



DEPARTMENT OF BUILDING
UNIVERSITY TEKNOLOGIMARA
(PERAK)

**CONSTRUCTION OF SEWERAGE PIPELINE NETWORK AT JALAN
MAMANDA 11 TO JALAN KABUS, AMPANG.**

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It is recommended that the report of this practical training provided

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Entitled

**CONSTRUCTION OF SEWERAGE PIPELINE NETWORK AT JALAN MAMANDA
11 TO JALAN KANBUS, AMPANG.**

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FEBRUARY 2022

STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references stated herein, prepared during a practical training session that I underwent at PDP UTEK (M) Sdn. Bhd. for duration of 20 weeks starting from 23 August 2021 and ended on 7 January 2022. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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Finally, I am thankful for both of my parents who always being there and supporting for me.

ABSTRACT

Sewerage pipeline network system is important as it helps to carry sewage from the community to the sewerage treatment centre. Therefore, this report will discuss about the aspects of sewerage pipeline network construction. This report is based on the construction of pipeline network in Jalan Mamanda 11 to Jalan Kabus, Ampang. More than that, this report also will discuss about the working of the sewerage system, the suitability of the type of pipe that has been chosen in this project, and the method used to install the sewer pipes. All information from this report is from the documentation analysis and interviews that conducted with the help of in charge engineers. At the end of this report, it will show the importance of choosing the right type of sewer pipe and the method to construct the pipeline network.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

Sewerage pipeline network system is defined as a conglomeration of pipes that work together to collect from the population or industrial centres to off-site treatment (Trenchless, 2021). In addition, sewerage systems are made up of service branch lines that feed into reticulation mains from individual dwellings. Pump stations and trunk sewers feed the mains, which lead to treatment plants. Other than that, it is impossible to monitor an underground pipe so as a consequence, those pipelines are designed to use gravity system (Icon Water, 2016) which will make sewage flow through those pipes without any problem. However, if there is a case where the quantity of sewage is increases, sewage pumps are used to push the sewage through the pipes.

Sewage is the water that has been affected in quality by anthropogenic influence wastewater by domestic residences, commercial properties, industry, and agriculture activity. It is basically waste or unneeded water released from household or industry field after various purposes like washing dishes, laundry, manufacturers process, gardening and more. Back then, sewer waste is released into the ocean without any treatment which have caused sewage pollution that created a dangerous threat not only to human but as well as animal and aquatic life. As this problem occurred, sewer water needs to have a systematic system where all sewage is collected accordingly before being treated in the Sewerage Treatment Plant, STP. Therefore, sewerage pipeline network system is built.

However, to make a successful sewage pipeline network process, a good piping system is essential to ensure the sewerage system work accordingly. To accomplish this, a suitable type of sewerage pipe and suitable pipe laying method in sewerage pipeline network system is important as it will ensure higher rate of effectiveness.

The type of pipe in the sewerage pipeline network is important as each type of sewer pipe has their own uses. Noted that not all type of sewer pipes is suitable for every sewerage construction. Starting from type of soil, site condition and others necessary aspects of sewerage installation legislation need a specific investigation in order to avoid any future damages when sewerage system starts their operation.

As for the method of installation of sewer piping system, pipe jacking and open cut method is the method that always been used in sewerage construction to install the sewer pipe. Pipe jacking is a trenchless method to install sewer pipe where a machine called hydraulic jack machine is used to push the pipe into ground. Specifically, pipe jacking has two types of method which are slurry method and manshield method. Slurry method is a method where soil is pumped out by slurry pipes before undergoing separation process in the slurry separation tanks while manshield method, labours are instructed to do manual excavation once the sewer pipe has been jacked into ground. Pipe jacking has many importance as, it helps to provide continuous ground support. Regarding to that, it also helps to reduce any congestion as pipe jacking only stay from one pit to another. After that, Open cut is an old way to install sewer pipe by excavating the soil according to the specific depth. This method is involved a long excavation through the site location to lay down the pipes. Open cut is suitable for larger surfaces as it needs space to undergo the construction process. Moreover, this method has the simplest construction process, and it is also more affordable than other methods.

It is undeniably that there are many types and method for sewerage pipeline network system. However, the aim of this report is to discover the construction of sewerage pipeline network by using the chosen pipe with two different laying method which is pipe jacking: slurry method and open cut method in the residential area.

1.2 Objectives

The objectives in this case study report is as follow.

- I. To explain the working of sewerage system in general
- II. To identify the type and reason for the chosen piping type adopted in the project
- III. To explain the method of construction of the chosen piping type in sewerage system

1.3 Scope of Study

The construction of sewerage pipeline network is taken place residential area in Jalan Mamanda 11, Selangor to Jalan Kabus, Selangor. Sewerage system has its own system on how it operates regularly in order to achieve a full working operation and sewer wastes undergo few operating stages in the sewerage operation system. First of all, it will deepen on the knowledge of how a sewerage system in Malaysia working according to the Indah Water Konsurtium, IWK system operation. After that, it will discuss about the type of pipe chosen to be installed in the sewerage pipeline network construction since the ability of sewerage pipeline network also depends on the type of the sewer pipe. Therefore, the type and reason of the chosen pipe important to maintain the sewerage system effectiveness. More than that, in order to lay sewer pipes, there are multiple steps that need to be followed to ensure the sewer pipes are successfully installed. In consequence, this report will describe about the methods used to install the sewer pipe specifically according to their sequence in the construction.

1.4 Method of Study

1. Interview – a lot of interviews were taken to collect the data and information related to this case study which they are closely involved in construction of pipeline network. More than that, the interviewees are among Pdp Utek workers starting from Quantity surveyor, Site Engineer and Professional Engineer. All the interviewees are interviewed in the office or in official social media for example in WhatsApp.

