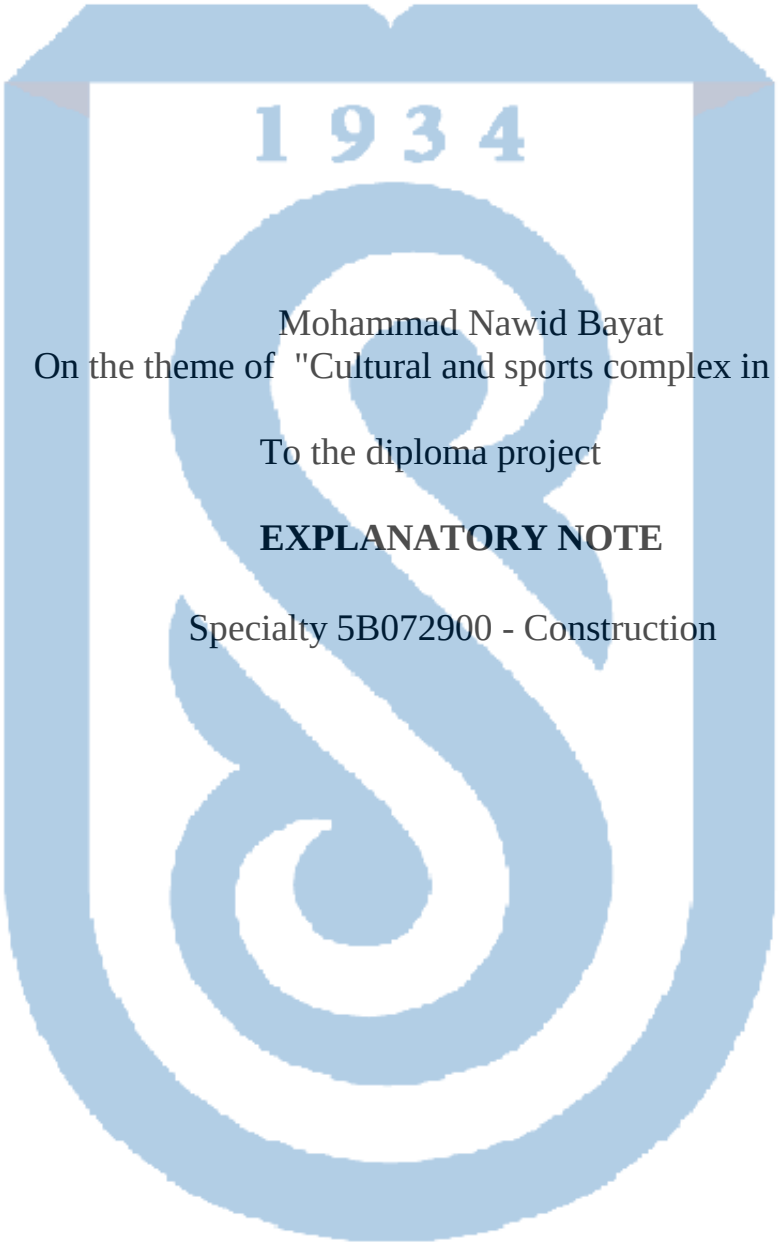
MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
Kazakh National Research Technical University named after K.I. Satpayev

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

Department of Construction and Building Materials



Mohammad Nawid Bayat

On the theme of "Cultural and sports complex in Atyrau "

To the diploma project

EXPLANATORY NOTE

Specialty 5B072900 - Construction

Almaty 2020

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ALLOWED TO PROTECT

Head of Department__K.A. Akmalayuli

Doctor of technical science

«25 » 05 2020 y.

EXPLANATORY NOTE

To the diploma project

On the theme of "Cultural and sports complex in Atyrau "

Specialty 5B072900 - Construction

Prepared by M. Nawid Bayat

Supervisor N.V. Kozyukova

«25» 05 2020 y.

Almaty 2020

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Department of Construction and Building Materials
Specialty 5B072900 – Civil Engineering

I APPROVE
Head of the department
_____K.A. Akmalayuli
Doctor of technical science
«25» 05 2020 y.

ASSIGNMENT
Complete a diploma project

Student __ M. Nawid Bayat _____
Topic Cultural and sports complex in Atyrau
№ _1210 b - approved by the order.
The deadline for submission of the completed project is "04" __June _2020 .
Initial submissions of the diploma project: _construction district - Atyrau, Production
The structural scheme of the building - frame, constant rigidity in height provided, columns, beams are fully cast, roof slabs are ready made of reinforced concrete.
List of issues to be considered in the diploma project:

1. Architectural and construction department: characteristics of the construction area; three-dimensional planning decisions; architectural and design solutions; outer wall thermal engineering accounting; engineering equipment of the building;
2. Computational and constructive section: calculation of loads and creation of the calculation scheme, calculation of the board and its calculation of reinforced concrete elements based on the results and their purpose

3. Technology and organization of construction production and labor protection: land determination of the volume of underground and surface works; by calculation dump trucks necessary number determine tower taps selection;
determination of the number of concrete trucks;
surface reinforced concrete of the building construction of technological map of structures installation; object design of construction master plan; safety and production Sanitation; Schedule

4. Department of Construction Economics: local and object preparation of estimates,

5. Safety of life and labor protection List of drawing materials (mandatory drawings must be specified):

1. Facade of the building, sections, joints, specifications, plans - 4 sheets;
2. Drawing, specification of the column - 2 sheets;
3. Calendar plan of construction production, general construction plan- 2 sheets

Recommended literature: 1. EUROCODE 2 .04-01-2010 Construction climatology,

4. SNiP RK 2.04-03-2002 Construction heat engineering, Construction

SCHEDULE

preparation of thesis (project)

№	Sections	33%	66%	100%	Примечание
1	Predesign analysis Architectural and construction	18.02.2020.-01.03.2020.			
2	Settlement constructive		18.03.2020.-29.03.2020.		
3	Technology and organization of construction production and labor protection Economic			03.04.2020.-19.04.2020.	
4	Anti-plagiarism, norm control, pre-defense	18.05.2020-27.05.2020			
5	Defence	01.06.2020-06.06.2020			

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	Zh.T.Nashiraliev, candidat 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	
Safety and labor protection	N.V. Kozyukova, master of technical science	25.05.2020	
Norm controller	N.V. Kozyukova,	25.05.2020	

Supervisor N.V. Kozyukova

The student accepted the task M. Nawid Bayat

Date «25» 05 2020

АҢДАТПА

Дипломдық жұмыстың тақырыбы: «Атырау қаласындағы мәдени-спорт кешені». Дипломдық жұмыс келесі бөлімдерден тұрады:

1. Сәулет және құрылыс бөлімі - көлемді жобалау, сәулет-конструктивті шешімдері және қоршау конструкцияларының есебі,
2. Есептік-конструктивті бөлім – «ETABS 18» бағдарламасы бойынша темірбетонды біртұтас қанқалы ғимаратының есебі,
3. Құрылыс өндірісінің технологиясы мен ұйымдастырылуы - негізгі техника - жер үсті жұмыстарын жасау механизмдері таңдалуы, кесте жасалып, еңбек шығындары есептелді,
4. Құрылыс экономикасы – СМЕТА AVS бағдарламасында құрылыс жұмыстарының құнының есептелуі.

АННОТАЦИЯ

Тема данной дипломной работы «Культурно-спортивный комплекс в городе Атырау». Дипломная работа включает в себя разделы:

1. Архитектурно-строительный - состоит из объемно- планировочных , архитектурно-конструктивных решений и теплотехнические расчеты ограждающих конструкций,
2. Расчётное– конструктивный - расчет железобетонного монолитного каркаса здания в программе ETABS 18,
3. Технология и организация строительного производства -подобраны основные машины- механизмы для выполнения подземных работ составленкалендарный план и вычислены калькуляций затрат труда.
4. Экономика строительства -разработан расчет себестоимости строительных работ в программе СМЕТА AVS.

ANNOTATION

The topic of this thesis is “Cultural and sport complex in Atyrau”.

Thesis includes the following sections:

1. Architectural and construction - consists of space-planning, architectural and design solutions and heat engineering calculations of enclosing structures,
2. Design-constructive - the calculation of the reinforced concrete monolithic frame of the building in the program ETBAS 18.
3. The technology and organization of construction production — the main Machinery-mechanisms for performing above-ground works were selected, a schedule was drawn up and labor cost calculations were calculated
4. Economy of construction - the calculation of the cost of construction work in the «ESTIMATION AVS» program.

CONTENT

INTRODUCTION

Economic and social development of the Republic of Kazakhstan

The direction of construction until 2020 is a single, scientifically based, reasonable It is planned to bring it to a reasonable and high quality level.

The most suitable for carrying out production work to strengthen the construction industry effective promising actions should be taken.

We are also a major leader in the construction industry we must use technologies and mechanisms.

Solve these problems through an automated control system will be.

Qualification of the existing building to increase the productivity of the construction industry solve the problem of formation.

We deal with economic issues of construction projects and construction the effectiveness of projects using solutions in certain situations we have to deal with.

Up to 30% of the construction load through the effective use of these solutions can be reduced. In addition, the rules introduced in Eurocode are strict stored. In addition to the proper layout of the premises, the relevant functional processes of the practicality of all buildings provided by rational distribution of vertical communications and engineering devices. The building model is determined by life regularity, but at the same time it is designed according to the laws of beauty and urbanization.

In today's fast-paced world, construction is one of indicators of a developing state, which should be in the top 30 the best states. The main purpose of construction is to create
sustainable, comfortable and safe building for existence person.

Cost reduction in construction is done right selection of space-planning solutions for buildings, rational selection of finishing and building materials, improvement construction methods. The main economic indicator in Urban planning is the efficient use of land.

1 Architectural part

1.1 Architectural planning solution

The topic of the thesis was chosen as a social object, which is necessary for a given region. The Sport Complex is intended for short and long stay of people, and appropriate serving their Football matches, competitions, moral, physical, spiritual needs, because this building should be equipped with all types landscaping to ensure quality service to guests.

The project "Construction of the cultural and sports complex" in the city of Atyrau located at the Ural River on the Caspian Sea Kazakhstan region"

1. For conditional mark 0.000 accepted the level of the clean floor of the first floor, which corresponds to the absolute mark +222.15 on the general plan.

2. Working drawings are developed in accordance with the applicable standards of the Republic of Kazakhstan:

Designing of sports halls, premises for sports and fitness facilities activities, indoor ice rinks with artificial ice

"Fire safety of buildings and structures",

"Public buildings and structures", "Urban planning. Planning and development of urban and rural settlements ",

"Car Parking", "Buildings and premises for institutions and

organizations ", Technical regulation" General requirements for fire safety ",

"Accessibility of buildings and structures for people with limited mobility."

Technical regulations

The space-planning decision of the building is determined by such conditions like high insolation, sound absorption of enclosing and bearing structures and the need to preserve many underground engineering networks.

Facilities systems that need to be examined are: Structural and enclosure elements. Power and natural gas, requirements Lighting requirements, Heating, ventilation and air conditioning requirements ,Water and sewage needs.

And components of a sport complex facility are: The stadium structure Parking lots around the stadium, Vendor selling areas, Maintenance components, Grounds-keeping equipment and personnel, Security, Customers, Athletic team personnel, Locker rooms, Vending equipment and supplies

These conditions are more consistent with this designed building, at the same time having a different configuration form.

Lift capacity:

LF1, LF2, LF3, LF4, LF5, LF6, LF7 - 1000 kg. LF8 -630 kg.

The building consists of 3 floors and a technical(underground) floor. A Football Stadium From the 1st floor to the 3rd floor the building is divided into 3 blocks. On the 1st floor: 4 entrance group, administration, exercise zone, in the block B located in the

left side : massive swimming pool for competitions, mini and special pool for unemployed people, massage room, Reception, plenty of Bathrooms and Toilets, dressing rooms and bed rooms.

In the block A which is located the stadium: 2 big restaurants in both side of the Stadium, Dozens of Toilets and bathrooms and Special VIP bedrooms for guests.

And in the Block C: swimming pool, Restaurants, receptions and administration, Toilets and bathrooms and bedrooms.

On the 2nd floor: sleeping block, , Cafe & restaurants, Film zal, Cashier, Dressing rooms, Toilets and bathrooms, staff rooms and sport technology unit.

On the 3rd floor: white spaces in block A and C, bathrooms and toilets, chairs, staircases and lifts.

And in the underground floor: certain toilets and bathrooms, technical rooms, security room, technical canals, drainages, foundation components, escalators, and staff rooms.

In each of these blocks there are various cabinets characteristic for a certain type of block. Number of rooms in the sleeping block A and C (mainly for 1-2 places). All rooms are lit by natural light. "Natural and artificial

lighting " in stadium, rooms have separate entrances, the height of the premises vary in different blocks. in the Block A stadium : the total height is 23.9m where starts from 1st floor with 6.9m to 5.1m, 5.1m and 6.8m accordingly.

In the Block B : the height of underground floor -5.6m, 1st floor 6.4m and for the second floor 4.5m.

And in the Block C in the right side: 4.5m in the 1st floor and 6.4m in the 2nd floor.

on the 1st floor - 4.05m, from the 2nd to the 5th floor the height of the room is 3.05m. Vertical communications are provided by passenger elevators.

and flights of stairs located in 5 different parts of the building.

The cost of the elevator and operating costs at times. However such the location of the machine device will adversely affect the acoustic noise properties of building envelopes.

The staircase is designed for everyday use, made of prefabricated reinforced concrete elements. Two-flight staircase with plumage on landings. All doors in the stairwell and in the vestibule

open towards the exit from the building, which meets the requirements os standards "Fire safety of buildings and structures, alarm system, camera security system, and automatic water drainage system.

1.1 Constructive solution

Having analyzed the location of the projected building, which be in a highland and seismic hazardous area, constructive system decided to choose a communication

frame. Construction bearing structures and pairing of their nodes, joints is made in compliance with the structural design of the building and taking into account the requirements of the joint venture of the Republic

"Construction in seismic regions of the Republic of Kazakhstan". According to this SP table A [ҚР НТҚ 08-01.1-2012] seismicity of the construction site of the designed building is 5.

Table 1.1 - seismic region in Atyrau city

ОС3-2 475	ОС3-2 2475	ОС3-1 475 (agR(475))	ОС3-1 2475 (agR(2475))
5	6	0,016	0,037

The constructive solution is based on a comprehensive coordination of the

joint venture of the Republic of Kazakhstan "Construction in seismic regions of the Republic of Kazakhstan" with volumeplanning and architectural and artistic solution.

The supporting structures of the building are made of monolithic reinforced concrete. Since the structural scheme of the communication frame, the columns perceive vertical loads and vertical stiffness diaphragms horizontal loads. The pitch of the columns of the frame is 9m by 9m in both directions. The foundation is designed on the basis of "Foundation of buildings and structures" is deep foundation, "Piling foundations ", " Construction in seismic areas RK ", as well as in accordance with geotechnical surveys at site. As a result of the analysis of the designed building as foundation, a combination system of foundation slab was chosen 300 mm thick.

Materials specification: units Qty

1 Square steel pipe 60x4 L = 383.16 mp m / kg 2613.15

2 Aluminum threshold with a rubber step for steps m.p. 70.12

3 Complete chrome fence m.p. 4.0

4 Cement bonded particleboard (DSP) 12mm with accessories m 2 149.54

5 External walls - aluminum coating with insulation in a metal frame, aluminum triple glazed windows

Internal walls - standard and partition AAC Blocks 200 mm thick, Red building brick

250x120x65 / 1,0/ 100 / 2,0 / 25 and plasterboard partitions according to Knauf technology, inside stained-glass windows

Overlap - monolithic reinforced concrete.

Roof - non-exploitable ventilated with a coating of aluminum sheet thickness. 1 mm, with an internal drain.

The basement is faced with granite on a mineral wool insulation.

The blind area is a concrete platform 4.5 m wide with granite coating.

Flooring and interior decoration - according to sanitary standards and design

project.

The middle layer is thermal insulation polyurethane foam δ = 50 mm, ρ = 80 kg / m Stucco on both sides, cement sand solution δ = 30 mm, ρ = 1800 kg / m 3 . And finishing shaping a layer for protection against atmospheric precipitation.

Stucco with two parties, from a cement-sand mortar δ = 30 mm, ρ = 1800 kg / m 3

6 The list of types of work for which it is necessary to draw up certificates for the examination of hidden works:

Basement waterproofing device.

The device insulation of external walls.

Device for vapor barrier of walls and roofs.

Reinforcement and fastening of external walls.

Reinforcement and fastening of partitions

Fiberglass mesh for plaster

Gypsum plaster 15mm "GRENDER" Alinex

Primer "Alinex"

Plaster putty "GLATT" 3,5mm

Putty finishing "Finish" 2mm

Water dispersion paint

7 Window - 1500x1200mm, automatic gate - 3000x3000

Foundation under PV1.2

h = 100mm 5700x2200

P = 1900 kg, Kdin = 1.2;

Cross breaker = 1.2 height

air inlets 2300mm

8. Tackett carpet pile

Bulk floor, 5mm

Screed from cement-sand mortar M200

Reinforced with mesh 5Vr1 100x100, 55mm

40 mm extruded polystyrene M350

Floor slab

Concrete preparation thickness= 100mm, RC slab thickness = 200mm

Columns made of monolithic reinforced concrete, square in plan. Section columns 400x400 mm. It is made of concrete of class B25, reinforcement class A400 and higher. The floor slab is designed from monolithic reinforced concrete class B25, 200mm thick. Cover plate made of monolithic reinforced concrete class B25, 200mm thick.

The floors in the building must meet the requirements of resistance wear, noiselessness, durability, sound insulation.. Coverings of a flight of stairs and corridors consists of ceramic tiles δ = 10mm, ρ = 1800kg /m 3, adhesive δ = 5mm, ρ = 2100kg/m3

The positive side of these floors is noiselessness and hygiene. Negative - the huge complexity that leads to increase the duration of construction. Stairs made of precast

concrete, and will be delivered from the factory.

According to Eurocode my building is type C5 where
q k (uniformly distributed load) and Q k
(Concentrated load). EN 1991-1-1: 2002 [6.3.1.2 (10)],
Table 6.2 - Temporary loads on floors, balconies and stairs of buildings
qk= 5.0–7.5 Qk=3.5–4.5 kn/m2
α A ≥ 0.6 - for categories C and D.
In the formula:
ψ 0 - coefficient in accordance with EN 1990, annex A.1, table A.1.1;
A 0 - 10.0 m 2 ;
A is the area of the loaded surface.
Table 6.12 - Horizontal loads on intermediate walls and fencing
NOTE 3 For use category C5, the value of q k may be applied within 3.0–5.0 kN / m.
Snow load according to НП к СН РК EN 1991-1-1:2002/2011
Table 2.1- 80 kg/m^2 (0.8 kpa)
To ensure fire resistance requirements,
4 cm thick plaster made

Table 1.2 - Explication of 1st floor rooms

Name	Area, m 2 Volume m3
Building total area	33,839.76
Block A	13 206.15
Block B	10 983.93
Block C	9 649.68
Built-up area	18 031.7
Construction volume of the complex	290 350
including: Block – A	147 618.3
including: Block – B	58 209.1
including: Block - C	47 852.9
Total usable area	31,463.96
Useful area block A	11966.25
Useful area block B	10490.53
Useful area block C	9007.18
Capacity of the visual stands Unit 1 places	5018
Capacity of the visual stands Unit 2	585

1.2 Thermotechnical calculation of the outer wall

According to the joint venture of the Republic of Kazakhstan 2.04-01-2017 “ Construction climotology” and "Construction heat engineering" it is necessary to determine the thickness insulation for the outer wall.

Climate characteristics

Climatic characteristics of the construction area:

- Outside air temperature:
- The average temperature in the coldest five days - 37.3 o C (reliability 0.98)
- Average temperature on the coldest days - 30 o C (reliability 0.92)
- Wind speed pressure - 0.38 kPa (district I)
- Weight of snow layer - 0,8 KPa (I area)
- Maximum depth of soil compaction - 1.43 m
- Seismic properties of the construction site - 5 points.

The thickness of the layer is 2.8–4.7 meters. Below it are sand fillers

There is a loamy soil. Loamy soils do not have sedimentary properties.

Threshold weight - 18.4 kN / m 3 , internal friction angle 22° maximum viscosity -5 KPa, modulus of deformation - 4.0 MPa.

Heating period dd-degrees-day RK KN 2.04-03-2011 Defined by "Thermal protection of buildings".

Tint = 21 deg. Internal design air temperature

Text = -37.3 deg. External design air temperature (coldest five)

Daily) MF RK 2.04-03-2011 "Thermal protection of buildings" 3-are accepted according to the appendix.

ΔTn = 4 normalized temperature fluctuations according to Table 2

2.04-03-2011 "Thermal protection of buildings" of the Ministry of Finance of the Republic of Kazakhstan.

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

$$ГСОП = (тв\text{-}тотпер).\ зотпер \qquad (1.1)$$

Where тв - buildings and structures in accordance with Internal design air temperature in accordance with design standards, ° C (16 ÷ 18);

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

Table 1.3 -Materials of the outer wall and its properties.

Name of material	Bulk density Υ_0 ,кg/м^3	Weight density λ, kN / m 3	δ,м
AAC Blocks Outer wall	650	0.6	0.01200
Extruded polystyrene foam M350	35	0,3	x
aluminum coating in a metal frame (building brick)	230	0.27	0,03
Cement-sand mortar	1800	0,79	0,03
Gypsum plastering	1600	0.16	0.015

For the city of Atyrau: $Z_{отпер}$= 202 days; $t_{отпер}$ = -7,2 ° C;

$$\Gamma_{СОП} = (21 + 7.2) \cdot 202 = 5696.4 \text{ ° C} \cdot \text{day};$$

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

Rтр = 3,234м ∗℃/Вт

Dd = 5696.4; normalized value of heat resistance 2.04-03- RK RK

2011 is determined according to Table 4 “Thermal protection of buildings”:

Rsi = 1 / αi; αi = 8.7– the surface of the structure for fencing internal heat supply schedule Table 4 RK TL 2.04-107-2013 “Instrumental heat technique ».

Rse = 1 / αe; αe = 23 – coefficient of the outer structure of the fence

Table of surface heating Table 6 RK TL 2.04-107-2013 “Instrumental heat technique ». The required heat transfer resistance of the enclosing structure is as follows determined by the formula:

$$R0 = \frac{1}{\alpha i} + \frac{\delta 1}{\Upsilon 1} + \frac{\delta 2}{\Upsilon 2} + \frac{\delta 3}{\Upsilon 3} + \frac{\delta 4}{\Upsilon 4} + \frac{\delta 5}{\Upsilon 5} + \frac{1}{\alpha e} \quad (1.2)$$

$$R0 = \frac{1}{8.7} + 0.02 + \frac{x}{0.3} + 0.11 + 0.037 + 0.0937 + \frac{1}{23} = 0.42 + \frac{x}{0.3} = 5.08 \text{ m} * ℃ / W,$$

$$x = 1.4$$

R0=5.08 ≥ Rтр = 3.234m ∗℃ / W

The condition is satisfied. We take the thickness of the insulation 140 mm. . The thermal inertia D of the building envelope should be determined according to the

formula 2.3:

$$D = R\,1 * s\,1 + R\,2 * s\,2 + R\,3 * s\,3 + R\,4 * s\,4 = 0.02 * 9.6 + 4.6 * 7.91 + 0.11 * 0.67 + 0.037 * 9.6 + 0.0937 * 0.67 = 37.1$$

The thermal inertia of the building envelope is excellent.

