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

Mohammadi Mohammad Zamin

« Economy class multi-story residential building with "Smart House" system in Nur-Sultan»

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 « Economy class multi-story residential building with "Smart House" system in Nur-Sultan »

5B072900 - "Civil Engeneering"

Prepared by Mohammadi Mohammad Zamin

Scientific adviser A.P. Turganbayev
Master of technical science,
Lecturer
«_____»___2021 yr.

Almaty 2021

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Specialty 5B072900 – Civil Engineering

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

ASSIGNMENT
Complete a diploma project

Student: Mohammadi Mohammad Zamin
Topic: «Economy class multi-story residential building with "Smart House" system in Nur-Sultan»
Approved by the Order of the Rector of the University No. 2131-b dated November 24, 2020.
The deadline for the completed work is May 10, 2020.
Initial data for the diploma project: construction area in Nur-Sultan.
Structural schemes of the building - frame-wall with cross-beams, structures are made of monolithic 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 slab and crossbar;
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 concrete works, 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", SN RK;
2 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	Turganbayev A.P., Master of technical science, lecturer		
Calculation and design	Turganbayev A.P., Master of technical science, lecturer		
Organizational and technological	Agataev A.M., civil engineer, lecturer		
Economic	Turganbayev A.P., 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 _____ Turganbayev A.P.

The task was accepted
for execution student _____ Mohammadi Mohammad Zamin

Date "__" _____ 20__ yr.

АҢДАТПА

Диплом жұмысының тақырыбы: « Нур-Сұлтан каласында "Акылды үй" жүйесі бар эконом класты көп қабатты тұргын үй». Дипломдық жұмыс 4 бөлімнен тұрады. Бірінші бөлімге ғимараттың сәулеттік-құрылыс шешімдері, екінші бөлім-ғимараттың негізгі құрылымдарының есебі, үшінші бөлім-жалпы құрылыс өндірісінің технологиялық шешімдері, төртінші бөлім-құрылыс жұмыстарының экономикалық есептеулері кіреді. Ғимараттың қаңқасы мен моделі Autodesk Revit 2020 бағдарламасында салынған; жобалық шешімдер Lira-SAPR-2016 өткізілді.

АННОТАЦИЯ

Тема дипломной работы: " Многоэтажный жилой дом эконом класса с системой "Умный дом" в городе Нур-Султан". Дипломная работа состоит из 4 разделов. Первая часть-включает архитектурно – строительные решения здания, вторая часть –расчет основных конструкций здания, третья часть – технологические решения общестроительного производства, четвертая часть-экономические расчеты строительных работ. Каркас и модель здания была построена в программе Autodesk Revit 2020, расчетно-конструктивные решения проводились в программе Лира-САПР-2016.

ANNOTATION

The topic of the thesis: " Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan". The thesis consists of 4 sections. The first part includes architectural and construction solutions of the building, the second part-calculation of the main structures of the building, the third part-technological solutions of General construction production, the fourth part-economic calculations of construction work. The frame and model of the building was built in the Autodesk Revit 2020 program; design solutions were carried out in Lira-SAPR-2016.

CONTENTS

INTRODUCTION

Construction is one of the most popular sectors of the economy one. Construction is carried out in the open and in a variety of natural environments. Therefore, the construction cycle of construction projects is several months lasts up to several years. Construction of the country's culture and economy allows you to develop the whole industry.

Currently, the level of construction is very high. Construction industry The first reason for the development of education and science is the rapid development Along with the daily growth of modern technology, construction is becoming easier. In the old days compared to the time spent on design work shortened. The paperwork is reduced and the calculation error is reduced.

Reinforced concrete is a project for almost everyone in any construction is carried out using constructions.

The construction sector in Kazakhstan remains one of the most important sectors of the economy, and one of the most attractive areas investing. This sector accounts for up to 6% of Kazakhstan's GDP, in terms of employment, the construction sector provides about 700 thousand workers places.

Today the share of monolithic construction in Kazakhstan is about 90%, despite the fact that concrete work, as in design and during construction is material-intensive, labour-intensive, capital-intensive, energy-intensive and science-intensive production.

The task of the thesis is to develop a residential buildings using software that simplifies design process and calculation of structural elements, while observing the provisions of NTP and Euro Code.

The task is achieved by the fact that the development uses modern software systems such as:

- Autodesk Revit 2020, Autodesk AutoCAD 2020 - building 3D, 2D building models;
- LIRA-SAPR 2016 R5

1 Architectural part

1.1 Characteristics of the construction area

The projected residential building in Nur-Sultan is in the drawings, the adopted technical solutions are applied in the territory of the Republic of Kazakhstan environmental, sanitary, fire and other meets the requirements of the standards.

The plot of land allocated for the construction of the building, the terrain is flat, valuable green no plants.

Natural conditions:

Climatic area - 1B;

Annual precipitation - 722 mm;

Normative depth of soil compaction - 0.8 m;

The main wind direction is North;

Wind speed - 61 km / h;

Snow cover weight - 75 kg / m2;

Average monthly relative humidity of the warmest month - 65%;

Estimated winter outdoor temperature -19º C;

Groundwater was detected at a depth of 15-16 m.

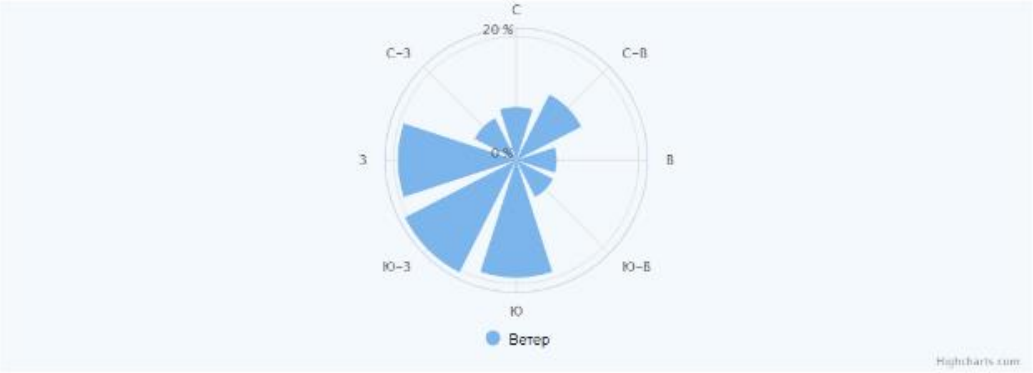

График ветра (направление - откуда дует ветер) в Астане, с усредненными значениями согласно нашим данным.

С ▼	С-В ▲	В ◄	Ю-В ►	Ю ▲	Ю-З ◄	З ►	С-З ▲
Северный	Северо-Восто...	Восточный	Юго-Восточный	Южный	Юго-Западный	Западный	Северо-Запад...
8.6%	11.9%	6.6%	6.7%	19%	20.4%	19.3%	7.6%

Figure 1- wind direction in Nur-Sultan

1.2 Volumetric planning solutions

The site is allocated for the construction of the centre of Astana in the newly developed micro district on the Shagen territory of construction placed.

The territory is subject to engineering for construction and production is an empty area from communications

The construction site is characterized by the following data:

- the relief of the construction site is calm;
- not flooded by floods and other surface waters;
- Predominant winds - East.

The orientation of the premises meets the standards. Located nearby sanitary and fire gaps between buildings is held.

The main indicators of the master plan:

- stratification - 2;
- building class - II;
- degree of fire resistance - II.

Landscaping. Dimensions of the elements of the master plan engineering networks, roads, sidewalks, landscaping taking into account the placement of elements, as well as sanitary and Accepted in accordance with fire regulations. The project is suitable for diverting storm water to the surface The method of mass planning, which provides the conditions, is obtained.

Discharge of rain and melt water from buildings and structures to the lowest points of the terrain on the planned surface provided. The accepted design slopes of the planned surface are territorial protects against rainwater runoff.

1.3 Calculation of the thermal conductivity of outer wall

According to SP RK 2.04-01-2017 "Building Climatology" and SNiP RK 2.04-03-2002 "Building heat engineering" it is necessary to determine the thickness insulation for the outer wall

Determine the value of the degree days of the heating period:

$$\text{GSOP} = (t_v - \text{op})\, z_{op} \quad (1)$$

Where: $t_v = 20$ ºC - design temperature of internal air, for public building

$t_{ot.per.} = -8.1$ ºC - average temperature of the heating period, with average daily air temperature 8 ºC

zot.per. = 200 days - duration of the heating period

$$\text{GSOP} = (20 + 8.1) \cdot 221 = 6210 \text{ °C} \cdot \text{days}.$$

The required thermal resistance of the enclosing constructions R_{0tr}, which meets comfortable and sanitary and hygienic conditions:

$$R_0^{tr} = \frac{n(t_v - t_H)}{\alpha_B \cdot \Delta t_H} \quad (2)$$

Where: n=1 - coefficient taking into account the position of the outer wall surface in relation to the outside air; αw = 8.7 W / m2 · ºC - coefficient taking into account heat transfer from the inner surface of the wall;

$$R_0^{tr}=5.021\frac{m^{2\cdot}℃}{BT}$$

Table 1- the composition of outer wall

Material name	DensityΥ_0 ,kg/m3	Thermal conductivity, w/m^2*$_s$	Layer Thickness δ,m	Heat transfer resistance=δ/λ, m^2 * C/w
Vyrav. c / p solution	700	0.01	0.011	1,1
Concrete Gas block	1800	0.26	0.30	1.15
Extruded polystyrene foam	70	0.041	0.13	3,17

R0 is the resistance of the design of the heating wall define:

$$R_0=\frac{1}{\alpha_B}+\frac{\delta_1}{\lambda_1}+\frac{\delta_2}{\lambda_2}+\frac{\delta_3}{\lambda_3}+\frac{1}{\alpha_H} \quad (3)$$

$$R_0=\frac{1}{8.7}+\frac{0.011}{0.01}+\frac{0.30}{0.26}+\frac{0.13}{0.01}+\frac{1}{17}=5.11\frac{m^{2\cdot}℃}{BT}$$

$$R_0^{tr} \leq R_0$$

$$5.021\frac{m^{2\cdot}℃}{BT} \leq 5.11\frac{m^{2\cdot}℃}{BT}$$

Therefore, the selected layer thickness satisfies the condition resistance of the enclosing structure.

2 Calculation and design part

2.1 Determination of loads and development of calculation scheme

Monolithic reinforced concrete consists of following materials:
- heavy concrete class B30;
- armature class A-500 (equivalent AIII)

Section of elements:
- square frame, cross section - 400x400 mm;
- beam frame with a cross section - 300x500 mm;

beam frame with a cross section - 300x450 mm
Monolithic ceiling and roof thickness 200 mm.

Table 2- Accepted stiffness's

No	Name	Parameter [section- (cm) stiffness- (t,m)]…
1	Bar 40x40 (column)	R_0=2.5,E=3310000, B=40,H=40
2	Bar 30x50 (crossbar)	R0=2.5,E=3310000,H=50,B=30
3	Bar 30x45 (lateral crossbar))	R0=2.5,E=3310000,H=45,B=30
4	Plate H 20 (wall)	R0=2.5,E=3310000,H=20
5	Plate H 20 (floor slab)	R0=2.5,E=3310000,H=16
6	Plate H 20 (lift wall)	R0=2.5,E=3310000,H=20
7	Plate H 16 (stairs)	R0=2.5,E=3310000,H=16
8	Plate H 90 (foundation)	R0=2.5,E=3310000,H=90

Table 3 – collection of loads

	Type load		
1	Dead weight according to figure		
2		Layer thickness, m Density, kg/m^3	Characteristic of load, kg/m^2
	For first floor		
	Parquet	0.015 700	10.5
	Bituminous waterproofing	0.01 1400	14
	Extruded polystyrene foam	0.1 40	4
	Cement-sand screed	0.025 700	17.5
	Reinforcement concrete slab	0.2 2500	500
	Total for ground floor		546
	For typical floor		
	Cement-sand screed	0.025 700	17.5
	Parquet	0.015 700	10.5
	Acoustic		4
	Reinforcement concrete slab	0.2 2500	500
	Total for typical floor		532
	For flat roofs		
	Concrete slope layer	0.05 1800	
	Reinforcement concrete slab	0.2 2500	500
	Vapor barrier		0.015
	Extruded polystyrene foam	0.15 40	6
	Bituminous waterproofing (2 layers)	0.02 1400	28

	Total for flat roofs	Total for flat roofs	534 .015
3	Wall construction	Layer thickness, m Density, kg/m^3	Characteristic of load, kg/m^2
	External self-supporting walls (height 3m)		
	Concrete Gas block	0.3 1800	1620
	Extruded polystyrene foam	0.13 40	15.6
	V-rax. c / p solution	0.01 700	54
	Total for self-supporting walls		1689.6
4			
	Partition (height 3m)		
	Drywall	0.02 600	36
	Soundproofing layer	0.04 14	1.68
	block	0.2 600	360
	Total		397.68
5	Horizontal pressure from the ground	Characteristic	
	Fine sand	E=28Mpa	
		γ=1.95t/m^3	
		∅=36°	
		C=0	
	calculation		
	Horizontal intensity of active soil pressure at 3.6m		
	Ground level relative to clean floor -0.60		
	$\sigma = \gamma \cdot H\ \lambda_g = \gamma\ H \cdot tg^2(45-\Phi/2) = 1.9 \cdot 3.3 \cdot tg^2(45-36/2) = 2.05\ T/M^3$		
	Horizontal intensity of active soil pressure at 3.6m, rom distributed load q= 5 t/m^3		
	$\sigma = q \cdot tg2(45-\Phi/2) = 5 \cdot tg2(45-36/2 = 0.38\ t/m^2$		
	2.05+0.34=2.39		

6	Live load according to EN1991	
	Floor slab	$0.2t/m^2$
	Stairs	$0.2t/m^2$
	Unexploited roof	$0.04t/m^2$
7	Snow load	$S=\mu_i*C_e*C_t*S_k=0.8*1*1*1.5=1.2$ kpa

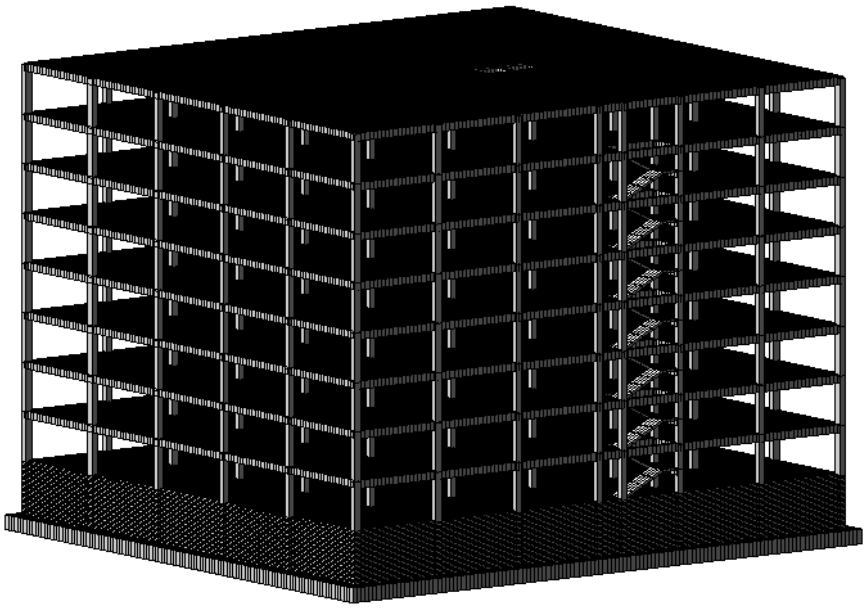

Figure 2 - Spatial model of building

2.2 Calculation of crossbar

Reinforced concrete products Crossbars are horizontal, the main purpose is to connect vertical and elements of structures.

Correctly designed reinforced concrete girders provide sufficient strength because they take the weight of the paving slabs. Calculated correctly and the choice of the number and diameter of fittings determines the strength design.