2. Documents review- all important documents were recorded and is being kept safely under the security of PDP UTEK which make it easier to refer. Referred documents are included progress report, construction drawing, invoices, claims and pictures taken during the construction process.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company



Figure 2.1 Logo of Pdp Utek (M) Sdn. Bhd.
Source: Pdp Utek (M) Sdn. Bhd (2002)

Pdp Utek (M) Sdn. Bhd. which located in Kuala Lumpur is a full Bumiputera Specialist Contractor who will maintaining a supervision and quality control mainly for pipe jacking construction and other requirements of underground utility. In 2002, Pdp Utek (M) Sdn. Bhd. is established with a wonderful team named Dato Ts. Shahrin Bin Sabu as Managing Director, Noor Zamri Yaacob as Executive Director and both are main shareholders of PDP UTEK (M) SDN BHD. More than that, the authorized capital of Pdp Utek (M) Sdn. Bhd is RM 500, 000, 00.

“Towards Global Competitiveness Through Quality Excellence & Committed Services To The Industries” is chosen as main mission as Pdp Utek (M) Sdn Bhd aim to provide a services for every clients with an excellence and professional quality excellence in other to bring the Malaysia’s construction industry into the global recognition. There are three Vision in Pdp Utek (M) Sdn. Bhd. which are first; *“Contribute To Industry By Providing Efficient & Quality Services”*, two; *“Consistently Improves & Develop Our Technology To Meet The Needs of The Industry”* and three; *“Provide Training Within & Outside Our Organization In The Area of Underground Utility Management”*

2.2 Company Profile

Pdp Utek (M) Sdn. Bhd. is located at Block C, No 7-5-1, Tingkat 5, Jalan Semarak Api 2, Diamond Square, Off Jalan Gombak, 53000 Kuala Lumpur. The company has started their journey since 2002 with the paid capital cost up to RM 300,000. Any information about can be discovered at their own websites which with the URL <http://trenchless solution.com.my/index.php>. If there are any inquiry, client can refer to their official hotline number at 03-4022 2867 or email the at pdputek@gmail.com.



Figure 2.2 Location of PDP UTEK (M) SDN BHD.
Source: Google Maps, 2021

Pdp Utek (M) Sdn. Bhd owned G5 license which make them able to take not exceeding 5 million worth projects. Usually, Pdp Utek (M) Sdn. Bhd offers good services which involves in trenchless construction. Specifically, in Pdp Utek (M) Sdn. Bhd. provided variety of services mainly involving underground structures and asset management as for instances installation of underground structure using trenchless method, dilapidation survey, soil investigation, design and implementation of Traffic Management Plan (TMP), topographic survey, Instrumentation handling and to supply M&E equipment and building material. (Figure 2.3)



Figure 2.3 Services in Pdp Utek (M) Sdn. Bhd
Source: Pdp Utek, 2002

2.3 Company Organization Chart

In Pdp Utek (M) Sdn. Bhd. there are four main power that help to control the management system in the company. Starting from Managing Director who will in charge to control workflow, budgets and regulating expenses of the company. Meanwhile, Executive Manager is responsible to overseeing the projects and activities in the office. Then, Project Director who will manage all the company's project from initial process until the end. After that, Project Manager who will help to overseeing finance and ensuring the project's quality. Others important position in Pdp Utek (M) Sdn. Bhd. are Contract, HR & Admin and Operation. Flow chart below shown the organization chart of Pdp Utek (M) Sdn. Bhd as in 2021 (Figure 2.)

