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Dnipro University of Technology**

FACULTY OF CONSTRUCTION

Department of Construction, Geotechnics and Geomechanics

**EXPLANATORY NOTE
of a Bachelor's qualification work**

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academic group 192-17-1 IC

specialty 192 Building and Civil Engineering

under educational programme Building and Civil Engineering

topic: “Construction project of nine-storey residential building in Dnipro city”

Supervisors	Name	Grade system		Signature
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TASK
for a Bachelor's qualification work

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Specialty 192 Building and Civil Engineering

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Chapter	Content	Deadlines
1	Architectural and construction chapter	
2	Calculation and design chapter	
3	Organizational and technological chapter	
4	Equipment and economic chapter	

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ABSTRACT

Qualification work: 57 pages, 2 tables, 2 figure, 1 annex, 12 sources.

ARCHITECTURAL - PLANNING SOLUTION, CALCULATION OF BUILDING STRUCTURES, CHOICE OF PILE, METHOD STATEMENT, BUDGET ESTIMATE.

The object of work is nine-storey residential building in Dnipro city.

The purpose of work is to design an apartment building.

Results. Selected and substantiated the main spatial planning and design solutions. The layout of the structural scheme, collection and calculation of loads. The calculation of the pile foundation was carried out. Method statement, construction master plan, estimate documentation and technological drawings are developed.

Scope - technologies of construction of civil engineering objects.

The practical significance of the work is to increase the technical, economic and cultural and social aspects of civil engineering..

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INTRODUCTION

The most important problem for Ukraine remains the housing problem. The only correct way to overcome this problem is intensive construction of residential buildings.

Construction, being a material-intensive, labor-intensive, capital-intensive, energy-intensive and science-intensive production, contains a solution to many local and global problems, from social to environmental. In addition, 1 construction job provides more than 10 jobs in related industries. The main economic reserve in urban planning is to increase the efficiency of land use. Also, to achieve the goal of savings, it is necessary to use local building materials, that is, to reduce the cost of construction.

In connection with aggravated environmental problems, it is extremely important to use the natural conditions of the construction site as efficiently as possible.

The project reveals the possibilities of designing buildings that fit into the urban environment as rationally as possible. Therefore, a multi-storey residential building was developed, which is the main type of dwelling in the cities of our country. Such houses allow rational use of the territory, reduce the length of engineering networks, streets, and public transport facilities. A significant increase in the density of the housing stock in multi-storey buildings gives a tangible economic effect. Therefore, the development of projects is an urgent task for the development of infrastructure in megacities.

1 ARCHITECTURAL AND CONSTRUCTION SECTION

1.1 Initial data for design

The city of Dnipro is located in the central part of Dnipropetrovsk region, within the steppe zone. The territory is located on the border of the Dnieper-Orel and Sursko-Dnieper physical-geographical districts. This situation determines the complexity of the relief structure of the territory. The left-bank part is represented by a floodplain relief with absolute marks of a surface of 51,0-72,6 m. The right-bank part is presented by a plain-watershed relief strongly dissected (0,8-0,9 km / km²), with a difference of heights of 51,0-180,0 m.

Building class - 2

Degree of durability - 2

The degree of fire resistance - 2

The city of Dnipro belongs to the I climatic zone. The average temperature of the coldest day is 260C; the coldest five days - 220C. Depth of soil freezing - 0.9 m.

The direction of prevailing winds:

- in summer - north-western;

- in winter - western.

The weight of the snow cover is 0.7 kPa

Wind load - 0.3 kPa

The relief of the site is calm, with a total natural slope in the north-eastern direction of up to 3%.

1.2 General plan

The projected building is being built on a site with a calm relief with a slope to the east. The size of area is 0.54 hectares. The projected building is oriented to the north-west. Gaps are accepted between the buildings, taking into account the requirements of sanitary and fire safety standards. The projected building is provided with motorways 5

m wide, which provide transport links with the main streets. The area is characterized by good environmental conditions. The residential building site is characterized by a calm relief.

When developing the master plan, all the necessary measures were taken to ensure the necessary sanitary standards for insolation and noise protection. According to the insolation conditions, the residential building is located taking into account the provision of the standard insolation illumination of each apartment. The apartments have two-sided orientation.

The construction project provides for a number of environmental protection measures, sanitary cleaning of the territory, landscaping and landscaping.

After the completion of the construction, it is planned to restore and re-create the sod cover and plantings throughout the construction area. Trampling-resistant tree species are planted in the development area. Planting of decorative shrubs and trees is envisaged. A network of roads and sidewalks is being created.

Engineering preparation of the territory includes the drainage of rain and melt water by trays near the roads to the storm inlet grates of the projected closed drain. Surface water is removed by a closed drainage network through water intake grids located along the roads. Waste water from the building is discharged into the external sewerage network and further to the city treatment facilities.

The improvement of the construction site includes the following measures:

- paving entrance areas and sidewalks, as well as paths on a green area with curly paving slabs, facing and paving of porches and stairs;
- landscaping with the arrangement of lawns, preservation of old and planting of new green spaces;
- arrangement of a children's playground with landscaping and installation of small architectural forms such as: sandboxes, swings, benches, etc .;
- installation of outdoor lighting lanterns to serve the territory at night.

Technical and economic indicators of the general plan.

Land area 1345 m².

Building area 585m².

The ratio of building area to land area 0.43

Hard surface area 310 m²

The ratio of the area of hard surface to the area of the site 0.23

Landscaping area 450 m².

The ratio of the area of green spaces to the area of the plot 0.33

1.3 Architectural and planning solution

1.3.1 technical - economic indicators of the building

Table 1.1 – technical - economic indicators

№	Indicators	Quantity
1	number of floors	9
2	building volume	19068 m ³
3	living area of the building	2751 m ²
4	total area of apartments	4719 m ²
5	total building area	5636,6
6	area of apartments	4545
7	number of apartments (total)	55
	three-room	11
	two-room	33
	one-room	11
8	coefficient of efficiency of the architectural and planning solution K1	0,7
9	coefficient of efficiency of space-planning solution K2	3,4

In height, the building consists of: a basement, 9 residential floors. Block - section is solved with a quiet mode of window openings. The residential building has two passenger elevators in the block - section, located in the staircase - elevator block, which is located in the central part of the block - section. It includes:

- 2 lift shafts running along the entire height of the building;
- staircase;
- flight of stairs. On the ground floor, through it, there is an exit to the street, on all floors there is an exit to the outside of the apartment corridor.

There are five apartments on a typical floor: 1 one-room, 3 two-room and 1 three-room. These apartments have different sizes. In all apartments, the zoning of residential and public areas is observed. All apartments have standardized insulation and each room except 2 located at both ends of the building is equipped with balconies; balconies are also absent on the first floor. The balconies are summer rooms of trapezoidal and rectangular apartments, fenced with walls and fences to a height of 1 meter. The depth of the loggia is 1.5 meters. All rooms and kitchens have natural light through the window openings, and the interior corridors through the glazed doors.

Comprehensive improvement of the adjacent territory of the quarter involves:

- placement of playgrounds for children and adults;
- small architectural forms;
- utility sites;
- reconstruction of the system of existing driveways and sidewalks;
- gardening.

The project provides for measures to create an accessible environment for people with limited mobility and people with disabilities in accordance with the set of rules for design and construction.

When forming the site, the continuity of pedestrian and transport routes was observed, providing access for disabled people and people with limited mobility to buildings and across the territory, taking into account the requirements of urban planning standards. The arrangement of ramps with a slope of not more than 1:10 at the intersection of sidewalks with the carriageway of internal roads is provided.

1.3.2 Design solutions

Residential block - section:

- structural type frame - diaphragm;
- constructive scheme - girder-free frame;
- the spatial rigidity of the building is ensured by the joint work of the floors and the rigidity core;

- foundation - monolithic girder on piles. The inner walls of the basement are monolithic. All surfaces of walls in contact with the ground are painted with hot bitumen in two times;

- external walls - the enclosing structures of the external walls are made of bricks 250mm with external thermal insulation 130mm thick. External finishing is ceramic slabs;

- internal walls - from gypsum concrete slabs of dry plaster;

- ceilings are designed with monolithic reinforced concrete 180 mm thick made of concrete of class B25, with reinforcement of class A-III;

- two-layer roll roof, flat. Insulation from extruded polystyrene foam and expanded clay gravel to create a slope. Organized internal drainage from the roof, designed with three funnels;

- flights of stairs and platforms made of monolithic reinforced concrete;

- staircases - standard metal;

- Elevator shafts are designed monolithic reinforced concrete made of concrete of class B25 and reinforcement of class A-III;

- for the passage of electrical wiring through concrete walls, holes with a diameter of 50 mm are drilled. Smoke exhaust shafts are plastered on both sides in parallel with the masonry;

- Columns are monolithic reinforced concrete 500mm without capitals. Made of class B25 concrete and class A-III reinforcement.

1.3.3 Engineering equipment

- natural exhaust ventilation from kitchens and bathrooms. Exhaust is carried out along vertical ventilation blocks with associated and collecting ducts;

- central heating, with a water temperature of 105-70 degrees Celsius. The system is a dead-end system with top wiring made of typical risers, designed for variable temperature and pressure loss in radiators. Water heating system with convectors. The heat supply system of the CHPP will serve as a source of heat for heating and hot water

supply. Connection of heating systems is provided according to a dependent scheme with a central heating station device;

- drinking water supply from the external network. Cold water will be supplied from the microdistrict network supplying drinking-quality water. To ensure the necessary pressure in the internal networks, it is planned to install booster pumps for both household and firefighters. The building is supplied with water from a separate central heating station. 12 pipes of cold and hot water supply from the central heating station are laid through the passage channels to the basement of the house, and booster pumps are also installed there. A combined fire-fighting water supply system is being designed in the building. To ensure fire extinguishing, it is planned to install on each floor two twin fire risers with a diameter of 50 mm, equipped with 20 m long hoses. Hot water supply is provided centrally from the central heating station. Risers are laid in the mines on the stairwell and in the bathrooms of the apartments. Shafts have access to risers on each floor. The pipelines of water supply systems are laid in the basement and are insulated with mineral wool products with a lacquered glass cloth covering over glassine;

- discharge of storm water from the roof is organized into funnels on the roof and into risers;

- the power supply of the residential building is carried out from the external supply network by two cable entries separately at a voltage of 380 / 220V. The power supply of the main consumers of a residential building and built-in premises should be carried out according to the II category of power supply reliability. For consumers of the 5th category (smoke removal and fire alarm systems, elevators, emergency and evacuation lighting), it is necessary to provide an ATS. In the niches of the electrical panels, electrical cabinets are mounted, two on the floor, in which there are meters for common apartment accounting, automatic protection of group lines. Lighting control of staircases is carried out by a photo switch, working and emergency lighting of staircases and elevator halls is provided. The supply networks are laid in the basement openly in steel pipes. The group network in apartments is laid in the channels of partitions and floor slabs. For each apartment, an electric bell with a 220V voltage button is provided. One common input switchgear will be installed in the building.

