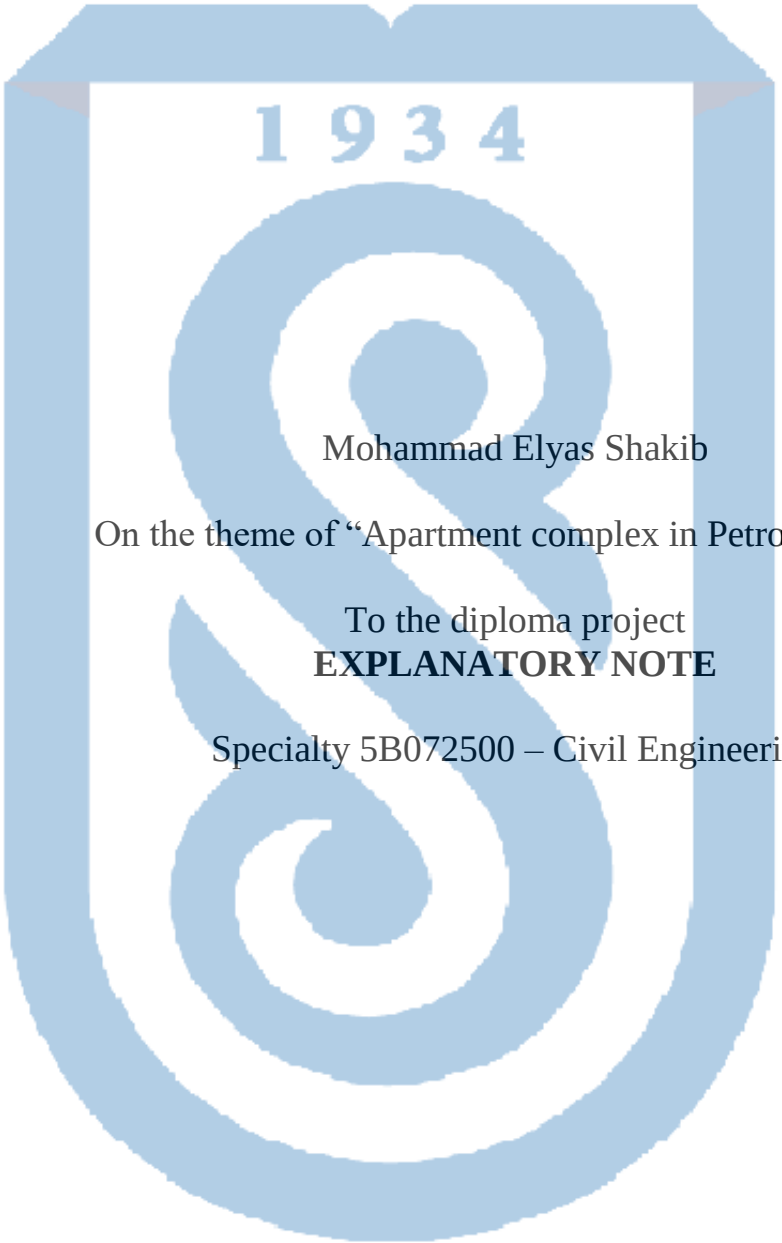
MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
Kazakh National Research Technical University named after K.I. Satpayev
Institute of Architecture, Construction and Energy named after T. Basenov
Department of «Construction and Building Materials»



Mohammad Elyas Shakib

On the theme of “Apartment complex in Petropavlovsk"

To the diploma project
EXPLANATORY NOTE

Specialty 5B072500 – Civil Engineering

Almaty 2020

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ALLOWED TO PROTECT

Head of Department

_____K.Akmalayuli

« 25 » 05 2020 y.

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Specialty 5B072500 – Civil Engineering

Prepared by M.Elyas Shakib

Supervisor N.V. Kozyukova

« 25 »_ 05 _2020 y.

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APPROVED
Head of Department
__ _K.Akmalayuli
«27» 01 2020 y.

ASSIGNMENT
Complete a diploma project

Student __ M.Elyas Shakib _____
Topic " Apartment complex in Petropavlovsk"
№ _1222 b - endorsed by the request.
Approved by the Order of the Rector of the University No. 762-b of January 27, 2020.
The deadline for completion is May 18, 2020.
Beginning entries of the certificate venture: construction locale – Petropavlovsk.
Rundown of issues to be considered in the recognition venture:
Architectural and development division: qualities of the development region; three-dimensional arranging choices; structural and plan arrangements; external divider warm designing bookkeeping; building hardware of the structure;
Computational and valuable segment: count of burdens and making of the computation conspire, figuring of the board and its estimation of fortified solid components dependent on the outcomes and their motivation Technology and association of development creation and work security: land assurance of the volume of underground and surface works; assurance of the quantity of solid trucks; surface strengthened cement of the structure development of innovative guide of structures establishment; object plan of development end-all strategy; Schedule. 4. Division of Construction Economics: neighborhood and article planning of assessments, List of drawing materials (compulsory drawings must be indicated):
Facade of the structure, segments, joints, determinations, plans - 4 sheets;
Drawing, detail of the section - 2 sheets; Calendar arrangement of development creation, general development plan, 2 Sheets 11 slides of the presentation of work are provided.
Recommended basic literature: SP RK 2.04-01-2017 Construction Climatology, SN RK 2.04-04-2013 Construction Heat Engineering, SN RK 2.03-30-2017 Construction in Seismic Zones.

SCHEDULE

preparation of thesis (project)

№	Sections	33%	66%	100%	Примечание
1	Predesign analysis Architectural and construction	18.02.2019г.-01.03.2019г.			
2	Settlement constructive		18.03.2019г.-29.03.2019г.		
3	Technology and organization of construction production and labor protection Economic			03.04.2020г.-19.04.2020г.	
4	Anti-plagiarism, norm control, pre-defense	18.05.2020y.-22.05.2020y.			
5	Defence	01.06.2020-05.06.2020y.			

Signatures

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

Name of sections	Consultants, I.O.F. (academic degree, rank)	date of signing	Signature
Architectural building	N.V. Kozyukova, master of technical science	25.05.2020	
Settlement and constructive	A.P.Turganbaev, master of technical science	25.05.2020	
Technology and organization of construction production	I.Z. Kashkinbaev, doctor of technical science	25.05.2020	
Economic section	N.V. Kozyukova, master of technical science	25.05.2020	
Norm controller	N.V. Kozyukova, master of technical science	25.05.2020	

Supervisor N.V. Kozyukova

The student accepted

The task S. Elyas

Date «_ 25 » 05 _2020

АҢДАТПА

«Петропавл қаласындағы көппәтерлі тұрғын үй кешені»

Ғимарат 24 қабатты және жер асты еденнен тұрады, үшбұрышты түрінде жасалған. Диссертация бес бөлімде жазылған: сәулет және құрылыс, монолитті қаңқаны жобалау және ETSBS18 бағдарламасы бар ғимараттың есептеулері, құрылымды жер жұмыстарынан бастап күнтізбелік картаға дейін, экономикалық және бағалау бөліміне дейін, ақыр соңында денсаулық және денсаулық қауіпсіздік бөлігінде экологиялық қауіпсіз ғимарат салу туралы шешімдер қабылданады, барлық қажеттіліктері бар өрт қауіпсіздігі ретінде тұрғындарға жақсы өмір сүру сапасын қамтамасыз ету үшін.

АННОТАЦИЯ

«Многоквартирный жилой комплекс в г.Петропавловск»

Здание 24-этажного и подземного этажа, обрамлено и выполнено в треугольной форме. Диссертация написана в пяти разделах: архитектурно-строительный, монолитное проектирование каркаса и расчеты здания с помощью программы ETSBS18, технологии, используемые для возведения конструкции, начиная с земляных работ и заканчивая календарной картой, раздел экономики и оценки, и, наконец, здоровье и С точки зрения безопасности, решающие решения принимаются для строительства экологически чистого здания со всеми необходимыми средствами пожарной безопасности, чтобы обеспечить лучшие условия жизни для его жителей.

ANNOTATION

“Apartment complex in Petropavlovsk”

The building is 24-storey and underground floor, framed and designed in a triangular form. The thesis is written in five sections which are: architectural and construction, monolithic frame design and calculations of the building with ETSBS18 program, technologies used to build the structure starting from earth works to the calendar map, economic and estimation section, and finally health and safety part, crucial decisions are made to build an environmentally friendly building with all needed facilities as fire safety to provide the best living qualities for its residents.

CONTENTS

INTRODUCTION

Multi-storey apartment houses takes a large share of the practice. Use them in apartments at home significantly increase the number, density of construction of cities and towns this will reduce the construction area.

The latter is important because the expansion of urban areas is a transport problem exacerbates, leads to higher prices for utilities, housing and that increases the distance between work and rest which in turn reduces a person's free time.

Repetition of vertical elements in multi-storey residential buildings

The design requires a certain order, which, of course, all residential floors designing a set of apartments on the same (typical) and typical floors shows the total ratio of apartments built in the program. Typical its planned solution due to the repeated repetition of the layer greatly affects the cost of the building. . While the exterior walls are expensive the value of each new fragments increases its perimeter on the layers increases several times as the number of layers increases. In this regard can be derived from complicating the configuration of the floor plan benefits due to the increase in the cost of construction, which they call should be considered.

The design and construction of forensic buildings are:

The use of very new construction technologies and modern processing and high characteristics in use construction that provides the building materials;

Convenient with modern engineering networks and the whole building systems providing reliable management;

As well as urban planning, which is inspected and regulated all safety requirements for buildings carefully follow the rules and regulations.

Important requirements for the design of residential buildings maximum functionality of rooms and convenience for residents is to take into account the placement. In addition, similar effective engineering systems for the design of complexes, including the following supply can be taken into account: power supply, air purification, ventilation, heating, firefighting, telecommunications and more others are. Only literate in residential buildings design, quality construction and operation during operation keep in mind that it provides convenience.

1 Architectural part

1.1 Initial data for design

Construction site: Petropavlovsk. Corresponding to the construction area characterized by the following climatic data:

- Standard value of wind speed pressure : 0.38 kPa;
- standard snow load for district I: 0.5 kPa;
- design temperature of outdoor air in winter period: -20 ° C;
- normative depth of seasonal soil compaction: 75 cm;
- seismicity of the construction area: 5 points;
- humidity zone: humid;
- construction and climatic zone: IV- G;

Table 1.1 - Outdoor air temperature by months

M	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
t°C	-1	-0,1	8,1	14,9	22,2	29,2	29,3	27	20,1	11	3,1	-0,3

Temperature conditions:

- average annual temperature: 17.6 ° C;
- absolute minimum: -45 ° C;
- absolute maximum: +45 ° C;
- The climate of the region is continental, winters are short and summers are short and hot;
- The amount of annual precipitation is 505 mm; - the maximum daily precipitation reaches 80 mm.

1.2 Master Plan decisions

The level of a clean floor of the 1st floor corresponding to the absolute mark of 544.50 on the vertical layout. In accordance with the Law of the Republic of Kazakhstan on certification, all products, structures and materials specified in the working drawings, used during construction should be CERTIFIED if, according to the current at the time of construction Legislation is subject to mandatory certification in relation to hygiene and (or) fire safety and (or) certification for compliance with state standards. All imported products and equipment in the absence of relevant certificates must have technical evidence of their suitability for use Architectural decisions were made in accordance with current standards and requirements of the Republic of Kazakhstan: -SNiP RK3.02-43-2007*" Residential buildings";

-CH RK 3.06-01-2011 "Accessibility of buildings and structures for people with limited mobility";

-SNiP RK 2.02-05-2009 * "Fire safety of buildings and structures."

The land is characterized by good ecological conditions. The residential construction site is characterized by a quiet terrain. Bass

Necessary for lighting and noise protection during the development of the plan all necessary measures to ensure sanitary standards done. Lighting conditions for each apartment in the apartment located taking into account the provision of standard lighting. Apartment has a two-way orientation.

The construction project includes a number of environmental measures, the territory sanitary cleaning, landscaping and beautification are provided.

Once construction is complete, the entire construction site will be rebuilt

It is planned to restore and create turf cover and plantings. Construction

The seeds of resistant trees are planted in the area. Trees and

The planting of ornamental seeds of shrubs is provided. Roads and sidewalks network is being created.

Landscaping of the construction site includes the following activities:

- Entrance areas and sidewalks, as well as landscaped paving of roads in the territory with figured paving slabs, wings and lining and laying of stairs;
- Landscaping with the installation of lawns, old and new greenery storage of plants;
- Children with landscaping and installation of small architectural objects installation of a playground: sandboxes, swings, chairs, etc. b .;
- Outdoor to service the area during the dark hours of the day installation of lighting fixtures.

Table 1.2 - Technical and economic indicators of the General Plan

Name	Unit		Area
Building total area	m 2		14245.48
the area of residential floors	m 2		13082.44
basement area	m 2		581.52
the attic space	m 2		581.52
Landscaping area	m 2		2946.1
Construction volume:	m³		44375.38
including: below mark 0.000	m³		2311.88
above mark 0.000	m³		42063.50
Built-up area	m²		713.07

Total area of apartments	m²		10829.50

Table 1.2 continuation

Living area of apartments	m²		6090.12
Floors of the building	floor		24

Table 1.3 - Characteristics of apartments

Name	Amount	Area
Number of apartments	192 sq.	
including one-room	72 sqm	2771.21 m²
including two rooms	96 sq.	6097.08 m²
including three rooms	24 sq	1961.21 m²
Total area of apartments		10829.50 m²

1.3 Volumetric and planning solutions

A project of a 24-story 192-apartment building has been developed, in terms of having the configuration of a “trefoil”. Building consists of: basement floor; 24 residential floors; stairwell with air pressure; Smooth elevator transition hall from which you can get into the elevator cabins, one passenger elevator with a carrying capacity of 400kg.

The second-cargo and passenger with a loading capacity of 1000 kg., the third for firefighters with a loading capacity of 1000 kg. Attic room which it is used for engineering communications and a flat roof with an internal drain. The engine room is located on the roof elevators and vestibule access to the roof. In the basement there are technical premises for house maintenance: ventilation chamber, automated heat station, water pumping station, switchboard and control room. There is free spaces that can be used. One leads into the basement, deepened 1.5m from the ground level. Service entrance and two emergency exits.

The ceiling between the basement and the first floor is insulated with mineral wool and hemmed drywall. The entrance group leading to the residential floors consists of a porch and a ramp for the mobility impaired. Is provided canopy from precipitation. On a non-smoking staircase and a passage fenced with a decorative metal grating, we get into the elevator hall and further to the necessary floor we rise in the elevator car. On the residential floor, 8 apartments go into the common corridor:

Three one-room, four two-room and one three-room. Apartments of IV class of comfort. The height of the premises is 2.5 m, kitchens up to 9 m², in one-room apartments are provided kitchen niches.

Sanitary units combined, in a three-room apartment - separate. Each apartment has a balcony, fenced a stained-glass window with an aluminum profile and a metal fence to a height of 1 m. From 24 to 5 floors on balconies are provided emergency hatches and step-ladders for evacuation of people. The architectural solutions of the building are made in the classical style with the use of modern decoration and decorative materials and elements. The following types of engineering equipment are provided for in the building: centralized heating from a thermal power plant, hot water supply, water supply, sewerage, electric lighting, and telephone installation.

1.4 Constructive decisions

Residential buildings: reinforced concrete monolithic frame with a beam-free system. Dimensions of columns 400x600 mm, diaphragms of rigidity 200 mm, thickness of floor slabs 200 mm. Foundations - Pile with a monolithic grillage

Knots of reinforcing and fastening of partitions look at sheets AR-36 Ceilings and coatings - monolithic reinforced concrete Stairs

- combined marches. Internal staircase guard
- painted metal External stair railings
- Stainless steel Platforms
- Monolithic reinforced concrete Lintels
- Prefabricated reinforced concrete in brick walls and partitions; metal in partitions from aerated concrete block Heater GOST 9573-2012:
- socle - 90mm (Miniplit PP-80 with a density of 80kg / m3), consumption-316.20m²
- external walls of 1 - 5 floors - 100 mm (Miniplate PP-80 with a density of 80 kg / m³), flow rate-893.8 m²;
- External walls of 6 - 24 floors and the walls of those. Floors - 100mm (Miniplate PP-80 with a density of 80kg / m³), consumption-3398m²;
- additional insulation on floor slabs and columns - 50 mm (Miniplate PP-80 with a density of 80 kg / m³), flow rate on columns-1133.00 m², consumption for floor slabs-291.00 m²;
- floor of the technical floor +66.400 - 200mm (top layer - ПЖ-140 Plate with a density of 140kg / m ³ - 50mm, consumption-485.95 m²; bottom layer
–PP-80 stove with a density of 80kg / m ³ - 150mm, consumption-485.95 m²)
- walls inside the balconies - 100mm (PP-80 minplita with a density of 80kg / m³), consumption - 1939.00 m²;
- The walls inside the vestibule - 50 mm (Miniplata PP-80 with a density of 80 kg / m³), consumption - 346.00 m²;
- ventilation ducts in the attic space -50mm (Miniplate ППП-80 with a density of 80kg / m³), consumption - 131.00 m²;
- stairwell and elevator shaft in the attic space - 110 mm (Miniplate ППП-80 with a density of 80 kg / m³), consumption - 45.00 m²;

- Covering the stairwell and the engine room of the elevator - the lower layer is 100 mm (PP-80 plate r = 80 kg / m³), consumption is 55.00 m², the upper layer is 50 mm (ПЖ-140 plate r = 140 kg / m ³), consumption-55.00 m²;

- Basement internal partitions - 60mm (PP-80 minplit with a density of 80kg / m ³), consumption-56.72 m²,

- The ceiling of the plenum box is 60 mm (Miniplate ПП-80 with a density of 80 kg / m ³), consumption-8.40 m².

Roofing

- Flat, roll Gutter - internal organized with heating, see section EL Elevator

- Mogilevliftmash, with a loading capacity of 400 and 1000 kg

Outside facing:

1) Basement walls - splitter block;

2) Walls from the 1st to the 5th floors - facing bricks, KR-l-pu 250x120x88 / 1.4NF / 125 / 2.0 / 100 / GOST530-2012, consumption - 41 pcs. on 1 m² tabs, on cement-sand mortar M75;

3) Walls from the 6th to the 24th floors - linear panels;

4) Attic walls - linear panels;

5) Window slopes - galvanized steel with a polymer coating of thicknesses. 0.7mm;

6) Window sill - galvanized steel with a polymer coating thickness. 0.7mm;

7) Porch - concrete tile;

8) The blind area of the building - asphalt;

9) An apron on the facade at elev. +18.600 - galvanized steel thickness. 0.7mm;

Doors: entrance doors to apartments are metal; interior - wooden; entrance groups on the 1st floor - the first door is metal, the second is wooden; balcony doors - PFH profile; service doors - metal, fire.

Windows:

1) Profile - PVC, color - white; double-glazed window double;

2) Sizes window pro g mov: 1800 mm (triple-), 1200 mm and 1500 mm (double-leaf), 900 mm (single leaf)

Walls:

1) The outer walls of the basement are monolithic 200mm;

2) The outer walls of the 1-24th and technical floors - a gas block of thicknesses. 250 mm, density D600kg / m3, frost resistance F25, compressive strength class of at least B2.0;

3) interroom partitions - gas block thicknesses. 200 mm, density D600kg / m3, compressive strength class no less than B2, 0;

4) Partition walls - gas block skinny. 100 mm, density D600kg / m3, compressive strength not less than B2.0;

5) Partitions of bathrooms - blocks SKTs 100mm and 200mm on cement-sand mortar M50 with a primer and waterproofing cement composition.

6) The walls of the ventilation shafts in the attic space are made of solid ceramic brick with a thickness of 120mm Recommendations for masonry and reinforcement.

7) The walls of the ventilation shafts on the roof are made of ceramic facing brick KR-l-pu 250x120x88 / 1.4NF / 125 / 2.0 / 100 / GOST530-2012. Recommendations for masonry and reinforcement, see l. AR-34

8) The partitions on the stairs N1 are made of ceramic facing brick KR-l-pu 250x120x88 / 1.4NF / 200 / 2.0 / 100 / GOST530-2012.

9) Facing ventilation boxes should be performed according to the series RK 1.073.9-2.07 (Table 15) from sheets of gypsum plasterboard, 12.5 mm thick in two layers, on metal frame (PS50, PN50) with soundproofing plates of the brand "IZOTERM" P-100 50 mm thick, in place. Facing type C 626 75mm thick. Facing area of ventilation ducts is 1180.4 m². See L. AR-27 - AR-29.

10) The cladding of the risers should be performed according to the series RK 1.073.9-2.07 (Table 15) from sheets of gypsum concrete, 12.5 mm thick in two layers, metal frame (PS50, PN50) with soundproofing plates of the brand "IZOTERM" P-100 50 mm thick, in place. Facing type C 626, 75mm thick. Facing risers to perform after installation of plumbing equipment. The lining area of the risers is 465.9 m².

11) The lining of electric niches in the apartment is made of drywall sheets of the brand GKLO with a thickness of 12.5 mm in two layers on metal frame (PS50, PN50) after installing electrical equipment in place. Facing Type with 626 Thick 75mm according to the RK series 1.073.9-2.07 (Table 15) without thermal insulation. Facing area 158.4 m². See L. AR-27 - AR-29.

Stained-glass windows:

1) Profile - aluminum, color - white; glazing - single glazing;

Interior decoration: ceiling - water-based paint walls - water-based paint flooring – linoleum Bathrooms:

Floor ceramic tiles with a rough surface, walls - ceramic tiles to a height of 1.8m kitchen: floor - linoleum, wall emulsion painting, corridor, And staircase: floor – ceramic floor tiles with rough surface steps, intermediate platforms - ceramic floor tiles with rough surface walls - painting with water-based paint.

1.5 Thermal design of roofs and windows

The main fencing layers of the roof structure:

1) Technoelast EKP2003 δ = 0.0042m, λ = 0.17 (W / m * o C).
2) Technoelast EPP2003 δ = 0.004m, λ = 0.17 (W / m * o C).
3) Primer bituminous, δ = 0.08m w / e 0.1 λ = 0.031 (W / m · o C).
4) Screed - cement-sand δ = 0.02 mλ = 0.76 (W / m · o C).
5) 1 layer of roofing material δ = 0.004 m λ = 0.17 (W / m · o C).

6) Utepl. Min.vatn. δ = 0.15m, λ = 0.042 (W / m * o C).
7) Technoelast EPP2003 δ = 0.0042m, λ = 0.17 (W / m * o C).
8) Monolithic slab etc. δ = 0.2m λ = 1.92 (W / m · o C).

The climate of the area:

Basic data: indoor temperature t d = 18 0 C,

Daily heating period D d; degrees-day, according to the following formula determined by:

$$Dd = (tint - tzht)\ ht \qquad (1.1)$$

Where: t int is the calculated average indoor air temperature of the building in ° C, + 20 ° C;

t ht , z ht - average outdoor temperature ° C, average outdoor air day taken for a period when the daily temperature does not exceed 8 ° C.

D d = (20-2,1) * 133 = 2380 ° C, day

Apart from the table, the values for the values of R req and D d are given by the following formula to be determined by;

$$Rreq = aD\ d + b \qquad (1.2)$$

Where:

D d is the degree-period of the heating period;

a, b - according to the data in the table for the corresponding groups of buildings the values of the coefficients to be taken; a = 0.00035, b = 1.4.

$$R\ req = 0.00035 \times 2380 + 1.4 = 2.23\ \frac{M^{2\circ}C}{B_T}$$

R k = 6.15m 2 ₒ C / W; > R req = 2.23 m 2 ₒ C / W; heat transfer requirements performed.

$$Ro = \frac{1}{\alpha_{int}} + R_k + \frac{1}{\alpha_{ext}} \qquad (1.2)$$

Where:

R k is the structure of the individual layers of fencing structures thermal resistance, which are δ 1 / λ 1, respectively; δ 2 / λ 2; ...; δ 6 / λ 6 α int is the internal height of the enclosure

Surface heat transfer coefficient. α int = 8.7 α ext - heat transfer of the outer surface of the enclosure

Coefficient, α ext = 23.

$$Rk = \sum \frac{\delta}{\lambda} = \frac{1}{8.7} + \frac{0.0042}{0.17} + \frac{0.004}{0.17} + \frac{0.08}{0.031} + \frac{0.02}{0.76} + \frac{0.004}{0.17} + \frac{0.0042}{0.17} + \frac{0.2}{1.92} + \frac{1}{23} =$$

$$2.89\ \frac{M^{2\circ}C}{B_T}$$

in this case R k is the set of layers for a multilayer structure is defined as.

R k = 2.89$\frac{M^{2\circ C}}{B_T}$; > R req = 2.23$\frac{M^{2\circ C}}{B_T}$; - on the resistance to heat transfer requirements are met.

Thermal technical calculation of windows

$$R\ req = 0.00005 \cdot 2380 + 0.3 = 0.41\frac{M^{2\circ C}}{B_T};$$

R pr = 0.68 - in a two-chamber glass package with a soft selective coating

SNiP II-3-79, R pr ›R req - requirements for resistance to heat transfer performed. Fully supplied with heat.

1.6 Engineering equipment of the building

The projected building has the following water supply and sewerage systems equipped with:

- domestic and drinking water supply;
- fire water supply;
- hot water supply;
- household fecal sewer;
- External water flow.

There is a domestic sewer with a diameter of 200 mm inside the building connected to the network. The line removed asbestos cement VT-9 with a diameter of 200 mm from the house designed from pipes.

The heating system of the educational and administrative building is one with a lower switch tubular. Parameters of heat carrier in heating systems 105 - 70 ˚C.

Fondital aluminum radiators as heating means accepted.

In the basement to disconnect the supports of the heating system valves are provided. Exhaust air from heating systems - high through air collectors located on the floor.

Main pipes and main supports of heating systems blocked:

- ø≤25 mm - fiberglass with a cord made of mineral wool in the finished package δ = 30mm according to TU 36-1695-79,
- MS-50 δ = 40mm glass staple according to GOST 10499-78 ø> 25mm made of fiber - mats-mineral wool.

Ventilation of apartments is natural. From toilets and kitchens through channels installed in the brick walls, which are above the roof produced through mines.

The building has smoke protection ventilation.

Each side of the corridor with a valve KDP-5A to eliminate smoke in case of fire the floor is equipped with a forced extraction smoke extraction mine provided. In case of fire to prevent the spread of smoke on the floors it is planned to supply outside air to the elevator shaft.

The source of heat supply to the building is the city heating network will be found. Calculated parameters of the heat carrier 150-80 ° C, operation pressure 160 kN / cm 2.

Pressure at the connection point:

- in the transmission line - 96 m. c. st; - back - 91 m. ш. b.

Static pressure level -237 m.

The connection of the building to the heating network is carried out according to an independent scheme carried out.

Power supply and distribution lines are on the floor performed with APV wire in concealed viniplast pipes.

The power line is designed for long-term current loads and checked for voltage loss.

Electricity meters installed in solid waste meters is generally provided in the introduction.

Telephony of the building City telephone of Petropavlovsk provided by the network. To perform external telephone networks, you need:

- removal of the existing telephone sewerage from the construction site, production by replacing existing telephone cables with new ones;
- 1-storey telephone sewer from the projected building design and construction;
- to the existing telephone sewerage on off-site networks execution of the report and replacement of existing wells;

Installation of a telephone distribution cabinet 1200x2 in the projected building Provided.

In the basement of TPP cables of different capacities, and then then build on the racks and installed in the floor electrical cavities in a telephone box. In public premises

The disconnection must be performed on the "LEGRAND" boxes.

Fire alarms and sensors not more than 2 m from the wall to the ceiling IP-105 type fire, which is installed at a distance of not more than 4 m between performed using alarm sensors.

Fire alarm

Two fire alarms of type "Vista-501" installed in the control room released to the station.

1.7 Earthquake measures

The theory of world construction and conditions of low seismicity the current state of practice in any of the seismically resistant buildings allows you to achieve high reliability of the floor.

Calculation and assembly methods to verify significant seismic loads capable of creating load-bearing structures of the building.

The basis of the design of seismic multi-storey buildings is the building design principles of seismic protection of the load-bearing structure is.

Reliable principles of seismic protection of multi-storey buildings development and inspection are carried out in three directions:

- engineering seismology, which is an instrumental study of the nature of earthquakes and for further use of empirical data in construction practice analyzes and summarizes;
- The theory of seismic resistance of buildings and structures, which determines the methods of calculating the seismic resistance of the building, the building determines the methods of design and assembly of the support;
- Theoretical calculation of the actual action of seismic forces compliance with multi-storey construction practices. This time instrumental data and their theoretical interpretation of buildings is a source of new data on seismic stability.

The principles of seismic protection of multi-storey buildings are minimal materials capable of withstanding seismic loads in use; various that neutralize the effects of seismic forces design and technical devices (shock absorbers and dampers). In addition, the nature of the seismic effect, the appearance the amount of effort involved in the building itself, its type, size and depending on weight.

Generally, the plan should be a good example of a building.

The height of the building is considered to be symmetrical.

In the surrounding areas, the slope of the buildings does not exceed 5 m.

The vertical lift structure is continuous at the height of the building, the stiffness of steel profiles with each wave with the help of an impact bolt with fixed welding surfaces and upper belt construction provided.

The surface area of profiled surfaces should not exceed a maximum of 200 mm.

It is necessary to prepare waterproofing layers from cement.

When calculating the structure of the outer wall of the foam block filling used.

The inner walls of the building are the supporting walls of the building

The inner walls are designed for the construction of the building, as well as for the construction of the building

Local seismic loads are calculated in accordance with the requirements of 3.22 and approved.

The connecting cells are made of brick, which has a common cross section reinforcement with an area of not less than 0.3 cm2 and a length of not less than 700 mm Equipped with reinforcing bars on the height of the beams.

2 Structural part

2.1 Constructive solution

24-storey building 14245.48M^2 . The plan has axes. As a lifting system of the building solid reinforced concrete frame is used.

The cross section of the column is 400x600 mm.

