Ministry of Education and Science of the Russian Federation
Federal State Budgetary Educational Institution of Higher Education
«Nizhny Novgorod State University of Architecture and Civil Engineering»

E. V. Kaidalova, A. A. Khudin

SMALL PARK

Educational-Methodological Manual
on the Performance of the course project

for Students in the direction of training 07.03.01 «Architecture»,
Profile «Architecture»

FOR INTERNATIONAL STUDENTS IN ENGLISH

Nizhny Novgorod
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The main provisions for the design of a small urban park are presented. The predesign site assessment and landscape analysis, the principles of urban planning, functional, spatial, and volumetric-planning solutions for the object are considered. The information necessary for completing the work is contained, the design stages and the requirements for the course work are outlined.

Materials used:

Architectural Design. Educational and methodological manual for the completion of the course project "Park" / G.A. Potaev, K.K. Khachatryants, E.E. Nitievskaya, L.E. Rys – Minsk: BNTU, 2005.

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CONTENTS

INTRODUCTION

The execution of a project on the topic "Small Park" within the discipline "Architectural Design" contributes to the acquisition of professional skills and knowledge in the field of landscape design and urban planning by students. This project prepares students to solve compositional tasks of high complexity. The use, in a specific sequence, of analysis, synthesis, differentiation, and integration of natural and urban components contributes to the development of volumetric-spatial thinking, which plays a leading role in the creative activity of an architect.

The methodological goal of this project is to cultivate artistic perception, emotional responsiveness, orient students towards an environmental, ecological approach to creativity, and create a correct understanding of the aesthetic and functional possibilities of natural elements.

Familiarization with the material outlined below and the execution of a project on the given topic will help to master skills in the field of landscape architecture as an integral part of architecture as a whole.

General Information

A small park typically has an area from 3 to 20 hectares. Depending on their significance and location in the city's planning structure, parks are divided into city parks, parks of planning districts, residential districts, and microdistricts.

The recommended minimum area for parks should be no less than: city park – 15 ha; planning districts – 10 ha; residential districts and microdistricts – 3 ha. When creating parks in the context of urban environment reconstruction, their area may be smaller [1, sections 9.4, 9.19].

The category of parks is established by the territory planning project, taking into account territorial planning documents and the size of the population served.

A **city park** is a landscape architecture object intended for recreation and cultural-mass work; its content and scale correspond to the needs of the city's population.

According to their functional purpose, city parks can be multifunctional and specialized.

A **multifunctional park** is a landscape architecture object combining various directions of recreational activity, with a developed system of amenities, intended for periodic

mass recreation of the population;

For designing a small urban park, the choice of a narrow profile is preferable, i.e., the creation of a specialized object. A **specialized park** is a landscape architecture object with one most prominent leading function, intended for carrying out one main type of recreational activity. These include: promenade parks, children's parks, memorial parks, scientific-educational parks, sports parks, memorial parks, exhibition parks, etc.

Parks of planning districts, residential districts, microdistricts are intended for diverse daily short-term pastime and carrying out cultural-mass work; their content and scale correspond to the needs of the population in the service area. They are designed for all age groups of the population and usually combine several functions – active and quiet recreation, walking, children's activities, sports, and others.

The goals of the architectural organization of small parks can be different. Firstly, all urban green objects have high ecological significance, as they are an integral part of the city's ecological framework. Parks and gardens also carry a significant social load, as they are designed to create optimal conditions for diverse outdoor leisure activities for citizens – walks, active and quiet recreation, cultural and educational events, hobby activities, communing with nature, etc.

The principles of landscape design for small parks and gardens (including squares, fragments of public centers, interior courtyard gardens, rooftop gardens, etc.) are uniform. Their main distinguishing feature is that architecture, ornamental horticulture, and landscape design play the main role in them. The entire small park should be adapted to people's needs and fully designed (while in large parks the landscape is closer to natural). The structure and layout of a small park, like all others, is determined by its purpose and location in the urban structure, the relief, and the nature of the architectural forms and green plantings used.

The methodology for designing a small park is conducted as indicated below.

Section 1. PROGRAM ASSIGNMENT FOR THE DEVELOPMENT OF A COURSE PROJECT

Objective of the Work In accordance with the curriculum, within the framework of the discipline “Architectural Design,” it is required to design a small park in the city,

creating a functional-spatial environment in the open air that possesses a high level of aesthetics, external improvement, and landscaping.

Tasks of the Work

1. Familiarization with the design assignment:
    - Studying modern domestic and international experience in designing small parks, collecting and systematizing reference materials (analogues);
    - Conducting a comprehensive study of the territory within the design boundaries, on-site inspection, and photographic documentation; where possible, collecting data on microclimate, soil-geological and hydrological conditions, terrain, and vegetation.
2. Search for an architectural concept:
    - Analysis of collected materials, resulting in schemes of urban planning and landscape analysis, transport-pedestrian connections, and landscaping of the territory;
    - Creation of an architectural concept-idea, finding a compromise between the need to transform and maximally preserve natural components.
3. Implementation of the park project:
    - Development of functional, architectural-planning, and spatial solutions.
4. Preparation and submission of the project.

Design Assignment

Each student develops an individual project for a specific urban planning and landscape situation. The functional profile of the park (recreational, children's, youth, exhibition, etc.), the target audience, the estimated number of visitors, the composition, and the areas of functional zones are determined in consultation with the supervising instructor. The project must consider the specifics of urban planning, landscape, and environmental conditions, as well as the prospects for the development of adjacent territories in accordance with the city's master plan. The placement of park facilities and structures should ensure convenient pedestrian connections with nearby residential and public areas and facilities, as well as the possibility of transit pedestrian movement through the park. It is

desirable to ensure spatial isolation of zones and objects with different functional purposes.

Initial Data for the Project

- Situational plan (plan of a city segment in relation to which the park is designed), scale 1:5000 – 1:10000;
- Topographic base map of the territory designated for park design, scale 1:2000.

1.1 Preliminary Assessment of the Territory

Functional Analysis of the Territory During the functional analysis of the territory, the following are determined:

- The location of the park (on the city's periphery, in the center);
- The type of adjacent territories (residential, industrial, public center, natural landscape, cultural-historical zones, etc.);
- The categories of adjacent streets;
- Established pedestrian routes to and through the park.

As part of the urban planning assessment, an analysis of sanitary-hygienic conditions for park placement is conducted, which involves identifying sources of air and water pollution (industrial facilities, thermal power plants, transport hubs, etc.). Taking into account the direction of prevailing winds, zones of unfavorable impact from pollution sources (if any) are identified, and sanitary protection zones are outlined.

The nature of the territories adjacent to the park, as well as the specifics of the park's placement within the city structure, largely determine its zoning, the placement of entrances, the system of pathways, and the possibility of using multi-level solutions, among other aspects.

Comprehensive Survey of the Territory (Field Work) Thus, the design process includes on-site study of the territory, preliminary assessment, development of a functional-planning structure, and spatial composition. The preliminary assessment is a process of interconnected study of the territory's natural conditions, representing one of the most

critical stages. Its key component is a comprehensive field survey, which involves collecting and systematizing data on the main components of the natural landscape:

- Climate data include microclimatic characteristics, information on noise levels, and air quality. Slopes with favorable (E, SE, S, SW) and unfavorable (N, NW, NE) orientations, waterlogged areas, fog accumulation zones, and directions of prevailing winds are identified;
- Soil-geological conditions are considered in terms of suitability for plant growth. Areas favorable and unfavorable for plant growth are specifically identified;
- Terrain is analyzed in terms of microclimate and accessibility for humans; dominant heights are determined, and areas with terrain slopes of up to 10%, from 10 to 30%, and over 30% are identified, along with natural terraces, ravines, and thalwegs;
- Hydrological survey determines the water regime of the site, the need for drainage, irrigation, or watering, and the possibility of creating water bodies and other water features. The suitability of water bodies and streams for water sports, beaches, or swimming is assessed, and prerequisites for creating new water features are identified; the presence and level of groundwater and filtration water are considered to determine the feasibility of designing underground structures;
- Vegetation study includes geobotanical and dendrological surveys, based on which a dendrological plan is compiled to determine the prospective plant assortment for the site. Existing tree and shrub plantings are evaluated (valuable and less valuable planting areas and species compositions are identified). Particularly valuable tree specimens are documented.

Analysis of the Spatial Structure of the Site The analysis of the spatial structure includes identifying territorial units of the site (areas with common typical characteristics). Based on dominant features, two types of landscape units are distinguished: compact and linear. For a small park, compact units are most characteristic. Within the landscape units, landscape elements are identified: vegetation masses, clearings, cliffs, watercourses, and artificial structures. Then, point objects are identified, including viewpoints, unique tree specimens, rock formations, caves, waterfalls, and springs. Despite their small size on the plan, these elements form the basis for creating future focal points.

Landscape Analysis of the Territory A universal approach to determining the prospective value of territories is achieved through landscape analysis. Landscape analysis involves comparing the merits of different areas based on various factors and identifying the overall character of the site. All valuable areas and their individual elements (picturesque terrain, unique tree specimens, rocks, springs, etc.) are considered at the site. Valuable areas and their elements shape the future appearance of the park. The more thoroughly the analysis is conducted, the more successful the resolution of artistic tasks in shaping the park. Viewpoints hold a special place. They are marked on the plan and described. The description includes the following data: the location of the viewpoint, the direction of the view relative to cardinal directions, the angle of view, the type of landscape scene, its scheme, and a verbal description indicating the scene's subject, its focal point, foreground, side scenes, and other features. At the same time, less valuable areas are identified to improve and rationally utilize them within the site's structure. The result is a graphical scheme of the landscape analysis. The results of the preliminary assessment of the urban planning situation and landscape are used to develop the concept for the planning and spatial organization of the park.

