**DEPARMENT OF BUILDING**

**UNIVERSITI TEKNOLOGI MARA**

**(PERAK)**

# WALL CONSTRUCTION

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**FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING**

**UNIVERSITI TEKNOLOGI MARA**

**(PERAK)**

**SEPTEMBER 2021**

It is recommended that the report of this practical training provided

**By**

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**Entitled**

**Wall Construction**

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

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**DEPARTMENT OF BUILDING**

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**(PERAK)**

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## STUDENT 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 Syarikat Perumahan Negara Berhad (SPNB) for duration of 20 weeks starting from 23 Ogos 2021 and ended on 7 January 2022. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfilment of the requirements for obtaining the Diploma in Building.

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Finally, I dedicated this to my beloved family and to my siblings for their endless love, prayers, and encouragement.

Thank you so much

## ABSTRACT

Wall could be a structural feature that divides or encloses an area and, in building construction, forms the space or building's perimeter. Traditional masonry construction required exterior walls to support the burden of floors and roofs, but modern steel and reinforced concrete frames, moreover as heavy timber, and other skeletal structures, only require exterior walls for shelter and sometimes do away with them entirely on the bottom floor to permit easier access. This report will discuss about wall construction. This report was conducted for the development of Single Storey House at GM 3652, Lot 14898, Mukim Kadok Dalam, Kota Bharu, Kelantan. the target of this report is to research the development of wall and therefore the way how it disbursed. it'll specialise in the entire process of wall construction. It also investigates the equipment and machinery within the methods of wall construction and to see the time that are used for the development. This report also will look to at the matter and the solution in wall construction that might fulfil the factors of wall.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Background of Study

A wall is a structure and a surface that defines an area, supports a load, offers security, shelter, or soundproofing, or is aesthetically pleasing.

A wall which doesn't help the structure to stand up and holds up only itself is known as a non-load bearing wall. It doesn't support floor roof loads above. It is a framed structure. Most of the time, they are interior walls that separate a structure into rooms. They are built lighter. One can remove any non-load bearing walls without endangering the safety of the building. Non-load bearing walls can be identified by the joists and rafters. They are not in charge of the property's gravitational support. It is inexpensive. This wall is known as the curtain wall.

Second, non-bearing walls, used where loads are carried by girders, beams, or other members, are called curtain walls, they are attached to the frame members. Any durable, weather-resisting material glass, plastic, metal alloy, or wood may be used, since non-bearing walls are freed from the limitations of structural requirements.

Third, there are such type of non-load bearing wall. The type is Hollow Bricks Wall, Hollow, Concrete Block Wall, Facade Bricks Wall, Brick Walls. Hollow Bricks, we are enjoying natural life. These will reduce the use of heating and refrigeration equipment. They are well-used and reliable. Hollow bricks are productive on the bill. These hollow clay blocks are an advancement in the building field.

Next, Hollow Concrete Block. The concrete building walls are rendered empty. It has a great power advantage. It gives stability, without any material waste. Concrete blocks consist of Portland cement and aggregate, sand and gravel can be used in the high-density blocks, whereas low-density blocks use industrial waste instead of aggregate. Lightweight blocks are constructed from aerated concrete. Hollow concrete blocks are created, cured, and healed until they reach the site and are a very durable and strong material.

Facade Bricks. It is strong, robust, and almost maintenance-free. In this brick, shades don't sacrifice their radiance. The bricks on the exterior are environmentally sound and reusable. Brick Walls: It is a block or wall made of brick which is immovable. Brick walls are easy to mount.

Lastly, applications of Non-Load Bearing it doesn't fit overloads on the ground-roof. The structural framing method is not an integral part of this. One can remove any walls bearing no-load without losing the safety of the house. The joists and the rafters will classify walls that are non-load bearing. That not responsible for aiding the gravity of the land. Most of the time, these are internal walls designed to separate the floor into spaces. It made lighter for taking down the dead load of the structure. There are many types of non-load bearing wall in theoretically. However, the aim of this report is to discover the masonry/brick wall process in the construction.

## 1.2 Objectives

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

- To identify the methods of wall construction process.
- To determine the time of wall construction process.
- To identify the problem and solution in wall construction.

## 1.3 Scope Study

The scope of study has been carried out at GM 3652, Lot 14898, Mukim Kadok Dalam, Kota Bharu, Kelantan. The project had started on 13 September 2021 and will be completed on 15 Disember 2021. The construction is a construction of One Storey Building House called RUMAH MESRA RAKYAT and cost seventy-five thousand (RM 75,00), The project is still under progress. As a result, the study's main goal is to figure out on how the wall construction process is undertaken. As a result, the research will cover not only the method of wall bricklaying, but also the benefits of stretcher bond in building, wall finishes, and technology and tools. In addition, this study included the problems and solution. Despite this, the study does not focus on the quantity of manpower or labors, the costs, and the duration matters. Observation, interview, and document reviews are the three approaches that must be used to complete the data. Finally, all further explanations pertaining to the preceding procedure were provided as follows.

