DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

WATER SUPPLY SYSTEM REPAIR WORKS

PREPARED BY;

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201926569

DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

FEBUARY 2022

It is recommended that the report of this practical training provided

By

Muhammad 'Ainul Furqon Bin Syarif

2019265696

Water Supply System Repair Works

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

Report Supervisor	:	_____ Cik Nor Azizah Binti Talkis
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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 stated herein, prepared during a practical training session that I underwent at Global Etika Jaya 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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UiTM ID No : 2019265696

Date : 10 January 2022

ACKNOWLEDGEMENT

Alhamdulillah,,praise to Allah SWT,the Most Merciful,the Most Graceful. I am very happy and feel grateful to have an opportunity to complete my internship at Global Etika Jaya SDN BHD.Within 20 weeks of my internship,I have learn a lots of things about construction. Im lucky to meet and work with magnificent persons in the company.I would like to express my gratitude and thank you to Mr Hasli which is my supervisor that give me a lots of knowledges and tips to be success in this construction field.Even he is busy with his works,he always check and make sure that im not in hard situation and sometime he cheers me up with his joke so that Im not feel stress while doing my works.Not to be forgotten either for other staffs which are Mrs Nadia,Mrs Linda,Mrs Madihah,Mr Aizudeen and Mr Hazmi that always guide and teach me if I have problem while doing my tasks.Their advices are very important to me and help me to be more confident to carry out my projects.Beside that,if I in short of idea and informations,they will find the old projects files even in the store to give me the tender as my reference to make my work run smoothly.I feel touch and grateful for their efforts for me. It is an honour to work with them.More over,I also want to give a special thanks to my friends for introducing me this company and help me a lots of things to complete my internship report.

Therefore,I would like to thank all the UITM lecturers for guiding me to be successful on doing my internship and report for this semester.Also big thank and appreciation to my Supervising Lecturer Cik Nor Azizah Binti Talkis, my Evaluation Lecturer,Encik Ezzat Fahmi, my Practical Training Coordinator Dr Nor Asma Hafizah Binti Hadzaman and Programme Coordinator Dr. Dzulkarnaen Bin Ismail.

Last but not least, my special thanks to my beloved family and friends for their support for over the years expecially during my internship.Without them, I might be not be able to complete my mission to finish my internship and my report for this semester.Their support were very important for me.

Thank you so much.

ABSTRACT

Water supply system is important to elaborate and this report will be mainly discuss about the construction and repair works of Water Supply System based on my company,Global Etika Jaya Sdn Bhd Report and Files.This tender project name is Kerja-Kerja Pembaikan Sistem Bekalan Air di Sekolah Menengah Kebangsaan Za'aba, Kuala Pilah, Negeri Sembilan Darul Khusus.This report objective to explain the method of waterproofing for water tank.Therefore,the important objectives of this report is to explain the importance of doing soil investigation and benefits using Probe Mackintosh Test that applied for water tank construction and also to explain in detail the procedure of MLT Test because this project will build a 7 levels of water tank tower with 70 000 GALLON of MALSTORE MAIN WATER TANK.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Every human need water to do their daily activities such as washing,take shower,cooking and even drinking water is needed fo human to stay hydrated. Water was an important factor in the location of the earliest settled communities, and the evolution of public water supply systems is tied directly to the growth of cities.Water Supply System is the only one system can be use.A water supply system's primary role is to transport water from water treatment plan to the consumer.The water must be stored in water tank before being distributed to consumers.There are many types of water tank such as Elevated Water Tank,Suction Tank and Overhead Tank.But for his project will be used Elevated Water Tank which is 7 levels tower.Many schools and universities are using this type of water tank like UITM Seri Iskandar.This is because it is very suitable to store and supply water within a designated area or community.

Elevated Water Tank has it own advantages.For domestic and fire purposes and independent of the risks of pumping equipment failure during an emergency,this type of water tank is immediately robbed of this one great advantage in any specific case.(ARTHUR S. MILINOWSKI)(July 1923).Other than that,the advantages of Elevated Water Tank is basically referred to as a water storage tank elevated above the roof of a building and is constructed at a height sufficient to pressurize a water distribution system. (Ironcon (M) Sdn Bhd, 2022).The towers should offer minmum of 20 psi of water tank pressure to users within the distribution system,though standard pressure is much higher-typically between 60 and 70 psi.The height of the elevated tank must be sufficieny to ensure a constant minimum pressure to all points distribution system.Moreover, Elevated Water Tanks also allow the natural force of gravity to produce consistent water pressure

throughout the system.Elevated water tank can eliminates the need for electrical pump to pump water out which mean we can cut the cost for electrical or fuel usage.Also if an incident of distruption of water supply from water treatment plan happen,the users can still used sufficient water from the water tank during the distruption.Eelevated water tank offer reliable solution for variety of other applications including fire protection,process water and emergency cooling.Last but not least,elevated water tanks may also prevent some form of water contamination like from rats or mice.

There are many various type of water tank,however,the aim of this report of is to discover water supply system repair works.

