



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

JACK- IN PILE FOUNDATION

Prepared by:

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2019242434

DEPARTMENT OF BUILDING
FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING
UNIVERSITI TEKNOLOGI MARA
(PERAK)

FEBRUARI 2022

It is recommended that the report of this practical training provided

By

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2019242434

entitled

Jack-in pile foundation

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

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FEBRUARY 2022

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 Jabatan Kerja Raya Negeri Perlis for duration of 20 weeks starting from 23 August 2021 and ended on 7 January 2022. 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 : 10 January 2022

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Then, her team of professionals comprising of En Mohammad Naim bin Ahmad Mahir, En Hasrul Nizam bin Ahmad, Pn Zawani binti Mat Akhir, and Pn Arleena binti Bashir Din have enabled me to learn and develop my understanding, knowledge and feel of real time projects, and the theory involved in analysis of structures, building and civil works. They are also responsible towards streamlining and assessing my training. Also a big thank to the colleague in Jabatan Kerja Raya Negeri Perlis who have directly or indirectly taught and guided me during the Industrial Training period. I feel very lucky to have the guidance and knowledge sharing by the colleague throughout twenty weeks of the Industrial Training.

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

Thank you so much.

ABSTRACT

Deep foundation is a very important thing to elaborate. Therefore, this report will be discussing about the installation of deep foundation which is Jack- in pile foundation. This report was conducted for the building envelope at Lembaga Pertubuhan Peladang (Lpp) Negeri Perlis. It will be conducted at the office building of Lembaga Pertubuhan Peladang (Lpp) Negeri Perlis. This report will be focus on the installation method of Jack-in pile foundation, problems and solution during installation of Jack-in pile foundation for office building. To illustrate the method of constructing the Jack- in pile as an important aspect to focus on building where the bearing capacity of the surface soils is not strong to support the building's load and it must be installed efficiently in order to avoid problems that might be occurred in the future. Then, the objective of this report is to demonstrate the installation method of jack-in pile foundation for office building and to identify the problems and solutions during installation of jack-in pile for office building. This report has three methods of study which is observation, interviews and document review. Observation have been done by do some site visit with supervisor to observe the installation of Jack-in pile. Then, interviews also have been done during the observation session with the engineer and supervisor on site regarding to the report's topic. For document review, documents that have been referred in collecting the data are construction drawings, company profile and the standard operating procedures. The result of this report concluded that finding the effective installation method of pile foundation which is Jack-in pile foundation based on guideline and also have been define the problems and solutions in order to get rid of defects that might be happen on site during installation of Jack-in pile foundation.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

A deep foundation is a one of the type of foundation that placed at a greater depth below the ground surface and will transfers the structure loads to the depth of earth, this is usually at depth 3 m below finished ground level. It will be used when adequate soil capacity is not available close to the surface and loads must be transferred to firm layers substantially below the ground surface. The process to construct a deep foundation is more expensive and complicated than shallow foundation. The common of deep foundation system for building is piled foundation. The definition of piled foundation is a column that inserted in into the ground to transmit the building's loads to a lower level of subsoil The process to construct the piled foundation can be characterized by the installation and testing. (R. Chudley, 2008).

Piled foundation is important when the upper layer of the soil is not strong enough to support of the vertical structures. It is also important to ensure that the building can stands on the strong enough foundation because the load of the buildings will transfer to the soil. Then, deep foundation which is pile foundation can also give strength to the vertical structure and in the meantime gives safety, security and reliability to the vertical structures. (Baran Toprak, Ilker Kalkan, 2018).

Next, pile can also be classified by the way there are formed like end bearing and friction. For the End Bearing, the end of the pile's column locates a solid ground or the piles buried in the solid ground. Solid ground can be rock strata, firm sand or gravel which have been compacted. Then, for the friction, the piles will transmit the load from the loose topsoil above to the soil below by friction between the surface of the soil and the pile. It is mainly supported by friction of the soil around the perimeter of the pile shaft (Baran Toprak, Ilker Kalkan, 2018).

Then, there are two types of piles which are Displacement piles and Replacement piles. Displacement piles will displace the soil radially as well as vertically as the pile shaft is jacked or driven into the ground. This is the most affordable piling method but may not be suitable for areas that are sensitive to vibration, noise and dust. The types of displacement piles which are precast reinforced concrete piles, steel preformed piles, composite piles and driven in situ piles. For the Replacement piles, the soil is removed and the hole will be filled with concrete into the hole and grout in. This Replacement piles is suitable for clay especially because in clays the bore hole walls only require support close to the ground surface. The type of this pile is bored piles that are carried out in a close proximity to existing buildings where noise, vibration and dust need to be minimized (Chee-Meng Chow, 2016).

These types of piles have their own differentiation between Displacement piles and Replacement piles. Displacement piles are the precast piles that are driven into the ground by a piling hammer that displaces the earth. When for the Replacement piles, the piles are put into the holes augured out of the earth and the steel or concrete will replace the earth that has been excavated (Chellis, 1951).

