

Ministry of Education and Science of Ukraine
National University "Yuri Kondratyuk Poltava Polytechnic"
Educational and Scientific Institute of Architecture, Construction and Land Management
Department of Architecture of Buildings and Design

EXHIBITION CENTRE IN POLTAVA

Explanatory note

to the qualification work for the higher education degree of "Bachelor"
in the specialty "Architecture and Urban Planning"

402-Ai 17022 EN

Developed by a student of group 402-Ai
___ of June 2021 _____ Ei Mzibri H.
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4. Chapters of related disciplines:

 4.1 Architectural structure

 4.2 Occupational safety

Reference

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Національний університет «Полтавська політехніка імені Юрія Кондратюка»
(повне найменування вищого навчального закладу)

Інститут Навчально-науковий інститут архітектури, будівництва та землеустрою
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Спеціальність 191 Архітектура та містобудування
(шифр і назва)

ЗАТВЕРДЖУЮ
Завідувач кафедри,
голова циклової комісії

Ніколаєнко В.А.
“ ” _____ 2021 року

З А В Д А Н Н Я **НА ДИПЛОМНИЙ ПРОЕКТ (РОБОТУ) СТУДЕНТУ**

Мзібрі Ель Хоссіне

(прізвище, ім'я, по батькові)

1. Тема проекту (роботи) Exhibition Centre in Poltava

керівник проекту (роботи) Шевченко Людмила Станіславівна, к.арх., доцент
(прізвище, ім'я, по батькові, науковий ступінь, вчене звання)

затверджені наказом вищого навчального закладу від “ ” _____ 2021 року № _____

2. Строк подання студентом проекту (роботи) _____

3. Вихідні дані до проекту (роботи):

- завдання на виконання дипломного проекту;
- опорні матеріали по ділянці проектування;
- фотофіксація існуючого стану території

4. Зміст розрахунково-пояснювальної записки (перелік питань, які потрібно розробити):

- передпроектні дослідження території;
- містобудівне вирішення (функціональне зонування території, організація транспортно-пішохідної мережі, вирішення генерального плану, техніко-економічні характеристики генплану);
- архітектурно-планувальне вирішення будівлі (функціонально-планувальне, архітектурно-композиційне, техніко-економічні характеристики будівлі);
- розділи суміжних дисциплін (архітектурні конструкції, охорона праці);
- список використаної літератури.

5. Перелік графічного матеріалу (з точним зазначенням обов'язкових креслень):

Ситуаційні схеми (міста, фрагменту міста, масштаб за узгодженням); опорний план ділянки забудови, М 1:500, 1:1000; генеральний план об'єкта проектування, М 1:500; план першого поверху будівлі М 1:100, 1:200; плани поверхів будівлі М 1:100, 1:200, 1:400; головний фасад будівлі М 1:100, 1:200; інші фасади будівлі М 1:200; два вертикальні розрізи будівлі М 1:100, 1:200; перспективи будівлі; 2-3 інтер'єри внутрішнього простору будівлі; 3-D вид на всю територію об'єкта проектування (вид з пташиного польоту).

6. Консультанти розділів проекту (роботи)

Розділ	Прізвище, ініціали та посада консультанта	Підпис, дата	
		завдання видав	завдання прийняв
Арх. конструкції	Руденко В. В., доцент кафедри будівництва та цивільної інженерії		
Охорона праці	Зима О. Є., доцент кафедри будівництва та цивільної інженерії		

7. Дата видачі завдання - 22.02.2021 р.

КАЛЕНДАРНИЙ ПЛАН

№ з/п	Назва контрольних етапів дипломного проекту	Строк виконання етапів проекту (роботи)	Примітка
1.	Збори дипломників, зустріч з керівниками дипломного проектування. Затвердження наказом по університету тем дипломних проектів та керівників. Складання програми-завдання на дипломний проект. Доопрацювання теки вихідних даних.	22.02.2021-26.02.2021	
2.	Видача затвердженого кафедрою бланку завдання на дипломне проектування. Оформлення теки вихідних даних. Виконання клазур містобудівного та об'ємно-просторового вирішення об'єкта.	22.02.2021-26.02.2021	
3.	Розроблення ескіз-ідей містобудівного, планувального і об'ємно-просторового вирішення об'єкту проектування.	22.02 - 06.03.2021	
4.	Кафедральна (секційна) перевірка. Захист ескіз-ідей містобудівного й об'ємно-планувального вирішення об'єкта проектування. Затвердження напрямку подальшої роботи	08.03 – 13.03.2021	
5.	Розроблення елементів ескізу. Плани, фасади, розрізи, перспективи, замальовки та ін.. Розроблення інтер'єру або елементів благоустрою.	15.03-20.03.2021	
6.	Розгляд комісією секції напрацювань: ескізу та схеми розташування креслень дипломного проекту на планшетах в М 1:5.	22.03-27.03.2021	
8.	Кафедральна перевірка. Попереднє затвердження ескізу	05.04-10.04.2021	
9.	Доопрацювання ескізів за зауваженнями комісії.	12.04-17.04.2021	
10.	Перша міжкафедральна перевірка: перегляд та затвердження ескізів у повному обсязі комісією інституту Допуск до подальшої роботи. Формування пояснювальної записки.	19.04.-24.04.2021	
8.	Друга міжкафедральна перевірка. Перегляд стану дипломного проектування комісією університету.	31.05 -05.06.2021	
	Дороблення проекту за зауваженнями комісії. Рецензування. Отримання рецензії.	05.06 – 12.06.2021	
9.	Здавання проекту і пояснювальної записки на кафедру. Допуск до захисту. Попередній захист	14.05 -15.06.2021	
10.	Захист КАП в ЕК	21.06 -26.06.2021	

Студент _____ Мзібри Ель Хоссіне
(підпис) (прізвище та ініціали)

Керівник проекту (роботи) _____ Шевченко Л.С.
(підпис) (прізвище та ініціали)

THE SCHEME OF DIVISION OF A GRAPHIC EXPOSITION

INTRODUCTION

The theme of the project for the implementation of complex architectural design was chosen "Exhibition Center in Poltava".

From the very beginning of their introduction, exhibition centers have occupied an important place in the life of the city and its inhabitants. Today, the need for this type of architecture is growing and becoming more relevant every day. After all, with the development of cities, population growth and mass industrialization and modernization, the question arises in the compact and high-quality construction of integrated architecture that could function in different directions. This exhibition center is not just a building, but also a great way to create a space that could unite and interest different segments of the city community, both in terms of age and interests.

Nowadays, it is increasingly difficult for people to properly organize and allocate their leisure time in such a way as to meet all their own and individual needs. This is a problem that requires some research in this area and a rational solution. After all, the main task of the cultural and educational center is to meet the differentiated cultural, educational and leisure needs of different groups of the population in weekly or daily recreation. The question of filling this type of building depends solely on the architect-designer or the wishes of the customer.

Such centers have long been gaining popularity among the population, however, architects and scientists have not paid enough attention to modern exhibition facilities. There are few modern examples of exhibition centers in Poltava. Those that remain from Soviet times are long outdated, do not make a person want to visit them, being inside and impressions of the object from the outside do not meet human expectations and do not impress with their novelty and creativity, and do not comply with updated regulations.

Therefore, this topic is relevant today and requires a deeper study of the main points regarding the filling of the building, its function, compactness, safety and figurative solution. After all, young people are the future of our country, which must

grow, be educated, saturated with knowledge and enriched with impressions in the appropriate conditions of comfort and aesthetics of the environment.

1 PRE-DESIGN RESEARCH

1.1 Analysis of the functional structure of the quarter.

Since the quarter is located in the "Diamond" neighborhood, the projected object can become its central zone. The territory is limited by Heroiv ATO and Nikitchenko streets. At present, there is a large parking lot in this area, next to it is a residential area with residential buildings from 9 floors high, across Nikitchenko Street - shopping facilities and a children's clinic; across Heroiv ATO Street - a large park area of this neighborhood.



Fig.1 – Location of the plot.

The selected area has a calm terrain, but borders on a steep slope of the adjacent landscape area, so it has geological limitations.

