



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

INSTALLATION OF RC COLUMN

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JULY 2020

It is recommended that the report of this practical training provided

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entitled

Installation Of RC Column

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

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(PERAK)

AUGUST 2021

STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references stated herein, prepared during a practical training session that I underwent at WIRICON ENGINEERING for duration of 20 weeks starting from 23 August 2021 and ended on 07 January 2022. 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

Alhamdullillah, 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 En Muhammad Rezeki Mustaqqhim for the opportunity given, to conduct my training in his esteem company. His team of professionals comprising of Cik Nurul Shamin Hasni , En Mohd Khairul Ikhwan and Mohamad Hafidzi Muhammad 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 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 Cik Nor Azizah Binti Talkis, Supervising Lecturer, Puan Nurhasyimah Binti Ahmad Zamri, Evaluation Lecturer, En Noor Azam Bin Yahaya, Practical Training Coordinator and Dr. Dzulkarnaean 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.

ABSTRACT

Energy is a very important thing to elaborate, therefore this report will discuss about energy efficiency for the building envelope based on Code of Practice on Energy Efficiency and Use of Renewable Energy for Non-Residential Building MS 1525: 2007. This report was conducted for the building envelope at Library of UiTM Perak and Main Library of UM. The objective of this report is to compare the capacity of two educational buildings and how far it fulfills the requirements in the guideline. It will focus on energy conservation that provides a comfortable environment for its occupants. To illustrate the function of building envelope as an important aspect to focus on building surface design achievement and then to evaluate how far the potential of the building envelope that could fulfill the building criteria that is prescribed by the requirements in the guideline based on U Value and OTTV Value. This report will also look at the energy efficiency management based on the guideline by producing the use of effective and continuous energy and to evaluate the quality of energy usage by creating energy efficient environment that gives a better impact for the National Energy Sector in the future.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

There are various types of RCC Column based on its shape, length and forces. RCC Columns are classified according to their shape, length, and forces. For these types of columns, the function and construction methods are discussed. A column is a vertical member that bears the entire load of the beam, slabs, and entire structure, while the floor and other areas of the building are adjusted to the client's or owner's specifications. The size of the columns, the amount of cement sand and aggregate to be mixed, the number of steel bars to be installed, and the spacing between the stirrups are all detailed in the structural drawing, which is created by a structural designer based on the actual load on the column and safety considerations. A column is a vertical member that bears weight by compression. As load acts along its longitudinal axis, the column is essentially a compression member. Wind earthquakes or accidental loads can cause bending moments. The load of the slabs beams structure is transferred from above to below by the column, and then the load is transferred to the soil. The columns should be placed in such a way that no tensile stresses develop at the cross section of the columns. Columns should be placed in such a way that they partially or completely blend into the walls. (The Constructor, 2016)

Moreover , there are two types of concrete grade which is PCC (plain cement concrete) .It is a type of plain cement concrete that contains a mixture of cement sand and aggregate and is primarily used for flooring and the construction of various types of pathways. PCC is a type of concrete that does not use steel bars. PCC is a type of concrete that does not use steel bars. Next is ,RCC (Reinforced cement concrete). It is a type of reinforced cement concrete that combines cement, sand, and aggregate with steel bars and is used to create a variety of civil construction structures such as beams, slabs, footings, columns, bridges, dams, and piles. RCC is a concrete mix that includes steel bars. (Civil Sir, 2020)

Furthermore, the concrete construction grade is chosen in accordance with the structural design requirements. Nominal mix and design mix are the two types of concrete mixes. Nominal mix concrete is a type of concrete that is commonly used for small-scale construction and residential buildings with low concrete consumption. Nominal mix provides a safeguard against a variety of quality control issues that commonly arise during concrete construction. The proportions of design mix concrete are determined through a series of lab tests. When using design mix concrete, strict quality control is required during material selection, mixing, transportation, and placement. If large-scale concrete construction is done, this concrete offers mix proportions based on locally available materials and offers cost savings. As a result, design mix concrete is used in large concrete construction projects. As a consequence, a suitable concrete grade can be chosen based on structural requirements. For small-scale construction, nominal mixes for concrete grades such as M15, M20, and M25 are commonly used. Large structures require a lot of strength, so they use

concrete grades like M30 and higher. These concretes' mix proportions are determined by mix design.(The Constructor, 2017). As an RCC structure, it use a minimum grade of M20 and a concrete mix ratio is 1:1.5:3 for the column.(Civil Sir, 2020).

There are many types of process for column in theoretically. However, the aim of this report is to discover the RC column process at a conjected area in Malaysia.

1.2 Objective

There are several objectives have been developed from this construction as follow;

- i. To identify the methods of Installation of RC Column.
- ii. To identify the problem and solution in process of installation in RC Column.

