Ministry of Science and Education of Ukraine
"Dnipro University of Technology"

FACULTY OF CIVIL ENGINEERING

Department of Construction, Geotechnics and Geomechanics

EXPLANATORY NOTE
qualifying work for a bachelor's degree

student **Abodef mouhab mamdouh ibrahim**
(ПІБ)

academic group **192-17-IC**
(шифр)

specialties 192 Construction and civil engineering
(код і назва спеціальності)

according to the educational and professional program Construction and Civil Engineering
(офіційна назва)

on the topic «Cottage in Cairo City (Egypt) »
(name by order of the rector)

Leaders	**Surname, initials**	**Score on scale**		**Signature**
		Rating	**institutional**	
qualification work, sections				
Architectural and construction				
Reinforced concrete structures				
Technology and organization of construction				
Construction economics				

Reviewer				

Normocontroller				

Dnipro
2021

APPROVED:
Head of Department
of Construction, Geotechnics and Geomechanics

_____
(signature) (surname, initials)

«__»_____ 2021year

TASK
for qualifying work
bachelor's degree

student Abodef mouhab mamdouh Ibrahim academic group 192-17-IC
(signature) (surname, initials)
specialties 192 Construction and civil engineering
according to the educational and professional program Construction and Civil Engineering
(official name)
on the topic «Cottage in Cairo City (Egypt)»,
approved by the order of the rector of NTU "Dnieper Polytechnic" from 26.05.21 2021 № 296-c

Section	**Content**	**Term implementation**
Architectural and construction	Brief description, spatial planning decisions and purpose of the survey object	
Reinforced concrete structures	Constructive decisions of elements of object of inspection	
Technology and organization of construction	technological solutions for the production of construction works	
Construction economics	Economic justification of construction production	

Task issued _____NechitailoO.Ye.
(signature of the head) (surname, initials)

Date of issue _____

Date of submission before the examination of the committee _____

Accepted for execution _____Abodef mouhab mamdouh ibrahim
(signature of the head) (surname, initials)

ABSTRACT

Qualifying work: 136 pp., 65 tables, 41 Figure, 52 sources.

FACILITY BUILDING, DESIGN, TECHNOLOGY AND ORGANIZATION OF WORKS.

Object of work - build in New Cairo in Katameya.

The purpose of the project to design ancivil house, using progressive methods of construction production.

Results and their novelty. Selected and substantiated basic design and construction solutions. The calculation of the roof enclosure structures was performed. The design of the construction scheme, the collection and calculation of loads. The calculation of the coating plates, the beams on which they are supported and the columns was calculated. The rational scheme of combination of technological processes is chosen. The project of work execution and corresponding technological maps is developed. The analysis of thermotechnical features of the calculation of the inversion roof was performed.

Interconnection with other works - continuation of innovative activity of the Department of Civil Engineering, Geotechnics and Geomechanics of NTU "Dnipro university of technology" in the field of industrial and civil engineering and civil engineering.

Scope - civil engineering construction technology.

The practical importance of the work is to increase the technical, economic and cultural-social aspects of civil construction.

CONTENTS

INTRODUCTION

Construction arose at the dawn of human society in the process of man's struggle with natural conditions as a means of protection from atmospheric phenomena. Over the past millennia, construction has come a long way from primitive settlements to modern cities.

The main purpose of construction: to create the necessary for human existence living environment. Masterpieces of construction production originate about 3.5 thousand years ago. Subsequently, low-quality ceramic tiles appeared. Floors and walls were decorated with faience tiles.

The first cities were built in the correct geometric shapes, which simplified the supply of water supply channels to them. Subsequently, the cities had a round shape, then rectangular. Construction was carried out on artificial rises due to the threat of flooding.

Later, multi-storey brick houses were built, where there were separate rooms intended for rent. The buildings had rectangular plans, divided by a series of columns and pillars, which divided the building into several parts. Knowledge of the characteristic features of the region, wind direction, precipitation load and national traditions were used in the construction.

Considering the modern definition of construction, it has two definitions: it is a branch of material production, which creates funds for production and non-production purposes; it is a process of erection of buildings and structures, as well as work on their operation. The construction industry includes contractors, design, engineering and research organizations and institutions. The basis of the industry are construction and installation organizations and transport and industrial enterprises serving them. The main task of the construction industry is to create construction products and ensure high efficiency of construction production.

Construction production - a set of interconnected labor processes of production relations aimed at obtaining construction products.

SECTION 1.ARCHITECTURAL AND CONSTRUCTION

Village Garden in Katameya is located in new cairo in Katameya .

The Total area of project is about 285,000 m² and the total cost of the is about 550 million L.E .

Owner of project is Palm Hills

The architect is ShehabA.Mazhar

The general contractor is Orascom Construction Industries

And structural consultant is Adel EL Atar&Talaat Abdel Fattah and electro mechanical consultant is Crown Home Consultant .

The project Director is E. Khaled Amen and project manager is E. Dalia Ramadan.

The Project consist of : 1- 56 Condominium appartments . 2- 79 Villa divided into 2 types :

Villa Type 1 : 55 villa. Villa Type 2 : 24 villa.

3- 6 Twin house , each twin house consist of 6 symmetric villa.

1-Condominium

- It consist of 56 unit and area of each unit is 945 m² - Each unit consist of: 1- Basment . 2- ground floor . 3- 4 typical floor .

-The one floor consist 4 apartment each apartment consist of :

- 2 Bed room - Living room - 2 Bathroom - Dining room - reception

2-stand alone villa type one:

-Total area equal 154 m2

- It consist of :

1- Ground Floor consist of: - Reception - toilet - Dining room - Driver room - 2 bathroom - Nanny room - kitchen

2- First Floor consist of :

- 3 Bedroom - Family living - 2 bath

3-stand alone villa type two:

- the total area equal 121 m2 and consist of : - Ground Floor - First floor

4-Twine House

-Total area equal 717 m2

- It consist of 6 villas each villa area is (15×8) and each villa consist of - Ground Floor - First Floor

Dwelling houses are intended for permanent residence of citizens. Provision of premises in residential buildings for industrial purposes is prohibited. This building provides the following facilities: toilets, bathrooms, guest rooms, kitchens, bedrooms, basement, garage.

Construction of a two-storey cottage is underway in the city of Kamyanske, which belongs to the second climatic region. This construction area is characterized by:

- long and cold winter;

- a lot of precipitation in the spring;

- hot summer.

The following structural elements are accepted in the designed building:

- foundations - prefabricated reinforced concrete belts;

- walls - expanded clay-concrete blocks of 360 mm;

- partitions - brick 120 mm;

- floor slabs and coverings - reinforced concrete multi-hollow panels;

- stairs - prefabricated wooden;

- roof - pitched metal tiles;

- floors - ceramic tiles, board;

- drainage - external organized.

The cottage is being built in the city of Kamyanske. In this city the natural climate is temperate, the soils are loess, loam, the second type of subsidence. The depth of soil freezing is 1 m - 1.1 m. During the research period, the groundwater level was recorded at a depth of 1.2 m. The relief is flat.

The following winds prevail in this region: in summer - north and north-west, in winter - east and north-east, wind speed 440Pa, snow load - 1170Pa. Construction is underway in an area with normal geological conditions.

Maximum air temperature plus 24 ° C; minimum - minus 26 ° C. The coldest month is January, the warmest is July, and the rainiest month is October. The average annual temperature is plus 14 ° C. The average annual rainfall is 75 mm. The building has two light sources - natural and artificial. Natural lighting is provided by windows and a source of artificial lighting

there are fluorescent lamps. For the inter-storey connection, the designed building is equipped with stairs. The projected building is a residential building. This is a capital-type building, constructed in compliance with the requirements established by law and other regulations.

Under the housing of an individual means a house, apartment, other premises, designed and suitable for permanent residence in them. An isolated apartment in a residential building is an apartment.

The designed building is located on a flat area with a general slope for drainage from west to east.

Soils lie under the building - loess-like loam of the second type of deposition, which is marked by porosity up to 15%, is very strong. The area around the building is equipped with greenery, deciduous and coniferous trees, shrubs, lawns, and next to the building there is a playground. Explication to the master plan and symbols indicated on the sheets of drawings - sheet 3.

1.1 Foundations

The foundation, as you know, is technology, correctly performed calculations and well-made foundation guarantee in the future reliable and long-term operation of the building, as well as the absence of any complications in the future.

Given that the foundation is required to distribute the load created by the aboveground part of the structure on the ground, it must meet certain requirements. It is worth noting such requirements as: sufficient strength, impossibility of overturning and movement in the soil, resistance to low temperatures and groundwater, compliance with the service life of the structure durability of the foundation, efficiency, environmental friendliness

and the ability to manufacture in specific conditionsRequirements for foundations: strength, stability, durability, frost resistance, efficiency, resistance to soil moisture.Prefabricated reinforced concrete foundations are accepted in the designed building.Depth of laying in connection with existence of the cellar is 2,5 m. The mark of a sole of the base - 3,100 m.

The thickness of the foundation wall is 400 mm.

The width of the foundation cushion is 600 mm.

The basement walls are prefabricated reinforced concrete blocks, so they require vertical coating and horizontal waterproofing of rolled materials.

The foundations of concrete blocks are laid on a cement-sand mortar with obligatory bandaging of seams. The thickness of the seams will be 20 mm. The connection between the prefabricated foundations of the longitudinal and transverse walls is provided by ligation of the blocks and laying in the horizontal seams of the walls of round steel 8-10 mm.

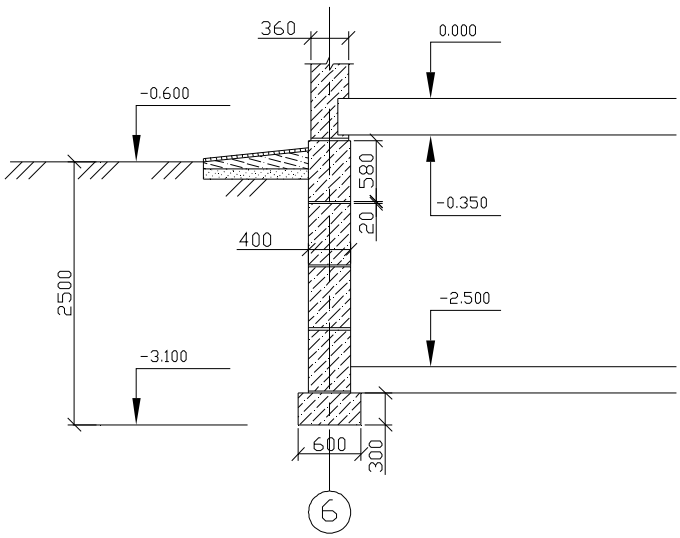


Fig.1 Scheme of the foundation

1.2 Waterproofing the foundation

Foundations are subject to moisture, moisture penetrating through the soil

The foundation rises to the top, which leads to dehumidification of the basement walls and the first floor. this type of waterproofing is called horizontal waterproofing.

Vertical waterproofing is arranged by painting the outer surface of the foundation walls with hot bitumen.

Waterproofing of the ground part of the walls is arranged at a level not less than 150 mm above ground level. It is performed along the entire length of the outer and inner walls of two layers of roofing felt or roofing felt, glued with appropriate mastic. Its purpose is not to miss the capillary rise of soil moisture and wetting of the walls.

1.3 Walls and partitions.

Walls are an important structural element of a building, which serves not only as a vertical enclosing structure, but also as a load-bearing element on which floors and coverings rest. The walls of buildings must meet the following requirements: static - be strong and stable; fire-fighting - depending on the degree of fire resistance of the building to have a limit of fire resistance; thermal - to provide the necessary temperature - humidity regime in the premises; acoustic - to have enough soundproofing qualities for

enclosing premises; special - depending on the purpose of the enclosing premises; economic - to have a design that allows construction of its industrial methods at the lowest labor and monetary costs.

The walls of the building are made both external and internal. The outer walls are made with a thickness of 360 mm,, as a heater adopted PENOPLEX type 35, 50 mm thick, on the inside of the walls are finished with sheets of drywall. The inner walls are 360 mm thick. Partitions brick δ = 120 mm.

Door and window openings in walls and partitions are covered with prefabricated reinforced concrete bridges (see Appendix № 1, 2, 3). In this building brick partitions, -120 mm thick, on M75 solution are used.

Brick partitions are made on a complex mortar with bandaging joints and plastered on both sides with cement mortar.

Such partitions are moisture resistant and non-combustible. Brick partitions are arranged with a thickness of ½ and ¼ bricks. Partitions with a thickness of ½ bricks are made unreinforced.

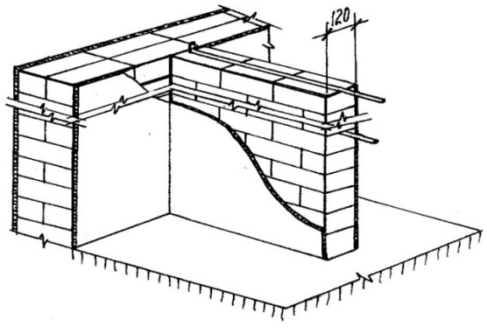


Fig.2 Brick partition.

1.4 Stairs

Stairs are a structural element that serves as a connection between floors, as well as for the evacuation of people in the house.

Stairs consist of marches and platforms.

The march is a structure that consists of steps that support the beams. Sites are floor and mezzanine.

For safety when moving marches and platforms are equipped with a fence with handrails 900 mm high. The size of the steps is 250 x 152 mm.

In stairs, the vertical face is called a step, and the horizontal - a tread. All steps of the march must have the same shape, except for the top and bottom, which are called friezes.

1.5 Overlapping

Slabs are reinforced concrete products used in construction for the floor of the lower floor and, accordingly, serve as a floor for the top.

The panels are placed on the walls on a layer of cement-sand mortar. Depth of support

the ends of the panels must be at least 100mm. To protect the ends of the panels from crushing above the lying wall, as well as to improve the heat and sound insulation of the holes at the ends of the panels are laid with lightweight concrete. The seams between the long sides of the panels in order to give the floor the properties of a rigid monolithic diaphragm carefully filled with cement mortar grade not less than 100.

This building uses prefabricated reinforced concrete multi-hollow panels of the following sizes:

- PC 51-12-8 - 5 pcs .;

- PC 42-12-6 - 3 pcs .;

- PC 24-12-8 - 12 pcs .;

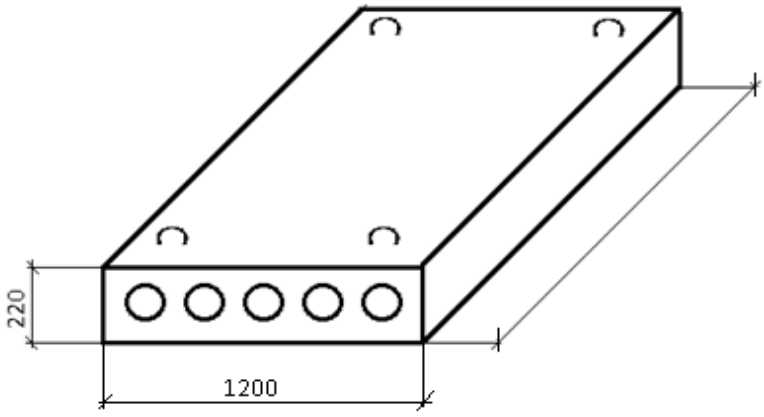


Fig.3 Reinforced concrete slab.

1.6 Coating

The covering is the top vertical constructive element of the building which protects its internal space from atmospheric influences.

Requirements for roofs:

- water resistance;

- durability;

- minimum operating costs.

Prefabricated reinforced concrete slabs are accepted in this building. They are placed on the walls.

Cover thickness 220 mm. Depth of support of the ends of panels should be not less than 100 mm. To protect the ends of the panels from being

crushed by the overlying wall, as well as to improve the heat and sound insulation of the holes at the ends of the panels

laid with lightweight concrete. The seams between the long sides of the panels in order to give the floor the properties of a rigid monolithic diaphragm carefully filled with cement mortar grade not less than 100. In this project plates of the following standard sizes are used:

- PC 51-12-8 - 5 pcs .;

- PC 42-12-6 - 3 pcs .;

- PC 24-12-8 - 12 pcs .;

1.7 The roof

Roof - the upper structural element of the roof or roof, which directly insulates the building from external influences (sun, precipitation, wind).

According to the number of slopes and their geometric shape of the roof are divided into: single-slope, double-slope, multi-slope, dome, complex shape, flat with a slight slope for water runoff. The roof in the designed building is pitched with metal tiles.

Metal as a roofing material occupies a leading position and is in greatest demand. It successfully combines such qualities as reliability, durability, aesthetics and affordability. An external organized drainage system has been designed in this building.

At the organized external drainage the water flowing down from a roof, on gutters is taken away to external drainage pipes. The main problem with which

it is necessary to face at the device of this type of drainage, it is icing of eaves and a joint of slopes, and also wetting of protective designs. To solve this problem it is necessary to carry out a set of measures (the use of anti-icing systems for roofs). Particular attention should also be paid to the methods of fastening the individual elements to each other and the installation of gutters (trays).

Any external drainage system consists of horizontal wall or suspended gutters, vertical gutters and drains, through which the vertical elements of the gutter system are connected to the horizontal elements.

1.8 Jumpers

A jumper is a structure that covers the slots in the walls and supports part of the wall. They are strong elements that provide any architectural design of buildings and structures. The main ability of the jumper in perception, in addition to its own weight and the weight of the wall above, then transmits to the walls of the load from the floor elements and other structures. Load-bearing jumpers accept the load only from its own weight and the weight of the wall above.

In this building, I designed reinforced concrete bridges, block type. They are made of prestressed concrete.

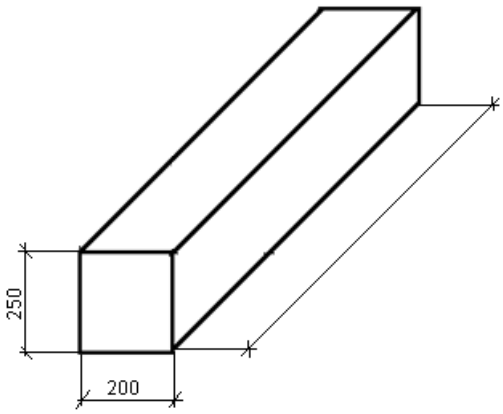


Fig.3 Jumper.

SCOPE OF PROJECT

Project Parameters:

- Project Vision:

Deliver variety of Residential Buildings and villas of different designs and sizes to fulfill the needs of different clients , all to be integrated with an infrastructural Network , landscaping forming a massive residential compound.

Development Objectives:

The scope will consist of designing & supervising the construction of:

1. 56 condominum and associated Car Parking areas for building's residents.
2. 79 villas composed of two types : 55 villa for type 1 and 24 for type 2 .
3. 6 twin houses

Project Scope:

The Project consists of Several activities including:

1. Mobilization
    - Surveying.
    - Site Cleaning.
2. Earth Works
    - Excavation works.
    - Backfilling works.
    - Grading.
3. Civil works
    - Formwork.
    - Pouring concrete.
    - Reinforcement.
4. Finishing Works
    - External painting Works.
    - External Masonary.
    - Internal Masonary.

- External Calm shell.

5.Electromechanical Works

- External electric works.

6. Sanitary Works

- External Sanitary Systems.

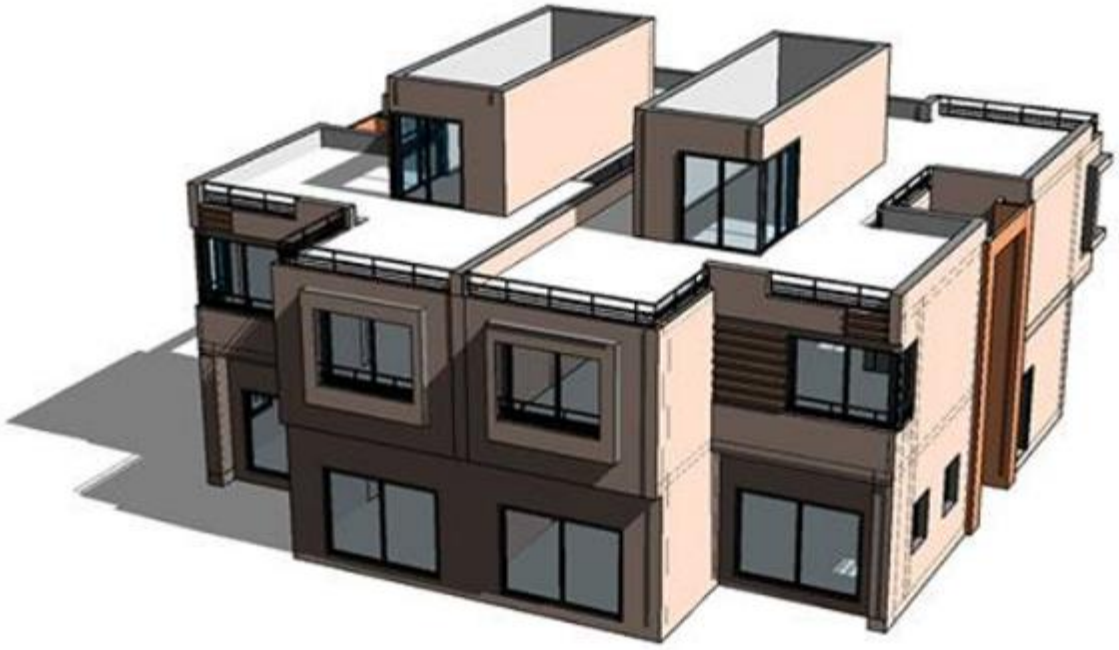
Project Total cost is Approx. 550,000,000 EGP.

Other project activities that are not included in scope:

- Infrastructure systems.

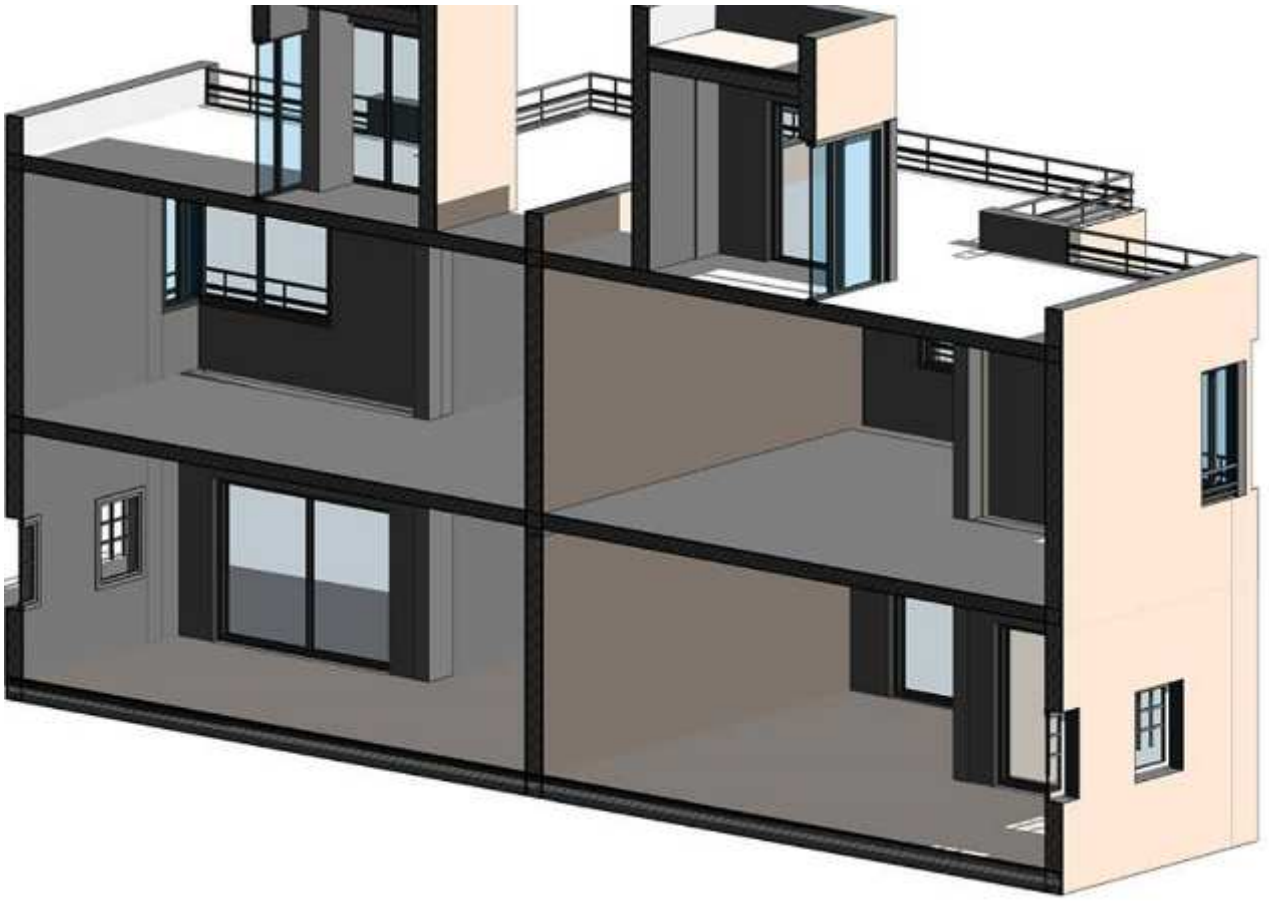
- Internal plumbing and sanitary works.

Drawings of Building

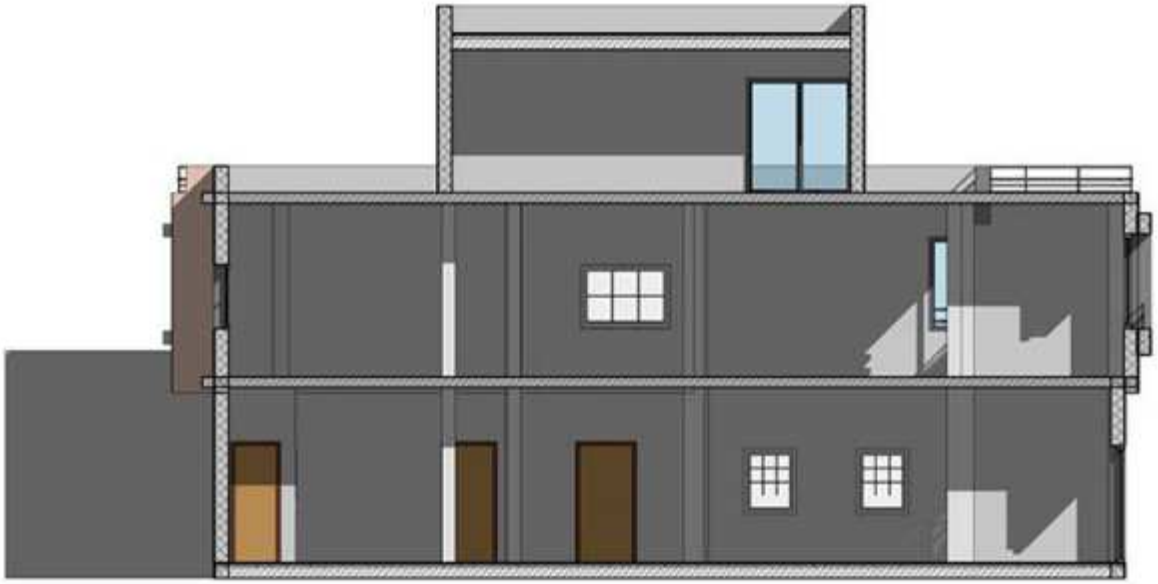


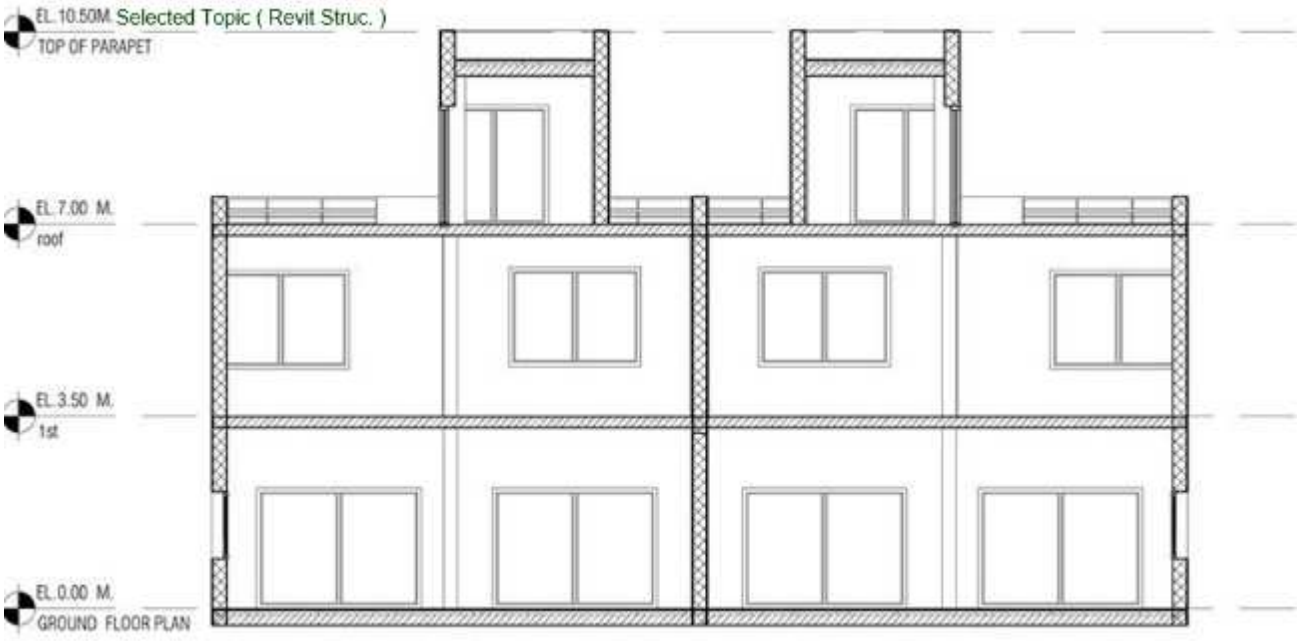
Pic. 1. 3d view of building

Pic 2

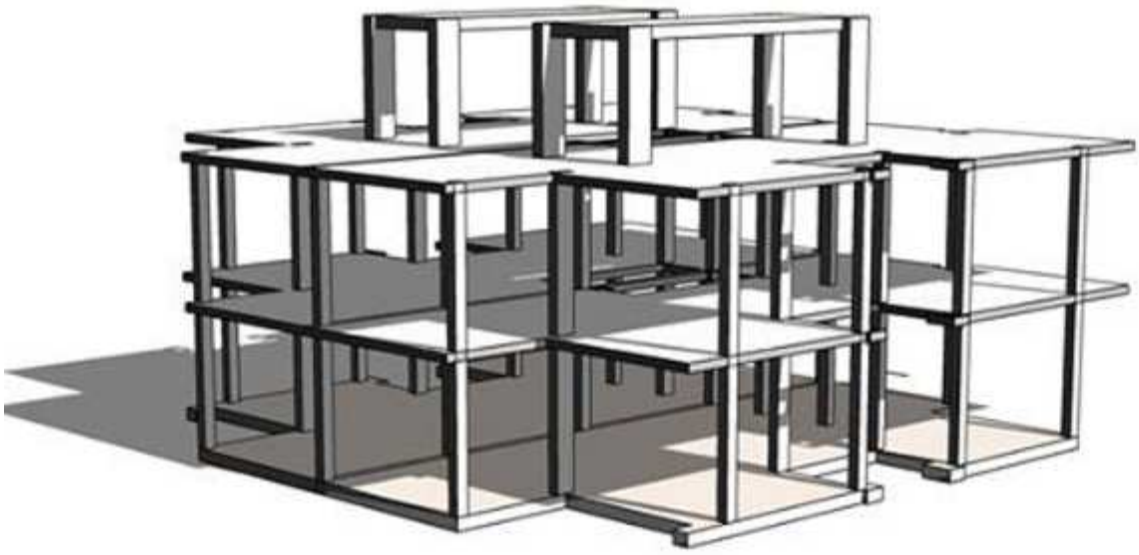


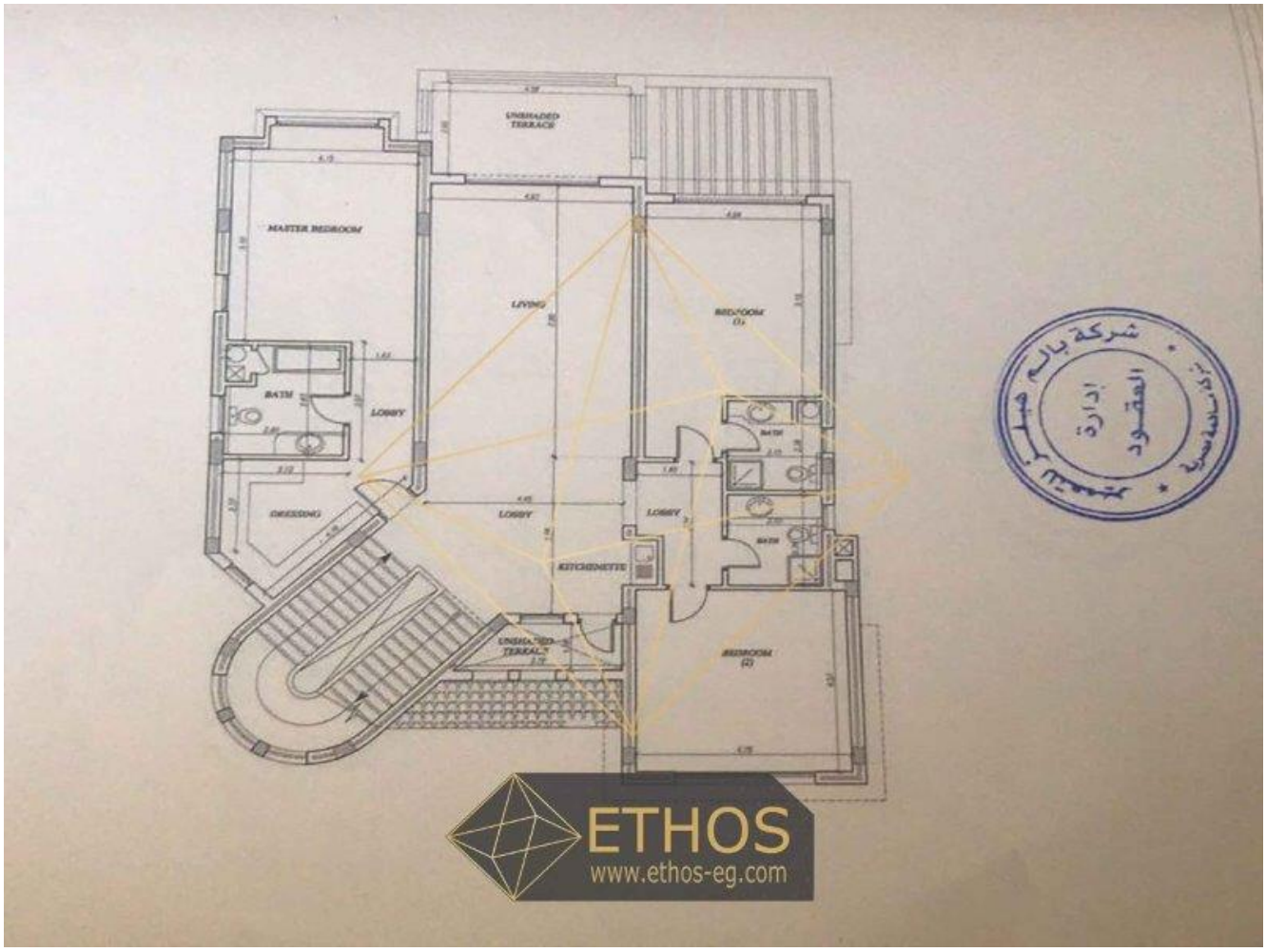
Pic 3




EL. 10.50M Selected Topic (Revit Struc.)
TOP OF PARAPET
EL. 7.00 M.
roof
EL. 3.50 M.
1st
EL. 0.00 M.
GROUND FLOOR PLAN

