



DEPARTMENT OF BUILDING
UNIVERSITI TEKNOLOGI MARA
(PERAK)

MANGROVE PILING AT GUNUNG LANG

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(PERAK)

FEBRUARY 2022

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entitled

Mangrove Piling at Gunung Lang

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

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STUDENT'S DECLARATION

I, hereby declare that this practical training report that I underwent at JABATAN KERJA DAN BANGUNAN at MAJLIS BANDARAYA IPOH is my own work, except for extract and summaries for which the original references stated herein for duration of 20 weeks starting from 23 August 2021 and ended on 7 January 2022. It is submitted as one of the essential requirements of BGN310 and accepted as a partial fulfilment of the requirements for obtaining the Diploma in Building.

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ACKNOWLEDGEMENT

Alhamdulillah, praise to Allah, the Almighty for HIS blessing to let me complete my practical training and finish the report successfully.

Here, I would like to express my gratitude for the guidance, advices and help through the period of my practical training by the following group of great peoples. First and foremost, I would like to thank to Pn. Aifa Farihah and En. Arif for the opportunity to conduct my practical training under their department at Majlis Bandaraya Ipoh. Her team of professionals involve of En. Anuar, Pn. Irna, Pn. Diana, Pn. Hanim, Pn. Fatimah, Pn. Sharifah, Pn. Ita and all other civil/mechanical/electrical engineer also admin staffs that have enabled me to learn and develop my understanding, knowledge and the feel of performing at workplace, also not forget the theory involved in analysis of sites, law and building. They are also responsible in given me the assessment while the training such allow to follow them to the sites, etc. It is an honour for me to have the opportunity to 'work' with all of you.

In addition, I also would like to thank ALL of the UiTM lecturers that have taught and encourage me in becoming a better student and person. I'd like to express my deepest appreciation to the lecturers who are directly involved during my training period. En. Ezzat Fahmi bin Ahmad, Supervising Lecturer, Dr. Hafizah Binti Mohd Latif, Advisor Lecture, En. Muhammad Naim Bin. Mahyuddin, Practical Training Coordinator and Dr. Dzulkarnaean Bin Ismail, Programme Coordinator. The time, effort, encouragement, advices and ideas that they have given towards the successful completion of my internship, this report and the knowledge that have been shared over the last few semesters.

Last but not least, my special thanks to my beloved parents and friends for their never ending encouragement, advices and supports.

Thank you so much.

ABSTRACT

A mangrove pile is one of the piles that serves to support a building or soil or a structure that does not have the strength to carry a heavy load on its own. Piles are usually used by buildings that need additional support or buildings erected on / near water to support them from collapsing when hit by storms and so on. This report will show how mangrove piles are installed around the edge of the island for the purpose of preventing soil from settling into the lake. In addition, in this report will be introduced important equipment in helping mangrove piles keep the island soil from collapsing. Finally, this report also shows the problems encountered during the project and formulates solutions for it. In conclusion, this project is very important to always preserve and take care of the island which is indeed one of the tourist attractions remains strong.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

Piles are used as the foundation of the building that its load is too large or the topsoil at a low-capacity. So, the load of the building had to be transferred to a stronger layer of soil located deep in the ground. Piles can be divided into two types, the first is a pile that depends entirely on the friction that occurs between the pile and the soil around it. Therefore, the pile should have a rough surface and the soil should be of a high friction type. For example, concrete piles are planted in compacted sandy soil to support loads. In addition, the type of pile that transfers the load of the building directly to the solid layer found in the ground. This type of pile should be planted or built up to a solid soil layer beneath it (Ashrul, 2014).

In this report, the topic will be more focusing on mangrove piles. Mangrove piles are one of the piles that used in the construction industry. It has a rough bark skin and a light brown sap wood. There are many types of piles such as concrete pile, steel pile, sheet pile, etc. Mangrove piles serve to cover soil that is not strong or soft from settling and collapsing. The wood will be preserved first and can then be used in piling works. It is suitable for the construction of small buildings and does not have a high load. Usually the diameter of mangrove wood is 75mm to 125mm (Azaman, 2010).