Table 2.1 - Load on the roof

Name	Unit	Normative	According to coefficient γ_f	Calculated
Regular:				
Technoelast ЭКП 2003 δ= 0,0042 м ρ = 6 кН/м^2	т/м^2	0,0252	1,2	0,03024
Technoelast ЭПП2003 δ =0,0040м ρ = 6кН/м^2	т/м^2	0,024	1,2	0,0288
Primer bitumen TECHNONICOL №01	т/м^2	0,021	1,2	0,0252
Cement-sand coupler δ = 0,02м ρ = 18 кН/м^2	т/м^2	0,36	1,3	0,468
Technoelast ЭПП2003 δ =0,0040м ρ = 6кН/м^2	т/м^2	0,024	1,2	0,0288
A Thermal layer δ =0,15м ρ = 0,35кН/м^2	т/м^2	0,05	1,2	0,06
1 layer of roofing felt δ =0,004м ρ = 6 кН/м^2	т/м^2	0,024	1,2	0,03
All the Regulars:	т/м^2	0,52	1,28	0,67
Temporary:				
Complete set:	т/м^2	1,20	1,45	1,74
Snow Load	т/м^2	0,5	1,4	0,7
Overall:	т/м^2	0,284		0,386

Table 2.2 - Loads on the floor slabs and effects

Name	Unit	Normative	According to coefficient γ_f	Calculated
Regular:				
Sandy smoothing layer, δ = 17mm, γ = 1.6t / m 3	т/м^2	0,027	1,3	0,035
Sound insulation ROCKWOOL FlorBatts, δ = 30 mm, γ = 0.125t / m 3	т/м^2	0,004	1,2	0,005
Cement-sand screed, δ = 50 mm, γ = 1.8 t / m 3	т/м^2	0,09	1,3	0,117
Linoleum Tarkett δ = 3 mm, γ = 1.6 t / m 3	т/м^2	0,005	1,2	0,006
All Stables:	т/м^2	0,126	1,29	0,163
Temporary:				
Distribution intervals	т/м^2	0,21	1,2	0,252
Useful long	т/м^2	0,15	1,2	0,18
Useful short	т/м^2	0,03	1,2	0,036
periodic	т/м^2	0,39		0,468
Overall	т/м^2	0,516		0,631

Table 2.3 - Loads on the Rostver panel

Name	Unit	Normative	According to coefficient γ_f	Calculated
Regular:				
Cement-sand screed, δ = 50mm,γ = 1.8 t/m 3	т/м^2	0,09	1,3	0,117
Temporary:				
Useful long	т/м^2	0,2	1,2	0,24

Table 2.3 continuation

Useful short	т/м^2	0,1	1,2	0,12
Overall	т/м^2	0,39		0,477

Table 2.4 - Load on vestibules, corridors, and stairs

Name	Unit	Normative	According to coefficient γ_f	Calculated
Temporary:				
Useful long	т/м^2	0,3	1,2	0,36
Useful short	т/м^2	0,1	1,2	0,12
All temporary	т/м^2	0,4		0,48

Table 2.5 - Load from the outer wall enclosure

Name	Unit	Normative	According to coefficient γ_f	Calculated
Plaster layer, δ = 20 mm, h=2.68 m, γ = 1.8 t / m t / m 3	т/м	0,096	1,3	0,125
Stone laying, δ = 250 mm, t / m h = 2.78, γ = 1.8 t / m 3	т/м	1,251	1,3	1,626
Thermal insulation ROCKWOOL VentiBatts D, δ = 110 mm, h = 3 m, γ=0.045t / m 3	т/м	0,015	1,2	0,018
The skeleton of the facade, h = 3 m	т/м	0,005	1,2	0,006
Porcelain tiles, δ = 8 mm, h = 3 m, γ = 2.4t / m 3	т/м	0,058	1,2	0,07
Overall	т/м	1,425		1,845

Table 2.5 continuation

Glazing coefficient taking into accounsitting total 0.3	т/м	0,998		1,292

To the basement wall, which is formed as a result of exposure to soil soil load:

$$q_B = \gamma_f * p_{bf} * h_{np} * tg^2(45 - \frac{\emptyset}{2}) \quad (2.1)$$

Where: γ_f = 1,2 - reliability coefficient under load;
p bf = , 165t / m^3 - back cover density;
φ = 20 ° - angle of internal friction;
γ_g = , 115 - coefficient of soil reliability; Horizontal force:

$$h_{np} = \frac{p}{p_{bf}} = \frac{1.0}{1.65} = 0.61M$$

$$q_B = 1.2 * 1.65 * 0.61 * tg^2[45 - \frac{20}{2}] = 0.6m/M^2$$

$$q_h = \gamma_g * p_{bf}\left[\frac{\gamma_f}{\gamma g} h_{np} + d\right] * tg^2[45 - \frac{\emptyset}{2}]$$

$$[q_h = 1.5 * 1.65\left[\frac{1.2}{1.15}0.61 + 7.2\right] * tg^2\left[45 - \frac{20]}{2}\right] = 1.15 * 1.65 * 3.9965 * tg^2 35 = 5.8m/M^2$$

Table 2.6 - Load on the balcony slab

Name	Unit	Normative	According to coefficient γ_f	Calculated
Temporary:				
Stained glass glazing	т/м	0,118	1,2	0,142
Balcony fence	т/м	0,015	1,2	0,018
Balcony fence along the width of 0.8 m evenly spaced section	т/м2	0,4	1,2	0,48
Overall	т/м2	0,533	1,2	0,64

Report on the requirements of PM&E 2.01.07-85 * "Loads and effects" done. Estimated seismic loads RK M&E 2.03-30-2006 “Seismic Construction in the districts "and on the same basis values were accepted.

The following coefficients in the calculation of seismic loads accepted:

k 1 = 1; k 2 = 0.25; k 3 = 1.78 .; k φ = 1;

A g = 0.5; A in = 0.4; K o = 1.0.

Table 2.7– Load from the inner wall enclosure

Name	Unit	Normative	According to coefficient γ_f	Calculated
Silicate brick	т/м	2,16	1,1	2,37
The height of the 1st floor is 3 m when there is plaster next layers height 2.6 m	т/м	0,09	1,3	0,117
Overall	т/м	2,25	1,1	2,48

Materials and construction presented in the department of architectural design

Area engineering and geological under the circumstances lift to determine the forces and deformations that occur in the elements the modeling of the building was performed. Linear, flat in monolithic execution the building is made of horizontal and vertical elements in the system "ETABS 18" built.

The report is calculated according to the program "ETABS 18”.

The building is designed in a monolithic version. The basic scheme of the building 2.1shown in the figure.

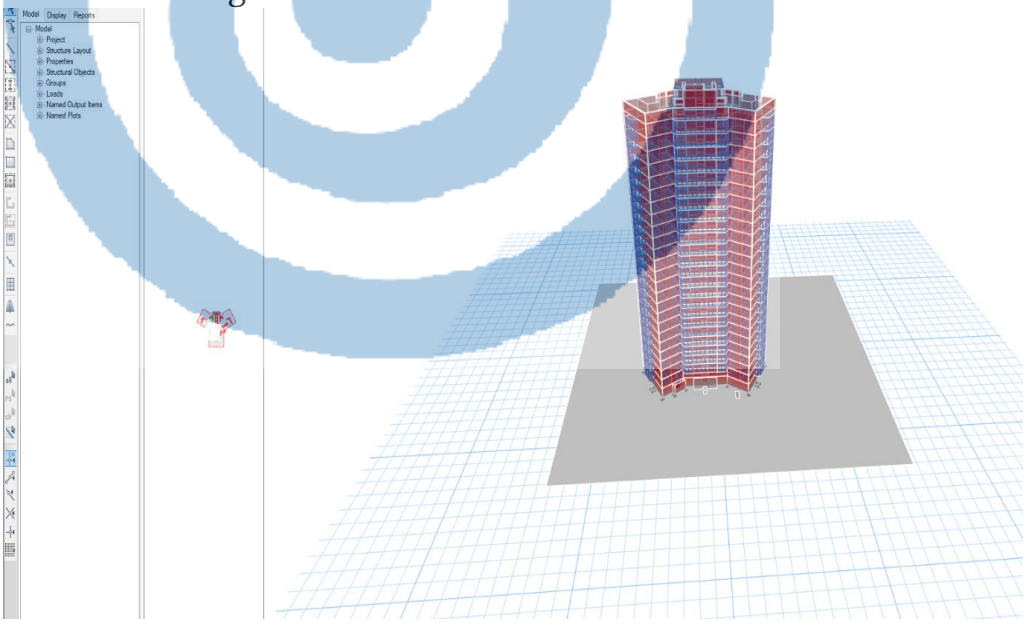

Figure 2.1 - The basic scheme of the building

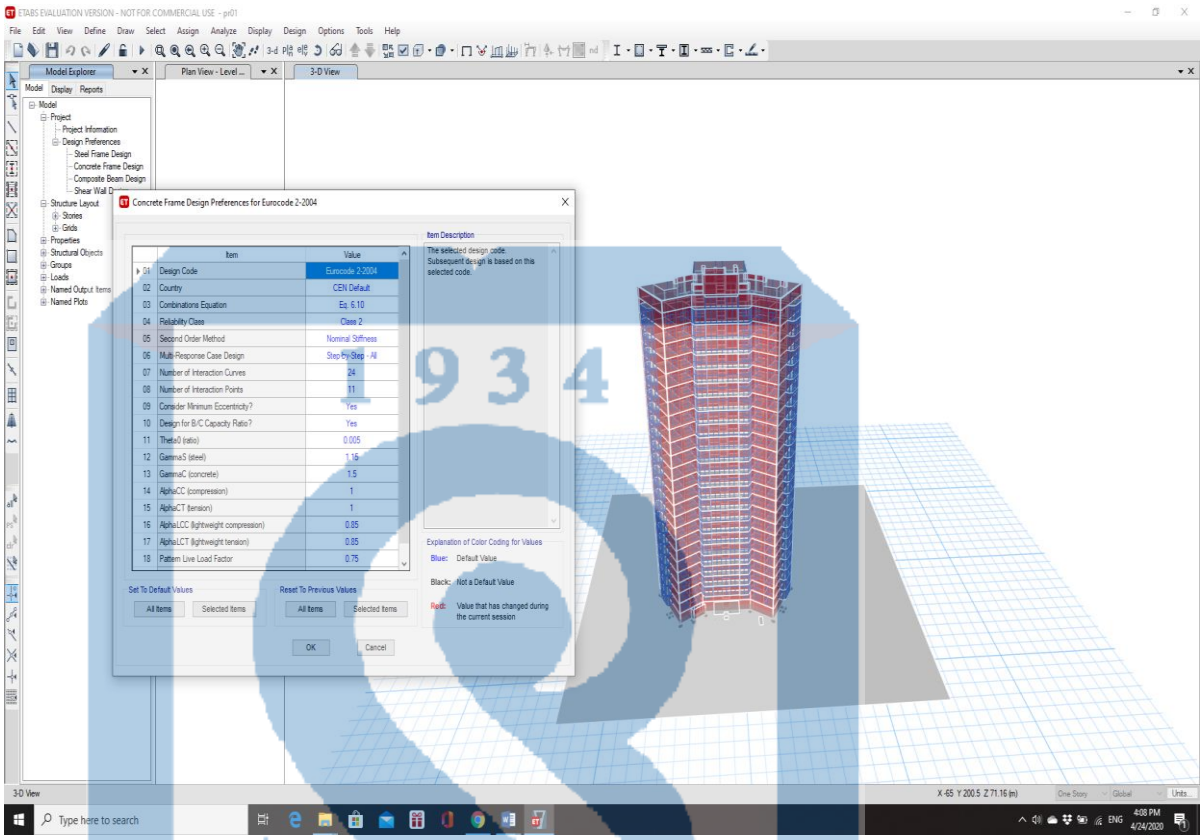

Figure 2.2 - Concrete frame design Eurocode 2-2004.

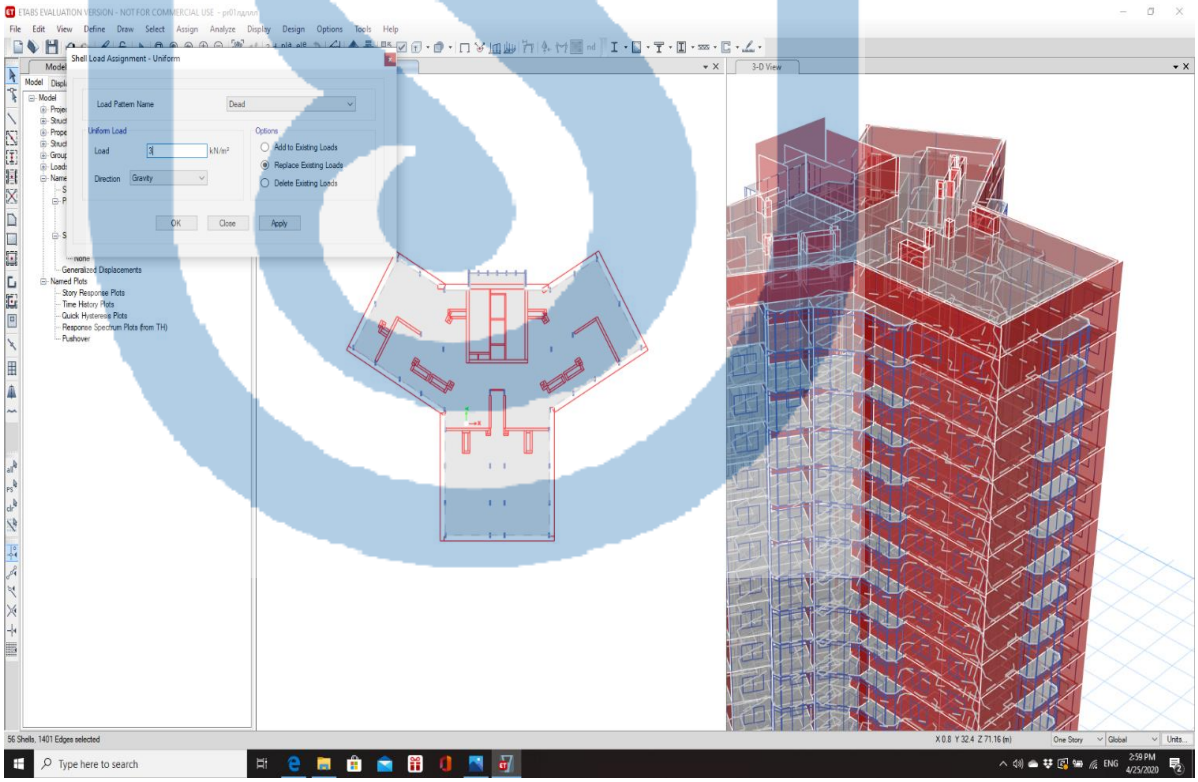

Figure 2.3 - Shell load assignment (dead load).

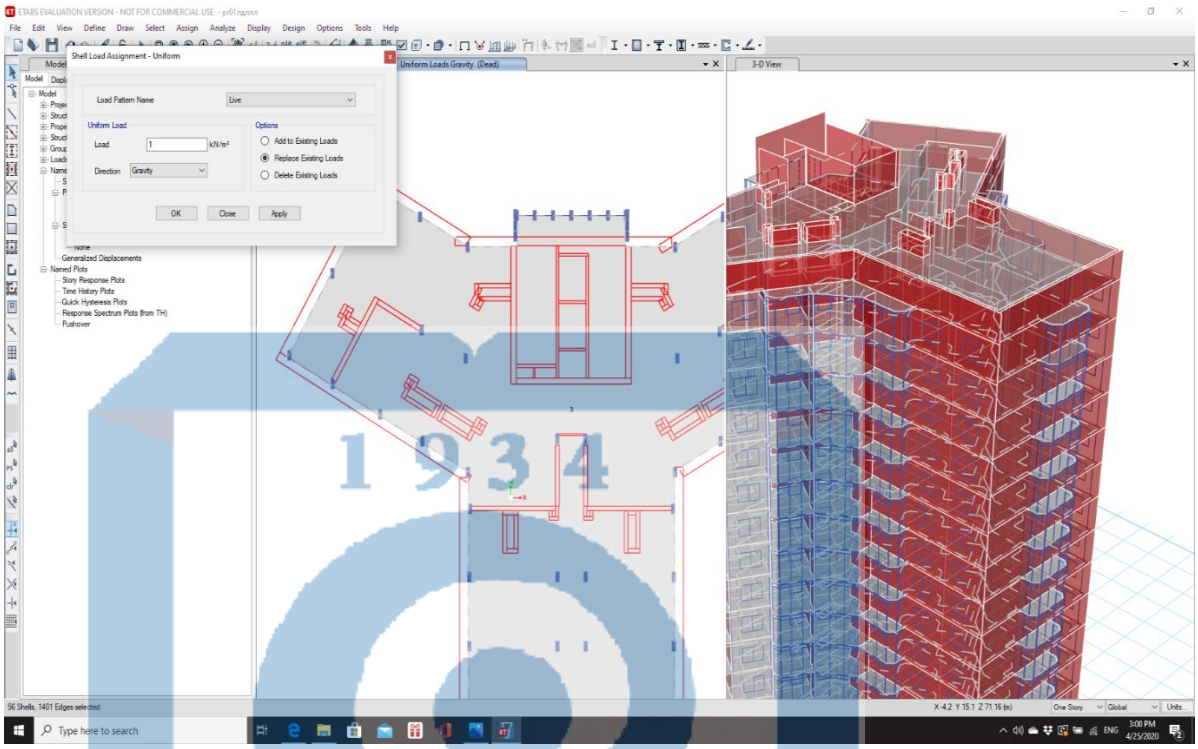

Figure 2.4 - Shell load assignment (live load).

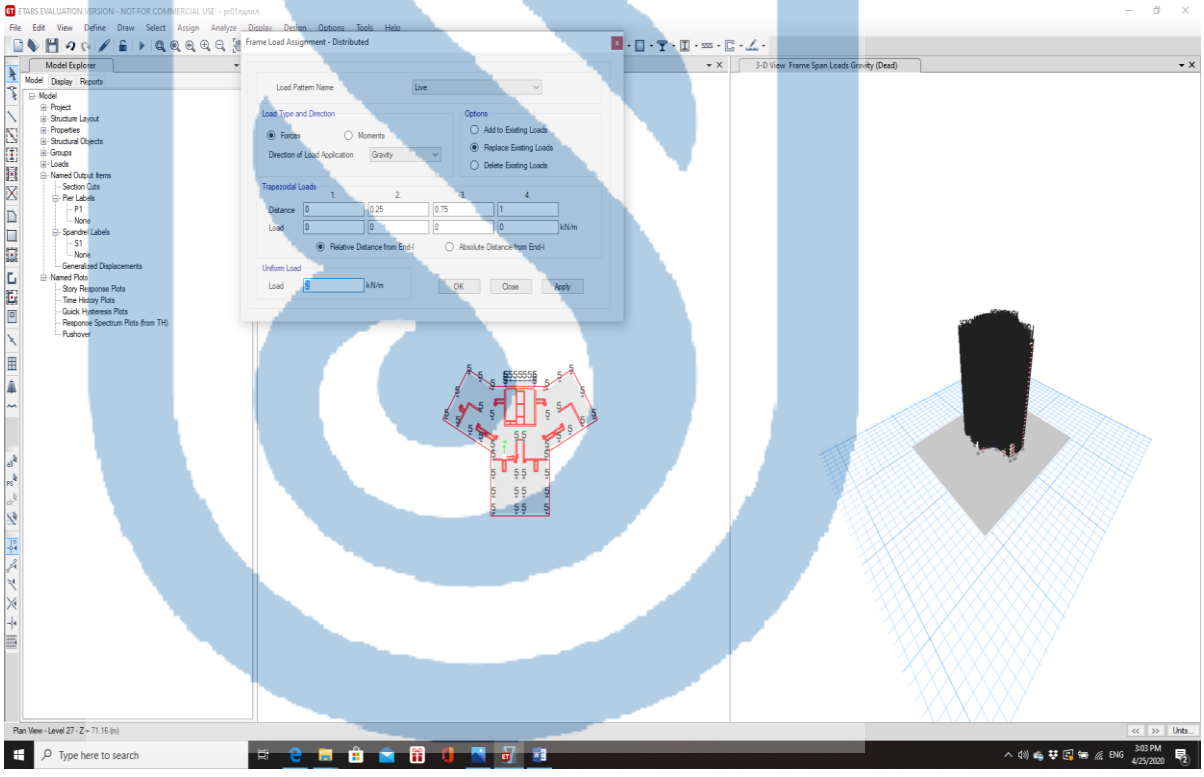

Figure 2.5 - Frame load assignment (distributed).

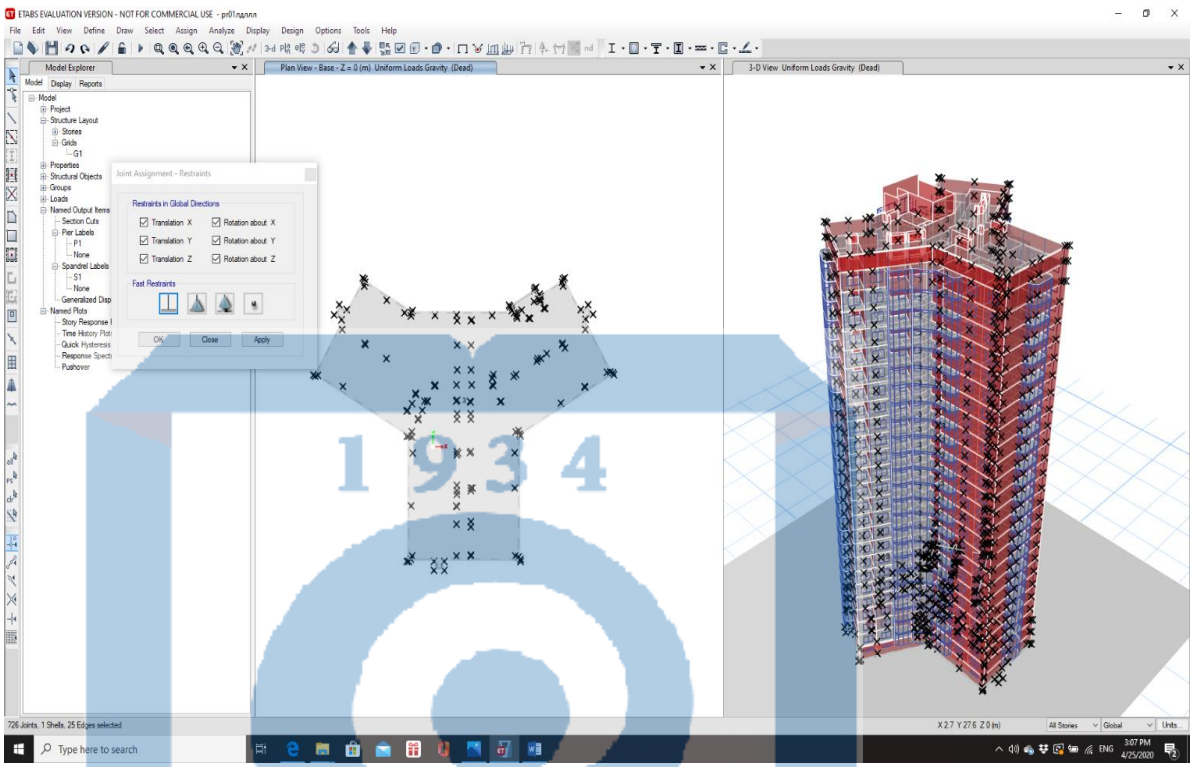

Figure 2.6 - Joint assignment restrains.

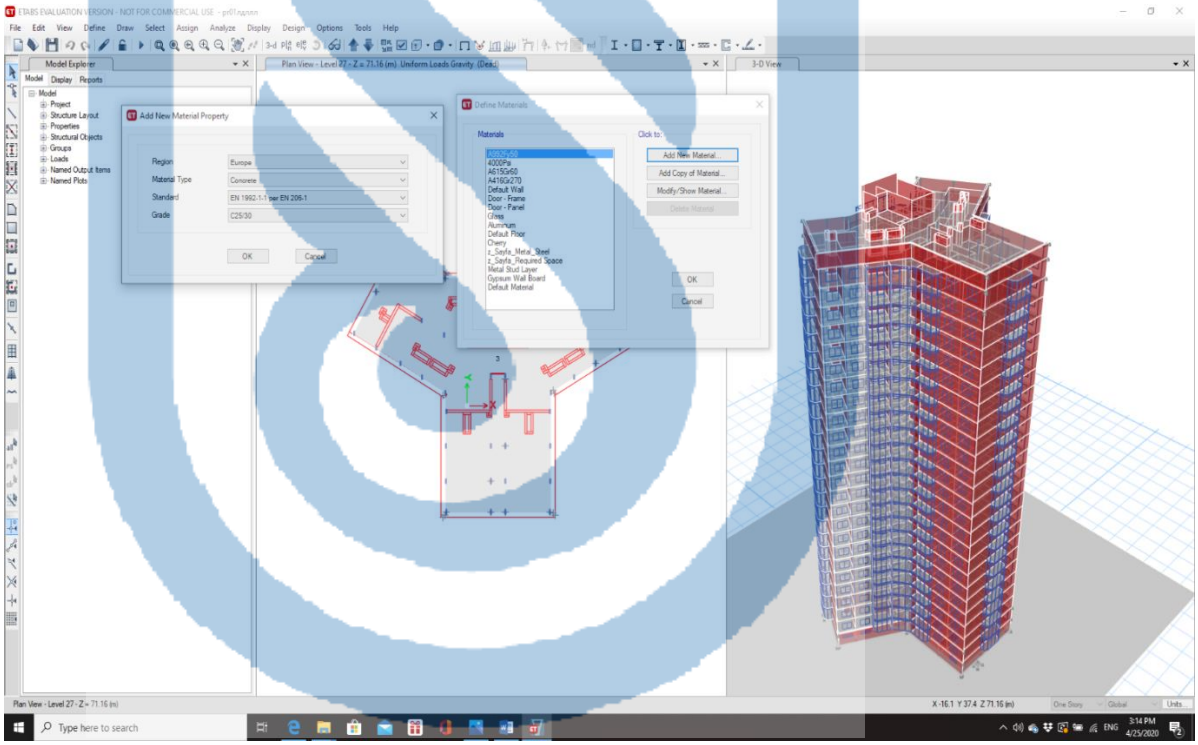

Figure 2.7 - Material property (defining material).

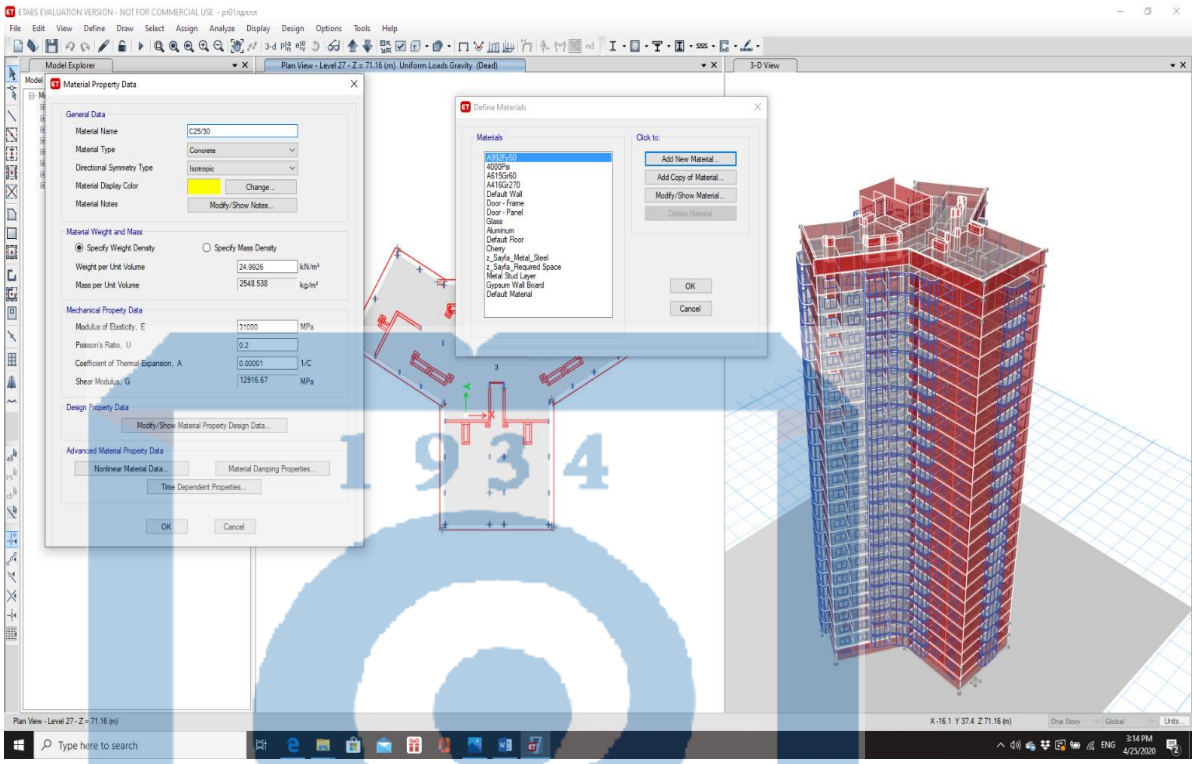

Figure 2.8 -Material property data.

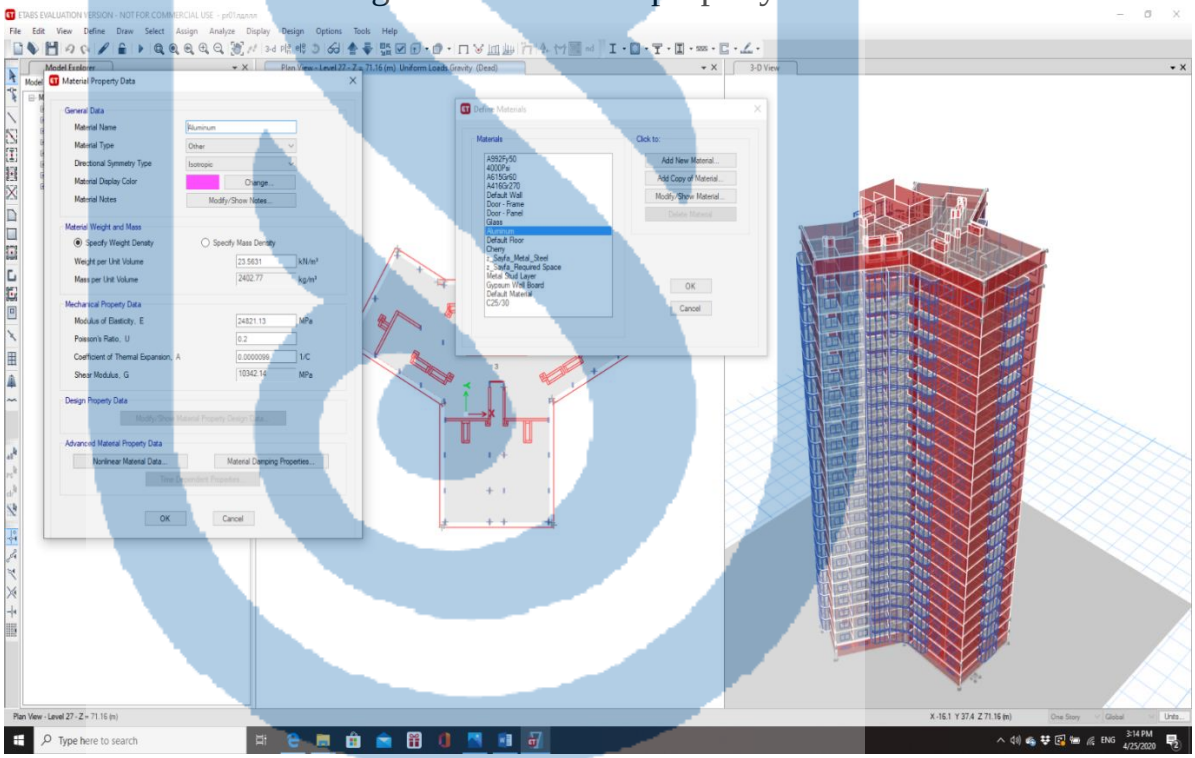

Figure 2.9 -Material property data (aluminum type).

