DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

PRACTICAL REPORT TITLE

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2019295706

DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

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PROCESS OF INTERLOCKING BRICKWORK FOR WALL AT PERLA APARTMENT PROJECT

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FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

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FEBRUARY 2022

It is recommended that the report of this practical training provided

By

Nurul Syafinaz Binti Nasfi

2019295706

Process Of Interlocking Brickwork For Wall At Perla Apartment Project

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 Grand Dynamic Builders Sdn Bhd for duration of 14 weeks starting from 27 September 2020 and ended on 7 January 2020. 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 : 2019295706

Date : 10/1/2022

ACKNOWLEDGEMENT

Alhamdulillah, praise to Allah, the Most Merciful, the Most Graceful.

First and foremost, I consider myself extremely fortunate to have had the assistance of the following remarkable individuals, who deserve my deepest thanks for their direction, counsel, and assistance during my industry training. To begin, I would want to express my gratitude to Mr.Cheah Ham Cheia for providing me with the chance to participate in this industrial training programme at Grand Dynamic Builders Sdn Bhd. His team of professionals, which includes Mr. Diow Rhu Yeh, Mr. Soo Chin Seng, Mr. Yam Mun hon, Miss Nurul Shahira and Miss Shazwina, has allowed me to learn and develop my understanding, knowledge, and feel of real-world projects, as well as the theory involved in structural, building, and civil works analysis. They are in charge of streamlining and evaluating my training as well. Then, I'd like to express my appreciation to the representatives from Tans Resources Corporation Sdn. Bhd, particularly Mr. Izzat, who provided a great deal of cooperation and assistance in helping me to better understand the procedures, testing procedures, and best practices of construction, regardless of the structure or infrastructure.

I would also want to convey my gratefulness to all of the UiTM instructors who have helped me grow as a student and person. I'd want to express my sincere thanks to the lecturers who were personally involved during my training period. I appreciate the time, effort, encouragement, and ideas that Cik Nor Azizah Binti Talkis, Supervising Lecturer, Sir Muhammad Redza Rosman, Evaluation Lecturer, En. Muhammad Naim Bin Mahyuddin, Practical Training Coordinator, and Dr. Dzulkarnaean Bin Ismail, Programme Coordinator have put in to ensure the successful completion of my training, this report, and the useful information that has been offered throughout the previous several semesters.

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

Thank you so much.

ABSTRACT

Brickwork is masonry created by a bricklayer using bricks and mortar. Generally, lines of bricks called courses are stacked on top of one another to form a structure such as for a brick wall, therefore the purpose of this report is to discuss the process of interlocking brickwork for wall at Perla apartment project. The two objectives of this report is to determine the equipment utilised in the building process and to investigate the finest forms of brickwork interlocking building technique for the apartment's wall structure. To attain these goals, a variety of procedures, including observation, interviews, and document analysis, must be employed.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

Brickwork is an old material and one of the most important building construction materials in the world. Bricks have been developed in different classifications which is solid brick and interlocking brick (Mohammed, 2018). The development of interlocking mortarless brickwork has resulted in a significant increase in field profitability and effectiveness, as well as a reduction in the need for highly specialised work teams (Ahmad et al., 2011). Interlocking blocks differ from normal blocks in that there is no mortar to fill between the layers of the blocks during the construction process (Al-Fakih, 2018). Numerous types of interlocking blocks and bricks have been manufactured in recent years, changing in material composition, size, and form according on the needed strengths and purpose (Nuruddin, 2018).

Interlocking brickwork is so important as it is part of the building that required a load bearing component which is basically a wall. As everyone knowledge, brick is the most plentiful and natural material in the world. Because of their longevity, bricks have been used to construct many constructions over many thousands of years which has resulted brickwork as an important part in the construction (Nikbakht, 2018). Various interlocking blocks have been produced throughout the years, with material composition, shape, and size varying based on the needed strengths and purposes (Kumar, 2014). To be more specific, other materials such as soil-cement blocks and rice husk ash (RHA) cement blocks were used . The volume ratio is what distinguishes soil-cement blocks from RHA blocks. Depending on the soil and

cement characteristics, the cement-to-soil ratio typically ranges between 1:6 and 1:10, whereas the cement-to-RHA ratio is typically 1:4 (Vigneshvar, 2014).

