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

Ghawsi Fawad

« Multi-level parking with the use of air purification systems inAlmaty »

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 «Multi-level parking with the use of air purification systems in Almaty»

5B072900 - "Civil Engeneering"

Prepared by Ghawsi Fawad

Scientific adviser N.V.Kozyukova
Master of technical science,
Lecturer
«_____»___2021 yr.

Almaty 2021

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Specialty 5B072900 – Civil Engineering

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

ASSIGNMENT
Complete a diploma project

Student: Ghawsi Fawad
Topic « Multi-level parking with the use of air purification systems in Almaty »
Approved by the Order of the Rector of the University No. 2131-b dated November24, 2020.
The deadline for the completed work is May 10, 2021.
Initial data for the diploma project: construction area in Almaty
Structural schemes of the building - frame-wall with cross-beams, structures are madeof 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;
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. KHz columns, specifications - 1 sheet.
3. Technical maps of earthworks and formwork, calendar plan, construction site plan -4 sheets.
11 slides of work presentation are provided.

Recommended main literature: SP RK 2.04-01-2017 "Construction climatology", SN RK 2.04-04-2013 "Construction heat engineering", SN RK 2.03-30-2017 "Construction in seismic zones"

SCHEDULE
preparation of thesis (project)

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	N.V. Kozyukova Master of technical science, lecturer		
Calculation and design	N.V. Kozyukova Master of technical science, lecturer		
Organizational and technological	N.V. Kozyukova Master of technical science, lecturer		
Economic	N.V. Kozyukova Master of technical science, lecturer		
Norm controller	Bek A.A., Master of technical science, assistant		
Quality control	Kozyukova N.V., Master of technical science, lecturer		

Scientific adviser ___________ N.V. Kozyukova

The task was accepted
for execution student ___________ Shafi Mohammad Ashrafullah

Date "___" ________ 2021 y.

АҢДАТПА

Әлем халқының саны олардың қоғамдық көлік жүйесінің айналасында өсіп отырады және қалалар мен қалалар өзінің айналасында өсті. Автотұрақтардың кернеуін төмендету үшін көлік тұрақтарының қажеттілігін қанағаттандыру үшін меншік иелерін, тиісті тұрақ орындарын қамтамасыз ету қажет.

Бұл зерттеулер әртүрлі іс жүргізу объектілерін пайдалана отырып, қоғамдық орындарда көлік қозғалысы ның сын-тегеуріндерін жеңілдету үшін көп деңгейлі автопаркті жобалауды ұсынады.

Біздің ғимараттың дизайны 9 қабаттан тұрады. Барлық қабаттар 140- 150 автомобильді орналастыруға арналған. Құрылыс жоспары AutoCAD бағдарламалық жасақтамасын пайдалана отырып дайындалды. Фреймді талдау ETABS бағдарламалық қамтамасыз ету көмегімен тік және көлденең жүктемелер үшін жүргізілді.

АННОТАЦИЯ

Население мира постоянно растет, и города и поселки выросли вокруг их системы общественного транспорта. Для того, чтобы уменьшить стресс от парковки, владельцы, адекватные парковки должны быть предоставлены для удовлетворения спроса на парковку.

Это исследование представляет собой дизайн многоуровневой автостоянки для смягчения транспортных проблем в общественных местах с использованием различных объектов случаев.

Наш дизайн здания, состоящий из 9 этажей. Все этажи рассчитаны на 140 - 150 автомобилей. План строительства был подготовлен с использованием программного обеспечения AutoCAD. Анализ рамы проводился для вертикальных и горизонтальных нагрузок с использованием программного обеспечения ETABS.

ANNOTATION

The population of the world is continuously on the increase and towns and cities have grown up around their public transport system. In order to reduce the stress of parking, owners, adequate parking facilities must be provided to meet up for the demand of parking.

This research presents the design of multi-level car park for the mitigation of traffic challenges in public areas using various case facilities.

Our building design consisting of 9 floors. All floors are designed to accommodate 140 - 150 cars. The plan for building was prepared using AutoCAD software. The analysis of the frame was carried out for vertical and horizontal loads using ETABS software.

CONTENT

INTRODUCTION

Civil and urban industry development of the Republic of Kazakhstan is looking create the plans of construction until 2020 is not with that all facilities which are most needs in every society, because the population of the country is going up and there are a lots of production companies inside of the city which can increase the pollution of the Almaty city.

Nowadays smart city projects are gaining a lot of attention. A novel method of effectively using the vertical limits of a building, for this purpose the lower stories with greater earning potential can be kept as commercial space while the higher floors can be used for living purpose.

The multi-story buildings which are used for commercial or residential purpose and accommodate a huge population in or the cities which have a huge amount of population in the have to solve their traffic problem using multi-story car parking which are good variant to accommodate more traffic in small area.

This research presents the design of multi-story car parking for the mitigation of traffic challenges in public areas using various case studies.

Our building consists of G plus 8 floor. All floors are designed to accommodate 108 cars.

The main goal of architecture has always been to create an auspicious natural environment for social life, the nature and suitability of which is strong-minded by the level of cultural and technical development of people, the achievements of knowledge and technology.

The plan for this project was prepared using AutoCAD software. The analysis of the frame was carried out for vertical and horizontal loads using Etabs software.

The design has been done according to the limit state method and confirming to Europe standard code for various structural and nonstructural components.

Further reinforcement detailing for various structural elements are made using general information from structural books.

1 Architectural part

1.1 Climate Characteristic of Almaty City

Almaty is 870m above sea level.

Climate characteristics of the construction according to the Almaty city Climatic characteristics of the construction area:

-Outside air temperature:

-The average high temperature - 18 o C

- Average temperature on the coldest days -6C

- Wind speed pressure – 7km/h

1.2 Architectural planning solution

A building can be either load bearing or can have frame structure or both combine. Generally, the structures with are confirmed these days. This structures are confirmed because they are strong. Reinforced concrete buildings includes the slabs, beams and columns which are continuously placed to form a rigid structure. This permanent system provides more gain, less torque and even more load distribution. The effects of horizontal paths, such as wind earthquakes, spread to the structure and are well protected. The floor is supported by beams that can be supported directly on the columns or columns supporting the columns. The frame of the building is three-dimensional, meaning the local structure. It can be considered as a system of interconnected two-dimensional vertical frames. Frames can be resolved independently, such as a phone frame or an empty space. The degree of accuracy of structural analysis depends on the importance of the structure. A wide variety of methods have been used for buildings of different heights and importance, from simple approximation methods to complex computer-aided methods.

1. Working drawings of the construction are developed in accordance with the architectural standards of the Republic of Kazakhstan.

2. Technical Facilities systems that need to be examined are: Structural and addition elements. Lighting requirements inside and outside, Heating, ventilation and air conditioning requirements, the arrangement of the transverse frame begins with the establishment of the basic (overall) dimensions of the structural elements in the plane of the frame. The vertical dimensions are snapped to the floor level, taking it to be zero. The horizontal dimensions are tied to the longitudinal axes of the building. All dimensions are taken in accordance with the basic provisions for unification. The layout is made in accordance with [1].

The crossbars of the transverse frames are rigidly connected to the extreme and middle columns. Floor slabs, prestressed in two versions, are accepted as hollow-core slabs. Hollow-core slabs are assumed to be equal with a nominal width of 2000 mm.

Structural layout includes selection of grid and column spacing, direction of main beams, etc. The layout is carried out taking into account the purpose of the structure, architectural and planning solutions, technical and economic indicators, etc.

The span of the main beams is 6□8m, the height of the section is hгл.б = (1/8 □1/15)□lгл.б, the width of the section is bгл.б = (0,4□0,5)□ hгл.б. The secondary beams are placed so that the axis of one of the beams coincides with the axis of the column. The span of the secondary beam is 5□7m, the section height hвт.б = (1/12 □1/20)□lвт.б, the section width bгл.б = (0,3□0,5)□ hвт.б. The height of the section of the beams is assigned a multiple of 50 mm if it is not more than 600 mm and a multiple of 100 m at a greater height.

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

1.3 Energy Efficiency of the building.

The building is 9-storey public car parking with half underground floor. Scope of Services are Architectural Designs, Structural Designs, MEP Service Designs, Quantity Surveying, Construction Supervision and Project Management. Total area of construction which need Energy efficiency is 6400 m2.

In This building there were applied energy efficiency techniques to save more energy and use renewable energies. The whole system: ventilation system, thermal stoves are used in a way which do not loss energy and heat from the building. Besides, we mostly focused on renewable energy (Solar panels) in this building. According to the area (6400sqm) we use 54 solar panels, due to the standard for 6400sqm we need to use 52-56 solar panels.

There are some alternate practices which was unfortunately not applied in this building are submissive houses techniques, which concentrate mostly on internal heating source like heating of shower room, kitchen, and heat from human body.

We estimate the procedure of concluding energy use for planetary boiler, airing, tap water warming and domestic and capability of electricity with the active energy equilibrium program. The space heating demand is modeled for climate conditions of the city Almaty, assuming indoor temperatures of $20C^0$-$21C^0$ for the Studding areas and 18 C^o for the mutual areas of the buildings. The primary energy required to offer the final energy for the procedure activities are calculated with the ENSYST software individually. We analyze the main energy use for cases where the buildings are heated with cogeneration-based region heat or rechargeable-based bedrock heat pump. The COP of the heat pump for heating is supposed to be 3. 0.. The solar panels are assumed to replace energy mostly.

To accomplish, this 9-storey parking building applied some energy efficiency techniques and methods to save energy and heats inside of the building. We only used Solar panels and a general electricity of Kazakhstan. In this building which is quite well-organized and warming radiators plus thermal heat pumps are connected in a way that uphold the sensible temperatures, low humidity, and increased air superiority inside the building. In addition, for future work we need to rely more on renewable energies such as (Wind Turbines, Biomass, geothermal etc.) and some of passive house techniques and devices for making the building more energy efficient.

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

1.4 Calculation of the ventilation system of the building

Ventilation system is one of the most important part of MEP, that can make us a great facility inside of our construction, for the entire project we divided our ventilation system by four blacks where every blocks. Every block has return diffuser, supply diffuser, Ducts and Air handing unit.

The composition of the indoor air is not constant but changes all the time. The breathing of people is accompanied by the consumption of oxygen and the release of carbon dioxide. In addition, in industrial and commercial facilities, oxygen can be consumed during certain technological processes, which are also often accompanied by the release of various gases, dust and other pollutants. As a result, the concentration of oxygen in the air decreases, which makes it poorly breathable. Finding people in such an atmosphere leads to a deterioration in well-being and can negatively affect health. The presence of various pollutants in the air can be directly hazardous to health, create a fire or explosion hazard. Therefore, a mandatory requirement is to equip any building with a ventilation system. It provides air exchange in the interior of the building, removing exhaust air from them, which is replaced by fresh air supplied from the street. Thanks to this, the rooms remain in the optimal amount of oxygen for breathing, there are no harmful gases and suspensions. Also, ventilation should maintain optimal values of temperature, humidity, air velocity. This allows you to maintain a safe and comfortable indoor environment, prevent dampness, mold, and mildew on surfaces. For some rooms, natural ventilation is sufficient, which does not involve the use of ventilation equipment. However, at many facilities, it does not allow achieving the required air exchange parameters. In such cases, you must mount the system forcibly.

Area calculation for ventilation system

Area calculation is the easiest way to determine the required air exchange. It is carried out based on the norm that 3 cubic meters of fresh air should be supplied to 1 square meter of air within an hour. In this case, the ratio of supply and exhaust ventilation is assumed to be 1: 1.

$$L = S \cdot 3. \tag{1}$$

Where L is the required performance of the ventilation system, m3 / h.

S is the total area of ventilated premises in buildings, m2.

To calculate the required performance of the ventilation system in terms of frequency, the following formula is used:

$$L = n \cdot V. \tag{2}$$

Where L is the required performance of the ventilation system, m3 / h.

n - Standard rate of air exchange.

V is the volume of the room, m3 / h.

2 Structural part

For the initial drawing up of options for flooring, spans of reinforced concrete beam slabs should be taken within 1.5 ÷ 2.7 m and, rarely, more. Spans of secondary beams are accepted within 5–7 m and spans of main beams are 6–9 m.

According to design requirements from rigidity conditions:

$$Hmb = (1/8 \div 1/15)\ lmb \tag{3}$$

$$Hmb = (1/8 \div 1/15)6000$$

We accept hmb = 600 mm

Width of main beam:

$$Bmb = (0.3 \div 0.5)\ h_{mb} \tag{4}$$

$$Bmb = (165 – 275)\ mm$$

We accept bmb = 400 mm.

2.1 Fine materials of the project

Air purification machines.

-Columns made of monolithic reinforced concrete, square in plan. Section of Rectangular columns 40x40cm and 40x80cm. It is made of concrete of class C 30/37.

The floor slab is designed from monolithic Reinforced concrete class C30/37, 200 mm thick.

2.2 Anti-seismic activity

The main feature of the seismic retention for this building is the foundation is strong with high ability of force observation and the share walls which are used for the resistance against the earthquakes, the size of columns are also designed for the transferring loads and being stable against the earthquakes. The main feature of the seismic retention of wonderful frame buildings is determined by the fact that these structures have a huge period own oscillation, which is how they differ from a frameless building. Complex frame structures own large reserves flexible plastic work and are allowed to work designs beyond limits of ductility and elasticity. Horizontal effort in complex frame buildings can perceived by its frame and with vertical connection, aperture or core rigidity. These complicated frames have a more correct frame. design scheme, which accompanies the optimization of various design decisions. The presence in complex frames of various additional element in the form of masonry, ties, diaphragms acts to limit displacements of elements, replenishment of the stiffness of the building. Stiffness cores connections and stiffness diaphragms are designed continuous in height structures and should be located in two directions symmetrically, evenly in the center of stiffness. Buildings must be completed by dividing with antiseismic seams into certain compartments if: space-planning and constructive solutions are not determinedrequirements; centers of gravity differ in different blocks over 30%. Over the entire height of the building, anti-seismic seams should be divided into equal blocks. Antiseismic seams are required to be performed by the method the construction of several paired frames, or separately frames and walls. Adjacencies blocks in the transition of anti-seismic seams should not always harm them combined horizontal movement during earthquakes. When erecting a building on non-rocky soils, the foundations of buildings, as usually settled on the same level. Technical floors should be built under the whole building. Elevator shafts and stairwells of complex frame buildings should be designed as stiffness cores accepting seismic load. Another option is possible, in the form of builtin simple structures with uniform floor cutting, usually not affecting the stiffness frame. The load-bearing walls must be designed so that have flexible connections with the basic frame structures without harming horizontal displacements of the walls.

2.3 Strength

The structure must be able to safely withstand the pressures of all elements as a result of loads, including fixed loads and horizontal loads.

2.4 Stability

During the specified loading process, the structure and its part must be protected from overturning, slipping or warping.

2.5 Serviceability

This structure must perform satisfactorily in poor operating conditions, ie it must be fit for the purpose for which it was built throughout its lifetime. If the build does not meet any of the above objectives (or combinations), it is considered not working. In addition to the three goals mentioned above, designers consider two more factors. These are economy and aesthetics. By economic we mean that the design must justify its value for the services it provides. It is always possible to design a large structure with enough strength, durability and services, but the cost of this structure can be prohibitive and the final product will be far from aesthetic.

2.6 Structural system

Loads in the building structure are transferred to the ground by a system of interconnected elements. Most complete frames are designed to withstand vertical loads. Some frames in buildings are designed to transfer horizontal loads more efficiently. A building system can be classified as a low load-bearing wall system, a building with a curved wall system, a framing system with moment resistance, a double framing system of a curving wall, a space frame, and a piping system.

2.7 Load bearing wall system

There is no column in such a structure. The walls support to withstand all gravitational loads as well as lateral loads.

2.8 Building with flexural

The weak gravity is mainly due to the frames supported by the columns rather than the load-bearing walls. A small gravitational force can also be applied to load-bearing walkways, but their bearing capacity should not exceed a few percent of the construction area. The resistance to background loads is due to the unbearable bending of the brass frame wall. Although low vertical resistance frames do not require background resistors, it is highly recommended to use nominal torque resistors when designing vertical power frames. The vertical power frame provides a modest secondary line of defense even if all the background forces required by other frames are maintained. The presence of the frame can ensure the vertical stability of the building and prevent it from collapsing after damaging a sloping wall or brake frame. The frame also serves to bind the building and redistribute the next force to the unused elements in the shear resistance system.

2.9 Flexural wall system

This wall is a reinforced concrete wall designed for parallel lateral forces of the aircraft and the necessary details are provided to ensure its stability. However, it can be used up to a height of 70 meters and only if the seismic design, including the effects of storm bending the walls on each plate, does not exceed 33% of the design. The goal is to ensure that each of these four or more detours is on a different plane and spaced far enough around or around the building, resulting in premature failure of a wall or frame. More complexity is created.

2.10 Loads

The building is subjected to the following load during its service life.

2.11 Dead load

The building's own load should include the weight of all walls, partitions, floors and ceilings, as well as the weight of other permanent structures in the building.

2.12 Live load

Live loads are mounted loads and include all live or variable loads caused by people, vehicles, machinery, etc. Live loads on the ground should include all loads except wasted loads. In IS 875: 1987 different live loads operating in different classes are given. The following loads can be reduced in the design of columns, foundations and foundations in multi-story buildings.

Table 1.4 – All loads applied taken from Euro code 1 EN 1991-1-1: 2002

Type of loads	Measured unit	Values
q k (uniformly distributed load)	kN/m^2	5-7.5
Q k (Concentrated load).	kN/m^2	3.5-4.5
Own weight of building per m2	kN/m^2	3-5
Snow load	kg/m^2 (kpa)	80(0.8)
Wind load	Kpa	0.38
Plastering	Cm	4

2.13 ULTIMATE LOAD METHOD

This is the method to obtain the final load. Uses a bad member to increase the workload and takes into account the non-linear behavior of the concrete. The design is designed to withstand the required final load. Whitney's final theory is based on the assumption that the final stress in concrete is 0.3% and that the stress applied to the end fibers of that part is equal to that stress.

2.14 Limit state method

It is based on the concept as to achieve an acceptable probability that the structure will not become unserviceable in its life time. Hence this method is based on its probability that the structure should be able to withstand safely the working load throughout the following limit state are examined.

2.15 Limit state of collapse

It corresponds to maximum load carrying capacities and it violation implies failure but do not mean complete collapse. This limit state corresponds to:

a) Flexure.
b) Compression.
c) Shear, and
d) Torsion

2.16 LIMIT STATE OF SERVICEABILITY

It corresponds to the development of excessive deformation. This state corresponds to:

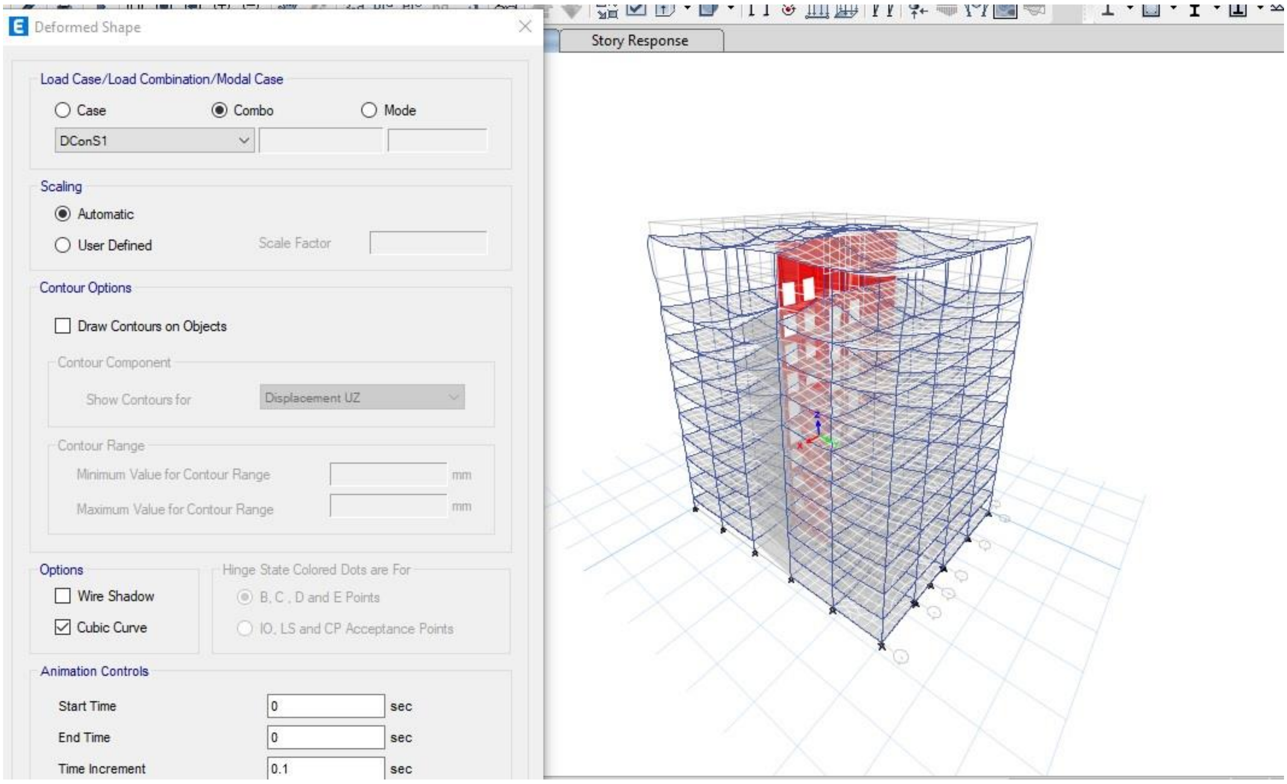
a) Deflection.
b) Cracking the idealized stress and strain.