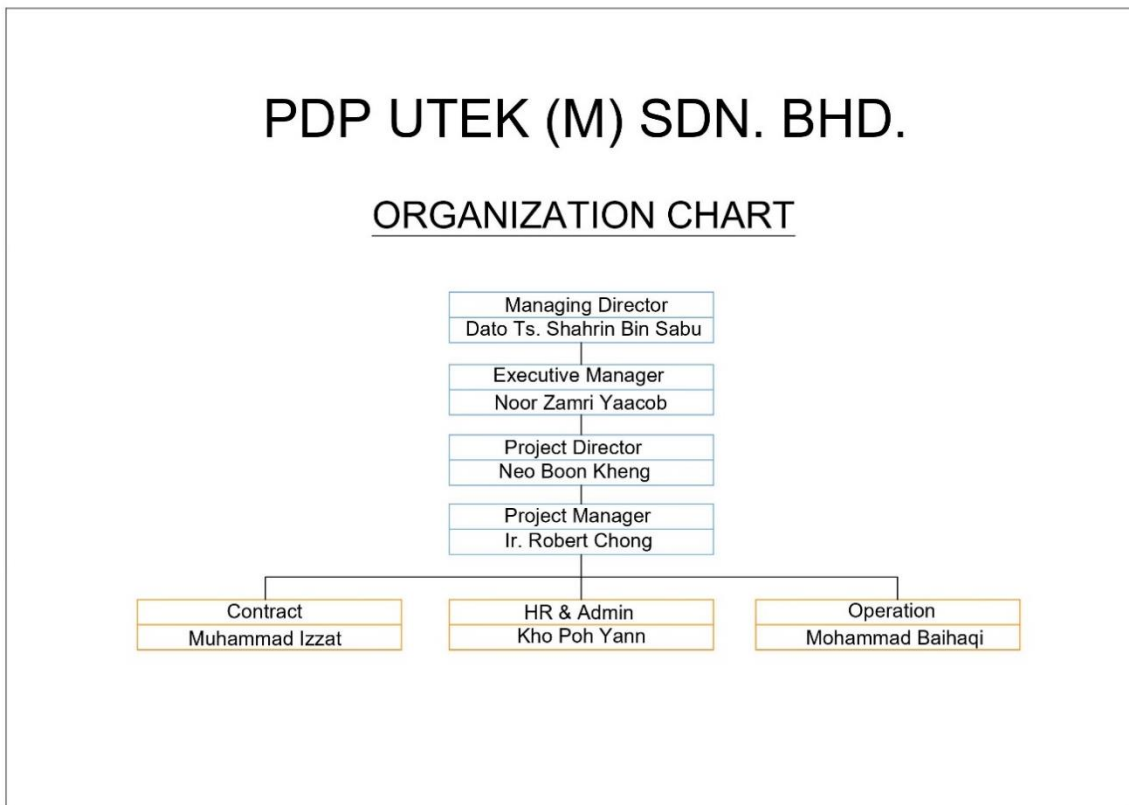


Figure 2. Organization Chart of PDP UTEK (M) SDN. BHD.
Source: Pdp Utek (M) Sdn. Bhd organization chart (2018)

2.4 List of Projects

2.4.1 Completed Projects

Table 2.1 shown the list of completed project in Pdp Utek Sdn. Bhd.

Item	Project Title	Client	Contract Value	Status Of Completion
1.	Installation Testing & Commissioning Of 33kv Aluminium Xlpe Single Core Underground Cables And Accessories At SSU Cuepacs, For TNB Distribution, Selangor. ~Sub-Contractor For Survey & Underground Utility Mapping	Jati Tinggi Sdn. Bhd.	25,655.00	100%
2.	Cadangan Meningkatkan Perparitan Secara 'Pipe Jacking' Menyeberangi Jln. Cheras Dari Kalbat Sediada Ke Longkang Sungai Krayong, Berhampirann Dengan Persimpangan Jalan Mutiara Barat Dan Jalan Cheras, Mukim Kuala Lumpur. (2014/A184) ~Sub-Contractor For Pipe Jacking Work	Alfa Ehsan Sdn. Bhd.	1,658,500.00	100%

3.	<p>Kerja-Kerja Menaiktaraf Sistem Saluran & Kerja-Kerja Yang Berkenaan, Di Bandar Rawang Fasa 2</p> <p>~Sub-Contractor For Survey And Pipe Jacking Work</p>	Tasek Menara Sdn. Bhd.	800,000.00	100%
4.	<p>Pakej D44- Pembinaan Rangkaian Paip Pembentungan Di Bunus, Kuala Lumpur. (Reka & Bina)</p> <p>~Sub-Contractor Works- Pipe Laying & Pipe Jacking Construction Work (Zone 1)</p>	Puncak Niaga Construction Sdn. Bhd.	4,926,428.00	100%
5.	<p>Projek Membina Structur Kawalan Banjir Serta Kerja-Kerja Berkaitan Di Taman Mesra, Shah Alam Daerah Petaling, Selangor Darul Ehsan.</p> <p>~ Sub-Contractor Works</p>	Rh Mutiara Sdn. Bhd.	688,000.00	100%

Table 2.4.1 Completed Projects

2.4.2 Ongoing Project

Table 2.2 shown the list of ongoing project in Pdp Utek Sdn. Bhd.

Item	Project Title	Client	Contract Value	Status Of Completion	Target Complete
1.	<p>Pakej D43- Pembinaan Rangkaian Paip Pembentukan Dan Rasionalisasi Loji Rawatan Kumbahan Di Batu, Jinjang, Kepong</p> <p>~Sub-Contractor Work: For Supply And Welding Of Hdpe Pipe</p>	Ban Hin Electrical & Construction Sdn. Bhd.	358,038.00	95%	Dec 2018
2.	<p>Cadangan Pembinaan Langat Centralsed Sewage Treatment Plant Dan Penyambungan Rangkaian Paip Pembentukan Kawasan Tadahan Sg Langat</p> <p>~Sub-Contractor Work: Gravity Sewer Work For Health Clinic Batu 9 And Sekolah Menengah Sultan Abdul Aziz Shah</p>	MMC Pembentungan Langat Sdn. Bhd.	1,375,581.00	98%	March 2019

3.	Pembinaan Rangkaian Paip Pembentngan Di Kajang Untuk Tetuan Jabatan Perkhidmatan Pembentungan ~Sub-Contractor Work: Pipe Jacking of RCPG pipe	Puncak Niaga Construction Sdn. Bhd.	1,260,890.00	95%	May 2019
4.	Cadangan Pembangunan Rumah Kedai Di Pekan Sg. Besi Lama Untuk Tetuan Dbkl ~Sub-Contractor Work	Dewan Bandaraya Kuala Lumpur (DBKL)	4,717,000.00	98%	July 2019
5.	Pakej Dd4- Pembentungan Rangkaian Paip Pembentungan Di Bunus, Kuala Lumpur ~Sub-Contractor Works: Retionalisation And Decommissioning Works.	Puncak Niaga Construction Sdn. Bhd.	3,870,00.00	10%	March 2020

Table 2.4.2 Ongoing Projects

CHAPTER 3.0

CONSTRUCTION OF SEWERAGE PIPELINE NETWORK IN JALAN MAMANDA 11 TO JALAN KABUS, AMPANG

3.1 Introduction to Case Study

Construction of sewerage pipeline network in Jalan Memanda 11 (Figure 3.1) to Jalan Kabus, Ampang (Figure 3.2), is a domestic sewerage pipeline network to collect the sewer from the local residential area to the network pumping station and further to Sewerage Treatment Plant, STP. The main contractor of this sewerage project is Puncak Niaga Construction Sdn. Bhd. The total length of piping network is 2.13Km starting from AMA052 (NPS) Jalan Memanda 11 to AMA010 (NPS) Jalan Kabus. The whole value is RM12,217,840.00. On 6 February 2017, Pdp Utek has been awarded as the sub-contractor to carry out the project to install forcemain sewerage pipes as per approved design and method of construction by the consultants and Indah Water Konsortium (IWK). The works commence on-site on 14 Jun 2017 after a few months of design, survey, planning and preparation work (Figure 3.3). This project is completed on 27 September 2019.



