

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

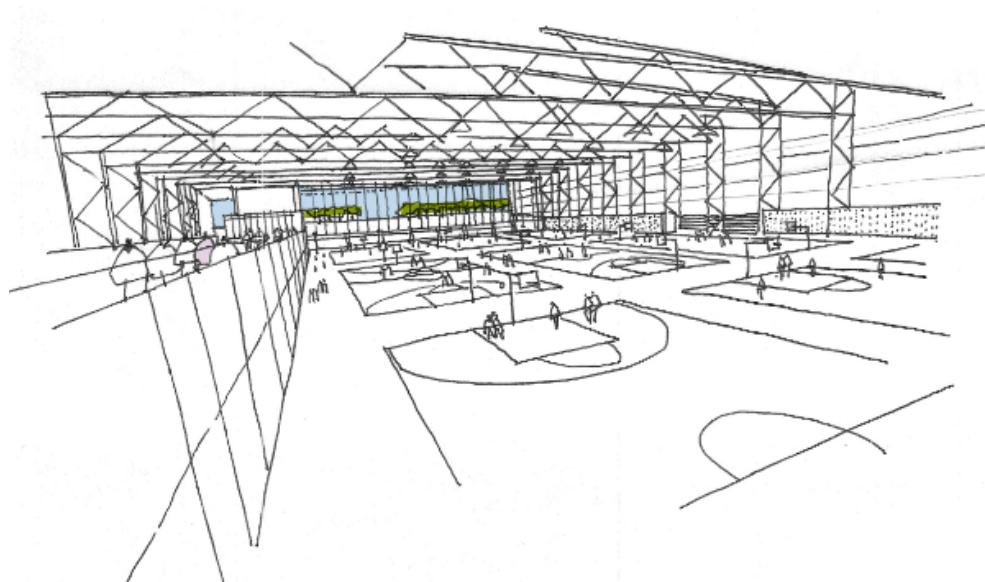
**O. M. BEKETOV NATIONAL UNIVERSITY
of URBAN ECONOMY in KHARKIV**

METHODOLOGICAL RECOMMENDATIONS

for practical classes and organizing individual work
on an academic discipline

**“ARCHITECTURAL DESIGN:
BUILDING WITH SPORTS AND
RECREATION FUNCTION”**

*(for full-time students first (bachelor's) level of higher
education specialty 191 – Architecture and urban planning)*



**Kharkiv
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INTRODUCTION

The purpose of teaching the academic discipline “Architectural design: building with sports and recreation function” is to provide the student with knowledge of the theoretical and practical foundations of the master training of an architect, which consists of the development of volumetric-spatial and compositional thinking; development of the student’s understanding and practical skills of designing an architectural object as an integral component of the spatial system of the environment; mastering various techniques of architectural graphics.

The main aim of the course of architectural design is to teach the student aspects of creative search on the scale of urban planning objects.

Tasks of the discipline:

- 1) development and testing of pre-project analysis methods;
- 2) assimilation of the stages of formation of the creative design of a building with a sports and recreation function: construction of block diagrams, functional zoning of the territory, formation of the composition of external and internal spaces and architectural volumes;
- 3) study of the methodology of designing buildings with a sports and recreation function.

The subject of study in the discipline is principles of designing buildings with a sports and recreation function.

The student must **be able to** form a figurative unity of an architectural object with the urban planning structure of a settlement or city. Also, students learn to combine the spatial structure formed by the natural landscape with the functionally determined system of the building with a sports and recreational function.

These methodological recommendations are intended for creating a project of a public building (sports and recreation complex), in which a complex of architectural-planning, engineering-technical, ecological and aesthetic issues must be resolved.

Practical work is carried out in the form of consecutive tasks-clauses and sketches, in accordance with the main stages and purpose of practical classes, followed by their collective discussion and graphic design of their results in the form of diagrams, plans of various scales and 3D models.

An individual form of studying the discipline is a series of graphic tasks that are performed on the topics of practical classes.

1 CONTENTS OF THE EDUCATIONAL DISCIPLINE BY CONTENT MODULES AND TOPICS

1.1 Program of academic discipline

Module 1 Architectural design: building with sports and recreation function

Content module 1 Pre-project analysis and concept of the object's architectural solution.

Topic 1 The basic principles of placing a sports and recreation building in the structure of the settlement.

Topic 2 Analysis urban planning and artistic conditions of the design territory

Topic 3 Creating of a functional block diagram of the building.

Topic 4 Inventing of the idea of a functional planning solution of the master plan.

Topic 5 Master plan sketching and spatial solution of the building.

Content module 2 Functional planning, constructive and compositional solution of the object.

Topic 6 Design of the master plan in accordance to current norms and urban planning conditions.

Topic 7 Sketching of plans of the building.

Topic 8 Selection of the constructive solution of the building.

Topic 9 Finalization of the external image of the building.

Content module 3 Development of spatial and planning solutions for a building with a sports and recreation function.

Topic 10 Graphic design of drawings.

Topic 11 3D modeling of the building and the external environment.

Topic 12 Calculation of technical and economic indicators.

Topic 13 Completion of work on the project.

1.2 Distribution of time by content modules and forms of students' educational work

Table 1.1 – Distribution of time by content modules

Content modules	Number of hours				
	Total	Lect.	Pract.	Labor.	Indiv.
MODULE 1 (fifth semester)	150		60		90
Content module 1	45		20		25
Content module 2	45		20		25
Content module 3	45		20		25
Final control	15				15

2 ORGANIZATIONAL AND METHODOLOGICAL RECOMMENDATIONS

The teaching methodology of the course “«Architectural design: building with sports and recreation function” involves work in dialogue between teachers and students and is designed for 60 hours of practical classes and 90 hours of individual work.

In order for students to understand the structure of the educational process and the connection between practical classes and individual work, this section is presented in the form of structural and content tables, which include both information about the content, structure and time distribution for individual topics and types of classes, as well as brief recommendations for performing practical tasks and organization of individual work.

2.1 Plan and content of tasks

Table 1.2 – Structure of the organization and content of practical classes and individual work

Topic	Contents (plan)	Number of aud. hours**
1	2	3
Module 1 Architectural design: building with sports and recreation function		
Content module 1 Pre-project analysis and concept of the object's architectural solution		
Topic 1 The basic principles of placing a sports and recreation building in the structure of the settlement	1. Familiarization with the task of the course project. 2. Familiarization with the design features of buildings with a sports and recreation function. 3. Acquaintance with the requirements for selecting a plot for design. Approval of the design site. 4. Preparation of surveying for work, scaling, adjustment	4
Individual work 1 Analysis of prototypes	1. Analysis of the compositional and functional structure of modern building projects with a sports and recreational function. 2. Determination of the basic principles of designing such objects	5
Topic 2 Analysis urban planning and architectural and artistic conditions of the project area	1. Analysis of the landscape and compositional planning situation. 2. Analysis of the functional organization of the design area. 3. Analysis of transport accessibility to the design object	4

Continuation of table 1.2

1	2	3
Individual work 2 Work on analytical schemes	1. Implementation analytical schemes, work on their graphic presentation	5
Topic 3 Development of a functional block diagram of the building	1. Acquaintance with mandatory and additional blocks of premises in buildings with a sports and recreation function. 2. Discussion of the logic of building connections between them and the composition of the premises of each block. 3. Principles of building connections of functional areas of the master plan with the internal structure of the blocks	4
Individual work 3 Preparation of the basis for further design	1. Development of a 3D relief model in software. 2. Determination of the possibility of organizing the selected functions on the given terrain	5
Topic 4 Inventing of the idea of a functional planning solution of the master plan	1. Study of the specifics of placement of each of the zones of the master plan. 2. Consideration of analogues and examples of master plan zoning and submission of functional zoning schemes. 3. Search for harmonious placement and combination of functional zones with different types of activity and noise load. 4. Formation of the idea of primary and secondary connections between zones	4
Individual work 4 Analysis of norms for planning sports grounds for various sports	1. Selection of the nomenclature of sports grounds. 2. Studying their sizes and arrangement norms	5
Topic 5 Master plan sketching and spatial solution of the building	1. Study of regulatory requirements for the master plan of the building. Performing zone area calculations. 2. Placement of all components of the master plan according to the urban planning situation. 3. The search for a preliminary idea of the location and form of the future complex according to the conditions of accessibility, insolation and a harmonious functional combination of spaces. 4. Sketching of the spatial three-dimensional solution of the complex	4
Individual work 5	1. Graphic design of the sketch of the master plan of the complex	5