## 1.4 Method of Study

1. Observation

   Observation is a method of gathering facts through observation. The observation pertains to the wall construction process, which begins with the ground beam process and ends with the wall finishes.

2. Interview

   The interview is one of the methods for gathering construction data by conducting a structured or semi-structured interview with a project's trusted person. It was

completed while making observations and working on the job site. The interview was held with the firm manager, who is also the contractor in charge of managing the project on the job site. Workers who were working on brick ties at the construction site were also interviewed. Every week in the office, semi structured interviews with the contractor in charge of the project were performed, which lasted about 10 - 15 minutes on average. Short notes were taken during the semi-structured interview.

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 wall construction process. The pictures that belong to others also the best reference during the document reviews. This document reviews placed at the office.

# CHAPTER 2

# COMPANY BACKGROUND

## 2.1 Introduction of company

SPNB (Syarikat Perumahan Negara Berhad) is responsible for the Rumah Mesra Rakyat (RMR) and Kediaman SPNB affordable housing projects in Malaysia. Time to find out about this company which has built more than 42,000 units of affordable housing since 2002. SPNB was established under the Ministry of Finance (MOF) on 21st August 1997. Its establishment is none other than to provide quality and sustainable affordable housing to every family in Malaysia in line with the National Housing Policy. On 2002 SPNB introduces the Terengganu Fishermen's Family House Scheme. The program is designed to help low -income groups, especially fishermen, to build houses on their own land. The government bears a subsidy of 1/3 of the house price to ensure the price is affordable.

Next, the program was later changed to Rumah Mesra Rakyat (RMR). Since then, SPNB has completed more than 40,000 RMR units. The National Disaster Management Agency - NADMA (formerly known as the National Security Council) has appointed SPNB as the implementation agent to provide homes for flood and tsunami victims in Kedah, Penang and Acheh in 2004. On 2008 NADMA has appointed SPNB again to develop houses for flood victims in Johor, Pahang, Kelantan, and Sabah. Won the Best Affordable Home Developer at the Property Insight Prestigious Developer Award (PIPDA) 2016.MOU with CIDB to implement a Quality Assessment System for Building Construction Works (QLASSIC) to measure the quality of construction projects.

## 2.2 Company profile

SPNB KELANTAN located at SPNB KOTA BHARU, 5231e, Jalan Hamzah, Bandar Kota Bharu, 15050 Kota Bharu, Kelantan


Figure 2.1: location of Syarikat Perumahan Negara Berhad Cawangan Kelantan

https://www.google.com/maps/@6.0449132,102.2433484,15z

SYARIKAT PERUMAHAN NEGERA BERHAD known as SPNB responsible for the Rumah Mesra Rakyat (RMR) and Kediaman SPNB projects. Offering a wide range of housing that prioritizes a sustainable environment for its residents, it has built over 42,000 affordable housing units since 2002. The RMR program was created to help low -income groups such as fishermen, farmers and poor families who do not have a house or live in dilapidated houses but have land to build their own houses. SPNB also has another scheme called "KEDIAMAN SPNB" which emphasizes a sustainable environment and a harmonious atmosphere for its residents with various attractive facilities.

LIST OF PROJECTS

2.1 Completed Project

| NO | PROJECT TITTLE | PROJECT VALUE | START DATE | COMPLETION DATE | PROJECT DURATION |
|---|---|---|---|---|---|
| 1 | TAMAN BATOR HARMONI (BACHOK) | Twenty-two million Malaysian Ringgit (RM 22,000,000.00) | 2 July 2009 | 18 August 2011 | 2 years |
| 2 | TAMAN PERISAI WIRA (KUALA KRAI) | twenty -four million six hundred thousand Ringgit Malaysia (24,600,000.00) | 7 May 2007 | 18 September 2010 | 3 years |
| 3 | TAMAN BATOR HARMONI (KOK LANAS) | seventy -two million, five thousand three hundred and ninety -nine Malaysian Ringgit (RM72,005,399.00) | <u>Phase 1</u><br>18 May 2010<br><br><u>Phase 2</u><br>18 March 2013 | <u>Phase 1</u><br>31 May 2013<br><br><u>Phase 2</u><br>10 October 2013 | 3 years |
| 4 | TAMAN SRI BAYU TUMPAT | Phase 1<br>Forty -four million, four hundred and fifty -three, two hundred and fifty Malaysian Ringgit (RM44,453,250.00)<br><br>Phase 2<br>thirty -seven million, three hundred and thirty -nine thousand | <u>Phase 1 (A)</u><br>12 November 2008<br><br><u>Phase 1 (B)</u><br>12 November 2009<br><br>8 August 2012 | <u>Phase 1 (A)</u><br>15 August 2014<br><br><u>Phase 1 (B)</u><br>30 Jun 2015<br><br>31 December 2015 | 6 years<br><br>6 years<br><br>3 years |

| | | | | | |
|---|---|---|---|---|---|
| | | six hundred Malaysian Ringgit<br><br>Phase 3<br><br>Thirty-one million Ringgit Malaysia | 25 May 2015 | 21 September 2017 | 2 years |

