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Department of Construction, Geotechnics and Geomechanics

EXPLANATORY NOTE
of a Bachelor's qualification work

student Amer Abdelrahman Mohamed Salaheldin Mohamed

academic group 192-17-1 IC

specialty 192 Building and Civil Engineering

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topic: "Construction project of multi-storey building in Dnipro city"

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ABSTRACT

Qualification work: 57 pages, 7 tables, 3 figure, 12 sources.

ARCHITECTURAL - PLANNING SOLUTION, CALCULATION OF BUILDING STRUCTURES, CHOICE OF PILE, METHOD STATEMENT, BUDGET ESTIMATE.

The object of Multi story house in the city of Dnipro.

The purpose of the work is to design a residential building using progressive methods of construction production, to develop a technology map of the ha implementation of the selected technological process, to perform a set of drawings, to calculate the selected design.

Methods of work – drawing, technical calculations, determination of economic indicators using software.

Results and their novelty – Selected and substantiated basic three-dimensional - planning and design solutions . and the corresponding calendar schedule. A technological map for concreting a monolithic reinforced concrete foundation with the help of an auto botom pump has been developed.

Scope – technologies of mining of civil construction objects.

Practical importance of work – improvement of technical, economic, cultural and social aspects of civil construction

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INTRODUCTION

The paper presents the construction and architectural characteristics of the most spectacular twisted forms of high-rise buildings that have hotel, office, residential and public functions.

The stiffness of the bearing structure is a superior criterion in the shaping of such buildings and its value lies in the size of permissible vertical deflection. Limitation of the vertical deflection of a high-rise building is not only aimed at preventing and minimizing the adverse P-delta effects on the structure of the building.

The stiffness of a tall building can also be considered as an indirect indicator of its susceptibility to dynamic influences. This impact depends on the strength of the wind and on the aerodynamic properties of the building.

The value of the wind load increases with the height of the building. High spatial rigidity reduces the amount of acceleration associated with the horizontal displacements of a structure and also increases the natural vibration frequency, which for low values can be dangerous for construction.

The structure can fall into resonance at critical wind speeds, which generates both high stresses and vertical deflection. The aerodynamic twisted shape has the advantage of disturbing the form of the impact of wind around the building to effectively reduce wind excitation.

1 ARCHITECTURAL AND CONSTRUCTION SECTION

1.1 Initial data for design

One of the biggest challenges for engineers when designing modern high buildings is the impact of wind. It has a dynamic character and its strength depends on the aerodynamic properties of the building and strength of the wind .

Analysis of the aerodynamic system of buildings concerns variable phenomena, which are dependent on many unpredictable factors. The structure of air swirling around a building, as a result of air mass collision with the building's form, is very complex and not fully explained theoretically. Therefore, traditional calculation methods that are, sufficient for static load testing are not an effective tool in this regard. Experimental and advanced computer simulations are required. For buildings with complex shapes, and because there are no standard procedures for this type of construction, research is performed in an aerodynamic tunnel. Rigid reinforced concrete cores are constructed for the transfer of horizontal loads and to prevent buildings from swaying. Apart from swaying, the wind has a significant impact on a building when the vortex shedding frequency approaches its natural vibration frequency.

Building class - 2

Degree of durability - 2

The degree of fire resistance - 2

The city of Dnipro belongs to the I climatic zone. The average temperature of the coldest day is 260C; the coldest five days - 220C. Depth of soil freezing - 0.9 m.

The direction of prevailing winds:

- in summer - north-western;
- in winter - western.

The weight of the snow cover is 0.7 kPa

Wind load - 0.3 kPa

The relief of the site is calm, with a total natural slope in the north-eastern direction of up to 3%.

1.2 General plan

The construction site of a residential building has a rectangular and circular in the middle . The main façade is oriented to the west. The building is located at the main road 60’(11A).

126 parking spots 4 of them are only for disabled people and its located near the lobby. There is also a garbage room for the location of garbage containers and a convenient projection wide entrance +5.50m , and also lobby entrance +6.00m.

There is also another entrance for the apartments separated , all services are exist , and it will be working till 10pm for week days and till 12am in weekends

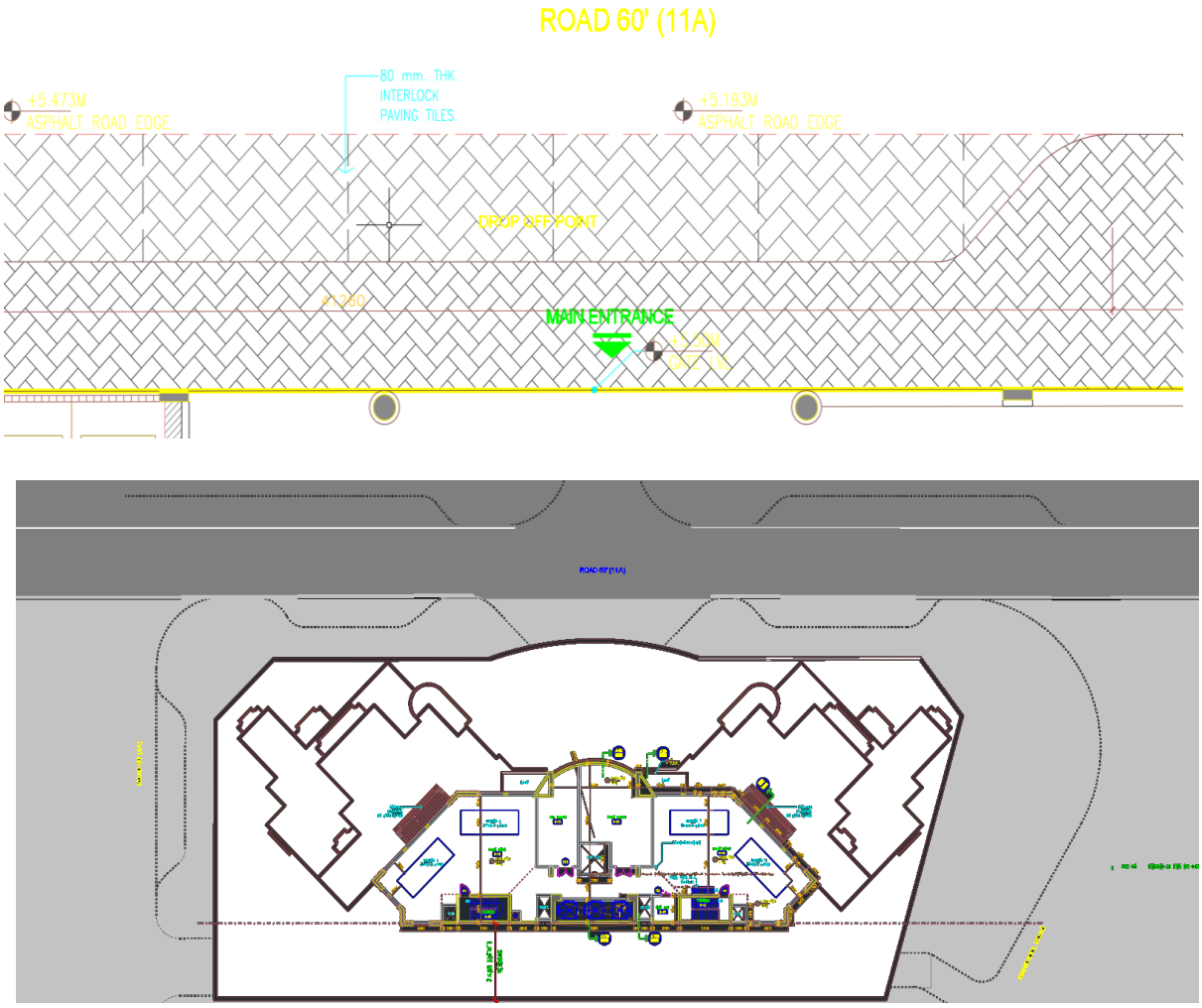


Figure 1.1 – General plan

- landscaping with the arrangement of lawns, preservation of old and planting of new green spaces;

Technical and economic indicators of the general plan.

Total Build up Area 291,69500SQ.FT.

Basement 1&1 Area: 28958.00SQ.FT.

Total 1 bedroom apartmen Area : 967.40SQ.FT

2 bedroom apartment Area : 1491SQ.FT

3 bedroom apartment: 1320SQ.FT

1.3 Architectural and planning solution

1.3.1 Technical - economic indicators of the building

Table 1.1 – technical - economic indicators

№	Indicators	Quantity
1	number of floors	25
2	building volume	19068 m^3
3	living area of the building	2751 m^2
4	total area of apartments	4719 m^2
5	total building area	291,69500SQ.FT
6	area of apartments	4568SQ,FT
7	number of apartments (total) three-room two-room one-room	250 50 100 100
8	coefficient of efficiency of the architectural and planning solution K1	0,7
9	coefficient of efficiency of space-planning solution K2	3,4

In height, the building consists of: a basement, 25 residential floors. Block - section is solved with a quiet mode of window openings. The residential building has two

passenger elevators in the block - section, located in the staircase - elevator block, which is located in the central part of the block - section. It includes:

- 2 lift shafts running along the entire height of the building;

- staircase;

- flight of stairs. On the ground floor, through it, there is an exit to the street, on all floors there is an exit to the outside of the apartment corridor.