Other than that, pile foundation contains a few types of construction methods such as drive, drive cast in place, injection, vibration and boring. Drive method will drive the pile by dropping the hammer using the pile rig until the pile shaft reaches the hard strata. Then, for the drive cast in place, it is driven with a drop hammer, expands, grips the sides of the casing and then takes the casing of the piles out into the ground. Next, injection method is used hydraulic machine to inject the pile into the ground until the pile reaches the required depth. Furthermore, vibration method is using vibro hammer to install the pile into the ground by holding the head of pile and transferring the vibration to the end of the pile. For the boring method, it is using excavation machine which is rotary to boring a column of soil and replacing it with steel reinforcement then fresh concrete is cast through a funnel or tremie pipe (Caltrans, 2015).

However, the piled foundation needs to be tested first in order to confirm that the design and formation of the pile type chosen is adequate. The pile test is named as a pile load test. Pile load test is important in order to give the information on the installation problems, performance of the pile, working loads, lengths and settlements. Piled load

test can be classified as Static load test and Dynamic load test. Static load test is uses of a heavy load or reaction method to counter the application of an axial load to the top of the test pile using hydraulic jacks. There are two types of Static Load Test which are Maintained load test and Ultimate load test. Then, for the Dynamic load test, it is a direct method using the wave propagation theory to estimate the condition of a hammer system (Zygmunt Meyer, 2020).

Every construction methods of pile foundation have its advantages. The advantages of the Jack-in pile foundation systems are low noise and low vibration which are attributable to the pseudo-static jacking force applied to install the piles, as oppose to conventional percussive dynamic methods. Other than that, the another advantages of Jack-in pile is less pile damage, cleaner site condition, faster installation rates, and better quality control. As with all foundation system, the Jack –in pile foundation system also has disadvantages like it need a stronger and larger working platform in order to support the huge and heavy Jack-in pile machinery However, the aim of the study is to investigate the method of Jack-in pile foundation system for office building and to determine the problems occurred and also the solutions taken to solve the problems (F.C. Chow, 1997).

1.2 Objectives

- i) To demonstrate the installation method of Jack-in pile foundation for office building.
- ii) To identify the problems and solutions during installation of Jack-in pile foundation for office building.

1.3 Scope of Study

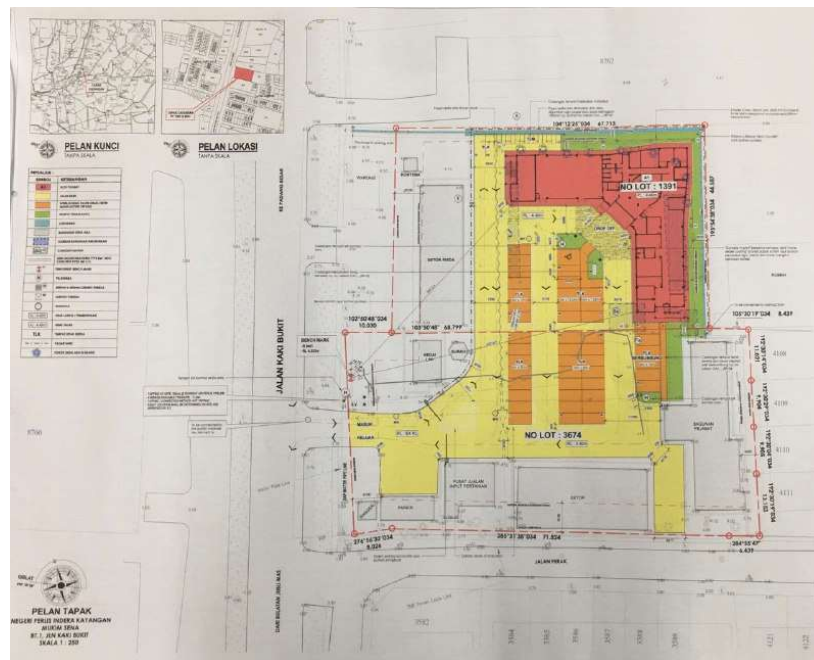


Figure 1.1: Site Layout

This projects are carried out for Bangunan Pejabat Lembaga Pertubuhan Peladang (LPP) Negeri Perlis at KM 2, Jalan Kaki Bukit, 01000 Kangar Perlis. The site project entitles “Pembinaan Bangunan Pejabat Lembaga Pertubuhan Peladang (LPP) Negeri Perlis”. This projects have been started on 1 January 2021 and the client for this project is Kementerian Pertanian dan Industri Makanan. This study is focus on the pile foundation which is the method of Jack-in pile foundation system and problems occurred also solutions taken to solve the problems of this piling method. Then, this study also described about the machinery and material used for this method such as Jack-in pile, excavator, spun pile and other materials.

1.4 Methods of Study

1. Observation

Went to a site visit along with my supervisor to observe the installation of pile foundation for office building of Lembaga Pertubuhan Peladang (Lpp) Negeri Perlis. The observation was about a month long. All the collected data from the observation are recorded in notes and pictures.

