal layout of the house; organization of through and corner ventilation; rational mutual placement of the house and farm buildings on the site; use for walls and roofs of building materials with high heat-insulating properties, ventilated structures (horizontal, vertical); use of sun-protective architectural elements (visors, shutters, blinds); construction of summer premises (balconies, terraces, galleries, courtyards); extensive use of water facilities (swimming pool, fountain, stream) and landscaping of various types near the house and on the site (exploited ("green" roofs, vertical landscaping of walls, small and winter garden); creation of open and semi-open stairs. The specified measures with the maximum transfer of economic and household processes to the territory of the site will create effective protection of housing from overheating.

Forming modern residential buildings *in conditions of low temperatures*, in projects with the aim of protection against harsh natural and climatic conditions, it is advisable to provide for the following measures: maximum increase in the width of the housing of the residential building; compact layout of the house and auxiliary buildings (reduction of the perimeter of the external walls); connecting the buildings of the development with heated covered passages; use of windows with triple glazing and double vestibules; construction of protective window screens with warm air supply; organization of heating systems in floors; increasing the area of entrance vestibules (double, triple, revolving vestibules); creation of an enlarged, undivided volume of the house with small window openings; non-traditional constructive

solutions of heat-saving buried, underground houses. It is especially important to consider the features of the natural landscape of the construction area for integrating the architectural volume into the surrounding landscape without disturbing its structure. The natural landscape has a pronounced artistic style. It is the main formative tool for a modern residential building. Features of the natural landscape, which refers to different natural zones, are determined by the specificity and combination of landforms, water surfaces and vegetation. The most expressive areas for the placement of buildings are the edges of slopes, floodplain terraces and banks of reservoirs, as well as accent forms of relief like hills, rocks, cliffs, water areas of the sea, rivers, lakes, ponds, vegetation (groves, groups of trees, floodplain meadows). Identifying such accent elements and incorporating them into the structure of the house contributes to the creation of areas with a bright individual image. In this case, the search for an original compositionally harmonious architectural image of a residential building should be combined with careful consideration of the type of natural landscape (forest, steppe, riverside, mountain landscape).

*The three-dimensional structure of a residential building in the forest landscape* should have a vertical development. It should be with pyramidal shape, a distinct acute-angled silhouette and ease architectural and constructive solution. The compositional techniques of green architecture should be actively used. The reflection of vegetation in the glazed surfaces of the house, the construction of a residential building on supports, partial immersion in the soil should be used too. It is advisable to use building materials like wood, plant materials, glass, and metal. The color solution corresponds to the background of the natural landscape (green, blue, brown scale).

*The volume-spatial structure of a residential building in the steppe landscape* should be represented by an asymmetric pavilion-type volume with different heights. The main element can stand out among subordinates due to its larger size, large forms, richness and activity of the silhouette, plasticity, and its location in the structure of the house. Against the background of a neutral natural landscape, active sunlight models the shape of a residential building. It is worth using compositional

techniques of sharp juxtaposition of emphasized geometric architectural forms and lines, born of technology, with monotonous forms of the natural landscape (contrast connections). It is possible to place the house on stilts and organize a covered, sun-protected courtyard, application of landscaping. Natural stone and wood are the main building materials. The color solution is warm ocher tones or contrasting cold shades that break the color monotony of the environment and create a psycho-physiological feeling of coolness.

*A residential building in the structure of a coastal landscape* is formed in the immediate vicinity of a water surface, along or on sloping territories, which determines its volume-spatial structure (long, gradual, compact). Large plastic forms of curvilinear contours are arranged along the coast (the length of the house-plate) or descend to the reservoir in measured rhythmic rows (the fragmented structure of the house). In the first case, the reservoir becomes the main compositional axis and an essential connecting element. The house has a linear character and is consistently perceived when moving along the shore, which allows the house to be widely revealed in silhouette. It is possible to sink the building partially or completely into the ground. In the second case, the inclination of the slope organizes and determines the entire system of visual communications. Visual perception is carried out from the upper terraces to the lower ones and to the foot of the slope. The horizontal planes of the house on a sloping site with a dynamic landscape are solved by the arrangement of terraces, retaining walls, stairs, platforms on supports with an accentuation of architectural and landscape means of a stepped, rhythmic structure of the relief. The composition is characterized by multifacetedness, complexity, dynamism, picturesqueness of forms. The fragmented, openwork structure of the house is subject to light, flexible rhythms of natural forms. Building materials are reinforced concrete, shell, glass. Panoramic glazing reflects water, vegetation, and the surrounding nature. Color solution is blue, white, green, yellow, golden colors.

*The volume-spatial structure of a residential building in the mountain landscape* should be compact (on the mountain it is with a conical top, between mountainous spurs it is with a flat surface). The architecture of a residential building

should be expressive and monumental, consisting of extremely massive large-scale elements devoid of subtle modulations. The vertical arrangement of architectural forms is compositionally consistent with the natural forms of rocks (nuanced connections). The house is characterized by large elongated, sinuously outlined forms that repeat the folds of the relief; the vertical length of the volume, its increase in height and mass, coordination with the (“movement” of the dynamic shape of the mountain. A residential building on the top of a mountain should have active visual connections with the sea. Building materials are wood, concrete, stone with a large texture. It is characteristic to use the material's ability to reflect sunlight and actively model the shape. Coloristic solution is the light pastel tones, neutral gray, and white shades.

All identified types of natural landscapes have pronounced composite structure-forming elements that determine the uniqueness of their natural environment and contribute to the creation of individual silhouettes and panoramas of modern residential buildings and their landscape environment. The nature of the relationship between the residential building and the natural landscape depends on the combination of their spatial forms, which are characterized by size, geometric appearance, texture, colour, light and shade, position in space. An integrated system of interior and exterior spaces of a residential building is created considering the specifics of a type of landscape. The following methods can be used:

– the dominance of a residential building in the natural landscape by means of features of shape, mass, colour, texture, etc.;

– a neutral relationship between the residential building and the natural landscape;

– organic inclusion of the architectural volume of the residential building into the structure of the relief with subordination to the natural landscape.

# 4 ARCHITECTURAL AND ARTISTIC FEATURES OF A MODERN INDIVIDUAL RESIDENTIAL BUILDING

The formation of residential buildings should be carried out considering the aesthetic ideals of a specific era, which is the reason for the appearance of great diversity in the manifestation of their artistic image. This is caused by natural and climatic, social, and urban planning factors and the use of new technologies.

The artistic image of a modern residential building should be expressive (Appendix F), especially in combination with the natural landscape. National colour can also be used in the formation of the artistic image of a residential building. The development of new construction technologies, which include complex life support systems and innovative resource-saving devices that consider human needs, should be the basis for creating a unique volume of a modern residential building with pronounced plasticity of forms. The style of modern residential buildings can be diverse:

*Modern.* A house with individual, rational forms. The configuration of the plan is varied, complex. The volume of the building is clearly geometric, a flat exploited roof, white walls, large window openings and stained glazing, simplified details, or their absence. The main characteristic is asymmetry of volumes and details. Styles are pseudo-modern, classic, eclectic, pseudo-country. A modern house carries a touch of history, past culture through style. The garden next to the house is distinguished by strict planning, geometry, and integrity.