Based on Food and Agriculture Organisation (FAO, 2005), mangrove forests have civil-cultural characteristics which lead themselves to intensive forest management for wood products. Some of these characteristics is rapid growth. Mangrove mature stands under suitable conditions may yield over 270 m³/ha within 30 years. Mangrove also has a good regeneration potential

because most species of mangrove that flower and fruit regularly and the spores are dispersed by tides. It has the ability to survive in water. Mangroves are also economical for use in light construction industries or light load structures such as single storey houses. Thus, mangrove can recover rapidly from natural or man-made disturbances, including intensive logging. Not forget that mangrove also can made variety of forest products (FAO, 2005).

Piles made of wood are one of the best options. This type of pile is traditionally treated with a shellac coating to prevent insects from penetrating into the wood structure, thus increasing the durability of the wood. Wood has the advantage that it is lighter to transport than steel or concrete. It is a resource that is easy to renew and adds an advantage in terms of ecological resources that can attract the interest of some industries as well as consumers. Wood is also easily treated to make it adaptable to different environments even when it is underwater (STI Group, 2015).

In the industrial industry, there are many different facilities. Piles are not necessarily built for free -standing buildings. It can also be erected for buildings close to water. For example, terminals and refineries are often located near rivers, bays or bodies of water because the proximity to waterways allows for easy transportation of industrial products. However, such locations often have very soft and unstable soils that would not be able to bear the weight of a large facility without solid piles. Similarly, such locations are often vulnerable to environmental threats such as wind, storms and hurricanes that can affect the safety and stability of buildings that are not supported by high-quality piles (STI Group, 2015).

1.2 Objectives

- To identify the construction method of mangrove piles installation;
- To describe types of equipment that were used for soil retainer at Gunung Lang's island and;
- To determine the problems occurred at the construction site and solutions taken to solve the problems.

1.3 Scope of Study

This study was carried out at Gunung Lang Recreational Park, Ipoh, Perak. It focusses on installation/construction method of the mangrove piles at the edge of the island. This report will explain how the workers do the construction starting from removing the old pile until the project is ready. To describe the types that equipment needed for retain the soil at island edge from settles and collapses. And last, it will focus at problem that occurs at the site and the solutions to those problems. This project, teaches about the equipment and machines used during the construction. In addition, it also shows the construction method of the piles and an experience to be on a construction site and see construction underway. This study does not require costing or quantity of labour that needed in the construction site.

1.4 Methods of Study

a) Meeting

At the beginning before the start of this pile project, a meeting was held in the meeting room with the contractor and the engineers. They discussed the equipment that should be used to replace the old piles. They also discussed important matters such as more effective methods to prevent mangroves from decaying rapidly. *No photos are allowed because the meeting is confidential.

b) Interview

During the site visit, questions will be asked to the engineer who holds the project. Then he will describe what happened while construction was underway. That way, the understanding of the method being carried out is clearer.

c) Observation

Observations that have been made for the collection of project data is to monitor the situation during construction. Monitoring in terms of methods performed by workers to tie stones to gabions and so on. Typically, the period for observation of construction work is about half an hour. Observations are made weekly and while employees are performing their duties. In addition, there is machinery used by workers to lift rocks such as backhoes. Data were collected by taking some required photographs.



Figure 1.1 Old mangrove piles that already decayed



Figure 1.2 Soil and water deposition has passed over old rocks



Figure 1.3 The site collapsed because the soil had settled into the water

d) Site Visit

Site visits are important for current data collection. It is done every week to see how much progress the work has reached. Officers will also check that each pile that has been installed is satisfactory or does not reach the desired level. The other following method is by gathering information by supervisor that handling this project.



Figure 1.4 Site visit to check the old Mangrove Piles

CHAPTER 2.0

MAJLIS BANDARAYA IPOH BACKGROUND

2.1 Introduction of Majlis Bandaraya Ipoh

Majlis Bandaraya Ipoh (MBI) Or Ipoh City Council is the local authority that was established under the Local Government Act 1976 (Act 171). MBI is the body government that responsible for managing the Ipoh City area based on local interest, as well as a local planning authority under the Town and Country Planning Act 1976 (Act 172). MBI is directly given the responsibilities by law to formulate and implement development planning policies locality-based, accordance to the policies set by the Government. Ipoh as the state of Perak serves as the centre of administration, commerce, sports, finance, politics, religion and education. In the present, Ipoh City Council continues to transform the city into an effective and prominent city under the leadership by Mayor. (MBI, n.a)