1.3 Scope of Study

The scope of study has been carried out at No 75 Lorong Limonia 10 , and located at Taman Bertam Lakeside Perdana 2 , Kepala Batas , Pulau Pinang. The project had started in 19 July 2020 and will be completed on 19 July 2021. The construction is a construction of One Storey Bungalow House and cost One Million and Two Hundred Thousand Ringgit Malaysia (RM 1 200 000.00). The project is currently on going. Therefore, the focus of the study is to determine on how the RC Column process is undertaken. Hence, the study will be explained not only about the method of the process but including the grades of concrete used, finishes , as well as machinery and tools. Furthermore, the problems and solution also included in this study. Even so, the study do not concentrate on the quantity of manpower or labors, the costs and the duration matters. In order to fulfill the data, there were three methods need to be carried out which is observation, interview, and document reviews. In conclusion, all further explanation relating the above method were explained as below.

1.4 Methods of study

1. Observation

The observation is a way of collecting data through observing. The observation is about how the process of concrete flat roof starting from at footing process, reinforcement work, formwork work, rain water down pipe until the finishes. The average time taken for this observation approximately around 2-3 hours. Overall, it took more than 2 weeks for the each process. The data for the observation was taken using a phone for a photo as well as written notes, while the labourer was working.

2. Interview

The interview is one of the method to collect the construction data by doing the structured or semi structured interview with the trusted person for the project. The have been done while doing the observation and while doing the work at the site. The interview was conducted with the company site manager, the contractor who is responsible for handling the project while at the construction site. This interview was also done to the workers who were at the construction site while doing works. Semistructured interviews were also conducted with the contractor responsible for conducting the project each week in the office and usually carried out around 10 – 15 minutes. The semi-structured interview recorded through short notes.

3. Document Review

The documents review that have been used to collect all the data for the construction is company profile, construction drawing, standard operating procedures (SOP), progress report and the pictures that taken by other workers. Drawing plan will be used as the reference at the site that under monitoring for the process. The pictures that belongs to others also the best reference during the document reviews. The time for document reviews will usually take 30 minutes for one drawing plan in a week. This document reviews placed at the office.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of company

Wiricon Engineering is a company undertake a wide variety of construction , renovation and maintenance work from small , one of residential jobs to home builds to large commercial or industrial projects . This company is registered in grade G2 in category B (Building construction) . Wiricon Engineering company has SSM Business Registration certificate with the registration number is 201903294857 (KC0053815-V) . Has been registered under the Business Registration Act , 1956 , at 8 Lorong Perda Utama 10 Bandar Perda Utama 10 Bandar Perda , 14000 Bukit Mertajam , Penang . Wiricon Engineering's business form is partnership. Wiricon Engineering has cooperate with several professional panel companies to meet customer demands as well as to facilitate all construction matters. The professional panel involved consists of interior designers in doing the work of drawing the project plan. This company also has a number of general workers and skilled workers with deep skills and experience fields of wiring, electrical, and construction. Wiricon Engineering is a trusted company that delivers high quality , reliable construction , renovation , and interior design also maintenance services for our clients . This company are fully licensed company in all facets of home renovation , interior and exterior design , air conditioning installation and other specialized works.

2.2 Company Profile



Figure 2.2 : Company Logo.

Wiricon Engineering has been the main house and renovation contractor experts since 2019 and we have been providing our quality services for years. Wiricon Engineering serves as a leading Construction Company in the North Malaysia area (Perlis , Kedah & Pulau Pinang). Wiricon Engineering is a team of fully-certified professionals who tackle everything from complex large projects to smaller scale jobs . Filled by the commitment to excellence , Wiricon Engineering go the extra mile to make sure clients are completely satisfied.

Table 2.2 : Company Profile

Name Of Company	Wiricon Engineering
Address	<p>No 8 , Lorong Perda Utama 10 , Bandar Perda , 14000 Bukit Mertajam , Pulau Pinang .</p>  <p>Figure 2.2.1 : Location of the company based on the satellite map</p> <p>Source: https://www.google.com.my/maps</p>

Contact Number	019-4514733
Email	wiriconengineering@gmail.com
Core Business	<ul style="list-style-type: none"> i. Renovation & construction services ii. Interior design with 3D drawing plan iii. Built-in furniture iv. Custom made metal based product

2.2.1 Vision & Mission

Precision. Punctuality. Professionalism.

Wiricon Engineering will help individuals and businesses with top of the line services. Since starting out, Wiricon Engineering taken on a variety of projects, always providing personalized attention to ensure precision and satisfaction with all of work.