2.2 Ongoing Project

| NO | PROJECT TITTLE | PROJECT VALUE | START DATE | COMPLETION DATE | PROJECT DURATION |
|---|---|---|---|---|---|
| 1 | APPARTMENT MADINAH AL-SALAM, ISLAMIC CITY, TUNJUNG | Thirty - three million, four hundred and seventy thousand Malaysian Ringgit | 13 dec | In construction | |

## 2.3 Organizational chart

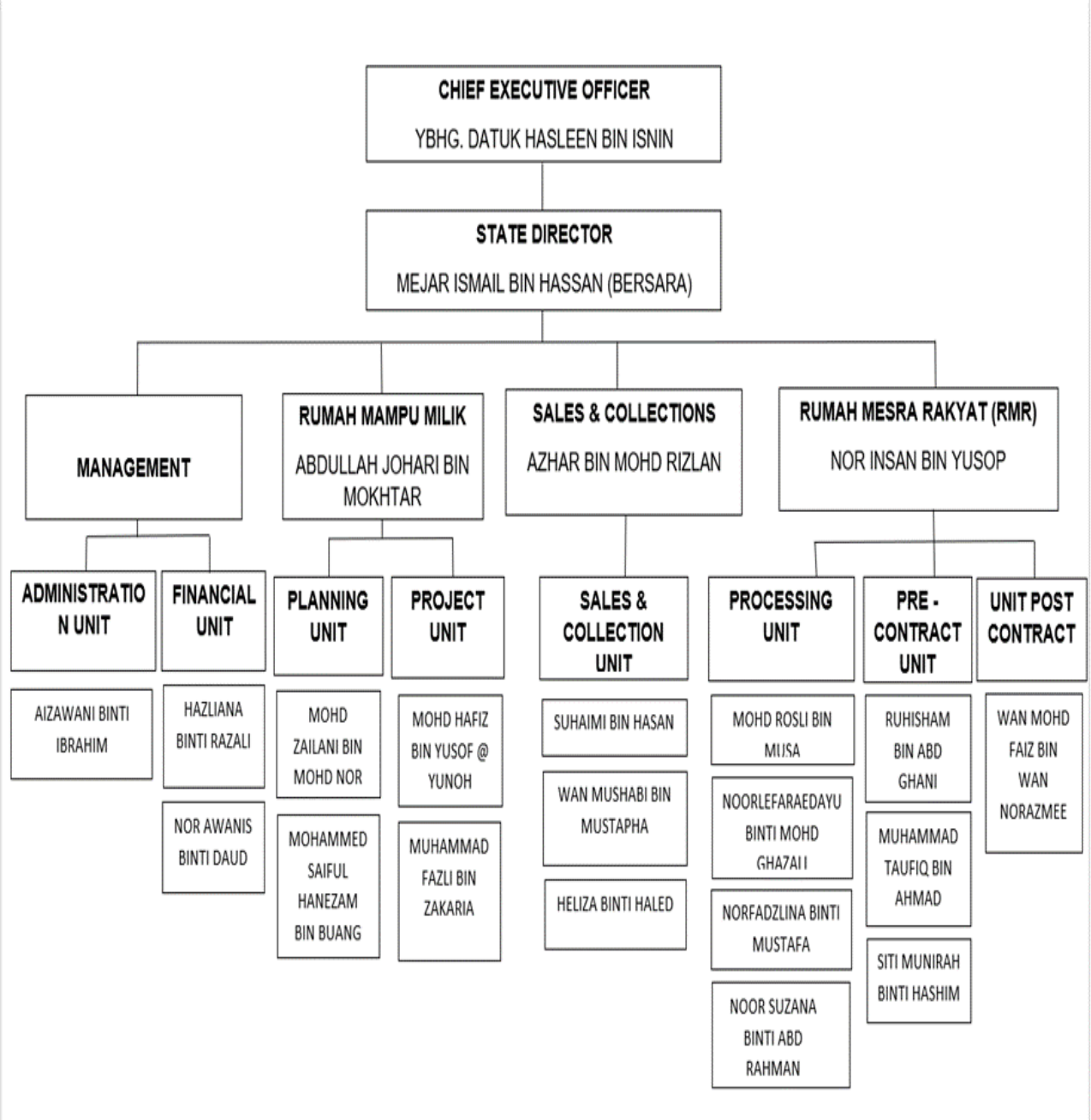


Figure 2.2: the figure show organization chart of this company

# CHAPTER 3

# CASE STUDY

## 3.1 Introduction to case study

The case study is about wall construction (non-load bearing wall). The project where has started the construction on 13 September 2021 and predictions will be completed on 15 Disember 2021. The cost of construction approximately seventy-five thousand (RM75,00). 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 does not concentrate on cost matters and manpower. The site location took place at the GM 3652, Lot 14898, Mukim Kadok Dalam, Kota Bharu, Kelantan.

