



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

**CONCRETE MASONRY UNIT:  
CHARACTERISTIC, METHOD, ADVANTAGES AND  
DISADVANTAGES INSTALLATION**

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**(PERAK)**

**DECEMBER 2019**

It is recommended that the report of this practical training provided

by

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**entitled**

**Concrete Masonry Unit:**

**Characteristic, Method, Advantages and Disadvantages Installation**

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

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**DECEMBER 2019**

**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 Group Sdn Bhd for a duration of 20 weeks starting from 5 August 2019 and ended on 20 December 2019. 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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Date : 20<sup>th</sup> December 2019

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## ABSTRACT

Concrete masonry units (CMU) is one of the most common construction material used in the housing development industry in Malaysia and has been utilized throughout the world of exterior walls of conventional structures. This report was carried on for 35 acres of 35 blocks for 500 units 20'×60' Single Storey House, Community Hall and Kindergarten owned by Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan Tempatan (KPKT). This project has divided in some batches which each batch is doing the same method but in different time and location. Not same as other usual housing construction, this project started with the use of buoyant system which involved bamboo for the base and Raft Foundation as their platform. *It is green and sustainable system of construction which has designed to solve a critical contemporary engineering problem of supporting heavy construction safely without any settlements in due course.* The aim of this report is to identify the characteristic and method of application CMU into the building. It will concentrate on the sequences from delivering the material to the site until finishing of lay out CMU. Other than that, this report will also look at the difference advantages and disadvantages of application CMU at site. There will be many input and knowledge about this application of CMU in construction industry in Malaysia which has been mentioned in Chapter 3.

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## CHAPTER 1.0

### INTRODUCTION

#### 1.1 Background and Scope of Study

Malaysia is a developing country placed in the South East Asia region. Many type of method and material which used to be installed in every construction work in Malaysia. A building has to design first specifically and then get approval from authorities before starting the work of construction. Each of method used must suited with the building to support the load applied to it safely. This study was located at Jalan Sungai Yu, Tanjung Karang, Selangor which this project was owned by the Ministry of Housing and Local Government or in other word Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan Tempatan (KPKT). Their mission is to accomplish the National People's Housing Program, Municipal and Fire Services to improve the quality of lives and wellbeing of the people. Basically, the project is built for providing affordable housing to fulfill the need of local residents. The RM100 Million project involved 500 units of 20'×60' Single Storey Houses (including house for Disable People OKU), a unit of community hall, a unit of kindergarten and substation of TNB. There will be used of buoyant system which involved bamboo and raft foundation as their platform. But on this study, there will be highlight about the application of Concrete Masonry Unit (CMU) at the site starting from delivery material until the finishing work of expansion joint.

Concrete Masonry Unit (CMU) which also can be referred as concrete block, contains design of solid and single or multiple hollows. The term of concrete blocks itself was identified by the formerly limited to only hollow masonry units made which created with any kind of aggregate (Khairani, 2011). According to (Army, 1998) CMU is made from conventional cement mixes and various types of aggregate, including sand, gravel, crushed stone, air-cooled slag, volcanic cinders, pumice and scoria . Concrete masonry is an increasingly important type of construction due to technological developments in both the manufacture and the use of concrete blocks. It has come in different compressive and durability strength which each of block has to through in a few tests.



Normally, in Malaysia the selection of material depends on the design from the consultant. There will be referred to the approval drawing where there is including the calculation of structure and impacts of load. As (Wieffering, 2009) mentioned in his book, the manufacture of concrete masonry units is a specialized precasting process that consists of mixing concrete suitable for masonry manufacture. There will be a few tests to each of block before supplier deliver it to the customer. Other than that, also mentioned in (Wieffering, 2009) book, masonry walling is formed when masonry units are laid in mortar, usually in bonded configuration. Mortar is an important part of the strength of wall construction. The stronger the mortar, the more strong of a wall but fit in more rigid, which this means that the wall is more likely to crack when stressed.

## **1.2 Objectives**

1. To describe the characteristic and specification of material for application CMU blocks at the site.
2. To explain the method of installation Concrete Masonry Unit (CMU) at the site.
3. To differentiate advantages and disadvantages when used Concrete Masonry Unit (CMU) at site.

### **1.3 Method of study**

This study carried out by three methods which are observation, interview and document reviews. The resource and research were helped and supervised by person in charge, who has responsibility to share all the information and knowledge about the application of Concrete Masonry Unit (CMU) in the site area.

#### **1.3.1 Observation**

The observation of this case study was taken during my practical training which took about a month from 4<sup>th</sup> November 2019 until 29<sup>th</sup> November 2019. The observation was about of the progress work of 500 units 20'×60' single storey house, kindergarten and community hall. There will be some short notes and pictures in the same angle of the block but in different days and weeks.

#### **1.3.2 Interview**

The interview session with the person in charge which represent as Assistant Resident Engineer for this project. His profession is to design and supervise the laying work of Concrete Masonry Unit (CMU) at the site. In this interview session, he has told and explained the specification, advantages, disadvantages and type of CMU used at the site. He also mentioned the comparison of the strength and criteria of the material used at the site. There has a voice recorded by smart phone and some short notes in the book.

#### **1.3.3 Document Review**

The document was including the Site Plan, Specification Material, Method Installation Checklist, Timeline Progress Work, Material Approval, Safety and Inspection of Work Finished of CMU. All documents will be referred either in softcopy or hardcopy.

## CHAPTER 2.0

### COMPANY BACKGROUND

#### 2.1 Introduction of Company

Zikay Group Sdn Bhd or ZGSB is a 100% Bumiputera business company which provided services and development management included Property Development, Hospitality, Construction, Financial Services and others such as Education, Minting, Internal Ventures, and Security Service. From an initial call on available property to project conceptualization, to city approvals, construction, marketing, sales and management, the Company has had the capabilities to get the project done successfully. These efforts are made possible with the very talented backbone of the company. Dato' Mohd Kay Ibrahim, one of Group Managing Director hopes that ZGSB will be a renowned Bumiputera developer in the country and in time comes as well as to be known globally. To keep the journey still in track, Tamu Hotel & Suites is a gem of company which located at strategic location that almost people will come once they want to explore Kuala Lumpur. There could not be the best as what ZGSB achieved today except from strong management and team cooperation; the staff and workers in the company. All their productive works have been done at the head office of group which situated in the center of Kuala Lumpur. To introduce ZGSB in the public, Tamu Hotel & Suites, Kuala Lumpur (figure 2.1.1) is indeed Zikay icon's and creating the legacy which the most proud development that shown how far they have come. Tamu Hotel & Suites provided accommodation and facilities into hotel and service suites as amount as 276 rooms for the hotel and 130 units including two penthouses of the service suites. There also included with a well equipped gym, infinity pool with the great views, banqueting and host of dining facilities.



*Figure 2.1.1 Tamu Hotel & Suites Kuala Lumpur*



## 2.2 Company Profile

Zikay Group Sdn. Bhd (ZGSB) had a humble start as a Small Landscape Contractor since 1994 and has been growing up slowly but surely taking steps to be one of the market leader in the development industry. The project development of this company be authorized capital as much RM50,000.00 and paid up capital as much as RM37,500,000.00. 'Grow as a Reputable Organization' is company's mission can be defined as to keep this business maintain efficiently, sustain and getting recognized in the country to the world.

With the spirit to be successful, the Group has completed their first development in Kluang on 1996 and their journey be continue through 2006, by the incorporation of Zikay Factoring Sdn.Bhd as a small factoring company. At this moment, ZGSB has enhanced their performance and quality in what they have involved until 2010, about 3,000 keys of houses has successfully delivered to the developers. ZGSB continue on developing a small township in 2013 and the group has completed of establishment Hospitality Division which includes Bukit Beruntung Golf & Country Resort and The Mines Resort & Golf Club in 2017. The Group's journey did not stopped until in 2013, ZGSB has venture into High End and Hotel Development in Kuala Lumpur and Langkawi as stated in the figure below.

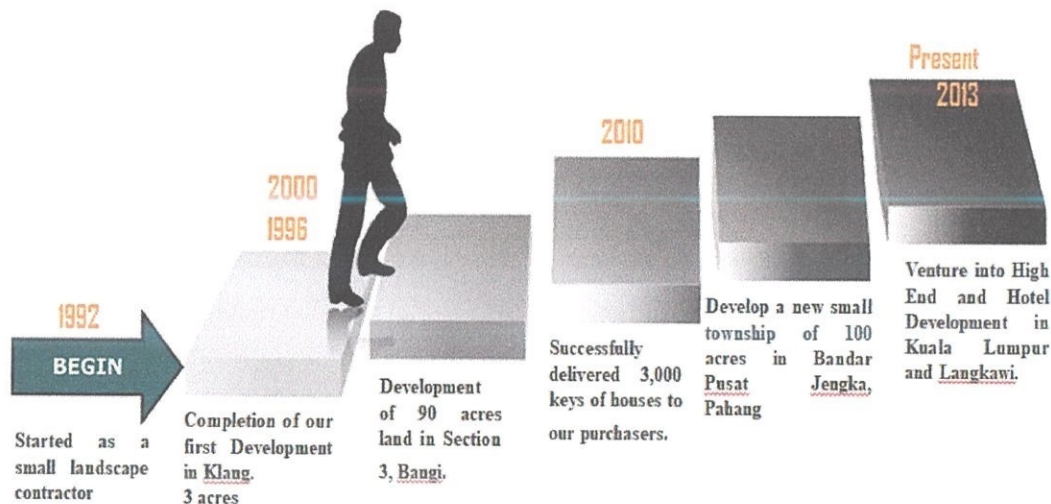


Figure 2.2.1 Corporate Structure



*Figure 2.2.2 Logo*

*Table 2.2.1 Contact Information of Company*

Name of Company	Zikay Group Sdn Bhd
Address	53, Aras 8, Bangunan ZIKAY, 50300 Kampung Baru, Kuala Lumpur
Telephone	
Fax	
Email	office@zikay.com

There will be more number of future and planning development in upcoming years. Zikay Group Sdn Bhd will be one of the best developer company in Malaysia which produce variety products in large quantity and good quality in next ten to 50 years by followed their mission:

Mission of company:

1. To provide superior customer service and satisfy customer's needs through a culture of excellent.
2. To enhance shareholder's value.
3. To be a caring and responsible employer.
4. To be mindful of our social responsibilities.

### 2.3 Organization Chart

Many types of programs have successfully achieved by directing and managing from its larger cooperation of corporation. The Group Managing and Executive Director will make sure that company's journey become much greater and growing as other bigger and popular property developer's company in Malaysia. The Group was founded by two of capable and proficient name in this industry, Dato' Mohd Kay Ibrahim and Dato' Iszhar Ibrahim and been supported by professional of Group Managing and Executing Director of ZGSB, and site staff as shown in the figure below:

(i) Management

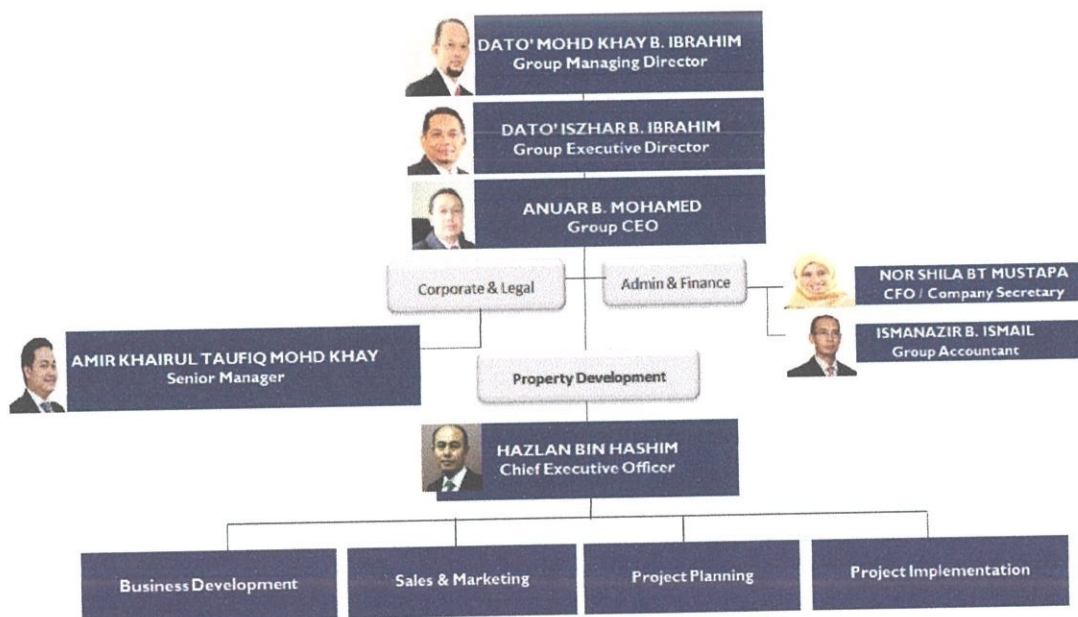


Figure 2.3.1 Organization Chart (Management)