It is necessary to provide for the following types of lighting:

- 1) working;
- 2) emergency;
- 3) evacuation.

- the project provides for the device of internal networks:

1) radio transmission from city transformers to subscriber radio sockets in all apartments;

2) television antennas for collective use with the device and installation of universal branch boxes in floor cabinets;

3) Internet cable.

- installation of internal sewerage is provided from polyethylene pipes. In bathrooms, pipes are laid above the floor in decorative stitching. Stands are laid in shafts with access to each floor. The following sanitary devices are designed for the installation:

1) ceramic toilets with directly located cisterns and oblique outlets;

2) cast-iron enamelled straight-sided bathtubs with a siphon, overflow and outlet;

3) ceramic semicircular washbasins with brass outlet and siphon, overflow and outlet;

4) ceramic semicircular washbasins with a brass outlet, a siphon and a single mixer with a flexible hose;

5) double sinks made of stainless steel with a siphon, outlet and tabletop mixer.

The drainage is designed into the external domestic sewer network through two outlets with a diameter of 150 mm, oriented to the courtyard facade. To ensure uninterrupted robots of the sewer network, revisions must be designed on it. On risers, revisions are installed on the upper and lower floors

- the waste bin is designed according to the Prana catalog - waste disposal and fire extinguishing systems for residential and office buildings. Inlet valves are located on all floors with the exception of the 1st and 9th floors; the waste collection chamber is located at the level of the first floor.

Conclusion

In architectural and construction section, the spatial planning solutions of the building were considered, engineering communications were considered in detail, and the issues of heat preservation and provision of normative conditions of room lighting with constructive solutions were skillfully combined. The description of constructive decisions and the general plan is executed.

2 CALCULATION AND DESIGN SECTION

2.1 Choosing foundation option

According to the assignment for diploma design, calculation of pile foundations from driven piles;

2.2 Collecting loads

We collect loads on the foundation under the basement wall along axis 1. From a cargo area of $4.5 * 5\text{m}$ The foundation absorbs loads from all overlying structures, including the structure of the covering, its own weight and the weight of the snow cover.

Total constant 2575.5 kN

temporary 509.4 kN

Calculated loads on the foundation, taking into account the reliability factor for the purpose of the building $\gamma_n = 0.95$:

- constant, $g = 0.952575.5 = 2446.7 \text{ kN}$
- temporary, $v = 0.95509.4 = 483.9 \text{ kN}$
- full $g + v = 2446.7 + 483.9 = 2930.6 \text{ kN}$

2.3 Choosing depth of grillage and length of the pile

We accept for design driven prismatic piles without prestressed reinforcement. We assign the length of the pile based on the engineering and geological conditions, immersing the lower end into the soil with a sufficiently high design resistance to a depth of 3 m. As a base, we take coarse-grained soils with medium-sized sand aggregate. Choosing piles, pile grade - C90.30 A-III. The pile cross-section is taken as 300x300 mm, and the piles are immersed to 8m. For design reasons, we assign the depth of the foundation of the foundation grillage from the planning mark $d_p = 3.45 \text{ m}$, i.e., the

basement depth is 2.8 m + the basement floor is 0.15 m + the thickness of the grillage is 0.5 m.

2.4 Calculation of driven piles

2.4.1 Determination of the bearing capacity of the pile

$$F_d = \gamma_c \cdot R \cdot A = 8400 \cdot 0,12 \cdot 1 = 1008 \text{ kPa.}$$

where F_d is the bearing capacity of the pile of the rack

R is the calculated soil resistance under the lower end of the pile;

A is the cross-sectional area of the pile;

$\gamma_c = 1.0$ is the coefficient of the working conditions of the pile in the ground;

Determine the permissible design load on the pile

$$N \leq \frac{\gamma_0 F_d}{\gamma_n \gamma_k} = 720 \text{ kN}$$

where N is the design load transmitted to the pile (the longitudinal force arising in it from the design loads acting on the foundation with their most unfavorable combination), determined in accordance with;

F_d - bearing capacity (ultimate resistance) of the soil of the base of a single pile;

γ_0 - coefficient of working conditions, taking into account the increase in the uniformity of soil conditions when using pile foundations;

γ_n is the reliability factor for the purpose (responsibility) of the structure, taken equal to 1.2; 1.15 and 1.10, respectively, for structures of I, II and III levels of responsibility;

γ_k is the coefficient of reliability on the ground.

We take from the design experience $F_d = 540 \text{ kN}$.

2.4.2 Determination of the number of piles in the foundation and the size of the grillage.

The number of piles per 1 running meter in a tape grillage, based on the condition of maximum use of the bearing capacity:

$$n = \frac{\sum N_i}{\frac{F_d}{\gamma_k} - 0,9 \cdot d_p \cdot \gamma_{cp} - 1,1 \cdot 10 \cdot g_c}$$

where $\sum N_i$ is the sum of vertical loads on the edge of the grillage in the combination N_{max} , and the loads are taken for the calculation according to the limit state;

$0,9 \cdot d_p \cdot \gamma_{cp}$ - load per one pile from the grillage, kN;

0.9 - the area of the grillage per one pile, m²;

d_p is the depth of the grillage, m;

γ_{av} - the average specific gravity of the grillage and soil on its edges, accepted 20 kN / m;

g_w is the mass of the pile, t.

$$n = \frac{2930,6}{540 - 0,9 \cdot 3,35 \cdot 20 - 1,1 \cdot 10 \cdot 2,05} = 6,4 \text{ piles}$$

We accept 7 piles

We will preliminarily perform the placement of piles in the bush (taking into account the requirements of the norms and the dimensions of the sub-column)

Minimum distance between piles in a row

$$l^1 = 3 d = 3 \cdot 0,3 = 0,9 \text{ m}$$

where l^1 is the distance between piles in a row, m;

d - pile diameter, m.

Axial distance between the rows of piles in the grillage

$$l_{oc} = \sqrt{(3d)^2 - \left(\frac{3d}{2}\right)^2}$$

where l_{os} - axial distance between piles, m

$$l_{oc} = \sqrt{(3 \cdot 0,3)^2 - \left(\frac{3 \cdot 0,3}{2}\right)^2} = 0,8 \text{ m}$$

Find the length of the grillage in the plan

$$b_p = 2 \cdot 3d + d + 2 \cdot 0.15 = 2.4\text{m}$$

where b_p is the length of the grillage, m;

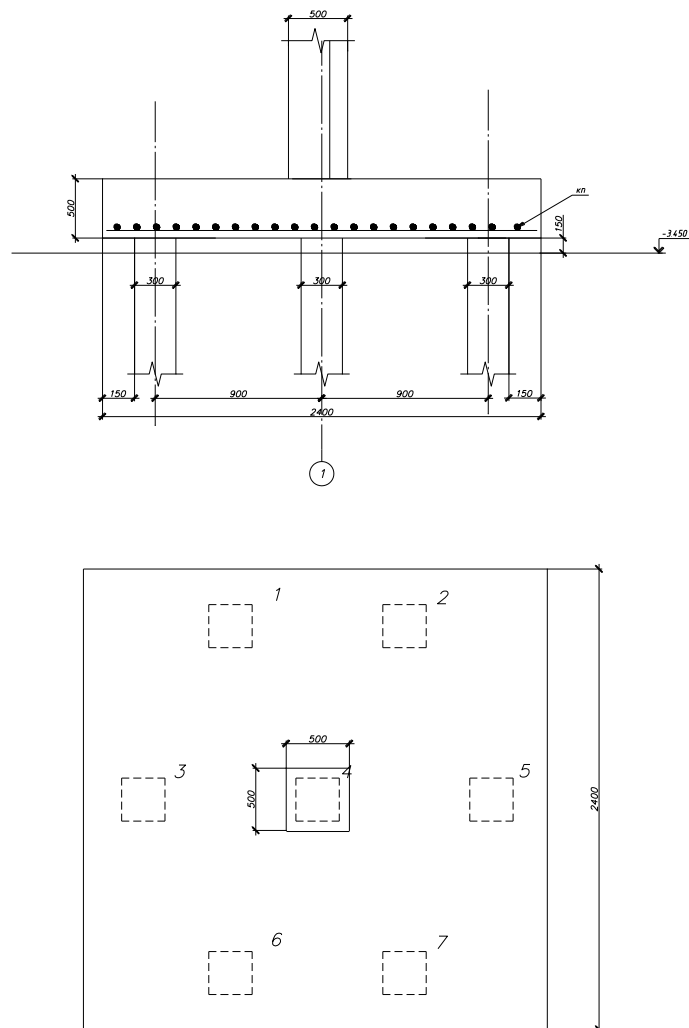
For design reasons, we take $b_p = 2.4\text{m}$

Find the width of the grillage in the plan

$$l_p = 2 \cdot l_{oc} + d + 2 \cdot 0.15 = 2.2\text{m}$$

where l_p is the width of the grillage, m;

From design considerations, we take $l_p = 2.4\text{m}$ (pic 2.1).



Picture 2.1 – Piles location in the grillage

$$N_p = 1,1 \cdot 2,4 \cdot 2,4 \cdot 0,5 \cdot 25 = 79,2\text{kH}$$

For 1 combination

$$N' = N_p + N_k$$

$$N' = 79,2 + 2930,6 = 3009,8 \text{ kN}$$

$$M' = M_K + Q_K \cdot (d_p - 0,15 \cdot M)$$

where M' , Q' , N' loads applied to bottom of the grillage

$$M_x' = 0,51 + 11,03 \cdot (3,35 - 0,15) = 35,8 \text{ kN}\cdot\text{m}$$

$$M_y' = 10,21 + 1,21 \cdot (3,35 - 0,15) = 14,08 \text{ kN}\cdot\text{m}$$

2.4.3 Determination of loads on each pile

We find the load on each pile in an eccentrically loaded foundation:

$$N = \frac{N_d}{n} \pm \frac{M_x^p}{\sum y_i^2} \pm \frac{M_y^p}{\sum x_i^2} + 1,1 \cdot 10 g_{cb}$$

where N_d is the calculated compressive force, kN, transmitted to the pile grillage at the level of its base;

M_x , M_y - calculated bending moments, kNm, transmitted to pile grillage in the plane of the foundation, relative to the main central axes x and y of the pile plan in the plane of the foundation of the grillage;

n - is the number of piles in the foundation;

x, y - distances from the main axes to the axis of each pile, for which the design load is calculated, m.

$$N_{cb}^3 = \frac{3009,8}{7} - \frac{35,8}{0,81} + \frac{14,08}{0,81} + 1,1 \cdot 10 \cdot 2,05 = 425,75 \text{ kN},$$

$$N_{cb}^5 = \frac{3009,8}{7} + \frac{35,8}{0,81} - \frac{14,08}{0,81} + 1,1 \cdot 10 \cdot 2,05 = 479,35 \text{ kN},$$

$$N_{cb}^{1,6} = \frac{3009,8}{7} - \frac{35,8}{0,2} + \frac{14,08}{0,2} + 1,1 \cdot 10 \cdot 2,05 = 343,95 \text{ kN},$$

$$N_{cb}^{2,7} = \frac{3009,8}{7} + \frac{35,8}{0,81} - \frac{14,08}{0,81} + 1,1 \cdot 10 \cdot 2,05 = 561,15 \text{ kN},$$

$$N_{cb}^4 = \frac{3009,8}{7} + 1,1 \cdot 10 \cdot 2,05 = 452,22 \text{ kN},$$

$$N_{max} = 561,15 \text{ kN} < 1,2 N_{cb} = 1,2 \cdot 540 = 648 \text{ kN}, \text{ condition is fulfilled;}$$

$$N_{\max}/N_{\min} < 3$$

$N_{\min} = 425,75 \text{ kN}$; $N_{\max}/N_{\min} = 1,32 < 3$, condition is fulfilled, therefore, layout of pile cluster is correct.