2.2.2 Services

- Free Consultation
- Full Renovation
- 3D Painting , House Plan
- Manufacture of steel kiosks, Custom made furniture and cabinets
- Lighting and Wiring
- Addition of house space
- Wainscoting and Wall Design
- Installation and Supply of aircond and Electrical wiring
- Awning , Grill and Gate

2.3 Organization Chart

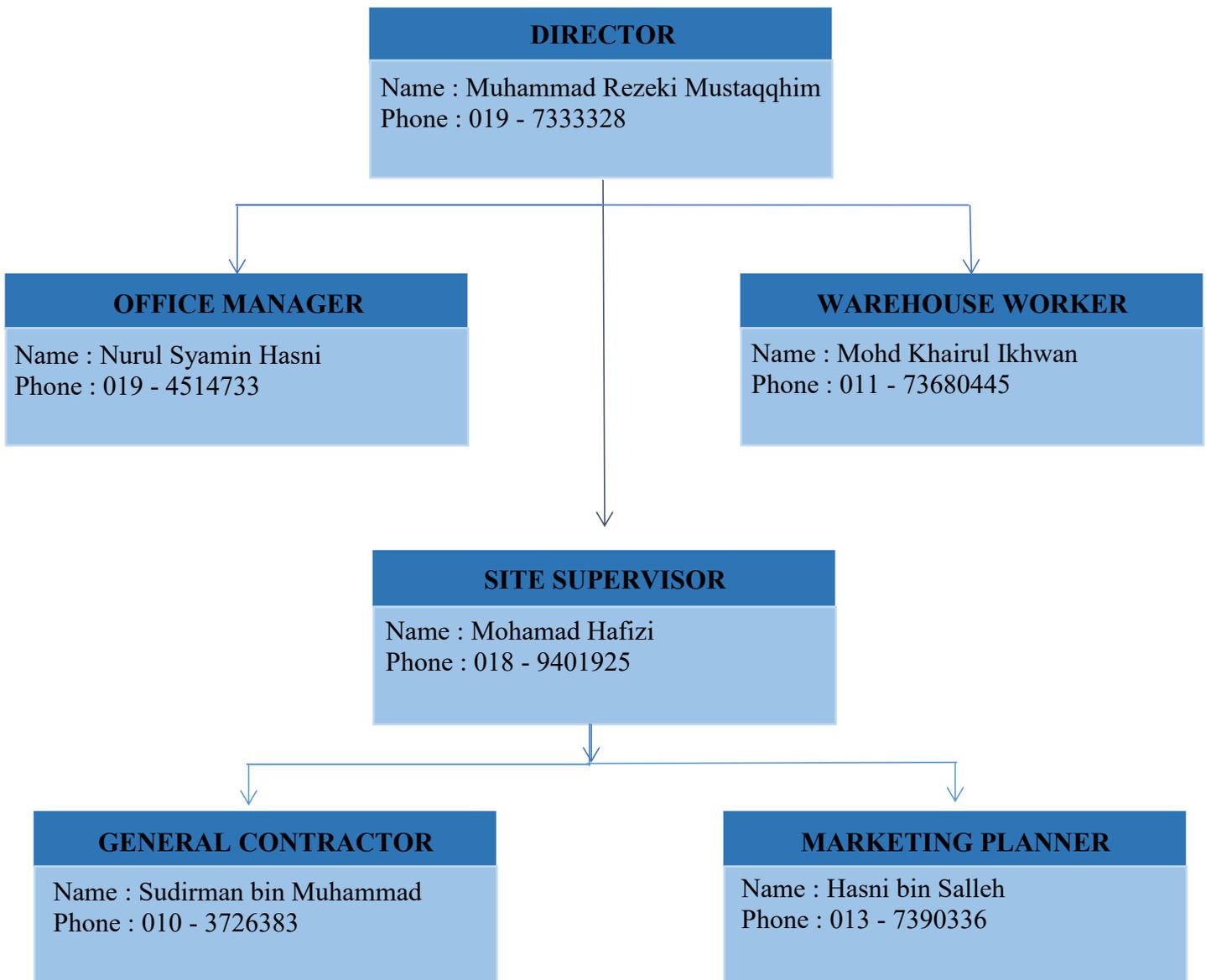


Figure 2.3 : Organization Chart

2.4 List of Projects

2.4.1 Completed Projects

Table 2.4.1 : Completed Projects

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	Cadangan mengubahsuai pejabat di SA Group , 123 Jalan Lagenda 4 , 09400 Padang Serai , Kedah .	Eighty Five Thousand Nine Hundred and Eighty Six Ringgit Malaysia (RM 85,986.00)	20/09/2020	27/11/2020	10 Weeks	Encik Sahir
2.	Cadangan mengubahsuai rumah di Eco Residence , No 9 persiaran perindustrian Bertam Perdana , 13200 Kepala Batas, Pulau Pinang.	Two Hundred , Sixty Thousand , Seven Hundred and Thirty Ringgit Malaysia (RM 260,730.00)	10/03/2020	11/10/2020	7 Months	Encik Ammar
3.	Cadangan mengubahsuai rumah No. 69 Lorong 2/3 Taman Desa Sentosa , Lunas 09600 , Kedah.	Two Hundred , Twenty Five Thousand , Four Hundred and Sixty Ringgit Malaysia. (RM 225,460.00)	26/05/2021	12/09/2021	18 Weeks	Encik Niranjijraj

4.	Cadangan pengubahsuaian rumah di No.2919 Lorong Serai Wangi 3 , 09400 Padang Serai , Kedah	Sixty Four Thousand and Two Hundred Ringgit Malaysia (RM 64,200.00)	17/03/2021	08/05/2021	8 Weeks	Cik Sarah
5.	Cadangan pengubahsuaian premis di Sohoh Perfume , no 51 , Taman Sri Utama 08300 Gurun , Kedah.	Twenty One Thousand , Eight Hundred and Fourty Ringgit Malaysia (RM 21,840.00)	09/04/2021	29/05/2021	8 Weeks	Cik Mimie
6.	Cadangan pengubahsuaian premis di Miko Beauty Care , 23A-01 The Light Point , Jalan Pantai Sinaran , 11700 Gelugor Pulau Pinang .	Forty One Thousand , Four Hundred and Forty Four Ringgit Malaysia. (RM 41,440.00)	26/11/2021	24/01/2021	2 Months	Encik Muhammad Nazini

2.4.2 Project in Progress

Table 2.4.2 : On-going Projects

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	Cadangan pengubahsuaian rumah No . 12 , Lorong Menerong Indah 1 , Taman Menerong Indah , 13300 Tasek Gelugor , Pulau Pinang .	Fifty Six Thousand , Two Hundred and Eighteen Ringgit Malaysia. (RM 56,218.00)	20/09/2021	12/12/2021	12 Weeks	Siti Habsah Samsudin