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Days	Monday – Sunday

2.2 Majlis Banadaraya Ipoh Profile



Figure 2.1 Ipoh City Council Logo

Ipoh City Council is a special administrative institution. The types of services contributed by the Ipoh City Council are varied. There are various types of departments available at the Ipoh City Council. Among them are the Building Control Department, Community Affairs Department, Engineering Department, Health Department, Finance Department, Landscape and Recreation Department, Valuation and Property Management Department, Administration and Organizational Development Department, Audit Office Planning Department, Public Relations Office, Legal Office, Licensing Division and Enforcement Division. With that, all matters can be managed more quickly and thoroughly. Internet services by the Ipoh City Council provide services such as E-Services and E-Community.

i)



Figure 2.2 Ipoh tree

- Two numbers tree at right and left is symbolizing Ipoh tree, which is the origin of Ipoh City. Epu tree or the scientists name is *Antiaris Toxicaria* are many found in Kinta, Kampong Parloh. So based on the founder of Epu tree, he named the city as Ipoh. Today, Ipoh has developed into a modern and advance city.

ii)



Figure 2.3 Tiger

- Two numbers tiger at right and left of logo. These two tigers symbolize the courage and strength of country citizens. It based from *Jata Persekutuan* of Malaysia.

iii)



Figure 2.4 Yellow platform

- Yellow platform at the below was pictures the limestone hills that place at Kinta Valley, Ipoh. Limestone hills are very much synonym with Perak. It places at Gunung Rapat, Gunung Lang, Gunung Tambun, Gua Tempurung, etc.

iv)



Figure 2.5 Fortress

- Fortress in the middle up is symbolize the Kota Dato Laksamana that people believe as the first man who built and open a settlement at Ipoh. Dato Laksamana also known as one of the The Eight Great Man of Perak.

v)



Figure 2.6 Blue undulating stripes

- Blue undulating stripes is symbolizing the Kinta River. The Kinta River divides the historic centre of Ipoh into two parts which is Old Town and New Town. During the era of the Raja Kerajaan Melayu, Ipoh was only a small village. Then, British government come to ruled Perak around 1877, Ipoh was transformed into a town.

vi)



Figure 2.7 Star and Moon

- Star and moon is symbolizing the official religion – Islam. The purpose of this star and moon placed on the MBI logo is to highlight that the official religion as well as the majority of the population in Perak is Islam.

vii)



Figure 2.8 Perak flag

- Three vertical stripes with white, yellow and black colours at the bottom is symbolize as Perak Darul Ridzuan flag. The three white, yellow and black stripes in the flag symbolize the sovereignty of the Sultan, Raja Muda and Raja DiHilir of Perak.

2.2.1 Objectives

To create an equal and comfortable quality of life as well as upgrade the standard of living of all residents that live in the City Council area by:

- i. Providing all facilities and services as the foundation to achieve a comfortable quality of life;
- ii. Arranging and upgrading the services quality and the development planning in all areas;
- iii. Encouraging and providing public recreational facilities;
- iv. Enhance Ipoh City suits its status as Perak state capital and administrative centre as well as advertise the industries;
- v. Advertise industrial and commercial growth;
- vi. Aspire to achieve the government's objective and aspiration in execute the National Development policy.

2.2.2 Vision & Mission

- i. Vision: "Clean, Green and Developed Ipoh"
- ii. Mission: "Leading Strategic and Innovative Urban Governance Towards a Conducive and Sustainable City for the Well -Being of Urban Citizens"

2.2.3 Functions

- Control and planning development;
- Controlling building, advertisements and sign boards;
- Services of collecting city rubbish and control of hygiene and sanitation;
- Maintenance the streets building;
- Control of businesses and hawkers licensing;
- Manage traffics;
- Provision of public facilities;
- Improving and upgrading settlement by providing basic services.