There are ten apartments on a typical floor: 4 one-room, 4 two-room and 2 three-room. These apartments have different sizes. In all apartments, the zoning of residential and public areas is observed. All apartments have standardized insolation and each room except 2 located at both ends of the building is equipped with balconies; balconies are also absent on the first floor. The balconies are summer rooms of trapezoidal and rectangular apartments, fenced with walls and fences to a height of 1 meter.

The project provides for measures to create an accessible environment for people with limited mobility and people with disabilities in accordance with the set of rules for design and construction.

When forming the site, the continuity of pedestrian and transport routes was observed, providing access for disabled people and people with limited mobility to buildings and across the territory, taking into account the requirements of urban planning standards. The arrangement of ramps with a slope of not more than 1:10 at the intersection of sidewalks with the carriageway of internal roads is provided.

1.3.2 Design solutions

- the spatial rigidity of the building is ensured by the joint work of the floors and the rigidity core;

- foundation - monolithic girder on piles. The inner walls of the basement are monolithic. All surfaces of walls in contact with the ground are painted with hot bitumen in two times;

- external walls - the enclosing structures of the external walls are made of bricks 250mm with external thermal insulation 130mm thick. External finishing is ceramic slabs;

- internal walls - from gypsum concrete slabs of dry plaster;

- ceilings are designed with monolithic reinforced concrete 180 mm thick made of concrete of class B25, with reinforcement of class A-III;

flights of stairs and platforms made of monolithic reinforced concrete;

- staircases - standard metal;

- Elevator shafts are designed monolithic reinforced concrete made of concrete of class B25 and reinforcement of class A-III;

1.3.3 Engineering equipment

Supply of the main consumers of a residential building and built-in premises should be carried out according to the II category of power supply reliability. For consumers of the 5th category (smoke removal and fire alarm systems, elevators, emergency and evacuation lighting), it is necessary to provide an ATS. In the niches of the electrical panels, electrical cabinets are mounted, two on the floor, in which there are meters for common apartment accounting, automatic protection of group lines. Lighting control of staircases is carried out by a photo switch, working and emergency lighting of staircases and elevator halls is provided. The supply networks are laid in the basement openly in steel pipes. The group network in apartments is laid in the channels of partitions and floor

slabs. For each apartment, an electric bell with a 220V voltage button is provided. One common input switchgear will be installed in the building.

It is necessary to provide for the following types of lighting:

1) working;

2) emergency;

3) evacuation.

- the project provides for the device of internal networks:

1) radio transmission from city transformers to subscriber radio sockets in all apartments;

2) television antennas for collective use with the device and installation of universal branch boxes in floor cabinets;

3) Internet cable.

- installation of internal sewerage is provided from polyethylene pipes. In bathrooms, pipes are laid above the floor in decorative stitching. Stands are laid in shafts with access to each floor. The following sanitary devices are designed for the installation:

1) ceramic toilets with directly located cisterns and oblique outlets;

2) cast-iron enamelled straight-sided bathtubs with a siphon, overflow and outlet;

3) ceramic semicircular washbasins with brass outlet and siphon, overflow and outlet;

4) ceramic semicircular washbasins with a brass outlet, a siphon and a single mixer with a flexible hose;

5) double sinks made of stainless steel with a siphon, outlet and tabletop mixer.

The drainage is designed into the external domestic sewer network through two outlets with a diameter of 150 mm, oriented to the courtyard facade. To ensure uninterrupted robots of the sewer network, revisions must be designed on it. On risers, revisions are installed on the upper and lower floors

- the waste bin is designed according to the Prana catalog - waste disposal and fire extinguishing systems for residential and office buildings. Inlet valves are located on all floors with the exception of the 1st and 9th floors; the waste collection chamber is located at the level of the first floor.

Conclusion

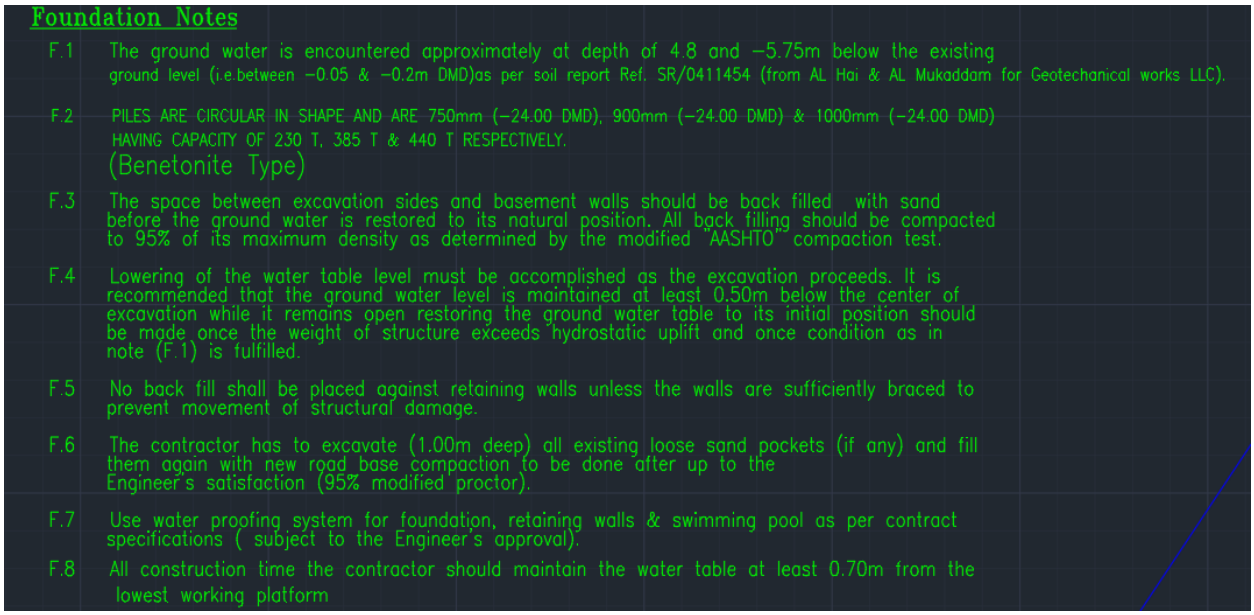
In architectural and construction section, the spatial planning solutions of the building were considered, engineering communications were considered in detail, and the issues of heat preservation and provision of normative conditions of room lighting with constructive solutions were skillfully combined. The description of constructive decisions and the general plan is executed.

2 CALCULATION AND DESIGN SECTION

2.1 Choosing foundation option

According to the assignment for diploma design, calculation of pile foundations from driven piles;

2.1 Figure – Foundation notes



We will use raft foundation, because A raft foundation is a reinforced concrete slab under the whole of a building or extension, 'floating' on the ground as a raft floats on water. This type of foundation spreads the load of the building over a larger area than other foundations, lowering the pressure on the ground.

2.2 Choosing depth of grillage and length of the pile

We accept for design driven prismatic piles without prestressed reinforcement. We assign the length of the pile based on the engineering and geological conditions, immersing the lower end into the soil with a sufficiently high design resistance to a depth of 4.8m. As a base, we take coarse-grained soils with medium-sized sand aggregate. Choosing piles, pile grade - C90.30 A-III. The pile cross-section is taken as 300x300 mm,

and the piles are immersed to 8m. For design reasons, we assign the depth of the foundation of the foundation grillage from the planning mark dp = 3.45 m, i.e., the basement depth is 2.8 m + the basement floor is 0.15 m + the thickness of the grillage is 0.5 m.

2.3 Calculation of driven piles

Also in this section of the report arethe main characteristics of the design scheme for the projected building, taking into account the initial data.

Determination of the depth of foundation sole laying The depth offoundation sole laying should be assigned from the given by:

1 Depths of seasonal freezing.

2 Engineering and geological features of the structure of the soil thickness.

3 Design features of the designed structure (for example, the presence or absence) of the basement.

4 The values of the vertical load acting on the foundation N.

5 Depth of laying the foundations of neighboring houses

6 Rellef territory on which the building is erected.

7 Location in terms and depth of engineering communications.

8 Hydrogeological conditions of the construction site when accounting for their changes in the construction and operation of the structure.

According to the design task in determining the depth of laying the sole of the foundations, we will take into account the requirements.

