UNIVERSITI TEKNOLOGI MARA

DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

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(PERAK)

SEPTEMBER 2015

It is recommended that the report of this practical training provided

By

Mohamad Razien Faiz Bin Abdul Halim

2013630942

Entitled

Building Structure For Double Storey Terrace House

Accepted in partial fulfillment of requirement has for obtaining Diploma In Building.

Report Supervisor	:	Pn. Nurhasyimah Binti Ahmad Zamri
Practical Training Coordinator	:	Pn. Noor Rizallinda Binti Ishak
Programme Chairman	:	Dr. Mohd Rofdzi Bin Abdullah

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SEPTEMBER 2015

STUDENTS DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references stated herein, prepared during a practical training session that I underwent at Alaf Pentawaris Sdn. Bhd. for duration of 5 month starting from 25th May and ended 9th October 2015. It is submitted as one of the prerequisite requirements of DBN307 and accepted as a partial fulfillment of the requirement for obtaining the Diploma In Building.

Name : Mohamad Razien Faiz Bin Abdul Halim

UiTM ID No : 2013630942

Date 3.2.2016

ACKNOWLEDGEMENT

In the name of Allah, the most merciful, the most compassionate.

Alhamdulillah, I would like to praise to Allah s.w.t for letting me finish my practical training successfully. I also want to extend my gratitude for the guidance, advice and help throughout the practical training period by the following amazing group. I would to thanks to En. Shahril Hizham Bin Reduan for the opportunities given to me to practical with his amazing team. His amazing professional teams comprising of En. Muhammad Ilyasa bin Razali, En. Mohd Suhaimi Bin Baseri, En. Azman Bin Sungip, Pn. Nuraishah binti Johari and lastly En. Mohamad Izli bin Mustakim. Thanks to them cause guide me to develop my understanding, knowledge and theory about the superstructure of a building. Also to the client and consultant cause give me a chance to gain more knowledge and experience on construction site.

I would also like to thanks to my lecturer that have taught and guide me to complete my practical report. I want to extend my gratitude and appreciation to my supervisor lecturer Pn. Nurhasyimah Binti Ahmad Zamri, to my visiting lecturer Pn. Sahidah. I value the effort, time and encouragement that they have contribute toward my practical training.

Lastly I would like to thanks to both of my parents for their sacrifices for me.

ABSTRACT

Superstructure is the most important element in building. Their role in making the building stable that safe for people to use. Therefore these reports will discuss and explain on how to construct a superstructure. The objective of this report is to shows on construction of superstructure and how to build it. This report will show he method of construction from pile cap to the roof beam of a double-storey terrace house at Taman Pasir Putih. This report also will show on what to do before and during the construction of the superstructure.

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CHAPTER 1.0

PREFACE

1.1 Introduction

Structure is the most important part of building element of Frame Structure building. The function of superstructure or also known as building structure is to distribute live and dead load to the ground.

Live load is the load that not static or load that moving or changing. For example of live load are people and vehicles. Dead load is a load that static or not changing for example is furniture and the load of the building itself.

Building Structure is consist of foundation, column stump, ground beam, ground floor slab, ground floor column, 1st floor beam, 1st floor slab, 1st floor column and roof beam.

In this report I will show the construction of structure of 184 units double storey affordable terrace house at Taman Pasir Putih, Pasir Gudang.

1.2 Objective

The objectives of this report are:

i. To identify the various type structure element
ii. To identify the method statement of the construction
iii. To identify the safety measure on work.
iv. To understand the function of structure.

1.3 Scope Of Study

The scope of study that on this report is focused on the method of construction, machineries and equipment that has been used in construction and completion of 184 unit Double Storey Affordable Terrace Houses (18" x 60") At Plot 1, Taman Pasir Putih, Mukim Plentong Daerah Johor Darul Takzim.

1.4 Method Of Study

There are 2 (two) method of study which is primary and secondary that have been used as sources to obtain an information for this report. The primary sources is a sources that is original and not interpreted by any party. These information can obtain based on experience of the person. In this report, the primary sources divided into two, observation and interview.

i. Observation

Observation method is done by observing the process or the method of work that been used at site. The information is obtain by see what happen at site and observe it. The camera is needed to capture any picture or image that can help to gain some more information such as picture of project progress, method of construction and phase of construction. Picture that been taken by camera also can give information about the equipment and machineries that been used in the construction.

ii. Interview

The interview method is very useful to gain more information or specific information by asking someone that have more experience in construction industries. The person that i had interviewed is Project Manager En. Shahril Hizham Bin Reduan, Site Engineer En. Ilyasa Bin Razali and Site Supervisor En. Suhaimi Bin Baseri.

The Secondary sources of information that can be found or obtained is in written document. Example of written document is such as journal, magazines, book, article and blog. For this report, the information is taken from internet, books and journal that related to construction industry.

i. Internet

Internet is one of the sources that most people will use to obtain information and other things. People use internet because internet is the fastest and a lot sources that can be found. There are many website that related to construction that we can take information. The website that I had browsed is http://www.aboutcivil.org/frame-structures-definition-types.html , http://www.understandconstruction.com/concrete-frame-structures.html and http://www.businessdictionary.com/definition/structural-frame.html .

ii. Books

Book is a reading material that been used for century. Book is a source that can be trusted. There are many books that related to construction or method of construction. The book can be found by searching at the

library or bookstore. The books that I used as refer is Complete Book of Framing: An Illustrated Guide for Residential Construction by Scot Simpson, Building Construction Handbook 9th Edition by Roy Chudley and Roger Greeno.

iii. Journal

Journal is a reading material that been created by person by its own thought or experience. Journal usually created by a small group of people. Journal also can be a source of information because it was written by someone that has experience in construction industries. The journal that I used is Journal of Construction Engineering and Management editor by Jesus M. de la Garza.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction Of Company

Alaf Pentawaris Sdn. Bhd or formly known as Bandi Bina Sdn. Bhd is a company that was establish on 25th April 1994. On early of its establishment, the company name was Pembinaan Bandi Gomri Dan Keluarga (M) Sdn. Bhd or Bandi Bina Sdn. Bhd taken from the name of the company founder Hj. Bandi Gomri.

Then on 26th August 2013 the company name changed from Bandi Bina Sdn. Bhd to Alaf Pentawaris Sdn. Bhd. The company is Grade 7 Contractor and performs a building construction, civil construction and mechanical and electrical work.

