



UNIVERSITI TEKNOLOGI MARA

**DEPARTMENT OF BUILDING  
UNIVERSITI TEKNOLOGI MARA  
(PERAK)**

**DECEMBER 2018**

**THE CONSTRUCTION OF PAD FOUNDATION**

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**(PERAK)**

**DECEMBER 2018**

It is recommended that the report of this practical training provided

**By**

**'Ainaa 'Arifah binti Awang Omar**

**2016458528**

**Entitled**

**CONSTRUCTION OF PAD FOUNDATION**

Accept in partial fulfillment of requirement has for obtaining Diploma in Building

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**STUDENT 'S DECLARATION**

I hereby declare that this report is my own work, except for extract and summaries for which the original references are stated herein, prepared during a practical training session that I underwent at Fattahhome Design and Construction for duration of 14 weeks starting from 3 September 2018 and ended on 7 December 2018. It is submitted as one of the prerequisite requirements of DBG307 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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Last but not least, my special thanks to my beloved parents for their sacrifices over the years that given. Theirs' motivation and support encouraged me to not give up and try my best in everything I do and done.

Thank you so much.



## **ABSTRACT**

Foundation is the element structure which connects it to the ground and transfers loads from the structure to the ground. There are two types of foundation which is shallow and deep foundation. Therefore, this report will discuss about the pad foundation more detail based on the project at Fattah home Design & Construction, Kepala Batas, Pulau Pinang. The objective of this report is to identify the installation method of pad foundation and problem encountered and solution method during the construction. An observation is done through on site visit at the construction site and interview by asking an experienced person in construction industry. As an addition, books and websites also had been used as the medium that support the information and data collected. To conclude, foundation is an important structure in the construction industry as it will sustain and transmit loads from upper structure and spread it to the earth.

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## CHAPTER 1.0

### INTRODUCTION

#### 1.1 Background and Scope of Study

Foundation is the element of a structure which connects it to the ground and transfers loads from the structure to the ground. Foundation engineering is the application of soil mechanics and rock mechanics in the design of foundation elements of structures. (Wikipedia, 2004) There are two types of foundation which is shallow foundation and deep foundation. The different between this two foundation are shallow foundation is excavated less than 3 meters while deep foundation is excavated more than 3 meters inside the soil.

There are a very wide range of foundation types suitable for different applications, depending on considerations such as the nature of the load requiring support, ground conditions, the presence of water and also sensitivity to noise and vibration. Shallow foundations are typically used where the loads imposed by a structure are low relative to the bearing capacity of the surface soils. (designbuildings.co.uk, 2014). There are three types of shallow foundations such as strip foundation, pad foundations and raft foundation. Factors in choosing the most suitable foundations are depending on the condition of the soil.

Strip foundations (or strip footings) are a types of shallow foundation that are used to provide a continuous, level (or sometimes stepped) strip of support to a linear structure such as a wall or closely-spaced rows of columns built centrally above them. Strip foundations can be used for most subsoils but are most suitable for soil which is of relatively good bearing capacity. They are particularly suited to light structural loadings



such as those found in many low-to-medium rise domestic buildings – where mass concrete strip foundations can be used.

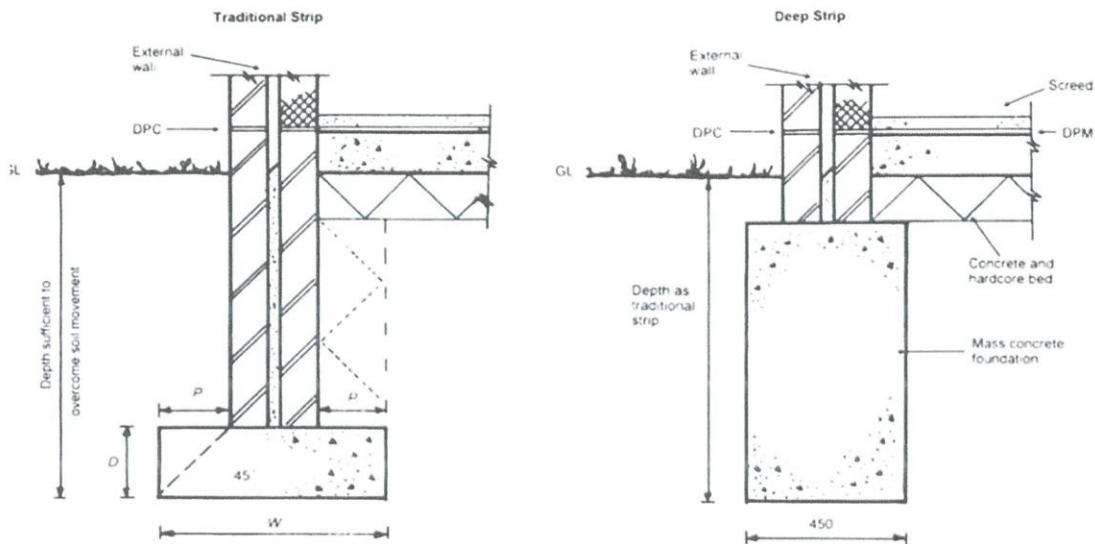


Figure 1.1 diagram of strip foundations

Source: <https://www.designingbuildings.co.uk/wiki/File:Stripfoundation.jpg>

Pad foundation are generally shallow foundation, but can be deep depending on the ground conditions. They are a form of spread foundation formed by rectangular, square or sometimes circular concrete ‘pads’ that support localized single-point loads such as structural columns, group of columns or framed structures. This load is then spread by the pad to the bearing layer of soil or rock below. Pad foundations can also be used to support ground beams. They are generally of a uniform thickness, but sometimes the upper face may be sloped or stepped. Their plan shape will depend on the nature of the applied load and the allowable bearing capacity of the layers below. Their thickness must be sufficient to distribute the load across the plan shape. They are generally reinforced on all but the smallest structures, with the reinforcement allowing higher loads to be imposed and the construction of shallower pads which requires less excavation and use less concrete. (designbuildings.co.uk, 2015)

