DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

INTERNAL COLD WATER SUPPLY SYSTEM OF OFFICE BUILDING AT CHEMICAL FACTORY

Prepared by:

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DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

DECEMBER 2019

It is recommended that the report of this practical training provided

by

Maizatul Hanisah Binti Lani

2017206346

entitled

Internal Cold Water Supply System of Office Building at Chemical Factory

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

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STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references are stated herein, prepared during a practical training session that I underwent at Yeo Plumber Sdn Bhd for a duration of 20 weeks starting from 5 August 2019 and ended on 20 December 2019. 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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Name : Maizatul Hanisah Binti Lani

UiTM ID No : 2017206346

Date : 13 December 2019

ACKNOWLEDGEMENT

My appreciation and gratitude towards my most graceful and love aspiring merciful Almighty Allah S.W.T for blessing me with all required knowledge, health and courage to successfully accomplish and render this practical training report.

The internship opportunity I had with YEO PLUMBER SDN BHD was a great chance for learning and professional development. Therefore, I consider myself as a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having a chance to meet so many wonderful people and professionals who led me though this internship period.

I express my deepest thanks to Ms Nurul Nadia Binti md Said, Engineer for taking part in useful decision & giving necessary advices and guidance and arranged all facilities to make life easier. I choose this moment to acknowledge her contribution gratefully. It is my radiant sentiment to place on record my best regards, deepest sense of gratitude to Ms. Noor Farahana Hawa as a Project Executive, Ms. Deena Farhana as a Quantity Surveyor, for their careful and precious guidance which were extremely valuable for my study both theoretically and practically.

I would also like to thank all the UiTM lecturers that have taught and nurtured me in becoming a better student and person. I would also like to extend my deepest appreciation to the lecturers who are directly involved during my training stint to Puan Nurhasyimah binti Ahmad Zamri, Supervising Lecturer, for her constant guidance and advice played the vital role in making the execution of the report. She always gave me her suggestions that were crucial in making this report as flawless as possible.

Last but not least, my special thanks to my beloved parents for their sacrifices over the years and without their support this journey would not be easy for me. Also thanks to all my friends for sharing their experiences, time and commitment especially during finishing this internship program.

ABSTRACT

Internal cold water supply system is system that explain about the water flow from the source of water inside the building. Usually internal cold water used indirect system which is the most common system found in building. In this system, only one draw-off point is fed from the mains supply pipes. All other outlets are supplied through a cold water storage, usually located in the roof space. This report will discuss the internal cold water supply at the chemical factory. This report was conducted for the Chemical Factory. The objective of this report is to determine the type of the internal cold-water supply system, observe the method of installation for the internal cold-water supply and determine the test to ensure water flow work efficiently. The construction starts with installation of the concealed pipi inside the building. Also, identify the problem in installation the internal cold-water supply and the solution to the problems. The conclusion is to provide the best result for the water flow inside the building, to overcome all the problems that has been faced at the construction site and achieved the duration time to complete all the work.

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CHAPTER 1.0

INTRODUCTION

The water supply and distribution system carry water from the water source, street main to the building and various points in the building. It also a well-planned distribution of pipe networks that can distribute water supply to the premises in an organized way. Overall, the effectiveness of the water supply system means a decision may be taken by examining a method of water distribution to the premises in an orderly manner and properly. Water requirements depend on several factors. Water supplies can be derived either by supplying water to homes or to place a tap at the roadside to be shared with surrounding neighbors (Norleeza, 2016)

In Malaysia, Jabatan Bekalan Air which also known as "JBA" is the one and only water supply. JBA distributes water throughout the whole country and in each state, those water is received by its own private company such as Syarikat Bekalan Air Selangor (SYABAS), Syarikat Air Johor (SAJ) and Lembaga Air Perak (LAP). This private company are responsible to operate water supply systems efficiently and supply clean water to the consumer according to each state requirement. (Norleeza, 2016)

The water supply system is very important to the residents and the economy to ensure all daily needs can be met, for example, the need for cooking, washing clothes, business, industrial, health, tourism, and others. To ensure that the supply of water to the country is clean, the government carries out efforts to enhance water productivity and quality regularly to avoid a water crisis. (Norleeza, 2016)

Cold water is natural water which being supplies to sanitary appliances in a building, without using any equipment or machine to maintain the temperature of water in the pipe. A plentiful supply of wholesome water is essential for the occupants of the buildings intended for human habitation. The most building can obtain their supply

from the Water Authorities' main, but in rural areas, it is sometimes necessary to obtain water from private sources, such streams, rivers, lakes, wells, springs for by catchment areas from roofs and paved surfaces. The water used must be colourless, odourless, and tasteless which is free from bacteria. Once water is used, wastewater is typically discharged in the sewer system and treated in a wastewater treatment plant before discharged into a river, lake or the sea or reused for landscaping, irrigation or industrial use. (Rasydan, 2015)

Internal cold water supply has two types which are a direct water supply system and an indirect water supply system. A direct system is supplying the water directly given to various floors with required pressure for sufficient hours. This is only used for the building which is not more than two floors and separate connections to be provided for the domestic and non-domestic requirement. The indirect system used generally when the pressure in the mains not sufficient. The water is pumped directly to the overhead storage tank and from there the water is supplied to different floors by gravity. (Tombre, 2016)

1.1 Background and Scope of Study

The scope of the study is carried out at the site of Propose of Chemical Factory at Lot 91240, Jalan Perindustrian Saleng 3, Mukim Senai, Daerah Kulai, Johor Darul Takzim. The duration of this project begins 19 October 2018 and ends in December 2019. The scope of works for this project is the installation of internal cold-water supply and sanitary. This report will focus on the internal cold-water supply that explain about the flow of the cold-water supply inside the building start from the sources of the water until it distributes to the whole area in the building. The internal cold-water supply system divided into two which is a direct system and indirect system. The direct system mostly used for the kitchen while the indirect system is used for toilet. For this project, mostly the system that been used is an indirect system for toilet and prayer room.

1.2 Aim

- To study the internal cold-water supply system in factory building.

1.3 Objectives of Report

- To determine the criteria of the internal cold-water supply system used in the building.
- To observe the method of installation for the internal cold-water supply and testify for water flow work efficiently.
- To identify the problem in installation the internal cold-water supply and the solution to the problems.

1.4 Methods of Study

Method study is the process of subjecting work to systematic, critical scrutiny to make it more effective and or more efficient. It is one of the keys to achieving productivity improvement. Therefore, the overall process of producing this study through practical reports and through these methods:

1. Observations:

Based on the observation, we can see the reality of what is happening on the site project and we can take the information quickly and accurately with the method. From the observation, it can see clearly the insulation of the installation of internal cold-water supply for the case study. The observation method can identify any possible problems encountered when installing an internal cold-water supply.

2. Interviews:

The interview can identify the problems that has in the construction site, the explanation about plan and type of work, how to improve progress work in the site, clearance site to reduce accident hazards. Through the observation that has been done on the construction site, interviewed the session had been done with the engineer of the construction of the site that monitor the plumbing system of the project. Interview sessions are conducted while viewing the construction area. The observation starts from the source of the water supply until inside the building with a full explanation from the person in charge. All the question was about the problems encountered when installing the internal cold water supply and the tests performed to check for proper installation of the internal cold water supply.

3. Document reviews:

Document it is very important and useful for collect information and gains knowledge. All the important information recorded into the paper its also called a document. They are some of the documents such as monthly site progress report, monthly safety report, company profile, minute meeting paper, and detail drawing. However, not all documents can easily get because it is a private and confidential document, some of the documents required permission form the person in charge.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

YEO PLUMBER SDN BHD was established on 09 December 2000 and started off as a general plumbing contractor and over the years, this company evolved to specialise mainly in internal Cold & Hot water System, Sanitary Plumbing System, External Water Reticulation and Sewerage Reticulation System.

This company has been registered with CIDB as a G7 which is the highest grade that allows us to participate in tenders with unlimited contract value. This company also have obtained the Certification for Quality Mangement System (ISO 9001: 2015). In the meanwhile, we are currently working towards the Certification of ISO 45001: 2018 and ISO 14001: 2015.

This company also have completed many prestigious and iconic projects including Seagate Substrate Plant, Gardenia Plant, Mitsui Outlet Park KLIA, Aeon Kulai, Aeon Kempas, IKEA Tebrau, IKEA Batu Kawan, Paradigm Mall Johor Bahru, Hotels, Hospitals, Apartments, Hypermarkets and Landed Properties. This company have secured projects exceeding RM130 million and have completed works in excess of RM95 million.