2.3 Organization Chart

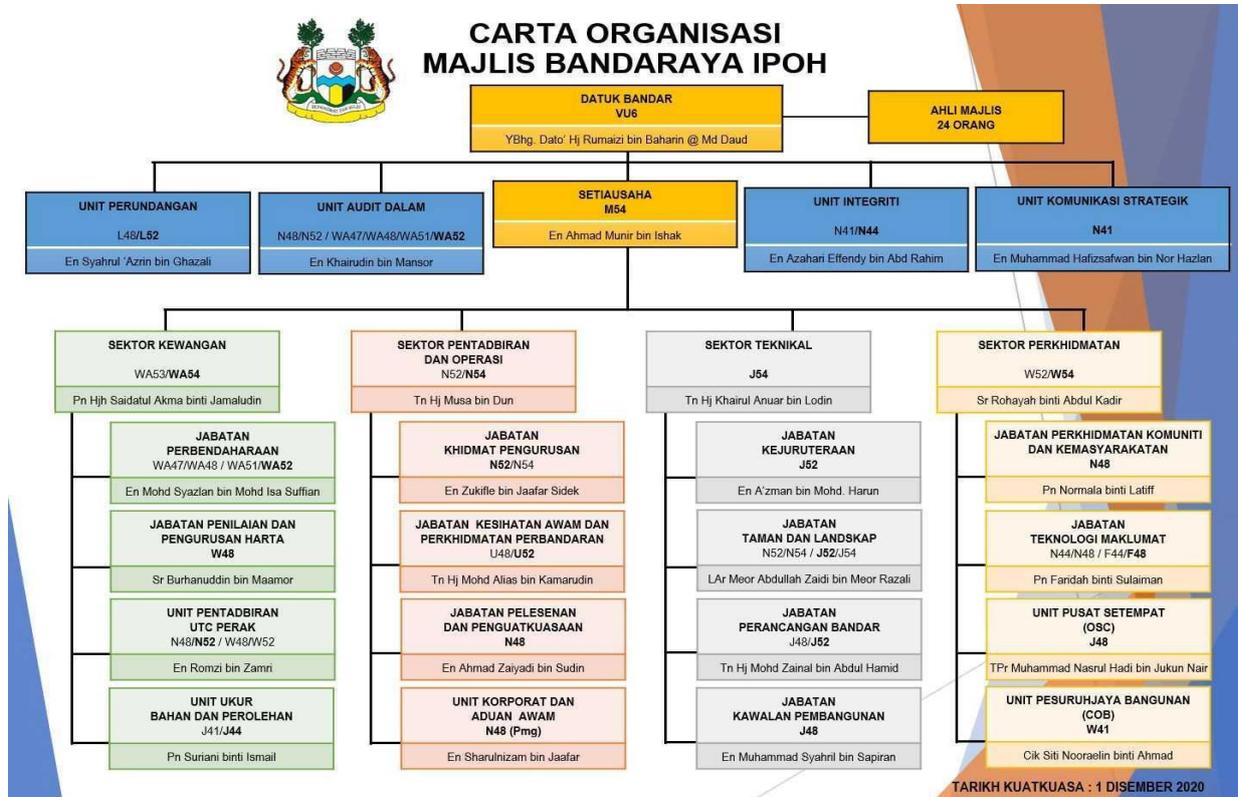
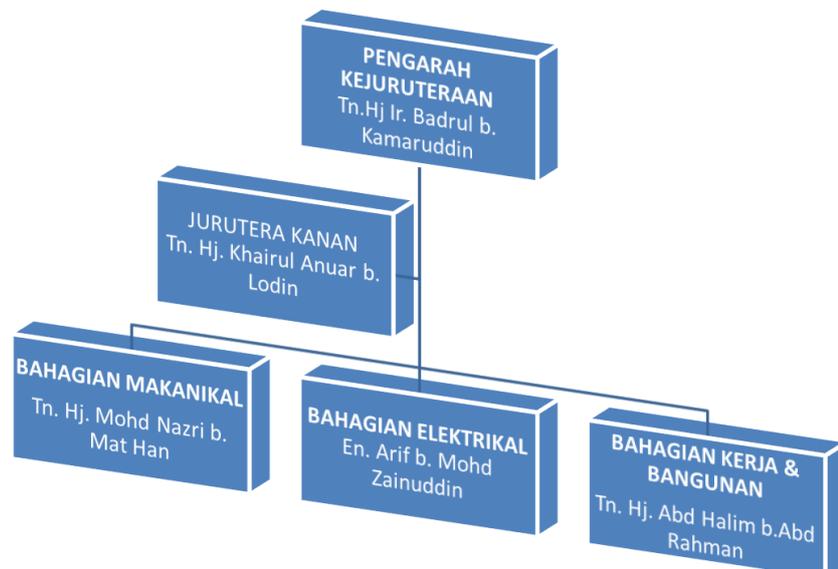


Figure 2.9 Organisation Chart of MBI

2.3.1 Engineering Department

Engineering department divided into several divisions which is drainage division, traffic division, road division, work and building division, mechanical division, admin unit and also quantity survey division. I was directed by the Department of Engineering to undergo industrial training at Work and Building Services Division. The main objective of the engineering department is to plan development and construct of infrastructure and public facilities under the Council's Administration.