1.2 OBJECTIVES

1. To explain the importance of doing soil investigation and benefits of using Probe Mackintosh Test that applied for water tank construction.
2. To explain in detail the procedure of Maintained Load Test.
3. To explain the method of waterproofing for water tank.

1.3 SCOPE OF STUDY

The study carried out at Sekolah Menengah Kebangsaan Za'aba at Kuala Pilah, Negeri Sembilan Darul Khusus and focusing on method of Maintained Load Test (MLT) where it is supposed to explain in details the procedures of the MLT test for purpose of finding the settlement to be expected at the working load and twice the working load.The reason why this report focusing on this test is because this project will construct 7 level of water tank tower and 70 000 gallon of water tank.

This report studied that MLT test require machineries such as 1 mobile crane to move and handle I-Beam and Concrete Blocks,1 crawler crane also to move and handle I-Beam and Concrete Blocks,1 hydraulic jack to jack the loading,1 backhoe or excavator to assist mobile crane and 5 survey instrument (Dumping Level) to take the reading after jacking..Other than that,MLT test require materials like Settlement Monitoring Frame,I Steel beam or H Steel Beam,Concrete Blocks,Kentledge,Canvas and Plastic Sheet.

The first objective of this report is to explain the importance of doing soil investigation and benefits of using Probe Mackintosh Test that applied for water tank construction.The site investigation is the first important step before the construction start.This project which is Kerja-Kerja Pembaikan Sistem Bekalan Air di Sekolah Menengah Kebangsaan Za'aba, Kuala Pilah needs to make a report of soil investigation to be presented to Penolong Pengarah Kanan (Pendidikan) Jabatan Kerja Raya Negeri Sembilan Darul Khusus. Soil investigation also known as geotechnical investigation, is a process for determining the stratigraphy (rock studies) and physical qualities of the soil beneath a given location. This is done to ensure that the substructure that will eventually support buildings is safe and long-lasting.This investigation will carried out using JKR Probe Mackintosh.The procedure will be start with collecting soil sampling while drilling and continue with the test procedure and lastly laboratory testing.

The second objective is to explain in detail the procedure of Maintained Load Test. The primary goal of the load test is to examine the performed working barrette piles when a two-time working load is applied to the chosen tested pile. If the settlement/deflection of the pile head at various stages of loading in the Maintained Load test complies with the standard requirement stated below, the test pile's performance is regarded to have met the specification requirement.

The last objective of this report is to explain the method of waterproofing for water tank.The waterproofing coating that use is Boscoflex.This kind of waterproofing is recommended uses for waste water treatment plant,bathrooms,balconies,swimming pools,outdoor deckings and even recommended for water tank based on brochure (Bostik December 2020).Waterproofing is needed for water tank to prevent from leaking happen.The coating will be applied to the concrete and the edges of the water tank.

1.4 METHOD OF STUDY

1. Observation –

Observation is method of gathering data and information by watching the prosess or reading a piece of document that contain information.The observation is about to understand the importance of doing soil investigation.The average time taken to do observation of every work which are soil investigation,probe mackintosh test,maintained load test and waterproofing is around 1 week due to procedure of doing the test.The observation of all these work prosess had been noted in my notebook.

2. Interviews

Interview is one of the best way to get a lot of information.The information from the interview can be more details because the if we don't understand what the informer talk about,we can directly ask and state our opinion.The interview can be done through online or offline if the infomer is far a way.I already made an interview with a person in charge for this project which is Mr Hazmi,Project Manager.He explained to more deeply and even show me the picture and video of the project that he handle.Without made an interview ,it will be hard to understand the project by only observe and looking at documents report files.Fortunately,I can understand the flow of the project due to information given by Mr Hazmi.The interview was made at my office and the information I had been write it in my notebook.

3. Document Reviews

To complete the report,I need data collections like company profile, building quantities,report progress,result of works,construction drawing and especially picture of the procedure.This is because through these data,we can understand deeply into the works.This document review took me 1-2 days to collect all the information that I need for my report.

CHAPTER 2

COMPANY BACKGROUND

2.1 INTRODUCTION OF COMPANY

Figure 2.1.1 Company Logo

Source: Company Profile Book

Global Etika Jaya operates in the Construction of Buildings industry about 17 years. At first,this company known as Glokal Etika Jaya and had changed to Global Etika Jaya at date 5th June 2018. Global Etika Jaya was established since 10th November 2005.This company CIDB Grade is G7 which is have no limit for tendering and have the highest chance to get a tender.

With the effort and hardwork of the staffs,Global has successfully executed the projects from Government,DBKL,PNB,FELDA,FGV and IWK.They involved in activities of engineering,mechanical and electrical projects.Global Etika Jaya always give their full commitments to achive their mission to be a successful construction company.

