



اُنْبُوْا سِيْقِيْ تِكْنُوْلُوْجِيْ مَارَا  
UNIVERSITI  
TEKNOLOGI  
MARA

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

**OCTOBER 2012**

It is recommended that this practical training report is prepared

**By**

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

**OCTOBER 2012**

**STUDENT DECLARATION**

I hereby declare that this practical training report was fully prepared by me except as I expressed in this report through the practical training that I went through for five months starting from 21 May 2012 until 6 October 2012 in Teras Khidmat Niaga Sdn. Bhd. It is also one of the requirements to pass the DBN 307 course and approved as to fulfill a part of the requirements to obtain a Diploma in Building.

.....

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Date : 21 May 2012

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Thank you very much.

## **ABSTRACT**

This report briefly describes about all the process and method involved in bored pile construction. Based on these five months working in this construction site, the author has an opportunity to actually learned how to construct bored pile visually since this type of piling is rare and seldom used in construction of building. This report is divided by several parts which started with the company background and construction project background. Based on the observation, bored pile construction is more complicated in terms of its construction process because it involves various procedures for constructing the pile as compared to the ordinary reinforced concrete (RC) pile. However, it is more systematic in consideration of its minimal noise, vibration and flexibility of sizes to suit different subsoil conditions. The method of drilling bored pile is different from RC Square pile or spun pile, which use driving method, piling machine to be used will be different too. On the other hand, this study also involves the identification of machineries and equipments used in bored pile construction. The most common machine used on site is the boring machine which being used to drill hole throughout the soil. The pile boring operations shall be performed using the suitable rotary drill rigs depends on the diameter, depth, soil condition and construction method.

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Appendix A: Key plan, location plan and site plan of this site.

Appendix B: Bored pile foundation plan.

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## LIST OF ABBREVIATIONS

PKK	Pusat Khidmat Kontraktor
CIDB	Construction Industry Development Board
TNB	Tenaga Nasional Berhad
SPAN	Suruhanjaya Perkhidmatan Air Negara
MIDF	Malaysian Industrial Development Finance
FELDA	Federal Land Development Authority
IWK	Indah Water Konsortium
PNB	Permodalan Nasional Berhad

# CHAPTER 1

## INTRODUCTION

### 1.1 Prologue

The author is focusing on the construction of piling since there has no other activity take place in this site. This project started in early February 2012 and ends in August 2014.

According to David Pritchard, (2008), piling is a technique use extensively by contractors to set a deep foundation for structures such as buildings. Piling forms the basic structure of construction. It is necessary foundations that hold a building in place. It is well known and accepted fact that for any building, house or concrete structure to be built well, it must have a very strong foundation and underground structural base that supports the building. This is what makes piling so important. The function of piling is to transmit loads from the building to the foundations and the ground soil layers whether these loads are in vertical or inclined. Furthermore, it can increase the factor of safety for heavy loads building. Piling is a very complicated process as it involves a lot of planning and measuring. There are many elements that have to be taken into consideration, for example using the right materials and equipments for the condition of the soil beneath the ground.

There are several types of piling in Malaysia and one of them is bored pile. As for the construction site that the author has chose is using bored piling method, the author would like to describe how to construct bored pile in this practical training report.

## **1.2 Objective**

The objective of this practical report will be achieved after this report is completed. There are two objectives of this report:

- 1) To identify the construction method of bored pile.
- 2) To identify the machineries and equipments used in the construction of bored pile.

### **1.3 Scope of Study**

The study that has been conducted is about the construction of bored pile in a project which purposed to build an office complex included an office block (12 storey) on a podium (2 storey) contain a floor of restaurant and a storey for parking lot and a storey of semi – basement parking lot in Lot 20743, Mukim Bandar Seremban, Seremban Negeri Sembilan Darul Khusus.

This research is focused on these 136 points of bored piles construction, how it is constructed based on the procedure given and the machineries and equipments used to construct bored piles which purposed to build this 12 storey office block on a 2 storey podium and a storey of basement.

## **1.4 Method of study**

There are several methods of study that has been use by the author to complete this report by using primary and secondary methods.

### **1.4.1 Primary Method**

One of the primary methods that the author has used is indirect interview. All parties are involved in this process. They have given their fully commitment to briefly explain about the construction of bored pile.

Another primary method is by observation. From the observation, the author gets a lot of knowledge visually aside from the theory that the author had learned from the books and website.

### **1.4.2 Secondary Method**

Author starts to find some information related to the topic in website, books and articles to seek for information about the bored piles construction. All the information is then been collected together and scrutinized in order to get the most useful information for this study.

Final identification of bored pile construction is made after being through all the methods of study that has been stated above.



## CHAPTER 2

### COMPANY PROFILE

#### 2.1 Introduction



**Photo 2.1:** Teras Khidmat Niaga located in Seremban 2.

Photo Credit: Teras Khidmat Niaga

Teras Khidmat Niaga Sdn. Bhd. (TKN) was founded in 1983 through the initiative of the professional entrepreneurs of its board of directors. Through the years, TKN has grown from a humble, local civil and building construction firm into a class 'A' contractor, ready to make its mark in the construction and development scene. TKN has the experience, expertise, and resources to successfully undertake different ranges of construction works a client may require. With the right expertise in monitoring cost control from inception right through to the completion for various types of projects, TKN has establish itself into a reputable contractor without contemplating the quality of the projects undertaken.

## The Vision

- We aspire to build a company with a strong character of integrity and ethical conduct, dedicated to providing very competitive, innovative, high quality management and financial services to our clients.
- Create a performance-driven culture and work environment conducive to the development and growth of our partners which enable them to exercise competitively superior skills.
- Organize in a manner that best leverages people, capital and technology.

## 2.2 Company Profile

Since the Company started its operations, most of its business activities were confined within the state of Negeri Sembilan. Having gained ample experience and stability, the company is now venturing into other business avenues elsewhere.

To meet its business objectives, the company had injected a project development cell, solely to identify and develop feasible business opportunities for its expansions. To achieve this, the company would be willing to foster joint ventures and co-operations with local and foreign entities as regards to sophisticated and specialized work for mutual benefits.

AUTHORISED CAPITAL : RM 5,000,000.00

PAID UP CAPITAL : RM 3,165,750.00

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Oakland Commerce Square,  
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TELEPHONE NO :

FACSIMILIE NO :

EMAIL : [teraskhidmatniaga@yahoo.com](mailto:teraskhidmatniaga@yahoo.com)

REGISTRATION :

No	Board	Registration No.	Class
1	PKK	140 1A 860684	A (Bumiputera)
2	CIDB	1960914 – NS005791	Grade G7
3	TNB	V 003044	A
4	TNB	V 003044	Kontraktor KerjaPembekal & Kontraktor Perkhidmatan
5	SPAN	SPAN/EKS/(PT)/800-2C/1/01/258	C1 (PEMBETUNGAN)
		SPAN/EKS/(PT)/800-2C/1/01/258	D (PEMBETUNGAN)
6	Pos Malaysia	POS. BK (PB) 1138/1082/(1698)	Civil Works
7	MIDF	ABM 7 – 119	Civil Eng Construction (Category A), Building Construction (Category B)
8	Kementerian Kewangan	357 – 01013020	Bumiputera 040100, 040200, 090300, 130 100, 140 100, 140 200, 180 100, 220401, 220402, 220404, 220405, 220406, 220403
9	FELDA	B-0 10 3 0 9 0 1534-01	Kejuruteraan Awam
10	IWK	IWK 1242 (TT-0 3 2 0)	Civil Works
11	PNB	0020003091 (Class A)	Contractor & Renovation