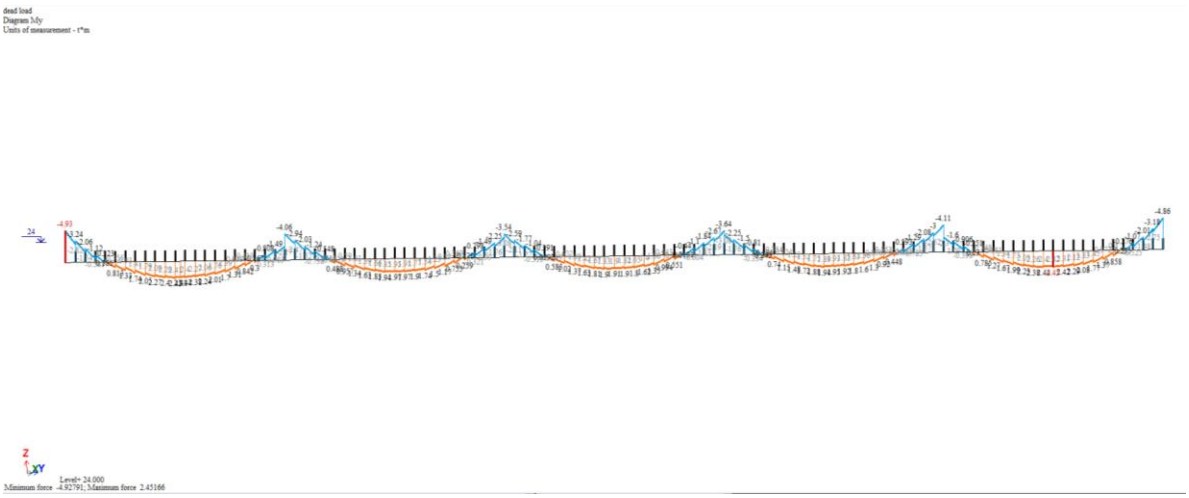

Figure 3 - Moment of crossbar diagram(Lira-SAPR-2016)

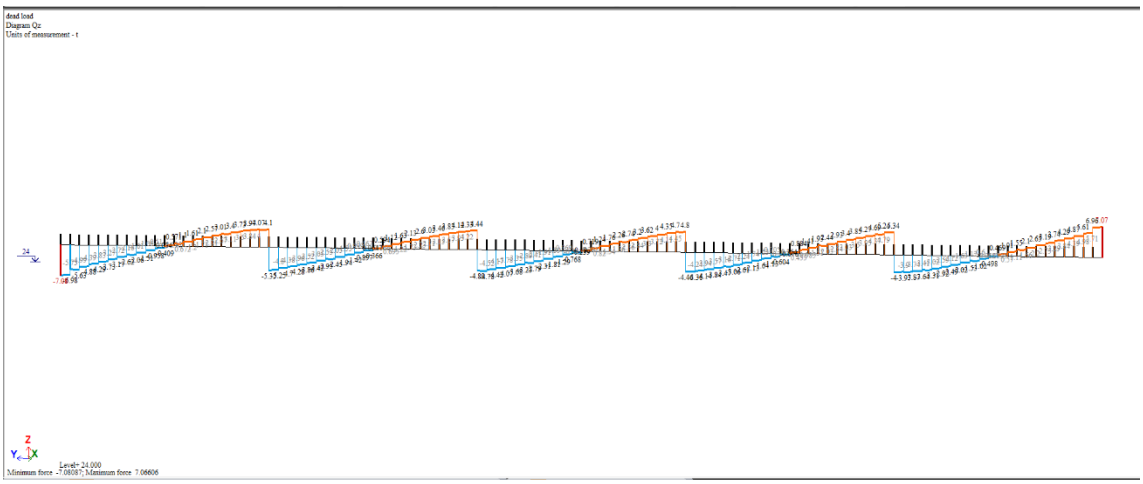

Figure 4 -Shear force diagram of crossbar

Supporting moment in the diagram

M_{12}=-47.6 kN·m

M_{21}= -40.2 kN·m

M_{23}= -35.10 kN·m

Maximum torque:

M_{max}=24.02 kN·m

Medium torque:

M_{23} = M32 = 19.31 kN

M_{34} =18.73 kN

Maximum longitudinal force:

Q= 69.43кN

Calculation of the strength of crossbars on the longitudinal axis

Concrete class C25 / 30, the design resistance of concrete to the axial compression fck = 25MPa, individual safety factor for concrete γc = 1,5; in advance concrete for the compression of pre-stressed structures and reinforced concrete design resistance

$$f_{cd} = a_{cc} \cdot f_{ck} / \gamma_c = 0.85 \cdot 25/1.5 = 14.16 \text{ MPa};$$

Longitudinal reinforcement class S500 (f_{yk} = 500 MPa, $f_{yd} = f_{yk} / \gamma_c$ = 435 MPa); horizontal reinforcement class S240 (f_{yk} = 240 MPa, $f_{yd} = f_{yk} / \gamma_c$ = 167 mPa);

The design torque of the crossbar on the edge of the support:

$M_{Ed, max}$ =47.6 kN·m;

We determine the following coefficient:

$$A_{Ed}=M_{Ed.max}/(f_{cd} \cdot b'_f \cdot d^2) = 47.6 \cdot 10^3/14160 \cdot 10^3 \cdot 0.30 \cdot 0.41^2 = 0.03$$

Where d = h-c1 = 45-4 = 41 cm,

$M_{Ed, max}$ = MEds. ST RK 02-01-1.1-2011 B.

In Annex B.1. according to the table for concrete

a_{Ed} = 0.03 and $\sigma_{sd} = f_{yd}$ = 435 MPa - ω = 0.13, ξ = 0.189.

Required area of elongated reinforcement:

$$As1=\frac{1}{fyd}(\omega \cdot b \cdot d \cdot fcd + N_{Ed}) = \frac{1}{435}(0.13 \cdot 30 \cdot 41 \cdot 14.16) = 5.20 \text{cm}^2$$

We accept: 2Ø20 S500 from the assortment (A_{S1} = 6.28 cm2). Rigidly reinforcement.

Maximum intermediate torque: M = 24.02 kH · m

$$A_{Ed}=M_{Ed.max}/(f_{cd} \cdot b'_f \cdot d^2) = 24.02 \cdot 10^3/14160 \cdot 10^3 \cdot 0.30 \cdot 0.41^2 = 0.33$$

Concrete according to the schedule

For a_{Ed} = 0.33 and $\sigma_{sd} = f_{yd}$ = 435 MPa - ω = 0.0412, ξ = 0.079

Required area of elongated reinforcement:

$$As1=\frac{1}{fyd}(\omega \cdot b \cdot d \cdot fcd + N_{Ed}) = \frac{1}{435}(0.041 \cdot 30 \cdot 41 \cdot 14.16) = 1.641 \text{cm}^2$$

We accept: 2Ø12 S500 from the assortment (A_{S1} = 2.26 cm2). Rigidly reinforcement

Determining the area and pitch of horizontal reinforcement According to the calculation, the length of the area where the horizontal reinforcement is installed: determined by the diagram of the transverse forces. First of all, concrete determine the transverse force that receives

$$VRd,c = \left[\left(\frac{0.18}{\gamma c}\right) \cdot k \cdot (100\rho 1 \cdot fck)^{\frac{1}{3}}\right] \cdot bw \cdot d, ; \geq Vrd,c,min = \left[0.035 \cdot k^{\frac{3}{2}} \cdot fck^{\frac{1}{2}}\right] \cdot bw \cdot d, KN \quad (4)$$

where V_{Rd}, c=70.11kN accepted for horizontally reinforced concrete transverse force;

γc- safety factor of concrete;

ρ1- longitudinal reinforcement coefficient;

fck- characteristic resistance of concrete to axial compression;

d- height of the section;

$$k=1+\sqrt{200/d} \leq 2, =1+\sqrt{300/441}=1.822$$

$$\rho 1=\frac{As1}{bw \cdot d}=\frac{520}{300 \cdot 410}=0.0042$$

$$d=h-c1=450-40=410mm$$

The calculation area is:

$$a_w = (V_{Ed,\,max} - V_{Rd,\,c,\,min})/(q+g) = (69.43 - 52.73)/(79.24) = 0.210\ M$$

$$Vrd,c,min = \left[0.035 \cdot 1.82^{\frac{3}{2}} \cdot 25^{\frac{1}{2}}\right] \cdot 300 \cdot 410 = 52.736, kN$$

Assign the first design section at a distance of d_z = 410 mm from the support.

The value of the transverse force in this section: V_{Ed} = 69.43 kN.

The angle of inclination of the light is θ = 40°

The horizontal reinforcement of the calculation zone is the length of this zone within the following conditions:

$$V_{Ed}=V_{Rd,sy};\ V_{Ed} \leq V_{Rd,max}$$

where $V_{Rd,\,sy}$ is the calculated transverse force with the cross section of the transverse reinforcement accepted.

Taking the step of the horizontal reinforcement, its cross section We determine the area by the last formula, the number of horizontal reinforcement The given method assumes the following condition, the leakage of the voltage is equal to the limit: $f_{sw} = f_{ywd}$

Assume the pitch of the horizontal reinforcement s = 200 mm

$$Asw=\frac{VEd \cdot s}{dz \cdot fsw \cdot cot\theta}=\frac{69.43 \cdot 10^3 \cdot 200}{410 \cdot 167 \cdot cot40}=169.81mm^2=1.698cm^2$$

From the assortment 2Ø12 S240 (Asw = 2.26cm^2). crossbar reinforcement Iron wrought iron.

Only if the following conditions are met:

$$\frac{Asw \cdot Fsw}{bw \cdot s} \leq 0.5 \cdot v \cdot fcd, \quad (5)$$

$$V_{Ed} \leq V_{Rd,max} = \frac{V \cdot fcd \cdot bw \cdot dz}{cot\theta + tan\theta} \quad (6)$$

Where v is the tensile strength of concrete, the coefficient to be taken into account for heavy concrete is as follows:

$$V_{Ed} =< V_{Rd,max} = 69.43kN \leq 70.11kN$$

The condition is met.

Since all the conditions are met, the horizontal reinforcement is 2Ø12 S240 (Asw = 2.26 cm2), we take the step s = 200 mm.

2.3 Calculation of monolithic floor slabs

Rectangular slab with bottom reinforcement Characteristic resistance of concrete to axial compression C25 / 30 fck = 25 MPa

Statistical variability with provision: acc = 0.85

Safety factor for concrete: yc = 1.5

Design concrete resistance [3]:

$$Fcd = acc \cdot \frac{fck}{yc} = 0.85 \cdot \frac{25}{1.5} = 14.16 \text{ MPa}$$

Characteristic resistance of the reinforcement: S500 f_{yk} = 500 MPa

Partial safety factor for reinforcement: ys = 1.15

Design resistance of reinforcement:

$$Fyd = \frac{fyk}{ys} = \frac{500}{115} = 435 \text{ MPa}$$

Determine the bending moment in the section:

$$MEds = Med - Ned \cdot zs1 \quad (7)$$

where, Ned = 0

$MEds$ = 36.78 kN · m

$d = h - c1 = 200 - 40 = 160$ mm.

The required area of longitudinal reinforcement is determined using coefficient kd:

$$kd = \frac{d}{\sqrt[2]{\frac{Meds}{b}}} = 2.66$$

Determine the coefficient ks, according to concrete grade C25 / 30 ks = 2.41; ξ = x / d = 0.094; x = 0.094 · 200 = 18.8 mm Required tensile reinforcement area:

$$As1 = ks1 \cdot \frac{Meds}{d} + \frac{Ned}{fyd} \quad (8)$$

We select stretched reinforcement according to the assortment: 5⌀12 (As1 = 4.52 cm2) To check, we make a selection of longitudinal reinforcement according to table B.1 [3] Appendix B [3] for determining the bearing capacity of bending members rectangular section using dimensionless coefficients. Determine the value of the coefficient:

$$\text{Aeds} = \frac{Meds}{fcd \cdot b \cdot d^2} \quad (9)$$

According to table B.1 [3] ω = 0.0765, ξ = x / d = 0.12; x = 0.12 · 200 = 24 mm Required area of longitudinal reinforcement:

$$\text{As1} = \frac{1}{fyd} \cdot (w \cdot b \cdot d \cdot fcd + Ned) = 4.83\text{cm2}$$

Therefore, we select 5⌀12 (As1 = 5.65 cm2) Calculation of the strength plate [4]:

Let's define the lateral force that concrete can perceive:

$$k = 1 + \sqrt{\frac{200}{d}} = 2.29$$

Therefore, we take k = 2

$$\rho l = \frac{As1}{bw \cdot d} = 0.0011$$

$$V_{Rd,c} = [(\frac{0.18}{y_c}) \cdot k \cdot (100\rho l \cdot f_{ck})^{1/3}] \cdot b_w \cdot d = 43.14 \quad (10)$$

Let us determine the minimum shear force of the overlap [4]:

$$V_{Rd,c,min} = [0.035 \cdot k^{\frac{3}{2}} \cdot f_{ck}^{\frac{1}{2}}] \cdot b_w \cdot d = 52.04$$

$$V_{Rd,\,c} < V_{Rd,\,c,\,min}$$

The check is carried out the strength of the section is ensured. The step of the transverse reinforcement is taken in the range: 200 - 400 mm, in depending on the load on the plate. An overlap with a height of 240 mm is calculated, therefore we take a step: s = 200 mm

3 Technological part

Modifications, software, etc. used during the construction phase of a project that enables advancement Construction technology refers to the collection of innovative tools, machinery, in field construction methods, including semi-automated and automated construction equipment. Construction and Building Technology introduces students to construction processes and procedures. Students will learn about construction technology, construction materials and management, and project design. They will study building foundations, subsystems, and structures, and learn how these systems are maintained, repaired, or altered. Chapters on commercial, industrial, and engineered construction processes and procedures are also included. The book is correlated to the Standards for Technological Literacy. Course work includes basic construction concepts such as general construction, blueprint reading, construction estimating, and project management. Students will also diversify their knowledge of construction in other areas like electrical wiring, construction surveying, plumbing, and static/strength of materials. Construction technology is an increasingly important aspect of the future of construction. With the skilled labor shortage, stagnant productivity, and safety issues that plague the industry, it's hard to stay ahead of these issues. Construction companies, universities, and technology companies are working hard to find solutions to these problems. Companies are finding ways to improve productivity, reduce workplace injuries, and push construction into the future. These new construction technologies are shaping the industry in 2019, and the changes made will leave the industry completely changed. Without an understanding of basic building technology, an architect cannot demonstrate (to an owner, to a contractor, or to the building department) the constructability of a design. A building is not made up of bits and pieces erected next to each other; a building is composed of interrelated systems and assemblies that work together to contribute to the building's proper functioning. If these components are not carefully selected, specified, and detailed, with the designer taking into account these components' effects on all the other parts of the building, the completed building may not be able to protect its occupants from drafts, moisture intrusion, mold, condensation, cold, outside noise, or excessive heat.

3.1 Concrete production technology

All concrete work is carried out in accordance with the working drawings in compliance with the Organization of construction of enterprises, buildings and structures. " The flow chart shows the concrete production scheme, as well as technological schemes and processes. Before laying concrete mix, the following work must be done, checked the presence of fixatives, providing the required thickness of the protective layer of concrete formwork, reinforcement adopted according to the act, the releases of working reinforcement from adhered concrete are cleaned, prepared working seam concreting. An

incoming quality control of the concrete mixture was performed. Delivery to the facility of concrete mix is provided by concrete mixers. Concrete mixture is supplied to the place of concreting:39 tubs (bunkers) using tower or self-propelled cranes (in vertical structures), concrete pumps (in horizontal structures up to); When the outdoor temperature is below -10 ° C, immediately before concreting densely reinforced structures with reinforcement of the frame with a diameter of more than 24 mm, it is necessary to heat the reinforcing frame in the formwork block. Releases of reinforced concrete structures must be covered or insulated to a height (length) of at least 0.5 m. The process of preparing a working seam in the contact zone of the "old" concrete of the floor slab and the "fresh" concrete of the concrete column is carried out by cleaning the surface of old concrete slabs (before mounting the reinforcing cage) from the carbonate film with a metal brush, or with a high pressure compressor (7 bar); At air temperatures below -15 ° C, it is recommended to heat the concrete of the working joint (immediately before the first portion of the concrete mixture is fed) through a special window in the lower part of the formwork using warm air from the air heater. During the incoming quality control of the concrete mix, you should especially follow the concrete passport data (H / C compliance = 0.5, i.e. no more than 0.55) and the process of adding 0.2-0 superplasticizer to the site before unloading the mixture 4% by weight of cement. When the concrete mixture is fed into the casing column block by a concrete pump equipped with a manipulator in winter conditions, it is necessary to perform additional maintenance operations on the mechanism and concrete pipelines. General requirements for the installation of concrete pipelines: vertical or inclined sections of concrete should be located no closer than 7-8 m from a stationary or mobile concrete pump; avoid sharp turns, especially the use of elbows with an angle of 90 ° C. Features of the operation of the concrete pump and concrete pipelines in winter conditions: at an outdoor temperature of -15 ° C, it is allowed to use a concrete pump and concrete pipelines in the usual (summer) version, but subject to the supply of hot concrete mix (30-35 ° C) or a mixture with antitrust additives; at temperatures below -15 ° C, it is necessary to equip the receiving hopper of the concrete pump with a warmed lid, to insulate the concrete ducts with a roll insulation of thicknesses. 15 mm; before supplying the concrete mixture with a concrete pump, pour hot water into the washing tank of the concrete pump; start the hydraulic system of the concrete pump idling at minimum engine speed and, while maintaining this mode of operation of the hydraulic pump for 10-15 minutes, heat the oil in the hydraulic drive of the pump; warm up the hopper, transport cylinders and concrete pump of the concrete pump with hot water (+ 40-50 ° C);

Feed into the hopper a starting solution with a temperature of 30-40 ° C and carry out 3-4 cycles of pumping and suction with a working motive screw; After the two-stage heating of the concrete pump of the concrete pipelines is completed, it is possible to start pumping the concrete mixture, the temperature of which should not be lower than + 20 ° C, in the absence of anti-frost additives in the mixture. While waiting for the concrete mixer, close the concrete pump hopper with insulated lid. In case of forced interruptions in the supply of concrete mixture, the mixture inside the concrete pipeline must circulate

in a closed system (recirculating pumping mode), while constantly measuring the temperature of the mixture in the receiving hopper, which should not be lower than + 10 ° C. If the temperature of the concrete mixture drops below + 10 ° C, the mixture must be removed from the concrete pipe and the entire system should be washed and cleaned. Use hot water with a temperature of at least + 30 ° C to flush concrete pipelines, hopper and transport cylinders. The water remaining in the flushing and water tanks must be drained, and the accumulation of water in the transport cylinders, hopper and concrete conduit must be removed using compressed air supplied from the concrete pump compressor

Table 4 - given source data

№	Name			
1	Structure length, *l*1	m	36	
2	Structure width, *l*2	m	33	
3	Soil class		II	
4	Type of soil	m	Sandy, loam	
5	Step and span in longitudinal and transverse directions (a and b)	m	a=6m b=6.6m	
6	Range of transportation of soil	km	12	
7	Foundation type		Slab foundation	

Table 5- Determination of workvolume

No	**(Name of processes)**	**(Unit of measure)**	**(Volume of work)**	
			(on one base)	(In total)
1	(The construction of temporary fencing)	(m)	112	238
2	(Removal of top soil)	(m3)	77.3	628.01
3	(Soil excavation in the pit (trench) and trench access to the pit)	(m3)		5422.1
4	(Excavation of soil underrun)	(m3)	216	1296
5	(Concrete preparation for foundations)	(m3)	3.6	1511.2
6	(Reinforcement installation, incl.:)			
a	grids installation	(pieces/t)		1815.32
b	frames installation	(pieces/t)		1144.45
7	(Formwork installation)	(m2)	0.18	912.28
8	(Concreting of foundations)	(m3)	3.6	151.2
9	(Formwork removal)	(m2)	0.18	9129.28
10	(Foundation waterproofing)	(m2)		623.44
11	(Backfilling)	(m3)		1124.07
12	(Soil compaction)	(m2)		1188.33
13	(Final land planning)	(m2)		1094.18
14	(Removal of temporary fencing)	m		238

The formwork used for the construction of monolithic reinforced concrete structures must be manufactured and applied in accordance with the work design approved in the established manner.