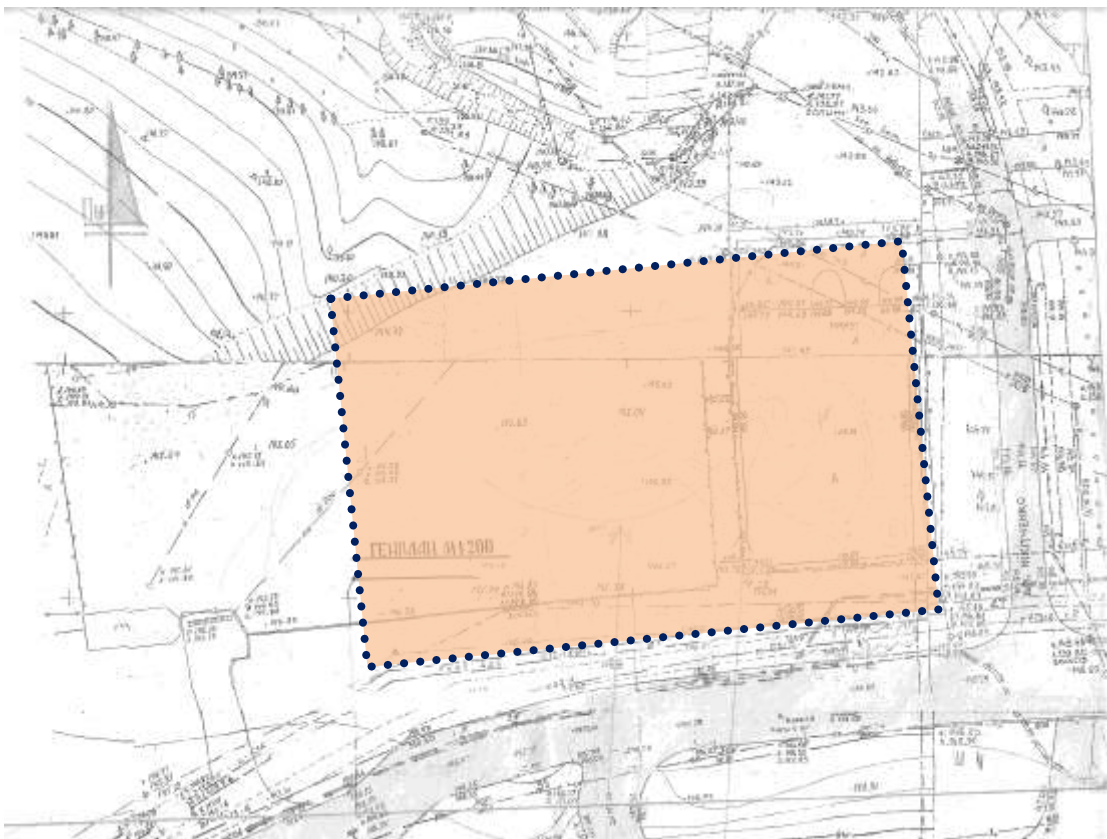


Fig.2 - Topographic situation of the design area.



Fig.3 – Functional organization of the territory with the environment

1.2. Analysis of the street network and the nature of transport and pedestrian connections.

The design district is surrounded on 2 sides by streets, including: - st. Heroiv ATO (highway of district significance) and street Nikitchenko (residential). There are public transport stops on Heroiv ATO Street, which in turn indicates a possible powerful flow of cars and visitors.

As for pedestrian flows, they are concentrated mainly along the sidewalks and somewhat through the parking lot. In general, the area is not provided with a sufficient number of footpaths, which is, of course, a disadvantage for city residents.

The project proposes a system of pedestrian communications of different widths. Larger aisles will connect the exhibition center building with a public transport stop and the sidewalk of the surrounding streets. Paving with greenery will be provided in front of the main entrance to the building.

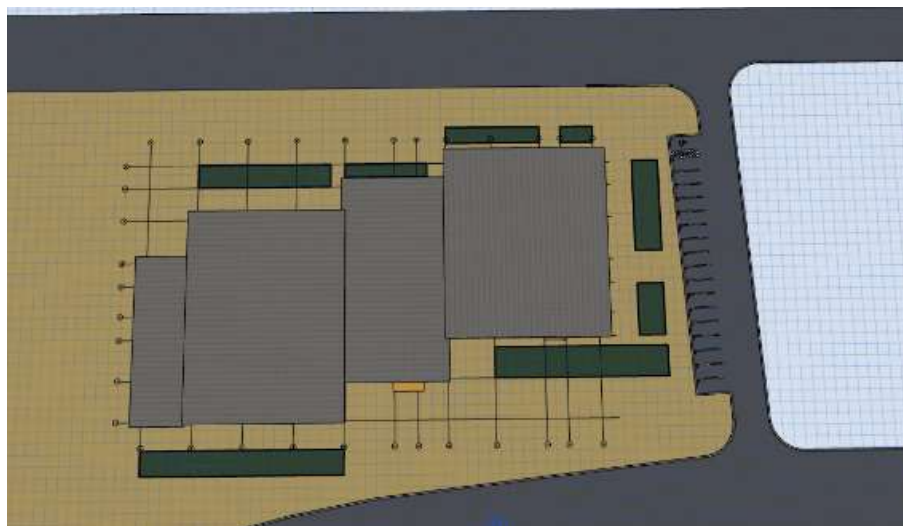


Fig.4 - Scheme of the street-pedestrian network.

2. URBAN PLANNING SOLUTION OF THE QUARTER

2.1 General provisions.

Reconstruction of the quarter is necessary, as the selected part of its territory is under parking spaces. In terms of urban composition, this area is strategic and needs a good accent.

It is proposed to place the building of the exhibition center there. In this way it will be possible to give the cultural life of the quarter, to launch people inside it.

The building will be separated from the system of footpaths, as well as behind a small park area, which will create a wonderful recreational area in the quarter, which was not enough before.

2.2 Solving the master plan

The total area of the master plan, where the exhibition center is designed, is 6.2 hectares. The project area offers an entrance area in front of the main entrance with appropriate plantings. The area of the center occupies an area of 3.84 hectares and consists of such functional areas as:

- zones of the entrance group;
- storage sites on evacuation routes;
- recreation area for visitors;
- parking area;
- loading area of exposition materials.

According to "DBN B.2.2-12: 2018. State building codes. Planning and Development of Territories "the required number of parking spaces in the parking lots for visitors to the complex was calculated. The result of the calculations was 260 parking spaces. The part was located on the surface of the earth, namely 90 pcs. at a distance of 15m from the walls of the building, and part was an underground parking lot, with a capacity of 170 seats. All above-ground car parks are connected by paved paths to the main inner-quarter communications.

There are 3.5 m wide entrances to the building with turning platforms measuring 12x12 m, as well as a circular detour around the building at a distance of 6 m from the walls in case of fire.

There is a sufficient number of trees, lawns and grasses on the territory, which create harmonious landscape compositions.

General plan of the territory:

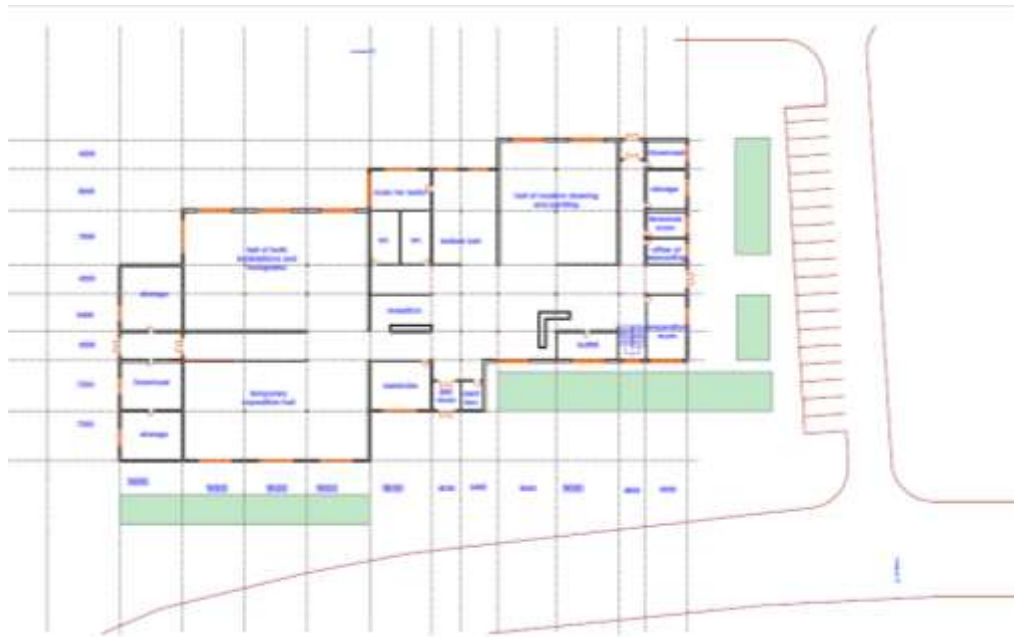


Fig.5 - Master plan.

