



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

**STRUCTURAL WORKS OF COLUMN AND STAIRCASE FOR
WATER TANK**

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It is recommended that the report of this practical training provided

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entitled

Structural Works of Column and Staircase of Water Tank

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

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STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references stated herein, prepared during a practical training session that I underwent at AZM Jitu Sdn Bhd for duration of 20 weeks starting from 27 August 2021 and ended on 7 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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ABSTRACT

A water tank is a storage container for water. Water tanks are used to store water for a variety of purposes, including drinking water, irrigated agriculture, fire suppression, agricultural farming, both for plants and animals, chemical manufacture, food preparation, and a variety of other applications. The water tank should be placed at the high place to make it easier for the water to flow to the consumer, so the water tank tower should be built to support the water tank. Therefore, this report will discuss about the components of the tower which are column and staircase. The objective of this report is to identify the type of material and equipment used to build these structures. It will focus on the typical material used to ensure that the column and staircase that be built are strong enough to receive the loads. On top of that, the methods of building these structures are also will be highlighted in this report so that the steps of building them are correct and in orderly manner. This report also will discuss about the problems that happened along the construction process to find the solutions to overcome them. These solutions will make the next construction process run smoothly without the same problems happen again and with that, it will make the structure of the tower in a good condition and will last longer to provide the better place for water tank to flow the water for a long time.

CONTENTS

PAGE NO

| | |
|--------------------------------------|------|
| ACKNOWLEDGEMENT | iii |
| ABSTRACT | iv |
| LIST OF TABLES | vii |
| LIST OF FIGURES | viii |
| CHAPTER 1.0 | 9 |
| 1.1 Background of Study | 9 |
| 1.2 Objectives | 10 |
| 1.3 Scope of Study | 10 |
| 1.4 Methods of Study | 11 |
| 1.4.1 Observation | 11 |
| 1.4.2 Interviews | 12 |
| 1.4.3 Document Reviews | 12 |
| CHAPTER 2.0 | 14 |
| 2.1 Introduction of Company | 14 |
| 2.2 Company Profile | 15 |
| 2.2.1 Vision | 15 |
| 2.2.2 Mission | 15 |
| 2.2.3 Objectives | 15 |
| 2.2.4 Company Logo | 16 |
| 2.3 Company Organisation Chart | 16 |
| 2.4 List of Projects | 17 |
| 2.4.1 Completed Projects | 17 |
| 2.4.2 Project in Progress | 20 |
| CHAPTER 3.0 | 21 |
| 3.1 Introduction to Case Study | 21 |

| | | |
|-------------|--|----|
| 3.2 | Material and Equipment Used to Build the Columns and Staircases for Water Tank | 22 |
| 3.3 | Method Statements of Column and Staircase Construction..... | 28 |
| 3.3.1 | Method Statements of Column | 28 |
| 3.3.2 | Method Statement of Staircase..... | 32 |
| 3.4 | Problems Occurred and The Way to Solve During Construction | 35 |
| CHAPTER 4.0 | | 39 |
| REFERENCES | | 40 |

LIST OF TABLES

| | |
|--|----|
| Table 2.1: Completed projects of AZM Jitu Sdn. Bhd | 17 |
| Table 2.2: Current project of AZM Jitu Sdn. Bhd. | 20 |
| Table 3.1: Material and Equipment..... | 22 |

LIST OF FIGURES

| | |
|--|----|
| Figure 1.1: Location of the site | 11 |
| Figure 1.2: Construction drawing | 12 |
| Figure 1.3: Site Diary | 13 |
| Figure 2.1: Company's logo | 16 |
| Figure 2.2: Company Organisational Chart | 16 |
| Figure 3.1: Construction signboard..... | 21 |
| Figure 3.2: Bar bender machine | 28 |
| Figure 3.3: Column rebars | 28 |
| Figure 3.4: Column stirrups | 29 |
| Figure 3.5: Column formworks..... | 29 |
| Figure 3.6: Scaffoldings installation | 30 |
| Figure 3.7: Column shutters installation | 30 |
| Figure 3.8: Column concrete pouring | 31 |
| Figure 3.9: Column formwork dismantling process | 31 |
| Figure 3.10: Column painting work | 32 |
| Figure 3.11: Formwork installation for soffit | 32 |
| Figure 3.12: Rebar installation to staircase | 33 |
| Figure 3.13: Sides formwork installation..... | 33 |
| Figure 3.14: Riser formwork installation | 33 |
| Figure 3.15: Concrete pouring to staircase | 34 |
| Figure 3.16: Staircase formworks dismantling process | 34 |
| Figure 3.17: Steel checking progress | 35 |
| Figure 3.18: Incorrect column rebars | 36 |
| Figure 3.19: Covid 19 cases at Bukit Sagu 07 | 37 |

CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

Columns are vertical load-bearing components that primarily support axial compressive loads (*Shaikh Tajwar Ahmed*, n.d.). This structural member is responsible for transferring the structure's load to the foundation. Beams, floors, and columns are monolithically cast in reinforced concrete structures. Tensile forces may be produced by the column's bending motion over a portion of its cross-section. Compressive forces dominate the behaviour of columns, therefore they are referred to as compression members.