2.4.4 Construction of the grillage

$$c_1 = 300\text{mm}; c_2 = 250\text{mm}; l_c = 800\text{mm}; b_c = 400\text{mm};$$

Punching force:

$$F \leq \frac{2 \cdot R_{bt} \cdot h_{op}}{\alpha} \cdot \left[\frac{h_{op}}{c_1} \cdot (b_c + c_2) + \frac{h_{op}}{c_2} \cdot (l_c + c_1) \right];$$

$$F = 2 \cdot N_{cb\ 1,6} + 2 \cdot N_{cb\ 2,7} + N_{cb\ 3} + N_{cb\ 4} + N_{cb\ 5}$$

$$F = 425,75 + 479,25 + 2 \cdot 343,95 + 2 \cdot 561,15 + 452,22 = 2688,17 \text{ kN}$$

$$\alpha = 1 - \frac{0,4 \cdot R_{bt} \cdot A_c}{N_k}; \quad \text{when } \alpha \geq 0,85.$$

We accept concrete of class B-25 with design resistance $R_{bt} = 660 \text{ kPa}$.

$$A_c = 2 \cdot (b_c + l_c) \cdot d_c = 2 \cdot (0,5 + 0,5) \cdot 2,8 = 5,6$$

where $d_c = 2.8 \text{ m}$ - column height;

$b_c = 0.5 \text{ m}$ - column section width;

$l_c = 0.5 \text{ m}$ - the length of the column section.

$$\alpha = 1 - \frac{0,4 \cdot 660 \cdot 5,6}{2930,6} = 0,5$$

Accept $\alpha = 0,85$

$h_{op} = 0.45 \text{ m}$ - the height of the steps, taking into account the gap

$$2688,17 < \frac{2 \cdot 660 \cdot 0,45}{2,8} \cdot \left[\frac{0,45}{0,25} \cdot (0,5 + 0,1) + \frac{0,45}{0,1} \cdot (0,5 + 0,25) \right] = 1534,5 \text{ kN}$$

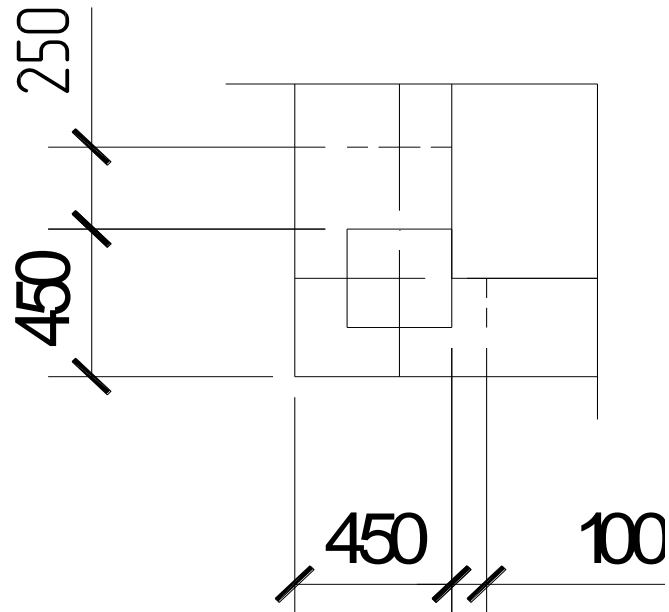
Condition is fulfilled.

Corner pile punching test:

$$c_{01} = 0,4 \cdot h_{op} = 0,18 \text{ m},$$

$$c_{02} = h_{op} = 0,45 \text{ m},$$

$$b_{01} = 0,45\text{m}, b_{02} = 0,45\text{m},$$



Picture 2.2 – Fragment of grillage

$$N'_{cb} \leq R_{bt} h_{op} [\beta_1 (b_{02} + 0,5 \cdot c_{02}) + \beta_2 (b_{01} + 0,5 \cdot c_{01})]$$

$$561,15 \geq 660 \cdot 0,45 \cdot [0,85 \cdot (0,45 + 0,5 \cdot 0,45) + 0,6 \cdot (0,45 + 0,5 \cdot 0,18)] = 152,95$$

Condition is fulfilled.

We accept the reinforcement of the lower mesh C1 in one direction 11Ø12 AIII with an area $A_S = 14.44 \text{ cm}^2$; in the other direction 9Ø10 AIII with area $A_S = 7.07 \text{ cm}^2$.

Conclusion

The section analyzes the engineering and geological conditions of the construction site for the projected building and identifies the soil layers with their physical characteristics. The depth of the foundation sole is determined, taking into account the basic design conditions, hydrogeological and relief features of the building site.

The section collects loads, calculates the load on the pile and the required number of piles in the bush. As a result, a layout of piles and a grid diagram were developed.

3 ORGANIZATIONAL AND TECHNOLOGICAL SECTION

3.1 Method statement for roofing

3.1.1 Scope method statement

The method statement is designed for reuse, provided that the same roofing composition is used. The technological map is intended for new construction. The technological map is developed for the device of roofing from roll roofing material. The composition of the works considered by the card includes: a vapor barrier device, a thermal insulation device, a slope device, a reinforced screed device, a two-layer carpet sticker.

3.1.2 Work instructions

- before the start of laying the vapor barrier layer, it is necessary to complete all construction work, the base must be free of debris;
- on all vertical surfaces, the vapor barrier material must be glued with continuous gluing, starting above the heat-insulating layer;
- on the entire horizontal plane, glue the sheets of material in the seams, ensuring the overlap of the panels 80 - 100 mm and 150 in the end panels;
- when laying thermal insulation, place the seams between the plates apart, ensuring a snug fit to each other. Cut the insulation boards so that the joints of the 1st and 2nd layers do not coincide. Lay the layers over yourself
- install beacons before starting the deviation device. Backfill carefully, without damaging the heat-insulating layer, achieve the design slope $i = 2.5$;
- when laying a screed from a cement-sand mortar, arrange temperature-shrinkage joints with a width of 5 mm dividing the screed no more than $6 * 6$ m. Reinforce the screed with a mesh. When making a cement-sand screed, the mortar should be used before setting and periodically stirred during use. In places where the roof adjoins the walls of mines and other structural elements, provide transitional inclined sides at an angle of 45°,

with a height of at least 100 mm from a cement-sand mortar. Brick walls in these places should be plastered with cement-sand mortar of grade 50;

- priming with a primer should be done in 3 - 4 hours as the screed was laid;

- before the start of the gluing of the main waterproofing carpet, all preparatory work must be completed: ventilation shafts are installed, abutments, eaves overhangs, and funnels of the internal drain are made. The slope should be checked for compliance with the design;

- the first layer is applied as follows:

- 1) roll out a roll of material on the prepared surface, trying it on in place and in relation to the neighboring one, ensure it with a whip;

- 2) roll the material back to the middle on both sides;

- 3) burn the film with a burner on the underside of the roll in the place of the steam-conducting strips, preventing the sand from drowning in the binder. During fusion, the lateral lash should be additionally heated until a bead of bitumen-polymer binder is formed, it should protrude 0.5-1.5 cm from the side seam. The roll attachment in the lateral places should be carried out most carefully;

- sticker of the second carpet layer:

- 1) roll out a roll of material on the prepared surface, measure it in place and in relation to the adjacent one, ensuring it with a whip, remove the protective film;

- 2) roll the material back;

- 3) gluing is carried out as follows: for this, the roofer lights the burner and melts the rolled roll with the pendulum motion of the burner along the roll, holding the burner glass at a distance of 10 - 20 cm from the roll. After the formation of a bead of the melted deposited layer (on the bottom side of the roll), the roofer gripper-unroller clings to the roll and, stepping back, rolls it out and glues it. Rolling at the docking points is carried out by an IR-735 roller;

- the device of the roofing carpet within the limits of the working grips to start from lowered sections to high

- eaves overhangs, areas of the location of drainage funnels, with the location of the panels perpendicular to the water flow;

- when adjoining vertical surfaces, make a sticker from bottom to top. At the junctions of the roof to the parapets, lay the layers of the additional carpet on the upper edge of the parapet, after which the junction is finished with galvanized roofing steel, which is fastened with self-tapping screws;

- the tension of the panels when laying on the base should eliminate residual waviness and wrinkles on the surface of the roofing material. The panel laid on the base after gluing must firmly adhere to the base, without forming waves and swelling to prevent such defects, roll the rolls from the axis of the roll diagonally to its edges, the defects found after gluing each layer must be eliminated before gluing the next layers of material;

- walking on a newly laid carpet is not permissible;

- when installing the roof, make acceptance of each layer with the completion of the act for hidden work.

3.1.3 Flow chart of the work process

A specialized team of 6 people performs work on the installation of a roll roofing made of roofing material with a layer of mastic. Including:

- roofer of the V category, and he is also a foreman - 1 person;
- grade IV roofer - 1 person;
- grade III roofer - 2 persons;
- grade II roofer - 2 persons;
- V category crane operator - 1 person;
- Riggers of the II category - 2 people.

The 1st grade II roofer prepares the base. The 2nd grade II roofer and the 1st grade III roofer glue the vapor barrier. After finishing the preparation, the 1st grade II roofer and the 2nd grade III roofer lay the 1st layer of thermal insulation. After gluing the vapor barrier, the 2nd grade II roofer and the 1st grade III roofer lay the 2nd layer of thermal insulation. After the 1st grade II roofer and the 2nd grade III roofer have installed the thermal insulation, the two of them begin the construction of expanded clay deflector. After the slope is completed, the IV grade roofer and the 1st grade III roofer begin the

installation of the cement-sand screed, and the III grade roofer helps them by laying the reinforcing mesh along the screed. When the mortar has hardened, the V category roofer performs an abutment to the roof outlets. Parallel to it, grade II roofers begin priming the base. Roofers begin to work with them: grade IV and grade III, they sequentially carry out the gluing of the 1st and 2nd layers of waterproofing carpet, they also perform lining of the abutments.

