



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

**CONSTRUCTION OF RC PILE FOR DOUBLE STOREY SEMI-D  
HOUSES**

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(PERAK)**

**DECEMBER 2019**

It is recommended that the report of this practical training provided

by

**Nursyamimi Asyiqin Binti Ahmad Nizam**

**entitled**

**Practical Report Title**

**Construction of RC pile for double storey semi-d houses**

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

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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 Kitacon Sdn Bhd for a duration of 20 weeks starting from 5<sup>th</sup> August 2019 and ended on 20<sup>th</sup> 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.

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## ACKNOWLEDGEMENT

Alhamdulillah, praise to Allah, the Most Merciful, the Most Graceful.

I would like to extend my heartfelt gratitude for the guidance, advice and help rendered throughout the period of training by the following group of amazing individuals. First and foremost, I would like to thank Mr. Tan Ah Kee for the opportunity given, to conduct my training in his esteem company. His team of professionals comprising of Mr. Kwo Hwa Sung, En. Khairil Asraf, Mr. Tan Kow, Mr. Ku Thiam Poh, En. Muhd Asral, En. Riff Shafiq, En Fakhrul Rizal and En. Muhd Luqman Hakim have enabled me to learn and develop my understanding, knowledge and feel of real time projects, and the theory involved in analysis of structures, building and civil works. They are also responsible towards streamlining and assessing my training. Also to the site personnel in Kitacon Sdn. Bhd and Worldwide who have extended their cooperation and help to further enhance my ability in understanding the procedures in construction and site administration, tests procedures, site safety and best practices in the industry. It is an honour for me to be given the opportunity to ‘work’ with all of you.

I would also like to thank ALL the UiTM lecturers that have taught and nurtured me in becoming a better student and person. I would also like to extend my deepest appreciation to the lecturers who are directly involved during my training stint. To Dr. Azamuddin bin Husin, Supervising Lecturer, En Muhammad Naim bin Mahyuddin, Practical Training Coordinator and Dr. Dzulkarnaen bin Ismail, Programme Coordinator, I value the time, effort, encouragement and ideas that they have contributed towards the successful completion of my training, this report and the valuable knowledge that have been shared over the last few semesters.

Last but not least, my special thanks to my beloved parents for their sacrifices over the years.

Thank you so much.

## ABSTRACTS

Deep foundation is very important structure in the building. Its role is to transmit load all the way from the roof to the firm layer underground. All the load such as live load, dead load and wind load will be transferred to the substructure. Ignoring the importance of deep foundation may cause more costs for the remedial works in the future. Therefore, the main purpose of deep foundation is to avoid structure from collapse or settlement. The objective of this report is to study the method of construction Reinforcement Concrete Pile. It also focuses on how to rectify problems that occur during piling work. All the broken piles were rectified by adding more piles around the area to make sure the piles are able to transmit load from the structure. To sum up, the proper process of driven piling and welding joint between two piles is important to avoid any consequences such as broken pile.

## CONTENTS

ACKNOWLEDGEMENT .....	ii
ABSTRACTS.....	iii
CONTENTS.....	iv
LIST OF TABLES .....	v
LIST OF FIGURES .....	vi
CHAPTER 1: INTRODUCTION .....	7
1.1 Background and Scope of Study .....	7
1.2 Objective .....	8
1.3 Method of study.....	8
CHAPTER 2: COMPANY BACKGROUND .....	10
2.1 Introduction of Company .....	10
2.2 Organization Chart .....	11
2.3 Director & Key Management .....	13
2.4 List of Completed Projects .....	14
2.5 List of Current On-Going Projects .....	15
CHAPTER 3: CASE STUDY .....	17
3.1 Method of RC piling construction.....	19
3.2 Machineries and tools used for RC pile construction.....	24
3.3 Problems and solutions of RC pile construction implemented on site.....	26
CHAPTER 4.0: CONCLUSION.....	30
REFERENCES.....	31

## LIST OF TABLES

Table 1.1: List of completed projects.....	16
Table 1.2: List of on-going projects.....	17
Table 1.3: Machineries, tools and purpose .....	24

## LIST OF FIGURES

Figure 1: Organisation chart.....	13
Figure 3.1 : Location plan of site via Google Satellite .....	17
Figure 3.2: Location of Piling at Type C/C1, Block C3.....	18
Figure 3.3: Ready platform.....	19
Figure 3.4: Peg that had been peg by surveyor.....	19
Figure 3.5: Unload RC pile from trailer .....	20
Figure 3.6: Pile is hoist up.....	20
Figure 3.7: Vertically checked using spirit level.....	21
Figure 3.8: Example of blow record.....	21
Figure 3.9: Show the worker is welding joint between two piles.....	22
Figure 3.10: Set graft taken by assistant operator .....	23
Figure 3.11: PDA test conduct by engineer at point number 61 .....	23
Figure 3.12: Unset pile at 30m into the soil .....	26
Figure 3.13: Drawing of Compensation Pile.....	27
Figure 3.14: Notes of compensation pile drawing.....	27
Figure 3.15: Hard material found in the ground during piling work .....	28
Figure 3.16: Excavator excavate 2m from ground level .....	29
Figure 3.17: Pegging point by surveyor .....	29