2.17 Analysis

After assigning all the member properties and loads the analysis was done manually and it was checked by ETABS. After the analysis the results were obtained.

The beam end forces and reactions are found out. The maximum bending moment in beams and maximum axial load in columns was found out.

2.18 Etabs analysis



Displacement

2.19 Calculation and design of beam

Beams are the members on which the slabs rest upon. Beams are horizontal members over which slabs rest. The reactions from the slab gets transferred to the beams. The loading for a beam is given as a uniformly distributed load. The weight of overlying walls also gets transferred to the beams. There are two types of beams.

1. Plinth beams
2. Roof beams

2.20 Beam design

Design scheme and loads. The transverse multi-story frame has a regular design scheme with equal spans of crossbars and equal lengths of racks (height of floors). The cross-sections of the crossbars and racks by floors are also taken constant. Such a multi-story frame is dismembered to calculate the vertical load on single-story frames with zero points of moments by hinges located at the ends of the racks in the middle of the length of the racks of all floors except the first. The design diagram of the calculated frame of the middle floors is shown in accordance with Figure 1.1.

The load on the girder from hollow-core slabs is considered uniformly distributed, from ribbed slabs with more than four ribs in the girder span, it is also evenly distributed. The width of the load strip per crossbar is equal to the step of the transverse frames, in the example - 6.2 m.

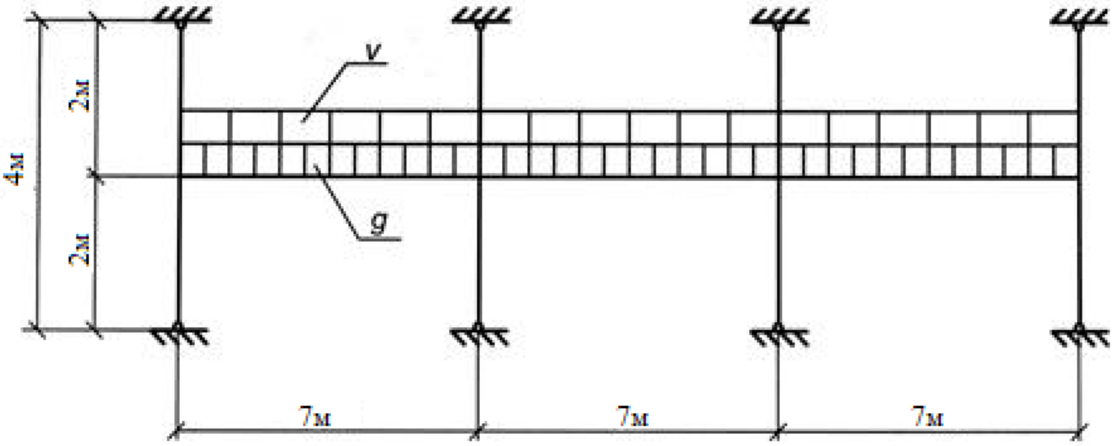


Figure 1.1 - Design diagram of the transverse frame of middle floors

Calculation of loads per 1м^2 of flooring is given in accordance with Table 2.1.

Calculate the design load per 1m of the girder length.

Constant: from overlap taking into account the coefficient

Reliability for the purpose of the building $\gamma_п$ = 0.95; 4.134 · 6.2 · 0.95=24.3кN /м; от веса ригеля сечением 0.25 · 0.6м (ρ =2500кг/cm3) taking into account reliability factors γ_f = 1.1и γ_n =0.95; 0.25·0.6·25·1.1·0.95=3.9 кN /м. Итого g=24.3+3.9=28.2 кN /м.

Timed tailored γ_n=0,95; v=6·6·0,95=34,2кN /м, including long 4,2 · 6 · 0,95=24 and short-term 1.8 · 6 · 0,95=10,2кN /м.

Full load g+υ=62.4 кN /м.

Calculation of bending moments in the design cross-sections of the girder. The supporting moments are calculated according to table 2, appendix 2 [1] for girders connected to the columns on the middle and extreme supports rigidly, according to the formula M=(αg+ßυ)l^2. The tabular coefficients α and ß depend on the crossbar loading schemes and the coefficient k - the ratio of the linear stiffness of the crossbar and the column. The cross-section of the girder is taken to be 25X60cm, the section of the column is 30X30cm, the length of the column is l = 4.0 m. Calculated by the formula 3.1 [1]:

$$k=\frac{I_{bm}*l_{col}}{I_{col}*l_{bm}} \qquad (5)$$

where $I_{bm}=\frac{b_р*h_р^3}{12}$; $I_{col}=\frac{h_c^4}{12}$

I_{bm} – Deadbolt moment of inertia,

I_{col} – Column moment of inertia,

L_{col} – Column length,
L_{bm} – Crossbar length

$$k=\frac{25 \cdot 60^3 \cdot 400}{30 \cdot 30^3 \cdot 700}=3.8$$

The calculation of the supporting moments of the girder from a constant load and various schemes of loading with a temporary load is given in accordance.

Span moments of the crossbar:

1) In the extreme span of the loading scheme 1 + 2, support moment's M_{12}=-144 кN ·м, M_{21}= -240 кNm; load g+υ=62.4 кN /м; lateral forces are determined by the formula 3.2 [1]:

$$Q_1=\frac{g+υ}{2} \cdot l-\frac{M_{12}-M_{21}}{l} \quad (6)$$

$$Q_1=\frac{62,4*7}{2}-\frac{-144+240}{7}=218\text{-}13=205кN;\ Q_2=218+13=231кN\ ;$$

Maximum flight moment according to formula 3.3 [1]:

$$M=\frac{Q_1^2}{2 \cdot (g+υ)}+M_{12} \quad (7)$$

$$M=\frac{205^2}{2 \cdot 62.4}-144=193кN \cdot м;$$

1) in the middle span - loading schemes 1 + 3, support moments M_{23}= M_{32}=-230 кNm; maximum flight moment:

$$M=\frac{(g+υ) \cdot l^2}{8}+M_{23}=\frac{62.4 \cdot 7^2}{8}-230=153кNm$$

Diagrams of the moments of the girder with various combinations of loading schemes are built according to the data in Table. 3.1. Constant load according to loading scheme 1 is involved in all combinations: 1 + 2.1 + 3.1 + 4.

Redistribution of moments under the influence of the formation of plastic hinges in the transom. A practical calculation is to reduce the girder bearing moments by about 30% M_{21} and M_{23} according to loading schemes 1 + 4; in this case, the formation of plastic hinges on the support is outlined. An alignment moment diagram is added to the moment diagram of loading schemes 1 + 4 so that the supporting moments are equalized M_{21} =M_{23} and the convenience of reinforcing the support assembly was provided. Moment alignment plot ordinates:

$$\Delta M_{21}= 0.3 \cdot 317=95\ кNm$$
$$\Delta M_{23}=95\text{-}(317\text{-}292)=70\ кNm;$$

Wherein

$$\Delta M_{12}=:\ -\Delta M_{21}/3= 95/3=32\ кNm$$
$$\Delta M_{32}= -\Delta M_{23}/3=-70/3= -23кNm;$$

The difference in ordinates at the node of the alignment moment plot is transmitted to the struts. The supporting moments on the aligned moments diagram are:

M_{21} = -125-32=-157кNm; M_{21}= -317+95= -222кNm; M_{23}= -292+70= -222кNm; M_{32}= -208-23=231 кNm.

The moments of flight on the leveled moment diagram can exceed the values of the flight moments for loading schemes 1 + 2 n 2 + 3, then they will be calculated.

Support moments of the girder along the column face. On the middle support, with a loading scheme of 1 + 4, the support girder along the edge of the column does not always turn out to be calculated (maximum in absolute value). With a large live load of a relatively low linear stiffness of the columns, it can be calculated for loading schemes 1 + 2 or 1 + 3, i.e. at large negative moments in the span. The required loading scheme for the calculated support moment of the girder on the column face can often be established by comparative analysis of the values of the support moments in accordance with Table 3.1 and the calculations can be limited to this one scheme. Below are the calculations for all schemes.

Girder support moment on the middle edge on the left (absolute values):

1) According to loading schemes 1 + 4 and leveled moment diagram, we determine by the formula 3.4 [1]:

$$M_{21,1}=M_{21}-\frac{Q_2\cdot h_{col}}{2} \quad (8)$$

$$M_{21,1}=222-\frac{228\cdot 0.3}{2}=188\text{кNm}$$

$$Q_2=\frac{(g+\upsilon)\cdot l}{2}-\frac{M_{21}-M_{12}}{l} \quad (9)$$

$$Q_2=\frac{62.4\cdot 7}{2}-\frac{-222+157}{7}=218+10=228\ \text{кN}\ ;\ Q_1=218-10=208\ \text{кN}$$

1) according to loading schemes 1 + 2

$$M_{21,1}=187-\frac{120\cdot 0.3}{2}=169\text{кNm}$$

$$Q_2=\frac{g\cdot l}{2}-\frac{M_{21}-M_{12}}{l} \quad (10)$$

2) according to loading schemes 1 + 2:

$$M_{21,1}=M_{21}-\frac{Q_2\cdot h_{col}}{2}=240-\frac{232\cdot 0.3}{2}=205\text{кNm};$$

$$Q_2=\frac{62,4\cdot 7}{2}-\frac{-240+144}{7}=218+14=232\ \text{кN}$$

Girder support moment along the edge of the middle column on the right:

1) According to loading schemes 1 + 4 and leveled moment diagram

$$M_{23,1}=M_{23}-\frac{Q\cdot h_{col}}{2}=222-\frac{217\cdot 0.3}{2}=190\ \text{кNm};$$

$$Q=\frac{62,4\cdot 7}{2}-\frac{-222+231}{7}=218-1.3=217\ \text{кN}$$

1) according to loading schemes 1 + 2$M_{23,1}$<M_{23} =-163 кNm;

Therefore, the calculated support moment of the girder along the face of the middle support M=205 кNm.

The supporting moment of the girder along the edge of the extreme column according to the loading scheme 1 + 4 and the aligned diagram of moments:

$$M_{12,1}=M_{12}-\frac{Q_1\cdot h_{col}}{2}=157-\frac{208\cdot 0.3}{2}=126\ \text{кNm}$$

Crossbar forces. To calculate the strength along sections inclined to the longitudinal axis, the values of the transverse forces of the girder are taken, which are larger from two calculations: an elastic calculation and taking into account the redistribution of moments. On extreme support Q_1=208 кN, on the middle support on the left according to the loading scheme 1 + 4:

$$Q_2=62.4\cdot 7/2-(-317+125)/7=246\ \text{кN}$$

2.21 Calculation of the strength of the girder along the sections normal to the longitudinal axis

Strength characteristics of concrete and reinforcement. Heavy concrete, class B25; design compressive resistance f_{cd}=14.5 MPa; under tension f_{cdt}=1,05MPa; coefficient of concrete working conditions: γ_{b2} =0, 90; elastic modulus 30 000MPa (appendix 1 and 2)

Longitudinal working armature, class S300, design resistance f_{yd}=365MPa, elastic modulus *E*, = 200000MPa.

Determination of the height of the cross-section of the girder. The height of the section is selected according to the reference moment at, since the moment on the support is determined taking into account the formation of a plastic hinge. The accepted cross-section of the girder should then be checked by the moment of flight (if it is greater than the reference one) so that the relative height of the compressed zone is $\xi<\xi r$ and the re-reinforced uneconomical section is excluded. At ξ = 0.35, find the value α_m = 0.289. Determine the boundary height of the compressed zone is determined by the formula 3.7 [3]:

$$\xi_R=\frac{\omega}{1+\frac{G_{SR}}{G_{sec}}\left(1-\frac{\omega}{1.1}\right)} \quad (11)$$

Where $\omega = 0.85 - 0.008\times 14.2\times 0.9 = 0.75$

$$\xi_R=\frac{0.75}{1+\frac{365}{500}\left(1-\frac{0.75}{1.1}\right)}=0.6$$

Working section height according to the formula 3.8 [3]:

$$d = \sqrt{\frac{M}{\alpha_m f_{cd} b}} \quad (12)$$

where b - section width

$$d = \sqrt{\frac{20500000}{0.289 \times 0.9 \times 14.2 \times 2500}} = 46 \text{ cm}$$

Full section height according to the formula 3.9 [3]:

$$h = d + c_1 \quad (13)$$

where c_1 – protective layer

$$h = 46 + 4 = 50 \text{ cm}$$

Middle span section.

For the moment $M_{ed,max}$ = 153 кNm is determined by the formula 3.10 [3]:

$$\alpha_{ed} = \frac{M_{ed,max}}{f_{cd} b d^2} \leq \alpha_{Ed,lim} \quad (14)$$

where ω = 0.2327; $\xi = \frac{x}{d}$ = 0.446

$$\alpha_{ed} = \frac{153000000}{14.2 \times 250 \times 460^2} = 0.25 \leq \alpha_{Ed,lim} = 0.372$$

The sectional area of the reinforcement is determined by the formula 3.11 [3]:

$$A_{s1} = \frac{\omega b_{eff} d}{\frac{f_{yd}}{f_{cd}}} \quad (15)$$

$$A_{s1} = \frac{0.2327 \times 250 \times 460}{\frac{435}{14.2}} = 874\ mm^2 = 8.74\ cm^2$$

We accept: 2Ø16 S500 (A_{s1} = 4.02 cm^2), 2Ø18 S500 (A_{s1} = 5.09 cm^2). A_{s1} = 4.02+ 5.09 = 9.11 cm^2.

Section on the middle support. $M_{ed,max}$ = 205 кN ×м. It is determined by the formula 3.10 [3]:

$$\alpha_{ed} = \frac{205000000}{14.2 \times 250 \times 460^2} = 0.27 \leq \alpha_{Ed,lim} = 0.372$$

where ω = 0.3398.

The sectional area of the reinforcement is determined by the formula 3.11 [3]:

$$A_{s2} = \frac{0.3398 \times 250 \times 460}{\frac{435}{14.2}} = 1276\ mm^2 = 12.76\ cm^2.$$

We accept: 2Ø28 S500 (A_{s2} = 12.32 cm^2).

Calculation of transverse reinforcement. Protective layers at the top and bottom of the section, respectively c_1 = 40 mm, c_2 = 30 mm.

Let us determine the lateral force that concrete can perceive is determined by the formula 3.12 [3]:

$$V_{Rd,c} = \left[\frac{0.18}{\gamma_c}) \times k \times (100\rho_l \times f_{ck})^{\frac{1}{3}}\right] \times b_\omega \times dk = 1 + \sqrt{\frac{200}{d}} \leq 2 \quad (16)$$

$$V_{Rd,c} = \left[\left(\frac{0.18}{1.5}\right) \times 1.7 \times (100 \times 0.008 \times 25)^{\frac{1}{3}}\right] \times 250 \times 460 = 63.68 \text{ к}N\ ;$$

$$k = 1 + \sqrt{\frac{200}{460}} = 1.7$$

$$\rho_l = \frac{A_{s1}}{b_\omega d} \leq 0.02 \quad (17)$$

$$\rho_l = \frac{911}{250 \times 460} = 0.008 \leq 0.02$$

$$V_{Rd,c,min} = \left[0.035 \times k^{\frac{3}{2}} \times f_{ck}^{\frac{1}{2}}\right] \times b_\omega \times d \quad (18)$$

$$V_{Rd,c,min} = \left[0.035 \times 1.7^{\frac{3}{2}} \times 25^{\frac{1}{2}}\right] \times 250 \times 460 = 44.61 \text{ к}N$$

Since the condition $V_{Rd,c} \geq V_{Rd,c,min}$ is performed, we continue the calculation to calculate the cross-sectional area of the transverse reinforcement and set the pitch is determined by the formula 3.15 [3]:

$$a_w = (V_{Ed,max} - V_{Rd,c,min})/(q+g) \quad (19)$$

$$a_w = (246 - 44.6)/62.4 = 3.23 \text{ м}$$

First design section d_z = 460 mm. V_{Ed} in this section:

$$\frac{V_{Ed}}{V_{Ed1}} = \frac{l/2}{\frac{l}{2} - d_z};\ \frac{246}{V_{Ed1}} = \frac{3.5}{3.5 - 0.46};\ V_{Ed1} = 246 \text{ к}N$$

$$f_{sw} = f_{yw}d$$

$$A_{sw} = \frac{V_{Ed}S}{d_z \cot\theta f_{sw}} \quad (20)$$

$$A_{sw} = \frac{214000 \times 50}{460 \times 167 \times \cot 40} = 117\ mm^2$$

where s = 50 mm (we accept in advance).

We accept: 2Ø10 S240 (A_{sw} = 1.57 cm^2).

Checking the condition:

$$\frac{A_{sw} f_{sw}}{b_w s} \leq 0.5\nu f_{cd} \quad (21)$$

$$V_{Ed} \leq V_{Rd,max} = \frac{\nu f_{cd} b_w d_z}{\cot\theta + \tan\theta} \quad (22)$$

$$\nu = 0.6(1 - \frac{f_{ck}}{250}) > 0.5 \quad (23)$$

$$\nu = 0.6(1 - 0.1) = 0.54 > 0.5$$

$$V_{Ed} < V_{Rd,max} \quad (24)$$

$$V_{Ed} = 214 < V_{Rd,max} = \frac{0.5 \cdot 14.2 \cdot 250 \cdot 460}{1.2 + 0.84} = 432.5 \text{ кN}$$

$$\frac{A_{sw} f_{sw}}{b_w s} = \frac{157 \times 167}{250 \times 50} = 2.1$$

$$0.5 \nu f_{cd} = 0.5 \times 0.54 \times 14.2 = 3.8$$

$$2.1 < 3.8$$

Second design section d_z = 2000 mm. V_{Ed} in this section:

$$\frac{V_{Ed}}{V_{Ed1}} = \frac{l/2}{\frac{l}{2} - d_z}; \frac{246}{V_{Ed1}} = \frac{3.5}{3.5 - 2}; V_{Ed1} = 105 \text{ к}N$$

Determined by the formula 3.16 [3]:

$$A_{sw} = \frac{105000 \times 130}{460 \times 167 \times \cot 40} = 150 \, mm^2,$$

where s = 130 mm (we accept in advance).

We accept: 2Ø10 S240 (A_{sw} = 1.57 cm^2).