Continuation of table 1.2

1	2	3
Content module 2 Functional planning, constructive and compositional solution of the object		
Topic 6 Design of the master plan in accordance to current norms and urban planning conditions	1. Repetition of the rules for drawing up master plans. 2. Drafting in M 1:500. 3. Detailing of the master plan. 4. Checking the drawing	4
Individual work 6 Adjustment of the master plan	1. Selection of analogues of the design of the graphic presentation of the master plan. 2. Completion of the design of the drawing and accompanying tables to it	5
Topic 7 Sketching of plans of the building	1. Acquaintance with building design standards. 2. Calculation of the standard area of premises. 3. Finding the most suitable building configuration according to all regulatory constraints and the logic of the master plan	8
Individual work 7 Completion of the sketching of building plans	1. Finalization of sketches of building plans. 2. Checking the placement of blocks and premises on the terrain. 3. Verification of the idea of the plan in the form of a simple block 3D modeling on the issue of building the composition of facades and the flow of external and internal spaces	10
Topic 8 Selection of the constructive solution of the building	1. Acquaintance with various types of constructive solution of buildings with a sports and recreation function. 2. Selection of the structural system and the pitch of the columns according to the sketch of the plans. 3. Adjustment of plans according to selected structures. 4. Rules for displaying structural elements on plans	4
Individual work 8 3D modelling of the structural system of the building	1. 3D modeling of the structural system of the building in software without external decoration. 2. Development of complex structural units	5
Topic 9 Finalization of the external image of the building	1. Sketching of building facades from different points of view and approaches. 2. Selection of color solutions, materials and decoration of the building	4
Individual work 9 Adjustment of plans according to sketches of facade solutions	1. Update of plans according to adjustments of facade solutions. 2. Development of the main external spaces of the building to form a harmonious "indoor-outdoor" transition	5

Continuation of table 1.2

1	2	3
Content module 3		
Development of spatial and planning solution of the building with a sports and recreation function		
Topic 10 Graphic design of drawings	<ol style="list-style-type: none"> Preparation of preliminary scale drawings of the building: plans of all floors, sections, facades. Checking the correctness of the display of structures on the drawings. Correction of mistakes 	4
Individual work 10 Graphic design of drawings	<ol style="list-style-type: none"> Graphic design of drawings in software 	5
Topic 11 3D modeling of the building and the external environment	<ol style="list-style-type: none"> Finalization of the 3D model of the building in the software. Preparation of the object for visualization. Finalization of facades 	8
Individual work 11 Completion of work on the building model	<ol style="list-style-type: none"> Completing the building model in the software 	10
Topic 12 Calculation of technical and economic indicators	<ol style="list-style-type: none"> Calculation of technical and economic indicators of the building. Calculation of the balance of the territory. Drawing up conventional markings and explanations for drawings. Studying the requirements for the explanatory note to the project 	4
Individual work 12 Work with tables	<ol style="list-style-type: none"> Drawing up calculation tables and drawings on sheets. Work on an explanatory note, design of a text document 	5
Topic 13 Completion of work on the project	<ol style="list-style-type: none"> Placement of all drawings, tables, information and images on sheets 	4
Individual work 13 Design of the album	<ol style="list-style-type: none"> Grouping of all drawings into a single album 	5

Examples of works are given in Appendix A

2.2 Methodical recommendations for implementation practical and individual works

Topic 1 The basic principles of placing a sports and recreation building in the structure of the settlement

Sports and recreation facilities are specially created and equipped indoor or outdoor facilities, which are intended for physical culture and sports, provide other recreation services and meet the requirements of master and special safety of participants and spectators. They are classified according to their functional purpose,

depending on the types of sports and leisure activities, as well as according to the nature of use:

- educational and training;
- sports and demonstration;
- sports and entertainment;
- physical culture and recreation.

They can be cooperated with cultural and performing arts and educational institutions.

Sports and recreational buildings consist of complexes and groups according to their functional purpose:

- the main ones, intended directly for sports and physical culture and recreation activities;
- auxiliary, intended for persons involved, coaches and judges, as well as medical, service-administrative, warehouse, etc.;
- complex for spectators.

There are two types of sports facilities: indoor and outdoor. Indoor sports facilities are facilities in which training sessions and competitions are held in indoor halls, arenas, swimming pools, sports palaces, etc. Open sports facilities are facilities in which training sessions and competitions are not held indoors, and in the fresh air. There are also buildings of mixed type. In the project, an indoor complex is being developed, but the territory may also accommodate additional open structures for the maintenance of outdoor sports grounds.

In the structure of the settlement and city, objects with a sports and recreation function play the role of a public center, are a center of attraction, and a compositional center. Such objects should be located in recreation areas, on other specially allocated plots of land, provided with a good in accordance with DBN B.2.2.12-2019 with mandatory compliance with normative noise regime on the adjacent territory of residential buildings and provision of sanitary gaps to residential and public buildings. It is advisable to place such objects next to unique landscape objects: reservoirs, slopes, forests. This location allows creating sufficient conditions for sports and recovery not only inside the facility, but also on its territory. Buildings with a sports and recreation function have a large size and an expressive shape, which is due to the large internal spaces of sports halls. Therefore, such a building is a decoration of any settlement or city district. The idea of building development is formed according to the principle depicted in Figure 2.1.

Task: according to the result of the received information, students should choose a suitable site for a building with a sports and recreation function in the structure of the settlement project or in urban conditions. The size of the plot should be 2–2.5 hectares. The site is discussed and evaluated for feasibility and the

possibility of construction. After approval, the student receives a 1:500 or 1:1000 (1:2 000) topogeodetic survey from the supervisor and prepares it for work: places it in the software at the correct scale, cuts, glues, applies new buildings and boundaries of the design area. Also, the student should choose the direction of the building by sports, find information about such complexes (Fig. 2.2).

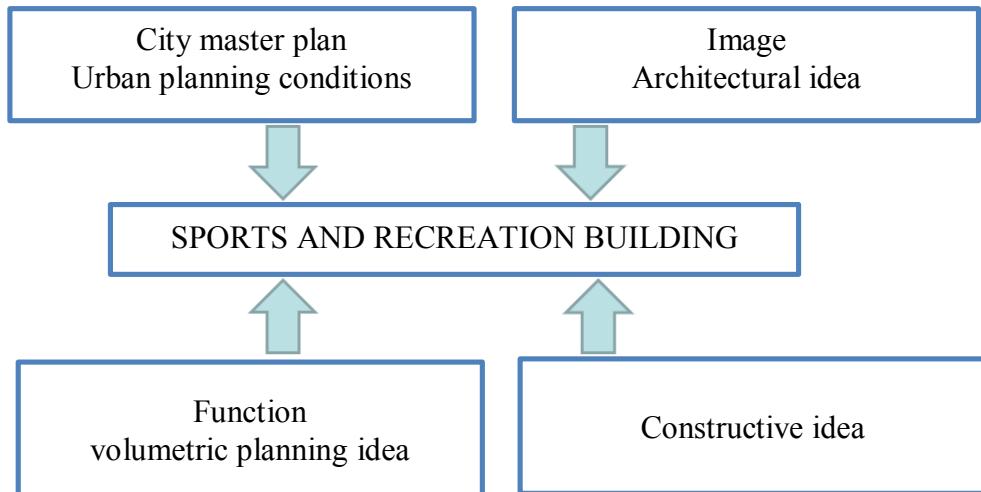


Figure 2.1 – Scheme of the formation of the idea of a building with a sports and recreation function

Individual work 1 Analysis of prototypes

It is necessary to select and analyze 2–3 examples of modern buildings with a sports and recreation function. The analysis can be developed in the form of a presentation or placed on A3 sheets. For each example, it is necessary to find and analyze the master plan of the object (its functional zoning, composite structure), plans with explanations, sections and images of the exterior and interiors, information about the structural system of the building. Each of the analogues is discussed with teachers and students.

Topic 2 Analysis urban planning and architectural and artistic conditions of the project area

The first step in designing a building with a sports and recreation function is to collect data on the existing state of the design area and its surroundings. A detailed analysis of the area makes it possible to answer the question: which project proposals are possible and appropriate, as well as how many of these ideas can be implemented.