## CHAPTER 1:

### INTRODUCTION

#### 1.1 Background and Scope of Study

Reinforcement Concrete Pile is a column inserted in the ground to transmit loads from the building to the earth farther down more than 3meter below the substructure. It is considered when the soil strength capacity is weak and structural loads need to be transmitted to the firm layers in order to resist load from the building and avoid from settlement. It is located below the pile cap and at the lowest part of the building which is underground. Numbers of pile each types of building may be vary depend on the design specified by engineer to suit the amount of loads that need to carry by the piles to the firm layer of the subsoil. The design may be in group of piles or individual pile. After the piling process, pile cap will be install to provide a stable foundation and offers a larger area to transfer load evenly onto the pile. The focus of this report is about various number and design of piles used in construction semi-detached double story house located at Bukit Bandaraya, Seksyen U11, 40170, Shah Alam, Selangor.

In order to determine sufficient load transfer to the ground, pile need to be correctly placed at correct point. Orientation of pile depends on calculation of loads transmitted from building determine by engineer. Size, of reinforcement concrete pile used for this project is 175mmX175mmX3m and 175mmX175mmX6m. The amount of pile designed for this site each group is one, two, three and four piles. As per calculate, the maximum depth to get set is 30m. As per calculate this piles will be set at the firm layer, this is called as End Bearing Pile. The design and size of pile cap also depends on design by engineer. Every group of pile and pile cap will hold one column. Besides, most common shape used for pile cap in this site is hexagonal shape and square and the amount of pile each group is one, two, three and four piles.

This report contains information about the process for construction of reinforcement concrete piles for semi-detached double storey houses, problems arising during the construction process and its solution for problems in constructing the pile reinforcement concrete piles located at Bukit Bandaraya, Seksyen U11, 40170, Shah Alam, Selangor that commences on 11<sup>st</sup> June 2019 and is expected to finish on 11<sup>st</sup> September 2020.

## **1.2 Objective**

- i)** To identify the methods of RC pile construction process.
- ii)** To determine the machineries and tools used for RC pile construction through observation on site.
- iii)** To identify the problems during RC pile construction work and solution implemented on site.

## **1.3 Method of study**

### **1.3.1 Primary**

- i)** Observation
  - Observation is held during the construction of reinforcement concrete piling as it is a continuous progress.
- ii)** Interview
  - Questions and answering session were done with Site Manager, Site Agent, Site Supervisor and piling workers from time to time if any doubts occur.

### **1.3.2 Secondary**

- i)** Document review

- Plan drawing of piling points orientation were given to know the length between centre to centre, orientation and design of the pile cap of piles

ii) Books

- Books are used to support fact the knowledge gained from the observation at the site.

## **CHAPTER 2:**

### **COMPANY BACKGROUND**

#### **2.1 Introduction of Company**

Kitacon Sdn Bhd is a Malaysian company owned by Mr Tan Ah Kee and Mr Teow Choo Hing. The company were established on March 1990. Kitacon Sdn Bhd is registered with “CIDB G7”, “SPAN KELAS C” and “PKK KELAS A”. The company has implemented a Certificate of Quality Management System complying with ISO 9001:2015 for scope provision of construction services for building and civil engineering works. Next, the company has implemented an a Certificate of Occupational Health and Safety Management System complying with MS 1722:2011 for scope provision of construction services for building and civil engineering works. Other than that, Certificate of Environmental Management System also has been implemented and maintain of the standard ISO 14001:2015. Kitacon Sdn Bhd core activities are construction of housing, offices, factory and TNB house.

