MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN

Satbayev University

Institute of Architecture and civil engineering named after T. Basenov

Department of Civil engineering and building materials

Hamed Motawakel

« Youth center using construction technology (GRUBER) »

To the diploma project
EXPLANATORY NOTE

Specialty 5B072900 – Civil Engineering

Almaty 2021

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ALLOWED TO PROTECT
Head of Department
Master of technical science,
lecturer
_____N.V. Kozyukova
«___»_____2021 yr.

EXPLANATORY NOTE

to the diploma project

On the theme of « Youth center using construction technology (GRUBER) »

5B072900 - "Civil Engeneering"

Prepared by — Hamed Motawakel

Scientific adviser — Zh.Sh. Mukhanbetzhanova
Master of technical science,
Lecturer
«_____»_____2021 yr.

Almaty 2021

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Specialty 5B072900 – Civil Engineering

I APPROVE
Head of Department
_____N.V. Kozyukova
Master of technical science, lecturer
«___»_____20__ yr.

ASSIGNMENT
Complete a diploma project

Student: Hamed Motawakel
Topic «Youth center using construction technology (GRUBER) »
Approved by the Order of the Rector of the University No. 2131-b dated November 24, 2020.
The deadline for the completed work is May 10, 2020.
Initial data for the diploma project: construction area (Astana). Structural schemes of the building: the main building structure (Administration) is made of monolithic reinforced concrete and its sport hall is made of trussed steel.
List of questions to be developed:
a) Architectural and analytical part: basic initial data, space-planning solutions, heat engineering calculation of enclosing structures (outer wall), lighting calculation, calculation of the foundation option and depth of laying, justification of energy efficiency measures;
b) Calculation and design part: calculation and design of a column;
c) Organizational and technological part: development of technological maps, construction schedule and construction plan;
d) Economic part: local estimate, object estimate, summary estimate;
List of graphic material (with exact indication of required drawings):
1 Facade, standard floor plans, parts 1-1 and 2-2 - 4 sheets.
2 KZh columns, specifications - 1 sheet.
3 Technical maps of earthworks and formwork, calendar plan, construction site plan - 4 sheets.
11 slides of work presentation are provided.
Recommended main literature:

1 SP RK 2.04-01-2017 "Construction climatology";
2 SN RK 2.04-04-2013 "Construction heat engineering", SN RK 2.03-30-2017 "Construction in seismic zones".

SCHEDULE

preparation of thesis (project)

Part	30%	60%	90%	100%	Note
Architectural and analytical	11.01.2021г.-14.02.2021г.				
Calculation and design		15.02.2021г.-23.03.2021г.			
Organizational and technological			24.03.2021г.-01.05.2021г.		
Economic				01.05.2021г.-09.05.2021г.	
Pre-defense	10.05.2021г.-14.05.2021г.				
Anti-plagiarism, norm control	17.05.2021г.-31.05.2021г				
Quality control	26.05.2021г.-31.05.2021г.				
Defense	01.06.2021г.-11.06.2021г.				

Signatures

consultants and the normative controller for the completed diploma work (project) with an indication of the parts of work (project) related to them

Name parts	Consultants, I.O.F. (academic degree, rank)	the date signing	Signature
Architectural and analytical	Mukhanbetzhanova Zh.Sh., Master of technical science, lecturer		
Calculation and design	Kozyukova N.V., Master of technical science, lecturer		
Organizational and technological	Mukhanbetzhanova Zh.Sh., Master of technical science, lecturer		
Economic	Mukhanbetzhanova Zh.Sh., Master of technical science, lecturer		
Norm controller	Bek A.A., Master of technical science, assistant		
Quality control	Kozyukova N.V., Master of technical science, lecturer		

Scientific adviser _____ Zh.Sh. Mukhanbetzhanova

The task was accepted
for execution student _____ Hamed Motawakel

Date "__" _____ 2021 yr.

АҢДАТПА

Диссертация: Нұр-Сұлтан қаласындағы құрылыс технологиясын қолданатын жастар орталығы (GRUBER)

Ғимарат 2 қабаттан және жер асты автотұрақтан тұрады. Жобаның архитектуралық егжей-тегжейлерін ұсынумен қатар, құрылымдық бөлік эцабс құрылымдық бағдарламалық жасақтамасымен жасалады. Сондай-ақ, жобалауды талап ететін іргетас CSI қауіпсіз бағдарламалық қамтамасыздандырумен жүзеге асырылады.

Сыртқы қабырғалардың термиялық есебі, құрылымның архитектуралық дизайнын және бас жоспарын жоспарлау, антисимиялық өлшемдерді жоспарлау сәулет-құрылыс бөліміне сәйкес жүзеге асырылады.

АННОТАЦИЯ

Диссертация: Молодежный центр строительных технологий (GRUBER) в г. Нур-Султан.

Здание состоит из 2 этажей и подземного паркинга. Помимо предоставления архитектурных деталей проекта, структурная часть генерируется программным обеспечением для проектирования конструкций etsabs. Кроме того, фундамент, который требуется спроектировать, осуществляется с применением безопасного программного обеспечения CSI.

Тепловой расчет внешних стен, планирование генеральной планировки и архитектурного проекта конструкции, а также антисемейные измерения выполняются архитектурно-строительным отделом.

ABSTRACT

Thesis: Youth center using construction technology (GRUBER) in Nur-Sultan city

The building consists of 2 floors and an underground parking. Besides providing architectural details of the project, the structural part is generated by the etsabs structural engineering software. As well as, the foundation which is asked to be designed is carried out with the implementation of CSI safe software.

The thermal calculation of the external walls, planning the general layout and the architectural design of the structure as well as the antisiesmic measures are accomplished according to the architectural and construction department.

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INTRODUCTION

The building Youth center located on the junction of Turan Avenue and Syghanaq Street, Nur-Sultan “was designed considering the issues of norms and anti-seismic measures. According to thermal engineering calculations, the wall thickness of the building was determined. The project does not provide for temperature seams, as the length of the building is not large. In order to reduce the load on the foundation, light gas block bricks were used.

During the construction, the necessary machinery was compared and selected for underground and surface calculations. It is in close contact with construction materials, engineering, agriculture, science, defense and non-manufacturing industries on the construction site. In other words, the engineering industry provides the construction site with the main tools of mechanization - hoists, assembly cranes, excavators and other mechanisms, and equips the construction industry with machinery. The building materials industry provides the construction site with bricks, concrete, mortar, precast concrete structures, finishing and other materials required for the construction of buildings and structures. These figures are clear evidence that the construction industry is closely linked with other industries.

Thanks to the development and progress of this industry, many buildings and structures are being built on the ground and under water. Currently, the increase in the consumption of transport equipment due to domestic and industrial needs is increasing the number of buildings that provide vehicles.

The projected object is planned to be located in Nur-Sultan at the intersection of Turan Avenue and Syghanaq streets. This youth center with a sports bias, on the ground floor there are: a gym (for training and various sports events), with dressing rooms and showers, a coffee shop, two conference halls (small and large for important meetings or presentations), dressing room, as well as various administrative premises and retail outlets. On the second floor there is a fitness center, table tennis area and retail outlets. It is planned to place an underground parking at an elevation of -2000, the entrance to which is from the other side.

The building has three fire escapes and three entrances (main, north and southwest entrances). The master plan shows the organization of several arrivals to the site, including the drive to the coffee shop, with the ability to unload products. There is also ground parking, which provides ample parking space for sporting events. There is an outdoor soccer field and stadium.

1 Architectural and construction section

1.1 General information

Diploma project of a 2-storey "Youth Center" designed in Nur-Sultan. The area of construction of the Youth Center corresponds to the II climatic zone.

The project was developed for the following construction conditions:

Humidity zone – normal [1];

Maximum depth of penetration of zero isotherm into the ground 2m

Climatic region - I: temperate continental climate [1]; **СП РК 2.04-01-2017**

Snow region - III, the standard value of the weight of the snow cover is 1.5 kPa [2]; **НТП РК 01-01-3.1 (4.1)-2017**

wind region - IV, standard value of wind pressure - 0.77 kPa; wind speed – 35 m/s [2]; **НТП РК 01-01-3.1 (4.1)-2017**

Climatic parameters of the cold season: air temperature of the coldest day: -30 Celsius; air temperature of the coldest five-day period: -23 Celsius;

Soil class – II, type of soil is sand and gravel that has medium dense [1];

The construction area is non-seismic zone, and the magnitude is 6 points [3];

The construction site is located in the zone of residential and administrative buildings, the relief of the site is calm.

a) Outdoor air temperature:

- The coldest five days - 33 Celsius;
- The coldest day – 38 Celsius;

b) Wind direction and speed:

1.2 Natural-climatic and engineering-geological conditions

The characteristic features of the climate of this territory are: an abundance of sunlight and warmth, continentality, hot long summers, relatively cold winters with alternating thaws and cold snaps, large annual and daily amplitudes of air temperature fluctuations, dry air and changes in climatic characteristics with terrain altitude [1].

Table 1 - Air temperature

Weather station	months												per year
	1	2	3	4	5	6	7	8	9	10	11	12	
Average monthly and average annual air temperature, ˚C													
Nur-Sultan	-15.1	-14.8	-7.7	5.4	13.8	19.3	20.7	18.3	12.4	4.1	-5.5	-12.1	3.2
Average maximum air temperature,˚C													
Nur-Sultan	-9.9	-9.2	-2.5	10.9	20.2	25.8	26.8	25.2	18.8	10	-1.4	-8	8.9

Absolute maximum air temperature, ˚C													
Nur-Sultan	3.4	4.8	22.1	29.7	35.7	40.1	41.6	38.7	36.2	26.7	18.5	4.5	41.6
Average minimum air temperature, ˚C													
Nur-Sultan	-18.3	-18.5	-11.5	0.2	7.9	13.2	15	12.8	6.6	0.2	-8.9	-16.1	-1.5
Absolute minimum air temperature, ˚C													
Nur-Sultan	-51.6	-48.9	-38	-27.7	-10.8	-1.5	2.3	-2.2	-8.2	-25.3	-39.2	-43.5	-51.6

The coldest month - January is characterized by negative temperatures minus - 18.3-9.9 Celsius (for plains and foothills). The hottest month is July. The average temperature for the plains is +15 - +26.8 Celsius. The absolute maximum temperature reaches + 40.1_ + 41.6 in the same zone. The main data on the snow cover are given in Table 2.

Table 2 - Blanket of snow

Weather station	months												Highest values for the winter		
	1	2	3	4	5	6	7	8	9	10	11	12	Average.	Max.	Min.
Average monthly snow height, см(inch)															
Nur-Sultan	0.2	0.2	0.2	0.1	0.9	1	1.2	0.8	0.6	0.5	0.3	0.1	28	55	7

With distance from the mountains, the wind regime changes. The average annual wind speed is 2.3 m / s. The wind breakthrough reaches 35 m / s. The lowest average monthly wind speeds throughout the entire territory are observed in winter (December, January), and the highest - in summer.

Table 3 - Wind

Wind Weather Station	months												Per year
	1	2	3	4	5	6	7	8	9	10	11	12	
Average wind speed by months and per year, м/с													
Astana	12.2	12.1	11.6	11.1	10	9.2	8.8	8.7	9.4	10.3	11.5	11.9	1.5
Maximum wind speed and wind vane breakthrough, м/с													
Astana	12.6	12.4	12.6	11.6	11.1	9.9	9.2	9.3	10.3	11.4	11.9	12.5	>20

Table 4 – Winds and how repeated are they in different directions, %

Weather station	Direction								Calm
	С	СВ	В	ЮВ	Ю	ЮЗ	З	СЗ	
Astana	7	11	10	10	20	21	14	6	26

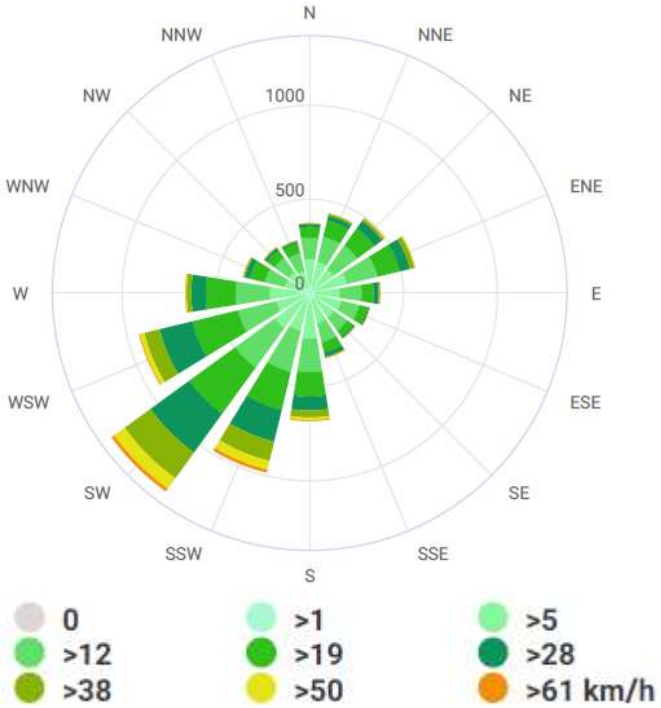

Figure 1 - Wind rose according to the weather station in Nur-Sultan

1.3 General plan. Improvement of the territory

The master plan has been developed for the entire territory of the construction land plot. The plot with a total area of 31250 m^2, allocated for construction, located in the city of Nur-Sultan, has a semi-triangular shape. The plot allocated for construction is free of buildings. An 8.0 meter wide driveway is provided for the territory of the facility; the pavement is made of asphalt concrete on a crushed stone base. Improvement and gardening of the site provided for by the project reduces the overall dust content and eliminates local sources of dust.

Table 5 - Technical and economic indicators for the general plan

Name	Indicator
Land area	1.5*а*
Built-up area	6996*м*^{2}
Building factor	0,11
Landscaping area	14843.9*м*^{2}
Landscaping factor	0.34
Hard surface area	9866*м*^{2}

Territory utilization rate	0,84

1.4 Space-planning solution

The Youth Center consist of two floors and one ground floor. The ground floor has an area of 1019.2 m^2 and each 2 floors has an area of 705.3 m^2. The height of the building from the zero mark is 13.5 m. The height of the typical floor is 5 m, and the height of basement is 3m. The main staircase, elevators of the engineering equipment shaft are located in the concrete core of stiffness near to the middle in the front side of the building. Two escalators are used in this building to connect first and second floor together. That each of them has respectively 630kg, and 1000kg weight. At the three side of the building there are three staircases system.

The scales for the plan and section is accepted 1:100 according to ГОСТ 21.501.

As a rule, various premises of the building are grouped according to functional characteristics, which allow organizing clear technological interconnections between them, meeting sanitary-hygienic and fire safety requirements, contributing to the convenience of operating the building, as well as increasing the comfort of living in it.

1.5 Constructive solutions of the project

The structural scheme of the building is a frame, while at the level of the basement, reinforced concrete columns and walls are load-bearing (that is, it is a frame-link system). Spatial immutability is ensured by external and internal heating blocks, reinforced concrete columns and beams, and a hard floor plate made of monolithic reinforced concrete slabs.

Foundations – raft foundation with a thickness of 600 mm. Under the foundations, perform a reinforced monolithic pad and crushed stone preparation of thicknesses 150mm and 75mm sand binding. Make horizontal waterproofing of foundations from membrane barrier. Vertical waterproofing of foundations in contact with the grounds wetsuit membrane 80mil dry.

Walls - the outer walls of the basement are monolithic reinforced concrete walls with a thickness of 350 mm, the outer walls of the first to the second floor are 350 mm thick walls made of CMU blocks, internal walls with a thickness 200 mm should also be made of masonry blocks on cement-sand mortar M75.

Partitions – partition walls with a thickness of 200 mm to be made of masonry cmu units / 1F / 125 / 2.0 / 25 / GOST530-2012 on cement mortar of the M75 grade.

Slabs - monolithic reinforced concrete floor slabs with a thickness of 200mm.

Beams - reinforced concrete with a section of 350x350;

Lintels – 25 cm depth reinforced concrete beam

Windows - Triple Casement Vinyl Replacement Windows are selected for this buildig. It is a double-glasses wondow and the most energy-efficient windows and suitable for the project.

Doors –Three revolving doors with 2650 mm width are put in the three main interance to the Center. Single-flush doors are used for interior doors in accordance with GOST 6629-88, Wood - Birch - Solid Stained Light Low Gloss which is a double-glass door are used for semi-external entrances.

Blind area - The blind area is concrete along the entire perimeter of the building with a width of 1.2 m.

External finishing - from external façade rainscreen panels, plaster and exteerior curtain wall is used in the front view of the building.

Table 6 - Live load:

Types of rooms	Class	Live load(kN/m^2)
Café	C1	2.5
Auditorium & Conference room	C2	3
Areas with free movement of people	C3	4
Sports hall (active people)	C4	4.5
Stairs		2

1.6 Calculation of dead loads

Floor and wall loads are presented in the form of table 7.

Table 7 - Dead loads

Applied loads	Characteristics of loads, kg/m^2
1 Specific weight:	Auto
1.1 Floor construction: for basement floor:	
Hardcore layer δ=150 mm, ρ=1600 kg/m^3	$0.15 * 1600 = 240$
Membrane waterproofing layer, δ=80 mils (2.032mm),Areal density=1.648kg/m^2	1.648
Concrete raft δ=600mm,ρ=2240 kg/m^3	$0.6 * 2240 = 1344$
Screed δ=50 mm, ρ=2162 kg/m^3	$0.05 * 2162 = 108.1$
Total	1693 kg/m^2 =1.693 t/m^2
For 1st and 2nd floors:	
Floor finish(Tile)	$0.01 * 2000 = 20$

δ=10 mm, ρ=2000 kg/m^3	
Light concrete δ=30 mm, ρ=2162 kg/m^3	$0.03 * 2162 = 64.86$
Protection and vibration cancelling layer δ=0.5 mm, ρ=5.2 kg/m^2	5.2
Acoustic insulation δ=50 mm, ρ=10 kg/m^3	$0.05 * 10 = 0.5$
Reinforced concrete slab δ=200 mm, ρ=2200 kg/m^3	$0.2 * 2200 = 440$
Gypsum plaster on a mesh δ=10 mm, ρ=2960 kg/m^3	$0.01 * 2960 = 296$
Total	826.56 kg/m^2 = 0.826 t/m^2(0.386)
for flat roof:	
Gypsum plaster on a mesh δ=10 mm, ρ=2960 kg/m^3	$0.01 * 2960 = 296$
Reinforced concrete slab δ=200 mm, ρ=2200 kg/m^3	$0.2 * 2200 = 440$
Vapor control layer δ=5 mm, ρ=1.7 kg/m^2	1.7
Concrete with incline protection δ=40-80 mm, ρ=2162 kg/m^3	$0.06 * 2162 = 129.72$
Waterproof membrane δ=5 mm, ρ=1300kg/m^3	$0.005 * 1300 = 6.5$
Total	873.92 kg/m^2 = 0.874 t/m^2(0.434)
Loads	Characteristic of loads, kg/m
1.2 Wall construction	
external self-supporting walls (wall height 3 m):	
Interior finish core δ=30 mm, ρ=2162 kg/m^3	$0.03 * 2162 = 64.86$
CMU block δ=200 mm, ρ=700 kg/m^3	$0.2 * 700 = 140$
Insulation panel(board foam) δ = 60 mm, ρ = 30 kg/m^3	$0.06 * 30 = 1.8$
Air vapor barrier δ=40 mils(1.016) , ρ=0.824 kg/m^2	0.824
Render finish coat(with reinforcing mesh) δ=30 mm, ρ=2100 kg/m^3	$0.03 * 2100 = 63$
Total	270.484 kg/m = 0.2704 T/m
Internal self-supporting walls (wall height 3m)	

Interior finish core δ=30 mm, ρ=2162 kg/m^3	$0.03 * 2162 = 64.86$
Autoclaved aerated concrete AAC blocks (Foam concrete block) δ=100 mm, ρ=600 kg/m^3	$0.01 * 600 = 60$
Board foam δ = 60 mm, ρ = 30 kg/m^3	$0.06 * 30 = 1.8$
Air vapor barrier δ=40 mils(1.016) , ρ=0.824 kg/m^2	0.824
Render finish coat δ=30 mm, ρ=2100 kg/m^3	$0.03 * 2100 = 63$
Total	215.88 kg/m = 0.21589T/m
Partitions (height, h = 3m)	
Aluminum-framed glass partition δ=10мм, ρ=2500 kg/m^3	$0.01 * 2500 = 25$
Total	25 kg/m = 0.025 t/m
2.2 Horizontal pressure from the ground [4]:	1.27 t/m^2

Collecting lateral soil pressure

Type of soil bases for foundations – sand and gravel (category II)

$\gamma = 1.9737$ т/м3

$\varphi = 36.5°$

$c = 0$

h=2 m

q=0.82 Т/м2

Active pressure

The intensity of the horizontal active soil pressure from its own weight γ, at a depth of h = y = 2 m should be determined by the formula:

$$P_\gamma = \left[\gamma * h * \lambda_г - c * 2\sqrt{\lambda_г}\right] y/h = \left[1.9737 * 2 * 0.27 - 0 * 2\sqrt{0.27}\right] 2/2$$
$$= 1.06579 \text{ т/м2}$$

Where:

$$\lambda_г = tg^2\left(45 - \frac{\varphi}{2}\right) = tg^2\left(45 - \frac{36.5}{2}\right) = 0.25404$$

Passive pressure:

$$\lambda \text{ для } \varphi = 27° - 0.38$$
$$\lambda = 0.25$$
$$P_q = q * \lambda \text{ t/m}^2$$
$$P_q = 0.82 * 0.25 = 0.205 \text{ t/m}^2$$
$$=> P = 1.06579 + 0.205 = 1.27 \text{ т/м2}$$

1.6 Thermal calculation of the outer wall

According to СП РК 2.04-01-2017 «Construction technology» [стр.7-10] и SNiP RK 2.04-03-2013 [стр.14-16] «Construction technology» it is necessary to determine the thickness of the insulation for the outer wall. To specify the temperature of the heating period:

$$ГСОП=(t_в-t_{отпер})*z_{отпер} \quad (1)$$

Where,

$t_в$= 21℃ - indoor air temperature, ℃;

$t_{отпер}$= 16.9 ℃ – average temperature of the heating season;

$z_{отпер}$= 120 days. - Duration of the heating period;

$$ГСОП=(21-16.9)*120=492 ℃* days$$

The required resistance to heat transfer of enclosing structures that meet sanitary and hygienic and comfortable conditions is equal to:

$$R_0^{тр} = 2{,}45 *^{\circ}С/Вт$$

Table 6 - Composition of the outer wall

Name of material	Υ_0 ,кг/м^3	λ, Вт/м^2*℃	δ,м	R_n=δ/λ , м^2 * ℃/Вт
Plaster on cement-sand mortar	2162	0,78	0,03	0,038
CMU block	700	0.2	0.2	1
Insulation panel	30	0,03	0,06	2
Air vapor barrier	0.824	0,01	0,00102	0.102
Cement-sand mortar plaster	2100	0,77	0,03	0,04

The heat transfer resistance of the enclosing structure should be determined by formula 2.2:

$$R_0 = \frac{1}{\alpha_в} + \frac{\delta_1}{\gamma_1} + \frac{\delta_2}{\gamma_2} + \frac{\delta_3}{\gamma_3} + \frac{\delta_4}{\gamma_4} + \frac{1}{\alpha_н} \quad (2)$$

$$R_0 = \frac{1}{8{,}7} + 0{,}038 + 1 + 2 + 0{,}102 + 0{,}04 + \frac{1}{23}$$

$$= 3{,}18 \text{ м}^2 * °С/Вт$$

$$R_0 = 3{,}18 \text{ м}^2 * ° \frac{С}{Вт} \geq R_0^{тр} = 2{,}45 \text{ м}^2 *^{\circ}С/Вт$$

The condition is met. We accept the thickness of the insulation 60 mm.

1.7 Anti-seismic measures

The Youth Centre designed in the thesis is not located in a seismic zone, therefore, anti-seismic measures are not required. Seismicity of the work area according to NTP RK 08-01.1-2017 is 6 points.

1.8 Calculating snow load

Nur-Sultan city - III snow region [1]:

$$\mu_i = 1.5,\ C_e = 1, C_t = 1, s_k = 1.8$$

$$s = \mu_i \cdot C_e \cdot C_t \cdot s_k = 1.5 \cdot 1 \cdot 1 \cdot 1.8 = 2.7\ kPa$$

Where

C_e −Enviromental factor;

C_t −Thermal coefficient;

s_k − The characteristic value of the snow load on the ground;

μ_i – Snow load shape factor

1.9 Calculation of wind load

Nur-Sultan city is located in the IV wind region, $q_b = 0.77$ кPa, wind speed – 35 m/s

The dimensions of the building are 67 x 108.2 x 9 m, Astana is the IV wind region.

