



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

**METHOD CONSTRUCTION OF RAFT FOUNDATION**

**Prepared by:**

**MOHAMMAD FAQHRUL ADZMI BIN KHAIRUDDIN**

**2017206804**

**DEPARTMENT OF BUILDING  
FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING  
UNIVERSITI TEKNOLOGI MARA  
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**DECEMBER 2019**

It is recommended that the report of this practical training provided

**by**

**MOHAMMAD FAQHRUL ADZMI BIN KHAIRUDDIN  
2017206804**

**Entitled**

**METHOD CONSTRUCTION OF RAFT FOUNDATION**

Be accepted in partial fulfillment of the requirement for obtaining the Diploma In Building.

Report Supervisor : Dr. Sallehan Bin Ismail

Practical Training Coordinator : En. Muhammad Naim Bin Mahyuddin.

Programme Coordinator : Dr. Dzulkarnaen Bin Ismail

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**DECEMBER 2019**

**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 Taman Bunga Merlimau Sdn Bhd for a duration of 20 weeks starting from 5 August 2019 and ended on 20 December 2019. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

.....

Name : Mohammad Faqhrul Adzmi Bin Khairuddin  
UiTM ID No : 2017206804  
Date : 20 December 2019



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## **ABSTRACT**

Raft foundations are the large concrete slab that can support columns and wall. This raft foundation is spread under the whole building. This raft foundation is one of the substructure. This report conducted for the process to construct the raft foundation for cluster and semi detach house. The objective of this report are to discuss the process that involved in construct raft foundation and to identify the important and problem facing during construct the raft foundation. In this report it focusing on cluster and semi detach house raft foundation. The main thing for this report is the process involved to construct raft foundation for the cluster and semi detach house. To complete construction of raft foundation it will start with setting out of the building, underground piping, excavation, laying hardcore, installing formwork and reinforcement bar and concrete. All this work must be done correctly by follow the drawing provided to get a good raft foundation. This report contains all the process involved to construct the raft foundation, the important and problem facing during constructs the raft foundation.

<b>CONTENTS</b>	<b>PAGE</b>
Acknowledgements	i
Abstract	ii
Contents	iii
List of Tables	iv
List of Figures	v
<b>CHAPTER 1.0 INTRODUCTION</b>	
1.1 Background	1
1.2 Objectives	3
1.3 Scope of study	3
1.4 Methods of Study	4
<b>CHAPTER 2.0 COMPANY BACKGROUND</b>	
2.1 Introduction of Company	5
2.2 Company Profile	6
2.3 Organization Chart	7
2.4 List of Project	9
2.4.1 Completed Projects	9
2.4.2 Project in Progress	10
<b>CHAPTER 3.0 METHOD INSTALLATION OF RAFT FOUNDATION</b>	
3.1 Background of project	11
3.1.1 Project Information	12
3.1.2 Parties Involved	12

3.2	Introduction of Building Foundation	14
	3.2.1 Important of Building Foundation	14
	3.2.2 Types of Building Foundation	15
3.3	Process Involved in Construction of Raft Foundation	18
	3.3.1 Setting out	19
	3.3.2 Install underground sewerage pipe	21
	3.3.3 Excavation	22
	3.3.4 Install formwork of raft foundation	23
	3.3.5 Laying crusher run	24
	3.3.6 Compact soil and crusher run	25
	3.3.7 Anti-termite works	26
	3.3.8 Install polythene sheet	27
	3.3.9 Install reinforcement bar for raft foundation and column	28
	3.3.10 Place the spacer block	30
	3.3.11 Concrete the raft foundation	31
	3.3.12 Dismantle the raft foundation formwork	32
3.4	The Problem Facing During Construct Raft Foundation	33

## **CHAPTER 4.0 CONCLUSION**

### 4.1 Conclusion

## **REFERENCES**

## **APPENDICES**



## LIST OF TABLES

Table 2.0	Company profile information
Table 2.1	Complete project
Table 2.2	Current project

## LIST OF FIGURES

- Figure 2.4      Organization chart
- Figure 3        Key plan for Taman Seraya Rembau
- Figure 3.1      The actual location of Taman Seraya Rembau
- Figure 3.2      Flow chart process to construct raft foundation
- Figure 3.3      Setting out work
- Figure 3.4      The surveyor setting out equipment
- Figure 3.5      The wooden peg with top of nail
- Figure 3.6      Backhoe digging trench
- Figure 3.7      Plumber install the pipe
- Figure 3.8      Backfill the trench
- Figure 3.9      Backhoe excavate top soil
- Figure 3.10     Excavate 150mm thickness
- Figure 3.11     Workers preparing formwork
- Figure 3.12     Install formwork at raft foundation
- Figure 3.13     The backhoe spread the crusher run
- Figure 3.14     The workers level the crusher run
- Figure 3.15     Workers compact the crusher run
- Figure 3.16     300ml anti-termite mix with water
- Figure 3.17     Using water jet to spread the anti-termite

- Figure 3.18 Worker spread the anti-termite
- Figure 3.19 Workers laying polythene sheet
- Figure 3.20 Raft foundation fully covered with polythene sheet
- Figure 3.21 The worker preparing BRC A7 for slab
- Figure 3.22 Worker tie the starter bar for column
- Figure 3.23 Reinforcement bar for raft foundation
- Figure 3.24 Preparing spacer block
- Figure 3.25 Placing the spacer block under BRC
- Figure 3.26 Slump test 75 mm and cube on site
- Figure 3.27 The workers spread the concrete
- Figure 3.28 Workers compact the concrete using vibrator
- Figure 3.29 Dismantle the formwork of raft foundation
- Figure 3.30 The concrete mixer
- Figure 3.31 Small number of worker
- Figure 3.32 The temporary road eroded
- Figure 3.33 There is no safety equipment
- Figure 3.34 The bar bender machine
- Figure 3.35 The vibrator starter already broke

## CHAPTER 1.0

### INTRODUCTION

#### 1.1 Background and Scope of Study

A raft foundation support numbers of columns or load bearing walls so as to transmit approximately uniform loading to the supporting soil. Usually, foundation structures are designed for bearing capacity and piles are then introduced as settlement reducer plus bearing capacity enhancer whenever is required. (Tan Kim Leong, 2013).

There are several types of raft foundation in construction such as piled raft foundation, two-way beam and slab and flat plate mat. This project used flat plate mat type as foundation. This type foundation is the simplest raft foundation. This type is used when the columns and walls are construct at small building. The standards thickness for this foundation within 150mm to 300mm for economic reason.

Another type of raft foundation is piled raft foundation. Piles are deep foundations. They are formed by long, slender, columnar elements typically made from steel or reinforced concrete. A foundation is described as 'piled' when its depth is more than three times its breadth. Pile foundations can help transfer loads through weak, compressible strata or water onto stronger, more compact, less compressible and stiffer soil or rock at depth. (Atkinson, 2007). This type foundation is more expensive than other type raft foundation. This type raft foundation improved the strengthen of the soil.