Figure 3.1 Jalan Memanda 11

Source: Google Maps, 2021



Figure 3.2 Jalan Kabus
Source: Google Maps, 2021



Figure 3.3 Construction Drawing for Pipeline Network
Source: Pdp Utek AMA052 Drawing compilation, 2017

The pipe chosen in this sewerage pipeline network is Glass Reinforced Plastic, GRP. Generally, composite material that consists of a polymer matrix and glass fibres. Glass Reinforced Plastic is chosen as the main pipe in this construction is because it suits all categories and satisfy every aspect needed in the project as Glass Reinforced Plastic pipe is widely known for their advantages.

In this sewerage project, there are 21 pits designed and proposed to complete a whole pipeline network (Figure 3.4) however there are two existing methods used in this project. Noted that manholes are not needed in this construction as this is forceman pipe installation which will only use pit construction to install pipes. The first method of this project is pipe jacking: slurry method (Figure 3.5) and open cut (Figure 3.6) method. Pipe jacking: slurry method is a trenchless method to install pipes or utility underground by applying hydraulic jack machine forces and all excavated soil will be transferred to a separation slurry tank where it will divided into two part which is solid part and liquid part meanwhile open cut method is a pipeline installation that requires opening up ground surfaces to lay down the pipe. More than that, the total length to use pipe jacking and open cut method is 1.12Km and 1.01Km respectively.

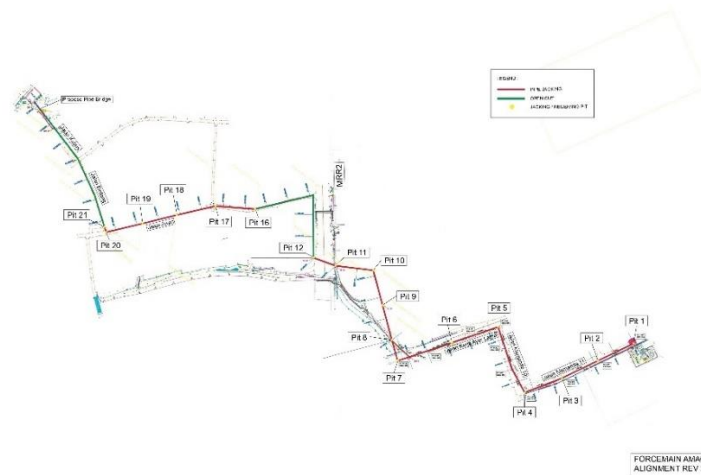


Figure 3.4 Construction drawing for pipeline pits
 Source: Pdp Utek AMA052 Drawing compilation, 2017



Figure 3.5 Pipe Jacking Construction in Jalan Memanda 11

Source: Pdp Utek AMA052 monthly report, 2017



Figure 3.6 Open Cut in Jalan Kabus

Source: Pdp Utek AMA052 monthly report, 2018

Furthermore, this case study focuses how sewerage system works in general. Moreover, this case study will give all details about the reason why Glass Reinforced Plastic pipe is chosen as the main pipe in this sewerage construction. After that, this project also will provide step-by-step explanation of how to lay pipes from beginning until the end using to pipe jacking: slurry method and open cut method.

3.2 The Sewerage System

Sewerage system is one of the most important infrastructures in every country in the world and this is including Malaysia. Sewage is the mixture of water and some ions, solid waste or harmful material that flow from domestic and industrial waste. In other to solve this problem, sewerage system is built in order to collect and transport sewage from both residential and industrial area. So, in general sewerage system is a network of pipes to collect sewer or wastewater or either from community or from industrial waste (Figure 3.7). To make a sewerage system work perfectly, a complete sewerage system complete with pumping station, underground sewer pipes, necessary equipment are needed to carry the waste to Sewage Treatment Plant, SWP.

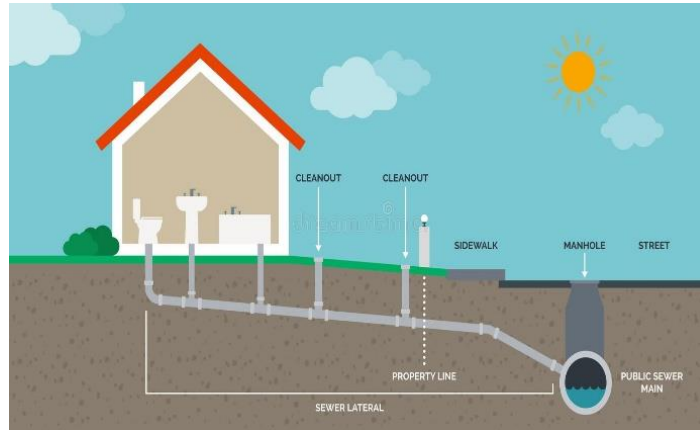


Figure 3.7 Sewerage System

Source: Dreamstime, 2012

In order to make sewage system function accordingly, sewer waste is processed through these few important steps. Firstly, sewage from the residential or industrial area will be pumped out from homes and buildings through sewer pipe. Next, sewer waste will go through a process called primary test which sewage is stored in a tanks or basin where solid waste like plastics, bottle, diapers, etc. will sink to the bottom of the tank while material that has lower density like oil will rise to the top of surfaces. After that, sewer waste will go through secondary treatment which will help to remove dissolved and suspended biological matter by using aerobic bacteria which consume organic components in the sewage. After secondary treatment, sewage then flows into treatment plant where oxygen is added to the water to activate the growth of microorganisms. The function of these microorganisms is to consume 90% of human’s leftover waste that settled down deep down in the tanks. This process is taken up about 20-25 minutes to ensure there are no bacteria in the water. Meanwhile, the remaining water is disinfected and filtered into local lakes or ocean (Figure 3.8)