When installing formwork elements in several tiers, each subsequent tier should be installed only after the lower tier has been fixed.

Placing equipment and materials on the formwork that is not provided for by the work project, as well as the presence of people not directly involved in the production of work on the formwork flooring, is not allowed.

The dismantling of the formwork should be carried out (after the concrete reaches the specified strength) with the permission of the manufacturer, and especially critical structures (according to the list established by the project) - with the permission of the chief engineer.

Harvesting and processing of valves must be carried out in specially designed and suitably equipped places.

When performing work on the preparation of valves, it is necessary:

enclose places intended for unwinding coils (coils) and straightening reinforcement;

when cutting reinforcing rods by machine tools into segments of less than 0.3 m in length, use devices that prevent their expansion;

to protect the workplace when processing reinforcing bars that protrude beyond the dimensions of the workbench, and for bilateral workbenches, in addition, divide the workbench in the middle with a longitudinal metal safety net at least 1 m high;

fold the prepared reinforcement in specially designated places;

cover with shields the end parts of the reinforcing rods in places of common passages having a width of less than 1 m.

When performing work on tensioning the reinforcement, it is necessary: to install protective barriers at least 1.8 m high in places of passage of workers; equip devices for tensioning valves with an alarm that is activated when the drive of the tensioner is turned on; prevent people from staying at a distance closer than 1 m from reinforcing bars heated by electric current.

Elements of reinforcement cages must be packaged taking into account the conditions of their lifting, storage and transportation to the installation site.

When using steam to heat inert materials in bins or other containers, measures should be taken to prevent steam from entering workplaces. The steam line should be checked periodically for tightness and integrity of the thermal insulation. Steam line valves should be located in places with convenient access to them.

The descent of workers into chambers heated by steam is allowed after turning off the steam supply, as well as cooling the chamber and the materials and products inside it to 40 ° C.

When preparing a concrete mixture using chemical additives, measures must be taken to prevent skin burns and eye damage to workers.

Bins (buckets) for concrete mix must meet GOST 21807. Moving a loaded or empty hopper is allowed only with the shutter closed.

Installation, dismantling and repair of concrete pipelines, as well as removal of delayed concrete (plugs) from them, is allowed only after reducing the pressure to atmospheric.

During cleaning (testing, purging) of concrete pipelines with compressed air, workers not directly involved in these operations should be removed from the concrete piping by a distance of at least 10 m.

Every day before starting to lay concrete in the formwork, it is necessary to check the condition of the packaging, formwork and screed. Detected malfunctions should be rectified immediately.

Before starting to lay the concrete mixture with a vibrating trunk, it is necessary to check the serviceability and reliability of fixing all the links of the vibrating trunk to each other and to the safety rope.

When laying concrete from tubs or a hopper, the distance between the lower edge of the tub or hopper and previously laid concrete or the surface on which the concrete is laid should be no more than 1 m, unless other distances are provided for by the project.

When compacting the concrete mixture with electric vibrators, it is not allowed to move the vibrator behind the current-carrying hose, and during breaks in operation and when moving from one place to another, the electric vibrators must be turned off.

Workers laying concrete mix on a surface with a slope of more than 20 ° must use safety belts.

Platforms for concrete supply by dump trucks must be equipped with breaker bars. Passages with a width of not less than 0.6 m must be provided between the chimney bar and the fence. Transverse chimney bars must be installed on dead ends.

When concrete is electrically heated, the installation and connection of electrical equipment to the supply network should be carried out only by electricians with a safety qualification group of at least III.

Insulated flexible cables or wires in a protective hose must be used in the electric heating zone. It is not allowed to lay wires directly on the ground or on a layer of sawdust, as well as wires with broken insulation.

When concrete is electrically heated, the electrically heated zone must have a protective fence that complies with GOST 23407–78, a light alarm and safety signs. The signal lamps must be connected so that when they burn out, the power supply is turned off.

The electric heating zone of concrete should be monitored around the clock by electricians installing the power grid.

The presence of people and the performance of any work in these areas is not permitted, with the exception of work performed by personnel with a safety qualification group of at least II and using appropriate protective equipment.

Open (non-concrete) reinforcement of reinforced concrete structures associated with the area under electric heating is subject to grounding (grounding).

After each movement of the electrical equipment used for heating concrete to a new place, the condition of insulation of wires, protective equipment for fencing and grounding should be visually checked.

3.2 Determination of work labor input and crew composition

The labour input of operations is calculated based on respective works and actually performed by equipment or manually. For manual processes in the column “operator” put a dash. Total labor costs and wages are obtained by multiplying the amount of work on the standards of time and rates. The calculation is presented in tabular form (tab. 10) in the calculation of labor costs, make it only by the accepted type.

Labor costs of processes in man– hours are determined by the formula:

$$Q_{m-hour}. = V \cdot \mathrm{N_{tr}}. \quad (11)$$

where, V– volume of work (table 4);
Ntr – Standard time
The construction of temporary fencing

Q_{m-hour}=238·1.2=285.6

Removal of top soil

Q_{m-hour}=628.01·0.56=351.685

Soil excavation in the pit (trench) and trench access to the pit

Q_{m-hour}= 542.21·2.8=1518.188 people

Q_{m-hour}=542.21·0.56=303.637

Excavation of soil underrun

Q_{m-hour}= 1296·1.64=2125.44

Concrete preparation for foundations

Q_{m-hour}=1511.2·0.79=1193.84

Reinforcement installation, incl

Q_{m-hour}=2960·2,17=6423.2

Formwork installation

Q_{m-hour}=912.28·0,36=328.42

Q_{m-hour}=912,36·0,12=109.47

Concreting of foundations

Q_{m-hour}=151.2·1,2=181.44

Formwork removal

Q_{m-hour}=912,36·0,31=282.83

Foundation waterproofing

Q_{m-hour}=623.44·1.0=623.44

Backfilling

Q_{m-hour}=1124.07·0.39=438.38

Soil compaction

Q_{m-hour}=1188.33·0.92=1093.26

Final land planning

Q_{m-hour}=1094.18·0.33=361.079

Q_{m-hour}=1094.18·0.49=536.14

Removal of temporary fencing

Q_{m-hour}=238·0.039=9.282

And in man–days defined as:

$$Qm-day=\frac{Q_{m-hour}}{8.2} \quad (12)$$

The construction of temporary fencing

$$Qm-day=\frac{285.6}{8.2}=34.82\approx35$$

Removal of top soil

$$Qm-day=\frac{351.68}{8.2}=42.88\approx43$$

Soil excavation in the pit (trench) and trench access to the pit

$$Qm-day=\frac{1518.18}{8.2}=185.14\approx186$$

Excavation of soil underrun

$$Qm-day=\frac{2125.44}{8.2}=259$$

Concrete preparation for foundations

$$Qm-day=\frac{1193.8}{8.2}=145$$

Reinforcement installation, incl

$$Qm-day=\frac{622.32}{8.2}=75$$

Formwork installation

$$Qm-day=\frac{328.42}{8.2}=40$$

$$Qm-day=\frac{109.4}{8.2}=13$$

Concreting of foundations

$$Qm-day=\frac{181.44}{8.2}=22$$

Formwork removal

$$Qm-day=\frac{282.83}{8.2}34$$

Foundation waterproofing

$$Qm-day=\frac{623.4}{8.2}=76$$

Backfilling

$$Qm-day=\frac{438.38}{8.2}=73$$

Soil compaction

$$Qm-day=\frac{1093.26}{8.2}=133$$

Final land planning

$$Qm-day=\frac{361.079}{8.2}=44$$

$$Qm{-}day=\frac{536.14}{8.2}=65$$

Removal of temporary fencing

$$Qm{-}day=\frac{9.282}{8.2}=1.12\approx2$$

The amount of the salary is determined by multiplying the volume of work on pricing. According to the accepted number of machines and composition of units recommended by ENiR is determined the team.

3.3 Preparation of work schedule

The planned schedule of works specifies sequence of the processes and the duration of their mutual coordination. Schedule of work production plan is recommended to be prepared as per the table. 5 given in SNIP–3.01.0185. The data in columns 1, 2, 3, 4, 6 are transferred from the calculation of labor input and machine.

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 planned schedule of works designed in the form of a line graph. Each process is depicted in the graph line on which to specify the number of workers employed in carrying out this process. Schedule terms of the performance of certain types of processes on the chart cannot be arbitrary scheduled, but should be set in strict compliance with the conditions of the process sequence. All processes should be aligned with each other at the beginning and end dates.

The duration of the mechanized processes is determined by:

$$P_m=\frac{N_{m.sh}}{N\cdot A} \tag{13}$$

where, N(m.sh) – volume–shift;
n – number of machines;
A – number of shifts per day
Duration of manual processes is determined by:

$$P_p=\frac{Q}{n\cdot A} \tag{14}$$

where, Q–labor costs, (human – day);
n– number of workers per shift.
Removal of top soil

$$P_m = \frac{238}{1 \cdot 2 \cdot 18} = 7 \text{ days}$$

Soil excavation in the pit (trench) and trench access to the pit

$$P_m = \frac{129.09}{1 \cdot 2 \cdot 20} = 4 \text{ days}$$

Formwork installation of foundation manually

$$P_m = \frac{912.28}{2 \cdot 2 \cdot 50} = 5 \text{ days}$$

Concreting of foundations

$$P_m = \frac{151.2}{1 \cdot 2 \cdot 22} = 4 \text{ days}$$

Backfilling

$$P_m = \frac{1124.07}{2 \cdot 2 \cdot 200} = 2 \text{ days}$$

Soil compaction

$$P_m = \frac{1188.33}{2 \cdot 2 \cdot 115} = 3 \text{ days}$$

Final land planning

$$P_m = \frac{1094.18}{2 \cdot 2 \cdot 140} = 2 \text{ days}$$

Duration of manual processes is determined by:

The construction of temporary fencing

$$P_p = \frac{285.6}{2 \cdot 10} = 14 \text{ days}$$

Soil excavation in the trench and trench access to the pit

$$P_p = \frac{30.367}{2 \cdot 5} = 4 \text{ days}$$

Excavation of soil underrun

$$P_p = \frac{212.544}{2 \cdot 20} = 6 \text{ days}$$

Concrete preparation for foundations

$$P_p = \frac{119.384}{2 \cdot 10} = 6 \text{ days}$$

Reinforcement installation of columnar foundation manually

$$P_p = \frac{642.32}{2 \cdot 20} = 32 \text{ days}$$

Formwork installation of columnar foundation manually

$$P_p = \frac{328,42}{2 \cdot 20} = 9 \text{ days}$$

Concreting of columnar foundation

$$P_p = \frac{181,44}{2 \cdot 20} = 5 \text{ days}$$

Formwork removal of columnar foundation

$$P_p = \frac{282,83}{2 \cdot 20} = 15 \text{ days}$$

Foundation waterproofing

$$P_p = \frac{623,44}{2 \cdot 20} = 16 \text{ days}$$

Final land planning

$$P_p = \frac{361,079}{2 \cdot 10} = 19 \text{ days}$$

Removal of temporary fencing

$$P_p = \frac{9,282}{2 \cdot 5} = 1 \text{ days}$$

For an overall assessment of the correctness of construction schedule, coherence and alignment processes, as well as for the calculation of the required area of temporary buildings at the site, it, in addition to checking for compliance with the total duration of the regulatory or legislative terms, checked also to comply with the continuity and uniformity of requirements of the workforce. To this end, by adding the number of workers (by occupation), who daily have to work in different shifts, around the schedule in the

Vertical direction at different intervals of time in the bottom of the schedule to be prepared a graphics of the movement of labor power, on which can judging the optimality compiled schedule

3.4 Waterproofing of subsurface parts of building

To protect the vertical surfaces of the underground part of the outer basement walls against capillary moisture at low pressure or ground water is used surface waterproofing and insulation for horizontal surfaces – membrane. Surface waterproofing is applied mostly in mechanized way (asphalt distributor) after the construction of the underground part of the building. When small amounts of waterproofing work carried out during the construction of basements walls by application of coating layers by hand. In the presence of basements, membrane horizontal waterproofing is laid on two levels: at the level of the floor of the basement foundation and 10÷15 cm above the planned level of the ground. In no– basement part, the membrane hydraulic waterproofing need only one level – 10÷15 cm above the planned level of the ground.

3.5 Method choice of complex mechanized earthwork processes

During the comprehensive mechanization, the processes are performed by machine sets, complementing each other and linked to each other on the basic parameters and the location in the processing chain. When choosing methods of production work to be considered: the type of soil, the size of earth construction, the groundwater level, the range of soil haulage and the season of the work. Excavation and haulage of soil during pits and trenches excavation can be carried out by bulldozers, excavators, in set with dump trucks. The choice of a complex– mechanized production process of excavation is carried out on the basis of technical and economic comparison of options of different sets of machines.

For comparison to be chosen 2–3 cars of one or different types. Top soil removal is carried out by bulldozers or scrapers. When choosing types of machines must be taken into

3.6 Selection of a bulldozer

In construction, the most productive and cost-effective production is a mechanical method. In this regard, the main task in production - reducing the manual method and, therefore, human hours. To cut the vegetation layer, a bulldozer will be used: it can cut off a small layer from above and move it up to 150 m. You can do earthwork with any bulldozer, but not always this will be beneficial. To find the best option, you need to compare the two the most suitable bulldozer. The main characteristic for comparison is shift able operational performance, the higher it is, the more profitable using this machine.

Shift operating of the bulldozer is calculated per the formula

$$P=\frac{60\cdot T\cdot q\cdot a\cdot K_B}{T_H+T_P+\frac{I_g}{V_g}+\frac{I_n}{V_n}} \quad (15)$$

Where

T is the duration of the work. shifts;

q - the amount of soil in a dense state;

a - accounting for soil loss

during movement;

K_B - the utilization rate of the machine over time;

$T_н$ - the duration of the soil collection;

T_P - time for speed switching;

l_g, l_p - distance of transportation with cargo and empty;

V_g, V_p - speed of the bulldozer when loaded and empty; bulldozer mark **DZ-42**

$$P_1=\frac{60\cdot 8\cdot 1.5\cdot 1.06\cdot 0.8}{0.23+0.01+\frac{12}{4.4}+\frac{12}{6.4}}=126.14 m^3/min$$

Determine the performance for the bulldozer mark **DZ-27C**

$$P_2=\frac{60\cdot 8\cdot 3.5\cdot 1.06\cdot 0.8}{0.15+0.05+\frac{12}{4.9}+\frac{12}{5.2}}= 272.39 m^3/min$$

$$P_2 \geq P_1$$

After comparing finally, we select bulldozer mark **DZ-27C** because P_2 is working better.

3.7 Selection of the excavator

The excavation is carried out by an excavator with a backhoe, since work takes place below the level of the machine mark, with teeth on the bucket. For the optimal choice, we take the 2 most suitable excavators and let's compare their development costs 1 m3 soil **E-1252B, EO-4121A**

Determine the cost of developing 1m of soil for the Hitachi E-1252B model

$$C=\frac{1.08\cdot C_{mach.shift}}{P_{sh.r.pr}}=\frac{1.08\cdot 37600}{385.68}=105.289 \text{ tenge}$$

The total number of machine shifts of the excavator model E-1252B

$$N_{mach.shef}=\frac{H_{1vr}\cdot V_{OZ}+H_{2vr}\cdot V_3}{8.2\cdot 100}=\frac{3301\cdot 1,64+11353\cdot 2,2.}{8.2\cdot 100}=37.06$$

We find a removable development for the E-1252B model

$$P=\frac{V_k}{N_{mach.shef}}=\frac{14654,3}{37}=396.06 \text{ tenge/m}^3$$

Determination of the capital investment in the development of 1 m3 soil for each given type of excavator

$$K_{od}=\frac{1.07\cdot C_{er}\cdot 1000}{P\cdot T_g}=\frac{1.07\cdot 38000\cdot 1000}{385.63\cdot 300}=351.45 \text{ tenge/m}^3$$

Where 1.07Ce is the inventory and estimated cost for the excavator and its actually different for each excavator, here we have for Hitachi **E-1252B** it is 38000tg and for Hitachi **EO-4121A** we have 43000tg.

Tg- is the standard annual number for excavator shift, and the size is300 shift.