2.	Cadangan pengubahsuaian rumah No 75 Lorong Limonia 10 , Bandar Bertam , Lakeside Perdana 2 Kepala Batas , Pulau Pinang .	One Million and Two Hundred Thousand Ringgit Malaysia. (RM 1 200 000.00)	06/03/2021	28/05/2022	1 Year	Encik Khairul
4.	Cadangan pengubahsuaian rumah No 57 Lorong Limonia 10 , Bandar Bertam , Lakeside Perdana 2 Kepala Batas , Pulau Pinang .	Thirty Four Thousand , Nine Hundred and Forty One Ringgit Malaysia . (RM 34,941.00)	28/09/2021	22/11/2021	8 Weeks	Encik Hassan Ali
5.	Cadangan mengubahsuai rumah di Eco Residence , No 6 , Lorong 7	Seventy Five Thousand , One Hundred	26/05/2021	12/09/2021	18 Weeks	Cik Hanim Hishamuddin

	persiaran perindustrian Bertam Perdana , 13200 Kepala Batas, Pulau Pinang.	and Fifteen Ringgit Malaysia. (RM 75,115.00)				
6.	Cadangan mengubahsuai rumah di Eco Residence , No 23 , Lorong 10 persiaran perindustrian Bertam Perdana , 13200 Kepala Batas, Pulau Pinang.	Twenty Five Thousand , Eight Hundred and Eighty Three Ringgit Malaysia. (RM 25,883.00)	26/11/2021	06/01/2022	7 Weeks	Encik Imran Aqil
7.	Cadangan mengubahsuain rumah di No 9 , Jun Poh Nee , Taman Poh Nee , 14000 , Bukit Mertajam.	Twenty Two Thousand , Four Hundred and Nineteen Ringgit Malaysia. (RM 22,419.00)	12/11/2021	17/12/2021	1 Month	Encik Reshitaran
8.	Cadangan pengubahsuaian premis di Coffee and Boba Tea , No 15 , Jalan Jentayu Indah Simpang Ampat , Pulau Pinang.	Thirty Two Thousand , One Hundred and Sixty Five Ringgit Malaysia. (RM 32,165.00)	29/10/2021	12/12/2021	7 Weeks	Encik Zahar Bahrin

CHAPTER 3.0

CASE STUDY (BASED ON TOPIC OF THE REPORT)

3.1 Introduction to Case Study

The case study is about installation of RC Column. The project where has started the construction in 6 March 2021 and predictions will be completed on May 2022. The cost of construction approximately One Million and Two Hundred Thousand Ringgit Malaysia (RM 1 200 000.00). Currently, the project progress is still on going. Thus, the study will be explained not only regarding installation but including the machinery and tools, the time that have been carry out and the problem and solution of the construction. Nevertheless, the study do not concentrate on cost matters and manpower. The site location took place at Bertam Lake Side , Perdana 2 Kepala Batas , Pulau Pinang.