This company Managing Director, Mr. Ai Sew Fuat is a span registered permit holder (Type A2) with over 40 years of experience in plumbing services. He has vast experince and good rapport in the construction industry with consultants, contractors and developers.

Director of this company, Ms. Lim Ay Yum oversees the company finance and administration department and have been serving company for the past 34 years.

General manager of this company, Mr. Ai Boon Chen is a mechanical engineer graduated from Universiti Teknologi Malaysia and currently involved in the daily operations of the company. He is also the head of contracts for the company.

This company are confident and believed that their core values and positive attitude in delivering only excellent and profesional services to their customers, they will soon become the leading plumbing contractor in the nation and create the most valuable brand in the plumbing industry.

2.1.1 Vision and mission

Yeo Plumber Sdn Bhd, have aligned with quality and timely system delivery strive to become the leading plumber in nation. Continuosly, nurturing the next generation of high performers and giving back profit responsibly to the society.

2.1.2 Location of Yeo Plumber Sdn Bhd

Figure 2.1 Location of Company by Google Maps

2.1. Pontian Map

Figure 2.2 Location of Pontian by Google Maps

2.2 Company Profile

Company Name	:	YEO PLUMBER SDN. BHD.
Company Registration	:	534398-D
Established Year	:	2000
Nature of Business	:	PLUMBING WORKS ETC.
CIDB NO.	:	G7
BUSINESS ADDRESS	:	763, TAMAN ANGGERIK, JALAN PARIT MESJID 82200 PONTIAN, JOHOR DARUL
NO. TEL	:	
NO. FAX	:	
EMEL	:	yeoplumber@gmail.com
CIDB No.	:	0120150119-JH160987
SPAN Permits No.	:	1.SPAN Permit IPA Type a2 -Tukang paip 2.SPAN Permit IPA Type C3 -Bekalan air 3.SPAN Permit IPA Type C3 -Pembentungan
Manpower	:	1. Executive - 37 person 2. General Labour - 200 person
Banker	:	1. MALAYAN BANKING BERHAD 2. CIMB BANK BERHAD
Main Clients	:	1. NAKANO CONSTRUCTION SDN. BHD. 2. KAJIMA (M) SDN. BHD. 3. T.T.E ENGINEERING (M) SDN. BHD. 4. SHINRYO (M) SDN. BHD. 5. TAISEI CORPORATION 6. MUDAJAYA CORPORATION BERHAD 7. MIE INDUSTRIAL SDN. BHD. 8. PEMBINAAN MITRAJAYA SDN. BHD. 9. WCT CONSTRUCTION SDN. BHD. 10. KHOO SOON LEE REALTY SDN. BHD.

2.3 Project Organization Chart

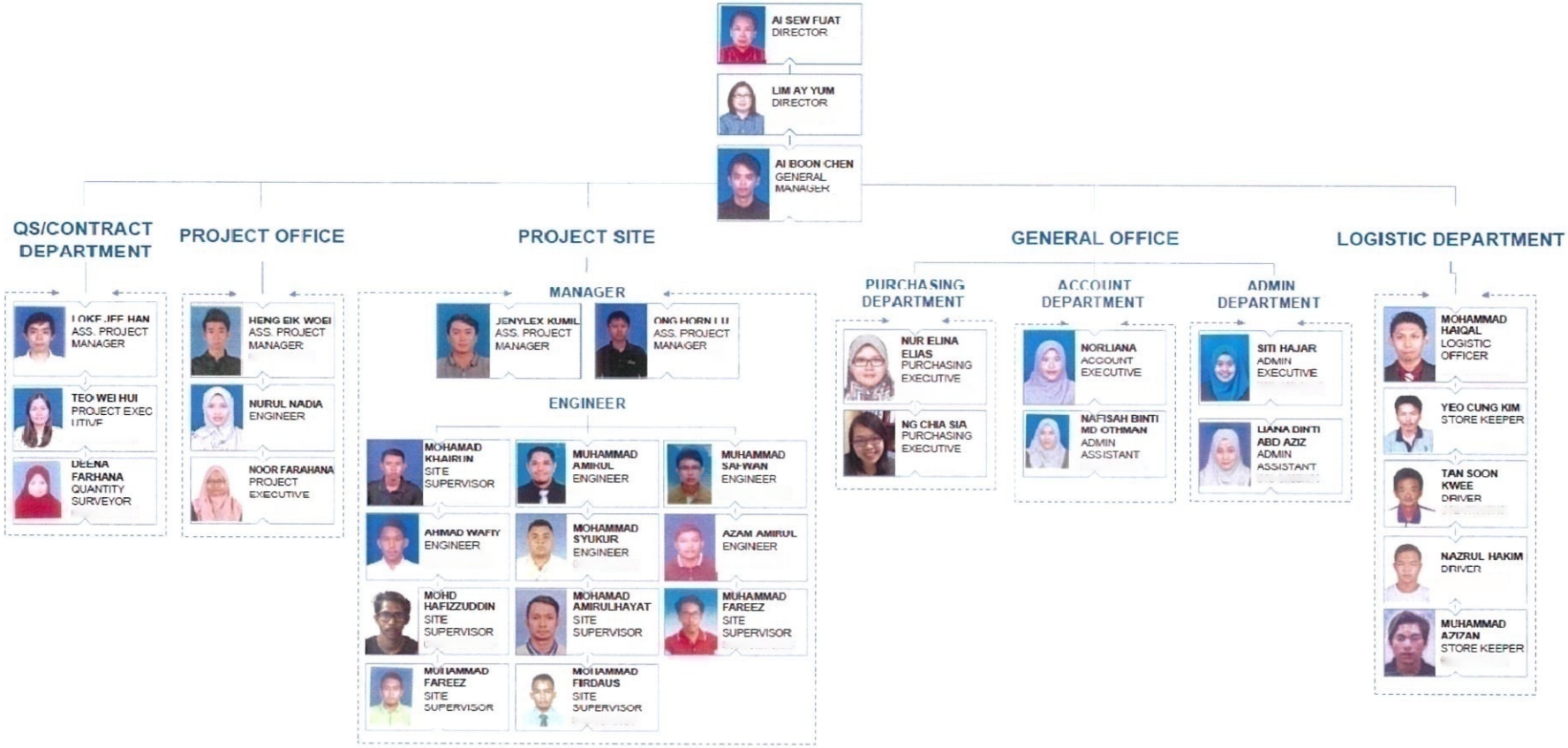

Chart 2.1 : Organization Chart of Yeo Plumber Sdn.Bhd

2.4 List of project

2.4.1 Completed Project since 2017, 2018 and 2019

No.	Name of project	Client	Cost Project (RM)	Year
1	Proposed Phased Development of One Block Of 2-Storey Administration Building and One Block Of 2-Storey Data Centre at Nusajaya Technology Park, Johor Bahru, Malaysia for TM/VADS Malaysia.	Bond M&E Sdn. Bhd.	2,040,000.00	2017
2	Supply and Install Temporary Water Supply Pipeline from Tanjung Piai To Benalec Temporary Site Office	Benalec Holdings Berhad	232,000.00	2017
3	Cadangan Tambahan Ubahan Ke Atas Dewan Serbagunan Dan Kawasan Lounge Sediada Kepada Bilik Di Tingkat 7, Cinta Ayu Apartment, Pulai Springs Resort, 20km, Jalan Pontian Lama, 81110 Pulai, Johor Darul Takzim Untuk Tetuan Pulai Springs Resort Berhad.	Sinlexon Construction & Decoratrion Sdn Bhd	120,004.00	2018
4	Engineering, Procurement, Construction and Commissioning (EPCC) of The Development of Pengerang Cogeneration Plant (PCP) At Refinery and Petrochemical Integrated Development (Rapid) Complex, Pengerang, Johor. - Workshop&Warehouse (UST), Visitor Centre Building (UYG) And Sanitary Facilities Buildings (UYB02)	MMC Engineering Services Sdn. Bhd.	1,400,000.00	2018
5	Cadangan Membina Kompleks Kilang Perindustrian Berat Yang Mengandungi: - i) 1 Unit Kilang 1 Tingkat Beserta Menzanin ii) 1-unit Penjabat 2 Tingkat iii) 1 unit Pondok Pengwal iv) 2 unit Pencawan Elektrik v) 1-unit Rumah Pam vi) 1-unit Kebuk Sampah Di Atas Sebahagian Lot 89, Mukim Kota Tinggi, Daerah Kota Tinggi, Johor Darul Takzim Untuk Tetuan Sage Evergreen Sdn. Bhd.	Transgreen Construction Sdn. Bhd.	350,000.00	2019
6	Permohonan Permit Bangunan Sementara Bagi Cadangan Membina: - i) 350 Unit Hotel 1 Tingkat; ii) 14 Unit Stor 1 Tingkat; iii) 1 Unit Pejabat Tapak Berserta Kemudahan Berkaitan; iv) 2 Unit Pondok Kawalan; v) 1 Unit Clubhouse Substructure Works Di Atas Lot 5847, 5848, 5849, 5850& 5865, Mukim Pengerang, Daerah Kota Tinggi, Johor Darul Tak'zim. Untuk: Tetuan Perintis Majumas Sdn Bhd	Synerlitz (Malaysia) Sdn Bhd	2,214,178.00	2019