There are several types of columns based on materials such as composite column, steel column, timber column, reinforced concrete column and brick column. However, in this case study report, the column that is being used to build a water tank tower is reinforced concrete column. Reinforced concrete columns are the most common type of framed structural column. As a matrix, this sort of column is made of concrete. The steel structure is reinforced. The compressive load is carried by the concrete, while the tensile load is resisted by the reinforcing. Steel, polymers, or alternative composite materials can be used as reinforcing materials. Thermal compatibility, high resistance to tensile stress, good bond to concrete, and anti-corrosive qualities are all required for a robust, ductile, and long-lasting structure.

On the other hand, entire flight of stairs connecting two floors is referred to as a staircase. A stair flight is a set of steps or stairs that connects two landings. A staircase, often known as a stairwell, is a set of stairs that leads from one floor to another and contains landings, newel posts, handrails, balustrades, and other components. A stairwell is a vertically expanding compartment in a building where stairs are put. A stair hall is a set of stairs, landings, passageways, or other parts of a public hall that must be passed through to get

from the ground level to the upper floors of a building. Box stairs are stairs that are built between two walls and are normally supported only by the wall strings.

Stairs may just go straight from one floor to the next floor, with no turns or changes in direction. Stairs can be turned around by connecting two straight stairs at a 90-degree angle landing. Stairs can also return to itself, forming a vertical stairway with 180-degree angle landings at each end of straight flights, which is popular in multistory and high-rise buildings. Circular, elliptical, and irregular constructions can be used to create a variety of geometrical stair designs (*R.E Putnam and G.E Carlson, 1974*).

The type of staircase that will be highlighted in this case study is half turn stairs. The half-turn staircase is a variation of the quarter-turn staircase. It's made up of two straight flights and two 90-degree turns. The steps and the person on them turn 180 degrees from the bottom to the top of this sort of staircase. This kind of stair creates a space advantage at the bottom, where the angle is incorporated, maximizing space that otherwise would have been wasted. The quarter turns may have angled treads or intermediate landings, and the staircase's center can be left free, allowing for a variety of styles based on the area. By lowering the tapering of the angled treads, the turns can also be curved, making the step much more comfortable and safe.

1.2 Objectives

This report is produced based on a few objectives: they are as follows.

1. To identify the types of material and equipment used to build the columns and staircases for water tank.
2. To describe the method statements of columns and staircases construction.
3. To identify the problems occurred and the way to solve during construction.

1.3 Scope of Study

The current construction project that being held by the company is to build 60,000 gallons of water tank structure that located at FGVP M Bukit Sagu 07 Estate, Kuantan, Pahang.

Instead of focusing on the whole structure of water tank, this study would like to elaborate deeper about these two highlighted structures in this case study, which are columns and staircases of water tank. In fact, this research will explain more detail about the material and equipment needed by the labors to build these two structures, also to describe more about the process of building columns and staircases from early stage until it done. However, there are several problems occurred during the construction process that are identified and there are ways that will be discussed to solve it. The figure below shows the location of the current site construction of water tank.

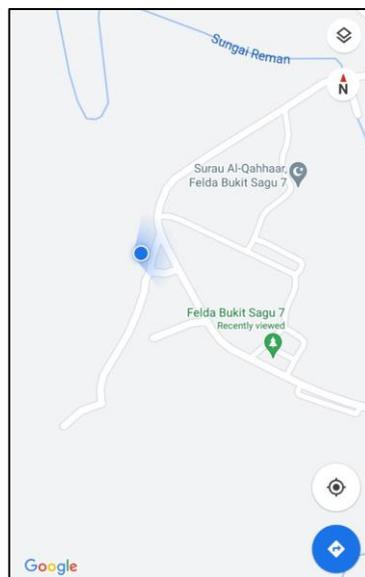


Figure 1.1: Location of the site

1.4 Methods of Study

The methods of study that are used in order to complete this case study are observation, interviews and document reviews. With these methods, there a many data and the details of the project can be collected to make this case study writing process is run smoothly.

1.4.1 Observation

During my internship period, I was placed at the construction site where it constructs the water tank structure. With that, I got the chance to see and observe on how the structure is constructs from the substructure until superstructure, especially columns and staircases

which is related to this case study topic. For this method, a smartphone device is used to capture the pictures and videos about the process of the construction. There are also short notes taken to the things that I do not know about to gain more knowledge about this topic.