*High tech* is a modern style with pronounced individual characteristics of the environment. The house often consists of separate blocks. Blocks, communication systems, component volumes are left open. The engineering logic of assembly is visible. Inscriptions and pointers, bright coloring with synthetic dyes play an active role. Modern composite materials, metal panels with sandwich-type insulation, continuous stained-glass windows on the entire wall, openwork steel frames, many technical devices are used. Machine aesthetics in relation to the house is primarily the lightness and modularity of the structure. The garden is characterized by a mixed

method of planning. Materials used in the landscape design of the garden are the same like in the design of the house.

*Avant-garde*. The shape of the plan, the three-dimensional structure and plasticity of the residential building are the most unusual, dictated by the desire to implement the author's scheme or principle, which will be relevant in the future, independence, and originality in general approaches and in the elements of the form, conceptual construction, schematic, detachment from modern conditions and requirements, futurism. The modern house reflects the authors' vision of a possible future, which is also characteristic of a small avant-garde garden. The use of modern building materials and new technologies makes it possible to create plastic volumes of residential buildings of varying degrees of complexity, which contributes to the realization of conceptual projects that are unique in terms of architectural design. The design of a residential building is the basis of its large-scale arrangement, which determines the large-scale perception of this object. As a rule, the scale of the external architectural form of a residential building is larger than the scale of the interior, because the internal space is more limited and fragmented, and is much closer to a person.

*Organic architecture.* A trend aimed at greening the living environment with the help of its natural continuation in the surrounding natural landscape. The shape of the plan, the three-dimensional structure and plasticity of the residential building are individual, depend on modern conditions, the spirit of the place and function, the principled independence in the general approaches and in the elements of the form, its originality and integrity. All formal means are the result of thoughtfulness by the author who solves a specific task. The house is maximally connected with the natural landscape environment.

*Formalism.* The shape of the plan, volume structure and plasticity of the house are fundamentally independent of modern conditions, requirements of place and function, independence, and originality in general approaches and in form elements, integrity of form. All formal means are the result of the implementation of a certain scheme, idea. A house is like some well-known shape that has a symbolic meaning or

image (a tower, a fortress, a flower, a bird, a ship, a greenhouse), or an exotic shape or image.

*Bionic architecture.* The shape of the plan is simple or complex, the curvilinear, three-dimensional structure of the residential building is exposed to favourable natural and climatic conditions, greenhouses, terraces, solar collectors, ecological local materials (wood, soil, adobe, reeds, clay, straw). Similarity of nature in general approaches and elements of form, integrity. All formal means are the result of creating comfortable living conditions and maximum harmony with nature. A one- or two-story house with a recessed floor is like a traditional or natural dwelling. The garden next to such a house is created mainly with a mixed layout, often in organic connection with the architecture of the house.

The stylistics of the architectural and landscape environment determines the artistic image not only of the residential building, but also of the small garden included in its structure, revealing their constructive, planning, and decorative elements. In the projects, it is necessary to adhere to the uniform style of the house and the garden.

The organization of a small garden near a modern residential building can be carried out with regular, landscape and mixed planning.

*A small garden with a regular planning* is characterized by the presence of the main compositional axis, oriented to the dominant, and the creation of extended perspectives, as well as the formation of secondary axes, the identification of the compositional centre (a building, a small architectural shape, and other elements). The severity of the composition is emphasized by clear proportions, symmetry of the members, a certain rhythm of placement of all the elements forming the space; compositional integrity of all elements, expressed in their stylistic unity. Such objects include Italian, French, Spanish-Moorish gardens, formed based on historical stylistics, and small gardens of modern stylistics in the styles of (“Modern”, “Avant-garde”, “High-tech”.

*A small garden with a landscape planning* made it possible to highlight the following patterns of its formation: construction of spaces consider the conditions of

the area, inclusion of its natural advantages in the designed landscape environment, imitation of nature, revealing the artistic image of a small garden; denial of symmetry and straight alleys, the presence of freely winding paths, the picturesque shape of water surfaces and various hills with smooth contours, the presence of landscape paintings, the formation of walking routes with a variety of landscape species, etc. Such objects include Chinese, Japanese, Anglo-Chinese small gardens with a historical style. And objects with a modern style are a Dutch garden, a garden in the styles“Rural”, “Exotic”, “Country”. A small garden in the “Colonial” style can be attributed to a mixed approach to planning. The formation of the planning structure of a modern small garden near an individual residential building is due to the functional zoning of the territory and the definition of planning elements by zone. The main task of forming a small garden is to create a comfortable environment, considering ecological, functional, and aesthetic characteristics.

## 5 GRAPHIC DESIGN OF THE COURSE WORK

The computer graphic design of the course work should help to reveal the volumetric and spatial solution more clearly, the architectural, planning, and artistic idea of the organization of a modern residential object and its adjacent territory. For a better disclosure of the idea, it is worth considering the means of graphic presentation of the course work to perform the finished exposition at a high level. On the master plan, it is necessary to show the wind rose, the horizontal topography, the network of streets and passages (in red lines) with the image of the roadway, the location of the main volume of a modern residential building, farm plots, car parking spaces, recreational areas with green spaces and small architectural shapes. On the sheet of the master plan should be shown an explication, symbols, project balances of the territory and technical and economic indicators according to the master plan. It is recommended to use several computer programs with the possibility of students demonstrating various graphics and preparing a 3D video presentation of their project proposal of the course work (Appendix I).

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## GLOSSARY

**Above-ground floor** is the floor, and the floor mark of the premises is not lower than the planning mark of the ground.

**Balcony** is an open platform that protrudes in the form of a console on the facade of the house or in the interior, surrounded by railings.

**Basement floor** is a floor with the floor marking of the premises below the planning mark of the ground at a height of no more than half the height of the premises.

**Climate** is the average state of the atmosphere in the Earth, which is characterized by features that are almost constant during one generation (about 30-40 years).

**Comfort of the architectural and landscape environment** is the main indicator in the system of assessing the quality of the residential environment, which reveals the degree of satisfaction of natural and climatic, urban planning, functional, aesthetic, psychophysiological, ergonomic, and other factors.

**Concept** is a system of views on something. The main idea in determining the goals and objectives of the research and indicating the ways of its implementation.

**First floor** is the lower above-ground floor of a residential building.

**Individual residential building of increased comfort** is a house where special priority is given to the issue of increasing the comfort of the living environment by means of an organic combination with the natural environment, which is an elite small garden.

**Loggia** is a room covered and fenced in plan on three sides, open to the outside space or glazed.

**Mansard floor** is a floor in the attic space, the facade of which is completely or partially formed by the surface of a sloping or broken roof. The area of the horizontal part of the ceiling of the premises should be at least half of the floor area, and the height of the walls to the bottom of the sloping part of the ceiling should be at least 1.6 m.

**Microclimate** is a complex of physical factors of the internal and external environment of the premises, which is determined by temperature, humidity, speed of air movement and affects the heat exchange of the body and human health.

**Residential environment** is a complex of architectural and urban planning objects that ensure the implementation of the processes of work, life, recreation of the family and an individual, and their moral and aesthetic improvement.