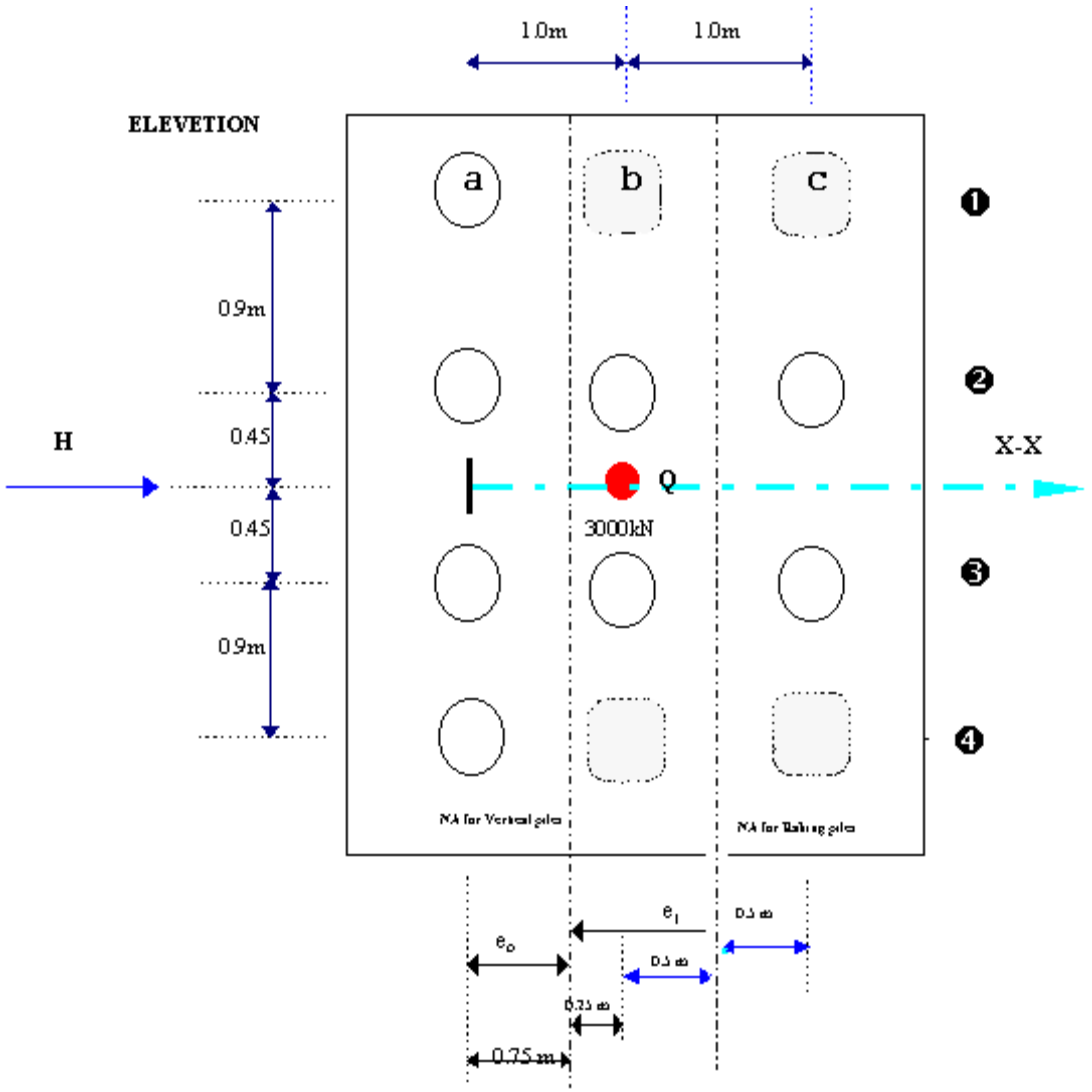


Figure 2.1 Calculations piles

Both neutral axis till they cross each other at point C and establish the lever arm distance, **Y**, so that we can calculate the moment M, about **C**.

Pile inclination 4:1 Y = (0.75)4 - 0.6 = 2.4m

where 0.75 m is the location of N.A of raking piles from e_o or from the N.A Of the vertical piles.

M =0 Q(X) - H(Y) = 3000(0.25) - 250(2.4) = 150kNm

the angle and calculate sin, cos, and tangent of the angle □

The inclination 4:1 = 14.04

tan = 0.25

sin = 0.24

cos. = $0.97\cos^2 = 0.94$

2.3.1 Determination of loads on each pile

Calculate the forces acting on each pile:

$$P_v = \frac{Q}{n} = \frac{3000}{8} = 375kN$$

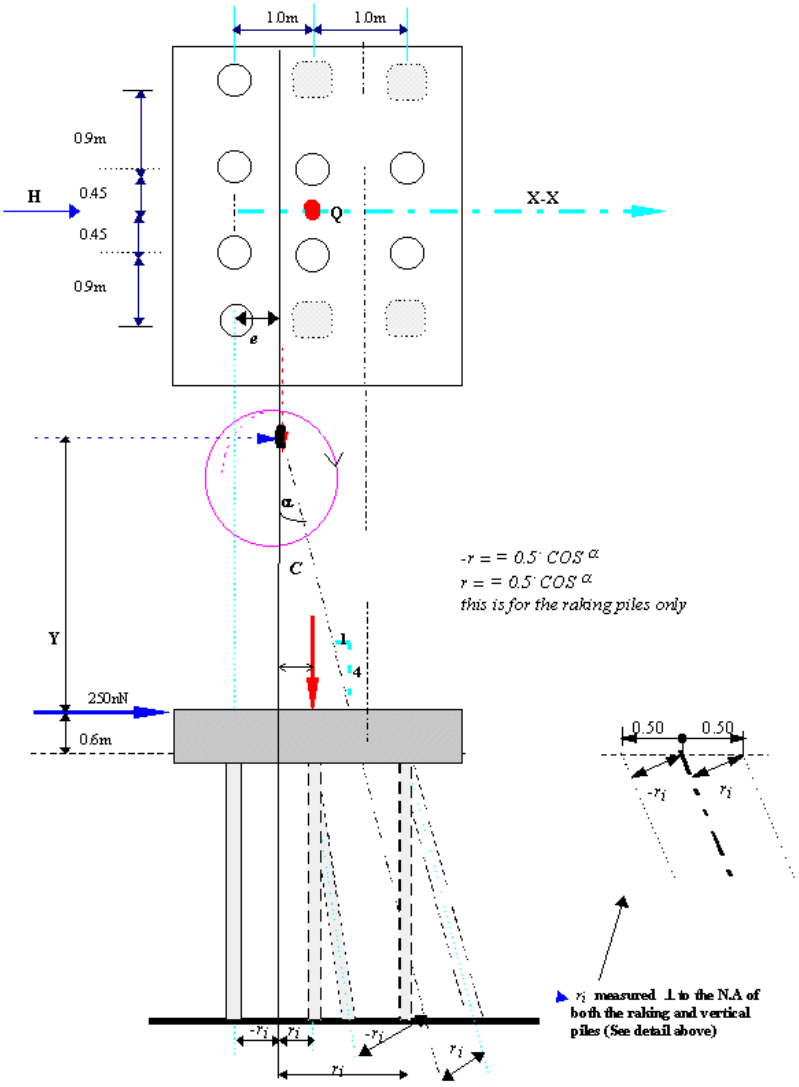


Figure2.2 – Calculate the forces acting on each pile

2.3.2 Determination of the number of piles in the foundation and the size of the

$$P_n = +\frac{H}{m \cdot \sin \alpha} = \frac{250}{4(0.24)} = +260kN$$

$$\sum r_i^2 = 4(0.75)^2 + 2(0.25)^2 + 2(1.25)^2 + 4(0.5 \cdot 0.97)^2 = 6.44m^2$$

$$\frac{M \cdot r_i}{\sum r_i^2} = \frac{150 \cdot r_i}{6.44} = 23.29 \cdot r_i$$

Raking piles

r_i measured perpendicular to the neutral axis →

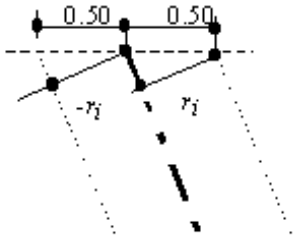


Figure 3-10

b❶ ,b❹ , r_i = -0.5(0.97) = -0.485 m

c❷ ,c❹ , r_i = 0.5(0.97) = 0.485

-

Vertical Piles

r_i measured perpendicular to the neutral axis

b❷ ,b❸ , r_i = 0.25 c2,c3, r_i = 1.25m

a ❶ , a ❷ , a ❸ , a ❹ , r_i = -0.75m

PILE (k N)	a	b2, b3	c2, c3	b1, b4	c1, c4
r_i	-0.75 *m*	0.25 *m*	1.25 *m*	0.485 *m*	0.485 *m*
Q (kN)	375	375	375	0	0
H (kN)	-125	-125	-125	260	260
M (kN)	23.29(0-0.75 = -17.47	23.29(0.25) =5.82	23.29(1.25) =29.11	23.29(0.485) =-11.3	23.29(0.485) = 11.30

Conclusion

The section analyzes the engineering and geological conditions of the construction site for the projected building and identifies the soil layers with their physical characteristics. The depth of the foundation sole is determined, taking into account the basic design conditions, hydrogeological and relief features of the building site.

The section collects loads, calculates the load on the pile and the required number of piles in the bush. As a result, a layout of piles and a grid diagram were developed.

3 ORGANIZATIONAL AND TECHNOLOGICAL SECTION

3.1 Method statement for excavation

3.1.1 Scope method statement

Method of excavation:

- Obtain the good for construction drawings from the Architect/Engineer. Engineer refers to the Geotechnical/Structural consultant.
- Review and study the drawings well in advance viz before the start of construction and obtain all clarifications from the Architect/engineer.
- Demarcate the excavation setting out plan with reference co-ordinates and levels. Please note that the survey bench marks are away from the excavation in order to prevent the damage to markers and to maintain accuracy.
- Cable or utilities scanning has to be done in order to avoid the cables and pipes and underground utilities damage. It is recommended to go for trial pits so that underground utilities can be find out.
- Protect and support underground utilities.
- Mobilize the machinery for excavation.
- Start the excavation from one end and proceed to another end in layers such as one meter depth layers.
- If the excavation depth exceeds 2.0m depth, it is necessary to protect the sides of excavation by driving sheet piles or soldier piles or timber shoring with strutting. The vertical members to protect the excavation is to be driven first followed by horizontal members.
- The other option is to provide slope not less than 1:1.5 with intermediate berms and the slopes have to be protected by short creting or planting grass etc.
- After the completion of excavation 0.5m below the first strut level, install the first strut as per the drawings.The procedure may be repeated till the bottom of excavation.

