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

Hussniya Amiri

«Hospital building for pre-fabricated technology in Ust-Kamenogorsk»

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 «Hospital building for pre-fabricated technology in Ust-Kamenogorsk»

5B072900 - Civil Engeneering

Prepared by Hussniya Amiri

Scientific adviser N.V.Kozyukova
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
«___»_______2021 yr.

ASSIGNMENT
Complete a diploma project

Student: Hussniya Amiri
Topic: «Hospital building for pre-fabricated technology in Ust-Kamenogorsk»
Approved by the Order of the Rector of the University №2131-b dated November 24, 2020.
The deadline for the completed work is May 10, 2020.
Initial data for the diploma project: Ust-Kamenogorsk
Structural schemes of the building - frame-wall(brick), self-supporting with crossbeams, structures are made of per-fabricated reinforced concrete, architectural solution.
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 and foundation;
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, 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	Zhambakina Z.M., Candidate of technical sciences, assistant-professor		
Calculation and design	Zhambakina Z.M., Candidate of technical sciences, assistant-professor		
Organizational and technological	Kyzylbayev N.K., Master of technical science, senior-lecturer		
Economic	Zhambakina Z.M., Candidate of technical sciences, assistant-professor		
Norm controller	Bek A.A., Master of technical science, assistant		
Quality control	Kozyukova N.V., Master of technical science, lecturer		

Scientific adviser ___________ Zhambakina Z. M.

The task was accepted
for execution student ___________ Hussniya Amiri

Date "__" ________ 2021 yr.

АҢДАТПА

Дипломдық жұмыстың тақырыбы: « Өскемен қаласындағы тез тұрғызылатын технология бойынша аурухана корпусы ». Дипломдық жұмыс келесі бөлімдерден тұрады:

1. Сәулет және құрылыс бөлімі - көлемді жобалау, сәулетконструктивті шешімдері және қоршау конструкцияларының есебі,

2. . Есептік-конструктивті бөлім – «ETABS 18» бағдарламасы бойынша темірбетонды біртұтас қаңқалы ғимаратының есебі

3 . Құрылыс өндірісінің технологиясы мен ұйымдастырылуы - негізгі техника - жер үсті жұмыстарын жасау механизмдері таңдалуы, кесте жасалып, еңбек шығындары есептелді,

4. Құрылыс экономикасы – СМЕТА AVS бағдарламасында құрылыс жұмыстарының құнының есептелуі.

АННОТАЦИЯ

Тема данной дипломной работы «Больничный корпус по быстровозводимой технологии городе Усть-Каменогорск». Дипломная работа включает в себя разделы:

1. Архитектурно-строительный - состоит из объемно- планировочных , архитектурно-конструктивных решений и теплотехнические расчеты ограждающих конструкций,

2. Расчѐтное– конструктивный - расчет железобетонного монолитного каркаса здания в программе ETABS 18,

3. Технология и организация строительного производства -подобраны основные машины- механизмы для выполнения подземных работ составленкалендарный план и вычислены калькуляций затрат труда.

4. Экономика строительства -разработан расчет себестоимости строительных работ в программе СМЕТА AVS.

ANNOTATION

The topic of this thesis is ― Hospital building for pre-fabricated technology in Ust-Kamenogorsk, Thesis includes the following sections:

1. Architectural and construction - consists of space-planning, architectural and design solutions and heat engineering calculations of enclosing structures,

2. Design-constructive - the calculation of the reinforced concrete monolithic frame of the building in the program ETBAS 18.

3. The technology and organization of construction production — the main Machinery-mechanisms for performing above-ground works were selected, a schedule was drawn up and labor cost calculations were calculated

4. Economy of construction - the calculation of the cost of construction work in the «ESTIMATION AVS» program.

CONTENT

INTRODUCTION

Economic and social development of the Republic of Kazakhstan The direction of construction until 2021 is a single, scientifically based, reasonable it is planned to bring it to a reasonable and high quality level. The most suitable for carrying out production work to strengthen the construction industry effective promising actions should be taken. We are also a major leader in the construction industry we must use technologies and mechanisms. Solve these problems through an automated control system will be.

Qualification of the existing building to increase the productivity of the construction industry solve the problem of formation. We deal with economic issues of construction projects and construction the effectiveness of projects using solutions in certain situations we have to deal with. Up to 30persent of the construction load through the effective use of these solutions can be reduced. In addition, the rules introduced in Euro code are strict stored. In addition to the proper layout of the premises, the relevant functional processes of the practicality of all buildings provided by rational distribution of vertical communications and engineering devices.

The building model is determined by life regularity, but at the same time it is designed according to the laws of beauty and urbanization. In today's fast-paced world, construction is one of indicators of a developing state, which should be in the top 30 the best states. The main purpose of construction is to create sustainable, comfortable and safe building for existence person. Cost reduction in construction is done right selection of space-planning solutions for buildings, rational selection of finishing and building materials, improvement construction methods. The main economic indicator in urban planning is the efficient use of land.

1 Architectural part

1.1 Architectural planning solution

The topic of the thesis was chose by social object, which is necessary for a given the area. The hospital are intended for treatment of people, and appropriate serving their treatment of every kind of sicknesses. The project" Hospital building for pre-fabricated technology "in the city of Ust-Kamenogorsk located at the eastern Kazakhstan region"

1) For conditional mark of 0.000 accepted the level of the clean floor of the first floor, with column foundation.

2 Working drawings are developed in accordance with the suitable standards of the country of Kazakhstan Designing of "Public buildings and structures with modern Planning and development of rural settlements. Car Parking", "Buildings and premises for institutions and organizations ", Technical regulation" General Technical regulations The space-planning decision of the building is determined by such conditions like high insolation, sound absorption of enclosing and bearing structures and the need to preserve many underground engineering networks

For the Maintenance components, Grounds keeping equipment and personnel, Security, patient, seminar room for doctors, Locker rooms, Vending equipment and supplies these conditions are more consistent with this designed building, at the same time having a modern configuration form. Lift capacity: LF1, LF2, LF3, and F4 - 1000 kg.

The building consists of 5 floors and the same of main building like; reception, kitchen, dressing room, office, hall, administration, shower for man and women, meeting room, reaction area, toilet and Gym are located at the 1st floor to the 2th, 3rd and 4th floor are the same that consist of kid hall, LUX room, terrace 3, 4, 5 and technical room. On the 5th floor: with one black and kid hall and double room.

Canals, drainages, foundation components, escalators, and staff rooms. In each of these blocks there are various cabinets characteristic for a certain type of block. All rooms are lit by natural light. The total height is 18.4m where starts from 1st floor with 4.3m to 3.3m, we have three block up to fort floor but in five floor I have just one block , 1st floor 4m and for the second floor 3.3m all block are the seam height . Vertical communications with patient provided by elevators. And flights of stairs located in 4 different parts of the building. The cost of the elevator and operating costs at times. Every emergency room has own elevator for patient for noisy station and patient we need insulation material for wall to keep the more sound. Of building. The staircase is designed for everyday use, made of prefabricated reinforced concrete elements. Two-flight staircase with plumage on landings. All doors are designed like in the stairwell and in the vestibule open towards the exit from the building, which meets the requirements according the standard also "Fire safety of buildings and structures, alarm system, camera security system are designed for every room.

1.2 Improvement of project

According to the weather of city and type of building mostly materials are prefabricated, structure scheme of the building like frame, wall self-supporting with crossbeams, structures are made from prefabricated reinforcement concrete.

For dimension of column according to the space between columns we can chose 40x40 with spaces 6m. for dimension of rooms like reception 3x4m it is enough for one or two persons, staff room need more bigger than 6.5x5m, for equipment we have some material so 15m2 and for toilets too. For kitchen we have 42 meter for staff and patient with restaurant 310m and others room has chosen according the standard of hospitals rule and what for illnesses. The wind rose, the main wind direction in the city of Ust-Kamenogorsk is southeast (28) percent the prevailing wind direction are northwest (15) percent and west.

1.3 thermomechanical calculation of the outer wall

According to the joint venture and location of city in south of the Republic of Kazakhstan 2.04-01-2017 ― Construction climatology‖ and "Construction heat engineering" it is important to determine the thickness insulation for the outer wall.

Climate characteristics

Climatic characteristics of the construction area:

-Outside air temperature:

-The average temperature in the coldest five days – 27 centigrade (reliability 0.98)

-Average temperature on the coldest days - 32 o C (reliability 0.92) –

-Wind speed pressure - 0.98 kilo Pascal (district I)

-Weight of snow layer – 0.8 kilo Pascal (I area)

-Maximum depth of soil compaction - 1.50 meter

-Seismic properties of the construction site - 7 points.

The thickness of the layer is 2.8–4.7 meters.

Below it are sand fillers there is a sand soil. Sandy soils do not have sedimentary properties. Threshold weight - 18.4kilo newton per meter, internal friction angle 22° maximum viscosity -7 kilopascal, modulus of deformation - 4.0 mega Pascal.

Heating period and there degrees-day 2.04-03-2011 Defined by "Thermal protection of buildings".

Tint = 22 deg. Internal design air temperature

Text = -27.3 deg External design air temperature (coldest five) Daily) mega Fran height 2.04-03-2011 "Thermal protection of buildings" 5-are accepted according to the appendix.

ΔTn = 4 normalized temperature fluctuations according to Table 2 2.04-03-2011 "Thermal protection of buildings" of the Ministry of Finance of the Republic of Kazakhstan.

According to the initial data and formula of degree-accuracy of heating season (GMS) to be determined.

$$G_{osp} = (tв\text{-}tотпер).\ Zотпер \quad (1)$$

where tв - buildings and structures in accordance with internal design air temperature in accordance with design standards, centigrade form 16 up to 18 centigrade.

From 8 centigrade according to the Civil Construction Climatology of the Civil Code of the Republic of Kazakhstan average daily temperature and duration of low and equal, day.

Table 1 - Material the outer wall properties

Name of material	Bulk density ϒ0 ,кg/м 3	Weight density λ, kN / m	δ,м
AAC Blocks Outer wall	650	0.6	0.01200
Extruded polystyrene foam M350	35	0.3	x
aluminium coating in a metal frame (building brick)	230	37	0.3
Cement-sand mortar	1800	0.79	0.03
Gypsum plastering	1600	0.015	0.16

For the city of Ust-Kamenogorsk:

Zотпер= 230 days; tотпер = -17 centigrade

$$Г_{СОП} = (26 + 17)\cdot 230 = 3936\ °C \cdot day$$

Resistance to heat dissipation of enclosing structures. Intermediate values should be determined by interpolation.

$$Rтр = 3{,}234 м \cdot C/Вт$$

Dd = 5450.4; normalized value of heat resistance 2.04-03- according the TL-RK 2011 is determined according to Table 4 —Thermal protection of buildings:

$$Rsi = \frac{1}{\alpha i};\ \alpha i = 8.7$$

– the surface of the structure for fencing internal heat supply schedule Instrumental heat technique »

$$R_{se} = \frac{1}{\alpha e} = 23$$

– coefficient of the outer structure of the fence Table of surface heating Table 6 TL-RK 2.04-107-2013 —Instrumental heat technique ».

The required heat transfer resistance of the enclosing structure is as follows determined by the formula:

$$R_0 = \frac{1}{a_i} + \frac{\delta_1}{\gamma_1} + \frac{\delta_2}{\gamma_2} + \frac{\delta_3}{\gamma_3} + \frac{\delta_4}{\gamma_4} + \frac{\delta_5}{\gamma_5} + \frac{1}{\alpha_e}$$

$$R_0 = \frac{1}{8.7} + 0.02\frac{x}{0.3} + 0.01 + 0.037 + 0.0937 = 0.42\frac{x}{0.3} = 5.08m \cdot ℃/w$$

X=1.4

R0=5.08 ≥ Rтр = 3.234m C / W

The condition is satisfied. We take the thickness of the insulation 140 mm.

The thermal inertia D of the building envelope should be determined according to the 15 formula 2.3:

$D = R_1 \cdot s\,1 + R_2 \cdot S_2 + R_3 \cdot S_3 + R_4 \cdot S_4 = \cdot 9.6 + 4.6 \cdot 7.91 + 0.67 + 9.6 = =37.1$

The thermal inertia of the building envelope is excellent.

1.4 Ant seismic activity

The main feature of the seismic retention of wonderful frame buildings is determined by the fact that these structures have a huge period own oscillation, which is how they differ from a frameless building. Complex frame structures own large reserves flexible plastic work and are allowed to work designs beyond limits of ductility and elasticity. Horizontal effort in complex frame buildings can perceived by its frame and with vertical connection, aperture or core rigidity. These complicated frames have a more correct frame.

Design scheme, which accompanies the optimization of various design decisions. The presence in complex frames of various additional element in the form of masonry, ties, and diaphragms acts to limit displacements of elements, replenishment of the stiffness of the building. Stiffness cores connections and stiffness diaphragms are designed continuous in height structures and should be located in two directions symmetrically, evenly in the center of stiffness. Buildings must be completed by dividing with ant seismic seams into certain compartments if: space-planning and constructive solutions are not determined requirements; centers of gravity differ in different blocks over 30%. Over the entire height of the building, anti-seismic seams should be divided into equal blocks.

Ant seismic seams are required to be performed by the method the construction of several paired frames, or separately frames and walls. Adjacencies blocks in the transition of anti-seismic seams should not always harm them combined horizontal movement during earthquakes. When erecting a building on non-rocky soils, the foundations of buildings, as usually settled on the same level. Technical floors should be built under the whole building. Elevator shafts and stairwells of complex frame buildings should be designed as stiffness cores accepting seismic load. Another option is possible, in the form of built in simple structures with uniform floor cutting, usually not affecting the stiffness frame. The load-bearing walls must be designed so that have flexible connections with the basic frame structures without harming horizontal displacements of the walls. Between columns of the frame and surfaces walls always provide a small gap of at least 20 mm.

2 Structural part

2.1 Baseline

The structural design of the building is designed as a wireframe. Building frame - columns, ceilings and stiffness diaphragms from monolithic reinforced concrete. The class of concrete is determined depending on the purpose of the structure for building.

- Floor slab used B25 class concrete, 300milimeter thick;
- For concrete slab B25 class, on sulfate-resistant Portland cement; -for columns and diaphragms of rigidity concrete class
- B25; section of columns – 400 ×400.

Monolithic reinforced concrete structures of the building are reinforced from valves class A400 (A-III) and A800 (AI).

-Soil category by seismic properties II. Seismicity district - 7 points

-Seismicity of the site-7 points;

2.2 Calculation of dead load

The load per square meter of floor is considered the same as in previous calculations the characteristic of load stat. (Appendix A, Table A.1)

2.3 Live load according EN1991

For term of temporary load we find according the type of building which kind of building we have category -c (hospital), – 5kilo newton per meter. Live load on the slab that max moment according live load is less than one.

$$M_{max} = -0.0617 < 1$$

2.4 Snow load calculation

According to the region and snow load my construction area is Ust-Kamenogorsk city snow region is $\mu_i = 0.8$, $C_e = 1$, $C_t = 1.2$ $= 2.8$

$$s = \mu_i \cdot C_e \cdot C_t \cdot s_k \quad (2)$$

where μ_i - Snow load coefficient

C_e- snow load efficient according the regain

s_k- standard on snow area

$$S = 0.8 \cdot 1 \cdot 1.2 \cdot 2.8 = 2.688\ Kpa = 2.6KN/m$$

According the result in Etabs the maximum moment =-0.004 and minimum moment =0.011 according to the Fieger.1 on: (Annex. A)

2.5 Wind load calculation

For wind load also we fine according the regen and Building dimension 30x30x7.5m. Ust-Kamenogorsk city- III wind region Calculation of wind load ox we need to divide our building height in 2 zones corresponding to the base height for external pressure z_e according the Euro code.b = 138 m; h = 15 м

So I need to calculate just for one height of my building Calculation of basic velocity of wind load for region 3 q_b=0.56 KN Wind pressure we equal to: P_{ce} = 0.8

$$w_e = \cdot Ze \cdot Pce \quad (3)$$

where Ze-height of building

Pce-Wind pressure according the region of wind

q_b- coefficient according zone of wind

$$w_e = 0.56 \cdot 18 \cdot 0.8 = 8.064KN/M$$

For wind load external pressure on side of building zone. For zone a half of my height and height of basement equal to 3.5mater, the result of wind load on :(Appendix. A)

Table 2.1 value of wind pressure

A	$c_{pe} = -1.2$	$c_e(18) = 3.0$	We = 3.0 · 0. 560 · (−1.2) · 3.5 = -7.5KN/m
B	$c_{pe} = -0.8$	$c_e(18) = 3.0$	We = 3.0 ·0. 560 · (−0.8) · 3.3 = 3.6KN/m
C	$c_{pe} = -0.5$	$c_e(18) = 3.0$	w_e = 3.0· 0.56 · (−0.5) · 3.3 = 4.4KN/m
E	$c_{pe} = -0.7$	$c_e(18) = 3.0$	w_e = 3.0· 0.560 · (−0.5) · 3.3 =3.8KN/m

2.6 Combinations of action for permanent design situation (basic combination)

All coefficient and formulas are taken from SR PK EN 1990 chapter 6 bases for designing loading structure.

$$\sum \gamma_{G \cdot GK} + \gamma_P \cdot P + \gamma_Q \cdot Q_K + \sum \gamma_Q \cdot \psi_{0.1} \cdot QK$$

$$j{\geq}1, i{>}1$$

All the that we fined before on program are saved we just click combination load the program automatically combined how much is possible

2.7- combination of action for seismic design situations

For calculation of action of seismic we need to combined load together all coefficient and formulas are taken of RTG (Regulatory-technical Guide) 8-01.2-2012 .for calculation of seismic on the building.

$$F_{ik}=\gamma_d \cdot S_d \cdot T_i m_{ik} \gamma_h \quad (4)$$

where γh, coefficient to the ground floor

S_d (T_i), the value of the spectrum

mik- effective modal mass referred to the point k

The number of floors in the building (except for the floor located below the planed Ground level, as well as the basement floor); the number of floors must be more than 5 the transition coefficient to the graphed can defined as follows.

$$\gamma h \cdot 9.81 = 11.57 \approx 12$$

The value of the spectrum of calculated reactions in acceleration at the period. Ti- is the period of oscillation in the i-th from in the considered horizontal direction, mik- effective modal mass referred to the point k, corroding to the i-th mode of vibration, determined using the expression. The combination of load case on :(Appendix A)

2.8 Combination of seismic impacts with other impact

The internal effects of the design seismic action should be determined considering the presence of masses associated with all gravitational loads included in the following combination of actions:

The standard formula for combination every king f load just depend on the coffined of load and some coffined of regen

$$\sum G_{kj} + \sum \psi_{E,i} \cdot Q_{k,i} \quad (5)$$

where $\Psi_{e,i}$ combination factor for variable

$Q_{k,i}$, combination load

The combination factor for variable action according SR PK EN 1998-1:2004/2011). Combination coefficient for variable action:

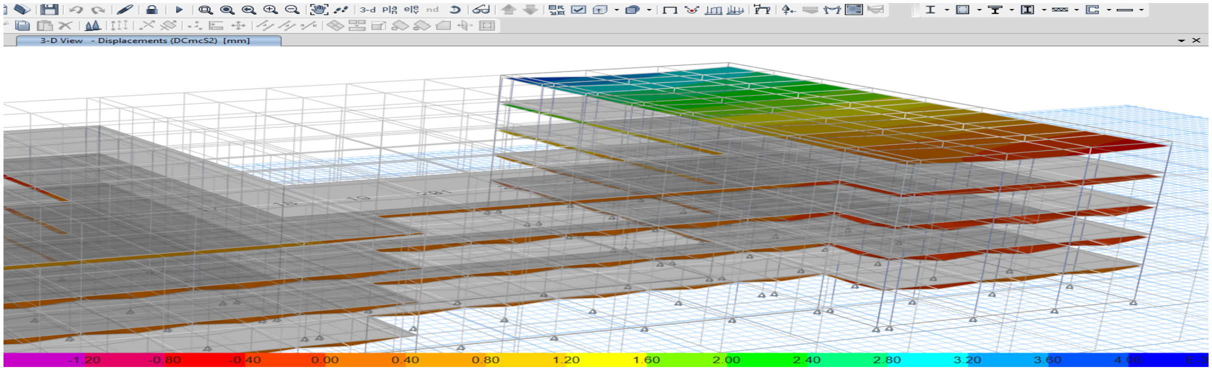


Figure 1 - Combination load case 2

2.9 Calculation of seismic loads

All coefficient and formulas are taken from RTG PK 08-01.1-2017'' design of earthquake-resistance building and structure " coarse sand soil- type III soil condition,

Which mean that the calculation for determining seismic loads along the X and Y axis in necessary, for horizontal calculation we don't consider the z axis.

$$0 \le T \le 0.15\ S_C(T) = ag \cdot s \left[1 + \frac{T}{T_B}(\eta \cdot 2.5 - 1)\right] \qquad (6)$$

where T -seismic period on seismic zone

a_g -Coefficient of seismic according the zone area equal to 0.09

Q- Value of the coefficient of behavior equal to 4

T_B and T_c -are the Coefficient of seismic according the zone area equal to 0.15and 0.5.