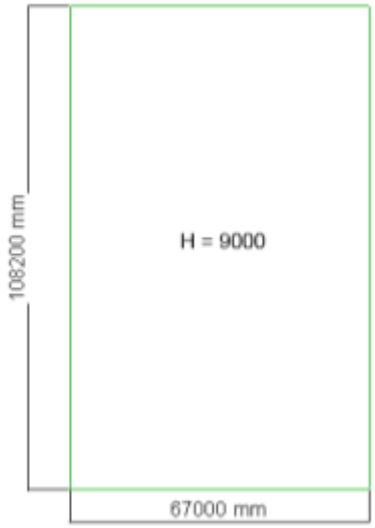

Figure 2 - Building Layout

Calculation of wind load by OX

We divide the building in height into zones corresponding to the base height for the external pressure z_e according to the standard at $b = 67$ m ; $h = 9 < 2b = 134$ m:

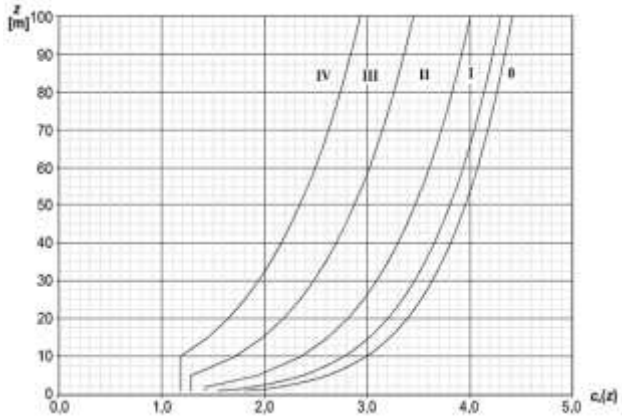

Figure 3 - Graphical representation of exposure ratio c_e (z) for c_o = 1, *ki* = 1

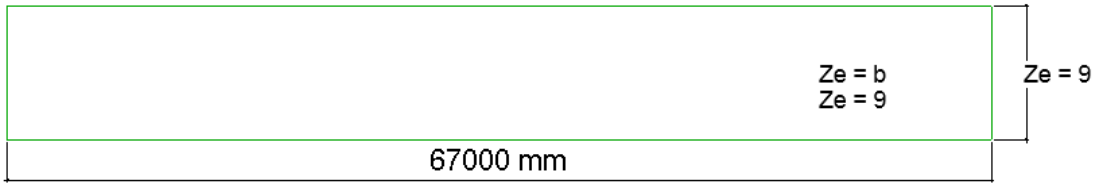

Figure 4 - base height Z_e depending on h and b and the profile of the velocity head

Basic velocity wind pressure for wind region II, q_b = 0.77 kPa
Wind pressure w_e is equal to:

$$w_e = c_e(z) \cdot q_b \cdot c_e$$

At z_e = 9 m:$c_e = 0.8$; Z_e = 9m; $c_e(9) = 2.8$

$$w_e = 2.8 \cdot 770 \cdot 0.8 = 1724.8\ Pa = 172.48\ kg/m^2$$

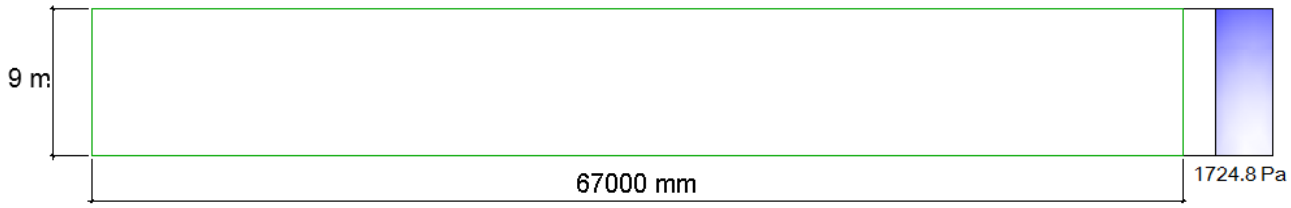

Figure 5 - Diagram of wind pressure

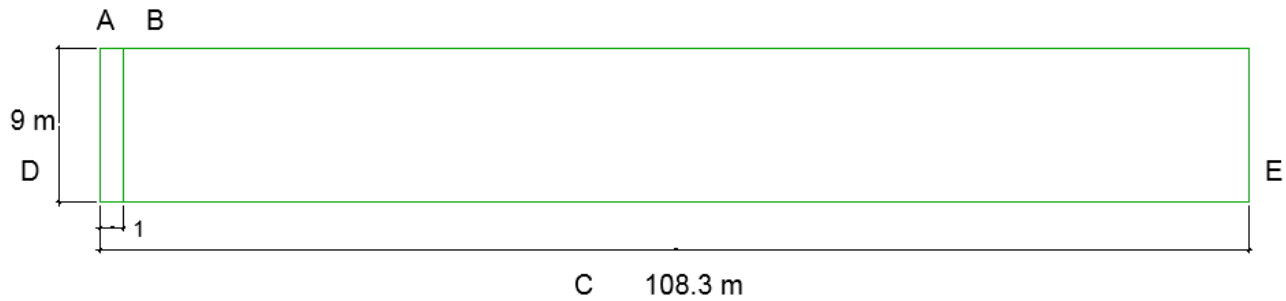

Figure 6 - Scheme of division into zones of lateral sides

External pressure on the sides:

External pressure coefficients c_{pe}.

Wind pressure w_e is equal to:

Table 1 - Values of wind pressure

A	$c_{pe} = -1.2$	$c_e(9) = 3.3$	$w_e = 3.3 \cdot 770 \cdot (-1.2) = -3049.2$ Pa $= -304.9$ kg/m^2
B	$c_{pe} = -0.8$	$c_e(9) = 3.3$	$w_e = 3.3 \cdot 770 \cdot (-0.8) = -2032.8$ Pa $= -203.3$ kg/m^2
C	$c_{pe} = -0.5$	$c_e(9) = 3.3$	$w_e = 3.3 \cdot 770 \cdot (-0.5) = -1270.5$ Pa $= -127.05$ kg/m^2
D	$c_{pe} = -0.8$	$c_e(9) = 3.3$	$w_e = 3.3 \cdot 770 \cdot (+0.8) = +12032.8$ Pa $= +120.32$ kg/m^2
E	$c_{pe} = -0.7$	$c_e(9) = 3.3$	$w_e = 3.3 \cdot 770 \cdot (-0.7) = -1778.7$ Pa $= -177.9$ kg/m^2

Wind loads are applied at the floor level:

At the level of the 1st floor: take into account half of the floor (2500 mm) + foundation above ground level (1000 mm). The design strip for the 1st floor is 3500 mm.

The second floor calculated strip - 5000 mm.

Table 2 - Pressure across the floors of the building

	1st floor
D	$+120.32 \cdot 3.5 = 421.12\ kg/m$= 0.421 T/m
A	$-304.9 \cdot 3.5 = -1067.15\ kg/m$= -1.067 T/m
B	$-203.3 \cdot 3.5 = -711.55\ kg/m$= -0.712 T/m
C	$-127.05 \cdot 3.5 = -444.67\ kg/m$= -0.444 T/m
E	$-177.9 \cdot 3.5 = -622.65\ kg/m$= -0.623 T/m
	2nd Floor
D	$+120.32 \cdot 5 = 601.6\ kg/m$= 0.602 T/m
A	$-304.9 \cdot 5 = -1524.5\ kg/m$= -1.524 T/m
B	$-203.3 \cdot 5 = -1016.5\ kg/m$= -1.016 T/m
C	$-127.05 \cdot 5 = -635.25\ kg/m$= -0.635 T/m
E	$-177.9 \cdot 5 = -889.5\ kg/m$= -0.89 T/m
	Roof
D	$+120.32 \cdot 2.5 = 601.6\ kg/m$= 0.602 T/m
A	$-304.9 \cdot 2.5 = -1524.5\ kg/m$= -1.524 T/m
B	$-203.3 \cdot 2.5 = -1016.5\ kg/m$= -1.016 T/m
C	$-127.05 \cdot 2.5 = -635.25\ kg/m$= -0.635 T/m
E	$-177.9 \cdot 2.5 = -889.5\ kg/m$= -0.89 T/m

Wind load calculation according to OY

We divide the building in height into zones corresponding to the base height for the external pressure z_e according to the standard at $b = 67$ м $< h = 9$ м $< 2b = 134$ м:

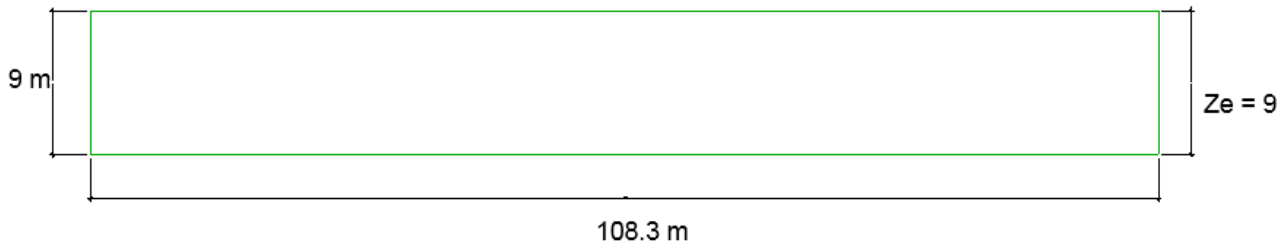

Figure 7 - base height z_e depending on h and b and the profile of the velocity head

Basic velocity wind pressure for wind region II, q_b = 0.77 kPa
Wind pressure w_e is equal to:

$$w_e = c_e(z) \cdot q_b \cdot c_e$$

At z_e = 9 м; $c_e(9) = 2.2$;

$$w_e = 2.2 \cdot 770 \cdot 0.8 = 1355.2\ Pa = 135.52\ kg/m^2$$

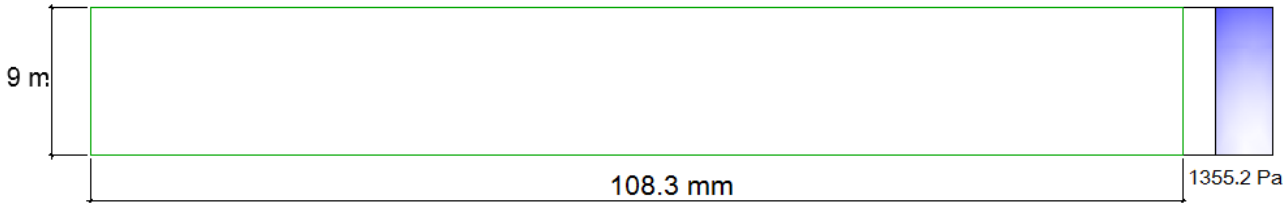

Figure 8 - Diagram of wind pressure

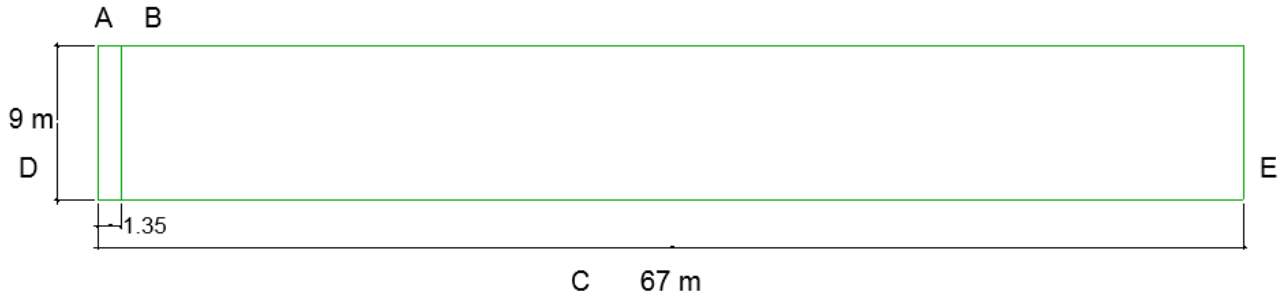

Figure 9 - Scheme of division into zones of lateral sides

Wind pressure w_e is equal to:

Table 1 - Values of wind pressure

A	$c_{pe} = -1.2$	$c_e(9) = 2.2$	$w_e = 2.2 \cdot 770 \cdot (-1.2) = -2032.8$ Pa $= -203.3$ kg/m^2
B	$c_{pe} = -0.8$	$c_e(9) = 2.2$	$w_e = 2.2 \cdot 770 \cdot (-0.8) = -1355.2$ Pa $= -135.5$ kg/m^2
C	$c_{pe} = -0.5$	$c_e(9) = 2.2$	$w_e = 2.2 \cdot 770 \cdot (-0.5) = -847$ Pa $= -84.7$ kg/m^2
D	$c_{pe} = -0.8$	$c_e(9) = 2.2$	$w_e = 2.2 \cdot 770 \cdot (+0.8) = +1355.2$ Pa $= +135.5$ kg/m^2
E	$c_{pe} = -0.7$	$c_e(9) = 2.2$	$w_e = 2.2 \cdot 770 \cdot (-0.7) = -1185.8$ Pa $= -118.6$ kg/m^2

Wind loads are applied at the floor level:

At the level of the 1st floor: take into account half of the floor (2500 mm) + foundation above ground level (1000 mm). The design strip for the 1st floor is 3500 mm.

The 2nd calculated strip - 5000 mm.

Table 2 - Pressure across the floors of the building

	1st floor
D	$+135.5 \cdot 3.5 = 474.25\ kg/m$= 0.474 T/m
A	$-203.3 \cdot 3.5 = -711.55\ kg/m$= -0.712 T/m
B	$-135.5 \cdot 3.5 = -474.25\ kg/m$= -0.474 T/m
C	$-84.7 \cdot 3.5 = -296.45\ kg/m$= -0.296 T/m
E	$-118.6 \cdot 3.5 = -415.1\ kg/m$= -0.415 T/m
	Typical floor 2-6
D	$+135.5 \cdot 5 = 677.5\ kg/m$= 0.678 T/m
A	$-203.3 \cdot 5 = -1016.5\ kg/m$= -1.016 T/m
B	$-135.5 \cdot 5 = -677.5\ kg/m$= -0.678 T/m
C	$-84.7 \cdot 5 = -423.5\ kg/m$= -0.424 T/m
E	$-118.6 \cdot 5 = -593\ kg/m$= -0.593 T/m
	Roof
D	$+135.5 \cdot 2.5 = +338.75\ kg/m$ =-0.339 T/m
A	$-203.3 \cdot 2.5 = -508.25\ kg/m$ =-0.508 T/m
B	$-135.5 \cdot 2.5 = -338.75\ kg/m$ =-0.339 T/m
C	$-84.7 \cdot 2.5 = -211.75\ kg/m$=-0.212 T/m
E	$-118.6 \cdot 2.5 = -296.5\ kg/m$=-0.296 T/m

2. Calculation-constructive section

2.1 Initial data

Rectangular slab with bottom reinforcement with dimensions b = 1000mm, h = 200mm;$c_1 = 20\,mm$ Concrete is of normal grade C30 ($f_{ck} = 25\,M$Па$, \gamma_c = 1{,}5$, $f_{cd} = 14{,}2$ МПа$, \alpha_{cc} = 0{,}85$) . Armature class S500 ($f_{yк} = 500\,M$Па$, f_{yd} = 435$ МПа , $E_s = 20 * 10^4$ МПа$, \alpha_{cc} = 0{,}85$) . A bending moment acts on the slab M_{ed}= 32, 91 кН*м.

Required: Determine the area of the longitudinal reinforcement.

2.2 Calculation raft foundation

A) Therefore, take average DP and OR

The cushion base will be designed by the conventional method (rigid method) for the load shown in the figure. the following.

All columns are 35X35cm

Ultimate soil bearing pressure q_{ult} = 100kPa

f_{yk} = 350MPa ⇒ f_{yd} = 350/1.15 = 285.4 Mpa

C25 ⇒f_{ck}= 20MPa⇒f_{ctk} = 1.5 MPa,

For calculating settlement immediate settlement should be considered:

$$S_i = \frac{qxB}{E}(1-\mu^2)\,If \qquad (3)$$

Where:

q- mat foundation pressure

μ- poisson's ratio

E- Young's module

If- Influence ratio

B- Foundation breadth

$$S_i = \frac{70.5x7}{10.04}(1-0.15^2)\,0.72=34.3\text{ mm}$$

Position of load c.g.

$$\sum P = (600+750+600)*2 + (1800+1800+1320)*2 = 13740\text{kN}$$

$$13740\,X = (750+1800+1800+750)*5 + (600+1320+1320+600)*10$$

$$X=4.65\text{m}$$

$$e_x = 5-4.65 = 0.35$$

$$X' = 5+0.35 = 5.35\text{m}$$

$$B_{min} = 2*(5.35+0.20+0.15) = 11.40\text{m}$$

$$13740\,\bar{y} = (600+750+600)*18 + (1800+1800+1320)*12 + (1800+1800+1320)*6$$

$$\bar{y} = 9\text{m}$$

$$e_y = 6+6/2-9 = 0$$

L_{min} = 2* (9+0.20+0.15) = 18.70m

b) Actual contact pressure

$\sigma = \sum P/(BL)$ = 13740/(11.40*18.70) =64.45kPa < σ_{ult} = 100kPa

The thickness of the cushion

Punching shear

Punching shear deformation under a load of 1800kN

Consider d= 0.80m and $\rho = \rho_{min} = 0.50/f_{yk} = 0.50/350 = 0.0014$

$k_1 = (1+50) = (1 +50*0.0017) =1.085$

$k_2 = 1.6 – d =1.6 -0.70 = 0.90$, Take $K_2 =1$

P_r = (0.85+0.4+1.105)2+ (0.4+3(0.70) =7.21m

Net shear development 1.5d=1.105>0.85 1.5d

V_d= 1800 -σ*(2.355* 2.50), σ =64.45kP

V_d= 1800 -64.45*(2.355* 2.50) =1420.55kN

Punching shear resistance

$V_{up} = 0.25 f_{ctd} k_1 k_2 u d$ (MN)

V_{up} = 0.25 *1000* 1.085*1.00*7.21*0.70

=1369.00kN < V_d... NOT OK! Increase the depth

Take d= 0.75m and $\rho = \rho_{min} = 0.50/f_{yk} = 0.50/300 = 0.0017$

$k_1 = (1+50\square) = (1 +50*0.0017) =1.085$

$k_2 = 1.6 – d =1.6 -0.75 = 0.85$, Take $K_2 =1$

P_r = (0.85+0.4+1.125)2+ (0.4+3(0.75)

=7.40m

Net shear force developed

V_d= 1800 -σ*(2.375* 2.65), ρ =64.45kP

V_d= 1800 -64.45*(2.375* 2.65) =1394.37Kn

Punching shear resistance

$V_{up} = 0.25 f_{ctd} k_1 k_2 u d$ (MN)

V_{up} = 0.25 *1000* 1.085*1.00*7.40*0.75

=1505.44kN >V_D... OK!

Net shear development Check punching shear under 1320kN

P_r = (1.125 +0.15+0.4)2+ (0.4+3(0.75))

=6.00m

Net shear development

V_d= 1320 -64.45*(1.675*2.65) =1033.92kN

Punching shear resistance

$V_{up} = 0.25 f_{ctd} k_1 k_2 u d$ (MN)

V_{up} = 0.25 *1000* 1.085*1.00*6.00*0.75

=1220.63kN > V_d... OK!

Check the punching shear below 600kN

P_r = (1.125+0.15+0.4) + (1.125+0.15+0.4) =3.35

Net shear force developed

Net shear force developed

V = 600 -64.45 * (1.675 * 1.675) = 419.18kN

Punching shear resistance V = 0.25f kN ud (MN)

Pr • V = 0.25 * 1000 * 1.085 * 1.00 * 3.35 * 0.75% 3D = 681.52kN > V... OK!

Soil reaction analysis: - Divide the slab mat into strips in x and y

Strip A, (64.45) * 3.55 = 228.80kN / m

Strip B, (64.45) * 6.00 = 386.70kN / m

Strip C, (64.45) * 2.85 = 183168kN / m

Strip 1 & Strip 4, (64.45) * 3.35 = 215.91kN / m

Strip 2 & Strip 3 (64.45) * 7.00 = 451.15kN / m

Shear force and bending moment diagram of each bar

$\sum_{i=1}^{4} P_i$600 +1800+ 1800 +1600 = 4800 KN

$\sum$ R = 228.80 * 18.70 = 4278.56kN

$\sum$ V = $\sum$ P - $\sum$ R = 4800-4278.56 = 521.44 0 0.

So take average P and R.

l.e. , (4800 +4278.56) / 2 = 4539.28kN

Σavg= (4539.28) /18.70 = 242.74kN / m

$P_{1avg} = P_{4avg}$ = (4539.28 / 4800) * 600 = 567.41kN •

$P_{2avg} = P_{3avg}$ = (4539.28 / 4800) * 1760 = 1673.93kN

$\sum$ R = 215.91 * 11.40 = 2461.37kN

$\sum$ V = $\sum$ P - $\sum$ R = 1950-2461.37-511.37 00

Therefore, take average DP and OR

I.e. , (1950-2461.37 1/2 = 2205.69Kn

Σavg= (2205.69) /11.40 = 193.48kN / m

P_{1avg}= P_{3avg} = (2205.69 / 1950) * 600 = 678.67kN

P_{2avg} = (2205.69 / 1950) * 750 = 848.34kN

2.3Calculation of isolated foundation

The size of the cross section of the column 35×35 см, concrete class. C30, individual safety factor for concrete $\gamma_c=1,5$; design resistance of concrete for compression of prestressed structures and reinforced concrete $f_{cd}=a_{cc}\cdot f_{ck}/\gamma_c=0,85\cdot 16/1,5=9,1$ *МПа*; Longitudinal reinforcement class *S500* ($f_{yk}=500$ *МПа,* $f_{yd}=f_{yk}/\gamma_c=435$ *МПа);* armature class *S500* ($f_{yk}=240$ *МПа,* $f_{yd}=f_{yk}/\gamma_c=167$ *мПа);*

Column cross section *40×40 м*. The calculated value of the longitudinal force in the section on the edge of the foundation:

Regular: $N_{ed}=1400$ *kN*

Estimated value:

$$N_n = \frac{N}{\gamma} = \frac{1400}{1.15} = 1218kH$$

We calculate the volume of the base with a preliminary formula:

$$A = a \cdot b = \frac{N_n}{R_0 - \gamma_m \cdot d} = \frac{1218}{0{,}018 - 20 \cdot 33 \cdot 10^{-6}} = 4{,}2\ м^2$$

Where:

$$d = d_0\sqrt{\sum M} = 0{,}23\sqrt{-2} = 0{,}33$$

$d_0 -$ Coefficient taking into account the type of soil; $d_0 = 0{,}23.$

$\sum M -$ the sum of minus temperatures throughout the year;

Dimensions of a square foot a 4.2 2.05$\sqrt{м}$. a=2,4 м we accept as equal (0,3 м multiple). Pressure on the soil from the rated load:

$$P = \frac{N}{A} = \frac{1400}{420000} = 0{,}019$$

Working height of the base:

h_0=*-0,25*(h_c+h_b)+*0,5*$\sqrt{\frac{N}{R_{bt}+P}} = -0{,}25 \cdot 40 \cdot 2 + 0{,}5\sqrt{\frac{1400}{1{,}6+0{,}019}} = 0{,}34$ м

According to the contract, we determine the total height of the foundation:

H=37+ 4=41 см;

Welding of the reinforcement of the compressed part of the column 20 A500C , C25/30 The column is concreted.

H=24·2,8+25=140 см

The final height of the foundation H=140 см we accept that, h_0=140–4=136 см – three-stage.

$$M_{Ed} = N_{Ed} \cdot \left(\frac{b}{8}\right) \cdot \left(1 - \frac{c}{b}\right) = 1400 \cdot \left(\frac{3{,}3}{8}\right) \cdot \left(1 - \frac{0{,}4}{3{,}3}\right) = 380\ кН\cdot$$

$$a_{Eds} = \frac{M_{Ed}}{b \cdot d^2 \cdot f_{cd}} = \frac{380 \cdot 10^6}{3300 \cdot 1330^2 \cdot 9{,}1} = 0{,}04$$

Here *d=h-c_1=1400-70=1330 см*. [3] In Appendix B. table

For concrete a_{Ed}*=0,04* және σ_{sd}= f_{yd}*=435 МПа –* ω*=0,0412,* $\zeta = 0{,}971$

Required area of elongated reinforcement:

$$m_{Ed} = \eta \cdot V_{Ed} = 0{,}125 \cdot 1400 = 175\ кН\cdot м$$

$$a_{Eds} = \frac{m_{Ed}}{b \cdot d^2 \cdot f_{cd}} = \frac{175 \cdot 10^6}{3300 \cdot 1330^2 \cdot 9{,}1} = 0{,}012$$

Here *d=h-c_1=1400-70=1330 см*. [2] In Appendix B. table

For concrete a_{Ed}*=0,012* және σ_{sd}= f_{yd}*=435 МПа –* ω*=0,0101,* $\zeta = 0{,}987$

Required area of elongated reinforcement: *4,3 мм²*

$$a_s = \frac{m_{Ed}}{f_{yd} \cdot z} = \frac{m_{Ed}}{f_{yd} \cdot \zeta \cdot d} = \frac{175 \cdot 10^6}{435 \cdot 0{,}987 \cdot 1330} =$$

$$A_s = a_s \cdot b_{eff} = 4{,}3 \cdot 3{,}3 = 14{,}2$$

We accept assortment: *16∅ 150 S500* (*A_s= 14,2 см²*).

Reinforcement percentage μ_{min}=0,05%

2.4 Calculation on Etabs & Safe

Calculation of the spatial system for static and dynamic actions with the choice of design combinations of efforts.

We create 10 load cases, thereby applying loads to the building frame:

-The dead weight of the building;
-Floors;
-Walls;
-Ground pressure;
- Super dead
- Snow load;
- Wind X
- Wind Y

This building model is designed in accordance with the design features of the projected building. Stiffness diaphragms and slabs were modeled by finite elements of a flat slab.

