DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

METHOD OF CONSTRUCTION FOR GROUND BEAM

Prepared by:

MUHAMMAD RIDZUAN BIN MUHAMAD ALI

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FEBRUARY 2022

It is recommended that the report of this practical training provided

By

MUHAMMAD RIDZUAN BIN MUHAMAD ALI

2019446738

entitled

METHOD OF CONSTRUCTION FOR GROUNG BEAM

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

		_____
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(PERAK)

FEBRUARY 2022

STUDENT'S DECLARATION

I'm hereby declare that this report is my own work, except for extract and summaries for which the original reference stated herein, prepared during a practical training session that I underwent at Ar. AZMAN ZAINONABIDIN for duration 20 weeks starting from 23th August 2021 and ended on 7th January 2022. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfilment of the requirements for obtaining the Diploma in Building.

…….

Name : MUHAMMAD RIDZUAN BIN MUHAMAD ALI

UiTM ID No : 2019446738

Date : 10 January 2022

AKNOWLEDGEMENT

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

I would like to extend my heartfelt gratitude for the guidance, advice and help rendered throughout the period of training. I would like to say thank you to En. Azman Bin Zainonabidin for the opportunity given to conduct, my training in his esteem company. I also want to thank you to En. Muhd Agos and En. Alim because guidance during practical at site. I have learn and develop my understanding, knowledge and feel of real time project, and the theory involved in analysis of structures, building and civil works. Besides, I want to credit for Energiser Enterprise because they are also teach about construction and civil work. I would like to thank you to Mr Chang Kok Kheong and Miss Josephine Chor as Project Director, En Raja Syahrom Bin Raja Halimul Rashid as Project Manager, En Izal Ikmal Bin Ibrahim as Site Supervisor, En, Khairul Hadfiz as Safety Officer and En. Faiz Amir Bin Che Anuwar as Site Safety Supervisor because they help to further enhance ability in understanding the procedure in construction and site administration, test procedures, site safety and the best practice in Industry.

I would also like to thank you to all my lectures UiTM that have thought and nurtured me in becoming a better student and person. I would also like extend my deepest appreciation to the lecturers who are directly involved during my training stint. To Cik Nor Azizah Binti Talkis. Supervising Lecturer, Ir Raja Nurulhaiza Raja Nhari, Report Supervisor, Evaluation Lecturer, -Dr. Nor Asma Hafizah Bin Hadzaman, Practical Training Coordinator and Dr. Dzulkarnaean Bin Ismail, Programme Coordinator, I value the time, effort, encouragement and ideas that they have contributed towards the successful completion of my training, this report and the valuable knowledge that have been shared over the last few semesters.

Lastly, I want to say thank you to my beloved parent because the sacrifices over the years and to my friends always support me in this semester.

Thank you very much.

ABSTRACT

Beams are structural elements that transfer loads imposed along their length to end points. Beams are utilised to sustain the weight of a building's floors, ceilings, and roofs while also transferring the load to a vertical load bearing element (column and foundation).. The ground beams are designed to span between footing and piles. . This report was prepared using information from the site's experience and observation for the single-story house project under the Program Khas Perumahan Perwira Negeri Perak (PKPPNP). Project Perwira is located at Seri Iskandar, Perak Darul Ridzuan. The objective of the report is to study the method of construction for ground beam. It focused on preparation before concreting of ground beam, during concreting and after concreting. , This report shows the process and equipment that was used during construction of ground beam. Lastly, the concreting ground beam can be easily and quickly build in construction also give strength at the building.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Every building will have structure element for support that building. Structure elements is a basic components at the building structure. The example structure element must have in building such as foundation, floors, walls, beams, columns, roof, stair and etc. Structure elements used for supporting, enclosing and protecting the building structure.