3.1.4 Requirements for the quality of work

Table 3. 1 – Instructions on acceptance of works and quality control

The name of the technological process and its operations	Controlled parameter	permissible parameter values, quality requirement	Method of control , means (devices) of control
one	2	3	four
p base ovnost (couplers)	base	deviation of the base surface along the slope and on the horizontal surface ± 5 mm, across the slope and on the vertical surface ± 10 mm	and using a 3-meter ruler
screed device	also	no more than 5%	instrumental
vapor barrier device , device of the main waterproofing carpet	roofing quality	quality of the roofing device Longitudinal not less than 100mm transverse not less than 150mm	visual
also	also	perpendicular to the water outlet	also
also	also	not less than $5 \text{ kg} / \text{cm}^2$	visually by tearing
laying insulation	also	no more than 10%	measuring
also	also	no more than 5 mm	also
deflector device	also	Not more than 0.01%	also
screed device	also	also not less than $100 \text{ kg} / \text{cm}^2$	samples of cubes are tested after 7 and 28 days
also	also	According to the project, the permissible deviation is 10%	ruler
Availability of passports (quality documents) for all types of raw materials and products		documentation	visual

3.1.5 Occupational safety and health

- before starting work, each roofer must receive the following set of overalls: male overalls, tarpaulin boots, protective helmet, universal mask;
- when installing roll roofs made of weldable materials using the gas burner method, the safety rules must be observed;
- to work on the construction of roofs made of deposited material, persons are allowed to be at least 18 years old who have passed a medical examination, special theoretical training and practical training, passed exams and received a certificate;
- regardless of the production experience, roofers must undergo an introductory (general) safety briefing, as well as a production briefing directly at the workplace;
- elements and details of the roof, including expansion joints in the seams, protective aprons, links of drainpipes, drains, overhangs, etc., should be submitted to the workplace in a prepared form. Before starting work, the roofer must wear special clothing and make sure that it is in good working order. Shoes must be non-slip;
- by external inspection, check the serviceability of: cylinders, burners, hoses, the reliability of their fastening (fasten only with metal clamps), serviceability of gearboxes, pressure gauges. When working with gas cylinders (working gas - propane), it is necessary to be guided by the "Temporary instructions for the safe operation of posts, storage and transportation of cylinders of liquefied gases of a propane-butane mixture during waterproofing works";
- when working with gas-flame equipment, it is recommended to use protective goggles;
- when igniting a manual gas-flame burner (working gas - propane), open the valve by 1/4 - 1/2 turn and after a short purge of the hose ignite the combustible mixture, after which the flame can be regulated;
- ignite the burner with a match or a special lighter, it is forbidden to ignite the burner from accidental burning objects;
- with a lit burner, do not move outside the workplace, do not climb ladders and scaffolding, do not make sudden movements;

- the burner is extinguished by shutting off the gas supply valve, and then lowering the locking lever;
- during breaks in operation, the burner flame must be extinguished, and the valves on it must be tightly closed. During breaks in work (lunch, etc.), valves on gas cylinders, reducers must be closed;
- in case of overheating of the burner, work must be suspended, and the burner must be extinguished and cooled to the ambient temperature in a container with clean water;
- gas-flame works must be carried out at a distance of at least 10 m from groups of cylinders (more than 2) intended for conducting gas-flame works; 5 m from separate flammable gas cylinders; 3 m from gas pipelines of combustible gases;
- it is forbidden to work in oiled clothing and smoke at the workplace;
- penetration of unauthorized persons, drunken workers or those who are not employed in this work area is not allowed;
- the roofer's workplace must be provided with the following fire extinguishing and medical aid: powder fire extinguishers per roof section at least two pieces, a sand box with a capacity of 0.05 m³, shovels - 2 pieces, an asbestos cloth - 1 m², a first aid kit with a set medicines.

3.1.6 Guidelines for quality control of construction and installation works

The required quality and reliability of buildings and structures must be ensured by construction organizations through the implementation of a set of technical, economic and organizational measures of effective control at all stages of the creation of construction products.

Quality control of construction and installation work should be carried out by specialists or special services that are part of the construction organization or are attracted from the outside and equipped with technical means that ensure the necessary reliability and completeness of control.

Production quality control of construction and installation work should include incoming control of working documentation, structures, products, materials and

equipment, operational control of individual construction processes or production operations and acceptance control of construction and installation work.

Operational control should be carried out during the execution of construction processes or production operations and acceptance control of construction and installation work.

During acceptance control, it is necessary to check the quality of the completed construction and installation works, as well as critical structures.

Based on the results of production and inspection quality control of construction and installation work, measures should be developed to eliminate the identified defects, while the requirements of designer supervision of design organizations and state supervision and control bodies should also be taken into account.

3.1.7 Measures for labor protection and fire safety

Dangerous zones, into which the entry of people not associated with this type of work is prohibited, are fenced off and marked.

There are safe paths for pedestrians and car transport.

Temporary and administrative-economic and utility buildings and structures are located in such a way that the distance from the most distant place outside the building does not exceed 200m.

Drinking installations are located at a distance not exceeding 75 m from workplaces.

Fire-prevention breaks are provided between temporary buildings and structures.

Safe working conditions must be created at the construction site, excluding the possibility of electric shock to people in accordance with the norms.

The construction site, walkways, driveways and workplaces are illuminated.

Places for kureia are designated and fire posts equipped with fire extinguishing equipment are located.

Wheels are washed from a barrel, dirty water is discharged into the city storm water system

Safety at the construction site.

Welded works

The workplaces of welders in the room should be separated from adjacent workplaces and passages by fireproof screens to a height of 1.8 m. When welding in the open air, a fence should be installed in case of simultaneous work of several welders close to each other and in areas of intense active movement of people. Welding in the open air during the rain and snowfall should be stopped.

Excavation:

When carrying out earthworks on the territory of settlements or on industrial territories, pits, pits, trenches and ditches in places where people and vehicles move, must be fenced, and transitional bridges must be installed.

The personnel operating the means of mechanization, equipment, devices and hand-held machines, before starting, must be trained in safe methods and techniques of work.

Rigging works

Rigging or slinging loads must be carried out by trained personnel.

Winter work

Work on the construction of structures in the winter is allowed to be carried out according to the project for the production of work, developed by the construction organization and agreed with the binding organization.

3.1.8 Measures for environmental protection

It is envisaged to establish the boundaries of the construction site, which ensures maximum safety outside the construction site of trees, shrubs, and grass cover.

The disorderly and disorganized movement of construction equipment and vehicles is excluded. Temporary highways and other access roads are arranged taking into account the requirements to prevent damage to trees and artisanal vegetation.

Concrete mix and mortars are stored in special containers. Places are organized where containers for garbage are installed.

3.1.9 Measures to ensure the safety of materials

For the preservation of expensive materials or materials that deteriorate in the open air (cement, lime, gypsum, plywood, nails, etc.), closed warehouses are arranged.

Materials are stored in compliance with certain rules. When stacking products in a stack, the spacers between them are placed strictly one under the other. The cross-section of gaskets and pads is usually square with a side of 6 ... 8 cm. Dimensions are selected so that higher prefabricated elements do not rest on mounting loops or protruding parts of lower ones.

When installing the elements, the slings must be correctly selected, otherwise the structures may break.

At the entrances and exits of the construction site, gates are installed, a guard is working, located in temporary buildings located at both entrances.

An alarm system is provided at the site. In the dark, the construction site is illuminated from all sides by floodlights.

Conclusion

In organizational and technological section, general provisions on organization of construction from the preparatory stage to quality control of work performed were considered. The method statement for roofing has been developed, construction master plan has been developed and a work schedule has been drawn up.

A more detailed description of all these operations is given, taking into account the needs for skilled workers, machines and mechanisms. The main part of the report discusses the main elements of labor protection, fire safety measures and safety instructions for installer.

4 EQUIPMENT AND ECONOMIC SECTION

4.1 Local estimate

In economic and social development in the field of capital construction the task is to provide in projects wide application of advanced scientific and technological achievements, resources and energy saving technologies and the equipment, economic volume-planning decisions, designs, materials, advanced methods of the organization of production and work, consistently reducing consumption of material, fuel and energy and labor resources per unit of output.

In the economic part of the diploma project are calculated:

- Comprehensive local estimate for the pile-tape foundation.
- Negotiated price.

On the basis of the estimate-contractual documentation technical and economic indicators of the project are calculated. When preparing local estimates are used:

- resource element estimate norms of Ukraine;
- instructions on the application of resource element estimates;
- resource estimated norms of operation of construction machines and mechanisms;
- current prices for materials, products and structures;
- current prices of machine hours;
- the current cost of man-hours of the corresponding category of work;
- current prices for transportation of goods for construction;
- rules for determining overhead costs and covering administrative costs.

Local estimates are the primary estimate documents and are compiled for certain types of work and costs for buildings and structures or for site-wide works on the basis of volumes determined during the development of working documentation (working drawings).

The investor's local estimate is made in accordance with the "Rules for determining the cost of construction".

4.2 Negotiated price

The contract price is formed as follows:

- the cost of construction and installation work of the contract price is determined by the object estimate.
- the costs of erection (adaptation) and dismantling of titular temporary buildings and structures are calculated, on average to determine the limit of funds for titular temporary buildings and structures in the investor's estimate documentation for construction.

The coefficient of 0.85 in the contract price compensates for the return amounts on temporary buildings and structures. When calculating the complexity of temporary buildings and structures, this factor is not applied.

CONTRACTUAL PRICE №
 for construction Nine-storey residential building in Dnipro city
 (name of the object of construction, start-up complex, house, building, construction,
 linear object of engineering and transport infrastructure)

which is carried out in 2021
 Type of contract price: "fixed contract price"
 Agreement № 1 dated 07.07.2021
 Defined in accordance with DSTU B D.1.1-1: 2013
 Compiled in current prices as of July 6, 2021

№	Reasoning	Name of costs	Cost, thousand UAH		
			Total	including:	
				construction works	other costs
1	2	3	4	5	6
1	Calculation №1-1	Direct costs including Salary of builders, installers Cost of material resources Cost of exploitation of construction machines	44 545,139 5 750,313 26 521,315 12 273,511	44 545,139 5 750,313 26 521,315 12 273,511	
2	Calculation №1-2	Total expenditures	4 310,368	4 310,368	
3		Total direct and overhead costs	48 855,507	48 855,507	
4	Calculation №3 (DSTU B D.1.1-1: 2013 Dod.K p.26)	Additional costs for construction work in the winter	385,959	385,959	
5	Calculation №4 (DSTU B D.1.1-1: 2013 Dod.K p.27)	Additional costs for construction work in the summer outdoors at an outdoor temperature of more than +27 C	131,910	131,910	
		Total	49 373,376	49 373,376	
		Total contract price	49 373,376	49 373,376	
6		VAT	9 874,675		9 874,675
		Total contract price	59 248,051	49 373,376	9 874,675

The head of the enterprise
(organization) - the customer

Head (General)
contractor

(signature, initials, surname, seal)

(signature, initials, surname, seal)

Calculated Local Estimate, Resource Statement, Object Estimate, Consolidated Estimate and Contract Price added at Annex A.