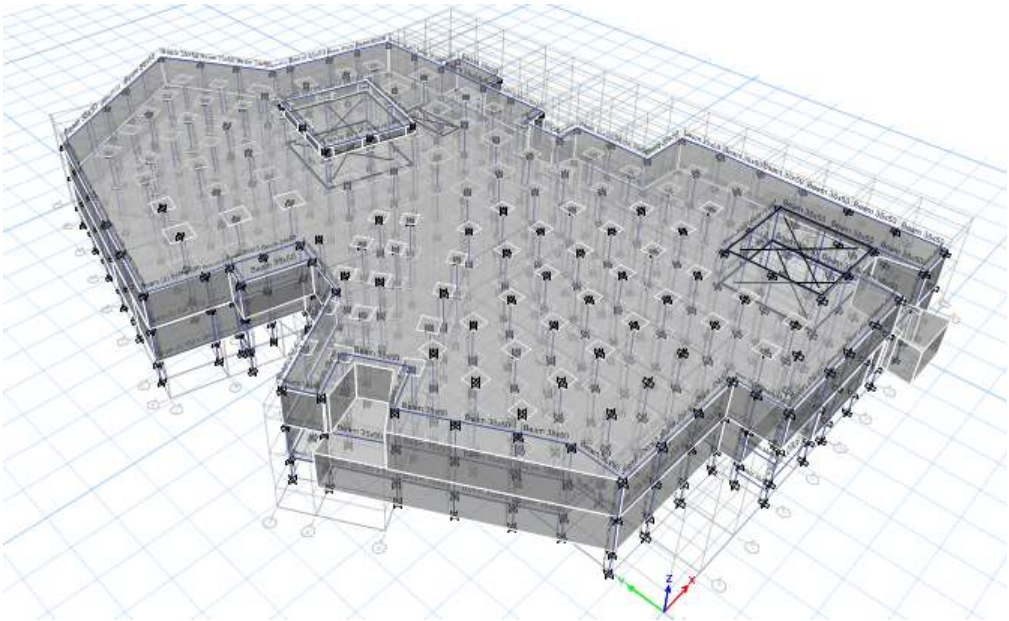

Figure 10 - Initial spatial model of the building

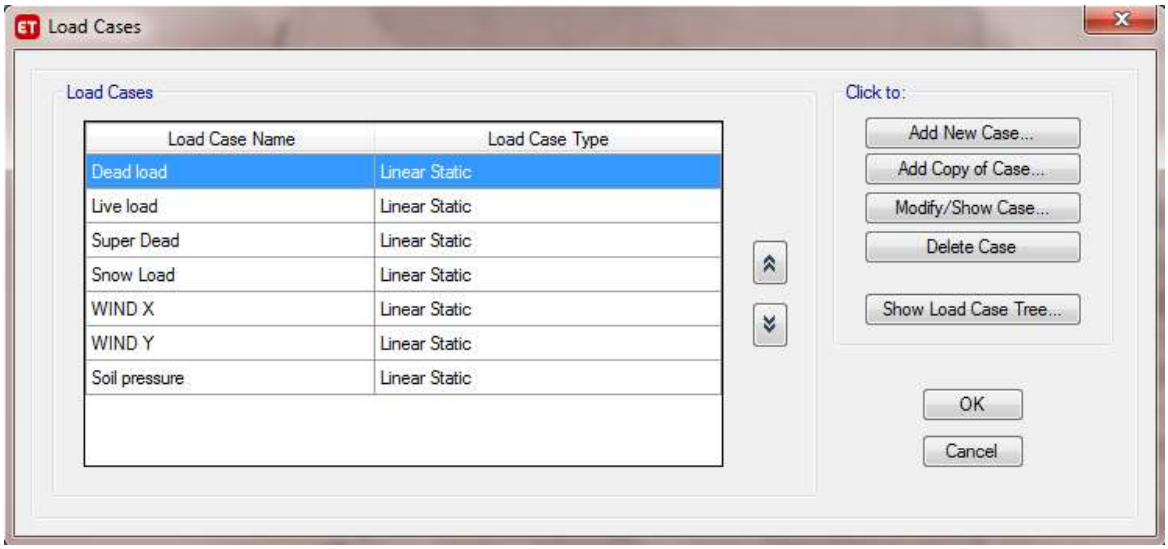

Figure 11 – Load cases

Various design files are created to meet the code and design features of the designed building.

We create 5 calculation files:

Basic combination with bed coefficient (for statics).

Basic combination with $E_{гор}=0,3*E_0$, $E_{вер}=0,6*E_0$.

Special combination with bed ratio $C_1*10*1,5$.

Special combination with bed ratio $C_1*10*0,667$.

Special combination with $E_{гор}=0,5*E_0$.

The first calculation file is needed to identify the slab settlement. The second calculation file is required to identify deflections in horizontal elements. The third, fourth and fifth calculation files are required to check the fulfillment of the condition СП 2.03-30-2017 « Construction in seismic regions of the Republic of Kazakhstan ».

3. Construction and technological section

3.1 Technological map for zero cycle works

3.1.1 Characteristics of soil development conditions

Loam, light and loess-like with an admixture of crushed stone, pebbles or construction waste up to 10% by volume – soil category II

Table 7 - Initial data

	Unit of measurement	Numeric data
Soil group		II
Average soil density	кг/м^3	1700
First-time coefficient flax loosening	%	18-24
Residual coefficient loosening	%	3-6
Slope factor slope	%	0,75

Soil transportation range: 4 km
Average winter outdoor temperature: -12˚C
Foundation sole elevation: -2m

3.1.2 Determination of the scope of work

As it is known at the present time, the construction of a building and structure is not implemented without an approved estimate, therefore, customers require to know the volume of capital investments and the timing of striatal, then for the construction of each building or structure it is necessary to calculate the volume of work.

The volume of earthworks is determined when designing earthworks.

$$V_к = \frac{H}{6} \cdot \left(a \cdot b + c \cdot d + (a + c) \cdot (b + d)\right), м^3 \quad (8)$$

Where

a, b are the width and length of the pit along the bottom;

c, d - width and length of the pit along the top

$$V_{к1} = 9/6 \cdot (15 \cdot 34 + 33 \cdot 52 + (15 + 33) \cdot (34 + 52) = 9531 \text{ м}^3$$

Since I have 2 identical foundation pit, $V_{к2} = V_{к1}$

$$V_{к2} = V_{к1} = 9531 \text{ м}^3$$

$$V_к = 9531 + 9531 = 19062 \text{ м}^3$$

2. Determine the volume of backfilling

$$V_{\text{обр.з.}} = \frac{V_к - V_ф - V_{\text{подв}}}{1+К_{\text{о.р.}}}, м^3 \quad (9)$$

$$V_{\text{обр.з}} = \frac{19062 - 793.6 - 8100}{1 + 0{,}06} = 9593 м^3$$

$V_{подв}$ – basement volume

$V_ф$- volume of foundation elements

$V_ф = 31* 16*0.8= 396.8\ 82 = 793.6\ м^3$

$К_{о.р.}$- Residual loosening factor

$V_{подв}=a\cdot b\cdot h= 2(15 *30*9) = 8100\ м^3$

3. Determination of the volume of surplus soil

$$V_{\text{изл.г}} = V_к - V_{\text{обр.з}}, м^3 \quad (10)$$

$V_{изл.г}=19062 - 9593= 9469\ м^3$

4. Determination of the volume of soil shortage

$$V_{н.г}=a\cdot b\cdot h_{нед}, м^3 \quad (11)$$

$h_{нед}=0{,}1÷0{,}4\ м$

$V_{н.г}=2(30*15*0.4) = 360\ м^3$

5. Determination of the cutting area of the vegetation layer

$$F_{срез} = (10+c+10)\ (10+d+10), м^2 \quad (12)$$

$F_{срез} = 54*73+54*73 = 7884\ м^2$

6. The total volume of cutting of plant soil.

$V = S * h_{рг}=7884*0{,}2 = 1576.8\ м3$

7. The area of soil compaction.

$$F_{упл} = V_{о.з.} / h_у \quad (13)$$

$h_у$ - thickness of the compacted layer

$F_{упл} =9593/0{,}2 = 47965\ м^2$

8. Waterproofing area of foundation slab

$$S=V_{под}/h = 8100/9= 900\ м^2 \quad (14)$$

Table 8 - List of volumes of earthworks

№ п/п	Name of works	unit of measurement	amount	Notes (edit)
earthwork				

1	Cutting off the vegetation layer	1000 м^2	7.88	
2	Excavation by excavator			
А)	To the dump	100 м^3	95.93	
Б)	In vehicles	100 м^3	94.96	
3.	Development of shortage of soil	1 м^3	360	
4.	Backfilling of soil	100 м^3	95.93	
5.	Soil compaction	100 м^2	*479.65*	
6.	Waterproofing device	1 м^2	900	

3.1.3 Selection of a set of machines for excavation work

The main indicators that affect the choice of machines in the execution of earthworks are the design and dimensions of the earth structure, the group of soil, the grain size distribution of the moist and the soil itself.

In construction, there are basically four methods of soil development, mechanical, hydro mechanical, explosive and combined.

Most of the volume of earthworks is carried out mechanically, using various types of machines.

Soil development, according to the existing classification, is divided into 3 groups:

- Earthmoving
- Machines for soil compaction
- Machines for auxiliary work

3.1.4 Choosing a bulldozer

Basic tractor T-130, bulldozer ДЗ-28, soil - loam,
Cutting path length - 19 m, soil transportation path length - 60 m.
Cycle time:

$$T=t_1+t_2+t_3+t_4 \quad (15)$$

Where t_1 - soil cutting time:
$t_1=l_1/v_1=3,6*19/3,2 = 21.37$с
3,6 - conversion factor км/ч в м/с;
l_1 - cutting path length, l_1=19 м,
v_1 - speed of movement of the bulldozer in 1st gear when cutting the soil,
v_1=3,2 км/ч;

t_2 - soil transference time by blade:

$t_2=l2/v_2=3,6*60/3,8 = 57c$

3,6 - conversion factor км/ч в м/с;

l_2 - length of soil transportation path, $l_2=60$ м;

v_2 - the speed of the loaded bulldozer, $v_2=3,8$ км/ч;

t_3 - return (empty bulldozer) time:

$$t_3= (l_1+l_2)/v_3=3,6*(19+60)/5,2 = 55 c$$

v_3 - reverse travel speed, $v_3=5,2$ км/ч;

t_4 – extra time spent on elevating, lowering the blade, switching speeds, rotating the bulldozer, $t_4=25$ с.

$$T=t_1+t_2+t_3+t_4 = 21.4 + 57 + 55 +25 = 158.4c$$

The technical efficiency of the bulldozer is specified by:

$$П_т=q_{пр}*n*k_н/k_р \quad (16)$$

Where

$q_{пр}$ - volume of the soil dragging by blade, м;

$$q_{пр}=L*H^2/2*m=3.94*0,815^2/2*0,7=1,87 м^3$$

L - Blade length, L = 3,94 м,

H - Blade height, H=0,815 м,

m = 0,7 - coefficient depending on the ratio H/L,

n - Number of cycles per 1 hour of work:

$$n = 3600/T = 3600/158.4 = 22.73$$

Кн=1,1 - coefficient of filling the geometric volume of the prism with soil, $k_р$=1,25 - coefficient of soil loosening,

$П_т=q_{пр}*n*k_н/k_р=1,87*22.73*1,1/1,25 = 37.4 м^3/ч$

Operating performance of the bulldozer:$П_э=П_т*k_в = 37.4*0,8= 30 м^3/ч$

где $k_в$ the time-using factor of the bulldozer, $k_в=0,8$.

Replacement bulldozer performance:

$$П_с=8*П_э = 8* 30 = 240 м^3/ч,$$

Where

8 - The number of hours of work per shift.

3.1.5 Excavator Choice

The development of the pit is made by a kinavater, equipped with a straight shovel with loading of soil in the dumps and with partial dumping in the dump.

Choose 2 excavators with a straight shovel with a bucket with teeth with a bucket volume of 1.25 m3 and 1 m3 and make a comparison.

Table 9 - Specs

	Э-1251	ЭО-4121А
Drive	hydraulic	hydraulic
Bucket volume	1.25	1 $м^3$

The greatest depth of digging	9,3 м	6,85 м
Largest cutting radius	9,9 м	7,25 м
Unloading height	6,6 м	4,7 м
Power	90 кВт	59 кВт
Massa	39,5 т	27,6т
$Н_{вр1}$	1,64	2,2
$Н_{вр2}$	2,2	2,6
$С_{м.с.}$	38 у.е.	32 у.е.
$С_{и.р.}$	26 тыс. у.е.	24 тыс. у.е.

I. Excavator E-1251

1. Determine the cost of developing 1 m of soil in a pit for this type of excavator (tg)

$$C = \frac{1{,}08 \cdot С_{маш.смен}}{П_{см.выр}} \quad (17)$$

$$C = \frac{1{,}08 \cdot 38000}{476.55} = 86.12тг$$

1,08 - overhead factor

$С_{маш.смен}$- the cost of the machine change excavator

2. Replacement excavator, taking into account the development of the ground, and with loading in transport

$$П_{см.выр} = \frac{V_к}{\sum n_{маш.смен}} \quad (18)$$

$$П_{см.выр} = \frac{19062}{40} = 476.55м^3/смен$$

3. The total number of excavators at work will be increased and loaded on transport

$$\sum n_{маш.смен} = \frac{V_{обр.з} \cdot Н^1_{вр} + V_{изл} \cdot Н^2_{вр}}{8{,}2 \cdot 100} \quad (19)$$

$$= \frac{9593 \cdot 1.5 + 9469 * 1.9}{820} = 39.5 = 40$$

$Н^1_{вр}$ = 1.5 – the time of the mechanism when working will be edits (mash-hour).

Н2вр=1.9 – is the time limit for the mechanism when loading the ground into transport.

1. Determining the capital investment for the development of 1 m3 soil for each of this type of excavator (tg/m3)
2.

$$К_{уд} = \frac{1{,}07 \cdot С_{ир}}{П_{см.выр} \cdot t_{год}} \quad (20)$$

$$= \frac{1{,}07 \cdot 26000}{476.55 \cdot 300} = 0{,}194 \text{тг/м}^3$$

5. Determining the 1m3 soil development costs for this type of excavator

$$П_д = С + Е_н \cdot К_{уд} \quad (21)$$

$П_д$=86.12+0,15·0,194= 86.15 тг/м3

$Е_н$ – regulatory efficiency ratio of capital investments-0.15

II. Excavator EO-4121A

1. Determine the cost of developing 1 m of soil in a pit for this type of excavator (tg)

$$C = \frac{1{,}08 \cdot С_{маш.смен}}{П_{см.выр}} = \frac{1{,}08 \cdot 32000}{340.4} = 101.5 \text{ тг}$$

1,08 - overhead factor

$С_{маш.смен}$- the cost of the machine change excavator

2. Replacement excavator, taking into account the development of the ground, and with loading in transport

$$П_{см.выр} = \frac{V_к}{\sum n_{маш.смен}} = \frac{19062}{56} = 340.4 \text{ м}^3/\text{смен}$$

3. The total number of excavators at work will be increased and loaded on transport

$$\sum n_{маш.смен} = \frac{V_{обр.з} \cdot Н^1_{вр} + V_{изл} \cdot Н^2_{вр}}{8{,}2 \cdot 100} = \frac{9593 \cdot 2{,}2 + 9496 * 2{,}6}{820} = 55.76 = 56$$

$Н^1_{вр}$=2,2 – the time of the mechanism when working will be edits (mash-hour).

Н2вр=2,6 – is the time limit of the mechanism when loading the ground into transport.

4. Determining the capital investment for the development of 1 m3 soil for each of this type of excavator (tg/m3)

$$К_{уд} = \frac{1{,}07 \cdot С_{ир}}{П_{см.выр} \cdot t_{год}} = \frac{1{,}07 \cdot 24000}{340.4 \cdot 300} = 0{,}25 \text{ тг/м}^3$$

5. Determining the 1m3 soil development costs for this type of excavator

$П_д = С + Е_н \cdot К_{уд}$=101.5+0.15 · 0,25 = 101.54тг/м3

$Е_н$ – regulatory efficiency ratio of capital investments-0.15

As a result of comparing the two excavators, the E-1251 excavator has a low present cost compared to the EO-4121A.

3.1.6 Determining the number of cars

To take out the excess soil from the construction site and ensure joint work with the excavator choose the dumps. The cargo capacity and the mark are assigned depending on the volume of the excavator and the range of the ground.

Choose the MAz-5516

1. The volume of soil in a dense body in the excavator bucket

$$V_{\text{гр}} = \frac{V_{\text{ков}} \cdot К_{\text{нап}}}{К_{\text{пр}} + 1} \tag{22}$$

$$= \frac{1.25 \cdot 1,2}{0,25+1} = \frac{1,5}{1,25} = 1.2 \text{м}^3$$

$V_{ков}$- accepted bucket volume

$К_{нап}$- the ratio of filling the bucket:

For straight shovel- from 1-1.25

$К_{пр}$- Primary smearing factor

$К_{пр}$=0,25

2. Determining the mass of the soil in the excavator bucket

$Q=Vгр \cdot \rho_{гр}=1.2 \cdot 1,85= 2.22$ т

$\rho_{гр}$=1,85 т/м^3- average ground density

3. Determining the number of boilers loaded into the body of the car dump

$$n = \frac{П}{Q} = \frac{20}{2.22} = 9 \text{ шт}$$

4. Determining the volume of soil in the dense body of the car dumper loaded into the body

$$V=V_{гр} \cdot n= 1.2 \cdot 9 =10.8 \text{ м}^3$$

5.*Determining the duration of one cycle of the bus*

$$Т_{ц} = t_{ц} + \frac{60 \cdot L}{V_{г}} + t_{р} + \frac{60 \cdot L}{V_{П}} + t_{m} \tag{23}$$

$$= 12.3 + \frac{60 \cdot 7}{18} + 2 + \frac{60 \cdot 7}{30} + 3 = 54,63 \text{ minutes}$$

L- Distance of ground transportation

$t_{п}$- Loading time

$t_{р}$- unloading time - от 1-2 мин

t_{m}- maneuvering time before loading and unloading –от 2-3 мин

$V_{г}$- The average speed of the car was in a busy state.

$V_{г}$=18 км/ч

$V_{п}$-от 25-30 км/ч

$$t_{п} = \frac{V \cdot Н_{вр}^2 \cdot 60}{100} \tag{24}$$

$$t_{\text{п}} = \frac{10.8 \cdot 1.9 \cdot 60}{100} = 12.3 \text{ мин}$$

6. Determining the required number of cars

$$N = \frac{\text{Т}_{\text{ц}}}{t_{\text{ц}}} = \frac{54.63}{12.3} = 4{,}44 \approx 5 \text{ шт}$$

3.1.7 Choosing a primer

Since Subline is a related ground, therefore choose a method of sealing the roll and for the length of the seal band more than 50 m choose a skating rink on pneumatic tires static action DU-31A - self-propelled with a width of compacted strip - 2.2 m Soil roll-off produced by self-propelled rollers on Pneumatic tires of the type OF DU-31A with a thick 25cm thick.

3.1.8. Calculating the working parameters of the walk-through

Excavator E-1251 has the largest cutting radius of 9.9 m For the pit choose frontal passage with moving in a straight line, with one-way loading of the ground into transport.Шаг передвижки экскаватора $l_п$ = 5м

1. Determine the nabib. Width of the 1st frontal passage on the top

$$B_п=2*b=2\sqrt{(0.9*R_{max})^2-L_n} \quad (25)$$

$$B_п =2\sqrt{(0.9*9.9)^2- 5^2} = 14.7 \text{ м}$$

2. Determine the nabib. Width of the 1st excavation at the excavator's parking level

$B_п=2*b_1=2*0{,}9*9.9= 17.8$м

Determine the width of the 2nd side passage

$$B=B_1+B= 4{,}5+6{,}5= 11\text{м}$$

Table 10 - Foundation volume

name	V Works		Note or counting formula
	Units. ism	Number	
The device of monolithic structures			
For the foundation			
Formwork device	1 м^2	153.6	2(a*0.8+0.8*b)
Fixtures	1 т	123.55	0,02*V_b*7.8
Laying concrete	1 м^3	792	(a*h*0,6)
Caring for concrete	1 м^2	990	A*b
form removal	1 м^2	153.6	
For the column			
Formwork device	1 м^2	806.4	L*h*0.35*n

Fixtures	1 т	3.23	0,035*V_b
Laying concrete	1 м^3	80.64	0.35*0.35*h*2.5
Caring for concrete	1 м^2	201.6	
form removal	1 м^2	806.4	
For basement panels			
Formwork device	1 м^2	1620	(a*3.3)+(b*3.3)
Fixtures	1 т	224.64	0,04*V_b*7.8
Laying concrete	1 м^3	720	(a*h*3.3)
Caring for concrete	1 м^2	1800	(a*3.3)+(b*3.3)
form removal	1 м^3	1620	
For slabs of overlaps			
Formwork device	1 м^2	806.4	(a*0,2)+(b*0,2)+(a*b)
Fixtures	1 т	7.2	0,04*V_b*7.8
Laying concrete	1 м^3	180	(a*h*0,2)
Caring for concrete	1 м^2	900	A*b
form removal	1 м^3	806.4	

3.2 Technological map for the construction of the above-ground part of the building

3.2.1 source data

Number of floors - 13 (taking into account those floors)

Transportation range - 7 км

Transportation range: a=14 м, в=61 м

Transportation range: h= 20см

Transportation range: 2500кг/м^3

Transportation range - 3,3 м, Transportation range – 4,5 м

Transportation range - 400 мм.

3.2.2 Transportation range

Transportation range

1) Transportation range

Transportation range

$$S = L * h \quad (26)$$

Slabs of overlaps:

$$S=L*B= 854 \text{ м}^2$$

wall:

$$S=L*B=330 \text{ м}^2$$

Small-looking formwork:

Column:

$$S=56*0,4*4*3,3 = 295,68 \text{ м}^2$$

crossbar:

S = 610,4 м^2

total:2090,08 м^2

Backup device, racks:

According to the rules and regulations, one rack is installed for every 4 m-2. In order to find out the number of racks you need to know the area of the building, divide the area by 4 learn the number of racks. But the racks according to the NINR are measured in meters 100 meters.

$$S=L*b=14*61 = 854 \text{ м}^2\text{(Building area)}$$

$$n=S/4= 854/4= 213 \text{ шт. (Number of racks)}$$

Beam device:

Beams are laid in a longitudinal direction every 3 meters, and in a cross direction through every 1 meter. The beam is 3 m long.

In the longitudinal direction:

$$N = 61/3=20 \text{ шт.}$$

$n_{общ}$ = 20*4=80 шт. (Всего)

$$L=80*3=240 \text{ м.}$$

In a cross-section:

$$n=14/3=4 \text{ шт.}$$

$n_{общ}$ = 4*60=240 шт.(Всего)

L= 240*3 = 720 м.

2) Fixture works.

Installation of reinforcement nets frame of floors and coatings. Size 1 mesh 6 m/2. The plates are reinforced from above and below.

S=L*b=14*60=840 $м^2$

n= (840/6)*2= 280 шт.

Installation of rebar rods.

$$\rho = \frac{m}{V} \rightarrow m = p * V \quad (27)$$

V= 183.568 м3 (Volume of concrete)

$m_{арм.} = 28{,}6$ т

To begin with, we determine the mass of concrete, 2-4 % is reinforcement rods.

3) Concreting.

Laying the concrete mixture into the wall structures.

$$V_{ст} = (h * a * b * \rho) = 66\ м^3$$

Laying the concrete mixture in the coating and overlapping:

$$S=L*b*h=61*14*0.2= 170{,}8\ м^3$$

Laying the concrete mixture in the column:

$$S=L*b*h=56*0{,}4*0{,}4*3{,}3= 29{,}568\ м^3$$

Stacking the concrete mixture in the rigel:

$$S=L*b*h=0{,}4*0{,}5*L= 88\ м^3$$

Caring for concrete

The strength of concrete depends on many factors. One of the important factors influencing the strength of concrete is the correct, timely care for concrete. Opening the surface of the concrete is watered with clean water, then the concrete is faster and better gaining the required strength.

$$S = a * b = 854\ м^2$$

4) Formwork:

Demolition of the formwork:

Large-shielding formwork - 1184 $м^2$

Small-looking formwork – 906.08 $м^2$

altogether: 2090.08 $м^2$

Disassembly of racks and beams:

Rack n=213 шт., L= 702.9 м

Beam L=960 м.,n= 320

Table 11 - Volumes of Construction Installation

Process name	Ed.ous.	1st floor	Number of floors	Total
Formwork				

Large-shielding formwork	м^2	1184	13	26 187
Small-looking formwork	м^2	906.08	13	12 805
Rack	100 м	7,02	13	91,26
Beam	м	960	13	12480
Fixtures				
Grid	шт	280	13	3640
Bars	т	28,6	13	371,8
concreting				
stowage	м^3	354,368	13	4606,78
care	м^2	854	13	11102
dismantling				
Large-shielding formwork	м^2	1184	13	15392
Small-looking formwork	м^2	906,08	13	11779
Rack	100 м	7,02	13	91,26
Beam	м	960	13	12480

3.2.3 Breaking down structures into tiers and determining the size of grips

To make a flow of the production of the work of the object must be broken into tiers and captures. The tier is a section of the conventionally extended construction site vertically. 1-storey-1 tier. Capture is a part of the erected object on which a private flow with a certain number of workers is allocated.Количество захваток можно определить по формуле:

$$m = \frac{A * t_{в}}{к} + n - 1 \quad (28)$$

where $A -$ *Number of shifts per day*

$t_{в} -$ The time of stood the concrete until it acquired a strength of 15 kg/, cm-2. (Take from 1-6 days)

K- Cycle module i.e. the duration of the capture work is taken equal to 1. n- Количество простых процессов (4)

$$m = \frac{2*3}{1} + 4 - 1 = 9 \text{ Captures}$$

1. Calculating the turnover of the formwork

This calculation shows us how many times one formwork is used. A qualitative indicator of formwork is its turnover, i.e. the possibility of reuse.

