DEPARTMENT OF BUILDING

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(PERAK)

PRACTICAL REPORT TITLE

CONSTRUCTION OF SLUICE GATE BUILDING

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FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

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FEBRUARY 2022

It is recommended that the report of this practical training provided

By

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entitled

Construction of Sluice Gate Building

be accepted in partial fulfillment of requirement has for obtaining 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 stated herein, prepared during a practical training session that I underwent at Jabatan Pengairan Dan Saliran Daerah Sabak Bernam for duration of 20 weeks starting from 23 August 2021 and ended on 10 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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ABSTRACT

The sluice gate building is a very important structural element for controlling the irrigation of water between seawater and land water. Then, sluice gates also play a role are used to regulate the flow of water in canals. To obtain a goal flow rate for a specified time period, gates are manually raised or lowered and then left in place. This report was discussed about and conducted for the construction of sluice gate building at 170, Jalan 7 in Bagan Sungai Besar, 45300 Mukim Sungai Besar, Daerah Sabak Bernam, Negeri Selangor. The objective of this report is to explain the method of construction temporary road. This report will focus on the installation process of sheet pile. It also to describe the types of sheet pile used and identify the problem faced during construction. So, building sluice gates is important to control water irrigation to prevent flooding occurs when the water level in the canal rises too high, affecting the community. Flooding may also ruin irrigated plants, paddy, and vegetable cultivations, among other things.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

A sluice (from the Dutch word'sluis') is a water canal that is regulated at its head by a gate. A millrace, for example, is a sluice that directs water toward a water mill. In the water/wastewater industrial, the names "sluice gate," "knife gate," and "slide gate" are equivalent (Khan, 2016). Traditionally, a sluice gate is a wooden or metal plate that slips into slots in the channel's sides. Sluice gates are often used in rivers and canals to regulate water levels and flow rates. They are also used in wastewater treatment plants, mining operations, and watermills to extract minerals (Khan, 2016). Sluice gates are also utilised in irrigation as flow diversion and flow measurement systems. Alignment is one of the most critical elements influencing the sluice gates' discharge characteristics (Khan, 2016).

Next, a sluice gate is a control opening in a hydraulic system that regulates discharge. The discharge coefficient of a sluice gate is a complex function of geometric and hydraulic characteristics (Swamee, 1992). It is connected to upstream depth and gate opening for free flow, and it is related to tail-water depth for submerged flow in addition to these parameters (Swamee, 1992). The current method for determining discharge coefficient is to create curves linking discharge coefficient and upstream-depth gate-opening ratio, with the tail-water-depth gate-opening ratio as the third parameter for submerged flow (Swamee, 1992). Because of the interpolation between two types of curves, this method lends itself to a considerable amount of judgement error. Furthermore, any analytical and/or numerical method for flow control and flow profile determination cannot be employed with the graphical data (Swamee, 1992).

Furthermore, sluice gates are used to regulate the flow of water in canals. To obtain a goal flow rate for a specified time period, gates are manually raised or lowered and then left in place (Dimuthu D. K. Arachchige et al., 2017). This is a time-consuming and labor-intensive technique. Due to flow variations in the upstream canal and downstream sea side, water flow near a discharge mouth has a chaotic behaviour (Dimuthu D. K. Arachchige et al., 2017). Water levels change in a complex manner, making it difficult to implement a good control system (Dimuthu D. K. Arachchige et al., 2017). Wave fluctuations and salinity profiles at the canal mouth are used to determine the degree of variation in water levels. Wave heights are recorded independently on the seaside and on the landside using two level sensors. The salinity profiles at the land side water flow are recorded using a salinity sensor (Dimuthu D. K. Arachchige et al., 2017).

On the other hand, Inland water is drained through tiny water canals, which serve as a discharge point between the canal end and the sea. The canal's water release is to be controlled in such a way that the community benefits significantly while ensuring seamless operation at the canal mouth (Dimuthu D. K. Arachchige et al., 2017). Flooding occurs when the water level in the canal rises too high, affecting the community. Flooding may also ruin irrigated plants, paddy, and vegetable cultivations, among other things (Dimuthu D. K. Arachchige et al., 2017). Moreover, the sea level rises from time to time, causing violent tidal movements toward the land (Dimuthu D. K. Arachchige et al., 2017). When sea water flows to the land side, the concentrated salt water affects the surrounding agricultural, making plants vulnerable. As a result, the water discharge point necessitates a suitable salinity barrier that can react to the water levels on both sides (Dimuthu D. K. Arachchige et al., 2017).

There are many different types of sluice gates, however, the aim of this report is to discover the construction of sluice gate building.