Next is two-way beam and slab raft foundation. When the column spacing is large and carries unequal loads it would be more economical if a two-way beam and slab raft is used. This type of mat is particularly suitable when underlying soil is too compressible. (Revathi P, 2019). This type of raft is suitable when the columns are at the large distance and the loads from the columns changed.

The raft foundation has its own advantages. This raft foundation able to overcome any settlement problems such as low soil bearing capacity. Load that on raft foundation will distributed to the soil by covering the entire site structure. This raft foundation also can use for small building such as single storey house and double storey shop. It also cheaper than other type of foundation.

There are many types of raft foundation however, the aim of the study is to discuss the method construction of raft foundation that used in this project.

## **1.2 Objectives**

The aim of this report is to discuss on construction of raft foundation for cluster and semi detach house at Taman Seraya Rembau, Negeri Sembilan

The objective of this report, as stated below:

- a) To study the important of building foundation
- b) To investigate the process, involve in construction of raft foundation
- c) To identify the problem facing during construct the raft foundation

## **1.3 Scope of Study**

This report contains information about the process involved, the important of raft foundation and the problem facing during construct the raft foundation of cluster and semi- detach house at Lot 2144, Hak Milik Geran 38350, Mukim Selemak, Daerah Rembau, Negeri Sembilan Darul Khusus. The process involved the first stage to the final stage on the construction of raft foundation from setting out, underground piping, excavation the soil, laying polyethylene sheet, install formwork, install raft foundation, the important of raft foundation and the problem facing during construct the raft foundation for cluster and semi-detach house.

## 1.4 Method of Study

### i. Interview

Interview had been made with project manager, site supervisor, engineer and architect on how to construct raft foundation from the first stage to the final stage for cluster and semi detach house. The sub-contractor such as underground piping and reinforcement-bar work also gives some information about the important of the raft foundation and the problems occur during the construction. This interview had been made at the site. All the information and data had been recorded in handbook.

### ii. Observation

Observation had been made every day at the site. The observation on construction of raft foundation by the workers had been observed. Every morning the workers had been told about the safety and the work procedure by the site safety supervisor. All the activity on the site had been recorded by pictures and note and recorded in daily report book such as the progress of construct of raft foundation, preparing formwork, reinforcement-bar and number of workers.

### iii. Document reviews

Study all the information about the construction of raft foundation from the architect and engineer drawing such as number of reinforcement-bar and design of the house. All the data had been given by the project manager and site supervisor. All the data show the detail on construction of raft foundation.

## CHAPTER 2.0

### COMPANY BACKGROUND

#### 2.1 Introduction of Company

Taman Bunga Merlimau Sdn Bhd (TBM) was incorporated on the 3 September, 1985 with a paid-up capital of RM250,000.00. Its' registered office is at No 2, Lorong Gereja, 75000 Melaka. Taman Bunga Merlimau is a Licensed Develepor whose principle activity is in construction of residential and shophouses.

Taman Bunga Merlimau Sdn Bhd is reputable and reliable property develepor in the state of Melaka and Negeri Sembilan with vast experiences in timely deliveries of quality industrial, commercial and residential projects since 1988. There are more than thousand units of houses and shop lots being and delivered to their customers. The company has successfully completed the 50 phases and more than thousand units mix development in the duration of 21 years from 1988 to 2018.

The current development project for this company on going is at Rembau (Cadangan Pembangunan Perumahan Dan Perniagaan Di Atas Lot 2144, Hak Milik Geran 38350, Mukim Selemak, Daerah Rembau, Negeri Sembilan.

Taman Bunga Merlimau Sdn Bhd award the project to YKH Home Builder as the main contractor of this projects.



## 2.2 Company Profile

All the company information has been stated in the table.

Table 2.0 Company profile information

1.	Company name	Taman Bunga Merlimau Sdn Bhd
2.	Company address	No 2, Lorong Gereja, 75000 Melaka
3.	Owner	Tan Boon Siong
4.	Year of establishment	3rd September 1985
5.	Contact	Tel No: Fax No: Email: <a href="mailto:asiasetangroup@gmail.com">asiasetangroup@gmail.com</a>
6.	Scope of work	1. Real Estate 2. Civil Engineering works
7.	Company Vision	We are committed to achieve business success by delivering to our buyers' needs, giving outstanding performance to our shareholders, providing good rewards system for our employees.
8.	Company Mission	Our Mision is to maintain our status as a reliable property develepor in the real estate industry by providing quality products and services to satisfy our buyers.

Source : Taman Bunga Merlimau Sdn Bhd

### **2.3 Organization Chart**

This organization chart is describing the position each of the employer in the company Taman Bunga Merlimau Sdn Bhd. Mr. Tan You Eag as the Director and owner of this company. The project General Manager is Mr. Chee Siang Oy then followed by Mr. Vincent Tan as the Project Manager who supervise the planning, coordination and implementation of construction projects.

To make sure the construction doing with planning, Site Manager will lead the role in planning, executing, monitoring, controlling and closing project with his Site Supervisor Mr. Darmashah bin Mohd Shah. The organization chart as shown in figure 2.4.