The beams are horizontal structure elements in building which transfer the loads imposed on them. The ground beam is a part of the masonry wall bearing building. The ground beam are different between plinth beam or grade beam. The ground beam is a beam that is normally installed at the foundation level of a structure.. The use of ground beam is to support building walls, joists and another elements in building. Typically of the ground beam are directly rested of the ground and can be supported by end piers. The facts of ground beam are typically ground beam are made of reinforced concrete. Ground beam are typically constructed at foundation level.

The important about ground beam is that it's easy to construct and can be done so in variety of sizes and shapes. They also flexible beam to supports the soil and foundation, providing a very sturdy surface to build on. The ground beam is also buildable (more beams can be added to it). Some additions include rebar, pipes, dowels and conduit. According to the top concrete companies, the ground beam requires less installation time and less labour and is quite trustworthy and cheap.

The difference between the ground beam and plinth beam. The ground beam is constructed at the foundational level of a structure. It helps to support the wall, joist and other structures, especially in places where the soil is not sturdy enough to support the structure. In other words, the ground beam helps to establish a strong foundation to begin construction on. The plinth beam is constructed slightly higher than ground level, the plinth level is where the plinth beam is constructed. It also helps to tie in all the columns of a structure to reduce the slenderness ratio. Usually, a minimum of 2 bars on the top and bottom, 10 mm wide are used to construct it.

The advantage when constructing the ground beam is ground beam can be constructed easily and quickly. Besides, the resists the settlement of the supporting walls and the bearing capacity of soil may increase indirectly due to the generated pressure. The aim of this report is study about concreting ground beam.

1.2 OBJECTIVE

The main objectives for this report are as follows:

- To study the method of construction for ground beams.
- To determine the problems occurred and solution taken to solve the problems during the construction of ground beams

1.3 SCOPE OF STUDY

This study was carried out at the ongoing site that is handled by Pembinaan NKZ Sdn Bhd. This site is situated at Sekolah Menengah Kebangsaan Hamzah, Machang, Kelantan. It involves the construction of additional blocks for the facility of the school**.** This report is based on the project single storey houses for Program Khas Perumahan Perwira Negeri Perak (PKPPNP). The project located at Seri Iskandar, Perak Darul Ridzuan. The project includes 3 phases of construction.

This study pursue to describe all related process requires to be applied on the construction of ground beams. This stage includes all the progress activities associated with:

i) Determining the type of machineries, equipment and materials used in concreting of the ground beam

ii) Identifying the problem and method required for the defects on concrete.

1.4 METHOD OF STUDY

There are various methods used for this study to complete this report. The methods are required to obtain information about a construction of ground beams..

i) **Observation**

In this study, observation of the surrounding plays a major role to gain new knowledge and information about the method of construction for ground beams. Observation is made on the process of construction, types of problems and solution taken in order to run the construction work smoothly. This case study had taken along the construction process to fully observe the required data. The data was collected by taking a pictures and written notes.

ii) **Interview**

Interview session with the engineers, site supervisors and the contractors are conducted to gain clearer vision and knowledge. Interviews are done during working hours and during site visit. Some questions asked was about the construction process, the problems and challenges faced, how long the process takes to complete and etc. The supervisor also shared the knowledge and experience.regarding the construction process of ground beam.

iii) **Document Review**

This method provide more precise data. The document review was architecture drawings and structure drawings. The two(2) drawings show the details measure and material used to construct the ground beams. Besides that, progress report can be used as a document reviews where it provide the construction planning or sequence of works at the site. .

iv) Web browsing

Web browsing also be one of the method of study because it can assist in searching about research information In this approach, the information about the study can be easily access.

CHAPTER 2

COMPANY BACKGROUND

2.1 INTRODUCTION COMPANY

Figure 2.1: logo Arkitek AzmanZainonabidin

Arkitek AZMAN ZAINONABIDIN was established in year 2000 and they will offer a true professionalism and dedication to all assignment undertaken, coupled with a continuous striving for the highest standard in design and project delivery. In year 2017, Arkitek AZMAN ZAINONABIDIN was upgraded from sole proprietorship firm to partnership.

