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"

Fardin Waheb

On the theme of "Exhibition pavilion with biomass heating system in Almaty"

EXPLANATORT NOTE
to the diploma project

Specialty 5B072900 – Civil Engineering

Almaty 2021

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ALLOWED TO PROTECT
Head of Department
_____Kozyukova N.V.
Master of technical science,
lecturer
«_30_»__06__2021 y.

EXPLANATORY NOTE

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On the theme of " Exhibition pavilion with biomass heating system in Almaty "

5B072900 - "Civil Engeneering"

Prepared by Waheb Fardin

Scientificadviser Zh. Mukhanbetzhanova
Master of technical science,
Lecturer
«_____»__2021 yr.

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

ASSIGNMENT
Complete a diploma project

Student: Fardin Waheb

Topic «Exhibition pavilion with biomass heating system in Almaty»

Approved by the Order of the Rector of the University No. 2131-b dated November 24, 2020.

The deadline for the completed work is May 10, 2021.

Initial data for the diploma project: Construction area – Almaty

Structural schemes of the building – reinforced concrete frame without beam system.

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, justification of energy efficiency measures;

b) Calculation and design part: calculation and design of a column;

c) Organizational and technological part: development of technological maps, construction schedule and construction plan;

d) Economic part: local estimate, object estimate, summary estimate;

List of graphic material (with exact indication of required drawings):

1 Facade, standard floor plans, sections 1-1 and 2-2 - 3 sheets.

2 Column specifications - 1 sheet.

3 Technical maps of concreting and reinforcing, calendar plan, construction site plan - 4 sheets.

10 slides of work presentation are provided.

Recommended main literature: SP RK 2.04-01-2017 "Construction climatology", 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	Zh. Mukhanbetzhanova Master of technical science, lecturer		
Calculation and design	N.V. Kozyukova Master of technical science, lecturer		
Organizational and technological	Zh. Mukhanbetzhanova Master of technical science, lecturer		
Economic	Zh. Mukhanbetzhanova Master of technical science, lecturer		
Norm controller	Bek A.A., Master of technical science, assistant		
Quality control	Kozyukova N.V., Master of technical science, lecturer		

Scientific adviser _____ Mukhanbetzhanova Zh.Sh.

The task was accepted for execution student _____ Waheb F.

Date «30»___01___ 2021 y.

АҢДАТПА

Дипломдық жоба тақырыбы - «Алматыдағы биомасседегі виставочный павильон жүйелік отопления». Проект состоит из четырех основных частей, дәл осындай архитектурно-строительная, проектно-строительная, технологическая и организационная и экономическая.

Бағдарламалардың мазмұны:

1 AutoCAD 2021 - по технологической части;

2 Autidesk Revit 2021 - здания 3D-моделі үшін;

3 Etabs 2018 - на проектирование конструктивной части здания;

4 ҚР Смета - проекта бойынша.

АННОТАЦИЯ

Тема дипломного проекта - «Выставочный павильон с системой отопления на биомассе в Алматы». Проект состоит из четырех основных частей, таких как архитектурно-строительная, проектно-строительная, технологическая и организационная и экономическая.

В этом проекте использовались следующие программы:

1 AutoCAD 2021- по технологической части;

2 Autidesk Revit 2021 - для создания 3D-модели здания;

3 Etabs 2018 - на проектирование конструктивной части здания;

4 Смета РК - для оценки стоимости проекта.

ANNOTATION

The theme of this diploma project is «Exhibition pavilion with biomass heating system in Almaty». The project consist of four main parts, such as architectural and construction, design and construction, technology and organization, and economic.

Software programs that were usesd in this project are as following:

1 AutoCAD 2021- for technological part;

2 Autidesk Revit 2021- for creating 3D-model of building;

3 Etabs 2018- for designing structural part of building;

4 Estimation RK- for estimating the cost of project.

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INTRODUCTION

From the past century the work on using natural material in construction industry is started, especialy on biomass material for producing heat insulation. The building is on the theme of exhibition pavilion with biomass heating system that is located in the crossroad Rozibakiva, Eskerayeva. The building has two stories and one basement. The new system of heating that is called boiomass heating system is used for providing good insulation.

This new system is the most valuable building future heating system. In this system we use natural material to produce heat for the building without pollution. The dedacted area for the entire building is 1.5 hectare that is properly enough for the requirmement of such building. Therefore, modern large, developing cities need extra-class administrative buildings, the so-called business centers. And especially the capitals of developing countries, such as Astana, need such buildings.

A modern pavilion, located in the business center of the city, with its architecture should fully correspond to the external appearance of the city. It must have modern equipment, meet all safety requirements, especially fire safety, and have a large open scpace for exhibitors, large facility, among other things, must have a large staff. An exhibition pavilion, being a place of helding national and trade exhibition for a large number of people, should have spacious corridors, large, well-lit and ventilated halls premises.

Therefore, the topic of the graduation project is relevant for our city and for the region as a whole.

1 Architectural and construction Parts

1.1 General information about the construction site

The diploma project was developed for "Exhibition pavilion with biomass heating system in Almaty" that is located in crossroad Rozebakiva and Eckarayeva".

Characteristics of the building:

The project was developed for the following construction conditions:

-humidity zone – normal [1];

wind region - II, standard value of wind pressure - 0.39 kPa; wind speed – 25 m/s [2];

-climatic region - II: temperate continental climate [1];

-snow region - II, the standard value of the weight of the snow cover is Sk = 1.2 kPa [2];

-climatic parameters of the cold season: air temperature of the coldest day: -30 degrees celsiuse; air temperature of the coldest five-day period: -23 degrees celciuse;

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

-the region hieght from sea level is 681 m;

-the construction area is seismic zone, and the magnitude is 9 points [3];

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

1.2 Natural-climatic and engineering-geological conditions

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

The coldest month - January is characterized by negative temperatures minus 6.6-16.5degrees celciuse (for plains and foothills). The hottest month is August. The average temperature for the plains is +24 - +26 degrees celciuse. The absolute maximum temperature reaches + 36.7_ + 41.7 in the same zone.The main data on the snow cover are given in Table 2 [3].

Table 1 – Blanket of snow

Weather station	months									Highest values for the winter		
	9	10	11	12	1	2	3	4	5	Average.	Max.	Min.
Average monthly snow height, см												
Almaty			4	10	19	21	9			28	55	7

With distance from the mountains, the wind regime changes. The average annual wind speed is 2.3 m / s. The wind breakthrough reaches 28 m / s. The lowest average monthly wind speeds throughout the entire territory are observed in winter (December, January), and the highest - in summer.

Table 2 - Wind

Wind Weather Station	months												Per year
	1	2	3	4	5	6	7	8	9	10	11	12	
Average wind speed by months and per year, м/с													
Almaty	1,0	1,1	1.3	1.7	1.8	2.0	1.9	1.9	1.8	1.5	1.1	1,0	1.5
Maximum wind speed and wind vane breakthrough, м/с													
Almaty	12	11	20	>20	>20	18	20	18	12	15	12	12	>20

Table 3 - Repeatability of wind and calm directions, percentage

Weather station	Direction								Calm
	N	NE	E	SE	S	SW	W	NW	
Almaty	14	8	6	14	29	11	10	8	26

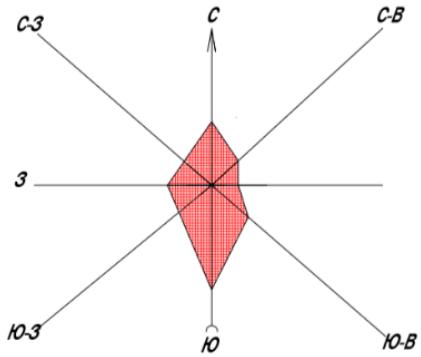

Figure 1 - Wind rose according to the weather station in Almaty

1.3 General plan

The master plan has been developed for the entire territory of the construction land plot. The plot with a total area of 1.5 hectares, allocated for construction, located in the city of Almaty, has a rectangular shape. The plot allocated for construction is free of buildings. An 6.0 meter wide driveway is provided for the territory of the facility; the pavement is made of tile and asphalt concrete on a crushed stone base. Improvement and gardening of the site provided for by the project reduces the overall dust content and eliminates local sources of dust. The use of biomass primarily provides the goal of saving saving energy and clean nature. The growth of cities is "wide" and exacerbates the transport problem and increases the length of engineering networks. For the selection of types of exhibition pavilion with biomass in large cities, the urban planning situation is considered, as well as the conditions for the reconstruction of the central regions.

Table 4 - General plan area's indicators

Name	Indicator
Land area	1.5 hectare
Built-up area	1892.1 м^2
Building factor	0.104
Landscaping area	7000 м^2
Landscaping factor	0.297
Hard surface area	6107.9 м^2
Territory utilization rate	0.745

1.4 Space-planning solution

The Exhibition pavilion with biomass heating system consists of one buildings of two floors and one ground floor. The ground floor has an area of 1892.1 m^2 and. The height of the building from the zero mark is 9.7 m. The main staircase, located into the middle of the building..

The scales for the plan and section is accepted 1:100.

1.5 Constructive solutions of the project

The structural scheme of the building is a frame without beam, while at the level of the basement, reinforced concrete columns and. reinforced concrete columns, and a hard floor plate made of monolithic reinforced concrete slabs.

Foundations – footing foundation with a thickness of 1000 mm . Under the foundations, perform a reinforced monolithic pad and crushed stone preparation of thicknesses 100mm.

Walls – the outer walls of the basement are monolithic reinforced concrete walls with a thickness of 350 mm, the outer walls of the first to the second floor are 400 mm thick walls made of concrete blocks, internal walls with a thickness 250 mm should also be made of on masonry brickcement-sand mortar.

Partitions – partition walls with a total thickness of 200 mm to be made of Reinforced brick partition wall**.**

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

Lintels – bar for buildings with masonry walls;

Windows - A double-glasses window is suitable for the project.

Doors - installation of molded wooden interior doors in accordance, installation of steel exterior doors. All the types of doors used in this building is made of environmentally-friendly materials.

Blind area - The blind area is concrete along the entire perimeter of the building with a width of 0.9 m.

External finishing - from external facade plaster and, a decorative clading made of glass.

2 Calculation and design part

2.1 Calculation of dead loads

The loads of floors and wall are presented in Table A.1 in Appendix A.

2.2 Calculation of soil pressure

Type of soil bases for foundations – sand and gravel (category II)
$\gamma = 1.73\text{t}/m^3$
$c = 0$
$\varphi = 35°$
$h = 4\ m$
$\text{q} = 0.6\ \text{t}/m^2$
Active pressure
The intensity of the horizontal active soil pressure from its own weight γ, at a depth of h = y = 4.1 m should be determined by the formula:

$$P_\gamma = \frac{\left[\gamma \cdot h \cdot \lambda_\text{г} - c \cdot 2\sqrt{\lambda_\text{г}}\right]\text{y}}{h} \quad (1)$$

$$P_\gamma = \left[1.73 \cdot 4.1 \cdot 0.27 - 0 \cdot 2\sqrt{0.27}\right]4/4 = 1.915\ \text{t/m}^2$$

where:

$$\lambda_\text{г} = tg^2\left(45 - \frac{\varphi}{2}\right) = tg^2\left(45 - \frac{35}{2}\right) = 0.26$$

Passive pressure:
$\varphi = 35°$
$\lambda = 0.26$

$$\text{P}_\text{q} = \text{q} \cdot \lambda, \text{t/m}^2$$

$$\text{P}_\text{q} = 0.6 \cdot 0.26 = 0.15\ \text{t/m}^2$$

$$=> P = 1.915 + 0.156 = 2.93\ \text{t/m}^2$$

2.3 Determining Live loads according to EN 1991

Building category - A (residential building)
- floor – 2 кН/м^2 = 0.2 t/m^2
- staircase – 2.5 kN/m^2 = 0.2 t/m^2

- balconies – 2.5 kN/m^2 = 0.25 t/m^2
- unexploited roof – 0.5 kN/m^2 = 0.05 t/m^2

2.4 Calculating snow load

Almaty city - II snow region [1]:
μi $=$ 0.8,
$C_e = 1$,
$C_t = 1$,
$s_k = 1.2$

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

$$s = 0.8 \cdot 1 \cdot 1 \cdot 1.2 = 0.96\ kPa$$

where C_e −enviromental factor;
C_t −thermal coefficient;
s_k −the characteristic value of the snow load on the ground;
μ_i –snow load shape factor.

2.5 Calculation of seismic loads

Sand and gravel soil - class II
According to the soil conditions $a_g = 0.63\ g > 0.08g$ therefore, the calculation of seismic loads along the X and Y axes is necessary.
where $a_g > 0{,}4g$; $a_{gv}/a_g = 0.9$:

$$a_{vg} = a_g \cdot 0.9 = 0.63g \cdot 0.9 = 0.47g > 0.32g$$

Taking into account the vertical seismic load along the Z axis is necessary.
Calculation according to horizontal:
$a_g = 0.63g$,
$q = 3$
$T_B = 0.20\ s$,
$T_c = 0.72$
With a value of the coefficient of behavior q = 3:
At $0 \le T \le 0.25$:

$$S_d\ (T)_{\max} = a_g\ \left[\frac{2}{3} + \frac{T}{T_B}\left(\frac{2.5}{q} - \frac{2}{3}\right)\right] = 0.63\left[\frac{2}{3} + \frac{T}{0.20}\left(\frac{2.5}{3} - \frac{2}{3}\right)\right]$$
$$= 0.93\ (0.66 + 0.83T)$$

But not less than:

$$a_g \cdot \frac{2.5}{\text{q}} = 0.63 \cdot \frac{2.5}{3} = 0.48$$

At 0.25 ≤ T < 0. 96:

$$S_d\ (T) = a_g \cdot \frac{2.5}{\text{q}} = 0.63 \cdot \frac{2.5}{3} = 0.48$$

At T ≤ 0.96:

$$S_d\ (T)_{\max} = a_g \left[\frac{2.5}{\text{q}}\left(\frac{T_c}{\text{T}}\right)\right] = 0.63 \cdot \frac{2.5}{5}\left(\frac{0.96}{\text{T}}\right) = \frac{0.25}{\text{T}}$$

But not less than:

$$0.2\ a_g = 0.2 \cdot 0.63 = 0.116$$

The quantitative values of the ordinates of the spectra of the calculated reactions, calculated for some periods T at q = 3, are given in tables 1 [7].

Table 10- Values of ordinates of the spectrum of calculated reactions at q = 3

T, s	0	0.25	0.50	0.96	1.20	1.50	2.0	2.50	3.0
S_d(T), in shares g	0.34	0.46	0.44	0.26	0.103	0.084	0.061	0.053	0.053

2.6 Thermal calculation of the outer wall

According to SPRK 2.04-01-2017 «Construction heat engineering» [p.7-10] it is necessary to determine the thickness of the insulation for the outer wall. Determine the value of the degree days of the heating period:

$$\text{G}_{\text{SOP}} = \left(t_B - t_{avg}\right) \cdot z_{avg} \qquad (4)$$

where, $t_в$= 21 degrees of Celsuise,℃ – indoor air temperature;

t_{avg}= 1.7℃ – average temperature of the heating season;

z_{avg}= 160 days – duration of the heating period;

$$\text{GSOP} = (21 - 1.7)160 = 3088℃ \cdot \text{days}$$

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

$$\text{R}_0^{\text{тр}} = 2.45 \cdot ℃/\text{Вт}$$

Table 11 - Composition of the outer wall

Material name	Υ_0, kg/m^3	λ, Вт/m^2 · ℃	δ,m	$R_n = \delta/\lambda, m^2$ · ℃/Вт
cement siding	1650	0.76	0.148	0.196
Extruded foam(2 layers)	40	0.03	0.1	3.3
Concrete block	600	0.26	0.20	0.76
Polyethylene sheets	940	0.76	0.002	0.0013

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

$$R_0 = \frac{1}{\alpha_в} + \frac{\delta_1}{\delta_1} + \frac{\delta_2}{\delta_2} + \frac{\delta_3}{\delta_3} + \frac{\delta_4}{\delta_4} + \frac{1}{\alpha_н} \quad (5)$$

$$R_0 = \frac{1}{8.7} + 0.196 + 3.3 + 0.76 + 0.0013 + \frac{1}{23}$$
$$= 4.6 \text{ m}^2 \cdot ℃/Вт$$
$$R_0 = 4.6 \text{ m}^2 \cdot ℃/Вт \geq R_0^{тр} = 2{,}45\ m^2 \cdot ℃/Вт$$

The condition is met. We accept the thickness of the insulation 200 mm.