Pic 4




UNROOFED TERRACE
MASTER BEDROOM
LIVING
BEDROOM (1)
BATH
LOBBY
DRESSING
LOBBY
LOBBY
KITCHENETTE
UNROOFED TERRACE
BEDROOM (2)
ETHOS
www.ethos-eg.com
شركة بالم هيلز
إدارة العقود


Terrace
Reception
Dining
Open Kitchen
Master Bedroom
M.Bath
Bath
Bedroom

CONDOMINIUM (Type-C4)

SECOND FLOOR PLAN

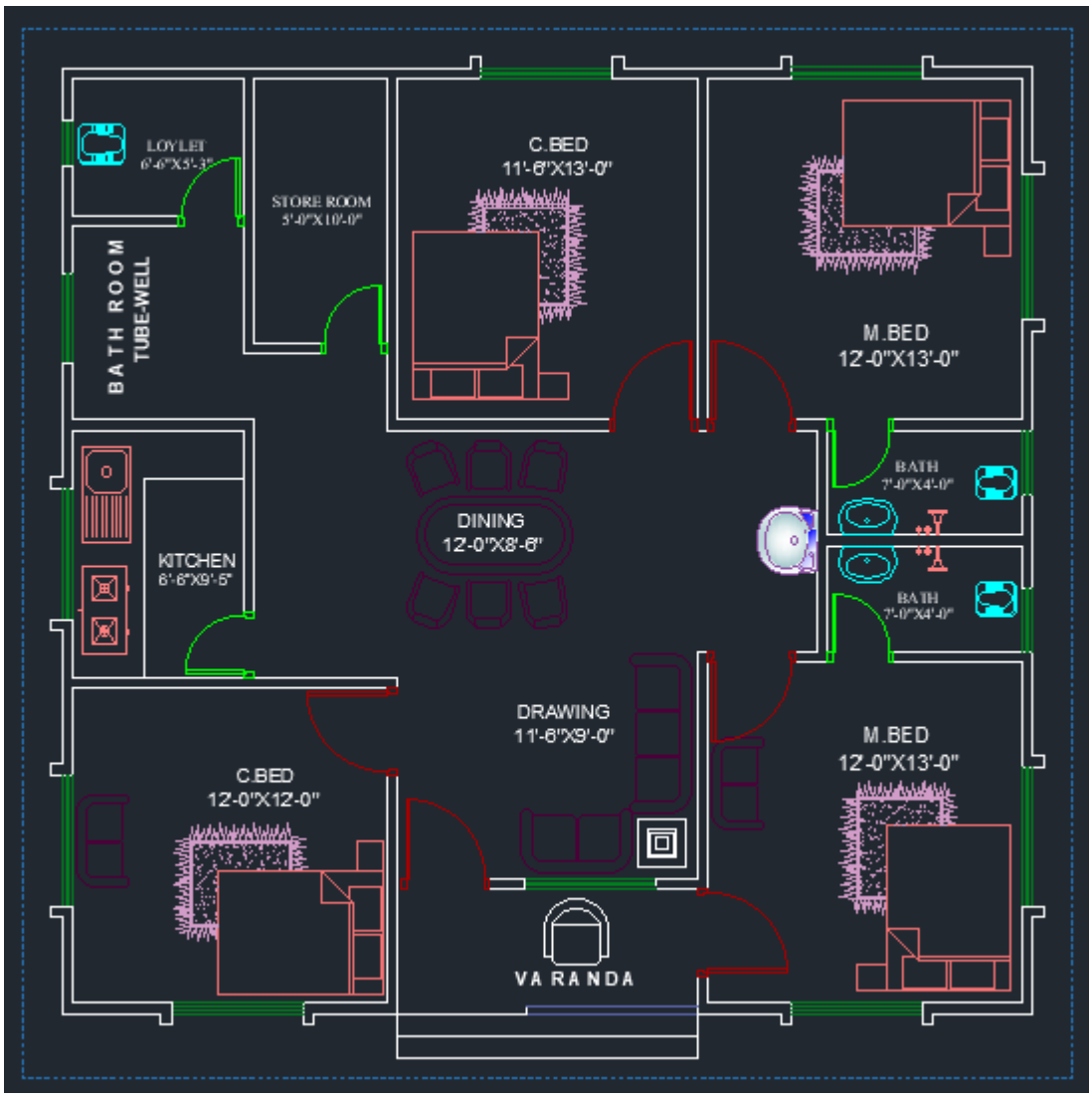
PALM HILLS DEVELOPMENT VILLAGE GARDENS KATAMYA

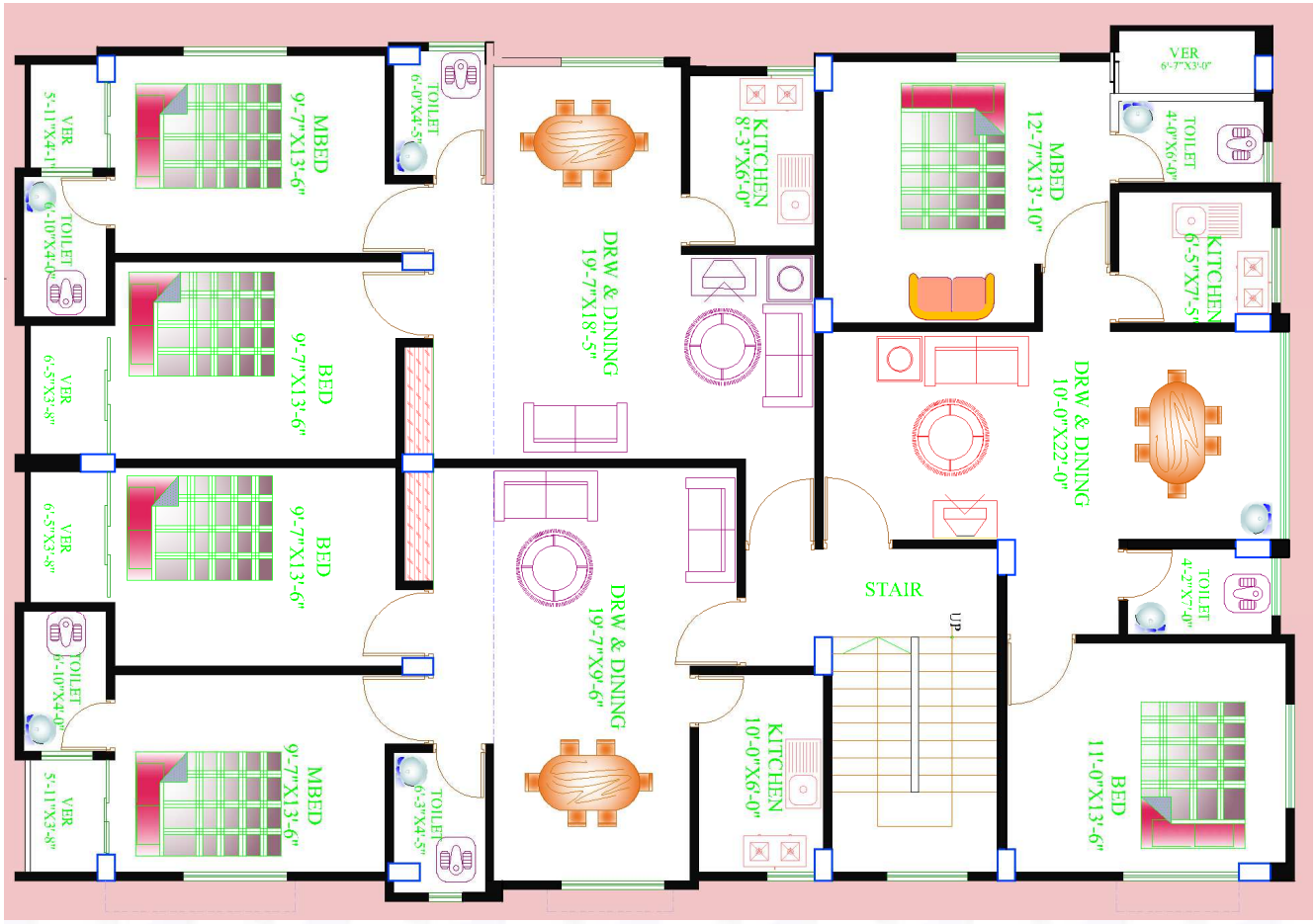
Project Code : ---

Scale :

Sheet No: ---

Architect
Shehab A. Mazhar


LOY LET
6'-6"X3'-3"
STORE ROOM
5'-0"X10'-0"
C.BED
11'-6"X13'-0"
M.BED
12'-0"X13'-0"
BATH ROOM
TUBE-WELL
BATH
7'-0"X4'-0"
DINING
12'-0"X8'-6"
KITCHEN
6'-6"X9'-5"
BATH
7'-0"X4'-0"
DRAWING
11'-6"X9'-0"
M.BED
12'-0"X13'-0"
C.BED
12'-0"X12'-0"
VA RANDA


VER
6'-7"X3'-0"
TOILET
4'-0"X6'-0"
MBED
12'-7"X13'-10"
KITCHEN
6'-5"X7'-5"
DRW & DINING
10'-0"X22'-0"
TOILET
4'-2"X7'-0"
BED
11'-0"X13'-6"
STAIR
UP
KITCHEN
10'-0"X6'-0"
DRW & DINING
19'-7"X9'-6"
MBED
9'-7"X13'-6"
TOILET
6'-3"X4'-5"
VER
5'-11"X3'-8"
TOILET
5'-10"X4'-0"
BED
9'-7"X13'-6"
VER
6'-5"X3'-8"
BED
9'-7"X13'-6"
VER
6'-5"X3'-8"
DRW & DINING
19'-7"X18'-5"
TOILET
6'-0"X3'-5"
KITCHEN
8'-3"X6'-0"
MBED
9'-7"X13'-6"
VER
5'-11"X4'-1"
TOILET
5'-10"X4'-0"

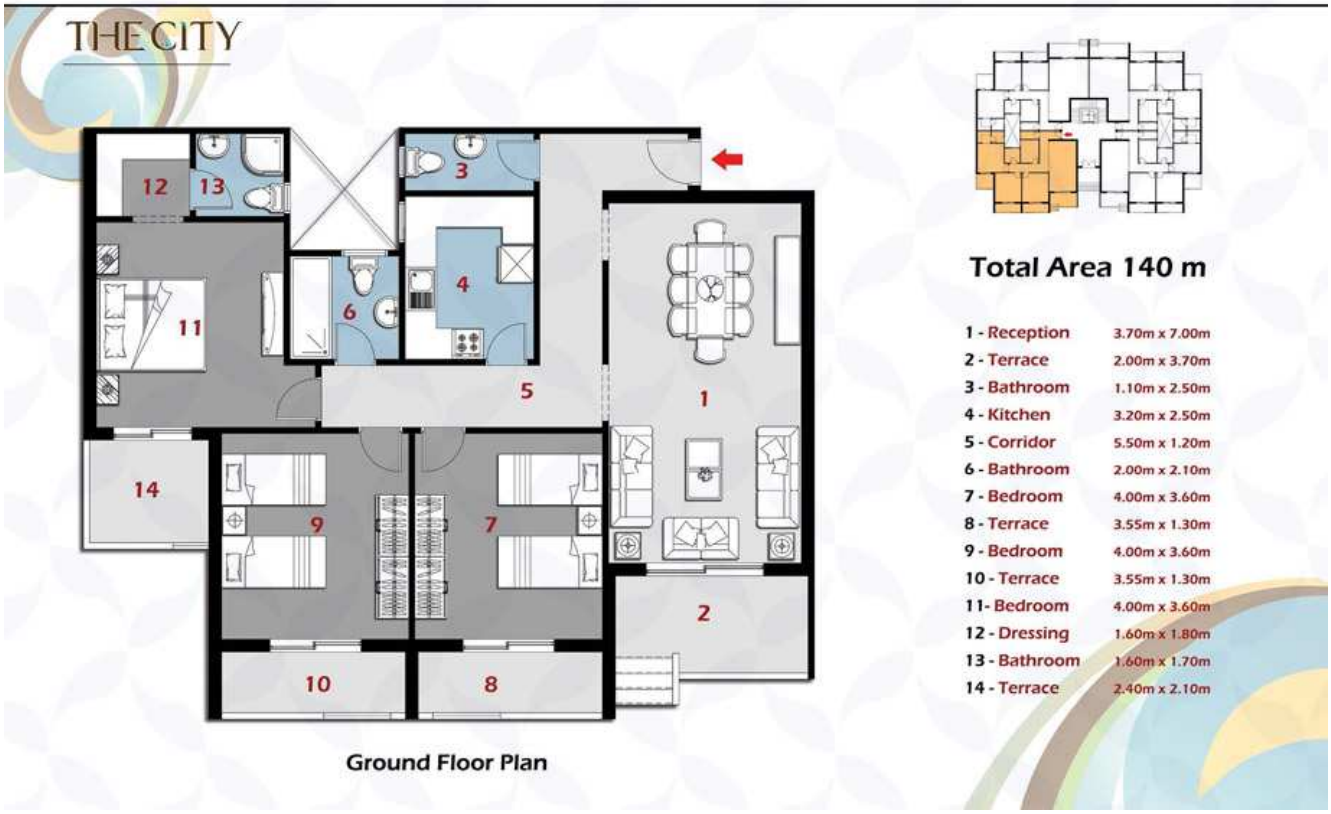

THE CITY
12
13
3
4
6
11
5
1
14
9
7
2
10
8
Ground Floor Plan
Total Area 140 m
1 - Reception 3.70m x 7.00m
2 - Terrace 2.00m x 3.70m
3 - Bathroom 1.10m x 2.50m
4 - Kitchen 3.20m x 2.50m
5 - Corridor 5.50m x 1.20m
6 - Bathroom 2.00m x 2.10m
7 - Bedroom 4.00m x 3.60m
8 - Terrace 3.55m x 1.30m
9 - Bedroom 4.00m x 3.60m
10 - Terrace 3.55m x 1.30m
11- Bedroom 4.00m x 3.60m
12 - Dressing 1.60m x 1.80m
13 - Bathroom 1.60m x 1.70m
14 - Terrace 2.40m x 2.10m

Table. 1 - Activity coding of project

ID	Activity Code
M. Sur.	Site Surveying
Ex.	Excavation
B.F.	Backfill
FW. PC. Foot.	Form Work Plain Concrete Footing
Pour. Pc. Foot.	Pouring concrete Plain Concrete Footing
R. FW. Pc. Foot.	Remove Formwork Plain Concrete Footing
FW. Rc. and S. Foot.	Form Work Reinforced Concrete and semels Footing
RFT. Rc. and s. Foot.	R.F.T Reinforced Concrete and semels Footing
Pour. Rc. and s. Foot.	Pouring concrete Reinforced Concrete and semels Footing
R. FW. Rc. and s. Foot.	Remove Formwork Reinforced Concrete and semels Footing
Ins. Foot.	Insulting Reinforced Concrete and semels Footing
FW. SoG. B	Form Work Slab on grade Basement
Rft. SOG. B	R.F.T Slab on grade Basement
Pour. SOG. B	Pouring concrete Slab on grade Basement
R. FW. SOG. B	Remove Formwork Slab on grade Basement
Fw. Col. B	Form Work Columns Basement
Rft. Col. B	R.F.T Columns Basement
Pour. Col. B	Pouring concrete Columns Basement
R.FW. Col.B	Remove Formwork Columns Basement
FW. B and s. G.	Form Work Beams and slabs Ground floor
Rft. B and s.G .	R.F.T Beams and slabs Ground floor
Pour. B and s. G.	Pouring concrete Beams and slabs Ground floor
R. FW. B and s.G.	Remove Formwork Beams and slabs Ground floor
Fw. Col. G.	Form Work Columns Ground floor
Rft. Col. G.	R.F.T Columns Ground floor
Pour. Col. G.	Pouring concrete Columns Ground floor
R. FW. Col. G.	Remove Formwork Columns Ground floor
FW. B and s. st.	Form Work Beams and slabs First Floor
Rft. B and s. st.	R.F.T Beams and slabs First Floor
Pour. B and s. st.	Pouring concrete Beams and slabs First Floor
R. FW. B and s. st.	Remove Formwork Beams and slabs First Floor
Fw. Col. st.	Form Work Columns First Floor
Rft. Col. st.	R.F.T Columns First Floor
Pour. Col. st.	Pouring concrete Columns First Floor
R. FW. Col. st.	Remove Formwork Columns First Floor
FW. B and S. nd.	Form Work Beams and slabs Second Floor
Rft. B and S. nd .	R.F.T Beams and slabs Second Floor
Pour. Band S. nd.	Pouring concrete Beams and slabs Second Floor
R. FW. B and S .nd.	Remove Formwork Beams and slabs Second Floor
Fw. Col. nd.	Form Work Columns Second Floor
Rft. Col. nd.	R.F.T Columns Second Floor
Pour. Col. nd.	Pouring concrete Columns Second Floor
R. FW. Col. nd.	Remove Formwork Columns Second Floor
FW. B. and s. rd.	Form Work Beams and slabs third Floor
Rft. B. and s. rd.	R.F.T Beams and slabs third Floor
Pour. B. and s. rd.	Pouring concrete Beams and slabs third Floor
R. FW. B. and s. rd.	Remove Formwork Beams and slabs third Floor

Fw. Col. rd.	Form Work Columns third Floor
Rft. Col. rd.	R.F.T Columns third Floor
Pour. Col. rd.	Pouring concrete Columns third Floor
R. FW. Col. rd.	Remove Formwork Columns third Floor
FW. B and s. th.	Form Work Beams and slabs Forth Floor
Rft. B and s.th .	R.F.T Beams and slabs Forth Floor
Pour. B and s. th.	Pouring concrete Beams and slabs Forth Floor
R. FW. B and s.th.	Remove Formwork Beams and slabs Forth Floor
Fw. Col. th.	Form Work Columns Forth Floor
Rft. Col. th.	R.F.T Columns Forth Floor
Pour. Col. th.	Pouring concrete Columns Forth Floor
R. FW. Col. th.	Remove Formwork Columns Forth Floor
FW. B and s. roof.	Form Work Beams and slabs Roof
Rft. B and s.roof .	R.F.T Beams and slabs Roof
Pour. B and s. roof.	Pouring concrete Beams and slabs Roof
R. FW. B and s.roof.	Remove Formwork Beams and slabs Roof
E. B. M.	External Basement Masonary
E. G. M.	External Ground floor Masonary
I. G. M.	Internal Ground floor Masonary
E. St. M.	External First Floor Masonary
I. St. M.	Internal First Floor Masonary
E. nd. M.	External Second Floor Masonary
I. nd. M.	Internal Second Floor Masonary
E. rd. M.	External third Floor Masonary
I. rd. M.	Internal third Floor Masonary
E. th. M.	External Forth Floor Masonary
I. th. M.	Internal Forth Floor Masonary
E. R. M.	External Roof Masonary
E. Ch. G.	External Calm Shell Ground floor
E. ch. st.	External Calm Shell First Floor
E. ch. nd.	External Calm Shell Second Floor
E. ch.rd.	External Calm Shell third Floor
E. ch. Th.	External Calm Shell Forth Floor
E. ch. roof.	External Calm Shell Roof
E.P.F	External External Painting
E.M.F.	Entrance Marble Finishing
S.M.F.	Stairs Marble Finishing

1. Condonminiumappartment

ID	Activity	Quantity	Unit	Resources	Prod/ crew	No. crew	Total Pro	Duration	Cost (LE/hr)
Mobilization									
M. Sur.	Site Surveying			1 surveyor + 1 helper +1 total station	----	1	----	1	33
Earth Work									
Ex.	Excavation	6355	M^3	1 Excavator+2 Truck + 1 helper	500	2	1000	7	903
B.F.	Backfill	2195	M^3	1 helper +1 Truck	400	3	1200	2	394
Civil Work									
Foundation									
Footing									
Plain Concrete									
FW. PC. Foot.	Form Work	242	M^3	1 Carpenter + 1 Helper	3	12	36	7	390
Pour. Pc. Foot.	Pouring concrete	242	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. Pc. Foot.	Remove Formwork	242	M^3	1 Carpenter + 1 Helper	----	12	----	1	390
Reinforced Concrete and semels									
FW. Rc and s. Foot.	Form Work	268.9	M^3	1 Carpenter + 1 Helper	3	12	36	8	390
RFT. Rc and s. Foot.	R.F.T	17.45	Ton	1 Steel worker + 1 helper	0.3	10	3	6	325
Pour. Rc and s. Foot.	Pouring concrete	268.9	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. Rc and s. Foot.	Remove Formwork	268.9	----	1 Carpenter + 1 Helper	----	12	----	1	390
Ins. Foot.	Insulting	698	M^2	2 helper	75	4	300	3	90
Basement									
Slab on grade									
FW. SOG. B	Form Work	144	M^3	1 Carpenter + 1 Helper	3	10	30	5	325
Rft. SOG. B	R.F.T	12.15	Ton	1 Steel worker + 1 helper	0.3	10	3	4	325
Pour. SOG. B	Pouring concrete	144	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. SOG. B	Remove Formwork	144	----	1 Carpenter + 1 Helper	----	10	----	1	325
Columns									
Fw. Col. B	Form Work	51.25	M^3	1 Carpenter + 1 Helper	3	8	24	2	260
Rft. Col. B	R.F.T	8.38	Ton	1 Steel worker + 1 helper	0.3	10	3	3	325
Pour. Col. B	Pouring concrete	51.25	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R.FW. Col.B	Remove Formwork	51.25	----	1 Carpenter + 1 Helper	----	8	----	1	260
Ground floor									
Beams and slabs									
FW. B and s. G.	Form Work	168.12	M^3	1 Carpenter + 1 Helper	3	12	42	5	390
Rft. B and s.G .	R.F.T	16.08	Ton	1 Steel worker + 1 helper	0.3	12	3.6	5	390
Pour. B and s. G.	Pouring concrete	168.12	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. B and s.G.	Remove Formwork	168.12	----	1 Carpenter + 1 Helper	----	12	----	1	390
Columns									
Fw. Col. G.	Form Work	51.25	M^2	1 Carpenter + 1 Helper	3	8	24	2	260
Rft. Col. G.	R.F.T	8.38	Ton	1 Steel worker + 1 helper	0.3	10	3	3	325
Pour. Col. G.	Pouring concrete	51.25	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. Col. st.	Remove Formwork	51.25	----	1 Carpenter + 1 Helper	----	8	----	1	260
Second Floor									
Beams and slabs									
FW. B and S. nd.	Form Work	168.12	M^3	1 Carpenter + 1 Helper	3	12	42	5	390
Rft. B and S.nd .	R.F.T	16.08	Ton	1 Steel worker + 1 helper	0.3	12	3.6	5	390
Pour. Band S. nd.	Pouring concrete	168.12	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. B and S.nd.	Remove Formwork	168.12	----	1 Carpenter + 1 Helper	----	12	----	1	390
Columns									
Fw. Col. nd.	Form Work	51.25	M^2	1 Carpenter + 1 Helper	3	8	24	2	260
Rft. Col. nd.	R.F.T	8.38	Ton	1 Steel worker + 1 helper	0.3	10	3	3	325
Pour. Col. nd.	Pouring concrete	51.25	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. Col. nd.	Remove Formwork	51.25	----	1 Carpenter + 1 Helper	----	8	----	1	260
third Floor									
Beams and slabs									
FW. B. and s. rd.	Form Work	168.12	M^3	1 Carpenter + 1 Helper	3	12	42	5	390
Rft. B. and s. rd.	R.F.T	16.08	Ton	1 Steel worker + 1 helper	0.3	12	3.6	5	390
Pour. B. and s. rd.	Pouring concrete	168.12	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. B. and s. rd.	Remove Formwork	168.12	----	1 Carpenter + 1 Helper	----	12	----	1	390
Columns									
Fw. Col. rd.	Form Work	51.25	M^2	1 Carpenter + 1 Helper	3	8	24	2	260
Rft. Col. rd.	R.F.T	8.38	Ton	1 Steel worker + 1 helper	0.3	10	3	3	325
Pour. Col. rd.	Pouring concrete	51.25	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. Col. rd.	Remove Formwork	51.25	----	1 Carpenter + 1 Helper	----	8	----	1	260

Forth Floor									
Beams and slabs									
FW. B and s. th.	Form Work	168.12	M^3	1 Carpenter + 1 Helper	3	12	42	5	390
Rft. B and s.th .	R.F.T	16.08	Ton	1 Steel worker + 1 helper	0.3	12	3.6	5	390
Pour. B and s. th.	Pouring concrete	168.12	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. B and s.th.	Remove Formwork	168.12	----	1 Carpenter + 1 Helper	----	12	-----	1	390
Columns									
Fw. Col. th.	Form Work	51.25	M^2	1 Carpenter + 1 Helper	3	8	24	2	260
Rft. Col. th.	R.F.T	8.38	Ton	1 Steel worker + 1 helper	0.3	10	3	3	325
Pour. Col. th.	Pouring concrete	51.25	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. Col. th.	Remove Formwork	51.25	----	1 Carpenter + 1 Helper	----	8	----	1	260
Roof									
Beams and slabs									
FW. B and s. roof.	Form Work	168.12	M^3	1 Carpenter + 1 Helper	3	12	42	5	390
Rft. B and s.roof .	R.F.T	16.08	Ton	1 Steel worker + 1 helper	0.3	12	3.6	5	390
Pour. B and s. roof.	Pouring concrete	168.12	M^3	1 Pump +1 truck Mix + 1 helper	300	1	300	1	322
R. FW. B and s.roof.	Remove Formwork	168.12	----	1 Carpenter + 1 Helper	----	12	-----	1	390
Masonary									
Basement									
E. B. M.	External	83.33	M^3	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
Ground floor									
E. G. M.	External	83.33	M^3	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
I. G. M.	Internal	332.33	M^2	1 Builder + 2 helper + 1 mwan	25	4	100	4	210
First Floor									
E. St. M.	External	83.33	M^3	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
I. St. M.	Internal	332.33	M^2	1 Builder + 2 helper + 1 mwan	25	4	100	4	210
Second Floor									
E. nd. M.	External	83.33	M^3	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
I. nd. M.	Internal	332.33	M^2	1 Builder + 2 helper + 1 mwan	25	4	100	4	210
third Floor									
E. rd. M.	External	83.33	M^3	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
I. rd. M.	Internal	332.33	M^2	1 Builder + 2 helper + 1 mwan	25	4	100	4	210
Forth Floor									
E. th. M.	External	83.33	M^3	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
I. th. M.	Internal	332.33	M^2	1 Builder + 2 helper + 1 mwan	25	4	100	4	210
Roof									
E. R. M.	External	30	M^3	1 Builder + 2 helper + 1 mwan	25	2	50	1	105
Finishing									
Ground floor									
Calm Shell									
E. Cs. G.	External	390.66	M^2	1 concrete Painter + 1helper	30	7	200	2	184
External Electrical									
First Floor									
Calm Shell									
E. cs. st.	External	390.66	M^2	1 concrete Painter + 1helper	30	7	210	2	184
External Electrical									
Second Floor									
Calm Shell									
E. cs. nd.	External	390.66	M^2	1 concrete Painter + 1helper	30	7	210	2	184
External Electrical									
third Floor									
Calm Shell									
E. cs.rd.	External	390.66	M^2	1 concrete Painter + 1helper	30	7	210	2	184
External Electrical									
Forth Floor									
Calm Shell									
E. cs. Th.	External	390.66	M^2	1 concrete Painter + 1helper	30	7	210	2	184
External Electrical									
Roof									
Calm Shell									
E. cs. roof.	External	130.22	M^2	1 concrete Painter + 1helper	30	7	210	1	184
External Painting									
E.P.F.	External	2396	M^2	1 painter+1 helper	30	15	450	6	394
Marble									
E.M.F.	Entrance	49	M^2	1 Marbling worker + 2 helper	7	2	14	4	75
S.M.F.	Stairs	100	Unit	1 Marbling worker + 2 helper	20	1	20	5	38

Stand alone villa type one

ID	Activity	Quantity	Unit	Resources	Prod/ crew	No. crew	Total Pro	Duration	Cost (LE/hr)
Mobilization									
M. Sur.	Site Surveying			1 surveyor + 1 helper +1 total station	----	1	----	1	33
Earth Work									
Ex.	Excavation	508	M^3	1 Excavator+2 Truck + 1 helper	400	1	400	2	452
BF.	Backfill	462	M^3	1 Loader +1 Truck	200	2	400	2	540
Civil Work									
Foundation									
Footing									
Plain Concrete									
FW. Pc. Foot.	Form Work	16	M^2	1 Carpenter + 1 Helper	3	3	9	2	98
Pour. Pc. Foot.	Pouring concrete	16	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Pc. Foot.	Remove Formwork	16	----	1 Carpenter + 1 Helper	----	3	----	1	98
Reinforced Concrete and semels									
FW. Rc and s. Foot.	Form Work	28.2	M^2	1 Carpenter + 1 Helper	3	3	9	4	98
RFT. Rc and s. Foot.	R.F.T	3.14	Ton	1 Steel worker + 1 helper	0.3	6	1.8	2	195
Pour. Rc and s. Foot.	Pouring concrete	28.2	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Rc and s. Foot.	Remove Formwork	28.2	----	1 Carpenter + 1 Helper	----	3	----	1	98
Ins. Foot.	Insulting	222.6	M^2	2 helper	75	3	225	1	68
Ground floor									
Slab on grade									
FW. SOG. G.	Form Work	19.45	M^2	1 Carpenter + 1 Helper	3	2	6	4	65
Rft. SOG. G.	R.F.T	1.52	Ton	1 Steel worker + 1 helper	0.3	2	0.6	3	65
Pour. SOG. G.	Pouring concrete	19.45	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. SOG. G.	Remove Formwork	19.45	----	1 Carpenter + 1 Helper	----	2	----	1	65
Columns									
Fw. Col. G.	Form Work	5.36	M^2	1 Carpenter + 1 Helper	3	1	3	2	33
Rft. Col. G.	R.F.T	1.165	Ton	1 Steel worker + 1 helper	0.3	2	0.6	2	65
Pour. Col. G.	Pouring concrete	5.36	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Col. G.	Remove Formwork	5.36	----	1 Carpenter + 1 Helper	----	1	----	1	33
First Floor									
Beams and slabs									
FW. B and s. st.	Form Work	33.95	M^2	1 Carpenter + 1 Helper	3	2	6	6	65
R. FW. B and s. st.	R.F.T	3.165	Ton	1 Steel worker + 1 helper	0.3	4	1.2	3	130
Pour. B and s. st.	Pouring concrete	33.95	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
RFT. B. st.	Remove Formwork	33.95	----	1 Carpenter + 1 Helper	----	2	----	1	65
Columns									
Fw. Col. st.	Form Work	5.36	M^2	1 Carpenter + 1 Helper	3	1	3	3	33
Rft. Col. st.	R.F.T	1.165	Ton	1 Steel worker + 1 helper	0.3	2	0.6	2	65
Pour. Col. St.	Pouring concrete	5.36	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Col. St.	Remove Formwork	5.36	----	1 Carpenter + 1 Helper	----	1	----	1	33
Roof									
Beams and slabs									
FW. B and s. roof.	Form Work	33.95	M^2	1 Carpenter + 1 Helper	3	2	6	6	65
R. FW. B and s. roof.	R.F.T	3.165	Ton	1 Steel worker + 1 helper	0.3	4	1.2	3	130
Pour. B and s. roof.	Pouring concrete	33.95	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
RFT. B and s. roof.	Remove Formwork	33.95	----	1 Carpenter + 1 Helper	----	2	----	1	65
Masonary									
Ground floor									
E. G. M.	External	54	M^2	1 Builder + 2 helper + 1 mwan	25	2	50	1	105
I. G. M.	Internal	90	M^2	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
First Floor									
E. St. M.	External	54	M^2	1 Builder + 2 helper + 1 mwan	25	2	50	1	105
I. St. M.	Internal	90	M^2	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
Roof									
E. R. M.	External	18	M^2	1 Builder + 2 helper + 1 mwan	25	2	50	1	105
Finishing									
Ground floor									
Calm Shell									
E.CS. G.	External	270	M^2	1 concrete Painter + 1helper	30	5	150	2	132
External Electrical									
First Floor									
Calm Shell									
E.cs. st.	External	270	M^2	1 concrete Painter + 1helper	30	5	150	2	132
External Electrical									
Roof									
Calm Shell									
E.cs. roof.	External	90	M^2	1 concrete Painter + 1helper	30	5	150	1	132
External Painting									
E.P.F.	External	540	M^2	1 painter+1 helper	30	6	180	3	158

Stand alone villa type two

ID	Activity	Quantity	Unit	Resources	Prod/ crew	No. crew	Total Pro	Duration	Cost (LE/hr)
Mobilization									
M. Sur.	Site Surveying			1 surveyor + 1 helper +1 total station	----	1	----	1	33
Earth Work									
Ex.	Excavation	446	M^3	1 Excavator+2 Truck + 1 helper	400	1	400	2	452
BF.	Backfill	400	M^3	1 Loader +1 Truck	200	2	400	1	540
Civil Work									
Foundation									
Footing									
Plain Concrete									
FW. Pc. Foot.	Form Work	16	M^3	1 Carpenter + 1 Helper	3	2	6	3	65
Pour. Pc. Foot.	Pouring concrete	16	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Pc. Foot.	Remove Formwork	16	----	1 Carpenter + 1 Helper	----	2	----	1	65
Reinforced Concrete and semels									
FW. Rc and s. Foot.	Form Work	25.98	M^3	1 Carpenter + 1 Helper	3	4	12	3	130
RFT. Rc and s. Foot.	R.F.T	3.42	Ton	1 Steel worker + 1 helper	0.3	6	1.8	2	195
Pour. Rc and s. Foot.	Pouring concrete	25.98	M^3	1 pump + 1 mix truck + 1 helper	300	1	300	1	322
R. FW. Rc and s. Foot.	Remove Formwork	25.98	----	1 Carpenter + 1 Helper	----	4	----	1	130
Ins. Foot.	Insulting	218.4	M^2	2 helper	75	3	225	1	68
Ground floor									
Slab on grade									
FW. SOG. G.	Form Work	19.2	M^2	1 Carpenter + 1 Helper	3	2	6	4	65
Rft. SOG. G.	R.F.T	1.82	Ton	1 Steel worker + 1 helper	0.3	2	0.6	4	65
Pour. SOG. G.	Pouring concrete	19.2	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. SOG. G.	Remove Formwork	19.2	----	1 Carpenter + 1 Helper	----	2	----	1	65
Columns									
Fw. Col. G.	Form Work	9	M^3	1 Carpenter + 1 Helper	3	1	3	3	33
Rft. Col. G.	R.F.T	1.19	Ton	1 Steel worker + 1 helper	0.3	2	0.6	2	65
Pour. Col. G.	Pouring concrete	9	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Col. G.	Remove Formwork	9	----	1 Carpenter + 1 Helper	----	1	----	1	33
First Floor									
Beams and slab									
FW. B and s. st.	Form Work	33.47	M^3	1 Carpenter + 1 Helper	3	2	6	6	65
RFT. B and s. st.	R.F.T	2.87	Ton	1 Steel worker + 1 helper	0.3	4	1.2	3	130
Pour. B and s. st.	Pouring concrete	33.47	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. B and s. st.	Remove Formwork	33.47	----	1 Carpenter + 1 Helper	----	2	----	1	65
Columns									
Fw. Col. st.	Form Work	9	M^3	1 Carpenter + 1 Helper	3	1	3	3	33
Rft. Col. st.	R.F.T	1.19	Ton	1 Steel worker + 1 helper	0.3	2	0.6	3	65
Pour. Col. St.	Pouring concrete	9	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Col. St.	Remove Formwork	9	----	1 Carpenter + 1 Helper	----	1	----	1	33
Roof									
Beams and slab									
FW. B and s. roof.	Form Work	33.47	M^3	1 Carpenter + 1 Helper	3	2	6	6	65
RFT. B and s. roof.	R.F.T	2.87	Ton	1 Steel worker + 1 helper	0.3	4	1.2	3	130
Pour. B and s. roof.	Pouring concrete	33.47	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. B and s. roof.	Remove Formwork	33.47	----	1 Carpenter + 1 Helper	----	2	----	1	65
Ground floor									
E. G. M.	External	45	M^3	1 Builder + 2 helper + 1 mwan	25	1	25	2	53
I. G. M.	Internal	75	M^2	1 Builder + 2 helper + 1 mwan	25	2	50	2	105
First Floor									
E. St. M.	External	45	M^3	1 Builder +2 helper +1 mawan	25	1	25	2	53
I. St. M.	Internal	75	M^2	1 Builder +2 helper +1 mawan	25	2	50	2	105
Roof									
E. Roof. M.	External	15	M^3	1 Builder +2 helper +1 mawan	25	1	25	1	53
Finishing									
Ground floor									
Calm Shell									
E.CS. G.	External	270	M^2	1 concrete Painter + 1helper	30	5	150	2	132
External Electrical									
First Floor									
Calm Shell									
E.cs. st.	External	270	M^2	1 concrete Painter + 1helper	30	5	150	2	132
External Electrical									
Roof									
Calm Shell									
E.cs. roof.	External	90	M^2	1 concrete Painter + 1helper	30	5	150	1	132
External Painting									
E.P.F.	External	540	M^2	1 painter+1 helper	30	6	180	3	158