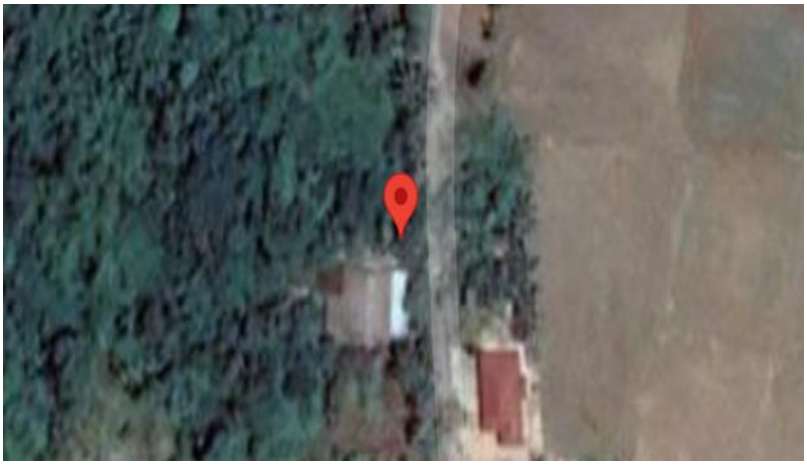

Figure 3.1: location of site construction

https://www.google.com/maps/@6.0449132,102.2433484,15z

The project construction located at GM 3652, Lot 14898, Mukim Kadok Dalam, Kota Bharu, Kelantan. The close building to this construction area Mosque Kampung Kadok Dalam. The area is quite secluded as it is still surrounded by forests. There are several existing housing buildings close to the construction area.

The activities that have been carry out on the site is wall construction process. This uneasy work needs to be handled by skilled workers to get a perfect wall bonding.

There are also several unskilled workers that help mix the mortar and bring it with the bricks to the construction site to save the time of bricklaying process. The machineries and tools that involved in this construction are wheelbarrow, trowels, hawks, scaffolding, spirit levels, concrete mixers, brick bolsters, bucket, brick line and pins, brick hammer, shovels, and measurement tape.

Next, time is very important for the success of a construction. By referring the drawing plan of the building, the length of the building is 1000 square feet. There were many partitions in this building such as 3 rooms with 2 bathrooms, one of it was master bedroom and guestroom. Besides, there was also living area, and kitchen. First thing first to do when to start wall construction work, the columns and the roof beam must have been done first. The string will be attached with the brick pin and pulled from each column to another column to make a line as a mark for bricklaying work. The brick will be tied up together guided from the string to get a straight wall. This process will take a long time as it requires precision. Therefore, the time used for the brick laying process will be recorded started from the first process of bricklaying until the wall finishes process.

Finally, the problems of bricklaying process will be determining throughout the construction process. The solutions of the problems also will be state after determining the problem of the process. This chapter will be focused on the method of bricklaying, the time that have been use for bricklaying process and the problem and solution.

## 3.2 To identify the methods of wall construction process

**PLAN OUT THE WALL**

Figure 3.2: Brick that used for the construction.

First, plan out the wall by referring the length and height of each wall in the building on the drawing plan from floor plan and elevation plan. The length of building was used from the value inside the floor plan that already state it. Meanwhile, the height value of wall was measure from ground floor until the roof beam of building in the drawing plan. After planning out and calculate the amount of brick that need to be used by using a calculator, purchase the right type and amount of the brick at the hardware. The amount was included 5% of wastage.

**CLEAN THE FLOOR**

Figure 3.3: The floor of building that have been cleaned before bricklaying process.

The floor is swept with a wire broom and all unnecessary items was removed from the place where the bricks will be fastened. Clean floor surfaces are very important in the process of tying brick wall to make it easier for workers to tie bricks on a flat surface and avoid any obstacles during the process. It was easy for workers to pile all the bricks on the floor when the floor is already clean.

LIFT THE BRICK

Figure 3.4: The brick that lifted from stockpile to the construction site.

The workers were lifting the bricks using a wheelbarrow from the stockpile to the construction site. Bricklaying work is easier once the bricks have been lifted and

brought into the construction site. Time can be saved when using a wheelbarrow to lift bricks from stockpile.

