



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

THE CONSTRUCTION PROCESS OF PRE-CAST CONCRETE PILING

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It is recommended that the report of this practical training provided

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THE CONSTRUCTION PROCESS OF PRE-CAST CONCRETE PILING

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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 Jack-In-Pile (M) Sdn. Bhd. for duration of 24 weeks starting from 20 August 2021 and ended on 7 January 2021. 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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ABSTRACT

Piling is the process of drilling foundations through the ground to provide more structural strength to the weak soil underneath. Piling is essential for high-rise buildings. This report is about to recognise the pre-cast concrete piling method. This report also covers pre-cast concrete piling installation, management, and other aspects of pre-cast concrete piling construction. Interviews are also utilised to go more into piling construction and project management. Several elements for piling construction were taken from Jack-In-Pile construction sites in Batu Kawan. These construction aspects included pile driving, machineries or piling rigs, welding of two-piece piles, and steel connection of two-piece piles. This pile construction should be recognised by every contractor and client in order to increase construction productivity. Last but not least, employees must complete their tasks on schedule. This is relevant to the building industry. Every client who makes a deposit to the developer or general contractor wishes their ideal home or building would be finished on schedule.

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CHAPTER 1:

INTRODUCTION

Piling is described as foundations that are driven or bored through the ground over a specific length of land to transport and transmit loads to soil that is believed to be structurally weak owing to soil characteristics. Essentially, piles are applied when the bearing capacity of the earth is deemed insufficient for the structural load of heavy building. The weight is transferred to the solid ground at a depth by the piles. - aarsleff.co.uk

Pilings are utilised as foundations when the height of the building, poor soil quality at shallow depths, and excessive site gradients make conventional or raft foundations impractical. Pilings are long pieces of solid or hollow steel, wood, or concrete driven into the earth by a pile driver, positioned in ready-excavated cavities, or cast in place in precisely drilled holes. Several piles are often set together in a group in the case of driven pile foundations. To form a single structural unit, a reinforced concrete slab is cast over the heads of the group. This enables for an equal distribution of the weight carried by the pile group, ensuring that no one member is overstressed.

“The art lies in selecting the most suitable type of pile and method of installation for the ground conditions and the form of loading. Science enables the engineer to predict the behaviour of the piles once they are in the ground and subject to loading. This behaviour is influenced profoundly by the method used to install the piles and it cannot be predicted solely from the physical properties of the pile and of the undisturbed soil”
– Burton-on-Stather, 1977

Pile cap must always be properly built to account for soil and load conditions. The piles should be designed to withstand axial, shear, and bending loads that may arise as a result of the piles' relative horizontal movement between soil strata. When utilised to support constructions subjected to overturning pressures from winds or waves, piles may be required to sustain uplift loads. The influence of berthing ships and waves on pilings used in maritime constructions causes lateral stresses. When piles are used to support retaining walls, bridge piers and abutments, and machinery foundations, they carry a combination of vertical and horizontal loads. Piles can be made of a variety of

materials, including steel, wood, in-situ or precast concrete, each with unique properties that must be addressed. The advantage of piling is weight capacity. Piling can easily support extremely large concrete structures. Most piles are constructed to order and are always erected by specialists, ensuring a secure foundation for large buildings. Piling also can be utilised in places where drilling is not generally permitted.

1.1 Background and Scope of Study

Piling is employed in the construction of buildings, bridges, and other structures when the soil on the job site cannot hold the weight of the structure at a shallow depth. As a result, for these "deep foundation" undertakings, piling is utilised to ensure that the structure of the building, bridge, etc. is sustained both above ground and underneath.

This study at Micron Memory Phase 2, Batu Kawan, (Figure 1.0 shown the Map) 4 and more piles are grouped depending on the soil quality, and a pile cover is built. Soil should not come into touch with concrete. Pile driving must always be properly driving to account for soil and load conditions. Piles should be built to withstand axial, shear, and bending loads that may arise as a result of pre-cast concrete piles moving horizontally across strata in the soil. The pre-cast concrete piles are linked together and a pile cap is built over them to direct the weight from the pier to the pile. (Figure 2.0)



Figure 1.0 Micron Memory Map

Source: Google Maps



Figure 2.0 The Construction Progress of Pre-cast Concrete

As a result, a pile cap is constructed with a flat surface in mind. The depth of the cap is 1.8–2.0 metres. Fe500 reinforcement is delivered according to design standards for various diameters at any given moment. 75 mm clear cover spacing on the site. The formwork is put in position, and the concrete is poured. The pile foundation's top level is 0.5m below the current ground level. The pile tops might be constructed based on the pier's load.

Pile cap must've been deep enough to enable for column and pile reinforcement anchoring, and concrete of grade M35 is employed. The pile cap should be stiff enough to distribute the imposed weight evenly across the piles in a group. The pile cap's clear overhang beyond the group's outermost pile must be at least 150 mm. To do pile cap, the pile's concrete should be cut up to the cut off level, leaving the reinforcement up to 1.8 m from the cut off level, since waste concrete, which contains sludge, must be removed. The pile cap in the viaduct is (square) 5.2*5.2*1.8 m in size. The pile cap dimensions at stations are 8.3*5.3*2.5 m (rectangular).

