MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN

Satbayev University

Institute of Architecture and civil engineering named after T. Basenov

Department of Civil engineering and building materials

Muterahman Inami

« School-gymnasium with the use of ABS concreting in fixed formwork in Taraz »

To the diploma project
EXPLANATORY NOTE

Specialty 5B072900 – Civil Engineering

Almaty 2021

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ALLOWED TO PROTECT
Head of Department
Master of technical science,
lecturer
_________N.V. Kozyukova
«__»_______2021 yr.

EXPLANATORY NOTE
to the diploma project

On the theme of « School-gymnasium with the use of ABS concreting in fixed formwork in Taraz »

5B072900 - "Civil Engeneering"

Prepared by Muterahman Inami

Scientific adviser Z.M. Zhambakina
Candidate of technical science,
Assistant-professor
«_____»___2021 yr.

Almaty 2021

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Specialty 5B072900 – Civil Engineering

I APPROVE
Head of Department
________N.V. Kozyukova
Master of technical science, lecturer
«___»_______20__ yr.

ASSIGNMENT
Complete a diploma project

Student: Muterahman Inami
Topic: «School-gymnasium with the use of ABS concreting in fixed formwork in Taraz»
Approved by the Order of the Rector of the University No. 2131-b dated November 24, 2020.
The deadline for the completed work is May 10, 2020.
Initial data for the diploma project: construction area (Taraz)
Structural schemes of the building: the main building structure (Academic building) is made of monolithic reinforced concrete and its Gymnasium is made of trussed steel.
List of questions to be developed:
a) Architectural and analytical part: basic initial data, space-planning solutions, heat engineering calculation of enclosing structures (outer wall), lighting calculation, calculation of the foundation option and depth of laying, justification of energy efficiency measures;
b) Calculation and design part: calculation and design of a foundation and slab;
c) Organizational and technological part: development of technological maps, construction schedule and construction plan;
d) Economic part: local estimate, object estimate, summary estimate;
List of graphic material (with exact indication of required drawings):
1 Facade, standard floor plans, parts 1-1 and 2-2 - 4 sheets;
2 KZh columns, specifications - 1 sheet;
3 Technical maps of formworks, calendar plan, construction site plan - 4 sheets.
11 slides of work presentation are provided.

Recommended main literature:

1 SP RK 2.04-01-2017 "Construction climatology";

2 SN RK 2.04-04-2013 "Construction heat engineering", SN RK 2.03-30-2017 "Construction in seismic zones".

SCHEDULE
preparation of thesis (project)

Part	30%	60%	90%	100%	Note
Architectural and analytical	11.01.2021г.-14.02.2021г.				
Calculation and design		15.02.2021г.-23.03.2021г.			
Organizational and technological			24.03.2021г.-01.05.2021г.		
Economic				01.05.2021г.-09.05.2021г.	
Pre-defense	10.05.2021г.-14.05.2021г.				
Anti-plagiarism, norm control	17.05.2021г.-31.05.2021г				
Quality control	26.05.2021г.-31.05.2021г.				
Defense	01.06.2021г.-11.06.2021г.				

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

Name parts	Consultants, I.O.F. (academic degree, rank)	the date signing	Signature
Architectural and analytical	Z.D. Kalpenova Master of technical science, lecturer		
Calculation and design	A.P. Turganbayev Master of technical science, lecturer		
Organizational and technological	Z.D. Kalpenova Master of technical science, lecturer		
Economic	Z.D. Kalpenova Master of technical science, lecturer		
Norm controller	Bek A.A., Master of technical science, assistant		
Quality control	Kozyukova N.V., Master of technical science, lecturer		

Scientific adviser ___________ Kalpenova Z.D.

The task was accepted
for execution student ___________ Muterahman Inami

Date "___" ________ 2021 y.

АҢДАТПА

Дипломдық жұмыстың тақырыбы – «Тараз қаласындағы бекітілген қалыпта ABS бетонын қолданатын гимназия-мектеп». Жұмыс келесі бөлімдерден тұрады: сәулет-құрылыс, есептік-конструктивтік, құрылыс өндірісінің технологиясы мен ұйымдастырылуы, экономикалық, тіршілік қауіпсіздігі және еңбекті қорғау.

Осы жұмысты құру кезінде бағдарламалық кешендердің келесі тізімі пайдаланылды:

1 AutoCAD 2021;
2 Revit 2021;
3 LIRA-SAPR 2016
4 TUIN-MOTION.

АННОТАЦИЯ

Тема данной дипломной работы – «Гимназия-школа с применением АБС-бетона в несъемной опалубке в г. Тараз». Работа состоит из следующих разделов: архитектурно-строительный, расчетно конструктивный, технология и организация строительного производства, экономический, безопасность жизнедеятельности и охрана труда.

При создании данной работы был использован следующий перечень программных комплексов:

1 AutoCAD 2021;
2 Revit 2021;
3 LIRA-SAPR 2016
4 TUINMOTION.

ANNOTATION

The topic of this final thesis is “Gymnasium-school with the use of ABS concrete in fixed formworks in Taraz City” The work consists of the following sections: architectural and construction, design and construction, technology and organization of construction production, economic, life safety and labor protection.

For creation of the building, the following software programs are used:

1 AutoCAD 2021;
2 Revit 2021;
3 LIRA-SAPR 2016
4 TUINMOTION.

CONTENT

INTRODUCTION

A gymnasium School is a type of school with a strong burden on academic learning, and providing radical secondary education in some parts of Europe similar to British grammar schools, sixth form colleges and US preparative high schools. Nowadays, it typically states to secondary schools absorbed on preparing students to go into a university for advanced academic study. Prior to the 20th century, the system of gymnasiums was a common piece of educational systems throughout many countries of central, north, eastern, and southern Europe.

The word "γυμνάσιον" (gymnasion) was used for the very early time in Ancient Greece, in the sense of a place for both physical and academic education of fresh men.

Currently, much attention is paid to school construction in Kazakhstan. School education is the socio-economic basis of the state that is, literate and qualified youth is the future of every country.. That is why the number of school-age children in Kazakhstan is growing every year The need for secondary schools in new areas is also growing I want to. However, in order to fully address this issue in the country for a year At least 30 schools should be built each year. With this project, the design of technological processes and the organization of the district all feasibility studies in the construction of school buildings, the aesthetic must take into account other requirements; all the corresponding issues must be designed in advance. The construction of the school is due to the fact that the development of the city and the increasing population requires the construction of new schools for gifted children The project school for children with special needs in Taraz city is designed taking into account current requirements and the condition of the school's location on the territory. The planning decisions of the school building are made taking into account technological and functional connections training sections general group of premises, auxiliary premises. A set of training classes, classrooms, industrial training classes, facilities for sports, recreation, meals adopted in accordance with the requirements of school design standards and design assignments.

1 Architectural and analytical Parts

1.1 Natural, climatic and engineering-geological conditions

The characteristic features of the climate of this territory are: an abundance of sunlight and heat, continentally , hot, long summers, relatively cold with alternating thaws and cold snap winters, large annual and daily amplitudes of fluctuations in air temperature, air dryness and changes in climatic characteristics with the height of the terrain.

The average monthly temperature of the coldest month of the year of January is -10 centigrade degrees of frost, and the warmest of July is +32 centigrade degrees of heat. The average duration of the heating season is 190 days.

Atmospheric precipitation

The average amount of precipitation falling over the year is 330-370 mm.

Rainfall is unevenly dispersed over the seasons of the year; the greatest amount of precipitation falls in the warm season (May-September) - 238 mm. The average annual snow depth is 22 mm; the water supply in the snow is 67 mm. According to SNiP 2.01.07-85 . snow area by weight of snow cover - I.

Wind

The study area is characterized by frequent winds blowing mainly in the south-westerly direction. The average annual wind speed is 4m/s.

Soil freezing depth

The standard freezing depth according to SNiPu “Construction Climatology” is 205 cm. The average depth of permeation of “0” into the soil is 234 cm (the greatest penetration is usually in March).

By analogy with data from other regions, the possible penetration of zero into the depth, with little snow, can reach 350 cm in loams (SNiP RK 5.01-01-2002, SNiP RK 2.04-01-2010)

Air humidity

The smallest value of absolute humidity in January-February (1.6-1.7 m), the highest - in July (12.7 m).

The lowest relative humidity is in the summer months (40-45per cent), the highest in winter.

The average annual relative humidity is 86per cent. The highest moisture deficit is observed in June-July (12.2-12.4 m). Low in December-February (0.3-0.4 m). The average annual humidity is 4.8 m.

The planned building has three blocks in rectangular shapes connected together with over all dimensions 3600 $m^2\ area$. The height of the building is 16.35m.

Building class - II; the designated outdoor air temperature for the coldest five days (provided 0.92) -20 centigrade degrees

- duration of the heating period - 176 days;
- the average annual air temperature is plus 9.8 centigrade degrees;
- average temperature of the coldest month of the year - minus-5.3 ° C;

Geological features of the construction site are determined by engineering and geological surveys. The purpose of the search was to study the physical and mechanical properties of the soil on the basis of foundations.

According to the geological profile, the area has a quiet relief, three geomorphological layers of one genesis. Groundwater is located at a depth of more than 10 m

The basis of the foundations is loamy soil:

- soil density ρ = 1.72-1.73 t / m3
- specific coupling C = 25 kPa
- internal friction angle φ = 23 centigrade degrees
- Modulus of deformation E = 62 mPa
- design resistance - Ro = 600 kPa
- wind area - according to III (W = 38 kg / m2);
- snow area - II (S = 70 kg / m2);
- rated outdoor air temperature - 25 centigrade degrees
- soil category-II on seismic properties;
- Depth of soil compaction - 130 cm.
- Groundwater is at a depth of more than 5 m

The required orientation of the premises, the master plan for the development of industrial areas, taking into account landscaping and landscaping in accordance with the requirements of SN RK 3.02-07.2014 "Public buildings and structures" and SP RK 3.01-101-2013 "Urban planning. Improvement and gardening of the site provided by the project reduces the overall dust content and eliminates local sources of dust.

Table 1 - Technical and economic indicators of the master plan

Name	Unit	Quantity
Area		
- plot	м2	14600
- the designed building	м2	3600
- coatings	м2	2000
- landscaping	м2	9000

The area around the building is landscaped and landscaped. The building has hard surfaced access roads.

1.2 Constructive solution

The location of this projected building is in the city of Taraz, the settlement is an area subject to seismic impacts and is located in the middle of the city. It was decided to adopt a monolith structural scheme, that is, a monolith scheme with reinforced concrete beams and columns.

1.3 Thermal calculations

Thermal calculation of the outer wall is carried out in accordance with the current SP RK 2.04-01-2017 "Construction climatology", as well as SN RK 2.04-04-2013 "Construction heat engineering". The purpose of this calculation is to determine the thickness of the outer wall insulation material.

The value of the heating season degree days is calculated according to the following formula: [5, p. 32]:

$$GSOP = (t\text{v - op})\ z\text{op},$$

where tв = 22 °C - is the internal air temperature;

$t$op = 1.7 °C - average temperature with an average daily air temperature below or equal to 8 ° C;

op = 160 days - the duration of the period with the average daily air temperature below or equal to 8 ° C.

GSOP = (22 + 1.7) · 160 = 3792 °C · days.

Table 2 - Materials of the outer wall and its properties

Material name	Density γ0, kg / m	Thermal conductivity λ, W / m2 · °C	Layer thickness δ, m	Heat transfer resistance Rn = δ / λ, m2 · °C / W
Cement-sand mortar plaster	1700	0.75	0.03	0.04
Polyurethane foam	80	0.041		
Reinforced concrete	2500	1.92	0.2	0.1

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

R0тр = 2,275 м2 · °C/Вт.

The heat transfer resistance of the enclosing structure is determined by the formula 1.2 [5, p. 33]:

$$R_0 = \frac{1}{\alpha_B} + \frac{1}{\lambda_1} + \frac{1}{\lambda_2} + \frac{1}{\gamma_3} + \frac{1}{\lambda_4} + \frac{1}{\alpha_n}$$

$$R_0 = \frac{1}{8.7} + 0.04 + \frac{x}{0.041} + 0.1 + 0.04 + \frac{1}{23} = .0335 + \frac{x}{0.041}$$

$$x = 0.079m$$

We preliminarily accept the thickness of the insulation equal to 0.08 m.

Check the condition:

R0 ≥ R0тр,

R0 = 2,286 м2 · °C/Вт ≥ R0тр = 2,275 м2 · °C/Вт

The condition is met. The required value of the heat transfer resistance is less than the calculated one, which fully satisfies the conditions for the location of the building. The thickness of polyurethane foam can be taken equal to 80 mm.

The calculated final thickness of the outer wall is 340 mm. The calculations performed comply with all these rules and regulations.

2 Calculation and design part

2.1 Anti-seismic measures

Since that the location of the construction is the city of Taraz, anti-seismic measures are mandatory. This clearing has a seismicity of 8 points.

Due to the significant seismic impact, variable number of storeys and the complex, asymmetric shape of the building, several anti-seismic measures were taken. The building is divided 3 block sections. As the building is monolithic reinforced concrete, this will be an advantage in case of seismic impacts. There is a stiffness diaphragm in the vertical direction along the entire height of the building. All knots of crossbars and columns are rigid.

According to NTP RK 08-03-2012 "Design of earthquake-resistant buildings. Part. Monolithic Reinforced Concrete Buildings", the project considers all the requirements and rules to prevent seismic instability.

2.2 Calculation of dead loads

The calculation of loads on floors and walls are shown in Table B.1 in Appendix B.

- temporary load on slabs, balcony and stairs according to CH PK EN 1991-1-1:2002/2011, C1 => qk = 3кН/м2

- snow load (City. Taraz – 1 snow load, sk = 0.9 kПa)

$$S = \mu i \cdot Ce \cdot Ct \cdot sk$$

$$\mu i = 0.8,\ Ce = 1,\ Ct = 1$$

$$S = 0.8 \cdot 0.9 = 0.72\ \text{kПa}$$

- Wind load (City. Taraz – V wind region; wind velocity = 4м/с, wind pressure = 1кПа).

-

Примечание - Рекомендуется принимать в качестве базовой высоту здания.

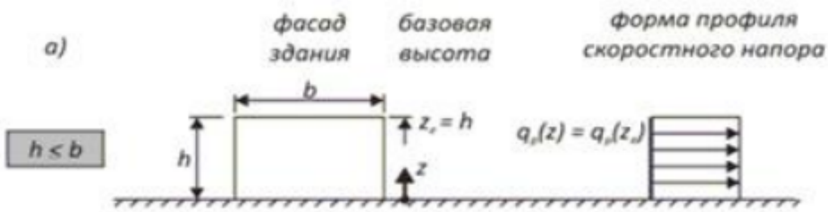

Figure 1 – Wind pressure

External pressure:

A

cpe =-1,2; ce(16.35)=1.7 we= -1,2 · 1000 · 1.7= -2040 Pa

B

cpe =-0,8; ce(16.35)=1.7 we= -0,8 · 1000 · 1.7= -1360 Pa

C

cpe =-0,5; ce(16.35)=1.7 we= -0,5 · 1000 · 1.7= -850 Pa

D

cpe = 0.7 ; ce(16.35)=1.7 we= -0,5 · 1000 · 1.7= -850 Pa

E

cpe = 1 ; ce(16.35)=1.7 we= -0,7 · 1000 · 1.7 = -1190 Pa

3 Internal pressure on wind directin (D): (cpi = 0,25)

1 Ze = 16.35m => *we* = 1.7 · 1000 · 0.25 = 425 Pa

4 Internal direction (A,B,C,) :

1 Ze = 16.35m => *we* = 2.1· 1000 · 0.25 = 525 Pa

2.3 Calculation of Slab

The moment for calculation of slab has taken from LIRA-SAPR software.

Table 3 - Moments on slab

Measurement units for forces: t
Measurement units for stresses: t/m**2
Measurement units for moments: t*m
Measurement units for distributed moments: (t*m)/m

DCL No.	ELEM t...	ELEM	NX, t/m...	NY, t/m...	TXY, t/...	MX, (t*...	MY, (t*...	MXY, (t...	QX, t/m	QY, t/m
20 - DCL42	44	49971	-111.68	-37.513	-10.001	1.2020	2.1258	-.01998	.00074	-.49208
21 - DCL43	44	49971	-84.448	-41.598	-5.5150	1.2155	2.1297	-.01723	.01792	-.46749
22 - DCL44	44	49971	60.928	-60.143	28.452	1.2470	2.1450	-.00328	.07429	-.40909
1 - DCL1	44	49972	-130.37	-78.047	2.0068	2.2895	4.1785	.08134	.03593	.44374
2 - DCL2	44	49972	-114.81	-68.604	1.8726	1.9874	3.6108	.07034	.03012	.38361
3 - DCL3	44	49972	-107.73	-64.173	1.7563	1.8480	3.3510	.06509	.02712	.35482
4 - DCL4	44	49972	-124.78	-74.444	1.8744	2.1778	3.9720	.07701	.03328	.41991
5 - DCL5	44	49972	-117.84	-70.502	1.9224	2.0472	3.7221	.07259	.03141	.39595
6 - DCL6	44	49972	-99.860	-59.843	1.8698	1.7018	3.0689	.06034	.02539	.32916
7 - DCL7	44	49972	-107.73	-64.173	1.7563	1.8480	3.3510	.06509	.02712	.35482
8 - DCL8	44	49972	-99.860	-59.843	1.8698	1.7018	3.0689	.06034	.02539	.32916
9 - DCL24	44	49972	-194.16	-29.116	-22.612	1.1595	2.1170	.02975	-.04123	.16213
10 - DCL25	44	49972	-189.66	-29.899	-18.880	1.1750	2.1570	.03045	-.04487	.16103
11 - DCL26	44	49972	64.719	-57.052	29.491	1.2521	2.2333	.05678	.07686	.29876
12 - DCL27	44	49972	-58.695	-43.857	5.5473	1.2144	2.1953	.04423	.01819	.23017
13 - DCL28	44	49972	-195.17	-29.749	-22.595	1.1794	2.1541	.03050	-.04080	.16624
14 - DCL29	44	49972	-208.24	-28.838	-26.794	1.1820	2.1510	.02933	-.04112	.17091
15 - DCL30	44	49972	-106.17	-39.169	-4.9947	1.2052	2.1814	.03952	.00033	.21332
16 - DCL31	44	49972	-101.23	-39.748	-5.3503	1.2075	2.1811	.04051	.00465	.21480
17 - DCL32	44	49972	-85.643	-40.989	.61330	1.2063	2.1876	.04135	.00513	.21629
18 - DCL33	44	49972	-98.710	-40.077	-3.5853	1.2090	2.1844	.04017	.00482	.22095
19 - DCL41	44	49972	-108.43	-38.940	-5.1400	1.2047	2.1813	.03915	-.00098	.21316
20 - DCL42	44	49972	-112.91	-38.652	-6.7710	1.2060	2.1800	.03881	-.00066	.21508

Element type-44 and element number 49971, Level +10.05m

Rectangular slab with the dimensions of; b =1000mm, h = 150mm; c_1= 30mm; concrete normal class C20/25 (fck =20MPa, Yc = 1.5, fcd = acc • fck/ Yc

= 0.85• 20/1.5 = 11.3MPa, acc = 0.85) rebar class S500 (fyk = 500Mpa, fyd = fyk/ys = 500/1.15 = 435MPa).

MEd = My = 2.14т ·м = 21.40 кН · м

d = 150-30 = 120 mm

$$Kd = \frac{d}{\sqrt{MEd/b}} \quad (1)$$

$$Kd = \frac{12}{\sqrt{21.4/1}} = 4.6$$

Due to table. B.3. appendix B for normal cement ≤ C50/60 → Ks = 2,42.

$$As = Ks \cdot \frac{MEd}{d} \quad (2)$$

$$As = 2.42 \cdot \frac{21,4}{12} = 4.31 \text{ см}^2$$

The accepted rebar is 5Ø14 S500 (As = 6 см^2)

2.4 Calculation of Foundation

Determination of the depth and sizes of the foundation

The depth of freezing;

We could Estimated depth of soil freezing: according to the formula

$$d_f = k_n \cdot d_{fn} = 0.4 \cdot 1.34 = 0.536м$$

where the coefficient $k_h = 0.4$ is the coefficient of influence of the thermal regime of the building on its freezing.

$$d_{fn} = d_0\sqrt{M_1} = 0.3\sqrt{20} = 1.34.м$$

- Constructive depth of the foundation

$$d_ф = (h_{под} + \delta_{пол} + \delta_{п.ф}) - h_1$$

$$d_ф = (2.2 + 0.2 + 1.8) - 0.8 = 3.4м$$

- Taking into account the geological conditions, the depth of embedding is assumed to be 3 m (bearing on a more powerful soil at 0.5 m).

Definition of the preliminary sizes of a sole of the base.

$$N_n = \frac{N}{\gamma_f} \quad (3)$$

$$Nn = \frac{3227.8}{1.35} = 2391 \text{ Кн}$$

$$A = \frac{N_n}{R - \gamma_m d} \quad (4)$$

$$A = \frac{2391}{0.25 - 2*10^{-5}*138} = 39400\ cm^2$$

Calculation of reinforcement:

$$\alpha_{Eds} = \frac{M_{Ed}}{f_{cd} b d^2} \leq \alpha_{Eds,lim} \quad (5)$$

where b – the size of the lone of the foundation;

d – the bristly height of the foundation;

f_{cd} –confrontation of concrete to axial compression;

M_{Ed} – moment of the foundation.

$$M_{Ed} = N_{Ed}(\frac{b}{8})(1 - \frac{c}{b}) = 3227.8\left(\frac{3.5}{8}\right)\left(1 - \frac{0.4}{3.5}\right) = 1421\ кN\ м,$$

$$d = h - c_1 = 120 - 5 = 115\ см$$

According to table B.1. Appendix B from [3] for normal concrete

α_{Eds}= 0.015 and $\sigma_{sd} = f_{yd}$ = 347.8 Мпа, ω = 0.015.