Construction cost at current price level with VAT – UAH 59 248 051.

Conclusions

The section describes the calculation of estimated cost of foundation construction of building, developed a calendar plan, provides technical and economic indicators of construction and performed the calculation of the contract price. According to the results of calculations, the construction cost amounted to UAH 59 248 051.

GENERAL CONCLUSIONS

In architectural and construction section, the spatial planning solutions of the building were considered, engineering communications were considered in detail, and the issues of heat preservation and provision of normative conditions of room lighting with constructive solutions were skillfully combined. The description of constructive decisions and the general plan is executed.

In calculation and design section analyzes the engineering and geological conditions of the construction site for the projected building and identifies the soil layers with their physical characteristics. The depth of the foundation sole is determined, taking into account the basic design conditions, hydrogeological and relief features of the building site.

The section collects loads, calculates the load on the pile and the required number of piles in the bush. As a result, a layout of piles and a grid diagram were developed

In organizational and technological section, general provisions on organization of construction from the preparatory stage to quality control of work performed were considered. The method statement for roofing has been developed, construction master plan has been developed and a work schedule has been drawn up.

A more detailed description of all these operations is given, taking into account the needs for skilled workers, machines and mechanisms. The main part of the report discusses the main elements of labor protection, fire safety measures and safety instructions for installer.

In economical section describes estimated cost calculation of foundation construction of building, developed a calendar plan, provides technical and economic indicators of construction and performed the calculation of the contract price. According to the results of calculations, the construction cost amounted to UAH 59 248 051.

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ANNEX A

DSTU BD.1.1-1: 2013, Appendix A
Form No. 1

Nine-storey residential building in Dnipro city
(name of the construction object)

Local estimate for construction works № 02-001-001

of Earthworks and foundation. Nine-storey residential building in Dnipro city
(name of works and expenses, name of the house, building, construction, linear object of engineering and transport infrastructure)

Based on:
drawings (specifications) № 1-6

	Estimated cost	17 874,522	thousand UAH
	Estimated complexity	76,86056	thousand man-hours
	Estimated salary	5 803,439	thousand UAH
	The average category of work	3,9	category

Compiled in current prices of July 6, 2021

№	Name of works and costs	Unit	Quantity	Unit cost, UAH		Total cost, UAH			Labor costs of workers, man-hours. unoccupied service-machines	
				Total	operation of machines	Total	salary	operation of machines	those who service the machines	
				salary	including salary					
								per unit	total	
1	2	3	4	5	6	7	8	9	10	11
1	Planning areas with 79 kW [80 hp] bulldozers per pass	1000m2	13,6224	169,56	169,56	2 310	-	2 310	-	-
				-	43,95			599	0,5148	7,01
2	Excavation of soil in the dump by excavators "dragline" or "backhoe" with a bucket capacity of 2.5 [1.5-3] m3, soil group 1	1000m3	2,8178	6 154,48	5 723,16	17 342	1 215	16 127	7,1600	20,18
				431,32	2 373,47			6 688	31,4781	88,70
3	Excavation of soil manually in trenches with a width of more than 2 m and pits with a cross-sectional area up to 5 m2 with fasteners at a depth of trenches and pits up to 2 m, soil group 1	100m3	1,70775	15 111,20	-	25 806	25 806	-	275,4000	470,31
				15 111,20	-			-	-	-

4	Arrangement of reinforced concrete bored piles with a diameter of up to 630 mm in soils of groups 1-2	m3	2 183,93	6 342,58	5 519,06	13 851 751	1 545 873	12 053 241	10,8100	23 608,28
				707,84	1 477,47			3 226 691	19,1576	41 838,86
5	Arrangement of concrete preparation	100m3 of concrete, rubble concrete and reinforced concrete in practice	0,854	222 037,24	1 782,93	189 620	7 130	1 523	150,7000	128,70
				8 348,78	782,73			668	10,6641	9,11
6	Installation of foundation slabs of reinforced concrete flat	100m3 of concrete, rubble concrete and reinforced concrete in practice	3,15	231 001,35	6 350,49	727 654	47 327	20 004	249,4100	785,64
				15 024,46	2 382,54			7 505	32,7235	103,08
7	Arrangement of reinforced concrete walls and concrete partitions up to 3 m high, over 300 mm thick up to 600 mm	100m3 of reinforced concrete	1,1525	471 422,48	14 553,22	543 314	59 878	16 773	852,0000	981,93
				51 954,96	5 586,11			6 438	76,5584	88,23
8	Arrangement of reinforced concrete columns in a wooden timbering up to 4 m high, perimeter up to 2 m	100m3 of reinforced concrete	0,1365	498 719,37	28 799,50	68 075	13 015	3 931	1 508,0000	205,84
				95 350,84	12 085,96			1 650	165,0336	22,53
9	Arrangement of a waterproofing covering with bituminous mastic in one layer 2 mm thick	100m2	6,3	8 642,91	5,86	54 450	13 077	37	31,7000	199,71
				2 075,72	5,24			33	0,0777	0,49
10	Add to each subsequent layer of waterproofing coating with bituminous mastic 1 mm thick	100m2	6,3	2 309,42	1,67	14 549	4 253	11	10,3100	64,95
				675,10	1,50			9	0,0222	0,14
11	Backfilling of trenches and ditches with bulldozers with a capacity of 79 kW [108 hp] with soil movement up to 5 m, soil group 1	1000m3	1,128	3 969,36	3 969,36	4 477	-	4 477	-	-
				-	1 028,95			1 161	12,0516	13,59
Total direct cost estimates						15 499 348	1 717 574	12 118 434		26 465,54
								3 251 442		42 171,74
Total direct costs					UAH	15 499 348				
including:										
cost of materials, products and structures					UAH	1 663 340				
cost of EMM					UAH	12 118 434				
incl. wages in EMM					UAH		3 251 442			

salary of workers	UAH	1 717 574	
total wages	UAH	4 969 016	
Total expenditures	UAH	2 375 174	
labor-intensive in overhead costs	man-hours		8 223,28
wages in overhead costs	UAH	834 423	
TOTAL according to the estimate	UAH	17 874 522	
Estimated complexity	man-hours		76 860,56
Estimated salary	UAH	5 803 439	

Compiled
by

[position, signature (initials, surname)]

Checked
by

[position, signature (initials, surname)]

Nine-storey residential building in Dnipro city
(name of the construction object)

Local estimate for construction works № 02-001-001

of Construction of the aboveground part of the house. Nine-storey residential building in Dnipro city
(name of works and expenses, name of the house, building, construction, linear object of engineering and transport infrastructure)

Based on:
drawings (specifications) № 1-6

Estimated cost	27 149,084	thousand UAH
Estimated complexity	44,76948	thousand man-hours
Estimated salary	3 131,897	thousand UAH
The average category of work	4,1	category

Compiled in current prices of July 6, 2021

№	Name of works and costs	Unit	Quantity	Unit cost, UAH		Total cost, UAH			Labor costs of workers, man-hours. unoccupied service-machines			
				Total	operation of machines	Total	salary	operation of machines	those who service the machines			
				salary	including salary						including salary	
								per unit	total			
1	2	3	4	5	6	7	8	9	10	11		
1	Arrangement of reinforced concrete columns in wooden formwork up to 4 m high, perimeter up to 2 m	100 m3 of reinforced concrete in practice	1,63	498 719,37	28 799,50	812 913	155 422	46 943	1 508,0000	2 458,04		
				95 350,84	12 085,96			19 700			165,0336	269,00
2	Masonry of external walls 510 mm thick from a brick (ceramic) (silicate) (hollow) with facing by a brick at floor height to 4 m	m3 of masonry	115,62	3 361,49	88,36	388 655	72 907	10 216	9,7400	1 126,14		
				630,57	40,93			4 732			0,5576	64,47
3	Arrangement of beamless floors with a thickness of more than 200 mm, at a height of up to 6 m from the support platform	100 m3 of reinforced concrete in practice	1,51389	398 323,15	9 644,10	603 017	62 637	14 600	678,5000	1 027,17		
				41 374,93	4 049,28			6 130			55,4895	84,00
4	Arrangement of partitions on a metal single-row framework with a covering by gypsum cardboard sheets or gypsum fiber plates in one layer with isolation in inhabited and public buildings	100m2	22,2768	63 299,35	198,64	1 410 107	431 104	4 425	306,0600	6 818,04		
				19 352,17	141,17			3 145			2,0328	45,28
5	Arrangement of roofs of flat four-layer from rolled roofing materials on bituminous mastic	100m2	5,0463	1 841 234,01	445,62	9 291 419	9 715	2 249	30,1000	151,89		
				1 925,20	176,39			890			2,3651	11,94
6	Installation of leveling screeds cement-sand 15 mm thick	100m2	5,0463	6 824,66	1 254,04	34 439	10 155	6 328	38,3900	193,73		
				2 012,40	480,64			2 425			6,4686	32,64
				18 417,23	350,43			92 939			20 801	1 768