CIDB MALAYSIA

184408 A

PERAKUAN PENDAFTARAN

Adalah dengan ini diperakui bahawa kontraktor yang dinyatakan di bawah ini telah berdaftar dengan Lembaga mengikut Bahagian VI Akta Lembaga Pembangunan Industri Pembinaan Malaysia 1994. Pendaftaran ini adalah tertakluk kepada syarat-syarat yang telah ditetapkan di belakang Perakuan ini

No Pendaftaran: 1981012-JH0149000

Nama Kontraktor: ALAF PENTAWARIS SDN. BHD

Alamat Berdaftar: NO. 488, JALAN TITIWANGSA 3
TAMAN TAMPOI INDAH
81200 JOHOR BAHRU
JOHOR

Gred Kategori dan pengkhususan berdaftar:

G7	B	B02 B04 B12 B24 B14 B13
G7	CE	CE01 CE13 CE36 CE34 CE10 CE02 CE21 CE03
G7	ME	M15 M01 E10

Tarikh Mula Berkuatkuasa: 14 MAY 2015

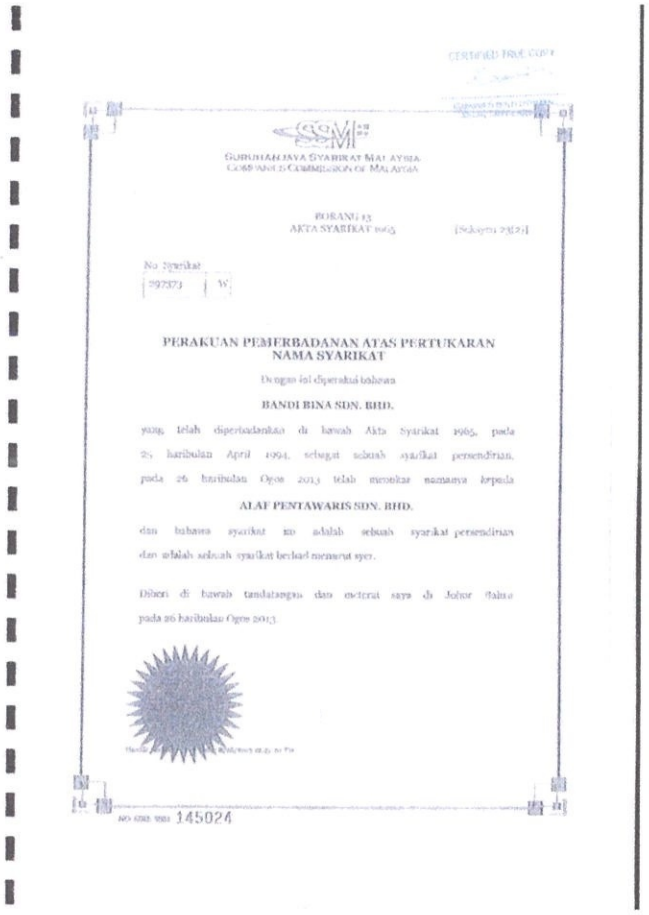
Tarikh Habis Tempoh Perakuan: 13 MAY 2018*

*Pendaftaran ini automatik dibatalkan sekiranya kontraktor gagal mendapatkan pelanjutan sebelum tarikh tamat tempoh

STATUS : AKTIF - Kontraktor yang diawardkan projek semasa perakuan pendaftaran ini dikeluarkan.

CIDB MALAYSIA

Photo 2.1: The CIDB certificate license



SURUHANJAYA SYARIKAT MALAYSIA
COMPANIES COMMISSION OF MALAYSIA

BORANG 13
AKTA SYARIKAT 1965 [Seksyen 23(2)]

No. Syarikat
297373 W

PERAKUAN PEMERBADANAN ATAS PERTUKARAN NAMA SYARIKAT

Dengan ini diperakui bahawa

BANDI BINA SDN. BHD.

yang telah diperbadankan di bawah Akta Syarikat 1965, pada 25 haribulan April 1994, sebagai sebuah syarikat persendirian, pada 26 haribulan Ogos 2013 telah menukar namanya kepada

ALAF PENTAWARIS SDN. BHD.

dan bahawa syarikat ini adalah sebuah syarikat persendirian dan adalah sebuah syarikat berhad menurut syer.

Diberi di bawah tandatangan dan meterai saya di Johor Bahru pada 26 haribulan Ogos 2013

NO. KOD: 9881 145024

Photo 2.2 : shows the certificate of changing company name

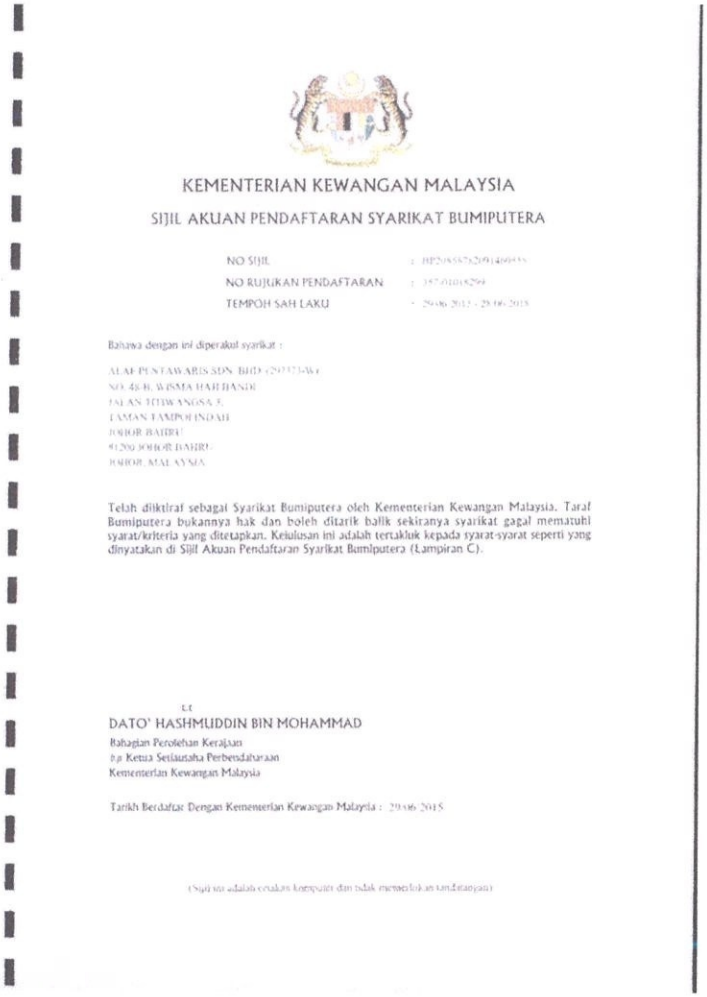
2.2 Company Profile

Logo of the company:

Alaf Pentawaris
(Co No. 297373-W) SDN BHD

Photo 2.3: shows the logo of the company

Alaf Pentawaris Sdn. Bhd Chairman are En. Ahmad Fauzan Hatim Bin Datuk Hj. Abdul Latif and the director is En. Roslee Bin Ismail since 2010. The company is a Bumiputera Company that certified by Jabatan Kerja Raya (JKR).



KEMENTERIAN KEWANGAN MALAYSIA

SIJIL AKUAN PENDAFTARAN SYARIKAT BUMIPUTERA

NO SIJIL : [illegible]

NO RUJUKAN PENDAFTARAN : [illegible]

TEMPOH SAH LAKU : [illegible]

Bahawa dengan ini diperakui syarikat :

ALAF PENTAWARIS SDN. BHD. (297373-W)
NO. 48-B, WISMA HARTANDE
JALAN TEBRAU 3,
TAMAN TAMPOI INDAH
JOHOR BAHRU
81200 JOHOR BAHRU
JOHOR, MALAYSIA

Telah diiktiraf sebagai Syarikat Bumiputera oleh Kementerian Kewangan Malaysia. Taraf Bumiputera bukannya hak dan boleh ditarik balik sekiranya syarikat gagal mematuhi syarat/kriteria yang ditetapkan. Kelulusan ini adalah tertakluk kepada syarat-syarat seperti yang dinyatakan di Sijil Akuan Pendaftaran Syarikat Bumiputera (Lampiran C).