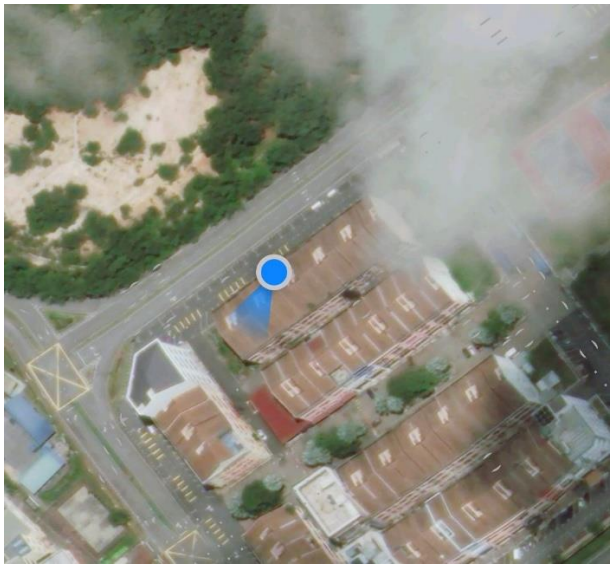


Figure 2.1.2 Location of Global Etika Jaya Office

2.2 COMPANY PROFILE

Table 2.1 Company Profile

Company Name	Global Etika Jaya SDN BHD
Registration Number	714617-T
Address	PT12999, Jalan BBN 1/7D, Putra Indah, Bandar Baru Nilai,71800 Nilai, Negeri Sembilan
Branch Address	13A, Blok 1, Worldwide Business Centre, Jalan Tinjau 13/50, Seksyen 13,40100 Shah Alam, Selangor Darul Ehsan.
Email	g_ejaya@yahoo.com
Telephone Number	06-8507575 /06-8507574 /019-7575950
Fax Number	06-8507576
Established	10th November 2005
Status	Bumiputera
CIDB Grade	G7