1.3 Antiseismic activity

The main feature of the seismic retention of wonderful frame buildings is determined by the fact that these structures have a huge period own oscillation, which is how they differ from a frameless building. Complex frame structures own large reserves flexible plastic work and are allowed to work designs beyond limits of ductility and elasticity.

Horizontal effort in complex frame buildings can perceived by its frame and with vertical connection, aperture or core rigidity. These complicated frames have a more correct frame. design scheme, which accompanies the optimization of various design decisions. The presence in complex frames of various additional element in the form of masonry, ties, diaphragms acts to limit displacements of elements, replenishment of the stiffness of the building. Stiffness cores connections and stiffness diaphragms are designed continuous in height structures and should be located in two directions symmetrically, evenly in the center of stiffness.

Buildings must be completed by dividing with antiseismic seams into certain compartments if:

space-planning and constructive solutions are not determinedrequirements;

centers of gravity differ in different blocks over 30%.

Over the entire height of the building, anti-seismic seams should be divided into equal blocks. Antiseismic seams are required to be performed by the method the construction of several paired frames, or separately frames and walls. Adjacencies blocks in the transition of anti-seismic seams should not always harm them combined horizontal movement during earthquakes.

When erecting a building on non-rocky soils, the foundations of buildings, as usually settled on the same level. Technical floors should be built under the whole building. Elevator shafts and stairwells of complex frame buildings should be designed as stiffness cores accepting seismic load. Another option is possible, in the form of built-in simple structures with uniform floor cutting, usually not affecting the stiffness frame.

The load-bearing walls must be designed so that have flexible connections with the basic frame structures without harming horizontal displacements of the walls. Between columns of the frame and surfaces walls always provide a small gap of at least 20 mm.

2 Structural part

2.1 Baseline

The structural design of the building is designed as a wireframe. Building frame - columns, ceilings and stiffness diaphragms from monolithic reinforced concrete.

The class of concrete is determined depending on the purpose of the structure:

- floor slab used B25 class concrete, 200mm thick;
- for concrete slab B25 class, on sulfate-resistant

Portland cement;

-for columns and diaphragms of rigidity concrete class - B25; section of columns – 400 * 400.

Monolithic reinforced concrete structures of the building are reinforced from valves class A-400 (A-III) and A-240 (AI).

When calculating the structures, the following climatic terms:

- High-speed standard wind pressure for the I region - 0.38 kPa;
- Snow cover for district I - 0.8 kPa;
- soil category by seismic properties II. Seismicity district - 5 points.

-seismicity of the site-5 points;

The purpose of this calculation is to determine the movement of the frame itself buildings from combined horizontal and vertical actions loads, when comparing them with possible permissible movements, and receiving the same area of reinforcement of all types of reinforcement.

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

1) “Net weight of the building”
2) “Floors” (take loads from table 1)
3) “Walls” (take loads from table 1)
4) "Pressure from the ground"

As backfill we take loam, with characteristics according to the reference manual “Design of retaining walls and walls basements ”

Initial data:

The height of the wall, taking the horizontal load of the soil 3.0 m. Foundation height 5.6m

According to Eurocode my building is type C5 where EN 1991-1-1: 2002 [6.3.1.2 (10)] Table 6.2 - Temporary loads on floors, balconies and stairs of buildings

Table 1.4 – All loads applied taken from Eurocode 1 EN 1991-1-1: 2002 [6.3.1.2 (10)]

Type of loads	Measured unit	Values
q k (uniformly distributed load)	kN/m^2	5.0–7.5
Q k (Concentrated load).	kN/m^2	3.5–4.5
Own weight of building per m^2	kN/m^2	3.0–5.0
Snow load	kg/m^2 (kpa)	80 (0.8)
Wind load	Kpa	0.38
Plastering	Cm	4

Υ_{II} = 2.24t / m 3

φ= 36 °

Soil specific gravity 2.63 t / m3

The width of the load strip is taken 1m.

Decision:

Determine the coefficient of the horizontal component of the soil λ

$\lambda = tg^2 (45 – \varphi/2) = tg^2 (45 - 36/2) = 0.259$

Determine the intensity of horizontal pressure from the ground:

G_{gr} = 2.24 * 3.0 * 0.259 = 1.74 t / m 2

We determine the intensity of horizontal pressure from the time loads on the surface of the planning mark:

G_1 = 0.1 * 0. 259 * 1.15 = 0.0297 t / m 2

Total load at a depth of 3.0 m

$G_2 = (G_1 + G_{gr})$ = 1.74 + 0.0297 = 1.769 t / m 2

Where 1,15 - reliability coefficient;

"Long-term load according to Eurocode 1 EN 1991-1-1: 2002"

"Short-term load according to Eurocode 1 EN 1991-1-1: 2002"

"Snow load"

“Seismic in X” (according to Eurocode 8 CH PK EN 1998-5:2004/2012)

Seismic in Y” (according to to Eurocode 8 CH PK EN 1998-5:2004/ 2012)

“Seismic in Z” (according to to Eurocode 8 CH PK EN 1998-5:2004/ 2012)

Calculation of the building for forced vibrations

1) The formation of mass matrices for loads

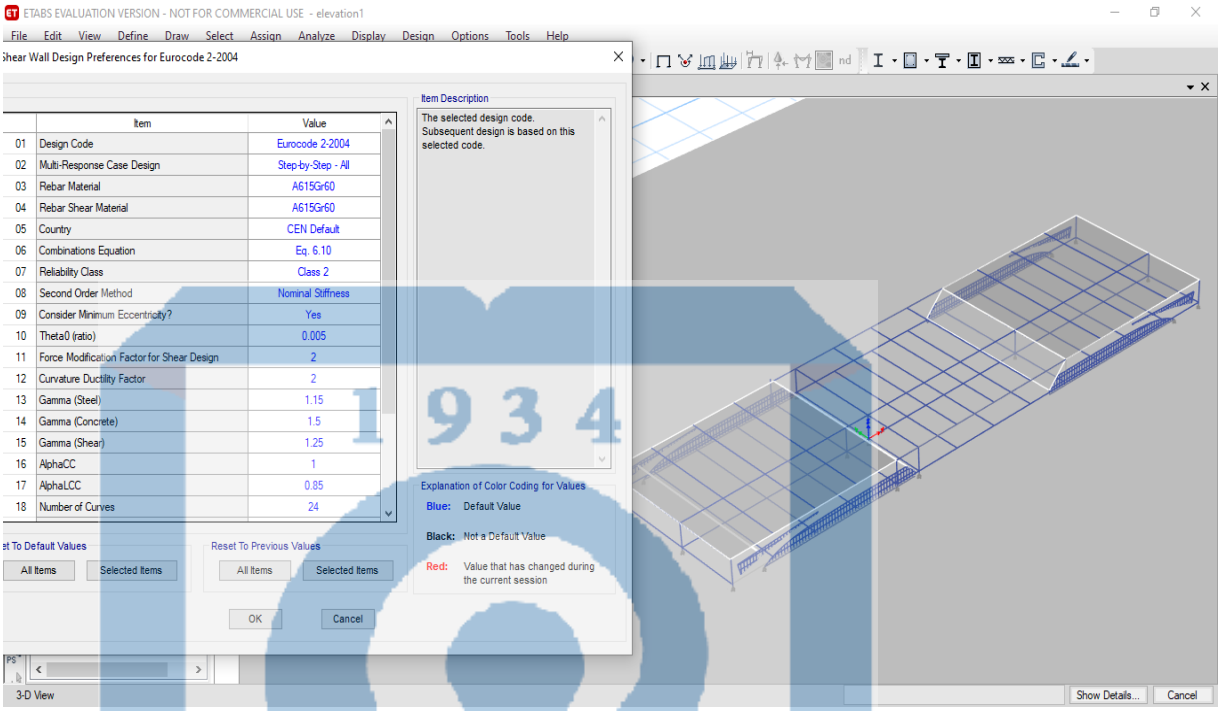

Figure 2.1 – Modeling and designing building according to Eurocode

The number of dynamic downloads is 3, since the building forced during earthquakes in space.

We set the characteristics for calculating the dynamic effects and restraints:

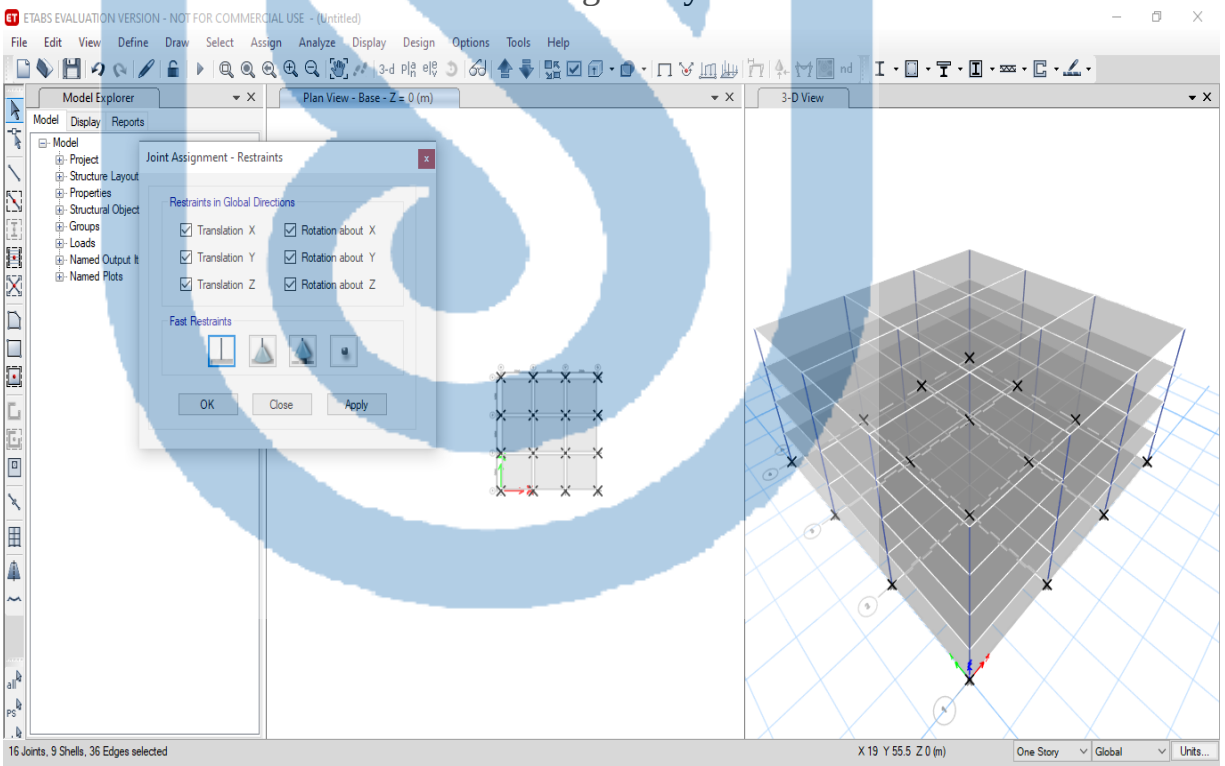

Figure 2.2 - Setting characteristics for restraints and setting it to fixed connection

1) Assigning dead loads for shell

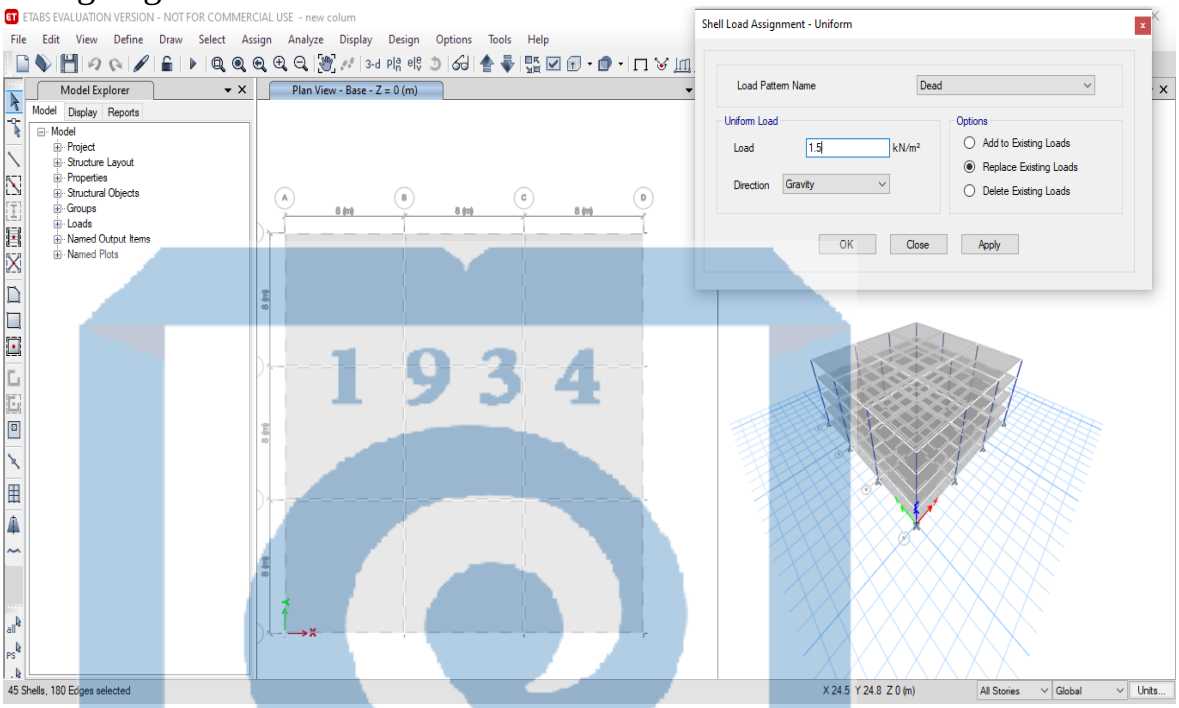

Figure 2.3 – Dead load assignation

2) Load combination data

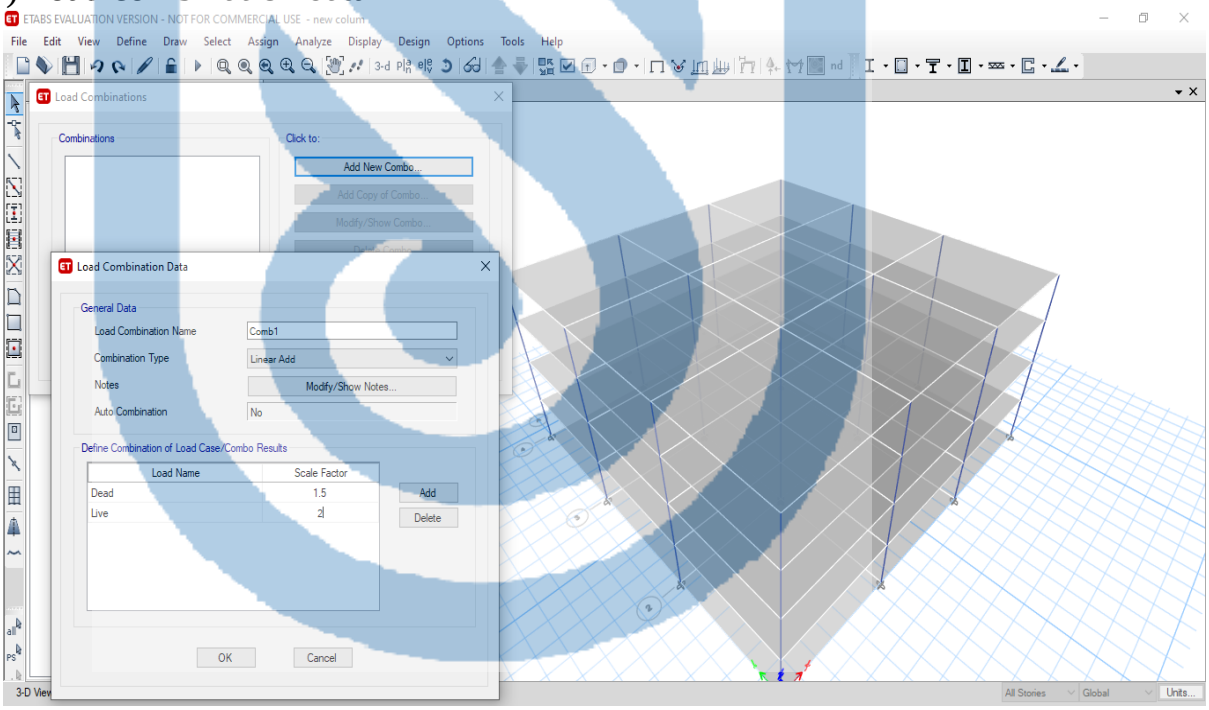

Figure 2.4 - Estimated combination of loads

This building model is designed in accordance with important design features of the designed building. Aperture stiffness and overlap were modeled by finite elements of

a flat shell. The design model of the building is adopted in the form of a spatial multi-mass discrete system with masses concentrated in nodes.

Each node has 6 degrees of freedom. Various calculation files are created to meet the norms of Eurocode and constructive features of the designed building.

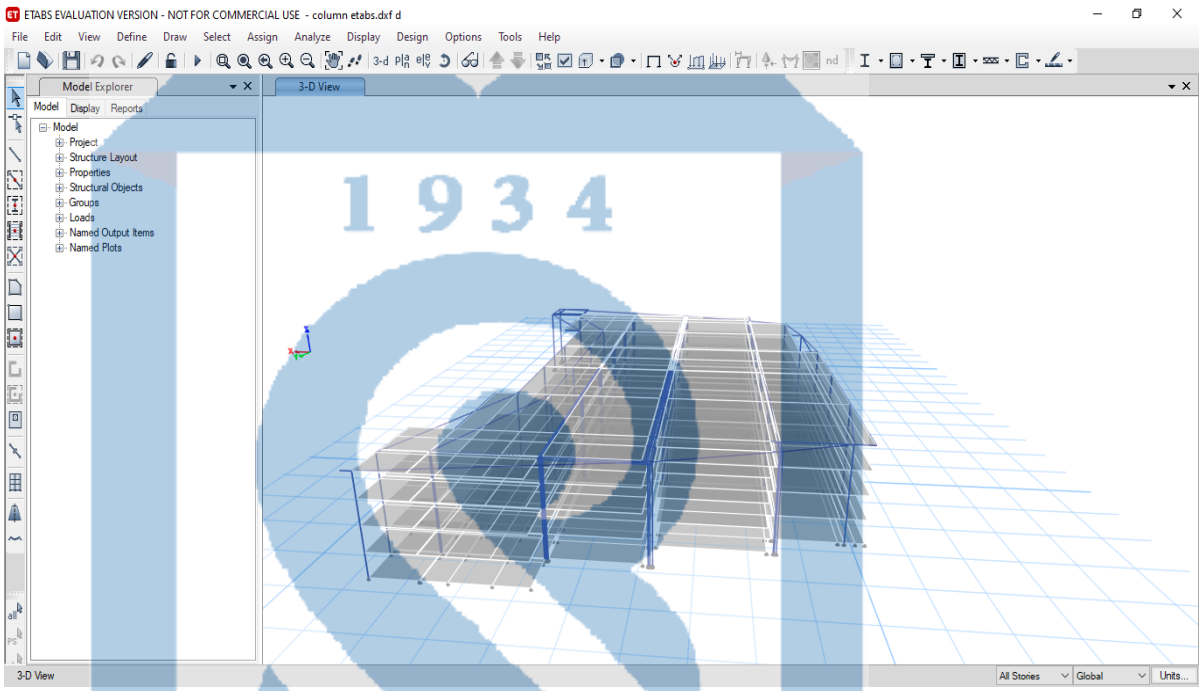

Figure 2.5 - Initial spatial model of the building

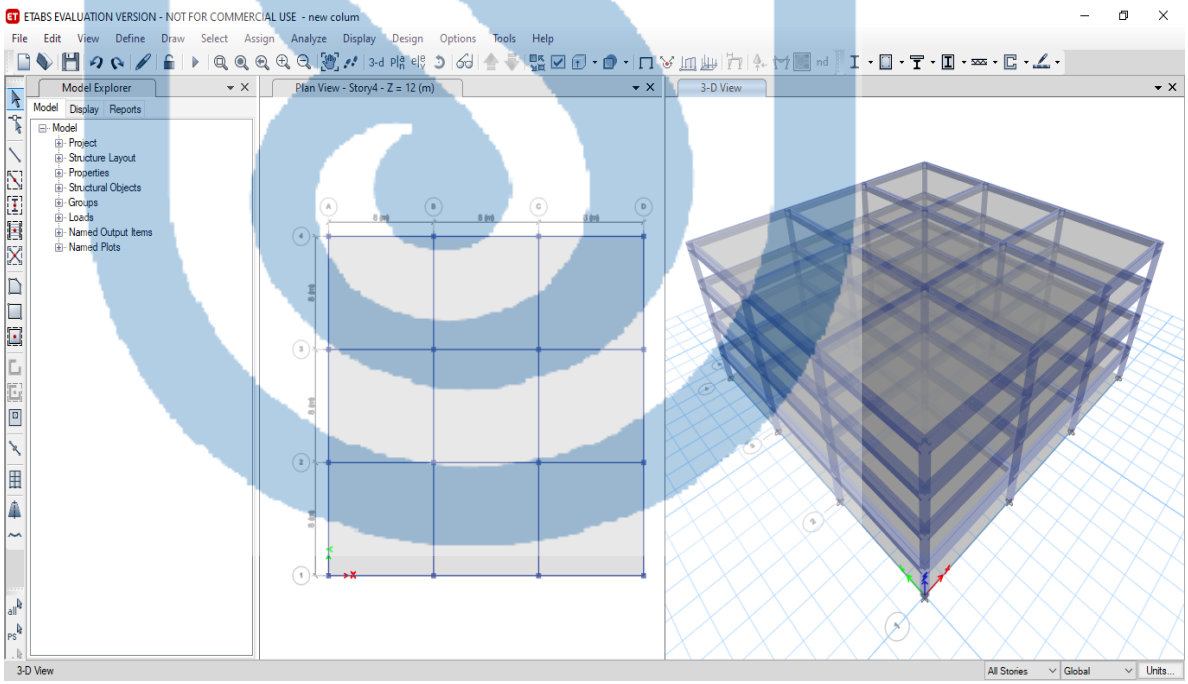

Figure 2.6 - Initial spatial model of the building and getting ready for analysis

2.2 Calculation and design of the column

The load per square meter of floor is considered the same as in previous calculations. The most loaded column is calculated basement floor with height h_{f1} = 5.6 m. Floor height differs in each block, in this project I have designed RC column for block B & C

Here the height of floors are h_f =6.4m and h_f = 4.5m.

The cargo area that the column perceives is A = 9 * 6.75 = 60.75 м².

