



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

LOAD BEARING MASONRY WALL CONSTRUCTION

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(PERAK)**

JULY 2019

It is recommended that the report of this practical training provided

By

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Entitled

LOAD BEARING MASONRY WALL CONSTRUCTION

Accepted in partial fulfillment of the requirement for obtaining the 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 are stated herein, prepared during a practical training session that I underwent at Zikay Construction Sdn Bhd for a duration of 14 weeks starting from 25 February 2019 and ended on 31 May 2019. It is submitted as one of the prerequisite requirements of DBG307 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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

Thank you so much.

ABSTRACT

Construction is the process of constructing a building or infrastructure. Therefore, this report will be discuss about load bearing masonry wall construction. This study is carried out at Sungai Yu, Tanjung Karang, Kuala Selangor which is construct for low cost 500 residential units house under the People's Housing Programme (PPR). There are many type of load bearing masonry wall. However, from this report we just focus on the reinforced concrete masonry wall type. The objectives are to know how the wall construct based on the requirement method. Reinforced concrete masonry wall must be construct with steel reinforcement to provide the tensile and bending strength and improves the compressive strength. Moreover, mortar is used to fill the gaps between to seal each of block. Failure to follow the method will cause the defect on the building. Crack on the wall, floor repair work not done properly and also hole between the gap of block are the illustrated of the defect on the wall.

CONTENTS		PAGE NO
Acknowledgements		i
Abstract		ii
Contents		iii
List of Tables		iv
List of Figures		v
CHAPTER 1.0	INTRODUCTION	1-4
1.1	Background	1
1.2	Scope of Study	3
1.3	Objectives	3
1.4	Methods of Study	4
CHAPTER 2.0	COMPANY BACKGROUND	5-10
2.1	Introduction of Company	5-6
2.2	Company Profile	7
2.3	Organization Chart	8
2.4	List of Project	9-10
	2.4.1 Completed Projects	9
	2.4.2 Project in Progress	10
CHAPTER 3.0	CASE STUDY	11-25
3.1	Introduction to Case Study and Component of Reinforced Concrete Masonry Wall.	11-15
3.2	Sequence Construction of Reinforced Concrete Masonry Wall.	16-25
3.3	Problem and the Solution from Defect.	26-28
CHAPTER 4.0	CONCLUSION	29
4.1	Conclusion	29
REFERENCES		30

LIST OF TABLES

Table 2.1	Table of Completed Project	7
Table 2.2	Table of Project Progress	8
Table 3.1	Size and Type of CMU Block	13
Table 3.2	Detail Construct of Wall for One Building Block	21
Table 3.3	Machine and Equipment	22-23

LIST OF FIGURES

Figure 2.1	Company Logo	5
Figure 3.1	Site Plan	11
Figure 3.2	Site View	12
Figure 3.3	Placement of Vertical and Horizontal Reinforcement	14
Figure 3.4	Block Infill with Grouting	15
Figure 3.5	Mortar Being Place Between of Block	15
Figure 3.6	Mark from Setting Out by Surveyor	16
Figure 3.7	Screeding	16
Figure 3.8	Lean Concrete	17
Figure 3.9	Completed of Kicker	18
Figure 3.10	Door Frame	18
Figure 3.11	Construct Besides the Door Frame	19
Figure 3.12	Construct at the Joint of Wall	19
Figure 3.13	Tie the Reinforcement	19
Figure 3.14	Fix the Link	20
Figure 3.11	Window Frame	20
Figure 3.12	Lintel	20
Figure 3.13	Nail	22
Figure 3.14	Tie Wire	22
Figure 3.15	Sawn Blade	22
Figure 3.16	Nail Hammer	22
Figure 3.17	Trowel	22
Figure 3.18	Tape	22
Figure 3.19	Wire Hock	23
Figure 3.20	Thread	23
Figure 3.21	Theodolite	23
Figure 3.22	Tripod Stand	23
Figure 3.23	Floor is Not in Good Condition	24
Figure 3.24	Reinforcement not available	24
Figure 3.25	Placement of Reinforcement	24
Figure 3.26	Hole Between the Block	24

CHAPTER 1.0

INTRODUCTION

1.1 Background

Load bearing masonry wall is a popular method that has long been used at the old times ago. This can be clarified as a structure that support the weight of the building to others from roof, dead load and lateral load. A wall that construct by form collective units of stones, bricks, blocks and concrete is a simplest technique for the construction. It performs strong durability to the building as the process of the construction are fill the concrete to the hole of block of masonry and also using reinforcement bar.