7	Warming of coverings by plates from mineral wool or perlite on bituminous mastic in one layer	100m2		4 122,00	139,69			705	1,8756	9,46
8	Warming of coverings by plates from mineral wool or perlite on bituminous mastic on each following layer	100m2	5,0463	14 966,85	350,43	75 527	16 106	1 768	49,3000	248,78
				3 191,68	139,69			705	1,8756	9,46
9	Arrangement of vapor barrier pasting in one layer	100m2	5,0463	8 806,47	96,61	44 440	7 904	488	24,4900	123,58
				1 566,38	37,23			188	0,4915	2,48
10	Arrangement of vapor barrier paste on each subsequent layer	100m2	5,0463	5 661,57	94,38	28 570	5 151	476	15,9600	80,54
				1 020,80	36,36			183	0,4782	2,41
11	Waterproofing of concrete surfaces with a polymer-cement mix with a thickness of a layer of 20 mm on GKZh-10 liquid	100m2	5,0463	23 091,62	5 443,77	116 527	37 642	27 471	110,5400	557,82
				7 459,24	2 647,71			13 361	42,4690	214,31
12	Installation of door blocks in external and internal openings of stone walls, the area of an opening to 3 m2	100m2	4,86	1 319 184,98	4 568,77	6 411 239	42 418	22 204	139,6700	678,80
				8 727,98	1 950,73			9 481	23,5338	114,37
13	Installation of door blocks in external and internal openings of stone walls, the area of an opening to 3 m2	100m2	0,357	445 206,98	4 568,77	158 939	3 116	1 631	139,6700	49,86
				8 727,98	1 950,73			696	23,5338	8,40
14	Installation of window blocks with separate [separate-paired] frames in the stone walls of residential and public buildings with an opening area of more than 2 m2	100m2	4,104	863 484,87	2 138,73	3 543 742	61 287	8 777	247,9000	1 017,38
				14 933,50	913,17			3 748	11,0166	45,21
15	Arrangement of concrete screeds 20 mm thick	100m2	56,37	7 589,73	77,85	427 833	189 073	4 388	57,8300	3 259,88
				3 354,14	69,66			3 927	1,0323	58,19
16	Arrangement of a waterproofing from a polyethylene film on butyl rubber glue with protection by roofing material, the first layer	100m2	56,37	26 431,60	20,09	1 489 949	853 481	1 132	218,0400	12 290,91
				15 140,70	17,98			1 014	0,2664	15,02
17	Arrangement of a waterproofing from a polyethylene film on butyl rubber glue with protection by roofing material, the following layer	100m2	56,37	15 879,62	1,67	895 134	597 445	94	152,6300	8 603,75
				10 598,63	1,50			85	0,0222	1,25
	Total direct cost estimates					25 825 389	2 576 364	154 958		39 007,61
								71 115		987,89
	Total direct costs				UAH	25 825 389				
	including:									
	cost of materials, products and structures				UAH	23 094 067				
	cost of EMM				UAH	154 958				
	incl. wages in EMM				UAH		71 115			
	salary of workers				UAH		2 576 364			
	total wages				UAH		2 647 479			
	Total expenditures				UAH	1 323 695				
	labor-intensive in overhead costs				man-hours					4 773,98
	wages in overhead costs				UAH		484 418			

TOTAL according to the estimate	UAH	27 149 084	
Estimated complexity	man-hours		44 769,48
Estimated salary	UAH	3 131 897	

Compiled
by

[position, signature (initials, surname)]

Checked by

[position, signature (initials, surname)]

Nine-storey residential building in Dnipro city
(name of the construction object)

Local estimate for construction works № 02-001-001

of Construction of the aboveground part of the house. Nine-storey residential building in Dnipro city
(name of works and expenses, name of the house, building, construction, linear object of engineering and transport infrastructure)

Based on:
drawings (specifications) № 1-6

Estimated cost	3 831,901	thousand UAH
Estimated complexity	22,44747	thousand man-hours
Estimated salary	1 640,711	thousand UAH
The average category of work	4,5	category

Compiled in current prices of July 6, 2021

№	Name of works and costs	Unit	Quantity	Unit cost, UAH		Total cost, UAH			Labor costs of workers, man-hours. unoccupied service-machines	
				Total	operation of machines	Total	salary	operation of machines	those who service the machines	
				salary	including salary					
						per unit	total			
1	2	3	4	5	6	7	8	9	10	11
1	Warming of facades by mineral plates 100 mm thick with finishing by a decorative solution on the "Seresit" technology. The walls are smooth	100m2	28,4101	74 332,71	-	2 111 800	960 732	-	479,9400	13 635,14
				33 816,57	-			-	-	
2	Decorative plastering of facades	100m2	28,4101	27 468,11	-	780 372	469 552	-	231,3500	6 572,68
				16 527,64	-			-	-	
3	Cement painting of facades from scaffolding with surface preparation	100m2	28,4101	11 553,29	4,19	328 230	26 091	119	14,8700	422,46
				918,37	3,75			107	0,0555	1,58
	Total direct cost estimates					3 220 402	1 456 375	119		20 630,28
	Total direct costs				UAH	3 220 402		107		1,58
	including:									
	cost of materials, products and structures				UAH	1 763 908				
	cost of EMM				UAH	119				
	incl. wages in EMM				UAH		107			
	salary of workers				UAH		1 456 375			
	total wages				UAH		1 456 482			
	Total expenditures				UAH	611 499				
	labor-intensive in overhead costs				man-hours					1 815,61
	wages in overhead costs				UAH		184 229			
	TOTAL according to the estimate				UAH	3 831 901				
	Estimated complexity				man-hours					22 447,47

	Estimated salary	UAH	1 640 711
Compiled by	_____		
	[position, signature (initials, surname)]		
Checked by	_____		
	[position, signature (initials, surname)]		

Customer: DniproTech
(name of organization)

Contractor: DniproTech
(name of organization)

CONTRACTUAL PRICE №

for construction Nine-storey residential building in Dnipro city
(name of the object of construction, start-up complex, house, building, construction, linear object of engineering and transport infrastructure)

which is carried out in 2021
Type of contract price: "fixed contract price"
Agreement № 1 dated 07.07.2021
Defined in accordance with DSTU B D.1.1-1: 2013
Compiled in current prices as of July 6, 2021

№	Reasoning	Name of costs	Cost, thousand UAH		
			Total	including:	
				construction works	other costs
1	2	3	4	5	6
1	Calculation №1-1	Direct costs	44	44 545,139	
		including	545,139		
		Salary of builders, installers	5	5 750,313	
		Cost of material resources	750,313		
		Cost of exploitation of construction machines	26	26 521,315	
			521,315		
			12	12 273,511	
			273,511		
2	Calculation №1-2	Total expenditures	4	4 310,368	
			310,368		
3		Total direct and overhead costs	48	48 855,507	
			855,507		
4	Calculation №3 (DSTU B D.1.1-1: 2013 Dod.K p.26)	Additional costs for construction work in the winter	385,959	385,959	
5	Calculation №4 (DSTU B D.1.1-1: 2013 Dod.K p.27)	Additional costs for construction work in the summer outdoors at an outdoor temperature of more than +27 C	131,910	131,910	
		Total	49	49 373,376	
			373,376		
		Total contract price	49	49 373,376	
			373,376		
6		VAT	9		9
			874,675		874,675
		Total contract price	59	49 373,376	9
			248,051		874,675

The head of the enterprise
(organization) - the customer

Head (General)
contractor

(signature, initials, surname, seal)

(signature, initials, surname, seal)

Nine-storey residential building in Dnipro city
(name of the construction object)

Statement of resources
to the Contract Price №1

№	Resource code	Name	Unit	Quantity	Current price per unit, UAH	including			
						selling price, UAH	transport component, UAH	procurement and storage costs, UAH	
						total UAH	total UAH	total UAH	
1	2	3	4	5	6	7	8	9	
I. Labor costs									
1	1	Labor costs of construction workers	man-hours	86 103,43	66,78	-	-	-	-
2		The average category of work performed by construction workers	category	4,10	-	-	-	-	-
3	3	Labor costs of workers engaged in the management and maintenance of machines	man-hours	43 161,21	76,9826	-	-	-	-
4		The average category of workers engaged in the management and maintenance of machines	category	5,10	-	-	-	-	-
5		Labor costs of workers whose wages are provided in overhead costs	man-hours	14 812,87	101,4705	-	-	-	-
6		Labor costs of workers whose wages are provided in the additional costs of performing work in the winter	man-hours	2 973,09	-	-	-	-	-
7		Labor costs of workers whose wages are provided in additional costs when performing work in the summer	man-hours	1 421,91	-	-	-	-	-
8		Together, the total estimated complexity	man-hours	148 472,51	73,4053	-	-	-	-
9		The average category of works	category	4,10	-	-	-	-	-
II. Construction machines and mechanisms									
1	CH201-12	Automobiles are onboard, loading capacity is 5 t	machine-hours	101,481093	223,04	-	-	-	-
2	CH203-101	Forklifts, load capacity 5 t	machine-hours	9,8416367	22 634	-	-	-	-
3	CH210-1207	Units electropump with adjustment of giving manually for building solutions, giving 2 m ³ / h, pressure 150 m	machine-hours	18,267606	301,93	-	-	-	-
4	CH204-202	Units are welding mobile with the diesel engine, with a nominal welding current of 250-400 A	machine-hours	4 586,253	2 971	-	-	-	-
5	CH207-149	Bulldozers, power 79 kW [108 hp]	machine-hours	15,611376	14,09	-	-	-	-
6	CH214-411	Low-frequency vibration dredgers for deepening pile shells	machine-hours	4 280,5028	257	-	-	-	-
7	CH233-261	Hydraulic tube bending machine	machine-hours	20,9191869	143,45	-	-	-	-
					657 898	-	-	-	-
					434,76	-	-	-	-
					6 787	-	-	-	-
					441,66	-	-	-	-
					1 890 527	-	-	-	-
					10,26	-	-	-	-
					215	-	-	-	-
					27,980754	576,35	-	-	-

8	CH206-411	Excavators single-bucket electric on a caterpillar course, capacity of a ladle is 2,5 m3	machine-hours		16 127			
9	CH202-128	Tower cranes, loading capacity is 5 t	machine-hours	69,052827	215,50	-	-	-
10	CH202-129	Tower cranes, loading capacity is 8 t	machine-hours	366,2571065	14 881	-	-	-
11	CH202-1141	Cranes on automobile course, loading capacity is 10 t	machine-hours		255,80	-	-	-
12	CH202-1243	Crawler cranes, loading capacity up to 16 t	machine-hours		93 689	-	-	-
13	CH203-1090	Hoists are cargo-passenger, loading capacity is 0,8 t	machine-hours	13,826862	373,26	-	-	-
14	CH203-1080	Mast construction elevators, loading capacity is 0,5 t	machine-hours	4 372,2995	5 161	-	-	-
15	CH233-345	Combination shears	machine-hours		355,27	-	-	-
16	CH211-901	Mortar mixers, capacity is 65 l	machine-hours	37,425024	1 553 347	-	-	-
17	CH211-255	Mortar pumps, productivity 3 m3 / h	machine-hours		118,24	-	-	-
18	CH204-502	Installation for welding of manual arc [direct current]	machine-hours	69,067805	4 425	-	-	-
19	CH214-610	Impact-rope drilling rigs for drilling wells under piles up to 20 m deep, diameter up to 1200 mm	machine-hours	56,9319213	83,71	-	-	-
			machine-hours		5 782	-	-	-
			machine-hours	64,945881	66,55	-	-	-
			machine-hours		3 789	-	-	-
			machine-hours	18,16668	65,81	-	-	-
			machine-hours		4 274	-	-	-
			machine-hours	205,71625	75,83	-	-	-
			machine-hours		1 378	-	-	-
			machine-hours	8 561,0056	25,71	-	-	-
			machine-hours		5 289	-	-	-
			machine-hours		932,61	-	-	-
			machine-hours		7 984 079	-	-	-
		Total:	UAH	-	12 273 510	-	-	-
III. Mechanized tool								
1	CH211-101	Buddy, capacity 2 m3	machine-hours	329,249083				
2	CH270-162	Bunker	machine-hours	3 428,7701				
3	CH270-117	Deep vibrators	machine-hours	3 643,1708				
4	CH270-116	Surface vibrators	machine-hours	314,684706				
5	CH203-202	Hydraulic jacks, loading capacity up to 25 t	machine-hours	4 586,253				
6	CH270-115	Electric drills	machine-hours	473,596367				