**Residential unit** is an integrated interior and exterior space with a certain set of functional and planning zones, interconnected by rational functional connections, forming a living environment of increased comfort for an individual family.

**Style** is a set of artistic techniques that determines the nature of the organization of the architectural and landscape environment and helps reveal its bright artistic image.

**Technical floor** is a floor for placing engineering equipment and laying communications; can be in the lower (including technical subfloor space), upper (including technical attic) or in the middle part of the building.

**Terrace** is a fenced open extension to the building in the form of a recreation area, which may have a roof; placed on the ground or above the floor below.

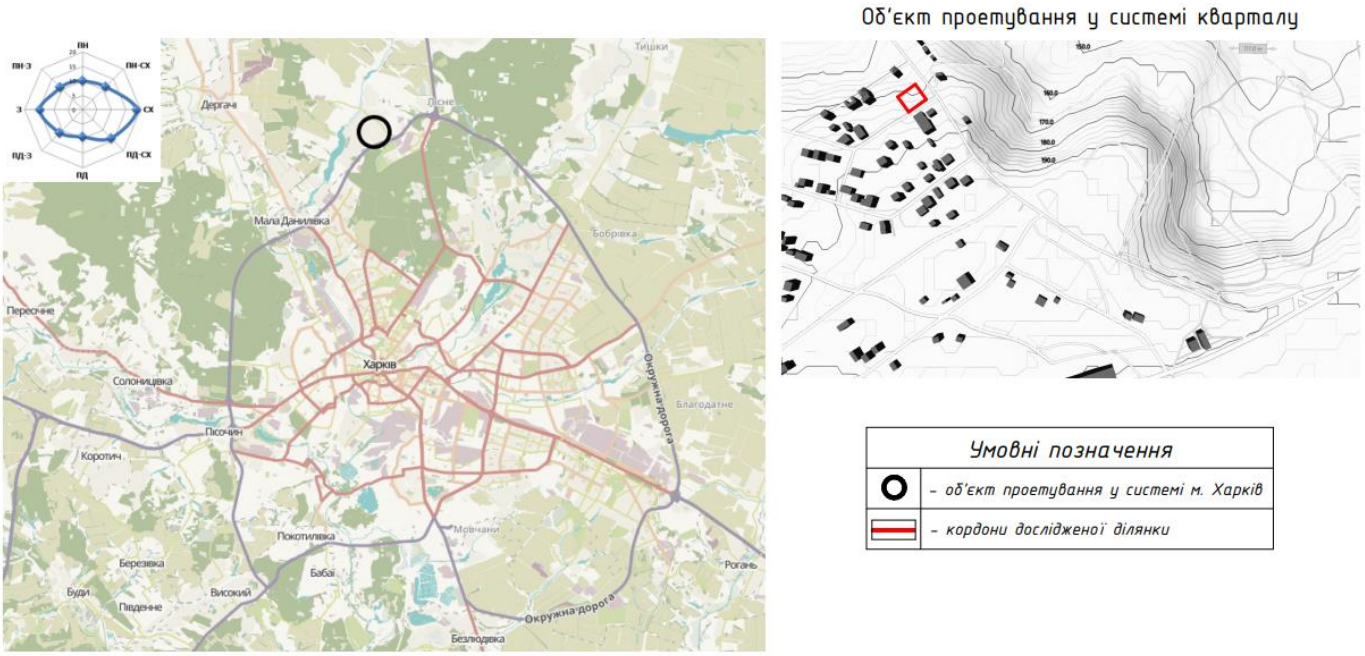
**Underground floor** is a floor with the marking of the floors of the premises below the planning mark of the ground for the entire height of the premises.

**Villa** is a separate residential building (180-200 $m^2$) or a group of buildings, which includes residential buildings, structures, small architectural shapes with elements of a certain style, located on a landscaped area of 1-6 hectares.

**Vestibule** is a passage space between doors, designed to protect against the penetration of cold air, smoke and smells when entering a building, stairwell, or other premises.