3. ARCHITECTURAL PLANNING BUILDING SOLUTION

3.1 Functional and planning solution

The building of the exhibition center has 2 ground floors. The functional-planning structure contains the following blocks:

1st floor:

- input group block
- small catering unit
- the lobby block
- block of the cash lobby
- exhibition block with three separate halls
- wardrobe
- administrative and business unit
- utility room (toilets)

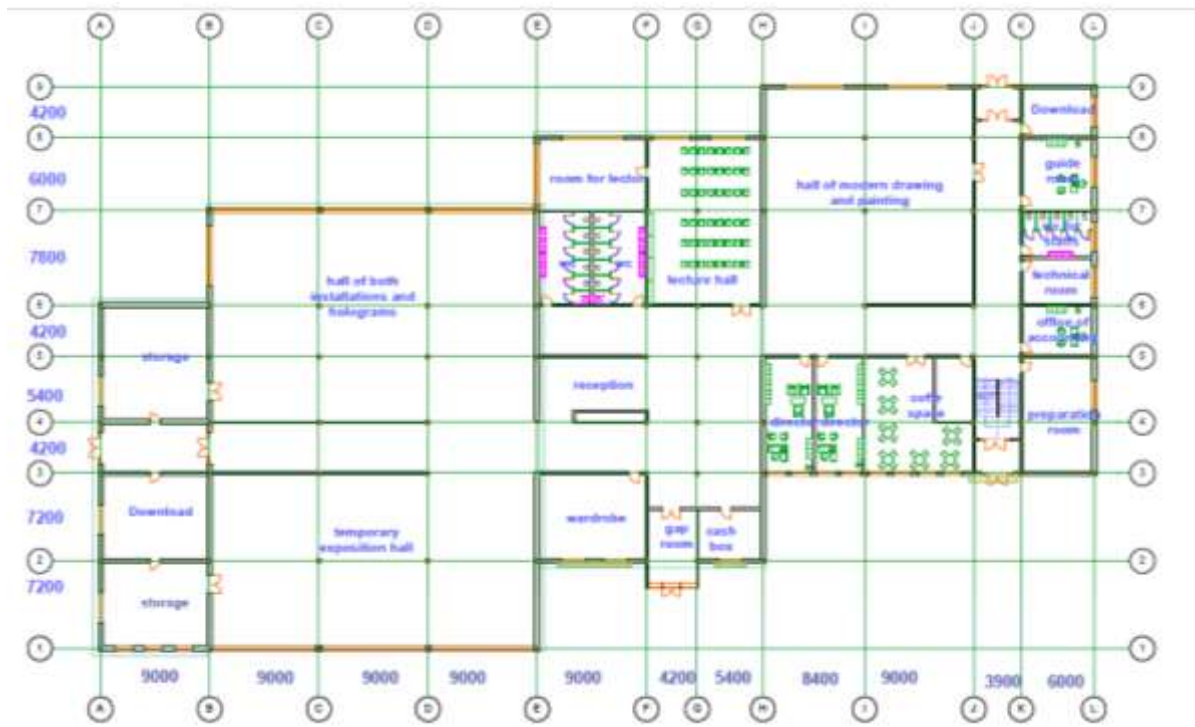


Fig. 6 - Ground floor plan

2nd floor:

- block of administrative premises
- exhibition block (one hall with two-light space)
- administrative and business unit

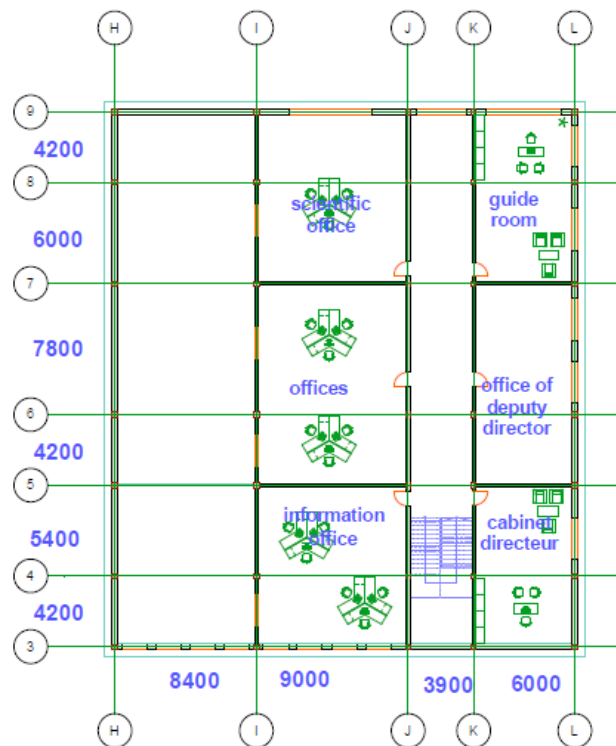


Fig. 7 - First floor plan

The planning of the center is based on the method of blocking individual exhibition halls of the building with different exhibition functions around a single large unifying

space of the entrance area. In this way, you can divide the flow of people according to their needs in the building.

Evacuation exits are provided in the center.

3.2 Architectural and compositional solution

The architectural and compositional solution of the exhibition center aims to unite the existing buildings on the periphery of the quarter, to highlight this quarter of the city, making it expressive. The shape of the building is dictated by the functional content. It is oblong, elongated, geometric, with branches - the main halls, but quite simple.

The choice of colors inherent in the building was influenced by the environment.

The restrained minimalist colors used are: dark brown (wood and metal). The accents are brown wooden elements as well as large areas of darkened glazing of the facades.

Figurative solution of the building:





Fig. 8 - Figurative solution of the building

References:

1. Архитектурное проектирование общественных зданий и сооружений/Под ред. И.Е.Рожина и А.И.Урбанова. – М.: Стройиздат, 1990.- 488 с.
2. Бархин Б.Г. Методика архитектурного проектирования. – М.: Стройиздат, 1982.- 224 с.
3. ДБН Б.2.2-12:2018. Державні будівельні норми. Планування і забудова територій. – К.: Мінрегіонбуд України
4. ДБН Автостоянки і гаражі для легких автомобілів В.2.3-15:2007
5. ДБН Вулиці і дороги В 2.3-5-2001
6. ДБН В.2.2-9-2009. Громадські будинки та споруди: Вид. офіційне. - К.: Держбуд України, 2009. - 48 с.
7. ДСТУ Б А.2.4-6-95. Державний стандарт України. Правила виконання робочої документації генеральних планів підприємств, споруд та житлово-цивільних об'єктів.- К.: Укрархбудінформ, 1996. – 40 с.
8. Лях В.М. Типологія будівель і споруд. Громадські будівлі: Конспект лекцій. – Полтава, 2000- 264 с.
9. Тосунова М.И., Гаврилова М.М., Полищук И.В. Архитектурное проектирование. – М.: Высшая школа, 1988.- 288 с.
10. Яргина З.Н. Градостроительный анализ. – М.: Стройиздат, 1984.-200 с.
11. Савченко В. В. Багатоцільові глядацькі та спортивні зали / В. В. Савченко. – Київ: Будівельник, 1990. – 158 с.

1. General structural system.

The designed building is an exhibition center in Poltava. This is a two-storey building consisting of three main halls of different heights for various exhibitions.

During the design, a frame system with a different grid of columns was selected - 6,000 m, 4,200 m, 5,400 m, 7,800 m, 7,200 m, and 3,900 m.

