MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN

Kazakh National Research Technical University named after .K.I. Satbayev

Institute of Architecture, Construction and Energy named after T. Basenov
Department of Construction and Building Materials

Nabil Bahadur Nawidullah

On the theme of "Multi-storey building in Aktau"

To the diploma project
EXPLANATORY NOTE

Specialty 5B072500 – Civil Engineering

Almaty 2020

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ALLOWED TO PROTECT
Head of Department
_____ K.A.Akmalayuli
Master of Engineering
"25" 05 2020

EXPLANATORY NOTE
To the graduation project

On the theme of "Multi-storey building in Aktau"

Specialty 5B072900 –Construction

Performed N.B Nawidullah.

Supervisor Paktin.M.

"25" 05 2020

Almaty 2020

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THE TASK
For the implementation of the graduation project

Learning Nabil Bahadur Nawidullah

Theme: "Multi-storey building in Aktau"

Approved by Order of the Rector of the University No. 1618-8 of November 30, 2017. Deadline for completion of work

Initial data for the graduation project: construction area of Aktau, Structural design of the building - Frame, supporting structures made of monolithic reinforced concrete

The list of issues to be developed:

a) Architectural part: basic input data, volume planning Decisions, thermal engineering calculation of enclosing constructions.

b) Design and construction section: calculation and design of the slab overlap.

c) Technology of construction production: development of technological maps, construction schedule and construction plan.

d) Calculation of the cost of construction: local estimates for underground and elevated work, object estimate, summary estimate.

e) Safety and labor protection: describe measures in case of emergency situations.

The list of graphic material (with an exact indication of the required drawings):

1. General plan, facades, plans of typical floors, sections 1-1-4 sheets

2. KZh slabs, specifications –1 sheets

3.The technical map of the underground part of the building, the technical map for the construction of the aboveground part buildings, schedule, construction plan –3 sheets 12 work presentation slides are provided.

Recommended basic literature: SP RK 2.04-01-2017 "Construction Climatology", SP RK 2.04-107-2013"Construction heat engineering", SN

2.03-30-2017 "Construction in seismic zones."

Schedule

Preparation of thesis (project)

No	Sections	33%	66%	100%	Note
1	Predesign analysis Architectural and construction	30/03/020 - 30/02/2020			
2	Settlement constructive		15/04/2020 15/04/2020		
3	Technology and Organization of construction and Economic			15/05/2020 - 15/05/2020	
4	Antiplagiarism, standard control, pre-protection	18/05/2020 - 20/05/2020			
5	Protection	01/06/2020 - 06/06/2020			

Signatures

Consultants and the norm controller for the completed thesis (project) indicating the sections of work (project) related to them

Name sections	Consultants,I.O.F.(academic degree, rank)	The date signing	Signature
Architectural building	Manizha Paktin , master of technical science	25.05.2020	
Settlement	A.P.Turganbaev, master of technical science	25.05.2020	
Technology and Organization construction industry	I.Z. Kashkinbaev, doctor of technical science	25.05.2020	
Economic part	Manizha Paktin , master of technical science	25.05.2020	
Norm controller	Manizha Paktin , master of technical science	25.05.2020	

Scientific adviser: M Paktin

The student accepted the task: Nabil Bahadur Nawidullah

АҢДАТПА

Осы дипломдық жұмыстың мақсаты - Қазақстанның Ақтау қаласында сыйымдылығы 10 млн. Көпқабатты тұрғын үй кешенінің құрылысы.

Диссертация сәулет бөлігі, құрылыс бөлігі, технологиялық бөлігі және экономикалық бөлігі болып табылатын төрт бөлімнен тұрады және жобалау, технологиялық және жылу жобалау кезінде есептер шығарылды, бас жоспарға сәйкес сәулет жоспарлау шешімдері негізделді, негізгі және көмекші объектілердің орналасуы жасалды. Жасалды және негізгі техникалық-экономикалық көрсеткіштер есептелді.

Бұл 40 парақта ұсынылған, 19 кесте, 5 сурет, 45 формула, 4 қосымша, 26 сілтеме.

Түйін сөздер: құрылыс, саз, өндіріс, көп қабатты.

АННОТАЦИЯ

Целью данной дипломной работы является строительство многоэтажного жилого комплекса в городе Актау, Казахстан, мощностью 10 миллионов.

Диссертация состоит из четырех частей, которые являются архитектурной частью, строительной частью, технологической частью и экономической частью, и в ходе проектирования были выполнены технологические и теплотехнические расчеты, архитектурно-планировочные решения были обоснованы в соответствии с генеральным планом, планировка основных и вспомогательных объектов была сделано, и основные технико-экономические показатели были рассчитаны.

Окончательный вариант представлен на 40 страницах, включает 19 таблиц, 5 рисунков, 45 формул, 4 приложения, 26 ссылок.

Ключевые слова: строительство, глина, производство, многоэтажный.

ABSTRACT

The aim of this final thesis is the construction of a multi storey residential complex in Aktau city of Kazakhstan with a capacity of 10 million.

Thesis consists of four parts which are architectural part, construction part, technological part and economic part and during designing, technological and thermal engineering calculations were made, architectural planning decisions were justified according to the master plan, the layout of the main and auxiliary facilities was made, and the main technical and economic indicators were calculated.

The final this is presented on 40 pages, includes 19 tables, 5 figures, 45 formulas, 4 appendixes, 26 references.

Keywords: construction, clay, production, multi storey.

CONTENT

INTRODUCTION

Construction is engineering transactions for the construction of buildings and structures such as residential buildings. In a simple building, you can define how fenced space with roof walls, food, cloth and basic human needs. In ancient times, people lived in caves, on trees or under the trees to protect themselves from wildlife, rain, sun etc. Over time, people began to live in huts made of wooden branches.

The shelters of those old ones turned into beautiful houses. Rich people live in Exquisite homes. Building is an important indicator of social country progress. Every person has a desire to have comfortable at home, on average, as a rule, each person spends in their homes two-thirds of life. A civilian sense of responsibility is safe. It is somewhat reasons why a person does everything possible and spends with difficulty earned savings in their own homes. Today, house building is the main work of the country's social progress. Daily developing new technologies for building houses, economically, quickly and in accordance with the requirements of the community, engineers and architects, performing design work, planning and layout of buildings.

The designer is responsible for the drawing work of the building, as well as for direction of engineers and architects. The designer must know his work and be able to follow the instructions of the engineer and be able to draw the required building drawing, site plans, location plans, etc. In accordance with requirements.

The main type of urban development are multi-storey residential buildings operations of such houses allow us to rationally use Territory, reduce urban transport facilities, length engineering networks, and streets.

In world housing, a large proportion Multi-storey residential buildings.

The application of a multi-story residential building primarily provides the goal of saving urban areas, as during construction multi-storey residential buildings can significantly increase the density settlement. The growth of cities "wide" and exacerbates the transport problem and extends the length of utility networks. For Type Choices multi-story residential buildings in major cities is considered urban situation, also the conditions for the reconstruction of the central areas.

1 Architectural part

1.1 Basic information about the construction site

The graduation project was developed on "Construction of a social residential complex Located in Aktau Kazakhstan."

Building characteristic:

The project is a multi storey residential complex which consists of ten block and every block has 39m height from ground level is going to be built in Aktau city of Kazakhstan. The total area of the project is 1.7 hectare with environmental site

The degree of fire resistance of the building is II. The degree of durability of the building is -II.

The project was developed for the following construction conditions: humidity zone - normal;

Climatic region – IVG: the climate is temperate continental;

Snow area - II, normative value of snow cover weight 0.8 kPa;

Wind region - I, standard value of wind pressure - 0.48 kPa;

Climatic parameters of the cold season: air temperature

The coldest days: -21˚C coldest air temperature

Five days: -17˚C;

The construction area is seismic hazardous, magnitude is 9-10 points; the construction site is located in the residential and administrative area, the relief of the plot is calm.

The mark of the existing land is an average mark of 650m.

1.2 Natural and climatic and engineering-geological conditions

Characteristic features of the climate of this territory are: abundance

Sunlight and heat, continental, hot long summer, relatively cold winter with alternating thaws and cold spells, large annual and daily amplitudes of fluctuations in air temperature, dry air and climate change with height terrain.

Table 1.1- Aktau weather by month //weather average

	Jan	Feb	Mar	apr	May	Jun	Jul	Aug	Sept	Octo	Novem	Dec
Avg. Temperature (°C)	-1.2	1.2	.5	1.6	8.5	3.2	6.2	5.8	20	2.9	6.5	.8
Min. Temperat	-4.7	4.8	0.5	4	3.1	7.7	0.8	8.9	14.5	2	2.9	1.1

ure (°C)												
Max. Temperature (°C)	2.3	5	5	6.9	3.9	8.8	1.7	2.8	25.5	7.6	10.1	.8
Avg. Temperature (°F)	29.8	9.8	8.3	2.9	5.3	3.8	9.2	8.4	68.0	5.2	43.7	5.2
Min. Temperature (°F)	23.5	3.4	1.1	3.5	5.6	3.9	9.4	6.0	58.1	6.8	37.2	0.0
Max. Temperature (°F)	36.1	6.5	5.5	2.4	5.0	3.8	9.1	1.0	77.9	3.7	50.2	0.6
Precipitation / Rainfall (mm)	8	9	3	6	7	1	0	9	13	4	16	4

The coldest month - January is characterized by negative temperatures – 5 and - 15.5 ° C (for plains and foothills). The hottest month - july. The average temperature for the plains is +32 - + 36˚C.

The absolute maximum temperature in the same zone reaches + 36.7_ + 41.5

Basic data on snow cover are given in table 2.

Table 1.2 - Snow cover

Weather station	month										High value for winter	
	9	10	11	12	1	2	3	4	5	avere	max	min
The average monthly snow depth, cm												
			4	10	19	21	9			28	55	7

As you move away from the mountains, the wind regime changes. Average annual wind speed - 2.5 m / s. Wind breakthrough reaches 27m / s. Smallest monthly average wind speeds throughout the territory are observed in winter period (in December, January), and the largest - in the summer.

Table 1.3 - Wind

Wind	month												year
Weather Station	1	2	3	4	5	6	7	8	9	10	11	12	
Monthly and annual average wind speed, m / s													

Aktau	1.0	1.1	1,3	1.7	1.8	2	1.9	1.9	1.8	1.5	1.1	1.0	1.5
Maximum wind speed and wind breakthrough on the weather vane, m / s													
Aktau	12	11	20	>20	>20	18	20	18	12	15	12	12	>20

Table 1.4 - Repeatability of wind and calm directions, %

Weather station	Direction								Calm
Aktau	N	NW	E	SE	S	SW	W	NW	
	14	8	6	14	9	11	10	8	26

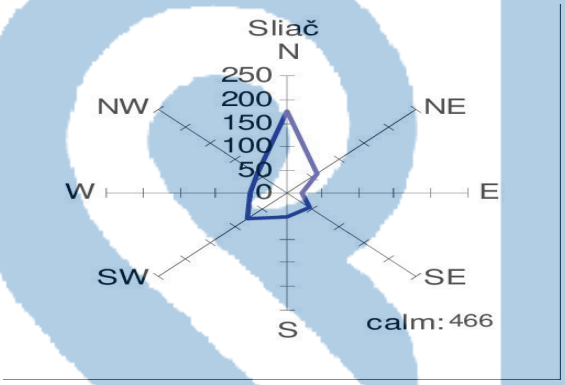

Figure 1.1 - Wind rose according to the weather station in Aktau

1.3 General plan. Landscaping

The master plan is developed for the entire territory of the land construction. Plot common area 2 hectare allotted for construction, located in the city of Aktau, has a rectangular form. The land allocated for construction is free from buildings. On the territory of the facility provides for a 8.0 meter wide race, coverage accepted from asphalt concrete on the crushed stone base. Designed by project landscaping and landscaping reduces overall dustiness and eliminates local foci of dust

Table 1.5 - Technical and economic indicators for the master plan

Name	Indicator
Land area	1.7 hectare
Built-up area	1.2 hectare
Building factor	0.104
Landscaping area	0,5 hectare
Gardening rate	0.297
Hard surface	8992.1 m 2

The utilization of the territory 0.745

The area around the building is landscaped and paved access roads are provided.

1.4 Space-planning solution

The residential complex is made from ten blocks with 13 floors (including ground floor) and at an altitude of 13 and 11 floors has technical floors with an area of 453 m ^2. Height of ground floor is 3 m, typical 3 m. Main staircase cage elevators mine engineering equipment are in the concrete core stiffness in the middle of the front side of the building. At the ends of the building are Spare stairwells between separate floors.

Usually different rooms of a building are grouped according to functional features that allow you to organize clear technological interconnections corresponding to sanitary-hygienic and fire-fighting requirements conducive to the ease of use of the hotel, as well as increasing the comfort of living in it.

Since the residential and public parts are located in the same building, then public premises are located on the lower floors, and residential above them.

1.5 Constructive solutions of the object

The structural scheme of the building is frame, while at the level of the basement and the supporting columns are reinforced concrete columns and walls (i.e. Communication system). Spatial immutability is provided External and internal heat blocks, reinforced concrete columns and crossbars, a hard drive of overlapping from prefabricated reinforced concrete plates.

Foundations - made monolithic with a thickness of 800 mm. Under foundations perform reinforced monolithic pillow and crushed stone thickness preparation. 100mm horizontal waterproofing of foundations perform from 2 layers of roofing material on bitumen mastic. Vertical waterproofing foundations in contact with the soil Coating with hot bitumen (BN 70/30) for 2 times.

Walls with t – exterior basement walls are monolithic reinforced concrete walls with a thickness of 400 mm, the outer walls of the first to the twelfth floor serve 400 mm thick foam block walls with masonry reinforcement reinforcing mesh 4Bp1-100 / 4Bp1-100 every 5 rows of masonry height, internal walls with a thickness of 200 mm are also made of foam blocks on cement-sand mortar M75 with reinforcing masonry reinforcing 4Vr1-100 / 4Vr1-100 nets every 5 rows of masonry in height;

Partitions - thicknesses. 120mm made of solid ceramic brick brand KR-r 250x120x65 / 1F / 125 / 2.0 / 25 / GOST530-2012 cement brand M75 solution. Brick

walls reinforced with 2 rods reinforcement class A-I Ø6 every 5 rows of masonry in height.

Coating plates - monolithic reinforced concrete floor slabs 220mm thick.

Beams - reinforced concrete with a section of 400x400;

Lintels - squared for buildings with masonry walls in a series 1.038.1-1 release 1;

Windows - installation of PVC windows in accordance with GOST 21519-2003. Window sill's metal-plastic.

Doors - installation of internal wooden doors in accordance with GOST 6629-88, from PVC in accordance with GOST 309702002, installation of metal exterior doors in accordance with GOST 31173-2003.

The blind area is concrete around the entire perimeter of the building with a width of 1.0m.

Exterior finish - from external facade plaster and with need a decorative layer.

1.6 Thermo technical calculation of the outer wall

According to the joint venture of the Republic of Kazakhstan 2.04-01-2017 "Construction climatology" [p. 7-10] and Snip RK 2.04-03-2013 [pp. 14-16] "Construction heat engineering" is necessary determine the thickness of the insulation for the outer wall. We determine the value of the degree days of the heating period:

$$GSOP = (t\ inside - t\ unlock) * z\ unlock \quad (1.1)$$

Where, t inside = 22℃ - temperature of internal air, ℃;

T unlock = 1.8℃ - average temperature of the heating period;

Z unlock = 160 days - the duration of the heating period;

$$GSOP = (22-1.8) * 160 = 3232\ ^\circ C * day$$

The required heat transfer resistance of the building envelope, meeting sanitary-hygienic and comfortable conditions is equal to:

R0tr = 2.45 ∗℃ / W

Table 1.6 - the composition of the outer wall

Number	Name of material	ϒ 0 , kg / m 3	λ, Вт/м2*℃	δ,м	Rn=δ/λ , м2 *℃/Вт
1	Stucco on cement sand solution	1800	0.76	0.03	0.039
2		40	0,033	0.06	2

3		600	0.27	0.30	1.15
4		1800	0.76	0.03	0.039

The heat transfer resistance of the building envelope follows determined by the Formula 2.2:

$$R\ 0 = 1/\ \alpha\ in + \delta\ 1/\ \gamma\ 1 + \delta\ 2/\gamma\ 2 + \delta\ 3/\gamma\ 3 + \delta\ 4/\gamma\ 4 + 1/\alpha\ n \qquad (1.2)$$

$$R\ 0 = 1/8.7 + 0.039 + 2 + 1.15 + 0.039 + 1/23 = 3.38\ m\ 2 * ° C / W$$

$$R\ 0 = 3.38\ m\ 2 * °c/w$$

FROM R0 = 3.38 m 2*c/w≥ R 0tr = 2.45 m 2 *c/w

The condition is satisfied. We take the thickness of the insulation 60 mm.

1.7 Anti seismic activities

Seismic hazard - seismic hazard impacts in the considered territory. Seismic hazard determined in space, in time (frequency or probability for a certain period of time) and in intensity (in points or in kinematic parameters of soil movements).

The seismic hazard of construction zones should be determined with using a map of seismic generating zones of the territory of Kazakhstan, a set of maps of the general seismic zoning of the territory of the Republic Kazakhstan or according to the list of settlements located in seismic areas.

List of settlements located in seismic zones Of the Republic Residential projected building is located in seismic zone, therefore, anti-seismic measures are necessary.

Seismicity of the work area according to SP 2.03-30-2017 9 points.

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

The residential building has a length of 176 meters, since our frame is reinforced concrete then the length should not exceed 48 meters, therefore we do sedimentary (expansion joint. Anti-seismic seams should be performed by erecting paired walls, paired frames or frames and walls.

The width of the anti-seismic seam between buildings or compartments should be take at least the total value of their calculated horizontal displacements at the appropriate level calculated using the expression (7.31).

With a building height of up to 5 m, the width of the anti-seismic seam, outside depending on the calculation results, must be at least 30 mm. Width seismic seam for larger buildings should be increased by 20 mm for every 5 m of height.

Anti-seismic seams separating the foundations (except pile foundations), it is allowed to take a width of 10 mm.

Structures of anti-seismic seams and their filling shall not discourage mutual displacements adjacent compartments at earthquakes.

In buildings located on construction sites with a seismicity of 8 points or more, it is not allowed to provide the possibility of mutual movements of adjacent compartments due to the movement of span structures, freely lying on the structures of adjacent compartments.

2. Structural part

2.1 Baseline

For the calculation, a structural element was chosen - a plate at +36,500 on the axis 6-7 / AB.

Plate of rectangular cross section with bottom reinforcement with dimensions b = 1000 mm, h = 200mm; c 1 = 20 mm; Concrete has a normal class C25 / 30 (= 25 Pa, s = 1.5, = 14.2 MPa, ss = 0.85). S500 class fittings (UK = 500 Pa, = 435 MPa, = 20 ∗ 10 4 MPa, ss = 0.85). On the stove acts bending moment = 32.91 KN * m.

Required: Determine the area of longitudinal reinforcement.

2.2 Collection of loads

Units of effort: t
Voltage units: t / m ** 2
Unit of measurement of moments: t * m
Units of measurement of distributed moments: (t * m) / m
Units of distributed distributed cutting forces: t / m
Units of measurement of surface displacements in elements: m
Combination Odds

Table 2.1 - the collection of loads

N download.	View	1	2	3	4
1	Constant (P)	1	1	1	1
2	Constant (P)	1	1	1	1
3	Constant (P)	1	1	1	1
4	Constant (P)	1	1	1	1
5	Long (D)	0	1	0	0
6	Short-term (C)	0	0	1	0
7	Short-term (C)	0	0	0	1
8	Seismic (C)	0	0	0	0
8-1		1	1	1	1
8-5		1	1	1	1
8-6		1	1	1	1
9	Seismic (C)	0	0	0	0
9-2		1	1	1	1
10	Seismic (C)	0	0	0	0

10-3		1 1 1 1
10-5		1 1 1 1
10-7		1 1 1 1

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| C AND L AND I / VOLTAGES / IN ELEMENTS. |

| 44_ 30089-1 30148-1 30197-1 |
| 41627 27979 27980 |
| 27979 27980 27981 |

| 11 |
| NX -3.2262 -2.5428 -1.7961 |
| NY 1.4248 .83151 .43525 |
| TXY -4.1112 -4.7996 -5.0819 |
| MX -. 70284 -.59122 -.55035 |
| MY -2.7874 -2.8813 -2.6900 |
| MXY -.31569 -.22484 -.19582 |
| QX -.20839 .21115 .60190 |
| QY -2.5847 -2.6546 -2.4412 |
| 2 - _ 2 |
| NX -3.3161 -2.6158 -1.8521 |
| NY 1.3998 .79908 .39933 |
| TXY -4.1862 -4.8837 -5.1686 |
| MX -.72100 -.60691 -.56546 |
| MY -2.8562 -2.9567 -2.7658 |
| MXY-32159 -.22754 -.19803 |
| QX -.22054 .20721 .60708 |
| QY -2.6499 -2.7360 -2.5294 |
| 3 - _ 3 |

| NX -3.5517 -2.8010 -1.9852 |
| NY 1.4694 .82811 .40370 |
| TXY -4.4535 -5.1926 -5.4930 |
| MX -.77610 -.65501 -.61132 |
13
| MY -3.0693 -3.1880 -2.9953 |
| MXY -.34019 -.23718 -.20608 |
| QX = -.25763 .20135 .62853 |
| QY -2.8458 -2.9768 -2.7842 |

| 4 - _ 4 |

NX	-3.0277	-2.2796	-1.4343
NY	3.7977	2.8581	2.2030
TXY	-5.1576	-6.1283	-6.5587
MX	-.79146	-.67582	-.62390
MY	-3.2017	-3.2915	-3.0504
MXY	-.35650	-.26258	-.22934
QX	-.27122	.29625	.72562
QY	-2.8723	-2.9470	-2.6524

2.3 Calculation

Determination of the cross-sectional area of the reinforcement
Bending moment acting in section:

$$M_{eds} = M_{ed} \ -N_{ed} * \ Z_{S1} \tag{2.1}$$

M_{eds} = 32.91 KN * m. (N_{ed} = 0), d = h- c1 = 200 - 20 = 180 mm.

The required area of longitudinal reinforcement is determined according to the table B.4 [1]

$$K_D = \frac{D}{\sqrt{M_{ed}/b}} \tag{2.2}$$

$$\text{K d} = \frac{18}{\sqrt{32.91/1}} = 3.13$$

Determine k s according to table B.3 for normal concrete ≤C 25/30 → k s = 2, 40

$$A_{S1} = \text{k s1} * M_{eds}/\text{d} + N_{ed} \ /\sigma \text{ s1d} \ldots \tag{2.3}$$

A s1 = 2.40 * 32.91 / 18 + 0/435 = 4.388 cm 2

Accepted: 5Ø16 (A s1 = 10.05)

b) Selection of longitudinal reinforcement (see example 3) is carried out according to table B.1

Annex B for determining the bearing capacity of bent elements rectangular with single reinforcement using dimensionless coefficients

We determine the value of the coefficient

$$A_{eds} = M_{eds} // \text{ f cd} * \text{b} * \text{d 2} \tag{2.4}$$

$$\alpha_{eds} = 32.91$$

$$14.2 * 1 * 0.18\ 2 = 0.071$$

$$\alpha\ Eds \leq \alpha\ Eds,\ lim = 0.372$$

$$0.071 \leq 0.372$$

Compressed fittings are required by design. We put it constructively.

5Ø16 (A s2 = 10.05)

B) Calculation of checking the width of the crack opening normal to the longitudinal axis of the element [p. 125-127]

Working section height

$$d = h - ccov - dsw - Ø14 / 2 = 200 - 20 - 16/2 = 172\ mm.$$

$$\rho = s1 / bd = 1005/1000 \cdot 172 = 0.0058\ (0.58\%).$$

We check the crack opening width using a simplified technique, using table data 8.3 for rectangular sections reinforced reinforcement of class St500 at 0.5% ≤ ≤1.0% the shoulder of an internal force pair, determined by:

$$0.85 = 0.85 \cdot 172 = 146.2\ mm.$$

Stresses in tensile reinforcement are determined by the formula:

$$s = Med / As1 \cdot z \qquad (2.5)$$

$$s = 32.91\ (N \cdot mm) / 1005 \cdot 146.2 = 223.98\ N / mm2.$$

According to the table 8.4 d a = 20 mm at = 223, 98 MPa and, = 0, 4 mm.

The accepted diameter Ø = 16 mm ≤ Ø = 20 mm, i.e. by calculation Checking the crack opening width is not required

2.4 Calculation on Lira CAD

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

We create 10 loads, thereby applying loads to the skeleton of the building:

- Net weight of the building;
-Floors;
-Walls;
- Pressure from soil;
-Long-term load on the joint venture;
- Short-term load in the joint venture;
-Snow load;
-Seismic in X (according to SNiP RK 2.03-30-2006);
- Seismic in Y (according to SNiP RK 2.03-30-2006);
- Seismic in Z (according to SNiP RK 2.03-30-2006).

The formation of mass matrices for loads No. 8, No. 9, No. 10.