The analysis of the area takes place in the following directions:

- “*Analysis of the landscape situation*” reveals the natural features of the territory, the shape of the relief. Horizontal lines, edges, soles of slopes, thalwegs, watersheds, existing reservoirs and greening areas are applied to the scheme;
- “*Compositional analysis*” reveals the relationship between the elements

of the settlement, the main spatial and compositional axes and nodes. The axes of streets, natural elements, significant buildings, composite nodes formed at the intersection of these axes, socially important structures, as nodes of attraction: sacred buildings, educational, administrative institutions, etc., are applied to the scheme. Axes and composite nodes should be ranked depending on their status: the intersection of more significant axes will form a more significant composite node;

– “*Functional analysis*” plots provide information on the location of functional areas and buildings on the master plan;

– “*Transport analysis*” helps to determine the main flows of recreationists who use public, personal transport or visit the facility on foot. Depending on the category of roads, the placement of public transport stops (their number) near the object, it is possible to determine the entrance zones, the development and structure of the complex, the possible placement of service roads, parking lots, etc.

Task: students should develop analytical schemes, highlight graphically all the necessary elements, form notations. To implement schemes, not only the territory of the object itself is analyzed, but also the area around it (+200-300 meters from all sides of the design territory). First of all, the boundaries of the design object are drawn on the scheme. The scale of the scheme does not matter. Sometimes, for plots with a simple structure, schemes can be combined. According to the results of the analysis, the student must draw conclusions about the positive and negative features of the design area, make the first considerations regarding his project.

Individual work 2 Work on analytical schemes

It is necessary to analyze the trends in the graphical representation of analytical schemes and complete their execution in a graphically expressive form, draw up notations, and place the images on A3 sheets.

Topic 3 Development of a functional block diagram of the building

Modern sports and recreation buildings represent a complex developed volumetric and spatial structure, which should ensure both optimal functional and technological qualities, as well as architectural and artistic expressiveness of the ensemble. The volumetric and spatial organization of public buildings is determined by functional and compositional structures. Before starting the design, it is important to understand what functional blocks the building will consist of and how to organize them in space.

A functional block diagram is a representation of all premises of the building in the form of grouped blocks connected to each other by the shortest connections (Fig. 2.2). When developing the scheme, the number of floors of the building is not taken into account, and all blocks of premises are depicted in one plane. The

development of a block diagram helps the student to record all the functions and premises that will be designed in the future building, to understand the need to group them into blocks, that is, to place them together, to understand the size and hierarchy of the blocks, to determine the logic of their placement and the combination of different blocks with each other, to predict future directions movements for different groups of people: athletes, spectators (provided tournaments and competitions are held) and administrative workers.

The building with a sports and recreation function consists of the following main blocks: a hall group, sports facilities, lock rooms, administrative facilities, a medical block, utility and technical facilities. Also, students may use additional blocks: spa, public catering, children's areas, etc.

The internal blocks of the building must be connected to the zones of the master plan. So, the entrance "hall" group should be located next to the entrance square, and that, in turn, with the transport stops and the parking lot; sports blocks must have access to open sports grounds; it is necessary to organize access to utility and storage premises. It follows that internal and external structures are inextricably linked and should be planned simultaneously.

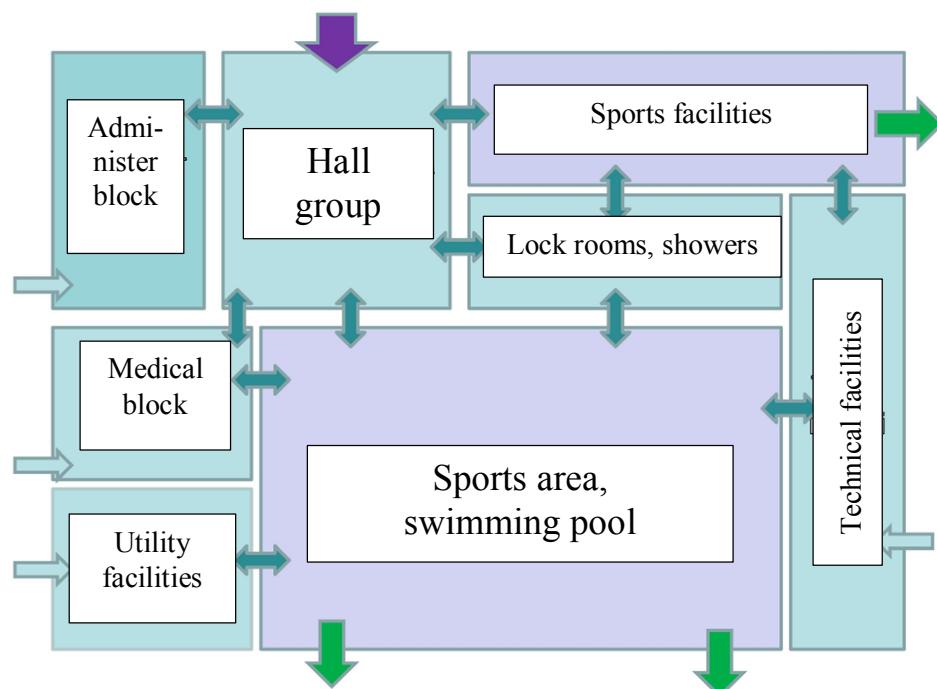


Figure 2.2 – Example of a functional block diagram
sports and recreation complex

Task: develop a functional block diagram of the future building and form logical connections between the blocks. Determine the composition of the premises of each block. Blocks of internal premises should be connected with zones of the master plan. After the development, the student must present their work for discussion.

Individual work 3 Preparation of the basis for further design

Students need to develop a 3D relief model of the design area in the software and think over a possible spatial composition of placing functional blocks on it.

Topic 4 Creating an idea of a functional planning solution of the master plan

Before developing a sketch of the master plan of a building with a sports and recreation function, it is necessary to decide on the zoning of the territory. The territory should include the following zones:

- 1) entrance area;
- 2) building zone;
- 3) parking area;
- 4) zone of open sports grounds;
- 5) recreation area;
- 6) household (utility) area.

The entrance area always gravitates towards the main traffic routes, is located next to the main street and public transport stops. There is a parking area not far from the entrance square. When placing it, it is necessary to take into account the convenience of organizing entrances in accordance with urban planning norms. Parking lot for disable people must be located no further than 40 m from the entrance to the building and have a convenient connection with it.

To place the zone of open sports grounds, it is necessary to choose areas with the smallest slope and with the possibility of correct orientation of the grounds according to the cardinal directions (N.–S.).

The utility yard should be located isolated from sports and recreation facilities, have an entrance to the territory of the main building and a separate external exit.

Driveways and footpaths should be provided to all structures located on the land plot of indoor structures and sports complexes. Driveways must have capital surface. The width of the paths of movement of spectators on the territory of the sports facility should be taken at the rate of 1 m per 500 spectators.

Individual work 4 Analysis of norms for planning sports grounds for various sports

Students need to select and compile into a text document information about open sports grounds that are wanted to use in their project. It is necessary to add plans with the dimensions on them. It is also necessary to write out from DBN V.2.2-13-2003 “Sports and recreation facilities” requirements for the placement and construction of sports grounds, the use of materials, coatings, and equipment.

Topic 5 Sketching of the master plan and spatial solution of the building

The sketch of the master plan of the building is made in M 1:200 with drawing and detailed processing of all elements of the design area. When sketching, it is necessary to present the future compositional idea of the complex: dominant, guiding elements, connecting spaces. The actual dimensions of spaces, buildings, and sites are taken into account in the sketch, and a clear functional logic of their placement is created.

Buildings of sports halls and indoor swimming pools should be placed with a setback from the red building line of at least 6 m, provided that the windows of the sports halls are placed on the side of the courtyard facade or the building of the sports facility is separated from the street by a strip of green plantings at least 4 m wide.

Areas of sports pools must be protected from adverse winds, dust, harmful industrial and transport emissions, well insulated and ventilated. Open baths and playgrounds must be at least 15 m away from the red building line and at a distance of 50 m from the boundary of residential buildings.

Along the perimeter of the site, strips of green vegetation with a width of at least 3 m should be provided. The total area of greening of the open pool area should be at least 35 % of the area of the land plot.

Near the entrances for spectators to the indoor sports facilities, free areas should be provided at the rate of 0,3 m per one spectator per this entrance.

In front of the entrances to the tribunes of open sports facilities, free spaces of 0,5 m should be provided² per viewer per this entry.