2. Interviews

Unstructured interview has been done during the observation with the engineer and supervisors on site regarding the topic of this report which is piled foundation that used Jack-in pile foundation system. The correct procedure and handling the machinery and material on site are explained during the interview. Then, the interview session was carried out about a few minutes every time went to this site project. Other than that, interviews also have been carried out in the office. This interviews session also has been recorded by writing the short notes when there are some important parts are shared by the engineer and assistances. Then, interviews sessions have been carried out among the engineers and assistance engineer that named as Siti Norhaslinda Binti Othman, En Ahmad Ridzuan bin Manaf, En Mohammad Naim bin Ahmad Mahir, En Hasrul Nizam bin Ahmad, Pn Zawani binti Mat Akhir, and Pn Arleena binti Bashar Din

3. Document review

For document review, documents that have been referred in collecting the data are construction drawings, company profile and the standard operating procedures. Then, document reviews also have determined by the time that the project in progress until end of the practical training session. The documents reviews have been collected from the books, drawings and data such as standard operating procedure that given by the supervisor.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

Jabatan Kerja Raya Negeri Perlis is the local government authorities was being debuted during year 1969. Before, Jabatan kerja Raya Negeri Perlis is officially debuted in 1963, it is known as Jabatan Kerja Raya Branch Kedah/Perlis as was administered by Executive Engineer.

In April 1970, Jabatan Kerja Raya Negeri Perlis have been separated from Jabatan Kerja Raya Kedah. The administration of the organization has been directed by Ir. Lim Teik Mei.

These are the list of department in Jabatan Kerja Raya Perlis:

Department in JKR Perlis
Bahagian Korporat
Bahagian Mekanikal
Bahagian Ukur Bahan
Bahagian Jalan
Bahagian Bangunan
Bahagian Elektrik
Bahagian Arkitek
Bahagian Caw. Aset Bersepadu Negeri
Bahagian Pasukan Projek Khas Negeri
Bahagian Rekabentuk Awam & Struktur

Table 1.1: List of department in JKR Perlis

2.2 Company Profile

Jabatan Kerja Raya Perlis (JKR) is responsible for construction and maintenance of public infrastructure which is under Ministry of Works Malaysia (MOW).

The function of Jabatan Kerja Raya Perlis is it responsible for planning, design and construction of infrastructure ventures such as government buildings, roads, harbour and other related to engineering works. Then, JKR also provide maintenance of roads and selected government buildings also responsible on technical advisory to the Federal Government as well as states and district.

Next, the vision of JKR is “To become a world-class service provider and centre of excellence in asset management, project management and engineering services for the development of nation’s infrastructure through creative and innovative human capital and state of the art technology”

Mission

JKR mission is to be a factor to national improvement by:

- Helping our customers grasp the basic information and providing services through collaborations as strategic partner.
- Standardized our procedures and systems to deliver results dependable services.
- Provides asset management services and an effective and pioneering project.
- Strengthen existing engineering expertise.
- Developing human capital and new competencies.
- Prioritizing integrity in delivering the service.
- Fostering a well-proportioned relationship with the community.
- Preserving the environment in service delivery.

OBJECTIVES

As Principal Consultant to the Government of Malaysia, the objectives of Jabatan Kerja Raya are to:

“Yield the product and execute the maintenance services that congregate the quality, cost and time are set to accomplish the optimum benefit asset”.