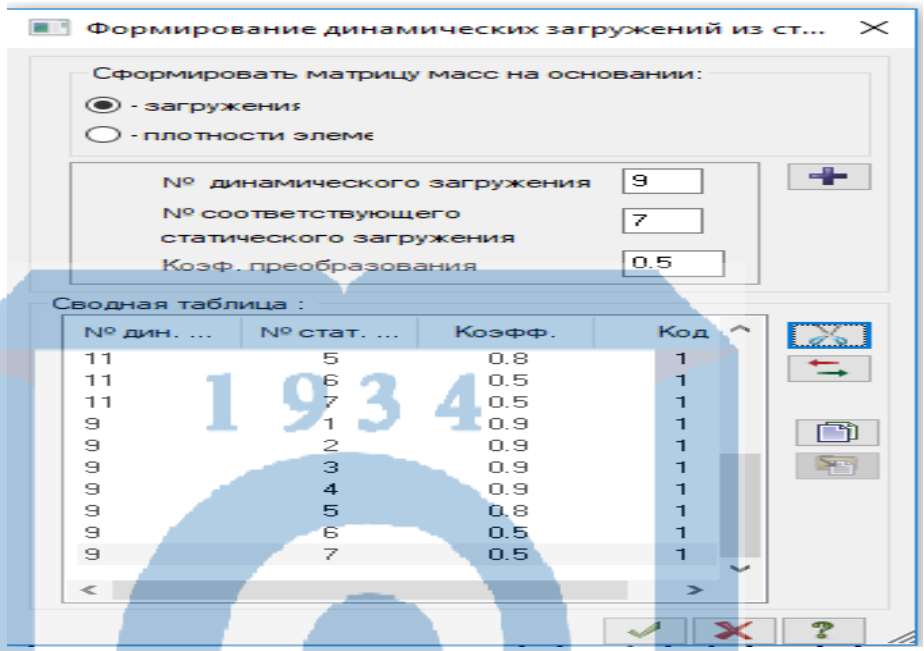

Figure 2.1 - Formation of dynamic downloads

We set the characteristics for calculating the dynamic effects:

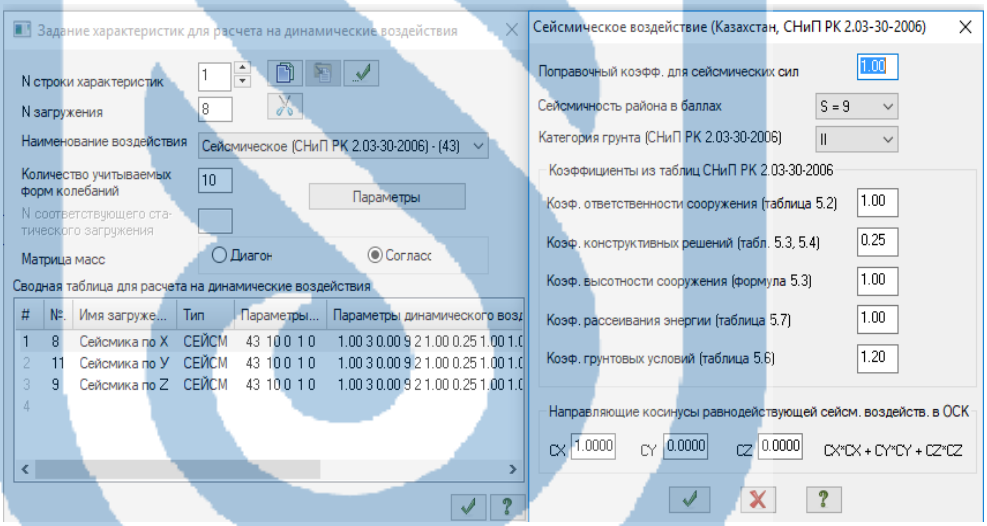

Figure 2.2 - Setting characteristics for dynamic loads

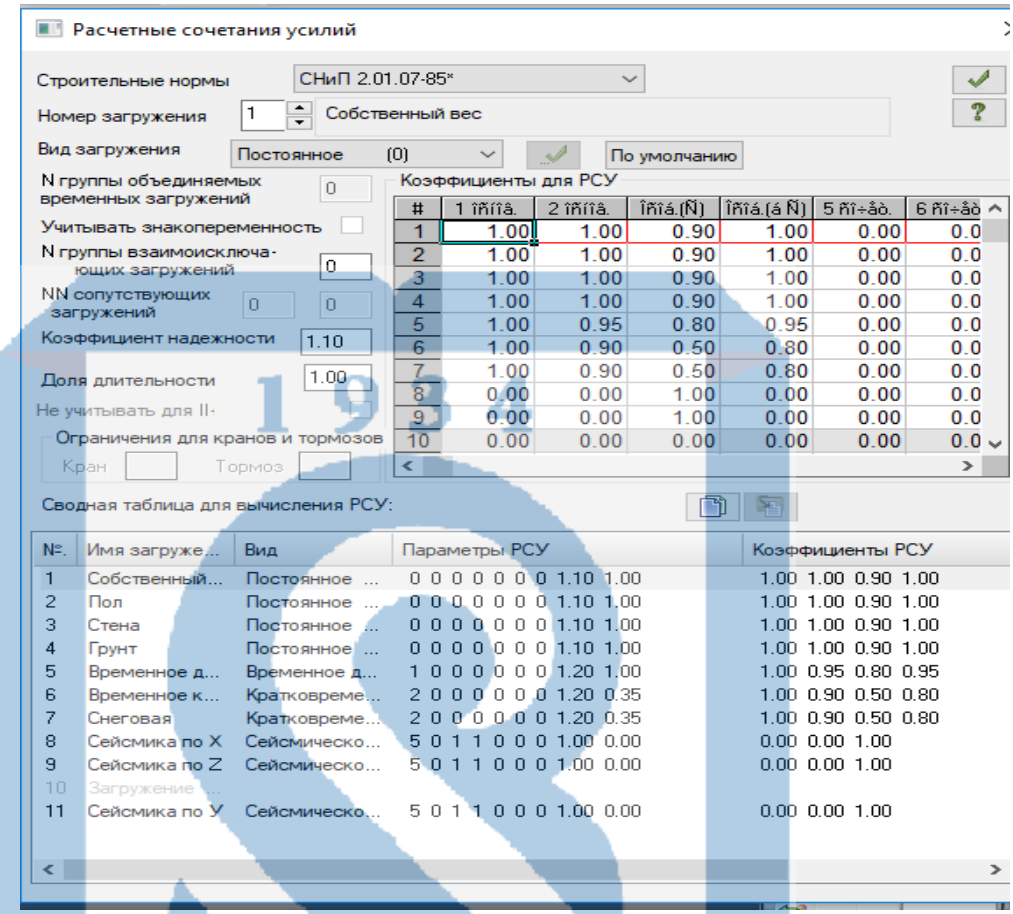

Figure 2.3 - Design combinations of efforts

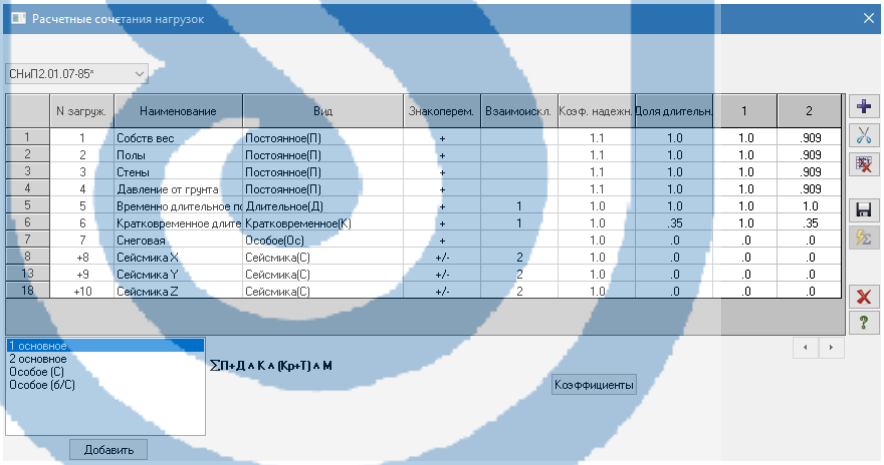

Figure 2.4 - Estimated combination of loads

This building model is designed in accordance with the design features of the designed building. Diaphragms stiffness and overlap modeled by finite elements of a flat shell. Calculation model buildings adopted in the form of a spatial multi-mass discrete system with masses concentrated in nodes. Each node has 6 degrees of freedom.

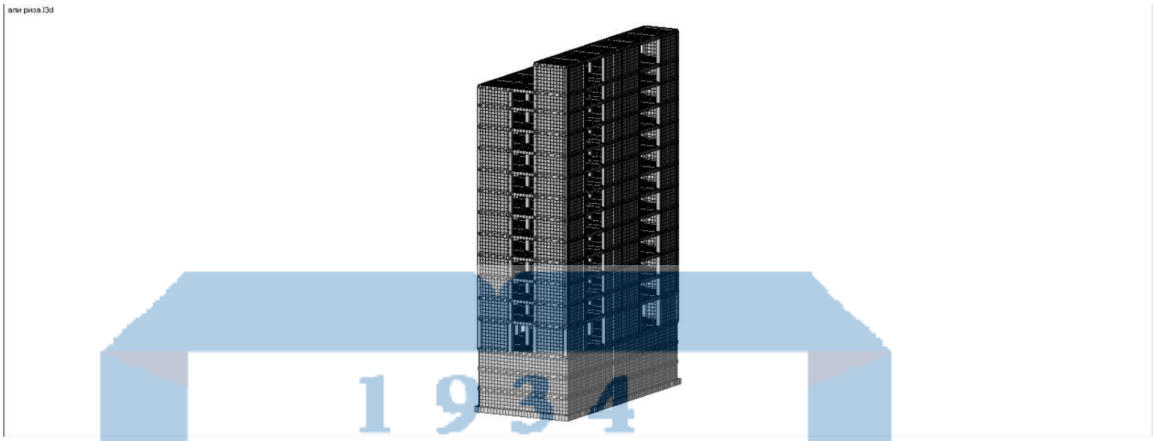

Figure 2.5 - The initial spatial model of the building

Various calculation files are created to meet the standards. Snip and design features of the designed building.

We create 5 calculation files:

The main combination with the coefficient of bed (for statics).

The main combination with E mountains = 0.3 * E 0, E ver = 0.6 * E 0.

A special combination with the coefficient of bed C 1 * 10 * 1.5.

A special combination with the coefficient of bed C 1 * 10 * 0.667.

A special combination with E mountains = 0.5 * E 0.

The first calculation file is needed to identify the sediment in the foundation slabs. The second calculation file is necessary to detect deflections in horizontal elements. Third, fourth and fifth calculation file necessary to verify compliance with the conditions of SP 2.03-30-2017 "Construction in seismic regions of the Republic of Kazakhstan." Full calculation on the program

Lira CAD systems are given in Appendix A.

3 Technological part

3.1 Characterization of soil development conditions

Loam, light and loess like with an admixture of gravel, pebbles or building garbage up to 10% by volume - soil category II

Table 3.1 - the Source data

No		Unit measuring	Numeric data	Note
1	Soil group		II	ENiR 2, issue 1pg. 6-12
2	Average soil density	kg / m 3	1700	ENiR 2, issue 1
3	The ratio of the initial lax loosening	%	18-24	ENiR 2, issue 1 page 206
4	Residual ratio loosening	%	3-6	ENiR 2, issue 1page 206
5	Slope coefficient slope	%	0.75	Hamzin Karasev "Technology building processes ", page 35

Soil transportation range: 7 km

Average winter external temperature: -10˚C

Foundation sole mark: -9m

UGV: -12m

The definition of the scope of work

As it is known at the present time, the construction of a building and structures are not sold without an approved estimate, so customers require to know the volume capital investments and terms of construction, then for the construction of each building or structures need to calculate the volume of work.

The volume of earthwork is determined in the design of earthworks facilities.

$$V_К = H/6 \cdot (a \cdot b + c \cdot d + (a + c) \cdot (b + d)),\ м3 \qquad (3.1)$$

Where a, b - the width and length of the pit on the bottom c, d - width and length of the pit on top

$$vk1 = 9/6 \cdot (15 \cdot 34 + 33 \cdot 52 + (15 + 33) \cdot (34 + 52) = 9531\ m\ 3$$

Since I have 2 identical pits, Vk2 = Vk1

$$Vk2 = Vk1 = 9531\ m\ 3$$

$$Vk = 9531 + 9531 = 19062\ m\ 3$$

Define the volume of backfill

$$Vsample = Vк - Vf - Vbas/1 + Ко.р.\ м3 \quad (3.2)$$

$$Vsample = 19062 - 793.6 - 81001 + 0,06 = 9593 м3$$

Where V basement - basement volume

V f - the volume of the foundation elements

V f = 31 * 16 * 0.8 = 396.8 82 =793.6m 3

KO.r. - coefficient of residual loosening

V bottom = a · b · h = 2 (15 * 30 * 9) = 8100 m 3

Determination of the amount of excess soil

$$ex.g = Vk - Vsample,\ m\ 3 \quad (3.3)$$

V ex.g = 19062 - 9593 = 9469 m 3

Determination of the volume of soil shortage

$$V\ n.g = a \cdot b \cdot h\ wk,\ m\ 3 \quad (3.4)$$

H week = 0.1 ÷ 0.4 m

V ng = 2 (30 * 15 * 0.4) = 360 m 3

Determination of the cut area of the plant layer

$$F\ slice = (10 + s + 10)\ (10 + d + 10),\ m\ 2 \quad (3.5)$$

F slice = 54 * 73 + 54 * 73 = 7884 m 2

The total amount of cut of plant soil.

V = S * hpr = 7884 * 0.2 = 1576.8 m3

The area of compaction of the soil.

$$F_{opl} = V\ oz. / h\ y \quad (3.6)$$

H y - thickness of the sealing layer F upl = 9593 / 0.2 = 47965 m 2

The area of waterproofing the base plate

$$S = Vunder / h = 8100/9 = 900\ m\ 2 \quad (3.7)$$

Table 3.2 - a list of the volume of earthwork No. p / p Name works

No	Name of works	Units measuring	amount	Notes
excavation				

1	Cut vegetable layer	1000 m 2	7.88	
2	Development Soil excavator			
A	excavator To the dump	100 m 3		95.93
B	IN transport funds	100 m 3		94.96
3	Development shortage soil	1m 3		360
4	Feedback	100 m 3		95.93
5	soil	100 m 3		479.65
6	Device waterproofing	1m 3		900

Key indicators that affect the choices of cars in arbitrariness earthworks, construction and dimensions of earthworks, group soil, granulometric composition of the soil and soil moisture.

In construction, there are basically four ways to develop soil, mechanical, hydro mechanical, explosive and combined.

Most of the volume of excavation is carried out mechanically, various machines are used.

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

- Earth moving
- Soil compaction machines
- Machines for auxiliary works

Base tractor T-130, bulldozer DZ-28, soil - loam, the length of the cutting path is 19 m, the length of the soil transportation path is 60 m.

Cycle time:

$$T = t\,1 + t\,2 + t\,3 + t\,4 \qquad (3.8)$$

Where t 1 - time of cutting soil:

$$t\,1 = l\,1 / v\,1 = 3.6 * 19 / 3.2 = 21.37 \text{ s}$$

3.6 - conversion factor km / h to m / s;

l 1 - the length of the cutting path, l 1 = 19 m,

v 1 - the speed of the bulldozer in 1st gear when cutting soil,

v 1 = 3.2 km / h;

t 2 - the time of movement of the soil dump:

$$t\ 2 = l2 / v\ 2 = 3.6 * 60 / 3.8 = 57\ s$$

3.6 - conversion factor km / h to m / s;

l 2 - the length of the path of transportation of soil, l 2 = 60 m;

v 2 - the speed of movement of the loaded bulldozer, v 2 = 3.8 km / h;

t 3 - time reverse (idle):

$$t\ 3 = (l\ 1 + l\ 2) / v\ 3 = 3.6 * (19 + 60) / 5.2 = 55\ s$$

v 3 is the speed at the reverse, v 3 = 5.2 km / h;

t 4 - additional time spent on lifting, lowering the blade, on switching speeds, to turn the bulldozer, t 4 = 25 s.

$$T = t\ 1 + t\ 2 + t\ 3 + t\ 4 = 21.4 + 57 + 55 + 25 = 158.4\ s$$

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

$$P\ t = Q_{pr} * n * k\ n / k\ p \qquad (3.9)$$

where - $Q_{pr} * Q_{pr}$ the volume of the prism of soil drawing, m;

Q_{pr}* = L * H 2 /2*m=3.94*0,815 2 /2 * 0.7 = 1.87 m 3

L - Blade length, L = 3.94 m,

H - Blade height, H = 0.815 m,

m = 0.7 is a coefficient depending on the ratio H / L,

n is the number of cycles per 1 hour of operation:

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

k n = 1, 1 - filling factor of the geometric volume of the prism soil

k p = 1.25 - coefficient of loosening of the soil,

P t = Q_{pr}* * n * k n / k p = 1.87 * 22.73 * 1.1 / 1.25 = 37.4 m 3 / h

Bulldozer operational performance:

$$P\ e = P\ t * k\ in = 37.4 * 0.8 = 30\ m\ 3 / h$$

Where k in - the coefficient of use of the bulldozer in time, k in = 0, 8.

Interchangeable bulldozer performance:

$$P\ s = 8 * P\ e = 8 * 30 = 240\ m\ 3 / h,$$

Where 8 is the number of working hours per shift

Excavation is carried out by an excavator equipped with a direct

Shovel with loading soil into dump trucks and with partial dumping into the dump.

We select 2 excavators with a direct shovel with a bucket with teeth with a volume

Bucket 1.25 m 3 and 1 m 3 and perform a comparison.

Table 3.3 – Specifications

	E-1251	EO-4121A
1. Drive	Hydraulic	Hydraulic
2. Bucket capacity	1.25	1 m2
3. The largest digging depth	9.3m	6.85 m
4. The largest cutting radius	9.9m	7.25 m
5. Height unloading in transport	6.6m	4.7 m
6. Power	90kw	59 kw
7. Mass	39.5t	27.6 t
N bp1	1.64	2.2
N bp2	2.2	2.6
S MS	38	32
C I.R.	26	24

I. Excavator E-1251

1. We determine the cost of developing 1 m of soil in the pit for a given type of excavator

$$S = \frac{1.08 * S\ mash}{P\ CM\ vyr} \quad (3.10)$$

S= 1, 08 · 38,000 /476.55 = 86.12tg

Where 1, 08 - coefficient taking into account overhead costs

With mash.smen - cost Excavators change

2. Interchangeable excavator production, taking into account the development of the soil, will sweep, and loading into transport

$$P\ CM\ vyr = \text{to } \Sigma \text{ mash.smen} \quad (3.11)$$

Where $P\ CM\ vyr$ =19062/40= 476.55m 3 / shift

3. The total number of machine tools of the excavator during operation will sweep and loading by transport

$$\Sigma \text{ mash.smen} = \text{Vobr.z} \cdot H1_{vr} + \text{Vrad} \cdot \text{H2vr} / 8.2 \cdot 100 = 9593 \cdot 1.5 + 9469 * 1.9 /820 = 39.5 = 40$$

where H 1vr = 1.5 - the rate of time of the mechanism during operation will sweep (machine-hour). (ENiR 2, vol. 1, pp. 40-41).

H2vr = 1.9 - the rate of time of the mechanism when loading soil into vehicles.(ENIR 2, Issue 1, pp. 40-41).

The determination of the capital specific investment in the development of 1 m 3 soil for each given type of excavator (tg / m 3)

$$K\ beats = 1,07 \cdot CU / P \cdot T\ year \quad (3.12)$$

$$K\ beats = 1,07 \cdot 26,000 / 476.55 \cdot 300 = 0.194 tg / m\ 3$$

5. The definition of the reduced costs for the development of 1 m 3 soil for this type of excavator

$$P\ d = C + E\ n \cdot K\ beats \quad (3.13)$$

$$P\ d = 86.12 + 0.15 \cdot 0.194 = 86.15\ TG / m3$$

where E n - normative coefficient of efficiency of capital investments -0.15 II.

Excavator EO-4121A

1. Determine the cost of developing 1 m of soil in the pit for a given type of excavator

$$S = 1,08 \cdot S\ mash / P\ cm\ vyr = 1,08 \cdot 32,000\ 340.4 = 101.5\ TG$$

1, 08 - coefficient taking into account overhead costs with mash.smen - cost Excavators change

2. Interchangeable excavator production, taking into account the development of the soil, will sweep, and loading into transport

$$P\ cm.vyr = Vk / \Sigma\ mash.smen = 19062 = 340.4\ m\ 3 / shift$$

3. The total number of machine tools of the excavator during operation will sweep and loading by transport

$$\Sigma\ mash.smen = obr.z \cdot H1\ vr + rad \cdot H2vr / 8.2 \cdot 100 = 9593 \cdot 2.2 + 9496 * 2.6 / 820 = 55.76 = 56$$

where H 1bp = 2.2 - the time norm of the mechanism during operation will sweep (mash-hour).(ENiR 2, vol. 1, pp. 40-41).

H2вр = 2.6 - the rate of time of the mechanism when loading soil into vehicles. (ENIR 2, Issue 1, pp. 40-41).

The determination of the capital specific investment in the development of 1 m 3 soil for each given type of excavator (TG / m 3)

$$K\ beats = 1,07 \cdot P\ CM\ vyr \cdot year = 1,07 \cdot 24,000\ 340.4 \cdot 300 = 0.25\ TG / m$$

The definition of the reduced costs for the development of 1 m 3 soil for this type of excavator

$$P\ d = C + E\ n \cdot K\ beats = 101.5 + 0.15 \cdot 0.25 = 101.54 tg / m3$$

where E n - normative coefficient of efficiency of capital investments -0.15

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

E-1251.

Determining the number of dump trucks

To remove excess soil from the construction site and provide teamwork with an excavator choose dump trucks.

Capacity and brand are assigned depending on the volume of the excavator and from the range of soil transportation.

We select the MAZ-5516 dump truck

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

$$Vgr = Vkov \cdot K\ nap/Kol + 1 \quad (3.14)$$

$$Vgr=1.25 \cdot 1.20.25 + 1=1,\ 5\ 1.25= 1.2m\ 3$$

where V kov - accepted bucket volume

K nap - bucket filling ratio:

For a direct shovel - from 1-1.25

KP - the coefficient of primary loosening

Kp = 0.25

Determination of soil mass in the excavator bucket

$$Q = Vgr \cdot \rho\ g = 1.2 \cdot 1.85 = 2.22\ t$$

ρ gr = 1.85 t / m 3 - average soil density

Determination of the number of soil buckets loaded into the body Dump truck

$$n=P/Q=20/2.2=9pcs= 9\ pcs$$

Determination of soil volume in a dense body loaded into the body dump truck

$$V = V\ gr \cdot n = 1.2 \cdot 9 = 10.8\ m\ 3$$

Determination of the duration of one cycle of the truck

$$T\ c = tc +60 \cdot L\ /Vg+ tr +60 \cdot L/Vp+tm \quad (3.15)$$

$$T\ c = 12.3 +60 \cdot 7/18+2 +60 \cdot 7/30+ 3 = 54.63\ min$$

where L- Ground transportation distance

t p - soil loading time

t r - time of unloading of soil - from 1-2 minutes

t m - maneuvering time before loading and unloading - from 2-3 min

V g - the average speed of the truck in a loaded state.

V g = 18 km / h

V p - from 25-30 km / h

$$tp =V \cdot N2\ vp\ \cdot 60\ /100 =10.8 \cdot 1.9 \cdot 60\ /100= 12.3\ min$$

Determination of the required number of dump trucks

$$N=Ts =54.6312.3= 4.44 \approx 5\ pcs$$

Selection of soil compaction machines

Since loam is bound soil, therefore, choose sealing method by rolling and for a sealing strip length of more than 50 m we choose a skating rink on pneumatic tires of static action DU-31A - self-propelled with a sealing strip width of 2.2 m

We pack the soil with self-propelled rollers on pneumatic tires type DU-31A with a thickness of rolled layer 25cm.

Calculation of operating parameters of sinking

The E-1251 excavator has the largest cutting radius of 9.9 m

For the pit, we select frontal penetration with moving in a straight line, with unilateral loading of soil into vehicles.

With moving in a straight line, with Excavator moving step l p = 5m

We determine naib. Width of 1st frontal penetration on top

$$Vp = 2 * b = 2\sqrt{(0.9 * R\ max)\ 2 - L\ n} \qquad (3.16)$$

$$Vp = 2\sqrt{(0.9 * 9.9)\ 2 - 5\ 2} = 14.7\ m$$

We determine Naib. Width of the first penetration at the excavator parking level

$$Vn = 2 * b\ 1 = 2 * 0.9 * 9.9 = 17.8m$$

Determine the width of the 2nd side penetration

$$V = V\ 1 + V = 4.5 + 6.5 = 11m$$

Table 3.3 - a sheet of the volume of work on the construction of foundations

Number	Name	V works		Note or calculation formula
		Units ism	Qty	
1	Monolithic device constructions			
	For foundation			
a	Formwork device	1 м2	153.6	2(a*0.8+0.8*b)
b	Reinforcement work	1T	123.55	0,02*Vb*7.8
c	Concrete laying	1 м3	792	(a*h*0,6)
d	Curing	1 м2	990	A*b
e	Formwork	1 м2	153.6	
2	For the column			
a	Formwork device	1 м2	806.4	L*h*0.4*n
b	Reinforcement work	1T	3.23	0,04*Vb

c	Concrete laying	1 м3	80.64	0.4*0.4*h*2.5
d	Curing	1 м2	201.6	
e	Formwork	1 м2	806.4	
3	For basement panels			
a	Formwork device		1620	(a*3.3)+(b*3.3)
b	Reinforcement work		224.64	0,04*Vb*7.8
c	Concrete laying		720	(a*h*3.3)
d	Curing		1800	(a*3.3)+(b*3.3)
e	Formwork		1620	
4	For floor slabs			
a	Formwork device		806.4	(a*0,2)+(b*0,2)+(a*b)
b	Reinforcement work		7.2	0,04*Vb*7.8
c	Concrete laying		180	(a*h*0,2)
d	Curing		900	A*b
e	Formwork		806.4	

3.2 Technological map for the construction of the aerial part of the building

Source data
Number of floors - 13 (including technical floors)
Range of transportation - 7 km
Dimensions of the building: a = 14 m, b = 61 m
Thickness of floor slabs and coatings: h = 20cm
Bulk mass of heavy concrete: 2500kg / m 3
Floor height: typical - 3.3 m, first floor - 4.5 m
The thickness of the bearing walls is 400 mm.
Scope of work
Calculation of the volume of work on one floor:
Formwork:
Large-panel formwork:

$$S = L * h \quad (3.17)$$

Floor slabs:

$$S = L * B = 854 \text{ m}$$

Wall:

$$S = L * B = 330 \text{ m}$$

Small panel formwork:

Columns:

$$S = 56 * 0.4 * 4 * 3.3 = 295.68 \text{ m}$$

Crossbar:

$$S = 610.4 \text{ m}$$

Total: 2,090.08 m 2

Support device, racks:

According to the rules and regulations for every 4 m 2 is installed 1 rack.

In order to know the number of racks you need to know the area of the building, divide area of 4 find out the number of racks. But racks according to ENiR measured in meters

100m to do this, multiply the number of racks by the height of the floor and divide by 100.

$$S = L * b = 14 * 61 = 8542 \text{ m (Building Area)}$$
$$n = S / 4 = 854/4 = 213 \text{ pcs. (Number of racks)}$$

Beams device:

We lay the beams in the longitudinal direction every 3 meters, and in transverse direction every 1 meter. Beam length 3 m.