Twin house

ID	Activity	Quantity	Unit	Resources	Prod/ crew	No. crew	Total Pro	Duration	Cost (LE/hr)
Mobilization									
M. Sur.	Site Surveying			1 surveyor + 1 helper +1 total station	----	1	----	1	33
Earth Work									
Ex.	Excavation	1937	M^3	1 Excavator+2 Truck + 1 helper	400	2	800	3	903
BF.	Backfill	1737	M^3	1 Loader +1 Truck	200	3	600	3	394
Civil Work									
Foundation									
Footing									
Plain Concrete									
FW. Pc. Foot.	Form Work	66.7	M^2	1 Carpenter + 1 Helper	3	5	15	5	163
Pour. Pc. Foot.	Poring concrete	66.7	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Pc. Foot.	Remove Formwork	66.7	----	1 Carpenter + 1 Helper	----	5	----	1	163
Reinforced Concrete and semels									
FW. Rc and s. Foot.	Form Work	123.4	M^2	1 Carpenter + 1 Helper	3	9	27	5	293
RFT. Rc and s. Foot.	R.F.T	12.35	Ton	1 Steel worker + 1 helper	0.3	9	2.7	5	293
Pour. Rc and s. Foot.	Pouring concrete	123.4	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Rc and s. Foot.	Remove Formwork	123.4	----	1 Carpenter + 1 Helper	----	9	----	1	293
Ins. Foot.	Insulting	1288	M^2	2 helper	75	5	375	4	113
Ground floor									
Slab on grade									
FW. SOG. G.	Form Work	99.1	M^2	1 Carpenter + 1 Helper	3	6	18	6	195
Rft. SOG. G.	R.F.T	10.2	Ton	1 Steel worker + 1 helper	0.3	5	1.5	7	163
Pour. SOG. G.	Pouring concrete	99.1	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. SOG. G.	Remove Formwork	99.1	----	1 Carpenter + 1 Helper	----	6	----	1	195
Columns									
Fw. Col. G.	Form Work	40	M^3	1 Carpenter + 1 Helper	3	5	15	3	163
Rft. Col. G.	R.F.T	3.75	Ton	1 Steel worker + 1 helper	0.3	5	1.5	3	163
Pour. Col. G.	Pouring concrete	40	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Col. G.	Remove Formwork	40	----	1 Carpenter + 1 Helper	----	5	----	1	163
First Floor									
Beams and slabs									
FW. B and s. st.	Form Work	149.1	M^3	1 Carpenter + 1 Helper	3	10	30	5	325
RFT. B and s. st.	R.F.T	17.635	Ton	1 Steel worker + 1 helper	0.3	10	3	6	325
Pour. B and s. st.	Pouring concrete	149.1	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. B and s. st.	Remove Formwork	149.1	----	1 Carpenter + 1 Helper	----	10	----	1	325
Columns									
Fw. Col. st.	Form Work	40	M^3	1 Carpenter + 1 Helper	3	5	15	3	163
Rft. Col. st.	R.F.T	3.75	Ton	1 Steel worker + 1 helper	0.3	5	1.5	3	163
Pour. Col. st.	Pouring concrete	40	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. Col. st.	Remove Formwork	40	----	1 Carpenter + 1 Helper	----	5	----	1	163
Roof									
Beams and slabs									
FW. B and s. roof.	Form Work	149.1	M^3	1 Carpenter + 1 Helper	3	10	30	5	325
RFT. B and s. roof.	R.F.T	17.635	Ton	1 Steel worker + 1 helper	0.3	10	3	6	325
Pour. B and s. roof.	Pouring concrete	149.1	M^3	1 pump + 1 mix truck + helper	300	1	300	1	322
R. FW. B and s. roof.	Remove Formwork	149.1	----	1 Carpenter + 1 Helper	----	10	----	1	325
Masonary									
Ground floor									
E. G. M.	External	155	M^2	1 Builder +2 helper +1 mawan	25	3	75	3	158
I. G. M.	Internal	1058	M^2	1 Builder +2 helper +1 mawan	25	5	125	9	263
First Floor									
E. St. M.	External	155	M^2	1 Builder +2 helper +1 mawan	25	3	75	3	158
I. St. M.	Internal	1058	M^2	1 Builder +2 helper +1 mawan	25	5	125	9	263
Roof									
E. Roof. M.	External	51	M^2	1 Builder +2 helper +1 mawan	25	1	25	2	53
Finishing									
Ground floor									
Calm Shell									
E.CS. G.	External	648	M^2	1 concrete Painter + 1helper	30	12	360	2	315
External Electrical									
First Floor									
Calm Shell									
E.cs. st.	External	648	M^2	1 concrete Painter + 1helper	30	12	360	2	315
External Electrical									
Roof									
Calm Shell									
E.cs. roof.	External	216	M^2	1 concrete Painter + 1helper	30	12	360	1	315
External Painting									
E.P.F.	External	1510	M^2	1 painter+1 helper	30	8	240	7	210

Project Cost

Labor	
Labor	Cost (LE/day)
Carpenter	170
Helper	90
Steel Worker	170
surveyor	170
mwan	120
Builder	120
Concrete Painter	120
Painter	120
Marbling worker	120

Material		
Material	Cost	Unit
BackFill	60	LE/M^3
Concrete	400	LE/M^3
marble	500	LE/M^2
marble stairs	200	LE/Unit
Steel	6000	LE/Ton
Insulting	50	LE/M^2
External Masonary	1500	LE/M^3
Internal Masonary	500	LE/M^2

Equipment		
Equipment	Cost	Unit
Excavator	200	(LE/hr)
Truck	120	(LE/hr)
Loader	150	(LE/hr)
Pump	130	(LE/hr)
Truck Mix	180	(LE/hr)
Crane	70	(LE/hr)

PROJECT QUALITY MANAGEMENT

Project Quality Management includes the processes required to ensure the project satisfaction of the needs for which it was undertaken. It includes all the activities of the overall management function that determine the quality policy and responsibilities and implements them by means such as quality planning , control assurance and improvement .
Project quality management should address both the procedures and the final product of the project , failure in meeting quality requirements in either dimension can have negative consequences for any or all of the porject's stakeholders.

Types of Quality Management:

Quality Planning:
Quality Planning involves identifying which quality standards are relevant to the project and determining how to satisfy them. It is one of the most important processes in the during project planning and should be performed regularly and in parallel with other planning

Quality Assurance:
the quality system. It involves evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.

Quality assurance is often provided by a Quality Assurance Dept. or similarly titled organizational unit.

Quality Control:
quality control involves monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.

Project results include both product results such as deliverables and management results such as cost and schedule performance.

Quality Policy:

Quality policy is the overall intentions and direction of an organization with regard to quality , as formally expressed by top management.

Quality Improvement:

Quality improvement includes taking action to increase the effectiveness and the efficiency of the project to provide added benefits to the project stakeholders.

Quality Management Plan:

The quality management plan should describe how the project management team will implement its quality policy .It should describe the project quality system which are : " Organizational structure responsibilities, procedures, processes, and resources needed to implement quality management.

AUTHORITIES AND RESPONSIBILITIES AUTHORITIES:

The Quality Management organization performing quality control and quality assurance functions shall have sufficient authority and organizational freedom to identify quality problems and to initiate, recommend , provide and verify implementation of the solution.

Responsibilities :

Quality Management Organization should be responsible for performing the following tasks :

1. Continuous daily inspection.
2. 2.Conduct phased inspections on daily basis.
3. Perform all testing required under the technical provisions of thespecifications.
4. Prepare daily Quality Control (QC) reports as required in contract.
5. Review, Approve and submit all shop drawings, brochures and samples asrequired for approval by the Design Consultant.
6. Inspect materials as they are delivered to site to ensure compliance withapproved shop drawings and contract requirements.
7. Conduct off-site inspection of supplies and materials to be incorporatedinto the work.
8. Maintain records of all QC activities and submit to the project manager regularly on established intervals.
9. The following is a summary of the responsibilities of each member participating in the project:

Contractor's Responsibilities:

- The contractor is solely responsible for achieving project quality and shall have overall responsibility for the quality of all construction work.
- The contractor shall conduct quality management activities which includeinspection, materials testing and other activities specifically developed

and chosen by the contractor.

Owner's Responsibilities:

- Oversight of the contractor's quality management activities to ensureadherence to the construction quality control (CQC) plan and compliance with the contract documents.
- Notifying the contractor promptly of irregularities or deficiencies observedin the work.
- Oversight of the contractor's construction management including scheduling, invoicing, shop drawings review ,etc.

The Project Manager:

- Responsible for overall site performance.
- Review of the tender documents and contract.
- Contact with the client.
- Responsible for quality site work force.
- Responsible for coordination with sub-contractors.
- Document control.
- Approves Quality Control/Quality Plan.

The Quality Manager:

- maintain Responsible for preparing and implementing the Quality Plan.
- Preparation Quality procedures, test plans and inspection sheets.
- Audit and Quality system integrity.
- Quality documents and data control.

Quality Assurance Engineer:

- Responsible for reviewing applicable plans and specifications.
- Responsible for reviewing the CQA plan.
- Responsible for reviewing approved changes to the plans and specifications.

- Responsible for reviewing and recommending approval or disapproval of site specific documentation, including contractor submittals,manufacturer's information and referenced standards.
- Verify that construction is performed in accordance with the plans and specifications. Inspectors shall be assigned to every major construction activity being performed and a minimum of one CQA engineer shall be on site at all times.
- Attend required meetings.
- Assign CQA inspection personnel to observe all activities requiring monitoring.

Quality Control Engineer:

- Confirm that QCA tests are properly performed ,recorded and the results meet specified requirements.
- Operating lab tests and measurements.
- Take Samples.
- Provide testing results.

HOW TO ASSURE QUALITY:

In order to maintain construction quality:

Field Office:

- During construction temporary jobsite offices will be setup for the field office. It will have the full support of the home office technical design staff.
- The project designers should be used as much as possible as field inspectors.
- The home office support will be ready to prepare any major field change orders.
- The services of the field office will also include the inspection of construction , documentation of the daily progress of the construction and the preparation of the periodic field reports for distribution to the owner consultant, the contractor and the home office.

Preconstruction Meeting:

- Before the start of construction the contractor shall meet with owner's consultant or his representative in a pre construction meeting.
- The topic of the pre-construction meeting shall be the contractor's proposed quality management system.
- During the meeting a mutual understanding of the system details shall be developed , including the forms for recording the contractor quality control operations, control activities, offside work, and the contractor's quality control program.
- Results of the meeting shall be prepared and signed by both the construction manager and the owner's consultant
- Those results shall be included as a part of the contract files.
- Additional conferences may be called at any time to reconfirm mutual understandings.

Construction Monitor:

- During construction the QCD will appoint a Construction Monitor (CM) to keep a daily project log, and to be at the field office on jobsite everyday to observe construction operations and reports directly to the QCD.

Weekly Construction Report:

- The CM will generate a weekly report that will describe the construction progress to the previous week, the results of any material testing and any unusual occurrences.

Contractor's project schedule:

- The CM will monitor the progress schedule on a weekly basis and determine the adherence to the project schedule

- QCD personnel are familiar with several CPM software programs and sometimes create CPM programs for delivery to the contractor as a starting point for scheduling the work of the contract.

- Architects and engineers are construction oriented and have a good opinion of the time required for various construction operations.

Material testing :

- Material shall be stored at a clean place faraway from any damage source.
- All materials shall be handled in a safe manner to prevent damage, misuse or deterioration.
- All handling shall be as recommended by the manufacturer or supplier or in accordance with accepted procedures of practice.
- To ensure proper handling , suitable equipment shall be provided and operated by personnel who are trained , competent and licensed.

Sample testing

- The QCD would be responsible for taking concrete and other construction material samples for testing.
- Local labs will be utilized or any of the project's material consultant will perform these tests.

Photographs:

- Digital photographs will be taken during all constructions phases.
- QCD will deliver these photographs as a soft copy to the clients for future reference.
- These photographs will fully indicate all concealed utilities and construction features ,and will minimize demolition required for solutions to future maintenance problems.

Labor:

- The QCD will be responsible for the labor performance to ensure

accomplishment of tasks meeting the required quality.

- The QCD will prepare qualification training for the new labors and direct them to the suitable job.
- The QCD will regularly check on the labor that uses machines or equipment to increase their performance and teach them new techniques.
- The QCD will be responsible for producing monthly reports about labor productivity.

Equipment:

- The QCD will apply periodic maintenance for all equipments.
- The QCD will periodically check on lifting equipments to prevent any damage.
- The QCD will employ well experienced operators.

Documentation:

The Contractor shall maintain:

- Daily records of quality control operations. Activities and tests performed.
- The work of suppliers and contractors.

These records will be including:

- Type and number of activities and tests involved.
- Results of control activities or tests.
- Proposed remedial action.
- Description of trades working on the project , number of personnel working and the weather conditions encountered.

Home Support office:

- QCD will have actual designers involved to check the shop drawings and to be available for consultation.
- Designers will perform on-site inspections and prepare written reports

documenting the progress of construction and any deficiencies that need to be corrected.

- Any contractor's questions are required to be documented through a RFI (Request For Information) process.
- The original designers are assigned to reply to those questions presented through that RFI process.

GENERAL WORK CONDITIONS

- All tests and experiments shall be performed in a certified laboratory ,the lab must be having trained labor and equipments essential for these tests.
- Experiments shall be performed under supervision of the engineer.
- Quality control Engineer should inspect the delivered materials to the site to ensure that they meet the quality specifications of the required materials.
- An approved quality control representative shall be on the job at all times and maintain continuous inspections during the critical phases of the work.
- The Quality Control Plan shall be adhered to and remain in effect until the work has been substantially completed with phased inspections which should function as follows:

  1. Preparatory Inspections: Before starting any of the work segments Drawings ,specs. ,materials , existing conditions and controls shall be checked.

  2. Initial Inspection: Results shall be checked as the initial work segments have been completed.

  3. Follow-up Inspection: Inspections that shall be performed frequently as required to ensure continued compliance to specified requirements.

5. Final Inspection: Inspection that should be carried out to correct any deficient works before requesting formal inspection from Supervision Consultants.

SPECIFIC WORK CONDITIONS

Earth Works Package:

All Earthwork activities including Excavation and Backfill with clean soil shall be performed according to:

- Specifications assigned by the owner' consultant.
- Site Engineer's instructions.
- All works must be performed within limits and requirements of the (Egyptian

Code of Soil Mechanics & Foundations)

Concrete Works Package:

the contractor has to install the utilities passing through concrete before casting the contractor must obtain:

1- the engineer's written approval on all steps taken for casting , including the used materials in concrete , transportation work , casting , formwork , curing and

tests and this approval doesn't affect the contractor's full responsibility.

2-the instructions of the Egyptian code for designing and execution of reinforced concrete structures must be followed , in addition to the special conditions mentioned Quality.

Materials:

1-Cement:

- the contractor must supply the engineer with a report about the used cement including its type, source and a certification with its components and properties
- tests must be carried out to prove it's suitability for work before execution .
- the cement must be delivered in the original closed bags, and it must be well stored on an elevated wooden floor to protect it from humidity rain.
- the site must be provided with the required amount of cement to continue work without stoppage and assure the continuity of work.

2-Aggregates :

- The contractor must supply the engineer with a sufficient report about the coarse and fine aggregates that he intends to use . This report clarified the source ,(type and available dimensions.)
- The contractor must supply the engineer with aggregate samples the work

starts, so that the samples' volume is not less than 2m3 to apply the required tests on it.

- It is not allowed to supply or use any type of aggregates before performing the required tests and taking the engineer's written approval on using it, and this approval doesn't affect the contractor's full responsibility.

The major nominal dimensions for aggregates must not :

1-exceed 1/5 the smallest distance between the forms' sides or slab' depth

2- 1/3 the clear distance between reinforcing bars

Aggregates grading must allow the production of concrete with high workability, so that it could be casted in its positions without segregation and without

increasing its water content.

The contractor must carry out the required tests to check the suitability of aggregates for concrete and its correspondence to the specifications The tests are done under the supervision of the engineer and according to the mentioned rate (quality control) and it must be taken into consideration especially that the percentage of chlorides represented in the form of ionic chloride as a percentage of aggregates with doesn't exceed :

- 0.04 % for large aggregates
- 0.06%for small aggregates

-The sulphur content doesn't exceed

- 0.4 for large and small aggregates

3-water:

The water used in mixing and curing must be from a source suitable for drinking and clear of harmful materials like oils, acids, alkalis ,salts, and organic material The engineer has the right to ask for chemical analysis considering that the percentage of salts doesn't exceed the maximum for salt content and harmful materials in mixing water clarified in section 2-4-1 in the Egyptian code.

4-Admixtures:

- the engineer's approval must be taken on any type of admixtures before using it
- Used admixtures must correspond to one of the international specifications and must not affect the fundamental concrete properties .
- The instructions of the factories must be followed for using the required admixtures , in addition to performing the required experiments to chech its suitability and effect under the engineer's supervision

5-Reinforced Steel:

- The reinforced steel used for one part of the structure must be from one resource, and if it's not possible , the each amount of reinforcing steel must be accompanied by a certified test certificate.
- The reinforcing steel must be clean and clear of oils, separate rust, and harmful materials and all precautions must be taken to prevent it rust and corrosion, therefore it must be well stored away from humidity sources.
- reinforcing steel must not be delivered to site before doing the required experiments and submitting factory's certificate with all mechanical and chemical properties.

Mixing and transportation:

- The scale used in weighing concrete contents must be accurate to 0.4% of its total load value and it must be examined before work by standard methods .
- All precautions should be taken to prevent the component of any mixture to enter the mixer before the previous component is completely out of it .
- the mixing time for mixtures with volume 1m3 should not be less than two minutes and the engineer's approval on the mixing time should be taken.
- A percentage of water should be added to the mixture before adding cement and

aggregates , such that adding water should continue to 1\4 of the mixing time , and all contents should be mixed in the remaining 3\4 of

mixing time .

- the mixer must be clean and clear of impurities ,and the mixer fans must be replaced when the percentage of decrease in its edges reaches 10% of the original dimensions.

The concrete must transported from mixer to the casting site, such that not segregation or reduction in the water percentage occur and generally the time between adding water to the components and final casting must not exceed twenty minutes .

Fixing Reinforcement Steel:

- The contractor must supply the engineer before work begins with 3 copies of detailed lists of reinforcing steel clarifying the shape of bars , their length,diameter , number and weights.
- Reinforcement steel must be clear of oils , impurities and rust that might reduce the bonds between steel and concrete.
- Reinforcement steel must be fixed that it doesn't move during casting or due to any other loads.
- Formation of reinforcing steel and joints must fulfill the Egyptian Specifications of Reinforced Concrete structures

Curing:

- Concrete must be kept without losing its water in a relatively constant temperature for the time required for its setting.
- Concrete must be cured for 10 days and this period can be reduced if flash setting cement is used.

Testing Program

An independent laboratory should be dealt with to perform the required on and off-site tests.

Test reports will include specification requirements ,test data and a statement of recommended corrective action should the test fail to meet specified criteria.

Tests and inspection reports should include the date and the time of the activity ,its exact location and other pertained information.

All tests and inspection reports prepared by the testing laboratory should be submitted along with daily reports.

The following are some examples of the tests that should be performed:

- Field Determination of Maximum Dry Density & soil's OMC using one point Procter method Compressibility Test.
- Particle grading tests for aggregates , relative weight and impurities every 40 m^3 for fine soils and 75 m^3 for coarse soils.
- Cement tests according to specifications including initial and final setting ,resistance and softness.
- Reinforcing steel tests according to the specifications including tension ,cold bending and chemical analysis.

SAFETY PLAN OF PROJECT

Introduction

This manual is intended to serve as the basis for an employer integrated safety and health management program. Implementation of this safety program satisfies the requirements of the division of safety, The essential elements of this program include:

- Top management's commitment and involvement.
- The establishment and operation of safety committees.
- Provisions for safety and health training. First aid procedures.
- Accident investigation.
- Record keeping of injuries.
- Workplace safety rules.

This manual should be continuously improved by the employer. Any section of this manual can be modified to accommodate actual operations and work practices , provided that the original intent of that section is not lost.

Benefits of Safety Planning

- Reduced expenses related to injuries and illnesses.
- Improve Workers attendance.
- Decrease employees complaints.
- Improve employee's morale .
- Reduced insurance costs.

Health, Safety and Environmental Policy(HSE).

It is the policy to take all possible steps to ensure the health and safety of all employees and other persons engaged in work for the organization and any third parties who come in contact with the business.

It is the duty of each employee to comply with the safety policy and to cooperate with the management of the company to ensure that the work place remains as safe as possible.

If any person is unsure of the safety of anything they must assume that it is unsafe until further guidance has been given by their manager of by the safety manager. The managing Director of the organization is fully responsible of maintaining safe systems of work and fully recognize their overall responsibility for safety in the
workplace.

SAFETY CONTROL

1. Engineering Controls:
Where feasible and appropriate the first and best strategy is to control hazard at its source. Engineering controls unlike other controls which are generally focused on the employee exposed to the hazard rather than its origin.
Working Environment and the job itself should be designed to eliminate hazards or at least reduce them.
2. Administrative Controls:
It includes exercise breaks and rotation of workers .These types of controls are usually used in conjunction with other controls.

RESPONSIBILITIES

Project Superintendents:

- Shall enforce compliance with project safety program specific standards and all other State and local safety codes and regulations.
- Shall assist all contractor and their subcontractors in pre-planning their operations

to prevent personal injury and property damage.

- Shall monitor and expedite activities related to the monthly safety meetings minutes and reporting functions.
- Shall issue safety bulletins pertinent to the project as often as it is necessary.
- Shall receive all safety related correspondence and copies of all accident reports.
- Shall regularly inspect the project for safety compliance.
- Shall approve the contractor safety coordinators who will assist the contractor or subcontractors.

Contractor Safety Coordinators:

- Shall make a minimum of one complete project safety inspection per week with a written report to the responsible Project Superintendents.
- Shall implement immediate corrective action regarding non-compliance with project safety program and/or state and local codes and regulations.

- Shall check with contractor and sub-contractor safety representatives on disposition of safety related matters.
- Shall render assistance at contractor and subcontractor Tool box Talks if requested.
- Shall investigate all accidents per superintendent instructions.
- Shall distribute and post all safety meeting minutes, safety bulletins and other safety related items.

- Contractor/Sub-contractor's Safety Representatives :
- Shall foster safety awareness in all employees.
- Shall attend monthly Project Safety Meetings.
- Shall chair as necessary tool box talks with a written report and copies to the respective safety coordinator.
- Shall advise and direct employees to perform their activities in safe manner and

increase the ability to recognize dangers and other hazards.

- Shall report safety related matters to Project Superintendents and respective coordinator.

Other Staff members and Employees:

- Shall follow safety precautions to prevent accidents happening to their fellow workers or themselves.
- Shall attend Tool Box Talks.
- Shall alert their foremen of hazards and unsafe acts.

Crane operations responsibilities:

Many parties are involved in crane operations and they share different responsibilities considering the safety of these operations and they include:

- Crane Manufacturers:

  They must design the crane such that it will be capable of being safely operated by an adequately trained crane operator that meet all applicable safety and design standards, that are easily maintained and that address typical human factors .Manufacturers should also actively monitor the field performance of their cranes and it's spare parts.

  Crane Operators:

  They have the most direct influence on how safely cranes are operated .it's their responsibility to operate the crane in a professional way such that it isn't operated in any way that could compromise mechanical integrity of the crane.

  also the contractor and sub-contractor need to have effective crane safety inspections and notify crane manufacturers if needed.

SAFETY INSTRUCTIONS FOR EMPLOYEES:

When workers are first employed they shall be given instructions regarding the hazards and safety precautions applicable to the type of work and directed to read the Code Of Safety Practices.

The employer shall permit only qualified persons to operate equipment and machinery.

Employee Safety Rights:

Employees have several important rights concerning safety , which are protected by local laws which are :

- The right to a safe work place free from recognized hazards.
- The right to request information on safety and health hazards in the workplace , precautions that maybe taken and procedures to be followed if an employee is injured.
- The right to know about the hazards associated with chemicals at workplace and the safety procedures to be taken to protect the employee from those hazards.

Information and Training:

Workers should be adequately and suitably :

- Informed of potential safety and health hazards to which they may be exposed at their workplace.
- Instructed and trained in the measures available for prevention and control and protection against those hazards.

Training:

Training is intended to reduce or eliminate the possibility of human factors related failures and to involve personnel in the selection and use of safety devices. Employees should receive formal classroom training from qualified and competent instructors to insure sufficient knowledge of specific activities.

- Training for Safety:
  Safety officer must be qualified to have certain certificate of safety from an authorized institute.
- Training for firefighting:
  All safety labors should be trained and have certificate of firefighting from civil defense organization.

SAFETY PRECAUTIONS:

- Contractor and subcontractors should ensure that all of their employees are fully aware of the site layout and approved routs to and from work-site.
- Contractor Shall notify the details of key persons to be contacted in case of emergency. such details should include site and home telephone numbers and other information.
- Contractor must finalize and agree upon with the Supervision Consultant for the location of temporary site office, material storage lay-down area and the connecting routes.
- Contractor must store separately the inflammable materials away from other materials. All high pressure cylinders such as oxygen and acetylene should be stored upright and away from any inflammable materials.
- Contractor must provide proper sanitary toilets , washing area, clean cool drinking water and shaded rest area for workers.
- Contractor shall take all feasible precautions to avoid damage to the existing services such as power lines , sanitary lines and water lines during mobilization of temporary site office and other site facilities.
- Contractor must ensure that all works are carried out under experienced and qualified supervision of the site which will be aware of all safety measures to be implemented and the responsibilities of the work site emergency.
- Safety officer should coordinate on daily basis with the site foreman on safety issues and attend safety meetings.
- Safety Officer should perform weekly formal inspections with written reports to

the site foreman and contractor.

- Subcontractor should understand and comply to all site safety rules and regulations.
- Protective equipment will be provided for specific job for workers which will include but not limited to:

  -Appropriate eye protection.

  -Dust mask/ respirator

  -Hard Hats

  -Safety belts

  -Safety boots.

  -Gloves and welding aprons.

Protective Equipments.

For Vehicles safety measures:

- All lifting operations will be carried out in a safe manner by experienced and trained personnel.
- No lifting operations are carried out adjacent to building, services , roads unless the crane is de-rated to 66% of its rated load at operating radius.
- All vehicles should be operated by authorized persons only.

- All drivers of vehicles should have current driving license.
- No vehicle is driven inside the site at speed exceeding 15 km/hr.
- All vehicles including and larger than pick up should have functional backup alarm.
- All vehicles entering and leaving the work site carrying loads with potential dust and dirt should be properly secured so that no materials leave the vehicle.

For Working at heights safety measures:

- Workers at lower levels will be protected from falling tools and equipments.
- Workers must use safety belts and helmets. All tools and equipments used are properly secured to avoid accidental fall.
- All tools and equipments will be brought down after work is interrupted or completed.
- Proper ladder is used for reaching the working platform.
- Ladders must not be placed near a door or on the way of passengers.
- Workers should use both hands while climbing or descending of the work platform.
- Hand tool and equipment should be carried by a rope or any other means.

No Safety Belt used

For Electricity safety measures:

- No excavation is carried out in the vicinity of buried cables except under permit to work.
- All portable hand operated tools shall be suitable for 220 volts supply.
- Heights restriction barriers are installed for the overhead power and telephone cables.
- All electrical works are carried out as per regulations.
- All works are carried out by authorized personnel only.
- No works are carried out on any energized system other than by permit to work.

Cleanliness:

Staff working in all areas must regard the following:

- Ensure that loose and worn flooring is reported to supervisor.
- Ensure that all entrances, corridors, walkways and exits are kept clear of obstructions at all times.
- Close all cabinets , cupboards and drawers after use.
- Never overload shelving or store heavy items above head height except on load bearing purpose built for racking.
- Never leave a lit cigarette unattended in the designated smoking area.

- Clear away immediately any dangerous substance or spillage dangerous substance ,they should be marked and defined as toxic , harmful ,flammable ,etc.
- Dust and fumes should not be inhaled , don't perform any activity producing dust or fumes unless wear appropriate protective gear.
- Equipment must not be left where it might cause tripping hazard.

For Handling hazardous materials:

- All concerned employees should be conservative with materials which are hazardous in nature and working crew should be trained to deal with those materials safely.
- Material safety data sheet should specify the actions to be taken in case of emergency.
- An employee exposure record is maintained.

Gaurding:

- Guard should be present around machines at all times except for times of cleaning or maintenance.
- Only trained and authorized persons should perform cleaning that require absence of guard like painting removal or fixing valves.
- Machines under maintenance or cleaning should be electrically isolated and notice should be fixed on the machine to prevent and accidental switching the machine on.
- A guard kiosk is installed at the work site which will be the primary location of the site guard whose job is to keep the idle machines or equipments from thieves.

Conditions of floors and traffic routes:

- floors and traffic routes must be of a sound construction and have adequate strength to take into account loads placed upon them .
- Floors shouldn't be overloaded.

- Surfaces of floors and traffic routes should be free from any holes , slopes or any uneven surface which may cause slipping , tripping or falling of a person or cause dropping or loss of control of anything or loss of control of a vehicle.
- Slopes shouldn't be steeper than necessary.

Facilities of rest and eating meals:

- There must be sufficient and suitable rest facilities for workers.
- There must be facilities to eat meals where the food eaten at workplace would not be contaminated.
- These facilities should include arrangements to protect non-smokers from other smoking worker's tobacco smoke .
- Provision for any person at work who is pregnant or nursing mother to rest in.

- Rest rooms that are kept clean and built to a good hygienic standards.

Drinking water:

- An adequate supply of drinking water must be provided for all persons and this must be readily accessible at suitable places and marked by appropriate signs.
- Suitable amount of drinking vessels shall be provided for the workers unless drinking water is in jet form which workers can drink easily.

Scaffolds:

- Scaffolds must be rigid , sound and sufficient to carry its own weight plus four times intended load without setting or displacement.
- Unstable objects must not be used to support scaffolds.
- They must be equipped with guard rails, mid rails and toe boards.
- Synthetic ropes used in suspension of the scaffold should be protected from heat producing sources.
- Employees must be instructed from the several hazards when using scaffold.
- Scaffolds can be accessed by using ladders or stairwells.
- Scaffolds must be at least ten feet away from electric power lines at all times.

Emergency Medical Services:

- Emergency medical services should be available for each employee at the worksite.
- One medical program should be established at the worksite.
- Appropriately trained personnel shall be present in a sufficient number and shall be responsible for providing first aid procedures in case of injury of an employee or any other emergencies.

- At least one first aid kit shall be provided for each working crew which is kept in a weatherproof container The contents of the kit shall be inspected regularly to ensure that the expired items are promptly replaced, these contents shall be arranged to be quickly found and remain sanitary.
- First aid dressings shall be kept in an independent and sterile sealed package for each item.
- Other supplies and equipment provided in accordance with the documented recommendations of an authorized and licensed physician
  depending on the extent and the type of medical emergency care to be
- given based on the nature of injury or illness and ability to transport injured person to medical care.
- Drugs, antiseptics ,eye irrigation solutions and other types of medicines will not be included in first aid kits

licensed physician.

- Each employee shall be informed of procedures to follow in case of injury or illness.
- Proper equipment required to transport injured person to a hospital or a physician shall be provided, or an effective communication system for contacting hospitals or other medical facilities.
- Emergency washing facilities where eyes or body of any person exposed to a dangerous material can be treated and cleaned shall be present and readily accessible.

<u>Personal Protective Equipment:</u>

Head Protection:

Workers shall wear hard hats when there is a potential risk of any injury to the

head that can be caused by falling object or any other hazards.

Safety helmet

Eye and face Protection:

Safety glasses or face shields are worn at work operations that can cause objects

getting into the eye or harming the face of the employee. These protections are selected according to the type of activity and its potential hazards.

Different types of face shields

Safety Glasses

Foot Protection:

Safety boots should be worn at all times to prevent injuries resulting from working around heavy machinery and presence of metals or glass on ground of
the site.

Safety boots

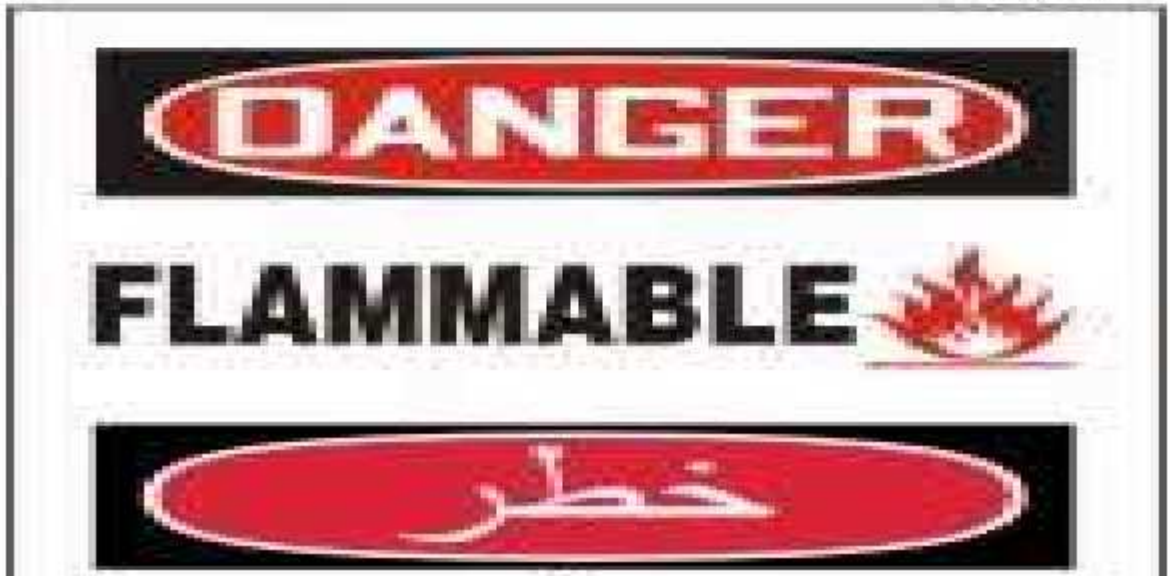
Hand Protection:

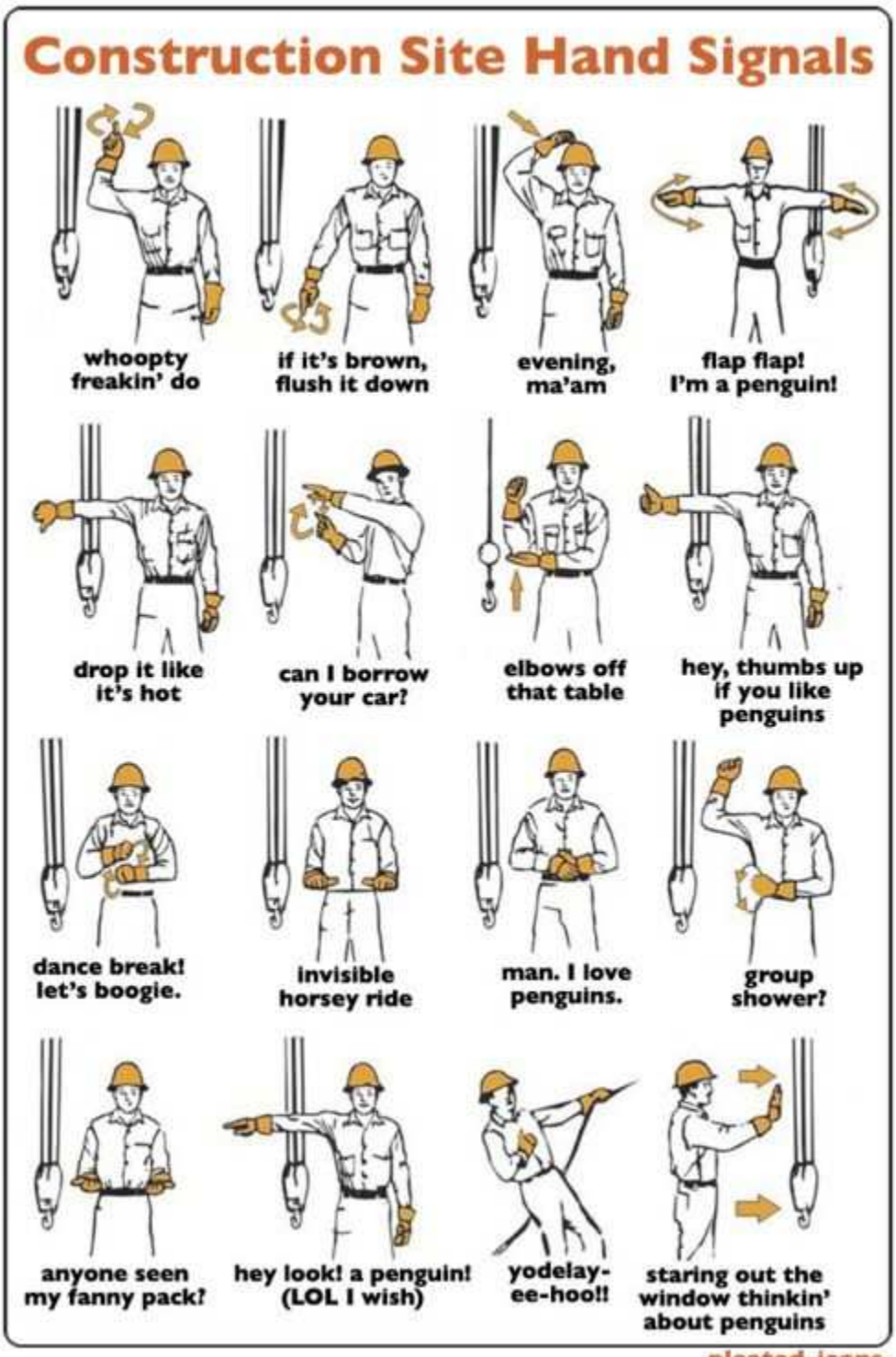
Workers should wear gloves which are appropriate to their specific jobs.