(ii) Consultant

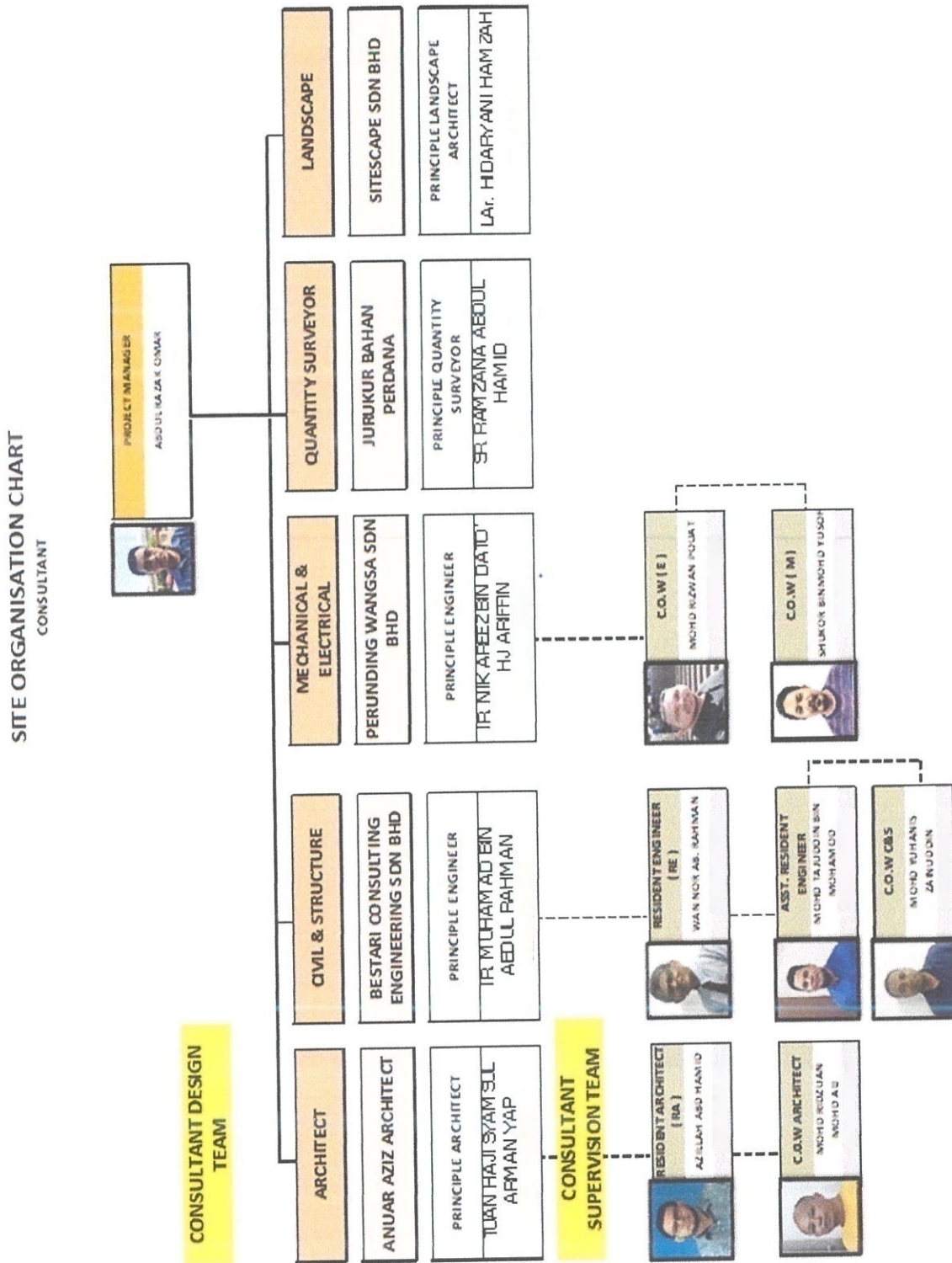


Figure 2.3.2 Site Organization Chart (Consultant)

(iii) Main Contractor

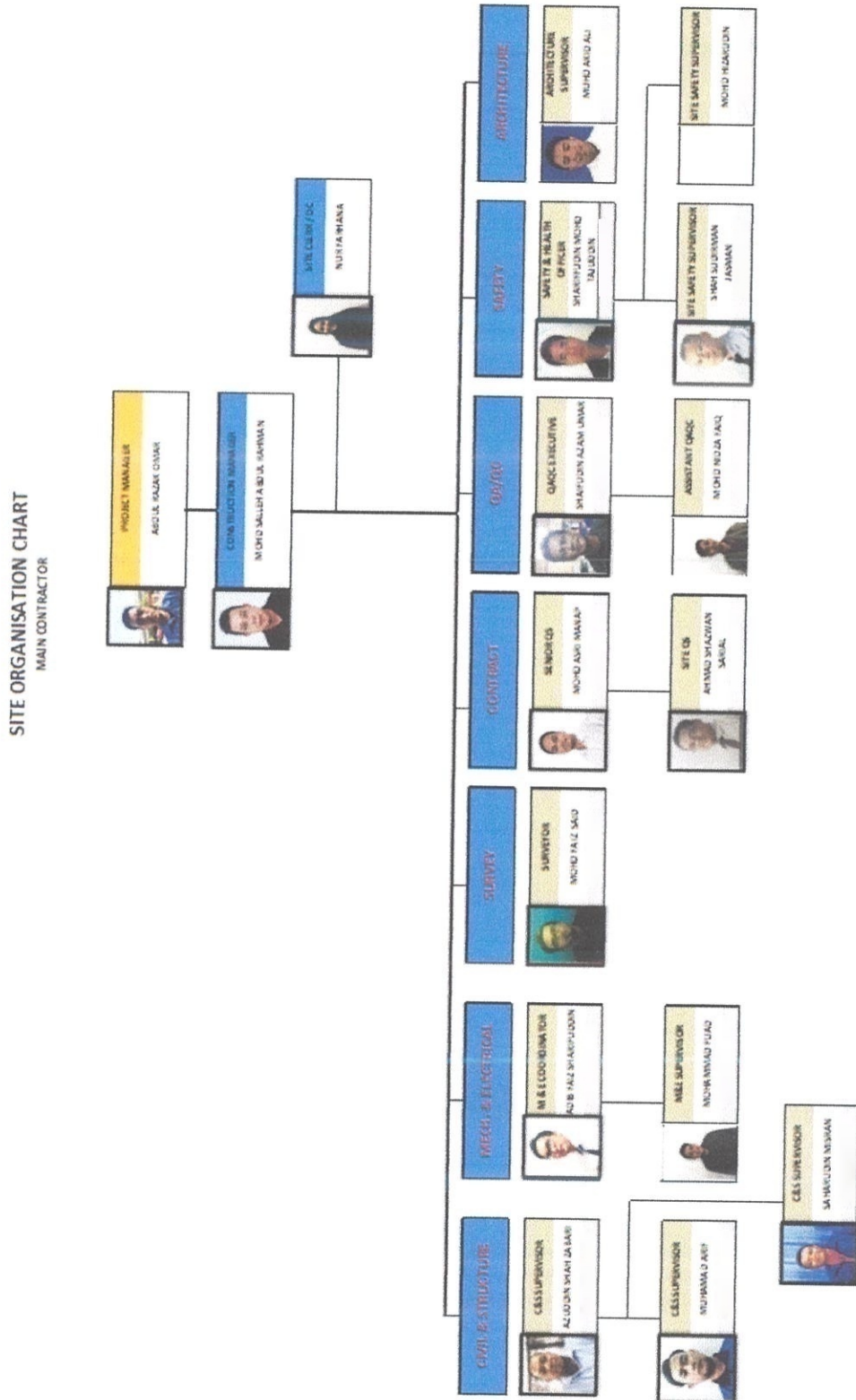


Figure 2.3.3 Site Organization Chart (Main Contractor)

## 2.4 List of Project

Throughout ZGSB development, there is about few projects that can be highlight of the year and at certain place. Zikay Signature Development can be list as:

1. Tamu Hotel & Suite, Kg Baru, Kuala Lumpur
2. Radiance By Zikay Gurney, Kuala Lumpur
3. Hotel & Services Apartment at Chenang, Langkawi
4. The Sail, Langkawi
5. The Splash, Langkawi
6. Taman Seroja, Pasir Gudang, Johor
7. Bukit Selagon, Beaufort Sabah

One of this project which is Tamu Hotel & Suite at Kampung Baru, Kuala Lumpur become special representation of this company because Y.A.B Dato' Sri Mohd Najib B. Tun Abdul Razak, the 6<sup>th</sup> of Malaysia Prime Minister has officiated the ground breaking of Mercu Zikay on 2nd May 2011 (figure 2.4.1). This has shown the uplift of Bumiputera spirit to retain and growing its potential in the development and construction industry.



*Figure 2.4.1 Dato' Sri attend the launching of Mercu Zikay*

There are many more developments that completely completed which:

1. Apartment 5 Block and Double Storey 48 units of 20' x 70' at Taman Subang Impian
2. Link Home and Semi Ds at Seksyen 3, Bandar Baru Bangi
3. Mukim Luit, Bandar Baru Maran
4. Sungai Sireh Klang Phase 1
5. Taman Tasik Biru, Kundang
  - a) Terrace Double Storey (Phase 1A & 1B)
  - b) Apartment 5 Block
  - c) 42 Unit 2 Storey Terrace House 20'x 60'
  - d) 2 Units 2 1/2 Storey Terrace House 20'x60'
6. Shop Offices and Kolej PTPL of Plot 1 & 1A, Seksyen 13, Shah Alam
7. Sg Merab, Bangi Selangor

ZGSB has been targeted many outcomes in the future but for now, the group has focused on developing the project of:

1. Taman Jengka Indah, Pahang
  - a) Single Storey 20'X70' Phase 1
  - b) Single Storey 20'X75' Phase 1
  - c) Semi-D 40'X80' Phase 1
2. Apartment Laguna Biru Phase 2
3. Shop Office Block A Phase 2
4. My Home 2 Phase 2
5. Sg Sireh Klang Phase 2
6. Jalan Sungai Yu, Mukim Ujong, Pematang Daerah Kuala Selangor





This study was highlight on the use of CMU at the site which the method started after finished the platform of Raft Foundation and Bamboo as buoyant system to the soil. For this project, the first proposed method is conventional method which same as like the usual method used in construction industry in Malaysia. The previous plan and idea were to use piling as foundation but there was so pricy and took more time than expected because of the condition of soil so bad which are totally clay soil. After discussion between client and person in charge for this project, they had decided to change the method by using of raft foundation and IBS system for the structure. There will be more challenging and difficult because the exact proposed drawing are not same as what are going on now at the site. Person in charge had to recreate the layout first for subcontractors' guidance before they are starting doing their work.

This project was about 35 acres of land area and involved 35 blocks which has been categorized by five batch which are block A, B, C, D and E. This project has started at 11<sup>th</sup> December 2017 and target accomplished by 10<sup>th</sup> December 2020 where a year from now. The progress work on site still in track but not too move forward. This project was built for 35 blocks of 500 units 20'× 60' single storey house include three units for use and employed of disable People (OKU), 1 unit of community hall, 1 unit of kindergarten (Tadika/Taska), 2 units of substation of TNB and a unit of Sewerage Treatment Plant for the whole area as shown on the layout plan (Figure 3.1.2) below.