To be specific, there are many types of structural masonry that is plain masonry, reinforced masonry and pre stressed masonry. Plain masonry is the simplest method to construct as this method is not using steel reinforcement to construct the building. In order to rely the load of building on masonry, it just can be applied in low rise building construction in areas of low seismic. Therefore, the construction of reinforced masonry will construct with added of steel reinforcement to gain the tensile and bending strength and improve the compressive strength. This enable the construction of column and wall. Reinforced masonry is more preferred than plain masonry in the construction area of earthquake. While the pre-stressing is carried out by tensioning high strength steel rods or tendons embedded within the masonry structure.

There are many type of load bearing wall, however, the aim of this is to discover the construction of reinforced concrete masonry wall. The advantage of using reinforced concrete masonry walls is its durability. Concrete is one of the strongest materials available and is not easily exposed to rotting, mold, or damage from various types of pests. Concrete is also fireproof to act as a firewall between rooms and other structures. It's also ideal for wet environments because it resists moisture. It also not shows incompatibility to the environment. Reinforced concrete masonry walls don't contain any harsh chemicals that will affect your health or the health of the environment as they use recycled materials. The thickness gives a great insulation and reducing energy use. Last not least, cost can be reducing as wall can be faster to construct.

1.2 Scope Of Study

This study is carried out at Sungai Yu, Tanjong Karang, Kuala Selangor which construct low cost 500 residential units house under the People's Housing Programme (PPR). The project also includes 5 residential units for OKU, 1 unit kindergarten and 1 unit community hall. The allocation given to build this house is RM 100 Million by Urban Wellbeing, Housing and Local Government Ministry. The percentage of house that had been built was 40% most of which focus on construction wall.

Scope of study are practically view and focus on the reinforced concrete masonry wall construction which follow the methods that include with materials and machineries that used. In each building, the element and technique of reinforced concrete masonry wall is the same but the different is how the work and process to be followed by contractor. The defect will occur when the construction is not built perfectly.

1.3 Objectives

There are few objectives will be achieved under this industrial training as stated below:

- 1.3.1 To identify component of reinforced concrete masonry wall.
- 1.3.2 To explain the sequence of reinforced concrete masonry wall construction.
- 1.3.3 To identify the problem and the solution of the problem.

1.4 Method Of Study

The method of study is the method or process a case study from find of information to the analysis of information. In process find information or data which many methods are using to find information through theory and data. It is a basic for a method of study. The methods that being used for this report are:

i. Observation from site

Observation from the site are more focus on the topic that have been chosen which is process of wall construction. The observe is from early stage until reach to the top during work hour. The observation is taking by written notes and taking pictures as an evidence for this report.

ii. Interviews

Another appropriate method is by interviewing workers such as labours, supervisor and also construction manager. This is more detail because they have an experience and more knowledge about the construction. Usually the questions will make in person during observation or when do work to get more meticulous detail about the topics.

iii. Document Reviews

Besides that, the sources from company such as document can be used to get more information and more detail. From reviewing, the detail will be clearer to avoid any mistakes. The documents that can reviews are construction drawing, project progress and so on

iv. Internet

Last but not least, the major method that are commonly used which is by surfing internet. Through surfing internet, the information is easier to found and mostly it can be obtaining accurately by type the keyword.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company



Figure 2.1 Company Logo

Zikay Construction Sdn. Bhd. formerly known as Imbas Mesra Sdn Bhd, a Private Limited Company, incorporated on 2nd April 1994, under the Companies Act, 1965 with its operation office at Jalan Raja Alang, Kampung Baru, Kuala Lumpur. The company is managed by an excellent team of qualified and experience professionals who have had years of experience in all aspects of disciplines. On top of that company also registered with Construction Industry Development Board (CIDB) under G7.