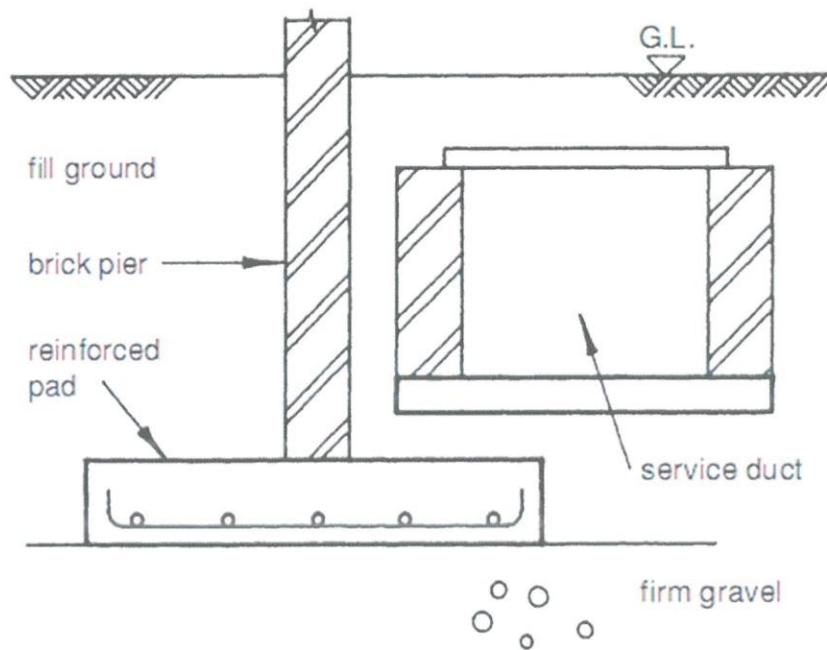


Figure 1.2 diagram of pad foundation

Sources: <http://www.abuildersengineer.com/2012/12/deep-reinforced-concrete-pads.html>

Raft foundation (sometimes known as mat foundation) are a large concrete slab which can support a number of columns and walls. The slab is spread out under the entire building or at least a large part of it which lowers the contact pressure compared to the traditionally used strip or trench footings. The raft foundation was cheaper, easier to install and most importantly did not require as much excavation as the usual strip foundation. Raft are most often used these days when the strata is unstable or a normal strip foundation would cover more than 50% of the ground area beneath the building. There are also situations (usually in areas where mining are occurred) where there may be area of movement in the strata. A raft foundation spreads the weight of the building over the whole ground floor area of the building. The raft is laid on a hardcore, or scalping beg and usually thickened at the edges,

especially in very poor ground. rafts are most suitable when the ground is of good load bearing capacity and little work is required to get a solid foundation.

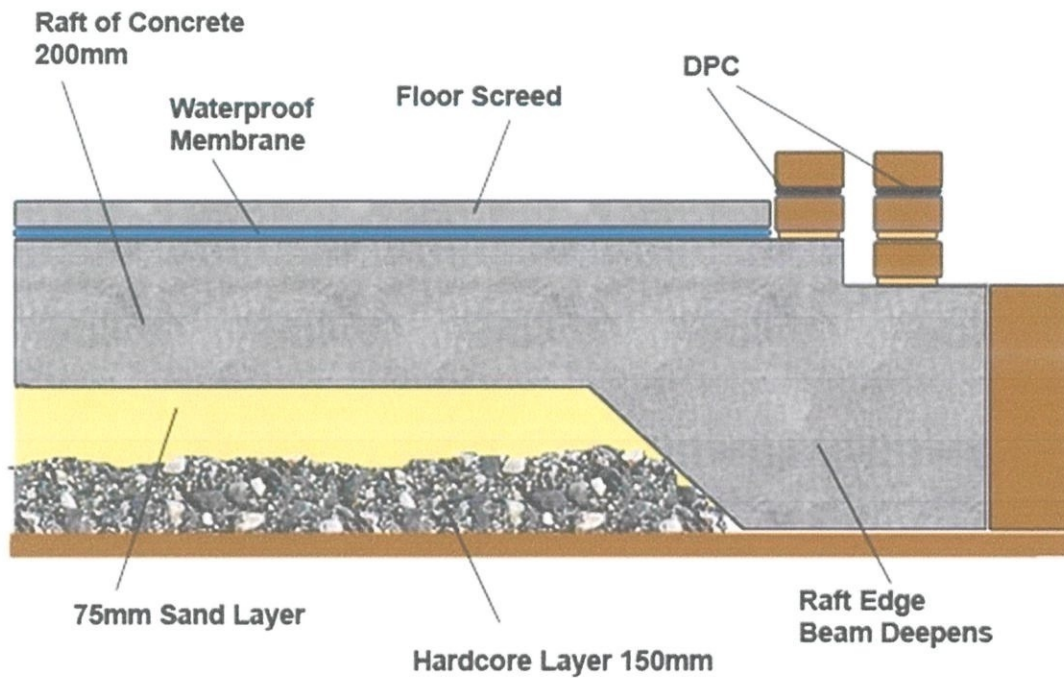


Figure 1.3: diagram of raft foundation

Source: <https://www.diydoctor.org.uk/projects/rafts.htm>

A deep foundation is a type of foundation that transfers building loads to the earth farther down from the surface than a shallow foundation does to a subsurface layer or a range of depths. A pile or piling is vertical structural element of a deep foundation, driven or drilled deep into the ground at the building site. There are many reasons that a geotechnical engineer would recommend a deep foundation over a shallow foundation, such as for a skyscraper. Some of the common reasons are very large design loads, a poor soil at shallow depth, or site constraints like property lines. There are different terms used to describe different types of deep foundations including the pile (which is analogous to a pole), the pier (which is analogous to a column), drilled shafts, and caissons. Piles are generally

driven into the ground in situ; other deep foundations are typically put in place using excavation and drilling. The naming conventions may vary between engineering disciplines and firms. Deep foundations can be made out of timber, steel, reinforced concrete or pre-stressed concrete. (Wikipedia, 2006)