1.2 Objectives

Several objectives have been formed as a result of this construction:

i. To explain the method of construction temporary road.
ii. To identify the installation process of sheet pile.
iii. To briefly describe the types of sheet pile used.
iv. To identify problem faced during construction.

1.3 Scope of Study

The research was carried out at 170, Jalan 7 in Bagan Sungai Besar, 45300 Mukim Sungai Besar, Daerah Sabak Bernam, Negeri Selangor. The construction of the project began on December 08, 2020, and will be completed on December 07, 2022. The project entails the construction of the Water Gate Building at a cost of three million two hundred and ninety-four thousand nine hundred and thirty-two Ringgit Malaysia (RM 3,294,932.00). The project is currently being built, and progress is being made. As a result, the study's main objective was to find out how the sluice gate construction process works. As a result, the study will focus on sluice construction methods, such as temporary road construction for the construction site, sheet pile installation, sheet pile types, and equipment and machinery. This analysis also focused on the following problems that emerge throughout the construction process. Unfortunately, since this work will be managed by SYABAS Air Selangor, the study will not focus on pipe maintenance. There are three approaches that must be used to collect information such as observation, interviews, and document examination.

1.4 Method of Study

1. Observation

During construction work, making observations is important and it is a way to collect data through observations at the construction site. Thus, making an observation is about how the sluice gate building construction process and it starts by observing the temporary road construction work for the construction site. The temporary road access has 2 layers which is prime coat and premix coat. The size of the premix coat is 20mm and 14mm. Next, the observation of the work of installing the sheet pile and it takes about 3 to 4 weeks to complete the installation if there is no heavy rain. Doing observations for work on a construction site takes about 2-3 hours for a day. Furthermore, record the observation data made by way of writing notes and taking some important pictures about the sluice gate building construction process information.

2. Interviews

Interviews are one of the best methods to gather data about any construction by doing structured or semi-structured interviews with experienced and knowledgeable people for the construction project. Conducting interview sessions while conducting observations and while doing work on construction sites. Therefore, interviews were conducted with company managers, contractors and supervisors in charge to handle large projects such as the construction of a current sluice gate building on the site. In addition, these interviews were also conducted jointly contractor workers who are on site while doing road making work and installing sheet piles. Furthermore, semi-structured interviews were also conducted with the contractors carry out projects every month at the construction site and usually the interview sessions run for 10 – 20 minutes and it is recorded through a notebook.

3. Document Reviews

Initially, a review of the documents used to collect all data for the construction of the building is a company profile, a construction drawing, progress reports and construction progress photos taken by contractor workers. Next, a drawing plan will be used as a reference source at construction sites that are under observation for temporary road work processes and sheet pile installation. In addition, a picture of the progress of the construction owned by others is also the best source of reference when conducting document reviews.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

The Department of Irrigation and Drainage is a technical Department under the Ministry of Agriculture which is responsible as an agency that functions directly in providing and maintaining various infrastructure and facilities of irrigation systems for the purpose of paddy cultivation to achieve the National Agricultural Policy.

Sabak Bernam District Irrigation and Drainage Department plays a very important role in helping to increase the development and socio-economic growth of the people in Sabak Bernam District as 96% of the entire district has been developed with agriculture.This department provides and supplies engineering services that cannot be implemented by the private target group and in turn ensures optimal land development and more efficient management of the country's water resources.

The committee released its findings in 1931 after conducting a comprehensive investigation. A Department of Irrigation and Drainage must be formed for the Straits Settlements and the Federated Malay States, as well as advisers in the Malay States UMs, who will absorb the Hydraulics Branch Public Works Department, Federated Malay States, according to one of the key proposals. On January 1, 1932, this suggestion was approved as a separate department.

20,000 hectares of additional paddy land were created and developed in the first ten years of the Department's existence until the Japanese invasion, while irrigation and drainage facilities were given for about 50,000 hectares of existing paddy land. In Selangor and Perak, the agency has taken over drainage maintenance work for 40,000 hectares of estate land and smallholders.

2.2 Company Profile

Sabak Bernam District Irrigation and Drainage Department (JPSSB) is a technical Department under the Ministry of Agriculture that was established in 1932 and currently involved in construction of sluice gate, construction of intake canal and renovation. This company based in Sungai Besar located at Jabatan Pengairan Dan Saliran Sabak Bernam Kompleks Pentadbiran Kerajaan Daerah Sabak Bernam 45300 Selangor.

Figure 2.1 Location of the company Sabak Bernam District Irrigation and Drainage Department (JPSSB).