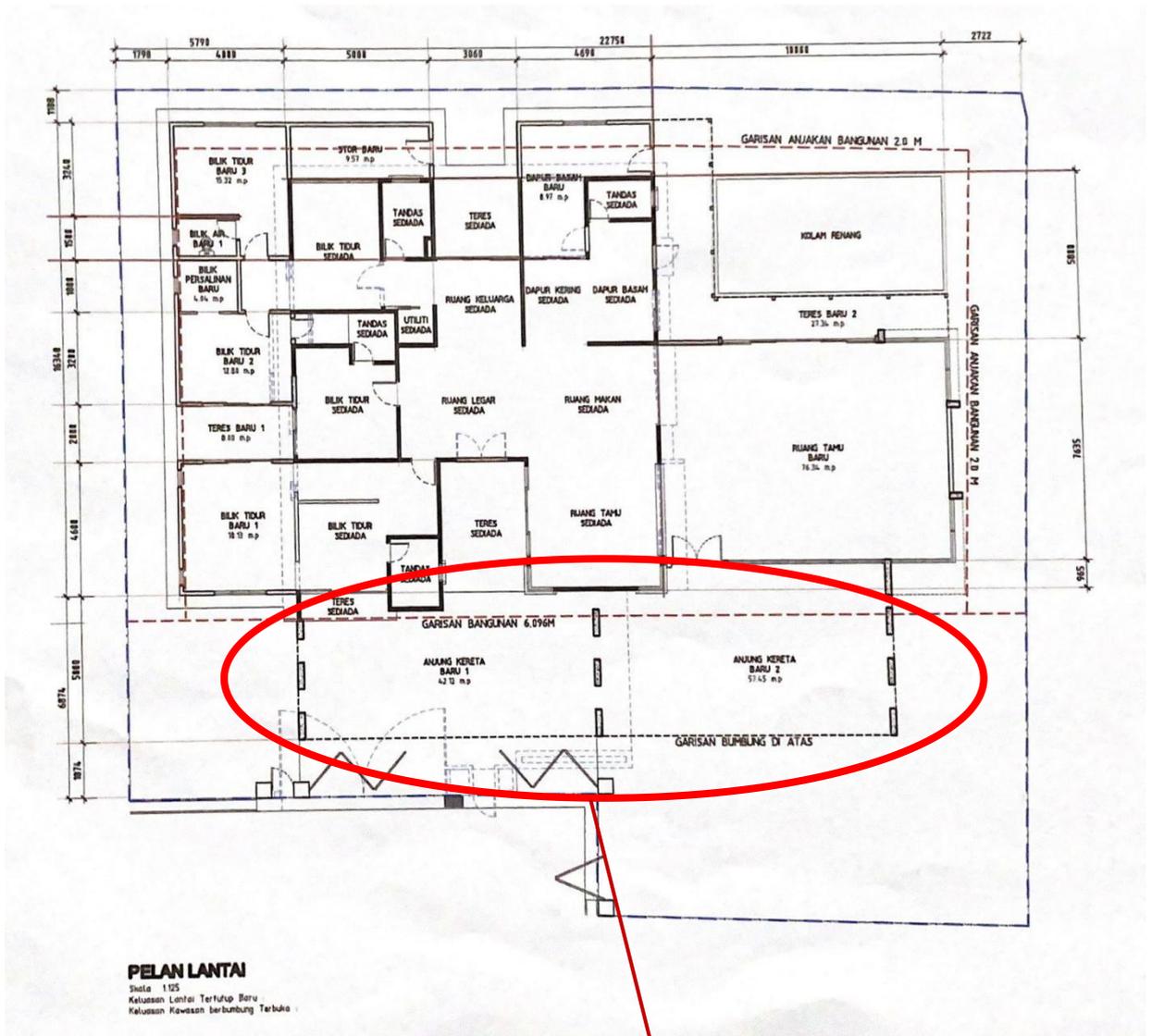
Figure 3.1 : Location of site based on the satellite map

Source: <https://www.google.com.my/maps>

The project construction located at No 75 ,Bandar Bertam , Lake Side Perdana 2 Kepala Batas, Pulau Pinang. This construction area is facing the main road of Lorong Limonia 10 . The area is quite secluded as it is still surrounded by residential area. The main buildings close to this construction area are Masjid Abdullah Fahim ,Kepala Batas, Sekolah Menengah Sains Kepala Batas dan Kolej Kejururawatan , Bertam , Pulau Pinang. There are several existing housing buildings close to the construction area. There are also existing residential areas near the construction area, namely Taman Bertam Perdana.