## Organization Chart

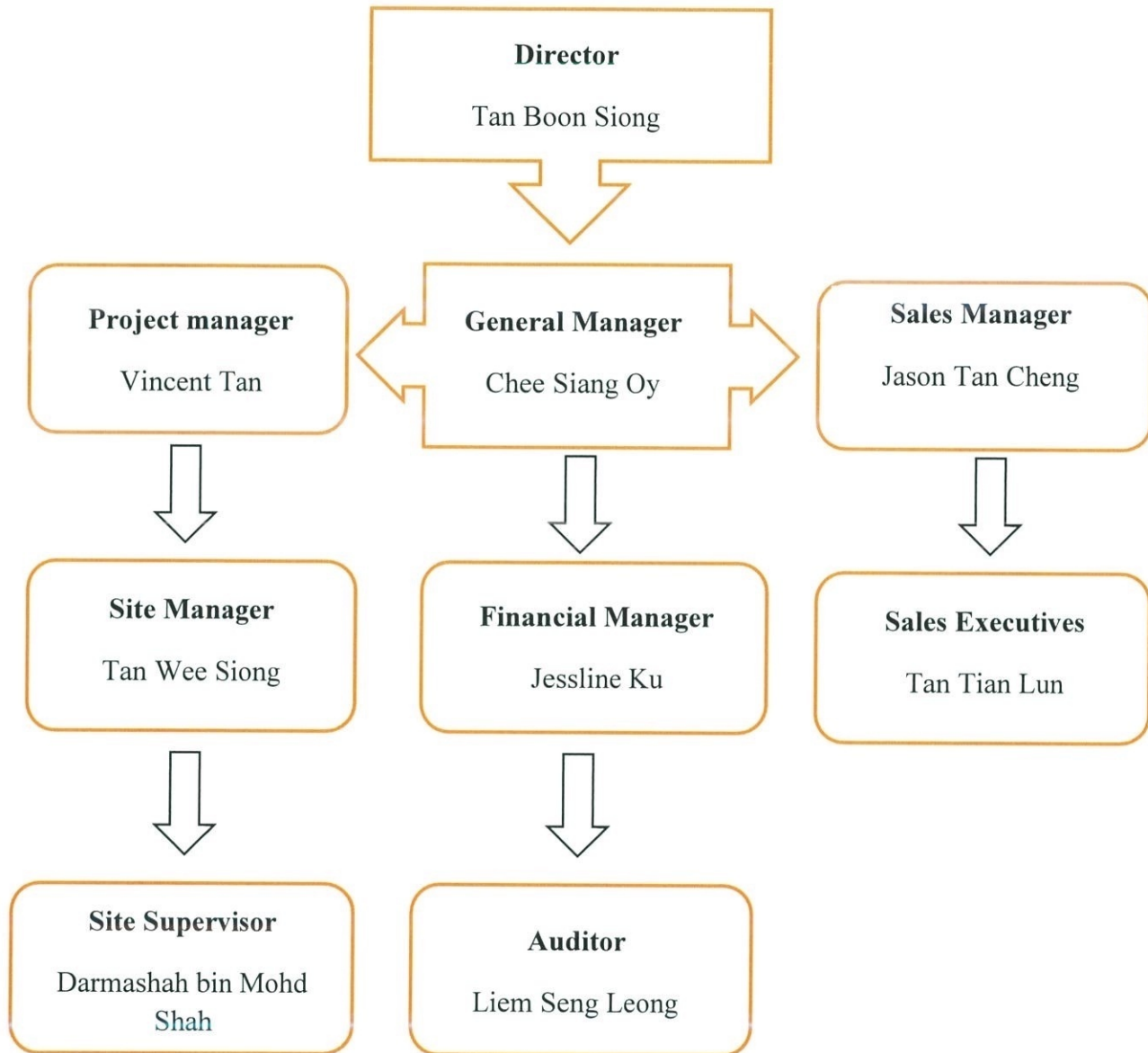


Figure 2.4 Organization chart

Source: Taman Bunga Merlimau

## 2.4 List of Project

Taman Bunga Merlimau have done works related to building construction in Melaka from 2015 until 2018.

### 2.4.1 Completed Project

There are 4 latest complete project from Taman Bunga Merlimau Sdn Bhd from 2015 until 2018.

Table 2.1 Complete project

No.	Name of Completed Project	Cost	Date Done
1.	Cadangan Pembangunan 13 Lot Rumah Kedai Satu Tingkat, 31 Lot Teres, 35 Lot Rumah Cluster, Di Atas Lot 7444, Hak Milik Geran 58250, Mukim Ayer Panas, Melaka	RM 21,582,240.00	May 2015
2.	Cadangan Pembangunan 34 Lot Teres, 8 Lot Rumah Semi-Detached Satu Tingkat, 2 Lot Banglo Di Atas Lot 4375, Mukim Merlimau, Jasin, Melaka	RM 10,810,540.00	September 2017
3.	Cadangan Pembangunan 84 Lot Teres Satu Tingkat, 6 Lot Rumah Semi-Detached, 5 Lot Banglo, Di Atas Lot 237, Mukim Merlimau, Jasin, Melaka	RM 12,490,306.00	November 2018

Source: Taman Bunga Merlimau Sdn Bhd

## 2.4.2 Project in Progress

The current project for this company at Rembau. The project is construct mix unit types of house for Taman Seraya Rembau.

Table 2.3 Current project

No.	Name of Completed Project	Cost	Date Done
1.	Cadangan Pembangunan Perumahan Dan Perniagaan Yang Terdiri Daripada : 68 Unit Rumah Berkembar 1 Tingkat Jenis B, 18 Unit Rumah Kluster 1 Tingkat, 56 Unit Rumah Teres 1 Tingkat Jenis A, 1 Unit Rumah Banglo 1 Tingkat Jenis A, 1 Unit Pencawang Elektrik (SSU) Di Atas Lot 20085, Hak Milik Geran 268954, Mukim Selemak, Daerah Rembau, Negeri Sembilan, Darul Khusus	RM 25,450,000.00	August 2021

Source: Taman Bunga Merlimau Sdn Bhd

## CHAPTER 3.0

### CASE STUDY

#### 3.1 Background of Project

Taman Bunga Merlimau Sdn Bhd had own a project in Rembau that is Cadangan Pembangunan Perumahan Dan Perniagaan Yang Terdiri Daripada : 68 Unit Rumah Berkembar 1 Tingkat Jenis B, 18 Unit Rumah Kluster 1 Tingkat, 56 Unit Rumah Teres 1 Tingkat Jenis A, 1 Unit Rumah Banglo 1 Tingkat Jenis A, 1 Unit Pencawang Lektrik (SSU) Di Atas Lot 20085, Hak Milik Geran 268954, Mukim Selemak, Daerah Rembau, Negeri Sembilan, Darul Khusus. The signboard of this project as shown in appendix C.