## 2.2 Organization Chart

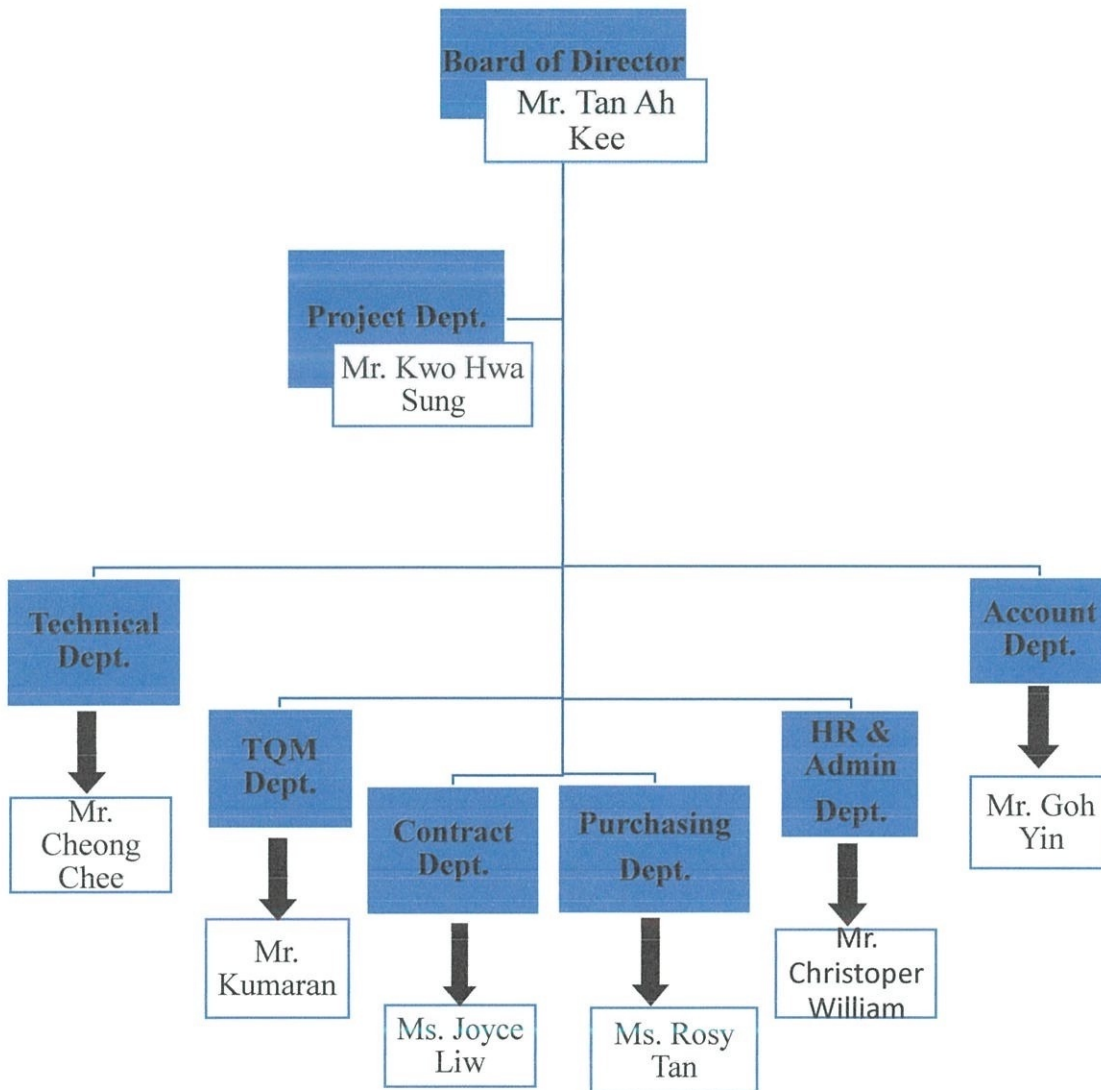


Figure 1: Organization Chart

Based on the organization chart, Mr Tan Ah Kee was the board of director in this company. The board of director is purpose to ensure the company prosperity by collectively directing the company's affairs. Next in project department were conduct by Mr. Kwo Hwa Sung as General Manager. Duties as General Manager is to coordinating business operations, monitoring and motivating staffs, managing operational costs, improving administration process and also hiring and training employees. After that, in Technical Department were conduct by Mr. Cheong Chong Chee as Senior Technical Officer. As a technical officer, he is needed to plan and coordinate activities in fields help by other technical assistant.

Next, in Total Quality Management Department or known as TQM is conduct by Mr Kumaran and were distribute to QA/QC Department, Safety and Health Department and TQM Document Controller. Then, Contract Department conduct by Ms Joyce Liw as Contract Manager for Pre-Contract stage and Ms Tan Wei Khim as Contract Manager for Post-Contract stage. They are responsible for coordinating every aspect of the project from reviewing and approving contract terms to coordinating deadlines, approving budgets and more.

After that, in Purchasing Department, Mrs Rosy Tan is responsible as Purchasing manager who buying or approving the acquisition of goods and services needed by company. A purchasing manager's responsibilities may include seeking reliable suppliers to provide good quality good at reasonable prices, reviewing technical specifications for raw materials, components, equipment or building.

Besides, in Human Resources and Admin Department conduct by Mr Christopher William who responsible to provide oversight and guidance to the development and monitoring of processes related to recruitment and retention, compliance, compensation, benefits, training and development.

Last but not least, Account Department conduct by Mr Goh Yin Huat as Chief Financial Officer(CFO). He is responsible for managing the financial actions of a company. CFO duties include tracking cash flow and financial planning as well as analysing the company's corrective actions help by account manager, assistant account manager, senior account executive, account executive and account clerk.

