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

Asim Poya

« College building with the use of kinematic supports in Almaty »

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 « College building with the use of kinematic supports in Almaty »

5B072900 - "Civil Engeneering"

Prepared by Asim Poya

Scientific adviser Z.M. Zhambakina
Candidate of technical science,
Assistant professor
«_____» _____2021 yr.

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

ASSIGNMENT
Complete a diploma project

Student Asim Poya
Topic: «College building with the use of kinematic supports in Almaty»
Approved by the Order of the Rector of the University No. 2131-b dated November 24, 2020.
The deadline for the completed work is May 10, 2020.
Initial data for the diploma project: construction area in Almaty
Structural schemes of the building - frame-wall with cross-beams, structures are made of monolithic reinforced concrete, architectural solution.
List of questions to be developed:
a) Architectural and analytical part: basic initial data, space-planning solutions, heat engineering calculation of enclosing structures (outer wall), lighting calculation, calculation of the foundation option and depth of laying, justification of energy efficiency measures;
b) Calculation and design part: calculation and design of a column 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 reinforcing bar works, calendar plan, construction site plan - 4 sheets.
11 slides of work presentation are provided.
Recommended main literature:

1 SP RK 2.04-01-2017 "Construction climatology";
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	Zhambakina Z.M., Candidate of technical science, assistant professor		
Calculation and design	Zhambakina Z.M., Candidate of technical science, assistant professor		
Organizational and technological	Kyzybayev N.K., Master of technical science, lecturer		
Economic	Zhambakina Z.M., Candidate of technical science, assistant professor		
Norm controller	Bek A.A., Master of technical science, assistant		
Quality control	Kozyukova N.V., Master of technical science, lecturer		

Scientific adviser _____ Z.M. Zhambakina

The task was accepted
for execution student _____ Asim Poya

Date "___" _____ 2021 yr.

АҢДАТПА

Университеттердің құрылысы білім беруде, зерттеулерде және технологияларда маңызды рөл атқарады. Бұл жоба төрт негізгі бөлімнен тұрады

1) Сәулет ережелері бойынша айырмашылықтары мен шешімдері бар төрт айырмашылық жоспары бар сәулет бөлігі

2 ETABS инженерлік бағдарламасымен есептелетін жобалау бөлігі және стандарттарға немесе ғимараттың орналасуына қатысты таңдалған материалдарға қатысты негізгі жүктемелер.

3. Ғимаратта салу тәсілін көрсететін технологиялық бөліктер.

4. Құрылыстың құнын анықтайтын сметалық бөлігі.

АННОТАЦИЯ

Строительство университетов играет важную роль в образовании, исследованиях и технологиях. Этот проект состоит из четырех основных частей.

1. Архитектурная часть, состоящая из четырех разностных планов с разностными площадями и решениями в соответствии с архитектурными правилами.

2. Расчетная часть, которая рассчитывается инженерной программой ETABS, и основные нагрузки на материалы, которые уже были выбраны с учетом стандартов или местоположения здания.

3. Технологические части, которые покажут способ постройки в здании.

4. Сметная часть, определяющая стоимость здания.

ANNOTATION

Build of the Universities play an important role in education, research and technology. This project has four main parts

1. The architectural part which contains of four difference plan with difference area and solution regarding to architectural rules

2. Design part which is calculate it by the ETABS engineering program and the basic loads regarding the materials which were chosen already regarding standards or building location.

3. Technological parts which going to show the way of constructing in the building.

4. The estimated part which is define the building cost.

CONTENT

INTRODUCTION

The goal of university education has always been the creation, transfer and implementation of knowledge. Knowledge in its current form is at the heart of the processes shaping modern society; today higher education and research are key elements of sustainable biological development of culture, social economy, individuals, societies and countries.

And building of the Universities play an important role in education and training, education, research and technology. In the field of education, universities provide specific training for high-level study and training necessary for personal development. The role of the university is crucial for all disciplines, both social and legal. Graduates of all disciplines also need knowledge of sustainable development. Universities gain the new knowledge and skills needed to address sustainable development issues in society, raise awareness, make informed decisions, provide conditions for responsible behavior and consumer choice. Universities are considered as important institutions in the process of social change and development. The most important task assigned to them is the training and research results of highly qualified personnel in order to achieve the determined goals. Another role that universities can play is the creation of new institutions in civil society, the development of new cultural values, and the formation and socialization of people in a new social era. This document focuses not only on a legal perspective, but also on the role of universities in promoting economic, political, social and cultural change in society. It also describes the impact of education on social change.

The project is going to build in the Almaty, Kazakhstan (st.Gabdullin, 5). The project is kind of university about nine floors, Aside of its population, Almaty has the wonderful climate.

1 Architectural Part

1.1 Architectural planning solution

The exact configuration starts with measuring the basic (overall) dimensions of the components of the structure of the frame. Vertical dimensions are fixed on the base. The horizontal part is related to the length of the building.

The collapsed remnants of the transitional frame are very intact and firmly attached to the central pillars. And the slabs going to be design as there supports. And in Display properties include position selection between frame and column, orientation of main tree, etc. Contains. These factors include construction objectives, design and design decisions, technical and economic drawings, etc.

The college going to build in Almaty Kazakhstan, the average temperature of Almaty city is $10 Celsius$ with the 1.1m/s average wind speed.

As it's a college building and in the partition should be considered standard of architecture like from universities or colleges standards.

The outside wall of the building is with the width of 0.35m and the inner walls are with the 0.25m (brick masonry wall), the floors thickness is 20cm according the required code for buildings.

And the column size are (45x60), (45*55), (45*45), (35*50). From the first up to third floor is with the cross section area of 45*60, from fourth to five 45*55, and others 45*45 and the last story is 35*50.

The architecture reference instruction take out from the Kazakhstan national code 3.02-10-2011

Lecture hall chairs

A combination of folding and swivel chairs, chairs with a backrest and a table (with a hook for hanging a box (frame) or bag) are often fixed. The order of placement varies from style to style based on people, number of students and type of education (slide show facilities and electronic audio facilities). Some lecture halls (mathematic, chemistry and physics) have sloping chair rows, the space required for each student depends on the type of chair, the depth of the desk and the slope of the floor. The required space for each student is equal to $1.10\ m^2$ in small halls and in normal conditions 0.8-0.95 m^2 includes all the moving spaces in larger lecture halls in a cramped position.

Projections, boards, sound features, projection screen brightness

Black-and-white boards can be placed on separate surfaces or fixed directly on the wall. Wall panels in multiple pieces, often moving vertically, manually or mechanically, can be pulled down to the projection range. It is also possible to use wheeled boards or monitors. The sound of the speech should be as uniform as possible without any disturbance such as the return of the sound to the listener. Suspended ceilings help reflect and absorb sound. The back walls should be covered with sound-absorbing materials and the other walls should remain as simple as possible.

Seminar rooms and design services Lecture halls and seminar rooms must comply with executive regulations. Wheelchair users should ensure that there is

adequate space in the lecture hall in accordance with the standards.

Lecture Room Service Rooms Each lecture hall should have a side room with direct access. These rooms do not have a fixed use and can be used as storage. Sufficient space for ceremonies should be located next to all lecture halls for experiments at the same level and lead to a short path to the balcony. Instructions for the minimum size of a rectangular lecture hall is about 0.25-0.2 m per person and for trapezoidal plans 0.18 m - 15.5 m per person and in natural science halls per clinical sample. 0.3m - 0.2 per person The space required for storage and staff rooms is essential for the proper functioning of lecture halls A room for technical staff to store equipment, a room for laundry staff, a storage room for Interchangeable components such as lamps, bulbs and moonlights, blackboards and clothes, the minimum size of each room is 15m and the total space required for the side rooms is at least equal - 50-60m

Computer rooms

Computer rooms depends on the number and size of the computer desk also the size of transformer display

General educational rooms

Seminar rooms have a normal size of 20,40,50,60 chairs, have double movable desks with a length of 1,2m, a depth of 0.6 m and the space required for each student is 1.9-2m. How to arrange the tables for training and group work is different. If free ventilation is provided through an external wall, the depth of the room should not exceed the exact ceiling height of 2.5m.

Office science members

Teacher rooms dimension 20-24m^2

Scientific Assistance rooms dimension 15m^2

Assistance rooms dimension 20m^2

Secretary rooms dimension 15 (for two = 20 m^2)

Dressing rooms and toilets

At least it should be consider (0.15-0.16) m^2 per seat

Library

Library with free Access It is possible to store 20,000 to 30,000 volumes of books freely on the shelves.

Book storage

Bookcase with 6-7 shelves has a height of 2m (accessible height) the distance between the bookshelves is 1.6-1.5 m. The required space is 1-1.2 m per 200 volumes of books.

Study area in library

With the width (0.9-1) m depth ، 0.8m required space to

(2.4 – 2.5) m per checkpoint at the entrance with storage of books and packages, catalogs, Copy room.

1.2 Decision of general plan

The land allocated for the construction of a college for education in Almaty city in the newly developed area of the city and on the construction site will be built.

The area is free from the construction of utilities the construction site is characterized by the following data and values:

- Not flooded by floods and other surface waters;
- Prevailing wind-east.

Transport services are provided by existing roads. The building is surrounded by hard pavements.

The dimensions of the elements of the master plan include utilities, roads, taking into account the placement of sidewalks, landscaping elements, as well as in accordance with sanitary and fire safety norms and regulations.

0.2 m thick for restoration before construction. It is planned to remove the vegetation layer. Orientation of the premises meets the standards.

1.3 Constructive solution

The college going to build in Almaty Kazakhstan, the average temperature of Almaty city is 10℃ with the 1.1m/s average wind speed.

Constructive solutions

Monolithic reinforced concrete frame for the frame of the building in construction applied.

The lifting structures of the building are designed of monolithic reinforced concrete.

The frame scheme - frame system was accepted as the design scheme of the building.

Structural strength and stability of the building, joint operation of beams. Column pitch -the variable varies according to the architectural solution.

The cross section of the columns was taken differently in height and section:

This project is a monolith made of C30 / 37 class concrete, slab contraction joints should intersect at the openings for columns. Frame dimensions of the cross section of the elements: made of concrete of class C30/ 37crossba 450x60), (450x550), (450 x500), (450x450) mm (bxh), the height of the cross section of the columns variable.

Slab contraction joints should intersect at the openings for columns 200 mm and 200 mm reinforced concrete.

Stairs made of monolithic reinforced concrete.

Place for reinforcement, S500 class hot-rolled steel fittings according to 5781-82 applied. Enclosure construction on standard floors 75 marks made of heat block (200mm).

The partitions are also made of brick around the building made of 80 mm thick concrete with a width of 1000 mm, sand base with a thickness of 100 mm, impregnating two layer bitumen until complete saturation the floor is installed.

Reinforced concrete elements in contact with the soil 2 times with hot bitumen should be lubricated.

Floors:

1) in the playground and administrative rooms – parquet;

2) Sanitary facilities and bathrooms have ceramic tiles;

3) in vestibules, elevator halls, main entrance vestibule-granite tiles;

4) Stair railings, loggias, electrical panels and garbage collection.

In the chambers - ceramic tiles.

Doors are decorated with valuable species of wood. Built-in cabinets and mezzanines are covered with plywood and knife painted twice with clear matte varnish.

2 Structural part

2.1 basic loads calculation

For calculation of deal load of building we need to have the thickness of slabs and the material density that we are going use in our building .We calculate load in tabular form table 2.1

Table 1 - Collecting of loads
In the Appendix B

2.1.1 Live loads of building

For calculation in programs we need to take them out from the codes

Table 2 Live loads category

Categories of use **Category**	**Specific use**	Example
A	Area for domestic and residential activities	Residential buildings
B	Office area	--
C	Areas where people may Cong rate	University, college , coffee etc
D	Shopping areas	Markets

My buildings in category C (C1) so we choose load from the table 2.3 which is equal to 2KN

Table 3 Live loads measure regarding to EURO CODE

Categories of loaded area	KN/m^2	KN
Category A		
-floors	1.5 to 2	2.0 to 3.0
-stairs	2.0 to 4.0	2.0 to 4.0
-balcony	2.5 to 4.0	2.0 to 3.0
Category B	2.0 to 3.0	1.5 to 4.5
Category C		
-C1	2.0 to 3.0	3.0 to 4.0
-C2	3.0 to 4.0	2.5 to 7.0 (4.0)
-C3 -C4	3.0 to 5.4 4.5 to 5.0	4.0 to 7.0 3.5 to 7.0
-C5	5.0 to 7.5	3.5 to 4.5
Category D		

-D1	4.0 to 5.0	3.5 to 7.4 (4.0)
-D2	4.0 to 5.0	3.5 to 7.0

2.1.2 Calculation of Snow Load

For the determining snow load we need to know the our area zone so it's on II category

$$S = \mu_i \cdot C_e \cdot C_t \cdot S_k \quad (1)$$

where S_K- calculation value of the extreme snow load on the ground =0.8KPa;

Ce- the environmental coefficient or exposure factor if protected =1.2 Regarding to the zone ;

C_t- the temperature coefficient if heated = 1;

μ_i- coefficient of snow load form for general buildings=1.

$$S = 1 \cdot 1.2 \cdot 1 \cdot 0.8 = 1 \text{ KPa}$$

The combination of effects of actions to be considered should be based on

- The design value of the leading variable action, and
- The design combination values of accompanying variable actions

We can have the following formula [6]:

$$\sum \gamma_{G,\,JGK,J} + \gamma_P P + \gamma_{Q,1} Q_{K,1} + \sum \gamma_{Q,i}\, \psi_{0,i} Q_{k,i}$$

Where for permanent ($\gamma_{G,J}$) we have 1.35 for variable(floor $\gamma_{Q,1}$) we have 1.5 and for $\gamma_{Q,I}$ we have 1.5·0.5=0.75.

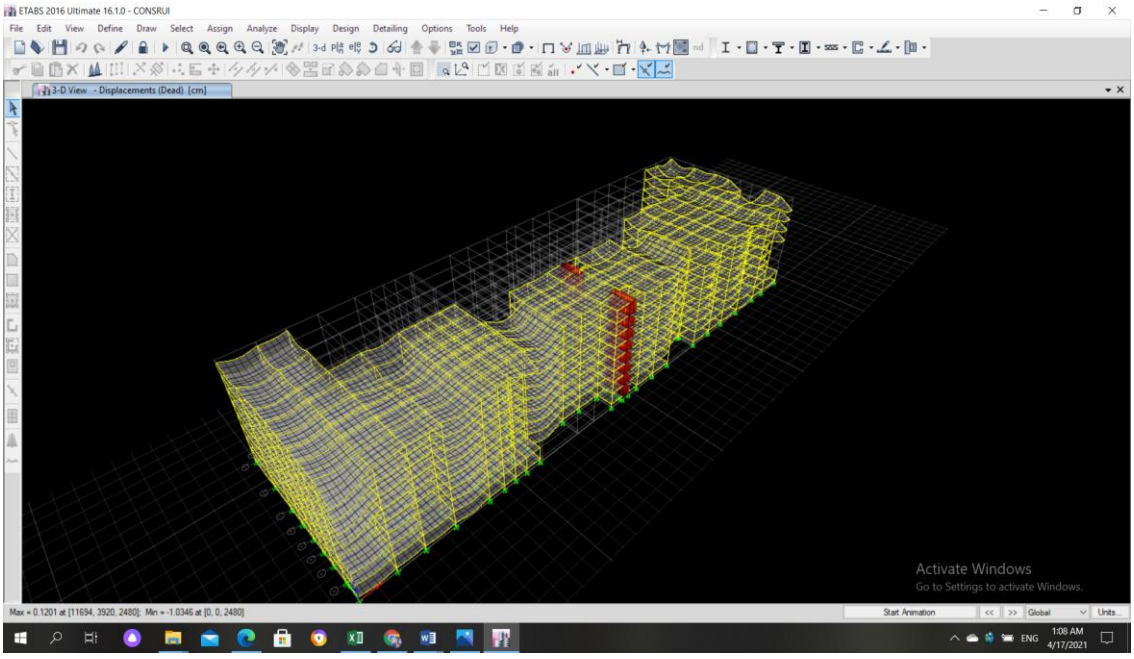

Figure 1-Analyse of building

More explanation on the application 2

2.2 Design of rectangular slab

Estimated span. The one end support is cantilever, simply support and other end is connected T_o establish the design span, the slabs are preset by the dimensions of the crossbar according to the formula 2 [1]:

$$h_p=(\frac{1}{18}) \cdot l_1 \quad (2)$$

where l_1 – column spacing, cm.

$$h_p =(\frac{1}{18}) \cdot 940=52 \text{ cm}$$

According to the unification requirement, we can't take it less than 55cm so we take the crossbar height 55cm.

Preliminary beam width according to formula 3 [1]:

$$b=(0.3\text{-}0.4) \cdot h_p \quad (3)$$

where h_p – cross-sectional height of the girder, cm

$$b =55 \cdot 0.4=22 \text{ cm}$$

According to the unification requirement and considering more safety requirements we take the crossbar with the width of 35 cm.

$$l_0 = l_2 - \frac{b}{2}, \quad (4)$$

where l_2 – span of the building, cm;

b – Cross-sectional width of the crossbar, cm

$$l_0 =8.4\text{-} \frac{0.35}{2} =8.2 \text{ м}$$

Collection of loads. Calculation of loads per 1 m^2 of flooring is given in accordance with table 2.1.

Design load per 1 m with a slab width of 0.2 m, taking into account the safety factor for the purpose of the building $\gamma_n = 0.95$:

Constant g=2· 0.2 · 0.95=3.5 кN /м;

Complete g+υ =(1.2 · 2.0) · 0.95=5.49 кN /м; υ=1.2 · 2.0 · 0.95=2.28кN /м.

Including permanent and long-term 6.49 · 2· 0.95=12.33 кN /м

2.2.1 Efforts from design and standard loads

The bending moment of the design load is determined by the Etabs program we choose from there for calculating other values.

$$M == 52 \text{ kN/m}$$

The shear forces also chosen from the Etabs results .

Q= 17.5kN

From standard full load:

From standard constant and long-term loads:

2.2.2 Determining the dimensions of the slab section

The height of the section of a hollow-core (10 round voids with a diameter of 15 cm) slab according to the 7 [1]:

$$h = \frac{l_0}{30} \quad (7)$$

where l_0 - calculated span;

$h = \frac{820}{30} \approx 26$cm

The working height of the section is determined by the formula [1]:

$$h_0 = h - c_1 \quad (8)$$

where h – section height

c_1 - protective layer

h_0=26-3+3=20 cm

Dimensions: thickness of the upper and lower shelves 3 cm. Width of ribs: medium-4 cm, extreme ribs - 5 cm.In calculations for the limiting states of the first group, the calculated thickness of the compressed T-section flange h_f'= 3 cm; attitude h_f'/h=3/26=0.11>0.1, in this case, the entire width of the shelf is taken into account b_f'=200 cm; design rib width $b = \frac{840}{20}$=42 cm. Should not be less then 55cm

Strength characteristics of concrete and reinforcement. Restressed reinforcement: σ_{sp}=0.75 ·820=615 MPa. The condition is checked. With the electro thermal tensioning method p= $\frac{30+360}{l} = \frac{30+360}{8.4}$=46 MPa; σ_{sp}+ p=615+46=661<R_{sn}=840 MPa - the condition is met. The plan and side views are shown in accordance with Figure 2.1.