$0 \le T \le 0.15$ and we fine according the formula

$$0 \le T \le 0.15\ S_C(T) = ag \cdot s \left[1 + \frac{T}{T_B}(\eta \cdot 2.5 - 1)\right]$$

$$0.09 \cdot 0.05 \left[1 + \frac{2.5}{0.15}(1 \cdot 2.5 - 1)\right] = 0.118KN/m$$

$$0.15 \le T \le 0.5 = S_C(T) = ag \cdot s \cdot \eta = 0.09 \cdot 0.5 \cdot 1 \cdot 2.5 = \frac{0.01125\ \text{KN}}{\text{m}}$$

$$0.0.5 \le T \le 2.5 = S_C(T) = ag \cdot s \cdot \eta \cdot 2.5 \left[\frac{T}{T_B}\right] = 0.09 \cdot 0.5 \cdot 1 \cdot 2.5 \left[\frac{0.5}{2.5}\right] = 0.0225LN/m$$

$$2.5 \le T \le 4.5 = S_C(T) = ag \cdot s \cdot \eta \cdot 2.5 \left[\frac{T \cdot T_D}{T^2}\right] = 0.09 \cdot 0.5 \cdot 1 \cdot 2.5 \left[\frac{0.5 \cdot 2.5}{2.5^2}\right] = 0.0225KN/m$$

For vertical calculation we consider the other type of formula

$$0 \le T \le 0.15\ S_C(T) = avg \left[1 + \frac{T}{T_B}(\eta \cdot 3.0 - 1)\right] = 0.09 \cdot 0.05 \left[1 + \frac{2.5}{0.15}(1 \cdot 3.0 - 1)\right] = 3.98KN/m$$

$$0.15 \leq T \leq 0.5 = S_C(T) = \text{avg}\,[\eta \cdot 3] = 0.27KN/m$$

$$0.0.5 \leq T \leq 2.5 = S_C(T)\ \text{avg}\left[\eta \cdot 3\frac{T}{T_B}\right] = 0.54KN/m$$

$$2.5 \leq T \leq 4.5 = S_C(T) = \text{avg}\ \eta \cdot 3\ \left[\frac{T \cdot T_D}{T^2}\right] = 0.54KN/m$$

According the calculation we have less displacement according the seismic load the result of all seismic load on :(Appendix A)

3 Column calculation

For the calculation of column we need to find the force which we have on column: Then the main system is sequentially loaded with constant and temporary loads (N, M, H, p), which cause corresponding reactions and bending moments in the racks. Bending moments and shear forces in the column sections are determined both in the cantilever beam loaded with an external load and the reaction.

3.1 Determination of longitudinal forces from design loads

Load area of the middle column with a grid of columns 6.5×5.5 =35.7$м^2$.

- From overlapping according to the formula from 3.1

$$N_1 = \gamma_n g A_{гр} \tag{7}$$

where g – constant floor load,

$A_{гр}$ – Middle column cargo area

$$N_1 = 0.95 \times 5 \times 35.7 = 169.5 \text{ кN}$$

From the crossbar according to the formula from 3.2

$$N_2 = \gamma_n \cdot \gamma_f \cdot h_р \cdot b_р \cdot L_р \cdot \rho \tag{3.2}$$

where γ_f – Coefficient equal to 1.1

$h_р$ – Crossbar height

$b_р$ – Crossbar width

$L_р$ – Crossbar length

ρ – reinforced concrete density

$$N_2 = 0.95 \cdot 1.1 \cdot 0.8 \cdot 0.4 \cdot 6.5 \cdot 25 = 54.3 \text{ кN}$$

Column dead weight according to the formula from 3.3

$$N_3 = \gamma_n \cdot \gamma_f \cdot h_к \cdot b_к \cdot H_{эт} \cdot \rho \tag{8}$$

where $h_к$ – Column section height

$b_р$ – Column section width

$H_{эт}$ – Floor height

$$N_3 = 0.95 \cdot 1.1 \cdot 0.4 \cdot 0.4 \cdot 4 \cdot 25 = 16.72 \text{ кN}$$

From the coating is determined by the formula from 3.4

$$N_4 = \gamma_n \cdot \gamma_f \cdot g_{покр} \cdot А_{гр} \tag{9}$$

where $g_{покр}$ – temporary load from the coating

$N_4 = \gamma_n \cdot \gamma_f \cdot g_{покр} \cdot A_{гр}$ = 0.95×1.1×5×35.7 = 186.5кN

The total constant load is:

$N_{пост}$ = (169.5 + 54.3)·3.3 + 16.7· 5 + 186.5 = 1007.54кN.

Live load:

From the overlap is determined by the formula from 3.5

$$N_5 = \gamma_n \cdot \gamma_f \cdot \vartheta \cdot A_{гр} \cdot n_{перекр} \quad (10)$$

where ϑ – Temporary design load

N_5 = 0.95·1.2·6·35.7·4 = 976.7 кN

- From snow is determined by the formula from 3.6

$$N_6 = \gamma_n \cdot \gamma_f \cdot p \cdot A_{гр} \quad (11)$$

where p – Snow load

N_6 =0.95·1.4·2.6·35.7 = 123.4 кN

Longitudinal force acting on the column:

N = V_{Ed} = $N_{пост}$ + N_5 =1007.54 + 976.7 = -1984.24 кN.

The moment acting on the column

M= 3.66кN ·м.

3.2 Selection of section and calculation of the sectional area of reinforcement

The height of the section of the upper part of the middle columns is assigned taking into account the conditions of the support of the two crossbars on the end of the column; if ht <60 cm, symmetrical double-sided consoles are arranged along the top of the column.

Determined by the formula:

$$\frac{c_1}{h} = \frac{c_2}{h} = \frac{3}{40} = 0.075$$

where c_1 And c_2 – column reinforcement cover

h - Column length.

$$V_{Ed} = \frac{N_{Ed}}{(bhf_{cd})} \quad (12)$$

where a_{cc}- Compressive strength

f_{ck}- Axial compaction

γc-safety factor

$$V_{Ed} = \frac{-1984.24}{(400 \times 4000 \times 19.8)} = -0.062$$

$$f_{cd} = a_{cc}\left(\frac{f_{ck}}{\gamma c}\right) = 0.85\left(\frac{35}{1.5}\right) = 19.8\text{MPa}$$

$$a_{Eds} = \frac{M_{Ed}}{(bh^2 f_{cd})} \quad (13)$$

where M_{Ed} −the maximum moment on the Etabs program

B and h- are the thickness and width of column.

$$a_{Eds} = \frac{366000000}{(400 \times 4000^2 \times 19.8)} = 0.28$$

$$\omega_{tot} = 0.72$$

$$A_{s,tot} = \omega_{tot}\text{bh}/\left(\frac{f_{yk}}{f_{cd}}\right) \quad (14)$$

$$A_{s,tol} = 0.72 \times 400 \times 400\left(\frac{500}{19.8}\right) = 2094 mm^2$$

$A_{s1} = A_{s2} = 1454 mm^2$, accept 4Ø28S500 ($A_s = 2012 mm^2$).

We accept transverse reinforcement constructively on the basis of the following condition that the diameter should be at least 6 mm and not more than ¼d_{max}: Ø8S400

The step is taken based on the conditions:

- No more than 400 mm;
- No more than the minimum side of the section;
- No more $20d_{min}$.

The step is taken equal to 400 mm.

Check the percentage of reinforcement of the column:

$$\mu = \frac{A_s}{b \cdot h} \cdot 100\% = \frac{145}{400 \cdot 400} \cdot 100\% = \text{h} \cdot 100\% = 0.09\%$$

The value of the actual reinforcement percentage is in the parameters.

Assign the diameter of the cross roads:

dsw≥0, 25ds=0, 25·8=2 мм

According to the design rules, the lowest diameter of the transverse rebar rods in the frames should be at least 6mm, so we take dsw'6mm (A-I)

We assign a step of cross roads**:**

S_w≤15ds (not more than 500мм) =15·8=120мм

The calculation of the limits of the first group is test for carrying ability and resilience.

Checking the column's carrying capacity is reduced to checking the condition.

$$N \leq \varphi\,(R_b\,A + R_{sc}A_{s,\,tot})$$

$$0,\ 98*(14,\ 5*10^6 *0,\ 4*0,\ 4+365*10^6 *2012*10^{-6}) = 734382\text{N} = 7343.82\text{KN}$$

$$1984.24\ \text{KN} \leq 2434.61\text{KN}$$

Condition is being working.

The column is tested for stability according to the condition

$$\delta = \frac{N}{\varphi \cdot A} \leq R_b \cdot \gamma_C$$

$$\delta = \frac{1984.24}{0.98 \cdot 0.4 \cdot 0.4} = 12.6 Mpa \leq 14.5 \text{Mpa}$$

So the condition is met and according the Etabs result on fieger.3.2 :(Appendix B)

M_{max}= 0.24KN· M and Main= -0.089KN· M

We check the overlap, relative movement equals, 1.1-0.2= 0.9 KN· M

The flyby in both directions is,

$$L = 6600\text{mm}, \frac{l}{250} = 26.4$$

The condition is being met.

Relative in the rigs are also not significant, they do not exceed 1 mm, and the condition is fulfilled

4 Foundation calculation

4.1 Determination of geometric dimensions and selection of reinforcement

For design of column in safe program we consider about the

Footing size 0.8x0.8m (G+400) G is the column carrying with depth 1500mm Safe bearing capacity of soil is 250 kilo Newton per meter Settlement 8-9mili meter C30/37 f_{yk} = 500 newton per millimeter square for rebar

The standard load on the foundation is determined by the formula.

$$N_n = \frac{N}{\gamma_f} = \frac{1193.7}{1.4} = 1047\text{кN} \tag{14}$$

where γ_f – Average load factor for the reliability,

N – The max load on foundation

Moment according maximum force designing on safe program on :(Annex .B)

The depth of the foundation is determined by the formula.

$$d = d_\theta\sqrt{\sum_{i=1}^{n} M_i} \tag{15}$$

where d_θ – depends on the type of soil, equal to 0.3 m for clay in the second group,

$\sum_{i=1}^{n} M_i$ – Average annual sum of negative temperatures

$$d = 0.3\sqrt{8.3 + 5.7 + 3.5 + 2.6} = 1.3 \text{ м}$$

So we can take 1.5m

The area of the base of the foundation according to the formula.

$$\text{A} = \frac{N_n}{R - \gamma_m d} \tag{16}$$

where R – Design soil resistance equal to 0.041кN /cm^2,

R is the range of (0.1-0.5) Mpa

γ_m – The average load from the weight of 1 m^3 of the foundation soil and the soil on its ledges, equal to $20.86 \cdot 10^{-6}$ кN /cm^3

$$\text{A} = \frac{1193.7}{0.041 - 20.86\times10^{-6} \cdot 130} = 4772\ cm^2 \cong 5500$$

The length and width of the basement base are taken, in accordance with the unification condition, in multiples of 40 cm equal to 450 cm.

From the condition of anchoring according to the formula:

$$\text{H} = 24d_{max} + 25 \tag{17}$$

where d_{max} – maximum diameter of the longitudinal reinforcement of the column

H = 24·3.6 + 25 = 111.4 cm

We accept the useful height of the largest of the three options, in accordance with the unification condition, equal to 120 centimeter.

Determine the value of the coefficient using the maximum moment from safe the formula (4.3)

$$\alpha_{Eds} = \frac{M_{Ed}}{f_{cd}bd^2} \leq \alpha_{Eds,lim} \tag{18}$$

where d – Effective foundation height

$M_{\ Ed}$ – Moment acting on the foundation according design in Etabs

b – Width of the base of the foundation

f_{cd} – design axial compression resistance of concrete

$$\alpha_{Eds} = \frac{952.4 \cdot 10^6}{19.8 \cdot 4500 \cdot 113.0^2} = 0.037 \leq \alpha_{Eds,lim} = 0.76 \text{ KN}$$

d = h – c_1 = 120 – 7 = 113 cm

According to table B.1. Appendix B of [3] for normal concrete α_{Eds} = 0.85

And $\sigma_{sd} = f_{yd}$ = 435 MPa. ω = 0.037

The area of the required area of tensile reinforcement according to the formula.

$$A_{st} = \frac{1}{\sigma_{sd}} (\omega \cdot b \cdot d \cdot f_{cd} + N_{Ed}) \tag{19}$$

$$A_{st} = \frac{1}{435} (0.037 \cdot 4500 \cdot 1130 \cdot 14.2 + 955.4) = 2672.6\ mm^2$$

We accept 18Ø20S800 (A_s = 35.4 cm²)

Checking the condition for foundation

$$\alpha_{Eds} = \frac{m_{Ed}}{f_{cd} \cdot b \cdot d^2} < \alpha_{Eds,lim}$$

$$\omega = 0.015, \zeta = \frac{z}{d} = 0.995, z = 0.995 \cdot 1135 = 1129 mm$$

$$\alpha_{Eds} = \frac{9524 \cdot 10^6}{19.8 \cdot 800 \cdot 1130^2} = 0.012 < \alpha_{Eds,lim} = 0.76$$

According to table standard table and Appendix B for normal concrete α_{Eds} = 0.030 and $\sigma_{sd} = f_{yd}$ = 583 MPa. ω = 0.039

The area of the required area of tensile reinforcement according to the formula from

$$a_s = \frac{m_{Ed}}{f_{yd} \times z}$$

where $b_{eff} = b = 4.5m, A_s = a_s \cdot b_{eff} = 427 \cdot 4.5$ =1921mm², which is less than accepted18Ø20S800 (A_s = 35.4 cm²) the condition is met.

$$a_s = \frac{9524\cdot 10^6}{583\cdot 995} = 171\ mm^2$$

Maximum force that are acted on foundation Fieger on :(appendix, B)

The value of the maximum shear stress using the formula

$$v_{Ed} = \frac{\beta \times V_{Ed}}{u_1 \times d}$$

$$V_{Ed} = N_{Ed} - \sigma_0 \times A_{cont} \times 0.5$$

$$\sigma_0 = \frac{N_{Ed}}{A} \quad (20)$$

where Ned- maxim force on the foundation

A-Cross section area

$$A_{cont} = 0.4 \times 0.4 + 2.4 \times 0.45 \times 1.5 + \pi \times 1.5^2 = 18.31\ m^2$$

$$V_{Ed} = 8400 - 97.98 \times 1831 \times 0.5 = 1894.5\ \text{kN}$$

where $\beta = 1.15 -$ middle column

$$\sigma_0 = \frac{N_{Ed}}{A} = \frac{9524}{4.5 \times 4.5} = 97.98\ \text{kN}/m^2$$

Control Perimeter Length:

$$u_1 = 4.5 \times 0.4 + 2 \times \pi \times 1.1 = 12m$$

$$V_{Ed} = \frac{1.15 \times 189450}{12000 \times 1135} = 0.15\ N/mm^2$$

$$V_{Rd,c} = \left[0.12 \times k(100\rho_1 \times f_{ck})^{1/3}\right]$$

But not less

$$V_{Rd,c,min} = \left(0.035 \times k^{\frac{3}{2}} \times f_{ck}^{\frac{1}{2}}\right)$$

$$V_{Rd,c,min} = \left(0.035 \times 1.42^{\frac{3}{2}} \times 30^{\frac{1}{2}}\right) = 0.321\ N/mm^2$$

where:

$$k = 1 + \sqrt{\frac{200}{d}} = 1 + \sqrt{\frac{200}{1135}} = 1.41 \le 2mm$$

The all checking the condition for foundation according some value that we find form Etabs program.

5. Calculation of construction technological part

5.1 Earthwork

Determining the volume of work is one of the most important steps planning the volume of excavation forms the basis for determining methods Production of such works, the choice of necessary equipment for earthworks Works, machine-building organization, as well as the order and the cost of the work

For Preparation and detailing of initial data to calculated the earth working.

where, H – slope height;

a– laying of a slope or projection of a slope to the horizon;

m – Coefficient of a slope.

Table 5.1 initial data for calculation of earth work

Foundation type		Monolithic columnar	
Soil class	II		
Type of soil		Sandy gravel	
Coefficient of the steepness of a slope		0.5-0.25	
Range of transportation of soil	2Km		
Coefficient of an initial loosening	1.05		
Coefficient of a residual loosening	1.03		
Average winter temperature of external air	C^0	17	
Step and span in longitudinal and transvers directions (a and b)	m	a=6.5m b=5.5m	
Structure length, l_1	m	138m	
Structure width, l_2	m	54m	
The base of foundation mark, the depth of the pit (trench) (hp, htr)	m	Trench=(-2.20m)	
Level of water soil, howls	m	(-2.50m)	

5.2 The construction of temporary fencing

Prior to the construction work necessary to perform the construction temporary fencing, fencing perimeter determined by the formula (for the trench)

$$\text{P}_{fen} = (20 + l1) \cdot 2 + (20 + l2) \cdot 2, (m) \tag{21}$$

$$\text{P}_{fen} = (20 + 138) \cdot 2 + (20 + 54) \cdot 2 = 444m$$

where l_1,l_2– length and width of the structure in plan, distance from the axis of the building in each direction is 20 meter.

5.3 Removal of top soil

During trench excavation, removal of the top soil to be implemented at the area (only for the trench).

$$S\text{a} = (10+l1) \cdot (10+l2), (m2) \tag{22}$$

wherel_1 – the length of structure

L_2 – width of structure

$$S\text{a} = (10 + 138) \cdot (10 + 54) = 7992m^2$$

The total volume of top soil removal is calculated by the Formula.

$$V_{sr} = S_{1(a)} \cdot 0{,}15m, (m^3) \Rightarrow V_{sr} = 7992 \cdot 0{,}15m = 1198.8m^3$$

5.4 Soil excavation in the trench access

Calculation of the trench volume (V_{tr}) is carried out on the basis of longitudinal profiles and cross–sections of the separate sections. The volume of each trench section can be determined by the formula

$$V_{tr} = \sum L_1 \cdot F_a \tag{23}$$

where L_1 – full length of the trench per the scheme per meter

F_a– The average cross–sectional area of the trench meter square

$$F_a = \frac{(L_{2s.b} + L_{2s.t})h_{tr}}{2} \tag{24}$$

where M–slope factor

h_{tr}–depth of trench meter

$$L_{2s.b} = L_2 + (0.8 \cdot 2)m = 54 + 1.6 = 55.6m$$

$$L_{2s.t} = L_{2s.b} + 2mh_{tr} = 55.6 + 2(0.67)(-2.20) = 58.54m$$

$$L_{1s.b} = L_1 + (0.8 \cdot 2)m = 138 + 1.6 = 139.6m$$

$$L_{1s.t} = L_{1s.b} + 2mh_{tr} = 139.6 + 2(0.67)(-2.20) = 142.54m$$

$$F_a = \frac{(55.6+58.54)\cdot(-2.20)}{2} = 76.194m$$

$$V_{tr} = \sum L_1 \cdot F_a = 138 \cdot 76.19 = 10514.22m^3$$

5.5 Excavation of soil shortage

In the project, a manual soil treatment was adopted. Mechanization of cutting of under burden is carried out according to ENIR Collection E2. Earthwork. Mechanized and manual excavation.