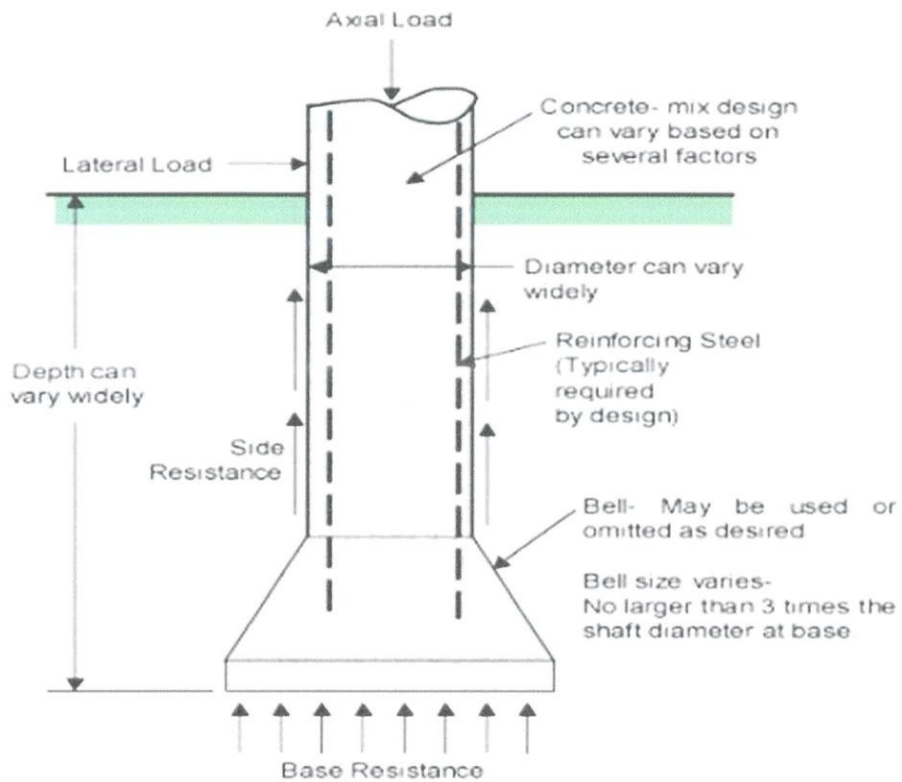


Figure 1.4: deep foundation

Sources: <https://theconstructor.org/geotechnical/types-of-deep-foundation/7252/>



