DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

BRICKWORK INSTALLATION
(LOAD-BEARING WALL)

Prepared by:

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DEPARTMENT OF BUILDING
FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING
UNIVERSITI TEKNOLOGI MARA
(PERAK)

FEBRUARY 2022

It is recommended that the report of this practical training provided

By

MUHAMMAD FAIQ BIN MOHD SYUHAIRI
2019298454

entitled

BRICKWORK INSTALLATION
(LOAD-BEARING WALL)

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 Sri Pengkalan Binaan Sdn. Bhd. for duration of 20 weeks starting from 23rd August 2021 and ended on 7th 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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UiTM ID No : 2019298454

Date : 10th January 2022

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Allah, the Most Merciful, the Most Graceful, deserves praise.

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I'd also want to express my gratitude to all the UiTM lecturers who have helped me improve as a student and person. I'd want to show my thankfulness to the lecturers who were personally involved during my training period. I appreciate the time, effort, encouragement, and ideas that TS Mohd Fareh bin Majid (Supervisor Lecturer), PM TS SR DR Hayroman bin Ahmad (Evaluation Lecturer), Dr. Nor Asma Hafizah Bt. Hadzaman (Practical Training Coordinator), and Dr. Dzulkarnaean Bin Ismail (Program Coordinator) have placed into the successful completion of my practical training, this report, and the valuable knowledge that have been shared over the last few semesters.

Finally, I want to convey my gratefulness to my loving parents and family member for their efforts throughout the years.

Thank you.

ABSTRACT

Generally, brickwork is masonry created using bricks and mortar. Rows of bricks called courses are often put on top of one another to form a structure such as a brick wall. A building's walls are one of its most significant structural features. A wall serves several functions in the performance of a building, and these functions must be properly understood in required to design an appropriate and comfortable structure that also provides privacy and weather protection. Therefore, this report will discuss about brickwork installation for load-bearing wall. This report was conducted on one of a large-scale residential landed house area named Taman Nuri which is located at Durian Tunggal district in Melaka. The main objective of this report is to determine the method of wall bricklaying process of load-bearing wall. It will concentrate on a method use in wall construction and the way how it carried out. In addition, this report will emphasis on the overall bricklaying wall construction procedure. It also analyses the materials and tools needed in bricklaying wall construction techniques, as well as the problem and solution in wall building that would meet the load bearing wall specifications. At the end of this study, we can conclude that there are several methods that can be used in brickwork for load-bearing walls by using some mandatory materials such as mis of mortar and special tools used by the bricklayer while the process wall construction going on.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

Housing or building is one of the most fundamental necessities for human life. Masonry is an unavoidable component of home construction. Brick masonry is one of the most frequently utilized types of masonry in our nation and worldwide due to its low cost, simple availability of raw materials, great strength, easy construction with little supervision, good sound and heat insulation qualities, and availability of labor (Peri Raghava,2015). Brick masonry is a composite material made up of systematically arranged brick pieces and mortar joints (Peri Raghava,2015).

A load-bearing wall, sometimes known as a 'bearing wall' is an active structural feature of a structure that sustains vertical load in addition to its own weight. Load bearing walls are used to transmit loads in a vertical manner. They often carry loads from a floor, beam, or roof structure to the ground. Load bearing walls, which are similar in principle to columns, simply transmit the load they are carrying by compression of the material they are constructed of (NFCC,2018). Load-bearing walls generally separate internal building areas and carry loads from other elements of the structure to the foundations (Load-bearing wall ,2019). A load-bearing wall often supports loads from the roof, any wall directly above it, and floors, which can occasionally be constructed into or rest on top of an interior wall. Concrete, blockwork, and/or brick are widely used to create load-bearing walls. The thickness of the load-bearing wall is determined by the kind of building, the number of levels that require support, the materials used to create the wall, and any other imposed loads (Load-bearing wall ,2019).

Failure of a load bearing wall is likely to result in the failure of one or more of the other structural elements, notably those listed above. Failure of part or all a load bearing column may also result in more of the overall weight of the building being shifted to other load

bearing walls or portions of walls, which may cause the remainder of the structure to fail suddenly or prematurely (NFCC,2018). The failure of a load-bearing wall usually occurs because of the wall bending and buckling. The stability of a load carrying wall, on the other hand, is considerably improved if (and is dependent on) it is constrained top and bottom over the length of the wall (NFCC,2018).

1.2 Objective

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

i. To identify the methods of bricklaying wall process.

ii. To identify the problems and solutions in brickwork installation of wall.

iii. To determine equipment and materials used in wall construction.

1.3 Scope of Study

The scope of study has been carried out at Taman Nuri (Phase 3B), Daerah Durian Tunggal, Melaka Bandaraya Bersejarah. The project title is “Cadangan Pembangunan Perumahan di Atas Lot 11, Lot 12, Lot 13, PT9753, PT9754, PT9755, PT 9728, PT9729, PT9730, PT9731 & PT 7635, Mukim Durian Tunggal, Daerah Alor Gajah, Melaka Yang Mengandungi Unit-unit Berikut:”

Taman Nuri Fasa 3B:

1) Rumah Berkembar (Zero Lot) 2 Tingkat (RB(ZL)) (45’ X 70’-80’) 53 Unit
2) Rumah Teres 2 Tingkat (RT1) (24’ X 60’) 42 Unit
3) Rumah Kluster 2 Tingkat (RK1) (34’ X 60’) 44 Unit
4) Rumah Sesebuah 3 Tingkat (RS2) (60’ X 80’-100’) 10 Unit
5) Rumah Sesebuah 2 Tingkat (RB1) (45’ X 70’) 2 Unit
6) Rumah Sesebuah 3 Tingkat (RS1) (60’ X 80’) 1 Unit

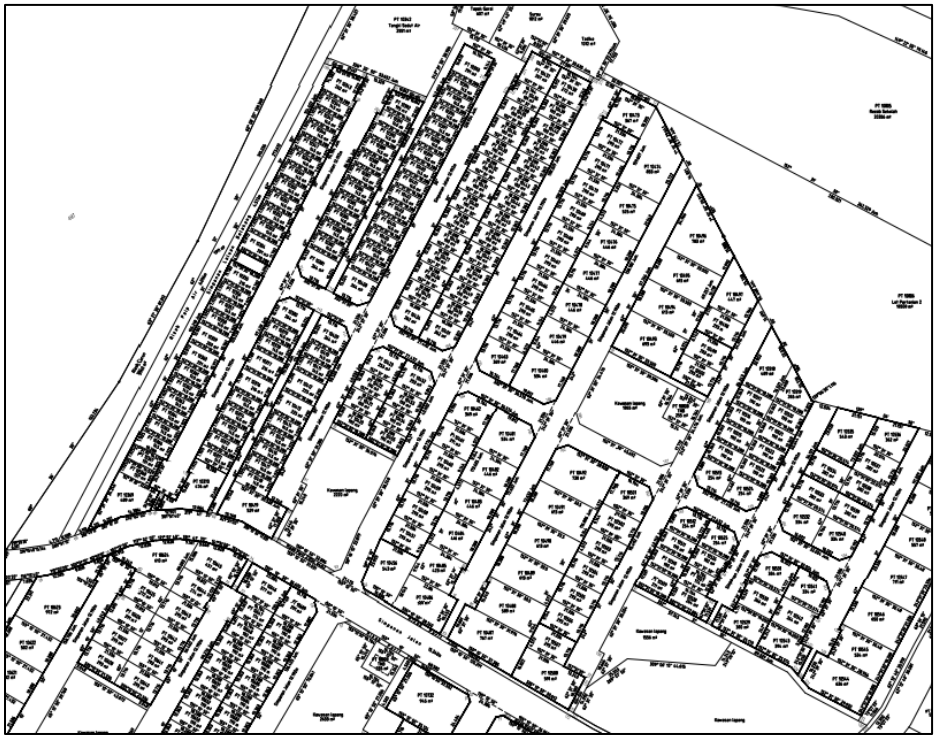


Figure 1: Taman Nuri phase 3B (TN3B) site plan

The project has started on 1st July 2019 and will be completed on 31st December 2021. My research is focused on "Rumah Berkembar 2 Tingkat (Zero Lot) (RB(ZL)) (45' X 70'80') Type B" and the focus of this case study is to identify the methods of bricklaying wall process or brickwork installation.