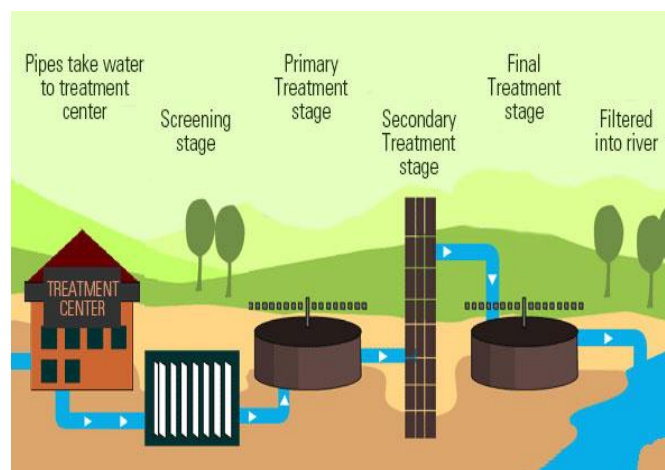


Figure 3.8 The process of sewer waste system

Source: Eibik, 2021

In addition, there are two types of sewerage system in Malaysia and each of the type has their own uniqueness and importance. The first type of sewerage system is separate system (Figure 3.9). Separate system consists of two different pipes which are sewer pipe and rainwater pipe. One will carry stormwater from the storm drain while the other one will carry sanitary sewage to the Wastewater Treatment Facilities. Separate system can help to prevent any overflow of sewer system and treatment station as both pipes are connected differently according to their network station, but this type of sewerage system is not suitable for congested area as it needs larger space to install the system. Moreover, combined system (Figure 3.10) is a type of sewerage system where both domestic and industrial waste will be using the same pipe. It is the easiest and simplest way to collect sewer waste from community. However, since only one pipe is carrying both wastes it is prone to have overflow or leaks which may spoil public hygiene.

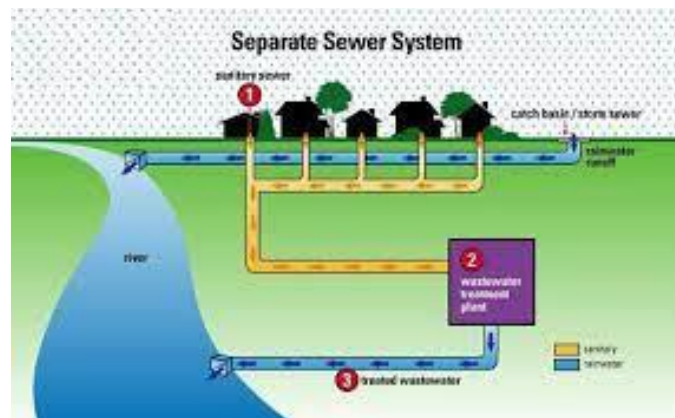


Figure 3.9 Separate sewer system

Source: Medium,2018

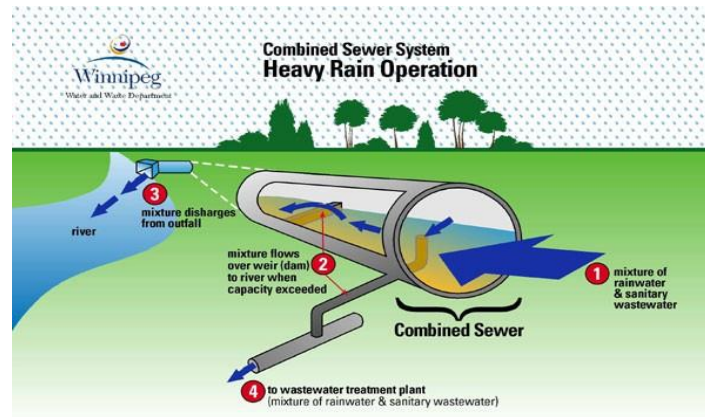


Figure 3.10 Combined sewer system

Source: Medium, 2018

Sewerage system helps people to transport the sewage away from their places. Therefore, sewer system must be functioning well to avoid pollution and viruses around community. In nutshell, sewer system is important as it will ensure community safety and as well as hygiene.

3.3 Type of Sewerage Pipes

Sewerage pipe is a conduit for the elimination of waste materials. As mentioned frequently, sewerage pipes come in various type and size which designed perfectly according to the stated specifications in British Standard (BS). In general, the most basic use of sewer pipe is to transport all wastewater or sewage across the city produced by community usually from residential and industrial area. More than that, all sewage from sewer pipelines will be carried to local utility company to be treated with specific chemicals.

In Malaysia, there various type of sewerage pipes. For example, Reinforced Concrete Jacking Pipe, RCJP, Mild Steel Cement Lining Pipe, High density polyethylene pipe, HDPE, polyvinyl chloride Pipe, PVC and Vitrified Clay Pipe, VCP and Ductile Iron Pipes, DI Pipe and more. However, for construction in Jalan Mamanda 11 to Jalan Kabus, Ampang used a high-quality sewerage pipe which are Glass Reinforced Plastic Pipes (GRP).

Glass Reinforced Plastic, GRP pipes is a commonly used in sewerage project since 1992 especially in Middle east, South Asia and Africa. Specifically, Glass Reinforced Plastic pipes are composite material pipes consisting of a polymer matrix that is reinforced with glass fibre

and because of that, there are many reasons Glass Reinforced Plastic pipe is chosen as one of the sewerage pipelines networks in Jalan Mamanda 11 Selangor, to Jalan Kabus, Selangor.