The turnover of the formwork is calculated by the formula

$$Z = \frac{\sum_1^a m}{n-1+\frac{A*t_в}{к}} \quad (29)$$

Where

Σm - The total number of seizures on all tiers of the building. A- Число смен 24 hours =1

Σm=9*n=9*13=117

$$Z = \frac{117}{4-1+\frac{1*3}{1}} = 19{,}5 \text{ раз}$$

That is, one formwork in the process of construction is used 19.5 times.

The required number of formwork kits is determined by the formula:

$$a = n + 1 + \frac{A*t_в}{к} \quad (30)$$

$$a = 4 + 1 + \frac{1*3}{1} = 8 \text{ Sets}$$

3.2.4 Choosing how to transport, feed, stack and seal the concrete mixture

The tower crane is an arrow-type crane, with an arrow fixed at the top of the vertically located tower.Башенный кран различают:

- Stationary
- Agile
- combined

1) Determining the required height of the tower crane hook lift:

$$Н_{кр}^{тр} = Н_о + Н_{запаса} + Н_{элем} + Н_{строп} \textbf{ (м)} \quad (31)$$

Where

$Н_о$- Where the mounted item is installed (43,45 м)

$Н_{запаса}$- Reserve by height (0.5 м)

$Н_{элем}$- The height of the element in the mounted position (3,7 м)

$Н_{строп}$- Sling height (2,5 м)

$$Н_{кр}^{тр} = 43{,}45 + 0{,}5 + 3{,}7 + 2{,}5 = 50{,}15 \text{ м}$$

2) Determining the required departure of the tower crane arrow:

$$l_{стр}^{тр} = в + \frac{а}{2} + с \text{ (м)} \quad (32)$$

Where B- The width of the building object

a- The width of the sub-screen path (4,5-6 м)

c- Distance from the edge of the building to the turning point of the crane (2 м)

$$l_{стр}^{тр} = 2 + \frac{5}{2} + 14 = 18{,}5 \text{ м}$$

3) Determining the required cargo moment.

$$M_{тр}^{тр} = (Q_{эл} + Q_{стр}) * l_{стр}^{тр} \text{ (т*м)} \quad (33)$$

Где $Q_{эл}$ - Mass tap tubia (5,9 тонн)

$Q_{стр}$- Mass of the sling (0.1 т)

$l_{стр}^{тр}$ - The required departure of the arrow

$$M_{тр}^{тр} = (5,9 + 0,1) * 18,5 = 111 \text{ т*м}$$

Choosing a mobile crane: КБ-408

Lifting capacity: 8 т

Cargo moment: 120 тсм

Cargo capacity at maximum departure: 3 т

Sortie: 25 м

Height of the free-standing crane: 28 м

Speed: 18 м/мин

Badya crane:

table 12

Product name	Volume, l	Cargo lift, kg	Length, mm	Width, mm	Height, mm	mass
Psu -2	2000	6000	3600	1000	2200	880

4) The actual duration of the badia is determined by the formula:

$$T = \frac{V}{П_с} \quad (34)$$

$$T = \frac{4606,78}{49,5} = 93 \text{ Days.}$$

Where

V- The total required amount of concrete for the entire building.

$П_с$- Replacement operating performance of the mechanism of the m-3/shift mechanism

5) The shift performance of the tubia to the supply of concrete mixture is calculated by the formula:

$$П_с = \frac{60 * V * T * K_в}{T_ц} \text{ м}^3/\text{смен} \quad (35)$$

$$П_с = \frac{60 * 2 * 8 * 0,8}{15,5} = 49,5$$

Where

V - Volume of the concrete mixture loaded into the tap tub.

T - duration of shift (8 hours)

$K_в$- Time-use of the crane:

For a crane with no power supports - 0.82

For a crane with electric drive with takeaway supports - 0.8

For an internal combustion engine crane without takeaway supports - 0.78

For an internal combustion engine with takeaway supports -0.76

$T_ц$- Running cycle duration

6. The length of the work cycle is calculated by the formula:

$$T_ц = t_р + t_с + 2t_п + t_у \text{ (мин)} \quad (36)$$

Where

$t_р$- Time to unload the concrete mixture from the auto-concrete truck in the tuby (0.5-1.5 min)

$t_с$ - Sling and slinging time (1-1.5 min)

$t_п$- Time of supplying the tap-bag with concrete mixture in the block of concrete (min) (Depending on the pitch and speed of lifting, as well as the distance and speed of horizontal movement)

$t_у$- Time to lay the concrete mixture in the design (1-3 minutes)

$$T_ц = 1{,}5 + 3 + 2 * 4 + 3 = 15{,}5 \text{ min}$$

3.2.5 Choosing a mechanism to serve the concrete mixture

Concrete pumps are used in general construction work related to concrete, filling with commercial concrete all kinds of formwork during the construction of walls, floors, foundations, various tunnels. Used in combination with equipment for the production, storage or supply of finished concrete. Pneumonagnestants are aggregates used to make a concrete mixture and serve it at the same time. This type of pump has a built-in compressor with an electric motor or diesel installation.

1) concrete pump:

Model C296-A

5) The actual duration of the concrete pump is determined by the formula:

$$T = \frac{V}{П_с} \quad (37)$$

$$T = \frac{4606.78}{36.1} = 127.6 \text{ Days}$$

Where

V- The total required amount of concrete for the entire building.

$П_с$- Replacement operating performance of the mechanism of the m-3/shift mechanism

$$П_э = 60 * T\left(\frac{П * d^2}{4}\right) * l * \vartheta * К_{вых} \text{ м}^3/\text{ Shifts} \quad (38)$$

Where

T- 8 hours of work per shift.

П=3.14

d- The diameter of the working cylinder

l- The length of the piston

ϑ- Number of 2 piston-mine moves (pumping speed)

$К_{вых}$- Coefficient characterizing the ratio of the volume of the concrete mixture served for 1 move to the working volume of the amplifier (0.8-0.9)

$$П_э = 60 * 8\left(\frac{3{,}14 * 0{,}2^2}{4}\right) * 1{,}5 * 2 * 0{,}8 = 36.1$$

Airmannet ПН-500-К

The actual duration of the pneumonneter is determined by the formula:

$$T = \frac{V}{П_с} \quad (39)$$

$T = \frac{12360{,}24}{52{,}5} = 235$ (If you run in parallel, then 118 days)

Where

V- The total required amount of concrete for the entire building.

$П_с$- Replacement operating performance of the mechanism of the m-3/shift mechanism

$$П_э = \frac{3600 * T * V * К}{t_ц} м^3/смен \quad (40)$$

Where

$t_ц$- Cycle time, sec

V- Volume of pneumonneter$м^3$

$$t_ц = t_з + \frac{L}{V} \quad (41)$$

$t_з$- Time to load the supercharger opening and close the shutter.

L- The range of transporting the concrete mixture

V- The speed of movement of the concrete mixture without solution on the concrete water m/sec (With horizontal arrangement of concrete grower speed is from 0.5-0.6 m/s, at vertical - 0.25-0.4 м/с) (0.45)

$t_ц = 15 + \frac{48{,}3}{0{,}45} = 123{,}3$ Sec

$П_э = \frac{3600 * 8 * 0{,}25 * 0{,}9}{123{,}3} = 52{,}5$ $м^3$/ Shifts

Number of auto-concrete trucks from the condition of uninterrupted delivery to the facility

$$N = \frac{К_г * П_э}{П_а} \quad (42)$$

Where

$К_г$- coefficient taking into account the reserve of performance of mechanisms to the leading machines (0.85-0.9)

$П_{вых}$- Autobeton productivity

$$П_а = \frac{60 * V * T * K}{t_ц} \quad (43)$$

$$П_э = \frac{k * L * n}{100} = \frac{0.72 * 800 * 18}{100} = 103.7$$

Where

L - Liter of concrete mixer in l;

n — the number of kneads per hour

K - The ratio of concrete output from 0.65 to 0.72 (usually taken 0.67).

$T_ц$- Cycle duration

$$t_ц = t_з + \frac{2 * L * 60}{v_{ср}} \quad (44)$$

$t3 -$ Time of loading of concrete truck at the plant

$$t_ц = 5 + \frac{2 * 21 * 60}{38} = 75$$

$$П_а = \frac{60 * 12 * 8 * 0{,}92}{75} = 69$$

$\text{Number of auto} - \text{concretes}$

$$N = \frac{0{,}9 * 103{,}7}{69} = 1{,}45 \approx 2\text{шт.}$$

Conclusion: As a result of the calculations made, the most economical and profitable is - the tap of the tub

3.3 Construction master plan

The basic data necessary for the development of the construction master plan are: the General Plan of the territory with existing and under construction buildings, as well as underground communication networks; A calendar plan for the production of work with a schedule of labor needs; Necessary construction machines and mechanisms; The necessary amount of need for general building design elements, products and bulk and non-bulk resources; The number, list and dimensions of structures and buildings, as well as temporary warehouses on the construction site;

Standard information on the development of construction master plans. In general, construction masterplans can be dredged at various stages of construction. The explanatory notes show the function of the construction master plan, its purpose and for what period (e.g. installation of foundation blocks, installation of roofing elements or installation of structures in general) was developed. You want to explain the requirements that are enshrined in the base of its implementation. After that, we give

the necessary calculations and give an explanatory note. In the explanatory notes you need to show drawings of installation of structural elements, materials and products, show the design place, its geometric indicators and methods of installation.

3.3.1 Calculating temporary electricity supply

Electricity is the main source of energy used in the construction of buildings and structures. Power electricity is used to power machines and machinery, electrical welding and other technological needs. Electricity is provided from existing systems or inventory of mobile power plants. Therefore, the issue of electricity supply needs to be solved in the development of the diploma works. Maximum electricity consumption is set on the basis of a calendar or network schedule of work production. The power of the outdoor lighting network is found according to the formula:

$$W_{H.O} = K_c * \sum P_{O.H.} \quad (45)$$

$$W_{H.O} = 1*13,69 = 13,69 \text{ кВт}$$

Power network for internal lighting:

$$W_{H.O} = 0,8 * 2,4 = 2 \text{ кВт}$$

Total power capacity for lighting:

$$W_{общ} = 13,69 + 2 = 15,69 \text{ кВт} .$$

4. Occupational safety and safety

4.1 General requirements

5.1.1 The organization and performance of work in the construction industry, construction materials industry and construction industry should be carried out in compliance with the requirements of the "Labor Code of the Republic of Kazakhstan" as well as other regulations containing state regulations on occupational health and safety":

1) building codes, codes of rules for design and construction;

2) Inter-industry and industry rules and standard work safety and safety guidelines approved in due course;

3) State standards of the system of work safety standards operating in the Republic of Kazakhstan;

4) Requirements and rules of safety and safety, rules of device and safe operation, safety instructions;

State health and epidemiological standards, hygiene regulations, sanitary regulations and regulations in force in the Republic of Kazakhstan.

5.1.2 Participants in the construction of facilities (customers, designers, contractors, suppliers, as well as manufacturers of building materials and structures, manufacturers of construction equipment and production equipment) are liable for violations of the requirements of the regulations specified in article 5.1.1. And p.5.1.2.

5.1.3 Responsibility for compliance with safety and health requirements in the operation of cars, manual electric and pneumatic machines, and technological equipment is assigned:

- for the technical condition of construction machinery, machinery, production equipment, tools, technological equipment, including means of protection - on the organization on which they are on balance, and when they are transferred to temporary use (rent) - to the organization (person), defined by the contract;

- To ensure that the work is safely produced by organizations that do the work.

The general contractor or landlord is obliged to perform work on construction sites with the involvement of subcontractors or tenants:

- Develop with them measures to ensure a safe working environment, mandatory for all organizations and persons involved in construction;

- To ensure that the planned activities are carried out and that subcontractors and tenants coordinate their safety activities at their assigned sites.

5.1.4 In the production of work on the site and works sites involving contractors (including citizens engaged in self-employment), the person carrying out the construction is obliged to:

5.1.5 - Develop a joint action plan with the contractors involved to ensure a safe working environment that is mandatory for all organizations and persons involved in construction;

- ensure that planned activities are carried out and that subcontractors and tenants coordinate in terms of health and safety activities at their assigned sites;

- When contracting contracts provide for mutual responsibility of the parties to implement measures to ensure safe working conditions on the site and work sites.

Before the start of construction and installation work on the territory of the organization, the customer and the general contractor with the participation of subcontractors and the administration of the current organization are obliged to issue an act-admission on the established form. The heads of construction organizations and the operating organization are responsible for the implementation of the measures stipulated by the act-admission.

Before starting work in conditions of production risk, it is necessary to identify dangerous areas for people, within which dangerous production factors related to or not related to the nature of the work are constantly active or may operate.

4.2 Organization of production areas, work sites and jobs

Production areas (construction and industrial sites with construction sites, production and sanitary facilities and facilities), work sites and jobs should be prepared to ensure safe production.

Preparatory activities must be completed before the work begins. Compliance with the requirements of occupational health and safety of production areas, buildings and facilities, works and workplaces of newly built or reconstructed industrial facilities is determined when they are put into operation.

The completion of preparatory work at the construction site should be adopted under the act on the implementation of work safety measures. The production equipment, appliances and tools used to organize the workplace must meet the safety requirements of the workplace and СанПиН 1.01.002-94.

Manufacturing areas, work sites and workplaces must be provided with the necessary collective or individual protection of workers, primary firefighting equipment, as well as communications, alarms and other technical means to ensure safe working conditions in accordance with the requirements of the existingНПА.

Places of temporary or permanent location of workers (sanitary premises, places of rest and passages for people), when the construction and maintenance of industrial areas, areas of work, should be located outside the danger zones.

Dangerous zones must be marked with safety signs and labels of the established form.

Moving goods over the ceilings, when in dangerous zones enter the production, residential or office premises where people may be, is not allowed.

Admission to the industrial territory of outsiders, as well as workers in a drunken state or not employed in the workplace in the territory, is prohibited.

While on the site of a construction or production site, in production and household premises, on work sites and workplaces, workers, as well as representatives of other organizations are obliged to comply with the rules of internal labor regulations related to the health and safety of the organization.

Geographically separate premises, sites, work sites, jobs should be provided with telephone or radio communication.

Workers, managers, specialists and employees should be provided with special clothing, special equipment and other personal protective equipment, according to the Rules of providing workers with special clothing, special shoes and other means of individual and collective protection, sanitary facilities and devices at the expense of the employer.

5. Economic section.

5.1 Calculating the estimated cost of construction

The estimated cost of construction is the necessary material means, which is determined on the basis of project materials and regulations in accordance with the legislation of the Republic of Kazakhstan.

The basis of the construction is the estimated cost required to determine the indicator of investment funds for construction, to form a price for construction, serves as a guide for customers in the procurement and conclusion of the contract, payments for works performed in a contract under the current legislation of the Republic of Kazakhstan.

The cost of production in the project stage is determined by the enlarged resource estimates.

This site shows the capital for the construction. The composition of the above consists of: the construction cost, having in the PIR, the price of the cost of the deposit, the price of the rent, etc.

Capital investments are determined by compiling a consolidated estimate.

In the estimated summary calculation of construction, the funds are distributed to the following chapters:

Section 1. The cost of preparatory work on the territory.

Section 2. The main elements of the object.

Section 3. Elements of a service and support nature.

Section 4. Elements of the energy economy.

Section 5. Transport and communications facilities.

Section 6. Outdoor networks and facilities of water supply, sewerage, heating and gas supply.

Section 7. Landscaping and landscaping of the territory.

Section 8. Temporary buildings and structures.

Section 9. Costs are secondary.

Section 10. The company's management.

Section 11. Staff training.

Section 12. Exploration and design work.

The cost of construction of buildings and facilities of the main and additional purpose is calculated on the basis of CH PK 8.02-01-2002. The stage of calculating the cost of construction.

The cost of construction of the estimated structures and buildings of the main and secondary nature is found with the help of the general estimates in the prices of 2019.

For housing and civil construction, Chapter 3 includes the estimated cost of such facilities as: economic buildings; walk-through, greenhouses in hospital and scientific towns; garbage collectors, etc.; Cultural and domestic buildings designed to serve workers and located within the territory reserved for the construction of enterprises; conservation work, work on the protection of cultural monuments, etc.

5.2 Calculating investment costs for construction

Investment costs for the construction include all costs of the customer on the project and are compiled in the form of a consolidated estimate of the cost of construction. The summary estimate of the cost of construction additionally includes the following cost items:

- The cost of the engineer's services;
- Training of operational staff;
- The cost of design and exploration;
- The cost of examination of project-estimated documentation;

The cost of design and exploration is determined according to the general provisions for determining the cost of design work for construction in РК (РДС РК 08.02-03-2002 taking into account the changes from 02.7.2004 г.)

5.3 Technical and economic indicators of the project

Borrowing is expected to be used for the implementation of the investment project. But at the same time, according to the legislation of the Republic of Kazakhstan, 15% of the total amount of investments should be financed with their own funds. The required capital investment for the construction of the facility is 684.194 million tinge. At the same time, its own funds amount to 102.6 million tenge. Design and exploration work, as well as intra-site preparatory work are carried out at their own expense. The full estimated cost of underground works (local, consolidated, object) of the object is attached in Annex B.

CONCLUSION

On the basis of the tasks, a diploma project on the theme of "Youth Center" in Astana was launched. After analyzing the projected building, I made several conclusions. First, the main purpose of a modern social housing is to provide elderly citizens with living quarters and provide them with social, medical, and other services and the construction of a modern social housing house would make life easier for many citizens of the country, while living in the city of Astana. The advantage of a Youth Center is that the projected building is located in the center of the city and has an additional maintenance condition. Secondly, the building is located in clay soil, which is not dangerous in construction in seismic areas. Thirdly, the construction of the sanatorium will last less than a year, which will entail additional investments for the finished business platform. This project is designed for the permanent residence of elderly citizens in the city of Astana.

The projected object is planned to be located in Nur-Sultan at the intersection of Turan Avenue and Syghanaq streets. This youth center with a sports bias, on the ground floor there are: a gym (for training and various sports events), with dressing rooms and showers, a coffee shop, two conference halls (small and large for important meetings or presentations), dressing room, as well as various administrative premises and retail outlets. On the second floor there is a fitness center, table tennis area and retail outlets. It is planned to place an underground parking at an elevation of -2000, the entrance to which is from the other side.

LIST OF USED LITERATURE

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8 СП РК 3.01-101-2013 «town planning. Planning and development of urban and rural settlements».

9 СП РК 2.04-107-2013 «Construction thermal engineering».

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14 СН РК 2.04-01-2011 «Natural and artificial lighting».

15 НТП РК 02-01-1.4-2011 «Designing prefabricated, prefabricated monolithic and monolithic reinforced concrete structures».

16 СН РК 2.02-01-2014 «Fire safety of buildings and structures».

17 СН РК 2.01-01-2013 «Protecting construction structures from corrosion».

18 НТП РК 02-01.2-2012 «Designing reinforced concrete structures with fire resistance in mind».

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20 НТП РК 01-01-3.1(4.1)-2012 «Loads and impacts on buildings. Snow loads. Wind impacts».

21 Lyoshenko T.A. Methodical instructions for the implementation of the course project - Tikhoretsky: ФГБОУ ВПО РГУПС, 2016 – 52 с.

22 СН РК 1.03-05-2011 «Occupational safety and safety».

Appendix A:

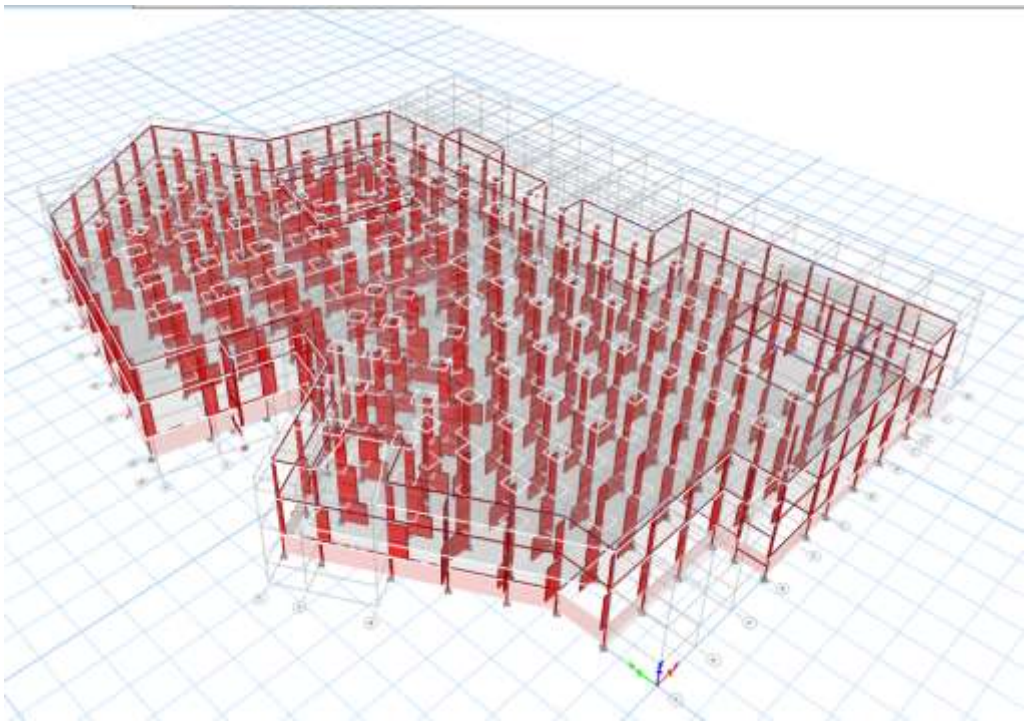


Figure 12 – Axial force diagram (dead load)

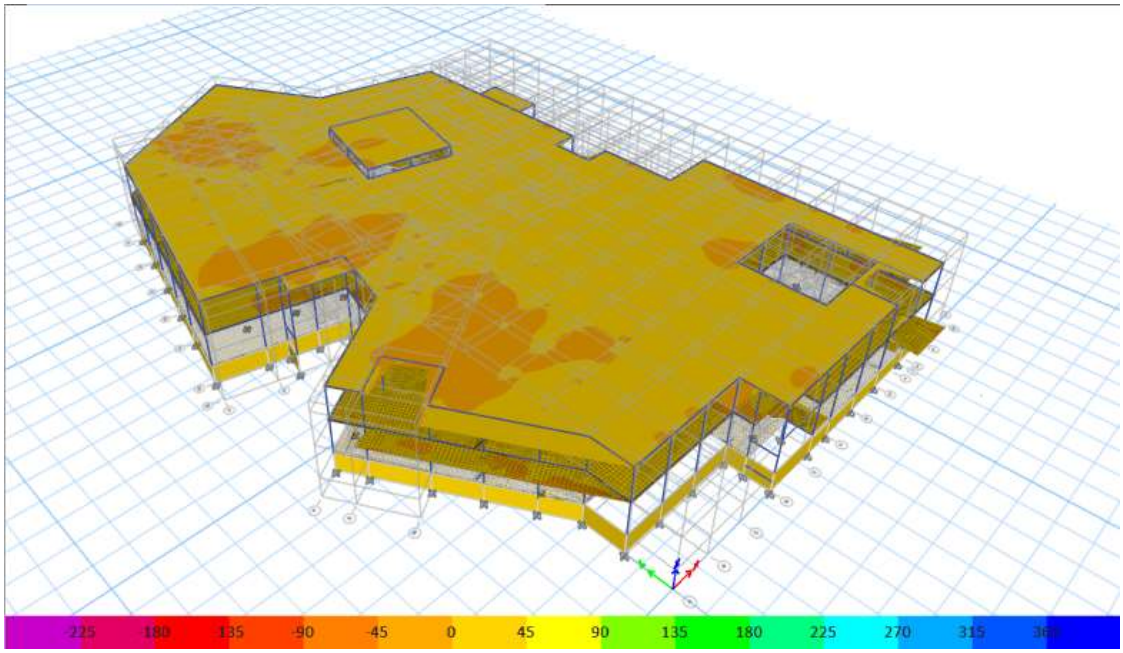


Figure 13 – Resultant Fmax (wind load)