2.2.3 Calculation of longitudinal working reinforcement

Characteristic resistance of concrete class C30 /37 to axial compression f_{ck} = 30MPa. Partial safety factor for concrete γ_c = 1.5.

The design resistance of concrete to axial compression is determined by the formula 2.8 [3]:

$$f_{cd} = a_{cc} \cdot \frac{f_{ck}}{\gamma_c} \quad (9)$$

$$f_{cd} = 0.85 \cdot \frac{30}{1.5} = 17 \text{ M}Pa$$

Characteristic tensile strength of working reinforcement class S500 $f_{yk} = 500$ MPa. The design tensile strength of the working reinforcement is determined by the formula 2.9 [3]:

$$f_{yd} = \frac{f_{yk}}{\gamma_s} \tag{10}$$

$$f_{yd} = \frac{500}{1.15} = 434.78 \text{ M}Pa$$

A variable uniformly distributed load is applied to the slab q_k = 17 кN/m and constant g_k =2 кN /м.

The design section of the slab is shown in accordance with Figure 2.2.

$M_{Ed,\ max}$=52 кNm.

Effective cross-section width b_{eff} = 2.0 м.

Working section height according to the formula 2.6 [3]:

$$d = h - c_1 \tag{11}$$

$$d = 230 - 30 = 200 \text{ mm}$$

We determine the value of the coefficient is determined by the formula 2.12

$$\alpha_{Ed} = \frac{M_{Ed}}{f_{cd} \cdot b_{eff} \cdot d^2} \leq \alpha_{Eds,lim} \tag{12}$$

Where d - working section height

$$\alpha_{Ed} = \frac{100 \cdot 10^6}{17 \cdot 1000 \cdot 200^2} = 0.14 \leq 0.372$$

According to the table. A.1. Appendix A [3] for normal concrete ≤ C50/60; α_{Ed} = 0.1 и $\sigma_{sd} = f_{yd}$ = 434 MPa → ω = 0.14, $\xi = \frac{x}{d} = 0.14$. $N_{Ed} = 0$

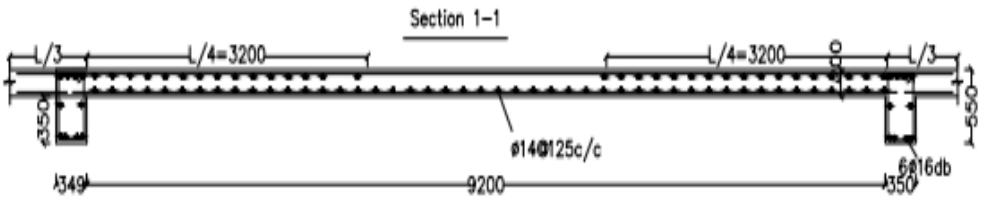

Figure 2 - Design section of the slab

The relative height of the compressed zone is determined by the formula 13[3]:

$$x = \xi \cdot d < h_f \tag{13}$$

$$x = 0.14 \cdot 175 = 28 \text{ mm} < 30 \text{ mm}$$

Since the neutral axis is located within the shelf. In this regard, further calculation is carried out as a rectangular section with dimensions b =b_{eff}=2000 mm, d =175 mm.

Required area of tensile reinforcement according to formula 2.13 [3]:

$$A_{s1} = \omega \cdot b_{eff} \cdot \frac{d}{\frac{f_{yd}}{f_{cd}}} \tag{14}$$

$$A_{s1} = 0.14 \cdot 200 \cdot \frac{175}{\frac{434}{17}} = 1370\, mm^2 = 13.7\, cm^2$$

The area of the working reinforcement is taken according to the range of bar reinforcement is 9th rebar 14mm and the mark is S500 and placing the reinforcing is in every 200mm: (9Ø14) S500 (A_{s1} = 13.7 cm^2).

2.2.4 Calculation of transverse reinforcement

Characteristic tensile strength of transverse reinforcement class S500$f_{y\omega} = 500$ MPa. Design tensile strength of transverse reinforcement according to the formula 15 [3]:

$$f_{y\omega d} = \frac{f_{y\omega k}}{\gamma_s} = \frac{500}{1.15} = 434 \text{ M}Pa$$

The length of the section on which the transverse reinforcement must be installed according to the calculation is determined from the diagram of the shear forces.

To do this, we determine the lateral force that concrete can perceive according to the formula 16 [3]:

$$V_{Rd,c} = \left[\left(\frac{0.18}{\gamma_c}\right) \cdot k \cdot (100\rho_l \cdot f_{ck})^{\frac{1}{3}}\right] \cdot b_\omega \cdot d \tag{16}$$

$$k = 1 + \sqrt{\frac{200}{d}} \leq 2 \tag{17}$$

where f_{ck} -

$$k = 1 + \sqrt{\frac{200}{175}} = 2.02$$

$$\rho_l = \frac{A_{s1}}{b_\omega d} \leq 0.02 \quad (18)$$

$$\rho_l = \frac{1370}{2000 \cdot 175} = 0.003 < 0.02$$

$$V_{Rd,c} = \left[\left(\frac{0.18}{1.5}\right) \cdot 2 \times (100 \cdot 0.0035 \cdot 30)^{\frac{1}{3}}\right] \cdot 2000 \cdot 175 = 183.9 \text{ к}N ;$$

But not less $V_{Rd,c,min}$ according to the formula 19 [3]:

$$V_{Rd,c,min} = \left[0.035 \cdot k^{\frac{3}{2}} \cdot f_{ck}^{\frac{1}{2}}\right] \cdot b_\omega \cdot d = \left[0.035 \cdot 2^{\frac{3}{2}} \cdot 30^{\frac{1}{2}}\right] \cdot 2000 \cdot 175 =$$
$$= 189.21 \text{ к}N ;$$

Insofar as $V_{Ed,max} < V_{Rd,c,min}$; 50 кN < 183.9 kN we install transverse reinforcement based on design considerations.

The step of the transverse reinforcement is determined by the formula 20 [3]:

$$s \leq 0.75d \quad (20)$$

$$s \leq 0.75 \cdot 175 = 130\text{mm}$$

The layout of the transverse bars is shown in accordance with Figure 2.3.

The rebar's for the tensile force is the same as rebar we used in the moment part: 9Ø14S500 (A_{s1} = 13.7 cm^2).

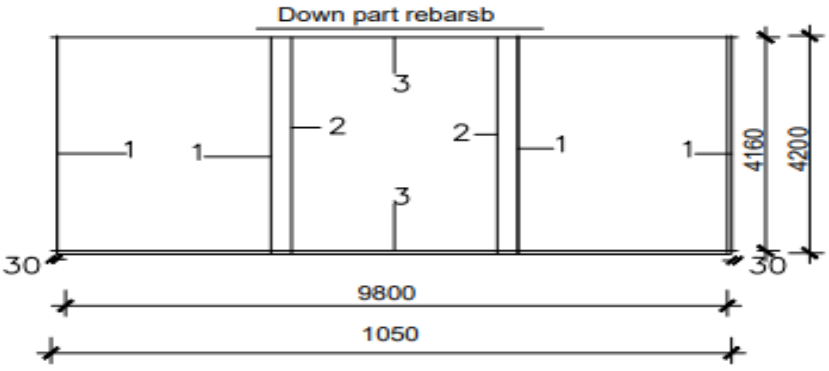

Figure 3 - slab steel design

2.3 Calculation rectangular column

2.3.1 Determination of longitudinal forces from design loads

Load area of the middle column with a grid of columns $9 \cdot 4.2 = 37.8$м^2.
Constant load:
- From overlapping according to the formula from 21 [1]:

$$N_1 = \gamma_n g \tag{21}$$

where g – constant floor load, which is equal to 2kN;
$A_{\text{гр}}$ – middle column cargo area.

$$N_1 = 0.95 \cdot 2 \cdot 37.8 = 71.82\text{кN}$$

- From the crossbar according to the formula from 22 [4]:

$$N_2 = \gamma_n \cdot \gamma_f h_{\text{р}} b_{\text{р}} L_{\text{р}} \rho \tag{22}$$

where γ_f – Coefficient equal to 1.1;
$h_{\text{р}}$ – Crossbar height;
$b_{\text{р}}$ – Crossbar width;
$L_{\text{р}}$ – Crossbar length;
ρ – reinforced concrete density.

$$N_2 = 0.95 \cdot 1.1 \cdot 0.6 \cdot 0.45 \cdot 27 \cdot 22 = 167.5 \text{ кN},$$

- Column dead weight according to the formula from 23 [4]:

$$N_3 = \gamma_n \gamma_f h_{\text{к}} b_{\text{к}} H_f \rho \tag{23}$$

where $h_{\text{к}}$ – Column section height;
$b_{\text{р}}$ – Column section width;
H_f – Floor height.

$$N_3 = 0.95 \cdot 1.1 \cdot 3 \cdot 0.45 \cdot 0.6 \cdot 22 = 18.62 \text{ кN}$$

- From the coating is determined by the formula from 24 [4]:

$$N_4 = \gamma_n \gamma_f g_{\text{покр}} \text{A}_{\text{гр}} \tag{24}$$

where g_c – temporary load from the coating.

$$N_4 = \gamma_n \gamma_f g_{\text{покр}} \text{A}_{\text{гр}} = 0.95 \cdot 1.1 \cdot 1.5 \cdot 37.8 = 52.9 \text{ кN},$$

The total constant load is:

$$N_{total} = (167.5 + 71) \cdot 9 + 18.62 \cdot .1.2 + 52.9 = 2146+22.34+52.9=2221 \text{ кN}$$

Live load:

- From the overlap is determined by the formula from 25 [4]:

$$N_5 = \gamma_n \gamma_f \vartheta \mathrm{A_{rp}} n_{cr} \quad (25)$$

where ϑ – temporary design load

$$N_5 = 0.95 \cdot 1.1 \cdot 2 \cdot 38.7 \cdot 4 = 323\text{кN}$$

- From snow is determined by the formula from 26 [4]:

$$N_6 = \gamma_n \gamma_f p \mathrm{A}_{cr} \quad (26)$$

where p – snow load

$$N_6 = 0.95 \cdot 1.1 \cdot 1.2 \cdot 38.7 = 45.9 = 46 \text{ кN}$$

Longitudinal force acting on the column:

$$\mathrm{N} = V_{Ed} = N_{total,d} + N_{t.l} = \text{-}2589 \text{ кN}$$

The moment acting on the column is take 3202кN.м from the Etabs calculation.

2.3.2 Selection of section and calculation of the sectional area of reinforcement

Determined by the formula:

$$\frac{c_1}{h} = \frac{c_2}{h} = \frac{4}{4o} = 0.1,$$

where c_1 and c_2 – column reinforcement cover;

h - column length.

$$V_{Ed} = \frac{N_{Ed}}{(bhf_{cd})} \quad (27)$$

So as our value is more then Ned on etabs (Ned = 2589Kn, in program regarding to the reduction factor (0.9) for safety its 2827KN, it seems that we calculate it correctly as manually.

Concrete mark is C30/37, so *fcd* = 20 MPa for α_{cc1}= 1.0

$$V_{Ed} = \frac{-2827000}{(450 \cdot 600 \cdot 20)} = \text{-}0.5$$

$$a_{Eds} = \frac{M_{Ed}}{(bh^2 f_{cd})} = \frac{3202 \cdot 10^5}{(450 \cdot 600^2 \cdot 20)} = 0.9$$

where ω_{tot} = 0.4

$$A_{s,tot} = \omega_{tot} \mathrm{bh} / (\frac{f_{yd}}{f_{cd}}) \quad (29)$$

$$A_{s,tot} = 0.4 \cdot 450 \cdot 600 / (\frac{434.78}{20}) = 2347\ mm^2$$

Maximum steel area for column is 4 Celsius cross-section of column area in Etabs I find it 1 percent like 2700mm^2, so we accept the bigger one 2700 and regarding this value we calculate amount of longitudinal bars

$$\frac{22^2 \cdot 3.14}{4}4 = 379 \text{ , } \frac{2700}{379} = 7.12 = 8$$

$A_s = 2700mm^2$, accept 8Ø22 S500 (A_s =2700 mm^2).

For the ties that are going to save the longitudinal bars we use Hc/4 in two bases but in the middle we find the length by the Hc/2 (in moment area)

where *Hc* is height of the column

¾= 0.7m

3/2= 1.5m

The distance between ties is 15Dlb or a/2, a/4.

In the middle:

45/2 = 22.5cm

At the top and bottom of the column:

45/4 = 11.25cm

3 Organizational and technological

3.1 Removal of top soil

During pit excavation removal of top soil to be implemented at the area *(*only for the pit in kind of mat foundation):

$$S_1 = (10 + l_{1s.t} + 10) \cdot (10 + l_{2s.t} + 10), (m^2) \quad (30)$$

where, $l_{1s.t}$– the pit length at the top, m;
$l_{2s.t}$– the pit top, m,

$$l_{1s.t}=l_{1s.b}+2\text{mh} \quad (31)$$

$$l_{2s.t}=l_{2s.b}+2\text{mh} \quad (32)$$

where $l_{1s.b}$ – the pit length at the bottom;
$l_{2s.b}$ – the pit width at the bottom.

$$l_{1s.b}= l_1 + (1{,}3 \cdot 2), \text{ m} \quad (33)$$

$$l_{2s.b} = l_2 + (1{,}3 \cdot 2), \text{ m} \quad (34)$$

where m - Slope steepness factor (Annex No 1, table 2, Euro code 2);
h - formation level (the height of the pit) per the task, m;
1.3m– distance between the axis and slope bottom, destined for a person access to the structure;
l_1, l_2– length and width of the structure in plan, respectively (per the task), m.

$$l_{1s.b}= 129+ (1{,}3\cdot 2) = 131.6 \text{ m}$$
$$l_{2s.b} =39 + (1{,}3x2) = 42.2 \text{ m}$$
$$l_{1s.t} =129+2 \,.\, 0.5 \,.\, 4 =133$$
$$l_{2s.t}=39+2 \,.\, 0.5 \,.\, 4 = 43$$
$$S_1 = (10 + 131\cdot 6+ 10) \cdot (10 + 43 + 10)= 9550.8m^2$$

The total volume of top soil removal is calculated by the formula *(*only for the pit):

$$V_{s.r}=S_{1(a)} \cdot 0{,}15m{,}m3 \quad (35)$$

$$V_{s.r}=9550.8 \cdot 0.15= 1432.62\ m^3$$

3.2 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):

$$v_{com} = \frac{v_{bf}}{h_c} \text{ m}^2 \quad (36)$$

where V_{bf} – backfilling **v**olume, m^3;

h_c– compacted layer thickness, (0.2 to 0.4)m

$$v_{com} = \frac{4503.93}{0.3} = 15013.12 \text{ m}^2$$

$$v_{b.f} = \frac{v_{p\_}v_s}{1+K_{rl}} \quad (37)$$

where $V_{s/f}$– volume of strip foundation, m^3;

V_{cellar}– volume of cellar.

$$V_{cellar} = l_1 \cdot l_2 \cdot h_{f\,(b)}, m^3$$

$$V_{cellar} = 129 \cdot 39 \cdot 0.3 = 1509.3, m^3$$

where K_{rl} – Index of residual soil loosening;

$h_{f\,(s)}$– the height of the structure basement, ref. mat strip foundation section.

$$v_{b.f} = \frac{9845.97-5.4-607.5}{1+1.05} = 4503.93$$

3.3 Reinforcement installation

Reinforcement consumption for the math and pile foundation**:**

$$G_1 = g \cdot V_{s/f}, t \quad (38)$$

where g – reinforcement frame consumption for $1m^3$ of concrete, kg/m^3 (100–150 kg/m^3).

$V_{s/f}$– volume of strip foundation, m^3;

$$G_1 = 130 \cdot 2.16 = 280 \quad (39)$$

$$V_{s/f} = (h_{f\,(s)} \cdot 0{,}3 \cdot P_{base.}) + (h_{f\,(b)} \cdot 0{,}8 \cdot P_{base}), m^3 \quad (40)$$

where $V_{s/f}$ – volume of strip foundation, m^3;

$h_{f\,(b)}$– the height of the foundation base, ref. math foundation;

$h_{f\,(s)}$– the height of the structure basement, ref. math foundation ;

P_{base} − total foundation length per the scheme.

$$V_{S/f}=(3.2 \cdot 0{,}3\ 4\cdot) + (0.3 \cdot 0{,}8 \cdot 4) = 4.8m^3$$

Reinforcement weight distribution between grid and frame conditionally accepted as: for the grid–$0.7G_1$; for the frame – $0{,}3G_1$.

$$0.7 \cdot 480 = 336$$

$$0.3 \cdot 480 = 144$$

The building height is about 27.8m from the soil level, my building foundation deptid

3.4 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. When mounting the structure monolithic strip foundations with basement to be used column– tower crane.

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

Tower and jib rail cranes

When choosing the crane, it is required:

- to determine the technical capacity of crane type;
- to prepare feasibility evaluation of its use;

Initial data in this case are:

- dimensions and space–planning decision of a building or structure;
- dimensions, weight and operating position of mounted element with allowance for mounting equipment;

Mount technology work performance conditions (access roads, storages, proximity of adjacent structures and utilities, soil and climatic features, structure of the underground part, etc.) the schemes for determination of the mounting characteristics of tower cranes and jib rail cranes when mounting (a) aboveground and (b) underground structure parts.

Lifting height of crane hook H_r, m is calculated using the formula:

$$H_r, = h_1 + h_2 + h_3 + h_4 \quad (41)$$

where h_1 – the height of mounted structure from the crane base (taken equal to 0), m;

h_2 – the height of mounted element (1.5÷2 m);

h_3 – the height from the top level of the structure to the bottom of the cargo ($\frac{0.5}{1}$m);

h_4 – the height of lifting equipment ($\frac{2}{4.5}$m);

$$H= 0+1.75+0.75+3=5.5$$

In certain cases, the amount of h_4 to be selected through the catalogs of lifting

equipment in relation to the mounted elements.

Crane working radius during construction of underground part L_u, m, is calculated using the formula

$$L_u = a + c + B_p + 0{,}5 \quad (42)$$

where, c – slope construction, m;

$$C = L_{1s.t} - l_{2s.t} \quad (42)$$

where $l_{1s.t}$– length of a pit on top, m;

$l_{2s.t}$– width of a pit on top, m.

$$C = \frac{51.6-51.6}{2} = 0$$

where B_p – the width of structure underground part ($l_1 + (0{,}5 \cdot 2)$), m; 0,5 – reserve zone width, m.

a – the distance from the crane rotation axis to the pit edge, m, is equal to.

$$a = \frac{b}{2} + 0{,}5 + r1$$

where b – width of the crane track ($\frac{5}{7}$), m;

0.5 – half the width of the sleeper or sleeper unit;

r_1 – minimum allowable distance from the slope base to the sleeper structure, m, accepted per.

$$6/2 + 0.5 + 3 = 6.5$$

According to the basic characteristics of the directories or catalogs to be selected corresponding crane.