OFFICIAL LOGO



Figure 2.1: JKR Perlis official logo

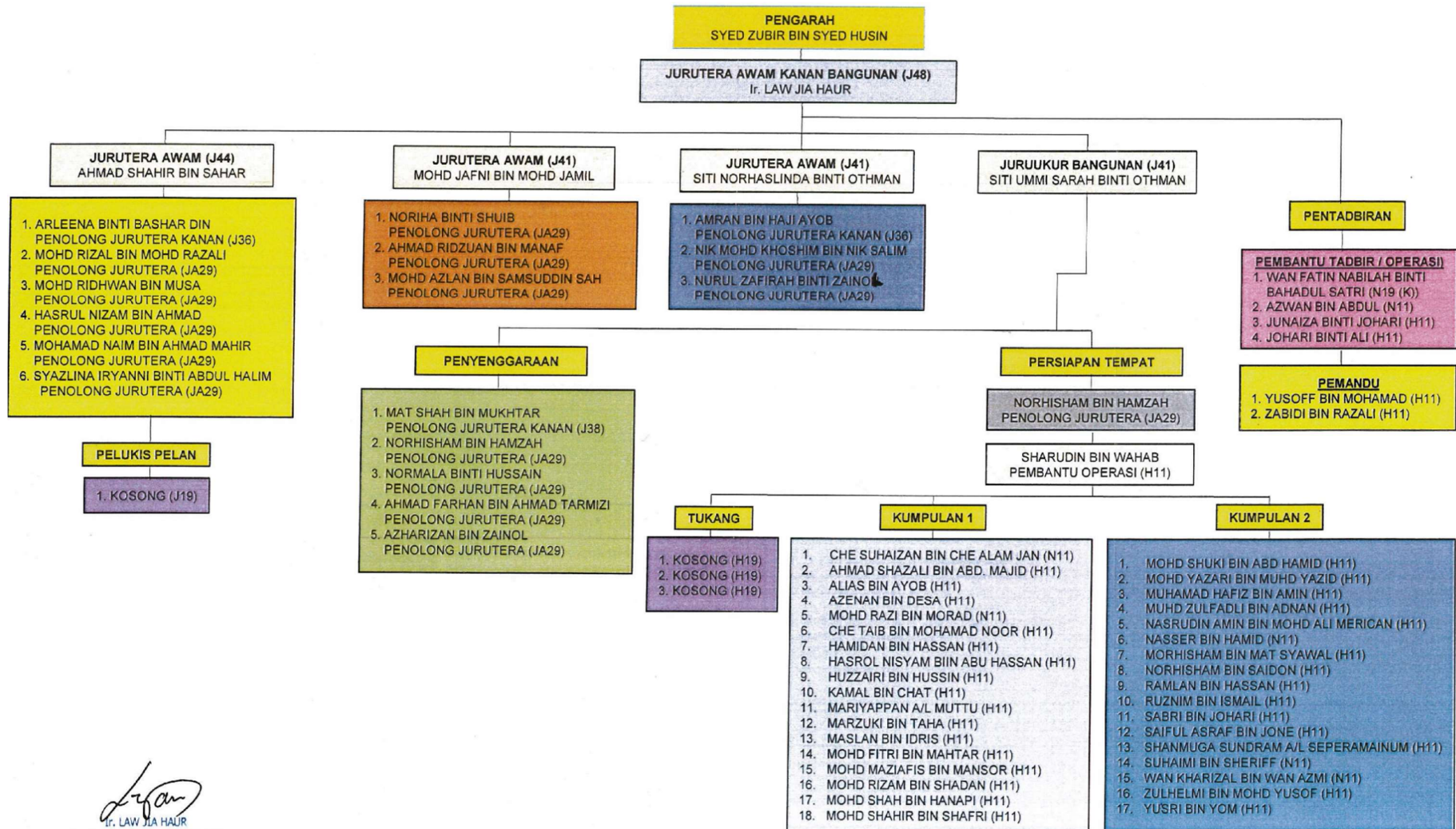
Source: Google

Description:

Generally, the exhibited logo as it mirrors the diversity of fields of work entrusted to the Jabatan Kerja Raya (JKR).

1. Starting from the base, black coloured curved lines symbolizes clean water supply and reflects that JKR is a dynamic organization.
2. The arch-shaped lines in concentrated black colour denotes to construction related work and maintenance of bridges and as well as a representative of the JKR organizations assigned as one of the leading the country in implementing engineering work.
3. Straight black lines, on the line shaped arch symbolize the participation to implement the road network nationwide.
4. Fourteen lines on a straight line signify a pledge to executing building operations comprising 14 states and federal territories in Malaysia.

2.3 Company Organisation Chart




 Ir. LAW JIA HAUR
 Jurutera Awam Kanan Bangunan
 Jabatan Kerja Raya
 Negeri Perlis

4 November 2020

2.4 List of Projects

2.4.1 Completed Projects

Project that have been successfully completed for the past few years by Jabatan Kerja Raya Perlis:

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	Cadangan Membina dan Menyiapkan Sebuah Masjid Al Munir , Batu 5, Kuala Perlis,Perlis	RM 4,727,600.00	8/5/2018	30/7/2021	3years 2months 22days	Unit Penyelarasan Pelaksanaan
2.	Projek Penempatan Semula Nelayan Di Kuala Perlis, Perlis Fasa 1 (Reka dan Bina)	RM 10,487,674.66	10/5/2017	25/6/2019	2years 1month 15days	Lembaga Kemajuan Ikan Malaysia (LKIM)
3.	Naiktaraf dan Membina Masjid Al-Istiqamah, Bintong, Perlis	RM 4,531,500.00	30/3/2016	23/4/2018	2years 24days	Jabatan Agama Islam
4.	Pembinaan Kompleks Penyiaran Negeri Perlis	RM 16,698,548.00	4/1/2018	1/11/2019	1year 9months 28days	Kementerian Komunikasi Dan Multimedia Malaysia (KKMM)

5.	Cadangan Membina dan Menyiapkan Bangunan Baru Bengkel Kejuruteraan Mekanikal dan Pembuatan, Bengkel Kejuruteraan Elektrek dan Elektronik, Bengkel Kejuruteraan Awam dan Lain-lain Kemudahan di Kolej Vokasional Arau, Arau Perlis, (Program Conversion SMV KE Kolej Vokasional 7 Kolej Rintis.	RM 14,988,400	23/1/2018	20/1/2021	2years 11months 28days	Kementerian Pendidikan Malaysia (KPM)
6.	Cure & Care Rehabilitation Centre (CCRC) Bukit Chabang, Perlis (Fasa ii- Kerja Bangunan	RM 35,216,910.00	4/12/2017	31/5/2021	3years 5months 27days	Agensi Antidadah Kebangsaan

