JABATAN BANGUNAN
UNIVERSITI TEKNOLOGI MARA
PERAK

CONSTRUCTION METHODS OF SEWAGE TREATMENT PLANT

MOHD SHAH KIMI REDUAN BIN MOHD ZAKI
2009682786

JABATAN BANGUNAN

FAKULTI SENIBINA, PERANCANGAN DAN UKUR

UNIVERSITI TEKNOLOGI MARA

APRIL 2012

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MOHD SHAH KIMI REDUAN BIN MOHD ZAKI

2009682786

Bertajuk

CONSTRUCTION METHODS OF SEWERAGE TREATMENT PLANT

Diterima sebagai memenuhi sebahagian dari syarat untuk memperoleh Diploma Banguan

Penyelia Laporan	Pn. Rafizah Mohamed Nordin
Koordinator Latihan Amali	En. Azim Sulaiman
Koordinator Program	Pn. Siti Jamiah Tun Jamil
(Tandatangan)	(Nama)

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APRIL 2012

PERAKUAN PELAJAR

Adalah dengan ini, hasil kerja penulisan Laporan Latihan Praktikal ini telah dihasilkan sepenuhnya oleh saya kecuali seperti yang dinyatakan melalui latihan praktikal yang telah saya lalui selama 6 bulan mulai 31Oktober 2012 hingga 30 April 2012 di Sincere Image Sdn. Bhd. Ianya juga sebagai salah satu syarat lulus kursus BLD 299 dan diterima sebagai memenuhi sebahagian dari syarat untuk memperolehi Diploma Banguan.

Nama : Mohd Shah Kimi Reduan Bin Mohd Zaki

No KP UiTM : 2009682786

Tarikh : 21 Mac 2012

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CONSTRUCTION METHODS OF SEWAGE TREATMENT PLANTS

Prepared by:
MOHD SHAH KIMI REDUAN BIN MOHD ZAKI
2009682786

ACKNOWLEDGEMENT

Grace be upon Allah the Almighty, with His blessings, I managed to complete this Practical Training Report. Next goes the deep appreciation and gratitude to all of infinite individuals who have expressed time by give me encouragement , guidance, cooperation and comments that helped me in preparing my report, especially to Mr. Faizal Ramli as Board of Director, Mr. Hakimimudin as site engineer and all the staffs in company Sincere Image Sdn. Bhd.. I also would like to thank so much to Mr. Azim Sulaiman as Coordinator of Practical Training, Mrs. Hasni Suryani Hassan as a visiting lecturer, Ms. Rafizah Mohamed Nordin as student's supervisor and all lecturers in Building Department. Finally special thanks to my parents and friends who always give me encouragement and guidance which allow me to gained an experience in construction industry.

Thank you

ABSTRACT

This report will specifically explain on the methods to construct Sewage Treatment Plant (STP) in a project of Hotel Wakaf in Kuala Terengganu, Terengganu Darul Iman. The explanation in this report is complete because the combination both of source information about theoretical and practical Sewage Treatment Plant (STP). This report was written based on my experience as practical student in a project of Hotel Wakaf in Kuala Terengganu. The main contents of the report include a company profile background construction and information about Sewage Treatment Plant (STP). From the observation, in construct Sewage Treatment Plant (STP) has many considerations to take into account especially on the future maintenance because the Sewage Treatment Plant (STP) because will be constructing in underground level, so that when any damage occurs is rather it again. In this report have some explanation about theoretical Sewage Treatment Plant (STP) and types of Sewage Treatment Plant because every type of Sewage Treatment Plant (STP) has different function respectively. Besides that, also explain about the installation of pipes and its function in Sewage Treatment Plant (STP). As conclusion, these reports present a basic information the construction of Sewage Treatment Plants (STP).

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LIST OF ABBREVIATIONS

UiTM	Universiti Teknologi MARA
STP	Sewerage Treatment Plants
CIDB	Construction Industry Development Board
SDI	Sustainable Development Indicators
IST	Individual Septic Tank
CST	Communal Septic Tank
PKK	Pusat Khidmat Kontaktor
SiSB	Sincere Image Sdn. Bhd.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Sewage Treatment Plants (STP) system is vital to be install at any building community and industry sewage because it is a basic needs in human life. Usually, Sewage Treatment Plants (STP) is constructed at underground level because to determine it not smell on surrounding area.

Architects and engineers do designing for Sewage Treatment Plants (STP) in variety of shapes and sizes depending to the condition of soil, area or space available and population of users in that particular building. The considerations about that must parallel with to construct Sewage Treatment Plant (STP) because when have any mistakes it complicated to repair in future. Therefore the preparation plan to construct STP must do early and systematically because any problem can be overcome as soon as possible.

The interesting about Sewage Treatment Plants (STP) is methods to construct because it need professional and skill person to determine the joining and continuous wall must accurate especially the joining wall to wall with the installation of water stop to avoid water enter in Sewage Treatment Plants (STP). The main purpose the installation water stop is to avoid water entering in the Sewage Treatment Plants (STP). The construction must be precisely and focus to all the aspects such as sizes, shapes and other necessary.

1.2 THE SELECTION OF REPORT TITLE

During this practical training, I was appoint to assist the site supervisor to do any works construction such as look after Sewage Treatment Plants (STP) to determine the measurement is accurate, measure the structures building and also do taking off and estimation to claim the progress of works and others. Many information I obtained from the contractor, supervisor, site engineer, quantity surveyor, electrical consultant, resident engineer and skill labour because they have many experiences and knowledge in construction industry. During my practical training, I have observed many labours to construct frames structure, brick wall, skim coat, water proofing, Sewage Treatment Plant (STP) and other works it really need skill and knowledge. I choose Sewage Treatment Plant (STP) as a title for my report because I want to know and understand more about the construction including few problems arise during the installation of Sewerage Treatment Plants.

1.3 THE OBJECTIVES OF STUDY

The objective of study is to learn about the Sewage Treatment Plants (STP) especially about the functions, methods and problems. There are three major objectives in resulted this report.

1. To study the function and process in every part of Sewage Treatment Plants
2. To study the general methods to construct Sewerage Treatment Plants.
3. To determine the problems arise during the construction of Sewerage Treatment Plants.

1.4 SCOPE OF THE STUDY

Scope of study in this report is more focus on the aspects on how to construct Sewerage Treatment Plants (STP) specifically in a project of Hotel Wakaf, ditanah Wakaf Zainal Abidin, in Kuala Terengganu, Terengganu Darul Iman. I use the simple explanation to readers easy to understand about the Sewerage Treatment Plants (STP). Apart from that, I also include some information theoretical about the function and process of Sewage Treatment Plants (STP) in the chapter 3.

1.5 METHOD OF THE STUDY

In this report, I can information several of sources information such as reference from books, media prints, media electronics, observations and interviews. The all information is very helpful me to know and understand the Sewerage Treatment Plants (STP). The following below has some explaining about the sources of information:

1. References

Most of information I can from the books because it more theoretical and complete with the explanation, diagram, picture and others. Information from book also more accurate and complete to be main reference to me does in my report. Some information from the book in aspects of calculation especially about calculation parts of structure and reinforcement.

2. Media prints

Apart from that, I also refer to media prints to more understand in about progress development Sewage Treatment Plants (STP) in media mass such as, from magazines and catalogues. The information from that, I can more understand commonly types of Sewage Treatment Plants (STP) in use in Malaysia country. In sample catalogues has many types and functions Sewage Treatment Plants (STP) in use in building especially for domestic buildings.

3. Media electronics

The others information I can from the source of media electronics because it more fast and effective to understand because it complete information with the pictures, examples and the simple explanation about the every topics in the Sewage Treatment Plants (STP). The method of media electronics is commonly I surfing from the internet. The information from that, I can read and look the pictures, videos and data to more understand about the methods and process of Sewage Treatment Plants (STP).

4. Observations

Besides that, the methods of the observation is very helpful me to do in my report because from that, I can more understand and knowing about the construction of Sewage Treatment Plants (STP) for example I can look more near and clear about the procedure works, equipments, plants and problems during construction of Sewage Treatment Plants (STP) .

5. Interviews

The others addition source of information I can interview to person who has many experiences in construction of Sewage Treatment Plants (SPT). I interview with the site supervisor, site engineer and skill labours to understand about the construction of Sewage Treatment Plants (STP). Methods of interview are more practical and effective to use.

CHAPTER 2

BACKGROUND OF COMPANY

2.1 INTRODUCTION

Begin at 31 October 2011; I begin practical training while six month and end at 30 April 2012 in a company is Sincere Image Sdn. Bhd. in Terengganu Darul Iman. Practical Training is compulsory subject for students in course building who take code BLD 299 because it include syllabus in Universiti Teknologi Mara (UiTM) in Perak Darul Ridzuan.

In every company has their logo respectively to show the symbol and the meaning their business like the contractor needs the company to manage their project. Sincere Image Sdn. Bhd. has logo to show the project which their run is sincere and responsibility.

Figure 2.1: Logo Sincere Image Sdn. Bhd.

Source: Company Profile Sincere Image Sdn. Bhd.

2.2 HISTORY OF INCORPORATION

The history of incorporation Sincere Image Sdn. Bhd. is incorporation the date registered is 30 March 2000 and it started operation as a sub-contractor works in civil and building engineering. Sincere Image Sdn. Bhd. also is a leading Class 'A' Bumiputera Contractor registered with Pusat Khidmat Kontraktor (PKK) and 'G7' contractor with the Construction Industry Development Board (CIDB).

Apart from that, Sincere Image Sdn. Bhd. also good potential in construction industry and can to be competition the other contractors because Sincere Image Sdn. Bhd. has many experiences such as construction bridges, buildings and roadways. From that experiences can help this company able management project construction completed.

The location of SiSB is Lot 17680, Ground Floor, Taman Semarak, Bukit Tunggal, 21200 Kuala Terengganu in Terengganu Darul Iman. This address is rather near with the town of Kuala Terengganu; therefore this company not complicate to clients find it.

2.3 THE OBJECTIVE OF THE COMPANY

Sincere Image Sdn. Bhd. is wholly committed in their pursuit of achieving effective quality management system to ensure that the overall objective of the Company is realized through:

1. Quality product and services
2. Customer satisfaction
3. Safe work practice
4. Time delivery of product and services
5. Competitiveness

Quality assurance is an essential part of good management that contributes to the achievement of quality through the analysis of the task to be performed, the identification of the skills required, the selection and training of appropriate personnel, the use of the correct equipment, the creation of satisfactory working environment and recognition of the responsibility of the individual who is to perform the task.

Every employee is obliged to participate in the implementation of the Quality System and shall constantly strive and excel to continuously improve the quality of our service to meet or exceed the expectation of our customers.

The implementation of the Quality System set out in this Manual will increase customer satisfaction, enhance our productivity and competitiveness through continuous improvement.