Source : https://maps.google.com/

With relation to the company's mission, to provide expert engineering and water resources management services including river basin management, coastal zone as well as integrated flood and drought management to improve the quality of life of the people by ensuring water security and environmental sustainability. Then, the vision of company is a Leader of National Water Resources Management and Engineering Expertise Services. The company has 2 function which is irrigation to provide drainage facilities for paddy and other crops, and drainage to provide drainage facilities for permanent crop development. Sabak Bernam District Irrigation and Drainage Department (JPSSB) can be contacted via company email at jps_sabakbernam@waterselangor.gov.my, fax (03-3224 2226) and can directly contact telephon number (03-3224 6900)

2.3 Company's Organization Chart

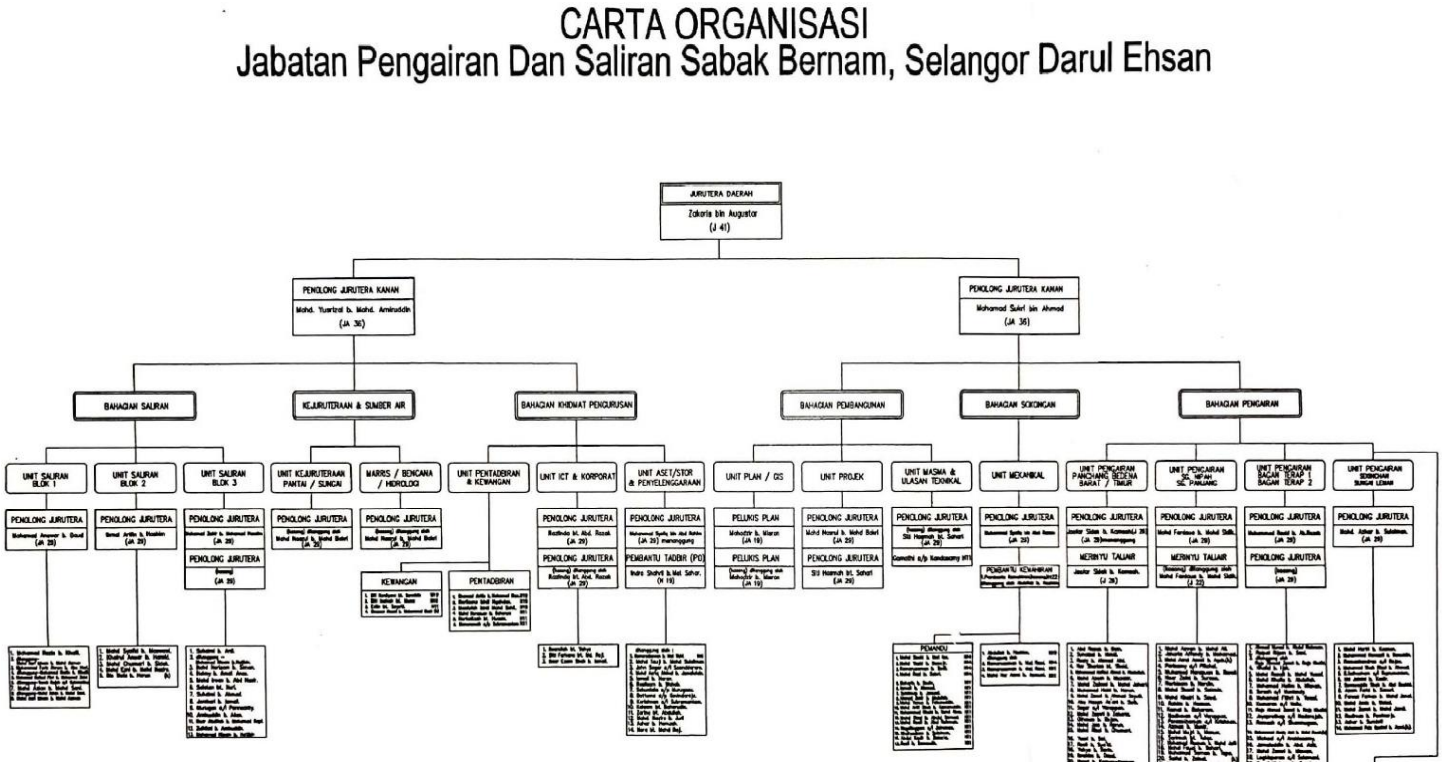

Figure 2.2 : Organization Chart of Sabak Bernam District Irrigation and Drainage Department (JPSSB).