As for the advantages, termites cannot destroy the blocks, unlike in the case of timber buildings. When compared to traditional masonry, the dry assembly of interlocking blocks saves time and a significant amount of mortar that would otherwise be used for the horizontal and vertical connections (Kumar, 2014). Building expenses are cheaper than for normal masonry construction because to the lack of high-wage professional masons, the use of less cement (less mortar), and the speed of construction (Vigneshvar, 2014). There are many other forms of brickworks, but the aim of this is to learn about the process of interlocking brickwork for wall at Perla apartment project.

1.2 Objectives

As previously stated, this study is on the process of interlocking brickwork for the Perla apartment project's wall. This report has multiple objectives, which are as follows:

i. To determine the method statement of interlocking brickwork for wall.
ii. To investigate the machinery, materials and equipment used in the process of the brickwork laying.
iii. To determine the cost and time taken during the process of the interlocking brickwork.

1.3 Scope of Study

The scope of this study is to know how to interlock the brickworks began from the beginning process. All the data achieved for this study had been carried out at Jalan Lapangan Terbang Subang, Ara Damansara, Petaling Jaya. This project entails the construction of an 18-story apartment building. This study is highly concerned with identifying the process of interlocking wall brickwork as the building progresses. The process including materials used and machinery that is being used in the interlocking brickwork. However, during the interlocking brickwork procedure, the amount of labors is not analysed.

Figure 1.0 The Project Signboard

Figure 1.1 Front View of the Project at 75% progress

Source: https://www.facebook.com/AraSentralOfficial/photos/905026200146880

1.4 Methods of Study

Several strategies have been explored to attain excellent report quality in order to provide a desirable outcome. This research of the interlocking brickwork process also employed numerous approaches to collect data, and it is still being used throughout this industrial training duration.There are three sorts of methods: observation, interview, and document review.

1.4.1 Observation

This method is commonly used to learn something new. It allows us to see the world in a different way, which makes it easier to recall. During the practical training session, the observation methodology was applied by visiting a site. There are also notes taken on crucial details so that the research does not miss anything, no matter how minor. An additional observational initiative also taken, such as photographing the work process, because we all know that our memories have a limited lifespan. The data collected helped to formulate a report that is based on the findings of my study.

After observing the interlocking brickwork method, the researcher had a deeper grasp of the procedure as well as a clear picture of them. The technique of interlocking brickwork has been adopted as one of the wall building constructions at the Perla Ara Sentral site.

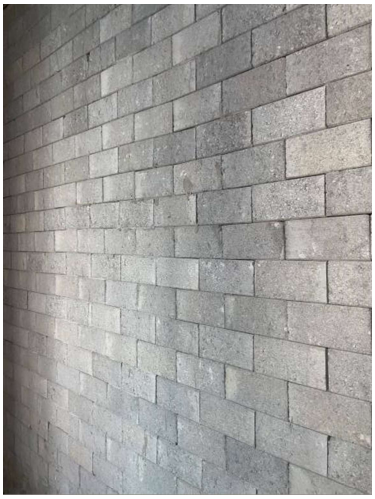


Figure 2.0 Interlocking Brickwork for wall

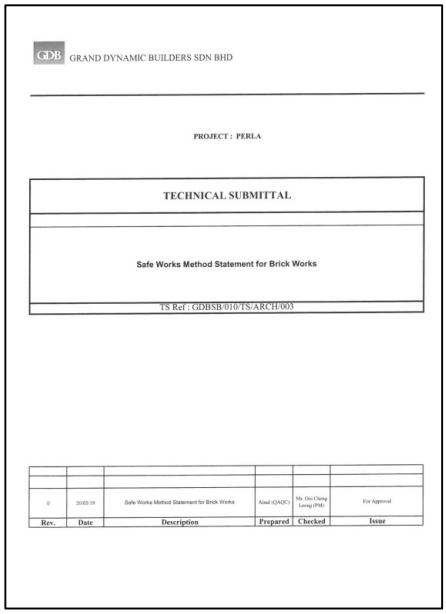
1.4.2 Interview

Next method is to interview the laborers and supervisor to learn more about the interlocking brickwork. During the interview, a few questions about this case study were asked when the observation procedure was taking place so that it could be included in this report.