The land plot of the sports and recreation facility must have at least two entrances (including the utility one) and two exits. The paths of movement of persons practicing from the outdoor playgrounds to the classes should not intersect with the paths of movement of spectators. Between open sports facilities and stands, a bypass track with a width of at least 1,5 m or a bypass track with a width of at least 3,5 m should be provided.

The total greening area of the land plot of the sports building, including the nursery for growing turf, lawn coverings of fields and playgrounds, wind, dust protection and other planting strips, should be at least 30 % of the land plot area.

The calculation of the number of car spaces is determined according to DBN B.2.2.12-2019.

The master plan should be developed taking into account the idea of the internal structure of the building (location of the main blocks). In parallel with the sketch of the master plan, it is worth making graphic sketches of the future complex from long and short perspectives, the main points of movement of visitors in order to check the correctness of the idea of the master plan.

Individual work 5 Graphic design of the sketch of the master plan the complex

The student needs to choose an interesting graphic presentation and finalize a sketch of the master plan for his future presentation. Think over landscaping of the design area, types of paving, decorative elements to emphasize the future building and make the design area interesting and attractive.

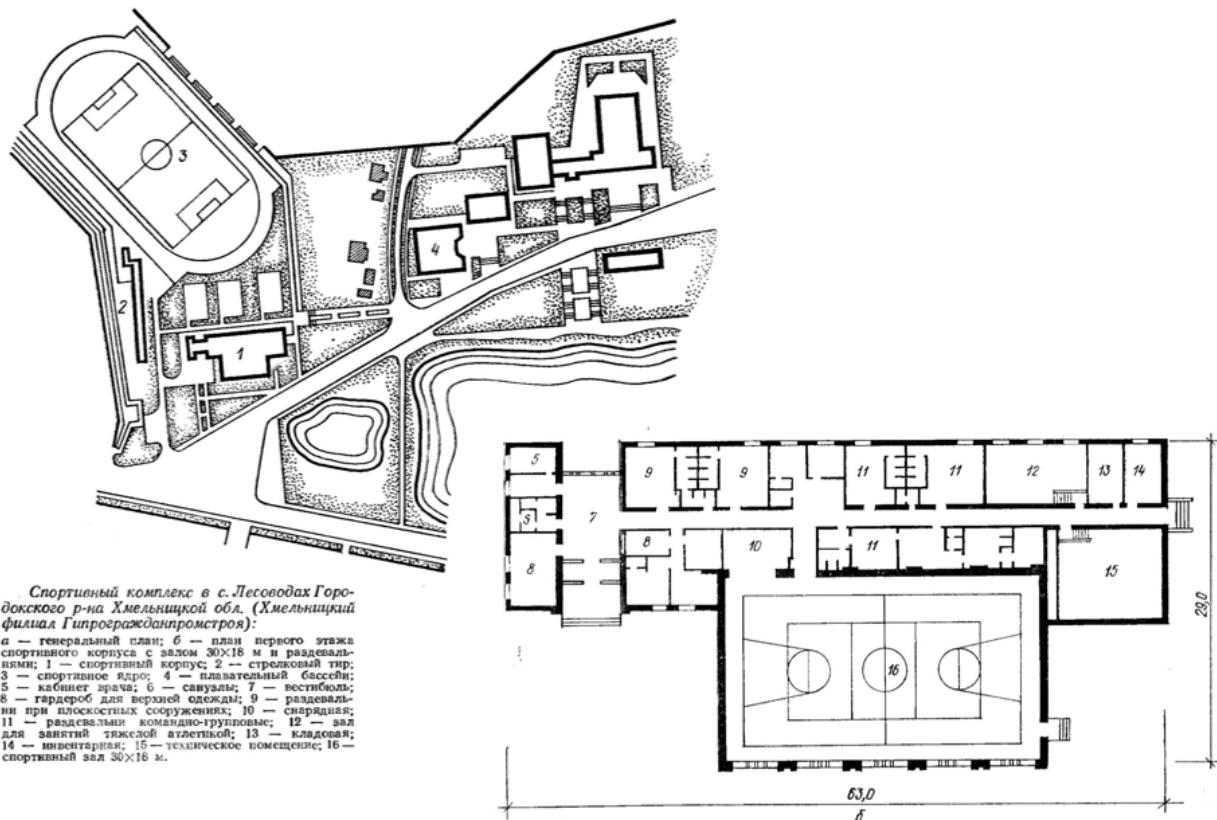


Figure 2.3 – Master plan and plan of the main building with a sports and recreation function in the settlement. Foresters of Khmelnytskyi region

Topic 6 Design of the master plan taking into account current norms and urban planning conditions

After the execution of the sketch of the master plan, it goes through the stage of discussion, checking for compliance with urban planning norms, finalizing and correcting the identified problematic points.

When drawing the master plan, it should be remembered that the main graphic element of the drawing is a line of different thickness and fill. Drawings must be made according to the recommendations of DSTU B A.2.4-7:2009 "Rules for execution of architectural and construction working drawings". It is worth using a semi-transparent fill of paving and lawns and displaying the topographical survey on the lower layer. The level of detail of the master plan should correspond to its scale.

Individual work 6 Adjustment of the master plan

To form an expressive graphic presentation of the master plan, it is necessary to analyze existing projects and color trends. According to the conducted research, finalize the drawing of the master plan and prepare it for design on the letter.

Topic 7 Sketching of plans of the building

An architectural sketch is a form of creative search for a design idea, from which the design process begins, a way of improving the architect's creative idea, which predicts the master features of the shape of the future building or structure. At this stage, the block diagram and the conceptual idea of the building should be combined in the drawing of the building plan. When sketching, it is necessary to take into account the norms of DBN V.2.2-13-2003 Sports and recreation buildings. The sketch is made in M 1:200, 1:100 depending on the size of the building.

It is recommended to design sports-demonstration and sports-spectacle buildings universally with a transformable arena for alternately holding competitions in several sports or several types of cultural-spectacle or public events. The rest of the sports buildings, intended mainly for educational and training classes, should be provided for one sport or a group of sports that do not require time-consuming transformation of sports equipment.

In sports buildings the movement paths of those who exercise (in sports clothes) from the changing rooms to the places of exercise should not intersect with the movement paths of spectators.

In small settlements and in rural areas, it is allowed to provide universal halls measuring 24×12 m, 6 m high and 30×15 m high, 8 m high and with a capacity of 25 and 40 people per shift, respectively, for public sports classes alternating with physical education lessons for schoolchildren.

For sports swimming, swimming pools are built with the size of the bowl: $50 \text{ m} \times 25 \text{ m}$, $25 \text{ m} \times 16/11/8,5 \text{ m}$. The width of the swimming lane is assumed to be 2,5 m. Free water strips up to 0,5 m. Around the perimeter of the baths, a detour with a width of at least 1,5 m in indoor and at least 2 m in open baths should be provided.

For other sports halls, the area norms and capacity are calculated according to table 2.1.

Task: Clause “Architectural and planning solution of a sports and recreation building”.

Representation of the volume-spatial, planning structure of the public complex, which is designed in the form of two-dimensional projections: plans, facades, sections, three-dimensional perspective models can be added.

Content graphic composition of the task: sketches of plans, facades, sections are made on paper in M 1:100 (M 1:200).