1.2 Objectives of Study

The objectives of this study are:-

- i. To describe the construction process of pre-cast concrete piling.
- ii. To identify the plant or equipment used in the construction of pre-cast concrete piling.
- iii. To explain the problem in the construction of pre-cast concrete piling and solving the problem in a construction industry.

1.3 Scope of Study

For the scope of study, this report will gain many information and knowledge about construction of the pre-cast concrete piling which is that had been used for the Jack-In-Pile, Batu Kawan. Before do the installation, standard procedure from getting the Work Inspection Require (WIR), arrange the schedule for the technician and approval for the work of installation pre-cast concrete piling.

This study was carried out at Batu Kawan, Pulau Pinang. This project is from developer into proposing a factory building. This studied is focused on installing the pre-cast concrete piling. This study will give the information more detail about installation of the pre-cast concrete.

1.4 Methodology

Below are the proposed methodology for the installation of Pre-cast Concrete Piling for Micron Memory Phase 2:-

i) Observation

During the piling process, the Project Manager, Site Engineer, Construction Manager, and Surveyor will be present. Be on a site to receive the information and the proper manner to take any additional action to understand how it works.

ii) Interview

Refer to the Project Manager and even the Site Engineer for any additional information or tips on how to properly conduct the works on site. If any new knowledge was gained during the observation, the Site Engineer will be checking all the information first before any further questions about the problem on site so that the valid information is gained.

iii) Document Review

The sheet of the Work Inspection Request (WIR), the site plan, the as-built plan, and the cost of the piling progress will be requested from the Project

Manager and the Quantity Surveyor in charge of the site in Batu Kawan in order to get further information about the progress.

CHAPTER 2

COMPANY BACKGROUND

2.1 Introduction of Company

Jack-In Pile (M) Sdn. Bhd. is a pioneer and leading specialised contractor for hydraulic pile systems, with operations in Malaysia, Singapore, and Australia. This piling technology has a considerable presence in metropolitan areas since it is ecologically benign and efficient. The major and most significant aspect of accommodating the building's huge load capacity is the installation of piles for the foundation. This is because piles are one of the architectural elements that may accommodate and reinforce the building structure by distributing the load of the building into the ground.

The construction of structures without piles will result in a variety of structural issues such as slanted buildings, collapse, damage, and so on. Piles are classed into several categories based on their type, size, strength, material, shape, and so on. Timber piles, concrete piles, spun piles, steel piles, and micro piles are some of the piles that are often exploited in construction (Edzuan, 2006). Developers use Jack-In Pile (M) Sdn. Bhd.'s hydraulic piling technology because it is almost free of noise, vibration, and pollution. Jack-In Pile (M) Sdn. Bhd.'s project portfolio spans various market areas, including commercial, industrial, and high-rise construction projects.

2.2 Company Profile

Jack-In Pile (M) Sdn. Bhd. provides basic accumulation services. Since 2006, Jack-In Pile (M) Sdn. Bhd. has been working in the Malaysian construction business as a wholly-owned subsidiary. (Figure 3.0 shows the logo of Jack-In-Pile)



Figure 3.0 Logo of Jack-In-Pile (M) Sdn. Bhd

Jack-In Pile (M) Sdn. Bhd., one of Malaysia's leading piling firms, is a pioneer of jack-in piling systems for piling operations required in building and infrastructure projects. Prior to the building of the top structure, concentration and service work are normally completed. A strong foundation is critical because it must be appropriately built to transfer the weight from the building to a layer of soil or stone with enough load resistance and suitable solution properties.

i. Vision of Jack-In-Pile


The vision of Jack-In-Pile is to be the greatest value-added construction service specialist for our clients.

ii. Mission of Jack-In-Pile

The mission of Jack-In-Pile is customer satisfaction. Secondly is resource allocation. The third mission is the minimization of waste. Lastly, completion on time and management of continual quality.

2.2 On-going Project

Project management is the discipline of coordinating all of a project's resources and aspects to ensure that the resources provide all of the outputs required to complete the project within the scope, schedule, and budget constraints. By the time the project begins, all stakeholders and team members will have a thorough understanding of the process, approach, and anticipated outcomes. In Batu Kawan, Jack-In-Pile is working on multiple of projects.

No.	Date	Project	Figure	Project Value	Description
1.	1 January 2021	Dexcom Factory 3	 <p><i>Figure 4.0 Dexcom Factory 3</i></p>	RM31,863,754.25	Jack-In-Pile has employed two sorts of procedures or ways to plant pre-cast concrete piles, notably the Hammer and Injection methods. Spun piles are piles that may be used in any site situation. This pile is likewise made of a higher grade of concrete, ranging from 60 to 80. The size utilised in the Dexcom Factory 3 project, Batu Kawan, is between 300mm and 500mm



No.	Date	Project	Figure	Project Value	Description
2.	21 August 2021	Micron Memory Phase 2	 <p><i>Figure 5.0 Micron Memory Phase 2</i></p>	RM26,204,329.00	Phase 2 of Project Micron Memories was completed with 2819 points of piling. Otherwise, pre-cast concrete pile 500, Reinforce Concrete (RC) 250 x 250 mm, and 400 x 400 mm were employed in this project. To plant pre-cast concrete piles, Jack-In-Pile only used special injection methods.

Table 1.0 On-going Projects of Jack-In-Pile (M) Sdn. Bhd.