In this construction, there are two different Glass Reinforced Plastic used for open cut and pipe jacking method which are Uniaxial Pipes (Figure 3.11) and Pipejacking pipes (Figure 3.12) respectively. Uniaxial Pipe is 12m long and it is designed for underground installations where support is provided by the surrounding soil and the bedding. These pipes are primarily used for transferring sewerage with pressure ratings up to 32bars while Pipejacking pipes is 2m long are used in trenchless construction in sewerage transfer, gas mains and oil pipeline application. The common feature about these pipes is both pipe have 900mm inner diameter. However, even though there are two different Glass Reinforced Plastic pipes used in this sewerage pipeline network construction, both pipes have the same functions and benefits.



Figure 3.11: Unaxial Pipe

Source: Faratec, 2016



Figure 3.12: PipeJacking Pipe

Source: Faratec, 2016

There are many reasons Glass Reinforced Plastic pipe is chosen as the sewer pipe in this sewerage pipeline network construction. First, Glass Reinforced Plastic pipes have higher corrosion resistance for both external and internal properties which mean, Glass Reinforced Plastic pipes are well suited for conveyance of corrosive liquid that came from community of the residential area and Glass Reinforced Plastic pipes also no need to apply coatings, cathodic protection, wraps or other forms of corrosion protection. Plus, Glass Reinforced Plastic pipes are made from polymer matrices and fibre glass which make Glass Reinforced Plastic pipes have an excellent toughness and adhesion which help Glass Reinforced Plastic pipes to have a longer life span approximately about fifty years. After that, outer and inner surface of Glass Reinforced Plastic pipes are smooth and clean which decrease the friction force to lay and jack the pipes into the ground and to minimize the cleaning cost of the construction and able to help to make the flow rates or sewage in the residential area move smoothly.

More than that, Glass Reinforced Plastic pipes comes with a precision coupling with elastomeric gaskets for underground structure. Regarding on this matter, Glass Reinforced Plastic pipes have tight and efficient joint designed to eliminate infiltration and exfiltration so that it can smoothen the process of pipe jointing and accommodates small changes in line direction without any fittings and differential lining projects. In addition, Glass Reinforced Plastic pipes also have been through multiple of qualification test such as stiffness determinations, deflection test, strain corrosion and ensure the Glass Reinforced Plastic pipes follow the universal standard.

As mentioned earlier, there are many types of sewerage pipe. However, to construct a good sewerage pipeline, it is essential to choose a suitable and applicable type of sewerage pipes. This is because, domestic waste could be in any shape and form such as liquid, solid or sludge contain chemicals, heavy metals, radiation, pathogens, or other material that contain toxic elements that able to harm both human and animal if these gases are released. As for this construction of sewerage pipeline network in Jalan Mamanda 11 to Jalan Kabus, Glass Reinforced Plastic pipe is chosen as the main piping system for sewerage system in the residential area.

3.4 Method of Sewerage Pipes Laying

A. Pipe Jacking Method

In this sewerage pipeline network construction, starting from pit No. 1 to pit No. 21, pipe jacking: slurry method is used to install the Glass Reinforced Plastic pipes. Slurry method is one of the pipe jacking method which involve Tunnel Boring Machine (TBM) to excavate the underground soil. The excavated soil produced by the Tunnel Boring Machine will transferred out by slurry pipe before undergo slurry separation process where liquid and solid that came from the excavated soil in the prepared slurry separation center. There are total six steps in pipe jacking; slurry method which are setting out and piloting works, excavation and dewatering, jacking pit, pipe jacking, backfilling, reinstatement and clean-up. The description of these step's description are as follow.

1. Setting Out and Piloting Works

In pipe jacking method, setting out need to be carried out to determine the correct alignment and level to install Glass Reinforced Plastic pipes. This is because, in order to construct a proper thrust wall and base slab need an accurate data and calculation approved by engineers. Plus, by setting out process, it is much easier for engineer to set up hydraulic jack machine against the concrete thrust wall. Next, piloting works need to be done allocate the utilities underneath underground to avoid any damages in future (Figure 3.13). The surveyor must mark out the alignment and position of the pipeline in accordance with the design approved by Indah Water (IWK). After setting out and piloting documentation has been prepared, it will be submitted to resident engineer for further action.



Figure 3.13 Setting out and piloting works

Source: Pdp Utek AMA052 monthly report, 2017

2. Excavation and Dewatering

Once setting out and piloting result and documentation has been approved by appointed engineer, contractor can start the construction work by placing H-beam on the ground to form a rectangular ring as a guide to install the sheet piles. Next, sheet piles are driven into the ground according to the required depth approved by vibro-hammer (Figure 3.14) while being held in the position by the H-beam. After installing sheet piles around the pit, excavation can take place on the site. In this project, excavated depth for pipe jacking is in the range of 4-6m according to soil condition (Figure 3.15). As for the dewatering process, if the water level increases, water pump is used to extract all excess water from the previous excavation.



Figure 3.14 Driving sheet piles

Source: Pdp Utek AMA052 monthly report, 2017



Figure 3.15 Excavation pipe jack pit

Source: Pdp Utek AMA052 monthly report, 2017

3. Jacking Pit

In pipe jacking construction, it is important to construct jacking pit and receiving pit. Jacking pit is the starter point of jacking construction happened in the jacking pit where equipment like slurry pipe (Figure 3.16), slurry separation tank (Figure 3.17) Tunnel Boring Machine, TBM (Figure 3.18) and hydraulic jack machine (Figure 3.19) is installed. Meanwhile, receiving pit is the final destination of jacking equipment to be lifted up once the jacking construction is complete.