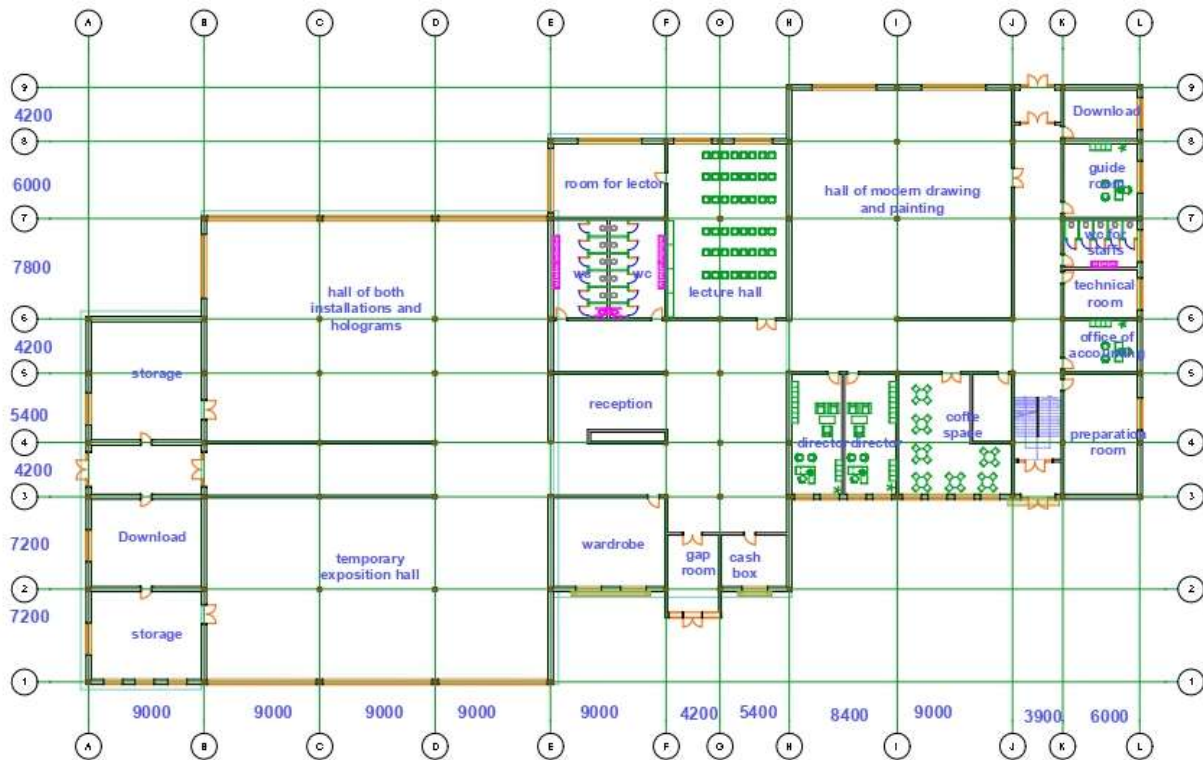


Figure 1 – Structural scheme of the building.

3. Structural elements of the house.

3.1. Foundations.

The project envisages the construction of a building on a pile foundation with grilles for columns. Piles are the main structural elements of a building that receive and transmit the corresponding load of the building to the ground. One of the advantages of this type of foundation is the large depth. In general, the elements of the pile foundation are such components as: piles, pile heads, mortars. Most often, such a foundation is used during construction on weak, moist and mobile soils. However, pile foundations can also be used in strong soils in order to save time and work. The dimensions of reinforced concrete piles

in cross section can be from 200x200 to 400x400 mm, and their length varies from 3 to 16 m, depending on the type of soil and the load that will be perceived.



Figure 2 – Photo from performance of works on installation of the pile base,
the scheme of a design of the pile base

Additional advantages of such base are its low cost, speed of performance of works by builders, the design is easy enough in comparison with other types of the bases.

3.2. Frame, columns (bearing elements), walls.

The building uses grid columns with square and round columns. Round columns are placed at obtuse corners of the joint walls of the building, in places of use of monolithic floors.

Round tubular concrete columns are 200 mm in diameter, and square columns are 300x300 mm in size.

Half-timbered rectangular columns measuring 100x50 mm were used in the places of continuous glazing.

As the total size exceeds 60 m in length, two temperature seams, measuring 100 mm, were installed throughout the building.

External walls - multilayer expanded clay concrete panels with 150 mm wide insulation.

Internal walls - expanded clay concrete panels with decorative finish, width 120 mm.

The building also has a movable rail drum partition on the horizontal axis.

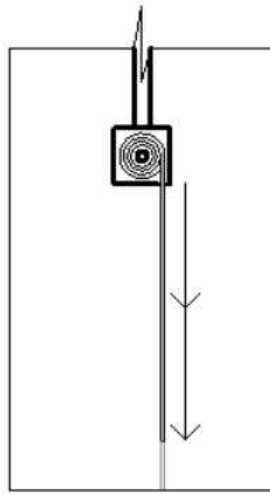


Figure 3 – The scheme of functioning of a movable drum partition on a horizontal axis.

3.3. Overlapping.

The floor of the exhibition center is made of prefabricated reinforced concrete hollow slabs. We accept height of overlapping of 220 mm. The sizes of plates are uniform, multiples of 300 mm. The most used slabs are 6x6 m and 6x9 m, although there are places where smaller slabs are laid.

Since the outline of the building is not rectangular, but complex-geometric, in places where there are obtuse angles laid monolithic floor slabs, made to order in accordance with the required size, shape.

3.4. Coating.

The building of the exhibition center has a flat roof, with a slope of up to 5% for water drainage.

In the main halls of the building on the floor is provided artificial lighting, which is provided with anti-aircraft flat lights. They perform an additional function - smoke removal in case of fire.



Figure 4 – Photo of placement of anti-aircraft flat lights; the scheme of opening of a lantern for the purpose of smoke removal.

The drainage of the building is provided with an internal drainage system with funnels located on the roof at the rate of 1 funnel per 500 square meters. The problem of snow accumulation on the part that is lower in height compared to other blocks is solved with the help of a system of wire heaters located under the ceiling. Thus, releasing heat, they provide melting snow, after which the melted water flows through the arranged drainage system.

The parapet on the building is 60 cm high.

4. Vertical communications.

Vertical communications in this building project are stairs from reinforced concrete marches and an elevator. The width of the used stairs is 1.35 m, the height of the steps is 150 mm, the width is 300 mm. The largest number of steps in the march of this building - 14, which corresponds to building codes. Stair railings are metal, 900 mm high. The first and last steps of the march, as well as the beginning and end of the handrail are painted yellow, which provides security for the movement of small mobile groups.

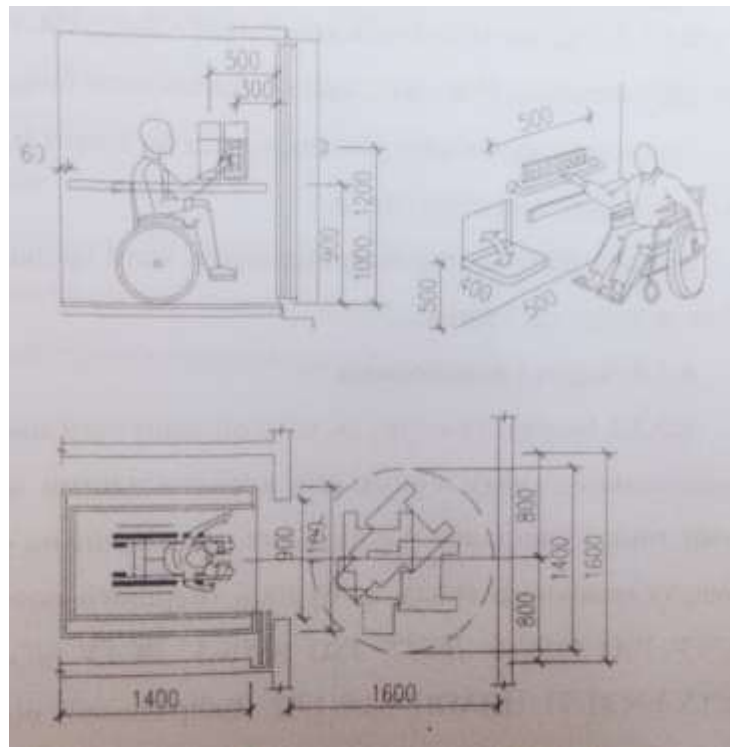


Figure 5 – Normative schemes of elevator design for low mobility groups. Excerpt from DBN B.2.2-40: 2018 Inclusiveness of buildings and structures.

The ramps are made at the entrances to the building with a height of 150 mm and a slope of 1:12.

They are equipped with handrails at a height of 0.9 and 0.7 m.