Table 2.1 – Size standards and capacity of sports facilities

Sport type	Sports area size			Capacity	
	length	width	Hight to constructions	during training	during competitions
1	2	3	4	5	6
Acrobatics	36	18	6	32	75
Badminton	16	9	8	8	8
Basketball	38	26	9	24	48
Volleyball	36	18	9	24	48
Handball	42	24	6	24	48
Boxing	18	12	4	17	20
Greco-Roman wrestling	30	15	4	30	20 (each mat)
Judo	24	15	4	30	20 (each mat)
Sports Gymnastics	30	18	6	50	75
Gymnastics	21	15	8	10	50
Tennis	36	18	10	12	8
Table tennis	15	9	4	4 (each table)	4 couples on each table
Weightlifting	18	9	4	16	40
Fencing	24	15	4	18	10 (yach pass)
Soccer	96	48	15	60	64
Figure Skating	66	36	6	50	50
Hockey	66	36	6	50	92

Table 2.2 – Norms of premises for physical culture and recreation classes

Classes type	Size (m)			Capacity
	length	width	Hight to constructions	
1	2	3	4	5
Group classes on general physical training	24	12	4	35
	18	12	6	26
		9	4,8	20
Rhythmic gymnastics, choreography	12	12	3,9	25
	9	9		15
Table tennis	6	4	2,7	4
Fighting elements	12	9	3,9	10
Gym	4 m on each equipment, but not less 20 m			1 on each equipment

Table 2.3 – Norms for calculating the area of auxiliary premises

Rooms	Area, m ²
1. Lobby: a) for those who are engaged; b) for the audience	0,5 m ² /1 os. Ale not less than 20m ² 0,25 m ² for one place for spectators
2. Outerwear wardrobe: a) for those who are engaged; b) for the audience	0,1 per place, but not less than 10
3. Cashiers	2,5 per booth
4. Places for changing clothes in locker rooms for those who exercise (benches and aisles)	1,0 – per seat for more than 50 seats in one room; 1,2 – for the number of seats from 30 to 50
5. Lock rooms for engaged	0,18 per one two-tier closed cabinet measuring $0,6 \times 0,3$ m
6. Premises for recreation of persons who are engaged in	1,5 per seat, but not less than 18 is calculated on 10–20 % of people
7. Premises for medical services: a) doctor's office; b) expectant; c) nurse's room (procedural room)	14 10 12
8. Rooms for workers (male and female)	1,5 per place, but at least 10 per room (50 % of places from the state)
9. Rooms for instructors and coaches	2,5 for one place (1,8 for the number of places in the room more than 10), but not less than 10 per 1 room
10. Service premises: a) director's office; b) reception room; c) deputy director; d) others	12 12 10 10
11. Water analysis laboratories	10
12. Premises for equipment for cleaning.	4 per 1 000 m ² cleaning area

Individual work 7 Completing the sketching of building plans

Topic 8 Selection of the constructive solution of the building

When covering large sports halls, it is advisable to use a frame system and roof trusses. With this solution, it will be convenient to arrange large glass areas for lighting the room, it requires much less materials. Also, the columns always look distinct on the facade of the building, creating the articulation of the form. Currently, trusses of various profiles can be used to cover the roof, which makes it possible to develop an interesting idea for the roof and the entire complex. It should be

remembered that any structural element can be an expressive design element (Fig. 2.4).

The essence of the spatial and tectonic idea of a sports and recreation building consists in combining two factors: the main idea or theme of the composition and the aesthetic appearance of building structures, and consists in the correspondence of the choice of structural structure and building materials to the figurative compositionally and functionally conditioned structure of the complex. So, first the main and secondary forms are revealed. The main thing in the architectural composition is determined by the content of the architectural structure, that is, its social purpose, a set of functional and ideological requirements. Secondary – everything that complements and serves the main purpose, emphasizing and strengthening its meaning. The constructive solution is based on combining the sketch idea with functional requirements.

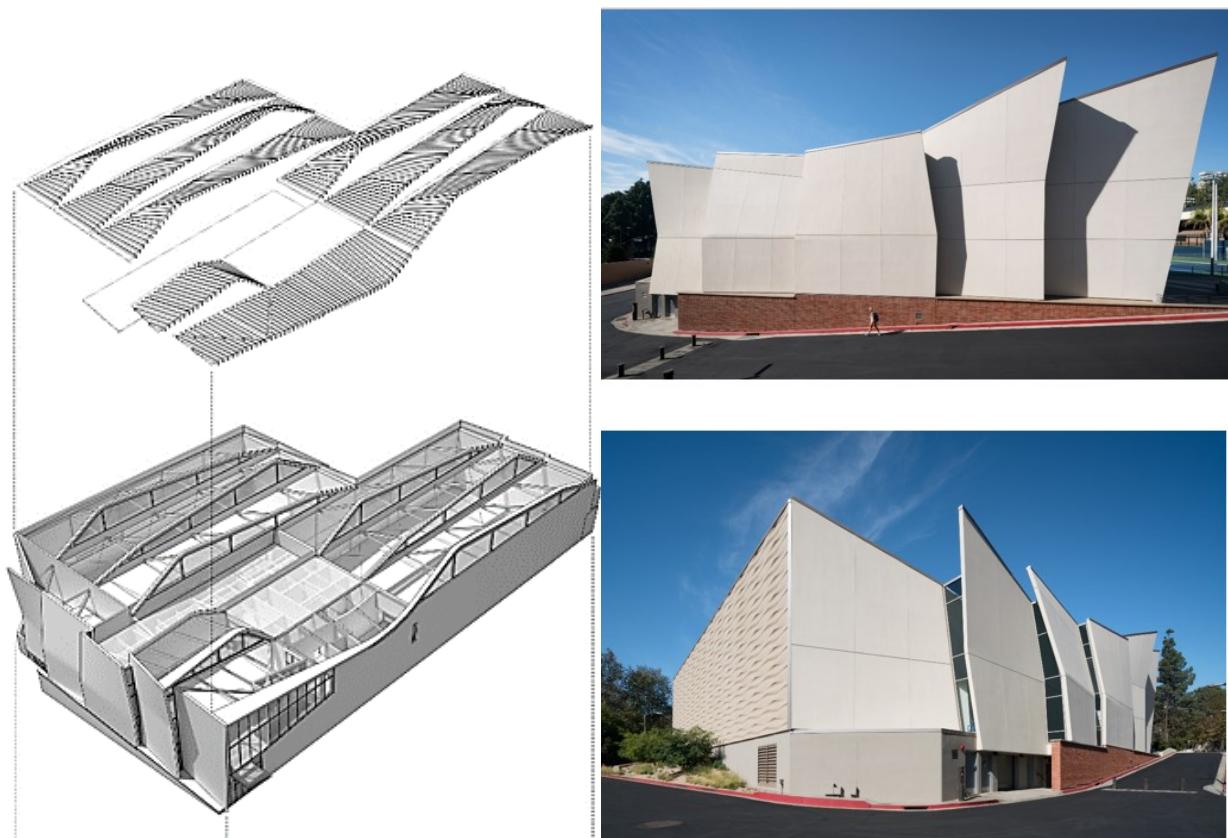


Figure 2.4 – The principle of influence of the design solution on the master image of the building.
Mo Austin Basketball Center, California

Task: clause “Constructive solution of a sports and recreation building”.

The goal is to invent a constructive solution for the structure of the sports and recreation building according to the tectonic idea.

The task is to reveal a tectonic idea. Find options for a constructive solution to the spatial structure of the sports and recreation complex according to constructions

and building materials. To create an architectural image of the building, which through the compositional and artistic expression of tectonics receives the necessary large-scale divisions, defined artistic appearance and proportions.

The meaningful graphic composition of the task: a perspective three-dimensional sketch of the tectonic structure of the complex, made on paper in any technique of the student's free choice.

Individual work 8 3D modelling of the structural system of the building

It is necessary to develop in the software a model of the structural system of the building with all its components: load-bearing structures and types of ceilings, foundation. Place a 3D image of the structural system on a sheet of A3 format.

Topic 9 Finalization of the external image of the building

After selecting the structural system and tectonic expressiveness of the building, it is necessary to select smaller design elements of walls, window openings, shade canopies, etc. A harmonious combination of colors and materials has a great influence.

In the selection of colors and shades, it is necessary to take into account some recommendations:

- 1) use no more than three;
- 2) first choose the main one, then choose two connected to it;
- 3) the main color should occupy 75% of the facade, additional – about 20 %, and 5 % is recommended to be used for color accents, bright elements.

Unlike a residential or administrative building, a sports complex should express the idea of activity and movement. Therefore, bright dynamic color combinations are often chosen for its facades. Additional attractiveness is added by dynamic facades developed with the help of shells, or various types of wall panels, which are only an enclosing structure.

It is also better to use the rule of three when choosing materials and forms of windows. The materials must have a common origin. It is better to choose materials specific to the design area. This creates a connection between the building and the environment.

The facades should maintain a balance of vertical and horizontal forms, and the facade itself should be designed taking into account the harmony of the composition of form, color, and light.

Individual work 9 Adjustment of plans according to sketches of facade solutions

After working out the facades, it is necessary to finalize the building model and plans. Each decorative element will appear in sections, or will be depicted as an outline. At this stage, the final axis grids are drawn on the plans, and the premises with equipment are detailed.

Topic 10 Graphic design of drawings

At this stage, students need to detail and work out all the drawings of the building according to the requirements for their image. In addition to plans, students develop section drawings showing all supporting structures and materials and facades. On facades, much attention is paid to their visual image. Either a purely graphic presentation is chosen, when materials are replaced by color and hatching, or a more naturalistic one, when future coatings are depicted on the facades in the same form as in the model.