To start pipe jacking construction. a working shaft need to be constructed at the beginning of the section of pipeline to support hydraulic jack machine. The working shaft and base slab are constructed based on the engineer's recommendation to ensure the strengthness and ability to bear the large forces of the hydraulic jack. Next, thrust ring is constructed right after launching shaft as the dimension of the thrust ring will follow the dimension of the Glass Reinforced Plastic pipes. The reason of this matter is, thrust ring is used to distribute the jacking forces around the Glass Reinforced Plastic pipes to avoid any cracking during jacking process. Then, entrance sealing arrangement is installed for Tunnel Boring Machine pass as it enters (Figure 3.20)

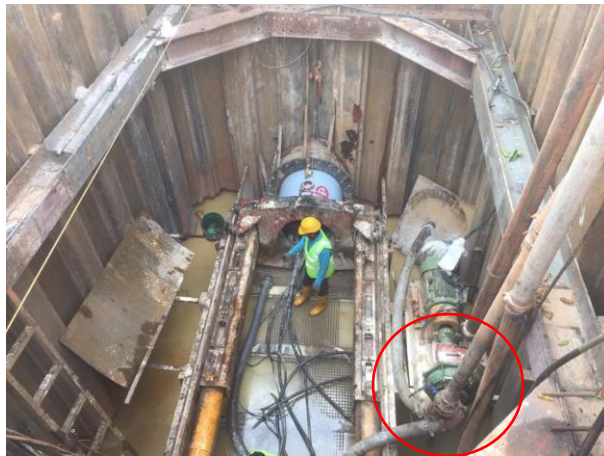


Figure 3.16 Slurry pipes

Source: Pdp Utek AMA052 monthly report, 2017



Figure 3.17 Slurry A052 separation tanks

Source: Pdp Utek AMA052 monthly report, 2017



Figure 3.18 Tunnel Boring Machine (TBM)

Source: Pdp Utek AMA052 monthly report, 2017



Figure 3.19 Hydraulic Jack Machine

Source: Pdp Utek AMA052 monthly report, 2017



Figure 3.20 Construction of shaft, base slab, thrust ring and entrance sealing arrangement

Source: Pdp Utek AMA052 monthly report, 2017

4. Pipe Jacking

After the jacking pit is complete with all necessary equipment and machines, it is the right time to proceed on the pipe jacking process. The first step to install the Glass Reinforced Plastic pipes are, Tunnel Boring Machine is being place on the ground (Figure 3.21) with the help of excavator. Once the Tunnel Boring Machine is laid

perfectly according to the proposed alignment, hydraulic machine will push the Tunnel Boring Machine into the ground. The boring machine usually excavates a slightly larger diameter, typically 10 to 20 than the outside diameter of the pipes in order to reduce the friction on the pipes. When Tunnel Boring Machine has excavated 2.5m length, excavator will help to lay down Glass Reinforced Plastic in the same position as the Tunnel Boring Machine to jack the pipes into the ground. This process is repetitive until the length of the proposed pipe is complete (Figure 3.22).

After that, the soil that has been excavated by Tunnel Boring Machine, the slurry is pumped out by slurry pipes to prevent soil collapse. Next, the slurry pipe is connected to the slurry separation tank as the excavated material will be separated into solid-liquid unit. The separated solid is sent to disposal and the liquid is returned to the slurry tank. After separation process is done, solid waste will be transferred into assigned location while liquid waste will be used in the construction. Once all the Glass Reinforced Plastic pipes is completely jacked into the ground, Tunnel Boring Machine will be extracted from the receiving pit along with the necessary equipment.



Figure 3. 21 Placing Tunnel Boring Machine (TBM)

Source: Pdp Utek AMA052 monthly report, 2017



Figure 3.22 Constructing of pipe jacking

Source: Pdp Utek AMA052 monthly report, 2017

5. Backfilling

For backfilling work, soil is transferred to the jacking pit and receiving pit gradually by the excavator. The sand will be compacted by the plate compacter before reinstatement work. More than that, all equipment will be extracted gradually as the depth of the sand increases (Figure 3.23)



Figure 3.23 Backfilling

Source: Pdp Utek AMA052 monthly report, 2017

6. Reinstatement work and Clean-Up

The sand will be trimmed down according to the specific instruction before spraying bituminous layer on the ground. As for the clean-up process, labors are required to remove excess, rubbish, and waste material to a proper place before proceeding to the next pit (Figure 3.24)



Figure 3.24 Reinstatement and clean-up work

Source: Pdp Utek AMA052 monthly report, 2018

B. Open Cut Method

Open cut is the most traditional method to install sewer piping network. Open cut is a type of method where excavation will take place where pipes are laid down accordingly in an open trench. Once pipes are installed, the exposed hole is covered up by the soil before reinstatement takes place. Open Cut method is used in Jalan Memanda 11, between pit No. 12 to pit No. 16, and in Jalan Bintang to Jalan Kandus Ampang. There are total 10 steps in open cut method, including setting out, road cutting process, invert level calculation and level control during excavation, sheet pile installation, dewatering, pipe laying, pipe jointing, backfilling, reinstatement and clean-up. The description of these steps is as follows.

1. Setting Out

Setting out pipeline alignment should be carried out by awarded surveyor. The surveyor needs to peg out the alignment, position of the pipeline, according to the design that has been approved by Indah Water (IWK). Usually, red spray will be used to mark the alignment on the ground (Figure 3.25). More than that, Request for Inspection (RFI) is submitted to the resident engineer one day before to allow any construction work. If underground services are detected by the responsible resident engineer, relevant authorities given a notice to investigate in advance of the excavation activity work which shall be proceed once upon written approval is submitted from the engineer.