2.4 COMPANY INFORMATION

Company Name	:	SINCERE IMAGE SDN.BHD.
Company Registration No	:	509566-A
Registration Office Address	:	#202, 2ND FLOOR, 111 JALAN BATAS BARU, 20300 KUALATERENGGANU, TERENGGANU DARUL IMAN.
Business Office Address	:	LOT 17680, GROUND FLOOR, TAMAN SEMARAK, BUKIT TUNGGAL, 21300 KUALA TERENGGANU, TERENGGANU DARUL IMAN.
Dated of Registration	:	30 MARCH 2000
Authorised Capital	:	RM 1,000,000.00
Paid-up Capital	:	RM 1,000,000.00
Board of Director	:	Mr. MOHD FAIZAL BIN RAMLI
Company Secretary	:	JETHRO MANAGEMENT SERVICES SDN. BHD., # 202, 2ND FLOOR 111, JALAN BATAS BARU 20300 KUALA TERENGGANU, TERENGGANU DARUL IMAN.
Company Auditor	:	S.T. TOH & CO. #111-A, 2ND FLOOR, JALAN BATAS BARU TERENGGANU DARUL IMAN.

A 118089

CIDB
MALAYSIA

Perakuan Pendaftaran

Adalah dengan ini diperakui bahawa kontraktor yang dinyatakan di bawah ini telah berdaftar dengan Lembaga mengikut Bahagian VI Akta Lembaga Pembangunan Industri Pembinaan Malaysia 1994. Pendaftaran ini adalah tertakluk kepada syarat-syarat yang telah ditetapkan di belakang Perakuan ini

No Pendaftaran: 0120030425-TR082961

Nama Kontraktor : SINCERE IMAGE SDN. BHD.

Alamat Berdaftar : #202, 2ND FLOOR
111, JALAN BATAS BARU
20300 KUALA TERENGGANU
TERENGGANU

Gred, kategori dan pengkhususan berdaftar

G7	Tiada limit	B	B04
G7	Tiada limit	CE	CE21

Tarikh Mula Berkuatkuasa : 22 JUL 2009

Tarikh Habis Tempoh Perakuan : 21 JUL 2012*

**Perakuan ini hendaklah diperbaharui selewat-lewatnya 60 hari sebelum tarikh habis tempoh*

STATUS : AKTIF - Kontraktor yang diawardkan projek semasa perakuan pendaftaran ini dikeluarkan.

(DATUK IR. HAMZAH HASAN)
Ketua Eksekutif
Bertarikh: 22 JUL 2009

Figure 2.3: Registration with Construction Industry Development Board (CIDB)
Source: Company Profile Sincere Image Sdn. Bhd. (SiSB)

2.5 ORGANIZATION CHART IN SINCERE IMAGE SDN. BHD.

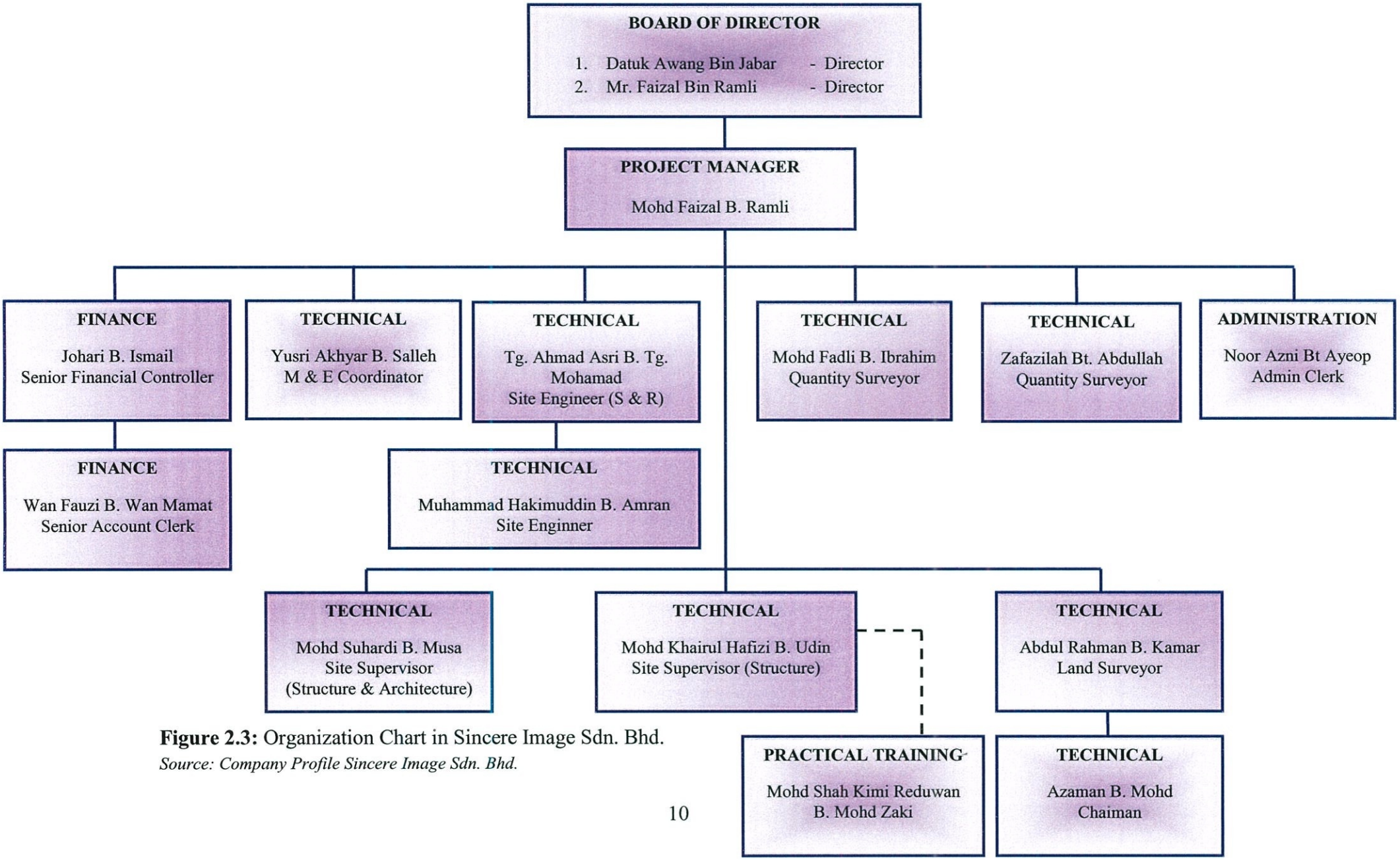

Figure 2.3: Organization Chart in Sincere Image Sdn. Bhd.

Source: Company Profile Sincere Image Sdn. Bhd.

2.6 BOARD OF DIRECTORS IN SINCERE IMAGE SDN. BHD.

NO.	NAME	I/C NO.	POSITION	QUALIFICATION
1	Datuk Haji Awang Bin Jabar		Director	B.A. (Hons) Usuluddin Al-Azhar
2	Mr. Mohd Faizal Bin Ramli		Director/ Project Manager	B. Sc. (Hons) Building (UiTM)
3	Miss Chang Yong Woon		Project Coordinator	B. Eng. (Hons) Civil (University of Tasmania) and MBA (SUOT-Victoria Australia)
4	Mr. Tg. Ahmad Asri Bin Tg. Mohamad		Site Engineer	B. Eng. (Hons) Civil (UiTM)
5	Mr. Wan Fauzi Bin Wan Mamat		Senior Account Clerk	LCCI - Mara
6	Mr. Mohd Suhardi Bin Musa		Site Supervisor	Dip. in Civil Eng. (Politeknik Kuantan)
7	Mr. Abdul Rahman Bin Kamar		Land Surveyor	Dip. in Land Surveying (UTM)
8	Mr. Johari Bin Ismail		Senior Financial Controller	B. Accountancy (Hons) (UiTM)
9	Mr. Yusri Akhyar Bin Salleh		M & E Coodinator	B. in Engineering (Hons) Electrical, Electronic and System Engineering (UKM)

NO.	NAME	I/C NO.	POSITION	QUALIFICATION
10	Mr. Muhammad Hakimuddin Bin Amran	840319-11-5013	Site Engineer	B. in Civil Engineering (KUITHO)
11	Mr. Mohd Fadli Bin Ibrahim	790420-11-5269	Quantity Surveyor	Dip. in Quantity Surveying (UiTM)
12	Miss Zafazilah Binti Abdullah	860308-46-5120	Quantity Surveyor	Dip. in Quantity Surveying (UiTM)
13	Miss Juliana Binti Yahya	860308-11-5612	Property & Purchasing Department	Dip. in Information Technology (KTB)
14	Mr. Mohd Khairul Hafizi Bin Udin	820104-11-5157	Site Supervisor	Certificate in Civil Engineering (Politeknik Dungun)
15	Mr. Azman Bin Mohd	730802-11-5155	Asst. Surveyor/ Chainman	Sijil Perlajaran Malaysia (SPM)

Table 2.1: Board of directors in Sincere Image Sdn. Bhd.

Source: Company Profile Sincere Image Sdn. Bhd.

2.7 LIST OF COMPLETED PROJECT

NO.	TRANSACTION	NO. CONTRACT	CLIEN	TOTAL CONRACT	START DATE	END DATE	NOTE
1	Pembinaan Sebuah Masjid dan Lain-lain Kerja Yang Berkaitan Di Maahad Tahfiz Al-Quran, Bukit Payong, Marang Terengganu.	JKRNT (T) 4/2005	JKR Kop. Pembangunan Daerah Dungun Gotong Royong Bhd	951,561.20 (Sub-Contractor Amount)	27.06.2005	05.05.2006	Kerja-kerja Bangunan
2	Cadangan Bangunan Tambahan Dua (2) Blok Asrama Dan Satu (1) Blok Dewan Makan Di SMK Lemdang Bidung Setiu, Terengganu Darul Iman.	JKRNT (T) 7/2005	JKR Time Future Construction (M) Sdn Bhd	6,490,948.00 (Sub-Contractor Among)	06.07.2005	05.10.2006	Kerja-kerja Bangunan
3	Program Menilai / Menbaiki / Menggantikan Jambatan Di Jalan Persekutuan Di Negeri Terengganu Darul Iman.	JKR/T/P/03/2006	JKR Ainatech Sdn Bhd	2,249,800.00 (Sub-Contractor Among)	01.03.2006	21.11.2006	Jambatan

NO.	TRANSACTION	NO. CONTRACT	CLIEN	TOTAL CONRACT	START DATE	END DATE	NOTE
4	Pembinaan Kompleks Kediaman Pelajar Baru, Kolej Ugama Sultan Zainal Abidin (KUSZA), Kuala Terengganu.	JKRNT (T) 4/2006	JKR	27,998,118.00	03.04.2006	28.04.2008	Kerja-kerja Bangunan
5	Cadangan Pembangunan (1) Asrama Tiga Tingkat, Kolej KETENGAH, Bandar Al-Muktafi Billah Shah, Dungun, Terengganu Darul Iman.	LKKT/3/2005	LKKT Lahir Dinamik Sdn Bhd	4,400,000.00 (Sub-Contractor Among)	03.05.2006	16.03.2009	Kerja-kerja Bangunan
6	Pembinaan Bangunan Fakulti Pengajian Quran Dan Sunnah Serta Lain-lain Kerja Berkaitan Di Kolej Universiti Islam Malaysia, Bandar Baru Nilai, Negeri Sembilan.	USIM/UP/NS/08/ 2007	USIM	23,998,080.00	08.03.2007	26.06.2009	Kerja-kerja Bangunan

NO.	TRANSACTION	NO. CONTRACT	CLIEN	TOTAL CONRACT	START DATE	END DATE	NOTE
7	Cadangan Pembangunan Bercampur Yang Mengandungi 14 Unit Rumah Kedai 2 Tingkat, 36 Unit Rumah Teres Kos Sederhana Rendah 1 Tingkat, 59 Unit Rumah Teres Kos Sederhana 1 Tingkat Dan 16 Unit Rumah Berkembar 1 Tingkat Di Sungai Bajar, Mukim Kuala Berang, Daerah Hulu Terengganu, Terengganu Darul Iman.		Time Future Construction (M) Sdn Bhd	15,036,000.00	August 2007	Feb 2010	Kerja-kerja Bangunan

Table 2.2: List complicated project in Sincere Image Sdn. Bhd.