We check the condition is determined by the formula 3.19 [3]:

$$\nu = 0.6(1 - \frac{f_{ck}}{250}) = 0.6(1 - 0.1) = 0.54 > 0.5$$

Determined by the formula 3.20 [3]:

$$V_{Ed} = 105 < V_{Rd,max} = \frac{0.5 \times 14.2 \times 250 \times 2000}{1.2 + 0.84} = 1880 \text{ кN} .$$

$$\frac{A_{sw} f_{sw}}{b_w s} = \frac{157 \times 167}{250 \times 130} = 0.8,$$

$$0.5 \nu f_{cd} = 0.5 \times 0.54 \times 14.2 = 3.8.$$

$$0.8 < 3.8$$

Third design section d_z = 3000 mm. V_{Ed} in this section:

$$\frac{V_{Ed}}{V_{Ed,i}} = \frac{l/2}{\frac{l}{2} - d_z}; \frac{246}{V_{Ed3}} = \frac{3.5}{3.5 - 3}; V_{Ed3} = 26 \text{ к}N$$

Determined by the formula 3.16 [3]:

$$A_{sw} = \frac{26000 \times 400}{460 \times 167 \times \cot 40} = 136 \, mm^2,$$

where s = 400 mm (we accept in advance).

We accept: 2Ø10 S240 (A_{sw} = 1.57 cm^2).

We check the condition is determined by the formula 3.16 [3]:

$$\frac{A_{sw} f_{sw}}{b_w s} \leq 0.5 \nu f_{cd}$$

We check the condition using the formula 3.19 [3]:

$$\nu = 0.6(1 - \frac{f_{ck}}{250}) = 0.6(1 - 0.1) = 0.54 > 0.5,$$

$$V_{Ed} = 26 < V_{Rd,max} = \frac{0.5\times14.2\times250\times3000}{1.2+0.84} = 2821 \text{ кN} .$$
$$\frac{A_{sw}f_{sw}}{b_w s} = \frac{157\times167}{250\times400} = 0.3,$$
$$0.5\nu f_{cd} = 0.5\times0.54\times14.2 = 3.8.$$
$$0.3 < 3.8$$

The condition is fulfilled, therefore, the selected step and area can be accepted.

Design of transom reinforcement.

1) Determine on the middle support. The crossbar is reinforced with two welded frames, part of the longitudinal rods of the frames are cut off in accordance with the change in the envelope of the moment diagram and along the reinforcement diagram. The plot of materials is shown in accordance with Figure 3.2.

We determine the bending moments perceived in the design sections, according to the actually accepted reinforcement, it is determined by the formula 3.21 [1]:

$$M_{2\emptyset28} = f_{yd}A_{s1}\zeta d \tag{25}$$

Where
$$\mu = \frac{A_{s1}}{db} = \frac{12.32}{25\times46} = 0.0107,$$
$$d = \text{h} - c_1 = 50 - 4 = 46 \text{ cm},$$
$$\xi = \mu\frac{f_{yd}}{f_{cd}} = 0.0107\frac{435}{14.2} = 0.34,$$
$$\zeta = 1 - 0.34\xi = 0.83$$
$$M_{2\emptyset28} = 435\times12.32\times0.83\times46 = 206 \text{ кN }\times\text{м}$$

We determine the moments in the places of the theoretical break is determined by the formula 3.22 [1]:

$$M_{2\emptyset12} = f_{yd}A'_{s1}\zeta d \tag{26}$$

Where
$$\mu = \frac{A_{s1}}{db} = \frac{2,26}{25\times46} = 0.006,$$
$$d = \text{h} - c_1 = 40 - 4 = 46 \text{ cm},$$
$$\xi = \mu\frac{f_{yd}}{f_{cd}} = 0.006\frac{435}{14.2} = 0.006,$$
$$\zeta = 1 - 0.006\xi = 0.99$$

$$M_{2\emptyset12} = 435\times2,26\times0.99\times46 = 45 \text{ кN }\times\text{м}$$

Anchorage length is determined by the formula 3.23 [1]:

$$w = \frac{Q_i}{2q_{wi}} + 5\text{d} > 20\text{d} \tag{27}$$

Where

Q=190 кN - shear force at the break point

$$q_{wi} = \frac{f_{yw}dA_{swi}}{s} = \frac{16700\times3.08}{10} = 5140,$$
$$w = \frac{190000}{2\times5140} + 5\times2,8 = 33 < 56 \text{ cm}.$$

We take w equal to 56 cm.

2) Determine on the middle span. We determine the bending moments perceived in the design sections, according to the actually accepted reinforcement, it is determined by the formula 3.21 [1]:

$$M_{4\emptyset18,16} = 435\times9.11\times0.875\times46 = 159 \text{ кN } \times\text{м},$$

Where

$$\mu = \frac{A_{s1}}{db} = \frac{9,11}{25\times46} = 0.008,$$

$$d = \text{h} - c_1 = 50 - 4 = 46 \text{ cm},$$

$$\xi = \mu\frac{f_{yd}}{f_{cd}} = 0.008\frac{435}{14.2} = 0.25,$$

$$\zeta = 1 - 0.5\xi = 0.875$$

Спецификация арматуры

Марка изделия	Поз. изделия	Диаметр, класс стали	Длина поз. мм	Кол. шт.	Масса 1поз. кг.	Масса изделия, кг
Кр-1	1	Ø16S500	6640	2	1,58	21
	2	Ø14S500	3150	2	1,21	7,63
	3	Ø28S500	870	4	4,83	16,81
	4	Ø12S500	6600	2	0,888	11,73
	5	Ø10S500	1000	51	0,617	32
П-1	6	Ø10S240	1500	1	0,617	1,18
	7	Ø10S240	500	10	0,785	1,18

Figure 3.3 - Arrangement of reinforcement in the frame

We determine the moments in the places of the theoretical break by the formula 3.22 [1]:

$$M_{2\emptyset12} = 435\times5,09\times0.94\times46 = 96 \text{ кN } \times\text{м},$$

where

$$\mu = \frac{A_{s1}}{db} = \frac{5,09}{25\times46} = 0.004,$$

$$d = \text{h} - c_1 = 50 - 4 = 46 \text{ cm},$$

$$\xi = \mu\frac{f_{yd}}{f_{cd}} = 0.004\frac{435}{14.2} = 0.13,$$

$$\zeta = 1 - 0.13\xi = 0.94$$

Anchorage length is determined by the formula 3.21 [1]:

$$q_{wi} = \frac{f_{yw}dA_{swi}}{s} = \frac{16700\times3.08}{10} = 5140,$$

$$w = \frac{105000}{2\times5140} + 5\times1,8 = 19 < 36 \text{ cm}.$$

We take w equal to 36 cm.

3 Technological part of the project

3.1 Finishing work

The finish is great when building. It shapes the beauty of the building. Depending on the materials used, the environment and the cost, different types of coatings can be used. The decoration is divided into several parts.

Ceiling finishing
Wall finishing
Floor finishing

3.2 Ceiling finishing

Ceiling is an overhead interior surface that covers the upper limits of a roof. The process of finish should be start from the ceving whole ceiling then washing whole ceiling by water after that giving gratin (combination of cement and water) the next step is to pest the mortar in the ceiling. Leveling is the next step which is the main part of plastering.

6mm thickness sand is better for ceiling plastering.

3.3 Wall finishing

This process is the coating of rough surfaces with plastic material to obtain a smooth, clean and durable surface. The wall covering can be divided into two parts.

Exterior and interior
Outside: plaster, types of tiles, aluminum composite panels.
Interior: plaster, tile, marble, granite, mosaic.

3.4 Plaster

Wetting whole wall by water
Give (gratin- combination of cement and water)
Pest mortar in wall
Leveling
12 mm plaster for wall
1:4 is the better ratio for wall plaster

3.5 Tile finishing

At first wetting the whole wall the wetting should be medium.

Gratin (combination of cement and water)
Pest mortar in the wall
Set tiles in the wall
Check leveling

3.6 Earthworks

Preparing of the construction site before starting construction work is the first technological part of site. The work starts with clearing the construction site from trees shrubs and other natural materials which can increase the quality of building materials. The main stages of work are underground, above ground and finishing of the building consists of works. The underground part of the construction is called the zero cycle and for the entire project we have two underground floors at this stage, dig a pothole, process it, lay the foundation installation of walls, covering the roof of the basement and reinforcement of the foundation and shear wall must considering on this part.

3.7 Earthworks

Before starting the calculation part of earth, we should have the following characteristic about earth and building.

Stability of soil in slopes is characterized by physical properties of soil, where the soil is in stable condition. The stability of soils in such cases is determined by the steepness of slopes and expressed by an inclination angle of the slope to the horizon at the ratio of 1: m or:

$$H/\mathrm{a}=1/m \tag{28}$$

Where, H – slope height;

a– laying of a slope or projection of a slope to the horizontal;

m – Coefficient of a slope

$$11/\mathrm{a} = 11/0.5=22\mathrm{m}$$

This methodology guidelines contains the angles of natural slope and the largest allowable steepness. In the case of earthworks implementation in winter it is required to specify additional information: temperature zone of construction: the thickness of snow cover and the number of days with a subfreezing temperature: soil freezing depth.

According to the corrected initial data of soil characteristics and work performance conditions to be prepared.

3.8 Determination of work volume

The construction of temporary fencing, Removal of topsoil, Removal of topsoil, Soil excavation in the pit and trench access to the pit, Excavation of soil shortage, Concrete preparation for foundations, Reinforcement installation, Form work installation and so on. Prior to the construction work necessary to perform the construction temporary fencing, fencing perimeter determined by the formula

$$(29) P_{fen} = (20 + l1) \cdot 2 + (20 + l2) \cdot 2, (m)$$

$$P_{fen} = (20 + 60) \cdot 2 + (20 + 72) \cdot 2, (m) = 344m$$

3.9 Removal of topsoil

During pit excavation removal of topsoil to be implemented at the area (only for the pit):

$$S1 = (10 + l1s.t + 10) \cdot (10 + l2s.t + 10), (m^2). \quad (30)$$

Where $l1s.t$– the pit length at the top, m.

$l2s.t$– the pit width at the top, m,

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

$l2s.b$ – the pit width at the bottom

$$S1 = (10+85+10) \cdot (10+73+10), =9765(m^2)$$

$$l1s.t = l1s.b + 2mh;\ l1s.t = 75+10=85$$

$$l2s.t = l2s.b + 2mh = 63+10=73$$

$$l1s.b = 72 + (1,3 \cdot 2) = 75 \text{ m}$$

$$l2s \cdot b = 60 + (1,3 \cdot 2) = 63 \text{ m}$$

Where -$l1s.b$ – the pit length at the bottom.

$l2s.b$ – the pit width at the bottom

The whole rectangle of construction is 4320m^2 with slope the excavation will be 6205$m^{2.}$

m– Slope steepness factor we took from (annex № 1. table.2); h–formation level (the height of the pit. 1,3m– distance between the axis and slope bottom, destined for a person access to the structure; $l1$, $l2$– length and width of the structure in plan, respectively (per the task), m

3.10 Soil excavation in the pit and trench access to the pit.

For determination of the Pit volume, we have,

$$Vp=h/6\cdot [(2l1s.\ b+l2s.\ t)\ l2s.b. +(2l1s\cdot t + l1s\cdot b)\cdot l2s\cdot t], (m3). \quad (31)$$

Where, h– depth of pit, m.

$$Vp=11/6\cdot [(75+73)\ 63+(85+ 75)\cdot 73], =38507\ (m3)$$

Earthwork's quantity of the trench access to the pit is calculated by the formula (only for pit):

$$V_{tr.a}. = \beta(\frac{(bh^2}{2} + \frac{h^3.m}{3}) \quad (32)$$

where, B – factor of access trench bottom construction, β=100/ i – access slope, % (for the project can be accepted 10% and I:10=10).

h– depth of pit, m.

b–access trench width on the bottom, is accepted independently and equals 3,5 (with one–way traffic) or 6 (with two– way traffic), m.

M–slope construction factor (annex. №1. table.2). All soils for backfilling, forming further the foundation basis for the equipment, floors, a perimeter walk, access roads to be compacted. During determination of filled and compacted layers' thickness, number of passes of soil compacting machines it is reasonable to implement it per the ENiR.

$$V_{tr.a}. = \frac{100}{10}\left(\frac{(6\cdot 11^2}{2} + \frac{11^3\cdot 0.5}{3}\right) = 5848m^3$$

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

$$V_{\text{shortage}} =_{(tr)} \cdot \Delta h_{sh}, (m^3). \quad (33)$$

$$Fp = l1s.b.\ \cdot l2s.b. \quad (34)$$

Where (tr) – area of the pit (trench) bottom

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

$$Fp=\cdot AB= 75 \bullet 63= 4725\ m^2$$

$$V_{\text{shortage}}=4725 \cdot 0.2 = 945m$$

3.11 Concrete preparation for foundations

In soft soils for monolithic foundations is arranged concrete preparation from lean concrete. The quantity of concrete preparation for one foundation is (for strip foundation and columnar foundation we have the following calculation.

$$Wp = Fp \cdot hp, m^3. \quad (35)$$

Where hp – thickness of concrete preparation,

hp=0,1m; Fp – area of preparation:

$$Fp = a1 \cdot b1, m2. \quad (36)$$

where, a1 and $b1$ – the dimensions of concrete preparation, ref. foundation section.

$$Fp = 2.1.5 = 3m^2$$
$$Wp = 3 \cdot 0.1 = 0.3m^3$$

3.12 Reinforcement installation.

Reinforcement consumption for the strip foundation:

$$G1 = g \cdot Vs/f, \text{ t.} \quad (37)$$

Where g – reinforcement frame consumption for $1m3$ of concrete, kg/$m3$ (100–150 kg/$m3$)

$$Vs/f = (hf\ (s) \cdot 0{,}3 \cdot \mathrm{P}base.) + (hf\ (b) \cdot 0{,}8 \cdot \mathrm{P}base), m^{3.} \quad (38)$$

Where Vs/f – volume of strip foundation, m^3.

$hf\ (b)$– the height of the foundation base, ref. monolithic strip foundation.

$hf\ (s)$– the height of the structure basement, ref. monolithic strip foundation section.

$\mathrm{P}base$ – total foundation length per the scheme (8 page). Reinforcement weight distribution between grid and frame conditionally accepted as: for the grid–0,7$G1$; for the frame – 0,3$G1$.

$$Vs/f = (1\ (s) \cdot 0{,}3 \cdot 72.) + (1\ (b) \cdot 0{,}8 \cdot 60), = 70.5m^3$$
$$G1 = 100 \cdot 70.5, = 7050\text{kg}/1000 = 7.05\text{t}$$

The quantity of formworks is equal to the area of the surfaces form. It is necessary to count the area of rectangular side faces of the foundation and trapezoidal inner glass surfaces. The scheme of foundations reinforcement, type of reinforcement structures and reinforcing bars consumption in real conditions is included in the working drawings of the foundations. In the Course Project the amount of reinforcement work is defined as follows. Accepted the foundation reinforcement in the form of a horizontal grid at the bottom and vertical spatial frame at the entire height of the concrete preparation to the top of column footing. For the formwork of the construction, we will discuss later.

3.13 Foundation waterproofing.

In the Diploma project accepted the following form of waterproofing – waterproofing coating. Painting is done by applying bituminous mastics to the surface to be painted. The number of applied layers is 2. Waterproofing is carried out in accordance with E4-3- 184.

For the strip foundation: To calculate the amount of work necessary to find the surface waterproofing area.

$$S_{waterproof} = [(hf\ (s) \cdot P_{\text{exterior walls}}) + ((0{,}25 + 0{,}3) \cdot P_{\text{exterior walls}})] \cdot 2,\ m2. \qquad (35)$$

Where $hf\ (s)$– the height of the structure basement, ref monolithic strip foundation section (figure.3)

$P_{\text{exterior walls}}$– perimeter of the exterior walls of the building.

$$S_{waterproof} = [(10\ (s) \cdot 72) + ((0{,}25 + 0{,}3) \cdot 60)] \cdot 2, =1449\ m^2$$

3.14 Backfilling.

The volume of soil to be backfilled in the pit gaps, in structures with basements is calculated by the formula (for pit):

$$v_{b.f} = \frac{vp - v_{s/f} - v_{cellular}}{1 + kir} \qquad (36)$$

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

V_{cellar}– volume of cellar:

K_{rl}– Index of residual soil loosening.

$h_{(s)}$– the height of the structure basement, ref. monolithic strip foundation section;

$$V_{cellar} = l_1 \cdot l_2 \cdot hf(b), m^3 \qquad (37)$$

$$V_{cellar} = 72 \cdot 60 \cdot 10 = 43200 m^3$$

$$v_{b.f} = \frac{38507 - 70.5 - 43200}{1 + 1.05}$$

$$= -2323{,}65\ m^3$$

3.15 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):

$$v_{com} = \frac{v_{bf}}{h_c}, m^{2.} \quad (38)$$

Where V_{bf}– backfilling **v**olume, m^3.

h_c– compacted layer thickness, 0,2÷0,4 m

$$v_{com} = \frac{2323,65}{0.5} = 4647 \text{ m}^2$$

3.16 Selection of the assembly crane

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

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

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

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

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

$$Lcr=l1+l2+l3, \quad (39)$$

Where, Lcr– mounting radius

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

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

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

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

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

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

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

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

4 Economic part

4.1 Calculation of estimated construction cost

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

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

According to the estimated estimates, the cost of construction is calculated products in the pre-design stage, at the stage of feasibility justification. This part defines capital investments for building. The complete set of capital investment includes: including design and survey, calculates the cost of building the facility, the cost of equipment, installation cost, etc. The method of compiling the estimated estimate is calculated capital investment in the construction of the facility. In the consolidated estimate the calculation of the construction of the facility funds are divided into the following chapters:

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

Conclusion

The construction of multi-story buildings are a good solution for the traffic problems in world which in increasing day by day as by the increasing of population and using more from car.

The space which a car accommodate is more that the space which could be afford as the amount is bigger so using form the space area is a good idea.

In this project we have a detailed a 9-story car parking in Almaty city which accommodate approximate 100 cars at a time which is a good result for our work and saving space in the ground.

Calculation of structures with the help of computer technology There is a possibility that it is a software package ETABS. Calculate through this and the assembly process is capacious, all in the design schedule of the building including seismic effects, including recording the effects with the required load in other words. Built various elements of the main building accurate on the basis of load combinations, sections and stiffness's gives the result; In addition, the department of technology of construction production is all designed taking into account modern methods and techniques of production. It is also an effective choice of construction machinery and equipment it is better to reduce the time and complexity of the labor process calendar planning increases the efficiency of construction.

Significance depends on the size of the project and the structure of the construction project. Basically, construction projects can be considered as a collection of information and data that must be stored, organized and distributed to those in need.

The packaging control appears as a tool to replace the printed version and the printed version and the previous painting. In this article, I will focus on the importance of structural control in a construction project. Controlling the need for organization, storage and distribution of new information and data in an accurate and timely manner is an important aspect of the construction project for all those who need it. Importance of construction control in a construction project Understanding the meaning of control construction in a construction project, it should be noted that the methods of controlling and managing change based on policies, documents and programs are relevant.