The volume of soil shortage is calculated by the formula:

$$V_{\text{shortage}} = _{(tr)} \cdot \Delta h_{sh}, (m3) = 6072.2 \cdot 0.1 = 1214.4\ m3$$

where $_{(tr)}$ – area of the trench bottom:

Δh_{sh} – 0, 05up to 0, 2 – quantity of soil shortage level during excavation equal to:

$$F_{tr} = L \cdot l_{2s.b.} = 138 \cdot 44 = 6072m^3$$

5.5 Concrete preparation for foundations

In soft soils for monolithic foundations is arranged concrete preparation from lean concrete.

The quantity of concrete preparation for one foundation is (for columnar foundation):

$$W_p = F_p \cdot h_p(m^3) = 35.75 \cdot 0.1 = 3.75m^3$$

where, hp – thickness of concrete preparation, $h_p = 0{,}1m$;

F_p – Area of preparation: [5.2]

$$F_p = a_1 \cdot b_1\ (m^2) = 6.5 * 5.5 = 35.75m^2$$

For all foundation = 35.7*240=8568

where a_1 and b_1 – the dimensions of concrete preparation, ref. foundation section.

5.6 Reinforcement installation

Reinforcement consumption for the columnar foundation:

$$G_{1} = g_1 + g_2, t = 39{,}4 + 78{,}8 = 118.2 \, {}^{kg}/_{m^3}$$

Reinforcement weight distribution between grid and frame conditionally accepted.

5.7 Formwork installation

The quantity of formworks is equal to the area of the surfaces form. It is necessary to count the area of rectangular side faces of the foundation and trapezoidal inner glass surfaces.

The scheme of foundations reinforcement, type of reinforcement structures and reinforcing bars consumption in real conditions is included in the working drawings of the foundations. In the Course Project the amount of reinforcement work is defined as follows. Accepted the foundation reinforcement in the form of a horizontal grid at the bottom and vertical spatial frame at the entire height of the concrete preparation to the top of column footing.

$$(1.6 \cdot 2 + 1.6 \cdot 2)0.3 = 1.92m^2$$

$$(0.6 \cdot 0.9)4 = 2.16m^2$$

$$\text{Total} = 4.08 \cdot 240 = 979.2$$

5.8 Concreting of foundation

Concrete works quantity. Concrete quantity in the foundations is determined by geometry formulas with the use of plan and foundation section drawn earlier

$$V_{c/f} = V_f \cdot \text{a}, m^3 \qquad (25)$$

where $V_{c/f}$ – Volume of all columnar foundations per meter cube

V_f– Volume of concrete for 1 foundation meter cube

a– number of foundations in the plan (per the scheme)

$$v\text{f} = 2.2 \cdot 1.6 \cdot 1.6 = 5.63m^3$$

$$V_{c/f} = 5.63 \cdot 240 = 1351.2m^3$$

5.9 Formwork removal

The quantity of formworks is equal to the area of the surfaces form.

One=1.6·2.2·4 =14.08

Total=14.08·240 =3379.2 (2-3) days =74.2

5.10 Foundation waterproofing

In the course project adopted the following form of waterproofing – waterproofing coating. Painting is done by applying bituminous mastics to the surface to be painted. The number of applied layers is 2. Waterproofing is carried out in accordance with E4-3184.

For the columnar foundation:

$$S\_waterproof = [(0,3 \cdot 1,6) \cdot 4 + (0,9 \cdot 0,9) \cdot 4) + ((1,6 \cdot 1,6) - (0,9 \cdot 0,9))]a \cdot 2 = 13.82 \cdot 240 = 3316.8 m^2$$

where a– number of base in the plan equal to 240

5.11 Backfilling

The volume of soil to be backfilled in the trench gaps, in structures without basement, is calculated by the formula: [15]

$$V_{bf} = \frac{V_{tr} - V_{c/f}}{1 + K_{rl}}$$

$$V_{bf} = \frac{8568 - 1351.2}{1 + 1.03} = 7902.38 m^3$$

5.12 Soil compaction

Compaction volume is measured mainly by the area of compaction that can be found, given by the average value of the compacted layer thickness (for the trench).

$$V_{comp} = \frac{V_{bf}}{h_c}, m^2 \rightarrow = \frac{7902.38 m^3}{0.3 m} = 26341.26 m^2$$

where Vbf equal to 7902.38meter cube, backfilling volume.

hc– compacted layer thickness, 0, 2up to 0, 4 meter.

5.13 Final land planning

The final planning is made after the completion of all excavations and communication devices (for the trench):

Where s_1 is cutting area of the vegetation layer of the trench.

$$S_{planning} = S_{1(a)} - S_{building}, \text{m}^2 \quad (26)$$

$$S_{building} = L_1 \cdot L_2 = 138 \cdot 44 = 6072 \text{m}^2$$

$$S_{planning} = 6072 - 5248 = 854 \text{m}^2$$

1.14 Removal of temporary fencing

After finishing the construction work necessary to remove the construction temporary fencing, fencing perimeter determined by the formula (for the trench)

$$P_{fen} = (20 + 138) \cdot 2 + (20 + 44) \cdot 2, (\text{m}) = 444\text{m}$$

where, l_1,l_2– length and width of the structure in plan, respectively (per the task)

6 Method choice of complex mechanized earthworks process

For comparison to be chosen 2-3 cars of one or different types. Bulldozers to be used preferably to move the soil at a distance of 50–70 meters (depending on the power of a bulldozer). Maximum efficiency is achieved when moving soil at the following distances: for bulldozer on the basis of tractors DT–74, DT–75, T–4AP1 – 30–50 m; on the basis of tractors T–100, T–130 – 50–70 m; on the basis of tractors T– 180, DET250, T–330 – up to 150 m.

So: The average distance of soil haulage, (70 - 150)

According the volume the brand of the bulldozer, (DZ-37).

Soil volume moved dump truck, ($0.75m^3$).

Equipment factors, (108...130).

6.1 Selection of the excavator

Selection of excavator depends on the soil volume in the pit (trench), kind of excavator(E-150) →(ZE -1054)new, capacity of excavator=0.8). To determine the cost of $1m^3$ of soil in the pit (trench) for each excavator type:

$$c_{(1,2)} = \frac{1.08 c_{eqp-shift}}{p_{shf.pr}} \quad (27)$$

where Kind of excavator (E–153)

Capacity of excavator=0.8

1, 08 Ceqp – factor including overheads.

C_{eqp}-$shift$ – cost of equipment– shift of excavator =5.5;

$$c_{(1,2)} = \frac{1.08(6.8)}{3.12} = 2.3$$

6.2 Selection of mechanisms for soil compaction

Soil compaction work in the pits are implemented in two steps: I – soil compaction between the columns foundations; II – over the columns foundations. Shift operating performance of rollers is calculated by the formula:

$$P_{sh.o} = \frac{(B-b)\cdot V\cdot 1000\cdot h\cdot T}{m} 0.85 \quad (28)$$

where B– width of compaction line (annex. №1. Table. 4 = 3.5)

b – width of overlap of adjacent lines (0, 1–0, 2 m =0.5)

ν – average speed (4–6 km / h 3km);

h – width of the condensed layer, m =2.5

m– Required number of blows or passes= 9

$$P_{sh.o} = \frac{(3.5 - 0.15) \cdot 5 \cdot 1000 \cdot 2.5 \cdot 8}{9} 0.85 = 22194$$

6.3 Measures for water drainage and artificial lowering of groundwater

Dewatering can be assumed that 1 meter square of pit (trench) surface and vertical projections of the walls,

with fine–grained sands 0, 16;

-with medium–grained sands 0,24;

-with coarse sands 0,3–3,0;

With fracture rock material 0, 15– 0,5meter per hour

Water inflow into the pit (trench) in meter per hour can be calculated by the formula:

$$Q = (F_{a.b(\,tr)} + F_{sl}) \cdot \alpha \quad (29)$$

where, $(F_{a.b(\,tr)})$area of a bottom, pit (trench), meter cube

$Fsl.$ – Slope area, located below the groundwater level, $m2$

$$Q = (6072 + 41.4)0.3 = 1834.02 m^6/h$$

$$F_{a.b(tr)} = L \cdot l2s.\mathrm{b}$$

$$F_{a.b(tr)} => 138 \cdot 44 = 6072 m^3$$

$$F_{sl} = \left(h_{tr} - h_{gwl}\right) \cdot L => (-2.20 + 2.50) \cdot 138 = 41.4 m^2$$

where htr– pit or trench depth,

$hgwl$ – level of underground water, m (per the task equal to 2.5);

The depth of soil freezing H with the protection of ploughing surface, harrowing, or covering with melted soft snow is calculated by the formula:

$$\mathrm{H} = \mathrm{A}(4\mathrm{P} - \mathrm{P}^2) \quad (30)$$

$$H = 20(4 \cdot 0.476 - 0.476^2) = 33.68$$

Where, A– accepted factor depending on the P:

$$\mathrm{P} = -\frac{\sum \mathrm{z}.\mathrm{t}}{1000} \quad (31)$$

where$\sum z$ – the number of days with a freezing temperature (December–26d; January–28d; February–10d)

t – the average monthly freezing temperature (per the task=-17° C);

$$\mathrm{P} = \frac{28 \cdot 17}{1000} = 0.476$$

The depth of soil freezing H with insulation layer is calculated by the formula:

$$\mathrm{H} = \mathrm{A}\big((4 \cdot \mathrm{P}) - \mathrm{P}^2\big) \cdot C_{ins} = 33.68 \cdot 1.68 = 56.58$$

where, C_{ins}= 0.85,accepted factor depending on the type of insulation: for soft snow– 2,0–3,0,

A – Factor taking into account the soil insulation method for lowing to a depth of 35 centimeter (annex. №1. tab.1=20)

6.4 Work process scheme development with calculation of mine face operating conditions

During development of face parameters of excavator passes, equipped with shovel, first to be defined the largest width of the first (front) pass at the level of excavator datum level Bl in meter:

$$\mathrm{B}_l = 2 \cdot 0{,}9R_{dl} \tag{32}$$

Where Rdl– digging radius at the level of the parking, m =4.3).

$$\mathrm{B}_l = 2 \cdot 0.9 \cdot 4.3 = 7.74\text{m}$$

The largest width of the (front) pass at the topBp is calculated by the formula:

$$\mathrm{B}p = 2\sqrt{(0{,}9R_{max})^2 - ln^{\,2}}, \tag{33}$$

where, R_{max}– the maximum digging radius

ln– the length of working transfer Maximum width of the second (side) excavator pass:

$$\mathrm{B}p = 2\sqrt{(0.9 \cdot 3)^2 - 1} = 2.5\text{m}$$

$$B = b_1 + b_2, = 3.47 + 3.01 = 6.48m$$

where, $b_{1,2}$ – the maximum distance from the axis of excavator motion to the face frontal to meter.

$$b_1 = 0{,}9Rdl = 0.9 \cdot 4.3 = 3.47$$

$$b_2 = 0{,}7Rdl = 0.7 \cdot 4.3 = 3.01$$

In order to reduce the average work cycle duration, the rotation angle of the excavator front sinking should take no more than 70–90gerad.

6.5 Selection of vehicles for the construction of excavations and trenches

As a set of equipment for haulage of extra soil out of trench and ensuring of joint work with excavator to be chosen dump trucks. Dump trucks are selected by two parameters: the capacity of the body and carrying capacity.

Kind of dump truck (type GAZ-52A), with loading capacity=2, 5, the solid soil we can use for extra soil trench.

6.6 Selection of the assembly crane and freight–catching devices

Cranes selected by the technical parameters: load capacity, hook lifting height, working radius and the largest load moment for column foundation with self-propelled jib crane. Kind pf crane depend on the type of foundation and installation of column

If the strip foundation with monolithic column we chose tower crane,

If per-fabricated and column foundation chose the self-propelled jib crane.

Lifting height of crane

$$Hr = h1 + h2 + h3 + h4$$

$$Hr = 0 + 2.2 + 1 + 15 = 19.5$$

where, $h1$ – the height of mounted structure from the crane base (taken equal to 0),meter.

$h2$ – the height of mounted element (1, 5÷2) meter.

$h3$ – the height from the top level of the structure to the bottom of the cargo (0,5÷1 meter).

$h4$ – the height of lifting equipment (2÷4, 5) meter

Also we cane sleeted according the lifting equipment.

Crane hook radius Lcr, m, is calculated by the formula:

$$Lcr = l1 + l2 + l3 \qquad (33)$$

where Lcr– mounting radius

$l1$ – the distance from the pivot axis to the mount joint of crane boom (3÷3, 5), m;

$l2$ – the smallest admissible distance from the slope basis to the closest support of the crane (portable, wheel, caterpillar), for tower cranes – to a sleeper design at not bulk soil

$l3$ – the distance the structure outer surface or its protruding part

$$Lcr = 3.5 + 3 + 27 = 33.5m$$

Crane hook axis, to be taken as equal to the half of the structure width $l2/2$. 54/2=27meter.

7. Design of concrete works

7.1 Formwork and reinforcement works

The formworks for column is equal to the area of the surface form. 1600$m^{2.}$
But my column are prefabricated.
For formwork to internal wall consider the wall between the column axes 24.

$$\text{Area of longitudinal wall}=L\cdot B=6.5\cdot 0.3=1.92m^2$$

$$\text{Volume of wall}= 1.92\cdot 4= 7.68m^3$$

$$\text{Volume of timber}= 0.01\cdot 6.5\cdot 4= 0.26m^3$$

Formwork for slab: For calculation formwork for slab consider the area surface.
Area of slab= 37488m^2 but I don't needed my slab is prefabricated.

7.2 Reinforcement work

Foundation Reinforcement: in foundation for 1m^3 of concrete it consumes 40kg reinforcement. Reinforcement consumption for the column foundation:

$$v_f=1.6\cdot 1.3=2m^3$$

$$v_{c/f}=2\cdot 240=480m^3$$

$$G= 480\cdot 40=19200kg/m3$$

Reinforcement for slab: the consumption of reinforcement for slab for floor slabs are 65kg per m^3.

$$\text{Volume of slab}= 44985m^3$$

$$G= 44985\cdot 65=291817kg/m^3$$

8 Determination of work labor input and crew composition

Total labor costs and wages are obtained by multiplying the amount of work on the standards of time and rates.

Labor costs of processes in man– hours are determined by the formula:[2]s

$$Q_{m-hour}. = V \cdot \text{Ntr.} \quad (34)$$

Where, V– volume of work,

Ntr – Standard time =0.15

$$Q_{m-hour} = 444 \cdot 1.2 = 532.8$$

And in man–days defined as:

$$Qm{-}day = \frac{\text{Qm−hour}}{8.2} = \frac{532.8}{0.82} = 64$$

The number of shifts take depending on the method of manufacture of works. During mechanized method their implementation using machinery number of shifts take at least two, and the processes performed without applying machines are usually one shift

The membrane hydraulic waterproofing need only one level – 10÷15 cm above the planned level of the ground. Cost calculations of machine time, labor costs and salary.

Check the correctness of the graphics on the coefficient of uneven movement of workers:

$$\text{K}u = \frac{n_{max}}{n_{av}} = \frac{2}{1} = 2$$

where, n– the maximum number of workers at the facility;

navy – the average number of worker:

$$nav = \frac{\sum Q}{p_{total}} = \frac{666}{666} = 1$$

where, Q – total labor input (labor costs);

The membrane hydraulic waterproofing need only one level – 10÷15 cm above the planned level of the ground.

$$Pm = \frac{Nm.sh}{n \cdot A} = \frac{1}{1 \cdot 2} = 0.5$$

where, N (m.sh) =1, required number of machine–shift;

n =1, number of machines;

A =2, number of shifts per day.

Duration of manual processes is:

$$P\text{p} = \frac{Q}{n \cdot A} = \frac{64.9}{2 \cdot 10} = 3.24$$

where, Q–labor costs, (human – day);

n– Number of workers per shift.

The number of shifts take depending on the method of manufacture of works. During mechanized method their implementation using machinery number of shifts take at least two, and the processes performed without applying machines are usually one shift

CONCLUSION

The building I am planning is a Sport complex with a stadium Factors affecting the environment in construction due to construction observed. That is why it is one of the factors that have a detrimental effect I thought that cars pollute the atmosphere and this is a harmful effect I calculated the results. One of the main sources of air pollution in construction harmful substances emitted from motor vehicles.

That's we must take into account the pollution of the air with these harmful substances. That's what we are perform the above calculations. Based on the results of those calculations - in our construction that the operating vehicles do not pollute the air much showed. Thus, the above calculations are based on the territory of the object Harmful concentrations threshold possible was dosage showed lower concentrations. Therefore, in the object Calculations from sources of pollution may be limited can be assumed to be. The location of the projected object is significant for the environment does not have a negative effect. The following results were achieved during the writing of the diploma project:

The architectural solution of the building is, first of all, the lifting structures should be stabilized in the right choice. Modern construction is high allows you to use a series of positional systems, including monolithic skeletal leading position. The structure of light farms has a large range construction of structures, reinforced concrete slabs, crossbars and beams as a necessity. Prefabricated ceilings and covers application of industrial work in the construction of the building allows to reduce the term; Calculation of structures with the help of computer technology There is a possibility that it is a software package ETABS. Calculate through this and

The assembly process is capacious, all in the design schedule of the building including seismic effects, including recording the effects with the required load in other words. Built various elements of the main building accurate on the basis of load combinations, sections and stiffness's gives the result; In addition, the department of technology of construction production is all designed taking into account modern methods and techniques of production. It is also an effective choice of construction machinery and equipment It is better to reduce the time and complexity of the labor process calendar planning increases the efficiency of construction; estimates of the objectivity and feasibility of the construction project allows you to evaluate. It is also the ABC-4 software package significantly simplifies calculations; The impact of construction on the environment in modern society assessment is important, and appropriate action should be taken; In any industry, including construction, human resources are subject to the law

LIST OF REFERENCE

1. EUROCODE 0 – EN 1990 Basis of Structural Design
2. EUROCODE 1 - EN 1991 Actions on Structure
3. EUROCODE 2 . EN 1992 Design of Concrete structure
4. EUROCODE 7 . EN 1997 Geotechnical design,
5. EUROCODE 8 .EN 1998 Design of structures for earthquake resistance
6. SNiP RK 2.04-03-2002 Construction heat engineering, Construction
7. Dimensions and rules of construction of the RK. CN RK 2.04-01-2016

Construction climatology. - Most. 2017-01-05. -Astana: Construction of the Ministry of Industry and New Technologies of the Re and Agency for Housing and Communal Services, 2016. -20p.

8. Construction norms and rules. CN 2.01.07-85 *. Loads and effects. - Enter. 1987-01-01. M .: Goss troy of Russia, GUP CPP, 2003, p betrayal. - 60s.

9. Dimensions and rules of construction of the RK. CN RK 2.03-30- 2006. Construction in seismic areas. - Most. 2018-01-07. -Astana: Ministry of Industry and New Technologies of the Republic of Kazak Agency for Construction and Housing, 2006. -80p.

10. Dimensions and rules of construction of the RK. CN RK 3.01-01- 2008. Urban development. Urban and rural construction design. - Most. 2017-01-06. Astana: Agency for Construction and Housing of the Ministry of Industry and New Technologies of the Republic of Kazakhstan,

11. Dimensions and rules of construction of the RK. CN RK 3.02.02- 2001. Public buildings and structures. - Astana: Construction works of the Ministry of Industry and New Technologies of the Republic o Committee on, 2001. -84p.

12. Dimensions and rules of construction of the RK. CN RK 3.02-20- 2004. Cultural and entertainment institutions. 2005-01-01.- Astana: Ministry of Industry and New Technologies of the Republic o Committee for Construction and Housing, 2005. -44p.

13. Dimensions and rules of construction of the RK. CN RK Sh.2.6-3- 2000. Floors. - Astana: Committee for Construction of the Ministry of Industry and New Technologies of the Republic of Kazakh 28p.

14. Dimensions and rules of construction of the RK. CN RK 3.02-06- 2009. Roofs and roofs. - Astana: Construction and Housing Affairs of the Ministry of Industry and New Technologies of the Republic o Agency, 2009. -67p.