2.3 COMPANY ORGANIZATION CHART

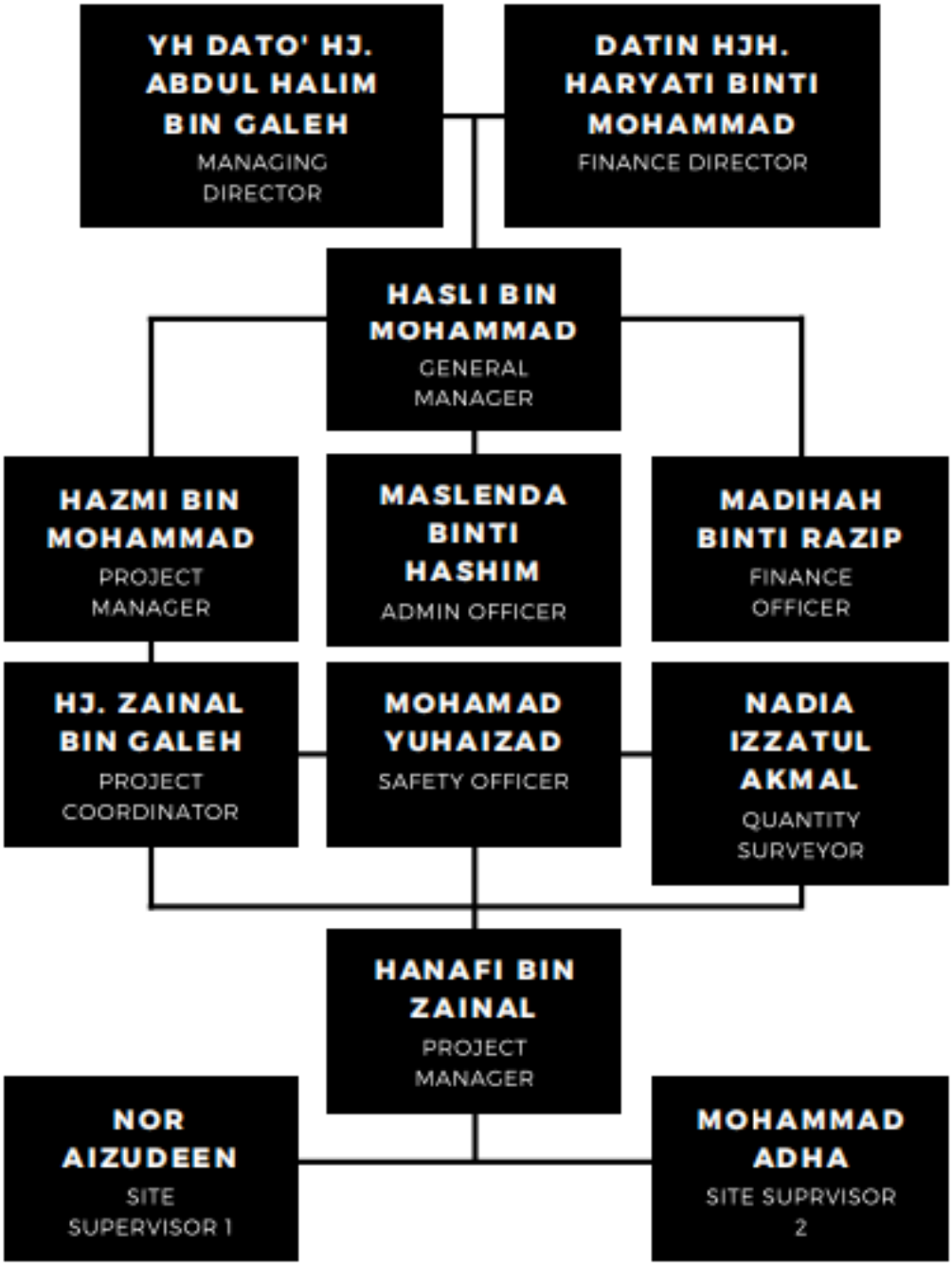


Figure 2.3.1 Organizational Chart of Global Etika Jaya

Source: Company Profile Book

2.4 LIST OF COMPLETED PROJECTS

Table 2.2 List of completed projects

Bil	Contract Name	Contract Value	Client
1	Menaiktaraf Dan Membaiki Jalan Kampung Felda Serting Hilir 1,Mukim Rompin,Negeri Sembilan Darul Khusus.	902,670.56	FELDA
2.	Cadangan Kerja Membina dan Mensyiapkan Sebuah Dewan Komuniti Serta Kerja Yang BerkaitanDi Atas Lot.3429,Mantin,Mukim Setul,Negeri Sembilan Darul Khusus.	2,365,156.80	Majlis Pembandaran Nilai
3.	Membina, Memasang Dan Mentauliah Laluan Paip Air Jenis Keluli Lembut (MSCL) Bergarispusat Nominal 250mm,200mm,150mm Dan kerja-Kerja Berkaitan Di Felda Gunung Besout 4 Dan 5, Daerah Mualim, Perak Darul Ridzuan.	2,599,204.80	FELDA
4.	Proposed TO Upgrade The Existing Panel Display (Pylon Signage) At Phase 3A, Pulau Indah Industrial Park, Mukim And District Of Klang,Selangor Darul Ehsan.	178,610.00	Central Spectrum (M) Sdn Bhd.
5.	Cadangan Pembangunan Landskap Di Kawasan Rekreasi Presint 10, Seksyen U13, Mukim Bukit Raja, Daerah Petaling,40170 Shah Alam, Selangor	4,240,220.48	PKNS
6	Kerja-Kerja Pembaikan Sistem Bekalan Air Di Sekolah Menengah Kebangsaan Za,aba, Kuala Pilah,Negeri Sembilan.	1,699,800.00	JKR Negeri Sembilan

2.5 LIST OF PROJECTS IN PROGRESS

Table 2.3 List of ongoing projects

Bil	Contract Name	Contract Value	Client
1.	Membina, Memasang Dan Mentauliah Laluan Paip Air Jenis Keluli Lembut (MSCL) Bergaris Pusat Nominal 400MM, 200MM, 150MM Dan Tangki Sedutan, Peralatan Mekanikal Dan Elektrikal, Rumah Pam Penggalak Felda Bukit Tembaga Serta Kerja-kerja Berkaitan Di Felda Sungai Tiang, Felda Lubuk Merbau Dan Felda Bukit Tembaga,Di Daerah Kuala Nerang,Kedah Darul Aman	6,424,563.83	FELDA
2.	Proposed Pipe Replacement Program In Selangor, Wilayah Persekutuan Kuala Lumpur And Putrajaya For Year 2017/2018 (Continuation For Completion Of The Project) (Package 10 Gombak And Hulu Selangor)	17,471,957.00	PENGURUSAN AIR SELANGOR
3.	Membekal dan Menghantar Perabot Pejabat di Rancangan Felda Wilayah Raja Alias, 72120, Bandar Seri Jempol, Negeri Sembilan Darul Khusus.	80,5000.00	FELDA
4.	Membekal Dan Menghantar 140 Ekor Lembu Jantan Baka Kacukan Ke Projek Gedung Makanan Negara (GMN) Di Ladang Satelit, Kg Londah,Negeri Sembilan Daarul Khusus	517,916.00	FELDA

CHAPTER 3.

Case Study

3.1 Introduction to Case Study

Water Supply System is the subject of the case study.The title of the project is Kerja-Kerja Pembaikan Sistem Bekalan Air di Sekolah Menengah Kebangsaan Za'aba, Kuala Pilah, Negeri Sembilan Darul Khusus.The project has started in 3rd October 2016 and the project ended on 13th August 2017.The cost of the construction approximately One Million Six Hundred Ninety-Nine Thousand Eight Hundred Ringgit Malaysia (RM1,699,800.00).Although this project has finished years ago,my supervisor suggested that I used this case study for the report because this project contain more information and even the person in charge of this project is the one of the staff at Global Etika Jaya.

The location of the site project took place at Sekolah Menengah Kebangsaan Za'aba, Kuala Pilah Negeri Sembilan Darul Khusus.