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14. Dimensions and rules of construction of the RK. SNiP RK 3.02.02-2001.[10]
15. Dimensions and rules of construction of the RK. SNiP RK 3.02-20- [11]
16. Dimensions and rules of construction of the RK. SNiP RK Sh.2.6-3- [12]
17. Dimensions and rules of construction of the RK. SNiP RK 3.02-06-2009.[13]
18. Dimensions and rules of construction of the RK. SNiP RK 2.02-05-2002.[15]

Appendixes

Appendix A

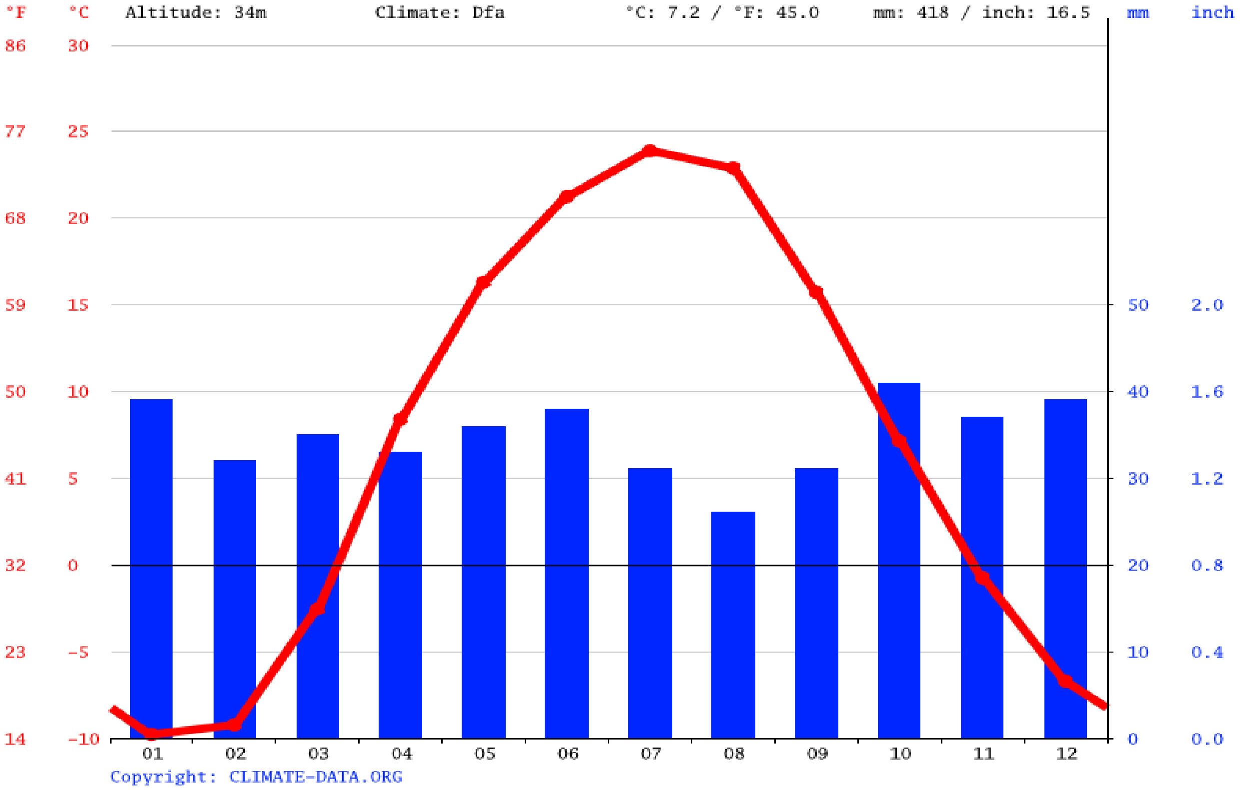

Figure 1- Climate graph of Almaty city

Appendix B

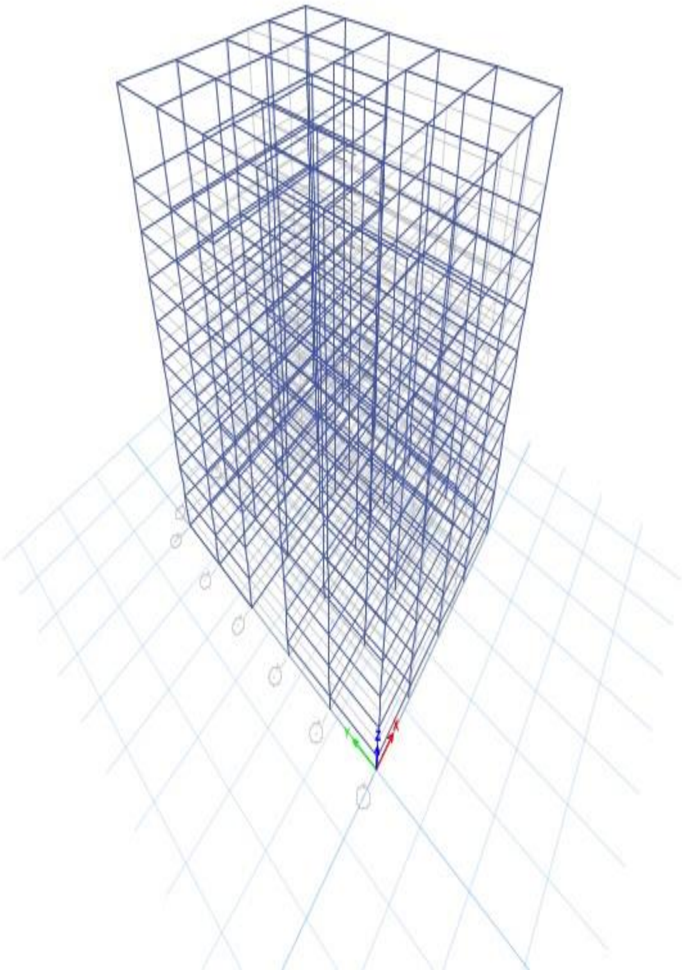

Figure 2 - Skeleton of the structure

Contionoution of appendix B

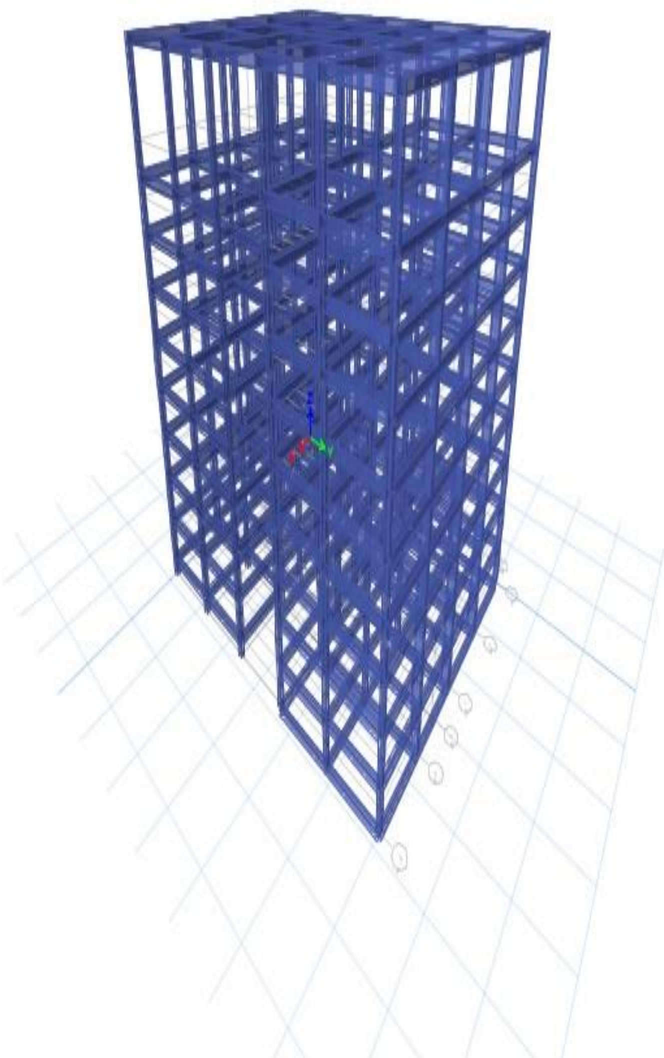

Figure 3 - 3D View of structure

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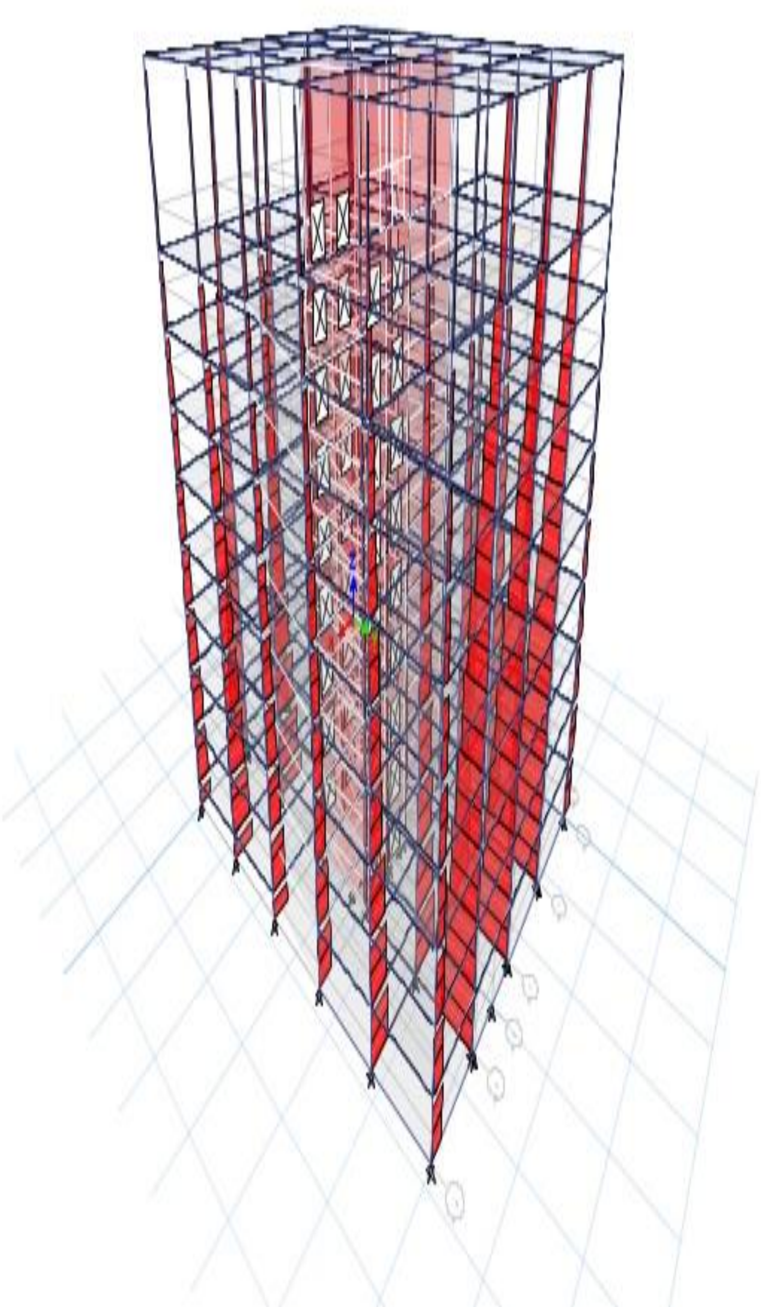

Figure 4 - Axial force

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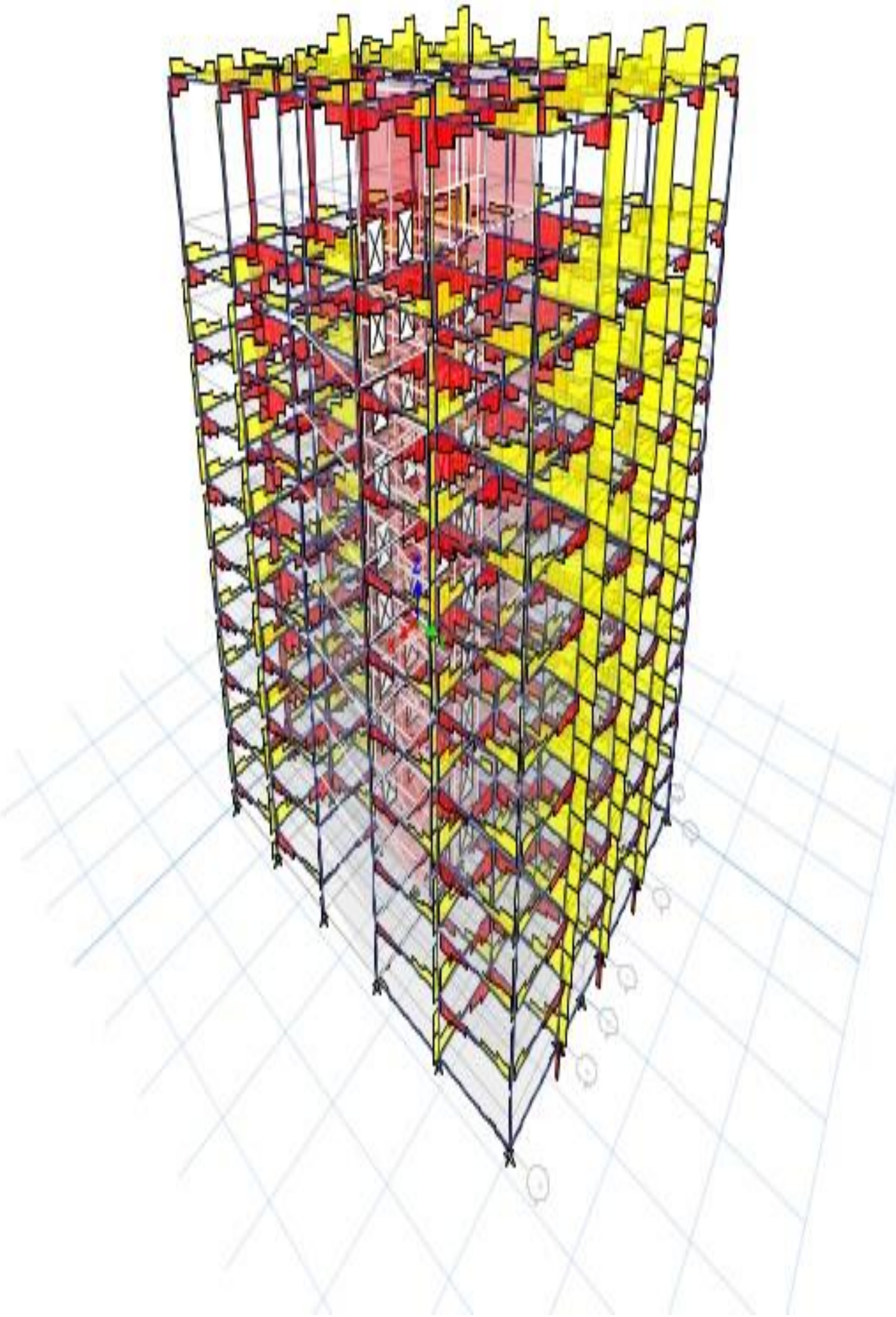

Figure 5 - Shear force

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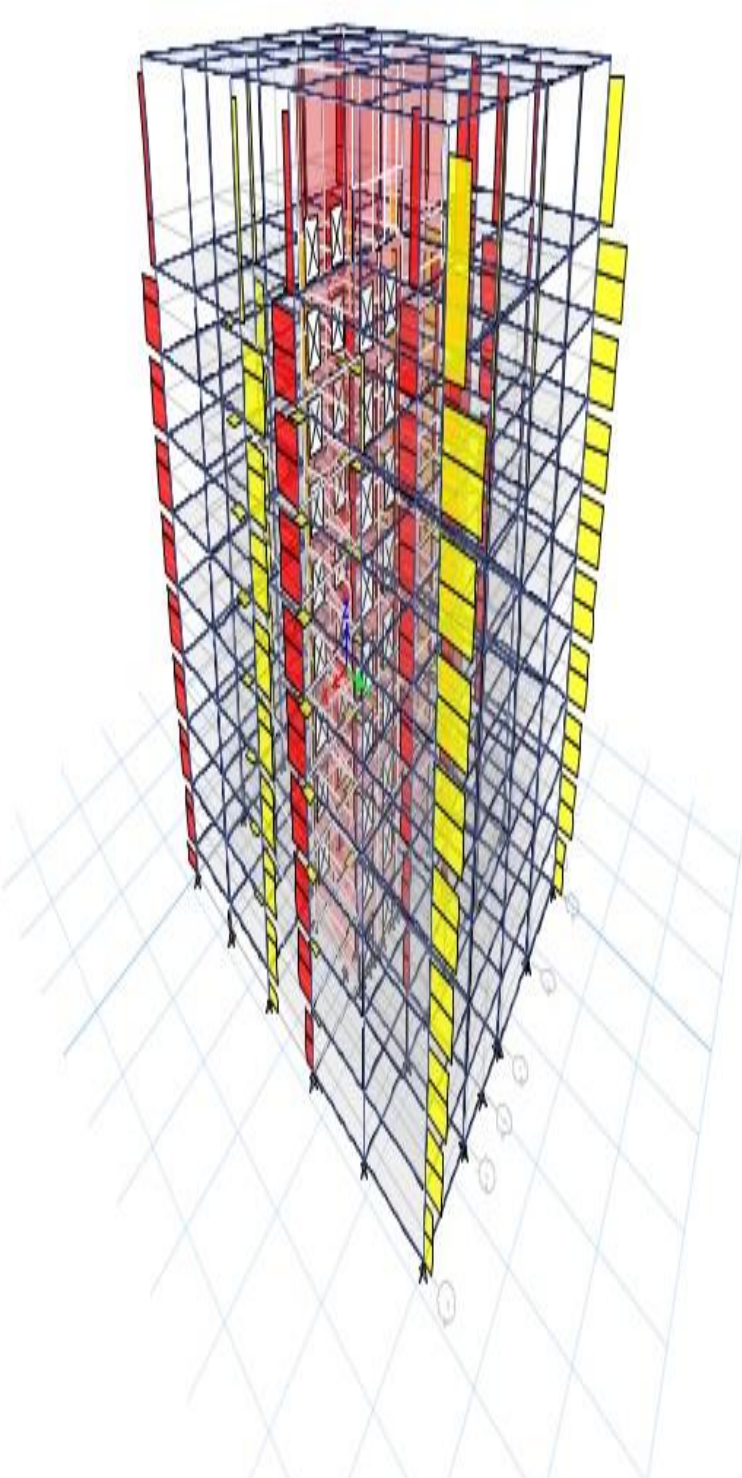