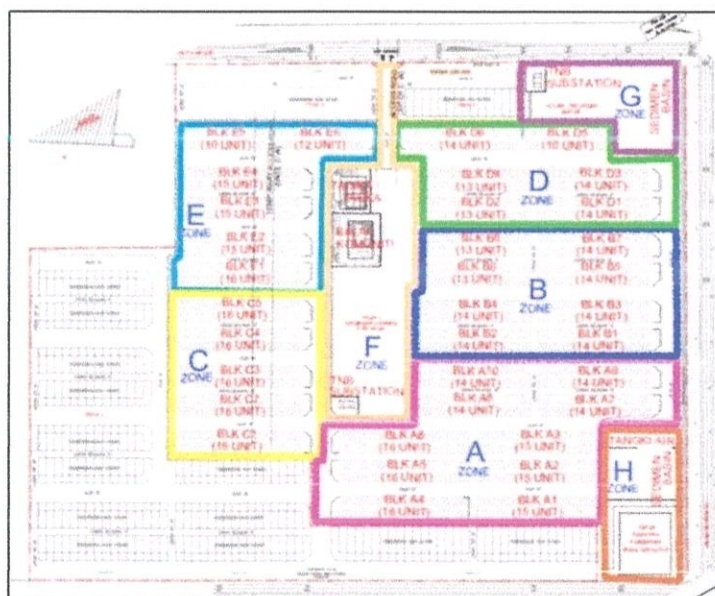


Figure 3.1.2 Layout Plan



Table 3.1.1 below show details of this project construction:

Project Title	Cadangan Merekabentuk, Membina dan Menyiapkan Fasa 1: a) 500 Unit Rumah Teres Satu Tingkat b) 1 Unit Tadika dan Taska c) 1 Unit Balai Komuniti d) 2 Unit Pencawang Elektrik e) 1 Unit Rumah Sampah dan Kerja-Kerja Berkaitan Dengannya Bagi Program Perumahan Rakyat (PPR) Di Atas Sebahagian Lot PT2089 (H.S.D 19901), Jalan Sungai Yu, Mukim Ujong Permatang, Daerah Kuala Selangor, Selangor Darul Ehsan.
Owner/ Client/ Employee Representative	 Jabatan Perumahan Negara: Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan Tempatan
Architect	 Anuar Aziz Architect
Civil & Structure Engineer	 Bestari Consulting Engineers Sdn.Bhd.
Mechanical & Electrical Engineer	 Perunding Wangsa Sdn.Bhd.
Quantity Surveyor	 Jurukur Bahan Perdana
Landscape Architect	 Site Scape Sdn.Bhd.
Contractor	 Zikay Construction Sdn.Bhd.
Date Started	11 <sup>th</sup> Disember 2017
Estimated Accomplish	10 <sup>th</sup> Disember 2020

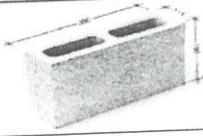

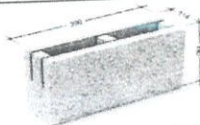
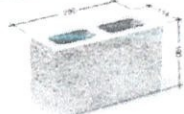
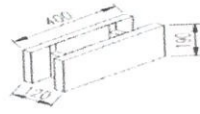


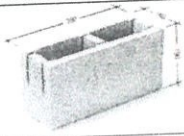
Table 3.1.1 Details of project

### 3.2 Characteristic and Specification Material

#### 3.2.1 Concrete Masonry Unit (CMU)

Concrete Masonry Unit is a part of IBS which made from the mixture of Portland cement and aggregates in required condition and ratio. CMU is one out of five subtopic in IBS where can be categorized as Block System. This unit can be made in various dimension, design and size upon the request from client or just followed by the common referred dimension of block used in Malaysia as shown in the table below. There are two type of block which are load bearing and non-load bearing (carry load) block. CMU is load bearing wall construction for low rise buildings, but also for structures rising as high as 16 storeys. It is typically larger than the normal brick. All concrete masonry units to be used shall comply with Malaysian Standard MS27 or BS6073, and, unless otherwise stated, be specified accordance with BS6073. They shall be manufactured from raw materials which satisfy the requirements of respective Malaysian or British Standard, where appropriate. They shall be obtained from approved sources, as audited by SIRIM. All details also be included in Appendix 1.

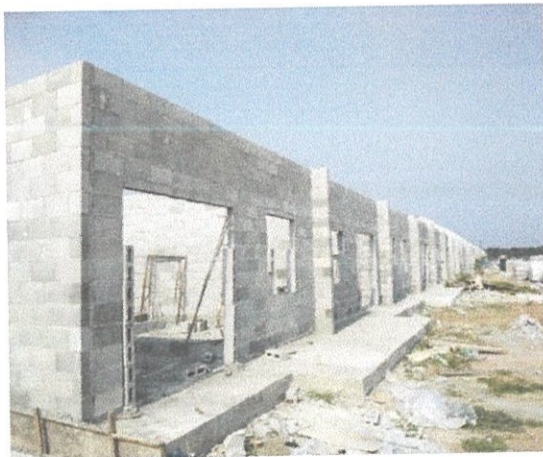
Table 2.2.1 Type of CMU used

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 

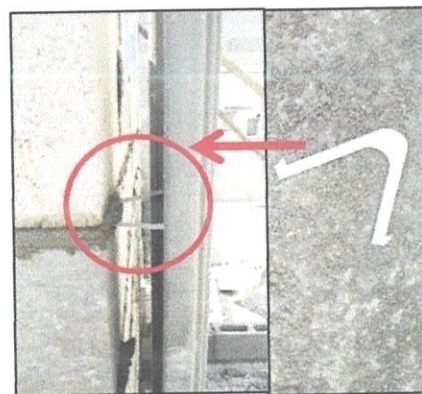
Notes : \* = Size of CMU is 140thk. Used for construction at community hall and kindergarten only.

The minimum compressive strength shall not less than  $7\text{N/mm}^2$  when determined in the mortar described in BS6073 or MS27. Structural masonry walls shall be constructed to comply with the Uniform Building By-Laws commensurate with the occupancy, and the Jabatan Perkhidmatan Bomba dan Penyelamat Malaysia. One of the most architectural benefits of designing with concrete masonry is its versatility which the finish appearance of concrete masonry wall can be varied with the unit size and shape, colour of units and mortar, bond pattern, and surface finish of the units. CMU (Figure 3.2.1) is used for interior and exterior walls, partition, terrace walls, and other enclosures, on top of being widely used for landscaping elements. Some units are available with the same treatment or pattern on both faces, to serve as both exterior and interior finish wall material, increasing both economic and aesthetic advantages.

The application of CMU at this project involved 6 different height of wall as can be referred in wall elevation drawing. There can be different especially when involving wall 2,3,8,13 and party wall 1 and 2 as shown in Appendix 2 and 3. The installation of CMU also involved other accessories especially at the position of opening such as fish tale (Figure 3.2.2). Fish tale has to apply in every application of opening such as door and window frame. There can be more efficient if the contractor has fixed it during the installation of CMU.



*Figure 3.2.1 Finished laying CMU below 3.2m height*



*Figure 3.2.2 Fishtail*



### 3.2.2 Steel and Starter Bar

Steel as basic raw material is used in a wide range of applications from construction to fabrication, engineering and manufacturing. Generally, all products are produced in compliance to international standards such as BS, JIS, AISI, ASTM, DIN, AS and others with precise adaption for specific application.

Steel bars are inserted in the appropriate cavities such that they extend above the top course by a length equal to 30 bar diameters. This is sufficient to provide lapping with the reinforcement in the next masonry lift. The following below shows rebar used at site:

#### i) Starter Bar

Starter bar are cast into concrete to give a lapped connection to provide continuity of reinforcement across a cold joint or construction joint. Errors in position can affect the all being under strength and in many cases unable to be built without the replacing of the bars by drilling or epoxy grouting steel in the correct position.

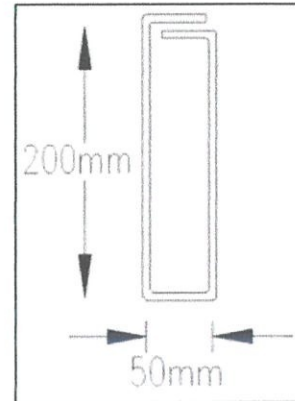
Starter bars are available in 12mm and 16mm bar diameters and in variable dimensions. There are few places as shown in the figure below (Figure 3.2.3) which mandatory to put starter bar to give the wall in good stability and more strong.



*Figure 3.2.3 Starter Bar*

## ii) Rebar Link

To tie the rebar, link (figure 3.2.4) is used to hold the proper position of rebar. Not all link of wall blocks are suitable for every application. There has to consider the wall height, site access, the possible surcharge behind the wall, the possibility wall be curve or straight and many more aspects. Most retaining walls are relatively simple rectangle as shown in the figure below whose area is easily calculated. For this project, rebar R6 will be used as a link. Link shall be installed in every 2 blocks as equal to 400mm height.



*Figure 3.2.4  
Rebar Link  
(Source:  
Modul Pemasangan CMU  
Projek PPR Tanjung  
Karang)*

## iii) Mesh

There are two different types of wire mesh available for this construction project which engineered and steel fabric mesh. Wire mesh shall be installed at the base of bond block surface to facilitate the installation of infill concrete.

Engineered mesh is a special configured mesh whereby each piece of mesh can be produced with a combination of different wire diameter and spacing. The wire can also be arranged in staggered or twin wire form. This special configured mesh is produced to suit certain specific design requirement, and could be used with considerable steel saving in any reinforcement concrete structures.

Size : Special configuration of wire diameters or wire spacing

Grade : Grade 485 and 500

Specification : MS145: 2006 (BS 4483: 2005)

There also provided steel fabric (cut to size) at the site. Cut to size mesh manufactured to any required dimensions to suit specific needs. These fabrics are custom-made to eliminate wastage of material and to simplify the laying process to avoid possible mix-up.

Size : A, B, C and DA series

Grade : Grade 485 and 500

Specification : MS145: 2006 (BS 4483: 2005)

### 3.2.3 Damp Proof Course

Damp Proof Course (DPC) is a barrier, usually formed by membrane built into the walls of building. The main function of DPC is to prevent damp rising through the walls and for greater wall thickness. Damp proof course has formed by using bitumen, and other materials such as asphalt, pitch or low absorption bricks. It should be strong and durable, and should be capable of withstanding both dead as well as live loads without damage. DPC should be free from absence of chemicals like sulphates, chlorides and nitrates.

### 3.2.4 Infill Concrete

Infill concrete is made from concrete grade G30/20 in ratio of 1:1:2 as describe in figure below which mixture of cement, sand and stones. Infill concrete will be used at party wall, bond beam, door and window lintel and pillar. Mortar is replaced as infill material totally prohibited. The use of this material is very important because there will be increase the durability and high composition during fire break. The concrete shall have a slump of 75-175mm for unplasticised mixes to make sure the durability strength is enough.



*Figure 3.2.5 Mixture of Infill Concrete*



### 3.3 Installation of CMU

#### 3.3.1 Delivery, Storage and Handling

Material is arriving to site after they have received an order from the client. Then, it will be arrange in orderly manner and store in the required preferred place. All the material shall be delivered to the jobsite in a good condition with the waterproof covering to protect the blocks from effect of weather. Units shall be inspected upon delivery. Defective units shall be removed immediately. Person in charged will be inspected all the materials arrived according to Material Inspection Checklist and Borang Kelulusan Bahan. These including the detail of purchase such as record of delivery order, number of request, amount has arrived, type and design of material, details of supplier and price of material.



Figure 3.3.1 Handling material at site

As stated in the figure 3.3.1, these units shall be handled in good manner which can prevent form damage and breakage. These all material then will be distribute to all subcontractor by batches according the Good Issue Note (GIN) as shown in the figure below.