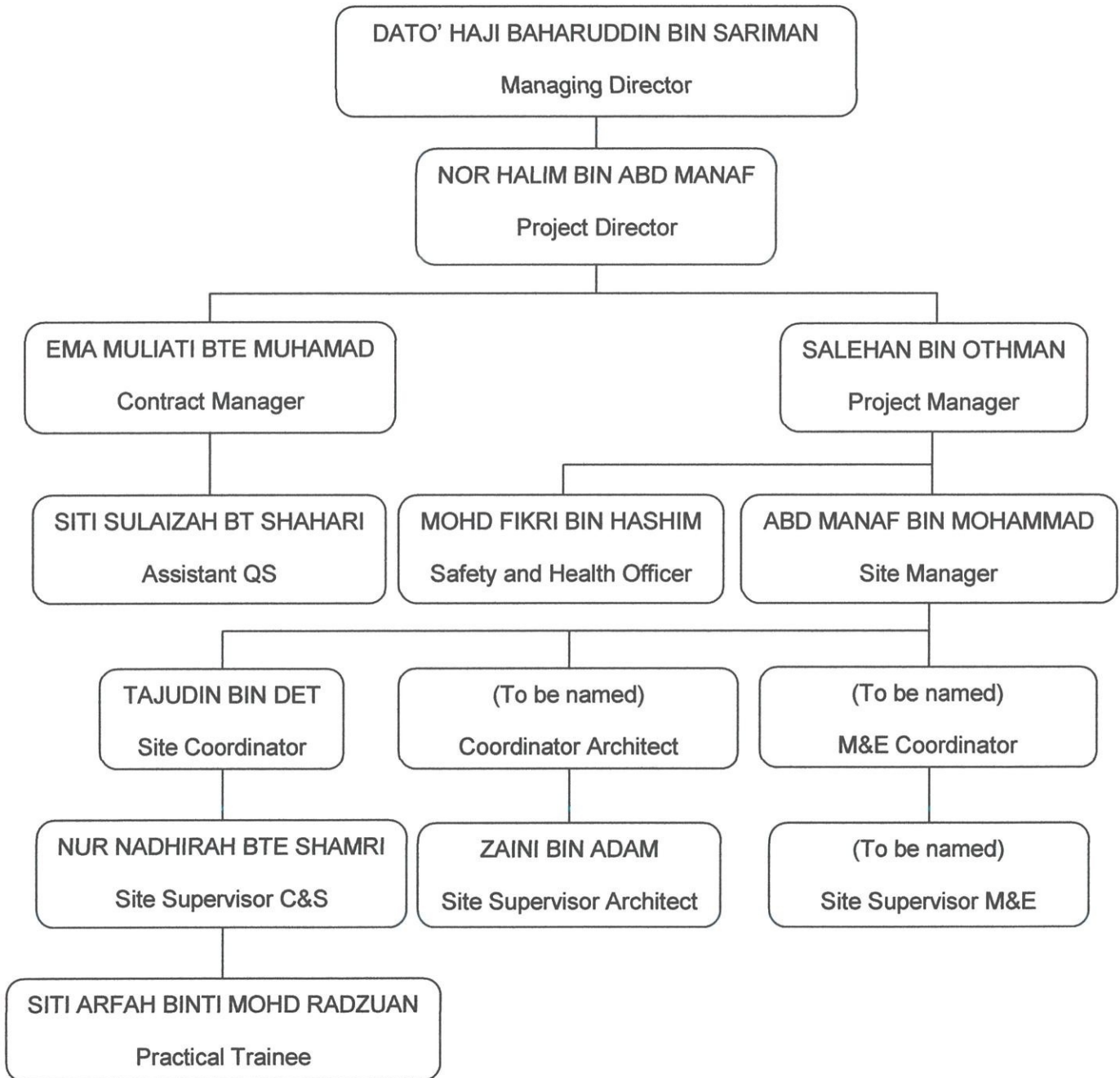
**Table 2.1:** Company registration details. (Sources: Teras Khidmat Niaga)

BOARD OF DIRECTORS :

No	Name	Position
1	Dato' Haji Baharuddin bin Sariman	Managing Director
2	Nor Halim bin Abd Manaf	Project Director

**Table 2.2:** Board of directors. (Sources: Teras Khidmat Niaga)

### 2.3 Organization Chart



**Diagram 2.1:** Organization chart of Teras Khimat Niaga. (Sources: Teras Khidmat Niaga)

## 2.4 List of Project

### 2.4.1 Completed project (2000 – 2012)

Name of Project	Construction Sum	Project Duration	Date of Completion
Kerja-kerja kecemasan membaiki cerun runtuh di Jalan Seremban – Jelebu, (Laluan 86) km 19 – 26 Daerah Seremban, Negeri Sembilan.	RM 986,870.00	30 Aug 1999 – 16 Jan 2000	16 Jan 2000
Membina dan menyiapkan Balai Bomba (2) Petak, Menara Kawad, Kuarters Kelas 'F' dan G2 dan lain-lain kerja di Gemas, Tampin, Negeri Sembilan.	RM 5,115,813.05	20 Apr 1999 – 16 Oct 2000	16 Oct 2000
Menaiktaraf jalan Bahau/ Jelai, (N 17) Daerah Jempol Negeri Sembilan	RM 7,624,092.85	15 Jun 1999 – 25 Dec 2000	25 Dec 2000
Projek membina dan menyiapkan jalan kampung secara konsep payung Negeri Sembilan 2000	RM 4,800,000.00	17 Jul 2000 – 22 Jan 2001	22 Jan 2001
Membina dan menyiapkan bangunan tambahan asrama Surau dan lain-lain kerja yang bersangkutan Sek. Men. Lui Barat (FELDA) Daerah Jempol, Negeri Sembilan.	RM 6,233,198.00	26 Jan 2000 – 29 May 2001	29 May 2001

Name of Project	Construction Sum	Project Duration	Date of Completion
Cadangan merekabentuk dan menyiapkan Projek Sekolah Menengah Kebangsaan Sg. Long, Daerah Hulu Langat, Selangor secara runding terus design and build untuk tetuan Kementerian Pendidikan Malaysia.	RM 11,800,000.00	11 Jul 2000 – 10 Oct 2001	10 Oct 2001
Cadangan merekabentuk dan menyiapkan Projek Sekolah Menengah Kebangsaan Sg. Long, Daerah Hulu Langat, Selangor secara runding terus design and build untuk tetuan Kementerian Pendidikan Malaysia.	RM 11,800,000.00	11 Jul 2000 – 10 Oct 2001	10 Oct 2001
Kerja-kerja penurapan semula jalan di Kuala Lumpur 2002	RM 5,000,000.00	2 Nov 2000 – 31 Dec 2002	31 Dec 2002
Menyiapkan baki kerja untuk membina dan menyiapkan Klinik Kesihatan Jenis 3 dan Kuarters kelas G (8 unit) Pangsa F (4 unit) Berkembar di Pekan Gemencheh Baru, Daerah Tampin, Negeri Sembilan.	RM 6,437,600.00	20 Feb 2001 – 31 May 2002	31 May 2002