Figure 6 - Shear force Column

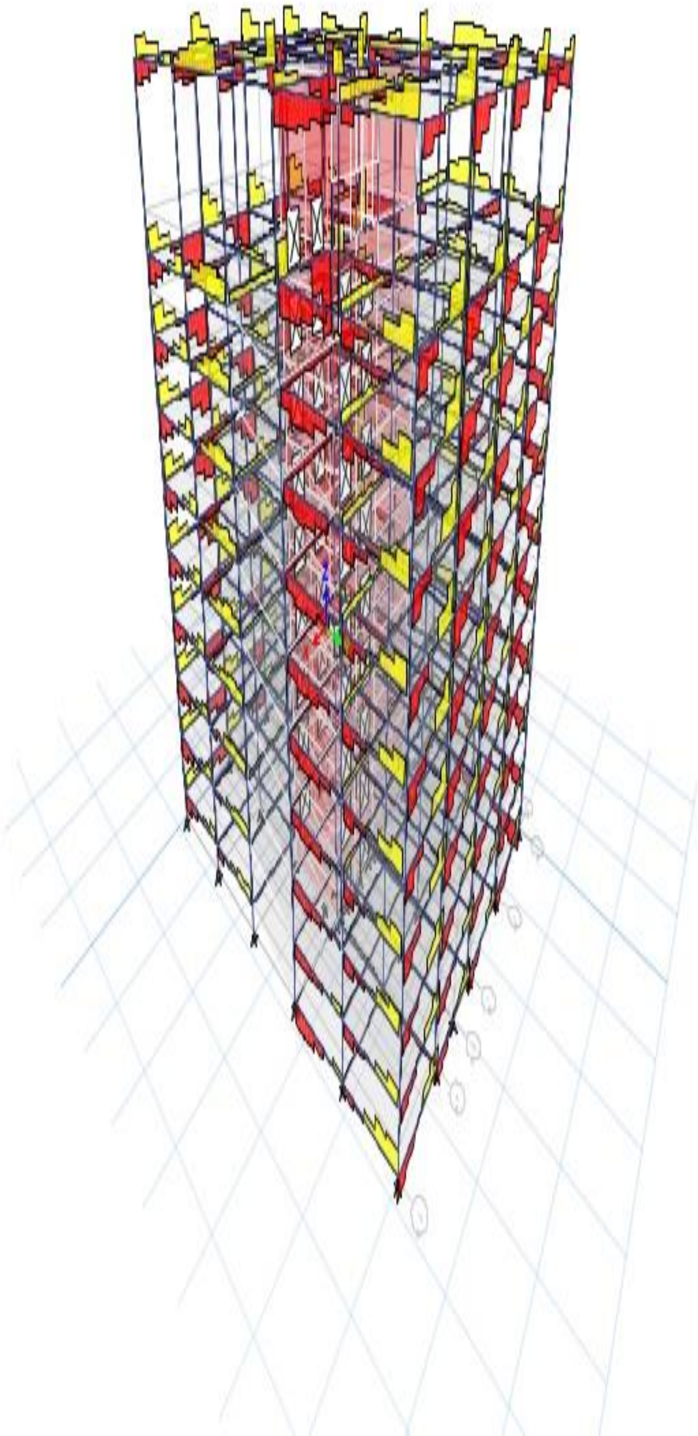

Figure 7 – Torsion

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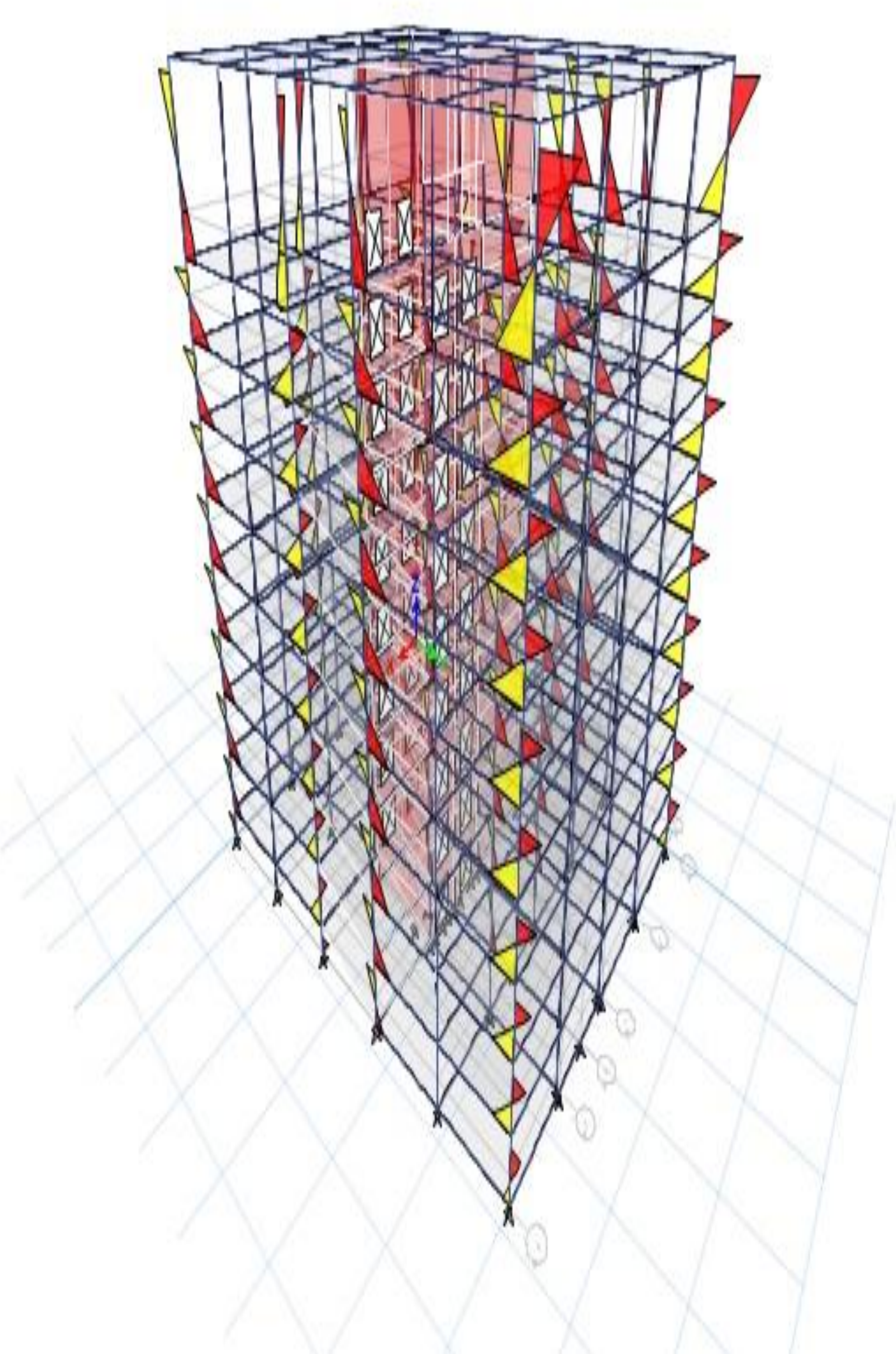


Figure 8 - Moment 2-2

Contionoution of appendix B

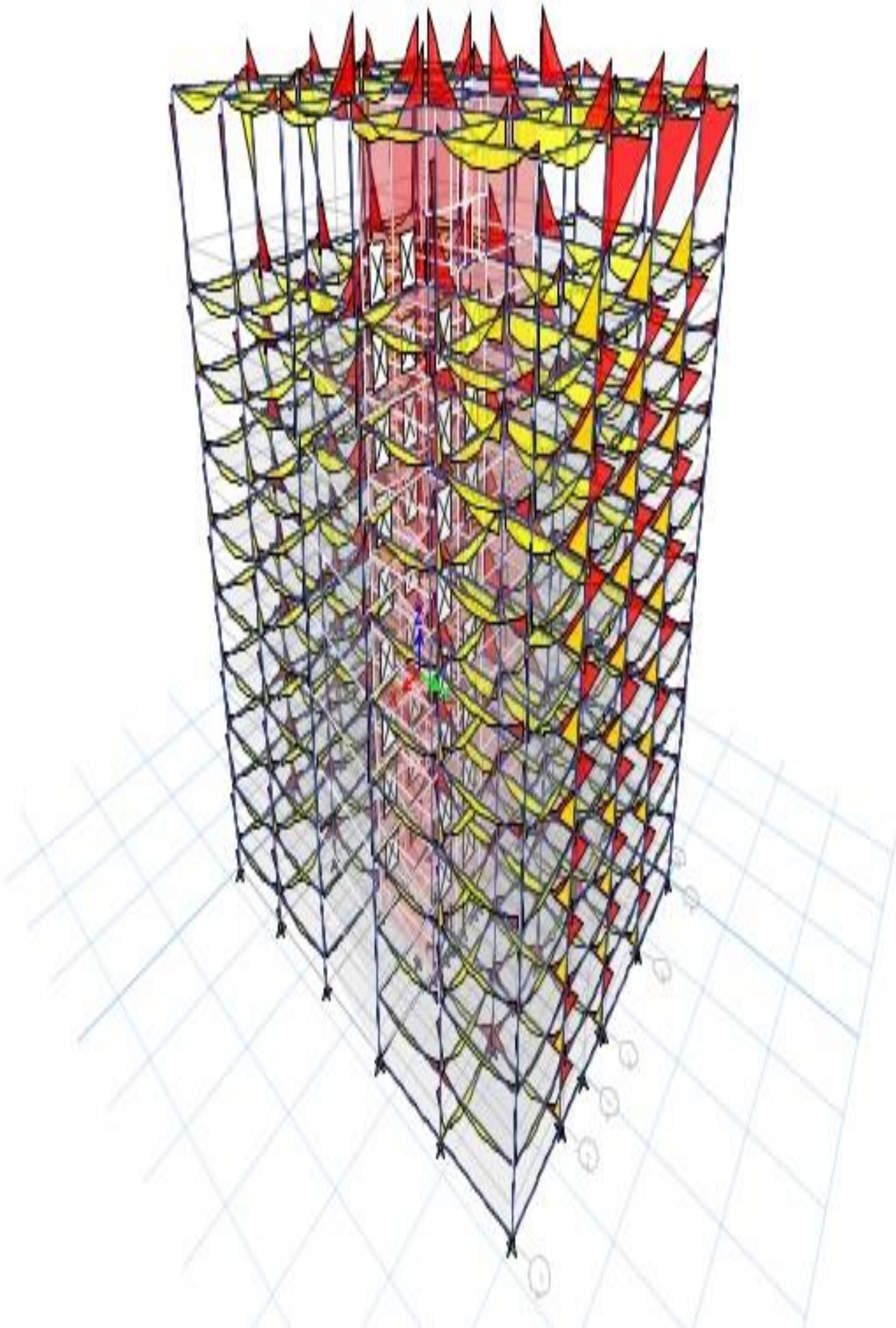


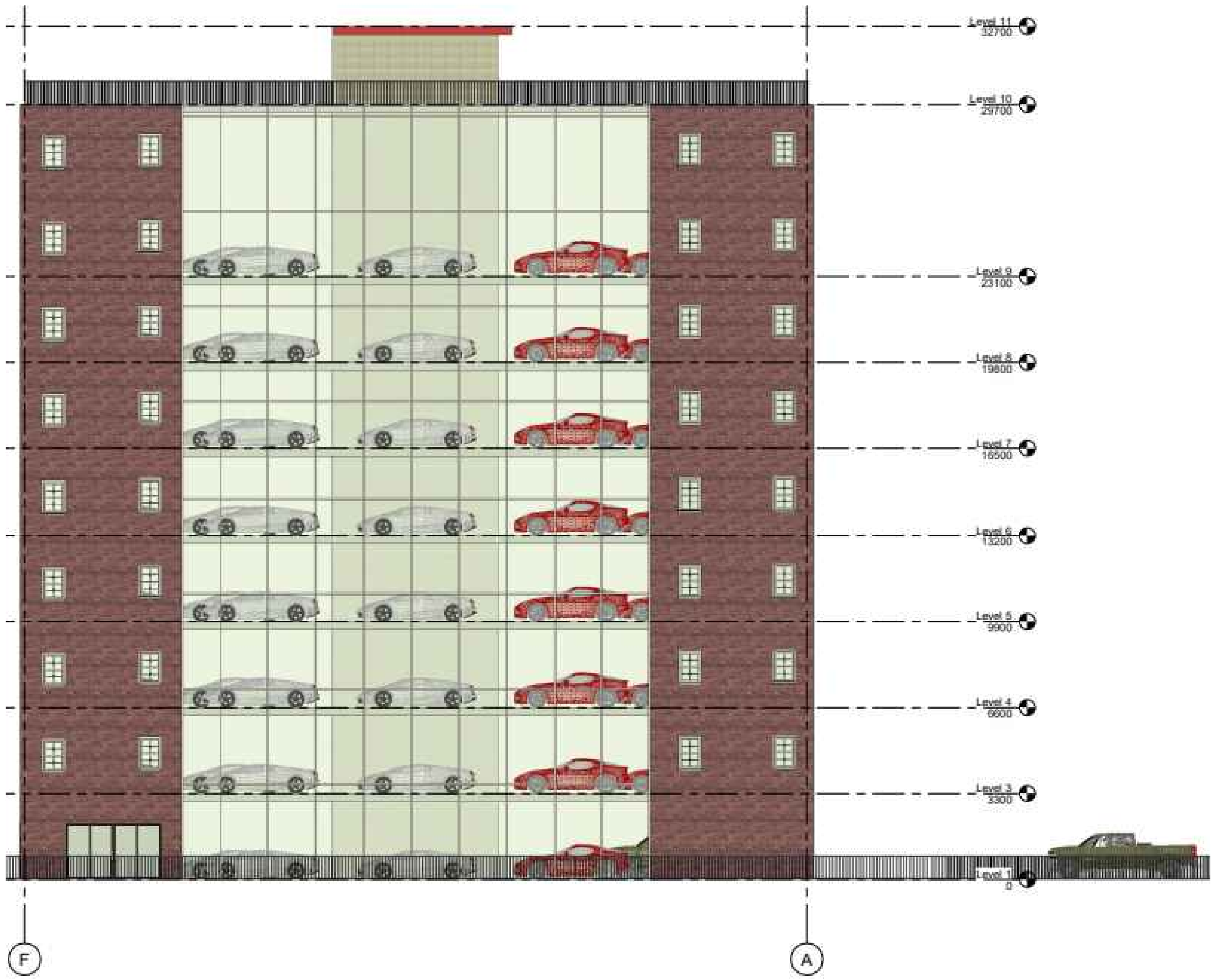
Figure 9 - Moment 3-3

Appendix C

BOQ For multi-story car parking			
NO.	**Description**	**Unit**	**QTY**
1	**Preliminary work**		
1.1	Site installation	LS	1
1.2	Site cleaning	LS	
2	**Foundation**		
2.1	Excavation	m^3	220
2.2	Backfilling and compaction	m^3	113
2.3	Blinding concrete layer	m^3	25
2.4	Reinforced concrete ground beams	m^3	35
2.5	Reinforced concrete footing	m^3	37
2.6	Reinforced sub columns	m^3	1
3	**Ground floor**		
3.1	Reinforced concrete columns	m^3	17.28
3.2	Reinforced concrete beams	m^3	27
3.3	Reinforced concrete Slabs	m^3	108
3.4	Reinforced concrete Stair	m^3	2
3.5	Shear wall	m^3	36
4	**First floor**		
4.1	Reinforced concrete columns	m^3	17.28
4.2	Reinforced concrete beams	m^3	27
4.3	Reinforced concrete Slabs	m^3	108
4.4	Reinforced concrete Stair	m^3	2
4.5	Shear wall	m^3	36
5	**Second floor**		
5.1	Reinforced concrete columns	m^3	17.28
5.2	Reinforced concrete beams	m^3	27
5.3	Reinforced concrete Slabs	m^3	108
5.4	Reinforced concrete Stair	m^3	2
5.5	Shear wall	m^3	36
6	**Third floor**		
6.1	Reinforced concrete columns	m^3	17.28
6.2	Reinforced concrete beams	m^3	27
6.3	Reinforced concrete Slabs	m^3	108
6.4	Reinforced concrete Stair	m^3	2
6.5	Shear wall	m^3	36

7	**Fourth floor**		
7.1	Reinforced concrete columns	m^3	17.28
7.2	Reinforced concrete beams	m^3	27
7.3	Reinforced concrete Slabs	m^3	108
7.4	Reinforced concrete Stair	m^3	2
7.5	Shear wall	m^3	36
8	**Fifth floor**		
8.1	Reinforced concrete columns	m^3	17.28
8.2	Reinforced concrete beams	m^3	27
8.3	Reinforced concrete Slabs	m^3	108
8.4	Reinforced concrete Stair	m^3	2
8.5	Shear wall	m^3	36
9	**Sixth floor**		
9.1	Reinforced concrete columns	m^3	17.28
9.2	Reinforced concrete beams	m^3	27
9.3	Reinforced concrete Slabs	m^3	108
9.4	Reinforced concrete Stair	m^3	2
9.5	Shear wall	m^3	36
10	**Sixth floor**		
10.1	Reinforced concrete columns	m^3	17.28
10.2	Reinforced concrete beams	m^3	27
10.3	Reinforced concrete Slabs	m^3	108
10.4	Reinforced concrete Stair	m^3	2
10.5	Shear wall	m^3	36
11	**Seventh floor**		
11.1	Reinforced concrete columns	m^3	17.28
11.2	Reinforced concrete beams	m^3	27
11.3	Reinforced concrete Slabs	m^3	108
11.4	Reinforced concrete Stair	m^3	2
11.5	Shear wall	m^3	36
12	**Eight floor**		
12.1	Reinforced concrete columns	m^3	18.5
12.2	Reinforced concrete beams	m^3	29
12.3	Reinforced concrete Slabs	m^3	108
12.4	Reinforced concrete Stair	m^3	1.4
12.5	Shear wall	m^3	39

East Elevation 1/100



South Elevation 1/100

3D Elevation of the Building

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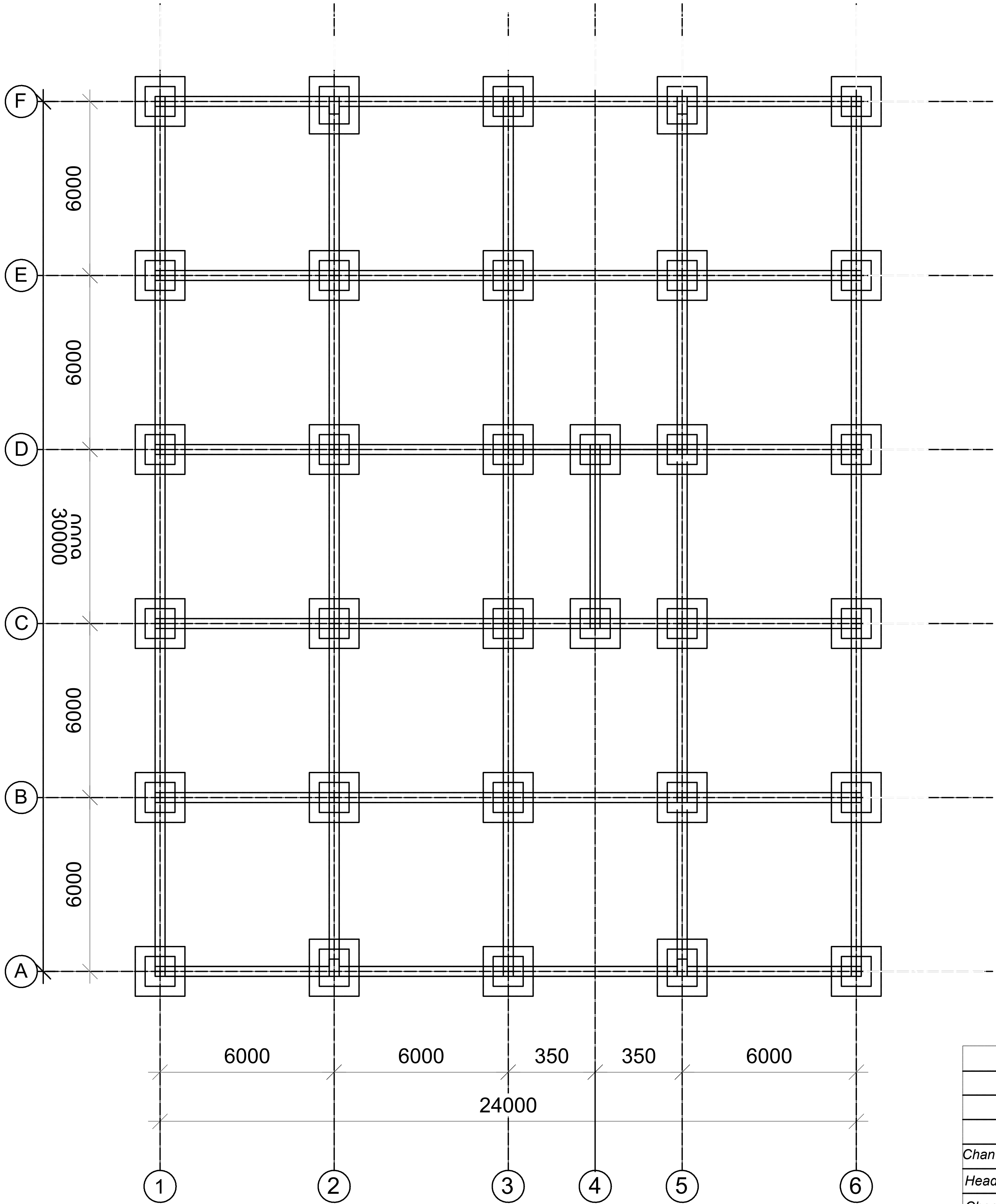
Chan.	Num.par.List	№doc	Sign	Date	Multi-Level parking with use of air purification system		
Head of Dep		Kozyukova .N.V			Architecture and Analytical part	stage	list	scale
Checked		Kozyukova .N.V				DP	01	1/100
Supervisor		Kozyukova .N.V						
Controller		Bek .A.A			Elevations and 3D model	Civil Engineering and building materials department		
Created		Ghawsi .F						