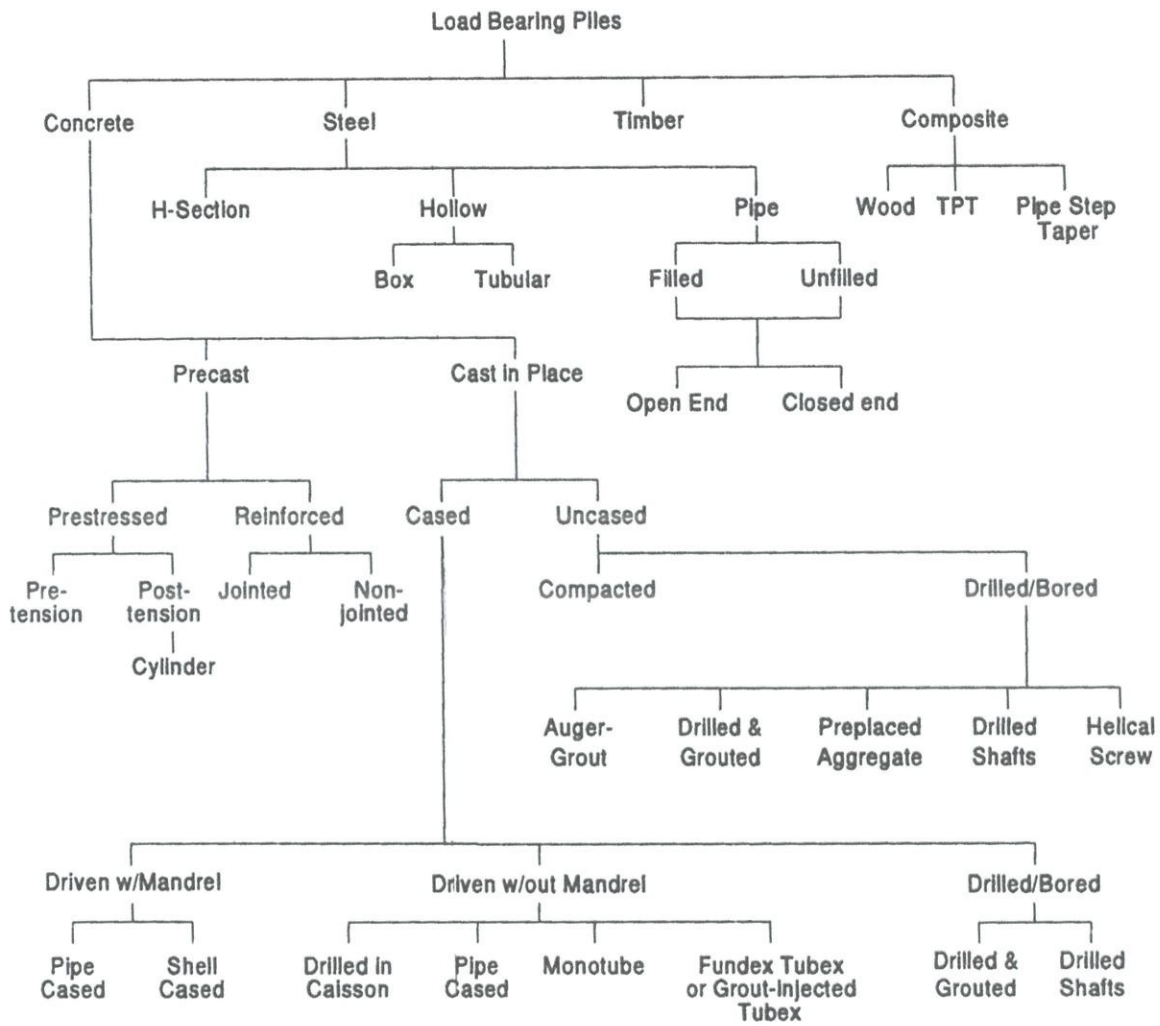


Figure 1.5: types of piling foundation

Sources: <http://www.pilebuck.com/foundation/pile-bucks-pile-guide-part-1-bearing-piles/>

## **1.2 Objectives**

- i. To identify the installation method of pad foundation.
- ii. To determine the problem encountered and solution method during the construction.

## **1.3 Method of study**

Method being used are:

- 1) Observation – this observation method is done during practical training directly by site visit. The information collected based on what happen at site construction guided by person in charge. Camera and cellphone was used to record any important information such as progressing of construction, equipment and machineries that used while construction is on progress.
- 2) Interview – interview sessions with several people who are responsible in charge on the site construction. Several of those people are the supervisor, contractor, sub-contractor, skilled worker, unskilled worker and many more.
- 3) Book – this method is used in order to collect and figure out more information on how the process of the construction, materials used in the project and how to construct it through relevant books and article at Perpustakaan Tun Abdul Razak (PTAR) at UiTM Seri Iskandar, Perak. Book can be used to obtain more information about construction method of pad foundation. These books are available at the library and also at website of the library.
- 4) Research – several research is done in order to gain more information on this topic in form of referring previous drawing plan at the office. Such as architectural drawing plan and structural drawing plan.

- 5) Internet – internet also being used to obtain information about the construction of pad foundation. There are several websites that have been used to gather more information.



## CHAPTER 2.0

### COMPANY BACKGROUND

#### 2.1 Introduction of Company

Formerly known as Anajaya Bina that was established in 2006 until 2014 and base in Kepala Batas, Pulau Pinang. Anajaya Bina focus more on construction field. Until 2014 Anajaya Bina was operated under new label; Fattahhome Design & Construction.

The company is a well experienced in the field of construction, housing, real estate, infrastructure and construction contract for both government and private sectors.

Throughout the operation, FHDC had done many residential property and government properties without abandoned. Main focus area are construction works especially owned bungalow and renovations.

Now, FHDC planning to expand their businesses to develop few real estate areas into residential area. Three main principle that always being held by all the staffs are diligent, discipline and confidence have turned success to the company. One of strategy that being used in order to expand the company are getting involved in residential project and involved directly in sales and marketing works.

Since the establishment of FHDC, it is supported by skilled labour and experience in real estate and construction field. FHDC are more committed in providing services that are effectives, competitive and also gives satisfaction to customers.



Figure 2.1 Location of the office

Source: Google Maps

### 2.1.1 Company Objective

The objective of the company is:

- 1) To create opportunities for a people to enjoy the convenience and to owned a very comfortable house in a harmonious environment.
- 2) To ensure that all people especially low income groups enjoy the facilities and buy house that suit their ability.
- 3) To reduce existing squatter areas and establishing more comfortable housing areas.

## 2.2 Company Profile

Name : Fattah Home Design & Construction

Registered Address : No. 2, Lorong Bentara 27, Bertam Perdana 13200 Kepala Batas, Penang.

Business Address : No. 91-1, Jalan Seri Serdang 3, Taman Seri Serdang 13200 Kepala Batas, Penang