Name of Project	Construction Sum	Project Duration	Date of Completion
Construction and Completion of 1 Block 3 storey building consisting of six (6) unit classes 'F' Teacher's Quarters and Associated work at Sekolah Kebangsaan Palong 3 Daerah Jempol, Negeri Sembilan.	RM 929,524.00	14 Apr 2001 – 15 Mar 2002	15 Mar 2002
Construction and Completion of 1 Block 3 storey building consisting of six (6) unit flats class 'F' Teacher's Quarters and Associated work at Sekolah Menengah Agama Haji Mohd Said Seremban, Negeri Sembilan.	RM 1,035,139.00	27 Apr 2001 – 20 Jun 2002	20 Jun 2002
Cadangan merakabentuk, membina dan menyiapkan Pusat Pertahanan Awam Seremban, Negeri Sembilan secara Tender Terhad 'Design & Build' untuk Jabatan Pertahanan Awam Malaysia.	RM 7,825,350.52	7 Jul 2001 – 28 Feb 2003	28 Feb 2003
Membina dan Menyiapkan Projek Jalan Kampung secara Konsep Bersepadu Negeri Sembilan 2001	RM 7,811,000.00	8 Oct 2001 – 7 Mac 2002	7 Mac 2002
Cadangan Kompleks Rakan Muda Daerah Kuala Pilah, Negeri Sembilan.	RM 15,097,79.23	8 Nov 2001 – 6 Oct 2003	6 Oct 2003



Name of Project	Construction Sum	Project Duration	Date of Completion
Membina bangunan tambahan dan lain-lain kerja berkaitan di Sekolah Kebangsaan Temiang Seremban, Negeri Sembilan.	RM 3,957,270.00	21 Dec 2001 – 1 Aug 2002	1 Aug 2002
Membekal, membina dan menyiapkan Fasa 2 Bangunan Makmal Biji Benih Sawit, Pejabat, Gazebo, Garaj Kereta, Garaj Motosikal, dan kerja-kerja berkaitan di Kompleks Tun Razak, Pahang.	RM 1,235,000.00	14 Feb 2002 – 13 Jul 2002	13 Jul 2002
Membina dan menyiapkan projek jalan kampung secara konsep bersepadu Negeri Sembilan 2002.	RM 10,789,000.00	1 Apr 2002 – 30 Sept 2002	30 Sept 2002
Cadangan Pusat Latihan Gabungan Pasukan Tempur (PLGPT) Tentera Darat, Fasa II di Gemas, Negeri Sembilan untuk Kem Pertahanan Malaysia.	RM 2,504,937.60	10 Jul 2002 – 8 Feb 2004	8 Feb 2004
Cadangan pembinaan Kuarfers Tambahan Jabatan Tenaga Rakyat (ILP) di Pedas, Negeri Sembilan.	RM 7,410,560.56	15 Aug 2002 – 25 Jun 2003	25 Jun 2003

Name of Project	Construction Sum	Project Duration	Date of Completion
Cadangan merembentuk, membina dan menyiapkan asrama doktor pelatih Hospital Seremban, Seremban Negeri Sembilan.	RM 8,700,000.00	5 Nov 2002 – 5 May 2004	5 May 2004
Menaiktaraf Stadium Tuanku Abdul Rahman Paroi, Seremban, Negeri Sembilan.	RM 7,010,934.00	18 Feb 2004 – 30 Apr 2004	26 Apr 2004
Cadangan membina dan menyiapkan pembangunan 3 tingkat pejabat kesihatan dan 1 tingkat tempat letak kereta besmen dan kerja-kerja berkaitan di Presint 11, Wilayah Persekutuan Putrajaya.	RM 14,215,062.75	17 Feb 2003 – 15 Apr 2005	15 Apr 2005
Cadangan tambahan 1 blok Pejabat 3 tingkat kepada kilang-kilang yang sedia ada di atas Lot 1 H. S. (M) 158 Kawasan Perusahaan Senawang, Mukim Ampangan Seremban, Negeri Sembilan.	RM 1,102,012.00	18 Nov 2004 – 30 Jun 2005	30 Jun 2005
Menaiktaraf Jalan Kuala Klawang – Simpang Pertang Laluan 86 Jelebu, Negeri Sembilan.	RM 14,838,990.00	30 Sept 2002 – 26 Jan 2006	26 Jan 2006

Name of Project	Construction Sum	Project Duration	Date of Completion
Proposed Construction of Discharge and all Associated Works for Development of Lot 2606 Mukim Pedas Daerah Rembau, Negeri Sembilan.	RM 384,000.00	17 May 2007	6 Aug 2007
Cadangan melaksanakan Projek Pembinaan Pagar 'Anti-Climb' Institusi Pemulihan Dadah, Jabatan Penjara Malaysia, Jelebu, Negeri Sembilan.	RM 8,108,196.00	11 Jul 2005 – 11 Jul 2006	31 Oct 2008
Proposed Design & Build Of Aviation Hangar at Sultan Abdul Aziz Shah Airport, Subang, Selangor.	RM 1,880,000.00	21 May 2007 – 24 Sept 2007	31 May 2008
Cadangan Pembinaan Rumah Peranginan Persekutuan (RPP) Port Dickson, Negeri Sembilan (Reka & Bina)	RM 41,600,000.00	20 Nov 2007	21 Oct 2009
Cadangan Tambahan dan ubah suai ke atas Balaiorong Seri Istana Besar Seri Menanti, Kuala Pilah, Negeri Sembilan.	RM 4,606,026.00	13 Jul 2009	26 Nov 2009

<b>Name of Project</b>	<b>Construction Sum</b>	<b>Project Duration</b>	<b>Date of Completion</b>
Kerja-kerja penstabilan cerun di Taman Bukti, Ampangan, Seremban, Negeri Sembilan.	RM 356,075.00	7 Dec 2009 – 11 Jan 2010	11 Jan 2010
Cadangan membina gerai-gerai Bazaar Seremban untuk menggantikan gerai-gerai di Jalan Lee Sam, Seremban, Negeri Sembilan.	RM 450,000.00	1 Jul 2010 – 30 Jul 2010	3 Aug 2010
Pojek membina Jalan Keru ke Batu Belang, Tampin, Negeri Sembilan.	RM 18,393,000.00	22 Jul 2010	19 Nov 2011
Cadangan pembinaan Hotel Wakaf dan Baitul Hial di tanah wakaf Lot 4506, Teluk Kemang, Port Dickson, Negeri Sembilan.	RM 28,930,000.00	4 Nov 2009 – 1 Nov 2011	30 Mar 2012

**Table 2.3:** List of project for completed project. (Sources: Teras Khidmat Niaga)



**Photo 2.2:** 'Stadium Tuanku Abdul Rahman Paroi', Seremban, Negeri Sembilan.

Photo Credit: Teras Khidmat Niaga



**Photo 2.3:** Bahau – Jelai Main Road

Photo Credit: Teras Khidmat Niaga



**Photo 2.4:** 'Institut Latihan Perindustrian' (ILP), Pedas  
Photo Credit: Teras Khidmat Niaga



**Photo 2.5:** 'Kompleks Bomba', Gemas  
Photo Credit: Teras Khidmat Niaga

## 2.4.2 Current Projects

Name of Project	Construction Sum	Date of Possession	Date of Completion	% Completion
Cadangan membina Sekolah Rendah Kebangsaan Intan Perdana – Pakej 3	RM 19,643,600.00	20 Jan 2011	19 May 2012	61.60% (as at 30 Apr 2012)
Cadangan membina Sekolah Rendah Kebangsaan Intan Perdana – Pakej 3	RM 23,016,000.00	20 Jan 2011	19 May 2012	64.7% (as at 30 Apr 2012)
Cadangan Pembangunan Sebuah Kompleks Ibu Pejabat yang melibatkan sebuah blok pejabat (12 tingkat) di atas podium (2 tingkat) yang mengandungi 1 aras souq/ restoran & 1 tingkat tempat letak kereta beserta 1 tingkat separa besmen tempat letak kereta di atas Lot 20743, Mukim Bandar Seremban	RM 52,000,000.00	3 Feb 2012	2 Aug 2014	5.35% (as at 26 Apr 2012)
Proposed roadwork & all associated infrastructure works at Kawasan MIEEL Masjid Tanah for MIDF Property Sdn Bhd.	RM 2,208,842.00	23 Feb 2012	22 May 2012	62% (as at 3 May 2012)