15. Dimensions and rules of construction of the RK. CN RK 2.02-05- 2002. Fire safety of buildings and structures. - Astana: Construction of the Ministry of Industry and New Technologies of the Republic and Agency for Housing and 44 Communal Services, 2009. –36p

Appendixes

Appendix A

Table A.1- Load state

1.Own weight	Characteristic of load Kg/M
1.1Floor concrete external wall, floor height of 4m	
Concrete preparation δ=150мм,ρ=1700 кg/м^3	0.15 · 1700 = 255
Water proofing layer δ=20 мм, ρ=1400 кg/м^3	0.02 · 1400 = 28
Extruded protoplast δ=40мм, ρ=35 кg/м^3	0.04 · 35 = 1.4
Cement sand plaster δ=300мм, ρ=1600 кg/м^3	0.3 · 1600 = 800
total	1084.4.4·4= 40KN/M
2.2 for a typical floor external concrete wall height of 3.3m	
Water proofing layer δ=20 мм, ρ=1400 кg/м^3	0.15 · 1700 = 867
Extruded protoplast δ=40мм, ρ=35 кg/м^3	0.02 · 1400 = 28
Extruded protoplast δ=40мм, ρ=35 кg/м^3	0.04 · 35 = 1.4
Cement sand plaster δ=300мм, ρ=1600 кg/м^3	0.3 · 1600 = 800
total	1084.4·3.3=31KN/M
1.floor floor external curtain wall height of 4m	
Mullion Aluminum framed	0.2 · 2600 = 520
Glass thickness	0.03 · 2500 = 75
Air gap	0.01 = 0
Total	595·4=23.34KN/M
for a typical floor external curtain wall height of 3m	
Mullion Aluminum framed	0.2· 2600 = 520
Glass thickness	0.03 ·2500 = 75
Air gap	0.01 = 0
Total	595·3.3=19.2KN/M
1.1Floor concrete eternal wall, for floor height of 4m	
Concrete preparation δ=150мм,ρ=1700 кg/м^3	0.31 · 1700 = 527
Water proofing layer δ=20 мм, ρ=1400 кg/м^3	0.02 · 1400 = 28
Extruded protoplast δ=40мм, ρ=35 кg/м^3	0.04 · 35 = 1.4
Cement sand plaster δ=100мм, ρ=1600 кg/м^3	0.1 · 1600 = 160

Continuation of appendix A

Continuation of A.1

	Characteristic of load Kg/M
total	444.4 · 4=17.4KN/M
2.2 for a typical floor eternal concrete wall height of 3.3m	
Water proofing layer δ=20 мм, ρ=1400 кg/м^3	0.15 · 1700 = 255
Extruded protoplast ,δ=40мм, ρ=35 кg/м^3	0.02 · 1400 = 28
,Extruded protoplast ,δ=40мм, ρ=35 кg/м^3	0.04 · 35 = 1.4
Cement sand plaster ,δ=100мм, ρ=1600 кg/м^3	0.1 · 1600 = 160
total	444.4x3.3=14.3KN/M
Waterproofing δ=5мм, ρ=0.06 кг/м^3	0.005 · 0.06 = 0.0004
Total	675.0012
	Loading characteristic load Kg/m
	515.66 X4=20.234KN/m
3.3 partition (height=4m)	
Ceiling guide profiles δ=15мм,ρ=15 кг/м^3	0.015 · 4.2 · 15 = 0.945
Support rack profiles δ=10 мм,ρ=15 кг/м^3	0.01 · 4.2 · 15 = 0.63
Insulation δ=100мм,ρ=500 кг/м^3	0.1 · 4.2 · 500 = 210
Gypsum plasterboard δ=15мм,ρ=800 кг/м^3	0.015 · 4.2 · 800 = 50.4
Total	261.975
4.Horizontal ground pressure	2.57 т/м2

Table A.2- Stiffness for floor

Story	Output Case	Case Type	Step Type	Step Number	Shear X kN	Drift X mm	Stiff X kN/m	Shear Y kN	Drift Y mm	
Story5	SLX1	LinStatic	Step By Step	1	176.92032110...	0.170057339...	1040356.870...	5.835827537...	0.008432279...	
Story4	SLX1	LinStatic	Step By Step	1	716.5364637...	0.196060712...	3654666.226...	8.485718030...	0.010924894...	
Story3	SLX1	LinStatic	Step By Step	1	1166.2037930...	0.265025630...	4400343.428...	1.1177329128...	0.013660714...	
Story2	SLX1	LinStatic	Step By Step	1	1475.880350...	0.348519199...	4234717.489...	2.245301774...	0.015356056...	
Story1	SLX1	LinStatic	Step By Step	1	1657.297044...	0.628320800...	2637660.637...	3.013163172...	0.023621821...	
Story5	SLY	LinStatic	Step By Step	1	8.955264466...	0.127950863...	0	1990.353612...	1.363995745...	14
Story4	SLY	LinStatic	Step By Step	1	1.567926045...	0.1711460676...	0	8061.035216...	1.777383850...	45
Story3	SLY	LinStatic	Step By Step	1	4.400790466...	0.225467704...	0	13119.792671...	2.5667611835...	511
Story2	SLY	LinStatic	Step By Step	1	8.448093631...	0.298727302...	0	16603.65393...	3.599534249...	46
Story1	SLY	LinStatic	Step By Step	1	1.474927025...	0.538018803...	0	18644.59174...	6.937650740...	268

Continuation of appendix A

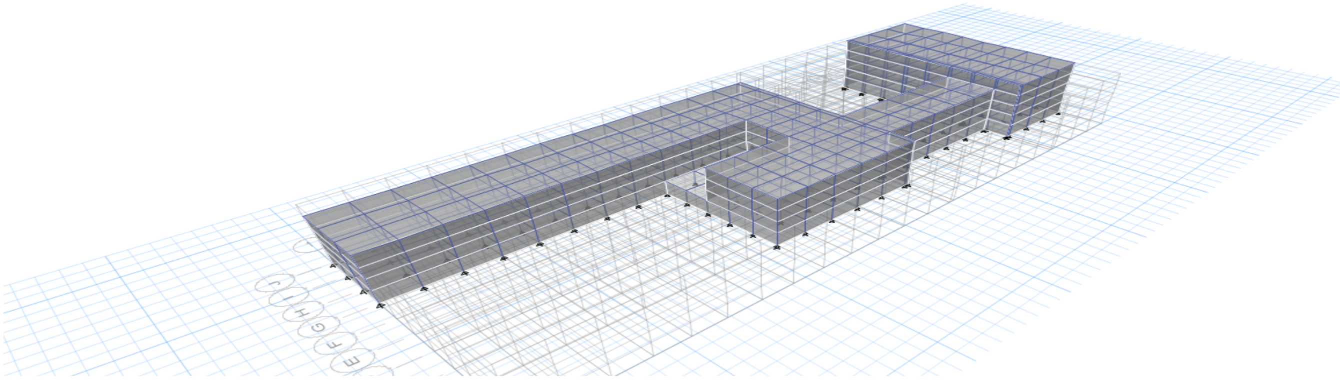


Figure A.1-3Dview of building

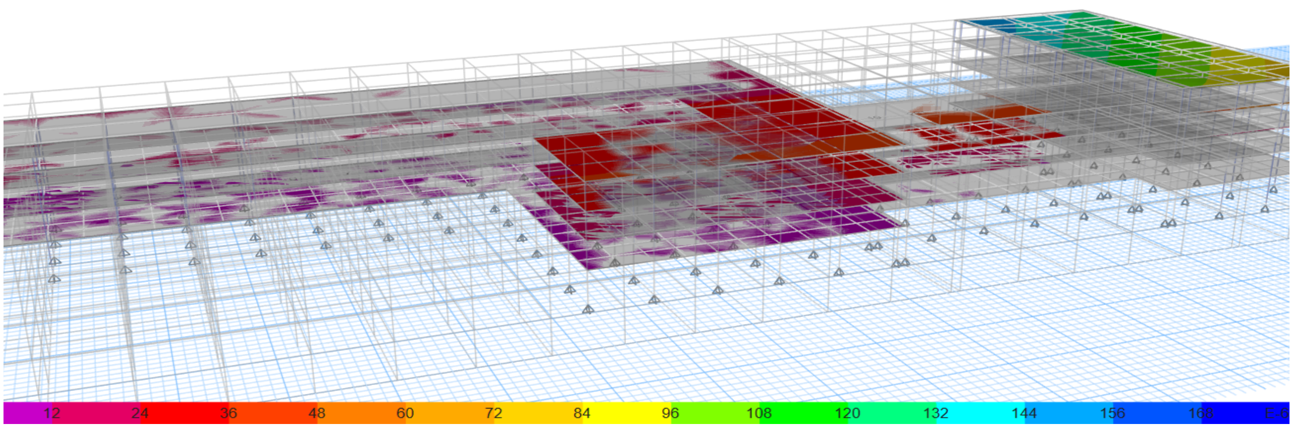


Figure A.2- wind load

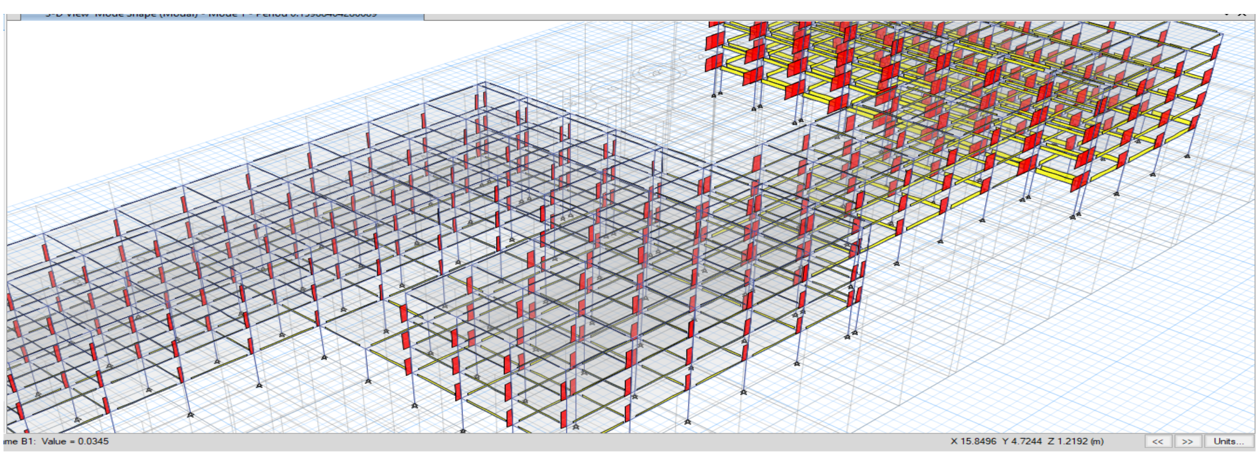


Figure A.4- torsion

Continuation of appendix A

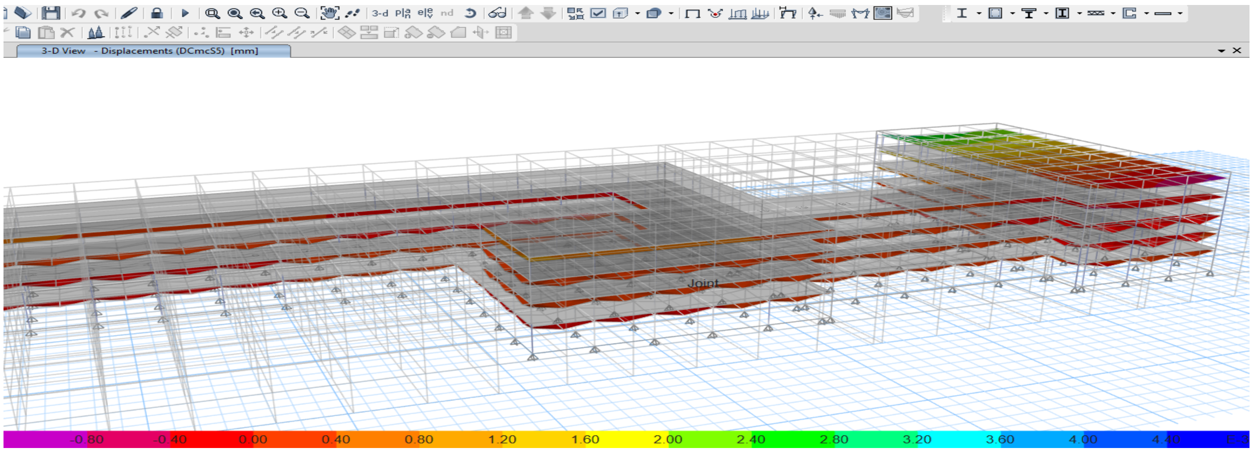


Figure A.5-Combination load case seismic

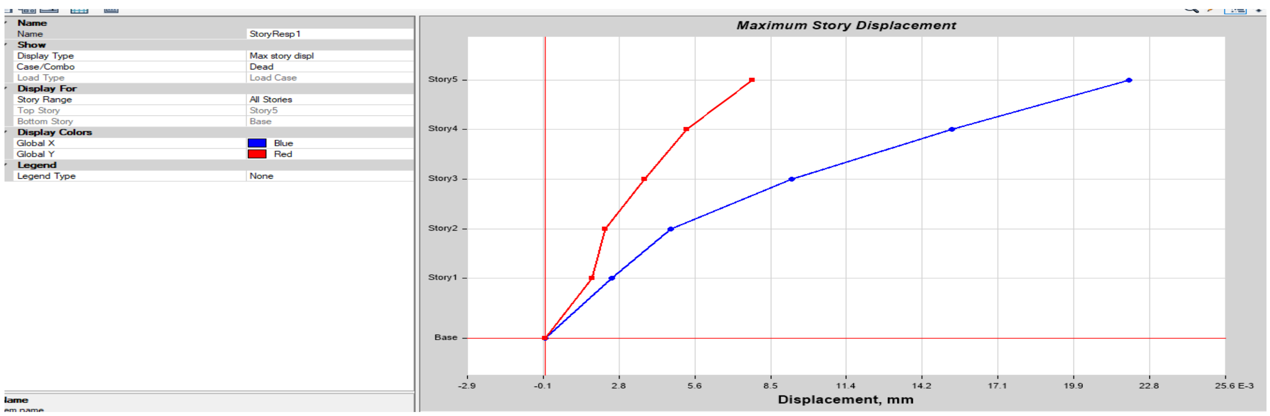


Figure A.6 maximum displacement

	Longitudinal Bars							Stirrups		
Item	A	B	C	D	E	F	G	Zone A	Zone B	Zone C
Bar Sizes										
Smallest Bar Size	#13SM	#13SM	#13SM	#13SM	#13SM	#13SM	#13SM	#10SM	#10SM	#10SM
Largest Bar Size	#29SM	#29SM	#29SM	#29SM	#29SM	#29SM	#29SM	#19SM	#19SM	#19SM
Preferred Bar Size	#19SM	#19SM	#19SM	#19SM	#13SM	#19SM	#19SM	#10SM	#10SM	#10SM
Bar Numbers & Spacing										
Minimum Number of Bars	2	0	2	0	2	2	0			
Maximum Number of Bars	-	-	-	-	-	-	-			
Minimum Spacing (mm)								76	76	76
Maximum Spacing (mm)								610	610	610
Maximum Spacing (Factor of d)								0.5	1	1
Zone Length (Factor of d)								2		
Minimum Number of Stirrup Legs								2	2	2
Maximum Number of Stirrup Legs								4	4	4
Stirrup Type								90 Deg	90 Deg	90 Deg