5. Windows, doors.

The building uses rectangular double doors 1.5 m wide and 2.1 m high, as well as single doors 0.9 m wide and 2.1 m high. Such dimensions allow low-mobility groups to move freely in the interior of the building. The building also uses large parts of solid glazing, which provides good insolation.

References:

1. ДБН В.2.2-40:2018 Інклюзивність будівель споруд.
2. ДБН В.2.2-9:2018 Громадські будівлі та споруди.
3. Зенькович Г. В. Сільські клубні споруди / Г. В. Зенькович. – Київ: Будівельник, 1980. – 245 с.
4. Лях В.М. Типологія будівель і споруд. Громадські будівлі: Конспект лекцій. – Полтава, 2000- 264 с.
5. Хайно Е. Несущие системы / Енгель Хайно. – Москва: Издательство Ассоциации строительных вузов. Астрель, 2007. – 344 с.

Analysis of harmful and dangerous factors that are taken into account when designing a public building

1. General provisions

The designed object is Exhibition Centre. The building is located in Poltava.

Main design standards and ways to avoid harmful and dangerous factors are described in the regulations of the Ministry of Health of Ukraine.

The following harmful and dangerous factors are taken into account when designing a public building:

- movement of vehicles and their moving parts; movement of cargoes by load-lifting mechanisms over zones of performance of works;
- violation of the requirements for transportation and storage of explosive substances and materials;
- non-compliance with regulatory requirements for storage of structures, insufficient artificial lighting of storage areas for materials and structures;
- unfavorable meteorological conditions of the production environment;
- location of workplaces in dangerous areas, closed volumes, at a significant height relative to the ground or well below ground level;
- probability of fires and explosions;
- increased voltage in the electrical circuit, the short circuit of which can occur through the human body;
- increased dustiness (gassiness) of the air at the working area;

- location of the workplace at a significant height relative to the earth's surface;
- spontaneous collapse of brickwork elements;
- moving machines, their working bodies, structures and materials moved by them;
- insufficient artificial lighting of the work area during work in the dark;
- location of workplaces near the difference in height up to 1.3 m and more;
- moving machines and objects moving by them;
- collapse of elements of building structures and formwork;
- elevated temperature of the reinforcement bar (during the work on the preliminary thermal stress of the reinforcement bar);
- noise and vibration, insufficient illumination of the workplace; adverse weather conditions;
- collapse of structural elements of buildings and structures;
- falling materials, tools;
- performance of works in the area near overhead power lines;
- lifting loads, the weight of which exceeds the load capacity of the mechanisms;
- insufficient rigidity of the structure, which can lead to its destruction during installation;
- overturning of machines, falling of their parts;
- increased contamination of the skin, overalls with chemicals, aerosol, dust;
- sharp edges, roughness on surfaces of finishing materials and structures;
- hazardous substances;
- flammable substances;
- sharp edges, corners, pins.

2. Technical means and organizational measures provided in the project for elimination of action of harmful and dangerous production factors

2.1. Transport and loading and unloading works

The movement of trucks on production territories, construction sites, loading and unloading areas and access roads to them must be regulated by effective road signs and indicators.

Vehicles and equipment used for loading and unloading operations must correspond to the dimensions of the site and the nature of the cargo.

Transport and loading and unloading operations must be performed in a mechanized manner. Compliance with the procedure and method of transportation, loading and unloading of goods and the relevant safety requirements is the supervisor's responsibility.

Loading and unloading platforms must have a slope of not more than 5°, the dimensions and coverage must correspond to the design of works and be placed in the assembly areas of cranes.

During loading and unloading operations, it is necessary to comply with the requirements of regulations on the limits of lifting and moving cargo and admission of employees to perform such work. As an exception, men are allowed to carry loads up to 50 kg on stretchers horizontally and at a distance of not more than 50 m.

In the case of placing trucks on loading and unloading platforms, the distance between trucks standing one behind the other must be not less than 1.0 m, and between cars standing side by side, not less than 1.5 m.

2.2. Electric welding and gas-flame works

Persons not younger than 18 years of age who have passed a medical examination, special training and testing of theoretical knowledge and practical skills in specific welding methods and certain types of welding work, passed the examination of the attestation commission and have the appropriate certificate are allowed to perform electric welding and gas-flame works.

Electric welders must have an electrical safety group not lower than II.

Workers who have violated electrical or fire safety requirements must pass an extraordinary knowledge test.

Welders who have passed a special medical examination, have experience of climbing work of at least one year, the category of the welder is not lower than III are allowed to perform electric welding and gas-flame works at a height of 5 m and more.

Welding, cutting and heating with open flames of appliances, vessels and pipelines that contain any liquids or gases under pressure, as well as filled with flammable or harmful substances, or those belonging to electrical devices, is not allowed.

Before sealing, welding (cutting) containers from flammable and combustible liquids, they must be pre-cleaned (washed, steamed, ventilated five or six times by changing the air) to remove traces of these liquids, followed by monitoring the air. Such containers must be filled and refueled during soldering or welding with neutral gases and with open plugs (lids) before sealing and welding.

Simultaneous performance of electric welding and gas-flame works inside closed tanks is not allowed.

It is not allowed to use petrol cutters when performing gas-flame works in tanks, wells and other closed tanks.

It is not allowed to perform welding work outdoors during rain and snow.

2.2.1. Safety requirements at workplaces where electric and gas welding works are performed

Locations of welding work outside the permanent welding stations must be determined with the written permission of the supervisor or a specialist responsible for fire safety.

Welding places must be provided with fire extinguishers.

Workplaces where electric and gas welding works are performed, passages to them at a height of 1.3 m and more and at a distance of less than 2 m from the difference in height, must be protected by temporary fences. When welding in a carbon dioxide atmosphere, the fences must not reach the floor by 300 mm.

It is forbidden to perform welding work on additional portable ladders.

Places of electric welding and gas-flame works on this, as well as on the lower tiers (if there is no protective refractory flooring or flooring protected by refractory material) must be free from combustible materials within a radius of at least 5 m, and from explosive materials and equipment (gas generators, gas cylinders, etc.) – not less than 10 m.

When cutting structural elements, measures must be taken to prevent accidental collapse of the cut elements.

Workplaces of welders in the room during open arc welding must be separated from adjacent workplaces and passages by non-combustible and light-proof screens (screens, shields) with a height of not less than 1.8 m.

When welding outdoors, fences must be placed in the case of simultaneous operation of several welders near each other and in areas of heavy traffic.

If welding work is performed using liquefied gases (propane, butane) and carbon dioxide, the welders' workplaces must be equipped with local suction from below.

Welding places must be equipped with exhaust ventilation. Welding is not permitted if the local exhaust ventilation does not work.

Work in closed or confined tanks must be performed by a welder under a permit under the supervision of a supervisor with electrical safety qualification group II and above, who must be outside. The welder must use a seat belt with a safety rope, the end of which is with the supervisor.

2.3. Concrete works

Cement for concrete work must be stored in silos, hoppers, crates and other closed containers, preventing spraying during loading and unloading. The loading openings must be closed with protective grilles and the grilles must be locked.

When concreting floors, the formwork must be fenced along the entire perimeter. All openings in the working floor of the formwork must be covered with shields. If it is necessary for the openings to be permanently open, they must be closed by a lattice.

Locations of supports of floor formwork risers must be fenced and marked with prohibitory safety signs with explanatory inscriptions. Entrance (passage) during concrete works in (through) this zone is forbidden.



Before installation of prefabricated formwork of walls, columns, pylons located on the edge of the floor, crossbars, vaults in cases where the installer during the work is not on the working floor of the formwork, must be arranged working decks at least 0.8 m wide with protective solid fences, the design of which must be designed for possible technological loads and be defined in the work execution program and schedule.

After removing part of the sliding formwork and suspended scaffolding, the end sides of the formwork must be fenced.

To protect workers performing work on suspended scaffolding from objects that may fall from above, the outer perimeter of the sliding formwork must be equipped with visors not less than the width of the scaffolding.

A protective fence at least 1.8 m high must be installed at the reinforcement bar tension sections in places where people can pass.

Reinforcement bar tensioners must be equipped with an alarm that is activated when the tensioner actuator is switched on.

It is forbidden for people to be closer than 1.0 m from electrically heated reinforcing bars.

Procurement and assembly of enlarged reinforcement frames must be performed in specially designated places.

Protective gloves and goggles must be worn when using concrete mixes with chemical additives.