Date of incorporation : 2014

No. registration : PG 0356021-T

No. CIDB : 0120150150401-PP162476

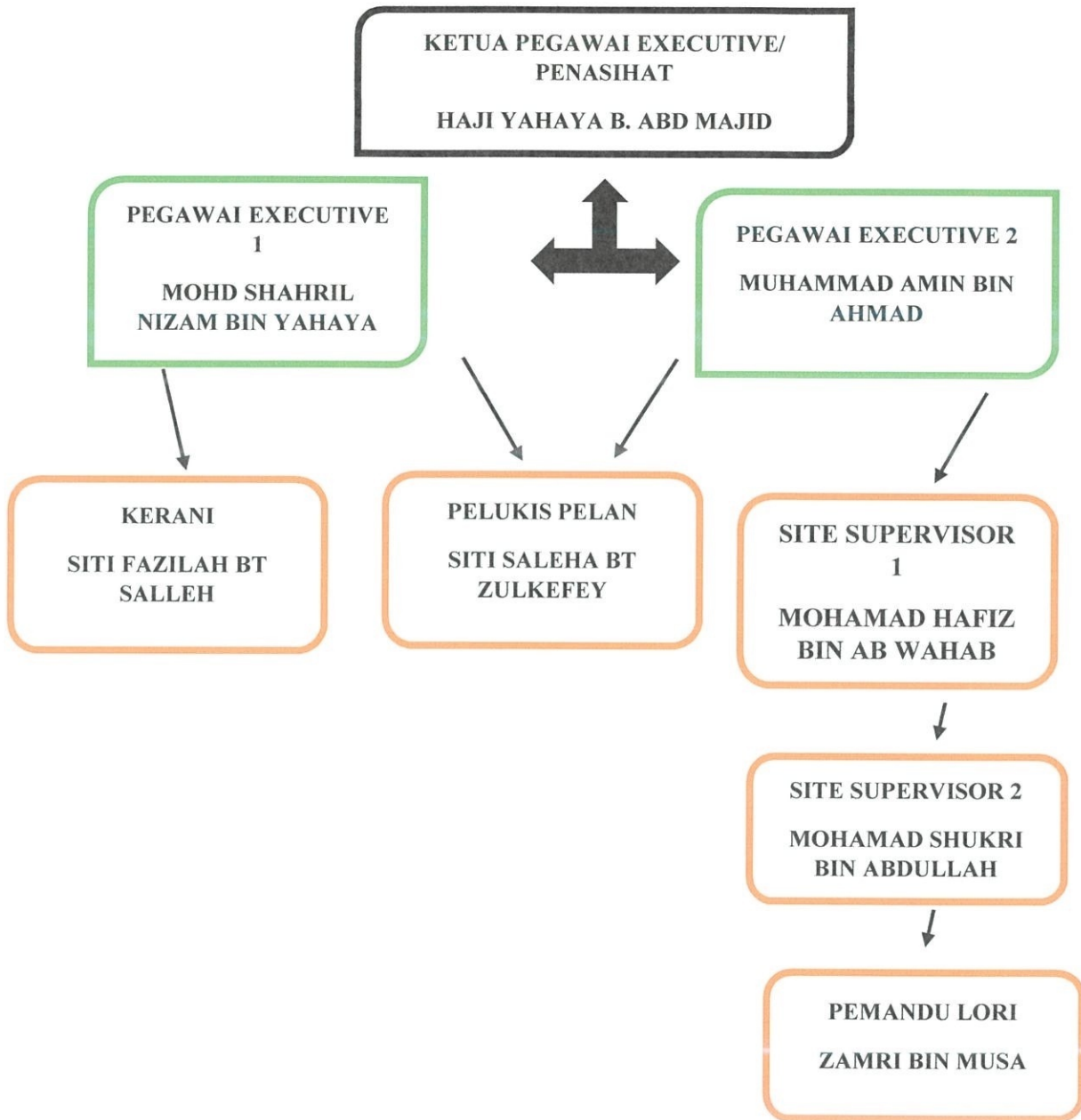
Telephone Number : \_\_\_\_\_

Fax Number : \_\_\_\_\_

Main business : construction and real estate

Bank : Maybank Malaysia Berhad  
: Bank Islam (M) Berhad

### 2.3 Organization Chart



## 2.4 List of Project

### 2.4.1 Completed project.

**Table 2.1: list of completed project**

No.	Name of project	Value
1.	CADANGAN MEMBINA 1 UNIT RUMAH KEDIAMAN JENIS TERES DUA TINGKAT YANG BERALAMAT DI TAMAN DESA SENA TASEK GELUGOR	RM370,000.00
2.	CADANGAN MEMBINA 3 UNIT CHALET RESORT DI LANGKAWI	RM4,500,000.00
3.	CADANGAN MEMBINA 2 UNIT BANGUNAN RESORT BERALAMAT DI YAN, KEDAH DENGAN KELUASAN 4004 sqft.	RM2,100,000.00
4.	CADANGAN MEMBINA SEBUAH BANGLO DUA TINGKAT DI SUNGAI DURI, SUNGAI BAKAP, PULAU PINANG DENGAN KELUASAN 7250 sqft	RM1,400,000.00
5.	CADANGAN MEMBINA SEBUAH SURAU AL-KHAFI DI JUNJUNG KULIM DENGAN KELUASAN 3283 sqft.	RM1,100,000.00
6.	KERJA KERJA MEMBINA RUMAH BANGLO DUA TINGKAT DI BERTAM PUTRA, KEPALA BATAS, PULAU PINANG DENGAN KELUASAN 3150 sqft	RM1,500,000.00

Source: Fattah home Design & Construction

#### 2.4.2 Project on progress.

**Table 2.2: list of on-going project**

<b>No.</b>	<b>Name of project</b>	<b>Value</b>
1.	KERJA KERJA MEMBINA RUMAH BANGLO SATU TINGKAT DI KULIM GOLF RESORT, KULIM, KEDAH DENGAN KELUASAN 4108 sqft.	RM1,300,000.00
2.	KERJA KERJA MEMBINA 3 UNIT RUMAH SATU TINGKAT YANG BERALAMAT DI KAMPUNG BERJAYA, ALOR STAR, KEDAH	RM500,000.00
3.	KERJA KERJA MEMBINA RESORT DENGAN DI JANDA BAIK, PAHANG.	RM850,000.00
4.	KERJA KERJA UBAHSUAI KESELURUHAN RUMAH DAN HIASAN DALAMAN DI TERAS JERNANG.	RM250,000.00



## **CHAPTER 3.0**

### **CASE STUDY**

#### **3.1 INTRODUCTION OF PROJECT**

The location of the construction is located at Kampung Berjaya in Alor Star, Kedah. This is a low-cost house with area of house 60ft x 25ft. It consists 3 houses with one bedroom, two toilets and kitchen each house. Total cost for this project is around RM80,000.00 and it is among the cheapest project ever received. The drawing was designed by draughtsman from Fattah home Design & Construction and was approved by selected engineer. The project commenced on September 2018 and expected to complete by end of November 2018. Due to the changes of the weather, it extends until December and expected to fully complete by the end of December 2018.

Kampong Berjaya is also very strategic as it located behind morning market that operate daily. It is also full of accessibility because it placed near to main road and other infrastructure such Aeon Big, Petronas pump station, Maybank, Sekolah Tunku Abdul Rahman and many hardware store. It is also not too far from Alor Star town and 10 minutes from Alor Star railway station. For this case study, the focus will only be on construction of pad foundation as suitable topic due to process of construction is not very complex.