1.4.2 Interviews

The type of interview that is used for this case study is unstructured interviews. During the working hours, there are several questions that has been asked to the labors about the work that they did that I do not know. With that, I can get the ideas and can imagine how the structure will be when it done. The main contractor of the project also did some explanations about the project during his site visit to give better understanding about this project.

1.4.3 Document Reviews

The document that has been reviewed to get more details about this case study is construction drawing. This drawing is the most detail source to get more information because there are the specifications provided for each of the structure, for example, the length and the width of ground beam that should be constructed. Other than that, there is also daily site report that must be filled about the works that has been done every day. From there, the information can be collected by reviewing the site daily report to know the process step by step to build the structure. The two figures below show the construction drawing and site daily report that are used to collect the informations.

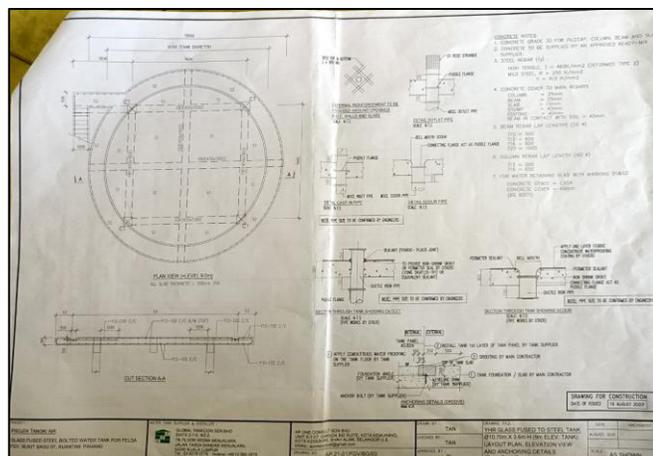


Figure 1.2: Construction drawing

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

AZM Jitu Sdn. Bhd. officially registered with the Suruhanjaya Syarikat Malaysia (SSM) on 10th February 2007. Its main activity is to carry out and provide specialized services for building construction and civil engineering works.

AZM Jitu Sdn. Bhd. is a Class 'B' CIDB 'G7' contractor registered with the Pusat Khidmat Kontraktor (PKK) and Construction Industry Development Board (CIDB). This company is led by Encik Azmi bin Abd Rashid and Encik Sharun bin Yusoff which is located at No.76, Level 1, Persiaran Damai 1, Damai Court, 28000, Temerloh, Pahang.

AZM Jitu Sdn. Bhd. formerly known as AZM Bina Enterprise, was given a new opportunity to be more productive and proactive on 30th May 2005. After taking over the AZM Bina Enterprise company, which was previously registered with the Pusat Khidmat Kontraktor in Class 'E' CIDB 'G2', AZM Jitu Sdn. Bhd. upgraded the company to Class 'C' CIDB 'G5'.

AZM Jitu Sdn. Bhd. proved its rapid growth when on 14th December 2015, it upgraded the company's value to class 'B' CIDB 'G6' and, on 19 May 2017, it upgraded the company's value to class 'A' CIDB 'G7'. In addition, the formation of this company is following the government's intention of producing visionary, diligent, and competitive Bumiputera entrepreneurs.

Therefore, AZM Jitu Sdn. Bhd. offers a combination of excellent service and improving service quality in order to attract customers and meet high demand, particularly in the construction industry, which necessitates expertise and skills in project implementation.

2.2 Company Profile

COMPANY NAME: AZM JITU SDN. BHD.
COMPANY ADDRESS: NO. 76, TINGKAT 1, PERSIARAN DAMAI 1, DAMAI COURT, 28000, TEMERLOH, PAHANG DARUL MAKMUR
TELEPHONE NO: 09-2967005
FAX NO: 09-2966005
EMAIL: azmjitu5005@gmail.com

2.2.1 Vision

To be a systematic company in all management and service activities in order to achieve the reputation of a successful Bumiputera contractor at the international level.

2.2.2 Mission

To ensure that construction works is completed professionally and on time by satisfying the customers.

2.2.3 Objectives

1. Develop construction that provides the highest level of satisfaction and customer friendliness.
2. Prioritize in aspects of quality, cost, safety, and timeliness for each construction project.
3. To develop a workforce that is highly skilled, disciplined and responsible in all aspects of the job.

2.2.4 Company Logo



Figure 2.1: Company's logo

2.3 Company Organisation Chart

According to the company organisation chart below, En. Azmi bin Abd. Rashid is the managing director of this company along with En. Sharun bin Yusoff as the director. The main project engineer is En. Mohd Ratfi bin Ahmad while under him, there is En. Omar who is the engineer and the supervisor of the student's internship. For the administration and finance part, there is Pn. Nurul Muza binti Ab Basir as the manager of the finance part.