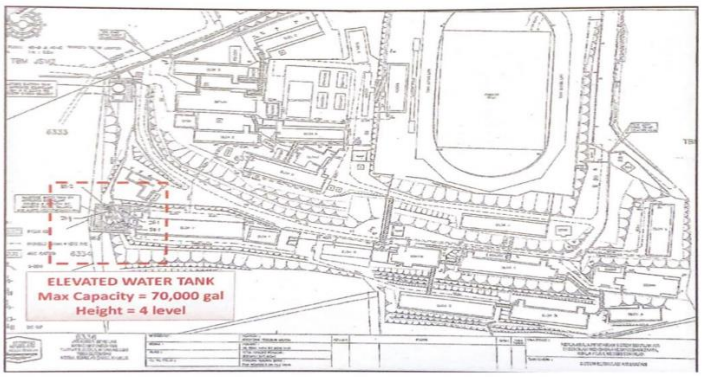


Figure 3.1.1 Location of the site construction

Source: Final Report SMK Za'aba Project Document Files

The construction area is located at South West of the school and nearest to the Boy's Room.Although there are multiple existing building around the site construction,it is free from student activity.The site is closed by the temporary gate where only allowed person can enter into the site.The materials had been cover with canvas and the machineries are safely placed far from students.The machineries and tools that been used is Drilling Rig,Grout Pump,Grout Mixing Machine,Water Pump,Backhoe,Mobile Crane,Excavator,Hydraulic Jack,Crawler Crane and Survey Instrument (Dumping Level).

Figure 3.1.2 Materials of the construction

Source: Mr Hazmi,Project Manager of project SMK Za'aba

The activities carried out on the site is Water Supply System Repair Work and focusing to construct a 7 level of water tank tower,suction tank and pump house.This chapter will be more study about Maintained Load Test (MLT) This is because Maintained Load Test is important due to construct 70 000 gallon of main water tank which to accommodate the load of water.

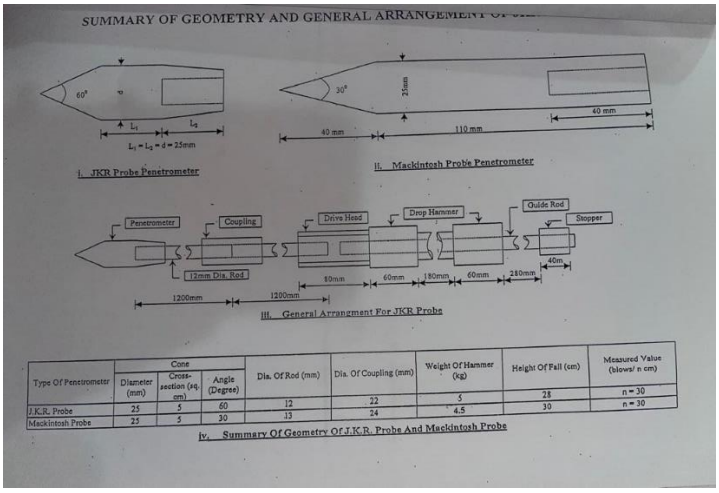
3.2 To explain the importance of doing soil investigation and benefits of using Probe Mackintosh Test that applied for water tank construction.

Soil investigation and also known as geotechnical investigation, is a process for determining the soil properties which is stratigraphy (rock studies) and physical qualities of the soil beneath a given location.Experienced geotechnical engineers who are trained is responsible to take proper samples and do the testing.It is performed by drilling into the soil to a reasonable depth, depending on the construction plans, and then having a professional grade the soil and estimate its qualities for the length of the drilled hole.Drilling is done whenever possible since it allows for the collection of undisturbed samples from which settlement rate and bearing capacity may be determined.

The importance of doing soil investigation is to ensure that the substructure that will eventually support the building is safe and long-lasting. While you may be able to construct with the most durable materials and the most innovative techniques,inadequate awareness of ground conditions is one of the leading reasons of foundation collapse or lead to an inevitable disaster. A proper field survey and a very exact geotechnical investigation are essential for any civil engineering project, no matter how big the project.Other than that,you'll be able to anticipate any potential problems and organise your budget accordingly if you do this type of investigation.

Probe Mackintosh

Probe Mackintosh is one the test for soil investigation work.A Mackintosh probe is a portable penetrometer that can be used to investigate the bearing capacity of soil.The Mackintosh probe is used by assembling the equipment, marking each 0.3m on the rods, setting up the equipment on the ground, pulling up the hammer until maximum height, dropping freely to drive the rod and cone into the soil, and continuing until the blows per 0.3m penetration reached more than 400, or the depth reached 15m.