During the interview with the supervisor, questions such as the method and length of the interlocking brickwork created on the site, as well as the advantages and disadvantages of the interlocking brickwork, were asked.

1.4.3 Document Reviews

Document review is another strategy that has been employed to acquire data for this case study. There are several materials to which has been referenced as to work on the report.Generally, the construction drawing is frequently referred to since it contains crucial information such as the arrangement plan, size required, or type of material utilised. A safe works method statement for brickworks is also used to get vital information such as the construction that must adhere to the company's safe work specifications, such as the laying of bricks on a layer by layer basis to a maximum wall height of 1500mm as specified.



GDB GRAND DYNAMIC BUILDERS SDN BHD

PROJECT : PERLA

TECHNICAL SUBMITTAL

Safe Works Method Statement for Brick Works

TS Ref : GDBSB/010/TS/ARCH/003

Rev.	Date	Description	Prepared	Checked	Issue
0	20/05/19	Safe Works Method Statement for Brick Works	Azad (QAQC)	Mr. Ooi Chang Leong (PM)	For Approval

Figure 3.0 Safe Works Method Statement for Brick Works

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

The firm was formed on 28 February 2013 as a private limited company called CHC Synergy Venture Sdn Bhd as an investment holding company and was presumed registered under the Act. The name was changed to GDB Holdings Sdn Bhd on July 15, 2016. They were turned into a public limited company and given their current name on September 14, 2017.

Grand Dynamic Builders primarily provides construction services, with a concentration on high-rise residential, commercial, and mixed-use development projects as the primary contractor and principal works contractor. They are involved in the implementation of construction projects, which involves daily administration of all work necessary for the projects to be completed on schedule. Grand Dynamic Builders also hires subcontractors to offer services such as construction material supply and installation, machinery and equipment installation, and other specialised trade work.

Grand Dynamic Builders began to grow its company in the supply of construction services under the guidance of its directors. They have a track record of finishing projects ahead of the contractual deadline. Since the start of their firm in May 2013, they have completed four projects, all of which were completed ahead of the contractual completion date. Grand Dynamic Builders currently has four projects in the works.

2.2 Company Profile

GDB GRAND DYNAMIC BUILDERS Sdn Bhd

Figure 4.0 The Logo and The Name Of The Company

Source: https://www.jobstreet.com.my/en/job-search/building-construction-jobs-in-sabah-others/

Company Name	**:**	Grand Dynamic Builders Sdn Bhd.
Registration No	**:**	0718036-T
Address	**:**	A-02-01, F-02-01 & F-02-02, Sekitar 26 Enterprise, Persiaran Hulu Selangor, Seksyen 26, 40400 Shah Alam, Selangor
Email	**:**	enquiry@gdbhb.com.my
Contact/Fax	**:**	+603 5103 8162 / +603 5103 6621
Profession	**:**	Provision of construction service
Directors	**:**	Cheah Ham Cheia (Group Managing Director) Alexander Lo Tzone Leong (Group Executive Director)
Vision	**:**	To be a highly reputable and progressive construction firm that delivers products and services of sustainable and excellent quality via innovation in People, Quality, Safety And Technology.
Mission	**:**	To employ, cultivate, and support our knowledgeable and motivated teams through continuous development and improvement driven by the synergy of Efficiency, Teamwork, and Commitment of the management and staff.