### 2.3 Director and Key Management

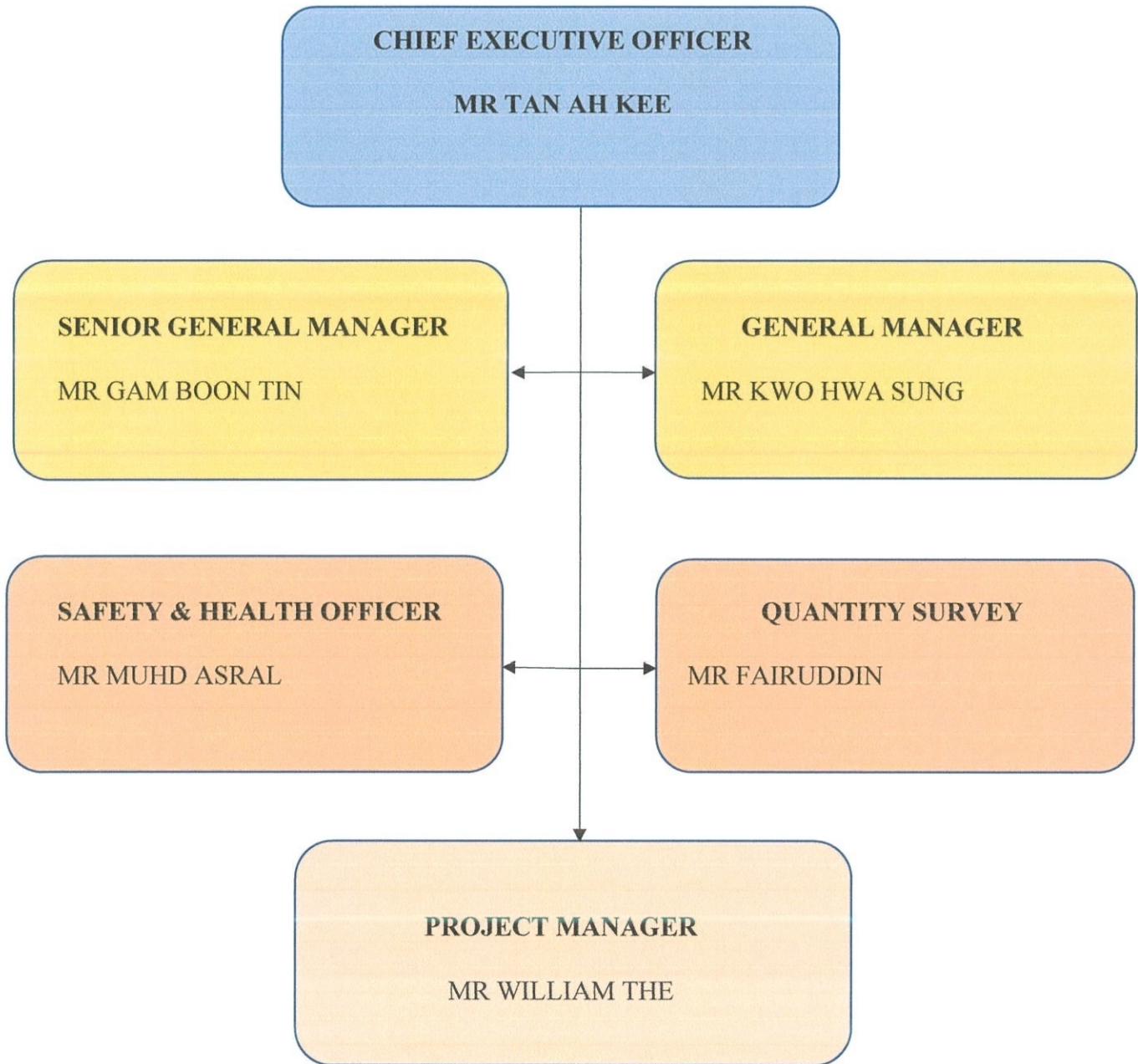


Figure 2: Organisation chart

## 2.4 List of Completed Projects

*Table 1.1: List of completed projects*

No	Project Description	Amount (RM)	Commence	Complete	
1	Proposed construction & completion of 206 units double storey terrace house, Phase R20 and 1 unit TNB substation, Lot Ptd 13318, Mukim Jorak, Daerah Muar, Johor Darul Takzim.	40,894,580.47	13-Jun-16	13-Apr-18	
2	Cadangan membina & menyiapkan 67 unit rumah teres dua tingkat beserta 1 unit Pencawang elektrik di atas Lot 360, Fasa G3B, Elmina, Seksyen U16, Shah Alam, Selangor	36,366,480.00	23-Jun-16	22-Mar-18	
3	Cadangan Pembangunan Skim Perumahan Komuniti Berpagar Dan Berkawalan (Hak milik srata) Precint 8, Yang Mengandungi 1) 45 Unit Rumah Teres 2 Tingkat 2) 69 Unit Rumah Teres Dua Tingkat di atas Lot 42195, Mukim Beranang, Daerah Hulu Langat, Selangor	12,000,000.00	5-Apr-17	31-Mar-18	
4		25,690,000.00	53,800,000.00	30-Dec-15	31-Mar-18
5	Proposed construction and completion of 127 units Double Storey terrace Houses and Infrastructure at Pahse A2-05, Alam Impian, seksyen 35, 40470, Shah Alam		6-Feb-17	7-Jan-19	