Work and Building Services Division function as plan and assists in designing the preparation of plans, stalls, shop houses, public toilets and others. Besides that, manage and supervise the building and other public facilities projects. Carrying out maintenance works on Council's buildings or assets and also carpentry and preparation works for Council's functions.



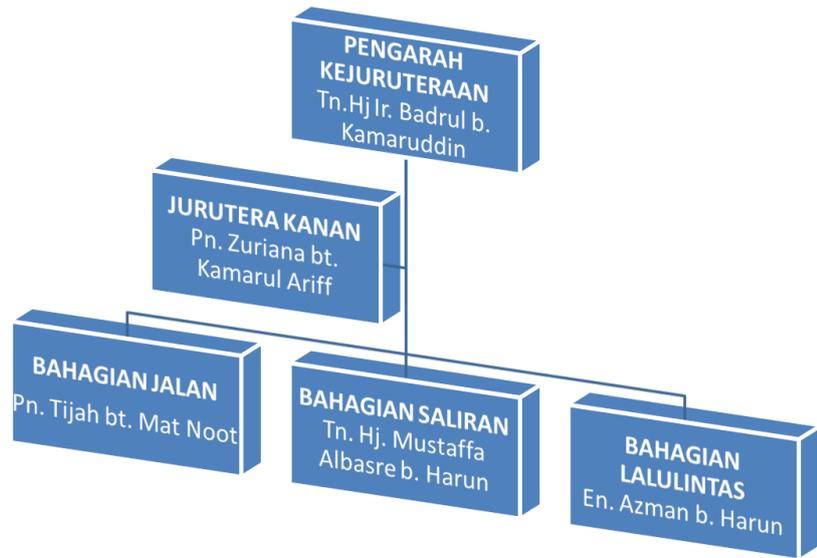


Figure 2.10 Organisation Chart of Engineering Department

2.4 List of Project

2.4.1 Completed Projects

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1	Cadangan Pembangunan Semula Pasar Ayam dan Parkir Bertingkat di Ipoh, Perak	RM13,194,684.30	10.2.2014	31.1.2017	24 month	Badrul Hisham Architect
2	Kontrak Bagi Pelantikan Firma Perunding Untuk Reka Bentuk Struktur dan infra Bagi Cadangan Pembangunan Semula Pasar Ayam dan Parkir Bertingkat di Ipoh, Perak	RM1,133,405.36	8.7.2013	31.1.2017	Until the project done	Badrul Hisham Architect

3	Cadangan Kerja-Kerja Membina Pasar Chemor Fasa II Daerah Kinta	RM800,000.00	20.2.2011	19.12.2011	9 months, 29 days	RRE Builder Sdn Bhd
4	Cadangan Membangun Semula Pasar Tanjung Rambutan, Ipoh	RM7,270,278.08	1.7.2011	27.8.2013	788 days / 2 year 2 month	Jamal Shuaib Arkitek Malaysia (ARC Radius Sdn Bhd)
5	Tender Reka dan Bina (Design & Build) Untuk Kerja-Kerja Awam Pengubahsuaian Tingkat 3 & 4 Bangunan Pasar Ipoh Bagi Perlaksanaan Pusat Transformasi Bandar (UTC) Negeri Perak	RM19,748,567.80	22.10.2012	1.4.2014	17 months, 10 days	Syarikat Anjung Emas Sdn Bhd