The necessary efforts were selected from the calculation program.

"ETABS 18". N = 287.2 T = 2872.01 KN; M = 4.19 T * m = 41.80 kN * m

Q = 2.831 T = 28.39 kN. [Appendix A, p. 3]

The efforts taking into account γ n = 0.95 will be:

N 1 = 2872.01 * 0.95 = 2728.4 kN

Materials for the column

Class B25 concrete, heavy, with strength 2400 <N = 2728.4<2750 kN, the calculated value of the compressive strength R_b = 14.5 MPa Fittings:

transverse reinforcement class A240 R_{sw}= 170 MPa

- longitudinal reinforcement class A400, rated resistance

R_s= R_{sc}= 355 MPa

Typically, the strength calculation of the middle column is defined as a centrally compressed element that has a random eccentricity e_a:

$e_a = h_{col}$ /30 = 45 / 30 = 1.5 cm; $e_a = h_{f1}$ / 600 = 560/600 = 0.93 cm; e_a = 1.5 cm

But the calculation of compressed elements from class B25 concrete to action longitudinal force applied with random eccentricity

$e_0 = e_a \leq h_{col}$ /30 = 1.5 cm and with possible flexibility l_0 / h_{col} < 20 allowed to produce from condition 3.1:

$$N \leq \varphi \cdot (\gamma_{b1} \cdot R_b \cdot A_b + R_{sc} \cdot A_{s,tot}) \quad (2.1)$$

A_b = 40 * 40 = 1600cm - sectional area of the column;

L_0- the estimated length of the column.

$L_0 = \mu \cdot h_{f1}$ = 560 cm

basement columns with hard termination at the 1st floor level and with hard termination μ = 1 - since the coefficient depends on the accepted design length at the foundation level.

Column Flexibility:

L_0 / h_{col} = 560 / 45 = 12.4 <20

φ = 0.92 - coefficient perceived with prolonged action in the desired depending on the flexibility of the column.

Then the approximate area of the entire longitudinal reinforcement , in section of the column from condition above will be:

$$A_{s,tot} = \frac{\frac{N}{\varphi} - \gamma_{b1}\, Rb * Ab}{R_s} \quad (2.2)$$

$$A_{s,tot} = \frac{\frac{2872.01}{0.92} - 0.9 * 1.45 * 1600}{35.5} = 19.11 \text{ cm}^2$$

We accept 8Ø20 A400 = 20.36 cm^2

Reinforcement percentage:

$$\mu = \frac{20.36}{1600} . 100\% = 1.27\ \% > 0.1, \text{ because } L_0 / h_{col} \approx 12.4$$

The structural diameter of the transverse reinforcement must be taken Ø 8 A240 (from the welding condition). Constructive pitch of cross rods reinforcement = 200 mm, which equals the design requirements:

$$S \leq 15d = 15 \cdot 25 = 375 \text{mm and } S \leq 500 \text{ mm.}$$

Actual bearing capacity of a column with dimensions of 400 * 400mm:

$$N_{fc} = n\varphi\ (R_b \gamma_{b2} A \sum A_s * R_s) \quad (2.3)$$

$$N_{fc} = 1 * 0.92 * (14.5 * 0.9 * 1600 + 20.36 * 355) = 2585.9 \text{ kN} > N\ 1 = 2728.4 \text{ kN}$$

Actual carrier capacity provided.

3 Technological part

Preparing the construction site before starting construction work work is underway. The work begins with clearing the construction site. On the square demolition of demolished buildings and obstruction of growing trees planted elsewhere.

The main stages of work are underground, aboveground and finishing of the building consists of works. The underground part of the construction is called the zero cycle. At this stage, dig a pothole, process it, lay the foundation installation of walls, covering the roof of the basement and other land work is being done.

The building is above ground level for surface work construction works. They are mainly the walls of the building construction, covering of floor slabs and surface other work related to the work.

Finishing works are divided into internal and external finishing works. Interior finishing of walls and ceilings of rooms, floor installation works. Exterior finishing of the building exterior wall plastering and other works.

3.1 Earthworks

Volume of earthworks

Soil characteristics of the construction site.

- name of the soil – loam and clay;
- soil group - I;
- average soil density loam- 1600 kg / m³
- Clay- 1 702 kg/m³.
- coefficient of primary grinding (Kp.r.) - 1.15;
- residual grinding coefficient (Co.r.) - 1.2;
- slope coefficient (m) - 0.75.

Coefficient Kp.r. and Co.r. We accept ENiR from 2-1.

The slope coefficient m is determined in accordance with SNiP 3.01-85. 1) The area of the removed vegetation layer:

$$S = (l + 2).(b + 2) \quad (3.1)$$

where l - is the length of the surface of the pit;

b - is the width of the pit.

$$S = (41.05 + 2)(42 + 2) = 1894.2 \text{ ì}^2$$

Find the size of the pit:

$$V_k = H_k / 6 [A .B + C. D + (A + C)* (B + D)] \quad (3.2)$$

Where kH is the depth of the pit; $H_k = 3.05$

A - is the length of the bottom of the pot;

B - the width of the bottom of the pit;

C - is the length along the surface of the pit;

D - width on the surface of the pit;

$$A = 2 \cdot d + b/2 + b/2 + A0 \quad (3.3)$$

$$B = 2 \cdot d + b/2 + b/2 + B0 \quad (3.4)$$

$$C = A + (2 \cdot m \cdot Hk) \quad (3.5)$$

$$D = B + (2 \cdot m \cdot Hk) \quad (3.6)$$

Where d = 5.0 m ;

b - is the width of the foundation of the building

A and B - length and width along the outer axes of the building.

m - slope coefficient; m = 0.75

$V_к = 1/6[42 * 43{,}2 + 45{,}05 * 46{,}25 + (42 + 45{,}05) * (43{,}2 + 46{,}25) = 5935{,}77 м3$

1) The amount of uncultivated soil (volume of soil insufficiency):

$$nFVn = k \Delta \quad (3.7)$$

where kF is the area of the bottom of the pit; n Δ is the thickness of the uncultivated soil;

$$\Delta n = 0{,}2\ (0{,}15...0{,}2)$$

$$F_k = AB = 42 * 43.2 = 1814.4\ m^2$$

$$V_i = 1814.4 * 0.2 = 362.88 m^3$$

2) The volume of backfilled soil:

$$Vкк = \frac{Vк - Vж}{1 + Kкк} \quad (3.8)$$

$$Vж = Fк \cdot Hкк = 9037.16 \cdot 0.8 = 7229.73\ м3$$

$$Vкк = \frac{9493{,}75 - 7229{,}73}{1 + 0.07} = 21 m^3$$

Where V - the size of underground structures and landfills;

$V_1 = 4947.11\ м^3$

$K_{o.p}$ - residual collapse coefficient; For group I loamy soils

$K_{o.p} = 1.2$

$$V = (5935.77 * 4947.11)\ 1.2 = 1186.39 m^3$$

3) Area of compaction:

$$FT = V_{кк} / 0.2 \quad (3.9)$$

$$FT = 1186.39 / 0.2 = 5931.96 ì 2$$

where 0.2 is the thickness of the compacted soil layers.

4) The amount of soil loaded on vehicles:

$$V_{көл} = V_к – V_{кк} \quad (3.10)$$

$$V_{көл} = 5936,77\ 1186,39 - = 4749.38 м3.$$

5) The amount of piled soil:

$V_{үйн} = V_{кк}$

$V_{үйн} = 1186.39$ м3

3.2.1 The pit was drilled in accordance with the technical and economic indicators selection of processing excavator

When choosing an excavator to dig a pit, October take into account the size and depth of the pit.

Two types of excavators for technical and economic comparison We accept and accept the most effective.

Option 1: Hydraulic drive E-5015A.

- Depth of excavation - 4.5 m;
- Excavation radius - 7.3 m;
- Loading height - 3.9 m;
- The volume of the bucket - 0.5 m³;
- Norms of time:
- N_1= 2.2 - to pile up;

N_2= 2.8 - loading on the vehicle

Option 2: EO-4321, hydraulic drive.

- Excavation depth - 5.5 m;
- Excavation radius - 9m;
- Loading height - 5.6 m;
- The volume of the bucket - 0.65 m³;
- Norms of time:
- N_1= 1.8 - to pile up;

N_2= 2.1 - loading on the vehicle

Calculation of the excavator E-5015A

1) Determining the number of excavators per machine shift:

$$\Sigma \text{Пмаш.ауыс} = (V\text{үйінд} \cdot N1 / 100 + V\text{көлік} \cdot N2 / 100)/8.2 \quad (3.11)$$

Σ Пмаш.ауыс= (1186,4 * 2.2 / 100 + 4749,4 * 2.8 / 100) / 8.2 = 19.4

2) Product of one shift excavator:

Пөнім.ауыс = *V*қ / Σ Пмаш.ауыс

Пөнім.ауыс = 5935.7 / 19.4 = 305.96

3) The cost of tillage of 1 m³ of excavator:

$$c = 1.08 \cdot \text{см.с/Пөнім.ауыс} \quad (3.12)$$

c = 1.08 * 26.20 / 305.96 = 0.092

where $C_{mash\ -\ aus}$ = 20.26 - cost of machine replacement.

4) Determine the cost of tillage of 1 m³ of excavator:

$$K=1.07 \cdot C_{o}.n / \text{Пөнім.ауыс} * t \text{ years} \quad (3.13)$$

Where C_{on} = 20340tenge - the estimated cost of the excavator;

t_{years} = 350 (if the volume of the bucket is 0.5 m³);

K = 1.07 * 20340 /305.96 * 350 = 0.203

5) The damage caused by the excavator to cultivate 1 m³ of soil:

$$П = C + E_n \cdot k \quad (3.14)$$

Where E_n = 15.0n - normative ratio of financial efficiency.

П =0.092 + 0.15 * 0.203 = 0.122

6) Excavator productivity:

$$Пэ = T \cdot 60 \cdot g \cdot Ke \cdot Kв \quad (3.15)$$

where T = 2.8 - duration of shift, (hours);

g = 5.0 - bucket capacity (m³)

N 60/$t^{ц}$- number of cycles per minute; $t_{ö}$ =21.2 - time of one cycle;

K_c = 76.0 - estimated time utilization factor (SNiP 2. Appendix 3)

K_e = 85.0 - bucket capacity utilization factor (Table 3.23)

Пэ = 8.2 * 60 * 0.5 * 2.83 * 0.85 * 0.76 = 449.73

Calculation of the excavator brand EO-4321:

1) Determining the number of excavators per machine shift:

Σ Пмаш.ауыс= (1186,4 * 1.8 / 100 + 4749,4 * 2.1 / 100) / 8.2 = 14.7

2) Product of one-shift excavator:

$$\text{Пөнім.ауыс} = V\text{қ} / \Sigma\ \text{Пмаш.ауыс} \quad (3.16)$$

$$\text{Пөнім.ауыс} = 5935.7 / 14.7 = 403.78$$

The cost of tillage of 1 m³ of excavator:

$$c = 1.08 \cdot \text{см.с/Пөнім.ауыс} \quad (3.17)$$

$$c = 1.08 * 33.62/\ 403.78 = 0.09$$

where $C_{mash\ -\ aus} = 33.62$ - cost of machine replacement.

3) Determine the cost of tillage of 1 m³ of excavator:

$$K = 07.1 \cdot C_{o}.n / \text{Пөнім.ауыс} * t\ years \quad (3.18)$$

Where $Con. = 17140$tenge - the estimated cost of the excavator;

$t_{years} = 350$ (if the volume of the bucket is 0.5 m³);

$$K = 1.07 * 28780/403.78 * 350 = 0.\ 217$$

4) The damage caused by the excavator to cultivate 1 m³ of soil:

$$П = C + E_n \cdot k \quad (3.19)$$

where En = 15.0n - normative ratio of financial efficiency.

$$П = 0.092 + 0.15 * 0.\ 217 = 0.123$$

5) Excavator productivity:

$$Пэ = T \cdot 60 \cdot g \cdot Ke \cdot Kв \quad (3.20)$$

where T = 2.8 - duration of shift, (hours);

g = 65.0 - bucket capacity (m³);

N $60/t^{ц}$ - number of cycles per minute;

$t_{ц} = 8.23$ - time of one cycle;

$K_{c} = 76.0$ - estimated time utilization factor

$K_{e} = 85.0$ - bucket capacity utilization factor

$$Пэ = 8.2 * 60 * 0.65 * 2.6 * 0.85 * 0.76 = 537.13$$

Comparing the results of calculations with the excavator EO-4321 We see that it is effective, so we take this excavator.

3.2.2 Selection of a vehicle to transport the soil of the boiler pit

Kraz-222 depending on the size of the bucket of the excavator Vож = (0.65 m.)

We accept branded cars.
Self-propelled Kraz-222:

- Carrying capacity - 10 tons;
- The volume of the body - 7.5 m³;
- Travel speed - 47 km / h
- Engine: 14.86 L diesel 8 cyl.
- Power: 240 PS /2100 rpm
- Torque: 883 Nm /1500 rpm
- Top speed: 71 km/h (44 mph)

1) The volume of the soil in the bucket of the excavator in dense conditions:

$$V_{group} = V_{ожау} \cdot к_{тол}/к_{коп} \quad (3.21)$$

where $к_{тол}$ =0.9 - bucket filling ratio;
$к_{коп}$ = 1.15 - coefficient of initial soil compaction;

$$V_{group} = 0.65 * 0.9 / 1.15 = 0.5 м^3$$

2) The mass of soil in the bucket of the excavator:

$$Q = V_{топ} \cdot \gamma \quad (3.22)$$

where γ = 1.6 t / m³ - soil density;

$$Q = V_{топ} \cdot \gamma = 0.5 * 1.6 = 0.8т$$

3) Number of buckets of soil removed when loading the vehicle:
where P is the load capacity of the vehicle Kraz-222 ma = 10;

$$n = ma / Q \quad (3.23)$$

$$n = 10 / 0.8 = 13$$

3) The amount of soil loaded on the vehicle:

$$V = V_{топ} \cdot n \quad (3.24)$$

$$V = V_{топ} \cdot n = 0{,}5*13 = 6.5 м^3$$

4) Time of soil loading on the vehicle:

$$t_n = V \cdot Н_{вр} \cdot 60 / 100 \quad (3.25)$$

Where Нвр = N2 = 2.1

$$t_n = 7 * 2.1 * 60 / 100 = 8.82 \text{ min} = 9 \text{ min}$$

5) Time of transport operation per cycle:

$$Тц = tn + 60L/Vr + tр + 60L/Vп + tм \quad (3.26)$$

Where L = 2 km - distance of soil transportation;

V_r = 15 km / h - speed of the vehicle during loading;

V_n = 30 km / h - the speed of the vehicle at idle;

t_p =0.8 min - unloading time;

t_m = 2, 2min - additional work.

Тц = 8.82 + 60*2 / 15 + 0.8 + 60*2 / 28 + 2.2 = 24.1 min

6) Number of vehicles required:

$$N = Tц / tn \quad (3.27)$$

N = 24.1 / 8.82 = ≈ 3 pieces of

3.2.3 Bulldozer acceptance

Preparatory work for the construction site, cutting of vegetation, T-130 for cultivation of uncultivated soil and re-burial of soil We accept DZ-28 bulldozer on the basis of a tractor.

Technical performance of the bulldozer:

$$Пэ = 3600 \cdot V_{пр} / L \cdot K_p \quad (3.28)$$

where $V_{пр}$ - volume of the prism, $м^3$;

$V_{пр} = BH^2 \cdot K_{пр} = 2 * 0.7^2\ 1.15 = 1.127\ м^3$;

B = 2 m is the width of the prism;

H = 0.7 m is the height of the prism;

$k_{пр}$ = 1.15 - coefficient of proportional soil compaction;

$$L = 3.6 \cdot [\ L\ k\ /V_p + L\ T\ /\ V\ t\ + (\ Lk\ + L\ T\ ) / V_p\ ]\ li + ly\ M \quad (3.29)$$

Where L - cycle duration, s;

l_T = 49.5 m - length along the surface of the pit;

Lk = 49 m - width on the surface of the pit;

L = 3.6 [49/8 + 49.5/15 + (49+49.5) / 8] + 7 + 7.5 = 92.75

Пэ = 3600 * 1,127 / 92.75 1.1 = 39.76

П= Пэ * Ki = 39.76 0.02 = 0.79

Table 3.1 - Equipment involved in earthworks, name of equipment, the number of Excavator brand EO-4321

Kraz is a 222 self-propelled vehicle	3
DZ-28 bulldozer on the basis of T-130 tractor	1
D-480 brand catalog	1
LPG-40A crane	3

3.2.4 Calculation of cranes

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

$$H к = H 0 + H б + H э + Hz + hп \quad (3.30)$$

Where H 0 = 23.9 m - height of the building;

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

H э = 3.m is the height of the element, in this case the turning angle height;

Hz = 1 m - height of the sling.

Hп = 2.1m – height of the pulling belt

$$H k = 23.9 + 0.5 + 3 + 1 + 2.1 = 30.5m.$$

Hook flight:

Crane for Block -1 staduim:

$$L = L n + L b + L o -0.9 m \quad (3.31)$$

Where L n = 35 m - the furthest from the edge of the foundation of the building transmission distance to the column. safety zone

L b = 1 m - from the edge of the foundation of the building to the edge of the crane foundation

L o = 4.5 m - from the edge of the crane foundation to the axis of the crane tower distance.

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

$$L = 35 + 1 + 4.5-0.9 = 39.6 m.$$

The mass of the rising element

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

1) Crawler depending on the calculated results accept:

LPG-40A crane:

- lifting height - 30 m;
- load capacity - 40 tons;
- the length of the arrow - 4.5 ... 24 m;- estimated cost - 40.3 thousand tenge;
- Cost per machine shift - 42.64 mash-aus.

2) Angle of inclination of the crane boom:

$$tg\ \alpha = \frac{\sqrt[3]{h - hoc}}{(lk + \delta)} \quad (3.32)$$

where $h = {}_{23.9}$ m - height of the building;

$h_{oc} = 5.1$m - height from the hinge of the arrow to the ground;

$l\ k = 6$ m - transfer of cargo from the outer wall of the building close to the crane distance;

$\delta = 5.1$ m is the distance from the axis of the arrow to the building;

$$tg\ \alpha = \frac{\sqrt[3]{23.9 - 5.1}}{(6 + 5.1)} = 2.05$$

$\alpha = 63.99\ °$

3) Crane boom output length:

$$Lcm_p = (h_0 - h_{os}) / \sin\alpha + (l_k + \delta) / \cos\alpha \quad (3.33)$$

$$Lcm_p = (23.9 - 1.5) / 0.89 + (6 + 5.1) / 0.43 = 50.9\text{m}$$

3) The length of the boom of a crane with a length of 6 meters we find:

$$L^G_{cmp} = L_{cmp} - l_2 \quad (3.34)$$

Where l_2 is the contraction of the arrow

$$l_2 = D \cdot \cos(\alpha - \beta) / \cos\alpha \quad (3.35)$$

Where $D = 6$ m is the length of the crane head;

$\beta = 30\ °$ - the angle between the main goose and the arrow (25 ... 30);

$$l_2 = 6 \cdot \cos(63.99 - 30\ °) / \cos(63.99) = 11.34\text{ m}$$

$$L^G_{cmp} = L_{cmp} - l_2 = 50.9 - 11.34 = 39.56\text{ m}$$

3) The total required output length of the crane boom

$$l_p^{tr} = L^G_p \cdot \cos 63.99\ ° + D \cdot \cos 33.99\ ° = 39.56 * 0.43 + 6 * 0.82 = 21.93\text{m}$$

4) Required crane load capacity:

$$P_{tr} = P_k + P_a + P_c \quad (3.36)$$

where P^k is the weight of one wall;

$$Pk = Sk \cdot \delta \cdot \gamma D \quad (3.37)$$

$$P_k = 36 * 0.05 * 0.7 = 1.26 \text{ t};$$

$S k = {}_{36}$ m² - area of the mold;

$\delta = {}_{0.05}$ m is the applied thickness of the mold;

$\gamma = 0.7$ D t / m³ is the volume of the mold materialmass;

$P_a = 0.792$ t - weight of fittings per wall;

$P_c = 0.05$ t is the weight of the sling;

$$P \text{ tr} = 1{,}26 + 0{,}792 + 0{,}05 = 2{,}1 \text{ т}$$

Crawler depending on the calculated results accept:

LPG-40A crane:

- lifting height - 27 m;
- load capacity - 40 tons;
- the length of the arrow - 4.5 ... 24 m;- estimated cost - 40.3 thousand tenge;
- Cost per machine shift - 42.64 mash-aus.
- Use a crane to be technically and economically efficient
- Consider two cases:
- Option 1
- LPG-40A for lifting concrete, reinforcement and formwork
- We use two taps.

Option 2

LPG-40A for lifting fittings and molds We use a crane and a concrete pump C-296.

Option 1 calculation:

- Concrete supply

1) The volume of total concrete supplied by a hopper with a volume of 0.75 m³:

$V_b = 882{,}85$ м³

2) Time spent on delivery of 1 m³ of concrete:

$$T = (0{,}14 + 0{,}2 + 0{,}3 + 0{,}28) \cdot 0{,}5 = 0.46 \text{ mash-hours.}$$

3) Mechanical capacity for lifting concrete with two cranes:

$$T_{bsm} = V_b \cdot {}^{H}{}_{vr} \quad (3.38)$$

$T_{bsm} = V_b \cdot N_{vr} = 0.46 * 882{,}85 = 406{,}11$ mash-hours. = 49.5 mash-aus.

- Setting templates

1) General formwork for walls and roofing panelsarea:

$$S_{op} = 1132{,}2 + 3538{,}2 + 57{,}75 + 97{,}44 = 4816{,}5 \text{ м}^2$$

The size of the templates:

$$V_{on} = 4816,5 * 0,05 = 240,8 \text{ м}^3$$

where 0.05 is the thickness of the mold, m;

3) Density of the prepared material of the molds γd = 7.0 t / m³ when it weighs:

$$P_{оп} = V_{оп} \cdot \gamma d \quad (3.39)$$

$$P_{оп} = 240,8 * 0,7 = 168,56 \text{ т.}$$

4) What is the position of the support posts at intervals of 1 m each where the number of columns:

$$N_c = 3538.2 * 3 = 14152.8 \text{ piece}$$

where 3 is the number of floors;

3538.2 - area of formwork of roofing tiles, m².