Required area of main rebar according to the formula of 5.5 [3]:

$$A_{st} = \frac{1}{\sigma_{sd}} (\omega \cdot b \cdot d \cdot f_{cd} + N_{Ed}) \quad (6)$$

$$A_{st} = \frac{1}{347.8} (0.015.3500.520.14.2 + 3227.8) = 21.4MM^2$$

We choose 10 Ø 16 S400 (A_s = 23.32 см^2)

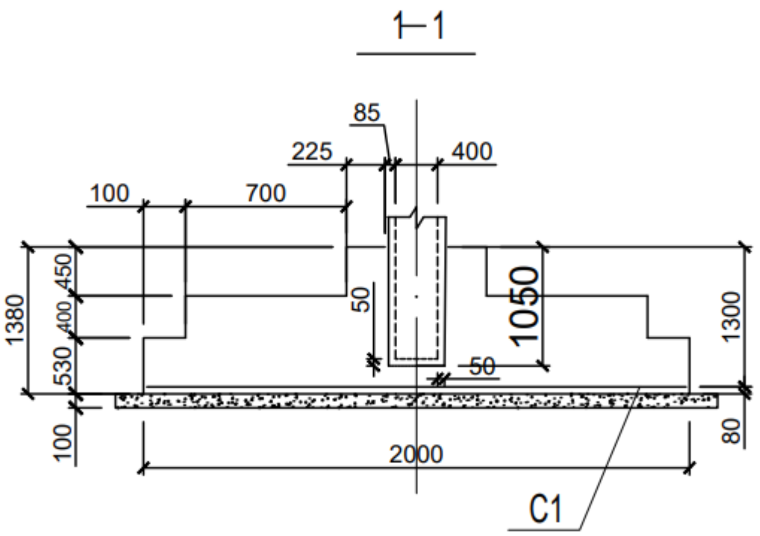

Figure 2 – Section of foundation

2.3 Determination of pressure at the base of the foundation

Determination of average pressure at the base of the foundation.

$$P_{11} = \frac{N + G_f + G_g}{A} = \frac{550 + 128{,}14 + 40{,}04}{3{,}39} = 211{,}28\kappa H\,,$$

$$G_f = V \cdot \gamma_b = (3{,}39 \cdot 1.8 \cdot 1) \cdot 21 = 128{,}14\kappa H$$

$$G_g = V \cdot \gamma_g = (1{,}495 \cdot 1.4 \cdot 1)19{,}13 = 40{,}04\kappa H$$

Determination of boundary pressures at the base of the foundation.

$$W = \frac{l \cdot b^2}{6} = \frac{3{,}39 \cdot 1}{6} = 0{,}565$$

Check conditions:

$$P_{11} \le R = 211{,}28 > 168.28$$

$$P_{\max} \le 1{,}2R = 288{,}05 > 1.2 \cdot 168{,}28 = 201{,}936$$

$$P_{\min} \ge 0$$

3 Organizational and technological part

3.1 Removal of top soil

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

During trench excavation, removal of the top soil to be implemented at th

$$S_1 = (10 + l_1 s.t + 10) \cdot (10 + l_2 s.t + 10), (m^2) \quad (7)$$

where, l_{1st}– the trench length at the top, m (determined per the scheme); l_{2st}– the trench width at the top, m. (determined per the scheme);

$l1s.t$ =$l1s.b$+2mh

$l2s.t$=$l2s.b$+2mh

$l1s.t$ =98+2 x 1.06 x 6.9=114.23

$l2s.t$=69+2 x 1.06 x 6.9=54.23

$l1s.b$ – the pit length at the bottom;

$l2s.b$ – the pit width at the bottom

$l1s.b$= $l1$+(1,3x2), m

$l2s.b$=$l2$+(1,3x2), m

$l1s.b$= 97+(1,3x2)=99.6

$l2s.b$=37+(1,3x2)=39.6

m– slope steepness factor;

h–formation level (the height of the pit (trench)) per the task, m;

1,3m– distance between the axis and slope bottom, destined for a person access to the structure;

$l1$,$l2$– length and width of the structure in plan, respectively (per the task), m.

$$S_1 = (10 + 114.23 + 10) * (10 + 54.23 + 10) = 7681.98\, m^2$$

3.2 Excavation of soil shortage

Calculation of the trench volume (V_{tr}) is carried out on the basis of longitudinal profiles and cross–sections of the separate sections. The volume of each trench section can be determined by the formula:

$$V_{tr} = \sum L_1 \cdot F_a \quad (8)$$

where L_1 – full length of the trench per the scheme, m; F_a– the average cross–sectional area of the trench,m^2;

$$F_a = \frac{(L_{2s.b} + L_{2s.t}) h_{tr}}{2} \quad (9)$$

m–slope factor (annex №1 table.2); h_{tr}–depth of trench, per the task, m;

$$L_{2s.b} = L_2 + (0.8 \cdot 2)m \tag{10}$$

where, L_2–width of the base is equal 1,6 m; 1,3 m– distance between the structure edge and slope bottom, destined for a person access to the structure (0,3÷1 m).

$$L_{2s.t}=L_{2s.b} + 2\mathrm{m}h_{tr} \tag{11}$$

$$L_{2s.b} = L_2 + (0.8 \cdot 2)m = 3.2m$$
$$L_{2s.t} = 5.88$$
$$F_a = \frac{(3.2 + 5.88)2}{2} = 41,22$$
$$V_{tr} = 288 \cdot 41.22 = 11871,36$$

3.3 The volume of soil shortage is calculated by the formula (for the pit and the trench):

Vshortage=Fp ·Δhsh, (m^3)

Vshortage= 3944,16·0.2=788.83 m^3)

where, $Fp(tr)$ – area of the pit (trench) bottom:

Fp =$l1s.b.$·$l2s.b.$=99.6·39.6=3944,16

Δhsh – 0,05÷0,2 – quantity of soil shortage level during excavation, m.

3.4 Soil compaction

Compaction volume is measured mainly by the area of compaction that can be found, given by the average value of the compacted layer thickness (for the pit and the trench)

$$V_{comp} = \frac{V_{bf}}{h_c}, m^2 \tag{12}$$

V_{bf} – $backfilling\ volume, m^3$; h_c– $compacted\ layer\ thickness$, 0,2 ÷ 0,4 m.

$$V_{comp} = \frac{V_{bf}}{h_c}, m^2 \rightarrow = \frac{1108,04m^3}{0.3m} = 3693.45m^2$$

3.5 Removal of temporary fencing

After finishing the construction work necessary to remove the construction temporary fencing, fencing perimeter determined by the formula (for the pit and the trench)

$$P_{fen} = (20 + l1) \cdot 2 + (20 + l2) \cdot 2, (m) \qquad (13)$$

where, l_1,l_2– length and width of the structure in plan, respectively (per the task), m.

$$P_{fen} = (20 + 97) \cdot 2 + (20 + 37) \cdot 2, (m) = 348m$$

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

3.6 Selection of mechanisms for soil compaction

Soil compaction work in the pits are implemented in two steps: I – soil compaction between the columns foundations; II – over the columns foundations. Depending on the lack of space of works performance conditions, can be used: -motor rollers with smooth rolls – for cohesive soil; -vibrio roller– for non–cohesive soils;

-hydraulic–mechanical vibratory compactors – for all soils;

-electrical self–moving vibrating rammer – for non–cohesive and lowly cohesive soils; -electrical rammer – for cohesive and non–cohesive soils.

Shift operating performance of rollers is calculated by the formula:

$$P_{sh.o} = \frac{(B-b) \cdot V \cdot 1000 \cdot h \cdot T}{m} 0.85 \qquad (14)$$

where, B– width of compaction line (annex. №1. table. 4); b – width of overlap of adjacent lines (0,1–0,2 m); v – average speed (4–6 km / h);

h – width of the condensed layer, m (annex. №1. table. 4); m– required number of blows or passes (8…10). The composition of the machines included in the set to be determined by estimated (operational performance) and selected on the basis of the requirement for mechanization of all processes in the volume of works, the usage of a minimum number of machines in the set, compliance with the specified flows of excavation in shift.

$$P_{sh.o} \frac{(5.20-0.18) \cdot 5 \cdot \frac{1000}{3600} \cdot 1000 \cdot 520 \cdot 1}{9} 0.85 = 51362$$

Rammer D-471V selected with the following characteristics:

Tractor carrier: T–130

Power, kW: 118

Mass, t: 6,5

Depth of the condensed layer, m: 1,2

Width of the condensed layer, m: 2,5
Dimensions: length x width x height, m: 5,0x2,5x3,0
Productivity, m3/h: 115
Measures for water drainage and artificial lowering of groundwater

During implementation of zero cycle construction works it is necessary that the bottom of the pit (trench) was cleaned from groundwater. For this purpose, is used an open drainage, artificial lowering of groundwater levels and other ways. The choice of method for groundwater control depends on the nature of the soil and excavation depth. Recommendations for choose of drainage and dewatering systems depends on the soil type that can be accepted from [2]. Open drainage is produced by pumping units, while entering the pit (trench) water is collected in areaway (shaft bottom sump), from there it is swap out by pump in the open or underground drains.

With an open dewatering can be assumed that 1 м2 of pit (trench) surface and vertical projections of the walls, locations below the static groundwater level, the water flow is:

with fine–grained sands 0,16; -with medium–grained sands 0,24; -with coarse sands 0,3–3,0;

with fracture rock material 0,15– 0,5m3/h.

Water inflow into the pit (trench) in m3/h can be calculated by the formula:

$$Q = (F_{a.b(\,tr)} + F_{sl}) \cdot \alpha \tag{15}$$

where $F_{a.b(\,tr)}$area of a bottom, pit (trench), $m3$

$Fsl.$ – slope area, located below the groundwater level, $m2$

α – water inflow from 1$m2$, 0,16 – 0,5$m3$/h.;

$$F_{a.b(tr)} = L \cdot l2s.b \tag{16}$$

$$F_{sl}. = \left(h_{tr} - h_{gwl}\right) \cdot L \tag{17}$$

where hp,htr– pit or trench depth (per the task); $hgwl$ – level of underground water, m (per the task;

L– trench length;

$$F_{a.b(tr)} = 70 \cdot 73.6 \cdot 1.45 = 7470.4$$

$$F_{sl}. = (2 - 1) = 1$$

$$\text{P}p\ -\ perimeter\ of\ the\ pit\ (l1 + l2) \cdot 2\ ; = 140 \cdot 2 = 280$$

$$Q = (7470.4 + 1)2 = 14940.8$$

The number of pumps required for water pumping:

$$N = \frac{Q \cdot Sf}{Pn} \tag{18}$$

where, Sf– assurance coefficient, to be taken to be equal to 1,1–1,2; Pn– hour pump capacity, (annex. №1. tab.8) $m3$/h.

$$N = \frac{14940.8 \cdot 1.1}{52.6} = 284.045$$

With a significant inflow of groundwater (in soils with a filtration ratio of 2 to 40 m /day.), it is recommended to use a method of artificial lowering of groundwater using well point systems, which are located along the outer perimeter of the earthworks at a distance from the pit (trench) slope edge 0,5–1m.

Water inflow to the closed installations for pits is calculated by the formula:

$$Q = \alpha \cdot C \cdot S = 1 \cdot 12 \cdot 2 = 24 \tag{19}$$

where, Q – water inflow, $\frac{m^3}{h}$; α– factor varying from 1 to 3m;

C– filtration coefficient (for clay – 0,005; loam – 0,005–0,4; sandy loams – 0,2–0,7; sand small – 1–10; average sand – 10–25; coarse sand – 25–75; gravel – 75–1000 m/days);

S– depth of required lowering of the water level (per the task);

$$Q = 1 \cdot 12 \cdot 2 = 24$$

The water–removing self–soaking–up pumps: S–203 with the following characteristics:

Productivity, m3/h: 24
The pressure created by the pump KPa: 90
Absorption height (greatest), m: 9
Diameter of absorption of a hose, mm: 50
Diameter of absorption of a hose, mm: 50

3.7 Selection of vehicles for the construction of excavations and trenches

As a set of equipment for haulage of extra soil out of pit (trench) and ensuring of joint work with excavator to be chosen dump trucks. Dump trucks are selected by two parameters: the capacity of the body and carrying capacity. Carrying capacity and brand of dump truck are shown in (Annex №1. table 12).

The solid soil volume in excavator bucket is determined:

$$V_{soil} = \frac{V_{buck} \cdot c_f}{C_{fr}} \tag{20}$$

where, V_{buck}–accepted volume of excavator bucket, $m3$; c_f–bucket filling factor: for front shovel from 1 to 1,25; the backhoe – from 0,8 to 1; C_{fr}– Initial increase soil volume later developments (annex. №1.tab.1).

$$V_{soil} = \frac{0.4 \cdot 1.21}{0.8} = 0.605$$

The soil volume in excavator bucket is determined:

$$n = \frac{P}{Q} \tag{21}$$

where, P– truck carrying capacity (annex. №1. tab.12,14).

$$n = \frac{40}{1391.5} = maz = 0.02874$$

The solid soil volume in excavator bucket, loaded into dump truck body is determined:

$$V = V_{soil} \cdot n. = 2300 \cdot 1 = 2300$$

The duration of one work cycle of the truck is calculated

$$T_c = t_1 + \frac{60L}{v_r} + t_p + \frac{60L}{V_n} + t_m \tag{22}$$

where, t_1– time of soil loading (min.) determined by a formula:

$$t_1 = \frac{v \cdot N_{tm} \cdot 60}{100} = \frac{2300 \cdot 23.3 \cdot 60}{100} = 32154$$

where, N_{tm} – standard of machine time per the ENiR (annex. №1 tab.22); *L*– distance of ground transportation, (km); *V r*– average speed of loaded truck (annex. №1 tab.16.1);

V n– average speed of empty truck (annex. №1 tab.16.1); *tp*– defrocking time (annex. №1 tab.16); *tm*– duration of auxiliary operations (installation time for loading, unloading, expectation at the excavator, admission of the oncoming dump truck), min, (annex №1. table 16).

$$T_c = 32154 + \frac{60 \cdot 2000}{25} + 1.83 + \frac{60 \cdot 2000}{6.3} = 56003.44$$

Required number of trucks:

$$N = \frac{T_c}{t_1} = \frac{56003.44}{32154} = 1.74$$

The number N is rounded to the nearest smallest integer number, including the over–fulfilment of the shift tasks during excavator work.

The dump truck GAZ — 52 was selected with the following characteristics:
Characteristic: Dump truck Onboard
Loading capacity, t: 2,5

3.8 Selection of the assembly crane

As an initial data in cranes selection serves the dimensions of pit for foundations and the basement of the structure, dimensions and weight of mounted structures.

In the cranes selection for installation of column foundations need to be used self–propelled jib cranes.

Cranes selected by the technical parameters: load capacity, hook lifting height, working radius and the largest load moment.

When taking into account the basic parameters of cranes (lifting capacity, working radius, lifting height) is also to be considered modifications of crane base models with interchangeable equipment: jib and tower–jib, various jibs, platforms, etc.

Crane hook radius Lcr, m, is calculated by the formula:

$$Lcr=l1+l2+l3, \quad (23)$$

where Lcr– mounting radius

$l1$ – the distance from the pivot axis to the mount joint of crane boom (3÷3,5), m;

$l2$ – the smallest admissible distance from the slope basis to the closest support of the crane (portable, wheel, caterpillar), for tower cranes – to a sleeper design at not bulk soil (annex.1, tab. 17);

$l3$ – the distance the structure outer surface or its protruding part crane hook axis, to be taken as equal to the half of the structure width $l2/2$.

$$Lcr=l1+l2+l3=3+3+24=30$$

The required lifting capacity G is determined the same as for column–jib and rail jib cranes.

Required working radius is determined graphically. For cranes without jib (figure 5) boom axis is lined through two points: A1– located at the height Hп+1,5 m (where 1.5 m – minimum height from the hook to the boom head), and B providing a safe gap between the boom and the closest to the boom point D a part of the building (taken from 0.5 to 1.5 m, depending on the length of the boom). The axis of the boom is drawn by line N – N, located at the level of its mounting joint (for jib cranes can be taken 1.5 m from the crane datum level – CDL – with subsequent adjustment). At the same time, seeking to provide the minimum radius and boom length, to be implemented lineup through the point B and the vertical axis of the load.

Position of the boom A1M1 is as desired. Then, lineup to the left from the point M1 distance $l1$, can be received the position of the crane rotation axis.

For cranes that use the jib, the construction is similar.

Location of jib cranes on the edge of the pit or trench slope is determined by taking into account the type of soil and the depth of the pit (trench). This should take into account features of the crane support (figure 15).

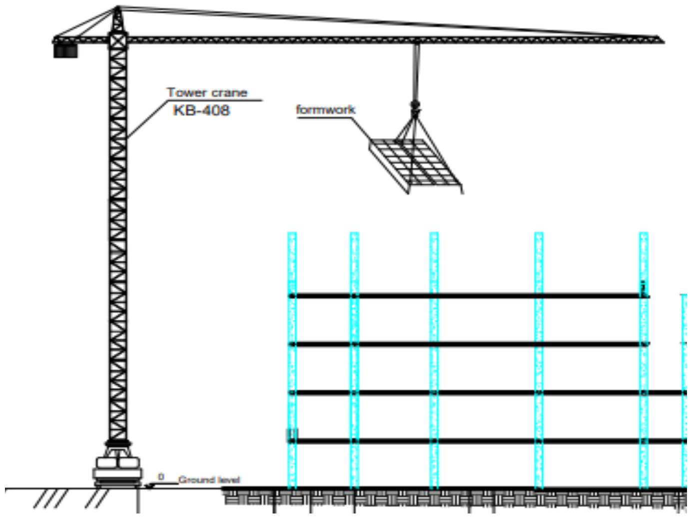

Figure 4 – Tower crane

The KB-408 crane with the following characteristics was selected:

Loading capacity, t: 50

Departure, m: 6…34

Height of rise, m: 30

Inventory settlement cost of K1, thousand u: 69,7

Cost value machine change C (mach–change.u.e.): 53,44

Set of machines and equipment for concrete works

The number of machines and vehicles included in the set must provide the required intensity of the concrete work. Hours or shift intensity of concrete mix laying can be given by the head of the Course Project. If neither the intensity nor the duration of the concrete works are not set, then as the intensity of the concrete should be accepted a performance of leading concrete paver. The operational performance of the crane for the supply of concrete in bins is determined from the condition of performing by the crane an 8 – 10 cycles per hour.

To installation of the formwork and reinforcement, feeding of concrete mix into the bins to be used self–propelled jib cranes – automobile, at a special chassis of motor type, pneumatic and caterpillar–mounted. When choosing a brand, it is necessary to state the required crane cargo characteristics – capacity, radius and hook height.

The required load capacity of the crane is the heaviest weight of the lifted load (formwork block–form, reinforcing mesh or frame, bin with concrete mix). Weight of bin with concrete mix M:

$$M = Me + E \cdot \gamma dc, t, \quad (24)$$

where, Me – mass of the empty bunker, (annex.1 , tab. 18) t; E – hopper capacity, (annex.1 , tab. 18) $m3$; γdc – 2,4 t/$m3$ – density of concrete mix.

$$M = 380 + 2.5 \cdot 2.4 = 2280$$

Features of rotated bins and not rotated bins for feeding the concrete mix by valves are given in (annex №1. tab. 18).

The required radius and height of crane hook lifting is determined graphically through the drawn works schemes on a scale.

Selection of crane brand is made by comparing the required parameters of the crane with cargo characteristics of self–propelled jib cranes. Generally, to perform formwork and reinforcement works, supply concrete mix is used one crane.

Choosing a concrete pump as a paving machine, should take into account the relative placement of the concrete pump and concreted foundations – the desired range. Specifications for the concrete truck are given in (annex №1 tab. 19). The RVM 42 concrete pump with the following characteristics was selected:

Technical productivity, $m3$/h: 90

Quantity of sections of an arrow, piece: 4

Inner diameter of a concrete delivery, mm: 125

The greatest range of giving of a concrete mixture: 38,05

(Basic car: MV 3328)

The car sizes in transport situation, m

Length: 12,9

Width: 2,48

Heigh: 3,93

For transportation of concrete mix should select the brand of mixer truck (annex №1 tab. 20). The amount of concrete mix, hauled in mixer trucks must comply with concreting intensity.

With a relatively low intensity of concreting by the crane to be adopted a mixer truck 4 to 5, m during the concreting by concrete pump – 5 to 7, m.

3.9 Calculation of formwork Types of System Formwork

Footing Forms – Formworks for Foundation

The essential part for any concrete work starts with the building of foundation. Foundation would be for columns or walls. So, founded on kind of structural member, the shape and size of footing are designed. Consequently, formwork size and shape is determined by the type and dimension of the footing.

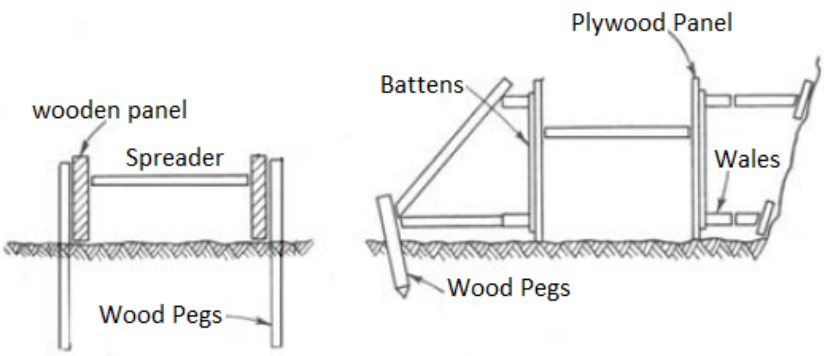

Figure 5 - Formwork of footing

Size of footing= 350x350x60cm

Volume of footing = 7.3m^3

For formwork we have; 1.85cm thickness and the mass of formwork is 30.62 kg

Size of formwork for footing=151.85x151.85x61.85

Area of formwork=151.85x151.85=2.3m^2

Volume of formwork=1.42m^3

For formwork of every kind of construction structure elements the above number or value of formwork is not enough because we also need small pieces of wood (timber) for connecting and stability of large pieces. We shall multiply 1.05 as coefficient to increase the value of formwork.

Area of formwork=2.3 m^2 x1.05=2.415m^2

Weight of plywood is taken from table where the weight of 2.9768$m^2$is 30,62kg in metric system for 1.55m^2 plywood we have the following calculation

2.9768X=30.62x2.415

Amount of plywood=24.84kg

Table 4 - Specification of formwork

item	Shield type	Sizes cm		Weight kg	Number of shield m^2
footing	Hardwood rectangular	151.85	151.85	24.84kg	2.415m^2

Column Forms – Formwork for Concrete Column Construction

Reinforced concrete column systems are exposed to horizontal pressure because of their small cross section, large heights and fairly high amounts of concrete placement..For calculation of formwork of columns and footing we shall consider the following table.

Table 5 - Specification of monolithic reinforced concrete columns on the standard floor

Item name	Concrete grade	Size without opening			Element volume	Opining dimension			Opening volume	Number of item per floor	Concrete volume	
		L	w	H		L	W	H			One element	
column	B25	0.8	0.4	3	0.96					55	0.96	28.8

Note: Approximate metric weight of 1220mm x 2440mm sheets of various types and thicknesses of plywood measured in kilograms.

Calculation

The thickness of plywood shelters are 1.85cm, type of wood structure is hardwood

Sizes=81.85x41.85x310cm
Volume=1.06m^3
Weight=6.26x1.05=6.58kg

Table 5 - Specification of formwork

Item No#2	Shield type	Sizes cm		Weight kg	Number of shield
Monolithic column	hard wood	80	40	6.5837	4 where the weight of each shield=1.64kg

Formwork for construction of RCC Slabs

Formwork used for reinforced concrete slabs rest on on the kind of slabs to be built.