6	Cadangan Memasang Pagar Di Pasar Lahat	RM349,761.00	27.11.2017	14.6.2018	6 months, 18 days	Asfabina Enterprise
7	Cadangan Menaiktaraf Gelanggang Tenis di Kompleks Sukan Majlis Bandaraya Ipoh	RM2,222,735.20	2.7.2018	5.9.2018		Hiasan Lestari Sdn Bhd
8	Cadangan Menaiktaraf Stadium Indera Mulia di Kompleks MBI, Ipoh, Perak	RM14,554,630.34	16.1.2017	27.6.2018	75 weeks	Nurummi Sdn Bhd
9	Cadangan Membina Tandas Awam dan Gerai di Pasar Falim, Ipoh.	RM 192,635.00	28.7.2021	15.12.2021	20 Weeks	Majlis Bandaraya Ipoh
10	Cadangan Kerja Mengecat Bangunan Rumah Pangsa Bercham, Ipoh, Perak.	RM 200,000.00	4.8.2021	29.9.2021	8 Weeks	Majlis Bandaraya Ipoh

Table 1.1 Completed Project

2.4.2 Ongoing Projects

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1	Cadangan Menaiktaraf Laluan Pejalan Kaki Berbumbung, Parkir Bas dan Kaunter Bayaran Di Majlis Bandaraya Ipoh	RM 550,000.00	1.9.2021	19.1.2022	20 Weeks	Majlis Bandaraya Ipoh
2	Cadangan Membina Cerucuk Bakau di Sekeliling Pulau Gunung Lang	RM239,000.00	29.11.2021	Mid-February 2022	Unknown	Majlis Bandaraya Ipoh

Table 1.2 Ongoing Project

CHAPTER 3.0

CASE STUDY (MANGROVE PILES AT GUNUNG LANG)

3.1 Introduction to Case Study

The project for the case study in this report is a construction project and installing mangrove piles around the island in Gunung Lang to prevent soil sedimentation caused by lake water. The value of this project is RM 239,000.00. The project started at the end of November 2021 and the estimated completion date of this project is in mid -February 2022. The project is carried out on an artificial island located in the Gunung Lang area. Boats are needed to go to the island. Gunung Lang is located at Jalan Kuala Kangsar, 30010 Ipoh, Perak and is close to a Chinese temple. The last time a site visit was done was on 5 January where the installation of mangrove piles had reached 90%.

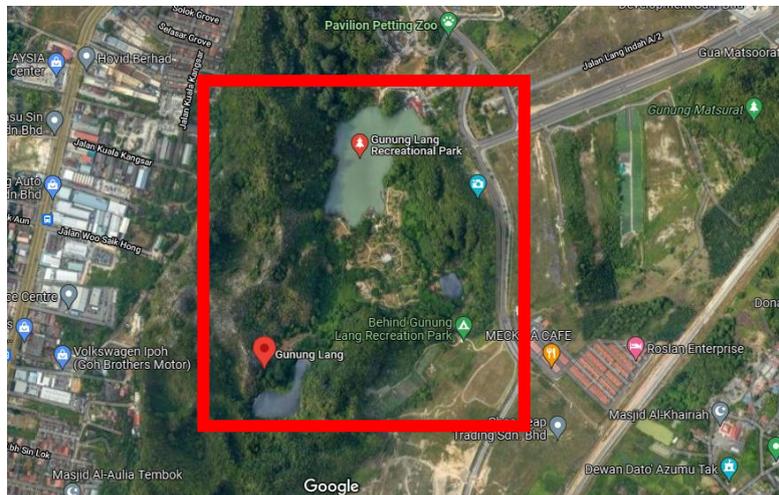


Figure 3.1.1 View Gunung Lang from map

3.2 Construction Method of Mangrove Piles

1) Remove the Old Mangrove Piles

Construction began by uprooting old and rotting mangrove piles. This is because the mangrove wood can no longer be used. If continued to be used, the situation will get worse such as the occurrence of landslides on the island. So the workers need to remove the old pile.



Figure 3.2.1 Old Mangrove Piles

2) Remove Old Gabion

Old gabions and rocks will also be removed and replaced with new ones. The rocks tied inside the gabion have already created some space that allows water to pass through it. This is also one of the reasons why the soil becomes sedimentary and the water exceeds the gabion level. In fact, old gabions can no longer be used because there are some parts that have been damaged due to friction that occurs with the rocks.



Figure 3.2.2 Old gabion and rocks



Figure 3.2.3 Gabion that broken

3) Measure Mangrove Wood

Next, measurements for each length of mangrove pile need to be taken. This is very important to ensure that each pile has the same length. If one of the piles exceeds the specified length, the excess must be cut off. Meanwhile, for piles whose length does not reach the specified amount, the pile must be exchanged with another. This is also to show the packaging of the pile arrangement at the end of the project.