2.7 Anti-seismic measures

The threat of seismic impacts on the territory is under consideration. Seismic hazard is determined in space, in time (frequency or probability over a certain period of time) and in intensity (in points or in kinematic parameters of ground movements).

List of settlements located in the seismic zones of the Republic of Kazakhstan.

The residential building designed in the thesis is located in a seismic zone, therefore, anti-seismic measures are required. Seismicity of the work area according to SP 2.03-30-2017 is 9 points [10].

The category of soils for seismic properties is II (second). The revised seismicity value should be taken equal to 9 (nine) points.

The residential building has a length of 60 meters, since our frame is reinforced concrete, the length should not exceed 48 meters, therefore we make a sedimentary (expansion) seam.

Anti-seismic joints should be performed by erecting paired walls, paired frames, or a frame and wallThe width of the antiseismic seam between buildings or compartments should be taken not less than the total value of their calculated horizontal

displacements at the corresponding level, calculated using expression (7.31). With a building height of up to 5 m, the width of the antiseismic joint, regardless of the calculation results, must be at least 30 mm. The width of the anti-seismic joint for buildings of greater height should be increased by 20 mm for every 5 m in height.

Anti-seismic joints separating the foundations (except for pile foundations) are allowed to be 10 mm wide.

In buildings located on construction sites with seismicity of 9 points or more, it is not allowed to provide the possibility of mutual displacement of adjacent compartments due to the movement of the span structures that are freely lying on the structures of adjacent compartments.

2.8 Selection of column reinforcement

Longitudinal reinforcement calculation:
Rectangular column (500x500mm)
Normal concrete class C30 / 35

$$f_{ck} = 30, Yc = 1.5,$$

$$f_{cd} = acc \cdot \frac{fck}{Yc} = 0.85 \cdot \frac{30}{1.5} = 17\,mPa$$

Reinforcement class S450

$$f_{yk} = 450\,MPa$$

$$f_v = f_{yk} / Y_s = 450 / 1.15 = 435\,MPa$$

$$M_{ED} = 390.2\ кN \cdot м$$

The values are taken from the ETABS program

$$\frac{c_1}{500} = \frac{c_2}{h} = \frac{40}{500} = 0.08$$

$$N_{ed} = 14.9KN$$

$$M_{ED} = 4.42KN \cdot m$$

(Efforts from RSN1 in column C57, 513) The values are taken from the ETABS software

$$\alpha_{Eds} = \frac{N_{ed}}{b \cdot h \cdot f_{cd}} \quad (6)$$

$$\alpha_{Eds} = \frac{14.9 \cdot 10^3}{500 \cdot 500 \cdot 17} = 0.014 \rightarrow \omega_{tot} = 0.25$$

$$A_{s,tot} = \omega_{tot} bh/(\frac{f_{yd}}{f_{cd}}) \quad (7)$$

$$= As_{,tot} = \frac{0.52 \cdot 500 \cdot 500}{(\frac{435}{17})} = 2442мм2 = 24.42\ см2$$

A_{s1}= 24.42 accept 4Ø 28 S500 (A_s = 24.83 cm^2).

We accept transverse reinforcement constructively proceeding from the following condition that the diameter should be:

-not less then 6 мм

-not more then 1/4d_{max}

1/4d_{max}=1/4·460=115mm

d_{max}=h-c=500-40=460 mm

=> accept ø10 S275

The step is taken based on the conditions:

- not more then 400 мм;
- no more than the minimum side of the section;
- not more 20d_{min}.

We take the step equal 150 мм.

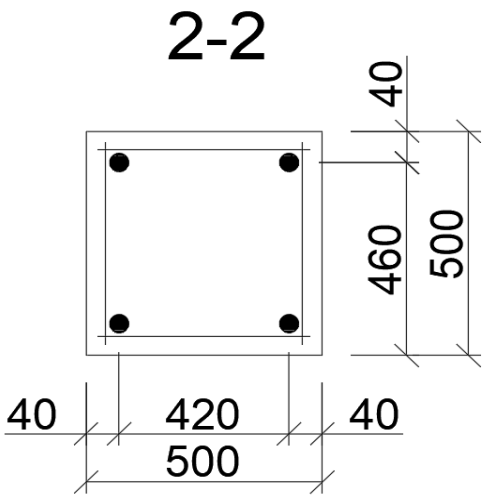

Figure 2 – Columns reinforcement

2.9 Analysis

The 8 load cases are defined in my structure and according these load case the structure is analyzed, the load cases are illustrated in following figures.

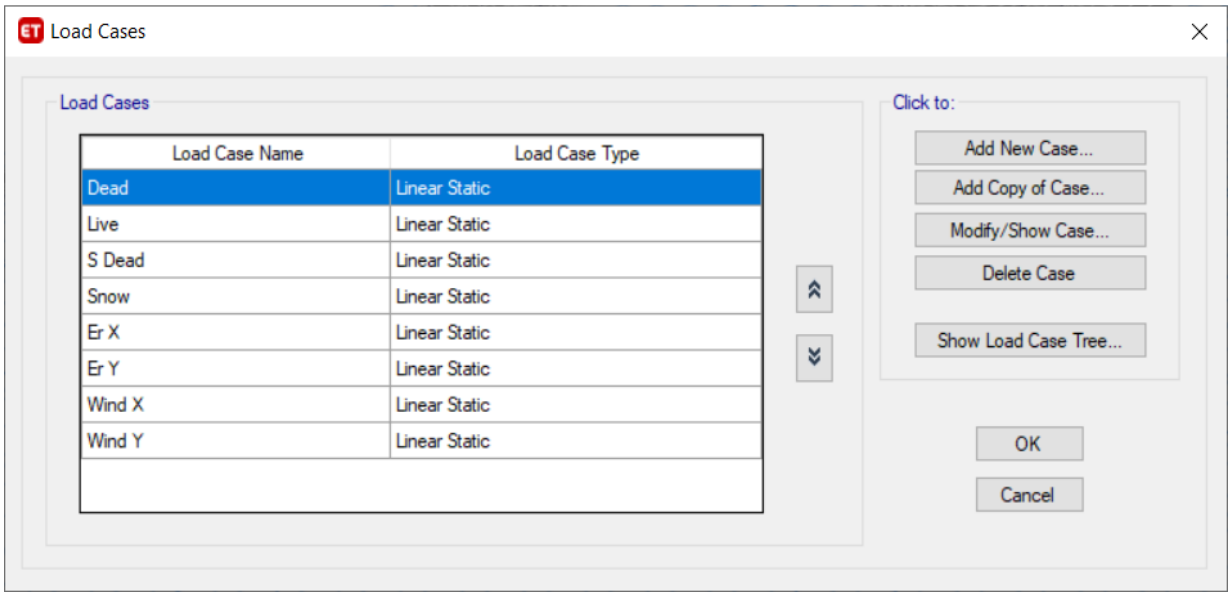

Figure 3 - Editing load cases

Then we proceed to the loading of our building itself that are shown in Figure B.1, Figure B.2 and Figure B.3 in Appendix B.

Combinations of action for permanent design situation (basic combination)

All coefficient and formulas are taken from СП РК EN 1990 bases for designing loading structure. We can calculate manually by the following formulas.

$$\sum_{j\geq 1}\gamma_G \cdot G_K + \gamma_p \cdot \mathrm{p} + \gamma_Q \cdot Q_K + \sum_{i>1}\gamma_Q \cdot \Psi_{0.1} \cdot Q_k \quad (8)$$

$$\sum_{j\geq 1}\gamma_G \cdot G_K + \gamma_p \cdot \mathrm{p} + \gamma_Q \cdot \Psi_{0.1} \cdot Q_K + \sum_{i>1}\gamma_Q \cdot \Psi_{0.i} \cdot Q_k \quad (9)$$

$$\sum_{j\geq 1}\gamma_G \cdot G_K + \gamma_p \cdot \mathrm{p} + \gamma_Q \cdot Q_K + \sum_{i>1}\gamma_Q \cdot \Psi_{0.i} \cdot Q_k \quad (10)$$

where $\gamma_G = 1.35$ –for permanent loads;
G_K – sum of permanent loads;;
$\gamma_Q = 1.5$ – for temporary loads ;
Q_K – sum of temporary loads;
Ψ_0, Ψ_1, Ψ_2 – in table НП.А1.1.

Combinations of actions for seismic design situations

$$\sum_{j\geq 1} G_{kj} + \mathrm{p} + A_{Ed} + \sum_{i>1} Q_{k.i} \cdot \Psi_{2.i} \quad (11)$$

Table 12 - The values of ψ

Воздействия	ψ_0	ψ_1	ψ_2
Приложенные нагрузки в зданиях, категории (см. EN 1991-1-1):			
Категория A: бытовые, жилые зоны	0,7	0,5	0,3
Категория B: офисные площади	0,7	0,5	0,3
Категория C: зоны для собраний	0,7	0,7	0,6
Категория D: торговые площади	0,7	0,7	0,6
Категория E: складские площади	1,0	0,9	0,8
Категория F: зоны дорожного движения для транспортных средств весом ≤ 30 кН	0,7	0,7	0,6
Категория G: зоны дорожного движения для транспортных средств весом от 30 кН до 160 кН	0,7	0,5	0,3
Категория H: покрытия (крыши)[a)]	0,7	0	0
Снеговые нагрузки на здания (см. EN 1991-1-3)*:			
Для районов, находящихся на высоте H > 1000 м над уровнем моря	0,7	0,5	0,2
Для районов, находящихся на высоте H ≤ 1000 м над уровнем моря	0,5	0,2	0
Ветровые нагрузки на здания (см. EN 1991-1-4)	0,6	0,2	0
Температурные воздействия (исключая пожары) на здания (см. EN 1991-1-5)	0,6	0,5	0
а) См. также 3.3.2(1) EN 1991-1-1.			

Then the combinations of design load combinations will look in accordance with Figures 8.

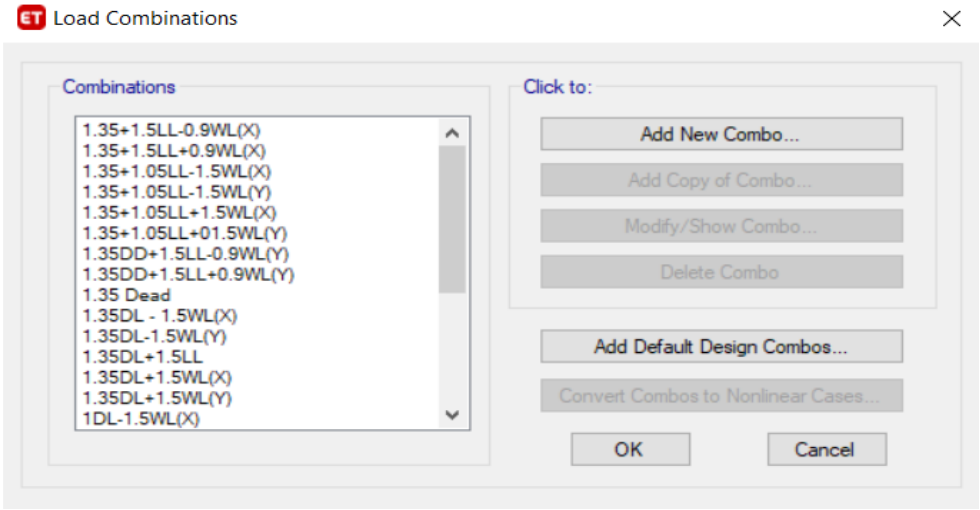

Figure 4 - Combination of actions

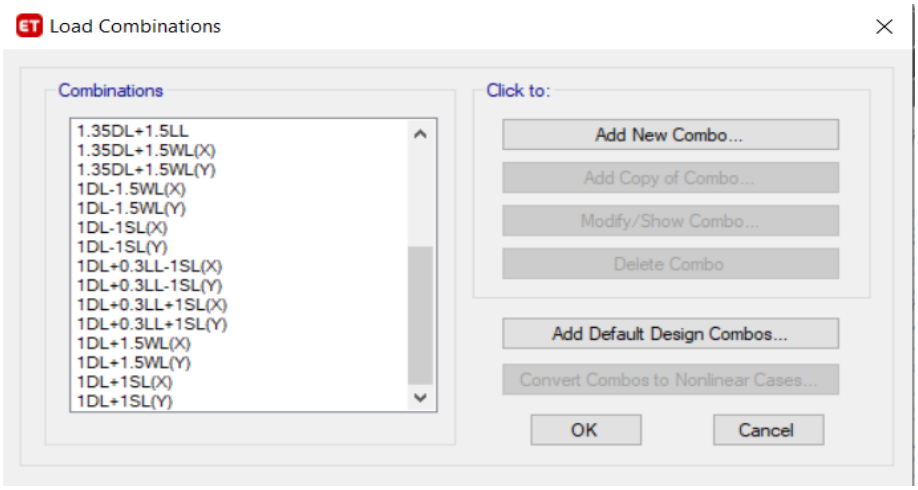

Figure 5 – Combination of actions

Ultimate strains and bases

Industrial and civil one-story and multi-storey buildings with a full frame: the same, with the device of reinforced concrete belts or monolithic floors, as well as buildings with a monolithic structure, Average s_ (max, μ) = 10 cm., Respectively, according to the standard (SP RK 5.01-102- 2013-Base, According to [1], the maximum settlement of the base is s_ (max, μ) = 10 cm)

For our design scheme, the maximum drift is 8 mm, which satisfies the condition which is shown in Figure A.1 in Appendix A.

$$s \leq s_{max,\mu}$$

$$8 \text{ мм} \leq 100 \text{ мм}$$

The relative difference in sediment is:

$$\text{RS} = (\frac{\Delta s}{L})_u,$$

where L is the distance between the axes of the foundation blocks in the direction of horizontal loads, and in guyed supports - the distance between the axes of the compressed foundation.

According to Appendix B [1], the relative draft should not exceed 0.002.

Then, according to FigureA.1 in Appendix A, we get that the relative draft is:

$$\frac{65}{30000} = 0.0017 < 0.002$$

Condtion is met

Deflection of the slab and girder

The appearance and overall serviceability of the supporting structure may be compromised if the calculated deflection of a beam, slab or cantilever beam, near a constant combination of actions, exceeds L / 250 span. According to the standard (sn pk en 1992-1-1 + np <Design of reinforced concrete structures for buildings>, according to sub-clause 7.4 Control of deflections).

a) For plat

The deflection of the floor slab is determined according to Figure A.2 in Appendix A

The deflection is 18mm

According to subparagraph the deflection of the slab should not exceed a value equal to:

$$\frac{l}{250} = \frac{9000}{250} = 36 \text{ мм}$$

Maximum horizontal displacement from the wind

According to paragraph EN1991 10.14 of Table 22 [3], the maximum horizontal displacements from the wind are calculated by the formula:

$$\text{Maximum horizontal displacements from the wind} = \frac{h}{500}$$

where h - is the height of multi-storey buildings, equal to the distance from the top of the foundation to the axis of the roof girder.