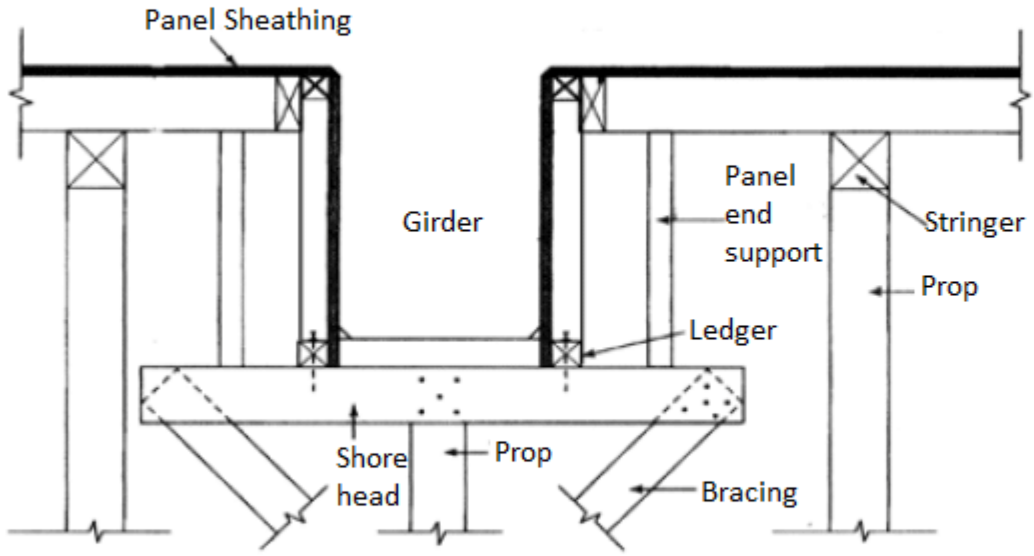

Figure 6 - formwork of slab

Calculation

Amount or plat of monolithic concrete slab= 30

Sizes of monolithic concrete slab=7mx7mx0.15m

Area of monolith concrete slab=49m^2

Volume of monolithic concrete slab= 7.35m^3

For formwork of monolithic concrete slab we have the following calculation

In the following sizes of slab we should add the sizes of dropped or heading beam where the thickness of heading beams are more than slab I will accept as a 50cm for each beam

Sizes of formwork for monolithic concrete slab=9.185x9.185x0.445

Sizes of formwork for monolithic concrete slab with beam=7.2 x7.2x0.50m

Volume of formwork=25.9m^3

Area of formwork=51.8m^2

Weight of formwork=393.025kg

Table 6 - Specification of formwork

Item No#2	Shield type	Sizes cm		Weight kg	Number of shield
Monolithic concrete slab	hard wood	7.2	7.2	350.4kg	55 shield

3.10 Preparation of work schedule

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

The duration of the mechanized processes is determined by:

$$Pm = Nm.sh / n \cdot A \tag{25}$$

where, N(m.sh) – required number of machine–shift;

n – number of machines;

A – number of shifts per day.

Determination of the required number of machine shifts

$$N_{MC} = \frac{Q}{\pi} \tag{26}$$

Where Q is the amount of work to be performed on this operation, ha;

$П_{cM}$ – changeable productivity of the unit, ha / shift.

Removal of top soil

$$Pm = -368/1.2.18662.4 = 1 \text{ day}$$

Soil excavation in the trench and trench access to the pit

$$Pm = 87.86/1.2.200 = 2 \text{ days}$$

Backfilling

$$Pm = 2179.68/2.2.200 = 3 \text{ days}$$

Soil compaction

$$Pm = 7265/2.2.115 = 5 \text{ days}$$

Final land planning

$$Pm = 1540/2.2.200 = 2 \text{ days}$$

Duration of manual processes is determined by:

$$Pp = \frac{Q}{n} \cdot A \tag{27}$$

where, Q–labor costs (table 10), (human –day);

n– number of workers per shift.

The construction of temporary fencing

$$Pр=\frac{441.6}{2.10}=2 \text{ days}$$

Soil excavation in the trench and trench access to the pit

$$Pр=\frac{246.01}{2.5}=2 \text{ days}$$

Excavation of soil underrun

$$Pр=\frac{19469.03}{2.20}=15 \text{ days}$$

Final land planning

$$Pр=\frac{508.2}{2.10}=3 \text{ days}$$

Removal of temporary fencing

$$Pр=\frac{331.2}{2.10}=2 \text{ days}$$

3.11 Temporary buildings on the construction site

The total number of personnel employed in a shift in construction:

$$R = \frac{(\text{RCM} + RITR + RMOS)}{1.06} = \frac{(46+5+3)}{1.06} = 51$$

where RCM = 46 people is the maximum number of employees in the shift is determined according to the schedule of movement of labor;

RITR - the number of engineering and technical personnel equal to 0.06 · RMAX = 5 people;

RMOS - the number of KSK and security, equal to 0.03 R · MAX = 3 people;

RMAX = 71 people - the maximum number of employees is determined according to the timetable for the movement of the labor force; 1.06 is a coefficient that takes into account not going to work.

4 Analysis of building in structural program LIRA-SAPR

First, we determine our structural materials and loads effecting on the building.

Table 7 – Stiffness for structure elements

Stif.type	Name	Parameters
1	Rect. bar 40 X 40	Ro=2.5,E=2.75e+006,GF=0
		B=40,H=40
2	Rect. bar 35 X 45	Ro=2.5,E=2.75e+006,GF=0
		B=35,H=45
3	Rect. bar 40 X 70	Ro=2.5,E=2.75e+006,GF=0
		B=40,H=70
4	Plate H 15	E=2.75e+006,V=0.2,H=15,Ro=2.5
5	Plate H 12	E=2.75e+006,V=0.2,H=12,Ro=2.5
6	Numerical for FE 10	q=0
		EF=1e+006,EIy=1e+006
		EIz=1e+006,GIk=0
		Y1=57.7,Y2=57.7,Z1=57.7,Z2=57.7,RU_Y=0,RU_Z=0

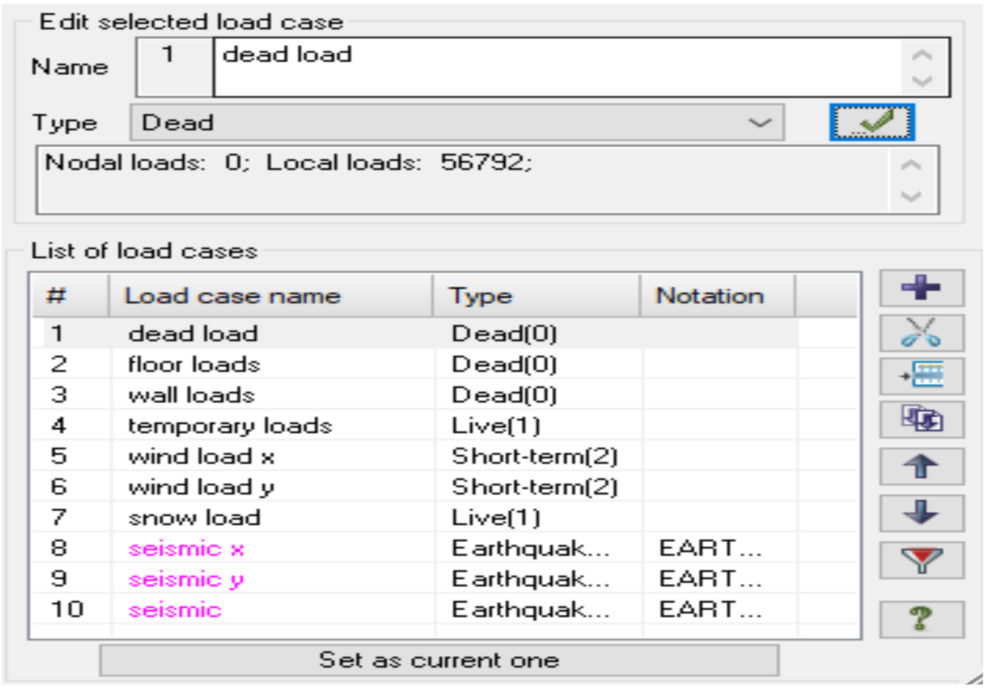

Figure 7 - Defined loads

First, the limiting deformations of the elements are checked. Let us start at the bottom. A characteristic combination is used for sediment analysis.

Base z displacement plot

4.1 Foundation deformation

According to SP RK 5.01-102-2013-basics. The ultimate deformation for our building type is a school with a full reinforced concrete frame, the maximum draft is GXYZ, 10 cm. According to the displacement diagram, the maximum draft in our building is less then 1 cm, it is being tested.

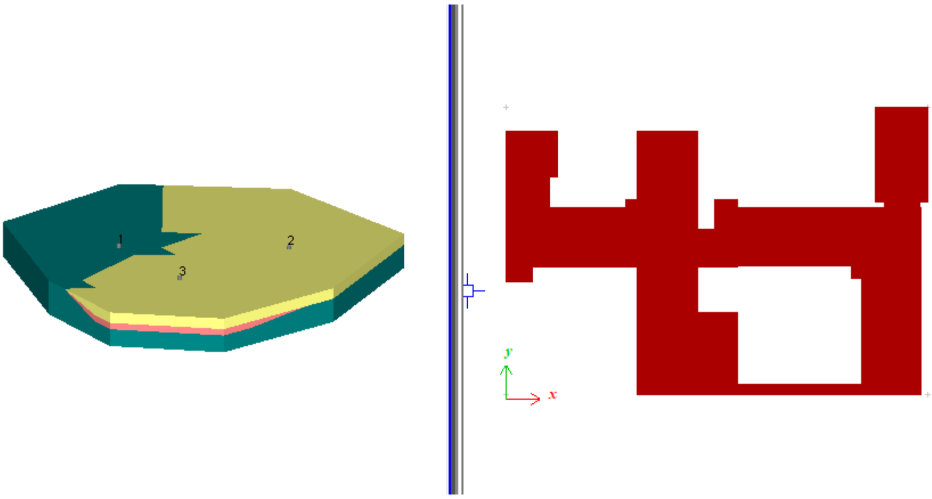

Figure 8 – Soil model

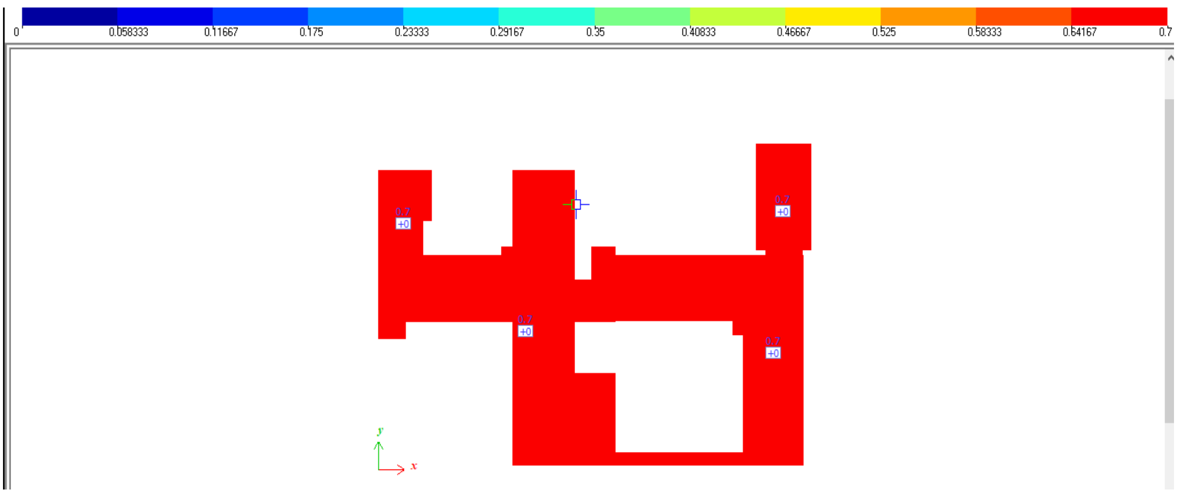

Figure 9 – Foundation deformation

4.2 Slab and beam displacement

According to (SN RK EN 1992-1-1) the maximum bending is L/250, which the chosen span is 11m and the largest span.

L/250

11000250 = 44mm

10.3mm (conditions met)

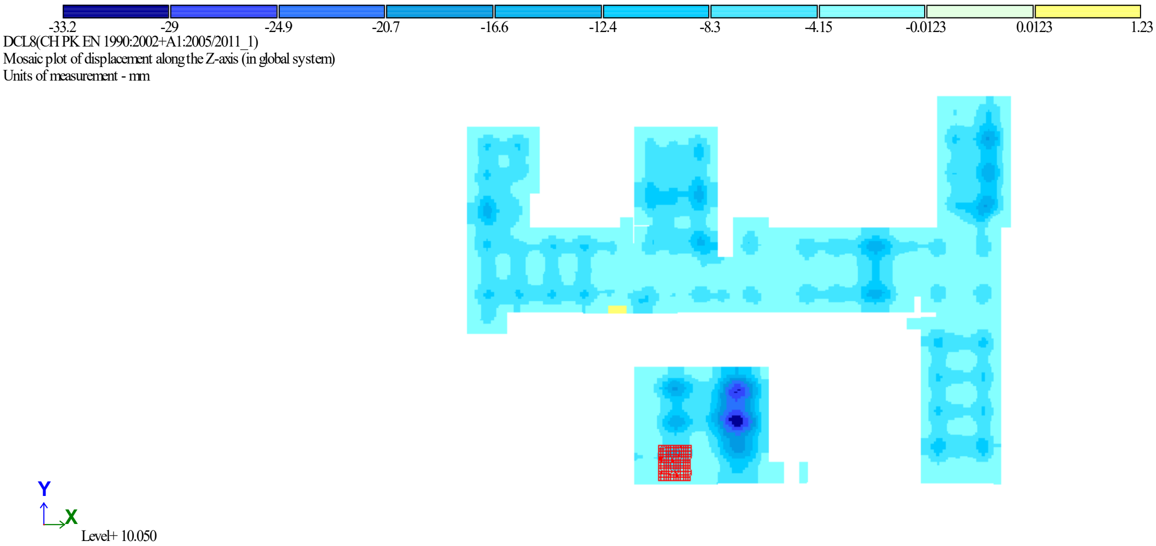

Figure 10 – Displacemet along Z

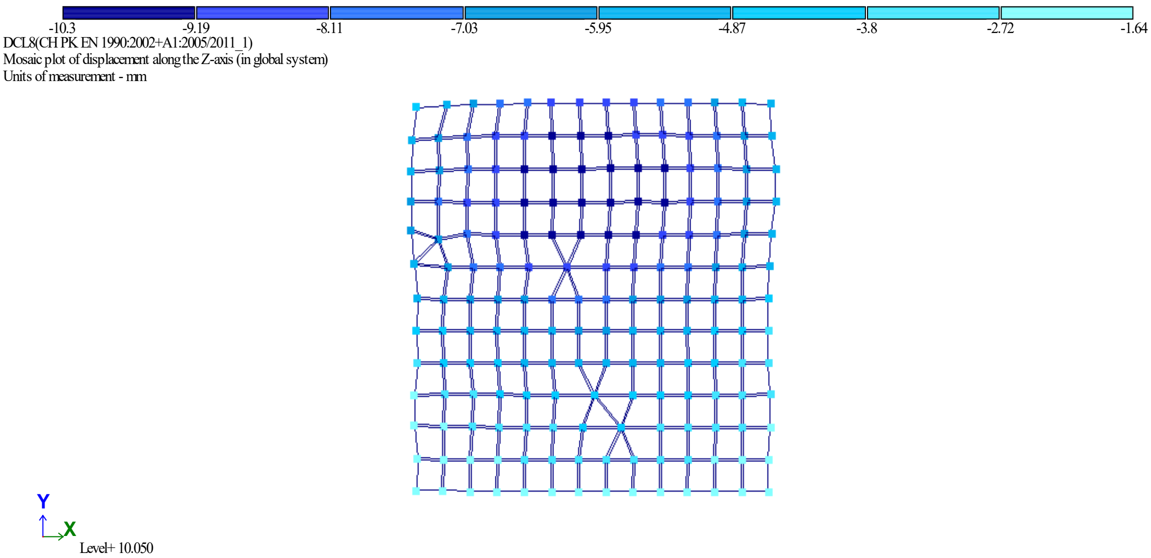

Figure 11 – Displacemet along Z

$$\frac{L}{250}$$

$$\frac{11000}{250} = 44mm$$

10.3-5.95 = 4.35mm (conditions met)

4.3 Wind displacement

The structure displacement due to wind pressure are calculated as followings.

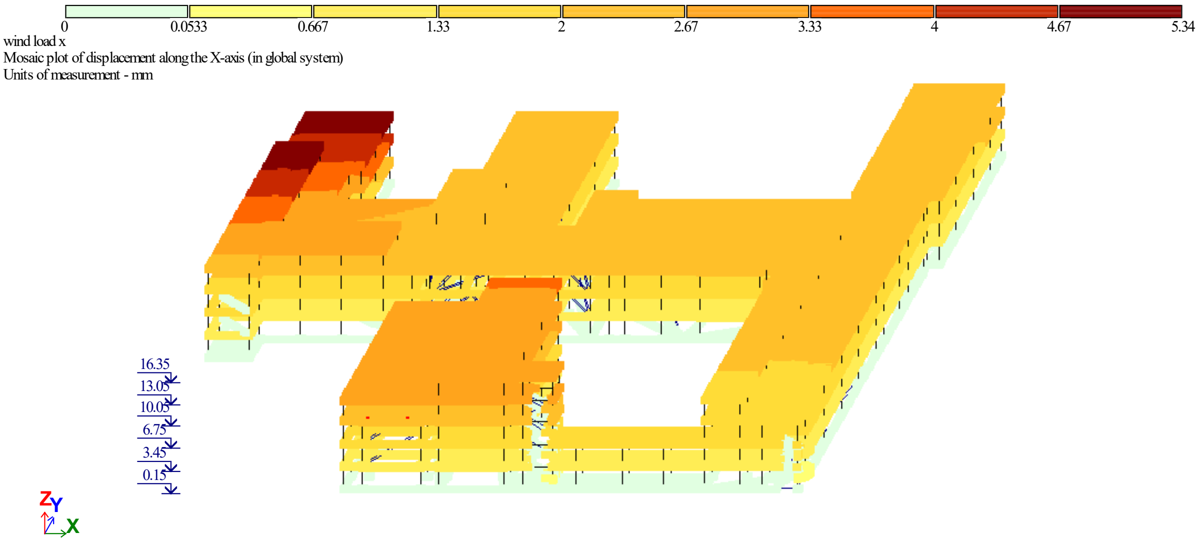

Figure 12 - Mosaic plot of displacement along the X-axis (in global system)

h/500

16350/500 = 32.7

Max 5.34mm< 32.7mm

Condition met

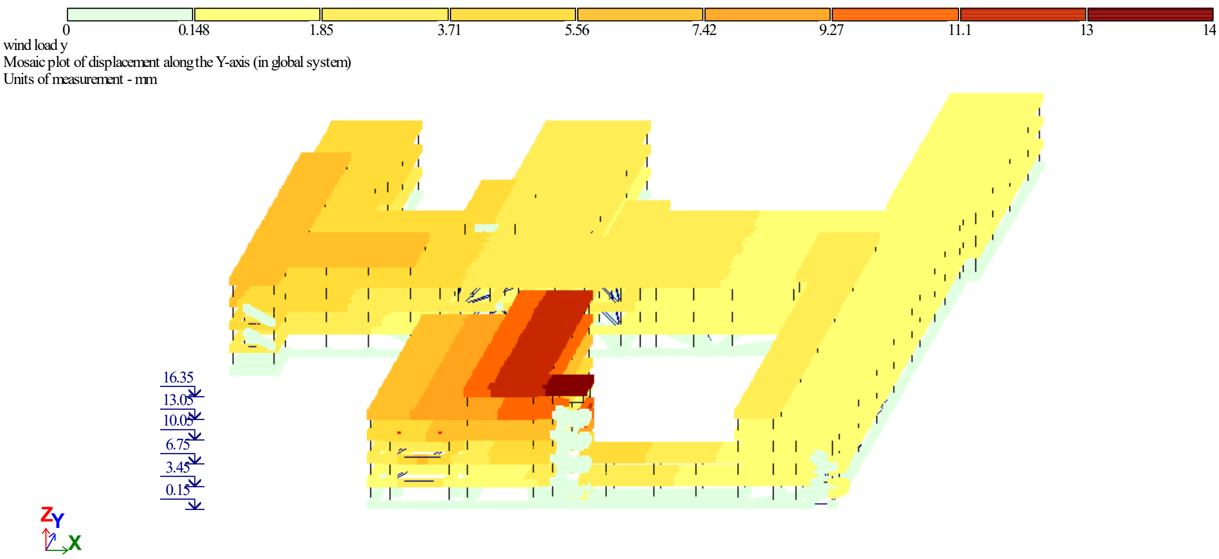

Figure 13 - Mosaic plot of displacement along the Y-axis (in global system)

h/500

16350/500 = 32.7

Max 14.8mm< 32.7mm

Condition met

4.3 Seismic displacement

The structure displacement due to seismic load are calculated as followings.

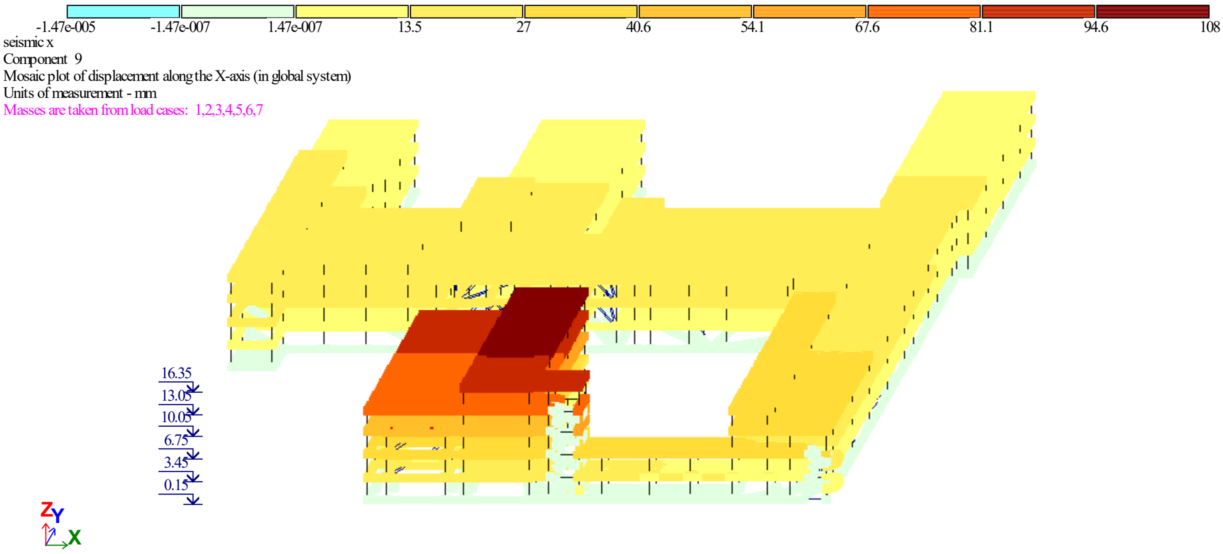

Figure 14 - Mosaic plot of displacement along the X-axis (in global system)(2)

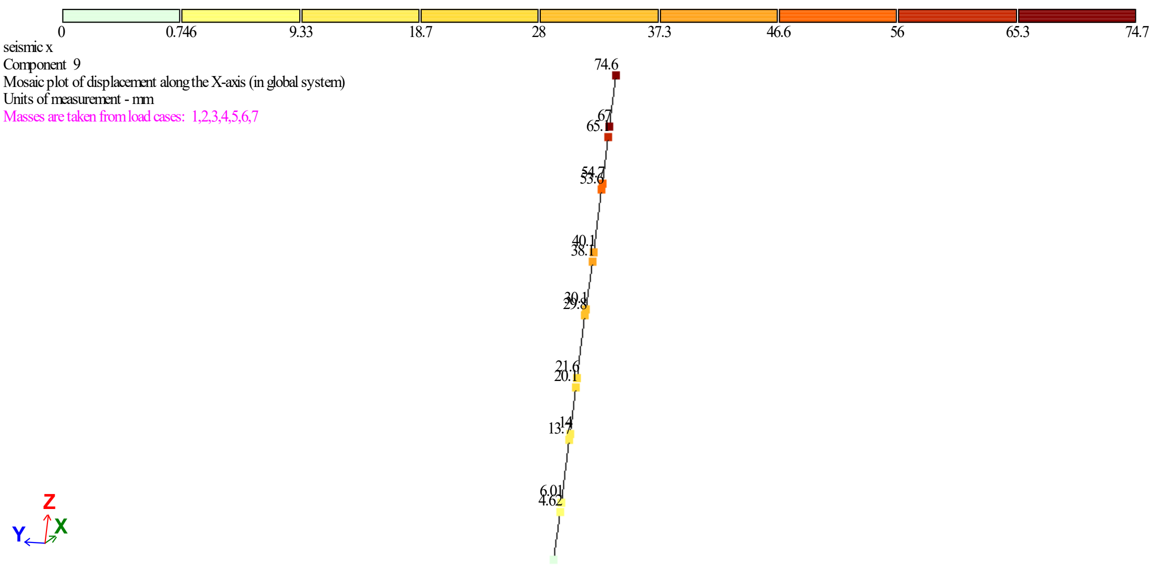

Figure 15 - Mosaic plot of displacement along the X-axis (in global system)(2)

According to SN RK 2.03.30-2017

$$D \leq h.\frac{\epsilon}{q}$$

I chose the tallest part of the building to check

$$\frac{3300 \cdot 0.02}{4} = 16.5$$

As it is clear from the column all differences are less than 16.5mm, so condition meets.