Table 2.1 Completed Project Started From 2017, 2018

2.4.2 Ongoing Project started from 2018 and 2019

No.	Name of project	Client	Cost Project (RM)	Duration project
1	Permohonan Pelan Bangunan Di Bawah Akta 133 Bagi Tujuan Membina:1) 40 Unit Kilanf Teres 2 Tingkat Dengan Pejabat (Plot 18-57)2) 1 Unit Pencawang Elektrik 'Double Chamber'Di Atas Sebahagian Lot 408, Lot 409, Lot 2667 Dan Lot 2668, Mukim Plentong, Daerah Johor Bahru, Johor Darul Takzim Untuk Tetuan JM Cemerlang Sdn Bhd.	JM Cermerlang Sdn Bhd	540,000.00	11-09-2018 - 15-10-2019
2	Cadangan Mendirikan Sebuah Kompleks Kejuruteraan 2 Tingkat Di Atas Sebahagian Lot PT25 (HSD 7441), Lapangan Terbang Antarbangsa Kuala Lumpur (KLIA), Mukim Labu, Daerah Sepang, Selangor Darul Ehsan Untuk Tetuan Airasia Berhad	Airasia Berhad	665,000.00	01-12-2018 - 25-10-2019
3	Proposed Design & Build, Testing & Commisioning of Extension & Refurbishment Works to The Existing Shopping Complex Complete with Infrastructure Works to Aeon Taman Maluri Shopping Center, Jalan Jejaka, Taman Maluri, Cheras, 55100 Kuala Lumpur, Malaysia (Phase 2) Untuk Tetuan AEON CO. (M) Sdn Bhd	Aeon Co. (M) Sdn Bhd	1,270,000.00	09-05-2019 - 21-11-2019
4	Package C01 General Supply & Installation of Cold Water & Sanitary System for Sumitomo Electric Interconnect Factory M5 & M6	Sumitomo Electric Interconnect Products (M) Sdn Bhd	236,500.00	24-04-2019 - 30-12-2019
5	Cadangan Merobohkan Empat Buah Kilang Sediada & Membina Semula: 1)1 Unit Kilang 1 Tingkat Beserta Pejabat 2 Tingkat & Ruang M&E 3 Tingkat 2)1 Unit Pencawang Elektrik 3)1 Unit Kebuk Sampah Di Atas Lot 41061 (Old Lot 468), MK Semenyih, Daerah Ulu Langsat, Selangor Untuk Atom Corporation Sdn Bhd	Atom Corporation Sdn Bhd	218,600.00	09-05-2019 - 15-10-2019

Table 2.2 Undergoing Project Started From 2018 and 2019

CHAPTER 3

CASE STUDY
(INTERNAL COLD WATER SYSTEM)

3.1 Project Background

This is a project from Transmare Chemie (M) Sdn Bhd. Yeo Plumber Sdn Bhd as sub-contractor that is charged to handle the cold water and sanitary services. This project named proposed Chemical Factory. It stated at Lot 91240, Jalan Industri Saleng 3, Mukim Senai, Daerah Kulai, Johor Darul Takzim. Its location is not far from the city of Kulai and around this site surrounded by industrial areas. There are many factories built in this area. Besides this site area, there also have another factory and company which is a lightweight food factory, iron engineering factory and wooden door company. The cost of cold water and sanitary services is RM 189,000.00. The date of commencement for this project is 19 October 2018. The scope of the project is the internal cold water plumbing system, internal sanitary plumbing system, external water reticulation system and external sewerage system.

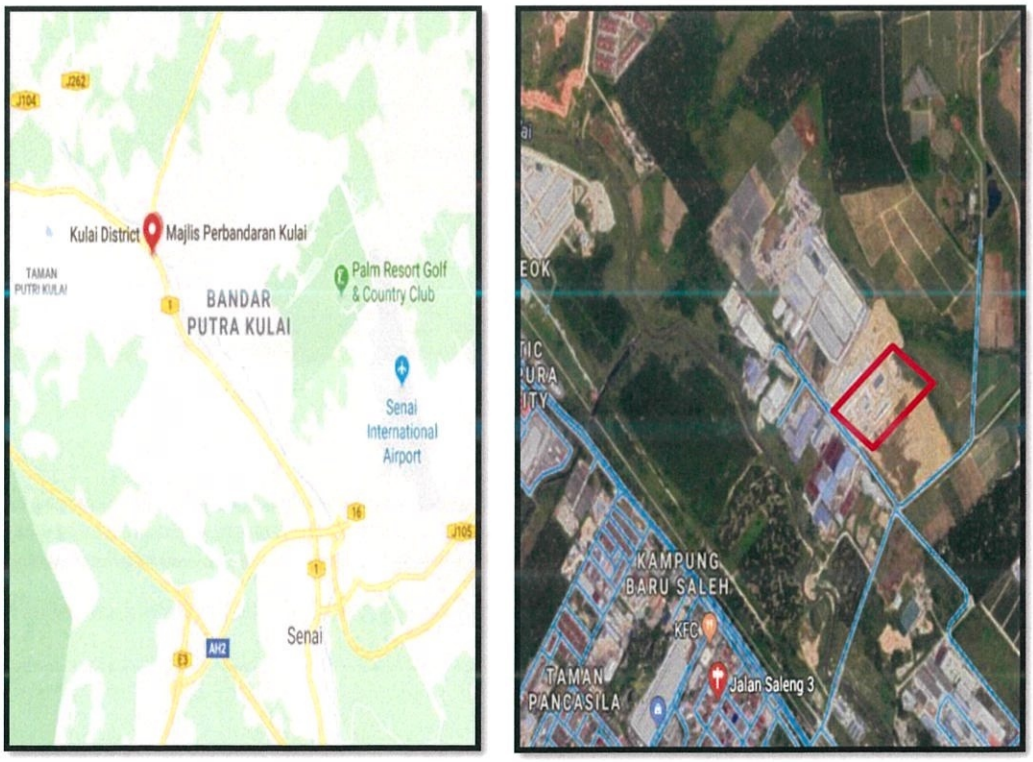

Figure 3.1: Maps of Chemical Factory (Source: Google Maps)

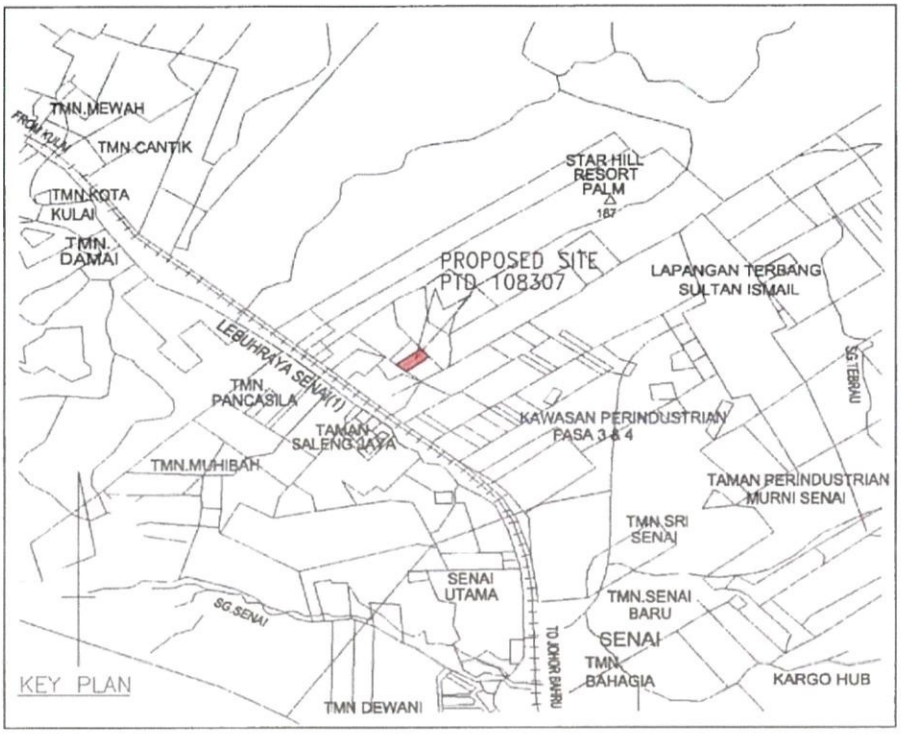

Figure 3.2: Key Plan (source: Yeo Plumber Sdn Bhd Shop Drawing)