Arkitek AZMAN ZAINONABIDIN was recognized the value of innovative design approaches which are compatible with Malaysia's environment and culture and endeavours to follow this trend but more moderated with sound constructional principles to ensure long term durability and reliability of all project undertaken.

The company also draws it from experience and expertise from its principal who has worked for major practices in Malaysia. Projects included high-rise condominiums, housing development, mixed development, offices, shopping complexes, resort, sport complexes, highway facilities and interior design.

Arkitek AZMAN ZAINONABIDIN always provides comprehensive services including master planning, architectural concept design, contract management and interior design.

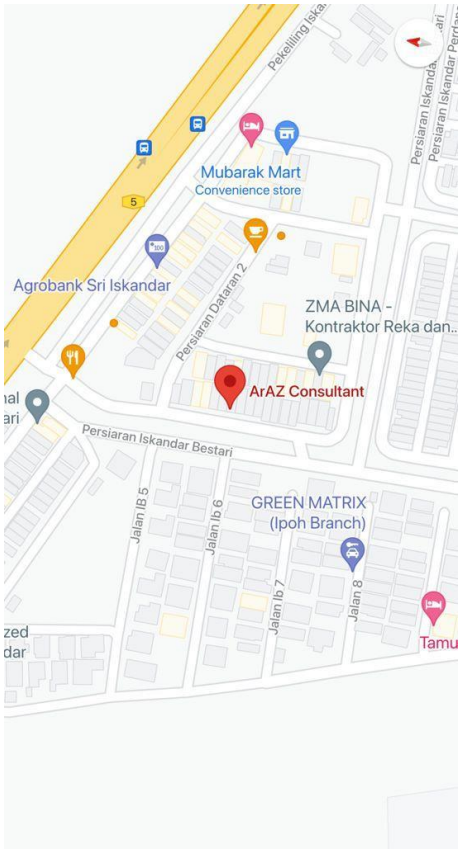


Figure 2.2: Location ArAz Company

2.2 COMPANY PROFILE

COMPANY PROFILE

NAME OF COMPANY : Arkitek AZMAN ZAINONABIDIN

REGISTERED OFFICE : 19A, Persiaran Dataran 2, 32610 Seri Iskandar, Perak Darul Ridzuan.

NO. OFFICE : 05-3712796

REGISTERED YEAR : 2000

NO. COMPANY REGISTRATION : 201503314527 (IP0441753-M)