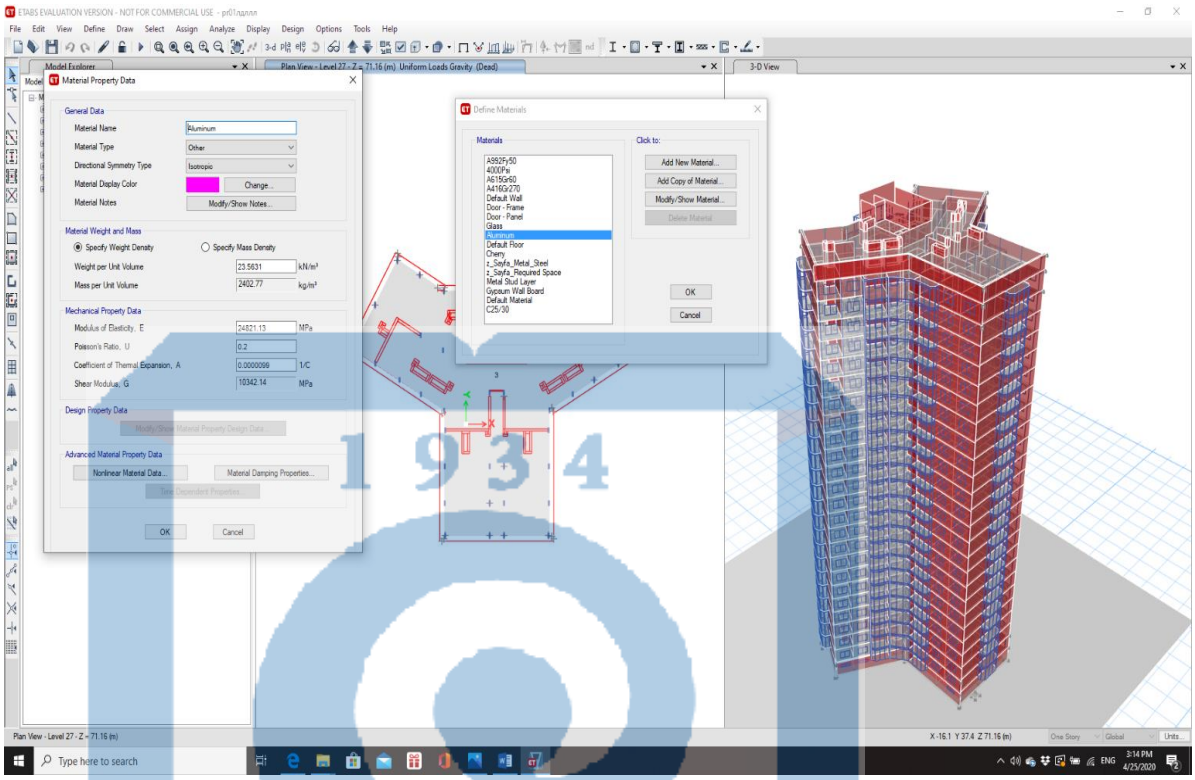

Figure 2.10 -Material property data (glass type).

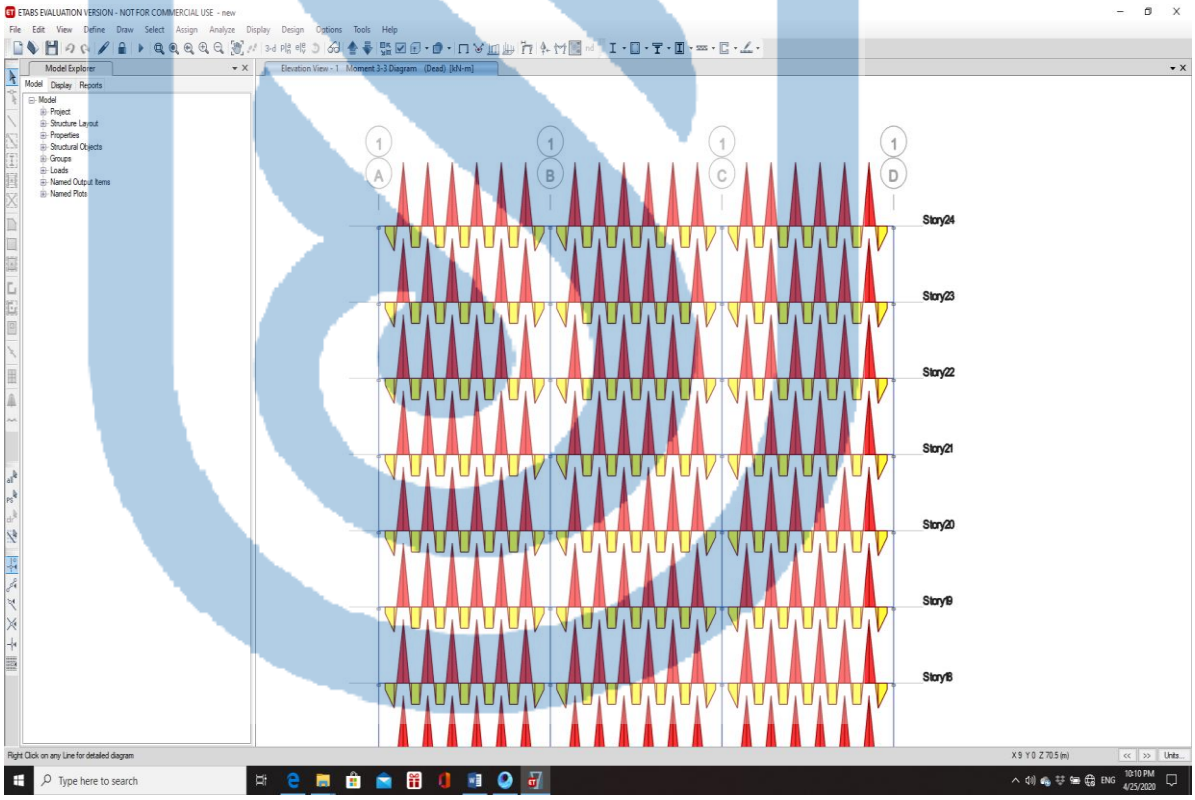

Figure 2.11 - Moment diagram.

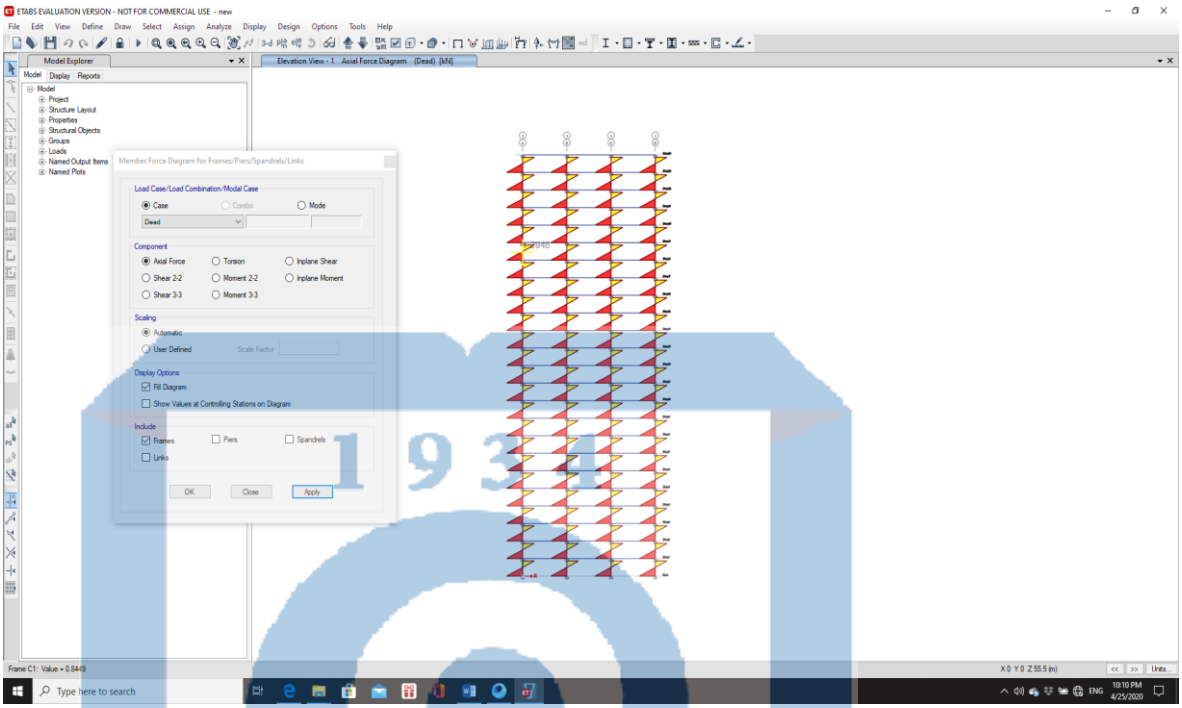

Figure 2.12 - Axial force.

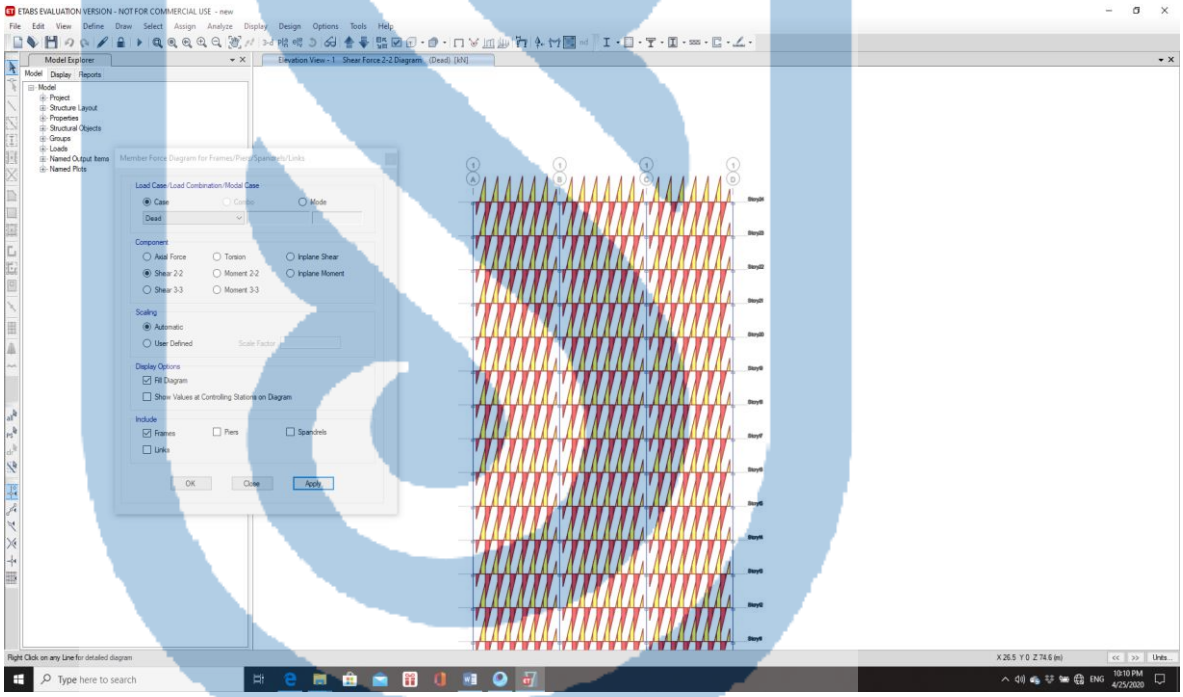

Figure 2.13 - Shear force.

2.2 The choice of fittings for the ceiling panels of the building

PC ″ ETABS 18” we carry out on. Slabs are made of heavy concrete class B30 and The calculated compressive strength R b = 17 MPa, the initial modulus of elasticity Eb = 29 * 103 MPa, the coefficient of working conditions is assumed to be γ b2 = 0.9. Longitudinal reinforcement class A500SP, design resistance R s = 450

MPa, modulus of elasticity E s = 200000. We accept the minimum reinforcement longitudinal reinforcement bottom layer ø12 pitch 200 mm, top layer ø10 pitch 200 mm.

Slab contraction joints should intersect at the openings for columns the cross section of the board is considered to be rectangular 1000x200 mm.

Calculate the reinforcement in the distance between the axes.

Maximum torque in the range, Mx = 1,361 T * m/m; My = 1,323 T*m/m; KN/m

$h\ 0_x = h - a = 200 - 2 = 174$ cm;6

$h\ 0_y = h - a = 200 - 38 = 162$ cm.

Calculate in the X direction;

$$\alpha_m = \frac{M}{R_b * b * {h_0}^2} = \frac{1.361}{0.9 * 1700 * 1 * 0.174^2} = 0.03$$

According to the schedule $^{\alpha}{}_R = 0.372$, $^{\alpha}{}_m < {}^{\alpha}{}_R$ determine the compressed reinforcement no need to calculate.

Determine the area of the armature;

$$A_s = \frac{R_b * b * h_0(1 - \sqrt{1 - 2\alpha_m})}{R_s} = \frac{17 * 0.9 * 1000 * 174 * (1 - \sqrt{1 - 2 * 0.03})}{450} = 591MM^2$$

Calculate in the Y direction;

$$\alpha_m = \frac{M}{R_b * b * {h_0}^2} = \frac{1.323}{0.9 * 1700 * 1 * 0.162^2} = 0.032$$

According to the schedule $^{\alpha}{}_R = 0.372$, $^{\alpha}{}_m < {}^{\alpha}{}_R$ determine the compressed reinforcement no need to calculate.

Determine the area of the elongated reinforcement;

$$A_s = \frac{R_b * b * h_0(1 - \sqrt{1 - 2\alpha_m})}{R_s} = \frac{17 * 1000 * 162 * (1 - \sqrt{1 - 2 * 0.032})}{450} = 612MM^2$$

We calculate the reinforcement on the rack

Maximum torque in the range, M x = 2,249 T * m / m; M y = 4,133 T * m / m;

$h\ 0_x = h - a = 200 - 25 = 175$ cm;

$h\ 0_y = h - a = 200 - 35 = 165$ cm.

Calculate in the X direction;

$$\alpha_m = \frac{M}{R_b * b * {h_0}^2} = \frac{2.249}{0.9 * 1700 * 1 * 0.175^2} = 0.05$$

According to the schedule $^{\alpha}{}_R = 0.372$, $^{\alpha}{}_m < {}^{\alpha}{}_R$ determine the compressed reinforcement no need to calculate.

Determine the area of the armature;

$$A_s = \frac{R_b * b * h_0(1 - \sqrt{1 - 2\alpha_m})}{R_s} = \frac{17 * 1000 * 165 * (1 - \sqrt{1 - 2 * 0.05})}{450} = 623.3MM^2$$

Calculate in the Y direction;

$$\alpha_m = \frac{M}{R_b * b * {h_0}^2} = \frac{4.133}{0.9 * 1700 * 1 * 0.165^2} = 0.1$$

According to the schedule α_R = 0.372, $\alpha_m < \alpha_R$ determine the compressed reinforcement no need to calculate.

Determine the area of the armature;

$$A_s = \frac{R_b * b * h_0(1-\sqrt{1-2\alpha_m})}{R_s} = \frac{17 * 1000 * 165 * (1-\sqrt{1-2*0.1})}{450}$$
$$= 685.66MM^2$$

Slab contraction joints should intersect at the openings for columns

The top and bottom of the column on the axes of the D-11 axes touches, cross section 400x400mm. The top of the plate and affecting the top

The moments on the lower edges are equal: Mx, sup = 1.78t · m, Mx, inf =2.31t.m $M, ysup$ = 3,783t · m, $M, yinf$ = 0.048t · m; Class B30 concrete (R_{bt} = 1.15 MPa). Concentrated minus the load applied to the opposite side of the hob for strength, we accept the load from the roof and the impact force F = N = 568.96538.1 = 30.86t.

Accordingly settlement horizontal section contour geometric determine the characteristics.

$$u = 2(a + b + 2h) = 0\ 2 * (400 + 400 + 2 * 163) = 2252\,mm;$$

Design resistance moment Mx (i.e. a = 400 mm, b = 400 mm).

$$W_a = (a + h_0)\left[\frac{a + h_0}{3} + b + h_0\right] = (400 + 163) * \left[\frac{400 + 163}{3} + 400 + 163\right]$$
$$= 422625MM^2$$

Design moment of resistance My(i.e. a=400mm, b=400mm).Wy = 422625mm

The calculated concentrated moments are in the top of the board and in each direction we get half of the moment in the section along the lower edges, that is,

$$Mx = \frac{(\text{Mx},\text{sup} + \text{Mx},\text{inf})}{2} = \frac{(1.78 + 2.31)}{2} = 2.05\text{tm}$$
$$My = \frac{(\text{My},\text{sup} + \text{My},\text{inf})}{2} = \frac{(3.783 + 0.048)}{2} = 1.92\text{tm}$$

We will check taking into account the condition, M= M_x = 2.05tm, Wx =422625 mm^2 and add to the left part

$$\frac{My}{Wy} = \frac{19.2*10^6}{422625} = 45.43\ \text{N/mm}$$

This time

$$\frac{Mx}{Wx} + \frac{My}{Wy} = \frac{20.5*10^6}{422625} + 45.43 = 93.9\ \text{N/mm} > \frac{f}{u} = \frac{30.86*10^3}{2252} = 13N/mm$$

Accordingly we accept

$$\frac{Mx}{Wx} + \frac{My}{Wy} = 13N/mm$$

$$\frac{f}{u} + \frac{Mx}{Wx} + \frac{My}{Wy} = 13 + 13 = \frac{26N}{mm} < R_{bt}h_0 = 1.15 * 1.63 = 187.45N/mm$$

The condition is performed and horizontal reinforcement is not required.

3 Technological part

3.1 Determining the scope of work

Calculation of the volume of work on concrete according to structural drawings begins with determining the size, cost of fittings and molds. The published surface area and volume of concrete structures calculated by geometric dimensions. The results are tabulated.

The required number of assembly elements is also determined: universal assembly shields, towers, telescopic towers, trusses, wood plywood beams, laminated plywood sheets. Number of elements are included in Table 3.1.

Table 3.1 - Determining the scope of work

Mark of Elements	Number of elements	Laying concrete volume, m3		Steel consumption, т		page area, м2	
		One element	All	One element	All	One element	All
Solid ceilings							
PM1	1	365,7	365,7	29,2	29,2	1828,6	1828,6
PM2	1	240,2	240,2	19,2	19,2	1201,3	1201,3
Diaphragms							
D1	4	4,1	16,4	5,23	20,92	42,45	169,8
D2	2	3,67	7,34	4,78	9,56	37,17	74,34
Diaphragms on set:	6		23,74		30,48		244,14
Elevator shaft							
Elevator shaft	1	12,6	12,6	9,36	9,36	130,32	130,32
Staircase							
Staircase	1	9,17	9,17	8,49	8,49	92,88	92,88

Before starting the construction of the frame of the prefabricated building warehouses near the object (for fittings, molds) It is necessary to equip places for receiving concrete mix.

Universal prefabricated for the construction of the frame of a prefabricated building -

We use a replaceable mold. Transfer of molds is performed by a crane.

Delivery of all reinforcement products is carried out by crane.

Transportation of the concrete mix is necessary for the uniformity of the concrete mix the closest mortar to keep the mobility is concrete is carried out with auto-concrete mixers from the site.

Availability of the following schemes of supply of concrete mix to the structure

Possible: with cranes in the chase; Disassembly of molds is carried out manually with auto-concrete pumps. Place the box on the ground By means of a crane. On the ground, the barn is cleaned, lubricated, checked and then used in the next cycle.

Devices for concrete work on the intensity of concreting it is time for concrete workers to lay the concrete mix determined on the basis of the norm.

Table 3.2 - Determining the number of template elements

Name of elements	Number of Elements	1 Mass of Elements , т	All of Elements mass, т
Stay tuned area 3600x3000	42	0,114	4,788
Stay tuned area 1600x3000	37	0,09	3,33
Disassemble the stand	60	0,035	2,1
Telescopic supports	465	0,018	8,37
Trenoga	465	0,006	2,79
For the beam fork	280	0,002	0,56
Total:			21,82

Option 1

Unloading of fittings, unloading of molds and reinforcement products, further transfer of molds and necessary construction products and equipment An additional tower crane is used for Delivery of concrete mix to the construction site according to the "crane-shovel" scheme carried out. Concrete mix from the truck when delivering the crane the capacity of which is lowered into the rotary shafts to build a concrete mix intensity and concrete body transporting the car body capacity must be doubled.

Option 2

Unloading of fittings, unloading of molds and reinforcement products, further transfer of molds and necessary construction products and equipment An additional

tower crane is used for Instead of laying concrete mix The transfer is carried out by means of a concrete pump.

Select an additional tap for option 1

The main technological parameters of the crane include: hook flight L m, hook lifting height H m, crane load capacity Q crane we calculate the above characteristics for selection. Hook lifting height:

$$H к = H 0 + H б + H э + Нст_р \quad (3,1)$$

Where:H0 = 72.09 m - height of the building;

б = 0.5 m - height of the hole for safe work;

Нэ = 3.16 m is the height of the element, in this case the turning angle height;

$Нст_р$ = 3.3 m - height of ropes.

Hk = 72.09 + 0.5 + 3.16 + 3.3 = 79.05 m.

Hook flight:

$$L = L n + L b + L o -0.9 m \quad (3.2)$$

Where Ln = 30 m - the furthest from the edge of the foundation of the building transmission distance to the column.

Safety zone Lb = 1 m - from the edge of the foundation of the building to the edge of the crane foundation

L o = 3.6 m - from the edge of the crane foundation to the axis of the crane tower distance.

1.05 m - from the axis of the crane tower to the edge of the crane tower distance.

$$L = 30 + 1 + 3.6-1.05 = 33.55 m.$$

The mass of the rising element the calculation is made on a bucket of concrete, because it is the largest has a mass.

We accept a rotary bucket with a capacity of 2 m 3. Technical the characteristics are given in Table 3.3.

Table 3.3 - Determining the number of template elements

Indicator	Capacity, m3
	2,0
Response criteria. for shooting, mm	800x600
Response criteria. to shoot	Jaw
Mass, t	0,9
Dimensions	

Table 3.3 continuation

Length	3160
width	1232
height	1040

$$Q = Q\ b + Q\ page + Q\ p \quad (3.3)$$

Where: Q b = 0.9 t - weight of the bucket,

Q page = 2.2 * 2 = 4.4 t - weight of concrete in a bucket,

Q $ст_р$ = 0.06 t is the weight of the rope.

Q = 0.9 + 4.4 + 0.06 = 5.36 t.

The height of the hook as an additional crane was 62.3 m

Select the COMEDILCT / B-8 crane. The height of the tower is from 8.2 to 79.05 m may change to. The crane support is a concrete foundation, crane it is attached to it with anchor bolts. Crane arrow roller support -

The turning circle is rotated by means of two turning mechanisms.

Choice of additional crane and concrete pump for option 2

Choosing a crane

KC-5363 crane for the second version of the work we get, that is, the mass of the formwork and the mass of reinforcement with concrete

The mass of the bucket does not exceed, and the height of the mold is less than the height of the bucket.

Selection of concrete pump

Concrete feed height to deliver concrete to the highest point of the building A concrete pump of at least 73 m is required. Its technical characteristics 3.4given in the table.

Table 3.4 - Technical description BN - 80 concrete pump

Indicator	Values
The essence Pump type	hydraulic piston
Productivity, m3 / hour	80
Feeding height, m	120
Transmission distance, m	520
Fuel consumption, l / h	21
Fuel tank capacity, l50	50
Volume of the receiving hopper, m3	0,6
Concrete pump dimensions and chassis mm:	
length	5500

Table 3.4 continuation

Width	1800
height	2300
weight, t	4,5
chassis type	pneumatic chassis
Concrete mix for concrete pump:	
fraction, mm	Up to 40
convenient branding	P2
movement of the mixture	9

Feasibility study of options

Final concreting of the structure Feasibility study of the options provided by comparison.

For each version of concrete work to compare options need to make a calculation.

The time required for concrete work for the first and second options the salary is calculated. Results of calculations on concrete works Shown in Table 3.5.

Time first before performing the above calculation norms and concrete mix to the structure with BN-80 concrete pump and push the concrete mixture out of the concrete mixer and determine the assessment of the unloading of the concrete pump into the receiving hopper.

Feasibility study of concrete mix delivery options is made for the top layer, because the concrete mixture is "crane - chase"

While the rate of transmission time according to the scheme depends on the transmission height the rate of time of delivery of concrete mix by truck concrete of the building does not depend on height.

Calculation 1

Unload the concrete pump into a bucket and take the concrete pump determine the time and price rate for the hopper.

We accept concrete mixer 69363B.

The volume of the transported mixture is 5m 3.

KAMAZ-55111 base car.

Unloading time is 300 s.

The hourly rate for the driver is 0.79 tenge.

Time norm for unloading 100 m 3 $_{of}$ concrete mix:

$$1 * 100 * 300 / (5 * 3600) = 1.67 \text{ mash / h.}$$

Price:

$$0 .79 * 1.67 = 1.32 \text{ tg}$$

Timing and delivery of concrete mix to the structure with BN-80 concrete pump determination of evaluation standards.

The performance of the concrete pump is based on the following formula determined by:

$$P_e = P_t * K_1 * K_2 \quad (3.4)$$

Where: P t = 80 m 3 / h - technical capacity of the concrete pump,

K 1 = 0.5 - use of coefficient of technical performance

K 2 = 0.65 - coefficient of reduction of concrete pump performance

P e = 80 * 0.5 * 0.65 = 26 m 3 / h

The concrete pump is serviced by a unit of three people:

- concrete pumping machine operator 1 person 4th category,
- locksmith 4 category 1 person,
- 1 person of concrete worker of 2 categories.

Time norm of 1 m 3 of concrete mix:

- for workers: 1 * 2/26 = 0.077 people / hour, - for the driver: 1 * 1/26 = 0.0385 man-hours, The assessment is:
- for employees: 0.64 * 0.077 = 0.0493 tenge, - for the driver: 0.79 * 0.0385 = 0.0304 tenge.

We determine the cost of work for each option;

$$Ci = ПЗ + НР \quad (3.5)$$

Where: $ПЗ = (З_{раб} + С_{м\text{-}ч} * N_{м\text{-}ч} + С_{пп}) * И$,

Zrab - the wages of construction workers in this explanatory note defined in the table;

C m-h - car- hour price, rubles,

N m-h - the number of machine hours of machine work explanatory defined in Table 3.6 of the record,

C pp - the cost of installing the foundation of an additional tower crane,

I = 148,629 - from the base price level of 1984 to the current level of 2012 average conversion factor to the price level;

$$НР = К * (З_{раб} + З_{маш}) \quad (3.6)$$

Where: K = 1.12 - builder - workers and mechanics amount of overhead costs from the labor remuneration fund (as a percentage).

Z mash - the wages of drivers are given in Table 3.6 of this explanatory note identified.

Option 1

Additional tower crane for delivery of concrete mix to the place of laying COMEDIL CTT / B-8 is used.

C m-h = 8.47 tg;

N m-h = 29.41 mash - hours;

For slave = 194.75 tenge;

With mash = 26.82 tg; And = 148,629.

The cost of installing the foundation of an additional tower crane is not taken into account, because the tower crane was working on the installation before concreting will be.

PZ = (194.75 + 8.47 * 29.41) * 148.629 = 65 969.4 tg;

HP = 1.12 * (194.75 + 29.41) * 148.629 = 37 314.7 tg;

C i = 65 969.4 + 37 314.7 = 103 284.1 tg.

Option 2

BN-80 concrete pump for delivery of concrete mixture to the place of laying used.

Cm-h = 17.36 tg;

Nm-h = 7.65 mash - h;

Hwork = $ 142.52;

With mash = 6.04 tg; And = 148,629.

The cost of installing the foundation of an additional tower crane is not taken into account, because the tower crane was working on the installation before concreting will be.

PZ = (142.52 + 17.36 * 7.65) * 148.629 = 34 899.8 tg; HP = 1.12 * (142.52 + 6.04) * 148.629 = 34 723 tg;

Ci = 34 899.8 + 34 723 = 69 622.8 tg.

Table 3.6 - Feasibility study of options

Name of indicators	Unit	According to the options value of indicators	
		Option 1 (cranebucket)	Option 2 (concrete pump)
Scope of work	Scale-hr	29,41	7,65
Labor intensity	Man-hr	244,31	200,74
Duration of shift installation	shift	15,26	12,56
Cost (prices for 2019) tenge	tg	103 284,1	69 622,8

Basically, the resulting data versions of the technical accept the economic comparison for further development of option 1 (crane-bath), because the crane is required to perform reinforcement, normal, masonry and other works.

3.2 Selection of vehicles

Transportation of concrete mix from the concrete plant to the construction site for 69363B we get a concrete mixer.

The volume of the transported mixture is 5m 3.

KAMAZ-55111 base car.

Unloading time is 300 s.

Productivity of the vehicle in the method of portion delivery of the mixture determined by the following formula:

$$П\ т_р = Q\ т_р * t\ см * к\ вр * 60 / t\ ц \quad (3,7)$$

Where: Q $т_р$ = 5 m 3 - a portion of the concrete mixture transported in one flight volume;

tcm = 8 hours - shift duration; к вр = 0.9 - working time utilization factor;

tц = t3 + tГП + tВ + tпп + to - general transportation of concrete mix

Cycle duration; t 3 = 8 min - loading time of the vehicle at the concrete plant; t GP = 20 min - the movement of the truck from the factory to the place of laying the mixture

time; tB = 8 min - time of unloading of concrete mix; tпп = 20 min - idle time of the vehicle to the concrete plant; t o = 5 min - cleaning, washing and service time.

Ptr = 5 · 8 · 60 · 0.9 / (8 + 20 + 8 + 20 + 5) = 35.4 m 3 - shift.

Ensuring the required intensity of concrete mixing the need for vehicles:

$$N = P\ page * t\ cm / Ptr \quad (3.8)$$

Where: P page = k * n / Nvr - drinking capacity of concrete workers per hour,

k = 2 - number of concrete workers, n = number of people in 4 units,

Hvr is the time norm for laying the concrete mix.

For concreting columns, diaphragms and walls selection of the number of auto concrete mixers.

P page = 2 * 4 / 1.6 = 5.0 m 3 / h,

N = 5.0 * 8 / 35.4 = 1.13

We accept for concreting columns, diaphragms and walls 2 concrete mixer 69363B per shift.

Number of auto concrete mixers for concreting paving slabs selection.

P page = 2 * 4 / 0.57 = 14.04 m 3 / hour,

N = 14.04 * 8 / 35.4 = 3.17

We accept 4 concrete mixers for concreting slabs 69363 B per shift.

In the columns of the rigid core and elevator shaft, to seal the concrete mixture in the diaphragms and walls A depth vibrator with a flexible shaft is used. As follows IV-75 model with characteristics: - oscillation frequency 20000 Hz; vibrating tip:

- Diameter 28 mm; - length 400 mm; - weight 14.3 kg.
- Thickness of concreting layer 35-40 cm; - technical capacity 4-7 m3 / h.