## 2.5 List of Current On-Going Projects

*Table 1.2: List of on-going projects*

No	Project Description	Amount (RM)	Commence	Complete
1	Cadangan Pembangunan Perumahan Di Bawah Skim Komuniti Berpagar & Berkawalan di Bawah Akta Hakmilik Srata 1985 di atas Lot PT20090, Seksyen U13,40170, Shah Alam Untuk Tentuan Eco Ardence sdn Bhd	110,730,708.75	2-May-17	30-Jun-19
2	Cadangan Membina & Menyiapkan 69 Unit Rumah Teres, Sungai Purun, Semenyih, for Worldwide Land Development Sdn Bhd	19,948,000.00	15-May-17	29-Nov-19
3	Proposed construction and completion of 168 units double storey link house type 1 and 1 unit of TNB sub-station with infrastructure works on part lot 368, Phase EV5A, Elmina West Seksyen U15, 40170, Shah Alam Selangor, for MESSRS Sime Darby Elmina Development Sdn Bhd.	56,282,957.53	5-April-19	4-Feb-22
4	Cadangan Membina dan Menyiapkan 299 unit rumah Teres 2 Tingkat Fasa 7 dan 2 Unit Pencawang Elektrik TNB (Double Chamber) Diatas Sebahagian	71,500,00.00	1-Aug-19	31-Jan-21

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PT48379 (Dahulu Lot 934), Mukim Rawang, Daerah Gombak, Majlis Perbandaran Selanyang, Selangor Untuk tentuan GLM Emerald West (Rawang) Sdn Bhd

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5	Cadangan	Membina	Dan	59,768,800.00	11-Jun-19	11-Sept-2020
	Menyiapkan	102 Unit	Rumah			
	Kediaman Berkembar	2 Tingkat,	5			
	Unit Rumah Kediaman	Sesebuah	2			
	Tingkat Dan	1 Unit	Pencawang			
	Elektrik Di Plot A,	Bukit Bandaraya,				
	Seksyen U11,	40170, Shah Alam,				

---

## CHAPTER 3:

### CASE STUDY

#### 3.1 Introduction to case study

Bukit Bandaraya U11, Shah Alam is a new developing residential area that is still on-going construction. This project is Cadangan Membina Dan Menyiapkan 102 Unit Rumah Kediaman Berkembar 2 Tingkat, 5 Unit Rumah Kediaman Sesebuah 2 Tingkat Dan 1 Unit Pencawang Elektrik Di Plot A, Bukit Bandaraya, Seksyen U11, 40170, Shah Alam, Selangor Darul Ehsan. The area is located near recreational park, Taman Botani Shah Alam. This project commence on 11<sup>st</sup> June 2019 and expected completed on 11<sup>st</sup> September 2020. The project value is RM59,768,800.00.



*Figure 3.1: Location plan of site via Google Satellite*

*Source: Google Maps*

The focus of this case study is at piling located at No 10,12, Type C/C1, Block C3, Bukit Bandaraya, Seksyen U11, Shah Alam, Selangor. The type of this house is double storey semi-detached house.