Required carrying capacity of the crane is calculated using the formula:

$$Q_{cr} = (q_1 + q_2) \cdot K, \ldots \quad (44)$$

where q_1–maximum weight of the mounted element, t;

$$q1 = m_{b1} + m_{c2} \quad (45)$$

where m_{b1}–bucket weight

m_{c2}– concrete weight (2÷2,5) t/m^3.

$$q_1 = 0.380 + 2.25 = 2.63$$

where q_2– lifting equipment and tools weight (0,1÷0,15), t;

K– factor including the deviation of lifting device weight, taken equal $\frac{1.08}{1.12}$.

So $Q_{cr} = (2.63+0.125)1.1 = 3.3$

Required working radius is determined by the formula:

$$L_{cr}^{tr} = b/2 + a_1 + c \quad (46)$$

where, b– width of the crane way (track), (5÷ 7), m;

a_1 – 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;

c – the distance from the gravity center the farthest from the crane mounted element to the protruding part of the crane (taken equal to the width of the structure – l_2) m.

$$L = \frac{6}{3} + 3 + 18 + = 24$$

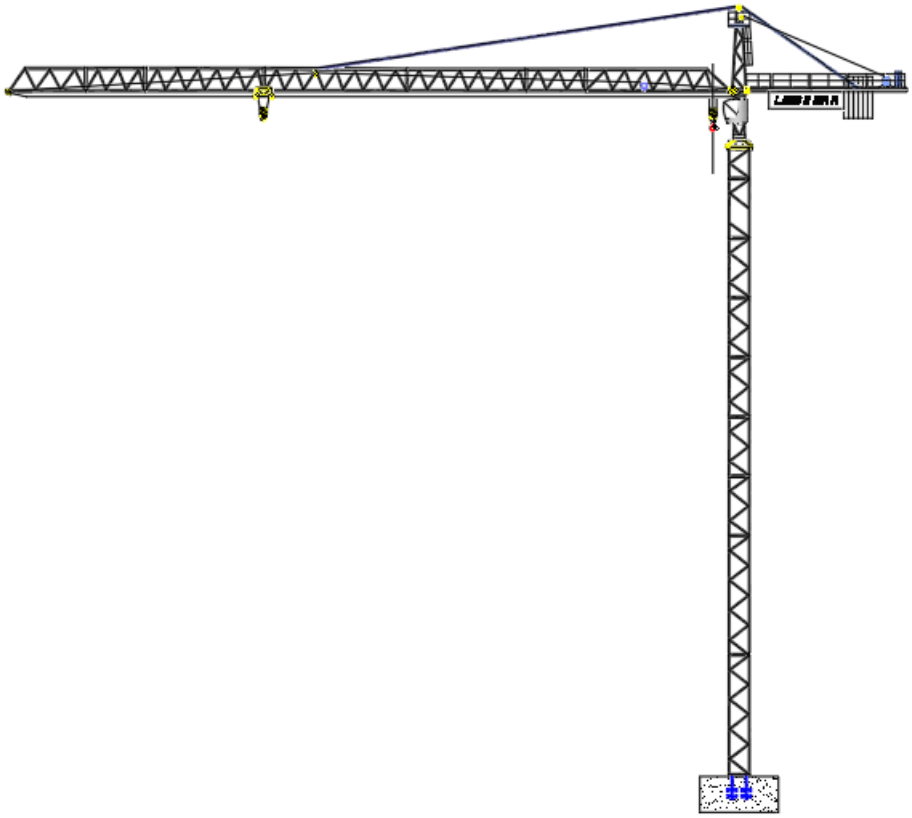

Figure 4- Tower crane

4 Economic

4.1 Estimation of building

The estimated construction cost is the amount required, the amount required to be built

Adapts to count on reliable, high-quality content. Law of the Republic of Kazakhstan.

The basis for determining the investment value for construction, the cost of construction work is a good guide to preparing contractors.

Clients and construction services contracts and accounting as a general rule, the employment contract is in accordance with the applicable law in this law. Estimating the cost of the construction project calculate the estimated construction cost feasibility study is at the product planning stage. This section investments in buildings must be identified.

The entire investment portfolio includes: planning and certification, cost of construction equipment, cost of goods, cost of installation, etc. Considered this is a way to increase the planned capital invest in building utilities. In a combined analysis the calculation of doing something is as follows:

1) For preparatory work in the construction site;
2) The main thing of construction;
3) Restrictions for the purposes of the service.
4) Energy facilities
5) Transport and communication facilities
6) The external network, sewage and water supply.
7) Landscaping and landscaping.
8) Temporary buildings and structure
9) Additional construction costs.
10) The Headquarters Department.
11) Training
12) Research and planning activities.

CONCLUSION

Constructing of college firstly based on the people of that city, those who are eager to read and learn, second the master plan of educational center which is going to made in central part of the city or people can easily get in to that, like it should be spoort by transportation or like bus lines meetro station and etc.

The architectural part of the buildings is related to the climate of that region, and the data are taken out from those sourse and making the arch of building.

The constructive area of building is importnt as its place, the inviromental affects is a main factor of constructive part. The standard already chosen by the spatial codes and regarding to this standrd codesd codes dwe can design our building.

The importance of universites is that helps peope to do better financially, figure out the job and having exellent life And stay strong in their organization. This gives students multiple options and allows them to decide which career path they want to take. At the time, this university seemed expensive, but over time, people's lives have improved. Times are changing and many people are trying to ignore the important benefits of university. The fact is that a good university education enables graduates to choose more jobs, which will help prepare graduates for real life and motivate people to become better citizens. The initial cost of a kidney can be violent, but it has long-term benefits. University is the best choice for those who feel good in real life.

So this college is going to be build in the Amaty Kazakhstan in the satbayev street, the college has 9^{th} floor with the 27.8 m height from groud level and the construction is kind of monolitic rcc concrete.

In a result constructing of educational centers has many benefits here are some example of them

1) Learning skills before job

Colege allow you to get more experirnce in what do you wan to become in future, so after finishing theis degree you will easilly find out jobs.

2) Internal satisfiction

Byb the attain on college you will realize a sense of inear satification. When you finish the college you are ready to take any chalinging task in the world and its really increas your confidence level.

3) Transform the world

Knowledge gives you this oppourtunity to tranformy yourself and the world around you.

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APPLICATIONS

APPENDIX .A

NO	Abbreviation	Area (m^2)	Name	quantity
1	2	(1*1.2) = 1.2m^2	Window	142
2	3	1.4*1.2 =168m^2	Window	12
3	4	2.5*1.6 =4m^2	Window	2
4	5	3.7*1.8 =6.66m^2	Window	4
5	6	5.6*18 =10.08m^2	Window	2
6	7	6.6*1.8 =11.88	Window	2
7	3	0.8*1.9 =1.52m^2	Door	10
8	4	0.95*2=1.9m^2	Door	24
9	5	1.8*1.9 =3.42m^2	Door	8
10	3	2.5*2.2 =5.5m^2	Door	2

Figure 1 – number and area of building partition

NO	ABBREVIATIONS	
1	R.C.C	REINFORCED CEMENT CONCRETE
2	P.C .C	PLAIN CEMENT CONCRETE
3	N.G.L	NATURAL GROUND LEVEL
4	P.V.C	POLY VINYLE CHLORIDE
5	C.L	CENTER LINE

Figure – Abbreviations

APPENDIX B

Colledge

Loading on Roof Slab

No	Material Name	Thickness	Unit	ensity of Materi	Unit	/eight of Materi	Unit
1	Gravel	0	m	1800	Kg/m^3	0	Kg/m^2
2	Torch Applied Bituminous	0.005	m	1200	Kg/m^3	6	Kg/m^2
3	mortar	0.005	m	2200	Kg/m^3	11	Kg/m^2
4	P.C.C	0.03	m	1800	Kg/m^3	54	Kg/m^2
5	R.C.C	0.2	m	2400	Kg/m^3	480	Kg/m^2
6	Plaster	0.025	m	2200	Kg/m^3	55	Kg/m^2
7	Electrical	1	m	10	Kg/m^3	10	Kg/m^2
8	Mechanical	1	m	10	Kg/m^3	10	Kg/m^2
Total Load on Roof Slab						626	Kg/m^2
						146	

n typical floor Slab — Tepic1-2-3-4-5-6-7-8

No	erial Name	Thickness	Unit	ty of Material	Unit	ht of Material	Unit
1	trerrazzo	0.025	m	2400	Kg/m^3	60	Kg/m^2
2	Mortar	0.03	m	2100	Kg/m^3	63	Kg/m^2
3	R.C.C	0.2	m	2400	Kg/m^3	480	Kg/m^2
4	Plaster	0.025	m	2200	Kg/m^3	55	Kg/m^2
5	Electrical	1	m	10	Kg/m^3	10	Kg/m^2
6	lechanical	1	m	10	Kg/m^3	10	Kg/m^2
ad on Roof Slab						678	Kg/m^2
						198	

Loading on Stair

No	CATEGORY	USAGE	Unit	ensity of Materi	Unit	/eight of Materi	Unit
1	A	dential buildi	m	2400	Kg/m^3	#VALUE!	Kg/m^2
2	B	office area	m	2100	Kg/m^3	#VALUE!	Kg/m^2
3	C	iiversity , cof	m	2400	Kg/m^3	#VALUE!	Kg/m^2
	D	eople may c		2400	Kg/m^4	#VALUE!	Kg/m^2
4	Plaster	0.025	m	2200	Kg/m^3	55	Kg/m^2
Total Load on Roof Slab						#VALUE!	Kg/m^2
						#VALUE!	

WALLS LOADING

No	Material Name	Thickness	height	ensity of Materi	Unit	/eight of Materi	Unit
1	masonery brick	0.35	2.5	2000	Kn/m^2	1.83	KN/M^2
2	masonery brick	0.25	2.5	2000	Kn/m^2	1.3	KN/M^2

Figure 1

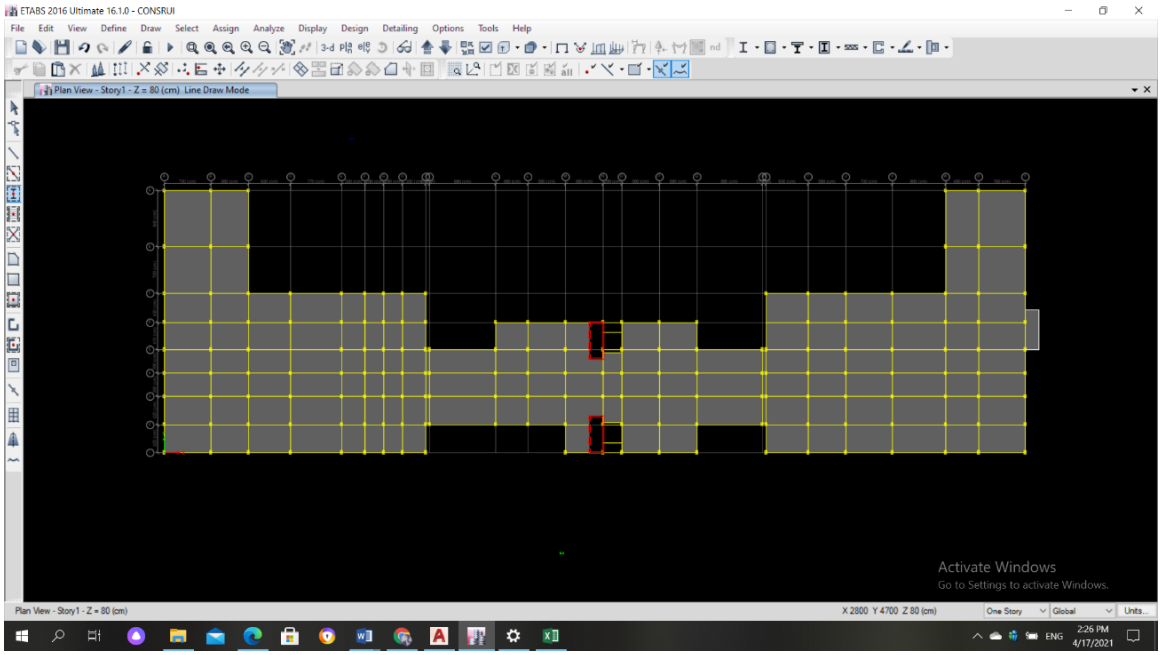

Figure 1 – structural plan of the building

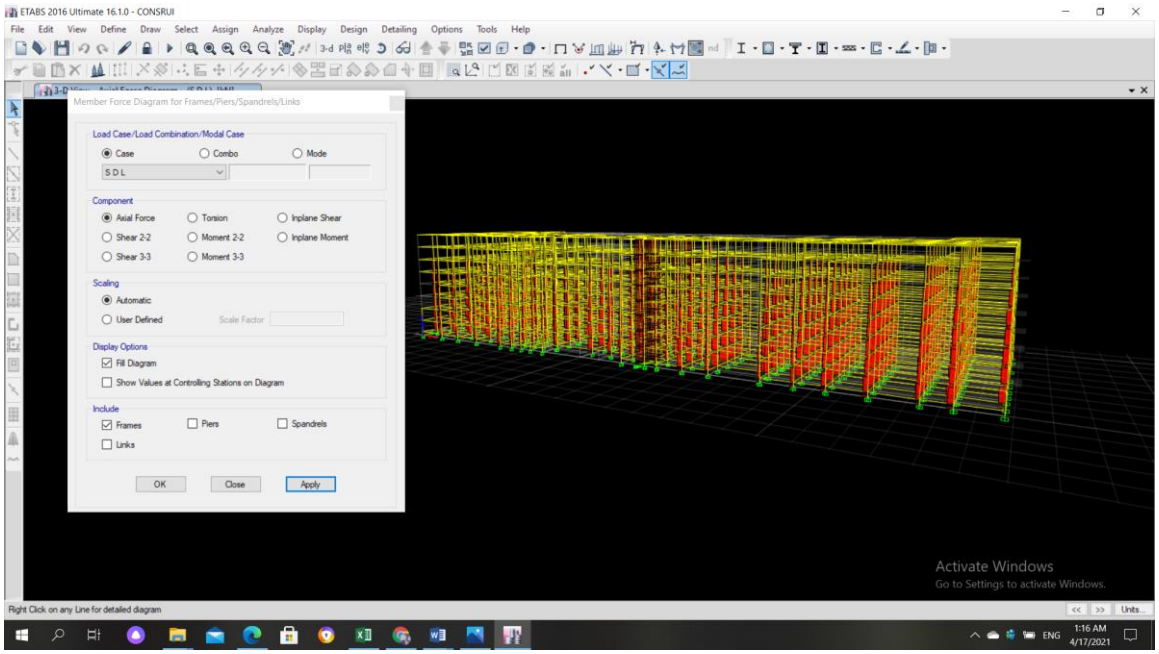

Figure 2 tension force

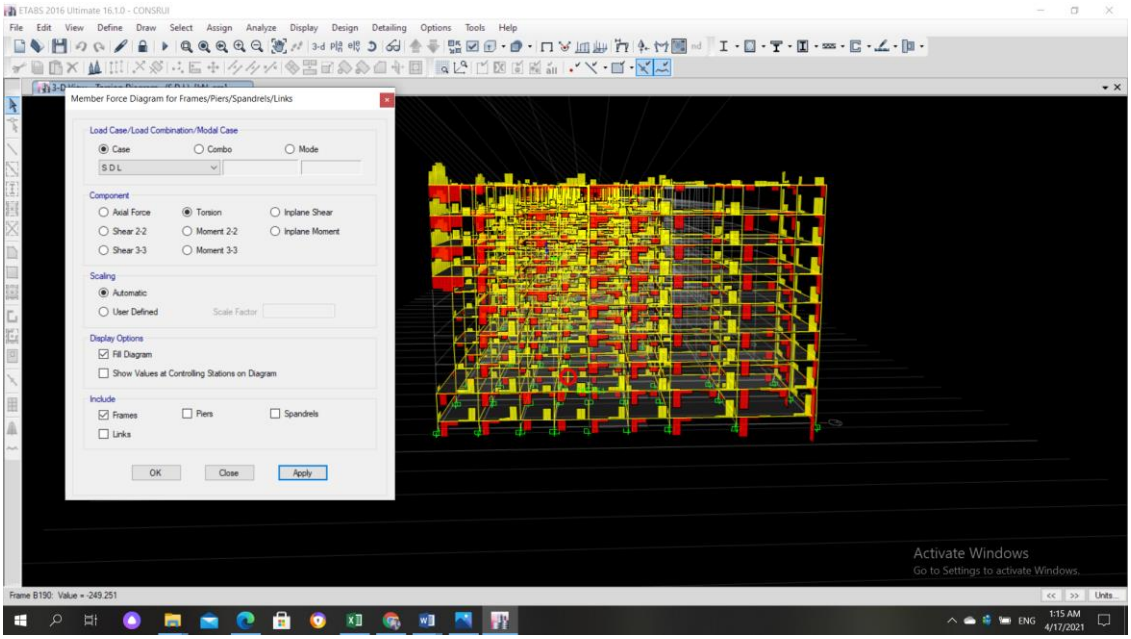

Figure 3 – Shear 2-2 (shear force acting on beam)

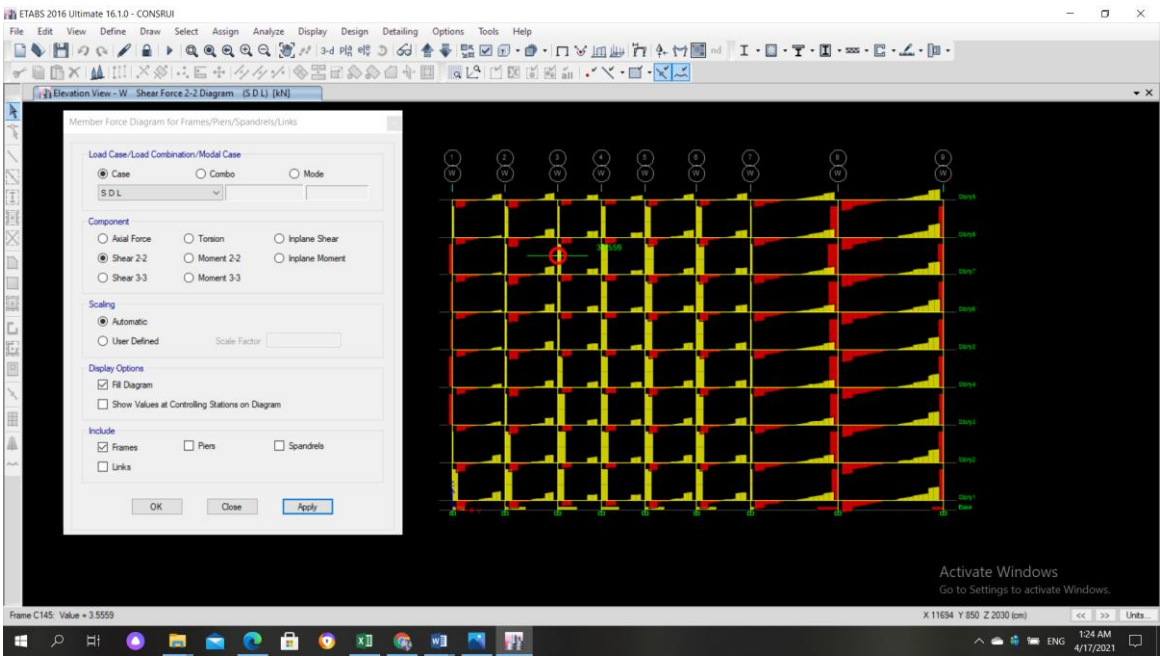

Figure 4 - shear 3-3 (shear on longitudinal bars / columns)