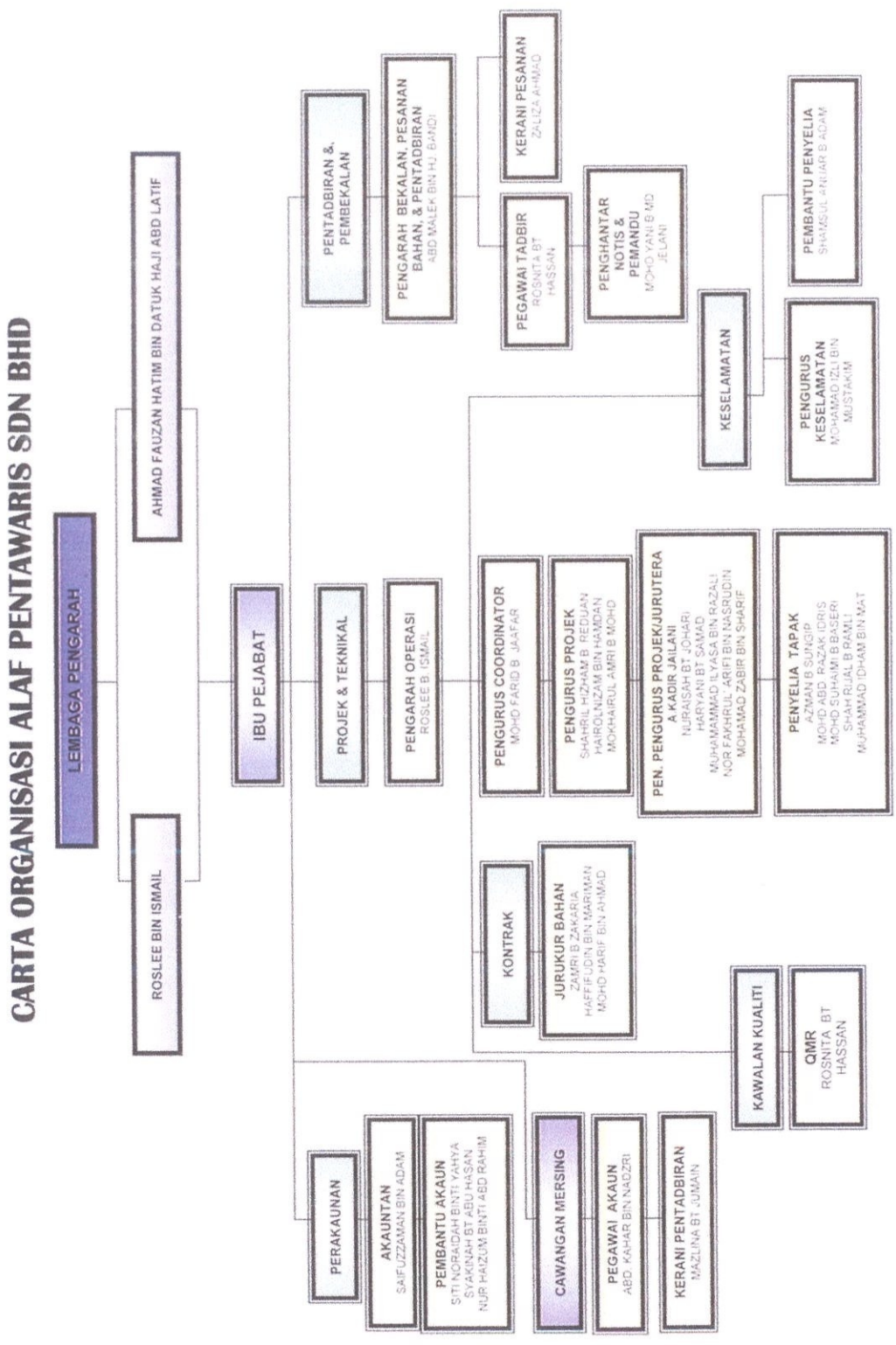
DATO' HASHMUDDIN BIN MOHAMMAD
Bahagian Perolehan Kerajaan
b.p Ketua Setiausaha Perbendaharaan
Kementerian Kewangan Malaysia

Tarikh Berdaftar Dengan Kementerian Kewangan Malaysia : 29/06/2015

(Sijil ini adalah cetakan komputer dan tidak memerlukan tandatangan)

Photo 2.4: Shows the certificate from JKR

2.3 Organization Chart



2.4 List Of Project

Alaf Pentawaris Sdn. Bhd has completed nearly 64 of project from 1994 until now. In early of its establishment, the company only takes a tender to deliver a material to a project site. But now, the company has taken a tender to build a building. The biggest project for Alaf Pentawaris is to build and completed MRSM Johor Bahru. The price for the contract is RM 79,217,921.51.

2.4.1 Completed Projects

The table below shows the completed and on progress project of Alaf Pentawaris from 2002 until now :

Num.	Project	Contract Price	Finish Date
1	Cadangan Membina dan Menyiapkan satu Blok Bangunan Sekolah Tambahan empat tingkat dan lain-lain kerja yang berkaitan untuk Sek. Keb. LKTP Bukit Besar, Kulai, Johor	1,750,840.00	26/1/2002
2	Cadangan membina pejabat dan makmal di stesen MARDI, kluang, Johor	4,326,347.31	20/4/2002
3	Membina dan menyiapkan projek jalan kampung secara konsep bersepadu negeri johor	6,239,000.00	18/2/2003
4	Memperelokkan jejaran jalan Kluang/Jemaluang di laluan FT0050 Daerah Mersing, Johor Darul Takzim	6,502,486.00	9/7/2003

5	Johor State Administrative Centre Bandar Nnusajaya, Johor. Structural and Associated works for propose Menteri Besar and State Secretary Complex	9,479,265.22	31/10/2006
6	Membina dan Menyiapkan Rumah keluarga kelas D pangsa, F Pangsa dan G Pangsa di Kem Mahkota Kluang, Johor	40,812,948.00	31/03/2008
7	Cadangan Membina dan menyiapkan Maktab Rendah Sains Mara (MRSM) di atas lot PTD 198869 Mukim Plentong, Daerah Johor Bahru, Johor	79,217,921.51	23/3/2011
8	Cadangan Membina Dan menyiapkan bangunan tambahan fakulti kejuruteraan elektrik di Universiti Teknologi Malaysia Skudai, Johor	26,438,685.80	28/6/2012
9	Cadangan Membina dan menyiapkan pangkalan Marin Polis Diraja Malaysia di atas lot PTD2417 Mukim Tanjung Kupang, Daerah Johor Bahru, Johor	43,839,813.40	22/12/2014
10	Proposed construction and completion of 184 unit double storey affordable terrace house at plot 1, Taman Pasir Putih,	22,701,388.70	On Progress

Table 2.1 : The completed project of Alaf Pentawaris Sdn. Bhd

CHAPTER 3.0

CASE STUDY

3.1 Introduction Of Project

The project of construction and completion of 184 unit double storey affordable terrace house at plot 1, Taman Pasir Putih is a project of Alaf Pentawaris Sdn. Bhd. With client Sime Darby Properties. The project is to construct a 184 units double storey affordable terrace house.