2.3 Company Organisation Chart

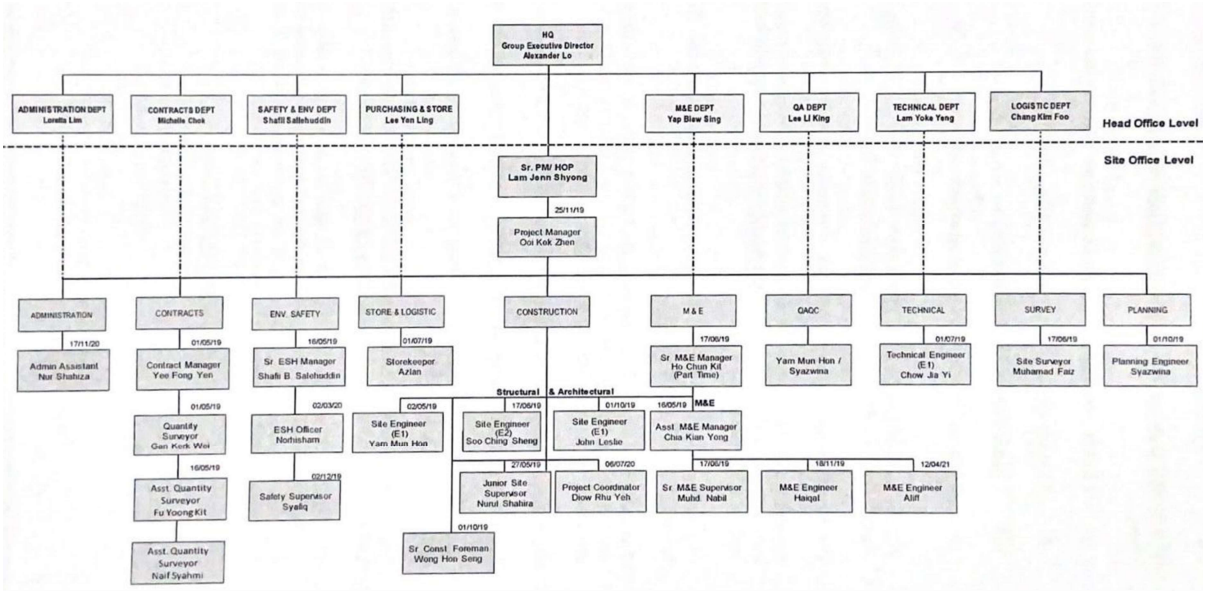


Figure 5.0 Company Organisation Chart

2.4 List of Projects

2.4.1 Completed Projects

Table 1.0 Completed Projects of Grand Dynamic Builders

No	Project Title	Project Value	Start Date	Completion Date
1	Westside III Desa Parkcity, Kuala Lumpur.	RM231,000,000	21/12/2015	20/10/2018
2	One Central Park Desa Parkcity, Kuala Lumpur.	RM388,000,000	16/12/2013	31/10/2016
3	KL Eco City, Kuala Lumpur.	RM275,000,000	7/4/2014	2/10/2017
4	Etiqa Office Tower, Jalan Bangsar, Kuala Lumpur.	RM330,000,000	1/8/2016	13/7/2018
5	BBC Show Units, Jalan Pudu, Kuala Lumpur.	RM57,000,000	9/5/2016	27/6/2016

2.4.2 Project in Progress

Table 2.0 Projects in Progress of Grand Dynamic Builders

No	Project Title	Project Value	Start Date	Completion Date
1	8 Conlay, Kuala Lumpur.	RM957,000,000	23/11/ 2020	26/11/ 2023
2	Autohaus Setia Alam, Setia Alam.	RM25,000,000	28/11/2019	13/10/2021
3	Park Regent Desa Parkcity, Kuala Lumpur	RM250,000,000	2/12/2019	3/5/2023
4	Hyatt Centric Kota Kinabalu, Sabah	RM97,000,000	2/1/2020	9/5/2022
5	Perla Ara Sentral, Ara Damansara	RM176,000,000	16/4/2019	14/3/2022

CHAPTER 3.0

PROCESS OF INTERLOCKING BRICKWORK FOR WALL AT PERLA APARTMENT PROJECT

3.1 Introduction to Case Study

Grand Dynamic Builders Sdn Bhd began developing an apartment project named as Perla Ara Sentral in Ara Damansara with a RM176 million contract, which is also a mixed development in Ara Damansara by TRC Synergy Bhd's unit. The contract began on April 16 and is slated to be completed by March 14, 2022. This project is called as Perla Ara Sentral, and it is a freestanding furnished apartment located near the Ara Damansara railway station, which is connected by a pedestrian bridge. This project is actually a collaborative project between the owner, Prasarana, and ADS Projek Sdn Bhd.