Movable vibration on the paving slab to compact the concrete mix used. Model EVR-380 with the following technical characteristics:

- aluminum profiles 180x40x4 mm;
- length 2.5-4.5 m;
- 220 V vibration unit; - power 0.5 kW; - weight 69 kg.

3.3 Technology of work performance

Installation of columns and walls

DOKA molds were selected for molding works. Universal for kneading beams, diaphragms and stiffness cores templates are used. A wedge lock serves for the molds.

There is also a support to hold the formwork in the design position uses debris.

Cover mold device and mold care

The telescopic supports will be delivered to the construction site in disassembled form. Collect them immediately before installation. Screw jack nut is set to approximately 1/2 the height of the transition groove, which is then assembled allows you to smooth the molds, movable with a jack device works by raising or lowering the bar.

The roof is assembled at once to cover all of the mold. Normal The installation begins with the installation of telescopic supports, their vertical the location is provided by the triangles. Then in the form of a lattice wooden plywood beams are installed on the telescopic supports laminated plywood sheets are laid. Collected molds Smoothing begins after checking the marks with a level. This is achieved by means of screw jacks.

Deck formwork and all screw parts, their covered with a layer of lubricant, regardless of whether it is in use or in storage should.

Inventory templates, as well as sponsoring elements (racks) and as well as fasteners (clamps, clamps, locks) from each turn should then be cleaned of cement mortar. Scrapers and for this purpose metal brushes are used. Hammers and other impacting hammers stopped using the tools to remove the mold elements from the solution. Strictly prohibited.

The use of inventory molds is mandatory for lubrication and each thorough cleaning of cement mortar residues after circulation provides. Lubrication should not leave grease stains, lubrication reinforced concrete should not impair the strength of the surface of the structure,

The absence of volatile and unhealthy substances in the lubricating components should. Lubricants must be fire safe, and they must be prepared and burned the technology should allow to mechanize these processes.

Reinforcement and concreting of ceilings Slab contraction joints should intersect at the openings for columns installation work.

Before the start of reinforcement of monolithic structures the following work must be performed on a typical floor:

- columns in the corresponding occupations of the lower layer work on installation of monolithic structures is completed;
- stairwells are installed in the occupations of the ground floor;
- openings in inventory panels are closed;
- workplace lighting, as well as electricity tools and tools for connecting welding machines prepared and installed on the floor;
- geodetic control of monolithic structures of the lower layer was conducted;
- Acceptance of reinforcement products in the warehouse near the object control performed.

Checks the fittings when receiving them in the warehouse near the facility:

- in armolements with the brand and number of elements availability of tags;
- Control measurements, inspection of amino elements, as well as controls the strength of welded joints.

Reinforcement products are made at the factory and by car delivered to the construction site. Loading and unloading of grids, frames and deformation, bending, reinforcement of individual rods must prevent damage to the welded joints of the elements.

Spatial frames of columns are assembled from a flat frame, the joints are made by spot welding. Spatial skeletons mount the tower crane COMEDILCTT / B-8. Previously concreted Careful adjustment of reinforcement structures before installation, must be inspected and adjusted to the design condition.

Specializes in laying concrete mix and maintenance of concrete joints. The work they perform includes:

- cleaning of forms before concreting, all over 10 mm wide sealing holes and lubricating the surface of steel molds;
- cleaning of fittings from rust, dirt and sticky concrete solution;
- processing of working seams;
- equipment used in the construction of concrete mixes, testing and inspection of inventory and equipment;
- receipt, delivery and loading of concrete mix into columns;
- installation of trucks and vehicles in the process of concreting and relocation;
- mechanisms, tools and after concreting cleaning devices from sticky concrete and mud;
- Watering during the initial hardening of concrete and requiring its moisture cover with materials (sand, sawdust).

One or more of each generation of concrete crews performs work processes. Specialists in concrete

The work of the joints is carried out in two shifts. Joints instruments must be provided with a set.

Control and maintenance of paved concrete must be provided. Open pages should be protected from the harmful effects of direct sunlight and wind. Hardening of concrete the favorable temperature-humidity conditions make it water regularly provides irrigation. Concrete in Portland cement in dry weather

Irrigation is carried out for at least 7 days. At a temperature of + 150C and above watering every 3 hours every day and at least once a night, and the next time at least 3 times a day. Water should not be aggressive to concrete.

Forms of concrete structures 70% of design strength should be carried out after assembly with concrete.

Structures reception design strength with concrete after accumulation.

Prior to the adoption of reinforced concrete structures sink

It is strictly forbidden to clog and wipe the surface. Poor surface iron the decision to accept concrete works is made by the design organization.

The composition of the work performed on the selected option specified: loading and unloading, reinforcement, formwork, as well as concrete mix solving the problems of compaction, maintenance of concrete and removal of molds construction. According to these production data the calculation is made (Table 3.7).

3.4 Development of a calendar plan and safety

Schedule and security technique

Schedule of work in the complex of concrete works reflects the sequence and organization of processes and conditionally consists of two parts. The first section in the form of a table is all engineering reports, and the second is the beginning and end of individual processes indicating the calendar time, as well as their relationship, shows the sequence and duration of work. To create the first part the basis is the data of production calculations and technological schemes is that machines and people work throughout the whole process should be taken into account.

Schedule of concrete works from 2 brands see has special instructions for the preparation and use of oils only trained workers should be sent. With a pneumatic grease gun protective equipment (goggles, respirators, rubber boots and tarpaulin protective suits). Lubrication Unauthorized persons are not allowed on the site.

The use of flammable materials requires high fire safety measures makes:

- cleaning of the area where the molds are lubricated from construction debris must;
- "No smoking" and "open fire" in a visible place

It is necessary to hang posters with the words "It is forbidden to use.”

- Lubricants should be stored only in hermetically sealed metal containers, the amount of fuel in the workplace does not exceed the need for replacement should.

Equipment and materials not provided for in the design not directly involved in the placement, as well as the conduct of work people are not allowed to be on the floor of the mold.

Installed formwork, supporting structures and the condition of the fastenings should be constantly monitored during the concreting process. Individual elements of the mold, irrigation equipment and deformation when deformation or displacement of fasteners is detected take immediate action to eliminate and, if necessary, the site suspension of concreting works.

Dismantling of formwork (achieving normal strength with concrete not less than 0.2 ... 0.3 MPa after delivery) while working with the manufacturer's permission of the most responsible constructions (according to the list established in the project) with the permission of the engineer.

From the separation of parts of the assembly and equipment assembly and equipment then the stability and preservation of the remaining elements is ensured should be divided in order.

Workplaces and access roads are 1.3 m and higher at a height and at a distance of less than 2 m from the boundary of the noise surrounded by temporary fences.

The width of access roads to workplaces and workplaces is 0.6 m not less than, and the height of the lighted passages not less than 1.8 m should.

Jobs and access roads are adequate must be illuminated (at least 30 lux for installation of templates). It is not allowed to work in unlit areas.

Support ladders are equipped with non-slip supports and should be placed in a working position at an angle of 75 ° to the horizontal plane.

Fittings must be installed in specially designated areas. General cover the edges of the rods in the passages with shields. Fittings conditions of their lifting, assembly and packing of skeletal elements (mass of the package).

Protruding structure to replace a loaded or empty hopper allowed only when the stopper is closed at a distance of at least 1 m from the elements is done.

Vibrator when compacting concrete mix with electric vibrators do not move outside the power cables.

Table 3.7 - Technical and economic indicators

Name of indicators	Unit	Number
Volume of concrete to be laid	m 3	198.7
Duration of shift work	shift	18
Labor intensity of work	man-shift	94
Production per person-shift	m 3 / person-shift	2.11
Salary per person-shift	tg / person-shift	1559.2

3.5 Occupational safety and health

Table 5.1 - Industrial sanitation, fire safety and labor protection

Industrial sanitation, fire safety and labor protection decisions on	These solutions developed diploma part of the project
	account explanation note
	Section
Dimensional planning solutions for safety: - sanitary protection zone, sanitary gap criteria were determined; - platforms, passages, entrance gates and entrance doors based on safety	SB
thermal engineering calculations of fencing structures were carried out heating system,	SB
local exhaust, sewage, general exchange based on the use of a fan.	
The ropes were counted	TH
fire safety The following were identified: general explosion and fire hazard categories of premises and buildings; fire in the building required degree of endurance; basic construction required limits of fire resistance of structures. evacuation routes and exits in case of fire; The required time for evacuation was determined.	SB
labor protection in the development of technological maps and safety precautions	TH
when developing a construction plan: hazardous areas, temporary	POS

Location of household buildings, t.b. identified.

Rope calculation

Hanging of cargo - when performing rigging works one of the responsible operations. Ropes of work

Safety and convenience, as well as quick hooking and hooking of goods should be able to. The number of branches of the rope on which the load is hung depending on the weight of the load and the diameter of the rope selects. Usually the number of branches is small due to the increase in the diameter of the rope tends to use loops.

Load capacity of ropes is the number of points and strength is determined by the breaking force of the rope, taking into account the stock factor. Permissible force at each point in the vertical position of the sling;

$$S = G \cdot g / (k \cdot n \cdot \cos \alpha) \quad (3.9)$$

Where:G is the weight of the load. H (kgf);

g - Acceleration of free fall (g = 10 m / s 2); n is the number of sling branches; α - Angle branches rope (in degrees).

Substitute for the coefficient m to calculate 1 / cosα;

$$S = m \cdot G \cdot g / (k \cdot n) \quad (3.10)$$

$$S = 1.41 \cdot 2980 \cdot 10 / (0.75 \cdot 4) = 14006 \text{ H} = 14, \text{kN}$$

Where:m is the coefficient depending on the vertical slope of the branch α = 45º - m =1.41.

Ropes for displacement of 2.98 tons of concrete the total weight of the load to be lifted was 2980 kg, ropes

The number of branches is m = 4, k з = 0, 75.

The ropes must be tested for strength

$$P / S \geq k \quad (3.11)$$

$$P > S \cdot k = 14 \cdot 6 = 84 \text{ kN}$$

Where:P is the total rope breaking strength H (kgf) according to the certificate;

S - maximum traction of rope branches; k is the coefficient of strength fund = 6.

The rope was selected according to the tensile strength R found and it's the technical data revealed: temporary interruption, maximum design, and its diameter.

Double flange of type lk-r of construction R 6x19 was found corresponds to the rope (1 + 6 + 6/6) + 1 o.s. (GOST 2688-80) with a diameter of 14 mm, the design breaking force of the rope is 98 kN.

Labor protection is a legal, socio-economic, organizational technical, sanitary-hygienic, treatment-and-prophylaxis, rehabilitation and other activities measures that include the lives and lives of employees in the process of employment the health care system is understood.

Occupational safety requirements are state regulations on labor protection requirements, including occupational safety standards, as well as labor protection requirements established by safety rules and instructions understood.

The state complied with the requirements of labor protection for employees guarantees the protection of their right to work.

Working conditions provided for in the employment contract to the requirements of labor protection must match.

4 Economical part

The building has 24 floors, the dimensions of the planned axes are 72.09x35.37 m. 2 Elevators, Heated building with elevator hall, smokeless stairs.

Solid reinforced concrete frame as the lifting system of the building applied. Transverse and longitudinal rigidity of the building diaphragms as well as the creation of a hard disk of the coating.

The ceilings are made of solid 200 mm thick. Pillars cross section of solid reinforced concrete 400x400 mm. Load thickness 200 mm are perceived by solid cast diaphragms.

Calculations to determine the amount of project costs complex. In addition, the estimate is in the process of project implementation a management tool used by management to raise funds for a project a tool for cost control and analysis.

The volume of capital investments is determined on the basis of estimates: Construction works;

1) Technological, energy, lifting - work of enterprises transport and other equipment, devices, tools and production equipment;
2) Work on the installation of this equipment,
3) Development of the construction site;
4) implementation of technological and author's supervision;
5) Development of project documentation.

It is very important to correctly determine the estimated cost of the project. Required the cost estimate of the project, which accurately reflects the level of costs valuation, capital investment planning and financing.

The set of estimates and the accuracy of the proposed forecasts the more accurate it is, the more accurate it will be.

Estimates of estimated cost of production and non-production facilities Evaluation of design solutions for construction and reconstruction and to choose an economic place from them. Despite this, estimated cost of construction and work organization options for comparison, for the selection of structural and building materials used.

The project budget is made on the basis of the estimate and the calendar plan and Accounting, reporting and evaluation of the customer's activities carried out. Therefore, the estimated cost is certain, not just to cover costs to ensure profitability. Estimated cost of works and actual Identify sources of income and reasons for costly work is the basis for. But in any case, the estimate of the project gives only a forecast of the final cost, because its final value will be known after the completion of project financing.

Preliminary calculation of the cost of construction at the design stage on aggregated standards in the development of the economic feasibility study construction of industrial facilities

Basic cost, models of industries and subsectors of the economy the aggregated indicators can be used. Housing and social current at the initial stage of design for

target facilities and to determine their value in estimated prices, as well as in general It is difficult both for cities and for the complex construction of housing estates for the calculation of investments in mass housing construction Developed on the basis of representative objects describing the model of buildings It is recommended to use aggregate indicators of base cost Estimates of the form SNiP RK A2.2-1-2001 "Institutions, design estimates for the construction of buildings and structures documentation composition and instructions for production, coordination, approval compiled. Estimates at the prices of 2001 SNiP RK 8.02-02-2002 “Kazakhstan The procedure for determining the estimated cost of construction in the Republic calculated. The transition from 2001 prices to 2009 prices is legislative through the calculated monthly index provided for in the budget calculated.

By considering all the materials and technologies with transportation, service, safety costs and technologies which used to do the project, costs reached to 160000 tenge per m2 which you can see more details and overall coasts of the project in the table.

Table 4.1- Calculation of the cost of the main construction projects

NO	Title	Measure unit	Quantity	Coast per m2	Total estimation in Tenge
	24-storey residential building	M2	13082.44	160000	2,093,190,400
Total					2,093,190,400

CONCLUSION

Designed for the construction of multi-storey residential buildings in Petropavlovsk diploma design task in full in accordance with the curriculum done. Makes 9 pages of graphic section and explanatory

Note sheets. Literature accepted in the construction of the diploma project the purpose of which is to create a modern and comfortable building will be found. New materials and technologies were used in the project. Feasibility study of the project and the decisions made confirms the rationality.

The following results were achieved during the writing of the thesis:

- Volumetric placement in the design of any building and the choice of architectural solutions is not only important, but also urban correct placement of the object in the middle of the construction site will be found.
- The architectural solution of the building is, first of all, the lifting structures should be stabilized in the right choice. Modern construction is high allows you to use a series of positional systems, including monolithic skeleton leading position.
- Ability to calculate structures using computer technology there is a software package. This is the process of calculation and design capacity, with all the necessary load on the structural schedule of the building it is possible to register effects. Built of the main elements of the building the combination of different loads gives accurate results.
- At the same time, the department of technology of construction production is all designed taking into account modern methods and production methods. Construction effective selection of machinery and equipment for the timing and labor process the ability to often reduce the complexity, to plan properly gives.
- Development of estimates of construction costs, local estimates of the objectivity and feasibility of the construction project allows you to evaluate.
- Assessment of the impact of construction on the environment in modern society the calculations for the environment are important for that is calculated.
- In any industry, including construction, human life is in accordance with the law safe, comfortable and legally protected employment conditions requires. To do this, work on safety and labor protection. A set of measures appears.

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Application A

The calculation was performed by the ETABS software package 2018 (non-commercial). "

The calculation is based on the finite element method In movements. The main unknowns are taken

The following node movements:

X axis linear X

Y axis linear Y

Z axis linear Z

UX angular around the axis X

UY angular around the axis Y

UZ angular around the axis Z

In the ETABS 18 (non- commercial)" the provisions are implemented

The following regulatory and regulatory documents:

Construction in seismic areas. Updated Edition of Eurocode 7 1997 *.

Steel structures. Updated Edition of Eurocode 3 1993 *.

Loads and impacts. Updated edition of Eurocode 2 1992 *

Foundations of buildings and structures. Updated Edition of Eurocode 2 1992 *

Pile foundations. Updated edition of Eurocode 2 1992.

Bridges and pipes. Updated edition of Eurocode 8 1998.

Concrete and reinforced concrete structures. The main provisions. Updated edition of Eurocode 2 1992.

Loads and impacts.

Concrete and reinforced concrete structures.

Construction in seismic areas.

Steel structures.

Foundations of buildings and structures.

Concrete and reinforced concrete structures.

Bridges and pipes.

Code of rules for design and construction.

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

МГСН 4.19-05. Moscow city building codes.

Multifunctional High-rise buildings and complexes.

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

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

According to Eurocode

ДБН В.2.3-14:2006. Transport facilities. Bridges and pipes. Norms designing.

ДБН В.1.2-2:2006.Loads and impacts. Design Standards.

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Continuation of application A

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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 stiffness's are also indicated.

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

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:

Loading1 - static load

Loading2 - static load

Loading3 - static load

Loading4 - static load

Loading5 - static load

Loading6 - static load

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,

Following download characteristics:

Loading1 - static load

This load is considered as a constant load.

Loading2 - static load

This load is considered as a constant load.

Loading3 - static load

This load is considered as a constant load.

Loading4 - static load

This load is counted as a long-term load.

Loading5 - static load

This load is counted as a long-term load.

Loading6 - static load

This load is counted as a long-term load.

Account results are divided into the following sections:

Section 1. The protocol of the processor.

Continuation of application A

Section 2. Initial data.

Section 3. Diagnostic messages.

Section 5. Moving nodes.

Section 6. Effort (stress) in the elements.

Section 7. Reactions in nodes.

Section 8. Estimated Combination of Forces (ECF).

Section 5 prints the tabulations in tabular form

Nodes of the calculated task. Dimension of movements indicated

In the header of the table.

The first column contains the load number and indexing Displacements.

In the remaining columns, the numbers of nodes in ascending order and

Values of displacements corresponding to them.

Linear displacements are considered positive if they directed along the coordinate axes. Positive angular movements Correspond to counterclockwise rotation when viewed from the end of the corresponding axis.

Displacements have the following indexation:

X axis linear X

Y axis linear Y

Z axis linear Z

UX angular around the axis X

UY angular around the axis Y

UZ angular around the axis Z

Section 6 prints out the tabular form in

Elements of the calculated task. Dimension of efforts indicated in the header of the table.

The first column indicates the type of CE from the library Finite elements, load number and indexing efforts.

The following columns indicate:

In the first line of the header - the number of the element and the number of the section in this element, for which efforts are printed;

The second line contains the numbers of the first two nodes.

N section 8, the calculated Force combination (ECF) in the elements for each section and Additional information on combinations of efforts.

The following ECF 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

Except seismic and other special.

Group C1 - includes group B1 plus seismic loading.

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

Continuation of application A

Group A2 – includes only constant and long downloads;
Types of downloads - 0, 1
Group B2 – includes permanent, long and short-term downloads (except Instant); types of downloads - 0, 1, 2.
Group C2 – includes all specified downloads regardless of duration Except seismic and other special.
Group D2 - includes group C2 plus seismic loading.

The calculated combinations form 4 result tables:
Table 1 - ECF calculated, calculated by the calculated values of efforts.
Table 2 - ECF estimated long-term obtained by multiplying the calculated Effort on appropriate duration factors.
Table 3 - regulatory DCS obtained by dividing the estimated effort by Appropriate load safety factors.
Table 4 - ECF regulatory long-term obtained by multiplication Regulatory efforts at appropriate duration factors.

The headings of the DCS tables contain the following indices:
ЭЛМ – element number in the circuit;
НС – number of the calculated cross-section in the element (all FEs except the core have one design section);
КРТ – number of criteria by which this combination of efforts is made, According to type КЭ;
СТ – column number of combination coefficients from the source data table ECF;
КС - a sign of the presence in the combinations of crane (K) and / or seismic (C) Loads;
Г 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:

ПЭ – sign of membership of the element;
ЭЛМ – serial number of an element in a circuit or in a super element;
НС – number of the calculated cross-section in the element (all FEs except the core have one design section);
КРТ – criterion number according to type КЭ;

Continuation of application A

CT – column number of combination coefficients from the source data table ECF;

KC – sign of the presence in the combinations of crane (K) and / or seismic (C) Loads;

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

Type 10. Universal spatial core KЭ.
The finite element perceives the following types of efforts:
N axial force; positive sign
Resists stretching.
MK torque about the axis X1;
a positive sign 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
Tsar 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.
NZ normal stress along the Z1 axis (for the case
Flat deformation); positive sign
Resists stretching.
TXY shear stress,

Continuation of application A

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).

Type 44. Universal quadrangular FE 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.
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 the moment acting on the cross section orthogonal to the axis X1;
A positive sign corresponds to stretching Lower fiber (relative to the Z1 axis).
MY the moment acting on the section orthogonal to the axis Y1;

Continuation of application A

A positive sign corresponds to stretching Lower fiber (relative to the Z1 axis).

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 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 shear force in a section orthogonal to the axis Y1; A positive sign matches Direction of force with the direction of the axis Z1 on that part Element in which node 1 is missing.