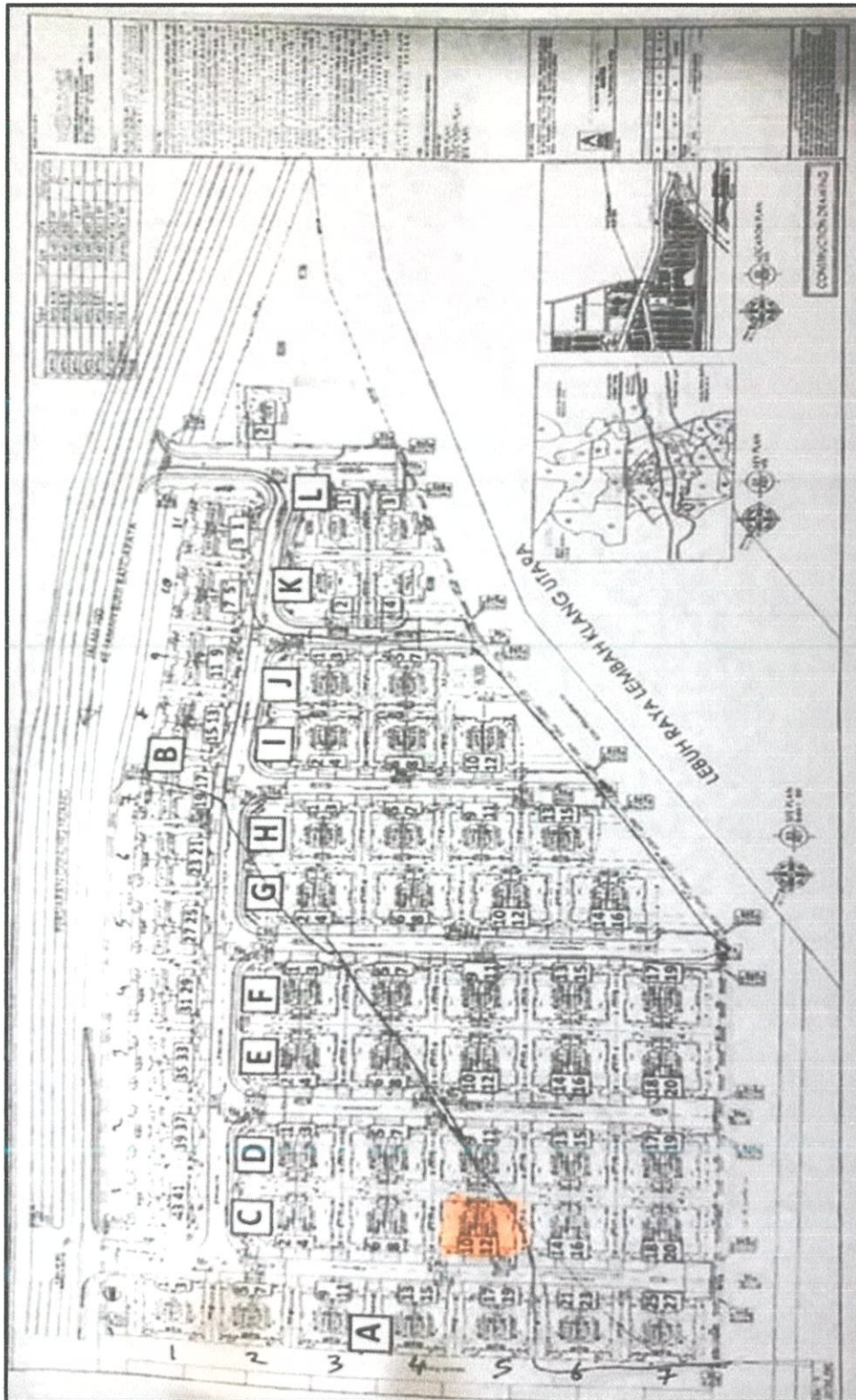


Figure 3.2: Location of Piling at Type C/C1, Block C3

Source: Kitacon Sdn. Bhd.

### 3.1 Method of RC piling construction

First of all, platform that are ready will be peg by surveyor at all the point as shown in figure 3.3 and 3.4 for piling according to the piling layout plan which has been design by engineer. Before pegging works, site supervisor need to make sure platform are ready by compacted at every 300mm layer of soil.



*Figure 3.3: Ready platfrom*



*Figure 3.4: Peg that been peg by surveyor*

After that, unload piles (175 x 175mm RC piles) from trailer using a crane and place piles at the nearest area that need to be pile as shown in figure 3.5.



*Figure 3.5: Unload RC pile from trailer*

With the piling rig machine suitably position at the piling block C3, the pile hoisted up and placed vertically over the steel peg as shown in figure 3.6. Vertical pile then is checked using a spirit level/plumb bob as in figure 3.7. Vertical check is important to make sure the pile will drive straight down to avoid pile from broken.



*Figure 3.6: Pile is hoist up*



Figure 3.7: Vertically checked using spirit level

The hydraulic hammer is activated with gradual increase in drop height to the required height which is 225 mm and the pile driven until the top of the pile is about 600mm above the ground to easy the extension of pile for further driving. The recorder records the number of blow of hammer for every 0.5 meter pile driven into the ground as shown in figure 3.8.

**BMC PILE DRIVING RECORD**  
 BMC INFRA SON BHD (197748-7)  
 27-18, JALAN 20 LONG 110, BANGOR 50 LONG, BT 574, 43000 KAJANG SELANGOR  
 TEL: 03-9111283 FAX: 03-9133863

PROJECT: PILING WORKS AT WW1ST BUKIT BANGARAYA BLOCK: I-2 LOCATION: 32  
 DATE: 17/11/19 PILE RIG NO.: 3  
 HAMMER WEIGHT: 3.0 Tonne OPERATOR: HAZREI  
 HAMMER DROP: 225 mm PENETRATION: 18.2 mm  
 PILE TYPE: RC PILE SET: E  
 PILE SIZE: 375 x 375 mm SUPPLY LENGTH: 6.42 x 6.13  
 JOINT: 2