MIX THE MORTAR

Figure 3.5: Mortar are mixed by hand using a shovel

Some workers mix cement mortar using a concrete mixer with a mortar ratio of 1: 3 i.e., cement: sand. This worker will mix mortar while another worker lifts the bricks to save time. These 1: 3 ratio mortars will be used as joints for each other bricks. The mortar was put inside the concrete buckets and brought to the wall construction site after finished mix the mortar with the concrete mixer by using a shovel.

PIN AND LINE

Figure 3.6: Strings that pinned together in between column.

The line for bricklaying wall were marked using a string which were pinned in between two columns of building. Strings are installed at every distance of one meter on column of the building from the floor level to the roof beam as a guide for workers during the wall bricklaying process.

WALL BRICKLAYING PROCESS

Figure 3.7: Bricklaying wall process

A small bed or mortar for the first brick to line on were layer over damp proof course by using the trowels and hawks. Next, a small amount of mortar was placed on the top of the first brick by using the trowel and placed another brick on the top of it at a downwards angle guided by the line from the strings that have been pinned in between

of the column of the wall. The brick is trapped using a trowel handle to level the position of the brick after stacking with each other. After that, a slab of mortar was coat at the end of the brick and pushed against the first lay of brick by using the trowel.

Figure 3.8: The window opening part of the wall.

Figure 3.9: The door opening part of the wall.

Figure 3.10: The lintels that used as a load support at the top of opening parts.

The opening part such as windows and door's part were leaved it empty for the windows and doors frame after measured it with the measurement tape based on the length of the opening that stated inside the drawing plan. The brick will be laid at the top of lintel that fix at the top of the opening parts to support the load from the roof.

FINISHES WORK

Figure 3.11: Plastering wall process

Figure 3.12: The wall after plastering process finish.

Plastering is one of the finishes processes for the wall in construction. The wall was cleaned and free from dust and any loose parts of mortar from bricklaying process. The water was sprinkled over the surface of the wall to ensure better sticking of the plaster. The process started by lay the plaster and distributed it on the trowel evenly over a certain area at the top of the wall. It repeated with the other area until the wall fully covered with the plaster.

## 3.3 To Determine the Time of Bricklaying Wall Process

Time for completion is an important concept in contracts. When a time limit is attached to an obligation under a contract, failure to complete that obligation within the time prescribed is usually a “material” breach of contract and the other party may be entitled to damages. If no time obligation is added, then the default position is usually that the allowance must be reasonable, or in some cases time is said to be “at large” and it is not considered relevant.

There are several reasons why the work has been delayed, and it is not always the contractor’s fault. Hold ups can be caused, for example, nature can often be an unwelcome intruder on a construction project.

For the bricklaying construction in this project, it supposed to take around 2 weeks but overall, it took around 2 - 3 weeks to finish the wall construction without plaster finishes. Throughout the construction there are some natural obstacles such as rainy day and the pandemic of Covid-19 that control the movement of construction. Those obstacles were the reasons why the work has been delayed.

The bricklaying process for The Construction of One Storey at GM 3652, Lot 14898, Mukim Kadok Dalam, Kota Bharu, Kelantan started from 3 September until 17 September 2021. The time of bricklaying wall process recorded by observation and the pictures took by a smartphone. Floor and elevations plans used as references during the brickwork process to get the measurement of the brick wall.