We find the reduced costs of the E-1252B model

$$P_d=C+E_n\cdot K_{yd} \quad (16)$$

Where, En is the standard efficiency ratio of capital attachments (0.15);

$$P_d=C+E_n\cdot K_{yd}=105.289+0.15\cdot 351.45=456.89 \text{ tenge/m}^3$$

Determine the cost of developing 1m of soil for the E0-4121A model

$$C=\frac{1.08\cdot C_{mach.shift}}{P_{sh.r.pr}}=\frac{1.08\cdot 31280}{385.68}=145.98 \text{ tenge}$$

The total number of machine shifts of the excavator model E0-4121A

$$N_{mach.shef}=\frac{H_{1vr}\cdot V_{OZ}+H_{2vr}\cdot V_3}{8.2\cdot 100}=\frac{3301\cdot 2.2+11353\cdot 2,5.}{8.2\cdot 100}=43.45=44$$

We find a removable development for the E0-4121A model

$$P=\frac{V_k}{N_{mach.shef}}=\frac{14654,3}{44}=333.05$$

Determination of the capital investment in the development of 1 m3 soil for each given type of excavator

$$K_{od}=\frac{1.07\cdot C_{er}\cdot 1000}{P\cdot T_g}=\frac{1.07\cdot 43000\cdot 1000}{385.63\cdot 300}$$=397.70 tenge/m^3

We find the reduced costs of the E0-4121A model

$$P_d=C+E_n\cdot K_{yd}$$= 145.98 + 0.15 · 397.70=543.83 tenge/m^3

456.89 tenge/m^3<543.83 tenge/m^3

Therefore, as a result of comparing two excavators, according to calculations model **E-1252B** was chosen - lower costs of using this model, for the development of 1 m3

3.8 Selection of dump trucks

For loading the vegetation layer into dump trucks, we select shovel single bucket excavator. We select a dump truck in depending on the volume and distance of transportation. We use a dump truck of the brand **YaAZ-210E**: carrying capacity 10 t, body capacity 8 m3, speed with a load - 45 km / h.

The volume of soil in a dense body in an excavator bucket

$$V_{gr}=\frac{V_{kov\cdot K_{nap}}}{1+K_{pr}} \quad (17)$$

Where, V_{kov} is the accepted volume of the bucket; Knap - bucket filling factor (1.15 straight; 0.8 reverse);

$$V_{gr}=\frac{1.3\cdot 1.15}{1.11}$$=1.35

Soil weight in excavator bucket

$$Q = V\text{gr}\cdot p\text{gr}$$=1.35·1.7=2.31

The required number of soil buckets to fill the dump truck

$$n=\frac{P}{Q}=\frac{10}{2.31}$$4.32

calculate the volume of soil in a dense body, dump truck body

$$V=V_{gr}\cdot n.=1.35\cdot 4$$=5.4

Duration of a single cycle of a dump truck

$$T_c=t_p+\frac{60L}{V_g}+t_r+\frac{60\cdot L}{V_p}+T_m \quad (18)$$

Where, L is the distance of soil transportation; ·

tp- is the time of loading the soil;

tr - soil unloading time (2-3 minutes);

tm - time of maneuvering before loading and unloading (2-3 minutes);

Vg- is the average speed of a loaded dump truck;

$$t_p=\frac{V\cdot H_{vr2}\cdot 60}{100}=\frac{5.4\cdot 2.2\cdot 60}{100}$$=7.128

$$T_c = 7.128 + \frac{60 \cdot 15}{40} + 2 + \frac{60 \cdot 15}{40} + 2.5 = 56.628 \text{ min}$$

Determining the required number of dump trucks

$$T = \frac{T_C}{t_p} = \frac{56.628}{7.128} = 7.944 = 8 \text{ pieces}$$

Conclusion: when calculating, it was revealed that 6 dump trucks are needed for transportation soil at a distance of 12 km

3.9 Selection of transportation, selection of crane, supply and placement of concrete mix

The choice of the type of cranes depends on: the configuration and size of the structure; overall dimensions, degree of enlargement, mass, and location of the structures to be mounted; adopted method of installation Ms. Preloading devices that affect the mounting weight of the element and the height of the lifting must first be selected. For tower cranes, determine: the mounting weight of the element m; the required height of the crane hook lifting; required minimum boom length. When erecting single-story buildings with jib cranes (with a run in the bays), the structures can be installed in several passes with mounting kits, for which you can select the appropriate cranes. Such sets are: foundation blocks; columns; Beams or trusses together with slabs of covering; Wall panels. When selecting an arrow valve, it should be borne in mind that its load capacity varies in a wide range and depends on three factors: the accepted length of the boom; out of the hook and the use of outriggers (for automobile and pneumatic-wheeled cranes). These factors are taken into account in the load carrying capacity curves given in reference literature .The mounting weight of the element is usually determined for the heaviest, the remote and the high-lying elements and is calculated as the sum of the masses of the mounted element (or enlarged block) and the mass of the gripping device and tooling fixed to the element (scaffolding, stairs, clamps, etc.).The required lifting height of the hook (Fig. 1, a) is determined by the technology of feeding the element to the support: A jib tower crane is used to supply the concrete mix. type, in conjunction with a bucket.

Required lifting height of the crane hook

$$Hcr = H_0 + H_{zp} + H_{Elm} + Hct \qquad (19)$$

Where, H_0 is the elevation of the installation of the mounted element;

H_{zp} - the margin of height between the support and the bottom of the mounted element, the number for it, is taken between 0.5 ... 1 m from the conditions of safe work;

H_{Elm} -height of the element to be mounted;

Hct- the height of the lines design height of load-gripping to the center of the hook of the crane, m

$$Hcr = 27 + 0.5 + 3 + 2.5 = 33\text{m}$$

The required height of the hook H.tr (m) is determined from the condition of lifting the highest positioned of element. The crane lifting capacity is taken according to the largest mounting mass of the element according to the formula, while checking that the required load moment corresponds to the load moment of the selected crane. Required load moment. After determining the design parameters of the mounting cranes according to their technical characteristics, such machines are selected whose operating parameters satisfy the design ones, equal to them or slightly surpass them. The type of mounting crane is selected in two stages. First accept technically acceptable options, and then, comparing the technical and economic indicators, choose the best option

The required outreach of the hook is determined based on the intended location of the crane parking lot. If you do not need to feed the crane hook in depth buildings above the previously assembled structures, then the elements (foundations, columns, rafters, trusses, wall panels) can be mounted on a minimum outreach hook.

Required boom reach

$$L_{cr}^{tr} = b + \frac{a}{2} + c \quad (20)$$

Where, b is the width of the span building;
a - the width of the crane runway;
c is the distance from the edge of the building to the slewing part of the crane;

$$L_{cr}^{tr} = 6 + \frac{6}{2} + 26.7 = 35.7 \text{ m}$$

Required load moment

$$M_{tr} = (Q_{\ni l} + Q_{str}) \cdot L_{cr}^{tr} \quad (21)$$

Where, $Q_{\ni l}$ is the mass of the crane tub;
Q_{str} - weight of lines;
$L_{cr}^{tr}$is the required outreach of the crane boom;

$$M_{tr} = (5.9 + 1) \cdot 35.7 = 246.33 \text{ t·m}$$

Selection of tower crane **KBM-401P-08**
Carrying capacity - 10 t, with a maximum outreach - 6.3 t
The maximum outreach of an arrow - 25 m
Hook lifting height - 35.4 m

$$T_c = t_r + 2t_c + 2t_p + t_y \quad (22)$$

Where, tp- is the time of loading the concrete mixture;
tc - time of slinging / slinging;
tp - the time of supply by the crane-bucket with the concrete mixture;
ty- is the time of laying the concrete mixture;

$$T_c = 1.5 + 2 \cdot 1.5 + 2 \cdot 2 + 3 = 11.5 \text{ min}$$

Replaceable bucket performance

$$P_c = \frac{60 \cdot V \cdot T \cdot K_V}{T_c} \quad (23)$$

Where, V is the volume of the concrete mixture loaded into the crane with a bucket;

T is the duration of the shift;

Kv - the coefficient of crane use in time (for a crane with an internal combustion engine without outriggers);

T_c is the duration of the working cycle;

$$P_c = \frac{60 \cdot 8 \cdot 2 \cdot 0.78}{11.5} = 66.01 \text{m}^3/\text{min}$$

Determine the actual duration of the bucket:

$$T = \frac{V}{P_c} = \frac{2234.34}{66.01} = 34 \text{ days}$$

3.10 Selection of the number of concrete trucks

For the delivery of concrete mix to the construction site, the most profitable use concrete trucks.

The same rule is followed by the technique and devices used to prepare concrete.

The machines are equipped with a special container - drum, which is in constant motion, so as not to give concrete mix to grab. Machine selection - concrete mixer **KAMAZ 581453**: 1) Find the duration of the transportation cycle;

$$T_c = t_3 + 2 \cdot l \cdot \frac{60}{V_{cr}} \quad (24)$$

Where, tc is the loading time of the concrete truck at the plant;

L - distance

Vcr - average speed of transportation;

$$T_c = 8 + 2 \cdot 33 \cdot \frac{60}{40} = 107 \text{ min}$$

We calculate the operational performance of a concrete truck

$$P_a = \frac{60 \cdot V \cdot T \cdot K}{T_c} \quad (25)$$

Where, K is the coefficient of use of the concrete truck over time;

V is the volume of the concrete truck;

$$P_a = \frac{60 \cdot 14 \cdot 8 \cdot 0.85}{108} = 53.38 \text{ m}^3/\text{min}$$

Determine the operational performance of the drum;

$$P_b = \frac{k \cdot L \cdot n}{100} \quad (26)$$

Where, k - coefficient of concrete yield from 0.65 to 0.72
n is the number of batches per hour;
L - concrete mixer displacement;

$$P_b = \frac{0.67 \cdot 450 \cdot 20}{100} = 60.3$$

We find the number of concrete trucks from the condition of uninterrupted delivery

$$N = (K_r . P_b)/P_a = 0.9 \cdot 60.3)/53.38 = 1.01 = 2 \text{ pieces}$$

Therefore, only 2 concrete truck is needed to carry out the work.

3.11 Building master plan

Master plan - a project document on the basis of which planning, construction, reconstruction and other types of urban development of territories.

Temporary buildings include objects that are being constructed in order to monitor the process of construction and installation work. There are several types: administrative, residential, public It is most often developed in two forms: general site and object. Site-wide shows the use of the construction site - temporary roads, tower crane installation, power supply. The maximum power consumption is set according to the schedule work schedule or network schedule. It is necessary to calculate the need for temporary buildings, taking into account maximum daily number of workers

$$N_{total} = 1.05(N_{op} + N_{vp} + N_{etr} + N_{cl} + N_{mop}) \quad (27)$$

Where, Nop - the number of workers according to the schedule
N_{op}=142
N_{vp} - the number of workers in auxiliary production, accepted 20% of N_{op}

$$N_{vp} = 142 \cdot 0.2 = 29 \text{ people}$$

N_{etr} - the number of engineering and technical personnel,

$$N_{etr} = 10\% \cdot (Nop + Nvp) = 0.1 \cdot (142+29) = 18 \text{ people}$$

Ncl - the number of employees

$$N_{cl} = 0.05(N_{op} + N_{vp}) = 0.05(142+29) = 8.55 = 9 \text{ people}$$

N_{mop} - the number of junior service personnel (cleaners, watchmen, etc.),

$$N_{mop} = 0.03(N_{op} + N_{vp}) = 0.03((142+29) = 5.13 = 6 \text{ people}$$

$$N_{total} = 1.05(142+29+18+9+6) = 195.3 = 196 \text{ people}$$

The estimated number of workers in shifts is taken: when one-shift work - N_{cm} = N_{total}, with two-shift:

$$N_1=0.7\cdot N_{total}=0.7\cdot 210=147 \text{ persons}$$
$$N_3=0.3\cdot N_{total}=0.3\cdot 210=63 \text{ persons}$$

3,12 Installation work

At the site (capture), where installation work is being carried out, it is not allowed to carry out other work and to find unauthorized persons.

When erecting buildings and structures, it is forbidden to perform work related to finding people in one section (grab, section) on floors (tiers) over which moving, installing and temporarily securing prefabricated structures or equipment are carried out.

When erecting single-section buildings or structures, the simultaneous installation and other construction work on different floors (tiers) is allowed if there are reliable (justified by the appropriate calculation for the impact loads) underfloor ceilings by written order of the chief engineer after the implementation of measures ensuring the safe performance of work, and subject to being directly at the place of work of specially designated persons responsible for the safe installation Ms. and the movement of goods by cranes, as well as for monitoring the implementation by the crane operator, slinger and signalman of production instructions for labor protection.

Ways of slinging structural elements and equipment should ensure their supply to the installation site in a position close to the design.

It is forbidden to lift prefabricated reinforced concrete structures that do not have mounting loops or marks that ensure their correct slinging and installation.

Cleaning of structural elements to be mounted from dirt and ice should be done before they rise.

Slinging of structures and equipment should be carried out with load-gripping means meeting the requirements of clauses 7.4.4, 7.4.5 Snip 12-03 and providing the possibility of remote distribution from the working horizon in cases when the height to the lock of the load-gripping means exceeds 2 m.

Elements of mounted structures or equipment during movement must be prevented from swaying and rotation by flexible guy wires.

People are not allowed to stay on structural elements and equipment during their lifting or moving.

During breaks in the work, it is not allowed to leave the raised structural elements and equipment on weight.

Braces for temporary fastening of mounted structures must be attached to reliable supports (foundations, anchors, etc.). The number of braces, their materials and cross-section, methods of tension and places of fastening are established by the project of work. Braces should be located outside the dimensions of traffic and construction vehicles.

Braces should not touch the sharp corners of other structures. Bending the braces at the points of contact with elements of other structures is allowed only after checking the strength and stability of these elements under the influence of efforts from the braces.

To move installers from one structure to another, inventory ladders, transition bridges and ladders with a fence should be used.

The installers are not allowed to go over the installed structures and their elements (trusses, crossbars, etc.), on which it is impossible to install a fence that provides the passage width in accordance with clause 6.2.19 of Snip 12-03, without the use of special safety devices (reliably a rope stretched along the truss or crossbar to secure the carabineer of the safety belt, etc.).

Elements of structures or equipment installed in the design position must be fixed so that their stability and geometric immutability are ensured.

Distribution of structural elements and equipment installed in the design position should be made after their permanent or temporary reliable fixation. It is not allowed to move installed elements of structures or equipment after their distribution, with the exception of cases justified by PPR.

It is not allowed to carry out installation work at a height in open places with a wind speed of 15 m / s or more with sleet, thunder or fog, which excludes visibility within the front of the work. Movement and installation of vertical panels and similar structures with high windbag should be stopped at a wind speed of 10 m / s or more.

It is not allowed to find people under the mounted elements of structures and equipment before installing them in the design position and fixing.

If it is necessary to find workers under the mounted equipment (structures), as well as on equipment (structures), special measures must be taken to ensure the safety of workers.

Mounted mounting sites, ladders and other devices necessary for the work of installers at a height should be installed and secured to the mounted structures before they are lifted.

In the course of installation (dismantling) work in the conditions of an operating enterprise, the operated electric networks and other existing engineering systems in the work area should, as a rule, be disconnected, short-circuited, and equipment and pipelines should be freed from explosive, combustible and harmful substances.

When carrying out installation works, it is not allowed to use equipment and pipelines, as well as technological and building structures to fix technological and installation equipment, without coordination with the persons responsible for their correct operation.

Before performing installation work, it is necessary to establish the procedure for exchanging conditional signals between the person managing the installation and the driver (minder). All signals are given by only one person (foreman of the installation team, link, rigging and slinger), except for the “Stop” signal, which can be given by any employee who has noticed a clear danger.

In especially important cases (when lifting structures using complex rigging, the turning method, when sliding large and heavy structures, when lifting them with two or more mechanisms, etc.), signals should be given only by the foreman of the installation team in the presence of engineers and technicians, responsible for the development and implementation of technical measures to ensure safety requirements.

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

Installation of structures of each subsequent tier (section) of a building or structure should be carried out only after reliable fastening of all elements of the previous tier (section) according to the design.

Mounted metal stairs with a height of more than 5 m must meet the requirements of clause 6.2.19 of SNiP 12-03 or be fenced with metal arches with vertical ties and securely attached to the structure or equipment. Workers are allowed to climb stairs to a height of more than 10 m if the stairs are equipped with rest areas at least every 10 m in height.

When installing frame buildings, it is allowed to install a subsequent tier of the frame only after the installation of building envelopes or temporary fences on the previous tier.

During the installation of structures, buildings or structures, installers must be on previously installed and securely fixed structures or scaffolds.

Installation of flights of stairs and platforms of buildings (structures), as well as cargo-passenger building lifts (elevators) should be carried out simultaneously with the installation of building structures. On mounted staircases, fences should be installed immediately.

On the capture, in which the building structure is being installed, it is not allowed to use the passenger-and-freight elevator (elevator) directly during the movement of structural elements.

When assembling metal structures from rolled billets, measures must be taken against spontaneous folding of the roll.

Painting and anticorrosive protection of structures and equipment in cases when they are carried out at a construction site should be carried out, as a rule, before they rise to the design mark. After lifting, paint or anticorrosion protection should only be done at joints or joints of structures.

Unpacking and de-preservation of equipment to be installed must be carried out in the area allocated in accordance with the project of work, and carried out on special racks or linings with a height of at least 100 mm.

When conservation of equipment is not allowed the use of materials with explosion and fire hazard properties.

The assembly and retrofitting of structures and equipment to be installed (threading on pipes, bending pipes, fitting joints and the like) should be performed, as a rule, at specially designated places.

In the process of assembly operations, the alignment of the holes and verification of their coincidence in the mounted parts should be carried out using a special tool (cone mandrels, assembly plugs, etc.). It is not allowed to check the coincidence of the holes in the mounted parts with fingers.

When assembling horizontal cylindrical containers, consisting of separate casing, wedge linings and other devices should be used that exclude the possibility of spontaneous rolling of the casing.