Basement floor plan 1/100



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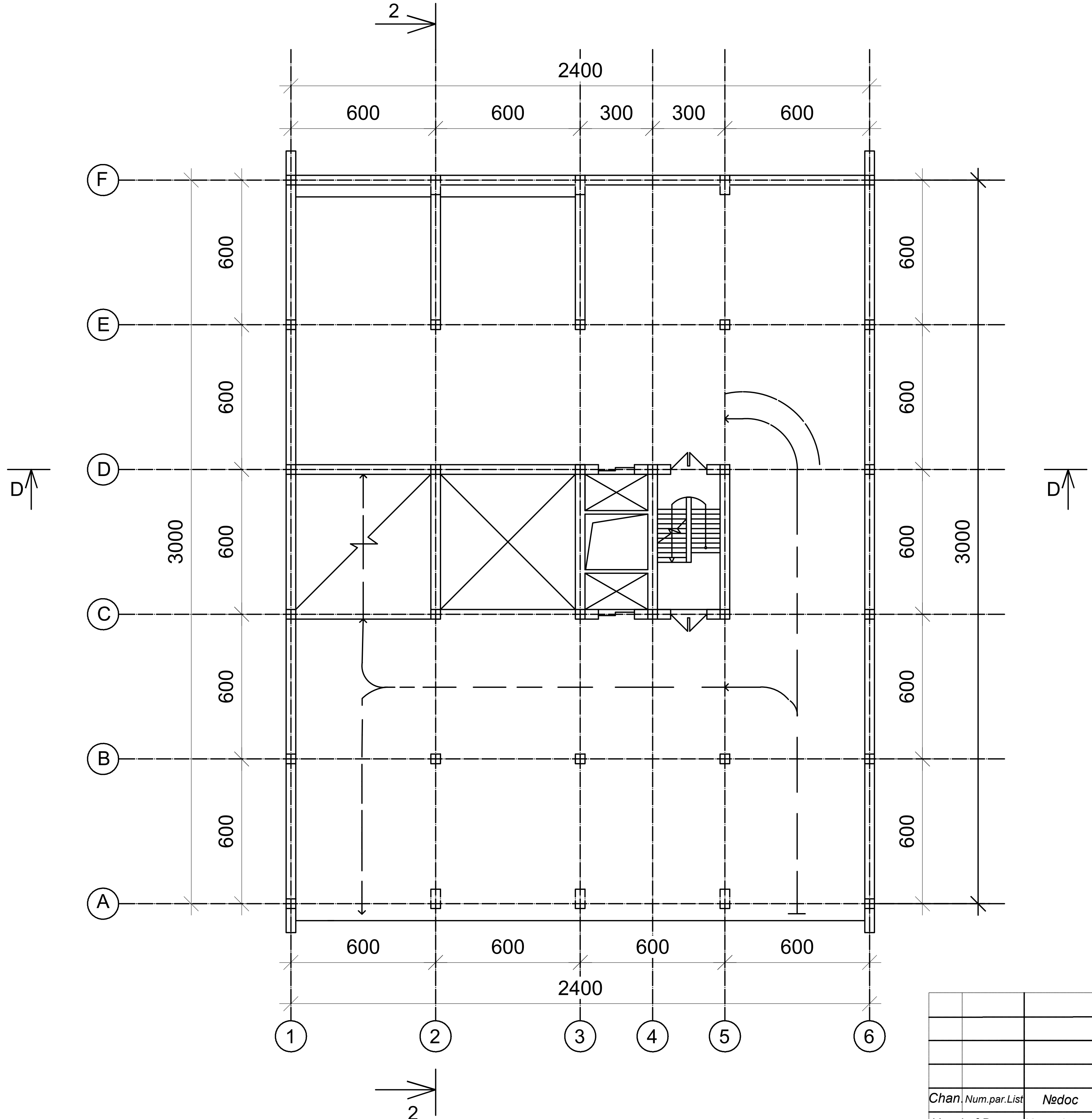
Supervisor		Kozyukova .N.V						
Controller		Bek .A.A			Foundation plan	Civil Engineering and building materials department		
Created		Ghawsi .F						

First floor plan 1/100



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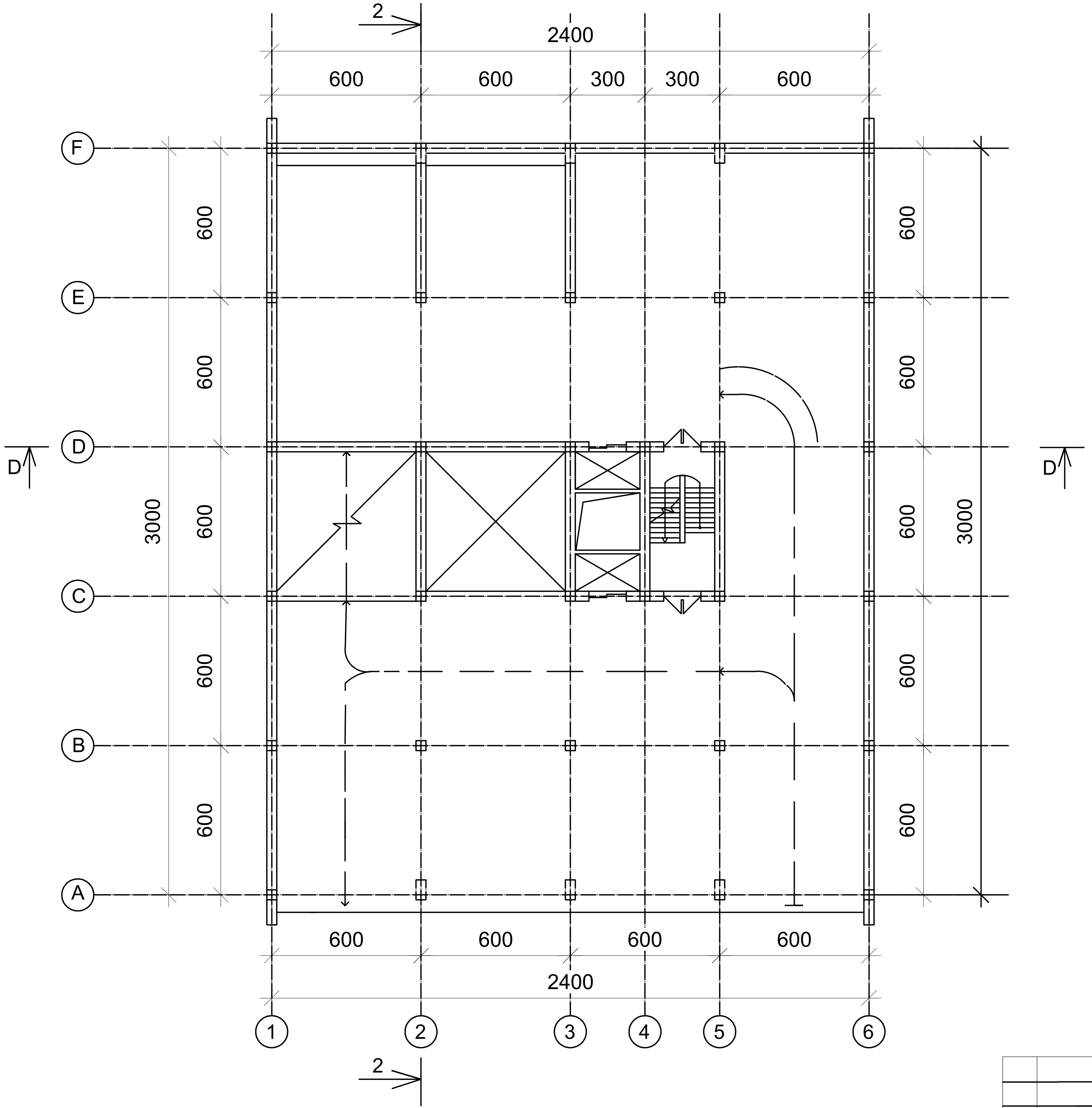
Controller		Bek .A.A			First Floor plan
Created		Ghawsi .F			Civil Engineering and building materials department

2th floor plan 1/100



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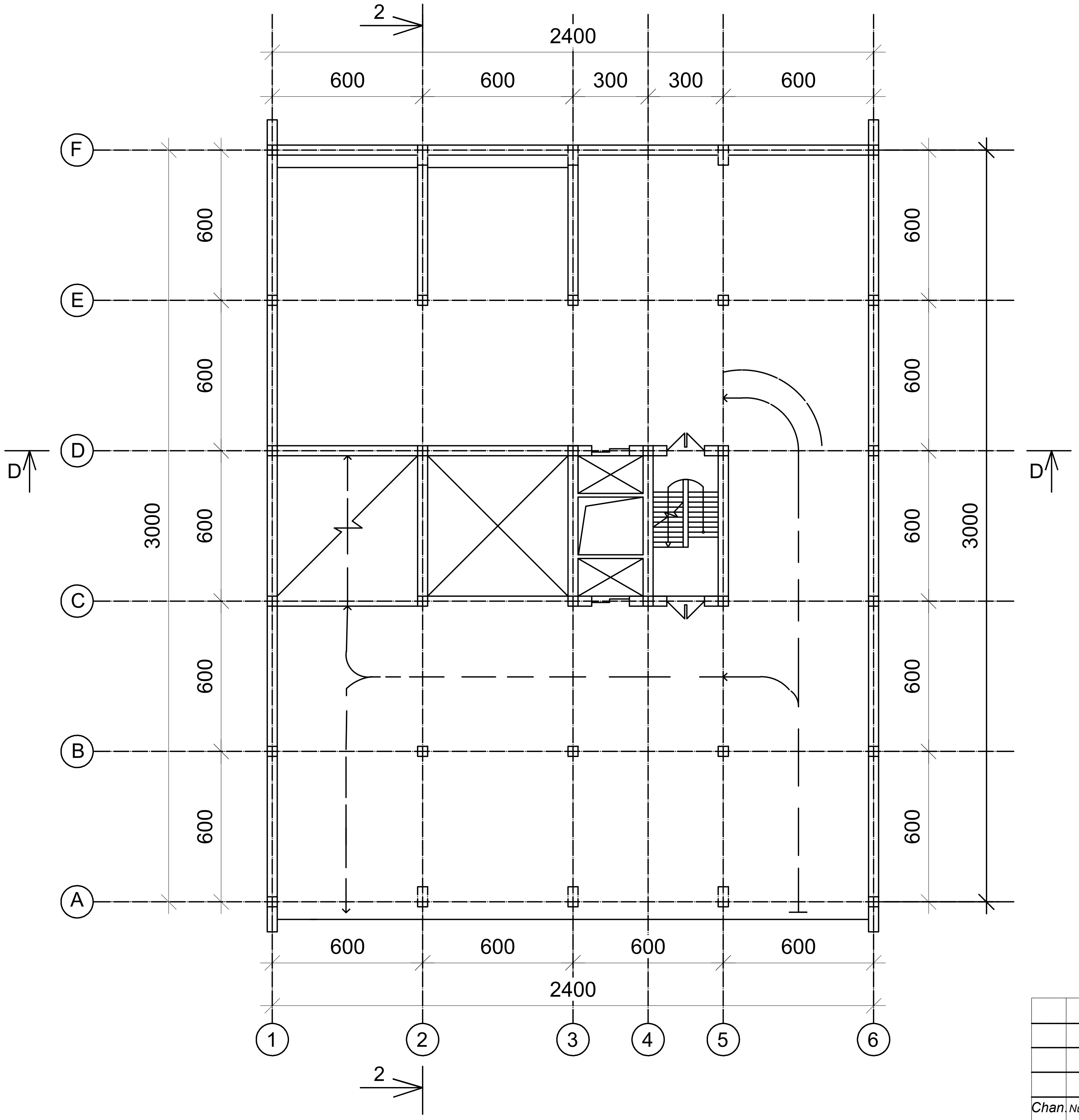
3th floor plan 1/100



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Controller		Bek .A.A			Typical floor plan	Civil Engineering and building materials department
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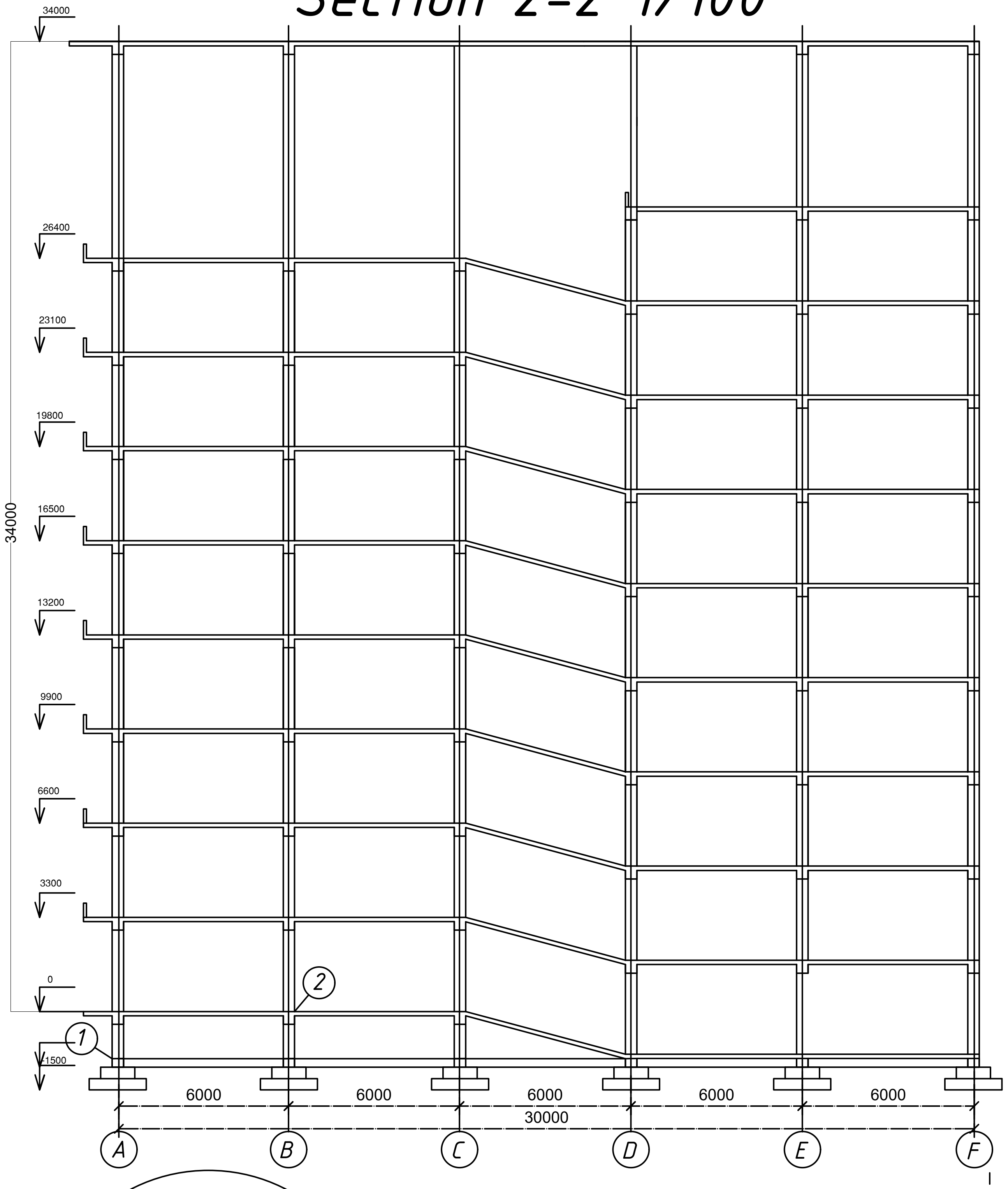
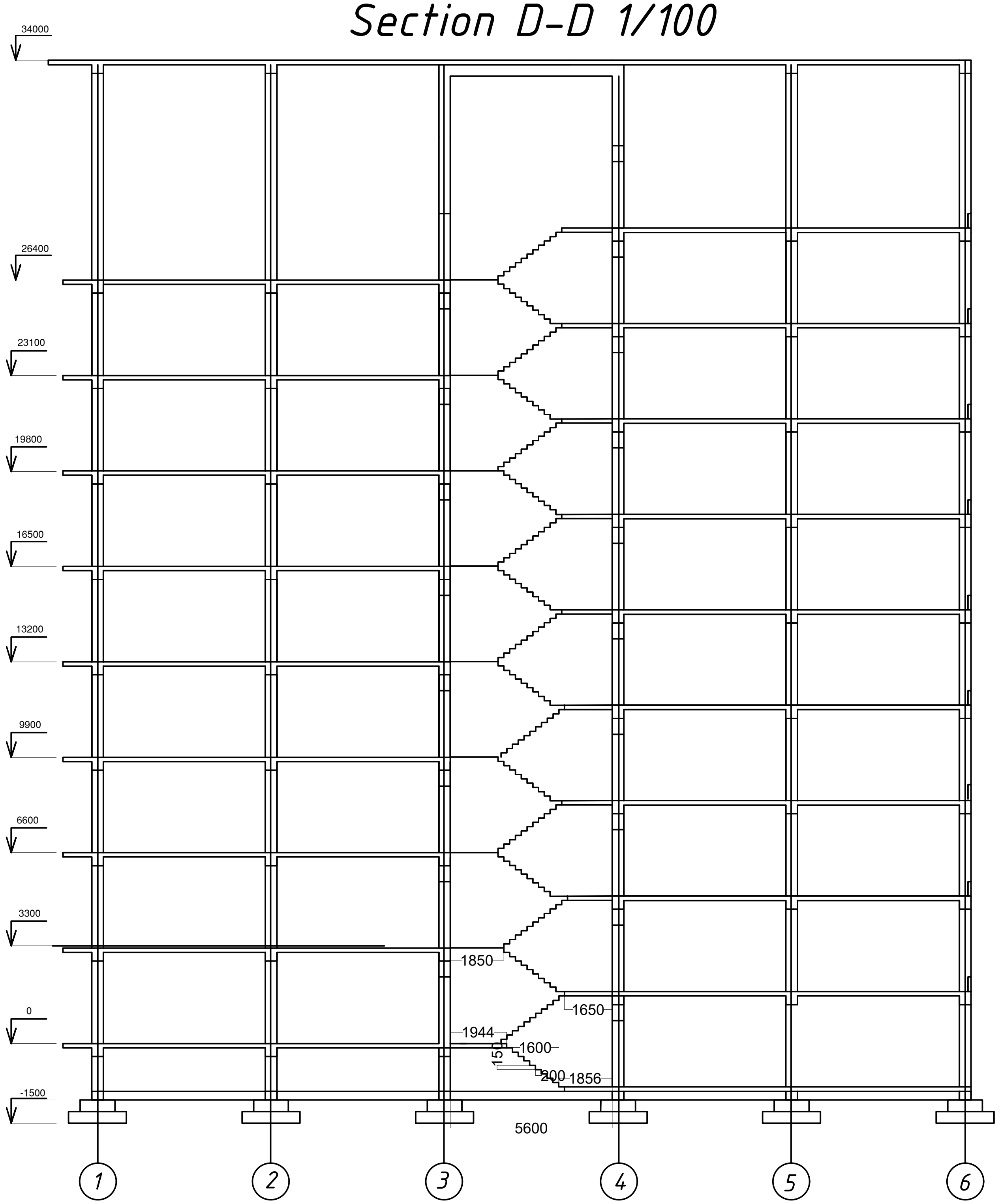
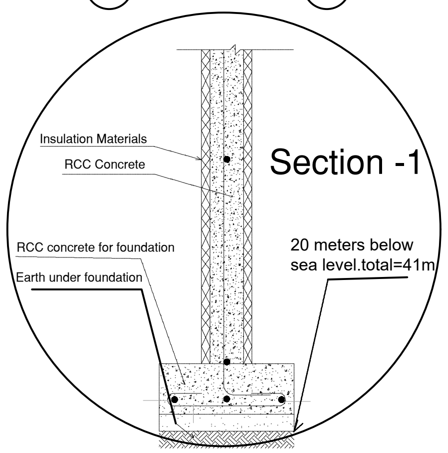
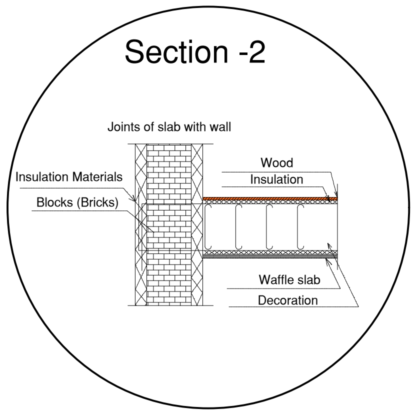
Section 2-2 1/100