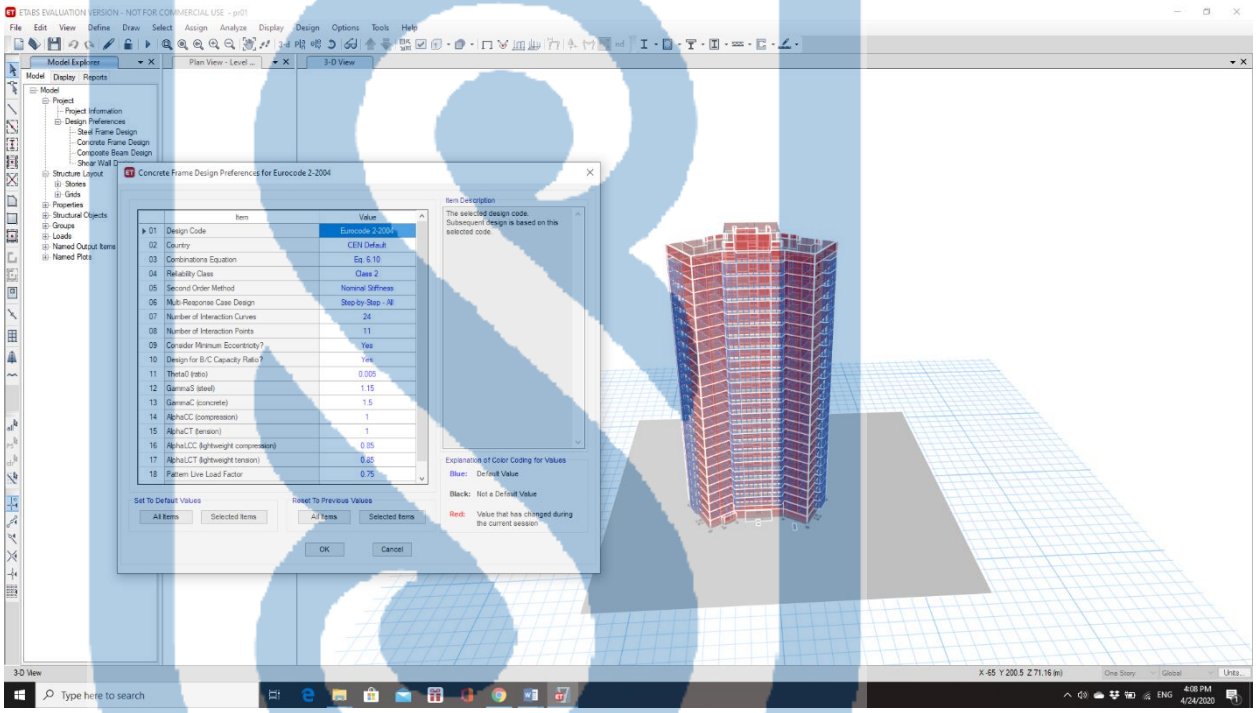

Figure A.1 - Design scheme

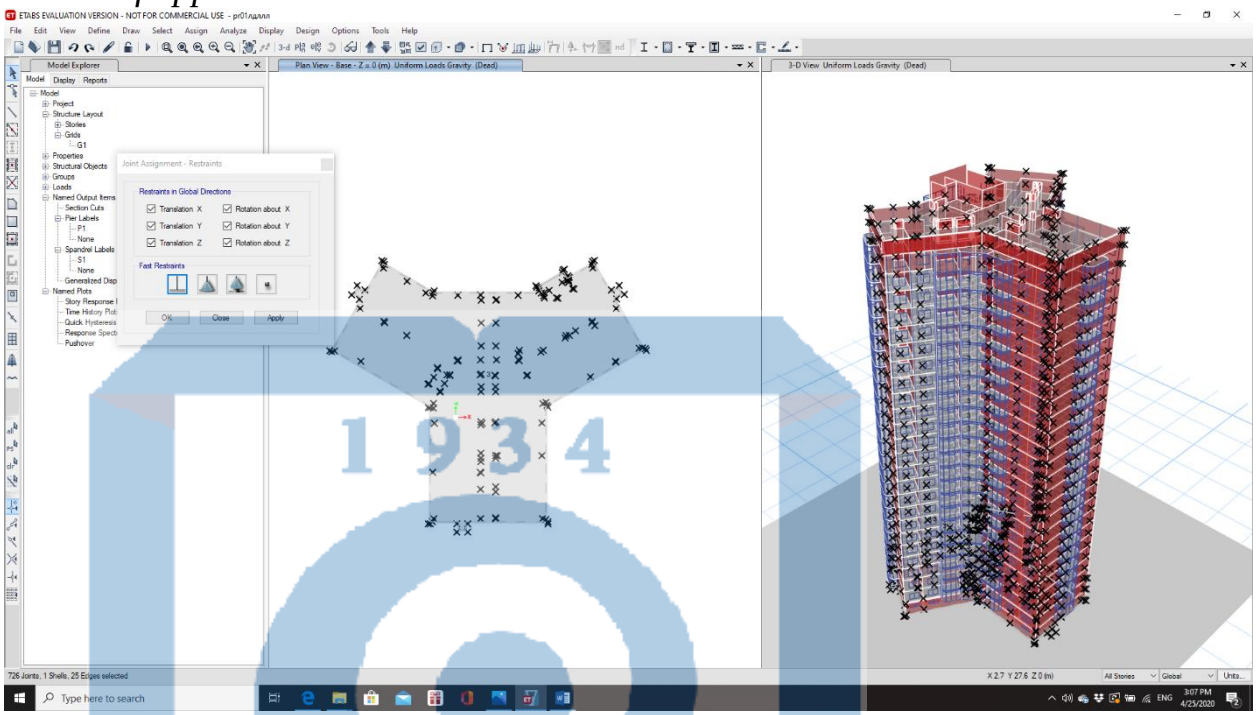

Figure A.2 – Stiffnesses

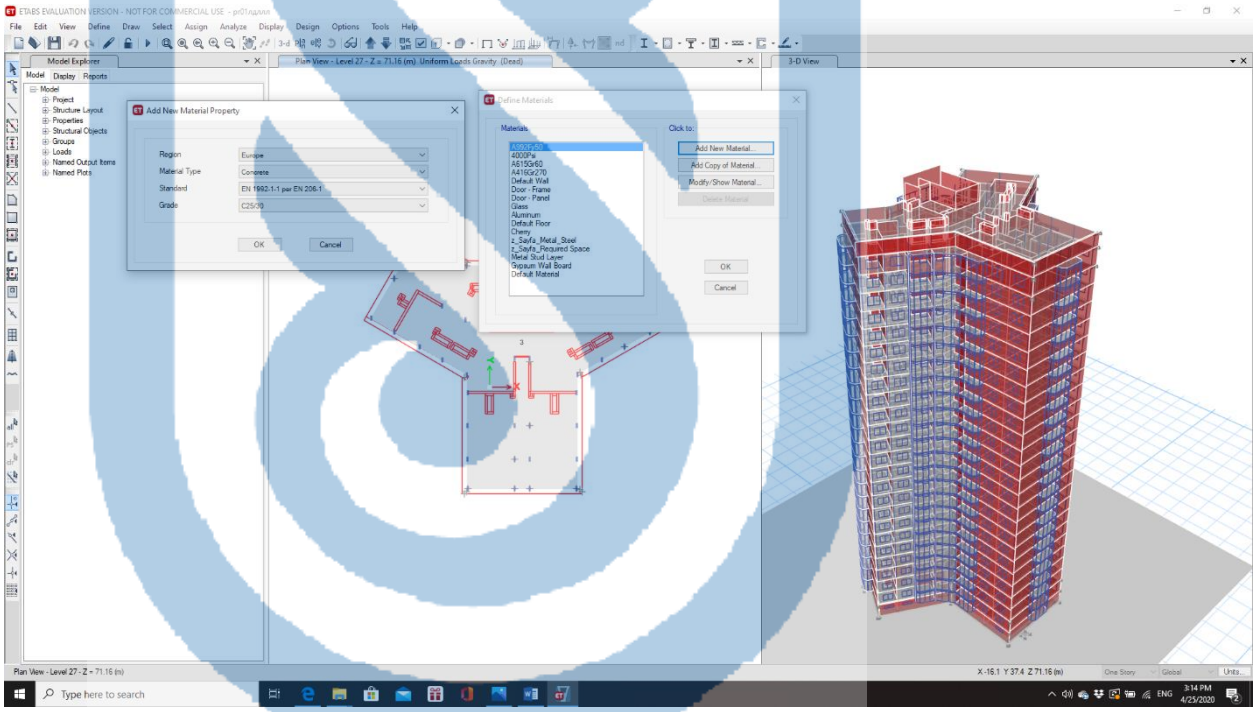

Figure A.3 - Spatial model

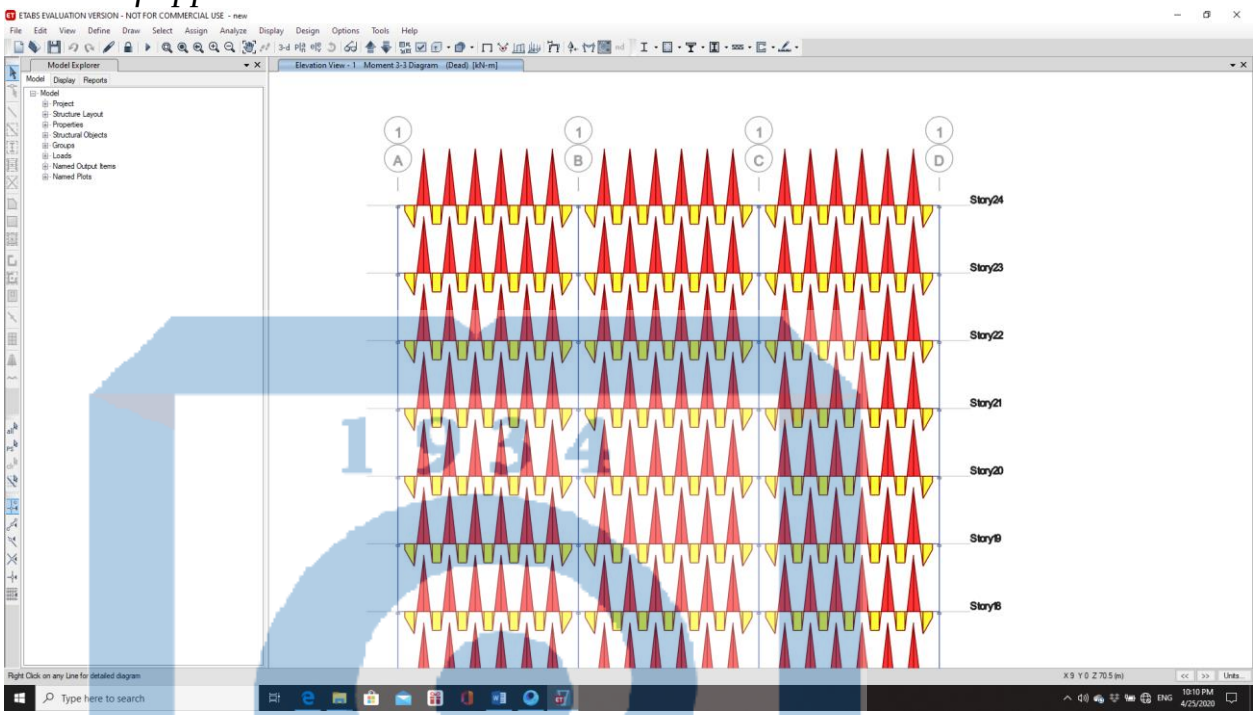

Figure A.4 – Moment 33 Diagram

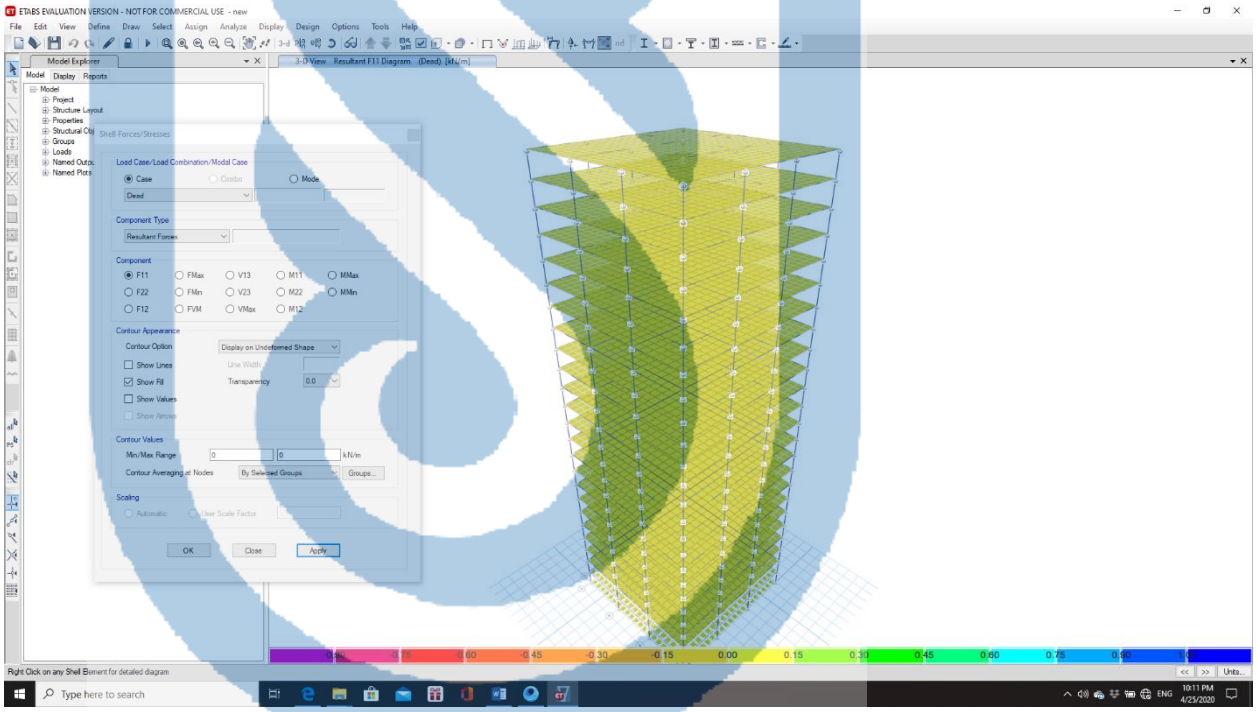

Figure A.5 – F11 diagram

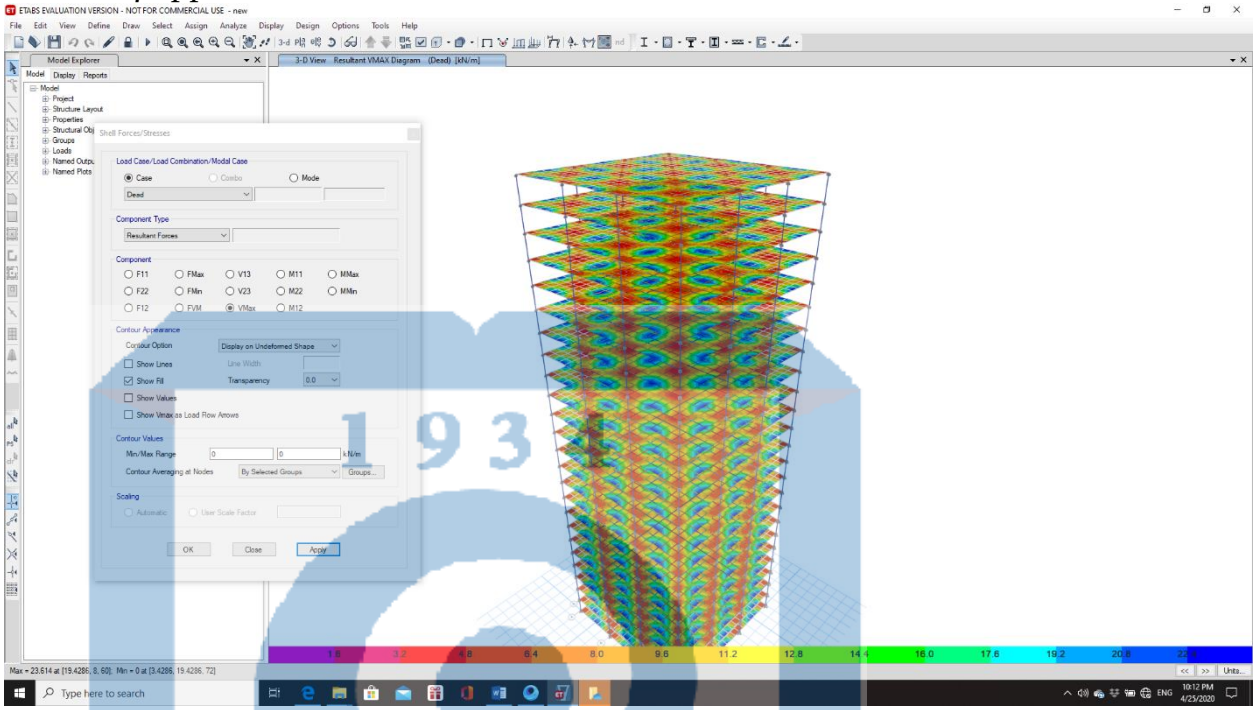

Figure A.6 –Vmax diagram

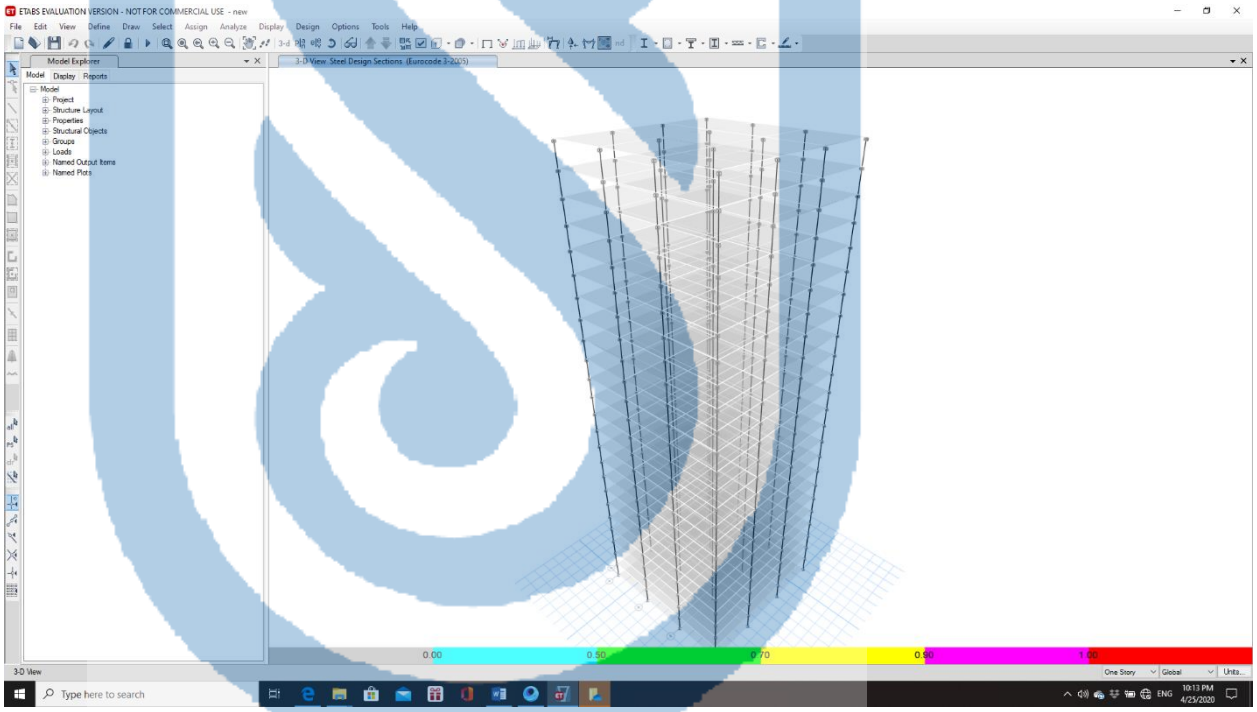

Figure A.7 - Design. Steel design sections

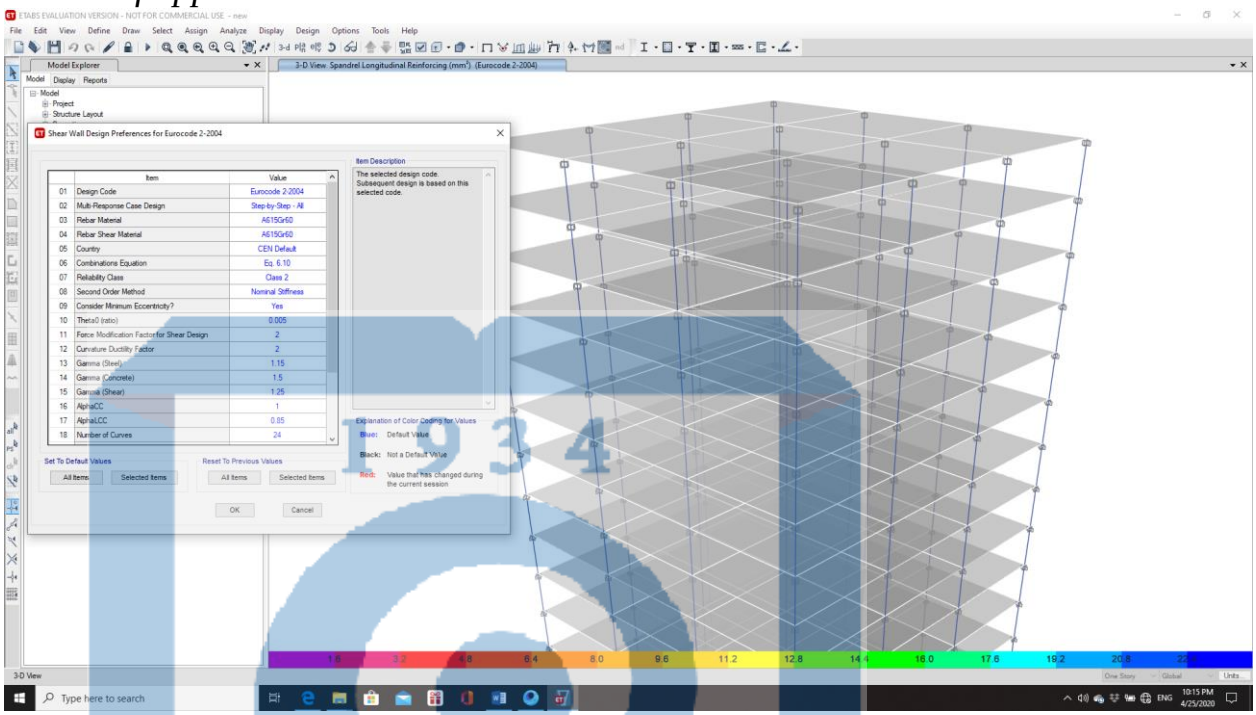

Figure A.8 - Design. Longitudinal reinforcing

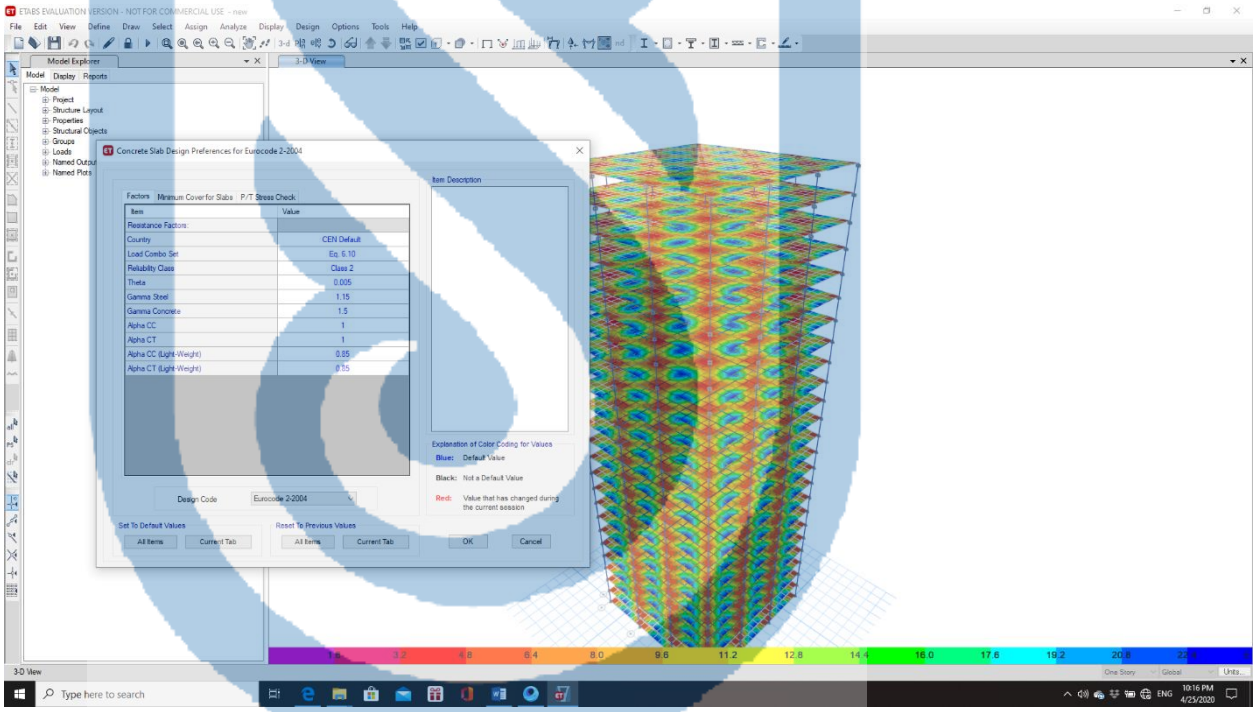

Figure A.9 - Design. Slab

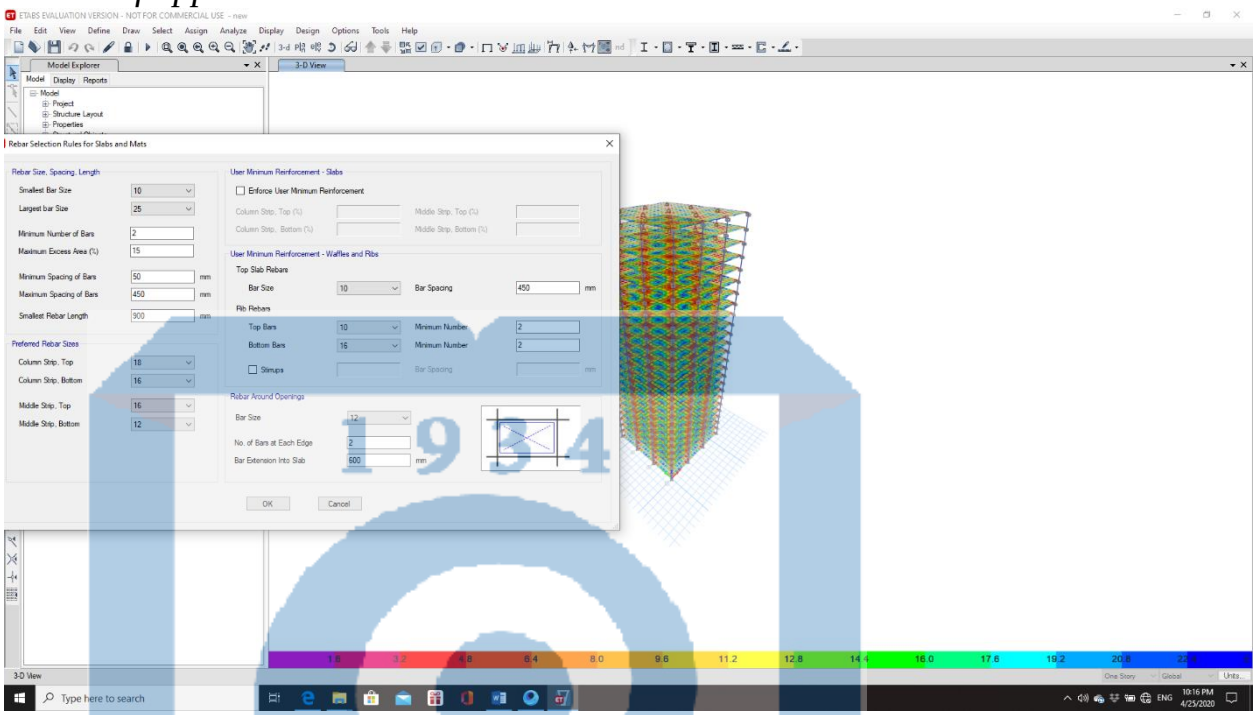

Figure A.10 - Design. Rebar selection

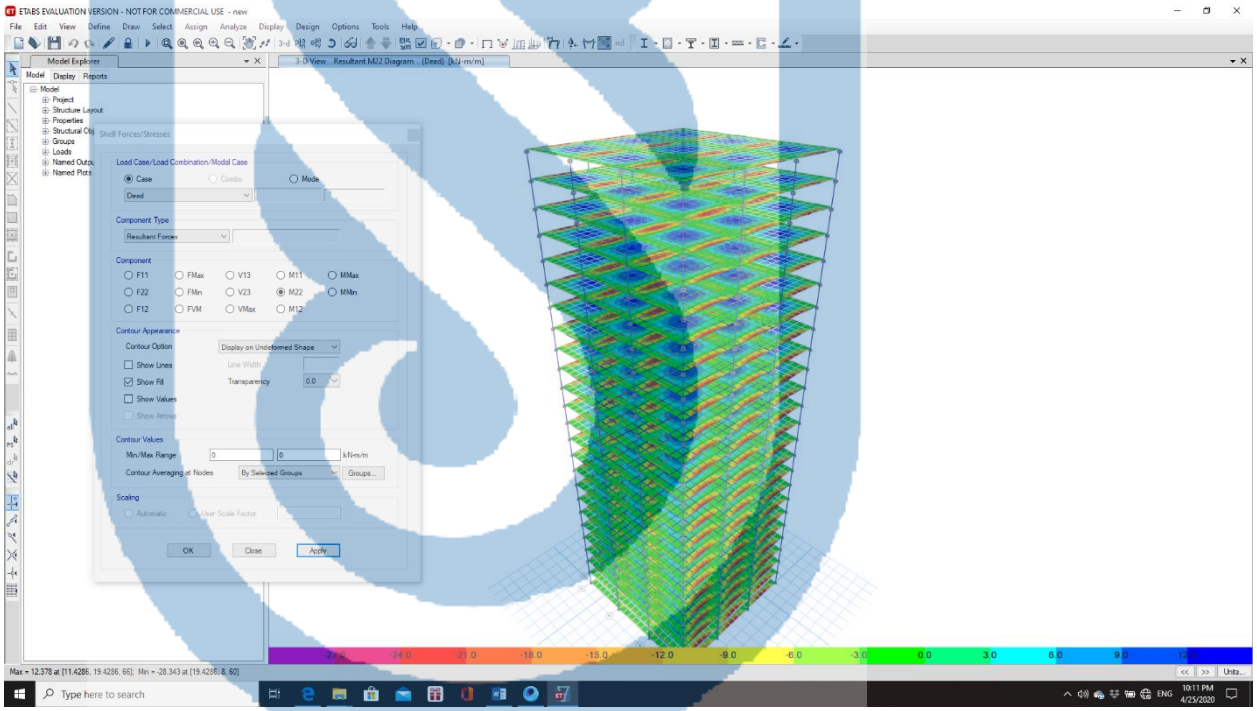

Figure A.10 – M22 Diagram

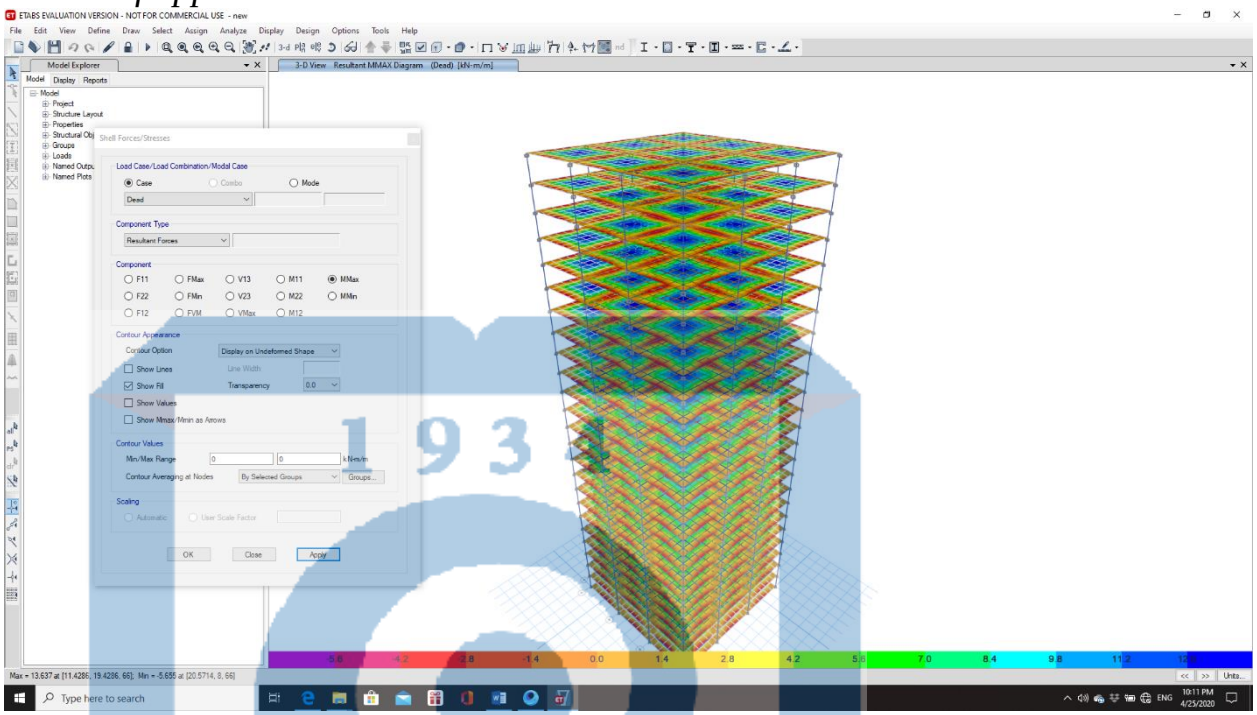

Figure A.10 – Mmax Diagram

Application B

application 2
to the normative document for the determination of the estimated cost of construction in the Republic of Kazakhstan

The form 4

Construction Name Multi storey residential building

Object name Multi storey residential building in Petropavlovsk

Local budget number 02-001-001
(Local cost estimate)

the Underground work
(name of work and costs)

Base:

Estimated cost 2,093,190,400 thousand tenge
Estimated salary 456320.2 thousand tenge
Normative labor input 89.6745 thousand tenge

Compiled at current prices as of 2019.

№ п/п	Code of norms resource code	Name work and costs	Unit measuring	amount	Unit cost, tenge		Total cost, tenge			Overhead, tenge	Total cost with HP and СП, tenge	Labor costs of construction workers, total
					Total	exploitation of cars	Total	machine operation	materials			
					the salary working builders	including the salary drivers	the salary working builders	including the salary drivers	equipment, furniture, inventory	Estimated profit, tenge		Labor costs of drivers, total
1	2	3	4	5	6	7	8	9	10	11	12	13
		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										
		Section No. 1 Earthwork										
1	1110-0113-0101	Wall are hard of hearing. Post Mounting Gadget	m2 fence	1680.0	9766.63	398.51	6859295	476734	468480	6665248	19818906	2287.80
					3511.88	152.81	3549781	173828	-	974363		75.37

1	2	3	4	5	6	7	8	9	10	11	12	13
2	1101-0207-1302	Bushes and light woodlands are medium. Cutting in soil of normal event with brush cutters on a tractor 79 кВт (108 л с)	га	10.45	12228.11	12228.11	127784	127784	-	29452	97545.5	-
					-	3914.47	-	40906	-	12579		22.71
3	1105-0102-0302	Soils of 2 groups. Development with loading on dump trucks by excavators with a bucket with a capacity of 1 m3	м3 soil	12441.0	190.50	179.99	2179507	2059291	1198	493607	97454.3	90.78
					10.40	49.52	119018	566547	-	213849		460.50
4	1101-0101-0302	Soils of 2 groups. Development into a dump with excavators " Dragline ", " Backhoe " with a bucket with a capacity of 1 (1 - 1.2) m3	м3 soil	54556.0	134.77	127.68	511853	484917	-	105381	6741548	25.51
					7.09	31.44	26936	119426	-	49379		110.94
5	1101-0205-0802	Soils of 2 groups. Manual development in pits with moving mobile conveyors	м3 soil	781.5	1615.41	149.59	1262440	116907	-	861638	4548781	907.71
					1465.81	65.50	1145533	51187	-	169926		48.41
6	1137-0103-0104	Sand preparation for structures. Device	m3 of concrete, gravel or sand in the structure	413.3	3840.48	372.92	1587269	154128	844483	599284	656875	432.52
					1424.29	169.12	588658	69896	-	174924		39.64
7	1101-0104-0405	Trenches and pits. Filling with bulldozers with a capacity 279 кВт (108 л с)when moving soil up to 5 m. Group of soils	m3 of soil	3798.0	22.19	22.19	84264	84264	-	25728	216545	-
					-	9.41	-	35734	-	8799		16.60

ESTIMATES RK

1	2	3	4	5	6	7	8	9	10	11	12	13
8	1101-0201-0101	Preparing. Fixing with trailed rollers on a pneumatic wheel 25 tons. To begin with pass along one track with a layer thickness of 25 cm	м3 compacted soil	187590.0	872.15	841.15	8717902	177902	-	529897	24454623	-
					-	38.24	-	726246	-	181824		342.21
9	1108-0101-0303	Walls, foundations. Horizontal waterproofing in 2 layers	м2 surface	2842.0	2056.29	51.62	5843969	146719	4868206	803075	7177808	656.93
					291.71	12.13	829044	34477	-	531764		22.88
		Section total № 1					20036283	5300346	8996967	6306310	28547800	4381.25
							7842145	1798247	-	2107407		1139.26
		Total section:	tenge				2845780					
		including:										
		- salary of construction workers	tenge				7894667					
		- the fetched of working the machines	tenge				5455878	]				
		- including the salary of drivers	tenge				7215615					
		- materials, products and structures	tenge				6566464					
		- overhead	tenge				6306310					
		- estimated profit	tenge				2107407					
		Section No. 2 Foundations										
10	1106-0101-0101	Concrete preparation. Device	м3	275.55	15525.72	1291.24	4278113	355802	3470563	489878	54545476	427.79
					1639.44	314.20	451748	86579	-	381439		57.45
11	1106-0101-0114	Base concrete slabs flat. Device	м3	1653.3	14702.32	1397.02	24307337	2309686	19670200	2648843	36985244	1844.26
					1407.76	352.85	2327451	583366	-	2156494		383.11

ESTIMATES PK

1	2	3	4	5	6	7	8	9	10	11	12	13
12	2105-0301-3202	Hot-rolled reinforcing steel A-III (A400) diameters from 14 to 32мм CT PK 2591-2014	т	171.9	207694.00	-	35702599		35702599	-	38558807	
					-	-		-	-	2856208		-
13	2105-0301-3001	Hot-rolled smooth reinforcing steel A-I (A240) diameter from 6 to 12 mm CT PK 2591-2014	т	17.19	216789.00	-	3726603		3726603	-	4024731	
					-	-		-	-	298128		-
		Total section number 2					68014652	2665488	62569965	3138721	76845642	2272.05
							2779199	669945	-	5692269		440.56
		Total section:	tenge				76845642					
		including:										
		- salary of construction workers	тенге				2779199					
		- the cost of operating the machines	tenge				2665488					
		- including the salary of drivers	tenge				669945					
		- materials, products and structures	tenge				62569965					
		- overhead	tenge				3138721					
		- estimated profit	tenge				5692269					
		Section No. 3 Frame										
14	1106-0501-0104	Reinforced concrete columns in wooden formwork up to 4 m high, perimeter up to 2 m. Device	м3	37.63	38230.54	7220.69	1438616	271715	576879	597391	2198888	450.05
					15679.56	1765.93	590022	66452	-	162881		43.57

ESTIMATES PK

1	2	3	4	5	6	7	8	9	10	11	12	13
15	2105-0301-3001	Hot-rolled smooth reinforcing steel A-I (A240) diameter from 6 to 12 mm CT PK 2591-2014	т	0.75	216789.00	-	162592		162592	-	175599	
					-	-		-	-	13007		-
16	2105-0301-3202	Hot-rolled reinforcing steel A-III (A400) diameters from 14 to 32 mm CT PK 2591-2014	т	7.526	207694.00	-	1563105		1563105	-	1688153	
					-	-		-	-	125048		-
		Total section number 3					3164313	271715	2302576	597391	4062640	450.05
							590022	66452	-	300936		43.57
		Total section:	tenge				4062640					
		including:										
		- salary of construction workers	tenge				590022					
		- the cost of operating the machines	tenge				271715					
		- including the salary of drivers	tenge				66452					
		- materials, products and structures	tenge				2302576					
		- overhead	tenge				597391					
		- estimated profit	tenge				300936					
		Section No. 4 Walls										
17	1106-0601-0205	Reinforced concrete walls and partitions up to 3 m high, up to 500 mm thick. Device	м3	410.4	30303.33	4273.30	12436484	1753761	6252548	4396914	18180070	3379.23
					10794.77	978.56	4430175	401599	-	1346672		265.05

ESTIMATES PK

1	2	3	4	5	6	7	8	9	10	11	12	13
18	2105-0301-3001	Hot-rolled smooth strengthening steel A-I (A240) breadth from 6 to 12 mm CT PK 2591-2014	т	8.72	216789.00	-	1777670		1777670	-	1919884	
					-	-		-	-	142214		-
19	2105-0301-3202	Hot-Hot-rolled fortifying steel A-III (A400) breadths from 14 to 32 mm CT PK 2591-2014	т	82.0	78454878	-	75487845		24552128	-	3688554	
					-	-		-	-	15454666		-
		Total section number 4					875458787	6487155	79858784	4396914	21575147	787.23
							4430175	401599	-	2851359		989.05
		Total section:	tenge				98955814					
		including:										
		- salary of construction workers	tenge				12456651					
		- the cost of operating the machines	tenge				8745452					
		- including the salary of drivers	tenge				401599					
		- materials, products and structures	тенге				25061126					
		- overhead	tenge				4396914					
		- estimated profit	tenge				2851359					
		Section No. 5 Overlap										
20	2105-0301-3202	Hot-rolled reinforcing steel A-III (A400) diameters from 14 to 32 mm CT PK 2591-2014	т	110.0	207694.00	-	22846340		22846340	-	24674047	
					-	-		-	-	1827707		-

ESTIMATES PK

1	2	3	4	5	6	7	8	9	10	11	12	13
21	2105-0301-3001	Hot-rolled smooth reinforcing steel A-I (A240) diameter from 6 to 12 mm CT PK 2591-2014	т	11.0	216789.00	-	2384679		2384679	-	2575453	
					-	-		-	-	190774		-
22	1106-0801-0101	Bezel-less overlapping up to 200 mm thick. The device at a height of from the reference area to 6 m	м3	551.1	34502.64	2158.41	19014404	1189497	11255831	6252268	27288006	5108.15
					11919.93	547.17	6569076	301548	-	2021334		197.54
		Total section number 5					44245423	1189497	36486850	6252268	54537506	5108.15
							6569076	301548	-	4039815		197.54
		Total section:	tenge				54537506					
		including:										
		- salary of construction workers	tenge				6569076					
		- the cost of operating the machines	tenge				1189497					
		- including the salary of drivers	tenge				301548					
		- materials, products and structures	tenge				36486850					
		- overhead	tenge				6252268					
		- estimated profit	tenge				4039815					
		Total estimate					166705733	11180807	135417484	20691604		15590.73
							20107442	3237791	-	14991786	852356780	2085.98
		Total estimate:	tenge				202389123					
		including:										
		- salary of construction workers	tenge				20107442					
		- the cost of operating the machines	tenge				11180807					

1	2	3	4	5	6	7	8	9	10	11	12	13
		- counting the compensation of drivers	tenge				8754586					
		- materials, products and structures	tenge				98754548					
		- overhead	tenge				642554541					
		- estimated profit	tenge				414687878					

Compiled _____
position, signature (initials, surname)

Checked _____
position, signature (initials, surname)

Appendix 2
to the normative document for the determination of the
estimated cost of construction in the Republic of Kazakhstan

The form 4

Construction Name Multi storey residential building

Object name Multi storey residential building in Petropavlovsk

Local budget number 02-002-001
(Local cost estimate)

the Aboveground
(name of work and costs)

Base:

Estimated cost 2,093,190,400 thousand tenge
Estimated salary 369854.564 thousand tenge
Normative labor input 861.6445 thousand tenge

Compiled at current prices as of 2019.