7	CH270-160	Capacity, 5 m3	machine-hours	8 561,0056				
8	CH200-40	Electric bitumen boiler, capacity 1 m3	machine-hours	100,370907				
9	CH270-108	Bituminous mobile boilers, capacity is 400 l	machine-hours	56,385				
10	CH203-401	Electric winches, traction force up to 5,79 kN [0,59 t]	machine-hours machine-hours	580,134242				
11	CH270-123	Double self-lifting cradles, loading capacity is 300/500 kg	machine-hours	3 286,196267				
12	CH270-135	Electric perforators	machine-hours machine-hours	1 149,469356				
13	CH270-124	Installations for welding of a polyethylene film	machine-hours	541,152				
14	CH270-126	Manual spray guns	machine-hours	67,616038				
15	CH270-119	Screwdrivers	machine-hours	1 257,970896				
Total:			UAH	-	40 809	-	-	-
IV. Building materials, products and structures								
1	C111-9	Chrysotile asbestos, brand K-6-30 [292,14 грн/т * 1,01 т]	t	0,0756	25 942,63	25 138,89	295,06	508,68
2	C1113-3	Acetone technical, I grade [292.14 UAH / t * 1.49 t]	t	0,124014	1 961	1 901	22	38
3	C111-74	Building bitumen, grade BN-70/30 [336.79 UAH / t * 1.03 t]	t	0,1197	57 213,61	55 656,48	435,29	1 121,84
					7 095	6 902	54	139
					12 648,63	12 053,73	346,89	248,01
					1 514	1 443	42	30

4	C111-73	Bitumens petroleum construction, BN-90/10 brand [336.79 UAH / t * 1.03 t]	t	1,4805	14 152,16	13 527,78	346,89	277,49
					20 952	20 028	514	411
5	C111-78	Bitumens oil roofing, the BNK-45/180 brand [336.79 UAH / t * 1.05 t]	t	0,252315	11 507,40	10 928,13	353,63	225,64
					2 903	2 757	89	57
6	C111-1600	Gasoline solvent [292.14 UAH / t * 1.13 t]	t	4,53048	53 360,54	51 984,13	330,12	1 046,29
					241 749	235 513	1 496	4 740
7	K53-6131-P001	Blocks window with separate shutters of the OP6-9 GOST 11214-86 brand [225.28 UAH / t * 0.026 t]	pcs	1 108,08	3 125,37	3 058,23	5,86	61,28
					3 463 160	3 388 763	6 493	67 903
8	C123-217	Door blocks external entrance and vestibule of a panel board design single-floor, DN 21-10Shch, the area is 2,05 m2 [225.28 UAH / t * 0.038 t]	m2	35,7	4 248,93	4 157,06	8,56	83,31
					151 687	148 407	306	2 974
9	K53-6111-501	Blocks door wooden DG21-12 GOST 6629-88 brands with small-hollow (lattice) filling of a board, deaf [225.28 UAH / t * 0.116 t]	pcs	874,8	7 215,95	7 048,33	26,13	141,49
					6 312 513	6 165 879	22 859	123 775
10	C111-1848	Construction bolts with nuts and washers [182.97 UAH / t * 1.12 t]	t	0,02961925	82 939,40	81 108,21	204,93	1 626,26
					2 457	2 402	6	48
11	C1113-101	Andesite acid - resistant flour, brand A [292.14 UAH / t * 1.03 t]	t	1,1844	6 067,71	5 647,84	300,90	118,97
					7 187	6 689	356	141
12	C112-25	Bars cut from coniferous breeds, length is 4-6,5 m, width is 75-150 mm, thickness is 40-75 mm, III grade [236.53 UAH / t * 0.61 t]	m3	0,1383	3 989,50	3 766,99	144,28	78,23
					552	521	20	11
13	C112-285	Bars edged of coniferous breeds, length is 2-6,5 m, thickness is 40-60 mm, II grade [236.53 UAH / t * 0.61 t]	m3	0,3533	5 349,17	5 100,00	144,28	104,89
					1 890	1 802	51	37
14	C1113-14	Butyl rubber, brand A [292.14 UAH / t * 1.55 t]	t	0,45096	191 653,37	187 442,64	452,82	3 757,91
					86 428	84 529	204	1 695
15	C111-253	Lime construction quicklime, grade 1 [292.14 UAH / t * 1.0 t]	t	0,29223577	5 369,65	4 972,22	292,14	105,29
					1 569	1 453	85	31
16	C142-10-2	Water	m3	6	11,38	11,38000	-	-
				789,54213272	77 265	77 265	-	-
17	C111-219	Gypsum binders G-3 [292.14 UAH / t * 1.01 t]	t	0,12516864	3 120,13	2 763,89	295,06	61,18
					391	346	37	8
18	C111-322	Kerosene for technical purposes, KT-1, KT-2 brand [292.14 UAH / t * 1.03 t]	t	0,5954634	38 145,62	37 096,77	300,90	747,95
					22 714	22 090	179	445
19	C111-1849	Self-tapping screws, CM1-35 brand [182.97 UAH / t * 1.11 t]	t	0,987307776	274 117,32	268 539,37	203,10	5 374,85
					270 638	265 131	201	5 307
20	C111-1624-2	Deep penetration primer [292.14 UAH / t * 0.0016 t]	l	1 152,398783	13,42	12,69	0,47	0,26
					15 465	14 624	542	300
21	C112-80	Unedged board from coniferous breeds, length is 4-6,5 m, all widths, thickness is 44 mm and more, II grade [236.53 UAH / t * 0.61 t]	m3	4,27493	4 737,17	4 500,00	144,28	92,89
					20 251	19 237	617	397
			m3	2,9606952	4 308,77	4 080,00	144,28	84,49

22	C112-53	Eaves boards from coniferous breeds, length is 4-6,5 m, width is 75-150 mm, thickness is 25 mm, III grade [236.53 UAH / t * 0.61 t]			12 757	12 080	427	250
23	C112-61	Eaves boards from coniferous breeds, length is 4-6,5 m, width is 75-150 mm, thickness is 44 mm and more, III grade [236.53 UAH / t * 0.61 t]	m3	4,7166854	4 082,39	3 858,06	144,28	80,05
24	C111-816	Low-carbon steel wire for various purposes light, diameter 1.1 mm [173.01 UAH / t * 1.0 t]	t	0,19650069	19 255	18 197	681	378
25	C111-818-1	Low-carbon steel wire for various purposes light, diameter 4.0 mm [173.01 UAH / t * 1.0 t]	t	0,019075014	30 903,24	30 124,28	173,01	605,95
26	C111-1608	Duds [423.21 UAH / t * 0.00113 t]	kg	114,978696	6 073	5 919	34	119
27	C111-140	Dowels with the calibrated head [in clips] 4x100 mm [195.64 UAH / t * 1.12 t]	t	0,03731364	20 785,66	20 205,09	173,01	407,56
28	C1555-216	Dowels hammered with a plastic core with a spacing zone of 50 mm, length over 160 mm to 280 mm	100 pcs	229,553608	396	385	3	8
29	C111-1529	Electrodes, diameter is 6 mm, E42 brand [195.64 UAH / t * 1.14 t]	t	0,405221	54 816,00	53 518,15	223,03	1 074,82
30	C111-1865	Metal clips [195.64 UAH / t * 0.0011 t]	kg	195,6375	22 213	21 687	90	436
31	C1555-202	BAUMIT STARCONTACT adhesive putty mix (Baumit StarKontakt)	t	0,2673216	131,71	128,91	0,22	2,58
32	C111-1708-1	Tow [292.14 UAH / t * 0.00111 t]	kg	273,61368	25 767	25 220	43	505
33	C122-40	The conductor for concreting of blocks of mortgage parts [TU 34-3230-78], C255 steel grade [220.73 UAH / t * 1.0 t]	t	3,275895	-	-	-	-
34	C1113-80	Varnish BT-783 [292.14 UAH / t * 1.26 t]	t	5,637	54 816,00	53 518,15	223,03	1 074,82
35	C1113-280	Latex, brand SCS-65 GP [292.14 UAH / t * 1.11 t]	t	0,03381021	22 213	21 687	90	436
36	C111-741	Sheets gypsum cardboard for partitions, thickness is 12 mm [204.47 UAH / t * 0.0116 t]	m2	4 678,128	131,71	128,91	0,22	2,58
37	C111-594	Bituminous roofing mastic is hot [292.14 UAH / t * 1.01 t]	t	9,0530622	25 767	25 220	43	505
38	C111-1695	Bituminous-rubber insulating mastic [292.14 UAH / t * 1.13 t]	t	6,53892	-	-	-	-
39	C111-1693	Bituminous-rubber roofing mastic [292.14 UAH / t * 1.13 t]	t	290,16225	9,55	9,04	0,32	0,19
40	C111-593	Bituminous-butyl rubber cold mastic [292.14 UAH / t * 1.13 t]	t	0,50463	2 613	2 473	88	52
			t	1,1583936	23 378,42	22 983,66	220,73	174,03
			t		76 585	75 292	723	570
			t		40 042,13	38 888,89	368,10	785,14
			t		225 717	219 217	2 075	4 426
			t		55 031,10	53 627,78	324,28	1 079,04
			m2		1 861	1 813	11	36
			t		45,94	42,67	2,37	0,90
			t		214 913	199 616	11 087	4 210
			t		15 600,96	15 000,00	295,06	305,90
			t		141 236	135 796	2 671	2 769
			t		18 087,56	17 402,78	330,12	354,66
			t		118 273	113 795	2 159	2 319
			t		31 695,43	30 743,83	330,12	621,48
			t		9 196 817	8 920 699	95 788	180 330
			t		38 090,89	37 013,89	330,12	746,88
			t		19 222	18 678	167	377
			t		38 045,41	36 969,30	330,12	745,99