Section D-D 1/100







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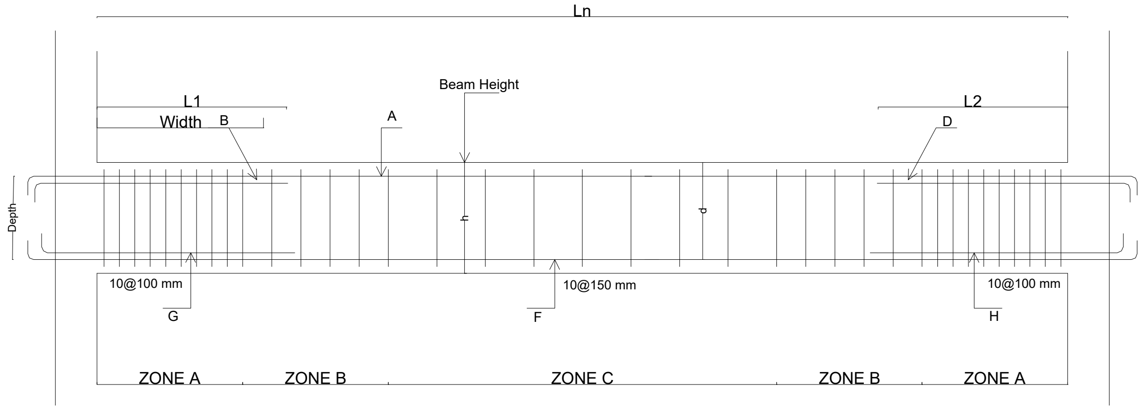
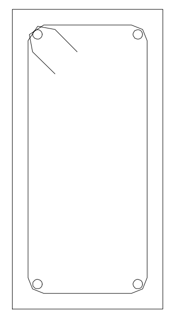
Supervisor		Kozyukova .N.V						
Controller		Bek .A.A			Sections	Civil Engineering and building materials department		
Created		Ghawsi .F						

long section A of the beam

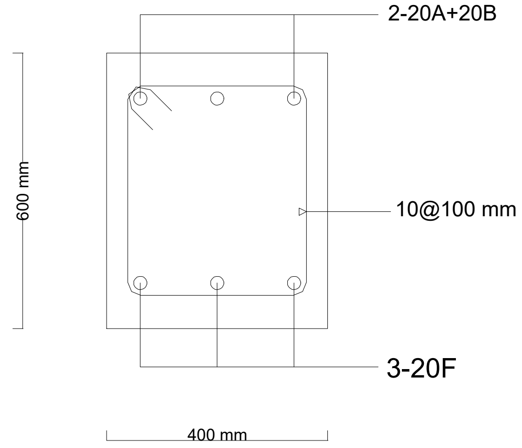


NOTES:
1. SEE BEAM SCHEDULE FOR STIRRUP TYPE AND SPACING.
2. ZONE A LENGTH SHALL BE TWICE THE BEAM DEPTH, d.
3. THE FIRST STIRRUP IN ZONE A SHALL BE LOCATED 50mm MAXIMUM FROM THE FACE OF THE SUPPORT.
4. LAP SPLICES SHALL NOT BE LOCATED WITHIN THE BEAM/COLUMN JOINT, NOR WITHIN A DISTANCE OF 2H.
5. LAP SPLICE LENGTH SHALL NOT BE LESS THAN 300mm.

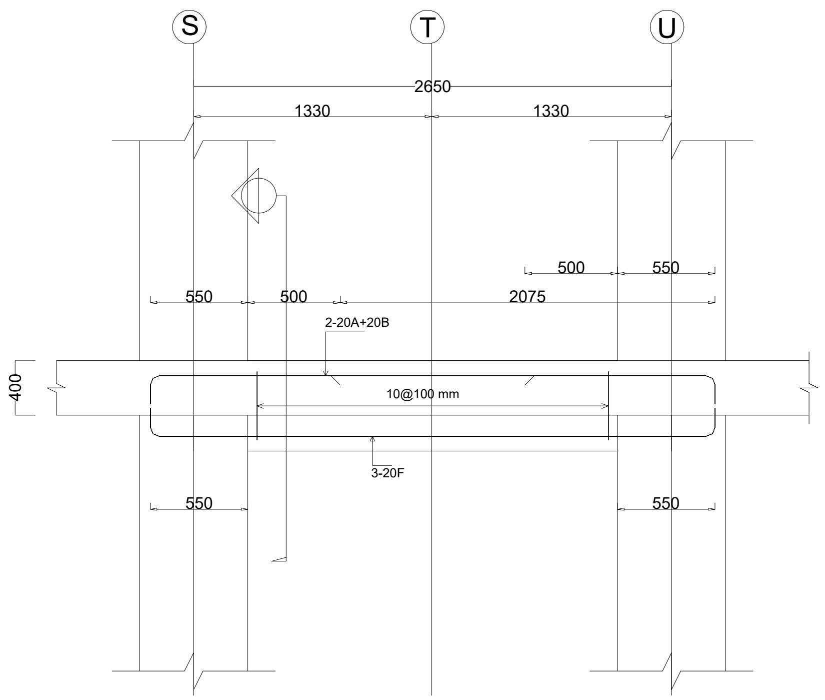
Section A (Without seismic)



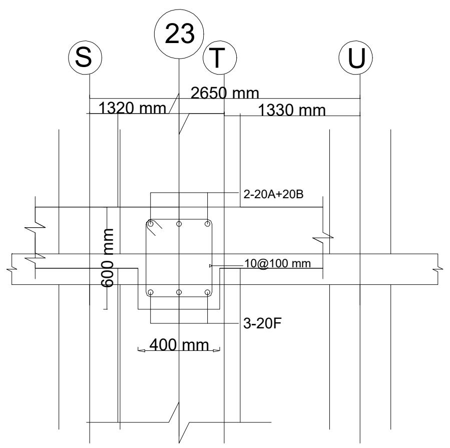
Section A (seismic)



Elevation of the Beam



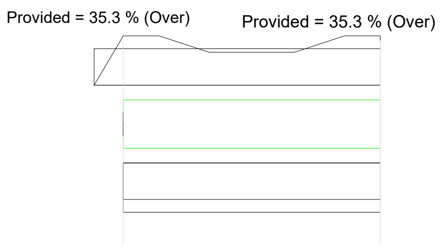
Section A of the beam



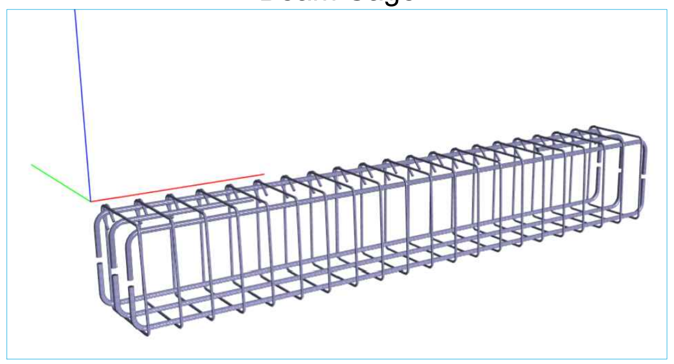
Specification of Reinforcement From manual Calculation

Name	Type	Standards	Diameter, class reinforcement	length mm	Number	Mass 1 Kg.	Mass Total,Kg
B-1	A	EN 10134-3	2Ø20 S800	6000	2	14.13	28.26
	B	EN 10134-3	3Ø20 S500	6000	3	14.13	42.39
	F	EN 10134-3	Ø10Bp-I	150	40	0,1	4

2CB1: Reinforcement Profile



Beam Cage



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Controller		Kozyukova .N.V			
Created		Ghawsi .F			

KazNITU-5B072900-Civil Engineering-9.03.02-2021-DP

Multi-Level parking with use of air purification system

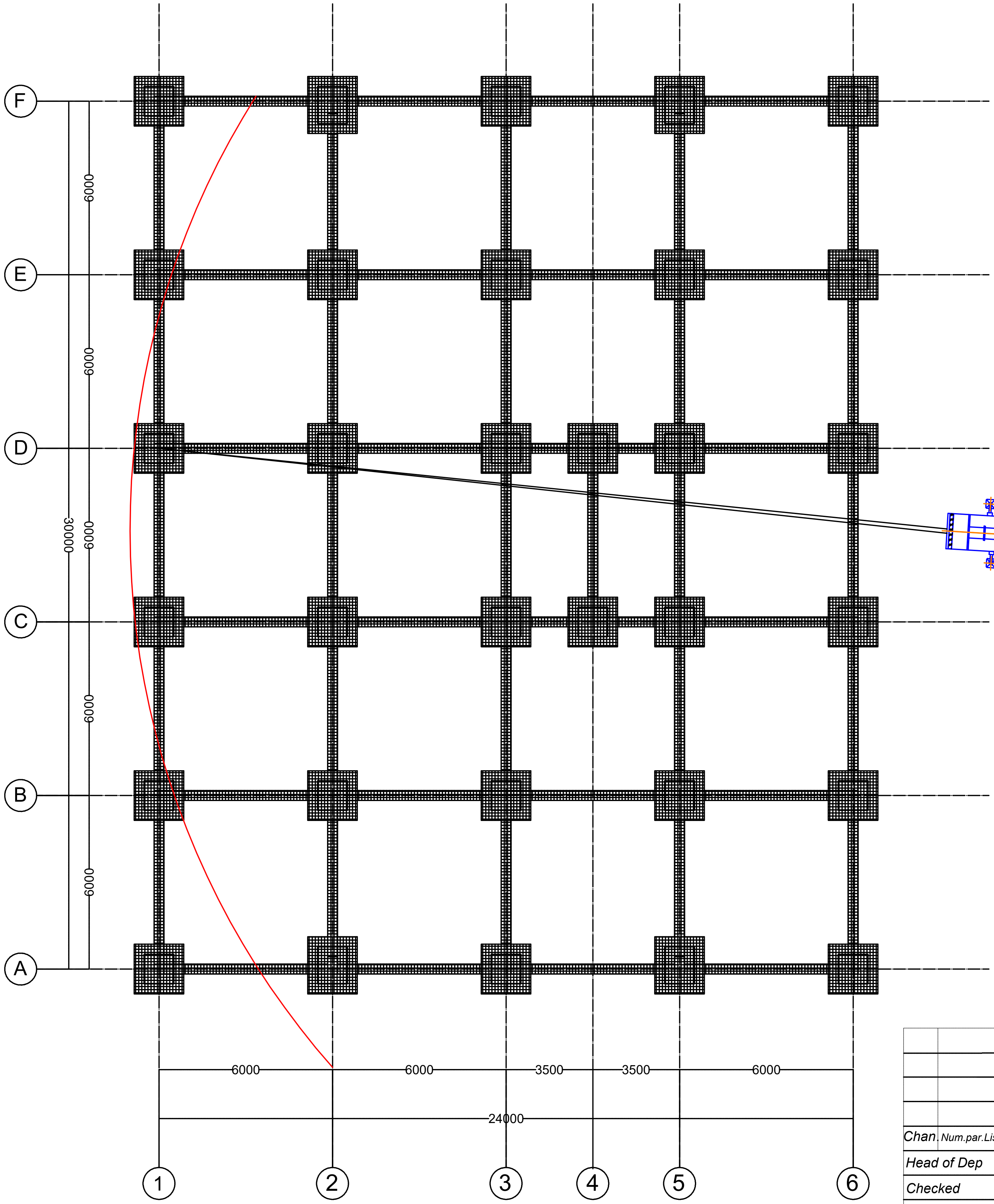
Calculation and Structural part

stage	list	scale
DP	7	1/100

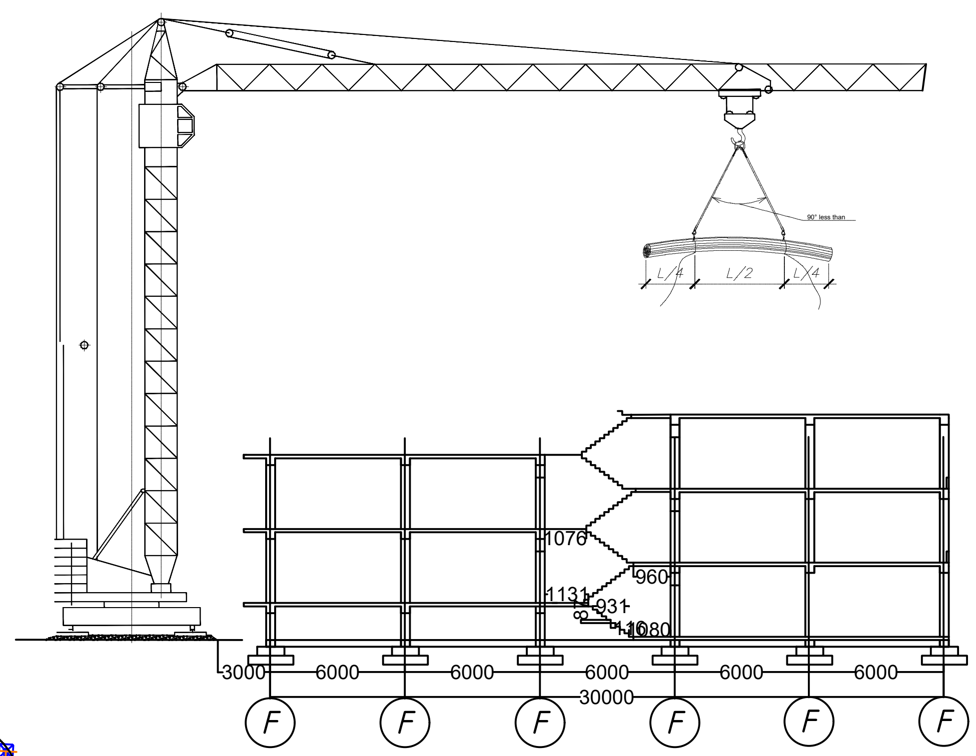
Design of beam

Civil Engineering and building materials department

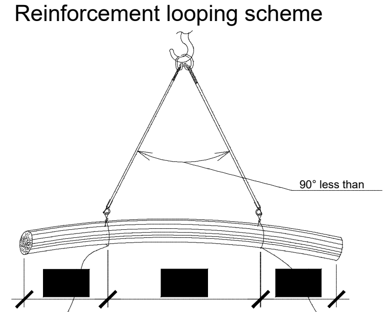
Reinforcement work plan 1/100



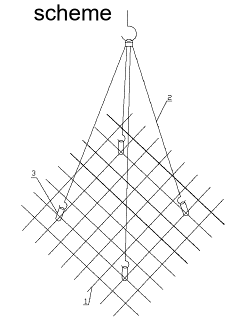
section of crane working



Reinforcement looping scheme

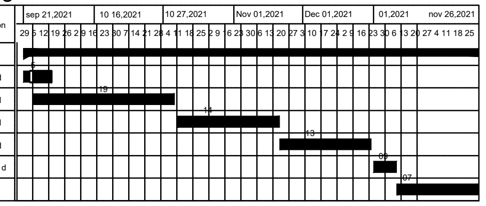


Reinforcement in base scheme



Working Schedule

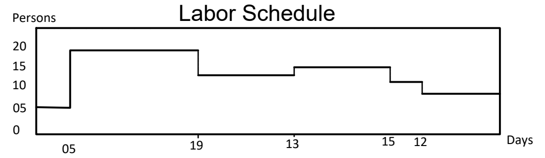
ID	Task	Start	Finish	Duration
1	project full time	2021-09-21	2021-11-26	73 d
2	Safety and preparation for RCC	2021-09-21	2021-09-27	5 d
3	Footing and G beam	2021-09-27	2021-10-16	19 d
4	Columns	2021-10-17	2021-10-29	13 d
5	Beams	2021-10-29	2021-11-14	15 d
6	Slab	2021-11-15	2021-11-27	12 d
7	Stair and ramp	2021-11-28	2021-12-07	09 d



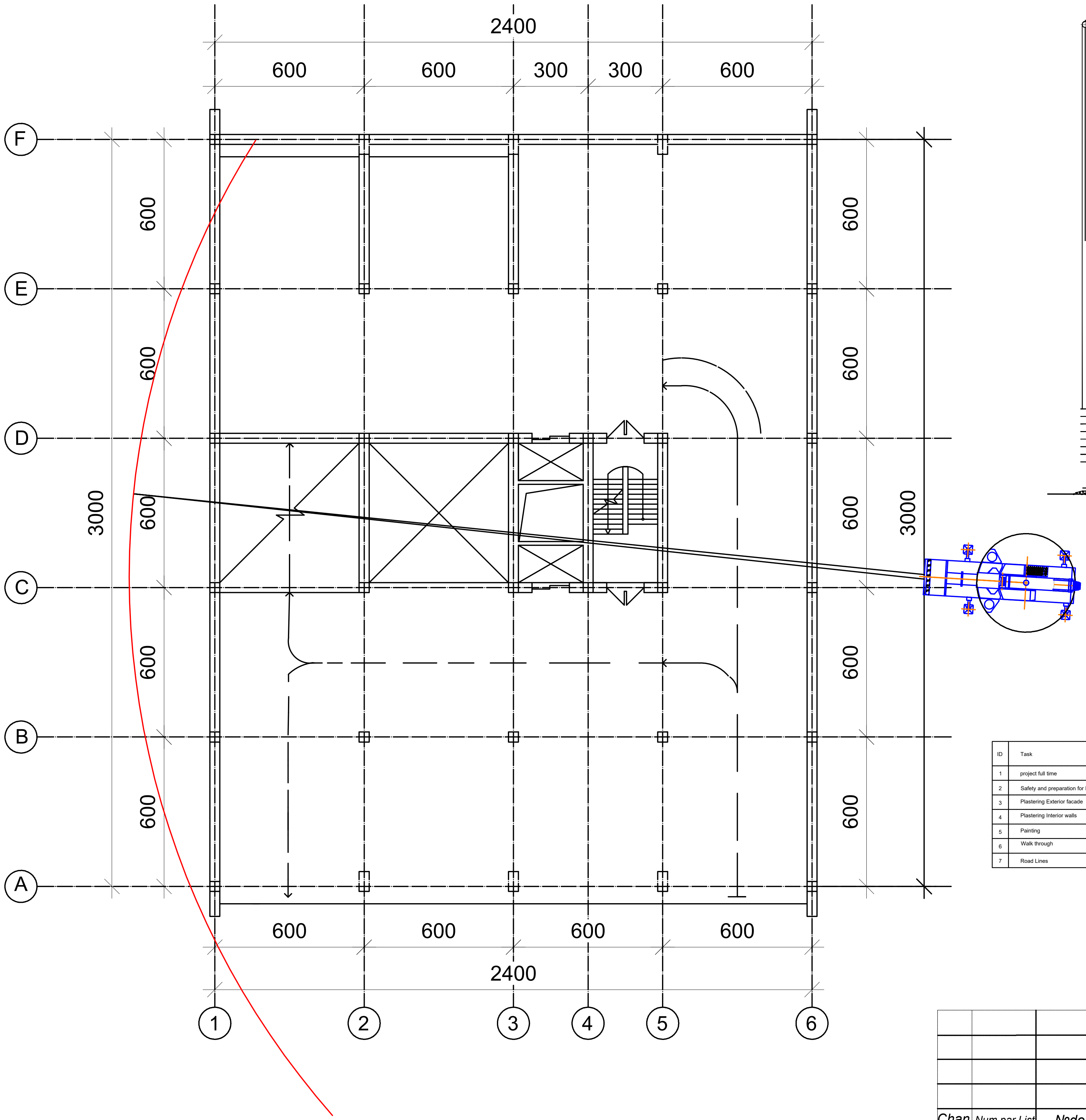
$$Kner = \frac{Pmax}{Psr} = \frac{19}{18.89} = 1 < 1.5$$