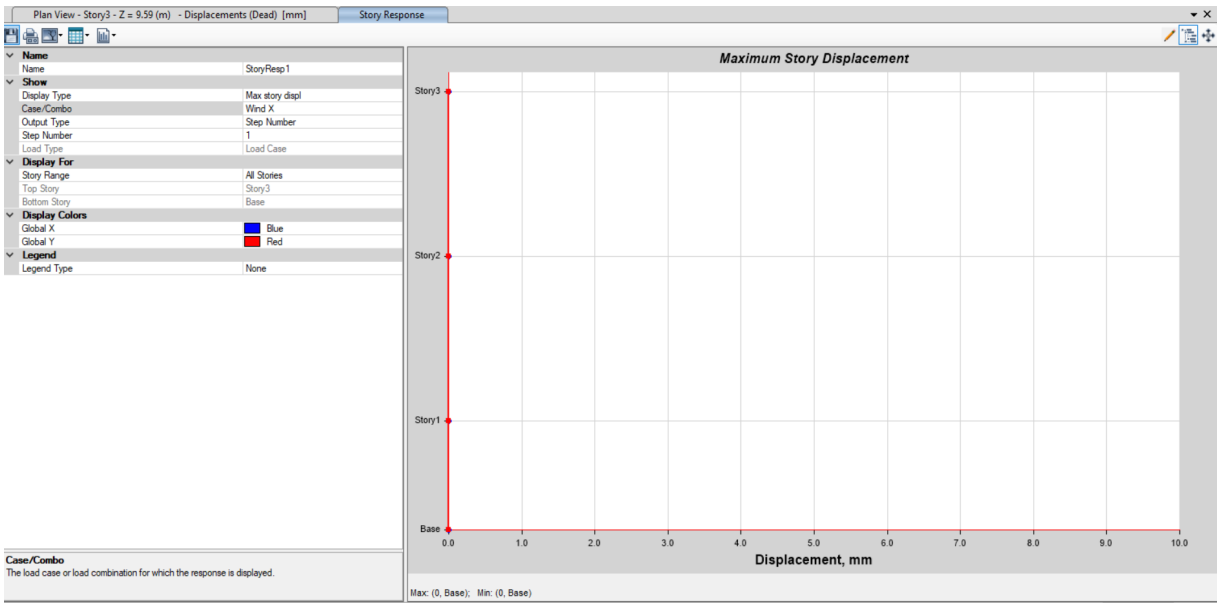

Figure 6 – Movements from the wind along the X axis

The maximum movement along the X axis is 0.01 mm.

$$0.01 \text{ мм} < \frac{8600}{500} = 17.2 \text{ мм}$$

The condition is met.

Checking the regularity of buildings in the plan

To begin with, let's check the building for regularity in terms of X. To do this, we use the formula according the Figure A.3 in Appendix A.

$$100 - \frac{\delta_{max}+\delta_{min}}{2\cdot\delta_{max}} \cdot 100$$

$$100 - \frac{0.279+10.2}{2\cdot10.2} \cdot 100 = 26.7\ percent$$

According the Figure A.4 in Appendix A.

$$100 - \frac{\delta_{max} + \delta_{min}}{2 \cdot \delta_{max}} \cdot 100$$

$$100 - \frac{30.2 + 10}{2 \cdot 30.2} \cdot 100 = 12.6\ \%$$

According the Figure A.5 in Appendix A.

$$100 - \frac{\delta_{max}+\delta_{min}}{2\cdot\delta_{max}} \cdot 100$$

$$100 - \frac{30+52}{2\cdot52} \cdot 100 = 3.2\ percent$$

Since not all values exceed 25%, our building is irregular in plan along the OX and OY axes.

We take all the displacement values from the ETABS software package (story response)

3 Organisational and technological Part

3.1 Earthwork

Type of soil is sand and gravel that is included in II category of soil with admixture up to 30 percent.

Range of soil transportation: 7 km

Winter temperature of external influence: -10 degrees celciuse

Elevation of the base of foundation: -2.4m

Determination of the scope of work

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

-temporary fencing

the fencing perimeter, m, determined by the formula:

$$P_{fen} = (20 + l_1) \cdot 2 + (20 + l_2) \cdot 2 \quad (12)$$

where l_1, l_2– length and width of the structure in plan, m.

Distance from the axis of the building in each direction is 20 m.

$$P_{fen} = (20 + 53) \cdot 2 + (20 + 35.8) \cdot 2 = 257 \text{ m}$$

But for the whole project the fencing will be 800 m.

- The volume of earthworks is determined when designing earthworks.

$$V_p = \frac{h}{6} \cdot \left(a \cdot b + c \cdot d + (a + c) \cdot (b + d)\right), m^3 \quad (13)$$

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

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

$$V_{p1} = \frac{2.8}{6} \cdot \left(35.8 \cdot 53 + 45.2 \cdot 60 + (35.8 + 53) \cdot (45.2 + 60)\right) = 4520 m^3$$

- Determine the volume of backfilling

$$V_{bf1} = \frac{V_p - V_f - V_{base}}{1 + K_{r.l}}, m^3 \quad (14)$$

$$V_{bf1} = \frac{4520 - 635.04 - 2116.8}{1 + 0{,}05} = 256.5\ m^3$$

where V_{base} – basement volume

$$V_{base} = a \cdot b \cdot h = (35.8 \cdot 53 \cdot 2.8) = 5312.72\ m^3$$

where V_f- volume of foundation elements

$$V_f = (1.2 \cdot 1.2 \cdot 1) \cdot 42 = 60.5\ m^3$$

$K_{r.l.}$- residual loosening factor

- Determination of the volume of surplus soil

$$V_{s.s} = V_p - V_{bf}\ , m^3 \quad (15)$$

$$V_{s.s1} = 4520 - 256.5 = 4250$$

- Determination of the volume of soil shortage

$$V_{short.s} = a \cdot b \cdot h_{short.s},\ m^3 \quad (16)$$

$$H_{short.s} = 0.1 \div 0.4\ m$$

$$V_{short.s} = (53 \cdot 35.8 \cdot 0.4) = 758.96\ m^3$$

- Determination of the cutting area of the vegetation layer

$$S_{veg} = (10 + c + 10)\ (10 + d + 10), m^2 \quad (17)$$

$$S_{veg} = (10 + 45.2 + 10)\ (10 + 60 + 10) = 5216\ m^2$$

- The total volume of cutting of plant soil.

$$V = S \cdot h_{p.s} = 4520 \cdot 0.2 = 904\ m^3$$

- Waterproofing area of foundation slab

$$S = \frac{V_{base}}{h} \quad (18)$$

$$S = \frac{60.5}{3} = 705.6\ m^2$$

Selection of a set of machines for excavation work

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

Soil development is divided into 3 categories:

- earthmoving
- machines for compaction
- machines for auxiliary work

1) Choosing a bulldozer

Basic tractor T-180, bulldozer DZ-110, soil –gravel, cutting path length – 25.7 m, soil transportation path length – 80 m.

The technical performance of the bulldozer is determined by the formula:

$$P_T = q_{pr} \cdot n \cdot k_n / k_r \quad (19)$$

where q_{pr} - volume of the soil dragging by blade, м;

$$q_{pr} = \frac{L \cdot H^2}{2 \cdot m} = \frac{3.94 \cdot 0.815^2}{2 \cdot 0.7} = 1.75 m^3$$

where L - blade length, L = 3.94 m;

H - blade height, H=0.815 m;

m = 0.7 - coefficient depending on the ratio H/L;

n - number of cycles per 1 hour of work:

$$n = 3600/T = 3600/200 = 13$$

where k_n=1.1 - coefficient of filling the geometric volume of the prism with soil, k_r=1.25 - soil loosening coefficient,

$$P_T = q_{pr} \cdot n \cdot \frac{k_n}{k_r} = 1.75 \cdot 13 \cdot \frac{1.1}{1.25} = 32 \text{ m}^3/\text{h}$$

Operating performance of the bulldozer:

$$P_e = P_T \cdot k_v = 32 \cdot 0.8 = 25.8 \text{ m}^3/\text{h}$$

where $k_в$ - bulldozer utilization rate over time, k_v=0.8.

Changeable bulldozer performance:

$$P_c = 8 \cdot P_e = 8 \cdot 25.8 = 206.4 \text{ m}^3/\text{h}$$

where 8 - the number of hours of work per shift.

2) Excavator selection

The excavation is carried out with a excavator equipped with a backhole shovel EO-5122 with loading soil into dump trucks and with partial filling into a dump with the following specifications:

Bucket volume, 1 m^3;

Maximum digging depth, 9.3 m;

Largest cutting radius, 9.9 m;

Power, 95 kwatt.

We select a front shovel excavators with teeth and with a bucket volume of 1 m^3.

3) Determining the number of dump trucks

To remove excess soil from the construction site and ensure joint work with the excavator, we choose dump trucks.

Choosing a dump truck MAZ-5516

- Determination of the required number of dump trucks

$$N = \frac{T_c}{t_p} = \frac{60}{13.8} = 4.6 \approx 5$$

4) Selection of soil compactors

Since gravel is course graind soils and have little cohesiveness, therefore, considering the smallest length of the condensed strip up to 50 m we choose (DU-128) – plate compactor with a width of the compacted strip - 2.5 m.

3.2 Technological map for concrete work

The composition of concrete work in the construction of a reinforced concrete frame without beam includes 4 steps.

Before beginning the constructing of the structures, we need:

- transport and place formwork panels and reinforcing bars at the storage

site;

- carry and prepare necessary devices, inventory and tools for the work to the site;

Concrete is transported to the construction site by concrete mixer trucks, or dump trucks adapted for the transportation of concrete.

In the places where the concrete is placed, an inventory wooden flooring is arranged.

Reinforced concrete structures in contact with the ground must be coated with bitumen.

Initial data

Number of floors - 3 (including the basement)

Transportation range -7 km

Building dimensions: l = 53 m, b = 35.8 m

Thickness of floor slabs and coverings: h = 20 cm

Bulk density of heavy concrete: 2500 kg / m^3

Floor height, 4 m and 5m, basement floor -2.8 m

The thickness of the shear walls are 200 mm.

Concreting

The maximum duration of transportation of the concrete mix should be established by the construction laboratory with the condition of ensuring the preservation of the required quality of the mix on the way and at the place of its laying.

Before placing the concrete mixture, the floor (artificial), the correct installation of the formwork, reinforcement structures and embedded parts must be checked.

breaks in concrete pouring, is determined by the laboratory depending on the type and characteristics of the cement and the temperature of concrete hardening. Placement of the concrete mixture after. The pouring of the concrete mixture in the structure to be concreted is prformed in horizontal layers of the same thickness, laid in one direction.

The concrete mix is compacted with vibrator with a flexible shaft. When compacting the concrete mixture, it is not allowed to rest the vibrators on reinforcement, embedded products, formwork fastening elements. The step of moving the vibrator should not exceed 1.5 of its radius of action. The optimal duration of vibration in one place is 20-30 s. The immersion depth of the vibrator in the concrete mixture should ensure its partial deepening into the previously laid unhardened.

Signs of the completion of concrete compaction during the operation of vibrators are:

When caring for concrete, it is necessary to provide favorable temperature and humidity conditions for concrete hardening, protecting it from the harmful effects of wind, direct sunlight by systematic watering of moisture-consuming coatings (burlap, a layer of sand, sawdust, etc.) of concrete surfaces; the frequency

of watering moisture-consuming coatings depends on climatic conditions and the need to maintain the concrete surface in a damp state;

Concreting structures must be accompanied by appropriate entries in the concrete work log.

Placement of concrete mix in coatings and ceilings:

$$S = L{\cdot}b{\cdot}h = 53{\cdot}35.8{\cdot}0.2 = \ 379.48m^3$$

Paving the concrete mixture into the column:

$$S = L{\cdot}b{\cdot}h = 42{\cdot}0.5{\cdot}0.5{\cdot}2.8 = \ 29.4\ m^3$$

- Concrete uring

When caring for concrete, it is necessary to provide favorable temperature and humidity conditions for concrete hardening, protecting it from the harmful effects of wind, direct sunlight by systematic watering of moisture-consuming coatings (burlap, a layer of sand, sawdust, etc.) of concrete surfaces; the frequency of watering moisture-consuming coatings depends on climatic conditions and the need to maintain the concrete surface in a damp state;

Selection of transportation methods, placement, supply, and strengthening of concrete mixture.

Mobile crane selection:

MKG-16M Carrying capacity: 10 t

Load moment: 170 t·m

Lifting capacity at maximum outreach: 3 t

Departure range: 6 -20 m

Lifting height freestanding crane: 25 m

Maximum Lifting speed: 55 m / min

- Concrete pump:

Model (ABN 75/32)

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

$$\mathrm{T} = \frac{\mathrm{V}}{\mathrm{P_c}} \tag{20}$$

$$\mathrm{T} = \frac{3291.8}{54.26} = 60 \text{ days}$$

where V- the total required volume of concrete for the entire building;

P_c- Changeable operational efficiency of the mechanism m^3 / shift

$$\Pi_e = 60 \cdot \mathrm{T}\left(\frac{\Pi \cdot d^2}{4}\right) \cdot l \cdot \vartheta \cdot K_{ex}, \frac{\mathrm{m}^3}{\text{shift}} \tag{21}$$

where T is the duration of work per shift 8 hours;

Π = 3.14

d - Working cylinder diameter m

l - Piston stroke length

ϑ - number of 2 piston strokes min. (Discharge rate)

K_{ex} - coefficient characterizing the ratio of the volume of concrete mixture supplied in 1 stroke to the working volume of the amplifier (0.8-0.9)

$$\Pi_e = 60 \cdot 8 \left(\frac{3.14 \cdot 0.2^2}{4} \right) \cdot 2 \cdot 2 \cdot 0.9 = 54.26$$

- Concrete mixer truck

KaMAZ-53212

- Vibrator

IV-65

The number of concrete trucks based on the condition of uninterrupted delivery to the object:

$$N = \frac{K_r \cdot P_e}{P_a} \tag{22}$$

where K_r- the coefficient taking into account the reserve of productivity of mechanisms to the leading machines (0.85-0.9);

P_e- operational performance of the concrete truck.

$$P_a = \frac{60 \cdot V \cdot T \cdot K}{t_c} \tag{23}$$

$$P_e = \frac{k \cdot L \cdot n}{100} = \frac{0.72 \cdot 800 \cdot 35.8}{100} = 122.3$$

where L-the volume of the concrete mixer in litre;

n-number of batches per hour;

k-coefficient of concrete output from 0.65 to 0.72 (usually 0.67 is taken);

t_c-cycle time.

$$t_c = t_z + \frac{2 \cdot L \cdot 60}{v_{sr}} \tag{24}$$

where t_z- loading time of the concrete truck at the plant

$$t_c = 5 + \frac{2 \cdot 21 \cdot 60}{35} = 75$$

$$P_a = \frac{60 \cdot 12 \cdot 8 \cdot 0.92}{75} = 58$$

Number of concrete trucks

$$N = \frac{0.9 \cdot 122.3}{58} = 2.3 \approx 3 \text{ pcs.}$$

3.3 Technical map for reinforcement work

Reinforcement of foundation is carried out by installing reinforcing cages with their fastening to each other with separate rods and viscous nodes. The installation of reinforcement into the structure is carried out according to the working drawings.

Wall reinforcement works include:

- marking the locations of the frames;
- installation of clamps to create a protective layer;
- installation of reinforcing cages;
- knitting of frame joints;
- welding of frames.

Before starting the installation of the reinforcement, it is necessary to carefully check the compliance of the formwork with the design dimensions and the quality of its implementation; prepare rigging equipment, tools for work; clean the reinforcement from rust; close the openings in the ceilings with shields or put up a temporary fence.

Reinforcing bars delivered to the construction site are placed on shelves in closed warehouses sorted by brands, diameters and lengths; the nets are stored in rolls in an upright position. Flat nets and frames should be stacked in the crane's operating area on blank spacers and pads. The height of the stack must not exceed 1.5 m. The width of the spacers must be at least 150 mm and the thickness at least 50 mm.

The fittings are supplied to the installation site by a Mobile crane.

Flat and spatial frames weighing up to 50 kg are fed to the installation site by a crane in bundles and installed manually, and weighing more than 50 kg - by a crane. The individual rods are fed to the installation site in bundles.

For temporary storage of reinforcing cages to the formwork, clamps are used.

To form a protective layer of concrete between the reinforcement and the formwork, clamps are installed with a step of 1.0-1.2 m in a checkerboard pattern.

The installation of the reinforcement is started after the installation of the formwork from one side of the wall.

Work on the installation of fittings is performed by a team of 3 people:

- electric welder of the 4th category - 1;
- fitter of the 3rd category - 1;
- 2nd class rigger - 1.