**Table 2.4:** List of project for current project. (Sources: Teras Khidmat Niaga)



**Photo 2.6:** 'Sekolah Menengah Intan Perdana', Port Dickson  
Photo Credit: Marya Suflin (22 September 2012)



**Photo 2.7:** 'Sekolah Rendah Intan Perdana', Port Dickson  
Photo Credit: Marya Suflin (22 September 2012)





**Photo 2.8:** 'Majlis Agama Islam Negeri Sembilan', Seremban, Negeri Sembilan.

Photo Credit: Siti Arfah (28 August 2012)

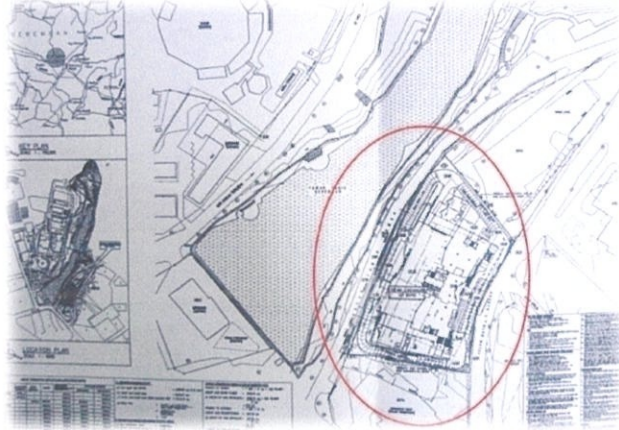
## CHAPTER 3

### CASE STUDY

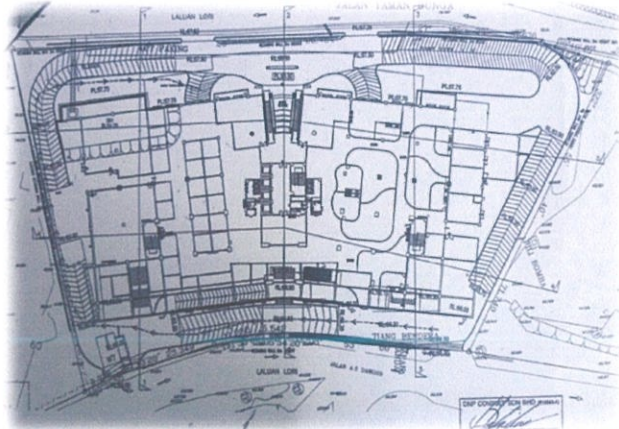
#### 3.1 Introduction

Bored piles are generally used in Malaysia as foundation to support strongly loaded structures such as high-rise buildings and bridges in consideration of its minimal noise, vibration, and flexibility of sizes to suit different subsoil conditions. Such attributes are especially privileged in urban areas where strict restrictions with regards to noise and vibration are imposed by relevant authorities which restricted the use of other conventional piling system such as driven piles. This report presents a summary of bored piles construction commonly adopted in Malaysia. Bored piling is cast by using machineries which have specially designed drilling tools, buckets and grabs; it's used to remove the soil and rock. According to Rodriguez, (2009), bore hole can be drilled as deep as 50 meters throughout the soil. The bored piling rig is track mounted and can be set up accurately over a marked piling position. The piles shall be installed using a specially developed rotary system which will ensure minimum disturbance of original soil condition and negligible influence to piles already casted.

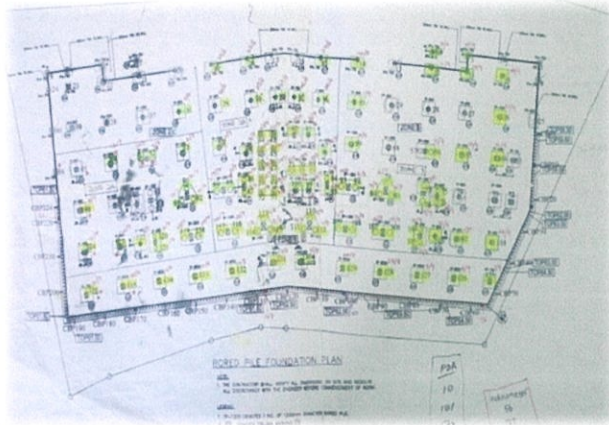
This project consist of 136 of bored piles to complete an office complex included an office block (12 storey) on a podium (2 storey) contain a floor of restaurant, a storey for parking lot and a storey of semi – basement parking lot in Lot 20743, Mukim Bandar Seremban, Seremban, Negeri Sembilan Darul Khusus.



**Photo 3.1:** The location plan of this site.  
Photo Credit: Siti Arfah (24 September 2012)



**Photo 3.2:** The site plan.  
Photo Credit: Siti Arfah (24 September 2012)



**Photo 3.3: Bored pile plan.**

Photo Credit: Siti Arfah (25 September 2012)

### 3.2 Project Background

The project that the author study is purposed to build an office complex included an office block (12 storey) on a podium (2 storey) contain a floor of restaurant and a storey for parking lot and a storey of semi – basement parking lot in Lot 20743, Mukim Bandar Seremban, Seremban Negeri Sembilan Darul Khusus.

The client of this project is Majlis Agama Islam Negeri Sembilan (MAINS) and the architect for this project is KACA Architect Sdn. Bhd.

This project cost RM 52 000 000.00 and it is started in February 2012 and expected to be completed in August 2014.



**Photo 3.4:** Current site condition.

Photo Credit: Siti Arfah (24 September 2012)



### **3.3 Case Study**

#### **3.3.1 Construction Procedure**

Based on the author's experience on site, it can be said that there are five procedures that need to be implemented in order to construct single bored pile. The procedures are as follow:

- 1) Setting out of pile position
- 2) Installation of temporary steel casing
- 3) Drilling
- 4) Installation of reinforcement (rebar cage)
- 5) Tremie concrete

### 1) Setting Out of Pile Positions



**Photo 3.6:** Surveyor peg out the pile point.

Photo Credit: Siti Arfah (17 July 2012)

Licensed Surveyor shall be engaged initially to setting out the controlled points and establish TBM level; all in accordance to the approved construction drawing provided. Based on these controlled point, the contractor's surveyor could then peg out all the rest of the pile point positions.



## 2) Installation of Temporary Steel Casing



**Photo 3.7:** Steel pins around the purposed pile point.

Photo Credit: Siti Arfah (17 July 2012)

- a. Three reference steel pins would be installed equal distances from the proposed pile centre location peg.



**Photo 3.8:** Remove the unwanted soil by drilling using soil auger.

Photo Credit: Siti Arfah (21 July 2012)

- b. Boring machine will then be positioned with the drilling auger directly house and align directly over the top of the proposed peg.
- c. When the aligned position over the peg is checked to be okay, drilling and removal of dry earth by auger could commence to a few meter depth, (this pre-boring operation is necessary to ease the installation of steel casing)



**Photo 3.9:** The installation of steel casing using vibro-hammer.

Photo Credit: Siti Arfah (29 June 2012)

d. After boring to a sufficient depth using auger, a steel casing would then be installed into the bored hole with the assistance of a standard vibro-hammer. The distance from the steel casing would be measured to the reference pins and adjustments made such that the casing installed is within the tolerance limit of pile usually not more than 75mm either way as stipulated in the code.

e. The verticality of steel casing will be checked by means of two sets of plumb line system at some distance from the pile position. The casing supports the weaker soil layers and acts as guide for drilling tools to ensure verticality of the bore. The installation depth of the casing is dependent on the soil conditions at that particular location on site. Where the casing is to be left in permanently, the length will be predetermined prior to installation.