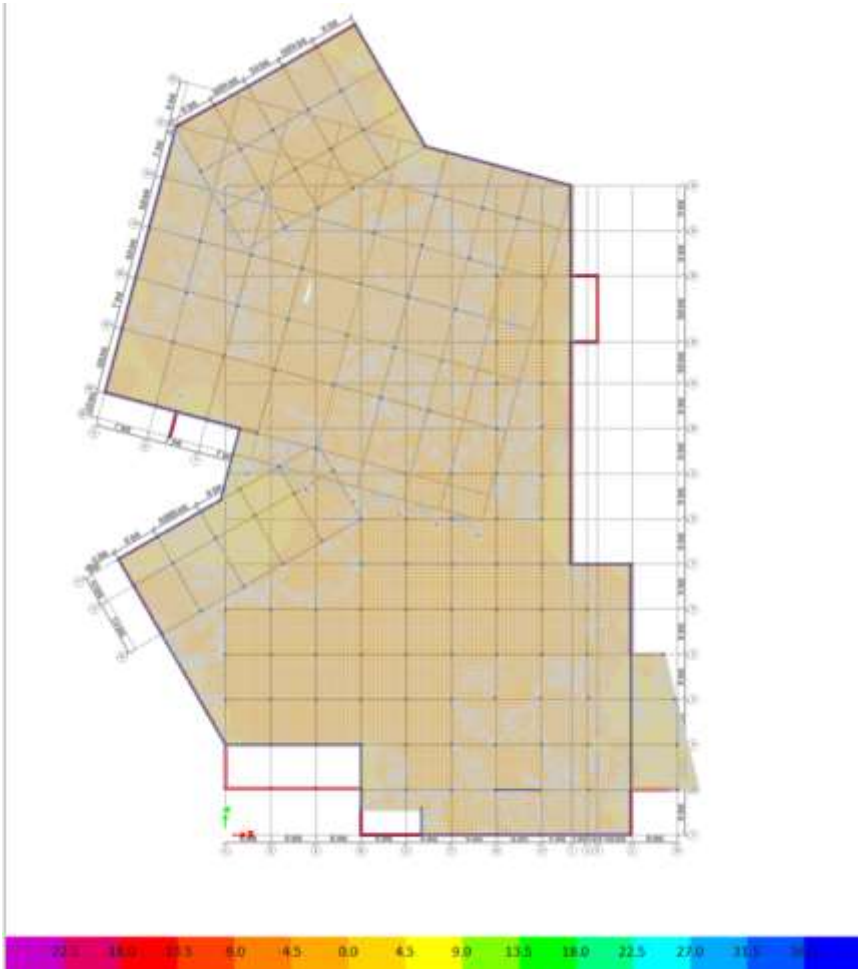


Figure 14 – Settlement

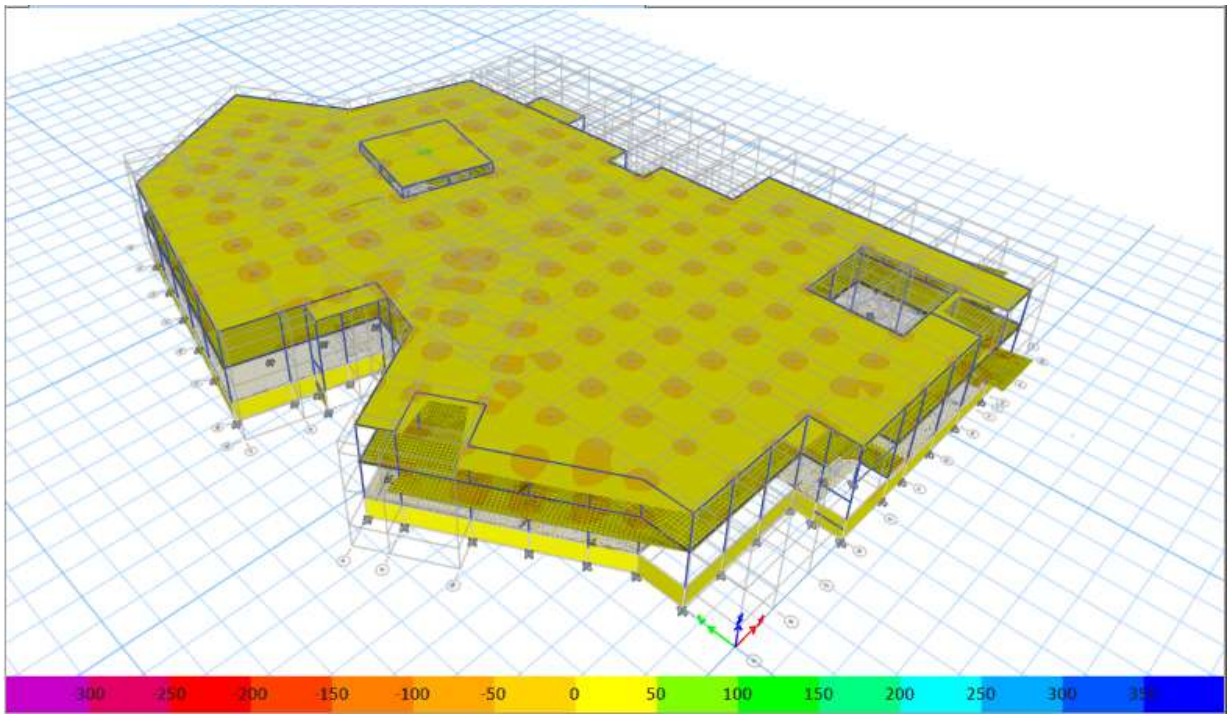


Figure 15 – Resultant Mmax diagram (dead load)

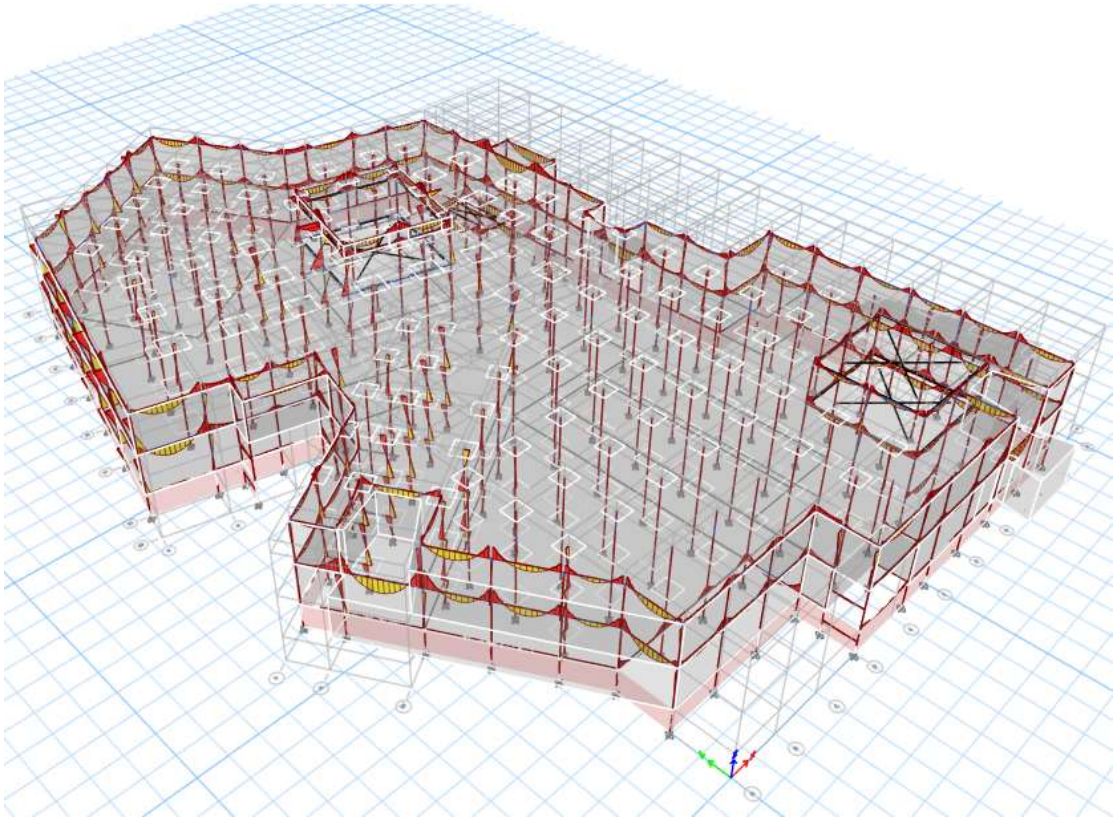


Figure 16 – Moment 3-3 diagram (super dead load)

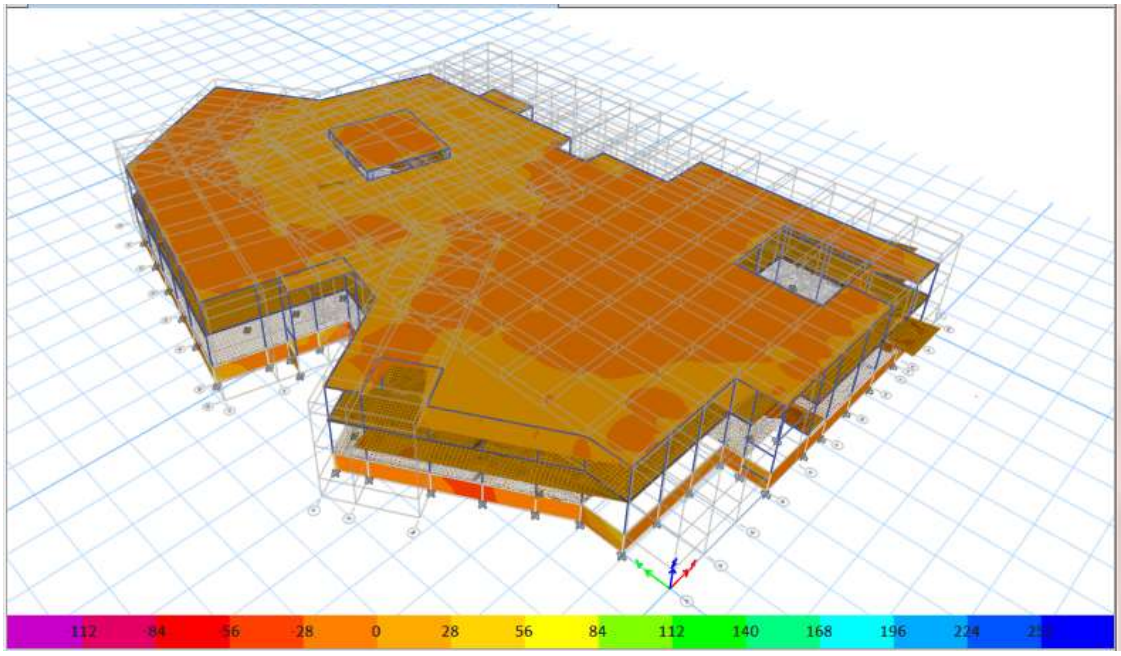


Figure 17 – Fmax diagram (dead load)

APPENDIX
B

Local Estimate No.
Local estimate calculation

on the

Base:

Event	esential	630453.256	thousand tenge
standard labor	intesity	91122.92	person-h
Estmated wage		27002.940	thousand tenge

Compiled in 2001

N p / p	Code and item number of the standard	Name of works and costs, unit of measure	Number	Unit cost, tenge		Total cost, tenge		Overheads	Labor costs, man-hours, construction workers	
				Total	Expl. machines	Total	Expl. machines			
				Salary of construction workers	incl. Salary of drivers	Salary of construction workers	incl. Salary of drivers	tenge	workers serving machines	
								%	for one.	Total
one	**2**	**3**	**four**	**five**	**6**	**7**	**eight**	**nine**	**10**	**eleven**
		Section 1 Earthwork								
one	**E11-01-03-072-02**	**Layout of areas with bulldozers up to 132 (up to 180) kW (hp)**	**4,936.75**	**7.38**	**7.38**	**36,433.22**	**36,433.22**	**2,623.19**	**-**	**-**
		m2		**-**	**0.74**	**-**	**3,643.32**	**72.00**	**0.41**	**2,024.07**
2	**E11-01-01-001-04**	**Development of soil of the 6th group into the dump with single-bucket dragline excavators, with a bucket with a capacity of 10 m3, electric walking when working on hydropower construction**	**4,291.17**	**205.32**	**204.18**	**881,063.02**	**876,171.09**	**22,121.84**	**1.36**	**5,835.99**
		m3		**3.64**	**3.52**	**15,619.86**	**15,104.92**	**72.00**	**0.94**	**4,033.70**
3	**E11-010104-0603**	**Backfilling of trenches and pits with bulldozers with a power of 303 kW (410 hp), when moving soil of the 2nd group up to 5 m**	**455.70**	**56.43**	**56.43**	**25,715.15**	**25,715.15**	**1,371.47**	**-**	**-**
		m3		**-**	**4.18**	**-**	**1,904.83**	**72.00**	**0.66**	**300.76**
		TOTAL SECTION 1 DIRECT COSTS	**Tenge**			**943,211.39**	**938,319.46**			**5,835.99**

			Tenge			**15,619.86**	**20,653.07**			**6,358.53**
	The cost of general construction works -		Tenge			**943,211.39**				
	Materials -		Tenge							
	Total salary -		Tenge			**36,272.92**				
	The cost of materials and structures -		Tenge							
		Overhead -	Tenge					**26,116.51**		
		Normative labor intensity in N.R. -	person-h							**609.73**
		Estimated wages in N.R. -	Tenge			**3,917.48**				
		Irregular and unforeseen costs -	Tenge			**58,159.67**				
	TOTAL, The cost of general construction works -		Tenge			**1,027,487.57**				
		Standard labor intensity -	person-h							**12,194.52**
		Estimated salary -	Tenge			**40,190.40**				
		TOTAL SECTION 1	Tenge			**1,027,487.57**				
		Standard labor intensity -	person-h							**12,194.52**
		Estimated salary -	Tenge			**40,190.40**				

Section 2 Foundation

four	**E11-060101-0101**	**Concrete preparation device, concrete class B7.5**	**91.14**	**7,006.11**	**1,346.00**	**638,536.87**	**122,674.44**	**57,870.40**	**1.43**	**130.33**
		m3		**685.20**	**12.56**	**62,449.13**	**1,144.72**	**91.00**	**0.19**	**17.32**
five	**E11-060101-0113**	**Construction of concrete strip foundations, concrete class B15**	**5,559.54**	**4,480.31**	**3,408.30**	**24,908,462.66**	**18,948,580.18**	**1,254,525.21**	**4.17**	**23,183.28**
		m3		**220.66**	**27.31**	**1,226,768.10**	**151,831.04**	**91.00**	**0.17**	**945.12**
6	**E11-080101-0307**	**Side coating bituminous waterproofing in 2 layers on the leveled surface of rubble masonry brick, concrete walls, foundations**	**24,060.900**	**365.30**	**27.01**	**8,789,446.77**	**649,884.91**	**482,216.53**	**0.19**	**4,571.57**
		m2		**21.20**	**0.35**	**510,091.08**	**8,421.32**	**93.00**	**0.00**	**26.29**
7	**S121-050301-3202**	**Reinforcement blanks not assembled into frames and meshes: steel of periodic profile of class A-III, d 14 mm**	**0.000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
eight	**S121-050301-3001**	**Reinforcement blanks not assembled into frames and meshes: smooth steel of class A-I, d 6 mm**	**0.000**	**65,745.09**	**-**	**-**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
		TOTAL SECTION 2 DIRECT COSTS	**Tenge**			**34,336,446.29**	**19,721,139.53**			**27,885.18**
			Tenge			**1,799,308.30**	**161,397.07**			**988.73**
	The cost of general construction works -		Tenge			**34,336,446.29**				
	Materials -		Tenge			**-**				
	Total salary -		Tenge			**1,960,705.38**				
		Overhead -	Tenge					**1,794,612.14**		
		Normative labor intensity in N.R. -	person-h							**1,443.70**
		Estimated wages in N.R. -	Tenge			**269,191.82**				
		Irregular and unforeseen costs -	Tenge			**2,167,863.51**				

	TOTAL, The cost of general construction works -		Tenge			**38,298,921.94**				
		Standard labor intensity -	person-h							**28,873.91**
		Estimated salary -	Tenge			**2,229,897.20**				
		TOTAL SECTION 2	Tenge			**38,298,921.94**				
		Standard labor intensity -	person-h							**28,873.91**
		Estimated salary -	Tenge			**2,229,897.20**				
		Section 3 column								
nine	**E11-060501-0201**	**column average in building**	**113.925**	**23,012.14**	**13,416.07**	**2,621,658.13**	**1,528,425.77**	**924,275.12**	**13.55**	**1,543.68**
		m3		**7,436.23**	**1,479.17**	**847,172.50**	**168,514.44**	**91.00**	**5.07**	**577.60**
10	**S121-050301-3203**	**reinfoecment class not assembled to the building class A-III, d 32-40 mm**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
eleven	**S121-050301-3202**	**Reinforcing blanks, not assembled into frames and meshes: periodic profile steel of class A-III, d 20-22 mm**	**3.7975**	**67,412.88**	**-**	**256,000.42**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
12	**S121-050301-3001**	**Reinforcing blanks, not assembled into frames and meshes: smooth steel of class A-I, d 10mm**	**1.899**	**65,745.09**	**-**	**124,830.20**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
		Total direct cost by section 3	**te**			**3,002,488.76**	**1,528,425.77**			**1,543.68**
			Tenge			**847,172.50**	**168,514.44**			**577.60**
	The cost of general construction works -		Tenge			**2,621,658.13**				
	Materials -		Tenge			**380,830.63**				
	Total salary -		Tenge			**1,015,686.95**				
		Overhead -	Tenge					**924,275.12**		
		Normative labor intensity in N.R. -	person-h							**106.06**
		Estimated wages in N.R. -	Tenge			**138,641.27**				
		Irregular and unforeseen costs -	Tenge			**235,605.83**				
	TOTAL, The cost of general construction works -		Tenge			**4,162,369.71**				
		Standard labor intensity -	person-h							**2,121.28**
		Estimated salary -	Tenge			**1,154,328.21**				
		TOTAL SECTION 3	Tenge			**4,162,369.71**				
		Standard labor intensity -	person-h							**2,121.28**
		Estimated salary -	Tenge			**1,154,328.21**				
		Section 4 wall								
13	**E11-080201-0103**	**Laying of simple exterior brick walls with a floor height of up to 4 m**	**3,690.48**	**4,875.72**	**812.62**	**17,993,747.15**	**2,998,957.86**	**6,956,724.41**	**4.90**	**18,083.35**
		m3		**1,820.44**	**206.49**	**6,718,286.80**	**762,062.02**	**93.00**	**0.41**	**1,513.10**
fourteen	**E11-080201-0107**	**Laying of internal brick walls with a floor height of**	**922.79**	**3,745.55**	**259.44**	**3,456,364.40**	**239,409.16**	**1,503,735.51**	**4.25**	**3,921.87**

		up to 4 m								
		m3		**1,556.64**	**195.56**	**1,436,454.94**	**180,464.96**	**93.00**	**0.39**	**359.89**
fifteen	**E11-080401-0301**	**Laying of partitions reinforced with a thickness of 120 mm at a floor height of up to 4 m**	**15,297.00**	**1,248.11**	**181.80**	**19,092,338.67**	**2,780,994.60**	**9,506,238.05**	**1.39**	**21,262.83**
		m2		**637.92**	**30.30**	**9,758,262.24**	**463,499.10**	**93.00**	**0.03**	**458.91**
		TOTAL SECTION 4 DIRECT COSTS	**Tenge**			**40,542,450.22**	**6,019,361.61**			**43,268.05**
			Tenge			**17,913,003.98**	**1,406,026.08**			**2,331.90**
	The cost of general construction works -		Tenge			**40,542,450.22**				
	Materials -		Tenge							
	Total salary -		Tenge			**19,319,030.07**				
		Overhead -	Tenge					**17,966,697.96**		
		Normative labor intensity in N.R. -	person-h							**2,280.00**
		Estimated wages in N.R. -	Tenge			**2,695,004.69**				
		Irregular and unforeseen costs -	Tenge			**3,510,548.89**				
	TOTAL, The cost of general construction works -		Tenge			**62,019,697.07**				
		Standard labor intensity -	person-h							**45,599.94**
		Estimated salary -	Tenge			**22,014,034.76**				
		TOTAL SECTION 4	Tenge			**62,019,697.07**				
		Standard labor intensity -	person-h							**45,599.94**
		Estimated salary -	Tenge			**22,014,034.76**				
		Section 5. overlop								
sixteen	**E11-060801-0105**	**Installation of non-girder slabs with a thickness of up to 200 mm at a height of more than 6 m from the support area, concrete class B35**	**189.88**	**23,999.10**	**1,534.00**	**4,556,829.11**	**291,268.25**	**1,155,803.51**	**11.05**	**2,098.12**
		m3		**6,568.91**	**120.30**	**1,247,271.79**	**22,841.96**	**91.00**	**0.36**	**68.36**
17	**S121-050301-3202**	**Reinforcement blanks not assembled into frames and meshes: steel of periodic profile of class A-III, d 16 mm**	**37.98**	**67,412.88**	**-**	**2,560,004.24**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
eighteen	**S121-050301-3001**	**Reinforcement blanks not assembled into frames and meshes: smooth steel of class A-I, d 6 mm**	**2.42**	**65,745.09**	**-**	**158,878.93**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
		TOTAL SECTION 5 DIRECT COSTS	**Tenge**			**7,275,712.28**	**291,268.25**			**2,098.12**
			Tenge			**1,247,271.79**	**22,841.96**			**68.36**
	The cost of general construction works -		Tenge			**4,556,829.11**				
	Materials -		Tenge			**2,718,883.17**				
	Total salary -		Tenge			**1,270,113.75**				
		Overhead -	Tenge					**1,155,803.51**		
		Normative labor intensity in N.R. -	person-h							**108.32**
		Estimated wages in N.R. -	Tenge			**173,370.53**				

		Irregular and unforeseen costs -	Tenge			**505,890.95**				
	TOTAL, The cost of general construction works -		Tenge			**8,937,406.74**				
		Standard labor intensity -	person-h							**2,166.47**
		Estimated salary -	Tenge			**1,443,484.28**				
		TOTAL SECTION 5	Tenge			**8,937,406.74**				
		Standard labor intensity -	person-h							**2,166.47**
		Estimated salary -	Tenge			**1,443,484.28**				
		Section 6. Roof								
nineteen	**E11-120101-0701**	**Roofing made of corrugated asbestos-cement sheets, ordinary profile on a wooden lathing with its device**	**331.42**	**749.54**	**47.91**	**248,411.05**	**15,878.24**	**79,812.15**	**0.42**	**139.20**
		m2		**252.80**	**8.96**	**83,782.47**	**2,969.86**	**92.00**	**0.02**	**6.63**
twenty	**E11-120101-0102**	**Installation of pitched roofs from three layers of roofing roll materials on bitumen mastic with a protective layer of gravel on bitumen mastic**	**87.34**	**464.44**	**41.39**	**40,565.35**	**3,615.04**	**18,012.44**	**0.23**	**20.09**
		m2		**216.93**	**7.23**	**18,947.21**	**631.53**	**92.00**	**0.01**	**0.87**
		TOTAL SECTION 6 DIRECT COSTS	**Tenge**			**288,976.40**	**19,493.27**			**159.28**
			Tenge			**102,729.68**	**3,601.40**			**7.50**
	The cost of general construction works -		Tenge			**288,976.40**				
	Materials -		Tenge							
	Total salary -		Tenge			**106,331.07**				
		Overhead -	Tenge					**97,824.59**		
		Normative labor intensity in N.R. -	person-h							**8.34**
		Estimated wages in N.R. -	Tenge			**14,673.69**				
		Irregular and unforeseen costs -	Tenge			**23,208.06**				
	TOTAL, The cost of general construction works -		Tenge			**410,009.05**				
		Standard labor intensity -	person-h							**166.79**
		Estimated salary -	Tenge			**121,004.76**				
		TOTAL SECTION 6	Tenge			**410,009.05**				
		Standard labor intensity -	person-h							**166.79**
		Estimated salary -	Tenge			**121,004.76**				
		TOTAL DIRECT COSTS BY ESTIMATE:	**Tenge**			**86,389,285.34**	**28,518,007.90**			**80,790.31**
			Tenge			**21,925,106.11**	**1,783,034.02**			**10,332.61**
	The cost of general construction works -		Tenge			**83,289,571.55**				
	Materials -		Tenge			**3,099,713.79**				
	Total salary -		Tenge			**23,708,140.13**				
		Overhead -	Tenge					**21,965,329.83**		
		Normative labor intensity in N.R. -	person-h							**4,556.15**
		Estimated wages in N.R. -	Tenge			**3,294,799.47**				
		Irregular and unforeseen costs -	Tenge			**6,501,276.91**				

	TOTAL, The cost of general construction works -		Tenge			**114,855,892.07**				
		Standard labor intensity -	person-h							**91,122.92**
		Estimated salary -	Tenge			**27,002,939.61**				
630		TOTAL BY AN ESTIMATE:	Tenge			**630,453,256.02**				
		Standard labor intensity -	person-h							**91,122.92**
		Estimated salary -	Tenge			**27,002,939.61**				
	Recalculation of totals into prices as of 04/26/2020									
	Total direct costs					**86,389,285.34**				
	Overheads					**21,965,329.83**				
	Irregular and unforeseen costs					**6,501,276.91**				
	TOTAL in prices as of 01.01.2001					**630,453,256.02**				
	Total with the cost of seniority					**636,757,788.58**				
	Total with the cost of additional. leave					**639,279,601.60**				
	Total in current prices as of 03.24.					**2,186,336,237.49**				
	Total with taxes, fees and obligations. payments					**2,230,062,962.24**				
	Value Added Tax (VAT)		**12%**			**267,607,555.47**				
	Total with value added tax (VAT)					**2,497,670,517.70**				