PRINCIPAL PARTNER : Ar. Hj. Azman Bin Zainonabidin

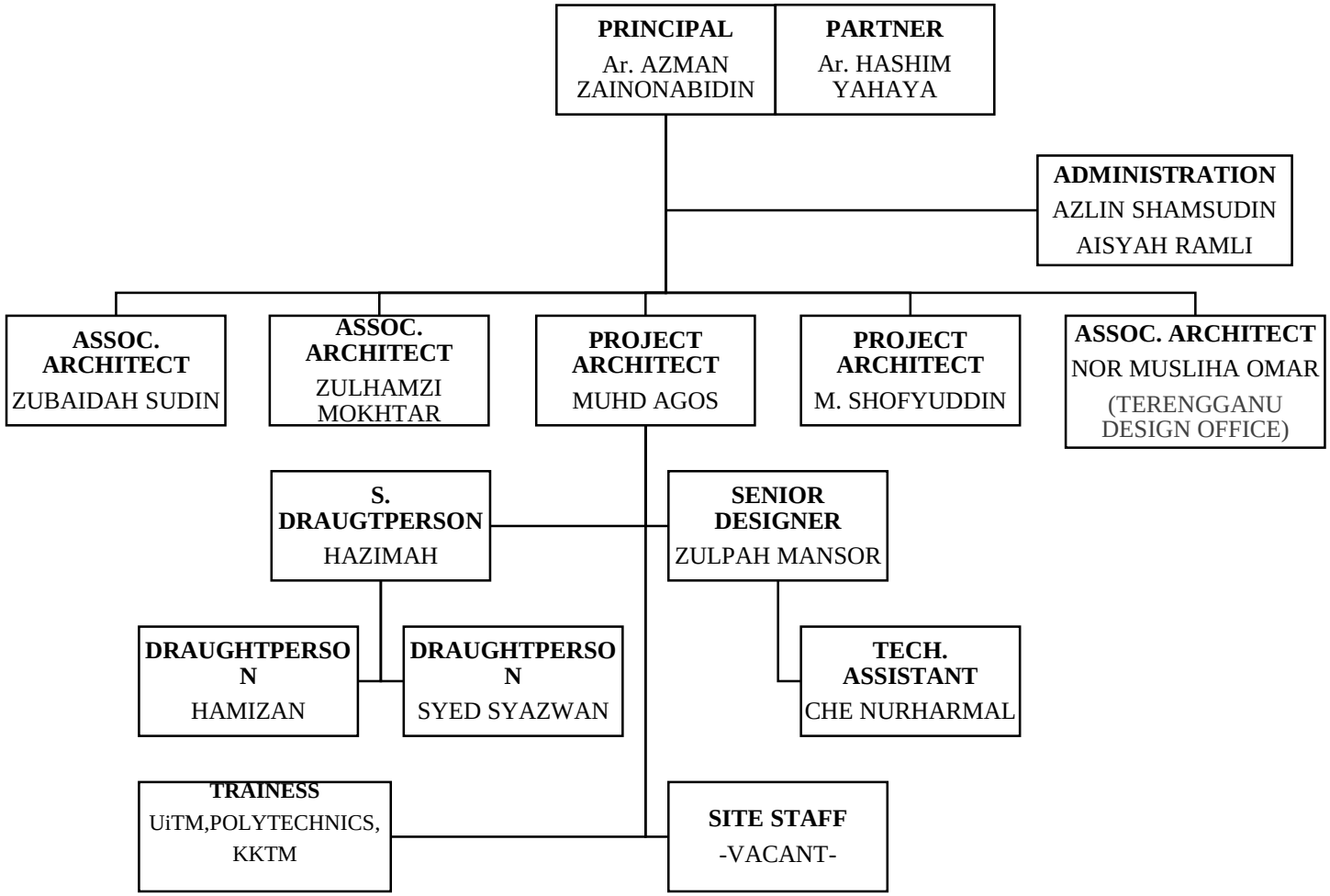
Adv. Dip. Arch. [ITM], Dip. Arch. [ITM]

PARTNER : Ar. Hashim Bin Yahaya

B. Arch. (Hons) [UiTM] Dip. Arch. [ITM

2.3 COMPANY ORGANISATION CHART

Arkitek AzmanZainonabidin (ArAz) is led by Ar. Azman Bin Zainonabidin and his partner is Ar. Hashim Bin Yahaya. It also has 9 main units or departments, all units have their scope of work. The 9 units include Administration, Assoc. Architect, Project Architect, S. Draughtperson, Senior Design, Technical Assistant, Draughtperson, Site Staff and Trainers which from UiTM, Politeknik and KKTM.



2.4 List of Projects

2.4.1 Completed Projects

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	IBU PEJABAT BOMBA NEGERI PERAK, IPOH, PERAK.	RM 18.O MILLION	12 SEPTEMBER 2011	APRIL 2016	5 YEARS	KEMENTERIAN PERUMAHAN (KPKT)
2.	PEJABAR MDPT, SERI ISKANDAR, PERAK	RM 9.5 MILLION	DECEMBER 2010	OCTOBER 2013	3 YEARS	MAJLIS DAERAH PERAK TENGAH

2.4.2 Project in Progress

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	PROJECT PERWIRA SERI ISKANDAR	RM 111,777,000	26 JULY 2021	2024	34 MONTH	RATU NAUTIKA SDN. BHD.
2.	BILIK KULIAH 2 TINGKAT, KUALA KANGSAR	RM 2, 700,000	22 APRIL 2021	2022	1 YEARS	RISDA