The activities that have been carry out on the site is installation of RC Column . This uneasy work needs to be handled by skilled workers for the work of installing the steel formwork, process from footing to column and to get a solid and perfect column. There are also some unskilled workers who help mix the mortar and bring all the equipment to the construction site to save process time. Stirrup, pipes, scaffolding, , concrete mixers, buckets, ropes and pins, hammers, saws, mixer drills, shovels and measuring tapes are among the machines and tools used in this construction.

Therefore, RC Column process will be recorded started from the first process of footing , reinforcement , rain water down pipe , formwork until the finishes processl. Last but not least, the problems of the process will be determining throughout the construction process. The solutions of the problems also will be state after determine the problem of the process. This chapter will be focused on the method of installation of RC Column, the equipment and tools that have been use for each process and the problem and solution that related with RC Column.



RC COLUMN

Figure 3.1.1 : Floor Plan

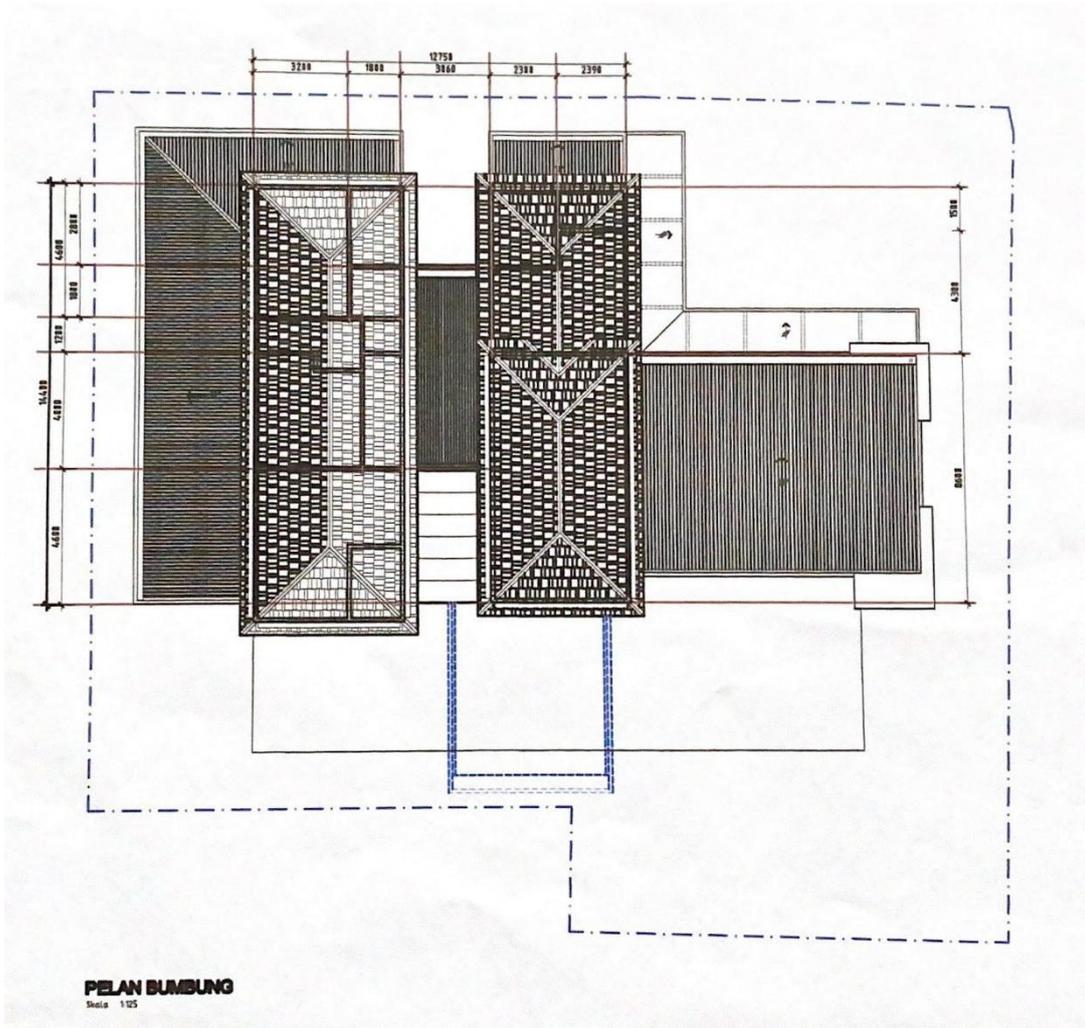


Figure 3.1.2 : Roof Plan

3.2 To Identify the Methods of installation of concrete flat roof

i. Site Planning



Figure 3.2 : Building Site Construction.