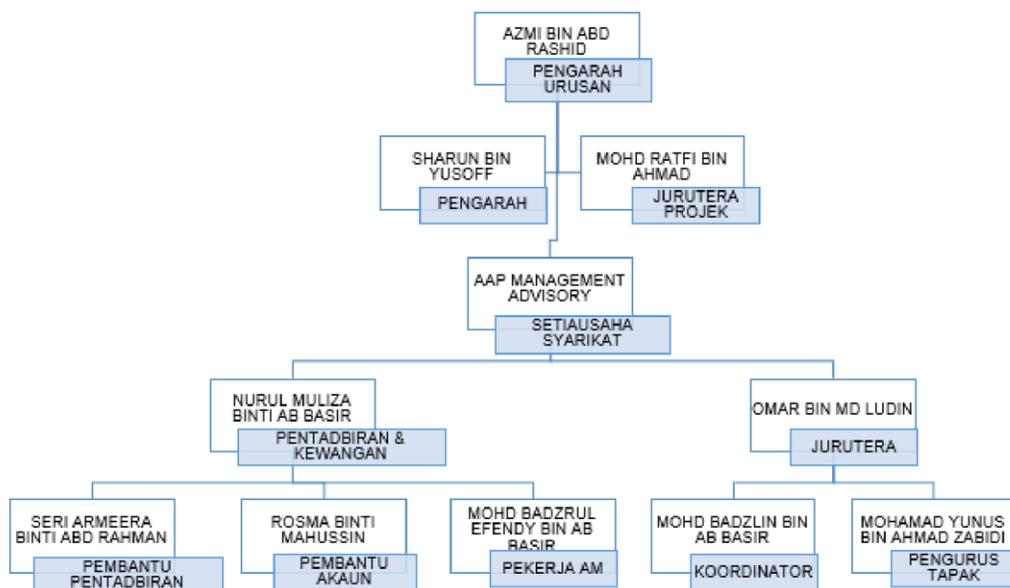


Figure 2.2: Company Organisational Chart

2.4 List of Projects

2.4.1 Completed Projects

Table 2.1: Completed projects of AZM Jitu Sdn. Bhd

| No. | Project Title | Project Value (RM) | Start Date | Completion Date | Project Duration | Client |
|------------|--|---------------------------|-------------------|------------------------|-------------------------|------------------------------|
| 1. | MEMBINA DAN MENYIAPKAN DUA (2) UNIT KUARTERS BANGLO DUA (2) TINGKAT (PERSEKUTUAN) KELAS D DI TEMERLOH, PAHANG | 823,235.90 | 09/07/2007 | 06/07/2008 | 9 MONTHS | JURUTERA DAERAH JKR TEMERLOH |
| 2. | MEMBINA DAN MENYIAPKAN SATU (1) BLOK TAMBAHAN SEKOLAH EMPAT (4) TINGKAT (RMK9) FASA 2 DI SK KUALA KAUNG TEMERLOH, PAHANG | 2,276,670.00 | 15/11/2007 | 12/11/2008 | 11 MONTHS AND 27 DAYS | JURUTERA DAERAH JKR TEMERLOH |

| | | | | | | |
|----|--|--------------|------------|------------|-----------------------------------|---|
| 3. | MEMBAIKI DAN MEMBAIKPULI H BANGUNAN ISTANA PAHANG KUALA LUMPUR | 675,000.00 | 24/11/2008 | 18/01/2009 | 1 MONTH AND 25 DAYS | JURUTERA DAERAH JKR BENTONG |
| 4. | TAWARAN SEMULA PEMBINAAN MASJID BARU KUALA SENTUL DAN KERJA KERJA BERKAITAN DI DAERAH MARAN, PAHANG | 859,410.00 | 28/04/2009 | 31/05/2010 | 1 YEAR AND 3 DAYS | JURUTERA DAERAH JKR MARAN |
| 5. | CADANGAN KERJA KERJA MEMBEKAL DAN MEMASANG KARPET UNTUK RUANG PEJABAT DI KEMENTERIAN DALAM NEGERI BLOK D1, PARCEL D, PUTRAJAYA | 2,482,710.50 | 05/10/2010 | 27/12/2010 | 2 MONTH S ABD 22 DAYS | KEMENTER IAN KESELAMA TAN DALAM NEGERI |
| 6. | TAWARAN SEMULA BAGI MEMBINA DAN MENYIAPKAN SATU (1) BLOK SEKOLAH 2 TINGKAT DI | 810,800.00 | 15/06/2010 | 16/05/2011 | 11 MONTH S AND 1 DAY | JURUTERA DAERAH JKR KUALA LIPIS |