3.4 Master plan

The basic data required for the development of a building master plan are:

- master plan of the territory with existing and under construction buildings, as well as basement communications networks;

- calendar plan for the production of work with a schedule of labor requirements;

- necessary construction machines and mechanisms;

- the required amount of the need for general construction structural elements, products and bulk and non-bulk resources;

- dimensions of structures and buildings, as well as temporary warehouses at the construction site;

- general information about the development of building general plans. In general, construction master plans can be dredged at various stages of the construction business.

- the explanatory notes for the function of the building master plan, its purpose and for what period (for example, the installation of foundation blocks, and the installation of roofing elements or in the installation of structures in general) was developed.

3.5 Calculation of temporary power supply

Electricity is the main source of energy used in the construction of buildings and structures. Power electricity is used to power machines and mechanisms, for electric welding and other technological needs.

Electricity is supplied to the construction from existing systems or inventory mobile power plants. Therefore, when developing theses, it is necessary to resolve the issue of power supply.

The maximum electricity consumption is set on the basis of the work schedule or network schedule.

We find the power of the outdoor lighting network by the formula:

$$W_{H.O} = K_c \cdot \sum P_{O.H} = 1 \cdot 22.5 = 22.5 \text{ kWatt}$$

where K_c- reduction coefficient of the power;

$\sum P_{O.H}$- sum of consuming power.

Indoor lighting network power:

$$W_{H.O} = 0.8 \cdot 4.1 = 3.28 \text{ kWatt}$$

Total power consumption for lighting:

$$W_{total} = 22.5 + 3.28 = 25.78 \text{ kWatt}$$

4 Economic Part

4.1 Estimated cost of construction

The estimated cost of construction is the necessary material resources, which is determined on the basis of design materials and standards in accordance with the legislation of the Republic of Kazakhstan.

The basis for construction is the estimated cost necessary to determine the indicator of investment funds for construction, to form a price for construction, serves as a guideline for customers when purchasing and concluding a contract, settlements for work performed by a contract in accordance with the current legislation of the Republic of Kazakhstan.

This section shows the cost, that is, the required capital for the construction.

The composition of the above consists of: construction cost, including design and survey work, the price of equipment, the price of installation of equipment, etc.

Capital investment is determined by drawing up a consolidated estimate.

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

- Costs of preparatory work on the territory;
- The main elements of the object;
- Elements of service and auxiliary character.
- Elements of the energy economy.
- Objects of transport facilities and communications.
- External networks and structures of water supply, sewerage, heat supply and gas supply.
- Landscaping and gardening of the territory.
- Temporary buildings and structures.
- Costs are secondary.
- Directorates of the enterprise.
- Training of personnel.
- Exploration and design work.

We find the construction cost of the estimated structures and buildings of the main and secondary nature using general estimated norms in 2019 prices [16].

4.3 Economic indicators of the project

For the implementation of the investment project, it is planned to use borrowed funds. But at the same time, according to the legislation of the Republic of Kazakhstan, 1 percent of the total investment should be financed from its own funds.

The cost for one building will be about 96625000 million tenge.

The full estimated cost of the building (local, consolidated, facility) of the facility is attached in Appendix C.

CONCLUSION

The developed thesis project on the topic "Exhibition pavilion with biomass heating system in Almaty", completed in accordance with the assignment, in full. The project consists of four parts.

Calculations were made for all parts of the diploma project, designs were selected. In the architectural and construction part, measures were taken to protect structures from corrosion, decay and fire, a general description of the building was given and its space-planning solution was developed a master plan for the site of the projected building, the technical and economic indicators of the projected building were calculated

In the design part of the design, the column, the floor slab and the roof girder are calculated. Selected working fittings.

In the technological part, the choice of the crane has been made. Temporary water supply and transformer were selected. A construction master plan for the construction of a 6-storey administrative and residential complex in Astana, a calendar schedule for the production of works has been developed, technical and economic indicators of the calendar schedule have been determined.

In the section on labor protection, questions have been developed on labor safety, environmental, fire safety. Particular attention was paid to the organization of the security service at the enterprise, recommendations were given to prevent or reduce the impact of hazardous production factors and monitor compliance with the Labor Code of the Republic of Kazakhstan on health and safety issues.

In the economic part, the costs of all types of work are calculated, starting with earthworks, aboveground types of work and ending with finishing work.

Based on the results of local estimates, an object estimate was made and according to the consolidated estimate of the cost of construction, the cost of construction is 96625000 tenge.

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Appendixes

Appendix A

Table A.1- Loads on floors and walls

Applied loads	Characteristics of loads, kg/m^2
1 Unit weight:	Auto
for floors:	
tile flooring δ=15 mm, ρ=976 kg/m^3	$0.015 \cdot 976 = 10.1$
Reinforced cement-sand plaster δ=55 mm, ρ=1600 kg/m^3	$0.055 \cdot 1600 = 80$
Waterproofing (Membrane) δ=15 mm, ρ=1400 kg/m^3	$0.02 \cdot 1400 = 28$
Soundproofing δ=20 mm, ρ=45 kg/m^3	$0.020 \cdot 45 = 1.125$
Foam for thermal insulation δ=50 mm, ρ=1000 kg/m^3	$0.05 \cdot 1000 = 50$
Floor slab δ=200 mm, ρ=2400 kg/m^3	$0.200 \cdot 2400 = 360$
Total	531.5 kg/m^2 = 0.531 t/m^2
for flat roof:	
Floor slabs δ=200 mm, ρ=2400 kg/m^3	$0.2 \cdot 2400 = 480$
Cement-sand plaster, δ=60 mm, ρ=1600 kg/m^3	$0.06 \cdot 1600 = 96$
Vapor barrier (low-Density Polyethylene sheets) δ=0.25 mm, ρ=940 kg/m^3	$0.00025 \cdot 940 = 0.235$
Thermal insulation , δ=150 mm, ρ=500 kg/m^3	$0.15 \cdot 500 = 55$
Waterproofing (Membrane), δ=20 mm, ρ=1400 kg/m^3	$0.02 \cdot 140 = 28$
Total	603.2 kg/m^2 = 0.603 t/m^2
Loads	Characteristic of loads, kg/m
1.2 Wall construction	
external self-supporting walls (wall height4 m):	
Concrete blocks δ=200 mm, ρ=600 kg/m^3	$0.2 \cdot 4 \cdot 600 = 480$
Thermal insulation δ = 100 mm, ρ = 40 kg/m^3	$0.1 \cdot 2 \cdot 4 \cdot 40 = 32$
Vapor barrier (low-Density Polyethylene sheets) δ=2 mm, ρ=940 kg/m^3	$0.002 \cdot 4 \cdot 940 = 4.52$

Continuation of Appendix A

Continuation of Table A.1- Loads on floors and walls

Applied loads	Characteristics of loads, kg/m^2
Fiber cement siding δ=148 мм, ρ=1650 kg/m^3	$0.148 \cdot 3 \cdot 1650 = 742.5.1$
Total	1112.37 kg/m = 1.1124 T/m
Internal self-supporting walls (wall height 3m)	
Autoclaved aerated concrete AAC blocks (Foam concrete block) δ=200 mm, ρ=600 kg/m^3	$0.2 \cdot 3 \cdot 600 = 360$
Thermal insulation (foam board) δ = 54 mm, ρ = 40 kg/m^3	$0.054 \cdot 3 \cdot 40 = 6.48$
Vapor barrier (low-Density Polyethylene sheets) δ=1 mm, ρ=940 kg/m^3	$0.001 \cdot 3 \cdot 940 = 2.82$
gypsum plasterboard δ=15мм, ρ=800 kg/m^3	$0.015 \cdot 3 \cdot 800 = 36$
Total	405.3 kg/m = 0.405 T/m
external self-supporting walls (parapet height 1m):	
Autoclaved aerated concrete AAC blocks (Foam concrete block) δ=200мм,ρ=600 kg/m^3	$0.2 \cdot 1 \cdot 600 = 120$
Thermal insulation (foam board) 2 layers δ = 50 mm, ρ = 40 kg/m^3	$0.05 \cdot 2 \cdot 1 \cdot 40 = 4$
Vapor barrier (low-Density Polyethylene sheets) δ=1 mm, ρ=940 kg/m^3	$0.001 \cdot 1 \cdot 940 = 0.94$
Fiber cement siding δ=149мм, ρ=1650 kg/m^3	$0.149 \cdot 1 \cdot 1650 = 245.85$
Total	370.79 kg/m = 0.3708 T/m
Partitions (height, h = 3m)	
Reinforced brick partition wall δ=100мм, ρ=2000 kg/m^3	$0.1 \cdot 3 \cdot 2000 = 600$
Support rack profiles δ=10 мм,ρ=15 kg/m^3	$0.01 \cdot 3 \cdot 15 = 0.45$
Thermal insulation (foam board) δ=55мм, ρ=40 kg/m^3	$0.055 \cdot 3 \cdot 40 = 6.5$
gypsum plasterboard δ=15мм, ρ=800 kg/m^3	$0.015 \cdot 3 \cdot 800 = 38$
Итого	652.3 kg/m = 0.652 t/m
2.2 Horizontal pressure from the ground [4]:	2.12 t/m^2