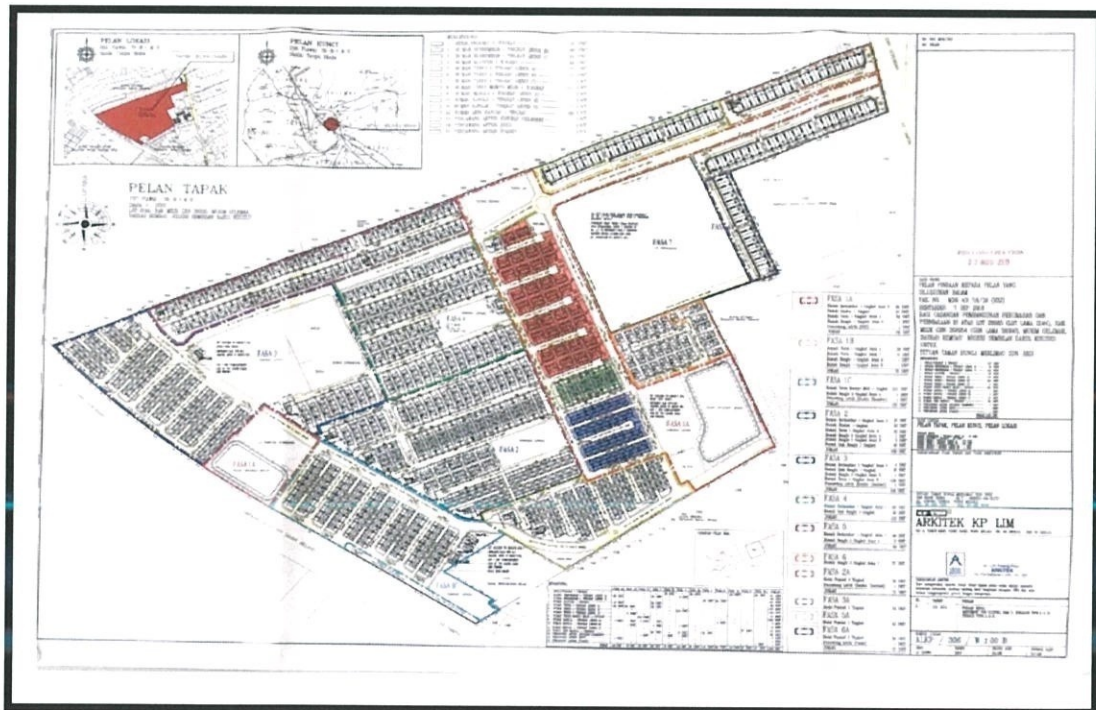


Figure 3 : Key plan for Taman Seraya Rembau

Source : Taman Bunga Merlimau Sdn Bhd

### **3.1.1 Project Information**

This project is located at Mukim Selemak, Rembau beside the main road. This project is near to the grocery store and clinic. This is easier for the workers if they have an emergency during the project. This project cost (RM 25,450,000.00) in the contract sum. The duration of this project is 2 years started from August 2019 and expected completion follow in the contract is November 2021. The total area of the project is 150 acres and will be built in phases.

This project is ongoing for phase 1 which is construct 68 units Semi-Detach house, 18 units Cluster house, 56 units Terrace house and 1 units Bungalow house. For the cluster and semi-detach house, raft foundation was completely finish using concrete grade 25. The contractor now continues construct the column and upper roof beam.

### **3.1.2 Parties Involved**

The client of this project is Taman Bunga Merlimau Sdn Bhd and it is private project. The consultants that involve in this project are Arkitek KP Lim (Architectural Consultant), Aries Engineering Consultant (Civil & Structure), CT Perunding (Mechanical and Electrical consultant) and Jurukur Kurnia (Surveyor).

The main contractor for this project is YKH Home Builder Sdn Bhd. Taman Bunga Merlimau Sdn Bhd as the developer award this project to this contractor. Taman Bunga Merlimau Sdn Bhd only monitoring the works doing by all the contractor. Person in charge in the site are Mr Tan Wee Siong as the Site Manager and Mr Darmashah as the Site Supervisor.

And lastly, the Terrace house is ongoing for the underground sewerage pipe and waiting for the engineer to inspect before continues backfill the soil.

In this report is focusing on the construction of raft foundation of cluster and semi-detach house from the begining. In this report also focusing on equipment, materials and machineries used to construct the raft foundation. The actual look for this project as shown in appendix B.



Figure 3.1 The actual location of Taman Seraya Rembau



## **3.2 Introduction of Building Foundation**

Building foundation is that the bottom a part of the substructure that transmit load of the structure along side its own weight into the soil beneath or surroundings. Foundation can be further classified as deep and shallow foundation. This classification also depends on the depth of load transfer from structure to the ground. The main purpose of the foundation is to distribute the structural load over an outsized bearing space while not inflicting any bearing capability failure and excessive settlement to get foundation is always being constructed the ground level so as to increase the lateral stability of the structure.

### **3.2.1 Important of Building Foundation**

The building foundation is important to safely transmit and sustain to the ground which rests the combined dead, wind and imposed loads in such a manner as not to cause any settlement or other movement which would impair the stability or it can damage to any part of the building or crack the building.

Other important of the building foundation is to increase the stability of the structure as a whole against sliding, other disturbing forces or overturning like wind. If the base of the building is not strong, within 5 years it will crack all the structure in the building and can make the building collapse. It is also for the safety of all the people in the building.

Next is, to provide a leveled and hard surface for supporting the superstructure of a building. If the foundation already has its strong strength, it can support the load from the superstructure and can effort all the loads that will transfer to the ground through the foundation. The strong superstructure depends on the strong of the substructure of a building.

Lastly, to hold the structure above it and keep it upright. A poorly constructed foundation can be dangerous to the occupants and the neighborhood. With high-rise buildings touching the sky of late, it's become all the a lot of necessary to own powerful foundations. Therefore, it is highly essential to determine the quality of the construction when looking for office complexes and outlets for retail stores.

### **3.2.2 Types of Building Foundations**

Building foundation has two types of foundations. There are shallow foundation and deep foundation. All types of foundation have their own function and important for their strength. The difference between these 2 types of foundation refers to the depth of soil in which the foundation is made.

Shallow foundation depth of as little as 3ft (1m). It is also called spread footings or open footings. For shallow foundation there are 3 types. There are,

#### **A) Strip Foundation**

Strip footing will be only found in load bearing masonry construction and act as the long strip that can support the weight of an entire wall. This footing has a base wider than a typical load bearing wall foundation and has better stability. This strip footing will be used only when the building's loads are carried by the entire walls rather than isolated columns, walls and bridge piers where the bearing soil layer is at intervals 3m (10 feet) from the bottom surface. To support the weight of the structure the soil bearing capacity must be sufficient.

#### **B) Individual Footing or Isolated Footing**

Individual footings are the most and common types of foundation used in construction. This type of foundation is only used when the load of the building is carried by the columns. The columns will have their own footing in the ground. The shape of the footing can be square or rectangular of concrete on which the column sits on. To get the size of the footing, the engineer will take the total load on the column and will divide it by the self bearing capacity (SBC) of the soil.

### **C) Raft or Mat Foundation**

Raft foundation can be called as mat foundation that most often used when basement are to be construct. In a raft foundation, the whole basement floor slab acts as the foundation the load of the building is spread over the whole footprint of the building. This foundation has name as raft foundation because the building is like a vessel that floats in a sea of soil. Mat or Raft foundation usually been use where the soil is weak and therefore building loads have to be spread over a large area, where the columns are closely spaced, which means that if individual footings were used, they would touch each other.

Deep foundation can be made depth of 60 - 200ft (20 - 65). Shallow foundations are used for little, light buildings, while deep ones are for large, heavy buildings. Deep foundations are to be construct deeply below the finished ground surface for the base bearing capability to be plagued by surface conditions, the typically depths is >3m below finished ground level. There are 2 types of deep foundation. There are,

### **A) Pad Foundation**

Pad foundation are design to support high loads over a limited area. This foundation is common where the structural form brings loads to the ground by the columns. This pad foundation is capable to pre-cast concrete, reinforced concrete and structural steel design solutions. This pad foundation can be found in low-rise industrial plants requiring large clear areas and higher rise building or office. For the design purposes, this pad foundation is treated as if it were an inverted cantilever carrying the soil pressure and supported by the column. This is an economic solution to construct the foundation, although there may be construction problems involved with casting the slope.

## **B) Pile Foundation**

Pile foundation is the deep foundation which is used to transfer heavy loads from the structure to hard rock strata to the deep below the ground level. They used column to transfer heavy loads of structure to hard soil strata which is much below ground level which shallow foundation cannot be used. This is to prevent uplift of structure due to lateral loads such as earthquake and wind forces. Generally, pile foundation been used where the soils conditions near the ground surface is not suitable for heavy load. The depth of hard rock strata may be 5m to 50m (15 feet to 150 feet) deep from the ground surface level. This pile foundation has two types there are end bearing pile and friction pile.