CHAPTER 3

CASE STUDY (METHOD OF CONSTRUCTION FOR GROUND BEAM)

3.1 INTRODUCTION

This case study was conducted on the site of the single-story housing project under the Program Khas Perumahan Perwira Negeri Perak (PKPPNP). The project located at Seri Iskandar, Perak Darul Ridzuan and its include three (3) phases of construction. The following is a breakdown of the projects:

Phase 1

- **i)** 465 Units single storeys (PT 30672 – PT 31136)
- **ii)** 2 units electrical substation
- **iii)** 1 unit sewerage treatment plant
- **iv)** 1 unit water tank

Phase 2

- **i)** 270 units single storey (Plot 466 – Plot 668 & Plot 697 – Plot 763)
- **ii)** 28 units double storey shop office (Plot 669 – Plot 696)

Phase 3

- **i)** 304 units single storey (Plot 764 – Plot 1067)
- **ii)** 1 unit electrical substation

This initiative was created for employees of government agencies such as Anggota Tentera Malaysia (ATM), Polis Di Raja Malaysia (PDRM), Tentera Udara Di Malaysia (TUDM), Tentera Laut Di Malaysia (TLDM) and etc. The cost of the project was RM111,000,000 and developed by Ratus Nautika Sdn. Bhd. The price ranges from RM120,000 to RM145,000 for one of the houses. This project's plan needs to be completed by 2024.