Source:Company Profile Sincere Image Sdn. Bhd. (SiSB)

CHAPTER 3

THEORETICAL STUDY

3.1 INTRODUCTION

Every human being in the world wants to living in the clean and healthy condition to comfortable and happiness atmosphere. Human beings also construct home as shelter to their family. For the toilet, the install sewerage treatment is needed to ensure the sewage can be process to avoid the smell on surrounding area.

In Malaysia country, Indah Water Konsortium Sdn. Bhd. is a company responsible to ensure the process of sewerage treatment can go on without any problems. The process of sewerage treatment is significant to determine the sewage can be treatment and filter in the STP. However, the problem can occur when the sewerage treatment cannot be process properly for example, can to be water pollution because out flow wastewater is dirty and smell.

Figure 3.1: Logo Indah Water Konsortium Sdn. Bhd.

Source: http://www.jobstreet.com.my/jobs/2012/1/i/10/1526476.htm?fr=R

3.2 DEFINITION AND TYPES OF SEWAGE

Sewage can be define as the waste products of a society including the human excreta had been collected, carried and disposed of manually to a safe point of disposal, by the sweepers, since in time immemorial (Admin, 2011). Generally sewage can be divided three category, there are:

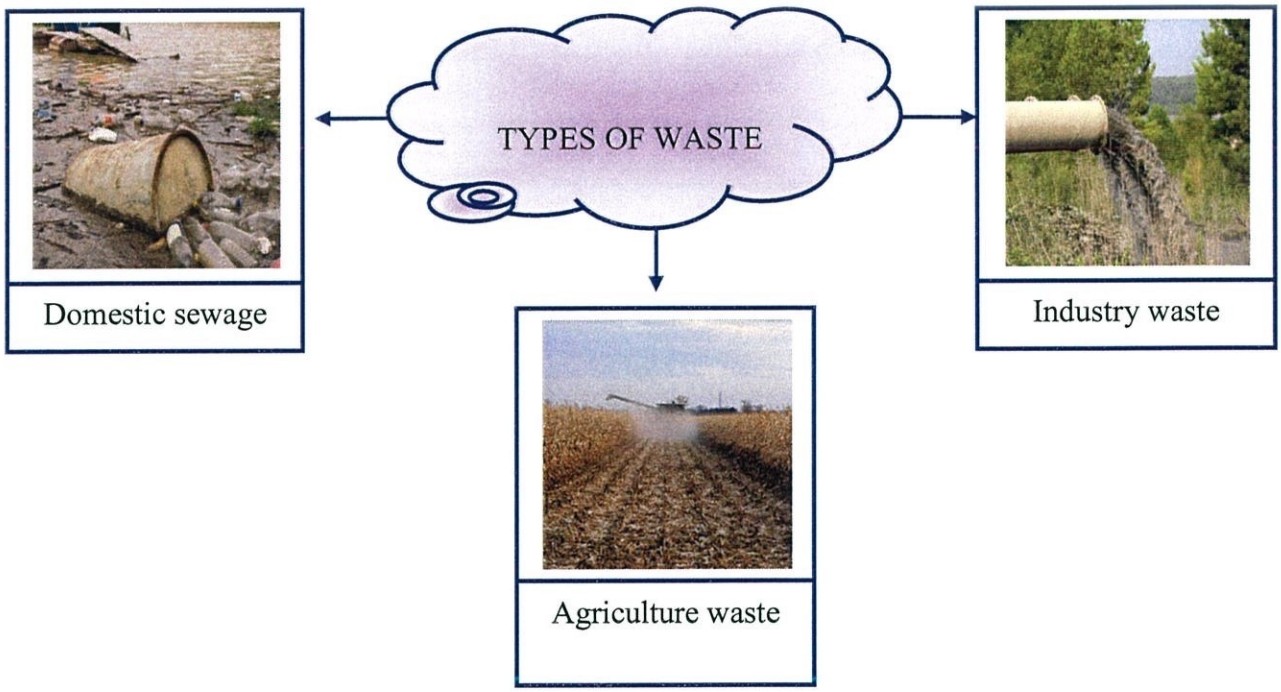

Figure 3.2: Types of waste: Domestic, Agriculture and Industry

1. DOMESTIC SEWAGE

What is domestic sewage? According to Planetary Notions (2002) domestic sewage is sewage originating primarily from kitchen, bathroom and laundry sources.

2. AGRICULTURAL WASTE

According to OECD (2001) agriculture waste is waste produced as a result of various agricultural operations. The agriculture includes the following below:

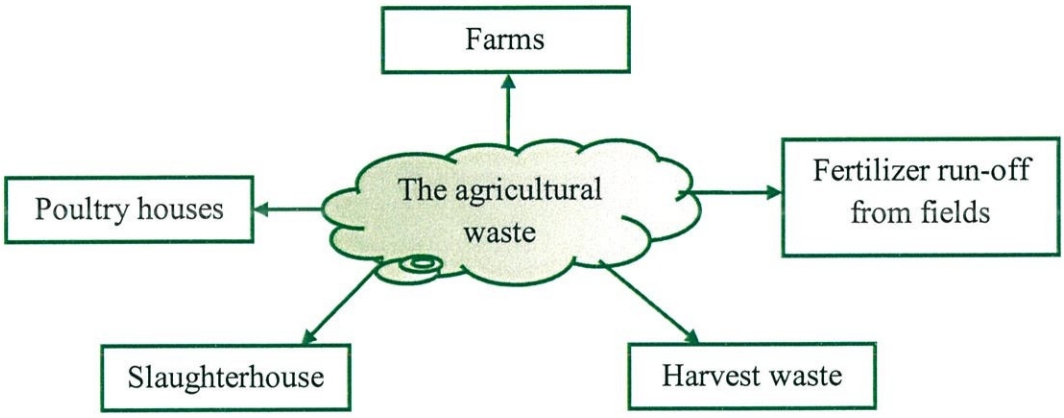

Figure 3.3: Types of the agricultural waste

3. INDUSTRIAL WASTE

What is industry manufacturing? It can be define the branch of manufacture and trade based on the fabrication, processing, or preparation of products from raw materials and commodities (SDI, 1996). Apart from that, according to TCT Solution (2012) Industrial wastes are the wastes industries and commercial establishment produce to manufacture.

Figure 3.4: Wastewater pollution by the factory

Source: http://agritech.tnau.ac.in/agriculture/agri_resourcemgt_soil_soilconstraint_industrial.html

3.3 SEWAGE TREATMENT

Sewage treatment is the process that removes the majority of the contaminants from waste-water or sewage and produces both a liquid effluent suitable for disposal to the natural environment and sludge (ScienceDaily, 2010).

3.4 METHODS OF SEWAGE TREATMENT

According to Syed Mubashir (2010) in Malaysia, method of sewage treatment can be divide two, there are sewerage treatment plants (STP) and septic tank. The methods of both treatment has some different about the process of sewage treatment.

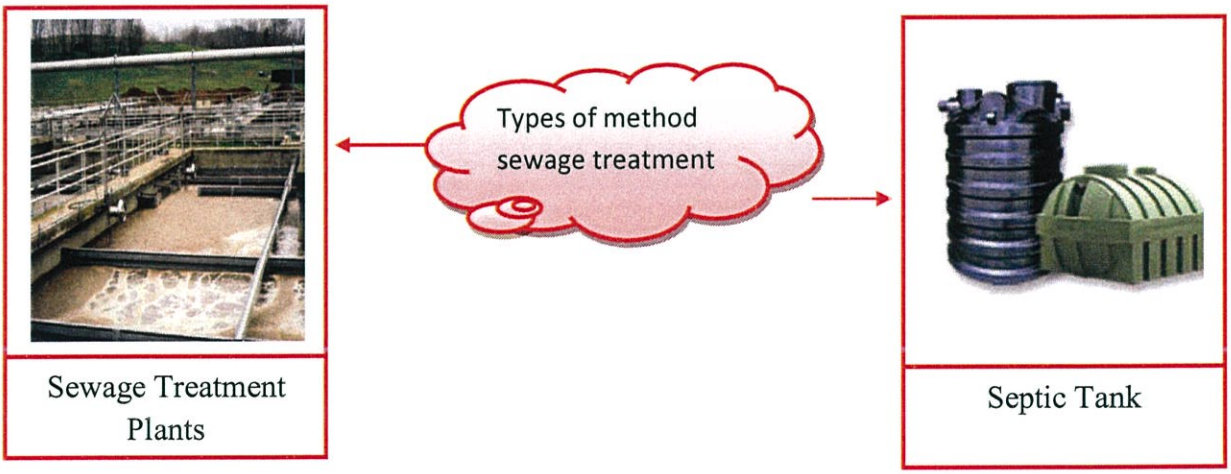

Figure 3.5: Types of method sewage treatment

3.5 DEFINITION OF SEPTIC TANK

According to water Services Industry Act 2006, septic tank is a basic form of on-site treatment facility consisting of one or more compartments that provides treatment of sewage by means of sedimentation and anaerobic process.

3.6 TYPES OF SEPTIC TANK

According to Teo Kem Sheng (2009) septic tank system can be divide two types there are Individual Septic Tank (IST) and Communal Septic Tank (CST). Generally the wastewater treatment processes in these two systems are similar but IST is used to serve individual household while CST is used to serve multiple household.

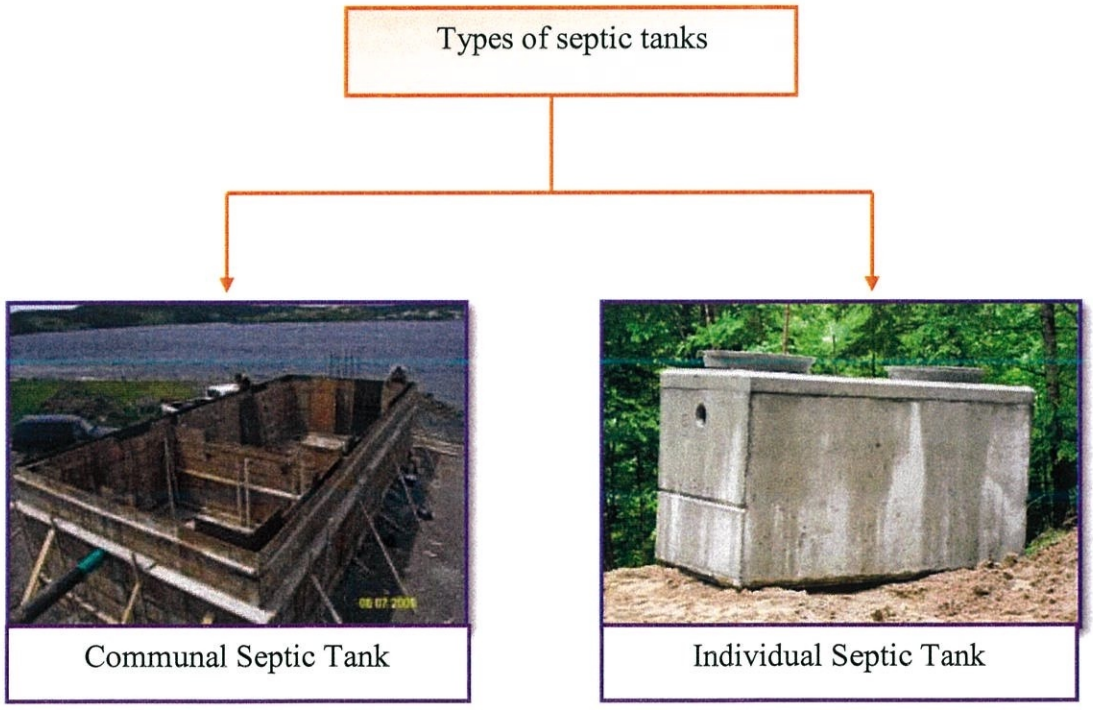

Figure 3.6: Types of septic is commonly to used

3.7 PROCESS OF SEPTIC TANK

Every people know what is septic tank and sewerage treatment pants system because both of this system commonly to used. However not have many people understand about the process of septic tank and sewerage treatment plants. Can I ask you questions? Are you know where the water goes when you flushing a toilet? Do you know what the different process of septic tank and sewerage treatment plants?