In the longitudinal direction:

$$N = 61/3 = 20 \text{ pcs.}$$
$$n \text{ total} = 20 * 4 = 80 \text{ pcs. (Total)}$$
$$L = 80 * 3 = 240 \text{ m.}$$

In the transverse direction:

$$n = 14/3 = 4 \text{ pcs.}$$
$$n \text{ total} = 4 * 60 = 240 \text{ pcs. (Total)}$$
$$L = 240 * 3 = 720 \text{ m.}$$

Reinforcing work.

Installation of reinforcing meshes of the framework of floors and coatings.

Size 1 grid 6 m 2. Plates are reinforced above and below.

$$S = L * b = 14 * 60 = 840 \text{ m } 2$$
$$n = (840/6) * 2 = 280 \text{ pcs.}$$

Installation of reinforcing bars.

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

V = 183.568 m3 (Concrete volume)

m arm = 28.6 t

To begin with, we determine the mass of concrete, 2-4% are reinforcing bars.

Concrete work.

Laying concrete mix in wall structures.

$$V\ st = (h * a * b * \rho) = 66\ m\ 3$$

Laying concrete mix in coatings and floors:

$$S = L * b * h = 61 * 14 * 0.2 = 170.8\ m\ 3$$

Laying concrete mixture in a column:

$$S = L * b * h = 56 * 0.4 * 0.4 * 3.3 = 29.568\ m\ 3$$

Laying concrete mixture in the crossbar:

$$S = L * b * h = 0.4 * 0.5 * L = 88\ m\ 3$$

Concrete Care

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

$$S = a * b = 854\ m\ 2$$

Formwork:

Formwork dismantling:

Large-panel formwork - 1184 m

Small-panel formwork - 906.08 m

Total: 2090.08 m

Dismantling racks and beams:

Racks n = 213 pcs. L = 702.9 m

Beams L = 960 m., N = 320 pcs.

Table 3.4 - a list of the volume of construction installation works

Name of processes	Unit.	1st volume floors	Qty floors	Overall volume
Formwork				
Large-panel formwork	м2	1184	13	26187
Small-panel formwork	м2	906.06	13	12805
Racks	100 м	7.02	13	91.26
Beams	м	960	13	12480
Reinforcement work				
Nets	pcs	280	13	3640
Rods	T	28.6	13	371.8

Concrete works				
Stacking	M 3	354.368	13	4606.78
care	м2	854	13	11102
Dismantling				
Large-panel formwork	м2	1184		15392
Small-panel formwork	м2	906.08	13	11779
Racks	100м	7.02	13	91.26
Beams	м	960	13	12480

Determination of the required lifting height of the tower crane hook:

$$Ntr,cr = N0 + Nstock + Nelem + N\ sling \quad (m) \qquad (3.18)$$

Where No - Mark where the mounted element is installed (43.45 m)
NStock - Reserve height (0.5 m)
Nelem - Element height in mounted position (3.7 m)
Nsling - sling height (2.5 m)

$$Ntr,\ cr = 43.45 + 0.5 + 3.7 + 2.5 = 50.15\ m$$

Determination of the required reach of the tower crane jib:

$$Istr = v + a/2 + s \quad (m) \qquad (3.19)$$

Where v - The width of the building
a- Crane track width (4.5-6 m)
c- Distance from the edge of the building to the rotary part of the crane (2 m)

$$Istr = 2 + 5/2 + 14 = 18.5\ m$$

3) Determination of the required load moment.

$$M\ tr\ tr = (Q\ el + Qstr) * Istr\ (t * m) \qquad (3.20)$$

Where Q el- Massa tap bucket (5.9 tons)
Qstr - Mass of slings (0.1 t)
Istr - Required boom reach

$$M\ tr\ tr = (5.9 + 0.1) * 18.5 = 111\ t * m$$

Choosing a tower crane:
KB-408
Payload: 10 t

Cargo moment: 120 t cm
Lifting capacity at maximum reach: 3 t
Departure: 40 - 35 m
Lifting height of a free-standing crane: 54 m
Lifting Speed: 18 m / min
Crane bucket:
Table 3.5

Product name	volume	1 Load capacity kg	Length mm	Width mm	Height mm	weight
BP-2	2000	6000	3600	1000	2200	880

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

$$T = V/Ps \quad (3.21)$$

$$T = 4606.78 /49.5 = 93 \text{ days.}$$

Where V- The total required volume of concrete for the entire building.
P s - Changeable operational capacity of the mechanism m 3 / shift
Changeable operational performance of concrete feed tub the mixture is calculated by the formula:

$$P\ s = 60 * V * T * Kv /Tc \quad м3/\text{shift} \quad (3.22)$$

$$P\ s = 60 * 2 * 8 * 0.8\ 15, 5 = 49.5$$

Where V is the volume of concrete mix loaded into the bucket crane.
T - Shift duration (8 hours)
K in - the utilization of the crane in time:
For a crane with an electric drive without outriggers - 0.82
For electric powered crane with outriggers - 0.8
For a crane with an internal combustion engine without outriggers - 0.78
For a crane with an internal combustion engine with outriggers -0.76
T c - the duration of the working cycle
The duration of the working cycle is calculated by the formula:

$$T\ c = tr + ts + 2tp + t\ y \quad (\text{min}) \quad (3.23)$$

Where t p - the time of unloading the concrete mix from the concrete truck in the tub (0.5-1.5 min)
t s - Sling and trooping times (1-1.5 min)

t p - the time of the supply of the bucket-tap with concrete mixture to the concrete block (min) (Depends on the feed height and lift speed, as well as on distance and speed horizontal movement)

t y - The time of laying the concrete mixture in the structure (1-3 min)

$$T_s = 1.5 + 3 + 2 * 4 + 3 = 15.5 \text{ min}$$

The choice of the mechanism for supplying concrete mixture

Concrete pumps are used during civil works, associated with concreting, filling with ready-mixed concrete of all types of formwork with the construction of walls, ceilings, foundations, various tunnels. Used in complete with equipment for the production, storage or supply of finished concrete.

Pneumo superchargers - units used for the preparation of concrete mixture and its simultaneous supply. This type of pump has an integrated compressor with electric motor or diesel installation.

Concrete pump:

Model CAR P4.4

The actual duration of the concrete pump is determined by

The formula:

$$T = V/N_s \quad (3.24)$$

$$T = 4606.78/36.1 = 127.6 \text{ days}$$

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

P s - Changeable operational capacity of the mechanism m 3 / shift

$$Pe = 60 * T (\Pi * d2 /4) * L * v * Kv \text{ m } 3 / \text{shift} \quad (3.25)$$

Where T is the duration of the shift 8 hours.

$\Pi = 3.14$

d- Diameter of the working cylinder m

l- Piston stroke length

Number of 2 piston strokes min. (Discharge rate)

To o - coefficient characterizing the ratio of the volume of concrete mixture filed in 1 turn to the working volume of the amplifier (0.8-0.9)

$$P_e = 60 * 8 (3.14 * 0.2\ 2\ 4) * 1.5 * 2 * 0.8 = 36.1$$

Air blower

PN-500-K

The actual duration of the air blower is determined by the formula:

$$T = V/P_s \quad (3.26)$$

T = 12360.24/ 52,5 = 235 days (if done in parallel, then 118 days)

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

P s - Changeable operational capacity of the mechanism m 3 / shift

$$P\ e = (3600 * T * V * K)/ts \quad cm\ 3 / shift \tag{3.27}$$

Where t c - cycle time, sec

V- Air blower volume m 3

$$t\ s = t\ z + L/V \tag{3.28}$$

t s - Time for loading the blower of opening and closing the shutter.

L- Range of transportation of concrete mix

V- The speed of movement of the concrete mixture without mortar along the concrete pipe m / s

(With a horizontal location of the concrete pipe, the speed is from 0.5-0.6 m / s, vertical - 0.25-0.4 m / s) (0.45)

$$t\ c = (15 + 48.3)/0.45 = 123.3\ sec$$

$$P\ e = 3600 * 8 * 0.25 * 0.9/123.3 = 52.5\ m\ 3 / shift$$

The number of concrete trucks from the condition of uninterrupted delivery to the facility

$$N = K\ r * P\ e/b\ P\ a \tag{3.29}$$

Where K r - coefficient taking into account the reserve productivity of mechanisms to driving machines (0.85-0.9)

P out - operational performance of a concrete truck

$$P\ a = (60 * V * T * K)/t\ c \tag{3.30}$$

$$P\ e = k * L * n/100 = 0.72 * 800 * 18\ /100 = 103.7$$

Where L is the displacement of the concrete mixer in l;

n -is the number of batches per hour;

From 0.65 to 0.72 (usually 0.67).

Ts - The duration of the cycle

$$t\ c = (tz+2 * L * 60)/Vcp \tag{3.31}$$

Tz - concrete truck loading time at the factory

$$Tc = (5 + 2 * 21 * 60)\ /38 = 75$$

$$P\ a = (60 * 12 * 8 * 0.92)/75 = 69$$

The number of concrete trucks

$$N = 0.9 * 103.7/69 = 1.45 \approx 2\ pcs.$$

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

3.3 Construction master plan

Basic data needed to develop a construction master plan are:

General plan of the territory with existing and under construction buildings, also underground communication networks;

Schedule for work with a schedule of work needs strength;

Necessary building machines and mechanisms;

The required number of building requirements elements, products and bulk and non-bulk resources;

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

Standard information on the development of building master plans. Generally general building plans can be dredged at various stages of the construction business.

The explanatory notes show the function of the general building plan, its purpose and for what period (e.g. installation of foundation blocks, installation roofing elements or in the installation of structures in general) has been developed.

Required to clarify the requirements enshrined in the base of its implementation. After that we give the necessary calculations and give an explanatory note.

In the explanatory notes, it is necessary to show the drawings of the installation of constructive elements, materials and products, show the design location, its geometric indicators and installation methods.

Calculation of temporary power supply

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

From existing systems or inventory mobile power plants electricity is supplied to the construction. Therefore, when developing graduate these works need to solve the issue of electricity.

Maximum power consumption is set based on a schedule or network schedule of work.

The power of the outdoor lighting network is found by the formula:

$$W\ H.o = K\ c * \Sigma\ P\ O.H. \qquad (3.34)$$

$$.W\ H.o = 1 * 13.69 = 13.69\ kW$$

Mains power for indoor lighting:

$$W\ H.o = 0.8 * 2.4 = 2\ kW$$

Total power consumption for lighting:

$$W\ H.o\ Total = 13.69 + 2 = 15.69\ kW.$$

3.4 Labor protection and safety in construction

3.4.1 General requirements

Organization and execution of work in the construction industry, building materials industry and building industry should carried out subject to the requirements of the "Labor Code of the Republic Kazakhstan ", as well as other regulatory legal acts containing state regulatory requirements for labor protection and safety ":

1) Building codes, design codes and construction;

2) inter sectorial and industry rules and model instructions for the protection and labor safety, approved in the prescribed manner;

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

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

5) State sanitary and epidemiological standards, hygienic regulations, sanitary rules and norms in force in the Republic of Kazakhstan.

Participants in the construction of facilities (customers, designers, contractors, suppliers, as well as manufacturers of building materials and structures, manufacturers of construction machinery and manufacturing equipment) carry statutory liability for violation of requirements regulatory documents specified in clause 5.1.1. And clause 5.1.2.

Responsibility for compliance with safety and labor protection requirements operation of machines, manual electric and pneumatic machines, and technological snap assigned:

- For the technical condition of construction machines, mechanisms, production equipment, tools, technological equipment, including means of protection - to the organization on whose balance they are located, and when transferring them to temporary use (lease) - for an organization (person) specified in the contract;

- For ensuring the requirements of safe work performance – on organizations performing work.

The general contractor or landlord is obliged when performing work on construction sites with subcontractors or tenants:

- To develop, together with them, measures ensuring safe working conditions mandatory for all organizations and persons participating in construction;

- ensure the implementation of planned activities and coordination subcontractors and tenants regarding the implementation of safety measures in the work areas assigned to them.

When performing work on the construction site and sites involving contractors (including individuals engaged in individual labor activity) the person carrying out the construction is obliged:

- develop an action plan together with the involved contractors, providing safe working conditions, mandatory for all organizations and persons involved in the construction;

- ensure the implementation of planned activities and coordination subcontractors and tenants regarding the implementation of safety measures and labor protection in work areas assigned to them;

- When concluding contracts, provide for mutual responsibility parties for the implementation of measures to ensure safe working conditions for the territory of the construction site and work sites.

Before starting construction and installation work on the territory customer and general contractor organizations with subcontractors and the administrations of the current organization are required to issue a certificate of approval for established form. Responsibility for the implementation of activities provided for act of admission, are the leaders of construction organizations and the current organization.

Before starting work in the conditions of production risk, it is necessary to highlight hazardous areas for people within which they are constantly operating or may hazardous production factors, whether or not related to the nature of the work performed.

3.4.2 Organization of production areas, work sites and workers places

Industrial territories (construction and industrial sites enterprises with construction objects, production and sanitary buildings and structures), work areas and jobs must be prepared to ensure safe work.

Preparatory activities must be completed before production begins. works. Compliance with occupational health and safety requirements territories, buildings and structures, work sites and jobs of newly built or reconstructed industrial facilities is determined upon acceptance in operation.

The completion of preparatory work at the construction site should be adopted by the act on the implementation of safety measures.

Production equipment, fixtures and tools used

For the organization of the workplace, must meet the requirements of labor safety and SanPiN (СанПиН) 1.01.002-94.

Production areas, work areas and jobs should be provided with the necessary means of collective or individual protection working, primary firefighting equipment, as well as communications, alarm and other technical means to ensure a safe environment labor in accordance with the requirements of existing regulations.

Places of temporary or permanent residence of workers (sanitary premises, places of rest and walkways for people), when arranging and maintaining production areas, work areas should be located behind outside hazardous areas.

Hazardous areas must be labeled with safety signs and signs. established form.

Movement of goods over ceilings when they get into hazardous areas industrial, residential or office premises where people may be, not allowed.

Admission to the production territory of unauthorized persons, as well as workers in while intoxicated or not employed at work in a given territory is prohibited.

Being on the territory of a construction or production site, in industrial and domestic premises, at work sites and workplaces employees as well as representatives of other organizations are required to comply with the rules internal labor regulations related to labor protection adopted in this organization.

Geographically separate premises, platforms, work sites, workers places must be provided by telephone or radio.

Workers, managers, specialists and employees should be provided overalls, safety shoes and other personal protective equipment, according to

Rules for providing workers with special clothes, special shoes and others personal and collective protective equipment, sanitary premises and devices at the expense of the employer.

4 Economic part

4.1 The Estimated cost of construction

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

The basis of construction is the estimated cost necessary to determine indicator of investment funds for construction, form a price for construction, serves as a guide for customers when purchasing and concluding a contract, payments for work performed by a contract in accordance with applicable law

Republic of Kazakhstan.

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

This section shows the costs, that is, the necessary capital for construction.

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

By drawing up a consolidated estimate, the capital is determined investments.

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

Chapter 1. The costs of preparatory work on the territory.

Chapter 2. The main elements of the object.

Chapter 3. Elements of the service and auxiliary character.

Chapter 4. Elements of the energy economy.

Chapter 5. Objects of transport and communications.

Chapter 6. External networks and constructions of water supply, sewerage, heat supply and gas supply.

Chapter 7. Land improvement and greening.

Chapter 8. Temporary buildings and structures.

Chapter 9. The costs are secondary.

Chapter 10. Directorates of the enterprise.

Chapter 11. Training.

Chapter 12. Survey work and design work.

The cost of construction of buildings and structures of the main and additional appointments are calculated on the basis of SN RK 8.02-01-2002. Cost calculation stage construction.

The cost of construction of estimated structures and buildings of the main and of a secondary nature we find using the general estimated norms in prices 2019 of the year.

For civil engineering, chapter 3 includes an estimate the cost of such objects as: household buildings; checkpoints, greenhouses in hospital and scientific towns; waste

bins, etc .; buildings and constructions cultural and domestic purposes designed to serve workers and located within the territory allotted for the construction of enterprises; environmental work, work to protect cultural monuments, etc.

Page 45

5.2 Calculation of investment costs for construction

Construction investment costs include all customer costs for project and compiled in the form of a consolidated estimated calculation of the cost of construction.

The consolidated estimates of construction costs are additionally included the following cost items:

- The cost of engineer services;
- Training of operational personnel;
- The cost of design and survey work;
- The cost of the examination of design estimates;
- Costs of the implementation of supervision by SNiP RK 1.03-03-2002.

The cost of design and survey work is determined according to the general provisions for determining the cost of design work for construction in the Republic of Kazakhstan (RDS RK 08.02-03-2002, subject to changes from 02.7.2004)

5.3 Technical and economic indicators of the project

For the implementation of the investment project, it is proposed to use borrowed funds. But at the same time, according to the legislation of the Republic of Kazakhstan, 15% of the total investment should be financed at their own expense.

The required capital investment for the construction of the facility is 684,194 million tinge.

At the same time, own funds amount to 102.6 million tinge.

Design and survey works, as well as on-site preparatory work is carried out at their own expense.

The total estimated cost of underground work (local, consolidated, object) object attached to Appendix B.

CONCLUSION

Based on the tasks, a graduation project was launched on the topic "Social residential complex" in Aktau.

After analyzing the designed building, I made several conclusions.

Firstly, the main purpose of a modern social residential building is providing senior citizens with housing for living and providing them social, medical, and other types of services and construction a modern social residential building would make life easier for many citizens of the country, when living in the city of Aktau. The advantage of a residential building is that the projected building is located in the city center and has additional serving condition. Secondly, the building is located in clay soil, which not dangerous during construction in seismic areas. Thirdly, the construction of the sanatorium will last less than a year, which will entail additional investments for a ready-made business platform.

This project is designed for permanent residence of senior citizens in

Aktau city. Since the possibility of developing construction in a given area has great potential due to convenient location and large investment in construction at the present time.

LIST OF USED LITERATURE

1 Building Technology: Student Handbook specialties 1-70 02 01 "Industrial and civil construction", 1-70 02 02

“Expertise and property management” specialties 1-27 01 01-17 “Economics and organization of production (construction)”/ S.N. Leonovich, V.N. Chernoivan. - Minx: BNTU, 2015. -- 505 s.

2 Dzhumagaliev T.K., Kalpenova Z.D. Underground Technology buildings and structures. Assignment and guidelines for the implementation of the course project in the discipline "Technology of building production-1" for students full-time and part-time studies of specialties 5B072900 - "Construction" and

5B042000 - “Architecture”. - Almaty: KazGASA, 2013 - 45 p.

3 NTP RK 02-01-1.1-2011 "Design of concrete and reinforced concrete structures made of heavy concrete without prestressing reinforcement »Astana

2015.

4 SP RK 2.04-01-2017 "Construction climatology".

5 SP RK 2.03-30-2017 "Construction in seismic zones."

SP RK 5.01-102-2013 "Foundations of buildings and structures."

NTP RK 08-01.1-2012 “Design of earthquake-resistant buildings and facilities. Part. General Provisions Seismic effects. "

8 SP RK 3.01-101-2013 "Urban planning. Planning and development urban and rural settlements. “Nine SP RK 2.04-107-2013 "Construction heat engineering".

10 NTP RK 06-01-1.2-2013 "Design of reinforced stone walls on actions of vertical and horizontal loads.”

11 CH RK 3.02-07.2014 "Public buildings and structures."

12 SN RK 3.01-01-2013 "Urban planning. Planning and development urban and rural settlements. "

13 SN RK 2.04-02-2011 “Protection against noise”.

14 SN RK 2.04-01-2011 "Natural and artificial lighting."

15 NTP RK 02-01-1.4-2011 “Designing of prefabricated, precast monolithic and monolithic reinforced concrete structures.”

16 CH RK 2.02-01-2014 "Fire safety of buildings and structures."

17 SN RK 2.01-01-2013 "Protection of building structures from corrosion."

18 NTP RK 02-01.2-2012 "Design of reinforced concrete structures with considering fire resistance.”

19 NTP RK 01-01-5.1-2013 “Impacts on load-bearing structures. Part 1-5.

General effects. Temperature effects. "

20 NTP RK 01-01-3.1 (4.1) -2012 “Loads and impacts on buildings. Snow load. Wind impacts. "

21 Lyashenko T.A. Guidelines for the implementation of the course project -

Tikhoretsk: FSBEI HPE RGUPS, 2016 - 52 p.

22 SN RK 1.03-05-2011 “Labor protection and safety equipment in construction.”

ENiR E4-1 "Installation of prefabricated and monolithic reinforced concrete constructions.”

24 SN RK 1.03-00-2011 "Construction Production"

25 SP RK 5.01-101-2013 "Earthworks, foundations and foundations",
Astana 2015.

26 SP RK 1.04-110-2017 “SURVEY, TECHNICAL ASSESSMENT CONDITIONS AND SEISMIC REINFORCEMENT OF BUILDINGS AND STRUCTURES”, Astana 2017

Annex A

The calculation was performed by the LIRA-SAPR software package.

The calculation is based on the finite element method in movements. The main unknowns are taken the following node movements:

X linear along the x axis

Y linear along the y axis

Z linear along the Z axis

UX angular around the X axis

UY angular around the y axis

UZ angular around the Z axis

The LIRA-SAPR PC implemented the provisions the following regulatory and regulatory documents:

SP 14.13330 2011. Construction in seismic areas. Updated edition of SNiP II-7-81 *.

SP 16.13330 2011. Steel structures. Updated edition of SNiP II-23-81 *.

SP 20.13330 2011. Loads and impacts. Updated edition of SNiP 2.01.07-85 *.

SP 22.13330 2011. Foundations of buildings and structures. Updated edition of SNiP 2.02.01-83 *.

SP 24.13330 2011. Pile foundations. Updated edition of SNiP 2.02.03-85.

SP 35.13330 2011. Bridges and pipes. Updated edition of SNiP 2.05.03–84.

SP 63.13330.2012. Concrete and reinforced concrete structures. The main provisions.

Updated edition of Snip 52-01-2003.

Snip 2.01.07–85 *. Loads and impacts.

Snip 2.03.01–84 *. Concrete and reinforced concrete structures.

Snip II – 7–81 *. Construction in seismic areas.

Snip II – 23–81 *. Steel structures.

Snip 2.02.01–83 *. Foundations of buildings and structures.

Snip II – 21–75. Concrete and reinforced concrete structures.

Snip 2.05.03–84 *. Bridges and pipes.

SP 50-101-2004. Code of rules for design and construction.

Design and arrangement of foundations and foundations of buildings and structures.

MGSN 4.19-05. Moscow city building codes.

Multifunctional high-rise buildings and complexes.

Snip 52–01–2003. Concrete and reinforced concrete structures.

NP-031-01. Design standards for earthquake-resistant nuclear power plants.

Gosatomnadzor of Russia.

DBN B.2.3-14: 2006. Transport facilities. Bridges and pipes. Norms designing.

DBN B.1.2-2: 2006. Loads and impacts. Design Standards.

DBN B.1.1-12: 2006. Construction in seismic regions of Ukraine.

Continuation of Appendix A

DBN B.2.2-24: 2009. Design of high-rise residential and civil structures.

DBN B.2.1-10: 2009. Foundations and foundations of structures.

DBN B.2.6-98: 2009. Concrete and reinforced concrete structures.

DSTU B.V.2.6-156: 2010. Heavy concrete and reinforced concrete structures concrete.

DSTU 3760: 2006. Reinforcing steel for reinforced concrete structures.

SNRA II-2.02-94. Earthquake-resistant construction. Armenia.

KMK 2.01.03-96 *. Construction in seismic areas. Uzbekistan

SNT 2.01.08-99 *. Construction in seismic areas. Turkmenistan.

AzDTN 2.3-1-2010. Construction in seismic areas. Azerbaijan.

SNiP RK 2.03-30-2006. Construction in seismic areas. Kazakhstan.

ISS Thu 07/22/2007. Earthquake-resistant construction. Tajikistan.

The types of finite elements used are indicated in document 1.

In this document, except for the node numbers related to the existing element, the types of stiff nesses are also indicated.

The following types of elements are included in the design scheme:

Type 10. Universal spatial core FE.

Type 41. Universal rectangular CE shell.

Coordinates of nodes and loads given in expanded documents 4,6,7 described in the right Cartesian system coordinates.

The calculation is made for the following downloads:

Load 1 - static load

Load 2 - static load

Load 3 - static load

Boot 4 - static boot

Load 5 - static load

Load 6 - static load

Boot 7 - static boot

Loading 8 - dynamic (seismic of SNiP RK 2.03-30-2006)

The calculation takes into account a given number of Eigen forms oscillations (KF).

The number of dynamic components is equal to the number of forms natural vibrations, according to which the dynamic load. Seismic loads corresponding to each in the form of natural vibrations, calculated according to Niyam building standards of Kazakhstan, Snip RK 2.03-30-2006.

Load 9 - dynamic (seismic of Snip RK 2.03-30-2006)

The calculation takes into account a given number of Eigen forms oscillations (KF).

The number of dynamic components is equal to the number of forms natural vibrations, according to which the dynamic load. Seismic loads corresponding to each in the form of natural vibrations, calculated according to

Continuation of Appendix A

Niyam building standards of Kazakhstan, Snip RK 2.03-30-2006. loading 10 - dynamic (seismic of Snip RK 2.03-30-2006)

The calculation takes into account a given number of Eigen forms oscillations (KF).

The number of dynamic components is equal to the number of forms natural vibrations, according to which the dynamic load. Seismic loads corresponding to each in the form of natural vibrations, calculated according to

Niyam building standards of Kazakhstan, Snip RK 2.03-30-2006.

Design combinations of forces for the rods are selected criterion of extreme normal and shear stresses in the peripheral zones of the section.

Design stress combinations for plate elements are selected according to the criterion of extreme stresses taking into account the direction of the main sites.

When choosing design combinations of efforts,

The following download characteristics:

Load 1 - static load

This load is considered as a constant load.

Load 2 - static load

This load is considered as a constant load.

Load 3 - static load

This load is considered as a constant load.

Boot 4 - static boot

This load is considered as a constant load.

Load 5 - static load

This load is counted as a long-term

Load.

Load 6 - static load

This load is considered as short-term

Load.

Boot 7 - static boot

This load is considered as short-term

Load.

Loading 8 - dynamic (seismic of Snip RK 2.03-30-2006)

This load is considered as a seismic load.

This download is alternating.

Load 9 - dynamic (seismic of Snip RK 2.03-30-2006)

This load is considered as a seismic load.

This download is alternating.

Loading 10 - dynamic (seismic of Snip RK 2.03-30-2006)

This load is considered as a seismic load.

This download is alternating.