Penetration (m)	No of Blow	Penetration (m)	No of Blow	Penetration (m)	No of Blow
0.00 - 0.50	5	14.00 - 14.50	14	28.00 - 28.50	
0.50 - 1.00	9	14.50 - 15.00	24	28.50 - 29.00	
1.00 - 1.50	11	15.00 - 15.50	23	29.00 - 29.50	
1.50 - 2.00	13	15.50 - 16.00		29.50 - 30.00	
2.00 - 2.50	14	16.00 - 16.50			
2.50 - 3.00	14	16.50 - 17.00			
3.00 - 3.50	16	17.00 - 17.50			
3.50 - 4.00	17	17.50 - 18.00			
4.00 - 4.50	15	18.00 - 18.50			
4.50 - 5.00	16	18.50 - 19.00			
5.00 - 5.50	19	19.00 - 19.50	ENT		
5.50 - 6.00	22	19.50 - 20.00			
6.00 - 6.50	24	20.00 - 20.50			
6.50 - 7.00	26	20.50 - 21.00			
7.00 - 7.50	27	21.00 - 21.50			
7.50 - 8.00	23	21.50 - 22.00			
8.00 - 8.50	25	22.00 - 22.50			
8.50 - 9.00	27	22.50 - 23.00			
9.00 - 9.50	32	23.00 - 23.50			
9.50 - 10.00	35	23.50 - 24.00			
10.00 - 10.50	37	24.00 - 24.50			
10.50 - 11.00	42	24.50 - 25.00			
11.00 - 11.50	45	25.00 - 25.50			
11.50 - 12.00	17	25.50 - 26.00			
12.00 - 12.50	20	26.00 - 26.50			
12.50 - 13.00	15	26.50 - 27.00			
13.00 - 13.50	17	27.00 - 27.50			
13.50 - 14.00	14	27.50 - 28.00			

REMARKS:   
 Date: \_\_\_\_\_  
 Project By: \_\_\_\_\_  
 Checked By: \_\_\_\_\_

Block I-2

2.35 PH

1.00 PH

17/11/19  
 Pile No. 32  
 Total Lph

Figure 3.8: Example of blow record

The subsequent length of pile is similarly hoisted up and placed directly over the recently driven pile. Welding for the extension of the pile at the interface/end of the two pile is then carried out as shown in figure 3.9. Proper welding is important to avoid the joint between two piles from breaking during the pile driving.



*Figure 3.9: Show the worker is welding joint between two piles*

Driving of piles is continued and repeated the process until the required depth of penetration of the pile is achieved or the set criteria for termination of the driving process is achieved so the driving process is terminated so that the pile is not overdriven and damaged. The set graft is taken by the assistant operator as shown in figure 3.10. Set is acceptable if the penetration at the graft less than 10mm. The maximum depth of penetration at this site is 30m depth. If the penetration is more than 30m the pile is considered as unset.





*Figure 3.10: Set graft taken by assistant operator*




After complete driven all the points for block C3, PDA test (pile driving analyser) is conducted by engineer as shown in figure 3.11. This test is to determine the pile integrity. If the pile integrity is less than 60%, that is mean the pile is failed. Further action such as add additional point need to be taken at failed point.



*Figure 3.11: PDA test conduct by engineer at point number 61*

### 3.2 Machineries and tools used for RC pile construction

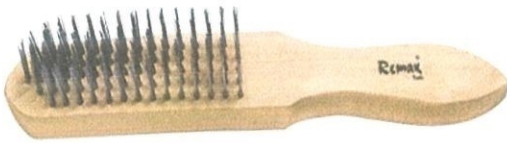
Table 1.3: Machineries, tools and purpose

Machineries	Purpose
 <p data-bbox="391 884 518 929">Piling rig</p>	<ul data-bbox="798 481 1340 638" style="list-style-type: none"><li>• Piling rig is used to drive piles into firm layer to support load transfer from structure above the ground.</li></ul>
 <p data-bbox="359 1299 598 1344">Welding machine</p>	<ul data-bbox="821 929 1340 1097" style="list-style-type: none"><li>• Welding machine is to provide power to the welding equipment to welding the piles.</li></ul>
 <p data-bbox="391 1825 614 1870">3 tonnes hammer</p>	<ul data-bbox="837 1332 1340 1512" style="list-style-type: none"><li>• Hammer used to drop pile head with allowable height which is 225mm until it reach set.</li></ul>



Welding set

- Welding set used to welding joint between two piles.



Steel wire brush

- Steel wire brush is used to clean the soil attached at the pile before welding the joint.



Glove

- Glove is used to protect hand from the heat during welding.



Handheld welding head shield

- Handheld welding head shield is used to protect the welder eyes and face during welding.