### 3) Drilling



**Photo 3.10:** Drilling process using boring bucket.

Photo Credit: Siti Arfah (4 July 2012)

After setting the casing, the borehole will continue to be excavated by the use of an auger (dry earth) or drilling bucket (employed for wet drilling). During the whole process, the borehole will be stabilized if necessary by hydrostatic pressure using water as the first choice and if not successful, stabilization by the use of bentonite will be adopted. Upon completion of the soil boring works and reaching the bedrock, a system comprising the use of rock auger/ rock coring bucket and rock cleaning bucket/ boring bucket will be used. The fragmented rock material will be removed by using the cleaning bucket or boring bucket. This may be followed up with the use of rock auger or rock coring bucket to further core into the depth rock. Upon reaching the required rock socket the base will be treated with a final base cleaning using the rock cleaning bucket.

#### 4) Installation of Reinforcement (Rebar Cage)



**Photo 3.11:** The installation of rebar cage in the bored hole.

Photo Credit: Siti Arfah (31 July 2012)

After clearing the borehole, the pre-fabricated reinforcement cage is lowered into the borehole. The main reinforcement used shall be in accordance to the design. The central location of the cage and a sufficient concrete cover along the entire length is achieved by spacers at about 3 meter placed on the perimeter of the cage.

### 5) Concreting Process Using Tremie Pipe



**Photo 3.12:** Tremie pipe.

Photo Credit: Siti Arfah (20 June 2012)

Concreting is done using the tremie method. After installation of rebar cage, tremie steel pipe is then lowered to full length into the bored hole.

In order to ease tremie – concreting process, a funnel shaped hopper is connected at the top of the tremie pipe. The bottom of the tremie pipe shall be kept/ submerge at least 2m below the concrete surface at all times and a high slump concrete (175 +/- 25 – 200 mm approximately) is used to ensure sufficient concrete supply in case of excessive over break.

Where the steel casing is part of the temporary work, it will be extracted when sufficient concrete is discharged into the bore hole.

### **3.3.2 Machineries and Equipments**

Machineries and equipments used in constructing the bored pile:

- 1) Boring Machine
- 2) Augers and Buckets
- 3) Steel Casing
- 4) Vibro Hammer
- 5) Reinforcement (Rebar Cage)
- 6) Tremie Pipe

## 1) Boring Machine



**Photo 3.13:** Drilling work by boring machine.

Photo Credit: Siti Arfah (6 September 2012)

Boring machine is a machine used to excavate soil with a circular cross section through a variety of soil by drilling method. It can drill from sand to hard rock.

## 2) Augers and Buckets



**Photo 3.14:** Auger and bucket used in bored pile construction.

Photo Credit: Siti Arfah (20 September 2012)



There are several augers and buckets used in bore pile construction. There is soil auger, rock auger, boring bucket, core barrel and cleaning bucket. These augers and buckets are used depends on the layer of the soil and it is available in different sizes of diameter.

a. Soil Auger is available with rotating helical screw blade known as flighting. These blades function as a screw conveyor and assist in removing drilled out material due to the rotation of blades.

b. Rock auger is used for drilling a hole through rock. It is used in combination with a conventional flighted auger used for drilling holes in dirt and clay.

c. In drilling under water, the bore hole has to be stabilized from collapsing during and after drilling. In this case, boring bucket is used to avoid the soil around the hole from collapse.

d. Core barrel is a hollow bucket used to obtain a continuous section of the rocks penetrated in drilling. Due to it high strength, core barrel is widely used when encountering gravel or rock layer.

e. When the final depth of a hole is reached, the base of the bored pile will be cleaned using a cleaning bucket before concreting.

### 3) Steel Casing



**Photo 3.15:** Temporary steel casing will be installed before the drilling work is done

Photo Credit: Siti Arfah (24 September 2012)

Bored pile must be supported using steel casing and to ensure the verticality of the bored hole.

### 4) Vibro Hammer



**Photo 3.16:** Steel casing installation by vibro hammer

Photo Credit: Siti Arfah (12 July 2012)

The vibro hammer drives the steel casing into the ground, leaving about 350mm length of steel casing protruding from the ground. It is also extracts the steel casing from the ground after the bore hole is concreted. The casing penetrates the ground due to the vibration, the weight of the hammer and its own weight.

#### 5) Reinforcement (Rebar Cage)



**Photo 3.17:** Reinforcement bar cage ready to be installed in the bore hole

Photo Credit: Siti Arfah (20 September 2012)

Before the bore hole is concrete, the reinforcement (rebar cage) must be installed and placed it within the bore hole to ensure the strengthen of the bore pile.

## 6) Tremie Pipe



**Photo 3.18:** Tremie pipe in bored pile construction

Photo Credit: Siti Arfah (24 September 2012)

Tremie pipe is a connectable pipes used to transfer concrete from the buckets to the bottom of the bored pile. The lower end of the pipe will displaces the water without washing out the concrete content.

## CHAPTER 4

### CONCLUSION AND RECOMMENDATION

#### 4.0 Conclusion

As a conclusion, the author had learned more about how the bored pile is made and the machineries and equipment used in the making of the bored pile. The author has achieved the objectives of this case study which to identify the construction method of bored pile and to identify the machineries and equipments used in the construction of bored pile. The author was fortunate to work with a group of enthusiastic and communicative people, who for whatever reason willing to share their knowledge and experience of what they are doing. Besides, the atmosphere in this site is unique and hope that it will stays that way. The bond was created between the author with supervisor and the staffs at Teras Khidmat Niaga Sdn. Bhd. Furthermore, the author get to know how to overcome some problems occur on site such as:

- a) Boring machine broke down. All machines need a proper monitoring. Regular maintenance should be done to ensure the smoothness of work on site.
- b) Rainfall. The construction of bored pile will be delayed due to the safety requirements and it will affect the progress of work on site. To avoid the project from delay, bored pile should be constructed more than one point per day.
- c) Concrete is too weak or rough. In this case, the batching plant must be handled by skilled workers and full time supervision should be carried out to maintain the quality of concrete.

## LIST OF REFERENCES

- i. Tomlinson, M. (2008). Pile Design and construction Practice. New York: Taylor & Francis.
- ii. Van Impe, W. F. (2003). Deep Foundations On Bored and Augers Piles. Belgium: Millpress.
- iii. Pritchard, D. (2008). Piling – All You Need To Know. Construction Industry News and Articles. Retrieved from <http://www.greatpossibilities.com/articles/publish/piling.shtml>
- iv. Need & Functions of Pile Foundation. (n.d.). Retrieved from <http://theconstructor.org/geotechnical/foundations/need-functions-of-pile-foundation/1785/>
- v. Rodriguez, J. (n.d.). Bored Pile – What It Is? Bored Pile Advantages. Retrieved from <http://construction.about.com/od/Industrial-Projects/a/Bored-Pile-Advantages.htm>




REVISION	DATE	DESCRIPTION
01	JUNE 12	REVISED LAYOUT PLAN AS PER CLOUD

MAJLIS AGAMA ISLAM NEGERI SEMBILAN


TAJUK PROJEK:  
 CADANGAN PROJEK PEMBANGUNAN SEBUAH KOMPLEKS IBU PEJABAT YANG MELIBATKAN SEBUAH BLOK PEJABAT ( 13-TKT ) DI ATAS PONDOK 2-TKT YANG MENYANDUNG 1-TKT SQUAD & LAMA SELERANG 1-TKT TEMPAT LETAK KERETA BERSERTA  
 1-TKT SEPARA SESUAI TEMPAT LETAK KERETA, DI ATAS NO: LOT 20743, MUKA BERSAMA SEREMBAN, SEREMBAN, NEGERI SEMBILAN DARUL KHUSUS

