The Hashemite University
Faculty of engineering
Civil engineering department

Summer 2021

TRAINING REPORT

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INDEX:

Summary

Through eight continuous weeks from 4/7/2021 to 30/8/2021, I trained under the supervision of Eng. Osama Abu-Alrish from ALKafa'a Engineering office.

The construction manager: Eng. Mofeed Al-kateeb

The training was at the site of Said-Saleh building at Amman.

The training was very important to me to obtain much knowledge in the field, connect concepts I took in classes with field, many concepts which were taught in the classes have been implemented and being training beside persons with high experience give me lot of information and confidant in the field.

Project Information:

- Project Name: Said-Saleh building
- Work Site: Amman-HayNazal.
- Area: 237m²
- Completion Date: Under construction
- Details: The project is a Residential Building with total area 237 m², consist of five floors, each floor has two apartments.

The Construction Sequence:

1. Paperwork.
2. Topography and Site survey and Soil test
3. Marking of layout.
4. Excavation.
5. Foundation Work.
6. Walls.
7. Stairs and elevator.
8. Backfilling and compaction work.
9. Manholes and Mechanical work (base floor).
10. Slab on grade
11. Columns (base floor); steel bars &formwork.
12. Bricks and stone works.
13. Hollow block Slab (base floor)
14. Next floor typical.

(Gr. floor,1st ,2nd ,3rd)

- Mechanical work.
- Columns
- Bricks and stone works.
- Hollow block slab

The construction sequences.

1. Paperwork.

Construction of residential building required paperwork before the start actual construction. The paperwork includes shop drawing, estimation of material cost and approval of drawing from City Development Authority.

2. Topography and Site survey and Soil test

general surveyor, plans

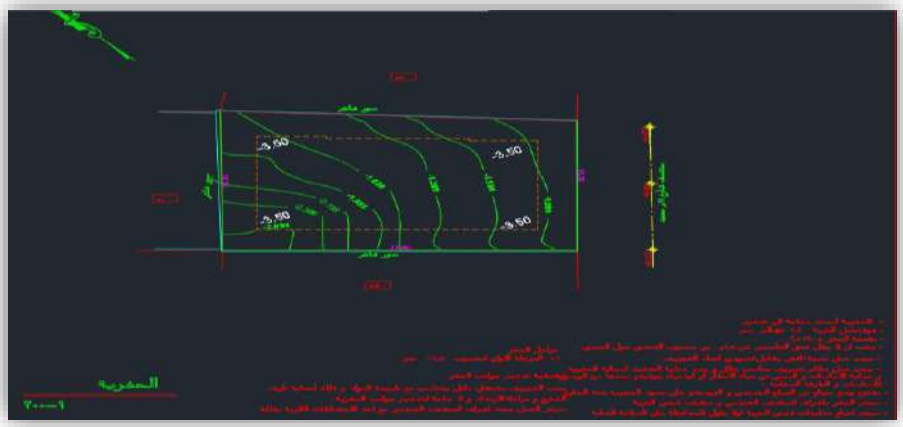


Fig. 1topography plan

3. Marking of layout.

The layout is marked on the ground with accurate dimensions and orientation.

Fig. 2site survey work

4. Excavation

4.1. **Excavation work**, the ground of the build was excavated at depth 3.50 m

4.2. **blinding concrete,** after finishing excavation, the learn concrete (100mm thickness) has been set to dry, to start foundation work.

Block formwork

100mm thickness

Fig. 3foundation

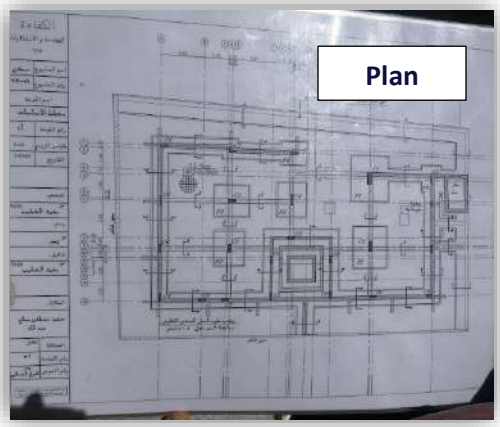
5. foundation work

At the beginning, the block formworks were placed around the foundation area, the foundation type was (single, tie ,strip)foundation.

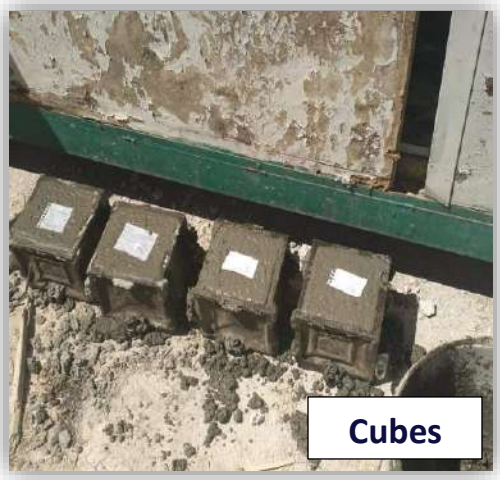
Then, the foundation reinforcement was applied in the control room as the plan and check it. After that the casting process was reached before beginner it, we were taking cubes to check strength of concrete mix.

During pouring concrete, vibrator was used to get maximum strength and to ensure that the concrete entered all areas.

After finishing casting and dryness of the concrete mix; water pump was used for curing.


Plan


Reinforcement


Cubes


After drying

6. Retaining walls

Are relatively rigid walls used for supporting backfilling “use in sub-basement in this project at height 3.10 m”

As an engineer in site, we should check steelwork from plans and calculate Concrete amount needed to fill this wall.