1.2 Principles of Small Park Design

Search for an Architectural Idea, Development of the Park "Scenario"

The basis for the search for an architectural image is the developed "scenario" of the park and the characteristics of the proposed construction site. The "scenario" or "plot," at the design stage, is translated into the language of spatial-volumetric expression. To perform this stage, it is necessary to mentally walk through the territory of the future park, determine the main "plot," and subordinate the functional zoning scheme to it. The "route network" is designed in such a way that it connects the main compositional centers of the park into a single whole in the order required by the author.

It is also necessary to consider whether the solution requires additional underground or above-ground levels.

The main task at the stage of searching for an architectural solution is the creation of pos-

sible variants of the planning structure of the object. After finding the optimal variant, a scheme for the functional organization of the territory is developed.

Creation of the Planning Framework

The planning framework of the park, i.e., its core or "skeleton," includes planning centers (a mass events square, park pavilions, a green theater, a boat station, etc.) and planning axes (the main park alleys connecting the planning centers). When forming the planning framework of the park, the features of the landscape and spatial conditions of the visual perception of the park area are necessarily taken into account.

The planning framework of the park is formed based on the natural framework of the territory, which includes the most important elements of the natural landscape – natural centers (water bodies, dominant hills, masses of green plantings, glades) and natural axes (watercourses, hollows, thalwegs, visual axes, etc.)

The scheme of the planning framework should express the main idea of the functional-planning solution of the park. The routing of the main alleys is advisable to conduct along watersheds, along steep and across gentle slopes; artificial streams can be created in hollows. When routing alleys, the fact that they serve not only for the movement of visitors but are also routes for viewing the park space must be taken into account. When placing park structures, it is necessary to know and remember that many of them perform not only a functional but also a communicative connection. As a result of moving through the territory, the visitor should form a complete and memorable image of the park.

Alleys and paths must be designed so that it is convenient to move and the shortest path of movement is visible. If an alley makes a bend or turn, then an object should be designed in that place that could serve as a logical explanation for this bend, turn, or stop.

Determination of the Park's Functional Profile

Functional zoning of the park territory involves the allocation of various functional zones, each of which is responsible for a specific function. This is the basis of the architectural-planning solution of the park.

The determination of the park's functional profile is carried out taking into account its place and significance in the system of landscape and recreational territories of the city. The features of the park's location in the city, the current and prospective (in accordance with the general plan of the settlement) nature of the use of territories adjacent to the park

(public, residential, industrial, landscape-recreational) are taken into account. The ratio of functional zones is influenced by the size of the park's total territory, the park's function, and its location in the city.

A small park is usually limited to a small number of proposed leisure options. Most often, one main function and one corresponding zone are the most developed, for example, children's, or exhibition, or memorial, etc. In this case, the small park can be called specialized. The presence of other, accompanying functions is quite possible and often necessary. For example, in a children's park – physical fitness and wellness, cultural-mass events, quiet recreation; in an exhibition park – walking, quiet recreation, children's; in a memorial park – cultural-mass events, quiet recreation, etc. However, these zones are of secondary importance and are not as developed as the main one.

The designed small urban park is recommended to be developed as a specialized one, with one prevailing function, which is also provided for by the Code of Rules SP 42.13330.2011 [1, section 9.17]. The choice of the object's functional content is provided to the student in agreement with the supervising professor.

Specific requirements are imposed on the placement and layout of each of them.

Functional Zoning of the Park

On the territory of a small park, three mandatory zones are always present: the entrance zone (distribution), the central zone (zone of main action or active recreation), and the periphery zone (for walks and quiet recreation).

The **entrance zone (distribution)** includes the entrance itself (portal) and a distribution area, standing on which one can look around and determine a plan for further movement through the territory.

The **central zone** is the zone of the main "action" or mass events. It includes an area for cultural events, a dance floor, an open-air green theater, areas with benches and resting places, flower beds and flower gardens, small architectural forms, and decorative elements, etc. Often, all functions are combined in a single planar structure that transforms according to necessity. Planar structures can be located above structures buried in the ground and represent an utilized roof at ground level. The flexibility of using this territory, i.e., the multifunctionality of planar objects, is a traditional approach to solving the

set tasks. For example, a pool decorating the main park square can become a skating rink in the winter, and the stage of an amphitheater can become the site for installing a New Year's tree or Maslenitsa festivities. It is recommended to place it near the main entrance to the park (to reduce visitor traffic through the territory of the object). The amenities are designed for high visitation density. Visitor movement is provided only along alleys and paths.

The **peripheral zone (quiet recreation)** consists of secluded corners of the park intended for quiet, solitary recreation. Landscapes close to natural in their physiognomic characteristics are most appropriate here. Any structures, except for small architectural forms like gazebos, garden furniture, and trellises, are excluded here. Green plantings and water bodies should occupy at least 90% of the zone's area. The main task is to create the most favorable microclimatic environment for visitors. Walking routes should reveal the natural, historical, ethnographic, and architectural attractions of the area as fully as possible, if they exist. The level of amenities and artistic design should be high.

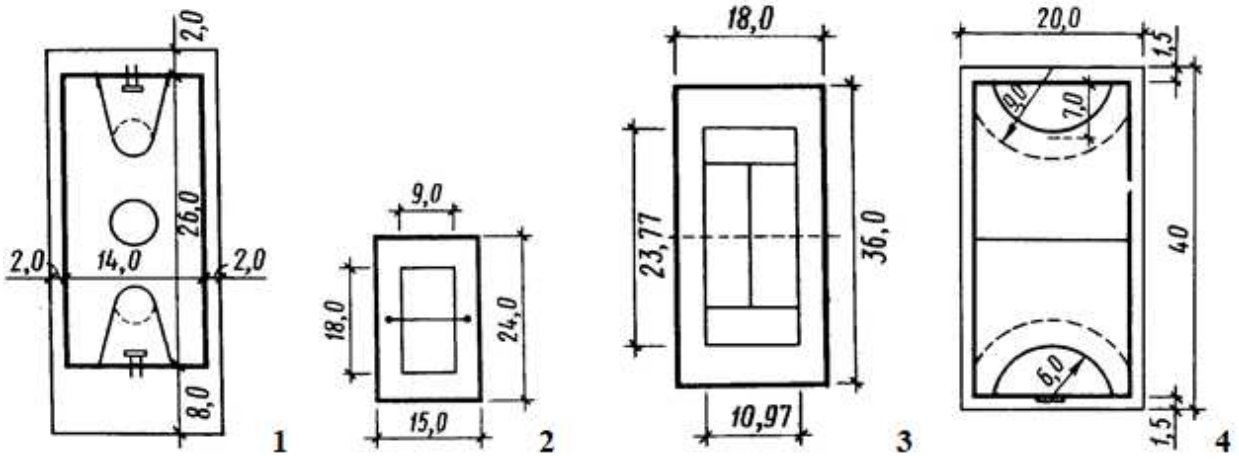
The presence of **other functional zones** depends on the specific urban planning situation, surroundings, purpose of the territory and its area, natural and ecological conditions, the historical component of the site (genius loci), the author's concept, etc.

If a **physical fitness and wellness zone** is provided for in the park, it is located on open areas of the park landscape with relatively even relief. The placement of large sports facilities, such as a stadium, sports complex, swimming pool, etc., is excluded in a small park. The organization of sports grounds is possible; in the winter period – skating rinks, equipment rental points. The sports zone must be well-equipped, furnished with special equipment, and have the necessary surfaces for active recreation, lighting fixtures for evening use. Landscaping should provide wind and noise protection, uniform solar lighting, and create a calm, monochromatic background (against which the ball and players stand out). The grass cover should be as resistant to trampling as possible.

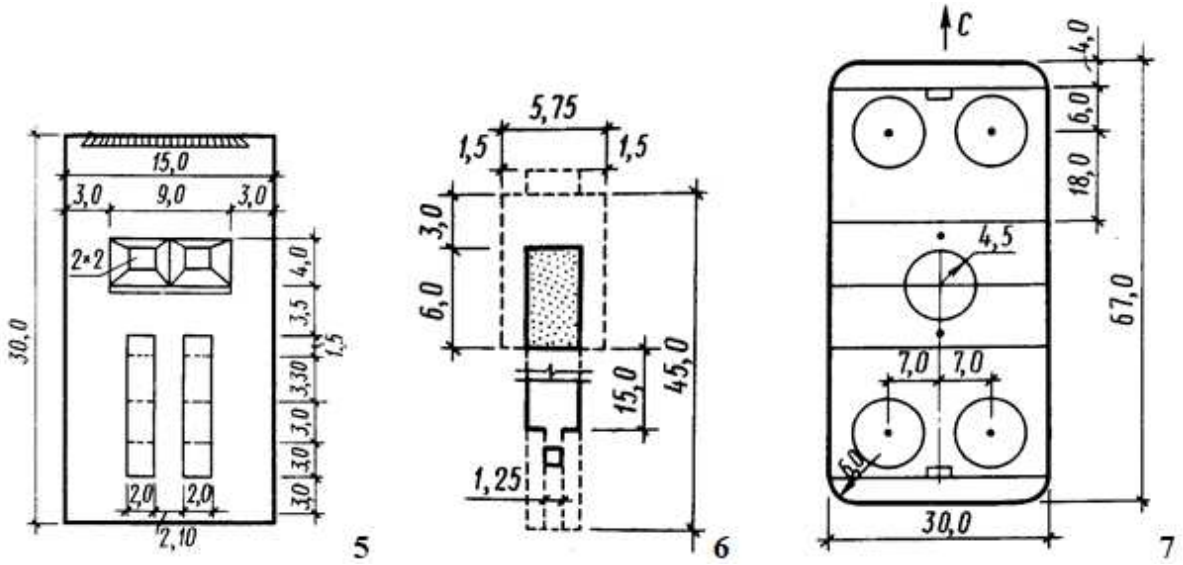
Despite the limited territory, it is necessary to consider strict requirements for the standard sizes and orientation to the cardinal directions of open sports grounds. Most sports grounds require a north-south orientation with a deviation of no more than 15º, but

some of them are oriented from northeast to southwest for daytime games. The main dimensions of sports grounds are indicated in Figure 1.