Figure A.7 Size of bars

Continuation of appendix A

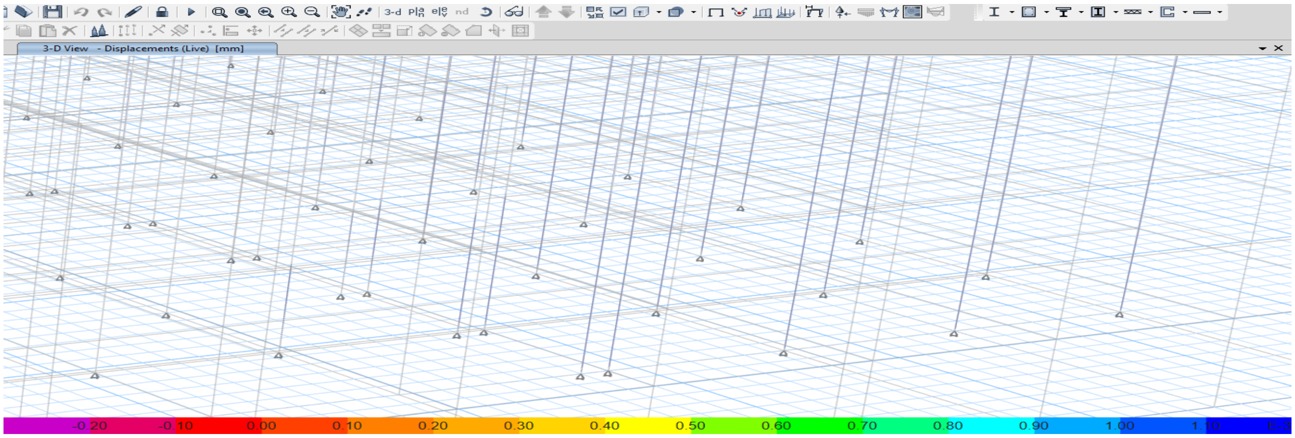


Figure A.8- M_{max} on column

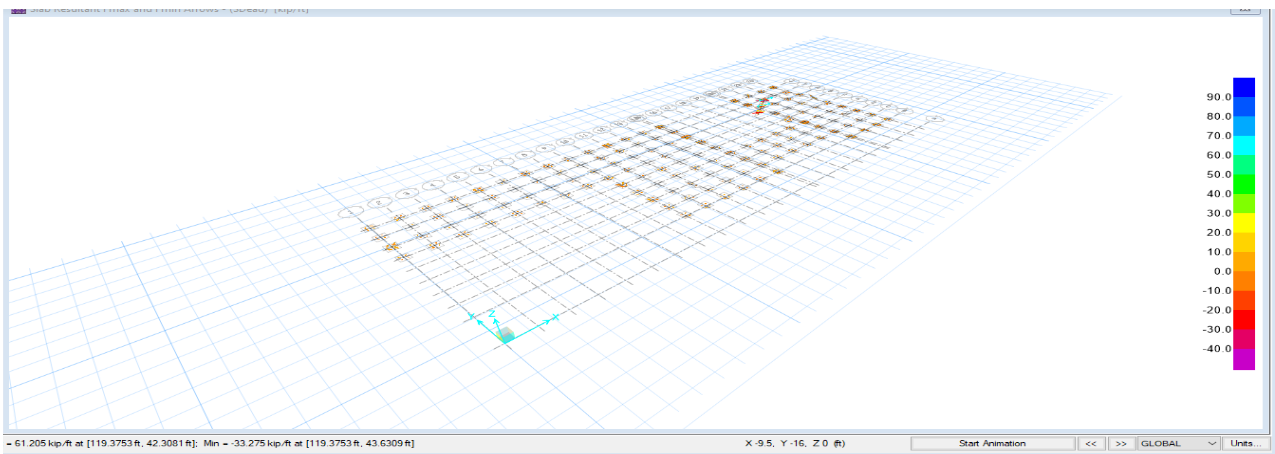


Figure A.9-Maxim moment on foundation

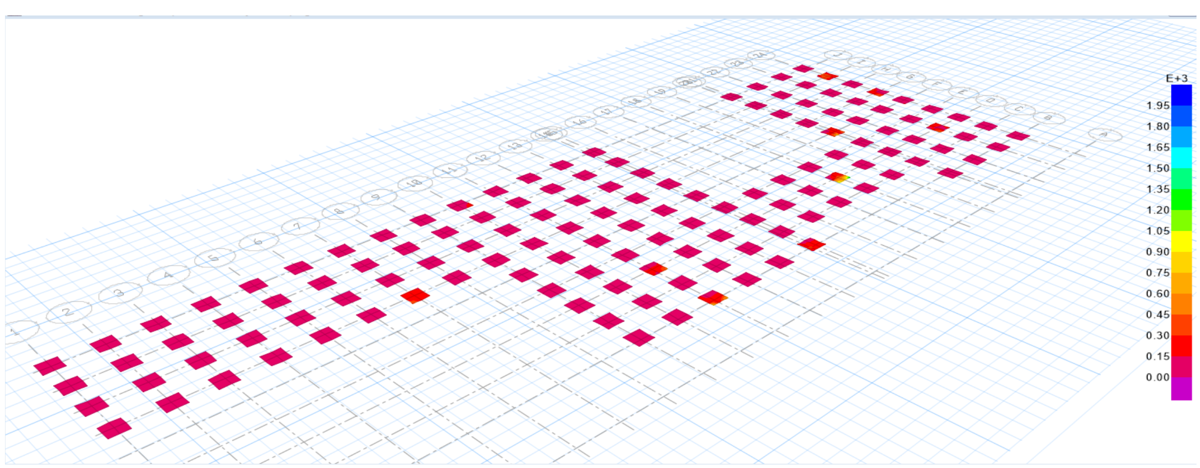


Figure A.10 displacement acceding snow load on foundation

Continuation of appendix A

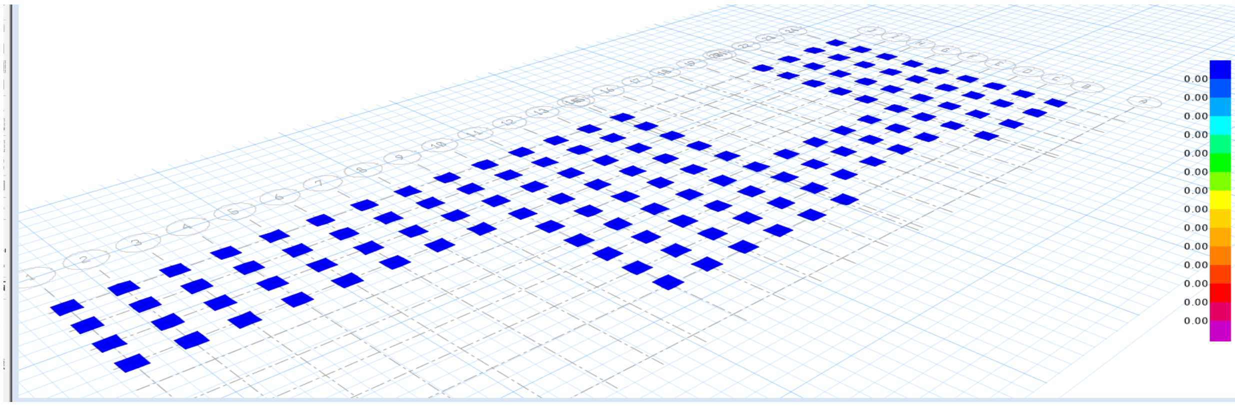


Figure A.11 wind load according y axis

Appendix B

Table B.1-bill of quantity

Name of processes	Unit of measure	Volume of Work	
		On one base	In total
The construction of temporary fencing	m	444	
Removal of top soil	M^3	1198.8	
Soil excavation in the trench and trench access to the pit	M^3	10514.22	
Excavation of soil shortage	M^3	6072	
Concrete preparation for foundations	M^3	10-15	
Reinforcement installation,	t	141.55	
a) grids installation	Pieces/t		
b) frames installation	Pieces/t		
Formwork installation	M^2	979.2	
Concreting of foundations	M^3	1351.2	
Formwork removal	M^2	3379.2	
Foundation waterproofing	M^2	3316.8	
Backfilling	M^3	7902.38	
Soil compaction	M^2	26341.26	
Final land planning	M^2	854	
Removal of temporary fencing	m	444	

Continuation of appendix B

Table B.2-lobar cost

(Name of processes)	(Volume of work)		Standard time		Quantitation,(u.e)		Lobar cost		Salary	
	Unit measurements)	Quantity	Working(h-h)	Drivers(m-cm)	working	Drivers	Working(h-d)	Drivers(m-cm)	Working	Drivers
The construction of temporary fencing	10 M	444	1.2	-	1.3	-	64.9	-	577.2	-
Removal of top soil	$1000m^2$	1198	-	0.56	-	0.6	175.3	81.8	1557.4	718.8
Soil excavation in the (trench) and trench access to the pit	$100M^2$	10514.22	2.8	3.56	1.48	1.7	401.23	556.6	15560.7	17873.8
Excavation of soil shortage	M^3	6072	1.64	-	0.54	-	1214.3	2636	3278.8	10322.4
Concrete preparation for foundations	M^3	8568	0.79	-	0.49	-	825.5	453.62	4198	14565.6
Reinforcement installation	t	141.55	22.17	-	15	-	1120.7	61.42	2123.2	240.63
Formwork installation	M^2	979.2	0.36	0.12	0.35	0.17	42.9	14.32	342.75	166.4
Concreting of foundations	M^3	1351.2	1.2	0.89	0.34	0.31	197.7	146.6	459.4	418.8
Formwork removal	M^2	3379.2	0.31	0.15	0.08	0.10	127.7	61.8	270.33	337.9
Foundation waterproofing	$100M^2$	3316.8	10	-	7.15	-	4044.8	60.67	23217.6	331.68
Backfilling	M^2	7902.38	-	0.39	-	1.58	9637.04	375.84	55316.6	12485.7
Soil compaction	$100M^2$	26341.26	-	0.92	-	0.26	32123.4	2955.2	184388	6848.7

Appendix C

Table C.1 Local cost

										form No1
Name of Object -			Hospital building for pre-fabricated technology in Ust-Kamenogorsk							
Name of the Building -			Hospital building for pre-fabricated technology in Ust-Kamenogorsk							
								Object Number -		
					LOCAL ESTIMATE No		№ 2-1-1			
			(Calculation of Local Estimation)							
	on the		Hospital building for pre-fabricated technology in Ust-Kamenogorsk							
Основание:										
				Estimated Cost						151687
				Normative Labor Intensity						62016
				Estimated Wages						1857.78
	Compiled in prices for 01.1. 2001 y									
N п/п	Code and No position of the standard	Name of Works and Costs, Unit of Measures	Quantity		unit Cost(1), Tenge		Total Cost, Tenge		overhead costs	Labor costs, per,h, construction workers
					Total	opera. Machines	Total	opera. Machines		
					Salary of construction workers	Salary of drivers	Salary of construction workers	Salary of drivers	Tenge	workers, serving machines
									%	in one
	SECTION 1 Earthworks									
1	E0101-30-3									
2	E0101-11-14	Development of soil of group 2 with loading on dump trucks excavators with bucket with a	23000	25.99	25.16	597770	578680	181826.50	0.01	230

		capacity of 2.5m3								

Continuation of Appendix C

Continuation of Table C.1

3	E0101-27-2	Backfilling of trenches and pits bulldozers with a capacity of 37(108) kW (hp) at movement of soils of group 2 up to 5 m	6072	3.35	3.35	20341	20341	6832	--	--
		м3		--	1.16	--	7044	97	_	
4	E0101-130-1	Soil compaction trailed pneumatic rollers running, 25 t, for the first pass one track at a thickness layer 25 cm	22194	14.01	14.01	310938	310938	103335.264	-	-
		m2		-	4.80		106531	97	0.02	444
		TOTAL SECTION 1 DIRECT COSTS	Tenge			929626	910536	292102		230
			Tenge			17940	283196			1134
	The cost of installation work -		Tenge			929626				
	Materials -		Tenge							
	Total salary -		Tenge				301136			
	The cost of materials and structures -		Tenge							
		Overhead costs -	Tenge			292102				
		Normative labor intensity in H.P. -	pers.-h							68
		Estimated wages in H.P. -	Tenge				43815			
		Irregular and unforeseen costs -	Tenge				947152			
	TOTAL, the cost of installation work -		Tenge				2168880			
		Standard labor intensity -	pers.-h							1432
		Estimated salary -	Tenge				327011			
		TOTAL SECTION 1	Tenge				2168880			
		Standard labor intensity -	pers.-h							1432
		Estimated salary -	Tenge				327011			
				SECTION 2 FOUNDATION						

Continuation of Appendix C

(Continuation of Table C.1)

				SECTION 2 FOUNDATION						
1	E0106-50-2	The construction of temporary fencing	444	799.97	235.22	355187	104438	69021	0.56	249
		м2		74.25	73.80	32967	32767	105	0.15	67
2	E0106-57-1	Soil excavation in the (trench) and trench access to the pit	10514.22	4604.04	289.29	48407889	3041659	46644260	25.90	272318
		m3		4146.75	78.30	43599842	823263	105	0.30	3154
3	E0108-4-7	Excavation of soil shortage	6072	245.44	3.82	1490312	23195	277929	0.21	1275
		м3		37.35	1.44	226789	8744	118	0.01	61
4	E0106-1-15	Concrete preparation for foundations	8.5	6490.82	100.65	55172	856	1645	0.97	8
		m3		146.25	38.03	1243	323	105	0.19	2
5	C12041-4	Reinforcement installation	141.55	799.97	235.22	113236	33295	22004	0.56	79
		t		74.25	73.80	10510	10446	105	0.15	21
		TOTAL SECTION 2 DIRECT COSTS	Tenge			50421796	3203442	47014859		273930
			Tenge			43871351	875544			3304
	The cost of installation work -		Tenge			50421796				
	Materials -		Tenge							
	Total salary -		Tenge				44746895			
	The cost of materials and structures -		Tenge							
		Overhead costs -	Tenge			47014859				
		Normative labor intensity in H.P. -	pers.-h							13862

Continuation of Appendix C

(Continuation of Table C.1)

		Estimated wages in H.P. -	Tenge				7052229			
		Irregular and unforeseen costs -	Tenge				53242687			
	TOTAL, the cost of installation work -		Tenge				150679342			
		Standard labor intensity -	pers.-h							291096
		Estimated salary -	Tenge				7927773			
		TOTAL SECTION 2	Tenge				150679342			
		Standard labor intensity -	pers.-h							291096
		Estimated salary -	Tenge				7927773			
SECTION 3. COLUMN										
1	E0106-15-1	Reinforcement installation	141.55	965.37	760.62	136648	107666	63445	1.42	201
		м2		204.75	222.12	28982	31441	105	0.45	64
2	C12041-28	Formwork installation	979.2	7207.00	148.00	7057094	144922	210317	38.00	37210
		m2		200.35	38.30	196183	37503	90	0.22	215
3	E0106-1-15	Concreting of foundations	1351.2	6490.82	100.65	8770396	135998	261449	0.97	1311
		m3		146.25	38.03	197613	51386	105	0.19	257
4	E0106-15-1	Formwork removal	3379.2	965.37	760.62	3262178	2570287	1514603	1.42	4798
		m2		204.75	222.12	691891	750588	105	0.45	1521
		TOTAL SECTION 3 DIRECT COSTS	Tenge			19226317	2958873	2049814		43520
			Tenge			1114669	870918			2056
	The cost of installation work -		Tenge			19226317				
	Materials -		Tenge							
	Total salary -		Tenge				1985588			

	The cost of materials and structures -		Tenge							
		Overhead costs -	Tenge			2049814				

Continuation of Appendix C

(Continuation of Table C.1)

		Normative labor intensity in H.P. -	pers.-h							2279
		Estimated wages in H.P. -	Tenge				307472			
		Irregular and unforeseen costs -	Tenge				19349306			
	TOTAL, the cost of installation work -		Tenge				40625437			
		Standard labor intensity -	pers.-h							47855
		Estimated salary -	Tenge				1178391			
		TOTAL SECTION 3	Tenge				40625437			
		Standard labor intensity -	pers.-h							47855
		Estimated salary -	Tenge				1178391			
`SECTION 4. WALLS										
1	E0106-50-1	Foundation waterproofing	3316.8	965.37	760.62	3201939	2522824	1486635	1.42	4710
		m2		204.75	222.12	679115	736728	105	0.45	1493
2	E0108-6-7	Construction of reinforced concrete walls up to 4 m high,	121.36	10182.71	5.80	1235774	704	201273	9.96	1209
		m3		1579.50	--	191688	--	105	1.63	198
3	E0108-4-5	Backfilling	790238.00	665.48	8.23	525508	65033	5315431.21	0.47	371412
		m2		81.68	3.08	640062	2433933	118	0.02	15805
4	E0106-5-1	for Soil compaction	26341.00	965.37	760.62	25428811.17	20035491	11806392	1.42	37404
		m3		204.75	222.12	5393320	5850863	105	0.45	11853
5	E0115-14-1	External cladding on a concrete surface individual ceramic tiles on polymer-cement mastic of walls	7452	2621.30	3.76	19533928	28020	1484874.342	1.04	7750
		m2		188.33	1.44	1403435	10731	105	-	-

		TOTAL SECTION 4 DIRECT COSTS	Tenge							

Continuation of Appendix C

(Continuation of Table C.1)

			Tenge			8307620	9032254			29349
	The cost of installation work -		Tenge			49925960				
	Materials -		Tenge							
	Total salary -		Tenge				17339874			
	The cost of materials and structures -		Tenge							
		Overhead costs -	Tenge			20294604				
		Normative labor intensity in H.P. -	pers.-h							22592
		Estimated wages in H.P. -	Tenge				3044191			
		Irregular and unforeseen costs -	Tenge				4213234			
	TOTAL, the cost of installation work -		Tenge				74433798			
		Standard labor intensity -	pers.-h							474425
		Estimated salary -	Tenge				12076445			
		TOTAL SECTION 4	Tenge				74433798			
		Standard labor intensity -	pers.-h							474425
		Estimated salary -	Tenge				12076445			
		Standard labor intensity -	pers.-h							474425
SECTION 5. SLAB										
1	E0106-50-2	Final land planning	854	799.97	235.22	683174.38	200877.88	132756.435	0.56	478.24
		m2		74.25	73.8	63409.5	63025.2	105	0.15	128.1
2	E0106-1-15	Construction of Slab concrete	44985.6	6490.82	100.65	291993432	4527801	8704444	0.97	43636
		м3		146.25	38.03	6579144	1710802	105	0.19	8547
3	E0106-62-1	Reinforcement work	19200					--		
				2404.72	385.72	46170624	7405824		11.58	222336

		m3		1683	104.40	--	2004480	105	0.20	--
4	E0106-50-2	Reinforcement for slab	291817	799.97	235	233444845	68641195	45363682	0.56	163418

Continuation of Appendix C

(Continuation of Table C.1)

m3		74.25	73.80	21667412	21536095	105	0.15	43773
TOTAL SECTION 5 DIRECT COSTS	Tenge			572292076	80775697	54200882		429868
	Tenge			28309966	25314402			52448
The cost of installation work -	Tenge			572292076				
Materials -	Tenge							
Total salary -	Tenge				53624368			
The cost of materials and structures -	Tenge							
Overhead costs -	Tenge			54200882				
Normative labor intensity in H.P. -	pers.-h							24116
Estimated wages in H.P. -	Tenge				8130132			
Irregular and unforeseen costs -	Tenge				575544129			
TOTAL, the cost of installation work -	Tenge				1202037087			
Standard labor intensity -	pers.-h							506431
Estimated salary -	Tenge				33444535			
TOTAL SECTION 5	Tenge				1202037087			
Standard labor intensity -	pers.-h							506431
Estimated salary -	Tenge				33444535			
Standard labor intensity -	pers.-h							506431
TOTAL DIRECT COSTS BY ESTIMATE:	Тенге			692795774	110500621	123852262		1170032
	Tenge			81621546	36376315			88291
The cost of installation work -	Tenge			692795774				
Materials -	Tenge							
Total salary -	Tenge				117997861			

The cost of materials and structures -		Tenge							
	Overhead costs -	Tenge			123852262				

Continuation of Appendix C

(Continuation of Table C.1)

	Normative labor intensity in H.P. -	pers.-h							**62916**
	Estimated wages in H.P. -	Tenge				18577839			
	Irregular and unforeseen costs -	Tenge				700226910			
TOTAL, the cost of installation work -		Tenge				1516874946			
	Standard labor intensity -	pers.-h							1321239
	Estimated salary -	Tenge				54954154			
Стоимость общестроительных работ -		Tenge							
Всего заработная плата -		Tenge							
	Overhead costs -	Tenge							
	Estimated wages in H.P. -	Tenge							
	Irregular and unforeseen costs -	Tenge							
ВСЕГО, Стоимость общестроительных работ -		Tenge							
	Estimated salary -	Tenge							
	ИТОГО ПО СМЕТЕ:	Tenge				1516874946			
	Standard labor intensity -	pers.-h							1321239
	Estimated salary -	Tenge				54954154			
Recalculation of totals into prices for 1.05.2021 г.									
Total direct costs					692795774				
Overheads Costs									

Irregular and unforeseen costs								

Continuation of Appendix C

(Continuation of Table C.1)

TOTAL in prices for1.01.2001 г.				1516874946				
Total with the cost of seniority		1532043695.87						
Total with the cost of additional leave	6067500	1538111195.66						
Total with taxes, fees and obligations. Payments	1.167008	5365547094.93						
alue added tax(НДС)	12 %	643865651.39						
Total with value added tax (НДС)				6009412746				

Appendix D

Table D.1- object estimation

OBJECT ESTIMATE

Estimated Cost	151687	Thous.Tenge
Normative Labor Intensity	13.213	Thous.pers.h
Estimated Wages	5495.41	Thous.Tenge

Compiled in prices for 01.1. 2001 y

№ п/п	No. of estimates and calculations	Name of works and costs	Estimated Cost, Thous. Tenge				Normative Labor Intensity	Estimated Wages
			construction and installation works	equipment, furniture and inventory	other costs	Total		
1	2	3	4	5	6	7	8	9
1	1	Administrative Building	151687	--	--	151687	38.082	2736.023
2		Total	151687	--	--	151687	38.082	2736.023
3		Temporary buildings and structures	1668.557	--	--	1668.557	38.082	2736.023
4		Return of materials from temporary buildings and structures	250.28355	--	--	250.28355	38.082	2736.023
5		Total	1668.557	--	--	1668.557	38.082	2736.023
6		Total	153355.557	--	--	153355.557	38.082	2736.023
7		Additional costs in the production of work in the winter	1840.266684	--	--	1840.266684	38.082	2736.023

8		Seniority costs			1533.55557	1533.55557	38.082	2736.023
9		Additional vacation costs			613.422228	613.422228	38.082	2736.023
10		Total	1840.266684		2146.977798	3987.244482	38.082	2736.023

Continuation of appendix D

Continuation of Table D.1

11		Total	155195.8237		2146.977798	157342.8015	38.082	2736.023
12		Including refundable amounts	250.28355		--	250.28355	38.082	2736.023
13		Total according to the estimated calculation in the base prices of 2001.	155195.8237		2146.977798	157342.8015	38.082	2736.023
14		Total estimated at current prices in 2021.	530769.717		7342.664069	538112.3811	38.082	2736.023
15		Including refundable amounts in current prices	855.969741			855.969741	38.082	2736.023
16		Taxes, fees, mandatory payments,			10762.24762	10762.24762	38.082	2736.023
17		Estimated cost at current price level	530769.717		18104.91169	548874.6287	38.082	2736.023
18		НДС (12%)			65864.95544	65864.95544	38.082	2736.023
19		Construction cost	530769.717		83969.86713	614739.5841	38.082	2736.023

Appendix E

Table E.1- Estimate of cost

Compiled in prices for 01.1. 2001 y						
№ п/п	No. of estimates and calculations	Name of works and costs	Estimated cost, Thous.Tenge			Total,Thous. Tenge
			construction and installation works	equipment, furniture and inventory	other costs	
1	1	Administrative Building	151687.49	--	--	151687.49
2		Total=1 row	151687.49	--	--	151687.49
3		Temporary buildings and structures 1,1%*2 row 7column	1668.56239	--	--	1668.56239
4		Return of materials from temporary buildings and structures 15%*3r7c	250.2843585	--	--	250.2843585
5		Total=3 row	1668.56239	--	--	1668.56239
6		Total 2r+5r	153356.0524	--	--	153356.0524
7		Additional costs in the production of work in the winter1,2%*6r7c	1840.272629	--	--	1840.272629
8		Seniority costs 1%*6r7c			1533.560524	1533.560524
9		Additional vacation costs 0,4%*6r7c			613.4242096	613.4242096
10		Total 7r+8r+9r	1840.272629		2146.984733	3987.257362
11		Total 6r+10r	155196.325		2146.984733	157343.3098
12		Including refundable amounts=4r	250.2843585		--	250.2843585
13		Total according to the estimated calculation in the base prices of 2001..=11r	155196.325		2146.984733	157343.3098
14		Total estimated at current prices in 2021. 13r*3,42	530771.4316		7342.687788	538114.1194

Appendix F

Table F.1 explication of premises first floor plan

Number	Name	Area M^2
1	Vestibule	26
2	Hall	260
3	Reception	12
4	Staff room	32
5	Cleaning equipment	15
6	T, women	15
7	T, men	15
8	Those room	15
9	Restaurant	300
10	Corridor	290
11	Dishes washing room	13
12	Kitchen	42
13	Those room	16
14	Restaurant	310
15	Corridor	9.5
16	Dressing room, women	10
17	Dressing room, men	10
18	Shower, women	10
19	Shower, men	10
20	T, women	15
21	T, men	15
22	Office	16
23	Gyp	365
24	Medical paragraph	31
25	CPA zone	63
26	Meeting room	64
27	Reaction area	380
28	Restroom	32
29	Restroom	32
30	Hall	3
31	Administration	32
32	Washing room	32
	Total	2463

Safety requirement during construction

During construction, a large amount of work takes on finishing work, so the following measures are considered

Irrigation equipment used for plastering and painting works must have a leak-proof coating;

Plastering works 114 when operating using a plastering station a, it is necessary to ensure two-way communication between the operator and the installation driver;

Use liquid fuel air heaters to listen to the premises

Safety of vehicles and people on the construction site

The organization of the construction site, work sites and workplaces ensures the safety of workers at all stages of work. [24]:

We limit the area of the construction site to the existing fences of the design organization;

We will install protective fences for areas of hazardous industrial factors that are constantly working to prevent unauthorized access to the construction site The boundary of the danger zone where the load may fall (from the outer perimeter of the building 5 m.) surrounded by signal barriers.