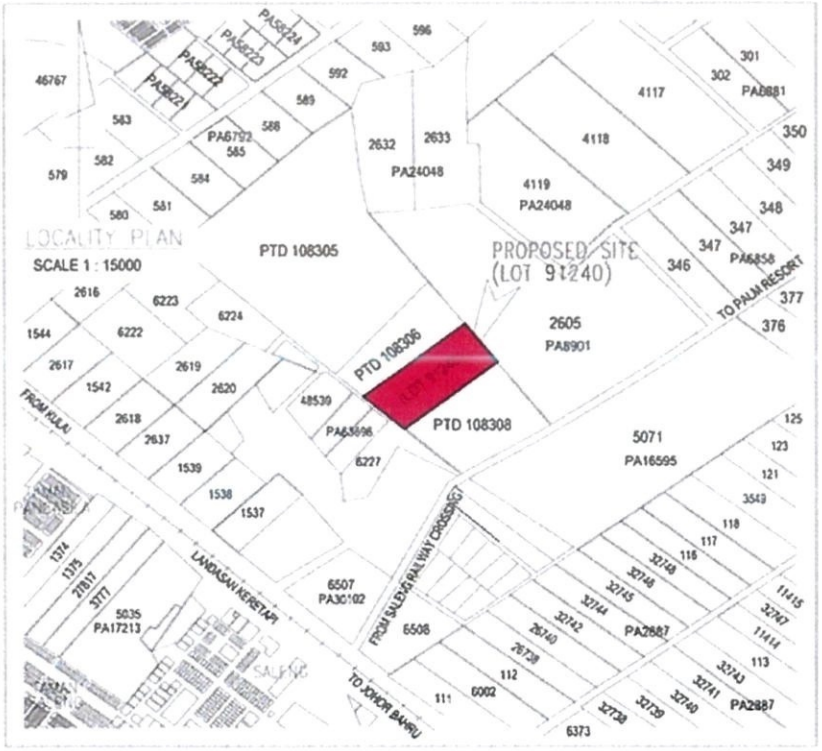

Figure 3.3: Plan Location (source: Yeo Plumber Sdn Bhd Shop Drawing)

Figure 3.4: Signboard

This area of this site is 2.65 hectares are providing the main building in front of the site. At the entrance of this site plan, there is a guardhouse between the exit and into the factory. The right of the guardhouse is a parking lot for a car. The first thing to notice is the main building, which is 2 storey office building. On the ground floor, there are 3 toilets, which are a male toilet, a female toilet, and a disabled toilet. Beside disable toilets, there is a female prayer room. On the first floor, there are only have two toilets which are for males and another one for females. On the roof floor of this office, there is a water storage tank. In front of the office building, there is parking lot for a motorcycle. Right of the parking lot, there are electric substations (single chamber) and garbage houses. The warehouse (open shed) was located behind the office building. Mixing and drumming shed located beside the 8 units of shore tanks and in front of it has built for utility and facilities. Inside of the utilities and facilities building, there are male prayer room and toilet.

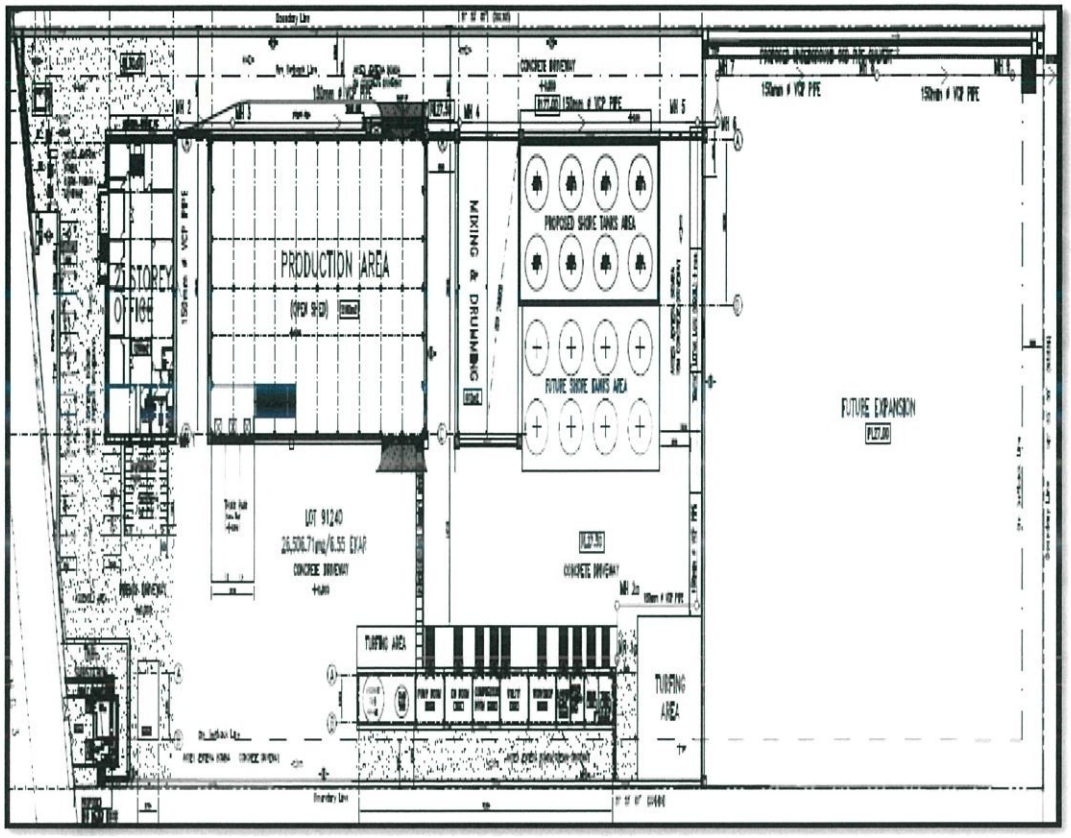

Figure 3.5 Site Plan (source: Yeo Plumber Sdn Bhd Shop Drawing)

3.1.1 Criteria of the internal cold water supply

Internal cold water supply has two types, direct cold water supply, and indirect cold water supply. In this site, we use a type of indirect system because when the water supply is stopped during certain time periods, water can still be made available to users from the storage tanks. In another way, the use of toilets and prayer rooms can be used despite the shortage of water.

Direct systems are source water straight from the mains water supply. It requires smaller storage cisterns and less pipework than indirect systems. The direct system is also cheaper to install. All of the taps with dispense drinkable water as connected to the mains supply. The direct system has better water quality as water directly comes after treatment. The water pressure of the direct system is high and sometimes a pressure reducing valve that required to save from damage due to higher pressure. It requires less maintenance compared to the indirect water supply system.

Pipe sizes depend on the system design but, generally, the size of the pipe is a 15mm rising main will be large enough to supply cold water demands for a three- to a four-bedroom house with all cold water outlets being supplied in 15mm, including the bath. If a hot water storage vessel is to be installed, then a 22 mm cold feed pipe is needed to the hot water storage vessel supplied from a 115-liter cold water feed cistern in the roof space. On larger installations, a 15 mm rising main may be required but this will depend on the water needs of the household.