This project building is constructed with the technique of an interlocking brickwork for their wall. This apartment features an 8-level podium with 7 levels of parking and 1 level of facilities, as well as two blocks, block 3A and block 3B. Each tower is 18 stories tall, with 648 residential units on levels 7 and above. This apartment unit's built-up space ranges from 550 square feet to 1271 square feet and is intended to fulfil a multitude of demands.

This case study focuses on the method by which laborers on a building site construct interlocking brickwork for a wall of both blocks. This construction site has a number of experienced workers, including a site manager, a site engineer, a project coordinator, and a safety supervisor. To facilitate discussions and work schedules, a modest basement room near the LRT station is utilised for the main contractor, site offices, and staffs and ultimately a conference space for official meetings amongst the persons engaged in this construction project.

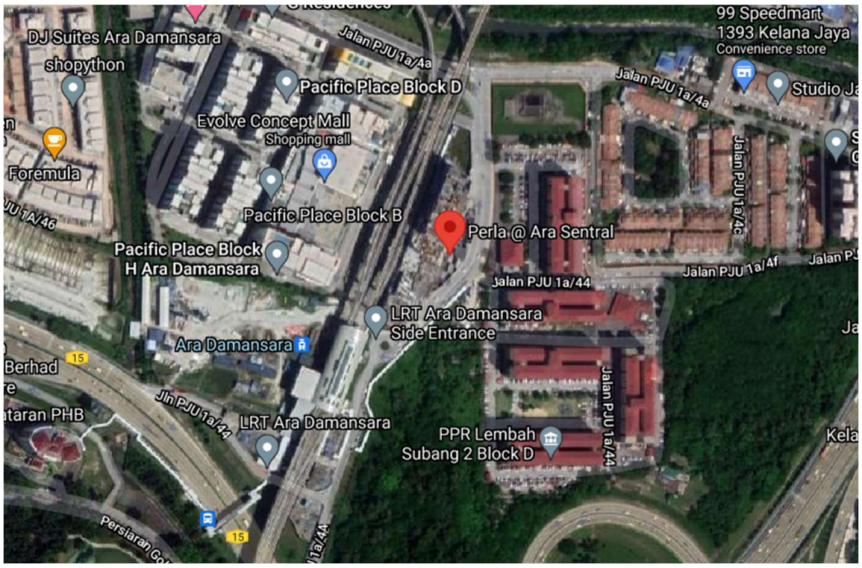


Figure 6.0 Satellite Image of the Site Location

Source: https://www.google.com/maps/place/Perla+@+Ara+Sentral/

Figure 6.1 Perla Ara Sentral Scale Model

Source: https://www.edgeprop.my/content/1695123/soft-launch-perla-ara-sentral-gets-good-response

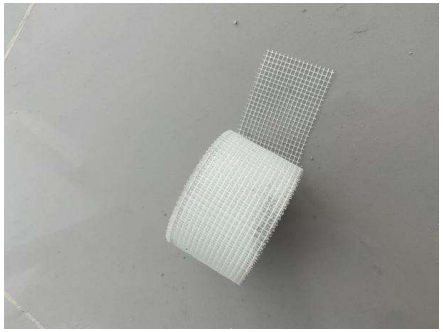
Figure 6.2 Back View of Perla Ara Sentral on 26 November 2021.

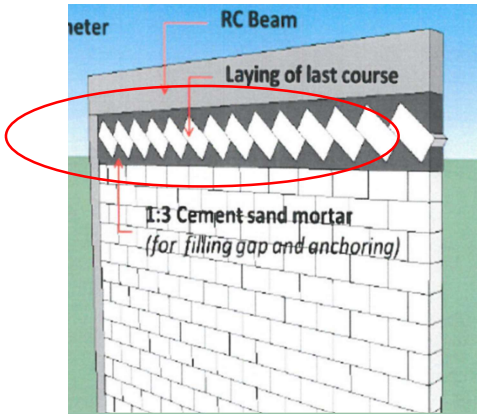
Source: https://www.facebook.com/AraSentralOfficial/photos/905026200146880