### 3.3 Process Involved in Construction of Raft Foundation

This is the chart process for construct the raft foundation in construction. This process is the common process doing by all the contractors.

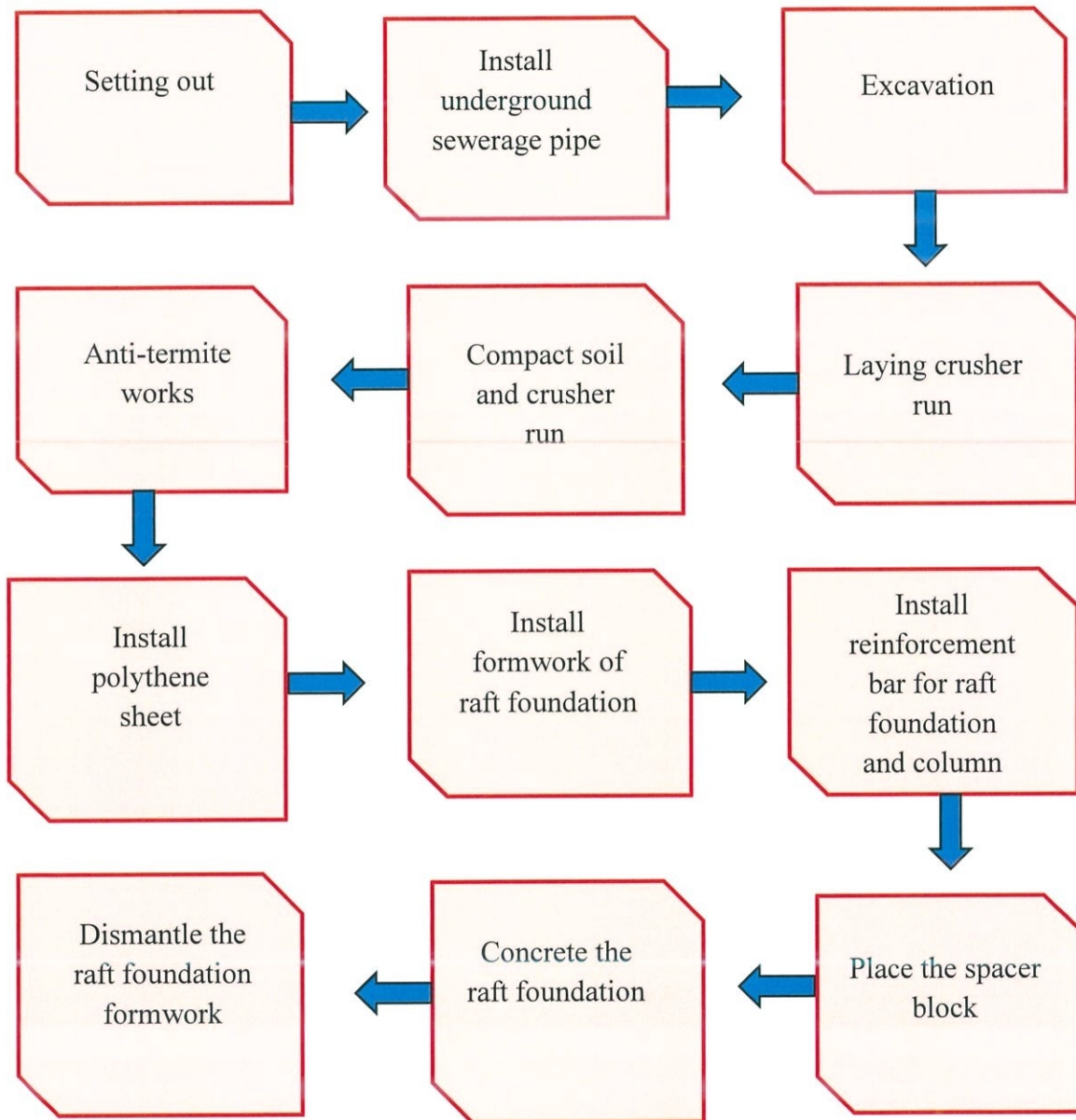


Figure 3.2 Flow chart process to construct raft foundation

### 3.3.1 Setting out and levelling process

In this stages the surveyor will come to peg the gridline and baseline to determine and located the actual corners of the raft foundation, so the raft foundation can easily to be install according to the site layout plan that been prepared at the site. The main instrument for this setting out are Theodolite, steel and linen tapes, arrows, wooden pegs, wire nails and nylon threads. After the base line had been establish, the main shape of the cluster and semi-detach house is being set up using the pegs and the Theodolite



Figure 3.3 Setting out work

Steel tape is important to measure the long distance and it must be tightly stretched when taking the reading for the cluster and semi-detach house. Then, use the wooden peg atop by a wire nail to complete the grid line of the house. This is to make sure the house grid line is straight follow the measurement that were establish in the drawing. The Theodolite will give accuracy place to construct the house without any mistake. Nylon threads are stretched between the pegs to obtain the gridlines when necessary. Then the workers start marking and peg the grid line using the wooden peg and nylon threads. This is to easier for next activities which is laying underground pipe.

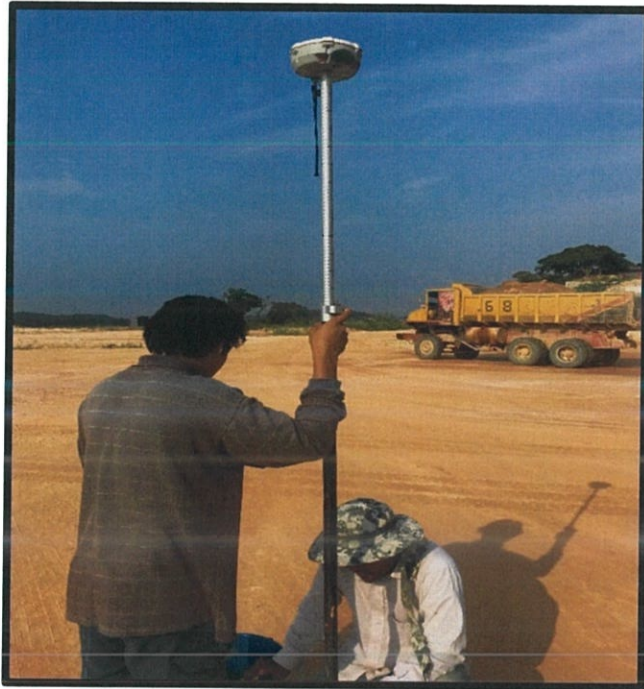


Figure 3.4 The surveyor setting out equipment



Figure 3.5 The wooden peg with top of nail

### 3.3.2 Install underground sewerage pipe

After doing the setting out works, the plumber installing the underground pipe for sewerage using PVC pipe 110mm × 3.2mm with SIRIM approval. Firstly, the backhoe digging the trench following the measurement in the drawing. Then, the plumber measure and cut the actual length of pipe. Plumber join the pipe using silicone glue to make sure the pipe joint tightly.