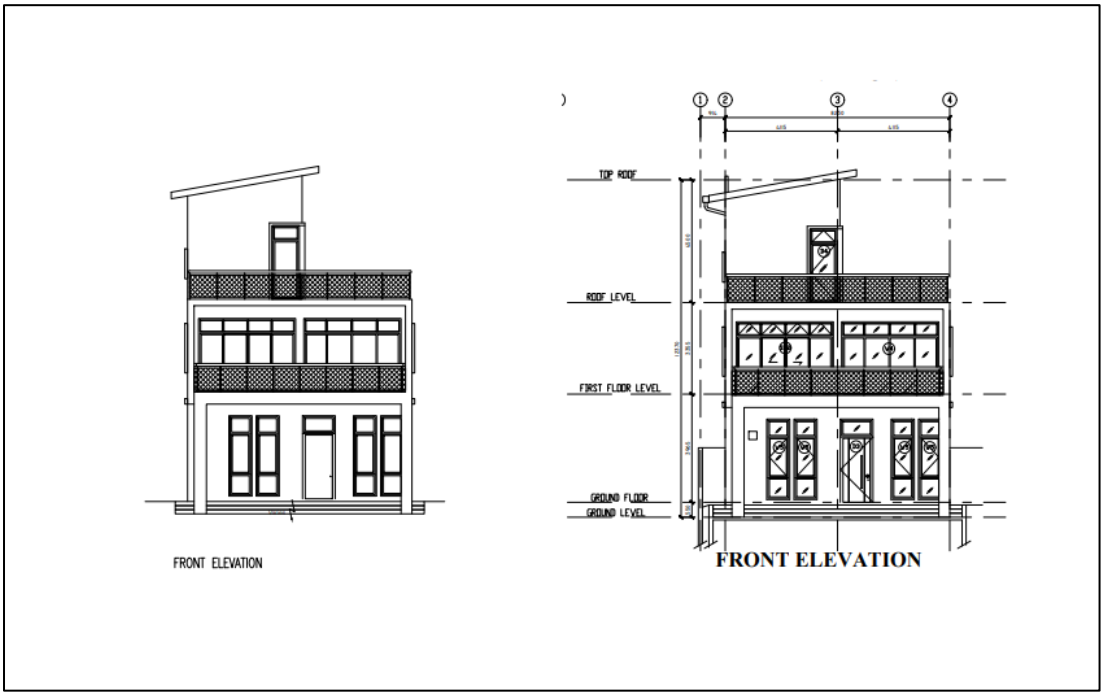


Figure 2: RBZL front elevation

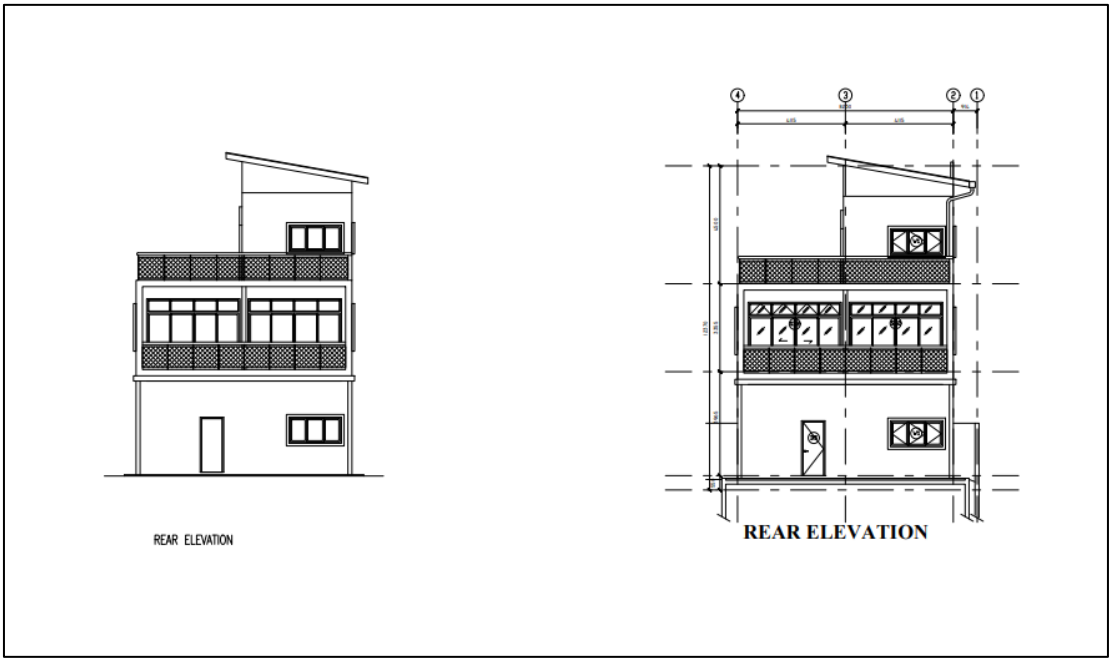


Figure 3: RBZL rear elevation

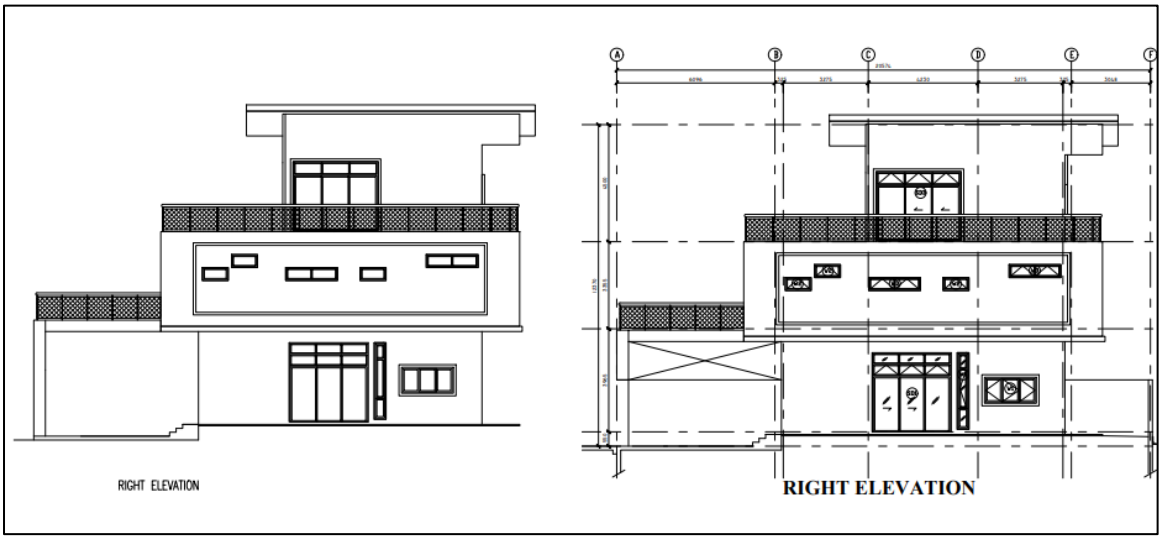


Figure 4: RBZL right elevation

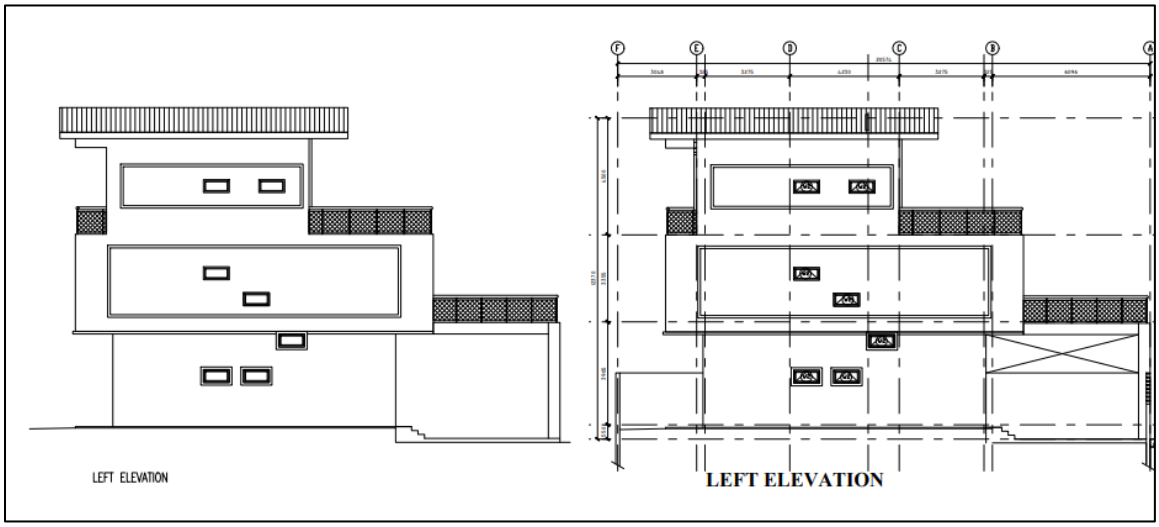


Figure 5: RBZL left elevation

Hence, this study will be explained the problems and solutions in brickwork installation of wall. The equipment and materials used in wall construction also will be determined in this research. Despite this, the study does not focus on the quantity of people or labors, expenses, or length issues. Observation, interview, and document reviews are the three approaches that must be used in needed to finalize the data. Finally, any further explanations pertaining to the preceding procedure were provided as follows.

1.4 Methods of Study

1. **Literature Study**

   To prepare this report, I used literature method where I do research on the internet based on global Wikipedia, online books, and PDF reports about the method statement of bricklaying work in general. All research was gathered to find the relevant information for us to be used as a reference to complete the observation for our case study.

2. **Observation**

   Observations were made at the construction site to take a closer look at the bricklaying methods, the tools, equipment, and material used, and the problems encountered while erecting the walls. The average time spent on this observation is around 3-4 hours, however this is simply for the bricklaying procedure, which varies depending on the size and area of the wall. The length of the wall determines how long it takes to finish the bricklaying process. The bricklaying process took two weeks in total to be fully done. The progress of wall construction was documented with a smartphone and some notes over the duration of 20 weeks.

3. **Interview**

   Interviews were conducted indirectly with my supervisor on the construction site while working. My supervisor and some of bricklayers have also explained in more detail about the wall construction and bricklaying process on site.

4. **Document Review**

   Several documents have been reviewed at the site office about the project details, especially the project of Taman Nuri 3 phase 3B2. Company profile, construction drawing, standard operating procedures (SOP), progress report, and images taken by other workers are among the documents reviewed to collect all the data for the construction. The drawing design will be utilized as a reference at the site where

the brickwork process is being monitored. During document checks, photos that belong to others are also the finest reference.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