Continuation of appendix B

Estimated calculation of the cost of construction in the amount of 19s 7k **365.81** thousand tenge

including refundable amounts: 15s7k **0.36** thousand tenge

value added tax 18s7k **18.04** thousand tenge

ESTIMATE CALCULATION OF THE COST OF CONSTRUCTION

Compiled in 2001

P / p No.	No. of estimates and calculations	Name of chapters, objects, works and costs	Estimated cost, thousand tenge			Total, thousand tenge
			construction and installation works	equipment, furniture and inventory	other costs	
one	2	3	four	five	6	7
one	one	Civil works	63.05	-	-	63.05
2		**Total = 1 line**	63.05	-	-	**63.05**
3		Temporary buildings and structures 1.1% * 2 line 7 column	0.69	-	-	0.69
four		Return of materials from temporary buildings and structures 15% * 3s7k	0.10	-	-	0.10
five		**Total = 3 lines**	0.69	-	**-**	**0.69**
6		**Total 2s + 5s**	63.74	-	**-**	**63.74**
7		Additional costs during the performance of work in the winter 1.2% * 6s7k	0.76	-	**-**	0.76
eight		Seniority costs 1% * 6s7k			0.64	0.64
nine		Costs for additional vacations 0.4% * 6s7k			0.25	0.25
10		**Total 7s + 8s + 9s**	**0.76**		**0.89**	**1.66**
eleven		**Total 6s + 10s**	64.50		0.89	65.40
12		Including refundable amounts = 4s	0.10		-	0.10
13		**Total according to the estimated calculation in base prices 2001 = 11s**	64.50		0.89	65.40
fourteen		Total estimated at current prices in 2020. 13s * 3.42	220.60		3.05	223.65
fifteen		Including refundable amounts in current prices 12s7k * 3.42	0.36			0.36
sixteen		Taxes, fees, mandatory payments, 2% * 14s7k			4.47	4.47
17		Estimated cost at the current price level 14s + 16s	220.60		7.52	228.13
eighteen		VAT (12%) * 17s7k			27.38	27.38
nineteen		Construction cost 17s + 18s	220.60		34.90	365.81

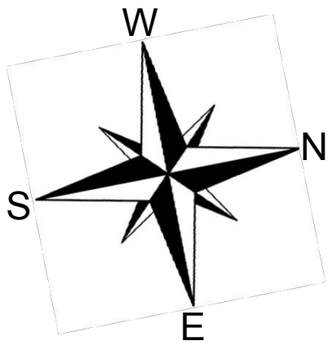
Continuation of appendix B

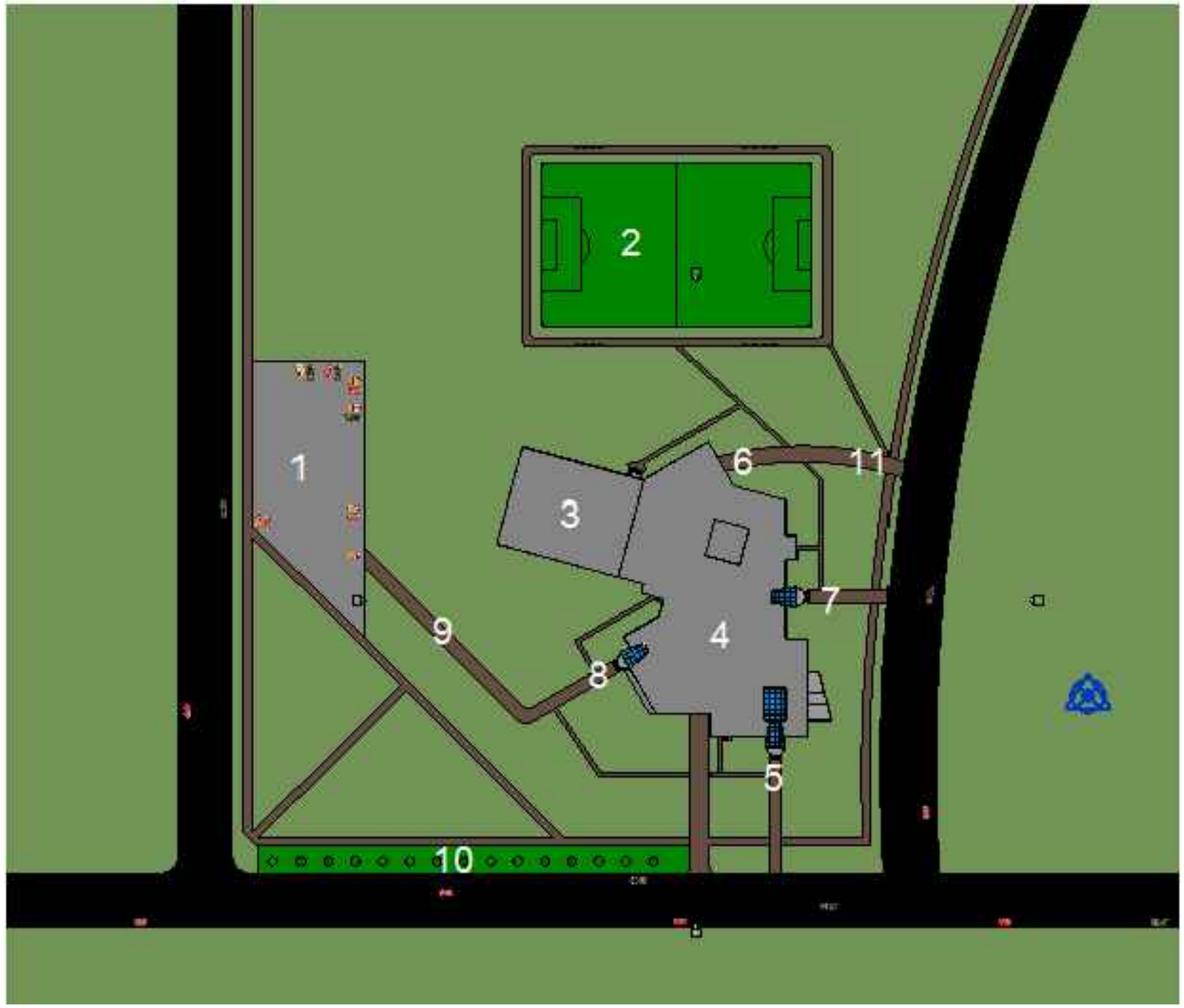
Object estimate

Estimated cost	63.045	thousand tenge
Standard labor intensity	91.123	thousand people hour
Estimated salary	18.042	thousand tenge

Compiled in 2001

P / p No.	No. of estimates and calculations	Name of works and costs	Estimated cost, thousand tenge				Normative labor intensity, thousand people hour	Estimated salary, thousand tenge	Indicators of a unit cost, thousand tenge
			construction and installation works	equipment, furniture and inventory	other costs	Total			
one	2	3	four	five	6	7	eight	nine	10
	one	Civil works	63.045			63.045	91.123	18.042	
		Total	63.045			63.045	91.123	18.042	



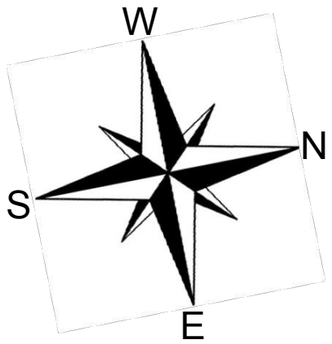


Landscaping
Asphalt
Tile pavement
Trees

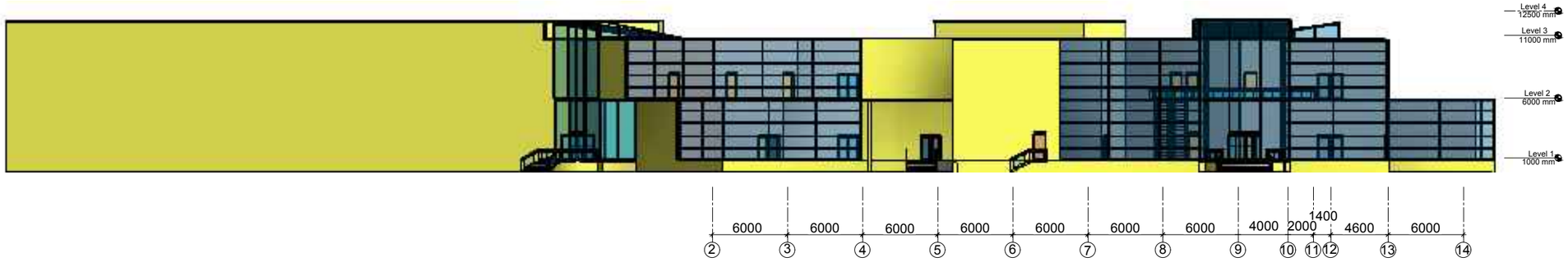
Explanation
1. Car parking for 75 cars
2. Football field
3. Sports hall
4. Main building
5. Main entrance to the youth center
6. Entrance to the underground parking
7. North entrance to the youth center
8. Tile pavement
9. Southwest entrance to the youth center
10. Grass
11. Driveways

Areas of the above
1. Land area - 47352.9 м.sq.
2. Built-up area - 6996 м.sq
3. Area landscaping (lawns)-14843,9 м.sq
4. Paving area - 4622.1 м.sq
5. Asphalt area -5244 м.sq

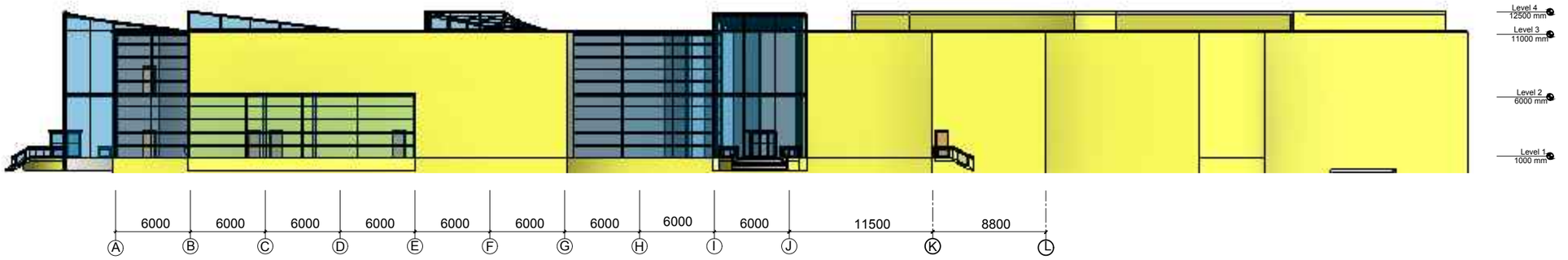
				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP			
				Youth center using construction technology (GRUBER) in Nur-Sultan city			
Position	Name	Signature	Date				
Head of Dep	Kozyukova.N.V			Architectural & analytical part	Stage	Sheet	Sheets
Superviser	Mukhanbetzhanova.Zh				DP	2	11
Consultant	Kozyukova.N.V						
Controller	Bek .A.A			General plan	Civil engineering and building materials department		
Prepared by	Motawakel.H						



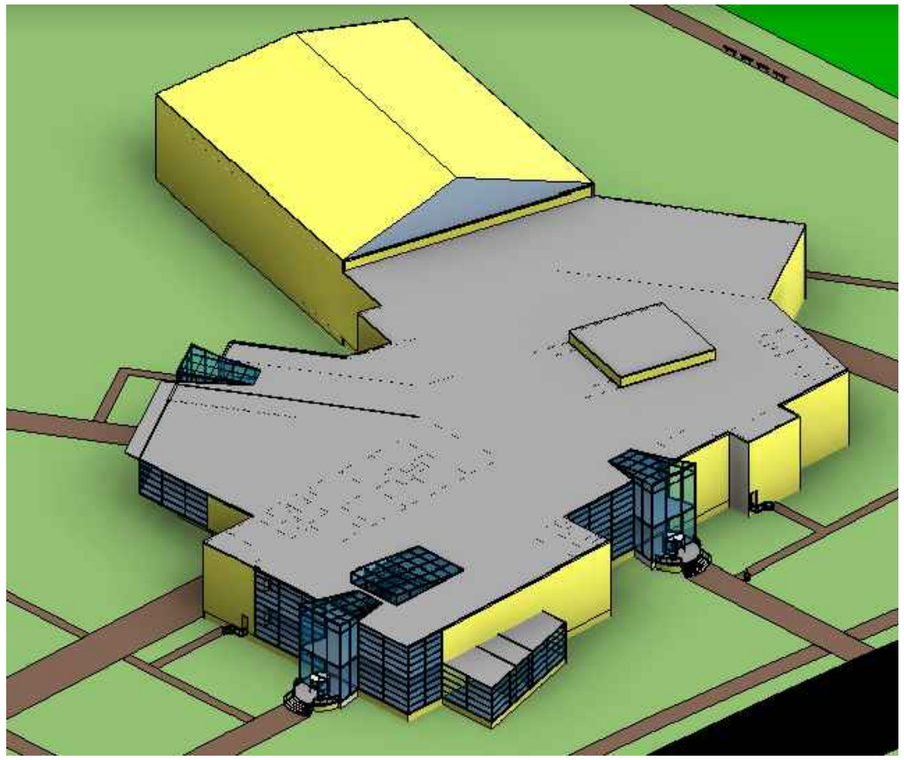
East view



North view



3D

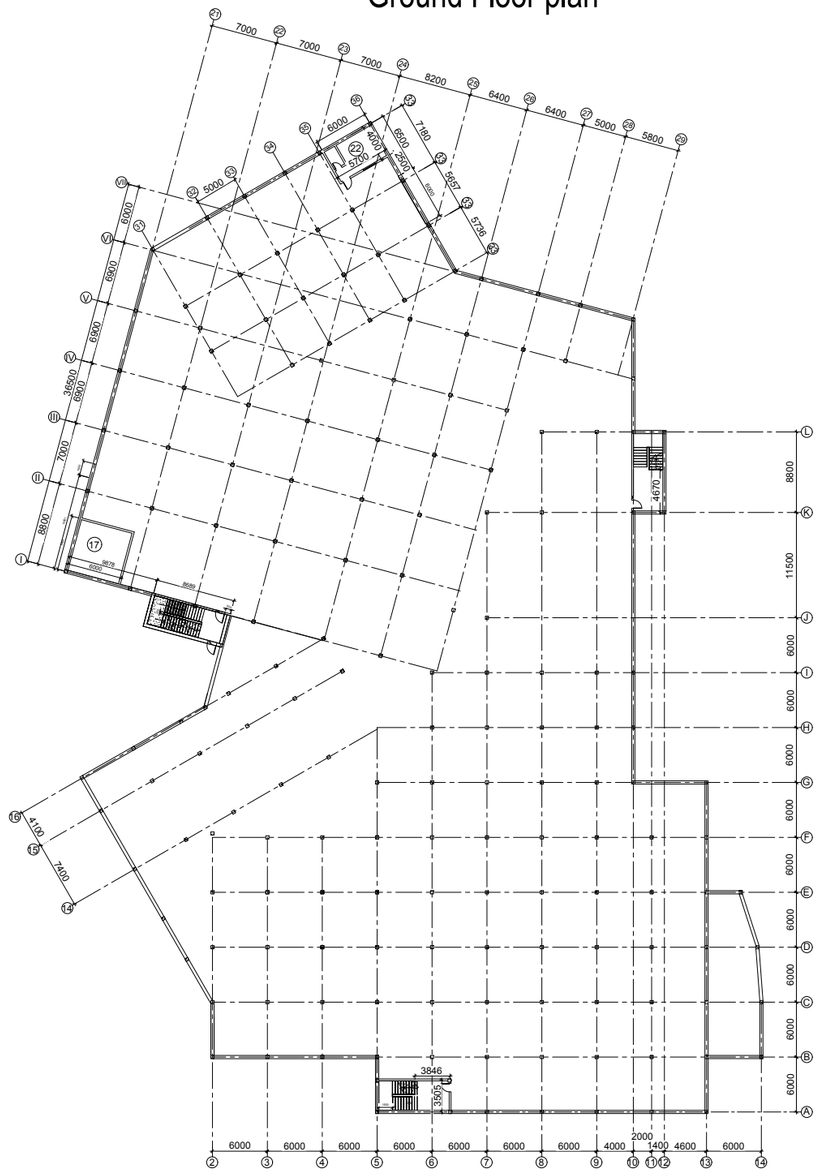


				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP
				Youth center using construction technology (GRUBER) in Nur-Sultan city
Position	Name	Signature	Date	
Head of Dep	Kozyukova.N.V			Architectural & analytical part
Superviser	Mukhanbetzhanova.Zh			
Consultant	Kozyukova.N.V			
Controller	Bek .A.A			Facade & 3D
Prepared by	Motawakel.H			

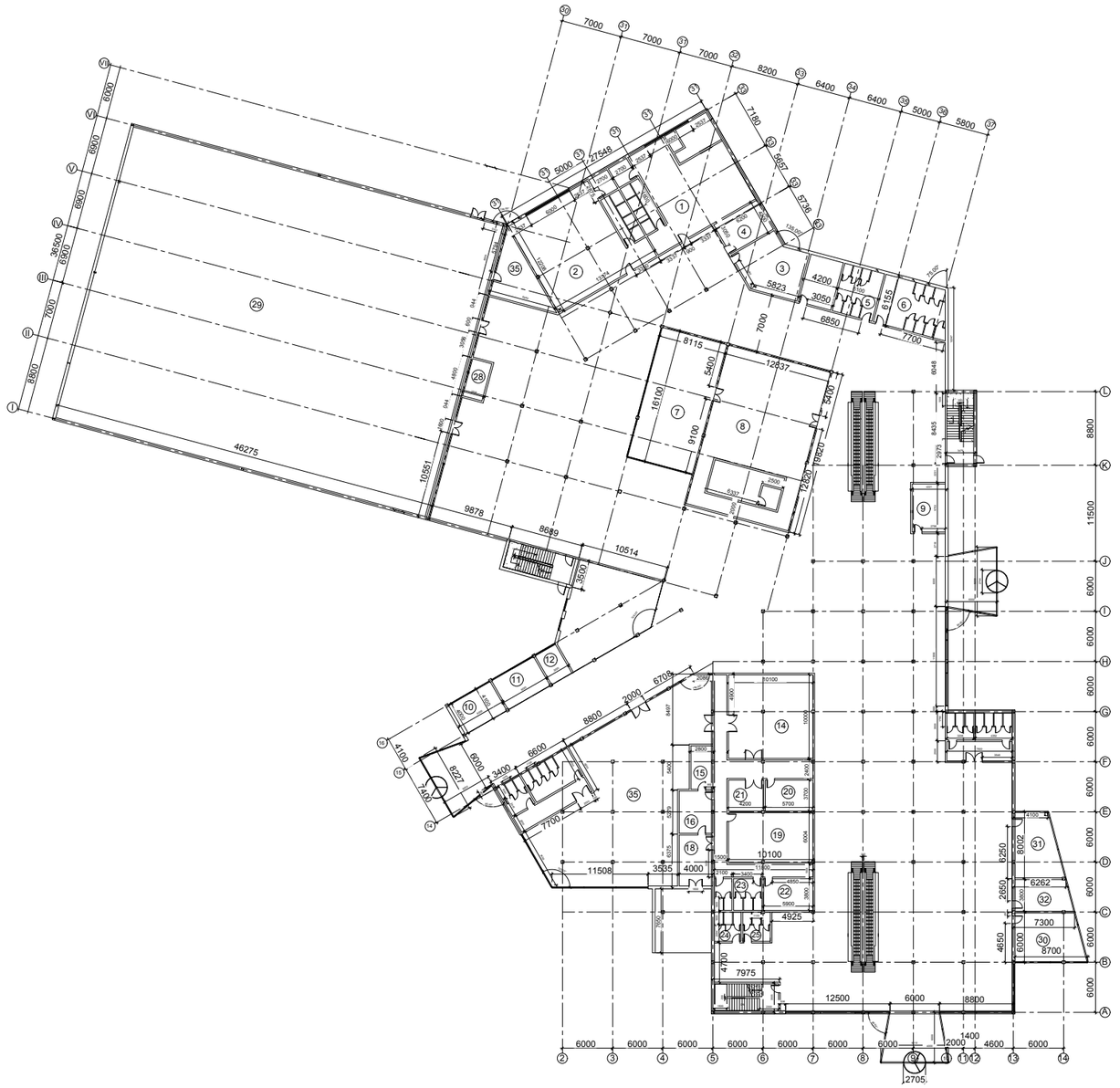
Stage	Sheet	Sheets
DP	1	11

Civil engineering and building materials department

Ground Floor plan



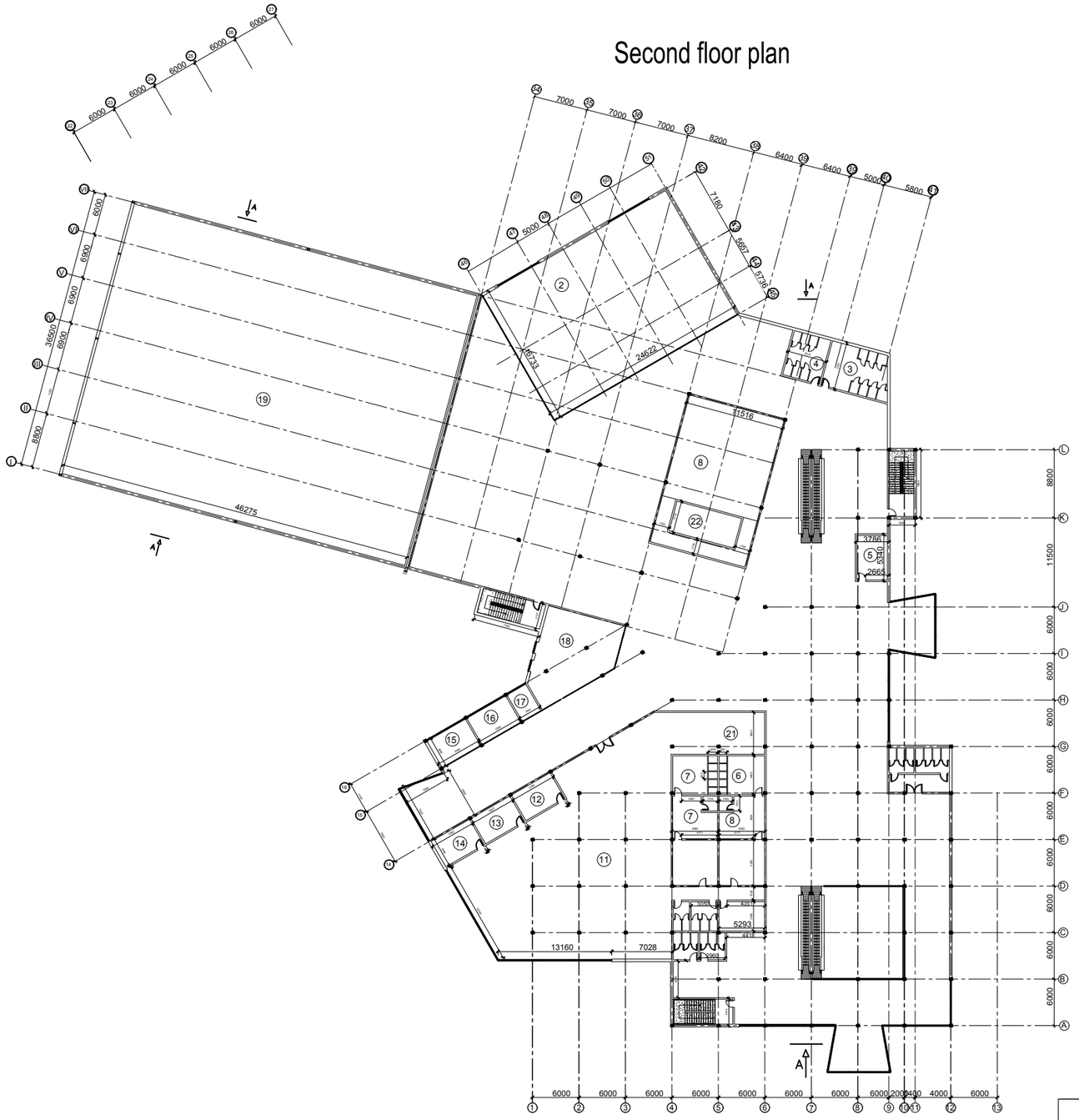
First floor plan



Note : Room Schedule First floor (Appendix 1)

				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP
				Youth center using construction technology (GRUBER) in Nur-Sultan city
Position	Name	Signature	Date	
Head of Dep	Kozyukova.N.V			Architectural & analytical part — Stage: DP; Sheet: 3; Sheets: 11
Superviser	Mukhanbetzhanova.Zh			
Consultant	Kozyukova.N.V			
Controller	Bek .A.A			Ground & First plan — Civil engineering and building materials department
Prepared by	Motawakel.H			

Second floor plan



Room Schedule Second floor

No	Name	Area (m²)
1	Wardrobe 2	23
2	Table tennis	506
3	Second kong bala	47
4	Second kong men	28
5	Wardrobe 2	23
6	Bathroom 6	28
7	Bathroom 5	29
8	Men's changing room	31
9	Women's changing room	32
10	Kong wasat dist rast	43
11	Gym	600
12	Staff room 2	20
13	Directorate 2	20
14	Administration 2	20
15	Retail 5	23
16	Retail 6	24
17	Retail 7	11
18	Retail 8	105
19	Sports hall	1656
20	Staff room	34
21	Restaurant	65

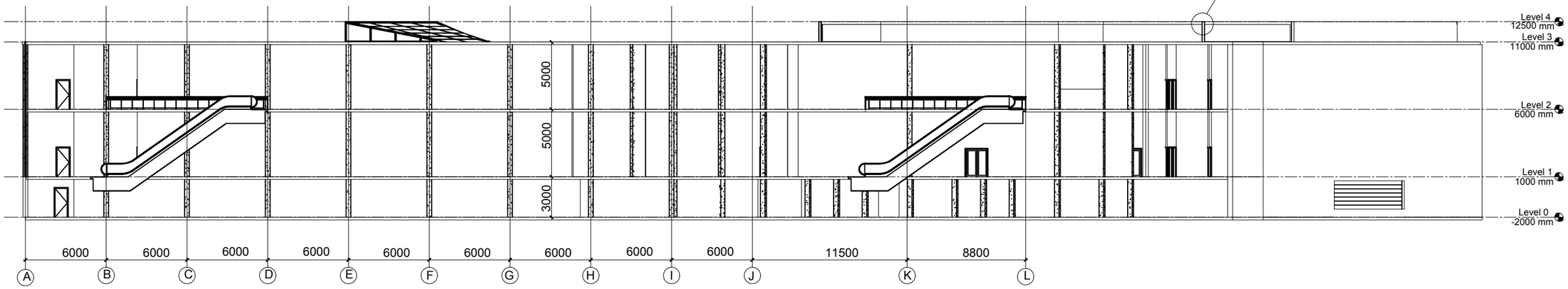
Note : Room Schedule Second floor (Appendix 2)