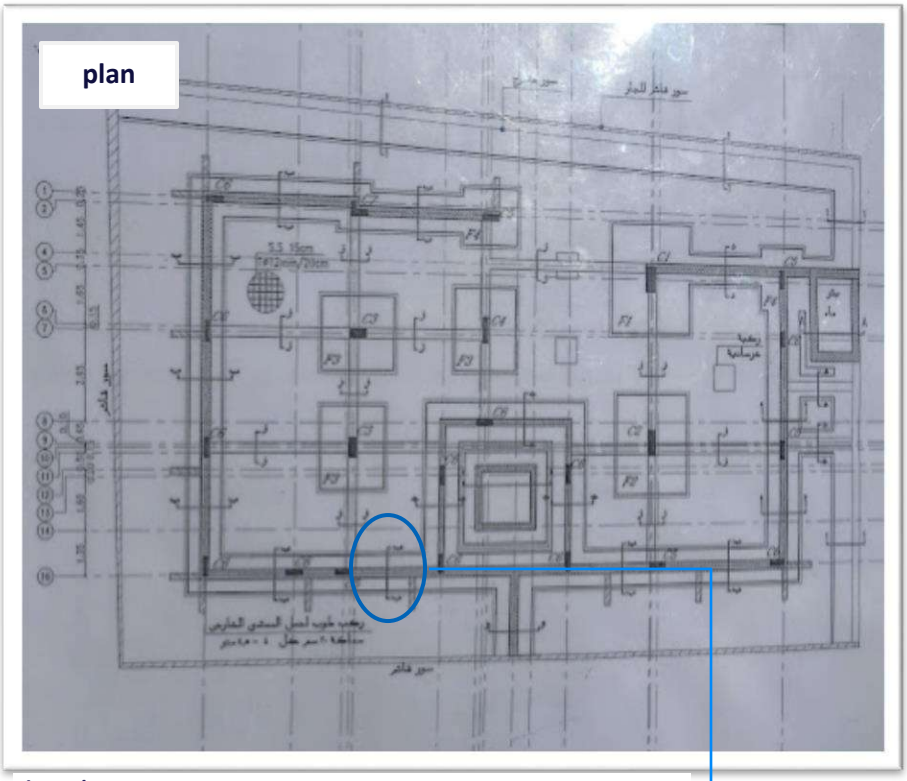
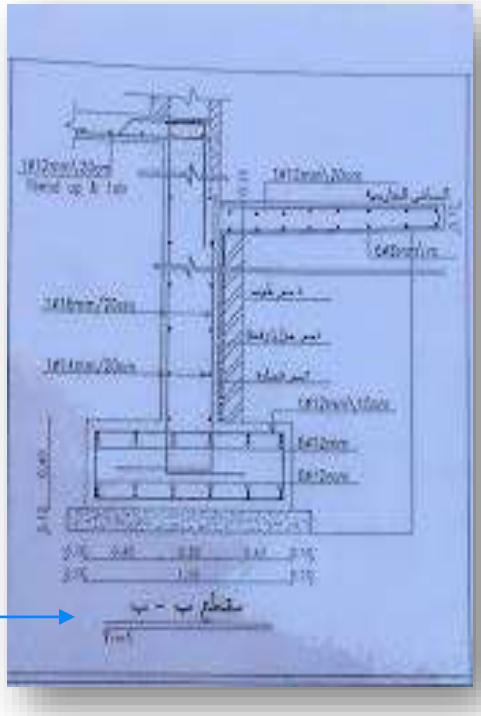


Fig. 4plan



Φ14@20 cm

formwork

Steel fixing

The construction sequences.

calculate amount of concrete = length*width*thickness

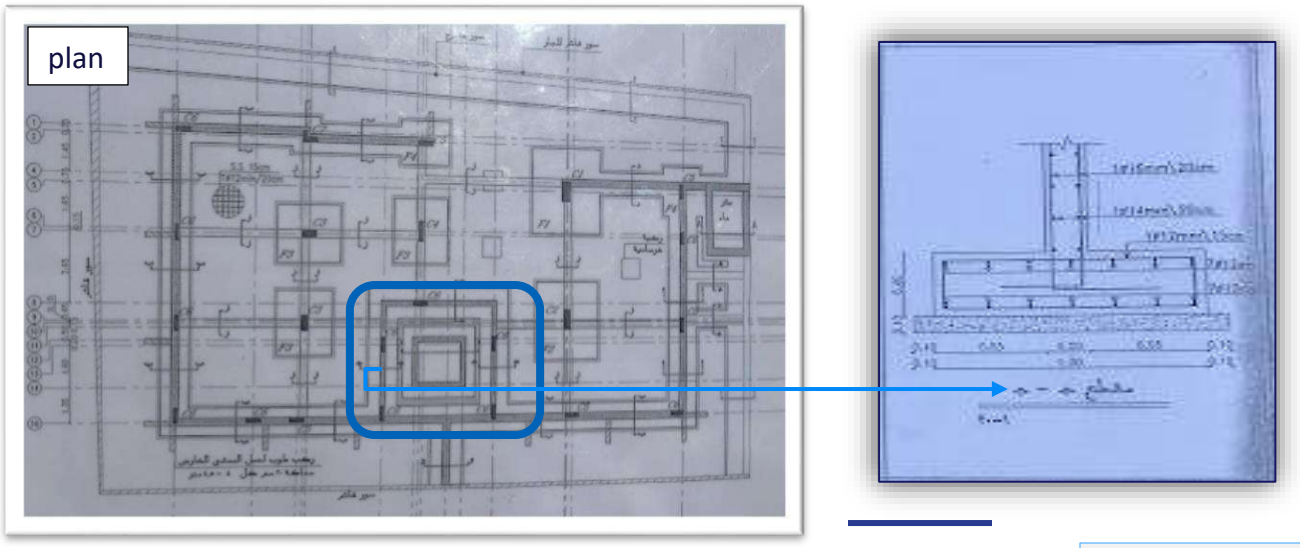
$$= 3.10*51.25*0.30 = 47.66\ m^3$$

During pouring concrete, vibrator was used to get maximum strength and to ensure that the concrete entered all areas.

Fig. 5 After removal of formwork

7. Stairs and elevator

7.1 Walls around of stairs are a Shear walls.



“Shear wall “

is a structural member in a reinforced concrete framed structure to resist lateral forces such as wind forces or seismic forces.