When installing equipment in an explosive atmosphere, tools, equipment and accessories should be used that exclude the possibility of sparking.

When installing equipment, the possibility of spontaneous or accidental switching it on should be excluded.

When moving structures or equipment with several lifting or traction means, the possibility of overloading any of these means must be excluded.

When moving structures or equipment, the distance between them and the protruding parts of the mounted equipment or other structures should be horizontal at least 1 m, vertical - 0.5 m.

The angles of deviation from the vertical of the cargo ropes and hoists of the lifting equipment during the installation process should not exceed the value specified in the passport, the approved project or the technical specifications for this lifting equipment.

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

When lowering structures or equipment on an inclined plane, brake means should be used that provide the necessary regulation of the speed of descent.

Installation of equipment units and pipelines and air ducts close to electrical wires (within a distance equal to the greatest length of the assembly or link to be mounted) should be carried out with the voltage removed.

If it is not possible to relieve stress, work should be carried out according to the tolerance approved in the established manner.

All work to eliminate structural deficiencies and eliminate deficiencies in installed process equipment that has been tested by the product should be carried out only after development and approval by the customer and general contractor, together with the relevant subcontracting organizations, of safety measures.

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

When dismantling structures and equipment, the requirements for installation work should be followed.

Simultaneous dismantling of structures or dismantling of equipment in two or more tiers along one vertical is not allowed.

4 Economical part

The process of creating and setting an estimate of construction costs is project-oriented standards and norms, prices based on product prices and others data. Study of economic aspects of capital construction organizational and economic complexity of construction production a large number of forms, different functional goals and objectives there are various processes, their and other factors (possible in nature), the process itself is dynamic in development. Therefore, the economic basis of complex construction, mathematical statistics, economic-mathematical modeling and systematic analysis widely used.

Design and estimate documentation includes: explanatory note, estimate summary calculation, summary of costs, estimate calculation local estimate calculations. The final estimate shows the total cost of construction, and then then its components are specified. Local estimates of the document The starting price is. They are certain types of work and is made to determine the cost of a project or work as part of the working documentation. The estimated cost of construction is necessary for this amount and project data of the Republic of Kazakhstan, determined by prices and accounting regulations. Basic in accordance with the technological and technical structure of investments capital and the work of contractors, the estimated cost of construction, in particular reconstruction, overhaul the following parts:

1) cost of construction (repair and construction) works;
2) the cost of work on the installation of equipment (installation works);
3) Cost of equipment, furniture, inventory;
4) Other expenses.

Direct costs of actual workloads. So their value is determined by direct accounting and the number of labor resources required Orientations and prices for resources. The direct costs are as follows These include: construction materials, parts and labor costs of builders, the cost of engineering 39 construction machinery and equipment, including machinery use of work. Construction to compensate for overhead costs costs of maintenance, organization and management of organizations works (administrative expenses, etc.). Their value is determined indirectly The method is direct as a percentage of wages costs. The estimated cost of the work is the sum of direct costs and value of overhead costs:

CONCLUSION

The building I am planning is a Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan. As architecture and contraction are modernizing by passing each single year. having building like Smart Houses are more acceptable in the society and is more profitable. The task of the thesis is to develop a residential buildings using software that simplifies design process and calculation of structural elements, while observing the provisions of NTP and Euro Code.

Back to the main process in the project, this project started with architectural part that is the first part of the diploma and the process of architectural part has done by Revit and AutoCAD programs and the second part is calculation part, the calculation part is done by program Lira-SAPR and part of diploma for hand writing chose calculation of crossbar and calculation of monolithic concrete slab. Next we have technological part and economical part which is calculated step by step. For the technological part i calculated amount and type of machine for concrete processing and for the economical part its calculated amount of budget for the building.

Construction is one of the most popular sectors of the economy one. Construction is carried out in the open and in a variety of natural environments. Therefore, the construction cycle of construction projects is several months lasts up to several years. Construction of the country's culture and economy allows you to develop the whole industry.

Currently, the level of construction is very high. Construction industry The first reason for the development of education and science is the rapid development Along with the daily growth of modern technology, construction is becoming easier. In the old days compared to the time spent on design work shortened. The paperwork is reduced and the calculation error is reduced.

Reinforced concrete is a project for almost everyone in any construction is carried out using constructions.

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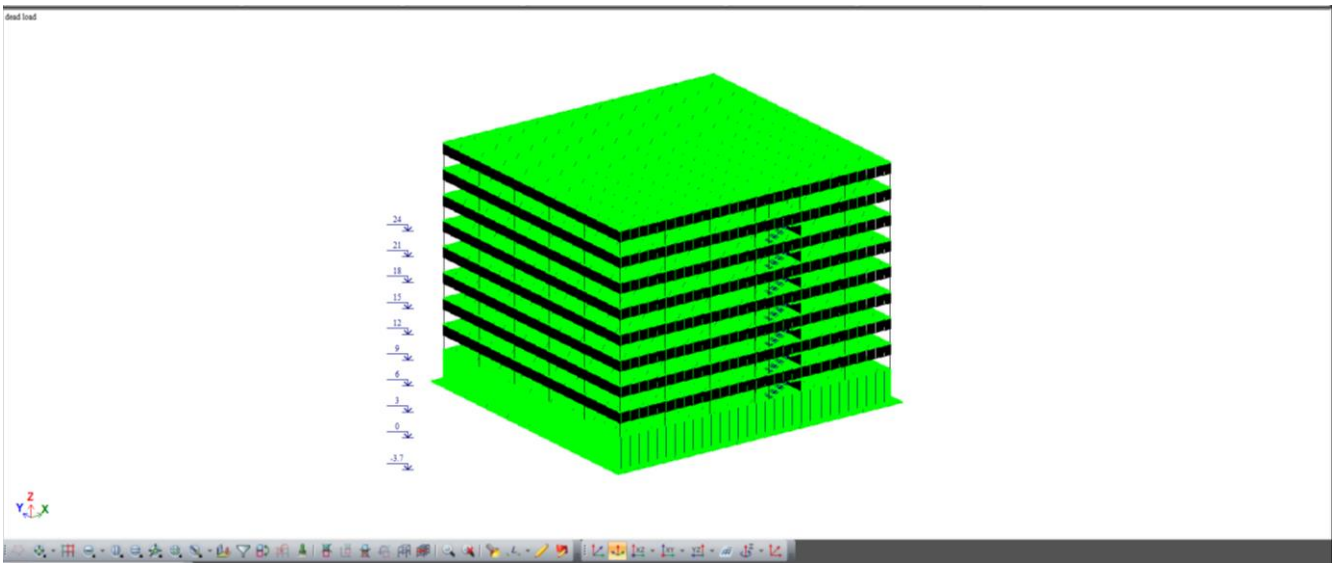


Figure 5 - Model of building

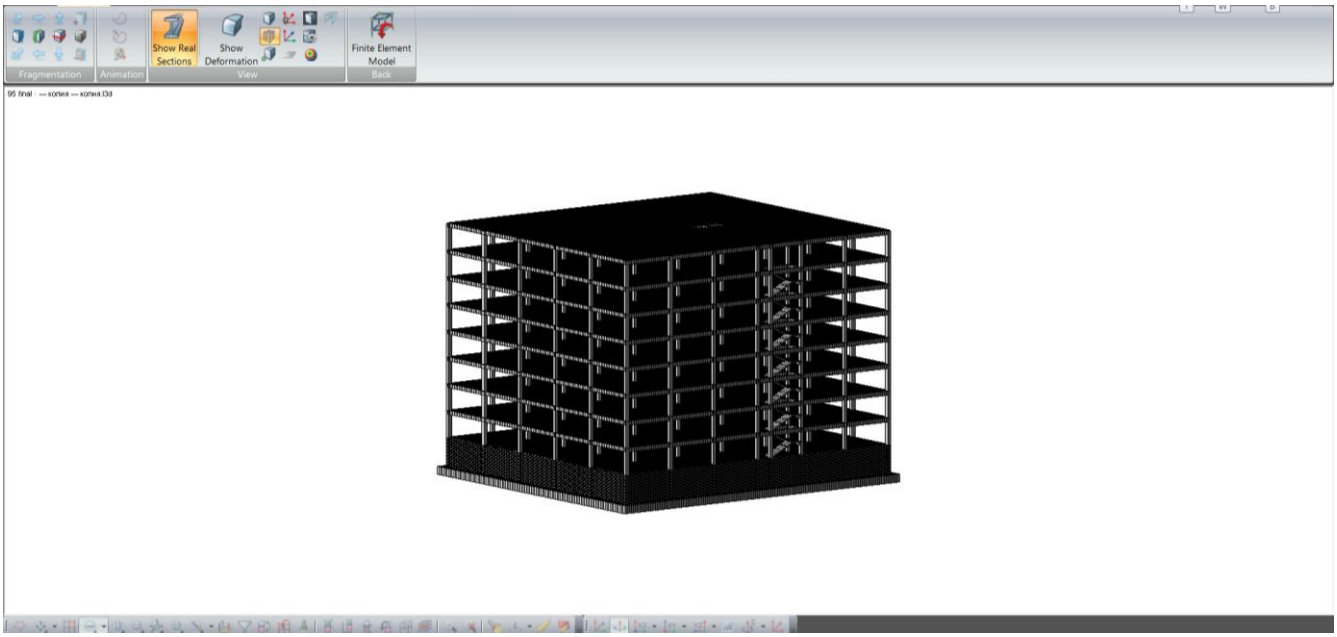


Figure 6 - Spatial model of building

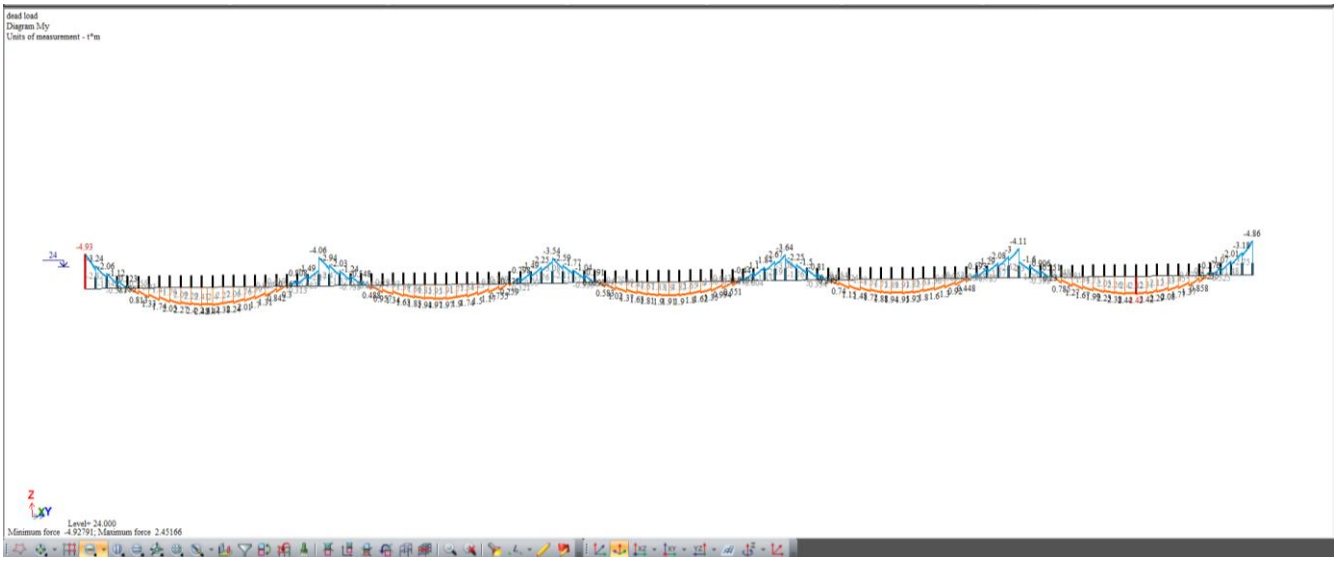


Figure 7 - Moment of crossbar diagram(Lira-SAPR-2016)

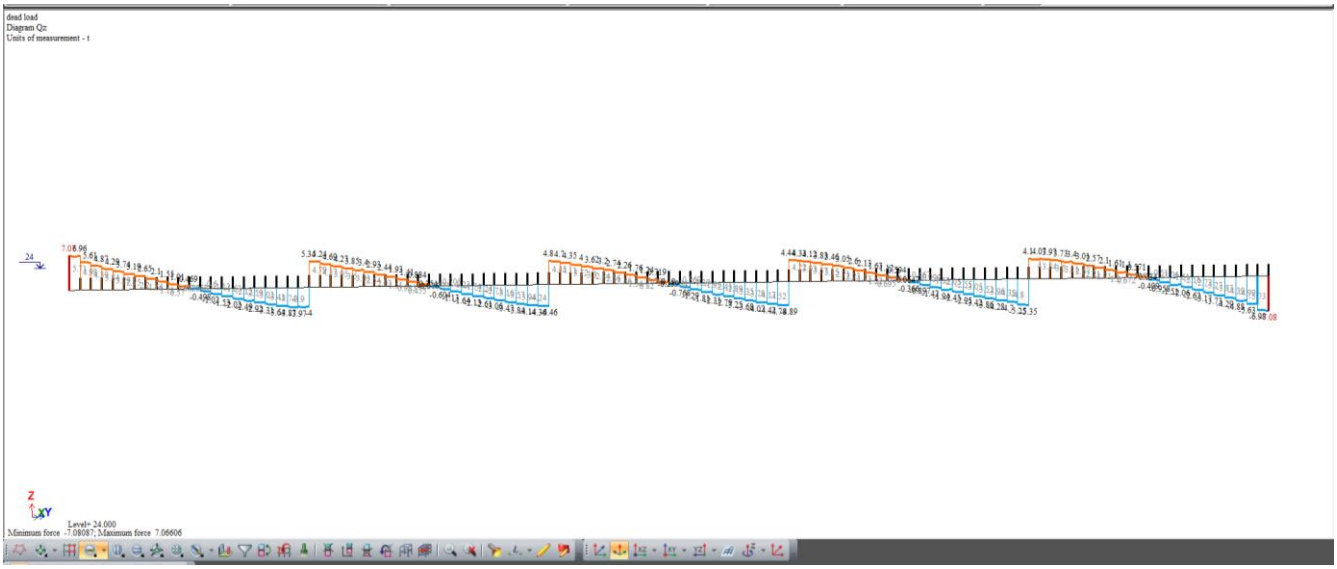


Figure 8 -Shear force diagram of crossbar

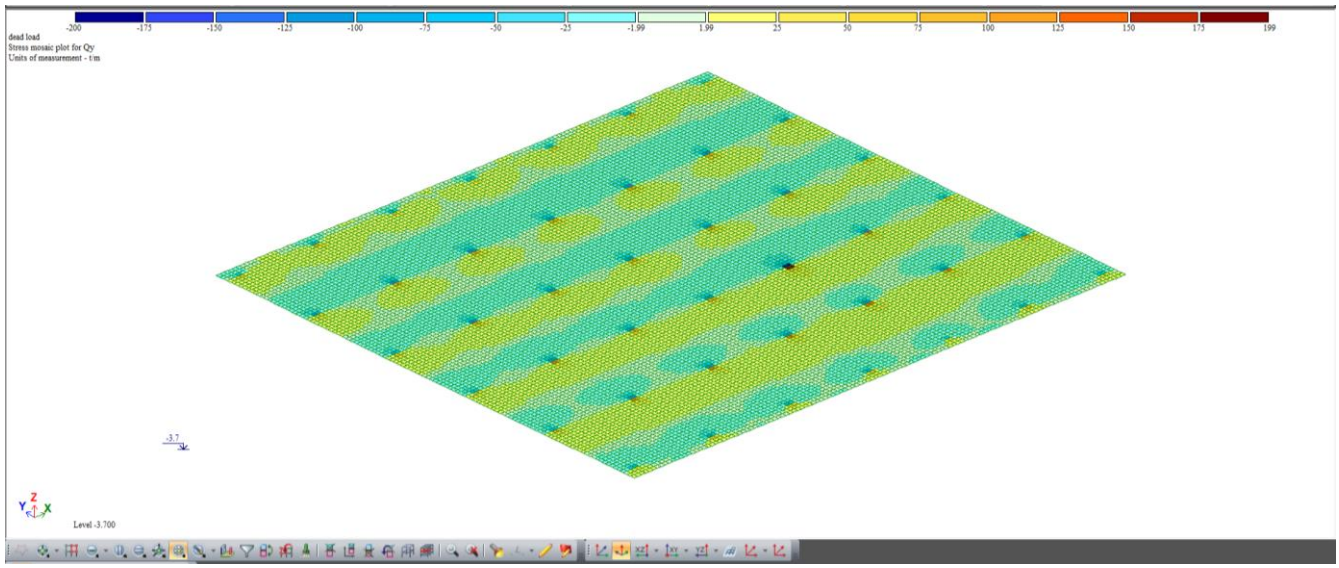


Figure 9 –Stress mosaic plot for Qy

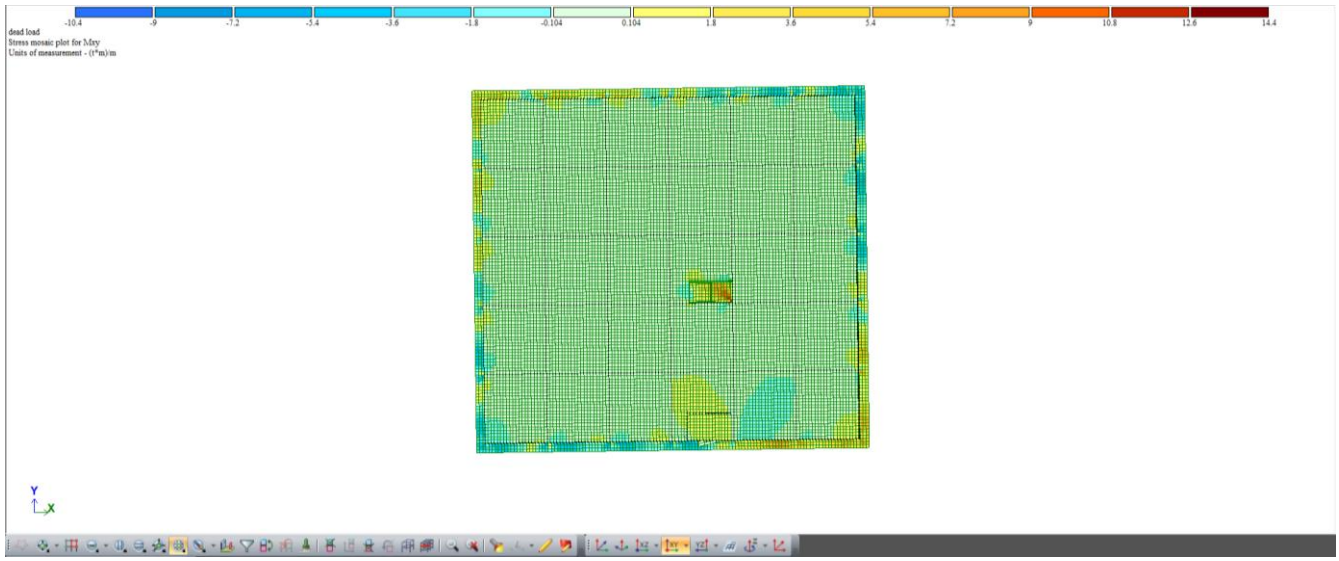


Figure 10 –Stress mosaic plot for Mxy

Name of construction Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan

(Object estimation process)