- If the excavation is deep, it is better to provide long arm excavators to reach the required level.
- Stack the soil away from the excavation edge to prevent soil collapsing to the excavation area.
- In case of soil disposal, appoint banks man to guide the machinery movement.
- Appoint signal man if the excavation is done by a mini excavator followed by soil disposal by another excavator.
- Provision for drainage is to be made with sufficient pumps and collecting.
- If there is ground water percolating to excavation, Please inform the Consultant and find out suitable preventive measures.
- All the excavation area is to be barricaded with GI hand railing and sign boards such as “deep excavation is in progress, stay away” to be kept in all languages which can understand by workers easily.
- Sufficient flood lights have to be provided at regular intervals.
- Complete the excavation as per the levels mentioned in the Method statement.
- In case of over excavation, fill the extra depth with PCC.
- After the completion of excavation inform the architect/Engineer to visit the site for checking.
- The next step of construction can only be started after the approval of excavation by Architect/engineer

SAFETY MEASURES:

- All the workers at the excavation shall wear PPE at all times such as Safety helmets, safety shoes, Safety harness or belts, Gloves etc.
- All the workers have to be briefed about the excavation and safety measures required for excavation.
- Deploy enough banks man, signal man if there are many excavators viz more than 2.
- The soil shall be stacked away from the edge of excavation to prevent collapse of soil on to workers working at bottom.

- All the excavation area shall be barricaded with GI hand railing and should be strong enough to take the loading of human beings slanting on it.
- All the excavation areas to be provided with enough flood lights, the light intensity at any point shall not be less than 150amps.
- Sign boards to be kept at all visible places and to be protected.
- Close supervision and recording by site engineer/ supervisor is required.
- Place fire extinguisher / first aid box near the access.
- Proper access with hand railing to be provided to the bottom of excavation.
- In case of dry weather, Sprinkle water to prevent dust pollution, and cover the soil stacking area with canvas.
- All the machinery has to be checked by the operators every morning before the start of work and to fill the check lists with signature.
- The speed limit of dumpers to be controlled.
- The dumpers drivers are responsible for any collapse of soil from dumper or flying of dust to atmosphere.

RESPONSIBILITY MATRIX FOR DEEP EXCAVATIONS

S.NO	ITEM	ARCHITECT/ CONSULTANT	CE	PE	SE	SO/SS
1)	Construction Drgs	R	A	C		
2)	Levels/Co-ordinates			R	A	
3)	Barricading					R
4)	Workers Training			R		A
5)	Proper Access				R	A
4)	Lighting				R	A
5)	Excavation protection			R	A	
6)	Machinery condition					R
7)	Pumps availability			R		A
8)	Silt traps				R	A
9)	Sedimentation tanks			R		A
10)	Excavation final approval	R		A	C	
11)	Dumper speeding					A
12)	Competency of operators			R		A
13)	Enough banks man/signal man			R	A	C
14)	Prevent mud water pumping into drains					R
15)	Safety PPE				A	R
16)	Review and approval of Method statement of Contractor		R	A	C	
17)	Overall safety		A	C	C	R
18)	Overall quality		R	A	C	

RISK ANALYSIS FOR DEEP EXCAVATIONS

S.NO	HAZARD	RISK LEVEL	LIKELY HOOD	SEVERITY	RISK CONTROL MEASURES
1	Workers falling in to excavation	Low	Low	High	Provide barricading around the excavation.
2	Workers hit by excavator	Low	Low	Medium	Appoint banks man to control excavator movements
3	Soil collapse	Low	Low	Medium	Stack soil away from excavation
4	Flooding of water in to excavation	Low	Low	High	Provide enough pumps
5	Workers falling from the slopes	High	Low	Medium	Provide proper access with hand railing
6	Workers hit by dumpers	High	Low	Medium	Appoint signal man to guide dumpers movement
7	Workers working in dark	High	Medium	High	Provide enough lighting
8	Excavators over turning	High	Low	High	Appoint competent operators
10	Collision of dumpers	Medium	Low	Medium	Appoint signal man
11	Sudden down pour	Low	Low	High	Provide alarm to evacuate the workers.

3.1.2 Work instructions

- before the start of laying the vapor barrier layer, it is necessary to complete all construction work, the base must be free of debris;

- on all vertical surfaces, the vapor barrier material must be glued with continuous gluing, starting above the heat-insulating layer;

- on the entire horizontal plane, glue the sheets of material in the seams, ensuring the overlap of the panels 80 - 100 mm and 150 in the end panels;

- when laying thermal insulation, place the seams between the plates apart, ensuring a snug fit to each other. Cut the insulation boards so that the joints of the 1st and 2nd layers do not coincide. Lay the layers over yourself

- install beacons before starting the deviation device. Backfill carefully, without damaging the heat-insulating layer, achieve the design slope i = 2.5;

- when laying a screed from a cement-sand mortar, arrange temperature-shrinkage joints with a width of 5 mm dividing the screed no more than 6 * 6 m. Reinforce the screed with a mesh. When making a cement-sand screed, the mortar should be used before setting and periodically stirred during use. In places where the roof adjoins the walls of mines and other structural elements, provide transitional inclined sides at an angle of 450, with a height of at least 100 mm from a cement-sand mortar. Brick walls in these places should be plastered with cement-sand mortar of grade 50;

- priming with a primer should be done in 3 - 4 hours as the screed was laid;

- before the start of the gluing of the main waterproofing carpet, all preparatory work must be completed: ventilation shafts are installed, abutments, eaves overhangs, and funnels of the internal drain are made. The slope should be checked for compliance with the design;

- the first layer is applied as follows:

1) roll out a roll of material on the prepared surface, trying it on in place and in relation to the neighboring one, ensure it with a whip;

2) roll the material back to the middle on both sides;

3) burn the film with a burner on the underside of the roll in the place of the steam-conducting strips, preventing the sand from drowning in the binder. During fusion, the lateral lash should be additionally heated until a bead of bitumen-polymer binder is formed, it should protrude 0.5-1.5 cm from the side seam. The roll attachment in the lateral places should be carried out most carefully;

- sticker of the second carpet layer:

1) roll out a roll of material on the prepared surface, measure it in place and in relation to the adjacent one, ensuring it with a whip, remove the protective film;

2) roll the material back;

3) gluing is carried out as follows: for this, the roofer lights the burner and melts the rolled roll with the pendulum motion of the burner along the roll, holding the burner glass at a distance of 10 - 20 cm from the roll. After the formation of a bead of the melted

deposited layer (on the bottom side of the roll), the roofer gripper-unroller clings to the roll and, stepping back, rolls it out and glues it. Rolling at the docking points is carried out by an IR-735 roller;

- the device of the roofing carpet within the limits of the working grips to start from lowered sections to high

- eaves overhangs, areas of the location of drainage funnels, with the location of the panels perpendicular to the water flow;

- when adjoining vertical surfaces, make a sticker from bottom to top. At the junctions of the roof to the parapets, lay the layers of the additional carpet on the upper edge of the parapet, after which the junction is finished with galvanized roofing steel, which is fastened with self-tapping screws;

- the tension of the panels when laying on the base should eliminate residual waviness and wrinkles on the surface of the roofing material. The panel laid on the base after gluing must firmly adhere to the base, without forming waves and swelling to prevent such defects, roll the rolls from the axis of the roll diagonally to its edges, the defects found after gluing each layer must be eliminated before gluing the next layers of material;

- walking on a newly laid carpet is not permissible;

- when installing the roof, make acceptance of each layer with the completion of the act for hidden work.

3.1.3 Flow chart of the work process

A specialized team of 6 people performs work on the installation of a roll roofing made of roofing material with a layer of mastic. Including:

- roofer of the V category, and he is also a foreman - 1 person;
- grade IV roofer - 1 person;
- grade III roofer - 2 persons;
- grade II roofer - 2 persons;
- V category crane operator - 1 person;
- Riggers of the II category - 2 people.

The 1st grade II roofer prepares the base. The 2nd grade II roofer and the 1st grade III roofer glue the vapor barrier. After finishing the preparation, the 1st grade II roofer and the 2nd grade III roofer lay the 1st layer of thermal insulation. After gluing the vapor barrier, the 2nd grade II roofer and the 1st grade III roofer lay the 2nd layer of thermal insulation. After the 1st grade II roofer and the 2nd grade III roofer have installed the thermal insulation, the two of them begin the construction of expanded clay deflector. After the slope is completed, the IV grade roofer and the 1st grade III roofer begin the installation of the cement-sand screed, and the III grade roofer helps them by laying the reinforcing mesh along the screed. When the mortar has hardened, the V category roofer performs an abutment to the roof outlets. Parallel to it, grade II roofers begin priming the base. Roofers begin to work with them: grade IV and grade III, they sequentially carry out the gluing of the 1st and 2nd layers of waterproofing carpet, they also perform lining of the abutments.