As shown above from Figure 2.2, there are six sections in the organization chart of the Sabak Bernam Irrigation and Drainage Department (JPSSB). Firstly, the drainage section as provide drainage facilities for permanent crop development. Next, the engineering & water resources division serves for management services including river basin management, coastal zone as well as integrated flood and drought management to improve the quality of life of the people by ensuring water security and environmental sustainability. In addition, the management services division and the development division which consists of finance, ict, assets, plan and project units. Finally, the irrigation section serves as to provide drainage facilities for paddy and other crops, and the mechanical unit of the support section.

2.4 List of Project

2.4.1 Completed Projects

Table 2.1: Table of Completed Projects.

No.	Project Title	Value	Start Date	Completion Date		Project Duration	Client
1.	Projek Kawalan Hakisan Dan Memperkukuh Benteng Blok 1, Blok 2 Dan Coastal Belt Daerah Sabak Bernam, Selangor Darul Ehsan	RM 3,895,500	01 NOVEMBER 2016	31 OCTOBER 2017		12 MONTHS	ABAD KENANGA SDN. BHD, SHAH ALAM
2.	Kerja-Kerja Membaikpulih Rumah Kuarters Kunci Air Parit 1, Jabatan Pengairan Dan Saliran Daerah Sabak Bernam	RM 19,990	10 MARCH 2021	01 APRIL 2021		4 WEEKS	MRS MULTISUPPLIERS & ENGINEERING
3.	Kerja-Kerja Membaikpulih Stor Mekanikal, Jabatan Pengairan Dan Saliran Daerah Sabak Bernam, Selangor Darul Ehsan	RM 100,000	01 OCTOBER 2021	30 NOVEMBER 2021		8 WEEKS	HASSIM BIN AHMAD
4.	Kerja-Kerja Membaikpulih Rumah Kuarters Jabatan Pengairan Dan Saliran Daerah	RM 19,990	18 OCTOBER 2021	15 NOVEMBER 2021		4 WEEKS	WAREEZ EMPIRE

	Sabak Bernam, Selangor Darul Ehsan						

2.4.2 Project in Progress

Table 2.2: Table of Project in Progress.

No.	Project Title	Value	Start Date	Completion Date	Project Duration	Client
1.	Menaiktaraf Rumah Pam Dan 'Intake Channel' Dikawasan Pengairan Bagan Terap, Daerah Sabak Bernam, Selangor Darul Ehsan	RM 15,754,895.50	10 AUGUST 2020	07 AUGUST 2022	2 YEARS	SITGES ENGINEERING SDN. BHD
2.	Kerja-Kerja Membina, Membekal, Memasang Dan Mengujijaya Pintu Air, Kerja-Kerja Elektrikal Serta Kerja-Kerja Lain Berkaitan Di Pintu Air Sungai Besar, Daerah Sabak Bernam Untuk Jabatan Pengairan Dan Saliran Negeri Selangor	RM 3,294,932	08 DISEMBER 2020	07 DISEMBER 2022	2 YEARS	TEGUH ILMU(M) SDN. BHD
3.	Kerja-Kerja Menaiktaraf Sistem Saliran Di Jalan SD 1, Bagan Sekinchan Daerah Sabak Bernam Selangor Darul Ehsan	RM 1,254,430	27 APRIL 2021	22 FEBRUARY 2022	10 MONTH	KUNDOO TRADING

CHAPTER 3.0

CASE STUDY OF CONSTRUCTION SLUICE GATE BUILDING

3.1 Introduction to Case Study

The case study is about the construction of a sluice gate building. Work the project has commenced with the ownership of the construction site on 8 December 2020 and the original completion date is expected on 7 December 2022. The construction cost of this sluice gate building in the amount of approximately three million two hundred and ninety-four thousand nine hundred and thirty-two Ringgit Malaysia (RM 3,294,932.00). Currently, the project construction is still underway. Therefore, the study will be explained installation of sheet piles, doing temporary roads, use of sheet pile types including machines and tools and problems during construction. The construction site took place at 170, Jalan 7 in Bagan Sungai Besar, 45300 Mukim Sungai Besar, Sabak Bernam District, Selangor.