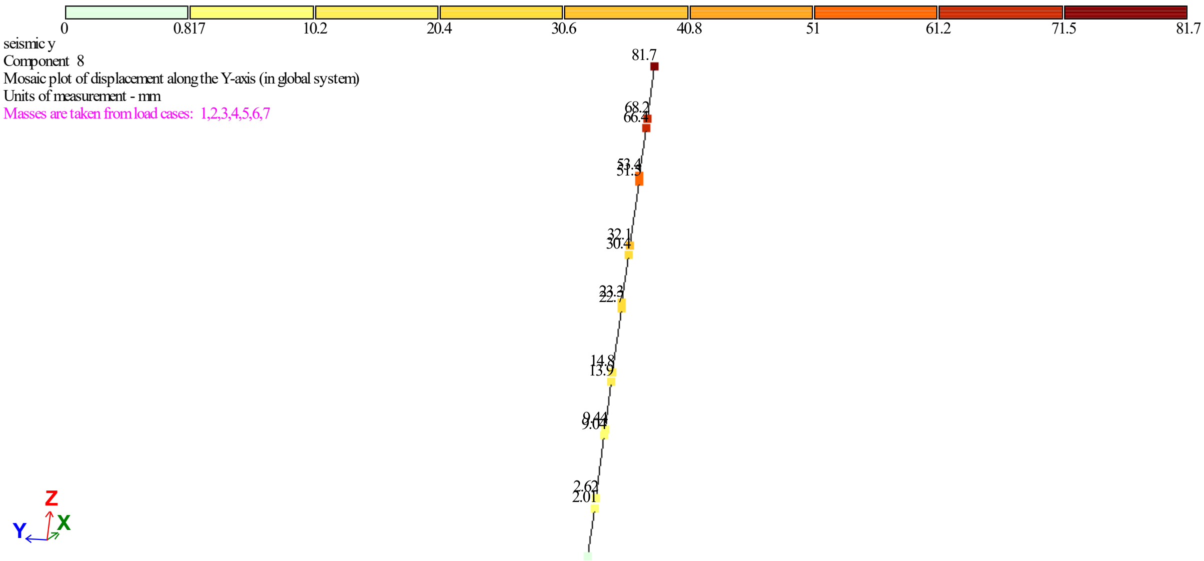

Figure 16 - Mosaic plot of displacement along the Y-axis (in global system)(2)

As it is clear from the column all differences are less than 16.5mm, so condition meets.

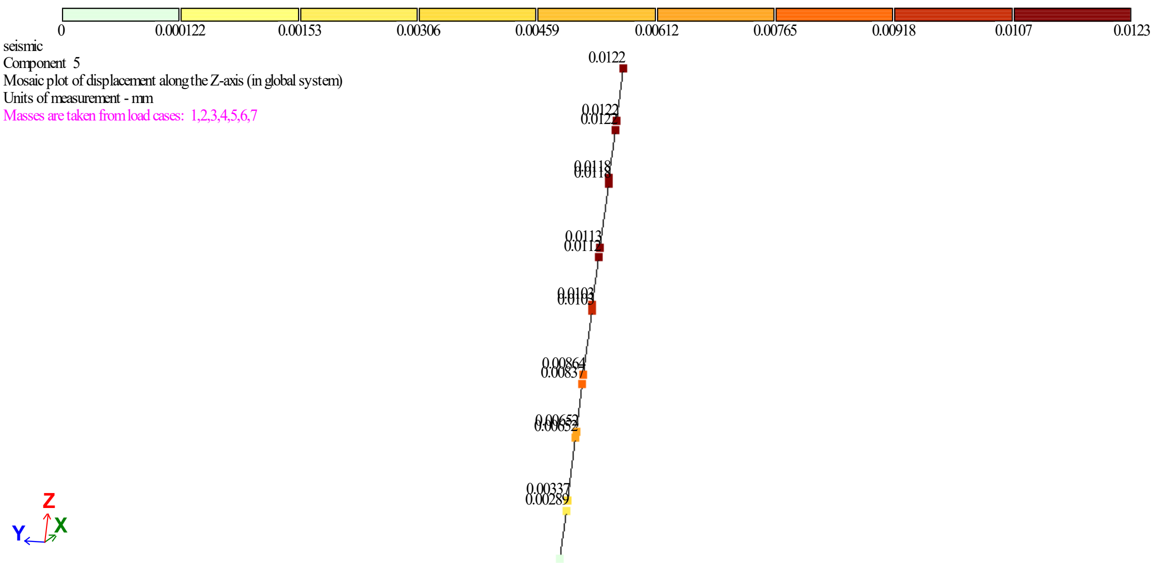

Figure 17 - Mosaic plot of displacement along the Z-axis (in global system)(2)

As it is clear from the column all differences are less than 16.5mm, so condition meets.

5 Economic part

Determining the cost of school construction in Karaganda today is a topical issue in the economy. It is still estimated in this direction calculation based on norms is widely used. General budget in this form of financing, the calculation is universal committed. And estimates for private construction use of the report are not required. But the budget standards and it's the cost of construction, calculated on the basis of production management, planning and has a special place in the organization. The basis for determining the estimated cost of construction is: - current legislation; - current budget standards; - design documentation. Estimated cost of construction - the amount based on design materials identified cash. Construction costs vary in current practice methods. Its cost in private construction determined on a contractual basis in accordance with market demand. And the budget construction facilities related to the financing of the estimated size determined on the basis of estimate documentation. The procedure for determining the estimated cost of construction in the Republic of Kazakhstan Regulated by the documentary rates 8.02-02-2002. In the diploma project aggregate estimates in determining the target estimated value was used.

Estimated cost - the sum of all cash costs necessary for the implementation of construction on project materials.

The estimated cost is the basis for the dimensional determination of capital investments, financing the construction process, creating contract prices for construction products, settlements for contract work (construction and others).

In the thesis reflects the following types of documentation estimates: - Local estimate - the primary document in the estimate, which is compiled on the basis of the volumes and costs of the projected building.

5.1 Department of labor protect

The Labor Code of the Republic of Kazakhstan is the 23rd in 2015 from November, in case of unsecured employment contract of the employee compensation for the damage caused by the employer or safety compensation. Perimeter of the construction site in accordance with SNiP RK 1.03-05-2001 and the location of all individual work areas appropriate. When assembling any structure or construction machinery specific safety documents have been developed for all workers after a personal presentation, access to special safety logs must be set. This magazine is signed by everyone involved in construction should be set. Familiarize workers with safety conditions is the task of the master. Construction in case of emergency the head of the facility will be held accountable. Therefore, construction work the following conditions must be met: 1) there should be no strangers on the construction site (in some cases) with the permission of the construction site manager).

2) All workers should be familiar with safety.

3) Workers should be provided with special work clothes and equipment (basic work clothes, helmet, goggles, respirator, gloves, storage belts etc.)

4) All work areas and upper on the construction site the boundaries of the floors should be fenced and the fence should look good.

5) Each job must be performed by a worker who specializes in that job.

6) Construction machines were moving around during operation Every worker m

ust be careful.38

7) All when slinging structures or materials on a crane it must be determined that the connections are properly established.

8) Putting the structure in the planned place, only it is better allowed only if stability is ensured.

9) Special when the cranes are working, if there is windy weather work measures should be taken.

10) In all major installation works, height works, especially insurance of one employee for another in hazardous work mandatory.

11) Each building material must be stored in its own warehouse. Especially Fire hazardous materials are stored in a special place.

12) Access to firefighting equipment and facilities appropriate.

5.2 Fire safety

Measures When performing construction work, the conditions must be observed SN RK 2.02-01-2014 "Fire safety standards." All employees are required to be allowed to work 39 only after passing fire training in absolutely all production, administrative, warehouse in places in conspicuous places should be hung signs indicating fire department call phone numbers. The territory of the construction site must be cleaned of combustibles in a timely manner waste, garbage, containers, etc. Roads, driveways and walkways to buildings, structures, open warehouses and water sources, approaches to fire ladders, fire equipment must always be independent in good condition, and in winter cleared of snow and ice. Roads on the construction site must be suitable for driving fire trucks at any time of the year. Gate for entry must be at least 4 m wide. The construction site must have fire source indicators water supply and primary fire extinguishing means, fire posters safety and warning labels. Up to the foundation of the construction should be more accurately defined and mark the location of fire hydrants to ensure the required radius of their service up to 100.00 meters and the possibility of access to them fire engines, in addition to installing fire shields at the rate of one per 1000 sq. m. plot.

5.3 Environmental protection

In the process of construction and installation works, implementation is taken into account a number of environmental protection measures. Existing green spaces falling into the construction zone, according to opportunities should be transplanted. Industrial and domestic wastewater, occurring at the construction site must be cleaned and decontaminated.

Temporary travel routes for mounting mechanisms must installed according to damage prevention requirements tree-shrubby vegetation. The section “Environmental Protection” shows and analyzes constructive decisions and environmental measures laid down in it; characteristics; - types of impacts and main sources of technologic impact; - character and intensity alleged impacts the designed facility on the air during construction and facility operation; - the amount of production waste, their degree of danger, conditions storage and disposal (disposal); - expected environmental changes due to exposure construction and operation of the designed facility.

The most important environmental problems in the construction and operation of the designed facility is: -40 air protection; - soil and soil protection; - protection of the subsoil. These design issues are addressed comprehensively and include The following key points: - removal and storage of garbage in designated areas; - reinforced anti-corrosion insulation; - anticorrosive protection of structures. Thus, we can conclude that, subject to all design decisions, as well as compliance with environmental measures; operation of the designed facility is possible without prejudice to the environment.

5.4 Life safety

Synoptic requirement and illumination at workplaces. During the construction of the school, construction work is carried out as in warm as well as in the cold season, for this reason for safety Vital functions are greatly affected by meteorological conditions. They are affected by temperature, humidity and speed air, barometric pressure and thermal radiation. A distinctive feature of construction production is that that builders have to work in both high and negative atmospheric phenomena (wind, rain, snow, etc.) and solar radiation. Protecting workers from hypothermia is achieved by providing their warm clothes and shoes, the establishment of a working regime with periodic breaks for heating workers in special rooms.

A similar room was provided during the development of the construction plan in composition of temporary buildings. Thus, as numerous construction works are carried out in two shifts, then an important safety issue is the creation of required illumination of the site. For this, projection lighting of the site is designed. For localized lighting, additional light sources installed on buildings, machines, portable installations etc.

5.5 Possibility of electric shock to workers

Electricity is widely used at the construction site: - For the electric drive of machines and mechanisms; - For lighting; - For electric welding. Construction production is characterized by negative criteria, forming the danger of electric shock: construction the equipment is operated mainly in humid rooms and in open areas exposed to atmospheric precipitation. Probability of defeat appears during the operation of electrical installations in which current-carrying conductors and car bodies can be energized as a result insulation damage. To prevent probable results, you must increase electrical safety at the construction site, that is: Disconnect networks supplying construction machinery at the end of work; - Disconnect inactive from the mains inactive for certain periods of time electricity consumers; - Check all power sources before use and Troubleshoot in a timely manner.

CONCLUSION

The first chapter of the thesis shows architectural and construction the part according to the result of which we determined for ourselves the gymnasium-School for pupils preparing for university in Taraz city on the general plan, orientated with the main technological process, most clearly set tasks in the space-planning and structural solutions of the building. The second chapter shows the design part, as a result of which a static calculation of the building frame was made in the program of LIRA-SAPR 2016 and calculation of the main structures (monolithic floor slabs, columns), and In addition, the selection of reinforcement for these structures. The third chapter describes the technology and organization of construction, I agree with the results of which it was determined: the amount of material technical resources, the complexity of work and the cost of computer time, and in addition to In addition, the main production methods are shown. In the fourth chapter, the economic effect, estimated cost home construction, normative labor, estimated wages, unit cost indicator for the option with minimal labor.

According to the results of local estimates, an object estimate was made and consolidated estimates of the cost of construction cost makes up 920351.814 thousand tinge. New materials and technologies were used in the project. Feasibility study of the project and the decisions made confirms the rationality. The following results were achieved during the writing of the thesis: - Volumetric placement in the design of any building and the choice of architectural solutions is not only important, but also urban correct placement of the object in the middle of the construction site will be found. - The architectural solution of the building is, first of all, the lifting structures should be stabilized in the right choice.

Modern construction is high allows you to use a series of positional systems, including monolithic skeleton leading position. - Ability to calculate structures using computer technology there is a software package. This is the process of calculation and design capacity; with the entire necessary load on the structural schedule of the building It is possible to register effects. Built of the main elements of the building.

The combination of different loads gives accurate results. - At the same time, the department of technology of construction production is all designed taking into account modern methods and production methods. Construction effective selection of machinery and equipment for the timing and labor process the ability to often reduce the complexity, to plan properly gives.

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Appendix A

Table A.1- Specification of the rooms, doors and windows

Specification		Specification	
no	name	13	Clinic 3
1	lecture hall 4	14	rehabilitation
2	Conferance room2	15	workshop
3	classroom 20 (lecture and pr.)	16	Administration
4	laboratory 8	17	Print centre
5	Dinning room 6	18	Cafeteria 3
6	Corridor	19	Sport hall 4
7	women's toilet 4	20	Auditoria
8	men's toilet 4	D1	Door(1m x 2.8m)
9	girls' changing room	D2	Door(2m x 2.8m)
10	boys' changing room	D3	Door(2.5m x 2.8m)
11	office 4	D4	Door(2.8m x 2.8m)
12	library 2	W	window

Appendixes

Appendix B

Table B.1 – determination of loads on floors and walls

loads	Characteristics of loads, kg/m^2
1 Unit weight:	Auto
1.1 Floors Ground floor	
Concrete preparation δ=120 mm, ρ=1700 kg/m^3	$0.12 \cdot 1700 = 204$
waterproofing layer, δ=30 mm,ρ=1400 kg/m^3	$0.03 \cdot 1400 = 42$
Extruded polystyrene foam δ=30 mm,ρ=40 kg/m^3	$0.03 \cdot 40 = 1.2$
cement-sand plaster δ=60 mm, ρ=1600 kg/m^3	$0.6 \cdot 1600 = 960$
Total	1207 Kg/m^2 =1.3 t/m^2
Typical floors	
Vinyl flooring δ=15 mm, ρ=976 kg/m^3	$0.015 \cdot 976 = 14.6$
Reinforced cement-sand plaster δ=40 mm, ρ=1600 kg/m^3	$0.04 \cdot 1600 = 64$
Waterproofing (Membrane) δ=20 mm, ρ=1400 kg/m^3	$0.02 \cdot 1400 = 28$
Soundproofing δ=40 mm, ρ=45 kg/m^3	$0.04 \cdot 45 = 1.8$
Foamed concrete for thermal insulation δ=50 mm, ρ=1000 kg/m^3	$0.05 \cdot 1000 = 50$
Floor slab δ=150 mm, ρ=2400 kg/m^3	$0.15 \cdot 2400 = 360$
Total	542.4 Kg/m^2 = 0.56 t/m^2
Flat roof	
Floor slabs δ=150 mm, ρ=2400 kg/m^3	$0.15 \cdot 2400 = 360$
Reinforced cement-sand plaster δ=100 mm, ρ=1600 kg/m^3	$0.1 \cdot 1600 = 160$
Vapor barrier δ=0.40 mm, ρ=940 kg/m^3	$0.004 \cdot 940 = 3.8$
Thermal insulation – PIR boards δ=120 mm, ρ=500 kg/m^3	$0.12 \cdot 500 = 60$
Waterproofing (Membrane) δ=30 mm, ρ=1400 kg/m^3	$0.03 \cdot 1400 = 42$
Total	625.8 kg/m^2 = 0.9 t/m^2

Continuation of Appendix B

Continuation of Table B.1 – determination of loads on floors and walls

loads	Characteristics of loads, kg/m^2
1 Unit weight:	Auto
1.2 Walls	
Autoclaved aerated concrete AAC blocks (Foam concrete block) δ=250 mm, ρ=600 kg/m^3	$0.25 \cdot 3.15 * 600 = 472.5$
Thermal insulation (foam board) 2 layers δ = 50 mm, ρ = 40 kg/m^3	$0.05 * 2 * 3.15 \cdot 40 = 12.6$
Fiber cement siding δ=100 мм, ρ=1650 kg/m^3	$0.1 \cdot 3.15 \cdot 1650 = 791$
Total	1276 kg/m = 1.4 T/m
Internal walls – 3.15m	
Autoclaved aerated concrete AAC blocks (Foam concrete block) δ=200 mm, ρ=600 kg/m^3	$0.2 \cdot 3.15 \cdot 600 = 378$
Thermal insulation (foam board) δ = 30 mm, ρ = 40 kg/m^3	$0.03 \cdot 3.15 \cdot 40 = 3.78$
gypsum plasterboard δ=20мм, ρ=800 kg/m^3	$0.02 \cdot 3.15 \cdot 800 = 50.4$
Total	432.2 kg/m = 0.47 T/m
Parapet- 1m	
Autoclaved aerated concrete AAC blocks (Foam concrete block) δ=250мм,ρ=600 kg/m^3	$0.25 \cdot 1 \cdot 600 = 150$
Thermal insulation (foam board) 2 layers δ = 50 mm, ρ = 40 kg/m^3	$0.05 \cdot 2 \cdot 1 \cdot 40 = 4$
Fiber cement siding δ=100мм, ρ=1650 kg/m^3	$0.1 \cdot 1 \cdot 1650 = 165$
Total	319 kg/m = 0.35 T/m
Live load on balcony, stairs and slab	3kH/m2
Snow load	0.72kPa

APPPENDIX C

Form 4

Local Estimate No.
Local estimate calculation

on the

Base:

Event	esential	364658.109	thousand tenge
standard labor	intesity	91122.92	person-h
Estmated wage		27002.940	thousand tenge

Compiled in 2001

N p / p	Code and item number of the standard	Name of works and costs, unit of measure	Number	Unit cost, tenge		Total cost, tenge		Overheads	Labor costs, man-hours, construction workers	
				Total	Expl. machines	Total	Expl. machines	tenge	workers serving machines	
				Salary of construction workers	incl. Salary of drivers	Salary of construction workers	incl. Salary of drivers	%	for one.	Total
one	**2**	**3**	**four**	**five**	**6**	**7**	**eight**	**nine**	**10**	**eleven**
		Section 1 Earthwork								
one	**E11-01-03-072-02**	**Layout of areas with bulldozers up to 132 (up to 180) kW (hp)**	**4,936.75**	**7.38**	**7.38**	**36,433.22**	**36,433.22**	**2,623.19**	**-**	**-**
		m2		**-**	**0.74**	**-**	**3,643.32**	**72.00**	**0.41**	**2,024.07**
2	**E11-01-01-001-04**	**Development of soil of the 6th group into the dump with single-bucket dragline excavators, with a bucket with a capacity of 10 m3, electric walking when working on hydropower construction**	**4,291.17**	**205.32**	**204.18**	**881,063.02**	**876,171.09**	**22,121.84**	**1.36**	**5,835.99**
		m3		**3.64**	**3.52**	**15,619.86**	**15,104.92**	**72.00**	**0.94**	**4,033.70**
3	**E11-010104-0603**	**Backfilling of trenches and pits with bulldozers with a power of 303 kW (410 hp), when moving soil of the 2nd group up to 5 m**	**455.70**	**56.43**	**56.43**	**25,715.15**	**25,715.15**	**1,371.47**	**-**	**-**
		m3		**-**	**4.18**	**-**	**1,904.83**	**72.00**	**0.66**	**300.76**

		TOTAL SECTION 1 DIRECT COSTS	**Tenge** **Tenge**			**943,211.39** **15,619.86**	**938,319.46** **20,653.07**			**5,835.99** **6,358.53**
	The cost of general construction works -		Tenge			**943,211.39**				
	Materials -		Tenge							
	Total salary -		Tenge			**36,272.92**				
	The cost of materials and structures -		Tenge							
		Overhead -	Tenge					**26,116.51**		
		Normative labor intensity in N.R. -	person-h							**609.73**
		Estimated wages in N.R. -	Tenge			**3,917.48**				
		Irregular and unforeseen costs -	Tenge			**58,159.67**				
	TOTAL, The cost of general construction works -		Tenge			**1,027,487.57**				
		Standard labor intensity -	person-h							**12,194.52**
		Estimated salary -	Tenge			**40,190.40**				
		TOTAL SECTION 1	Tenge			**1,027,487.57**				
		Standard labor intensity -	person-h							**12,194.52**
		Estimated salary -	Tenge			**40,190.40**				