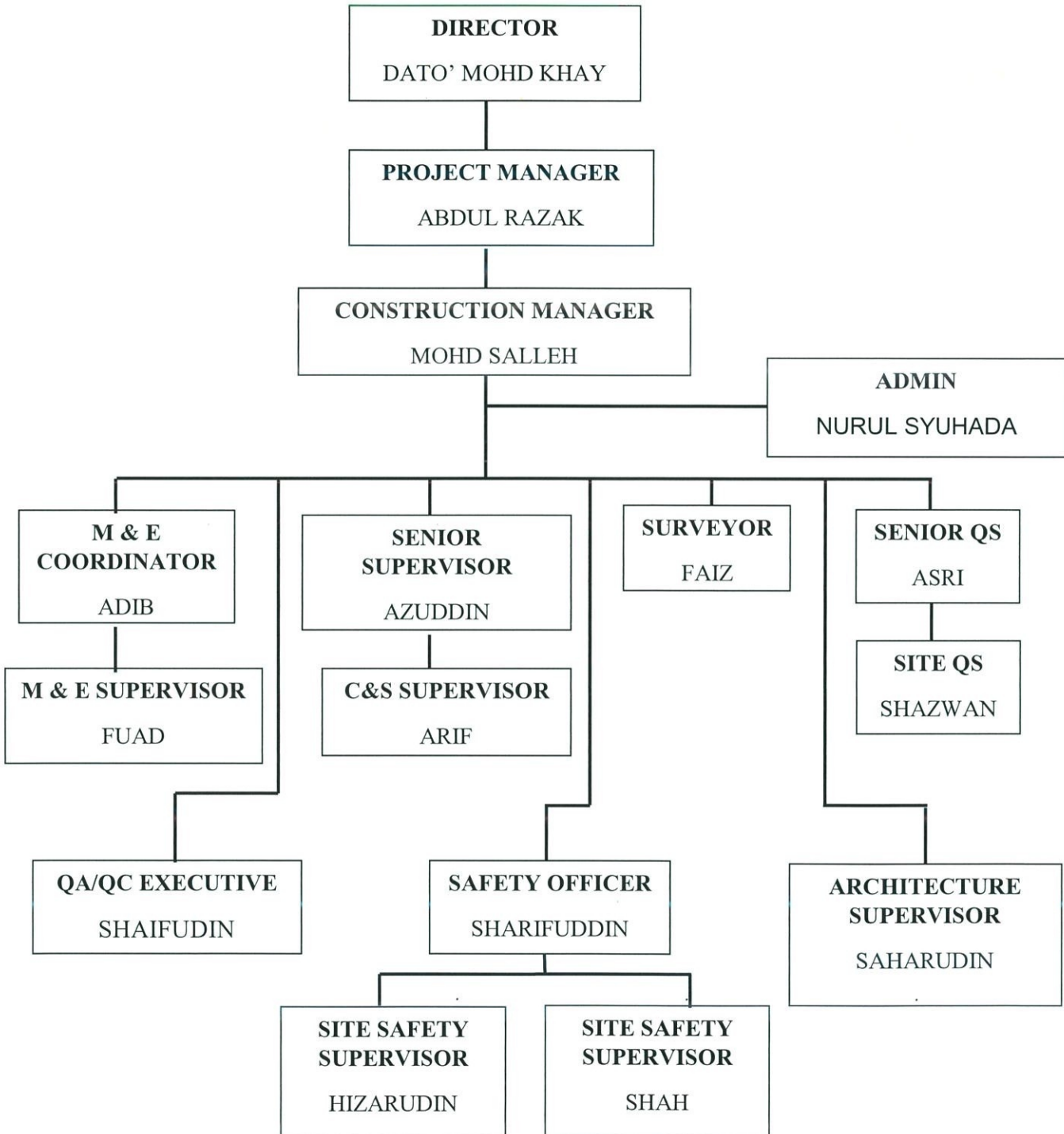
Zikay Construction commenced as a small general contracting company concentrating in constructions. As a company committed to the pursuit of excellence, the Company had persevered in its policy of “Total commitment” and to excel in all its commitments and undertaking with this, the company had grown from strength to strength. Commencing from a humble beginning, Zikay Construction had established itself as one of the leading Bumiputera company in construction industry. In just a short period, the company has performed construction jobs worth well above RM10 million in total values.