Individual work 10 Graphic design of drawings

After checking the drawings, students should refine them, eliminate all comments, and place the final version on suitable sized sheets with a frame and stamp.

Topic 11 3D modeling of the building and the external environment

3D modeling is a means of displaying the future object in three-dimensional form from different angles. When designing, special attention is paid to modeling, as it is the main presentation tool. Images of the building are often posted on banners, placed in advertisements, etc. Modeling is performed in any program convenient for the student: ArchiCad, 3DMax, SketchUP, etc. During modeling, elements need to be assigned different materials for further rendering. Visualization of the object can be done directly in the program, or you can use other software designed specifically for this.

Individual work 11 Completion of work on the building model

In addition to the model of the building, it is worth studying its external environment in detail: the territory of the complex, the nearest highways, the first line of construction. Urban buildings can only be drawn in the form of blocks, but their size must match the real one. This gives a feeling of exactly the space and frame that we will contemplate after the implementation of the project. It is also necessary to take into account the real lighting of the building and choose winning frames for its image.

When developing images, it is always important to show buildings from the street from the side of the main facade, the view of the entrance group, the view from the main squares and alleys, etc. You should not depict buildings from those sides where the flow of people is very small.

Topic 12 Calculation of technical and economic indicators

After completing the project, the student must complete the information tables for it. These include: calculation of technical and economic indicators of the building and balance of territories.

Table 2.4 – Technical and economic indicators

Number	Name	From the vim.
1	New construction	
2	Superficiality	
3	Degree of fire resistance	
4	Area of the site	him
5	Building area	m ²
6	Total area of the building	m ²
7	Building volume	m ³
8	Total number of employees	persons
9	The number of seats in public catering outlets (buffets)	places
10	Capacity of the building	persons/shift
13	Capacity of the gym	persons/shift
14	Number of seats	persons
16	Total number of cars in parking lots:	
	– for passenger vehicles;	mm
	– for buses	mm

Table 2.5 – Balance of territories

Name	Area (ha)	%
Territory within the project including:		100
– building;		
– hard surfaces of alleys and driveways;		
– lawns;		
– flower gardens;		
– water bodies		

The structure of the explanatory note

Introduction:

1 Analysis of the design territory

1.1 Landscape and compositional analysis of the territory.

1.2 Transport and functional analysis of the territory

2 The idea of a project solution

2.1 Structural structure of the sports and recreation building

2.2 Functional structure of the sports and recreation building

2.3 Composite solution of the anterior vestibular node as an intermediary

between external and internal structures

3 Technical and economic indicators references

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APPENDIX A

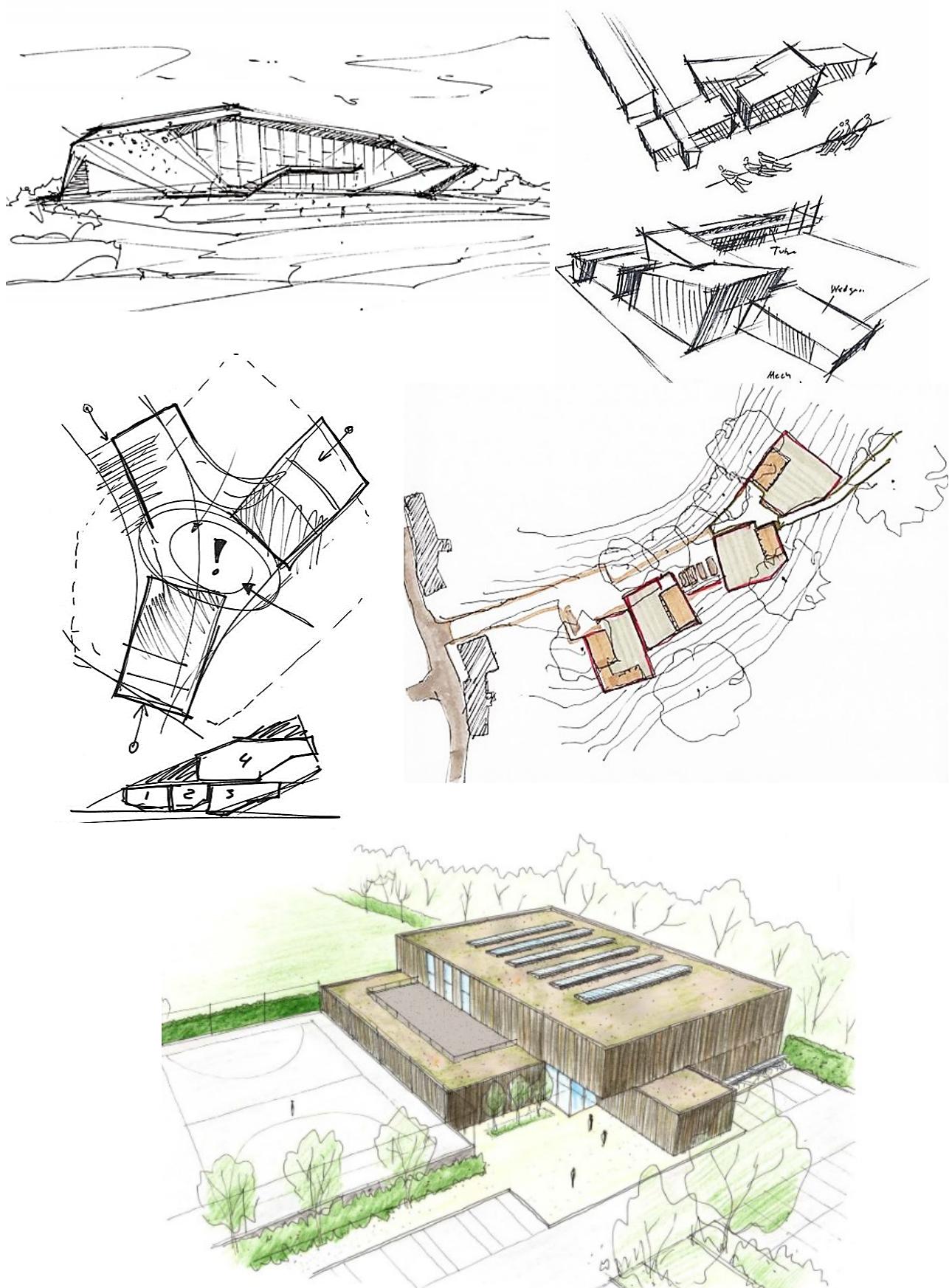


Figure A.1 – Search for a three-dimensional solution of the building with a sports and recreation function