Appendix B

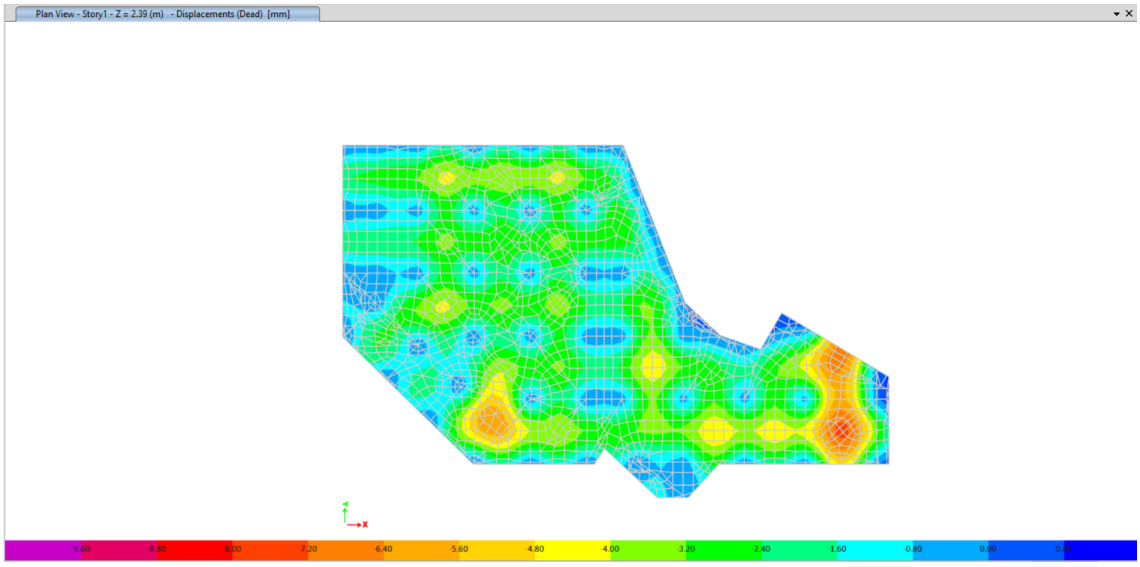


Figure B.1 – Stresses on the floors due to dead load

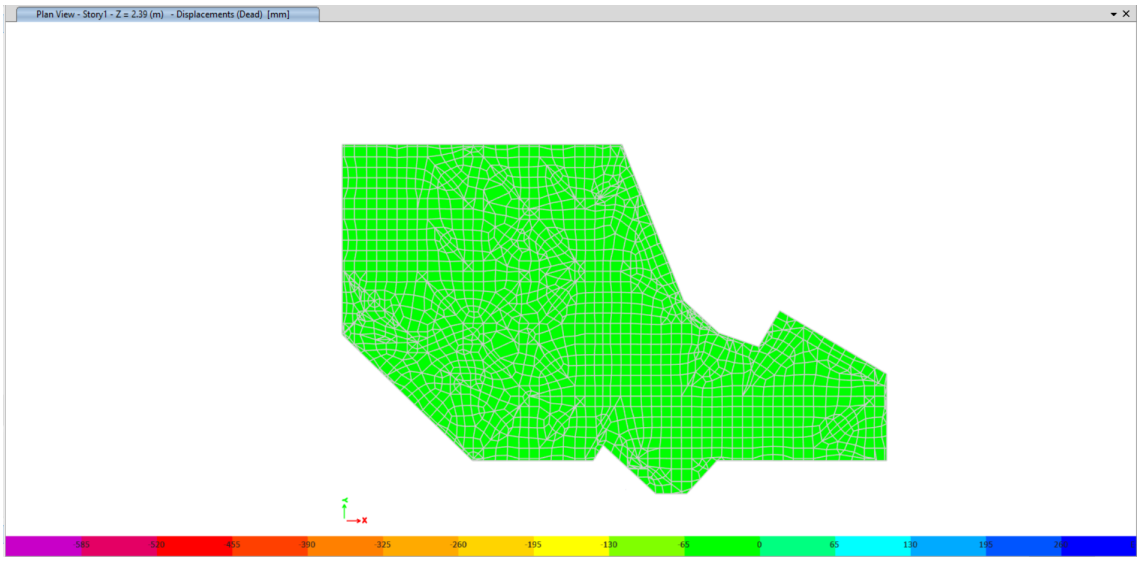


Figure B.2 – Slab defiliction along Z axis

Continuation of Appendix B

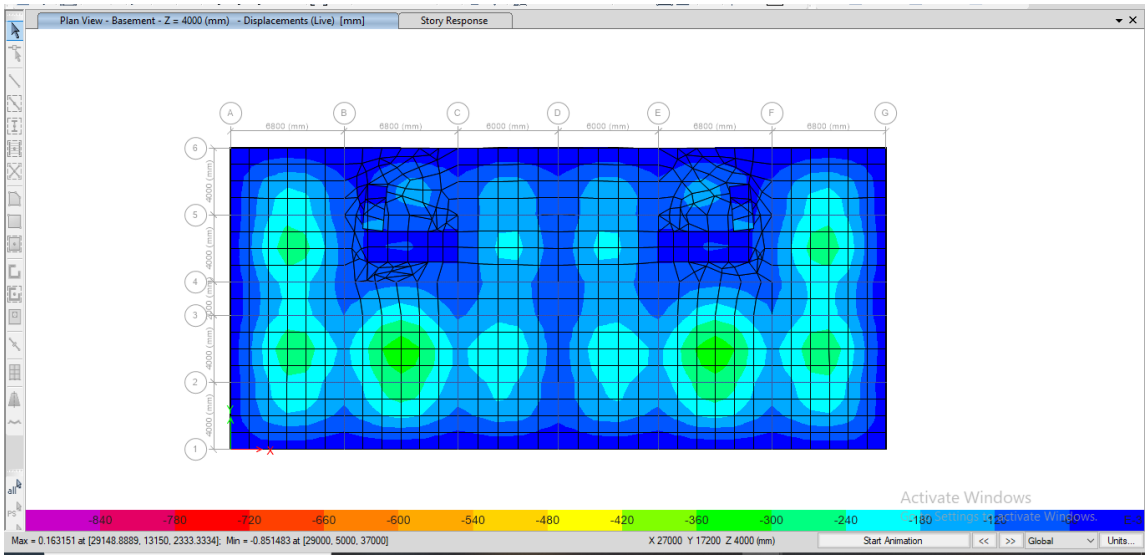


Figure B.3- Isofields of base dirift along the Z axis

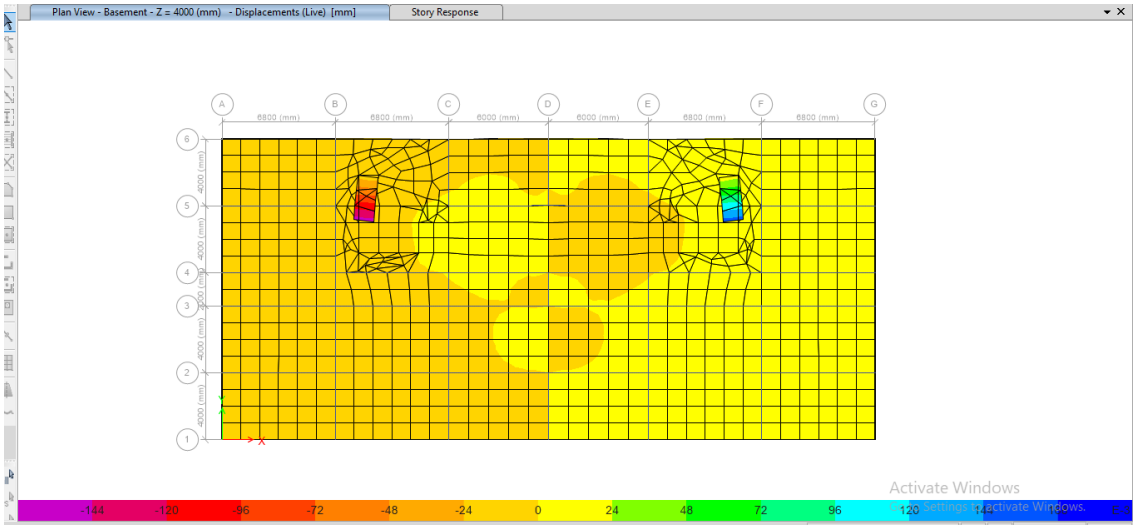
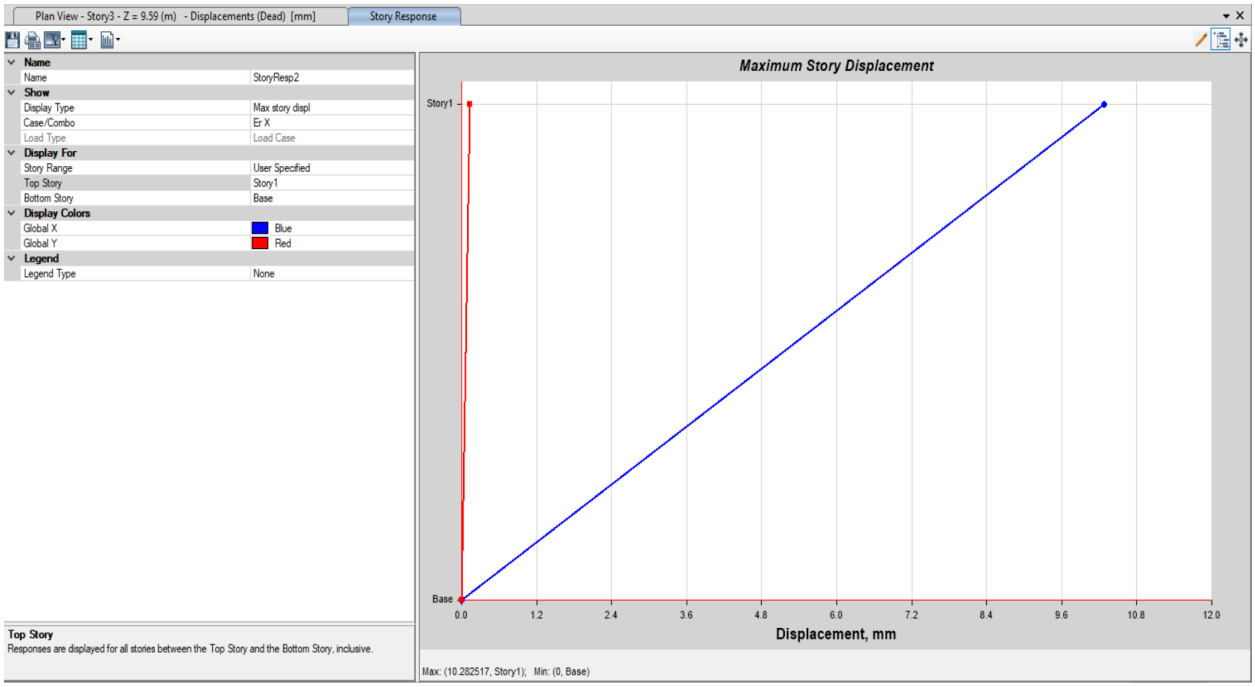
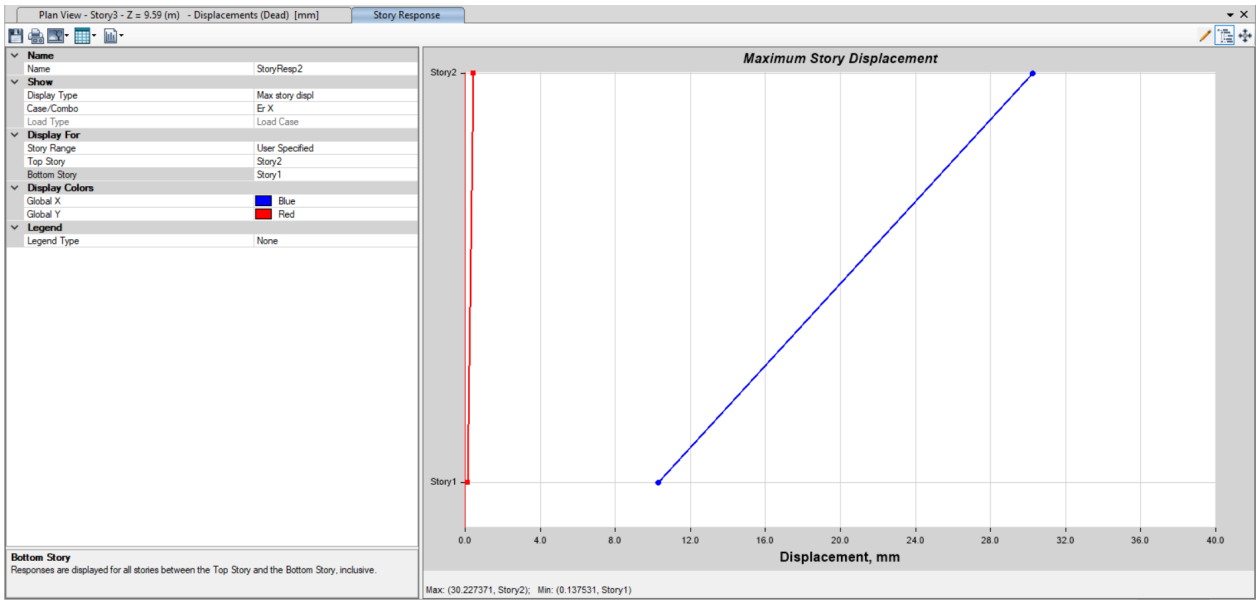


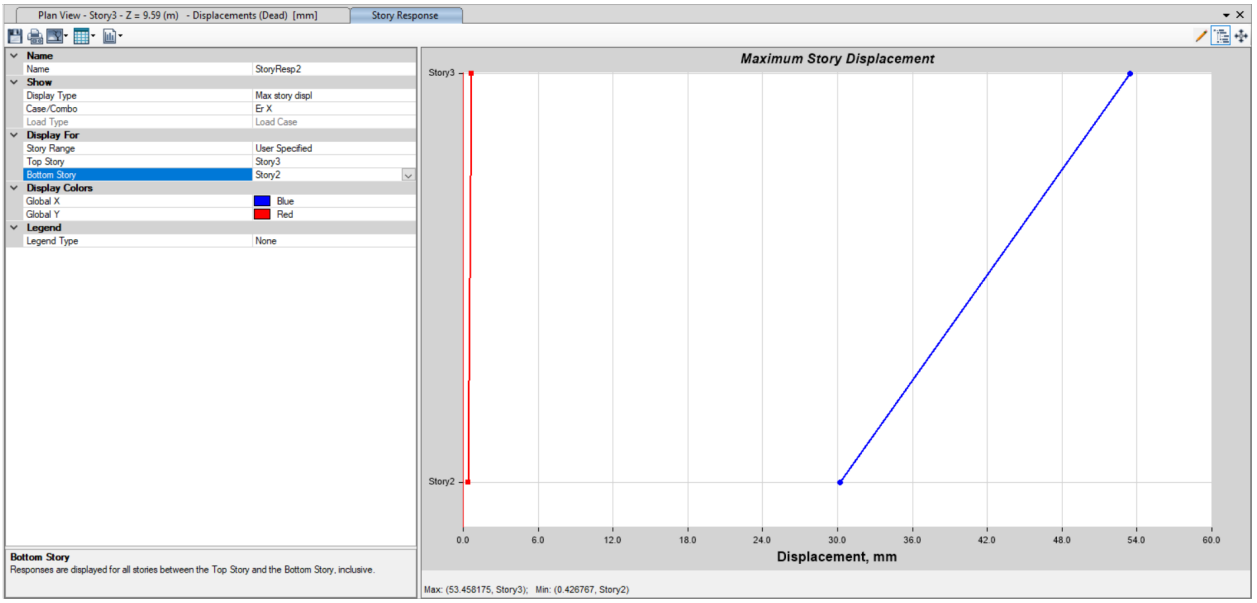
Figure B.4- Isofields of base dirift along the X and Y axis



Figures B.3 - Diagram of displacements of the first floor slab from seismic along X



Figures B.4 - Diagram of displacements of the secondt floor slab from seismic along X



Figures B.5 - Diagram of displacements of the third floor slab of the 6th floor from seismic along X

Appendix C

OBJECT ESTIMATE

Estimated Cost 94625.24 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	Energy-efficient social residential complex	151687	--	--	94625.24	38.082	2736.023
2		**Total**	151687	--	--	**94625.24**	38.082	2736.023
3		Temporary buildings and structures	1040.87764	--	--	1040.87764	38.082	2736.023
4		Return of materials from temporary buildings and structures	156.131646	--	--	156.131646	38.082	2736.023
5		**Total**	1040.87764	--	--	**1040.87764**	38.082	2736.023
6		**Total**	94625.24	--	--	**94625.24**	38.082	2736.023
7		Additional costs in the production of work in the winter	1135.50288	--	--	1135.50288	38.082	2736.023
8		Seniority costs			946.2524	946.2524	38.082	2736.023
9		Additional vacation costs			378.50096	378.50096	38.082	2736.023
10		**Total**	**1135.50288**		**1324.75336**	**2460.25624**	38.082	2736.023
11		**Total**	95760.74288		1324.75336	97085.49624	38.082	2736.023
12		Including refundable amounts	156.131646		--	156.131646	38.082	2736.023
13		**Total according to the estimated calculation in the base prices of 2001.**	95760.74288		1324.75336	97085.49624	38.082	2736.023
14		Total estimated at current prices in 2021.	327501.7406		4530.656491	332032.3971	38.082	2736.023
15		Including refundable amounts in current prices	533.9702293			533.9702293	38.082	2736.023
16		Taxes, fees, mandatory payments,			6640.647943	6640.647943	38.082	2736.023
17		Estimated cost at current price level	327501.7406		11171.30443	338673.0451	38.082	2736.023
18		НДС (12%)			40640.76541	40640.76541	38.082	2736.023
19		Construction cost	327501.7406		51812.06984	379313.8105	38.082	2736.023

Figure D.1- Object estimation

Continuation of Appendix C

Estimated calculation of the cost of construction in the amount of 19r 7c — 94625.24 Thous.Tenge

including refundable amounts: 15r 7c — **533.9702293** Thous.Tenge

value added tax 18r7c — 41087.81383 Thous.Tenge

ESTIMATE CALCULATION OF THE COST OF CONSTRUCTION

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	2	3	4	5	6	7
1	1	Energy-efficient social residential complex in Almaty	94625.24	--	--	94625.24
2		**Total=1 row**	94625.24	--	--	94625.24
3		Temporary buildings and structures 1,1%*2 row 7column	1040.87764	--	--	1040.87764
4		Return of materials from temporary buildings and structures 15%*3r7c	156.131646	--	--	156.131646
5		**Total=3 row**	1040.87764	--	--	**1040.87764**
6		**Total 2r+5r**	95666.11764	--	--	**95666.11764**
7		Additional costs in the production of work in the winter1,2%*6r7c	1147.993412	--	--	1147.993412
8		Seniority costs 1%*6r7c			956.6611764	956.6611764
9		Additional vacation costs 0,4%*6r7c			382.6644706	382.6644706
10		**Total 7r+8r+9r**	**1147.993412**		**1339.325647**	**2487.319059**
11		**Total 6r+10r**	96814.11105		1339.325647	98153.4367
12		Including refundable amounts=4r	156.131646		--	156.131646
13		**Total according to the estimated calculation in the base prices of 2001..=11r**	96814.11105		1339.325647	98153.4367
14		Total estimated at current prices in 2021. 13r*3,42	331104.2598		4580.493713	335684.7535
15		Including refundable amounts in current prices 12r7c*3,42	533.9702293			533.9702293
16		Taxes, fees, mandatory payments,2%*14r7c			6713.69507	6713.69507
17		Estimated cost at current price level 14r+16r	331104.2598		11294.18878	342398.4486
18		НДС (12%)*17r7c			41087.81383	41087.81383
19		Construction cost17r+18r	331104.2598		52382.00261	383486.2624

Figure C.2- Estimate calculation of the cost of construction

Continuation of Appendix C

OBJECT ESTIMATE

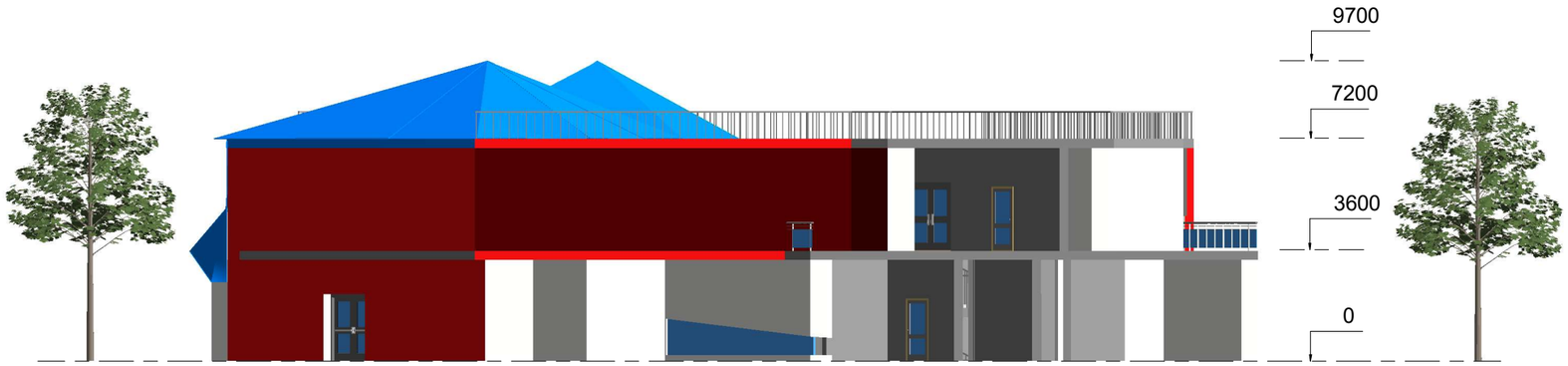
Estimated Cost	**94625.24**	Thous.Tenge
Normative Labor Intensity	**13.213**	Thous.pers.h
Estimated Wages	**5495.41**	Thous.Tenge