7.2 Stair formwork

We start elevator formwork then out its formwork of stair walls. When building concrete stairs, we should use proper formwork. The angle of flight, dimensions of tread, and riser are to be properly checked. In this project, it constructing stairs attached to the wall, so the line of flight, thread, and risers are marked on the wall for proper fixing of formwork.

The concrete steps are to be reinforced with steel bars so as it carries the loads coming upon the stairs and transfer them to the ground. The number of steel bars and size of the bars are to be calculated by a structural engineer depending upon the loads coming on the stairs and he draw it in plan, just in site we check to applied according to plan. These steel reinforcement bars are placed in the formwork with a minimum of 25 mm spacing and are tied together.

7.3 Pouring note

- Pouring of concrete into the formworks is started from the below part to above.

- It is pouring the concrete ceiling and stairs on the same day, to create a strong bond between these components.

7.4 calculate

Level of subbasement = -1.90 (AutoCAD plan)

Level of Gr. floor = +0.10 (AutoCAD plan)

Height of riser 0.10 - -1.90 = 2.00 …… 2.00/13(# risers) = 15 cm

7.5 Removal of formwork

The stairs require at least 21 days to dry out completely, so the removal of formwork is to do only after 21days. In these 21 days, proper curing is to be done to prevents the cracks in stairs due to thermal expansion.

Fig. 7 Stair's wall(shear wall)

Fig. 6 steel fixing in shear wall

Fig. 8 After drying

8. backfilling and compaction work

Proper backfilling of a basement is an important and essential step in basement construction as it largely contributes to its structural stability and properly compacted backfill provides support to the basement walls as well as acts as a barrier for external forces. With time, the natural abraders like water and tectonic movements may breach into the foundation and cause superfluous settlement which could prove perilous to the superstructure.

To mitigate this problem, proper compaction procedures are undertaken. There are many types of compaction procedures that can be used to compact the backfill in the basement. The selection of the compaction methods depends upon the site conditions. Before compaction, we should Sprinkle the water at the backfill surface well.

To Surface Finish, the compacted backfill must have hard, smooth and at the same level so use a laser level to check that or the traditional way “water pipe “.

loader: is used to move a backfill from into a dump truck and deposit it ground level. Then it is distribution on all area.

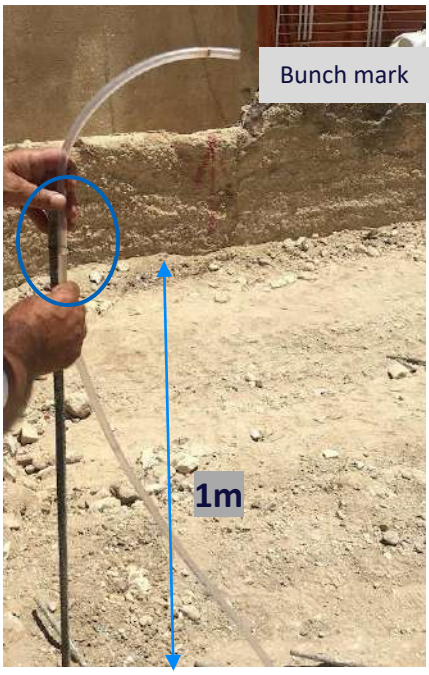
loader

- **The (Water pipe)**

The water level is a section of clear tubing, partially filled with water. Water is easily procured for use and easily discarded after use. The ends are held vertical, and the rest of the tubing lies on the ground.

The water level at each end of the tube will be at the same elevation, whether the two ends are adjacent or far apart.

- The water level is lower tech than the laser level!



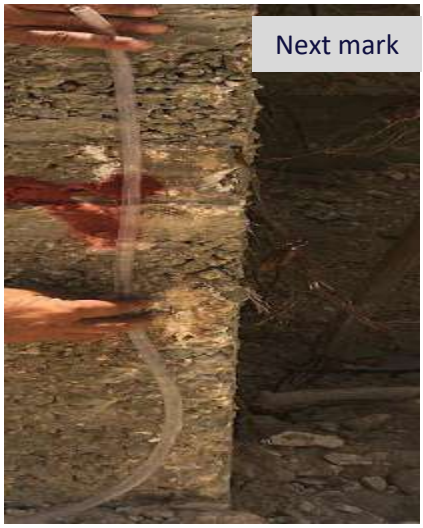


Fig. 9 After compaction-same level

9. manhole and mechanical work

According plans we check in this work (slope, distance,)