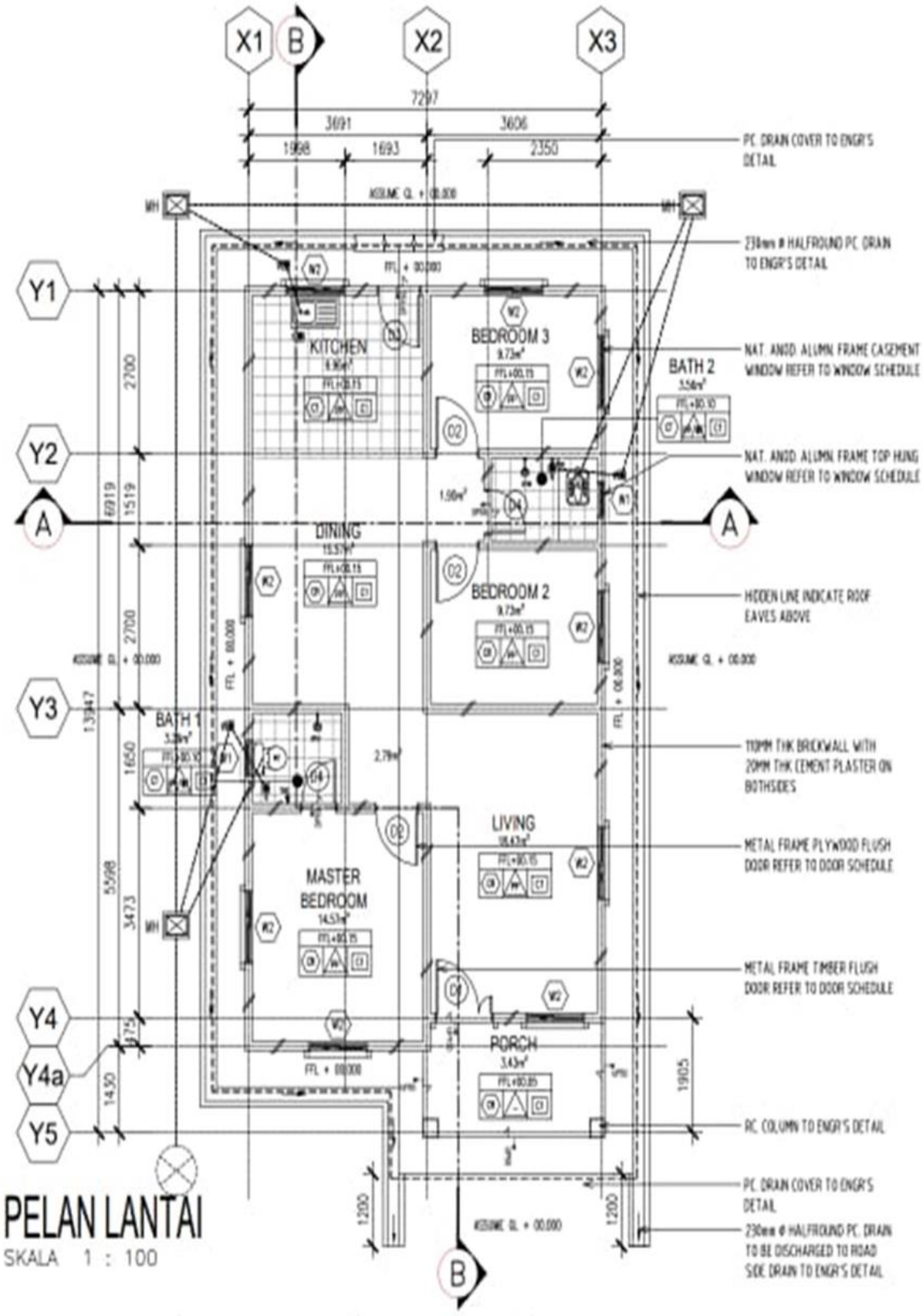


Figure 3.13: Floor Plan

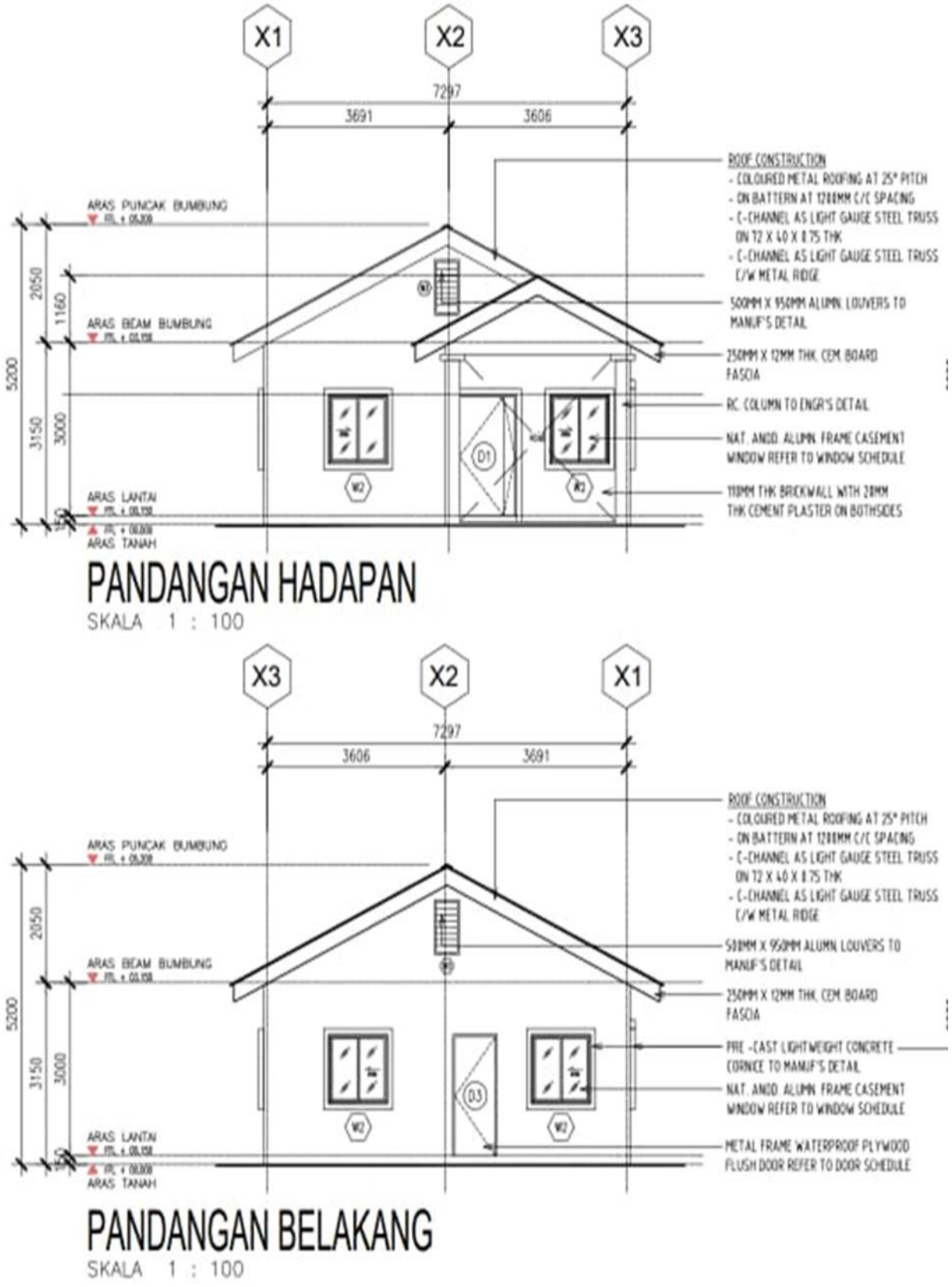


Figure 3.14: Front and Rear Elevation Plan