The architect for this project is Aziz Darmawi Architect Sdn Bhd, landscape architect Tropic Design Sdn Bhd, Quantity surveyor MRQS Consultant, Structural Engineer RAF Consult Sdn Bhd, civil engineer Jurutera Perunding Al-Ikhlas Sdn Bhd and mechanical and electrical engineer Emasjasa Consult Sdn Bhd.

The house area is 18" x 60" (feet). The project is consist of 24 block with average 7 units of house per block. The tender price for this project is RM 22,701,388.70. Sime Darby Properties Sdn Bhd is the developer of this project and their purpose for this project is to provide an affordable house to who that have low or mid income.

The project period is 14 month that started on 8th December 2015 and estimated finish on 8th February 2016.

3.2 Case Study

The case study for this report is the construction of structure for project construction and completion 184 units of affordable double storey terrace house at TamanPasir Putih, Pasir Gudang. Structure is the main component in construction of a building. Structure consist of a few building element such as foundation, column stump, ground beam, ground floor slab, ground column, first floor beam, first floor slab, first floor column and lastly roof beam.

There were a few steps in construction of building structure. Firstly the drawing of building structure is drawn by the structural engineer. The engineer will determine the suitable size of the structure for example size of footing, column, beam and others element.

Then the engineer will determine the suitable reinforcement bar to be use in the structure. The reinforcement bar function is to strengthen the concrete and to distribute the load of the building to the ground. The size, the numbers of reinforcement bar is determined by the load need to be carried by the structure.

If the design of the structure is failed the building might be dangerous to the people because the building might be collapse due to the weakness of the structure. After the structure drawing is approved the drawing will be given to contractor to construct the building.

3.2.1 Pile Cap (Foundation)

Foundation is the structure that distribute load of the building to the ground. Before the foundation is constructing, the piling work must be done first. Piling is a work that driving a concrete pile bar into the ground below the foundation to make the foundation even stronger. Piling will go depth in the ground until it reaches its limit point where the piling bar cannot go any deeper.

After the piling done the foundation will be construct. There are various type of foundation that exists such as pad foundation, rafter foundation and stripe foundation. The most type of foundation that been used in construction is pad foundation because it was easy to construct and economical. It also suitable for the frame structure building compare to other type of foundation that suitable with load bearing wall building.

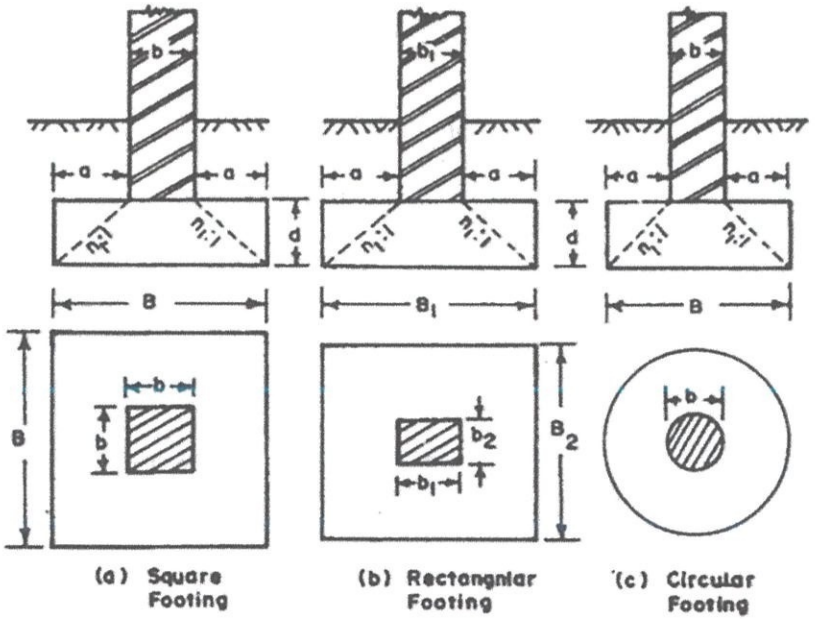


Figure 3.1: The example of pad foundation

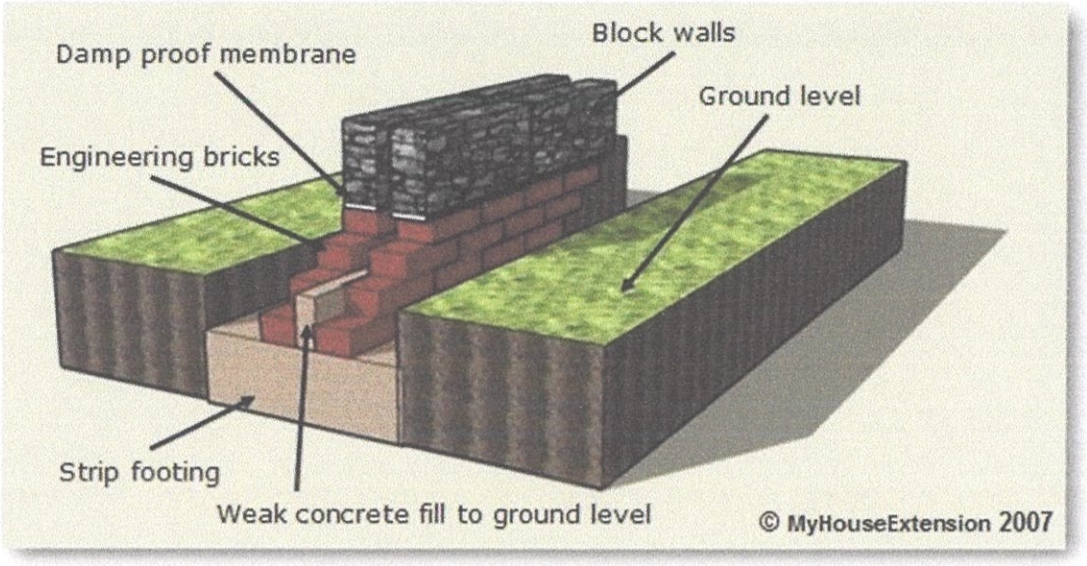


Figure 3.2 : The example of stripe foundation

In my project, to construct the pad foundation, contractor must follow the drawing that was given by the structural engineer. The drawing must been approved by the engineer and the client before hand out to contractor. Survey work must take place and done by a certified surveyor to determine the right point to construct the pad footing. The surveying work also must follow the drawing that was given by the engineer.