| | | | | | | |
|----|---|------------|------------|------------|-------------------------------|--|
| | SJK (TAMIL) LADANG BENTA DAERAH LIPIS, PAHANG | | | | | |
| 7. | KERJA KERJA PEMBAIKAN RANGKAIAN PAIP PEMBENTUNG AN BAGI PROJEK PERUMAHAN RAKYAT (PPR DIMILIKI) DI JENGKA, MARAN, PAHANG | 477,200.00 | 29/01/2011 | 01/08/2011 | 6 MONTH S AND 3 DAYS | KEMENTER IAN PERUMAH AN DAN KERAJAAN TEMPATAN |
| 8. | CADANGAN MEMBAIKPULI H DAN MENAIKTARAF SISTEM LOJI RAWATAN NAJIS MHP 400F DI HOTEL SERI MALAYSIA KUANTAN, PAHANG | 308,140.00 | 27/02/2012 | 26/04/2012 | 1 MONTH AND 30 DAYS | RANGKAI N HOTEL SERI MALAYSIA SDN. BHD. |
| 9. | PAVEMENT WORKS FOR PERIODIC MAINTAINANC E WORKS 2012 (PAVEMENT) AT ROUTE FT10. SEC 80.30 – 81.10, JALAN | 418,880.00 | 19/03/2012 | 15/04/2012 | 27 DAYS | ROADCARE (M) SDN. BHD. |

| | | | | | | |
|--|--|--|--|--|--|--|
| | GEMAS – TEMERLOH, DAERAH BERA, PAHANG | | | | | |
|--|--|--|--|--|--|--|

2.4.2 Project in Progress

Table 2.2: Current project of AZM Jitu Sdn. Bhd.

| No. | Project Title | Project Value (RM) | Start Date | Completion Date | Project Duration | Client |
|-----|--|--------------------|------------|-----------------|------------------|--------------------------|
| 1. | CADANGAN MEMBINA DAN MENYIAPKAN TANGKI AIR MENARA 60,000 GALLONS SERTA KERJA KERJA BERKAITAN DI FELDA BUKIT SAGU 07, KUANTAN, PAHANG | 987,000.00 | 01/09/2021 | - | - | FGV PLANTATION SDN. BHD. |

CHAPTER 3.0

CASE STUDY ON STRUCTURAL WORKS OF COLUMN AND STAIRCASE FOR WATER TANK

3.1 Introduction to Case Study

Building a 60 000 gallons of water tank tower is the project that currently underway by the company. With RM 987,000.00 of project value, this project is estimated to complete on April 2022, however, the works are currently 58% done which is 30% ahead from the actual planning percents. Because of that, the completion of the project is estimated to complete earlier than the actual date. The client of this project is Felda Global Ventures (FGVPM) that propose the company to build the water tank tower at Felda Bukit Sagu 07 Estate, Kuantan. Since the location of the site is at the estate, the people that live at the area are the Felda's staffs and the oil palm workers, that conclude the total numbers of residents is around 200 residents.

Throughout the project, I could watch the actual scene of work progress that are carried out to build the water tank tower starting from the footings until the slab structure, such as reinforcement bars installation, formworks installations, reinforcement bars bending work and concrete pouring work. But to emphasize, I would give the focus on the column and staircase build process since it is the aim of this report. The figure below shows the construction project signboard of this water tank tower project.



Figure 3.1: Construction signboard

3.2 Material and Equipment Used to Build the Columns and Staircases for Water Tank

Table 3.1: Material and Equipment

| MATERIAL/ EQUIPMENT | PICTURES | FUNCTIONS |
|------------------------|---|---|
| Scaffolding |  | <ul style="list-style-type: none"> ▪ Scaffolding on a construction site allows workers to work in separate locations at the same time, for instance, a worker doing the column formwork installation work while the other one doing steel installation work for staircase. ▪ Transports a certain amount of construction materials to various levels of a structure, for example, the workers transferring plywood from the ground to the first level of the structure. |
| Reinforcement bars |  | <ul style="list-style-type: none"> ▪ Use in both columns and staircases structures, rebar contains ribs that mechanically attach it to the concrete for better structural holding. |

| | | |
|--------------------------|---|---|
| | | <ul style="list-style-type: none"> Absorbs the shock of an earthquake for certain time before the building collapse to give the occupants a warning to evacuate the building immediately. |
| <p>Woods and plywood</p> |  | <ul style="list-style-type: none"> Also use in both columns and staircases structures, the primary function of these materials for this project is to build formwork which is the temporary mould that support the structure when the concrete is poured and formed. |
| <p>Measuring tape</p> |  | <ul style="list-style-type: none"> A portable device that is used to determine the measurement of height, length and width of the columns to make a correct size of columns according to the construction drawing provided. |
| <p>Rebar tying tools</p> |  | <ul style="list-style-type: none"> Consists of bar tie twister and wires, these pair function is to tie up the reinforcement bars of the columns and staircases. It is to make sure that the structure is strong and can |