UNTUK TETUAN:  
 MAJLIS AGAMA ISLAM NEGERI SEMBILAN ( MAINS )

TANDATANGAN PEJABAT/UMUM/KEBANGSAAN:  
  
 EN. HOSSAIN AMIR BIN KAMARUDIN  
 (No. KP: SEBAUSAKA)  
 MAJLIS AGAMA ISLAM NEGERI SEMBILAN  
 JALAN BATU HANZAM  
 70900 SEREMBAN  
 NEGERI SEMBILAN DARUL KHUSUS

PEMAJLJ PROJEK:  
  
 EN. AZRUL BIN KAMARUDIN  
 (No. KP: PENCURUS)  
 MARSS-HOLDING SDN. BHD.  
 LOT 1-2, WISMA ARAB MALAYSIAH  
 JALAN TUANKU SAHABAH  
 70990 SEREMBAN  
 NEGERI SEMBILAN DARUL KHUSUS


PERENCANA PERANCANG BANDAR:  
  
 SW PLANNING CONSULTANTS  
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 GARDEN AVENUE, SEREMBAN 2  
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PERENCANA M & E:  
  
 JURUTERA/DMF SDN. BHD.  
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 ARAS 3 - WISMA INTEGRASI  
 70, JALAN PUSAT 1/AM  
 46150 PUSAT 1/AM  
 SELANGOR DARUL EHSAN  
 Tel. :  
 Email : jpus1002@gmail.com

ARKITEK:  
  
 KACA ARCHITECTS SDN BHD  
 24, JALAN RUMAH 13/20, SEKSYEN 13,  
 40100 TANJAN ALAM, SELANGOR DARUL EHSAN, MALAYSIA  
 Tel. :  
 Fax :  
 E-mail : kaca@kacp-arch.com  
 Website : www.kacp-arch.com

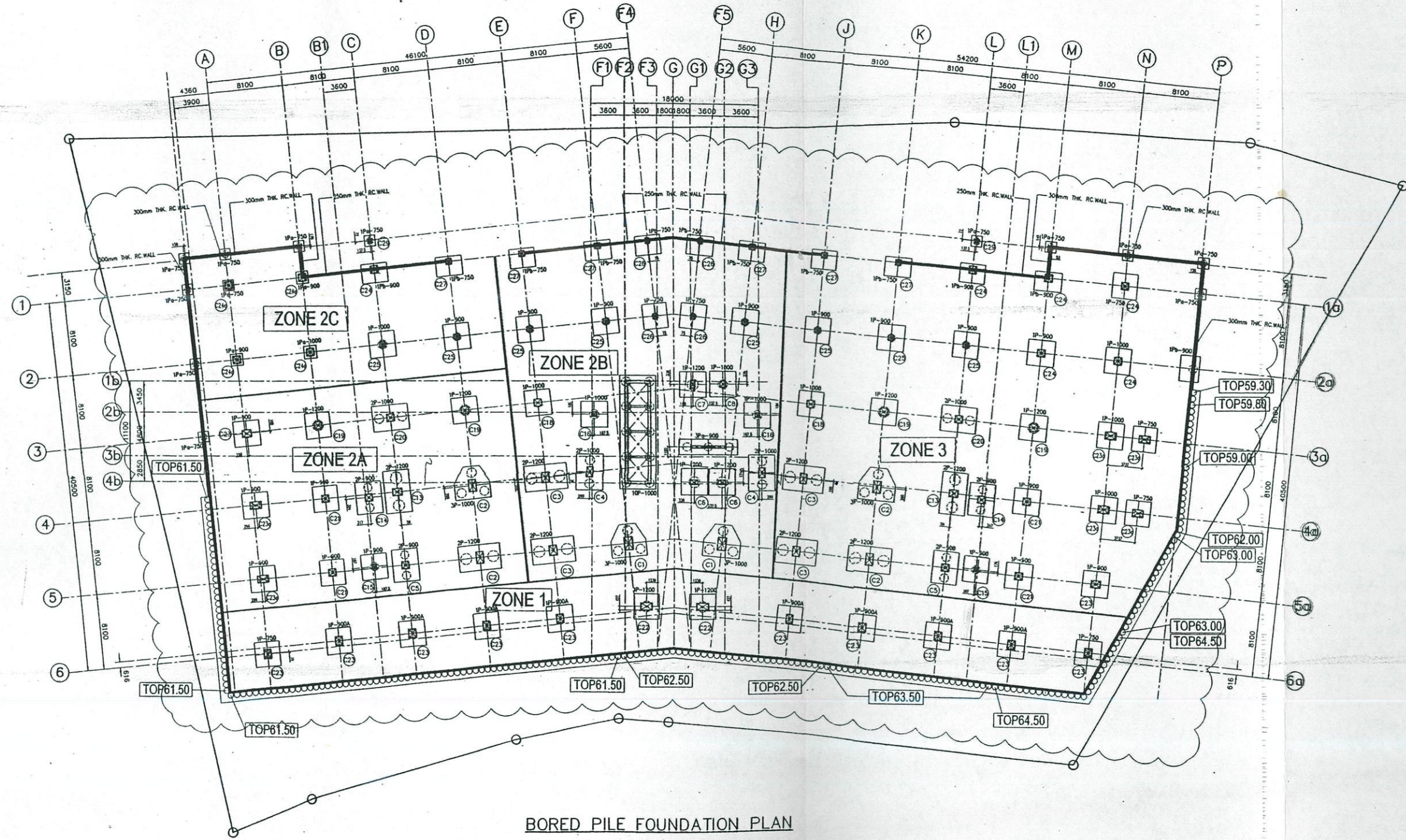
PERENCANA JURUTERA STRUKTUR:  
 I HEREBY CERTIFY THAT THESE WORKS HAVE BEEN DESIGNED BY ME IN ACCORDANCE WITH SOUND ENGINEERING PRACTICE AND THAT I TAKE FULL RESPONSIBILITY FOR THE DESIGN AND PROPER PERFORMANCE OF THE SAME

Dr. DARUS AMAN AWANG DERIS  
  
 DNP CONSULT SDN BHD  
 CONSULTING CIVIL & STRUCTURAL ENGINEERS  
 NO. 30, JALAN RUMAH 13/30,  
 TADASHA BUSINESS PARK, SECTION 13,  
 40150 SHAH ALAM, SELANGOR DARUL EHSAN  
 TEL. :  
 FAX :  
 E-MAIL :  
 WEBSITE :

NO.:	TARIKH:	PINDAAN:

TAJUK LUKSARAN:  
 PILING PLAN

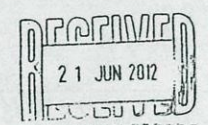
TARIKH:	DILUKS:	NO. KONTRAK:	REVISI:
MARCH 2011	CK,ITA		
SKALA: 1:250	DISEMAK: DR. DARUS AMAN		
NO. LUKSARAN:	DNPC/10115/MAINS/PL-01-		



**BORED PILE FOUNDATION PLAN**

NOTE:  
 1. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON SITE AND RESOLVE ALL DISCREPANCY WITH THE ENGINEER BEFORE COMMENCEMENT OF WORK.