Estimated cost of work and costs ----------215055.4500 th. tenge
Standard labor intensity----------2127.980 th. Tenge
Estimated salary----------3212933.038 th. Tenge

At current prices for the 4th quarter of 2019

No	Estimate number	Name of work and cost	Estimated cost thousand / tenge				Standard labor intensity thousand person/hour	Mortal wages thousand tenge	Unit cost show or indicators
			Construction And installation work	Furniture equipment and accessories	Other cost	Total			
1	2	3	4	5	6	7	8	9	10
1		General construction work block 2, block 6	22801.32			22801.32	5.38	6435.1	
2		Reinforcement concert str block 2	192254.13			192254.13	22.5	26497.9	
		Total	215055,45			215055,45	28.800	32933.05	

Local resource estimate

At current prices for the 4th quarter of 2019

No	Resource cipher	Name of the resources of the equipment of the building structure and parts	Unit of measure	Number of unit	Estimated cost	
					One	In total
1	2	3	4	5	6	7
Labor resource						
1	1	Labor costs of construction workers	Person-h	3862.72	1195.93	4619542.72
2	3	Driver labor costs	Person-h	1520.33	1199..61	1823803.0713
		Total labor costs	Tenge			4619542.72

Construction machines and mechanisms						
1	112	Fork lift trucks 5 T	Machine - h	0.032	4485	145.31
2	162	Cars and dump trucks 7 T	Machine - h	0.0004	3287	1.58
3	258	Bulldozer with super power 79kw	Machine - h	51.12556	4497	229911.64
4	403	Profound vibrator	Machine - h	2.57	37	95.1
5	521	Electrical drill	Machine - h	1.709422	12	20.51
6	619	Self-propelled vibration rollers 2.2 T	Machine - h	15.5232	3175	49286.16
7	660	Compressors mobile with internal combustion engine pressure up to 686 kpa , $5m^3/min$	Machine - h	44.400625	2571	114154.01
8	698	Tower crane 10 T	Machine - h	3.27	5981	19557.87
9	762	Crane for lower part of building shape of car 8 T	Machine - h	8.41266	4663	39228.2
10	864	Portable cranes 1T	Machine - h	146.65	1424	208829.5
11	956	Auxiliary mine winches with pulling force up to 13.73 kN	Machine - h	26.15625	229	5989.78
12	1135	Watering machines, 6000 L	Machine - h	21.472	5649	121295.33
13	1155	Heavy drilling hammers when operating from stationary compressor stations	Machine - h	41.5125	936	38855.7
14	1158	Pneumatic jack hammers when operating from stationary compressor stations	Machine - h	272.025	399	108537.97
1	2	3	4	5	6	7
15	1159	Pneumatic jack hammers when operating from stationary compressor stations	Machine - h	68.16	50	3408
16	1198	Electric winches up to 31.39 kN	Machine - h	3.5142536	90	316.28
17	1444	Installation for the manufactures	Machine - h	6	34	204
18	1483	Supports for portable pneumatic couplings	Machine - h	41.5125	42	1743.53
19	1776	Drilling tools sharpening machines	Machine - h	1.6875	225	379.69
20	1794	Electric chain saws	Machine - h	0.0972	75	7.29
21	1802	Station auxiliary trolleys	Machine - h	257.85	142	36614.7

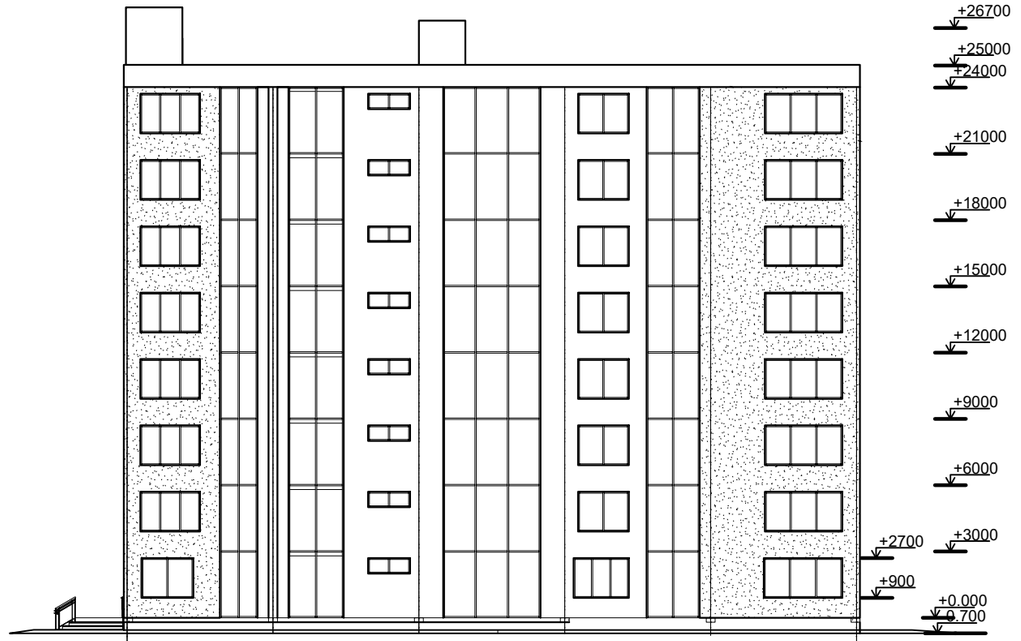
22	1866	Pneumatic ramps when operating from a compressor	Machine - h	41.2825	14	577.95
23	1969	Automated concrete mixing plants 500 L	Machine - h	98.55	11461	1129481.55
24	2016	DC installations for manual arc welding	Machine - h	56.0141047	166	9298.34
25	2136	Cement cannons	Machine - h	177.525	2219	393927.98
26	2265	Crawler-mounted single-bucket diesel excavators 1 m3	Machine - h	113.13938	9624	1088853.39
27	2509	Concrete cars (concrete dump truck)	Machine - h	27.9496647	2698	75408.2
		Total for construction machine	Tenge			3676130
		Including wages of drivers	Tenge			1694438
		Material resources				
1	100081	Crushed stone from dense rocks for construction work M1000-fraction 10-70 mm RK 1284-2004	m^3	0.298124	2469	736.070
2	100533	Heavy concrete class C25/30 Gost 7473-2010	m3	12.18	12880	156878.400
3	127900	Hexagonal hollow drilling inscribed with channel	Kg	1.5525	91	141.280
4	128070	Hot-tolled wire of ordinary precision in coils of SV 08A	Kg	3.6598	70	256
5	128150	Steel braided nets, single-sided of grommet wire diameter 2 mm cell side size 50 mm Gost 5336-80	m2	625	503	314375.000
6	128849	Double rope type TK	10m	0.014868	3360	49.960
7	131043	Structural elements of auxiliary purpose with a spray for the length of profile rolled products without holes and collection of welded joints	T	3.6748	478188	1757245.260
8	131534	Edged softwood bars long 4-6.5 mm	m3	0.0008189	63383	51.910
9	131598	Edged boards of coniferous wood up to 6.5m	m3	0.0168	63383	1064.830
10	131600	Edged coniferous boards up to m 5m long	m3	0.0564	63383	3574.800
1	2	3	4	5	6	7

11	131643	Unhedged boards of coniferous species up to 6.5 m long and the thickness from 32 mm up to 40 mm 3 grades	m3	0.6075	23806	14462.150
12	144600	Lump quicklime for construction grade 1, GOST 9179-77	T	0.003	32037	96.110
13	144746	Strutted bolts with solders and washers Gost 1759-87	T	0.0127213	404706	5148.380
14	145983	Construction nails with a flat head GOST 283-75	Kg	3.5929508	310	1113.810
15	147049	Cloth GOST 30090-93	10m2	1.0584	6994	7402.450
16	147074	Processed hemp ropes GOST 30055-93	T	0.0000795	1880677	149.530
17	147337	Electrical wires line Gost 9466-75	T	0.0413236	212247	8770.810
18	149219	Soil work GF-021	T	0.0002465	410962	101.290
19	149375	Solvents for paints and varnishes R-4 GOST 7827-94	T	0.000477	544441	259.720
20	249132	Technical water process	m3	187.67771	30	5630.330
21	275940	Boards made with disk shape with thickness 25mm	m2	4.704	1038	4882.750
22	279797	Galvanized carbon steel sheet with thickness of 0.8-1.2 mm GOST 1498-90	T	0.0018	271377	488.480
23	279626	Hot-rolled channel with an internal slope of the edges of the shelves N22U-40 U from carbon steel of ordinary quality GOST 380-2005	T	0.0015425	408505	630.100
24	279845	Reinforcing steel hot-rolled smooth diameter 12mm	T	0.32032	198308	6352.200
25	279852	Hot-rolled rebar with profile of class S500 with diameter of 12-18 mm	T	3.6748	192229	706403.130
26	With commercial offer of TOO	Master 1000K-Pastifier for concrete mortars	L	354.2	449.82	159326.750
27	With commercial	Master Relock SA-167 high-performance free setting accelerator for fast permanent spraying of concrete	Kg	1700.2	882.14	1499819.290
28	C121-060801	Heavy concrete class C25/30	m3	50.6	12880	651728.000

29	C121-060801	Individual structural elements of building and structures with predominance of hot-rolled profile, mass from 0.1-0.5 T	T	0.79508	415475	330335.860
30	C121-110401	Boards made of built-in polystyrene with the addition of fire retardant	m3	30	13371	401130.000
1	2	3	4	5	6	7
		Total for construction materials	Tenge			6038605.000
		Transportation cost				
1	C341-020102-1016	Transportation of construction trucks, lifting capacity and the currying distance is 12 km	T	3387.22	386	1307466.920
2	C341-020102-1027	Transportation of construction cargo and dump trucks outside,	T	30	586	17580.000
3	C341-310104-0501	Rubbish strustalny chest	T	30	77	2310.000
		Total transportation cost	Tenge			1327357.000
		Total direct cost	Tenge			15563097
		Overheads	Tenge			6017003
		Total with overheads	Tenge			21580100
		Estimated profit	Tenge			1726408
		Total by local resource estimated calculation	Tenge			230067076

Elevation A-G

Elevation 1-6



СОГЛАСОВАНО :

Гл.сп. СС | Гл.сп. ГП | Гл.сп. ОВ | Гл.сп. ВК | Гл.сп. ЭЛ

Взам. инв. №

Подп. и дата

Инв. № подл.

Name.	List No Doc	Signature	Date
Head of Dep	Kozyukova N.V		
Supervisor	Turganbaev A.P		
Consultant	Turganbaev A.P		
Controller	Bek A.A		
Prepered by	Mohammadi Z.M		

KazNRTU-5B072900-Civil Engineering-03.08.03-2021-DP

Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan

	Level	Sheet	Scale
Architectural part	DP	1	1:200
Elevation	Head Civil engineering and building materials department		

Формат А3

Typical floor

Department Legend

- 1rst Flat
- 2nd Flat
- 3nd Flat
- 4th Flat
- 5th Flat
- 6th Flat
- 7th Flat
- 8th Flat
- 9th Flat
- 10th Flat
- Corridor

No	first flat
1	livingroom
2	kitchen
3	Bedroom
4	BabiesBedroom
5	Bathroom
	Second flat
1	livingroom
2	kitchen
3	Bedroom
4	BabiesBedroom
5	Bathroom
	3rd flat
1	BabiesBedroom
2	Bedroom
3	livingroom
4	Bedroom
	4th flat
1	toilet
2	kitchen
3	Bathroom
4	livingroom
5	Bedroom
6	Bedroom
	5th flat
1	toilet
2	BabiesBedroom
3	livingroomandkitchen
4	Bedroom
5	Bedroom
	6th flat
1	BabiesBedroom
2	toilet
3	kitchen
4	livingroom
5	Bathroom
6	Bedroom
7	Bedroom
	7th flat
1	toilet
2	BabiesBedroom
3	kitchen
4	Bathroom
5	livingroom
6	Bedroom
7	Bedroom
	8th flat
1	livingroomandkitchen
2	Bedroom
3	Bathroom
	9th flat
1	livingroomandkitchen
2	Bathroom
3	BabiesBedroom
4	Bedroom
	10th flat
1	livingroom
2	kitchen
3	Bedroom
4	Bathroom
5	BabiesBedroom

СОГЛАСОВАНО :

Гл.сп. ОВ	
Гл.сп. ВК	
Гл.сп. ЭП	
Гл.сп. СС	
Гл.сп. ГП	

Взам. инв. №

Подп. и дата

Инв. № подл.

Name.	List No Doc	Signature	Date
Head of Dep	Kozyukova N.V		
Supervisor	Turganbaev A.P		
Consultant	Turganbaev A.P		
Controller	Bek A.A		
Prepered by	Mohammadi Z.M		

KazNRTU-5B072900-Civil Engineering-03.08.03-2021-DP

Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan

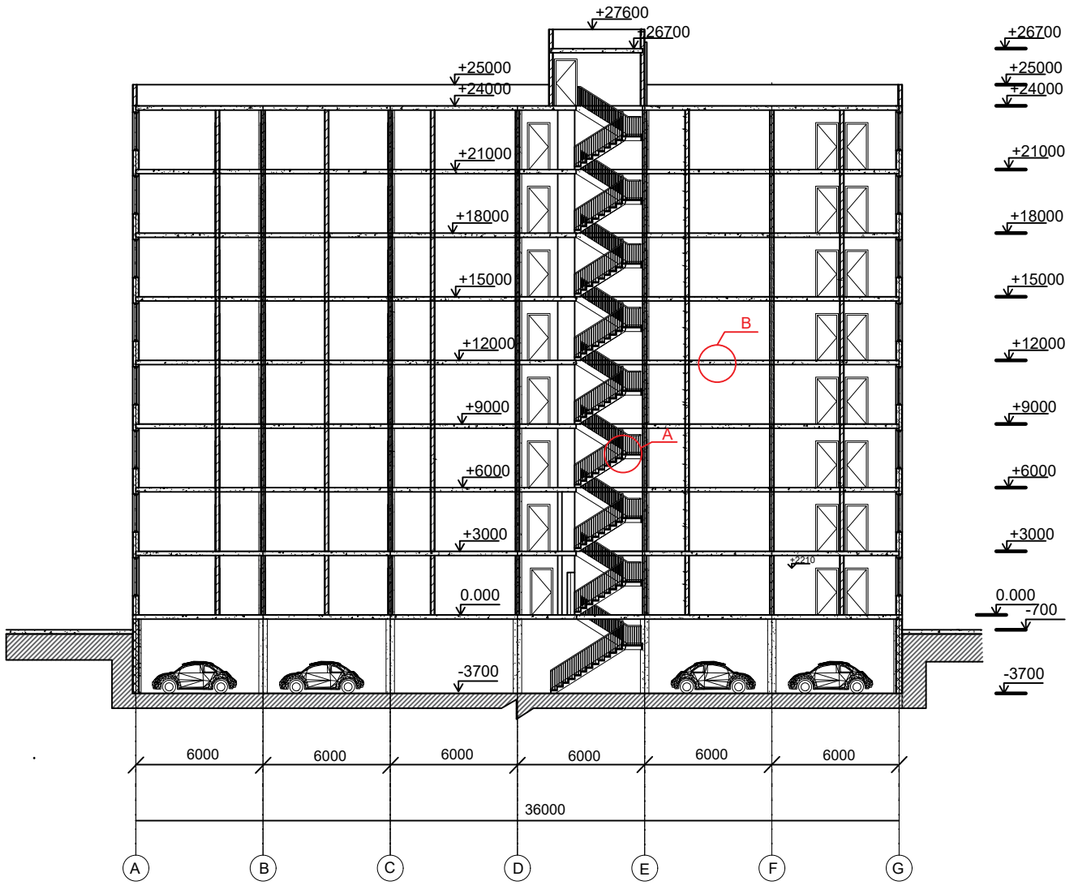
Architectural part	Level	Sheet	Scale
	DP	2	1:200