PORTLAND CEMENTS DISTRIBUTION AS AT 12TH NOV 2019					
NO	BLOCK	TEAM	DESCRIPTION (PORTLAND CEMENTS)	PALLET	BAIK
1	E6	JANAD	RECTIFICATION CMU	65	70
2	C4	IBRAL	RECTIFICATION / TO COMPLETE EXISTING CMU WORKS	1	40
3	D1	BIPPON	TO COMPLETE CMU WORKS	1	40
4	B5	SATLA	RECTIFICATION / TO COMPLETE EXISTING CMU WORKS	1	40
5	B4	SIN	RECTIFICATION / TO COMPLETE EXISTING CMU WORKS	1	40
6	B2	SCHAB	TO FINISH CMU WORKS	1	40
7	B1	NASIR	TO START & FINISH CMU WORKS	1.5	60
8	A10	NASIR	TO FINISH CMU WORKS	2	80
9	A8	SIN	TO FINISH CMU WORKS	2	80
10	A7	SCHAB	TO START AND FINISH CMU WORKS	1	40
11	A6	IBRAL	TO FINISH CMU WORKS	1	40
12	A5	IBRAL	TO START AND FINISH CMU WORKS	1	40
13	A4	SATLA	RECTIFICATION / TO COMPLETE EXISTING CMU WORKS	1	40
14		KABIR	EXTERNAL WORK	3	120
15		HASSAN	RENDER & TILING WORKS	2	80
TOTAL				30	800

Figure 3.3.2 Sample of Good Issue Note (GIN)

### **3.3.2 Arrangement and Assembly of Concrete Masonry Unit (CMU)**

Installation of CMU shall be referred as in the drawing provided (Appendix 1, 2 and 3) to avoid failure and wrongdoing during the application of CMU at site. This process must be particularly concerned especially when it closed to the position of opening such as door and window. Method Installation of Concrete Masonry Unit (CMU) as structure and wall for the house of this site can be divided into three different stages and these all stages has to be inspected in every work done. Three stages of Inspection Checklist for CMU Internal Brick and Party Wall are:

- i) Pre work
- ii) Early Stage to Bond Beam (3.2m)
- iii) Final Stage (Finishing Level- 27 Layers; 6.4m)

Before start laying out CMU blocks, contractor should:

- a) Study Starter Bar Layout Plan

The element of starter bar can give early knowledge before they are starting install the blocks for the wall. Contractor can estimate on where high and at which junction will they start to put the bar in the hollow of block before continue the process by infill the hollow with concrete chipping.

- b) Setting Out

Setting out is the process of transferring architectural drawing to the ground. It establishes the location points for site boundaries, centre-lines walls and other structural part in correct extent, angle and level. The requirement in setting out wall includes the direction, width and position of the wall. Accurate centre lines can be determined and marked by using theodolite as shown in the figure 3.3.3.



*Figure 3.3.3 Setting Out and Marking of level*

c) Find Out FFL

At distance of 1 metre from the edges reference pillars or on this case were replace by CMU wall are erected as shown in the figure 18. FFL stands for Finished Floor Level can be determined by the mark from surveyor at the boundaries of the building. The block bonding can be done at the specified level followed FFL of each houses and building. As shown in the figure below, FFL has used for starting block work at the internal building while RL means road level is used for guidance of starting block work from the platform. The screeding layer should be made according to the requirements of the FFL level by using the concrete and use of mortar is really prohibited.



*Figure 3.3.4 Marking of FFL and RL*



- d) Get all the material and equipment closed as much near to the workplace and location point

Construction material such as Concrete Masonry Unit (CMU) blocks, concrete infill (chipping), concrete mixture, cement render and so on shall be placed near to the workplace. For example, if subcontractor has to start CMU work at block E6, person in charge shall be supervise and make sure material are ready at the nearest block.



*Figure 3.3.5 Place Construction Material at the Nearest Workplace*



3.3.2(i) Method Statement of Mortar Mixes:

1. Sand shall be washed and free from clay, chalk, shells, organic materials and other impurities.
2. Ratio for the mix should be one part ordinary Portland cement by three part sand (1:3). The ingredients shall first be mixed dry before water is added to the mix as shown in the figure below (Figure 3.3.6).



*Figure 3.3.6 Subcontractor Prepare the Mixture of Mortar*

3. The completion mixture of mortar (figure 3.3.7) shall be used within 30 minutes of mixing. No mortar, which has achieved its initial set, shall be used in the work, and no water is to be added to the mortar, after the initial mix.



*Figure 3.3.7 Mortar is ready to use*

3.3.2(ii) Method Statement of Installation Concrete Masonry Unit (CMU):

1. The area is to be cleaned, all loose materials to be removed.  
Before starting of block work, the area is to be washed with water.



*Figure 3.3.8 Area has to be cleaned before starting of work*

2. Block work shall raise the maximum of 6 courses in a section in any one day.
3. Installation of DPC at external building at least 225mm to stop dampness in buildings before laid out CMU.
4. Wall shall be built in stretcher bond unless otherwise specified. Where block work abuts structural concrete columns or walls it shall be tied to the concrete with dowel bar or rebar (figure 3.3.9) as per position indicated on the drawings, unless otherwise specified.
5. Use wire mesh at very interval of 3 layers block height horizontally (Figure 3.3.10). All units shall be laid on a full bed of mortar in perfectly horizontal courses. All vertical joints in perfect vertical alignment and well filled by buttering the ends of unit and then sliding into position against its neighbour.



*Figure 3.3.9 Installation of the connection of starter bar*



*Figure 3.3.10 Laying of block wall*



*Figure 3.3.11 Marking the block in the required dimension before cutting it*

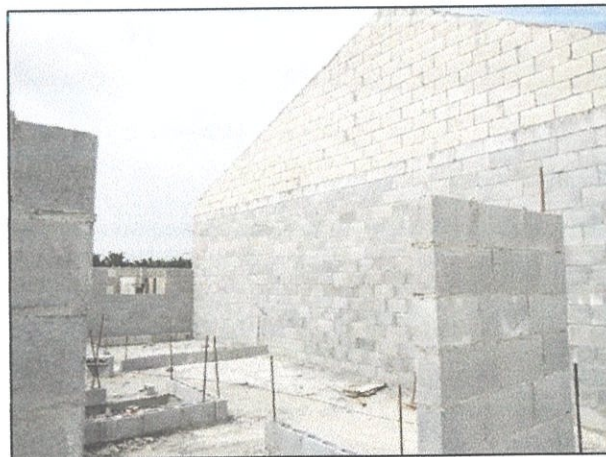


6. Cutting of blocks shall be kept to a minimum. Cut with motor driven masonry saws, using either an abrasive or diamond blade. Cut neatly and located for best appearance (Figure 3.3.11).
7. All joints shall be solidly filled and the thickness of joints shall not exceed of 10mm.



*Figure 3.3.12 Mortar joint*

8. Cement mortar should be in the ratio of 1 part of cement ratio to 3 part of sand (1:3). All mortar joints shall be pointed out when thumbprint hard into a concave configuration unless otherwise specified.
9. Curing of block work should be done for at least 7 days as shown in the figure 3.3.13.



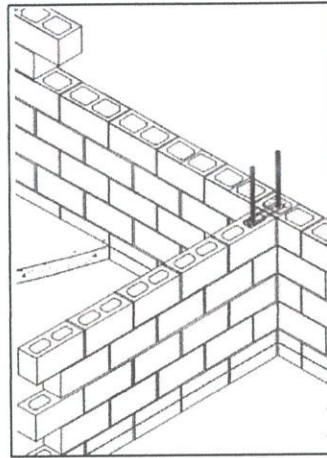
*Figure 3.3.13 Curing of block*



### 3.3.3 Starter Bar and Reinforced Wall

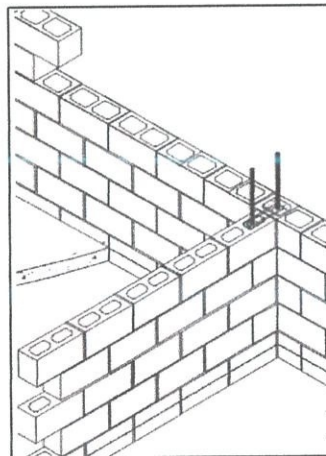
Starter Bar Layout Plan has to refer before install the reinforcement. In the event of an error on the installation of starter bar, the subcontractor should be responsible in order to repair or fix it. Every pillar CMU must use bar T12 which have been cut into 1500mm length. There are few of **mandatory** position for the installation of starter bar, T12:

- i) Corner of wall



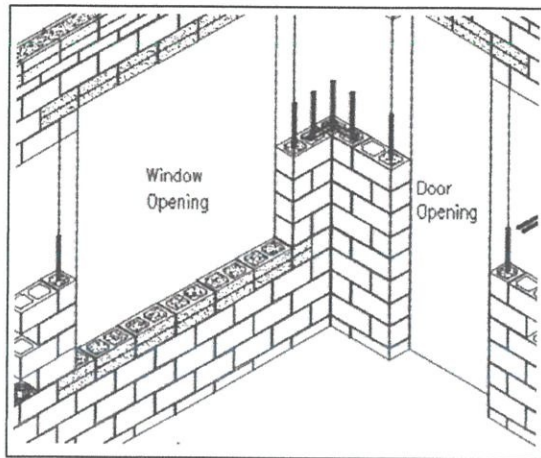
*Figure 3.3.14 Starter Bar at Corner of wall*  
(Source: Modul Pemasangan CMU Projek PPR Tanjung Karang)

- ii) At the end of the wall



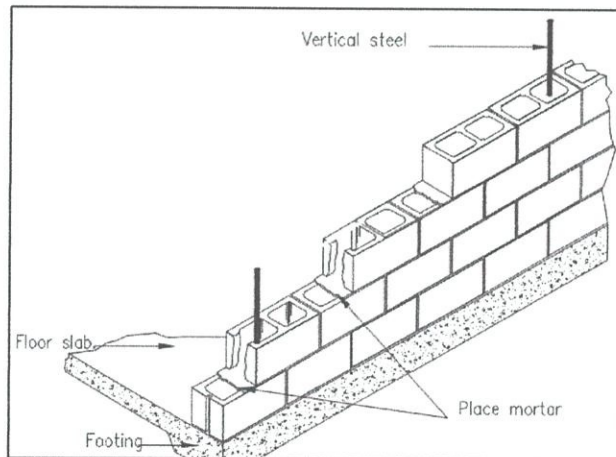
*Figure 3.3.15 Starter Bar at the End of the Wall*  
(Source: Modul Pemasangan CMU Projek PPR Tanjung Karang)

iii) At the place has opening



*Figure 3.3.16 Starter Bar at Place Has Opening  
(Source: Modul Pemasangan CMU Projek PPR Tanjung Karang)*

iv) Wall Stiffener



*Figure 3.3.17 Starter Bar at Wall Stiffener  
(Source: Modul Pemasangan CMU Projek PPR Tanjung Karang)*

Rebar R6 is used for the installation of rebar link. There has to be install in every two unit of CMU block as much as 400mm height.

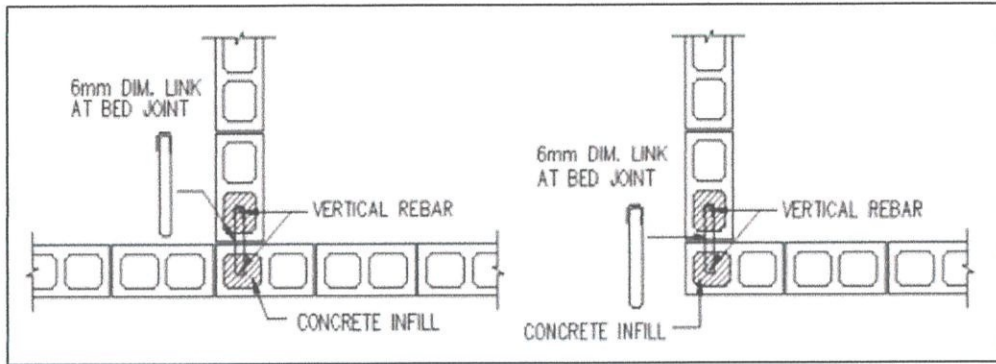


Figure 3.3.18 Installation of Rebar Link  
(Source: Modul Pemasangan CMU Projek PPR Tanjung Karang)

For the use of horizontal rebar, there has to be fitted at the opening of window, door and bond beam level structures. Bond beam block must be placed in reverse and the anchorage must be provided at the bond beam level.