Firstly, The location of columns is determined practically in the field at this stage of the project. It is accomplished by laying rope in accordance with the grids shown in the drawing, and then marking the location of rope-related columns. Column locations are shown in relation to a grid-line with dimension in the drawing. Ropes serve as our grid-line in the field. As a result, we place rope-line-related columns by measuring the dimensions shown in the drawing.. Based on the drawing plan, there are 9 columns required with each distance of 0.4 m for each 3 columns. Meanwhile, there are two concrete roofs built, each of which is 9.8 m long and 4 m wide. Following that, the contractor calculates the amount of material required such as steel bars, stirrup, formwork, cement, nails and other materials required. The contractor then goes to the construction material store and purchases the correct type of material.

ii. Installation of pad footing



Figure 3.2.1 : Footing Pad that have been prepared.

Small excavation are done as deep as 24 inches with a width and length of 48 inches to make a pad footing. After that, Lay a layer of lean concrete to make sure firm base for the footing were prepared and clean. Next, install reinforcement, the rebars were bent and tied before the whole thing was lowered and placed inside. The steel is place properly on spacer blocks, avoid touching the lean concrete below. The process continue by installing stump reinforcement and finally pour the cement that has been mixed into the mold.

iii. Making steel reinforcement bar and formwork for column



Figure 3.2.2: Install Column Formwork by the workers



Figure 3.2.3 : Workers used rebar tying hooks to secure the stirrups.

Workers install wood formwork according to the prescribed column size before erecting the column. Workers then used rebar tying hooks to secure the stirrups to the steel bars as reinforcement. Stirrup is a closed loop of reinforcement bars that serves to keep the main reinforcement bars in a reinforced concrete element together.

iv. Column reinforcement work and install rain water down pipe

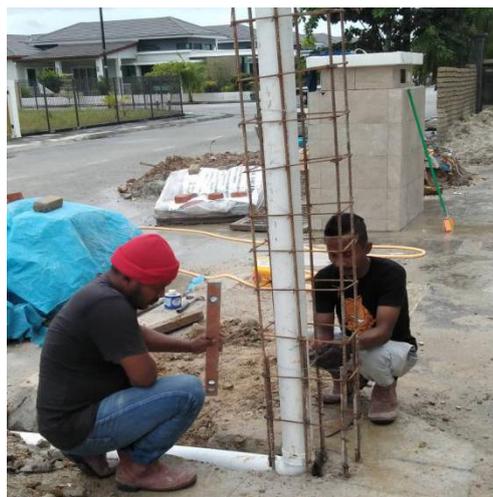


Figure 3.2.4 : Column Reinforcement Work.



Figure 3.2.5 : Rain Water Down Pipe installed

The stump reinforcement footing will be visible after the footing reinforcement has been installed, and the correct location of column can be determined. At the most basic level, the accuracy of column positioning is determined by the accuracy of the setting out work. This is why, during the foundation stage, proper setting is important. The footing reinforcement and column reinforcement are then installed by using a rebar tying hook to connect the two reinforcements. After installing column reinforcement, rain water down pipe is installed inside the column according to the height of the column. The pipe is then installed horizontally at the bottom as well as connected to the drain, to allow rainwater to flow down the pipe and into the drain.

v. Column formwork work



Figure 3.2.6 : Column Formwork Work.

To begin, three pieces of formwork are connected with nails. Then formwork is installed around the reinforcement. At the bottom of the formwork is nailed so that the formwork stands upright and strong. After that, the final piece is spliced together to cover the formwork. The formwork must be installed neatly and securely to prevent leakage during the concrete pouring process. The top of the formwork is left open for the purpose of pouring concrete.

vi. Mixing concrete work



Figure 3.2.7 : Concrete are Mixed using manual process.

When it comes to mixing concrete, the worker uses a hand mixing process which is the process of mixing the ingredients of the concrete manually without a mixer machine. The worker has to mix the concrete according to the required ratio based on the drawing plan. Concrete is mixed by hand on a hard and flat place. On the platform, a measured amount of sand is spread, and then the cement is poured over the sand. In a dry state, the sand and cement are thoroughly mixed with shovels several times until the mixture reaches an even colour throughout and is streak-free. The coarse aggregates are then spread out in a uniform layer on top of the above mixture and thoroughly mixed. After that, the entire mixture is properly blended by twisting it from centre to side, back to centre, and then to the sides several times. After that, a depression is made in the mixed materials' centre. 75 percent of the required amount of water is then poured into the depression and mixed with shovels. Finally, the

remaining water is added, and the mixing process is repeated until the concrete has a uniform colour and consistency.

vii. Pouring concrete into column



Figure 3.2.8 : Concrete is moved using buckets.