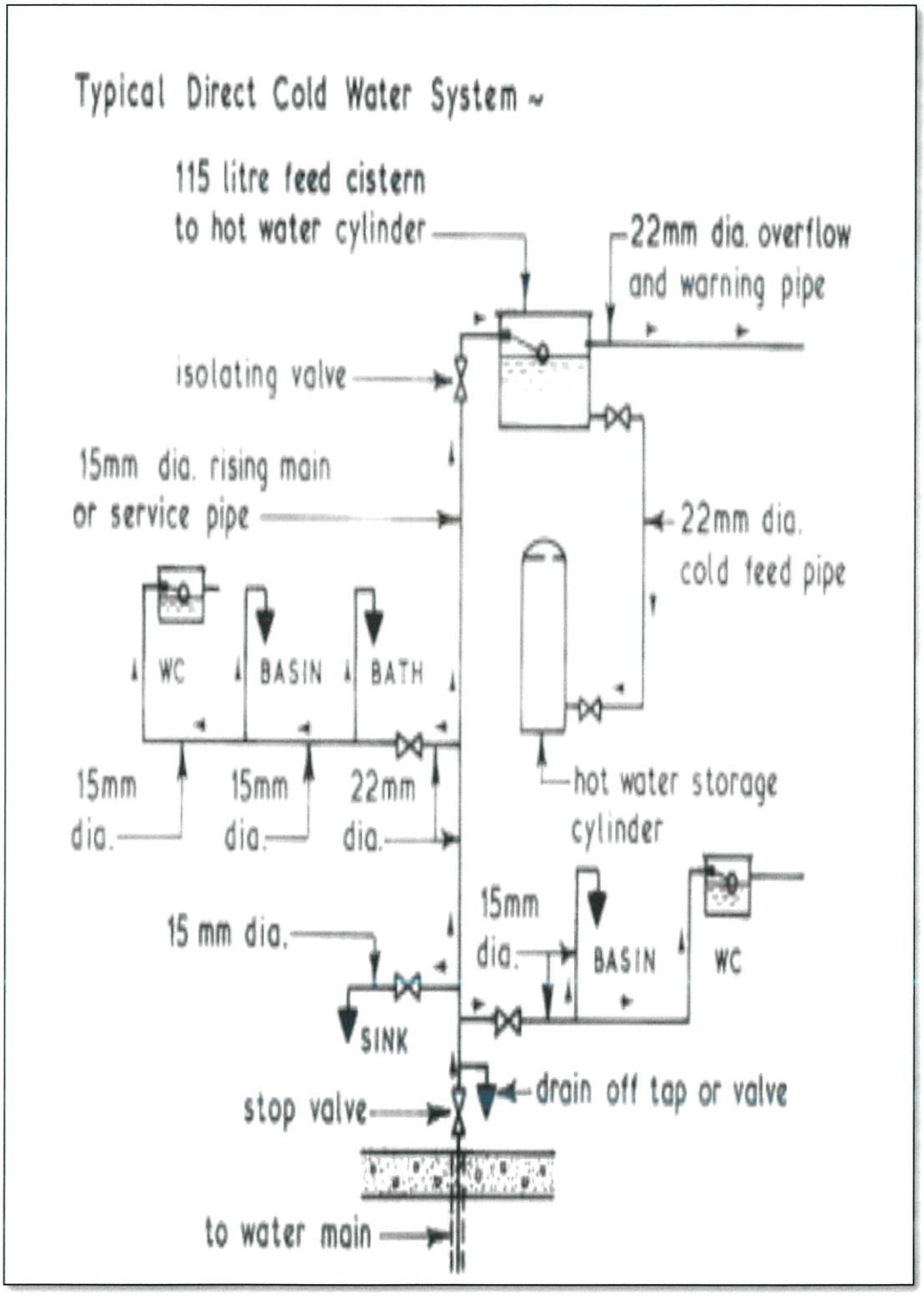

Figure 3.6 Direct System (source: Greeno, R. (2009). Building Services Handbook: Incorporating Current Building & Construction Regulations. Burlington: Taylor & Francis.)

Indirect cold water systems are used when the mains supply insufficient to deliver water to a large number of properties at peak times. By using indirect cold water systems, it used less pressure on the mains water supply. Indirect cold water systems require larger storage and more pipework because it provides water for hot and cold services. If you have an indirect cold water supply, the only taps that source water from the mains supply will be those used for drinking water and food preparation, the rest will source from the storage cistern. Storage water is used for heating, bathing and flushing the toilet. The water quality of the indirect system is affected because water stored in storage tanks and then supplied to appliances. The tanks also require regular maintenance, cleaning, protection from UV rays.

The pipe sizes will depend on the system design but, generally, a 15mm rising cold water main will be large enough to supply cold water demands for a four-bedroom of house. The kitchen sink should be supplied with water direct from the cold water main and 15 mm pipework is adequate for this. The cold water storage cistern can also be supplied via a 15 mm pipework. A cold water distribution pipe (22 mm minimum) distributes cold water from the cistern to the washbasin, WC and bath. The bath should be supplied from 22 mm pipework because of the lack of pressure but all other appliances can effectively be supplied from 15mm pipework. A 22 mm cold feed pipe is needed to supply the hot water storage vessel. This system is ideal when mixing valves and taps require equal pressure and flow rate as both hot and cold supplies are fed from the same source, this being the cold water storage tank.

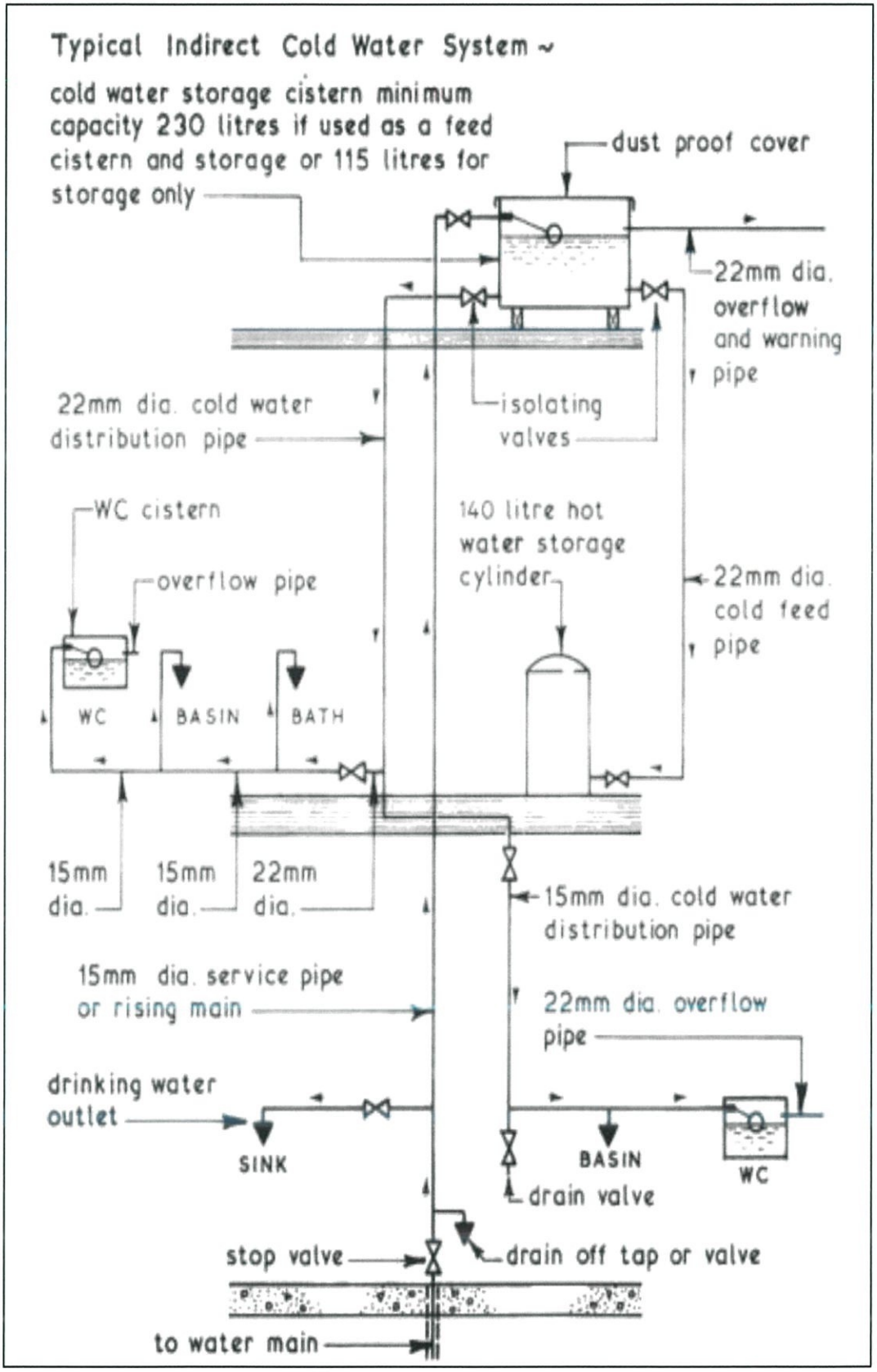

Figure 3.7 Indirect System (source: Greeno, R. (2009). Building Services Handbook: Incorporating Current Building & Construction Regulations. Burlington: Taylor & Francis.)