Section 2 Foundation

four	**E11-060101-0101**	**Concrete preparation device, concrete class B7.5** **m3**	**91.14**	**7,006.11** **685.20**	**1,346.00** **12.56**	**638,536.87** **62,449.13**	**122,674.44** **1,144.72**	**57,870.40** **91.00**	**1.43** **0.19**	**130.33** **17.32**
five	**E11-060101-0113**	**Construction of concrete strip foundations, concrete class B15** **m3**	**5,559.54**	**4,480.31** **220.66**	**3,408.30** **27.31**	**24,908,462.66** **1,226,768.10**	**18,948,580.18** **151,831.04**	**1,254,525.21** **91.00**	**4.17** **0.17**	**23,183.28** **945.12**
6	**E11-080101-0307**	**Side coating bituminous waterproofing in 2 layers on the leveled surface of rubble masonry brick, concrete walls, foundations** **m2**	**24,060.900**	**365.30** **21.20**	**27.01** **0.35**	**8,789,446.77** **510,091.08**	**649,884.91** **8,421.32**	**482,216.53** **93.00**	**0.19** **0.00**	**4,571.57** **26.29**
7	**S121-050301-3202**	**Reinforcement blanks not assembled into frames and meshes: steel of periodic profile of class A-III, d 14 mm** **t**	**0.000**	**-** **-**	**-** **-**	**-** **-**	**-** **-**	**-** **-**	**-** **-**	**-** **-**
eight	**S121-050301-3001**	**Reinforcement blanks not assembled into frames and meshes: smooth steel of class A-I, d 6 mm** **t**	**0.000**	**65,745.09** **-**	**-** **-**	**-** **-**	**-** **-**	**-** **-**	**-** **-**	**-** **-**
		TOTAL SECTION 2 DIRECT COSTS	**Tenge** **Tenge**			**34,336,446.29** **1,799,308.30**	**19,721,139.53** **161,397.07**			**27,885.18** **988.73**
	The cost of general construction works -		Tenge			**34,336,446.29**				
	Materials -		Tenge			**-**				
	Total salary -		Tenge			**1,960,705.38**				
		Overhead -	Tenge					**1,794,612.14**		
		Normative labor intensity in N.R. -	person-h							**1,443.70**
		Estimated wages in N.R. -	Tenge			**269,191.82**				

		Irregular and unforeseen costs -	Tenge			**2,167,863.51**				
	TOTAL, The cost of general construction works -		Tenge			**38,298,921.94**				
		Standard labor intensity -	person-h							**28,873.91**
		Estimated salary -	Tenge			**2,229,897.20**				
		TOTAL SECTION 2	Tenge			**38,298,921.94**				
		Standard labor intensity -	person-h							**28,873.91**
		Estimated salary -	Tenge			**2,229,897.20**				
				Section 3 column						
nine	**E11-060501-0201**	**column average in building**	**113.925**	**23,012.14**	**13,416.07**	**2,621,658.13**	**1,528,425.77**	**924,275.12**	**13.55**	**1,543.68**
		m3		**7,436.23**	**1,479.17**	**847,172.50**	**168,514.44**	**91.00**	**5.07**	**577.60**
10	**S121-050301-3203**	**reinfoecment class not assembled to the building class A-III, d 32-40 mm**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
eleven	**S121-050301-3202**	**Reinforcing blanks, not assembled into frames and meshes: periodic profile steel of class A-III, d 20-22 mm**	**3.7975**	**67,412.88**	**-**	**256,000.42**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
12	**S121-050301-3001**	**Reinforcing blanks, not assembled into frames and meshes: smooth steel of class A-I, d 10mm**	**1.899**	**65,745.09**	**-**	**124,830.20**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
		Total direct cost by section 3	**te**			**3,002,488.76**	**1,528,425.77**			**1,543.68**
			Tenge			**847,172.50**	**168,514.44**			**577.60**
	The cost of general construction works -		Tenge			**2,621,658.13**				
	Materials -		Tenge			**380,830.63**				
	Total salary -		Tenge			**1,015,686.95**				
		Overhead -	Tenge					**924,275.12**		
		Normative labor intensity in N.R. -	person-h							**106.06**
		Estimated wages in N.R. -	Tenge			**138,641.27**				
		Irregular and unforeseen costs -	Tenge			**235,605.83**				
	TOTAL, The cost of general construction works -		Tenge			**4,162,369.71**				
		Standard labor intensity -	person-h							**2,121.28**
		Estimated salary -	Tenge			**1,154,328.21**				
		TOTAL SECTION 3	Tenge			**4,162,369.71**				
		Standard labor intensity -	person-h							**2,121.28**
		Estimated salary -	Tenge			**1,154,328.21**				
				Section 4 wall						
13	**E11-080201-0103**	**Laying of simple exterior brick walls with a floor height of up to 4 m**	**3,690.48**	**4,875.72**	**812.62**	**17,993,747.15**	**2,998,957.86**	**6,956,724.41**	**4.90**	**18,083.35**

		m3		**1,820.44**	**206.49**	**6,718,286.80**	**762,062.02**	**93.00**	**0.41**	**1,513.10**
fourteen	**E11-080201-0107**	**Laying of internal brick walls with a floor height of up to 4 m**	**922.79**	**3,745.55**	**259.44**	**3,456,364.40**	**239,409.16**	**1,503,735.51**	**4.25**	**3,921.87**
		m3		**1,556.64**	**195.56**	**1,436,454.94**	**180,464.96**	**93.00**	**0.39**	**359.89**
fifteen	**E11-080401-0301**	**Laying of partitions reinforced with a thickness of 120 mm at a floor height of up to 4 m**	**15,297.00**	**1,248.11**	**181.80**	**19,092,338.67**	**2,780,994.60**	**9,506,238.05**	**1.39**	**21,262.83**
		m2		**637.92**	**30.30**	**9,758,262.24**	**463,499.10**	**93.00**	**0.03**	**458.91**
		TOTAL SECTION 4 DIRECT COSTS	**Tenge**			**40,542,450.22**	**6,019,361.61**			**43,268.05**
			Tenge			**17,913,003.98**	**1,406,026.08**			**2,331.90**
	The cost of general construction works -		Tenge			**40,542,450.22**				
	Materials -		Tenge							
	Total salary -		Tenge			**19,319,030.07**				
		Overhead -	Tenge					**17,966,697.96**		
		Normative labor intensity in N.R. -	person-h							**2,280.00**
		Estimated wages in N.R. -	Tenge			**2,695,004.69**				
		Irregular and unforeseen costs -	Tenge			**3,510,548.89**				
	TOTAL, The cost of general construction works -		Tenge			**62,019,697.07**				
		Standard labor intensity -	person-h							**45,599.94**
		Estimated salary -	Tenge			**22,014,034.76**				
		TOTAL SECTION 4	Tenge			**62,019,697.07**				
		Standard labor intensity -	person-h							**45,599.94**
		Estimated salary -	Tenge			**22,014,034.76**				
		Section 5. overlop								
sixteen	**E11-060801-0105**	**Installation of non-girder slabs with a thickness of up to 200 mm at a height of more than 6 m from the support area, concrete class B35**	**189.88**	**23,999.10**	**1,534.00**	**4,556,829.11**	**291,268.25**	**1,155,803.51**	**11.05**	**2,098.12**
		m3		**6,568.91**	**120.30**	**1,247,271.79**	**22,841.96**	**91.00**	**0.36**	**68.36**
17	**S121-050301-3202**	**Reinforcement blanks not assembled into frames and meshes: steel of periodic profile of class A-III, d 16 mm**	**37.98**	**67,412.88**	**-**	**2,560,004.24**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
eighteen	**S121-050301-3001**	**Reinforcement blanks not assembled into frames and meshes: smooth steel of class A-I, d 6 mm**	**2.42**	**65,745.09**	**-**	**158,878.93**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
		TOTAL SECTION 5 DIRECT COSTS	**Tenge**			**7,275,712.28**	**291,268.25**			**2,098.12**
			Tenge			**1,247,271.79**	**22,841.96**			**68.36**
	The cost of general construction works -		Tenge			**4,556,829.11**				
	Materials -		Tenge			**2,718,883.17**				
	Total salary -		Tenge			**1,270,113.75**				
		Overhead -	Tenge					**1,155,803.51**		

		Normative labor intensity in N.R. -	person-h							108.32
		Estimated wages in N.R. -	Tenge			173,370.53				
		Irregular and unforeseen costs -	Tenge			505,890.95				
	TOTAL, The cost of general construction works -		Tenge			8,937,406.74				
		Standard labor intensity -	person-h							2,166.47
		Estimated salary -	Tenge			1,443,484.28				
		TOTAL SECTION 5	Tenge			8,937,406.74				
		Standard labor intensity -	person-h							2,166.47
		Estimated salary -	Tenge			1,443,484.28				
		Section 6. Roof								
nineteen	**E11-120101-0701**	**Roofing made of corrugated asbestos-cement sheets, ordinary profile on a wooden lathing with its device**	**331.42**	**749.54**	**47.91**	**248,411.05**	**15,878.24**	**79,812.15**	**0.42**	**139.20**
		m2		**252.80**	**8.96**	**83,782.47**	**2,969.86**	**92.00**	**0.02**	**6.63**
twenty	**E11-120101-0102**	**Installation of pitched roofs from three layers of roofing roll materials on bitumen mastic with a protective layer of gravel on bitumen mastic**	**87.34**	**464.44**	**41.39**	**40,565.35**	**3,615.04**	**18,012.44**	**0.23**	**20.09**
		m2		**216.93**	**7.23**	**18,947.21**	**631.53**	**92.00**	**0.01**	**0.87**
		TOTAL SECTION 6 DIRECT COSTS	**Tenge**			**288,976.40**	**19,493.27**			**159.28**
			Tenge			**102,729.68**	**3,601.40**			**7.50**
	The cost of general construction works -		Tenge			288,976.40				
	Materials -		Tenge							
	Total salary -		Tenge			106,331.07				
		Overhead -	Tenge					97,824.59		
		Normative labor intensity in N.R. -	person-h							8.34
		Estimated wages in N.R. -	Tenge			14,673.69				
		Irregular and unforeseen costs -	Tenge			23,208.06				
	TOTAL, The cost of general construction works -		Tenge			410,009.05				
		Standard labor intensity -	person-h							166.79
		Estimated salary -	Tenge			121,004.76				
		TOTAL SECTION 6	Tenge			410,009.05				
		Standard labor intensity -	person-h							166.79
		Estimated salary -	Tenge			121,004.76				
		TOTAL DIRECT COSTS BY ESTIMATE:	**Tenge**			**86,389,285.34**	**28,518,007.90**			**80,790.31**
			Tenge			**21,925,106.11**	**1,783,034.02**			**10,332.61**
	The cost of general construction works -		Tenge			83,289,571.55				
	Materials -		Tenge			3,099,713.79				
	Total salary -		Tenge			23,708,140.13				
		Overhead -	Tenge					21,965,329.83		
		Normative labor intensity in N.R. -	person-h							4,556.15

		Estimated wages in N.R. -	Tenge			**3,294,799.47**				
		Irregular and unforeseen costs -	Tenge			**6,501,276.91**				
	TOTAL, The cost of general construction works -		Tenge			**114,855,892.07**				
		Standard labor intensity -	person-h							**91,122.92**
		Estimated salary -	Tenge			**27,002,939.61**				
		TOTAL BY AN ESTIMATE:	Tenge			**364,658,109.42**				
		Standard labor intensity -	person-h							**91,122.92**
		Estimated salary -	Tenge			**27,002,939.61**				
	Recalculation of totals into prices as of 04/26/2020									
	Total direct costs					**86,389,285.34**				
	Overheads					**21,965,329.83**				
	Irregular and unforeseen costs					**6,501,276.91**				
	TOTAL in prices as of 01.01.2001					**364,658,109.42**				
	Total with the cost of seniority					**368,304,690.51**				
	Total with the cost of additional. leave					**369,763,322.95**				
	Total in current prices as of 03.24.					**1,264,590,564.50**				
	Total with taxes, fees and obligations. payments					**1,289,882,375.79**				
	Value Added Tax (VAT)		**12%**			**154,785,885.09**				
	Total with value added tax (VAT)					**1,444,668,260.88**				

Continuation of appendix C

Estimated calculation of the cost of construction in the amount of 19s 7k **247.51** thousand tenge
including refundable amounts: 15s7k **0.20** thousand tenge
value added tax 18s7k **15.05** thousand tenge

ESTIMATE CALCULATION OF THE COST OF CONSTRUCTION

Compiled in 2001

P / p No.	No. of estimates and calculations	Name of chapters, objects, works and costs	Estimated cost, thousand tenge			Total, thousand tenge
			construction and installation works	equipment, furniture and inventory	other costs	
one	2	3	four	five	6	7
one	one	Civil works	34.65	-	-	34.65
2		**Total = 1 line**	34.65	-	-	**34.65**
3		Temporary buildings and structures 1.1% * 2 line 7 column	0.38	-	-	0.38
four		Return of materials from temporary buildings and structures 15% * 3s7k	0.06	-	-	0.06
five		**Total = 3 lines**	0.38	-	**-**	**0.38**
6		**Total 2s + 5s**	35.03	-	**-**	**35.03**
7		Additional costs during the performance of work in the winter 1.2% * 6s7k	0.42	-	**-**	0.42
eight		Seniority costs 1% * 6s7k			0.35	0.35
nine		Costs for additional vacations 0.4% * 6s7k			0.14	0.14
10		**Total 7s + 8s + 9s**	**0.42**		**0.49**	**0.91**
eleven		**Total 6s + 10s**	35.45		0.49	35.94
12		Including refundable amounts = 4s	0.06		-	0.06
13		**Total according to the estimated calculation in base prices 2001 = 11s**	35.45		0.49	35.94
fourteen		Total estimated at current prices in 2020. 13s * 3.42	121.24		1.68	122.92
fifteen		Including refundable amounts in current prices 12s7k * 3.42	0.20			0.20
sixteen		Taxes, fees, mandatory payments, 2% * 14s7k			2.46	2.46
17		Estimated cost at the current price level 14s + 16s	121.24		4.14	125.38
eighteen		VAT (12%) * 17s7k			15.05	15.05
nineteen		Construction cost 17s + 18s	121.24		19.18	247.51

Continuation of Appendix C

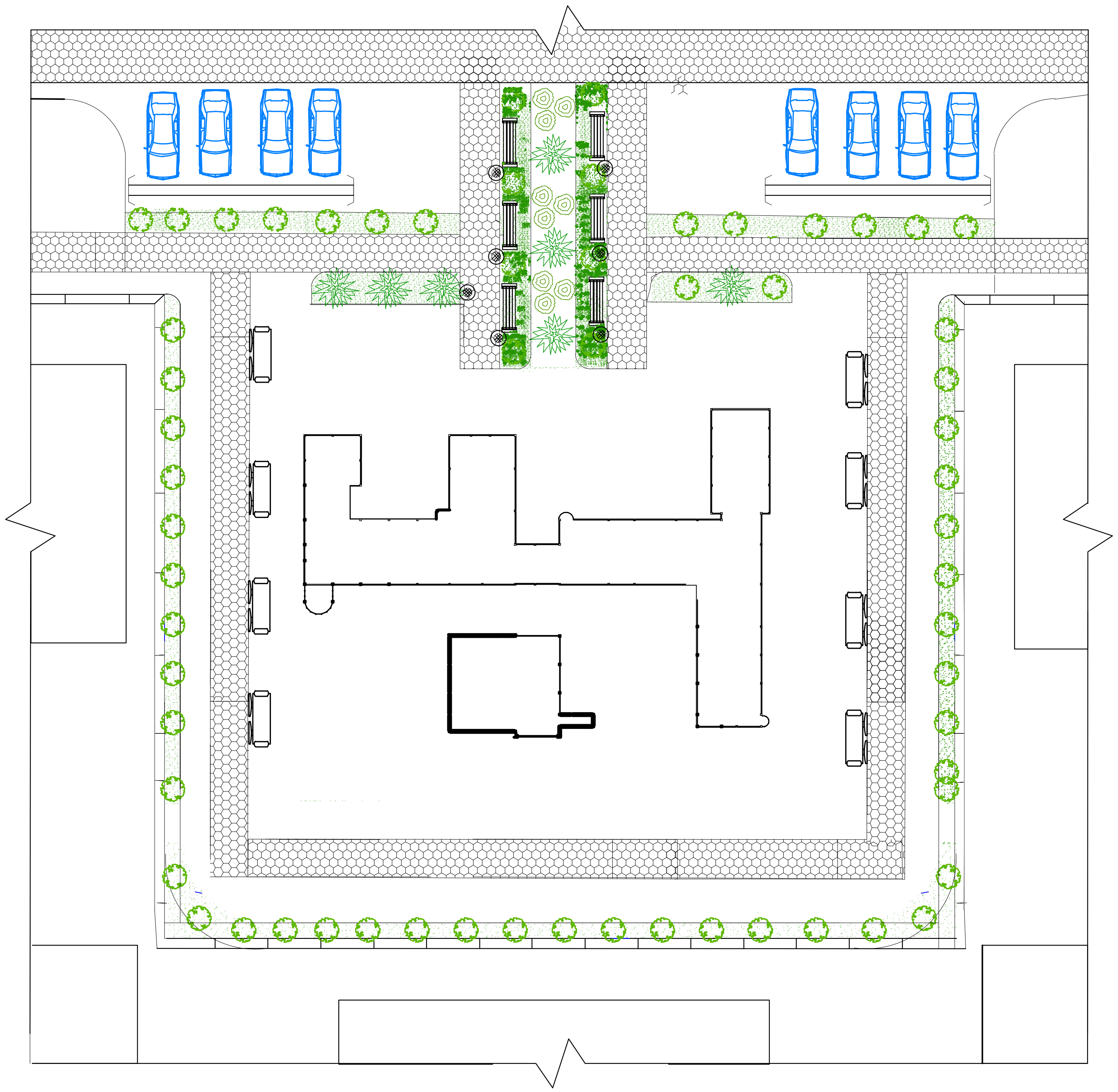
Object estimate

Estimated cost	34.632	thousand tenge
Standard labor intensity	91.123	thousand people hour
Estimated salary	16.081	thousand tenge

Compiled in 2001

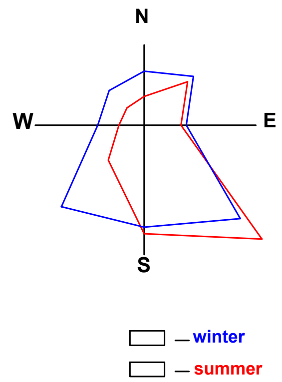
P / p No.	No. of estimates and calculations	Name of works and costs	Estimated cost, thousand tenge				Normative labor intensity, thousand people hour	Estimated salary, thousand tenge	Indicators of a unit cost, thousand tenge
			construction and installation works	equipment, furniture and inventory	other costs	Total			
one	2	3	four	five	6	7	eight	nine	10
	one	Civil works	34.632			34.632	91.123	16.081	
		Total	34.632			34.632	91.123	16.081	

Site Plan



N	symbols	Names
1		Designed
2		built building
3		plot boundary
4		tree
5		green area
6		asphalt road

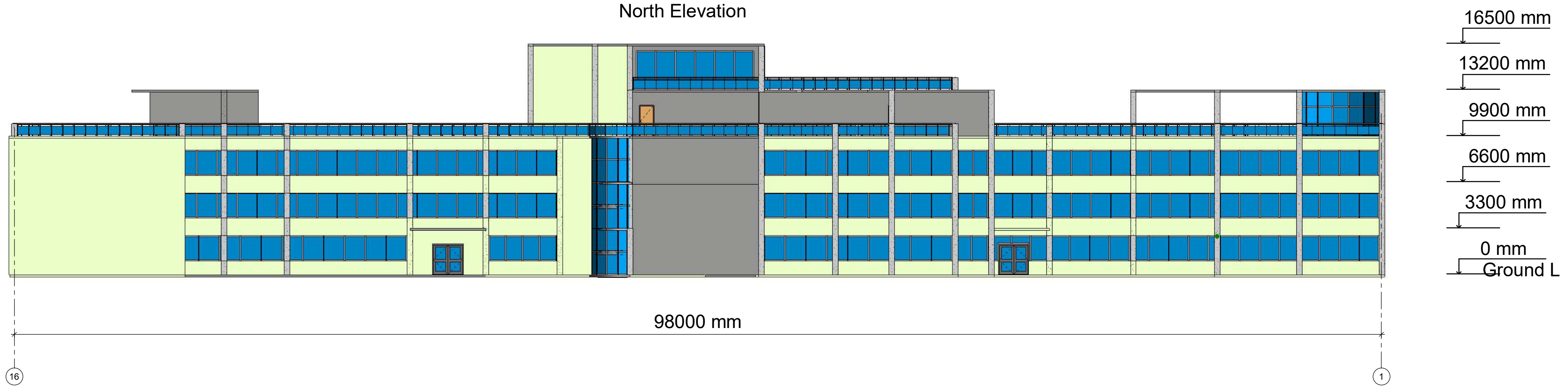
Wind direction



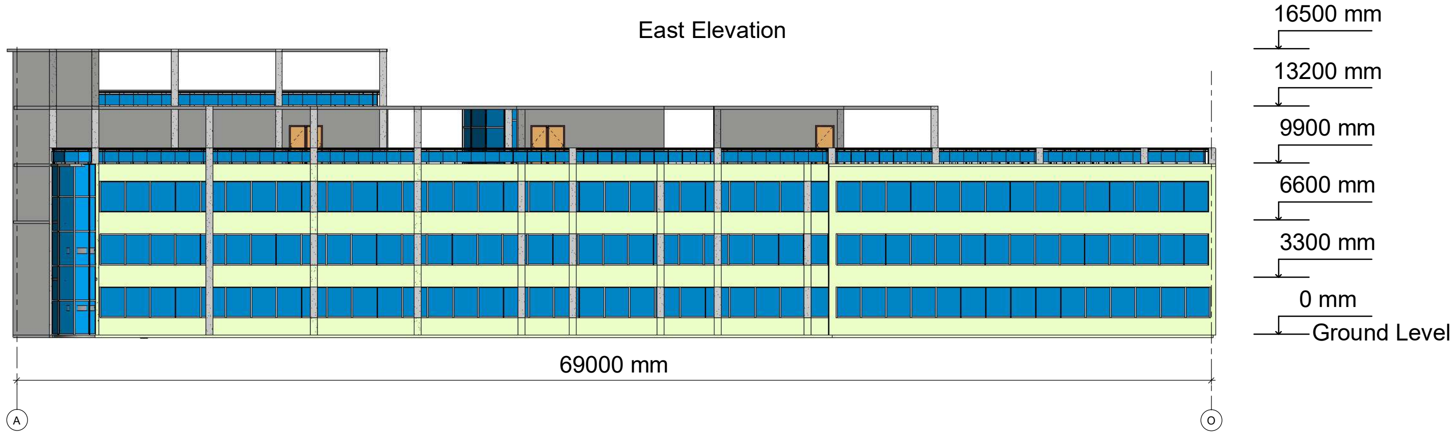
						KazNITU-5B072900-Civil Engeneering-03.08.02-2021-DP
						School-gymnasium with the use of ABS concreting in fixed formwork
Ch	sheet	List	№doc	Sign	Date	
Head of Dep.		Kozyukova N.V.				Architectural and analytical part; stage: DP; list: 1; lists: 12
Supervisor		Kalpenova Z.D.				
Consultant		Kalpenova Z.D.				
N. Controller		Bek A.A.				Site Plan; Civil Engineering and building materials department
Created		Inami M.				