Measuring tape

- Measuring tape is use to measure the excess of the pile above the ground level. It is to know the length of penetration into the ground. It is also used to measure the length between point to point.

### 3.3 Problems and solutions of RC pile construction implemented on site

#### Problem

##### i) Unset pile

Unset pile can consider as problems because the pile still did not reach the hard layer even has been drive 30m into the soil as the maximum depth to achieve set at this site is 30m. Unset pile can cause settlement to the house when the house is completely construct.



*Figure 3.12: Unset pile at 30m into the soil*

#### Solution

##### i) Additional point

If unset pile happen during piling, engineer need to be informed about the problem. Let the engineer knows the details of problem point such as, number of point, length of the pile has been driven and design of the pile cap and stump. After that, engineer will design a new design of pile cap and orientation of piling point.

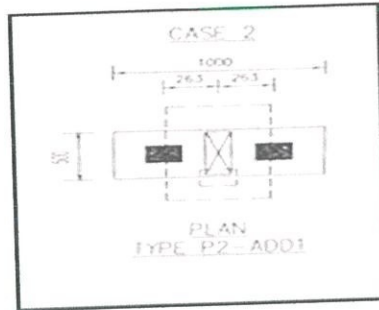


Figure 3.13: Drawing of Compensation Pile

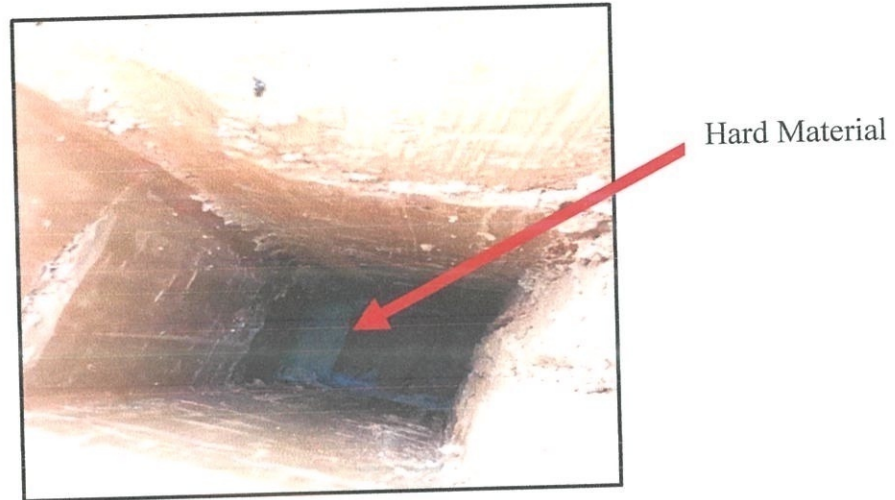


Figure 3.14: Notes of compensation pile drawing

### **Problem**

ii) Broken pile due to hard material in the ground

The pile broken during driving the pile into the ground, it is because the pile got hard contact with the hard material such as rock in the ground.



*Figure 3.15: Hard material found in the ground during piling work*

### **Solution**

ii) Remove the hard material

Excavate the area that found hard material using excavator. In this case, the hard material found two meter from the ground level. After that, excavate around three meter to remove the hard material.



*Figure 3.16: Excavator excavate 2m from ground level*

### **Problem**

#### iii) Missing steel peg/piling point

The points that has been survey and peg by surveyor got miss. This can happen because of surface of the ground are to not in got condition. Example, after heavy rain the ground surface became muddy that cause the peg miss. Besides, peg also can be miss because of the piling rig had so much movement at the peg area.

### **Solution**

#### iii) Conduct surveying or measuring

Pegging the point with new steel peg is held by surveyor. Also, can conduct measuring the point using tape. But to get the exact point, it is recommended to conduct pegging point by surveyor.



*Figure 4: Pegging point by surveyor*

## **CHAPTER 4.0:**

### **CONCLUSION**

This report can be concluded that proper construction process of RC pile driven is important in every stage of project either completed or not as it the most important structure especially at the area which their soil strength capacity is weak. The purpose of RC pile construction is to avoid the building from collapse or settlement and may causes more cost for building rectification in the future. Each structure required different types of pile, design of pile orientation, and total penetration of pile depends on load of the structure and the soil bearing capacity of the soil that the structure was built on.

Objectives of this report are to determine the method used of RC pile construction on this site, machineries and tools used and problems occur and solution during the RC pile construction process. It is concluded that the method used for RC pile construction on this site were similar to the theory.

Next, from this report, the problems occur and solution to rectify also being studied. As per observation on site, common problem occur during piling construction is broken pile because of hard materials in the ground and broken pile due to improper welding and improper driven pile by piling operator.

As for this report, the piling work in this site used a suitable design of pile orientation and type of pile as it is approved by the engineer and is built according to the given specification and is expected to last a lifetime and will pose no threat to the building occupants.



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