№ п/п	Code of norms resource code	Name work and costs	Unit measuring	amount	Unit cost, tenge		Total cost, tenge			Overhead, tenge	Total cost with HP And СП, tinge	Labor costs of construction workers, total
					Total	exploitation of cars	Total	machine operation	materials			
					the salary working builders	в т.ч. the salary drivers	the salary working builders	в т.ч. the salary drivers	equipment, furniture, inventory	Estimated profit, tenge		Labor costs of drivers, total
1	2	3	4	5	6	7	8	9	10	11	12	13
1	1106-0501-0201	Dividers. Stucco progressed cement-lime mortar for stone	м3	875.68	46571.99	28630.85	30192979	14449419	7055216	11134383	215450214	6273.17
					17215.55	7028.70	8688344	3547242	-	3306189		2347.57
2	1115-0201-0101	Walls. Stucco improved cement-lime mortar for stone	м2 plastered surface	16718.7	1207.37	34.46	20185674	576144	4215336	12720456	98986238	10215.13
					920.78	30.29	15394194	506376	-	2632490		401.25
3	1106-0701-0401	Crossbars of civil buildings in metal formwork. Device	м3	1288.8	36410.25	5812.46	46925530	7491095	17859820	21341293	989535621	97845.66
					16740.08	1456.67	21574615	1877355	-	5461346		3552.77

1	2	3	4	5	6	7	8	9	10	11	12	13
4	1106-0801-0101	Bezel-less covering up to 200 mm thick. The gadget at a tallness of from the reference zone to 6 m	м3	3364.5	897521.2	1876.88	109905882	6314748	68717553	33191726	976239587	27117.87
					10365.16	475.80	34873581	1600843	-	11447809		1048.71
5	2105-0301-3202	Hot-rolled reinforcing steel A-III (A400) diameters from 14 to 32мм СТ РК 2591-2014	т	722.32	207694.00	-	150021530		150021530	-	945156441	
					-	-		-	-	12001722		-
6	1109-0301-0401	Trusses-crane-girders with a span of more than 30 m. Establishment upon conveyance in bulk	т constructions	147.0	43029.27	24942.68	6325303	3666575	1294642	1486270	78796458	3652.90
					9279.50	5373.66	1364086	789928	-	624926		40772
7	2106-0209-0201	Steel structures from one profile ГОСТ 23118-2012	т	147.0	589603.00	-	86671641		86671641	-	93605372	
					-	-		-	-	6933731		-
8	2105-0301-3001	Hot-rolled smooth reinforcing steel A-I (A240) diameter from 6 to 12 mm СТ РК 2591-2014	т	80.4	216789.00	-	17429836		17429836	-	18824223	
					-	-		-	-	1394387		-
		Total estimate					467658375	32497981	353265574	79874128		60739.73
							81894820	8321744	-	43802600	4529875.103	5437.02
		Total estimate:	tenge				591335103					
		including:										
		- salary of construction workers	tenge				81894820					
		- the cost of operating the machines	tenge				32497981					
		- including the salary of drivers	tenge				8321744					

1	2	3	4	5	6	7	8	9	10	11	12	13
		- materials, products and structures	tenge				357395574					
		- overhead	tenge				9524.5478					
		- estimated profit	tenge				968421234					

Compiled _____
position, signature (initials, surname)

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position, signature (initials, surname)

Application C

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

Construction Name Multi storey residential building

Object name Multi storey residential building in Petropavlovsk

Consolidated Resource List No. 02-001-001
by building, construction, facility, construction

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

Base:
Local resource sheets (estimates)

№ п/п	Resource Codes	Name of resources	Unit measuring	amount	Cost, thousand tenge	
					per unit measuring	common
1	2	3	4	5	6	7
		Labor costs				
1	0101-0101-0131	Labor costs of construction workers (average grade 3.1)	person-h	45457.1459	1.45756	78754.076
2	0101-0101-0132	Labor costs of construction workers (average grade 3.2)	person-h	7575.0727	1.3787	57557.215
3	0101-0101-0130	Labor costs of construction workers (average rank 3)	person-h	78757.8967	1.26200	4302.028
4	0101-0101-0133	Labor costs of construction workers (average grade 3.3)	person-h	2267.8	1.33600	3029.781
5	0101-0101-0134	Labor costs of construction workers (average grade 3.4)	person-h	432.5185	1.36100	588.658
6	0101-0101-0120	Labor costs of construction workers (average rank 2)	person-h	453.2987	1.05600	478.683
7	0101-0102-0100	Labor costs of drivers	person-h	2085.9903	-	-
		Weighted average job category 3.1				
		Total::				75877.441
		Machines and mechanisms by type				
		Bulldozers				
1	3101-0101-0103	Bulldozers, 79 кВт (108 л.с.)	маш.-ч	467.67356	5.07700	2003.758
		Crawler Excavators				
2	3101-0201-0104	Crawler-mounted single-bucket diesel excavators, 1 m3	маш.-ч	252.82704	8.74200	2210.214
		Vibrators				
3	3104-0101-0101	Deep vibrator	маш.-ч	338.678719	0.03700	12.531
4	3104-0101-0201	Surface vibrator	маш.-ч	456.057294	0.01500	6.841
		Mobile and stationary tower cranes				
5	3105-0101-0102	Tower cranes8 т	маш.-ч	888.909509	6.17700	5490.794
		Jib cranes on the road				
6	3105-0102-0102	Truck-mounted cranes, 10 T	маш.-ч	82.151448	5.20700	427.763

1	2	3	4	5	6	7
7	3105-0104-0201	Crawler-mounted cranes for hydropower construction, 16 T	маш.-ч	34.553947	4.03500	139.425
		Forklift trucks				
8	3105-0501-0101	Forklift trucks, 5 т	маш.-ч	8.235795	4.68900	38.618
		Conveyors				
9	3105-0503-0102	Mobile belt conveyors 15 м	маш.-ч	132.112575	0.63700	84.156
10	3105-0503-0101	Mobile belt conveyors up to 10 м	маш.-ч	87.805432	0.37300	32.751
		Other electrical equipment				
11	3106-0103-0501	Direct current installations for manual arc welding	маш.-ч	840.356848	0.16600	139.499
		Trailed road rollers				
12	3201-0102-0301	Trailed road rollers on pneumatic wheels, 25 т	маш.-ч	29.918745	0.73600	22.020
		Bitumen boilers				
13	3201-0201-0101	Bitumen mobile boilers, 400 л	маш.-ч	124.52223	0.72300	90.030
		Machines for planting plants and others				
14	3206-0102-0701	Mounted brush cutters on a tractor, 79 кВт (108 л.с.) hydraulically operated	маш.-ч	22.713075	5.62600	127.784
		On-board cars				
15	3301-0201-0101	Cars, onboard, to 5 т	маш.-ч	70.765797	2.89100	204.584
		Crawler tractors				
16	3304-0101-0102	Crawler tractors, 79 кВт (108 л.с.)	маш.-ч	29.918745	4.75900	142.383
		Cutting tool				
17	3403-0102-0201	Electric chain saws	маш.-ч	49.398376	0.07500	3.705
		Planers				
18	3403-0201-0101	Electric Planers	маш.-ч	21.344	0.12200	2.604
		Hammers, drills, screwdrivers, wrenches, construction guns				
19	3403-0302-0301	Electric drills	маш.-ч	112.3228	0.01200	1.348
		Total for construction machines and mechanisms:				11180.808
		including pay for drivers	Tenge			78767.792
		Contractor Supply Materials				
		Dense rock for construction work				
1	2101-0201-0604	Crushed stone from dense rocks for construction works M1000, fraction 40-70 мм СТ РК 1284-2004	м3	0.45764	2.61800	1.198
		Natural sand for construction work				
2	2101-0401-0101	Natural sand ГОСТ 8736-2014	м3	433.965	1.65500	718.212
		General purpose concrete				
3	2102-0101-0301	Heavy concrete B7,5 ГОСТ 7473-2010	м3	1686.366	11.38600	19200.963
4	2102-0101-0601	Heavy concrete B15 ГОСТ 7473-2010	м3	1014.11695	12.42700	12602.431
5	2102-0101-0101	Heavy concrete B3,5 ГОСТ 7473-2010	м3	281.061	10.64900	2993.019
		Mortar solutions				
6	2102-0401-2801	Mortar ready masonry heavy cement grade M25 ГОСТ 28013-98	м3	71.05	9.57800	680.517

1	2	3	4	5	6	7
		Ceramic brick				
7	2103-0101-0103	Brick ceramic unary ordinary corpulent brand M100, dimensions 250 мм x 120 мм x 65 мм ГОСТ 530-2012	1000 шт.	0.58	25.99600	15.078
		Fittings				
8	2105-0301-3202	Hot-rolled reinforcing steel A-III (A400) diameters from 14 to 32 mm СТ РК 2591-2014	т	371.426	207.69400	77142.952
9	2105-0301-3001	Hot-rolled smooth reinforcing steel A-I (A240) diameter from 6 to 12 mm СТ РК 2591-2014	т	37.14	216.78900	8051.543
		Wire				
10	2105-0307-1007	General Purpose Low Carbon Light Steel Wire, Superior Quality, Heat Treated, 1.1 mm Diameter ГОСТ 3282-74	кг	63.9276	0.11200	7.160
		Separate structural elements of buildings and structures (columns, beams, trusses, communications, crossbars, racks and т.д.)				
11	2106-0801-0101	Individual structural elements of buildings and structures with a predominance of hot-rolled profiles, the average mass of an assembly unit up to 0,1 т	т	2.7555	463.32700	1276.698
		Round timber (logs)				
12	2107-0101-9901	Softwood round timber for construction from 140 mm to 240 mm thick, from 3 m to 6.5 m long ГОСТ 9463-88	м3	20.532	31.57200	648.236
		Edged bars and bars				
13	2107-0201-0301	Coniferous edged bars from 4 m to 6.5 m long, from 75 mm to 150 mm wide, from 40 mm to 75 mm thick, 3 grades ГОСТ 8486-86	м3	34.85298	25.49200	888.472
14	2107-0201-0201	Coniferous edged trunks with a length of 4 m to 6.5 m, a width of 75 mm to 150 mm, a thickness of 40 mm to 75 mm, 2 varieties ГОСТ 8486-86	м3	11.810075	47.24500	557.967
15	2107-0201-0203	Coniferous edged boards from 4 m to 6.5 m long, from 75 mm to 150 mm wide, 150 mm and more thick, 2 grades ГОСТ 8486-86	м3	5.45589	57.04600	311.237
		Edged boards				
16	2107-0203-0302	Coniferous edged boards up to 6.5 m long, from 75 mm to 150 wide, mm from 19 mm to 22 mm thick, 3 grades ГОСТ 8486-86	м3	30.044	47.48400	1426.609
17	2107-0203-0305	Softwood edging boards up to 6.5 m long, from 75 mm to 150 mm wide, 44 mm thick and more, 3 grades ГОСТ 8486-86	м3	21.40623	47.48400	1016.453
18	2107-0203-0304	Softwood edged boards up to 6.5 m long, from 75 mm to 150 mm wide, from 32 mm to 40 mm thick, 3 grades ГОСТ 8486-86	м3	9.28	47.48400	440.652

ESTIMATES PK

1	2	3	4	5	6	7
19	2107-0203-0303	Softwood edging boards up to 6.5 m long, from 75 mm to 150 mm wide, 25 mm thick, 3 grades ГОСТ 8486-86	м3	2.92083	47.48400	138.693
20	2107-0203-0405	Coniferous edged boards up to 6.5 m long, from 75 mm to 150 mm wide, 44 mm thick and more, 4 grades ГОСТ 8486-86	м3	5.82753	21.66800	126.271
		Unedged boards				
21	2107-0204-0205	Unneeded boards of coniferous species up to 6.5 m long, any width, 44 mm thick or more, 2 grades ГОСТ 8486-86	м3	0.63971	40.66400	26.013
		Other products				
22	2107-0510-0701	Inventory racks wood-metal sliding	шт.	15.4308	20.70200	319.448
		Ruberoid, glassruberoid, roofing, glassine				
23	2110-0401-1001	Waterproofing roofing ТГ-350 ГОСТ 10923-93	м2	6252.4	0.22700	1419.295
		Waterproofing mastics				
24	2110-0501-1404	Mastic frost-resistant bituminous-oil МБ-50 ГОСТ 30693-2000	кг	11936.4	0.22400	2673.754
		Lime				
25	2113-0102-0801	Building quicklime lump, grade 1,ГОСТ 9179-77	т	0.839149	31.84900	26.726
		Bitumen				
26	2113-0104-0103	Bitumen oil construction ГОСТ 6617-76 brands БН 90/10	т	0.45472	127.57700	58.012
		Bolts				
27	2113-0201-0901	Construction bolts with nuts and washers ГОСТ 1759.0-87	т	0.36936	499.61100	184.536
28	2113-0201-0902	Construction Hex Bolts with Hex Nuts ГОСТ 1759.0-87	т	0.08468	456.85200	38.686
		Nails				
29	2113-0209-0401	Flat head construction nails ГОСТ 283-75	кг	843.1525	0.40900	344.849
		Technical fluids				
30	2113-0703-0201	Kerosene for technical purposes brands КТ-1, КТ-2	т	0.68208	53.70000	36.628
31	2113-0703-1405	Technical water	м3	14.639488	0.02900	0.425
		Fabrics				
32	2113-0803-1101	Bag fabric ГОСТ 30090-93	10 м2	120.850719	6.93200	837.737
		Components, consumables for tools				
33	2113-0812-1035	Electrodes, d=4 мм, Э42 ГОСТ 9466-75	т	0.877245	211.27300	185.338
		Other materials				
34	2113-0816-9902	Antiseptic paste	т	0.12354	605.54700	74.809
35	2113-0816-2701	Coal tar	т	0.30856	80.24400	24.760
		Shields of formwork, flooring				
36	2701-0101-0104	Boards from boards, thickness 25 mm	м2	828.9936	1.02200	847.231
37	2701-0101-0105	Boards from boards, thickness 40 mm	м2	59.5188	1.25800	74.875
		Total contractor supply materials:				875868.483

1	2	3	4	5	6	7
		Total:				9865268.732

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position, signature (initials, surname)

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position, signature (initials, surname)

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

Construction Name Sport complex

Object name Cultural and sport complex in Atyrau city

Consolidated Resource List No. 02-002-001
by building, construction, facility, construction

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

Base:
Local resource sheets (estimates)

№ п/п	Resource Codes	Name of resources	Unit measuring	amount	Cost, thousand tenge	
					per unit measuring	common
1	2	3	4	5	6	7
		Labor costs				
1	0101-0101-0131	Labor costs of construction workers (average grade 3.1)	person-h	45432.87	1.545354	45754.581
2	0101-0101-0133	Labor costs of construction workers (average grade 3.3)	person-h	16148.664	1.33600	45458.615
3	0101-0101-0140	Labor costs of construction workers (average rank 4)	person-h	10215.1257	1.50700	15394.194
4	0101-0101-0135	Labor costs of construction workers (average grade 3.5)	person-h	7258.0724	1.38500	10052.430
5	0101-0102-0100	Labor costs of drivers	person-h	5437.0212	-	-
		Weighted average job category 3.4				
		Total ФОТ:				989351.820
		Machines and mechanisms by type				
		Mortar Pumps				
1	3103-0205-0202	Mortar pumps, 3 m3 / h	маш.-ч	401.2488	1.41300	688.965
		Vibrators				
2	3104-0101-0101	Deep vibrator	маш.-ч	958.25954	0.03700	35.456
3	3104-0101-0201	Surface vibrator	маш.-ч	1613.6142	0.01500	24.204
		Mobile and stationary tower cranes				
4	3105-0101-0102	Tower cranes, 8 т	маш.-ч	4446.2156	6.17700	27464.274
		Jib cranes on the road				
5	3105-0102-0102	Truck-mounted cranes, 10 т	маш.-ч	93.33898	5.20700	486.016
		Jib Crawler Cranes				
6	3105-0104-0105	Crawler Cranes 100 т	маш.-ч	174.93	18.94900	3314.749
		Gantry cranes				
7	3105-0202-0303	Gantry cranes when working on the installation of technological equipment,32 т	маш.-ч	5.88	6.07400	35.715
		Лебедки				
8	3105-0402-0302	Electric winches with traction effort up to 12,26 кН (1,25 т)	маш.-ч	150.4683	0.06100	9.179
		Forklift trucks				

1	2	3	4	5	6	7
9	3105-0501-0101	Forklift trucks, 5 t	маш.-ч	9.08415	4.68900	42.596
		Other electrical equipment				
10	3106-0103-0201	Multi-operator welding rectifiers with up to 30 posts	маш.-ч	114.66	1.07100	122.801
		Other equipment for welding and cutting				
11	3106-0202-0501	Apparatus for gas welding and cutting	маш.-ч	164.64	0.02600	4.281
		On-board cars				
12	3301-0201-0101	Cars, onboard, to 5 t	маш.-ч	131.393648	2.89100	379.859
		Cutting tool				
13	3403-0102-0201	Electric chain saws	маш.-ч	154.767	0.07500	11.608
		Grinding machines				
14	3403-0202-0101	Electric grinding machines	маш.-ч	10.29	0.02700	0.278
		Total for construction machines and mechanisms:				32497.981
		including pay for drivers	tenge			87924.745
		Contractor Supply Materials				
		General purpose concrete				
1	2102-0101-0601	Heavy concrete B15 ГОСТ 7473-2010	м3	5235.3497	12.42700	65059.691
		Finishing solutions				
2	2102-0402-0206	Heavy finished mortar, cement-lime 1:1:6 ГОСТ 28013-98	м3	315.98343	13.33500	4213.639
		Channels				
3	2105-0204-0703	Channel hot-rolled with an internal bias of the sides of the shelves № 22У-40У carbon steel of ordinary quality ГОСТ 380-2005	т	0.28518	406.90600	116.041
		Fittings				
4	2105-0301-3202	Hot-rolled reinforcing steel A-III (A400) diameters from 14 to 32 mm СТ РК 2591-2014	т	722.32	207.69400	150021.530
5	2105-0301-3001	Hot-rolled smooth reinforcing steel A-I (A240) диаметром от 6 до 12 мм СТ РК 2591-2014	т	80.4	216.78900	17429.836
		Wire				
6	2105-0307-1007	General Purpose Low Carbon Light Steel Wire, Superior Quality, Heat Treated, 1.1 mm Diameter ГОСТ 3282-74	кг	928.326	0.11200	103.973
7	2105-0307-1013	Hot-rolled wire of normal accuracy in steel coils СВ-08А diameters from 6.3 mm to 6.5 mm ГОСТ 10543-98	кг	4.41	0.07000	0.309
		Steel ropes				
8	2105-0310-1108	Steel double lay rope, type ТК, design 6x37 (1 + 6 + 12 + 18) +1 o.s., galvanized, from grade B wire, marking group 1770 N / mm2, diameter 5 mm ГОСТ 3241-91 (ГОСТ 3071-88)	10 м	2.7489	4.16900	11.460
		Other steel building envelope of industrial buildings				

1	2	3	4	5	6	7
9	2106-0209-0201	Steel structures from one profile ГОСТ 23118-2012	т	147.0	589.60300	86671.641
		Separate structural elements of buildings and structures (columns, beams, trusses, communications, crossbars, racks and т.д.)				
10	2106-0801-0101	Separate structural elements of buildings and structures with a predominance of hot-rolled profiles, the average weight of the assembly unit is up to 0.1 T	т	16.8225	463.32700	78556.318
11	2106-0801-0102	Individual structural elements of buildings and structures with a predominance of hot-rolled profiles, the average weight of the assembly unit from 0.1 to 0.5 tons	т	1.617	439.69200	710.982
		Edged bars and bars				
12	2107-0201-0301	Coniferous edged bars from 4 m to 6.5 m long, from 75 mm to 150 mm wide, from 40 mm to 75 mm thick, 3 grades ГОСТ 8486-86	м3	209.2719	25.49200	5334.759
13	2107-0201-0203	Coniferous edged boards from 4 m to 6.5 m long, from 75 mm to 150 mm wide, 150 mm and more thick, 2 grades ГОСТ 8486-86	м3	33.30855	57.04600	1900.120
14	2107-0201-0101	Coniferous edged trunks with a length of 4 m to 6.5 m, a width of 75 mm to 150 mm, a thickness of 40 mm to 75 mm, grade 1 ГОСТ 8486-86	м3	0.1176	60.07000	7.064
		Edged boards				
15	2107-0203-0305	Softwood edging boards up to 6.5 m long, from 75 mm to 150 mm wide, 44 mm thick and more, 3 grades ГОСТ 8486-86	м3	87.81345	47.48400	4169.734
16	2107-0203-0204	Coniferous edged boards up to 6.5 m long, from 75 mm to 150 mm wide, from 32 mm to 40 mm thick, 2 grades ГОСТ 8486-86	м3	35.8696	52.90300	1897.609
17	2107-0203-0303	Softwood edging boards up to 6.5 m long, from 75 mm to 150 mm wide, 25 mm thick, 3 grades ГОСТ 8486-86	м3	17.83185	47.48400	846.728
		Other products				
18	2107-0510-0701	Inventory racks wood-metal sliding	шт.	94.206	20.70200	1950.253
		Lime				
19	2113-0102-0801	Building quicklime lump, grade 1, ГОСТ 9179-77	т	2.89347	31.84900	92.154
		Bolts				
20	2113-0201-0901	Construction bolts with nuts and washers ГОСТ 1759.0-87	т	0.3969	499.61100	198.296
		Nails				
21	2113-0209-0401	Flat head construction nails ГОСТ 283-75	кг	3134.1974	0.40900	1281.887
		Technical gases				
22	2113-0701-0401	Technical gaseous oxygen ГОСТ 5583-78	м3	139.65	0.25200	35.192

ESTIMATES PK

1	2	3	4	5	6	7
23	2113-0701-1002	Propane-butane, technical mixture ГОСТ Р 52087-2003	кг	41.16	0.14400	5.927
		Oils				
24	2113-0702-0101	Anthracene oil ГОСТ 11126-88	т	3.1466	44.84000	141.094
		Technical fluids				
25	2113-0703-1405	Technical water	м3	67.162215	0.02900	1.948
		Fabrics				
26	2113-0803-1101	Bag fabric ГОСТ 30090-93	10 м2	14.433705	6.93200	100.054
		Ropes, cords, threads и.т.д.				
27	2113-0804-0301	Impregnated hemp ropes ГОСТ 30055-93	т	0.0147	1863.75100	27.397
		Components, consumables for tools				
28	2113-0812-1035	Electrodes, d=4 мм, Э42 ГОСТ 9466-75	т	0.5145	211.27300	108.700
		Primer for metal, wood, concrete and other surfaces				
29	2204-0101-0502	Glyphtal primer, ГФ-021 СТ РК ГОСТ Р 51693-2003	т	0.04557	426.06900	19.416
		Solvents				
30	2204-0601-0602	Solvents for paints and varnishes Р-4 ГОСТ 7827-74	т	0.0882	603.82500	53.257
		Shields of formwork, flooring				
31	2701-0101-0104	Boards from boards, thickness 25 mm	м2	2896.8345	1.02200	7845.565
		Total contractor supply materials:				964857.574
		Total:				9846345.375

Compiled _____
position, signature (initials, surname)

Checked _____
position, signature (initials, surname)

Application D

ESTIMATES PK (15) 5B072900_св_

Appendix 4
to the normative document for the determination of the estimated cost of construction in the Republic of Kazakhstan

The form 2

Customer Elyas Shakib
(name of company)

Approved / Agreed upon

Estimated construction cost in the amount of 8045874.5 thousand tenge

including:
value added tax 874877.36 thousand tenge

(link to approval / approval document)

"____"_____2020____

Estimated cost of construction

Multi storey residential building
(name of construction site)

Compiled at current prices as of 2019.