Figure 3.6 Backhoe digging trench



Figure 3.7 Plumber install the pipe



After install all the pipe with guide from the nylon threads, backhoe backfill the trench with soft soil and following with hard soil. The backfill work must be careful to prevent the pipe being damaged.



Figure 3.8 Backfill the trench

### 3.3.3 Excavation

After done the preliminary work setting out and install the underground pipe, workers continue for excavation works. By using a backhoe workers excavate top soil and organic matter following in the drawing which is 150mm thickness. This is for crusher run 150mm thickness that install on the of the soil.



Figure 3.9 Backhoe excavate top soil



Figure 3.10 Excavate 150mm thickness

### 3.3.4 Install formwork of raft foundation

Workers had prepared the formwork for raft foundation using plywood. They prepared according to the measurement in the drawing. For raft foundation they use formwork 15 cm for thickness. The worker minimum the cutting of plywood pieces to enable reuse of the material a number of times. They will ensure the formwork is following the measurement so that the reinforcement bar will not have any problem to be install.



Figure 3.11 Workers preparing formwork



Figure 3.12 Install formwork at raft foundation

When the formworks are ready, the workers install the formwork of raft foundation following the marking that had been done before. The formwork constructed rigidly and efficiently propped and brace both horizontally and vertically, so it can retain the raft foundation shape.

### 3.3.5 Laying crusher run

Workers lay 150mm thick crusher run on the top soil. Using a backhoe to reduce the time spread the crusher run to cover all the raft. The crusher run size is between 14mm to 20mm for this raft. For cluster and semi-detach house it using around  $3\text{m}^3$  to  $4\text{m}^3$ .



Figure 3.13 The backhoe spread the crusher run



Figure 3.14 The workers level the crusher run

The workers use shovel spread the crusher run and level to about 150mm deep.

### 3.3.6 Compact soil and crusher run

After the crusher run had been spread, the workers will compact the crusher run using plat compactor.



Figure 3.15 Workers compact the crusher run

The plate vibrates below the machine causing smaller particles in the soil to settle in the voids of the material underneath, forming a sturdy compact base. Workers compacting the crusher run 2 – 3 times to get a strong base for foundation.

### 3.3.7 Anti – termite works

For raft foundation, 300ml from the anti – termite chemical will be mix with water in the tank. Then the workers use the water jet to spread the anti – termite. 52m<sup>3</sup> are covered for this works. This anti – termite treatment can last for a long time.

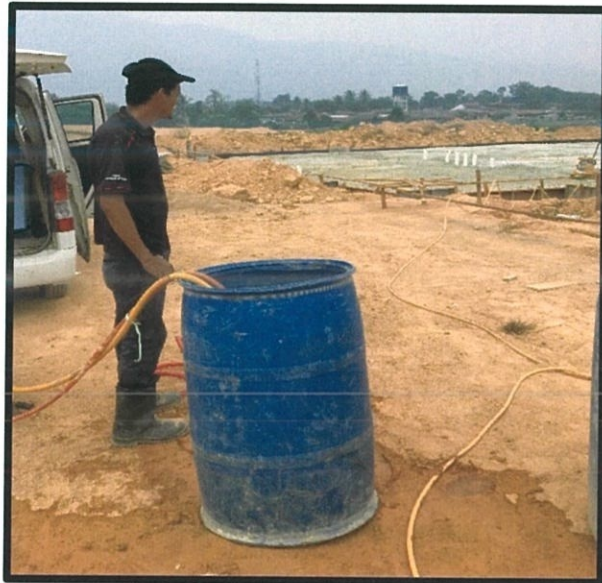


Figure 3.16 300ml anti-termite mix with water



Figure 3.17 Using water jet to spread the anti-termite



Figure 3.18 Worker spread the anti-termite

### 3.3.8 Install polythene sheet

After anti-termite works done, the workers continue with laying polythene sheet. It is use as damp-proof membrane. Thickness for this polythene sheet is 3mm.



Figure 3.19 Workers laying polythene sheet

This polythene sheet can prevent the moisture from coming up through the concrete and into the structure. The effect if the polythene is not installed is it can damage to surface finishes, mould growth which is cause of respiratory allergies and poor performance of insulation.

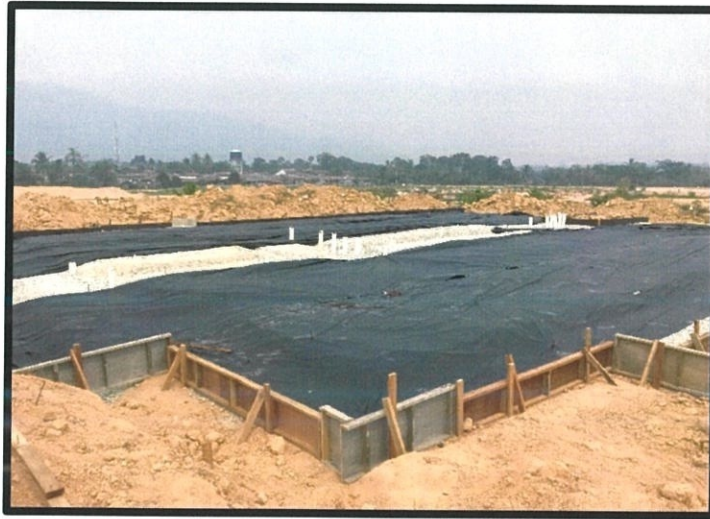


Figure 3.20 Raft foundation fully covered with polyethylene sheet

### 3.3.9 Install reinforcement bar for raft foundation and column

For this raft foundation, it uses BRC A7 for the bottom and top bar. It is a high tensile steel. The size of the reinforcement is follows the drawing provided to avoid any problem occur.



Figure 3.21 The worker preparing BRC A7 for slab

Starter bar for column use T12 and R6 for link. This starter bar will be concrete together with raft foundation.

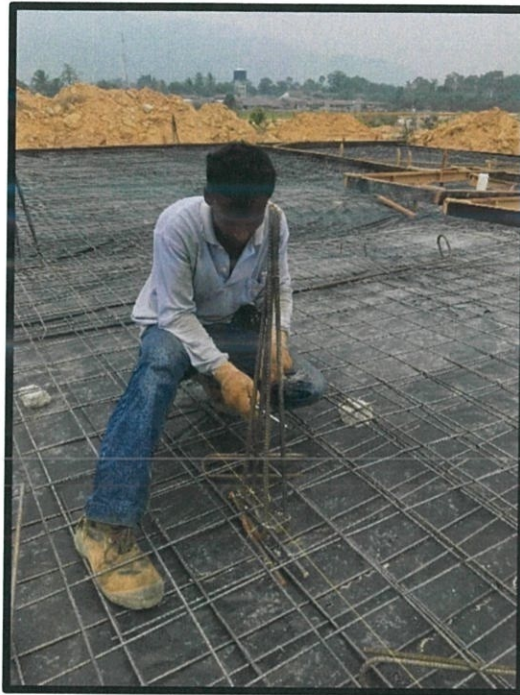


Figure 3.22 Worker tie the starter bar for column

The workers will tie each of the reinforcement bar tightly. This work need many workers to complete the works faster.