APPENDIX A

**The layout of the quarter in the city structure**




**The layout of the site in the city structure**

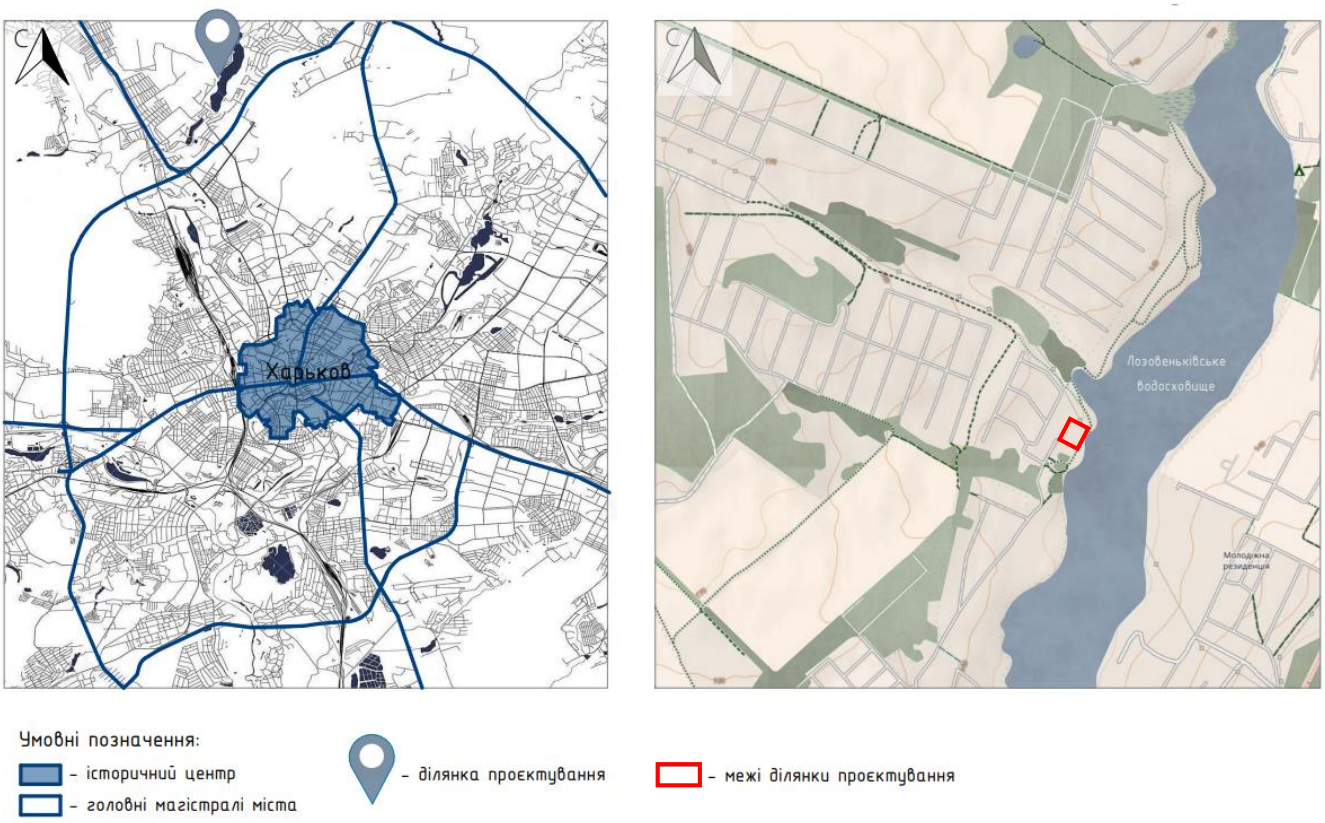



Figure A.1 – An example of a situational plan

APPENDIX B

**Landscape and compositional scheme S 1:2000**

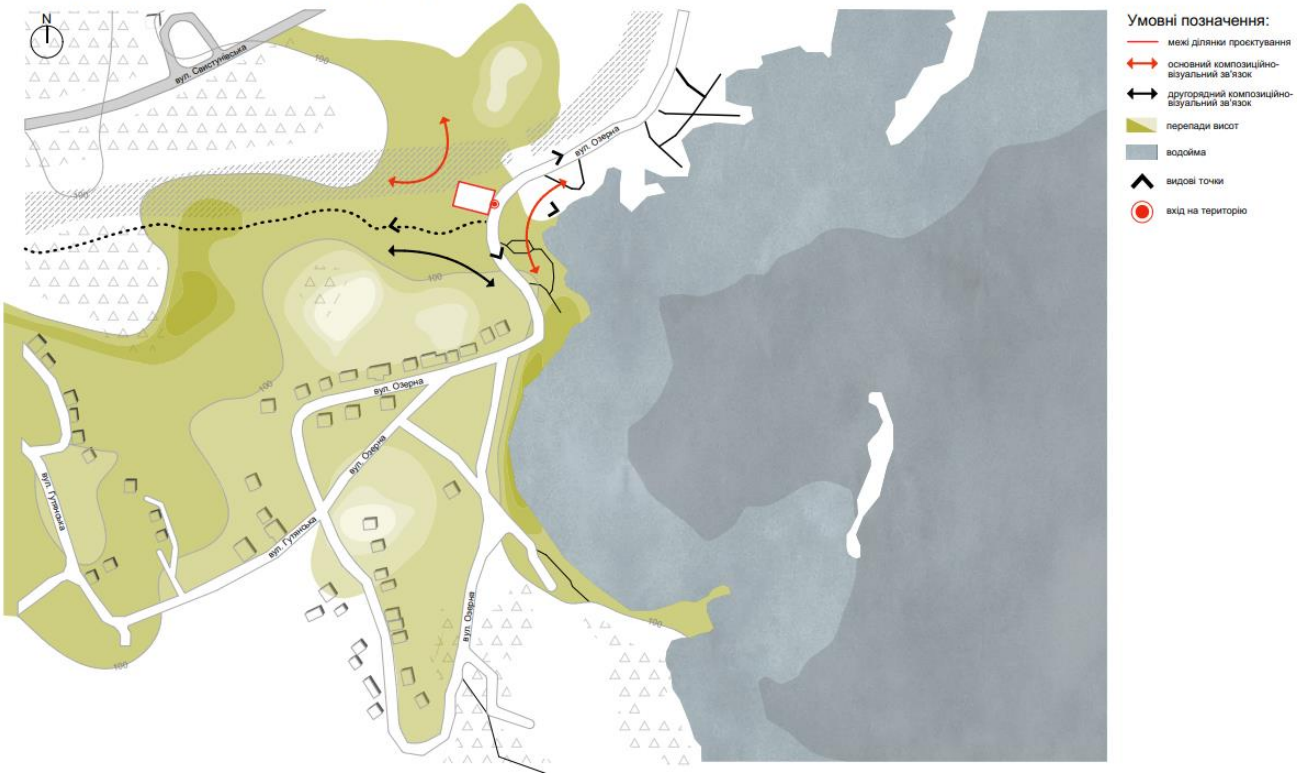



Figure B.1 – An example of a landscape analysis scheme of the territory

**Photo fixation**

**Formation of the functional organization of the master plan**

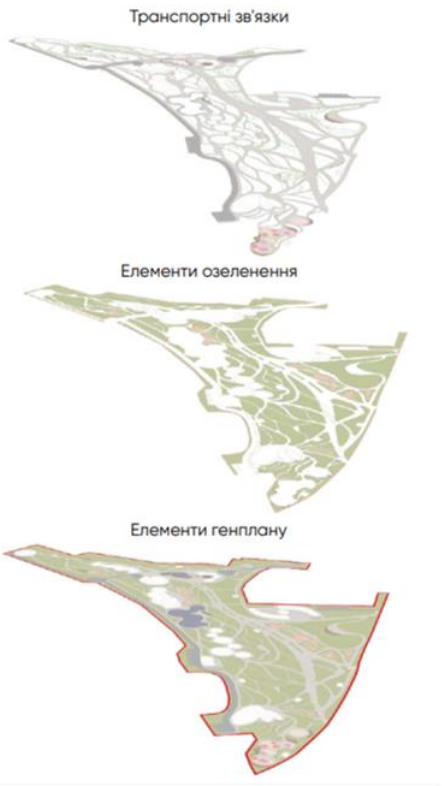



Figure B.2 – An example of the scheme of placement of viewpoints and photo fixation