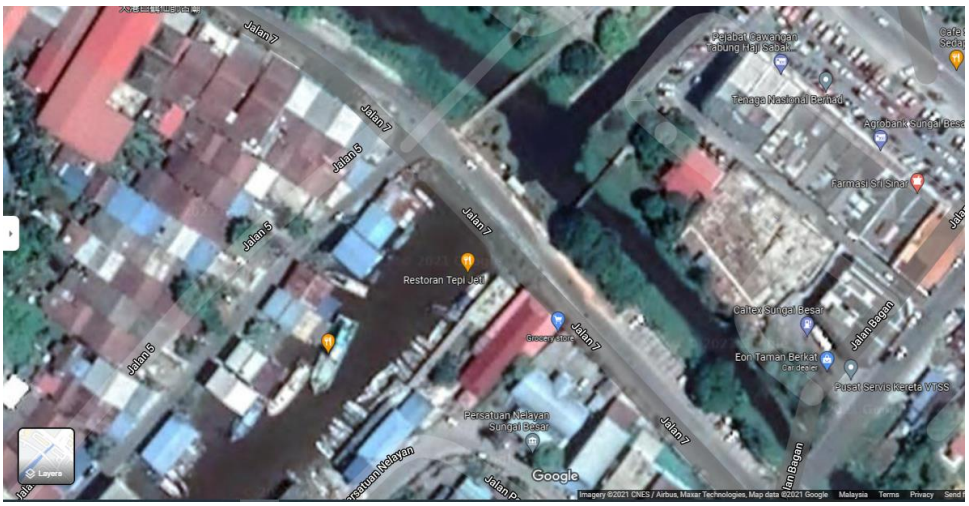

Figure 3.1 Location of construction sluice gate on the satelite map.

Source: https://maps.google.com/

The construction of sluice gate building has referred to drawing plan as shown in Figure 3.1.1 and the construction project is located at 170, Jalan 7 in Bagan Sungai Besar, 45300 Mukim Sungai Besar, Sabak Bernam District, Selangor. Next, this construction area faces the Big River Chart. The Bagan area is quite large as it is surrounded by many housing and shop buildings. In addition, the main buildings close to the construction area are the Tabung Haji Sabak Bernam Branch Office, Tenaga Nasional Berhad and Caltex Sungai Besar. There are several existing residential buildings close by construction area. There is also an existing boat area of the existing housing area near the construction area as it is a fishing spot in Bagan.

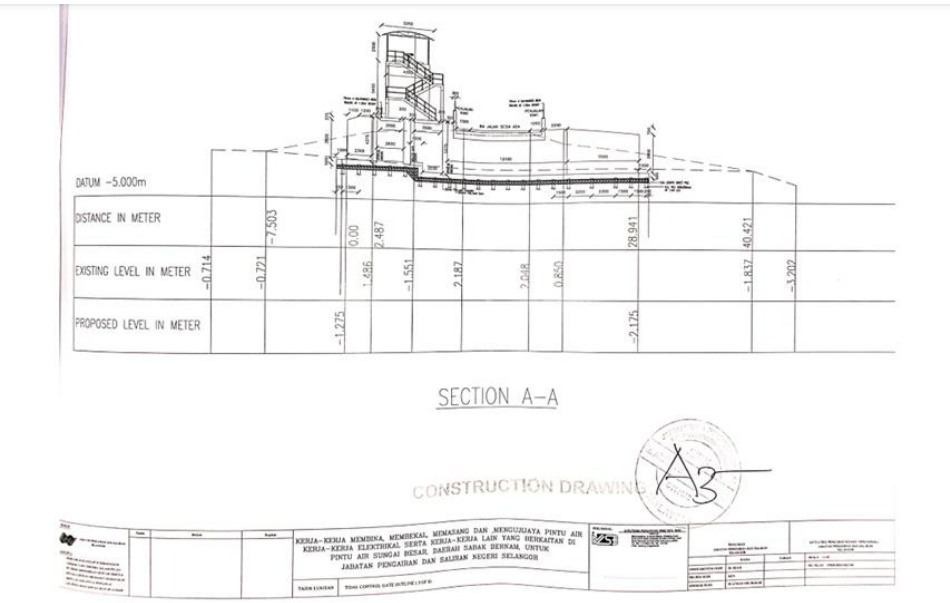

Figure 3.2: Drawing plan project construction of sluice gate buildings.

Next, the activity that has been carried out at the site is the work of installing sheet piles in the water area. Work to install this sheet pile work that is not easy and needs to be handled by skilled workers to get the perfect sheet pile depth and no errors occur. Next, in the construction area pneumatic tyred rollers, road rollers, machine mounted breakers, hydraulic breakers, cranes and hammer vibrators.