Fig. 1. Basic dimensions of sports grounds



1 – basketball, 2 – volleyball, 3 – tennis, 4 – handball



5 – gorodki, 6 – long jump and triple jump, 7 – hockey

A children's recreation zone or separate children's playgrounds are in demand in parks of various purposes and any sizes. They are usually located on the territory of the object on the side of the residential development, carefully isolated from noise, dust, and solar overheating with the help of greenery and geoplastics. The main task of the children's recreation zone is to organize active recreation for children in a natural environment. Appropriate play equipment is placed in it. It is possible that urban children be-

come acquainted with flora here for the first time, so it is better to use bright flowers, fruit and decorative shrubs and trees. Green labyrinths, tunnels, and halls; surprise fountains and other traditional garden amusements are appropriate here. Overall, open spaces with durable lawn should predominate.

For the installation of modern playgrounds in parks, standard variable construction parts made of plastic, wood, metal, and other materials are most often used. Geoplastics and microrelief modeling are widely used, creating artificial mounds for skiing and sledding. Play sculptures made from various materials are used (in winter, the creation of ice sculptures, slides, and entire towns is possible).

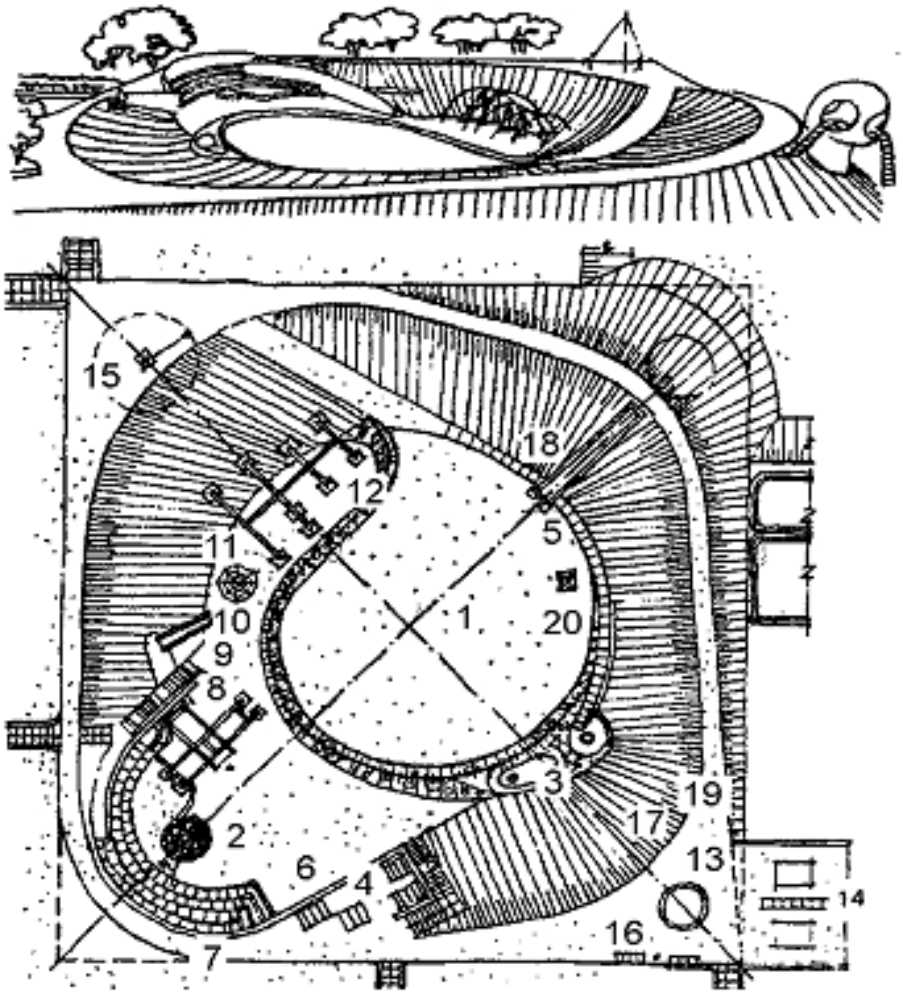


Fig.2. Organization of play spaces using artificial relief
1 - Lawn for games and mass events; 2 - Sandbox; 3 - Splash pool; 4 - Tables for board games; 5 - Dry stream bed; 6 - Tennis wall; 7 - Amphitheater; 8 - Gymnastic structure; 9 - Stairway descent; 10 - Slides for preschoolers; 11 - Carousel; 12 - Structure with swings; 13 - Flower plant-

er; 14 - Table tennis tables; 15 - Giant steps; 16 - Bicycle stand; 17 - Play slope; 18 - Slide for schoolchildren; 19 - Path along the top of the slope; 20 - Basketball hoop

The sizes of the areas and equipment are calculated for children of certain age groups (2-5, 6-7, 8-10, 11-13, over 14 years old). The scale of structures for younger groups is usually taken as "child-sized." For older children, on the contrary, a reduced scale is not imposed.

In children's zones of small parks, flexibility of functional-planning solutions must be provided for. For example, splash pools equipped with stands can be used for theatrical performances after water drainage, and for ice skating in winter.

With the development of the function of organizing children's recreation, the park can be positioned as a specialized children's park. To calculate the capacity of such a park, a norm of 0.5 sq.m / person is applied, including playgrounds and sports facilities [1, section 9.17].

The basis of a specialized urban park with a developed cultural and educational function can be an **exhibition zone**. The compositional basis of the exhibition areas of the park is the organization of a certain movement of visitors for the most complete disclosure of the exposition. The sequence of viewing exhibits and creating an optimal environment for their perception is always the main task. If necessary, a zone of botanical (herb garden, flower garden, etc.) and dendrological expositions (dendropark) can be provided, combining the functions of green construction, cultural and educational activities, and recreation for park visitors.
Small exhibition pavilions and cafes, reading rooms, and spaces for amateur activities in small parks can be freely placed throughout the park territory.

To maintain the park territory in proper condition, a need arises for a **utility zone (or service zone)**. It is not large – 5% of the total park area. A plot on the periphery of the park is allocated for the utility zone, with its own exit to the adjacent street and park alleys that combine the functions of intra-park driveways. The zone includes: a garage or shed where machines for garbage collection and watering are located; a warehouse for seasonal equipment; waste bins and visitor toilets.

Minimum calculated indicators for the ratio of areas of functional zones of parks and gardens of microdistricts (blocks) should be taken in accordance with Table 1.

Table 1. Minimum calculated indicators of the ratio of functional zones in parks

Functional zones of parks	Ratio of areas of functional zones, %	Indicators of the area of the functional zone, sq.m. / person			
		City Park	Park of a Planning District	Garden of a Microdistrict	Block Garden
Cultural and educational events	3 – 8	20	10	-	-
Mass events	5 – 17	40	30	-	-
Physical fitness and wellness	10 – 20	100	100	75	-
Children's recreation	5 – 10	170	170	80	80
Walking	40 – 75	200	200	200	200
Utility	2 – 5	0,2	0,2	0,2	0,2

Different zones of the park may correspond to areas with different spatial characteristics. In the central region of Russia, dense green plantations (closed park spaces), as a rule, occupy about 20%, thinned (semi-closed) – 35-45%, and they correspond to the zone of quiet recreation and walks. Glades, areas, and water bodies (open spaces) – 35–45% of the park territory are most characteristic for mass events and active recreation. Due to the small area of the designed park, it is important to correctly identify the ratio of natural and artificial components (Table 2). In the overall balance of the territory of parks and gardens, the area of landscaped territories should be taken as at least 70% [1, section 9.19]. The network of roads and paths usually occupies 10–15% or more (the smaller the park, the greater the percentage of its area is made up of alleys and paths). Compact placement of architectural objects is advisable.

Table 2. Minimum calculated indicators of the areas of territories, distribution of elements of recreational objects

Recreational objects	**Territories of elements of recreational objects, % of the total area of public territories**		
	Territories of green plantations and water bodies	**Alleys, paths, areas**	**Built-up territories**
City parks, parks of planning districts	65 - 70	25 - 28	5 – 7
Gardens of microdistricts	80 - 90	8 - 5	2 – 5
Squares	65 - 70	40 - 25	-

Table 3. Conditions for the placement of functional zones of the park, taking into account natural and planning factors

Functional zones of the park	**Natural and planning factors to be considered when placing functional zones of the park**					
	Relief		**Water bodies**	**Vegetation**	**Entrances to the park**	
	Slopes	**Horizontal areas**			**Main**	**Secondary**
Mass Events		+			+	
Physical Fitness and Wellness		+	+			+
Children's	+	+		+		+
Quiet Recreation	+	+	+	+		+
Utility		+		+		+

Calculation of the park's capacity and main park structures

The calculation of the number of park visitors is determined based on its area, level of amenities, and landscape features of the territory. The calculation is performed using

aggregated indicators of recreational loads, which determine the permissible number of visitors simultaneously present per unit area of the park territory. For city parks with a high level of territorial amenities, a dense network of pedestrian alleys, and a large number of park structures, recreational load indicators of 100 people/ha are adopted [1, section 9.16]. The composition of park structures and the estimated number of their visitors is determined based on the estimated number of park visitors and their expected distribution throughout the territory. The possible composition and calculated indicators of the main park structures are indicated in Table 4.

Table 4. Possible composition and calculated indicators of park structures

Park structures	Calculated indicators
Area for mass events	1 – 1.5 sq.m / person
Open-air green theater, open stage or dance floor	1.3 sq.m per 1 seat
Children's stage	
Children's playgrounds	20 – 40 sq.m per 1 playground or 0.5 sq.m/person
Sports grounds	Standard sizes are given in fig. 1
Boat station with pier, boat lift, cashier	3 linear meters per boat
Beach	Territory – 8 sq.m per 1 visitor; shoreline - 0.25 linear m per 1 visitor
Equipment rental base	
Gazebos	
Food service establishments	
Toilets	Radius of accessibility for the children's zone – 100 m, for areas of mass visitation – 200 m
Utility structures	

Modern parks are often considered as specific cultural institutions in the open air. With limited sizes, this leads to an overload of the territory with construction objects of various purposes. Therefore, in small parks, concentrated placement of architectural ob-

jects in the form of a single park center is preferable. Structures can be partially or completely buried underground, have utilized landscaped flat roofs, ramp-roofs, or mound-hill roofs, so-called geo-roofs.