№ п/п	No. of estimates and calculations other documents	Name of chapters objects, work and costs	Estimated cost, thousand tenge			Total, thousand tenge
			construction assembly works	equipment furniture and inventory	other cost	
1	2	3	4	5	6	7
		Chapter 2. The main objects of construction				
1	02-001	Are common	5246421.123			5246421.123
2	02-001-001	Civil works	5246421.123			5246421.123
3	02-002	Aboveground	4785483.366			4785483.366
4	02-002-001	Aboveground	4785483.366			4785483.366
		Total Chapter 2	97456753.36			97456753.36
		Total chapters 1 - 7	97456753.36			97456753.36
		Chapter 8. Temporary buildings and structures				
5	НДЗ РК 8.04-05-2015, Table 1 п.36	Stores for the development and disassembling of main brief buildings and structures. Type of development: Lodging and gracious designing in cities and workers' settlements wear complex, , nurseries, shops, authoritative buildings, cinemas, theaters, craftsmanship displays and other gracious designing buildings - 1.5%	12584512.36			12584512.36
		Total in Chapter 8	11905.863			11905.863
		Total chapters 1 - 8	805630.089			805630.089
		Total chapters 1 - 9	805630.089			805630.089
6	НД ССС	Unforeseen work and costs - 2%	16112.602			16112.602

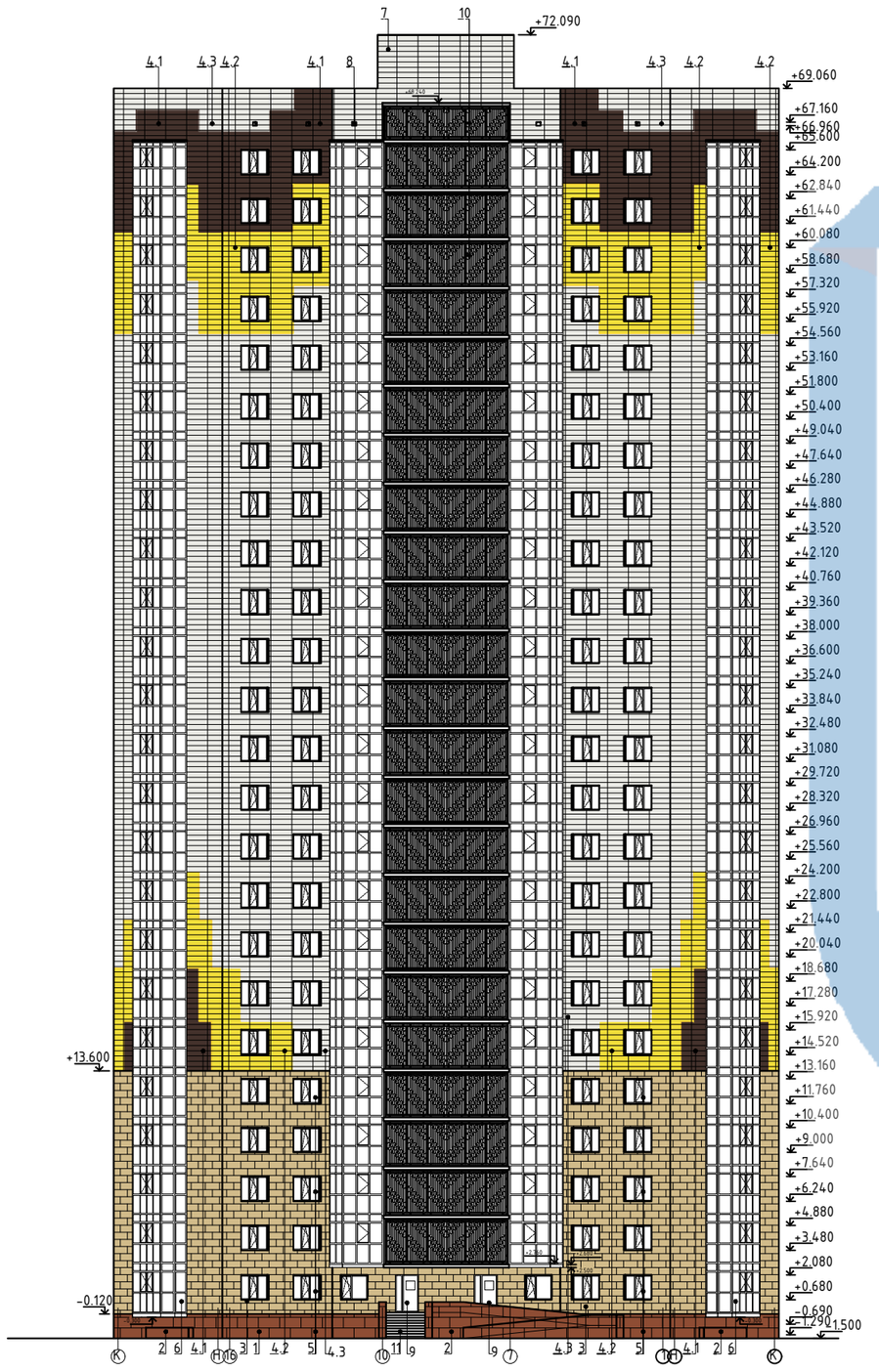
1	2	3	4	5	6	7
		Total estimated cost	7845215.36			821742.691
7	Codex РК от 10.12.2008 № 99-IV, ст.268	Value added tax (НДС) - 15 %			784545.123	98609.123
		Total Estimated	7845215.36		787545.123	2,093,190,400

Project Manager _____
signature (initials, surname)

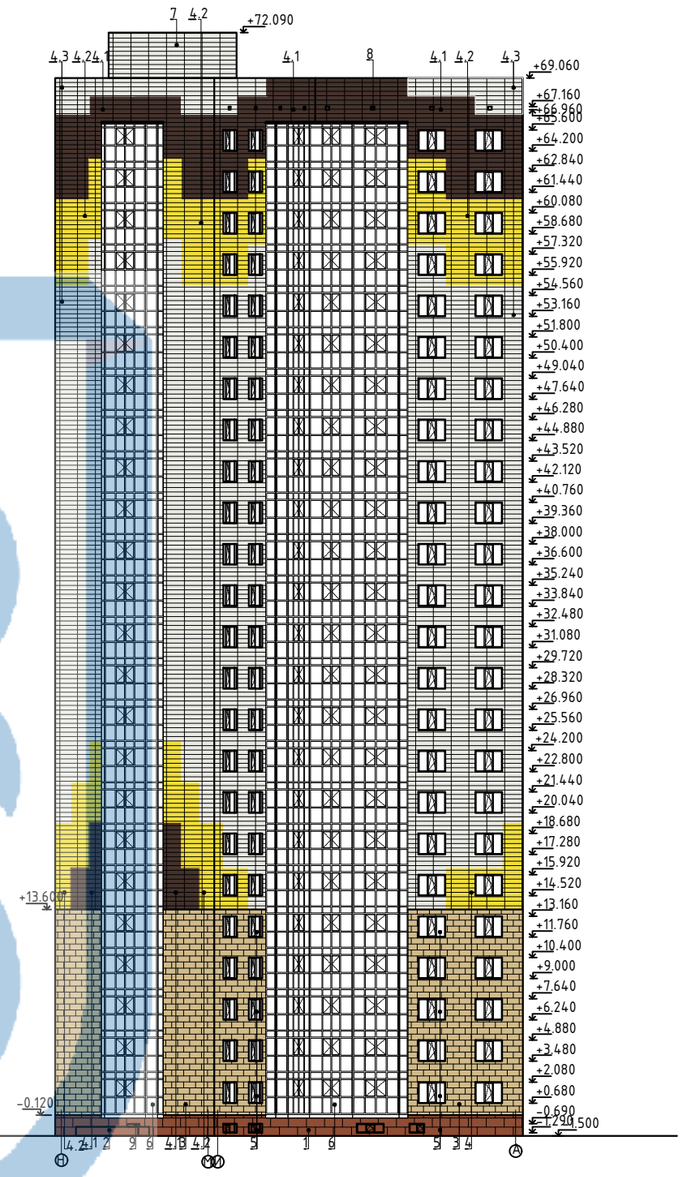
Chief Project Engineer _____
signature (initials, surname)

Chief _____ department
(name) signature (initials, surname)

Facade in axles 16-1



Facade in axles H-A

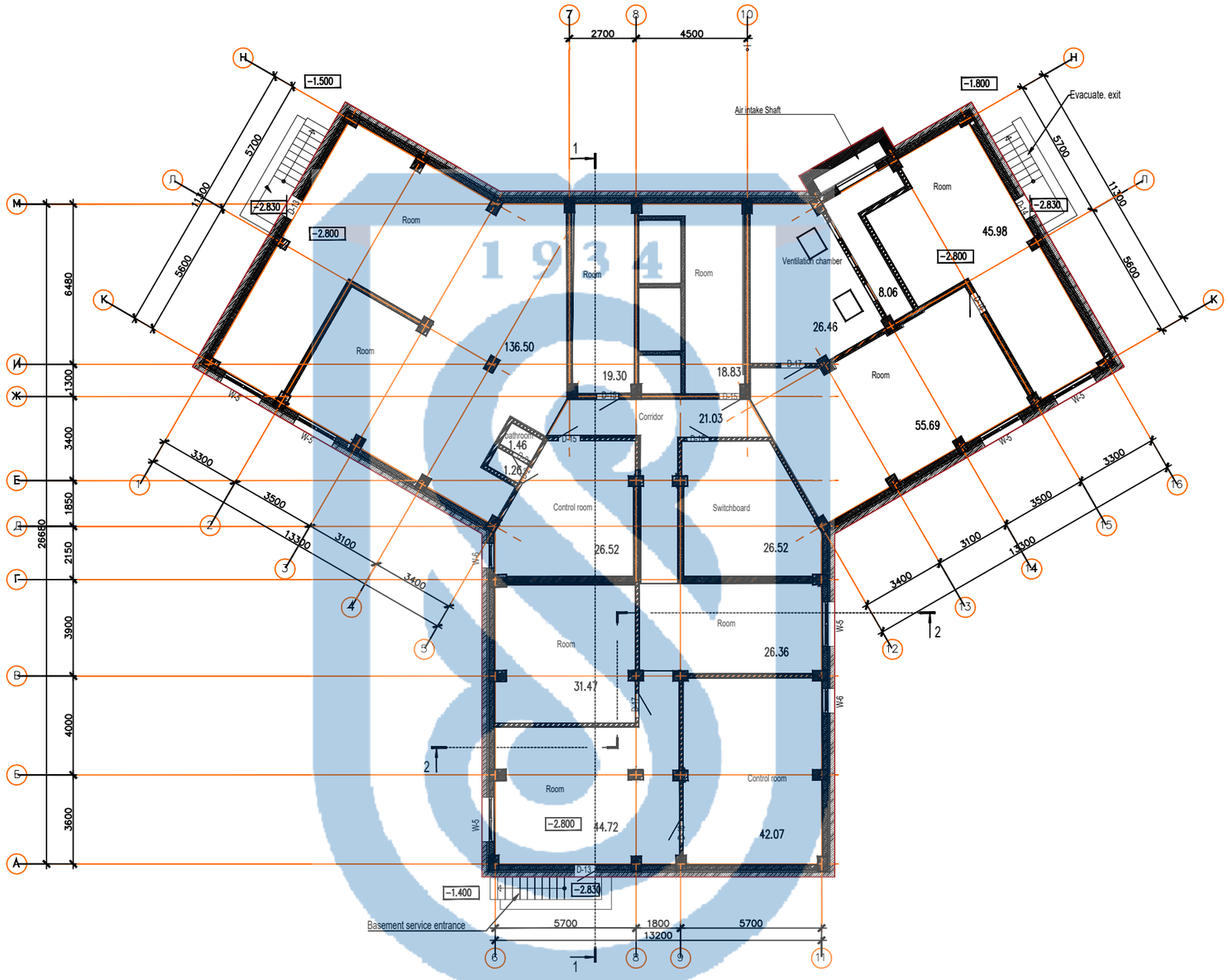


				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential building
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Kozyukova.N.V			
Consultant	Kozyukova.N.V			
Controller	Kozyukova.N.V			
Prepared by	M. Elyas Shakib			

Level	Sheet	scale
DP	1	1:200

Facade	Department of Construction and Building Materials

Basement plan

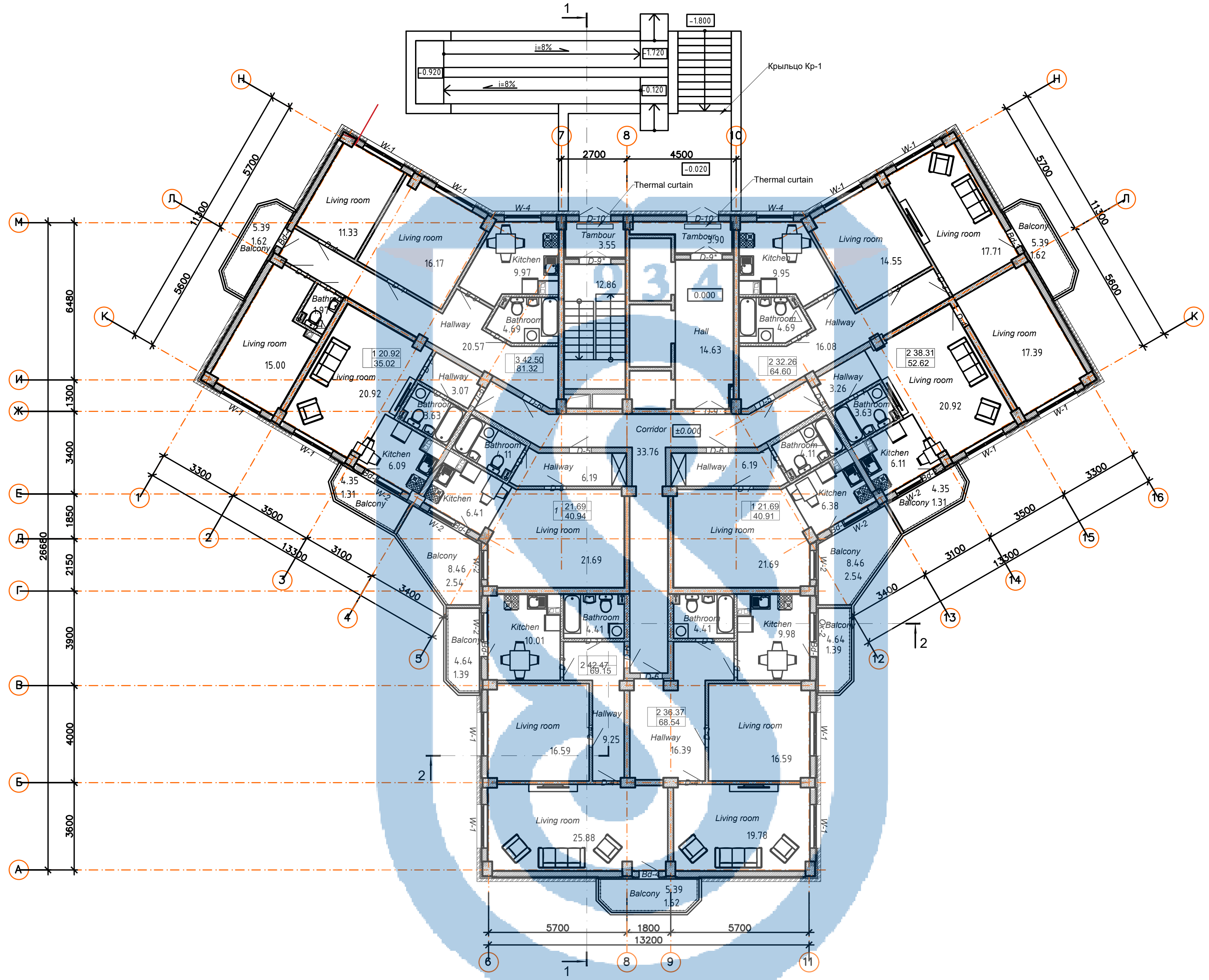


				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential building
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Kozyukova.N.V			
Consultant	Kozyukova.N.V			
Controller	Kozyukova.N.V			
Prepared by	M. Elyas Shakib			Underground floor plan

Level	Sheet	scale
DP	2	1:200

Department of Construction and Building Materials

1st floor finishing plan

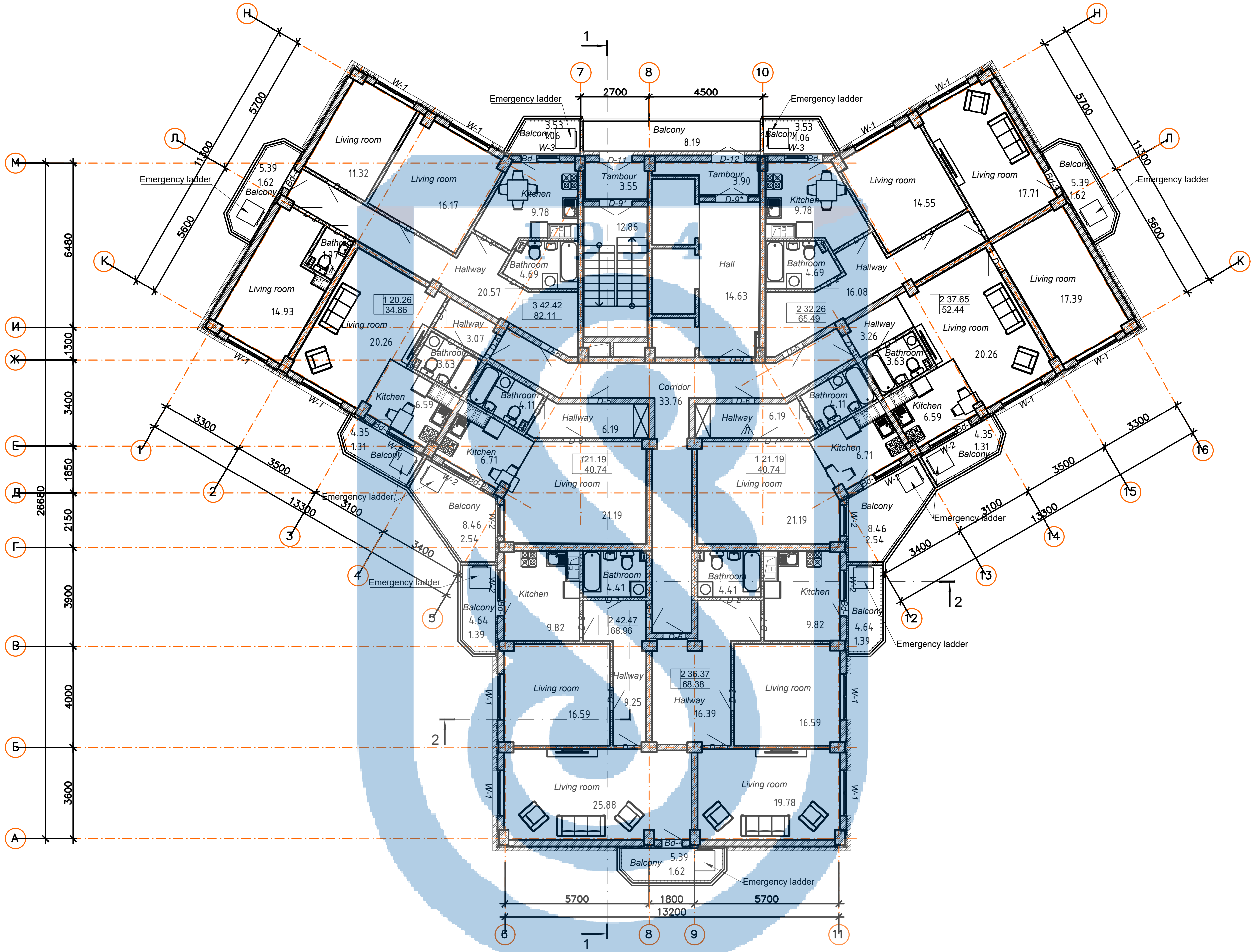


				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential building
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			
Superviser	Kozyukova.N.V			Architectural part
Consultant	Kozyukova.N.V			
Controller	Kozyukova.N.V			
Prepared by	M. Elyas Shakib			First floor plan

Level	Sheet	scale
DP	3	1:200

Department of Construction and Building Materials

Finishing plan 2-24 floors



name	Document №	Signature	date
Head of Dep	Akmalayuli K.A.		
Superviser	Kozyukova.N.V		
Consultant	Kozyukova.N.V		
Controller	Kozyukova.N.V		
Prepared by	M. Elyas Shakib		

KazNITU -5B072900 .29-03/2020 DP

Multi storey residential building

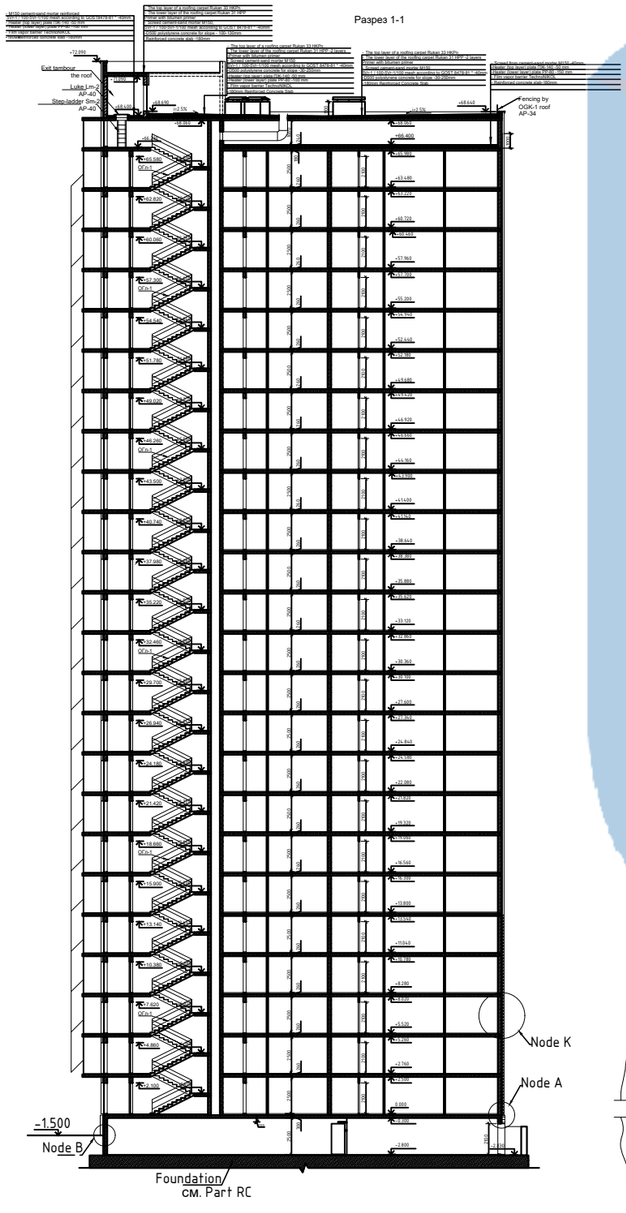
Architectural part

Level	Sheet	scale
DP	4	1:200

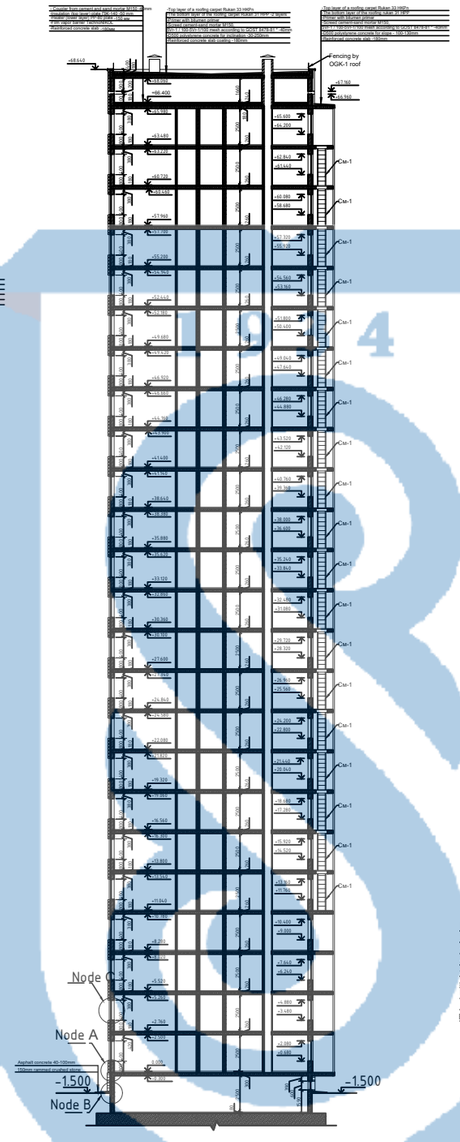
2 - 24 floor plans

Department of Construction and Building Materials

Разрез 1-1



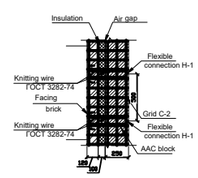
Section 2-2



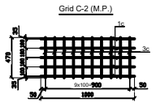
Item specification.

Num.	Designation	Name	Count.	Mass units/kg	Note
		Гибкие связи Н-1	3240	0,24	767,56
1	EN 10138-2	Wire Ø 6 BpI, L= 1030	1	0,24	0,24
		Grid C-2 (на 1 М.Р.)	1640	0,72	1185,23
1c	EN 10138-2	Wire Ø 4 BpI, L= 1000	3	0,10	0,30
3c	EN 10138-2	Wire Ø 4 BpI, L= 430	10	0,04	0,43
2	EN 10138-3	Tube 140x6, L=180	405	4,46	1807,92
4	EN 10138-3	Corner 100x8, L= 150	355,7	1,84	653,60

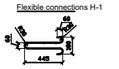
2-2



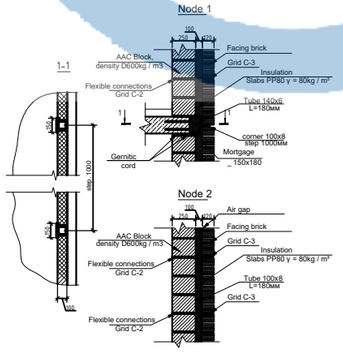
Grid C-2 (М.Р.)



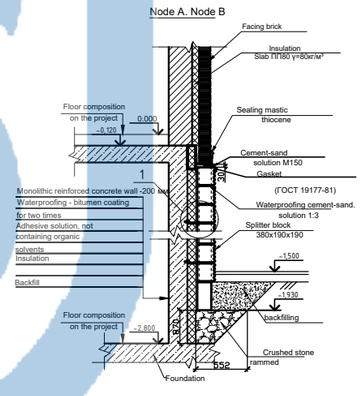
Flexible connections H-1



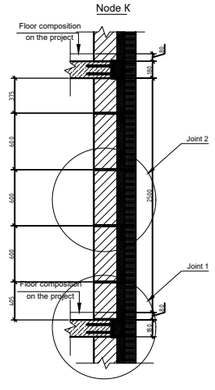
Node 1



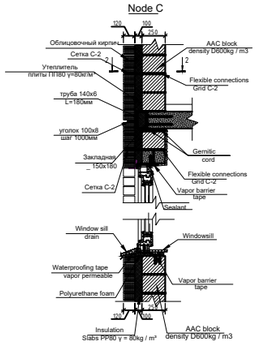
Node A. Node B



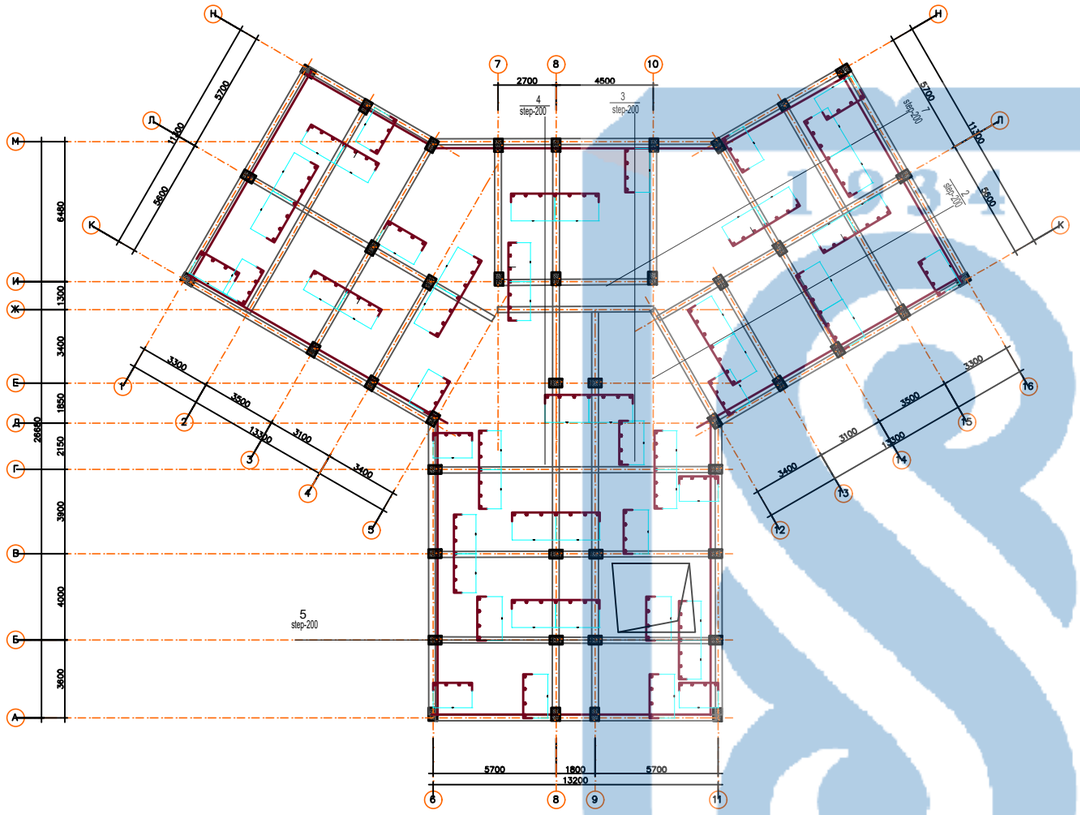
Node K



Node C



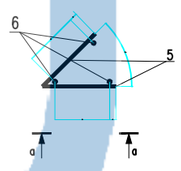
				KazNITU -5B072900 .29-03/2020 DP	
				Multi storey residential building	
name	Document №	Signature	date		
Head of Dep	Akmalayuli K.A.			Architectural part	Level: DP; Sheet: 5; scale: 1:200
Superviser	Kozyukova.N.V				
Consultant	Kozyukova.N.V				
Controller	Kozyukova.N.V			Section	Department of Construction and Building Materials
Prepared by	M. Elyas Shakib				



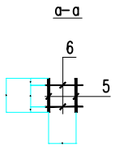
Mark	Standard	Name	num	Mass ед. кг	Note
		Slab on 3.600			
Вк-1	Given list	Vertical karkas	2091	0.8	
1	EN 10138-4	Арм. Ø6 AI, L=1064 п.м.		236.1	
2	EN 10138-4	Арм. Ø12 AIII, L=3215 п.м.		3890.2	
3	170 3000 170	Арм. Ø12 AIII, L=3340	352	4.1	
4	170 1500 170	Арм. Ø12 AIII, L=1840	383	2.3	
7	170 2500 170	Арм. Ø12 AIII, L=2840	144	5.9	
		Concrete C30		65.2	$м^3$
		Вк-1		0.8	
5	EN 10138-4	Арм. Ø10 AIII, L=600	2	0.3	
6	EN 10138-4	Арм. Ø10 AIII, L=145	2	0.1	

1. Knit the fittings with knitting wire in the extreme two rows at all intersections, in the rest through one.
2. Do not cut the reinforcement of the slab in places of openings for utilities.
3. Fixation of the upper rods in the design position to produce due to the vertical frames VK-1, which are installed in increments of 400 mm in a checkerboard pattern.
4. Joining the reinforcement of the floor slab to overlap with the bypass 36d, where d-diameter rods. Joints must be run apart after 1.5 m; see this sheet. Overrun arm taken into account in the specification.