Figure 3.2.9 :Pouring Concrete work.

Concreting of column is done by manually. Worker pour the concrete that has been mixed using a bucket repeatedly until it fills the space in the column. Concrete is poured little by little then compaction is done using rods. In rodding, generally, the workers tamp a steel rod for the compaction of concrete. During concreting pouring , the temperature should be below 30 °. Lastly , check verticality and horizontally of the column after pouring and vibrating the concrete.

viii. Removal of formwork



Figure 3.2.10 :The Formwork is remove by using the hammer .

After the concrete has turned and gained sufficient strength, it is time to remove the formwork. Workers open the formwork using a hammer by removing nails. The formwork should be opened carefully so as not to damage it as it can be reused.

ix. Finishing works



Figure 3.2.11 :Column that is ready for finishing with plastering work.

Finishing works is a job in the construction process that adds to a building's visual beauty and typically requires a skilled worker. Sand, cement, and water are mixed together to make cement plaster. To begin, skilled workers use a trowel to apply cement plaster to a dust-free column, then flatten the cement layer by layer until it is neat. After that, dap the surface of the column with a sponge scrub trowel to smooth it out. It was then repeated on the other side of the wall until the plaster was completely covered.

3.3 To Identify the Problems and Solutions in Wall Construction

Problem 1: Porous in Concrete

Concrete compaction is also known as consolidation of concrete which is used to get highest density of concrete. Air bubbles develop when the fresh concrete is poured in the form. If we do not eliminate air bubbles from the concrete mix then concrete becomes porous or permeable. Porous or permeable concrete leads to the problems like corrosion.

Solution 1: Use The Right Method For Compaction

The vibration method is probably the most widely used concrete compacting technique. Internal friction between aggregate particles is reduced for a short time in this method, causing concrete mixtures to behave like liquids and gravitational force to take effect. This causes trapped air to rise, causing the mixture to settle in the formworks.

Problem 2: Cracks in Column

Column cracks can be caused by incorrect design, poor work, overloading, corrosion of reinforcement, isolated foundation settlement, creep, and shrinkage. Cracking in reinforced concrete columns is a serious issue that can result in a loss of strength, stability, and durability, as well as a negative impact on aesthetics.

Solution 2: Column need to be designed correctly

A proper design for reinforcement concrete column is important to avoid failures when column are not properly designed. Structural engineers must measure the weight supported by the column before choosing an appropriate design. The vertical forces extruding load values will determine the column design, just as they do with beams. When deciding the column size and dimensions, the impact of lateral forces because of earthquakes and wind must be considered.

Problem 3: Lack of Proper Safety Equipment

Some companies may try to save money by not wearing safety equipment, or construction workers may feel more comfortable working without it, but they do not

consider the consequences of doing so. Falls, cuts, burns, lacerations, injuries from handling heavy machinery, and building collapses are all risks that construction workers face. The workers were not wearing full Personal Protective Equipment (PPE) such as gloves, safety helmets, safety boots, and a wide range of other items, according to the observation.

Solution 3: Provide Safety Equipment

All workers should receive pre-employment and in-service training from the construction site's management. It should include training on the importance and use of personal protective equipment, as well as workplace hazards and safety procedures (PPE). For day labourers, safety is important. Every year, accidents happen in the construction industry, and many of them are caused by a lack of Personal Protective Equipment (PPE) or a failure to wear the PPE that is provided. PPE is personal protective equipment that protects workers from workplace health and safety hazards

CHAPTER 4.0

CONCLUSION

Column is important type of structural elements that play a key role in creating a safe load path to transfer the weight and forces on a structure to the foundations and into the ground. The process of installing the RC column was started from site planning , install pad footing , make steel reinforcement bar and formwork , column reinforcement work and install rain water down pipe , column formwork work, mixing concrete work , pouring concrete into column , removal of formwork and lastly finishing work.

The process took around 1-2 months starting September 2021 untill November 2021 without the finishes work. The process for pouring concrete into column are delayed a few days because of the weather and also the movement control order during the pandemic Covid-19 . Therefore , it takes more time then the estimated.

The method for RC column process in the construction are common method and it similar to the theory . There is nothing that carried out differently during the process of installation the RC column . In addition , the problem that arise such as damaged columns have been demolished and rebuilt according to the correct RC column design and other problem also be solved easily.

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