5) The weight of one pole is 0.05 t. Then the total weight of the poles:

Pc = Nc * 0.05

$$P_c = 14152.8 * 0.05 = 707.64 \text{ t.}$$

6) The weight of additional trees used in the construction of the formwork:

$$P_e = 0,7 \cdot 14152,8 \cdot (1 \cdot 0,05 \cdot 0,15 + 2 \cdot 0,035 \cdot 0,12 + 1,5 \cdot 0,035 \cdot 0,12) = 219,93 \text{T}$$

7) The general number of accessories that hold it in place with moldsweight:

$$P_{op.l} = P_{op} + P_c + P_d \quad (3.40)$$

$$P_{op.l} = 168,56\ 707,64\ 219,93 = 1096,13 \text{ T}$$

8) When lifting molds and products from 0.5 tons to 100 tons of craneLifting time:

$$N_{vr} = 0,75 \cdot (3,2 + 0,33) = 2,65 \text{ mash-hours.}$$

9) Mechanical crane when lifting molds and productscapacity:

$$T_{op} = P_{op.l} / 100 * N \text{ mash} \quad (3.41)$$

$$T_{op} = 1096,18 / 100 * 2.65 = 29.04 \text{ mash-hours.} = 3.54 \text{ mash-aus.}$$

- Supply of fittings

1) Weight of fittings for all floors of the building:

$$P_a = V_c \cdot M_c + V_n \cdot M_n \quad (3.42)$$

where V = 112,32 m³ - reinforced concrete monolithic columns of the building total volume;

V = 707.6m³ - reinforced concrete monolithic floor covering of the building total volume of boards;

m = 0.11 t - consumption of fittings per 1 m³;

m = 0.09 t - consumption of fittings for the roofing panel 1m^3;

$$P_a = 112{,}32 * 0{,}11 + 707{,}6 * 0{,}09 = 76{,}03 \text{ T}$$

2) To lift 100 tons of crane when lifting fittings from 0.5 tonstime spent:

$$N_{vr} = 0{,}75 \cdot (3{,}2 + 0{,}33) = 2{,}65 \text{ mash-hours.}$$

3) Fittings raised when of the crane mechanical capacity:

$$T_{arm} = N_{vr} \cdot P_{arm} \quad (3.43)$$

$$T_{arm} = 2{,}65 \cdot 0{,}76 = 2{,}01 \text{mash-hours.} = 0.24 \text{ mash-aus.}$$

4) General mechanical operation of cranes according to the first optioncapacity:

$$T_1 = T._{b\,sm} + T_{op} + T_{arm} \quad (3.44)$$

$$T_1 = 49{,}5 + 3{,}54 + 0{,}24 = 53{,}28 \text{ mash-aus.}$$

Duration of work with each crane:

$$T_{o\,1} = 53.28 / 2 = 64.26 \text{ shift}$$

Option calculation 2:

- Concrete supply

Time to deliver 100 m³ of concrete with C-296 concrete pump costs:

$$N_{vr} = 14 \text{mash-hours.}$$

The total capacity of the concrete pumping mechanism:

$$T_{b.sm} = 8{,}19\ 14 = 114{,}78 \text{mash-hours} = 13.\ 99 \text{mash-hours.}$$

- Delivery of molds and fittings:

When lifting fittings and molds from 0.5 tons, the crane can lift 100 tons Lifting time:

$$N_{vr} = 0{,}75 \cdot (3{,}2 + 0{,}33) = 2{,}65 \text{ mash-hours.}$$

The general mechanism of the crane in the delivery of molds with fittings capacity;

$$T_{opar} = (10{,}96 + 0{,}76)\ 2{,}65 = 31{,}05 \text{ mash-hour} = 3.78 \text{ mash-shift.}$$

During the construction of the building 1 m³ of concrete and reinforced concrete To determine the cost of work, each machine Determine the cost of the shift:

1) LPG-40A crane:

$$C_1^1 = 37 / T_1 + 3884 / 400 + 8.2 * 4.23 = 37 / 53.28 + 3884/400 + 8.2 * 4.23 = 45.1 \text{ tg}$$

2) C-296 concrete pump:

$$C^1_2 = (159{,}9 + 7{,}3) / T_{b\,n} + 1562 / 472 + 8{,}2 * 1{,}09 = (159{,}9 + 7{,}3) / 13.99 + 1562 / 472 + 8{,}2 * 1{,}09 = 24.15 \text{ tg.}$$

Determine the estimated cost of 1 m³ of concrete for each option:472 99.13 472

Option 1: 2 cranes LPG-40A

$$C_1 = 2 \cdot C_1^1 \cdot T_{o1} \cdot K_{N1} + Salary * K_{N2} + \sum C_P \quad (3.45)$$

Where K N1 = 1.08 and K N2= 1.5 - mechanisms and manual coefficient taking into account the bills of lading;

Salary = 1957 02,- total number of manual workers salary;

C_1 = 2 * 45,1 * 26,64 * 1,08 + 1957,02 * 1,5 + 174,1 * 9 * 2 * 1,08 = 8915,19 tg

Option 2: LPG-40 crane and C296 concrete pump

C_2 = 45,1 * 13,99 * 1,08 + 1957,02 * 1,5 + 24,15 * 13,99 * 1,08 = 3981,83 tg

Determine the cost of processing 1 m³ of concrete:

Option 1: 2 cranes LPG-40A

$C_{ed} = C_1 / V_b$ =8915,19 / 882,85 = 10.09 tg / m³

Option 2: LPG-40A crane and C296 concrete pump

$C_{ed} = C_2 / V_b$ = 3981,83 / 882,85 = 4.51 tg / m³

Option 2 is effective, so version 2 of the LPG-40A crane and We accept C296 concrete pump.

Table 3.2 - Calculation of surface works

Job titles	Unit one.	Friday. lake.	ENIR	Workers' unit composition			Time norm	Labor costs		Price		Salary
				specialty	Raз	num		Hour	day	installation	Machine stop	
1	2	3	4	5	6	7	8	9	10	11	12	13
Of the column setting positions	м²	1123,2	4-1-34	Wood Carpenter	4p 2p	1 1	0,18	202,17	24	0,12	-	134,78
Concrete supply	100 м³	1,123	4-1-48	Concrete	4p 2p	1 1	27	30,32	3,69	19,31	-	21,68
Concrete installation	м³	112,32	4-1-49	Concrete	4p 2p	1 1	1,5	168,48	20,54	1,07	-	120,18
Of the column solution of postures	м²	1123,2	4-1-34	Wood Carpenter	3p 1p	1 1	0,16	179,71	21,91	0,1	-	112,32
Interlayer coating boards setting positions	м²	3538,2	4-1-34	Wood Carpenter	4p 2p	1 1	0,22	778,4	94,92	0,15	-	530,73
Concrete supply	100 м³	7,076	4-1-48	Concrete	4p 2p	1 1	27	191,05	23,29	19,31	-	136,63

Continuation of table 3.2

Do not mix concrete casting	м³	707,6	4 -1-49	Concrete	4p 2p	1 1	0,81	573,15	69,89	0,57	-	403,33
Interlayer coating boards solution of postures	м²	3538,2	4-1-34	Wood Carpenter	3p 2p	1 1	0,16	566,11	69,03	0,1	-	353,82
Stairs platforms setting positions	м²	57,75	4-1-34	Wood Carpenter	4p 2p	1 1	0,91	52,55	6,4	0,65	-	37,53
Concrete supply	100 м³	0,1155	4-1-48	Concrete	4p 2p	1 1	27	3,11	0,38	19,31	-	2,23
Concrete installation	м³	11,55	4-1-49	Concrete	4p 2p	1 1	2,1	24,25	2,95	0,15	-	1,73
Stairs platforms solution of postures	м²	57,75	4-1-34	Wood Carpenter	3p 2p	1 1	0,24	13,86	1,69	0,16	-	9,24
Stairs setting positions	м²	97,44	4-1-34	Concrete	4p 2p	1 1	0,91	88,67	10,81	0,65	-	63,33
Concrete supply	100 м³	0,194	4-1-48	Concrete	4p 1p	1 1	27	5,23	0,63	19,31	-	3,74

4 Economic part

4.1 Calculation of estimated construction costs

Estimated construction cost - cash required for construction, the amount of which depends on the estimated standards and design materials in accordance with the legislation of the Republic of Kazakhstan.

The basis for developing the size of investment rewards on construction, pricing of construction activities, serves good direction when supplying contractor's construction services by the customer and the conclusion of a contract, settlements for completed contract work, as a rule, according to the current Legislation is the estimated cost of the construction project.

According to the estimated estimates, the cost of construction is calculated products in the pre-design stage, at the stage of feasibility justification. This part defines capital investments for building.

The complete set of capital investment includes: including design and survey, calculates the cost of building the facility, the cost of equipment, installation cost, etc.

The method of compiling the estimated estimate is calculated capital investment in the construction of the facility. In the consolidated estimate the calculation of the construction of the facility funds are divided into the following chapters:

1. The cost of preliminary work.
2. The main objects.
3. Facilities for service purposes.
4. Facilities for energy supply.
5. Objects for communication and transport.
6. External networks, sewerage, water supply.
7. Land improvement and greening.
8. Temporary buildings.
9. Unforeseen construction costs.
10. The content of the headquarters.
11. Training.
12. Survey and design work

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

Title	Measure unity	Quantity your	Stoimos per unit rev.	Total estimated cost tenge: thousand
Stadium with capacity of 70000 people	m^2	13206.15	250000	33015375
Total:				33015375

For a civilian building, chapter 3 contains the estimated cost of this an object like: sport complex, utility buildings; cultural buildings, designed to specialize in serving and located in the boundary of the territory allotted, as a rule, for the construction of enterprises.

Table 4.2 - Calculation of the cost of construction of an auxiliary building.

Title	Unit measuring	Quantity	Cost for unit	Total estimated cost, thousand tenge
Checkpoint	m 3	290	143100	41499000
Total:				41499000

Table 4.3 shows the cost of equipment. Engineering cost installation is on the necessary sections of collections, and in the absence cost rate, installation cost is based on price lists and factory data.

Not included in the estimated object value of the main buildings the cost of installation, fixtures, inventory and other expenses.

The estimated cost of installation is defined as the sum of the costs of acquisition and delivery of all equipment to the place or warehouse of the transfer installation.

Table 4.3 - Local estimates for technological equipment

Name	Unit measuring	Amount, thousand tenge
Cost of equipment	thousand tenge	15791.1
The cost of setting up equipment and installation.	thousand tenge	2261
Total		18052.1

According to the general plan, a list of construction objects is determined, the distance engineering communications, the area of highways, railways, driveways.

For the accuracy of design estimates, design and construction organizations according to aggregated indicators calculate the estimate taking into account all the correction factors adopted with the construction area.

Table 4.4 - Local cost estimates for energy supply.

Name	Unit measuring	Quantity	Amount Cost, thousand tenge	
			Unit rev.	Total
Transformer	kw	60	20	1200

Cable networks	м	200	1.62	324
Continuation of Table 4.4				
Telephone	м	200	2.11	422
Total:				1946

Table 4.5 - local estimates for the provision of transport.

Name	Unit measuring	Quantity	Amount Cost, thousand tenge	
			Unit rev.	Total
Highway	$м^2$	685	10	6850
Total:				6850

Table 4.6 - Local estimates of the cost of engineering networks.

Name	Unit measuring	Quantity	Amount Cost, thousand tenge	
			Unit rev.	Total
Water pipes	м	400	10	4000
Heat conduit	м	250	26.02	6505
Sewerage	м	400	6.468	2587
Total:				13092

Table 4.7 - Local cost estimates of the main object.

No. of estimates and calculations other documents	Name of chapters objects, works and cost	Estimated cost, thousands			Total, thousands tenge
		builder assembly installation x works	equipment education of furniture and inventory	other cost	
1	2	3	4	5	6
	Chapter 2. The main objects of construction				
02-001	Sport complex in Atyrau city	89565.472			89565.472
02-001-001	Sport complex in Atyrau city	89565.472			89565.472
	Total chapter 2	89565.472			89565.472
	Total chapters 1 - 7	89565.472			89565.472

Continuation of Table 4.7					
	Total chapters 1 - 9	89565.472			89565.472
	Total estimated	89565.472			89565.472
Code of the Republic of Kazakhstan from added 10.12.2008 Continuation of table 4.7	Cost Tax on cost (VAT) - 14 %			10747.857	10747.857
	Total estimated calculation	89565.472		10747.857	1003138.329

4.2 calculation of investment costs for construction

Investment fees for the construction of the building include all Customer's spent on the project and is performed as a summary estimated calculation of the object.

The following are included in the consolidated estimate calculation of the construction price:

cost stages:

- personnel training;
- the cost of services of engineering and technical workers;
- the cost of the examination of design estimates;
- the cost of survey work;
- costs for technical supervision workers.

The cost of survey and design work is calculated according to general requirements for calculating the cost of design work for the construction of the building in the Republic of Kazakhstan.

Table 4.8 - Calculation of the cost of survey and design work.

Name	Indicators
Estimated cost of repairs	100315.329
Object difficulty category	V
The relative percentage of design work to the main	3.18%

Cost of survey and design work	30091
Total price for design work	39210
Continuation of Table 4.8l	
Value added tax	6506
Total with VAT	146029.326

Pricing for survey and design work in the base price level for 2019, sets the cost in the consolidated estimate entire construction, and is the initial value when establishing the cost of state examination of construction documentation in a certain period of time.

In table 4.9. the calculation of the cost of state examination is given design estimates.

Table 4.9 - Calculation of the cost of state. Expertise

Name	Indicators
The cost of settlement design work	30091
The lower value of the cost of survey and design work is	28091
The cost of state. expert work corresponding to the bottom the value of the survey and design work	503.6
The upper value of the PIR	31091
The cost of state. expert work relevant top the value of the design and survey	650.5
The cost of these works for 2001	774.3
All indexes included	32504
Value added tax	3258

4.3 Technical and economic indicators of the project

At the initial stage of planning, it was supposed to use credit funds for the implementation of this project. Moreover, according to the requirement of the legislation of the Republic of Kazakhstan, 15% of the total investment should be financed at own expense. Required Investments on construction of the facility is 80.5 billion tenge.

At the same time, own funds amount to 560 million tenge. Survey and design work, as well as on-site preparatory work is carried out at our own expense.

The planned profit of the facility is 121.3 million tenge. Selling price object 2 billion tenge. The cost of 1 m 2 is 510 thousand tenge.

CONCLUSION

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

One of the main sources of air pollution in construction harmful substances emitted from motor vehicles. That's We must take into account the pollution of the air with these harmful substances. That's what we are perform the above calculations.

Based on the results of those calculations - in our construction that the operating vehicles do not pollute the air much showed.

Thus, the above calculations are based on the territory of the object

Harmful concentrations threshold possible was dosage showed lower concentrations. Therefore, in the object Calculations from sources of pollution may be limited can be assumed to be.

The location of the projected object is significant for the environment does not have a negative effect.

The following results were achieved during the writing of the diploma project:

The architectural solution of the building is, first of all, the lifting structures should be stabilized in the right choice. Modern construction is high allows you to use a series of positional systems, including monolithic skeletal leading position. The structure of light farms has a large range construction of structures, reinforced concrete slabs, crossbars and beams as a necessity. Prefabricated ceilings and covers application of industrial work in the construction of the building allows to reduce the term;

Calculation of structures with the help of computer technology

There is a possibility that it is a software package ETABS. Calculate through this and The assembly process is capacious, all in the design schedule of the building including seismic effects, including recording the effects with the required load in other words. Built various elements of the main building

accurate on the basis of load combinations, sections and stiffnesses gives the result;

In addition, the department of technology of construction production is all designed taking into account modern methods and techniques of production.

It is also an effective choice of construction machinery and equipment It is better to reduce the time and complexity of the labor process calendar planning increases the efficiency of construction;

estimates of the objectivity and feasibility of the construction project allows you to evaluate. It is also the ABC-4 software package significantly simplifies calculations;

The impact of construction on the environment in modern society assessment is important, and appropriate action should be taken;

In any industry, including construction, human resources are subject to the law safe, comfortable and legally protected employment conditions.

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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.
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Loads and impacts.
Concrete and reinforced concrete structures.
Construction in seismic areas.
Steel structures.
Foundations of buildings and structures.
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Bridges and pipes.
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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
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:

Loading 1 - static load
Loading 2 - static load
Loading 3 - static load
Loading 4 - static load
Loading 5 - static load
loading 6 - 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.

Continuation of application A

When choosing design combinations of efforts, Following download characteristics:

Loading 1 - static load

This load is considered as a constant load.

Loading 2 - static load

This load is considered as a constant load.

Loading 3 - static load

This load is considered as a constant load.

Loading 4 - static load

This load is counted as a long-term load.

Loading 5 - static load

This load is counted as a long-term load.

Loading 6 - 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.
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.
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.

Continuation of application A

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;
СТ – column number of combination coefficients from the source data table ECF;
КС – 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 KE.

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,
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.

Continuation of application A

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;

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.