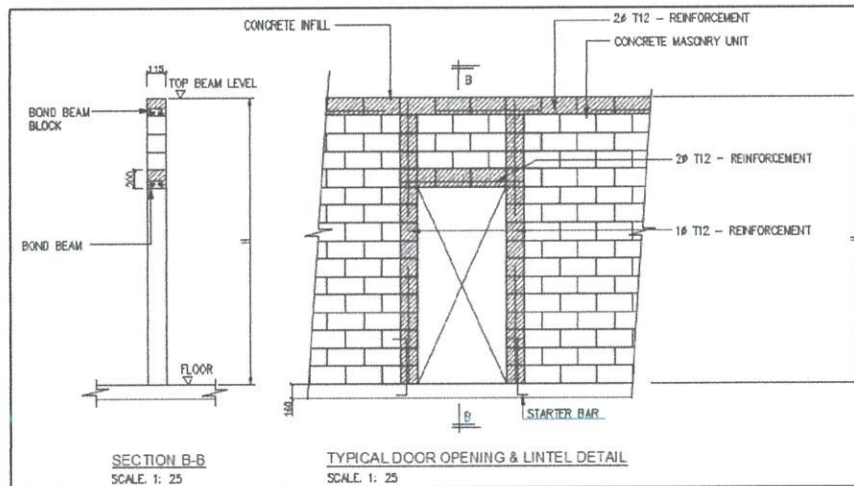
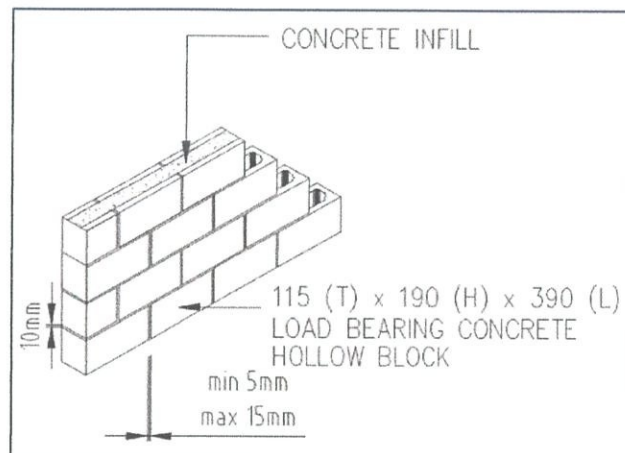


Figure 3.3.19 Installation of Horizontal Rebar at Door  
(Source: Modul Pemasangan CMU Projek PPR Tanjung Karang)

### 3.3.4 Party Wall

Party wall is a wall which has be connecting and adjoining between two different units, buildings or rooms. For this project, party wall has placed in between two units of houses. Every party wall and CMU pillar should be filled with concrete in height of four row of block as equal to 800mm height as shown in the figure below. Block from KKIBS is the only one supplier which allowed for the use of party wall because they have certificate from Jabatan Bomba dan Penyelamat Malaysia.



*Figure 3.3.20 Infill Concrete for Party Wall  
(Source: Modul Pemasangan CMU Projek PPR Tanjung Karang)*

Basically, party wall can act as the construction of a wall build up to, or also can be referred as line of the junction or otherwise it also can be classify as boundary line. The importance of party wall is to protect the residents from any potentially adverse effects which might involve numbers of people. But there will come out some issues for the owners if they have intention and planning on undertaking extension for their houses.

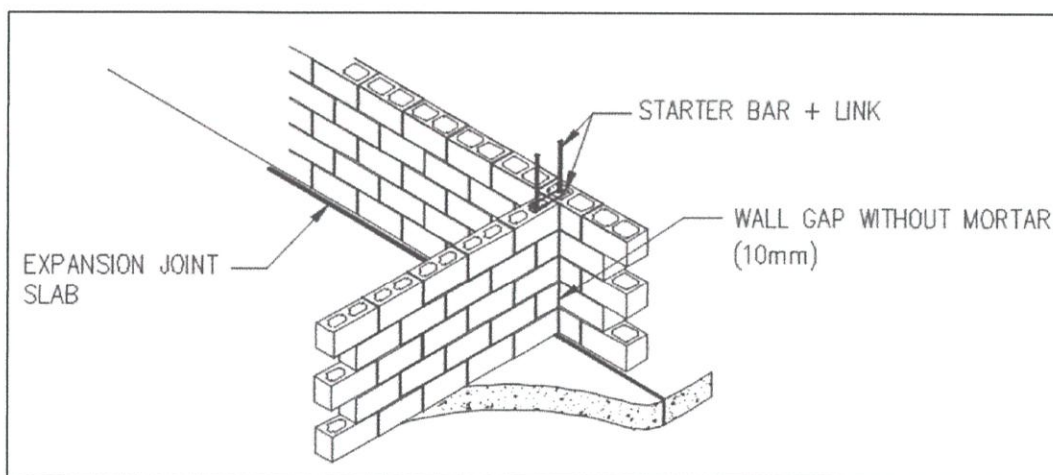
The installation of CMU for this party wall is just like the other common CMU wall. The difference is just has an extra work process by providing concrete infill in every block which not same as common one which just have to fill in at the bar area. The installation of CMU has to follow the specified height in the drawing. Links also need to be installed where the wall have been connected between internal and external area as refer in the starter bar layout plan.



### 3.3.5 Expansion Joint

The wall line must be adjacent to the floor expansion joint line. If there are setting out has shown, there could be expansion joint in between both areas, that will be a work of hacking and other improvement and correcting work have to be done. The jointing wall does not have to apply the mortar instead by install the starter bar and link.

Expansion joint is an assembly design to safely absorb the heat-induced expansion, and contraction of construction material, to absorb vibration and even to hold parts together. There will be a baby step to be careful in case if there is any earthquake or ground settlement happened.



*Figure 3.3.21 Expansion Joint for Slab  
(Source: Modul Pemasangan CMU Projek PPR Tanjung Karang)*



*Figure 3.3.22 Process of expansion join at site*

### 3.4 Advantages and Disadvantages of Application CMU at site

Table 3.4.1 Advantages and Disadvantages of Application CMU

Advantages	Disadvantages
<p>Minimum number order of each design</p> <ul style="list-style-type: none"> <li>Just ordered in one design but can apply in every wall just by cutting of the CMU</li> </ul>	<p>Expensive</p> <ul style="list-style-type: none"> <li>Quite expensive if want to compare with brick and other suited material</li> </ul>
<p>Aesthetic value</p> <ul style="list-style-type: none"> <li>Can be used as structure but also as decorative wall</li> </ul>	<p>Has weak spot</p> <ul style="list-style-type: none"> <li>Cannot predict the exact defect for structure until final touch up of block work</li> </ul>
<p>Simply work</p> <ul style="list-style-type: none"> <li>It combines into one simple operation, but the several complicated procedures of R.C construction</li> <li>It requires fewer trades on the jobs, simplifying scheduling of construction and ensuring faster completion.</li> </ul>	<p>Complicated installation</p> <ul style="list-style-type: none"> <li>Lapping procedure between laying of CMU block and install starter bar make the progress of work complicated</li> </ul>
<p>High strength</p> <ul style="list-style-type: none"> <li>Standards and approved specification of material can be safely used</li> </ul>	<p>Condition and durability of material low</p> <ul style="list-style-type: none"> <li>Easy broken especially when involve of delivery process from the placement area to the work area</li> </ul>

<p>Faster</p> <ul style="list-style-type: none"> <li>• Faster construction through elimination of some intermediate process and simplification of others</li> </ul>	<p>Unstable</p> <ul style="list-style-type: none"> <li>• Without any support from bar there will be easily collapsed</li> </ul>
<p>Saves material, time and labour</p> <ul style="list-style-type: none"> <li>• Formwork for column and beams is eliminated, no plastering is required (the even surfaces of the blocks can be painted straight on), less steel is needed</li> <li>• Structural work, enclosures and finishing are carried out in a one-step process</li> </ul>	<p>Depends on the workmanship</p> <ul style="list-style-type: none"> <li>• Only expert manpower can come out the best finishing of laying the CMU at site</li> <li>• Number of CMU experts decreased and difficult to find so company has decided to use the common and the available workers only</li> </ul>

## CHAPTER 4.0

### CONCLUSION

#### 4.1 Conclusion

In this research the characteristic of material, method installation, advantages and disadvantages of application Concrete Masonry Unit (CMU) were studied. Concrete Masonry Unit (CMU) has been used so much in the construction industry these days. As concrete block tended to be larger than standard bricks, block walls can be constructed faster than a traditional brick wall. There are typically used for house foundations, decorative blocks or retaining walls and many more.

This study revealed that there are many types of Concrete Masonry Unit available in this industry and each of them made in different design and sizes. To make CMU wall in straight vertically, steel and starter bar are used as supporting the wall from any event course. The infill concrete also can make the block wall become stronger and increase the durability. The use of CMU will definitely can be one of the most preferable material for the structure instead use of the common clay bricks.

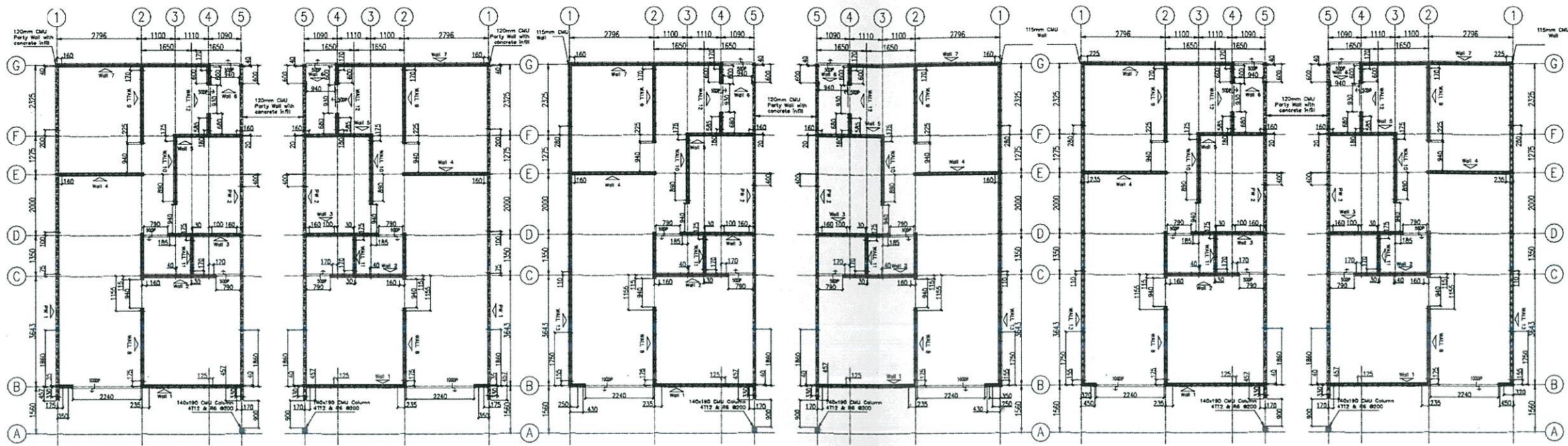


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APPENDIX 1



CMU LAYOUT PLAN SHOWING THE SETTING OUT OF STARTER BARS (INTERMEDIATE UNIT)  
Scale 1:75

CMU LAYOUT PLAN SHOWING THE SETTING OUT OF STARTER BARS (CORNER UNIT)  
Scale 1:75

CMU LAYOUT PLAN SHOWING THE SETTING OUT OF STARTER BARS (END UNIT)  
Scale 1:75

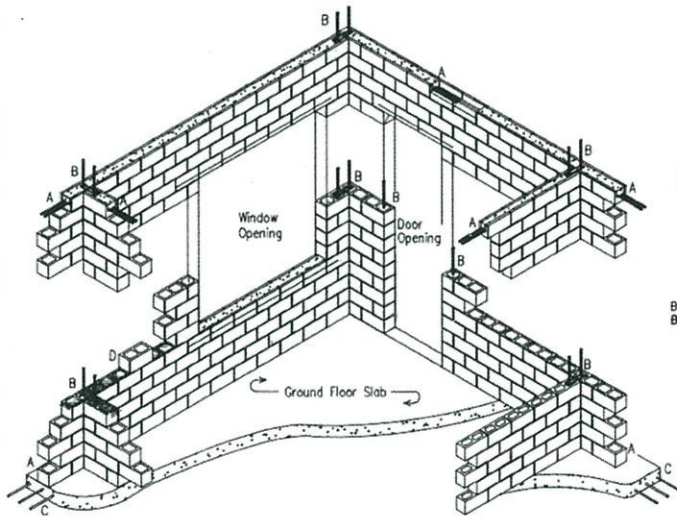


FIGURE 1  
SCALE: 1: 25  
A - Continuous reinforced concrete bond beam Lap bars at corners.  
B - Reinforced concrete studs tied to footing.  
C - Reinforced concrete footing.  
D - Reinforcement in horizontal mortar joints.