Safety Signs:


No pedestrian access
No unauthorised persons beyond this point
No parking
No admittance
Heavy goods vehicles must not be reversed without supervision
Footpath closed
No smoking
No exit
Danger Demolition in progress
Warning Overhead hazard
Caution Men working
Danger Scaffolding incomplete
Danger
No entry
Danger
Do not enter
Danger Electrical hazard
Danger
Warning Men working below
Warning
Warning Construction traffic
Warning Men working overhead
Caution Maintenance in progress
Danger Deep excavations
Caution Slippery surface
Caution Wet Floor
Warning Open manhole
Warning Open pit
Warning Fork lift trucks
Caution Trip hazard
Caution Lift out of order
Danger
Danger
Danger
Warning
No smoking
No naked lights
Mark up your message on this blank using the pen listed below.
Keep clear


DANGER
NO
SMOKING
خطر
ممنوع التدخين


DANGER
FLAMMABLE
خطر


Construction Site Hand Signals
whoopty freakin' do
if it's brown, flush it down
evening, ma'am
flap flap! I'm a penguin!
drop it like it's hot
can I borrow your car?
elbows off that table
hey, thumbs up if you like penguins
dance break! let's boogie.
invisible horsey ride
man. I love penguins.
group shower?
anyone seen my fanny pack?
hey look! a penguin! (LOL I wish)
yodelay-ee-hoo!!
staring out the window thinkin' about penguins
pleated-jeans

EXCAVATOR HANDSIGNALS

 Load Up	 Load Down	 Swing Left	 Swing Right
 Turn Left	 Turn Right	 Travel	 This Far To Go
 Everything Slow	 Stop Engine	 Stop	 Emergency Stop

SECTION 3 ECONOMY PART

-Tables of building

Back fill

*Back Fill = (area cut − area footings − area semels − area columns) * Depth*

Area cut =	945 m²
Area plan footing =	468.89 m²
Area Concrete Footing =	277.1 m²
Area Semels =	62.55 m²
Area Columns =	15.31 m²
Back Fill = (945-468.89-277.2-62.55-15.31)*1	

Back Fill = 121.1 m³

Form Work Est.

PC Footing

Type	No.	Dimensions of Unit					Total
		Length (m)	No. of faces	Width (m)	No. of Faces	Depth (m)	
F1	1	5.4	2	3.8	2	0.4	7.36
F2	2	3.2	2	2.25	2	0.4	8.72
F4	1	5.8	2	4.6	2	0.4	8.32
F5	1	3.95	2	3.15	2	0.4	5.68
F6	2	3.5	2	2.9	2	0.4	10.24
F7	4	3.25	2	2.8	2	0.4	19.36
F8	5	2.8	2	2.5	2	0.4	20.2
F9	19	2.45	2	2.25	2	0.4	74.48
F10	1	2.95	2	2.95	2	0.4	4.72
F11	1	3.2	2	1.7	2	0.4	3.92
F12	20	2.15	2	2.15	2	0.4	68.8
F3	2	-	-	-	-	0.4	19.504
F13	2	-	-	-	-	0.4	10.38

Total = 261.58 m²

Concrete Estimation

Pc Footing

Type	No.	Dimensions of Unit			Total
		Length (m)	Width (m)	Height (m)	
F1	1	504	3.8	0.4	8.208
F2	2	3.2	2.55	0.4	5.76
F4	1	5.8	4.6	0.4	10.672
F5	1	3.95	3.15	0.4	4.977
F6	2	3.5	2.9	0.4	8.12
F7	4	3.25	2.8	0.4	14.56
F8	5	2.8	2.5	0.4	14
F9	19	2.45	2.25	0.4	41.895
F10	1	2.95	2.95	0.4	3.481
F11	1	3.2	1.7	0.4	2.176
F12	20	2.15	2.15	0.4	36.98
F3	2	-	-	0.4	29.2
F13	2	-	-	0.4	7.527

Total = 187.56 m^3

Form Work Est.

RC Footing

Type	No.	Dimensions of Unit					Total
		Length (m)	No. of faces	Width (m)	No. of faces	Depth (m)	
F1	1	4.6	2	3	2	0.7	10.64
F2	2	2.4	2	1.45	2	0.7	10.78
F4	1	5	2	3.8	2	0.7	12.32
F5	1	3.15	2	2.35	2	0.7	7.7
F6	2	2.7	2	2.1	2	0.6	13.44
F7	4	2.45	2	2	2	0.6	31.45
F8	5	2	2	1.7	2	0.6	22.2
F9	19	1.85	2	1.45	2	0.6	75.24
F10	1	2.15	2	2.15	2	0.6	5.16
F11	1	2.4	2	1.3	2	0.6	4.44
F12	20	1.35	2	1.35	2	0.6	64.8
F3	2	-	-	-	-	0.7	30.03
F13	2	-	-	-	-	0.6	11.244

Steel Estimation

Rc Footing

Type	No.	Dimensions of Steel bar Bottom					Weight
		No.	Diameter Ø (mm)	Length (m)	Metric Weight	Length of Footing	
F1 Long	1	6	22	5.7	2.59	3	310.023
F1 Short	1	6	22	4.1	2.59	4.6	341.9318
F2 Long	2	5	16	3.5	1.578	1.45	96.1002
F2 Short	2	5	16	2.55	1.578	2.4	115.8883
F3 long	2	7	22	8.35	2.59	1.98	685.1275
F3 Short	2	7	22	12.12	2.59	3.07	1541.916
F4 long	1	7	22	6.1	2.59	3.8	480.2896
F4 Short	1	8	22	4.9	2.59	5	571.095
F5 Long	1	7	16	4.25	1.578	2.35	126.0822
F5 Short	1	7	16	3.45	1.578	3.15	137.1913
F6 long	2	7	16	3.1	1.578	2.1	164.3645
F6 Short	2	7	16	3	1.578	2.7	204.5088
F7 long	4	6	16	3.35	1.578	2	296.0328
F7 short	4	6	16	2.9	1.578	2.45	313.9273
F8 long	5	5	16	2.9	1.578	1.7	233.3862
F8 short	5	5	16	2.6	1.578	2	246.168
F9 long	19	5	16	1056	1.578	1.45	275450.6
F9 short	19	5	16	2.35	1.578	1.65	697.5312
F10 long	1	6	16	3.05	1.578	2.15	72.43415
F10 short	1	6	16	3.05	1.578	2.15	72.43415
F11 long	1	5	16	4.3	1.578	1.3	52.92612
F11 Short	1	5	16	2.2	1.578	2.4	49.99104
F12 long	20	5	16	2.25	1.578	1.35	575.181
F12short	20	5	16	2.25	1.578	1.35	575.181
F13 long	2	5	16	3.97	1.578	5	375.8796
F13 short	2	5	16	2.87	1.578	6.15	334.2299

Concrete Estimation
RC Footing

Type	No.	Dimensions of Unit			Total
		Length (m)	Width (m)	Height (m)	
F1	1	4.6	3	0.7	9.66
F2	2	2.4	1.45	0.7	4.704
F4	1	5	3.8	0.7	13.3
F5	1	3.15	2.35	0.7	5.1817
F6	2	2.7	2.1	0.6	6.804
F7	4	2	1.45	0.6	11.76
F8	5	2	1.7	0.6	10.2
F9	19	1.85	1.45	0.6	30.58
F10	1	2.15	2.15	0.6	2.77
F11	1	2.4	1.3	0.6	1.872
F12	20	1.35	1.35	0.6	21.87
F3	2	-	-	0.7	41.242
F13	2	-	-	0.6	6.3174

Total = 166.261 m^3

Semels

Type	No.	Dimensions of Unit					Total
		Length (m)	Width (m)	No. of faces	Depth (m)	No. of faces	
S2.1	4	1.724	0.3	1	0.6	2	10.33
S2.2	2	3.52	0.3	1	0.6	2	10.56
S2.3	2	2.9	0.3	1	0.6	2	8.7
S2.4	2	5	0.3	1	0.6	2	15
S2.5	2	3.65	0.3	1	0.6	2	10.95
S2.6	2	3.43	0.3	1	0.6	2	10.29
S2.7	2	0.97	0.3	1	0.6	2	2.91
S2.8	2	1.34	0.3	1	0.6	2	4.02
S2.9	1	1.24	0.3	1	0.6	2	1.86
S2.10	2	1.65	0.3	1	0.6	2	4.95
S2.11	2	1.79	0.3	1	0.6	2	5.37
S2.12	2	2.245	0.3	1	0.6	2	6.735
S2.13	2	1.795	0.3	1	0.6	2	5.385
S2.14	2	1.04	0.3	1	0.6	2	1.872
S2.15	2	1.59	0.3	1	0.6	2	2.862
S2.16	3	1.235	0.3	1	0.6	2	2.593
S2.17	2	2.36	0.3	1	0.6	2	4.248
S2.18	1	3.65	0.3	1	0.6	2	6.57
S2.19	2	3.5	0.3	1	0.6	2	6.3
S2.20	2	5.104	0.3	1	0.6	2	9.187
S2.21	1	2.87	0.3	1	0.6	2	4.305
S2.22	2	-	0.3	1	0.6	2	4.833
S2.23	2	-	0.3	1	0.6	2	3.582
S2.24	2	-	0.3	1	0.6	2	4.221
S2.25	1	-	0.3	1	0.6	2	2.287

S2.26	3	-	0.3	1	0.6	2	7.1925
S2.27	4	-	0.3	1	0.6	2	2.568
S2.28	2	-	0.3	1	0.6	2	14.04
S2.29	2	-	0.3	1	0.6	2	5.859
S2.30	5	-	0.3	1	0.6	2	1.89
S2.31	3	-	0.3	1	0.6	2	0.63
S2.32	1	-	0.3	1	0.6	2	6.18
S2.33	2	-	0.3	1	0.6	2	4.374
S2.34	2	-	0.3	1	0.6	2	3.42
S2.35	1	-	0.3	1	0.6	2	3.72
S2.36	2	-	0.3	1	0.6	2	4.32
S2.37	2	-	0.3	1	0.6	2	5.94
S2.38	1	-	0.3	1	0.6	2	4.68
S4.1	2	-	0.3	1	0.6	2	4.5
S4.2	2	-	0.3	1	0.6	2	6.462
S4.3	2	-	0.3	1	0.6	2	1.6
S5	1	-	0.3	1	0.6	2	8.548

Total = 233 m^2

Semels

Type	No.	Dimension of Bottom steel Bare				Weight (kg)	Stirrups (kg)				Total(Kg)
		Length (m)	No	Diamter ⌀	Metric Weight		Length	Metric Weight	NO	Weight	
S2.1	4	1.624	2	12	0.88	11.43296	2	0.39	10	31.2	42.633
S2.2	2	3.42	2	12	0.88	12.0384	2	0.39	18	28.08	40.118
S2.3	2	2.8	2	12	0.88	9.856	2	0.39	15	23.4	33.256
S2.4	2	4.9	2	12	0.88	17.248	2	0.39	26	40.56	57.808
S2.5	2	3.55	2	12	0.88	12.496	2	0.39	20	31.2	43.696
S2.6	2	3.24	2	12	0.88	11.4048	2	0.39	18	28.08	39.485
S2.7	2	0.87	2	12	0.88	3.0624	2	0.39	6	9.36	12.422
S2.8	2	1.24	2	12	0.88	4.3648	2	0.39	8	12.48	16.845
S2.9	1	1.14	2	12	0.88	2.0064	2	0.39	7	5.46	7.4664
S2.10	2	1.55	2	12	0.88	5.456	2	0.39	10	15.6	21.056
S2.11	2	1.69	2	12	0.88	5.9488	2	0.39	10	15.6	21.549
S2.12	2	2.145	2	12	0.88	7.5504	2	0.39	12	18.72	26.27
S2.13	2	1.695	2	12	0.88	5.9664	2	0.39	10	15.6	21.566
S2.14	2	0.94	2	12	0.88	3.3088	2	0.39	6	9.36	12.669
S2.15	2	1.49	2	12	0.88	5.2448	2	0.39	9	14.04	19.285
S2.16	3	1.135	2	12	0.88	5.9928	2	0.39	7	16.38	22.373
S2.17	2	2.26	2	12	0.88	7.9552	2	0.39	13	20.28	28.235
S2.18	1	3.55	2	12	0.88	6.248	2	0.39	19	14.82	21.068
S2.19	2	3.4	2	12	0.88	11.968	2	0.39	19	29.64	41.608
S2.20	2	5.0045	2	12	0.88	17.61584	2	0.39	27	42.12	59.736
S2.21	1	2.77	2	12	0.88	4.8752	2	0.39	16	12.48	17.355
S2.22	2	2.585	2	12	0.88	9.0992	2	0.39	15	23.4	32.499
S2.23	2	1.89	2	12	0.88	6.6528	2	0.39	11	17.16	23.813
S2.24	2	2.245	2	12	0.88	7.9024	2	0.39	13	20.28	28.182
S2.25	1	1.425	2	12	0.88	2.508	2	0.39	9	7.02	9.528
S2.26	3	3.325	2	12	0.88	17.556	2	0.39	18	42.12	59.676
S2.27	4	0.97	2	12	0.88	6.8288	2	0.39	7	21.84	28.669
S2.28	2	7.7	2	12	0.88	27.104	2	0.39	40	62.4	89.504
S2.29	2	3.155	2	12	0.88	11.1056	2	0.39	17	26.52	37.626
S2.30	5	0.6	2	12	0.88	5.28	2	0.39	5	19.5	24.78
S2.31	3	0.2	2	12	0.88	1.056	2	0.39	3	7.02	8.076
S2.3	1	4.02	2	12	0.88	7.0752	2	0.39	22	17.16	24.235
S2.33	2	2.33	2	12	0.88	8.2016	2	0.39	13	20.28	28.482
S2.34	2	1.8	2	12	0.88	6.336	2	0.39	11	17.16	23.496
S2.35	1	2.38	2	12	0.88	4.1888	2	0.39	14	10.92	15.109
S2.36	2	2.3	2	12	0.88	8.096	2	0.39	13	20.28	28.376
S2.37	2	3.2	2	12	0.88	11.264	2	0.39	18	28.08	39.344
S2.38	1	2.5	2	12	0.88	4.4	2	0.39	14	10.92	15.32

Concrete Estimation
Semels

Type	No.	Dimensions of Unit			Total
		Length (m)	Width (m)	Height (m)	
S2.1	4	1.724	0.6	0.3	1.241
S2.2	2	3.52	0.6	0.3	1.267
S2.3	2	2.9	0.6	0.3	1.044
S2.4	2	5	0.6	0.3	1.8
S2.5	2	3.65	0.6	0.3	1.314
S2.6	2	3.34	0.6	0.3	1.23
S2.7	2	0.97	0.6	0.3	0.284
S2.8	2	1.34	0.6	0.3	0.482
S2.9	1	1.24	0.6	0.3	0.223
S2.10	2	1.65	0.6	0.3	0.594
S2.11	2	1.79	0.6	0.3	0.644
S2.12	2	2.245	0.6	0.3	0.8
S2.13	2	1.795	0.6	0.3	0.646
S2.14	2	1.04	0.6	0.3	0.374
S2.15	2	1.59	0.6	0.3	0.572
S2.16	3	1.235	0.6	0.3	0.666
S2.17	2	2.36	0.6	0.3	1.2096
S2.18	1	3.65	0.6	0.3	0.657
S2.19	2	3.5	0.6	0.3	1.26
S2.20	2	5.1045	0.6	0.3	1.837
S2.21	1	2.87	0.6	0.3	0.5166
S2.22	2	2.685	0.6	0.3	0.966
S2.23	2	1.99	0.6	0.3	0.7164

S2.26	3	3.425	0.6	0.3	1.849
S2.27	4	1.07	0.6	0.3	0.77
S2.28	2	7.8	0.6	0.3	2.808
S2.29	2	3.255	0.6	0.3	1.17
S2.30	5	0.7	0.6	0.3	0.63
S2.31	3	0.3	0.6	0.3	0.162
S2.32	1	4.12	0.6	0.3	0.74
S2.33	2	2.43	0.6	0.3	0.847
S2.34	2	1.9	0.6	0.3	0.684
S2.35	1	2.48	0.6	0.3	0.89
S2.36	2	2.4	0.6	0.3	0.864
S2.37	2	3.3	0.6	0.3	1.188
S2.38	1	2.6	0.6	0.3	0.468
S4.1	2	2.5	0.6	0.4	0.9
S4.2	2	3.59	0.6	0.4	1.2924
S4.3	2	0.8	0.6	0.4	2.288
S5	1	4.27	0.8	0.4	1.3664

Total = 37.53 m^3

Form Work Est.

Columns
Basement

Type	No.	Dimensions of Unit					Total Area (m²)
		Length (m)	No. of faces	Width (m)	No. of Faces	Height (m)	
C1	2	0.3	2	0.3	2	4.6	11.04
C2	15	0.4	2	0.4	2	4.6	110.4
C3	2	0.45	2	0.45	2	4.6	16.56
C4	2	0.45	2	0.5	2	4.6	17.48
C5	4	0.3	2	0.4	2	4.6	25.76
C6	18	0.3	2	0.5	2	4.6	132.48
C7	8	0.3	2	0.6	2	4.6	66.24
C8	2	0.3	2	0.65	2	4.6	17.48
C9	2	0.3	2	0.7	2	4.6	18.4
C10	2	0.3	2	0.75	2	4.6	19.32
C11	1	0.3	2	0.8	2	4.6	10.12
C12	1	0.3	2	0.9	2	4.6	11.04
C13	1	0.3	2	1.1	2	4.6	12.88
C14	1	0.5	2	0.5	2	4.6	9.2
C15	2	0.25	2	0.7	2	4.6	17.48
C16	2	0.3	2	1.25	2	4.6	28.52
W1	1	0.3	2	2.5	2	4.6	25.76
W2	2	0.38	2	2.04	2	4.6	44.528
Core 1	1	2.5	2	1.65	1	4.6	45.05
		0.25	2	2	2	4.6	
		2.1	1			4.6	

Total Area = 639.74 m²

Basement
Bricks

Type	Dimensions of Unit				Total(m^3)
	Lenth(m)	faces	Width(m)	Hight(m)	
1	9.04	2	0.25	4.6	20.792
2	3.26	2	0.25	4.6	7.498
3	12.99	2	0.25	4.6	29.877
4	3.58	1	0.25	4.6	4.117
5	2.87	1	0.25	4.6	3.3005
6	2.72	1	0.25	4.6	3.128
7	3.93	2	0.25	4.6	9.039
8	4	2	0.25	4.6	9.2
9	3.43	2	0.25	4.6	7.889
10	6.16	2	0.25	4.6	14.168
11	4.86	2	0.25	4.6	11.178
12	10.95	1	0.25	4.6	12.5925
13	11.68	1	0.25	4.6	13.432

Total = 146.211 m^3

Formwork columns
Basement

Type	No.	Dimensions of Unit			Total
		Length (m)	Width (m)	Height (m)	
C1	2	0.3	0.3	4.6	0.828
C2	14	0.4	0.4	4.6	10.304
C3	2	0.45	0.45	4.6	1.863
C4	2	0.45	0.3	4.6	1.242
C5	5	0.3	0.4	4.6	2.76
C6	18	0.3	0.5	4.6	12.42
C7	9	0.3	0.8	4.6	9.936
C8	1	0.3	0.85	4.6	1.173
C9	2	0.3	0.7	4.6	1.932
C10	2	0.3	0.75	4.6	2.07
C11	1	0.3	0.8	4.6	1.104
C12	1	0.3	0.9	4.6	1.242
C13	1	0.3	1.1	4.6	1.518
C14	1	0.5	0.5	4.6	1.15
C15	2	0.25	0.7	4.6	1.61
C16	2	0.3	1.25	4.6	3.45
W1	1	0.3	2.5	4.6	3.45
W2	2	0.38	2	4.6	6.992
CORE	1	1.1	1	4.6	5.06

Total = 70.104 m^3

Columns steel
Basement

Type	No.	Dimension of Bottom steel Bare			Length (m)	Weight (Kg)
		N	Diameter Ø (mm)	Metric Weight		
C1	2	4	16	1.568	4.6	57.7024
C2	14	8	16	1.568	4.6	807.8336
C3	2	12	16	1.568	4.6	173.1072
C4	2	12	16	1.568	4.6	173.1072
C5	5	8	16	1.568	4.6	288.512
C6	18	10	16	1.568	4.6	1298.304
C7	9	12	16	1.568	4.6	778.9824
C8	1	12	16	1.568	4.6	86.5536
C9	2	14	16	1.568	4.6	201.9584
C10	2	14	16	1.568	4.6	201.9584
C11	1	16	16	1.568	4.6	115.4048
C12	1	16	16	1.568	4.6	115.4048
C13	1	20	16	1.568	4.6	144.256
C14	1	12	16	1.568	4.6	86.5536
C15	2	12	16	1.568	4.6	173.1072
C16	2	20	16	1.568	4.6	288.512

Toatal = 4991.2576 Kg

Formwork columns
Basement

Type	No.	Dimensions of Unit			Total
		Length (m)	Width (m)	Height (m)	
C1	2	0.3	0.3	4.6	0.828
C2	14	0.4	0.4	4.6	10.304
C3	2	0.45	0.45	4.6	1.863
C4	2	0.45	0.3	4.6	1.242
C5	5	0.3	0.4	4.6	2.76
C6	18	0.3	0.5	4.6	12.42
C7	9	0.3	0.8	4.6	9.936
C8	1	0.3	0.85	4.6	1.173
C9	2	0.3	0.7	4.6	1.932
C10	2	0.3	0.75	4.6	2.07
C11	1	0.3	0.8	4.6	1.104
C12	1	0.3	0.9	4.6	1.242
C13	1	0.3	1.1	4.6	1.518
C14	1	0.5	0.5	4.6	1.15
C15	2	0.25	0.7	4.6	1.61
C16	2	0.3	1.25	4.6	3.45
W1	1	0.3	2.5	4.6	3.45
W2	2	0.38	2	4.6	6.992
CORE	1	1.1	1	4.6	5.06

Total = 70.104 m^3

Beams
Ground Floor

Type	No.	Dimensions of Unit					Total Area (m²)
		Length (m)	Width (m)	No. of faces	Depth (m)	No. of Faces	
B2 -1	2	3.42	0.4	1	0.4	2	8.2
B2 -2	2	1.2	0.3	1	0.4	2	4.6
		0.78	0.4	1	0.4	2	
B2 - 3	1	1.78	0.25	1	0.8	2	3.3
B2 - 4	2	1.73	0.25	1	0.74	2	6
B2 - 5	1	4.38	0.25	1	0.6	2	6.35
B2 - 6	1	2.1	0.12	1	0.6	2	2.77
B2 - 7	1	1.8	0.12	1	0.6	2	2.4
B3 - 1	1	1.76	0.25	1	0.8	2	3.26
B3 - 2	1	1.73	0.25	1	0.8	2	3.2
B3 - 3	2	3.18	0.25	1	0.8	2	11.76
B3 - 4	1	3.68	0.25	1	0.6	2	5.34
B3 - 5	1	4.02	0.38	1	0.8	2	7.96
B4 - 1	2	2.6	0.4	1	0.4	2	6.24
B4 - 2	1	1.57	0.25	1	0.6	2	5.25
		1.8	0.4	1	0.8	2	
B4 - 3	2	8.59	0.4	1	0.6	2	27.4
B4 - 4	1	1.99	0.25	1	0.6	2	5.85
		1.8	0.4	1	0.6	2	
B4 - 5	2	3.96	0.25	1	0.8	2	14.66
B4 - 6	2	2.7	0.3	1	0.8	2	10.26
B4 - 7	1	2.31	0.3	1	0.6	2	3.5
B4 - 8	1	3.68	0.3	1	0.7	2	6.3
B4 - 9	2	0.92	0.3	1	1.45	2	5.88
B4 - 10	1	2.62	0.3	1	0.6	2	3.93

B4 - 11	1	1.8	0.25	1	0.7	2	2.97
B4 - 12	1	2.16	0.25	1	0.8	2	3.99
B4 - 13	1	0.62	0.3	1	0.6	2	0.93
B5 - 1	1	0.7	0.12	1	0.15	2	5.4
		1.46	0.25	1	0.7	2	
		1.42	0.4	1	0.7	2	
B5 - 2	1	1.65	0.25	1	0.8	2	3.1
B5 - 3	1	3.45	0.25	1	0.8	2	6.4
B9 - 1	2	2.8	0.25	1	0.8	2	10.4
B9 - 2	2	3.07	0.12	1	0.74	2	9.8
B9 - 3	2	2.8	0.12	1	0.8	2	9.64
B10	1	2.76	0.25	1	0.8	2	5.11
B11 - 1	1	3	0.4	1	0.6	2	4.8
B11 - 2	1	4.27	0.25	1	0.8	2	7.99
B11 - 3	1	4.72	0.25	1	0.8	2	8.7
B11 - 4	1	2.96	0.4	1	0.6	2	4.74
B11 - 4	1	4.2	0.25	1	0.6	2	6.09
CA2	1	0.53	0.12	1	0.74	2	0.85
CA3 - 1	1	0.55	0.25	1	0.8	2	1.02
CA3 - 2	1	1.46	0.12	1	0.6	2	1.93
CA4 - 1	1	1.55	0.38	1	0.8	2	3.1
CA4 - 2	1	0.25	0.4	1	0.8	2	0.5
CA4 - 3	1	1.07	0.3	1	0.8	2	2.033
CA4 - 4	1	0.9	0.4	1	0.8	2	3.55
		0.88	0.3	1	0.8	2	
CA5	1	0.7	0.3	1	0.97	2	5.63
		1.4	0.3	1	1.3	2	

Total Area = 263.08 m^2

Form Work Est.

Columns
Ground Floor

Type	No.	Dimensions of Unit					Total Area (m^2)
		Length (m)	No. of faces	Width (m)	No. of Faces	Height (m)	
C1	1	0.3	2	0.3	2	3.4	4.08
C2	15	0.4	2	0.4	2	3.4	81.6
C3	2	0.45	2	0.45	2	3.4	12.24
C4	2	0.45	2	0.5	2	3.4	12.92
C5	4	0.3	2	0.4	2	3.4	19.04
C6	16	0.3	2	0.5	2	3.4	87.04
C7	8	0.3	2	0.6	2	3.4	48.96
C8	2	0.3	2	0.65	2	3.4	12.92
C9	2	0.3	2	0.7	2	3.4	13.6
C10	2	0.3	2	0.75	2	3.4	14.28
C11	1	0.3	2	0.8	2	3.4	7.48
C12	1	0.3	2	0.9	2	3.4	8.16
C13	1	0.3	2	1.1	2	3.4	9.52
C14	1	0.5	2	0.5	2	3.4	6.8
C15	2	0.25	2	0.7	2	3.4	12.92
C16	2	0.3	2	1.25	2	3.4	21.08
W1	1	0.3	2	2.5	2	3.4	19.04
W2	2	0.38	2	2.04	2	3.4	32.912
Core 1	1	2.5	2	1.65	1	3.4	45.05
		0.25	2	2	2	3.4	
		2.1	1			3.4	

total area=469.64

concrete

Columns

Ground Floor

Type	No.	Dimensions of Unit			Total volume (m3)
		Length (m)	Width (m)	Height (m)	
C1	1	0.3	0.3	3.4	0.306
C2	15	0.4	0.4	3.4	8.16
C3	2	0.45	0.45	3.4	1.377
C4	2	0.45	0.5	3.4	1.53
C5	4	0.3	0.4	3.4	1.632
C6	16	0.3	0.5	3.4	8.16
C7	8	0.3	0.6	3.4	4.896
C8	2	0.3	0.65	3.4	1.326
C9	2	0.3	0.7	3.4	1.428
C10	2	0.3	0.75	3.4	1.53
C11	1	0.3	0.8	3.4	0.816
C12	1	0.3	0.9	3.4	0.918
C13	1	0.3	1.1	3.4	1.122
C14	1	0.5	0.5	3.4	0.85
C15	2	0.25	0.7	3.4	1.19
C16	2	0.3	1.25	3.4	2.55
W1	1	0.3	2.5	3.4	2.55
W2	2	0.38	2.04	3.4	5.27136
Core 1	1	2.5	1.65	3.4	5.865
		0.25	2	3.4	
		2.1		3.4	

Total volume = 51.47736 m3

concrete

Beams

Ground Floor

Type	No.	Dimensions of Unit			Total volume (m3)
		Length (m)	Width (m)	Depth (m)	
B2 -1	2	3.42	0.4	0.4	1.0944
B2 -2	2	1.2	0.3	0.4	0.5376
		0.78	0.4	0.4	
B2 - 3	1	1.78	0.25	0.8	0.356
B2 - 4	2	1.73	0.25	0.74	0.6401
B2 - 5	1	4.38	0.25	0.6	0.657
B2 - 6	1	2.1	0.12	0.6	0.1512
B2 - 7	1	1.8	0.12	0.6	0.1296
B3 - 1	1	1.76	0.25	0.8	0.352
B3 - 2	1	1.73	0.25	0.8	0.346
B3 - 3	2	3.18	0.25	0.8	1.272
B3 - 4	1	3.68	0.25	0.6	0.552
B3 - 5	1	4.02	0.38	0.8	1.22208
B4 - 1	2	2.6	0.4	0.4	0.832
B4 - 2	1	1.57	0.25	0.6	0.8115
		1.8	0.4	0.8	
B4 - 3	2	8.59	0.4	0.6	4.1232
B4 - 4	1	1.99	0.25	0.6	0.7305
		1.8	0.4	0.6	
B4 - 5	2	3.96	0.25	0.8	1.584
B4 - 6	2	2.7	0.3	0.8	1.296
B4 - 7	1	2.31	0.3	0.6	0.4158
B4 - 8	1	3.68	0.3	0.7	0.7728
B4 - 9	2	0.92	0.3	1.45	0.8004

B5 - 1	1	0.7	0.12	0.15	0.6657
		1.46	0.25	0.7	
		1.42	0.4	0.7	
B5 - 2	1	1.65	0.25	0.8	0.33
B5 - 3	1	3.45	0.25	0.8	0.69
B9 - 1	2	2.8	0.25	0.8	1.12
B9 - 2	2	3.07	0.12	0.74	0.545232
B9 - 3	2	2.8	0.12	0.8	0.5376
B10	1	2.76	0.25	0.8	0.552
B11 - 1	1	3	0.4	0.6	0.72
B11 - 2	1	4.27	0.25	0.8	0.854
B11 - 3	1	4.72	0.25	0.8	0.944
B11 - 4	1	2.96	0.4	0.6	0.7104
B11 - 4	1	4.2	0.25	0.6	0.63
CA2	1	0.53	0.12	0.74	0.047064
CA3 - 1	1	0.55	0.25	0.8	0.11
CA3 - 2	1	1.46	0.12	0.6	0.10512
CA4 - 1	1	1.55	0.38	0.8	0.4712
CA4 - 2	1	0.25	0.4	0.8	0.08
CA4 - 3	1	1.07	0.3	0.8	0.2568
CA4 - 4	1	0.9	0.4	0.8	0.4992
		0.88	0.3	0.8	
CA5	1	0.7	0.3	0.97	0.7497
		1.4	0.3	1.3	

Total volume = 30.624 m3

Steel Estimation

Ground Beam

Type	No.	Dimensions of Steel bar				Weight (kg)
		No.	Diameter Ø (mm)	Length (m)	metric Length	
B2 -1	2	8	12	3.42	0.88	48.1536
B2 -2	2	8	12	1.98	0.88	27.8784
B2 - 3	1	8	12	1.78	0.88	12.5312
B2 - 4	2	8	12	1.73	0.88	24.3584
B2 - 5	1	8	12	4.38	0.88	30.8352
B2 - 6	1	8	12	2.1	0.88	14.784
B2 - 7	1	8	12	1.8	0.88	12.672
B3 - 1	1	4	18	1.76	1.999	14.07296
B3 - 2	1	4	18	1.73	1.999	13.83308
B3 - 3	2	4	18	3.18	1.999	50.85456
B3 - 4	1	4	18	3.68	1.999	29.42528
B3 - 5	1	4	18	4.02	1.999	32.14392
B4 - 1	2	8	16	2.6	1.578	65.6448
B4 - 2	2	8	16	3.37	1.578	85.08576
B4 - 3	2	8	16	8.59	1.578	216.88032
B4 - 4	2	8	16	3.79	1.578	95.68992
B4 - 5	2	8	16	3.96	1.578	99.98208
B4 - 6	2	8	16	2.7	1.578	68.1696
B4 - 7	1	8	16	2.31	1.578	29.16144
B4 - 8	1	8	16	3.68	1.578	46.45632
B4 - 9	2	8	16	0.92	1.578	23.22816
B4 - 10	1	8	16	2.62	1.578	33.07488
B4 - 11	1	8	16	1.8	1.578	22.7232
B4 - 12	1	8	16	2.16	1.578	27.26784
B4 - 13	1	8	16	0.62	1.578	7.82688