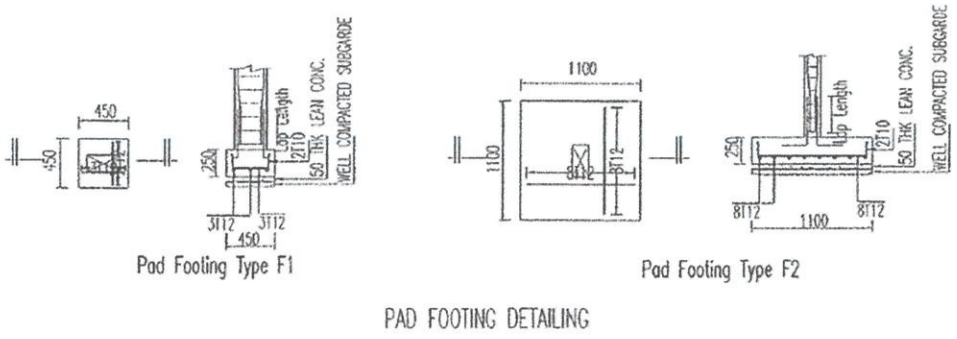


Figure 3.3: Drawing of pad foundation detail

After the surveying work has been done. The excavation work will begin. The excavator will excavate the point that has been marked by the surveyor. The depth of the pit is in the drawing refer on the height of the column stump. After the excavation work, the piling will be drive into the ground. The amount of the pile bar that need to be put in the ground is given by the engineer. The pile bar that want to be planted must follow exactly the amount that was given by the engineer.

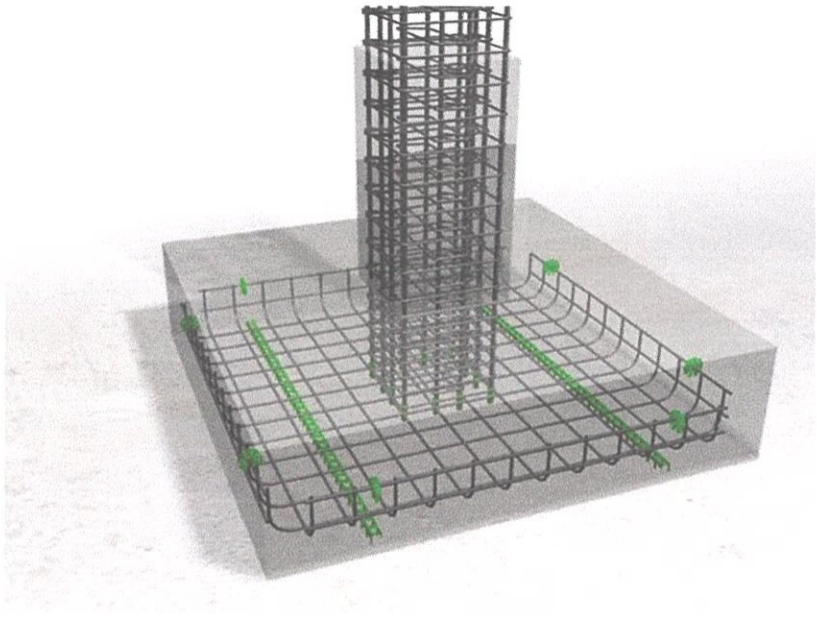


Figure 3.4 : The example of reinforcement bar of pile cap and column stump

If the amount needs to be decrease because of some reason, the contractor must seek for engineer approval. The engineer will determine if the pile bar is suitable to be decrease or not. After the piling work done, the Clerk Of Work (CoW) must make an inspection. The inspection is being done by consultant to make sure the work that the contractor has done is correct and perfect.

After that the formwork of pad foundation is installed. Formwork is the mold that used to make the shape of the concrete. Next the reinforcement bar is installed. The reinforcement bar for column stump is also installed because the column stump is part of the foundation.

Photo 3.1 : The installation of pad footing formwork

After the installation is complete, the footing will be concreted. By using grade 25 concrete with slump not exceeding 100mm the footing will be strong enough to endure the load of the building. The vibration work is the most important thing to do while concreting. By using vibrator poker, the concrete will be vibrated to make the concrete flow perfectly in the formwork. The vibration work also can prevent any defect of concrete to occur such as honeycomb, blistering and cracking.

Photo 3.2 : The concreting process of pad footing

After the concreting work is done, the formwork can be opened at least after 1 day the concreting work is done. Next the curing process must be done to make the concrete dry perfectly. The function of curing process is to make sure the concrete keep humid while the concrete dehydrate or dry to prevent the concrete from cracking. The curing process can be done by using water or a curing compound. The curing compound will be sprayed at the concrete footing using a sprayer. Another method of curing is using a blanket or canvas to cover the concrete area. The blanket will blocked the moisture in the concrete from evaporate too much and keep the concreted structure wet or moist.

3.2.2 Ground Beam

Ground beam is the beam that functions to support a ground floor slab. Ground beam will distribute the load of the building to the column stump and then it will distribute to foundation and next to the ground.

To construct a ground beam, firstly the excavation work will be done. We must excavate a trench to place the ground beam. The trench pit must be excavate refer to the ground beam drawing because the ground beam will be concrete in the trench. The trench depth is same with the ground beam depth.

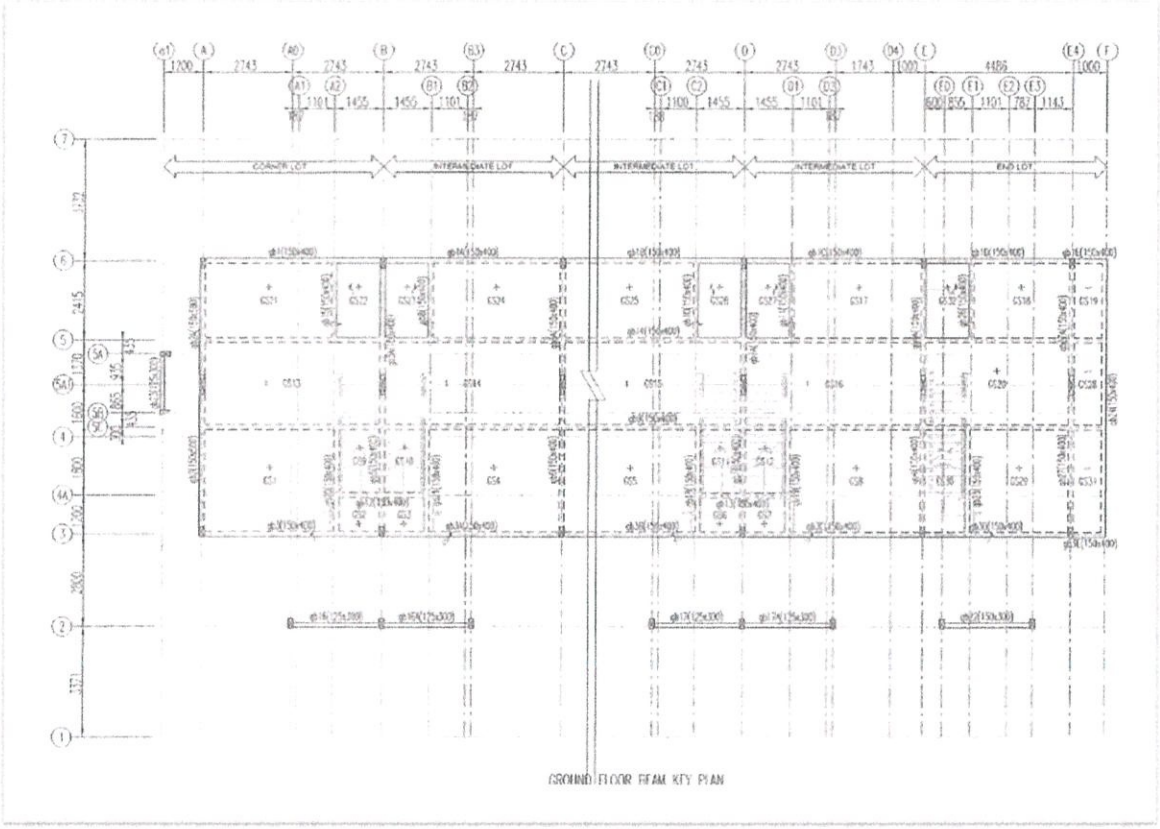


Figure 3.5 : Construction drawing of ground beam

After the trench is completely excavated, the formwork of ground beam will be installed. The formwork of the ground beam is only installed on the side of the trench. It is because if the formwork is installed at below of the trench it will be hard to remove the formwork when the concrete is hardening.