3.1.2 The method of installation for the internal cold water supply and testify for water flow work efficiently.

This method of installation of internal cold water supply at the main building which is the office. The method that been used for this installation is indirect system. This installation starts from the top of the building to the inside of the building. The location of installation is at the toilet of the office building. This building is a 2 storey office. On the ground floor have a female toilet, male toilet and disable toilet. At the first floor, there has a toilet for male and female and at the rooftop of the building have a water storage tank.

1. Installation of Frp Tank

a. Before starting the FRP tank installation activity, the concrete beams was secured horizontally and smoothly from the top. Drawings as needed in civil detail. Steel skid base was mounted on concrete beams. Steel skid base was levelled properly as required to drain off the Tanks water.

b. Base panels was installed on the levelled steel skid base and side panels was installed on the base panels. Gasket was put in between the panels for preventing water leakage from joints. Tank panels was jointed as per manufacturers recommendations by the bolts. Locations of the panels for inlet, outlet, drain & overflow pipe as per approved shop drawing.

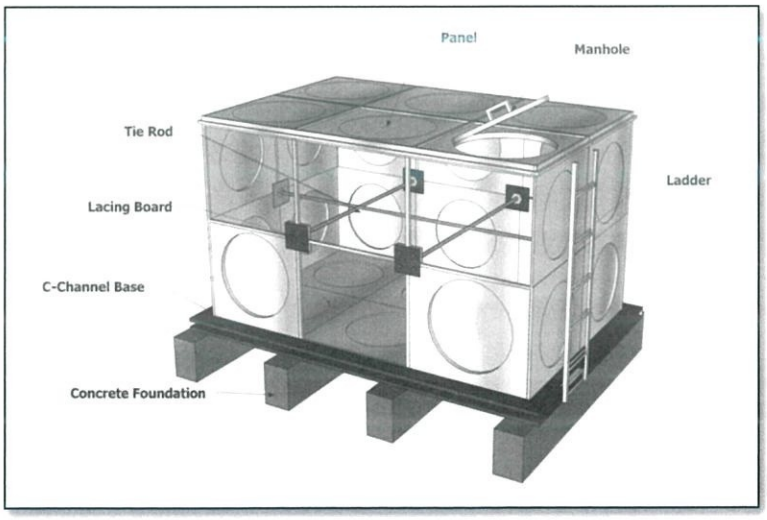

Figure 3.8 Schematic diagram of FRP tank (source: Tetuan Yeo Plumber Sdn Bhd

c. Installation of the internal accessories was carried out after side panels installation. Panels was tied internally by steel tie rod for side panels reinforcement and externally by stay plates as per manufacturer's recommendations.

d. Inlet, outlet, drain & overflow nozzles was connected to tank with flange connection. Top panels was installed on side panels. uPVC pipe support was provided for roof panels block supports. Ladder was provided externally and internally.

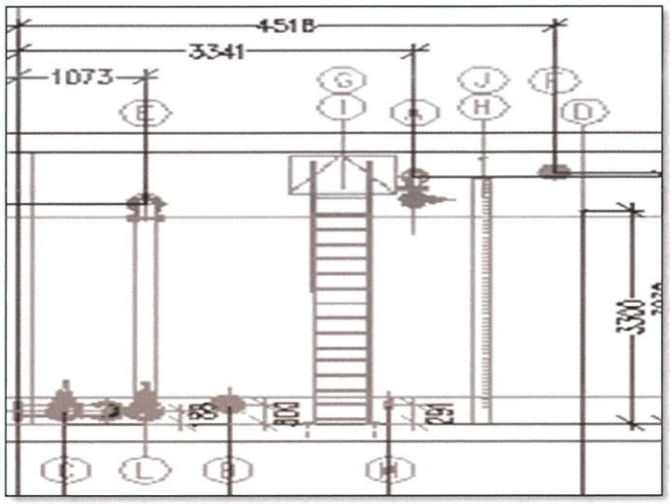

Figure 3.9 Shop drawing of ladder (source: Tetuan Yeo Plumber Sdn Bhd

e. All nut bolts securely tied with washer. Tanks installation was offered for Consultant's approval. After the approval of the tank installation works, tanks were allowed for water leak test as per manufacturer's recommendations. For testing, all openings shall be closed, water was filled in the tanks by temporary water supply line.

f. Air vent was installed on each tanks. Water shall be kept inside the Tanks for 24 hours, and leaks was checked, if any leak found, it was rectified and again offered for the same for consultant approval.

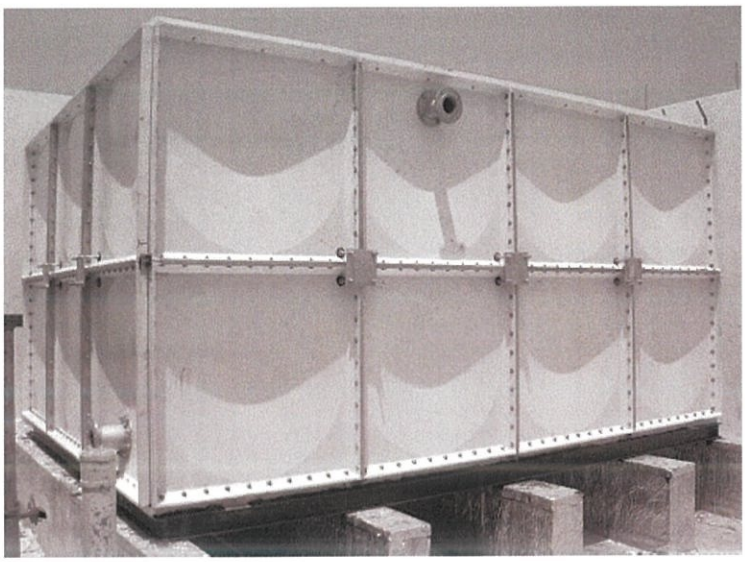

Figure 4.0 Frp Tank (source: Tetuan Yeo Plumber Sdn Bhd

2. Concrete coring work.

a. Concrete coring work starts with mark the position to be cored. Before the coring work start, all the services in front and behind the location to be cored were checked and the services were shut down. All the things that directly underneath the area to be cored were to protect and move away.

Figure 4.1 The position was marked

b. The drop-in anchor was installed, and the rod was a stud for the machine base.

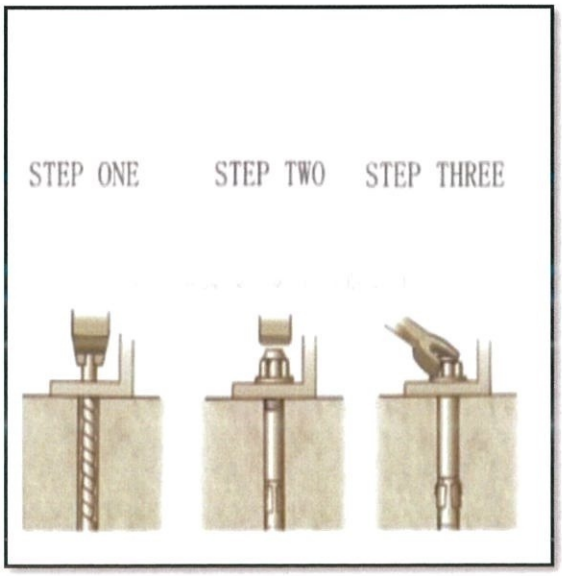

Figure 4.2 Drilling and installing (source: Tetuan Yeo Plumber Sdn Bhd)

c. The coring machine was adjusted and centralized to the marked position. The coring machine was standing straight to the target marking to get the perfect drilling.

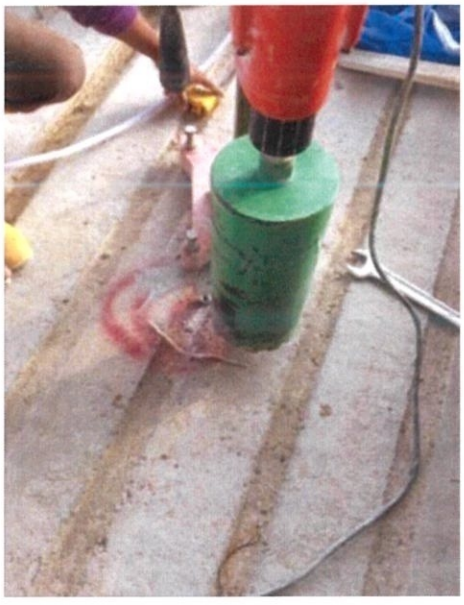

Figure 4.3 Adjust and centralized the coring machine

d. The water system was turned on and the coring work was started with a drill the roof slab at the marked position.