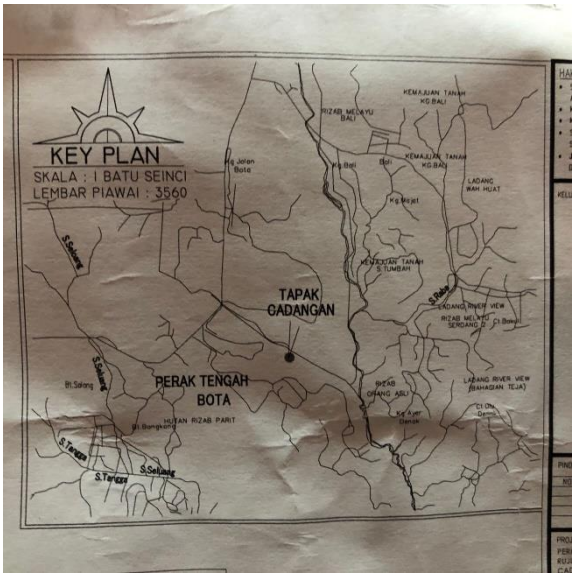


Figure3.1: key plan for the project

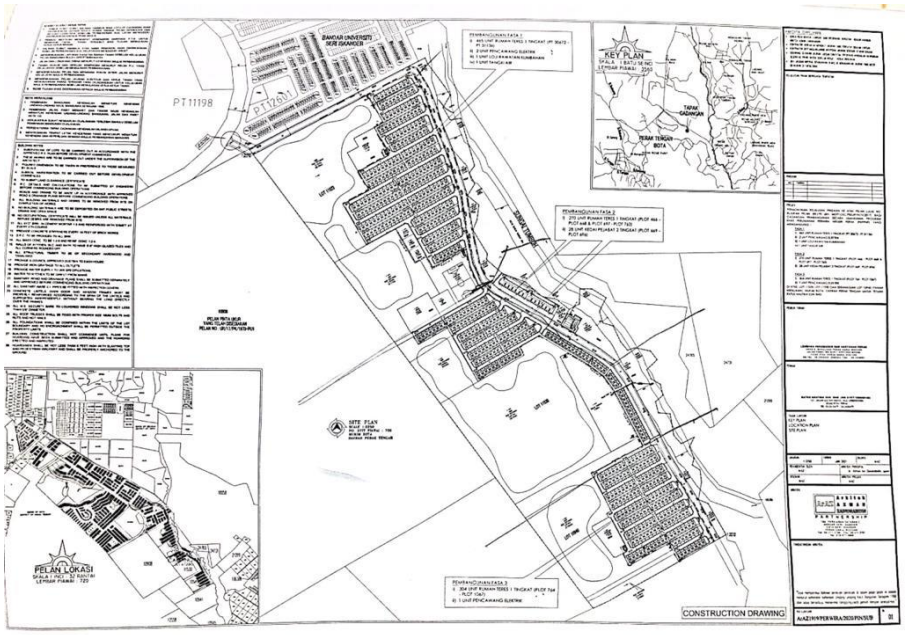


Figure 3.2: site plan project Perwira

Figure 3.3: plan location at project Perwira

Figure 3.4: the names of project

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Figure 3.5: signboard of project Perwira

The project Perwira build at the Seri Iskandar, Perak tengah, Perak Darul Ridzuan. This project also for help the veteran government to buy this house. The location project is at the back Bandar Universiti housing as the figure 4 is shown the location plan for project Perwira. This project contains 1039 house will build at this site.

The Perwira idea from Lembaga Perumahan dan Hartanah Tanah and also develop by Ratus Nautika Sdn. Bhd. The architecture on this project by Arkitek Azman Zainonabidin and Engineer plan by T.S. Yee and Associates. The contractor for the project Perwira is Energiser Enterprise Sdn. Bhd.

3.2 THE METHOD OF CONSTRUCTION FOR GROUND BEAM

Figure 3.6: - the concrete work

The ground beam are generally constructed from concrete and for low-rise buildings are commonly constructed in situ. The information, Project Perwira Seri Iskandar was used strip footing and follow by ground beam. It's meaning the strip footing and the ground beam was combined or just took one way for concrete. The reason there used strip footing because there not used any piles for substructure, meanwhile the just have sand for basement.

The material of ground beam is Reinforcing Fabric of Steel (BRC). The steel reinforcement has many type of sizes. The size is important for steel for durable and strength for structure. BRC is a steel reinforcement material very usually for floors, roads, slabs, column and beam. The steel reinforcement very important in construction for keep strength in building. At site, the steel reinforcement for ground beam is BRC A7 and BRC BB. Meanwhile, the steel reinforcement for strip footing for make a Rebar is size Y10, Y12, R8, R10 also R6 for the links. The Rebar footing and BRC ground beam must install before concrete.

Figure 3.7: the steel reinforcement arrive at site

Figure 3.8: the Rebar for footing

3.2.1 FABRICATE REBAR

The substructure at Project Perwira was used strip footing as a footing and continued by ground beam. The beginning concrete the ground beam is the workers were fabricate the steel reinforcement for Reinforcing Fabric of Steel (BRC) used for ground beam. Fabricate Rebar can related may conjure up images of million operation whereby rebar comes out all ready to be installed in a construction. Project Perwira called bar bender work and the work need three workers for done fabricate rebar and BRC in one days.

Figure 3.9: fabricate steel

3.2.2 EXCAVATE GROUND BEAM AND DAMP PROOF MEMBRANES (DPM)

The process of ground beam was started with marked the ground beam at every house. That work for easy to make excavate slab or floor and mark as a ground beam. The marked was did by row where one row have 19 – 23 houses. Before the work, the manhole was already build. It is because when the house build first, that can give trouble for workers when the space become small. A manhole is a unit constructed underground to provide access to the utilities like a sewer system, drainage system and etc. The sewage also build before the construction ground beam.

Figure 3.10:Setting Out in progress

After fabricate, the workers start excavate the sand for mark as a ground beam and the height ground beam and footing was 150mm. The excavation doing for make different between the foundation and ground beam also make easy to install the rebar footing and BRC for ground beam. After excavate, the ground beam has close with blue plastic as Damp Proof Membranes (DPM) for the ground beam not collapse. The DPM usually applied at below floor level like ground beam which restrict the movement of moisture through walls and floors. This safeguards concrete from gaining any moisture and helps prevent cracks. The another advantage DPM is protect from water going into wall or concrete until happen crack and defects. The DPM is really important in building for make the building durable in more 30 years.