Photo 3.3 : The installation of ground beam formwork

After the installing formwork is done the reinforcement bar will be install. The reinforcement bar must follow the engineer drawing. The size of the steel bar, the space between links is given in the drawing. The reinforcement bar of ground beam must connect with the column stump starter bar to make the structure stronger.

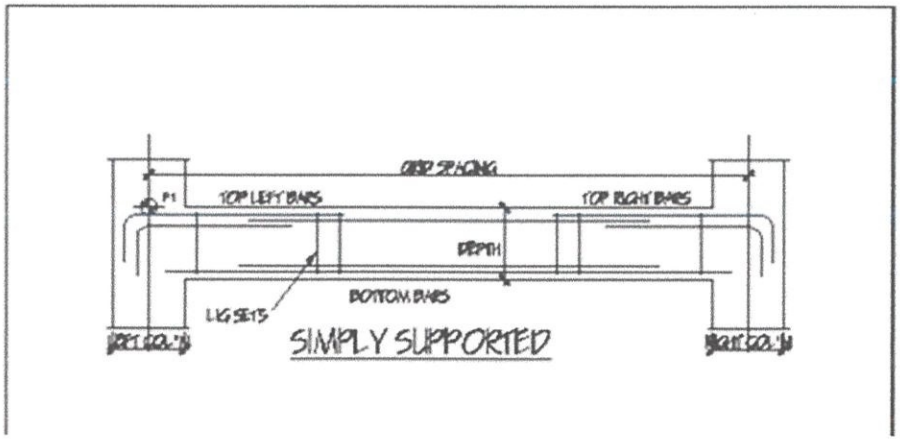


Figure 3.6 : An example connection of Reinforcement bar between ground beam and column stump.

After the installation of reinforcement bar is complete, concreting work can be done. Using a grade 25 concrete with slump test not exceeding 100mm the concreting work must be done perfectly. The concrete must flow and fill the formwork evenly make the structure tough.

Vibrator poker was used to make the concrete flow perfectly. Sometime the concrete cannot fill in the certain area. The vibrator poker will make the concrete flow to the area that the concrete cannot fill in.

When the concreting is done, it will take a day to make the concrete ground beam dry and hardening. After the ground beam is completely dry, the formwork can be remove. The curing process must be done to keep the concrete moisture when the drying process happens. If the curing process not being done there's possibilities the structure will crack.

3.2.3 Ground Floor Slab / 1st Floor Slab

A concrete slab is common structural element of a building. Horizontal slabs of steel reinforced concrete, typically 50 mm thick, are most often used to construct floor slab. The concrete slab is supported by double layer BRC with water proofing agent to make the slab strong and the humidity from soil does not penetrate the concrete slab.

Ground floor slab is the long span slab that was constructed in the ground floor of a building. The slabs connected with the ground beam and use the ground beam to distribute the load from the ground slab to the foundation.

After the ground beam is fully hardening, the soil will be filled in the slab area to make the slab area level higher. The soil will be compacted. Next the lean concrete will be filled in the slab area. The thickness of the lean concrete is normally 150 mm. Lean concrete is a mix where the amount of cement is lower than the amount of liquid present in the lean concrete layer. The thickness of the lean concrete and the slab is determined by the engineer in the drawing.

Photo 3.4 : The concreting of lean concrete in the slab

Lean concrete functions are to add more strength to the floor slab. Furthermore, slabs is a long span or wide span area of concrete so the lean concrete is used to add more strength to the slab. Sometimes the lean concrete is replaced with hardcore such as crusher run. The purpose of the crusher run is same as lean concrete to add more strength to the slab. While concreting the lean concrete we not used the vibrator poker to make the concrete spread evenly because the lean concrete is just a base of the concrete slab.

After the lean concrete is dry and hardening, a Damp Proof Membrane will be lay on the lean concrete. Damp Proof Membrane is a layer that made by plastic to prevent the humidity from the soil penetrate to the slab and create water droplet or humid surface and can make the concrete damaged. The Damp Proof Membrane (DPM) is only installed on the ground floor slab or a slab that attached on the soil.

Photo 3.5 : Process of laying a Damp Proof Membrane (DPM)

Next the BRC will be laid on the Damp Proof Membrane (DPM). BRC is a reinforcement steel that used in the slab. The function of BRC is to make the slab stronger and not collapse or break apart when load is placed on the slab. There are 2 layers of BRC that been used in the ground floor slab and first floor slab. The first layer of BRC that been used is a square type BRC with diameter 10mm to 12mm. The second layer of BRC is a rectangular BRC with diameter 6mm to 8mm. The BRC is made from mild steel reinforcement bars that normally are used in reinforcement link or stirrup and used in BRC.

In installation of any reinforcement in building element such as beam, column and slab, the reinforcement sometimes will touch or attached to the formwork and when been concrete the reinforcement steel bar will exposed in the concrete. Therefore they used a concrete space bar to make the reinforcement placed perfectly in the center of the structure.

Concrete spacer bar is a squared concrete that was precast in situ that function to lift up the reinforcement from touch the formwork. When laid the BRC at the both ground slab and first floor slab the spacer is used at the bottom of BRC to prevent the BRC from touch or attached to the formwork.

Photo 3.6 : The example of spacer that placed at the bottom of BRC

Next the slab can be concrete if the BRC, spacer, electrical conduit and sanitary pipe is completely installed. By using grade 25 concrete with specified slump test not exceeding 100mm slump, the concrete must spread evenly. The vibrator poker is the important machine when concreting. The vibrator will vibrate the concrete and let the concrete flow in the area that was narrow.

Photo 3.7 : The concreting process of ground floor slab

On the first floor slab, the slab is concreted simultaneously with first floor beam. It is because the first floor beam is connected with first floor slab to make the slab rigid and stronger and can support the load. Damp proof membrane is not being install on first floor slab cause the slab is not touching with ground and no humidity can penetrate through the slab.

Photo 3.8 : The concreting process of first floor slab and first floor beam

3.2.4 Column

Column is the structure that are function to distribute load from the upper part of structure such as roof beam and first floor slab to the lower part of structure like ground beam and next to the foundation.

Column or post can be design with various shapes but it's normally designed in square and round shape. Column can be made by various materials such as timber, steel and concrete as appropriate to the building. Steel column normally used in industrial building or warehouse because of its strength that suitable to use at heavy duty or large building.