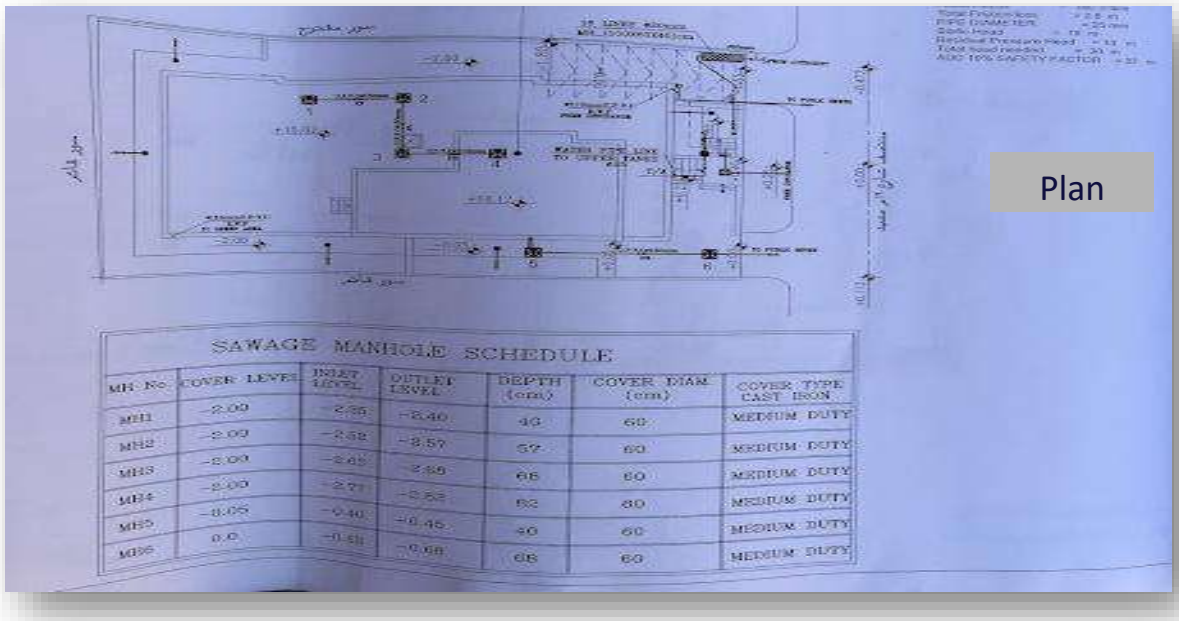


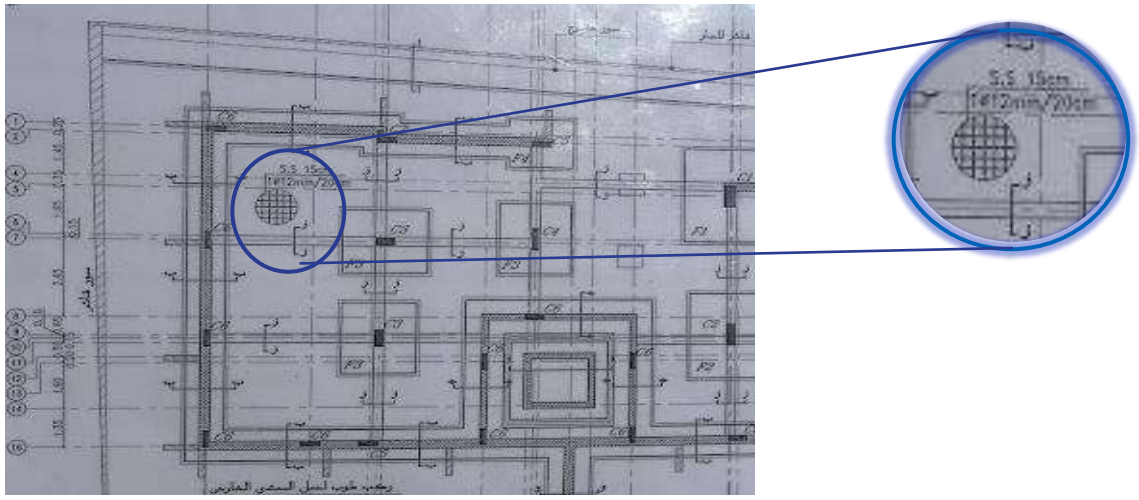
Fig. 10 manhole 3

Fig. 11 manhole 4

Fig. 12 manhole 6

Pipe with different size
6 in, 4 in, 2 in

10.Slab on grade



Φ12@20 cm

After Curing
(Thickness 15cm)

Figure 13 To drain rainwater

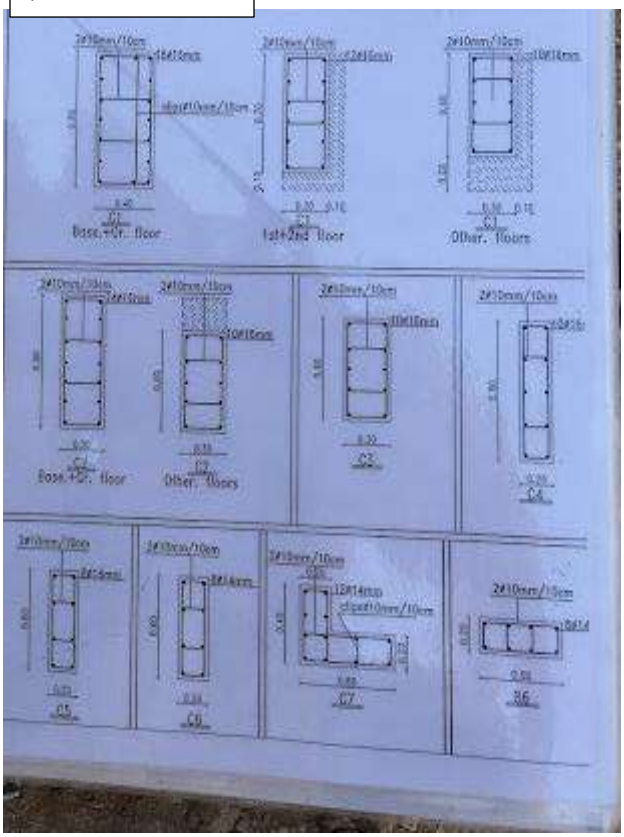
11. Column work

11.1 steel fixing.

quantity surveying:

- bars calculate

plan



Length = 3.10(height floor) +0.31(thickness slab) +60Φ (overlapping)

=3.10m +0.31m +60(16,14) m = 4.3 m

C	Φ	LENGTH	REPETITION
C1	16Φ16mm	4.5m	1
C2	14Φ16mm	4.5m	1
C3	10Φ16mm	4.5m	2
C4	10Φ16mm	4.5m	1
C5	8Φ16mm	4.5m	5
C6	8Φ14mm	4.5m	6
C7	12Φ14mm	4.5m	1
C8	8Φ14mm	4.5m	1

So, we need.

100 bars Φ16

68 bars Φ14

PO

50 bars Φ16

34 barsΦ14

- Stirrups calculate.