2.4.2 Project in Progress

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	Projek Membina Terminal Pengangkutan Awam Bersepadu Negeri Perlis (Kangar sentral)	RM 25,285,821.80	6/10/2020	5/4/2023	2years 5months 30days	Kementerian Kewangan Malaysia
2.	Pembinaan Bangunan Pejabat Lembaga Pertubuhan Peladang (LPP) Negeri Perlis	RM 5,300,000.00	1/7/2021	30/11/2022	1year 4months 29days	Kementerian Pertanian dan Industri Makanan
3.	Pembinaan Kompleks Pentadbiran Kerajaan Negeri Perlis (Bangunan SUK Baru Mukim Seriab, Perlis)	RM 87,980,000.00	27/4/2017	13/4/2022	4years 11months 17days	Kementerian Kewangan Malaysia (MOF)

CHAPTER 3.0

CASE STUDY (JACK-IN PILE FOUNDATION)

3.1 Introduction to Case Study

The site project entitled “Pembinaan Bangunan Pejabat Lembaga Pertubuhan Peladang (LPP) Negeri Perlis”. The surrounding construction project consist of office building, store, garage and residential house. Then, the project also located at KM 2, Jalan Kaki Bukit, 01000 Kangar Perlis. The project value is RM 5,300,000.00 and it will finish by end of November 2022. The work construction will be 16 months and 29 days. The activities that carried out on this site is Jack-in pile foundation system and only focus on pile foundation. There are 146 of spun piles that contained 54 pieces of piles cap.



Figure 3.1: Key Plan



Figure 3.2: Site Plan



Figure 3.3: Site Project

3.2

The installation method of Jack-in pile foundation for office building



Setting Out



Delivery of spun piles



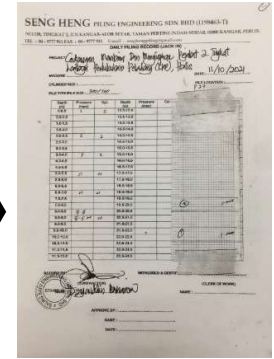
Marking the spun piles



Driving process (Lifting the spun piles)



Get correct vertical level of spun piles



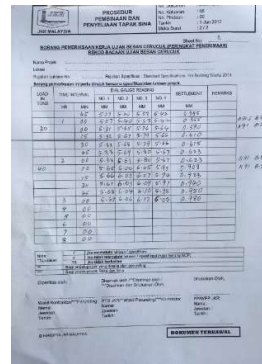
Pile installation record



Construct pile cap



Formwork for pile cap



Maintain Load Test record (point 1 and 2)



Setup for dial gauge and mechanical hydraulic mechanical pump for Maintain Load Test



Pile jointing and cut off the excess pile head

The Jack-in pile foundation is an injection method that used hydraulic machine to inject the pile into the ground until the pile reach the required depth. The installation method of Jack-in pile foundation can be demonstrated by several steps that begin with the setting out until pile testing.



Figure 3.4: Setting Out process



Figure 3.5: Pegs installation

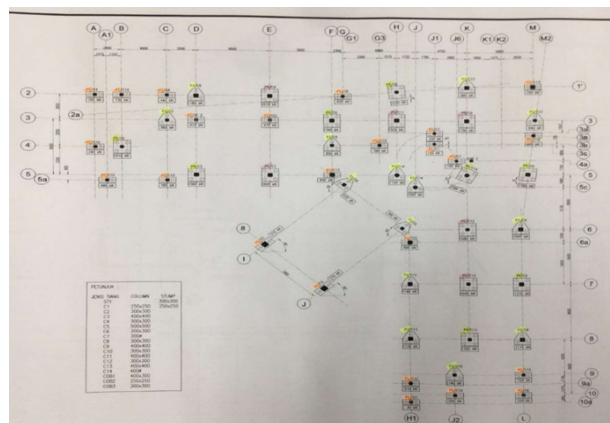


Figure 3.6: Spun piles reference points

In the beginning, setting out was carried out as in figure 3.6 by using the reference points and data that shown in the drawings provided. The positions of the piles are set out on the site project and pegs installed by a surveyor engage as in figure 3.7 by the main contractor. Then, the set out pegs are checked based on the drawing as in figure 3.8 before the piling operation commence for correctness. When the setting out have been done, delivery of piles will be carried out that required all piles delivered by the trailer and offloaded by the mobile crane. The all piles then stored on firm ground with timber support between soil and piles in order to avoid any undue bending in the piles.