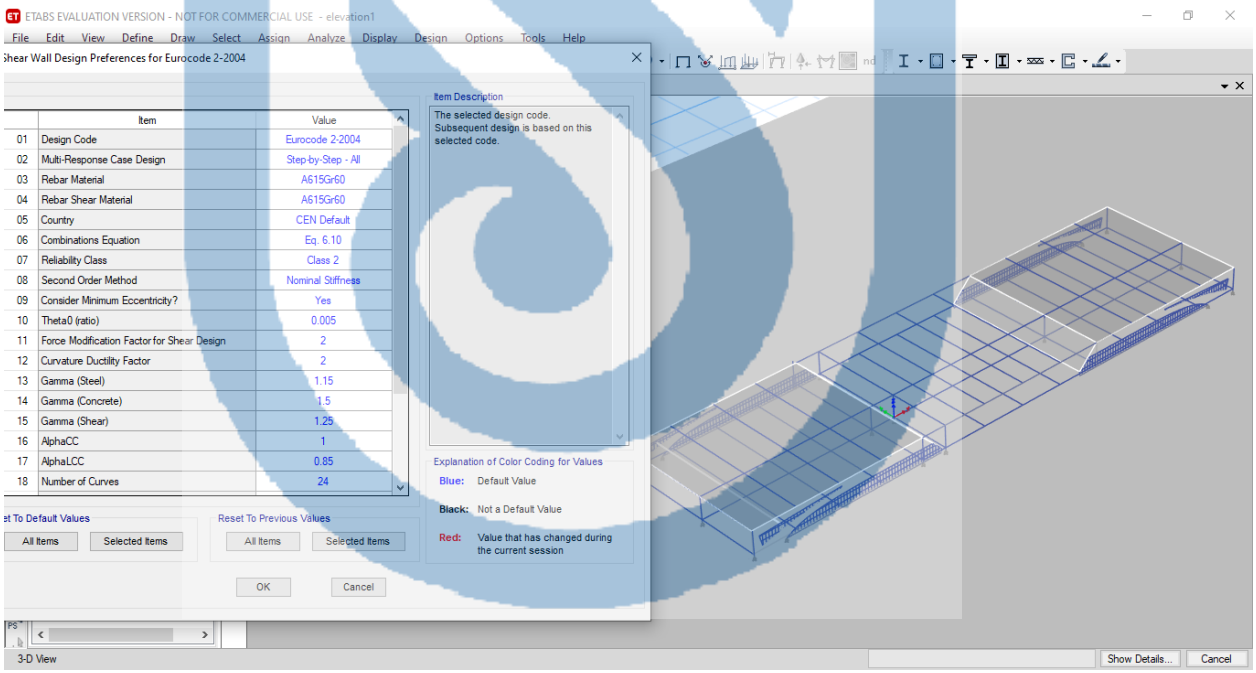

Figure A.1 - Design scheme

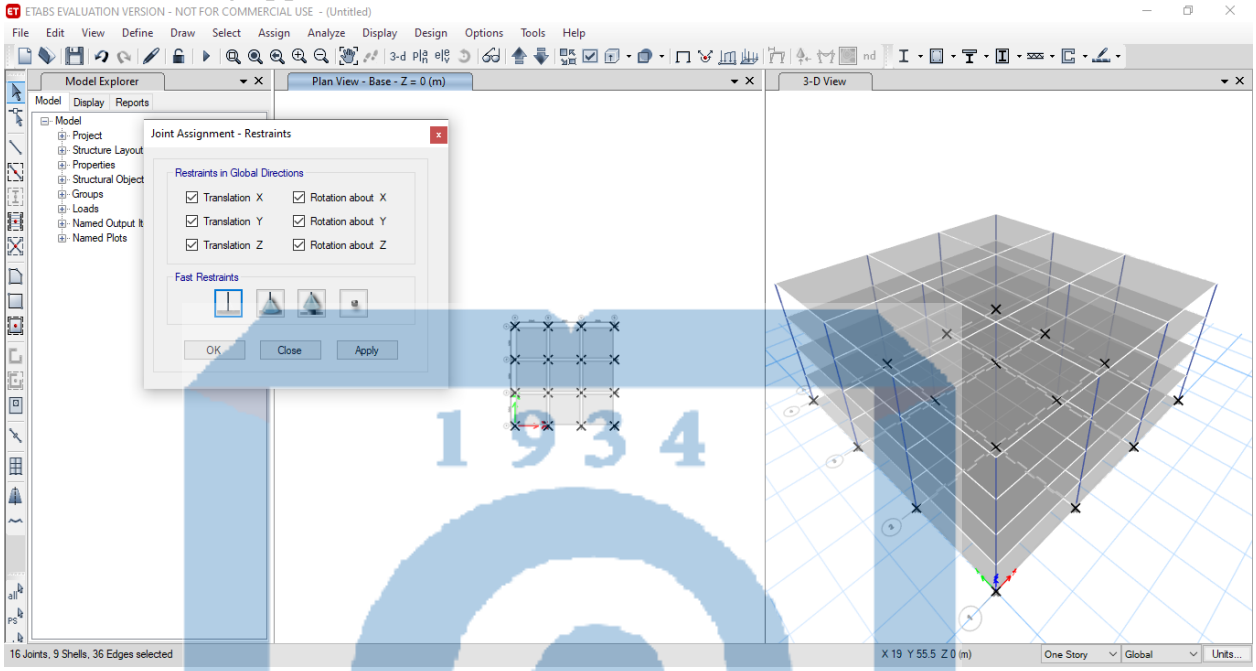

Figure A.2 – Stiffnesses

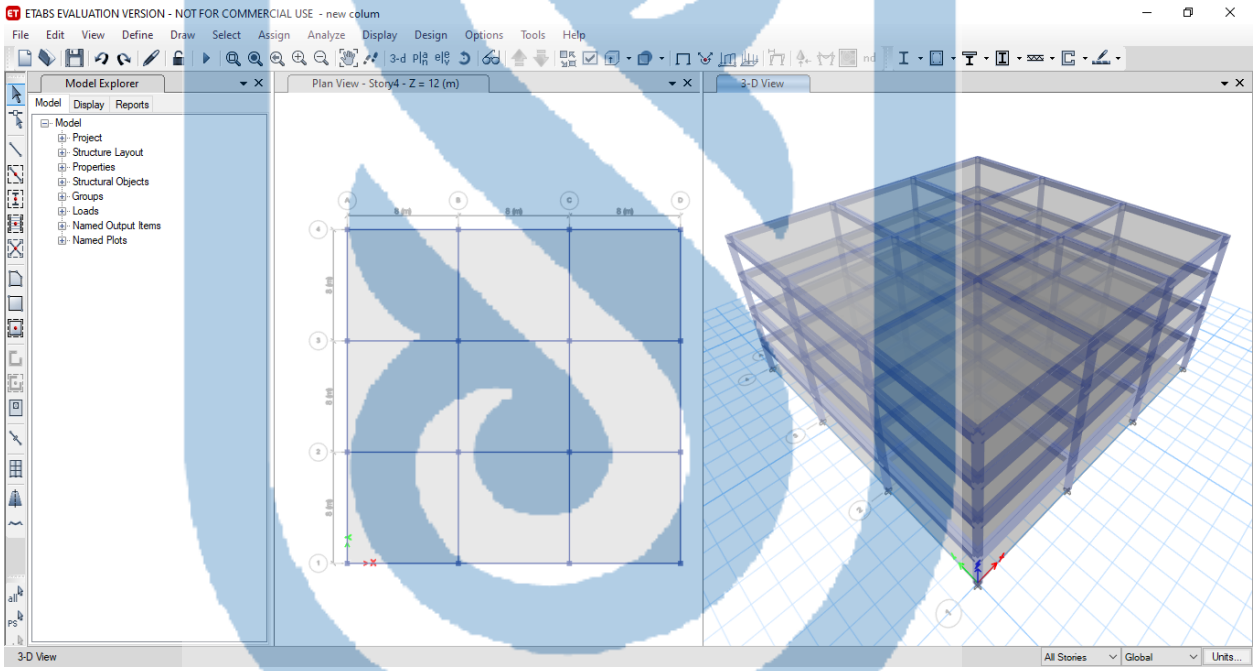

Figure A.3 - Spatial model

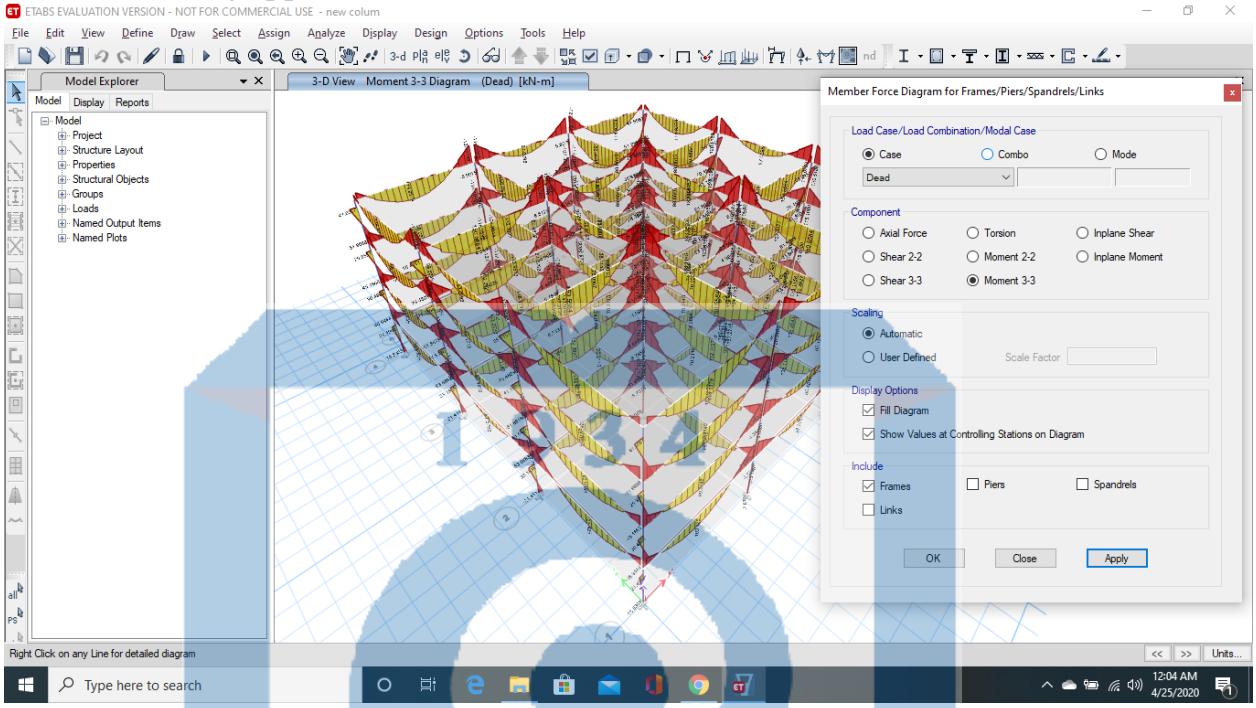

Figure A.4 - Mosaic of displacement from RSN along the X axis

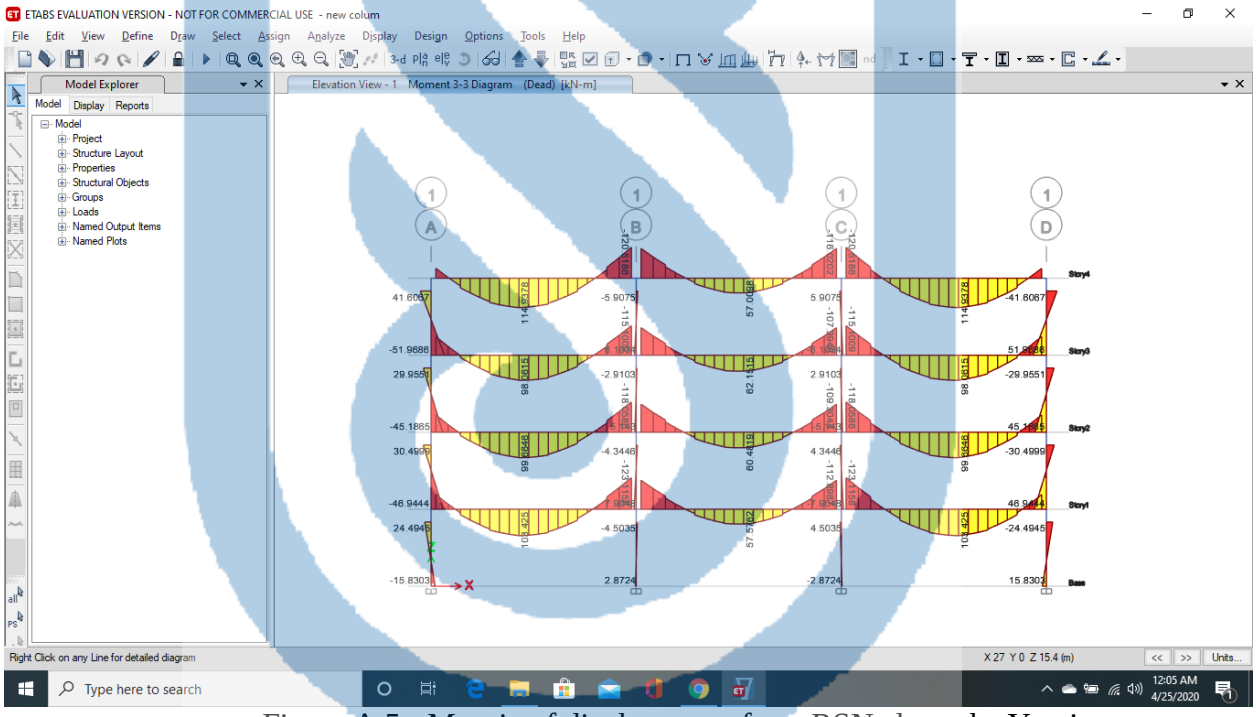

Figure A.5 - Mosaic of displacement from RSN along the Y axis

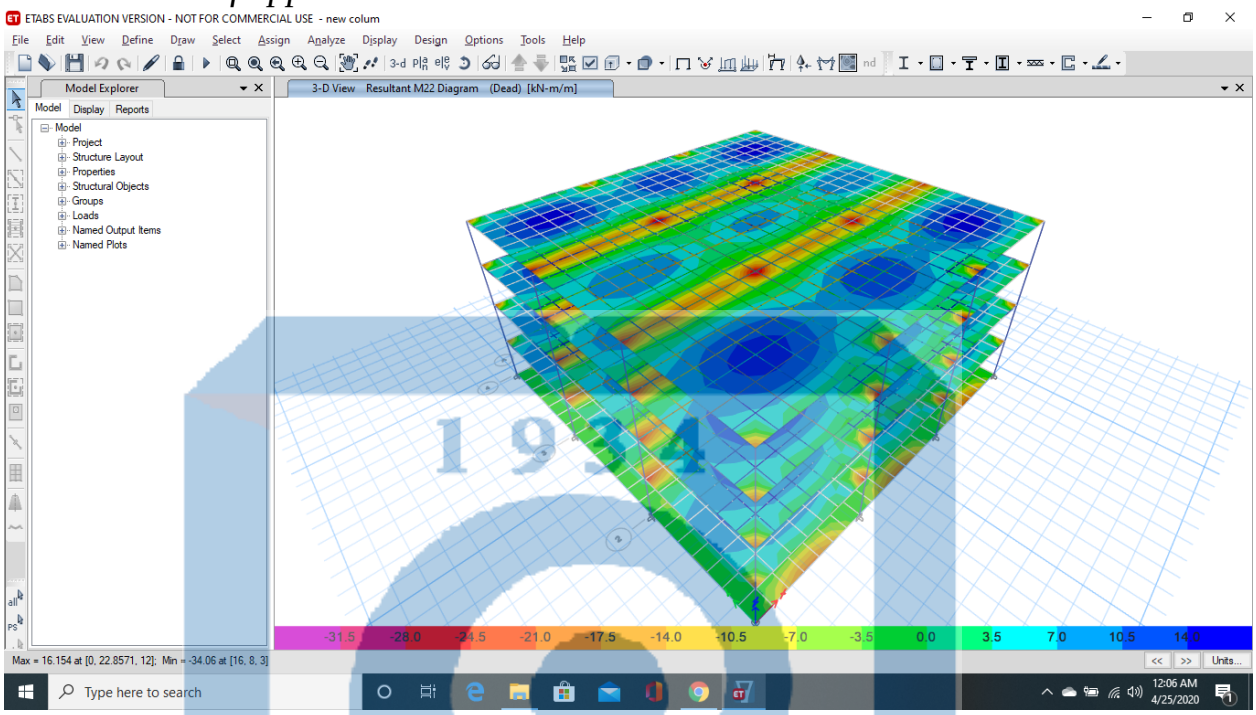

Figure A.6 - Mosaic of displacement from RSN along the Z axis

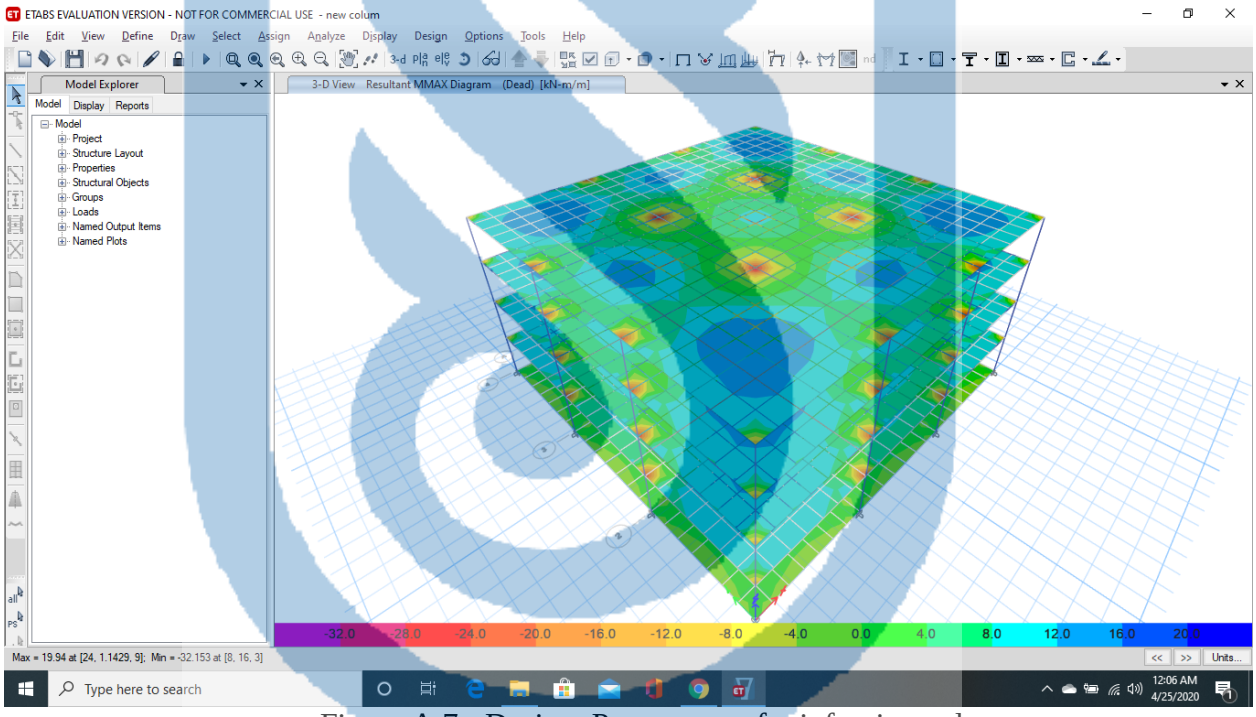

Figure A.7 - Design. Percentage of reinforcing columns

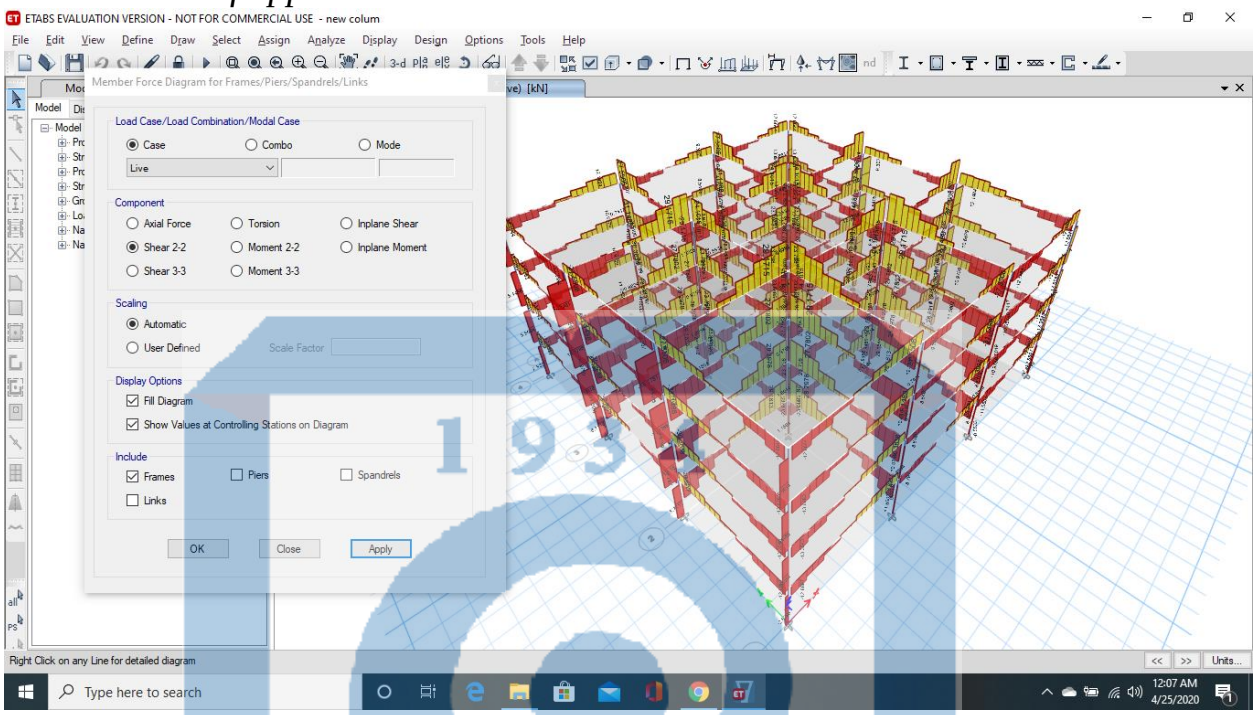

Figure A.8 - Design. Percentage reinforcement of crossbars

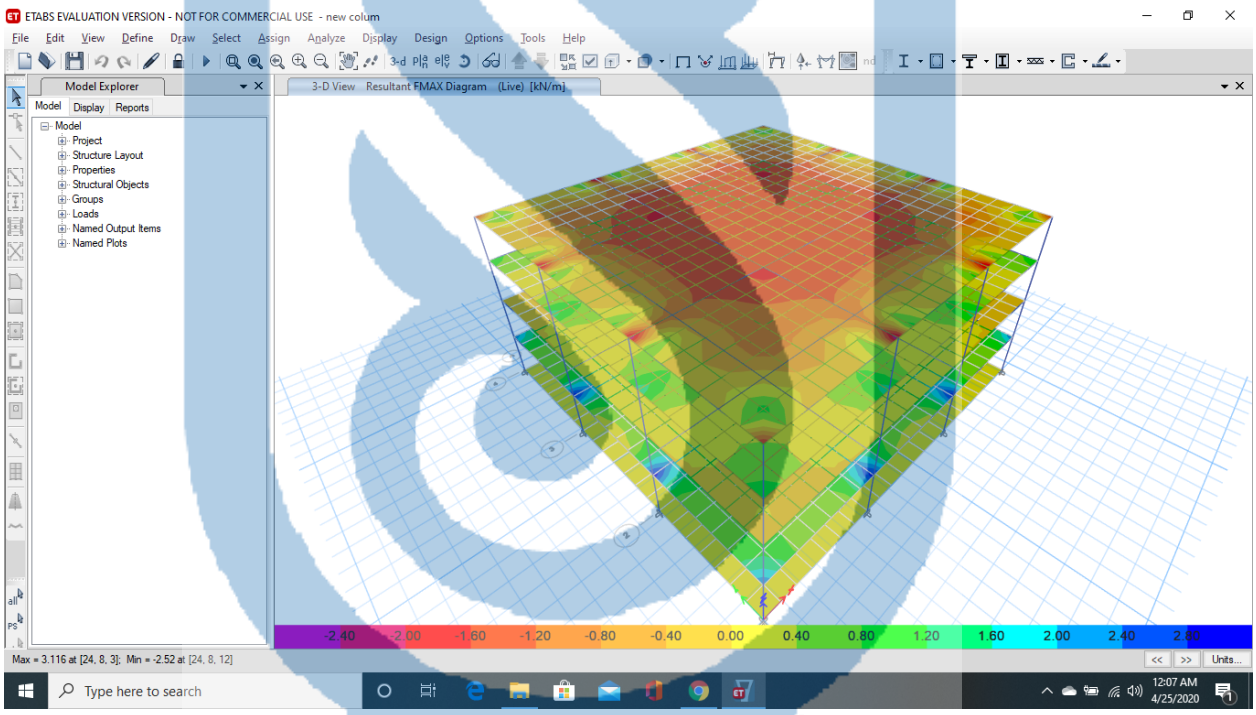

Figure A.9 - Design. Column

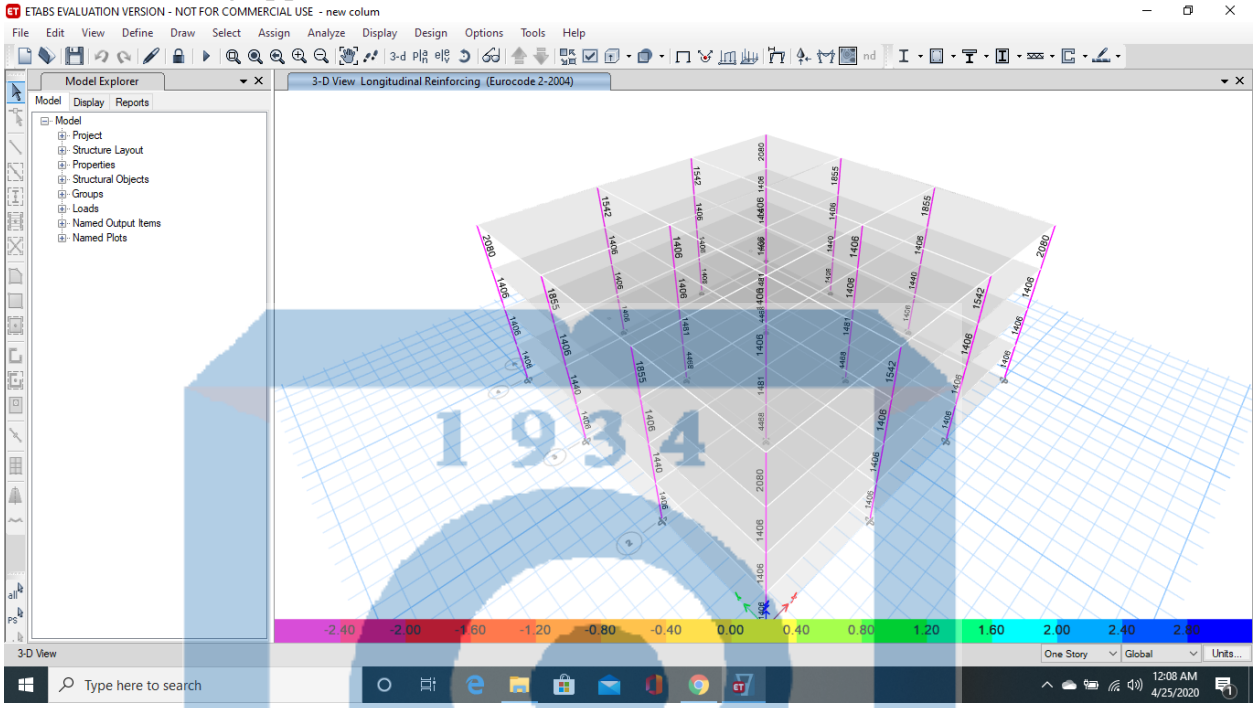

Figure A.10 - Design. Crossbar

Application B

ESTIMATES PK

(15) 5B072900_лс_02-001-001

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 Sport complex

Object name Sport complex In Atyrau city

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

the Underground work
(name of work and costs)

Base:

Estimated cost 852356.78 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

ESTIMATES PK

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

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

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)

Continuation of application B

ESTIMATES PK 2018 Trial

(15) 5B072900_лс_02-002-001

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 Sport complex

Object name Aboveground

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

the Aboveground
(name of work and costs)

Base:

Estimated cost 4529875.103 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

ESTIMATES PK 2018 Trial

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 CT PK 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 CT PK 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					

ESTIMATES PK

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

ESTIMATES PK

(15) 5B072900 CPB 02-001-001
Appendix 11
to the State standard for determining the estimated cost of construction in the Republic of Kazakhstan

Construction Name Sport complex

Object name Cultural and sport complex in Atyrau city

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	person-h	45457.1459	1.45756	78754.076
2	0101-0101-0132	Labor costs of construction workers	person-h	7575.0727	1.3787	57557.215
3	0101-0101-0130	Labor costs of construction workers	person-h	78757.8967	1.26200	4302.028
4	0101-0101-0133	Labor costs of construction workers	person-h	2267.8	1.33600	3029.781
5	0101-0101-0134	Labor costs of construction workers	person-h	432.5185	1.36100	588.658
6	0101-0101-0120	Labor costs of construction workers	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
		Jib Crawler Cranes				

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

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

Compiled _____
position, signature (initials, surname)

Checked _____
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 т	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 т	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-RK

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 Mohammad Nawid Bayat
(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