Figure 3.25 Open cut setting out

Source: Pdp Utek AMA052 monthly report, 2018

2. Invert level calculation and level control during excavation

Invert level is the elevation of the inside-bottom of a pipe, trench, culvert, or tunnel. It is also known as “floor level” of the pipe. Invert level can be discovered by measuring vertical distance from a fixed datum to the lowest level of the pipe.

As mentioned before, Resident Engineers are responsible to prepare and submit a complete report of confirmation before actual excavation. In the report, there are invert

level of upstream and downstream, invert levels of proposed sewer pipes, bedding finished level, excavation or trench invert level, and type and size of the chosen pipe.

For the level control, steel rods are pegged on the ground approximately 10m before actual excavation. The steel rods are in an exactly position in as the proposed alignment of the sewer pipe. Then, off-set level of the trench invert level will be marked on steel roads using red paint. After all preparation is approved, contractors are allowed to start the excavation works.

3. Excavation

Trench Excavation for open cut method will be commenced from down -stream of the proposed pipeline and working up-stream to ease dewatering within trench. More than that, in this type of excavation process, excavator with bucket will be used for open cut method. The range depth in this project is also 4-6m long (Figure 3.26)



Figure 3.26 Open cut excavation

Source: Pdp Utek AMA052 monthly report, 2018

4. Sheet pile Installation

Next, trench cofferdam is constructed by driving interlocking sheet piles of adequate length with vibro-hammer mounted or hydraulic excavator based on the suitability. In this project, sheet piles used is timber sheet pile with the length of 6m (Figure 3.27).



Figure 3.27 Sheet piles installation

Source: Pdp Utek AMA052 monthly report, 2018

5. Dewatering

Whenever there is trenching works is going on, water level is increase as where the excavation penetrates the water level. In order to solve this issue, a dewatering pit is place at downstream area of the excavated trench and manholes pit. Next, the suction head of the dewatering pit is set up in the pit to allows water to be pump out on the prepared disposal channel. (Figure 3.28)



Figure 3.28 Dewatering of water ground level

Source: Pdp Utek AMA052 monthly report, 2018

6. Pipe Laying

To lay Glass Reinforced Plastic pipes, the excavator needs to carefully lower the pipe onto the prepared bed in the excavated trench by means of sling and tackle. To successfully lay down Glass Reinforced Plastic pipes to the required level, a depression or recess will be left on the bedding to accommodate the protruded socket joint. Not to mention, before excavator lays down the Glass Reinforced Plastic pipes, all pipes will be checked thoroughly if there are any cracks, defect on the Glass Reinforced Plastic pipes. If any damages detected, these pipes will be rejected (Figure 3.29)



Figure 3.29 Pipe laying

Source: Pdp Utek AMA052 monthly report, 2018

7. Pipe Jointing

Before the work of pipe jointing can proceed, labors need to make sure Glass Reinforced Plastic pipes need to clean thoroughly especially the interior surface of the pipe, the inner surfaces of socket end and the outer surface of spigot ends and do not forget to apply lubricant oil to ensure a smoother jointing between Glass Reinforced Plastic pipes. To link the Glass Reinforced Plastic pipes together, labors need to bring the spigot end to the socket with a correct position to ensure strong connection between the pipes before excavator gently push the Glass Reinforced Plastic pipes. For extra caution, timer strip is used to protect the pipe end during Glass Reinforced Plastic pipes pushing (Figure 3.30).



Figure 3.30 Pipe jointing

Source: Pdp Utek AMA052 monthly report, 2018

8. Backfilling

To first step of backfilling the trench, labors need to add soil underneath the Glass Reinforced Plastic pipes. Make sure the whole length of Glass Reinforced Plastic pipes is supported by compacted soil to ensure Glass Reinforced Plastic pipes stay on the right position before backhoe transfer the sand to cover the whole area. More than that, to ensure a full backfilling process, plate compactor is used to flatten the sand and lastly, equipment used in open cut method will gradually lifted up as sand depth level increases (Figure 3.31)



Figure 3.31 Trench Backfilling

Source: Pdp Utek AMA052 monthly report, 2018

9. Reinstatement Work and Clean-Up

As for reinstatement work, compacted sand filling in trench will be trimmed down to sub-base level and top up with crusher run to a thickness as specified. After that, the vertical edge of existing premix is clean thoroughly before spraying with bituminous tack coat. Lastly, labours are required to clean rubbish, excess or waste material to a proper location such as dump truck. Then, construction tools are move to the next site in a clean, neat and acceptable condition (Figure 3.32)



Figure 3.32 Reinstatement and clean-up

Source: Pdp Utek AMA052 monthly report, 2018

CHAPTER 4.0

CONCLUSION

In this construction of sewerage pipeline network from Jalan Mamanda 11 to Jalan Kabus, Ampang, a lot of things has been discovered just by investigating this pipeline network project.

In this construction, it has been discovered that the way of sewerage working system from the first stage of sewer waste discharge until Sewerage Treatment Plant, STP process is the same as Indah Water Konsortium (IWK) from specification and legislation aspects.

More than that, the type of piping system in the sewerage system also been recognized specifically as in this construction of sewerage pipeline network, Glass Reinforced Plastic pipes are used as chosen sewer pipes. It has been approved that Glass Reinforced Plastic is one of the most familiar pipes in sewer system since it has a lot of benefits which made it suitable for piping system in Malaysia as its properties suitable in every aspect. Even though this project used two types of Glass Reinforced Plastic pipes, the function and importance are still the same.

After that, for the method of pipe laying, pipe jacking: slurry method and as well as open cut method used in the construction is similar to the work sequence theory. Thus, work and activity of constructing sewerage pipeline networks is carried out according to sequence of the chosen method.

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