The following DCS groups are calculated:

Group A1 - includes only those downloads that have a duration Actions; this group includes permanent, long-term and Short-term downloads; types of downloads - 0, 1, 2.

Group B1 - includes all specified downloads, regardless of duration actions except seismic and other special.

Group C1 - includes group B1 plus seismic loading.

Group D1 - includes group B1 plus special (non-seismic) loading.

Group A2 - includes only constant and long loads; types of downloads - 0, 1.

Group B2 - includes continuous, long and short-term downloads

(Besides instant); types of downloads - 0, 1, 2.

Group C2 - includes all specified downloads, regardless of duration actions except seismic and other special.

Group D2 - includes group C2 plus seismic loading.

The calculated combinations form 4 result tables:

Table 1 - DCS calculated, calculated by the calculated values of efforts.

Table 2 - DCS calculated long-term obtained by multiplication estimated effort on appropriate duration factors.

Table 3 - regulatory DCS obtained by dividing the estimated effort on appropriate load safety factors.

Table 4 - DCS regulatory long-term obtained by multiplication regulatory efforts at appropriate duration factors.

The headings of the DCS tables contain the following indices:

ELM - element number in the circuit;

NS - number of the calculated cross-section in the element (all FE except the rod have one design section);

CRT - the number of criteria by which this combination of efforts in accordance with the type of FE;

ST - column number of combination coefficients from the DCS source data table;

KS - a sign of the presence in the combinations of crane (K) and / or seismic (C) downloads;

G is the index of the internal group - A1, B1, C1, D1, A2, B2, C2, D2.

The following are the stress / stress identifiers according to the type of FE, and then a list of the download numbers that made up the current combination.

Alternating loading included in the DCS with the opposite sign marked with a '-'.

Tables of results for unified DCSs are formed for each design options with the option number.

The headings of the unified DCS tables contain the following indices:

PE - sign of membership of the element;

ELM - serial number of an element in a circuit or in a super element;

NS - number of the calculated cross-section in the element (all FE except the rod have one design section);

KPT - criterion number in accordance with the type of FE;

ST - column number of combination coefficients from the DCS source data table;

KS - a sign of the presence in the combinations of crane (K) and / or seismic (C) downloads;

G is the index of the internal group - A1, B1, C1, D1, A2, B2, C2, D2.

Section 9 for each dynamic (or after modal analysis) downloads prints the values of periods of their own fluctuations.

Section 10 for each dynamic (or modal) loadings print relative displacement values nodes corresponding to the forms of natural vibrations.

Section 11 prints for each dynamic load values of the dynamic load components after its decomposition in the forms of natural vibrations.

Section 17 prints for each dynamic load

The values of the masses collected in knots are given. Dimension of masses indicated in the header of the table.

The first column contains the load number and indexing mass in the remaining columns, the numbers of nodes in ascending order and corresponding quantities.

I N D E K S A C I Y P R A V I L A Z N A K O V

U S I L I Y K K O N E F N Y X E L E M E N T A X

Type 10. Universal spatial core FE.

The finite element perceives the following types of efforts:

N axial force; positive sign resists stretching.

MK torque relative to the axis X1;; corresponds to the action of the moment

Counterclockwise when viewed from the end of the axis

X1, to a section belonging to the end of the rod.

MY bending moment about axis Y1 positive sign corresponds to action torque counterclockwise when viewed from the end of the axis Y1, to the section belonging to the end of the reaping.

MZ bending moment about the axis Z1; a positive sign corresponds to the action of counterclockwise when viewed from

Tsa axis Z1, to a section belonging to the end of the rod.

QY cutting force along the Y1 axis; put-

The solid sign matches the direction forces with the Y1 axis for a section belonging to the end the rod.

QZ cutting force along the Z1 axis; put-

The solid sign matches the direction forces with the Z1 axis for a section belonging to the end the rod.

Type 41. Universal rectangular CE shell.

The finite element perceives the following types of efforts, stresses and reactions:

NX normal stress along the X1 axis; a positive sign corresponds to a stretch.

NY normal stress along the Y1 axis; a positive sign corresponds to a stretch.

Continuation of Appendix A

NZ normal stress along the Z1 axis (for the case flat deformation); positive sign resists stretching.

TXY shear stress, parallel to the X1 axis and lying in the plane, parallel X10Z1; accepted as positive direction coinciding with the direction of the X1 axis, if NY is aligned with the Y1 axis.

MX moment in force on a section orthogonal to the axis X1; positive sign corresponds to the stretching of the lower fiber (relative axis Z1).

MY moment in force on a section orthogonal to the axis Y1; positive sign corresponds to the stretching of the lower fiber (relative axis Z1).

MXY torque; a positive sign corresponds to the curvature of the diagonal - whether 1-4 directed downward bulge (relatively axis Z1).

QX shear force in a section orthogonal to the axis X1;

A positive sign matches direction of force with the direction of the axis Z1 on that part element in which node 1 is missing.

QY cutting force in a section orthogonal to the axis Y1; positive sign matches direction forces with the direction of the Z1 axis on that part of the element, in which node 1 is missing.

RZ soil response (when calculating shells on an elastic base); positive effort acts in the direction of the Z1 axis (soil is stretched).

1. Decision protocol
Calculation Protocol
Date: 04/24/2019
Genuine Intel Intel (R) Core (TM) i5-7200U CPU @ 2.50GHz 4 threads
Microsoft Professional RUS (build 9200), 64-bit
Available Physical Memory Size = 945958400
14:10 Reading source data from file C: \ Users \ Public \ Documents \ LIRA SAPR \ LIRA SAPR 2013 Non Commercial \ Data \ Ali Riza.txt
14:10 Control of the source data of the main circuit
Number of nodes = 41981 (of which the number of undeleted = 41981)
Number of elements = 48805 (of which the number of undeleted = 48805)
MAIN DIAGRAM
14:10 Optimization of the order of the unknown
Number of unknowns = 208532
STATIC LOADING CALCULATION
14:10 Formation of the stiffness matrix
14:10 Formation of load vectors
14:10 Decomposition of the stiffness matrix
14:10 Calculation of the unknown
14:10 Decision control
CALCULATION FOR DYNAMIC LOADS
14:10 Formation of the diagonal matrix of masses for dynamic loading No. 8

Continuation of Appendix A

14:10 Formation of the diagonal matrix of masses for dynamic loading No. 9
14:10 Formation of a diagonal mass matrix for dynamic loading
Number 10
Calculation of natural vibrations for dynamic buzzing No. 8 9 10
Total masses: mX = 1357.54 mY = 1357.54 mZ = 1279.48 mUX = 0 mUY = 0 mUZ = 0
14:10 monitoring the suitability of the circuit for calculating natural oscillations at such an application of the masses. Control is carried out by applying masses as static loads
14:10 Calculation of natural oscillations
14:10 Iteration No. 1
14:11 Iteration No. 2
Found forms 0 (of which 0 in the given range)
14:11 Iteration No. 3
Found forms 0 (of which 0 in the given range)
14:11 Iteration No. 4
Found forms 2 (2 of them in the given range)
14:12 Iteration No. 5
Found forms 3 (3 of them in the given range)
14:12 Iteration No. 6
Found forms 5 (of which 5 in the given range)
14:12 Iteration No. 7
Found forms 7 (7 of them in the given range)
14:13 Iteration number 8
Found forms 9 (of which 9 in the given range)
14:13 Iteration number 9
Found forms 10 (of which 10 in the given range)
14:13 Formation of dynamic load vectors
14:13 Calculation of the unknown
Results Formation
14:13 Topology Formation
14:13 Formation of displacements
14:13 Calculation and formation of efforts in the elements
14:14 Calculation and formation of reactions in elements
14:14 Calculation and formation of diagrams of efforts in the rods
14:14 Calculation and formation of plots of deflections in the rods
14:14 Formation of waveforms
Total nodal loads on the main circuit:
Load 1 PX = 0 PY = 0 PZ = 11002.3 PUX = 8.67535e-014 PUY = -1.15671e-013 PUZ = 0
Load 2 PX = 0 PY = 0 PZ = 1081.23 PUX = 1.37837e-014 PUY = -3.54664e-014

PUZ = 0

Load 3 PX = 0 PY = 0 PZ = 2709 PUX = 4.71845e-015 PUY = -3.31679e-014 PUZ = 0

Load 4 PX = 3.33067e-016 PY = 3.33067e-016 PZ = 0 PUX = 1.33574e-016 PUY = -

1.33574e-016 PUZ = 0

Load 5 PX = 0 PY = 0 PZ = 355.12 PUX = 6.22278e-015 PUY = -1.16936e-014

PUZ = 0

Load 6 PX = 0 PY = 0 PZ = 1109.66 PUX = 1.54154e-014 PUY = -3.52116e-014

PUZ = 0

Load 7 PX = 0 PY = 0 PZ = 687.6 PUX = 7.95197e-015 PUY = -1.98799e-014

PUZ = 0

Load 8-1 PX = -3666.89 PY = 8.5725 PZ = -11.722 PUX = 0 PUY = 0 PUZ = 0

Load 8-5 PX = -163.032 PY = 1.63057 PZ = -97.1048 PUX = 0 PUY = 0 PUZ = 0

Load 8-6 PX = -236.75 PY = 1.48907 PZ = 74.6773 PUX = 0 PUY = 0 PUZ = 0

Load 9-2 PX = -8.95845 PY = -3542.92 PZ = -1.58645 PUX = 0 PUY = 0 PUZ = 0

Load 10-3 PX = 38.1648 PY = 1.64966 PZ = -1475.03 PUX = 0 PUY = 0 PUZ = 0

Load 10-5 PX = -101.151 PY = 1.01167 PZ = -60.2474 PUX = 0 PUY = 0 PUZ = 0

Load 10-7 PX = -1.57756 PY = 0.325146 PZ = -58.0467 PUX = 0 PUY = 0 PUZ = 0

Calculation completed successfully

Elapsed time = 5 min

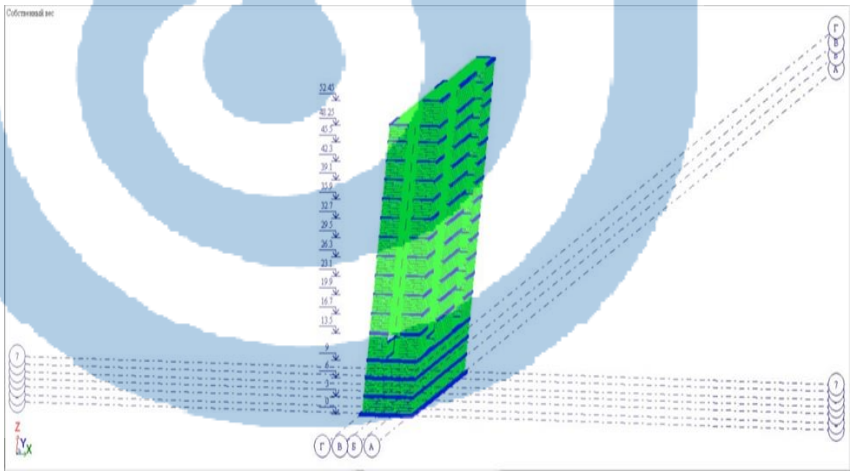

Figure A.1 - Design scheme

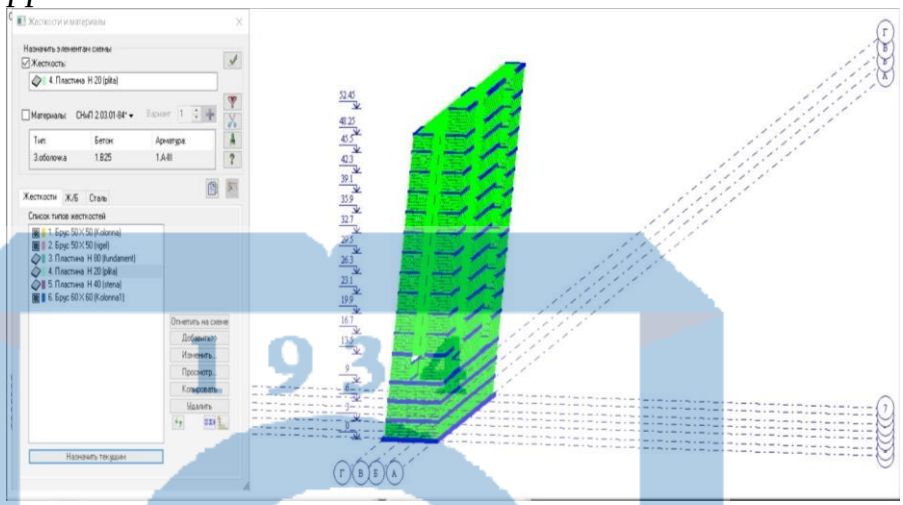

Figure A.2 – Stiffness's

Figure A.3 - Spatial model

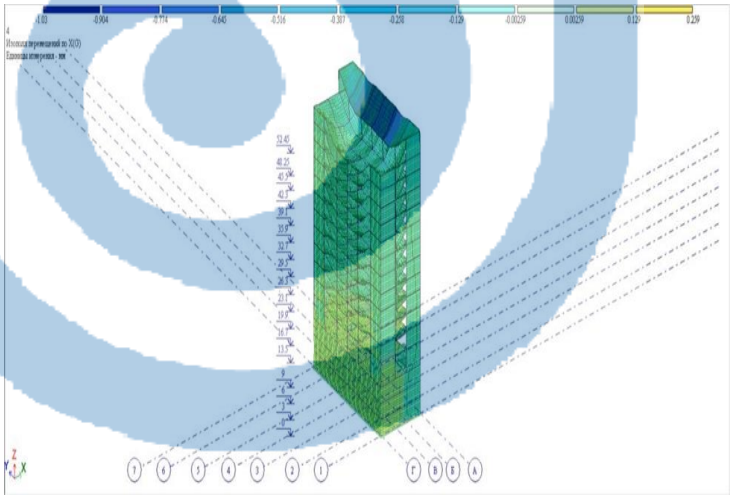

Figure A.4 - Mosaic of displacement from RSN along the X axis

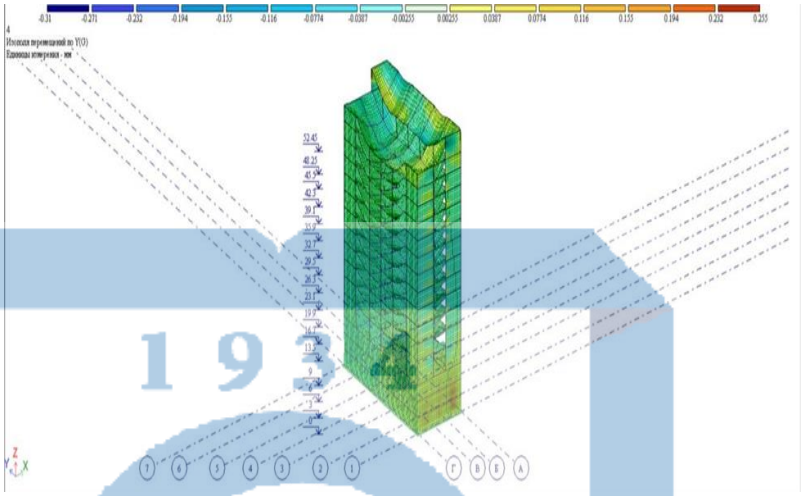

Figure A.5 - Mosaic of displacement from RSN along the Y axis

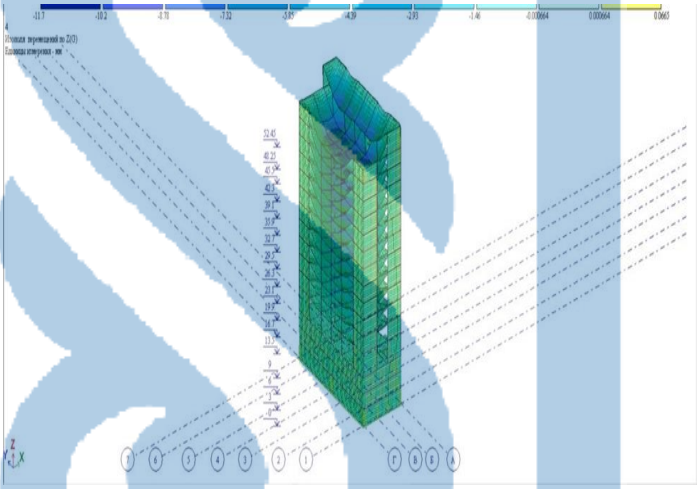

Figure A.6 - Mosaic of displacement from RSN along the Z axis

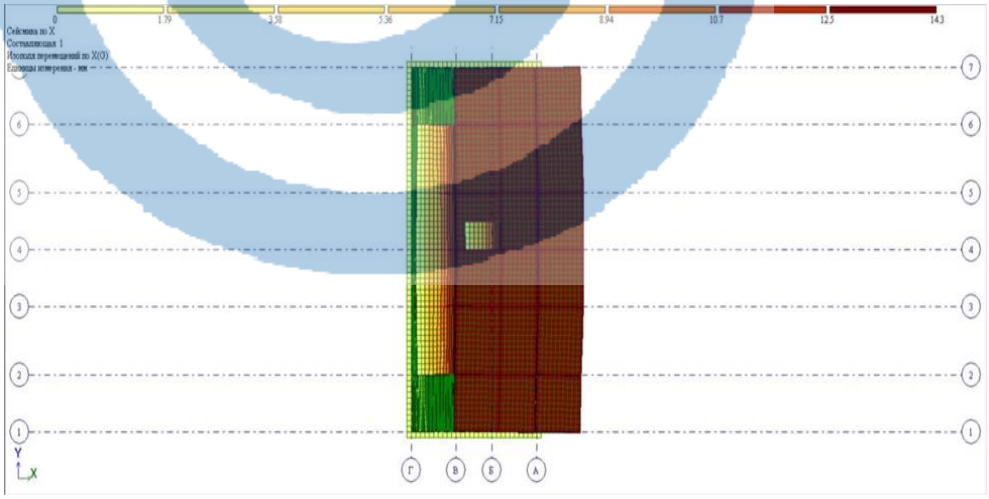

Figure A.7 - Mosaic of movement along the X axis from the Seismic load

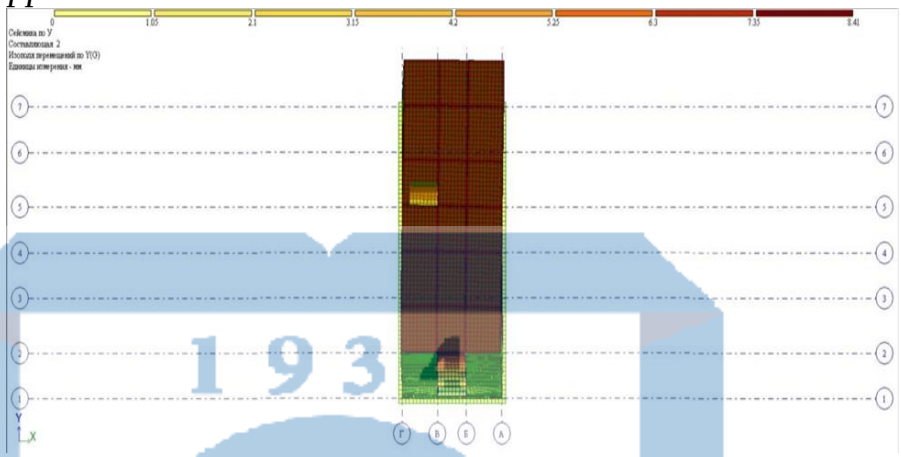

Figure A.8 - Mosaic of displacement along the Y axis from Seismic load

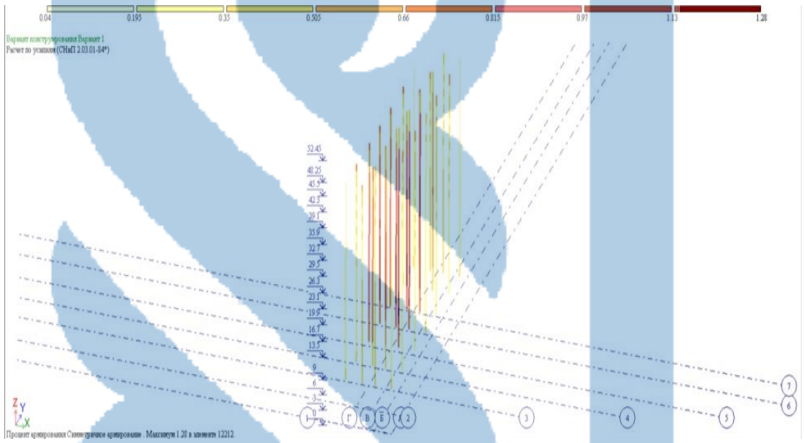

Figure A.9 - Design. Percentage of column reinforcement.

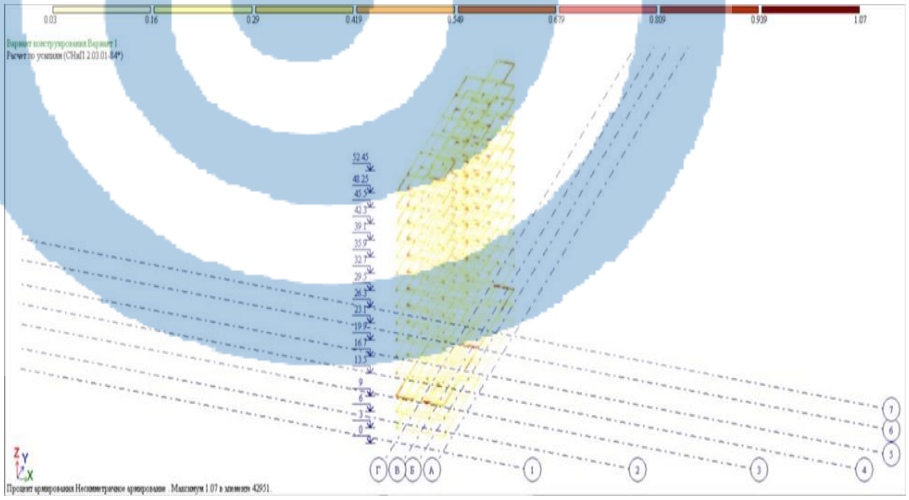

Figure A.10 - Design. Percentage Reinforcement Crossbar

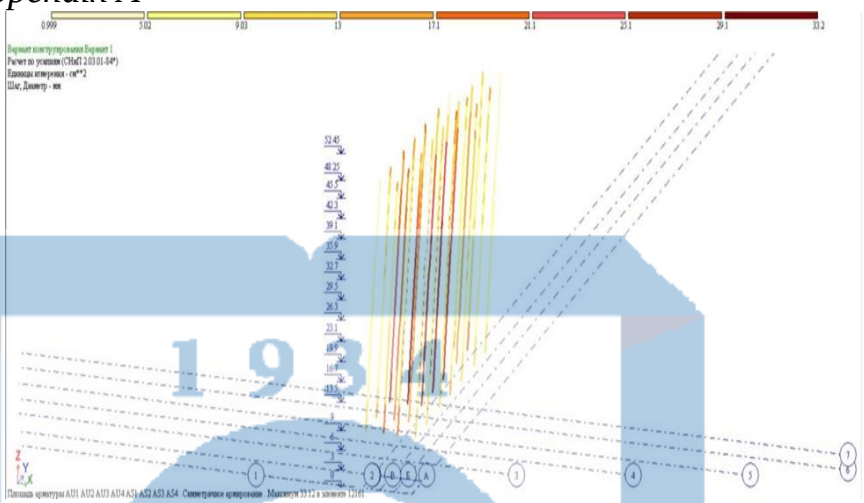

Figure A.11 - Design. Column.

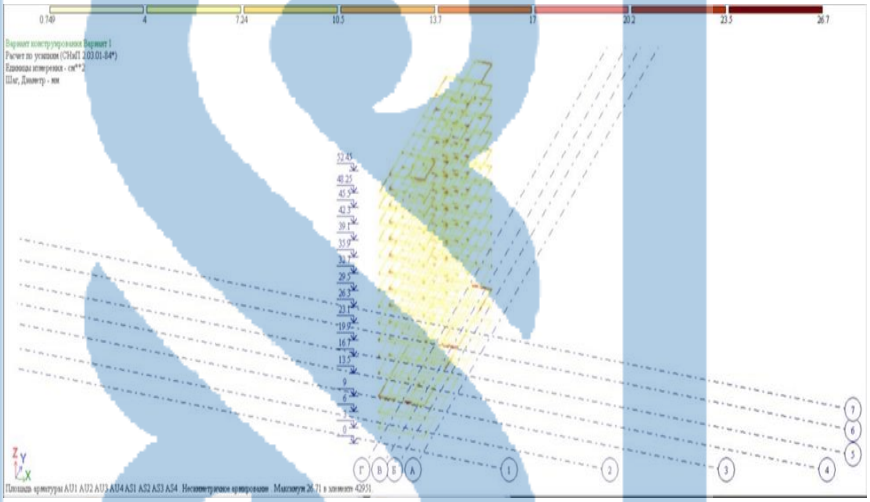

Figure A.11 - Design. Crossbar.