Desa Johan Sdn.Bhd is a subsidiary company of Sri Pengkalan Binaan Sdn. Bhd (SPB). SPB was founded and establish on 1981 by Datuk Yap Pit Kian & Datin Loh Ngook Chan. SPB started their business as small contractor and today SPB known as one of best housing developer and contractor in Melaka. By date, SPB already complete and sold around 5000 units house worth RM1.2 billion. Nowadays, SPB have 91 totals of employee with divided into a several departments such as marketing department, construction department, account department, human resources department, engineering department, and lastly development department.

Sri Pengkalan Binaan Sdn Bhd (SPB Property) has made its mark in the property landscape by delivering on their promises of building dream homes. The primary focus as a housing developer and Class A contractor is underlined by a proven track record of township, residential and commercial developments across the country.

The success draws from the expertise of the company founders, Datuk Yap Pit Kian and Datin Loh Ngook Chan, who grew the company from its humble beginnings as a housing contractor to one of the leading property developers in Melaka today.

Since 1981, this company command extensive know-how in crafting livable, sustainable spaces to bring enduring value in more than 5,000 homes with a gross development value (GDV) of over RM1.6 billion to date. SPB also have been appointed as a trustworthy partner of the government to deliver turnkey projects. Through this company uncompromising commitment to quality and innovation, SPB driven to create harmonious, aspirational spaces for life.

2.2 Company Profile

Desa Johan Sdn Bhd was established 31st January 1990 and a subsidiary company or main contractor under Sri Pengkalan Binaan Sdn Bhd. Desa Johan Sdn Bhd. currently active in residential housing manufacturing, renovation, government project work tenders and other related work. This company main office is located at 17A & B Plaza Seri Kubu, Jalan Tan Chay Yan, Melaka. Desa Johan Sdn Bhd is a company registered under the Malaysian Construction Industry Development Board (CIDB). This company is registered in grade G7 in category B (building construction) for specialization B04 (general building work) & B10 (installation of internal water pipes), CE (civil engineering construction) for CE10 (piling work) & CE21 (general works of civil engineering) and ME (mechanical and electrical) for M15 (various mechanical fittings) specialization under CIDB.

To suit client demands and facilitate all construction matters, Desa Johan Sdn Bhd has worked with numerous expert panel departments under Sri Pengkalan Binaan Sdn Bhd. A panel of architects, surveyors, engineers, and contractors makes up the company team. All sub-contractors also employ experienced individuals with experience and skill in the domains of wiring, electrical, drainage, and construction. Desa Johan Sdn Bhd, which specialises in the building of landed homes and bungalows, has been entrusted with the management, planning, and construction of a few residential houses and bungalows around Melaka. Desa Johan Sdn Bhd can now manage and carry out building construction, pipe, sewerage, and civil engineering work due to the Malaysian Construction Industry Board's (CIDB) certification as a Bumiputera contractor.