**Scheme of functional zoning of the territory S 1:2000**


Figure B.3 – An example of a scheme of functional organization of the territory

**Scheme of the organization of transport and pedestrian connections S 1:2000**

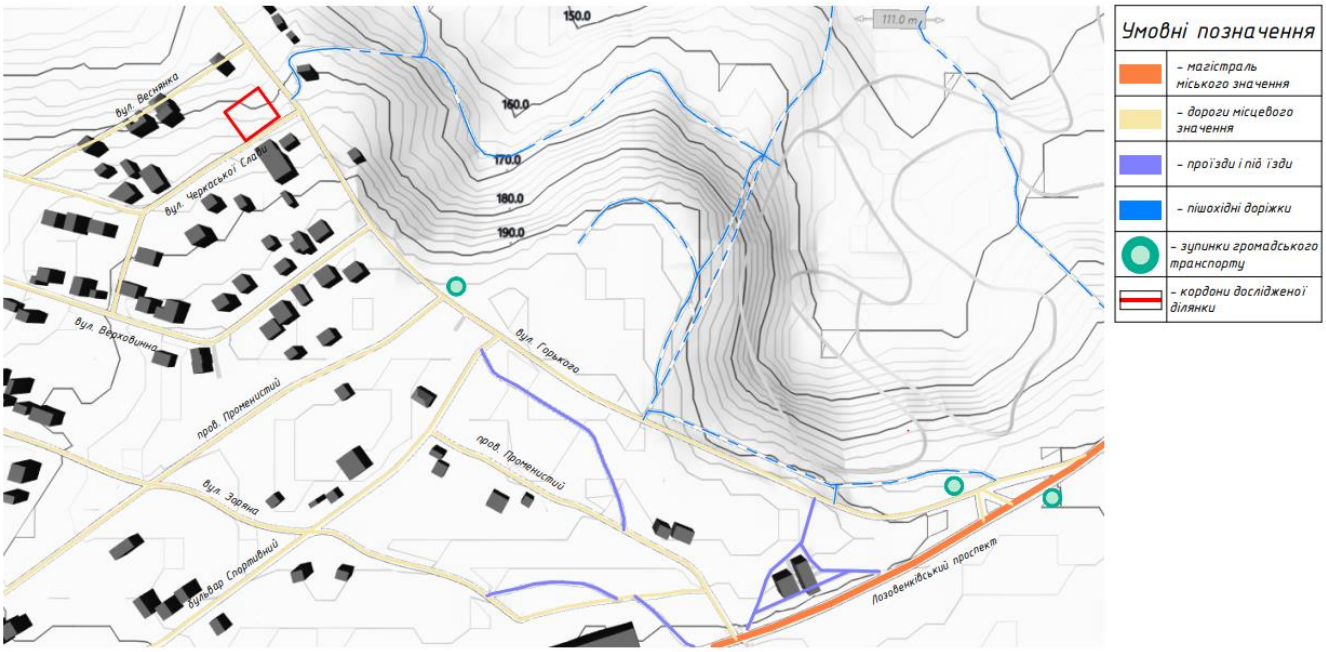



Figure B.4 – An example of a scheme of transport and pedestrian routes

# APPENDIX C


Figure C.1 – Development of a sketch idea of the master plan (options)

# APPENDIX D

MASTER PLAN OF THE ARCHITECTURAL AND LANDSCAPE SOLUTION OF THE SMALL GARDEN


Figure D.1 – Development of a master plan (based on previously proposed options)

Scheme of the master plan S 1 : 500

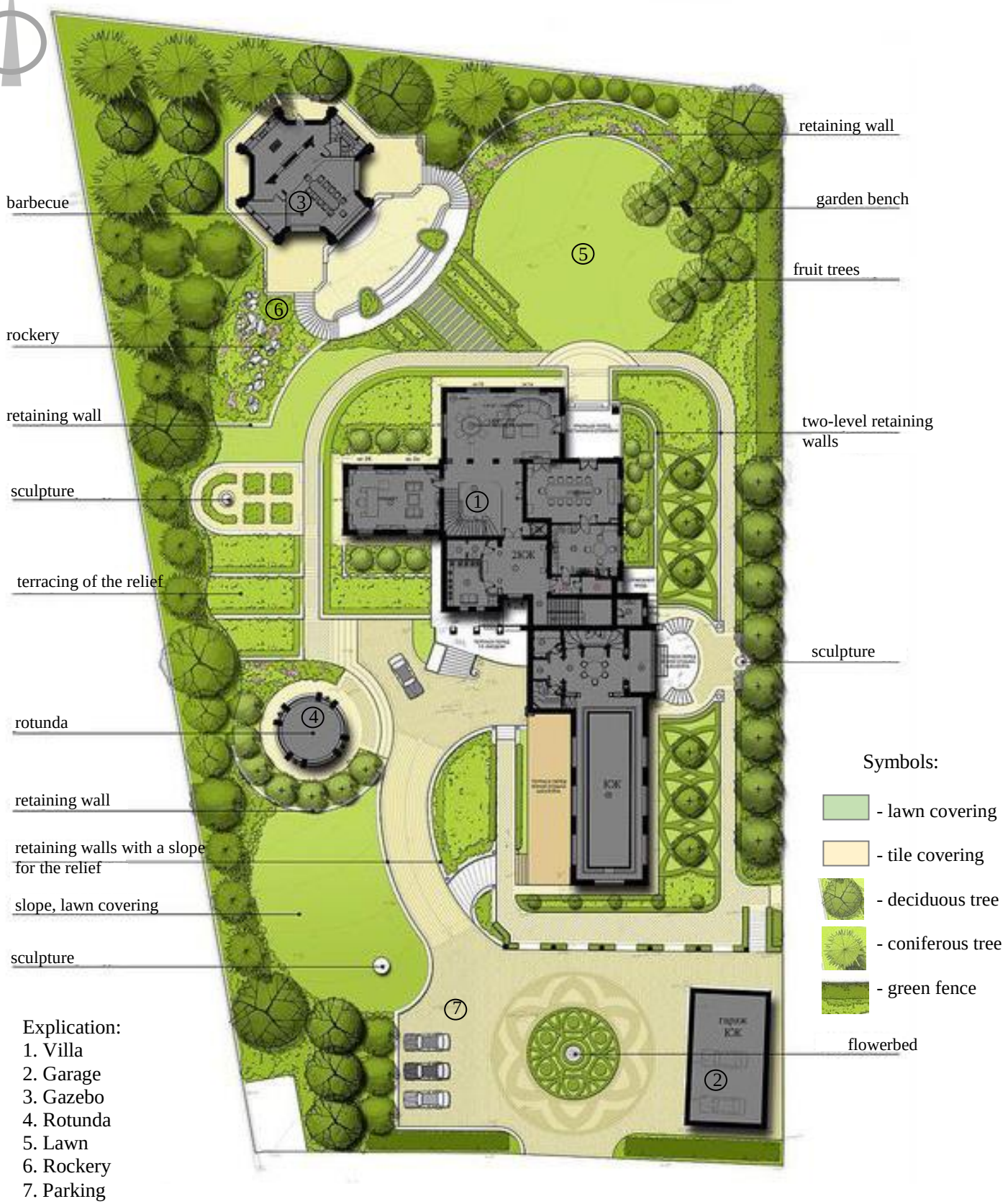
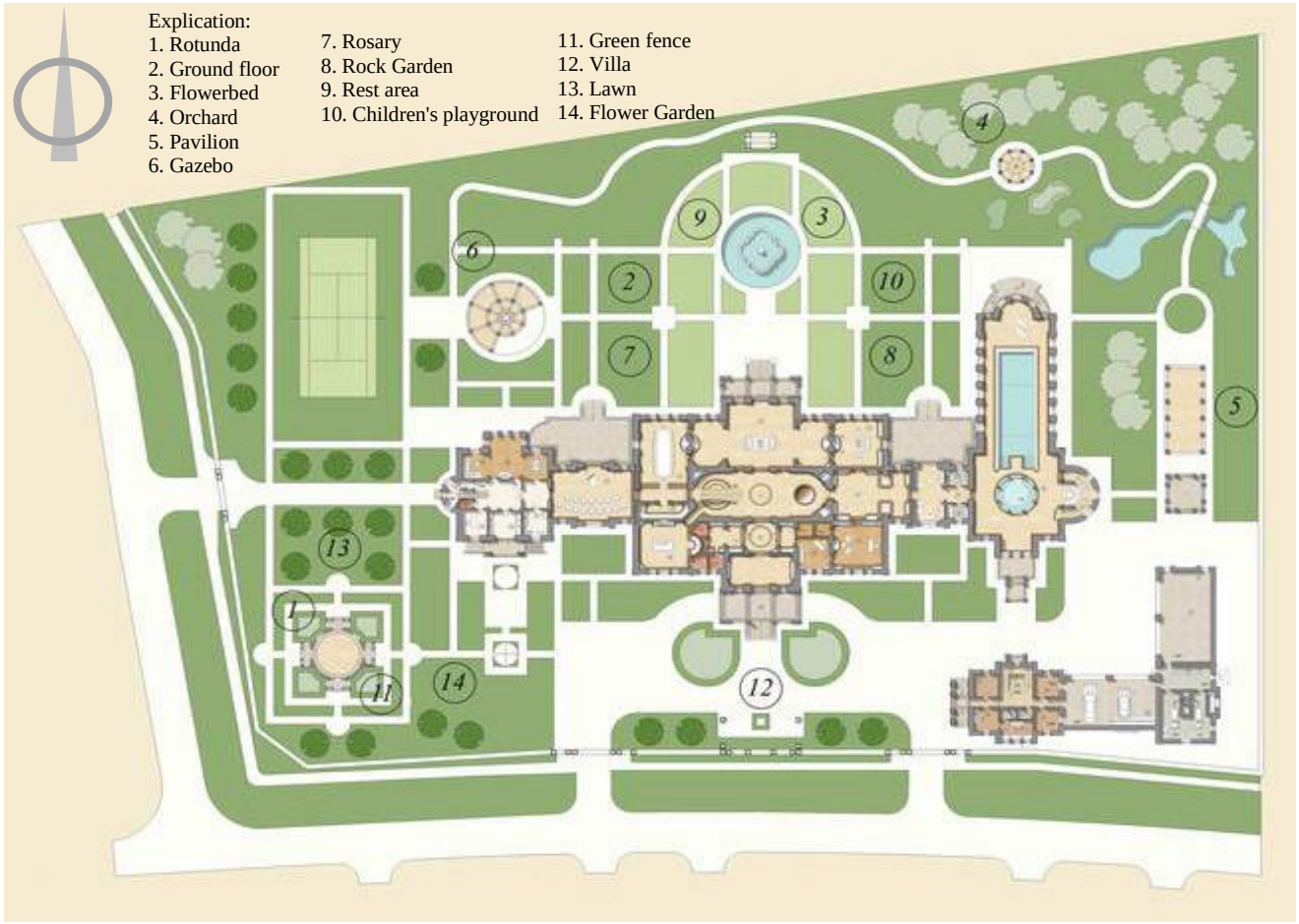