Sport complex
(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

ESTIMATES

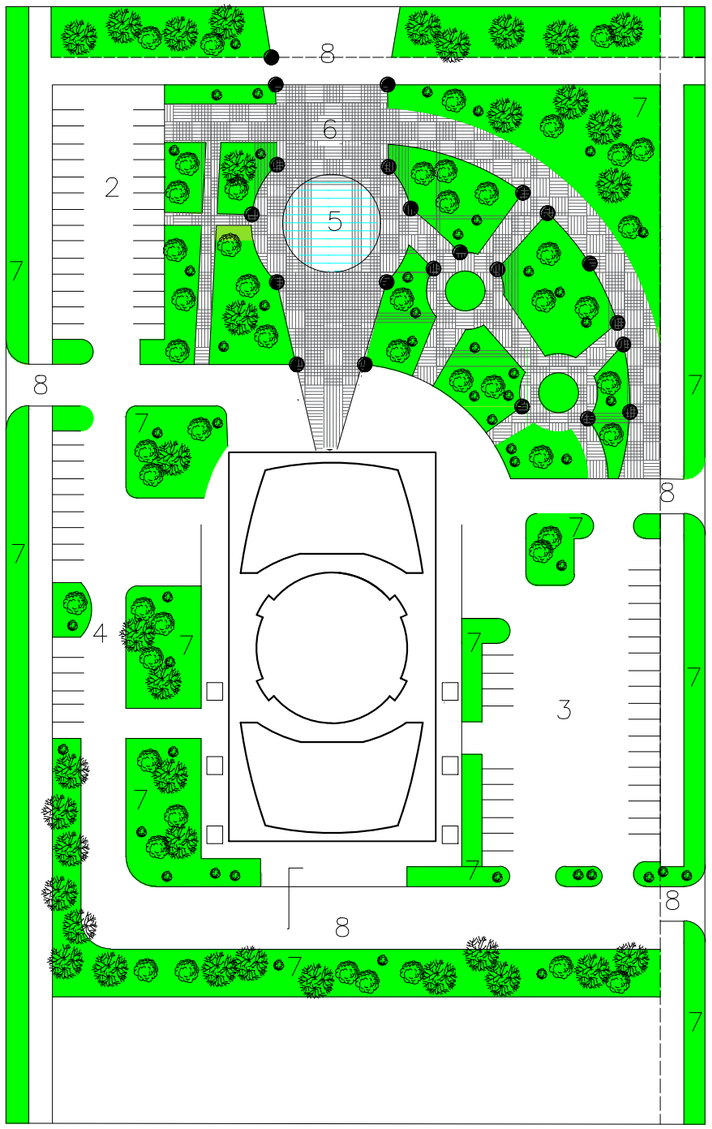
1	2	3	4	5	6	7
		Total estimated cost	7845215.36			821742.691
7	Codex РК от 10.12.2008 № 99-IV, ст.268	Value added tax (НДС) - 15 %			784545.123	98609.123
		Total Estimated	7845215.36		787545.123	8065987.545

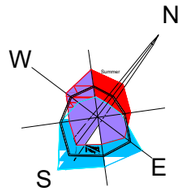
Project Manager _____
signature (initials, surname)

Chief Project Engineer _____
signature (initials, surname)

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

General plan





Explication
1. Wedding Palace
2. Car parking for a restaurant for 70 cars
3. Parking for the palace for a wedding for 40 cars
4. Individual parking for 6 cars
5. Fountain
6. Paving
7. grass
8. Driveways

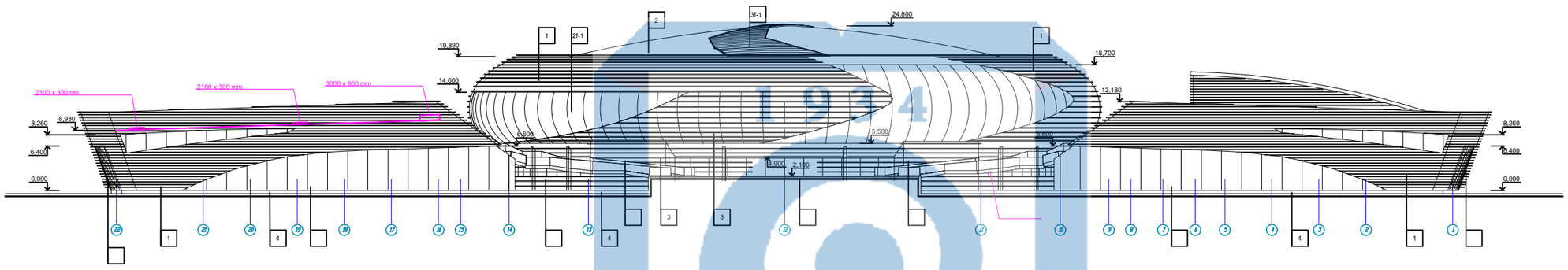
Necessary marks

- Landscaping
- Paving stones
- Asphalt pavement
- Fountain
- Trees
- Box

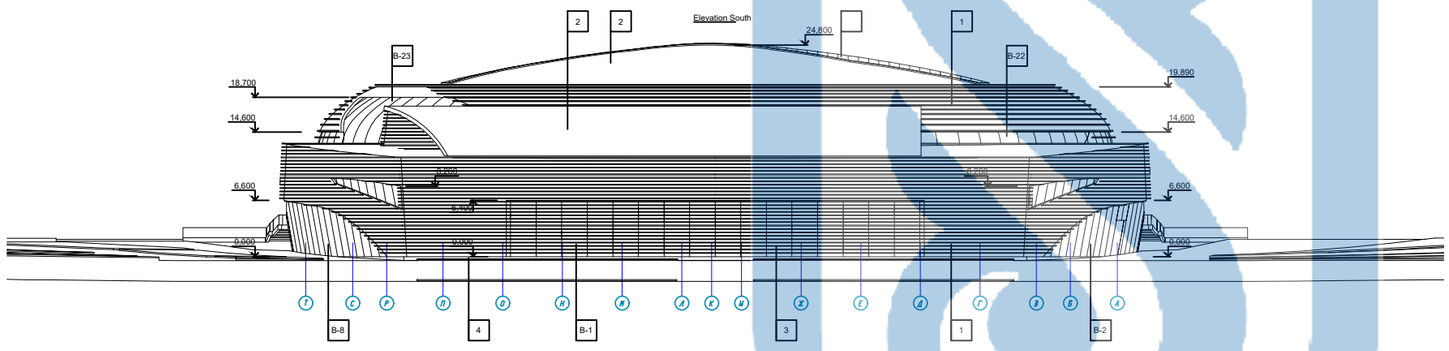
Areas of the above
1. Land area - 19852,8 м.sq.
2. Built-up area - 3295,5 м.sq
3. Area landscaping (lawns)-7804,5 м.sq
4. Paving area - 4865,3 м.sq
5. Asphalt area -6825,5 м.sq

				KazNITU -5B072900 .29-03/2020 DP		
				Cultural and Sport Complex in Atyrau		
name	Document №	Signature	date			
Head of Dep	Akmalayuli K.A.			Architectural part	Level / Sheet / Scale	
Superviser	Kozyukova.N.V				DP / 1 / 1:100	
Consultant	Kozyukova.N.V					
Controller	Kozyukova.N.V					
Prepared by	M. Nawid Bayat			General Plan	Department of Construction and Building Materials	

Elevation - N and S



Elevation South



Material Consumption Specification

Pos.	Designation	Name	Count	Weight units, kg	Note reading
		(consumption per 1 m²)			Total 26.30m2
1	GOST 19904-94	- 75 × 450 × 4 mm.	26 pcs	1.06	27.55 kg
2	GOST 30245-94	- 50 × 950 × 4 mm.	1 PC	1.50	1.50 kg
3	GOST 30245-94	sq. 9 50 × 4 mm.	2 r m	5.50 kg / 1 m	11.00 kg

KazNITU -5B072900 .29-03/2020 DP

Cultural and Sport Complex in Atyrau

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. Nawid Bayat		

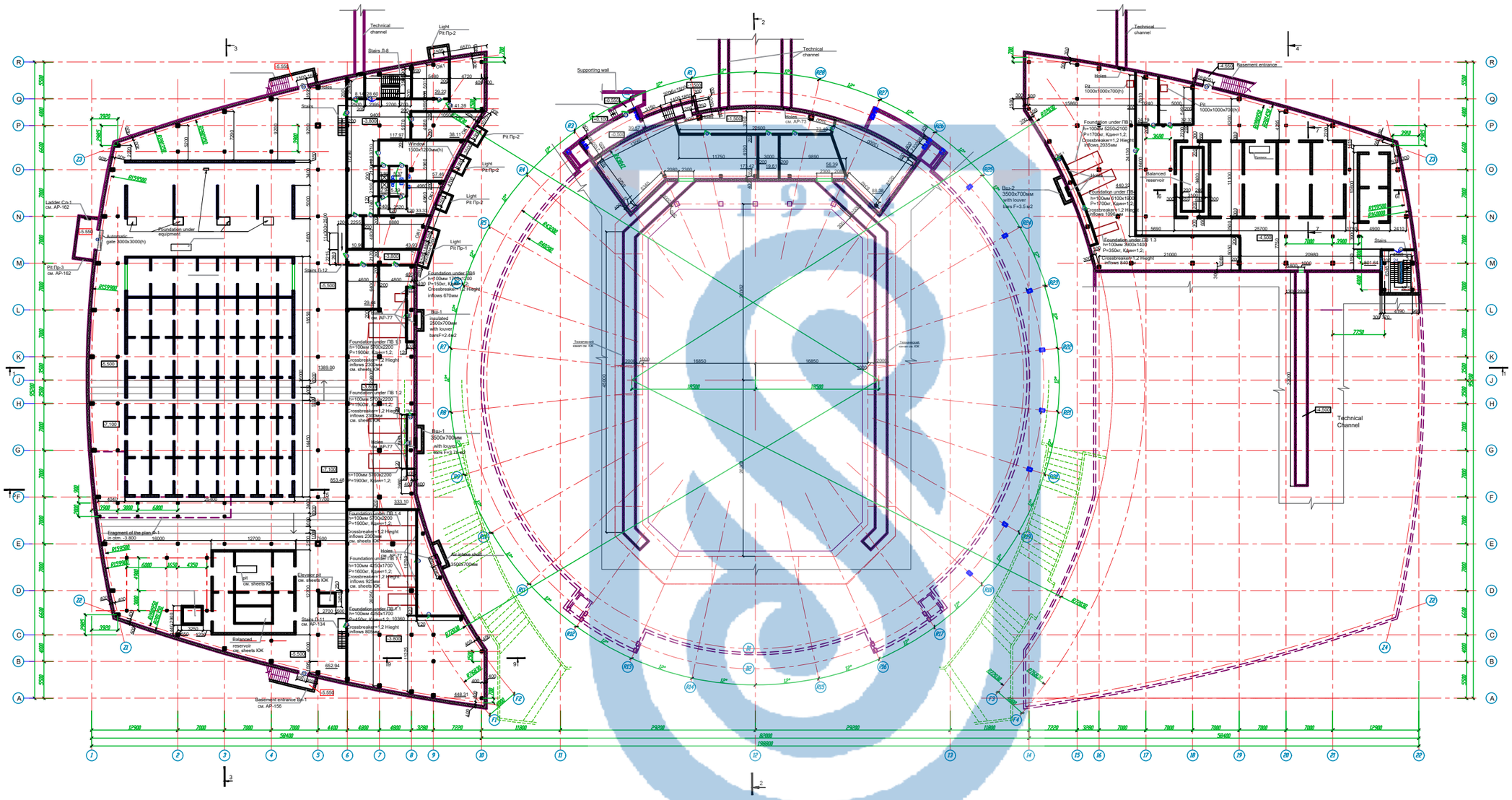
Architectural part

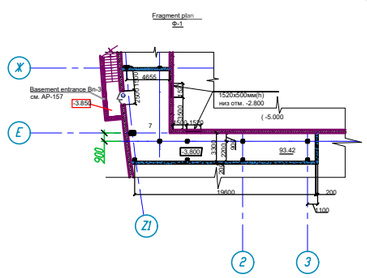
Level	Sheet	Scale
DP	6	1:100

Elevation

Department of Construction and Building Materials

Basement Plan



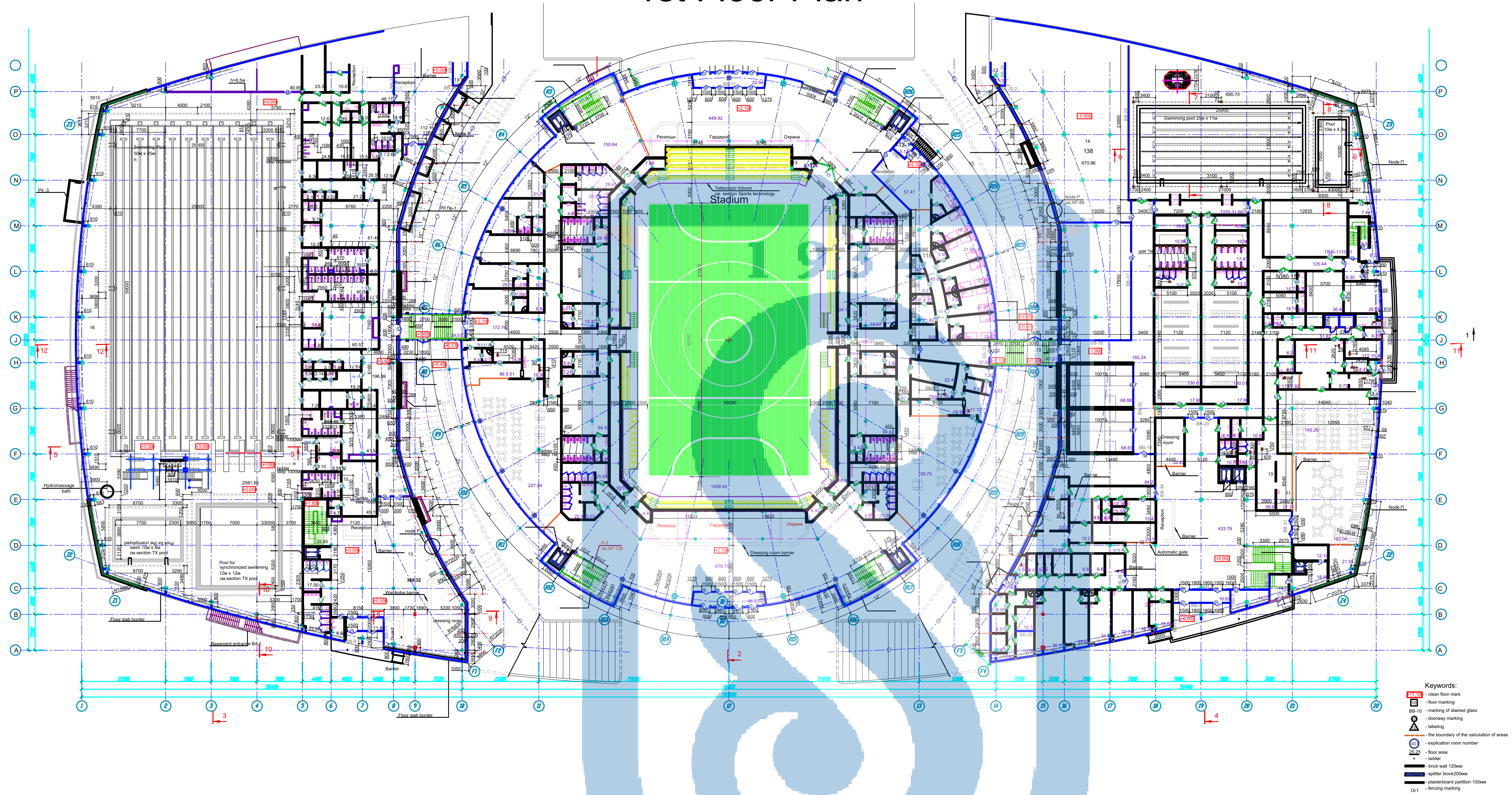


				KazNITU -5B072900 .29-03/2020 DP
				Cultural and Sport Complex in Atyrau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Kozyukova.N.V			
Consultant	Kozyukova.N.V			
Controller	Kozyukova.N.V			
Prepared by	M. Nawid Bayat			Basement Plan

Level	Sheet	Scale
DP	2	1:100

Department of Construction and Building Materials

1st Floor Plan



Explication of premises

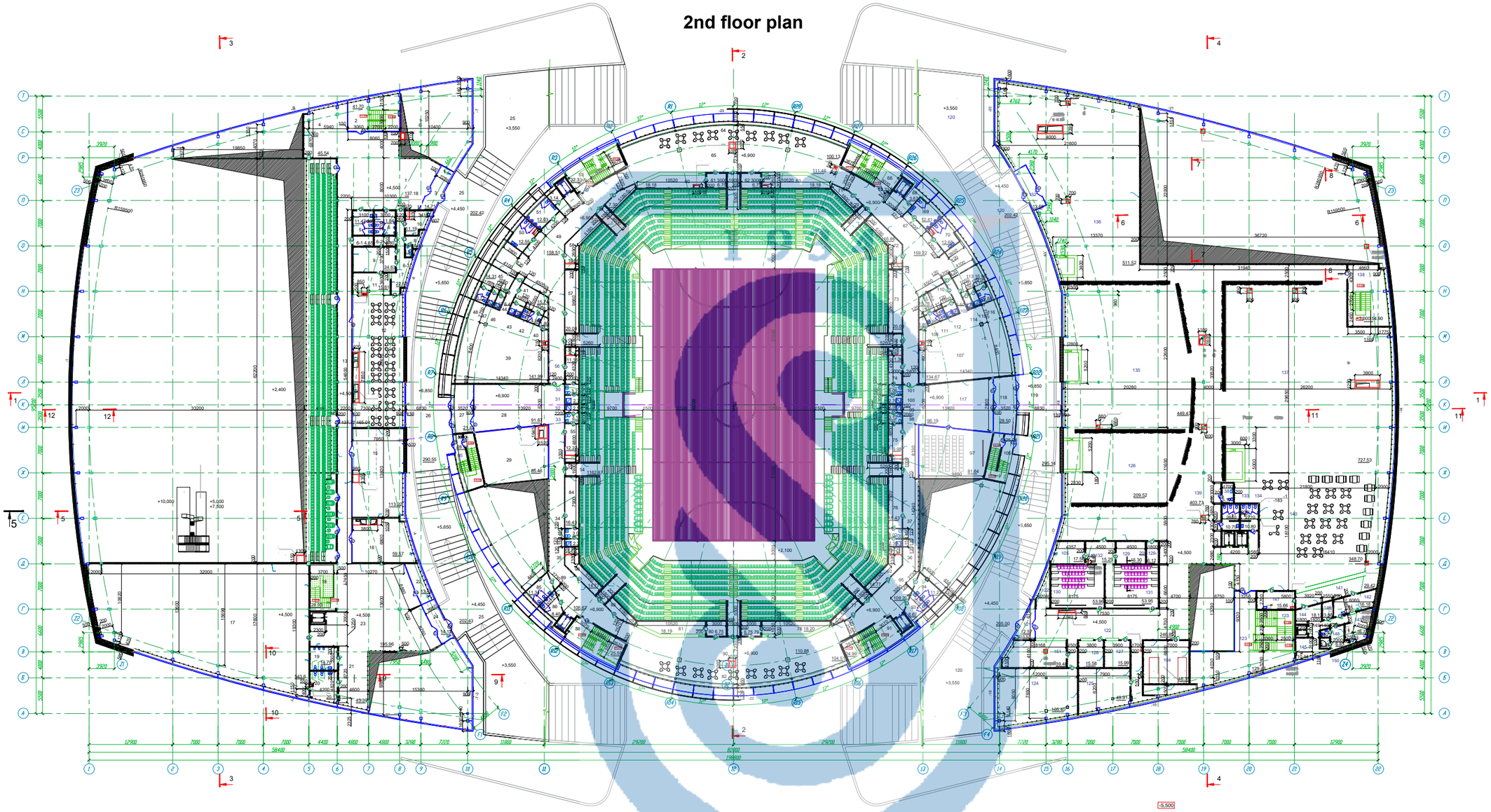
room pomegranate squash	Name	Area $м^2$	
	Block 2		
1	Pool room	2581.65	
1-1	Inventory	80.85	
2	A bathroom	22.58	
3	A bathroom	17.00	
4	Staircase	25.55	
5	Shower room	23.54	
6	A bathroom	4.73	
7	Locker room	45.19	
8	Bathroom for MGN	9.55	
9	Bathroom for MGN	9.55	
10	Locker room	41.54	
11	Shower room	23.53	
12	Pantry of clean linen	7.28	
13	Lounge with shower and dressing room	23.46	
14	Lobby with dressing room	368.32	
15	Tambour	11.80	
15-1	Security	6.93	
16	Coaching	19.26	
17	A bathroom	1.92	
18	Locker room	2.14	
19	Shower room	1.90	
20	Coaching	19.71	
21	A bathroom	1.80	
22	Locker room	3.19	
23	Shower room	1.90	
24	Locker room	60.57	
25	A Bathroom	9.30	
26	Bathroom for MGN	11.82	
27	Shower room	40.34	
28	Tambour	6.77	
29	Shower room	39.03	
30	Tambour	6.67	
31	Locker room	61.48	
32	A Bathroom	9.16	
33	Bathroom for MGN	10.31	
34	Coaching	21.27	
35	Locker room	2.02	
36	A bathroom	1.78	
37	Shower room	2.16	
38	Pantry of clean linen	6.36	
39	Lounge with shower and dressing room	26.53	
40	Judges Room	12.94	
41	A bathroom	1.78	
42	Shower room	2.69	
43	Corridor	196.99	
44	Shower Room	24.81	
45	Massage Room	15.51	
45-1	Massage Room	16.25	
45-2	Locker room with shower	6.27	
45-3	Locker room with shower	6.05	
46	A bathroom	13.98	
47	A bathroom	14.40	
48	A bathroom	3.21	
49	Locker room	12.67	
50	Reception Hall	48.17	
51	Doctor room	20.03	
51-1	Expected	10.67	
52	Staff room	23.39	
53	Staircase	19.05	
53-1	Tambour	6.93	
54	Reception lobby	112.15	
55	Wardrobe	38.36	
56	Tambour	11.19	
	Total area block 2	4287.96	
	Block 1		
57	Corridor	172.76	
58	Staircase and elevator hall	155.64	
59	Utility room	21.75	
60	Judges locker room	30.88	
61	Shower room	5.42	
62	A bathroom	4.55	
63	A bathroom	28.43	
64	A bathroom	26.47	
65	C / y for MGN	4.41	
66	Bathroom with showers	28.15	
67	Laboratory	42.63	
68	Doping control	29.18	
69	A bathroom	2.90	
70	Corridor	8.79	
71	Judges locker room	26.58	
72	A bathroom	2.69	
73	Shower room	4.62	
74	Technical staff room	8.64	
75	Locker room for 50 places	64.52	
76	Coaching	13.32	
77	A bathroom	2.21	
78	Shower room	3.88	
79	Boot	5.51	
80	Utility room	14.96	
80-1	Shower room	4.33	
80-2	Staff room	6.43	
80-3	Shower room	3.12	
81	Washing tableware	19.38	
82	Coaching	13.32	
83	Shower room	3.87	
84	A bathroom	2.21	
85	Locker room	64.52	
86	Handout	22.28	
87	Dining room at 48 pos. places	227.84	
88	Shower room	19.60	
89	A bathroom	8.40	
90	A bathroom	20.83	
91	A bathroom	22.99	
92	Harvesting room	5.03	
93	Lobby with dressing room	679.75	
94	Tambour	22.96	
95	Bathroom MGN	5.03	
96	A bathroom	23.00	
97	A bathroom	20.83	
98	A bathroom	8.42	
99	Shower room	19.60	
100	Locker room	64.52	
101	A bathroom	2.21	
102	Shower room	3.88	
103	Coaching	13.27	
104	Shower room	3.88	
105	A bathroom	2.21	
106	Coaching	13.32	
107	Locker room	64.62	
108	Bathroom with showers	28.17	
109	Server	18.34	
110	Lobby with dressing room	449.92	
111	Tambour	22.94	
112	Reception Hall	57.41	
112-1	Tambour	5.13	
113	Hotel room	13.35	
114	A bathroom	3.97	
115	Hotel room	18.77	
116	A bathroom	3.66	
117	Hotel room	21.96	
118	A bathroom	3.95	
119	Hotel room	21.97	
120	A bathroom	3.96	
121	Hotel room	21.97	
122	A bathroom	3.96	
123	Hotel room	22.27	
124	A bathroom	3.96	
125	Corridor	45.69	
126	Pantry dirty laundry	4.81	
127	Linen	8.31	
128	Staff room	11.46	
129	Pantry	9.05	
130	Corridor	108.01	
131	Corridor	37.28	
132	Sports equipment room	22.49	
133	Staff room with shower	7.30	
133-1	Pantry	4.93	
133-2	Corridor	7.64	
133-3	A bathroom	2.23	
134	Utility room	15.17	
135	Washing tableware	12.77	
136	Handout	19.96	
137	Dining room at 48 pos. places	159.75	
137-1	Sports Hall	1409.42	
137-2	Inventory	7.98	
137-3	Inventory	35.85	
137-4	Inventory	4.43	
137-5	Inventory	4.43	
137-6	Inventory	36.97	
137-7	Inventory	34.11	
137-8	Inventory	5.17	
137-9	Inventory	35.78	
	Total Area Block 1	4877.22	
	Block 3		
138	Gym	670.96	
139	Pool room	695.70	
140	Corridor	31.68	
141	Finnish sauna	10.80	
142	Hamam	10.96	
143	Shower room	17.43	
144	A bathroom	13.37	
145	Finnish sauna	10.80	
146	Hamam	10.96	
147	Shower room	17.43	
148	A bathroom	13.37	
149	Locker room for men 100 places	130.01	
150	Locker room for women 100 places	130.01	
151	Hair Drying Area	17.80	
152	Hair Drying Area	17.80	
153	Occupation studio pilates, stretch	110.91	
153-1	ПУИ	7.44	
154	Staircase	15.57	
154-1	Tambour	8.22	
155	Corridor	125.44	
156	Tambour	9.30	
157	Staff room	15.71	
157-1	Coaching	16.15	
157-2	Tambour	11.19	
157-3	A bathroom	3.72	
157-4	A bathroom	3.82	
158	Yoga studio	36.48	
159	Yoga studio	26.65	
160	Harvesting room	2.60	
161	Staff room	6.56	
162	Winter Garden	21.55	
163	A bathroom	2.80	
164	Pantry products	5.20	
165	refrigerators compartment	10.18	
166	Storage and washing containers	6.73	
167	Corridor	51.82	
168	Tambour	4.26	
169	Office of the Production Manager	6.25	
170	Waiters room	6.00	
171	Hot shop	37.65	
172	Pre-production workshop	15.47	
173	Washing dishes	7.43	
174	Tambour	3.39	
175	Cold shop	7.92	
176	Handout	11.04	
177	Service	6.72	
178	Washing tableware	12.87	
179	Cafe hall with 44 seats	145.20	
180	Fast food area at 48 pos. places	162.04	
181	Fast food handouts	21.11	
182	Storeroom of fast food	38.99	
183	Staff room	10.94	
184	Shower room	4.16	
185	A bathroom	32.47	
186	Harvesting room	5.63	
187	Male bathroom	10.79	
188	Female bathroom	10.77	
189	Lobby with dressing room	433.79	
190	Security room	14.72	
190-1	Tambour	10.24	
190-2	Elevator hall	18.96	
191	Tambour	16.87	
192	Tambour	5.76	
193	Doctor's office	13.68	
194	Procedural	16.56	
195	Doctor's office СПА	22.74	
196	Cabinet wraps	24.48	
197	Shower room	2.12	
198	Thai massage room	29.67	
199	Shower room	2.12	
200	Classical massage room	39.10	
201	Shower room	2.14	
202	Manager room	10.18	
202-1	Cashier	5.95	
202-2	Cashier	6.51	
202-3	Cashier	6.51	
203	ПУИ	2.95	
204	Accountant Head	10.56	
204-1	Corridor	17.83	
205	Corridor	36.35	
205-1	Tambour	4.85	
206	Reception	9.84	
207	Inventory	6.64	
208	Staff room	8.85	
209	Linen	8.85	
210	Male bathroom	3.44	
211	Female bathroom	3.44	
212	Harvesting room	4.42	
213	Medical waste	4.89	
214	Ironing	20.87	
214-1	Corridor	12.75	
215	Laundry	22.24	
216	Dirty laundry	9.77	
217	Dry Cleaning Reception	12.06	
218	Clean laundry	10.20	
219	Harvesting room	4.50	
220	A bathroom	4.93	
221	A bathroom	2.10	
222	A bathroom	2.10	
223	Shower room	2.56	
224	Staff room	15.47	
225	Sporting goods store	29.10	
226	Crossfit boxing room	84.27	
227	Corridor	165.24	
228	Squash hall №1	68.88	
229	Squash hall №2	68.83	
229-1	Storeroom products of a children's cafe	12.14	
	Total area of Block 3	4199.14	
230	Gallery	41.31	
231	Gallery	39.51	
	Total:	13458.28	