Format A3

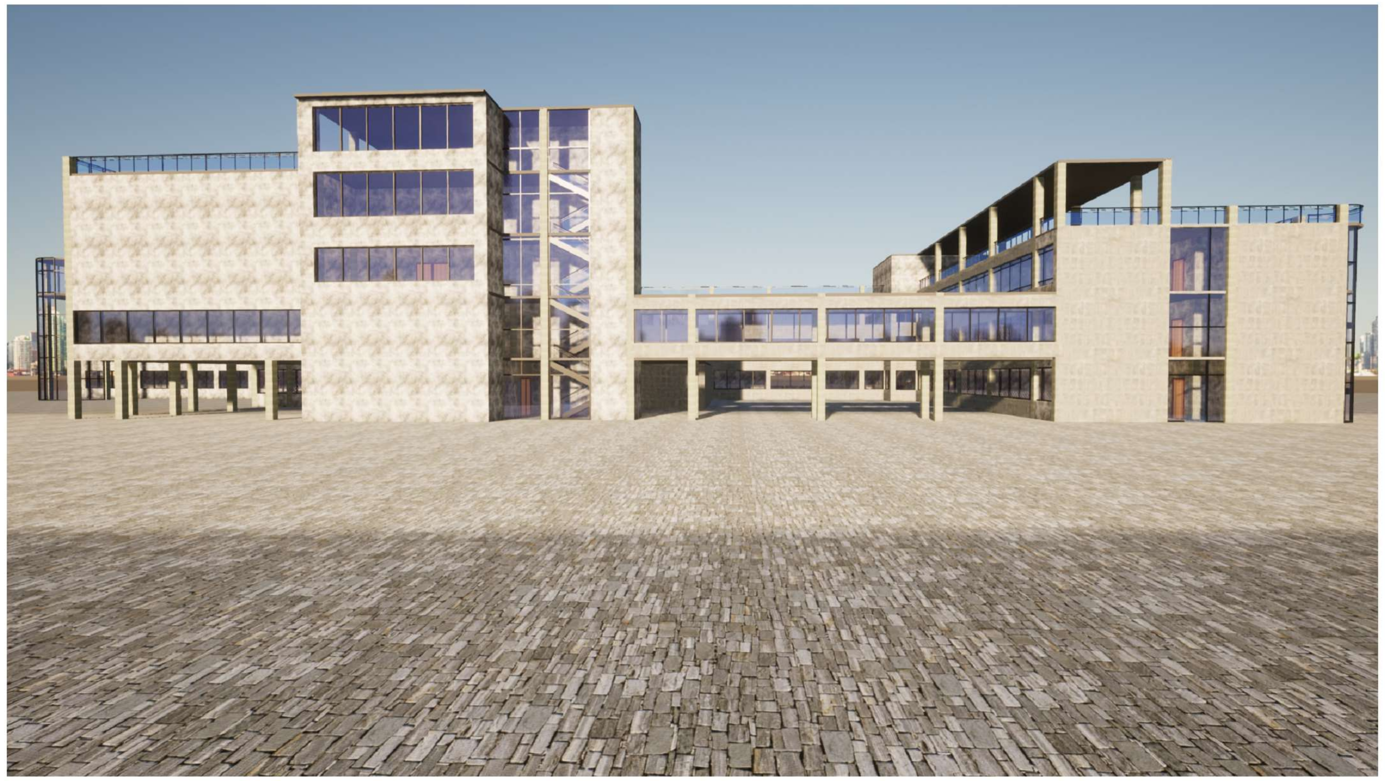
North Elevation



East Elevation

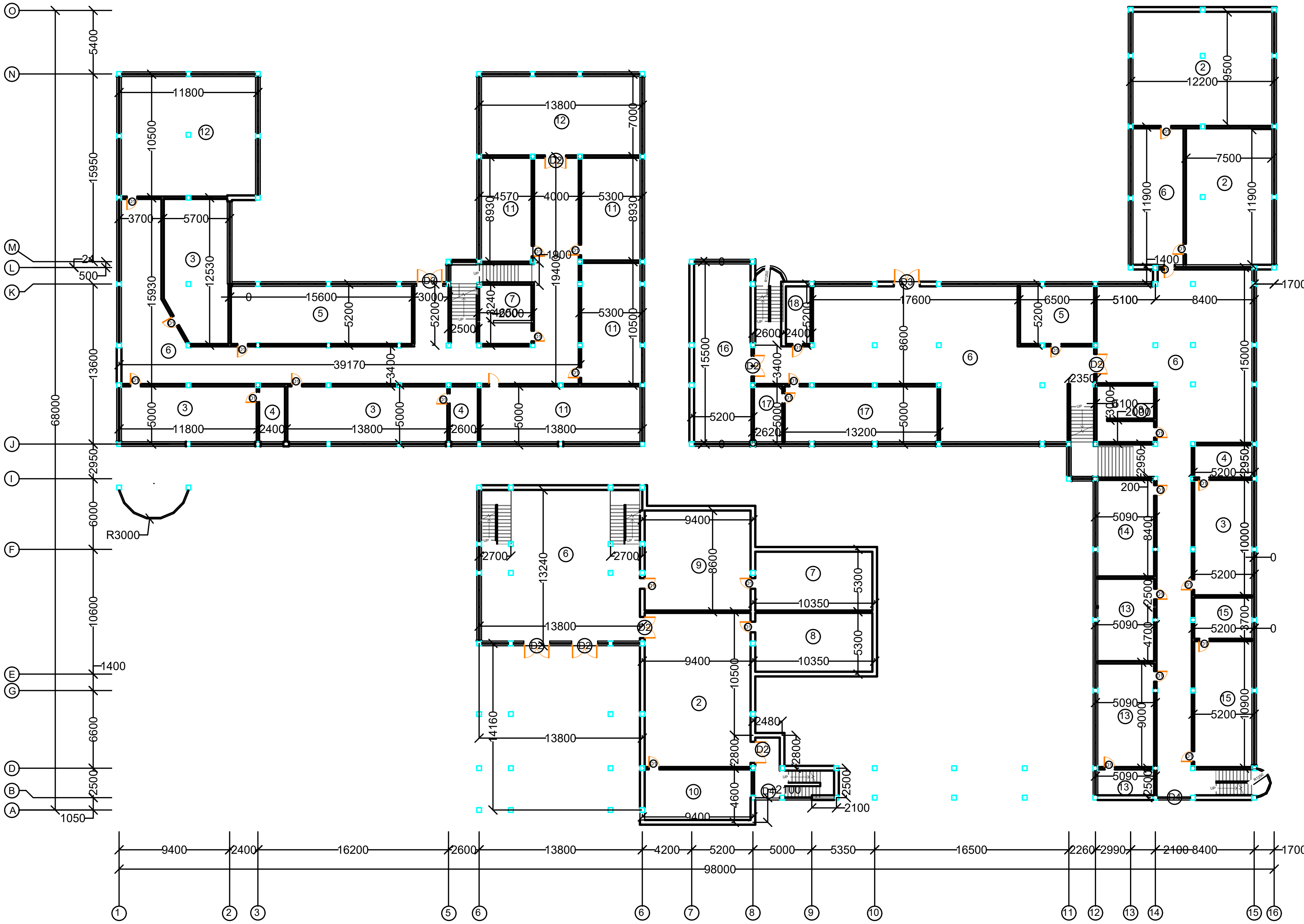


3D View



ch	sheet	List	no doc.	sign	date	KazNITU-5B072900-Civil Engeneering 03.08.02-2021- DP			
						School-gymnasium with the use of ABS concreting in fixed formwork			
Head of Dep		Kozyukova N.V.				Architectural and analytical Part	Stage	sheet	sheets
Supervisor		Kalpenova Z.D.					DP	2	12
Consultant		Kalpenova Z.D.							
N. controller		Bek A. A.				Elevation	Civil Engineering and building materials department		
Created		Inami M.							

First Floor Plan



Items Specifications and details are given in Appendix A, Table1.

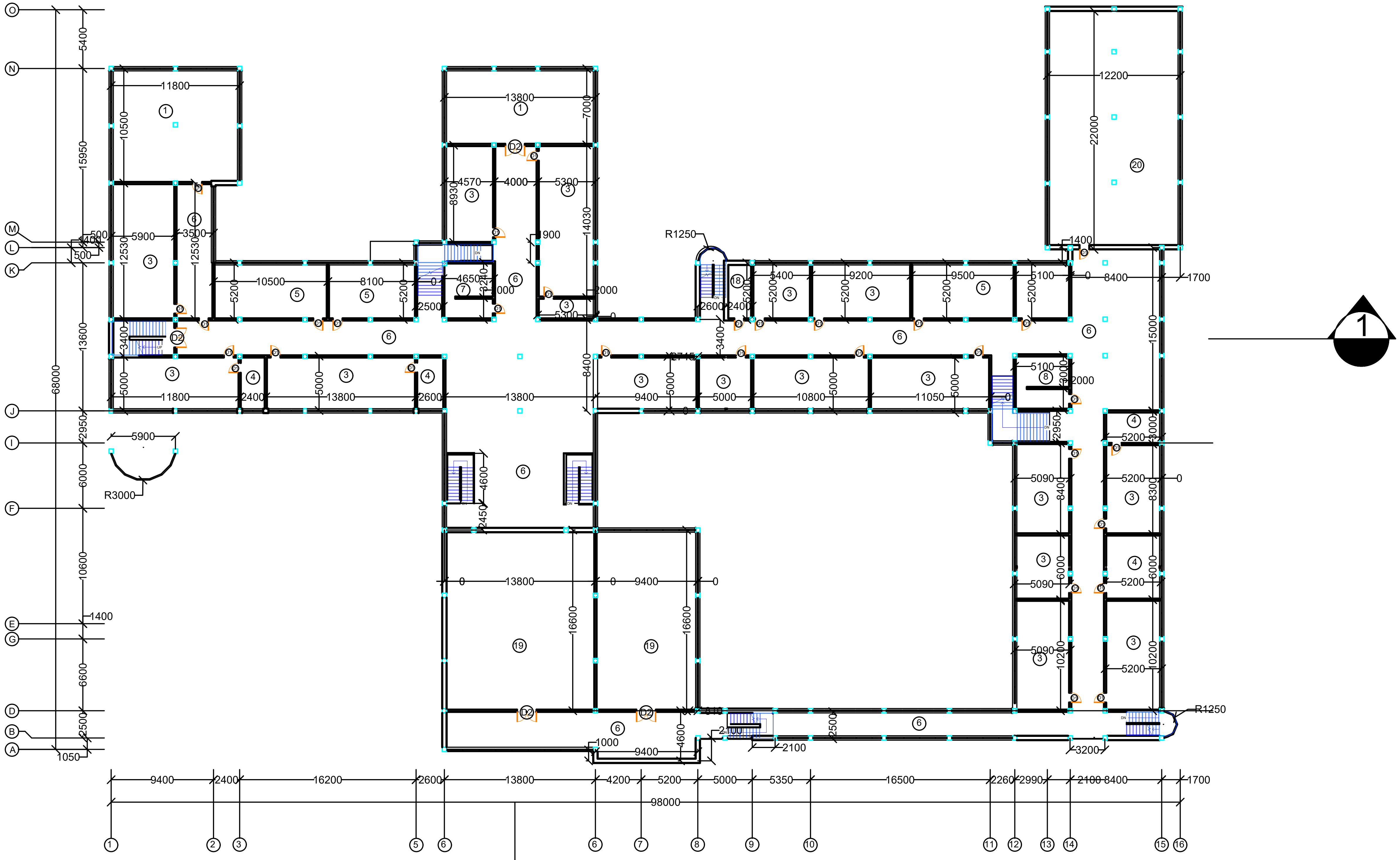
						KazNITU-5B072900-Civil Engeneering-03.08.02-2021-DP
						School-gymnasium with the use of ABS concreting in fixed formwork
Ch	sheet	List	№doc	Sign	Date	
Head of Dep.		Kozyukova N.V.				Architectural and analytical part
Supervisor		Kalpenova Z.D.				
Consultant		Kalpenova Z.D.				
N. Controller		Bek A.A.				First floor plan
Created		Inami M.				

stage	list	lists
DP	3	12

Civil Engineering and building materials department

Format A3

Second Floor Plan

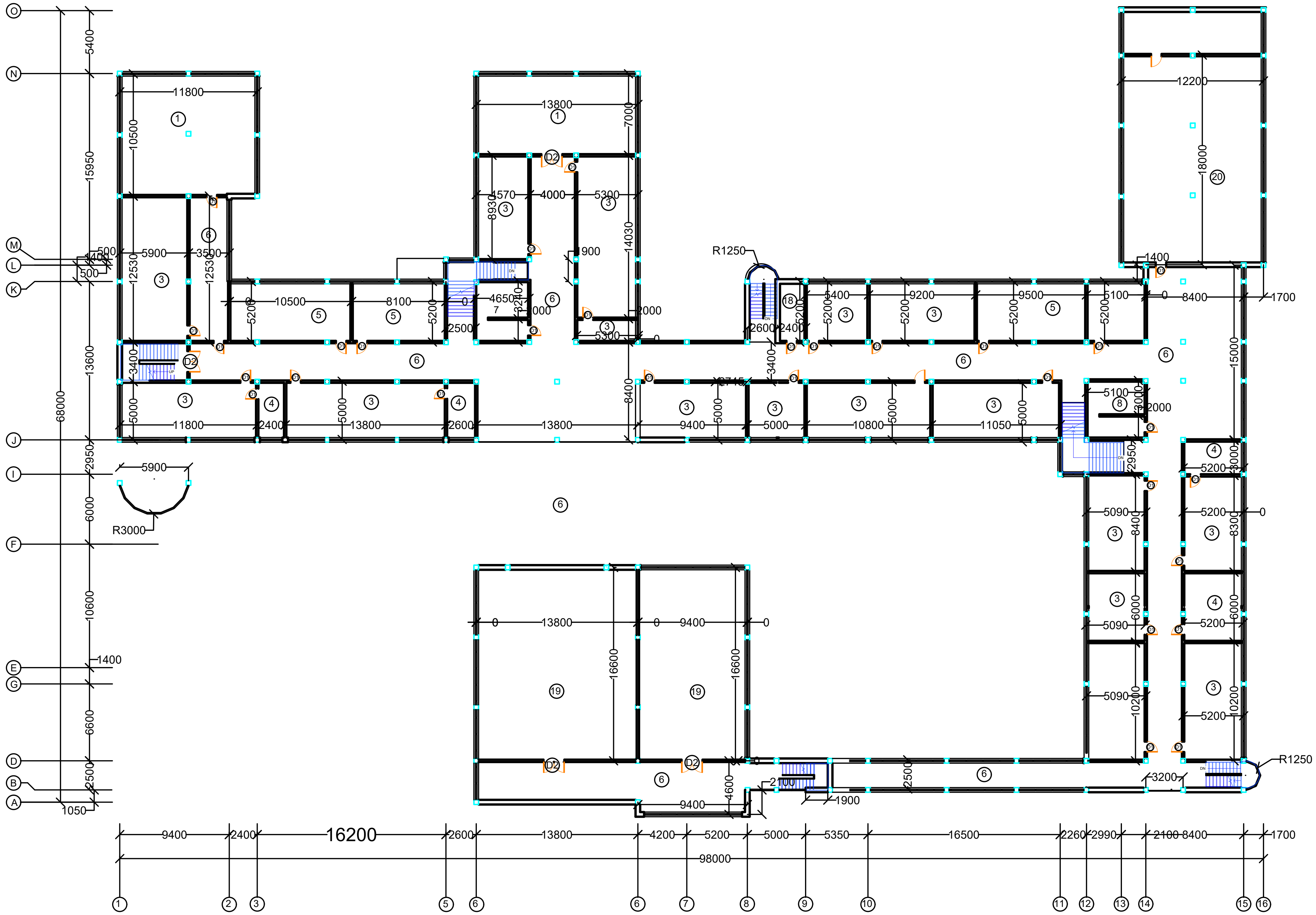


Items Specifications and details are given in Appendix A, Table1.

						KazNITU-5B072900-Civil Engeneering-03.08.02-2021-DP			
						School-gymnasium with the use of ABS concreting in fixed formwork			
Ch	sheet	List	№doc	Sign	Date				
Head of Dep.		Kozyukova N.V.				Architectural and analytical part	stage	list	lists
Supervisor		Kalpenova Z.D.					DP	4	12
Consultant		Kalpenova Z.D.							
N. Controller		Bek A.A.				Second floor plan	Civil Engineering and building materials department		
Created		Inami M.							

Format A3

Third Floor Plan



Items Specifications and details are given in Appendix A, Table1.

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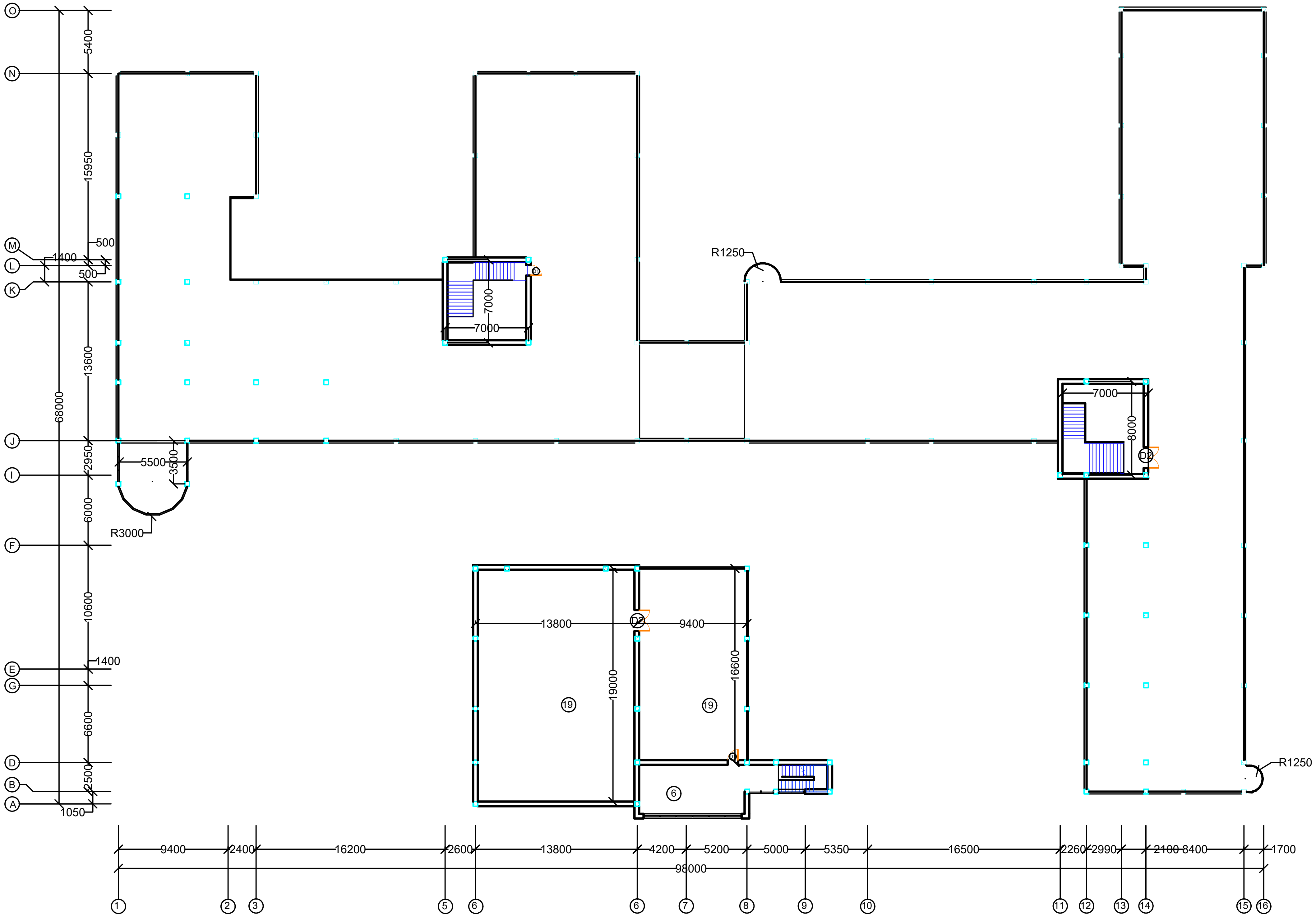
						School-gymnasium with the use of ABS concreting in fixed formwork			
Ch	sheet	List	№doc	Sign	Date				
Head of Dep.		Kozyukova N.V.				Architectural and analytical part	stage	list	lists
Supervisor		Kalpenova Z.D.					DP	5	12
Consultant		Kalpenova Z.D.							
N. Controller		Bek A.A.				Third floor plan	Civil Engineering and building materials department		
Created		Inami M.							

Format A3

Fourth Floor Plan

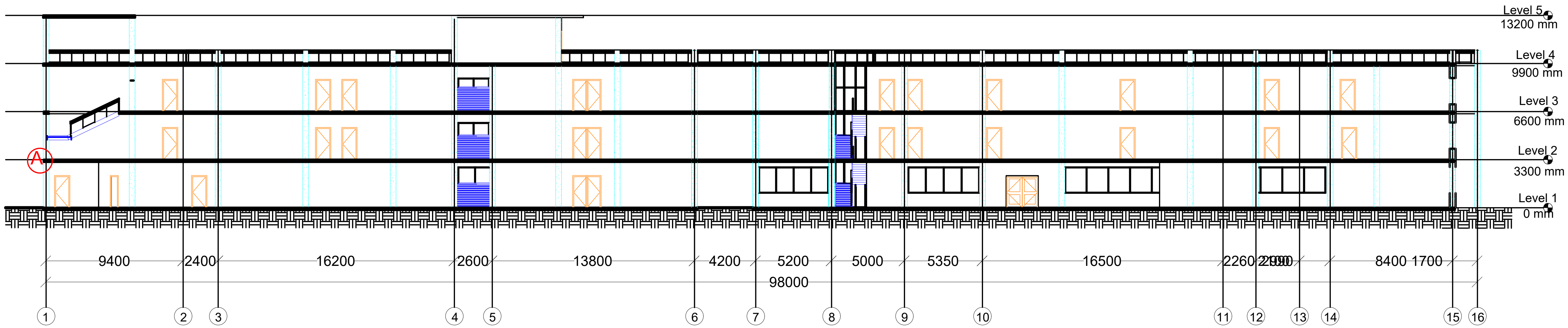


Items Specifications and details are given in Appendix A, Table1.