The overpass for feeding the concrete mixture by dump trucks must be equipped with bumpers. Passages not less than 0.6 m wide should be provided between jack beams and fences. Transverse jack beams should be installed on dead-end overpasses.

When freeing the bodies of dump trucks from the remains of the concrete mixture, workers are prohibited from being in / on the body of the vehicle.

Before starting concrete work, the manager must:

- check the stability, strength, serviceability of scaffolding, formwork structures, fences of working horizons;
- check the serviceability of containers, hoppers, concrete pumps, manipulators;
- provide employees with the necessary personal protective equipment.

During the operation of mixing machines, the cleaning of the pits for loading buckets should be carried out after secure fixing of the bucket in the raised position.

2.4. Masonry works

Erection of the walls (brickwork) of each upper floor of a multi-storey building must be carried out after the installation of floor structures, platforms and marches in the stairwells.

If it is necessary to erect brick walls without laying floors or coverings, it is necessary to use temporary fastenings of these walls.

When erecting walls higher than 7 m, it is necessary to use protective canopies or mesh fencing around the perimeter of buildings, which must meet the following requirements:

- the width of protective canopies or mesh fences must be at least 1.5 m with a slope to the wall so that the angle formed between the lower part of the building wall and the surface of the canopy was 110° , and the gap between the building wall and the plane of the canopy did not exceed 50 mm;

- protective canopies and mesh fences must withstand the snow load specified for this climatic region, and a concentrated load of at least 1600 N (160 kgf), applied in the middle of the run;

- the first row of protective canopies must be installed at a height of up to 6 m from the ground, have a solid deck and be stored until the end of the construction of the walls to full height.

The second row of protective canopies must be installed at a height of 6 – 7 m above the first row and in the process of further construction of the wall it must be rearranged every 6 – 7 m and have a solid or mesh floor with a hole size (cells) not more than 50 x 50) mm.

Workers working on the installation, cleaning or removal of canopies must wear seat belts. Walking on canopies, using them as scaffolding, as well as stacking materials on them is prohibited.

Construction of walls up to 7 m high is allowed to be performed without the installation of protective canopies with the definition of a dangerous zone around the perimeter of the building.

2.4.1. Performing of masonry works

Erection of walls must be performed from the floor slabs or scaffolding. The design of scaffolding must meet the allowable load in accordance with the specified in the work execution program and schedule.

It is forbidden to make brick masonry from accidental scaffolding.

The height of each working tier of masonry is determined in such a way that the level of masonry after each bridging of the paving means was not less than two rows of masonry above the level of the new working flooring.

Erection of walls below and at the level of the floor, which is arranged from prefabricated reinforced concrete slabs, must be performed from the scaffolding installed on the lower floor.

It is forbidden to mount floor slabs without a pre-lined brick board two rows above the stacking slabs.

Stitching of external seams of bricklaying should be carried out from overlapping or scaffoldings after laying of each row of a laying. It is forbidden to perform this operation from a freshly laid wall.

When erecting the walls of buildings to a height of up to 0.7 m from the working deck, as well as during work at height, it is necessary to use the means of collective protection (fencing, catching devices) or safety belts specified in the work execution program and schedule.

During thunderstorms, snowfall, fog, which significantly impair visibility within the work front, or at wind speeds of 15 mps and more, it is prohibited to perform brick masonry of the outer walls of multi-storey buildings and structures.

For transportation by cranes of artificial materials – bricks, ceramic stones, small blocks – it is necessary to use inventory pallets, containers, load-grabbing devices which prevent falling of these elements during lifting, unpacking, selection for work.

Above the place of loading of the lift the protective double flooring from boards not less than 40 mm thick has to be established at height of 2.5 m – 5 m.

Arrangement of fastenings of eaves, formwork of brick lintels, arched structures must be performed in accordance with the technological documentation. Remove temporary fasteners, formwork of brick lintels and arched structures is allowed if the solution has reached the strength determined by the process map.

Erection of stone structures by freezing is allowed if the work execution program and schedule has instructions on the possibility, procedure and conditions of application of this method. Thus on solutions without chemical additives it is allowed to erect constructions no more than 4 floors and no more than 15 m high.

Structures that are in the process of natural thawing and hardening must be constantly monitored.

Preparation and processing of natural stones within the construction site must be performed in specially designated areas, where the stay of persons who do not perform this work is prohibited. Workplaces at a distance of less than 3 m from each other must be separated by protective screens, and workers must be provided with personal protective equipment.

It is necessary to process stones in gloves and glasses with unbreakable glass.

2.5. Site erection works

Other work and the presence of unauthorized persons are not allowed in the working area of site erection works.

Installation of structures of buildings (structures) must begin with a spatially stable part: the connecting element, the core of rigidity, and so on.

Installation of structures of each upper floor (tier) of a multi-storey building must be performed after fixing all installed mounting elements in accordance with the project and achieving concrete (mortar) joints of load-bearing structures of the required strength.

Painting and anticorrosive protection of constructions and the equipment in cases when it is carried out on a building site, it is necessary to do before raising of designs on a design mark. After lifting these structures, painting or corrosion protection may be performed only at the joints and joints of structures.

Unpacking and canning of the equipment to be installed must be performed in the area designated in accordance with the work execution program and schedule and carried out on special racks or gaskets with a height of at least 100 mm.

Tools and materials with explosion-hazardous properties are not allowed during reactivation of the equipment.

During the installation of frame houses, the next tier of the frame may be installed only after the installation of enclosing structures or temporary fences on the previous tier.

Installation of stairways and platforms of buildings (structures), as well as freight and passenger lifts (elevators) must be carried out simultaneously with the installation of structures of the house. Fences must be installed immediately on mounted stairways.

When assembling structures of buildings or structures, installers must be on previously installed and securely fastened structures or means of paving.

It is forbidden for people to be on the elements of structures and equipment during their lifting and moving.

Hinged mounting platforms, ladders and other devices required to perform work at height must be installed on structures that are mounted before their lifting.

For transition of installers from one design to another it is necessary to apply ladders, transition bridges and ladders having protections.

People are not allowed to be under the elements of mounted structures and equipment.

Hinged metal ladders longer than 5 m must be enclosed with metal arches with vertical connections and securely attached to structures or equipment.

Lifting of workers on hinged ladders to height more than 10 m is allowed only in case of their equipment with platforms for rest not less than in each 10 m on height.

Stretchers for temporary fixing of the mounted designs need to be attached to reliable support. The number of dislocations, their material and cross section, methods of tension and fastening points are determined in the work execution program and schedule.

Stretch marks must be located outside the dimensions of traffic and construction machinery; they must not touch the sharp corners of other structures. Bending of extensions in places of their contact with other structures is allowed only after checking the strength and stability of these elements under the influence of forces from disengagement.

It is necessary to prevent the rocking and rotation of the elements of structures or equipment to be mounted during movement.

Slinging of structures and equipment must be performed by means that provide the possibility of remote slinging from the working horizon in the case when the height to the lock of the load-carrying means exceeds 2 m.

2.5.1. The order of site erection works performance

Prior to the installation work, it is necessary to determine the order of exchange of conditional signals between the person who manages the installation and the driver (motorist) of the crane. All signals are given by only one person (foreman of the assembly team, section leader, rigger-slinger). Only a worker who has noticed the danger can give a "Stop" signal.

If the structure to be mounted is out of sight of the crane operator, a reliable connection must be ensured between him and the installers. If this is not possible, intermediate signaling devices from among the slingers (riggers) are assigned.

In particularly important cases (in the case of lifting structures using complex rigging, the method of rotation, when pushing large and heavy structures; when lifting them by two mechanisms or more, etc.) signals should be given only by the supervisor.

Slinging of the mounted elements must be performed in the places indicated in the working drawings, and ensure their lifting and feeding to the installation site in a position close to the design.

It is forbidden to lift the elements of building structures that do not have mounting hinges or holes, markings and markings that ensure their proper slinging and installation.

During installation from vehicles, structural elements must not be carried over the driver's cab.

Cleaning of structural elements to be installed from dirt and ice must be done before lifting.

Elements to be mounted must be lifted smoothly, without jerks, swings and rotations. Lifting loads (frozen, partially covered with soil, debris, connected to elements of other structures, etc.) that exceed the capacity of the assembly crane is prohibited.

It is necessary to lift constructions in two stages: at first on height of 20 – 30 cm, then, after check of reliability of slinging and assembly loops, to carry out the further lifting.