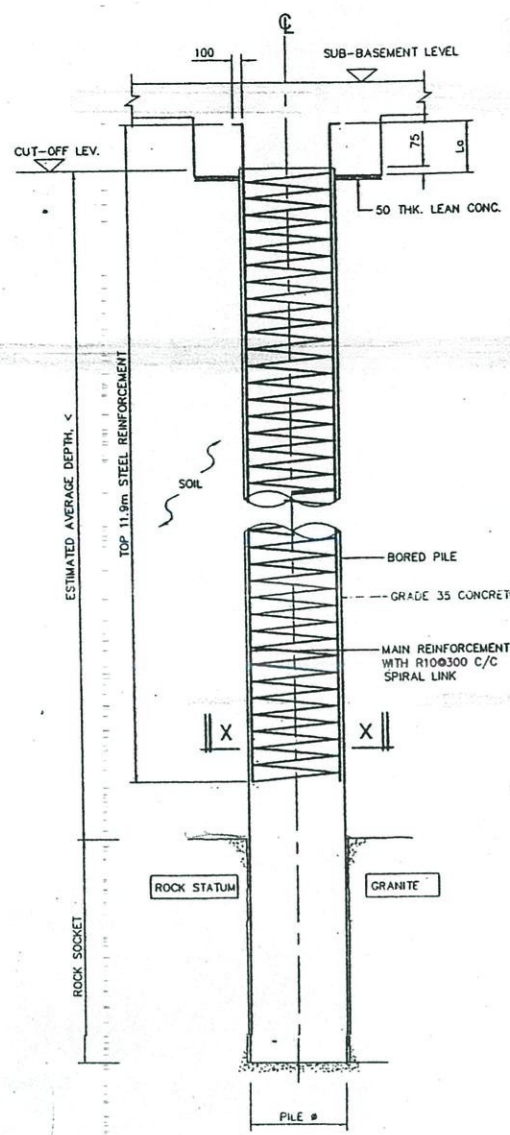
- LEGEND:
- 1P-1200 DENOTES 1 NO. OF 1200mm DIAMETER BORED PILE.
  - (C) DENOTES COLUMN MARKING (C)
  - TOP 62.50 DENOTES TOP OF CBP AT RL 62.50



21 JUN 2012

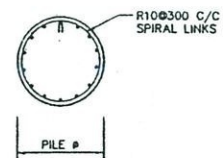
CONSTRUCTION DRAWING  
 MASTER COPY





**SOCKETING PILE INTO ROCK STATUM BORED PILE DETAIL**

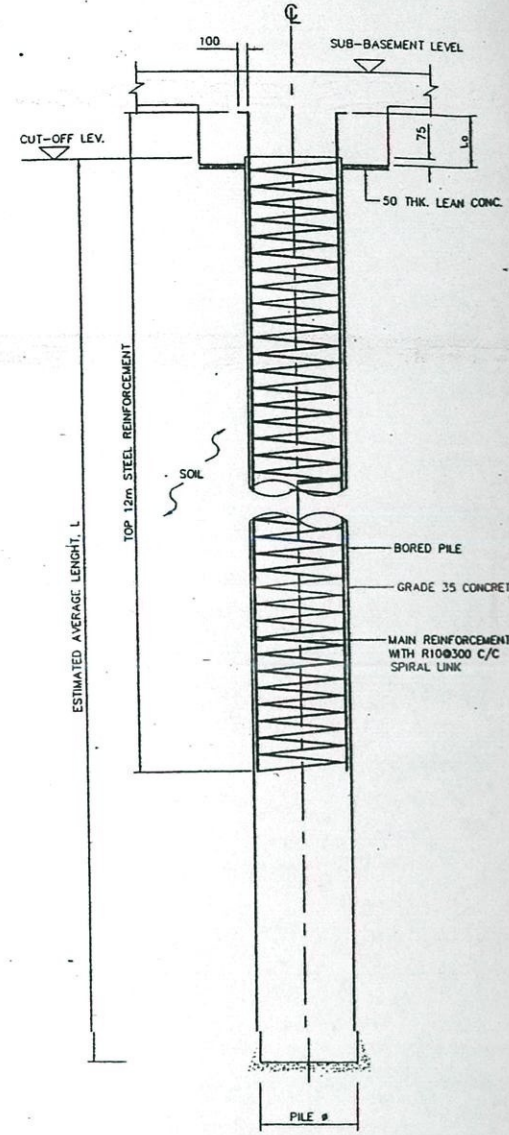
- NOTE:
- CONTRACTOR SHALL SUBMIT METHOD OF STATEMENT TO CLEAN THE BASE OF BORED HOLE FOR ENGINEER'S APPROVAL.
  - ALL BOREHOLE STABILIZATION MEASURE SHALL BE INCLUDED IN THE BORING RATE.
  - BOREHOLE FOR ROCK SOCKET SHALL BE FORMED BY CORING METHOD.



X-X  
SCALE 1:40

PILE Ø (mm)	CONCRETE GRADE	SPIRAL LINKS	ANCHORAGE LENGHT (Lo) (mm)	PILE		
				WORKING LOAD	MAIN REINF'	ROCK SOCKET
750	G35	R10@300 C/C	850	3100 KN	10T25	2.5m
900	G35	R10@300 C/C	850	4500 KN	13T25	3.1m
900A	G35	R10@150 C/C	850	4500 KN	16T32	3.1m
1000	G35	R10@300 C/C	850	5600 KN	16T25	3.4m
1200	G35	R10@300 C/C	850	8000 KN	24T25	4.0m

**BORED PILE SCHEDULE**



**PILE INTO SOIL BORED PILE DETAIL**

- NOTE:
- CONTRACTOR SHALL SUBMIT METHOD OF STATEMENT TO CLEAN THE BASE OF BORED HOLE FOR ENGINEER'S APPROVAL.
  - ALL BOREHOLE STABILIZATION MEASURE SHALL BE INCLUDED IN THE BORING RATE.

PILE Ø (mm)	ESTIMATED AVERAGE LENGHT L				
	ZONE 1	ZONE 2A	ZONE 2B	ZONE 2C	ZONE 3
750	27.0m	27.0m OR SOIL + 2.5m	31.0m OR SOIL + 2.5m	31.0m OR SOIL + 2.5m	SOIL + 2.5m
900	29.0m	33.0m OR SOIL + 3.1m	33.0m OR SOIL + 3.1m	35.0m OR SOIL + 3.1m	SOIL + 3.1m
1000	-	34.0m OR SOIL + 3.4m	36.0m OR SOIL + 3.4m	37.0m OR SOIL + 3.4m	SOIL + 3.4m
1200	36.0m	38.0m OR SOIL + 4.0m	39.0m OR SOIL + 4.0m	-	SOIL + 4.0m

- NOTE:
- CONCRETE USED IN BORED PILE SHALL BE GRADE 35 CONCRETE WITH MAXIMUM WATER CEMENT RATIO OF 0.45 AND MINIMUM CEMENT CONTENT OF 380 kg/cu.m.
  - MINIMUM CONCRETE COVER FOR REINFORCEMENT SHALL BE 75 mm.
  - PRELIMINARY LOAD TEST TO 2.5 TIMES WORKING LOAD.
  - PRELIMINARY TEST PILE SHALL BE NON-WORKING PILES.
  - PRELIMINARY TEST PILE SHALL BE INSTRUMENTED.
  - WORKING LOAD TEST TO 2.0 TIME WORKING LOAD.
  - PILE INTEGRITY TEST (PIT) SHALL BE CARRY OUT ON 20% OF BORED PILES.
  - CONCRETE SHALL BE CAST TO NOT LESS THAN 900mm ABOVE CUT OFF LEVEL TO ENSURE THAT ALL CONCRETE IS HOMOGENEOUS AND FREE OF LAITANCE AND DELETERIOUS MATTER.