The boundary of the danger zone of the electrical shield 1.5 limited by protective fences with a radius of m;

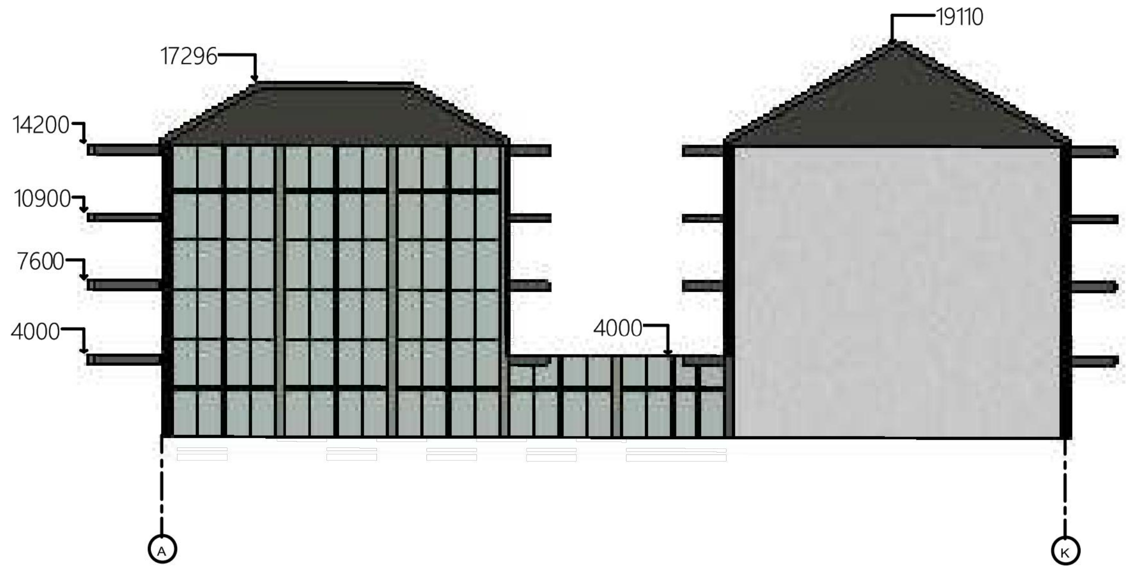
Road width 3.5 m. warehouse locations 4.5 with an extension of up to m, even at turning points 4.5 meter.

At the entrance to the construction site we will install a traffic diagram of vehicles, and on the roadsides and sidewalks we will install good road signs regulating the traffic of vehicles;

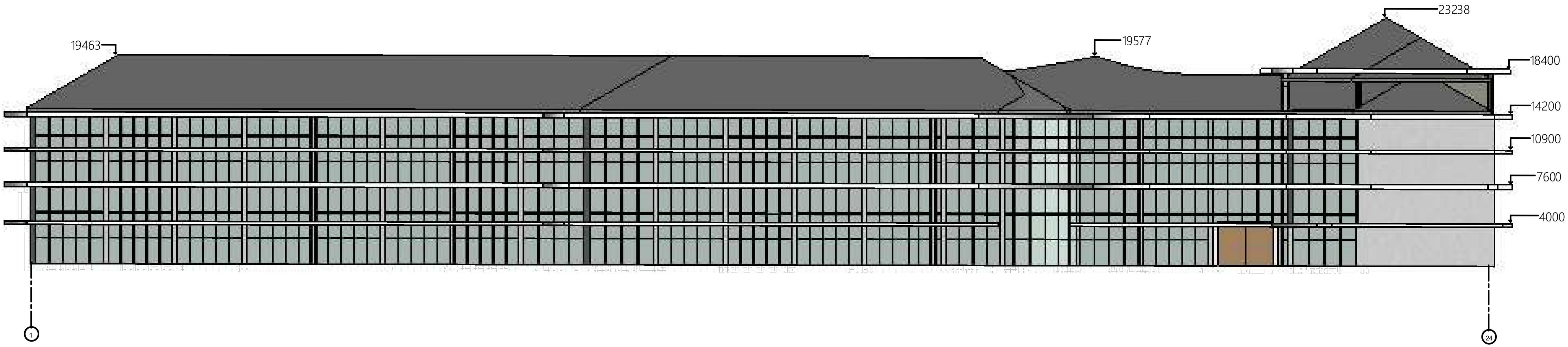
Width of entrance and exit to the construction site 4 m is carried out through the gate.

Electrical safety. Violation of the rules of technical operation of the equipment, contact with live parts, and contact with live parts under voltage due to failure of insulation or earthling devices can lead to the following types of electrical injuries: electric burns; metallization of the skin; tearing; electric shock.

North view 1:100

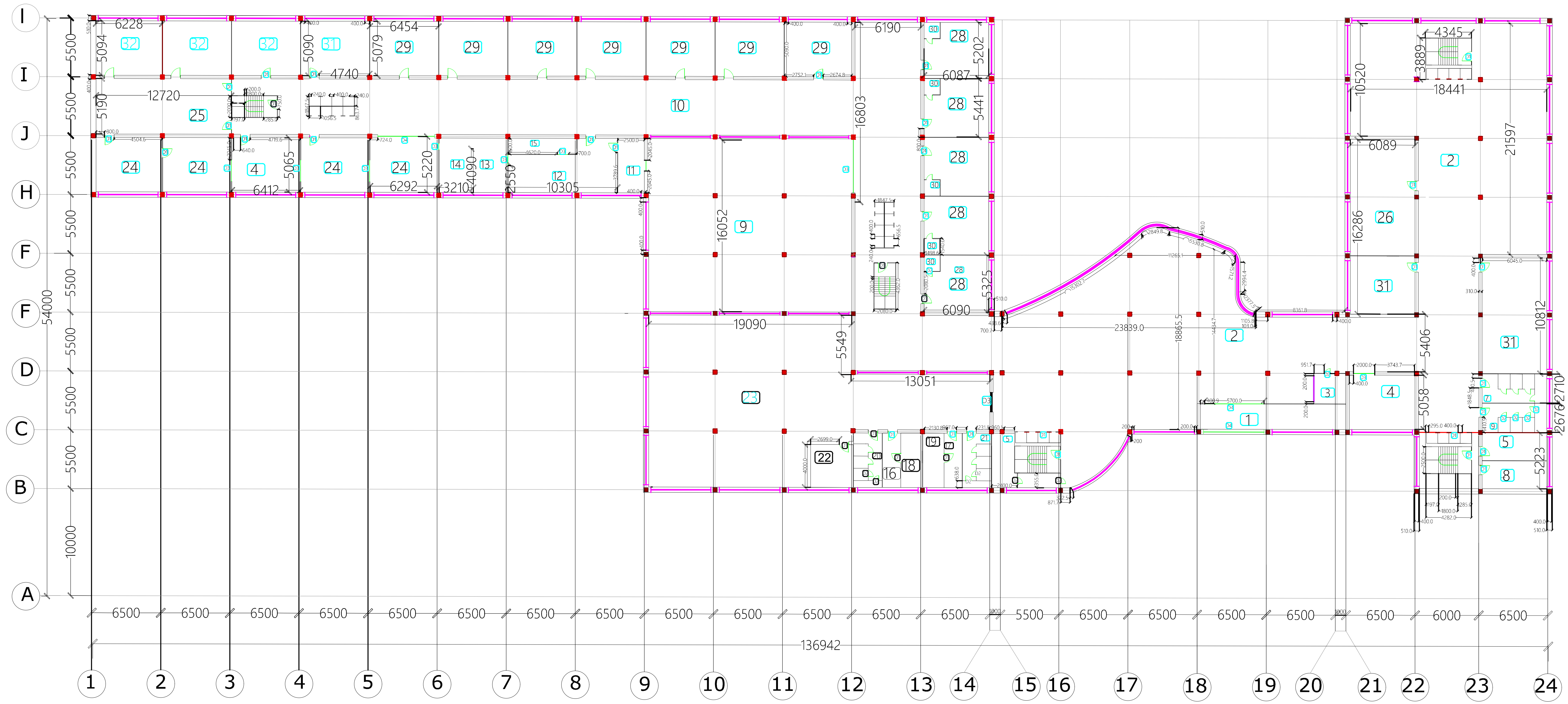


South View 1:100



					KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP				
					Hospital building for pre-fabricated technology in Ust-kamenogorsk				
Chan	Num.par.List	№doc	Sign	Date					
Head of Dep	Kozyukova .N.V				Architectural design part	Stage	List	Lists	Unit
supervisor	Zhambakena Z.M					DP	1	10	mm
Consultant	Zhambakena Z.M								
N.Controller	Bek.A.A				front and side elevation	Civil engineering and building material			
Created	Amiri .H								

First floor plan



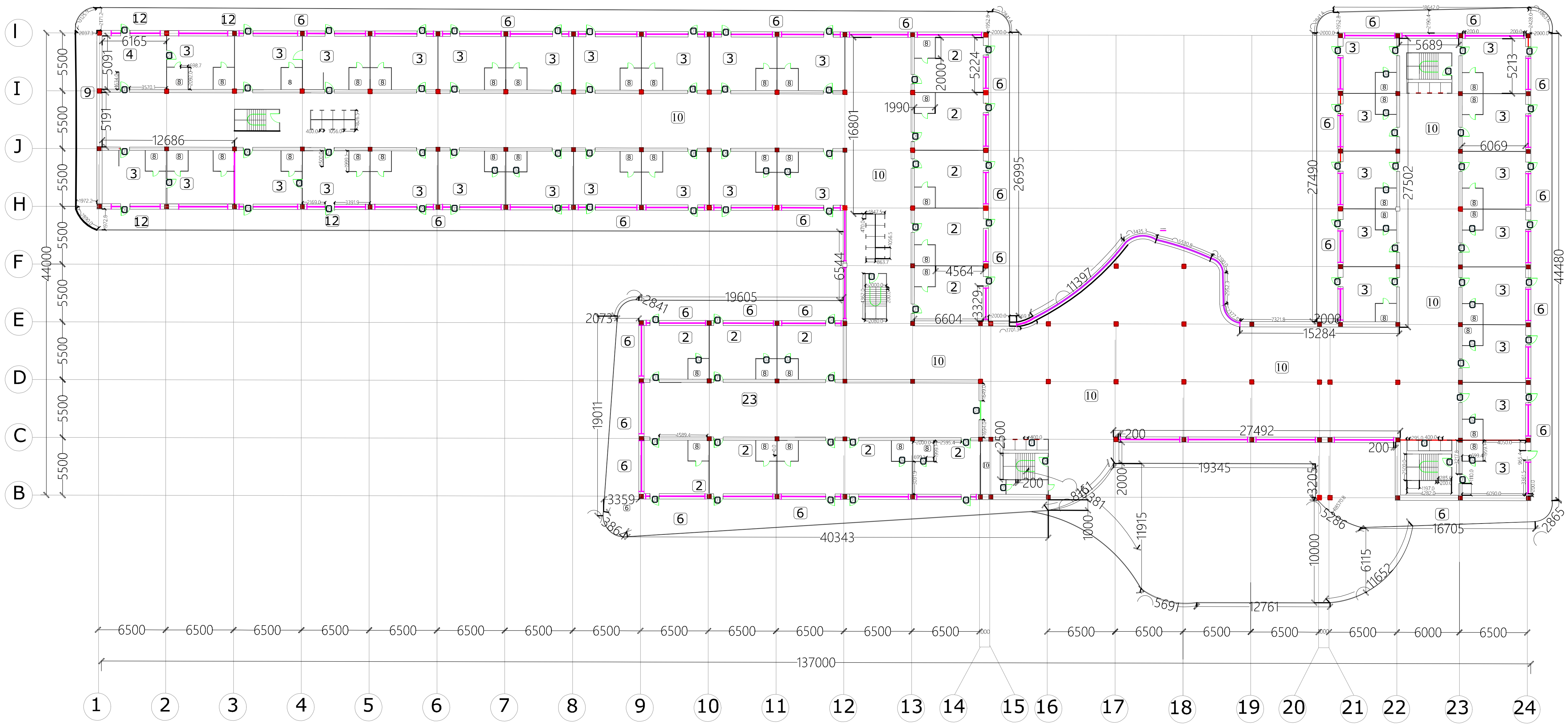
Note: Table for dimension rooms in Appendix F

					KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP
					Hospital building for pre-fabricated technology in Ust-kamenogorsk
Chan	Num.par.List	№doc	Sign	Date	
Head of Dep		Kozyukova .N.V			Architectural design part
Consultant		Zhambakena Z.M			
supervisor		Zhambakena Z.M			
Controller		Bek.A.A			First floor scheme
Created		Amiri .H			

Stage	List	Lists	Unit
DP	2	10	mm

Civil engineering and building material

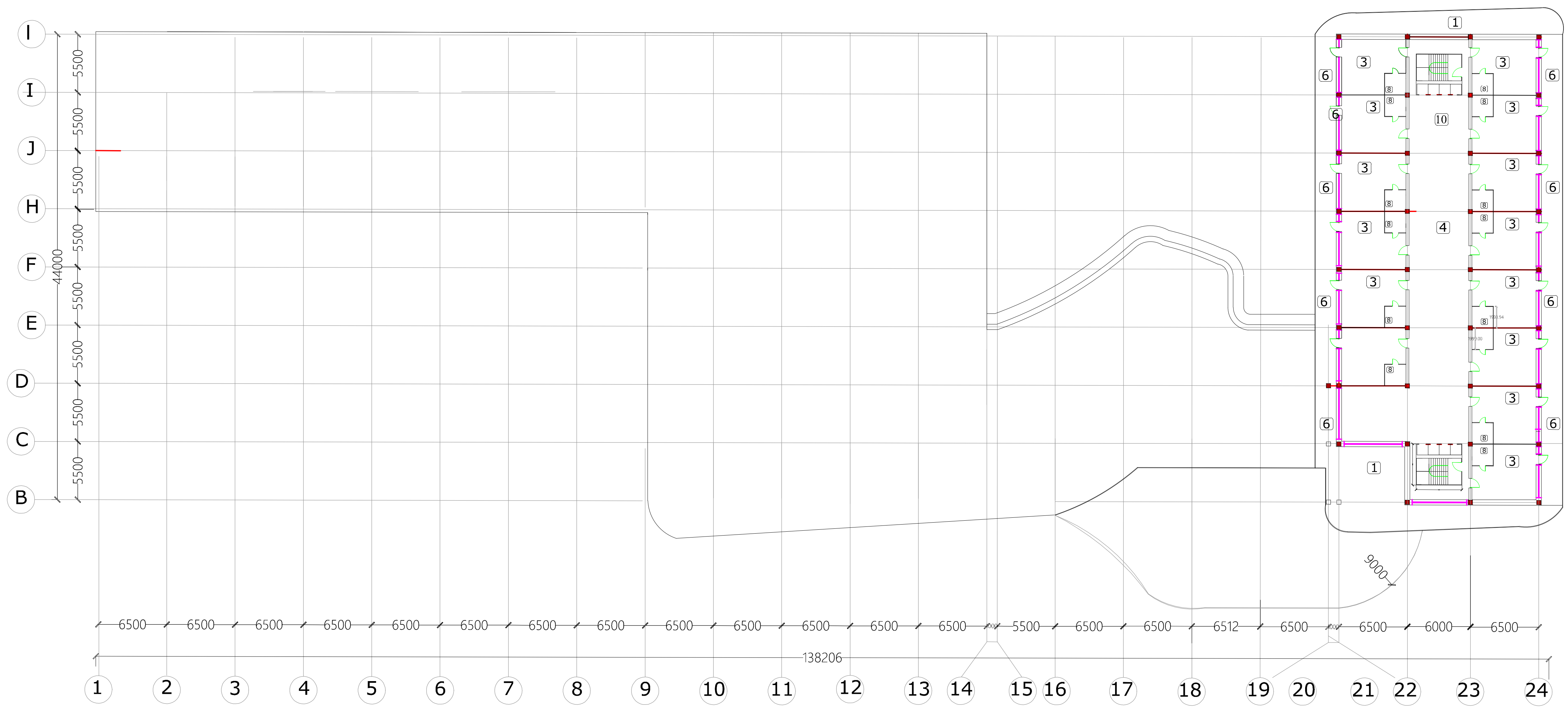
Second floor plan



Note: Table for dimension rooms in Appendix F

					KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP				
Chan	Num.par.List	Nºdoc	Sign	Date	Hospital building for pre-fabricated technology in Ust-kamenogorsk				
Head of Dep		Kozyukova .N.V			Architectural design part	Stage	List	Lists	Unit
Consultant		Zhambakena Z.M				DP	3	10	mm
supervisor		Zhambakena Z.M							
Controller		Bek.A.A			Second floor scheme	Civil engineering and building material			
Created		Amiri .H							

Fifth floor plan

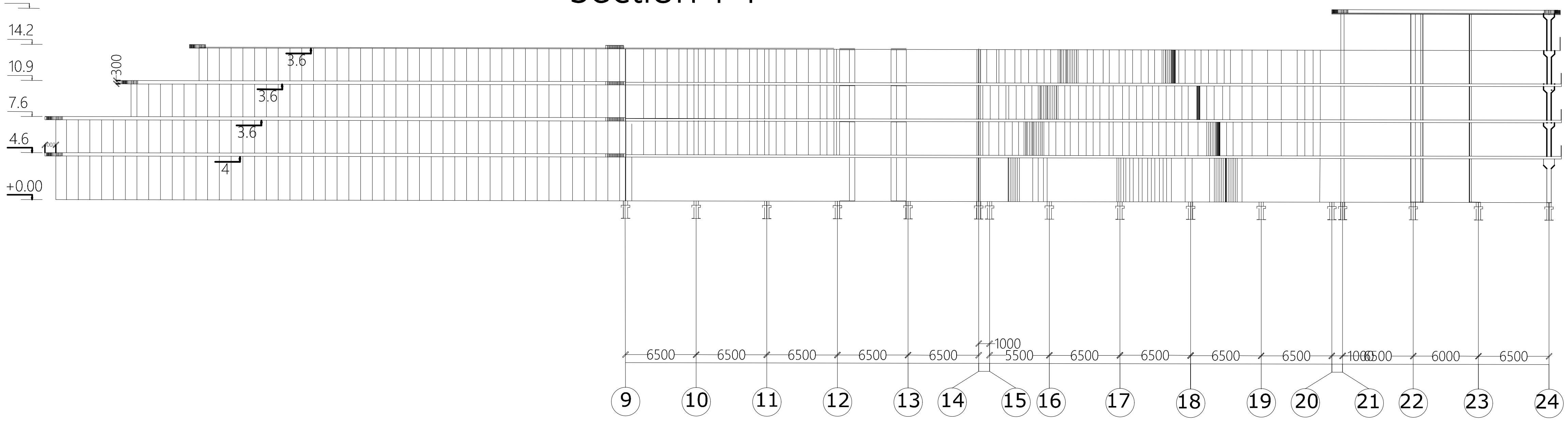


Explication of premises

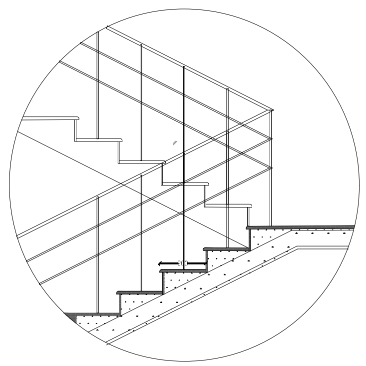
No	Name		Area m^2
1	terrace,1		56
2	stirs	2	15.75
3	double room	14	30
4	corridor	1	179
5	column	38	40x40
6	Balkan		10

					KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP
Chan.	Num.par.List	№doc	Sign	Date	Hospital building for pre-fabricated technology in Ust-kamenogorsk
Head of Dep		Kozyukova .N.V			Architectural design part; Stage: DP; List: 4; Lists: 10; Unit: mm
Consultant		Zhambakena Z.M			
supervisor		Zhambakena Z.M			
Controller		Bek.A.A			First and second floor scheme; Civil engineering and building material
Created		Amiri .H			

Section 1-1

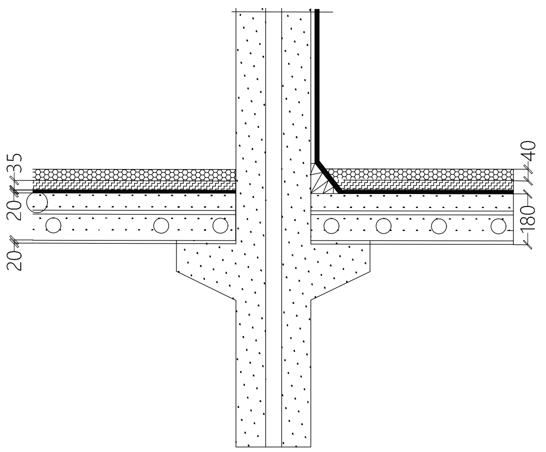


knot 1

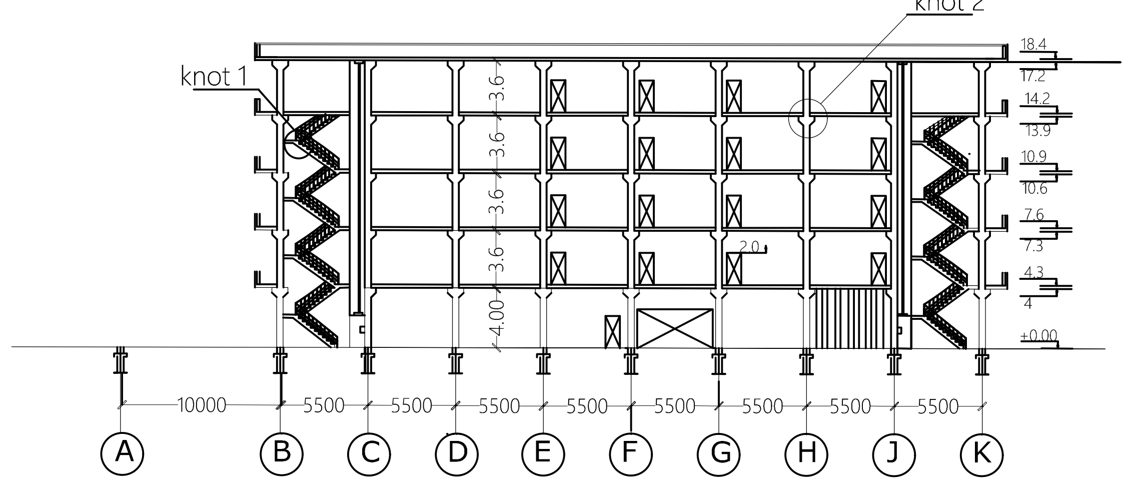


knot 2

- floating floor treatment
- Aggregate
- polystyrene expand (board insulation)
- water prrofing
- reinforcement
- concrete toping
- one layer of gypsum for support system

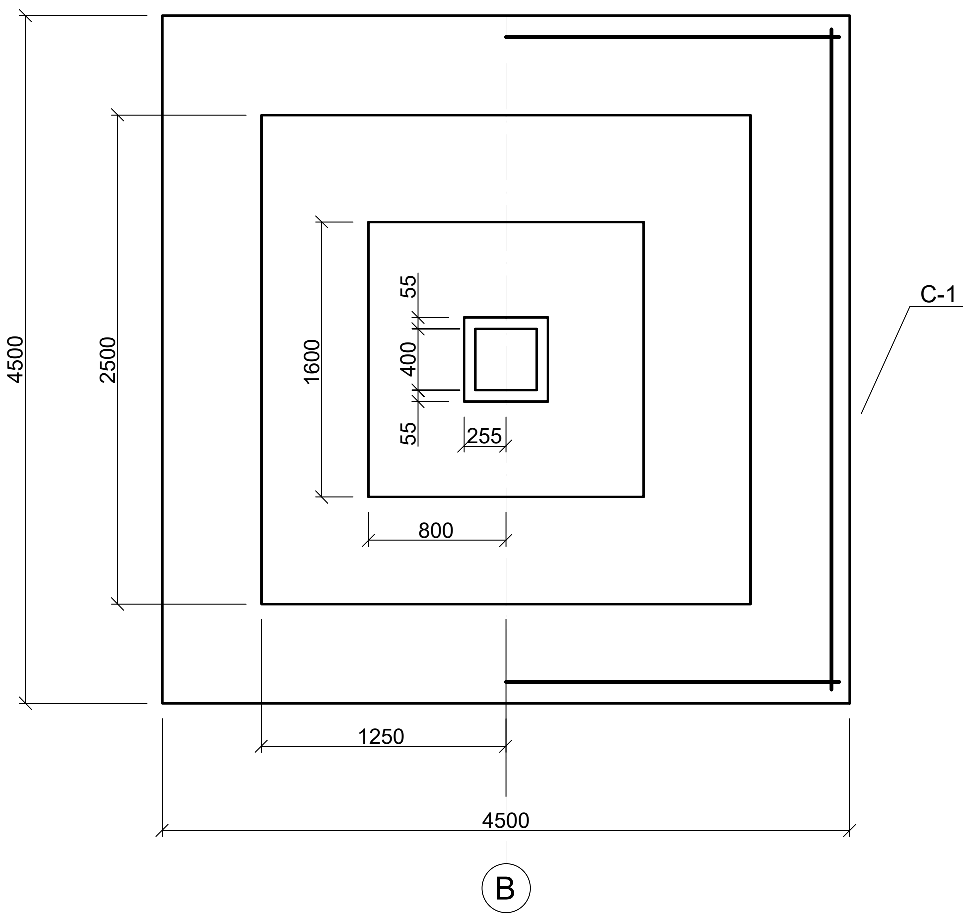


Section 2-2

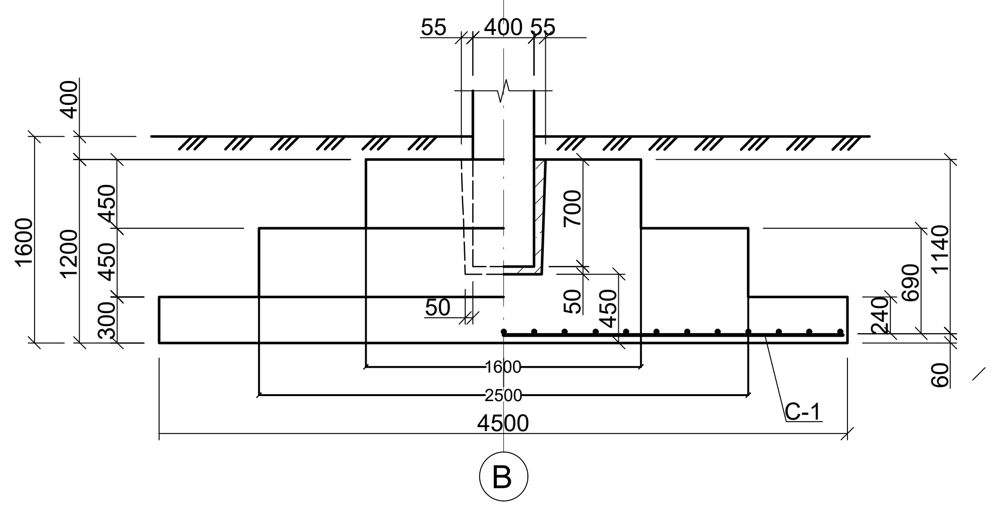


Chan	Num.par.List	№doc	Sign	Date	KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP				
					Hospital building for pre-fabricated technology in Ust-kamenogorsk				
Head of Dep		Kozyukova .N.V			Architectural design part	Stage	List	Lists	Unit
Consultant		Zhambakena Z.M				DP	5	10	mm
supervisor		Zhambakena Z.M							
Controller		Bek.A.A			section view	Civil engineering and building material			
Created		Amiri .H							

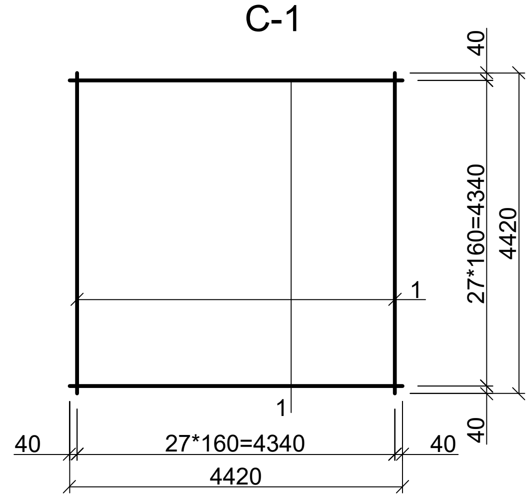
Plan of Foundation



Side View



C-1



Specification of Reinforcement of foundation

Mark	Designation	Name	Number	Mass 1, kg	Total, Kg
C-1	SN RK 591-2014	Ø20S800 l= 4420	46	0,246	42.5

Steel Consumption

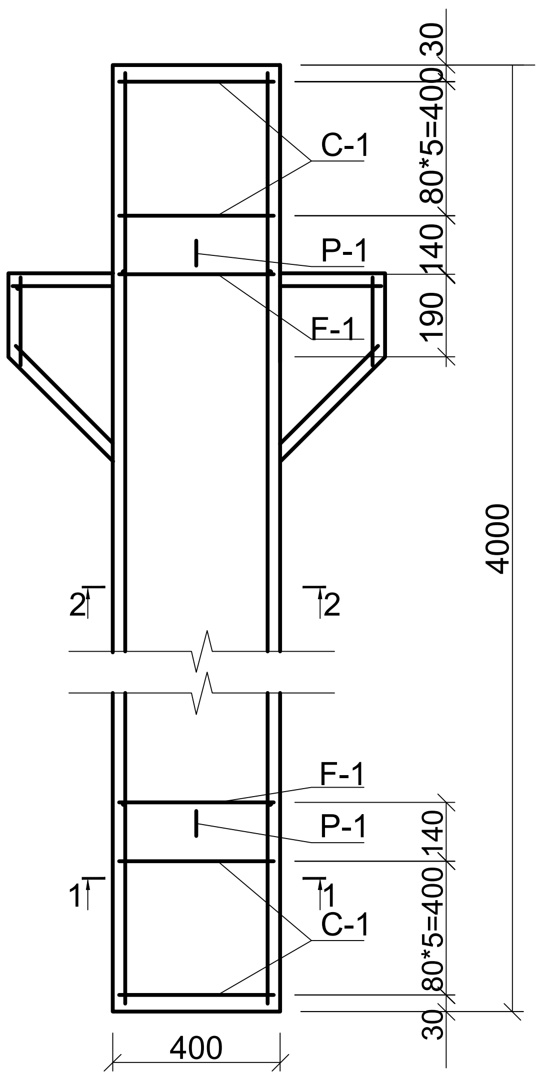
Mark	Ware reinforcement	
	Class of reinforcment40	
	S800	Total
	EN 5781-82	
	Ø20	42.5
P-1	42.5	

					KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP
Chan	Num.par.List	№doc	Sign	Date	Hospital building for pre-fabricated technology in Ust-kamenogorsk
Head of Dep		Kozyukova .N.V			Constructive part — Stage: DP; List: 6; Lists: 10; Unit: mm
Consultant		Zhambakena Z.M			
supervisor		Zhambakena Z.M			
Controller		Bek.A.A			Design of foundation plan — Civil engineering and building material
Created		Amiri .H			

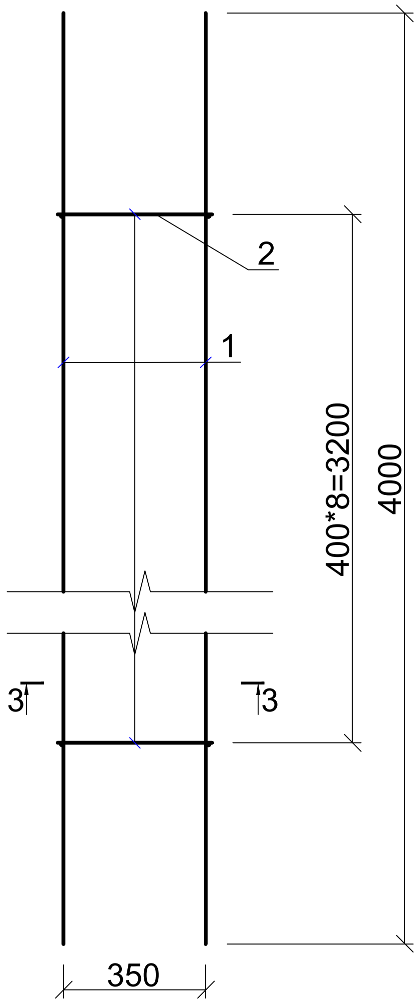
Steel Consumption

Mark	Ware Reinforcement				
	Class of Reinforcement				
	S400		S500		Total
	EN 5781-82				
	Ø10	Ø4	Ø8	Ø28	
P-1	0.78	1.24	1.24	120	123.26

Middel of column



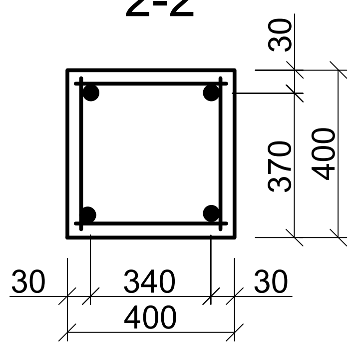
F-1



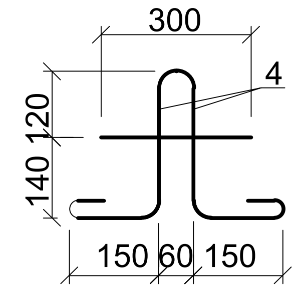
Specification of Reinforcement of column

Mark	Designation	Name	Number	Mass 1 Kg.	Mass Total,Kg
F-1	SN RK 591-2014	Ø28A500 L=4000	4	5.31	120
	SN RK 591-2014	Ø8A400 L=350	9	0.395	1.24
C-1	SN RK 591-2014	Ø4A400 L=350	16	0.222	1.24
P-1	SN RK 591-2014	Ø10s400 L=1000	1	0.785	0.785

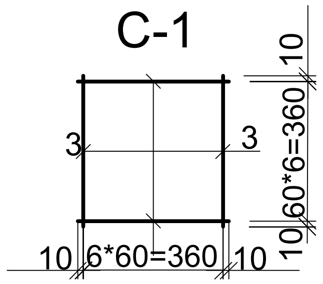
2-2



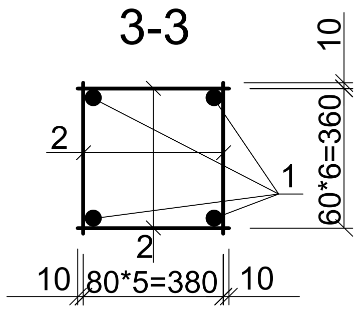
P-1



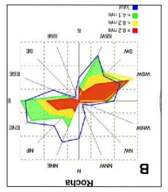
C-1



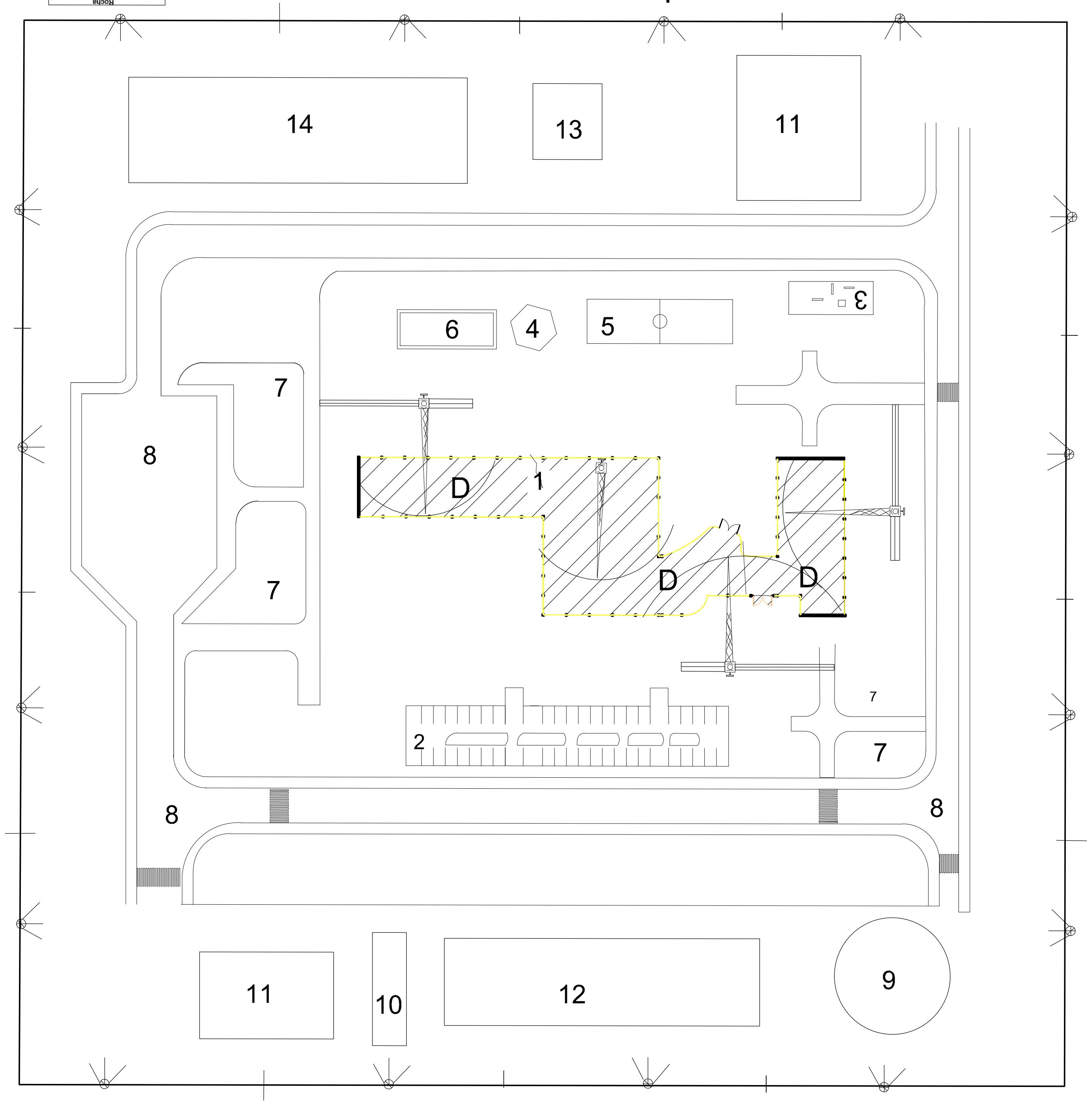
3-3



					KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP
Chan	Num.par.List	№doc	Sign	Date	Hospital building for pre-fabricated technology in Ust-kamenogorsk
Head of Dep		Kozyukova .N.V			Constructive part
Consultant		Zhambakena Z.M			Stage: DP; List: 7; Lists: 10; Unit: mm
supervisor		Zhambakena Z.M			
Controller		Bek.A.A			Design of column
Created		Amiri .H			Civil engineering and building material