Table 5. Distribution of buildings and structures recommended for placement by functional zones of the park

Recommended objects	Functional zones					
	Walking and quiet recreation	ports and wellness	Mass events	hildren's recreatio	Leisure objects	Administrative and utility
Security post			+			+
Sports equipment rental point		+				+
Information boards	+	+	+	+	+	+
Food service facilities			+			
Rest areas	+			+		
Children's playgrounds	+			+		
Leisure objects			+	+	+	
Sports facilities		+				
Utility and administrative buildings						+
Toilets	+	+	+	+	+	+

Due to the limited area, a small park can be a multi-level space and include two or more levels in certain areas. They can be both raised above the ground and hidden underground. The above-ground level can be located on the utilized roof of buildings [2], on a viaduct [3] or a platform. Usually, it represents additional pedestrian spaces and communications. In large and major cities, the comprehensive use of underground space should be ensured for the interconnected placement of urban transport structures, trade enterprises, public catering, entertainment and sports facilities, auxiliary premises, etc. [1, section 4.17]. This will free up more space, specifically for landscaping and amenities of pedestrian areas.

Development of the Architectural-Planning Solution for a Small Park

Design Standards

Two main factors ensure the suitability of the urban landscape for human life – the level of amenities and the safety of the landscape organization.

A high level of amenities in the urban environment affects the comfort of being in it. The safety of landscape organization has two aspects – ecological and social. The landscaping system ensures the ecological safety of people living in the city. Amenities, executed according to certain requirements, fixed in regulatory literature, ensure the physical safety of people.

A small park is designed for visitation by all social groups of the population and has an open public character. Therefore, a number of requirements are imposed on the designed object.

Transport and pedestrian paths are led to the park, the number of which must be rational and justified. Boulevards and pedestrian alleys leading to parks should be provided in the direction of mass flows of pedestrian traffic. The placement of a boulevard, its length and width, as well as its place in the transverse profile of the street should be determined taking into account the architectural-planning solution of the street. Boulevards and pedestrian alleys should provide areas for short-term rest. Depending on the placement, the width of boulevards with one longitudinal pedestrian alley should be taken [1, section 9.4] not less than:

- along the axis of streets – 18 m;
- on one side of the street between the roadway and the building line – 10 m. Design parameters of city streets and roads should be taken according to SP 42.13330.2011, the updated SNiP 2.07.01–89* [1, table 8*].

The distance of pedestrian approaches to the nearest public passenger transport stop should be taken no more than 500 m. Distances between stopping points on public passenger transport lines should be taken: for buses, trolleybuses, and trams 400–600 m, for express buses – 800–1200 m, for metro 1000–2000 m. The distance of pedestrian approaches from parking lots for temporary storage of passenger cars to entrances to parks, exhibitions, and stadiums should be taken no more than 400 m [1, sections 11.15, 11.16,

11.21].

Minimum accessibility indicators from residential areas to recreational objects should be taken in accordance with Table 6.

Table 6. Minimum accessibility indicators from residential areas to recreational objects

Recreational objects	Minimum radius of accessibility to recreational objects, meters	Minimum accessibility indicator from residential areas to recreational objects
City Park	6000 – 7000 m	30 minutes by transport
Park of a Planning District	1500 – 2000 m	20 minutes by transport
Garden of a Microdistrict	1000 m	20 minutes on foot
Block Garden	500 m	10 minutes on foot

An area for public transport stops is provided in front of the park entrance. Parking lots are organized at the main entrances to the park. According to the norms for calculating parking lots, the number of cars per 100 visitors is 5 – 7 [1, appendix K]. However, considering the current level of motorization, this indicator should be increased to 20 – 25 parking spaces / 100 visitors. The size of car parks is determined by the design brief, and in the absence of data – according to the Code of Rules SP 42.13330.2011 [1, appendix K] and SP 113.13330.2012 [4]. The size of land plots per one parking space for covered parking lots and car parks depending on their number of storeys is indicated in Table 7.

Table 7. Size of land plots for covered parking lots and car parks per 1 parking space

For Garages, sq.m					Above-ground Parking Lots, sq.m
1-storey	2-storey	3-storey	4-storey	5-storey	
30	20	14	12	10	25

Entrances to the park are located in an open place that is well visible from the adjacent territories. People must be clearly oriented in the designed park, accurately deter-

mining the necessary directions of movement. In addition to the main entrance, additional ones are arranged, which are linked to the streets and boulevards leading to the park.

Pedestrian paths, park alleys. The system of alleys, walking paths, and trails is the basis of the landscape-planning structure of the park. The main alley connects the central entrance with the main functional nodes. The width of pedestrian paths is determined by the flow of visitors. The width of the path should be a multiple of 0.75 m (the width of the traffic lane for one person). A solitary person walking, carrying a small load, requires a space of 75 – 100 cm. For two people to pass each other freely on one path, its width should be 150 cm. If the path is designed for intensive pedestrian traffic, then the movement of two pairs towards each other can be assumed, which will be 150 + 150 = 300 cm. The pedestrian space in width can be 300 + 150 = 450 cm or 300 + 300 = 600 cm, etc.

The width of alleys and walking paths in the park is recommended: in the mass visitation zone – 3-10 m, in the quiet recreation zone – 1-3 m.

The road network of landscape-recreational territories (roads, alleys, trails) should be routed, if possible, with minimal slopes in accordance with the directions of the main pedestrian traffic routes and taking into account the determination of the shortest distances to stopping points, play and sports grounds. Coverings of areas, the road-path network within landscape-recreational territories should be made of tiles, gravel, and other durable mineral materials, allowing the use of asphalt covering in exceptional cases [1, section 9.23].

In areas with calm relief, alleys are arranged with a longitudinal slope from 0.5 to 6%. Longitudinal slopes of paths in areas with rugged relief can be 8–10% or more (max 30%). With significant slopes, they are made winding in the form of a serpentine or alternated with stairs and ramps.

When designing pedestrian paths wider than 2 m, the possibility of driving vehicles with an axial load of up to 8 tons (watering vehicles, vehicles with telescopic booms, etc.) on them should be taken into account. Coverings of pedestrian paths and areas should ensure the drainage of surface water, should not be sources of dirt and dust in dry weather [5, section 3.1].

Stairs and Ramps. The usual slope of stairs in buildings is 1:2. Outdoors, this ratio is somewhat different. Outdoor stairs, considering step length, must correspond to the following parameters: step height 0.12 – 0.15 m; tread width 0.35 – 0.4 m. Steps must have a slope of at least 1% towards the step above. The cross slope of steps must be no more than 2%. All steps within one flight must be identical. A flight of an open staircase must not be less than three steps and must not exceed 12 steps. The use of single steps is unacceptable; they must be replaced by ramps. The width of flights of open stairs must be at least 1.35 m. The clear distance between stair handrails must be at least 1.0 m [5, section 3.27; 6, 4.1.12].

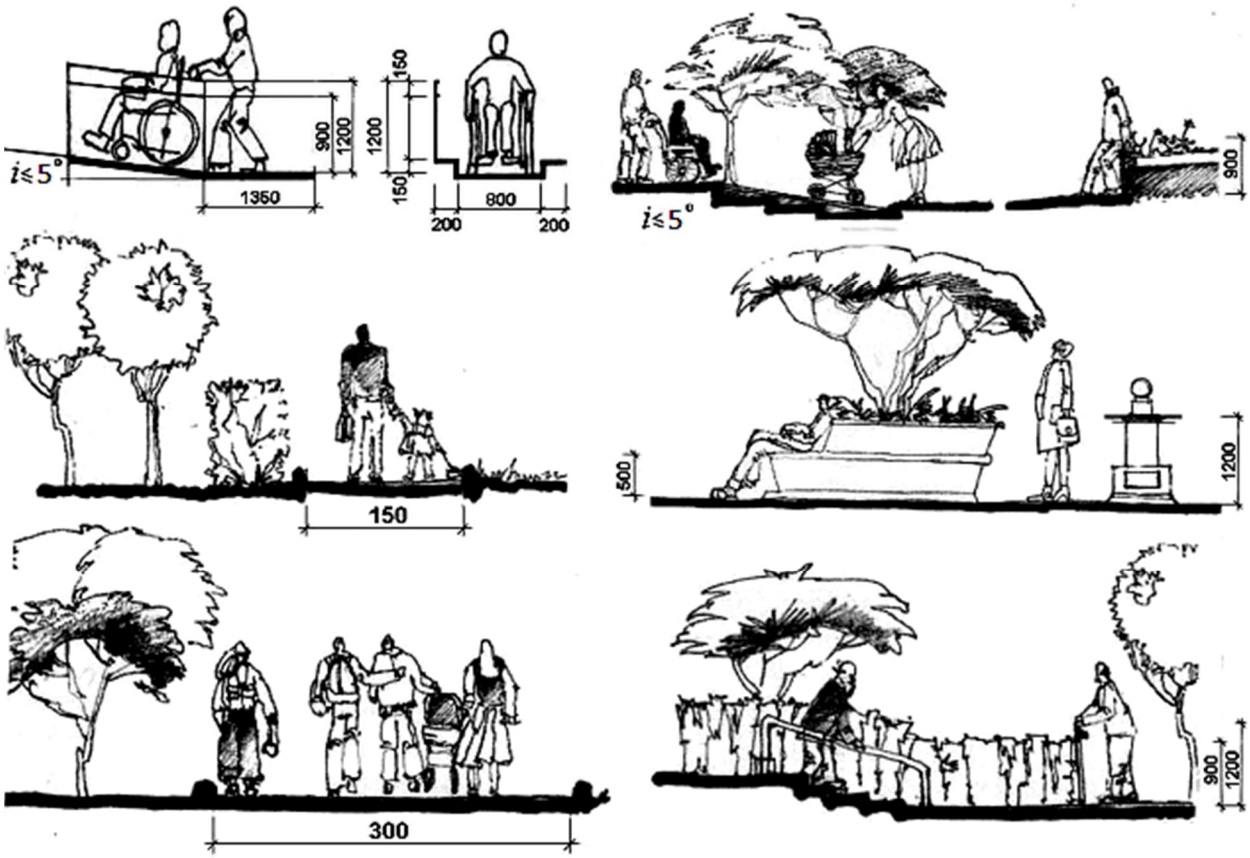
Modern design standards include requirements for the ubiquitous duplication of outdoor stairs with ramps. The length of a ramp flight must not exceed 9.0 m, and the slope can be from 1:8 to 1:20. Outdoor stairs and ramps must be equipped with handrails. The width between ramp handrails must be within 0.9-1.0 m [6, 4.1.13, 4.1.14].