Type Of Penetrometer	Cone			Dia. Of Rod (mm)	Dia. Of Coupling (mm)	Weight Of Hammer (kg)	Height Of Fall (cm)	Measured Value (blows/ n cm)
	Diameter (mm)	Cross-section (sq cm)	Angle (Degree)					
J.K.R. Probe	25	5	60	12	22	5	28	n = 30
Mackintosh Probe	25	5	30	13	24	4.5	30	n = 30

iv. Summary Of Geometry Of J.K.R. Probe And Mackintosh Probe

Figure 3.2.1 The Summary of JKR Probe And Mackintosh Probe

Source: Final Report SMK Za'aba Project Document Files

There are many benefits by using Probe Mackintosh Test.Probe Mackintosh Test used minimal equipment and personnel.The probe consists of penetration rod (1,2m each),coupling,penetration cone and hammer nut.Other than that,Probe Mackintosh Test costly cheaper than use deep borehole type.This is because Probe Mackintosh only use some small equipment which are most of them are cheaper than using boring equipment especially when the depth of exploration is moderate and soil under investigation are soft or loose.In addition,the speed operation of probe mackintosh is more faster than other method.Lastly, the Mackintosh Probe is a lightweight device, which can be conveniently used by anyone for the investigation of soft soil.

3.3 To explain in detail the procedure of Maintained Load Test.

Maintain Load Testing, also known as Static Load Testing, is required to guarantee that the piles that were driven can support the structure's design load. Load would be applied to the chosen pile during this test, and the pile settlement under the acting load would be recorded. As a common procedure, piles are loaded up to double their working load, which is referred to as the pile's Test Load. The SLT can be used for the load types which are compression,tension and lateral.For this project is using Static Load Testing (Compression).The load is applied using KENTLEDGE Method, kentledge blocks (dead weights) are supported by a deck of steel beams sitting on concrete blocks (crib pads). The area of the crib is sufficient to avoid bearing failure or excessive settlement of the ground. To provide a reation for the test load applied by jacking placed over the pile being tested, the maintained load test(MLT),Kentledge or adjecent tension piles or soil anchors are utilised.

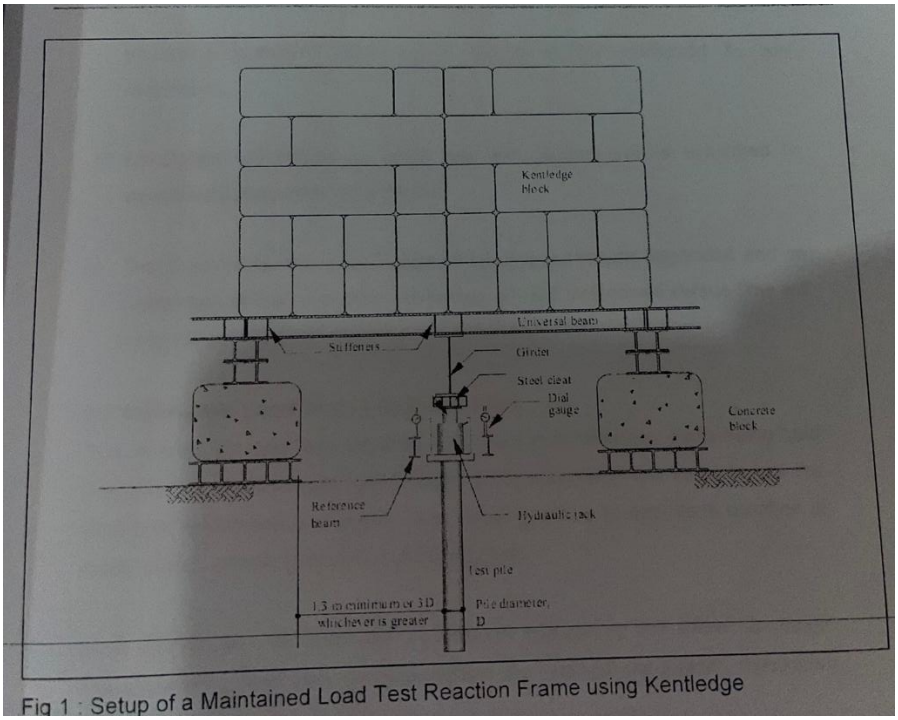


Figure 3.3.1 The setup of Maintained Load Test Reaction Frame using Kentledge

Source: Final Report SMK Za'aba Project Document Files

The procedure of Maintained Load Test/Static Load Test as follows

1) The test pile will be left for 5 days after it has been driven to set before the static load is placed.

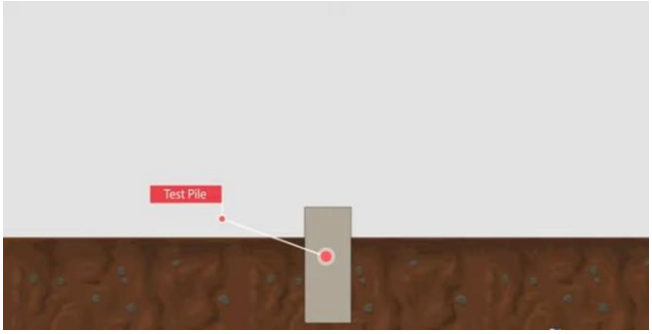


Figure 3.3.2 Install pile test

2) Installed the hydraulic jack in order to apply load.The ram of the jack is adjusted until the test start.