Compiled in prices for 01.1. 2001 y

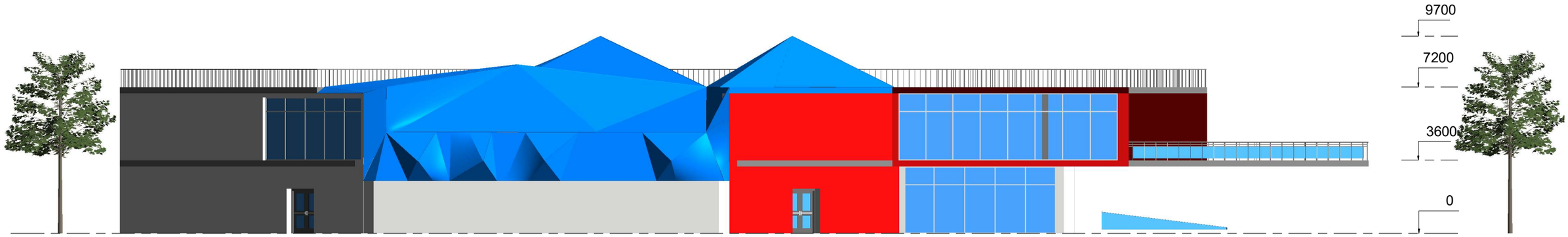
№ п/п	No. of estimates and calculations	Name of works and costs	Estimated Cost, Thous. Tenge				Normative Labor Intensity	Estimated Wages
			construction and installation works	equipment, furniture and inventory	other costs	Total		
1	2	3	4	5	6	7	8	9
1	1	Energy-efficient social residential complex in Almaty	**94625.24**	--	--	**94625.24**	38.082	2736.023
2		**Total**	**94625.24**	--	--	**94625.24**	38.082	2736.023
3		Temporary buildings and structures	1040.87764	--	--	1040.87764	38.082	2736.023
4		Return of materials from temporary buildings and structures	156.131646	--	--	156.131646	38.082	2736.023
5		**Total**	1040.87764	--	--	**1040.87764**	38.082	2736.023
6		**Total**	95666.11764	--	--	**95666.11764**	38.082	2736.023
7		Additional costs in the production of work in the winter	1147.993412	--	--	1147.993412	38.082	2736.023
8		Seniority costs			956.6611764	956.6611764	38.082	2736.023
9		Additional vacation costs			382.6644706	382.6644706	38.082	2736.023
10		**Total**	**1147.993412**		**1339.325647**	**2487.319059**	38.082	2736.023
11		**Total**	96814.11105		1339.325647	98153.4367	38.082	2736.023
12		Including refundable amounts	156.131646		--	156.131646	38.082	2736.023
13		**Total according to the estimated calculation in the base prices of 2001.**	96814.11105		1339.325647	98153.4367	38.082	2736.023
14		Total estimated at current prices in 2021.	331104.2598		4580.493713	335684.7535	38.082	2736.023
15		Including refundable amounts in current prices	533.9702293			533.9702293	38.082	2736.023
16		Taxes, fees, mandatory payments,			6713.69507	6713.69507	38.082	2736.023
17		Estimated cost at current price level	331104.2598		11294.18878	342398.4486	38.082	2736.023
18		НДС (12%)			41087.81383	41087.81383	38.082	2736.023
19		Construction cost	331104.2598		52382.00261	383486.2624	38.082	2736.023

Figure C.3- Object estimate

East view



South view



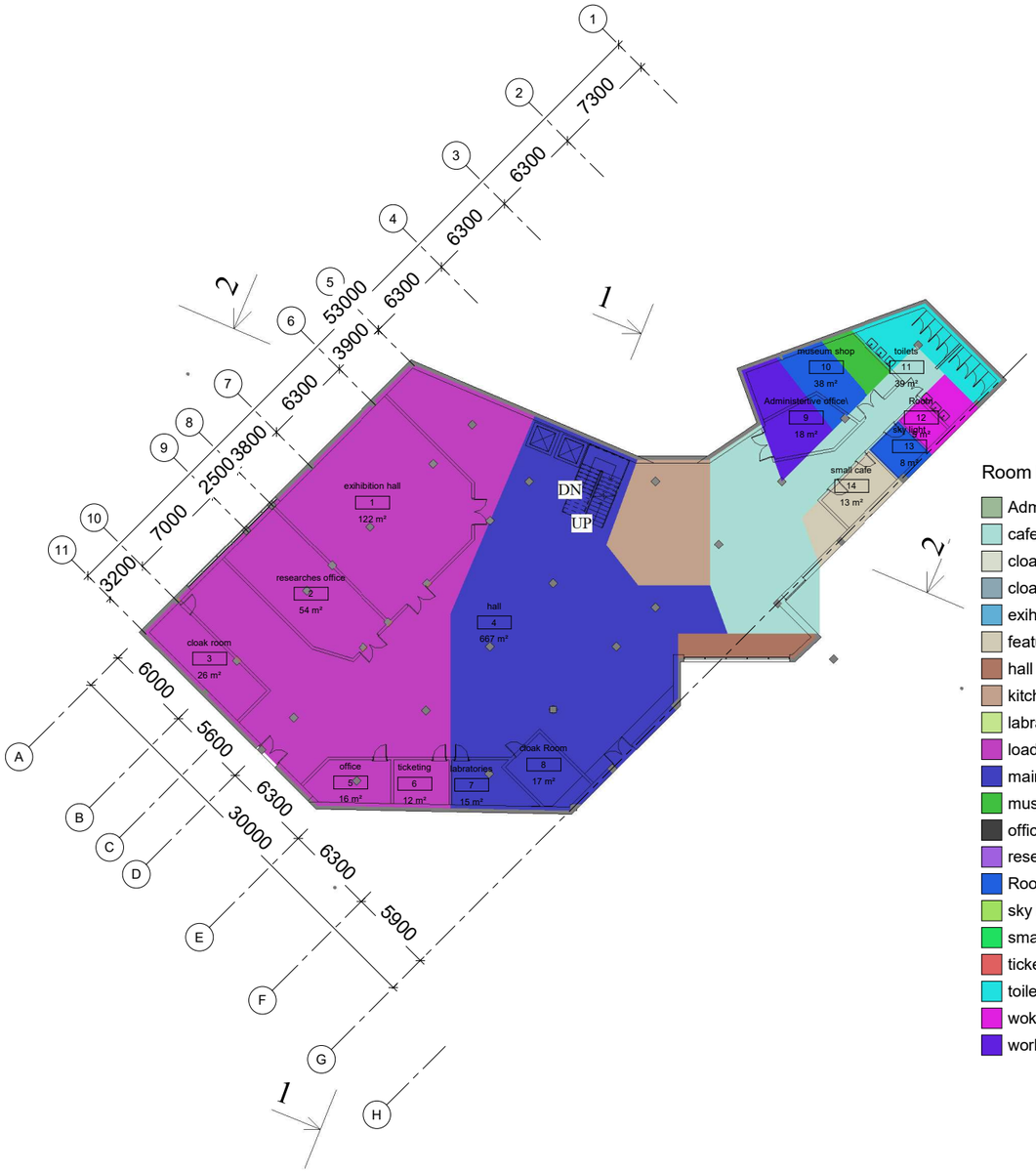
3D view

						KazNITU-5B072900-Civil Engeneering-02.08.02-2021-DP
						Exhibition pavilion with biomass heating system in Almaty
Ch	Sheet	List	Doc.No	Sign	Date	
Head of Dep		Kozukova N.V				Architectural and analytical part
Supervisor		Mukhanbetzhanova Zh.Sh.				
Consultant		Kozukova N.V.				
N. controller		Bek A.A.				Elevations
Created by		Waheb F.				

Stage	List	Lists
DP	1	8

Civil Engineering and Building Materials Department

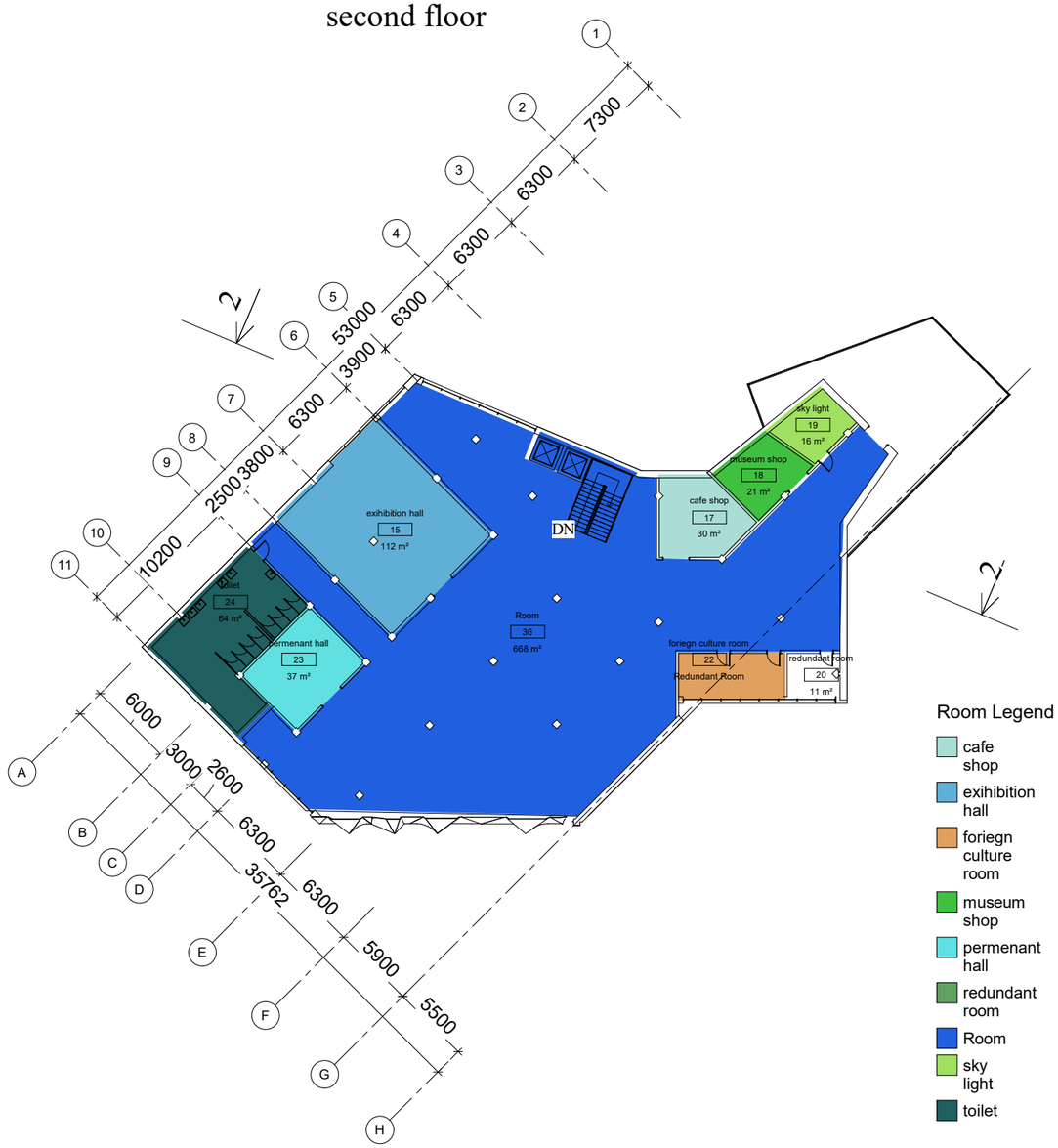
First floor



Room Legend

- Administertive office\
- cafe shop
- cloak Room
- cloak room
- exihibition hall
- feature room
- hall
- kitchen
- labratories
- loading dock
- main hall
- museum shop
- office
- researches office
- Room
- sky light
- small cafe
- ticketing
- toilets
- woker room
- worker room

second floor



Room Legend

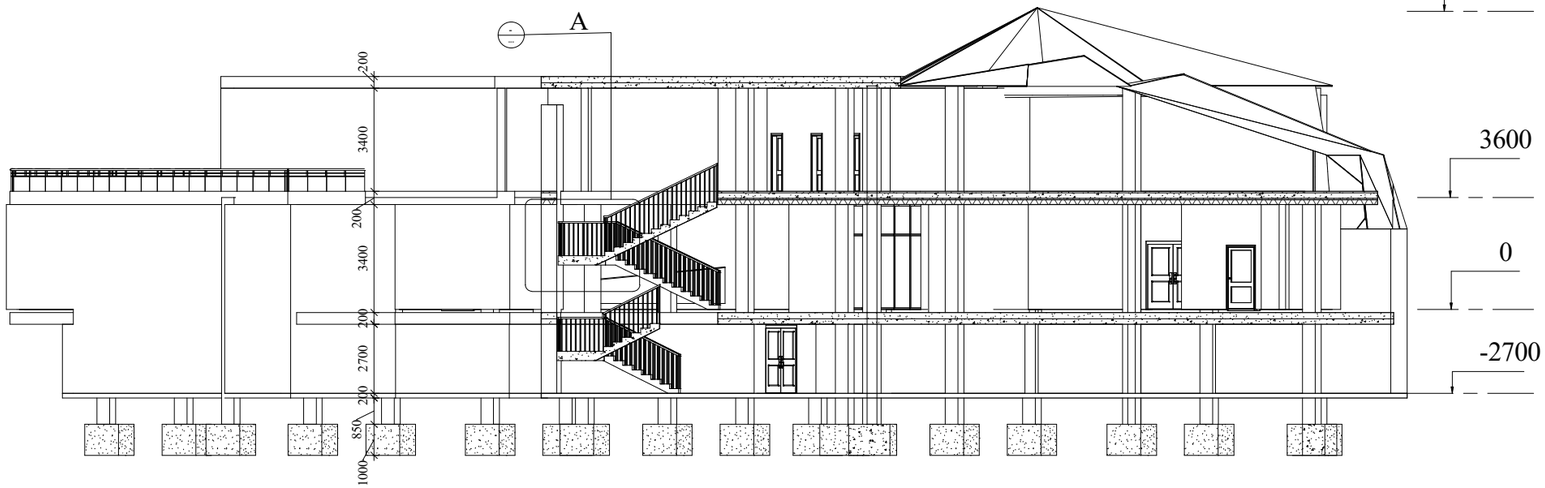
- cafe shop
- exihibition hall
- foriegn culture room
- museum shop
- permenant hall
- redundant room
- Room
- sky light
- toilet

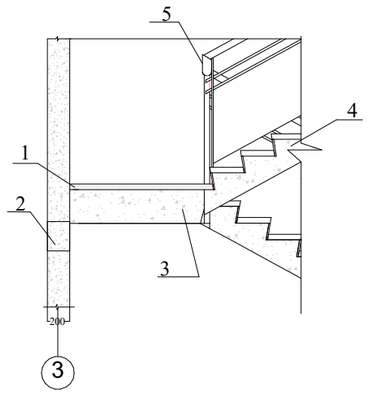
						KazNITU-5B072900-Civil Engeneering-02.08.02-2021-DP
						Exhibition pavilion with biomass heating system in Almaty
Ch	Sheet	List	Doc.No	Sign	Date	
Head of Dep		Kozukova N.V				Architectural and analytical part
Supervisor		Mukhanbetzhanova Zh.Sh.				
Consultant		Kozukova N.V.				
N. controller		Bek A.A.				Plans
Created by		Waheb F.				