In 2003, Zikay Construction Sdn Bhd has taken another step forward by venturing into Interior Design and Civil Engineering works and since then, managed to secure construction jobs worth RM15 million. Due to the excellent performance, Zikay Construction has been recognized by Pusat Khidmat Kontraktor (PKK) and awarded with CLASS A Contractor License with Bumiputera Status. Company also successfully obtained Certification of ISO 9001:2015 (Quality Management System) from Bureau Veritas Certification Sdn Bhd and accredited by United Kingdom Accreditation Service (UKAS)

2.2 Company Profile

Name of Company	:ZIKAY Construction Sdn. Bhd.
Registration No	:0120040531-WP095655
Date of Incorporation	:2nd April 1994
Paid Up Capital	:RM 11,200,000.00
Licence & Certificates	:CIDB Grade G7 Kementerian Kewangan Malaysia Care Certification International Felda Global Ventures Holding Berhad
Head Office	:Level 7, Bangunan ZIKAY 53, Jalan Raja Alang, Kampong Baru, 50300 Kuala Lumpur Tel : Fax : Email : office@zikay.com URL : www.zikay.com
Board Of Directors	:Dato' Mohd Khay Ibrahim Managing Director Pn. Nor Shila Mustapa Executive Director Abdul Razak Bin Mohamed Ali Director

2.3 Organization Chart



2.4 List of Project

2.4.1 Completed Projects

Table 2.1 Show Completed Projects

NO	PROJECT NAME	CONTRACT SUM (RM)
1	Proposed Construction Of Kampung La-Keruak Road In District Of Besut	40,500,000.00
2	Proposed Construction Of 18 Classes For Sekolah Kebangsaan Gong Pasir By Using Ibs System On Lot 2496, 2498 And 2499 At Mukim Kuala Dungun, Terengganu	16,100,000.00
3	Proposed Housing (Phase 1a) 288 Units Low Cost Terrace Houses (1 Storey)-18'x60' 127 Units Medium Terrace Houses 28 Units Semi D Houses (1 Storey) – 40'x60' 2 Units Tnb Substations (1 Unit Single Chamber And 1 Unit Double Chamber) At Lot 5068 Kampung Permata Kuang, Mukim Rawang Daerah Gombak Selangor	25,146,000.00
4	Proposed Housing (Phase 1b) 103 Units Medium Cost Double Storey Houses-20'x70' 1 Units Tnb Substation (Double Chamber) For Tetuan Roniaga Sdn Bhd At Lot 5068 Kampung Permata Kuang, Mukim Rawang Daerah Gombak	11,240,000.00
5	Proposed Phase 1 (Parcel 1b) At Seksyen 3 Tambahan Bandar Baru Bangi Mukim Kajang Daerah Hulu Langat	22,116,959.10

2.4.2 Project in Progress

Table 2.2 Show Project in Progress

NO	PROJECT NAME	CONTRACT SUM (RM)
1	Design And Build Of 500 Units Single Story For Program Perumahan Rakyat (Ppr) Tanjung Karang, Jalan Sungai Yu, Kuala Selangor, Selangor.	100,000,000.00
2	Proposed Mixed Development (Housing Business), 100 Units Of Single Storey Terrace 20'x70' (Sri Bayu) 29 Units Of Single Storey Terrace 20'x75' (Sri Ayu) 30 Units Of Single Storey Semi-Detached House (Sri Perdana) Infrastructure Works Bandar Pusat Jengka, Maran, Pahang.	27,800,000.00
3	Design And Build Of 24 Units Single Story 20' X 90' On The Lot Pt 73828 (Hsm 33921) Lot Pt 73849 (Hsm 33942) Jalan Sireh Pineng 1/Ks4, Taman Sungai Sireh, Kampung Sungai Sireh, Mukim Klang, Daerah Klang, Selangor.	7,400,000.00

CHAPTER 3.0

CASE STUDY

3.0 Introduction of Project

Zikay Construction to develop People's Housing Project (PPR) of 500 single storey units house phase 1 was construct at Sungai Yu, Tanjong Karang in Kuala Selangor. Urban Wellbeing, Housing and Local Government Ministry (KPKT) are appoint Zikay Construction to construct this low-cost house project. The construction takes over on 11 December 2017 and were expected to be completed by the end of 2020. The project worth RM 100 Million is providing facilities such as kindergarten, community hall and 5 residential units for OKU. Percentage of house that had been built was 40% most of which focus on construction of wall.