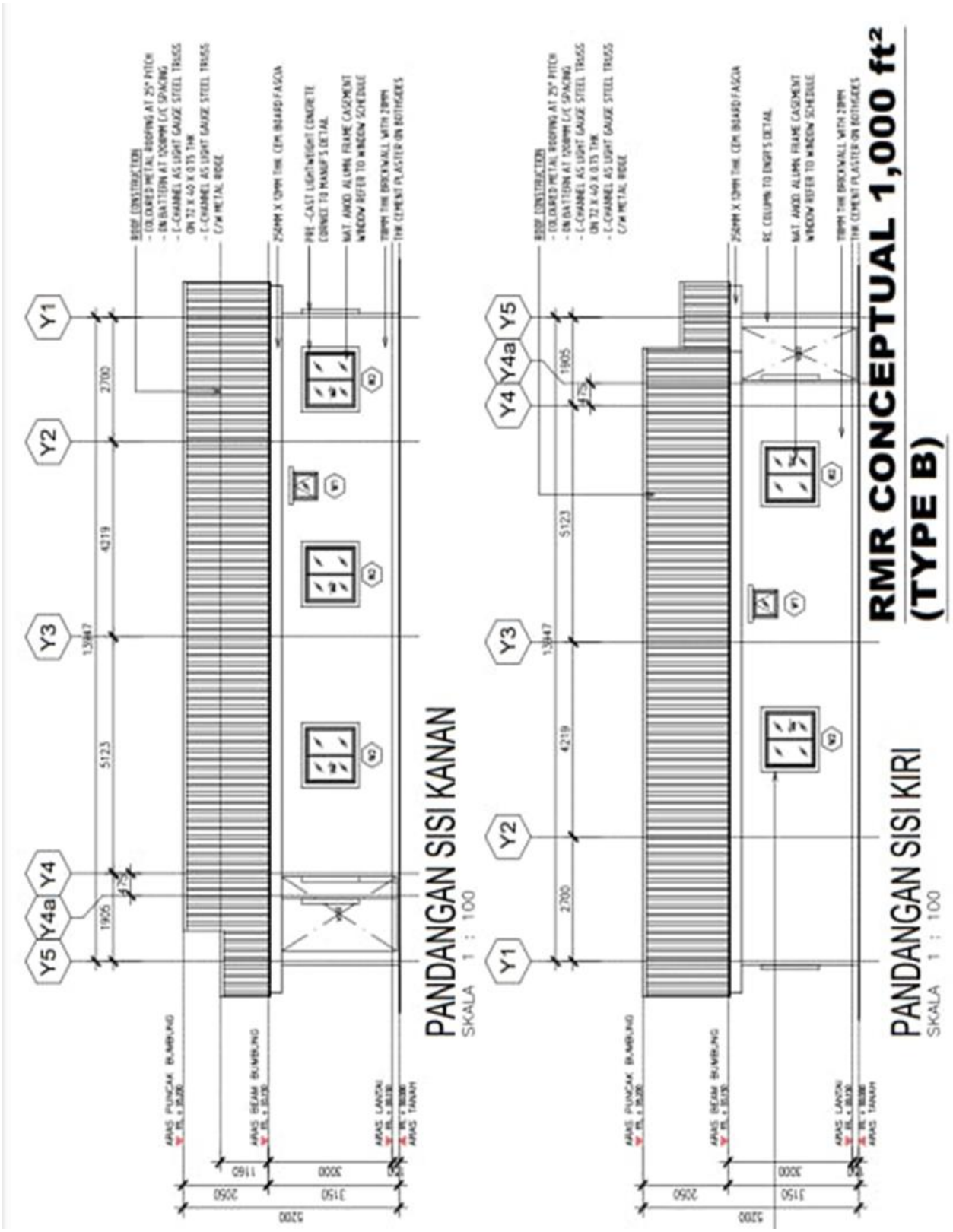


Figure 3.15: Left and Right Elevation

The bricklaying wall construction started on 3 September 2021 until 17 September 2021.