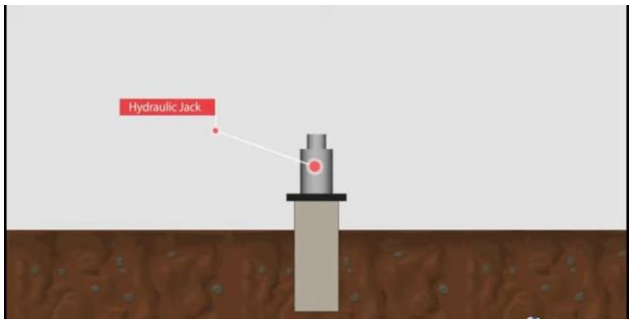


Figure 3.3.3 Install hydraulic jack

3) Placed the steel packer plate between the jack and the pile head.

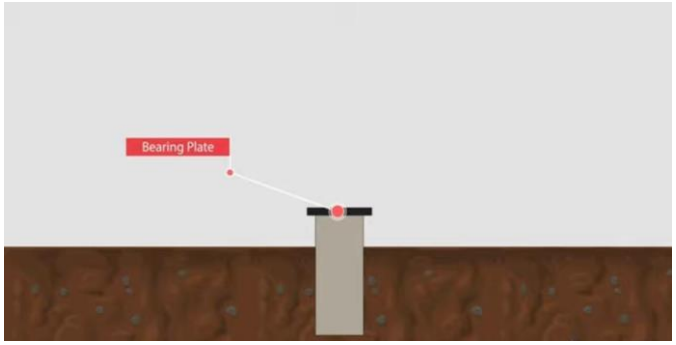


Figure 3.3.4 Placed the steel packer

4) With the jacking beam placed higher than the ram, the load frame can now be put directly above the jack.

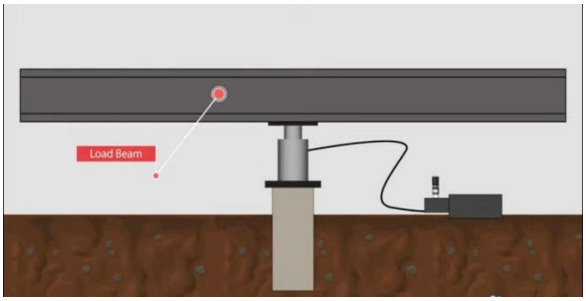


Figure 3.3.5 Place the load frame and beam

5) The load frame will be supported on the outside by two lines of concrete blocks.
6) Using a crane, the kentledge blocks are now loaded one by one into the frame.The kentledge blocks are loaded layer by layer to ensure the kentledge load is stable at all times.

Figure 3.3.6 Load the kentledge blocks

7) The four settlement gauges are next installed, with their measuring arms pointing vertically downwards, at each end of the channels.

Figure 3.3.7 Install gauge measurement

8) Record the reading and record the result.

3.4 To explain the method of waterproofing for water tank.

Water tanks are usually placed underground or overhead.As a result,there always a chance that water may seep through th common joints between structure and the tank, particularly if the tank is poorly constructed or simply not waterproofed.,waterproofing is very important to prevent from leaking happen or to protect the components inside the building.Membranes and coatings are used to waterproof a building or structure in order to protect structural.For water tank,the coating of waterproofing is needed to prevent from leaking or the concrete absorb the water.In order to prevent from this happen in this project which is to construct 70 000 gallon of main water tank tower,the type of waterproofing coat that used is boscoflex.This type of coating is recommended for water tank. Boscoflex is a two-component polymer modified flexible cementitious waterproof coating that is applied as a liquid.

To applied the waterproofing coat,there are steps and method to handle.Before start applying the coating,all the substure are cleand and free from the dust,oil or other loose particles.The method are as follows

1) Seal the edges of water tank and ring beam with using sealant.

Figure 3.4.1 Seal work

2) Make angle fillet at edges of the ring beam and ground slab.

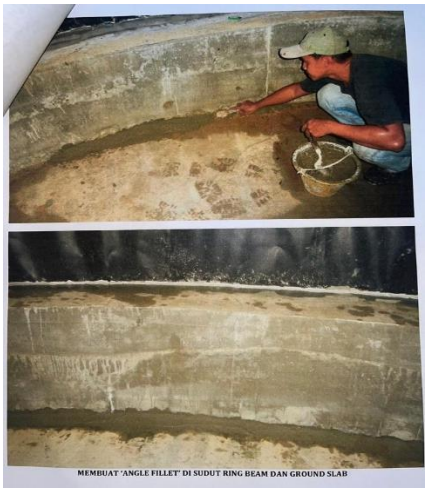


Figure 3.4.2 Angle fillet works

3) Apply the first layer of Boscoflex waterproofing.