Figure 3.23 Reinforcement bar for raft foundation



### 3.3.10 Place the spacer bar

After install the reinforcement bar and starter bar for raft foundation, the workers continue with the spacer bar. This is because to avoid the reinforcement bar and formwork stick together. Between reinforcement bar and polythene need to space in 50mm. The spacer bar is handmade by the workers using the concrete on the construction site. The spacer bar is cut with 50mm × 50mm size.



Figure 3.24 Preparing spacer block

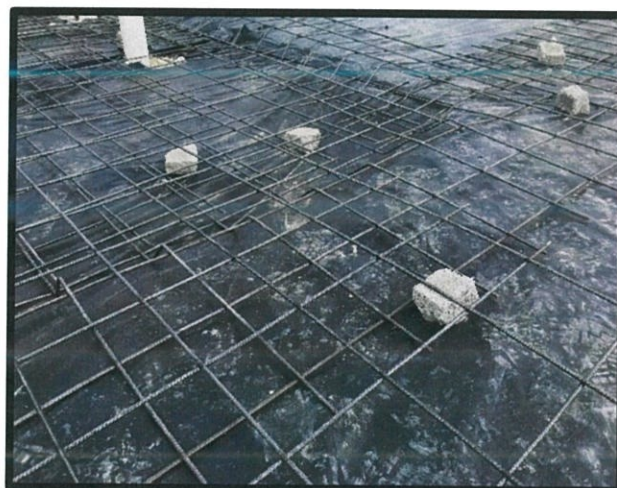


Figure 3.25 Placing the spacer block under BRC

### 3.3.11 Concrete the raft foundation

Before concrete the raft foundation, the workers will do the cleaning works at the raft foundation to remove all the soil because of heavy rain. For this raft foundation use concrete grade 25 for 52m<sup>3</sup>. The slump test high is 75 to 80 mm and cube on site.



Figure 3.26 Slump test 75 mm and cube on site

If the slump is fail, the concrete works on that day will not be allowed to be done. Site supervisor is the person will monitor the slump test and concrete works. To make sure the concrete is compact in the raft foundation, the workers use vibrator to spread all the concrete into the raft foundation. This is to prevent honeycomb defect.



Figure 3.27 The workers spread the concrete



Figure 3.28 Workers compact the concrete using vibrator

### 3.3.12 Dismantle the raft foundation formwork

The formwork of raft foundation was dismantling after 2 or 4 days after concreting works. The formwork will be used again to another building to save the cost and time. When the concrete has gained sufficient strength, at least twice the stress to which the concrete may be subjected to when the formworks are removed. It is also necessary to ensure the stability of the remaining formwork during formwork removal.



Figure 3.29 Dismantle the formwork of raft foundation

### 3.4 The Problem Facing During Construct Raft Foundation

#### A) Concrete

The concrete mixer did not come at the right time. They should come at 9 a.m. but they arrive at 10 a.m. This had made the workers waste time waiting the concrete while doing nothing. There is also a problem when they arrive with different grade of concrete and different amount as wished. So, to overcome this problems, site supervisor need to set the time with the concrete company and make sure they carry the right grade of concrete.



Figure 3.30 The concrete mixer

#### B) Workers

The number of workers for installing the raft foundation must be more than 5 workers. This is because to make sure can save time to install the reinforcement bar and formwork and quickly complete the raft foundation. The problems are the number of the workers to install the raft foundation is small and take time to tie the reinforcement bar. When the number of the workers is small, the work become slow and disturb the progress to install the foundation. If the reinforcement bar work is slow, the raft foundation cannot be concrete on time. Some of the workers had problems with communication because of different race. This is difficult to give instruction. Main contractor need to supply more workers for every works for more efficient.



Figure 3.31 Small number of worker

### C) Weather

The weather at the site can affecting the works on the site. It is also can make the works delay and not following the planning had been made by the Project Manager. Heavy rain had cause the raft foundation full with mud and water. The temporary road also damaged by the mud which hard lorry and machinery to enter the site. The workers need to pump out the water and repair the temporary road before start other works. This had made the project a bit delay. Concreting works also stop due the heavy rain. The concrete will be cancel and return to the factory. This made the company loss a lot of money. The developer must build more temporary drainage to prevent the water stagnant in the site.



Figure 3.32 The temporary road eroded

## D) Safety

Safety for the worker on site are the most important things that need to be concern to. This problem occurs when the workers did not have the personal protective equipment (PPE) during work. The workers did not wear safety helmet and safety boot. They also did not wear suitable clothes during working. Some of them only wearing safety equipment when Site Safety Supervisor or Project Manager come to the site. This will cause injury to the worker. Site Safety Supervisor must check the safety of the workers strictly every day and take action if they do not obey the instruction.



Figure 3.33 There is no safety equipment

## E) Machineries

Machineries is also important thing to construct the raft foundation. The backhoe only has one to excavate top soil. The bar bender also had a problem when it cannot bend the reinforcement bar because one of the part in the bar bender machine broken. The plate compactor and vibrator also has only one and it waste the time. The main contractor must prepare call the mechanic if the machine breaks down. This will improve the working time.



Figure 3.34 The bar bender machine



Figure 3.35 The vibrator starter already broke

## CHAPTER 4.0

### CONCLUSION

Raft foundation is an important part in substructure. If the substructure of the building had failed, it will make the building collapse or the building will not strong enough. The construction of the raft foundation is the first stage must follow the right procedure to construct it. Besides that, it is important of the raft foundation so that when there are problems during construct the raft foundation they know how to solve the problem. The important of raft foundation are increased the stability of the structure as a whole against sliding. Then, to provide a leveled and hard surface for supporting the superstructure of a building. Other than that, to hold the structure above it and keep it upright. A poorly constructed foundation can be dangerous to the neighborhood.

The process involved to construct raft foundation is same like the theory in the books. All the work stage to construct the raft foundation is followed the plan. 12 stages process involved in construct raft which is setting out, install underground piping, excavation top soil, laying crusher-run, compact soil and crusher-run, anti-termite work, install polythene sheet, install formwork of raft foundation, install reinforcement bar for raft and column, place spacer block, casting work and dismantle formwork. To ensure the concrete is strong and good, some test was performed such as slump test and cube test. All the test must be approved honestly.

Unfortunately, during the construction of raft foundation, there are some problems that make work slow. The main problem is about safety for the workers that occur on the construction site has been handle with successfully by the site supervisor and all the workers on the site. All the workers also follow the rule from the site safety supervisor by wearing the safety helmet, safety boots and suitable cloths on the site. All the workers know the personal protective equipment (PPE) when they are in the site.