B9 - 1	2	4	16	2.8	1.578	35.3472
		4	18		1.999	44.7776
B9 - 2	2	4	16	3.07	1.578	38.75568
		4	18		1.999	49.09544
B9 - 3	2	4	16	2.8	1.578	35.3472
		4	18		1.999	44.7776
B10	1	2	16	2.76	1.578	8.71056
		6	18		1.999	33.10344
B11 - 1	1	4	18	3	1.999	23.988
		4	22		2.95	35.4
CA4-2	1	4	18	0.25	1.999	1.999
		4	22		2.95	2.95
CA4 -3	1	4	18	1.07	1.999	8.55572
		4	22		2.95	12.626
CA4-4	1	4	18	1.78	1.999	14.23288
		4	22		2.95	21.004
CA- 5	2	2	12	2.1	0.88	7.392
		4	16		1.578	26.5104

Total = 1716.11708 Kg

Steel Estimation

column ground

Type	No.	Dimensions of Steel bar				Weight (kg)
		No.	Diameter Ø (mm)	Length (m)	Metric Weight	
C1	1	4	16	3.4	1.578	21.4608
C2	15	8	16	3.4	1.578	643.824
C3	2	12	16	3.4	1.578	128.7648
C4	2	12	16	3.4	1.578	128.7648
C5	4	8	16	3.4	1.578	171.6864
C6	16	10	16	3.4	1.578	858.432
C7	8	12	16	3.4	1.578	515.0592
C8	2	12	16	3.4	1.578	128.7648
C9	2	14	16	3.4	1.578	150.2256
C10	2	14	16	3.4	1.578	150.2256
C11	1	16	16	3.4	1.578	85.8432
C12	1	16	16	3.4	1.578	85.8432
C13	1	20	16	3.4	1.578	107.304
C14	1	2	16	3.4	1.578	10.7304
C15	2	12	16	3.4	1.578	128.7648
C16	2	20	16	3.4	1.578	214.608
W1	1	12	16	3.4	1.578	64.3824
W2	2	14	16	3.4	1.578	150.2256
Core 1	1	44	16	3.4	1.578	236.0688

Total= 3980.9784 Kg

Columns
First Floor

Type	No.	Dimensions of Unit					Total Area (m²)
		Length (m)	No. of faces	Width (m)	No. of Faces	Height (m)	
C1	1	0.3	2	0.3	2	3.4	4.08
C2	14	0.4	2	0.4	2	3.4	76.16
C3	2	0.45	2	0.45	2	3.4	12.24
C4	2	0.45	2	0.5	2	3.4	12.92
C5	4	0.3	2	0.4	2	3.4	19.04
C6	16	0.3	2	0.5	2	3.4	87.04
C7	8	0.3	2	0.6	2	3.4	48.96
C8	2	0.3	2	0.65	2	3.4	12.92
C9	2	0.3	2	0.7	2	3.4	13.6
C10	2	0.3	2	0.75	2	3.4	14.28
C11	1	0.3	2	0.8	2	3.4	7.48
C12	1	0.3	2	0.9	2	3.4	8.16
C13	1	0.3	2	1.1	2	3.4	9.52
C14	1	0.5	2	0.5	2	3.4	6.8
C15	2	0.25	2	0.7	2	3.4	12.92
C16	2	0.3	2	1.25	2	3.4	21.08
W1	1	0.3	2	2.5	2	3.4	19.04
W2	2	0.38	2	2.04	2	3.4	32.912
Core 1	1	2.5	2	1.65	1	3.4	45.05
		0.25	2	2	2	3.4	
		2.1	1			3.4	

Total Area = 464.2 m²

concrete

column
first floor

Type	No.	Dimensions of Unit			Total volume (m3)
		Length (m)	Width (m)	Height (m)	
C1	1	0.3	0.3	3.4	0.306
C2	14	0.4	0.4	3.4	7.616
C3	2	0.45	0.45	3.4	1.377
C4	2	0.45	0.5	3.4	1.53
C5	4	0.3	0.4	3.4	1.632
C6	16	0.3	0.5	3.4	8.16
C7	8	0.3	0.6	3.4	4.896
C8	2	0.3	0.65	3.4	1.326
C9	2	0.3	0.7	3.4	1.428
C10	2	0.3	0.75	3.4	1.53
C11	1	0.3	0.8	3.4	0.816
C12	1	0.3	0.9	3.4	0.918
C13	1	0.3	1.1	3.4	1.122
C14	1	0.5	0.5	3.4	0.85
C15	2	0.25	0.7	3.4	1.19
C16	3	0.3	1.25	3.4	3.825
W1	1	0.3	2.5	3.4	2.55
W2	2	0.38	2.04	3.4	5.27136
Core 1	1	2.5	1.65	3.4	5.865
		0.25	2	3.4	
		2.1	-	3.4	

concrete

Beams

Ground Floor

Type	No.	Dimensions of Unit			Total volume (m3)
		Length (m)	Width (m)	Depth (m)	
B2 -1	2	3.42	0.4	0.4	1.0944
B2 -2	2	1.2	0.3	0.4	0.5376
		0.78	0.4	0.4	
B2 - 3	1	1.78	0.25	0.8	0.356
B2 - 4	2	1.73	0.25	0.74	0.6401
B2 - 5	1	4.38	0.25	0.6	0.657
B2 - 6	1	2.1	0.12	0.6	0.1512
B2 - 7	1	1.8	0.12	0.6	0.1296
B3 - 1	1	1.76	0.25	0.8	0.352
B3 - 2	1	1.73	0.25	0.8	0.346
B3 - 3	2	3.18	0.25	0.8	1.272
B3 - 4	1	3.68	0.25	0.6	0.552
B3 - 5	1	4.02	0.38	0.8	1.22208
B4 - 1	2	2.6	0.4	0.4	0.832
B4 - 2	1	1.57	0.25	0.6	0.8115
		1.8	0.4	0.8	
B4 - 3	2	8.59	0.4	0.6	4.1232
B4 - 4	1	1.99	0.25	0.6	0.7305
		1.8	0.4	0.6	
B4 - 5	2	3.96	0.25	0.8	1.584
B4 - 6	2	2.7	0.3	0.8	1.296
B4 - 7	1	2.31	0.3	0.6	0.4158
B4 - 8	1	3.68	0.3	0.7	0.7728
B4 - 9	2	0.92	0.3	1.45	0.8004

B5 - 1	1	0.7	0.12	0.15	0.6657
		1.46	0.25	0.7	
		1.42	0.4	0.7	
B5 - 2	1	1.65	0.25	0.8	0.33
B5 - 3	1	3.45	0.25	0.8	0.69
B9 - 1	2	2.8	0.25	0.8	1.12
B9 - 2	2	3.07	0.12	0.74	0.545232
B9 - 3	2	2.8	0.12	0.8	0.5376
B10	1	2.76	0.25	0.8	0.552
B11 - 1	1	3	0.4	0.6	0.72
B11 - 2	1	4.27	0.25	0.8	0.854
B11 - 3	1	4.72	0.25	0.8	0.944
B11 - 4	1	2.96	0.4	0.6	0.7104
B11 - 4	1	4.2	0.25	0.6	0.63
CA2	1	0.53	0.12	0.74	0.047064
CA3 - 1	1	0.55	0.25	0.8	0.11
CA3 - 2	1	1.46	0.12	0.6	0.10512
CA4 - 1	1	1.55	0.38	0.8	0.4712
CA4 - 2	1	0.25	0.4	0.8	0.08
CA4 - 3	1	1.07	0.3	0.8	0.2568
CA4 - 4	1	0.9	0.4	0.8	0.4992
		0.88	0.3	0.8	
CA5	1	0.7	0.3	0.97	0.7497
		1.4	0.3	1.3	

Total volume = 30.624 m3

Steel Estimation
First floor
Beam

Type	No.	Dimensions of Steel bar				Total
		No.	Diameter Ø (mm)	Length (m)	Metric Weight	
B2 -1	2	8	12	3.42	0.88	48.1536
B2 -2	2	8	12	1.98	0.88	27.8784
B2 - 3	1	8	12	1.78	0.88	12.5312
B2 - 4	2	8	12	1.73	0.88	24.3584
B2 - 5	1	8	12	4.38	0.88	30.8352
B2 - 6	1	8	12	2.1	0.88	14.784
B2 - 7	1	8	12	1.8	0.88	12.672
B3 - 1	1	4	18	1.76	1.999	14.073
B3 - 2	1	4	18	1.73	1.999	13.8331
B3 - 3	2	4	18	3.18	1.999	50.8546
B3 - 4	1	4	18	3.68	1.999	29.4253
B3 - 5	1	4	18	4.02	1.999	32.1439
B4 - 1	2	8	16	2.6	1.578	65.6448
B4 - 2	2	8	16	3.37	1.578	85.0858
B4 - 3	2	8	16	8.59	1.578	216.88
B4 - 4	2	8	16	3.79	1.578	95.6899
B4 - 5	2	8	16	3.96	1.578	99.9821
B4 - 6	2	8	16	2.7	1.578	68.1696
B4 - 7	1	8	16	2.31	1.578	29.1614
B4 - 8	1	8	16	3.68	1.578	46.4563
B4 - 9	2	8	16	0.92	1.578	23.2282
B4 - 10	1	8	16	2.62	1.578	33.0749
B4 - 11	1	8	16	1.8	1.578	22.7232

B9 - 1	2	4	16	2.8	1.578	35.3472
		4	18		1.999	44.7776
B9 - 2	2	4	16	3.07	1.578	38.7557
		4	18		1.999	49.0954
B9 - 3	2	4	16	2.8	1.578	35.3472
		4	18		1.999	44.7776
B10	1	2	16	2.76	1.578	8.71056
		6	18		1.999	33.1034
B11 - 1	1	4	18	3	1.999	23.988
		4	22		2.59	31.08
CA4-2	1	4	18	0.25	1.999	1.999
		4	22		2.59	2.59
CA4 -3	1	4	18	1.07	1.999	8.55572
		4	22		2.59	11.0852
CA4-4	1	4	18	1.78	1.999	14.2329
		4	22		2.59	18.4408
CA- 5	2	2	12	2.1	0.88	7.392
		4	16		1.578	26.5104

Total = 1707.33308

Steel Estimation
column first

Type	No.	Dimensions of Steel bar				Weight (kg)
		No.	Diameter Ø (mm)	Length (m)	Metric Weight	
C1	1	4	16	3.4	1.578	21.4608
C2	14	8	16	3.4	1.578	600.9024
C3	2	12	16	3.4	1.578	128.7648
C4	2	12	16	3.4	1.578	128.7648
C5	4	8	16	3.4	1.578	171.6864
C6	16	10	16	3.4	1.578	858.432
C7	8	12	16	3.4	1.578	515.0592
C8	2	12	16	3.4	1.578	128.7648
C9	2	14	16	3.4	1.578	150.2256
C10	2	14	16	3.4	1.578	150.2256
C11	1	16	16	3.4	1.578	85.8432
C12	1	16	16	3.4	1.578	85.8432
C13	1	20	16	3.4	1.578	107.304
C14	1	2	16	3.4	1.578	10.7304
C15	2	12	16	3.4	1.578	128.7648
C16	3	20	16	3.4	1.578	321.912
W1	1	12	16	3.4	1.578	64.3824
W2	2	14	16	3.4	1.578	150.2256
Core 1	1	44	16	3.4	1.578	236.0688

Total = 4045.3608 Kg

Steel Estimation

column first

Type	No.	Dimensions of Steel bar				Weight (kg)
		No.	Diameter Ø (mm)	Length (m)	Metric Weight	
C1	1	4	16	3.4	1.578	21.4608
C2	14	8	16	3.4	1.578	600.9024
C3	2	12	16	3.4	1.578	128.7648
C4	2	12	16	3.4	1.578	128.7648
C5	4	8	16	3.4	1.578	171.6864
C6	16	10	16	3.4	1.578	858.432
C7	8	12	16	3.4	1.578	515.0592
C8	2	12	16	3.4	1.578	128.7648
C9	2	14	16	3.4	1.578	150.2256
C10	2	14	16	3.4	1.578	150.2256
C11	1	16	16	3.4	1.578	85.8432
C12	1	16	16	3.4	1.578	85.8432
C13	1	20	16	3.4	1.578	107.304
C14	1	2	16	3.4	1.578	10.7304
C15	2	12	16	3.4	1.578	128.7648
C16	3	20	16	3.4	1.578	321.912
W1	1	12	16	3.4	1.578	64.3824
W2	2	14	16	3.4	1.578	150.2256
Core 1	1	44	16	3.4	1.578	236.0688

Total = 4045.3608 Kg

Interior Walls

Description	Dimension			Area of Masonry (m2)
	Length (m)	Thickness (m)	Height (m)	
G.Floor-Int	103.75	0.125	3.14	325.8
1st Floor-Int	-	0.125	3.14	441.5
2nd Floor-Int	-	0.125	3.14	441.5
3rd Floor-Int	-	0.125	3.14	441.5
4th Floor-Int	-	0.125	3.14	441.5
Roof	-	-	-	-
Total	-	-	-	2104.4

Columns
Second Floor

Type	No.	Dimensions of Unit					Total Area (m²)
		Length (m)	No. of faces	Width (m)	No. of Faces	Height (m)	
C2	14	0.4	2	0.4	2	3.4	76.16
C3	2	0.45	2	0.45	2	3.4	12.24
C4	2	0.45	2	0.5	2	3.4	12.92
C5	4	0.3	2	0.4	2	3.4	19.04
C6	16	0.3	2	0.5	2	3.4	87.04
C7	9	0.3	2	0.6	2	3.4	55.08
C8	1	0.3	2	0.65	2	3.4	6.46
C9	2	0.3	2	0.7	2	3.4	13.6
C10	2	0.3	2	0.75	2	3.4	14.28
C11	1	0.3	2	0.8	2	3.4	7.48
C12	1	0.3	2	0.9	2	3.4	8.16
C13	1	0.3	2	1.1	2	3.4	9.52
C14	1	0.5	2	0.5	2	3.4	6.8
C15	1	0.25	2	0.7	2	3.4	6.46
C16	2	0.3	2	1.25	2	3.4	21.08
W1	1	0.3	2	2.5	2	3.4	19.04
W2	2	0.38	2	2.04	2	3.4	32.912
Core 1	1	2.5	2	1.65	1	3.4	45.05
		0.25	2	2	2	3.4	
		2.1	1			3.4	

Total Area = 453.32 m²

Columns
Third Floor

Type	No.	Dimensions of Unit					Total Area (m²)
		Length (m)	No. of faces	Width (m)	No. of Faces	Height (m)	
C2	14	0.4	2	0.4	2	3.4	76.16
C3	2	0.45	2	0.45	2	3.4	12.24
C4	2	0.45	2	0.5	2	3.4	12.92
C5	4	0.3	2	0.4	2	3.4	19.04
C6	16	0.3	2	0.5	2	3.4	87.04
C7	9	0.3	2	0.6	2	3.4	55.08
C8	1	0.3	2	0.65	2	3.4	6.46
C9	2	0.3	2	0.7	2	3.4	13.6
C10	2	0.3	2	0.75	2	3.4	14.28
C11	1	0.3	2	0.8	2	3.4	7.48
C12	1	0.3	2	0.9	2	3.4	8.16
C13	1	0.3	2	1.1	2	3.4	9.52
C14	1	0.5	2	0.5	2	3.4	6.8
C15	1	0.25	2	0.7	2	3.4	6.46
C16	2	0.3	2	1.25	2	3.4	21.08
W1	1	0.3	2	2.5	2	3.4	19.04
W2	2	0.38	2	2.04	2	3.4	32.912
Core 1	1	2.5	2	1.65	1	3.4	45.05
		0.25	2	2	2	3.4	
		2.1	1			3.4	

Total Area = 453.32 m²

Columns
Fourth Floor

Type	No.	Dimensions of Unit					Total Area (m²)
		Length (m)	No. of faces	Width (m)	No. of Faces	Height (m)	
C2	14	0.4	2	0.4	2	3.4	76.16
C3	2	0.45	2	0.45	2	3.4	12.24
C4	2	0.45	2	0.5	2	3.4	12.92
C5	4	0.3	2	0.4	2	3.4	19.04
C6	16	0.3	2	0.5	2	3.4	87.04
C7	9	0.3	2	0.6	2	3.4	55.08
C8	1	0.3	2	0.65	2	3.4	6.46
C9	2	0.3	2	0.7	2	3.4	13.6
C10	2	0.3	2	0.75	2	3.4	14.28
C11	1	0.3	2	0.8	2	3.4	7.48
C12	1	0.3	2	0.9	2	3.4	8.16
C13	1	0.3	2	1.1	2	3.4	9.52
C14	1	0.5	2	0.5	2	3.4	6.8
C15	1	0.25	2	0.7	2	3.4	6.46
C16	2	0.3	2	1.25	2	3.4	21.08
W1	1	0.3	2	2.5	2	3.4	19.04
Core 1	1	2.5	2	1.65	1	3.4	45.05
		0.25	2	2	2	3.4	
		2.1	1	-	-	3.4	

Total Area = 420.41 m²

Beams
Roof

Type	No.	Dimensions of Unit					Total Area (m²)
		Length (m)	Width (m)	No. of faces	Depth (m)	No. of Faces	
B3 - 1	1	2.31	0.3	1	0.55	2	3.234
B3 - 2	1	1.96	0.3	1	0.7	2	3.33
B3 - 3	1	1.52	0.25	1	0.7	2	2.51
B3 - 4	1	2	0.25	1	0.7	2	3.3
B4 - 1	1	3.68	0.3	1	0.7	2	6.3
B4 - 2	2	3.22	0.3	1	0.55	2	9.02
B4 - 3	1	2.94	0.3	1	0.55	2	4.12
B4 - 4	1	2.91	0.25	1	0.7	2	4.8
B4 - 5	1	1.52	0.25	1	1.26	2	4.2
B7	1	2	0.12	1	0.7	2	3.04
B8	1	3	0.25	1	0.55	2	4.05
B9	1	3	0.4	1	0.7	2	5.4
B10	1	3.37	0.3	1	0.7	2	5.73
CA3	1	1.22	0.25	1	0.7	2	2.01
CA4 - 1	1	1.59	0.3	1	0.55	2	2.23
CA4 - 2	1	1.12	0.3	1	0.55	2	1.57
CA4 - 3	1	1.3	0.3	1	0.55	2	1.82
CA4 - 4	1	1.22	0.25	1	1.26	2	3.38

Total Area = 70.044 m²

AHP Definition

the analytical hierarchy process is a frame work of logic and problem resolving achieved by organizing perception , feelings, judgments and memories into a hierarchy of forces that influence decision result .

we provide matrix of comparison of 5 categories:

1= same important 3= slightly more important 5= much important 7= very much important 9= absolutely important

- 1) Construction method:

  1. Form Work. 2. Concrete Used. 3. Insulation. 4. Equipment.

1- Form Work:

2- a- Timber Formwork. b- Steel Formwork.

Comparison Factor:

- Cost.
- Time for Concrete hardening.
- Durability.
- Finished concrete shape.

a - Timber Form Work:

- Cost is Low.
- Time for concrete hardening is low.
- The life time for timber is low.
- It is widely spread in Egypt and easily to find it.
- The shape of the finished concrete is bad.

b- Steel Form Work:

- Cost is high.
- Time for concrete hardening is high.
- Life time for steel form work is high.
- It is used for large and important project.
- The shape of finished concrete is good.

Using AHP process

Point of comparsion :

1 -Lower Cost

Cost	Timber formwork	Steel formwork	Weight	Eigen Vector
Timber formwork	1	3	4	0.75
Steel formwork	1/3	1	1.33	0.25

Point of comparsion	cost	Time	Durability	Shape	weight	% w
Cost	1	1/5	5	5	11.2	0.28
Time	5	1	7	7	20	0.511
Durability	1/5	1/7	1	5	6.34	0.1622
Shape	1/5	1/7	1/5	1	1.543	0.04

For Alternative 1: Timber Formwork Score =

0.28*0.75+0.511*0.125+0.1662*0.167+0.04*0.25= 0.3116

For Alternative 2 : Steel Formwork Score =

0.28*0.25+0.511*0.875+0.1622*0.833+0.04*0.75= 0.6855

Score of steel form is higher than Timber form

So , We Will use steel form instead of timber form.

2- Concrete Used:

A. Ready mix concret

B. Patch plant.

A.Ready mix Concrete:

Advantages:

- Initial cost is low.
- Economic for less amount of concrete in small project.

Disadvantages:

- Less Quality.
- Limited Concrete.
- Not available at sometimes and must be reserved before.
- Time is high.
- More risk (transfer , bringing concrete early or late)

B. Batch Plant:

Advantages:

- Quality is high.
- Risk is low.
- Unlimited concrete.
- Less time.

Disadvantages:

- Initial cost is high.
- Not economic for small project.

Using AHP Process

Point of Comparison :-

1-Lower Cost

Cost	Ready Mix	Batch Plant	Weight	Eigen vector
Ready Mix	1	3	4	0.75
Batch Plant	1/3	1	1.33	0.25

2-Time of arrival early

Time	Ready Mix	Batch Plant	Weight	Eigen vector
Ready Mix	1	1/3	1.33	0.25
Batch Plant	3	1	4	0.75

3-Lower Risk

Risk	Ready Mix	Batch Plant	Weight	Eigen vector
Ready Mix	1	1/5	1.2	0.167
Batch Plant	5	1	6	0.833

Point of comparsion	cost	Time	Risk	Weight	% weight
cost	1	1/5	3	4.2	0.25
Time	5	1	5	11	0.657
Risk	1/3	1/5	1	1.533	0.0916

For alternative 1 : Ready Mix

Score: 0.75*0.25+0.25*0.657+0.167*0.0916= 0.367

For alternative 2 : Batch Plant

Score 0.25*0.25+0.75*0.657+0.833*0.0916= 0.63155

So , We Will use Batch plant instead of ready Mix Concrete

3- Insulation :

Local	Strips
Cost is low	Cost is low
Speed in small project	Used in large project
Quality is low	Quality is high

So we will use Strips insulation

EQUIPMENT:

a- Buying. b- Rental.

A- Buying:

Advantages:

- More economical if used sufficiently.
- Availability of equipment when needed.

Disadvantages:

- Can be more expensive.
- Requires a substantial investment.

B- Rental:

Advantages:

- More economical for short duration jobs.
- Provides the opportunity to operate a specific machine under actual projectcondition before

making purchase decision.

Disadvantages:

- Unavailability of equipment during peak work Season.
- Unavailability of specialized equipment.

Comparison between costs :

1-Excavator

CATERPILLAR
336EL10.6
TRACK EXCAVATORS

£1,902,860 EGP

1366 HOURS

2012
Topeka Area, KS, US

Catalog #: CU1771428
Serial #: BZY01003

Price : 1,902,860 EGP

Salvage : 1,000,000 EGP after 2 years

Condation : Good

Rental Price 1600 LE / day No of years = 24 month = 2 years Salvage value =1,000,000 LE

Working days = 365 day/year= 2920 hr/yr

1) Buying the Equipment

   A)using Average Annual Investment n = 2 , i= 0.08 AAI= (P(n+1) +S(n-1))/ 2n=1677145 LE/yr Cost1 = 0.08*AAI / 2920 = 45.95 LE / hr

2) Initial cost= 1,902,860 LE

3) Salvage cost = 1,000,000 LE Cost2 = (1902860-1541716)/(2920*2) = 154.6 LE/hr Total cost = 45.95+154.6=200.55 LE/hr B)

4) Taxes, Insurance, and storage Assume (taxes=1%, Insurance=2%, Storage= 0.75%)

Cost= (3.75% * 1677145)/2920 = 21.54 LE/hr.

C)Fuel

Fuel consumption diesel engine 0.04 gal per fwhp-hr Assume combined factor = 0.69 & 200 fwhp Cost of gal = 6 LE /gal No. of gallons = 0.04 * 200*0.69 = 5.52 gal/hr

Cost= 5.52*6= 33.12 LE/hr

D)Oil

Assume Capacity = 8 gal number of hours between oil changes = 150hr cost = 12 LE/gal No.of gallons= (200*0.69*0.006Ib/hp-hr)/ (7.4Ib/gal) + 8/150 = 0.165 gal/hr

Cost = 0.165*12= 2 LE/hr

Total cost of purchases = 200.55+21.54+33.12+2= 257.21 LE/hr Rent cost = 1600 LE/day=225 LE/hrSo , Rent more Economic than buy so we will rent the Equipment.

2 - Statical System

a- Used type: Flat Slab

- The cost is high.
- Time needed is short.
- The work is easy to build.
- Carry large loads and have large spans.
- Labor is familiar to flat slab and it is widly spread.
- The design of concrete elements is critical as there is punching and shear and any mistake will make a disaster.
- It is very compatibility with architecture shape as there is no dropped beams.

B- Suggest type: 1- Solid Slab:

- Cost is low.

- Time needed is large than flat slab.
- The work is difficult than flat slab as the form work is difficult .
- Carry small loads and limited spans.
- The Labor is more familiar to solid slab.
- The design risk is low.
- It is not compatible with the architecture shape there a drop beam.

2-Panelled Beams:

- Used for larger span with no columns inside.
- Very difficult to built it.

So we will recommend that we use the solid slab as the alternative of flat slab.

Tables of Cash flow of project

contract Price=1.3*Total direct cost	Advanced Payment = 5 %	Retation = 10%
400960105	20048005.25	4009601.05

n	Direct Cost	Indirect cost	Total cost	Cumm. Total Cost	Invoice without retantion	Invoice with retation& Advance payment
1					0	0
1	4,566,202	456620.2	5,022,822	5,022,822	5936062.6	5045653.21
1	7,115,831	711583.1	7,827,414	12,850,236	9250580.3	7862993.255
2	8,320,563	832056.3	9,152,619	22,002,856	10816731.9	9194222.115
2	13,321,340	1332134	14,653,474	36,656,330	17317742	14720080.7
2	9,897,241	989724.1	10,886,965	47,543,295	12866413.3	10936451.31
2	13,257,403	1325740.3	14,583,143	62,126,438	17234623.9	14649430.32
2	12,869,306	1286930.6	14,156,237	76,282,675	16730097.8	14220583.13
2	5,782,272	578227.2	6,360,499	82,643,174	7516953.6	6389410.56
2	8,836,389	883638.9	9,720,028	92,363,202	11487305.7	9764209.845
2	7,827,208	782720.8	8,609,929	100,973,131	10175370.4	8649064.84
2	10,072,318	1007231.8	11,079,550	112,052,680	13094013.4	11129911.39
2	11,958,864	1195886.4	13,154,750	125,207,431	15546523.2	13214544.72
2	11,030,000	1103000	12,133,000	137,340,431	14339000	12188150
2	7,657,570	765757	8,423,327	145,763,758	9954841	8461614.85
3	6,972,854	697285.4	7,670,139	153,433,897	9064710.2	7705003.67
3	9,907,288	990728.8	10,898,017	164,331,914	12879474.4	10947553.24
3	10,648,666	1064866.6	11,713,533	176,045,447	13843265.8	11766775.93
3	9,775,936	977593.6	10,753,530	186,798,976	12708716.8	10802409.28
3	12,184,372	1218437.2	13,402,809	200,201,785	15839683.6	13463731.06
3	11,709,756	1170975.6	12,880,732	213,082,517	15222682.8	12939280.38
3	4,689,191	468919.1	5,158,110	218,240,627	6095948.3	5181556.055
3	8,310,551	831055.1	9,141,606	227,382,233	10803716.3	9183158.855
3	10,461,758	1046176.8	11,507,945	238,890,178	13600298.4	11560253.64
3	9,619,084	961908.4	10,580,992	249,471,170	12504809.2	10629087.82
3	10,634,508	1063450.8	11,697,959	261,169,129	13824860.4	11751131.34
3	11,770,388	1177038.8	12,947,427	274,116,556	15301504.4	13006278.74
4	7,660,410	766041	8,426,451	282,543,007	9958533	8464753.05
4	3,022,730	302273	3,325,003	285,868,010	3929549	3340116.65
4	6,145,394	614539.4	6,759,933	292,627,943	7989012.2	6790660.37
4	4,723,376	472337.6	5,195,714	297,823,657	6140388.8	5219330.48
4	4,718,064	471806.4	5,189,870	303,013,527	6133483.2	5213460.72
4	6,031,890	603189	6,635,079	309,648,606	7841457	6665238.45
4	4,809,132	480913.2	5,290,045	314,938,652	6251871.6	5314090.86
4	2,358,786	235878.6	2,594,665	317,533,316	3066421.8	2606458.53
4	4,274,272	427427.2	4,701,699	322,235,015	5556553.6	4723070.56
4	2,839,442	283944.2	3,123,386	325,358,402	3691274.6	3137583.41

Cash Inflow	cumm. Cash Inflow	cash outflow	cumm. Cash outflow	Overdraft
20048005.25	20048005.25	0	0	20048005.25
	20048005.25	5,022,822	5,022,822	15025183.05
	20048005.25	7,827,414	12,850,236	7197768.95
5045653.21	25093658.46	9,152,619	22,002,856	3090802.86
7862993.255	32956651.72	14,653,474	36,656,330	-3699677.885
9194222.115	42150873.83	10,886,965	47,543,295	-5392420.87
14720080.7	56870954.53	14,583,143	62,126,438	-5255483.47
10936451.31	67807405.84	14,156,237	76,282,675	-8475268.765
14649430.32	82456836.15	6,360,499	82,643,174	-186337.65
14220583.13	96677419.28	9,720,028	92,363,202	4314217.58
6389410.56	103066829.8	8,609,929	100,973,131	2093699.34
9764209.845	112831039.7	11,079,550	112,052,680	778359.385
8649064.84	121480104.5	13,154,750	125,207,431	-3727326.175
11129911.39	132610015.9	12,133,000	137,340,431	-4730414.785
13214544.72	145824560.6	8,423,327	145,763,758	60802.935
12188150	158012710.6	7,670,139	153,433,897	4578813.535
8461614.85	166474325.5	10,898,017	164,331,914	2142411.585
7705003.67	174179329.2	11,713,533	176,045,447	-1866117.345
10947553.24	185126882.4	10,753,530	186,798,976	-1672093.705
11766775.93	196893658.3	13,402,809	200,201,785	-3308126.975
10802409.28	207696067.6	12,880,732	213,082,517	-5386449.295
13463731.06	221159798.7	5,158,110	218,240,627	2919171.665
12939280.38	234099079	9,141,606	227,382,233	6716845.945
5181556.055	239280635.1	11,507,945	238,890,178	390457.2
9183158.855	248463794	10,580,992	249,471,170	-1007376.345
11560253.64	260024047.6	11,697,959	261,169,129	-1145081.505
10629087.82	270653135.4	12,947,427	274,116,556	-3463420.485
11751131.34	282404266.8	8,426,451	282,543,007	-138740.145
13006278.74	295410545.5	3,325,003	285,868,010	9542535.595
8464753.05	303875298.5	6,759,933	292,627,943	11247355.25
3340116.65	307215415.2	5,195,714	297,823,657	9391758.295
6790660.37	314006075.6	5,189,870	303,013,527	10992548.27
5219330.48	319225406	6,635,079	309,648,606	9576799.745
5213460.72	324438866.8	5,290,045	314,938,652	9500215.265
6665238.45	331104105.2	2,594,665	317,533,316	13570789.12
5314090.86	336418196.1	4,701,699	322,235,015	14183180.78
2606458.53	339024654.6	3,123,386	325,358,402	13666253.11
4723070.56	343747725.2	4,503,343	329,861,744	13885980.87
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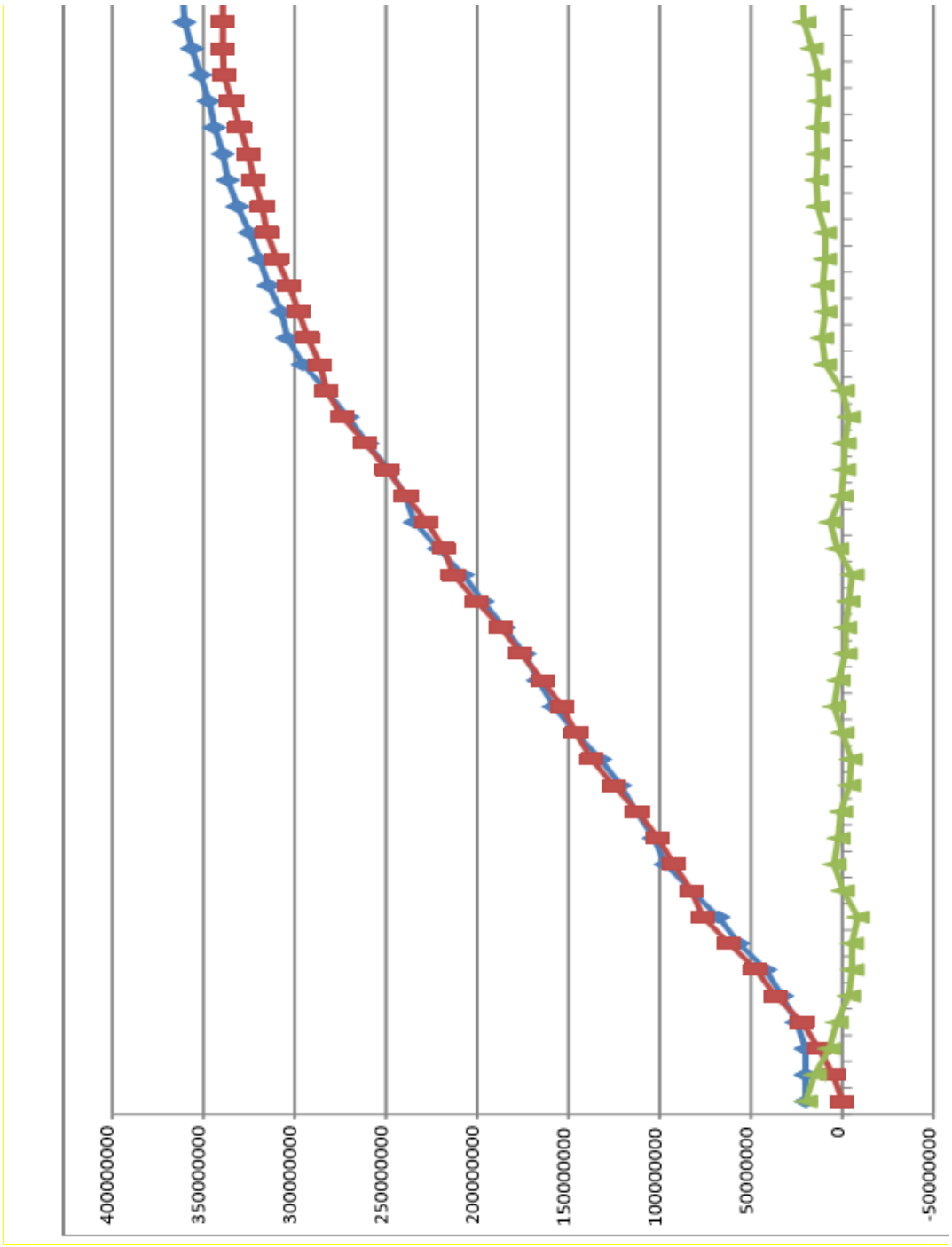
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Direct Cost	Cum.Direct cost
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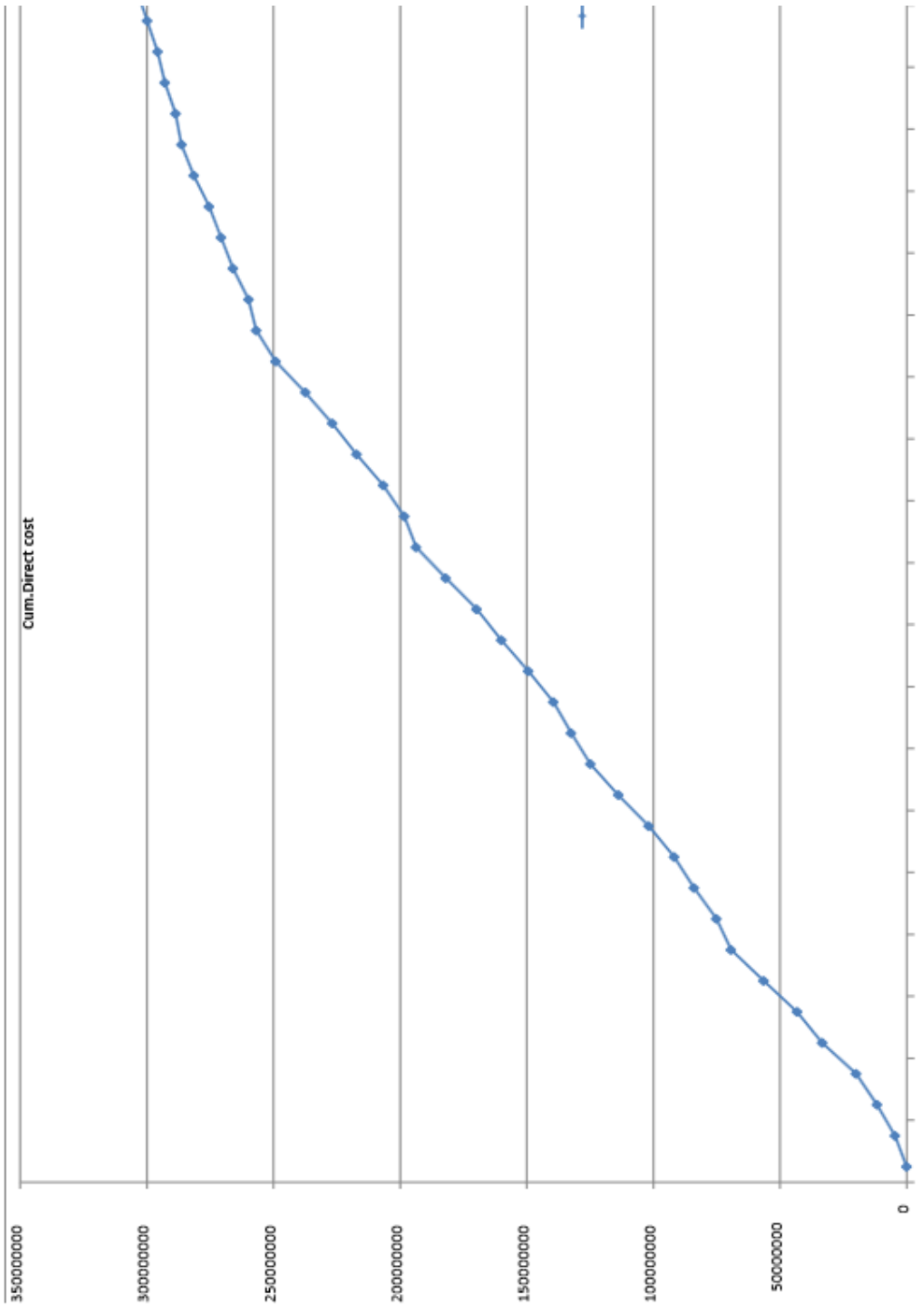
7,115,831	11,682,033
8,320,563	20,002,596
13,321,340	33,323,936
9,897,241	43,221,177
13,257,403	56,478,580
12,869,306	69,347,886
5,782,272	75,130,158
8,836,389	83,966,547
7,827,208	91,793,755
10,072,318	101,866,073
11,958,864	113,824,937
11,030,000	124,854,937
7,657,570	132,512,507
6,972,854	139,485,361
9,907,288	149,392,649
10,648,666	160,041,315
9,775,936	169,817,251
12,184,372	182,001,623
11,709,756	193,711,379
4,689,191	198,400,570
8,310,551	206,711,121
10,461,768	217,172,889
9,619,084	226,791,973
10,634,508	237,426,481
11,770,388	249,196,869
7,660,410	256,857,279
3,022,730	259,880,009
6,145,394	266,025,403
4,723,376	270,748,779
4,718,064	275,466,843
6,031,890	281,498,733
4,809,132	286,307,865
2,358,786	288,666,651
4,274,272	292,940,923
2,839,442	295,780,365
4,093,948	299,874,313
4,086,728	303,961,041
3,801,584	307,762,625