Stairs and ramps must have railings 1.2 m high and handrails at a height of 0.9 m. For turning and stopping a wheelchair and a baby stroller, a landing 1.35 m long is required before and after the ramp. The height of the curbstone limiting the ramp is at least 0.15 m.

With the loss or limitation of mobility, weakened vision, stairs, ramps, curbs, sharp turns along the path, and crossings of automobile roads become the main obstacles for a person. These barriers are the most difficult obstacles for children, elderly people, disabled people, and mothers with strollers. Even an increase in the path segment becomes a problem for an elderly person and a child. Accounting for people with limited mobility requires providing stopping and rest areas along the path, the distance between which should be no more than 25 – 30 m. Stopping and rest places on pedestrian routes can be in the form of benches, or small architectural forms combined with seating.

The width of a pedestrian path, considering the oncoming movement of wheelchair users, must be at least 2.0 m. In conditions of existing development, it is allowed to reduce the path width to 1.2 m. In this case, horizontal passing areas of at least 2.0 x 1.8 m should be arranged no more than every 25 m to ensure the possibility of wheelchair users passing each other [6, section 4.1.7].

Fig. 3 Spatial-anthropometric characteristics of the urban landscape



The longitudinal slope of paths along which wheelchair travel is possible must not exceed 5%, the transverse slope - 2% [6, section 4.1.7]. The length of the horizontal platform of a straight ramp must be at least 1.5 m. At the top and bottom ends of the ramp, a free zone of at least 1.5 x 1.5 m should be provided, and in intensively used zones at least 2.1 x 2.1 m. Free zones must be provided at every change in the ramp's direction. Ramps must have two-sided railings with handrails at heights of 0.9 m and 0.7 m. The distance between handrails must be within 0.9-1.0 m. Wheel stops 0.1 m high should be installed on intermediate platforms and at the ramp exit [6, 4.1.15]. A ramp with a design length of 36.0 m or more or a height of more than 3.0 m should be replaced with lifting devices [6, 4.1.13]. At the intersections of driveways and pedestrian communications, curbstones should be recessed with the arrangement of smooth adjacencies to ensure the passage of baby strollers, sleds, as well as the entry of vehicles [5, section 3.25; 6, sections 4.1.8, 4.1.9]. Distances from buildings, structures, as well as engineering amenity objects to trees and shrubs should be taken according to Table 8 [1, section 9.5, table 3].

Table 8. Distances from buildings, structures and engineering amenity objects to trees and shrubs

Building, structure, engineering amenity object	Distances, m, from building, structure, object to axis	
	Tree trunk	Shrub
External wall of building and structure	5,0	1,5
Edge of sidewalk and garden path	0,7	0,5
Edge of roadway of streets, reinforced shoulder strip edge or ditch berm	2,0	1,0
Mast and support of lighting network, tram, bridge support and viaduct	4,0	-
Toe of slope, terrace, etc	1,0	0,5
Toe / inner edge of retaining wall	3,0	1,0
Underground networks:		
Gas pipeline, sewerage	1,5	-
Heat network	2,0	1,0
Water supply, drainage	2,0	-
Power cable and communication cable	2,0	0,7

Notes: 1. The given standards apply to trees with a crown diameter of no more than 5 m and should be increased for trees with a larger crown diameter. 2. Trees planted near buildings should not impede the insolation and illumination of residential and public premises within the requirements [1, section 9] |

1.2 Elements of the Landscape Composition

Relief

Relief is the most stably preserved component of the landscape and constitutes its plastic basis. The degree of relief dissection dictates the planning structure of the park and its spatial construction. Therefore, the architectural-planning solution of the park is largely interconnected and depends on the topography of the site.

A characteristic feature of modern park construction is the large scale of work on transforming the relief, its plastic modeling. A variety of vertical planning, which pursues

artistic goals to a greater extent, is called **geoplastics**.
Another related concept is **land art** – a direction in art in which the work created by the artist is inextricably linked with the landscape. It is essentially a sculptural relief. The landscape in this case is used more as a form and means of creating the work.

To choose an approach to processing the relief, the architect starts primarily from the function of the object. New forms must be carefully checked on models. Designing relief is not much different from creating sculpture. Artificial relief should be combined with the existing landscape environment, stylistically and scale-coordinated with it. A new form can be contrasting in relation to the background, but should not introduce disharmony into the park landscape.

Plain relief. A flat surface is monotonous and lacks plastic picturesqueness. In this case, it is necessary to highlight the nuances of the relief and use barely noticeable irregularities of the earth's surface in the composition. The principle of including microrelief in the composition can be expressed as follows: what is relatively higher than the general level should seem even higher, what is lower – even lower. There are various techniques for emphasizing microrelief:

- planting trees and placing architectural structures on hilltops;
- organizing water bodies in depressions;
- considering certain viewpoints (view of the hill from below, view of the water body from a high bank);
- enhancing the significance of an elevation by complicating the road pattern (serpentine).

A comfortable urban environment, including the territory of an urban park, implies a wide palette of elements of urban and garden-park design.

Water and Water Features

Water amenities in a park involve adapting natural water bodies for recreation and sports or creating artificial water features (ponds, canals, cascades, fountains). The artistic qualities of a landscape object are significantly enhanced by the presence of water

bodies on its territory. Water surfaces possess an attractive force, impart freshness and lyricism to parks, and visitors are willingly drawn to them.

In landscape design, numerous devices utilizing water are actively employed. Utilitarian water features include: drinking fountains, wells, splash pools, fish ponds, canals. The utilitarian use of water does not preclude the revelation of its aesthetic properties. Decorative water features are decorative fountains, fountains with sculpture, wall fountains, water mirrors, cascades, waterfalls.

For landscape objects, the use of the static or dynamic state of water is of great importance. Both categories have a certain effect on a person. Standing water (water mirrors) evokes calm and balance. Moving water (a fast river, waterfall, cascade, fountain, etc.) stimulates energy, emotionality, and attention in a person.

Water improves the microclimate and serves to organize various forms of recreation. Depending on the use of the water body, specific requirements arise for its size, shape, depth, construction of banks and bottom, and water quality. A thorough study of the relief and other natural data allows for determining the size and nature of possible water bodies.

Small Architectural Forms

Public green areas must be improved and equipped with small architectural forms [1, clause 4.10].

Small architectural forms are various numerous devices of small sizes, made from different materials. They are intended for equipping, improving, and artistically enriching green areas. They must be useful and convenient to use, perfect in construction, inexpensive to manufacture, and beautiful in appearance, organically fitting into the natural park environment. Conventionally, small architectural forms can be divided into two main groups: those using plants, and those without plants.

Small architectural forms *using plants* include: trellis, pergola, bower, planter.

Trellis is a light wooden or metal supporting garden-park lattice for vertical landscaping with climbing or supporting plants. The lattice can be wall-mounted or freestanding. From several such lattices, a quiet corner for rest can be built, utility areas or technical service devices can be fenced off, unexpressive monotonous areas or sanitary facilities of the park can be hidden from view, etc. The assortment of plants for trellises is diverse: wild grape, hop, beans, sweet pea, ipomoea, clematis, climbing rose, etc.

Pergola is a light park structure made of wood or metal in the form of a gazebo, gallery, or canopy with a lattice on top instead of a roof. Pergolas, like trellises, landscaped with climbing or supporting plants, represent volumetric-spatial structures, unlike the planar trellis.

Bower is a vaulted alley formed with the help of semicircular frames on which tree crowns meet (linden and hornbeam are more often used) or entwined with climbing plants (common hop, Chinese magnolia vine, maiden grape).

Planters are small-sized boxes, baskets, bowls, or vases for plant soil, in which abundantly flowering, brightly colored flower plants are planted. Their shape is very diverse. Planters can be wooden, ceramic, concrete, stone, and made from other materials. Currently, planters made of concrete are especially common. Planters made of wood, metal, and plastics are less common, as they are inferior in durability to concrete ones. Most often, they are made with the possibility of moving them from one place to another. Skillful placement of planters allows creating rich, beautiful colored compositions. Planters can be placed directly on asphalt, a ground path, a concrete platform, stairs, retaining walls, and in other places, creating original flower beds, especially on holidays and significant public events.
The selection of flowers is carried out in the conditions of special farms dealing with landscaping issues, under the guidance of specialists.

Small architectural forms *without plants* include many devices of diverse functional purposes: fences, stairs, bridges, gazebos, retaining and decorative walls, park ceramics, decorative stones, sculptural works, benches, litter bins, lanterns, kiosks, vending machines, visual information means, etc. Diverse in purpose, size, use, form, material, tex-

ture, and color, they must, while being in the park environment, harmonize with it, be proportionate to it, and form a single whole with it.

Fences. There are various types of fences, for example, for limiting the park territory, for ensuring pedestrian safety with changes in relief elevation, for separating different functional zones in the park, etc.