				KazNITU -5B072900 .29-03/2020 DP
				Cultural and Sport Complex in Atyrau
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. Nawid Bayat			1st Floor Plan

Level	Sheet	Scale
DP	3	1:100

Department of Construction and Building Materials

2nd floor plan

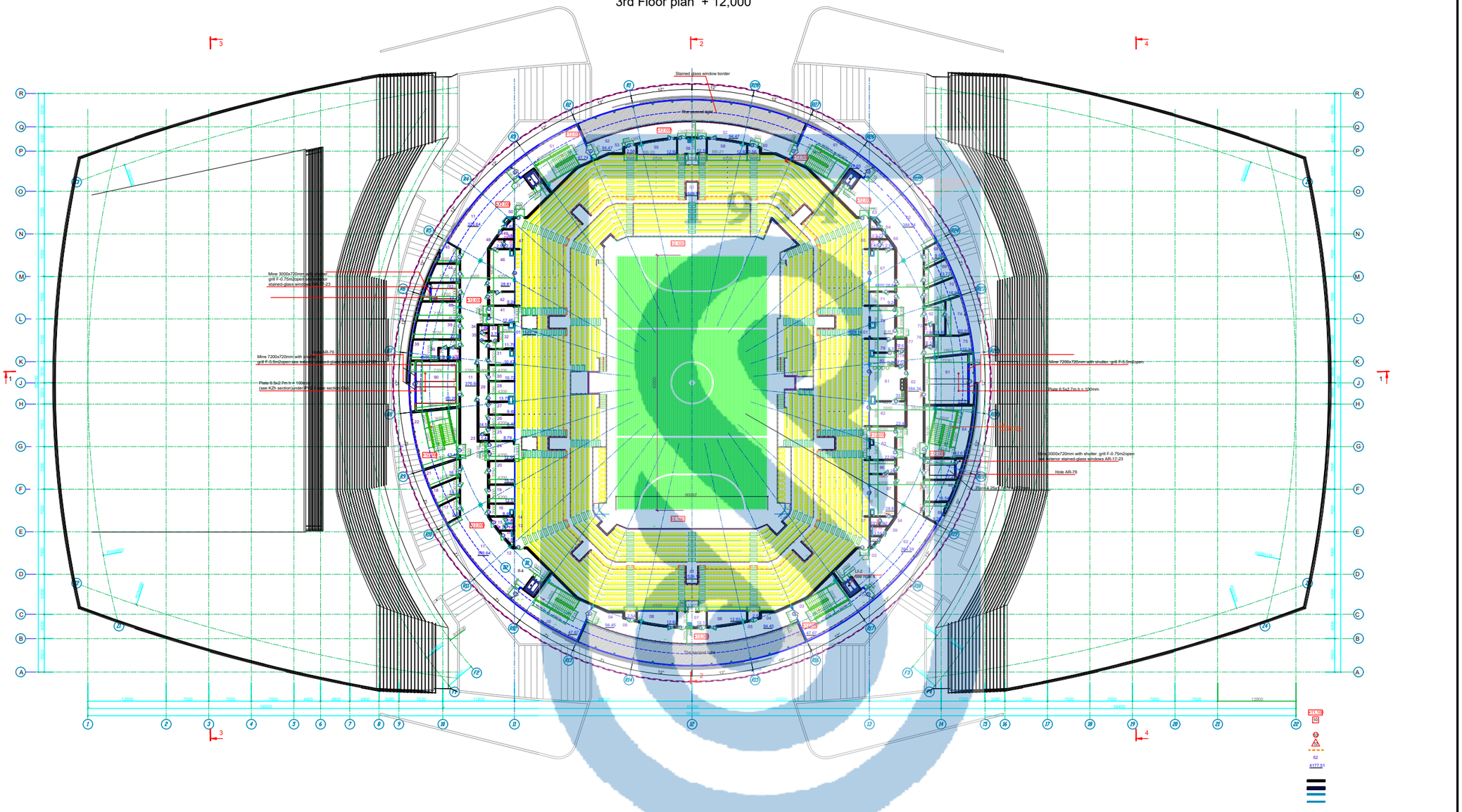


				KazNITU -5B072900 .29-03/2020 DP
				Cultural and Sport Complex in Atyrau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Kozyukova.N.V			
Consultant	Kozyukova.N.V			
Controller	Kozyukova.N.V			
Prepared by	M. Nawid Bayat			2nd Floor Plan

Level	Sheet	Scale
DP	4	1:100

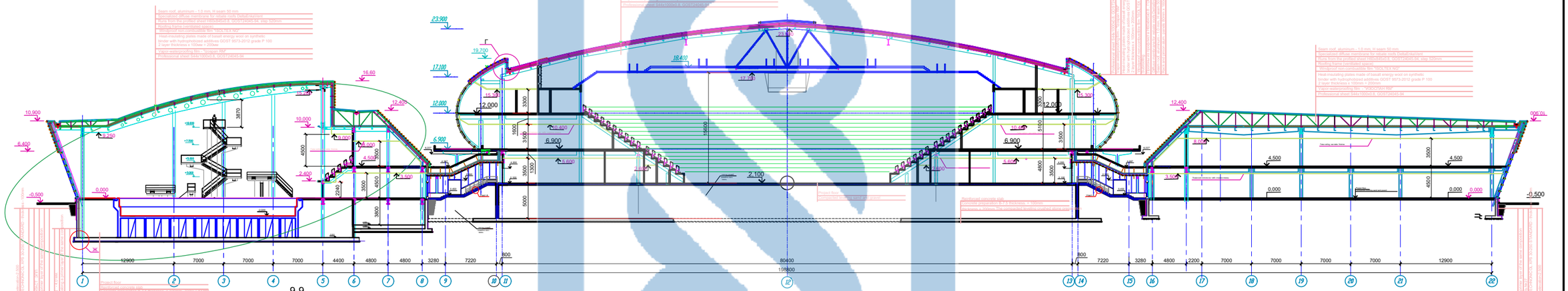
Department of Construction and Building Materials

3rd Floor plan + 12,000

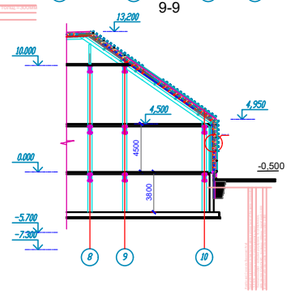


				KazNITU -5B072900 .29-03/2020 DP		
				Cultural and Sport Complex in Atyrau		
name	Document №	Signature	date			
Head of Dep	Akmalayuli K.A.			Architectural part	Level	Sheet	Scale
Superviser	Kozyukova.N.V				DP	5	1:100
Consultant	Kozyukova.N.V						
Controller	Kozyukova.N.V			3rd Floor Plan	Department of Construction and Building Materials	
Prepared by	M. Nawid Bayat					

1 - 1



9-9

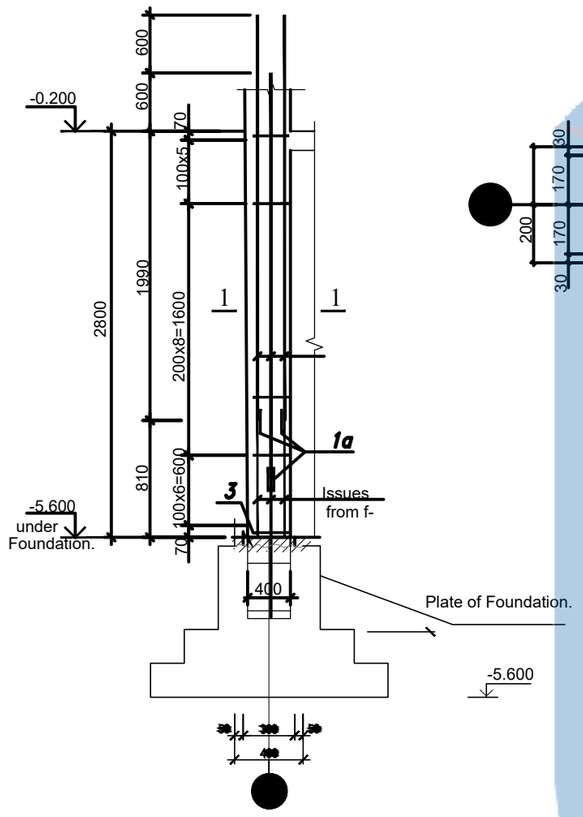


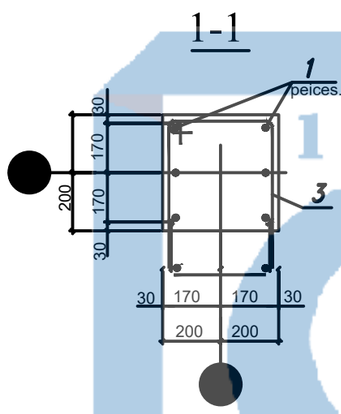
				KazNITU -5B072900 .29-03/2020 DP
				Cultural and Sport Complex in Atyrau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Architectural part
Superviser	Kozyukova.N.V			
Consultant	Kozyukova.N.V			
Controller	Kozyukova.N.V			Section
Prepared by	M. Nawid Bayat			

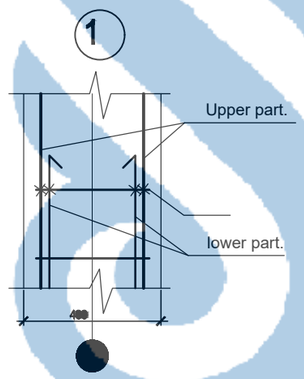
Level	Sheet	Scale
DP	7	1:100

Department of Construction and Building Materials

K1





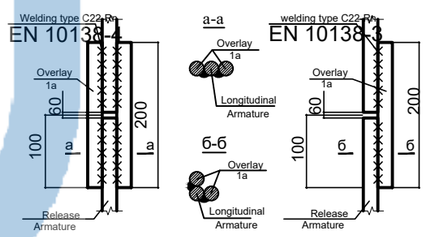


Num	Standards	Name		qua	Weight ед., кг	Note
		K1				
1	EN 10138-4	∅ 20 A400	L= 3150	8	12.54	
1a	EN 10138-4	∅ 20 A400	L= 200	12	0,5	
3*	EN 10138-4	∅ 8 A-I	L= 1600	20	0,68	
		Materials				
		Concrete class C25				0,45

Parts List

show.	Sketch
3	460 / 380 / 460 / 380

joint units for longitudinal reinforcement

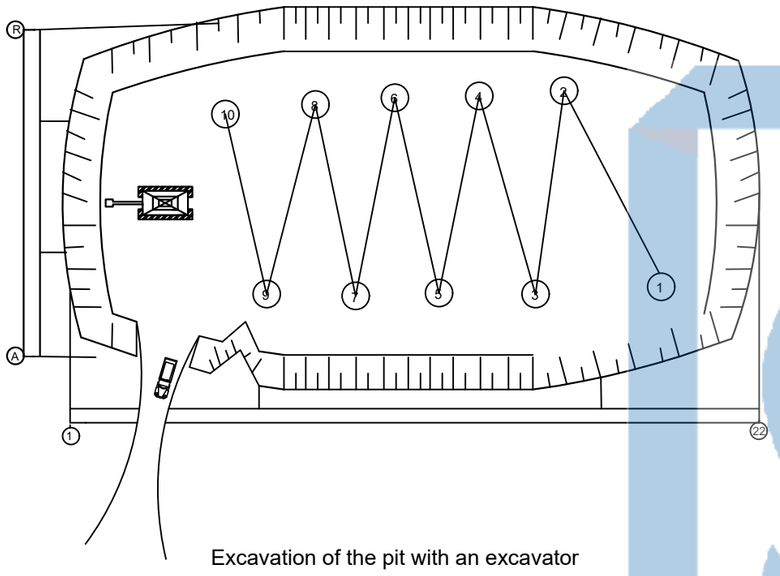


Statement of steel consumption, kg

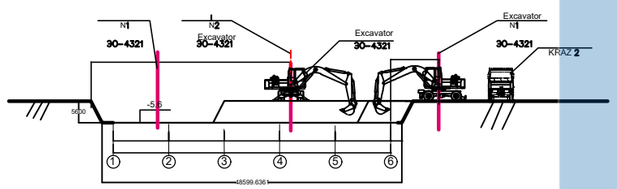
Mark of Elements	Reinforcing products					
	Class armature					Total
	A-I		A400			
	EN 10138-4		EN 10138-3			
	∅ 8	итого		∅ 20	итого	
Column K1	15.44	15,44		68,1	68,1	83,54

				KazNITU -5B072900 .29-03/2020 DP			
				Cultural and Sport Complex in Atyrau			
name	Document №	Signature	date				
Head of Dep	Akmalayuli K.A.			Constructive part	Level	Sheet	Scale
Superviser	Kozyukova.N.V				DP	8	1:100
Consultant	Kozyukova.N.V						
Controller	Kozyukova.N.V						
Prepared by	M. Nawid Bayat			Column K1	Department of Construction and Building Materials		

The scheme of operation of a single bucket excavator



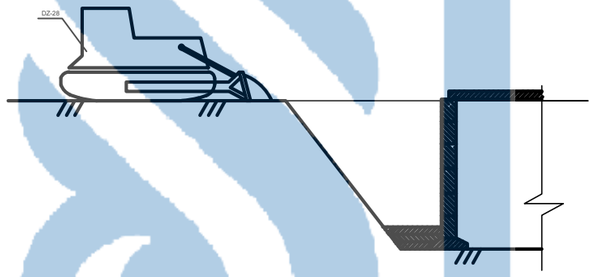
Excavation of the pit with an excavator

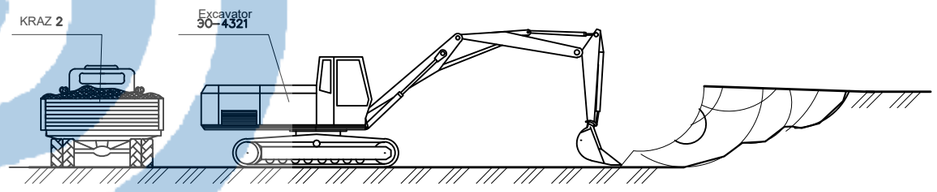


Safety instructions.

All works carried out on the object, to be performed in accordance with the requirements of SNiP 12.03-2001 and SNiP 12.04-2002.
Construction - assembly work to be carried out after the written permission of the chief engineer of the construction organization.
Before the start of construction and installation work must be assigned a person responsible for the safe production of work on the movement of loads with cranes.
It is not allowed to work without special equipment, special equipment and means of individual protection.
The installation of protective helmets for all persons present at the construction site is mandatory.
Do not accept unmarked, faulty and not compatible in terms of load capacity and the nature of the load-bearing capacity.
Location of a person in the danger zone of the crane is prohibited.
Before work to check the availability of safety locking devices on the hooks of cargo storage facilities. 9. Straps and traverses to subject a stubborn osmotru.
To bend the welding current to use flexible cables designed for maximum load.
Ground during welding of metal parts of electric welding equipment, as well as welded parts and structures.
Production of electric welding works is prohibited during the rainy season due to lack of equipment and work place.
It is not allowed to visit people on the elements of structures during their lifting or moving.
Disassembly of structures to be produced only after permanent or temporary hopeful fastening.
It is not allowed to perform the work at height, and also the work of the tower crane at a speed of more than 15 m / s.
It is not allowed to find people under the mounted structures before their installation in the design position and fastening.
Observe the stock at a height for safe installation 0.5 ... 1 m.
Only trained workers who have passed the special instruction are allowed to make and apply lubricants on the deck.
When applying the lubricant with a pneumatic sprayer, it is necessary to have individual means of protection: goggles, respirators, rubber boots and protective tarpaulin suits.
Anti-fire measures when applying lubricants: - the area on which the lubrication of formwork should be cleaned of garbage, - hang on a visible place posters
"Forbidden to smoke", "Forbidden to use". - store lubricants only in hermetically sealed metal tare, - the amount of lubricants in the workplace should not exceed the need for change.
Disposal of formwork equipment and materials not provided for in the project, as well as the presence of strangers is prohibited.
For the state of the installed formwork, supporting structures and fastenings, it is necessary to report constant observation. For the state of the installed formwork,
Do not allow deformation and displacement of formwork, means of reinforcement. Do not allow deformations and displacements of formwork, means of reinforcement.
Workplaces and passages to it at a height of more than 1.3 m and at a distance of less than 2 m from the border of the border shall be
temporarily guarded by temporary working places and passages to it at a height of more than 1.3 m and at a distance of less than 2 m from the border.
The width of the passages to the working places and to the working places should not be less than 0.6 m,
and the height of the passages in the light should not be less than 1.8 m. The width of the passages to the working places and to the working
places should not be less than 0.6 m, and the height of the passages in the light should not be less than 1.8 m.
Passages, passages and workplaces are prohibited. Passages, passages and workplaces are prohibited.
Working places and passages to it should be sufficiently illuminated in accordance with the requirements of GOST 12.1.046-85.
Production Workplaces and passages to it should be sufficiently illuminated in accordance with the requirements of GOST 12.1.046-85. Production is prohibited in uninformed areas.
Armature to be stored in specially allocated places for this purpose. The end parts of the rod in the places of common passages are covered with shields.
Armature to be stored in specially allocated places for this purpose. The end parts of the rod in the places of common passages are covered with shields.