Figure 3.1 The location of the site, Kampong Berjaya.

Source: google maps

Pad foundation are shallow foundation but also can be deep depending on the ground condition. It is in form of spread foundation formed by rectangular, square or sometimes circular concrete ‘pads’ that support localized single-point loads such as structural columns, groups of columns or framed structures. To construct this pad foundation, it does not take too much time. The function of pad foundation is,

- a. To support the structure that stands on it.
- b. It is much more economic compare to other foundation.
- c. It requires less excavation.
- d. Size and shape can be varied depending on site condition.
- e. Does not produce noise hazard to the neighborhoods area.



Figure 3.2 pad foundation

No matter what types of footing and foundation is used, a certain sequence should be followed. The sequence can change slightly according to the method involved. The basic sequence is as follows:

Find the amount of site preparation needed

1. Lay out footing and foundation shape
2. Excavate to proper depth
3. Level the footing corners
4. Build the foundation forms
5. Reinforce the forms needed
6. Estimate concrete needs
7. Pour the concrete footing
8. Build the foundation forms
9. Reinforce the forms as needed
10. Pour the concrete into forms
11. Finish the concrete and embed anchors
12. Remove the forms
13. Waterproof and drain as required.

Pad foundation can be used to carry point loads. They can also be designed so that the loads of the walls and the buildings are transferred through ground beams that rest on the pad foundation. Pad foundation transferred the loads to a lower level where soil of sufficient loadbearing exists. The width of the foundation can be increased to distributed the loads over a greater area, thus reducing the pressure on the ground.

Economic feasibility is one of the most important factors for selection of foundation system. There many other important factors that one should consider before choosing a foundation system for a particular structure. Those factors are briefly noted below:

1. Importance of the building
2. Life of the structure
3. Loads from superstructure
4. Type of construction materials to be used.
5. Water table level
6. Type of adjoining structure
7. The condition of soil
8. The location of the building

There are several different types of pad foundation:

1. Plain concrete – plain concrete pad foundations that do not use reinforcement are an economical solution but only where the applied load will be relatively light. These can also have referred as footings. The general rules is that the depth of the pad should be equal to the distance from the face of the vertical element to the edge of the pad on both sides.
2. Reinforced concrete – the addition of reinforcement allows for relatively wide but shallow pad foundations. In order to make the reinforcing cage easier to construct

and place, the pads tend to be designed to span in one direction, with the main bars longitudinal in the bottom.

3. Combined column foundations – these where two pad foundations are combined into a longer one and can be used where the outer column is close to a site boundary or existing wall. The purpose is that the balancing effect of the internal column can be incorporated. The plan shape usually a rectangle.
4. Continuous pad – this is where the pad foundation is combined together as a single long structural element. This is often the case where the pads and the columns they support are closely spaced. By extending the reinforcement between the pads, differential settlement can be resisted and longitudinal can be improved.
5. Pad and ground beam – this is similar to continuous pad but different in that similar isolated pads are connected by ground beams. This helps to improve structural rigidity.



### 3.3 Installation method of pad foundation

Reinforcement bars are used in the structures to strengthen and aid concrete under tension. Concrete are strong under compression but has weak tensile strength. The reinforcement that being used are Y10 and R6. Before the process of excavating the pad foundation, all reinforcements need to be cut and bent according to size and uses of it.

1. Clearing the site then marks the site with correct position of foundation. By pouring cement powder all around the space of foundation and the around the house area.



Figure 3.3: Marking the area of pad foundation and the area of house.

2. Excavate the soil from the reduce level down to the desired level. This pad foundation has been excavated down to good loadbearing strata.



Figure 3.4: the hole was dig with area of 2ft x 2ft and depth is 6inch.

3. Reinforcement bars were bent and tied before the whole thing been placed inside the space. The reinforcement is placed in the ground beam foundation, positioned correctly. The size of the reinforcement was cut to 2ft x 4 inch.



Figure 3.5: the reinforcement bars was place in the hole



4. Lay a layer of coarse aggregate to prepare a clean and firm base. It will act as a filler and add extra volume to the concrete. If there is more volume, it means less air and it is a stronger foundation.



Figure 3.6: lay some coarse aggregate

5. Tied the reinforcement bars at the foundation with stump reinforcement bars. It will be a connection between foundation and ground beam so the reinforcement bars will be a starter.



Figure 3.7: the reinforcement bars are tied to make a connection



6. Concrete the base until ground level. Let it set for the whole day to make sure that the concrete is completely hardened. So that it will bear the loads from the upper structure.



Figure 3.8: concrete the foundation.

### **3.4 Problem encountered and solution method during the construction.**

Main problem that involve in this construction project is the cracks that occur on the brick walls at the living room. All foundation problems mostly caused by one of four things; types of soil, the excessive amount of water in the soil, preparation of the construction and the weather condition.

- Soil matters – the types of soil play a major role in the strength and stability of the foundation. In general, there are many types of soil and each type has a different ability to support weight. Some soil is sensitive to the amount of moisture present and can fluctuate in size. For example, clay is an expansive and consolidating soil. This type of soil dramatically expands or swells when it absorbs water, while consolidating soils shrink when the water is removed.
- Construction matters – before the foundation are poured, the ground are excavated. The soil is then tested to determine the type of foundation footing is needed to properly support the weight of the house. If an improper footing is built, the house may end up sinking or settling. After the foundation footing and foundation walls are installed, the space surrounding the outside of the foundation is backfilled. If the wrong type of backfill is used, or it is not prepared properly, it could end up with hydrostatic pressure and settlement problems.