2.3 Completed Projects

When a project's aims and objectives are met, it is said to be finished. These objectives guide the project and its planning and execution activities. The following is a list of jack-in-completed pile's projects.

No.	Date	Project	Figure	Project Value	Description
1.	8 February 2021 – 21 March 2021	Jabil Factory Plant 2	 <p><i>Figure 6.0 Jabil Factory Plant 2</i></p>	RM7,069,242.00	<p>Jack-In-Pile has also finished piling work at Jabil Factory Plant 2, which is located in Bayan Lepas, near major air and seaports, as well as highways and trains.</p> <p>Jabil Penang's strategic location and outstanding skills in high-mix/low-volume and low-mix/high-volume production make it an excellent choice.</p>




No.	Date	Project	Figure	Project Value	Description
2.	8 February 2021 – 21 March 2021	Penang Sentral	 <p style="text-align: center;">Figure 7.0 Penang Sentral</p>	-	<p>Jack-In-Pile is also involved for the piling of a 12.8-hectare plot in the centre of Butterworth. The project was divided into eight parts, the second, third, and fourth of which included a shopping centre, three office buildings, and a 36-story hotel, respectively.</p>  

Table 2.0 Completed Projects of Jack-In-Pile (M) Sdn. Bhd.

2.4 Organisational Charts

The individuals who play a major part in the fulfilment of the company's activities and obligations are the most valuable asset in every company. As a result, Jack-In-Pile has a wealth of highly skilled and experienced staff. In turn, Jack-In-Pile has attempted to give all of the essential requirements to its employees as they accomplish their assigned responsibilities, as well as equipping them through training and seminars to improve their talents. Because of the reciprocal advantages that are shared, the firm as a whole and its workers have developed immensely and established a track record of meeting their duties and promises to both clients and the community. They aspire to be at the level where they belong. They set lofty goals because they have faith in the organisation. Years of hard labour have yielded a harvest of opportunity and money as a result of the teamwork that has been built. They will continue to improve and develop new management and technological concepts.