Figure D.2 – Example of design scheme of the master plan of a modern residential building (on the example of a villa in a natural environment)

Scheme of the master plan S 1 : 1 000



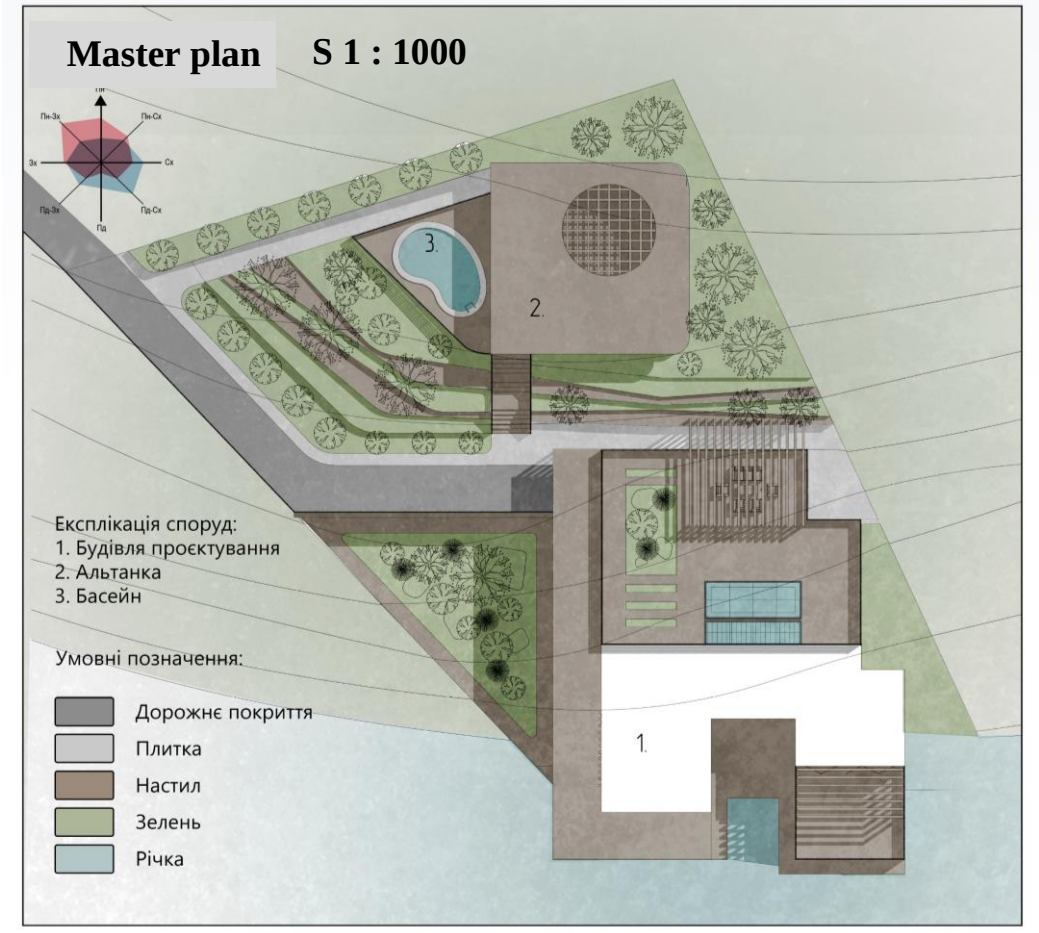
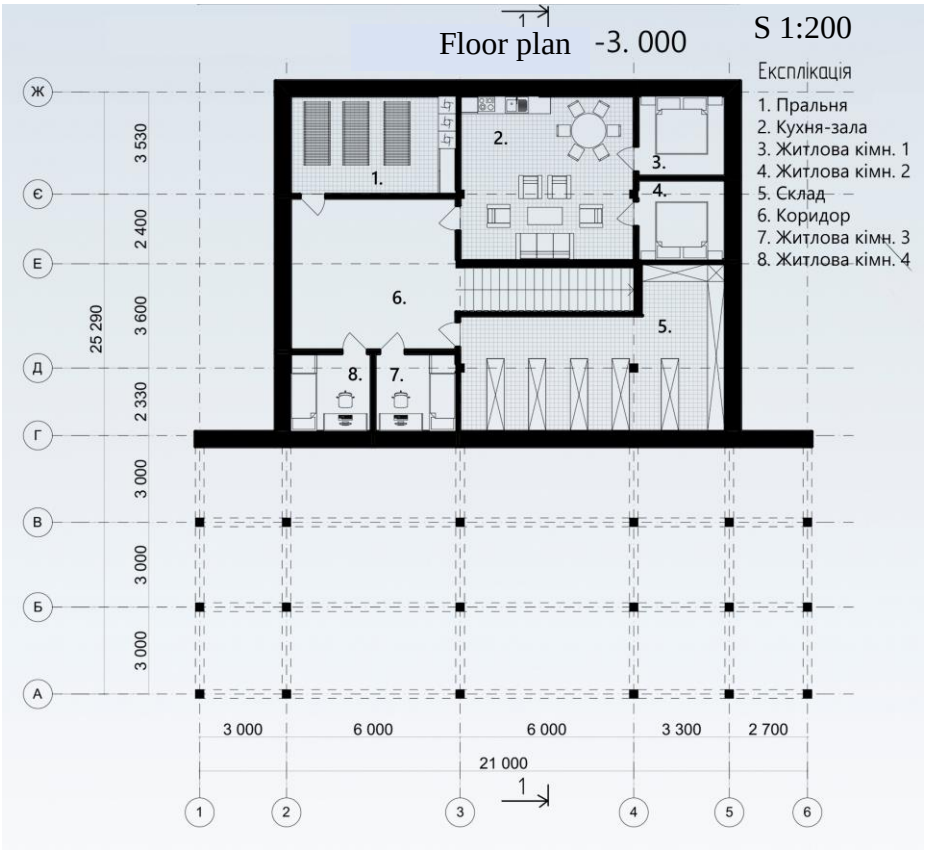