#### Foundation problems and the solution – signs to look forward:

Some foundation signs are obvious while others such as drywall cracks can be mistaken for a cosmetics issue. Here are few common problem signs to look for:

- a) Cracked bricks in the exterior wall.
  - The crack can be eliminating by mask the crack with tape and prop board across it, pour grout through a tube to fill the crack gradually

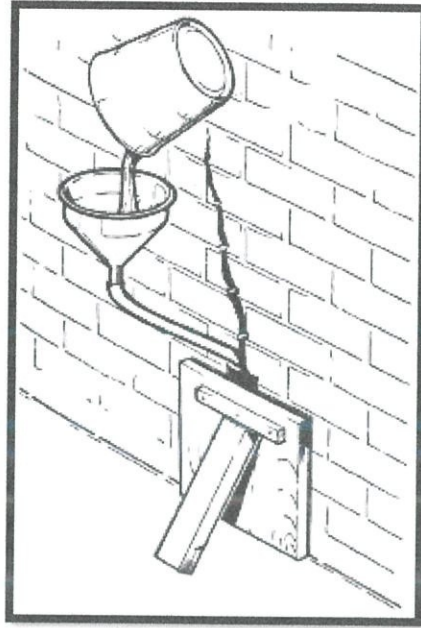


Figure 3.9: pour grout into the crack

- b) Erosion wear away around the foundation
  - Add gutters and downspouts to the eaves of the roof to catch the rain when it falls and set the downspouts to drain from the roof at least 5 feet from the house.



Figure 3.10: gutters at the roof

## Foundation solution

There are several options that may be recommended based on the type and cause of the foundation problem. Push piers, wall anchors, and shot concrete are some of the foundation repair solutions that can be used.

In particular, push piers are used to correct settlement problems. Push piers are round steel tubes that are installed under the foundation. The piers are driven deep into the ground until they reach stable, load-bearing soil or bedrock. When the piers are installed, resistance is created; this resistance is used to safely lift the home up to its original level.



Figure 3.11: push piers



Wall anchors basement wall systems are typically used to repair bowed or cracked basement walls. A strong steel plate is installed on the basement wall and is connected to the rod and anchor. Over time this system can straighten the walls while providing the necessary structural support,



Figure 3.12: wall anchors

Slabjacking is done by pumping a cement grout through small, strategically-located holes in the concrete slab. Once in place, the grout solidifies into a dense concrete mass and provides a competent bearing for the concrete slab.

If a soil-cement-lime grout is used, the lime content of the slurry will impart the benefits of lime stabilization to the base or sub-base. This combined treatment not only restores the slab to proper grade but also stabilizes the sub-soil to prevent re-occurrence of the problem.

## CHAPTER 4.0

### CONCLUSION

Holistically, after getting involved in the project, it can be seen that foundation is an important structure in the building. Most building still last long until today are because of the strength of the foundation. All loads from the roof will transfer to the wall of the building and will pass down to the foundation. Although a lot of problem arises at site, however it is still manageable because the site is quite small.

Pad foundation is considered as the simplest substructure exist in construction field. While constructing pad foundation, tools that being used is very affordable. The worker only use hand tool hoe to dig the hole. As can see at the site, the problem occurs because of the condition of soil that already backfill are very rocky and big. To dig the hole also take around 2 days. Other that weather condition during the construction, the condition of the soil also being the problem that occurred.

In the observation, installation method for pad foundation is not corresponding to the theory that have learned. It is not too complex and hard as shown in the book. Instead of installing formwork after the excavation, the concrete directly poured into the excavated areas. So through the installation of pad foundation, the problems occurred still can be handle because it is not a major problem.



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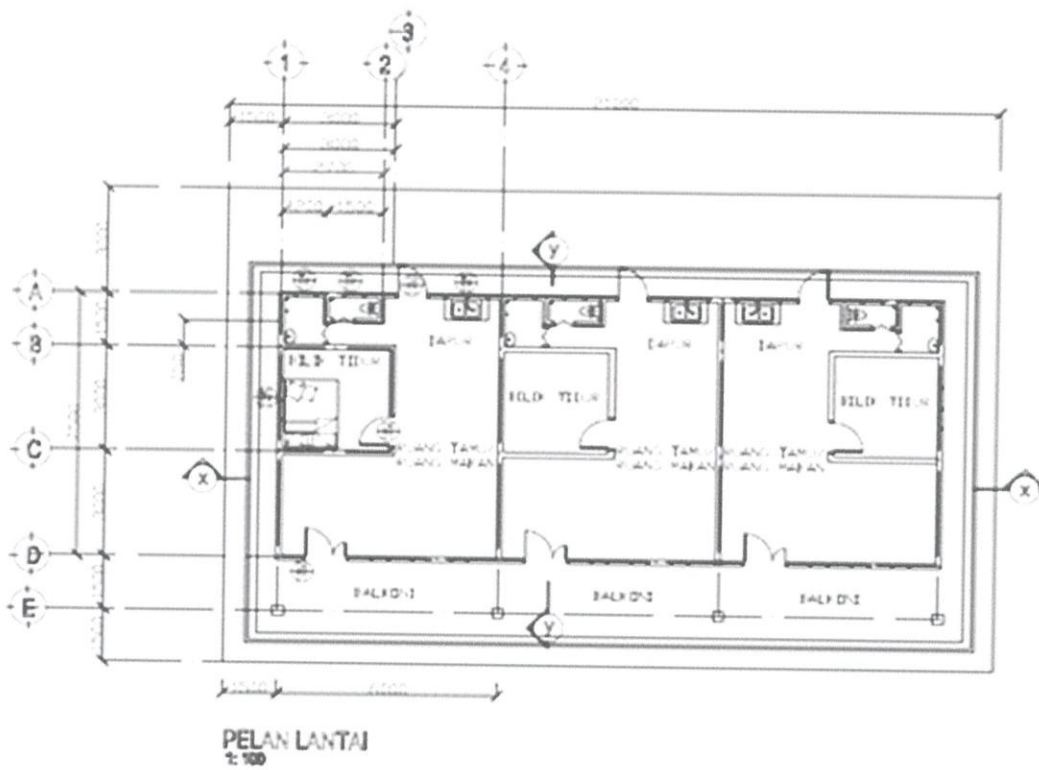
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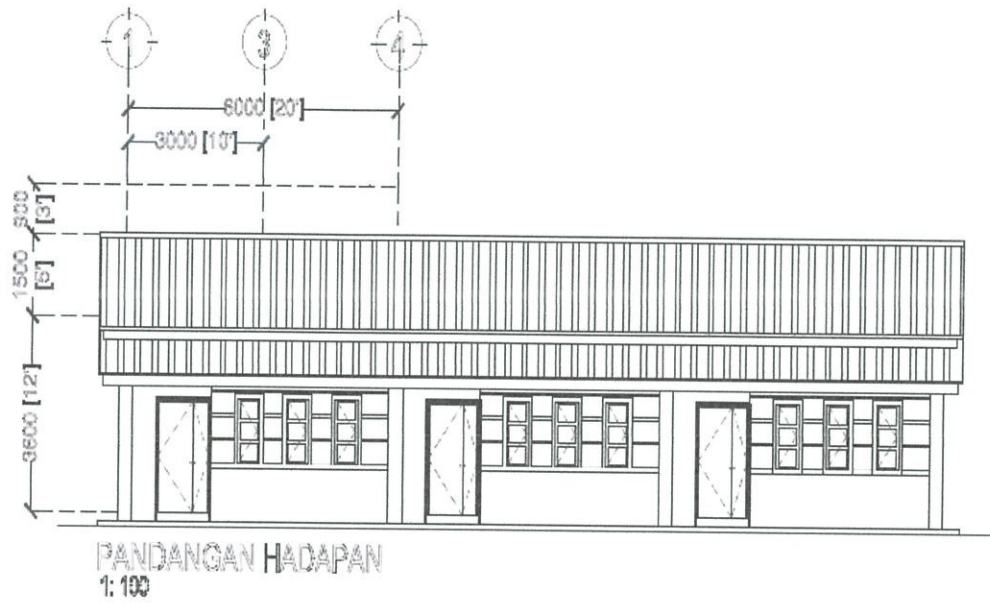
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# APPENDICES