Perimeter fences for the park are intended for long service life, made from high-quality and durable materials. Plinth parts and support posts are made of granite, basalt, sandstone, and other strong rocks, and the gratings and sills are made of wrought iron, cast iron, or welded steel. The load-bearing frame of the grating is made mainly of iron and steel, and decorative, ornamental overlays are cast from iron and attached to the fence link mainly with bolted connections. With a difference in relief elevation, the minimum height of protective structures ensuring pedestrian safety is 1200 mm.

To emphasize the public nature of the objects under consideration, the use of green plantings in the form of borders or green walls made of densely planted trees and shrubs performing the function of fences is possible. Green plantings can also be used to organize zoning of the territory.

Fences in the form of hedges should be arranged by planting one or several rows of shrubs. Trees can be included in the composition of a multi-row hedge [2, clause 4.3].

In conditions of linear tree planting in areas with intensive pedestrian traffic, tree guard fences can be provided. For this, the tree trunk area is left untouched in the hard pavement of the sidewalk, covering it with a special removable grating. A metal grating, most often cast iron, protects the plant's root system from trampling and soil compaction. The central part of the grating has a circular hole with a sufficient diameter allowance for the unimpeded growth of the tree. For young trees, it is required to install vertical tree guard fences at human height. They remain until the tree strengthens, which takes many years. Such a fence must be executed at a high artistic level.

Stairs, ramps. Even with a slight difference in relief, it is necessary to provide devices for the descent and ascent of visitors from one level of the platform to another. Besides stairs, when it is advisable, gentle descents-ascents from one relief level to another - ramps - are arranged. With the same lift height, a ramp is 8-10 times longer than a

stair flight. The ramp must have a hard surface, not washed away by melt or storm water, and also non-slip, but rough for the convenience of pedestrian movement.

Retaining walls. In areas with a large difference in relief, horizontal terraces at different levels are designed. Between terraces in these cases, vertical retaining walls are built, usually stone or concrete, restraining soil movement. The recommended height of retaining walls in gardens and parks is 0.3 - 2.5 m.

Monumental and decorative sculpture. Monumental and decorative sculpture is included in the complexes of parterres and other green territories as a component of great aesthetic importance.

A straight, solemn alley leads to the sculptural elements; a platform for circular viewing is formed around it. So that the monument is perceived by the viewer without significant angular changes, a free open space is created in front of it, equal to almost twice its height within a viewing angle of 25-27°. With a greater distance of the viewer from the monument, it may lose its majestic position, will seem small, insignificant. The silhouette of the monument looks perfect against the background of the sky or a smooth wall, contrasting in color to it, against the background of dark greenery, if the monument itself is light; it is perceived much worse with a variegated, fragmented background, close in color to the sculpture. It is very important to consider the solar illumination of the monument and place it so that the plastic qualities of the sculpture are well illuminated and more fully revealed.

Bridges. Water bodies are accents of parks, and in turn, accents of water bodies in many cases are bridges. They are placed so that they complete some picturesque perspective. Connecting viewing areas, they become a reference point for viewing landscape paintings. Bridges can also be an important communication element of parks in ravine territories. The best material for bridges at present is considered to be reinforced concrete [3].

Gazebos are light park architectural structures for quiet, calm rest of visitors. Forms of a round gazebo with four or six columns and a dome-shaped completion are widely distributed. Other architectural forms of gazebos are also found. Places for placing gazebos should be chosen where a beautiful species or panoramic overview of the

landscape opens. Sometimes quiet, secluded corners are found for them, conducive to calm rest and solitude.

Benches are of great importance in the improvement of urban territories. They are installed everywhere, starting from the main, front platform at the park entrance, along alleys, on viewing platforms, etc.

The usual height of a bench is 50 cm. An elderly person is more comfortable sitting on a bench with a back because they sat down for a long time. A teenager will prefer a fence or retaining wall, settling higher, as on an observation platform. Mothers with children choose benches without enclosing elements to have a circular view. Children usually do not sit. For a short stop of an always hurrying person, a stand with handrails or some other surface for support at a height of +1.10 may be suitable.

Wood is the most accessible material for making benches, easily processed. Wooden benches are pleasant in terms of thermal sensation in functional relation, but not durable. Stone is a hard, solid, heavy, and durable material, but functionally inferior to wood - stone benches are cold. In many cases, marble, limestone, sandstone, granite, gabbro, basalt are used for benches. Concrete is a very accessible material for making small forms, but in its pure form, benches made from it are of low quality; they are cold, hard, edges crumble, and the appearance of such benches is inexpressive. Most widely distributed are benches made from a combination of different materials. For supporting parts, strong, hard materials such as stone, brick, concrete, or metal are chosen, and for seats and backs, wood or plastic is used, as cheap, accessible, and quite meeting functional requirements. For making backs and seats, wooden slats with rounded upper edges and a slightly convex surface are best used. Water and snow do not linger on such forms.

Lanterns. Besides fluorescent and incandescent lamps, mercury and sodium lamps with highly efficient light output are used. Reinforced concrete for the supporting masts of lighting is combined with metal cantilever arms for attaching lamp devices.

The lighting system of urban, including park, territories includes several types of light sources, differing in function and location. Wide, open areas of mass visitation are usually illuminated by high lanterns (12 m and more) with powerful lamps in the amount of 4-12 pieces or more, directed in all directions, to obtain a large, brightly lit surface. The required number of lanterns on an area is determined considering the dimensions and effec-

tive radius of one lantern within 25-30 m from the support center.

Alleys are illuminated by lanterns, placing light points towards the axis of pedestrian movement and not bringing them close to dense tree crowns. Picturesque winding paths can be illuminated by low lanterns of the torchère type, 2.5-6 m high, installed at a distance of about 20-25 m from each other. Separate interesting corners of the urban landscape can be marked by a group of two or three torchères of different heights, creating an active decorative composition of light sources against the background of lawn, shrubs, and trees. Small areas of lawn or flower beds are illuminated by separate low lamps (up to 1.5 m) or gathered into free artistic groups of 2-5 pieces to create decorative spots. Their functional purpose is small, and they play the role of enlivening, bright, colored ground-level lights (Table 9). All the listed equipment belongs to the main, stationary lighting system. Besides, there is lighting of a festive, carnival, somewhat theatrical type.

Table 9. Recommended illumination standards for park territories

Element of territory	Width, m	Illumination standard, lx	Lamp power, W	Luminaire height, m	Intervals between luminaires, m
Alleys	8	4	160	4.5	25
	15	4	125	6	25
Rest areas	25x25	10	240	8.5	26
	100x120	10	500	12.5	27

Vegetation and Selection of Assortment

In green construction, many species and forms of wild and cultivated plants can be used, distinguished by a great diversity of their biological properties and external characteristics.

The conformity of the object to sanitary-hygienic, architectural-artistic, engineering, and other purposes largely depends on the selection of plants. Therefore, such a responsible task as the choice of assortment of trees and shrubs can be solved only on the basis of a thorough study in each individual case of all natural and planning conditions, which makes it possible to select plants that best correspond to the target purpose of land-

scaping.

When establishing a list of plants for each specific territory, it is necessary to ensure that they, in their biological properties and external characteristics, correspond to the climatic conditions of the given region; existing or created soils, hydrology, and light regime; the target purpose of landscaping; the features of the site's planning and development, as well as the functional and architectural-artistic solution of the object. Consequently, the selection of plants is determined by the sum of local conditions, as well as the totality of external characteristics and biological properties of plants (Table 10).

Climatic conditions. The selection of the assortment is carried out based on the climatic conditions of the central region of Russia, i.e., for a moderately continental climate. The selected species must possess resistance to low temperatures in the winter season and average daily temperature fluctuations.

Soil conditions. Work on landscaping in areas with natural soils has to be carried out mainly when creating plantings outside the boundaries of urban development. In cities, natural soils are most often found on the territory of relatively large parks. Areas allocated for squares, lawns, boulevards, intra-block landscaping, etc., as a rule, do not have natural soils. They actually have to be created anew: for this, necessary organic and mineral fertilizers are introduced into the ground, and sometimes soil suitable for plants is specially imported. Soil conditions must always correspond to the biological properties of plants. In each specific situation, it is necessary to use a certain assortment of vegetation:

- Trees and shrubs that are not demanding on the degree of soil fertility (downy birch and paper birch, downy oak, small-leaved elm, willow, field maple, fragrant poplar, yellow acacia, hawthorn, oleaster, etc.);
- Trees and shrubs growing on sandy soils (silver birch, purple willow, box elder, silver oleaster, white and Canadian poplar, golden currant, yellow acacia, etc.);
- Trees and shrubs for moist soils (downy birch, poplar, willow, larch, bird cherry, black and red currant, etc.).

Air humidity. Plants react differently to the degree of air humidity. Some species and forms tolerate lack of moisture poorly, others are unpretentious in this regard. Among the

most drought-resistant species used are: field elm, oak, blue spruce and white spruce, silver maple, gray walnut, yellow acacia, narrow-leaved oleaster, golden currant.

Insolation. One of the important conditions for the normal development of plants is illumination by the sun, and some species require a lot of light, while others are content with a smaller amount. This property allows subdividing plants into light-loving and shade-tolerant. Light-loving species: birch, oak, pear; box elder, red and fan maple, larch, black alder, poplar, ash, willow. Among the shade-tolerant trees and shrubs are: horse chestnut, hornbeam, field maple, spruce, linden, hawthorn, cotoneaster, viburnum.

Growth process of trees and shrubs. When implementing the project, it will be necessary to achieve a full-fledged result in the shortest possible time. The desired effect can be achieved relatively quickly in various ways. The simplest of them is the use of adult plants. However, this method is far from always possible for economic reasons. Then, when choosing plants for landscaping, it is necessary to take into account the growth rate of different species. A disadvantage of fast-growing trees and shrubs is their relatively short lifespan.

The group of fast-growing trees and shrubs includes: birch, elm, box elder, weeping willow, poplar, apple tree, black alder, bear walnut, bird cherry, common ash, white and yellow acacia, barberry, euonymus, privet, hawthorn, elder, dogwood, mock orange, viburnum, buckthorn, oleaster, golden currant. A disadvantage of fast-growing species is their relatively short lifespan.