Figure 6: SPB logo

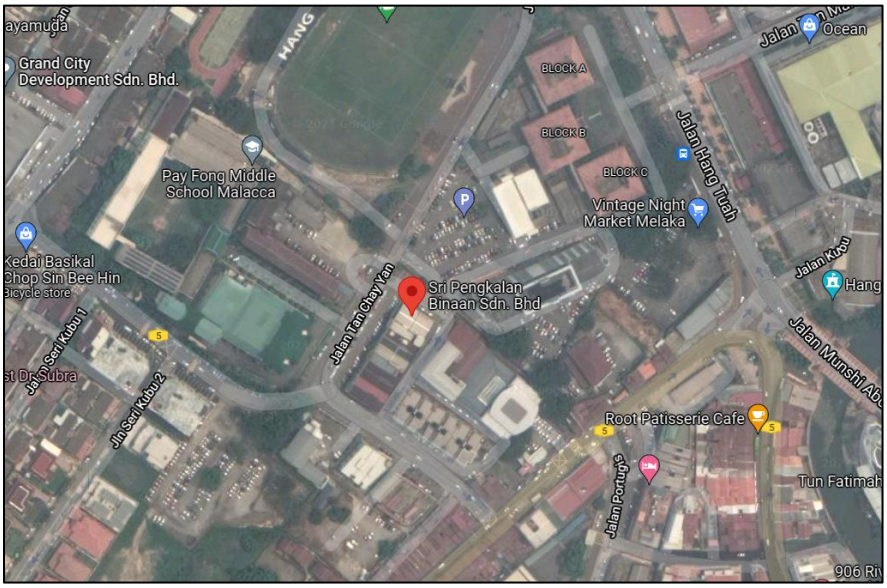


Figure 7: SPB Headquarters location on Google Maps

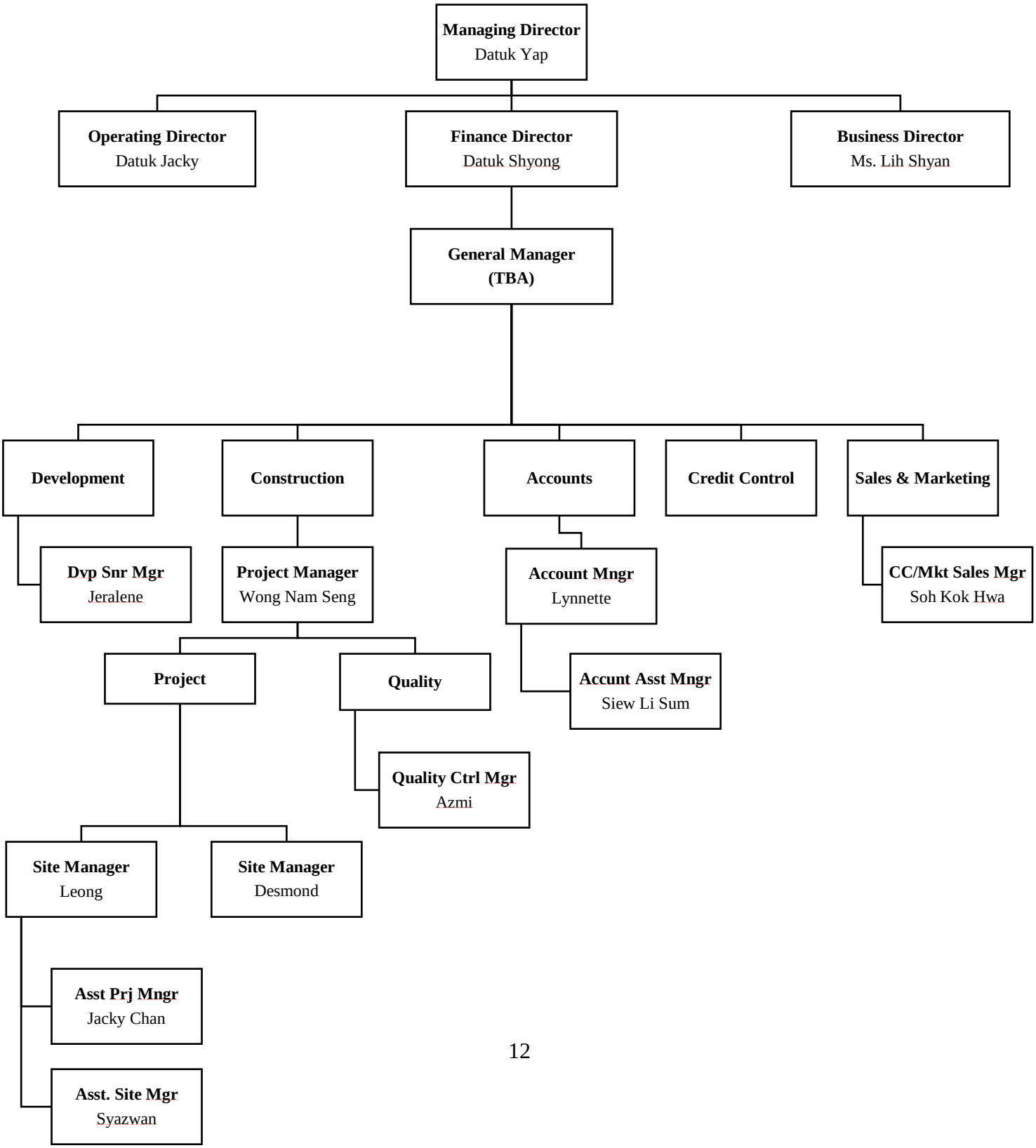
Source: https://www.google.com/maps/place/Sri+Pengkalan+Binaan+Sdn.+Bhd/

Sri Pengkalan Binaan Sdn. Bhd. and Desa Johan Sdn Bhd. are guided by their vision to become the region's foremost and trustworthy developer contractor by delivering quality, innovative and affordable homes to uplift communities, enhance landscapes and create a sustainable society.

By putting people at the forefront, these company uphold their commitment in building dreams by surpassing expectations and fulfilling lifestyle needs with desirable spaces and unparalleled customer experience. At SPB, they aim to form nurturing, synergistic, and sustainable relationships with their partners and employees, while they simultaneously bring positive transformation to the society.