3.1.4 Requirements for the quality of work

Table 3. 1 – Instructions on acceptance of works and quality control

The name of the technological process and its operations	Controlled parameter	permissible parameter values, quality requirement	Method of control , means (devices) of control
one	2	3	four
p base ovnost (couplers)	base	deviation of the base surface along the slope and on the horizontal surface ± 5 mm, across the slope and on the vertical surface ± 10 mm	and using a 3-meter ruler
screed device	also	no more than 5%	instrument tal
vapor barrier device , device of the main waterproofing carpet	roofing quality	quality of the roofing device Longitudinal not less than 100mm transverse not less than 150mm	visual
also	also	perpendicular to the water outlet	also
also	also	not less than 5 kg / cm ^{2}	visually by tearing
laying insulation	also	no more than 10%	measuring
also	also	no more than 5 mm	also
deflector device	also	Not more than 0.01%	also
screed device	also	also not less than 100 kg / cm ^{2}	samples of cubes are tested after 7 and 28 days
also	also	According to the project, the permissible deviation is 10%	ruler
Availability of passports (quality documents) for all types of raw materials and products		documentation	visual

3.1.5 Labor protection

Labor protection is not a separate discipline, but a set of measures combined under one name aimed at maintaining the safety of employees during the workflow.

The main elements of labor protection:

– Safety. This term combines all organizational and technical measures and means aimed at preventing the impact on service personnel of dangerous production factors, in other words - to prevent injuries in the workplace or other deterioration of health.

- the burner is extinguished by shutting off the gas supply valve, and then lowering the locking lever;

- during breaks in operation, the burner flame must be extinguished, and the valves on it must be tightly closed. During breaks in work (lunch, etc.), valves on gas cylinders, reducers must be closed;

- in case of overheating of the burner, work must be suspended, and the burner must be extinguished and cooled to the ambient temperature in a container with clean water;

- gas-flame works must be carried out at a distance of at least 10 m from groups of cylinders (more than 2) intended for conducting gas-flame works; 5 m from separate flammable gas cylinders; 3 m from gas pipelines of combustible gases;

- it is forbidden to work in oiled clothing and smoke at the workplace;

- penetration of unauthorized persons, drunken workers or those who are not employed in this work area is not allowed;

- the roofer's workplace must be provided with the following fire extinguishing and medical aid: powder fire extinguishers per roof section at least two pieces, a sand box with a capacity of 0.05 m^3, shovels - 2 pieces, an asbestos cloth - 1 m^2, a first aid kit with a set medicines.

3.1.6 Guidelines for quality control of construction and installation works

The required quality and reliability of buildings and structures must be ensured by construction organizations through the implementation of a set of technical, economic and organizational measures of effective control at all stages of the creation of construction products.

Quality control of construction and installation work should be carried out by specialists or special services that are part of the construction organization or are attracted from the outside and equipped with technical means that ensure the necessary reliability and completeness of control.

Production quality control of construction and installation work should include incoming control of working documentation, structures, products, materials and equipment, operational control of individual construction processes or production operations and acceptance control of construction and installation work.

Operational control should be carried out during the execution of construction processes or production operations and acceptance control of construction and installation work.

During acceptance control, it is necessary to check the quality of the completed construction and installation works, as well as critical structures.

Based on the results of production and inspection quality control of construction and installation work, measures should be developed to eliminate the identified defects, while the requirements of designer supervision of design organizations and state supervision and control bodies should also be taken into account.

3.1.7 Measures for labor protection and fire safety

Dangerous zones, into which the entry of people not associated with this type of work is prohibited, are fenced off and marked.

There are safe paths for pedestrians and car transport.

Temporary and administrative-economic and utility buildings and structures are located in such a way that the distance from the most distant place outside the building does not exceed 200m.

Drinking installations are located at a distance not exceeding 75 m from workplaces.

Fire-prevention breaks are provided between temporary buildings and structures.

Safe working conditions must be created at the construction site, excluding the possibility of electric shock to people in accordance with the norms.

The construction site, walkways, driveways and workplaces are illuminated.

Places for kureia are designated and fire posts equipped with fire extinguishing equipment are located.

Wheels are washed from a barrel, dirty water is discharged into the city storm water system

Safety at the construction site.

Plumbing, sewerage

In the designed house plumbing – household and drinking from the external network.It should be noted that there are two types of water supply:

Internal – water supply system which is located underground and connected to the central water supply system.

External – water supply system which is located on the surface (which is part of the houses) with the help of which the final result of water supplyto the goss gift occurs.

Water quality is characterized by a combination of its physical properties, chemical and bacteriological composition. The physical properties of water include its temperature, color, mutability, taste and smell.

Sewage is a set of engineering structures,mouth weeding and sanitary means that ensures the collection and removal of contaminated wastewater outside settlements and industrial enterprises, as well as their cleaning and disposal before use or discharge into the reservoir.

In this house sewage - household-fecal from the local network.

Drainage from the roof – outer, on the edge of the slopes of the roof.

Internal sewerage devices in residential and public buildings consist of receivers (sanitary devices) — toilets, urians,sinks, washbasins, washers, etc., ramps, baths, bidets, etc., and from the network — drain pipes, risers, outlets and yard network.

3.1.8 Measures to ensure the safety of materials

For the preservation of expensive materials or materials that deteriorate in the open air (cement, lime, gypsum, plywood, nails, etc.), closed warehouses are arranged.

Materials are stored in compliance with certain rules. When stacking products in a stack, the spacers between them are placed strictly one under the other. The cross-section of gaskets and pads is usually square with a side of 6 ... 8 cm. Dimensions are selected so that higher prefabricated elements do not rest on mounting loops or protruding parts of lower ones.

When installing the elements, the slings must be correctly selected, otherwise the structures may break.

At the entrances and exits of the construction site, gates are installed, a guard is working, located in temporary buildings located at both entrances.

An alarm system is provided at the site. In the dark, the construction site is illuminated from all sides by floodlights.

3.2 Method Statement covers shoring and underpinning, and excavation to the bottom of the raft foundation.

1. Equipment to be Deployed

	Item	No	Capacity	Purpose
1)	Borehole Rig (Truck-mounted)	1	300mm dia, 2000 ft, Max Torque 1385Nm, 120rpm	To drill shafts for shoring piles
2)	Compressor	1	300 psi	To operate the borehole rig
3)	Mobile Crane	1	20 Tonne	To insert universal beams into the shoring shafts and lift other heavy equipment on the Site
4)	Concrete mixer	1	$3.5m^3$	To produce insitu concrete
5)	Concrete Pump	1	$40m^3$/hour max	To deliver concrete produced insitu to the required point of placement on the Site
6)	Tremie Pipes	1 Set	200mm dia	To convey concrete from the mixer to the point of delivery
7)	Shotcrete Pump	1	$10m^3$/hour	To line the sides of excavations with concrete
8)	Down-hole drill	1	50kW	Drill holes for fixing tie-backs
9)	Excavator (with additional rock-breaker attachment)	1	$1.2m^3$ bucket	To remove material to soffit of raft foundation
10)	Generator	1	315 kW	To provide electricity for concreting operations
11)	Welding Machine	1	10kW	To weld steel elements as required

2. Shoring

i. Detailed setting-out shall be done to establish the extent of excavation for the foundation. Locations of piles for shoring shall then be established at 3m c/c along the line marking the edge of the excavation;

ii. 300mm dia shafts shall bored by auger from ground level to [-8.3m] or the bottom of the proposed raft foundation as shall otherwise be instructed.

iii. Universal Beam sections shall be inserted using a mobile crane into the bored shafts along their entire length;

iv. Concrete Class 30/20 shall be pumped into the bored shafts by tremie, the pipe being raised periodically to limit hydrostatic pressure exerted by the rising concrete. Concrete shall be poured up to the level at the soffit of the Raft Foundation.

3. Excavation

i. Excavation shall proceed in tandem with shoring and underpinning operations, along the boundary line marked by the locations of shoring piles;

ii. Excavation shall be done in depth increments of 1.0m (or as shall otherwise be instructed by the Consultants) and the following sequence shall be followed:

- Material shall be removed using an excavator;
- The face of the excavation shall be manually cut to line;
- A shotcrete pump shall be used to line the face of the excavation with 50mm of blinding concrete.
- During shot-creting, BRC mesh shall be placed on the face of the excavation at half the depth of the shotcrete to hold the shot-crete in place.
- Whenever excavation reaches wailer level, 50mm thick timber lagging, 3m long shall be placed against the face of the excavation, spanning between two soldier piles and being

iii. During the course of the excavation, when any soil-nail connection level is reached, a down-hole drill shall be used to bore 100mm dia holes (at the instructed angle) into which the 25mm dia tie-backs shall be placed; The tie-backs shall be fastened onto universal beams at the

excavation-face by welding;

iv. Concrete shall then be poured by a suitably sized tremie to fix the tie-back in place.

v. Excavation, reinforcement of sides and fixing in place of tie-backs shall proceed in the same manner until the level at the bottom of the raft foundation is reached

Conclusion

The organizational and technological section considered the general provisions on the faceting of constructions from the preparatory stage to the quality control of the work in accordancewith DBN A.3.1-5:2016. It contains the basic processes:

- preparatory work
- supply of concrete mixture to the place of laying;
- laying concrete mixture in the foundations;
- care of concrete;
- concrete distribution boom.