Stage	List	Lists
DP	2	8

Civil Engineering and Building Materials Department

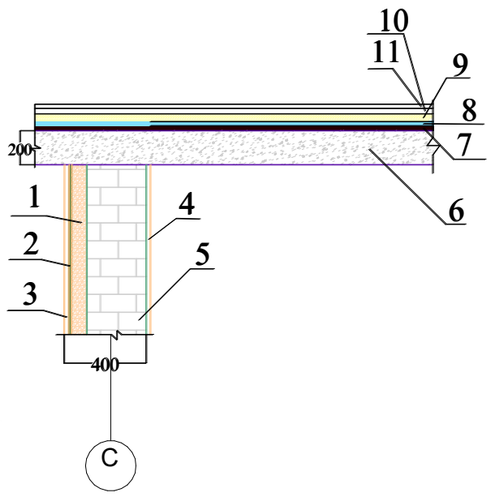
2-2





1-1

1- Tile with cement mortar
2- Reinforced concrete shear wall
3- Reinforced concrete plate, 150mm
4- Stairs
5- Railing



1- Thermal insulation, 100mm
2- Vapor barrier, 1mm
3- Fiber cement siding, 139mm

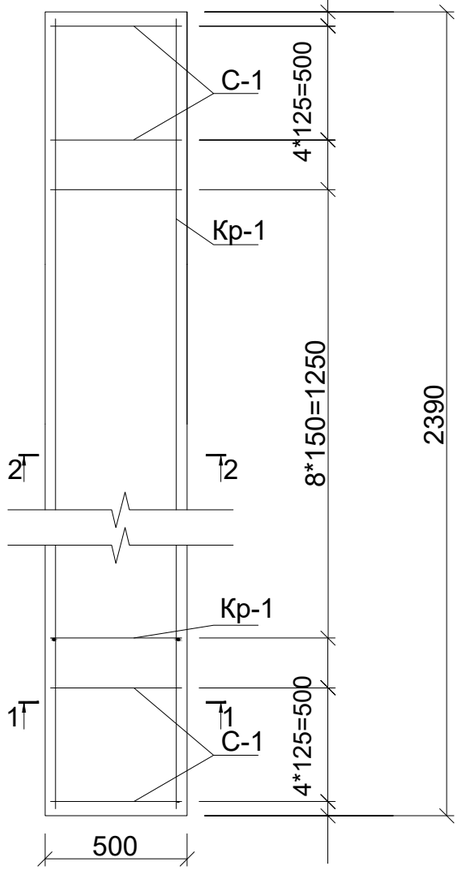
5- concrete blocks, 200mm
6- Reinforced concrete slab
7-Water proofing, 20mm
8- Sound proofing, 25mm
9- Thermal insulation , 50mm
10- Reinforced cement-sand plaster, 50mm
11- Vinyl flooring, 10mm

						KazNITU-5B072900-Civil Engeneering-02.08.02-2021-DP
						Exhibition pavilion with biomass heating system in Almaty
Ch	Sheet	List	Doc.No	Sign	Date	
Head of Dep		Kozukova N.V				Architectural and analytical part
Supervisor		Mukhanbetzhanova Zh.Sh.				
Consultant		Kozukova N.V.				
N. controller		Bek A.A.				Sections
Created by		Waheb F.				

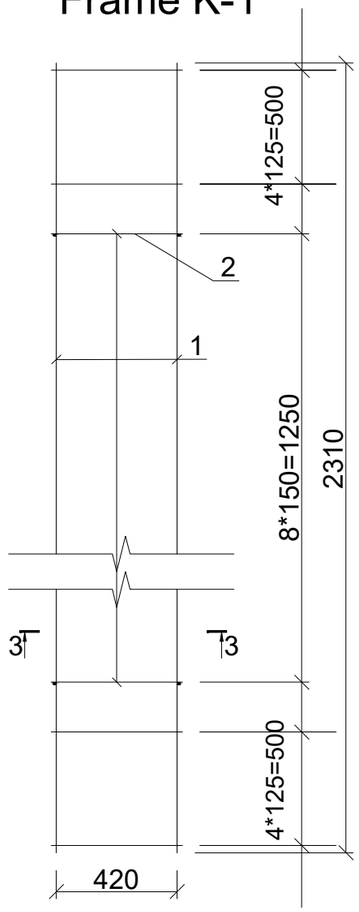
Stage	List	Lists
DP	3	8

Civil Engineering and Building Materials Department

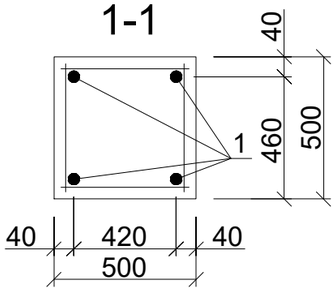
Middle column



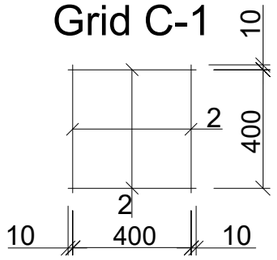
Frame K-1



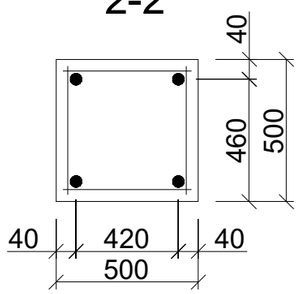
1-1



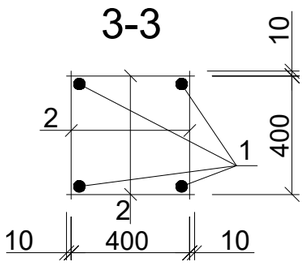
Grid C-1



2-2



3-3



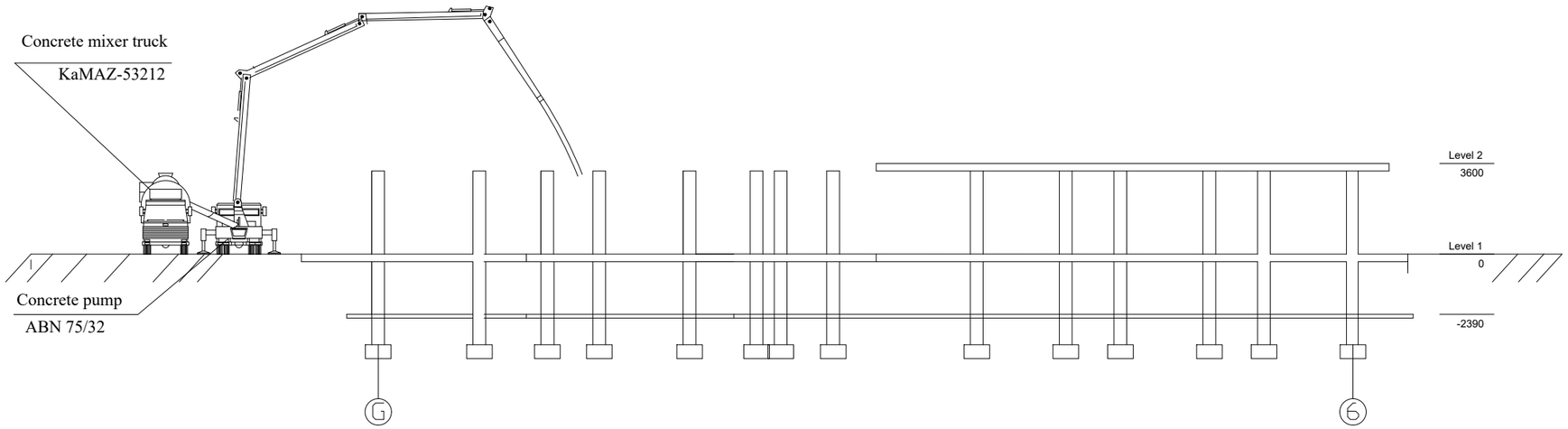
Column reinforcement specification

position	Design C	Diameter, steel grade	Length поз. мм	NO. шт.	Mass per. kg.	Note
1	EU 2-2004	Ø28S500	2390	4	4.83	
2	EU 2-2004	Ø10S275	460	16	0.62	
			Material			
			C30/37			37

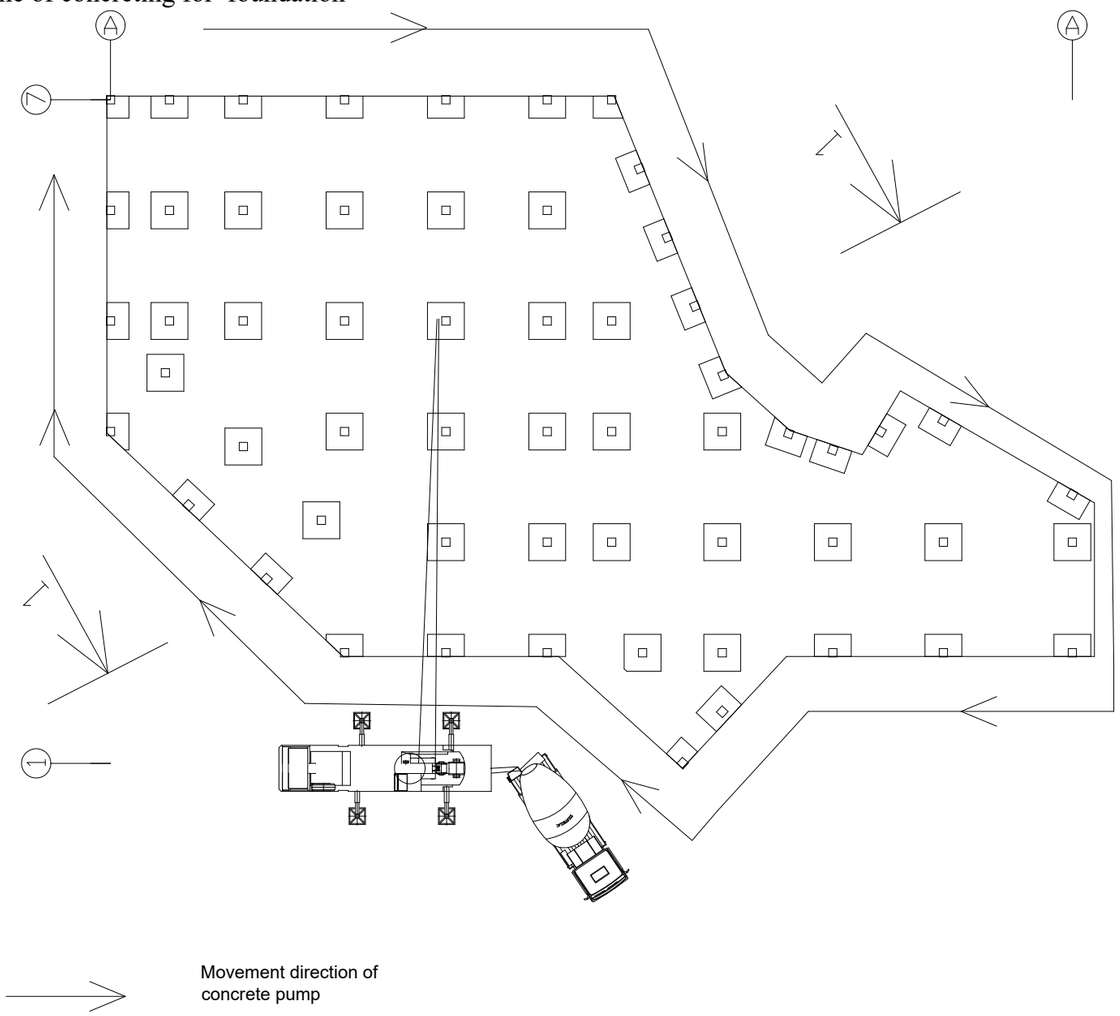
Column steel consumption

Brand	Reinforcement products		
	reinforcement class		
	S500	S275	Total
	EU 2-2004		
	Ø28	Ø10	
K-1	46.17	4.56	50.7

Ch	Sheet	List	Doc.No	Sign	Date	KazNITU-5B072900-Civil Engeneering-02.08.02-2021-DP			
						Exhibition pavilion with biomass heating system in Almaty			
Head of Dep		Kozukova N.V.				Calculation and design part	Stage	List	Lists
Supervisor		Mukhanbetzhanova Zh.Sh.					DP	4	8
Consultant		Kozukova N.V.							
N. controller		Bek A.A.				C57 Column	Civil Engineering and Building Materials Department		
Created by		Waheb F.							



Scheme of concreting for foundation



General information on concreting

Concrete mix must be transported by specialized methodes. The accepted method for transporting the concrete mixture must:

-Exclude the ingress of atmospheric precipitation and direct exposure to sunlight;

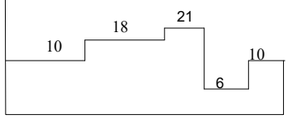
-Exclude stratification and violation of homogeneity;

-Prevent the loss of laitance or mortar.

The maximum duration of transportation of the concrete mix should be established by the construction laboratory with the condition of ensuring the preservation of the required quality of the mix on the way and at the place of its laying. Before placing the concrete mixture, the floor (artificial), the correct installation of the formwork, reinforcement structures and embedded parts must be checked. The inner surface of the inventory formwork must be cleaned and coated with a special grease that does not impair the appearance and strength of the structures. Breaks in concreting, which require the device of working seams, is determined by the laboratory depending on the type and characteristics of the cement and the temperature of concrete hardening. Placement of the concrete mixture after The distribution of the concrete mixture in the structure to be concreted is carried out in horizontal layers of the same thickness, laid in one direction. The overlapping of the previous layer is subsequently performed before the cement sets, and the overlapping time is set by the laboratory depending on the outside air temperature, the properties of the cement used. Approximately this time is no more than 2 hours. The duration of such breaks is carried out only after the surface of the working joint is treated with cement mortar with a thickness of 20-50 mm or with a layer of plastic concrete mixture. The concrete mix is compacted with a deep vibrator with a flexible shaft. When compacting the concrete mixture, it is not allowed to rest the vibrators on reinforcement, embedded products, formwork fastening elements. The step of moving the vibrator should not exceed 1.5 of its radius of action. The optimal duration of vibration in one place is 20-30 s.

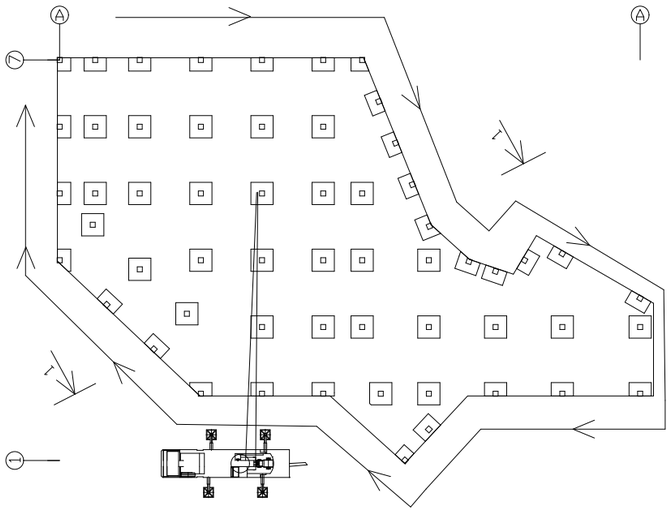
Schedule for the production of concrete work on foundation

No	Name of process	Volume of work		Labor intensity man.hour	Number of worker per shift	Duration		Days							
		Unite	Amount			Hour	Sh	1	2		3	4	5	6-7	8
1	Formwork installation	m^2	505.1	517.12	10	10	2	10							
2	Installation reinforcement	t	6	134	18	6	2				18				
3	foundation concreting	m^3	56	50.57	21	4	1						21		
4	Curing	m^3	56	42,67	6	12	1							6	
5	Dismantling	m^2	505.1	214.83	10	7	2								10

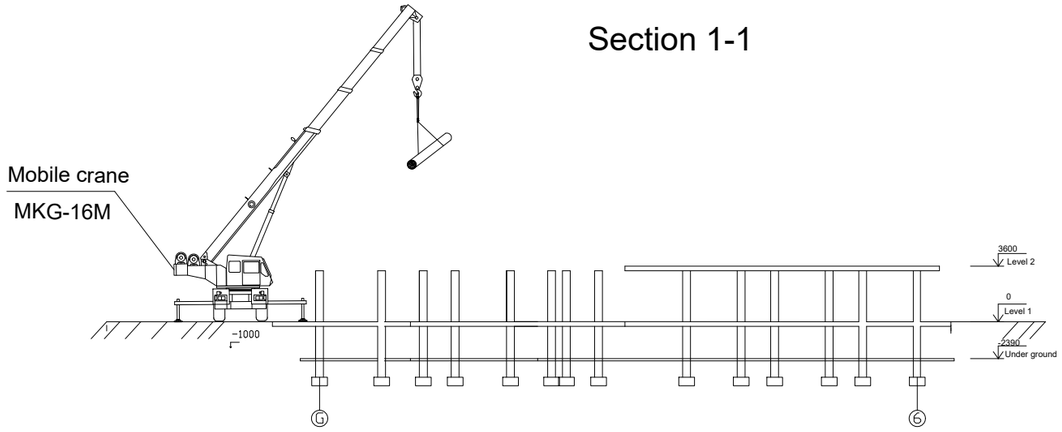


Ch	Sheet	List	Doc.No	Sign	Date	KazNITU-5B072900-Civil Engeneering-02.08.02-2021-DP			
						Exhibition pavilion with biomass heating system in Almaty			
Head of Dep		Kozukova N.V.				Organisational and technological part	Stage	List	Lists
Supervisor		Mukhanbetzhanova Zh.Sh.					DP	5	8
Consultant		Kozukova N.V.							
N. controller		Bek A.A.				Technological map for concrete work	Civil Engineering and Building Materials Department		
Created by		Waheb F.							