Slow-growing species are garden cherry, pear, winter oak and pedunculate oak, chestnut, linden, etc. Their practical value is determined by their high lifespan and preservation of physical and aesthetic qualities for a long time.

Trees and shrubs that strengthen slopes. Landscaping is one of the effective ways to strengthen the banks of water bodies, steep slopes and loose sands, ravines and slopes. Only those plant species that have a root system forming a large number of suckers can fix the soil. Such plants include: field maple, white or gray alder, bearberry, barberry, yellow acacia, steppe birch, sweet cherry, common hazel, two-colored broom, narrow-leaved oleaster, sea buckthorn, tree juniper, red, ledum, privet, wolfberry, as well as all types of hornbeam, cotoneaster, hawthorn, gooseberry.

Sizes of plants. The height of trees and shrubs and the width of their crown are very significant. Depending on the target purpose of the plantings and the architectural-artistic solution, plants of different sizes are used.

Tall trees: common oak, red oak, summer oak; common spruce; European and Siberian larch; large-leaved linden; common and cedar pine; white and Canadian poplar. If it is required to create shade on sidewalks, low-growing trees can be used: common cherry, box elder, horse chestnut, all types of rowan and cherry; shrubs: lilac, hawthorn, mock orange.

Crown transparency of plants. The degree of crown transparency of plants is of great sanitary-hygienic and architectural importance. Trees and shrubs with a dense crown most effectively protect from sun rays, dust, snow, and wind. These include: Norway maple, common horse chestnut, black alder, oriental thuja, common hornbeam, poplar, all types of juniper, bird cherry, and spruce – all of them are perfectly suited for creating shady alleys.

Trees with a transparent crown form less intense shade – these are, for example, silver birch, downy birch; willow-leaved pear, aspen – they are recommended for designing internal views of the park, landscaping children's playgrounds.

The indicator of crown density is of great importance for such ecological properties of plants as noise, dust, and gas protection.

Noise protection. Species of trees that retain a dense crown all year round have high noise protection properties – these are coniferous species: spruce, thuja and others, as well as some deciduous species: linden, hornbeam with undergrowth of privet, wayfaring tree, spirea.

Gas resistance. In the aggressive urban environment, vegetation is subjected to serious impacts from the atmosphere polluted by automobiles and industries. The most resistant: blue spruce and Engelmann spruce, privet, white dogwood, shiny cotoneaster, Pennsylvania maple and box elder, gooseberry, oleaster, golden currant, Canadian poplar, gray poplar, black poplar – are planted in areas with intensive automobile traffic, i.e., along roads, to create a kind of buffer protecting the other plantings. The least resistant to gases trees and shrubs: yellow acacia, downy birch, horse chestnut, Norway maple,

common spruce, sea buckthorn, staghorn sumac, common lilac, common pine, common rowan, common and Manchurian ash – are used in areas with less intensive air pollution.

Dust protection and gas protection. If the designed territory is located in an area with unfavorable ecological conditions and needs protection from dust and exhaust gases, a planting of species capable of restraining harmful effects is created along the perimeter. Such species are gas-resistant tree species that have a dense crown and possess phytoncidity, i.e., all coniferous and some deciduous species, for example, poplar, elm.

Crown shape. Based on geometric parameters, the following forms of tree crowns can be distinguished:

- Natural – basic (linden, larch), columnar (pyramidal poplar), conical (spruce), umbrella (pine), weeping (birch, willow), spherical (chestnut);
- Artificially created – grafted weeping and standard forms, trimmed in the form of geometric bodies or fantasy shapes.

  Picturesque areas of parks are characterized by freely growing shrubs and trees with picturesque crown forms. In areas of the park with a regular structure, trees and shrubs that are amenable to pruning are planted: box elder, white alder, common spruce, pedunculate oak, common hornbeam, elm, Russian white willow, Thunberg barberry and common barberry, yellow acacia, sea buckthorn, common privet, Tatarian honeysuckle, buckthorn, golden currant, black currant, red currant, common dogrose, snowberry, and all types of linden, rowan, poplar, hawthorn, juniper, cotoneaster.

Table 10. Dendrological characteristics of trees and shrubs

Species	Height, m	Crown diame-ter, m (for trees)	Lifespan, years	Growth rate	Gas resistance	Frost resistance	Decorative value	Soil requirements	Moisture requirements	Integral assess-ment of species prospects
Amorpha fruticosa	3-5	–	–	Fast	Medium	High	High	Sandy loam, loam	Medium	Low prospect
Aronia (black chokeberry)	1-2	–	–	Moderate	Medium	Very high	Medium	Sandy loam, loam	Medium to high	High prospect
Berberis vulgaris, Thunbergii	1-2	–	–	Moderate	Medium	Very high	Medium	Sandy loam, loam	Low to medium	High prospect
Phellodendron amurense	20	8	150	Fast	Sufficient and medium	Very high	High	Sandy loam, loam	Low to medium	Low prospect
Betula pendula, verrucosa	20	8	150	Fast	Medium	High	Medium	Sandy loam, loam	Low to medium	High prospect
Crataegus arnoldii, sanguinea	8	–	–	Moderate - slow	Medium	Very high	Medium	Sandy loam, loam	Low to medium	High prospect
Prunus besseyi, dwarf, japonica	12	–	–	Fast - moderate	High and medium	High	High	Sand, sandy loam, loam	Low to medium	High prospect
Ulmus spp.	12-25	10	200	Fast - moderate	Sufficient and medium	Very high	Medium	Humus-rich	Medium to high	Medium prospect
Quercus robur, rubra, summer oak	25	15	300	Moderate and slow	Sufficient and medium	Very high	High	Loam, humus-rich	Medium to high	High prospect
Picea abies, P. Pungens	30	10	200	Moderate	Medium	High	High	Loam, humus-rich	Low or medium	Medium and high prospect
Salix alba, weeping form	20	10	60	Fast	High and medium	Very high	Medium	Sand, sandy loam, loam	Low or medium	Medium and high prospect
Amelanchier spp.	Up to 10	–	–	Fast	Medium	Very high	Medium and high	Sandy loam, loam	Low or medium	High prospect
Viburnum, 'Boule de Neige'	3-5	–	–	Very fast	Sufficient and medium	Very high	High	Loam, humus-rich	Medium or high	High prospect

Species	Height, m	Crown diameter, m (for trees)	Lifespan, years	Growth rate	Gas resistance	Frost resistance	Decorative value	Soil requirements	Moisture requirements	Integral assessment of species prospect
Aesculus hippocastanum	20	20	100	Moderate	Medium	High	High	Humus-rich	Medium	High prospect
Cotoneaster lucidus, horizontalis, cinnabarinus	1-2	–	–	Fast	High and medium	High	Medium and high	Loam, sandy loam, humus-rich	Low or medium	High prospect
Acer platanoides, ginnala, 'Red King', saccharinum, negundo	20	10	100	Fast and moderate	High and medium	Very high	Medium and high	Loam, sandy loam, humus-rich soils	Low or medium	High prospect
Tilia platyphyllos, cordata, tomentosa	25	10	200	Moderate	Medium	High	High	Loam and humus-rich	Medium	High prospect
Larix decidua, sibirica	30	7	300	Fast	Sufficient and medium	Very high	Medium and high	Loam and humus-rich	Medium, high	High prospect
Elaeagnus argentea, angustifolia	3-10	–	–	Fast	High	High	High	Sand, sandy loam, loam	Low	High prospect
Mahonia aquifolium - evergreen	1	–	–	Moderate	Medium	High	High	Sandy loam, loam and humus-rich	Medium or high	High prospect
Juniperus communis, sabina, virginiana	5	3	200	Slow	Medium	High and medium	High	Sand, sandy loam, loam	Low or medium	High prospect
Juglans mandshurica, cinerea	20	10	150	Moderate	Insignificant	Very high	High	Humus-rich	Medium	Medium prospect
Abies alba, sibirica	20	8	200	Slow	Medium	Very high	High	Humus-rich	High	High prospect
Cytisus spp.	1-2	–	–	Fast	Insignificant, negative	High	Medium and high	Sand, sandy loam, loam	Low or medium	Medium prospect
Rhododendron spp. (poisonous!)	1-2	–	–	Slow	High and sufficient	High	High	Sandy loam, loam	Moderate or high	High prospect

Species	Height, m	Crown diameter, m (for trees)	Lifespan, years	Growth rate	Gas resistance	Frost resistance	Decorative value	Soil requirements	Moisture requirements	Integral assessment of species prospects
Rosa spp. (wild roses)	1-2	–	–	Fast	Medium	High	High	Sandy loam	Low	High prospect
Sorbus aucuparia	10	5	60	Moderate	Sufficient	High	High	Loam and humus-rich	Medium	High prospect
Syringa spp.	3	–	–	Fast	Sufficient	Very high	High	Sandy loam, loam and humus-rich	Low to high	High prospect
Symphoricarpos albus	1-2	–	–	Fast	Sufficient	Very high	High	Sandy loam, loam	Low to medium	High prospect
Pinus sylvestris, sibirica squat	25	8	200	Moderate	Medium	Very high	High	Sand, sandy loam, loam	Low to high	High prospect
Spiraea spp.	1-2	–	–	Fast	Sufficient	High	High	Sand, sandy loam, loam	Low to medium	High prospect
Populus alba, canadensis, pyramidalis, balsamifera, berolinensis	25	15	100	Very fast	From high to negative	From very high to low	From lack of aesthetic qualities to medium	Any	From low to high	From non-prospective to highly prospective
Thuja plicata, occidentalis, Spherical form Columnar form	30	8	300	Slow	Sufficient	From very high to medium	High	From sand to humus-rich	From low to high	High prospect
Padus spp.	3-15	–	–	Fast and moderate	Medium	Very high	High	From sand to humus-rich	From low to high	High prospect
Philadelphus spp. (jasmines)	1-2	–	–	Very fast	Sufficient	Very high	High	Sandy loam, loam and humus-rich	From low to high	High prospect
Fraxinus excelsior	25	10	150	Fast	Medium	Very high	Medium	Loam and humus-rich	Medium and high	High prospect

Section 2. BRIEF METHODOLOGICAL GUIDELINES FOR THE COMPILATION OF THE COURSE PROJECT

2.1. Main Design Stages

Any design process goes through two interconnected stages: the stage of analyzing objectively acting factors, the consideration of which determines the solution of a number of sequential compositional tasks, and the stage of synthesis – finding the optimal compositional variant using the means and techniques of architectural composition.