Conctract Analys provides a more detailed description of all these operations, taking into account the needs of skilled workers, machines and mechanisms. The main part of the report considers the main elements of labor protection, and Contract Analys contains fire protection measures andsafety instructions for the concrete worker.

4 EQUIPMENT AND ECONOMIC SECTION

4.1 Local estimate

In economic and social development in the field of capital construction the task is to provide in projects wide application of advanced scientific and technological achievements, resources and energy saving technologies and the equipment, economic volume-planning decisions, designs, materials, advanced methods of the organization of production and work, consistently reducing consumption of material, fuel and energy and labor resources per unit of output.

Table 4.1 – Equipment to be Deployed

	Item	**No**	**Capacity**	**Purpose**
1)	Borehole Rig (Truck-mounted)	1	300mm dia, 2000 ft, Max Torque 1385Nm, 120rpm	To drill shafts for shoring piles
2)	Compressor	1	300 psi	To operate the borehole rig
3)	Mobile Crane	1	20 Tonne	To insert universal beams into the shoring shafts and lift other heavy equipment on the Site
4)	Concrete mixer	1	3.5m^3	To produce insitu concrete
5)	Concrete Pump	1	40m^3/hour max	To deliver concrete produced insitu to the required point of placement on the Site
6)	Tremie Pipes	1 Set	200mm dia	To convey concrete from the mixer to the point of delivery
7)	Shotcrete Pump	1	10m^3/hour	To line the sides of excavations with concrete
8)	Down-hole drill	1	50kW	Drill holes for fixing tie-backs
9)	Excavator (with additional rock-breaker attachment)	1	1.2m^3 bucket	To remove material to soffit of raft foundation
10)	Generator	1	315 kW	To provide electricity for concreting operations
11)	Welding Machine	1	10kW	To weld steel elements as required

The investor's local estimate is made in accordance with the "Rules for determining the cost of construction".

4.2 Negotiated price

The contract price is formed as follows:

- the cost of construction and installation work of the contract price is determined by the object estimate.
- the costs of erection (adaptation) and dismantling of titular temporary buildings and structures are calculated, on average to determine the limit of funds for titular temporary buildings and structures in the investor's estimate documentation for construction. A project budget is the total sum of money allocated for the particular purpose of the project for a specific period of time. The goal of budget management is to control project costs within the approved budget and deliver the expected project goals. Our definition of a successful project is one that meets four success criteria: that the project's scope is delivered on schedule, it is delivered within budget and, once delivered, it meets the quality expectations of the donor and the beneficiaries. For project managers to be truly successful they must concentrate on meeting all of those criteria. The reality is that most project managers spend most of their efforts on completing the project on schedule. They spend most of their time on managing and controlling the schedule and tend to forget about monitoring and controlling the budget. The focus of this chapter is on managing and controlling the project budget throughout the entire project life cycle while relating budget control to the other success criteria.

Budget management consists of a series of tasks and steps designed to help manage the costs of the project, the steps are:

- Defining the Budget
- Executing the Budget
- Controlling the Budget
- Updating the Budget Inputs: Inputs for the project budget management include the following documents or sources of information:

- WBS
- Project contract or initial budget
- Resource requirements
- Resource cost estimates
- Activity duration estimates
- Historical information
- Market conditions
- Donor and organization policies

CONTRACTUAL PRICE №

Owner
Subject : CIVIL - BILL OF QUANTITIES.
Document N0.

17,148,796.05

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	Total amount of Mobilization carried to Summary				**244,462.00**	**187,500.00**					**142,500.00**	**45,000.00**	**0.00**	**9,374.99**	**1,875.00**		
	II SITE WORKS																
	a. Earthworks																
1	Excavation for building raft foundation and pile cap (around 500mm depth) and disposal of unsuitable materials offsite.	LS	1	161,671	161,671.00	124,000.00	124,000.00			124,000.00	0.00	0.00	124,000.00	6,199.98	1,240.00		
2	Backfilling to sides of pile cap and retaining wall including sand backfilling up to subgrade level, compacted to 95% of max. relative density for sand. Material must be cleaned sand approved by the consultant.	LS	1	49,231	49,231.00	37,760.00	37,760.00			37,760.00	0.00	0.00	37,760.00	1,888.00	377.60		
3	Marl fill material 200mm thick underneath raft foundation, compacted to 95% of its max. dry density (100mm width extension beyond external walling is considered).	M2	1,979	9	17,811.00	13,853.00	7.00			7.00	0.00	0.00	13,853.00	672.86	138.53		
4	Sand backfill 200mm thick underneath concrete screed walkway at basement area, compacted to 95% of its max. relative density.	M3	91	26	2,366.00	1,820.00	20.00			20.00	0.00	0.00	1,820.00	93.73	19.11		
5	Sand backfilling for meter room at basement area, compacted to 95% of its max. relative density.	M3	59	26	1,534.00	1,180.00	20.00			20.00	0.00	0.00	1,180.00	60.77	12.39		
6	Termite control (under all lean concrete to be used above the soil in all the site).	LS	1	10,952	10,952.00	8,400.00	8,400.00			8,400.00	0.00	0.00	8,400.00	419.97	83.99		
7	Cutting/chipping of concrete piles @ around 400mm high.	Ea.	144	196	28,224.00	21,600.00	150.00		150.00		0.00	21,600.00	0.00	1,074.24	214.56		
	b. Dewatering (for elevator shaft @ basement)																
	Throwing water in municipality rain drainage line is required and the item must be under contractor's responsibility.	Ls	1	19,557	19,557.00	15,000.00	15,000.00		15,000.00		0.00	15,000.00	0.00	750.00	150.00		
	c. Paving and Surfacing																
	(Work to include all the required tests according to GSBC specifications).																
1	Asphalt concrete 120mm thick for parking area, applied on 70mm & 50mm layer complete with MC-1 primer and tack coat.	M2	893	27	24,111.00	18,753.00	21.00			21.00	0.00	0.00	18,753.00	919.79	187.53		

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	Total amount of Site works carried to Summary				**396,105.00**	**364,402.00**					**45,268.00**	**48,288.00**	**210,846.00**	**15,197.14**	**3,051.19**		
	III BUILDING WORKS.																
	(Work to include formworks and Gr. 60 reinforcing bars. All rebars from and below ground floor shall be **use regular rebars in lieu of** epoxy-coated reinforcing bars).																
1	Lean concrete 100mm thk. below raft foundation, pile caps, retaining walls, footings and grade slab; Fc=2500 psi.	M3	274	262	71,788.00	51,238.00	187.00	162.00	25.00		44,388.00	6,850.00	0.00	2,561.90	512.38		
2	Screed concrete 50mm thk. above waterproof membrane layer of raft foundation and pile cap; Fc=2500 psi	M3	123	364	44,772.00	31,980.00	260.00	140.00	120.00		17,220.00	14,760.00	0.00	1,602.69	321.03		
3	R.C. pile cap; Fc=5000 psi.	M3	464	701	325,264.00	232,464.00	501.00	404.00	97.00		187,456.00	45,008.00	0.00	11,618.56	2,324.64		
4	R.C. Raft foundation with thickness as shown on the drawing, Fc=5000 psi.	M3	692	502	347,384.00	248,428.00	359.00	264.00	95.00		182,688.00	65,740.00	0.00	12,400.64	2,477.36		
5	R.C. Retaining wall and water storage tank wall @ basement, Fc=4500 psi.	M3	143	916	130,988.00	93,665.00	655.00	505.00	150.00		72,215.00	21,450.00	0.00	4,683.25	936.65		
6	R.C. retaining walls and footings on the North and South sections (perimeter fence and plant box), Fc= 4500 psi.	M3	72	902	64,944.00	46,440.00	645.00	505.00	140.00		36,360.00	10,080.00	0.00	2,321.28	464.40		
7	R.C. wall partitions inside the building and for the metal room walling @ basement area, Fc=4500 psi.	M3	23	838	19,274.00	13,777.00	599.00	459.00	140.00		10,557.00	3,220.00	0.00	688.16	137.54		
8	R.C. shear wall for elevator, Fc=4500 psi	M3	207	863	178,641.00	127,719.00	617.00	477.00	140.00		98,739.00	28,980.00	0.00	6,390.09	1,277.19		
9	R.c. shear wall for main stairways, Fc=4500 psi.	M3	126	863	108,738.00	77,742.00	617.00	477.00	140.00		60,102.00	17,640.00	0.00	3,889.62	777.42		
10	R.C. columns, Fc=5000 psi.	M3	534	1,061	566,574.00	404,772.00	758.00	578.00	180.00		308,652.00	96,120.00	0.00	20,238.60	4,047.72		
11	R.C. main & service stairways, Fc=4500 psi.	M3	69	870	60,030.00	42,918.00	622.00	462.00	160.00		31,878.00	11,040.00	0.00	2,147.97	429.87		
12	R.C. slab, Fc=4500 psi																
a	Suspended slab 150mm thick on portion of open parking area and roof of machine room.	M3	18	901	16,218.00	11,592.00	644.00	509.00	135.00		9,162.00	2,430.00	0.00	580.32	116.10		
b	Suspended slab 200mm thick for driveway/walkway along East/West elevation and @ elevator roof top.	M3	69	826	56,994.00	40,710.00	590.00	455.00	135.00		31,395.00	9,315.00	0.00	2,035.50	407.10		