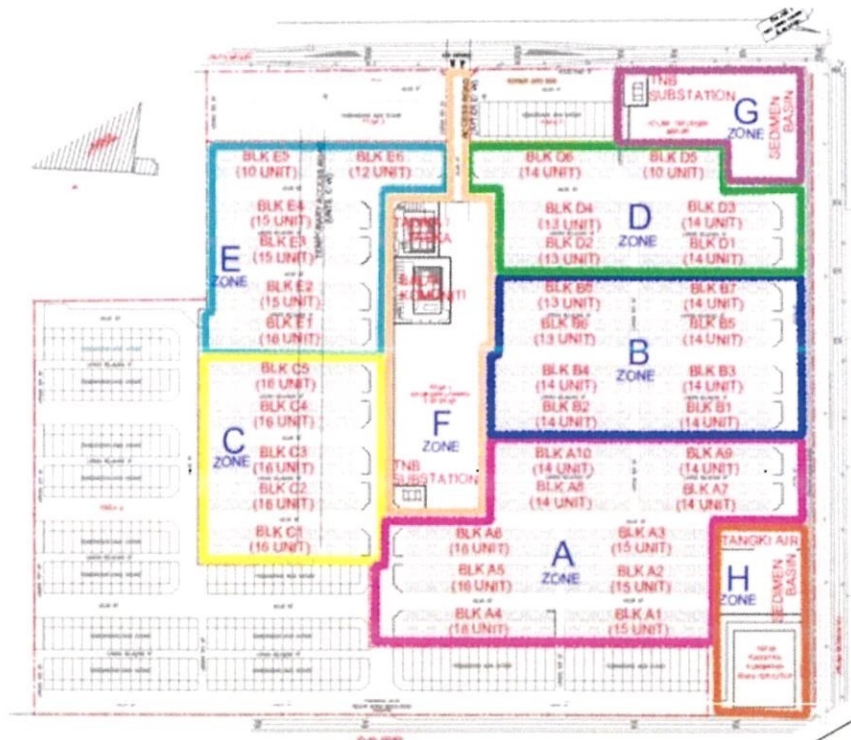


Figure 3.1: Site Plan



Figure 3.2: Site View

Generally, this low-cost house was built at area previously was covered with palm trees which has clay type soil. Zikay Construction are using method of reinforced concrete masonry wall, as it is known that concrete is the one strongest material besides has strong durability. The company are very attentive to the construction to make sure the building stand firmly as the load are rely to each other. Despite that, Urban Wellbeing, Housing and Local Government Ministry (KPKT) will be observed to ensure the outcome of the work every month. Currently, work of lay the brick are proceed to the all section blocks.

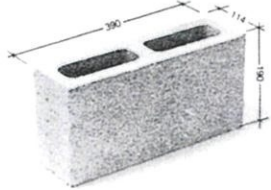

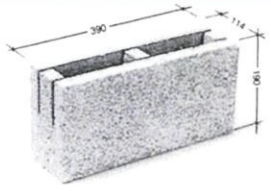

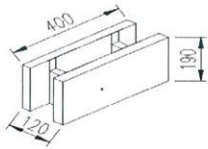

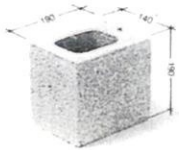
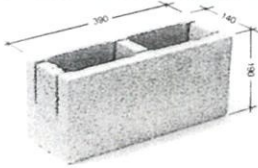
Each unit of block will hand over to the sub-contractor for construction work. In order to achieve the successful project, the company need to pick a team of contractor that have experience to handle the construction of reinforced concrete masonry besides understanding demand of owner. Thus, a safety plan will be outlined by doing inspection to the work have been done by contractor as a precaution and observation. Failure to follow the regulation construct of reinforce concrete masonry will cause various possibilities to occur defect and increase cost of construction.