Timber column are commonly used in traditional Malay house. The features of timber that are strong, durable and lightweight compare to concrete make the timber is an option of Malay villagers to use it as a material to build a house.

In project of 184 units affordable house they used a concrete column because of the strength, durability and consistent with modern house design. The engineer that design the column must take into account the load that the column need to distribute from roof beam and first floor slab to made sure the column is strong enough to hold the structure.

When to construct the column, the worker will install the reinforcement bar first compare to other structure that they install the formwork first. The reinforcement bar of column must be tied to the starter bar of the column stump or starter bar of ground column.

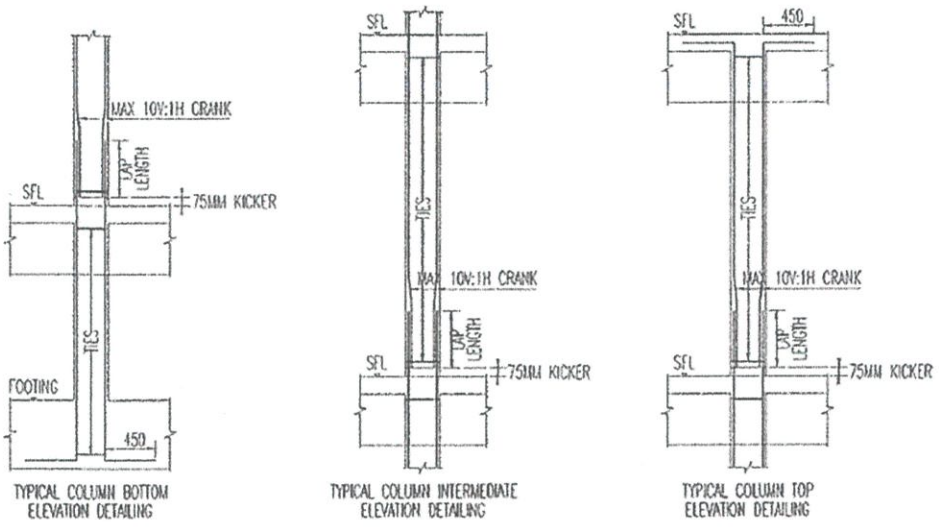


Figure 3.7 : Detail connection drawing of column

After finish the installation of reinforcement bar the worker will install the spacer at side of the reinforcement bar. The spacer is function to hold the reinforcement from touch the formwork that can make the reinforcement exposed after the formwork been removed. Then the formwork can be installed.

The column is using grade 25 concrete with slump test not exceeding 100mm slump. The vibrator is crucial in concreting work especially when concreting column. It is because when concreting the column the concrete sometimes not perfectly flow and fill the bottom of the formwork. Therefore the vibrator poker is used to make the concrete flow perfectly and fill in the formwork.

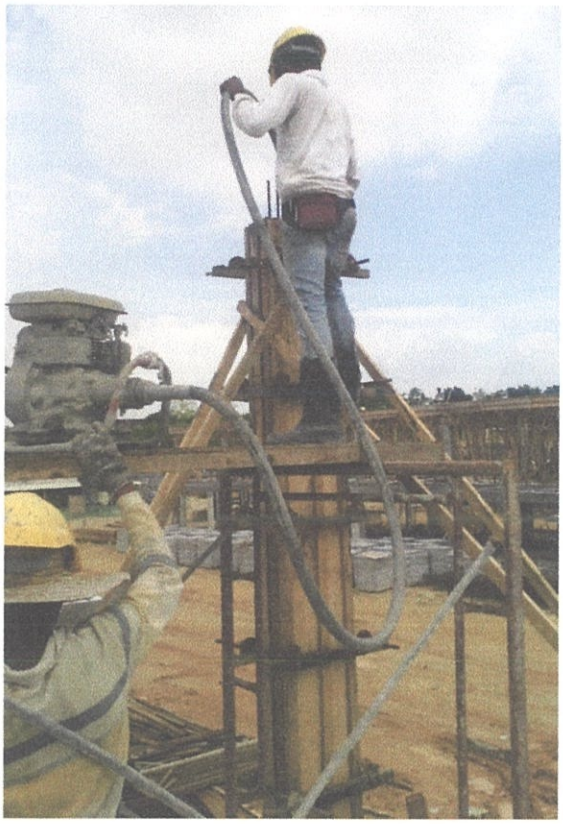


Photo 3.9 : The vibration work while concreting the column

3.2.5 Roof Beam

Roof beam is the last structure to be constructed. Located at the top of the structure it functions to support and distribute load from the roof to the column and next to the foundation. Roof beam is exactly same like ground beam and first floor beam but it does not have any slab and platform.

To construct the roof beam, the engineer consultant must provide a drawing of roof beam based on architect design. The engineer will decide the size of the roof beam and the amount and type of reinforcement to be use in the roof beam.

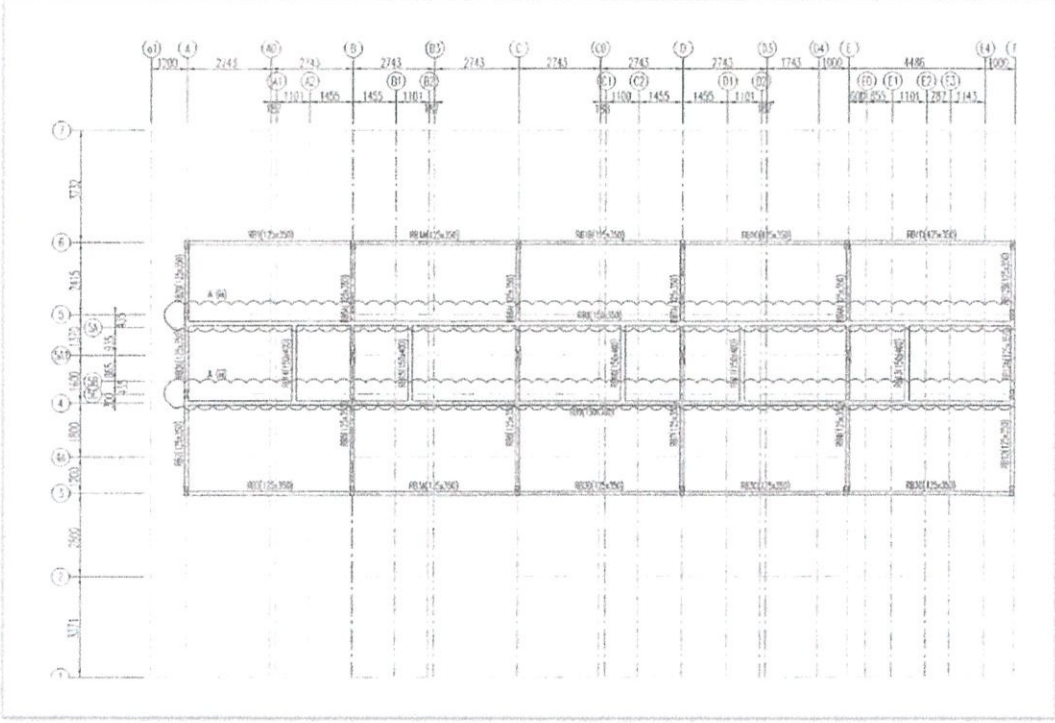


Figure 3.8 : Construction drawing of roof beam

To construct the roof beam, firstly the formwork must be installed on top of the column. The formwork height and width must follow the design of the roof beam in the drawing.