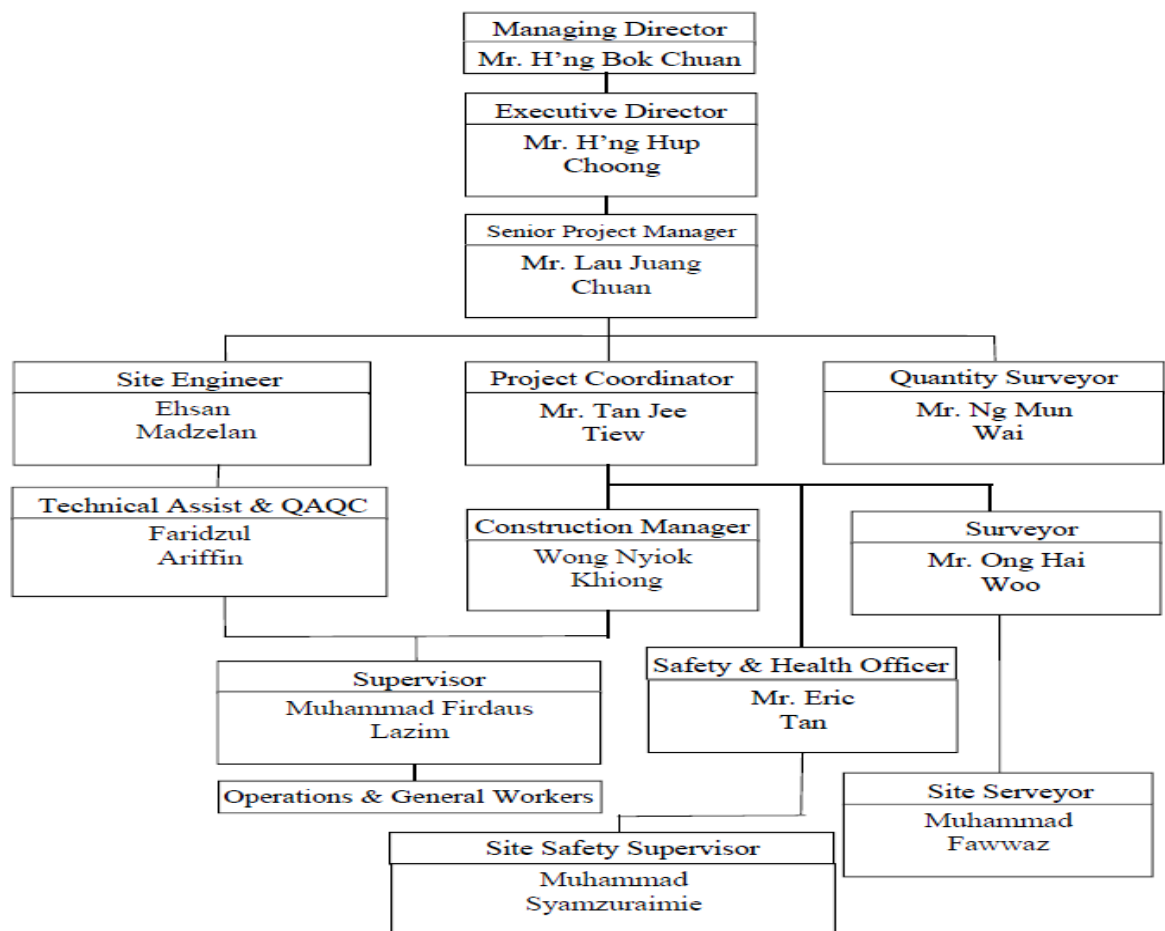


Figure 8.0 Organisational Chart

CHAPTER 3

CASE STUDY

The purpose of a high-rise structure in the urban region of Batu Kawan, Pulau Pinang, is the subject of this project. The developer intended for this project to provide inhabitants with access to the high-rise structure. This Micron Memory Phase 2 project will cost a total of RM26,204,329.00. This project was supposed to be finished in April 2022, but it won't be due of an unavoidable circumstance. Following consultation with the general contractor, all parties decided that the project would be finished the following year. According to my observations, this structure is already 45 percent complete. And the general contractor believes the job will be completed on schedule. Based on Figure 9.0, this project is around 1-2 kilometres from Penang's second bridge. The site's surroundings are dominated by manufacturing structures. Places can be designated as urban regions as long as the networks reach nearly everywhere. It needs to be looked into deeper in order to find an excellent internet.

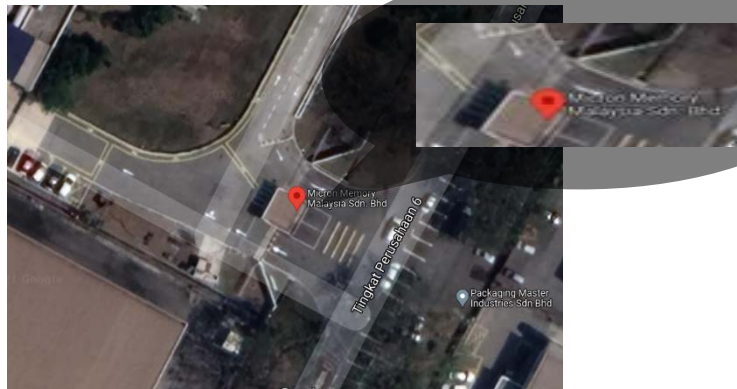


Figure 9.0 Micron Memory Located

Various operations are carried out at Jack-In Pile (M) Sdn. Bhd., such as monitoring the building site and learning the methodology or method of putting piles employed by Jack-In Pile at the Micron Memory Phase 2 development site in Batu Kawan. Jack-In-Pile has employed two sorts of procedures or ways to plant pre-cast concrete piles, notably the Hammer and Injection methods. Pre-cast concrete piles that may be used in this site situation. This pile is likewise made of a higher grade of concrete, ranging

from 60 to 80. On the micron memory project phase 2, Batu Kawan, the size is between 250mm and 500mm.

Jack-in-Pile selects pre-cast concrete pile for this job. This is due to the fact that pre-cast pre-stressed concrete piles are widely employed in the piling industry. Jack-In-Pile used pre-cast concrete piles on more than 90% of our installations. Due to the low cost of materials, bespoke pile lengths, and availability, pre-cast concrete piles are one of the most cost-effective pile kinds. We have recently been involved in Pile Jack-In Technology, which employs a Hydraulic Jack-In-Machine.

Before beginning any work, the subcontractor must submit a Work Inspection Request (WIR) (Figure 10.0) to the main contractor. The Work Inspection Request (WIR) created is meant for documentation as proof of work being completed formally. In order, to collect payment for the project's main contractor, Micron, our client requested that the subcontractor produce a Work Inspection Request, which includes a piling record based on the piling work or machine utilised, as well as the project design plan and checklist. This Work Inspection Request must also be preserved for a set length of time as proof in the event that something happens to the structure or product.

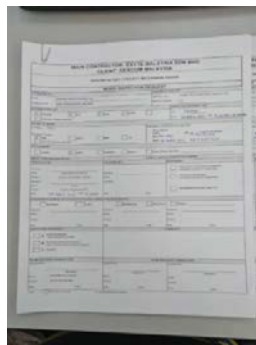


Figure 10.0 Example of Work Inspection Request (WIR)

3.1 Methods of Installing the Pre-Cast Concrete Piling

The pre-cast concrete piling installation is the most important aspect of these undertakings. The company's main business is pile driven into soil. Each piling has its unique installation procedure. There are several stages to follow to ensure a study and long-lasting piling installation. It can also help to reinforce the building's foundation, which will bear a lot of weight in the future.

3.1.1 Site Visit

Based on site visit at Micron Memory Phase 2 (Figure 11.0), there are various activities performed such as making monitoring at build sites and learn how or the methods installing a pile was used by this company at the Micron Memory Phase 2 construction site in Batu Kawan. There are 2 types of method or ways that have been used by this company for planting the pre-cast concrete pile like hammer and injection. Pre-cast concrete pile are suitable to use at all site conditions. This crevice is also a more grade high concrete such as grades 60 to 80. The size used are between 250mm to 500mm on the Micron Memory Phase 2 project in Batu Kawan. Before making the pile cap, the installing pile is the step to support the load of the building and make sure not collapse.



Figure 11.0 Site Visit with Site Manager

3.1.2 Piling Process

Each pile should be handled by someone who is more skilled and informed in order to avoid mishaps during the planting process. It is also vital to follow an organised protocol that has been established in order to avoid mishaps and to ensure that the piling job works successfully. A land surveyor will use a theodolite to determine the placement of the piling. The locations to be stacked will be marked with steel pins with a red mark on them so that they can be seen from a distance. Once the marks for all areas are complete, the piling process may begin by positioning the injection machine where the piles will be placed as shown in Figure 12.0.