3.1 Component of Reinforced Concrete Masonry Wall.

3.1.1 Concrete Masonry Unit (CMU)

Concrete Masonry Unit also known as Concrete Block which is always used as a building material in the construction of walls. Based on table 3.1, CMU are form in many shape and size depends on the placement block on the construction. The only perfect form of precast concrete block may be used for construction of both loads bearing as well as non-load bearing walls. Practically, the concrete block is commonly produced from a mixture of powdered Portland cement, water, sand and gravel. CMU tend have one or more hollow cavities. Therefore, it needs to infill with grout fully and in order to stacked one at a time and held together, fresh concrete mortar need to form.

Table 3.1: Size and Type of CMU

CMU Full Block 114 X 390 X 190 	CMU Half Block 114 X 190 X 190 
CMU Bond Block 114 X 390 X 190 	CMU 3/4 Block 114 X 290 X 190 
CMU Full Block 120 X 400 X 190 –party wall 	CMU Full Block 140 X 390 X 190 
CMU Half Block 140 X 190 X 190 	CMU Bond Block 140 X 390 X 190 

Source: Zikay Construction Document

3.1.2 Steel Reinforcement

Vertical and horizontal reinforcement of grade T12 are placed in order to hold other blocks for each cross section, tend to avoid from cracked activity. The placement of reinforcement must be accurate and to be placed in the center of block cells based on the drawing requirement. The process of this work often very complex however in order to get firm, vertical reinforcement needs to fix at all corners and junctions of walls, adjacent to all doors and windows and along of wall stiffener. Moreover, connector of reinforcement must have lapping and wire are used to tie the continuous of reinforcement. However, the placement for horizontal reinforcement are placed to along window lintel and door while block have to fix upside. This steel reinforcement bar must be placed to all required section without missing of one.

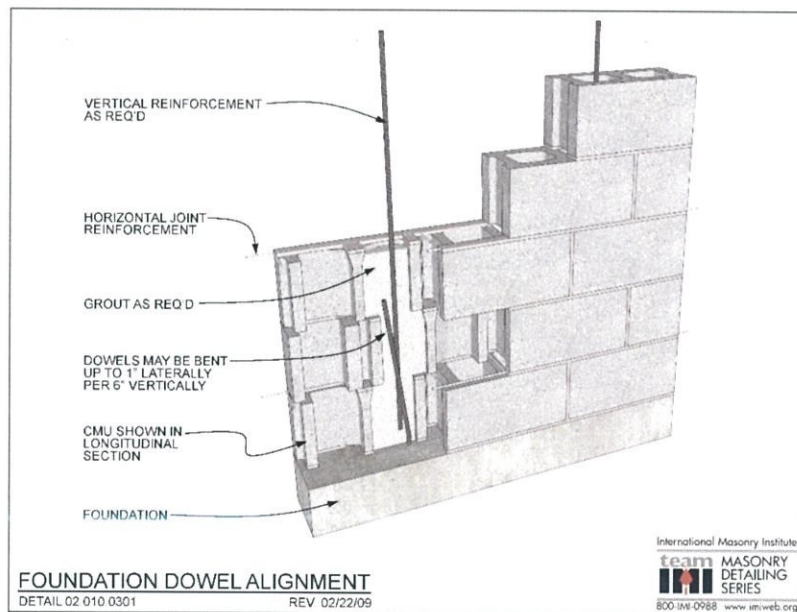


Figure 3.3: Placement of Vertical and Horizontal Reinforcement

Source: International Masonry Institute (2009)

3.1.3 Mortar and Grout

Mortar and grout use the same material and ratio to act to their function. The function of mortar is to fill and seal the gap between the blocks in the construction. However, grout is used to fill the center of the masonry core of the block as full as the height of the block. The material used to form mortar is cement, sand, and aggregates in a ratio of 1:1:2. Mixing should be done by using a concrete mixer or by hand. However, using a concrete mixer is more recommended and accurate. The amount of mixing water must be used with caution as the presence of it makes the mixing become hard.