Appendix B

Table B.1 - the Definition of complexity and costing labor

No.	Name of works	ENiR	Unit	amount	Norm of time m / hour	Cost mash. time		Link composition			Norm of time of workers, h / hour	Labor costs		Rate cu	
						Mash / hour	Mash / shift	Profession	Discharge	amount		Hours	Days	Cars.	Working
1	2	3	4	5	6	7	8	9	10	eleven	12	thirteen	14	fifteen	sixteen
1	Device temporary ogre.	9-2-33	m	580	-	-	-	raft Nick	3	1	0.25	145	18.125	-	0.175
2	Cut Rast. layer	2-1-5	1000 m^2	7.88	1.4	11.03	1.38	Ma bus driver	6	1	-	-	-	-	1,418
3	Development soil exc.														
AND)	With loading in t.s.	2-1-8	100 m^3	94.96	2.6	246.89	30.8	Ma bus driver	65	11	-	-	-	-	2,55
B)	To the dump	2-1-8	100 m^3	95.93	2.2	211.05	26.38	Ma bus driver	65	11	-	-	-	-	2.17
4	Manual bottom cleaning foundation pit	2-1-47	1 m^3	360	-	-	-	Earth Ecop	2	1	1.3	468	58.5	-	0.83
5	Device align layer	2-1-57	1 m^3	413.32	-	-	-	Earth Ecop	1	1	0.09	37,198	4.65	-	0,053
6	Monolithic construction device (foundation)														

A)	Formwork device	4-1-37	21 m	153.6	-	-	-	Slesar	43	11	0.39	59.9	7.49	-	0.29	-	44.37
B)	Reinforcemt work	4-1-46	1 t	123.55	-	-	-	Armaturctate	42	11	5,6	691.88	86.5	-	4	-	494
AT)	Concrete lying	4-1-49	31 m	792	-	-	-	Betonschito	42	11	0.22	174.24	21.78	-	0.157	-	124.34
D)	Curing	4-1-54	1002 m	9.9	-	-	-	Betonschito	2	1	0.14	1.386	0.173	-	0.09	-	0.89 1
D)	Formwork	4-1-37	21 m	153.6	-	-	-	Tearary	32	11	0.21	32.25	4	-	0.141	-	21.6
7	Monolithic device (Column)																
AND)	Formwork device	4-1-37	21 m	806.4	-	-	-	Slesar	43	12	0.2	96.768	12.1	-	0,088	-	70.96
B)	Reinforcement work	4-1-46	1 t	3.23	-	-	-	Armaturpike	52	11	8.7	28.1	3.51	-	7.74	-	25
AT)	Concrete lay	4-1-49	31 m	80.64	-	-	-	Beto to	42	11	0.2	17.74	2.22	-	0.157	-	12.6 6
D)	Curing	4-1-54	1002 m	2.016	-	-	-	Betons to	2	1	0.1	0.288	0.036	-	0.09	-	0.18 5
D)	Formwork	4-1-37	21 m	806.4	-	-	-	Tearary	32	12	0.09	72.577	9.1	-	0.059	-	47.57
8	Monolithic device (Basement wall)																

AND)	Formwork device	4-1-37	21 m	1620	-	-	-	Slesar	43	12	0.24	388.8	48.6	-	0.17	-	275.4
B)	Reinforcement work	4-1-46	1 t	224.64	-	-	-	Armatur pike	52	11	fifteen	3369.6	421.2	-	11.63	-	2610.3
AT)	Concrete laying	4-1-49	31 m	720	-	-	-	Beto to	42	11	0.79	568.8	71.1	-	0.565	-	406.8
D)	Curing	4-1-54	1002 m	eighte n	-	-	-	Betons to	2	1	0.14	2.52	0.315	-	0.09	-	1.62
D)	Formwork	4-1-37	21 m	1620	-	-	-	Tear ary	32	12	0.14	1226.8	28.35	-	0.09	-	145.8
9	Monolithic device (Plate perek.)																
B)	Reinforcement work	4-1-46	1 t	7.2	-	-	-	Armatur pike	42	11	thirteen	93.6	11.7	-	9.3	-	
AT)	Concrete laying	4-1-49	31 m	180	-	-	-	Betonsch t to	42	11	0.81	145.8	18.22	-	0.579	-	
D)	Curing	4-1-54	1002 m	9	-	-	-	Beto to	2	1	0.14	1.26	0.16	-	0.09	-	
D)	Formwork	4-	2	806.	-	-	-	Tear	3	1	0.09	72.5	9.1	-	0.06	-	

		1-37	1 m	4				ary	2	1		7					
10	Foundation waterproofing	4-3-185	2 1 m	900	-	-	-	Izlorov Shchik	43 2	11 1	0.41	369	46.12	-	0.291	-	
eleven	backfilling	2-1-34	1003 m	95.93	0.62	59.47	7.43	Mashinis t	6	1	-	-	-	0.657	-	63	
12	Soil compaction	2-1-31	1003 m	*479.65*	0.41	196.6 5	24.5 8	Mashinis t	6	1	-	-	-	0.435	-	208. 65	
13	Elevated part (on the 1st floor)																
14	Shuttering work	4-1-37	21 m	2090,08	-	-	-	Slesar	43	12	0.24	501.6	62.7	-	0.175	-	365 764
A)	Racks (scaffolding)	4-1-33	100 m	16.62	-	-	-	Raft Nick	43	12	6	99.72	12.465	-	4.38	-	72.8
15	Reinforcing work																
AND)	Grid	4-1-44	1 PC.	280	-	-	-	Armatur pike	42	13	0.42	117.6	14.7	-	0.285	-	79.8
B)	Rods	4-1-46	1 t	28.56	-	-	-	Armatur pike	52	11	10	285.6	35.7	-	7.75	-	221, 34

16	Concrete ave. sl																
AND)	Stacking	4-1-49	1 m3	354.368	-	-	-	Beto nschi	42	11	1,1	389.8	48.7	-	0.787	-	278,88
B)	Care	4-1-54	100 m2	854	-	-	-	Beto to	2	1	0.14	119.56	14.9	-	0.09	-	76.86
17	Dismantling formwork	4-1-37	1 m2	2090,08	-	-	-	Sles ar	32	12	0.14	292.6	36.57	-	0,092	-	192,3

Appendix C

QUESTIONS PK 2018 Trial - 68 - (18) 5B072900_sv_
Appendix 4 to the normative document for the determination of the estimated cost of construction in the Republic of Kazakhstan

Form 2

Customer Nabil Bahadur Nawidullah
(name of company)
Approved / Approved
Estimated construction cost in the amount of 684194 thousand tinge, including:
Value added tax 77,306,624 thousand tinge

" " 20 g.
Compiled at current prices as of 2019.
House
(name of construction site)

No. p / p	No. of estimates and calculations, other documents	Names of chapters, objects, works and costs	Estimated cost, thousand tenge			In total, thousands of tenge
			construction works	equipment, furniture and inventory	other expenses	
1	2	3	4	5	6	7
1	02-001	**Chapter 2. The main objects of construction**				177642.435
2 3	02-001-001	Underground ZhK General 177642.435				177642.435
4	02-002	construction work Overhead ZhK				412416.198
	02-002-001	177642.435				412416.198
5		Installation work 412416.198				590058.633
		Total for Chapter 2412416.198				590058.633
	NDZ RK 04/08/2015, Table 1 p. 36	**Total for Chapters 1 - 7** 590058.633				
		Chapter 8. Temporary buildings and structures 590058.633				8850.879
		Funds for the construction and dismantling of titular temporary buildings and structures.				

		Type of construction: Housing and civil construction in the cities and workers' settlements of the School, kindergartens, nurseries, shops, administrative buildings, cinemas, theaters, art galleries and others civil engineering buildings - 1.5%	8850.879			

Total for Chapter 8

Total for Chapters 1 - 8

Total chapters 1 - 9

Unforeseen work and costs - 2 %

1	2	3	4	5	6	7
7	Code of the Republic of Kazakhstan dated 10.12.2008 No. 99-IV, Art. 268	**Total estimated cost** Value Added Tax (VAT) - 12 % **Total Estimated**	610887.702 610887.702		73306.524 73306.524	610887.702 73306.524 684194.226

Project Manager
Signature (initials, surname)

Chief Project Engineer
Signature (initials, surname)

Head of Department
(name) signature (initials, surname)

		Chapter 2. The main objects of construction				
1	02-001					177642.435
2 3	02-001-001	Underground ZhK General	177642.435			177642.435
4	02-002	construction work Overhead ZhK				412416.198
	02-002-001	177642.435				412416.198
5		Installation work	412416.198			590058.633
		Total for Chapter 2	412416.198			590058.633
	NDZ RK 04/08/2015, Table 1 p. 36	**Total for Chapters 1 - 7** 590058.633				
		Chapter 8. Temporary buildings and structures 590058.633				8850.879
		Funds for the construction and dismantling of titular temporary buildings and structures. Type of construction: Housing and civil construction in the cities and workers' settlements of the School, kindergartens, nurseries, shops, administrative buildings, cinemas, theaters, art galleries and others civil engineering buildings - 1.5%	8850.879			

Total for Chapter 8

Total for Chapters 1 - 8

Total chapters 1 - 9

Unforeseen work and costs - 2 %

1	2	3	4	5	6	7
7	Code of the Republic of Kazakhstan dated 10.12.2008 No.	**Total estimated cost**	610887.702			610887.702
		Value Added Tax (VAT) - 12 %			73306.524	73306.524
			610887.702		73306.524	684194.226

	99-IV, Art. 268	**Total Estimated**				

Project Manager
signature (initials, surname)

Chief Project Engineer
signature (initials, surname)

Head of Department
(name) signature (initials, surname)

Appendix D

ESTIMATES PK 2018 Trial - 70 - (18) 5B072900_ls_02-001-001
Appendix 2
to the normative document for the determination of the estimated cost of construction in the Republic of Kazakhstan

Form 4

Name of the building Residential building Name of the object Underground Residential building on the General construction work
(Name of work and costs)

Base:

Estimated cost 177,642,435 thousand tenge Estimated salary 21,953,383 thousand tenge Normative labor input 16.09484 thousand man-hours Compiled (a) at current prices as of 2019.

No. p/p	Code of codes, resource code	Name of work and costs	unit of measurement	amount	Unit cost, tenge		Total cost, tenge			Overhead, tenge	Total cost with HP and SP, tenge
					Total	machine operation	Total	machine operation	materials		
					salary of construction workers	including salary of drivers	salary of construction workers	including salary of drivers	equipment, furniture, inventory	Estimated profit, tenge	
1	2	3	4	5	6	7	8	9	10	eleven	12
1	1110-0113-0101	Coef. to take into account the influence of the conditions of construction and special construction works: 1.15 - Construction of engineering networks and structures, as well as housing and civil facilities in the cramped conditions of the built-up part of cities									
2	1101-0207-	Section No. 1 Earthwork Fences are deaf. Polem2 fence 1600.05766.63324.51 92266145192194528387 Mounting Device			2611.88	132.61	4,179,00	21217	-	3952066 105429	14232974

	1302						8	7		4	
		Shrubs and light forests are medium. Cutting in soil of natural occurrence with brush cutters on a tractor 79 kW (108 ls)	ha	7.88	12228.11	12228.11	96358	96358	-	22209	128052
					-	3914.47	-	30846	-	9485	

1	2	3	4	5	6	7	8	9	10	eleven	12
3	1101-0102-0302	Soils of 2 groups. Development with loading on dump trucks by excavators with a bucket with a capacity of 1 m3	m3 of soil	9496.0	190.50	179.99	1808985	1709206	994	409692	2396171
4					10.40	49.52	98785	470232	-	177494	
5	1101-0101-0302	Soils of 2 groups. Development into a dump with excavators	m3 of soil	9593.0	134.77	127.68	1292839	1224805	-	266171	1683731
					7.09	31.44	68034	301648	-	124721	

	1101-0205-0802	" Dragline ", " Backhoe " with a bucket with a capacity of 1 (1 - 1.2) m3										
		Soils of 2 groups.	m3 of soil	360.0	1615.41	149.59	581547	53854	-	396916	1056740	
		Manual development in moving pits mobile conveyors			1465.81	65.50	527693	23579	-	78277		
6	1137-0103-0104	Sand preparation for structures. Device	m3 of concrete, gravel or sand in the structure	201.6	3840.48	372.92	774240	75181	411923	292318	1151883	
					1424.29	169.12	287136	34093	-	85325		
7		Trenches and pits.	m3 of soil	9593.0	22.19	22.19	212835	21283	-	64985	300046	
8	1101-0104-0405	Filling with bulldozers with a capacity of 79 kW (108 l s) when moving soil up to 5 m. Soil group 2			-	9.41	-	90257	-	22226		
9	1101-0201-010	Priming. Sealing with trailed rollers on a pneumatic wheel 25	m3 compacted soil	47965.0	92.15	92.15	4419910	4419910	-	1320734	6199896	
					-	38.24	-	1834353	-	459252		

	1 1108-0101-0303	tons. First pass along one track with a layer thickness of 25 cm Walls, foundations. Horizontal waterproofing in 2 layers	m2 surface	900.0	2056.29 291.71	51.62 12.13	1850657 262540	46462 10918	1541655 -	254316 168398	2273371
		Total section number 1					2026398 5	8357830	6482959	6979407	2942286 4

542 3 1963 008 103 -

2179472

Total section 29422864

including:

- salary of construction workers 5423196 tenge
- the cost of operating the machines tinge 8357830
- including the salary of drivers tinge 3008103 tenge
- materials, products and structures 6482959

1	2	3	4	5	6	7	8	9	10	eleven	12
		- overhead costs - estimated profit	tenge tenge	792.0 m3	14702.32 1407.76	1397.02 352.85	6979407 2179472 1164423 3 1114947	1106436 279457	942285 -	1268908 1033051	13946192
10 eleven	1106-0101-0114	Section No. 2 Foundations Base									

12	2105-0301-3202 2105-0301-3001	concrete slabs flat. Device									
		Hot-rolled reinforcing steel of a periodic profile of class A-III (A400) with a diameter of 14 to 32 mm ST RK 2591201 4	t	123.55	207694.00	-	25660594 2601468 39906295		25660594	-	27713442 2052848
thirteen 14		Hot rolled reinforcing steel smooth class A-I (A240) with a diameter of 6 to 12 mm ST RK 2591-2014	t	12.0	216789.00	-			2601468	-	2809585 2081117
	1106	Total section		80.6	38230.5	7220.		1106436	37684912	1268908	44469

	-0501-0104 2105-0301-3001	number 2 Total section: including: - salary of construction workers - the cost of operating the machines - including the salary of drivers - materials, products and structures - overhead costs - estimated profit Section No. 3 Frame	tenge tenge tenge tenge tenge tenge m3	4	4 15679.56	69 1765.93	1114947444692199 1114947 1106436 279457 37684912 1268908 32940163082912 1264400	279457582277 142404	-1236235 -	3294016128019 349048	19471215 2

		Reinforced concrete columns in wooden formwork up to 4 m high, perimeter up to 2 m. Device										
		Hot rolled reinforcing steel smooth class A-I (A240) with a diameter of 6 to 12 mm ST RK 2591-2014	t	0.32	216789.00	-	69372		69372	-	74922
					-	-		-	-	5550	

1	2	3	4	5	6	7	8	9	10	eleven	12
fifteen	2105-0301-3202	Hot-rolled reinforcing steel of a periodic profile of class A-III (A400) with a diameter of 14 to 32 mm ST RK 25912014	t	3.23	207694.00	-	670852		670852	-	724520
					-	-	3823136	-	-	53668	
		Total section number 3						582277	1976459	1280192	5511594

		Total section: including: - salary of construction workers - the cost of operating the machines - including the salary of drivers	tenge tenge tenge tenge tenge			12644000 5511594 12644000 582277 142404	142404	-	408266	

- materials, products and structures	tenge				1976459				
	tenge				1280192				
- overhead costs	tenge				408266				
- estimated profit									
Section No. 4 Walls	m3	720.0	30303.33	4273.30	21818396	3076774	1096938 5	7713885	31894863
Reinforced concrete walls and partitions up to 3 m high, up to 500 mm thick. Device			10794.77	978.56	7772237	704560	-	2362582	
Hot rolled reinforcing steel smooth class A-I (A240) with a diameter of 6 to 12 mm ST RK 2591-2014	t	22.46	216789.00	-	4869081		4869081	-	5258607
			-	-	46656380	-	-	389526	
Hot-rolled reinforcing steel of a periodic profile of class A-III (A400) with a diameter of 14 to 32 mm ST RK 25912014	t	224.64	207694.00	-	73343857		4665638 0	-	5038889 0
			-	-		-	-	3732510	
Total section number 4						3076774	6249484 6	7713885	87542360
Total section:	tenge				7772237 87542360	704560	-	6484618	
including:									
- salary of	tenge								

construction workers					7772237						

1106-0601-0205
2105-0301-3001
2105-0301-3202

1	2	3	4	5	6	7	8	9	10	eleven	12
nineteen twenty 21	2105-0301-3202 2105-0301-3001 1106-0801-0101	- the cost of operating the machines - including the salary oft drivers - materials, products and structures - overhead costs - estimated profit Section No. 5 Overlap Hot-rolled reinforcing steel of a periodic profile of class A-III (A400) with a diameter of 14 to 32 mm ST RK 25912014	tenge tenge tenge tenge	7.2	207694.00 -	- -	3076774 704560 6249484677138856484618149397 1560886210475	- -	14953 97 -	- 1196 32	16150 29
		Hot rolled reinforcing steel smooth class A-I (A240) with a	t	0.72	216789.00 -	- -		- -	15608 8 -	- 1248 7	16857 5

		diameter of 6 to 12 mm ST RK 2591-2014									
		Bezel-less overlappings up to 200 mm thick. The device at a height of from the reference area to 6 m	m3	180.0	34502.64	2158.41		388513	3676374	2042112	8912794
					11919.93	547.17	2145588	98491	-	660207	
		Total section number 5					7861960	388513	5327859	2042112	10696398
		Total section:	tenge				2145588	98491	-	792326	
		including:	tenge				10696398				
		- salary of construction workers	tenge				2145588				
		- the cost of operating the machines	tenge				388513				
		- including the salary of drivers	tenge				98491				
		- materials, products and structures	tenge				5327859		11396 7035	1928 4504	17764 2435
		- overhead costs	tenge				2042112	135 118 30			
		- estimated profit	tenge				792326				
		Total estimate					1451992 33				
		Total estimate:					1772036 817764	423 301 5	-	1315 8698	

							2435				
	2	3	4	5	6	7	8	9	10	eleven	12
		including: - salary of construction workers	tenge				17720368				
		- the cost of operating the machines	tenge				13511830				
		- including the salary of drivers	tenge				4233015				
		- materials, products and structures	tenge				11396 7035				
		- overhead	tenge				19284 504				
		- estimated profit	tenge				13158 698				

Compiled
position, signature (initials, last name)
Checked
position, signature (initials, last name)

Appendix G

to the normative document for the determination of the estimated cost of construction in the Republic of Kazakhstan

Form 4

Name of the building Residential building Name of the object Aboveground Residential building _____ on the
Installation work
(name of work and costs)

Base:

Estimated cost 412416.198 thousand tenge. Estimated
wages 71669.171 thousand tenge. Standard labor input 54.40777 thousand people-h
Compiled (a) at current prices as of 2019.

No. p/p	Code of codes, resource code	Name of work and costs	unit of measurement	amount	Unit cost, tenge		Total cost, tenge			Overhead, tenge
					Total	machine operation	Total	machine operation	materials	
					salary of construction workers	including salary of drivers	salary of construction workers	including salary of drivers	equipment, furniture, inventory	Estimated profit, tenge

1	2	3	4	5	6	7	8	9	10	eleven
1		Coef. to take into account the influence of the conditions of construction and special construction works: 1.15 - Construction of engineering networks and structures, as well as housing and civil facilities in the cramped conditions of the built-up part of cities								
2	2105-0301-3202	Hot-rolled reinforcing steel of a periodic profile of class A-III (A400) with a diameter of 14 to 32 mm ST RK 2591-2014	t	609.77	207694.00 - 126645570	- 126645570	14676615	-	-	10131646
3	2105-0301-3001	Hot rolled reinforcing steel smooth class A-I (A240) with a diameter of 6 to 12 mm ST RK 2591-2014	t	67.7	216789.00	-		-	14676615	-
	1106-0501-0201				-	-	25639279	-	-	1174129
		Columns of civil buildings in metal formwor	m3	384.38	66702.95	32925.48		12655897	5373472	9752336
					19797.88	8083.00	7609910	3106943	-	2831329

		k. Device									
1	2	3	4	5	6	7	8	9	10	eleven	12
4	1106-0601-5025	Reinforced concrete walls and partitions up to 3 m high, up to 500 mm thick. Device	m3	594.0	30303.33	4273.30	18000174	2538337	9049741	6363956	26313260
					10794.77	978.56	6412096	581262	-	1949130	
6	1106-0701-0102	Beams for floors, crane and strapping up to a height of 500 mm. The device at a height of from the reference platform to 6 m	m3	1144.0	48143.89	7276.28	55076608	8324070	22389731	23912063	85307765
					21296.16	1673.24	24362807	1914185	-	6319094	
	1106-0801-0101	Bezel-less overlappings up to 200 mm thick. The device at a height of from the reference area to 6 m	m3	2220.4	34502.64	2158.41	76609658	4792527	45350110	25190591	109944269
					11919.93	547.17	26467021	1214947	-	8144020	
		Total estimate					316647904	28310831	22348539	65218946	412416198

	Total estimate:	tenge				64851834 41241619 8	6817337	-	3054934 8
	including:	tenge							
	- salary of construction workers	tenge				64851834			
	- the cost of operating the machines	tenge				28310831			
	- including the salary of drivers	tenge				68173378			
	- materials, products and structures	tenge				22348523 9			
	- overhead costs	tenge				65218946			
	- estimated profit	tenge				30549348			

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position, signature (initials, last name)

Checked
position, signature (initials, last name)

Appendix F

ESTIMATES PK 2018 Trial - 78 - (18) 5B072900 SRV 02-001-001

Appendix 11 to the State standard for determining the estimated cost of construction in the Republic of Kazakhstan form

Name of construction Residential building

Name of the object Underground Residential building

Consolidated resource sheet No. 02-001-001 for a building, structure, facility, construction

General construction work

(name of the building, structure, object, construction site)

Base:

Local resource sheets (estimates)

No. p / p	Resource Codes	Name of resources	unit of measurement	amount	Cost, thousand tenge	
					per unit of measure	common
1	2	3	4	5	6	7
Labor costs						
1	0101-0101-0132	Labor costs of construction workers (average bit 3.2)	people -hours	6968.2852	1.31100	9135.422
2	0101-0101-0133	Labor costs of construction workers (average discharge 3.3)	people -hours	3128.0	1.33600	4179.008
3	0101-0101-0131	Labor costs of construction workers (average bit 3.1)	people -hours	1668.42	1.28600	2145.588
4	0101-0101-0130	Labor costs of construction workers (average discharge 3)	people -hours	1509.651	1.26200	1905.180
5	0101-0101-0134	Labor costs of construction workers (average bit 3.4)	people -hours	210.9744	1.36100	287.136
6	0101-0101-0120	Labor costs of construction workers (average discharge 2)	people -hours	64.4266	1.05600	68.034
7	0101-0102-0100	Labor costs of engine drivers	man-hours	2545.0895	-	-
Weighted average rank 3.2						
Total PHOT: 17720.368						
Machines and mechanisms by type						
Bulldozers						
1	3101-0101-0103	Bulldozers, 79 kW (108 h.p.)	engine-hours	885.307835	5.07700	4494.708

Crawler Excavators

2 3101-0201-0104 bucket, diesel at mash.-h 303.911765 8.74200 2656.797 tracked, 1 m3

Vibrators

3 3104-0101-0101 Vibrator deep mash.-h 463.212677 0.03700 17.139

4 3104-0101-0201 Vibrator surface mach.-h 99.2772 0.01500 1.489

Mobile and stationary tower cranes

5 3105-0101-0102 Tower cranes, 8 t mach.-h 763.727328 6.17700 4717.544

Jib cranes on the road

6 3105-0102-0102 Cranes on the road, 10 t mach.-h 100.849222 5.20700 525.122

Jib Crawler Cranes

1	2	3	4	5	6	7
7	3105-0104-0201	Crawler-mounted cranes for hydropower construction, 16 t	mach-h	16.854768	4.03500	68.009

Forklift trucks

8 3105-0501-0101 Forklift trucks, 5 t mach.-h 5.504047 4.68900 25.808

Conveyors

9 3105-0503-0102 Belt conveyors, mobile , machine-hour length 60.858 0.63700 38.767
15 m

10 3105-0503-0101 Belt conveyors, mobile , machine-hour length 40.4478 0.37300 15.087 up to
10 m

Other electrical equipment

11 3106-0103-0501 DC installations for manual mach-hour 1495.321632 0.16600 248.223
arc welding

Trailed road rollers

12 3201-0102-0301 Trailed road rollers for machine-hours 75.568857 0.73600 55.619
pneumatic wheels, 25 t

Bitumen boilers

13 3201-0201-0101 Mobile bitumen boilers, 400 l mach.-h 53.3255 0.72300 38.554

Machines for planting plants and others

14 3206-0102-0701 Mounted brush cutters on a tractor, 79 kW (108 mph 17.12718 5.62600 96.358 hp) hydraulically controlled

On-board cars

15 3301-0201-0101 Onboard vehicles, up to 5 t engine-hour 50.024595 2.89100 144.621

Crawler tractors

16 3304-0101-0102 Crawler tractors, 79 kW (108 mph 75.568857 4.75900 359.632 hp)

Cutting tool

17 3403-0102-0201 saws , electric chain mash.-hours 38.681584 0.07500 2.901 Planers

18	3403-0201-0101 Planers, electric mach.-h 29.44 Hammers, drills, screwdrivers, wrenches, construction guns				0.12200 3.592	
19	3403-0302-0301 Drills electric mach-h 154.928 Total for construction vehicles and 13511.829 including pay of drivers of tenge 4233.017				0.01200 1.859 mechanisms:	
Contractor Supply Materials						
Dense rock crushed stone for construction work						
1	2101-0201-0604 Crushed stone from dense rocks for 0.994 construction fraction 40-70 mm ST RK 1284-2004				m3 0.37984 2.61800 works M1000,	
Natural sand for construction work						
2	2101-0401-0101 Natural sand GOST 8736-2014 m3				211.68	1.65500 350.330
General purpose concrete						
3	2102-0101-0601 Heavy concrete, class B15, GOST 7473-2010 m3				995.3496	12.42700 12369.209
4	2102-0101-0301 Heavy concrete, class B7.5 GOST 7473-2010 m3				807.84	11.38600 9198.066
Mortar solutions						
5	2102-0401-2801 Mortar ready masonry heavy m3				22.5	9.57800 215.505

cement grade M25 GOST 28013-98

Ceramic brick

1	2	3	4	5	6	7
6	2103-0101-0103	Brick ceramic unary ordinary corpulent brand M100, dimensions 250 mm x 120 mm x 65 mm GOST 530-2012	1000 pcs	0.8	25.99600	20.797

Fittings

7 2105-0301-3202 Hot-rolled reinforcing steel t 358.62 207.69400 74483.222 periodic profile of class A-III (A400) with a diameter of 14 to 32 mm ST RK 2591-2014

8 2105-0301-3001 Hot rolled steel, smooth t 35.5 216.78900 7696.010 Class A-I (A240) with a diameter of 6 to 12 mm ST RK 2591-2014

Wire

9 2105-0307-1007 Light carbon wire, kg 20.88 0.11200 2.339 steel, general purpose, superior quality, heat treated, with a diameter of 1.1 mm GOST 3282-74

Separate structural elements of buildings and structures (columns, beams, trusses, communications, crossbars, racks, etc.)