Figure 3.11.: excavate for slab

3.2.3 INSTALL FORMWORK

The formwork must build from the wood and timber for easy to install and easy to uninstall when after concreting. The formwork install after work DPM was land at ground beam and make sure the formwork must install perfectly and tight for easy to concrete and no have problem. Formwork also used for the process of creating a temporary into which concrete is poured and formed. Formwork for beams takes the form of a three – sided box which supported and propped in the correct position and to desired level. But, when time removal formwork will vary with air temperature, humidity and consequent curing rate. The example, at the site using air temperature 37^{o}c – 37.6^{o}c and when raining will 27^{o}c.

Figure 3.12: install the formwork and BRC for ground beam and footing

3.2.4 INSTALL THE REBAR, BRC AND SPACER

Then, the rebar for footing and Reinforcing Fabric of Steel (BRC) for ground beam was installed at the house where want to concrete after the formwork was done installed perfectly. The rebar footing must installed first and follow with BRC for ground beam. After, the workers put down the spacing stones between steel Rebar footing and BRC ground beam. The spacer at Project Perwira used the spacing bar and stone spacer. The spacing bar 150mm to 180mm. The spacer usually for a device that secures the reinforcing steel and on reinforced concrete structures as the rebar is assembled in place prior to the final concrete pour. The spacer also left in place for the pour keep the reinforcing in place and become permanent part of the structure.

Figure 3.13: Install the space between steel footing and ground beam

3.2.5 CONCRETING GROUND BEAM

Before the concrete land at the house, the pipe work must continue with install the pipe for water meter and water tank. After that, the concrete can land at the row house carefully. The safety must important at concrete time because anything can happen at this work. The count of workers was have 11 workers at be done concrete in 1 days for one row house with 19 houses. The concrete has test with slump test and cube test. The concrete was used in grade 25 fo ground beam and footing. After one day concrete, the concrete already done. The workers ready for uninstall the formwork footing and ground beam. After uninstall, we can see the result and defects at concrete ground beam. The defects and problem will discuss at third objective this report also the solution for the problems.

Figure 3.14: concrete work with crane

Figure 3.15: compact and flatting the concrete

Figure 3.16: Remove formwork

Figure 3.17: Remove Drop Formwork

3.3 THE PROBLEMS OCCURRED AND SOLUTION TAKEN TO SOLVE THE PROBLEMS DUE TO THE CONSTRUCTION OF GROUND BEAM.

In construction, there is always an issue with the structures. When employees are unconcerned about this, a problem might arise. Meanwhile, complications have arisen at Project Perwira Seri Iskandar when constructing the ground beam. Here are the challenges with ground beam construction and how to solve them. First problem was pouring concrete in the rainy day.. Pouring concrete in the rain is not only miserable, but it can also lead to problems with the final surface strength. -

Figure 3.18: Problem Concrete in Raining

The figure 3.18 show the result after concreting in rainy day - As we all know, concrete is made up of water, cement, and aggregate, thus when it rains, the concrete will receive more water.. Rain falling on top of freshly laid concrete can damage the surface and compromise a level and floated finish. Even worse, if too much extra water works its way into the concrete mix, this can result in weak concrete. Furthermore, the cement had been drained from the formwork, leaving only the aggregate in the formwork, as shown in Figure 3.18. The solution to this problem is for the workers to place half of the concrete in the ground beam currently and the rest concrete on the next day. This concrete-making solution will perfectly construct the ground beam with no issues.