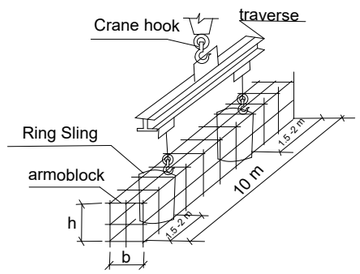
Reinforcing of column and beam



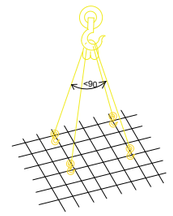
Section 1-1

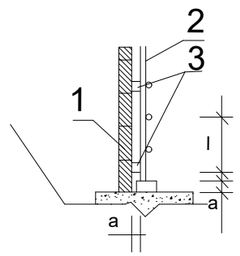


Armoblock Sing



Sling and lifting of reinforcement nets





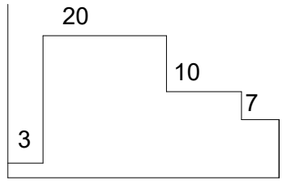
a) With vertical single reinforcement:
1 - formwork;
2 - rebar mesh (frames);
3 - plastic retainer;
a protective layer of concrete (projected);

Working schedule

№ п/п	Name of works	Scope of work		expenses labor per / day	required machines		prod. works in the day	number of shifts	number work in shift	Operating schedule
		units.	Qty		name	number mash				Day
1	Toe and laying of concrete pads.	kg	60	7.5			2	1	2	3
2	Toe nets or frames.	t	51.8	17.4	MKG-16M	1	0,5	2	2	20
3	nstallation of nets or frames in the formwork	t	71.5	17.4	MKG-16M	1		2	2	10
4	Reconciliation of installed grids or frames	t	1.1	11.6	DEKO 160A MMA	4	13	2	2	7

$$K_{нер} = \frac{n_{max}}{n_{ср}} = \frac{17}{22.9} = 0.74 \leq 1,5$$

$$n_{ср} = \frac{Q}{П} = \frac{390}{17} 22.9$$



Technical and economic indicators

№	Name	Unite	Number
1	Labor costs	man-day	390
2	Duration	day	17

Safety measurements

In the manufacture of reinforced concrete work, it is necessary to strictly comply with the requirements of SNiP III-4-80 "Safety measures in construction" and observe certain rules:

1. The dismantling of the formwork of the foundations is carried out with the permission of the manufacturer of the work, which is given after concrete reaches strength, ensuring the safety of surfaces and edges of the corners of concrete structures.
1. The materials from disassembly are immediately lowered to the ground, sorted, the protruding nails, staples are removed and stored in stacks by stamps.
2. Electric arc welding is carried out by persons having the relevant certificates for the right to perform welding work.
3. All lifting machines, mechanisms and devices before operation are checked in accordance with the rules of Gosgortekhnadzor.
4. When mounting valves, the crane works on outriggers.
5. During the operation of the cranes, it is prohibited for people to stay in the zone of its operation. The transfer of cargo over workers is not allowed.
6. The fed-in reinforcing mesh is lowered above the place of its installation by no less than 80 cm and only then do the fitters direct their design position.
7. Walking on reinforcing elements is allowed only on ladders 0.3-0.4 m wide.
8. It is forbidden to swing the suspended load and leave it unattended, as well as to carry out installation in case of a wind of more than 6 points.
9. It is forbidden to operate a jib crane directly under the wires of existing power lines of any voltage.
10. The descent of workers into the pit or trench is permitted only by stairs.
11. If cracks appear in the slopes of the pit or trench that threaten to collapse, it is necessary to fix the walls or reduce the steepness of the slope before starting work.
12. Connect welding transformers to the network only with the help of closed circuit breakers. 14. The voltage at the terminals of the welding transformers at the time of ignition of the arc should not exceed 70 V. You can switch the jumpers on the steps of the transformer only when the switch is turned off.
15. It is forbidden to repair, repair, adjust and clean the transformer when it is energized.
16. Moving the welding transformer to another catch is only permitted when disconnecting it from the mains.
17. The electric wires on the conveyors and from the conveyor to the circuit breaker are enclosed in rubber hoses, the conveyor frame is grounded.

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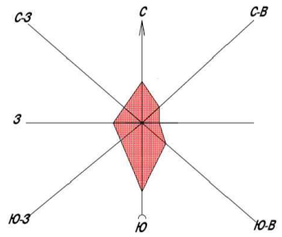
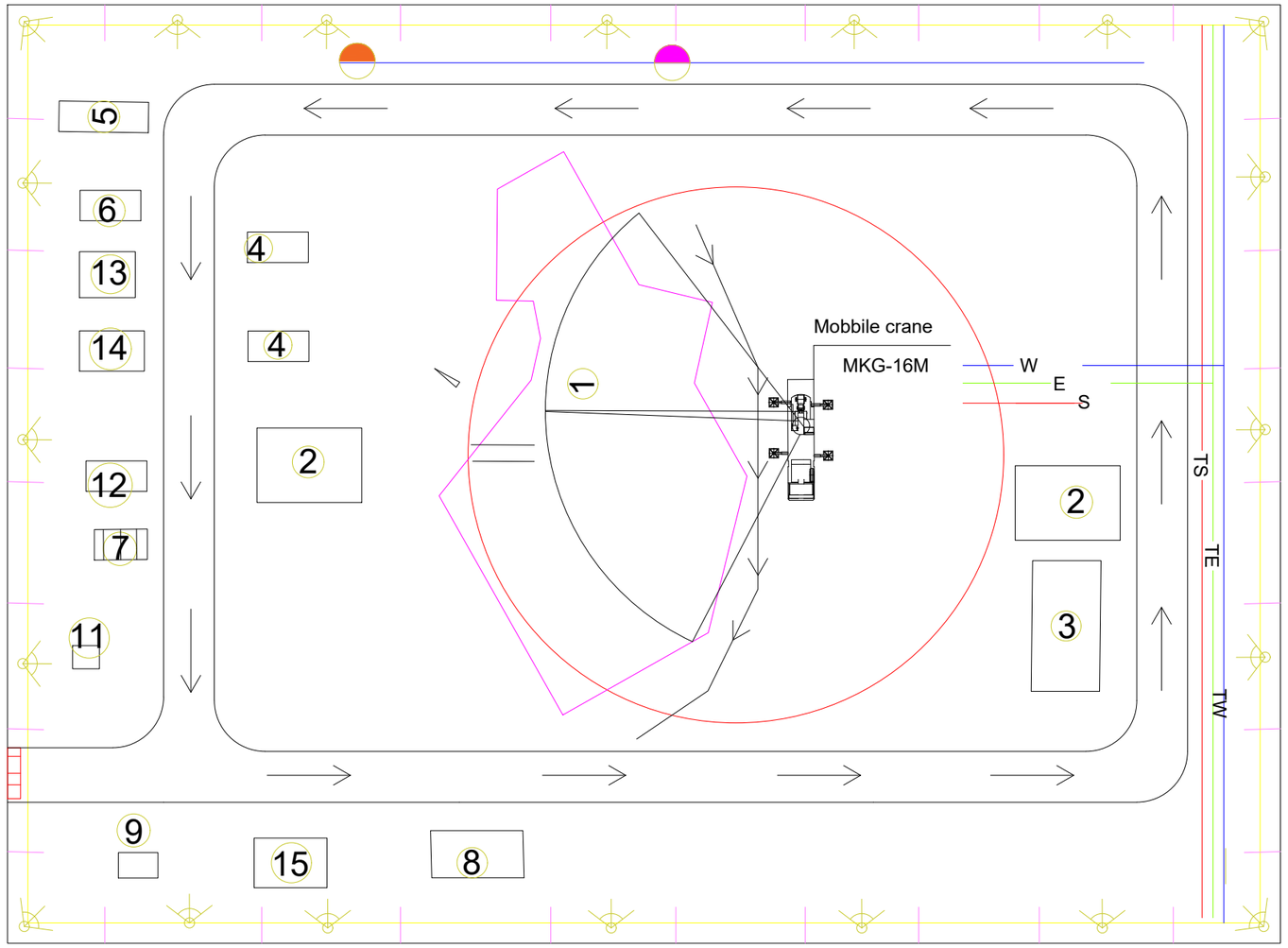
Supervisor		Mukhanbetzhanova Zh.Sh.				Stage: DP; List: 6; Lists: 8
Consultant		Kozukova N.V.				
N. controller		Bek A.A.				Technical map for reinforcement work
Created by		Waheb F.				Civil Engineering and Building Materials Department

Wind rose



General master plan



Temporary buildings

Pos.	Name of building	Size	Quantity
	Permanent		
1	Building under construction	53.1x35.7	1
	Temporary		
2	Closed warehouse	7x5	2
3	Open warehouse	10x7	1
4	Office and control room	5x4	2
5	Dining room	7x3	1
6	Room for foreman	5x3	1
7	Toilet	3x1	2
8	Trash can	5x3	1
9	Check point	3x3	1
10	Parking	14x7	1
11	Transformer substation	4x3	1
12	Restroom	5x3	1
13	Workshop	3x5	1
14	Shower	7x3	1
15	Car wash	3x3	1

S Permanent sewage
E Permanent power line
W Permanent water supply
Direction of movement
Direction of movement
Red zone of crane

Fire hydrant
External lighting of the site
Gate
TS Temporary sewage
TE Temporary power line
TW Temporary Water supply

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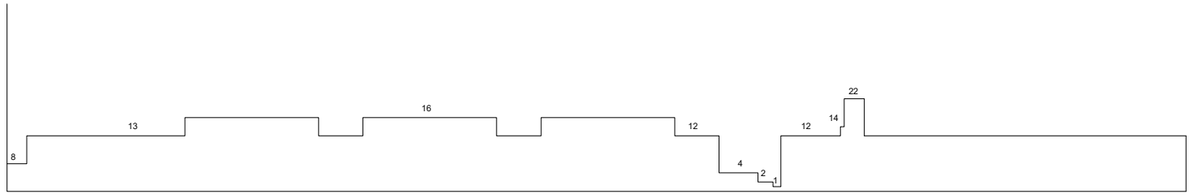
Consultant		Kozukova N.V.				
N. controller		Bek A.A.				General master plan
Created by		Waheb F.				Civil Engineering and Building Materials Department

Calendar schedule

№ п/п	Name of works	Объем работ: Ед. измер.	Кол-во	Затраты труда чел/см	Требуемые машины: наименование	число маш. в смену	Прод. работ в дн.	число смен	число раб. в смену
1	temporary fence	1 м	660	16,5			4	2	2
2	cutting off the vegetation layer	1000 м	13,916		Komatsu D85ESS-2A	2,6	1,5	2	1
3	excavation	100 м	840,8						
4	excavation of soil into vehicles	100 м	758,02		Hitachi ZX350LCR-5G	180	15	3	4
5	manual excavation	1м	715,7	152,1			4	3	6
6	device of monolithic structures. (foundation)								
7	Formwork installation	1м	1908	95,4			8	3	4
8	reinforcement work	т	50,9	39,1			2	3	4
9	concrete placement	1 м	785,6	21,7			1	3	4
10	curing	100 м	18,52	972			0,5	1	2
11	dismantling of formwork	1м	1908	23,8			4	3	2
12	device of monolithic features. (columns)								
13	Formwork installation	1 м	2122,5	106,1			8	3	4
14	reinforcement work	т	43,6	46,8			6	3	2
15	concrete placement	1 м	786,8	143,8			12	3	4
16	curing	100 м	0,74	0,04			0,5	1	2
17	dismantling of formwork	1м	2122,5	39,8			6,5	3	2
18	device of monolithic features. (walls)								
19	Formwork installation	1 м	5079,9	393,9			12	3	8
20	reinforcement work	т	92,2	99,1			4	3	8
21	concrete placement	1 м	1738,6	239,1			10	3	8
22	curing	100 м	8,76	0,46			0,5	1	2
23	dismantling of formwork	1м	9279,9	173,9			7	3	8
24	device of monolithic features. (overlap)								
25	Formwork installation	1 м	15768,4	833,6			18	3	4
26	reinforcement work	т	136,6	99,1			4	3	4
27	concrete placement	1 м	1198,8	83,9			3	3	4
28	curing	100 м	157,68	8,3			2	2	2
29	dismantling of formwork	1м	15768	177,4			12	2	2
30	foundation waterproofing	100 м	32,25	6,05			1,5	2	2
31	backfilling	100 м	87,78		Komatsu D85ESS-2A	4,4	2	2	1
32	soil compaction	100 м	17,48		Hamm HD 90	0,6	0,5	1	1
33	device of monolithic features. (columns)								
34	Formwork installation	1м	3537,5	176,8			15	3	4
35	reinforcement work	т	176,5	172,1			14	3	4
36	concrete placement	1 м	199	37,3			4,5	3	4
37	curing	100 м	54,82	2,87			1,5	3	4
38	dismantling of formwork	1м	3537,5	46,3			5,5	3	2
39	device of monolithic features. (walls)								
40	Formwork installation	1 м	4148,9	129,6			16	2	4
41	reinforcement work	т	372,5	400,4			33	3	4
42	concrete placement	1 м	3171	436			36	3	4
43	curing	100 м	82,23	4,3			2	3	4
44	dismantling of formwork	1м	4148,9	77,8			6	3	4
45	device of monolithic features. (slabs)								
46	Formwork installation	1 м	28037,5	116,1			59	3	4
47	reinforcement work	т	521,5	247,7			21	3	4
48	concrete placement	1 м	5210	364,7			30	3	4
49	curing	100 м	137,05	7,2			2	3	4
50	dismantling of formwork	1м	28037,5	292,9			24,5	3	4

Graphic work

days



Statement of the needs of machines and mechanisms

Name	Mark	Note
1. Bulldozer	Komatsu D85ESS-2A	Cutting vegetable backfill
2. Excavator with back shovel	EO-5122	Soil development in dump and transport funds
3. Self-propelled roller	DU-128	Soil compaction
4. Dump truck	MAZ-5516	Removal of soil
5. Concrete pump	ABN 75/32	Concrete supply
6. Mobile crane	MKG-16M	Delivery of goods

Technical and economic indicators

№	Name	Unite	Amount
1	Labor costs	man-day	3500
2	Duration	day	156

$$К_{нер} = \frac{n_{max}}{n_{ср}} = \frac{22}{22.4} 0.98 \leq 1,5$$

$$n_{ср} = \frac{Q}{П} = \frac{3500}{156} 22.4$$

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Supervisor		Mukhanbetzhanova Zh.Sh.				Stage: DP; List: 8; Lists: 8
Consultant		Kozukova N.V.				
N. controller		Bek A.A.				Calendar schedule
Created by		Waheb F.				Civil Engineering and Building Materials Department

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

RESPONSE

OF THE SUPERVISOR

for the graduation project

Waheb Fardin
5B072900 – Civil Engineering

Topic: «Exhibition pavilion with biomass heating system in Almaty»

Student Waheb Fardin 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 Almaty was taken into account. The architectural-planning and structural sections were developed in accordance with the issued task. The column of the projected building are calculated. The technological section of the project with the calendar plan and technological maps for concrete and reinforcing bars 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. Waheb Fardin deserves a good rating for the completed diploma project.

Supervisor
Master of technical sciences, lecturer

_____Mukhanbetzhanova Zh.Sh.

«30» may 2021 yr.

Протокол анализа Отчета подобия Научным руководителем

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

Автор: Вахеб Фардин

Название: Exhibition pavilion with biomass heating system in Almaty

Координатор:Надежда Козюкова

Коэффициент подобия 1:2

Коэффициент подобия 2:0

Замена букв:58

Интервалы:0

Микропробелы:1

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: Вахеб Фардин

Название: Exhibition pavilion with biomass heating system in Almaty

Координатор: Надежда Козюкова

Коэффициент подобия 1:2

Коэффициент подобия 2:0

Замена букв:58

Интервалы:0

Микропробелы:1

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