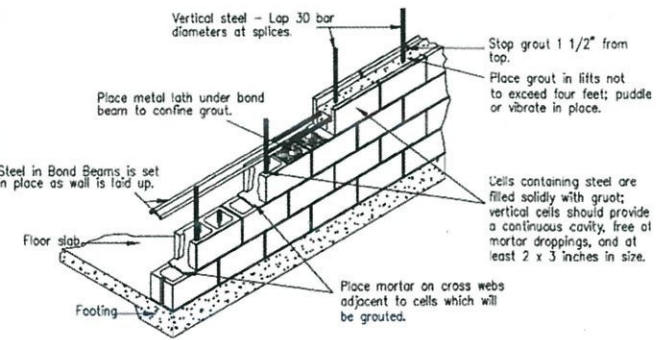
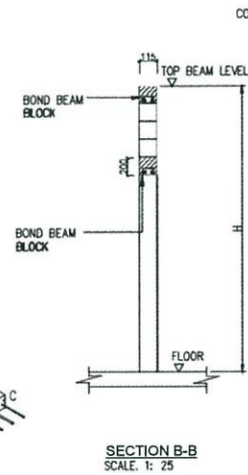
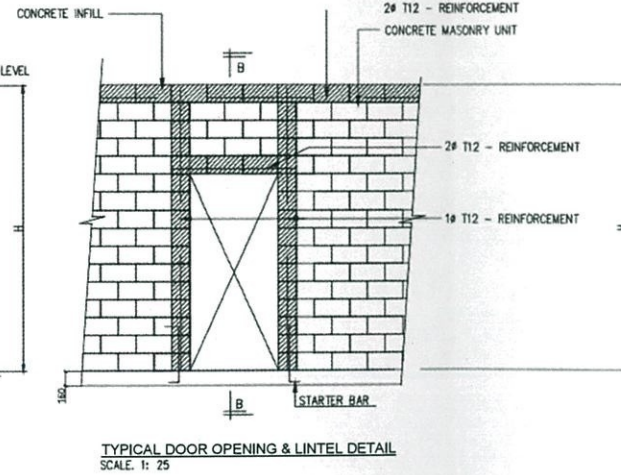


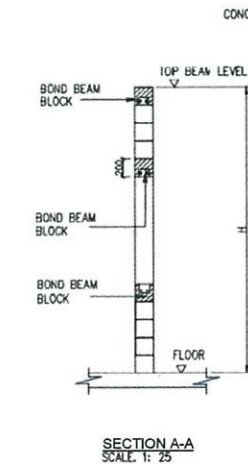
FIGURE 2  
SCALE: 1: 25



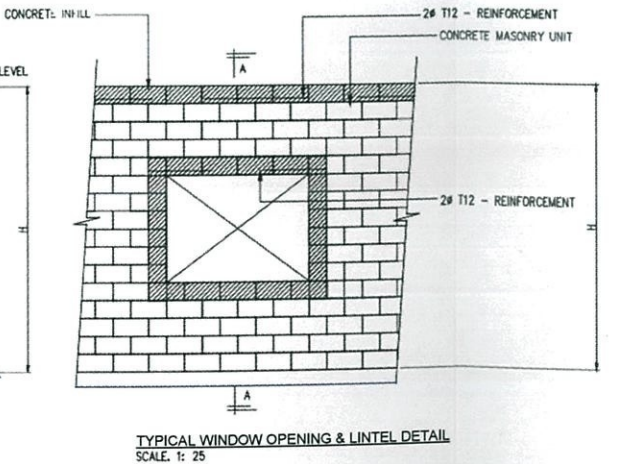
SECTION B-B  
SCALE: 1: 25



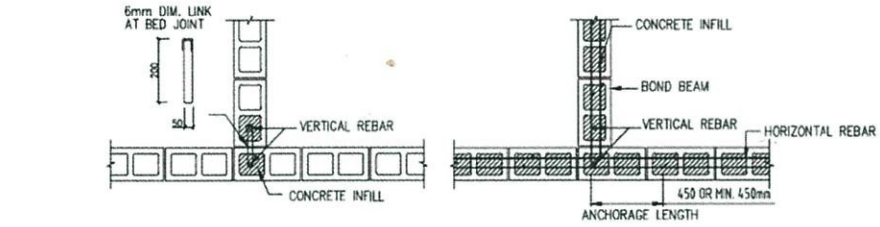
TYPICAL DOOR OPENING & LINTEL DETAIL  
SCALE: 1: 25



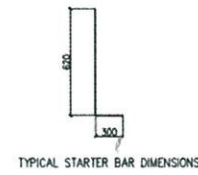
SECTION A-A  
SCALE: 1: 25



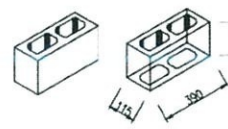
TYPICAL WINDOW OPENING & LINTEL DETAIL  
SCALE: 1: 25



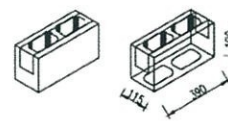
TYPICAL BLOCK WALL DETAILS AT T-JUNCTION  
(WHEN JOINING BLOCK WALL IN FULL PIECE)  
INTERMEDIATE LEVEL SCALE: 1: 10  
BOND BEAM LEVEL SCALE: 1: 10



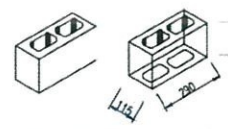
TYPICAL STARTER BAR DIMENSIONS



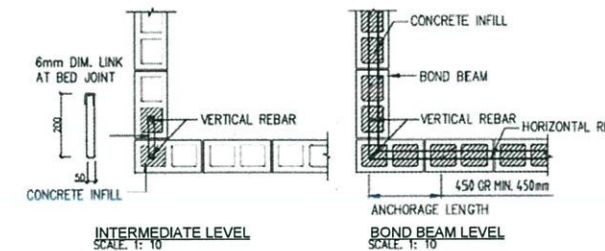
115mm FULL BLOCK  
SCALE: N.T.S.



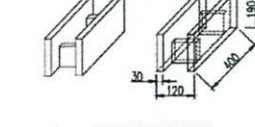
115mm BOND BEAM BLOCK  
SCALE: N.T.S.



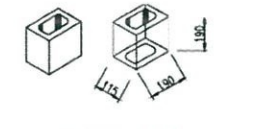
115mm 3- QUARTER BLOCK  
SCALE: N.T.S.



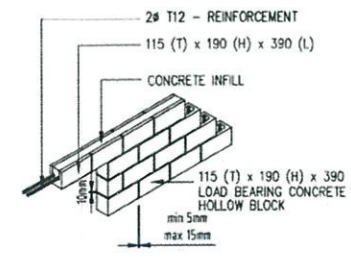
TYPICAL BLOCK WALL DETAILS AT L-JUNCTION  
(WHEN JOINING BLOCK WALL IN FULL PIECE)  
INTERMEDIATE LEVEL SCALE: 1: 10  
BOND BEAM LEVEL SCALE: 1: 10



120mm CMU PARTY WALL BLOCK  
SCALE: N.T.S.



115mm HALF BLOCK  
SCALE: N.T.S.



TYPICAL ARRANGEMENT LINTEL BOND BEAM  
SCALE: N.T.S.

Pelanggan

KEMENTERIAN KESEJAHTERAAN BANDAR, PERUMAHAN DAN KERAJAAN TEMPATAN

Pemilik Bangunan / Pengguna

JABATAN PERUMAHAN NEGARA  
Bahagian Perancangan & Pembangunan Projek PPR  
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Persiaran Perdana, Presint 4,  
Kompleks Pentadbiran Kerajaan Persekutuan,  
62100 Putrajaya.

(Tandatangan Pemilik)

Agensi Pelaksana

BAHAGIAN PEMBANGUNAN DAN PELAKSANAAN PROJEK (PMB) KEMENTERIAN KESEJAHTERAAN BANDAR, PERUMAHAN DAN KERAJAAN TEMPATAN (KPPT) Area 5, No. 51, Persiaran Perdana, Presint 4, Kompleks Pentadbiran Kerajaan Persekutuan, 62100 Putrajaya.

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50300 Kuala Lumpur.

(Tandatangan Pemilik)

Tajuk Projek

MEREKABENTUK, MEMBINA DAN MENYIAPKAN PEMBANGUNAN :

FASA-4

- 500 UNIT RUMAH TERES SATU-TINGKAT
- 1 UNIT TADIKA DAN TASKA
- 1 UNIT BALAI KOMUNITI
- 2 UNIT PENCAWANG ELEKTRIK
- 1 UNIT RUMAH SAMPAH

DAN KERJA-KERJA YANG BERKAITAN DENGANNYA SAGI PROGRAM PERUMAHAN RAKYAT (PPR) DI ATAS BEBAHAGIAN LOT FT2089 (H.S.D 19001), JALAN SUNGAI YU, MUKIM UJONG PERMATANG, DAERAH KUALA SELANGOR, SELANGOR DARUL EHSAN.

Kontraktor Reka Dan Bina

ZIKAY CONSTRUCTION SDN BHD  
Area 8, Bangunan ZIKAY,  
No. 55, Jalan Raja Alang,  
Kampung Bharu,  
50300 Kuala Lumpur.

Arkitek

ANUAR AZIZ ARCHITECT (SPRIS 99)  
601C, Level 6, Tower C, Uptown 5,  
No. 5, Jalan SS 21/39, Damansara Uptown,  
47400 Petaling Jaya, Selangor Darul Ehsan.

Jurutera Awam & Struktur

BCE BESTARI CONSULTING ENGINEERS SDN. BHD.  
CONSTRUCTION DIVISION  
38/18 FLOOR, JALAN HARAUVA AR USAR  
PROGRAM SUBANG SEKSYEN US  
TAMAN DESA SUBANG  
40150 SHAH ALAM SELANGOR DARUL EHSAN,  
Engineers' Site: 02.

\*I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same.\*

Jurutera Mekanikal & Elektrikal

Perunding Wangsa Sdn Bhd  
No. 81-2, Jalan Wangsa Delima 5, Pusat Bandar Wangsa  
Maju, 53300 Kuala Lumpur.

Juru Ukur Bahan

Jurukur Bahan Perdana  
No. 16A, Jalan 17/54, Seksyen 17, Taman Tan Sri Lee  
Yan Lian, 45400 Pratapa Jaya, Selangor Darul Ehsan.

Tajuk Lukisan

PPR TG KARANG  
TERRACE HOUSE

LAYOUT PLAN OF STARTER BARS,  
BLOCK WALL (CMU) & TYPICAL DETAIL  
OF CMU INSTALLATION

DILUKIS			
DISEMAK			
TARIK			
BAKAL			
NO. LUKISAN	PPR/ZC/TH/CMU/SD-01		
DILAKSI			
DISEMAK			
TARIK			
BAKAL			
NO. LUKISAN	PPR/ZC/TH/CMU/SD-01		

PRELIMINARY INFORMATION SUBMISSION REVISIONS

DATE: OCTOBER 2018

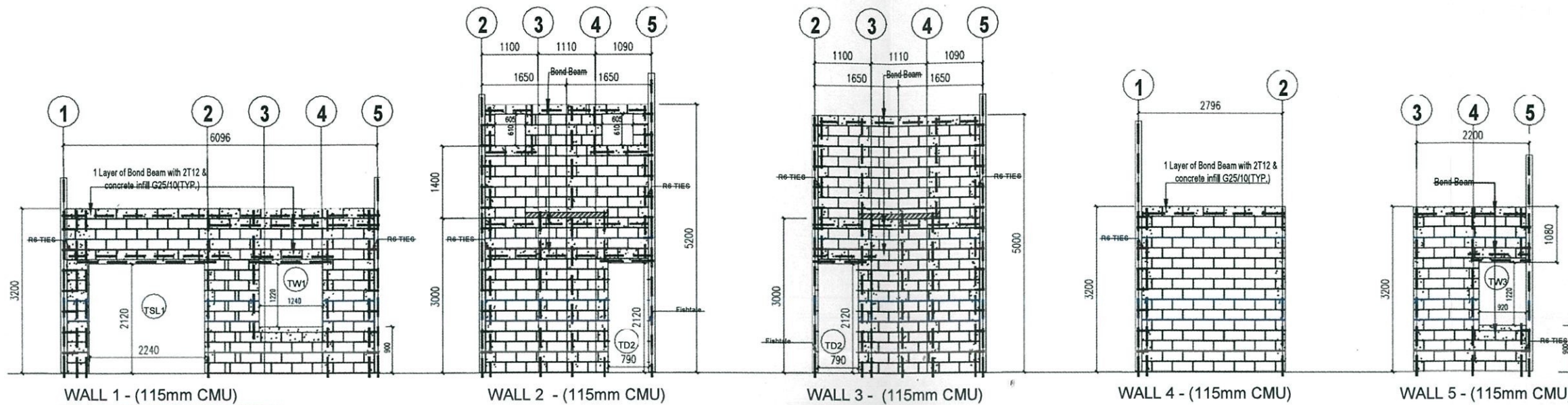
AS SHOWN

CONSTRUCTION AS BUILT DRAWING

SHOP DRAWING



APPENDIX 2



WALL 1 - (115mm CMU)  
INTERMEDIATE UNITS ONLY

WALL 2 - (115mm CMU)