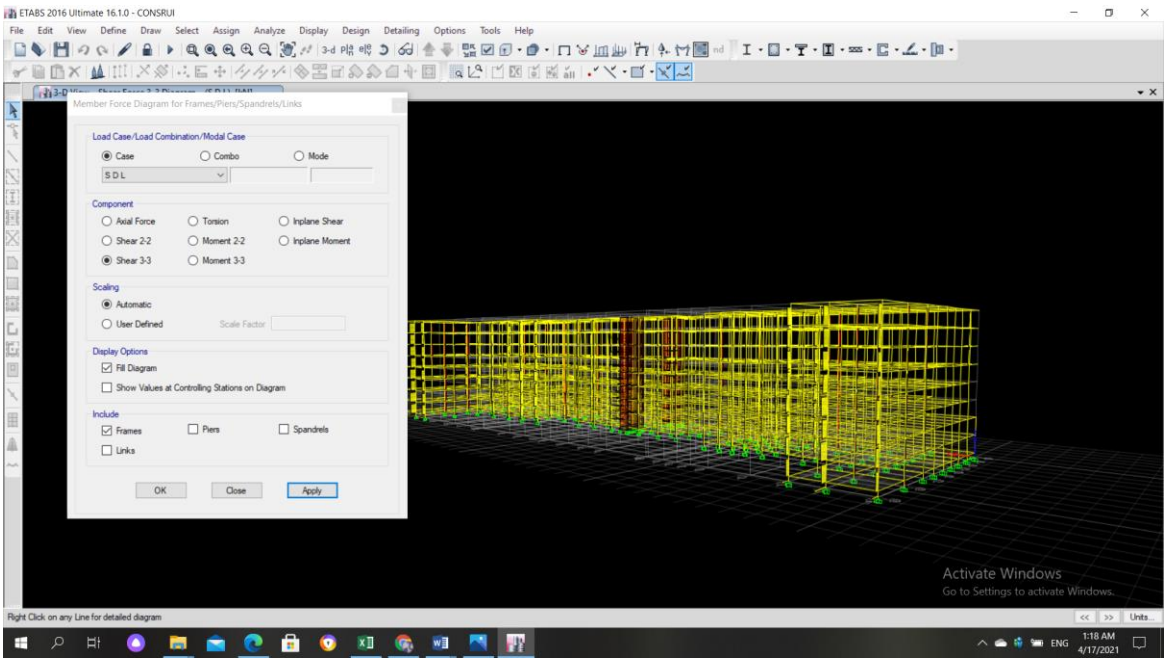

Figure 5– Moment diagram 2-2 (on column)

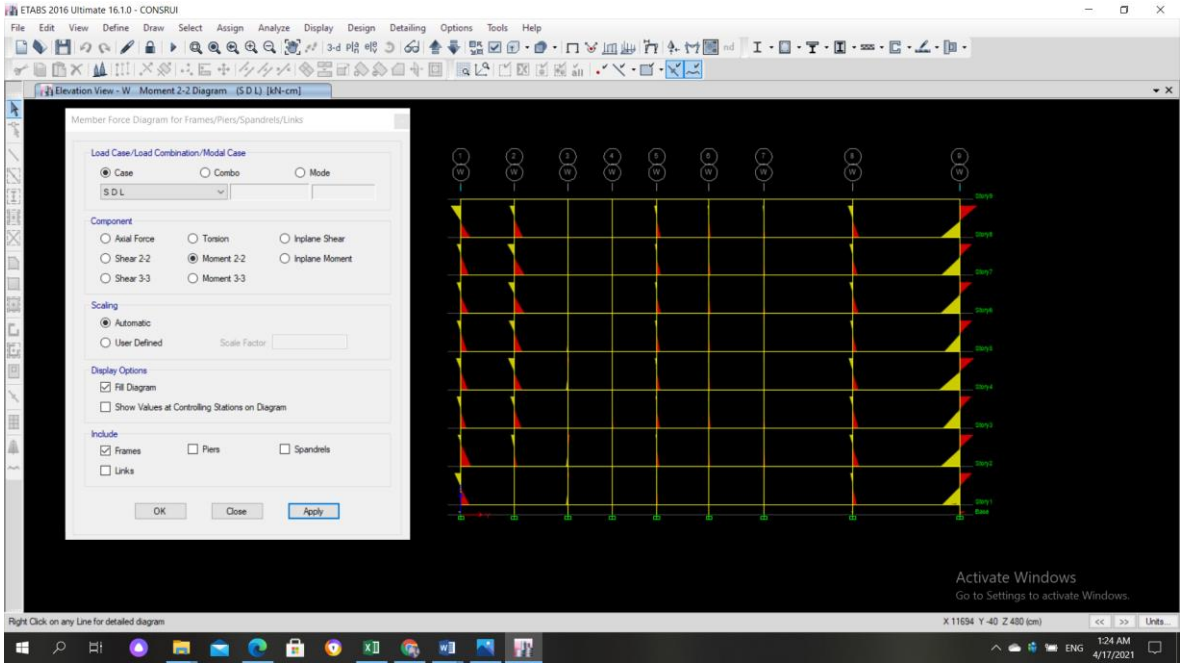

Figure 6 – Moment diagram 3-3 (on beam)