The pile is raised gently and fitted into the hole of the injection machine once the injection machine is ready to plant it. The marks on the pile's bottom surface must match the markings perfectly. To determine the stiffness of the planted piles, a spirit level will be employed. The piling process is started using an injection machine with an 800-ton weight after the piling level has been determined. After planting the pile on the pier is in a sloping or raked state, it should be placed according to the pre-determined tilt when it is finished. There are two types of planting on the abutment: raking and vertical planting. Each pile should be planted in a logical order. It should be at a 90-degree position for vertical planting (Figure 13.0).



Figure 12.0 Pre-cast Concrete Piling Process Using Injection Machine



Figure 13.0 After Installation Pre-cast Concrete Piling by Injection Machine

3.1.3 Welding

For pre-cast concrete pile connection works, the welding method must be used to further reinforce as shown in Figure 14.0. Below in Figure 15.0 shown how the perfect welding. It also has to be sprayed with anti-rust paint to prevent the piles from rusting in the ground.



Figure 14.0 Pre-Cast Concrete Welding Process



Figure 15.0 Perfect Welding

3.1.4 Pile Cutting Work

Typically, a diamond cutter is used to trim the pre-cast concrete pile (Figure 16.0). When compared to hacker cutting, this method is safer and less hazardous. It can also help to protect the pre-cast concrete pile, which can be easily destroyed if cut wrongly. After cutting, pre-cast concrete must be repaired as shown in Figure 17.0 and Figure 18.0.



Figure 16.0 Pre-Cast Concrete Cutting Process



Figure 17.0 Pile Head Repaired



Figure 18.0 Pile Head after Repaired

3.1.5 Take Set

The set is the final distance of the pile penetration into the earth after each shot. Typically, it is taken during the last ten shots. The goal of the test is to assess the pile's ultimate bearing capability. The end-bearing pile type is the only one that must be used; the friction pile type is not required.

To make the set, stack the graph and position the pencil horizontally on a straight and flat stick kept in place by two retainers. For each stroke on the pile, the pencil is moved and swiped from left to right for up to ten strokes (Figure 19.0).

The final set of measurements for each pile must be obtained at the rate of transparency in millimetres for every ten strokes necessary to provide transparency up to 25 millimetres as shown in Figure 20.0.



Figure 19.0 Take Set



Figure 20.0 Example of Set Graph

3.1.6 Excavation

Excavation around piles: The concrete will achieve roughly 70% of its compressive strength after 7 days of casting the pile. The earth around the piles will be removed to the proper levels and dimensions based on Figure 21.0, so that the pile cap may be built. If the excavation is longer than 1.5 metres, a precaution must be taken to prevent soil collapse.



Figure 21.0 Excavation Work

3.1.7 Blinding Concrete

The blinding concrete formation must be adequately compacted and evaluated for field density. Above the forming layer will be two layers of polyethylene sheet.

Pour the dazzling concrete. The thickness and dimensions should match the shop design. Termination grooves (22 cm x cm) for the pile cap and blinding concrete should be given to the waterproofing to terminate the waterproofing. The blinding concrete will be hardened for at least 24 hours.



Figure 22.0 Blinding Concrete

3.1.8 Pile cap reinforcement fixing

The piling cap reinforcement must be installed in accordance with the authorised drawing. The shop drawing for each structural part will be provided by the designer on the job site. These drawings are to be used as a guide only. There are, however, a few key considerations to consider. There should be enough cover block to maintain the needed cover. Maintaining the necessary cover is critical, and failing to do so may

result in a reduction in building durability. The following points summarise the significance of coverage:

- i. The concrete cover will act as a barrier between the reinforcing steel and corrosive substances such as chloride.
- ii. Concrete carbonation should be avoided by shielding the reinforcing steel.
- iii. Steel corrosion can be caused by concrete carbonation.
- iv. Fire Protection: The concrete cover will shield the steel from flames and keep it from melting.
- v. A sufficient number of chairs must be provided to maintain the reinforcement stiff and to avoid movement and distortion during concreting.
- vi. Pier columns must have dowel (starter) bars. Dowel bars must be securely braced to prevent movement during casting. Dowel bars must also be kept vertical.

3.1.9 Formwork Installation for Pile Cap

The engineer will develop a comprehensive drawing of the pile cap shutter as well as the necessary supports, such as jacks and tie rods. The constructed shutter must match the given design exactly.

- i. A corner chamfer must be put on all sides and the top of the shutter to produce a clean edge.
- ii. Following the installation of the shutter as shown in the drawing, the concrete cover should be maintained.
- iii. The surveyor should double-check the shutter's alignment and verticality.

The kicker and shear key shutter for the pier must be installed and the surveyor's placement verified (Figure 23.0). Before the pile cap concrete is poured, thermocouples must be installed to monitor the temperature differential between the top, middle, and bottom of the pile cap. In the case of mass concrete, thermocouples are employed to monitor the temperature difference between different concrete layers. The temperature difference should be less than 20 degrees Celsius. If the difference in temperature exceeds 20 degrees Celsius, tensile stress higher than concrete strength might occur, resulting in interior fissures. The region should be clean and dirt-free before the concreting.