10 2106-0801-0101 Separate structural elements of buildings t 0.9 463.32700 416.994 and structures with a predominance of hotrolled profiles, the average weight of an assembly unit is up to 0.1 t

Round timber (logs)

11 2107-0101-9901 round timber Softwood sawmills for m3 28.32 31.57200 894.119 construction thickness from 140 mm to 240 mm, length from 3 m to 6.5 m GOST 9463-88

Edged bars and bars

12 2107-0201-0201 Edged softwood bars from 4 m3 in length 16.3616 47.24500 773.004 m to 6.5 m, width from 75 mm to 150 mm, thickness from 40 mm to 75 mm, 2 grades GOST 8486-86

13 2107-0201-0301 Edged softwood bars from 4 m3 in length 12.204 25.49200 311.104 m to 6.5 m, width from 75 mm to 150 mm, thickness from 40 mm to 75 mm, 3 grades GOST 8486-86

14 2107-0201-0203 Edged boards of coniferous species from 4 m3 in length 1.782 57.04600 101.656 m to 6.5 m, a width of 75 mm to 150 mm, a thickness of 150 mm or more, 2 grades GOST 8486-86

Edged boards

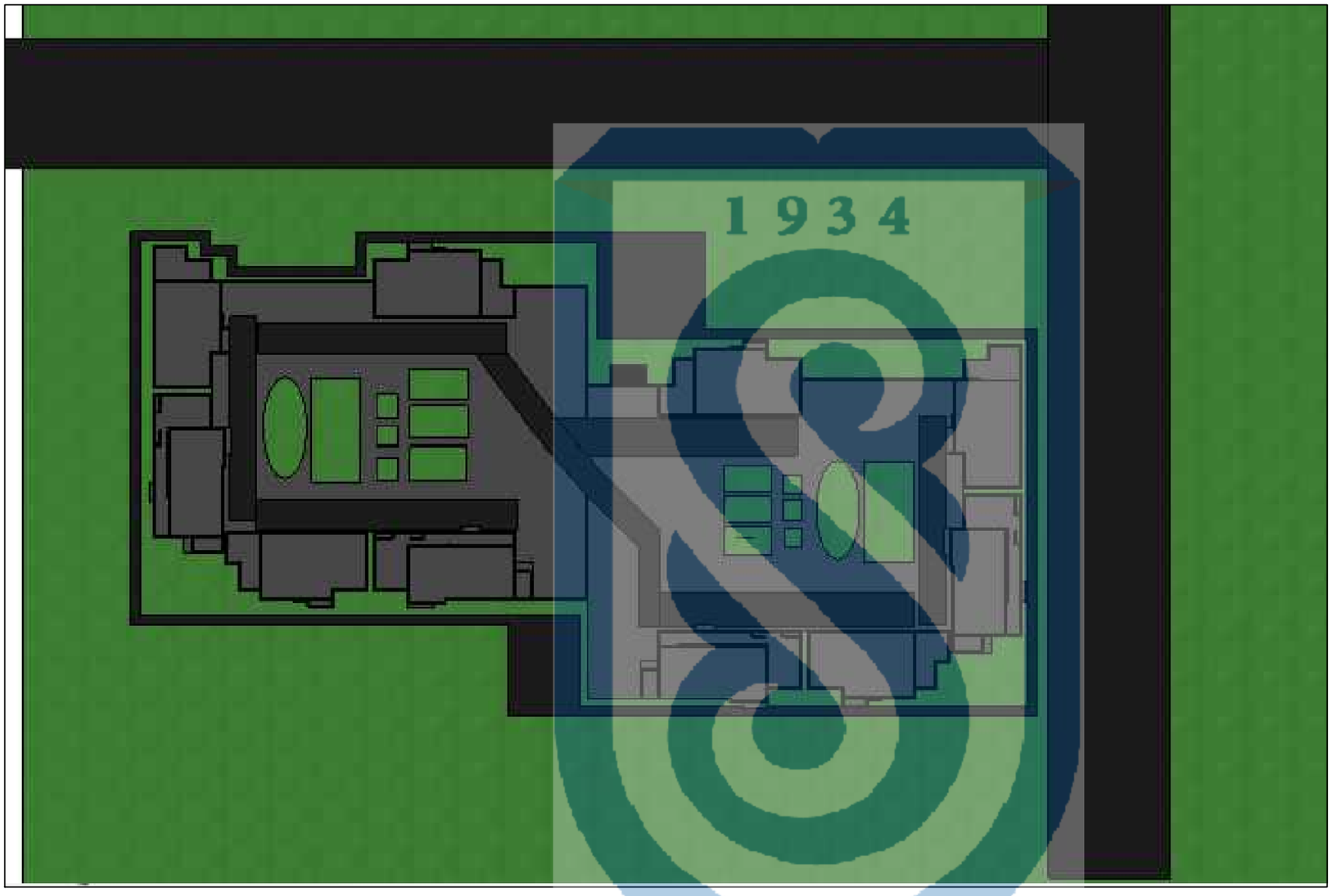
15 2107-0203-0302 Edged boards of coniferous species up to 6.5

		m3 in length 41.44 47.48400 1967.737 m, width from 75 mm to 150, mm thickness from 19 mm to 22 mm, 3 grades GOST 8486-86				
16		2107-0203-0305 Edged boards of coniferous species up to 6.5 m3 in length 16.1748 47.48400 768.044 m, width from 75 mm to 150 mm, thickness 44 mm and more, 3 grades GOST 8486-86				
17		2107-0203-0304 Edged boards of coniferous species up to 6.5 m3 in length 12.8 47.48400 607.795 m, width from 75 mm to 150 mm, thickness from 32 mm to 40 mm, 3 grades GOST 8486-86				

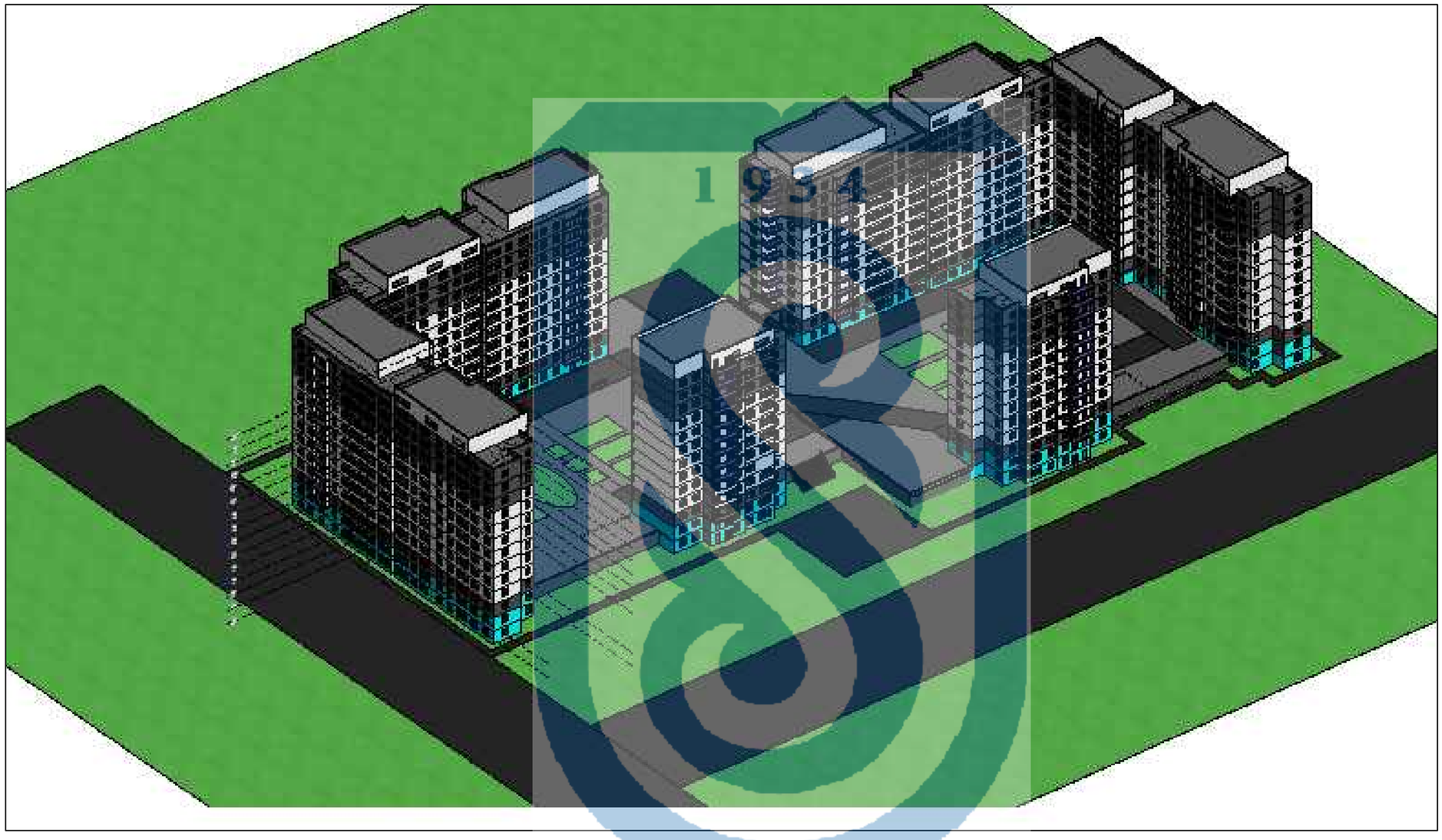
1	2	3	4	5	6	7
eighteen	2107-0203-0405	Boards edging coniferous species length to 6.5 m, a width of 75 mm to 150 mm, thickness 44 mm or more, 4 grade GOST 8486-86	m3	2.84256	21.66800	61.593

nineteen	2107-0203-0303	Boards edging coniferous species length to 6.5 m, a width of 75 mm to 150 mm, thickness 25 mm, grade 3 GOST 8486-86	m3	0.954	47.48400	45.300
Unedged boards						
20	2107-0204-0205	Unedged boards of coniferous species up to 6.5 m, any width, 44 mm or more, 2 grades GOST 8486-86	m3	1.37088	40.66400 20.70200	55.745 104.338
Other products					0.22700	449.460
21	2107-0510-0701	Inventory stands, wood-metal sliding	pcs.	5.04	0.22400 31.84900	846.720 01/192
Ruberoid, glassruberoid, roofing, glassine						
22	2110-0401-1001	Roofing waterproofing TG-350 GOST 1980.0	m2	m2 10923-93	127.57700 499.61100	18.371 323.748
Waterproofing mastics					456.85200	53.360
23	2110-0501-1404	Mastic frost - resistant bituminous-oil MB-50 GOST 30693-2000	kg	3780.0	0.40900 53.70000	313.428 11.599
Lime						
24	2113-0102-0801	Building quicklime lump, grade 1, GOST 9179-77	t	0.596938	0.02900 6.93200	0.213 170.057
Bitumen					211.27300	329.789
25	2113-0104-0103	Bitumen oil construction GOST 6617-76 brand BN 90/10	t	0.144	605.54700 80.24400	103.185 34.152
Bolts					1.02200	814.170
26	2113-0201-0901	Construction bolts			1.25800	35.868

with nuts and washers t 0.648 GOST 1759.0-87			113967.033
27	2113-0201-0902	Construction bolts with nuts with hex head GOST 1759.0-87	t 0.1168
Nails			
28	2113-0209-0401	Construction nails with a flat head GOST 283-75	kg 766.328
Technical fluids			
29	2113-0703-0201	Kerosene for technical purposes, grades KT-1, CT-2	t 0.216
30	2113-0703-1405	Technical water	m3 7.3386
Fabrics			
31	2113-0803-1101	Bag fabric GOST 30090-93 10	m2 24.5322
Accessories, consumables for tools			32
2113-0812-10 Electrodes, d = 4 mm, E42 GOST 9466-75			t 1.56096
Other materials			
33	2113-0816-9902	paste antiseptic	t 0.1704
34	2113-0816-2701	Resin coal	t 0.4256
Shields of formwork, flooring			
35	2701-0101-0104	Boards made of boards, thickness 25 mm	m2 796.644
36	2701-0101-0105	Boards made of boards, thickness 40 mm	m2 28.512
Total contractor supply materials:			

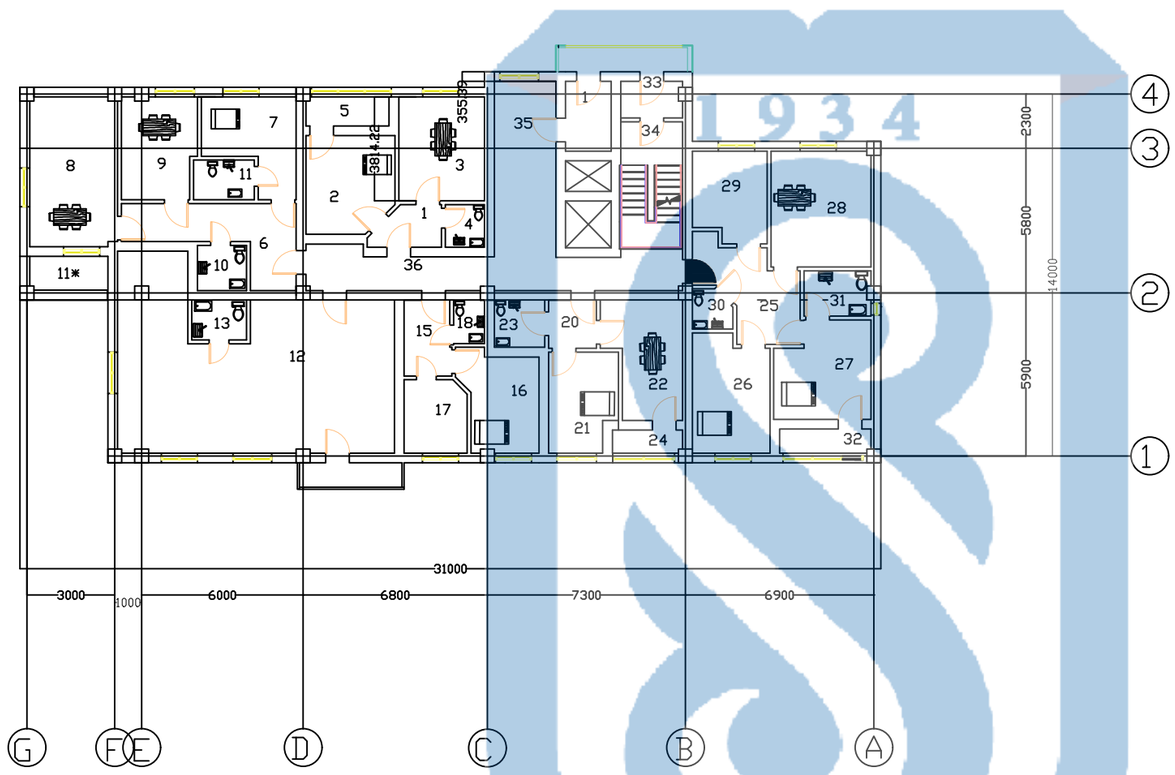


				KazNITU -5B072900 .29-03/2020 DP		
				Multi storey residential complex in Aktau		
name	Document №	Signature	date			
Head of Dep	Akmalayuli K.A.			Architectural part	Level / Sheet / scale	
Superviser	Manizha Paktin				DP / 14 / 1:200	
Consultant	Manizha Paktin					
Controller	Kozyukova.N.V					
Prepared by	N.B.Nawidullah			General plan	Department of Construction and Building Materials	



				KazNITU -5B072900 .29-03/2020 DP		
				Multi storey residential complex in Aktau		
name	Document №	Signature	date			
Head of Dep	Akmalayuli K.A.			Architectural part	Level / Sheet / scale	
Superviser	Manizha Paktin				DP / 15 / 1:200	
Consultant	Manizha Paktin					
Controller	Kozyukova.N.V			Facade	Department of Construction and Building Materials	
Prepared by	N.B.Nawidullah					

First floor of building(A)



FLATS	NUMBERS	Names	Area
firstflat	1	corredor	4.22
	2	bedroom	14
	3	dining room	14
	4	bathroom	3.42
	5	porch	4
second flat	6	corredor	8
	7	bedroom	12
	8	Guest room	18
	9	Diningroom	11.8
	10	bathroom	4.1
	11	kids room	4.2
third flat	12	dining room	72
	13	bathroom	3.69
	14	porch	3.80
fourth flat	15	porch	6.53
	16	corredor	12.44
	17	kitchen	8
	18	bathroom	4
	19	salon	4.8
fifth flat	20	corredor	5.2
	21	bed room	10.2
	22	dining room	10
	23	bathroom	4.2
	24	porch	3.2
sixth flat	25	corredor	7.8
	26	bed room	12
	27	kids room	10.5
	28	guest room	14
	29	dining room	9
	30	bathroom	3,2
	31	washing room	4.4
	32	porch	5
seventh flat	33	tambour	19,7
	34	stairs	13.4
	35	lifting hall	16
	36	hall	19.7
total area	380.1m^2		

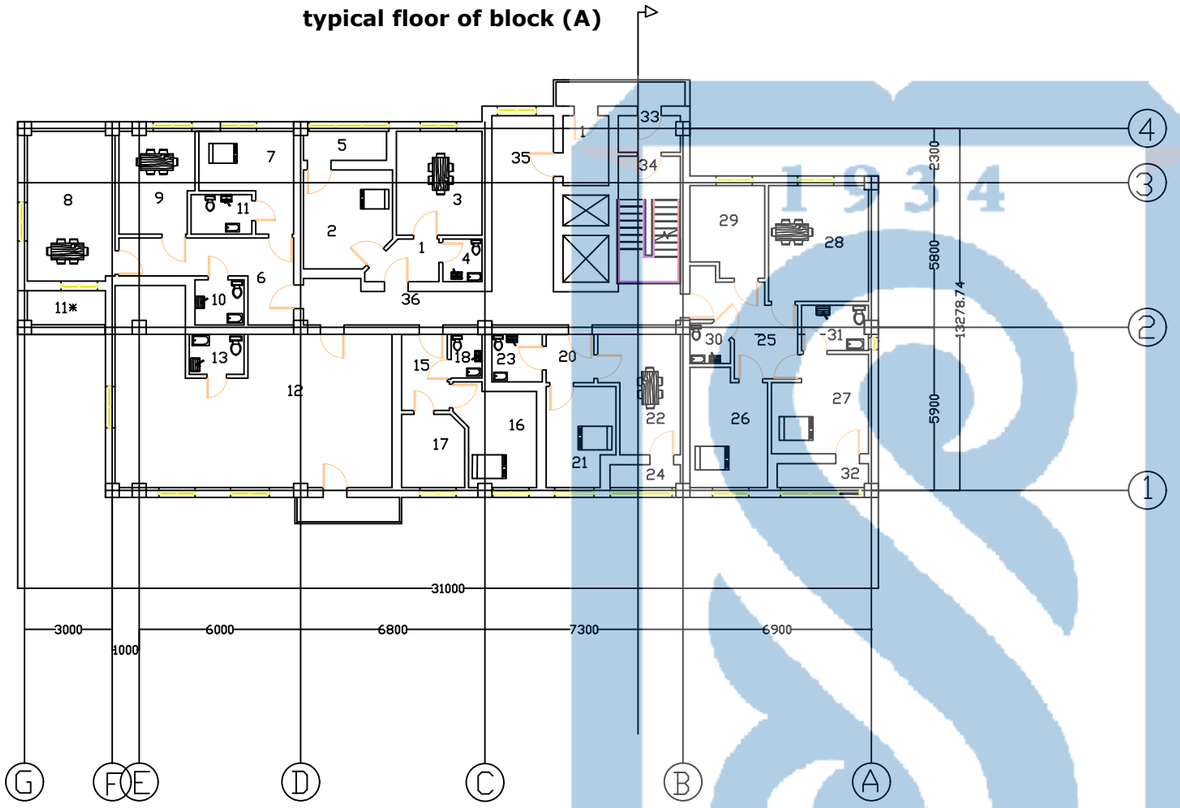
KazNITU -5B072900 .29-03/2020 DP

Multi storey residential complex in Aktau

name	Document №	Signature	date
Head of Dep	Akmalayuli K.A.		
Superviser	Manizha Paktin		
Consultant	Manizha Paktin		
Controller	Kozyukova.N.V		
Prepared by	N.B.Nawidullah		

Architectural part	Level	Sheet	scale
	DP	1	1:200
Plan of First floor block A	Department of Construction and Building Materials		

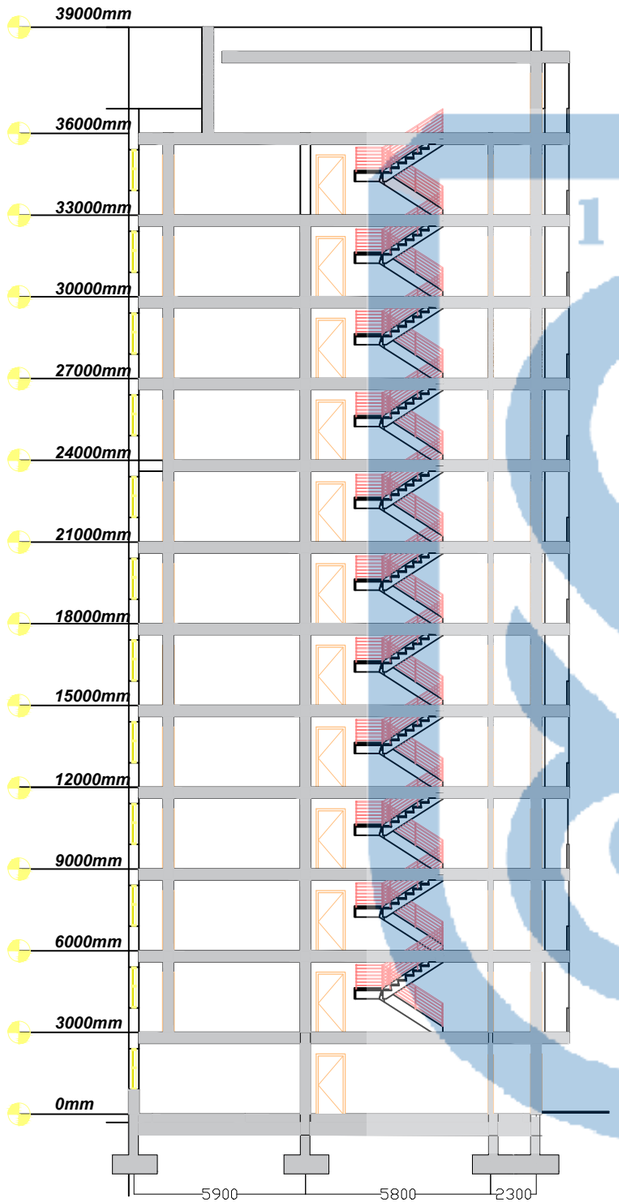
typical floor of block (A)



FLATS	NUMBERS	Names	Area
firstflat	1	corredor	4.22
	2	bedroom	14
	3	dining room	14
	4	bathroom	3.42
	5	porch	4
second flat	6	corredor	8
	7	bedroom	12
	8	Guest room	18
	9	Diningroom	11.8
	10	bathroom	4.1
	11	kids room	4.2
third flat	12	dining room	72
	13	bathroom	3.69
	14	porch	3.80
fourth flat	15	porch	6.53
	16	corredor	12.44
	17	kitchen	8
	18	bathroom	4
	19	salon	4.8
fifth flat	20	corredor	5.2
	21	bed room	10.2
	22	dining room	10
	23	bathroom	4.2
	24	porch	3.2
sixth flat	25	corredor	7.8
	26	bed room	12
	27	kids room	10.5
	28	guest room	14
	29	dining room	9
	30	bathroom	3,2
	31	washing room	4.4
	32	porch	5
seventh flat	33	tambour	19,7
	34	stairs	13.4
	35	lifting hall	16
	36	hall	19.7
total area	380.7m^2		

name	Document №	Signature	date	KazNITU -5B072900 .29-03/2020 DP			
				Multi storey residential complex in Aktau			
Head of Dep	Akmalayuli K.A.			Architectural part	Level	Sheet	scale
Superviser	Manizha Paktin				DP	2	1:200
Consultant	Manizha Paktin						
Controller	Kozyukova.N.V			Plan of second floor block A	Department of Construction and Building Materials		
Prepared by	N.B.Nawidullah						

Section of block A

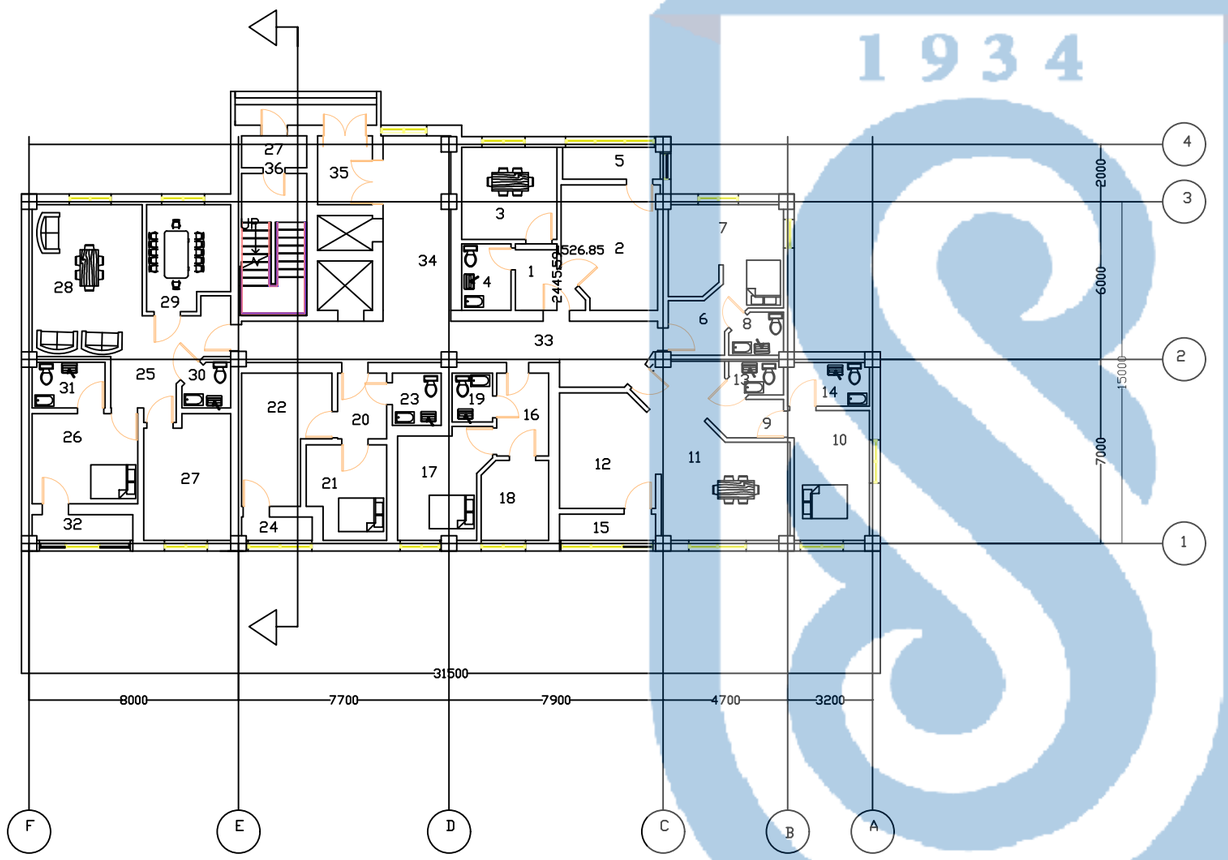


				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential complex in Aktau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Manizha Paktin			
Consultant	Manizha Paktin			
Controller	Kozyukova.N.V			
Prepared by	N.B.Nawidullah			Plan of section of block A