Figure 3.2.4 Mangrove piles that measures 16ft

4) Dig Soil

Then, the backhoe will dig the muddy soil and excess soil to facilitate the process of installing gabions and mangrove piles. Excess soil will be collected in one area and at the end of the project the soil will be buried on new gabions. After that, surrounding of edge island need to be tidy up for the next method.



Figure 3.2.5 Areas that have been cleared of gabions, rocks and old piles



Figure 3.2.6 Excess Soil

5) Install New Gabion

Afterwards, an operator using a backhoe picks up new rocks and places them close to the edge of the island. The workers then took a new gabion and shaped it into a cage. The gabion needs to be tied with wire to strengthen its position and shape. If you use a regular rope, the gabion tie will be broken and at the same time make the situation worse.

Later, new stones were inserted into the gabion. Rocks should be arranged closely and compactly to avoid space that allows water to pass through. If the rocks are not arranged neatly, water will easily pass through them and this project will need to be redone. The process will take more time and waste manpower.



Figure 3.2.7 Backhoe's operator put the new rocks near the edge island



Figure 3.2.8 Gabion cage and rock inside it

6) Cover with Non-Woven Geotextile Fabric

After all the rocks already put in the gabion, the cage need to be tied tightly with wire. Then non-woven geotextile fabric need to put on the gabion as cover. This fabric won't settle in water because of the chemical in the fabric prevent it from damping in water. It is used for gabion cover before it is cemented.



Figure 3.2.9 Non-Woven Geotextile as cover of gabion

7) Install New Mangrove Piles

Once the stones are inserted into the gabion, the surface should also be covered with gabion and tied with wire. This is to prevent the rocks from falling apart and coming out of the gabion. Then, fresh mangrove piles are taken and planted into the ground.



Figure 3.2.10 The way mangrove piles should be arranging

Mangrove piles should be planted deep into the ground to prevent them from being uprooted. This is because boats always use the lake route and water waves can cause the pile to be uprooted. Once planted into the ground, the mangrove piles need to be tied with wire to prevent them from moving. If it is tied neatly, the pile will be firm and will not be torn off. The piles also need to be stacked closely.



Figure 3.2.11 An ideal arrangement of mangrove piles

8) Cover the Gabion

Finally, the top of the gabion will be cemented to strengthen the position of the gabion. This is because, if not cemented the gabion will move because the soil in the water is quite soft compared to normal soil. It will endanger the safety of tourists coming to Mount Lang. After cementing, the surplus soils will be used to cover the cemented area. Lastly, the area needs to be cleaned and tidied of any construction equipment.



Figure 3.2.12 Final result

3.3 Types of Equipment

i) Mangrove Wood

Mangrove comes from the Portuguese "mangue" and the English "grove". "Grove" means a community of plants that grow in tidal areas and "Mangue" means an individual plant species. (Himiteka, 2017) Mangrove trees are one of the most important plants in our country. This is because mangroves live in tropical countries along coastal areas or river estuaries. This plant is also easy to reproduce because it is produced according to spores. Mangrove wood is widely used in industrial activities such as making piles, furniture and so on. Mangrove trees need to be well cared for in order to maintain their natural habitat and ecological system. (M Firuza Begham, 2005)

Mangrove wood is the main choice in this piling project because of its high water resistance. It is also durable and flexible. This is because the mangrove trees themselves grow on the banks of the river/foot of the water as a fort so that the soil is not eroded by river water or sea water. Mangrove roots grow and grip the soil firmly. It also grows closely as if forming a defense to prevent the soil from eroding and settling. (MyWilayah, 2020)



Figure 3.3.1 Mangrove woods at construction site

ii) Gabion

The word gabion comes from the Italian "gabbione" which means large cage. Gabion wire is made of a layer of heavy zinc galvanized wire which is anti-rust and coated with PVC. Then the wire was interlacing to form a hexagonal hole. (Kania Dekoruma, 2021)

The use of gabion is to reduce soil movement. It works to prevent erosion and landslides from occurring. This is because the large rocks arranged inside the gabion serve as a retaining wall. Heavy gabions are higher in their resistance to being soil retainers. (Azlan, 2014) In addition, gabion serves as a flood or water barrier. The rocks in the gabion cage act as a water barrier from touching the sandy areas. It will prevent water from settling the soil and at the same time avoid landslides/floods. This makes gabion the best choice for this mangrove pile project.