The analysis stage involves: a detailed study of bibliographic sources; data from scientific research on green construction issues; familiarization with the experience of park design in our country and abroad. The result of this work is the compilation of an abstract with copies of projects from literary sources, analyzing their functional-planning and spatial-volumetric structure.

The next step of this stage is the collection and analysis of a number of factors, the consideration of which allows for the creation of functionally convenient and architecturally expressive solutions. The brief description of these factors, considered by us earlier (Sec-

tion 1 of this methodological guideline), gives an idea of the large volume of initial material for design and its role in finding the optimal compositional variant, which becomes possible through the thorough study and resolution of contradictions arising from the consideration of all the aforementioned factors in combination.

The synthesis stage involves the use of diverse architectural-compositional techniques to create the spatial-volumetric compositions of parks. They are aimed at revealing structurality, proportionality, flexibility, subordination, and unity – the main principles of architectural space. The successful application of architectural-compositional means of construction (scale, nuance and contrast, proportionality, modularity, symmetry and asymmetry, patterns of rhythm and meter, plastic and color unity, etc.) determines the architectural and artistic uniqueness of the landscape object.

2.2 Technological Chart of Work on the Course Project

Week	Lesson	Completion, %	Content of Lessons	
			Classroom Work	**Independent Work**
I	1 2	5	Introductory lecture. Issuance of assignment. Clause 1: pre-design analysis, planning framework, functional zoning.	Preparation of an abstract on the project topic.
II	3 4	10	Review of Clause 1. Viewing and analysis of abstracts. Correction of sketches. Clause 2: planning and architectural-artistic solution.	Sketching
III	5 6	20	Review of Clause 2. Viewing and analysis of abstracts. Correction of sketches. Consultations on developing the sketch-idea. Selection of the optimal solution.	Development of sketch-idea variants.
IV	7 8	30	Approval of the sketch-idea. Elaboration of plans, elevations along the main axes, panoramas, perspective, viewpoints.	Correction of the sketch-idea on all parameters.
V	9 10	50	Development of the draft project (clarification of the planning structure, architectural composition). Approval of the draft project.	Preparation of the draft project (composition of drawings, choice of graphic execution).
VI	11 12	70	Work on the project, its review and approval.	Execution of the project in pencil graphics.
VII	13 14	100	"Continuous design" (completion of project development). Submission of works for review and inspection by the commission.	Formatting of the graphic part of the project and the explanatory note.

Approximate Composition of Clause No. 1
"Pre-Design Site Analysis, Functional Zoning"

1. Situational scheme (location within the city structure) Scale 1:10000;
2. Scheme of urban planning, compositional, and functional analysis of the territory (including adjacent territories) Scale 1:5000;
3. Scheme of landscape analysis of the territory (Scale 1:5000);

4. Scheme of existing transport-pedestrian connections and landscaping (Scale 1:5000);
5. Scheme of proposed functional zoning of the park (Scale 1:5000);
6. Scheme of visitor movement through the park territory;
7. Scheme of main landscaping elements.

Approximate Composition of Clause No. 2
"Architectural Solution of a Small Park"

1. Situational scheme;
2. Refined scheme of functional zoning of the park (1:5000)
3. Scheme of visitor movement through the park territory and landscaping;
4. General plan (Scale 1:2000);
5. Perspective view
6. Sectional elevations along the main axes - 2 pcs. (Scale 1:2000, 1:1000).
7. Sketches of the main conceptual nodes of the park, viewpoints (entrance zone / central alley / square, etc.).

2.3 Composition of the Course Project

No.	Name of graphic material (types of drawings, models, text)	Scales in sketches	Scales in project
1.	Situational scheme	Scale 1 : 20000	Scale 1 : 10000
2.	Scheme of urban planning analysis	Scale 1 : 10000	Scale 1 : 5000
3.	Scheme of landscape analysis	Scale 1 : 10000	Scale 1 : 5000
4.	Scheme of existing transport-pedestrian connections and landscaping	Scale 1 : 10000	Scale 1 : 5000
5.	Scheme of functional zoning	Scale 1 : 10000	Scale 1: 5000
5.	Scheme of designed transport-pedestrian connections and landscaping	Scale 1 : 10000	Scale 1: 5000
6.	General plan	Scale 1 : 2000	Scale 1 : 1000
7.	Longitudinal and transverse sections (profiles) or elevations along the main axes (2 or more)	Scale 1 : 2000	Scale 1 : 1000 or Scale 1 : 500
8.	Perspective or axonometry, a model is possible	Axonometry or model Scale 1 : 2000 Scale 1 : 5000	Axonometry or model Scale 1 : 1000 Scale 1 : 2000
9.	Viewpoints (2 or more)		
10.	Abstract, 15–20 pages		
11.	Explanatory note, 1 page		

During the design process, based on the development and comparison of options, it is necessary to choose the best solution, which is then developed in detail in accordance with the requirements for course projects. The results of the comparison of options should be reflected in the explanatory note with the attachment of diagrams and text material.

- **Situational scheme.** The city map must indicate the location of the park within the city structure.
- **Urban planning analysis scheme** displays the main compositional and visual axes of the site and adjacent territories, the main perception points.
- **Scheme of existing transport-pedestrian connections and landscaping** shows the network of transport-pedestrian communications leading to the park and within its territory, locations of public transport stops and personal vehicle parking, as well as trees and shrubs growing within the design boundaries.
- **Landscape analysis scheme** takes into account valuable areas and their individual elements. Viewpoints hold a special place. Low-value areas are also recorded simultaneously. Areas of relief with a uniform appearance (relatively flat, with an active slope), directions of slopes, thalwegs, river and stream channels, and water surfaces are shown.
- The **functional zoning scheme** shows the functional zones of the object proposed by the project.
- The **scheme of transport-pedestrian connections and park landscaping** shows the proposed network of transport-pedestrian connections and communications, optimized locations of public transport stops, and the calculated number of personal vehicle parking spaces, as well as the designed landscaping (trees and shrubs).
- On the **general plan**, within the design boundaries, the relief, network of pedestrian paths and vehicle roads, a full set of platforms, landscaping, and elements of amenities and landscape design, small architectural forms, public buildings, structures, communications, etc. are shown. The park layout must comply with the design brief, sanitary-hygienic, and fire safety requirements.
- On the **longitudinal and transverse section-profile or elevations along the main axes**, the relief, vegetation, and structural elements, axes, dimensions, level marks, and details are shown.
- The project provides for the execution of a **perspective or axonometry** of the park; a model is possible. Showing all details on the perspective and constructing shadows, allowing a complete understanding of the volumetric-spatial characteristics of the design solution, is mandatory. Viewpoints should help convey the main

idea of the design solution.

The total volume of the abstract for the course project is 10 – 20 pages.

2.4 Technical and Economic Indicators

1. Total area of the park within the design boundaries, ha.
2. List and area of functional zones, ha.
3. Total landscaping area – the total area of landscaped areas, including lawns and water surfaces, ha.
4. Total paved area – the total area of vehicle roads, parking lots, pedestrian and bicycle paths, platforms, and squares for mass events with various types of surfacing, including ground cover, ha.
5. Total built-up area by buildings and structures – the total area of horizontal sections along the external contour of buildings at the plinth level, including protruding parts. The area under buildings on stilts, as well as driveways under them, are included in the total built-up area, ha.
6. Nomenclature of park structures.
7. Capacity of park structures, persons.
8. Number of park structures, units.
9. Visitor density, persons / ha.

RECOMMENDED LITERATURE

1. Code of Rules SP 42.13330.2011 Urban Planning. Planning and Development of Urban and Rural Settlements. Updated version of SNiP 2.07.01-89*, effective date 20.05.2011.
2. Code of Rules SP 17.13330.2011 Roofs. Updated SNiP II-26-76, effective date 20.05.2010.
3. Code of Rules SP 46.13330.2012 Bridges and Pipes. Updated SNiP 3.06.04-91, effective date 01.01.2013.
4. SP 475.1325800.2020 Code of Rules. Parks. Rules for Urban Planning Design and Amenities. Effective date 2020-07-23. 21.10.2021
5. SP 113.13330.2012 Car Parks. Updated version of SNiP 21-02-99* (with Amendment N 1), effective date 01.01.2013
6. Code of Rules SP 82.13330.2011 Landscaping of Territories. Updated version of SNiP III-10-75, effective date 18.07.2011
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20. Razumovsky, Yu.V. Landscape Design: textbook for university students / Yu.V.Razumovsky, L.M.Fursova, V.S.Theodoronsky. – M.: FORUM, 2012.
21. Guide to the Comprehensive Development of the Underground Space of Large Cities / V.A.Ilyichev, G.E.Golubev, A.V.Zamaraev, A.N.Skachko, O.I.Ignatova, V.G.Budanov, O.N.Korotkova – M: Russian Academy of Architecture and Construction Sciences, 2004.
22. Garden and Park Construction and Management: Textbook / A.L.Kalmykova, A.V.Tereshkin. - M.: Alfa-M: INFRA-M, 2012.
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Kaidalova Elena Valentinovna
Khudin Alexander Alexandrovich

SMALL PARK

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Federal State Budgetary Educational Institution of Higher Education
«Nizhny Novgorod State University of Architecture and Civil Engineering»
603000, Nizhny Novgorod, st. Ilyinskaya, 65.
http://www.nngasu.ru, rector@nngasu.ru