Level	Sheet	scale
DP	3	1:200

Department of Construction and Building Materials

First floor of building(B)



FLATS	NUMBERS	Names	Area
firstflat	1	corredor	5.6
	2	bedroom	14
	3	dining room	10
	4	bathroom	3.42
	5	porch	4
second flat	6	corredor	4
	7	dining& bedroom	15.42
	8	badroom	2,14
third flat	9	corredor	5
	10	bedroom	13
	11	guest room	18
	12	dining room	13
	13	corredor	2.14
	14	washing room	4
	15	porch	4
fourth flat	16	corredor	6
	17	bed room	12
	18	dining room	8
	19	bathroom	3
fifth flat	20	corredor	3
	21	bed room	9
	22	dining room	10
	23	bathroom	3,9
	24	porch	4
sixth flat	25	corredor	8
	26	bed room	12
	27	kids room	12,6
	28	guest room	14
	29	dining room	9
	30	bathroom	3,2
	31	washing room	4.4
	32	porch	4
seventh flat	33	Hall	19,7
	34	LiftHall	6
	35	tambour	3.37/5,41
	36	stair area	13,4
total area	291.1m^2		

KazNITU -5B072900 .29-03/2020 DP

Multi storey residential complex in Aktau

name	Document №	Signature	date
Head of Dep	Akmalayuli K.A.		
Superviser	Manizha Paktin		
Consultant	Manizha Paktin		
Controller	Kozyukova.N.V		
Prepared by	N.B.Nawidullah		

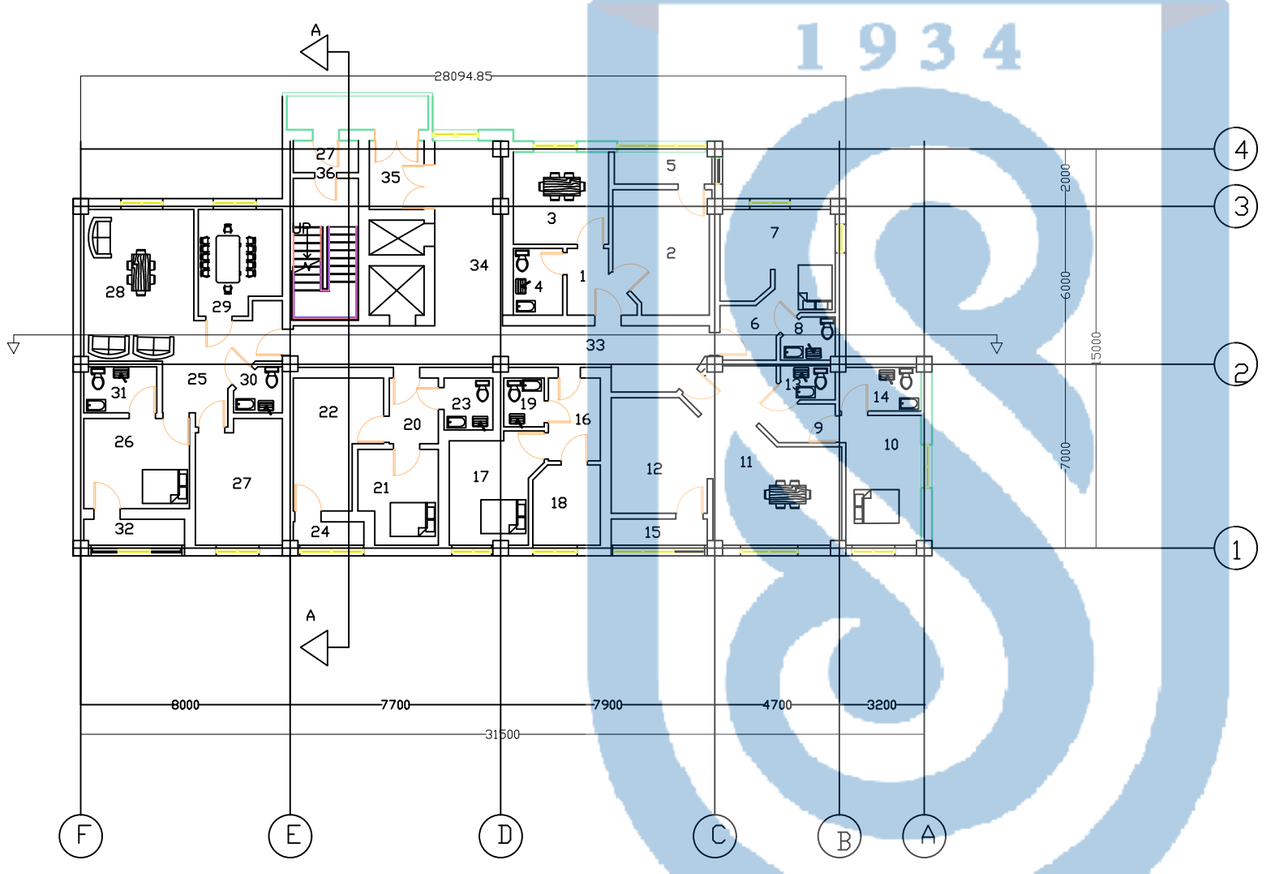
Architectural part

Level	Sheet	scale
DP	4	1:200

Plan of First floor block B

Department of Construction and Building Materials

First floor of building(B)



FLATS	NUMBERS	Names	Area
firstflat	1	corredor	5.6
	2	bedroom	14
	3	dining room	10
	4	bathroom	3.42
	5	porch	4
second flat	6	corredor	4
	7	dining& bedroom	15.42
	8	badroom	2,14
third flat	9	corredor	5
	10	bedroom	13
	11	guest room	18
	12	dining room	13
	13	corredor	2.14
	14	washing room	4
	15	porch	4
fourth flat	16	corredor	6
	17	bed room	12
	18	dining room	8
	19	bathroom	3
fifth flat	20	corredor	3
	21	bed room	9
	22	dining room	10
	23	bathroom	3,9
	24	porch	4
sixth flat	25	corredor	8
	26	bed room	12
	27	kids room	12,6
	28	guest room	14
	29	dining room	9
	30	bathroom	3,2
	31	washing room	4.4
	32	porch	4
seventh flat	33	Hall	19,7
	34	LiftHall	6
	35	tambour	3.37/5,41
	36	stair area	13,4
total area	291.1m^2		

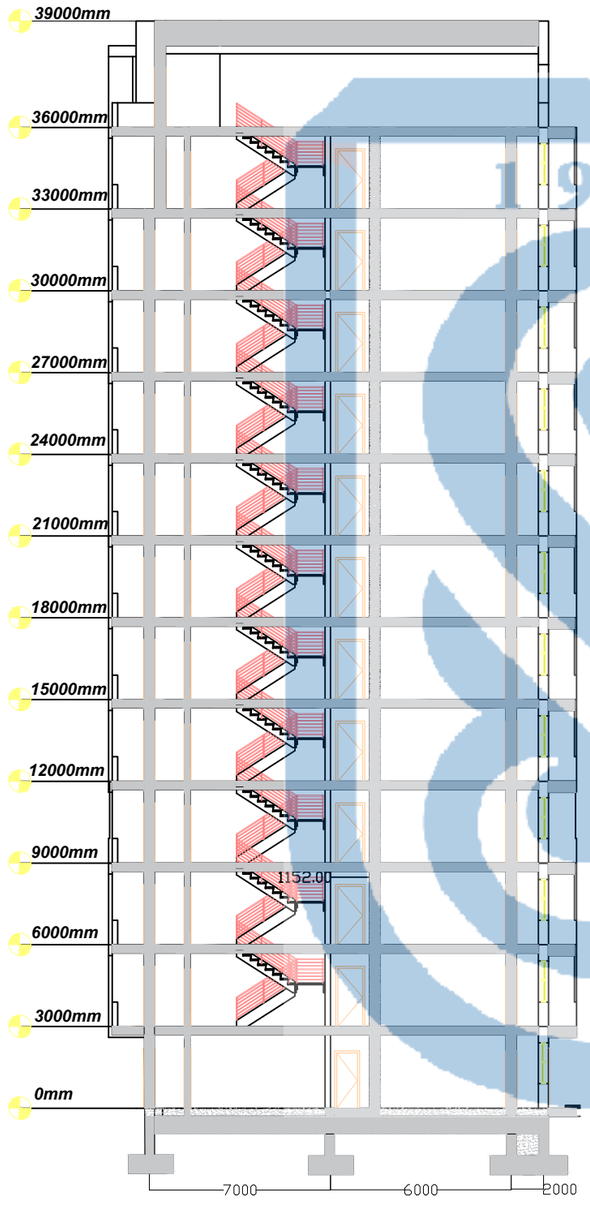
KazNITU -5B072900 .29-03/2020 DP

Multi storey residential complex in Aktau

name	Document №	Signature	date
Head of Dep	Akmalayuli K.A.		
Superviser	Manizha Paktin		
Consultant	Manizha Paktin		
Controller	Kozyukova.N.V		
Prepared by	N.B.Nawidullah		

Architectural part	Level	Sheet	scale
	DP	5	1:200
Plan of second floor block B	Department of Construction and Building Materials		

Section of block B

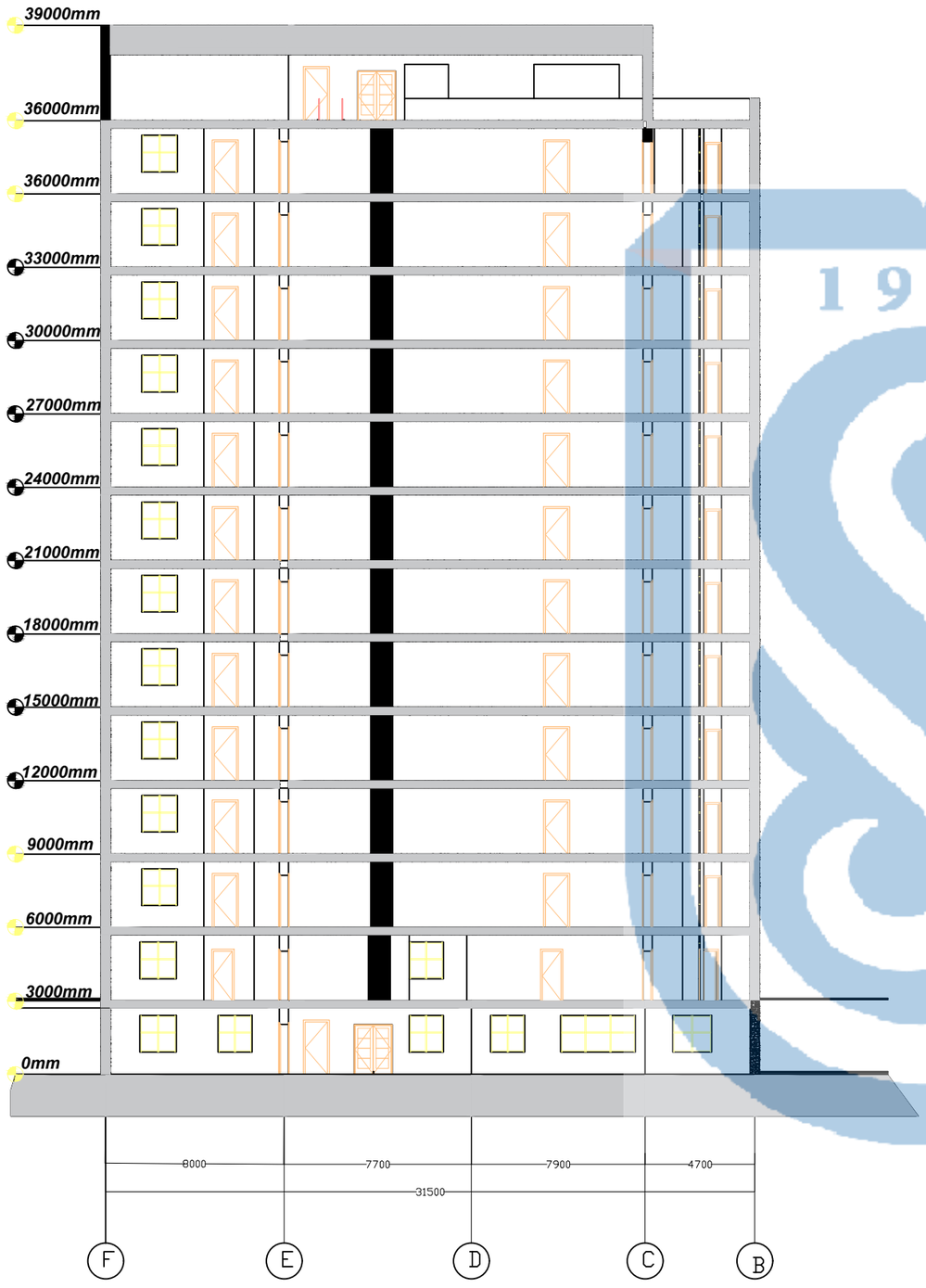


				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential complex in Aktau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Manizha Paktin			
Consultant	Manizha Paktin			
Controller	Kozyukova.N.V			Plan of section of block B
Prepared by	N.B.Nawidullah			

Level	Sheet	scale
DP	6	1:200

Department of Construction and Building Materials

front section of block B



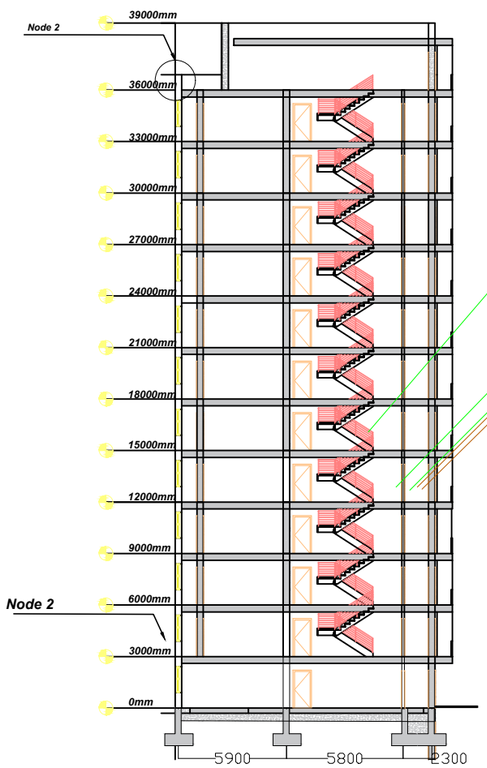
				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential complex in Aktau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Manizha Paktin			
Consultant	Manizha Paktin			
Controller	Kozyukova.N.V			
Prepared by	N.B.Nawidullah			Plan of section of block B

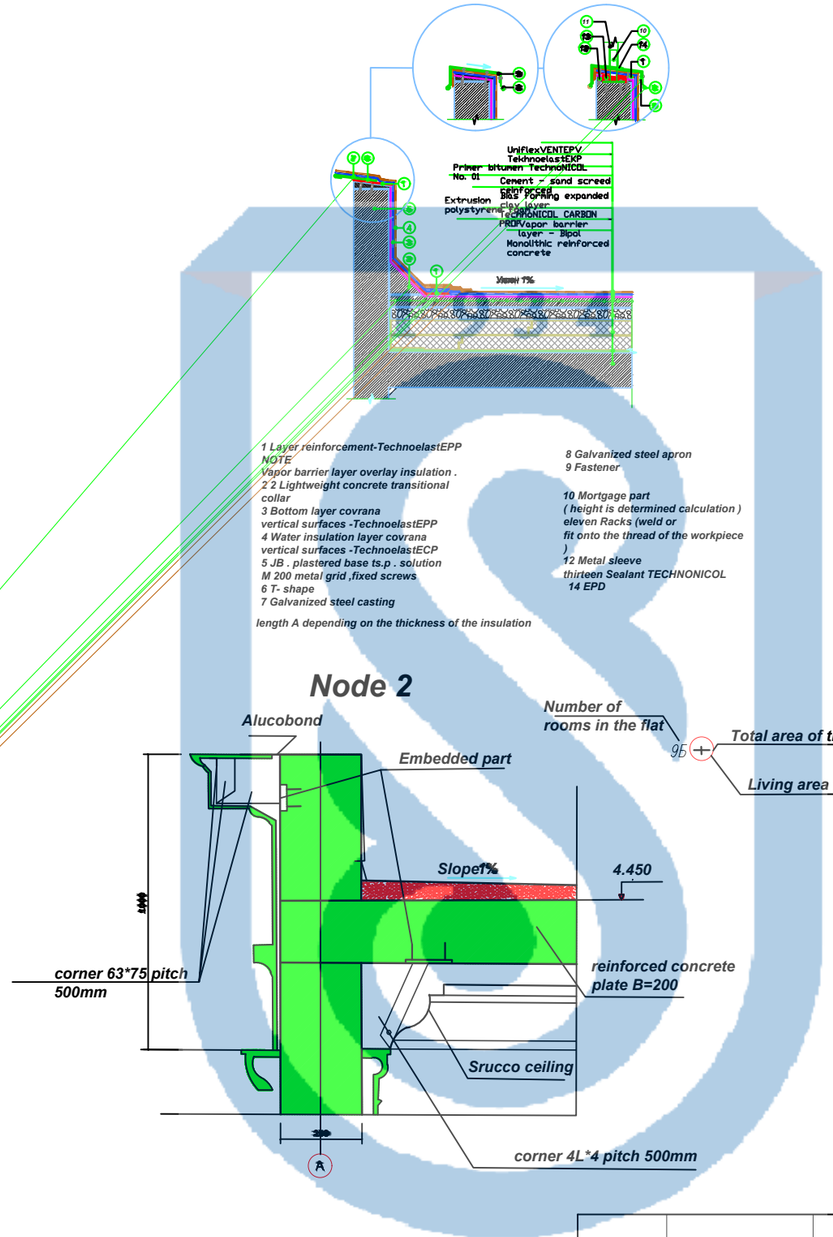
Level	Sheet	scale
DP	7	1:200

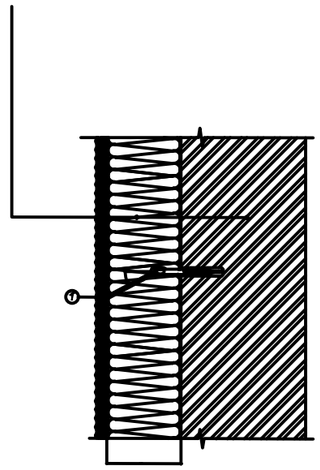
Department of Construction and Building Materials

Node 2

Section of block A

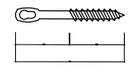




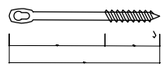


① fastner

screw LRH0

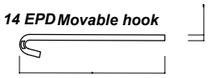


screw LRH30



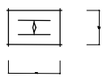
length A depending on the thickness of the insulation

14 EPD Movable hook



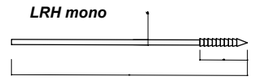
insulation thickness (mm)	length A (mm)
50	40
80	83
100	93
120	113
150	143

lock plat LRH



length A depending on the thickness of the insulation

LRH mono

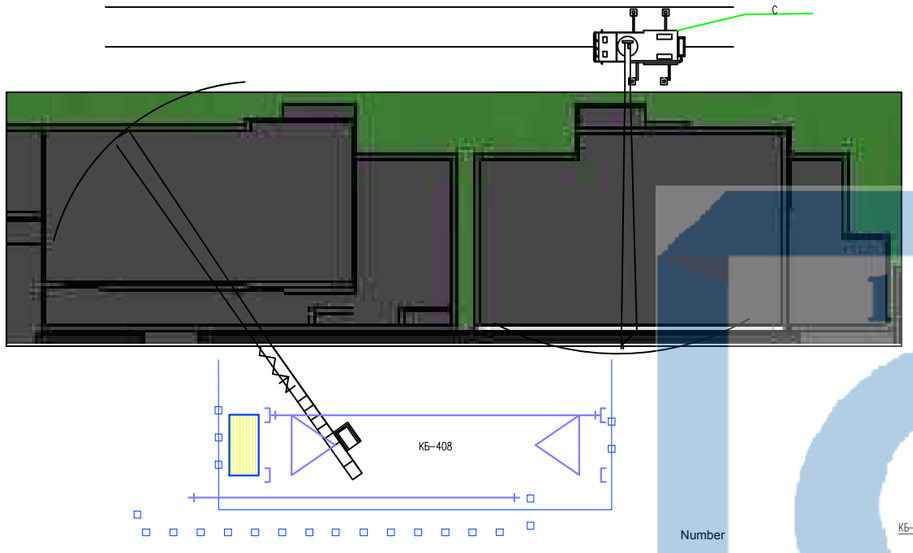


insulation thickness (mm)	length B (mm)
50	120
100	175
120	200
150	230

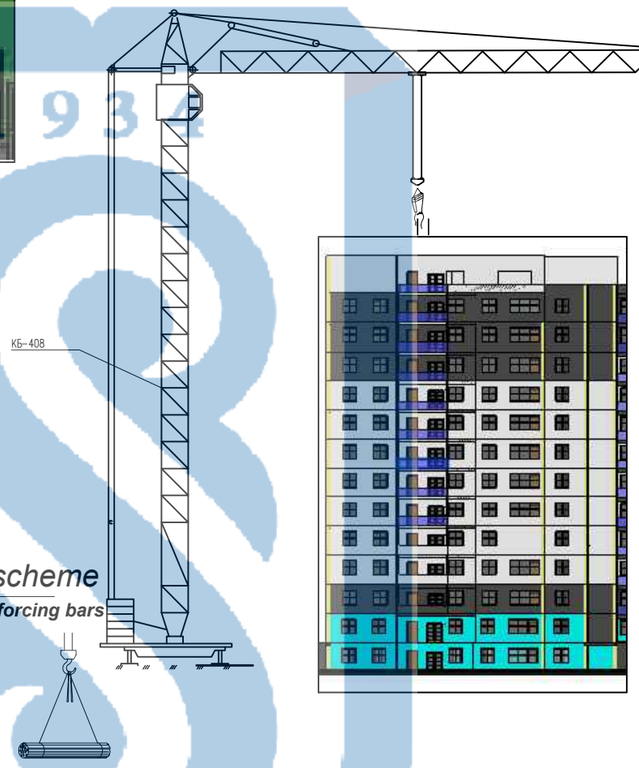
				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential complex in Aktau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Manizha Paktin			
Consultant	Manizha Paktin			
Controller	Kozyukova.N.V			
Prepared by	N.B.Nawidullah			Node 1-1 and Node 2-2

Level	Sheet	scale
DP	8	1:200

Department of Construction and Building Materials



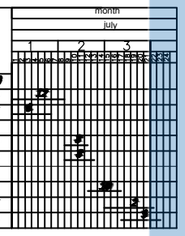
Number



work schedule

№	Name	scope of work Ed-izm	scope of work Kol-va	labor cost person day	required mash	Number	continuing day	No of workers	No of shift
1	2	3	4	5	6	7	8	9	10
1	Formwork	1 м2	2090	62,7	КБ-408	1	8	12	2
1.1	wood	100 м	16,62	12,46	КБ-408	1	6	6	1
2	reinforcing work								
2.1	Grid	1 шт.	280	14,7	КБ-408	1	3,5	8	2
2.2	Bar	1 т	28,6	35,7	КБ-408	1	4,5	8	2
3	Concrete works								
3.1	Concrete laying	1 м3	354,368	48,7	КБ-408	1	5	10	2
3.2	Concrete care	100 м2	854	14,9			7,5	2	1
4	formwork dismantling	1 м2	2090,06	36,57	КБ-408	1	6	9	2

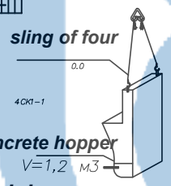
month: july



slinging scheme

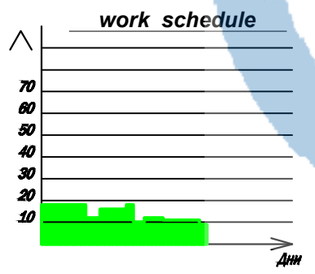
concrete bunker reinforcing bars

sling of four



concrete hopper V=1,2 м3

work schedule



excavation pit development scheme

Hiring	Ed-izm	indicators
Total elongation:	Da.	299
Total labor input	M.-Da.	3 128,19

Q = 3128 man/days

T = 299 days

Ncp=ΣQ/T=3128/299=10 workers

Nmax=18 workers

coefficient of uneven movement of workers

K=Nmax / Ncp=10/18=1.8 ≤ 2

				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential complex in Aktau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Technological part
Superviser	Manizha Paktin			Level: DP; Sheet: 9; scale: 1:200
Consultant	Manizha Paktin			
Controller	Kozyukova.N.V			Overhead working
Prepared by	N.B.Nawidullah			Department of Construction and Building Materials