				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP
				Youth center using construction technology (GRUBER) in Nur-Sultan city
Position	Name	Signature	Date	
Head of Dep	Kozyukova.N.V			Architectural and Analytical part
Superviser	Mukhanbetzhanova.Zh			
Consultant	Kozyukova.N.V			
Controller	Bek .A.A			Second floor & Section
Prepared by	Motawakel.H			

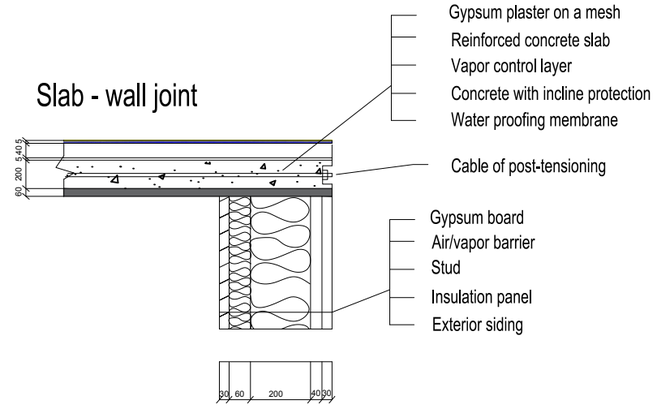
Stage	Sheet	Sheets
DP	4	11

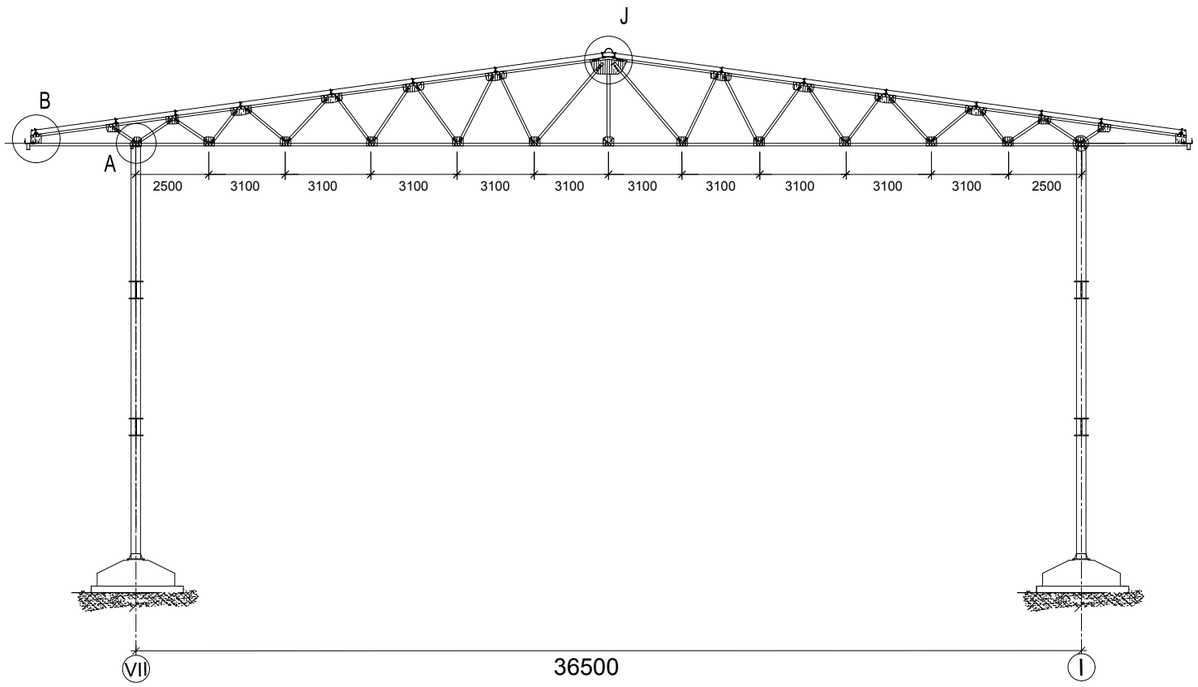
Civil engineering and building materials department

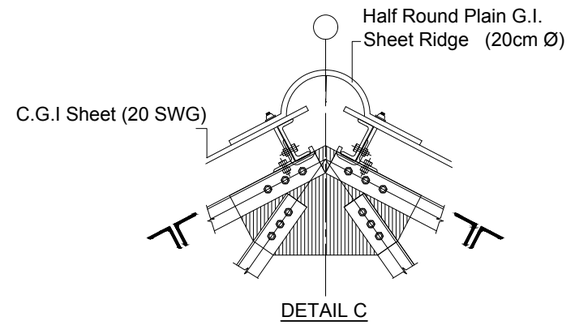
Section 1-1

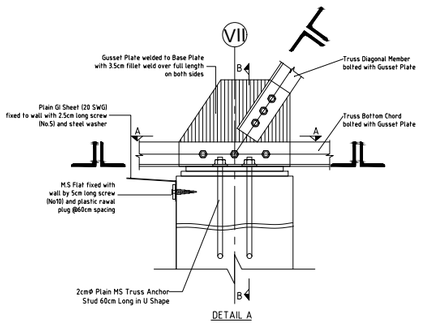


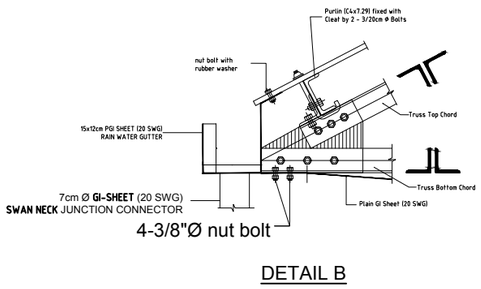
Slab - wall joint





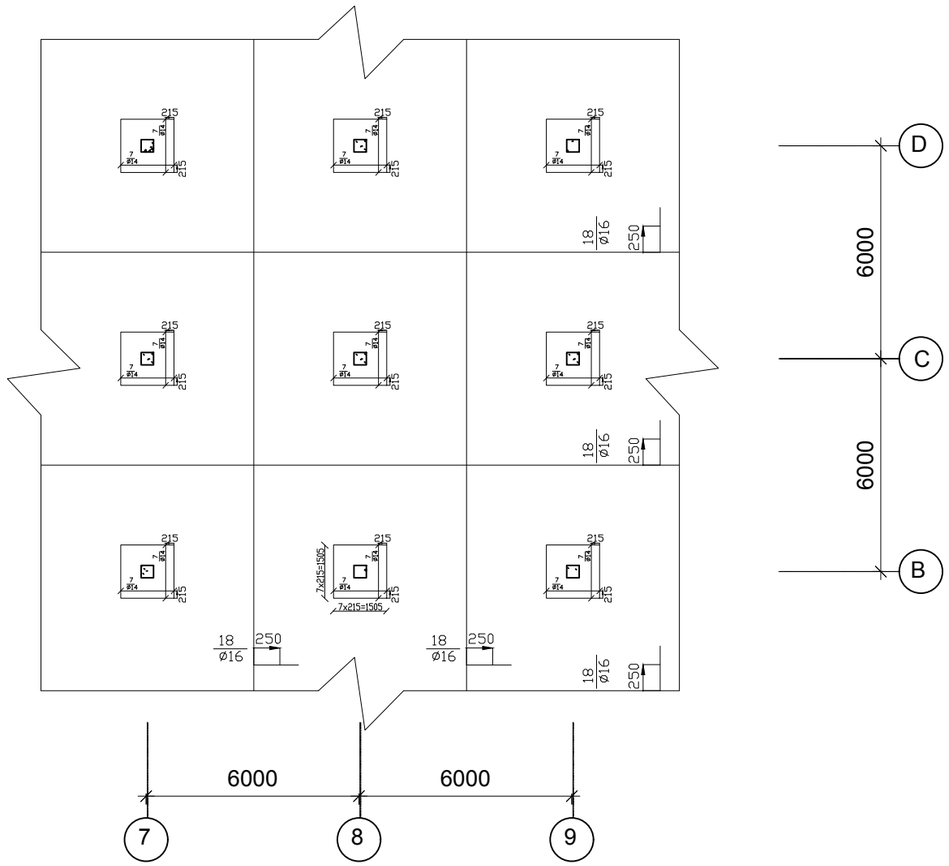






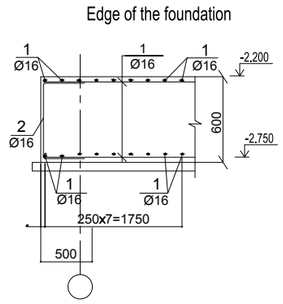
				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP			
				Youth center using construction technology (GRUBER) in Nur-Sultan city			
Position	Name	Signature	Date	Architectural and Analytical part	Stage	Sheet	Sheets
Head of Dep	Kozyukova.N.V				DP	5	11
Superviser	Mukhanbetzhanova.Zh						
Consultant	Kozyukova.N.V						
Controller	Bek .A.A			Sections	Civil engineering and building materials department		
Prepared by	Motawakel.H						

Reinforcement distribution

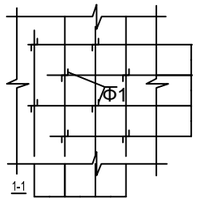


Statement of steel consumption, kg

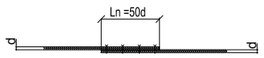
Num	Standards	Name	qua	Weight (Kg)	Sum up
		Top layer			
1	EN 10138-4	⌀ 16 S500 L= 9700	8	1.58	15.3
2	EN 10138-4	⌀ 14 S500 L= 3801	6	1.21	4.6
		Bottom layer			
3	EN 10138-4	⌀ 16 S500 L= 9700	8	1.58	15.3
4	EN 10138-4	⌀ 14 S500 L= 3801	6	1.21	4.6
		Hooks			
5	EN 10138-4	⌀ 12 S500 L= 4240	8	0.89	3.8
		Concrete class C30			43.6
		Materials			

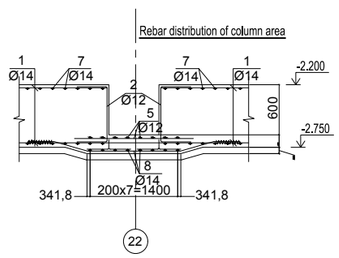


Clamp placement scheme Φ1

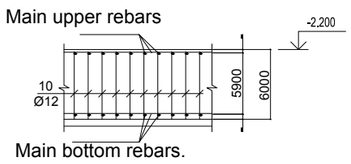


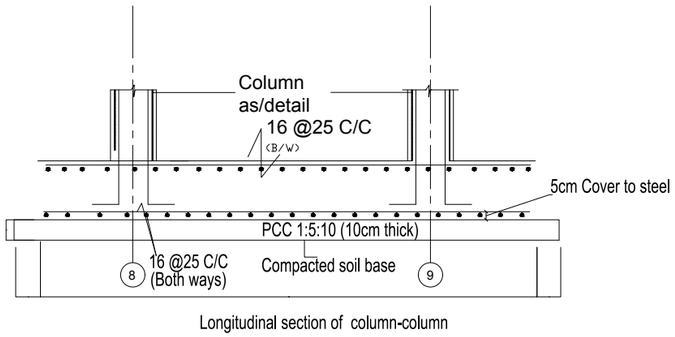
Overlapping reinforcement joint
(Non - welded)





Hooks at edge of two layers

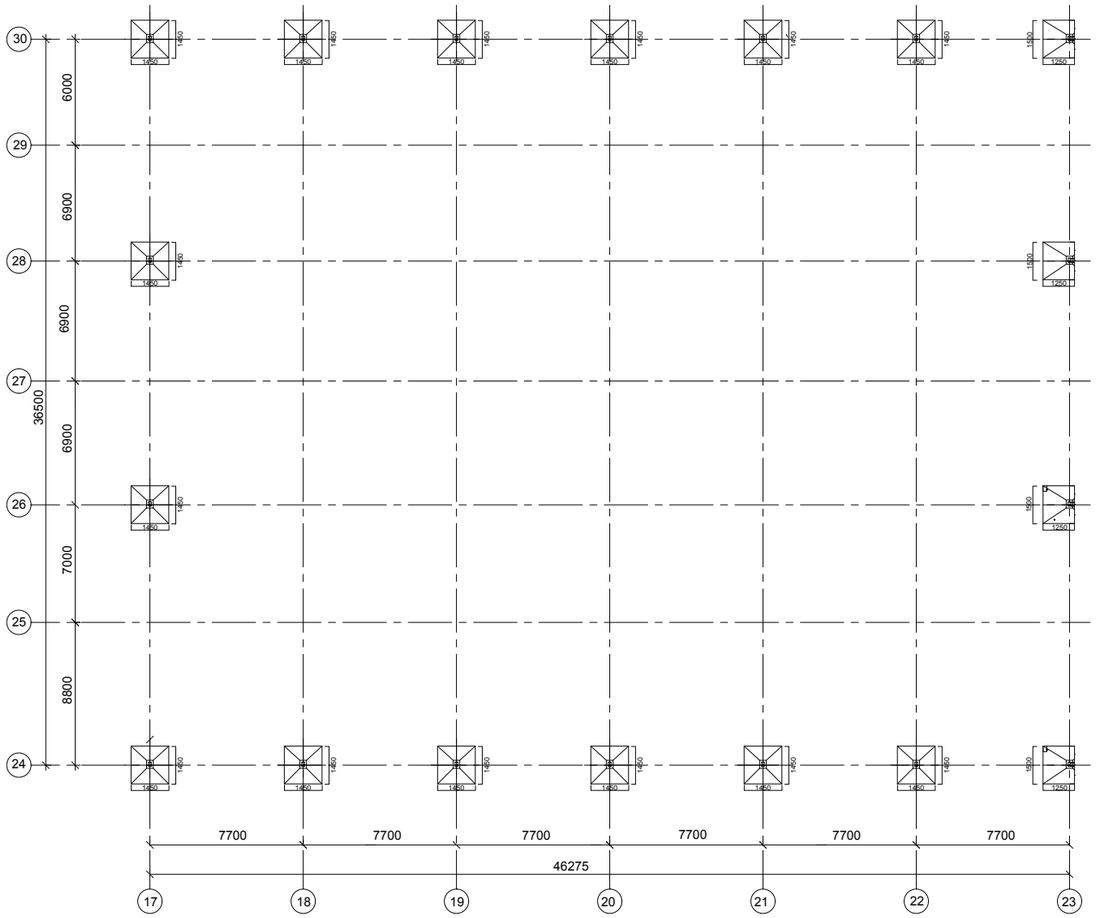




Longitudinal section of column-column

Note: The bottom reinforcements are distributed as the distribution of top reinforcements including the extra bars which are added for column strips

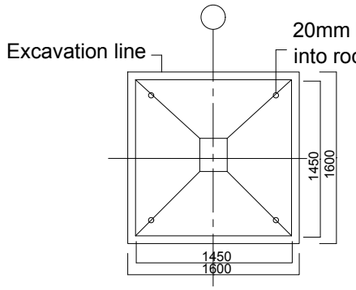
				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP
				Youth center using construction technology (GRUBER) in Nur-Sultan city
Position	Name	Signature	Date	
Head of Dep	Kozyukova.N.V			Constructive part — Stage: DP; Sheet: 6; Sheets: 11
Superviser	Mukhanbetzhanova,Zh			
Consultant	Kozyukova.N.V			
Controller	Bek .A.A			
Prepared by	Motawakel.H			Mat foundation — Civil engineering and building materials department



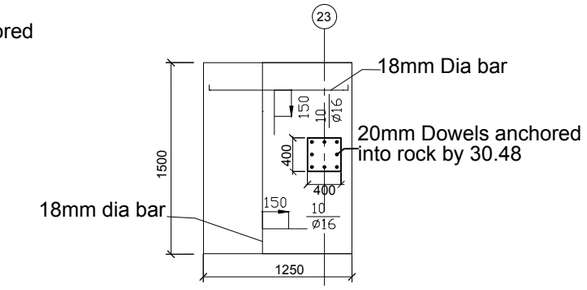
Statement of steel consumption, kg							
Mark of Elements	Reinforcing products						
	Class armature						Total
	S500						
	EN 10138-4						
	⌀14	total	⌀16	total	⌀20	total	
Footing (22x24 grid)	1.21	12.1	1.58	44.24	2.47	7.9	64.24

Num	Standards	Name	qua	Weight (Kg)	Sum up
		Bottom layer rebar			
1	EN 10138-4	⌀ 20 S500 L= 67.2	6	2.47	165.98
2	EN 10138-4	⌀ 16 S500 L= 588	49	1.58	929.04
3	EN 10138-4	⌀ 14 S500 L= 126	11	1.21	152.46
		Materials			1247.48
		Concrete class C30			

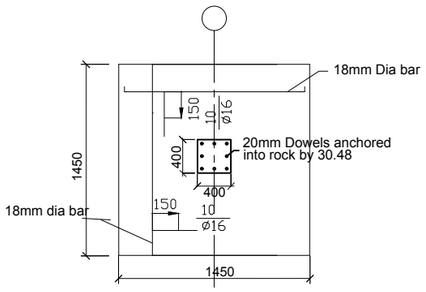
Details of isolated footings



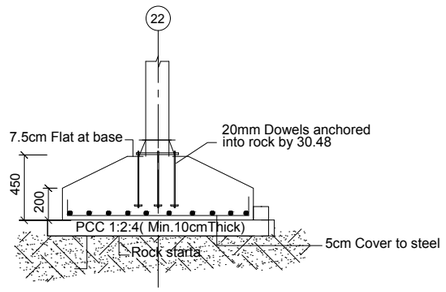
Plan of footing



Plan showing reinforcement curtailment of bottom steel



Plan showing reinforcement curtailment of bottom steel



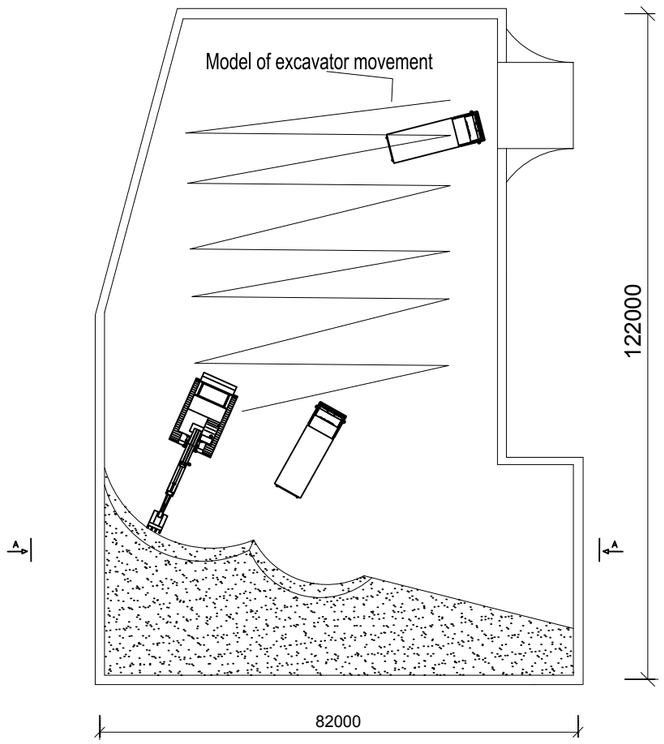
Section of isolated foundation on rock base

				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP
				Youth center using construction technology (GRUBER) in Nur-Sultan city
Position	Name	Signature	Date	
Head of Dep	Kozyukova.N.V			Constructive part
Superviser	Mukhanbetzhanova,Zh			
Consultant	Kozyukova.N.V			
Controller	Bek .A.A			Isolated foundation
Prepared by	Motawakel.H			

Stage	Sheet	Sheets
DP	7	11

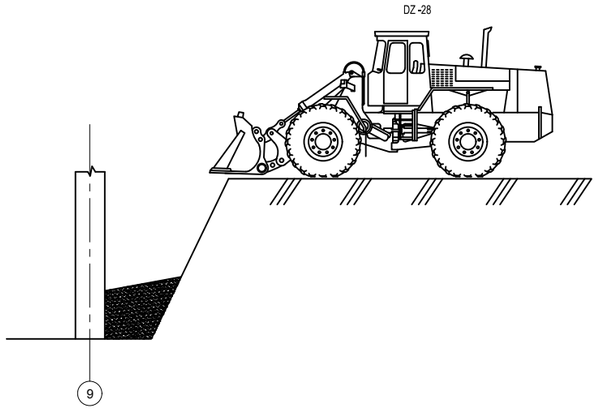
Civil engineering and building materials department

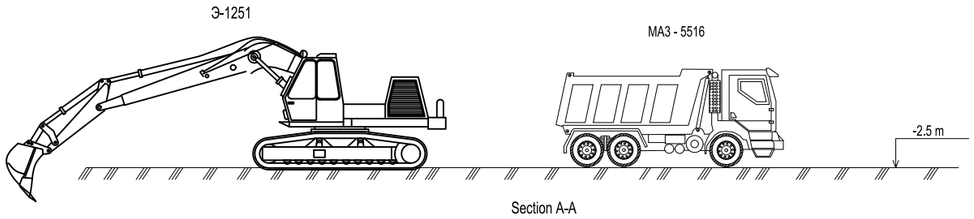
Excavation pit development scheme



Equipment involved in ground work

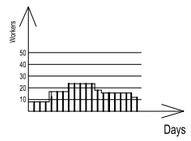
No	Name of equipment
1	МАЗ - 5516
2	Э-1251
3	Concrete pump C296 - A





Section A-A

Types of work	Scope of work		Labor cost	Necessary machines		Working number	Shift number	Working duration days	2021-2022
	Measure	one		Brand	Num of Machiones				1 2 3
Stage of preparatory work	-	-	688,11	-	-	15	3	15	
Production of potholes	100m3	1,34	1,26	Э-1251	1	1	2	1	
Manual tillage	m 3	41	10,15	-	-	5	1	2	
Reinforced concrete foundation	pcs	438	47,1	Concrete pump C296 - A	2	10	1	5	
Waterproofing of the underground section	100m2	4,41	36,13	-	-	3	2	4	
Installation of external engineering systems	-	-	1146,9	-	-	11	1	104	
Filling the soil tension	1000m3	0,2	0,91	Bulldozer DZ-28	1	1	1	1	



Safety precaution

1 The organization and performance of work in the construction industry, construction materials industry and construction industry should be carried out in compliance with the requirements of the "Labor Code of the Republic of Kazakhstan" as well as other regulations containing state regulations on occupational health and safety":

- building codes, codes of rules for design and construction;
- Inter-industry and industry rules and standard work safety and safety guidelines approved in due course;
- State standards of the system of work safety standards operating in the Republic of Kazakhstan;
- Requirements and rules of safety and safety, rules of device and safe operation, safety instructions;

State health and epidemiological standards, hygiene regulations, sanitary regulations and regulations in force in the Republic of Kazakhstan.

2 Participants in the construction of facilities (customers, designers, contractors, suppliers, as well as manufacturers of building materials and structures, manufacturers of construction equipment and production equipment) are liable for violations of the requirements of the regulations specified in article 5.1.1. And p.5.1.2.

3 Responsibility for compliance with safety and health requirements in the operation of cars, manual electric and pneumatic machines, and technological equipment is assigned:

- for the technical condition of construction machinery, machinery, production equipment, tools, technological equipment, including means of protection - on the organization on which they are on balance, and when they are transferred to temporary use (rent) - to the organization (person), defined by the contract;
- To ensure that the work is safely produced by organizations that do the work.

The general contractor or landlord is obliged to perform work on construction sites with the involvement of subcontractors or tenants:

- Develop with them measures to ensure a safe working environment, mandatory for all organizations and persons involved in construction;
- To ensure that the planned activities are carried out and that subcontractors and tenants coordinate their safety activities at their assigned sites.

4 In the production of work on the site and works sites involving contractors (including citizens engaged in self-employment), the person carrying out the construction is obliged to:

5 Develop a joint action plan with the contractors involved to ensure a safe working environment that is mandatory for all organizations and persons involved in construction;

- ensure that planned activities are carried out and that subcontractors and tenants coordinate in terms of health and safety activities at their assigned sites;
- When contracting contracts provide for mutual responsibility of the parties to implement measures to ensure safe working conditions on the site and work sites.