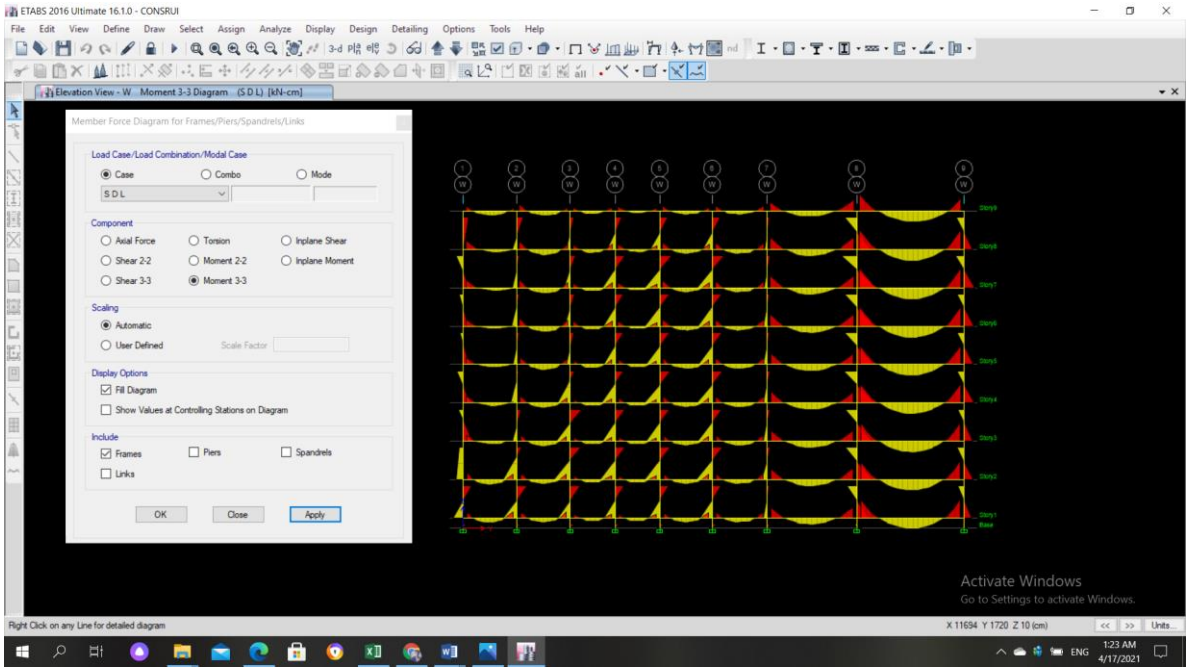

Figure 7 – Combination of loads effects on structure

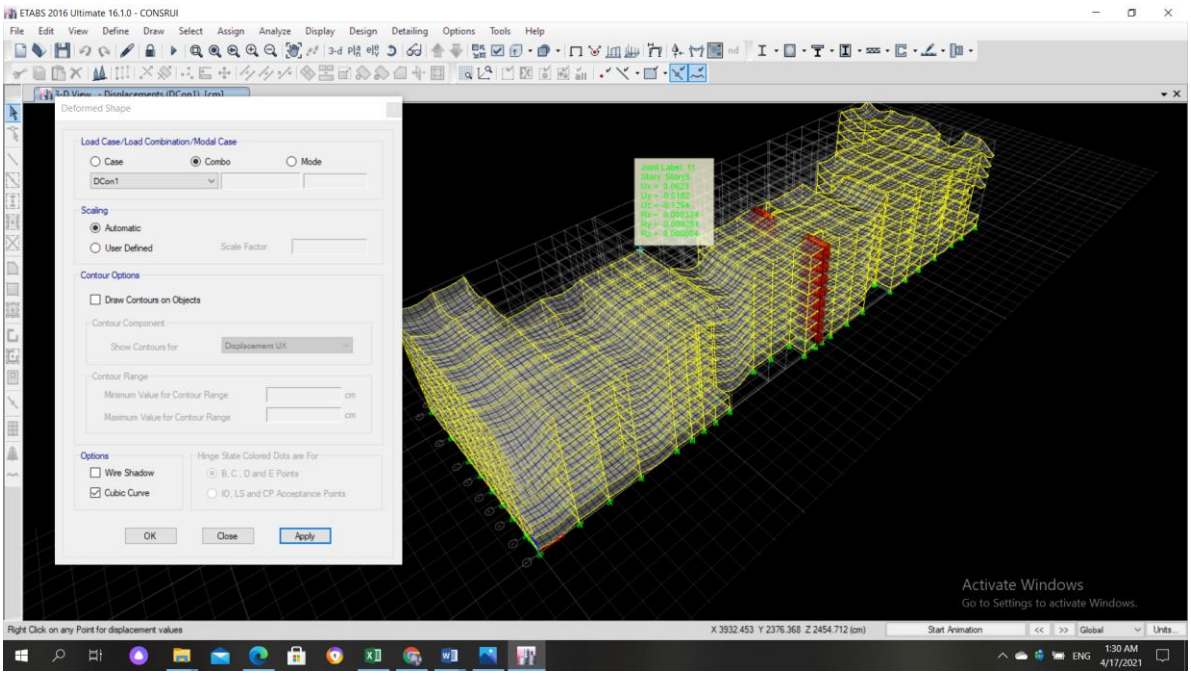

Figure 8 – Stress diagram

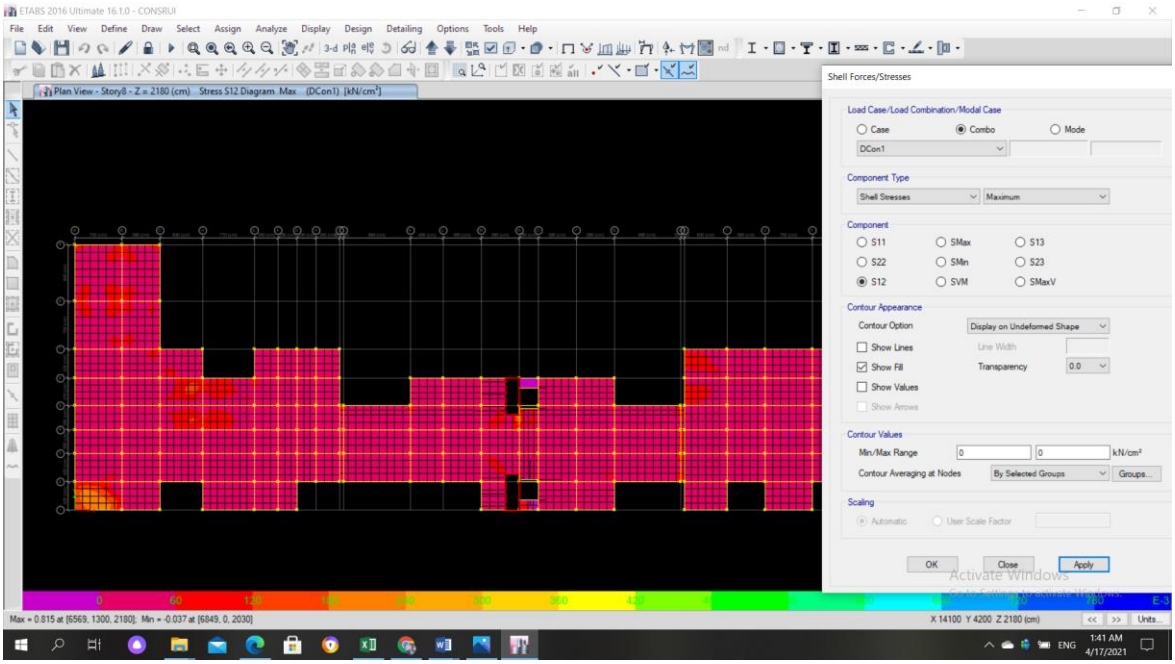

Figure 9 – Stress Max

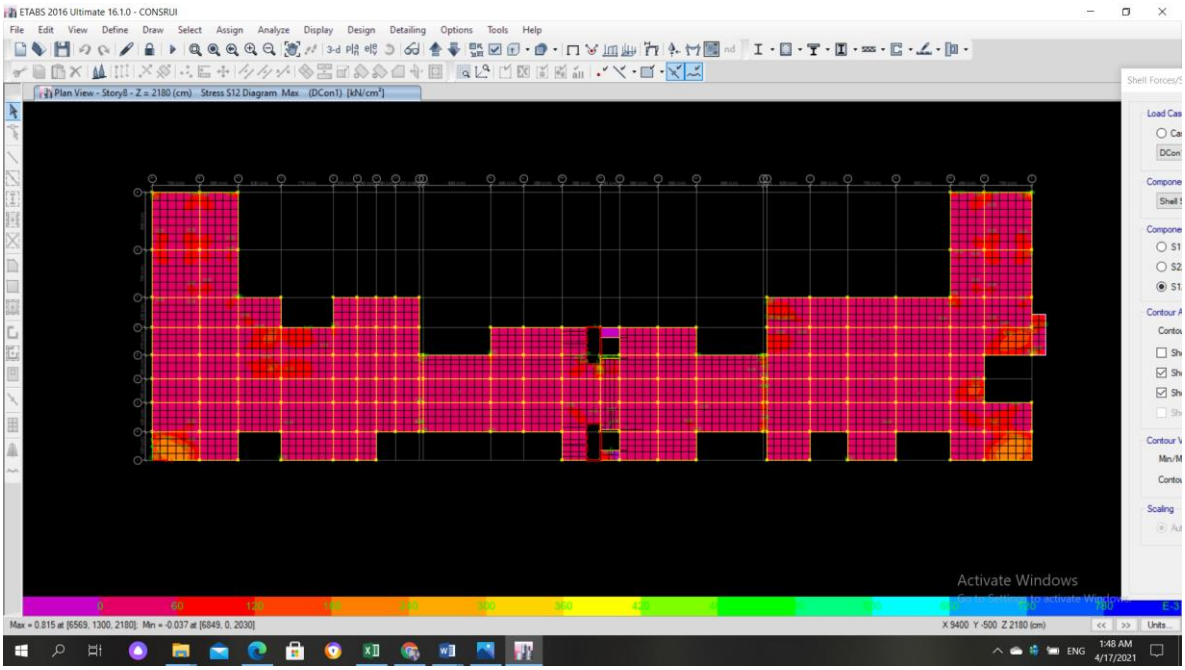

Figure 10 – Stress Min

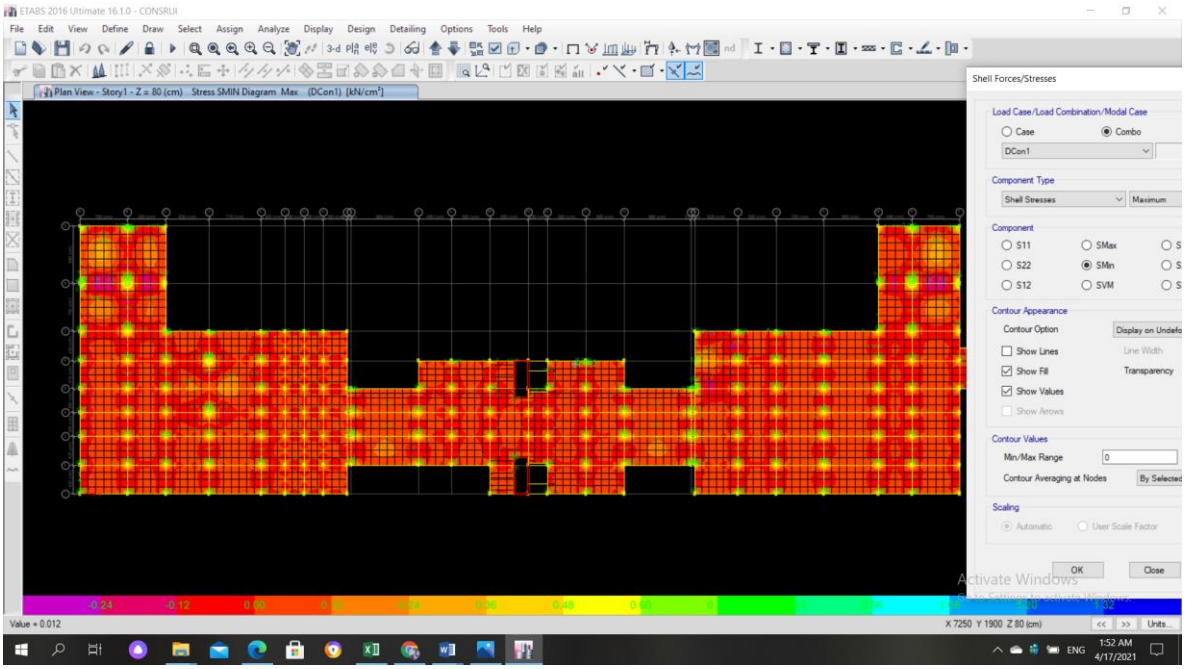

Figure 11 – Structure Design Values

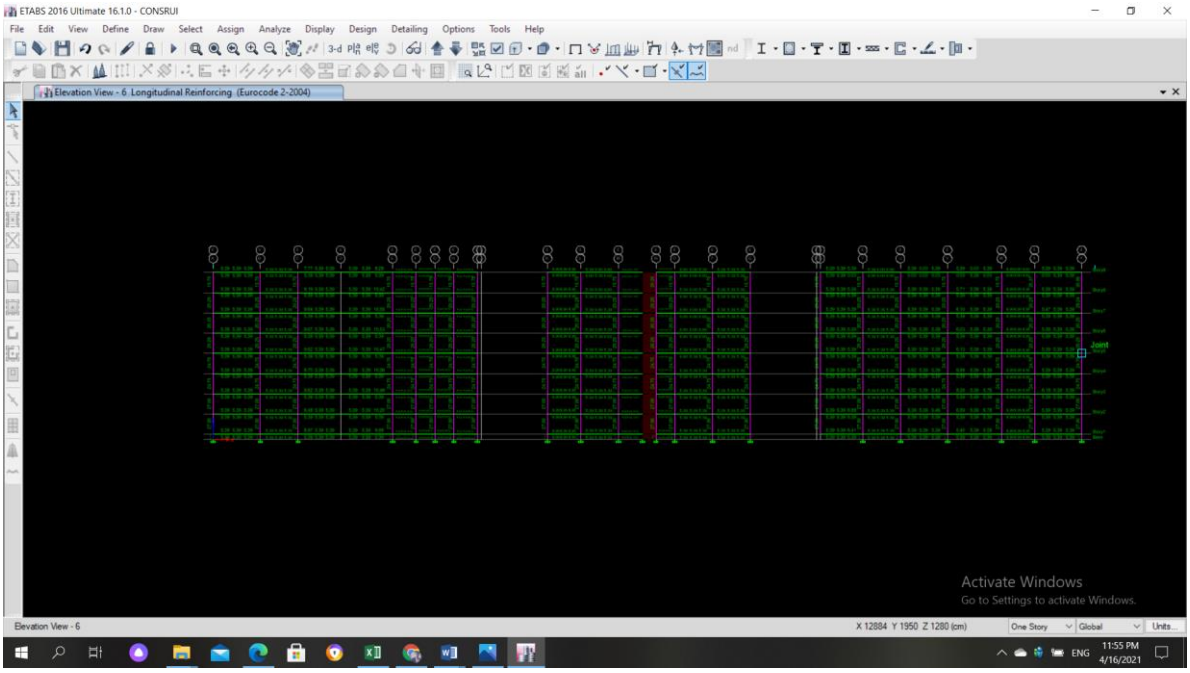

Figure 12 – steel area

Area for column 27 cm^2 and for beams its 5.9 cm^2
And regarding to codes it shouldn't be less than 5 cm^2 for beams

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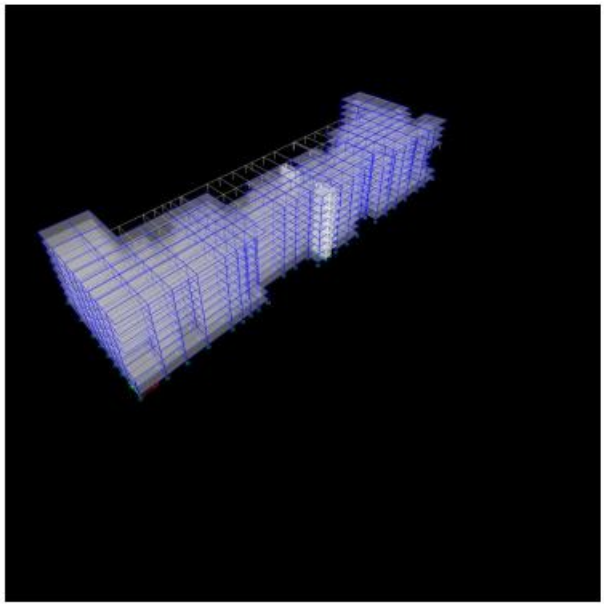


Summary Report

Model File: saied ASIM, Revision 0
12/1/2016

Figure 13

1 Structure Data

This chapter provides model geometry information, including items such as story levels, point coordinates, and element connectivity.

1.1 Story Data

Table 1.1 - Story Data

Name	Height cm	Elevation cm	Master Story	Similar To	Splice Story
Story9	300	2480	Yes	None	No
Story8	300	2180	No	Story9	No
Story7	300	1880	No	Story9	No
Story6	300	1580	No	Story9	No
Story5	300	1280	No	Story9	No
Story4	300	980	No	Story9	No
Story3	300	680	No	Story9	No
Story2	300	380	No	Story9	No
Story1	80	80	No	Story9	No
Base	0	0	No	None	No
Story9	300	2480	Yes	None	No
Story8	300	2180	No	Story9	No
Story7	300	1880	No	Story9	No
Story6	300	1580	No	Story9	No
Story5	300	1280	No	Story9	No
Story4	300	980	No	Story9	No
Story3	300	680	No	Story9	No
Story2	300	380	No	Story9	No
Story1	80	80	No	Story9	No
Base	0	0	No	None	No

Figure 14

2 Loads

This chapter provides loading information as applied to the model.

2.1 Load Patterns

Table 2.1 - Load Patterns

Name	Type	Self Weight Multiplier	Auto Load
Dead	Dead	1	
Live	Live	0	
S D L	Superimposed Dead	0	
W load	Wind	0	EUROCODE1 2005
S ex	Seismic	0	EUROCODE8 2004
S ey	Seismic	0	EUROCODE8 2004

2.2 Load Cases

Table 2.2 - Load Cases - Summary

Name	Type
Dead	Linear Static
Live	Linear Static
S D L	Linear Static
W load	Linear Static
S ex	Linear Static
S ey	Linear Static

Figure 15

3 Analysis Results

This chapter provides analysis results.

3.1 Structure Results

Table 3.1 - Base Reactions

Load Case/Combo	FX kN	FY kN	FZ kN	MX kN-cm	MY kN-cm	MZ kN-cm	X cm	Y cm	Z cm
Dead	0	0	204831.7579	286756551	-1301606797	-1.95E-05	0	0	0
Live	0	0	50176.6655	71316953.602	-321448910	0	0	0	0
S D L	0	0	67518.0104	96139520.527	-430012048	0	0	0	0
W load 1	0	0	0	0	0	0	0	0	0
W load 2	0	0	0	0	0	0	0	0	0
S ex 1	-16405.9417	0	0	-0.0001065	-28446556	23040900.318	0	0	0
S ex 2	-16405.9417	0	0	-0.0001065	-28446556	23040900.318	0	0	0
S ex 3	-16405.9417	0	0	-0.0001065	-28446556	23040900.318	0	0	0
S ey 1	0	-33514.428	0	58111266.349	0.001	-212544920	0	0	0
S ey 2	0	-33514.428	0	58111266.349	0.001	-212544920	0	0	0
S ey 3	0	-33514.428	0	58111266.349	0.001	-212544920	0	0	0
DSlbU1	0	0	367672.1871	516909697	-2337685440	-2.716E-05	0	0	0
DSlbU2	0	0	442937.1854	623885127	-2819858805	-2.858E-05	0	0	0
DSlbU3 Max	0	0	420357.6859	591792498	-2675206796	-2.816E-05	0	0	0
DSlbU3 Min	0	0	420357.6859	591792498	-2675206796	-2.816E-05	0	0	0
DSlbU4 Max	0	0	420357.6859	591792498	-2675206796	-2.816E-05	0	0	0
DSlbU4 Min	0	0	420357.6859	591792498	-2675206796	-2.816E-05	0	0	0
DSlbU5 Max	0	0	442937.1854	623885127	-2819858805	-2.858E-05	0	0	0
DSlbU5 Min	0	0	442937.1854	623885127	-2819858805	-2.858E-05	0	0	0
DSlbU6 Max	0	0	442937.1854	623885127	-2819858805	-2.858E-05	0	0	0
DSlbU6 Min	0	0	442937.1854	623885127	-2819858805	-2.858E-05	0	0	0
DSlbU7 Max	0	0	367672.1871	516909697	-2337685440	-2.716E-05	0	0	0
DSlbU7 Min	0	0	367672.1871	516909697	-2337685440	-2.716E-05	0	0	0
DSlbU8 Max	0	0	367672.1871	516909697	-2337685440	-2.716E-05	0	0	0
DSlbU8 Min	0	0	367672.1871	516909697	-2337685440	-2.716E-05	0	0	0
DSlbU9 Max	0	0	272349.7682	382896072	-1731618844	-2.012E-05	0	0	0
DSlbU9 Min	0	0	272349.7682	382896072	-1731618844	-2.012E-05	0	0	0
DSlbU10 Max	0	0	272349.7682	382896072	-1731618844	-2.012E-05	0	0	0
DSlbU10 Min	0	0	272349.7682	382896072	-1731618844	-2.012E-05	0	0	0
DSlbU11 Max	-16405.9417	0	287402.7679	404291158	-1856500073	23040900.318	0	0	0
DSlbU11 Min	-16405.9417	0	287402.7679	404291158	-1856500073	23040900.318	0	0	0
DSlbU12 Max	16405.9417	0	287402.7679	404291158	-1799606962	-23040900	0	0	0
DSlbU12 Min	16405.9417	0	287402.7679	404291158	-1799606962	-23040900	0	0	0
DSlbU13 Max	0	-33514.428	287402.7679	462402424	-1828053517	-212544920	0	0	0
DSlbU13 Min	0	-33514.428	287402.7679	462402424	-1828053517	-212544920	0	0	0
DSlbU14 Max	0	33514.428	287402.7679	346179891	-1828053517	212544920	0	0	0
DSlbU14 Min	0	33514.428	287402.7679	346179891	-1828053517	212544920	0	0	0
DSlbU15 Max	-16405.9417	0	204831.7579	286756551	-1330053353	23040900.318	0	0	0
DSlbU15 Min	-16405.9417	0	204831.7579	286756551	-1330053353	23040900.318	0	0	0
DSlbU16 Max	16405.9417	0	204831.7579	286756551	-1273160241	-23040900	0	0	0
DSlbU16 Min	16405.9417	0	204831.7579	286756551	-1273160241	-23040900	0	0	0

Figure 16

Table 3.4 - Story Stiffness (continued)

Story	Load Case	Shear X kN	Drift X cm	Stiffness X kN/cm	Shear Y kN	Drift Y cm	Stiffness Y kN/cm
Story9	S ey 3	0	0.081	0	6916.4553	0.4992	13855.5059
Story8	S ey 3	0	0.0868	0	13230.3063	0.3982	33223.2132
Story7	S ey 3	0	0.0913	0	18755.4747	0.6825	27482.5482
Story6	S ey 3	0	0.1319	0	23398.9674	0.7725	30289.7852
Story5	S ey 3	0	0.1534	0	27132.0462	0.7526	36052.5155
Story4	S ey 3	0	0.1662	0	30025.3887	0.7392	40618.6349
Story3	S ey 3	0	0.1552	0	32059.948	0.6395	50129.2864
Story2	S ey 3	0	0.1068	0	33273.8946	0.4681	71089.5815
Story1	S ey 3	0	0.0072	0	33514.428	0.0309	1082956.7319

3.3 Modal Results

Table 3.5 - Modal Periods and Frequencies

Case	Mode	Period sec	Frequency cyc/sec	Circular Frequency rad/sec	Eigenvalue rad²/sec²
Modal	1	1.051	0.951	5.9767	35.7211
Modal	2	0.934	1.071	6.7268	45.2496
Modal	3	0.823	1.215	7.6342	58.2815
Modal	4	0.458	2.181	13.7048	187.8214
Modal	5	0.356	2.809	17.6475	311.4342
Modal	6	0.339	2.948	18.5258	343.207
Modal	7	0.296	3.379	21.2294	450.6881
Modal	8	0.238	4.203	26.4055	697.2495
Modal	9	0.21	4.769	29.9676	898.056
Modal	10	0.206	4.847	30.4527	927.3687
Modal	11	0.192	5.211	32.7438	1072.1565
Modal	12	0.187	5.336	33.529	1124.1932

Table 3.6 - Modal Participating Mass Ratios (Part 1 of 2)

Case	Mode	Period sec	UX	UY	UZ	Sum UX	Sum UY	Sum UZ
Modal	1	1.051	0.046	0.0005	0	0.046	0.0005	0
Modal	2	0.934	0.6473	0.0004	0	0.6933	0.0008	0
Modal	3	0.823	0.0007	0.6131	0	0.694	0.614	0
Modal	4	0.458	0.0001	0.0706	0	0.6941	0.6846	0
Modal	5	0.356	0.0052	0.0027	0	0.6993	0.6873	0
Modal	6	0.339	1.427E-05	0.0613	0	0.6993	0.7486	0
Modal	7	0.296	0.1118	0.0001	0	0.8111	0.7487	0
Modal	8	0.238	0.0002	0.0015	0	0.8113	0.7503	0
Modal	9	0.21	0.0013	0.0069	0	0.8125	0.7572	0
Modal	10	0.206	0.0004	0.0108	0	0.8129	0.768	0
Modal	11	0.192	2.933E-06	0.0575	0	0.8129	0.8255	0
Modal	12	0.187	0.0005	0.0004	0	0.8133	0.8259	0

Figure 17

Table 3.6 - Modal Participating Mass Ratios (Part 2 of 2)

Case	Mode	RX	RY	RZ	Sum RX	Sum RY	Sum RZ
Modal	1	0.0003	0.0193	0.6556	0.0003	0.0193	0.6556
Modal	2	0.0001	0.2884	0.0451	0.0004	0.3077	0.7007
Modal	3	0.2765	0.0003	0.0008	0.2769	0.3081	0.7015
Modal	4	0.0389	1.227E-05	0.0003	0.3158	0.3081	0.7019
Modal	5	0.0078	0.015	0.0945	0.3236	0.323	0.7963
Modal	6	0.1728	0.0001	0.0052	0.4964	0.3231	0.8015
Modal	7	0.0001	0.2796	0.0055	0.4965	0.6028	0.807
Modal	8	0.0018	2.767E-05	0.0001	0.4983	0.6028	0.8071
Modal	9	0.0082	0.0017	0.0254	0.5065	0.6045	0.8326
Modal	10	0.0121	0.0005	0.0105	0.5186	0.6051	0.8431
Modal	11	0.0984	2.664E-05	7.535E-06	0.617	0.6051	0.8431
Modal	12	0.001	0.0012	0.0012	0.6181	0.6063	0.8443

Table 3.7 - Modal Load Participation Ratios

Case	Item Type	Item	Static %	Dynamic %
Modal	Acceleration	UX	99.73	81.33
Modal	Acceleration	UY	99.79	82.59
Modal	Acceleration	UZ	0	0

Table 3.8 - Modal Direction Factors

Case	Mode	Period sec	UX	UY	UZ	RZ
Modal	1	1.051	0.061	0.001	0	0.938
Modal	2	0.934	0.94	0.001	0	0.059
Modal	3	0.823	0.001	0.998	0	0.001
Modal	4	0.458	0.001	0.787	0	0.211
Modal	5	0.356	0.034	0.018	0	0.947
Modal	6	0.339	0	0.887	0	0.113
Modal	7	0.296	0.995	0.001	0	0.004
Modal	8	0.238	0	0.001	0	0.999
Modal	9	0.21	0.023	0.096	0	0.881
Modal	10	0.206	0.011	0.336	0	0.653
Modal	11	0.192	0.001	0.71	0	0.289
Modal	12	0.187	0.002	0	0	0.997

Figure 18

APPENDIX C

CALCULATION OF LABOR COSTS

Обосн. ЕНиР	Name of works	Unit rev.	Volume works	Time rate man-hour	Labor costs man-days	Pricing Tenge	costs for the entire volume
§4-1-33 1а	Reinforcement mesh laying in a horizontal position	one set-ka	539	0,45	30,32	0-23,7	127-74
§4-1-33 2а	Reinforcement mesh laying upright	one set-ka	75	0,84	7,87	0-44,2	33-15
§4-1-34 1б	Knitting of reinforcement with a diameter of up to 10 mm	т	61	18	137,25	10-06	613-66

Figure 1- Labor cost

Continuation of appendix C

Local estimate calculation

on the

Base:

Event	esential	114855.892	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			
				Salary of construction workers	incl. Salary of drivers	Salary of construction workers	incl. Salary of drivers	tenge	workers serving machines	
								%	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**			**943,211.39**	**938,319.46**			**5,835.99**
			Tenge			**15,619.86**	**20,653.07**			**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 civil 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**	**91.14**	**7,006.11**	**1,346.00**	**638,536.87**	**122,674.44**	**57,870.40**	**1.43**	**130.33**
		m3		**685.20**	**12.56**	**62,449.13**	**1,144.72**	**91.00**	**0.19**	**17.32**
five	**E11-060101-0113**	**Concrete strip foundations, class B15 concrete**	**5,559.54**	**4,480.31**	**3,408.30**	**24,908,462.66**	**18,948,580.18**	**1,254,525.21**	**4.17**	**23,183.28**
		m3		**220.66**	**27.31**	**1,226,768.10**	**151,831.04**	**91.00**	**0.17**	**945.12**
6	**E11-080101-0307**	**Side coating bituminous waterproofing in 2 layers on the leveled surface of rubble masonry brick, concrete walls, foundations**	**24,060.900**	**365.30**	**27.01**	**8,789,446.77**	**649,884.91**	**482,216.53**	**0.19**	**4,571.57**
		m2		**21.20**	**0.35**	**510,091.08**	**8,421.32**	**93.00**	**0.00**	**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**	**0.000**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
eight	**S121-050301-3001**	**Reinforcement blanks not assembled into frames and meshes: smooth steel of class A-I, d 6 mm**	**0.000**	**65,745.09**	**-**	**-**	**-**	**-**	**-**	**-**
		t		**-**	**-**	**-**	**-**	**-**	**-**	**-**
		TOTAL SECTION 2 DIRECT COSTS	**Tenge**			**34,336,446.29**	**19,721,139.53**			**27,885.18**
			Tenge			**1,799,308.30**	**161,397.07**			**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 civil 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**	**Reinforcement blanks not assembled into frames and meshes: steel of periodic profile 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 civil 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 civil 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 up to 200 mm thick 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 civil 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 civil 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 civil 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			**114,855,892.07**				
		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					**114,855,892.07**				
	Total with seniority costs					**116,004,451.00**				
	Total with the cost of additional. leave					**116,463,874.56**				
	Total in current prices as of 03.24.					**398,306,451.01**				
	Total with taxes, fees and obligations. payments					**406,272,580.03**				
	Value Added Tax (VAT)		**12%**			**48,752,709.60**				
	Total with value added tax (VAT)					**455,025,289.63**				