Generally septic tank is commonly used for home in rural area or a small community because not has waste water to process compared than city. What the purpose of septic tanks, according to Kieza (2011) the purpose of a septic tank is to treat household water using natural processes. A septic tank with an absorption field is the most common method for treating waste from a rural residence. Septic tank has three main components there are following below:

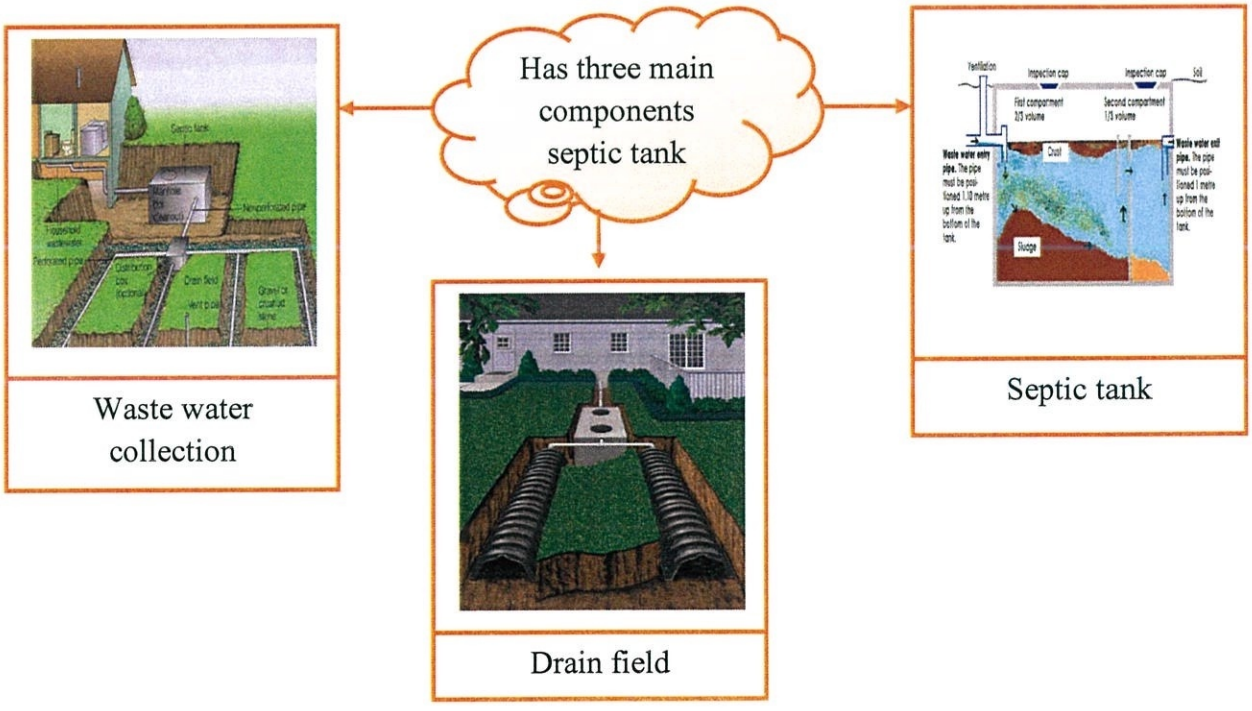

Figure 3.7: Three components septic tank

Source: http://www.kleizasolutions.com/septic.html

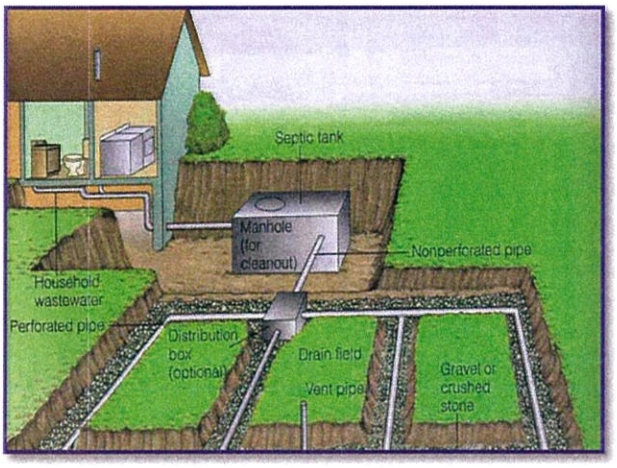

Figure 3.8: Plumbing wastewater collection system

Source: http://www.kleizasolutions.com/septic.html

All wastewater containing human wastes, nutrients, dirt, and other contaminants must be collected and delivered to the septic tank and drain field for treatment and disposal. All water used in bathing, toilets, laundry, and dishwashing must be treated by the system. Drains allowing wastewater to enter the system should be equipped with strainers and other filtration devices to reduce the amount of food particles, hair and lint entering the system. The following below is photo sand filter:

Figure 3.9: Reticulation aerobic sand filters

Source: http://www.eco-nomic.com/indexsdd.htm

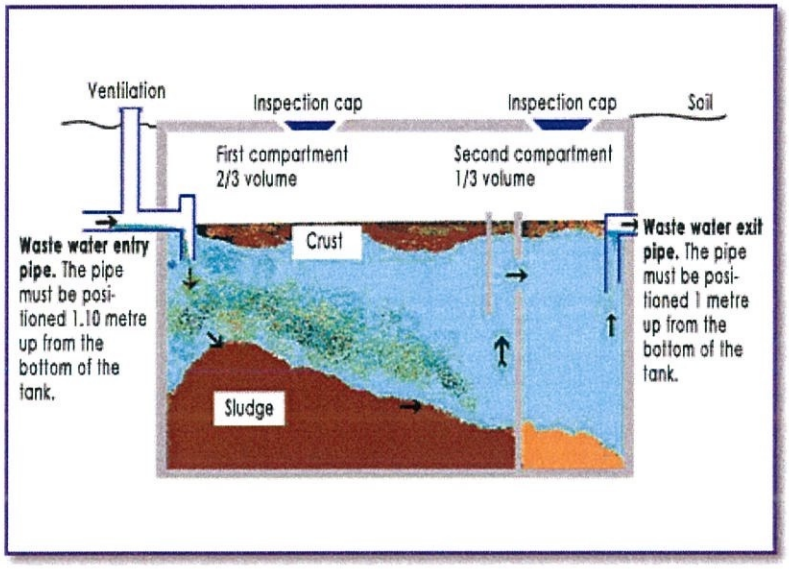

Figure 3.10: Septic tank system is wastewater separation

Source: http://www.kleizasolutions.com/septic.html

When the influent enters the first chamber, its velocity slows so that the heavier solids can settle out of the water into the bottom of the chamber and lighter materials can float to the surface. The accumulation of settled solids at the bottom of the tank is called sludge and the lighter solid (grease, fats and soaps) which form a mass on the surface of the liquid in the septic tank is called scum. In between the sludge and the scum is liquid waste or wastewater.

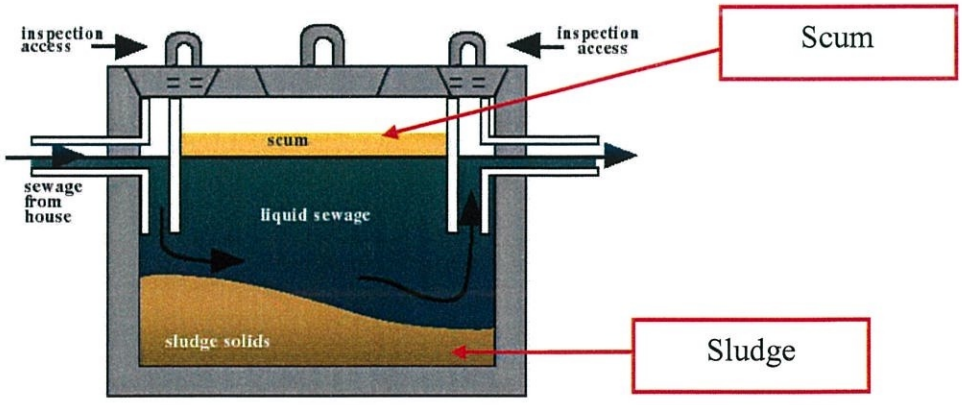

Figure 3.11: Sludge and scum in septic tank

The micro-organisms like bacterial and other natural processes act to decompose the waste materials in the liquid waste. Incoming water should be held in the tank for at least 24 hours in order to improve setting. Sludge and scum are also digested and compacted into a smaller volume. This is the first step in the process of purifying household. The following below is process of septic tank:

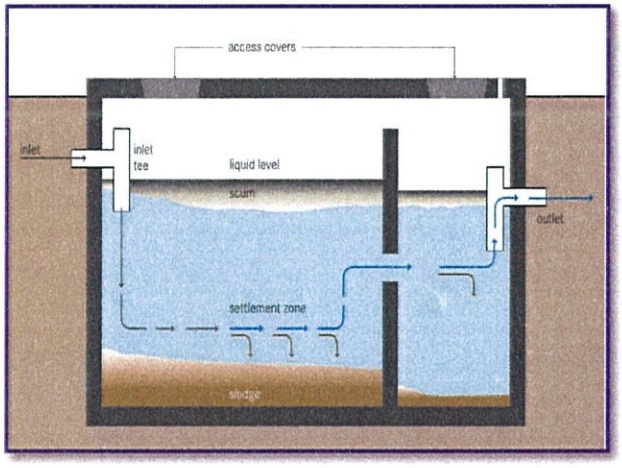

Figure 3.12: Process of septic tank

Source: http://www.sswm.info/category/implementation-tools/

When the first chamber of the tank becomes field, the liquid waste begins to fill the second chamber. The chambers of the septic tank are designed to prevent the movement of sludge and scum to the second chamber, allowing only the movement of liquid. Once the second chamber is filled and more influent enters the first chamber, an equal amount of the partly-treated liquid waste flows into the second chamber, while an equal amount flows out of the second chamber into the leaching bed or drain field. The water flowing out into the leaching bed is called effluent. It is as primary treatment.