Figure D.3 – Examples of design of the scheme of the master plan

APPENDIX E



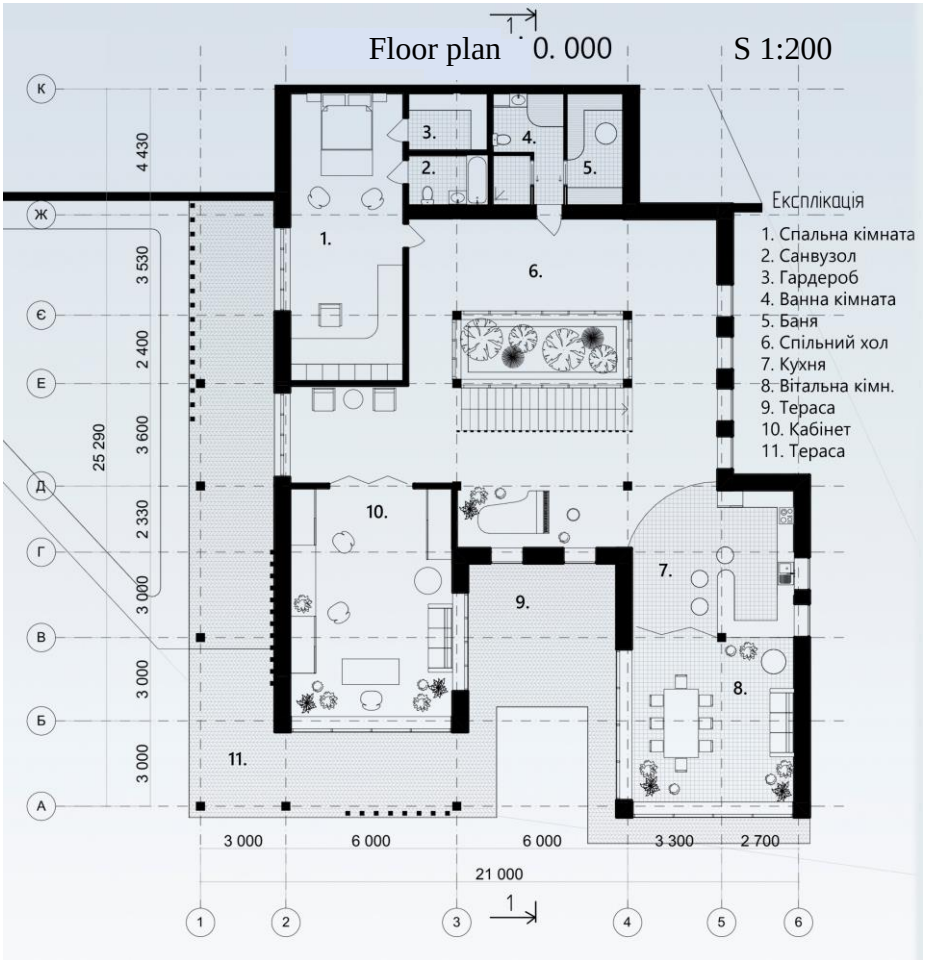




Figure E.1 – Planning organization of a residential building on the mark – 3.000 and 0.000

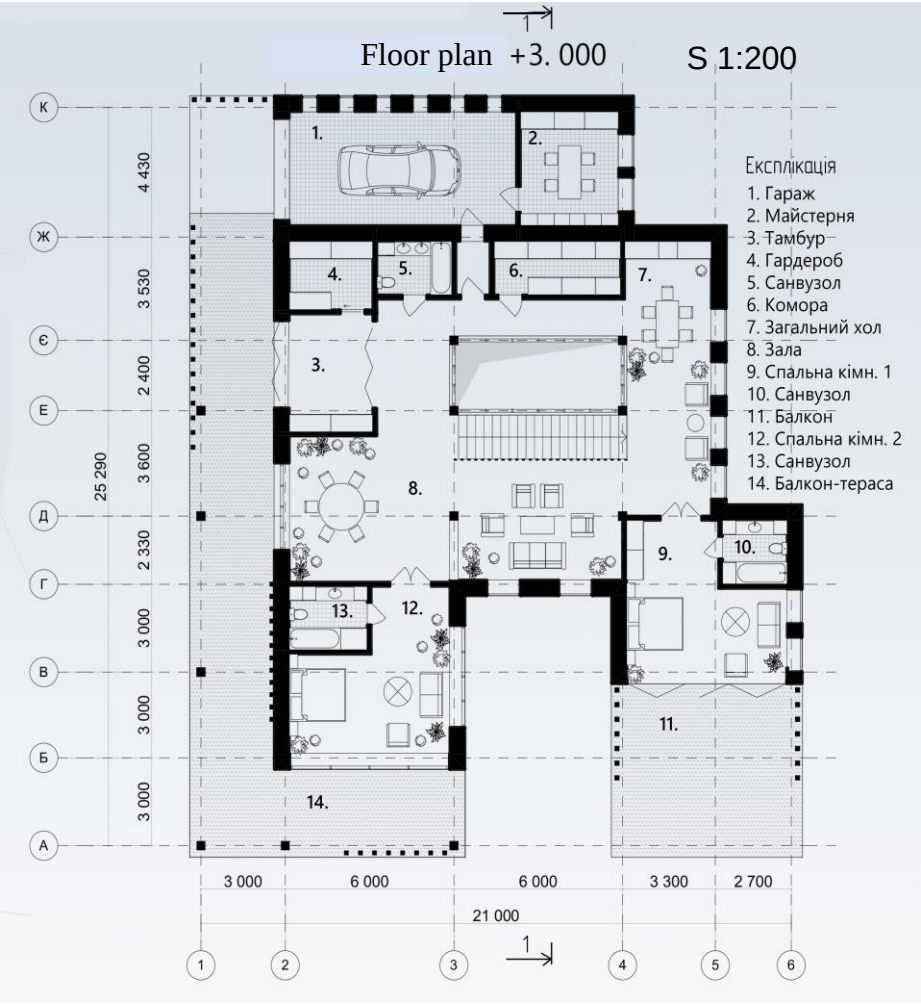
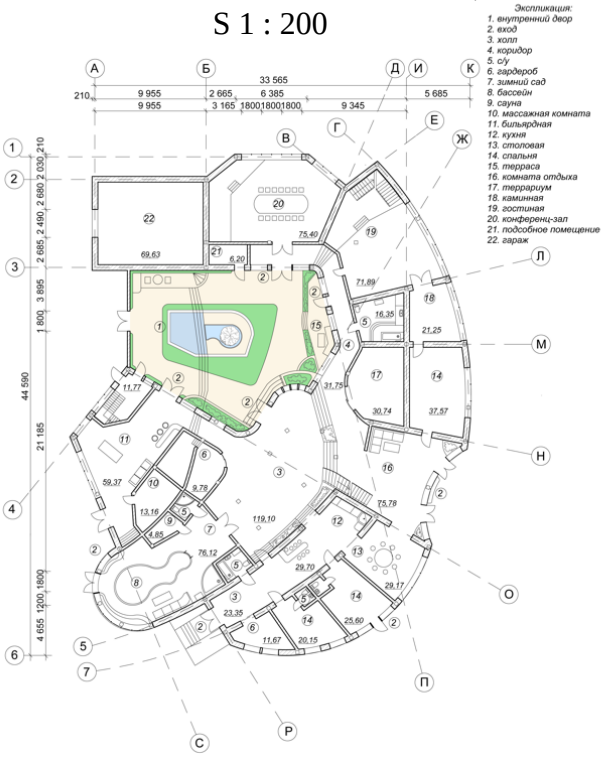