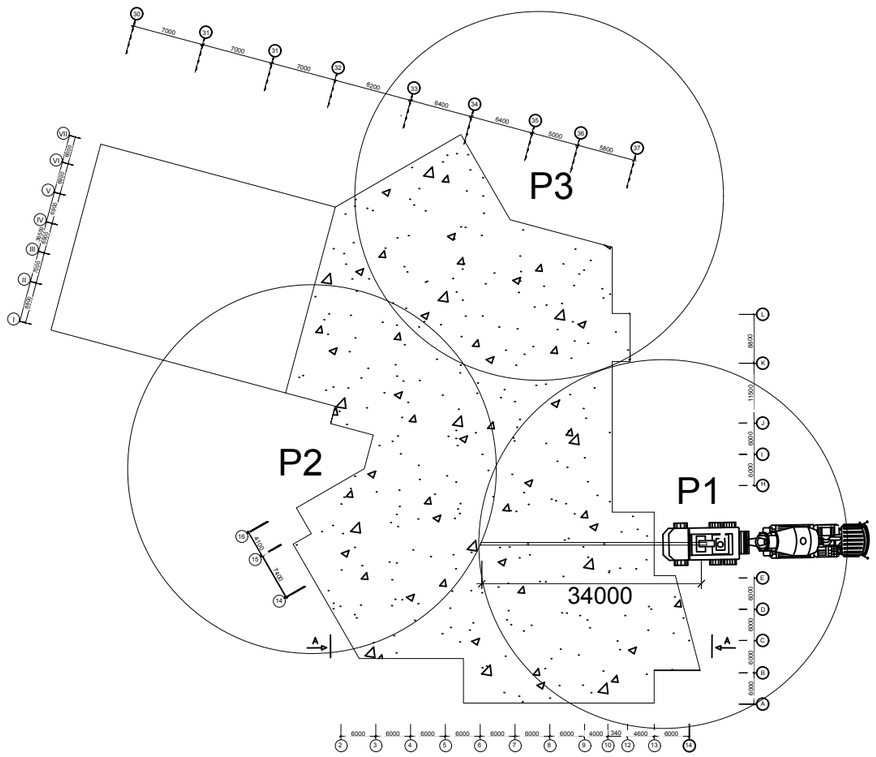
Before the start of construction and installation work on the territory of the organization, the customer and the general contractor with the participation of subcontractors and the administration of the current organization are obliged to

Position	Name	Signature	Date
Head of Dep	Kozyukova.N.V		
Superviser	Mukhanbetzhanova.Zh		
Consultant	Kozyukova.N.V		
Controller	Bek .A.A		
Prepared by	Motawakel.H		

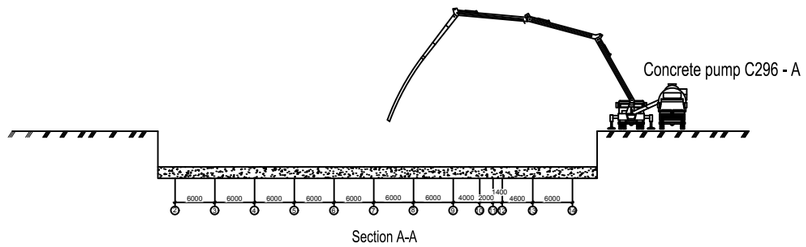
KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP

Youth center using construction technology (GRUBER) in Nur-Sultan city

Technological part	Stage	Sheet	Sheets
	DP	8	11
Earth work	Civil engineering and building materials department		



Technological work for concrete construction of building



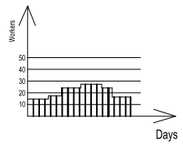
Concrete Needle vibrator

Equipment involved in ground work

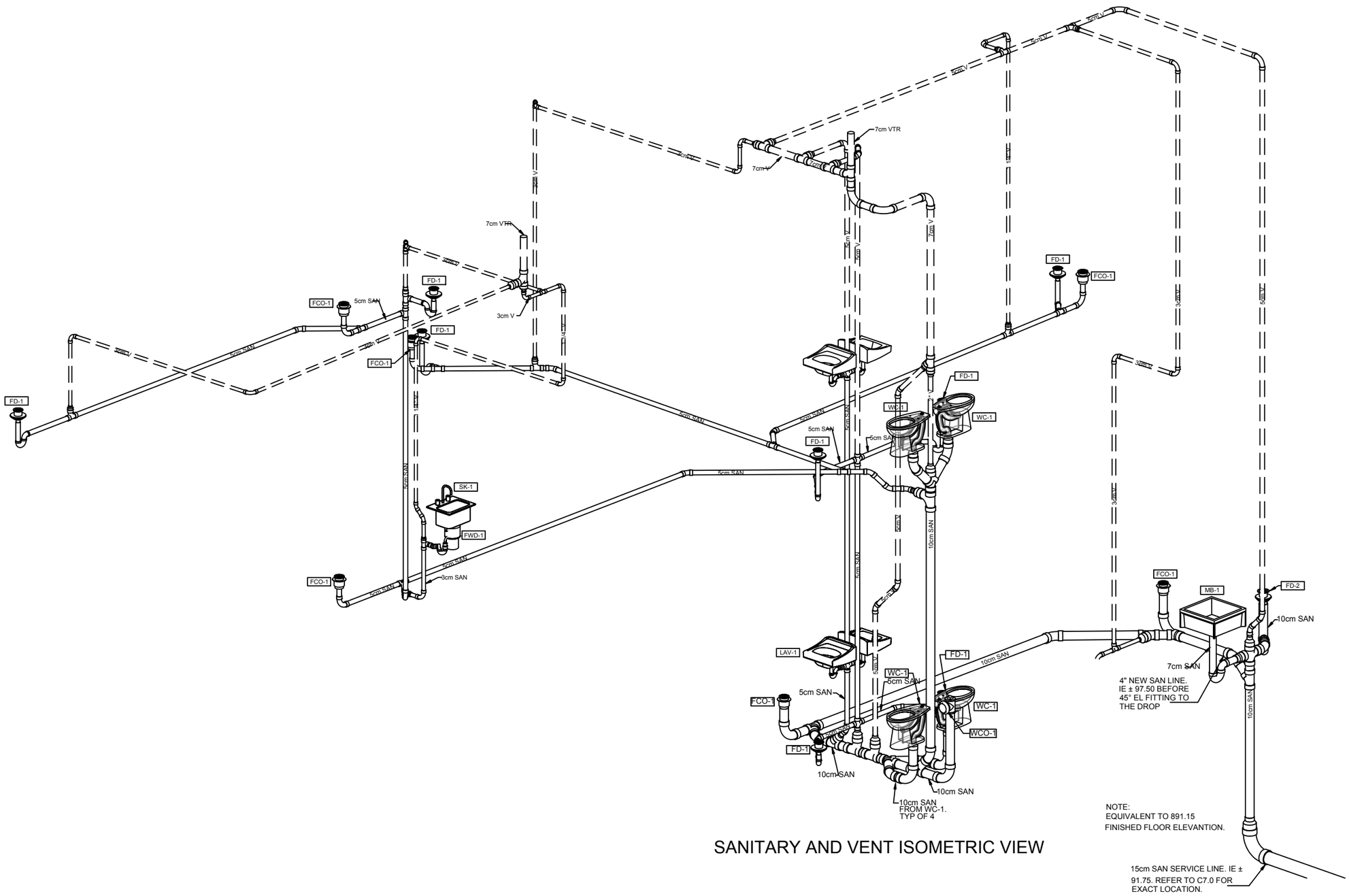
No	Name of equipment
1	DZ -28
2	Concrete pump C296 - A
3	Concrete Needle vibrator

Necessary machines

Types of work	Scope of work		Labor cost	Necessary machines		Working number	Shift number	Working duration days	2021-2022
	Measure	one		Brand	Num of Machiones				1 2 3
Stage of preparatory work	-	-	688,11	-	-	15	3	15	
Production of potholes	100m3	1,34	1,26	Э-1251	1	1	2	1	
Manual tillage	m 3	41	10,15	-	-	5	1	2	
Reinforced concrete foundation	pcs	438	47,1	Concrete pump C296 - A	2	10	1	5	



				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP			
				Youth center using construction technology (GRUBER) in Nur-Sultan city			
Position	Name	Signature	Date				
Head of Dep	Kozyukova.N.V			Technological part	Stage	Sheet	Sheets
Superviser	Mukhanbetzhanova.Zh				DP	9	11
Consultant	Kozyukova.N.V						
Controller	Bek .A.A			Concrete work	Civil engineering and building materials department		
Prepared by	Motawakel.H						

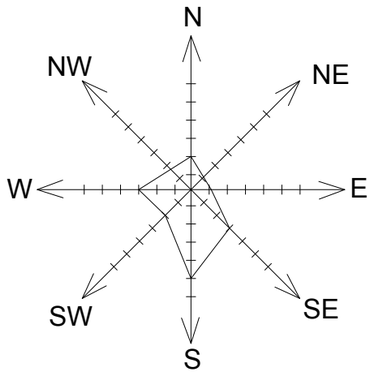


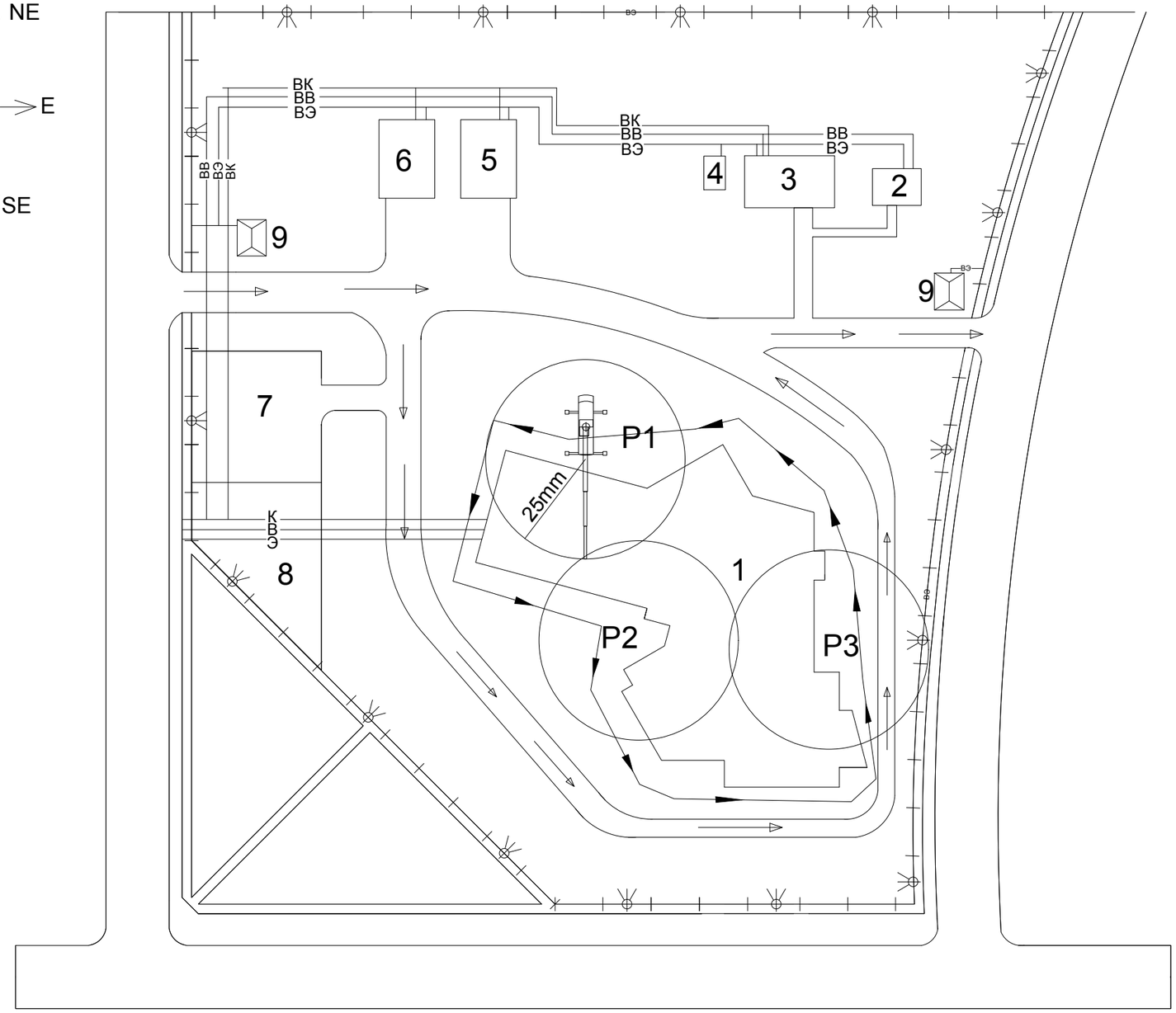
SANITARY AND VENT ISOMETRIC VIEW

				KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP
				Youth center using construction technology (GRUBER) in Nur-Sultan city
Position	Name	Signature	Date	
Head of Dep	Kozyukova.N.V			Thesis topic
Superviser	Mukhanbetzhanova,Zh			
Consultant	Kozyukova.N.V			
Controller	Bek .A.A			GRUBER9(Plumbing system)
Prepared by	Motawakel.H			Civil engineering and building materials department

Stage	Sheet	Sheets
DP	1	11

Building master plan





Symbols

- Temporary fencing
- External ligthing of the site
- Direction o fmovement
- К — Permanent sewage
- В — permanenet water supply
- Э — Constant power line
- ВВ — Temporary water supply
- ВК — Temporary sewage
- ВЭ — Temporary transmission line
- direction of the crane movement

Explication of temporary buildings and structures

1 Building under construction
2 Site office (Foreman)
3 Dining room
4 Clothing & Bathroom
5 Closed storage
6 Warehouse
7 Parking
8 Car wash
9 Check point

Explanation

No	Open warehouses and initiatives	State
1	Office and dispatching	Temporary
2	Closed warehouse	Temporary
3	Warehouse	Temporary
4	Dining room	Temporary
5	Clothing & bathroom	Temporary
6	Check point	Temporary
7	Car parking	Temporary
8	Car wash	Temporary

Technology-Economic indicators

No	Name of indicators	Unit	Volume
1	Area of the main construction	M2	6764
2	Construction area	M2	1506
3	Construction factor	%	0.08
4	Length of temporary roads	M	485
5	Length of temporary water pipes	M	287.5
6	Temporary power transmission length	M	938
7	Length of temporary sewer	M	194

Position	Name	Signature	Date
Head of Dep	Kozyukova.N.V		
Superviser	Mukhanbetzhanova,Zh		
Consultant	Kozyukova.N.V		
Controller	Bek .A.A		
Prepared by	Motawakel.H		

KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP

Youth center using construction technology (GRUBER) in Nur-Sultan city

Technological part

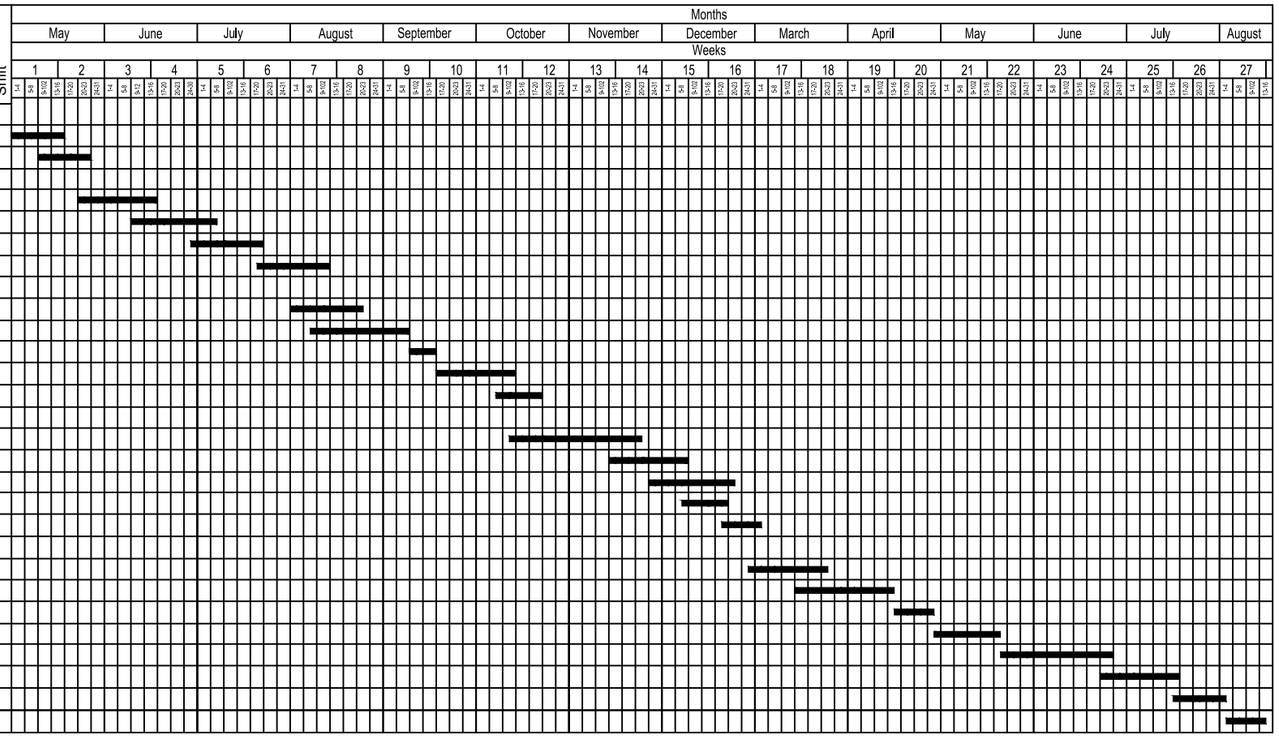
Stage	Sheet	Sheets
DP	10	11

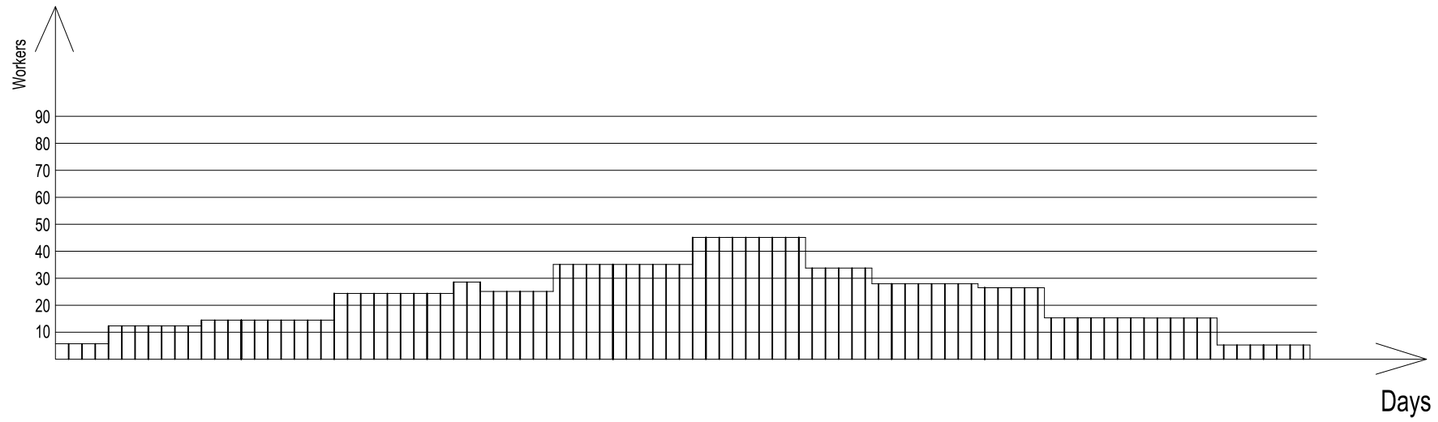
Master Plan

Civil engineering and building materials department

Work Schedule

No	Name	Scope of work		Cost Work Person-days	Required Mach		Will continue days	Number Workers	Number of Shift
		Unit	cod. no		Name	Date			
1	2	3	4	5	6	7	8	9	10
1	Device time fencing	M	770	24	-	-	4	3	2
2	Cut Rast. layer	1000m2	9.5		Д3-28	1	5	1	2
3	Excavation								
3.1	With loading in t	100m3	25.85		Э-1251	2	6.5	4	2
3.2	To the dump	100m3	12.24		Э-1251	1	6	1	2
4	Manual bottom cleaning	1m3	1183	124	-	-	6	10	2
5	The device is equal layer	1m3	381		Д3-28	1	2	2	1
6	The device of the monolithic foundation								
6.1	Formwork device	1m2	943.6	8.75	-	-	2	4	2
6.2	Reinforcement work	1t	33.935	178.5	-	-	11	16	2
6.3	Concrete laying	1m3	1500	41.25	-	-	5	8	2
6.4	Curing	100m2	30.05	0.525	-	-	1	1	1
6.5	Formwork work	1m2	180	4.725	-	-	2	2	1
7	The device of the monolithic foundation								
7.1	Formwork device	1m2	2006.4	30.1	-	-	5	9	2
7.2	Reinforcement work	1t	24.7	26.86	-	-	7	4	2
7.3	Concrete laying	1m3	200.64	2685	-	-	1	4	2
7.4	Curing	100m2	20.064	0.4	-	-	1	1	1
7.5	Formwork work	1m2	2006.4	22.5	-	-	3	9	2
8	The device of the monolithic foundation								
8.1	Formwork device	1m2	3001.5	287.3	-	-	8	10	2
8.2	Reinforcement work	1t	84	136.5	-	-	8	16	2
8.3	Concrete laying	1m3	600.3	60.8	-	-	5	12	2
8.4	Curing	100m2	30	0.525	-	-	1	1	1
8.5	Formwork work	1m2	3001.5	121	-	-	4	8	2
9	Waterproofing	1m2	6122.5	856.37	-	-	30	15	2
10	Backfilling	100m3	12.24	0.95	-	-	1	1	1
11	Soil compaction	100m3	30.25		ДО-31А	1	2	1	2





Name	Unit	Estimated
Total work	Day	436
The total complexity of work	Hour-day	4082

Position	Name	Signature	Date
Head of Dep	Kozyukova.N.V		
Superviser	Mukhanbetzhanova.Zh		
Consultant	Kozyukova.N.V		
Controller	Bek .A.A		
Prepared by	Motawakel.H		

KazNITU - 5B072900-Civil Engineering-08.03.02-2021-DP

Youth center using construction technology (GRUBER) in Nur-Sultan city

Technological part	Stage	Sheet	Sheets
	DP	11	11
Calendar schedule	Civil engineering and building materials department		

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
СӘТБАЕВ УНИВЕРСИТЕТІ

RESPONSE

OF THE SUPERVISOR
for the graduation project

Motawakel Hamed
5B072900-Civil Engineering

Topic: “Youth center using construction technology Gruber in Nur-Sultan

Graduation project of Motawakel Hamed made in accordance with the requirements and includes all the necessary sections of the diploma project.

In the Architectural part, facades, sections, floor plans and connection nodes of structures are presented. The thermotechnical calculation of the wall fencing was made.

In the constructive section, the calculation of the foundation on the LIRA CAD program is performed. In the technological part, technological maps for earthworks and concrete works have been developed.

The economic part of the project is calculated according to the program of ABC. All drawings are made in Autocad.

In general, the graduation project was performed at a good level, the student Motawakel Hamed showed good knowledge both during training and during the implementation of the project. The work deserves a good grade.

Supervisor
Master of technical science, lecturer

_____Mukhanbetzhanova Zh.Sh.

«30_» may 2021 yr.

Протокол анализа Отчета подобия Научным руководителем

Заявляю, что я ознакомился(-ась) с Полным отчетом подобия, который был сгенерирован Системой выявления и предотвращения плагиата в отношении работы:

Автор: Мотавакел Хамед

Название: Youth center using construction technology "GRUBER" in Nur-Sultan

Координатор:Надежда Козюкова

Коэффициент подобия 1:8.2

Коэффициент подобия 2:3.7

Замена букв:162

Интервалы:0

Микропробелы:33

Белые знаки: 0

После анализа Отчета подобия констатирую следующее:

☐ обнаруженные в работе заимствования являются добросовестными и не обладают признаками плагиата. В связи с чем, признаю работу самостоятельной и допускаю ее к защите;

☐ обнаруженные в работе заимствования не обладают признаками плагиата, но их чрезмерное количество вызывает сомнения в отношении ценности работы по существу и отсутствием самостоятельности ее автора. В связи с чем, работа должна быть вновь отредактирована с целью ограничения заимствований;

☐ обнаруженные в работе заимствования являются недобросовестными и обладают признаками плагиата, или в ней содержатся преднамеренные искажения текста, указывающие на попытки сокрытия недобросовестных заимствований. В связи с чем, не допускаю работу к защите.

Обоснование:

……

…… ……

Дата *Подпись Научного руководителя*

Протокол анализа Отчета подобия

заведующего кафедрой / начальника структурного подразделения

Заведующий кафедрой / начальник структурного подразделения заявляет, что ознакомился(-ась) с Полным отчетом подобия, который был сгенерирован Системой выявления и предотвращения плагиата в отношении работы:

Автор: Мотавакел Хамед

Название: Youth center using construction technology "GRUBER" in Nur-Sultan

Координатор: Надежда Козюкова

Коэффициент подобия 1:8.2

Коэффициент подобия 2:3.7

Замена букв:162

Интервалы:0

Микропробелы:33

Белые знаки:0

После анализа отчета подобия заведующий кафедрой / начальник структурного подразделения констатирует следующее:

☐ обнаруженные в работе заимствования являются добросовестными и не обладают признаками плагиата. В связи с чем, работа признается самостоятельной и допускается к защите;
☐ обнаруженные в работе заимствования не обладают признаками плагиата, но их чрезмерное количество вызывает сомнения в отношении ценности работы по существу и отсутствием самостоятельности ее автора. В связи с чем, работа должна быть вновь отредактирована с целью ограничения заимствований;
☐ обнаруженные в работе заимствования являются недобросовестными и обладают признаками плагиата, или в ней содержатся преднамеренные искажения текста, указывающие на попытки сокрытия недобросовестных заимствований. В связи с чем, работа не допускается к защите.

Обоснование:

……
……
……
……
……

……
……

Дата *Подпись заведующего кафедрой /*

начальника структурного подразделения

Окончательное решение в отношении допуска к защите, включая обоснование:

……
……
……
……
……

……
……

Дата *Подпись заведующего кафедрой /*

начальника структурного подразделения