Figure 23.0 Formwork Installation

3.1.10 Concreting of the Pile Cap

The concrete pile cap area should be cleaned one as well before the in the case of dust or sand collection, the blower should be utilised to guarantee full removal of all dirt. If the temperature during the pile cap casting is high, the shutter should be dusted with water to prevent the plywood from collecting concrete moisture. A sufficient number of vibrators and a qualified individual should be present during the casting process to generate a thick concrete surface devoid of honeycombs. Concrete must be cured for at least two weeks. The concrete surface must be covered with a hessian sheet and maintained moist at all times during the curing period. (Figure 24.0)



Figure 24.0 Concreting of The Pile Cap

3.2 Type of Plant or Machineries Used in the Construction of Pre-Cast Concrete Piling

Pile driving is the process of driving piles into the ground to provide foundation support for buildings and structures. Piles can be made of concrete, wood, or steel. In deep foundations, piles operate as structural components, transferring the weight of the structure to the desired depth. Driving piles enables the placement of a structure in a location that would otherwise be inappropriate due to subsurface constraints. There are several types of Jack-In-Pile pile driving machinery used in construction at Micron Memory Phase 2. The features and uses for each category are explained below.

3.2.1 Diesel Hammer

Hammer weights ranging from 13 kN to 60 kN are commonly utilised. This hammer is also utilised on mounds with diameters more than 200 mm. It is coupled to a chain wheel machine. A fuel oil explosion causes erratic mobility. This hammer has a high effect rate. a quick change from one position to another Piling using a hydraulic hammer is a rapid technique. Second, it is less expensive for huge projects. Environmental and noise pollution are two drawbacks of diesel hammers. Because of the high mobilisation rates, it is costly for modest initiatives. Finally, this hammer is unsuited for use in heavily populated areas. (Figure 25.0)

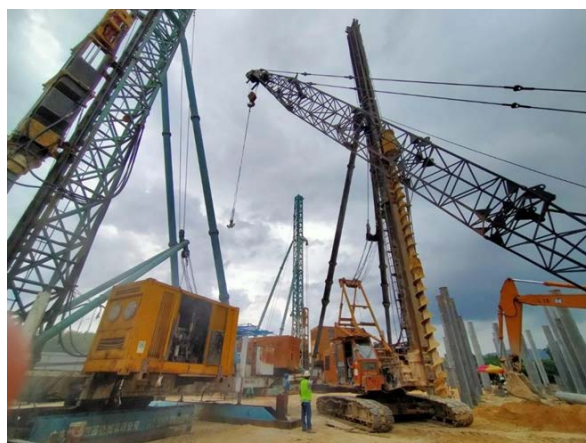


Figure 25.0 Diesel Hammer

3.2.2 Hydraulic Hammer

Hydraulic hammers with weights ranging from 10 kN to 70 kN are often employed as shown in (Figure 26.0). This hammer is typically used to pile 200mm or larger diameters. Suspended from a machine with a chain wheel. Hydraulic power aids in changing movement. A free fall hammer has a higher impact rate than a diesel hammer. Transitioning from one posture to another quickly. The benefits of hydraulic hammers include quick piling procedures. The second benefit is that it is more cost effective for huge projects. Following that, manageable effects are appropriate for limestone locations. Because of their high mobilisation rates, hydraulic hammers are costly for small projects. However, in Micron Memories Phase 2 site, hydraulic hammer only used for Pile Driven Analyzer (PDA).



Figure 26.0 Hydraulic Hammer

3.2.3 Injection Machine

Injection machine It is quite popular nowadays. It is appropriate for underpinning work where micro piling is not cost-effective. appropriate for limestone regions as well as around existing structures appropriate for use in small spaces There is no vibration and minimal noise. The injection machine has the benefit of having each pile checked for its aptitude while planting. Capable of being near existing buildings. This machine is especially appropriate for tight spaces, as there is no vibration and minimal noise. The injection machine's downside is that it is sluggish and inefficient under typical settings. As show in (Figure 27.0)



Figure 27.0 Injection Machine

3.3 The Problem in the Construction of Pre-Cast Concrete Casting

Defect can occur at any point during the construction of pre-cast concrete. These defect and problem can be determine based on test below:-

3.3.1 Maintain Load Test (MLT)

The strength of a building or structure begins with a solid foundation, particularly the piles. The maintain load test (MLT), also known as the static load test, is required as part of the foundation's quality assurance to guarantee that the pile that was driven can withstand the design load of the structure. A load would be applied to the selected pile during this test, and the pile settlement under the acting force would be recorded. In most cases, the pile would be loaded up to double its operating load, which is referred to as the pile's test load.

The load must be provided at a 25% increment rate until the maximum test load of double the workload is attained. Each load increase should be done on a regular and as soon as feasible basis. Before and after each load increase, sediment measurements and the time at which they were obtained must be documented. Sediment time graphs should be drawn to demonstrate when a sedimentation rate of 0.05mm is attained in 15 minutes.