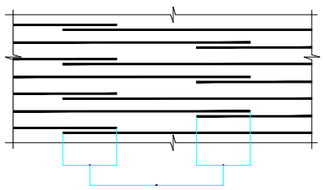
Vertical frame Вк-1



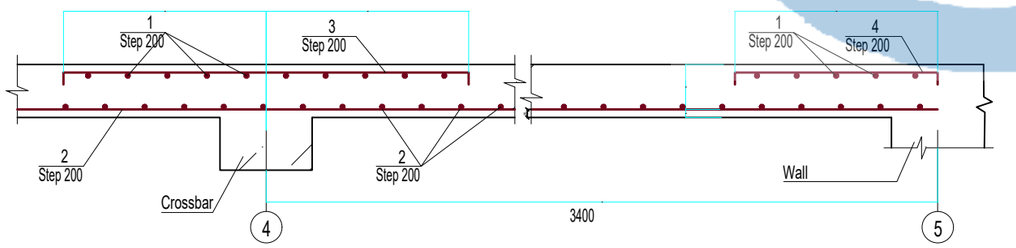
а–а



Overlap reinforcement

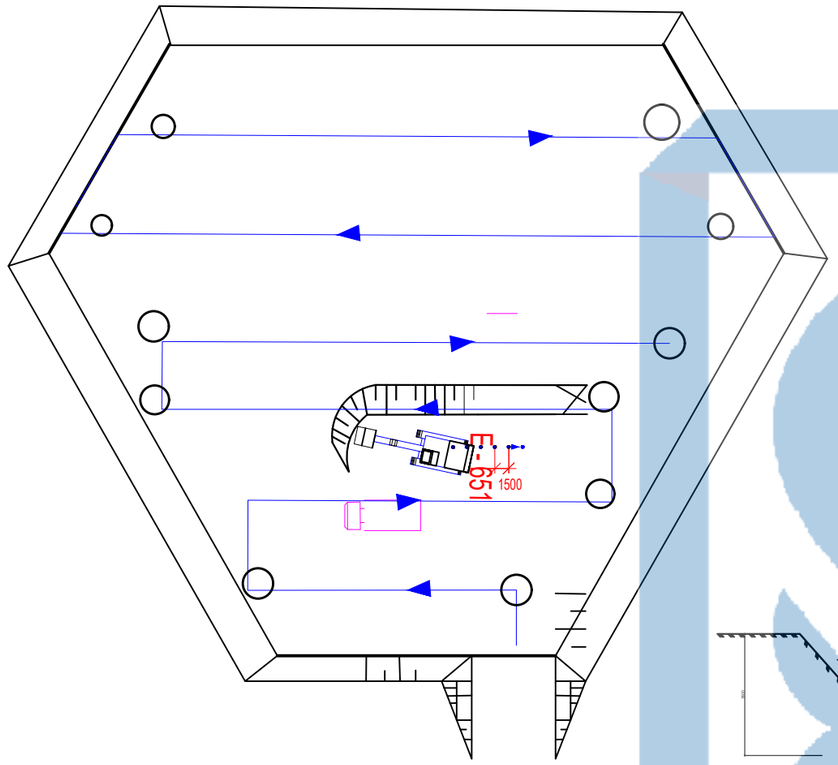


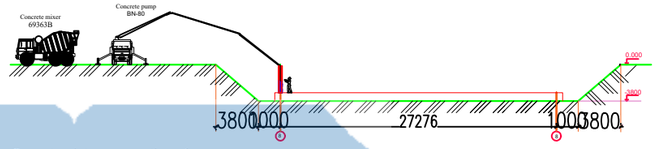
1-1



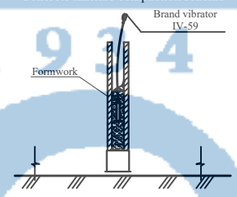
				KazNITU -5B072900 .29-03/2020 DP		
				Multi storey residential building		
name	Document №	Signature	date			
Head of Dep	Akmalayuli K.A.			Constructive part	Level / Sheet / scale	
Superviser	Kozyukova.N.V				DP / 6 / 1:200	
Consultant	Kozyukova.N.V					
Controller	Kozyukova.N.V					
Prepared by	M. Elyas Shakib			Slab design	Department of Construction and Building Materials	

Excavation pit development scheme

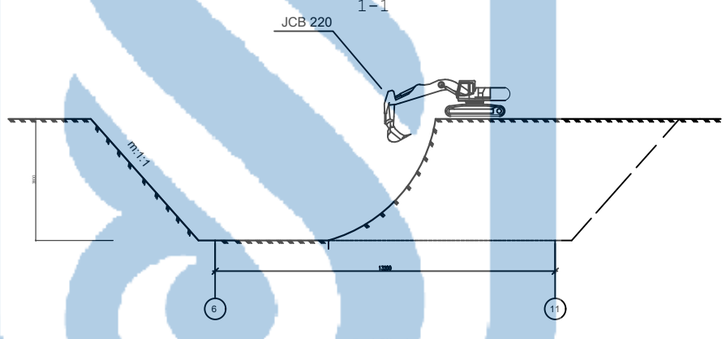




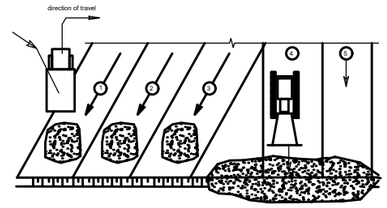
Concrete mixture compaction scheme



Excavation pit development section 1-1



Layout of soil for backfilling



Safety precautions

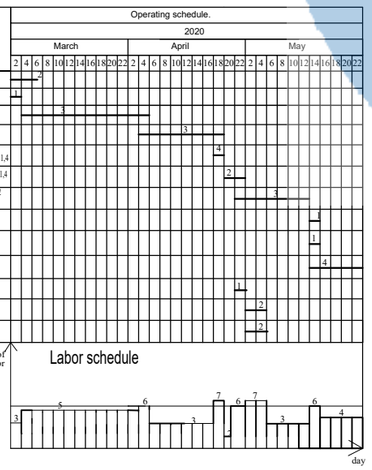
To ensure electrical safety of earthworks in places.
passage of electric networks and when using electric machines.
Install safety guards, warning signs and transitional
night bridges at work sites
Strictly observe the steepness of the slopes when developing a pit
according to table 4 SNiP - III 4 - 80.
Ensure the absence of people within the boundaries of the working bodies
mechanisms determined by the distance within 5 meters.
To ensure the movement of machines and mechanisms near the foundation pit with unreinforced
slopes outside the prism of the collapse of the ground or
the distance regulated by table 4 of SNiP III - 4 - 80, that is.
at a distance of at least 2 meters from the edge of the pit.

Zero-cycle instructions

Before the start of soil development, it is necessary to prepare the territory
to work, demolition unnecessary buildings, cut the plant layer.
Trees are removed along with the roots. Boulders larger than
half the height of the blade of the bulldozer to be exported from
construction area ..
The site planning with a bulldozer is carried out in a layered manner.
The development of the soil is carried out by side penetrations with its loading in
vehicles and dumping in the dump.
Foundations are concreted with a SKG-25 crane.

Work schedule

№	Name of work	Scope of work		Labor input Man/Day	Req. mash		Continued work in the shift day	volume of shifts in day	number workers per shift	Structure brigades
		Unit	volume		Employmntt	number mash shift				
1	Fencing device	м	360	20,7	--	--	5	2	2	рабочий - 2
2	Vegetable layer cut	1000м	0,69	1,8	ДЗ-4	1	1	2	1	машинист (6) - 1
3	Excavation excavation.	100м	144,03	46,3	САТ-1	46	23	2	4	машинист (6) - 1 рабочий - 3
4	Ground shortage development	м³	74,1	33,3	--	--	16	2	3	рабочий - 3
5	Installation of formwork under foundation	м²	122,2	5	КС 5363	--	1	2	5	сварщик(ами(4,3) - 1,4
6	Installation of fittings	т	81,5	39,7	КС 5363	--	4	2	5	арматурщики(4,3) - 1,4
7	Pouring concrete foundation	100м	8,14	27,5	Автобет	199,3	14	2	4	бетонщики(4,3) - 1,2 машинист(4) - 1
8	Formwork analysis	м²	122,2	4	--	--	1	2	2	
9	Watering concrete surface	100м	7,76	1	--	--	1	1	1	
10	Device waterproofing	100м	14,08	88	--	--	11	2	4	
11	backfilling	100м	16,67	1	ДЗ-4	7.24	4	2	1	машинист (6) - 1
12	Soil compaction	100м	255,5	24,6			5	2	2	бетонщики (3) - 3 машинист -1
13	Parse analysis fencing	м	360	20,7	--	--	5	2	2	



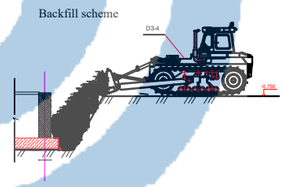
The coefficient of uneven movement of labor:

$$K_2=\frac{N_{max}}{N_m}\le 1.5,\quad K_2=\frac{7}{5}=1,4$$

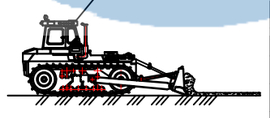
$$N_m=\frac{Q}{P}=\frac{1\,115,6}{66}\approx 5$$

K_2 — The coefficient of uneven movement of workers
N_{max} — Maximum number of workers at the facility
N_m — Average number of workers
P — Duration - 90 days.

Backfill scheme



Plant layer cutting



Technical and economic indicators

№	Name	units rev.	Number
1	Duration of construction and installation works	Day	56
2	The complexity of SMR	man/day	347
3	Production per worker per day	м3	0,69

name _	Document №	Signature	date
Head of Dep	Akmalayuli K.A.		
Superviser	Kozyukova.N.V		
Consultant	Kozyukova.N.V		
Controller	Kozyukova.N.V		
Prepared by	M. Elyas Shakib		

KazNITU -5B072900 .29-03/2020 DP

Multi storey residential building

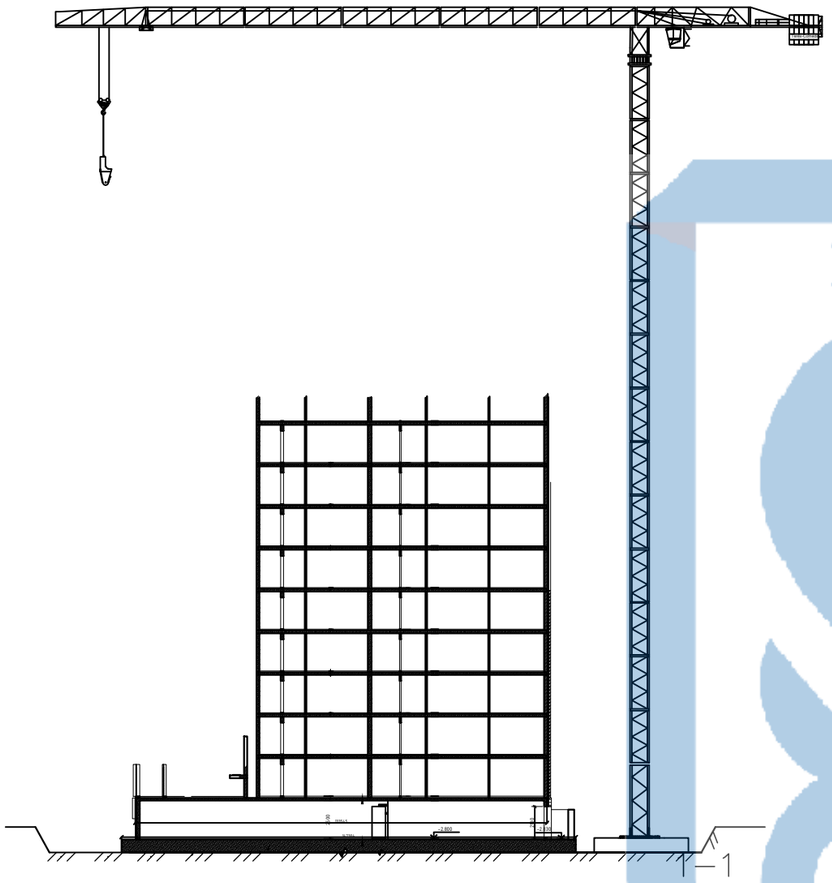
Technological part

Level	Sheet	scale
DP	7	1:200

Underground earth works

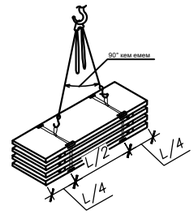
Department of Construction and Building Materials

The scheme of concreting the slab

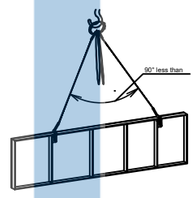


Hinging scheme of a rotary hopper

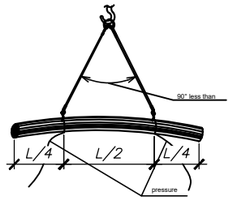
Scheme of looping the package



Hinging scheme of prefabricated molds



Reinforcement looping scheme



Schedule

№	work name	Scope of work		labor capacity Man - Shift		Amount of work	joint composition link	Cars		Number of gears people	Number of units	daily work length	year 2020
		per one	number	Norm	Plan			Model	Number				1 2 3 4 5 6 7 8 9
1	Unloading of fittings with a crane	100 т	0.82	0.73 (0.81)	1.6 (0.8)	116.25	M 5р-1, Т 2р-2	СТТ/В-8	1	1	1	1.0	
	Unloading molds with a crane	100 т	0.42	0.63 (0.32)									
2	Crane delivery of reinforcing frames	100 т	0.65	1.54 (0.76)	18.0 (3.00)	109.22	М 5р-1, Т 2р-2 Кр 5р-2, 4р-2	СТТ/В-8	1	3	2	1.5	
	Cranes and walls with a crane transfer of positions	100 т	0.12	0.2 (0.1)									
	Columns and wall reinforcement installation	т карка	50	1.95									
	Columns and walls	1 м2 5	7.54	15.7									
3	acceptance of wall formations	1 м3	59.03	0.83 (0.35)	11.00 (2.00)	113.36	М 5р-1, Б 2р-1 Кр 5р-2, 4р-2	СТТ/В-8	1	2	2	1.0	
	Forming of concrete mix	1 м3	59.03	11.64									
4	Concrete care	100 м2	39.02	4.2	4.0		Кр 2р-1				2	2.0	
5	Columns and walls disassembly of molds	1 м2 5	7.54	6.72	6.0	112.06	Кр 5р-2, 4р-2 М 5р-1, Т 2р-2	СТТ/В-8	1	1.5	2	1.0	
	Transmission of ceilings with a crane	100 т	0.3	0.49 (0.21)	(4.00) 18.00	109.39	Кр 5р-2, 4р-2 М 5р-1, Т 2р-2	СТТ/В-8	1	4	2	2	
6	setting the ceilings	1 м2 6	8.33	19									
	Provision of fittings for ceilings	100 т	0.17	0.4 (0.2)									
7	Installation and fastening of fittings	1 т	16.8	18.2	18.00 (3.00)	109.46	М 5р-1, Т 2р-2 Кр 5р-2, 4р-2	СТТ/В-8	1	3	2	1.5	
8	Acceptance of concrete mix and ceilings transfer to molds	1 м3	139.67	1.97 (0.84)	10.0 (2.0)	119.7	М 5р-1, Б 2р-1 Кр 5р-2, 4р-2	СТТ/В-8	1	2	2	1	
	Formwork of concrete mix ceilings to build	1 м3	9.67	10.00									
9	Concrete care	100 м2	98	0.12	8.0		Кр 2р-1				2	2.0	
10	Disassembly of ceilings	1 м2	698.33	1.62	3.0	112.29	Кр 5р-2, 4р-2				2	1.5	
			TOTAL	102.77 (47.66)	124 (24.8)	108.4							working labor

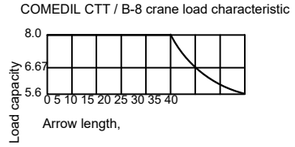
Inventory of molding elements

№	Name	Num
1	Formwork 600x3000	4
2	Formwork board 450x3000	2
3	Dissemble the stand	2
4	Shkvoren	6
5	Wedge castle	8
6	Matresses	1

Technical and economic indicators

№	Name of indicators	size, one	Num
1	Volume of concrete to be laid	м3	198.7
2	Duration of work	Shift	18
3	Labor intensity of work	Man per Shift	94
4	Production per person-shift	м3/Man / Shift	2.11
5	Salary per person-shift	тг/ Man / Shift	1559.2

COMEDIL CTT / B-8 crane load characteristic



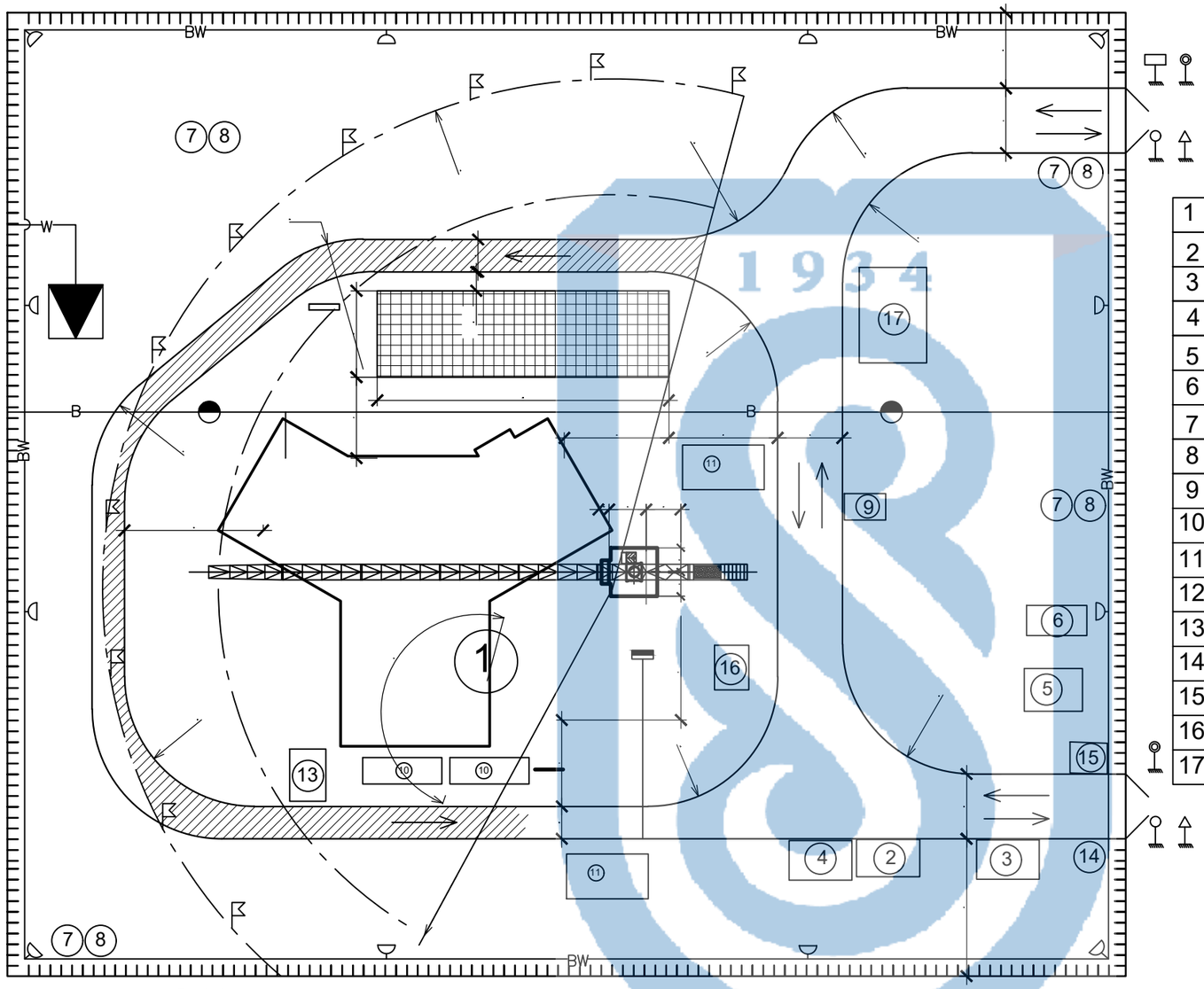
KazNITU -5B072900 .29-03/2020 DP

Multi storey residential building

name	Document №	Signature	date
Head of Dep	Akmalayuli K.A.		
Superviser	Kozyukova.N.V		
Consultant	Kozyukova.N.V		
Controller	Kozyukova.N.V		
Prepared by	M. Elyas Shakib		

Technological part	Level	Sheet	scale
	DP	8	1:200
Aboveground works	Department of Construction and Building Materials		

Construction master plan



Explication of the general plan of construction

1	Housing	Stable
2	Foreman's Office	Temporary
3	House for 3 to 10 people	Temporary
4	wardrobe for 10 people	Temporary
5	Showers and bathrooms	Temporary
6	Canteen	Temporary
7	Toilet E	Temporary
8	Toilet A	Temporary
9	Garbage container	Temporary
10	Open warehouse	Temporary
11	Closed warehouse	Temporary
12	Download platform	Temporary
13	Welding	Temporary
14	Object passport	Temporary
15	Security	Temporary
16	Fire protection	Temporary
17	Washing mechanism	Temporary

Symbols

- Object passport
- Unauthorized access is prohibited construction mark
- Speed limit sign
- Parking sign
- The tense area of the road
- External storage
- BW — Temporary electrical system
- W — DC power system
- B — Transformer station
- Distribution paddle
- Fire hydrant
- Light bulb
- Fire protection
- Dangerous area of crane operation
- Enclosure

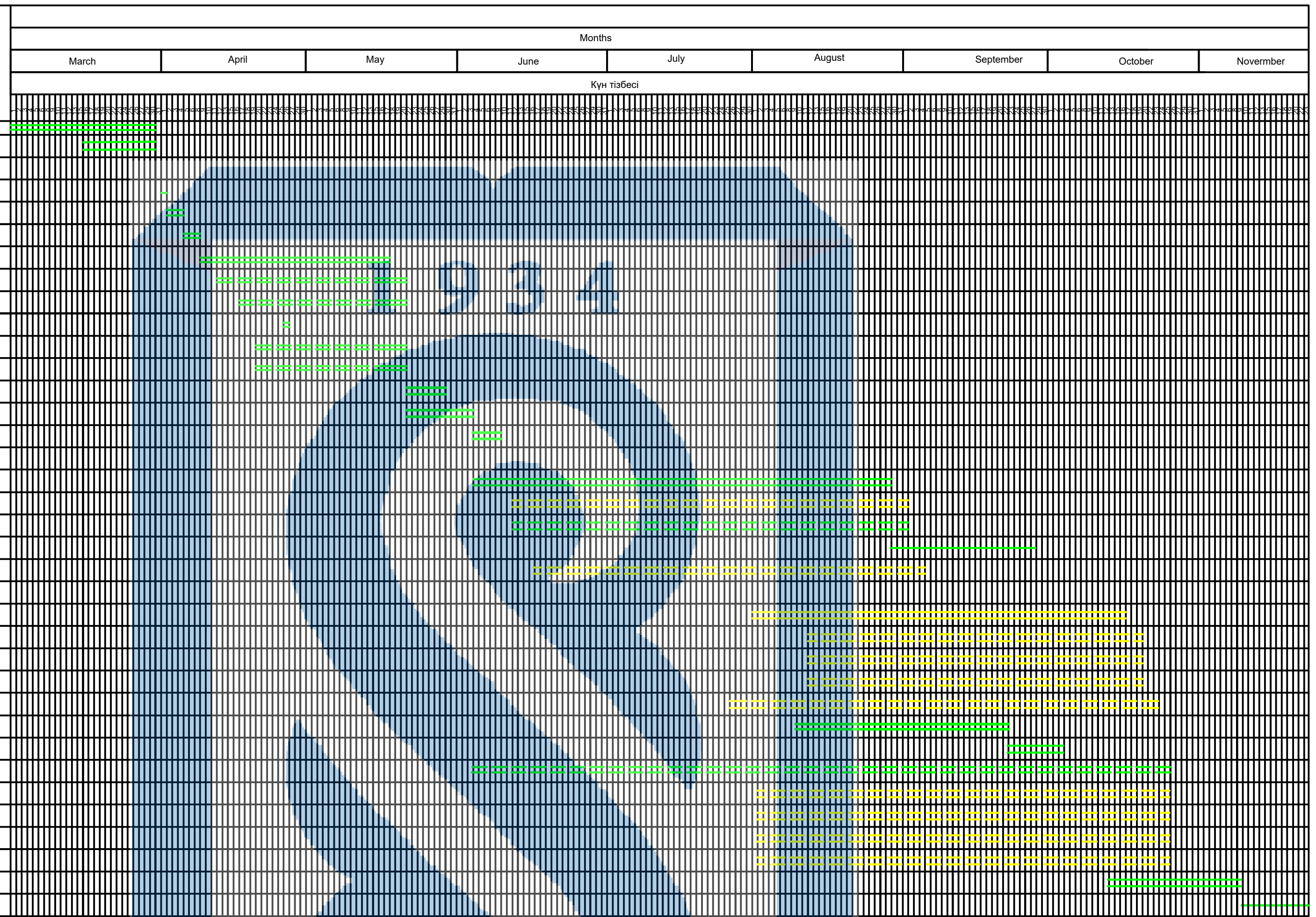
				KazNITU -5B072900 .29-03/2020 DP
				Multi storey residential building
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Technological part
Superviser	Kozyukova.N.V			
Consultant	Kozyukova.N.V			
Controller	Kozyukova.N.V			
Prepared by	M. Elyas Shakib			Master plan

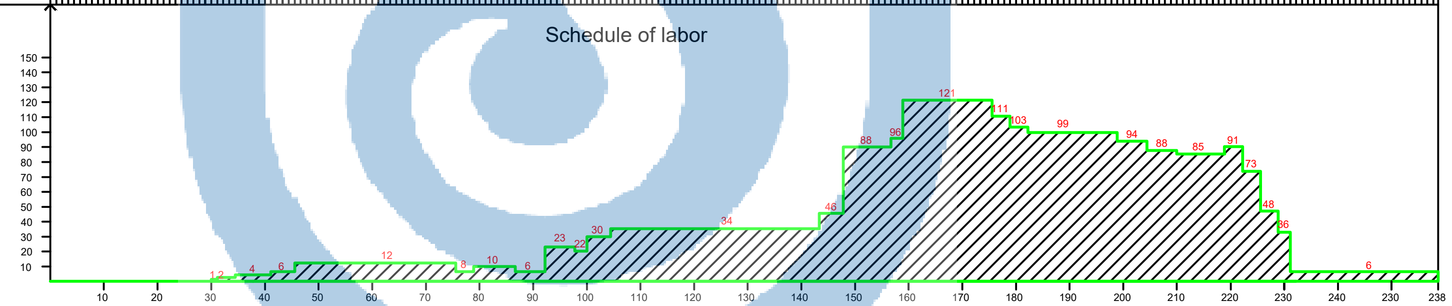
Level	Sheet	scale
DP	9	1:200

Department of Construction and Building Materials

Schedule of production of work

№ п/п	Job title	Scope of work: NO One	Scope of work: Number	Labor intensity Man,Shift	Necessary machine: name	Necessary machine: number	Duration of work Day	Shift number	Number of work shift	Bridge composition
1	2	3	4	5	6	7	8	9	10	11
1	Preparatory work	1000м³	0.69	10	Bulldozer T-100, D-259		30	2	2	
2	The structure of the underground part	1000м³	0.69	30	Bulldozer T-100, D-259			2	2	
2.1	Cutting the vegetative layer	1000м³	0,3	0,5	ДЗ-25	0,5	1	1	1	маш 6р
2.2	Soil preparation with an excavator	100м³	2,29	5,5	Э10011А камаз 5814V	5,5	3	2	2	маш 6р маш 6р
2.3	Manual preparation of the bottom of the pot	100м³	3,4	23,1			3	2	4	землекоп 3р
2.4	Drilling rig	м³	364	271,6	СКГ-40А камазМБУ-20 камаз 5814V	115	34	2	4	маш 6р-1 пом 4р-1 3р-1 кран 6р мон 4р-1 3р-1
2.5	Concrete preparation device	100м³	0,2	3,3	камазМБУ-20 камаз 5814V СКГ-40А	4	4	2	2	бетонщик 4р-1 3р-1
2.6	Monolithic rover device	100м³	1,5	107,3	СКГ-40А миксер камаз 5814V	42	7	2	8	машинист 6р-1 сварщик 4р-1 пл-ик 4р1 3р1 2р1 бет-ик4р-1 3р-1 ар-ик4р-1 2р-1
2.7	Monolithic foundation device	100м³	0,23	6,3	СКГ-40А миксер камаз 5814V	1	1	2	8	машинист 6р-1 сварщик 4р-1 пл-ик 4р1 3р1 2р1 бет-ик4р-1 3р-1 ар-ик4р-1 2р-1
2.8	Device of monolithic walls	100м³	0,75	98,6	СКГ-40А миксер камаз 5814V	57	6	2	8	машинист 6р-1 сварщик 4р-1 пл-ик 4р1 3р1 2р1 бет-ик4р-1 3р-1 ар-ик4р-1 2р-1
2.9	Device of monolithic columns	100м³	0,24	47	СКГ-40А миксер камаз 5814V	43	3	2	8	машинист 6р-1 сварщик 4р-1 пл-ик 4р1 3р1 2р1 бет-ик4р-1 3р-1 ар-ик4р-1 2р-1
2.10	Waterproofing foundations	100м²	1,97	5,2			1	2	4	изолировщик 3р-1 2р-1
2.11	The structure of external networks	100м²	1,97	144	Э10011А		12	2	6	машинист 6р-1 слесарь-сант 4р-1
2.12	Close the cavity	1000м³	2	8,4	ДЗ-25	8,4	5	2	1	маш 6р-1
3	The device of the ground part									
3.1	Construction of monolithic structures	100м³	18,2	2390,1	КБ-408.21 миксер камаз5814V	53,9	75	2	16	машинист 6р-1 сварщик 4р-1 бет-ик4р-13р-1 ар-ик 4р-12р-1
3.2	Exterior walls, balconies	м³	696,7	470,3	КБ-408.21 миксер камаз5814V	34,8	30	2	8	машинист 6р-1 каменьщик 3р
3.3	Laying partitions	100м²	22,3	281	КБ-408.21 миксер камаз5814V	4	17	2	8	машинист 6р-1 каменьщик 3р
3.4	Construction of the roof	100м²	64,4	156	КБ-408.21	1	26	1	6	кровельщик 2р 3р-2 4р-2 5р-1 машинист 6р-1
3.5	Filling the gaps	100м²	11,6	200,6	КБ-408.21	8,8	25	2	4	машинист 6р-1 плотник 4р-1 3р-1
4	Finishing work									
4.1	Plastering works	100м²	289,9	2390,4	КБ-408.21	117,2	67	2	18	машинист 6р-1 штукатур 4р-2 3р-2 2р-1 5р-1
4.2	Painting works	100м²	42,8	258,4			21	2	6	маляр 5р-1 4р-1 3р-1
4.3	General works	м²	108,7	729			41	2	9	маляр 5р-1 4р-1 3р-1
4.4	Wall cladding	100м²	10,1	307,4			16	2	10	плиточник 4р-1 3р-1
4.5	Floor structure	100м²	55,1	684,9	КБ-408.21	9,5	29	2	12	плит-к пар-ик 4р-1 3р-1 бетонщик 4р-1 3р-1
5	Facade finishing	100м²	29,4	593			38	2	8	монтажник 4р-1 3р-1
6	Installation of elevators		0	60,22	КБ-408.21	1	10	2	3	монтажник 5р-1 4р-1 3р-1
7	Other works	%	10	271	КБ-408.21		23	2	6	разно-раб-1
8	Plumbing works	%	8	217			18	2	6	слесарь-сант 4р-1
9	Ventilation	%	5	135,8			11	2	6	монтажник 4р-1 3р-1
10	Electrical installation work	%	5	135,8			11	2	6	электрик 4р-1
11	Weak power lines	%	5	135,8			11	2	6	электрик 4р-1
12	Landscaping	%	5	135,8			11	2	6	бригада по благоустр
13	Handing over the object									





SMR

N п/п	Name	Unit	Number
1	Total labor intensity	Man/day	8120
2	Duration of construction	Month	8,9
3	Norms. duration of construction	Month	15
4	Uneven workforce coefficient of movement	---	0,28

KazNITU -5B072900 .29-03/2020 DP

Multi storey residential building

name	Document №	Signature	date
Head of Dep	Akmalayuli K.A.		
Superviser	Kozyukova.N.V		
Consultant	Kozyukova.N.V		
Controller	Kozyukova.N.V		
Prepared by	M. Elyas Shakib		

Technological part

Level	Sheet	scale
DP	10	1:200

Calendar plan

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: Шакиб Мохаммад Ильяс

Название: Apartment complex in Petropavlovsk

Координатор:Надежда Козюкова

Коэффициент подобия 1:1

Коэффициент подобия 2:0

Замена букв:21

Интервалы:0

Микропробелы:0

Белые знаки: 0

После анализа Отчета подобия констатирую следующее:

- [x] 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: Шакиб Мохаммад Ильяс

Название: Apartment complex in Petropavlovsk

Координатор: Надежда Козюкова

Коэффициент подобия 1:1

Коэффициент подобия 2:0

Замена букв:21

Интервалы:0

Микропробелы:0

Белые знаки:0

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

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

Обоснование:

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

Shakib Mohammad Elyas
5B072900-Civil Engineering

Topic: “Apartment complex in Petropavlovsk”

The following tasks were solved in the work: a space-planning decision was made, the thermotechnical 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 successfully completed all the tasks. Shakib Mohammad Elyas 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, creative and analytical thinking, independence and showed excellent 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
Master of technical science, lecturer

_____ Kozyukova N.V.

«25» 05 2020… г.