| | | |
|---------------------------|---|---|
| | | <p>absorb the load of water tank.</p> |
| <p>Bar bender machine</p> |  | <ul style="list-style-type: none"> ▪ Steel round bar and steel rebar can be bent using a bar bender machine. Steel bending equipment can bend bars in various arcs between 0° and 180° within a specified range of diameters. ▪ Metal bars bent into 90° are the most common bends for columns. |
| <p>Black iron pipe</p> |  | <ul style="list-style-type: none"> ▪ This material is use to build hand railing that is used while ascending and descending the staircase and around the platform level of water tank. ▪ This is to provide stability and support to avoid any injurious falls. |

| | | |
|-----------------|--|--|
| <p>Concrete</p> |  | <ul style="list-style-type: none"> Concrete grade 35 normal are used to build columns and staircases structure for this project. |
| <p>Vibrator</p> |  | <ul style="list-style-type: none"> Concrete vibrators are used to remove air pockets that can form during the concrete pouring process that can damage the structural strength of the column and staircase. Bad weather and earthquakes can cause the structure to easily break apart without the use of vibrator. |

| | | |
|------------------------------|---|---|
| <p>Taper tie lock system</p> |  | <ul style="list-style-type: none"> ▪ Taper tie lock system is a formwork attachment that is used to keep concrete wall forms firmly in place against the pressure of concrete pouring. ▪ It retain the same amount of space between the shapes, resulting in walls of consistent thickness and avoid concrete leaking. |
| <p>Paint</p> |  | <ul style="list-style-type: none"> ▪ Paint is a coating of liquid material which is used over the surface of concrete that provides a smooth and attractive surface also It protects the surface from the impacts of the atmosphere's weathering as well as other liquids, fumes, and vapours. ▪ The colour that is used to paint the column and staircase is white colour. |
| <p>Roller paint</p> |  | <ul style="list-style-type: none"> ▪ A paint application tool that is used to paint large surfaces rapidly and efficiently. |

Cement plaster



- Cement plaster is a mixture of water, fine aggregate and cement that is used to plaster the honeycomb that exist on the column and staircase surfaces to ensure that the surfaces are even and smooth.

3.3 Method Statements of Column and Staircase Construction

The detailed process of building the columns and staircases of water tank tower will be explained in this chapter.

3.3.1 Method Statements of Column

1. Reinforcement bars are bent using bar bender machine. The sizes of reinforcement bars that are used are Y32, Y25 and Y10.



Figure 3.2: Bar bender machine

2. The primary reinforcement bars with length of 4.5 meters are placed vertically at the four places of column stumps. Each column required eight numbers of reinforcement bars and tied using binding wire.



Figure 3.3: Column rebars

3. The stirrup bars were installed to the columns with the spacing between each stirrup is 200 mm. The function of stirrups installation is to hold the primary reinforcement bars properly.



Figure 3.4: Column stirrups

4. The formworks with the height of 4.5 meters are installed properly using hammer and nails by the workers.



Figure 3.5: Column formworks

5. To continue the works at the next 4.5 meters' height, the workers installed the scaffoldings to allow workers to do works at the high place sufficiently.



Figure 3.6: Scaffoldings installation

6. After the scaffoldings already being installed, step 2, 3 and 4 are repeated to build the column with the total height of nine meters from the ground.
7. Column shutters are installed absolutely straight and plumb, with enough supports to keep the structure in place before and after concreting.



Figure 3.7: Column shutters installation

- The concrete was poured into the structure using crane and vibrated them using vibrator to avoid honeycomb to happen to the structure. The grade of concrete used for this structure is grade 35 normal ready-mix.



Figure 3.8: Column concrete pouring

- The structure was left for several days for the concrete to harden fully and after that, formworks are dismantled from the structure carefully.



Figure 3.9: Column formwork dismantling process

- The defect that happened at the columns are plastered using cement to create an even and smooth surface.

11. The columns were painted using interior emulsion paint to make them look nice and long-lasting by giving the protection from the environmental factors.



Figure 3.10: Column painting work

3.3.2 Method Statement of Staircase

1. The sawn formworks are formed to the slopping soffit of staircase for the first and second flight together with the timber strut to support the formwork.



Figure 3.11: Formwork installation for soffit

2. Mild steel and high tensile reinforcement bars are installed to flight and landing slab of staircase using binding wires together with spacer block.



Figure 3.12: Rebar installation to staircase

3. The sawn formworks are installed to sides and soffit of staircase landing slabs together with timber struts to give sufficient support to the formwork.