Cum.Direct cost
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contract Price=1.3*Total direct cost	Advanced Payment = 5 %	Retation = 10%
400960105	20048005.25	4009601.05

	Direct Cost	Indirect cost	Total cost	Cumm. Total Cost	Invoice without retantion	Invoice with retation& Advance payment
1					0	0
1	4,566,202	456620.2	5,022,822	5,022,822	5936062.6	5045653.21
1	7,115,831	711583.1	7,827,414	12,850,236	9250580.3	7862993.255
2	8,320,563	832056.3	9,152,619	22,002,856	10816731.9	9194222.115
2	13,321,340	1332134	14,653,474	36,656,330	17317742	14720080.7
2	9,897,241	989724.1	10,886,965	47,543,295	12866413.3	10936451.31
2	13,257,403	1325740.3	14,583,143	62,126,438	17234623.9	14649430.32
2	12,869,306	1286930.6	14,156,237	76,282,675	16730097.8	14220583.13
2	5,782,272	578227.2	6,360,499	82,643,174	7516953.6	6389410.56
2	8,836,389	883638.9	9,720,028	92,363,202	11487305.7	9764209.845
2	7,827,208	782720.8	8,609,929	100,973,131	10175370.4	8649064.84
2	10,072,318	1007231.8	11,079,550	112,052,680	13094013.4	11129911.39
2	11,958,864	1195886.4	13,154,750	125,207,431	15546523.2	13214544.72
2	11,030,000	1103000	12,133,000	137,340,431	14339000	12188150
2	7,657,570	765757	8,423,327	145,763,758	9954841	8461614.85
3	6,972,854	697285.4	7,670,139	153,433,897	9064710.2	7705003.67
3	9,907,288	990728.8	10,898,017	164,331,914	12879474.4	10947553.24
3	10,648,666	1064866.6	11,713,533	176,045,447	13843265.8	11766775.93
3	9,775,936	977593.6	10,753,530	186,798,976	12708716.8	10802409.28
3	12,184,372	1218437.2	13,402,809	200,201,785	15839683.6	13463731.06
3	11,709,756	1170975.6	12,880,732	213,082,517	15222682.8	12939280.38
3	4,689,191	468919.1	5,158,110	218,240,627	6095948.3	5181556.055
3	8,310,551	831055.1	9,141,606	227,382,233	10803716.3	9183158.855
3	10,461,758	1046176.8	11,507,945	238,890,178	13600298.4	11560253.64
3	9,619,084	961908.4	10,580,992	249,471,170	12504809.2	10629087.82
3	10,634,508	1063450.8	11,697,959	261,169,129	13824860.4	11751131.34
3	11,770,388	1177038.8	12,947,427	274,116,556	15301504.4	13006278.74
4	7,660,410	766041	8,426,451	282,543,007	9958533	8464753.05
4	3,022,730	302273	3,325,003	285,868,010	3929549	3340116.65
4	6,145,394	614539.4	6,759,933	292,627,943	7989012.2	6790660.37
4	4,723,376	472337.6	5,195,714	297,823,657	6140388.8	5219330.48
4	4,718,064	471806.4	5,189,870	303,013,527	6133483.2	5213460.72
4	6,031,890	603189	6,635,079	309,648,606	7841457	6665238.45
4	4,809,132	480913.2	5,290,045	314,938,652	6251871.6	5314090.86
4	2,358,786	235878.6	2,594,665	317,533,316	3066421.8	2606458.53
4	4,274,272	427427.2	4,701,699	322,235,015	5556553.6	4723070.56
4	2,839,442	283944.2	3,123,386	325,358,402	3691274.6	3137583.41