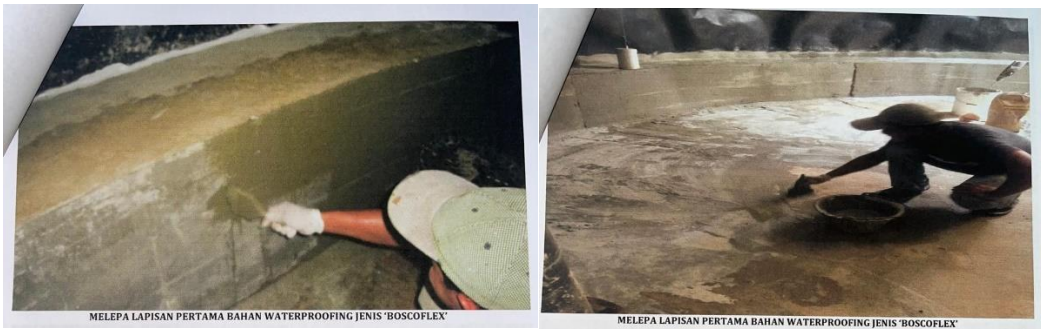


Figure 3.4.3 First layer of waterproofing works

4) After 3-6 hours,apply the second layer of Boscoflex waterproofing.

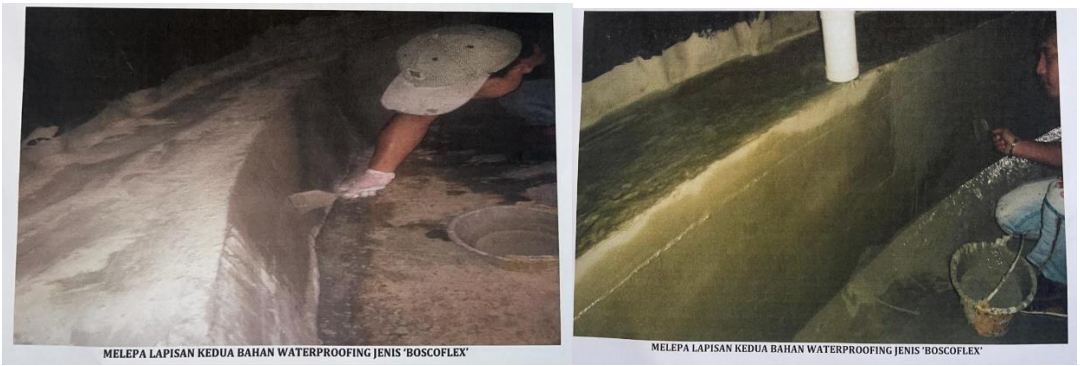


Figure 3.4.4 Second layer of waterproofing works

5) After 3-6 hours,apply the third layer of Boscoflex waterproofing.

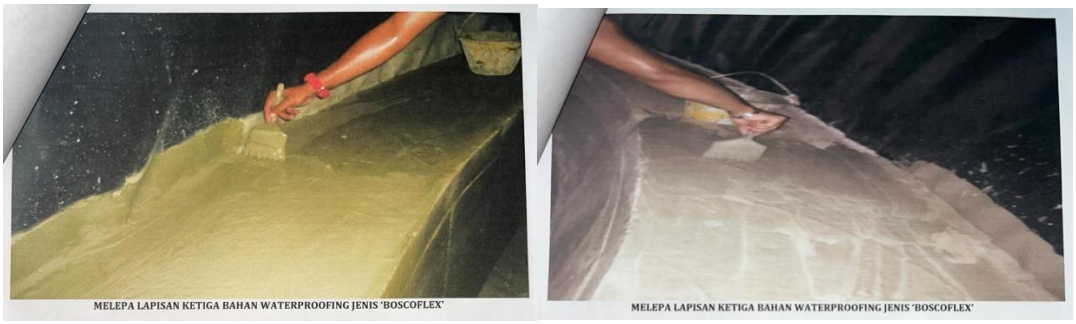


Figure 3.4.5 Third layer of waterproofing works

6) After 3-6 hours,apply the third layer of Boscoflex waterproofing.

Figure 3.4.6 Fourth layer of waterproofing works

7) After 3-6 hours,apply the last layer of Boscoflex waterproofing

Figure 3.4.7 After 3-6 hours,apply the last layer of Boscoflex waterproofing

8) Works completed

Figure 3.4.8 Works completed

CHAPTER 4

CONCLUSION

In conlusion,to provide clean water to every building to the communities or certain location,Water Supply System is very important to transfer clean water from water treatment plan to any buildings or houses.The water will be stored in the main water tank and then the water tank will deliver the water from the tank using pressurize water.Discovering and investigating the method of construction of elevated water tank is very important to know the processes and procedures to construct a good ,safe and long lasting water tank tower.The tests are required like PDA Test,Maintained Load Test and even Soil Test must be held in order to ensure the quality of the building is good and strong.To handle the project took a lot of time and patience in order to ensure the client is satisfied with our work result.Unfortunately this project was delay do to some reason but the delay is not to long and the end of the project show that the client are satisfied with our works.

Last but not least,the research reveals that the strategy is a valuable tool in water supply system design that reduces the risk of system failure to a manageable level.

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