Next the reinforcement bar will be installed. The reinforcement bar size and design was given in the drawing and must be followed. The end of the beam must be connected with the column starter bar to ensure the load can be distribute perfectly. After the reinforcement bar is completely installed, the spacer bar will be put at the reinforcement bar to prevent the reinforcement bar from touch the formwork and can cause a concrete defect such as honeycomb.

Then the structure can be concrete. Using a grade 25 concrete with specified slump not exceeding 100mm the concrete grade is strong enough to be used to concrete the roof beam.

Vibration work is the crucial part in concreting. The vibrator poker will make the concrete flow in the narrow part of the formwork and can prevent any honeycomb from occur. Honeycomb is one of the concrete defects. It happens when the concrete is not filled perfectly in the formwork and create air bubble in the formwork.

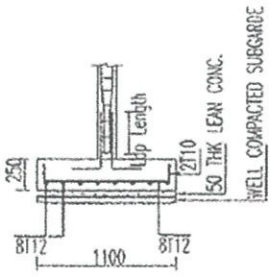
Photo 3.10 : Concreting of roof beam

The formwork can be removed from the concrete roof beam after at least 1 day after concreting being done. The curing process will take place to ensure the roof beam will remain the moisture in the concrete to prevent the concrete from cracking due to dehydration of the concrete.

METHOD STATEMENT FORM

Name : Mohamad Razien Faiz Bin Abdul Halim Class : AP1165D Matrix Num. : 2013630942

Job : Construction of Pile cap

No.	Operation	Diagram	Operator / Labour	Duration
1.	- Install the pile cap formwork refering to the drawing.		- 2 skilled worker / carpenter - 3 unskilled worker	- 1 hour per pile cap
2.	- Install the reinforcement bar of the pile cap. - Follow the drawing for the size of the reinforcement bar to use for the pilecap - Install the spacer bar after the reinforcemen bar is install completely.		- 3 skilled worker / bar bender - 3 unskilled worker	- 1 hour per pile cap

3.	- Lastly concrete the pilecap using a grade 25 concrete. - The slump test is not exceeding 100mm - Use the vibrator poker to make sure the concrete sapread evenly and can prevent defect from occur.		- 3 unskilled worker / concreter	-15 minutes per pile cap

METHOD STATEMENT FORM

Name : Mohamad Razien Faiz Bin Abdul Halim Class : AP1165D Matrix Num. : 2013630942

Job : Construction of Ground beam

No.	Operation	Diagram	Operator / Labour	Duration
1.	- Excavate the tranches or pit for the ground beam. - The depth of the trench must same as the depth of the ground beam.		- 1 excavator operator - 1 skilled worker	- 1 day
2.	- Install the formwork of the ground beam. - The formwork is installed only at the both side of the trenches		- 3 skilled worker / carpenter - 3 unskilled worker	-5 hour

3.	- Install the reinforcement bar for the ground beam - The reinforcement bar must follow the drawing to make sure the size and dimension of the reinforcement bar is correct - After install the reinforcement bar, put the spacer bar at the both side of the ground beam		- 3 skilled worker / bar bender - 3 unskilled worker	- 5 hour
4.	- After that, concrete the ground beam - Using a grade 25 concrete with specified slump not exceeding 100mm - Make sure the vibrator work is being done to prevent ant concrete defect from occur.		- 5 unskilled worker	- 3 hour

METHOD STATEMENT FORM

Name : Mohamad Razien Faiz Bin Abdul Halim Class : AP1165D Matrix Num. : 2013630942

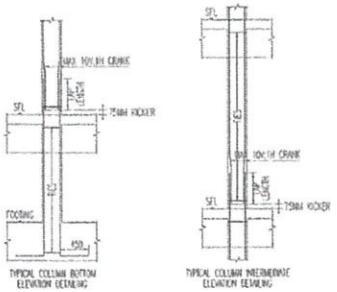
Job : Construction of Ground floor slab / 1st floor slab

No.	Operation	Diagram	Operator / Labour	Duration
1.	- Install the formwork of slab at the outside area of the slab		-3 skilled worker / carpenter - 2 unskilled worker	-3 hour
2.	- Fill the slab area with soil for first layer - Then fill the slab area with lean concrete or hardcore as the 2nd layer - Lay a Damp Proof Membrane (DPM) at top of the lean concrete - Then lay a 1st layer BRC and 2nd layer BRC at the top of the DPM		- 2 bar bender - 3 unskilled worker	- 3 days
3.	- Then concrete the slab with grade 25 concrete with specified slump no exceeding 100mm - Use the vibrator poker to vibrate the concrete. - The vibrator will make the concrete spread evenly and prevent from defect to occur		- 5 unskilled worker	- 5 hour

METHOD STATEMENT FORM

Name : Mohamad Razien Faiz Bin Abdul Halim Class : AP1165D Matrix Num. : 2013630942

Job : Construction of Ground column / 1st floor column

No.	Operation	Diagram	Operator / Labour	Duration
1.	- Firstly install the reinforcement bar of the column. - The reinforcement bar must connected wih the starter bar of column stump or starter bar of ground column - Then install the spacer bar at all side of the reinforcement bar.		- 3 skilled worker / bar bender - 2 unskilled worker	-3 hour
2.	- Next install the formwork of the column. - The formwork of the column must install correctly to prevent the formwork from rupture when concreting.		- 3 skilled worker / carpenter - 3 unskilled worker	-5 hour
3.	- Then concrete the column. - Using a grade 25 concrete with specified slump not exceeding 100mm - The vibration work is important to make sure the concrete flow perfecly in the forkwork and can preven the defect from occur.		- 5 unskilled worker	-3 hour

METHOD STATEMENT FORM

Name : Mohamad Razien Faiz Bin Abdul Halim Class : AP1165D Matrix Num. : 2013630942

Job : Construction of Roof beam

No.	Operation	Diagram	Operator / Labour	Duration
1.	- Firstly install the formwork of roof beam at top of 1st floor column. - The formwork must follow the consruction drawing.		- 3 skilled worker / carpenter	-2 days
2.	- Next install the reinforcement bar. - The reinforcement bar must connect and be tie with column starter bar. - Then after the reinforcement bar is completely installed, put the spacer bar at bottom and side of the roof beam.		- 3 skilled worker / bar bender - 3 unskilled worker	- 1 day

3.	- Lastly the roof beam can be concreted. - Using grade 25 concrete with specified slump not exceeding 100mm. - use vibrator poker to do the vibration work. - The vibrator will make the concrete flow perectly and fill the narrow area. - It will prevent the concrete defect from occur.		- 5 unskilled worker	- 4 hour

CHAPTER 4.0

CONCLUSION

4.1 Conclusion

As a conclusion, structure is the most important element in building. It functions as a load distributer or load supporter for the building. The structure also is the element make the building strong, rigid and preventing the building from collapse. The combination of concrete and reinforcement bar that make the superstructure is strong and durable that can stand for a decade and sometimes for a century.

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