WALL 3 - (115mm CMU)

WALL 4 - (115mm CMU)

WALL 5 - (115mm CMU)

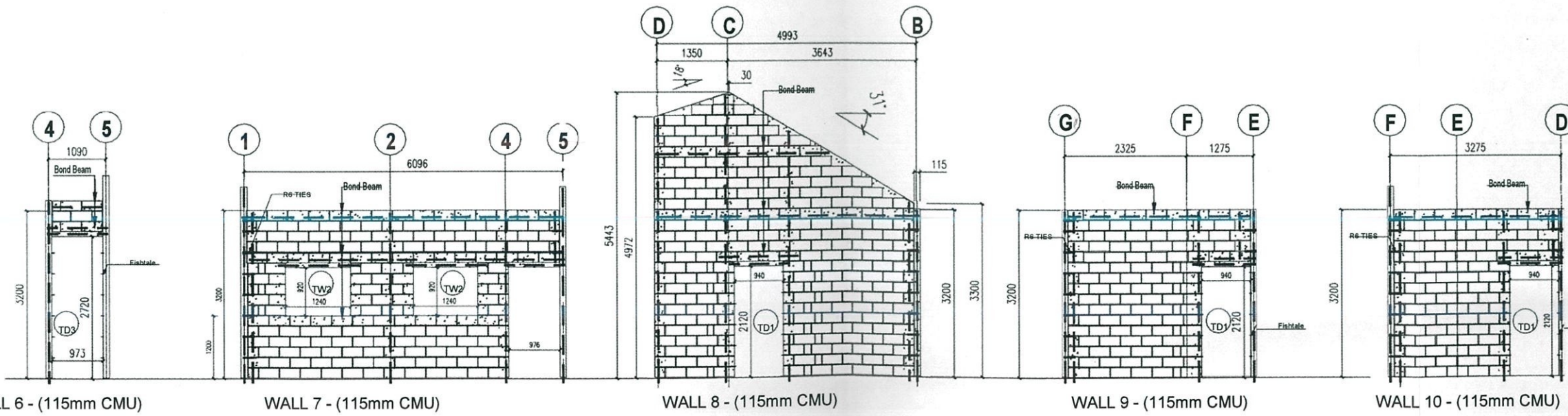
WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 1	104	25	37	

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 2	123	29	34	

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 3	138	24	23	

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 4	97	16	7	

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 5	51	15	11	



WALL 6 - (115mm CMU)

WALL 7 - (115mm CMU)

WALL 8 - (115mm CMU)

WALL 9 - (115mm CMU)

WALL 10 - (115mm CMU)

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 6	2	1	4	

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 7	108	17	34	

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 8	204	32	24	

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 9	95	11	11	

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
	WALL 10	82	15	11	

**Pelanggan**

**Pemilik Bangunan / Pengguna**

**JABATAN PERUMAHAN NEGARA**  
Bahagian Perancangan & Pembangunan Projek PPR  
Jabatan Perumahan Negara, Area 35, No. 51,  
Persiaran Perdana, Presint 4,  
Kompleks Penterbitan Kemajuan Persekutuan,  
62100 Putrajaya.

**Agensi Pelaksanaan**

**BAHAGIAN PEMBANGUNAN DAN PELAKSANAAN PROJEK (PMB)**  
KEMENTERIAN KESEHATAN BANDAR, PERUMAHAN DAN  
KERAJAAN TEMPATAN (KPKT)  
Area 5, No. 51, Persiaran Perdana, Presint 4,  
Kompleks Penterbitan Kemajuan Persekutuan,  
62100 Putrajaya.

**Pemilik Tanah**

**JABALNUR PROPERTIES SDN. BHD.**  
Area 8, Bangunan ZIKAY,  
No. 53, Jalan Raja Alang,  
Kampong Bharu,  
50300 Kuala Lumpur.

**Tajuk Projek**

MEREKABENTUK, MEMBINA DAN MENYAPKAN PEMBANGUNAN

**Fasa-1**

a. 501 UNIT RUMAH TERES SATU TINGKAT  
b. 1 UNIT TAKSI DAN TANKA  
c. 1 UNIT BALAKOMANTI  
d. 2 UNIT PENCAWANG ELEKTRIK  
e. 1 UNIT RUMAH SAMPAH

DAN KERJA-KERJA YANG BERKAITAN DENGANNYA BAGI PROGRAM PERUMAHAN RAKYAT (PPR) DI ATAS SEBAHAGIAN LOT P12089 (J.S.D 19901), JALAN SUNGAI YU, MUKIM UJUNG PERMATANG, DAERAH KUALA SELANGOR, SELANGOR DARUL EHSAN.

**Kontraktor Reka Dan Bina**

**ZIKAY CONSTRUCTION SDN BHD**  
Area 7, Bangunan ZIKAY,  
No. 53, Jalan Raja Alang,  
Kampong Bharu,  
50300 Kuala Lumpur.

**Arkitek**

**ANUAR AZIZ ARCHITECT (SPRS 99)**  
801-C, Level 8, Tower C, Lighten 5,  
No. 6, Jalan SS 2/20B, Damansara Uptown,  
47400 Petaling Jaya, Selangor Darul Ehsan.

**Jurutera Awam & Struktur**

**BCE** BESTARI CONSULTING ENGINEERS SDN. BHD.  
11A, FLOOR 11, JALAN WARRUNA AE USK  
PROGRAM SUSUNAN SEKEYEN US  
TAMAN DESA SUBANG  
Bestari Consulting Engineers Sdn. Bhd.  
40110 SHAH ALAM, SELANGOR DARUL EHSAN.

I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same.

**Jurutera Mekanikal & Elektrikal**

**Perunding Wangsa Sdn. Bhd.**  
No. 81-2, Jalan Wangsa Dharma 5, Pusat Bandar Wangsa Maju, 53300  
Kuala Lumpur.

**Juru-Ukur Bahan**

**PERDANA**  
Juruukur Bahan Perdana  
No. 104, Jalan 11/14, Seksyen 11, Taman Sri Selayang,  
Yan Lim, 44400 Petaling Jaya, Selangor Darul Ehsan.

**Tajuk Lukisan**

PPR-TG-KARANG  
TERRACE-HOUSE  
ELEVATION OF WALLS OF INTERMEDIATE  
UNIT, CORNER UNIT & END UNIT-1

**REVISIONS**

NO.	DESCRIPTION	DATE

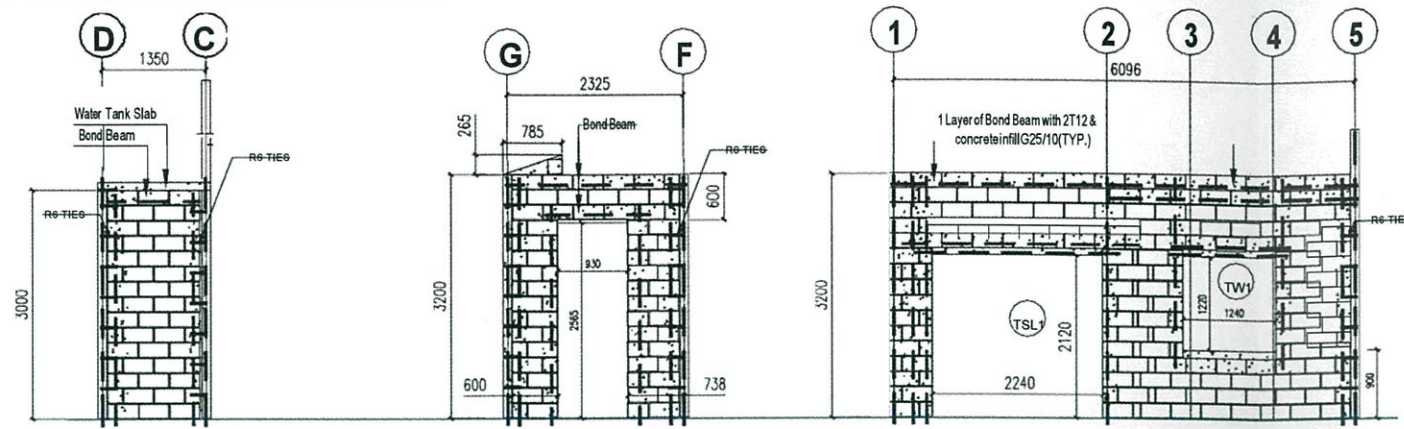
**DATE** OCTOBER 2018

**PROJECT NO.** PPR/ZCH/WE/SD-02

SHOP DRAWING



APPENDIX 3



WALL 11 - (115mm CMU)

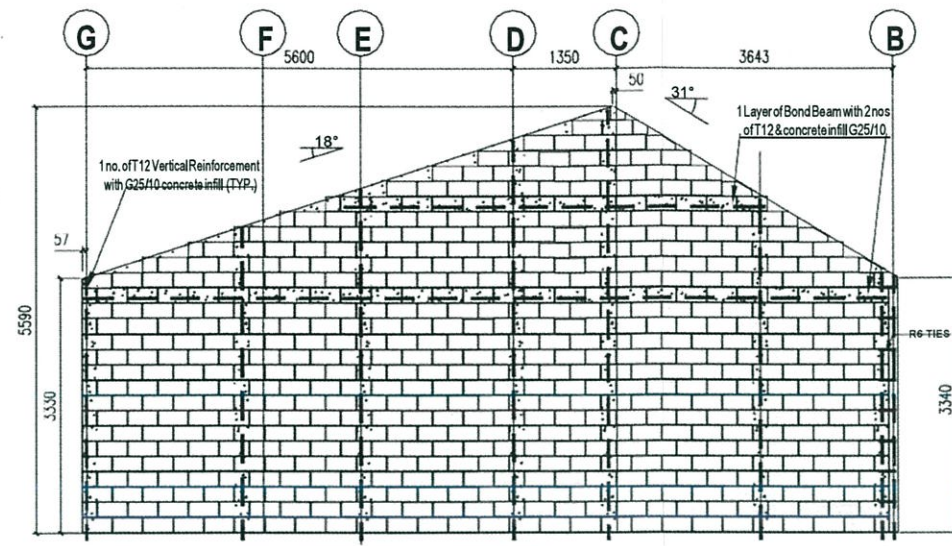
WALL 12 - (115mm CMU)

WALL 1A - (115mm CMU) CORNER UNIT ONLY

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
WALL 11	14	14	3	28	15

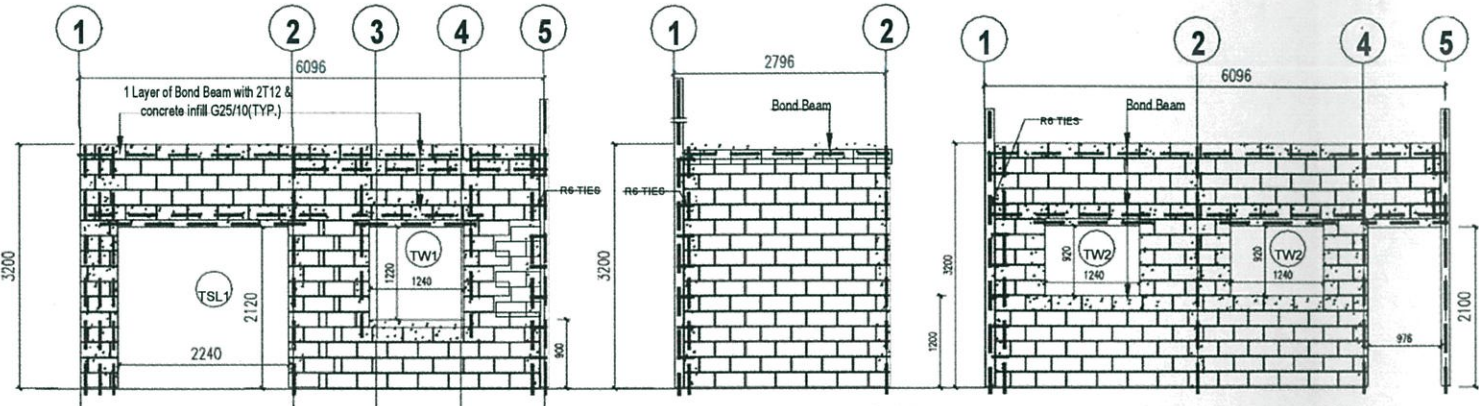
WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
WALL 12	33	20	9	14	5-15