When moving structures or equipment, the distance from them to the parts of the mounted equipment, protruding structures must be horizontally not less than 1.0 m, and vertically - not less than 0.5 m.

It is forbidden to leave the raised elements of constructions and the equipment in the lifted condition during a break in work.

Elements of structures or equipment installed in the design position must be fixed so as to ensure their stability and geometric invariance.

Slinging of structural elements and equipment, which are installed in the design position, must be done after their permanent or temporary fixing in accordance with the project. It is not allowed to move the installed elements of structures or equipment after their unbundling without the use of installation equipment provided by the work execution program and schedule.

Until the end of verification and reliable fixing of the installed elements, it is not allowed to lean on them the structures located above, unless it is provided by work execution program and schedule.

It is forbidden to sling a load that is in a precarious position, as well as to move the device on a raised load.

When pushing (moving) structures and equipment with winches, the load capacity of brake winches and hoists should be equal to the load capacity of traction means, unless otherwise specified by the project.

It is forbidden to perform installation work at height in open places at wind speeds of 15 mps and more, during ice, thunderstorms, fog, which makes it impossible to see within the work front.

When assembling horizontal cylindrical tanks consisting of individual tsars, it is necessary to use wedge gaskets and other devices that prevent involuntary rolling of tsars.

The aggregation assembly of those to be installed, structures and equipment must be performed in specially designated areas.

2.6. Finishing works, arrangement of heat-insulating facade systems

Mixtures and mastics during finishing works should be prepared, as a rule, centrally. Preparation of them, as well as the mortar mixture on the construction site must be carried out in rooms equipped with supply and exhaust ventilation to prevent exceeding the maximum permissible concentrations of harmful substances in the air of the working area.

Contractors must be provided with harmless detergents and warm water.

It is not allowed to use paints and solvents of unknown composition, as well as substances and materials that do not have indicators of fire and toxic hazards.

It is not allowed to use paints and solvents of unknown composition, as well as substances and materials that do not have indicators of fire and toxic hazards.



Operation of mobile painting stations for preparation of paint mixes which are not equipped with forced ventilation is not allowed.

Workplaces for finishing works, arrangement of facade systems at height must be equipped with means of paving and stairs-ladders for lifting on them.

The means of paving used during plastering, painting works, arrangement of facade systems in places under which other works are carried out or there is a passage, should be with floorings without backlashes.

Internal plastering works, and also installation of prefabricated eaves and modeled elements of internal rooms need to be carried out only from the platforms or mobile little tables established on a floor, or on continuous floorings. External plaster work must be performed from inventory vertical or suspended scaffolding.



When performing work on the internal stairwells, it is necessary to use special platforms (tables) with different lengths of support struts, which are installed on the steps. The working flooring must be horizontal and have parapet fences.

When working with harmful and flammable explosive materials that form explosive vapors, the room must be constantly ventilated, as well as for 1 hour after work, using natural or mechanical ventilation.

Places over which glass or facing works are performed must be fenced.

Glazing or facing works on several tiers on one vertical at the same time is forbidden.

It is forbidden to heat and dry the premises with roasters and other devices that emit fuel combustion products into the premises.

When working with solutions containing chemical additives, it is necessary to use personal protective equipment (rubber gloves, protective ointments, goggles) in accordance with the manufacturer's instructions, taking into account the composition of the substances used.

Respirators with safety goggles should be worn during dry cleaning of surfaces and other work related to the release of dust and gases, as well as during mechanized spackling and painting.

Wear safety goggles, rubber gloves and an acid-resistant apron with a bib when cleaning surfaces with acid or caustic soda.

Goggles must be worn when applying the mortar to a ceiling or vertical surface.

2.6.1. The order of works performance

Before the start of each shift, the serviceability of mortar pumps, hoses, dispensers and other equipment used during plastering must be checked. Manometers must be tested and sealed (pass state inspection). If the pressure on the manometers of the mortar pumps exceeds the permissible values specified in the passport, it is not allowed to work on the mortar pump.

It is not allowed to bend hoses at an acute angle and in the form of a loop, and also to tighten epiploons during work of plaster cars.

Workplaces of plaster station operators (nozzles) must be provided with two-way alarm (sound, light, radio, etc.) with workplaces of mortar pump drivers.

Operators who apply plaster to the surface with a nozzle and workers who spray the solution by hand must be provided with safety goggles.

When performing work on the preparation and application of paint mixtures, including imported, it is necessary to follow the requirements of the instructions of manufacturers on occupational safety.

All incoming components and ready-made paint mixtures must have hygienic certificates indicating fire and explosion hazards, terms and conditions of storage, the presence of harmful substances, recommendations on the method of application, the need for collective and individual protection.

It is not allowed to use solvents based on benzene, chlorinated hydrocarbons, methanol.

When performing painting works with the use of pneumatic units it is necessary:

- before the start of work to check up serviceability of the equipment by the pressure specified in the passport, the alarm system, existence of protective grounding;
- during performance of works not to allow bending of hoses and their contact to the moving steel ropes;
- switch off the air supply and close the air valve during a break in operation or in case of malfunctions of the unit mechanism.

Frozen hoses must be heated in a warm room. Do not heat the hoses with open flame or steam.

Containers with explosive materials (varnishes, enamels, nitro paints, etc.) during the break should be closed with corks or lids, and open with a tool that does not cause sparks. Paints and varnishes must be stored at workplaces in tightly closed containers, in quantities not exceeding the variable demand, or in quantities not exceeding the capacity of the paint tank or standard flask (40 l). Each container with paint, solvent must have a sticker or label with the exact name of the material and an indication of flammable properties.

Empty containers made of paints and varnishes must be tightly closed and stored in specially designated places.

When painting in rooms with the use of pneumatic devices, as well as quick-drying paints and varnishes containing harmful volatile solvents, workers must be provided by the employer with respirators of the appropriate type and goggles. Such work must be performed with open windows or artificial ventilation. However, the amount of gases, vapors and dust in the work area should not exceed the maximum permissible concentration of harmful substances.

For fans it is necessary to use electric motors in explosion-proof execution, and to take out switches in a safe place.

Fire works (welding, etc.) must be carried out at a distance of not less than 15 m from the open openings of the premises in which the work is performed using paints and varnishes containing volatile organic solvents.

Paint sprays and hoses at the end of the work shift must be cleaned and rinsed of paint residues.

At the workplace where the spray paint which is under a high pressure of a paint and varnish material is used, there should be warning inscriptions "Flammable", "High pressure!". The strainers of airless spraying systems must be removed and washed at least once a week.

When painting by airless spraying, it is forbidden to use electric heating systems until the hydraulic system is completely filled.

During dry cleaning indoors, workplaces must be equipped with local dust extractors.

When mechanizing sawing of finishing blocks and plates it is necessary to use means of dust suppression - for example, water.

The spraying machine must be equipped with a wooden deck with a stream for water drainage. The flooring must be cleaned daily.

Lifting and transferring the glass to the place of its installation must be performed in a mechanized manner in a special container.

The lifting area must be fenced.

Cutting of glass must be carried out in separate heated rooms in a horizontal position on special tables.

Glazing works areas must be fenced and protected from falling glass with canopies or solid flooring.

2.7. Electrical works

Laying cables and wires is allowed only in fully fixed pipes, trays, boxes, etc.

Welding work on the transformer housing is allowed only after filling it with oil to the level of 200 – 250 mm above the welding site.

Before drying electric machines and transformers with electric current, their housings must be grounded. When drying transformers in your own or special metal tank by induction method, it is necessary to avoid contact with the windings.

It is not allowed to perform work or be at a distance of less than 50 m from the test site of air switches. The safety valve on the air collector must be adjusted and tested for a pressure exceeding the working pressure by more than 10%.

Fuses in the electrical circuits of voltage transformers and power transformers on which the adjustment work is performed must be removed. At the place where the fuses are removed, you need to hang a poster: "Do not turn on. People are working."

2.7.1. The order of works performance

If it is necessary to supply operating current for the adjustment of mounted circuits and electrical installations, it is necessary to hang warning posters (signs) on them. Non-debugging work must be stopped and workers engaged in this work must be removed from the work area.

Prior to commissioning of switchgear, all supply lines and those to other substations must be disconnected from the equipment and grounded.