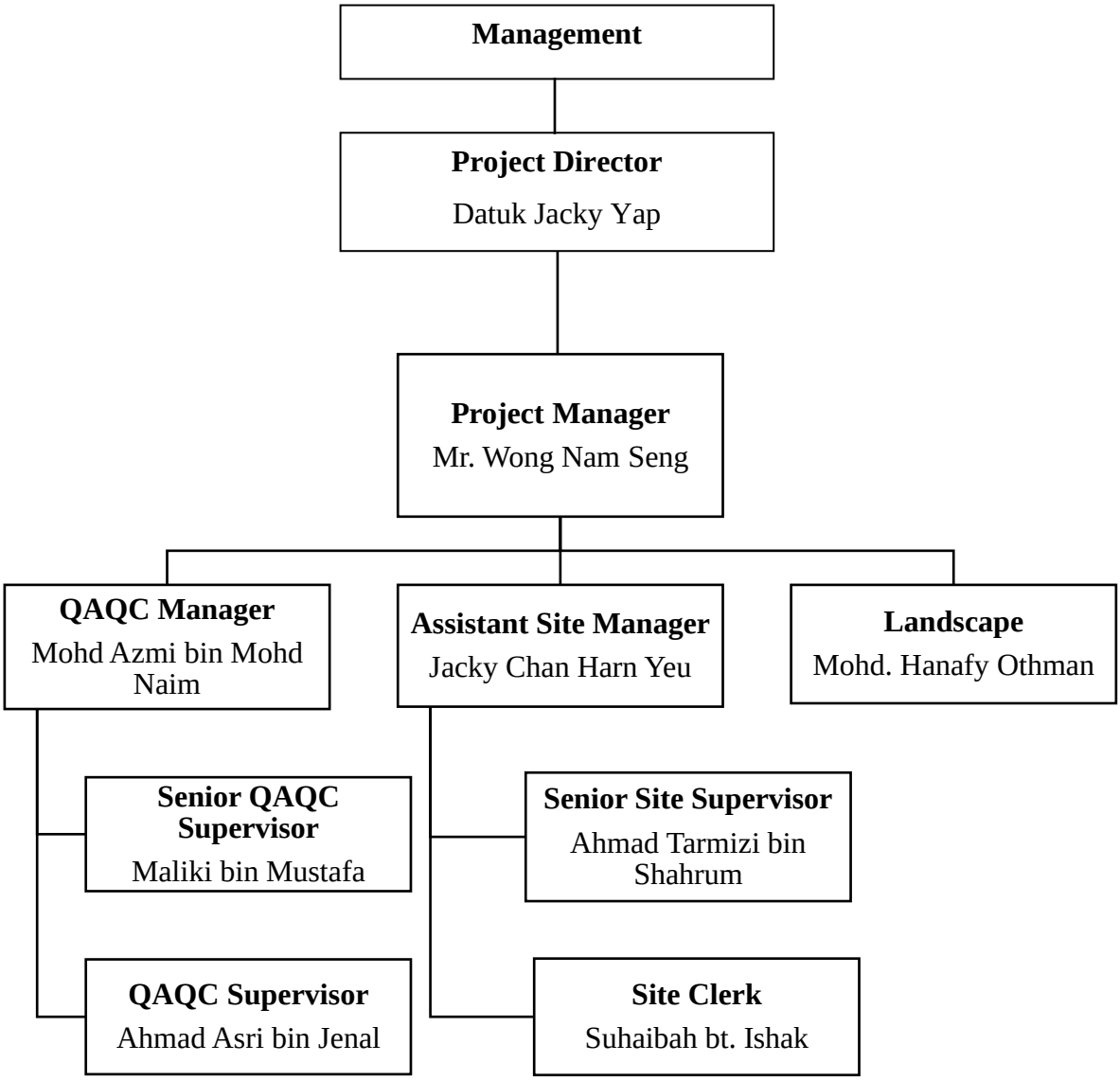
2.3 Company Organization Chart

Table 1: Sri Pengkalan Binaan Organization Chart



Project Organization Chart

Table 2: Site Organization Chart



2.4 List of Project

2.4.1 Completed Project

Table 3: List of completed projects

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1	Cadangan Pembangunan Perumahan yang Terdiri daripada 146 Unit Rumah Pangsa Mampu milik 2 Tingkat dan 3 Tingkat, 1 Unit Pondok Pengawal dan 1 Unit Bilik Mesyuarat Diatas PT.9724, Mukim Durian Tunggal, Daerah Alor Gajah, Melaka	RM5,480,000	1st September 2019	31st August 2021	24 months	Tetuan Exotika Sdn Bhd
2	Cadangan Project Pembangunan Diatas Lot PT 9753-9755, PT 9728, PT 9730, PT 9731, Sebahagian PT 7635, Lot 11, dan Lot 12, Taman Nuri, Mukim Durian Tunggal, Daerah Alor Gajah, Melaka untuk Tetuan Laman Exotika Sdn. Bhd	RM17,680,000	15th March 2018	14th September 2019	19 months	Tetuan Laman Exotika Sdn Bhd

3	Eco Kasa Heights, Daerah Alor Gajah, Melaka	RM8,560,000	1st September 2015	31st August 2018	36 months	Kementerian Perumahan dan Kerajaan Tempatan (KPKT) Negeri Melaka
4	Taman Nuri Phase 2, Durian Tunggal, Daerah Alor Gajah, Melaka	RM6,500,000	28th February 2018	29th September 2019	18 months	Tetuan Laman Exotika Sdn Bhd
5	Taman Maju Jasin 6, Daerah Jasin, Melaka	RM 7,850,000	15th March 2016	14th January 2017	10 months	Tetuan Laman Exotika Sdn Bhd

2.4.2 Project in Progress

Table 4: List of projects in progress

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration (Expected)	Client
1	Cadangan Pembangunan Diatas Lot 11, 12, 13, PT 9753, PT 9754, PT 9755, PT 9728, PT 9729, PT 9730, PT 9731 & PT 7635, Mukim Durian Tunggal, Daerah Alor Gajah, Melaka untuk Tetuan Laman Exotika Sdn. Bhd	RM25,206,150	30th September 2019	28th February 2022	17 months	Tetuan Laman Exotika Sdn Bhd
2	Cadangan Membina Sebuah Rumah Kediaman 2 Tingkat Jenis Kekal Berserta Kolam Renang di Atas Lot 708, Di Jalan Padang Temu, Mukim Padang Temu,,Melaka	RM2,850,000	1st December 2020	31st January 2022	14 months	Tetuan Jendela Prisma Sdn Bhd
3	Cadangan Membina 9 Unit Rumah Teres 3 Tingkat (20'X 75') Di Atas Lot 3515 hingga 3523, Mukim Cheng, Daerah Melaka Tengah, Melaka	RM3,500,000	15th June 2021	14th February 2021	9 months	Tetuan Good Rate Holdings Sdn Bhd

4	Puncak Kasa Height, Alor Gajah, Melaka	RM20,050,000	1st September 2017	31st Mac 2022	54 months (The project stalled due to a change of government and movement control order (MCO) due to Covid-19 pandemic)	Kementerian Perumahan dan Kerajaan Tempatan (KPKT) Negeri Melaka
5	Taman Bukit Cheng, Daerah Melaka Tengah, Melaka	RM3,750,000	15th May 2020	14th February 2022	21 months	Tetuan Good Rate Holdings Sdn Bhd

CHAPTER 3.0

CASE STUDY

3.1 Introduction to Case Study

Case study is process or record of research into the development of a particular person, group, or a situation over a period. Case studies may be prospective, in which criteria to be established and the cases fitting are available or surveying the criteria can be established for selecting cases from historical or new record to attach in the study.

The case study that has been conducting for this practical report is about brickwork installation for load-bearing wall. It was being held in at Taman Nuri (Phase 3B2), Durian Tunggal district, Melaka Bandaraya Bersejarah. The project title is "Cadangan Pembangunan Perumahan di Atas Lot 11, Lot 12, Lot 13, PT9753, PT9754, PT9755, PT 9728, PT9729, PT9730, PT9731 & PT 7635, Mukim Durian Tunggal, Daerah Alor Gajah, Melaka". This case study will be focusing on "Rumah Berkembar 2 Tingkat (Zero Lot) (RB(ZL)) (45' X 70'80') Type B". This two and a half- storey bungalow have 5 bedrooms and 4 toilets. The size of land is around 3150 sqft. This residential area is a large -scale residential area because it is in a rapidly developing area in Durian Tunggal district, Melaka.

Figure 8: Taman Nuri phase 3B2 (TN3B2) site plan

The project began development on 30th September 2019 and is expected to be finished on 28th February 2021 for phase 3B. The bungalow cost is estimated to be around six hundred-and ninety-Ringgit Malaysia (RM 690,000.00). Currently, the project is still under process. As a result, the study will be presented not only in terms of installation, but also in terms of machinery, materials & tools, and the problem & solution in brickwork installation process. Nonetheless, the research does not focus on cost and personnel issues.