3.2 The Method Statement Of Interlocking Brickwork For Wall

No	Activity	Manpower	Tools & Equipment
1.	Setting out for brick wall.  **Figure 7.0 Labourer Marking The Location Of The Brickwork**	2 workers per wall	 **Marker Chalk Line** **Source: fine-tools.com**
2.	Cleaning the working space for better accessibility.  **Figure 7.2 Laborers cleaning space**	2 workers	

3.	Fish tail installation.  **Figure 7.2 Installation of Fish Tail**	1 worker per wall	 **Galvanised Fish Tail** **Source: https://www.orbitalfasteners.co.uk/**
4.	Applying 1st layer to form the level for full brick at soffit.  **Figure 7.3 Applying Mortar On The Bricks' Surface**	2 workers per wall	 **Mason's Spade**

5.	Installing exmets at the brickwork for every 4th layer.  **Figure 7.4 Exmets installation at the brickwork**	1 worker per wall	 **Exmets**
6.	Installation of lintels to door/window frames at every openings.  **Figure 7.5 Precast Lintel Installation**	2 workers per wall	

7.	Finishing off brick to beam/slab.  **Figure 7.6 Illustration of solder course at 60º**	-	

As to construct an interlocking brickwork for wall, setting out were carried out as for first step before anything else. The location were marked and positioned for the brickwork using a marker chalk line from one column to another column. The chalk line and the reference grid line can be used to denote it. The next step was to clean the work space. The purpose was simply to gain access to the place for working and accessibility. Before placing the bricks, the surface got ensured that it was clean and free of oil and grime.

Next, installation of galvanised fish tail. For the junction between the brick wall and the structure wall, a galvanised fish tail has been affixed to the structure wall. The fish tail installation for the Perla Ara Sentral used 0.8mm thick galvanised fish tail that was installed every 6 layers of interlocking brick. Except for around openings, the ties were uniformly distributed throughout the wall area in a staggered pattern. After the installation, M&E (mechanical and engineering) Services such as pipe works, exposed conduits and duct works were then installed prior as well as the door frame to brick wall erection.

The mortar then has been mixed. 1 part masonry cement equals 3 parts sand. The mortar ratio for this brickwork was 3:1, which stands for sand:cement. A bag of mortar were combined with approximately 3 gallons of clean water. Furthermore, lime was also used as an additive. The ratio was 6:2:1. After that, the mortar applied to the brick surface by the laborers . The mortar was applied to the surface of the bricks before laying the next layer on top. They make sure to check for horizontal and vertical alignment with carpenter twine applied at each layer.

The next step before completion was to install exmets. A layer of exmet was laid for the first brick layered on surfaces, for the first two courses of brickwork, and then continuing to every fourth course of brickwork. After exmets installation, the installation of lintels are done by the laborers. Lintel placement and edge extension was not less than 150mm. Lintel was precast before the brickwork site began.

Last but not least was completing the brick to beam or slab. When completing brick laying to a beam or slab soffit junction, the last course of bricks were arranged at a 60º angle. For filling gaps and anchoring, 1:3 cement sand mortar has been utilised.

3.3 The Machinery, Materials and Equipment Used in the Process of the Brickwork Laying

1) Wheelbarrows - To carry the brickwork's materials to the site location and can be used to dispose of debris and waste of the construction.

Figure 8.0 Wheelbarrow with Materials Inside

2) Spirit Levels - Used to indicate how parallel (level) or perpendicular (plumb) a surface is relative to the earth and to make sure the brickwork is neat and straight before laying it off.

Figure 8.1 Spirit Level Used for Brickwork

3) Measuring Tapes - To determine the distance or size for the brickwork. A tape measure will contain imperial, metric, or both readings.

Figure 8.2 An image of Measuring Tapes

4) Mason's Spade - To take mortar and apply it to brickwork.

Figure 8.3 Mason's Spade used in Brickwork

5) Proven Bricks - Type of brick that is used for the site's brickwork wall which specifically made by Proven Holding.