Figure E. 2 – Planning organization of a residential building on the mark + 3.000

Plan of the first floor of the villa,
S 1 : 200



Plan of the second floor of the villa,
S 1 : 200

Figure E. 3 – An example of the planning organization of a modern residential building

APPENDIX F

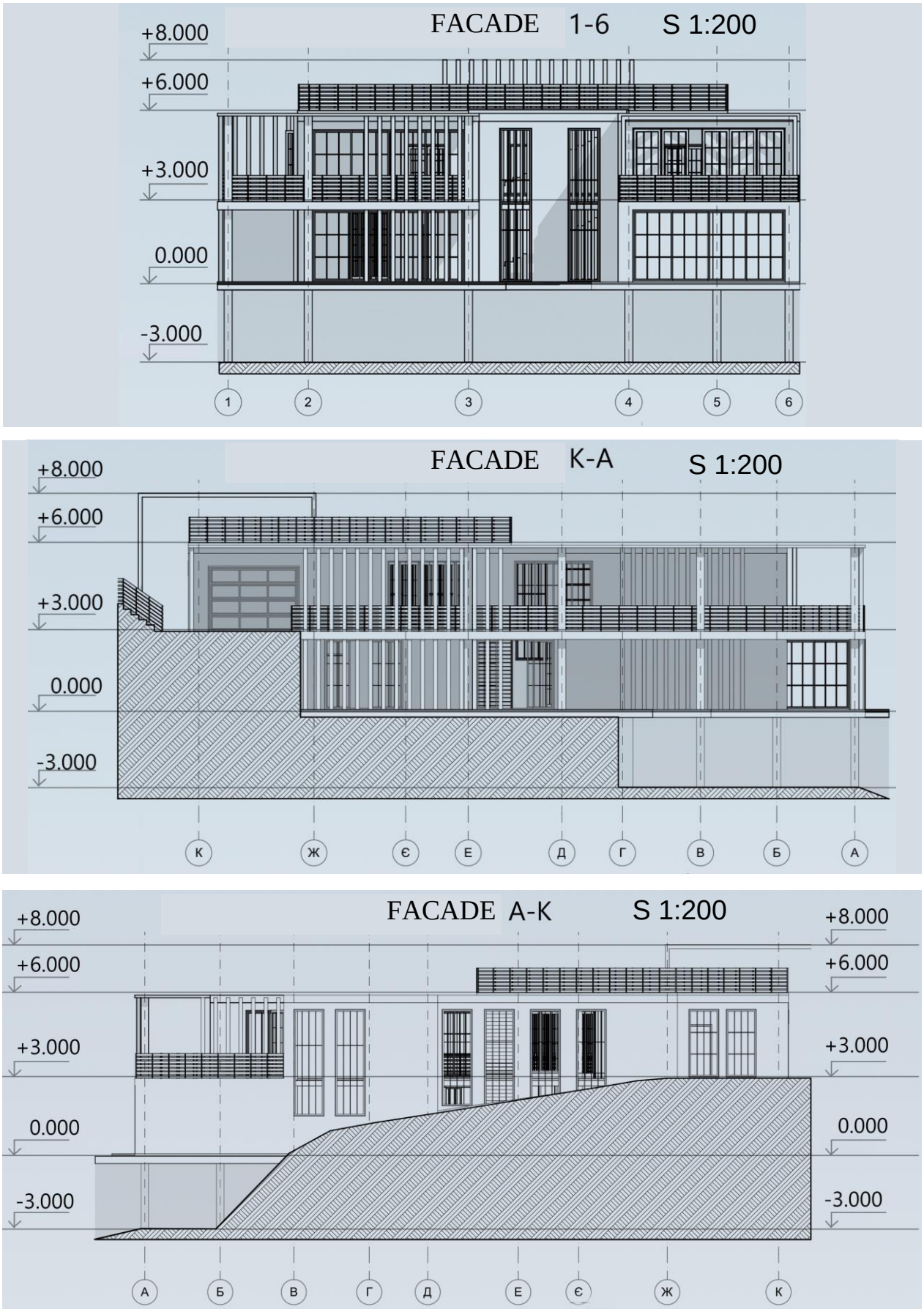



Figure F.1 – An example of the design of the facades of a modern residential building

APPENDIX G


Figure G.1 – An example of the design of a section of a modern residential building

APPENDIX H

**Visualization of the design object**

Figure H.1 – An example of visualizations of a residential building

**Calculation of technical and economic indicators of a residential building**

– Building area ($m^2$).

– Total area ($m^2$) is the sum of the areas of all floors (including technical, attic, basement, and basement).

– Usable area ($m^2$) is the sum of the areas of all rooms located in it, as well as balconies and mezzanines, excluding stairwells, elevator shafts, internal open stairs, and ramps.

– Estimated area ($m^2$) is the sum of the areas of all rooms located in it, except for corridors, vestibules, transitions, stairwells, elevator shafts, internal open stairs, as well as rooms intended for the placement of engineering equipment and engineering networks.

– Area of fencing structures ($m^2$);

– Constructive area ($m^2$) is the area occupied by the construction of walls, columns, partitions, ventilation shafts and ventilation units, electrical panels.

– Building volume of a residential building ($m^3$);

– Perimeter of external walls (m).

Figure H.2 – Examples of rendering visualizations of a modern residential building and its adjacent territory from a bird's eye view

APPENDIX I

**Designing the coursework exposition**


Figure I.1 – Examples of comprehensive presentation of course work

*Електронне навчальне видання*

Методичні рекомендації
до виконання курсової роботи

**«АРХІТЕКТУРА СУЧАСНОГО ЖИТЛА»**

*(для здобувачів другого (магістерського) рівня вищої освіти*
*денної форми навчання*
*зі спеціальності 191 – Архітектура та містобудування)*

(Англ. мовою)

Укладач **СМІРНОВА** Ольга В'ячеславівна

Відповідальний за випуск *Г. О. Осиченко*
*За авторською редакцією*
Комп'ютерне верстання *О. В. Смірнова*

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