Figure 3.3.2 Gabion cage



Figure 3.3.3 Gabion net

iii) **Rocks**

The choice of rocks is important to put in the gabion. A gabion is a box - shaped cage filled with stones. The stones stacked inside the Gabion make the wall look attractive and aesthetically pleasing and the structure is solid. Various types of rocks can be used to place in gabions. Pebbles, decorative stones or pieces of stone are some of the most popular choices. The selection of rock to fill the gabion before building it is important, as each different material requires a different thickness of wire. If using gravel, a thinner net is needed so that the stone does not slip out. If the rock is large, it is necessary to use steel wire mesh with a thicker wire diameter to ensure that the wall is structurally strong. (GabionReview, n.a)

For this project, sandstone was selected as the rock used for gabion. This is because, sandstone works well in being a retaining wall. It has the ability to absorb water well. Once water is absorbed, it can seep out slowly, ensuring the sandstone is not damaged and water is diverted from one location to another. (TJ, 2013) This can prevent water from hitting the soil on the edge of the island as well as prevent soil sedimentation. In addition, sandstone is easily available from other types of rocks. It is also economical and cost effective. Sandstone also does not require meticulous care as it is not easy to damage. Additionally, the sandstone features an aesthetic appearance and a beautiful finish.



Figure 3.3.4 Sandstone

iv) Non-Woven Geotextile Fabric

Non-Woven Geotextile is a fabric produced through a chemical process. It is mostly used in projects that require filtration such as water and waste treatment. (MHL, 2019) These fabrics can be produced directly from short staple fibres or using continuously twisted filament type yarns. The geotextile fibres will then go through a joint bonding process using heat (thermal), mechanically, by chemical reaction or a combination of both. Non-woven geotextile is often used in the construction industry because it has very little effect on its strong geo-synthetic properties. (Staff WVDEP, 2021)



Figure 3.3.5 Non-woven Geotextile Fabric

3.4 Problems Occurred at Site and Solutions

i) One of Workers was Exposed to Covid-19

A problem encountered during construction was one of the workers exposed to Covid-19. This makes the construction carried out had to stop for a while. For the health of the workers, they were all instructed to undergo a quarantine period of 2 weeks before resuming construction. Otherwise, tourists and other workers will also be affected by the disease. After 2 weeks, construction resumed smoothly without any interruptions.

Due to the workers being affected by the disease, the period for construction needs to be extended longer than it should be. With that, we provide an estimation of time (EOT) for the contractor as a reference. The contractor asked for a 2 week shift from the due time. The council gave permission and the EOT was approved. Thus construction can be completed before the set date.

ii) No Choice of Gabion Colour

During the meeting there was a problem where the gabion colour required by the council was out of stock. The colour of choice is between green or blue. This is because the two colours will blend well in water. Where the public will not see clearly the appearance and condition of the gabion being built.

The solution we recommend is to use a colour that is very similar to green or blue. Initially the contractor suggested white but the council did not agree with the proposal because white was too bright and easy to see. Then, they decided to choose grey. This is because the grey colour is close to the blue colour and it can blend well in water.

iii) The Pile Tilted

While the inspection was underway, it appeared that some of the newly installed piles looked slanted. This makes the arrangement of the mangrove piles untidy. The solution is to uproot the pile and replant it. But it needs to be done carefully so that it is no longer tilted as before. This is important to ensure that the final look looks neat, beautiful and organized.

CHAPTER 4.0

CONCLUSION

In conclusion, mangrove piles have a different process from other piles. Mangrove piles only need to be planted into the ground and tied together to prevent them from becoming disorganized. In contrast to other piles, where it needs to be planted with cement and requires reinforcement in it. Mangrove piles are very time -saving as they do not require time to mix cement or ensure hard concrete. It is also economical because mangrove wood is easily available in tropical countries such as Malaysia. The selection of mangrove trees as a pile to hold the edge of the island in Gunung Lang is very good because it makes its appearance look natural. Also the selection of gabion colours was blended well with the colour of sandstone.

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