Then, before beginning the construction work, temporary road construction work is completed to allow heavy vehicles and machinery to pass through. Grading the area, compacting the dirt, and laying the gravel are all things that need to be done now. The road surface has also been smoothed and compacted, allowing large construction vehicles to travel on it for the duration of the project. With the help of gravel and sand, as well as a coating of asphalt, heavy plant equipment will be able to navigate the expanded highways. In addition, the installation of sheet piling to keep water and dirt out of trenches when a bridge pier or other structure is being built. When building must take place below sea level, a cofferdam is built to provide a dry working environment for the workers. After sheet piling is driven around construction sites, the water is drained, and sealing concrete is put in the basement to prevent water from leaking in from underneath the sheet piling. Because precision for depth is required, this operation will take a lengthy time. As a result, the time spent on the sheet pile assembly process will be tracked from the beginning to the end.

Finally, Z-Type sections of sheet piles are among the most effective piles available today, and are employed for intermediate to deep wall construction. The U-Type is characterised by a large cross section width that ensures that the cross section's mechanical properties are completely exerted, a cross section structure that is designed suitably, and a high "quality factor." Braced sheet pile and double wall sheet pile are two further forms of sheet pile. Next, identify the issues that arose during construction, such as late delivery of materials, which is one of the issues that a contractor faces from a supplier. Premix coat's supplier was late in delivering the material, causing the procedure to be delayed by one day.

3.2 To Explain the Method of Temporary Road

On a construction site, a temporary access road is being built. It is time to grade the ground, compact the soil, and lay the gravel. The road surface has also been levelled and compacted as shown in Figure 3.2.1 so that big construction vehicles can travel on it for the length of the project. The heavy plant equipment will be able to navigate the widened roads with the help of gravel and sand, as well as a layer of asphalt. The temporary road access is built besides the sluice gate buildings

project and is use by heavy and very heavy vehicles for a limited period. Once the project finish, the temporary road access will be demolished and people in that area can use main road.

Figure 3.3: The road surface has been compacted.

The temporary road access has 2 layers which is prime coat and premix coat. The size of the premix coat is 20mm and 14mm. There is the step for construction of temporary access road such as:

- **Preparation of prime coat:**

A prime coat may be a thin layer of low viscosity asphalt applied to a granular base in preparation for an initial layer of asphalt (or surface course layer). The prime coat's purpose is to coat and bond loose material particles on the bottom course's surface, to harden or toughen the bottom surface to supply a piece platform for construction equipment, to plug capillary voids within the base course's surface to forestall moisture migration, and to supply adhesion between the bottom course and succeeding asphalt course. After applying the primer coat, it must cure for a minimum of 48-72 hours before asphalt is laid, supplied there's no rain forecast.

Figure 3.4: Applying the prime coat.

- **Premix coat:**

Premix Carpet (PMC) may be a graded open bituminous mix that's commonly utilised in India as a surface course on rural roads and as an overlay on urban portions. PMC is also sensitive to water intrusion because of the presence of great air voids, leading to an increase in pore pressure under traffic and therefore the start of moisture-induced distresses like bitumen peeling from aggregates and therefore the production of potholes. A sand seal coat is often put over PMC to stop surface water intrusion. Because most seal coats are applied by hand, there's an opportunity that the seal coat won't be uniform, leading to the surface not being entirely sealed against water infiltration. The premixes used are 20mm and 14mm in size.

Figure 3.5: Using a premix coat of premix carpet.

- **Used of Pneumatic tyred roller:**

Also known as rubber tyred rollers, this type of waggon is heavily loaded and has several rows of closely spaced tyres. They apply consistent pressure across the width of the cover and are frequently used in pavement subgrade work due to their suitability for compacting uniform coarse soils and rocks. Additionally, they are used to complete embankments compacted by sheep foot rollers.

Then, the weight tyre inflation pressure, and contact area all have an effect on the amount of compaction that can be achieved.

Figure 3.6: Pneumatic tyred roller to compacting uniform coarse soils and rocks.

- **Used of road roller:**

A road roller is a style of compaction vehicle that compacts soil, gravel, asphalt, crushed stone sub-base layer, or other site surface materials. Rollers are wont to crush, knead, or vibrate loose materials by applying direct pressure. They're most ordinarily employed for construction or to make compact foundations for huge areas, but they will even be utilised in areas as different as landfill sites or agricultural operations. The rolling process compacts loosely linked foundation materials, ensuring that they stay compact and don't fall loose.

The weight of the vehicle or mechanical advantage are being used by road rollers to compact the surface being rolled (vibrating). On a road project, the initial compaction of the substrates is done with a padfoot drum roller, which generates a greater compaction gradual development to the pads' smaller surface area.

Figure 3.7: Road roller for compacting road surface.