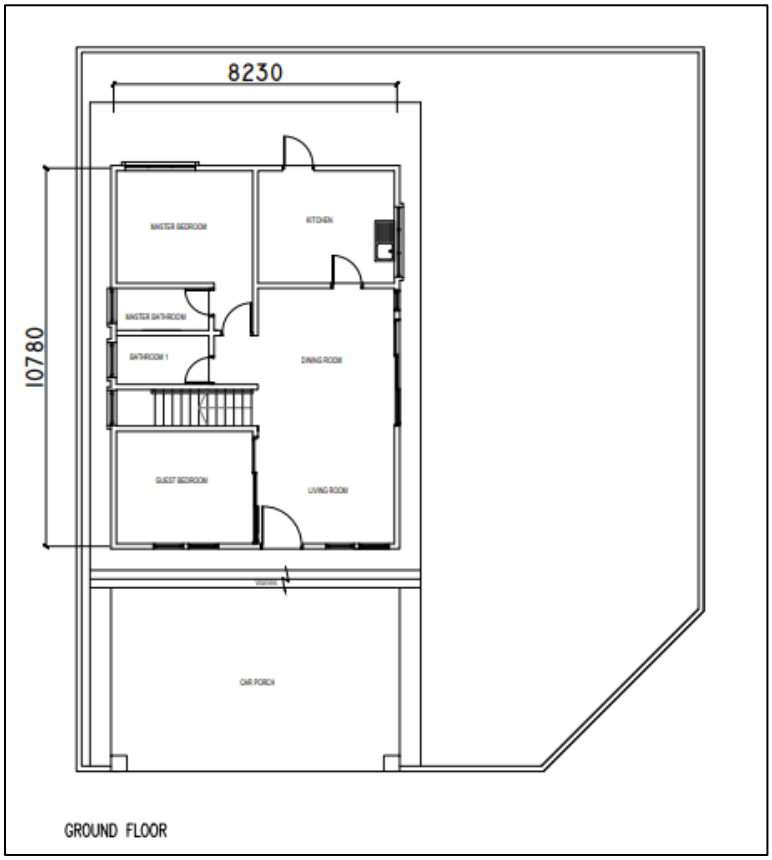


Figure 9: RBZL ground floor plan

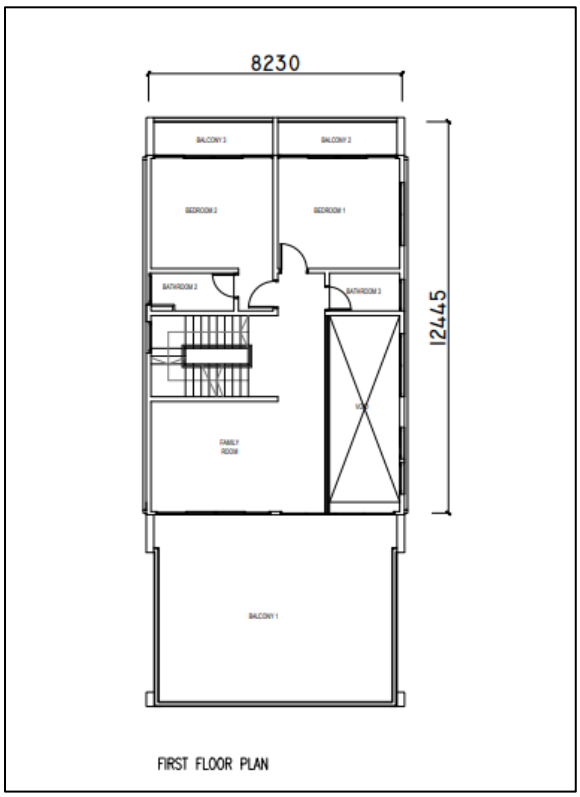


Figure 10: RBZL 1st floor plan

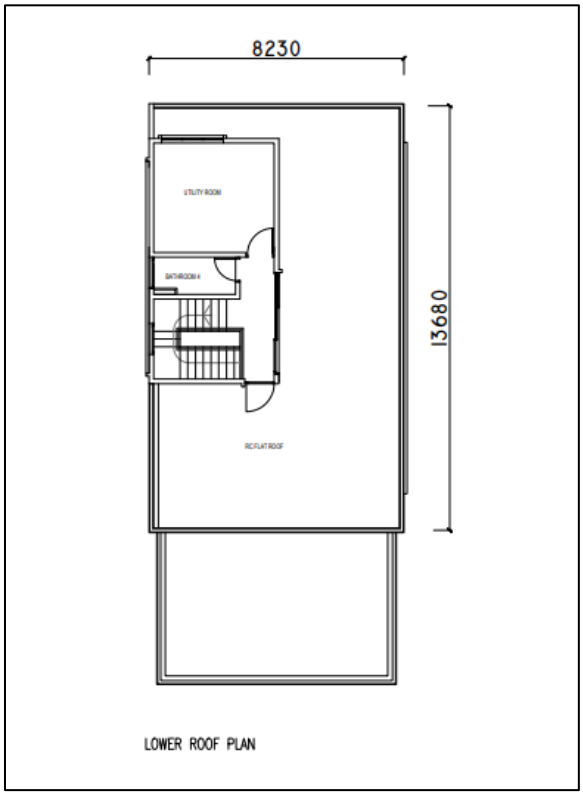


Figure 11: RBZL lower roof floor plan

Bricklaying is one of the tasks that has been carried out on the site. To achieve a perfect wall bonding, this difficult task must be handled by professional specialists or bricklayers. Several unskilled laborer's also assist in mixing the mortar and transporting it to the building site with the bricks to speed up the bricklaying process. Wheelbarrows, hawks, trowels, scaffolding, concrete mixers, spirit levels, brick bolsters, brick line, bucket and pins, brick hammer, shovels, and measuring tape are among the equipment and tools used in this construction.

Other than that, time is critical to a building project's success. According to the building's drawing plan, the building's length is 10780mm and its breadth is 8230 mm. This structure had numerous partitions, including 5 rooms with 4 bathrooms, one of which was the master bedroom and guest bedroom. Aside from that, there was a living room, a corridor, a family room, a dining room, a kitchen, and a utility room. The structure including columns and beam must be completed before the bricklaying construction begin. The string will be tied to the brick pin and drawn from one column to the next to form a line that will be used as a guide for bricklaying. To create a straight wall, the bricks will be connected and guided by the thread. This procedure will take a long time to complete since it necessitates accuracy.

Finally, the issues with the bricklaying method will be determined during the construction process. After determining the process problem, the solutions to the problems will be stated. This chapter will concentrate on the bricklaying method, the time spent on the procedure, and the problem and its solution.

3.2 Methods of bricklaying wall process

Preparation work / Pre-bricklaying

First, all drawings shall be studied and understood prior to work commencement. Before starting the bricklaying work, the working area shall be cleaned and ready to start brickworks. At the same time, plan out the wall by referring to the floor plan and elevation plan for the length and height of each wall in the building on the drawing plan. The length of the building was calculated based on the value stated in the floor plan. Moreover, in the drawing plan, the height value of a wall was measured from the ground floor to the roof beam of the building structure.

Figure 12: Studying all drawing and building plan

Setting out brickworks with reference to gridline and columns must be checked before the bricklaying work start. Determine and mark the control points at every floor by nail. A 1 m offset reference line for the floor must be marked from the control point. Brickwork alignment line and position for doors and windows must be included in the layout and marking.