Made up Poya asim

Continuation of Appendix C

Estimated calculation of the cost of construction in the amount of 19s 7k **471.95** thousand tenge

including refundable amounts: 15s7k **0.66** thousand tenge

value added tax 18s7k **50.57** 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	116.45	-	-	116.45
2		**Total = 1 line**	116.45	-	-	**116.45**
3		Temporary buildings and structures 1.1% * 2 line 7 column	1.28	-	-	1.28
four		Return of materials from temporary buildings and structures 15% * 3s7k	0.19	-	-	0.19
five		**Total = 3 lines**	1.28	-	-	**1.28**
6		**Total 2s + 5s**	117.73	-	-	**117.73**
7		Additional costs during the performance of work in the winter 1.2% * 6s7k	1.41	-	-	1.41
eight		Seniority costs 1% * 6s7k			1.18	1.18
nine		Costs for additional vacations 0.4% * 6s7k			0.47	0.47
10		**Total 7s + 8s + 9s**	**1.41**		**1.65**	**3.06**
eleven		**Total 6s + 10s**	119.15		1.65	120.80
12		Including refundable amounts = 4s	0.19		-	0.19
13		**Total by estimate in base prices 2001 = 11s**	119.15		1.65	120.80
fourteen		Total estimated at current prices in 2020. 13s * 3.42	407.48		5.64	413.12
fifteen		Including refundable amounts in current prices 12s7k * 3.42	0.66			0.66
sixteen		Taxes, fees, mandatory payments, 2% * 14s7k			8.26	8.26
17		Estimated cost at the current price level 14s + 16s	407.48		13.90	421.38
eighteen		VAT (12%) * 17s7k			50.57	50.57
nineteen		Construction cost 17s + 18s	407.48		64.47	471.95

Continuation of Appendix C

Object estimate

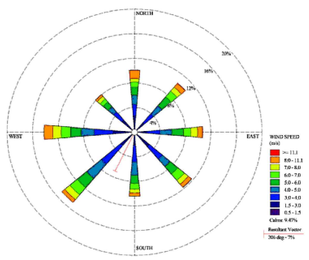
Estimated cost	116.453	thousand tenge
Standard labor intensity	91.123	thousand people hour
Estimated salary	27.003	thousand tenge

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	116.453			116.453	91.123	27.003	
		Total	116.453			116.453	91.123	27.003	

GENERAL PLAN OF THE BUILDING

Wind Direction, Zone Almaty



Abbreviation

- Tries
- Asphalt pavement
- Terrazo
- Foutain
- Grass
- Box

Explanation

1.Main building area = 5095.5m^2

2.Land area=25907m^2

3.Landscaping area =8255

4.Terrazo area =14252^2

5.Basketball zone=600m^2

6.Parking area=2800m^2

Chan.	Num.par.	List	No.doc	Sign	Date
Head of dp		Kozyukova N.V			
Superviser		Zhambakina.Z			
Consultant		Zhambakina.Z			
Controller		Kozyukova N.V			
Prepared by		Poya Asim			

KazNITU–5B072900–Civil Engineering–02.08.02–2021–DP

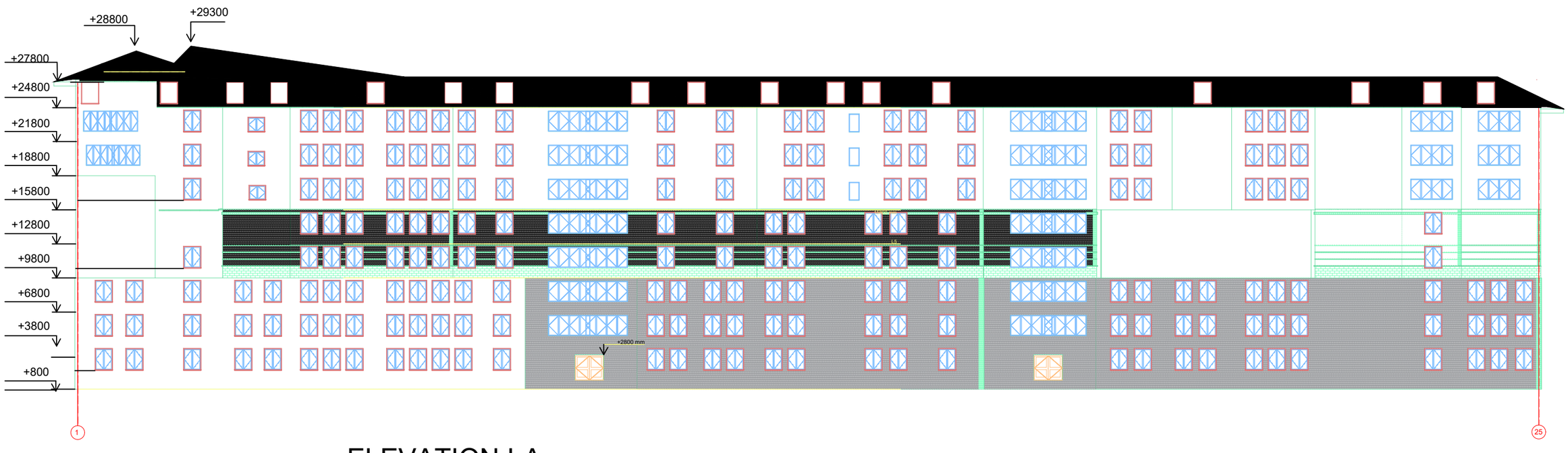
College Educational Center in Almaty

Architectural and analytical part	stage	Sheet	Sheet
	DP	1	10
General Plan	Civil Engineering and building materials department		

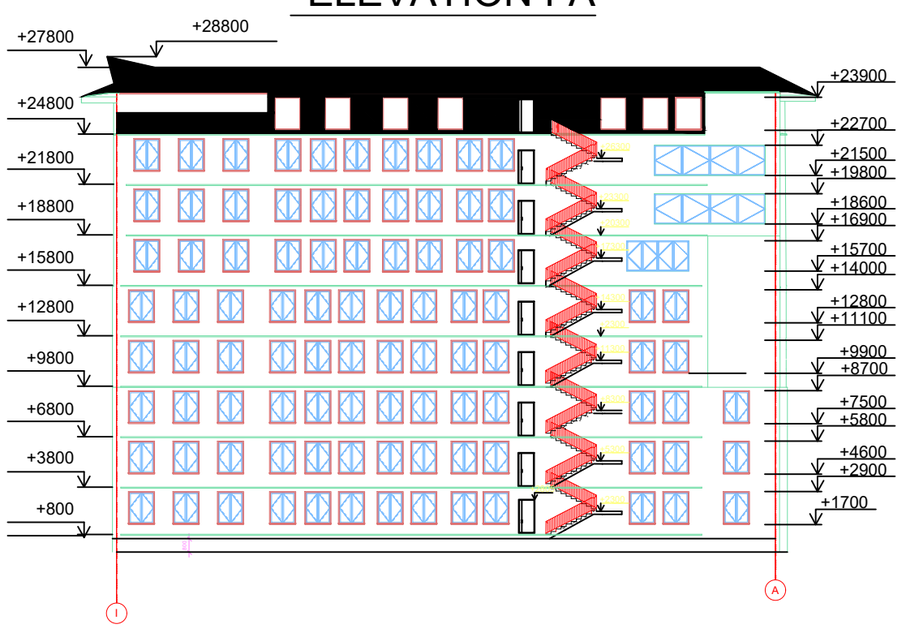
формат А3

PRODUCED BY AN AUTODESK STUDENT VERSION
PRODUCED BY AN AUTODESK STUDENT VERSION

ELEVATION 1-25



ELEVATION I-A

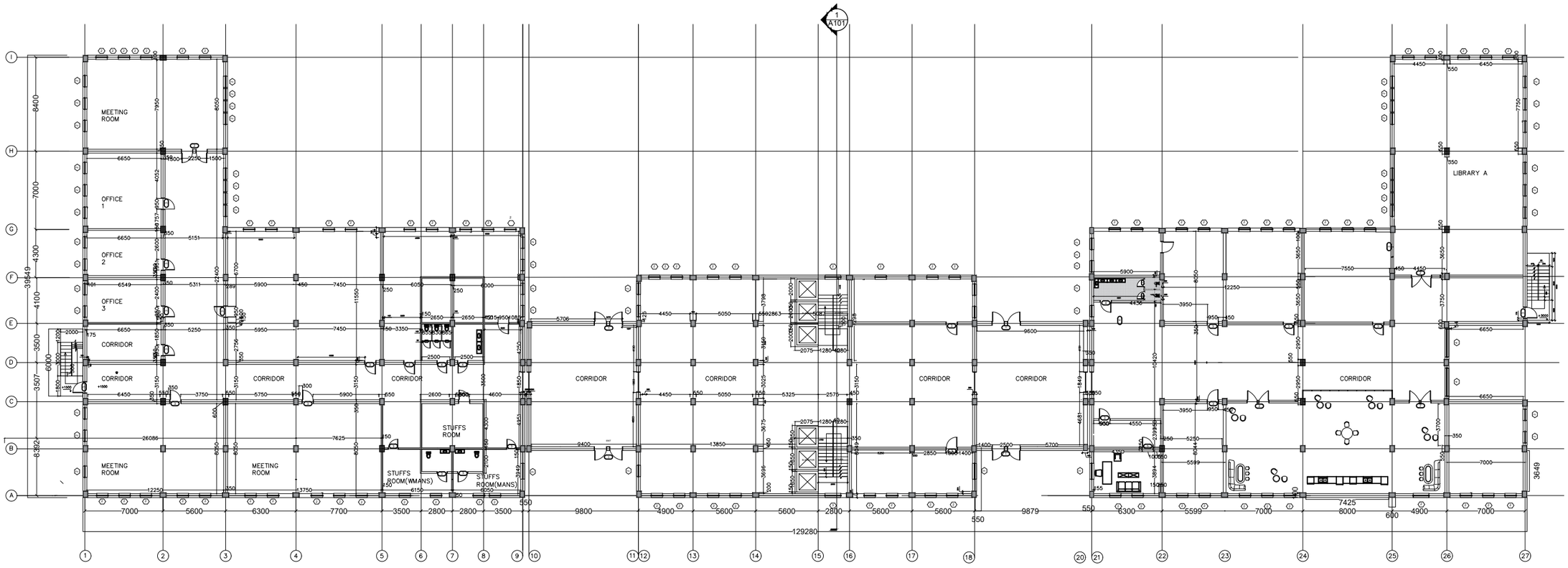


						KazNITU–5B072900–Civil Engineering–02.08.02.2021–DP	
						College Educational Center in Almaty	
Chan.	Num.pag.	List	N–doc	Sign	Date		
Head of dp		Kozyukova N.V				Architectural and analytical part	stage: DP; Sheet: 2; Sheet: 10
Superviser		Zhambakina.Z					
Consultant		Zhambakina.Z					
Controller		Kozyukova N.V				ELEVATIONS	Construction and building materials department
Prepared by		Poya Asim					

формат А3

PRODUCED BY AN AUTODESK STUDENT VERSION
PRODUCED BY AN AUTODESK STUDENT VERSION

FIRST FLOOR OF THE BUILDING



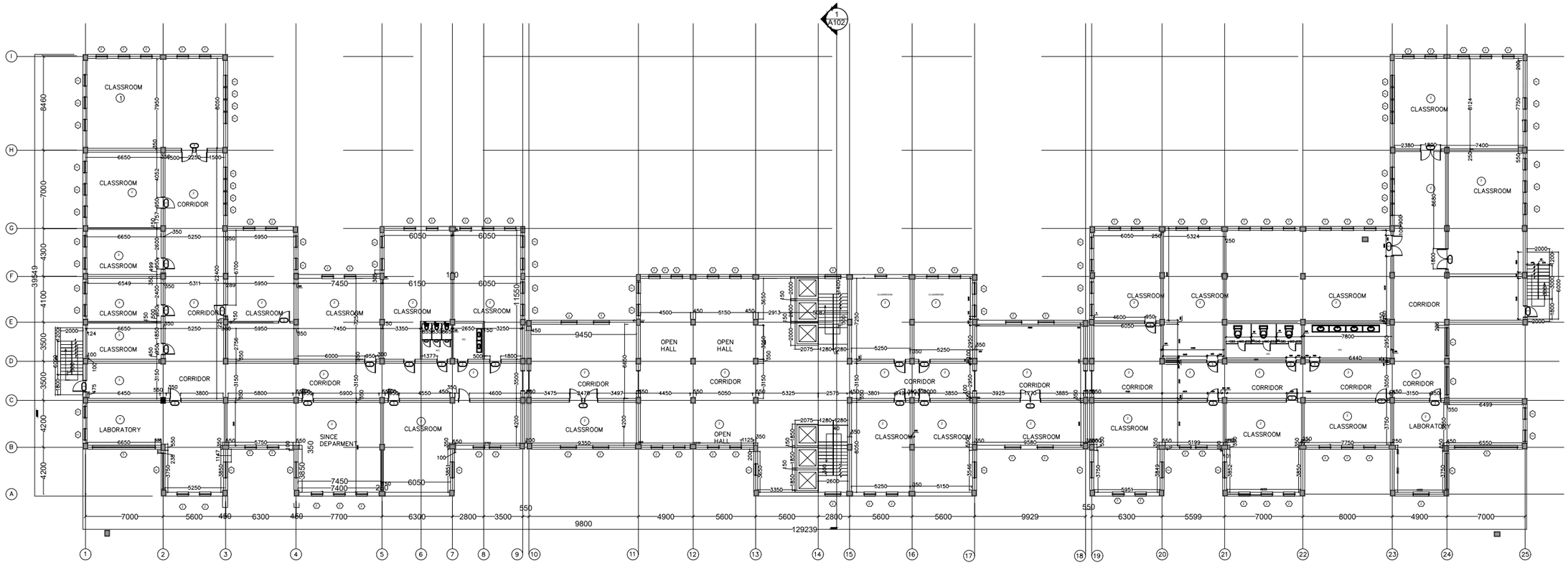
GROUND FLOOR PLAN
1 :300

NOTE:
More information on application A

						KazNITU-5B072900-Civil Engineering-02.08.02.2021-DP			
						College Educational Center in Almaty			
Chan.	Num.par.	List	№doc	Sign	Date				
Head of dp		Kozyukova N.V				Architectural and analytical part	stage	Sheet	Sheet
Superviser		Zhambakina.Z					DP	3	10
Consultant		Zhambakina.Z							
Controller		Kozyukova N.V				Ground floor	Construction and building materials department		
Prepared by		Asim Poya							

формат А3

TYPICAL FLOOR PLAN



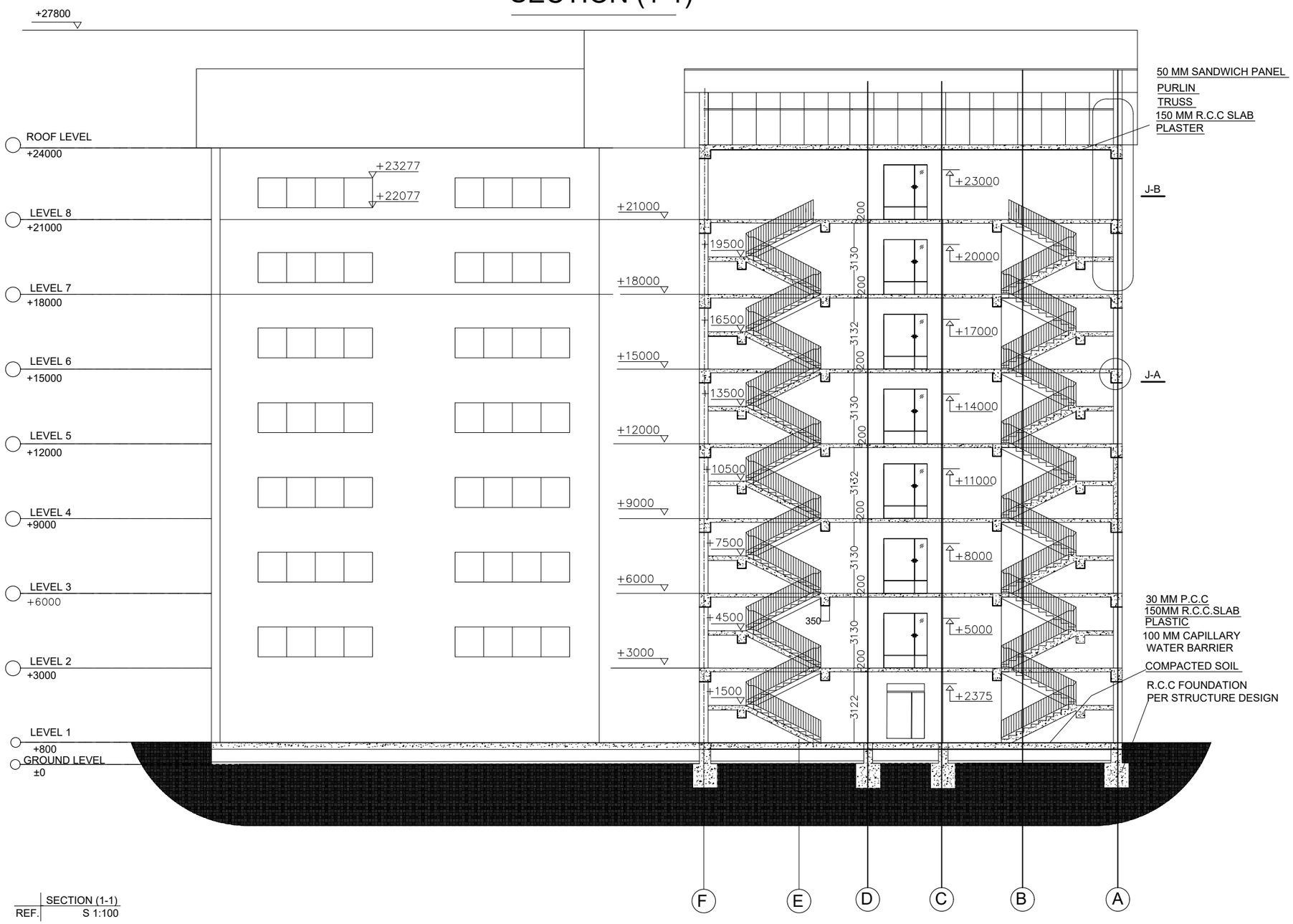
NOTE:
The explanation is on
Application A

1 TYPICAL FLOOR PLAN
1 :300

						KazNITU-5B072900-Civil Engineering-02.08.02.2021-DP	
						College Educational Center in Almaty	
Chan.	Num.par.	List	№doc	Sign	Date		
Head of dp		Kozyukova N.V				Architectural and analytical part	stage: DP; Sheet: 4; Sheet: 10
Superviser		Zhambakina.Z					
Consultant		Zhambakina.Z					
Controller		Kozyukova N.V				Typical floor plan till 9th floor	Construction and building materials department
Prepared by		Asim Poya					