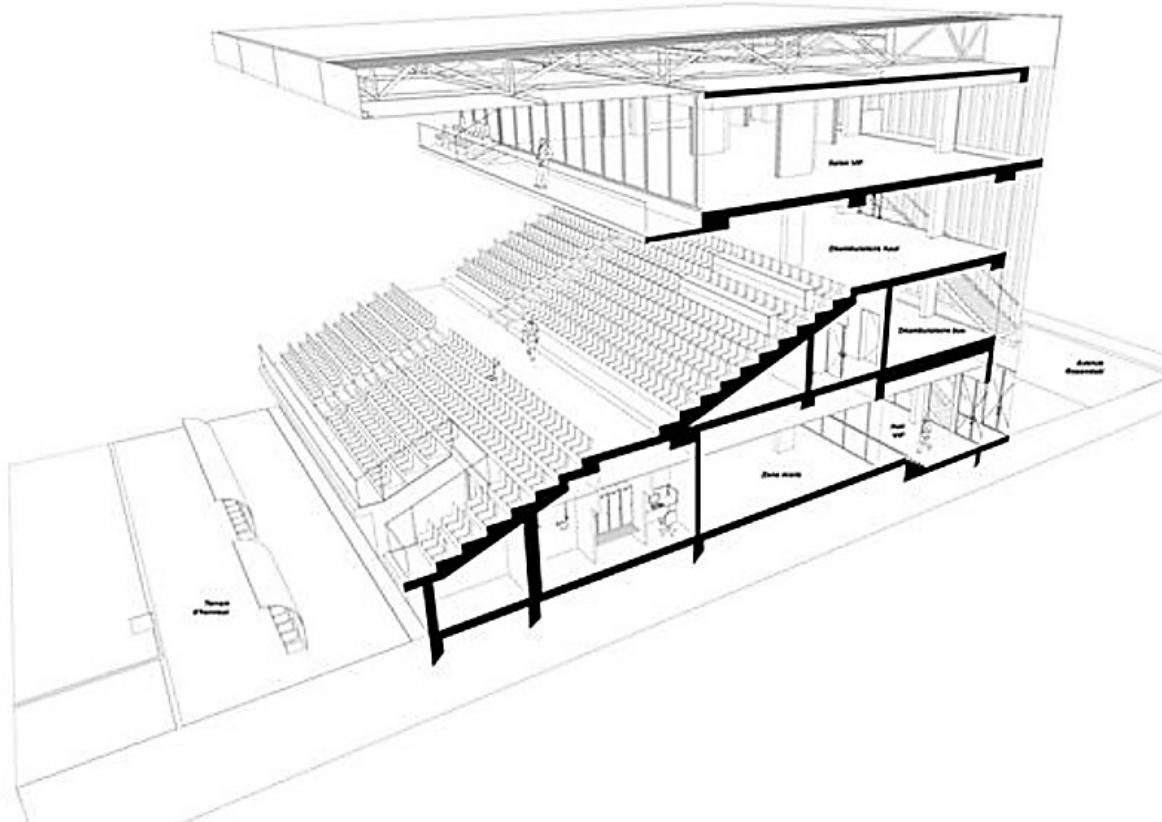


Figure A.2 – Use of the tribune space

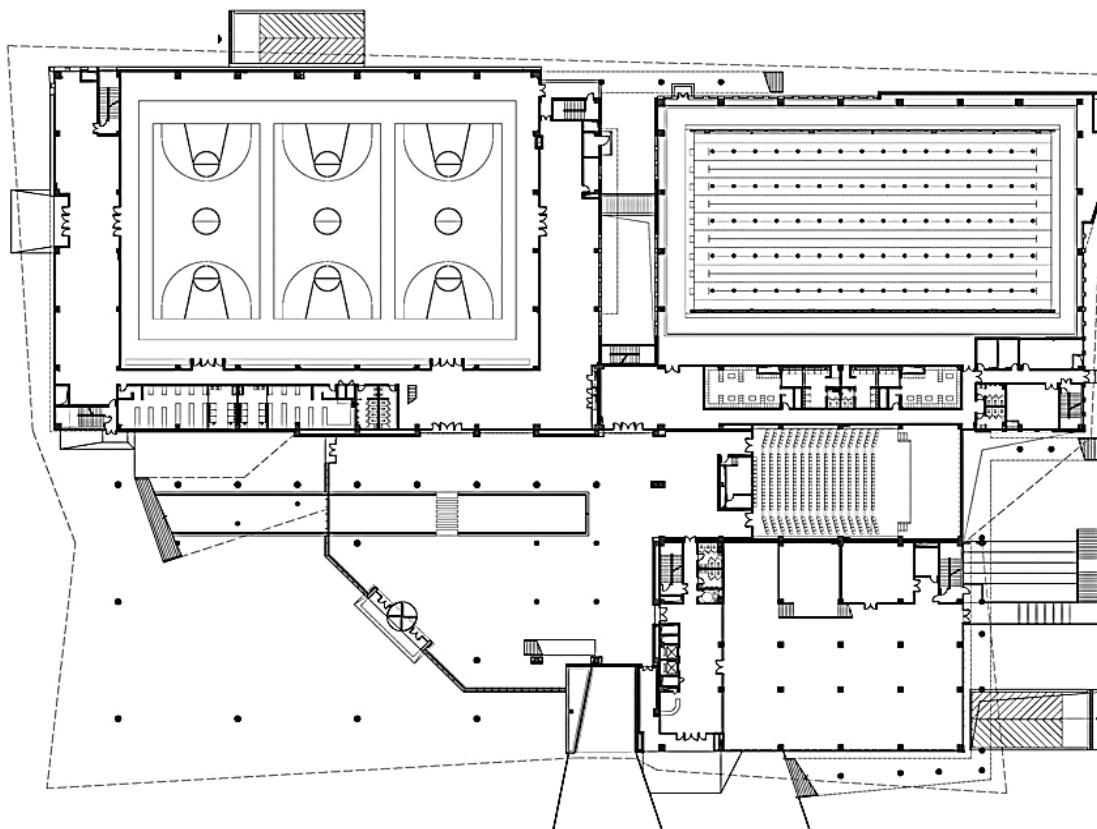


Figure A.3 – An example of combining several types of sports in a single sports complex