C1 = (0.34*2+0.74*2) +(0.34*2+0.24*2)

= 3.3m + 0.1m = 3.4 m

Of stirrups in one column = 3.10/ 0.15m(from plan) = 20 stirrups

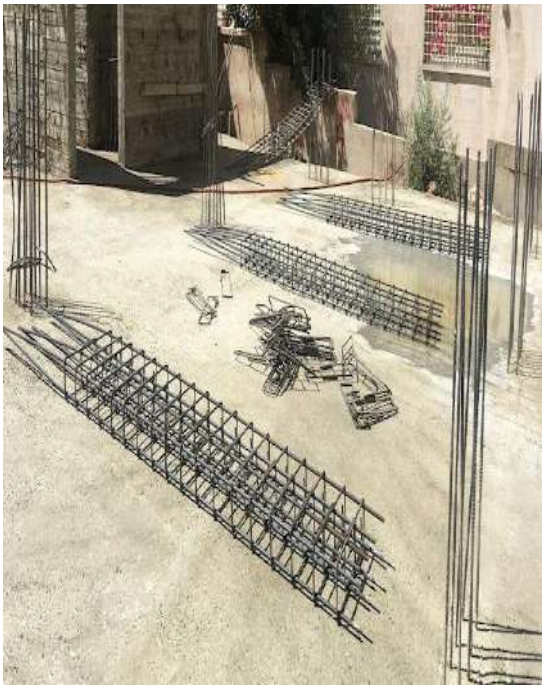
3.4m*20 = 68 m

68m/6m =11.3 bars Φ10

Other columns, the same thing

C2 =10 bars, C3 =17.3 bars, C4 =9.3 bars, C5&C6&C8 =79.2 bars, C7 = 8.7 bars

Then, total we need 136 bars Φ 10



Longitudinal reinforcement

11.2 Column formwork

Figure 14 Shuttering

Reinforced concrete columns are subjected to lateral pressure because of their small cross-section, large heights, and relatively high rates of concrete placement. so, it is necessary to provide tight joints and strong tie support to the formwork.

- **To check verticality of column we use "Plumb bob"**

11.3 Casting columns

- calculate concrete mix amount,

0.75*0.20*2.70(height of drop beam) * 2 = 0.81 m^3

0.6*0.2*2.70*10 = 3.24m^3

((0.4*0.2) +(0.45*0.2)) *2.70=0.459 m^3

0.7*0.4*3.10(height of floor) =0.868 m^3

0.7*0.3*3.10=0.65 m^3

0.5*0.3*3.10*2=0.93 m^3

0.7*0.2*3.10=0.43 m^3

Total=7.3 m^3

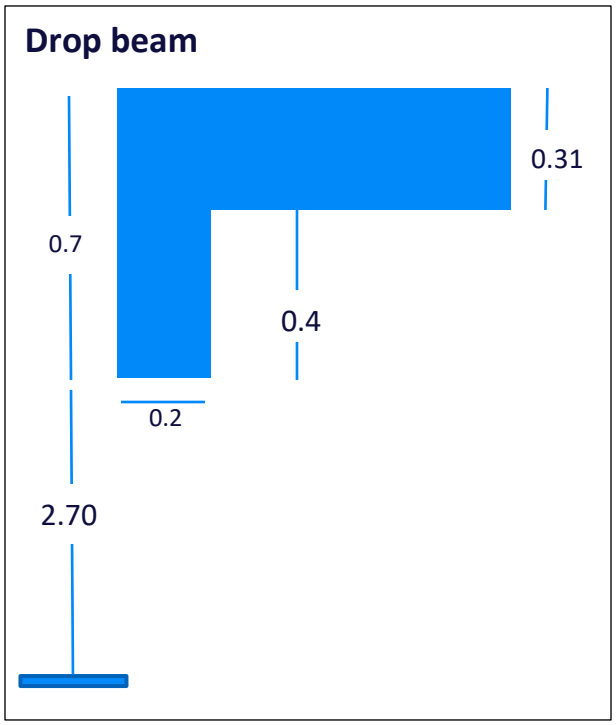


Figure 16 Drop beam above window

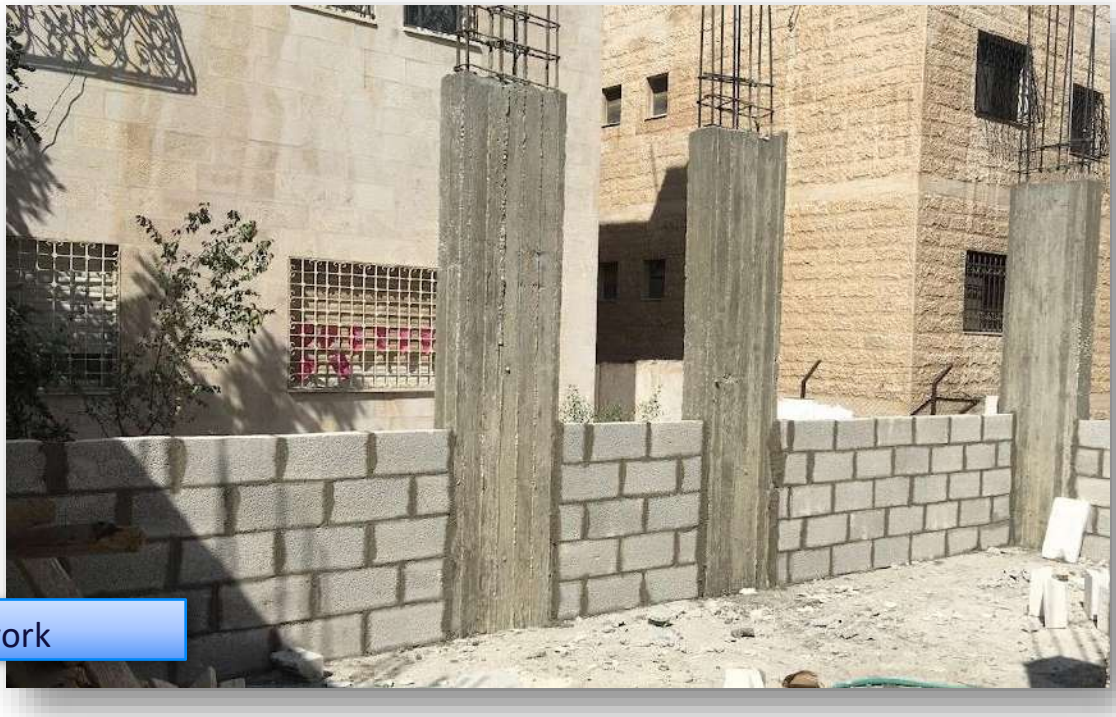
During cast

- we Remove formwork panels after 7 days according to code and during these days we would cure it every day with the water.