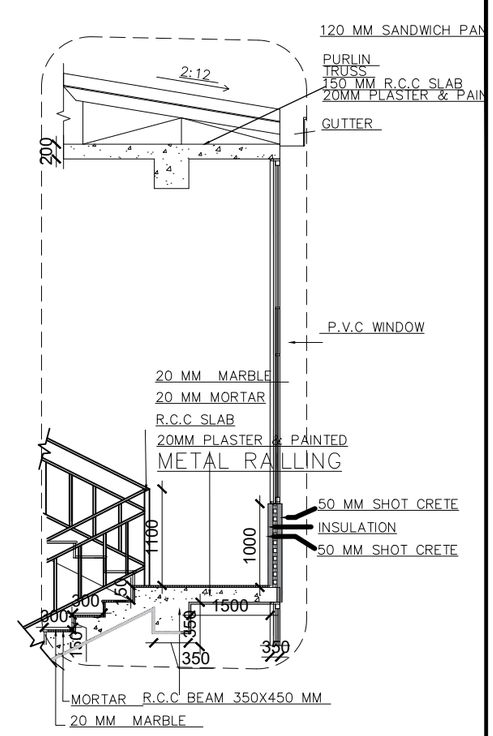
формат А3

SECTION (1-1)



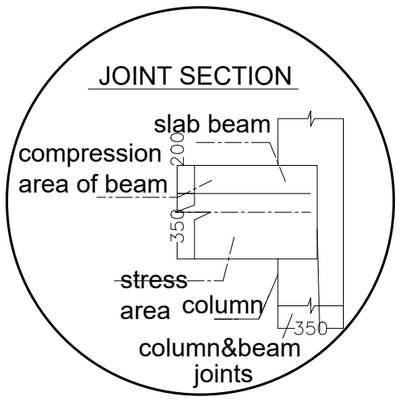
SECTION (1-1)
REF. | S 1:100

J–B



JOINTS
REF. | S 1:30

JOINT SECTION



J-A
REF. | S 1:50

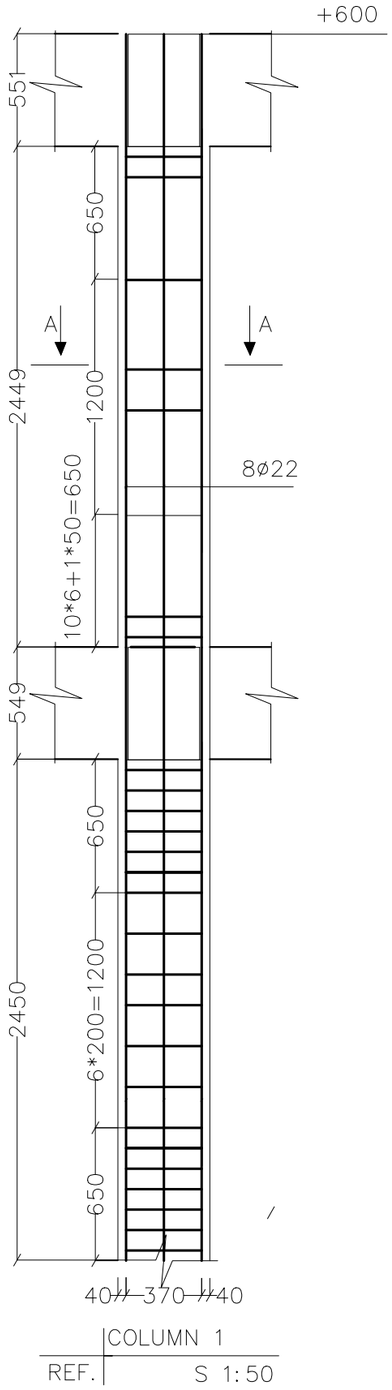
						KazNITU–5B072900–Civil Engineering–02.08.02.2021–DP
						College Educational Center in Almaty
Chan.	Num.par.	List	№doc	Sign	Date	
Head of dp		Kozyukova N.V				Architectural and analytical part
Superviser		Zhambakina.Z				
Consultant		Zhambakina.Z				
Controller		Kozyukova N.V				
Prepared by		Asim Poya				Secction 1–1

stage	Sheet	Sheet
DP	5	10

Construction and building materials department

формат A3

Column C1



COLUMN 1
REF. S 1:50

Note:
more explanation on App 2

Statement of rebar's

Item.	Sketch
2	A = 520 мм; B = 370 мм; x = 70 мм; L =1.9m
3	A = 230 мм; B = 230 мм; x = 60 мм; x' = 72 мм. L =1.3m

A-A

Statement of rebar's

Item.	Sketch
2	A = 420 мм; B = 370 мм; x = 60 мм; L =1.7m
3	A = 240 мм; B = 240 мм; x = 60 мм; x' = 72 мм.

B-B

Statement of rebar's

Item.	Sketch
2	A = 440 мм; B = 370 мм; x = 60 мм; L=1.8M
3	A = 240 мм; B = 240 мм; x = 60 мм; x' = 72 мм. L =1.2m

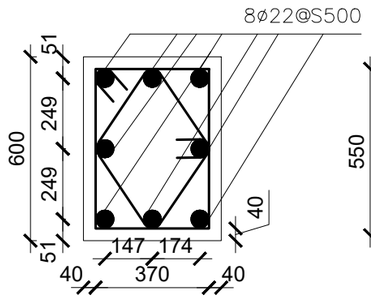
C-C

Statement of rebar's

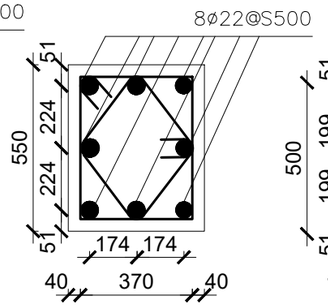
Item.	Sketch
2	A = 440 мм; B = 370 мм; x = 60 мм; L =1.8m
3	A = 240 мм; B = 240 мм; x = 60 мм; x' = 72 мм. L =1.2m

F-F

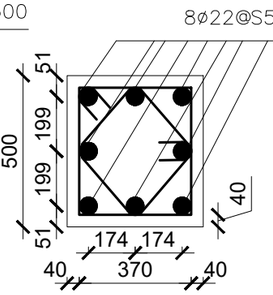
Section A–A



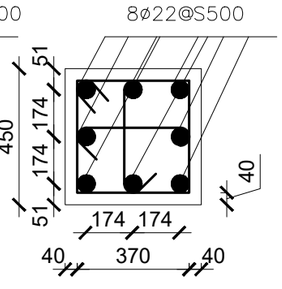
Section B–B



Section C–C



Section F–F



Statement of steel consumption, kg

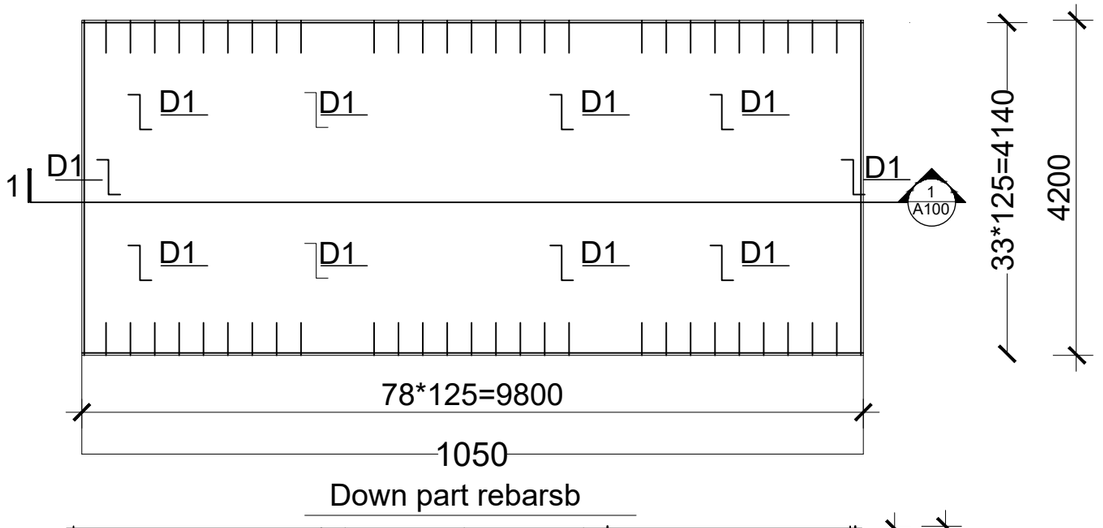
Mark of Elements	Reinforcing products					Total
	Class armature					
	A500					
	EN 10138-4					
	∅10	total		∅22	total	
Column C1 6.96	6.99	139.28		33.7	269.6	408.9

Num	Standards	Name		qua	Weight (Kg)	Note
		C1				
1	EN 10138-4	∅ 22 A500	L= 3300	8	33.85	270.8
2	EN 10138-4	∅ 10 A500	L= 1900	6	6.99	41.94
3	EN 10138-4	∅ 10 A500	L= 1300	14	6.99	97.86
		Materials				
		Concrete class C30				

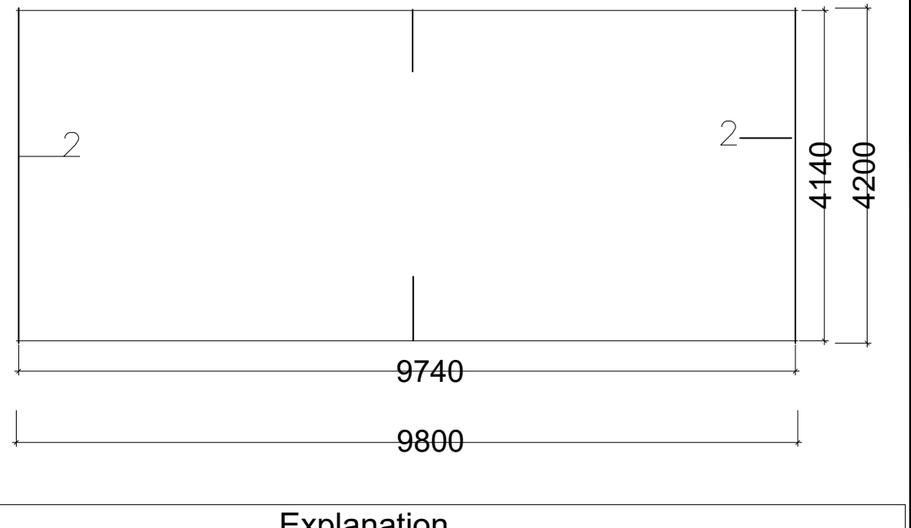
Chan.	Num.par.	List	№doc	Sign	Date	KazNITU-5B072900-Civil Engineering-02.08.02.2021-DP		
						College Educational Center in Almaty		
Head of dp		Kozyukova N.V				Calculation and Design	stage: DP	Sheet: 6 / Sheet: 10
Superviser		Zhambakina.Z						
Consultant		Zhambakina.Z						
Controller		Kozyukova N.V				Column A-1	Construction and building materials department	
Prepared by		Asim Poya						

формат А3

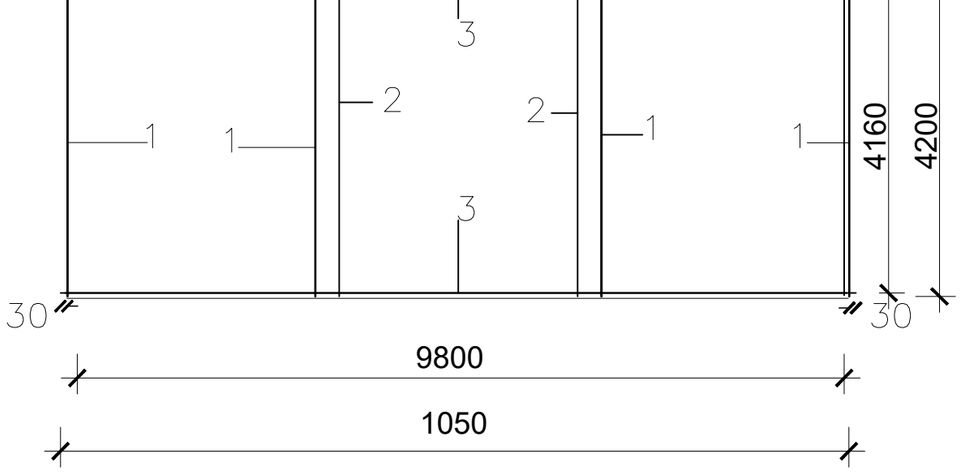
The largest slab of the building



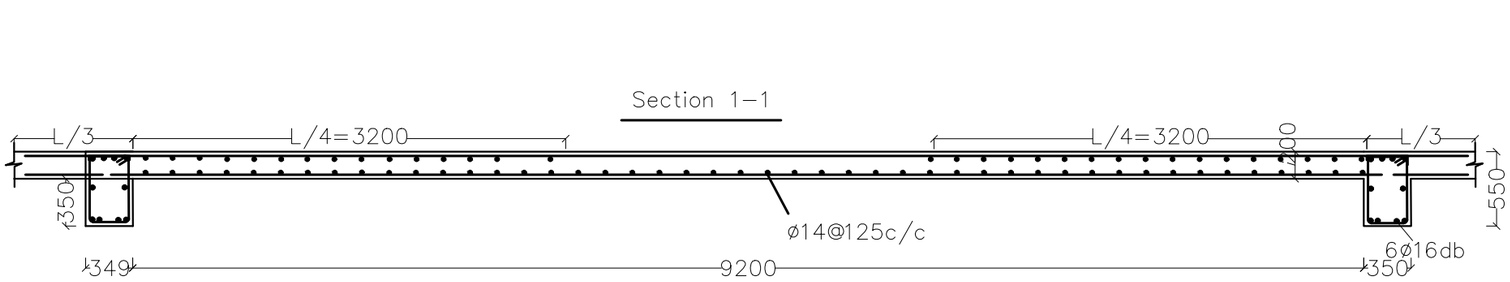
Upp part rebars



Down part rebarsb



Section 1–1



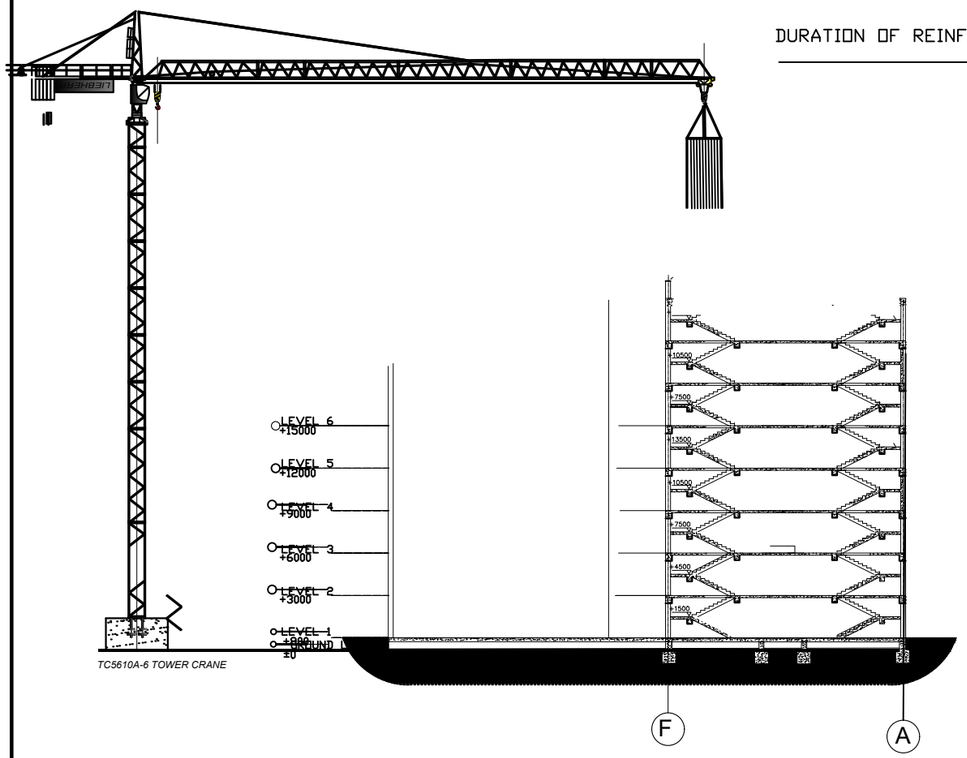
Explanation					
Num	Standards	Name	qua	Weight (Kg)	Note
		SLAB 10-11			
1	EN 10138-4	∅ 14 A500 L= 1050	88	5.06	446
2	EN 10138-4	∅ 14 A500 L= 4450	38	5.06	192.2
4	EN 10138-4	∅ 10 A500 L= 1000	14	6.99	97.86
5		Materials			
6		Concrete class C30			

Note:
more information on the APP 2

						KazNITU-5B072900-Civil Engineering-02.08.02.2021-DP
						College Educational Center in Almaty
Chan.	Num.par.	List	№doc	Sign	Date	
Head of dp		Kozyukova N.V				Calculation and Design
Superviser		Zhambakina.Z				stage: DP; Sheet: 7; Sheet: 10
Consultant		Zhambakina.Z				
Controller		Kozyukova N.V				Slab
Prepared by		Asim Poya				Construction and building materials department

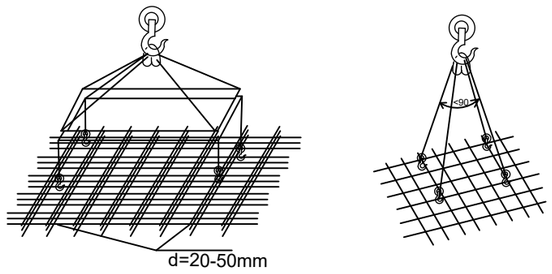
формат А3

DURATION OF REINFORCEMENT INSTALLATION



TC5610A-6 TOWER CRANE

lifting of reinforcement nets



APPLICATION AREA

The technological map was developed for the construction of a monolithic reinforced concrete slab foundation with a size of 39X129 and a height of 27.8m using the tower crane. The work flow chart includes:
1.1laying of reinforcement;
1.2The works are carried out during the summer period.