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	Total amount of Building work carried to Summary				**5,980,589.00**	**4,276,573.00**					**3,079,198.00**	**1,197,375.00**	**0.00**	**214,083.55**	**42,773.74**		
	IV PRE-CAST EXTERNAL R.C. WALL PANELS																
1	Supply, delivery and installation of precast walls @ 200mm thick with insulation, exposed light aggregate finish with horizontal strip grooves and simple decorative design. Manufacturer subject to approval by Consultant.	M2	3,806	373	1,419,638.00	1,145,606.00	301.00			301.00	0.00	0.00	1,145,606.00	57,432.54	11,494.12		
2	Supply, delivery and installation of colored metallic finish aluminum cladding panels & strips (ALUCOBOND or approved equal) as per drawing details. Manufacturer subject to approval by Consultant.	M2	457	589	269,173.00	217,075.00	475.00			475.00	0.00	0.00	217,075.00	10,853.75	2,170.75		
	Total amount of Pre-cast external R.C. Wall Panels carried to Summary				**1,688,811.00**	**1,362,681.00**					**0.00**	**0.00**	**1,362,681.00**	**68,286.29**	**13,664.87**		
	V WATER-PROOFING AND MOISTURE PROTECTION																
	(All materials are subject to approval by Consultant)																
1	Vapor barrier 200 microns below raft foundation, pile caps, footings, ramp, walkways and slabs on grade.	M2	3,420	3	10,260.00	6,840.00	2.00	1.50	0.50		5,130.00	1,710.00	0.00	307.80	68.40		
2	Bituminous damp-proofing protection (2 coats) on concrete surface in direct contact with the ground.	M2	521	7	3,647.00	2,605.00	5.00	3.00	2.00		1,563.00	1,042.00	0.00	135.46	26.05		
3	Liquid asphalt bituminous water-proof paint protection on top of basement slab underneath the driveway and parking area.	M2	272	94	25,568.00	19,679.20	72.35	64.35	8.00		17,503.20	2,176.00	0.00	979.20	195.84		
4	External water-proof paint protection on top of basement slab underneath arcade walkways and walkway on the East side.	M2	298	94	28,012.00	21,560.30	72.35	64.35	8.00		19,176.30	2,384.00	0.00	1,072.80	214.56		
5	Water-Proofing works to wet area of suspended slab	M2	481	42	20,202.00	15,392.00	32.00	25.00	7.00		12,025.00	3,367.00	0.00	784.03	158.73		
6	Water-Proofing **using Liquid type in lieu of** membrane 4mm thick @ 2 layers for bottom and sides of raft foundation, pile caps and external sides of basement retaining wall.	M2	3,502	94	329,188.00	253,369.70	72.35	64.35	8.00		225,353.70	28,016.00	0.00	12,607.20	2,521.44		
7	Water-Proofing membrane protection layer 6mm thick for sides of	M2	1,088	18	19,584.00	15,232.00	14.00	12.00	2.00		13,056.00	2,176.00	0.00	750.72	152.32		

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	Total amount of Water proofing & moisture protection carried to Summary				**646,625.00**	**495,721.20**					**414,238.70**	**81,482.50**	**0.00**	**24,687.40**	**4,939.42**		
	VI DOORS AND WINDOWS																
	a. Doors.																
	Notes -																
	1 Work includes supply of lockset, hardware and door stopper including door closer for main entrance doors of all major rooms.																
	2 All service doors exposed to outside shall be colored powder coated aluminum type.																
	3 All internal doors shall be fire rated (Class II per ASTM-E-84) laminated from Wilson Art (www.wilsonart.com). Inquire from K.S.A. authorized dealers. Color to be selected later.																
	1.) Glass Doors																
	1 D-1	Ea.	1	147,425	147,425.00	114,000.00	114,000.00			114,000.00	0.00	0.00	114,000.00	5,700.00	1,140.00		
	2 D-1A	Ea.	2	3,675	7,350.00	5,682.90	2,841.45			2,841.45	0.00	0.00	5,682.90	284.16	56.84		
	3 D-1B	Ea.	1	5,805	5,805.00	4,488.75	4,488.75			4,488.75	0.00	0.00	4,488.75	224.48	44.90		
	4 D-2	Ea.	2	23,584	47,168.00	36,474.30	18,237.15			18,237.15	0.00	0.00	36,474.30	1,823.78	364.76		
	5 D-2A	Ea.	8	22,423	179,384.00	138,715.20	17,339.40			17,339.40	0.00	0.00	138,715.20	6,935.68	1,387.12		
	2.) Aluminum Doors																
	1 Maintenance Access Door for Pipe Chase																
	a. 600 x 1800 - D/13	Ea.	6	1,413	8,478.00	6,555.00	1,092.50			1,092.50	0.00	0.00	6,555.00	327.72	65.52		
	b. 800 x 2100 - D/6	Ea.	8	1,597	12,776.00	9,880.00	1,235.00			1,235.00	0.00	0.00	9,880.00	493.92	98.80		

Owner
Subject : CIVIL - BILL OF QUANTITIES.
Document N0.

17,148,796.05

ITEM No.	DESCRIPTION OF WORK	UNIT	QTY.	UNIT RATE	TOTAL	DIRECT COST T/AMOUNT	DIRECT COST U/RATE	DISCOUNTED OFFER MATL U/RATE	DISCOUNTED OFFER LABOR U/RATE	DISCOUNTED OFFER SUBCON U/RATE	MATL T/AMOUNT	LABOR T/AMOUNT	SUBCON T/AMOUNT	P/P COST T/AMOUNT	TOOLS T/AMOUNT	ORIGINAL PRICE OFFER MATL U/RATE	ORIGINAL PRICE OFFER LABOR U/RATE
	Total amount of Doors & windows carried to Summary				**5,036,161.00**	**3,912,846.85**					**821,896.00**	**69,032.02**	**3,021,918.83**	**195,639.58**	**39,127.12**		
	VII MASONRY WORKS (Height of internal CHB walls was considered from finish floor level to 100mm above ceiling level for rentable spaces including internal walls of toilets. External toilet perimeter walls, tea rooms, meter rooms etc. @ full height)																
1	CHB 200 x 400 x 300 mm thick with insulation for machine room and stairway at roof deck.	M2	57	99	5,643.00	4,332.00	76.00	56.00	20.00		3,192.00	1,140.00	0.00	214.89	42.75		
2	CHB 200 x 400 x 200mm thick for building wall partition, parapet etc.	M2	4,348	50	217,400.00	165,224.00	38.00	24.00	14.00		104,352.00	60,872.00	0.00	8,217.72	1,652.24		
3	CHB 200 x 400 x 100 mm thick for water-proofing protection of basement wall and pile cap	M2	448	39	17,472.00	13,440.00	30.00	19.00	11.00		8,512.00	4,928.00	0.00	654.08	129.92		
4	CHB 200 x 400 x 150 mm thick for fence, plant box and false wall.	M2	169	46	7,774.00	5,915.00	35.00	22.00	13.00		3,718.00	2,197.00	0.00	288.99	57.46		
5	CHB 200 x 400 x 150mm thick for pipe chase area and stairway guard rail	M2	1,054	46	48,484.00	36,890.00	35.00	22.00	13.00		23,188.00	13,702.00	0.00	1,802.34	358.36		
	Total amount of masonry works carried to Summary				**296,773.00**	**225,801.00**					**142,962.00**	**82,839.00**	**0.00**	**11,178.02**	**2,240.73**		
	VIII GYPSUM BOARDS.																
1	Gypsum double wall partition @ 150mm thick with noise insulation @ 50DB. Partition height considered was 100mm above ceiling height.	M2	2,158	117	252,486.00	194,220.00	90.00			90.00	0.00	0.00	194,220.00	9,624.68	1,920.62		
2	Gypsum board ceiling 12mm thick supported with metal furring	M2	1,154	137	158,098.00	121,170.00	105.00			105.00	0.00	0.00	121,170.00	6,035.42	1,211.70		