Another issue during the construction of ground beams was the worker's carelessness during the formwork installation. For concrete to harden in the desired shape, formwork is required. Concrete is poured into a temporary or permanent support structure called formwork. When formwork is not installed properly, it can cause problems with the concrete. The concrete will erupt from the formwork, destroying the concrete's shape. The workers' solutions to this problem must be carefully checked to ensure that the form was installed correctly and that there were no holes. This issue is critical so that workers do not repeat the same tasks. When the formwork is perfect, the job should be simple and quick.

Figure 3.19: Problem concrete overflow from formwork

Others issue after concreting is honeycomb. Honeycombs can be simply be defined as a rough, pitted surface or voids in concrete resulting from incomplete filling of the concrete against the formwork, often caused by using concrete that is too stiff or by not vibrating is sufficiently during pouring the concrete

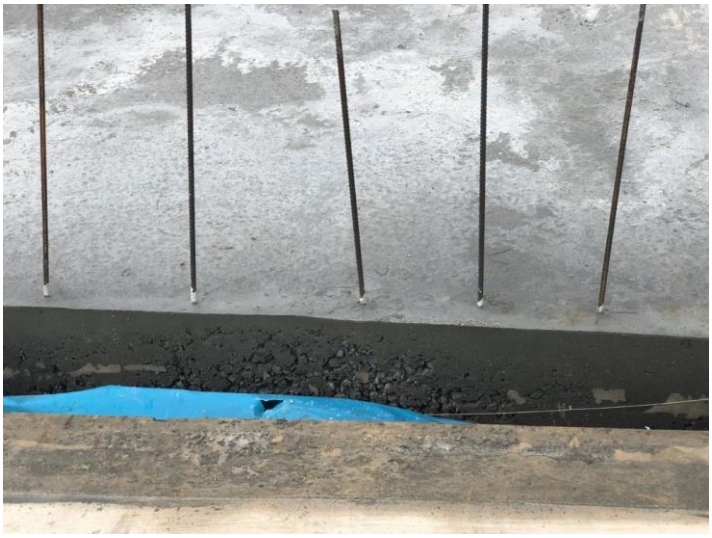

Figure 3.20: Problem Honeycomb in Concrete

The best way to deal with honeycomb is to repair it as soon as possible. The construction grout, white cement, and water must be mixed according to the manufacturer's specifications. The mixture should then be poured or applied to the area where the honeycomb has formed. Honeycombs are common in construction and are simple to repair. .

CHAPTER 4.0

CONCLUSION

Beams are structural elements that transfer loads imposed along their length to end points. Beams are utilised to sustain the weight of a building's floors, ceilings, and roofs while also transferring the load to a vertical load bearing element (column and foundation). From study at site about concreting ground beam, another ways for make easily and quickly is used excavator machinery for hold the concrete from concrete truck to house. Usually the concreting used a crane but the excavator can make easily concreting ground beam. It is because the excavator can brought more concrete than crane machineries. The problems hard to solve is raining weather. It is because that problem take a long time such as 1 day or after raining stop. After one day, can only continue concrete work.

REFERENCE

Flat Rock Concrete. *Difference Between Ground Beams and Plinth Beams* [online]. Available http://flatrockconcretecontractors.com/difference-between-ground-beams-and-plinth-beams/ Retrieve 25 December 2021.

Designing Buildings The Construction Wiki. *Ground Beam* [online]. Available https://www.designingbuildings.co.uk/wiki/File:Ground_beam.jpg Retrieve 24 December 2021.

Neenu S K. *Manhole – Purpose, Types, and Construction* [online]. Available https://theconstructor.org/practical-guide/manhole-purpose-types-features/36941/?amp=1 Retrieve 4 January 2022.

Nashirabad P.O of Birla.A1 *Important of Formwork* [online]. Available. https://theconstructor.org/practical-guide/manhole-purpose-types-features/36941/?amp=1 5 September 2021.

Suzuka Cement Texture Paint. *What is Honeycomb in Construction* [online]. Available https://basiccivilengineering.com/2015/04/what-is-honeycomb-in-construction.html Retrieve 20 December 2021.