CHAPTER 4

CASE STUDY

4.1 INTRODUCTION

The project Hotel Wakaf is develop at Lot 4060 and 262, Jalan Masjid Abidin, Kuala Terengganu, Terengganu Darul Iman. This project also is located at the town centre of Kuala Terengganu. The area to construct this project is approximately 1.67 acres. The following below is the site plan project Hotel Wakaf:

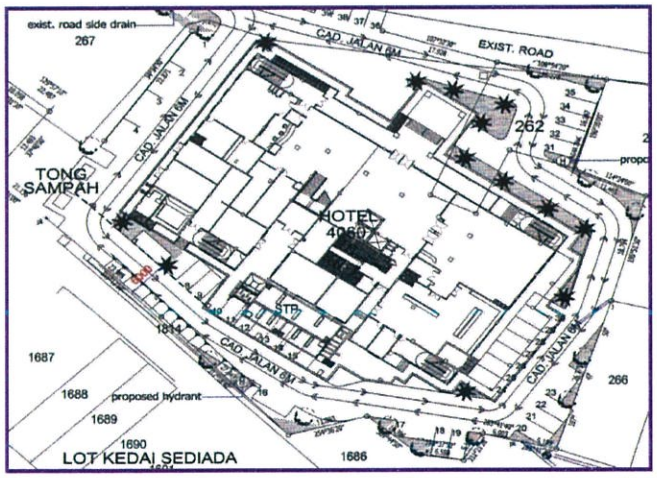

Figure 4.1: The site plan project Hotel Wakaf

The contract price for this project is RM 37,373,223.00 and the date to start this project is 17 hb. May 2010 and the date to complete this project is 02 hb. October 2011 but this project has problem at the zone D where about the Sewerage Treatment Plants (STP) has problem to construct and the effect to the others superstructure in zone D.

4.2 METHODS OF CONSTRUCTION FOR STP

Generally the methods of construction for STP is the same the others construction structure underground such as pile caps, pad and strip foundations, ground beams and column stumps because it use the same materials like concrete, reinforcement, aggregate, formworks and others. What are different is only about the shapes, function and design.

In a project Hotel Wakaf is many used spun pile with diameter 450 mm is standard size in construction. The total numbers of spun pile used is 340 piles and has 77 pile cap constructed in underground to support loading superstructure. However, what is the interesting the area to construct STP is not use spun pile to support loading structure STP.

Photo 4.1: Spun pile with diameter 450 mm to support loading

To knowing the strange of soil in the area STP the probe mackintosh tests can to do. From that we can know the strange of soil and engineer can decided what the best solution and action are to support loading structure STP.

4.2.1 SETTING OUT

In this company has two land surveyor to take measurement, level and setting out on every construction such as bridge, roadways, ground beams, pilings and other because to determine the position and level is accurate. In construction STP, land surveyor to take task to do setting out to determine the position of STP and level is accurate. From the drawing plan engineer and architect, land surveyor takes the measurement size, level and position of STP to transferring to ground.

Photo 4.2: Setting out, level and measurement by the Land Surveyor

To ensure the accurate setting out and level of the land the land surveyor commonly used the theodolite and dump level. The important of setting out and level is to avoid the mistakes during construct STP especially position and level to excavation. The land surveyor takes measure and mark to place to construct. From that, workers can know where level of land to excavate and the position of structure STP. The work also can be easy and fast to construct because the level and position we are known.

4.2.2 INSTALLATION OF STEEL SHEET PILES

Before the excavation work to do area of STP, the sheet piles is install in underground. The purpose to install sheet piles because to excavate soil is deep six (6) in underground so that the install sheet piles can avoid the soil slide down in. The following below is types of sheet piles:

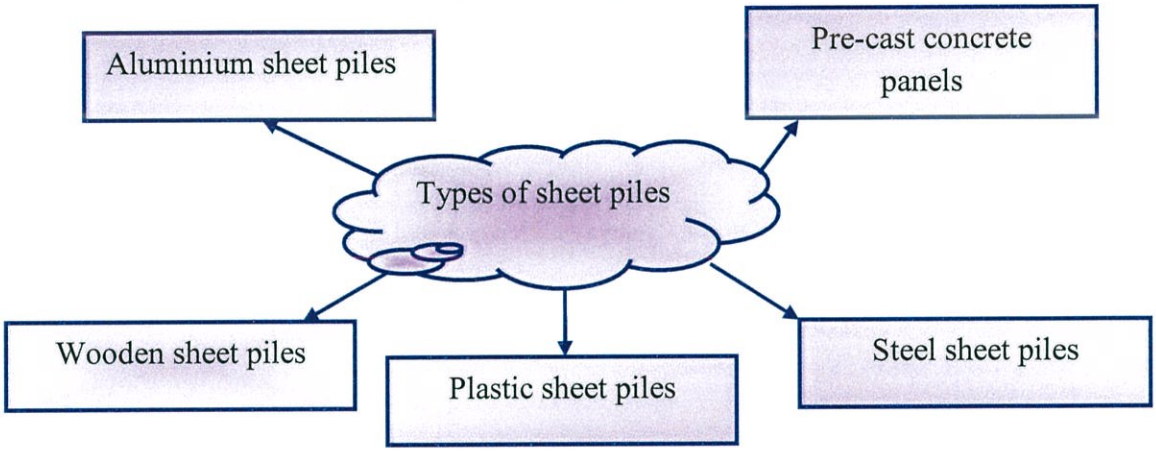

Figure 4.2.2: Types of Sheet Piles

Types of sheet pile in used this project is steel sheet piles where it only like sheet plate can which interlock the other steel sheet piles. Steel sheet pile is strange than the other sheet pile because it can be driven into soft rocks or gravelly soil and it also has high resistance to driving stresses.

Photo 4.3: The length Steel sheet piles used is six (6) meter

Usually have many size of steel sheet piles in used in construction industry but in this project used the size steel sheet plates is 310 wide x 6000 mm length x 180 mm deep Has three major equipments in used to bury steel sheet piles in underground in this project there are following bellow:

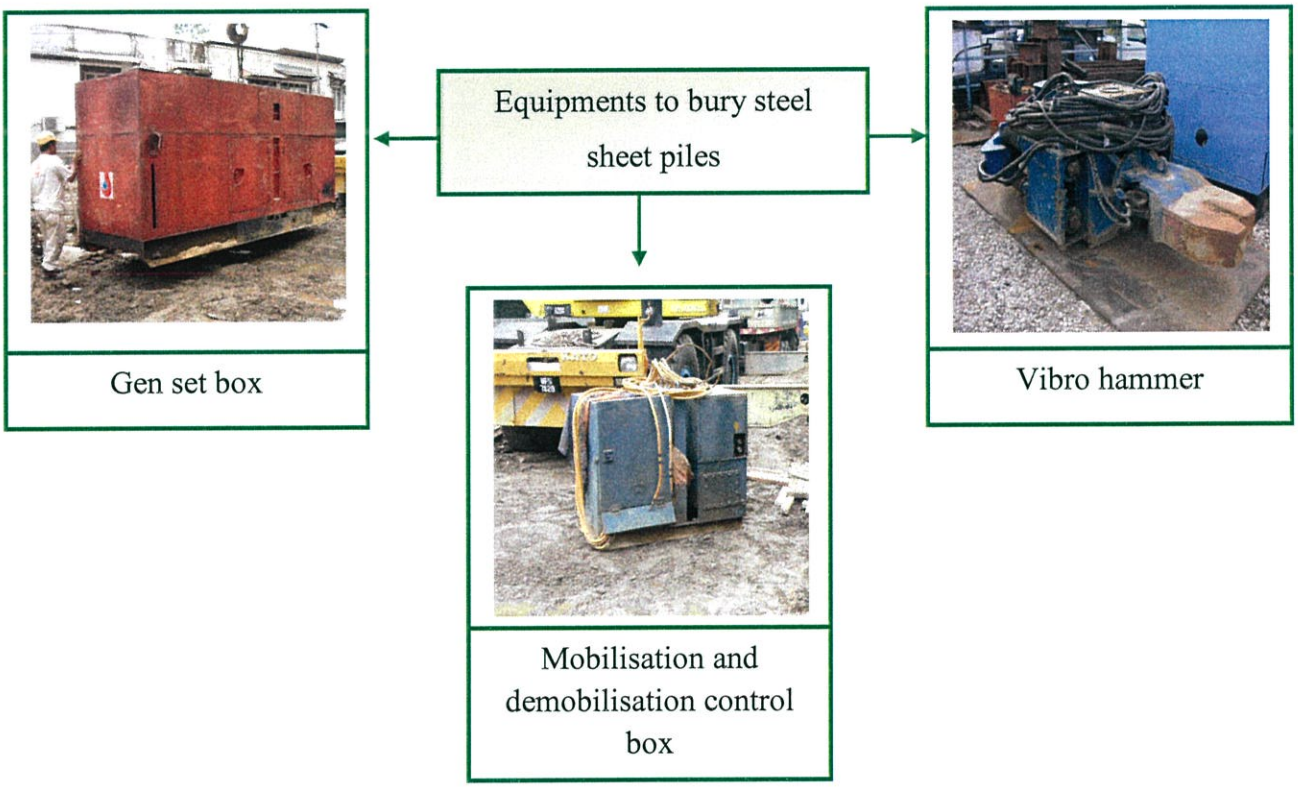

Photo 4.4: Equipment used to buried steel sheet piles at underground level

The mobilisation and demobilisation control box is control all the vibro hammer such as speed, vibrate and hand the steel sheet piles. From that, the speed of vibrate hammer depend to control box, through the button in control box. For vibrate hammer is to hold the steel sheet piles to planted in underground. Final equipment is gent set box is to generate energy to move vibrate hammer.

The mobile crane used to lift vibrate hammer with weight two (2) tan to determine the works to planted steel sheet piles. The condition of soil in area STP is rather soft land because the factor of rain. The following below is photo land in STP after rain:

Photo 4.5: Condition of soil after rain

Therefore the steel plates used to cover soil because soft land and wetland. The size steel plate used is 1532 mm wide x 6110 mm length. The following bellow is photo steel plates used in STP area:

Photo 4.6: The sheet plate lifted by the mobile crane

To planted the steel sheet piles in underground level the mobile crane used to lift vibrate hammer and also to lift steel sheet piles. The following below is photo mobile crane lifted vibrate hammer:

Photo 4.7: Mobile crane used to lifted vibrate hammer

Photo 4.8: Vibrate hammer used to vibration to steel sheet piles

4.2.3 EXCAVATION WORKS

After the install steel sheet piles, the excavation work can be run with the used excavator to excavate soil in underground six (6) meter. Generally the soil in this area is gravel and dark brown silty graded sand. The size to excavate soil in STP area is 6.00 m wide x 23.00 m length x 6.00 m deep. The excavation works take three (3) day to excavate soil. The following bellow is photo the excavation of soil:

Photo 4.9: The excavation works for the construction of STP

The soils excavated that can be put near with the area STP to determine the land that can be fill up. It so important to ensure the soil excavated is enough to covering area of STP. During the excavation works, has many water underground in area STP so that the water pump used to vacuum water that and can flowing to the drainage.