Cash Inflow	cumm. Cash Inflow	cash outflow	cumm. Cash outflow	Overdraft
20048005.25	20048005.25	0	0	20048005.25
	20048005.25	5,022,822	5,022,822	15025183.05
	20048005.25	7,827,414	12,850,236	7197768.95
5045653.21	25093658.46	9,152,619	22,002,856	3090802.86
7862993.255	32956651.72	14,653,474	36,656,330	-3699677.885
9194222.115	42150873.83	10,886,965	47,543,295	-5392420.87
14720080.7	56870954.53	14,583,143	62,126,438	-5255483.47
10936451.31	67807405.84	14,156,237	76,282,675	-8475268.765
14649430.32	82456836.15	6,360,499	82,643,174	-186337.65
14220583.13	96677419.28	9,720,028	92,363,202	4314217.58
6389410.56	103066829.8	8,609,929	100,973,131	2093699.34
9764209.845	112831039.7	11,079,550	112,052,680	778359.385
8649064.84	121480104.5	13,154,750	125,207,431	-3727326.175
11129911.39	132610015.9	12,133,000	137,340,431	-4730414.785
13214544.72	145824560.6	8,423,327	145,763,758	60802.935
12188150	158012710.6	7,670,139	153,433,897	4578813.535
8461614.85	166474325.5	10,898,017	164,331,914	2142411.585
7705003.67	174179329.2	11,713,533	176,045,447	-1866117.345
10947553.24	185126882.4	10,753,530	186,798,976	-1672093.705
11766775.93	196893658.3	13,402,809	200,201,785	-3308126.975
10802409.28	207696067.6	12,880,732	213,082,517	-5386449.295
13463731.06	221159798.7	5,158,110	218,240,627	2919171.665
12939280.38	234099079	9,141,606	227,382,233	6716845.945
5181556.055	239280635.1	11,507,945	238,890,178	390457.2
9183158.855	248463794	10,580,992	249,471,170	-1007376.345
11560253.64	260024047.6	11,697,959	261,169,129	-1145081.505
10629087.82	270653135.4	12,947,427	274,116,556	-3463420.485
11751131.34	282404266.8	8,426,451	282,543,007	-138740.145
13006278.74	295410545.5	3,325,003	285,868,010	9542535.595
8464753.05	303875298.5	6,759,933	292,627,943	11247355.25
3340116.65	307215415.2	5,195,714	297,823,657	9391758.295
6790660.37	314006075.6	5,189,870	303,013,527	10992548.27
5219330.48	319225406	6,635,079	309,648,606	9576799.745
5213460.72	324438866.8	5,290,045	314,938,652	9500215.265
6665238.45	331104105.2	2,594,665	317,533,316	13570789.12
5314090.86	336418196.1	4,701,699	322,235,015	14183180.78
2606458.53	339024654.6	3,123,386	325,358,402	13666253.11
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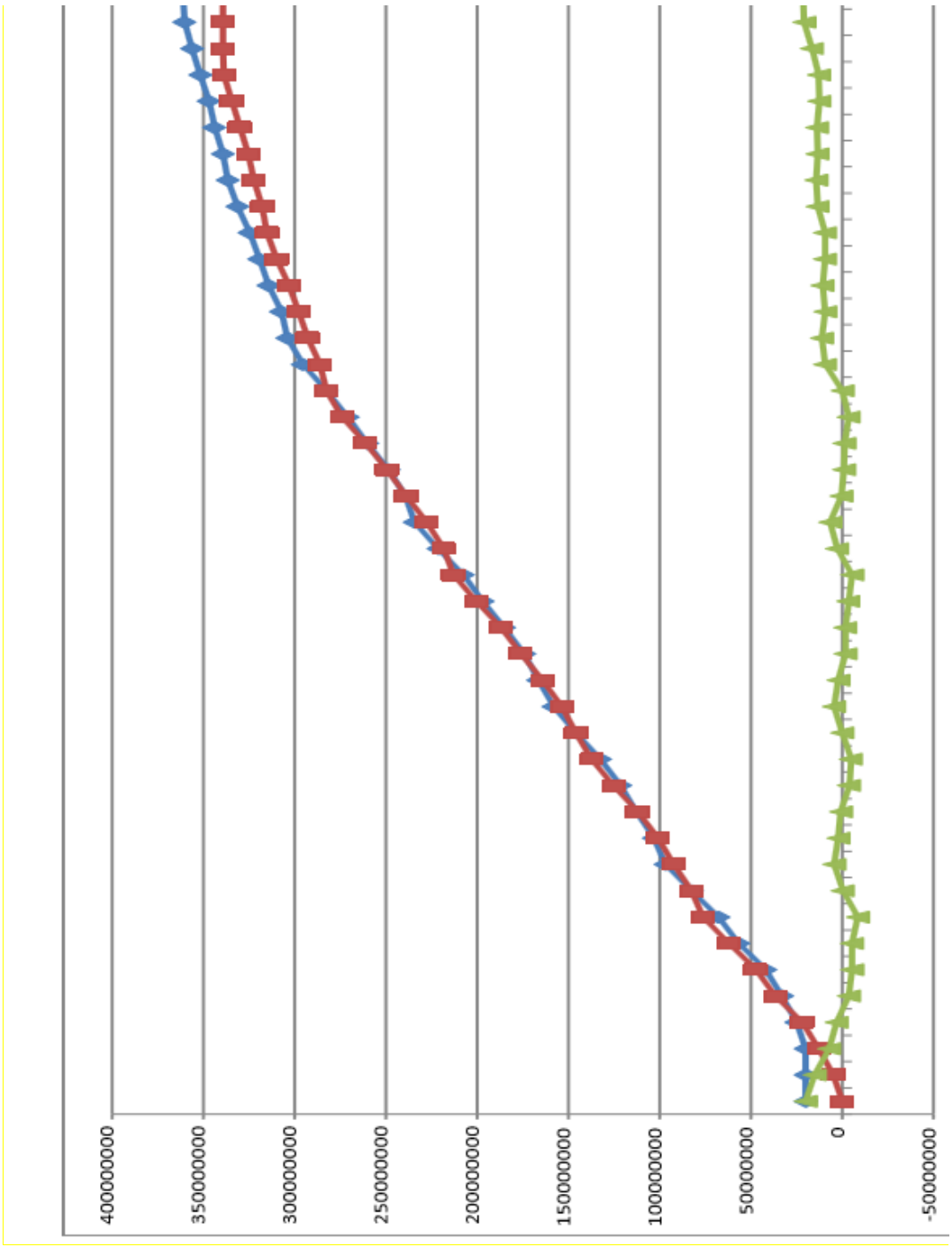
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Direct Cost	Cum.Direct cost
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4,566,202	4,566,202
7,115,831	11,682,033
8,320,563	20,002,596
13,321,340	33,323,936
9,897,241	43,221,177
13,257,403	56,478,580
12,869,306	69,347,886
5,782,272	75,130,158
8,836,389	83,966,547
7,827,208	91,793,755
10,072,318	101,866,073
11,958,864	113,824,937
11,030,000	124,854,937
7,657,570	132,512,507
6,972,854	139,485,361
9,907,288	149,392,649
10,648,666	160,041,315
9,775,936	169,817,251
12,184,372	182,001,623
11,709,756	193,711,379
4,689,191	198,400,570
8,310,551	206,711,121
10,461,768	217,172,889
9,619,084	226,791,973
10,634,508	237,426,481
11,770,388	249,196,869
7,660,410	256,857,279
3,022,730	259,880,009
6,145,394	266,025,403
4,723,376	270,748,779
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6,031,890	281,498,733
4,809,132	286,307,865
2,358,786	288,666,651
4,274,272	292,940,923
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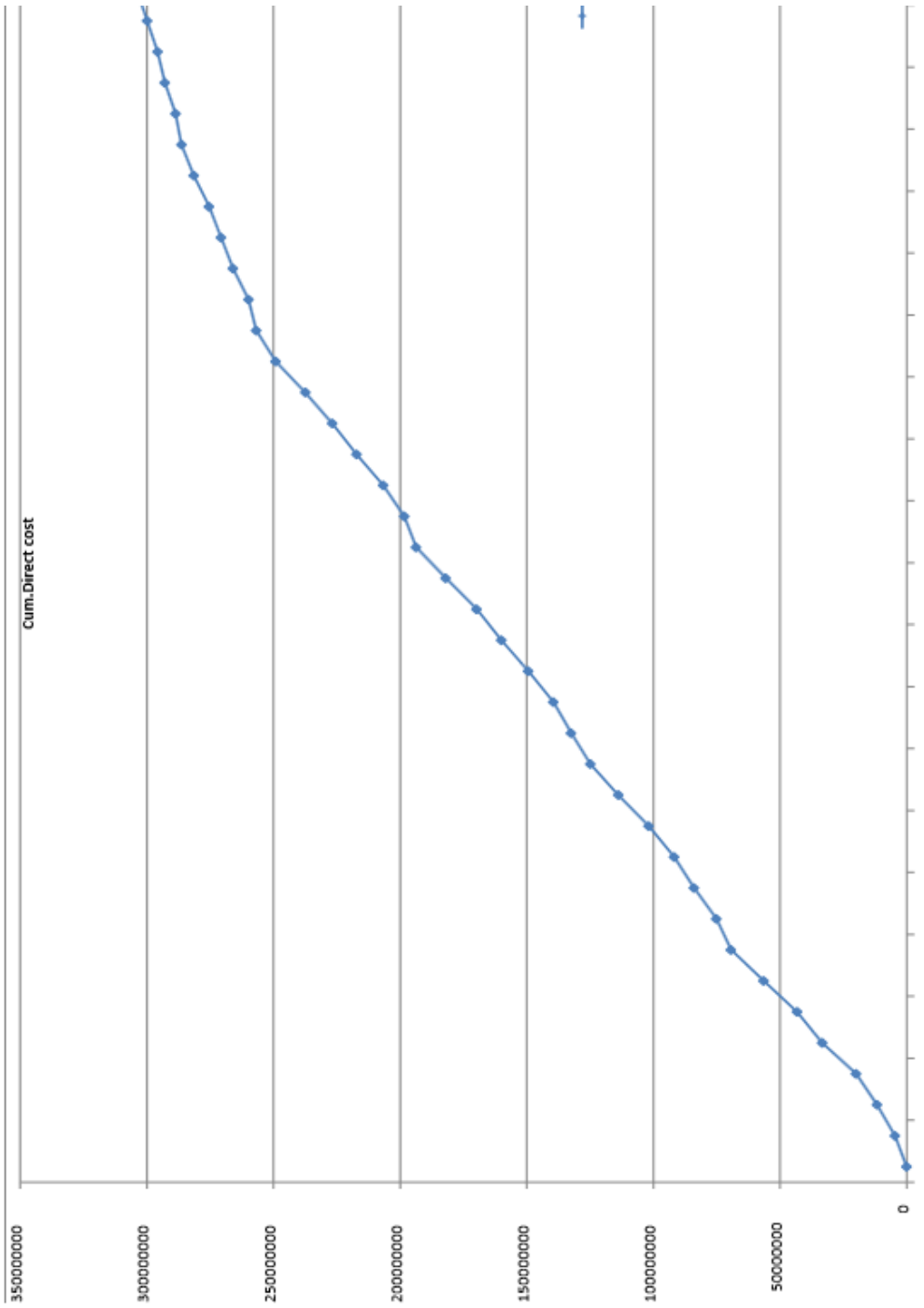
4,093,948	299,874,313
4,086,728	303,961,041
3,801,584	307,762,625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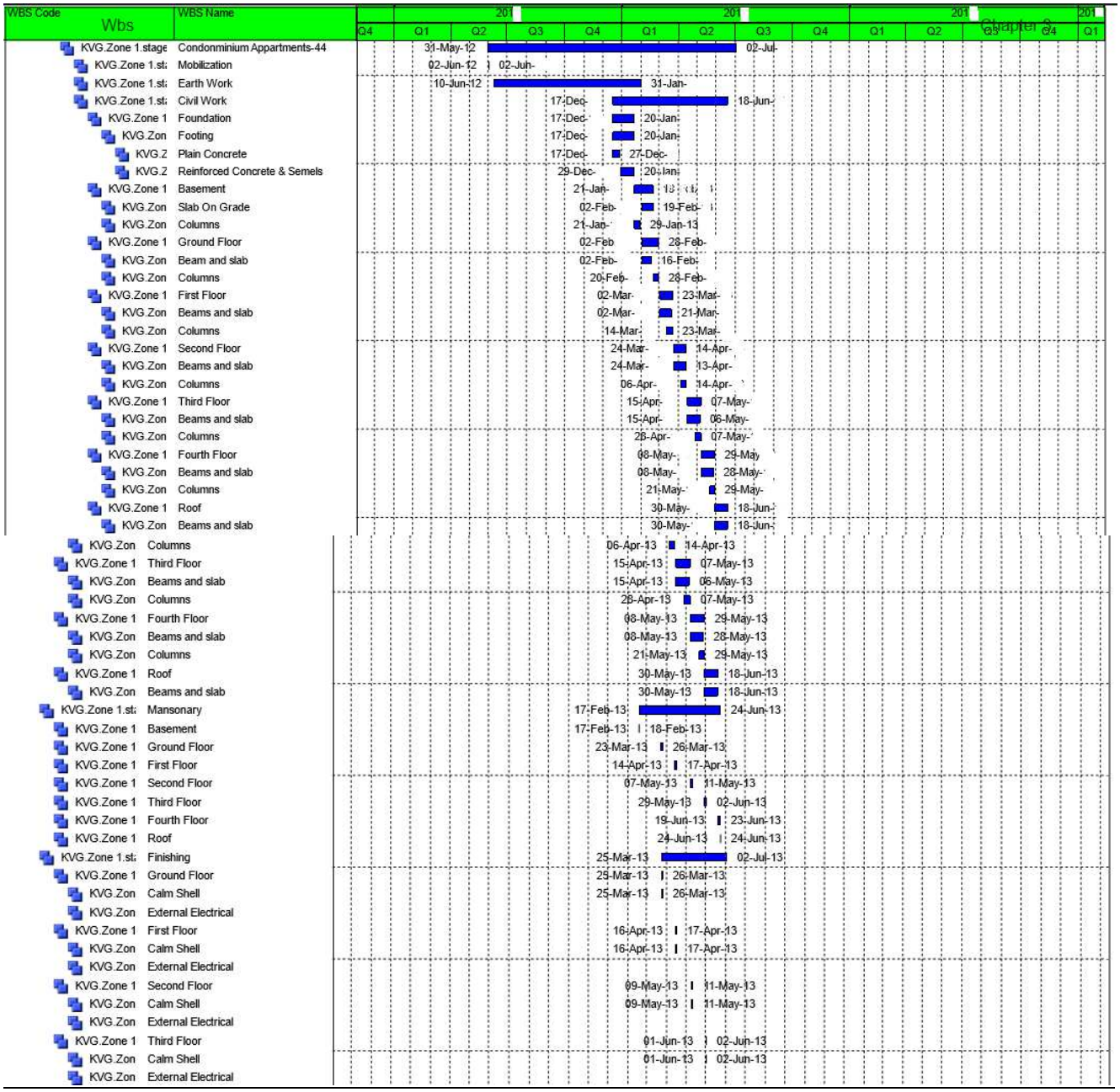
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Wbs
WBS Name
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KVG.Zone 1.st: Mobilization 02-Jun-12 02-Jun-
KVG.Zone 1.st: Earth Work 10-Jun-12 31-Jan-
KVG.Zone 1.st: Civil Work 17-Dec- 18-Jun-
KVG.Zone 1 Foundation 17-Dec- 20-Jan-
KVG.Zon Footing 17-Dec- 20-Jan-
KVG.Z Plain Concrete 17-Dec- 27-Dec-
KVG.Z Reinforced Concrete & Semels 29-Dec- 20-Jan-
KVG.Zone 1 Basement 21-Jan-
KVG.Zon Slab On Grade 02-Feb- 19-Feb-
KVG.Zon Columns 21-Jan- 29-Jan-13
KVG.Zone 1 Ground Floor 02-Feb 28-Feb-
KVG.Zon Beam and slab 02-Feb- 16-Feb-
KVG.Zon Columns 20-Feb- 28-Feb-
KVG.Zone 1 First Floor 02-Mar- 23-Mar-
KVG.Zon Beams and slab 02-Mar- 21-Mar-
KVG.Zon Columns 14-Mar- 23-Mar-
KVG.Zone 1 Second Floor 24-Mar- 14-Apr-
KVG.Zon Beams and slab 24-Mar- 13-Apr-
KVG.Zon Columns 06-Apr- 14-Apr-
KVG.Zone 1 Third Floor 15-Apr- 07-May-
KVG.Zon Beams and slab 15-Apr- 06-May-
KVG.Zon Columns 28-Apr- 07-May-
KVG.Zone 1 Fourth Floor 08-May- 29-May
KVG.Zon Beams and slab 08-May- 28-May-
KVG.Zon Columns 21-May- 29-May-
KVG.Zone 1 Roof 30-May- 18-Jun-
KVG.Zon Beams and slab 30-May- 18-Jun-
KVG.Zon Columns 06-Apr-13 14-Apr-13
KVG.Zone 1 Third Floor 15-Apr-13 07-May-13
KVG.Zon Beams and slab 15-Apr-13 06-May-13
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KVG.Zone 1 Fourth Floor 08-May-13 29-May-13
KVG.Zon Beams and slab 08-May-13 28-May-13
KVG.Zon Columns 21-May-13 29-May-13
KVG.Zone 1 Roof 30-May-13 18-Jun-13
KVG.Zon Beams and slab 30-May-13 18-Jun-13
KVG.Zone 1.st: Mansonary 17-Feb-13 24-Jun-13
KVG.Zone 1 Basement 17-Feb-13 18-Feb-13
KVG.Zone 1 Ground Floor 23-Mar-13 26-Mar-13
KVG.Zone 1 First Floor 14-Apr-13 17-Apr-13
KVG.Zone 1 Second Floor 07-May-13 11-May-13
KVG.Zone 1 Third Floor 29-May-13 02-Jun-13
KVG.Zone 1 Fourth Floor 19-Jun-13 23-Jun-13
KVG.Zone 1 Roof 24-Jun-13 24-Jun-13
KVG.Zone 1.st: Finishing 25-Mar-13 02-Jul-13
KVG.Zone 1 Ground Floor 25-Mar-13 26-Mar-13
KVG.Zon Calm Shell 25-Mar-13 26-Mar-13
KVG.Zon External Electrical
KVG.Zone 1 First Floor 16-Apr-13 17-Apr-13
KVG.Zon Calm Shell 16-Apr-13 17-Apr-13
KVG.Zon External Electrical
KVG.Zone 1 Second Floor 09-May-13 11-May-13
KVG.Zon Calm Shell 09-May-13 11-May-13
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KVG.Zon Calm Shell 01-Jun-13 02-Jun-13
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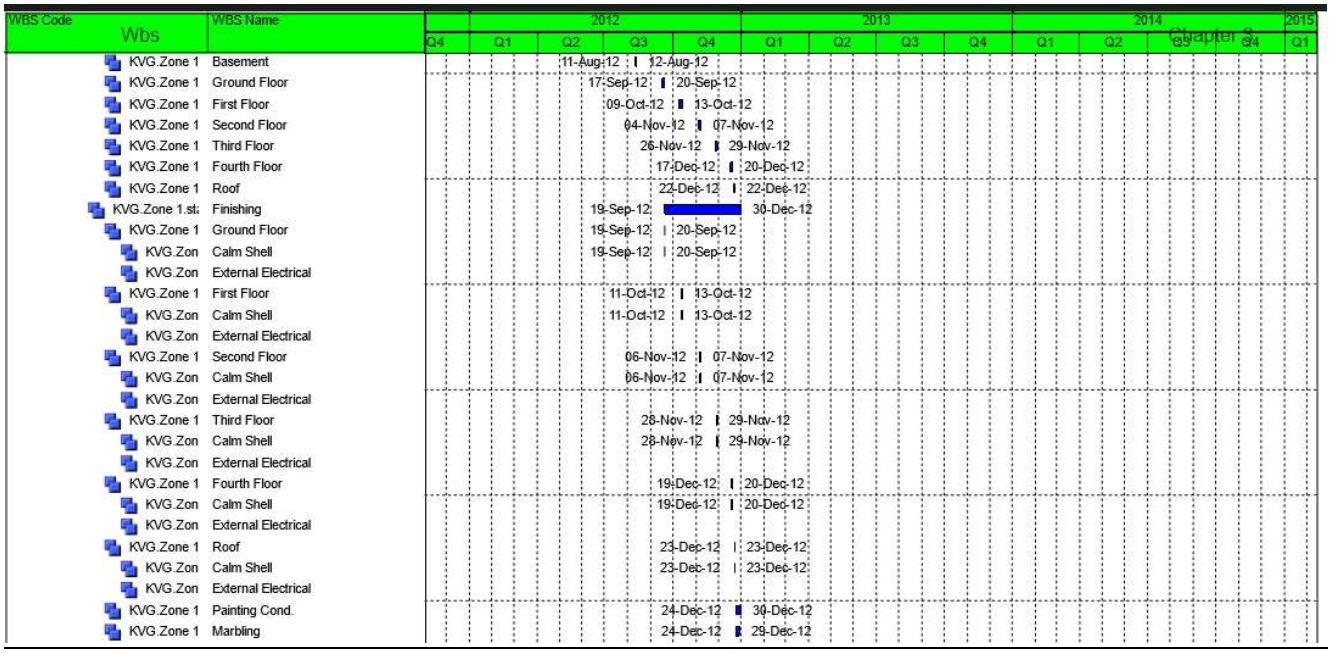
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KVG.Zone 1 First Floor 09-Oct-12 13-Oct-12
KVG.Zone 1 Second Floor 04-Nov-12 07-Nov-12
KVG.Zone 1 Third Floor 26-Nov-12 29-Nov-12
KVG.Zone 1 Fourth Floor 17-Dec-12 20-Dec-12
KVG.Zone 1 Roof 22-Dec-12 22-Dec-12
KVG.Zone 1.st Finishing 19-Sep-12 30-Dec-12
KVG.Zone 1 Ground Floor 19-Sep-12 20-Sep-12
KVG.Zon Calm Shell 19-Sep-12 20-Sep-12
KVG.Zon External Electrical
KVG.Zone 1 First Floor 11-Oct-12 13-Oct-12
KVG.Zon Calm Shell 11-Oct-12 13-Oct-12
KVG.Zon External Electrical
KVG.Zone 1 Second Floor 06-Nov-12 07-Nov-12
KVG.Zon Calm Shell 06-Nov-12 07-Nov-12
KVG.Zon External Electrical
KVG.Zone 1 Third Floor 28-Nov-12 29-Nov-12
KVG.Zon Calm Shell 28-Nov-12 29-Nov-12
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KVG.Zone 1 Fourth Floor 19-Dec-12 20-Dec-12
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KVG.Zone 1 Roof 23-Dec-12 23-Dec-12
KVG.Zon Calm Shell 23-Dec-12 23-Dec-12
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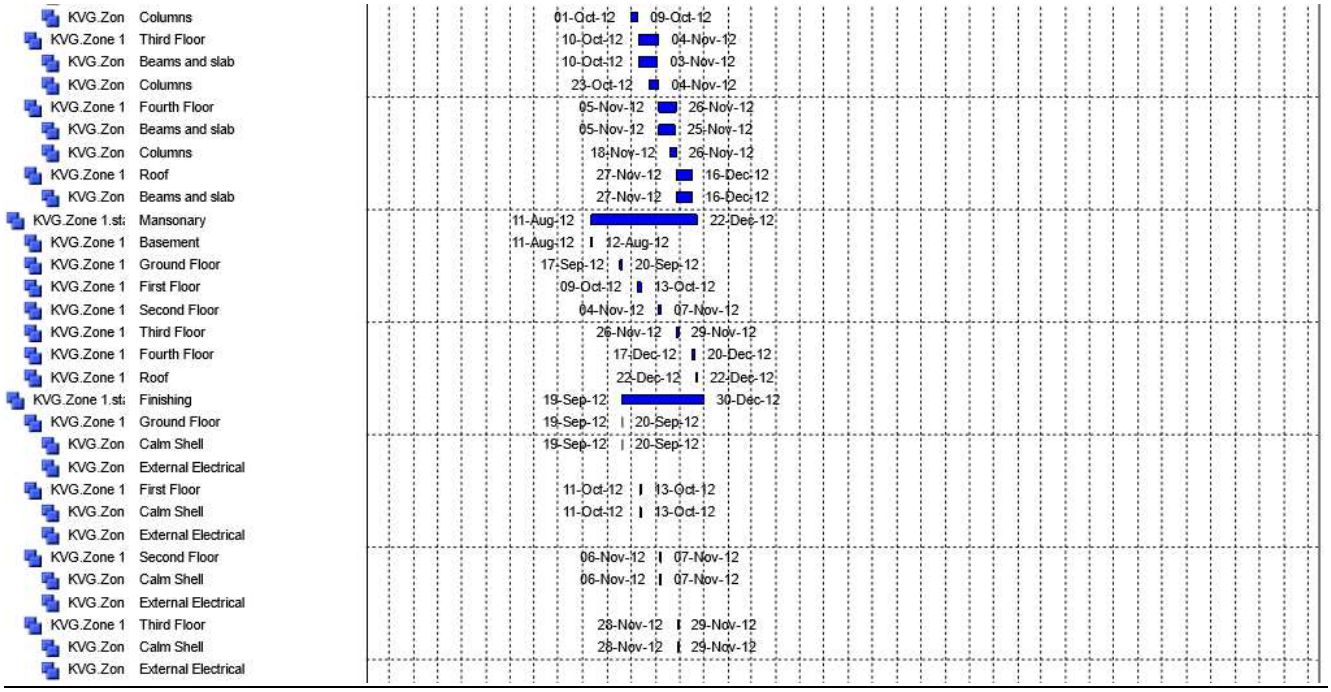
KVG.Zone 1 Marbling 24-Dec-12 29-Dec-12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KVG.Zon Columns 23-Oct-12 04-Nov-12
KVG.Zone 1 Fourth Floor 05-Nov-12 26-Nov-12
KVG.Zon Beams and slab 05-Nov-12 25-Nov-12
KVG.Zon Columns 18-Nov-12 26-Nov-12
KVG.Zone 1 Roof 27-Nov-12 16-Dec-12
KVG.Zon Beams and slab 27-Nov-12 16-Dec-12
KVG.Zone 1.st Mansonary 11-Aug-12 22-Dec-12
KVG.Zone 1 Basement 11-Aug-12 12-Aug-12
KVG.Zone 1 Ground Floor 17-Sep-12 20-Sep-12
KVG.Zone 1 First Floor 09-Oct-12 13-Oct-12
KVG.Zone 1 Second Floor 04-Nov-12 07-Nov-12
KVG.Zone 1 Third Floor 26-Nov-12 29-Nov-12
KVG.Zone 1 Fourth Floor 17-Dec-12 20-Dec-12
KVG.Zone 1 Roof 22-Dec-12 22-Dec-12
KVG.Zone 1.st Finishing 19-Sep-12 30-Dec-12
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KVG.Zon Calm Shell 19-Sep-12 20-Sep-12
KVG.Zon External Electrical
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KVG.Zon Calm Shell 11-Oct-12 13-Oct-12
KVG.Zon External Electrical
KVG.Zone 1 Second Floor 06-Nov-12 07-Nov-12
KVG.Zon Calm Shell 06-Nov-12 07-Nov-12
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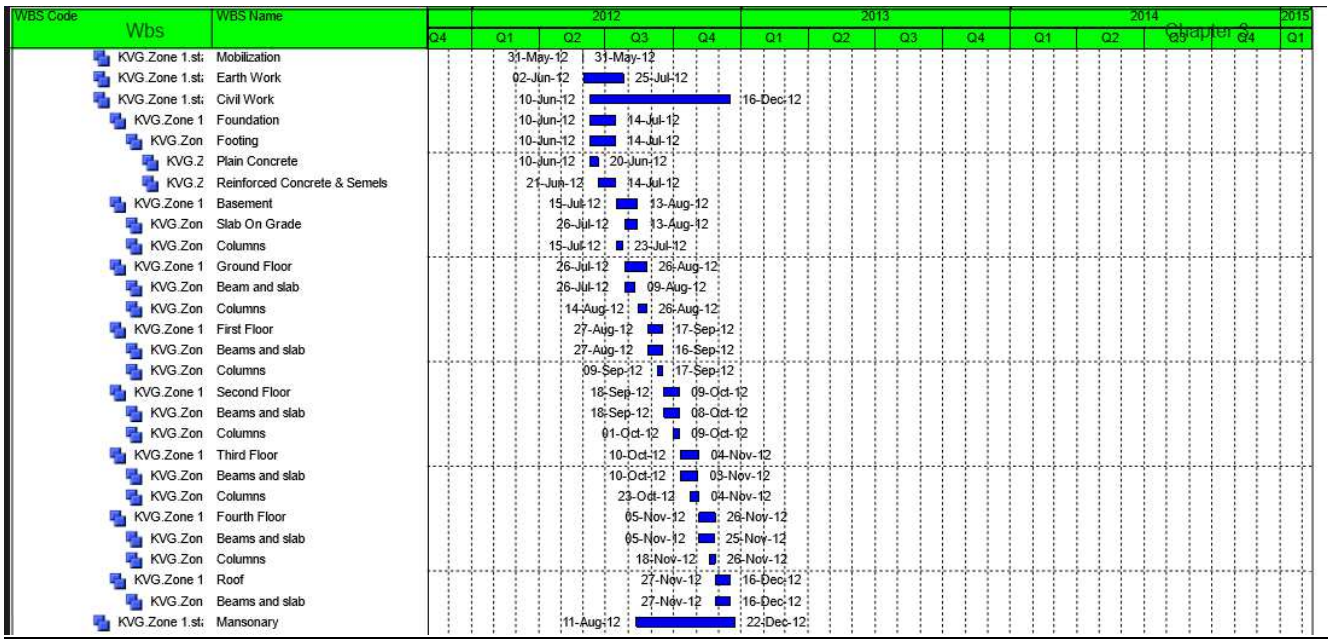
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KVG.Zone 1.st Civil Work 10-Jun-12 16-Dec-12
KVG.Zone 1 Foundation 10-Jun-12 14-Jul-12
KVG.Zon Footing 10-Jun-12 14-Jul-12
KVG.Z Plain Concrete 10-Jun-12 20-Jun-12
KVG.Z Reinforced Concrete & Semels 21-Jun-12 14-Jul-12
KVG.Zone 1 Basement 15-Jul-12 13-Aug-12
KVG.Zon Slab On Grade 26-Jul-12 13-Aug-12
KVG.Zon Columns 15-Jul-12 23-Jul-12
KVG.Zone 1 Ground Floor 26-Jul-12 26-Aug-12
KVG.Zon Beam and slab 26-Jul-12 09-Aug-12
KVG.Zon Columns 14-Aug-12 26-Aug-12
KVG.Zone 1 First Floor 27-Aug-12 17-Sep-12
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KVG.Zon Beams and slab 18-Sep-12 08-Oct-12
KVG.Zon Columns 01-Oct-12 09-Oct-12
KVG.Zone 1 Third Floor 10-Oct-12 04-Nov-12
KVG.Zon Beams and slab 10-Oct-12 03-Nov-12
KVG.Zon Columns 23-Oct-12 04-Nov-12
KVG.Zone 1 Fourth Floor 05-Nov-12 26-Nov-12
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KVG.Zon Columns 18-Nov-12 26-Nov-12
KVG.Zone 1 Roof 27-Nov-12 16-Dec-12
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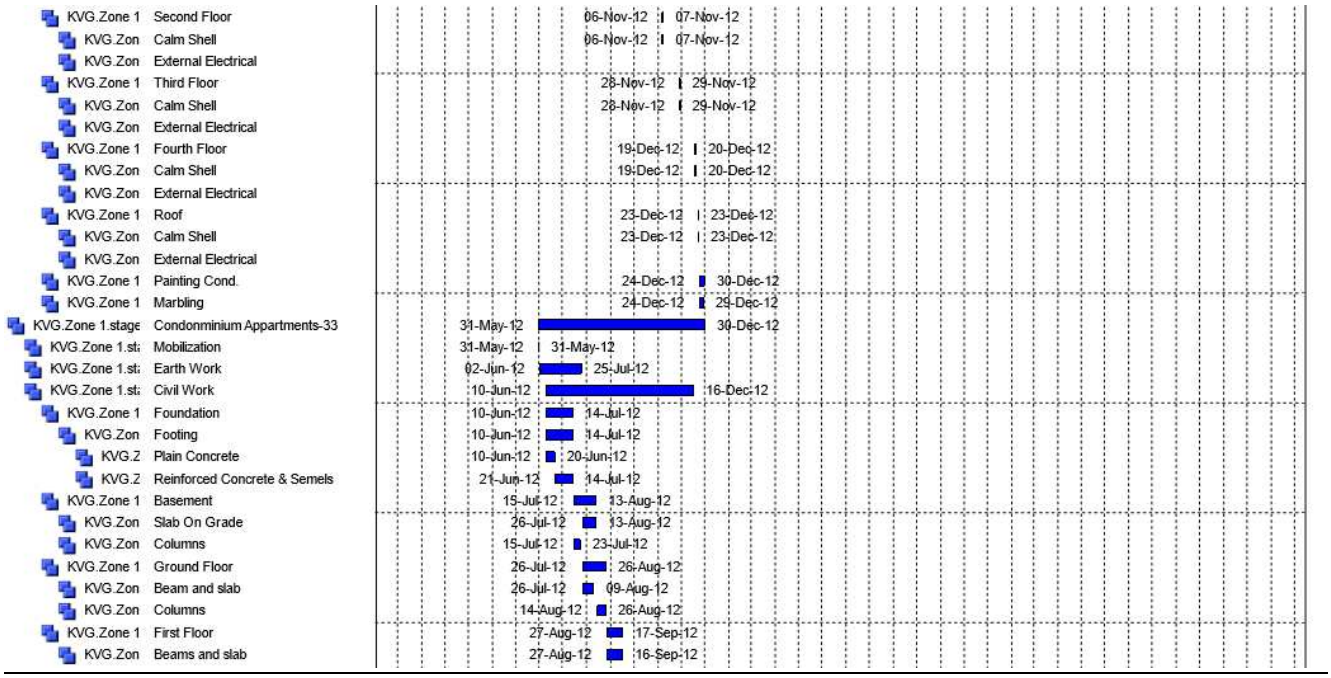
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KVG.Zon Calm Shell 28-Nov-12 29-Nov-12
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KVG.Zone 1 Fourth Floor 19-Dec-12 20-Dec-12
KVG.Zon Calm Shell 19-Dec-12 20-Dec-12
KVG.Zon External Electrical
KVG.Zone 1 Roof 23-Dec-12 23-Dec-12
KVG.Zon Calm Shell 23-Dec-12 23-Dec-12
KVG.Zon External Electrical
KVG.Zone 1 Painting Cond. 24-Dec-12 30-Dec-12
KVG.Zone 1 Marbling 24-Dec-12 29-Dec-12
KVG.Zone 1.stage Condonminium Appartments-33 31-May-12 30-Dec-12
KVG.Zone 1.st Mobilization 31-May-12 31-May-12
KVG.Zone 1.st Earth Work 02-Jun-12 25-Jul-12
KVG.Zone 1.st Civil Work 10-Jun-12 16-Dec-12
KVG.Zone 1 Foundation 10-Jun-12 14-Jul-12
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KVG.Zon Slab On Grade 26-Jul-12 13-Aug-12
KVG.Zon Columns 15-Jul-12 23-Jul-12
KVG.Zone 1 Ground Floor 26-Jul-12 26-Aug-12
KVG.Zon Beam and slab 26-Jul-12 09-Aug-12
KVG.Zon Columns 14-Aug-12 26-Aug-12
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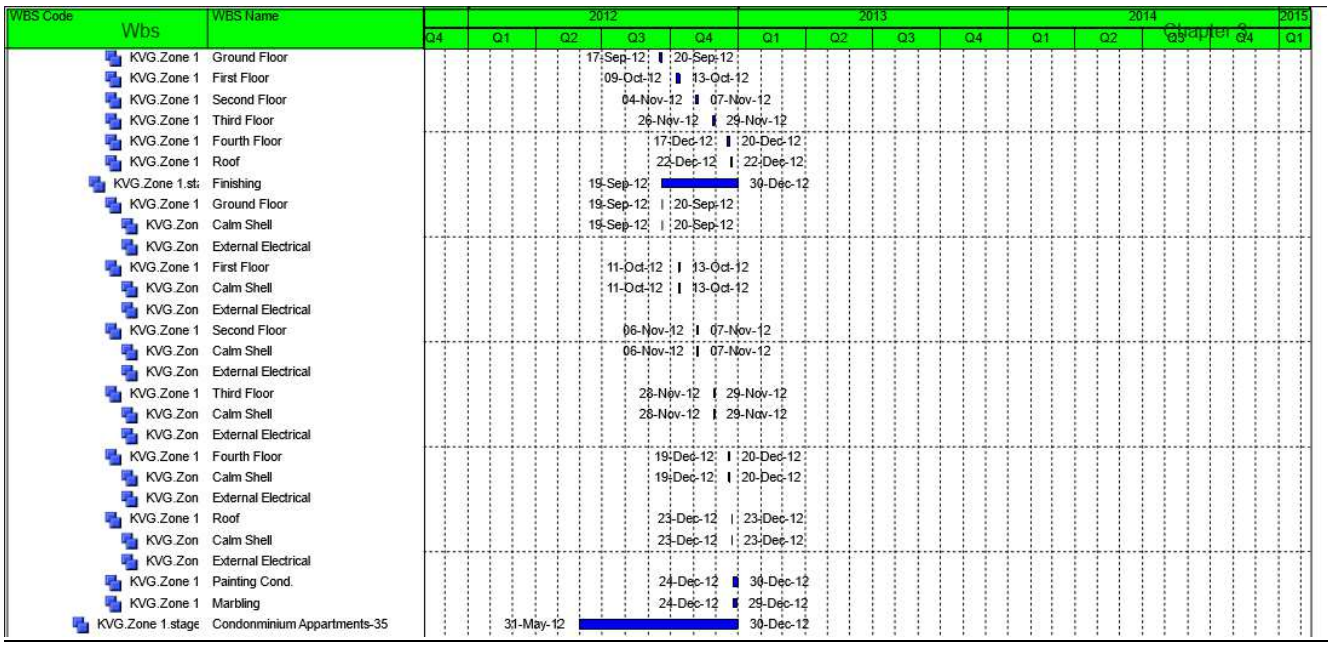
KVG.Zon Beams and slab 27-Aug-12 16-Sep-12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KVG.Zone 1 First Floor 09-Oct-12 13-Oct-12
KVG.Zone 1 Second Floor 04-Nov-12 07-Nov-12
KVG.Zone 1 Third Floor 26-Nov-12 29-Nov-12
KVG.Zone 1 Fourth Floor 17-Dec-12 20-Dec-12
KVG.Zone 1 Roof 22-Dec-12 22-Dec-12
KVG.Zone 1.st Finishing 19-Sep-12 30-Dec-12
KVG.Zone 1 Ground Floor 19-Sep-12 20-Sep-12
KVG.Zon Calm Shell 19-Sep-12 20-Sep-12
KVG.Zon External Electrical
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KVG.Zon Calm Shell 11-Oct-12 13-Oct-12
KVG.Zon External Electrical
KVG.Zone 1 Second Floor 06-Nov-12 07-Nov-12
KVG.Zon Calm Shell 06-Nov-12 07-Nov-12
KVG.Zon External Electrical
KVG.Zone 1 Third Floor 28-Nov-12 29-Nov-12
KVG.Zon Calm Shell 28-Nov-12 29-Nov-12
KVG.Zon External Electrical
KVG.Zone 1 Fourth Floor 19-Dec-12 20-Dec-12
KVG.Zon Calm Shell 19-Dec-12 20-Dec-12
KVG.Zon External Electrical
KVG.Zone 1 Roof 23-Dec-12 23-Dec-12
KVG.Zon Calm Shell 23-Dec-12 23-Dec-12
KVG.Zon External Electrical
KVG.Zone 1 Painting Cond. 24-Dec-12 30-Dec-12
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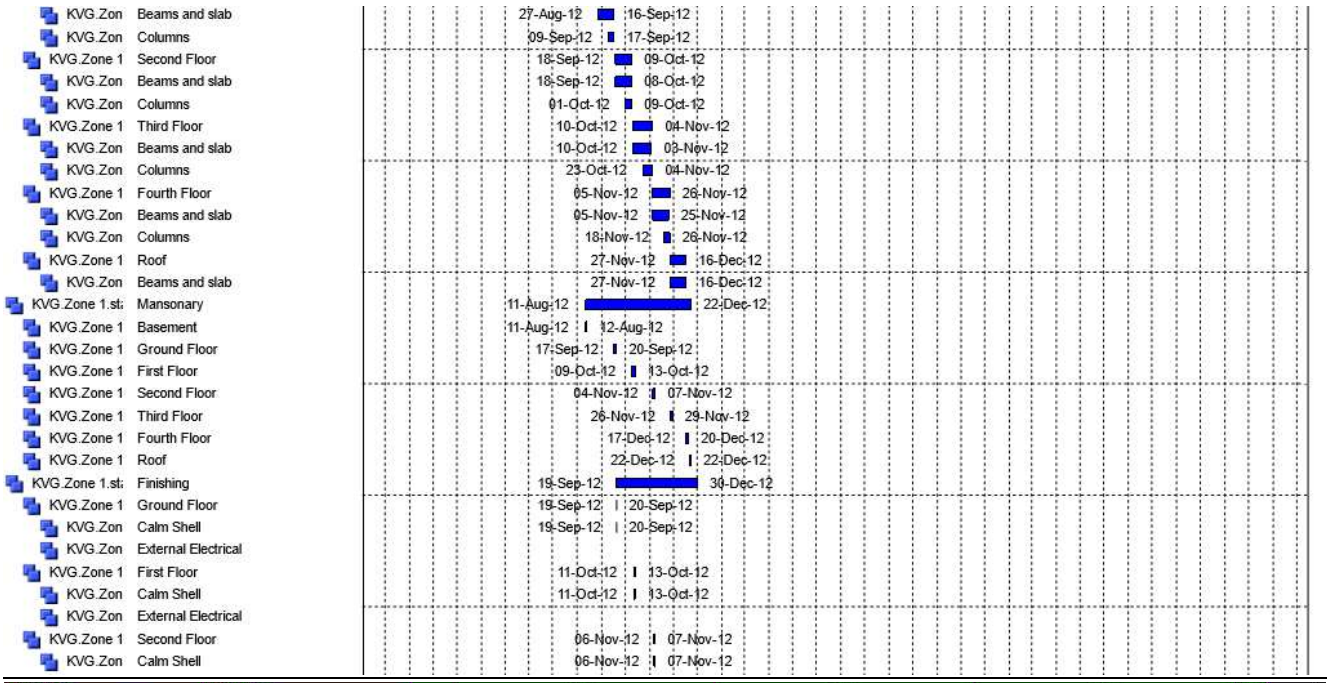
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KVG.Zon Beams and slab 18-Sep-12 08-Oct-12
KVG.Zon Columns 01-Oct-12 09-Oct-12
KVG.Zone 1 Third Floor 10-Oct-12 04-Nov-12
KVG.Zon Beams and slab 10-Oct-12 03-Nov-12
KVG.Zon Columns 23-Oct-12 04-Nov-12
KVG.Zone 1 Fourth Floor 05-Nov-12 26-Nov-12
KVG.Zon Beams and slab 05-Nov-12 25-Nov-12
KVG.Zon Columns 18-Nov-12 26-Nov-12
KVG.Zone 1 Roof 27-Nov-12 16-Dec-12
KVG.Zon Beams and slab 27-Nov-12 16-Dec-12
KVG.Zone 1.st Mansonary 11-Aug-12 22-Dec-12
KVG.Zone 1 Basement 11-Aug-12 12-Aug-12
KVG.Zone 1 Ground Floor 17-Sep-12 20-Sep-12
KVG.Zone 1 First Floor 09-Oct-12 13-Oct-12
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KVG.Zone 1 Third Floor 26-Nov-12 29-Nov-12
KVG.Zone 1 Fourth Floor 17-Dec-12 20-Dec-12
KVG.Zone 1 Roof 22-Dec-12 22-Dec-12
KVG.Zone 1.st Finishing 19-Sep-12 30-Dec-12
KVG.Zone 1 Ground Floor 19-Sep-12 20-Sep-12
KVG.Zon Calm Shell 19-Sep-12 20-Sep-12
KVG.Zon External Electrical
KVG.Zone 1 First Floor 11-Oct-12 13-Oct-12
KVG.Zon Calm Shell 11-Oct-12 13-Oct-12
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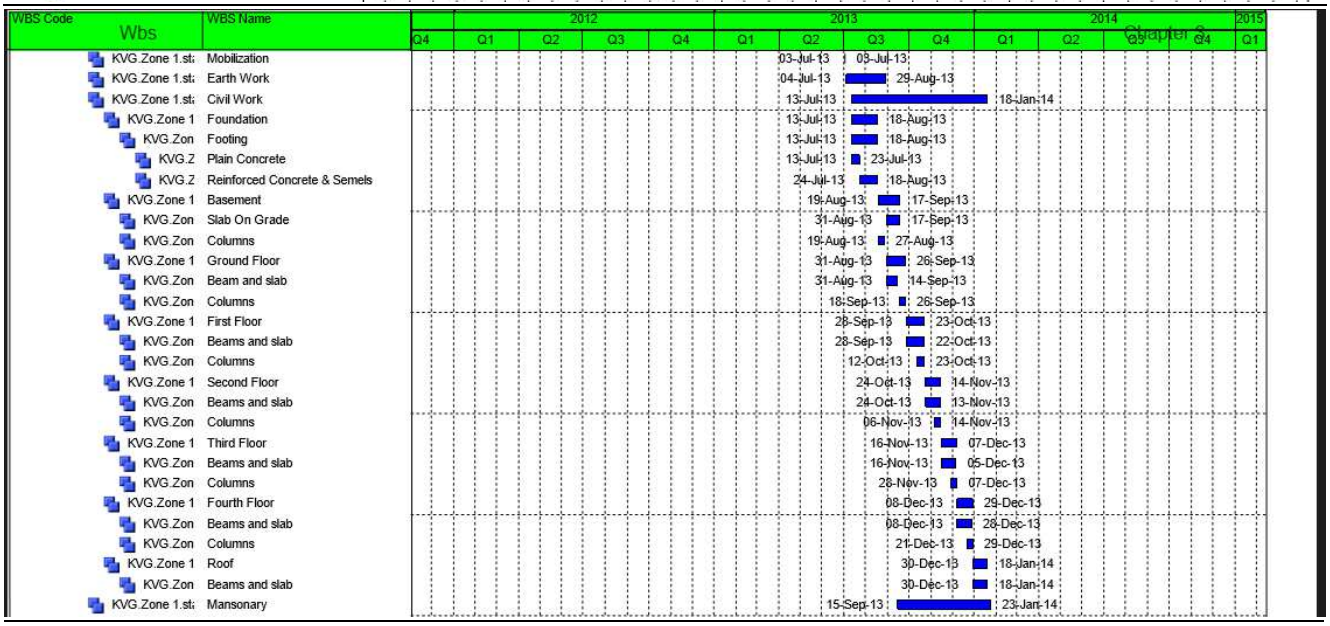
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KVG.Zone 1.st Civil Work 13-Jul-13 18-Jan-14
KVG.Zone 1 Foundation 13-Jul-13 18-Aug-13
KVG.Zon Footing 13-Jul-13 18-Aug-13
KVG.Z Plain Concrete 13-Jul-13 23-Jul-13
KVG.Z Reinforced Concrete & Semels 24-Jul-13 18-Aug-13
KVG.Zone 1 Basement 19-Aug-13 17-Sep-13
KVG.Zon Slab On Grade 31-Aug-13 17-Sep-13
KVG.Zon Columns 19-Aug-13 27-Aug-13
KVG.Zone 1 Ground Floor 31-Aug-13 26-Sep-13
KVG.Zon Beam and slab 31-Aug-13 14-Sep-13
KVG.Zon Columns 18-Sep-13 26-Sep-13
KVG.Zone 1 First Floor 28-Sep-13 23-Oct-13
KVG.Zon Beams and slab 28-Sep-13 22-Oct-13
KVG.Zon Columns 12-Oct-13 23-Oct-13
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KVG.Zon Beams and slab 24-Oct-13 13-Nov-13
KVG.Zon Columns 06-Nov-13 14-Nov-13
KVG.Zone 1 Third Floor 16-Nov-13 07-Dec-13
KVG.Zon Beams and slab 16-Nov-13 05-Dec-13
KVG.Zon Columns 28-Nov-13 07-Dec-13
KVG.Zone 1 Fourth Floor 08-Dec-13 29-Dec-13
KVG.Zon Beams and slab 08-Dec-13 28-Dec-13
KVG.Zon Columns 21-Dec-13 29-Dec-13
KVG.Zone 1 Roof 30-Dec-13 18-Jan-14
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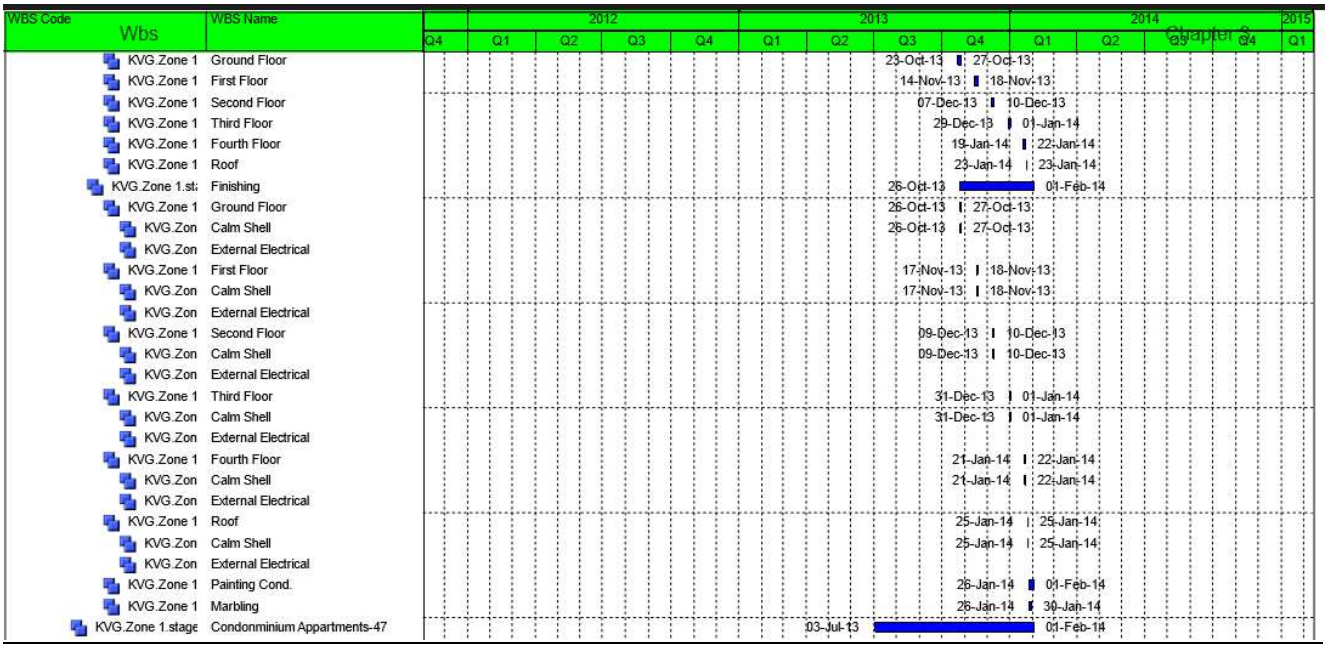
KVG.Zone 1.st Mansonary 15-Sep-13 23-Jan-14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KVG.Zone 1 Third Floor 29-Dec-13 01-Jan-14
KVG.Zone 1 Fourth Floor 19-Jan-14 22-Jan-14
KVG.Zone 1 Roof 23-Jan-14 23-Jan-14
KVG.Zone 1.st Finishing 26-Oct-13 01-Feb-14
KVG.Zone 1 Ground Floor 26-Oct-13 27-Oct-13
KVG.Zon Calm Shell 26-Oct-13 27-Oct-13
KVG.Zon External Electrical
KVG.Zone 1 First Floor 17-Nov-13 18-Nov-13
KVG.Zon Calm Shell 17-Nov-13 18-Nov-13
KVG.Zon External Electrical
KVG.Zone 1 Second Floor 09-Dec-13 10-Dec-13
KVG.Zon Calm Shell 09-Dec-13 10-Dec-13
KVG.Zon External Electrical
KVG.Zone 1 Third Floor 31-Dec-13 01-Jan-14
KVG.Zon Calm Shell 31-Dec-13 01-Jan-14
KVG.Zon External Electrical
KVG.Zone 1 Fourth Floor 21-Jan-14 22-Jan-14
KVG.Zon Calm Shell 21-Jan-14 22-Jan-14
KVG.Zon External Electrical
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KVG.Zon Calm Shell 25-Jan-14 25-Jan-14
KVG.Zon External Electrical
KVG.Zone 1 Painting Cond. 26-Jan-14 01-Feb-14
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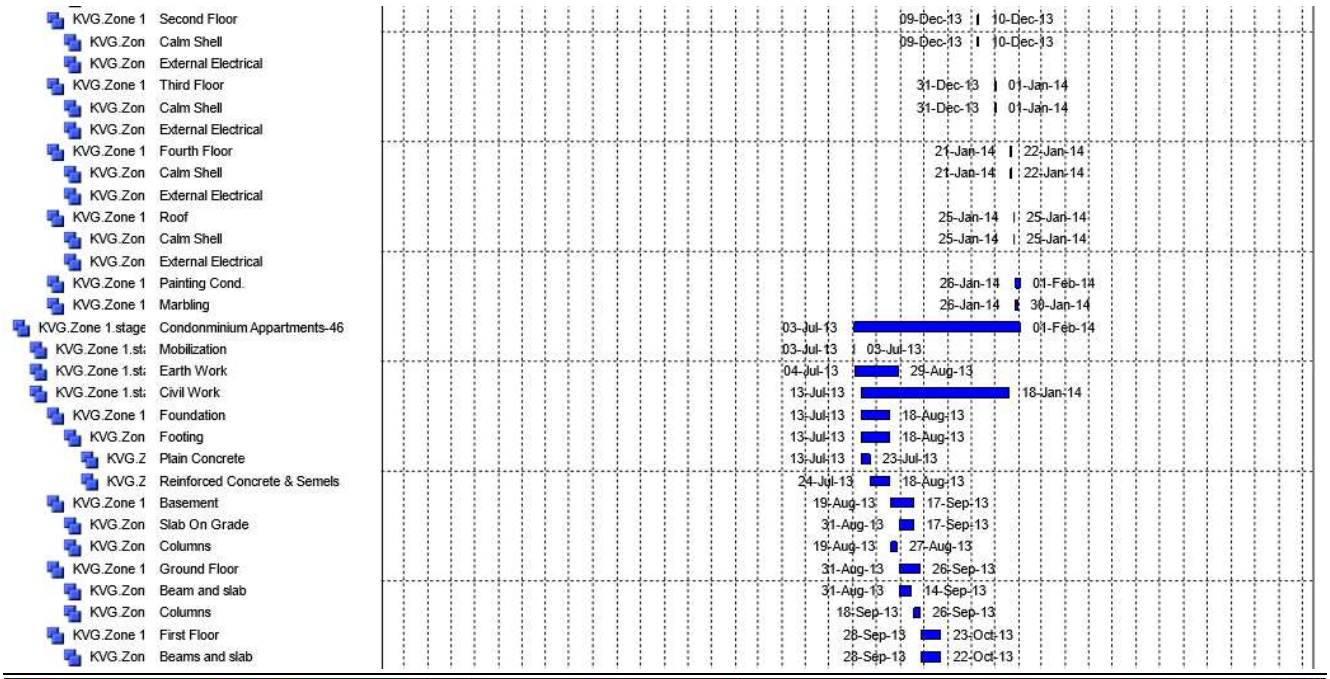
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KVG.Zone 1 Roof
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KVG.Zone 1 Marbling
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KVG.Zone 1.st: Civil Work
KVG.Zone 1 Foundation
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KVG.Z Reinforced Concrete & Semels
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KVG.Zon Slab On Grade
KVG.Zon Columns
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KVG.Zon Beams and slab
09-Dec-13 10-Dec-13
09-Dec-13 10-Dec-13
31-Dec-13 01-Jan-14
31-Dec-13 01-Jan-14
21-Jan-14 22-Jan-14
21-Jan-14 22-Jan-14
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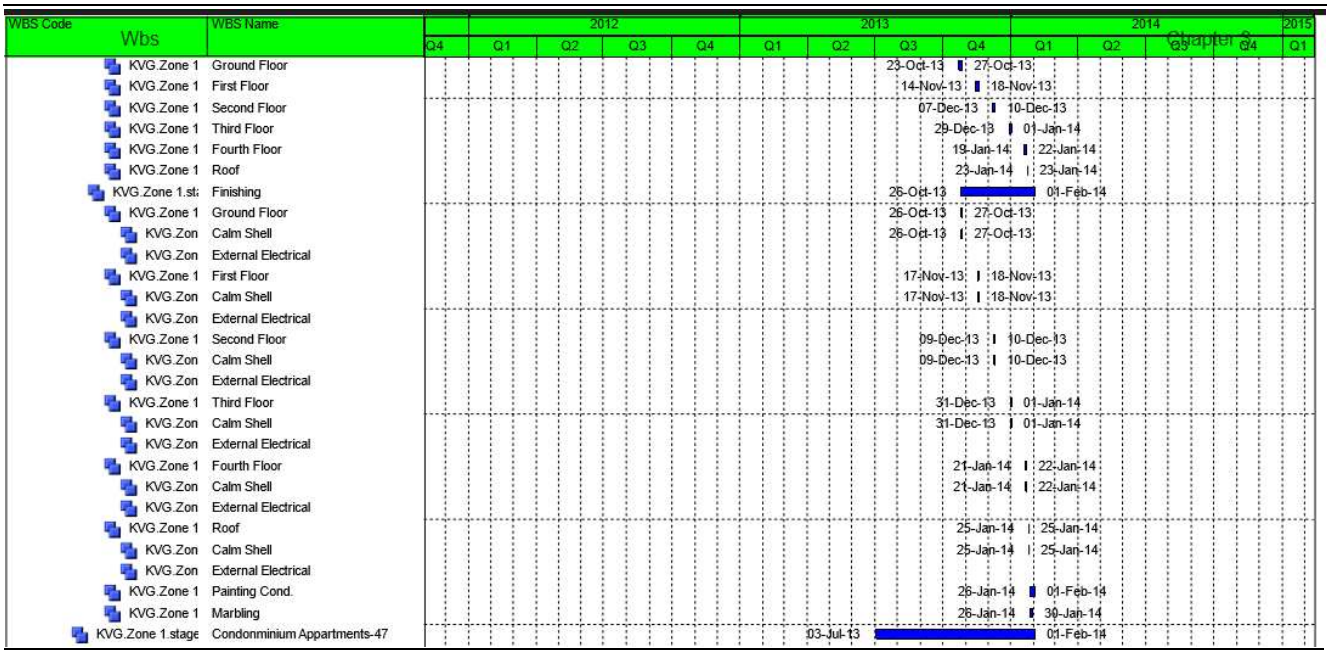
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KVG.Zone 1 Second Floor
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KVG.Zone 1 Fourth Floor
KVG.Zone 1 Roof
KVG.Zone 1.st: Finishing
KVG.Zone 1 Ground Floor
KVG.Zon Calm Shell
KVG.Zon External Electrical
KVG.Zone 1 First Floor
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KVG.Zon External Electrical
KVG.Zone 1 Third Floor
KVG.Zon Calm Shell
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KVG.Zone 1 Fourth Floor
KVG.Zon Calm Shell
KVG.Zon External Electrical
KVG.Zone 1 Roof
KVG.Zon Calm Shell
KVG.Zon External Electrical
KVG.Zone 1 Painting Cond.
KVG.Zone 1 Marbling
KVG.Zone 1.stage Condonminium Appartments-47
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14-Nov-13 18-Nov-13
07-Dec-13 10-Dec-13
29-Dec-13 01-Jan-14
19-Jan-14 22-Jan-14
23-Jan-14 23-Jan-14
26-Oct-13 01-Feb-14
26-Oct-13 27-Oct-13
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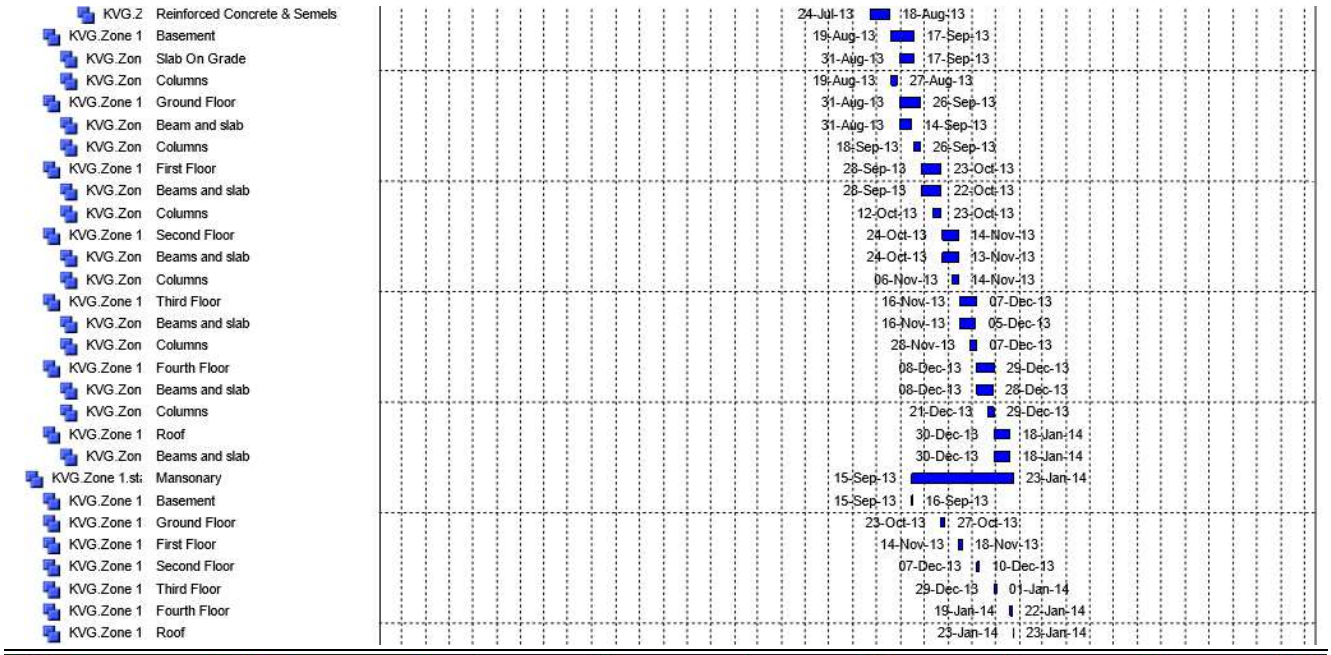
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KVG.Zon Columns 19-Aug-13 27-Aug-13
KVG.Zone 1 Ground Floor 31-Aug-13 26-Sep-13
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KVG.Zone 1 Roof 30-Dec-13 18-Jan-14
KVG.Zon Beams and slab 30-Dec-13 18-Jan-14
KVG.Zone 1.st: Mansonary 15-Sep-13 23-Jan-14
KVG.Zone 1 Basement 15-Sep-13 16-Sep-13
KVG.Zone 1 Ground Floor 23-Oct-13 27-Oct-13
KVG.Zone 1 First Floor 14-Nov-13 18-Nov-13
KVG.Zone 1 Second Floor 07-Dec-13 10-Dec-13
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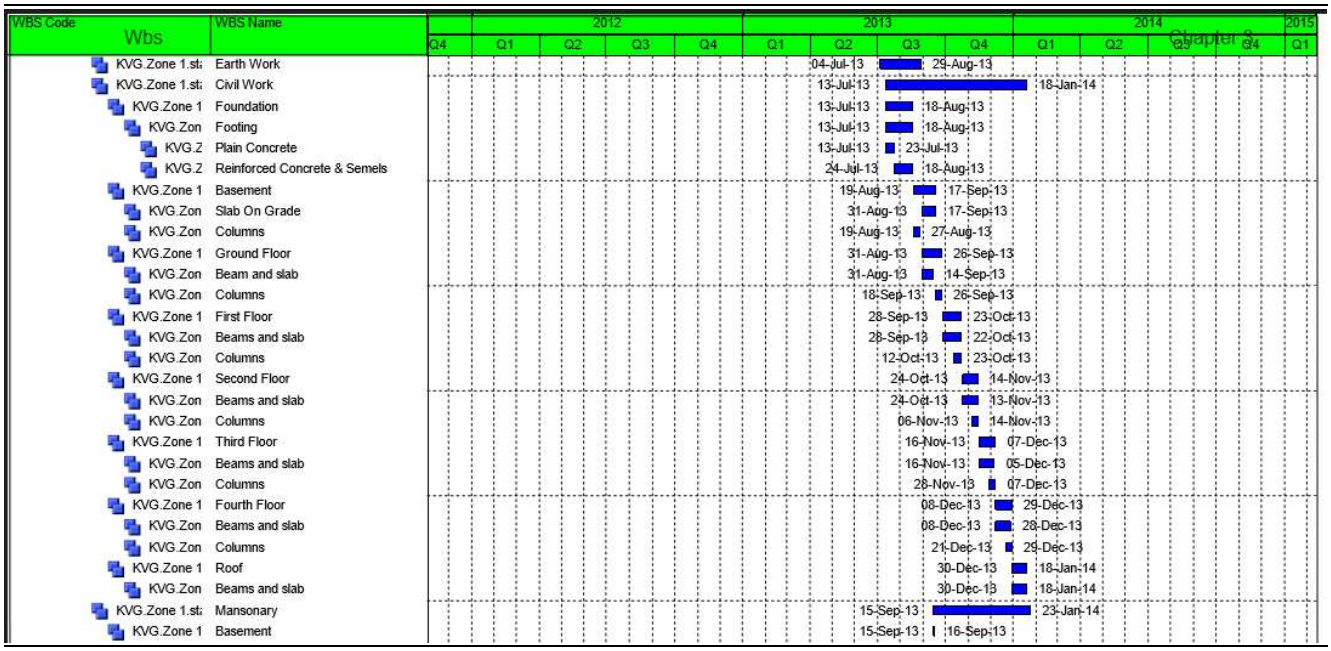
KVG.Zone 1 Roof 23-Jan-14 23-Jan-14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2014
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KVG.Zone 1.st: Civil Work 13-Jul-13 18-Jan-14
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KVG.Z Reinforced Concrete & Semels 24-Jul-13 18-Aug-13
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KVG.Zone 1 Ground Floor 31-Aug-13 26-Sep-13
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KVG.Zon Beams and slab 28-Sep-13 22-Oct-13
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KVG.Zone 1 Second Floor 24-Oct-13 14-Nov-13
KVG.Zon Beams and slab 24-Oct-13 13-Nov-13
KVG.Zon Columns 06-Nov-13 14-Nov-13
KVG.Zone 1 Third Floor 16-Nov-13 07-Dec-13
KVG.Zon Beams and slab 16-Nov-13 05-Dec-13
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KVG.Zon Columns 21-Dec-13 29-Dec-13
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KVG.Zon Beams and slab 30-Dec-13 18-Jan-14
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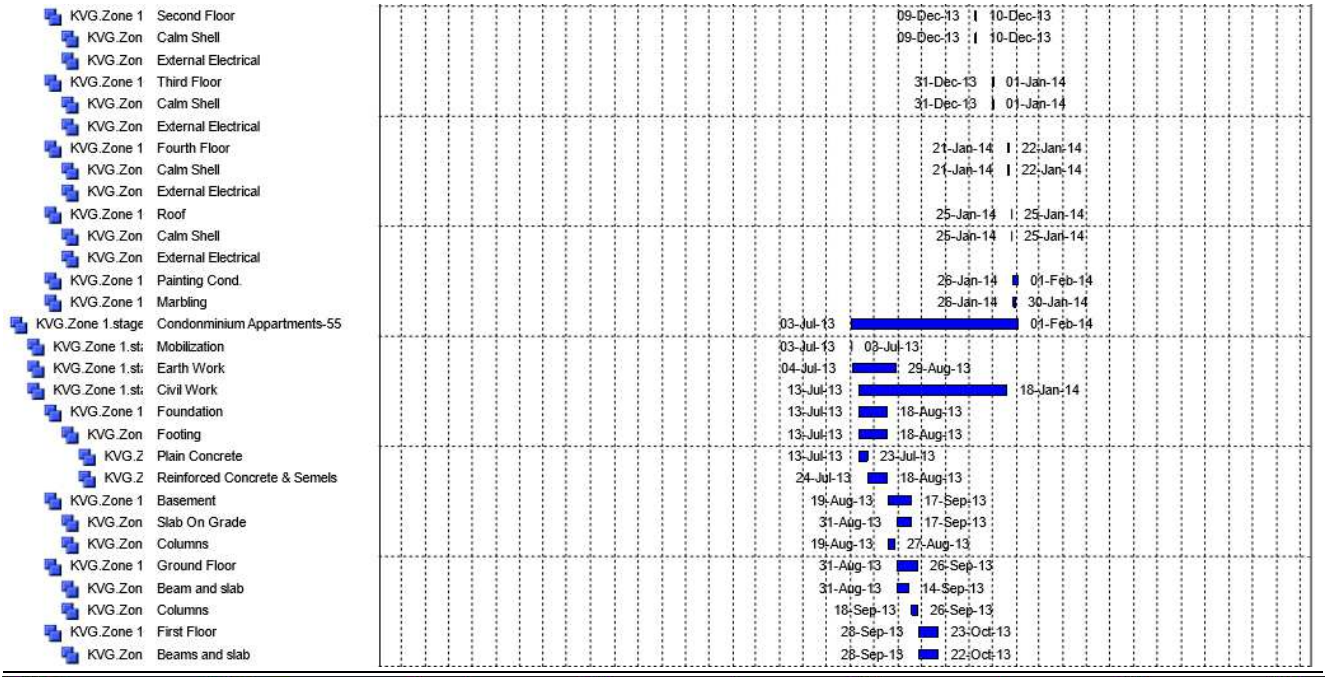
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KVG.Zone 1 Fourth Floor
KVG.Zon Calm Shell
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KVG.Zone 1 Roof
KVG.Zon Calm Shell
KVG.Zon External Electrical
KVG.Zone 1 Painting Cond.
KVG.Zone 1 Marbling
KVG.Zone 1.stage Condonminium Appartments-55
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KVG.Zone 1.st: Earth Work
KVG.Zone 1.st: Civil Work
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09-Dec-13 10-Dec-13
31-Dec-13 01-Jan-14
31-Dec-13 01-Jan-14
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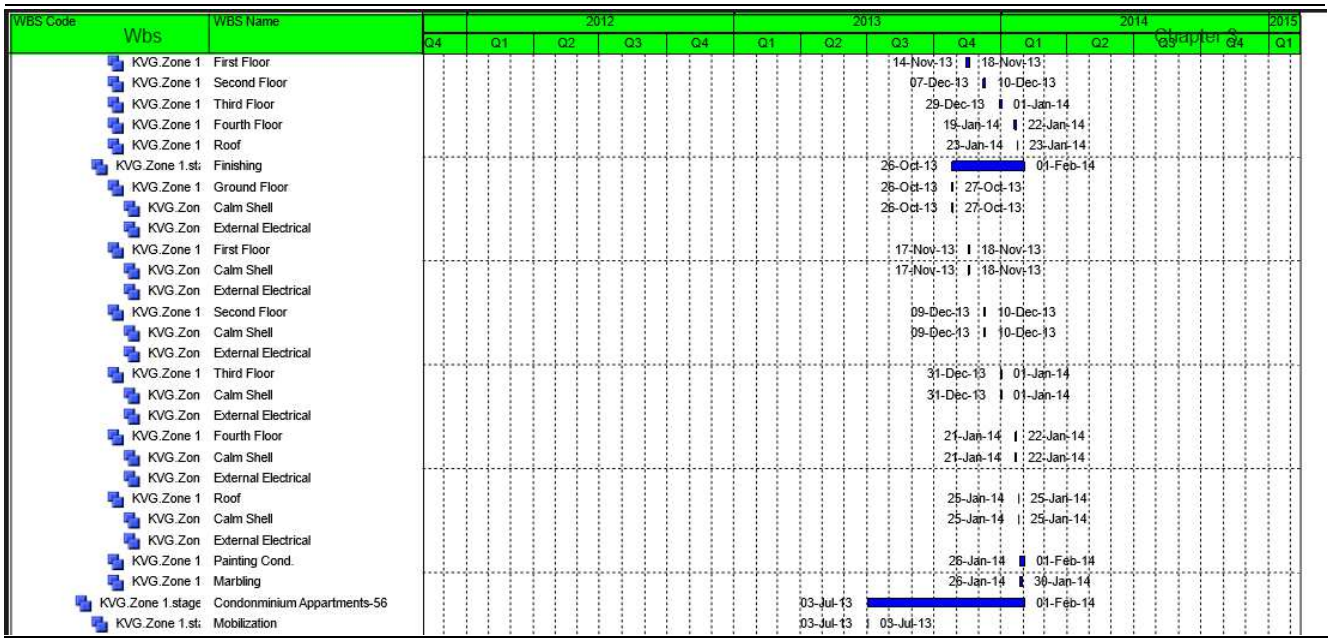
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KVG.Zone 1 Second Floor
KVG.Zone 1 Third Floor
KVG.Zone 1 Fourth Floor
KVG.Zone 1 Roof
KVG.Zone 1.st: Finishing
KVG.Zone 1 Ground Floor
KVG.Zon Calm Shell
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19-Jan-14 22-Jan-14
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17-Nov-13 18-Nov-13
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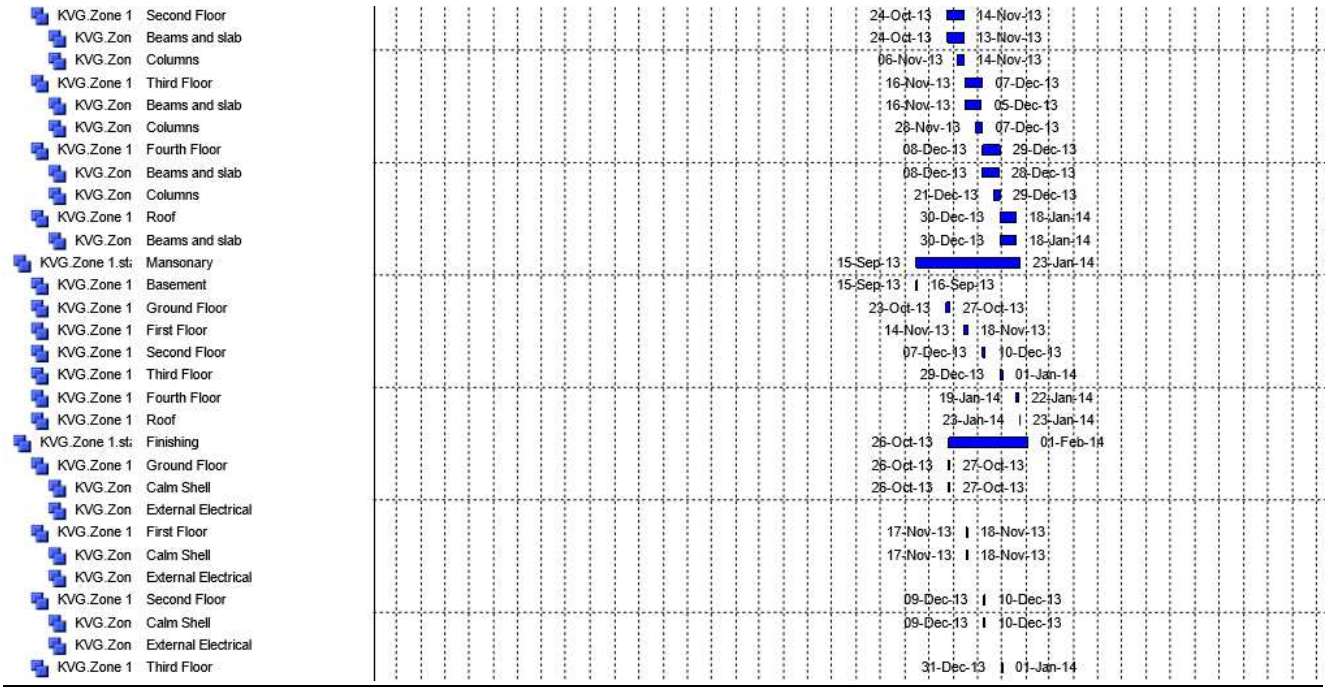
03-Jul-13 03-Jul-13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KVG.Zon Beams and slab
KVG.Zon Columns
KVG.Zone 1 Fourth Floor
KVG.Zon Beams and slab
KVG.Zon Columns
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KVG.Zon Beams and slab
KVG.Zone 1.st: Mansonary
KVG.Zone 1 Basement
KVG.Zone 1 Ground Floor
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KVG.Zone 1 Second Floor
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09-Dec-13 10-Dec-13
31-Dec-13 01-Jan-14