RECEIVED  
21 JUN 2012

**CONSTRUCTION DRAWING**

MASTER COPY

RUANG UNTUK KEGUNAAN MAJLIS

REVISION	DATE	DESCRIPTION
01	JUNE 12	REVISED AS PER CLOUD

PEMBINA

**MAJLIS AGAMA ISLAM NEGERI SEMBILAN**

TAJUK PROJEK:

CADANGAN PROJEK PEMBANGUNAN SEBUAH KOMPLEKS BUKU PEJABAT YANG MELIBATKAN SEBUAH BLOK PEJABAT (13-TKT) DI ATAS PODIUM (2-TKT) YANG MENYANDUNG 1-TKT SOJUK & LAMA SELERA DAN 1-TKT TEMPAT LETAK KERETA BESERTA

1-TKT SEPARA BERSAMA TEMPAT LETAK KERETA DI ATAS NO. LOT 20743, MAJLIS BANDAR SEREMBAN, SEREMBAN, NEGERI SEMBILAN DARUL KHUSUS

LINTUK TETAPAN: MAJLIS AGAMA ISLAM NEGERI SEMBILAN (MAINS)

TANDATANGAN PEMILIK TANAH & BANGUNAN:

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NEGERI SEMBILAN DARUL KHUSUS

PEMILIK PROJEK:

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(No. KP: ...)  
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MAINS HOLDING SDN. BHD.  
LOT 1-2, WISMA ARAB MALAYSIA  
JALAN TUANKU MUHAMMAD  
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NEGERI SEMBILAN DARUL KHUSUS

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TADASHA BUSINESS PARK, SEKSYEN 13,  
40100 SHAH ALAM, SELANGOR DARUL EHSAN  
TEL: ...

NOTA:

TAKAN LURUSAN:

**BORED PILE DETAIL & SCHEDULE**

TARIKH: AUG. 2011  
SKALA: AS SHOWN  
NO. KONTAK: ...  
NO. LURUSAN: DNPC/10115/MAINS/STD-07

DIKURS: ZBTY  
DSEMAK: R. DARUS AMAN  
REVISION: 01

**BORED PILE RECORD**

CONTRACTOR : TERAS KHIDMAT NIAGA SDN BHD  
 SUB CONTRACTOR : HUEY TIAN ENGINEERING SDN BHD

RECORD SERIAL NO. :  
 PILE REF NO. : 113  
 WEATHER CONDITION : FINE

OBJECT : Cadangan 12 TKT Pejabat Dengan Besmen Tempat Letak Kereta  
 di atas Lot 20743, Mukim Bandar Seremban, N. Sembilan, Untuk  
 Tetuan Majlis Agama Islam, Negeri Sembilan.

DATE	6/8/2012
PILE LOCATION	5/F
PILE REF NO.	113
PILE DIA.	1000 Ø
DRILLING RIG	K-1000
DRILLING TIME	START 0822 END 1647
CONCRETE GRADE	G35T2
CONCRETE TIME	START 1816 END 2009
THEORETICAL CONCRETE VOLUME	25.56 m³
ACTUAL CONCRETE VOLUME	29.00 m³
CONCRETING LENGTH	32.55 m
FINISHING TOP LEVEL RL	+ 59.461 m
FINISHING TOE LEVEL RL	+ 47.461 m
FINISHING DRIVEN IN BY VIBRO HAMMER	12.00 m
FORM LEVEL RL	+ 59.111 m
CUT-OFF LEVEL RL	+ 54.125 m
TOE LEVEL RL	+ 26.561 m
DEPTH OF BORING (FROM CASING TOP)	32.90 m
DEPTH OF BORING (FROM CUT-OFF LEVEL)	27.564 m
DEPTH OF BORING (FROM PLATFORM LEVEL)	32.55 m
DRILL LENGTH	32.55 m
DRIVE OVER BORING INTO ROCK	3.40 m
REINFORCEMENT TYPE	T25 / 12.00 m
STAPLE LINKS TYPE	T10 / 40300 m
LINK LENGTH	- m
LENGTH OF STARTER BAR	0.85 m
PILE CAGE LENGTH (Including Starter Bar & Lap Length)	12.00 m

Rock socket from depth 29.5m  
 until 32.9m

DEPTH (m)	DESCRIPTION
0	▽ RL + 59.461 m (TOC) 0822
0 - 5	Dark grey with medium brown silt
5	0854
5 - 10	Pale to brownish colour with light medium sandy silt.
10	
10 - 15	Ditto
15	1000
15 - 20	Hard, brownish grey mottled with silt
20	
20 - 25	Ditto
25	1114
25 - 30	Gravel
30	1242
30 - 35	Granite
35	▽ RL + 26.561 m (TOE) 1647
35	End of boring at 32.9m from TOC

DESIGNED BY  
 CHECKED BY TERAS KHIDMAT NIAGA SDN BHD  
 TAJUDIN DET  
 KOORDINATOR PROJEK  
 PROJEK KOMPLEKS MAJLIS  
 SEREMBAN



DATE :

375

# STEEL BAR RECORD

PROJECT NAME : Cadangan 12 TKT Pejabat Dengan Besmen Tempat Letak Kereta  
 Diatas Lot 20743, Mukim Bandar Seremban, N. Sembilan, Untuk Tetuan Majlis Agama Islam, Negeri Sembilan.  
 MAIN CONTRACTOR : TERAS KHIDMAT NIAGA SDN BHD  
 SUBCONTRACTOR : HUEY TIAN ENGINEERING SDN BHD

BORED PILE LOCATION : 113

ITEM	DESCRIPTION	SIZE (mm)	QTY. (nos)	LENGTH (m)	UNIT WEIGHT (kg/m)	TOTAL WEIGHT (kg)	REMARKS
1	Starter Bar	T25	16	0.85	3.854	52.4144	
2	Main Bar 'a'	T25	16	11.15	3.854	687.5536	
3	Links 'c'	T10	12	12.00	0.617	88.848	
4	Lapping Bar						
5	Main Bar 'b'						
6	Links 'd'						
7	Stiffener Bar	T10	3	12.00	0.617	22.212	
8	Lifting Bar						
9	Hanging Hook	T25	2	4.486	3.854	34.578	
TOTAL AMOUNT (kg)						885.606	

ORDER BY

APPROVED BY:







**AERIAL MIX SDN BHD** (606862-V)

(formerly known as Sterling Glory Mix Sdn Bhd)

No. 9, Jalan Era Square 2, Era Square, 70200 Seremban, Negeri Sembilan.

S/No.: 206091

**DELIVERY ORDER**

D/O NO.:

LB20801

Customer:

TERAS KHIDMAT NIAGA SDN BHD

Delivered To:

BP 113

SLUMP 190mm

LAKE GARDEN 0126122256

SPECIFICATION	GRADE	DATE	PLANT	TRUCK No.:	DRIVER
BS 5328	35T2	06/08/2012	Plant - Labu	BHM 2250	MANIAM
Characteristic Strength at 28 days (MPa)	Specified Slump (mm)	175+/-25	Total Order (M <sup>3</sup> )	This Load (M <sup>3</sup> )	Progress Total (M <sup>3</sup> )
			29.0	5.00	29.00
Leave Plant	Arrive at Site	Cement Type	Admixture Type	Max Agg Size (mm)	
6:19:59 PM	1850 PM	OPC	P100RI	20mm	
Leave Job Site	Arrive at Plant	Other Services or Additional Information			

GOODS RECEIVED in ACCORDANCE to STANDARD CONDITION of SALES and SUPPLY

TAMPERING or ABUSING of  
CONCRETE at SITE is at CUSTOMER's RISK  
i.e. WATER ADDITION, LONG WAITING and etc.

Name:

My card No.:

White Copy - Customer Pink Copy - Account Yellow Copy - Driver Blue Copy - Plant