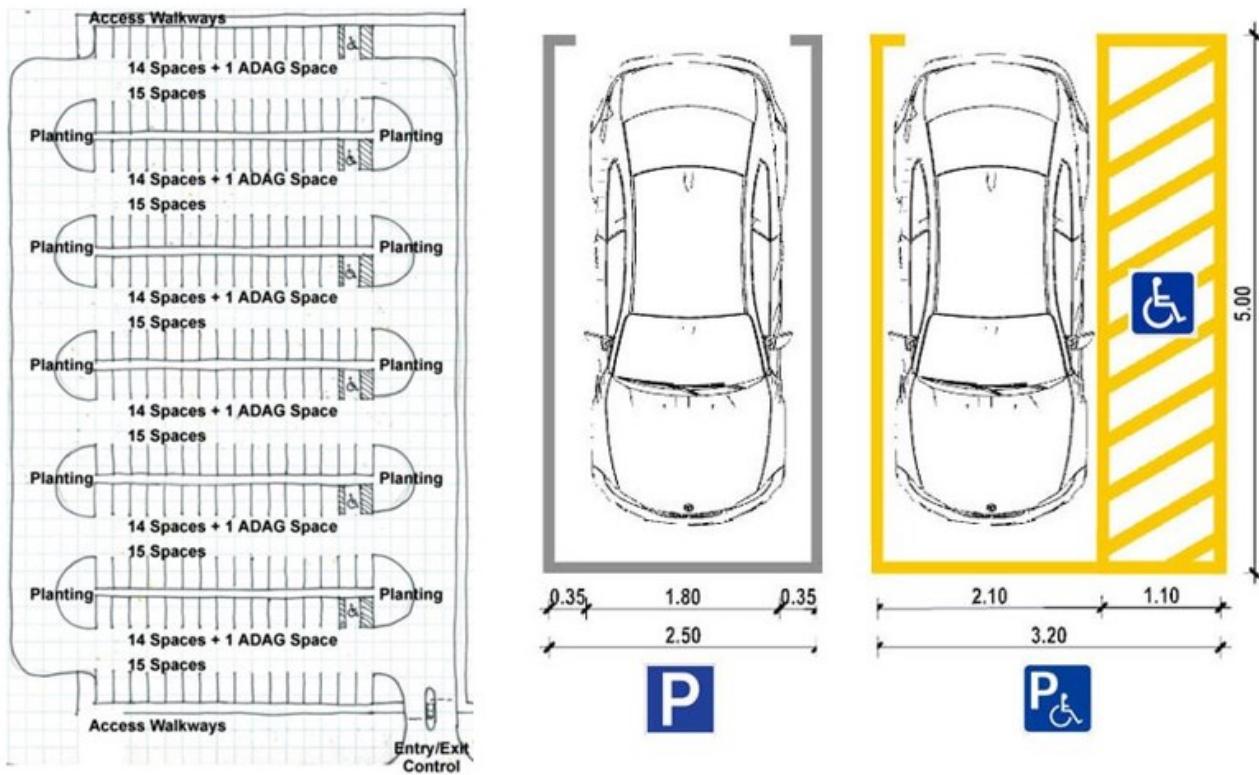


Figure A.4 – Example of the organization of parking lots

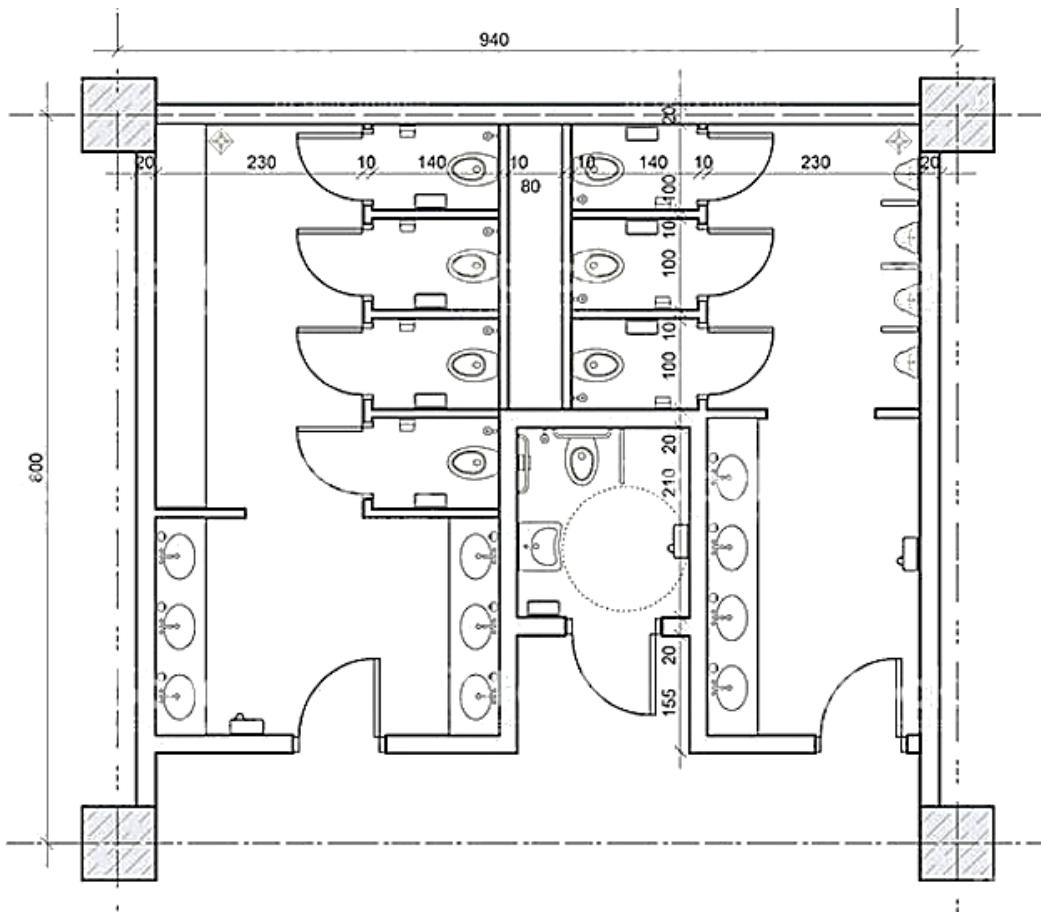


Figure A.5 – An example of the development of a block of bathrooms

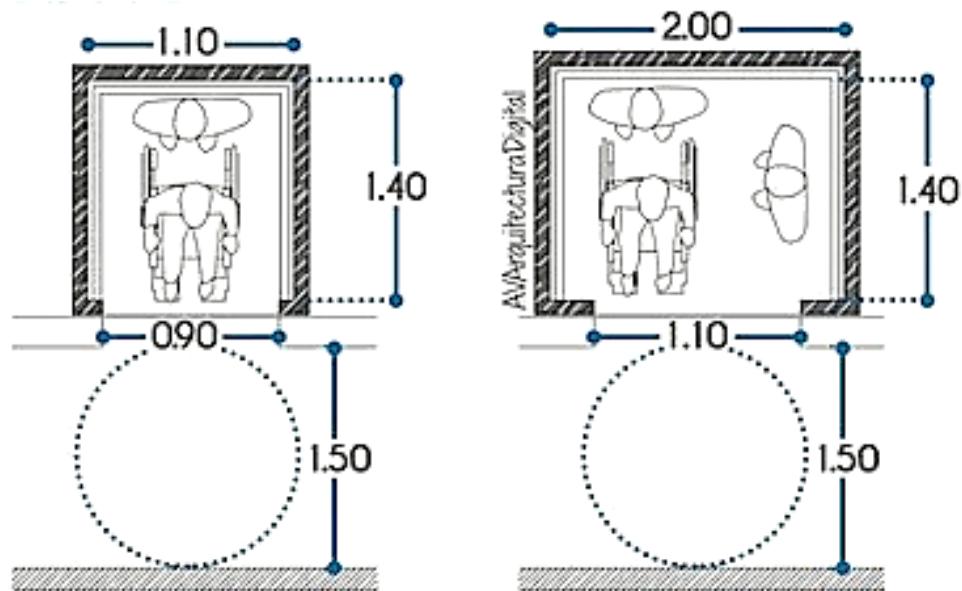


Figure A.6 – Design of elevator cabins

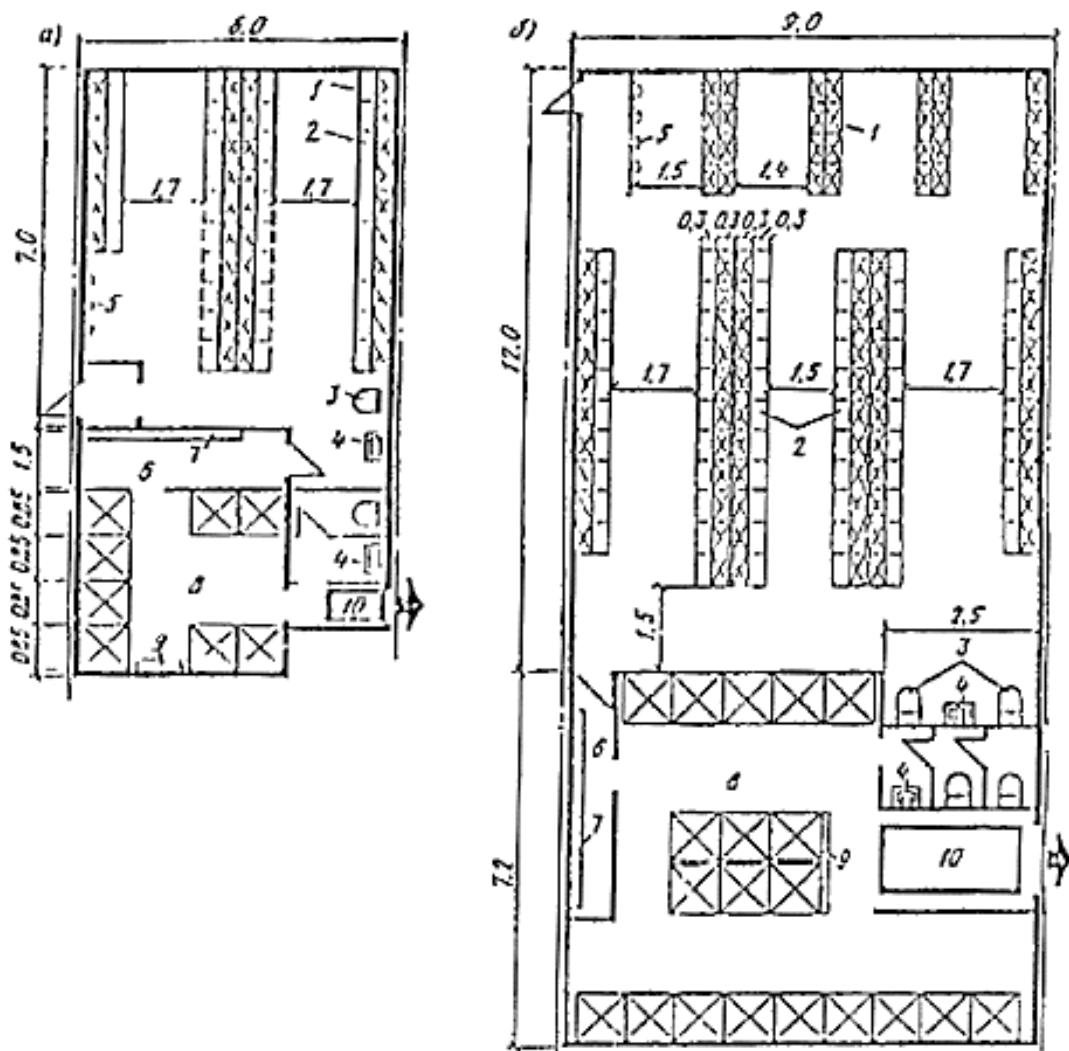


Figure A.7 – Principles of designing locker room blocks
and showers for the pool

Електронне навчальне видання

Методичні рекомендації
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з навчальної дисципліни

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*(для здобувачів первого (бакалаврського) рівня вищої освіти
денної форми навчання
спеціальності 191 – Архітектура та містобудування)*

(Англ. мовою)

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