Load	Normative (kPa)	Overload factorV_f	Estimated (kPa)

SECTION 4 CONSTRUCTION PART

REINFORCED CONCRETE STRUCTURES

Calculation of the monolithic section MD-1.

It is necessary to calculate the prefabricated reinforced concrete floor panel for a two-storey cottage. The panel is a bending element, which means that the calculation is based on the first group of the limit state. In the calculation, the normal and inclined sections along which the floor panel can be destroyed are considered. The limit of fire resistance of the panel is 1 hour.

Depth of support of panels should be not less than 100 mm. The floor panel belongs to the third category of crack resistance, they allow cracks during operation, and the width of the cracks should not exceed 0.3 mm.

Careful filling of seams with heavy concrete of a class not lower than B15 is necessary for ensuring distribution of loading on adjacent panels and improvement of sound insulation of overlappings and coverings. All frames with longitudinal rods of different diameters are arranged so that the large diameter is in the upper area of the panel.

Slab contraction joints should intersect at the openings for columns of 495 MPa. The protective layer of concrete to the bottom of the working reinforcement is taken 20 mm.

Concrete for panels should be made on fractionated, uncontaminated rubble from rocks such as granite, limestone and others. Deviations from the sizes of panels should not exceed on length ± 6 mm, on thickness and width ± 5 mm, on length of inserts ± 10 mm.

The panels should be kept in working position, and wooden strips of rectangular cross-section should be inserted between the panels. Gaskets under the bottom row of panels should be laid on a dense, carefully leveled basis.

Shpuntov. board	0,037x5,5=0,20	1,2	0,24
Heater, mineral wool	0,05x0,5=0,03	1,2	0,03
Lag	(0,08x0,04/0,5)x5,5=0,35	1,2	0,42
Board	(0,015x0,1/0,5)x5,5=0,17	1,2	0,20
Lightweight concrete	0,14x8=1,12	1,3	1,46
Plate z / b	0,08x25=2,00	1,1	2,20
Result	3,87	–	4,55
Temporary	2,5	1,3	1,95
Total	5,37	–	6,50

2.2.2. Calculation of a multi-hollow slab

Conditionally cut 1 × 1m plate and collect the load from top to bottom.

Table 5. Collection of loads on 1 m² of a plate

In accordance with the task to calculate and design a monolithic section (MD-1) of concrete B-15.

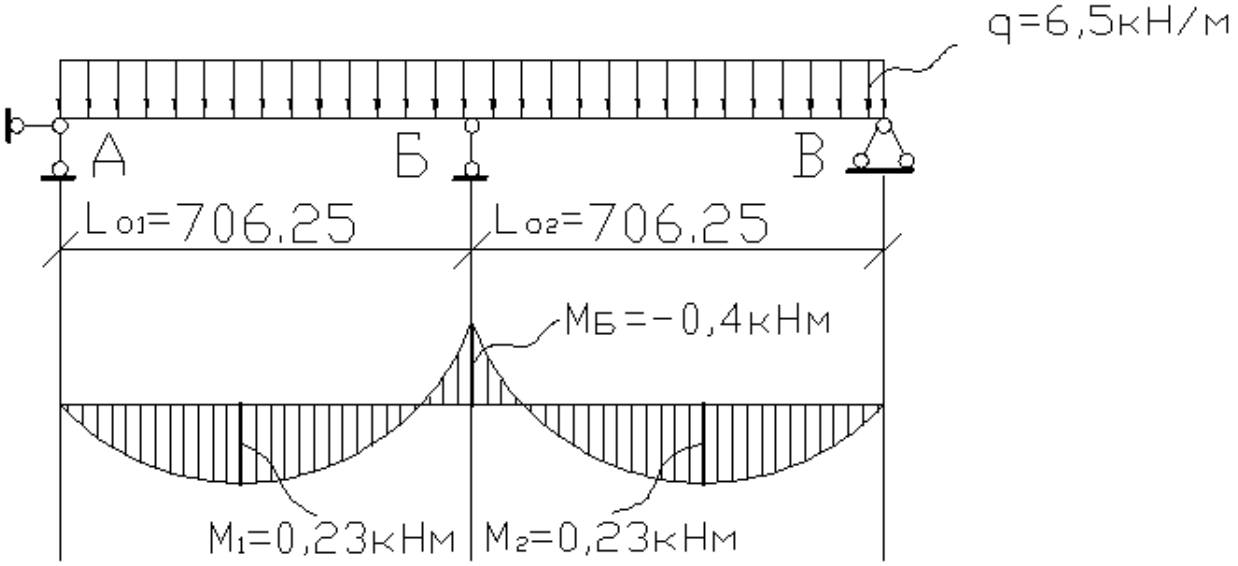
DETERMINATION OF LOADS AND FORCES IN THE SLAB

Plate dimensions:

In the short direction: Lo1,2 = (1750-120-120-195 / 2) / 2 = 706,25 mm.

In the long direction: Bo = 2400 mm.

Calculation scheme of the plate, Fig.5:



Determine the nature of the plate:

L d. / L k. = 1.75 / 2.4 = 0.73 <2

The plate works as supported on a contour.

Load calculation:

When calculating the plate supported on a contour, we cut out a cargo strip in width b = 1 m.

q = q x b = 6.5kPa x 1m. = 6.5 kN / m

Determine the calculated effort:

M1 = M2 = to x (qLo1,2) 2 = 0,07 x 6,5 kN / m x (0,706m.) 2 = 0,23 kNm.

Mv = up to x (qLo1,2) 2 = -0.125 x 6.5 kN / m x (0.706m.) 2 = -0.4 kNm

Transverse forces in the calculation of plates are usually not determined, because for solid plates usually adheres to the condition Q <Qb, ie. transverse reinforcement to calculate

not required.

DETERMINATION OF THE CALCULATED BENDING MOMENT AND TRANSVERSE FORCE

ho = h – a = 80-15 = 65mm

αm = M / (RbxB / ho²) = 0,4кНм / (7,65x1000мм.x (65мм.) 2) = 0,012

αR = 0.44> αm = 0.02

ζ = 0.99

As = M / (Rs x ζ x ho) = 0.4x106 Nmm. / (410mPa x 0.99 x 65 mm.) = 15.16 mm².

μ% = 100 x As / (b x ho) = 100 x 15.16 mm² / (1000mm x 65mm) = 0.023 <0.05%

We take the area of the working reinforcement, based on the minimum percentage of reinforcement.

As = μmin x b x ho = 0.0005 x 1000 mm. X 65mm. = 32.5 mm ².

I accept: 3ØBr I step of 150 mm. - working

3ØBp I step 150mm. - constructive

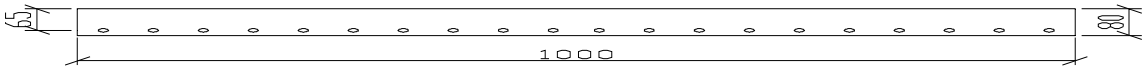
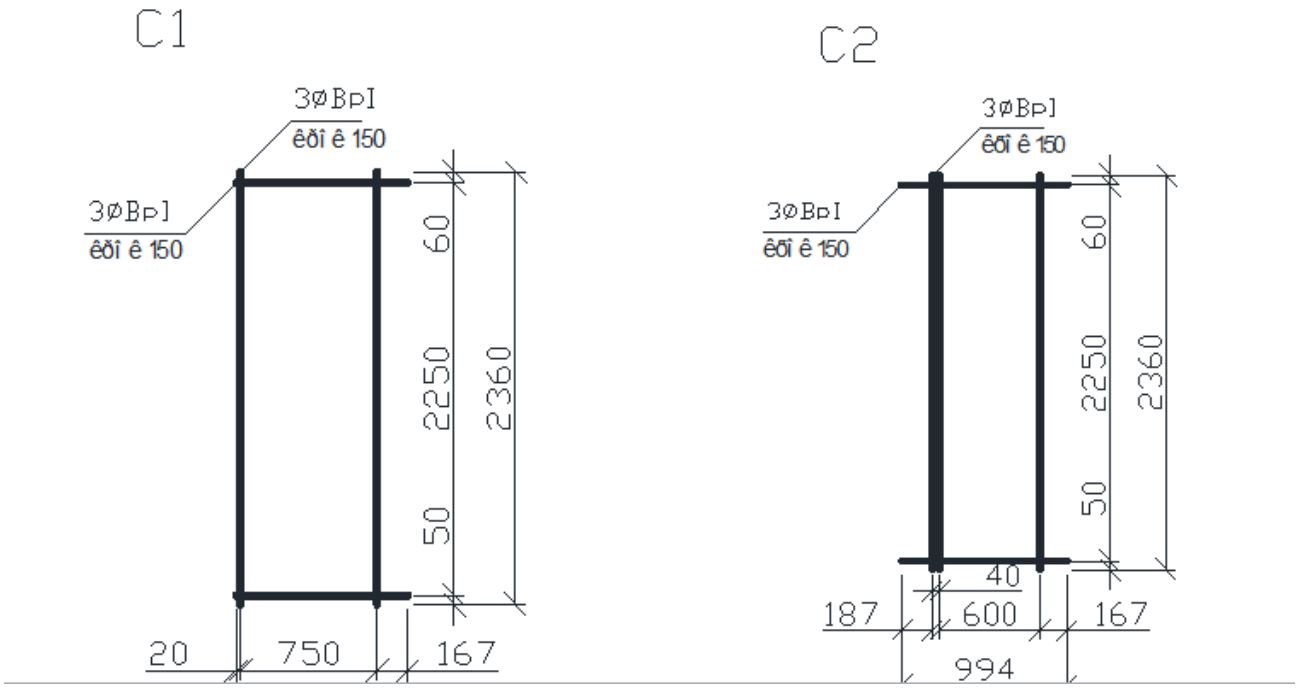
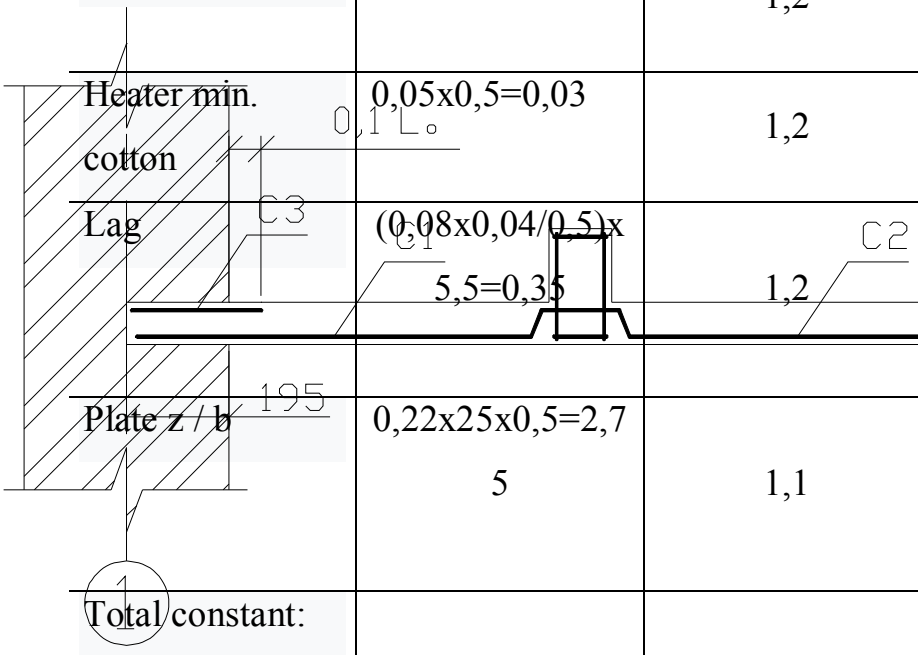


Fig.6 Calculation scheme of the bending element

Construction of grids C1, C2, C3



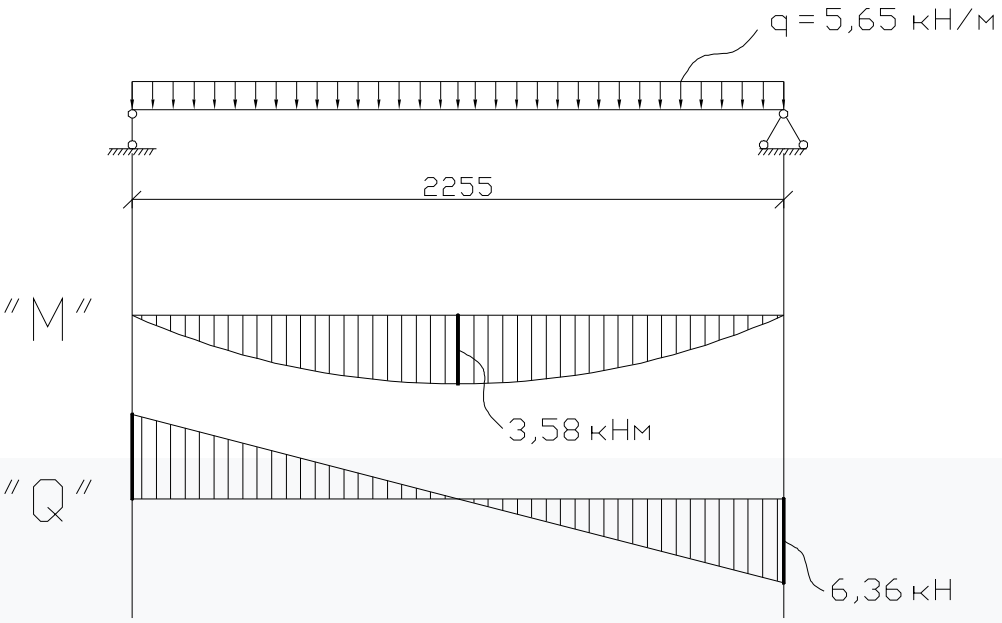
Load	Normative (kPa)	Overload factorV_f	Estimated (kPa)
Tongues. board	0,037x5,5=0,20	1,2	0,24
Heater min. cotton	0,05x0,5=0,03	1,2	0,03
Lag	(0,08x0,04/0,5)x 5,5=0,35	1,2	0,42
Plate z / b	0,22x25x0,5=2,75	1,1	3,03
Total constant:			3,72
Temporary	ДБН В.1.2-2:2006	1,3	1,95

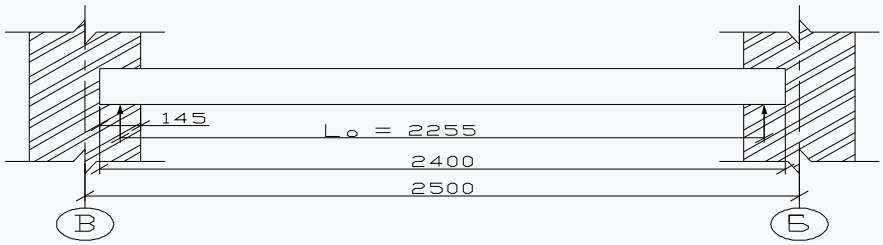


Total			5,67

CALCULATION OF LOAD PER 1M2 OF BEAM

Table 6. Collection of loads on 1 m² beam





Determination of load on 1 run. Beam meter

q = 8.89 kPa. x 0.12m. + 0.706 x 6.5 kPa. = 5.65 kN / m.

Determination of the design load:

M = q x (Lo) 2/8 = 5.65 kN / m x (2.25 m) 2/8 = 3.58 kNm.

Q = 0.5q x Lo = 0.5 x 5.65kN / m x 2.25m = 6.36 kN.

Calculation of the normal cross section for strength at the time of bending.

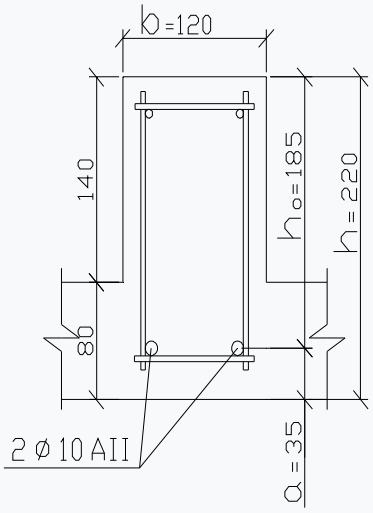
ho = h - a = 220mm - 35mm = 185mm.

αm = M / (Rb x b x ho) = 3.58 kNm / (7.65 x 120mm x (185mm) 2) =

= 3.58 x 106 Nmm / (7.65 x 120mm x (185mm) 2) = 0.114

α R = 0.44> α m = 0.114

ζ = 0.945



As = M / (Rs x ζ x ho) =

= 3.58 x 106 N * mm / (280 mPa x 0.945 x 185 mm)

= 73.13 mm2

μ% = As / (b x ho) x 100% =

= 73.13 mm2 / (120mm x 185mm) x 100%

= 0.33%> 0.05%

We accept fittings: 2 Ø 10AII

Calculation of an inclined section on durability on cross force.

a) Check the need for calculation

Qb = φb3 (1 + φf + φn) Rbt x bsb x hsbo

φb3 = 0.6 (DBN B.2.6-98-2009)

φf is a factor that takes into account the influence of compressed shelves.

φf = 0.75 x 3hs² / bsb x hsbo = 0.75 x 3 x 80² / 120 x 220 = 0.55> 0.5

We accept: φf = 0.5

φn - coefficient that takes into account the pre-compression of concrete.

φn = 0

(1 + φf + φn) = (1 + 0.5 +0) = 1.5

We accept: (1 + φf + φn) = 1.5

Qb = φb3 (1 + φf + φn) Rbt x bsb x hsbo

= 0.6 x 1.5 x 0.68 x 0.1 x 12 x 22 = 16.16 kN

Qвн. nagr. = 6.36 kN<Qb = 16.16 kN

Conclusion: the calculation of the transverse reinforcement is not required, because the concrete section can absorb the transverse force.

b) We make transverse reinforcement for design reasons.

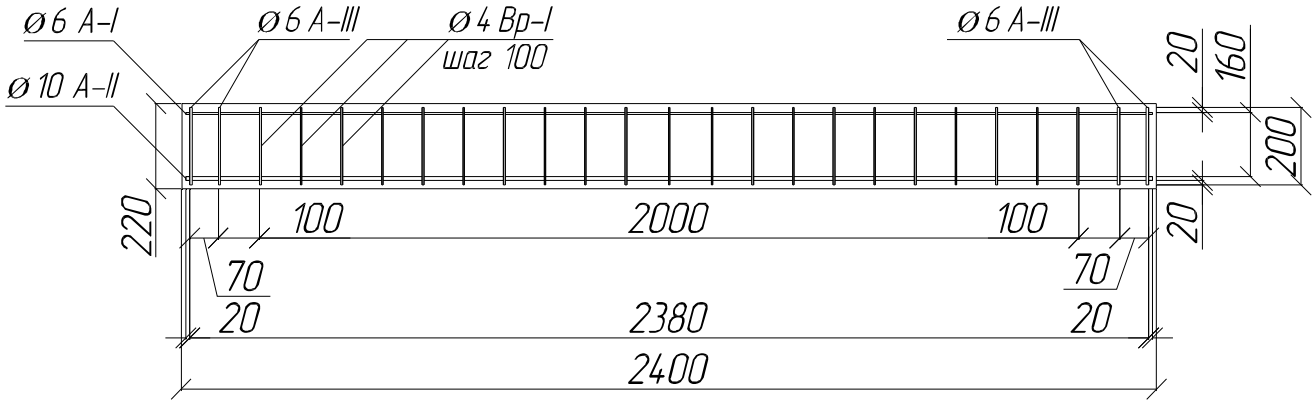
hsbo = 220mm. <450mm.

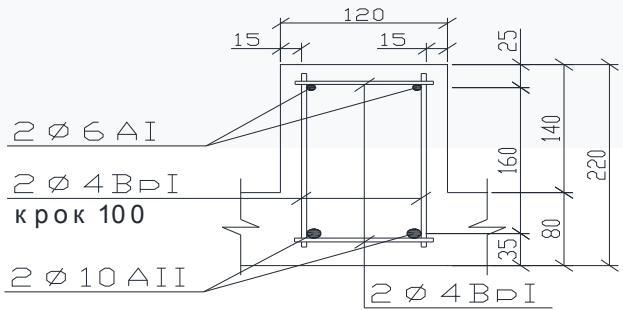
150mm. ≥ S1 ≤ hsbo / 2

150mm. ≥ S1 ≤ 110mm.

Sw1 = φb4 x Rbt x bsb x hsbo² / Q = 1.5 x 0.68 x 120 x 220² / 10 = 592mm.

I accept: S1 = 100mm. <Sw1 = 592mm





Check of durability on an inclined strip between inclined cracks.

Qвн. nagr.<0.3 φw1 x φb1 x Rb x bsb x hsbo

φw1 = 1 + 5 x αxμw = 1 + 5 x 74 x 0.009 = 1.33> 1.3

I accept: φw1 = 1,3

α = Es / Eb = 170000mPa / 23000mPa = 7.4

μw = Asw / b x S1 = 1.57 / 12 x 14 = 0.009

φb1 = 1 - β x Rb = 1 - 0.01 x 7.65 = 0.92

Qвн. nagr.<0.3 x 1.3 x 0.92 x 7.65 x 0.1 x 12 x 21 = 69.17 kN.

Conclusion: The dimensions of the cross section are sufficient for the perception of smooth stress compressions.

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41. DSTU-N B D.1.1-2: 2013 Guidelines for determining direct costs in the cost of construction.

42. DSTU B B.2.6-8-95 Building structures steel profiles bent closed welded square and rectangular.

43. DSTU B B.2.6-189: 2013 Methods of selection of thermal insulation material for building insulation.

44. DCTU-N B B.1.2-16: 2013 Definition of the class of consequences (responsibility) and the category of complexity of construction objects.

45. DSTU B B.1.1-36: 2016 Definition of categories of premises, buildings, installations on explosion and fire danger.

46. Project DSTU-N B B.1.2-16 Determining the class of consequences of buildings and structures.

47. DSTU B B.2.6-205: 2015 Guidelines for the design of monolithic concrete and reinforced concrete structures of buildings and structures.
48. DSTU B B.2.5-38: 2008 Arrangement of lightning protection of buildings and structures
49. DSTU A.2.2-12: 2015 Energy efficiency of buildings.
50. DSTU 4163-2003 Requirements for registration of documents.
51. DSTU 8302: 2015 Information and documentation. Bibliographic link.
52. DSTU B B.2.8-44: 2011 Sites and stairs for construction m.

APPENDIX **C.**
Feedback from the head

" Cottage in Cairo City (Egypt)" by students of the group 192-17-IC Abodefmouhabmamdouhibrahim 192 "Construction and Civil Engineering".

Diploma project Abodefmouhabmamdouhibrahim is devoted to the design of a Cottage in Cairo City (Egypt). The object of design is a two-storey building with dimensions in axes of 16×11.15 m and a floor height of 3.05 m. Designing private housing is always an urgent task in today's developing society. Fundamentally, this project, with reference to other engineering and geological conditions, can be used in other settlements of Ukraine. In general, the diploma project is executed in accordance with the task and in full.

As part of the project, the:

• three-dimensional planning and constructive solution of a residential building;

• calculated and constructed reinforced concrete bearing structures of the floor: slabs and beams, stripfoundation;

• technological maps for the arrangement of the foundation,the construction of the site and the calendar schedule ofwork, the selection of the crane, the needs for resources and mechanisms have been determined.

As part of the diploma project, measures on labor protection and fire protection measures were developed, as well as local estimates determined by the technical economic indicators of the project were calculated.

During the implementation of the diploma project student Abodefmouhabmamdouhibrahim and demonstrated the ability to work with normative literature, skills of work in modern software complexes used in the field of construction.

The work is done competently and at a high level, and with the appropriate protection **deserves a score of "good - 80 points",** and Abodefmouhabmamdouhibrahim a - awarding a bachelor's degree in Constructionand Civil Engineering.

Ph.D., Associate Professor of
Construction, Geotechnics and NechytailoO.Ye.
Geomechanics Department