Figure 3.4: Block Infill with Grouting



Figure 3.5: Mortar Being Placed Between Blocks

3.2 Sequence Construction of Reinforced Concrete Masonry Wall

3.2.1 Setting Out



Figure 3.6: Mark from Setting Out by Surveyor

Grid line from ground level is not unable to found therefore site surveyor needs to discover the marking of setting out to establish the right position of exist reinforcement. Moreover, surveyor also need to mark out the placement block to construct the wall that will to raise up and high level of floor finishes to proceed the screeding work. To achieve accurate line, string and spray will be used along the construction of the wall until the top.

3.2.2 Screeding



Figure 3.7: Floor completely screed

Pour concrete of G30 to the existed of formwork from slab work and use trowel to even the surface of concrete. The level of screeding is depending on the level of floor finishes that discover by surveyor from setting out. Using material of mortar for screeding are not allowed.

3.2.3 Dismantle Screeding Formwork

Dismantle formwork after the concrete has gained sufficient strength and totally harden. Using hammer for removal of formwork. This work will take about two day for one building of block.

3.2.4 Formwork for Kicker

Installation of formwork for kicker at each appointed location based on the drawing. The formwork of kicker is located to the between of existed reinforcement. The work will take about 3 persons for 3 days to construct for a building block.

3.2.5 Lay Lean Concrete for Kicker



Figure 3.8: Lay Lean Concrete

Lay of G30 concrete to the formwork according to the 50mm x 115mm measurement of kicker or not exceeding 50mm. The concrete will pour along the existed reinforcement so that by using the experience workers are more priority needed to handle work. Once the concrete pour, the mistakes require costly.

3.2.6 Dismantle Formwork



Figure 3.9: Completed of Kicker

Dismantle the formwork by using hammer after the concrete are harden. The whole entire dismantle process will take about 1 days for 2 persons.

3.2.7 Installation Door Frame



Figure 3.10: Door Frame

Fix the door frame by the experienced of worker at each appointed location based on the drawing and make sure the orientation of door place correctly. Two persons of worker will work for two day to settle up the installation of door for one unit of house. Plywood will be act as supporter for door frame.

3.2.8 Construct of Wall



Figure 3.11: Construct Besides the Door Frame



Figure 3.12: Construct at the Joint of Wall

Build up the first layer of block beside of the expansion joint and above floor level after spread the mortar on the top layer of floor or kicker which existed reinforcement T12 are being placed according to the drawing plan. Fill the mortar between 10-15mm to fill the gap between the block. Pouring grout to the core after the block are adequately fixed. Even and remove the excess of mortar with trowel. Fix fish tale to tie the door frame to adjacent block.

3.2.9 Reinforcement of Block



Figure 3.13: Tie the Reinforcement

Fix reinforcement to place where all corners and junctions of walls, adjacent to all doors and windows and along of wall stiffener. Tie the T12 of reinforcement to hold it in the position by using wire. The reinforcement need to tie when the length is getting short.

3.2.10 Fix the Link

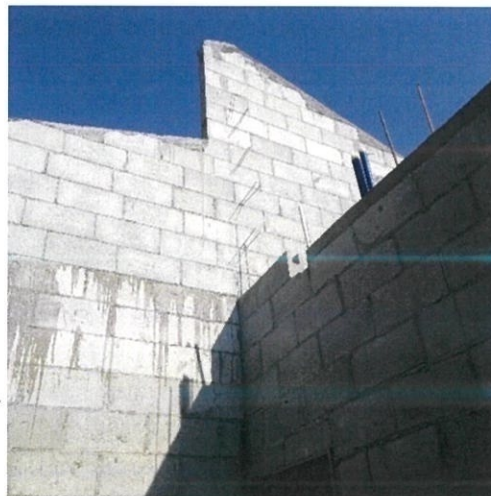


Figure 3.14: Fix the Link

R6 of reinforcement are being used as the link. The placement of link must be in every two layer of block until reach to the top.

3.2.11 Installation of Window Frame



Figure 3.11: Window Fram









Figure 3.12: Lintel





Attach the window frame when the block laying reach 6 layer or 1.2m height. Horizontal reinforcement need to fix to the lintel of window and door with upside position then continue lay of block.