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
WALL 1A	105	35	39	0	6-10



WALL 13 - (115mm CMU) Corner UNIT & End Unit

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
WALL 13	529	25	40	2	10



WALL 1B - (115mm CMU) END UNIT ONLY

WALL 4A - (115mm CMU) END UNIT ONLY

WALL 7A - (115mm CMU) END UNIT ONLY

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
WALL 1B	91	35	37	16	8, 10

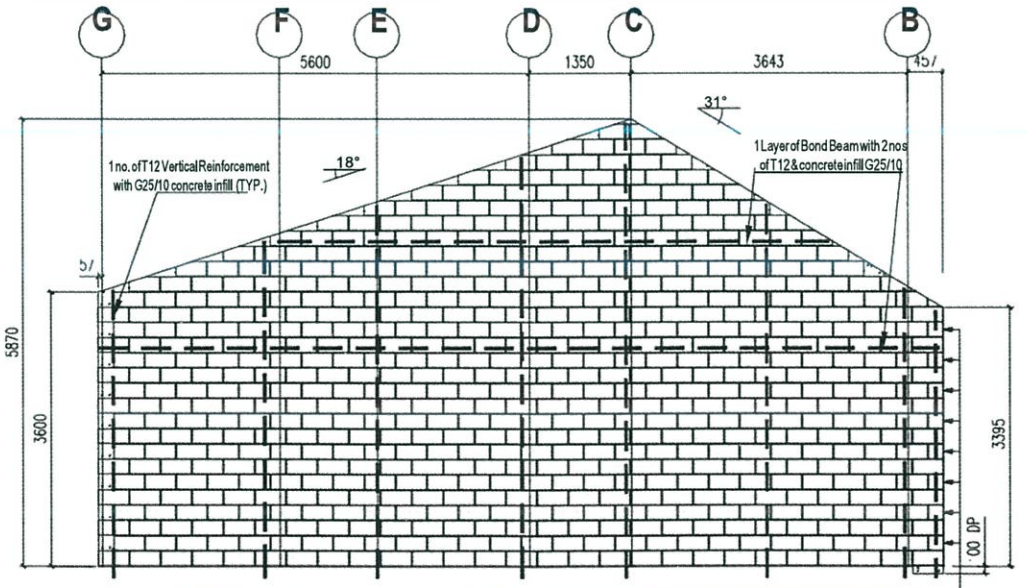
WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
WALL 4A	83	14	6	15	15

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.	
WALL 7A	114	20	33	5	11

WALL TYPE	BLOCK SIZE (115mm CMU)			
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.
WALL 1	104	25	37	0
WALL 2	123	29	34	10
WALL 3	138	24	23	0
WALL 4	97	16	7	0
WALL 5	51	15	11	6
WALL 6	2	1	4	0
WALL 7	108	17	34	20
WALL 8	210	31	24	30
WALL 9	95	11	11	4
WALL 10	82	15	11	0
WALL 11	14	14	3	28
WALL 12	33	20	9	14
TOTAL/UNIT	1057	218	208	112

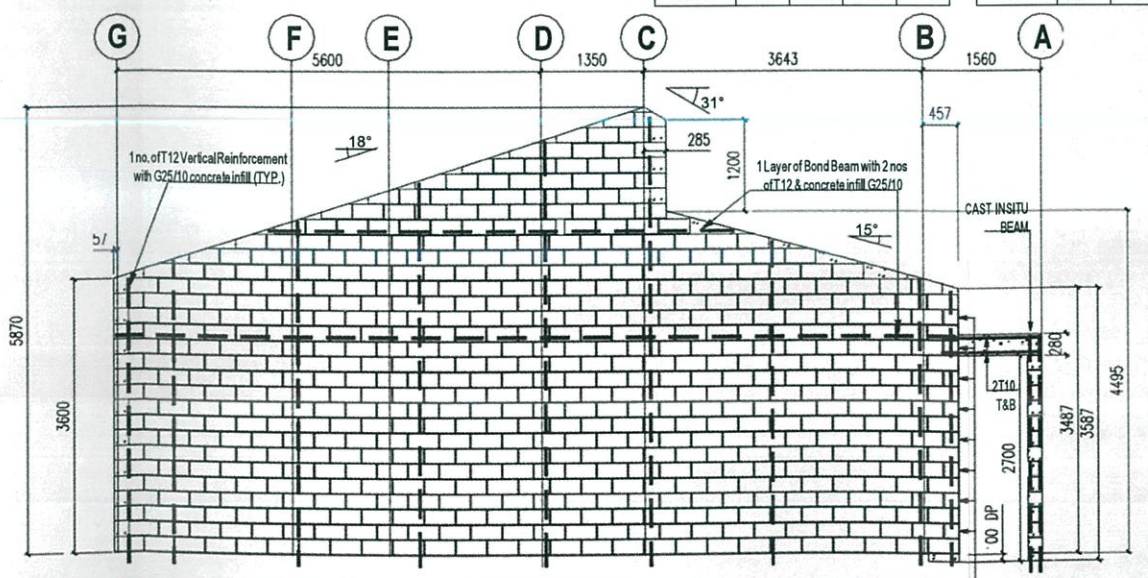
WALL TYPE	BLOCK SIZE (115mm CMU)			
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.
WALL 1A	105	35	39	0
WALL 2	123	29	34	10
WALL 3	138	24	23	0
WALL 4	97	16	7	0
WALL 5	51	15	11	6
WALL 6	2	1	4	0
WALL 7	108	17	34	20
WALL 8	210	31	24	30
WALL 9	95	11	11	4
WALL 10	82	15	11	0
WALL 11	14	14	3	28
WALL 12	33	20	9	14
WALL 13	529	25	40	2
TOTAL	1587	253	250	114

WALL TYPE	BLOCK SIZE (115mm CMU)			
	FULL BLK.	1/2 BLK.	BOND BLK.	1/4 BLK.
WALL 1B	91	35	37	16
WALL 2	123	29	34	10
WALL 3	138	24	23	0
WALL 4A	83	14	6	15
WALL 5	51	15	11	6
WALL 6	2	1	4	0
WALL 7A	114	20	33	5
WALL 8	210	31	24	30
WALL 9	95	11	11	4
WALL 10	82	15	11	0
WALL 11	14	14	3	28
WALL 12	33	19	9	14
WALL 13	529	25	40	2
TOTAL	1565	253	246	128



PW 1 (PARTY WALL 1) 120mm CMU with concrete infill

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	1/4 BLK.	3/4 BLK.	
PW 1	632	9	0	12	



PW 2 (PARTY WALL 2) 120mm CMU with concrete infill

WALL TYPE	BLOCK SIZE (115THK.)				HORIZONTAL SPACING OF BLOCKS (mm)
	FULL BLK.	1/2 BLK.	1/4 BLK.	3/4 BLK.	
PW 2	602	9	13	12	

SHOP DRAWING

Palangan

Pemilik Bangunan / Pengguna

**JABATAN PERUMAHAN NEGARA**  
 Bahagian Perancangan & Pembangunan Projek PPR  
 Jabatan Perumahan Negara, Area 35, No. 51,  
 Persiaran Perdana, Presint 4,  
 Kompleks Pertadbiran Kemajuan Persekitaan,  
 62100 Putrajaya.  
 Tel: +603 8981 4381, Fax: +603 8981 4328

Agensi Pelaksana

**BAHAGIAN PEMBANGUNAN DAN PELAKSANAAN PROJEK (PMB)**  
 KEMENTERIAN KESEKUTERAAN BANGSAR, PERUMAHAN NEGARA  
**KERAJAAN TEMPATAN (KPKT)**  
 Area 5, No. 51, Persiaran Perdana, Presint 4,  
 Kompleks Pertadbiran Kemajuan Persekitaan,  
 62100 Putrajaya.  
 Tel: +603 8981 5500, Fax: +603 8981 3912

Pemilik Tanah

**JABALNUR PROPERTIES SDN. BHD.**  
 Area 8, Bangunan ZKAY,  
 No. 53, Jalan Raja Abang,  
 Kampong Bharu,  
 50300 Kuala Lumpur.  
 Tel: +603 2698 8789 Fax: +603 2692 4789

Tajuk Projek

MEREKABENTUK, MEMBINA DAN MENYIAPKAN PEMBANGUNAN

FRSA-1

- 500 UNIT RUMAH TERES SATU TINGKAT
- 1 UNIT TADKA DANTASKA
- 1 UNIT BALAKOMUNITI
- 2 UNIT PENCAWANGELEKTRIK
- 1 UNIT RUMAH SAMPAH

DAN KERJA-KERJA YANG BERKAITAN DENGANNYA BAGI PROGRAM PERUMAHAN RAKYAT (PPR) DI ATAS SEBAHAGIAN LOT PT2089 (H.S.D 19991), JALAN SUNGAI YU, MUKIM UJUNG PERMATANG, DAERAH KUALA SELANGOR, SELANGOR DARUL EHSAN.

Kontraktor Raka Dan Bina

**ZIKAY CONSTRUCTION SDN BHD**  
 Area 7, Bangunan ZKAY,  
 No. 53, Jalan Raja Abang,  
 Kampong Bharu,  
 50300 Kuala Lumpur.  
 Tel: +603 2698 8789 Fax: +603 2692 4789

Arkitek

**ANUAR AZIZ ARCHITECT** (6719 19)  
 601C, Level 6, Tower C, Uptown 6,  
 No. 6, Jalan SS 15/19, Damansara Uptown,  
 47400 Petaling Jaya, Selangor Darul Ehsan.  
 T: +603 7728 3475 E: anuar@anuar-aziz.com  
 F: +603 7728 3884 www.anuar-aziz.com  
 Projektor Dalok Ar. H. Saiful Anwar Bin Abdul Aziz  
 (ICP: 650725-04-0203)

Jurutera Awam & Struktur

**BCE** BESTARI CONSULTING ENGINEERS SDN. BHD.  
 55/Floor 55, Jalan Anwar Utama, Anwar Utama, 47400 Petaling Jaya, Selangor Darul Ehsan.  
 47198 Street Alam, Selangor Darul Ehsan.  
 Engineers Sdn. Bhd. TEL: 937848 6209 FAX: 937848 6236

"I hereby certify that these works have been designed by me in accordance with sound engineering practice and that I take full responsibility for the design and proper performance of the same."

K. MUHAMMAD BIN ABDUL RAHMAN  
 Architects Professional Award Malaysia C110375

Jurutera Mekanikal & Elektrikal

**Perunding Wangsa Sdn. Bhd.**  
 No. 81-2, Jalan Wangsa Utama 5, Pusat Bandar Wangsa Maju, 53300 Kuala Lumpur.  
 Tel: +603 4143 6414, Fax: +603 4143 3501

Juru Ukur Bahan

**PERDANA** Jurukur Bahan Perdana  
 No. 15A, Jalan 17/06, Seksyen 17, Taman Tan Sri Lee Yau Lee, 47400 Petaling Jaya, Selangor Darul Ehsan.  
 Tel: +603 7394 6691, Fax: +603 7332 2700

Tajuk Lukisan

PPR-TG-KARANG  
 TERRACE HOUSE

ELEVATION OF WALLS OF INTERMEDIATE UNIT, CORNER UNIT & END UNIT- 2

NO. LUKISAN: 09/08/2016  
 NO. SKALA: 1:50  
 NO. LUKISAN: 09/08/2016

PRZC11/WEISD-03

REVISI: 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100