Typical floor

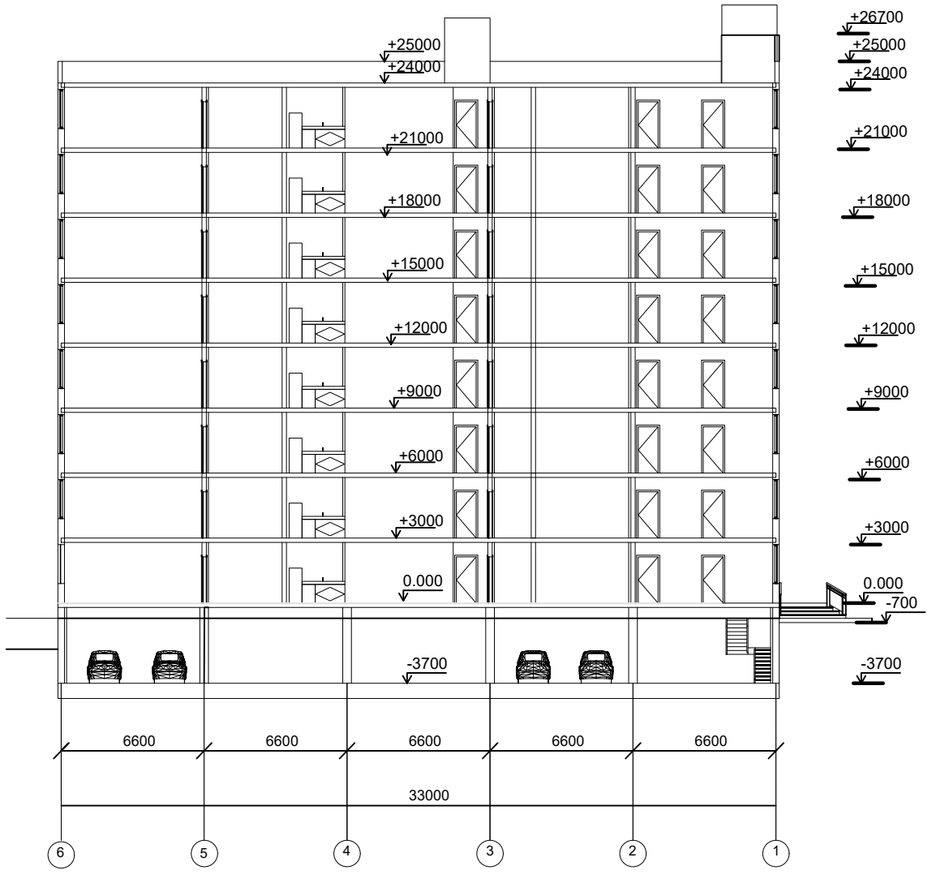
Head Civil engineering and building materials department

Формат А3

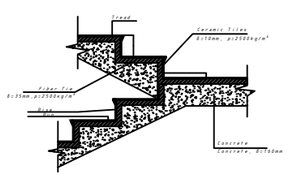
Section 1-1



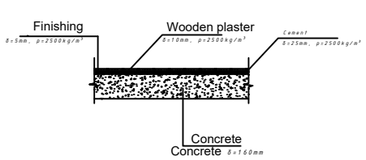
Section 2-2



Node A, stairs



Node B Slab



				KazNRTU-5B072900-Civil Engineering-03.08.03-2021-DP
				Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan
Name.	List No Doc	Signature	Date	
Head of Dep	Kozyukova N.V			Architectural part
Supervisor	Turganbaev A.P			
Consultant	Turganbaev A.P			
Controller	Bek A.A			Section
Prepered by	Mohammadi Z.M			

Level	Sheet	Scale
DP	3	1:200

Head Civil engineering and building materials department

Формат А3

СОГЛАСОВАНО :

Гл.сп. ОВ | Гл.сп. ВК | Гл.сп. ЭП | Гл.сп. СС | Гл.сп. ГП

Взам. инв. № | Подп. и дата | Инв. № подл.

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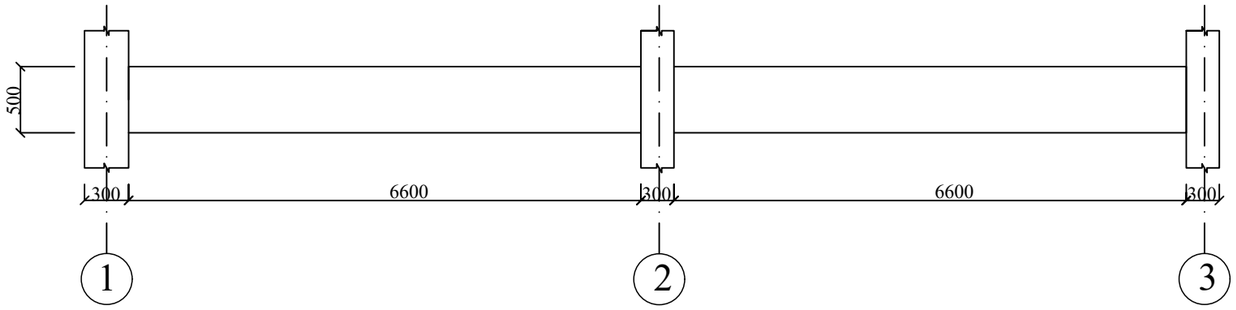
Взам. инв. №

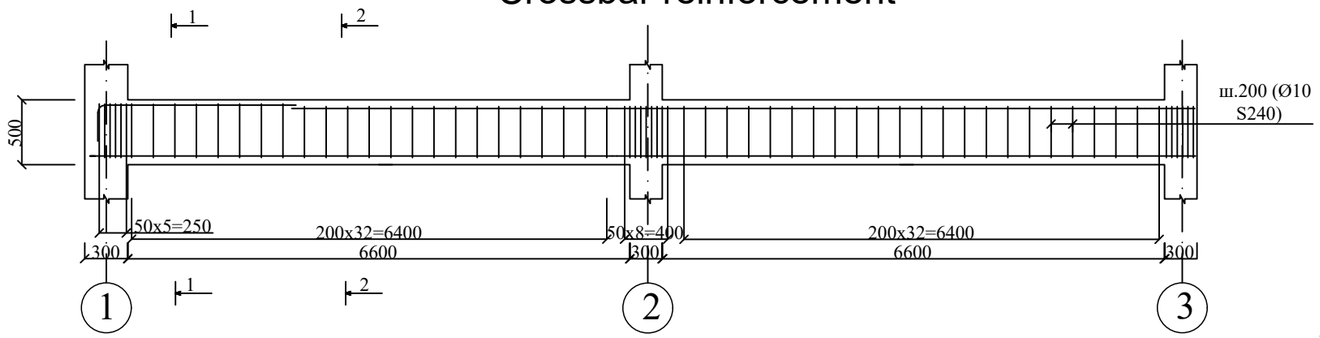
Подп. и дата

Инв. № подл.

Span of the Crossbar

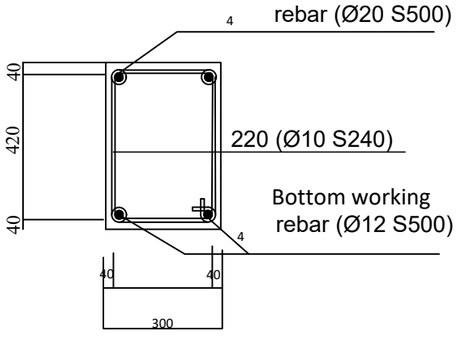


Crossbar reinforcement

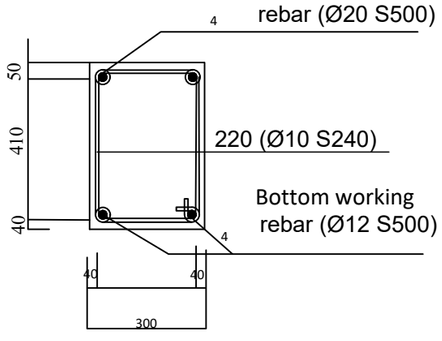


S500

Section 1-1 Top working



Section 2-2 Top working



Specification of crossbars R-1

pos.	Designation	Name	L-mm	Amount	Weight	Note
		Crossbar P-1			155.6	
1	ГОСТ 34028-2016*	Ø20S500	L= 7200	2	14.53	29.06
2	ГОСТ 34028-2016*	Ø12 S500	L= 6900	2	3.15	6.3
3	ГОСТ 34028-2016*	Ø12 S500	L= 6900	2	3.15	6.3
4	ГОСТ 34028-2016*	Ø20 S500	L= 7200	2	14.53	29.06
5	ГОСТ 34028-2016*	Ø12 S500	L= 1500	2	3.15	6.3
6	ГОСТ 34028-2016*	10 S240	L= 220	31	0.16	4.96
		Concrete C25/30		0.96		

Name.	List No Doc	Signature	Date
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Prepered by	Mohammadi Z.M		

KazNRTU-5B072900-Civil Engineering-03.08.03-2021-DP

Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan

Construction part	Level	Sheet	Scale
	DP	4	1:200
Crossbar	Head Civil engineering and building materials department		

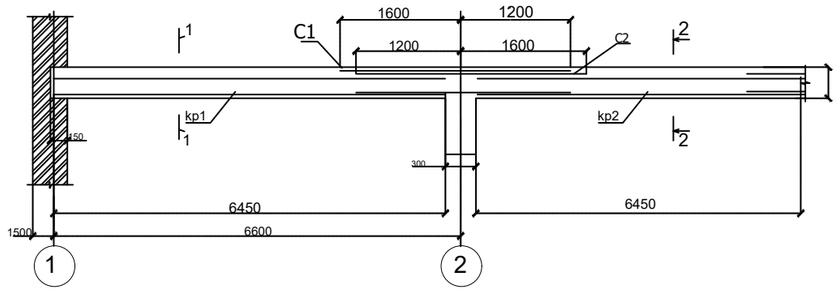
Формат А3

СОГЛАСОВАНО :

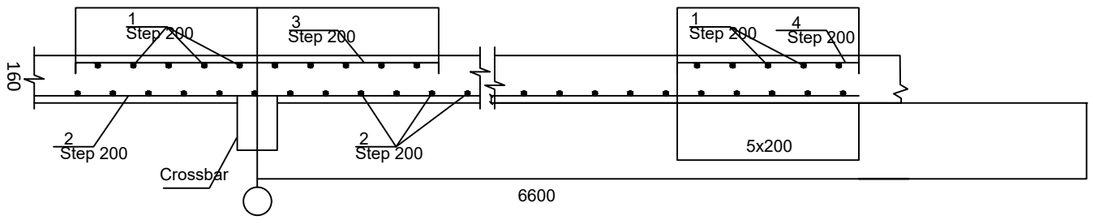
Гл.сп. СС | Гл.сп. ГП | Гл.сп. ОВ | Гл.сп. ВК | Гл.сп. ЭЛ

Взам. инв. № | Подп. и дата | Инв. № подл.

Span of the Slab



Reinforcement of the Slab



Specification of floor slab

No	Designation	Name	Amount	wieght	total wieght kg
		Plate on the mark.			
1	ГОСТ 34028-2016	Ø12 S500 L= 910.8	138	3,15	434,7
2	ГОСТ 34028-2016	Ø12 S500 L= 113.85	138	3,15	434,7
3	ГОСТ 34028-2016	S240 L= 600	252	0,237	59,724
		concrete C25/30			

Safety precautions

1.When performing work on laying a brick wall,
you should follow the safety rules in construction .
2. When lifting the columns, the organization of signaling is obligatory.
All signals to the crane driver are given by
only one person - the rigger or the link installer.

Name.	List No Doc	Signature	Date
Head of Dep	Kozyukova N.V		
Supervisor	Turganbaev A.P		
Consultant	Turganbaev A.P		
Controller	Bek A.A		
Prepered by	Mohammadi Z.M		

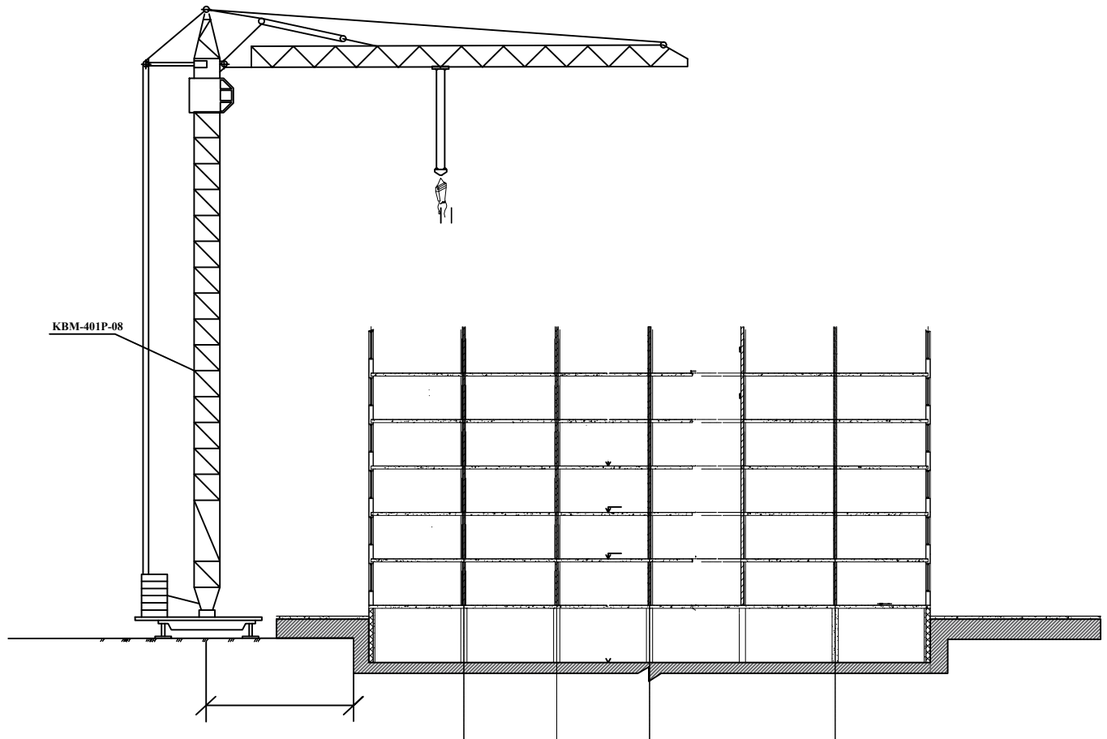
KazNRTU-5B072900-Civil Engineering-03.08.03-2021-DP

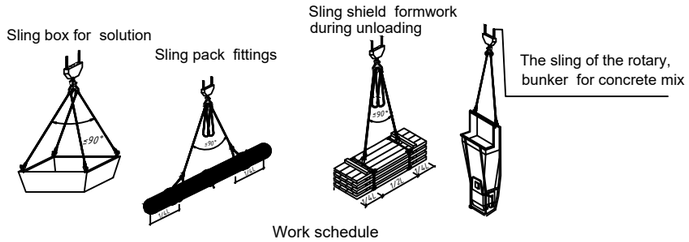
Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan

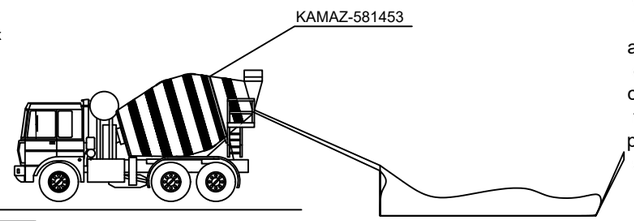
Construction part	Level	Sheet	Scale
	DP	5	1:200
Slab	Head Civil engineering and building materials department		

Формат А3

Tower construction crane, scheme of operation Concreting

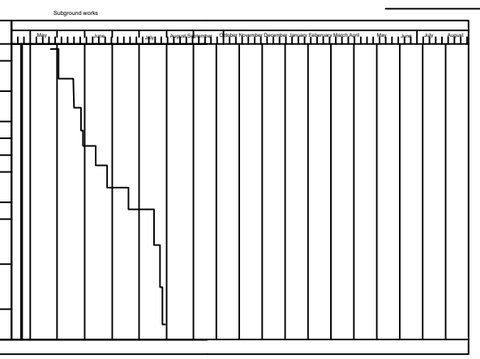






Work schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		Sites works	7 days	Wed 25.03.20	Wed 01.04.20	
2		Development of a pit	14 days	Thu 2.04.20	Wed 15.04.20	
3		Development of shortage of soil	7 days	Wed15.04.20	Thu 21.04.202	
4		Compaction of soil	3 days	Thu21 04.08.20	Tue 24.04.20 3	
5		Construction of foundation	16 days	Thu 24.04.20	Sun 10.05.20 4	
6		Water proofing foundation	10 days	Sun 10.05.20	Wed 20.05.20 5	
7		Basement wall construction	25 days	Fri 20.05.20	Thu 15.06.20 6	
8		Installation of floor slabs and basement beams	25 days	Fri 15.06.20	Fri 10.07.20 7	
9		Basement wall waterproofing	7 days	Mon10.07.20	Tue 17.07.208	
10		Backfilling of soil	2 days	17.07.20	Thu 19.07.209	
11		Finishing subearth work	2days	19.07.20	Tue 21.07.20	



Safety precautions

1. Concreting of structures of buildings and structures should be carried out in compliance with the requirements of rule.
"Labor safety in construction",should take serious.
2. Every day, before starting to place concrete in the formwork, it is necessary to check the condition of the container, formwork and means.paving. Any detected faults should be rectified immediately.
3. Before the start of placing the concrete mix with the vibrant, it is necessary to check the serviceability and reliability of fixing alllinks of vibroboth between themselves and to the safety rope.
4. Rotary bins (buckets) for concrete mix must comply.
5. Moving a loaded or empty hopper is allowed only when the gate is closed.
6. When placing concrete from buckets or bunkers, the distance between the lower edge of the bucket or hopper and the previously laid
concrete or the surface on which concrete is laid should be no more than 1 m, unless other distances
provided by the project for the production of works.
7. Opening of the bunker is performed by the concrete worker after the crane boom stops and being not under the bunker and the crane boom.
Unloading containers by weight should be carried out evenly for at least 5 seconds.
8. Instant unloading of containers by weight is prohibited.
9. Workers placing concrete mixture on surfaces with a slope of more than 20 should use
safety belts.
10. When compacting the concrete mixture with electric vibrators, it is not allowed to move the vibrator by the current-carrying hoses, and when
during breaks in work and when moving from one place to another, the electric vibrators must be turned off.
11. Special conditions for ensuring the safe production of work with steam, electric heating, the use of chemical additives, etc. should be solved as part of the.
12. It is forbidden for concrete workers to move along paving means that are not fixed to the design position by means of paving, not
with a guard or a safety rope.
13. In each shift, constant technical supervision by foremen, foremen, foremen and
other persons responsible for the safe conduct of work, monitoring the good condition of stairs, scaffolds and
fences, as well as for cleanliness and sufficient illumination of workplaces and passages to them, the presence and use of
safety belts and protective helmets.