Figure 3.13: Sides formwork installation

4. Sawn formworks are formed to receding riser of staircase with 180 mm high.

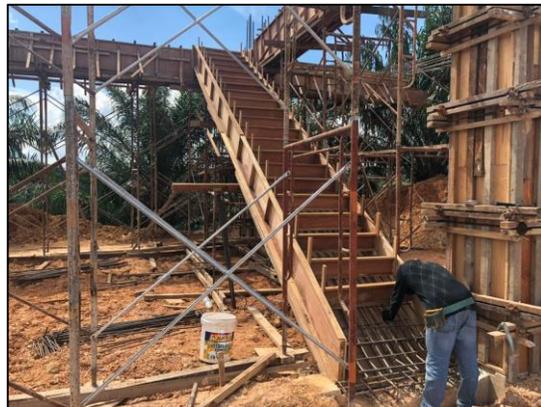


Figure 3.14: Riser formwork installation

5. The grade 35 normal ready mix concrete are poured into the formwork using crane bucket and vibrated using vibrator.



Figure 3.15: Concrete pouring to staircase

6. After the concrete already harden for several days, the formworks are dismantled carefully by the labours.



Figure 3.16: Staircase formworks dismantling process

7. The defects on the staircase surfaces are plastered using cement plastering and painted the staircases' side surfaces using interior emulsion paint.

3.4 Problems Occurred and The Way to Solve During Construction

❖ Lack of labours skills

Construction is a highly prestige business. Someone like to work with people they are familiar with and trust. This is frequently a good thing, as teams that know how to work together can be quite productive and efficient. However, if the team has a skills gap, it may create considerable delays. The unskilled labours can only started the works when the skilled labours or sub-contractor present, otherwise, they cannot continue the progress of the construction by themselves. In every construction projects, it is a must for the skilled labours to have the unskilled labours to work with them as their helper, but if the unskilled labours cannot do the works properly, it may cost the delay to the work progress. In this case, the unskilled labours doing the reinforcement bars tying works with idle as there were several reinforcement bars that supposed to be tied were left untied. As a result, when the engineer came to the site for steels checking progress, they have to tie the reinforcement bars again and it delayed the concrete pouring work and consuming much time to repair it.

The overcome this problem, it is a must to recheck the work progress several times before site visit by the engineer is done. The skilled and unskilled labours checked the progress two times to make sure that there were no unfinished works such as untied reinforcement bars and the formworks were not installed properly that avoid any problems to the structure in the future. The figure shows that the site visit by the engineer before the labours were asked to redo the works.



Figure 3.17: Steel checking progress

❖ Poor communication

Communication is the most important tool in doing any jobs as a team, especially in construction works. Important work can fall through the gaps if there isn't clear and effective communication, and the team may be unaware of an issue until it's too late to fix it. The thing that happened during this project is the skilled labours asked the unskilled labours to install the Y32 size of rebar, however, the unskilled labours miscommunication and installed the Y25 size instead. When the skilled labours came on the next day, they cannot continue to install the inner part of rebar because of wrong main rebar installation. They have to change the main rebar first that cost them half of a day working and delayed the progress.

To avoid this problem to happen again, before the labours started their works in the morning, the skilled labours will have a little discussion among them to explained what type of works and the types of equipment and materials that will be used on that day. These are to ensure that there will be no more miscommunication among them. Fortunately, the works were run smoothly onwards. The figure below shows that the incorrect reinforcement bars that were installed by the labours.



Figure 3.18: Incorrect column rebars

❖ COVID 19 cases outbreak

Doing the construction project during Coronavirus (COVID 19) season is a very hustle and might be dangerous. Since the construction site is at Felda Bukit Sagu 07 Estate, the

labours were living among the other palm oil workers and there were several positive cases founded at the estate and the Felda Bukit Sagu 07 Estate was closed for two weeks and all works cannot be carried out during that period, including this construction project. So it affected the progress as it delayed so much time.

During the Coronavirus (COVID-19) pandemic, construction sites must protect their workers by implementing measures to reduce the risk and spread of infection. Cleaning, disinfecting, and other maintenance and security services are critical to protecting the public health by reducing COVID19 infections. For example, personal items or supplies such as phones, pens, notebooks, tools, and PPE should not be shared, clean and disinfect frequently touched objects and surfaces, as well as all reusable personal protective equipment (PPE), handshakes and other common physical greetings should be avoided and maintain a physical distance of at least two meters from others. The figure shows the table of total numbers of Covid 19 cases at Bukit Sagu 07 Estate.

| BIL | KUANTAN | JUMLAH KES |
|-----|--|------------|
| 56 | Perkampungan Cenderawasih | 5 |
| 57 | Apartment Desa Samudera, Bandar Indera Mahkota | 1 |
| 58 | Taman Shahzan Bandar Indera Mahkota | 1 |
| 59 | Bandar Indera Mahkota | 6 |
| 60 | Bandar Indera Mahkota 2 | 2 |
| 61 | Indera Mahkota 6 | 1 |
| 62 | Taman Mahkota Permai | 5 |
| 63 | Kg Peramu | 5 |
| 64 | Kompleks Sri Meranti | 4 |
| 65 | Perumahan Kilang Sawit Bukit Sagu | 1 |
| 66 | Felda Bukit Sagu 1 | 1 |
| 67 | Ladang Bukit Sagu 8 | 23 |
| 68 | Felda Bukit Sagu 6 | 21 |
| 69 | Ladang Bukit Sagu 7 | 51 |
| 70 | Taman Gambang Damai 1 | 1 |
| 71 | Kampung Gelugor, Gambang | 1 |
| 72 | Kampung Jaya Gading | 3 |
| 73 | Kuaters Bukit Ubi | 1 |
| 74 | Astaka Vilage, Kempadang Utama | 1 |
| 75 | Tmn Kempadang Makmur Fasa 2 | 4 |
| 76 | Kg Kempadang | 11 |
| 77 | Taman Balok Sejahtera | 1 |