Subsequent load increases will occur when this rate is attained or after a minimum of 2 hours, whichever comes first. This procedure should be repeated until the maximum test load has been met. The maximum test load must be kept constant for 24 hours, and

deposition time values must be obtained at the same time intervals as for the preceding load stage.(Figure 28.0)

The test load is then lowered in four equal increments, and the deposition time values are recorded as previously stated until the movement stops. Each load reduction should be separated by at least 60 minutes refer to (Figure 29.0)



Figure 28.0 MLT Process



Figure 29.0 The Load Test

3.3.2 High Dynamic Strain

High Dynamic Strain Pile testing is performed to obtain data on the strain or force and acceleration of a pile when subjected to an impact force. The data is utilised to assess the bearing capacity and structural integrity of the pile, as well as hammer performance, pile stresses, and soil parameters such as soil damping coefficients and quake values. The engineer would be able to approve or reject the pile quickly if the pile's integrity was appropriately tested on site.

i. Pile Driven Analyzer (PDA)

The PDA recorded all pile and hammer information during the experiment (Figure 30.0) has shown the Pile Driven Analyzer. The gauge will be tested to verify if it is functioning properly based on (Figure 31.0). The dynamic measuring of the pile begins with the hammer falling at a specific height (as shown in Figure 32.0). When the hammer is struck, the hit data is shown on the PDA device. CAPWAP software will be used to analyse the captured data. The benefits of this experiment are that it can be conducted quickly, saves time, and is simple. The drawback is that it is expensive.

The PDA monitors the pile for damage by checking the recorded traces for the presence of any velocity wave returns, prior to the arrival of return wave from the pile toe. The PDA recorded traces obtained on Piles #C-2, C-9, C-913, C-917 (CUB) and F1210 (FAB) indicated that velocity reflection (joint) were detected at about 42.0m, 36.0m, and 42.0m, 36.0m and 42.0m, from their respective piles toe at the time of testing. Table 1.0 shown the record of PDA test.



Figure 30.0 Pile Driven Analyzer



Figure 31.0 Process to linked the pressure gauge



Figure 32.0 The setting of PDA Test

PILE NO.	PILE SIZE (mm)	DATE TESTED	HAMMER	LOAD (tonne)	
				WORKING	TEST
Piles are located at CUB					
C-1	500 X 110	07-12-21	13T Hyd	190	380
C-2	500 X 110	07-12-21	13T Hyd	190	380
C-4	500 X 110	07-12-21	13T Hyd	190	380
C-7	500 X 110	07-12-21	13T Hyd	190	380
C-9	500 X 110	07-12-21	13T Hyd	190	380
C-12	500 x 110	07-12-21	13T Hyd	190	380
C-14	500 X 110	07-12-21	13T Hyd	190	380
C-17	500x110	07-12-21	13T Hyd	190	380
C-913	500 x 110	06-12-21	13T Hyd	190	380
C-914	500 x 110	07-12-21	13T Hyd	190	380
C-915	500 X 110	06-12-21	13T Hyd	190	380
C-916	500 x 110	06-12-21	13T Hyd	190	380
C-917	500 X 110	07-12-21	13T Hyd	190	380

Table 3.0: Summary of PDA Test

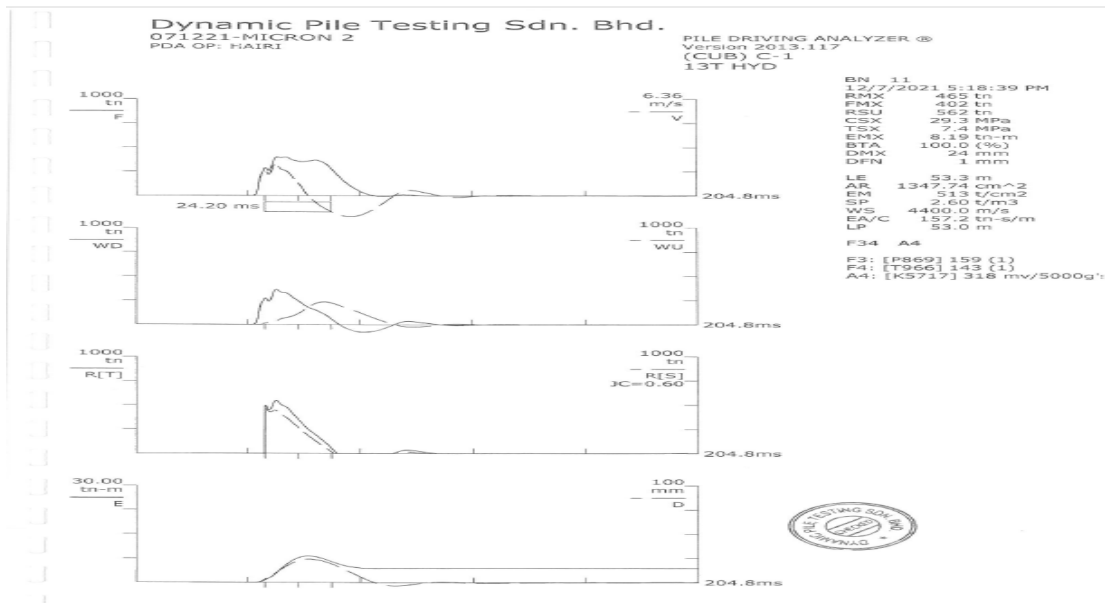


Figure 33.0 PDA Field Result

ii. Pile Integrity Test (PIT)

A pile integrity test (also known as a low-strain dynamic test, sonic echo test, and low-strain integrity test) is one method for evaluating the state of piles or shafts. It is inexpensive and takes little time as shown in (Figure 35.0)

Pile integrity testing employing low-strain tests, such as the TDR (Transient Dynamic Response) method, is a quick approach to check the continuity and integrity of concrete piled foundations. The geophone is placed on top of pile refer to (Figure 36.0). The function of geophone is to detect the integrity of pile.