12.Bricks and stone works

Stonework

Arrangement of masonry units so that by their overlapping the entire wall is tied together throughout its length and width and will therefore act as a unit in carrying the load. Another purpose the arrangement make beauty in masonry.



Brickwork

Mortar.

The Business of mortar is to hind Bricks and stones together to make a solid wall; to keep moisture out; to take up inequalities in the units; and to distribute the load on the wall. when good Bricks or stones are laid in good mortar, with all joints filled, the wall will stand.

Figure 17 mixer

Material

- Cement
- Water
- Aggregate

13. Hollow block slab

Ribbed slab is formed by placing blocks on the slab and concrete ribs.

Voided blocks are placed to reduce the total weight of the slab.

- Advantages:

Provide thermal and sound insulation.

Electrical and plumbing service can easily be accommodated.

Economical; Reduced cost for labor.

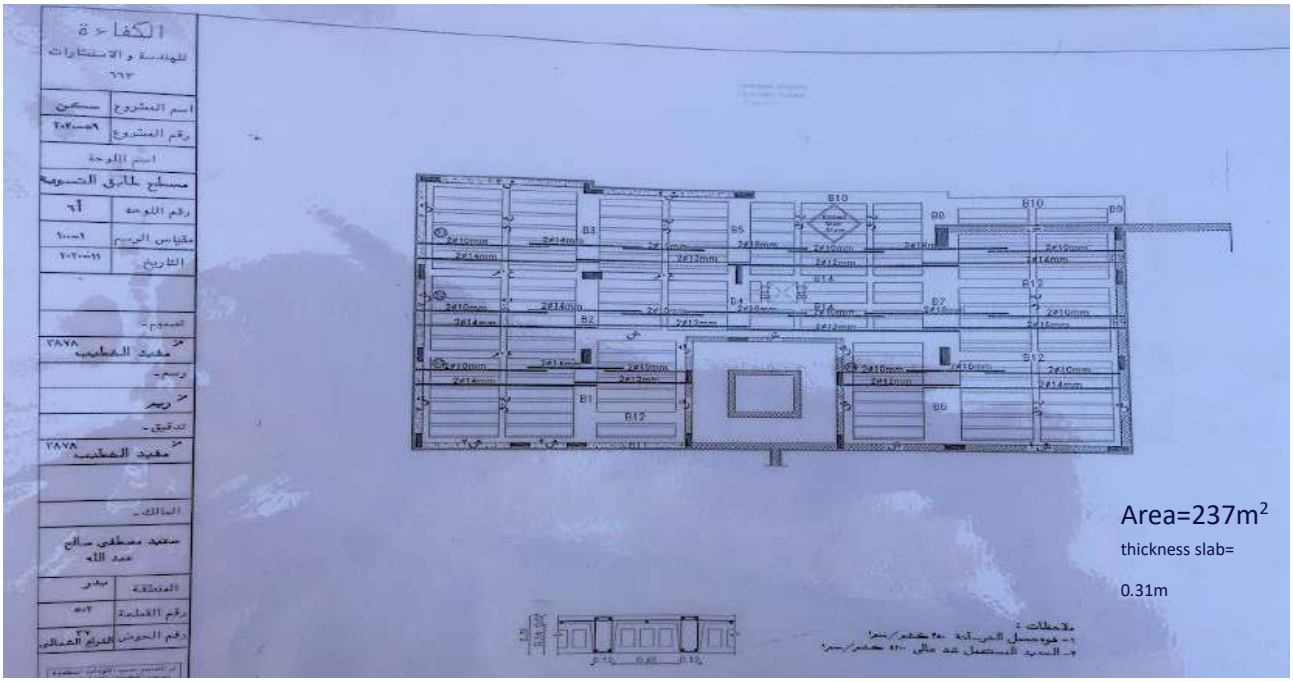
Highly durable.

Fire resistant.

This system is 30% lighter than a solid cast system on the supporting walls and foundation.

13.1 plans

One-way ribbed slab
(Long length/short length) >2m



13.2 quantity surveying: - **concrete**

1. Volume slab = area * thickness of slab
   = 237 m^2*0.31m = + 73.5 m^3
2. Volume ribs = area of ribs*height of block*number (-)

0.82*0.24*38=7.5 m^3
0.88*0.24*30=6.3 m^3
0.96*0.24*8=1.8 m^3
0.84*0.24*7=1.4 m^3
0.59*0.24*8=1.1 m^3
0.81*0.24*8=1.5 m^3
0.54*0.24*8=1.04 m^3
0.77*0.24*20=3.7 m^3

3. Stair (-) = area * thickness of slab

=23.2 m^2*0.31m = 7.34 m^3

4. Solid slab = 1.25m*0.31m*4.60m = + 1.8m^3

5.Stairs (+) = 0.59m^2 *1.10m *2 +1.10m *1.10m *0.17m = + 1.5m^3

Total, we need **46 m^3**

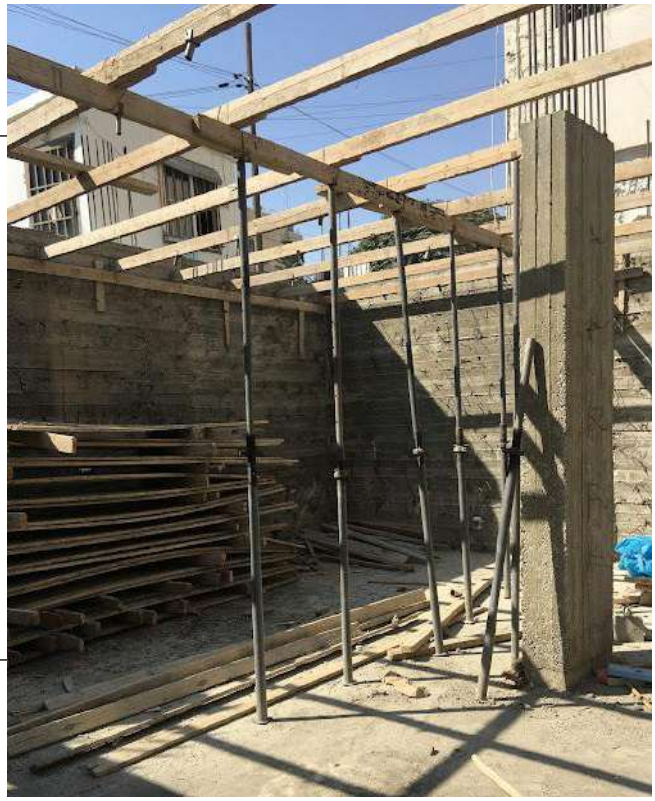
- **Steel,** from section of beam on plan