Figure 13: Setting out for bricklaying work

A string marker will be used to mark the horizontal alignment of the brickwork. In further, vertical control strings must be installed at brick wall corners to ensure that the brick wall is aligned. The door frame must be installed in the correct position, size, and dimension. Fish tails between door frames and the brickwork shall be installed. Prior to laying brick walls, the RC slab surface should always be cleaned. The wall base or floor must be clean and free of contaminants.

Figure 14: String marker used to make a reference line

Figure 15: Install door frame before brickwork start

Figure 16: Each control point must be nail

Figure 17: Reference lines

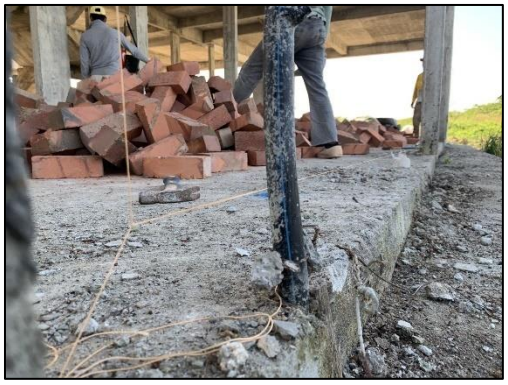


Figure 18: Vertical string

Figure 19: Vertical control strings must be installed at brick wall corners

Bricklaying

i) Mortar Mixing

Mortar must be mixed in the ratios specified (cement/sand=1:6). After thoroughly mixing the cement and sand, add the water and mix for at least 2 minutes. The preparation of materials for mortar mixing should be done in phases. It is not allowed to feed the material on a continuous basis. Importantly, masonry mortar must be well mixed and of the right density. Mortar should be used within 2-3 hours of being mixed.

Figure 20:Mixer machine

ii) Bricklaying

The bricks' dimensions, strength, and types must all be in accordance with the specifications and standards. Before using the bricks, they must be wetted. The damp proof course was installed according to the length of the wall, which was determined by measuring the distance between two columns using a measuring tape. To prevent groundwater from being absorbed by bricks, the damp proof course must be wider than the width of clay brick. A damp proof course (DPC) is an impermeable material barrier constructed into a wall or pier to prevent moisture from entering the structure.

Figure 21: Damp proof course (DPC)

A small bed or mortar for the first brick to line on were laid over damp proof course by using the trowels and hawks. Lay a small bed of mortar for the first brick to lie on and use the spirit level to make sure it is level. Next, apply a thin layer of mortar to the tops of the initial bricks and set another brick on top of it at a downward angle. Then, on the firm base for the wall, apply a layer of mortar. We may use the tape measure to ensure that they are the proper distance apart, as well as the spirit level to ensure that it is flat.

Figure 22: Every bottom layer of brick needs to put Damp Proof Course (DPC)

For the second row, move the string line up to where the top of the next course of bricks will be then lays a bed mortar on top of the first course of bricks, so that it's in a triangle shape. Next, take a slab of mortar and coat the end of the brick that will be pushed up against the first brick. Then, feather through it with the trowel to create an air pocket for the bricks to be laid on.

Figure 23: Move string line to for the next row

Figure 24:Vertical string

We may use the spirit level to make sure the bricks are flush and at an even height, then softly press on them to make sure they are ideal. Aside from that, we'll have to scrape away any extra mortar. Then apply mortar to the bricks' sides and lay them next to one other. After every fourth layers of bricks were laid, exmet wire was installed on the layer of the brick wall based on the length of the wall to absorb stress and vibration in the structure and prevent the wall from collapsing.

Figure 25: Exmet wire

Figure 26: Exmet wire applied in every fourth

Repeat this process until the wall has reaches the required height. Scaffolding was used to assist bricklayer who putting bricks at the top of the wall.

Figure 27: Scaffolding used to help bricklayer reach top height

Half brick and one brick on edge walling shall be built in stretcher bond. Stretcher bond walling with half bricks and one brick on the edge is required. The brick wall's corner and connection must be placed at the same time; otherwise, steps of a length equal to or higher than the height must be left for later connection. It shows a half brick wall built with a return corner. This means that the wall turns (usually 90 degrees) and continues in another direction. We should notice that the bond remains unchanged and that the course height remains constant on the return.

Figure 28: Stretcher bond

Figure 29: Brickwork corner

T-Joint (Teething) is required at the intersection joint between main brick wall to the brick wall partition. It shows a half brick wall which has a stop end and is toothed. The purpose of toothing the brickwork is to allow for plumbing to be taking higher than a racking would normally allow. We should try to avoid toothing brickwork to a significant height.

Figure 30: T-joint

Figure 31: 'Teething' at intersection joint

The space of 150mm between the wall and the bottom of the beam should be set aside and filled in after the wall body is sturdy and firm. Under the beam, the last layer of bricks must be securely tilted, with mortar entirely and densely filled. The bricks below beam shall be laid with soldier course at about 60 degrees and all gaps must be fully filled with cement mortar.

Figure 32: Soldier course brick pattern

Figure 33: Completed wall surface after bricklaying work

3.3 Problems and solutions in brickwork installation of wall

i) Deviation and Unstraight from Alignment or Verticality in Bricklaying

The vertical alignment of brick walls is one of the most common problems, which is why a plump is usually used to check for verticality at certain working areas. There may be unwanted deviations from needed vertical alignment if masonry brickwork is created without the use of plumb. As a result of the deviations, there will be an increase in abnormal loads and, as a result, it will loss in strength. For example, a brick wall with a 12 mm to 20 mm deviation from the acceptable alignment may have up to 15% less strength than walls without such a defect.

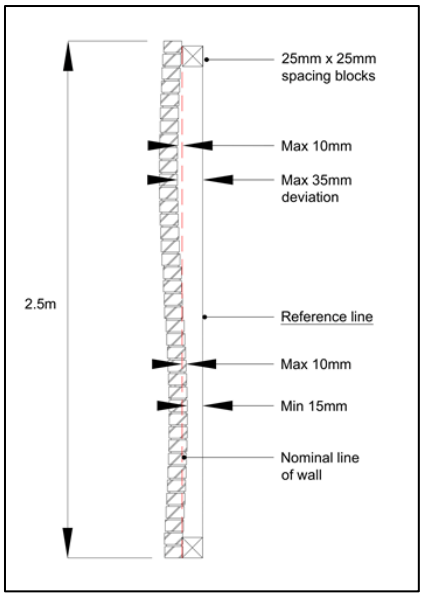


Figure 34: Wall deviation

Source: https://www.google.com/search?q=wall+deviation&rlz

Solution:

This problem can be fixed by using the bricklaying laser level because laser is a light. Light travels in straight lines, which helps workers in laying bricks in a straight path. The brickwork will be neater if you use a laser level instead of string as a guide since it is adjustable and portable and saving your time. To achieve a better outcome, use a spirit level while completing the brickwork and a laser level to verify the level of the wall.

ii) Failure to Adjust Suction in Bricks

A substantial amount of water is absorbed by the bricks during the building of slender walls using absorptive bricks. Because of the loss of water from mortar, its form changes from flat to pillow, and the mortar may not be able to return to its previous shape, since there is substantial movement of bricks along with the loss of water from mortar. Due to the curving and expanding out form of mortar and the consequent loss of strength, these situations may result in unstable brickwork.