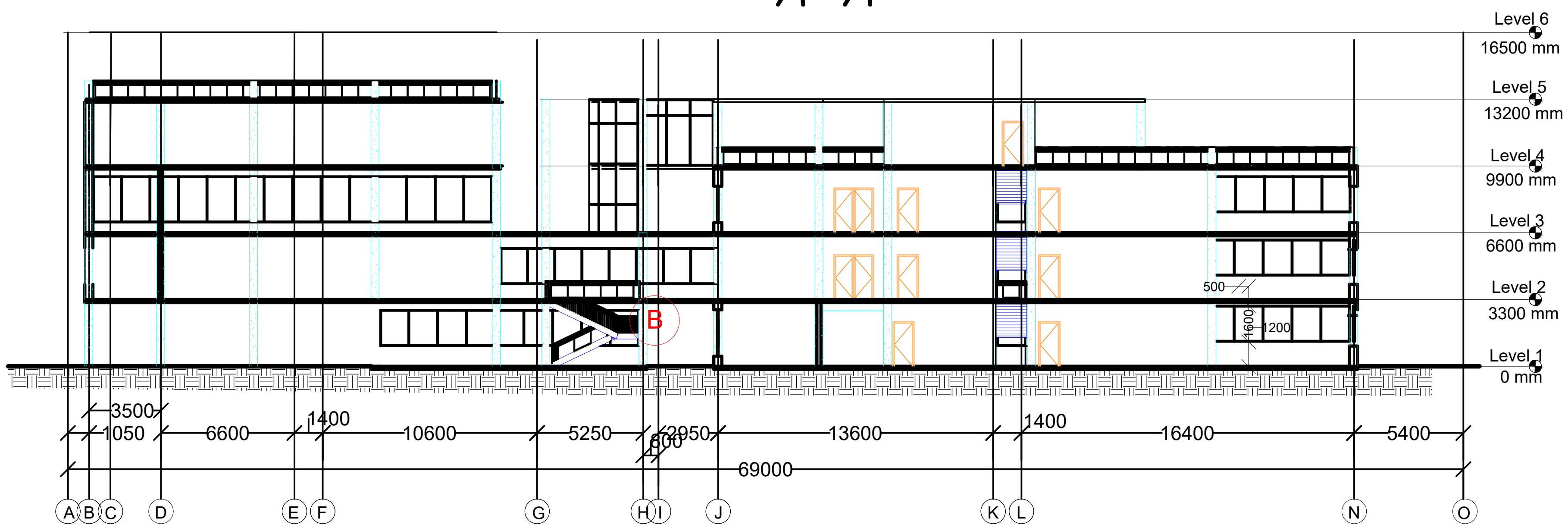
						KazNITU-5B072900-Civil Engeneering-03.08.02-2021-DP
						School-gymnasium with the use of ABS concreting in fixed formwork
Ch	sheet	List	№doc	Sign	Date	
Head of Dep.		Kozyukova N.V.				Architectural and analytical part
Supervisor		Kalpenova Z.D.				stage: DP; list: 6; lists: 12
Consultant		Kalpenova Z.D.				
N. Controller		Bek A.A.				Fourth floor plan
Created		Inami M.				Civil Engineering and building materials department

Format A3

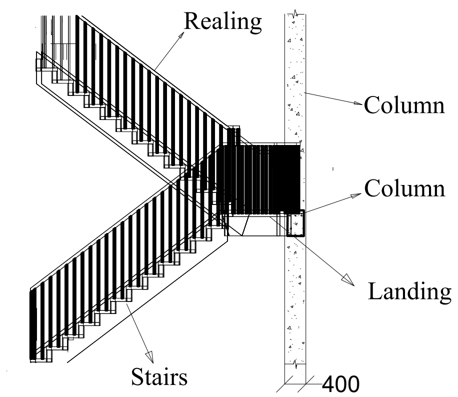
1–1



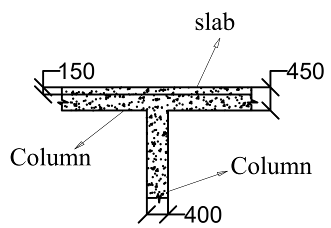
A–A



Joint B



Joint A



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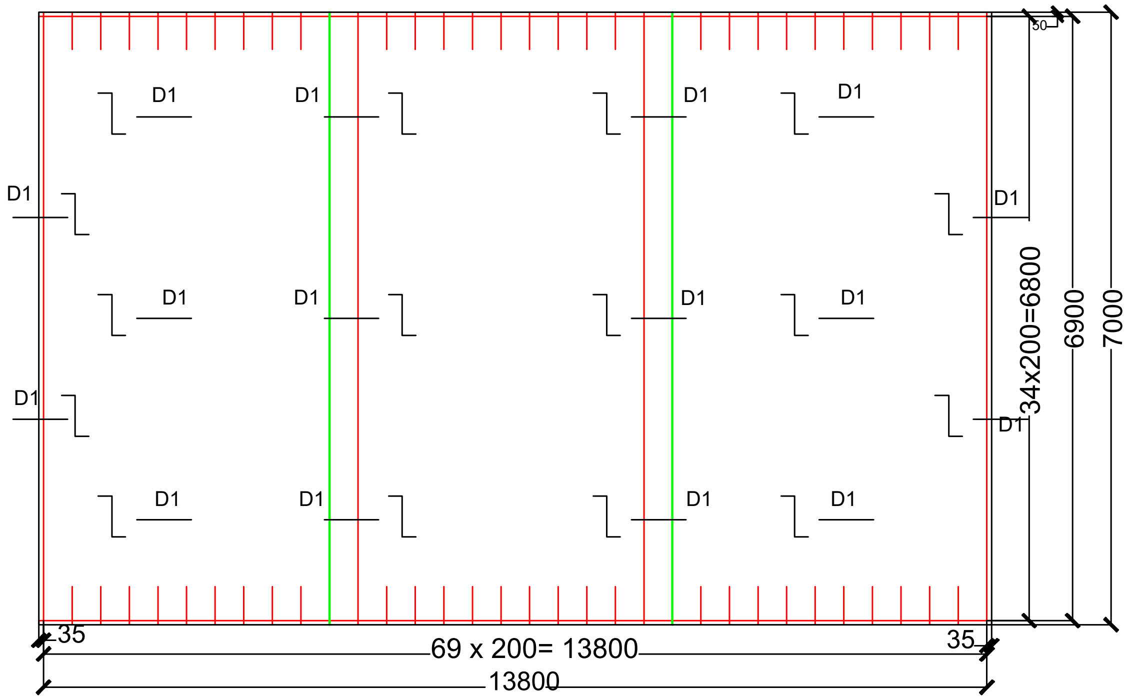
						School-gymnasium with the use of ABS concreting in fixed formwork
Ch	sheet	List	№doc	Sign	Date	
Head of Dep.		Kozyukova N.V.				Architectural and analytical part; stage: DP; list: 7; lists: 12
Supervisor		Kalpenova Z.D.				
Consultant		Kalpenova Z.D.				
N. Controller		Bek A.A.				Section; Civil Engineering and building materials department
Created		Inami M.				

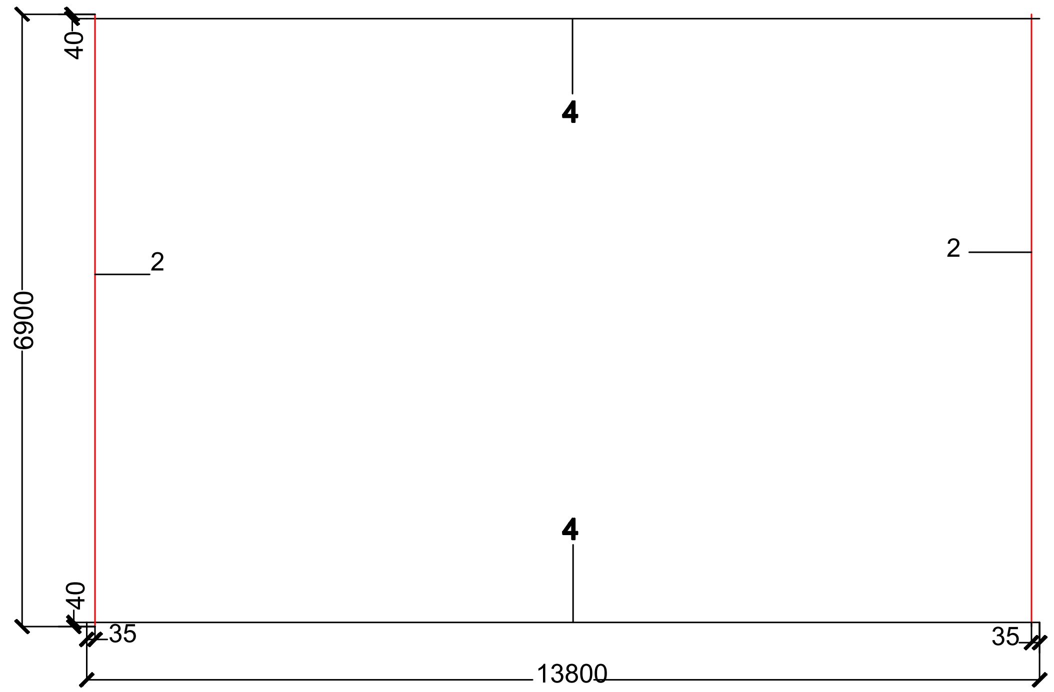
Format A3

Slab drawing

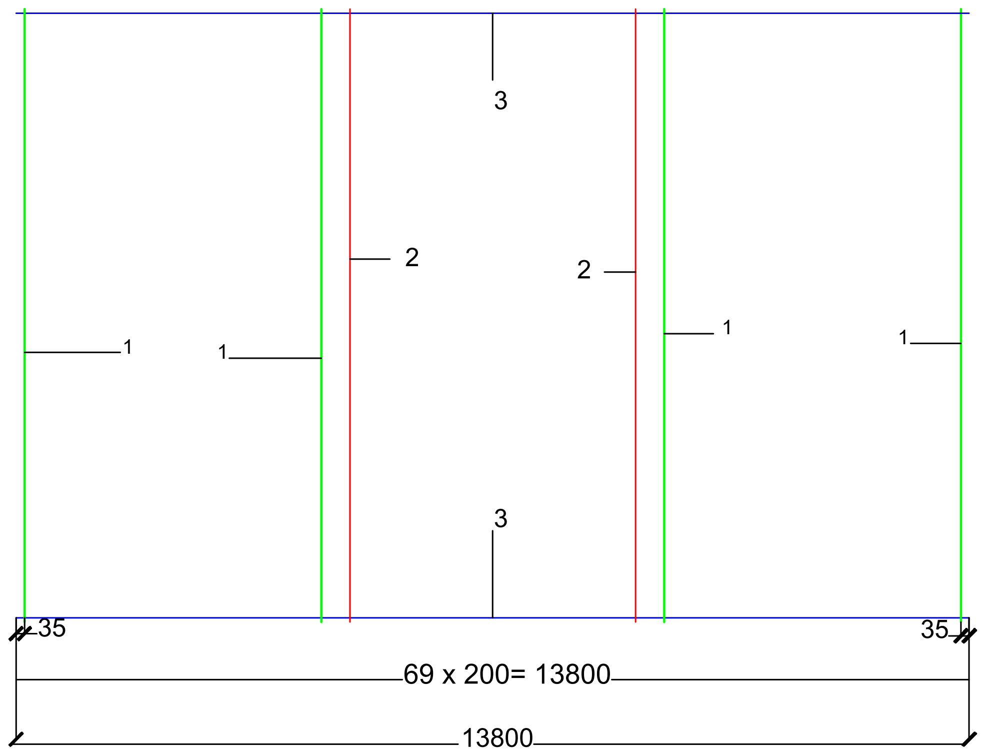
slab plan



mesh- 2



mesh- 1



specification

position	designation	name, length	numbers	weight kg	sum
1	GOST 34028-2016	ϕ10 A500 L=6900	34	0.6	20.4
2	GOST 34028-2016	ϕ12 A500 L=6900	35	0.8	28
3	GOST 34028-2016	ϕ14 A500 L=13800	34	1.29	34.68
П1	GOST 34028-2016	ϕ12 A500 L=900	54	0.8	42.7
D1	GOST 34028-2016	ϕ6 A500 L=1000	15	0.22	3.3

Ch	sheet	List	№doc	Sign	Date
Head of Dep.	Kozyukova N.V.				
Supervisor	Kalpenova Z.D.				
Consultant	Kalpenova Z.D.				
N. Controller	Bek A.A.				
Created	Inami M.				

KazNITU-5B072900-Civil Engeneering-03.08.02-2021-DP

School-gymnasium with the use of ABS concreting in fixed formwork

Calculation and Design part

stage	list	lists
DP	8	12

RCC Slab

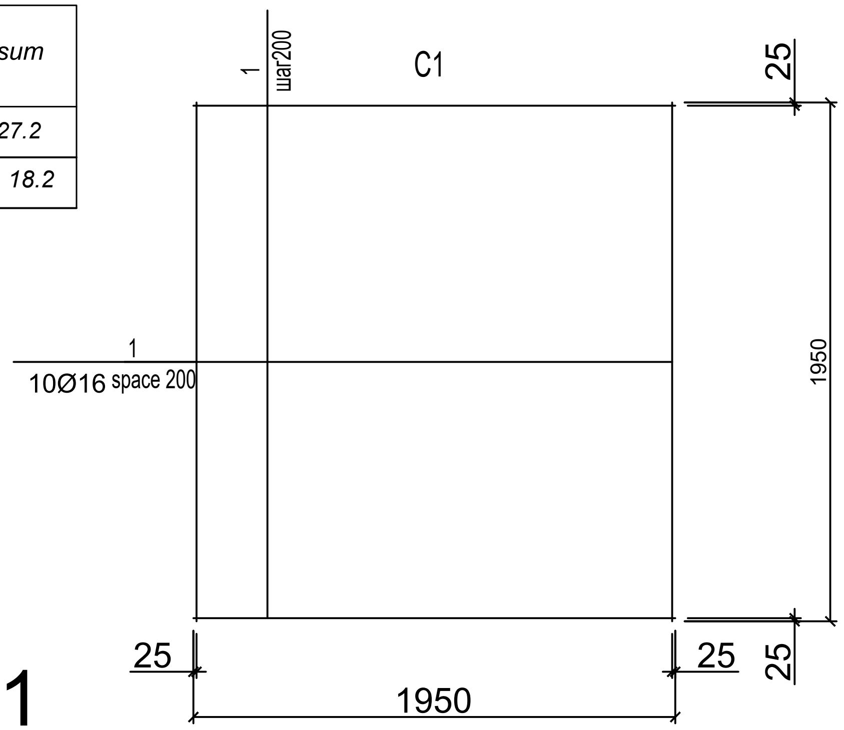
Civil Engineering and building materials department

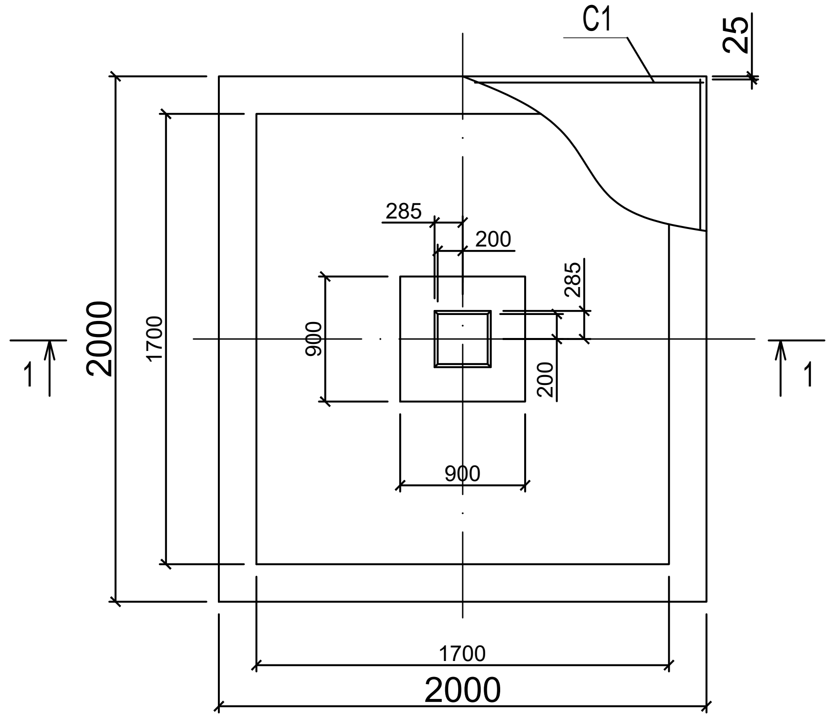
Format A3

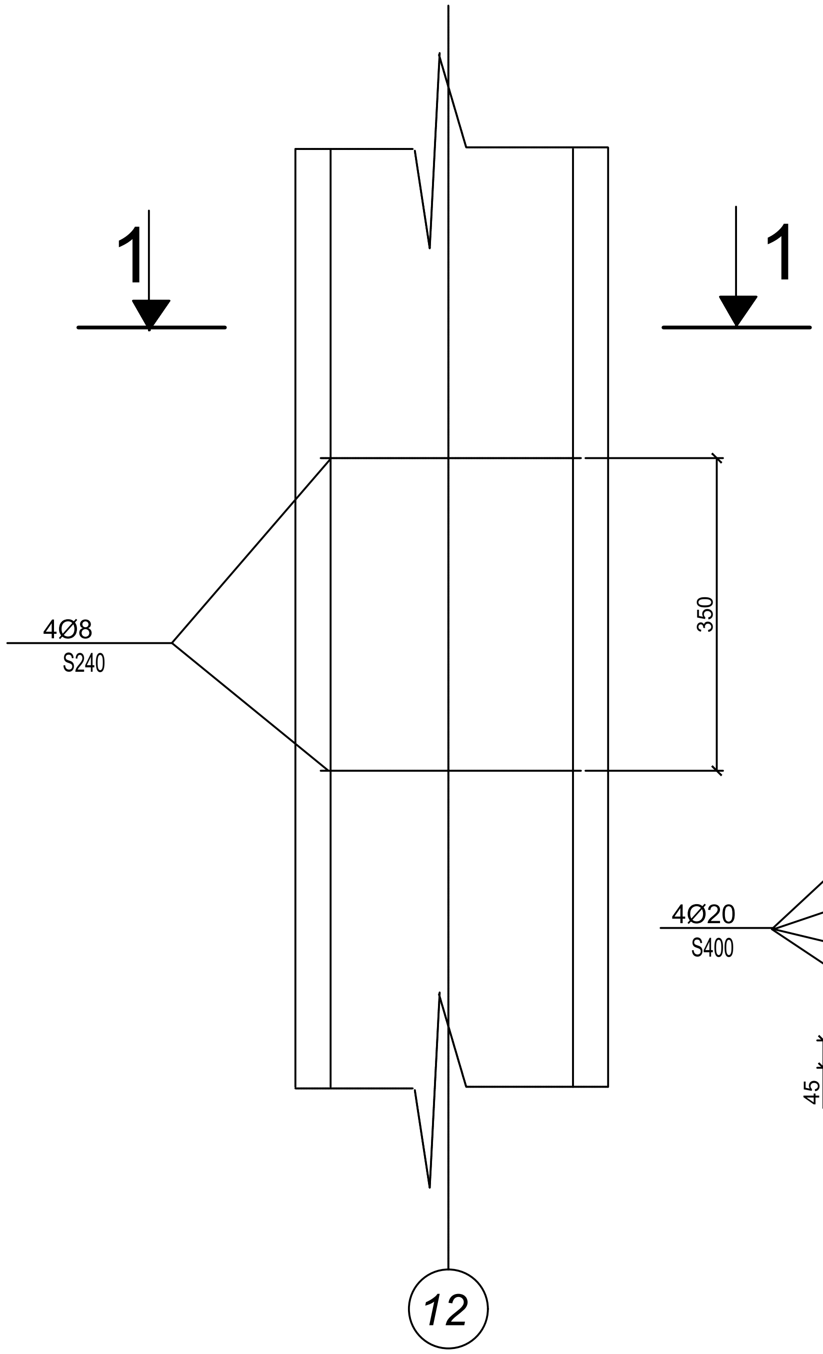
Foundation

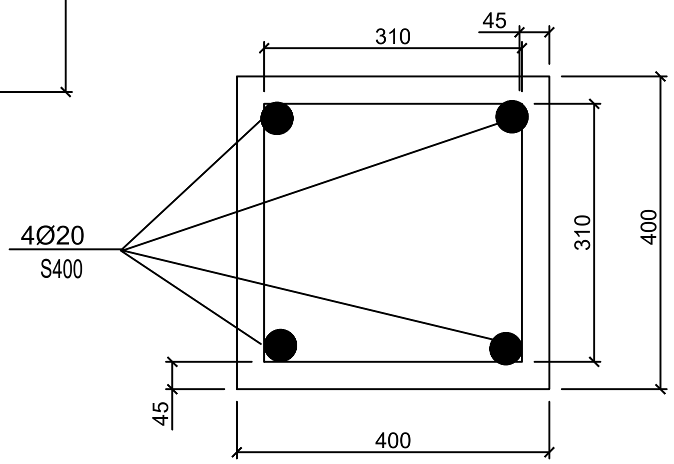
specification

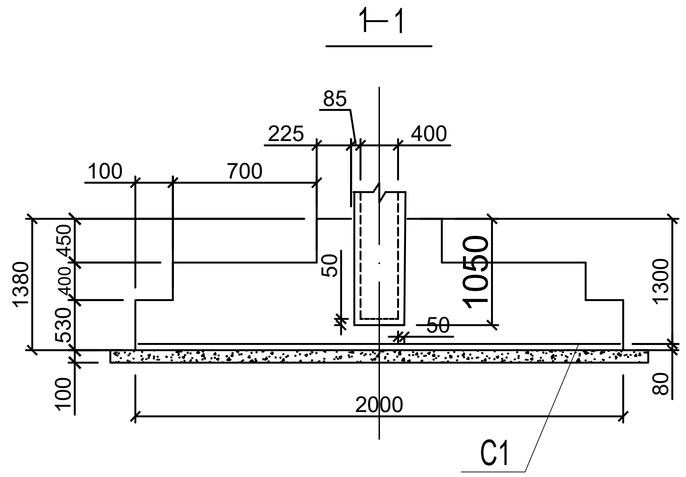
position	designation	name, length	numbers	weight kg	sum
1	GOST 34028-2016	Φ20 A500 L=3300	4	2.06	27.2
2	GOST 34028-2016	Φ8 A500 L=1900	12	0.8	18.2