Figure 3.7: Spun piles

The type of pile used for this project is spun pile as shown in figure 3.9. Once the pile is delivered to the site, a checking should be conducted in order to check the length, manufactured date and also find it if there have any defect or damage occurred on the piles. The details of the pile shown on the surface each of the pile delivered at site. The details of the manufacture name, serial number and length of pile are some of the details shown on the pile. The 9s number on the pile shown that the pile size is in size 9m and situation for 6m. Each of the pile comes with manufacturer date. The pile need to reach certain edge until it is mature enough to be used for construction. The spun pile is used in this project and it diameter is 300mm and pile shoes is used named as Cross Fin Pile Shoe. The function of this pile shoe as an artificial supporting layer to ensure that the enlargement of the pile base can perfectly be formed into the ground. At site, there were two type length of pile used for this project which are pile in length of 6m and 9m. The length of 9m is called initial pile when the 6m pile called extension

because it used to extend the length of pile because starter piles are not enough to get in the depth that provided by Jabatan Kerja Raya (JKR) which is 15m.



Figure 3.8: Marking the spun piles



Figure 3.9: Jack-in pile machine (Lifting process)

After the spun pile have been checked, the piles were marked as in figure 3.10 to show the depth of penetration in 1m interval during driving process. Then, injecting process the piles into the ground are proceed. The crane that mounted with the Jack-in pile machine as in figure 3.11 will lift the spun piles and placed into the centre of pile-driving box then the piston of two pile driving cylinder are withdrawn to raise the pile

driving box to the high position. Then, the spun pile is lifted and placed into the centre of the pile driving box. Next, pile cylinders from four directions are then engaged to clamp the pile tight. After that, the pile-driving cylinder at Jack-in pile are extended to produce pressure to drive the pile in the ground. When the pile has been driven into the ground, the pile-driving cylinders release the pile and rapid again from the first step until the spun pile fully driven into the ground. After finishing piling the initial pile, crane will take the second pile which is extension and repeat back as the first stage.



Figure 3.10: Used spirit level to get correct vertical level

At the same time, the condition of spun pile was monitor by the worker using spirit level as in figure 3.12 in order to get the correct vertical level of the pile before the injection machine continue inject into the ground. The jacking force has to be applied axially to avoid damaging the pile. As the pile is being injected into the ground, the injected pressure (Mpa) and the corresponding load (KN) are read instantly by the worker from the Pressure Meter and Load Meter in the control room at Jack- in pile machine. The working load for this project is 400KN. Therefore, load that need to be applied for this pile is 2 times of working load which is 800KN. Refer to the specification provided by Jabatan Kerja Raya (JKR), this type of pile is friction pile. So, every spun pile was driven until depth 15m. According to the driving process, some of the pilling point did not get friction pile because the pile is set which is 800KN before reach 15m deep.

SENG HENG PILING ENGINEERING SDN BHD (1196863-T)
 NO.18, TINGKAT 2, 15, KANGAR, ALOR SETAR, TAMAN PERTIWI (INDAH SERI), 08000 KANGAR, PERLIS.
 TEL : 06-97718143 / 06-9771813 E-mail : sengkengpiling@msn.com

PROJEK: Cabangan Nelayan Dan Pemukiman Peringkat 2, Teluk
Kawasan Pendidikan Pulau Kangar (CPE), Perlis DATE: 11/10/2021

NO. RUMAH: _____ PILE LOCATION: _____

PILE TYPE/PILE SIZE: 300x300

NO	PROFUNDITY (M)	DATE	TESTER	REMARKS
1	1			
2	2			
3	3			
4	4			
5	5			
6	6			
7	7			
8	8			
9	9			
10	10			
11	11			
12	12			
13	13			
14	14			
15	15			
16	16			
17	17			
18	18			
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20	20			
21	21			
22	22			
23	23			
24	24			
25	25			
26	26			
27	27			
28	28			
29	29			
30	30			

RECORDED BY: _____
 APPROVED BY: _____
 NAME: _____
 DATE: _____

Table 3.1: Pile installation record form

Then, a pile installation record form is enclosed as in table 3.1. In every pile installation, a record is kept of the load bearing in KN throughout the length of installed pile at interval 1m until the pile reached the depth which is 15m. Next, spun piles have used extension pile because the initial pile cannot be reach the specific depth occurred using one pile so that the extension pile need to be used.



Figure 3.11: Cut off the excess pile head

Each extension pile subsequent to initial pile is jointed using a welding, with the vertically of the extension pile checked prior to welding. Before that, the upper and

lower end plates are cleared first of any undesired material and seated. After that, the head of pile was cut off to the level specified as shown in figure 3.13 in order to ensure the Jack-in pile machine can move out from the current location to another piling points.

After that, pile testing was carried out which is Maintain Load Test. The Maintain Load Test was carried out of two piles where have the higher load within another piles. The testing was used Jack-in pile machine as a loading to carried the Maintain Load Test. A system of cross beam is place on top of the main girdle and orthogonal to it. The cross beam is also simply supported at this end. Concrete blocks that located at the Jack-in pile machine are weight of two tons each are stack on top of these cross beams to provide the necessary reactive load.



Figure 3.12: Setup for dial gauge and mechanical hydraulic pump

The pile top settlement is measures by means of calibrated dial gauge within accuracy of 0.01mm. Then, a mechanical hydraulic pump also used to jack up the reactive load. The load applied by the loading is measured by a four dial gauge that located around the steel plate that stand mechanical hydraulic pump as in figure 3.14.