m / Φ	9m	8m	7m	6m	5m	4m
Φ 25			14 bars			
Φ 20			22 bars	9 bars		
Φ 18	23bars		10 bars	15 bars	36 bars	12 bars
Φ 16			3 bars	4 bars	16 bars	30 bars
Φ 14	3 bars	24 bars	34 bars	91 bars	18 bars	46 bars
Φ 12	5 bars		41 bars	21 bars		16 bars
Φ 10			14 bars	26 bars		10 bars

13.3 slab work

The first step

installed jacks and lumber to the roof of the base floor



Second step; Arrange the panels above support

Slab formwork essentially supports the weight of the concrete during the curing process.

*Figure 17 ribs block 24*20- Step3*

Column steel bars continue to the next floor

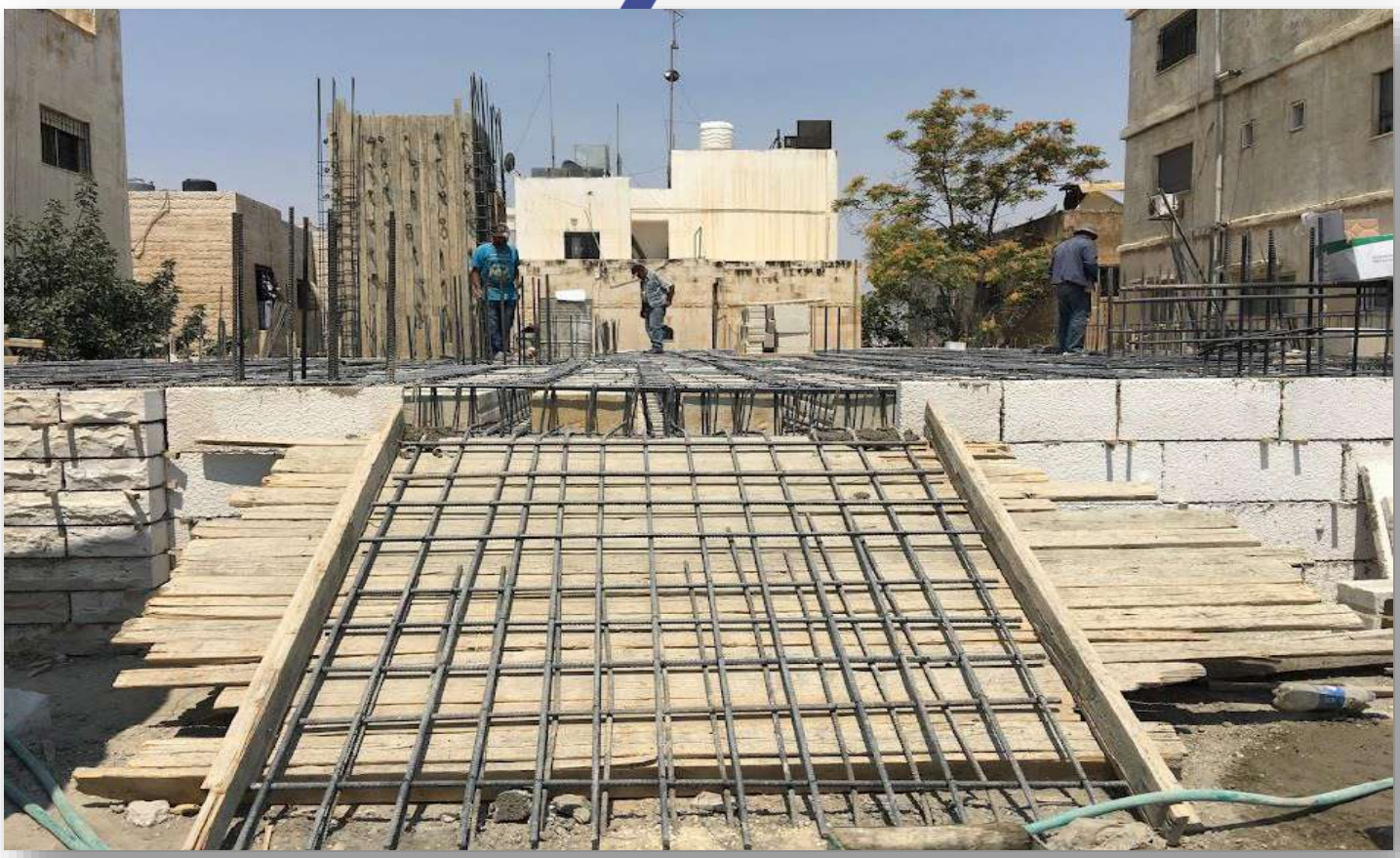
Space for ribs appear

ACI code limitations

Ribs are not less than 10cm in width, and a depth of not more than 3.5times the minimum web width.

Figure 18 Beam and ribs – fourth step

Concrete slabs are structural elements used to create flat horizontal surfaces, like roofs. They support and transfer the loads safely from columns to walls. They are made of reinforced concrete with their top and bottom surfaces parallel to each other. Their thickness is dependent on the load imposed on them and is supported by beams, columns, walls.