General master plan



Explication

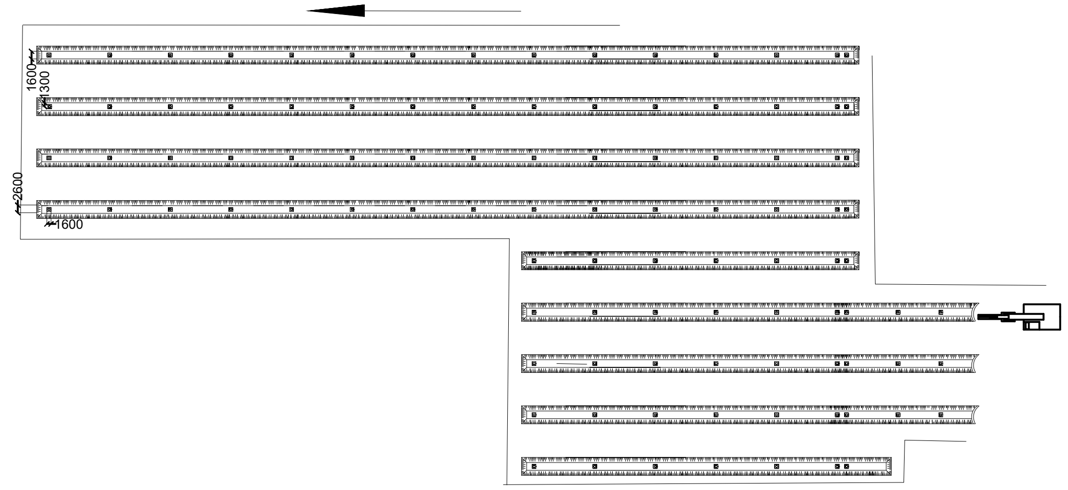
Number	Name of room
1	Central building
2	Car parking
3	Children's area
4	Soccer field
5	Basketball playground
6	Open pool
7	Walking area
8	Street
9	Guard point
10	Shower room
11	Restroom
12	dining room
13	Office masters
13	Foreman's office
	lamp
	Crane direction
	Cross way
D	Dangers area of crane
	Gate

technical and economic indicators

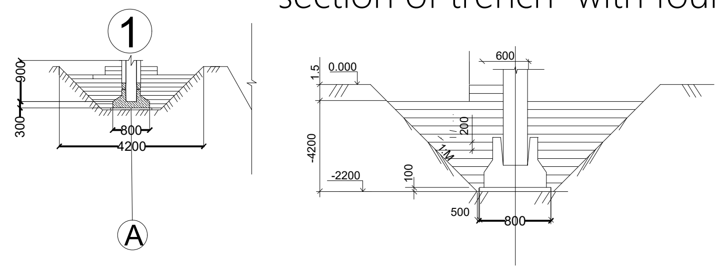
total land area	3.94Ga
built-up area	3000km
total building area	11000km

Chan	Num.par.List	Nºdoc	Sign	Date	KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP			
					Hospital building for pre-fabricated technology in Ust-kamenogorsk			
Head of Dep		Kozyukova .N.V			Architectural design part	Stage	List	Lists	Unit
supervisor		Zhambakena Z.M				DP	8	10	mm
Consultant		Zhambakena Z.M							
N.Controller		Bek.A.A			General master plan	Civil engineering and building material			
Created		Amiri .H							

Foundation plan

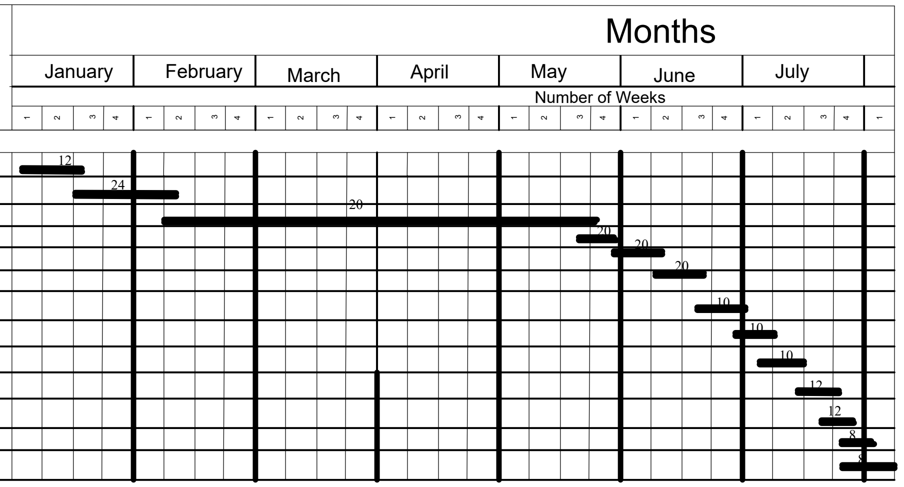


section of trench with foundation

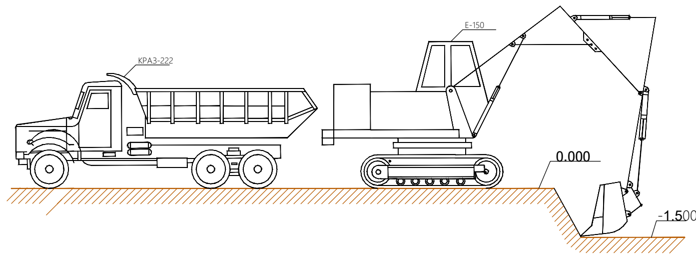


Planned Schedule of Work for under ground part

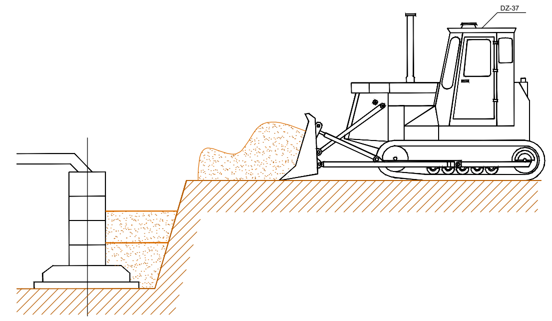
Name of Processes	work volume		Labor Cost, h- D	The Required Cars		Duration of Days, (P)	N. of Changes (A)	Number of workers in a Change, n	Duration of Time, h
	unit of measurement	Volume		Required Car	Number. shift				
Underground Part of Building									
The construction of temporary fencing	$10m^2$	444	64.9	2	2	2	2	6	6
Removal of top Soil	$1000m^2$	11980	175.3	3	2	25	2	12	6
Soil Excavation in the Trench access	$1m^3$	10514.2	410.2	4	1	165	1	10	6
Concrete peroration of foundation	$1m^3$	6072	121.43	3	1	2	2	10	6
Reinforcement Installation of Footing	$1m^3$	14.155	11.2	2	2	2	2	10	6
Form work installation	1t	97.92	825.5	2	1	1	1	10	6
Concreting of Foundation	$1m^2$	1351	19.72	4	2	3	1	10	6
Foundation Formwork Removal	$1m^3$	33.79	12.77	1	1	1	1	10	6
Foundation Water proofing	$100m^2$	33.168	40.44	2	2	3	1	10	6
Backfilling	$1m^2$	7902.3	10	2	1	3	2	6	6
Soil Compaction	$100m^2$	26340.2	96.37	2	1	2	2	6	6
Final land planing	$100m^3$	854	32.12	3	2	2	1	8	6
Removal temporary fencing	$10m^2$	444	48.73	1	1	1	1	8	6



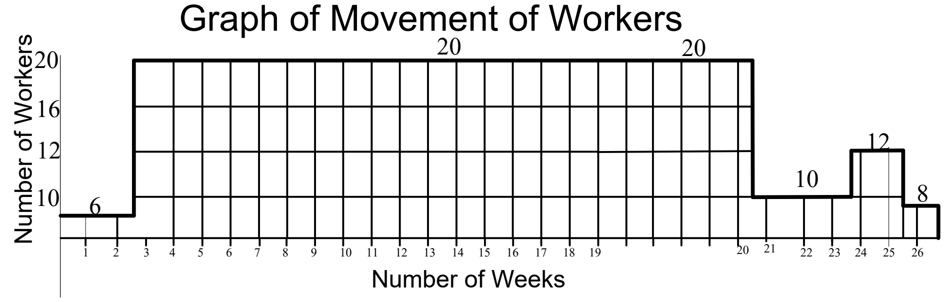
Scheme of excavation by excavator



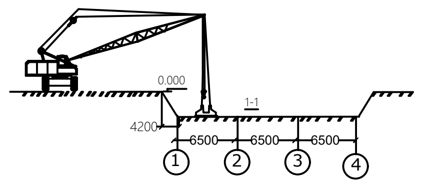
Scheme of backfilling by bulldozer



Graph of Movement of Workers



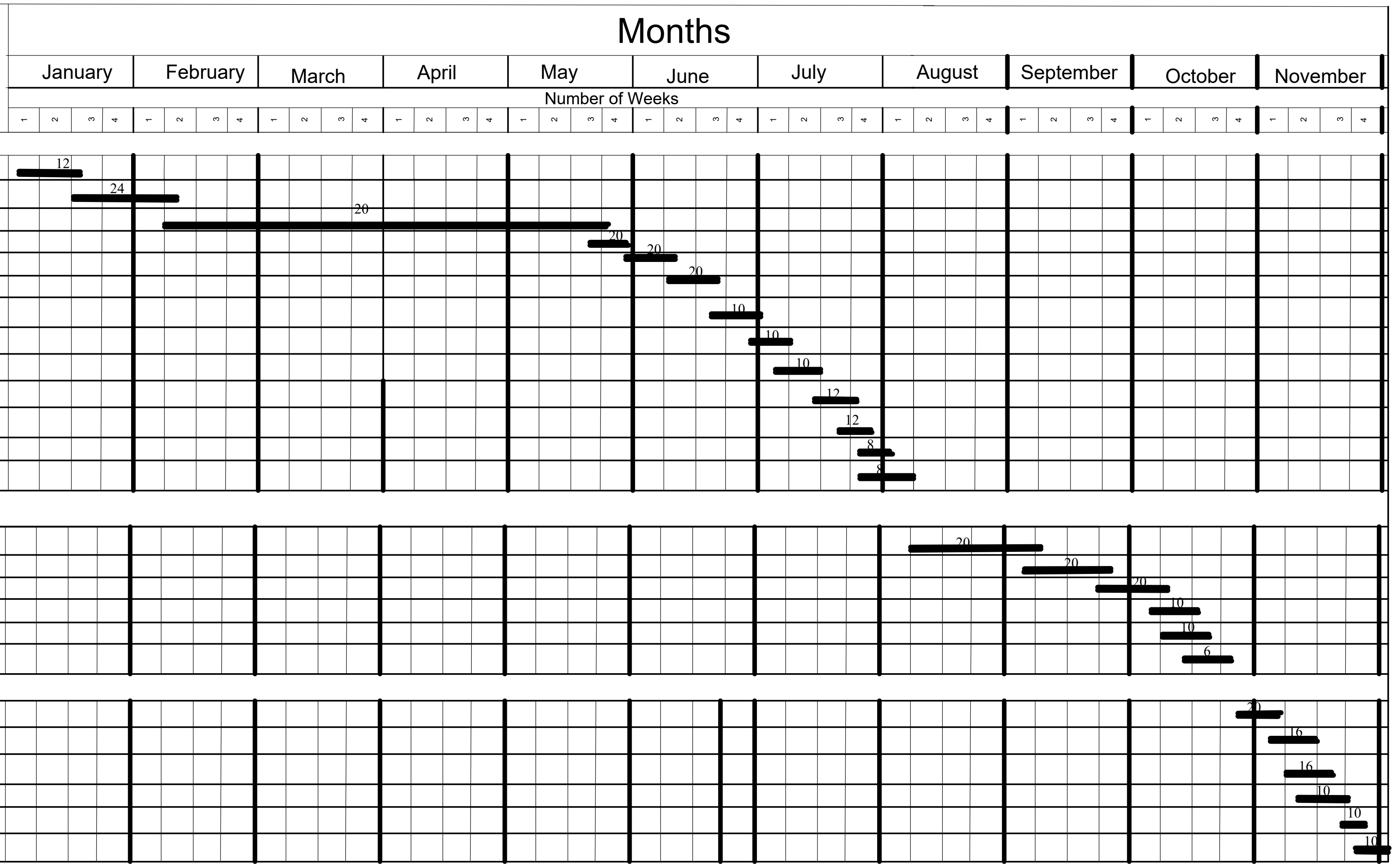
Scheme of crane above ground



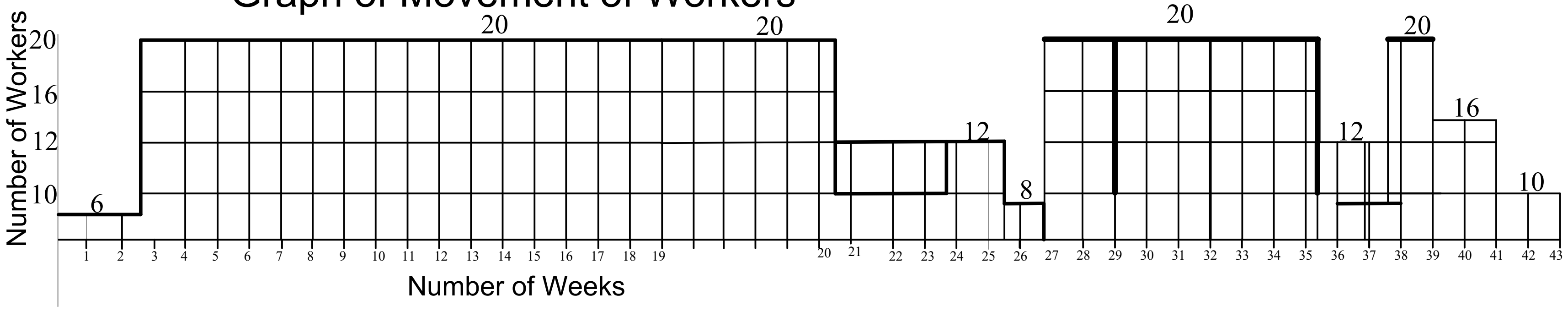
Chan	Num.par.List	№doc	Sign	Date	KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP
					Hospital building for pre-fabricated technology in Ust-kamenogorsk
Head of Dep		Kozyukova .N.V			Technological part — Stage: DP; List: 9; Lists: 10; Unit: mm
Consultant		Zhambakena Z.M			
supervisor		Zhambakena Z.M			
Controller		Bek.A.A			calendar schedule for under ground part — Civil engineering and building material
Created		Amiri .H			

Planned Schedule of Work for under ground part

Name of Processes	work volume: unit of measurement	work volume: Volume	Labor Cost, h- D	The Required Cars: Required Car	The Required Cars: Number. shift	Duration of Days, (P)	N. of Changes (A)	Number of workers in a Change, n	Duration of Time, h
Underground Part of Building									
The construction of temporary fencing	$10m^2$	444	64.9	2	2	2	2	6	6
Removal of top Soil	$1000m^2$	11980	175.3	3	2	25	2	12	6
Soil Excavation in the Trench access	$1m^3$	10514.2	410.2	4	1	165	1	10	6
Concrete peroration of foundation	$1m^3$	6072	121.43	3	1	2	2	10	6
Reinforcement Installation of Footing	$1m^3$	14.155	11.2	2	2	2	2	10	6
Form work installation	1t	97.92	825.5	2	1	1	1	10	6
Concreting of Foundation	$1m^2$	1351	19.72	4	2	3	1	10	6
Foundation Formwork Removal	$1m^3$	33.79	12.77	1	1	1	1	10	6
Foundation Water proofing	$100m^2$	33.168	40.44	2	2	3	1	10	6
Backfilling	$1m^2$	7902.3	10	2	1	3	2	6	6
Soil Compaction	$100m^2$	26340.2	96.37	2	1	2	2	6	6
Final land planing	$100m^3$	854	32.12	3	2	2	1	8	6
Removal temporary fencing	$10m^2$	444	48.73	1	1	1	1	8	6
1th,2th,3th and 4th Floor Of Building									
Installation of column	$1m^2$	1632	91.3	4	2	30	2	10	6
installation of beam	$1m^3$	4080	22.48	4	2	20	2	10	6
Installation of slab	$1m^2$	1414	11.2	4	2	20	2	10	6
Formwork Installation of First Floor Walls	$1m^3$	7100	25.66	2	1	2	1	10	6
Volume of Concrete For Walls	$1m^3$	1027	25.50	3	2	1	2	5	6
Wall Formwork Removal	$1m^3$	1414	11.2	1	1	2	1	6	6
fifth Floor Of Building									
installation of column	$1m^2$	720.0	2	2	1	15	2	10	6
installation of beam	$1m^2$	448.4	22	2	2	7	2	8	6
installation of slab	$1m^3$	78.43	14.5	2	2	2	2	8	6
form work for concrete wall	$1m^2$	448.4	22	1	1	1	1	10	6
volume of concrete for wall	t	32.28	10	2	1	1	1	10	6
Removal form work of walls	$1m^2$	1383.7	182.61	2	2	1	1	10	6



Graph of Movement of Workers



$$K_{ner} = \frac{P_{max}}{P_{avg}} = \frac{20}{26} = 0.7 \leq 1.5$$

$$p_{avg} = \frac{Q}{p} = \frac{3833}{143} = 26$$

Technical and Economical Indicators

N	Name	Unite	Quantity
1	Construction Volume	m^3	91240
2	Area of Building	m^2	7344
3	Normative Labor Intensity	h- pers	30854
4	Estimated Wages	Thous.tg	2730
5	Standard Construction Period	mon	24
6	Actually the Construction Period	mon	10

Note: the equipment for technological part in Appendix F

					KazNITU-5B072900-Civil Engineering-Stb-.03.06-2021-DP
					Hospital building for pre-fabricated technology in Ust-kamenogorsk
Chan	Num.par.List	№doc	Sign	Date	
Head of Dep		Kozyukova .N.V			Technological part — Stage: DP; List: 10; Lists: 10; Unit: mm
Consultant		Zhambakena Z.M			
supervisor		Zhambakena Z.M			
Controller		Bek.A.A			calendar scheduler — Civil engineering and building material
Created		Amiri .H			

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
имени К.И. САТПАЕВА

RESPONSE

OF THE SUPERVISOR
for the graduation project

Amiri Hussniya
5B072900 – Civil Engineering

Topic: «Hospital building for pre-fabricated technology in Ust-kamenogorsk»

Student Amiri H. during her undergraduate studies, student Amiri H. showed good preparation, professional literacy and diligence.

The diploma project was completed independently, in full, showed readiness and literacy for further work in the specialty**.**

An analytical review of the selected hospital design was carried out, and the seismicity of the city of Ust-Kamenogorsk was taken into account. The architectural-planning and structural sections were developed in accordance with the issued task. The column and the foundation of the projected building are calculated. The technological section of the project with the calendar plan and technological maps is completed in full accordance with the task.

The diploma project is completed at a good level and meets the requirements for bachelor's theses. Amiri Hussniya deserves a good rating for the completed diploma project.

Supervisor
Candidate of technical sciences, assistant professor

______Zhambakina Z.M.

«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: Амири Хусния

Название: Hospital building for pre-fabricated technology in Ust-Kamenogorsk

Координатор:Зауреш Жамбакина

Коэффициент подобия 1:0.7

Коэффициент подобия 2:0

Замена букв:63

Интервалы:0

Микропробелы:0

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: Амири Хусния

Название: Hospital building for pre-fabricated technology in Ust-Kamenogorsk

Координатор: Зауреш Жамбакина

Коэффициент подобия 1:0.7

Коэффициент подобия 2:0

Замена букв:63

Интервалы:0

Микропробелы:0

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:

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Дата *Подпись заведующего кафедрой / начальника структурного подразделения*

Окончательное решение в отношении допуска к защите, включая обоснование:

………
………
………
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…………………………………………………

Дата *Подпись заведующего кафедрой / начальника структурного подразделения*