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ITEM No.	DESCRIPTION OF WORK	UNIT	QTY.	UNIT RATE	TOTAL	DIRECT COST T/AMOUNT	DIRECT COST U/RATE	DISCOUNTED OFFER MATL U/RATE	DISCOUNTED OFFER LABOR U/RATE	DISCOUNTED OFFER SUBCON U/RATE	MATL T/AMOUNT	LABOR T/AMOUNT	SUBCON T/AMOUNT	P/P COST T/AMOUNT	TOOLS T/AMOUNT	ORIGINAL PRICE OFFER MATL U/RATE	ORIGINAL PRICE OFFER LABOR U/RATE
	Total amount of Gypsum boards system carried to Summary				**460,361.00**	**353,680.00**					**0.00**	**0.00**	**353,680.00**	**17,585.54**	**3,515.22**		
	IX FINISHES (To include underscreed for leveling and slope wherever required for a complete installation).																
	a. Plastering (To include all accessories required for a complete job).																
1	Plastering works to building CHB wall partition and stairway guard rails.	M2	6,014	22	132,308.00	102,238.00	17.00	7.00	10.00		42,098.00	60,140.00	0.00	5,172.04	1,022.38		
2	Plastering works to building CHB wall partitions to include 5 nos. (20 x 20mm) horizontal groove and 100 x 300mm vertical recessed groove (as shown on the drawings) to walls of hallway and corridor from first to sixth floors.	M2	3,768	27	101,736.00	79,128.00	21.00	7.00	14.00		26,376.00	52,752.00	0.00	3,881.04	791.28		
3	Plastering works to CHB walls for fence (side adjacent to neighbor's property along the East & West not included)	M2	122	20	2,440.00	1,830.00	15.00	7.00	8.00		854.00	976.00	0.00	93.94	18.30		
4	Plastering works to as-built slab ceiling including stair soffit and external ceiling.	M2	2,471	25	61,775.00	46,949.00	19.00	7.00	12.00		17,297.00	29,652.00	0.00	2,322.74	469.49		
	Note: Plastering is not considered for basement retaining wall, elevator shear wall, columns and main stairway shear wall. Contractor is responsible to make the surface of these items to be fair faced finish. Otherwise, they will be plastered without charge.																
	b. Floor Finishes																
	Notes:																
	* Hallways and corridors flooring shall be Cercom or Marazzi tiles from Tamimi Al-Mazroui, with a purchase price of SR. 150.00, typical from first to fifth floor.																
	* Steps & riser for main stair shall be granite finish or Cercom or																

L.5	Coordination, materials and equipment submittals, shop drawings, as-built documentation, spare parts lists, maintenance & operation manuals and instructions to personnel	Lot	1	33,337	33,337.00	33,337.00	1.27	26,249.99	26,249.99	1,249.99	0.00	0.82739%	25,000.00	25,000.00	0.00	25,000.00	0.00	0.00	25,000.00	0.00	1,249.99
	Note: If the Contractor determine any conflict from this Bill of Quantity with the drawings, the contractor should inform the Consultants for any changes.																					
	Total amount of Heating, Ventilation and Air-conditioning System				**4,031,465.00**																	
						4,031,465.00 858,846.45 27.07%		3,172,618.55 3,172,618.55					3,021,536.85 3,021,536.85					2,503,461.95	518,075.00	0.00	151,081.70

	4 x 240, 35M2 G	LM	100	236	23,600.00	23,600.00	1.27	18,568.00	185.68	8.76	1.75	0.00646%	17,517.00	175.17	157.17	18.00	0.00	15,717.00	1,800.00	0.00	876.00
	4 x 120, 35M2 G	LM	80	186	14,880.00	14,880.00	1.27	11,700.00	146.25	6.90	1.38	0.00509%	11,037.60	137.97	119.97	18.00	0.00	9,597.60	1,440.00	0.00	552.00
	4 x 150, 35M2 G	LM	120	197	23,640.00	23,640.00	1.27	18,613.20	155.11	7.31	1.46	0.00539%	17,560.80	146.34	128.34	18.00	0.00	15,400.80	2,160.00	0.00	877.20
	4 x 35, 35M2 G	LM	3,980	95	378,100.00	378,100.00	1.27	297,823.40	74.83	3.53	0.71	0.00260%	280,948.20	70.59	58.59	12.00	0.00	233,188.20	47,760.00	0.00	14,049.40
	4 x 70, 35M2 G	LM	26	127	3,302.00	3,302.00	1.27	2,592.20	99.70	4.71	0.94	0.00347%	2,445.30	94.05	79.05	15.00	0.00	2,055.30	390.00	0.00	122.46
	4 x 95, 35M2 G	LM	45	140	6,300.00	6,300.00	1.27	4,973.85	110.53	5.21	1.04	0.00384%	4,692.60	104.28	89.28	15.00	0.00	4,017.60	675.00	0.00	234.45
	4 x 25, 35M2 G	LM	15	91	1,365.00	1,365.00	1.27	1,078.05	71.87	3.39	0.68	0.00250%	1,017.00	67.80	55.80	12.00	0.00	837.00	180.00	0.00	50.85
	4 x 16, 10M2 G	LM	150	79	11,850.00	11,850.00	1.27	9,303.00	62.02	2.93	0.59	0.00216%	8,775.00	58.50	46.50	12.00	0.00	6,975.00	1,800.00	0.00	439.50
F2	Supply and installation through PVC conduit cable tray complete connection for A/C unit at roof																					
	4 x 35M2 G	LM	480	69	33,120.00	33,120.00	1.27	25,977.60	54.12	2.55	0.51	0.00188%	24,508.80	51.06	39.06	12.00	0.00	18,748.80	5,760.00	0.00	1,224.00
	4 x 25M2 G	LM	1,290	59	76,110.00	76,110.00	1.27	59,649.60	46.24	2.18	0.44	0.00161%	56,269.80	43.62	31.62	12.00	0.00	40,789.80	15,480.00	0.00	2,812.20
	4 x 16M2 G	LM	1,840	42	77,280.00	77,280.00	1.27	61,069.60	33.19	1.56	0.31	0.00115%	57,628.80	31.32	22.32	9.00	0.00	41,068.80	16,560.00	0.00	2,870.40
G	**Grounding System** 16mm dia. 3M length grounding rod complete installation with accessories required.	Ea.	7	4,447	31,129.00	31,129.00	1.27	24,510.78	3,501.54	165.17	33.03	0.12177%	23,123.38	3,303.34	2,732.34	571.00	0.00	19,126.38	3,997.00	0.00	1,156.19
	Total amount of Electrical works carried to Summary				**3,652,758.00**																	
						3,652,758.00 777,223.41 27.03%		2,875,534.59 2,875,534.59					2,712,793.09 2,712,793.09					2,072,101.09	640,692.00	0.00	135,608.04

Calculated Local Estimate, Resource Statement, Object Estimate, Consolidated Estimate and Contract Price added at Annex A.

Construction cost at current price level with VAT – UAH 155,271,980.

Conclusions

The section describes the calculation of estimated cost of foundation construction of building, provides technical and economic indicators of construction and performed the calculation of the contract price. According to the results of calculations, the construction cost amounted to UAH 155,271,980.

GENERAL CONCLUSIONS

In architectural and construction section, the spatial planning solutions of the building were considered, engineering communications were considered in detail, and the issues of heat preservation and provision of normative conditions of room lighting with constructive solutions were skillfully combined. The description of constructive decisions and the general plan is executed.

In calculation and design section analyzes the engineering and geological conditions of the construction site for the projected building and identifies the soil layers with their physical characteristics. The depth of the foundation sole is determined, taking into account the basic design conditions, hydrogeological and relief features of the building site.

The section collects loads, calculates the load on the pile and the required number of piles in the bush. As a result, a layout of piles and a grid diagram were developed

In organizational and technological section, general provisions on organization of construction from the preparatory stage to quality control of work performed were considered. The method statement for roofing has been developed, construction master plan has been developed and a work schedule has been drawn up.

A more detailed description of all these operations is given, taking into account the needs for skilled workers, machines and mechanisms. The main part of the report discusses the main elements of labor protection, fire safety measures and safety instructions for installer.

In economical section describes estimated cost calculation of foundation construction of building, provides technical and economic indicators of construction and performed the calculation of the contract price. According to the results of calculations, the construction cost amounted to UAH 155,271,980.

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LIST OF REFERENCE SOURCES

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REVIEW

For qualification work of student Amer Abdelrahman Mohamed Salaheldin Mohamed: **“**Construction project of multi-storey building in Dnipro city”.

The relevance of this project is the implementation of modern design and technological solutions to increase living space with population growth and infrastructure development, which positively affects the development of the city, and the speed of construction and optimization of the construction process confirms the relevance of this project.

The paper considers: general architectural and construction design; design of building structures; organizational and technological design; economic component of construction; labor protection and environmental protection.

Calculations and substantiation of the main structural elements of the building and detailed method statement, which are reflected in working drawings.

I think that the work is done at high level and deserves grades **“excellent – 90 points”**.

Reviewer

Director of LLC "Dniprospetsservice-Ukraine" P.V. Krymchak

RESPONSE

Supervisor of qualification work
Ph.D., Associate Professor of Construction,
Geotechnics and Geomechanics Department,
Ishchenko Oleksii Kostyantinovich,

For qualification work of student Amer Abdelrahman Mohamed Salaheldin Mohamed: **“**Construction project of multi-storey building in Dnipro city”.

Qualification work includes the following sections: architectural and construction, design and construction, organizational and technological and technical and economic.

The main volume-planning and constructive decisions are selected and substantiated in the work. The technology and organization of construction works are determined. A technological map, construction master plan and calendar schedule of works have been developed. The calculation of driven pile for raft fuondation according to the initial data is performed. The design and estimate documentation are made.

During work the set goal is reached completely. The very high degree of independence of execution deserves attention. Also noteworthy is the creativity of thinking in implementation of architectural and construction solutions acquired by the applicant during work.

I believe that the qualifying work of Amer Abdelrahman Mohamed Salaheldin Mohamed is performed at high level and deserves grades **“excellent – 92 points”**.

Supervisor of qualification work
Ph.D., Assoc. Prof. BGGM O.K. Ishchenko