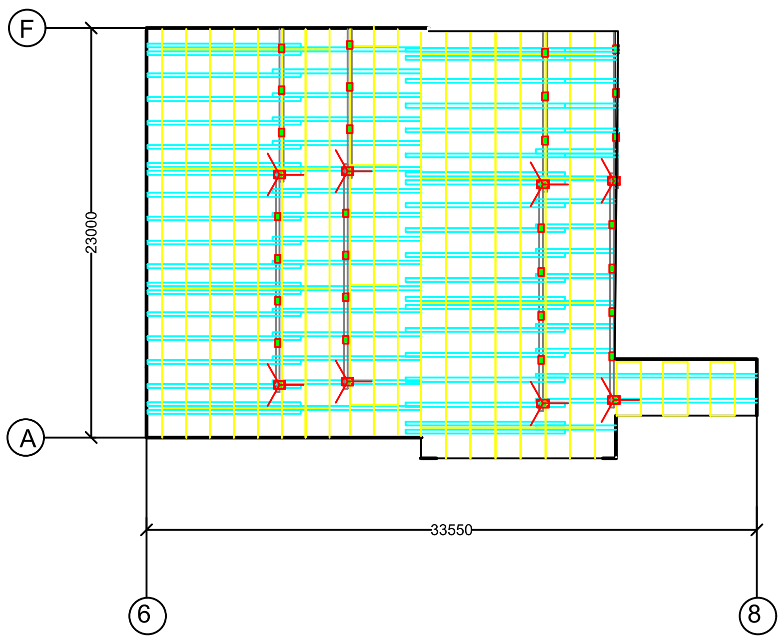




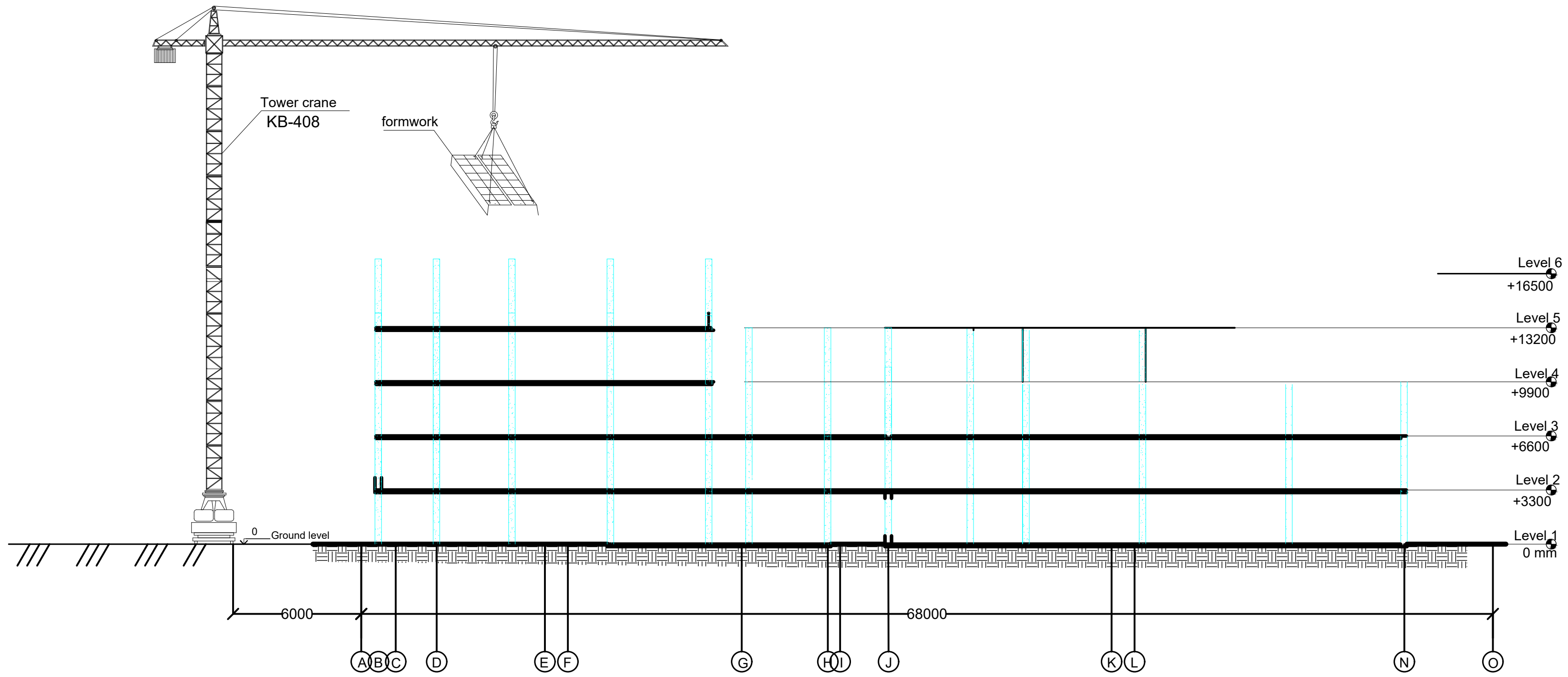
						KazNITU-5B072900-Civil Engeneering-03.08.02-2021-DP		
						School-gymnasium with the use of ABS concreting in fixed formwork		
Ch	sheet	List	№doc	Sign	Date			
Head of Dep.		Kozyukova N.V.				Calculation and design part	stage	list	lists
Supervisor		Kalpenova Z.D.					DP	9	12
Consultant		Kalpenova Z.D.							
N. Controller		Bek A.A.				Foundation	Civil Engineering and building materials department		
Created		Inami M.							

Format A3

RCC Monolithic Slab



Formworking process



LIST OF REQUIRED MACHINES AND EQUIPMENT

№ п/п	Mechanisms name	Brand	Amount	Note
1	2	3	4	5
1	Tower crane	КВ–408	1	Formwork supply and installation, reinforcement
2	Concrete mixer truck	СБ–130	1	Concrete supply
3	Concrete pump	CAR P4.4	1	Concrete supply and placement
4	Pneumatic rammer	И–157	1	Concrete compaction
5	Vibrator	ИВ–66	2	Concrete compaction
6	Formwork		–	Forming structures

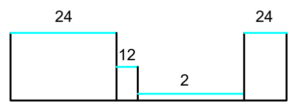
(red line)	H18 – 180cm	13
(yellow line)	H18 – 220cm	32
(green line)	H18 – 280cm	8
(cyan line)	H18 – 320cm	510
(grey line)	H18 – 470cm	65
(yellow rectangle)	Plywood 24mm 250x50cm	554
	Telescopic stand	361
	shearlegs	115
	fork	115
	Unvilka	246

SAFETY AND LABOR PROTECTION.

1. In the production of construction and installation works for the construction of a building from monolithic reinforced concrete in a large-panel formwork it is necessary to comply with the requirements of "Safety in construction. Fire safety rules for works ", " Rules for the construction and safe operation of cranes. "
The safety of work must be ensured: by choosing the appropriate rational technological equipment;The safety of work must be ensured: preparation and organization of workplaces for the production of work; the use of equipment for workers, holding medical examination of persons admitted to work; timely training and verification of their knowledge of safety precautions during construction and installation works.
3. When working at a height of more than 1.5 m, all workers must use safety harnesses with carabiners.
4. Dismantling of the formwork is allowed after the concrete has gained stripping strength and with the permission of the work manufacturer.
5. The separation of the formwork from the concrete should be carried out using jacks. The concrete surface in the process of tearing off must not get damaged. The use of cranes to lift the shuttering boards is prohibited.
6. Cleaning the tray of the concrete mixer and the loading opening from the remnants of the concrete mixture is carried out only when the drum.

Schedule for the production of work per floor

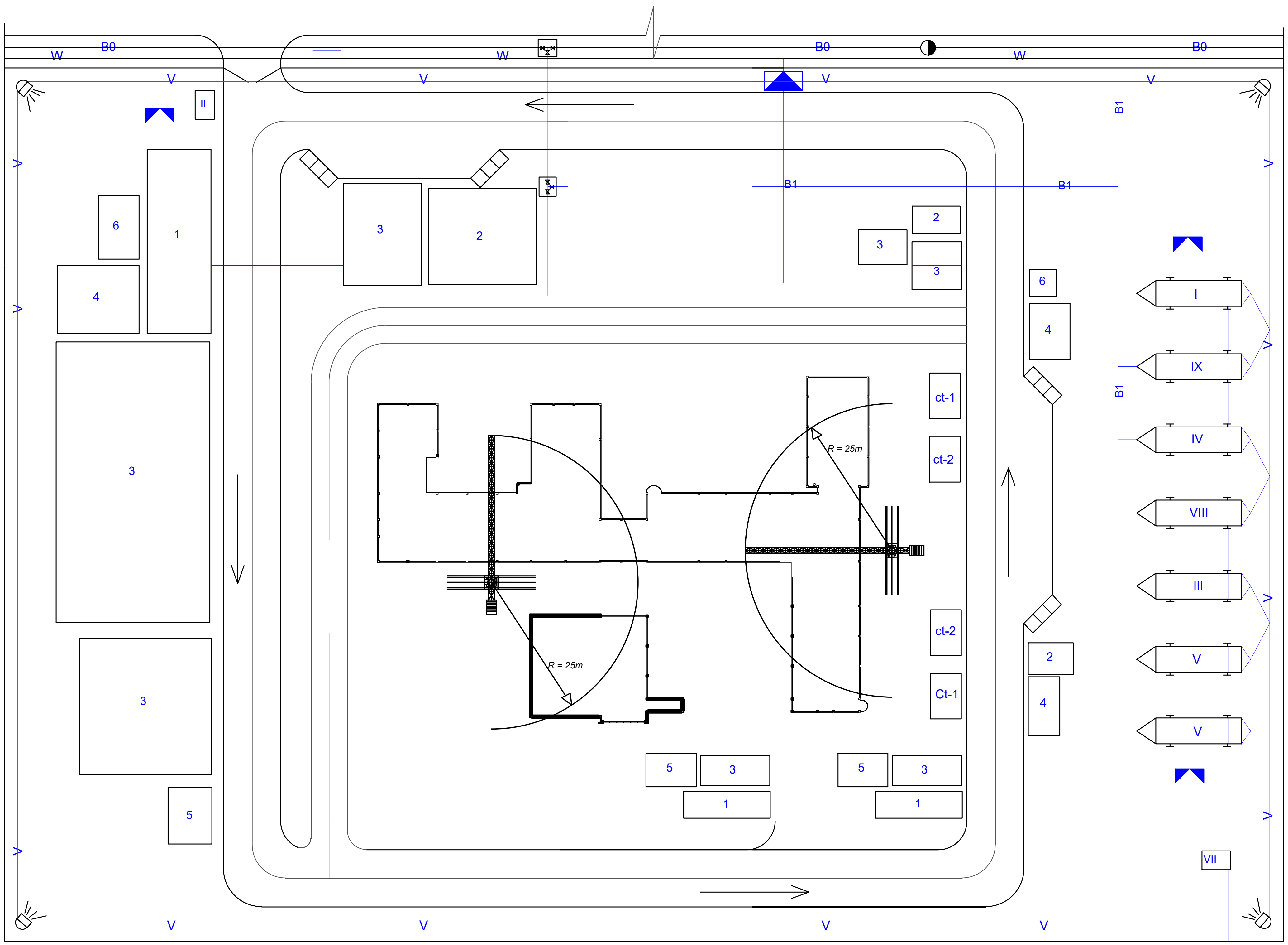
N n/n	Name of works	Volume of work: Unite	Volume of work: Amount	Labor intensity man.hour	Number of worker per shift	Duration: Hour	Duration: Sh	Days, Sifts, Hours (1 day – 4 day; 1 Sh, 2 Sh; 2 4 6 8)
1	Formwork installation	$м^2$	837	326,43	12	14	2	
2	Installation of fittings slabs	т	12	134	12	6	2	
3	Floor concreting	$м^3$	219,87	50,57	12	4	1	
4	Curing concrete	$м^3$	219,87	42,67	2	12	1	
5	Dismantling	$м^2$	837	175,77	12	7	2	



						KazNITU-5B072900-Civil Engeneering-03.08.02-2021-DP			
						School-gymnasium with the use of ABS concreting in fixed formwork			
Ch	sheet	List	№doc	Sign	Date				
Head of Dep.		Kozyukova N.V.				Technological Part	stage	list	lists
Supervisor		Kalpenova Z.D.					DP	10	12
Consultant		Kalpenova Z.D.							
N. Controller		Bek A.A.				Formwork	Civil Engineering and building materials department		
Created		Inami M.							

Format A3

General Plan



CONDITIONAL SYMBOLS

- projected building
- temporary mobile building
- shed
- production warehouse area
- fire safety equipment
- W — power line
- V — temporary lighting networks
- fire safety shield
- heavy wardrobe
- transformer
- danger zone boundary
- the boundary of the work area
- fencing of the territory
- concrete and solvent reception point
- lighting device
- water supply connections
- permanent water supply of general purpose
- temporary household drinking water

WAREHOUSE EXPLOSION

№	Name	unit	Measur	Warehouse
1	Pillars	M2	119,7	Open
2	Beams	M2	136,5	Open
3	Floor plate	M2	3120	Open
4	Cover plate	M2	152	Open
5	Window blocks	M2	8	Open
6	Door blocks	M2	12,2	Shelter

EXPLOSION B3uC

№	Name	Building type	Building size
I	Dedicated to the foreman	ПСВ	9*2,7
II	Passage-dispatching	Assemble	2*3
III	Change of clothes	ПСВ	9*2,7
IV	Washing up	ПСВ	9*2,7
V	Dining and rest area	ПСВ	9*2,7
VI	Place of heating	ПСВ	9*2,7
VII	Cleaner	Assemble	2*3
VIII	Plumbers	ПСВ	9*2,7
IX	Electricians	ПСВ	9*2,7

Ch	sheet	List	№doc	Sign	Date
Head of Dep.	Kozyukova N.V.				
Supervisor	Kalpenova Z.D.				
Consultant	Kalpenova Z.D.				
N. Controller	Bek A.A.				
Created	Inami M.				

KazNITU-5B072900-Civil Engeneering-03.08.02-2021-DP

School-gymnasium with the use of ABS concreting in fixed formwork

Organizational and technological part

stage	list	lists
DP	11	12

General plan

Civil Engineering and building materials department

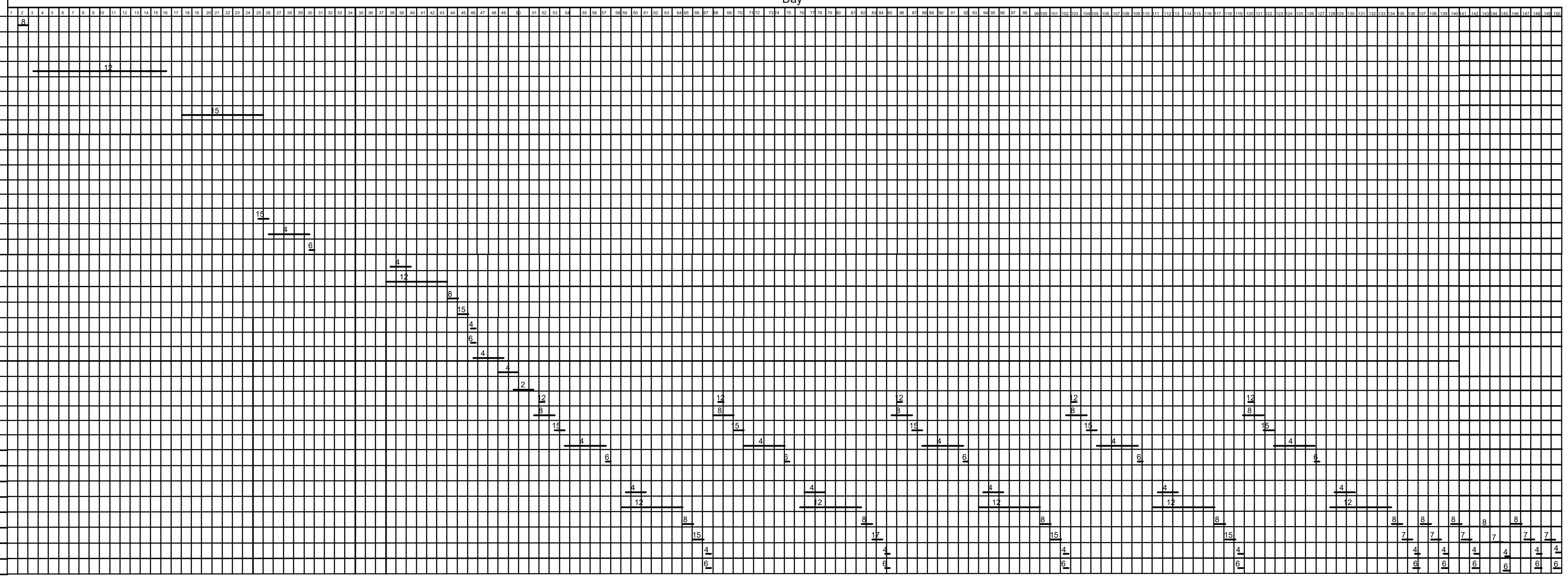
Format A3

Calendar Schedule

№ п/п	Name of works	Scope of work: units of measure	Scope of work: Qty	labor costs m/ day	required machines: Name	required machines: Number of machine per shift	works prod in days	number of shifts	number of workers per shift
1	temporary fence	м	278	16,5			4	2	4
2	cutting off the vegetation layer	$м^3$	940		DZ-42	2	1,5	2	1
3	excavation	$м^3$	7890.6		E - 801	2		2	1
4	manual excavation	$м^3$	562.9		E - 801	2	15	2	8
5	device of monolithic structures. (foundation)								
6	formwork device	$м^2$	1394.48	152,1		1	8	2	6
7	reinforcement work	$м^2$	171.7	95,4	BH-1	1	8	2	6
8	concrete placement	$м^3$	2430	39,1	KAMAZ 53212	2	2	3	5
9	concrete care	$м^3$	789,6	21,7			1	1	4
10	dismantling	$м^2$	1394.48	97,2			0,5	1	6
11	device of monolithic structures. (column)								
12	formwork device	$м^2$	1210	23,8			4	2	6
13	reinforcement work	т	986,1		BH-1	1	8	2	4
14	concrete placement	$м^3$	15	46,8	KAMAZ 53212	2	6	3	5
15	concrete care	$м^3$	15	143,8			12	1	4
16	dismantling	$м^2$	1210	0,04			0,5	1	6
17	device of monolithic structures. (beam and slab)								
18	formwork device	$м^2$	3150	173,9			7	2	6
19	reinforcement work	т	433,6		BH-1	1	18	2	4
20	concrete placement	$м^3$	530	99,1	KAMAZ 53212	2	4	3	5
21	concrete care	$м^3$	530				3	1	4
22	Dismantling	$м^2$	3150	8,3			2	1	6
23	foundation waterproofing	$м^2$	2430	177,4			12	2	2
24	backfilling	$м^3$	1510.5	6,05			1,5	2	2
25	soil compaction	$м^3$	5035.1		Hamm HD 90	4,4	2	2	1
26	device of monolithic structures. (column)								
27	formwork device	$м^2$	1210	23,8			4	2	6
28	reinforcement work	т	986,1		BH-1	1	8	2	4
29	concrete placement	$м^3$	15	46,8	KAMAZ 53212	2	6	3	5
30	concrete care	$м^3$	15	143,8			12	1	4
31	dismantling	$м^2$	1210	0,04			0,5	1	6
32	device of monolithic structures. (beam and slab)								
33	formwork device	$м^2$	3150	173,9			7	2	6
34	reinforcement work	т	433,6		BH-1	1	18	2	4
35	concrete placement	$м^3$	530	99,1	KAMAZ 53212	2	4	3	5
36	concrete care	$м^3$	530				3	1	4
37	Dismantling	$м^2$	3150	8,3			2	1	6

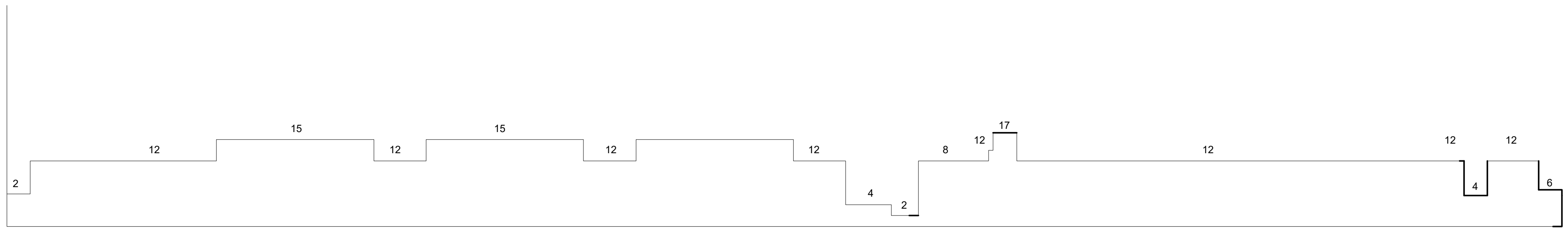
Operating schedule

Day



$$K_{нер} = \frac{n_{max}}{n_{ср}} = \frac{17}{22} = 0.77 \leqslant 1,5$$

$$n_{ср} = \frac{Q}{П} = \frac{3300}{150} = 22$$



Statement of the needs of machines and mechanisms

Name	mark	Note
1.Bulldozer	DZ-42	Cutting vegetable backfill
2. Excavator with back shovel	Hitachi ZX350LCK-5G	Soil development in dump and transport funds
3. Self-propelled roller	Hamm HD 90	Soil compaction
4. Dump truck	MAN TGX 50.480 8x8 BB-WW	Removal of soil
5. Concrete pump	KAMAZ 53212	Concrete supply
6. Tower crane	BH-1	Delivery of goods

Technical and economic indicators

№	Name	Unite	Number
1	Labor costs	man-day	3300
2	Duration	day	150

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Head of Dep.		Kozyukova N.V.				Organizational and technological part	stage	list	lists
Supervisor		Kalpenova Z.D.					DP	12	12
Consultant		Kalpenova Z.D.							
N. Controller		Bek A.A.				Calendar schedule	Civil Engineering and building materials department		
Created		Inami M.							

Format A3

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
СӘТБАЕВ УНИВЕРСИТЕТІ

RESPONSE

OF THE SUPERVISOR
For the graduation project
Inami Muterahman
5B072900-Civil Engineering

Topic: "School-gymnasium with the use of ABS concreting in fixed formwork in Taraz"

The following tasks were solved in the work: a space-planning decision was made, the thermomechanical calculation of the enclosing structures was performed, the calculation and design of building structures, technological maps, and a construction plan were developed, and the cost of construction was also calculated. The student successfully completed all the tasks. Inami Muterahman conducted an initial study of the assignment at a good level, competently conducted analysis of data from literary sources, applied many years of experience in designing this type of building, based on various design guidelines in the design and construction and technological sections. According to the calculations, the cost of construction was calculated. The design assignment was completed in full.

In the process, the student showed responsibility, creative and analytical thinking, independence and showed well 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 sciences, lecturer
_____________ Kalpenova Z.D.

«01» ______06________ 2021уг.

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: Инами Мутерахман

Название: School-gymnasium with the use of ABS concreting in fixed formwork in Taraz

Координатор:Надежда Козюкова

Коэффициент подобия 1:1.7

Коэффициент подобия 2:0.3

Замена букв:32

Интервалы:0

Микропробелы:13

Белые знаки: 0

После анализа Отчета подобия констатирую следующее:

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

Обоснование:

……

……………………… ……………………………………

Дата *Подпись Научного руководителя*

Протокол анализа Отчета подобия

заведующего кафедрой / начальника структурного подразделения

Заведующий кафедрой / начальник структурного подразделения заявляет, что ознакомился(-ась) с Полным отчетом подобия, который был сгенерирован Системой выявления и предотвращения плагиата в отношении работы:

Автор: Инами Мутерахман

Название: School-gymnasium with the use of ABS concreting in fixed formwork in Taraz

Координатор: Надежда Козюкова

Коэффициент подобия 1:1.7

Коэффициент подобия 2:0.3

Замена букв:32

Интервалы:0

Микропробелы:13

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;
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Обоснование:

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Дата *Подпись заведующего кафедрой / начальника структурного подразделения*

Окончательное решение в отношении допуска к защите, включая обоснование:

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Дата *Подпись заведующего кафедрой / начальника структурного подразделения*