Figure 4.4 Coring the slab using the coring machine

e. When coring in progress, one signalman was assigned below the cored area to avoid any bad circumstances. That area also was a barricade to avoid others from accident. When the cored was through the floor slab the motor and the water were stopped from operating. The drill motor and diamond bit were removed.

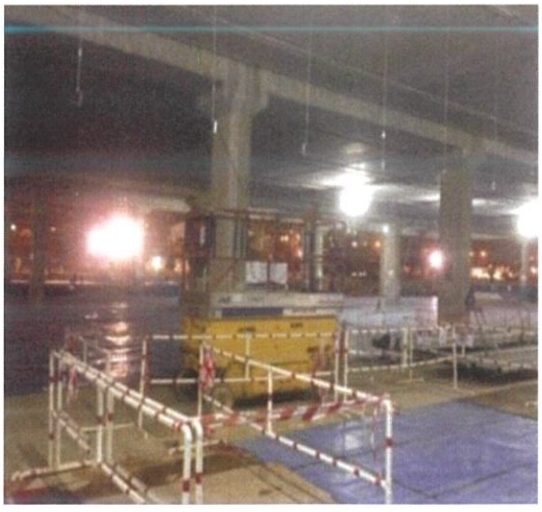

Figure 4.5 Barricade area

f. The concrete core was removed. The UPVC sleeve pipe was installed and the gap between the cored hole and pipe sleeve was fill up with SIKA grout cement for a slab.

Figure 4.6 Upvc pipe installation at rooftop

3. Installation of UPVC inside the building.

a. All installation was made as per approved drawings with specifications. Approved UPVC pipes class E-3505, fittings and valves were used for the installation of cold water supply.

Figure 4.7 Upvc pipe class E-3505

a. All UPVC class-E-3505 was mark and measure before the installation process. the Upvc pipe was marked using a marker pen.

Figure 4.8 Measuring process
(source: Tetuan Yeo Plumber Sdn Bhd)

Figure 4.9 Marking process
(source: Tetuan Yeo Plumber Sdn Bhd)

b. After finishing measuring and marking, the Upvc pipe was cut into the length that had been measured using pipe cutter and using a grinder to remove the wall partially for pipe runs.

Figure 5.0 Pipe cutter

Figure 5.1 Grinder

c. All UPVC class-E-3505, pipes were connected using solvent cement joints. Prior to installation the pipes and fittings were cleaned properly using the cleaner recommended by the manufacturer M/s Hepworth. The mating surfaces were cleaned again using the cleaning agent.

Figure 5.2 Cleaning process (source: Tetuan Yeo Plumber Sdn Bhd)

b. After the mating surfaces were thoroughly clean & dry, the bonding solvent cement (supplied by M/s Hepworth) was applied on both the mating surfaces. After the application of the solvent, the joint was made without any turning movement. The joint was left undisturbed for 5 minutes prior to proceeding with further works on the piping. All supports were installed ensuring correct alignment of pipes and location as per manufacturer recommendation.

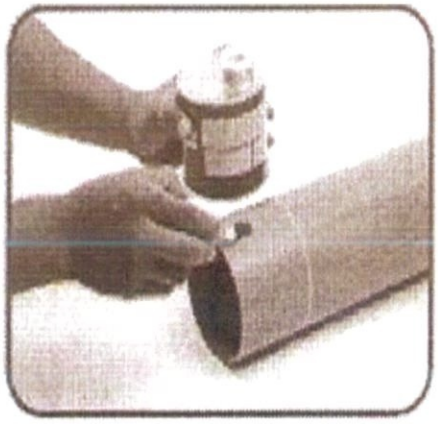

Figure 5.3 Apply the solvent cement (source: Tetuan Yeo Plumber Sdn Bhd)

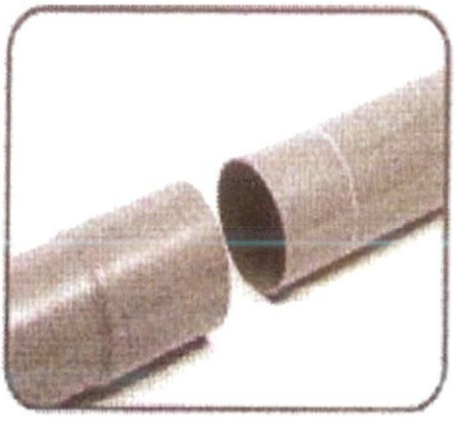

Figure 5.4 Upvc pipe connect each other (source: Tetuan Yeo Plumber Sdn Bhd)

c. UPVC (Class-E-3505 to BS 3505) sleeve was provided wherever water supply pipes pass through walls, slabs and. Annular space between pipe and sleeve was filled with rock wool and both ends were sealed with a waterproof sealant. After getting approval for the installation of pipe works, the system will be hydro tested. Hydro tested at 8 bar for 6 hours. In case any leak or drop in test pressure has been revealed, the respective pipe needs to rectify and retested.

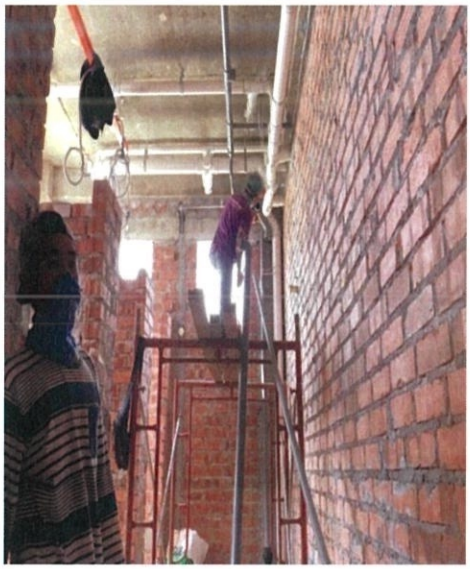

Figure 5.5 The installation of Upvc at toilet

Figure 5.6 The installation of Upvc pipe at high level

4. The installation of bracket.

a. The arrangement for grouping of parallel runs of horizontal piping was supported together on trapeze type hangers. The additional attachments were installed where support is required to be concentrated loads, including specialties, flanges, guides, strainers, expansion joints, manual and control valves at changes in direction of piping.

b. When using threaded drop rods for single hangers, all necessary was ensure inserts, bolts, rods, nuts, washers and other accessories are used. Anchor chain with u-bolts was installed to allow controlled movement of piping systems, and give free movements between pipe anchors.

c. Anchor chain with u-bolts also was installed so that piping live and dead loading and stresses will not be transmitted, and the maximum pipe deflections allowed by Pressure Piping Codes are not exceeded. The length of hangers was adjusted to distribute loads equally on all supports.

Figure 5.7 Anchor chain with u-bolts

5. The installation of concealed pipe.

a. All the services in front and behind the location to be hacked were cut off to prevent any bad thing that might be happening.

b. The installation of a concealed pipe was made as per approved shop drawings with a specification. Approved Cross-Linked Polyvinyl chloride (UPVC) pipes, fittings, and valves were used for concealed installations. Prior to installation, the pipes and fittings were cleaned properly. The location of pipes and outlet was marked on walls according to approved shop drawings. The routing of the pipes was marked on the wall/ slab & necessary chasing was done.