Cantilever formwork

Electrical work

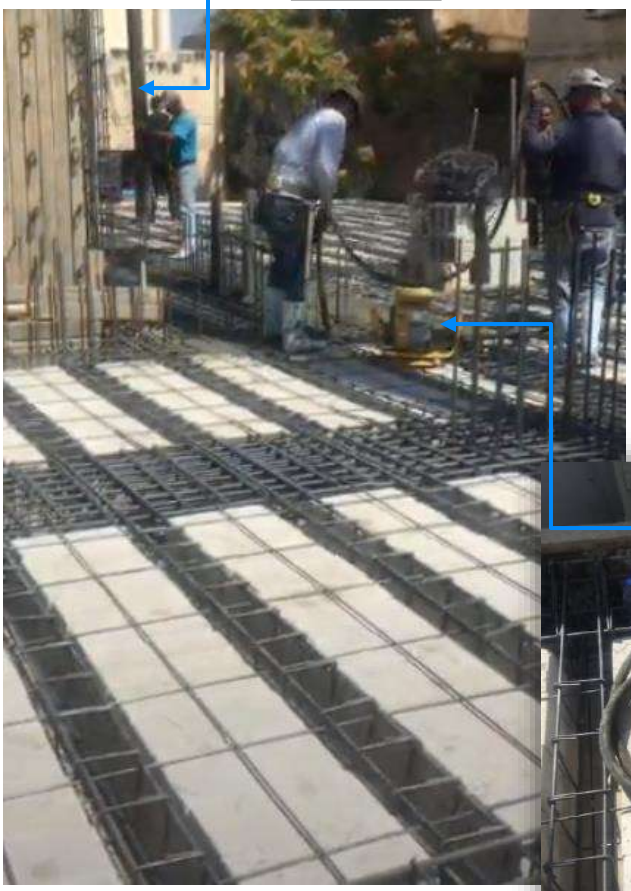
Mechanical work

- **Casting (ready mix concrete)**

The concrete mix plays an important role in the strength and durability of

pumping

casting



vibrator

Sub-structural

The concrete cube test is performed for the purpose of determining the compressive strength of a concrete element. The cubes used for this test have a dimension of 150 x 150 x 150 mm, the cubes are cured for and tested at 7 and 28 days, and they should achieve 65% of the strength at 7 days and 99% at 28 days.

The compressive strength of the concrete cube test provides an idea about all the characteristics of concrete. By this single test one judge that whether Concreting has been done properly or not.

Steps;

- Clean the molds
- Fill the concrete in the molds in 3 layers
- Compact each layer with 25 strokes per layer using a tamping rod (steel bar 16mm diameter and 60cm long, bullet-pointed at lower end).
- Level the top surface and smoothen it with a trowel.

After 24 hours, molds are removed, and test specimens are put in water for curing. The top surface of these specimen should be made even and smooth.

Figure 19 Cube

مركز أسيا الهندسي
لأبحاث التربـــة والمواد
Asia Engineering Center For
Soil Research and Material

تقرير فحص قوة إجهاد الخرسانة

العالك : السادة/سعيد مصطفر صباح عبد الله الخزعلي
المشروع : قطعة رقم 502 حوض 37 الفرع الشمالي
المقاول : السادة/ مؤسسة اعضان للمقاولات الخزعلي
الاشراف : السادة / مكتب الكفاءة للهندسة والاستشارات الخزعلي
المهندس المقيم : المهندس اسامة ابو الريش الخزعلي
درجة الخرسانة : 250 كغم/سم².

التاريخ : 2021 / 08 / 16
رقم الادخال : 2021/08/001

نتيجة فحص مكعبات
BS EN 12390 – 3: 2009

الرقم	رقم وتكان الصب	تاريخ الصب	تاريخ الكسر	العمر /يوم	القوة الدنيا كغم/سم²
1	عقدة التسوية	08/09	08/16	7	246
2		"	"	"	236
3		"	"	"	249

ملاحظات : تم استلام المكعبات في ظروف بيئية غير مناسبة (نتائج الفحص الواردة تتعلق فقط بالعينة المستلمة حسب المواصفات).

مركز اسيا الهندسي

مركز اسيا الهندسي
لأبحاث التربة والمواد

QF-44-Cnv.3

Figure 20 Result

Two days after the casting process, the column axes were taken to the ground floor.

Then casting the columns by fixing the shuttering framework and concrete are poured in the formwork. The shuttering removed after 24 hours of casting and curing is done.

Figure 1 Gr.floor work

After that, the installation of the stone was carried out, taking into consideration the places of doors and windows in each room.

Super structural

After the completion of the stonework, the workers began to install the jacks and lumber shuttering to start the next floor.

installed jacks and lumber to the roof of the First floor. Then began work on the distribution of bricks (Hollow Blocks), and as I mentioned earlier the ceiling was one-way ribbed slab for all areas except the cantilever.

And then began reinforcing the beams with (ϕ14 & ϕ16 & ϕ18 & ϕ20 & ϕ25) bars

according to what is in shop drawings, then double ribs, then cross rib, then ribs, with 2.5cm cover in all horizontal and vertical concrete sections

In the end casting the slab and start the same steps to the next floor.

Then after 14 days, the jacks were dismantled bellow the slabs.


LASER LEVEL


Portland - Pozzolana Cement - JS II / A-P 42.5


Power
Power
Power

Special work,

Insulation retaining wall and foundation by asphalt

The best quality to isolate (moisture) from any buried buildings or touched by the backfill, whether bases or walls, is the use of bitumen, which is characterized by flexibility and the ability to cover any cracks or pores in concrete without cracking

This bitumen is diluted with water and two sides are painted with a period between the drying of the first face

Conclusion

In conclusion, I am well satisfied with my training. I have learned many new subjects, acquired a number of new skills, and improved another group of existing skills. What I liked most about my training is that it is very strongly related to the academic materials and laboratories we studied in the university. This refutes the common saying that very little of the materials taught in university engineering courses are used by engineers working in the labor market.

I may count the technical skills that I learned or improved at the training site, other than those gained at university laboratories, in the following points:

- ✓ Improving my skills in the Auto Cad.
- ✓ Obtaining significant experience in fieldwork.

In my training, I have trained as a site engineer, during the training I noted that there a lot of problems facing engineer in the site, these problems need solutions, so the structural engineer needs a lot of experience or consulting another structural engineer to decide for any problem facing him.

Finally, the training added to me huge information about how to construct projects.