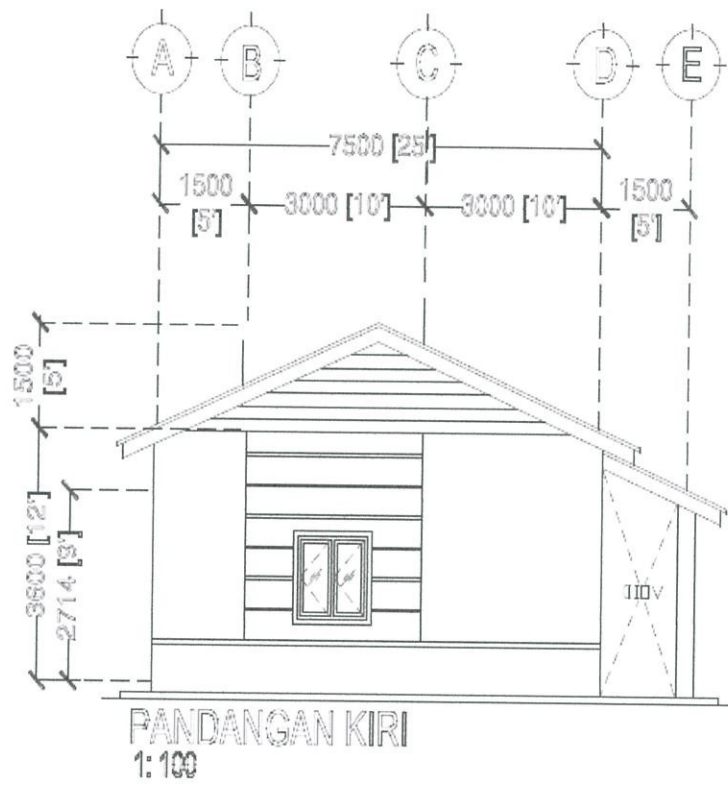
Appendix A: floor plan



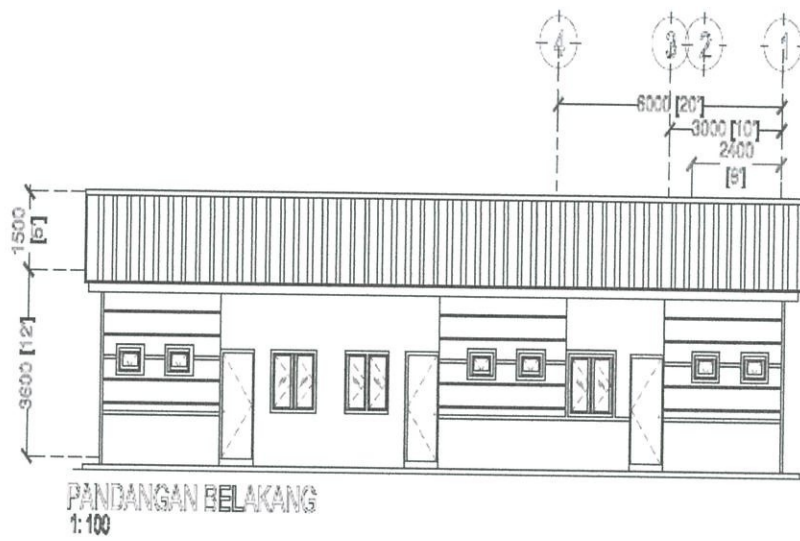
Appendix B: front elevation



Appendix C: left elevation



Appendix D: rear elevation





Appendix E: right elevation