Figure 3.19: Covid 19 cases at Bukit Sagu 07

❖ Rainy weather

Construction preparations might be severely disrupted by bad weather. This can be really troublesome when the construction project is done during monsoon season, around

the end of the year because the rain always occurs almost every day at the site. Heavy rain reduces visibility for labours to do the works and can cause less than ideal working conditions. The rain that cause the soft soil conditions and mud make the work will be difficult to carry on and lastly, the work cannot be done at all.

To avoid the delay of the work process because of heavy rain, the construction company must take part of this by make a plan ahead of time and keep alert about weather conditions. The weather is unpredictable, but a proper and accurate planning can assist the labours in optimizing their plans and resources to accommodate anticipated delays. For example, train labours to do their tasks more quickly and efficiently or not starting any construction project during monsoon season.

CHAPTER 4.0

CONCLUSION

To draw the conclusion, columns is the most important component in building structure to make the building can stand still for a long time by receiving the compressive loads by the water tank and the weight of the water. Reinforced concrete column, as an economic building material, is very popular nowadays and it is commonly used in a variety of structures all around the world. It is because the components work together to resist many type of loading compared to other types of column. Hence, to build the perfect reinforced concrete column, the workers should work together and have a good communication between workers to avoid any misunderstanding that lead to incorrect uses of materials and equipment.

On the other hand, the staircase is really a must build structure if the building has many levels. This is to ease the people to move from another level to another level by using the stairs. Despite of having different types of staircase, half turn staircase is the most common used for many structures, especially for this water tank tower project. Despite of the difficulty and require many extra support to build this type of staircase, it really easier to include into architectural plans. They are architecturally interesting and have a landing area that can be used as a rest stop if the structure has many levels.

REFERENCES

- 10 DIFFERENT TYPES OF STAIRS COMMONLY DESIGNED FOR BUILDINGS. (2015, September 28). *CivilBlog.Org*. <https://civilblog.org/2015/09/28/10-different-types-of-stairs-commonly-designed-for-buildings/>
- Bar Bending Machine Supplier | Advanced Technology & Durable Material. (n.d.). *Ellsen Bending Machine*. Retrieved November 22, 2021, from <https://ellsenbendingmachine.com/bar-bending-machine/>
- Column and Beam system in construction—Basic Civil Engineering*. (n.d.). Retrieved October 14, 2021, from <http://basiccivilengineering.com/2015/03/column-and-beam-system-in-construction.html>
- Concrete Column Failure Types*. (n.d.). Retrieved November 30, 2021, from <http://constructioncost.co/method-statement-for-column.html>
- How to Construct Concrete Stairs?* (2018, October 24). The Constructor. <https://theconstructor.org/practical-guide/concrete-stairs-construction/26064/>
- Sautya, M. (2019, September 8). *6 Functions of Paint*. Civil Engineering. <https://civilnoteppt.com/6-functions-of-paint/>
- Stairs. (2021). In *Wikipedia*. <https://en.wikipedia.org/w/index.php?title=Stairs&oldid=1049402426>
- TISCON, T. (2016, December 26). Functions of Rebar in Construction World. *Medium*. <https://medium.com/@tatatiscon/functions-of-rebar-in-construction-world-dbc23846b302>

Types and Uses of Concrete Vibrators. (n.d.). Tomahawk Power. Retrieved November 24, 2021, from <https://tomahawk-power.com/blogs/articles/types-and-uses-of-concrete-vibrators>

Types of Form Ties Used in Formwork. (2018, November 30). The Constructor. <https://theconstructor.org/building/formwork-shuttering/form-ties-types-formwork/26902/>

Types of staircases | Davibois. (n.d.). Retrieved October 14, 2021, from <https://davibois.com/en/content/types-staircases>

What are the functions of the scaffold? (n.d.). *ACE Scaffolding Brighton.* Retrieved November 3, 2021, from <https://acescaffolding-brighton.co.uk/scaffolding-hire/suspended/what-are-the-functions-of-the-scaffold>

What is Column? 19 Types of Columns - Civil Engineering. (n.d.). Retrieved October 14, 2021, from <https://civiltoday.com/construction/building/384-what-is-column-types-of-columns#Types-of-Columns>

What is the purpose of measuring tape? (n.d.). Retrieved November 22, 2021, from <https://askinglot.com/what-is-the-purpose-of-measuring-tape>