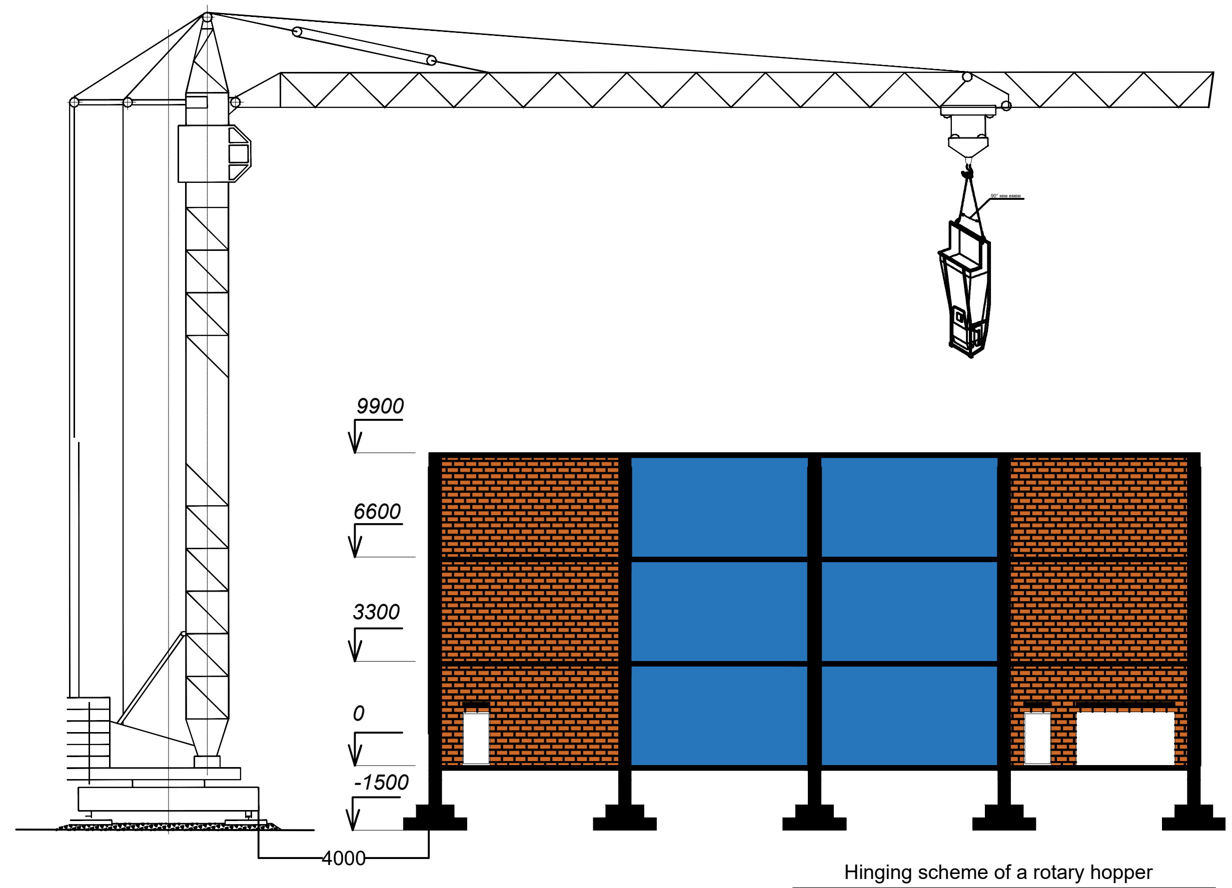
$$Psr = \frac{Q}{P} = \frac{1378.98}{73} = 18.89$$

Labor Schedule

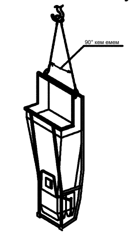


					KazNITU-5B072900-Civil Engineering-9.03.02-2021-DP
					Multi-Level parking with use of air purification system
Chan.	Num.par.List	№doc	Sign	Date	
Head of Dep		Kozyukova .N.V			Organizational and technological part
Checked		Kozyukova .N.V			stage: DP; list: 8; scale: 1/100
Supervisor		Kozyukova .N.V			
Controller		Bek .A.A			RCC work
Created		Ghawsi .F			Civil Engineering and building materials department

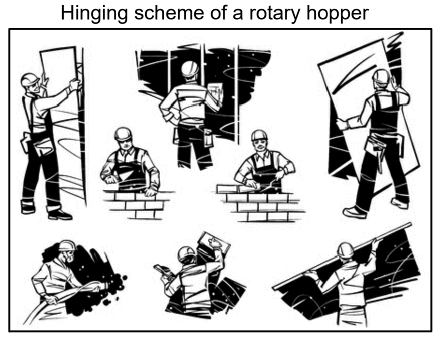




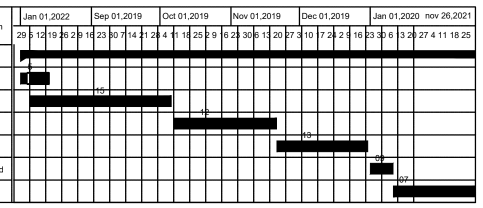
Hinging scheme of a rotary hopper



Hinging scheme of a rotary hopper

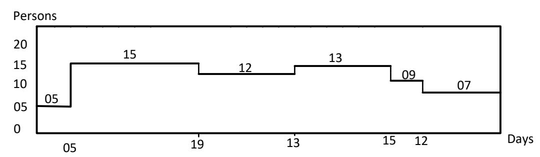


ID	Task	Start	Finish	Duration
1	project full time	2022-01-01	2022-02-30	60 d
2	Safety and preparation for Finishing	2022-01-01	2022-01-05	5 d
3	Plastering Exterior facade	2022-01-05	2022-01-22	17 d
4	Plastering Interior walls	2022-01-22	2022-02-05	13 d
5	Painting	2022-02-06	2022-02-20	19 d
6	Walk through	2022-02-20	2022-02-27	12 d
7	Road Lines	2021-02-27	2022-02-30	09 d



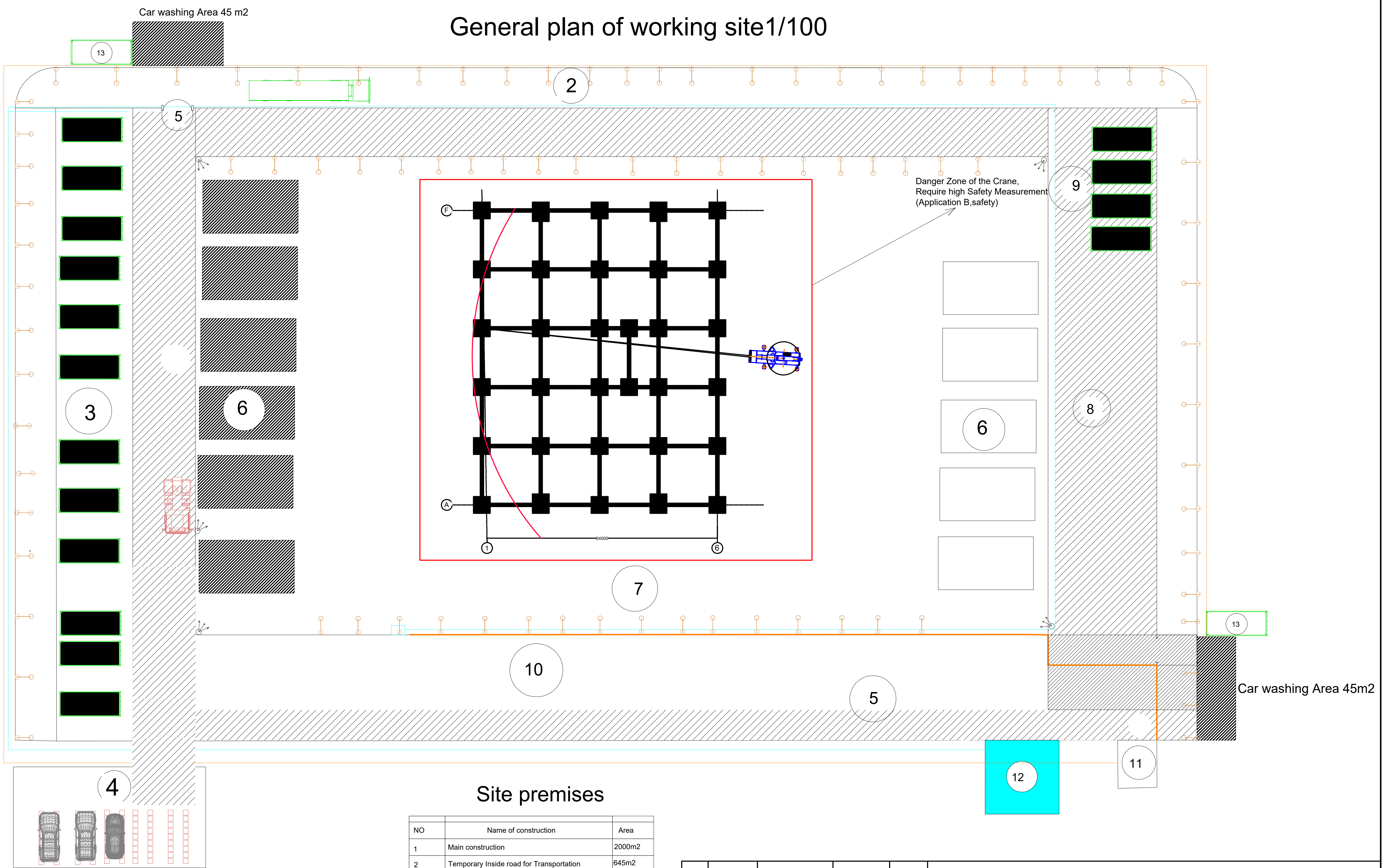
$$K_{ner} = \frac{P_{max}}{P_{sr}} = \frac{15}{16.26} = 0.92 < 1.5$$

$$P_{sr} = \frac{Q}{P} = \frac{975.87}{60} = 16.26$$



					KazNITU-5B072900-Civil Engineering-9.03.02-2021-DP
					Multi-Level parking with use of air purification system
Chan.	Num.par.List	№doc	Sign	Date	
Head of Dep		Kozyukova .N.V			Organizational and technological part
Checked		Kozyukova .N.V			stage: DP; list: 9; scale: 1/100
Supervisor		Kozyukova .N.V			
Controller		Bek .A.A			Finishing work
Created		Ghawsi .F			Civil Engineering and building materials department

General plan of working site1/100



Site premises

NO	Name of construction	Area
1	Main construction	2000m2
2	Temporary Inside road for Transportation	645m2
3	Temporary houses for Labors	55m2
4	Car parking only for 5 Cars	30m2
5	gate of construction	Site parking
6	Temporary house for materials	730m2
7	Tower crane controller room	7m2
8	Area for organizing of a construction materials	300m2
9	Engineering 4 Offices	6m2
10	Parking Area for large cars	1500m2
11	Electricity Room	6m2
12	Water Tang	17m2
13	Security room	12m2

Chan	Num.par.List	№doc	Sign	Date
Head of Dep		Kozyukova .N.V		
Consultant		Kozyukova .N.V		
supervisor		Kozyukova .N.V		
Controller		Bek.A.A		
Created		Ghawsi.F		

KazNITU-5B072900-Civil Engineering-09.03.02-2021-DP

Multi-Level parking with use of air purification system

Organizational &Technological Part

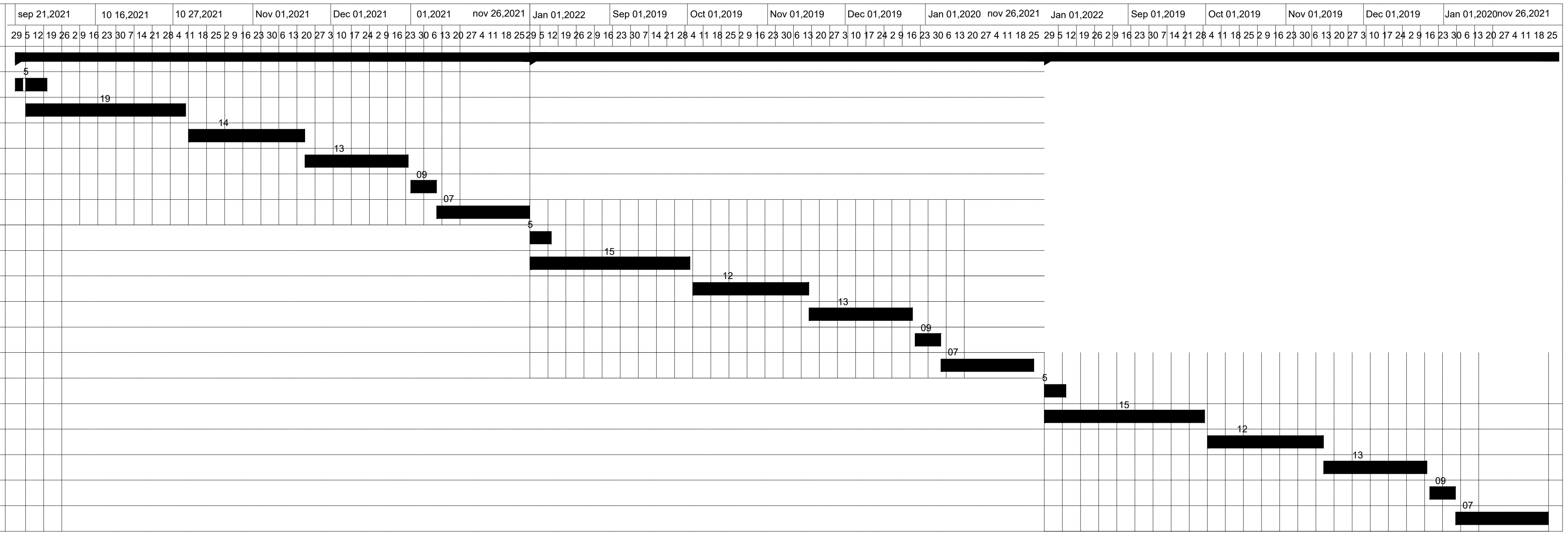
stage	Sheet	scale
DP	10	1/100

General site plan

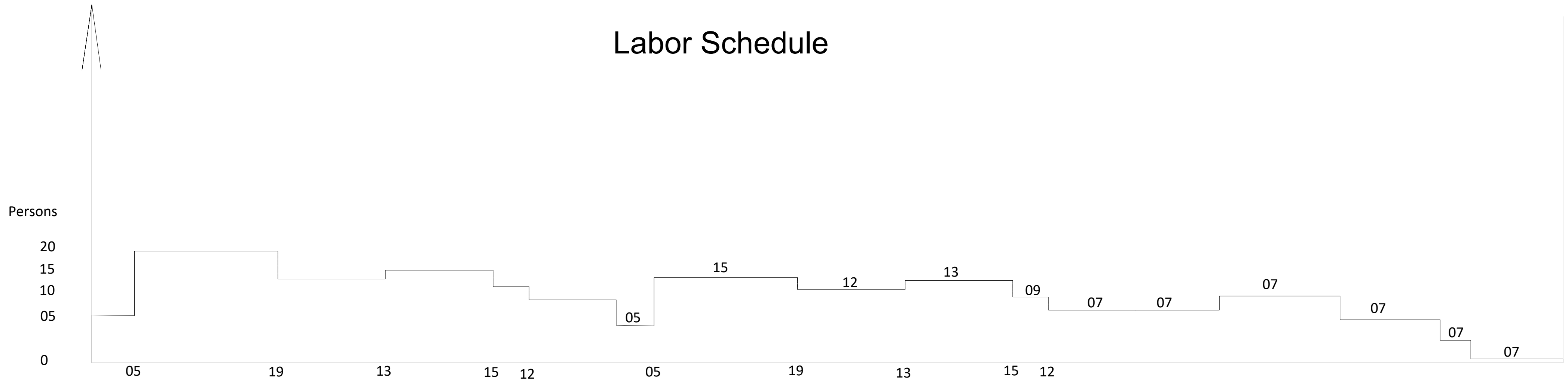
Civil engineering and building materials department

Working Schedule

ID	Task	Start	Finish	Duration
1	project full time	2021-09-21	2021-11-26	183 d
2	Safety and preparation for RCC	2021-09-21	2021-09-27	5 d
3	Footing and G beam	2021-09-27	2021-10-16	19 d
4	Columns	2021-10-17	2021-10-29	13 d
5	Beams	2021-10-29	2021-11-14	15 d
6	Slab	2021-11-15	2021-11-27	12 d
7	Stair and ramp	2021-11-28	2021-12-07	09 d
8	Safety and preparation for Finishing	2022-01-01	2022-01-05	5 d
9	Plastering Exterior facade	2022-01-05	2022-01-22	17 d
10	Plastering Interior walls	2022-01-22	2022-02-05	13 d
11	Painting	2022-02-06	2022-02-20	19 d
12	Walk through	2022-02-20	2022-02-27	12 d
13	Road Lines	2021-02-27	2022-02-30	09 d
14	plumbing	2022-01-01	2022-01-05	5 d
15	Electricity	2022-01-05	2022-01-22	17 d
16	internal lifting system	2022-01-22	2022-02-05	13 d
17	outside setting	2022-02-06	2022-02-20	19 d
18	Road	2022-02-20	2022-02-27	12 d
19	Final land	2021-02-27	2022-02-30	09 d



Labor Schedule



$$Kner = \frac{Pmax}{Psr} = \frac{19}{17{,}44} = 1{,}08 < 1.5$$

$$Psr = \frac{Q}{P} = \frac{3192}{183} = 17{,}44$$

Workers

№	Name	Value
1	G.S,MS and SE	7
2	working Specialists	10
3	Drivers	16
4	Labors	30
5	Guards	3

Chan.	Num.par.List	№doc	Sign	Date	
Head of Dep		Kozyukova .N.V			
Checked		Kozyukova .N.V			
Supervisor		Kozyukova .N.V			
Controller		Bek .A.A			
Created		Ghawsi .F			

KazNITU-5B072900-Civil Engineering-9.03.02-2021-DP

Multi-Level parking with use of air purification system

Organizational and technological part	stage	list	scale
	DP	11	1/100

Elevations and 3D model

Civil Engineering and building materials department

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
СӘТБАЕВ УНИВЕРСИТЕТІ

RESPONSE

OF THE SUPERVISOR
for the graduation project

Ghawsi Fawad
5B072900-Civil Engineering

Topic: «Multi level parking with the use of air purification systems in Almaty»

Mohammadi M. Zamin successfully completed the thesis "Multi-storey residential building of economy class with the "Smart Home" system in the city of Nur-Sultan". In the process of working on the project, the student used modern software systems Lira-Cad, Autodesk Revit and not bad knowledge of professional disciplines, responsibility in the preparation of materials. An analytical review of the selected parking structure was carried out, the seismicity of the city of Almaty was taken into account. The architectural-planning and structural sections were developed in accordance with the issued task. The technical and economic review and construction production technology have been developed at a good level.

In general, the graduation project was performed at a good level, the student Ghawsi Fawad showed good knowledge both during training and during the implementation of the project. The work deserves a good grade.

Supervisor
Master of technical sciences, lecturer

______________________Kozyukova N.V.

«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: Гавси Фавад

Название: Multi-level parking with the use of air purification systems in Almaty

Координатор:Надежда Козюкова

Коэффициент подобия 1:7.1

Коэффициент подобия 2:4.6

Замена букв:85

Интервалы:0

Микропробелы:35

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: Гавси Фавад

Название: Multi-level parking with the use of air purification systems in Almaty

Координатор: Надежда Козюкова

Коэффициент подобия 1:7.1

Коэффициент подобия 2:4.6

Замена букв:85

Интервалы:0

Микропробелы:35

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:

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Дата *Подпись заведующего кафедрой / начальника структурного подразделения*

Окончательное решение в отношении допуска к защите, включая обоснование:

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