3.3 To Identify the Installation Process of Sheet Pile

A cofferdam is a makeshift construction used to keep the water and/or soil out from the excavations where a bridge pier or other structure is being erected. A cofferdam is created to provide a dry working environment for the employees when construction must take place underneath the sea level. The water is drained out after sheet piling is driven around in the construction sites and sealing concrete is laid at the basement to avoid water from leaking in from underneath sheet piling.

A cofferdam could be a temporary dike built across a body of water, and constructed to permit the water to be pumped out of the enclosed area. Cofferdams are utilized in order to permit for a dry working environment. Once a cofferdam is in situ, crews are ready to do things like excavation, repairs, and pouring concrete.

Figure 3.8: Cofferdam for temporary dike built to across body of water.

- **Method of cofferdam sheet pile**

Maintaining tight tolerances during the development of cofferdams is challenging, as cofferdams are typically constructed offshore and sometimes under adverse weather. Significant deformations of cofferdam elements may occur during construction in these circumstances, and it's going to be necessary to deviate from the look dimensions so as to finish the project on time. The loads imposed on the cofferdam structure by construction equipment and operations must be considered, both during installation of the cofferdam and through construction of the structure itself.

Next, removal of the cofferdam must be planned and executed with the identical degree of care as its installation, on a stage-by-stage basis. The effect of the removal on the permanent structure must even be considered. For this reason, sheet piles extending below the permanent structure are often bring to a halt and left in situ, since their removal may damage the muse soils adjacent to the structure.

After that, safety requires that each cofferdam and each part thereof shall be of suitable design and construction, of suitable and sound material and of sufficient strength and capacity for the aim that it's used, proper construction, verification that the structure is being constructed as planned, monitoring the behaviour of the cofferdam and surrounding area, provision of adequate access, light and ventilation, and a focus to safe practices on the a part of all workers and supervisors, and shall be properly maintained.

Below the excavated elevation, the pressure is increased by submerged soil and water. The sheeting is formed sort of a beam supported by multiple supports. Loading conditions must be considered both during construction of the cofferdam and after dewatering. Additionally, the steadiness of the soil beneath and before of the wall should be evaluated for seepage effects. Internal bracing is spaced to avoid overstressing the piling.

3.4 To Briefly Describe the Types of Sheet Pile Used

- **Sheet Pile Shapes**

Z-Type (Z): Z sections are amongst the most effective piles available today, and are used for intermediate to depth wall building. Cantilevered and tied-back retention systems frequently use Z-piles. Joints for load-bearing bridges are another purpose.

U-Type (U): Large cross section width ensures that the mechanical properties of the cross section are fully exerted, cross section structure is meant reasonably and encompasses a high "quality factor" the utilization of steel sheet piles isn't restricted by weather. U sheet piles has significant environment protection effects, greatly reducing the number of borrowed soil and also the use of concrete, effectively protecting natural resource.

Cold-formed U Sheet Piles are widely utilized in South East Asia and geographic area. The sheets utilized in these applications are subjected to hoop tension from internal pressure exerted by the retained soil, instead of bending. As a result, the flexibility to transfer this stress across the interlocks is most vital and these sheet pilings have interlocks specifically designed for such loads.

Figure 3.9: Sheet pile of Z-Type (Z) and U-Type (U).

- **Sheet piles machine**

Vibrator hammer is the most effective and efficient method of driving steel sheet piles, and thus the best practise. A vibratory hammer is ideal for driving in

coarse-grained soils, such as gravels and sands, at a shallow depth. After erecting a pile driving frame, the sheet piles are driven with a vibratory hammer mounted on a crane, arig, or excavator.

The vibratory hammer is clamped to the top of the sheet pile. It generates a sine-wave vertical pressure, and the hammer's energy rapidly drives the pile into the soil. The critical frequency is exceeded by stress waves in the sheet pile, and the hammer's weight acts as static loading. There is no risk of deformed sheet piles or missing interlocks due to the significantly reduced critical frequency.

Figure 3.10: Vibrator hammer machine for driving steel sheet piles.

- **Doubled Wall**

  When larger areas are required in deeper water, single-walled cofferdams become unfeasible, and double-walled cofferdams are occasionally required. Two walls are constructed with a niche between them whose thickness is decided by the depth of the water. This also required when involving tides phenomenal. The pressure from water tides can cause problem if use single wall.

  The general rule is for the thickness of the wall to equal the depth of water up to three m, greater depths require 3 m plus half the surplus depth. the 2 wall faces are connected at the highest using steel rods placed at close intervals.

Figure 3.11: Doubled wall to prevent the pressure from water tides.

- **Braced sheet pile**

This method enables the undertaking of deep excavations whilst limiting deformation to the wall. Providing it's possible to implement this method, the employment of anchors for bracing sheet pile screens enables the undertaking of excavations within the proximity of elements which must be protected (buildings, installations, communications networks).