4.2.4 FORMWORK FOR SLAB

After the lean concrete work completed and take time one day to lean concrete hardens the installation formwork can be carried out. The carpenter is skill to install and cutting plywood. The size plywood is 4'' x 8'' with the thickness 7 mm for the cutting formwork is need skills because to prevent waste.

Photo 4.10: Site supervisor checking the plywood arrived in site

Photo 4.11: The carpenter do formworks follow the measurement

Black oil is used on the surface formwork in order to avoid the concrete sticking to the surface formworks after concrete hardened. The following below is photo black oil on the surface of plywood:

Photo 4.12: Black oil will use on surface of formworks

The size to cutting plywood should be consider for example the high slab STP is 450 mm , the thickness of hardcore is 300 mm compacted and the lean concrete is 50 mm, so that the total all is 600 mm. However to cutting plywood must be more to avoid the concrete overflow during concreting work.

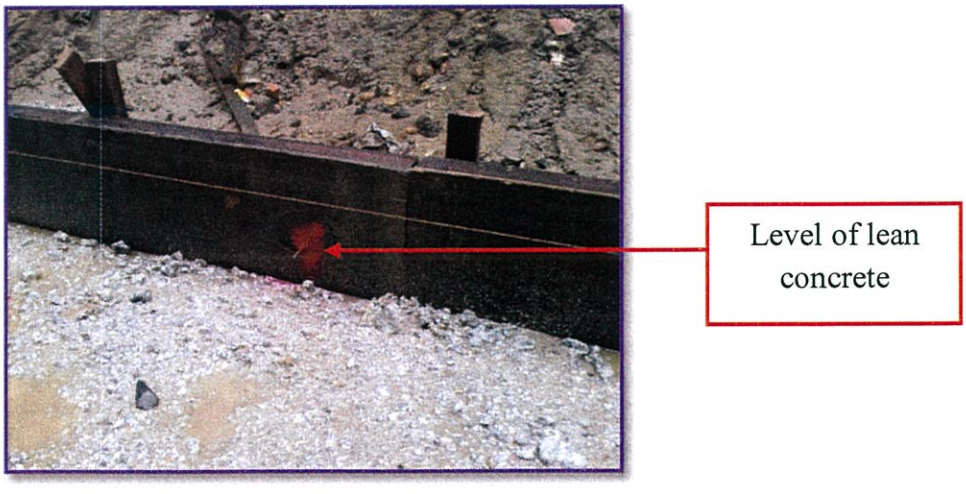

Photo 4.13: The installation of formwork for base slab

4.2.5 HARDCORE

The hardcore used a layer to covering slab and make-up material to provide a level base for slab below. Generally hardcore is category in aggregate and has many sizes aggregate in use construction but in this STP is used crusher run as hardcore. In construct STP the crusher run will be put above the soil and the sizes crusher run in used is 1-½". Crusher run that will compact 300 mm thickness in STP to ensure is all uniform.

Photo 4.14: The crusher run is put in a temporary place on site before use

Photo 4.15: The size crusher run used is1-½" and compact in STP.

4.2.6 LEAN CONCRETE SLAB

Lean concrete used in STP to provide the uniform surface to the slab and it also to prevent the slab direct contact to the hardcore. This lean concrete is used the above of hardcore as covering slab STP. Mix lean concrete consists from Portland cement, sand and water. The grade lean concrete is 15 and the ratio is 1:3 (1 part cement, 3 part sand).

The lean concrete is used as a layer below for covering substructure such as ground beams, basements, pile caps, pad foundation and others. The lean concrete in this project is order from the factory concrete because the quality of ready mix lean concrete is better than the manually. The thickness lean concrete in STP is 50 mm and for the wide and length is depending to the area to lean concrete.

Photo 4.16: Lean concreting work in STP to do by the concreter

4.2.7 THE INSTALLATION OF REINFORCEMENT FOR SLAB

After the lean concrete hardens the installation reinforcement slab can to do in STP. Commonly harden lean concrete is take time one day. To install reinforcement in STP to do by the skill workers is bar benders because to determine the joining and connecting reinforcement is properly.

Generally has two types of reinforcement used in construction there are High Tensile Rods and Mild Tensile Rods. Engineer is appointed to does calculation about the loading, strange and stability to choose the suitable size of reinforcement to construct STP. Through resulted calculation by the Engineer decided use reinforcement T16 for wall and slab.

The machine to cutting reinforcement is use the bar cutter machine where it can make easy to bar bender work. The purpose to bending reinforcement to ensure the joining and connecting reinforcement by reinforcement is strange and fitting. The following below is bending works by bar benders:

Photo 4.17: The bending reinforcement doing by the bar benders

The length slab STP is 19175 mm and wide is 6800 mm so that the measurement size of reinforcement follow the slab that. The reinforcement is T16-200 C/C and the number of install reinforcement for wide 97 reinforcement and length 35 reinforcement. The following below is photo the installation reinforcement slab in STP:

Photo 4.18: The installation of reinforcement slab for STP

At the same time the install reinforcement wall also must to do as connection for next reinforcement after concreting work slab.

Photo 4.19: The installation of reinforcement for wall

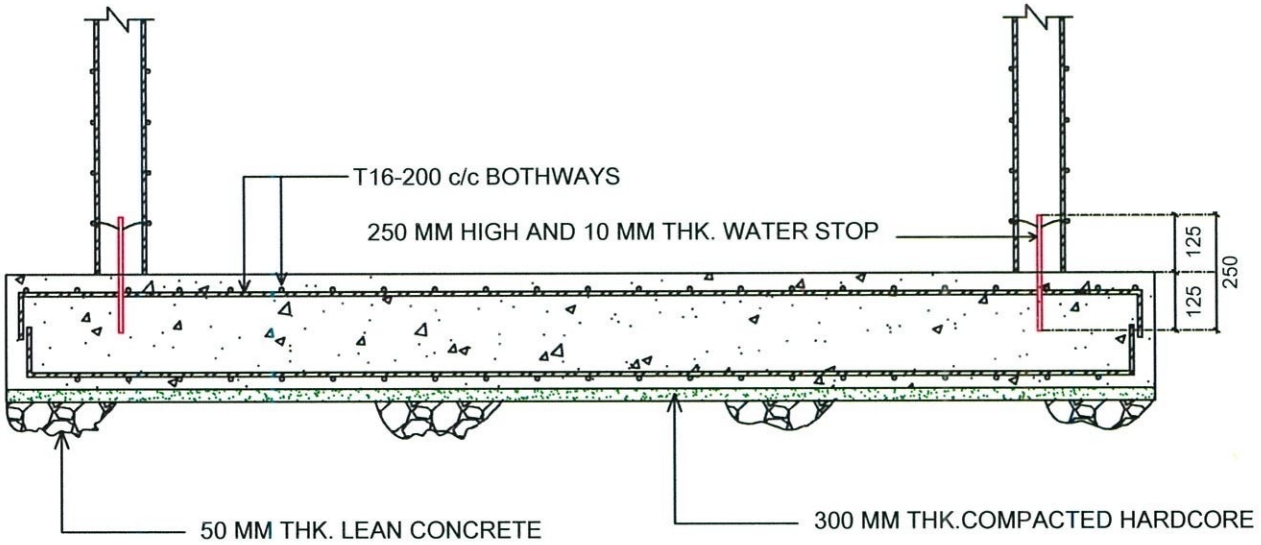

FIGURE 4.2.7 : PELAN SECTION FOR SEWERAGE TREATMENT PLANTS

SOURCE : JMJP CONSULT SDN BHD

4.2.8 SPACING BLOCKS FOR SLAB

Before the concreting work to do, the spacing blocks used to concrete cover. The thickness spacing block is 50 mm because in the drawing plan engineer has 50 mm thickness concrete cover, so that the size thickness spacing blocks follow the thickness concrete cover.

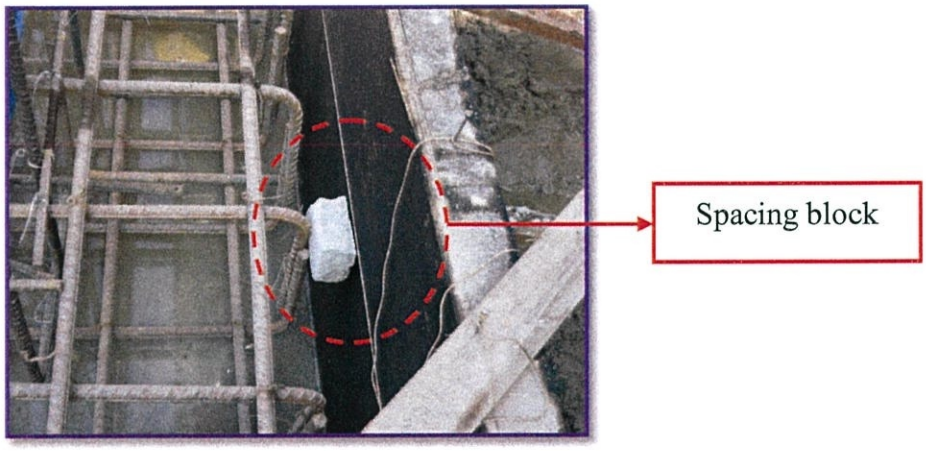

Photo 4.20: The spacing block for beside and thickness 50 mm

Generally spacing block will put at the bottom and besides because the concrete cover is has the bottom, besides and top but top not need to put spacing blocks. What are the functions of concrete cover? The concrete cover is important to structure in-situ concrete because the functions of concrete cover is to prevent the reinforcement expose the outside especially about the weather, moisture and water underground because can cause the corrosion to reinforcement.

4.2.9 CONCRETING WORK FOR SLAB

After the installation formworks and reinforcements slab in STP the JKR is responsibility to do checking every measurement, position, level, joining and connecting reinforcement, the thickness concrete cover and others in order to ensure the construction STP is correct follow the drawing architect and engineer. The following below is photo the checking by the JKR in STP:

Photo 4.21: JKR is responsibility to checking every construction STP

Has some problem when the JKR checking the slab reinforcement is about the joining of reinforcement is not correct and also the size wall formwork is not enough like in the drawing so that the carpenter should repair and improve the formwork that before concreting to do.