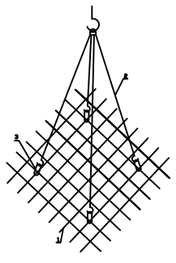
ORGANIZATION AND TECHNOLOGY OF THE BUILDING PROCESS

2.1. Before starting the installation of reinforcement , the following must be performed:
- *work on the organization of the construction site;*
- *concrete base for the foundation;*
- *the assembly crane, construction machines were delivered to the object, inventory, tools and devices;*
- *the framework panels were delivered and placed at the storage areas, reinforcing mesh and frames.*

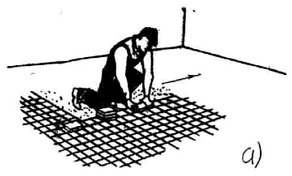
2.2 The steel should be already at the site area of construction
2.3 When erecting a monolithic slab foundation for the installation of a reinforcing mesh, a KS-3561 truck crane with an 18 m boom and a 3 m long jib, with a carrying capacity of 3 tons is used. Installation is carried out using universal slings.
2.4 The concrete is delivered to the construction site in a centralized manner by the C-1036 concrete mixer truck.
2.5 Concrete is supplied to the place of picking up by a crawler crane TC5610A-6 with a boom length of 32 m in buckets with a capacity of ton and height of 6 to 56m
2.6 The installation of rcc going to be perform:
-Reinforcement of the foundation is performed in 2 shifts of 2 links:
- reinforcement worker of the 4th category - 2 people;
-reinforcement worker of the 2nd category - 4 people.

NOTE :
More info on App C

Slinging scheme reinforcement mesh

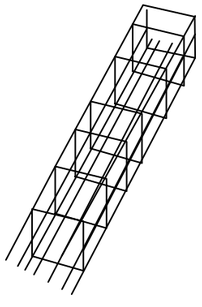


a - reinforcing mesh
b - 4 branch sling
c - universal sling

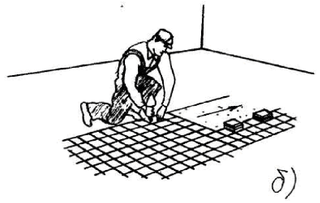


a) reinforcing mesh

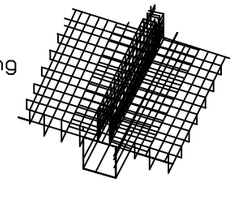
Rcc Design at Beam



MATH LAYER FOUNDATION



b) branch sling



c) universal sling

TECHNICAL AND ECONOMIC INDICATORS

volume of work, m3	- 1106.82
labor costs for the entire volume, man-day	- 234
labor costs per 1 m3 of monolithic reinforced concrete, man-day	- 0,27
output per worker per shift, m3	- 2,21
costs of computer time for the entire scope of work, machine-shifts	- 41
total cost of labor costs, RUB-kop.	- 1030-52

WORK SCHEDULE

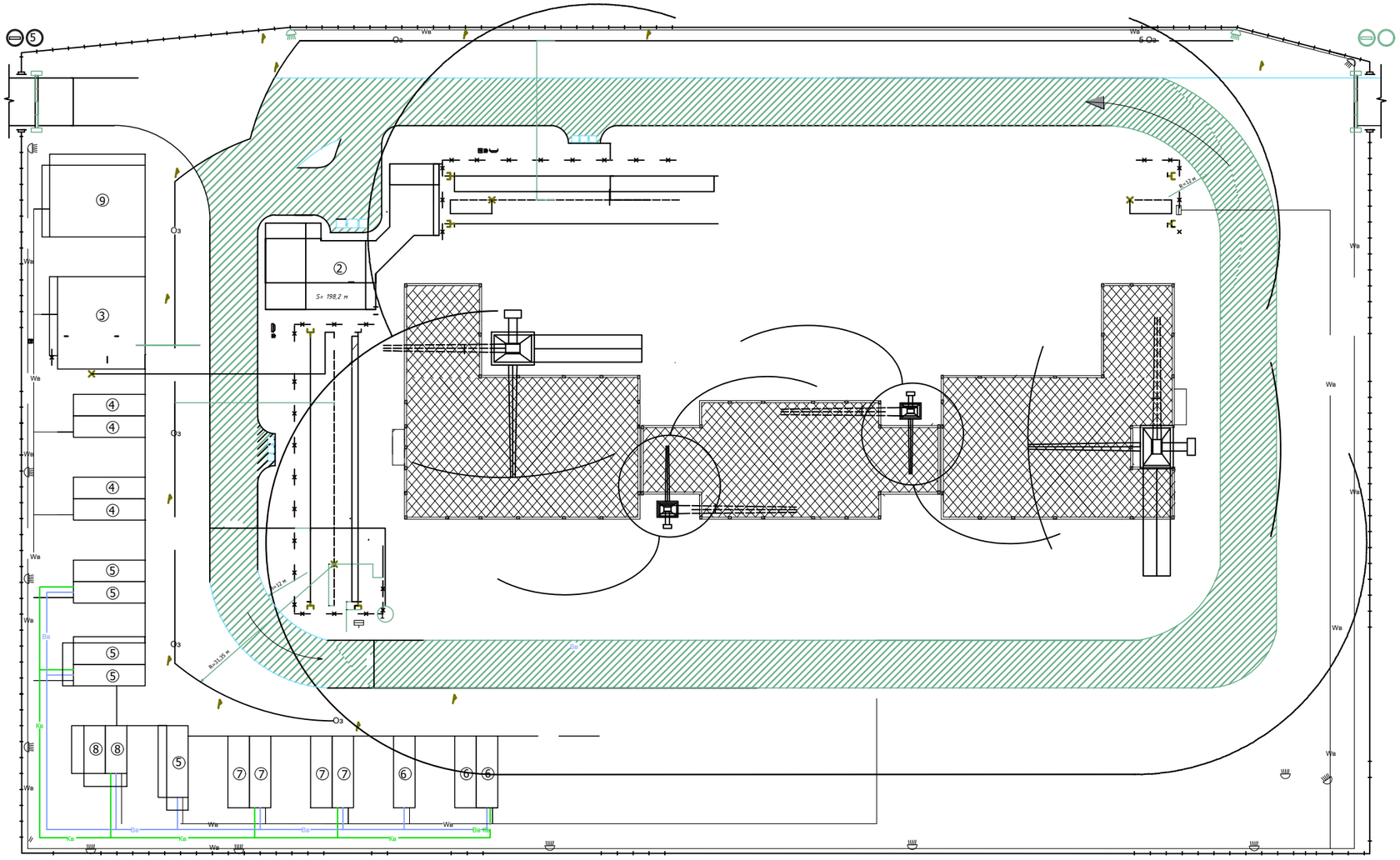
Name of works	Unit rev.	Volume works	Time rate man-hour	Labor costs people-days	Working days 4 8 12 16 20 24
Reinforcement of slab foundation	1 сетка	614	2,3	176,5	
Floor slab rcc	м^2	354,5	0,38	16,8	
Column rcc	м^2	711	0,52	46,2	
Beam rcc	м^2	354,5	0,22	10	
Crane service TC5610A-6	mash.-shifts	30			
Maintenance of the TC5610A-6	mash.-shifts	12			

Chan.	Num.par.	List	№doc	Sign	Date	KazNITU-5B072900-Civil Engineering-02.08.02-2021-DP		
						College Educational Center in Almaty		
Head of dp		Kozyukova N.V				Organization and technological part	stage: DP	Sheet: 8 / Sheet: 10
Superviser		Zhambakina.Z						
Consultant		Zhambakina.Z						
Controller		Kozyukova N.V				Reinforcement work	Civil Engineering and building materials department	
Prepared by		Poya Asim						

формат А3

PRODUCED BY AN AUTODESK STUDENT VERSION
PRODUCED BY AN AUTODESK STUDENT VERSION

CONSTRUCTIVE MASTER PLAN



NO	ABBREVIATIONS	EXPLATION
1		transformer station
2		power distribution cabinet
3		*touching the concrete mix &receiving area*
4		*fire extinguisher*
5		*barrel with water*
6		*box with sand*
7		*stand with load fixing schemes*
8		*special signs*
9		*barrier*
10		*5 speed limit 5 km / h*
11		*access is prohibited*
12	—K—	*permanent sewerage*
13	—KB—	*temporary sewerage*
14	—B—	*permanent water supply*
15	—BB—	*temporary water supply*
16	—W—	*permanent transmission line*
17	—WB—	*temporary transmission line*
18		*searchlight*
19	—×— ×—	*temporary enclosure*
20		*fire hydrant*

Technology - economic indicators

No	Name of indicators	Measurement signs	Volume
1	*Total using area for building*	m^2	11661
2	*Construction area*	m^2	1029
3	*Construction factor*	%	0.08
4	*Length of temporary roads*	m^2	1264
5	*Length of temporary water pipes*	m	63.2
6	*Temporary power transmission system length*		364
7	*Length of temporary sewer*	m^3	300

No	Work process	permanently	Temporary
1	*The price to pay*	*Stable*	
2	*Open warehouses and initiatives*		
3	*Office and dispatching*		*Temporary*
4	*Meeting room*		*Temporary*
4	*Dining and drying room*		*Temporary*
5	*Room for heating and drying*		*Temporary*
6	*Wardrobe and bathroom*		*Temporary*
7	*Restroom*		*Temporary*
7	*Material warehouse*		*Temporary*
8	*Instrument room*		*Temporary*
9	*Place of control load*		*Temporary*

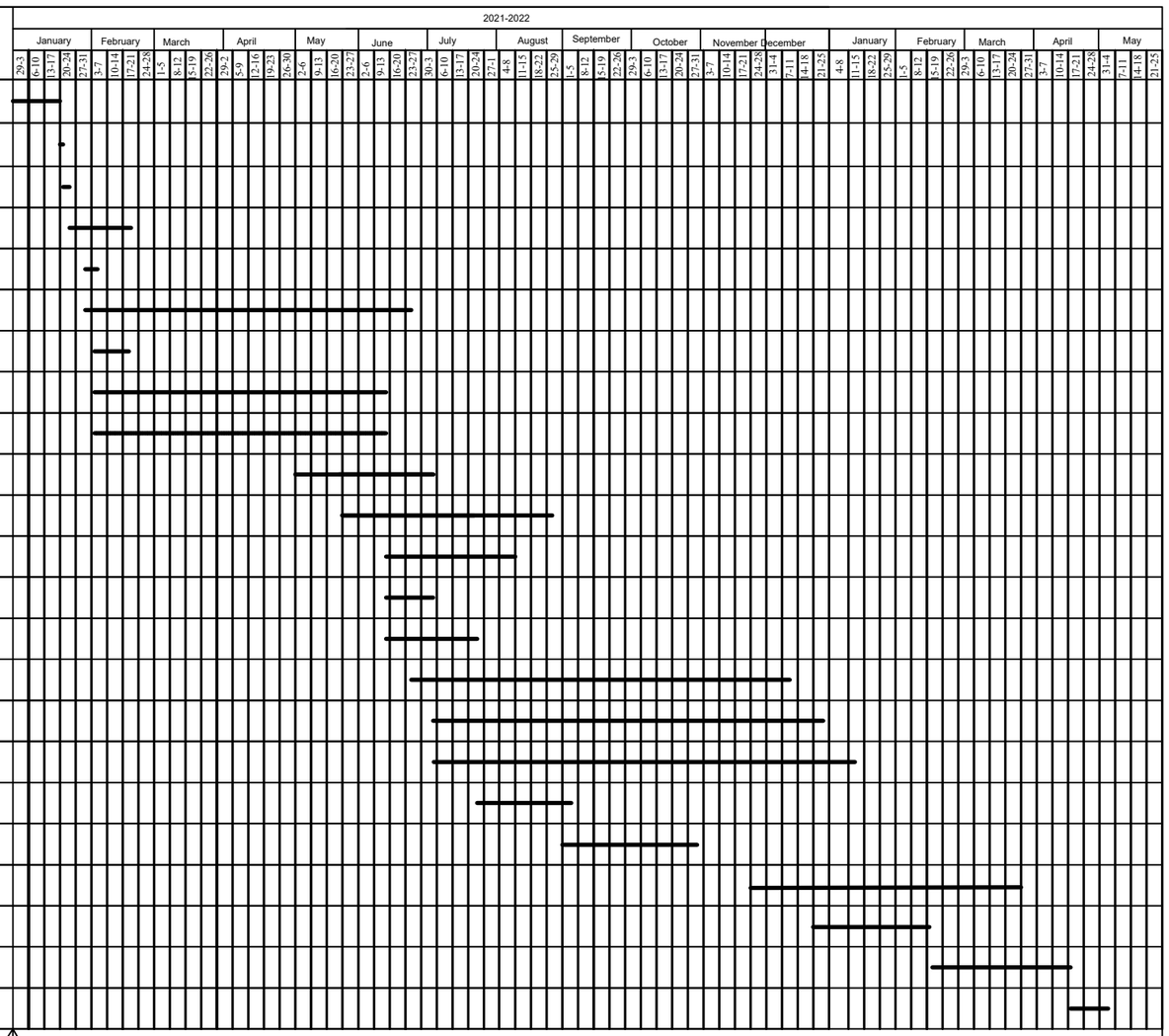
NO	Name of indicators	Measurement symptoms	Volume
1	*Total labor costs*	*day*	*102.5*
2	*Total duration of work*	*day*	*54*
3	*The total cost of installation work*	*$ 12.5/8hr*2*	*1350*

Chan.	Num.par.	List	№doc	Sign	Date	
						KazNITU-5B072900-Civil Engineering-02.08.02-2021-DP
						College Educational Center in Almaty
Head of dp		Kozyukova N.V				Oraganization and technological part
Superviser		Zhambakina.Z				stage: DP; Sheet: 9; Sheet: 10
Consultant		Zhambakina.Z				
Controller		Kozyukova N.V				Constructive master Plane
Prepared by		Poya Asim				Civil Engineering and building materials department

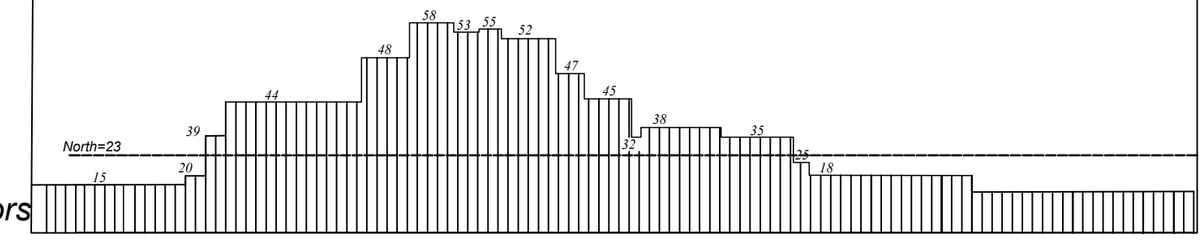
формат А3

CALENDAR PLAN

Types of work		Scope of work: Measure	Scope of work: The num one.	Labor cost ad.-day	Necessary machines: Marks	Necessary machines: Num of Machine	Working number	Shift number	Duration day
Stage of preparatory work		-	-	688,11	-	-	15	3	15
Production of potholes		1000м³	1,34	1,26	Excavator ЭО-4224	1	1	2	1
Manual tillage		м³	41	10,15	-	-	5	1	2
Reinforced concrete foundation		шт.	438	47,1	Concrete pump 24 М4 ХН	2	10	1	5
Waterproofing of the underground section		100м²	4,41	36,13	-	-	3	2	4
Installation of external engineering systems		-	-	1146,9	-	-	11	1	104
Filling the soil tension		100м³	0,2	0,91	Bulldozer	3	1	1	1
Surface constructions of the building concreting		из	4176,8	5570,8	Tower crane	2	15	3	93
Reinforced concrete surface section installation of structures		шт.	87	66,9	Crane TW-11	2	10	1	7
Fill door and window openings		м²	3651,4	610,8	-	-	14	1	44
Installation of process equipment		-	-	917,5	-	-	11	2	42
Sanitary works		-	-	1410,8	-	-	17	2	41
Roofing works		100м²	16,88	76	-	-	5	1	15
Sound and insulation of the floor		м²	10446,5	287,1	-	-	5	2	29
Landscaping of the territory		-	-	573,4	-	-	12	1	48
Making a cement drawer under the floor		м²	9016	161,2	-	-	6	1	26
Electrical installation work		-	-	522,5	-	-	10	2	26
Slab contraction joints should intersect at the openings for columns		из2	2205	297,7	-	-	5	2	30
Plastering of walls, ceilings and slopes		м²	36924	3206,7	-	-	25	3	43
Painting of facades		100м2	47,7	176,49	-	-	8	2	11
Making linoleum floors		м²	6152	294,5	-	-	8	1	37
Walls, ceilings and sewers painting		м²	6050	625,83	-	-	22	1	28
Maintenance of power lines		-	-	209	-	-	18	1	12



Employee shift schedule



Technical and economic indicators

Name of indicators	Measurement .unit	Indicator
Duration of construction	month	16
Total labor intensity	man.-day	21945
Own works labor intensity	man.-day./m3	0.39
Workers' movement non-uniform coefficient	-	1,1.56
Shift coefficient	-	1.045

Chan.	Num.par.	List	№doc	Sign	Date	
Head of dp		Kozyukova N.V				
Superviser		Zhambakina.Z				
Consultant		Zhambakina.Z				
Controller		Kozyukova N.V				
Prepared by		Poya Asim				

KazNITU-5B072900-Civil Engineering-02.08.02-2021-DP

College Educational Center in Almaty

Economic

stage	Sheet	Sheet
DP	10	10

schedule of full work

Civil Engineering and building materials department

формат А3

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
имени К.И. САТПАЕВА

RESPONSE

OF THE SUPERVISOR

for the graduation project
Asim Poya
5B072900 – Civil Engineering

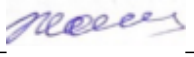
Topic: «College building with the use of kinematic supports in Almaty»

Student Asim Poya completed the diploma project of the college in Almaty. The complexity of this topic lies in the seismicity of the city and the choice of the type of foundation. Unfortunately, when issuing the task for the design and construction part of the building, the columns and floor slabs were determined for the calculation of the structure. Asim P. successfully coped with this task, but the special emphasis in the name was in the kinematic supports of the building, but this section was not included in the design and construction part.

Student Asim Poya completed the diploma project at a good level. All sections of the project have been developed and calculated. Calculations of the structural section were made in accordance with the new norms of the Republic of Kazakhstan, taking into account the seismic load and the specifics of Almaty. A technological section has been developed, technical maps, a calendar plan, and a construction plan have been completed. All sections of the diploma project are completed in full.

The diploma project is completed at a good level and meets the requirements for bachelor's theses. Student Asim Poya deserves a good grade.

Supervisor
Candidate of technical sciences, assistant professor

__  ____Zhambakina Z.M.

«30» may 2021 yr.

Протокол анализа Отчета подобия Научным руководителем

Заявляю, что я ознакомился(-ась) с Полным отчетом подобия, который был сгенерирован Системой выявления и предотвращения плагиата в отношении работы:

Автор: Поя Асим

Название: College building with the use of kinematic supports in Almaty

Координатор:Зауреш Жамбакина

Коэффициент подобия 1:0.3

Коэффициент подобия 2:0

Замена букв:54

Интервалы:4

Микропробелы:3

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: Поя Асим

Название: College building with the use of kinematic supports in Almaty

Координатор: Зауреш Жамбакина

Коэффициент подобия 1:0.3

Коэффициент подобия 2:0

Замена букв:54

Интервалы:4

Микропробелы:3

Белые знаки:0

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

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

Обоснование:

……
……
……
……
……

……
……

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