The excavation must be carried is required quite one introduce order that the anchors is installed and stress tested before proceeding with the opposite work. This kind of bracing makes it possible to undertake the excavation of huge enclosures in an exceedingly sort of geometries. The excavation remains completely freed from obstacles, enabling the optimum performance of the work to be allotted in its interior.

Piles, or sheeting, driven in close contact to create endless interlocking wall which resists the lateral pressure of water or earth. during this method, the steel sheath pile is driven round the boundary of the proposed excavations. a nonstop line of pile is driven earlier of excavation. because the soil is excavated from the enclosure Wales and struts are placed.

Figure 3.12: Braced sheet pile to undertaking deep excavation.

The Wales are made from the steel. The lateral thrust from the perimeters is resisted by horizontal members called the struts are placed across the excavation and wedged against the wales. The struts are also of the steel or wood. because the excavations progress, another set of wales and struts is inserted. the method is sustained till the excavation is complete. it's recommended that the sheet piles should be driven several meters below the underside of excavation to forestall local heaves. If the width of a deep excavation is large, inclined bracing could also be used. Figure 3.4.5 shows the main points of the joint J.

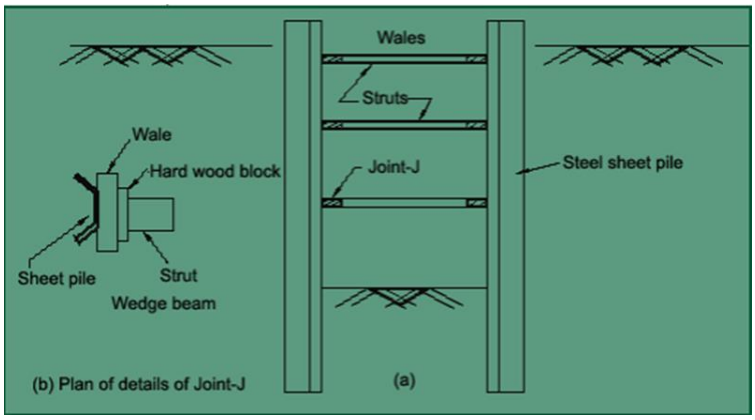

Figure 3.13: Main points of the joint J.

Source: Coursehero.com. https://www.coursehero.com/file/11249758/Lecture-module-30/

The upper strut is placed when the excavation is shallow and tiny lateral yield of soil has occurred to vary appreciably the first state of stress. As excavation proceeds downward the lower a part of the face is freely to yield inward before it may be restrained by the following strut. The inward yield of soil increase with a

rise within the depth of excavation. Thus, problem is analogues to a wall tilting about its top. The sheeting tilts about its tops.

3.5 To Identify Problem Faced During Construction

There are many problems encountered during the construction of sluice gate buildings carried out such as:

1	The road roller's engine fails to start and it took 30 minutes to start and this problem caused delay to compact the premix coat. This problem faced every time the engine needs to start and need mechanics to repair the failure. The maintenance took 2 hours and bring the compaction of premix coat till late evening until compaction work done.
2	Materials late delivered also one of problem faced by contractor from supplier. Premix coat's supplier late to deliver the material and the process of premix coat delay for 1 day.
3	Insufficient material such as premix coat caused delay to finish the work. This is because the supplier told the contractor that the material is enough but when the premix coat arrived, premix work cannot be done because need another 5 tons more to finish the work. The deliver process took 30 minutes because the supplier's factory is far from the site.
4	The piling work delay due to blocked by big old concrete under the water so that the piling work need to postpone first for removing old concrete work that need to be done early.

CHAPTER 4.0

CONCLUSION

In conclusion, sluice gate building is important to control tidal drainage on land and sea to prevent water from overflowing to land and avoid flooding. The building construction project started by building a temporary road for the use of heavy machinery in and out of the construction site for a long period of time. The temporary road access method has 2 layers which is prime coat and premix coat. The size of the premix coat is 20mm and 14mm. Next, the installation of sheet piles and types used for the construction of sluice buildings to keep water ingress to a safe level that can be pumped away.

This construction process takes about 2 years starting from 8 December 2020 to 7 December 2022. The construction of the sheet pile installation was delayed for several days because of the weather as well as movement control orders during pandemics Covid-19. Therefore, it took 2 years to complete the construction.

In addition, problems that arise during construction such as the piling work delay due to blocked by big old concrete under the water so that the piling work need to postpone first for removing old concrete work that need to be done early.

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