The grade concrete 35 used to concrete slab STP because the grade that is strange and durable materials. Concrete grade 35 is suitable to use for structure underground because the pressure of soil in underground, the water underground and the reaction chemical of soil. The concrete that is order from the factory concrete to ensure the grade concrete is good and strange. The grade concrete 35 is 1:1:6

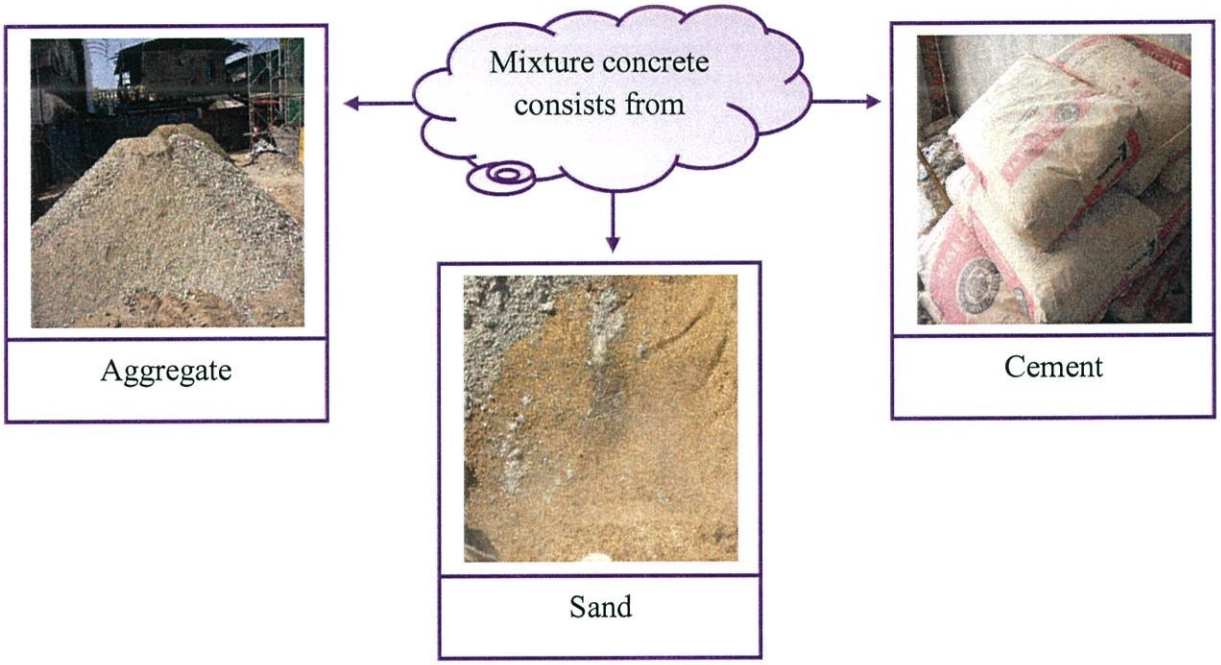

Photo 4.22: Mixture concrete from aggregate, sand and cement

Photo 4.23: Ready mix concrete

After the installation reinforcement and water stop done properly the JKR can be checking at every parts of reinforcement especially joining reinforcement to ensure the construct STP as well. The concrete STP is overall use the grade concrete 35 and it has in document contract about the grade that. The concrete is order from the factory is a company Yan Concrete Sdn. Bhd. in the Terengganu the price for $1M^3$ concrete is RM 239.00. To knowing the total order concrete STP for this slab should calculate in the M^3 there is Length x Wide x Deep. The sizes that can be take in structure plan STP and as well take the actual measurement from the site.

Photo 4.24: Concreting works for slab in STP

The calculation concrete should correct to ensure the concrete not has many excess concrete can to be wastage. Refer the drawing plan 1.0 .The calculation concrete is Length x Wide x deep: 19.175 m x 6.800 m x 0.450 m = 58.6755 m^3 the assumption is 60.00 m^3. The time order concrete should two (2) hour early before concreting works because the transportation concrete from the Gong Badak to Kuala Terengganu take time 1 hour if the traffic not jam.

4.2.10 FORMWORK FOR INTERNALL WALL

Commonly according the standard JKR the concrete slab, wall, column and others take the time three day to be completed hardens. After the three days, the formwork can be removed from the concrete slab. The installation formwork wall can be carriage on.

Refer the drawing plan Sewerage Treatment Plants section 1-1, page 44. The method to construct wall STP can be divide two construction because the high wall STP to construct is 4450 mm from the above slab below STP to end top wall. Has problem when install formwork and reinforcement direct 4450 mm because difficult to do vibrate concrete and will use many formwork. Therefore to construct wall STP should do two constructions. Firstly construct wall STP is high 2200 mm from the above slab below to middle water stop. The purpose to install water stop is to avoid water entering in STP. The installation formwork STP is first installed a part internal formwork because can make easy to bar benders install reinforcements. The following below is photo installation internal formwork:

Photo 4.25: The installation internal formwork wall in STP

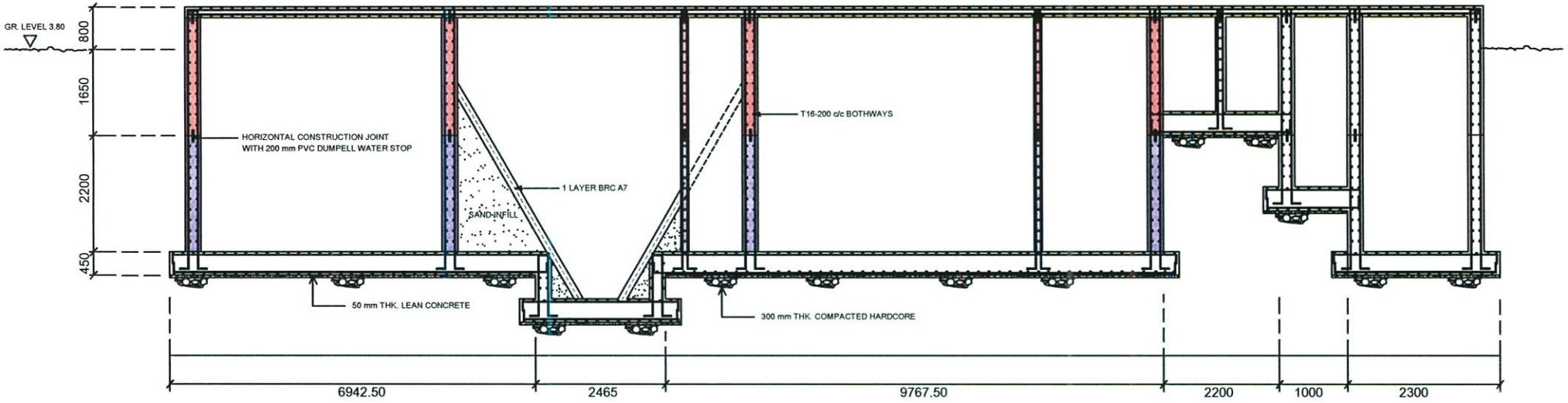

FIGURE 4.2 : SECTION SEWERAGE TREATMENT PLANTS (SECTION 1-1)

SOURCE: JMJP CONSULT SDN BHD

4.2.11 INSTALLATION OF REINFORCEMENT FOR WALL

After the internal formwork install completely the reinforcement works can be carriage out. The first installation reinforcement is vertical with used the reinforcement T16. The connection and joining reinforcement should correct to ensure the strange reinforcement to support loading. The spacing distance reinforcement to reinforcement is 200 mm centre to centre. The following below is photo the installation reinforcement wall STP:

Photo 4.26: The installation of reinforcement for wall STP

The installation reinforcement horizontal can to do when the installation reinforcement vertical completed. The spacing distance reinforcement horizontal is same with the reinforcement vertical is 200 mm centre to centre. The bar benders use strand of metal to tie reinforcement vertical and horizontal to ensure the joining is strange and to spacing distance reinforcement to reinforcement is correct.

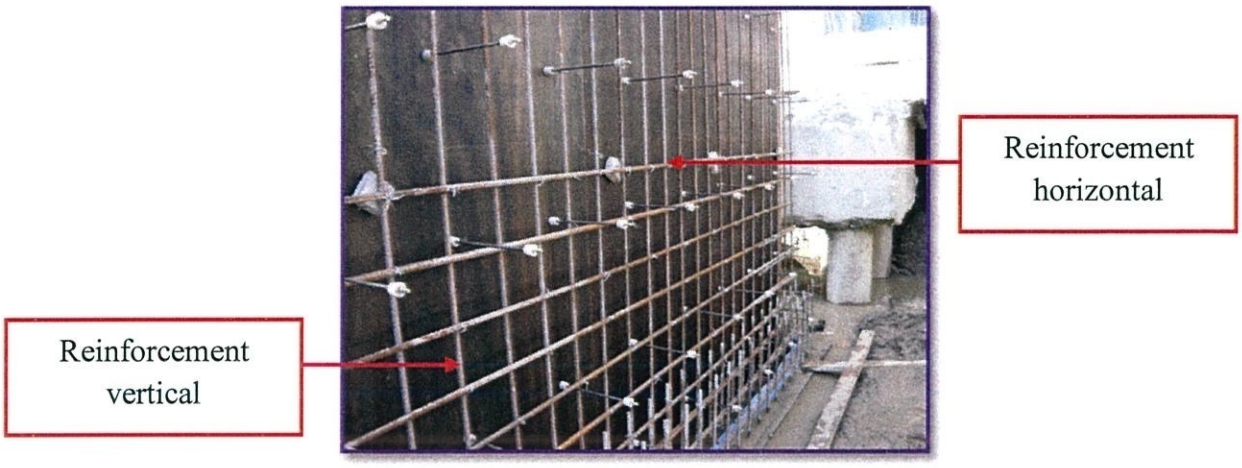

Photo 4.27: The installation reinforcement wall in STP

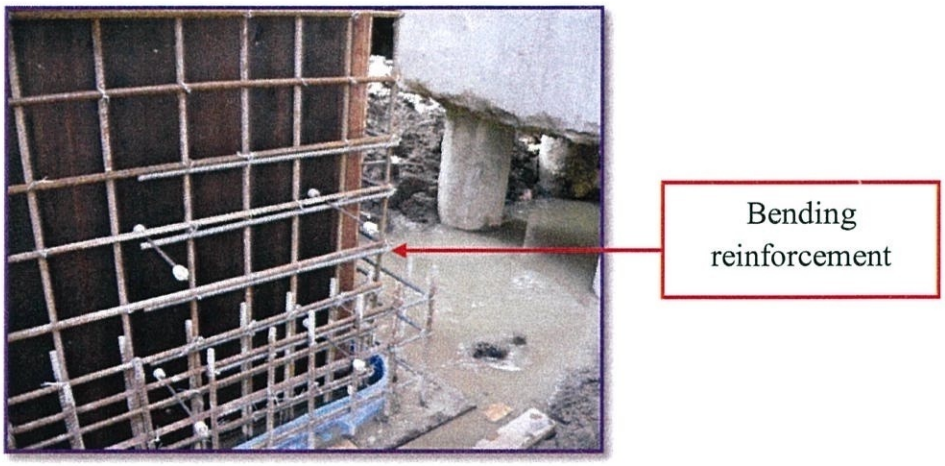

Photo 4.28: Bending reinforcement

The following below is calculation bending reinforcement:

Reinforcement wall T16-200 c/c

Bending: 10 x Diameter

= 10 x 16 mm

= 160 mm

4.2.12 WATER STOP FOR WALL

After the installation reinforcement horizontal completed the installation water stop can be installing. The main purpose install water stop is to avoid water entering in the STP. Refer the drawing plan Sewerage Treatment Plants section 1-1, page 38. The distance water stop installed from the above slab below to the middle water stop is 2200 mm. In other word, water stop should be install middle to continue concrete. The following below is photo water stop install to the wall reinforcement:

Photo 4.29: Water stop install to continue wall

Photo 4.30: Water stop install in slab below STP.

4.2.13 EXTERNAL FORMWORK WALL

The installation external wall STP is doing after the installation reinforcement and internal formwork completed. The installation external formwork is easier than internal formwork because the spacing the STP. The following below is photo installation external formwork:

Photo 4.31: The installation external formwork wall in STP

Photo 4.32: The cellular steel used as retaining formworks

4.2.14 CONCRETING WORKS FOR WALL

The concreting works do by the concreters in order to determine the concrete that properly. The concrete for wall also used the grade 35 to ensure the wall is strange and durable. The vibrate machine used to go out air in the formworks because can occur honey combing. The following below is photo vibrate concreting work and honey combing:

Photo 4.33: Vibration works to concreting

Photo 4.34: Honey combing on the surface of wall.