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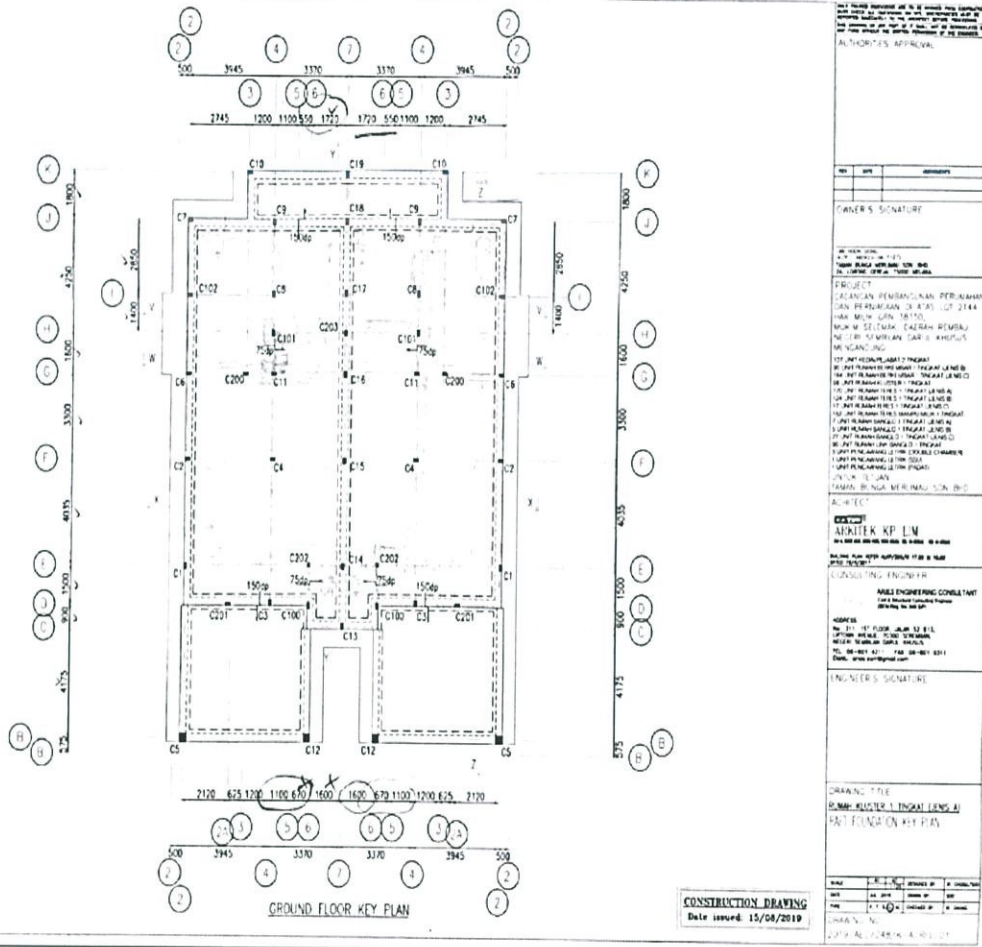
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# APPENDICES

## Appendix A Drawing of raft foundation



Source: Taman Bunga Merlimau

Appendix B The actual look of Taman Seraya Rembau



Source: Taman Bunga Merlimau

Appendix C The signboard of the project



Appendix D Example of site environment quality result from Department of Environment

**SPECTRUM LABORATORIES SDN. BHD.** (Co. No.: 167225-U)  
 Lot 14, (PT 5015) 2nd Floor, Jalan Pendamar 27/90, Seksyen 27,  
 40400 Shah Alam, Selangor Darul Ehsan.

**ON-SITE SERVICE RECORDS** No. **19630**

COMPANY : Uniti PROJECT : A1 Joffie Rembau  
 ADDRESS : \_\_\_\_\_ DATE : 25/9/19-27/9/19  
 PIC : Ilyani TECHNICIAN : Fendy  
 ISSUER : Fahmi

<p><b>AMBIENT AIR MONITORING</b></p> <p><u>4p</u></p>	<p>LAB NO.:</p> <p><input type="checkbox"/> TSP <input type="checkbox"/> NO<sub>2</sub></p> <p><input type="checkbox"/> PM10 <input type="checkbox"/> CO</p> <p><input type="checkbox"/> PM2.5 <input type="checkbox"/> O<sub>3</sub></p> <p><input type="checkbox"/> SO<sub>2</sub> <input type="checkbox"/></p>
<p><b>NOISE LEVEL MONITORING</b></p> <p><u>Sp</u></p>	<p>LAB NO.:</p> <p><input type="checkbox"/> 24 Hours ( ) <input type="checkbox"/> 8 Hours</p> <p><input type="checkbox"/> 12 Hours <input type="checkbox"/></p>
<p><b>VIBRATION MONITORING</b></p>	<p>LAB NO.:</p> <p><input type="checkbox"/> 24 Hours <input type="checkbox"/> 8 Hours</p> <p><input type="checkbox"/> 12 Hours <input type="checkbox"/></p>
<p><b>WATER QUALITY MONITORING</b></p> <p><u>3p</u></p>	<p>LAB NO.:</p> <p><input checked="" type="checkbox"/> pH, Temperature, DO <input checked="" type="checkbox"/> TURBIDITY</p> <p><input checked="" type="checkbox"/> WQI (COD,BOD,TSS,O/G,AN.E-Coll) <input checked="" type="checkbox"/> T. Uniform Count</p> <p><input type="checkbox"/> DOE FULL STD A / B <input type="checkbox"/></p>
<p><b>SILT TRAP MONITORING</b></p> <p><u>2p</u></p>	<p>LAB NO.:</p> <p><input checked="" type="checkbox"/> TSS <input type="checkbox"/> pH, Temp, Do</p> <p><input type="checkbox"/> TURBIDITY <input type="checkbox"/></p>
<p><b>ISOKINETIC / AIR EMISSION MONITORING</b></p>	<p>LAB NO.:</p> <p><input type="checkbox"/> Total PM <input type="checkbox"/> Cl<sub>2</sub></p> <p><input type="checkbox"/> SO<sub>x</sub>, NO<sub>x</sub> <input type="checkbox"/> H<sub>2</sub>S</p> <p><input type="checkbox"/> Hg, Pb, Cd, Cu, Zn, Sb, As <input type="checkbox"/></p> <p><input type="checkbox"/> Dark Smoke <input type="checkbox"/></p> <p><input type="checkbox"/> H<sub>2</sub>SO<sub>4</sub>, HF, HCl <input type="checkbox"/></p>
<p><b>OTHER</b></p>	<p>LAB NO.:</p> <p><input type="checkbox"/> <input type="checkbox"/></p> <p><input type="checkbox"/> <input type="checkbox"/></p>

Our Report & Invoice will follow shortly

We agree with the job above and confirmed the number of samples.  
Signed & chop on behalf

Source: Taman Bunga Merlimau