Figure 8.4 Proven Bricks Used in the Interlocking Brickwork

6) Exmet - A mesh tape where used in brickwork by inserting it every fourth joint in cement mortar to develops an inherent structure in a building to absorb stress and vibration from the building.

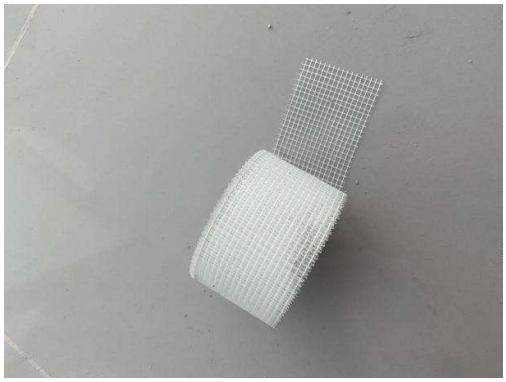


Figure 8.5 Exmet Used during the Brickwork

3.4 The Cost And Time Taken During The Process Of The Interlocking Brickwork

When it comes to building, it is apparent that one of the issues that have arisen is the cost especially when it is an proven bricks. To be more specific, during the brickwork, there may be minor faults made by the laborers, necessitating the replacement of certain materials. When it comes time to replace materials, there is a good chance that there will be a material deficit. In that case, extra materials must be ordered in order to have enough materials to complete the project. This will result in a substantially higher cost than was originally predicted.

Other than that, there will also be imperfections in the materials, whether as a result of careless collision by other workers or from the factory of the materials itself, which provided defective materials in the first place. In this regard, additional material replacement need be conducted, which increases the cost of the interlocking brickwork process. As for its endurance, interlocking brickwork is substantially more costly than standard brickwork.

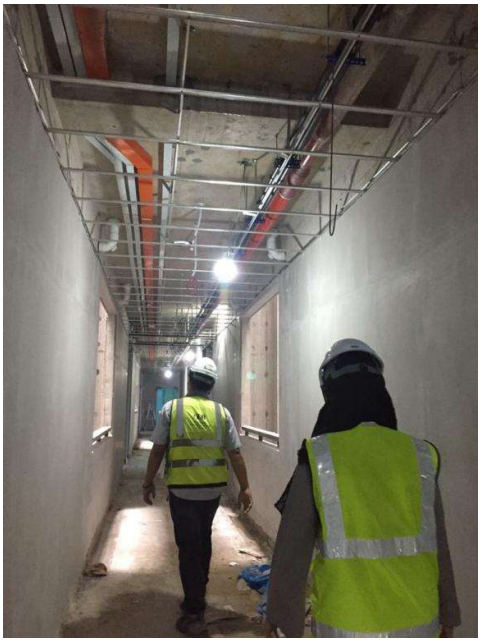


Figure 9.0 Site Visit to Monitor the Brickwork process

The time required for the interlocking brickwork is significantly less than predicted. Bricklaying, as everyone knows, is a challenging work to do in such a short amount of time. However, interlocking brickwork is significantly faster to finish since it simply has to be attached to each other with adhesive rather than typical cement mortar building excluding a section of the last course of bricks. In addition, interlocking bricks can aid because there is no need for bricks to cure for an extended period of time.

Figure 9.1 A Completion Image of Interlocking Brickwork

CHAPTER 4.0

CONCLUSION

To summarise, brickwork is a fundamental component of building construction. Brickwork is also vital since it serves as a construction wall as well as a load bearing. In building, two types of general brickwork are used which is proven interlocking brickwork and common brickwork. As for the Perla Ara Sentral, interlocking brickwork is being used in the building for the walls. Interlocking brickwork has numerous advantages, one of which is that it is ecologically beneficial and earthquake resistant. Interlocking brickwork also much more durable compared to the common brick and require minimal maintenance.

Throughout the report, there are two goals: first, to investigate the machinery, materials, and equipment utilised in building, as well as their purpose. Next is about the process of the interlocking brickwork. Many things can be learned from these two objectives, such as how to correctly execute construction so that the contractor can operate the installation successfully in the project.

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