3 September 2021 – 5 September 2021

Dry and wet kitchen

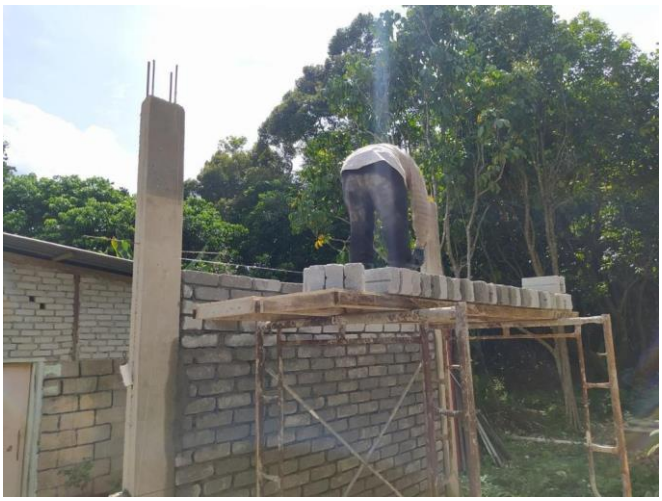

Figure 3.16: the bricklaying wall construction started with kitchen section

Figure 3.17: The kitchen area

6 September 2021 – 8 September 2021

3 Bedroom area

Figure 3.18: the bricklaying for 3 bedrooms area

Figure 3.19: the bricklaying process for opening section

12 September 2021 – 14 September 2021

Dining area

Figure 3.20: the bricklaying process at dining area

15 September 2021 – 16 September 2021

Family area

Figure 3.21: the bricklaying process at family area

7 September 2021

2 Bathroom

Figure 3.22: The Bricklaying process at bathroom area

## 3.4 To Identify the Problems and Solutions in Wall Construction

Problem: Unstraight Bricklaying Level

The quality of brickwork is important to load bearing wall because the poor quality of brickwork affects the structural integrity. The level become un straight when the workers too depend on the string line as a guide in brickwork. It also happened when the workers do not measure the height of the mortar while doing the brickwork.
Solution: Used Bricklaying Laser Level and Spirit Level

Solution: Use bricklaying laser level

The bricklaying level problem can be fixed by using the bricklaying laser level because laser is a light. A light will travel in straight lines, and it helps the workers laying the brick in the straight line. The brickwork will be neater when used laser level than string as a guide because it can be adjusted and portable hence it will also save more time. Use spirit level while doing the brickwork with the laser level to check the level of the wall to get a better result.

Problem: Shrinkage

The brick is a porous material that absorbs water from the ground or surrounding that causing it swell and then shrink when the water evaporates. The shrinkage then causes cracks in bricklayer joints. This won't affect the structural strength, but it does cause a damage on wall finishes after it is installed.

Solution: Install Damp Proof Course

The shrinkage can be prevented by installing the damp proof course on the floor below the bottom of the wall before the brickwork work begins. Damp proof course used to prevent damp rising through the walls. To obtain better protection of the brick from being absorbed by the water, the damp proof course installed beyond the width of the brick wall.

Problem: Brick Containing Dirt, Dust or Mold

Over time bricks get dirty or have moss or mold growing on it. This happened because of exposure to pollution and other airborne particles that attached to the bricks and mortar. It’s not typically damaging to the bricks and can even be considered protective it does compromise the overall look of the brick.

Solution: Clean and Cover the Wall with the Plaster

The dirt, dust and mold on the brick surface can be cleaned with water as gently as possible. The wall can also be plastered to protect the brick surface from dirt while covering the mold on the wall. This will result in a cleaner and more beautiful wall surface.

## CONCLUSION

The walls are important to the building to create suitable and comfortable building as well as providing privacy also as protection from weather. The wall construction process started from plan out the wall, clean the floor, lifted the brick, mix the mortar, pin, and line, install damp proof course, wall bricklaying process, and lastly plaster as the finishes work for the wall.

The process took around 2-3 weeks starting from 3 September until 17 September 2021. The wall construction was delayed a few weeks because of the weather in this area and the movement control order during the pandemic Covid-19.

The method for wall construction process is common method and it like the theory. There is nothing that carried out differently during the wall construction. In addition, the problems that arise such as brick contain dirt, dust and mold and others also be solved easily.

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