The connection of the mounted electrical networks and electrical equipment to the existing electrical networks must be carried out by the operation service of these networks.

It is not allowed to use and connect as temporary electrical networks and electrical installations that have not been put into operation in a certain order, as well as to perform electrical installation work on the assembled and commissioned electrical installations without the permission of the commissioning organization.

During commissioning work on the installed electrical installation, the operating voltage on it can be applied by the operating personnel only after the introduction of the operating mode on the electrical installation and in the presence of a written request of the head of commissioning work.

Lifting, moving and installing disconnectors and other circuit breakers are performed in the "On" position, and devices equipped with return springs or free distribution mechanisms – in the "Off" position.

When adjusting the switches connected to the drives, care must be taken to prevent them from being switched on or off unintentionally or unintentionally.

Fuses of the control networks of the installed device must be removed for the entire time of installation.

Before the beginning of test works it is necessary on switching devices:

- bring the spring drives of switching devices to the inoperative position;
- switch off the operating circuits, alarm circuits, drive power circuits and heating circuits;
- close and lock the latches on the air supply pipes in the tank tanks and pneumatic actuators, as well as release the air available in them;
- hang posters on the keys and buttons of the remote control "Do not turn on. People are working".

Simultaneous operation on drives and switching devices is not allowed.

When working on power transformers, the terminals of the primary and secondary windings must be shorted and grounded for the entire duration of electrical work.

All terminals of voltage transformers and current transformers must be shorted and grounded during installation.

It is necessary to measure the voltage and density of the electrolyte in rubber gloves, respirators, standing on an insulating rubber carpet.

It is necessary to check up a condition of pole clamps of accumulators in dielectric gloves. When tightening the bolts connecting the batteries to each other, it must be impossible to accidentally touch the key to the battery plates of different polarity.

Tightening wires through long boxes, boxes, pipes, blocks in which live wires are laid, as well as laying wires and cables in pipes, trays and boxes that are not fixed in accordance with the project, is not allowed.

Checking the insulation resistance of wires and cables with a megohmmeter must be performed by a link consisting of at least two people, one of whom has group IV, and the

other group III on electrical safety. The ends of wires and cables that may be live during the test must be insulated and (or) fenced.

Testing of electric drives is allowed after communication between the personnel located in the room of the board or the control panel, and near electric drives.

During the adjustment of line and limit switches, sensors and other means of automation, the voltage of the power supply networks must be removed.

2.8. Installation of engineering equipment of buildings and structures

The elimination of deficiencies identified during the testing of the installed system and equipment must be performed on the basis of measures developed and approved by the customer and the general contractor together with subcontractors for the safety of these works.

Installation and removal of jumpers (connections) between installed and operating equipment, as well as connection of temporary installations to existing systems (electrical, steam, technical, etc.) without the written permission of the general contractor and the customer is not allowed.

2.8.1. Organization of workplaces

Installation of pipelines and air ducts on overpasses must be performed from the inventory scaffolding, equipped with stairs for raising and lowering workers. Lifting and lowering of overpass structures is not allowed.

It is forbidden for people to be under the installed equipment, assembly units of equipment and pipelines until their final fixing.

It is necessary to lower pipes in the fixed trench so that not to break fastenings of a trench.

It is not allowed to roll the pipes into the trench with the help of crowbars and scales, as well as to use the struts securing the trenches as supports for the pipes.

Electrical installations in these premises must be fire and explosion-proof.

Premises in which degreasing is carried out must be equipped with supply and exhaust ventilation. When working outdoors, workers must be on the windward side.

Workers engaged in degreasing pipelines must be provided with appropriate gas masks, overalls, gloves and rubber gloves in accordance with the rules of free issuance of special clothing, special footwear and other personal protective equipment to workers.

2.8.2. The order of works performance

Installation of equipment, pipelines and air ducts near electrical networks (within a distance equal to the maximum length of the unit or link of the pipeline to be mounted) is performed when the voltage is removed.

During purging of pipes with compressed air it is forbidden to be in chambers and wells where latches, valves, cranes, etc. are established.

When blowing pipes, shields must be installed at the ends of the pipes to protect the eyes from scale and sand.

Personnel are not allowed to stand against or near the ends of the blown pipes.

When installing pipelines and equipment, joining and connecting holes and checking their coincidence in the parts to be mounted must be performed with a special

tool (conical mandrels, assembly plugs, etc.). It is not allowed to check the coincidence of holes in the mounted parts with your fingers.

Measures must be taken during the installation of the equipment to prevent its unauthorized or accidental switching on.

When installing equipment using jacks, measures must be taken to prevent skewing or tipping of the jacks.

2.9. Testing of engineering equipment of buildings and structures

Testing of equipment and pipelines must be performed under the direct supervision of a specially appointed person from among the specialists of the installation organization.

Before testing the equipment it is necessary:

- to acquaint the head of works with the personnel participating in tests, with the order of carrying out of works and measures of their safe performance;
- to warn workers on adjacent sites about the time of testing;
- to provide visual, and if necessary, by means of devices, check of fastening of the equipment, a condition of isolation and grounding of an electric part, presence and serviceability of fittings, starting and braking devices, control and measuring devices and plugs;
- fence and mark the test area with appropriate signs;
- if necessary, arrange an alarm system;
- ensure the possibility of emergency shutdown of the equipment under test;
- check the absence of foreign objects inside and outside the equipment;
- mark with temporary signs temporary plugs, hatches and flange connections;
- equip posts at the rate of one post within the visibility of another, but at least every 200 m from each other to warn of the danger zone;
- determine the places and conditions of safe stay of persons engaged in testing;
- to ensure the readiness of fire extinguishers and maintenance personnel who may be involved in the fire;
- to provide illumination of workplaces not less than 50 lux;
- appoint persons responsible for carrying out the safety measures provided for in the test program.

Elimination of defects on the equipment detected during the tests must be performed after its shutdown and complete shutdown.

Simultaneous hydraulic tests of several pipelines mounted on the same supporting structures or trestle are allowed if the supporting structures or trestle are designed for the appropriate loads.

If the pipelines are located near residential or operating public or industrial buildings, their pneumatic tests can be carried out provided that the window and door openings of these buildings, which are located within the danger zone, must be closed by protective fences (shields, bars).

2.9.1. The order of works performance

Inspection of the equipment after the tests is allowed to do after reducing the test pressure to the worker.

Protective fences (screens) must be installed in front of open hatches and fittings when testing equipment and piping after testing.

Tests of equipment and pipelines under load must be performed after tests of its idleness.

Testing of equipment is allowed only after timely warning of persons in the test area and obtaining the permission of the test manager.

During equipment tests it is not allowed:

- remove protective fences;
- open hatches, fences, clean and lubricate equipment, touch its moving parts;
- check and eliminate defects in electrical circuits of electrical equipment and automation devices.

Before pneumatically testing the piping, the safety valves must be adjusted to the appropriate pressure.

Plastering of welds directly during tests of pipelines and equipment is not allowed.

The connection and disconnection of the air supply lines from the compressor to the test line is only permitted after the air supply has been stopped and the atmospheric pressure has been reduced.

References

1. Система стандартів безпеки праці. Охорона праці та промислова безпека в будівництві. Основні положення (ДБН А.3.2-2-2009): НПАОП 45.2- 7.02-12. – [Чинний від 2012-04-01]. — К.: Мінрегіонбуд України. – 116 с. – (Державні будівельні норми України).
2. Орлов Г.Г. Охрана труда в строительстве. - М.: Высшая школа, 1984. – 346 с.
3. Русин В.И., Орлов Г.Г. Охрана труда в сельском строительстве. – М.: Агропромиздат, 1987. – 252 с.
4. Інклюзивність будівель і споруд. Основні положення: ДБН В.2.2-40:2018. – Офіц. вид. – [Чинні з 2019-04-01] – К. : Мінрегіон України, 2018. – 70 с. – (Державні будівельні норми).
5. Пожежна безпека об'єктів будівництва: ДБН В.1.1-17:2016. – Офіц. вид. – К. : Мінрегіон України, 2017. – 44 с. – (Державні будівельні норми).
6. Смирнов В.А., Дикань С.А. «Безпека життєдіяльності. Університетський курс: навч. посіб. для студ. вищ. навч. зак./ В.А. Смирнов, С.А. Дикань. – Вид. 2-ге, перероб. І доп.-Полтава: ТОВ «АСМІ», 2014.-349,[1]с.