Figure 3.13: Attachment scale at test pile



Figure 3.14: Attachment scale at reference frame


Then, two scales are attach to the reference frame and pile as in figure 3.15 and 3.16 to measure any movement of the reference time with reference to the datum markers establish outside the test area as shown in figure using auto level.

Table 1: Maintain Load Test Loading Increment

	Ton	Minimum Holding Time	% of Working Load
First Cycle	0	0	0
	10	1 hour	25
	20	1 hour	50
	30	1 hour	75
	40	6 hours	100
	30	1 hour	75
	20	1 hour	50
	10	1 hour	25
Second Cycle	0	1 hour	0
	10	1 hour	25
	20	1 hour	50
	30	1 hour	75
	40	1 hour	100
	50	1 hour	125
	60	1 hour	150
	70	1 hour	175
	80	24 hours	200
	60	1 hour	150
	40	1 hour	100
	20	1 hour	50
	0	1 hour	0

Table 3.2: Maintain Load Test Loading Increment

The loading sequence of the load test for this project is shown in table 1. Settlement reading to be taken before and after every increment or decrement of loading applied intermediate reading to be taken at 15minutes interval for holding time for 1 hour and taken at 1 hour for holding time at 6 hours for first cycle and 24 hours for second cycle.

 PROSEDUR PEMBINAAN DAN PENYELIAAN TAPAK BINA		No. Dokumen : 06 No. Pindaan : 00 Tarikh : 11 Jan 2017 Muka Surat : 2/2							
BORANG PEMERIKHAAN KERJA UJIAN BEBAN CERUCUK (PERINGKAT PENERIMAAN) BEKOD BACAAN UJIAN BEBAN CERUCUK		Sheet No. : 2							
Nama Projek : _____ Lokasi : _____ Rujukan Lukisan No. : _____ Rujukan Spesifikasi : Standard Specifications for Building Works 2014 Borang pemeriksaan ini perlu diisi bersama spesifikasi/rujukan lukisan projek.									
LOAD IN TONS	TIME INTERVAL		DIAL GAUGE READING				SETTLEMENT	REMARKS	
	HR	MIN	NO. 1	NO. 2	NO. 3	NO. 4			
30	45	00	5.77	5.80	5.83	5.92	0.585	A915 B90 A91 B90	
	30	00	5.87	5.90	5.93	5.94	0.585		
	15	00	5.91	5.95	5.96	5.96	0.590		
	15	00	5.92	5.97	5.99	5.96	0.610		
	30	00	5.93	5.98	5.99	5.96	0.615		
	45	00	5.93	5.94	5.90	5.67	0.623		
	3	00	5.93	6.01	6.00	5.67	0.623		A91 B90
	00	00	5.68	6.00	6.05	5.98	0.708		A91 B90
	15	00	5.60	6.02	6.07	5.90	0.708		
	30	00	5.67	6.03	6.09	5.97	0.740		
	45	00	5.68	6.04	6.10	5.98	0.750		
	3	00	5.69	6.06	6.12	6.00	0.780		
4	00								
5	00								
6	00								
7	00								
8	00								

Nota:
 ✓ Jika mematuhi lukisan / spesifikasi
 ✗ Jika tidak mematuhi lukisan / spesifikasi (ujian borang NCR)
 TB Jika tidak berkesan
 N Bagi proses-proses yang ditunda dan berulang
 M Bagi proses-proses yang gagal.

Diperiksa oleh: _____ Diisytiharkan oleh: _____ Ditukarkan Oleh: _____
 Waki Kontraktor: "Parunding" PTB JKR / Waki Perunding: "Koraktor" PWPP JKR
 Nama: _____ Nama: _____
 Jawatan: _____ Jawatan: _____
 Tarikh: _____ Tarikh: _____

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Table 3.3: Maintain Load Test form (Point 1)

Based on the result of Maintain Load Test, those two points were approved because the reading for point 1 as shown in table 3.3 is 2.5mm and point 2 is 4.34mm. The maximum settlement that for this spun pile is 30mm. So, the another point of spun piles can be carried out because the result for these two point of maintain Load Test is not fail. After carried out the maintain Load Test, the piling process was carried out until finished all the 146 of spun piles.



Figure 3.15: Construct formwork for pile cap



Figure 3.16 & 3.17: Pile caps

When the piling process finished, pile caps are constructed. The area around the pile was excavated in order to enable the steel rebar and formwork as shown in figure 3.17 to be insert. The head of piles is trimmed to ensure it at the same height. After that, reinforcement is built and positioned in the formwork and fastened then pouring concrete into the formwork. Then, the formwork is dismantled after three days as shown in figure 3.17 and 3,18. This steps is carried out until the 54 of pile caps finishes.

3.3 The problems and solutions during installation of Jack-in pile foundation for office building.

There are some problems that occurred during installation of spun piles using Jack-in pile foundation for office building. Therefore, the solutions for these problems need to be taken.