The scheme of reburial of the pit





Equipment involved in earthworks

Num	NAME OF EQUIPMENT
1	Excavator brand EO-4321
2	Kraz is a 222 self-propelled car
3	DZ-28 bulldozer on the basis of T-130 tractor

Underground works

Types of work	Scope of work		Labor cost	Necessary machines		Working number	shift number	Working duration days	2020-2021
	Measure.	one.	The number of	Brand	Num of Machines				October / November / December / January / February / March
Stage of preparatory work	-	-	*688,11*	-	-	*15*	*3*	*15*	
Production of potholes	*1000m³*	*1,34*	*1,26*	*Excavator EO-4224*	*1*	*1*	*2*	*1*	
Manual tillage	*m ³*	*41*	*10,15*	-	-	*5*	*1*	*2*	
Reinforced concrete foundation	*pcs*	*438*	*47,1*	*Concrete pump 24 M4 XH*	*2*	*10*	*1*	*5*	
Waterproofing of the underground section	*100 ²*	*4,41*	*36,13*	-	-	*3*	*2*	*4*	
Installation of external engineering systems	-	-	*1146,9*	-	-	*11*	*1*	*104*	
Filling the soil tension	*1000m3*	*0,2*	*0,91*	*Bulldozer DT-75*	*1*	*1*	*1*	*1*	

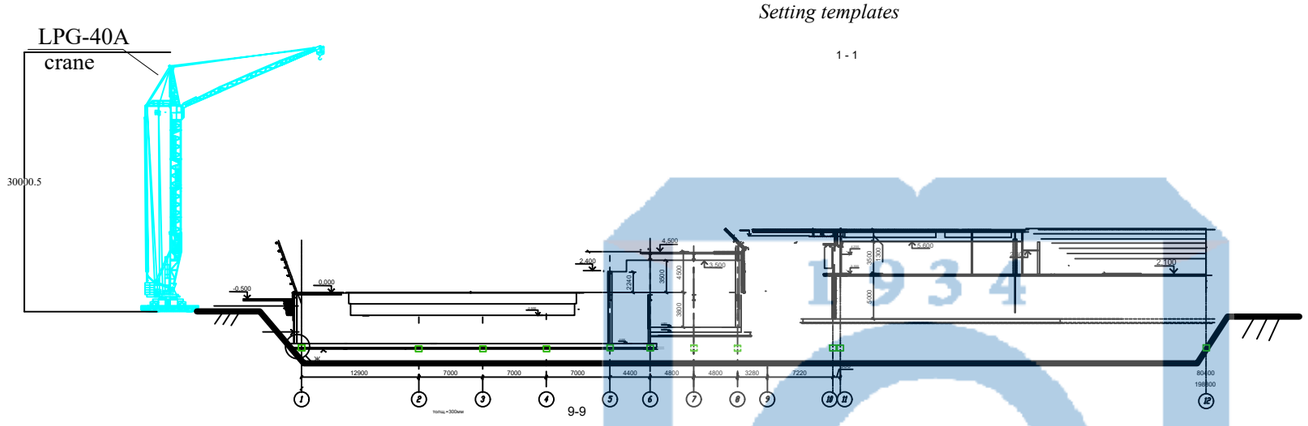
				KazNITU -5B072900 .29-03/2020 DP
				Cultural and Sport Complex in Atyrau
name	Document №	Signature	date	
Head of Dep	Akmalayuli K.A.			Technological part
Superviser	Kozyukova.N.V			
Consultant	Kozyukova.N.V			
Controller	Kozyukova.N.V			
Prepared by	M. Nawid Bayat			Underground work

Level	Sheet	Scale
DP	10	1:100

Department of Construction and Building Materials

Setting templates

1 - 1



9-9

Safety instructions.

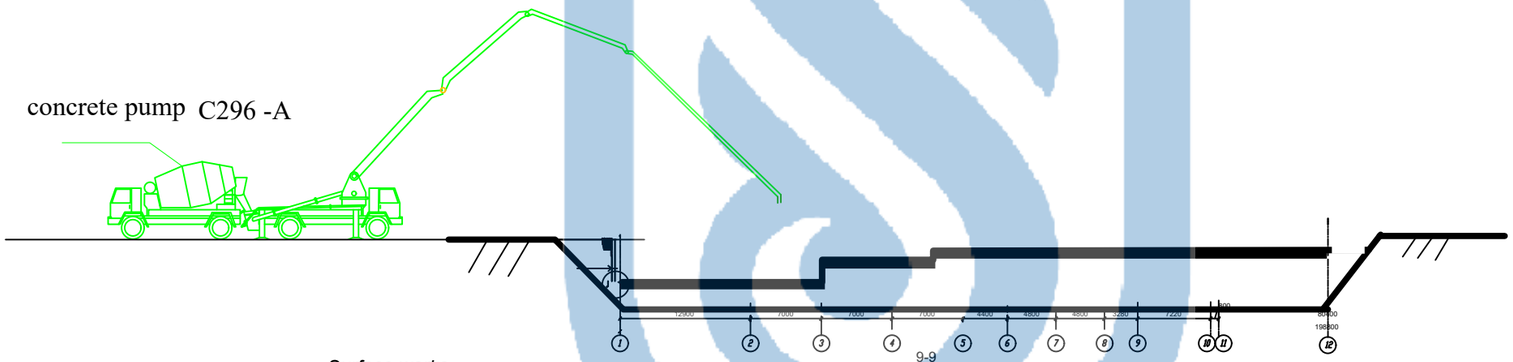
All works carried out on the object, to be performed in accordance with the requirements of SNiP 12.03-2001 and SNiP 12.04-2002.
Construction - assembly work to be carried out after the written permission of the chief engineer of the construction organization.
It is not allowed to work without special equipment, special equipment and means of individual protection.
The installation of protective helmets for all persons present at the construction site is mandatory.
Do not accept unmarked, faulty and not compatible in terms of load capacity and the nature of the load-bearing capacity.
Location of a person in the danger zone of the crane is prohibited.
To bend the welding current to use flexible cables designed for maximum load.
Ground during welding of metal parts of electric welding equipment, as well as welded parts and structures.
Production of electric welding works is prohibited during the rainy season due to lack of equipment and work place.
It is not allowed to visit people on the elements of structures during their lifting or moving.
Disassembly of structures to be produced only after permanent or temporary hopeful fastening.
It is not allowed to perform the work at height, and also the work of the tower crane at a speed of more than 15 m / s.
It is not allowed to find people under the mounted structures before their installation in the design position and fastening.
Observe the stock at a height for safe installation 0.5 ... 1 m.
Only trained workers who have passed the special instruction are allowed to make and apply lubricants on the deck.
Anti-fire measures when applying lubricants: - the area on which the lubrication of formwork should be cleaned of garbage,
Disposal of formwork equipment and materials not provided for in the project, as well as the presence of strangers is prohibited.
Workplaces and passages to it at a height of more than 1.3 m and at a distance of less than 2 m from the border of the border shall be temporarily guarded by temporary working places and passages to it at a height of more than 1.3 m and at a distance of less than 2 m
The width of the passages to the working places and to the working places should not be less than 0.6 m,
and the height of the passages in the light should not be less than 1.8 m. The width of the passages to the working places and to the working places should not be less than 0.6 m, and the height of the passages in the light should not be less than 1.8 m.
Passages, passages and workplaces are prohibited. Passages, passages and workplaces are prohibited.
Working places and passages to it should be sufficiently illuminated in accordance with the requirements of GOST 12.1.046-85.
Armature to be stored in specially allocated places for this purpose. The end parts of the rod in the places of common passages are covered with shields. Elements of carcass fittings should be packed with consideration of their lifting and storage conditions.
Elements of carcass fittings should be packaged with due regard to their lifting and storage.
When compaction of concrete mixes with electric vibrators to move the vibrator for current-carrying cables is prohibited
When compaction of concrete mixes with electric vibrators to move the vibrator for current-carrying cables

Equipment involved in ground work

Num	NAME OF EQUIPMENT
1	LPG-40A crane
2	concrete pump C296 -A

TECHNOLOGICAL WORK FOR CONCRETE CONSTRUCTION OF BUILDINGs

1 - 1



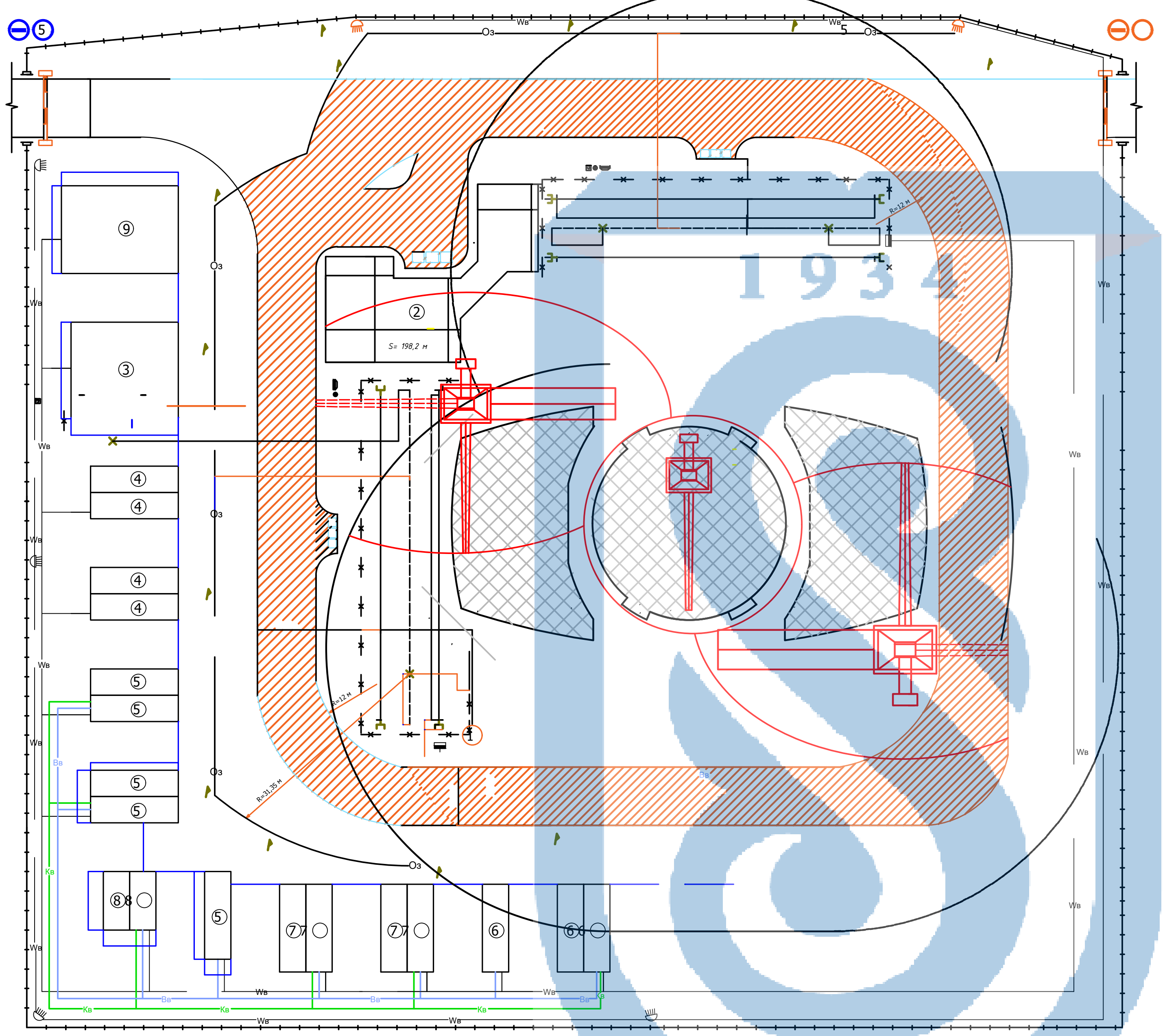
9-9

Surface works

Types of work	Scope of work		Labor cost	Necessary machines		Working number	shift number	Working duration days	2020-2021
	Measure.	one.	The number of	Brand	Num of Machines				October / November / December / January / February / March
Surface constructions of the building concreting	*m²*	*4176,8*	*5570,8*	*Crane LPG-40A*	*2*	*20*	*3*	*93*	
Reinforced concrete surface section installation of structures	*piece*	*87*	*66,9*	*Crane LPG-40A*	*2*	*10*	*1*	*7*	

				KazNITU -5B072900 .29-03/2020 DP			
				Cultural and Sport Complex in Atyrau			
name	Document №	Signature	date				
Head of Dep	Akmalayuli K.A.			Technological part	Level	Sheet	Scale
Superviser	Kozyukova.N.V				DP	9	1:100
Consultant	Kozyukova.N.V						
Controller	Kozyukova.N.V			Aboveground work	Department of Construction and Building Materials		
Prepared by	M. Nawid Bayat						

Construction master plan



Symbols:

- speed limit 5 km / h
- access is prohibited
- gate
- permanent sewerage
- temporary sewerage
- permanent water supply
- temporary water supply
- permanent transmission line
- temporary transmission line
- searchlight
- temporary enclosure
- fire hydrant
- transformer station
- power distribution cabinet
- touching the concrete mix and receiving area
- fire extinguisher
- barrel with water
- box with sand
- stand with load fixing schemes
- special signs
- crane power supply cabinet
- barrier

№	Name of indicators	Measurement symptoms	Volume
1	Total labor costs	day	99.56
2	Total duration of work	day	51
3	The total cost of installation work	thousand tenge	1577.5

Explication

	The price to pay	Stable
	Open warehouses and initiatives	Temporary
	Office and dispatching	Temporary
	Meeting room	Temporary
	Dining and drying room	Temporary
	Room for heating and drying	Temporary
	Wardrobe and bathroom	Temporary
	Restroom	Temporary
	Material warehouse	Temporary
	Instrument room	Temporary
	Place of control load	Temporary

Technology - economic indicators

No	Name of indicators	Measurement signs	Volume
1	Area of the main construction project	$м^2$	4120
2	Construction area	$м^2$	1029
3	Construction factor	%	0.08
4	Length of temporary roads	м	332
5	Length of temporary water pipes	м	240.6
6	Temporary power transmission system length	м	711.1
7	Length of temporary sewer	м	134.6

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. Nawid Bayat		

KazNITU -5B072900 .29-03/2020 DP

Cultural and Sport Complex in Atyrau

Technological part

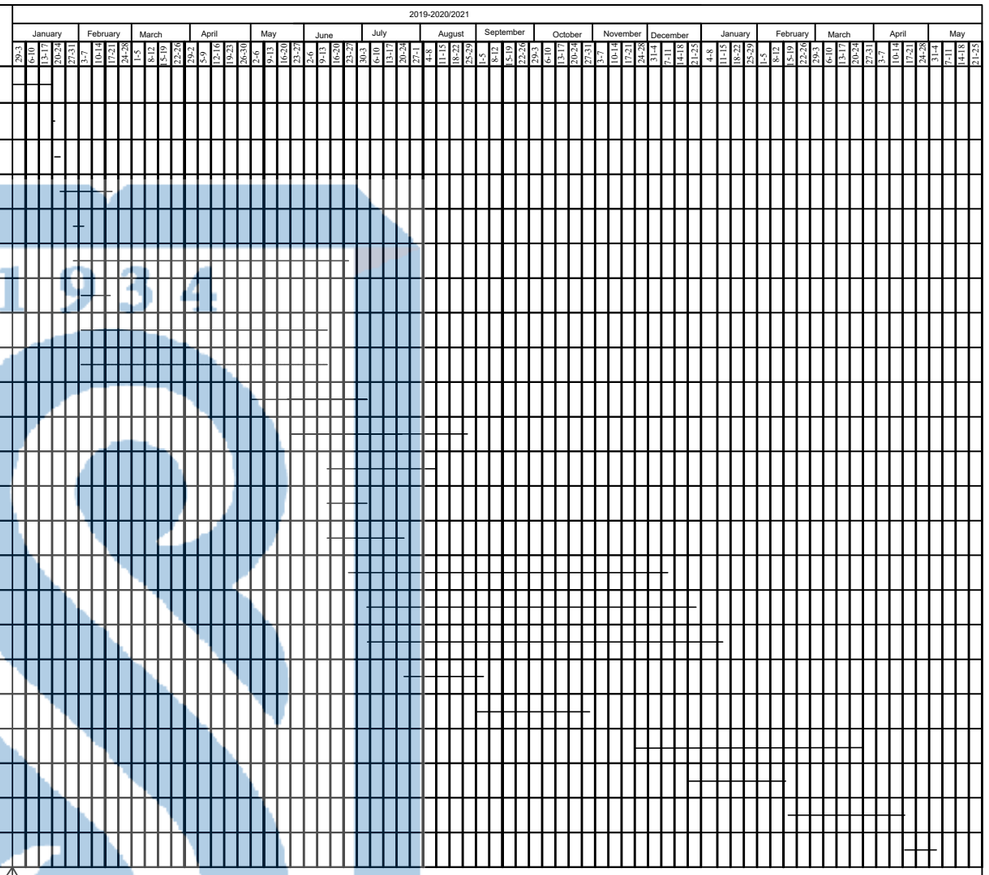
Level	Sheet	Scale
DP	11	1:100

Master plan

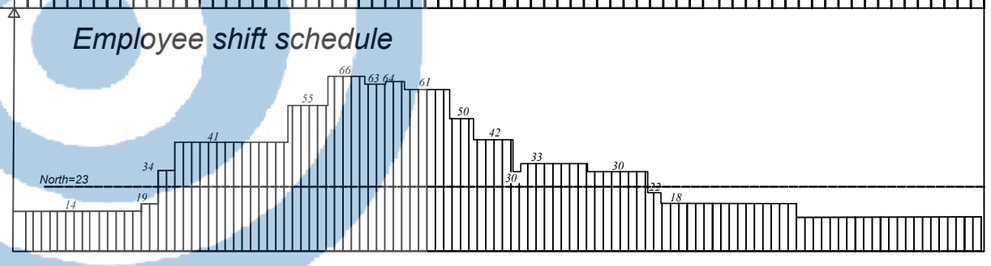
Department of Construction and Building Materials

Calendar plan

Types of work		Scope of work		Labor cost ad.-day	Necessary machines		Working number	Shift number	Duration day
		Measure one.	The num		Marks	Num of Machine			
Stage of preparatory work		-	-	688,11	-	-	15	3	15
Production of potholes		1000м³	1,34	1,26	Excavator ЭО-4224	1	1	2	1
Manual tillage		м³	41	10,15	-	-	5	1	2
Reinforced concrete foundation		шт.	438	47,1	Concrete pump 24 М4 ХН	2	10	1	5
Waterproofing of the underground section		100м²	4,41	36,13	-	-	3	2	4
Installation of external engineering systems		-	-	1146,9	-	-	11	1	104
Filling the soil tension		100м³	0,2	0,91	Bulldozer ДТ-75	1	1	1	1
Surface constructions of the building concreting		м³	4176,8	5570,8	Crane КБ-405	2	20	3	93
Reinforced concrete surface section installation of structures		шт.	87	66,9	Crane КБ-405	2	10	1	7
Fill door and window openings		м²	3651,4	610,8	-	-	14	1	44
Installation of process equipment		-	-	917,5	-	-	11	2	42
Sanitary works		-	-	1410,8	-	-	17	2	41
Roofing works		100м²	16,88	76	-	-	5	1	15
Sound and insulation of the floor		м²	10446,5	287,1	-	-	5	2	29
Landscaping of the territory		-	-	573,4	-	-	12	1	48
Making a cement drawer under the floor		м²	9016	161,2	-	-	6	1	26
Electrical installation work		-	-	522,5	-	-	10	2	26
Slab contraction joints should intersect at the openings for columns		м2	2205	297,7	-	-	5	2	30
Plastering of walls, ceilings and slopes		м²	36924	3206,7	-	-	25	3	43
Painting of facades		100м2	47,7	176,49	-	-	8	2	11
Making linoleum floors		м²	6152	294,5	-	-	8	1	37
Walls, ceilings and sewers painting		м²	6050	625,83	-	-	22	1	28
Maintenance of power lines		-	-	209	-	-	18	1	12



Employee shift schedule



Technical and economic indicators

Name of indicators	Measurement .unit	Indicator
Duration of construction	month	11,2
Total labor intensity	man.-day	27847
Own works labor intensity	man.-day./m3	0,41
Workers' movement non-uniform coefficient	-	1,67
Shift coefficient	-	1,7

KazNITU -5B072900 .29-03/2020 DP

Cultural and Sport Complex in Atyrau

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. Nawid Bayat		

Technological part	Level	Sheet	Scale
	DP	12	1:100
Calendar map	Department of Construction and Building Materials		

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: Баят Мохаммад Навид

Название: Cultural and sports complex in Atyrau

Координатор: Надежда Козюкова

Коэффициент подобия 1:3

Коэффициент подобия 2:0,6

Замена букв:68

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

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: Баят Мохаммад Навид

Название: Cultural and sports complex in Atyrau

Координатор:Надежда Козюкова

Коэффициент подобия 1:3

Коэффициент подобия 2:0,6

Замена букв:68

Интервалы:0

Микропробелы:0

Белые знаки: 0

После анализа Отчета подобия констатирую следующее:

■ обнаруженные в работе заимствования являются добросовестными и не обладают признаками плагиата. В связи с чем, признаю работу самостоятельной и допускаю ее к защите;

☐ обнаруженные в работе заимствования не обладают признаками плагиата, но их чрезмерное количество вызывает сомнения в отношении ценности работы по существу и отсутствием самостоятельности ее автора. В связи с чем, работа должна быть вновь отредактирована с целью ограничения заимствований;

☐ обнаруженные в работе заимствования являются недобросовестными и обладают признаками плагиата, или в ней содержатся преднамеренные искажения текста, указывающие на попытки сокрытия недобросовестных заимствований. В связи с чем, не допускаю работу к защите.

Обоснование:

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

23.05.2020 .....

Дата *Подпись Научного руководителя*

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
СӘТБАЕВ УНИВЕРСИТЕТІ

RESPONSE

OF THE SUPERVISOR
for the graduation project

Bayat Mohammad Nawid
5B072900-Civil Engineering

Topic: “Cultural and sports complex in Atyrau”

Based on the tasks issued by the consultants, the architectural - construction, design - structural, organizational - technological and economic sections of the graduation project were developed.

The architectural and construction section was executed using the Revit program. A 3D model of the building was developed, as well as other drawings were made in the AutoCAD program.

The design and structural section was performed using the LIRA-SAPR (analytical part) and AutoCAD (graphic part) programs.

The estimated section is calculated in the program ABC 4.

In the main section (for this specialization) - construction and technology - the wishes for the application of IT - competencies + are not taken into account, with: vertical planning of construction sites; comparison of earthmoving, lifting and concrete-laying equipment; layouts of formwork and implementation of concrete curing; calculation of calendar plans and the need for building materials. However, the above calculations are performed in the traditional way, meeting the requirements of RUE, RP and the department.

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.