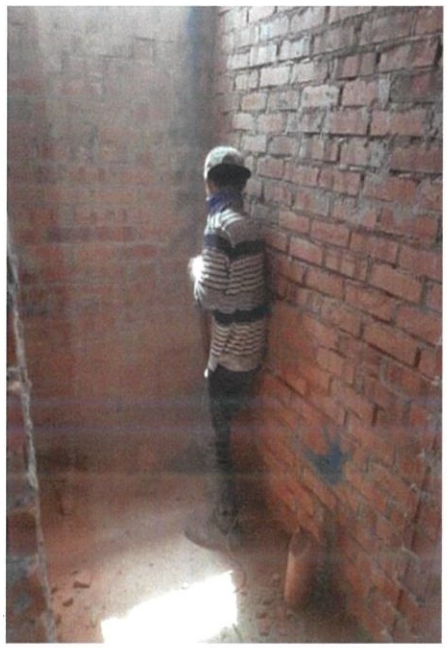

Figure 5.8 Marking the wall

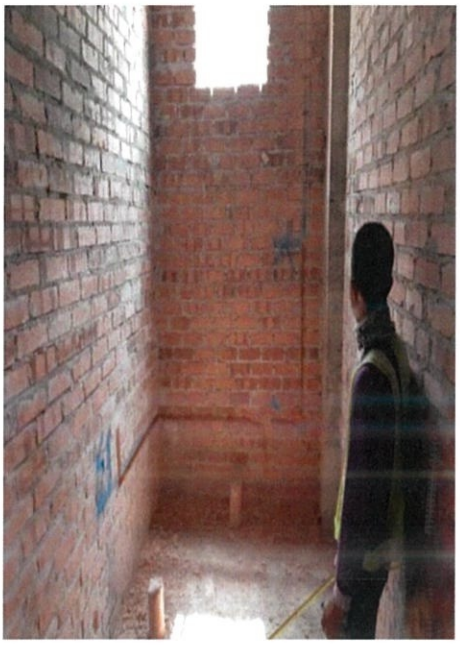

Figure 5.9 Measuring the marking point

a. A brick wall was cut for the proposed opening outer line by using the grinder in accordance with the marked location. This process is to prevent the wall surface near the hacked area affected or crack propagation during hacking work. Demolition hammer breaker is used for demolition for the hacking method. The required wall portion was hacked by manual hacking from top-down.

Figure 6.0 The demolition hammer

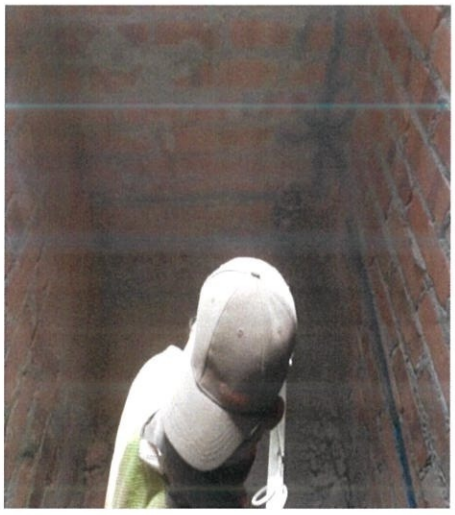

Figure 6.1 Brick wall cutting for hacking work

a. The uPVC concealed pipe was installed according to the shop drawing that needs to refer it, to connect the underground pipe with a concealed pipe. The uPVC pipe also was installed at a high level to connect to the concealed pipe.

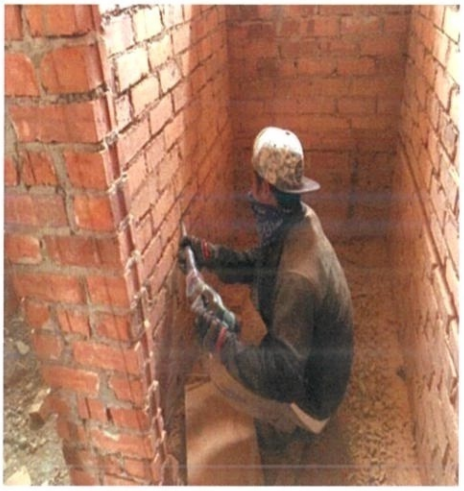

Figure 6.2 The installation of concealed pipe

Figure 6.3 Hacking work for conceal

b. The gap between pipe and wall was filled up after pipe installation with cement mortar after pipe installation. The pipes were installed in these grooves in the wall using supports. All the debris from the hacking wall was clear and moved to a designated area at the site. Once the Upvc pie is ready to be installed on the wall, the pipe will be tested using a flow test.

Figure 6.4 The Upvc concealed pipe installation

Figure 6.5 Installation of cement mortar

6. Testing the pipe using flow test.

a. A test ball, usually a ping pong ball were placed at the high end of the pipe and allowed to roll through the pipe to the low end of the pipe. If there are no obstructions and the pipe is graded correctly, the ping pong ball will be caught and removed.

b. The piping then passes the ball test. If the ball does not roll all the way through, an inspector will usually allow one 5-gallon bucket of water to be poured into the drain. If this does not dislodge the ball and cause it to roll through the piping then the piping does not pass the ball test.

c. The ball will then have to be retrieved and the procedure repeated again. During the flow test at each pipeline in the building, each drain passes all flow tests. Every pipe in this building does not have any problems. Upon successful completion of flow test, the flow pipes were concealed.

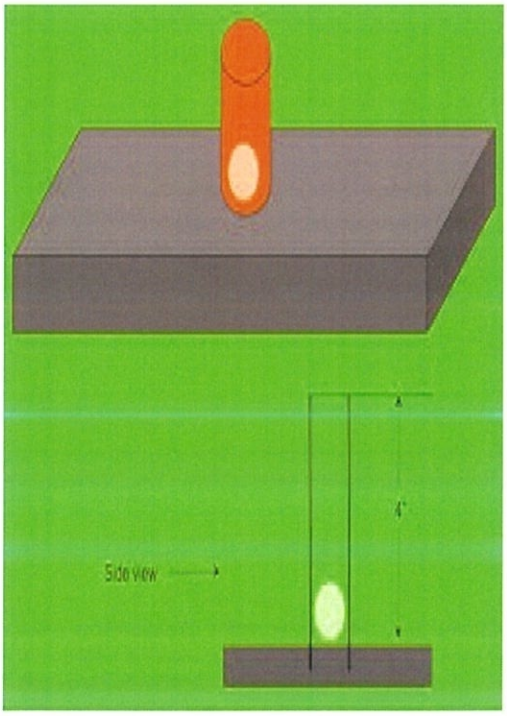

Figure 6.6 Flow test (source: Tetuan Yeo Plumber Sdn Bhd

3.1.3 The problem in installation the internal cold-water supply and the solution.

The problem that occur during the installation of an internal cold water supply is the main contractor does not follow the specified work schedule for installation of the plumbing. The problem happens when the main contractor did not determine which one needs to start the work first. Besides that, internal cold water installation also has hanging pipe that might cross the electric wire that can occur electric shock during installation. The solution for this problem is to determine the responsibilities for the specific work of the plumber, the main contractor and the electrician before start the project. So, it will not cause any problems for any party and will be able to do their work at a rapid rate and be able to complete work in advance also detect any possible problems. Discuss the location of pipe runs with the main contractor to minimize cutting or notching of framing.

Electric shock during installation also gives a big problem for the worker to do their work. Electric shock can be dangerous to surrounding especially during installation the pipework that need a machine that requires electricity. Electric shock from water pipes may occur in any building where the water supply piping is metal and in contact with the ground. Metal easily emits electric current that is the reason it easily to get an electric shock. Plus, the metal pipe used to supply the water inside the building. An electrical supply is provided into the building and building occupants are able to make contact with exposed pipes. The solution for this problem is the pipework must be connected to an earth electrode using earth-bonding conductors and metallic fixtures must be bonded to the pipework.

Water pressure can become a big reason for the problem that occurs during installation. Water pressure plays a big role to distribute water inside the building. Mains pressure systems require pressure limiting and pressure reducing valves to control water pressure and temperature. Typically, pressure limiting or pressure reducing valves will be used to control pressure in mains-supplied hot water systems or where high pressure may lead to problems such as burst pipes. Before installing the internal cold water, sub-contractor for plumbing must acknowledge and investigate the structure of the soil to determine the suitable system to use for plumbing system and every pipe inside the building must be inspected to detect any low water pressure to adequate levels using a pressurizing pump, in which case it may be necessary to use pressure limiting and pressure reducing valves.

CONCLUSION

Indirect systems suitable for multi-story building especially this building has particular cold water system requirements that can only be satisfied by pumping or 'boosting' the cold water supply either in part or in total. Most cold water supplies that are delivered from the mains cold water supply arrive at a building at 3 to 7 bars pressure (30–70 meters' head). The indirect system is suitable to apply for this project because cold water can supply the water to the storage tank from the main source and supply the water to every floor of the office building. The indirect system has a large capacity storage tank to provide a reserve of water during the failure of the mains supply and can sustain in 3 days if anything happens at that time in this building and support the whole area in this chemical factory. The water pressure on the taps supplied from the storage tank is reduced, which minimizes noise and fittings that supply the water can prevent from causing contamination of drinking water by back-siphonage. This method of installation is the same method that been used for all of the plumbing companies. Some of the methods is different from the other method that been used but it still gives a good piping installation. In nutshell, this indirect system is used to supply the water to the toilet inside the office building.

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