Problems during installation of Jack-in pile foundation for office building

- i. The problems that happened at site during installation the spun piles using Jack-in pile foundation is it need for a relatively stringer ground to support the heavy and large Jack-in pile machine and it is also generally larger working area to install the spun piles into the ground. Moreover, penetration depths of the jack-in piles are limited to the depth of the initial stiff subsoil stratum encountered during installation. Then, the hydraulic jacking system also occurred the problem because its has weight about 70 tons and the ground is not same with its bearing capacity, then this condition will lead to position of this tool to be tilted even fallen. This condition would be dangerous to the safety of workers.
- ii. Other than that, the another problem when carried out the Jack-in pile is cannot be used during wet weather. This problem occurred because the Jack-in pile machine is using genset generator in order to run the Jack- in pile machine. Genset is a combination of a generator and engine that provides the power used to run the Jack-in pile machine and it is also an engine that converts the chemical energy of a fuel to mechanical energy. Once the unit which is genset exposed to the rain, the unit will rust, corrode and damage. When the genset damage, rust and corrode cause by the wet weather, piling process cannot be carried out because the Jack-in pile machine cannot be used without power that provided by genset.
- iii. Furthermore, another problem during installation of Jack-in pile foundation for office building is mobilization of Jack-in pile machine is difficult when adverse weather especially rainy day that the area in a soft condition and muddy usually in the soil deposit area.

Solution during installation of Jack-in pile foundation for office building

- i. The solution of these problems which is a relatively stringer ground to support the heavy and large Jack-in pile machine that can be managed is when the designers is aware of the limitations and Jack-in pile foundation systems have been successfully adopted in congested area, piling work at different platform levels with limited working space and works carried out at lower ground level. The engineer need to ensure the Jack-in pile machine can move to the all point of pile foundation and the same time not move out from the project boundary or hoarding by measure the size of the machine with the area that need to be carried the pile foundation and sometimes the contractor need to take off the hoarding to give some space to Jack-in pile machine do its work. Then, the all platform at the piling location are provided by the civil engineer. The platform 4levels have been approved in this project prior the surveyor carried with the survey setting out. The ground conditions are to be examined for suitability of the movement and stability of the piling rig and the conditions corrected as deemed necessary.
- ii. The solution that provided to solve this problem which cannot be used during wet weather is try to wait for the adverse weather to pass and operate the machine once the conditions have cleared. Other than that, it can be also covered or enclosed by using plastic sheets or covering that easy to assemble and also maintains quality airflow and promotes natural cooling for genset from overheat.
- iii. The solution that have been considered by the engineered for problems that occurred which is mobilization of Jack-in pile machine is difficult when adverse weather is using lime stone as a solution for drying and preparing the soil before the machine enter to the site project. The lime stones have been used on the ground of the site project because it is effective to dries mud and wet soil and also prepares the ground by providing solid and stronger working platform for the Jack-in pile to easily enter to the site project. This solution has been carried out by using crawler dozer to spread the lime stone over the soil especially the area that used to mobilization the Jack-in pile machine. At the end, it changes the soil characteristic in terms of providing optimum level of

moisture for proper compaction. So, the problem of mobilization of jack-in pile in soft soil condition can be avoided by using lime stones because the water being absorbed from the soil and let the machine move smoothly on the dry and compact soil.

CHAPTER 4.0

CONCLUSION

In conclusion, high capacity Jack-in pile foundation have been successfully adopted for this project which is office building of 2-storeys building at Lembaga Pertubuhan Peladang (LPP) Negeri Perlis. The popularity of this Jack-in pile foundation systems especially for construction works in urbans area that need to take attention about their relatively lower vibration and lower noise compared to conventional system like driven piles. There are 10 process involved in this method that have been demonstrated in this report. Firstly, the methods of Jack-in pile foundation for office building have been discovered where the method to carried out the Jack-in pile foundation is quite similar to the theory. For this project, it is also used some different method when the problem occurred at site. The decision taken is not followed the theory but it is suitable to use on that situation to settle the problems occurred. The methods of Jack-in pile foundation can be divided into 10 steps which are setting out, delivery of piles, marking, driving process using Jack-in pile machine, monitoring vertical level of pile, pile jointing, cutting of the piles head, pile installation records, carried out the Maintain Load Test and construct the pile cap.

Based on this project, problems and the solutions also have been finding and identified. The problems happened on site while carried out the spun pile using Jack-in pile foundation system. The problem is mobilization of Jack-in pile machine is difficult when the area in soft condition and muddy. The solution that have been considered by the engineered is using lime stone as a solution for drying and preparing the soil before the machine enter to the site project. Other than that, cannot be used in wet weather also is one of the problem. The solution for this case is to wait for the adverse weather

to pass and operate once the conditions have cleared or covered the machine (genset). The another problem is generally larger working area to install the spun piles into the ground. In this case, the solution that can be taken are by ensure the Jack-in pile machine can move to the all point of pile foundation. This problem hard to solve because need to ensure the pile machine in correct position that sometimes the contractor need to take off the hoarding to give some space to Jack-in pile machine do its work.

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