4.2.15 FORMWORK TOP SLAB

The installation formwork for construct top slab in STP is put plywood one by one on wood retaining to ensure the plywood that can support the loading concrete slab during concreting works. The wood retaining is install horizontal with the size wood is 2''x 5''. This wood retaining is only temporary to support loading the plywood, concrete and reinforcement. The following below is photo the installation wood retaining:

Photo 4.35: The installation wood retaining size in STP

Photo 4.36: The installation plywood on top slab

4.2.16 OPENING FORMWORK ON TOP SLAB

After the formwork top slab install completed the formwork opening will put on the formwork slab. Has a few opening should install in top slab STP. Refer the drawing plan opening STP, has many size opening should installed. The following below is formwork opening to do by the carpenter works:

Photo 4.37: The installation opening formwork on top slab

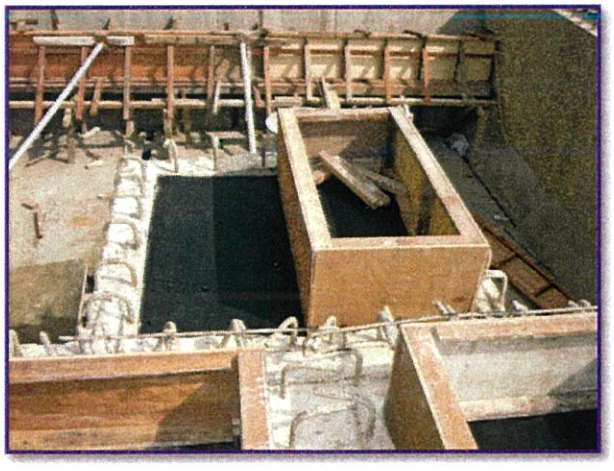

Photo 4.38: The high formwork opening is 300 mm

4.2.16 REINFORCEMENT ON TOP SLAB

The installation reinforcement top slab is same with the installation reinforcement below slab. The spacing block will put before the installation reinforcement to do because to determine the concrete cover is 50 mm thickness. The following below is photo spacing block for concrete cover:

Photo 4.39: Spacing block will put before install reinforcement

The installation reinforcement for top slab is rather complicated because in the top slab has openings and the joining reinforcement slab to the reinforcement wall STP. The reinforcement top slab is T16 which distance 200 mm centre to centre reinforcement.

The connection reinforcement to reinforcement is important to ensure the joining is strange because reinforcement can support the loading concrete.

Photo 4.40: The installation reinforcement to do by the bar bender

The installation reinforcement for part opening has some different because the installation like that not has in the drawing plan however from the resident engineer and skill worker purpose to install reinforcement that.

Photo 4.41: The installation reinforcement for opening

4.2.17 CONCRETING WORKS ON TOP SLAB

The concrete top slab STP used the grade 35 and will be concrete the all top slab exceed the formwork opening. The bucket used to lift concrete from the lorry ready mix concrete to the top slab STP. The following below is photo concrete top slab STP:

Photo 4.42: Concreting work for top slab use the grade concrete 35

Photo 4.43: Vibrate machine used to vibrate concrete

4.3 PROBLEMS ARISE DURING THE CONSTRUCTION OF STP

In every construction have problems itself which make challenge to a person which manage a project construction for buildings, bridges, highways, homes and others. Has a variety of problems in construction such as about the materials, condition of soil, loading structure, weather, labours, cost and others.

From my observation during construct STP has six problems to faces which made this construction challenge. However every problem has solution respectively. Through discussion, suggestion and cooperation every part organization in construction can be solution every problem during the construction STP. The following below is problems arise during construct STP:

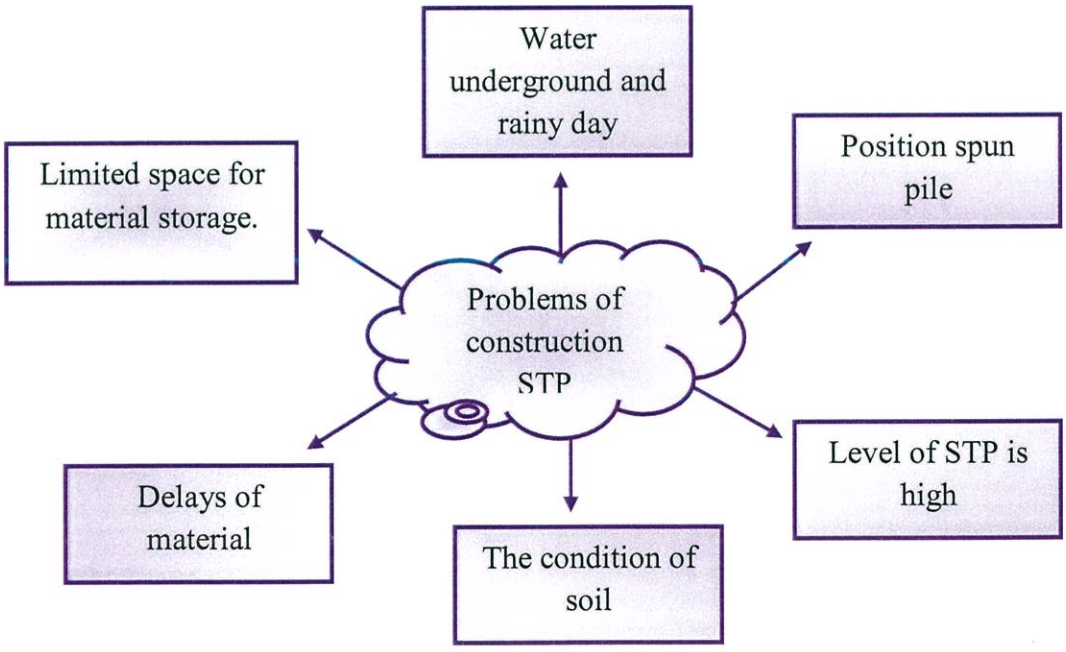

Figure 4.2: Problems arise during construction of STP at The Project Hotel Wakaf.

4.3.1 PROBLEMS ARISE DURING THE CONSTRUCTION OF STP AND ACTION TAKEN TO OVERCOME.

PROBLEM	BEFORE SOLUTION (PICTURE)	SOLUTION	AFTER SOLUTION (PICTURE)
1. Underground water and weather. During construct STP has much underground water; so that the construction STP cannot be proceed especially to put hardcore, lean concrete, reinforcement and formwork. Furthermore, the month to construction STP is November which always rainy day.	 **Photo 4.3 (i) :** The water in STP which avoid the process of work to construction.	From the discussion and suggestion between the contractor and Jabatan Kerja Raya (JKR) used water pump to vacuum water underground and flow water to the nearest drainage. The use water pump and petrol which put the cost price in the document contract.	 **Photo 4.4 (ii) :** Used the water pump to vacuum water in STP.

PROBLEM	BEFORE SOLUTION (PICTURE)	SOLUTION	AFTER SOLUTION (PICTURE)
2. The wrong position of spun pile The problem spun pile is wrong position because it near with wall STP. The problem that can difficult to install reinforcement and formwork because the space to be small. The size spun pile is 450 mm diameter and the length one spun pile is six (6) meter in underground and has three (3) spun pile used to buried underground.	 **Photo 4.3 (iii) :** The spun pile wrong position which combine the wall STP.	JMJP consult Sdn. Bhd. is appointed civil and structure engineers who recalculate the loading and weighing structure. They decided spun pile that can made pile cap and concrete combine with the wall STP so the position of STP can more stable because has spun pile to support wall STP.	 **Photo 4.3 (iv) :** The spun pile that made pile cap which increase the size of pile cap.

PROBLEM	BEFORE SOLUTION (PICTURE)	SOLUTION	AFTER SOLUTION (PICTURE)
3. Level of construction STP is high In the construction, level is very important because level can determine the high construction such as level of land, level of concrete, level of hardcore and others. However the wrong of level can occur. In the construction STP the level of STP is high more 3.80 from ground level.	 **Photo 4.3 (iv) :** The land surveyor take the measurement used the theodolite.	From the discussion land surveyor and contractor decided to add the level of superstructure because in order to determine the high of the construction follow the drawing plan architect and engineer.	 **Photo 4.3 (v) :** The level of wall STP is high.

PROBLEM	BEFORE SOLUTION (PICTURE)	SOLUTION	AFTER SOLUTION (PICTURE)
4. The condition of soil The construction of STP has problem about the condition of soil because when always rainy day soil can made soft and wet. So that, to construct STP can has problem because to support reinforcement concrete structure STP is need dry soil and strange.	 **Photo 4.3 (vi) :** The excavator to excavate the soil in STP.	Resident engineer and JKR decided to add land in the STP and use the crusher run 6'' x 9''and crusher run 1-½" as hardcore to make-up level materials for base slab of STP.	 **Photo 4.3 (vii) :** The delivery order crusher run 6'' x 9'' as hardcore in STP.

PROBLEM	BEFORE SOLUTION (PICTURE)	SOLUTION	AFTER SOLUTION (PICTURE)
5. Delays of material delivery on site The delays of material can occur in during construction because has many factors such about the costs, suppliers, transportation and others. In the construction of STP is about the transportation materials to site and also about the cost.	 **Photo 4.3 (viii) :** The formwork damage is not suitable to used.	To solution to this problem is the quantity surveyor in Sincere Image Sdn. Bhd. decided to choose other suppliers which able to supply the formwork on time and as per specification.	 **Photo 4.3 (ix) :** The new of formwork is suitable to used and also approved by JKR.

PROBLEM	BEFORE SOLUTION (PICTURE)	SOLUTION	AFTER SOLUTION (PICTURE)
6. Limited space for material storage The excavation work in area of STP is deep six (6) meter in underground. The soil that should to place in area which not has construction because not interferes with the other jobs.	 **Photo 4.3 (x) :** The limited space to put soil in STP.	The problem that can made spacing area of STP smaller. The discussion land surveyor and site supervisor decided every completed construction STP such as wall should put soil immediately. From that, the space required to stone material can be minimized.	 **Photo 4.3 (xi) :** After the excavation and every complete the parts of STP which immediately put the soil.

Table 4.1: Problems arise during the construction of STP

Source: Site in Hotel Wakaf, Kuala Terengganu, Terengganu Darul Iman.

CHAPTER 5

CONCLUSION

In conclusion the methods to construct the sewerage treatment plants is not easy and it is need a person has skills, experiences and knowledgeable to construction. During my practical training in this project, I have gained much knowledge about the construction, so that I understand it not easy to construct a building because has many problems arise during construction. I am so impress to noticed that the site supervisors, site engineer, resident engineer, contractor, quantity surveyor, land surveyor and others, they very responsible and confident in choose the best alternative to solution when they has problems. What important I learn from them is about the time management. In construction industry, time is so important because to manage a project it is really needs any works can complete on time. When site supervisor cannot manage their time can has problems because has many sub-contractors in under main contractors how the site supervisor to observe and look after every parts construction which do by sub-contractors. During I practical the site supervisor give me leaning how to handle sewerage treatment plants, from that I always look after the construction of sewerage treatment plants. When any problem occur in the construction of sewerage treatment plants I try ask to site supervisor because I need opinion and suggestion from him. From that, I know what the best alternative to solution from problem that.

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