Solution:

Pre-wetting of bricks and the inclusion of lime to the mortar mixture to resist water suction are suggested to avoid this situation. Before laying bricks, they must be well wetted, and if the previous course has dried out, it must be wetted before new bricks are set on top of it. Bricks should be hydrated one day ahead of time, with a moisture level of 10-15%. Thus, it is not possible to use dry bricks.

iii) Excessive and Deficient Bed Joint Thickness

Improper bed joint filling or gaps in mortar might happen because of too much pace, not paying attention, or a process known as furrowing. Furrowing is when a bricklayer uses his trowel to create a gap in the middle of the mortar bed, parallel to the masonry wall's face. The insufficient filling of bed joints can reduce masonry strength by about 33%, according to test results. Failure to fill vertical joints has been shown to have a greater negative impact on masonry strength properties than on masonry compressive strength. Inadequate vertical joint filling affects the building's sound insulation as well as its resistance to water penetration, and it reveals the bricklayer's carelessness.

Figure 35: Unstable bed joint thickness

Solution:

To avoid this problem from occur, spread a layer of mortar about 12mm–15mm thick for the bottom layer of blocks and a little wider than the blocks onto the concrete foundations. The joints between lay bricks must be smooth and straight. The joint thickness must be at least 6mm and no more than 10mm. At least 80% of the complete depth of the horizontal seam must be filled. The vertical seam must be continuous and free of gaps. It is not allowed to wet the dry cement after it has been spread. Before formally erecting, a test laying segment must be constructed. To construct the vertical seam, the mortar must be plastered on the bricks before they are placed.

iv) Defects Due to Incorrect Mixing and Proportioning of Mortar

The use of too much plasticizer or a high moisture content ratio might result in a weak or lean mortar, which has a lower strength. When selecting bricks with the required crushing strength, mortar strength and proportioning, proper considerations must be kept in mind. A minor variation in any of the strengths (brick or mortar) has a major impact on the bricklaying work.

Solution:

Materials for mortar are to be measured in properly constructed and accurate measuring boxes and examined at random by appointing supervisors. Mortars are typically mixed using machine-driven roller pan mixers of specified kind and size. In unusual situations and if tiny quantities are required, the mixture must be done by hand. Mortar that is not used within 2 to 3 hours of being mixed must be removed from the site. Mortar must be mixed according to the mix ratio (cement/sand=1:6). Mix the cement and sand thoroughly, then add the water and mix for at least two minutes. The preparation of materials for mortar mixing must be done in batches. Continuous material feeding is not allowed. Masonry mortar must be well mixed and of the right density. Mortar should be used within 2-3 hours of being mixed.

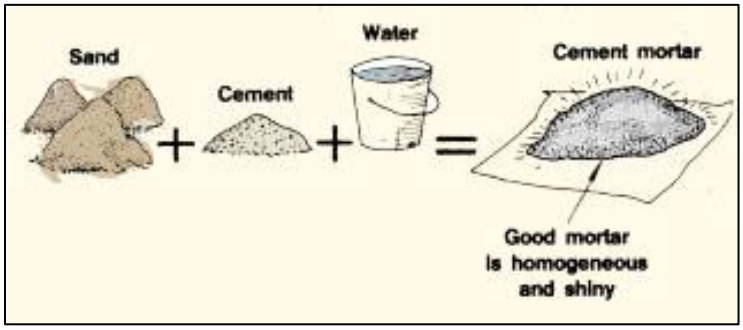


Figure 36: Cement mortar mixture for bricklaying work

Source: https://www.google.com/search?q=mortar+ratio&tbm=isch&ved

3.4 Equipment and materials used in wall construction process.

Materials

i) Bricks

All bricks must be chosen clay bricks that match to the contract Building Quantity (BQ), and they must be hard, sound, well-burned, even and uniform in shape, free of cracks and other defects, and like samples deposited with and approved by the supervisor.

Figure 37: Pallets of common bricks

ii) Cement and Sands

Cement or comparable cement must comply with strict standards and meet supervisory criteria. The sand must be organically occurring freshwater sand. Cement and sand will both keep nicely. Use the cement brand specified by the architect in the cement submissions.

Figure 38: Couple pallets of cement

iii) Mortar

Materials for mortar are to be measured in properly constructed and accurate measuring boxes, and then randomly tested by a site supervisor. Mortars are usually mixed with machine-driven roller pan mixers of the appropriate type and size. In unusual instances and for tiny volumes, hand mixing is required. Mortar that is not used within 2 to 3 hours of being mixed must be removed from the job site.

Figure 39: Mortar for bricklaying work

iv) Exmet wire

Exmet wire is an excellent reinforcement for brick and block works. By embedding it into the cement mortar at every fourth joint, it forms an integral structure to absorb stress and vibration in building.

Figure 40:Exmet wire laid on fourth layer

Equipment

i) Pins and Line

Two pins with a line wound around them. Used in the installation of wall bricks. Where the sills overhang from the wall, a pin is put into the brickwork at either end of the sill and a line is drawn parallel to the two end sill bricks. Also used to link the line into an interior corner when line blocks are not possible to utilize.

Figure 41: Pins and line

Figure 42: Pins and line on interior corner of brick line

ii) Trowel

Trowel or mason's trowel is a point-nosed trowel for spreading mortar on bricks or concrete blocks with a technique called "buttering". The shape of the blade allows for very precise control of mortar placement.

Figure 43: Bricklaying trowel

iii) String marker & string

Used to make an aligned line and reference line before bricklaying work start.

***Figure* 44: String marker**

iv) Spirit level

These are metal straight edges specially fitted with glass tubes containing a spirit and a bubble of air. It used for keeping brickwork upright and level.

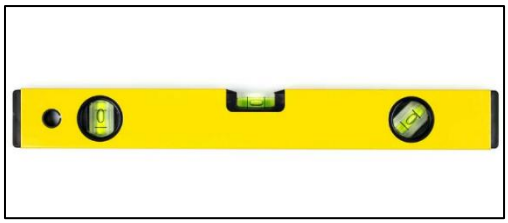


Figure 45: Spirit level

Source: https://www.google.com/search?q=spirit+level&rlz

v) Brick hammer

With one end, this equipment is used for hammering nails and the other for cracking block or brick. One end is square and flat and can be used as a hammer. The other end is pointy, like a little chisel. The pointed chisel tip is used to cut a line around the stone to be broken.

Figure 46: Brick hammer

Source: https://www.google.com/search?q=brick+hammer&rlz

vi) Measuring tape

Tape measure is frequently used in the continual inspection of bricklaying requirements, as well as in the checking of profiles at the start of a task (windows and door heads).

Figure 47: Measuring tape

CHAPTER 4.0

CONCLUSION

The walls of a building are one of its most important structural elements. A wall performs numerous purposes in a building's performance, and these functions must be thoroughly understood to construct an acceptable and pleasant structure that also provides privacy and weather protection. The bricklaying wall method was started from pre-bricklaying method such as studying all drawing and building plan, setting out for bricklaying work and install all door frames before the brickwork start. Then, mixed the mortar and started the bricklaying work which is started from install the damp proof course (DPC). Then, the brickwork installation process including installed the exmet wire until the layer of the bricklaying reached the required height of the wall.

While the bricklaying process is underway, there are several of problems identified common problem for brickwork in anywhere. Among those problems are deviation or unstraight layer from alignment or verticality in bricklaying, failure to adjust suction in bricks, excessive and deficient bed joint thickness, and defects due to incorrect mixing and proportioning of mortar. Thus, there are several solutions found to overcome and prevent from those problem occur while the process of brickwork in progress.

The bricklaying method in masonry is a standard procedure that is comparable to the theory. Nothing was done differently throughout the bricklaying wall construction in this study.

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