Table 3.2: Detail Construct of Wall for One Building Block

Work	Labour (no)	Material	Tool, Equipment and machineries	Day
Setting Out	2	- Tread - Nail - Spray	- Theodolite - Tripod - Hammer	1
Screeding	3	- Concrete G30	- Trowel - Concrete mixer	4
Dismantle	2		- Hammer	2
Formwork	3	- Nail - 1x2 Sawn timber	- Sawn cutter - Sawn blade - Tape	3
Lean Concrete	2	- Concrete G30	- Trowel - Concrete mixer	2
Dismantle	2		- Hammer	1
Installation	2	- 1x2 Sawn timber	- Hammer - Nail	2
Construct	5	- Concrete block - Mortar - Grout	- Trowel - Concrete mixer - Basket	14
Reinforcement	5	- Rebar T12 - Tie wire	- Tie wire hock	14
Fix	5	- Rebar R6 - Mortar	- Trowel - Concrete mixer - Basket	14
Installation	2	- 1x2 Sawn timber	- Hammer - Nail	1

Table 3.3: Machine and Equipment

No	Name	Diagram	Uses
1	Nail	 <p>Figure 3.13: Nail</p>	- Joint material
2	Tie Wire	 <p>Figure 3.14: Tie Wire</p>	- Tie and joint steel
3	Sawn Blade	 <p>Figure 3.15: Sawn Blade</p>	- Cut the wood
4	Nail Hammer	 <p>Figure 3.16: Nail Hammer</p>	<ul style="list-style-type: none"> - Hammer nail - Dismantle
5	Trowel	 <p>Figure 3.17: Trowel</p>	- Even concrete layer
6	Tape	 <p>Figure 3.18: Tape</p>	- Measure length

No	Name	Diagram	Uses
7	Wire Hock	 <p data-bbox="612 488 863 517">Figure 3.19: Wire Hock</p>	- Tie and lock wire
8	Thread	 <p data-bbox="632 779 842 808">Figure 3.20: Thread</p>	- Grid line
9	Theodolite	 <p data-bbox="612 1122 858 1151">Figure 3.21: Theodolite</p>	- To get grid line
10	Tripod Stand	 <p data-bbox="600 1440 871 1469">Figure 3.22: Tripod Stand</p>	- Stand for machine

3.3 Problem and Solution



Figure 3.23: Floor is Not in Good Condition

Floor repair work was not done properly tend to produce uneven floor and difficult to construct the wall. Moreover, irresponsible worker will ignore it and proceed the construction can cause the position of the wall are not stable. Lack experince of work is one of the reason that work done is not satisfied. However there are various way which is determine the accurate level to fix the floor right way after the concrete are completely harden is one of the solution. Hired the specialized knowledge worker are tend reduce the cost of construction. Lastly, hacking the floor.



Figure 3.24: Reinforcement not available



Figure 3.25: Placement of Reinforcement

Wall cracking occur when the soil moisture level are change and hard control footing movement. However, absence work of installing reinforcement can cause the load cannot be support then led to occur this damage getting worse. In addition, crack also can happen when the construction wall are interfere with the installation of reinforcement not right in place. Therefore, installing work of reinforcement need to emphasized and reminded to the worker or made them to take responsible of the mistake. Cut or bending the useless of reinforcement to avoid interfere construction work.



Figure 3.26: Hole Between the Block

Hole between the block and inside the core masonry are often happen when the mortar and concrete are not thorough properly. Generally this will made worse when the wall to collapse as there is no bind to the block. Moreover, poor quality of mortar and concrete tend to reducing the bond between them. The problem will be solved when using the higher quality of the concrete so that the concrete can be seal more stronger to hold between the block. In addition, the supervisor can make inspection to ensure that block are construct well.

CHAPTER 4.0

CONCLUSION

4.1 Conclusion

Reinforced concrete masonry wall is one of the methods to construct from type of load bearing masonry wall construction. The method construction of wall can be determined depends on the cost and planning of construction. The high quality of component is really important to use for construct of the wall because it can influence the strength and stability of the building wall. Despite that, steel reinforcement is installed in the method of wall to control the load and also to provide tensile and bending strength. Besides, the mortar is used in order to hold the bond of the block. Lastly, the accurate sequence installation of the block also tends to give the great condition result of wall.

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