Name.	List No Doc	Signature	Date
Head of Dep	Kozyukova N.V		
Supervisor	Turganbaev A.P		
Consultant	Turganbaev A.P		
Controller	Bek A.A		
Prepered by	Mohammadi Z.M		

KazNRTU-5B072900-Civil Engineering-03.08.03-2021-DP

Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan

	Level	Sheet	Scale
technological part	DP	6	1:200
Concreting	Head Civil engineering and building materials department		

Формат А3

СОГЛАСОВАНО :
Гл.сп. СС
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Взам. инв. №
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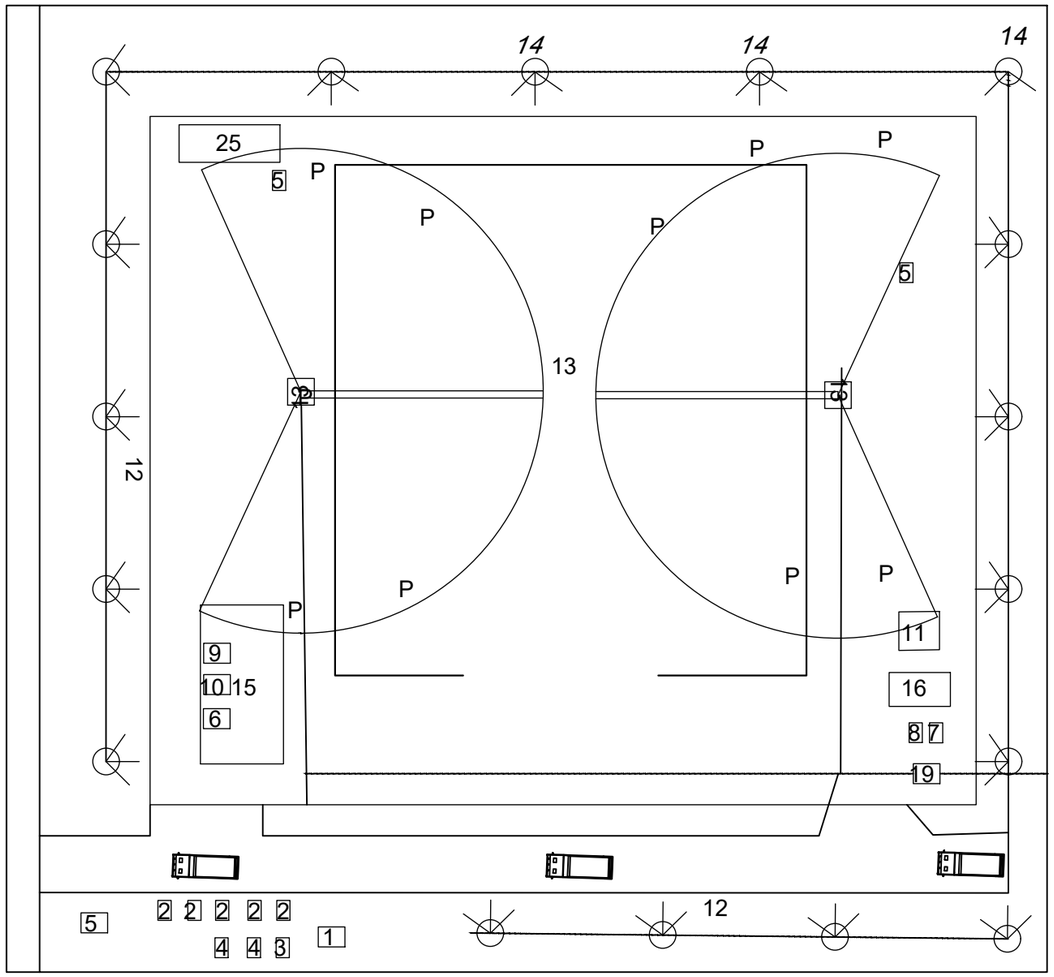
Name Amount Note

Construction master plan



P - danger zone

Wind direction

№	Name of machines	Mark of machines	Amount	purpose of use
1	Tower crane	**KBM-401P-08**	2	Lifting materials
2	Concrete trucks	KAMAZ-581453	2	Concrete preperation
3	Dump truck	**YaAZ-210E**	8	Moving soil

№	Name of machines	Mark of machines	Amount	purpose of use
1	Bulldozer	DZ-27C	1	Spreading soil, leveling
2	Excavator	E-1252B	2	Digging foundation
3	Dump truck	**YaAZ-210E**	8	Moving soil

Construction master plan explanation

No	Name		
1	Foreman (engineer)	1	Temporary
2	Workers house	5	Temporary
3	kitchen	1	Temporary
4	Shower room and drying clothes	2	Temporary
5	Tiolet	3	Temporary
6	Storage for material	1	Temporary
7	Elevator equipment storage	1	Temporary
8	Techical material warehouse	1	Temporary
9	Load-bearing devices and tarpaulines	1	Temporary
10	Site for receiving mortar and concrete	1	Temporary
11	Car unloading area	1	Temporary
12	Fire hydrant	1	Temporary
13	Tower crane KBM-401P-08	2	Temporary
14	lights	2	Temporary
15	Area of collecting material	1	Temporary
16	Area for construction machinery	1	Temporary
17	Temporary road		Temporary
18	Place for washing machines		Temporary
19	Total number of the building	9	

Safety precautions

1.When performing work on laying a brick wall,
you should follow the safety rules in construction .
2. When lifting the columns, the organization of signaling is obligatory.
All signals to the crane driver are given by
only one person - the rigger or the link installer.
3. It is forbidden to be under the structure suspended from
the crane hook, pull it off during movement and leave it
on weight during a break.
4. Areas dangerous for the movement of people should be
fenced off and equipped with warning signs.

Name.	List No Doc	Signature	Date
Head of Dep	Kozyukova N.V		
Supervisor	Turganbaev A.P		
Consultant	Turganbaev A.P		
Controller	Bek A.A		
Prepered by	Mohammadi Z.M		

KazNRTU-5B072900-Civil Engineering-03.08.03-2021-DP

Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan

	Level	Sheet	Scale
technological part	DP	7	1:200
Master plan	Head Civil engineering and building materials department		

Формат А3

СОГЛАСОВАНО :
Гл.сп. ОВ
Гл.сп. ВК
Гл.сп. ЭЛ
Гл.сп. СС
Гл.сп. ГП

Взам. инв. №
Подп. и дата
Инв. № подл.

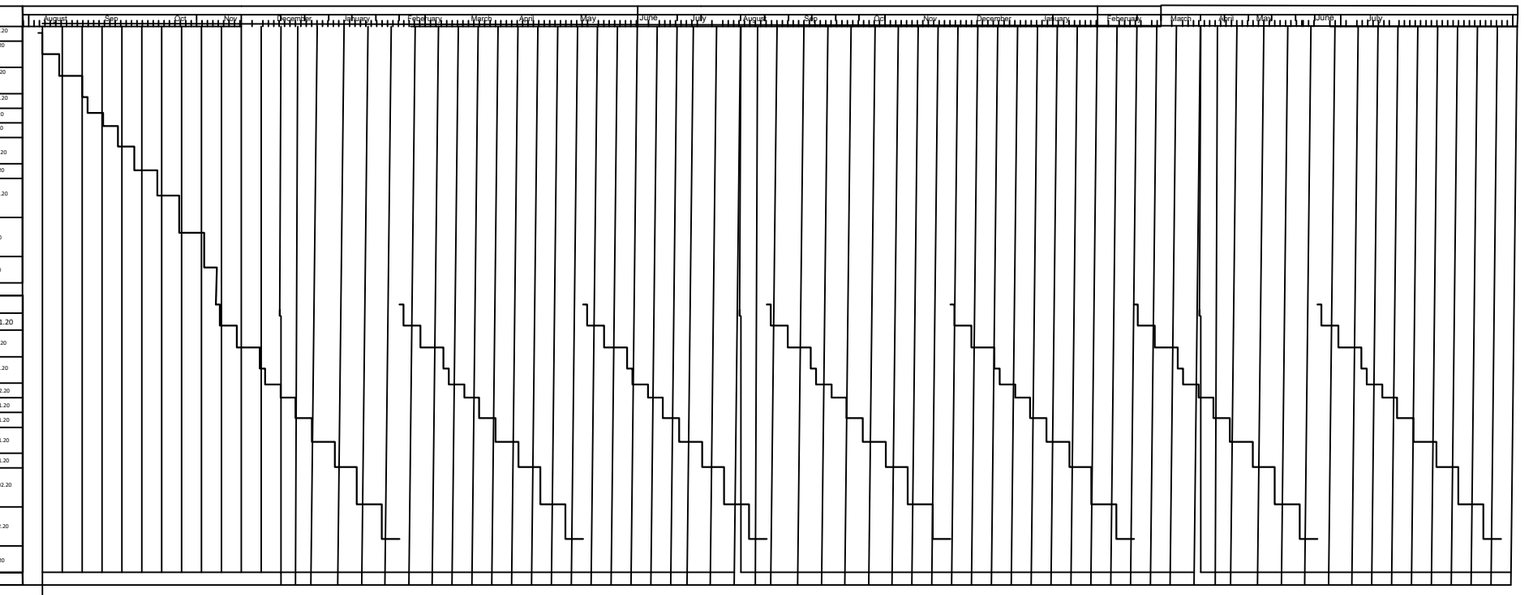
Calendar Schedule

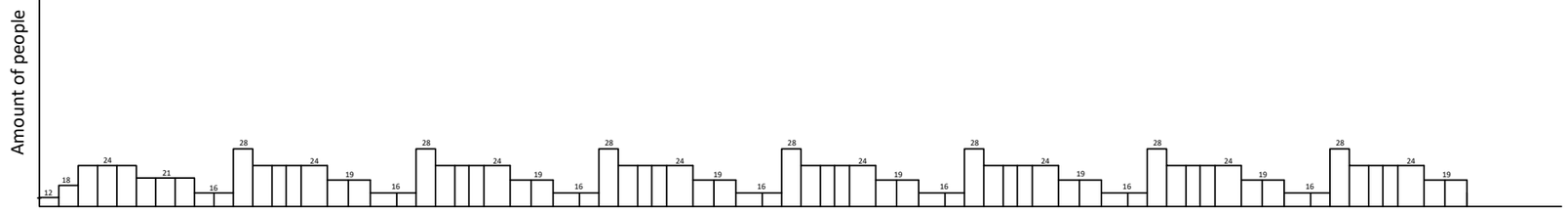
First block

ID	Task Mode	Task Name	Duration	Start	Finish
1		Cleaning area	3 days	Mon 25.08.20	Wed 28.08.20
2		Superstructure-floor concreting	9 days	Thu 28.08.20	Thu 06.09.20
3		Formwork installation and concreting Beams	10 days	Fri 06.09.20	Thu 16.09.20
4		Removal of formwork	7 days	Thu 16.09.20	Tue 22.09.20
5		Brick masonry work	11 days	Wed 22.09.20	Tue 01.10.20
6		Slab work	12 days	Wed 01.10.20	Thu 13.10.20
7		Installing doors and windows	6 days	Fri 13.10.20	Thu 19.10.20
8		Electrical and plumbing	8 days	Fri 19.10.20	Fri 27.10.20
9		Exterior finishing-Insulation and plastering	9 days	Mon 27.10.20	Tue 06.11.20
10		Internal finishing-Plastering internal walls	12 days	06.11.20	Tue 18.11.20
11		Final finishing-Painting and cleaning area	8 days	Wed 18.11.20	Tue 26.11.20

Typical block

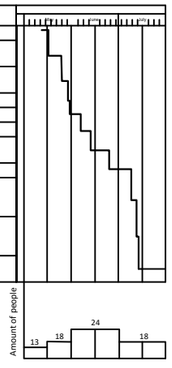
ID	Task Mode	Task Name	Duration	Start	Finish
1		Cleaning works	3 days	Mon 26.11.20	Wed 29.11.20
2		Superstructure-floor concreting	9 days	Thu 29.11.20	Thu 08.12.20
3		Formwork installation and concreting columns	9 days	Fri 08.12.20	Thu 17.12.20
4		Removal of formwork	7 days	Fri 17.12.20	Tue 24.12.20
5		Brick masonry work	9 days	Wed 24.12.20	Tue 01.01.20
6		Slab work	12 days	Wed 01.01.20	Thu 13.01.20
7		Installing doors and windows	6 days	Fri 13.01.20	Thu 19.01.20
8		Electrical and plumbing	8 days	Thu 19.01.20	Fri 27.01.20
9		Exterior finishing-Insulation and plastering	17 days	Mon 27.01.20	Tue 14.02.20
10		Internal finishing-Plastering internal walls	10 days	Wed 14.02.20	Tue 24.02.20
11		Final finishing-Painting and cleaning area	9 days	24.02.20	Tue 01.03.20





Subground works

ID	Task Mode	Task Name	Duration	Start	Finish
1		Sitec works	7 days	Wed 25.05.20	Wed 01.05.20
2		Development of a pit	9 days	Thu 01.05.20	Wed 10.05.20
3		Development of shortage of soil	7 days	Wed10.05.20	Thu 17.05.20
4			3 days	Thu17.05.20	Tue 20.05.20
5		Construction of foundation	13 days	Thu 20.05.20	Sun 03.06.20
6		Water proofing foundation	10 days	Sun 03.06.20	Wed 13.06.20
7		Basement wall construction	15 days	Fri 13.06.20	Thu 28.06.20
8		Installation of floor slabs and basement beams	11 days	Fri 28.06.20	Fri 09.07.20
9		Basement wall waterproofing	5 days	Mon09.07.20	Tue 14.07.20
10		Backfilling of soil	2 days	14.07.20	Thu 16.07.20
11		Finishing subearth work	2days	16.07.20	Sat 18.07.20



№	Name of machines	Mark of machines	Amount	purpose of use
1	Bulldozer	DZ-27C	1	Spreading soil, leveling
2	Excavator	E-1252B	2	Digging foundation
3	Dump truck	**YaAZ-210E**	8	Moving soil

№	Name of machines	Mark of machines	Amount	purpose of use
1	Tower crane	**KBM-401P-08**	2	Lifting materials
2	Concrete trucks	KAMAZ-581453	2	Concrete preperation
3	Dump truck	**YaAZ-210E**	8	Moving soil

Name.	List No Doc	Signature	Date
Head of Dep	Kozyukova N.V		
Supervisor	Turganbaev A.P		
Consultant	Turganbaev A.P		
Controller	Bek A.A		
Prepered by	Mohammadi Z.M		

KazNRTU-5B072900-Civil Engineering-03.08.03-2021-DP

Multi-storey residential building of economy class with the "Smart House" system in the city of Nur-Sultan

	Level	Sheet	Scale
Technological part	DP	8	1:200
Calendar Schedule	Head Civil engineering and building materials department		

СОГЛАСОВАНО :

Гл.сп. ОВ | Гл.сп. ВК | Гл.сп. ЭЛ | Гл.сп. СС | Гл.сп. ГП

Взам. инв. №

Подп. и дата

Инв. № подл.

Формат А3

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
СӘТБАЕВ УНИВЕРСИТЕТІ

RESPONSE

OF THE SUPERVISOR
for the graduation project

Mohammadi Mohammad Zamin
5B072900-Civil Engineering

Topic: «Economy class multi-story residential building with «Smart House» system in Nur-Sultan»

Mohammadi M. Zamin successfully completed the thesis "Multi-storey residential building of economy class with the "Smart Home" system in the city of Nur-Sultan". In the process of working on the project, the student used modern software systems Lira-Cad, Autodesk Revit and not bad knowledge of professional disciplines, responsibility in the preparation of materials. The graduation project was completed at a good level.

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

Supervisor
Master of technical sciences, lecturer

_____Turganbayev A.P.

«31» 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: Мохаммади Мохаммад Замин

Название: Economy class multi-story residential building with "Smart House" system in Nur-Sultan

Координатор:Алтай Турганбаев

Коэффициент подобия 1:3.6

Коэффициент подобия 2:2.4

Замена букв:28

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: Мохаммади Мохаммад Замин

Название: Economy class multi-story residential building with "Smart House" system in Nur-Sultan

Координатор: Алтай Турганбаев

Коэффициент подобия 1:3.6

Коэффициент подобия 2:2.4

Замена букв:28

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