The graphical results were shown on a length scale, despite the fact that they are actually functions of time. The translation from "time" to "length" was accomplished by multiplying time by the pile's stress "wave speed." The stress wave speed for these piles was discovered to be around 4400m/s. This velocity is indicative of concrete in general. However, depending on a variety of conditions, the actual wave speed might vary by 10% or more. The velocity traces were then examined for deflections that indicated variations in pile impedance at sites below the pile top.

In general, a velocity reflection before the pile toe suggests a positive peak happening before the pile toe reflection. This shows a decrease in pile impedance. A negative

peak or a curve that dips considerably below the median line suggests pile expansion. Based on (Figure 37.0).

There are no major abnormalities, indicating that the EA of the pile shaft is typically consistent, where E is the concrete modulus and A is the pile's cross-sectional area. The results of the testing on the piles are summarised in below Table 2.0.



Figure 34.0 Pile Integrity Tester



Figure 35.0 Geophone Placed on The Top of Pile



Figure 36.0 The Process of PIT

PILE NO	TESTED LENGTH (m)	DATE TESTED	PILE SIZE (mm)	COMBINATIO N (From Top To Bottom)	COMMENTS
F-1467A (FAB)	54.0	13-12-21	500mm pre-cast pile	12 + 6 + 12 + 12 + 12	No significant irregularities detected.
C-601 (CUB)	53.5	14-12-21	500mm pre-cast pile	11.5 + 12 + 15 + 15	Velocity reflection detected @ about 42m (joint) from pile toe.
C-605 (CUB)	53.5	14-12-21	500mm pre-cast pile	11.5 + 12 + 15 + 15	No significant irregularities detected.
C-609 (CUB)	53.5	14-12-21	500mm Spun Pile	11.5 + 12 + 15 + 15	No significant irregularities detected.
C-613 (CUB)	54.0	14-12-21	500m pre-cast pile	12 + 12 + 15 + 15	No significant irregularities detected.

Table 4.0: Summary of Integrity Test Results

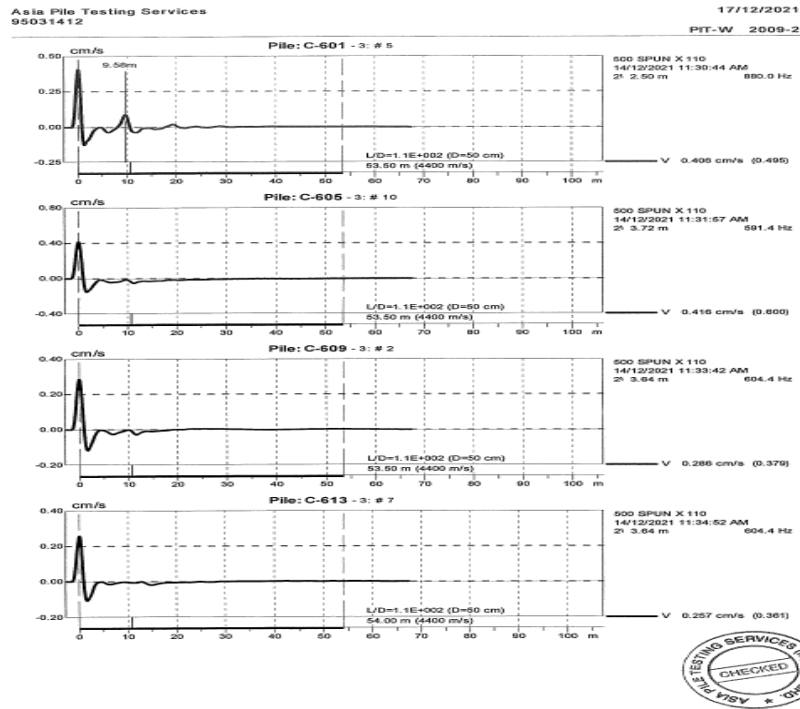


Figure 37.0 PIT Field Result

CHAPTER 4:

CONCLUSION

In conclusion, the installation of the Pre-cast Concrete has both advantages and disadvantage, especially when covering a big region like Batu Kawan. When it comes to keeping the work in good piling, every management must consider the advantages and downsides. However, regardless of the disadvantage, Jack-In-Pile (M) Sdn. Bhd. will always research innovative ways to avoid the same mistake from happening again until the firm reaches 100 % error-free.

The company also established strict rules to ensure that every problem is resolved as quickly as possible in order to avoid it from worsening and increasing the danger of repair. Following the company's technique, the workers may be in good shape, not be in a stressful situation, and even provide a decent outcome to the client. The technician's work method was extremely good and comprehensive in the process of installing the pre-cast concrete piling to provide a good performance for each of the duties.

Last but not least, after twenty-four (24) weeks of internship at Jack-In-Pile (M) Sdn. Bhd., I have got a lot of advantages and experience. The information and experience I obtained will aid me in my future job and allow me to perform better in my future construction employment.

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