41	C111-1697	Kumarono-rubber adhesive mastic, KN-3 brand [292.14 UAH / t * 1.13 t]			44 072	42 825	382	864
42	C1421-10634	Sand natural, ordinary [196.29 UAH / t * 1.6 t]	m3	7,771302	548,94	224,12	314,06	10,76
43	C111-1604	Sanding paper [423.21 UAH / t * 0.00008 t]	m2	329,55716	4 266	1 742	2 441	84
44	C111-1721	The film is polyethylene, thickness is 0,2-0,5 mm [423.21 UAH / t * 1.13 t]	t	2,48028	115,14	112,85	0,03	2,26
45	Ц1-226	Mineral wool boards [277.27 UAH / t * 0.0005 t]	m2	1 039,5378	37 945	37 191	10	745
46	C114-4-Y	Plates heat-insulating of mineral wool on synthetic binding, the M75 brand [277.27 UAH / t * 0.0983 t]	m3	418,71359	62 500,38	60 796,65	478,23	1 225,50
47	C111-2009-3	Ceresit CD 24 polymer cement putty [292.14 UAH / t * 0.00105 t]	kg	9 091,232	155 018	150 793	1 186	3 040
48	C111-1890	Straining portland cement, brand 400 [236.43 UAH / t * 1.0 t]	t	5,601393	78,87	77,18	0,14	1,55
49	*C1551-34- CII	PVC ribbed profile R2, width 140 mm, height 11.5 mm [474.64 UAH / t * 0.0009 t]	m	5 368,7088	81 988	80 232	146	1 611
50	*Ц1-234	The socle profile [277.27 UAH / t * 0.001 t]	m	1 942,72773	1 930,68	1 865,56	27,26	37,86
51	C1113-43	Liquid [GKZh-10] [292.14 UAH / t * 1.26 t]	t	0,0302778	808 402	781 135	11 414	15 852
52	C1425-11684	The solution is ready masonry heavy cement, M150 brand [214.59 UAH / t * 2.2 t]	m3	55,821954	26,72	25,89	0,31	0,52
53	C111-856	Руберойд покрівельний з пиловидною засипкою РКП- 350Б [292,49 грн/т * 0,00175 т]	m2	7 445,82972	242 918	235 372	2 818	4 727
54	C111-1757	Smartly [292.14 UAH / t * 0.0003 t]	m2	308,0	4 246,36	3 926,67	236,43	83,26
55	C111-1784	Grid construction glass, grade SS-1 [195.64 UAH / t * 0.0005 t]	m2	3 267,1615	23 786	21 995	1 324	466
56	Ц1-24	Ceresit CD 24 Polymer-cement putty [292.14 UAH / t * 0.001 t]	kg	1 358,8848	0,44	-	0,43	0,01
57	Ц1-11	Ceresit CM 11 Adhesive mixture	kg	34 092,12	2 362	-	2 309	54
58	Ц1-16-1	Seresit ST 16 Priming paint [292.14 UAH / t * 0.0011 t]	l	482,9717	0,29	-	0,28	0,01
59	Ц1-29	Seresit ST 29 Mineral putty [292.14 UAH / t * 0.001 t]	kg	5 682,02	563	-	544	19
60	C111-1591	Coal tar for road construction [336.79 UAH / t * 1.13 t]	t	0,12322554	74 382,13	72 555,56	368,10	1 458,47
61	C123-526	Racks inventory tree-metal sliding [272.47 UAH / t * 0.047 t]	pcs	0,2422224	2 252	2 197	11	44
			kg	891,072	2 262,29	1 745,83	472,10	44,36
					126 285	97 456	26 354	2 476
					12,07	11,32	0,51	0,24
					89 871	84 287	3 797	1 787
					25,88	25,28	0,09	0,51
					7 971	7 786	28	157
					23,56	23,00	0,10	0,46
					76 974	75 145	327	1 503
					26,70	25,89	0,29	0,52
					36 282	35 182	394	707
					4,30	4,30	-	-
					146 596	146 596	-	-
					53,01	51,65	0,32	1,04
					25 602	24 945	155	502
					7,57	7,13	0,29	0,15
					43 013	40 513	1 648	852
					8 807,43	8 254,17	380,57	172,69
					1 085	1 017	47	21
					3 284,81	3 207,59	12,81	64,41
					796	777	3	16
					202,51	198,29	0,25	3,97

62	C1545-97	Glass thread tape [221.64 UAH / t * 0.00111 t]			180 451	176 691	223	3 538
63	C147-4-16	Rod fittings A-III, diameter 16 mm [173.01 UAH / t * 0.1 t]	100kg	360,821557	1 674,57	1 624,44	17,30	32,83
64	C1424-11612	Concrete mixes ready heavy, concrete class B15 [M200], filler size more than 20 to 40 mm [214.59 UAH / t * 2.4 t]	m3	971,766135	604 221	586 133	6 242	11 846
65	C111-1882	Sack cloth [423.21 UAH / t * 0.004 t]	10m2	3,2548635	2 013,14	1 458,65	515,02	39,47
66	C111-1762	Roofing felt with coarse-grained topping is waterproofing, TG-350 brand [292.49 UAH / t * 0.0007 t]	m2	965,001	1 956 301	1 417 467	500 479	38 356
67	C1530-41	Pressure pipes from low-pressure polyethylene, type average, external diameter is 25 mm [474.64 UAH / t * 0.0015 t]	10m	12,447	291,03	283,63	1,69	5,71
68	C113-576	Casing steel pipes with a short triangular carving from steel of group of durability D, execution B, external diameter is 377 mm, wall thickness is 12 mm [173.01 UAH / t * 0.108 t]	m	54,59825	947	923	6	19
69	C111-472	Powder paint P-VL-212 of different colors [292.14 UAH / t * 1.11 t]	t	2,4716787	11,06	10,64	0,20	0,22
70	C1555-253	Paint front acrylic BAUMIT GRANOPORCOLOR (Baumit GranoporKolor)	l	1 426,18702	10 673	10 268	193	212
71	C111-1853-4	Nails construction 4,0x120 mm [182.97 UAH / t * 1.12 t]	t	0,23114119	126,55	123,36	0,71	2,48
72	C111-175	Construction nails with a conic head of 4,0x100 mm [195.64 UAH / t * 1.12 t]	t	0,0641325	1 575	1 535	9	31
73	C111-181	Construction nails with a flat head of 1,8x60 mm [195.64 UAH / t * 1.12 t]	t	0,02946693	1 295,68	1 267,34	18,69	9,65
74	C111-160	Finishing nails round 1,0x16 mm [195.64 UAH / t * 1.12 t]	t	0,0109557	70 742	69 195	1 020	527
75	C111-195	Tale round nails 3,0x40 mm [195.64 UAH / t * 1.12 t]	t	0,0114912	120 093,46	117 414,41	324,28	2 354,77
76	C1422-11089	Brick silicate single corpulent front unpainted, the sizes are 250x120x65 mm, the M300 brand [173.82 UAH / t * 3.7 t]	1000pcs	15,49308	296 832	290 211	802	5 820
77	C1422-11061	Brick silicate single corpulent, the sizes are 250x120x65 mm, the M300 brand [173.82 UAH / t * 3.7 t]	1000pcs	30,6393	-	-	-	-
78	C119-198	The drill rod, type 01-07, diameter is 25 mm [195.64 UAH / t * 0.0052 t]	pcs	4,149467	5 323,32	5 014,01	204,93	104,38
79	C111-2012-8	Plaster decorative acrylic (bark) Ceresit ST 64 [292.14 UAH / t * 0.0011 t]	kg	7 670,727	1 230	1 159	47	24
			t	0,0303696	28 450,51	27 673,54	219,12	557,85
					1 825	1 775	14	36
					35 708,24	34 788,96	219,12	700,16
					1 052	1 025	6	21
					50 523,43	49 313,65	219,12	990,66
					554	540	2	11
					27 701,17	26 938,89	219,12	543,16
					318	310	3	6
					5 611,41	4 858,25	643,13	110,03
					86 938	75 269	9 964	1 705
					5 067,00	4 324,52	643,13	99,35
					155 249	132 500	19 705	3 044
					891,02	872,53	1,02	17,47
					3 697	3 621	4	72
					35,77	34,75	0,32	0,70
					274 382	266 558	2 455	5 370
					24 507,66	23 808,00	219,12	480,54

80	C111-1484	Screws with a semicircular head, diameter of a core of 8 mm, length of 100 mm [195.64 UAH / t * 1.12 t]			744	723	7	15
81	C123-514-Y	Formwork boards, width 300-750 mm, thickness 25 mm [236.53 UAH / t * 0.014 t]	m2	309,81238	239,14	231,14	3,31	4,69
82	C123-515-Y	Formwork boards, width 300-750 mm, thickness 40 mm [236.53 UAH / t * 0.02 t]	m2	11,34	74 089	71 610	1 025	1 453
					330,53	319,32	4,73	6,48
					3 748	3 621	54	73
		Total:	UAH	-	26 480 508	25 219 596	747 879	513 033
Final indicators								
		Estimated complexity (I)	man-hours	148 472,51	10 898 669	-	-	-
		Construction machinery and equipment (II)	UAH	-	12 273 510	-	-	-
		Building materials, products and constructions (III + IV)	UAH	-	26 521 317	-	-	-
Resources consumed by construction machinery, vehicles and power tools								
		Petrol	kg	311,547	30,15		9 393,0900	
		Diesel fuel	kg	107 152,8372	26,13		2 799 891,3608	
		Electricity	kWh	751 623,7249	3,3595		2 525 056,9587	
		Wood	m3	6,7662	119,13		806,0574	
		Lubricants	kg	11 436,8588	72,85		833 183,1859	
		Hydraulic fluid	kg	97,0186	74,42		7 220,1216	

Current prices of material resources are accepted as of July 6, 2021.

* Marked resources, the price of which has changed.

Compiled by:

[position, signature (initials, surname)]

Checked by:

[position, signature (initials, surname)]

REVIEW

For qualification work of student Salem Abdelrahman Mohamed Hassan:

“Construction project of nine-storey residential building in Dnipro city”.

The relevance of this project is the implementation of modern design and technological solutions to increase living space with population growth and infrastructure development, which positively affects the development of the city, and the speed of construction and optimization of the construction process confirms the relevance of this project.

The paper considers: general architectural and construction design; design of building structures; organizational and technological design; economic component of construction; labor protection and environmental protection.

Calculations and substantiation of the main structural elements of the building and detailed method statement, which are reflected in working drawings.

I think that the work is done at high level and deserves grades “good – 88”.

Reviewer

Director of LLC "Dniprospetservice-Ukraine"

P.V. Krymchak

RESPONSE

Supervisor of qualification work
Ph.D., Associate Professor of Construction,
Geotechnics and Geomechanics Department,
Ishchenko Oleksii Kostyantynovich,

For qualification work of student Salem Abdelrahman Mohamed Hassan:
“Construction project of nine-storey residential building in Dnipro city”.

Qualification work includes the following sections: architectural and construction, design and construction, organizational and technological and technical and economic.

The main volume-planning and constructive decisions are selected and substantiated in the work. The technology and organization of construction works are determined. A technological map, construction master plan and calendar schedule of works have been developed. The calculation of the pile foundation according to the initial data is performed. The design and estimate documentation are made.

During work the set goal is reached completely. The very high degree of independence of execution deserves attention. Also noteworthy is the creativity of thinking in implementation of architectural and construction solutions acquired by the applicant during work.

I believe that the qualifying work of Salem Abdelrahman Mohamed Hassan is performed at high level and deserves grades **“good – 88 points”**.

Supervisor of qualification work
Ph.D., Assoc. Prof. BGGM

O.K. Ishchenko