Excavation pit development

Hiring	Unit	indicator
Total length work	Day	81
Total complexity	M/D	1298.454

Q=1298.454 *man/days*

T = 81 *days*

Ncp=ΣQ/T=1298.454/81=16 *worker*

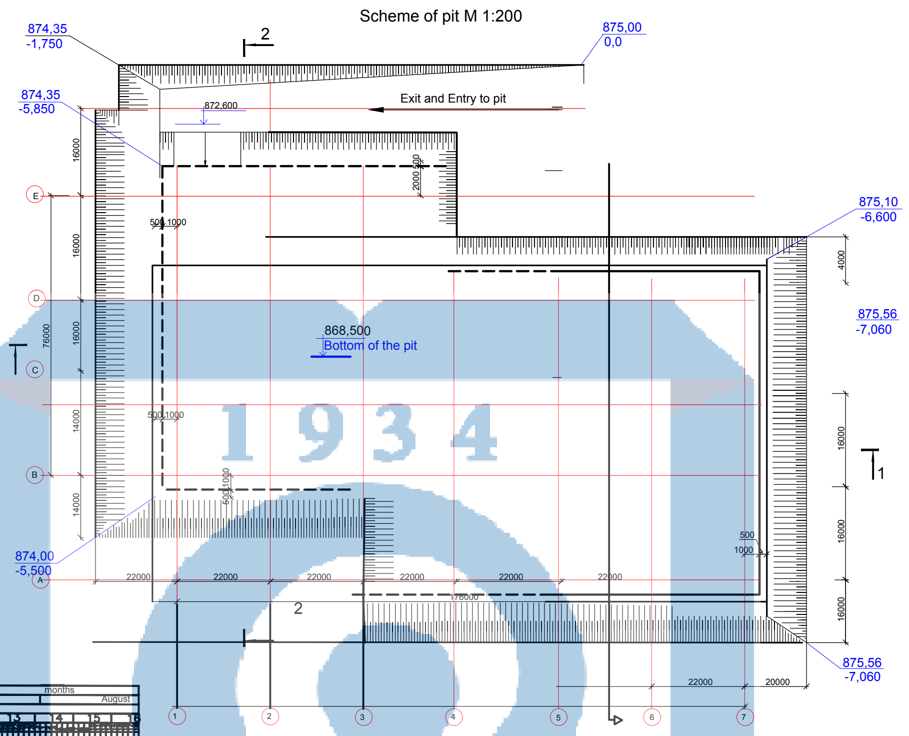
Nmax=30 *workers*

Coefficeint of uneven movement of workers

K 1,875 ⩽ 2

K=Nmax/Ncp=30/16=1,875 < 2

Scheme of pit M 1:200

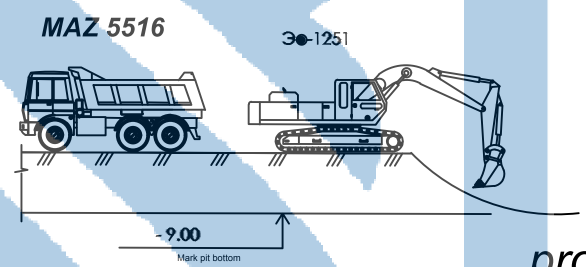


General transport and mechanism sheet

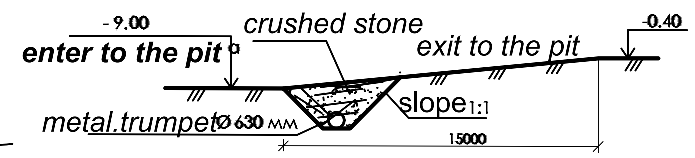
N	Атаулы	тип,марка	Саны
1	stationary building crane , Iron 50 м	QTZ125	1
2	Mine lift device	ПиГЛ-Т300	1
3	Bending device	ZTX-K500	1
4	Rebar cutting machine	KQW-SI	1
5	deep vibrator	ВГ-900	2
6	Heating transformer	ТС-200	2
7	welding transformer	ТС - 500	2
8	surface vibrator	В-0.16	3
9	Electrocompresor	ЭЛ-125М	1
10	Generator	Т3-500	1
11	cable box 8 compartment		1
12	Truck crane	СКГ63/100	1
13	concrete pump stationary	ISUZI-KQ	1
14	Electrocompresor	BOSH	1
15	on board transport 14ton.	КАМАЗ – 514	2
16	dump truck j,k . 15t.	КАМАЗ – 65115	3
17	Auto concrete mixer , КАМАЗ - 53213	СБ –126	2
18	pneumatic smoothing	К - 701	1
19	Excavator-reverse shovel, shovel capacity 0,65м³	Э - 505	1
20	bulldozer	Д - 170	1

№	Name	Scope of work: Units	Scope of work: Qty	Cost work	Required Mach: person-d	Required Mach: Number	Will continue	number of worker	number of shift.
1	2	3	4	5	6	7	8	9	10
1	Device time. fencing	м	580	18.12	-	-	2	4	2
2	Cut Rast. layer	1000 м2	7.88		А3-28	1	1	1	1
3	Excavation								
3.1	With loading in t.	100 м3	94.96		3-1251	2	8	4	2
3.2	To the dump	100 м3	95.93		30-1251	1	7	4	2
4	Manual bottom cleaning	1 м3	360	58.5	-	-	4	15	2
5	The device is equal. layer	1 м3	413.32		А3-28	1	1	2	2
6	The device of a monolithic con-tion (Foundation)								
6.1	Formwork device	1 м2	153.6	7.49	-	-	2	4	2
6.2	Reinforcement work	1 т	123.55	86.5	-	-	4	20	2
6.3	Concrete laying	1 м3	792	21.78	-	-	2	10	2
6.4	Curing	100 м2	9.9	0.173	-	-	1	1	1
6.5	Formwork	1 м2	153.6	4	-	-	2	2	2
7	The device of a monolithic con-tion (Column)								
7.1	Formwork device	1 м2	806.4	12.1	-	-	2	6	2
7.2	Reinforcement work	1 т	3.23	3.51	-	-	1	4	2
7.3	Concrete laying	1 м3	80.64	2.22	-	-	1	2	2
7.4	Curing	100 м2	2.016	0.036	-	-	1	1	1
7.5	Formwork	1 м2	806.4	9.1	-	-	2	6	2
8	The device monolithic con-tion (basement wall)								
8.1	Formwork device	1 м2	1620	48.6	-	-	4	24	2
8.2	Reinforcement work	1 т	224.64	421.2	-	-	14	30	2
8.3	Concrete laying	1 м3	720	71.1	-	-	3.5	20	2
8.4	Curing	100 м2	18	0.315	-	-	1	1	1
8.5	Formwork	1 м2	1620	28.35	-	-	3	10	2
9	The device of monolithic con-tion (Plate per-tiya)								
9.1	Formwork device	1 м2	806.4	22.18	-	-	3.5	6	2
9.2	Reinforcement work	1 т	7.2	11.7	-	-	3	6	2
9.3	Concrete laying	1 м3	180	18.22	-	-	2	10	2
9.4	Curing	100 м2	9	0.16	-	-	1	1	1
9.5	Formwork	1 м2	806.4	9.1	-	-	2	4	2
10	Waterproofing	1 м2	900	46.12	-	-	3	21	2
11	backfilling	100 м3	95.93	2.9	-	-	3	1	1
12	Soil compaction	100 м3	479.65		ДУ-31А	1	12	2	1
13	Formwork	1 м2	2090	62.7	КБ-408	1	8	12	2
13.1	The woods	100 м	16.62	12.46	КБ-408	1	6	6	1
14	Reinforcement work								
14.1	Grid	1 шт.	280	14.7	КБ-408	1	3.5	8	2
14.2	Rods	1 т	28.6	35.7	КБ-408	1	4.5	6	2
15	Concrete works								
15.1	Concrete laying	1 м3	354.368	48.7	КБ-408	1	5	10	2
15.2	Concrete Care	100 м2	354	1	-	-	7.5	2	2
16	Formwork dismantling	1 м2	2090.08	36.57	КБ-408	1	6	9	2

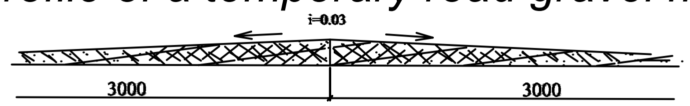
Section 2-2



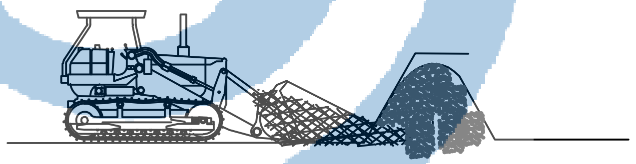
section 1-1



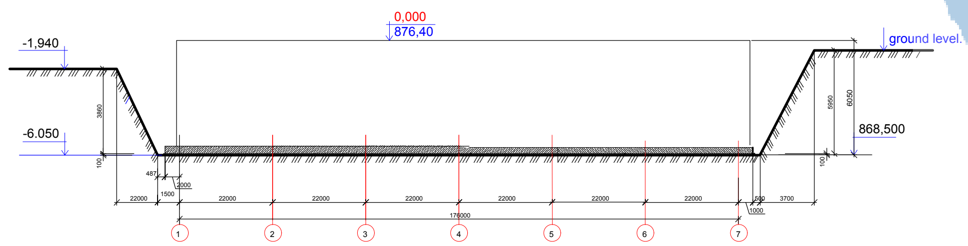
profile of a temporary road gravel mix



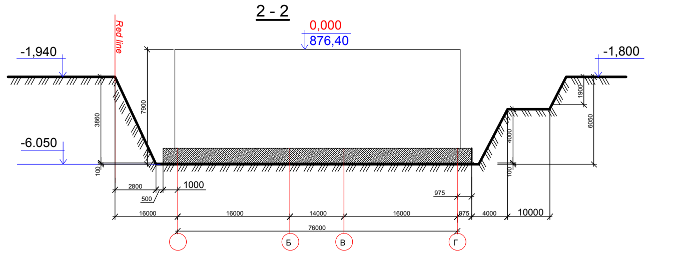
leveling the bottom surface of the pit with a bulldozer



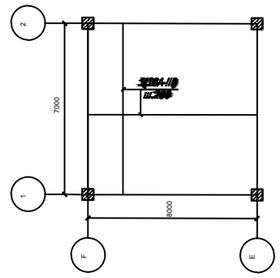
1 - 1

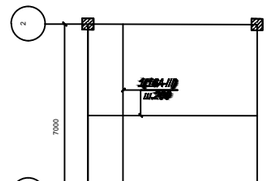


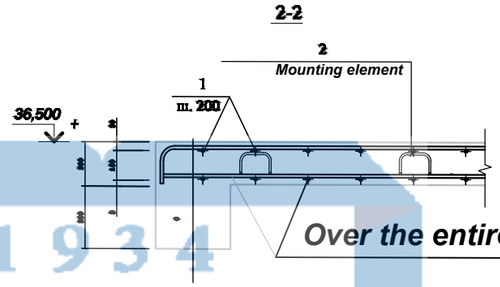
2 - 2



				KazNITU -5B072900 .29-03/2020 DP			
				Multi storey residential complex in Aktau			
name	Document №	Signature	date				
Head of Dep	Akmalayuli K.A.			Technological part	Level	Sheet	scale
Superviser	Manizha Paktin				DP	10	1:200
Consultant	Manizha Paktin						
Controller	Kozyukova.N.V						
Prepared by	N.B.Nawidullah			under ground works	Department of Construction and Building Materials		







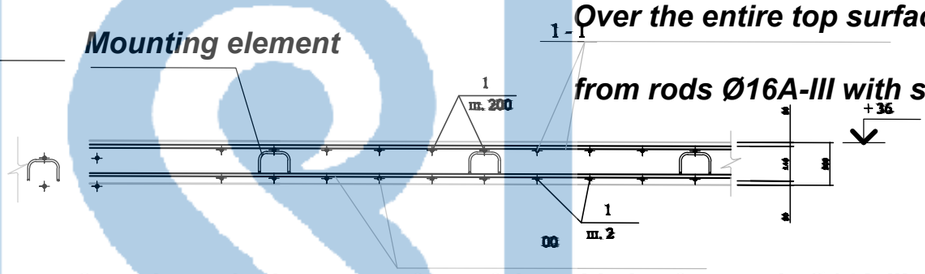
Over the entire bottom surface of the grid plate

from rods Ø16A-III (item 1) with size cell 200x200 mm

Over the entire top surface of the grid plate

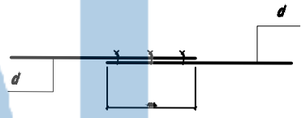
from rods Ø16A-III with size cell 200x200 mm

Mounting element



Over the entire bottom surface of the grid platefrom rods Ø14A-III with size cell 200x200 mm

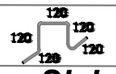
Rebar Connection Detail



1. To install the upper mesh, provide "frogs" (pos. 3) with a pitch of 400x400 mm.2.
2.The joints of the rods to carry out an overlap of length (40d) at a distance of 1500 mm from the axis
3. Fittings knit with wire at the intersections

Agreed

Parts List

Pos.	Sketch
3	

Slab specification at +36,500

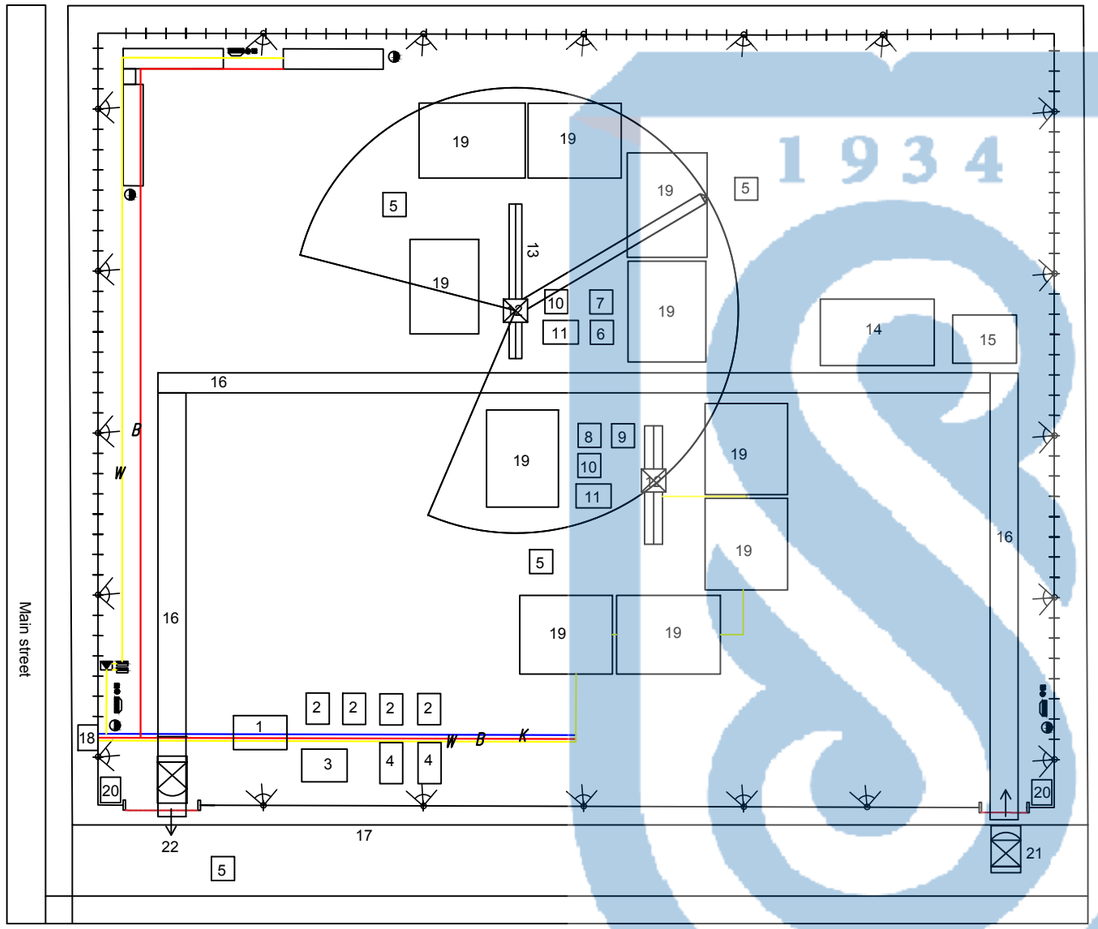
Pos.	Name	Designation	Count	Weight units, kg	Note
		plate on the mark. +3,700		1039.5	кг
1	GOST P 5781-82	Ø 16 A-III L= 632.5	пм	1.578 998.085	кг
3	GOST P 5781-82	Ø 8 A-I L= 600	175	0.237 41.475	кг
		Concrete B25	5	м3	

Statement of steel consumption, kg

Item brand	Reinforcing products											
	Class armature											
	A-I				A-III							
	GOST P 5781-82				GOST P 5781-82							
	Ø6	Ø8	Ø10	Итого	Ø12	Ø14	Ø16	Ø20	Ø22	Ø25	Ø32	Итого	Всего
stove lane on mark +36,500	0	41.475	0	41.475	0	0	998	0	0	0	0	998	1039.5

				KazNITU -5B072900 .29-03/2020 DP	
				Multi storey residential complex in Aktau	
name	Document №	Signature	date		
Head of Dep	Akmalayuli K.A.			Technological part	Level: DP; Sheet: 11; scale: 1:200
Superviser	Manizha Paktin				
Consultant	Manizha Paktin				
Controller	Kozyukova.N.V			Slab Design	Department of Construction and Building Materials
Prepared by	N.B.Nawidullah				

Construction general plan



Explication

1-Foreman
2-Inventory household premises for workers
3-dining Room
4-Shower room, clothes drying room
5-toilet
6 -the Material warehouse
7-Elevator equipment Warehouse
8-technical equipment Warehouse
9-Platform for cargo handling devices and containers
10-Platform for receiving mortar and concrete
11-Platform for unloading vehicles
12-Tower crane
13-Crane tracks for tower cranes
14-Storage Area
15-Parking Area for construction vehicles and mechanisms
16-Temporary highways
17-Temporary fence with two gates and passageways
18-Temporary transformer substation
19-Building under Construction
20-Security
21-Entrance
22-Exit

Symbols SP

- *Temporary fence*
- *Entry*
- W — *Constant*
- WB — *Temporary*
- B — *permanent water supply*
- BB — *Water supply temporary*
- K — *sewerage constant*
- KB — *sewerage temporary*
- *Floodlight*
- *Fire hydrant*
- *Distribution cabinet*
- *Transformer substation*
- *Fire extinguishing shield*
- *Water barrel*
- *Sand box*

KazNITU -5B072900 .29-03/2020 DP

Multi storey residential complex in Aktau

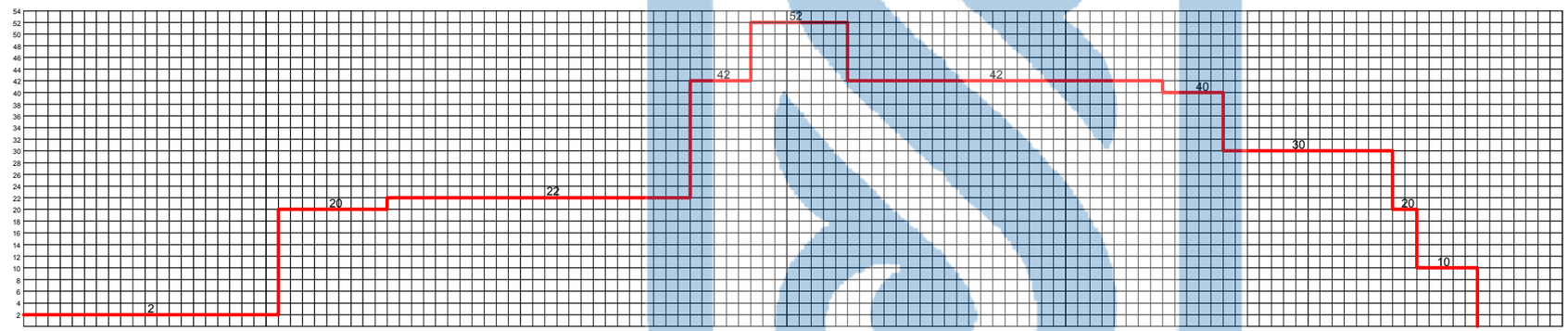
name	Document №	Signature	date
Head of Dep	Akmalayuli K.A.		
Superviser	Manizha Paktin		
Consultant	Manizha Paktin		
Controller	Kozyukova.N.V		
Prepared by	N.B.Nawidullah		

Technological part	Level	Sheet	scale
	DP	12	1:200
Construction master plan	Department of Construction and Building Materials		

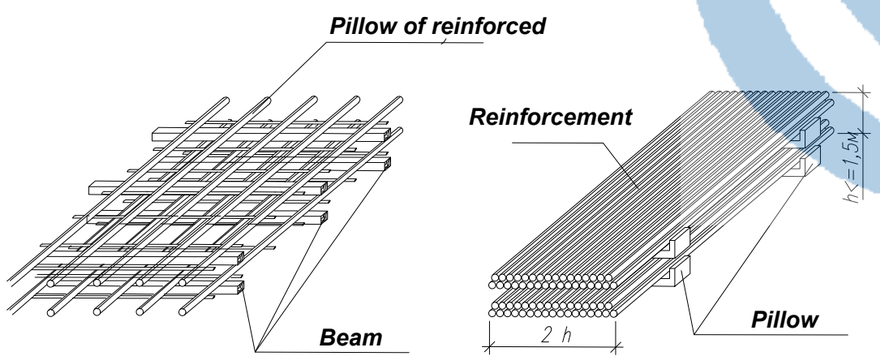
Work schedule

№	Name	Scope of work		Cost work	Required Mach		Will continue	Number of shifts	Months: May	June	July	August	September	October	November	December	january	February	March
		Units	Qty		person-d	Number			1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
1	2	3	4	5	6	7	8	9	
2	Device time, fencing	m	600	3612	-	-	3	1	
3	Cut Rapt. layer	1000m3	1.2		1.2	1	1	1	
3	EXcavation								
31	With loading in t.	1000t	3.12		3.12	1	1	1	
32	To the dump	1000t	3.12		3.12	1	1	1	
4	Manual bottom cleaning	1 m2	300	468	-	-	4	3	
5	The device is equit. layer	1 m2	4.032		1.2	1	1	3	
6	The device of a monolithic con-tion (Foundation)								
61	Formwork device	1 m2	1008	2.05	-	-	3	1	
62	Reinforcement work	1T	1008	302	-	-	1	3	
63	Concrete laying	1 m3	504	2.05	-	-	3	3	
64	Curing	1000m2	50	0.05	-	-	1	1	
65	Formwork	1 m2	1008	4	-	-	3	3	
7	The device of a monolithic con-tion (Column)								
71	Formwork device	1 m2	2016	0.5	-	-	3	6	
72	Reinforcement work	1T	336	302	-	-	1	3	
73	Concrete laying	1 m3	2016	2.05	-	-	3	3	
74	Curing	1000m2	2016	0.05	-	-	1	1	
75	Formwork	1 m2	2016	4	-	-	3	3	
8	The device monolithic con-tion (basement wall)								
81	Formwork device	1 m2	1008	0.5	-	-	1	3	
82	Reinforcement work	1T	201.6	302.4	-	-	1	3	
83	Concrete laying	1 m3	403	1.2	-	-	3	3	
84	Curing	1000m2	50	0.05	-	-	1	1	
85	Formwork	1 m2	1008	0.5	-	-	3	3	
9	The device of monolithic con-tion (Plate per-tiya)								
91	Formwork device	1 m2	2016	0.25	-	-	3	6	
92	Reinforcement work	1T	84	1.2	-	-	1	3	
93	Concrete laying	1 m3	504	0.25	-	-	3	3	
94	Curing	1000m2	50	0.05	-	-	1	1	
95	Formwork	1 m2	2016	0.5	-	-	3	3	
96	Waterproofing	1 m2	500	0.25	-	-	3	3	
97	backfilling	1000m3	0.12	35	-	-	3	1	
98	Soil compaction	1000m3	0.12		0.12	3	3	1	
99	Formwork	1 m2	1008	0.5	16.128	3	3	3	
100	The woods	1000t	1008	23.45	16.128	3	6	1	
10	Reinforcement work								
101	Grid	1 pc	300	3.03	16.128	3	3	3	
102	Rods	1T	336	302	16.128	3	6	3	
11	Concrete works								
111	Concrete laying	1 m3	16.128	403	16.128	3	3	3	
112	Concrete Care	1000m2	201	1	-	-	3	3	
113	Formwork dismantling	1 m2	1008	3.03	16.128	3	6	3	

amount workers



Warehousing Schemes



				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential complex in Aktau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Technological part
Superviser	Manizha Paktin			
Consultant	Manizha Paktin			
Controller	Kozyukova.N.V			
Prepared by	N.B.Nawidullah			General work schedule

Level	Sheet	scale
DP	13	1:200

Department of Construction and Building Materials

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: Набиль Бахадур Навидулла

Название: Multi-storey building in Aktau

Координатор:Манижа Пактин

Коэффициент подобия 1:4,2

Коэффициент подобия 2:1,1

Замена букв:5

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:

Обнаруженные в работе заимствования являются добросовестными,и не обладают признаками плагиата. В связи с чем,признаю работу самлстоятельной и допускаю ее к защите.

…… …… ……

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: Набиль Бахадур Навидулла

Название: Multi-storey building in Aktau

Координатор: Манижа Пактин

Коэффициент подобия 1:4,2

Коэффициент подобия 2:1,1

Замена букв:5

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:

Обнаруженные в работе заимствования являются добросовестными и не обладают признаками плагиата. В связи с чем, работа признается самостоятельной и допускается к защите;

....

Дата

Подпись заведующего кафедрой / начальника структурного подразделения

Окончательное решение в отношении допуска к защите, включая обоснование:

Работа признается самостоятельной и допускается к защите.

Обнаруженные в работе заимствования являются добросовестными и не обладают признаками плагиата.

.....	.....	.....
Дата	*Подпись заведующего кафедрой / начальника структурного подразделения*	

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
СӘТБАЕВ УНИВЕРСИТЕТІ

RESPONSE

OF THE SUPERVISOR
For the graduation project
Nabil Bahadur Navidullah5B072900-Civil Engineering

Topic: “Apartment complex in Aktrau”

The following tasks were solved in the work: a space-planning decision was made, the thermomechanical calculation of the enclosing structures was performed, the calculation and design of building structures, technological maps, a construction plan were developed, and the cost of construction was also calculated.

The student completed all the tasks. Nabil Bahadur Navidullah conducted an initial study of the assignment at a good level, competently conducted analysis of data from literary sources, applied many years of experience in designing this type of building, based on various design guidelines in the design and construction and technological sections. According to the calculations, the cost of construction was calculated. The design assignment was completed in full and on time.

In the process, the student showed responsibility, independence and showed good knowledge on completed professional disciplines during the educational process.

The project was carried out at a good level and the work fully meets the requirements for graduation projects of the "bachelor" level, the student is allowed to defend.

Supervisor
PhD Researcher, Senior lecturer

_____ Paktin.M

«25» 05 2020г.

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